

Stormwater Management Report



Project: 48 Grenoble Drive

Tenblock

Application No: 22 127124 NNY 16 SA

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Identification	Date	Description of issued and/or revision
FSR/SWM Report	March 18 th , 2022	Issued for Zoning and Site Plan Application
FSR/SWM Report	February 13 th , 2023	Issued for Site Plan Application

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Executive Summary

Lithos Group Inc. (Lithos) was retained by Tenblock (the “Owner”) to prepare a Stormwater Management (SWM) Report in support of Zoning and Site Plan Application for a proposed residential development at 48 Grenoble Drive, in the City of Toronto (the “City”). The following is a summary of our conclusions:

Storm Drainage

The site stormwater discharge will be controlled to the 2-year pre-development flow and will be connected to the proposed 300mm diameter storm sewer on Grenoble Drive. In order to attain the target flows and meet the City’s Wet Weather Flow Management Guidelines (WWFMG), quantity controls will be utilized and up to 174.37 m³ on-site storage will be required for the proposed residential development. The stormwater management (SWM) system will be designed to provide enhanced level (Level 1) protection as specified by the Ministry of Environment, Conservation and Parks (MECP). Quality control will be provided for the subject site for a minimum total suspended solids (TSS) removal of 80%.

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1.0 Introduction

Lithos Group Inc. (Lithos) was retained by Tenblock (the “Owner”) to prepare a Stormwater Management (SWM) Report in support of Zoning and Site Plan Applications for a proposed residential use development at 48 Grenoble Drive (M3C 1C8), in the City of Toronto (City).

The purpose of this report is to provide site-specific information for the City’s review with respect to infrastructure, required to support the proposed development. More specifically, the report will present details stormwater management drainage.

We contacted the City’s engineering department to obtain existing information in preparation of this report. The following documents were available for our review:

- Plan and profile drawings of Deauville Lane, from Grenoble Drive to Rochefort Drive, drawing No. D-186-01, dated October, 1959;
- Plan and profile drawings of Easement, from Grenoble Drive to St. Dennis Drive, drawing No. SA-58-R-01, dated January, 1967;
- Plan and profile drawings of Grenoble Drive, from Gateway Boulevard to Deauville Lane, drawing No. G-113-03, January, 1967;
- Plan and profile drawings of Gateway Boulevard, drawing No. ST-391-R, February, 1967;
- Toronto CU Maps of Grenoble Drive and Deauville Lane;
- Site Plan prepared by Diamond Schmitt Architects, dated February 8, 2023;
- Site Statistics prepared by Diamond Schmitt Architects, dated February 8, 2023;
- Survey Plan prepared by R. AVIS SURVEYING INC., dated August 4, 2021.

2.0 Site Description

The existing site is approximately 6,749 m² (0.675 hectares). It is currently occupied by a residential development and by outdoor parking area. The site is bound by a residential development to the north, Deauville Lane to the east, Grenoble Drive to the south and Parkland to the west. Refer to **Figures 1 and 2** following this report and site photographs in **Appendix A**.

The entire City was deemed as an area of basement flooding. As shown in the updated map, included in **Appendix B**, Environmental Assessment (EA) Studies are being performed across the City of Toronto, separated in areas. According to the “*Current Basement Flooding Investigation Environmental Assessment Studies*” for the City of Toronto found online, the site is located in area 55 into which, EA study is in progress .

3.0 Site Proposal

The proposed development will be comprised by:

- A residential high-rise development; and,
- Parkland area to be dedicated to the City.

The proposed development will consist of a 6-storey podium with two (2) high-rise, 39-storey towers, supporting residential use.

It will consist of 966 residential units and will be facilitated by two (2) levels of underground parking.

The existing site is approximately 0.675 hectares. In addition, under post-development conditions, approximately 0.068 ha will be conveyed to the City for parkland dedication; therefore, the proposed site area will be 0.607 ha. The total development will be approximately 67,811 m² of Gross Floor Area (GFA). Please refer to **Appendix B** for the proposed site plan and statistics.

4.0 Terms of Reference and Methodology

4.1. Terms of Reference

The Terms of Reference used for the scope of this report were based on the City's Sewer Capacity Assessment Guidelines, July 2021, the January 2021 Second Edition of the City of Toronto Design Criteria for Sewers and Watermains and the November 2006 Wet Weather Flow Management Guidelines (WWFMG).

All erosion and sediment control BMP's shall be designed, constructed and maintained in all development sites in accordance with the GTA CA's Erosion and Sediment Control Guidelines for Urban Construction (2005) and/or other City of Toronto requirements on a site-by-site basis.

4.2. Methodology: Stormwater Drainage and Management

This report provides a detailed Stormwater Management (SWM) review of the pre-development and post-development conditions and comments on opportunities to reduce peak flows. This is illustrated on a proposed servicing connection plan. Other requirements set by the WWFMG will also be discussed.

The proposed development will be designed to meet the City's WWFMG and the standards of the Province of Ontario as set out in the Ministry of Environment, Conservation and Parks (MECP) 2003 Stormwater Management Planning and Design Manual (SWMPD). The following design criteria will be reviewed:

- Post-development peak flow for the 100-year storm event from the site will be controlled to the two (2)-year target flow;
- A specified rainfall depth of 5 mm is to be retained on-site, as required by the WWFMG; and,
- A safe overland flow will be provided for all flows in excess of the 100-year storm event.

5.0 Stormwater Management and Drainage

5.1. Existing Conditions

According to available records, there are three (3) existing storm sewers abutting the subject property. More specifically, there is:

- A 300 mm diameter storm sewer on Grenoble Drive, flowing west;
- A 375 mm diameter storm sewer within the parkland area, flowing south; and
- A 450 mm diameter storm sewer on Deauville Lane, flowing north.

Residential Development

Following an investigation (please refer to 'Site Investigation And Dye Test Report' prepared by Lithos Group dated November 1st, 2022 in [Appendix B](#)), it was discovered that storm runoff from the existing building located at 48 Grenoble Drive is directed towards the storm sewer networks at Grenoble Drive, Deauville Lane and the existing Easement located at the west side of the site. Refer to drainage figure [DAP-1](#) in [Appendix C](#).

Furthermore, our investigation showed that the existing storm service connection from the existing building, is to the existing 375 mm diameter storm sewer, along the existing Easement located at the west side of the site.

All existing storm services will be removed from the right-of-way and capped at the City's main and this work is to be performed by City forces at the Owner's expense. Lastly, there is no overland external storm flow towards our site under pre-development conditions.

Parkland Dedication

The existing Park and future Parkland Dedication is located at the western portion of the site. As mentioned above, storm runoff from that area flows overland uncontrolled towards the City's storm sewer networks at Grenoble Drive and the existing Easement.

The existing run-off coefficients are estimated based on the infiltration of the area as well as the City's WWFMG guidelines. [Table 5-1](#) shows the input parameters which are illustrated on the pre-development drainage area plan in [Figure DAP-1](#) in [Appendix C](#).

Table 5-1 – Target Input Parameters

Catchment	Drainage Area (ha)	Design "C"	Tc (min.)
A1 Pre – towards Grenoble Drive	0.269	0.43	10
A2 Pre – towards Easement	0.394	0.50	10
A3 Pre – towards Deauville Lane	0.012	0.50	10

Peak flows calculated for the existing conditions are shown in [Table 5-2](#) below. Detailed calculations are in [Appendix C](#).

Table 5-2 – Target Peak Flows

Catchment	Peak Flow Rational Method (L/s)		
	2-year	5-year	100-year
A1 Pre – towards Grenoble Drive	28.4	42.4	80.5
A2 Pre – towards Easement	48.2	72.1	136.9
A3 Pre – towards Deauville Lane	1.5	2.2	4.2

As shown in [Table 5-2](#), post-development flows towards Grenoble Drive and towards the Easement will need to be controlled to the target flow of 28.4 L/s and 48.2 L/s respectively. Furthermore, there will be no storm runoff towards Deauville Lane under post-development conditions, up to a 100-year storm event.

5.2. Stormwater Management

In order to meet the WWFMG criteria, the post development flow rate from the subject site is to be controlled to the two (2)-year target flow established in [Section 4.2](#). The site consists of five (5) internal drainage areas:

1. A1 Post – Storm runoff from the green roof, controlled into the underground storage tank;
2. A2 Post – Storm runoff from the rooftop/terraces/walkways, controlled into the underground storage tank;
3. A3 Post – Storm runoff from driveway directed into the treatment device and then controlled into the underground storage tank;
4. A4 Post – Storm runoff from landscape surfaces, controlled into the underground storage tank; and,
5. A5 Post – Storm runoff from the Parkland Dedication. Storm flow will be conveyed, either directly through an internal swarers network or overland, towards the sewer network at the easement area.

The post-development drainage areas and runoff coefficients are indicated on [Figure DAP-2](#), located in [Appendix C](#) and summarized in [Table 5-3](#) below.

Table 5-3 – Post-development Input Parameters

Drainage Area	Drainage Area (ha)	"C"	Tc (min.)
A1 Post - Green Roof (Controlled in Tank)	0.118	0.45	10
A2 Post - Rooftop/Terraces/walkways (Controlled in Tank)	0.368	0.90	10
A4 Post - Driveway (Controlled in Tank)	0.028	0.90	10
A4 Post - Landscape (Controlled in Tank)	0.093	0.25	10
A5 Post- Parkland Dedication	0.068	0.50	10

5.2.1. Water Balance

Residential Development

Based on the "[Water Balance Calculations](#)" found in [Appendix C](#), the site will provide 14.51m³ of initial abstraction in post-development conditions. The remaining 15.85m³ will be provided within the main stormwater storage tank and will be used to service the proposed development through irrigation of the green roof. A pumping system (details of which will be provided by the mechanical engineer) will be implemented to facilitate the proposed irrigation design of the proposed development.

According to the irrigation calculations, provided by "Studio TLA", dated February 6, 2023, found in [Appendix B](#), the landscape water requirement within 72-hours is estimated at 22.58 m³. The results of the water balance analysis are summarized in [Table 5.4](#) below.

Table 5-4 – Post-development Input Parameters

Total Site Area (m ²)	Depth of Rainfall (mm)	Water Balance Requirement (m ³)	Water Balance Provided through Initial Abstraction (m ³)	Water Balance Provided in the Underground Tank (m ³)	Total Water Balance Volume Provided (m ³)
6,073	5.0	30.37	14.51	16.32	30.83

Parkland Dedication

The parkland dedication area will be designed to be composed exclusively by soft scape areas , thus it will meet the water balance requirement.

5.2.2. Quantity Controls

As mentioned in **Section 5.1** storm runoff from the existing property drains towards three (3) storm sewer networks. Due to the fact that storm runoff, up to a 100-year storm event, will not drain towards the Deauville Lane under post-development conditions, a quantity control analysis will not be required. Therefore, a quantity control analysis has been prepared for each storm network adjacent to the site in order to assess the pre to post development impacts on each network.

5.2.2.1 Post-development flows towards Grenoble Drive

Using the City's intensity-duration-frequency (IDF) data, modified rational method calculations were undertaken to determine the maximum storage required during each storm event. Results for the 2, 5 and 100-year storm events are provided in **Table 5-5**. The detailed post-development quantity control calculations are provided in **Appendix C**.

Table 5-5 – Post-development Quantity Control as per City Requirements (towards Grenoble Drive)

Site	Storm Event	Target Flow (L/s)	Required Storage Volume (m ³)	Total Controlled Release Rate of the Tank (L/s)
48 Grenoble Drive	2-year	28.4	46.57	28.4
	5-year		78.03	
	100-year		174.37	

As shown in **Table 5-5**, in order to control post-development flows to 2-year pre-development conditions, a target flow of 28.4 L/s is to be satisfied. The required on-site storage is accommodated by an underground storage tank located at P2 level.

Storm water from the driveway will be gravity driven towards the treatment device (Stormfilter SFPD 0608), before being discharged into the underground storage tank. Please refer to "**Site Servicing Plan**" (**SS-01**), submitted separately.

The stormwater flow released from the green roof, the rooftops, walkways and landscaped surfaces (**Drainage Areas A1 Post**, **A2 Post** and **A4 Post**), will be gravity driven into the proposed underground storage tank at P2 level. The 100-year storm yielded an underground storage tank of 74.20m².

Due to the fact that the underground storage tank located at P2 level which is lower from the municipal storm sewer in the right-of-way, a gravity SWM system would not be feasible. Therefore, storm runoff will be pumped towards the control maintenance hole and then through gravity towards the City storm sewer network.

Underground Storage Tank

An underground storage tank is proposed to meet the quantity control requirements set forth by the City's WWFMG.

Stormwater from the green roof (**A1 Post**), rooftop/terraces/walkways (**A2 Post**), driveway area (**A3 Post**) and landscaped area (**A4 Post**) and will be gravity driven into the underground storage tank. The **Drainage Area A3 Post** will be driven to the treatment device before being discharged into the underground storage tank.

The 100-year storm yielded an underground storage tank capable to store up to 174.37 m³, which will be pumped into the proposed controlled maintenance hole, with a maximum release rate of 28.4 L/s achieved, ultimately reaching the Town's infrastructure by gravity.

The underground storage tank will have a minimum storage of 190.69 m³ and a minimum storage depth of 2.57 m (2.35 m of active storage depth tank accounting for a quantity control maximum storage of 174.37 m³, and another 0.22 m accounting for 16.32 m³ of storage for Water Balance purposes), during the hundred-year storm event. The pump inlet from the underground storage will be installed 0.27 m above the bottom of the tank and will discharge stormwater at a flow rate of 28.4 L/s into the control. Additional details of the storage tank design will also be provided by the mechanical engineer. Tank configuration may also be found in **Figure 3, Appendix C**.

We recommend that a pumping system (designed by the mechanical engineer) discharging at least 28.4 L/s should be installed to accommodate the pumping needs. In case of a power blackout, a secondary (diesel) pumping system will be activated.

In case of pumping system failure, the proposed pump operates as a control valve, preventing any storm runoff discharging into the gravity fed system. Furthermore, backflow preventors will be implemented on all inlets of the proposed underground storage. Therefore, storm runoff overflow will ensue from the tank's access hatch and will be directed to Grenoble Drive.

5.2.2.2 Post-development flows towards Easement

Using the City's intensity-duration-frequency (IDF) data, modified rational method calculations were undertaken to determine the maximum storage required during each storm event. Results for the 2, 5 and 100-year storm events are provided in **Table 5-6**. The detailed post-development quantity control calculations are provided in **Appendix C**.

Table 5-6 – Post-development Quantity Control as per City Requirements (towards Easement)

Site	Storm Event	Target Flow (L/s)	Post-development Uncontrolled Flow (L/s)
Parkland Dedication	2-year	48.2	8.3
	5-year		12.4
	100-year		23.5

As shown on **Table 5-6**, under post-development conditions, uncontrolled flow towards the Easement during a 100-year storm event is smaller than the two (2)-year pre-development target flow, therefore, no stormwater storage is required and the existing storm infrastructure along the Easement will not be negatively affected by the proposed Parkland dedication.

5.2.3 Quality Controls

For MECP Enhanced Level protection, the removal of 80% total suspended solids (TSS) is required. Stormwater, discharged from the areas that will not be polluted by car waste, is considered "clean" and will be driven to the underground tank.

Car waste polluted water from the driveway, captured by the proposed trench drain #2 will be driven into the manufactured treatment device (Stormfilter SFPD 0608 with three (3) 12in cartridges), before being discharged into the underground storage tank. Therefore, polluted stormwater will be “cleaned” prior being discharged into the City’s storm sewer network. The detailed quality control calculations and Proposed manufactured treatment device can be found in **Appendix C**. A summary of the site quality control is included in **Table 5-7** below.

Table 5-7 – Site TSS Removal

Drainage Area	Drainage Area (ha)	Overall TSS Removal	Additional Quality Control Required
Rooftop / Terraces / Green Roof/ Walkways / Hardscape Areas	0.579	76%	Inherent
Driveway / Landscape Areas	0.028	4%	Stormfilter SFPD 0608
Total	0.607	80%	

5.3 Proposed Storm Connection

Residential Development

The storm sewer system for the residential development will be designed to meet the City’s requirements and discharge into the existing 300 mm diameter storm on Grenoble Drive via a 200 mm diameter storm lateral connection with a minimum grade of 2.00% (or equivalent design).

The engineering drawing (refer to “**Site Servicing Plan**” (SS-01), submitted separately), indicates the stormwater service connection.

Parkland Dedication

The proposed SWM plan in conjunction with the proposed grading and servicing, retains enough runoff volume to reduce the post-development flows below the pre-development target flows for each storm event. Consequently, no stormwater storage will be required for the Parkland Dedication portion of the site.

The storm sewer system for the Parkland Dedication will discharge into the existing 375 mm diameter storm along the Easement at the west side of the site, via a 150 mm diameter storm lateral connection with a minimum grade of 2.00% (or equivalent design).

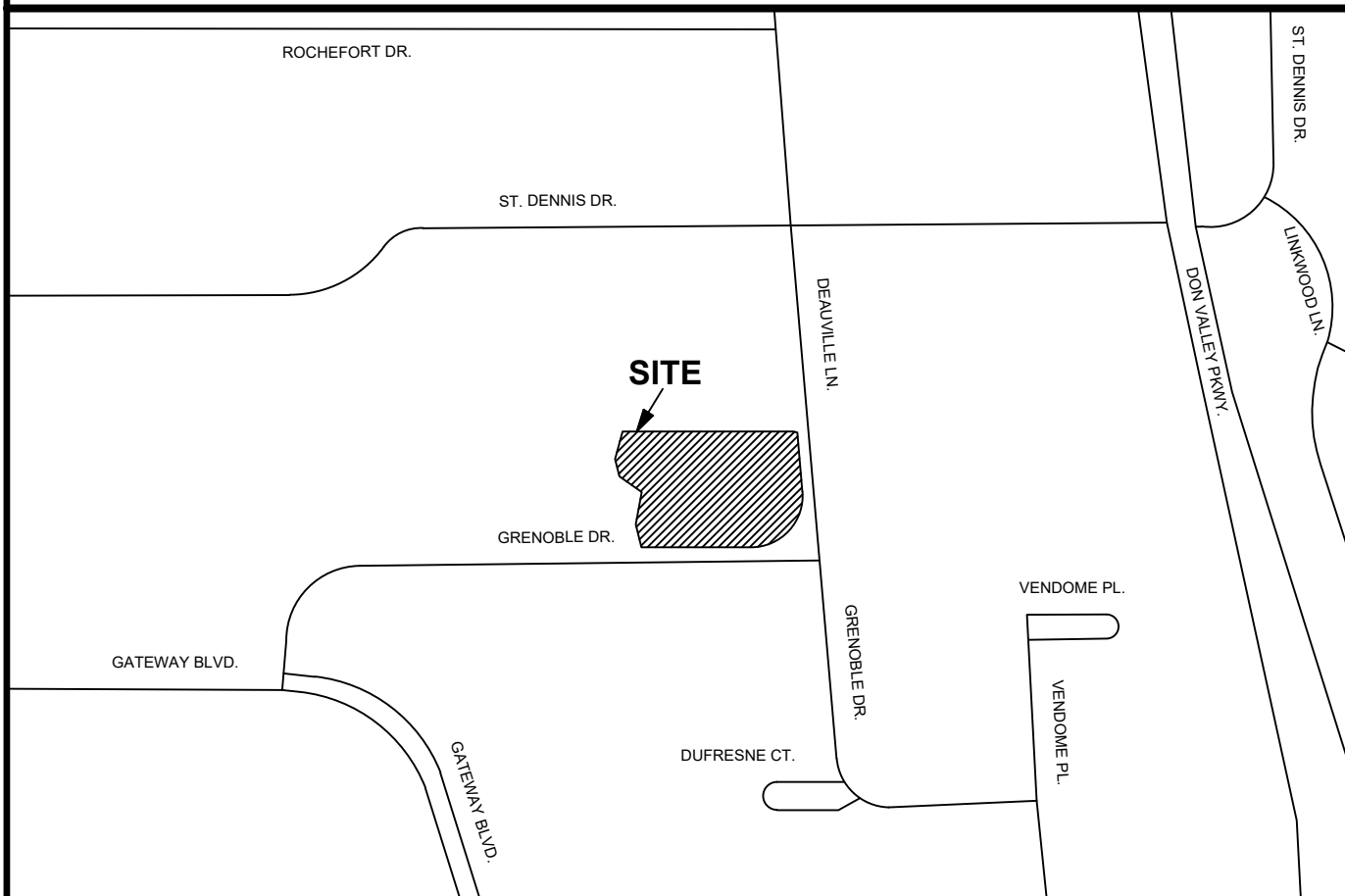
6.0 Conclusions and Recommendations

Based on our investigations, we conclude the following:

Storm Drainage

The site stormwater discharge will be controlled to the 2-year pre-development flow and will be connected to the proposed 300mm diameter storm sewer on Grenoble Drive.

In order to attain the target flows and meet the City’s Wet Weather Flow Management Guidelines (WWFMG), quantity controls will be utilized and up to 174.37 m³ on-site storage will be required for the proposed residential development. The stormwater management (SWM) system will be designed to provide enhanced level (Level 1) protection as specified by the Ministry of Environment, Conservation and Parks (MECP). Quality control will be provided for the subject site for a minimum total suspended solids (TSS) removal of 80%.



150 Bermondsey Road, Toronto, Ontario M4A 1Y1

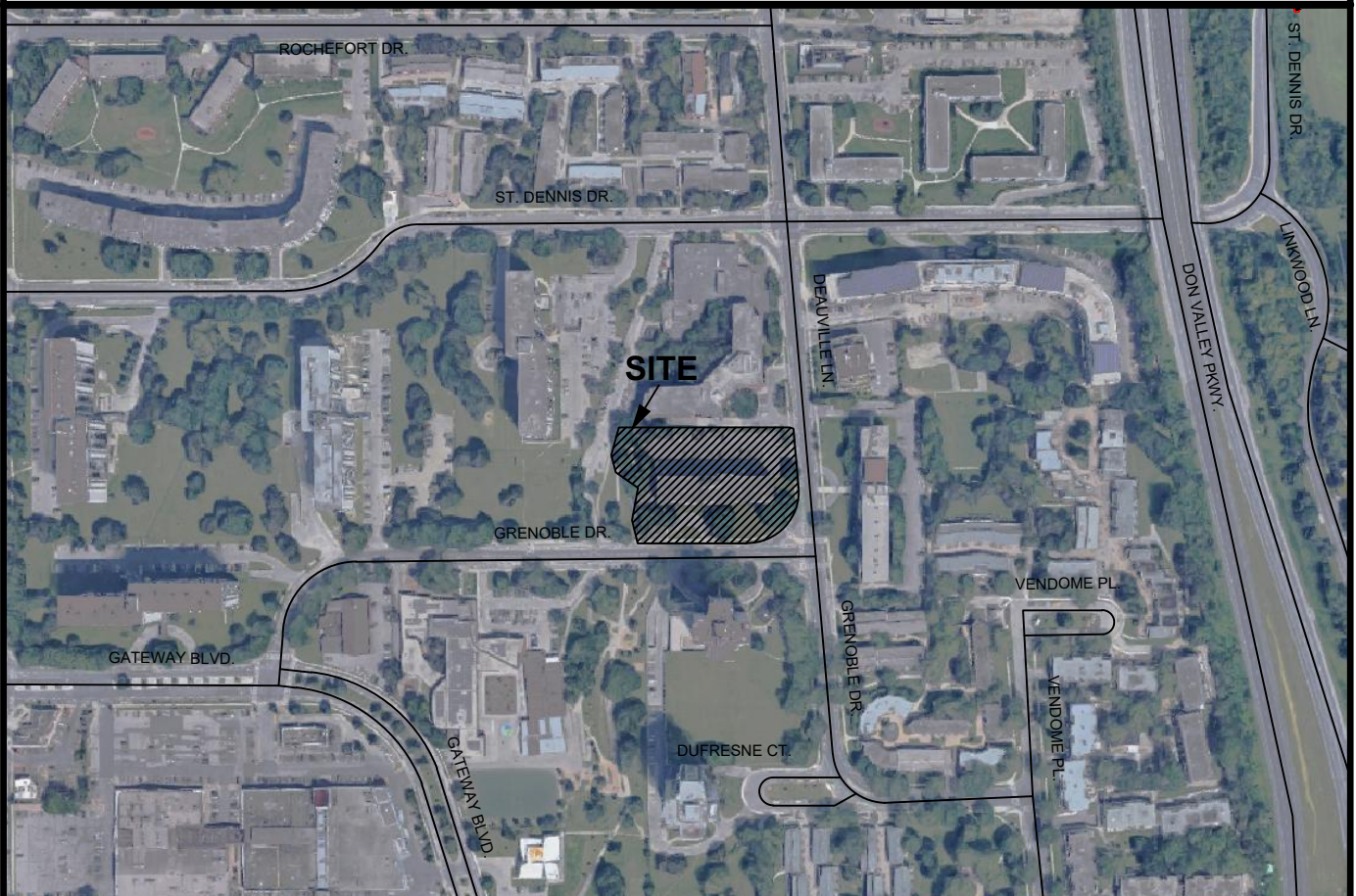
LOCATION PLAN
RESIDENTIAL USE DEVELOPMENT
48 GRENABLE DRIVE
TORONTO, ONTARIO

DATE: FEBRUARY 2023

SCALE: N.T.S.

PROJECT No: PUD21-110

FIGURE No: FIG 1



AERIAL PLAN
RESIDENTIAL USE DEVELOPMENT
48 GRENABLE DRIVE
TORONTO, ONTARIO

150 Bermondsey Road, Toronto, Ontario M4A 1Y1

DATE: FEBRUARY 2023

SCALE: N.T.S.

PROJECT No: PUD21-110

FIGURE No: FIG 2

Appendix A

Site Photographs



North East Corner of Property along Deauville Lane – Facing South West



South West Corner along Grenoble Drive – Facing North East



South East Corner along Grenoble Drive – Facing North West

Appendix B

Background Information

PLAN OF SURVEY OF
PART OF BLOCK G2
REGISTERED PLAN M-834
CITY OF TORONTO

SCALE 1 : 250

R. AVIS SURVEYING INC.

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

© COPYRIGHT: "NO PERSON MAY COPY, REPRODUCE, DISTRIBUTE OR ALTER THIS PLAN IN WHOLE OR IN PART WITHOUT THE WRITTEN PERMISSION OF R. AVIS, O.L.S."

NOTES AND LEGEND

BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE DERIVED FROM OBSERVE REFERENCE POINTS (S) AND (B) HAVING A BEARING OF N15°41'52" E BY REAL TIME NETWORK (RTN) OBSERVATION, ZONE 10, CENTRAL MERIDIAN 79° 30' WEST LONGITUDE
(1) MODIFIED TRANSVERSE MERCATOR PROJECTION, NAD 83 (CSRS-2010)

3' MTM ZONE 10 COORDINATES		
NAD83(CSRS-2010) (CENTRAL MERIDIAN 79°30' WEST LONGITUDE)		
	NORTHING	EASTING
A	4841837.355	318364.595
B	4841857.513	318425.919
C	4841898.285	318444.610
D	4841930.651	318430.958

- DENOTES SURVEY MONUMENT FOUND
 - RB DENOTES SURVEY MONUMENT PLANTED
 - SB DENOTES ROUND IRON BAR
 - IB DENOTES STANDARD IRON BAR
 - WT DENOTES WITNESS
 - W(1042) DENOTES EDWARDS & GUNN LIMITED
 - (OU) DENOTES ORIGIN UNKNOWN
 - MEAS/N DENOTES MEASURED
 - N,S,E,W DENOTES NORTH, SOUTH, EAST, WEST
 - RP DENOTES REGISTERED PLAN M-834
 - P1 DENOTES SURVEYOR'S REAL PROPERTY REPORT BY P.SALNA COMPANY LTD., O.L.S. DATED OCTOBER 08, 2001
 - P2 DENOTES PLAN 66R-11956
 - BD DENOTES BRICK
 - BRW DENOTES BRICK RETAINING WALL
 - BF DENOTES BOARD FENCE
 - CLF DENOTES CHAIN LINK FENCE
 - CONC. DENOTES CONCRETE
 - CB DENOTES CONCRETE
 - FI DENOTES FIRE HYDRANT
 - GM DENOTES GAS METER
 - C DENOTES COLUMN
 - LS DENOTES LIGHT STANDARD
 - MM DENOTES MANHOLE
 - TS DENOTES TRAFFIC SIGN
 - TR DENOTES TRANSFORMER
 - (T) DENOTES TOP OF CURB
 - (B) DENOTES BOTTOM OF CURB
 - (G) DENOTES GUTTER
 - AV DENOTES AIR VENT
 - ICV DENOTES IRRIGATION CONTROL VALVE
 - SAN DENOTES SANITARY
 - PED DENOTES PEDIESTAL
 - DENOTES OVERHEAD WIRE
- 0.100 DENOTES CONIFEROUS TREE WITH TRUNK DIAMETER 0.10 metres
- 0.050 DENOTES DECIDUOUS TREE WITH TRUNK DIAMETER 0.10 metres
- DENOTES SPOT ELEVATION

AREA = 6748.9 sq. m.

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.

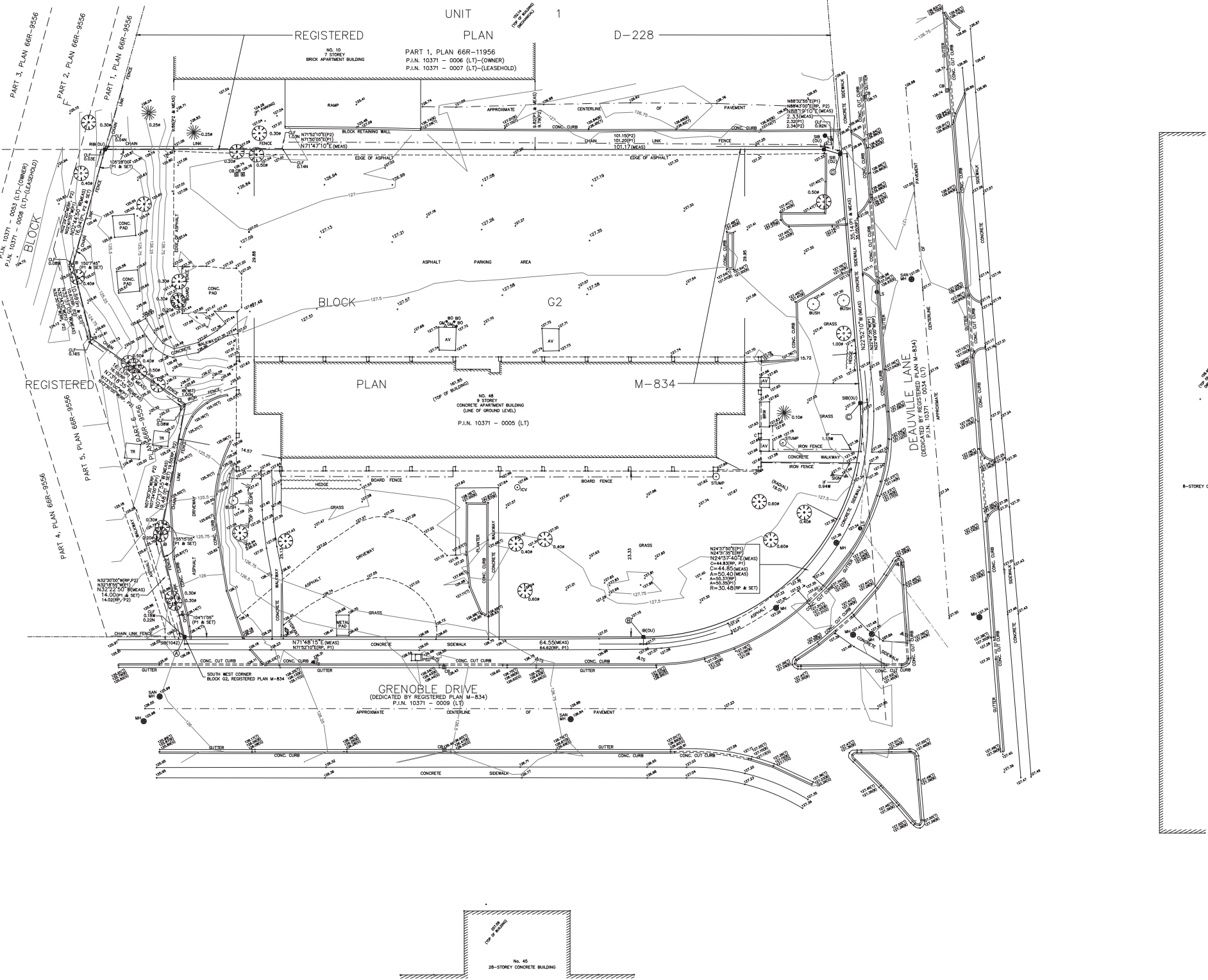
2. THE SURVEY WAS COMPLETED ON THE 4th DAY OF AUGUST, 2021

AUGUST 5, 2021
DATE

PIRATHEEPAN RAMACHANDRAN
Ontario Land Surveyor

R. AVIS SURVEYING INC.
SUITE 203
235 YORKLAND BOULEVARD
TORONTO, ONTARIO
M2J 4Y8
TEL: (416) 490-8352 FAX: (416) 491-8206
www.ravissurveying.com

CHECKED BY : P.R. O.L.S.	PROJECT No. : 3487-0
CALCULATED BY : .B	DRAWING No. : 3487-0T
DRAWN BY : .B	



1.0 SUMMARY			
SITE AREA	6,749	m ²	
TOTAL GFA	67,811	m ²	
FSI	10.0		

RENTAL REPLACEMENT UNITS	109
NET NEW AFFORDABLE RENTAL	1
NEW RESIDENTIAL UNITS	856
TOTAL RESIDENTIAL UNITS	965

2.0 BUILDING HEIGHT			
WEST TOWER		EAST TOWER	
Tower:	128.8m	Tower:	128.8m
MPH:	7m	MPH:	7m
TOTAL:	135.8m	TOTAL:	135.8m

3.0 FLOOR AREA															
Level	# of Levels	GCA/Level	Total GCA	Res GFA*	Amenity (Ext)	Amenity (Int)	Deductions	Non-Res GFA	Total GFA						
		m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²
P2	1	5,620	60,493	5,620	60,493	-	-	-	-	5,620	60,493	-	-	-	-
P1	1	5,272	56,747	5,272	56,747	-	-	-	-	5,272	56,747	-	-	-	-
TOTALS	2		10,882	117,240	-	-	-	-	-	10,882	117,240	-	-	-	-

WEST TOWER (L7-MPH)															
7 - Amenity	1	790	8,504	790	8,504	61	657	808	8,897	669	7,201	60	646	-	-
8 to 39	32	790	8,504	25,280	272,111	23,568	253,684	-	-	-	-	54	576	-	-
MPH	1	790	8,504	40	431	-	-	-	-	-	-	-	-	23,568	253,684
TOTALS	34		26,860	288,116	23,669	254,771	808	8,897	669	7,201	864	9,265	-	-	23,669

EAST TOWER (L7-MPH)															
7 - Amenity	1	790	8,504	790	8,504	61	657	808	8,897	669	7,201	60	646	-	-
8 to 39	32	790	8,504	25,280	272,111	23,568	253,684	-	-	-	-	54	576	-	-
MPH	1	790	8,504	40	431	-	-	-	-	-	-	-	-	23,568	253,684
TOTALS	34		26,860	288,116	23,669	254,771	808	8,897	669	7,201	864	9,265	-	-	23,669

PODIUM (L1-6)															
Lower TH	1	482	5,188	482	5,188	408	4,392	0	-	-	-	74	797	-	-
1	1	3,285	35,360	3,285	35,360	2,019	21,732	432	4,660	510	5,490	148	1,589	208	2,239
M	1	3,285	35,360	3,285	35,360	1,838	19,784	-	-	127	1,367	1,220	14,258	-	1,838
2	1	3,335	35,898	3,335	35,898	3,200	34,445	-	-	-	-	135	1,453	-	3,200
3	1	3,335	35,898	3,335	35,898	3,200	34,445	-	-	-	-	135	1,453	-	3,200
4	1	3,335	35,898	3,335	35,898	3,200	34,445	-	-	-	-	135	1,453	-	3,200
5	1	3,335	35,898	3,335	35,898	3,200	34,445	-	-	-	-	135	1,453	-	3,200
6	1	3,335	35,898	3,335	35,898	3,200	34,445	-	-	-	-	135	1,453	-	3,200
TOTALS	5		23,727	255,596	20,265	216,131	432	4,660	637	6,857	2,617	28,169	208	2,239	20,473

GRAND TOTAL															
		m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²	m ²
		88,339	950,872	67,603	727,872	2,048	22,045	1,875	21,259	15,236	163,999	208	2,239	67,811	729,911

*GFA exemption as per By-Law 569-2012

4.0 AMENITY						
Total units	Exterior	Exterior unit	Interior	Interior unit		
	m ²	m ²	m ²	m ²		
WEST TOWER	384	808	6,897	2,10	669	7,201
EAST TOWER	384	808	6,897	2,10	669	7,201
PODIUM	188	432	4,650	2,18	637	6,857
TOTALS	956	2,048	22,045	2,12	1,875	21,259

5.0 PARKING											
Residential Car Parking				Visitor Car Parking				Total Car Parking		Bicycle Parking	
Level	Regular	BF	Total	Regular	Car Share	BF	Pick-up/Drop-off	Total	Long-Term	Short-Term	Total
P1	45	2	51	5	4	2	-	11	82	918	918
P2	134	4	138	-	-	-	-	-	138	-	138
4	-	-	-	-	-	-	2	2	-	194	194
TOTALS	183	6	188	5	4	2	2	13	202	918	1112

BF = BARRIER FREE
Vehicle Parking Rate achieved 0.21
Visitors Vehicle Parking 0.01
Resident Vehicle Parking 0.20

6.0 STORAGE		Storage (m ³)
WEST BUILDING		0
EAST BUILDING		0
PODIUM		980.2
TOTAL		980.2

7.0 LOADING			
Level	Count	Type	
1	1	Type C Loading	
1	1	Type C Loading	

8.0 WASTE		
Level	Type	Area (m ²)
1	Bulky Storage	10
1	Garbage Room	175

WEST BUILDING		
1	Bulky Storage	10
1	Garbage Room	175
TOTAL		285

EAST BUILDING		
1	Bulky Storage	10
1	Garbage Room	175
TOTAL		285

UNIT DISTRIBUTION

NEW RESIDENTIAL					
Level	1B	1B+D	2B	3B	Total
WEST TOWER (L7-39)					
8-39 per level	4	4	3	1	12
8-39 Total	128	128	96	32	384
TOTALS	128	128	96	32	384

EAST TOWER (L7-39)					
8-39 per level	4	4	3	1	12
8-39 Total	128	128	96	32	384
TOTALS	128	128	96	32	384

MARKET UNITS AT PODIUM (L1-6)					
1	0	0	0	0	0
M	0	1	0	2	3
2	1	5	0	6	17
3	1	5	0	6	17
4	1	5	0	6	17
5	1	5	0	6	17
6	1	5	0	6	17
TOTALS	5	26	20	32	63

TOTAL NEW RES UNITS (East, West Tower & Podium)					
TOTALS	355	216	217	96	884
	38%	23%	23%	11%	
18	18-D	28	38		
Avg sq m	40	50	83	53	
Avg sq ft	434	538	891	569	
Range sq ft	411-544	564-655	647-838	825-1037	

RENTAL REPLACEMENT AT PODIUM (L1-6)											
1	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	0	0	0	0	0	0	0

NEW NET AFFORDABLE RENTAL UNITS AT PODIUM (L1-6)											
1	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	0	0	0	0	0	0	0

GRAND TOTAL					
18	18-D	28	38		
374	216	217	96		905

The Green Roof Statistics Template is required to be submitted for Site Plan Control Applications where a green roof is required under the Toronto Municipal Code Chapter 492, Green Roofs. Complete the table below and copy it directly onto the Roof Plan submitted as part of any Site Plan Control Application requiring a green roof in accordance with the By-Law. Refer to Section 4.402.1 of the Municipal Code for a complete list of defined terms, and greater clarity and certainty regarding the intent and application of the terms included in the template. The Toronto Municipal Code Chapter 492, Green Roofs can be found online at: http://www.toronto.ca/development/code/118_492.pdf

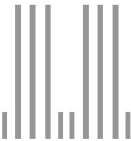
Green Roof Statistics

Green Roof Statistics		Required	Proposed
Gross Floor Area, as defined in Green Roof Bylaw (m ²)			81,182
Total Roof Area (m ²)			388
Area of Residential Private Terraces (m ²)			0
Roof-top Outdoor Amenity Space, if in a Residential Building (m ²)			0
Area of Renewable Energy Devices (m ²)			0
Tower (a) Roof Area with floor plate less than 750 m ²			0
Total Available Roof Space (m ²)			388
Coverage of Available Roof Space (m ²)		Required	Proposed
Coverage of Available Roof Space (%)		60%	60%

No.	Date	Description
1	03/18/2023	ISSUED FOR ZBA/SPA
2	02/08/2023	ISSUED FOR ZBA/SPAD

Bird-Friendly Design Statistics

Elevation First 16m* Above Grade						
	North	South	East	West	Total (m ²)	Total (%)
Glazing Area (m ²)	722	884	422	673	2699	100%
Untreated Area (m ²)	0	0	0	0	0	0
Treated Area (m ²)	722	884	422	673	2699	100%
Low-Reflectance	0	0	0	0	0	0
Opaque Glass (m ²)	0	0	0	0	0	0
Visual Markers (m ²)	722	884	422	673	2699	100%
Shaded (m ²)	0	0	0	0	0	0
*For Site Plan Approval applications received before January 1, 2020, treat the first 12m above grade.						
Elevation First 12m Above Rooftop Vegetation*						
	North (Floor 7)	South (Floor 7)	East (Floor 7)	West (Floor 7)	Total (m ²)	Total (%)
Glazing Area (m ²)	138	88	81	98	405	100%
Untreated Area (m ²)	0	0	0	0	0	



No.	Date	Description
1	09/18/2022	ISSUED FOR ZBA/SPA
2	02/08/2023	ISSUED FOR ZBA2/SPAD

ISSUED

NOTES

1. COLLECTION VEHICLE ACCESS DRIVEWAY TO BE LEVELLED TO EXIST. MARK EX.
2. A TRAINED ON-SITE STAFF MEMBER WILL BE AVAILABLE TO MANEUVER BINS FOR THE CITY COLLECTION DRIVER AND ALSO ACT AS A SPOTTER WHEN THE TRUCK IS REVERSING. IN THE EVENT THAT ON-SITE STAFF IS UNAVAILABLE AT THE TIME THE CITY COLLECTION VEHICLE ARRIVES AT THE SITE, THE COLLECTION VEHICLE WILL LEAVE THE SITE AND NOT RETURN UNTIL THE NEXT SCHEDULED COLLECTION DAY.
3. ALL ASPHALT WITHIN THE CITY'S RIGHT-OF-WAY IS TO BE RECONSTRUCTED TO MEET CITY STANDARDS.
4. BE ADVISED THAT SHOULD ANY PARTY, INCLUDING THE APPLICANT OR ANY SUBSEQUENT OWNER, APPLY FOR MORE THAN ONE CONDOMINIUM CORPORATION ENCOMPASSING ANY OR ALL OF THIS DEVELOPMENT OR MAKE AN APPLICATION THAT RESULTS IN A LANE DIVISION, STAFF MAY REQUIRE LEGAL ADVICE, INCLUDING BUT NOT LIMITED TO LEGAL OPINION, WITH RESPECT TO THE APPROVED SERVICES. SUCH ADVICE, INCLUDING BUT NOT LIMITED TO LEGAL OPINION, WILL BE DETERMINED AT THE TIME OF APPLICATION FOR CONDOMINIUM APPROVAL.
5. THE OWNER IS REQUIRED TO INSTALL AND MAINTAIN A PERMITS COLLECTION DEVICE FOR ALL APPLICABLE WATER SERVICES IN ACCORDANCE WITH TORONTO MUNICIPAL CODE, CHAPTER B01 WATER SUPPLY, THE BUILDING CODE, AND CSA B64 SERIES STANDARDS.
6. BEFORE SOLID WASTE COLLECTION SERVICES ARE TO BEGIN THE CITY WILL BE PROVIDED WITH A LETTER CERTIFIED BY A PROFESSIONAL ENGINEER THAT IN CASES WHERE A COLLECTION VEHICLE IS REQUIRED TO DRIVE ONTO OR OVER A SUPPORTED STRUCTURE (SUCH AS AN UNDERGROUND PARKING GARAGE) CAN SAFELY SUPPORT A FULLY LOADED COLLECTION VEHICLE (20,000 KG) AND BE CONSIDERED TO THE FOLLOWING:
 - (A) DESIGN CODE - ONTARIO BUILDING CODE
 - (B) DESIGN LOAD - CITY BUS LIFT VEHICLE IN ADDITION TO BUILDING CODE REQUIREMENTS
 - (C) IMPACT FACTOR - 1.5 FOR MAXIMUM VEHICULAR SPEEDS TO TRANSIT AND 2.0 FOR MAXIMUM SPEEDS
7. PROVIDE AND MAINTAIN A WARNING SYSTEM TO ALERT ON-SITE STAFF OF THE COLLECTION VEHICLE'S PRESENCE IN THE UNDERGROUND PARKING GARAGE THAT LARGE TRUCKS ARE MANEUVERING WITHIN THE DRIVING ALLEYS.
8. ALL EXISTING ACCESSORIES, CURB CUTS, TRAFFIC CONTROL DEVICES THAT ARE NO LONGER REQUIRED HAVE BEEN REMOVED AND REINSTATE THE CURB, GUTTER AND SIDEWALK WITHIN THE CITY'S RIGHT-OF-WAY IN ACCORDANCE WITH CITY STANDARDS AND TO THE SATISFACTION OF THE CHIEF ENGINEER AND DEPUTY CHIEF ENGINEER, ENGINEERING AND CONSTRUCTION SERVICES.

CONVEX MIRROR

P1 - BENTHOS VISTOR PARKING USE
P1 - BENTHOS RESIDENT PARKING USE
P1 - BENTHOS PARKING STATIONS WITH EYE

NOT FOR
CONSTRUCTION

Contractor Must Check & Verify all Dimensions on the Job.

Do Not Scale Drawings.

All Drawings, Specifications and Related Documents are the Copyright Property of the Architect and Shall be Returned Upon Request. Reproduction of Drawings, Specifications and Related Documents in Part or in Whole is Prohibited Without the Written Permission of the Architect.

This Drawing is Not to be Used for Construction Until Signed by the Architect.

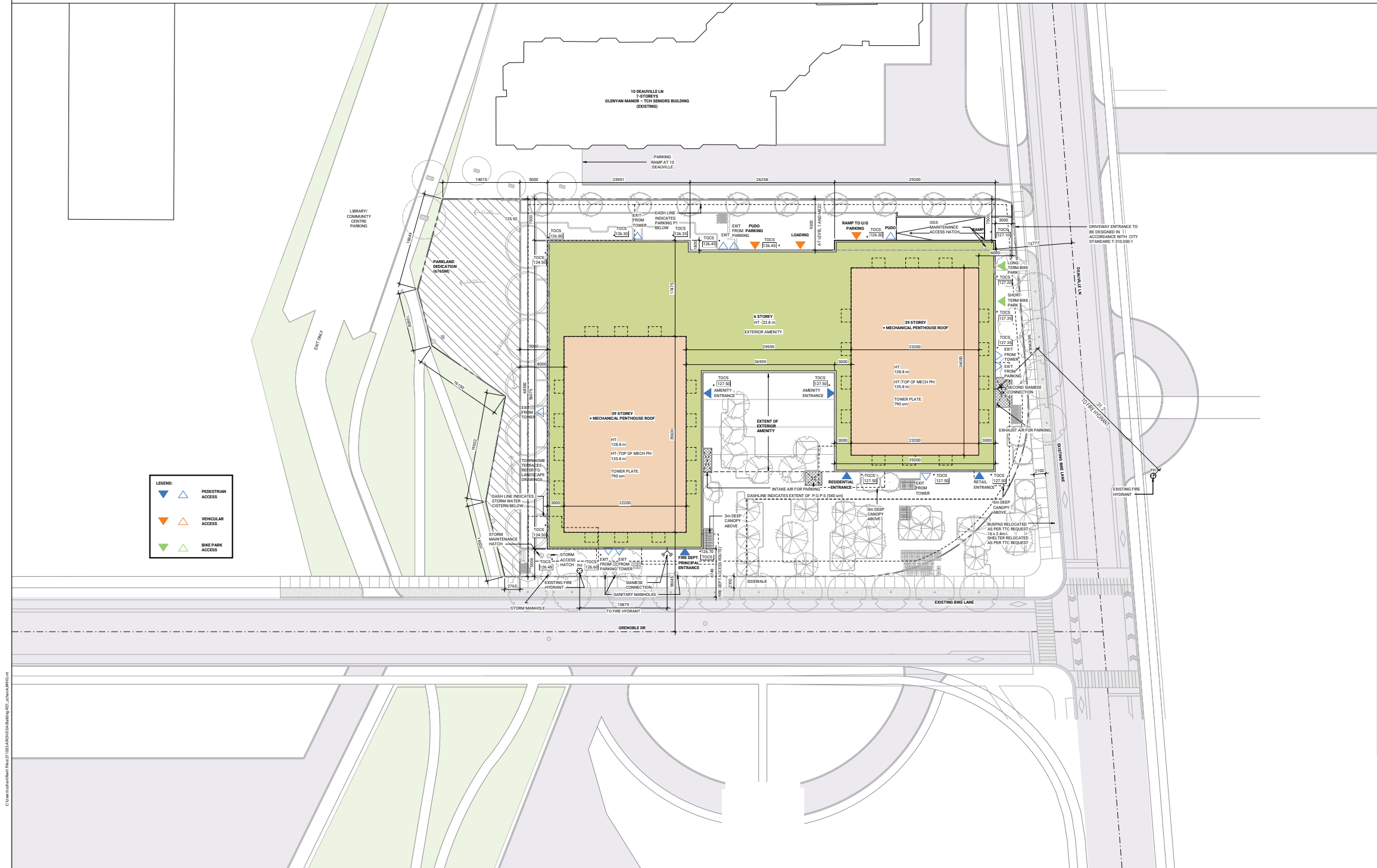
48 Grenoble Drive

211033

SITE PLAN

As Indicated

A012



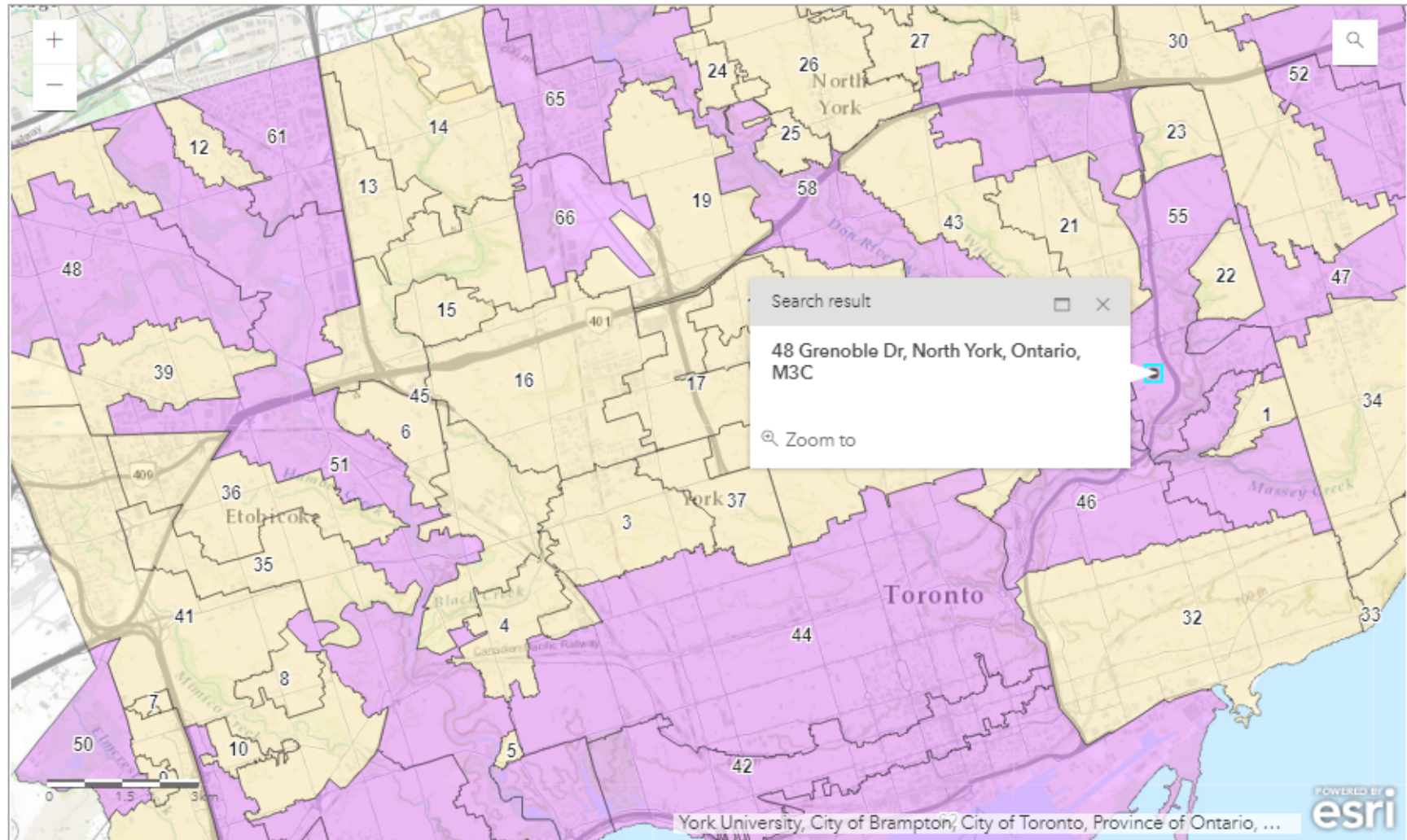
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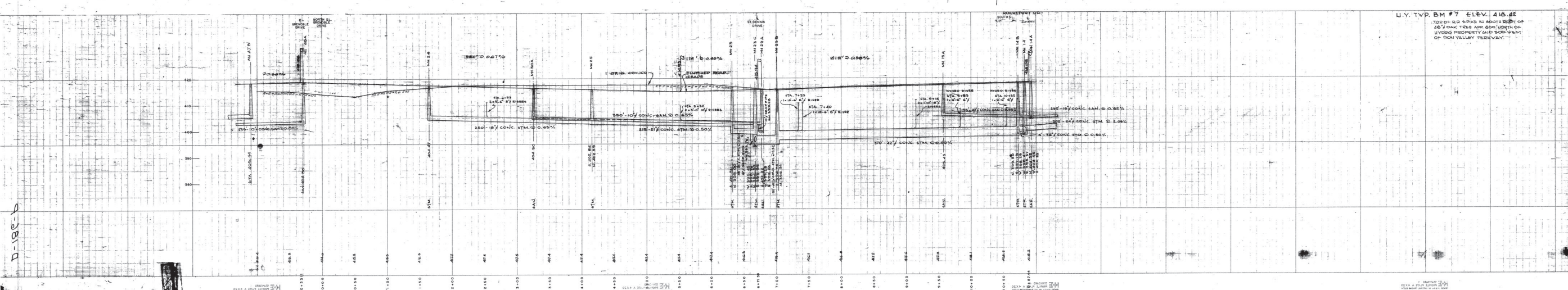
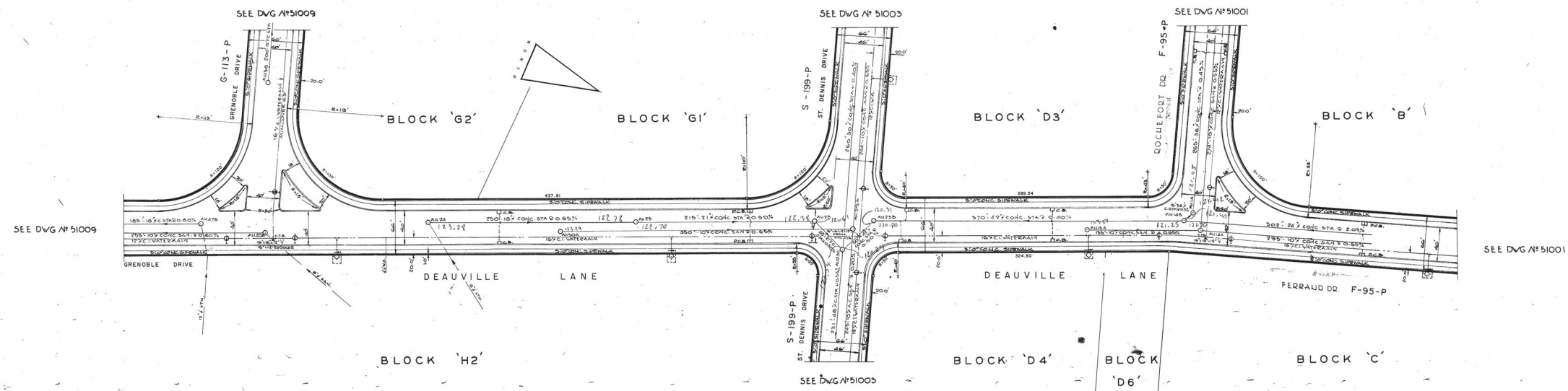
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Map Legend

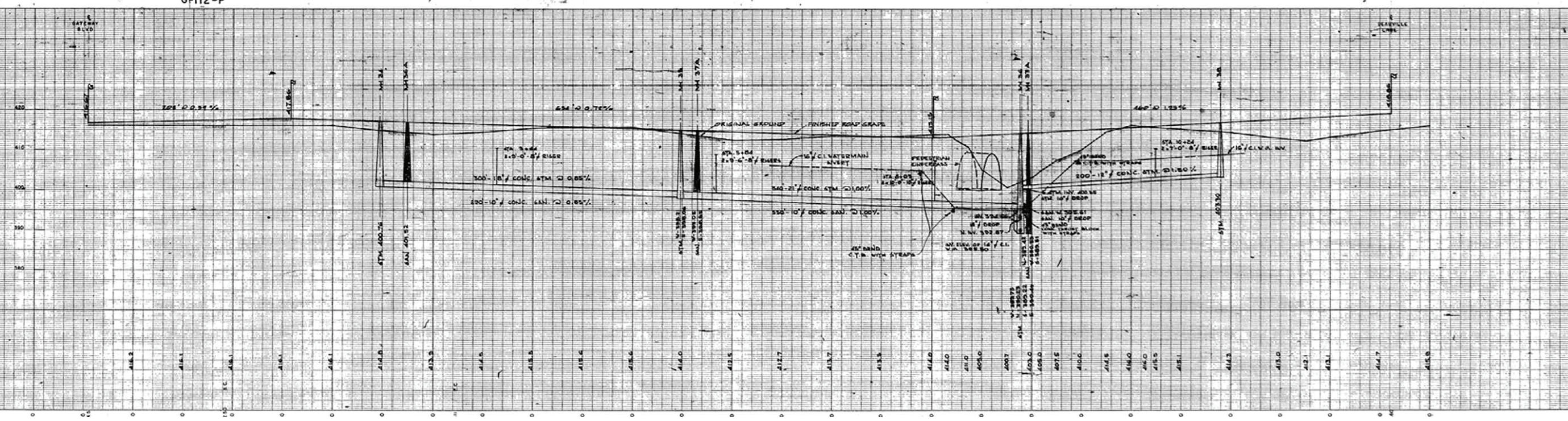
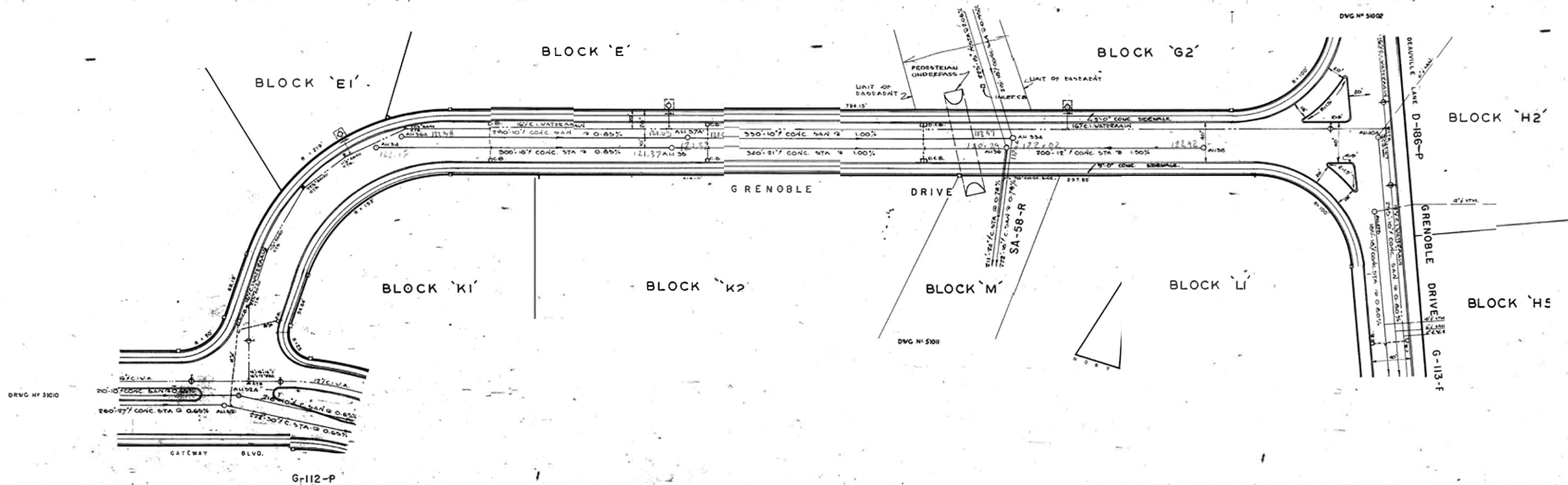
- Basement Flooding Study Completed
- Basement Flooding Study in Progress (started before 2019)
- Basement Flooding Study in Progress (started in 2019)

For more information enter an address in the search bar and/or click on the shaded area in the map



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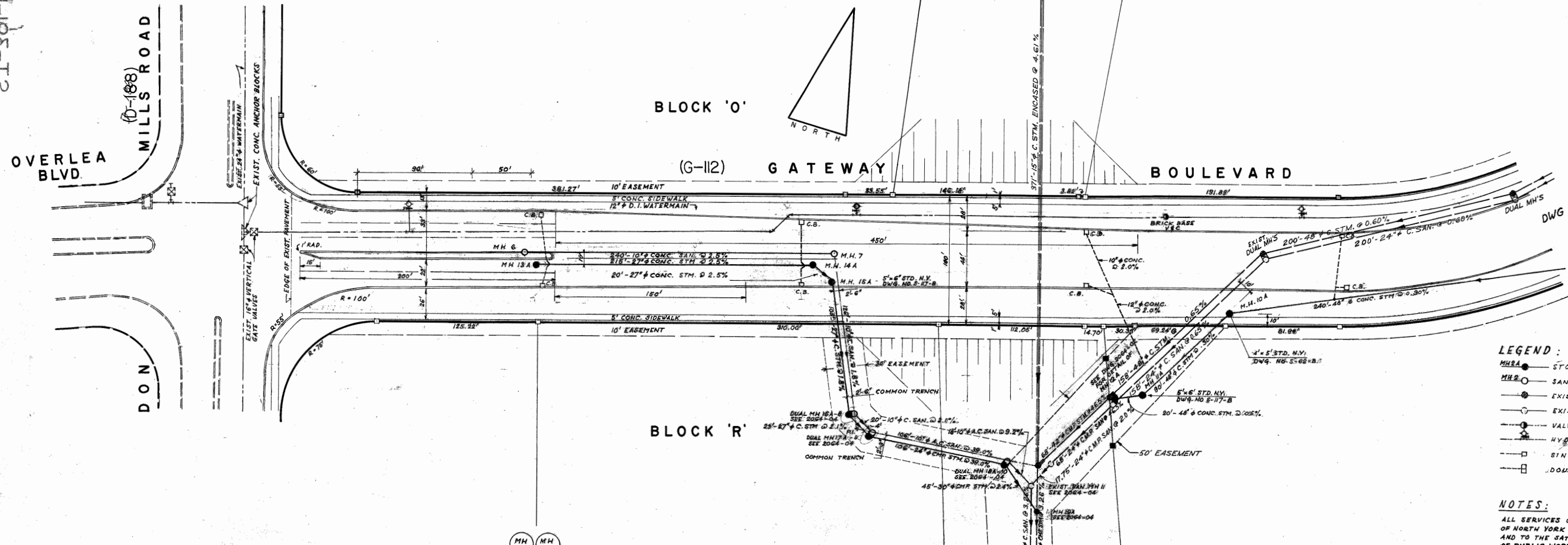
PART OF PLAN & PROFILE G-113-03



21-05-T2

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21-05-T2



- LEGEND:**
- MH 1 - STORM MANHOLE
 - MH 2 - SANITARY MANHOLE
 - EXISTING STORM MANHOLE
 - EXISTING SANITARY MANHOLE
 - VALVE & CHAMBER
 - HYDRANT & VALVE
 - SINGLE CATCHBASIN
 - DOUBLE CATCHBASIN

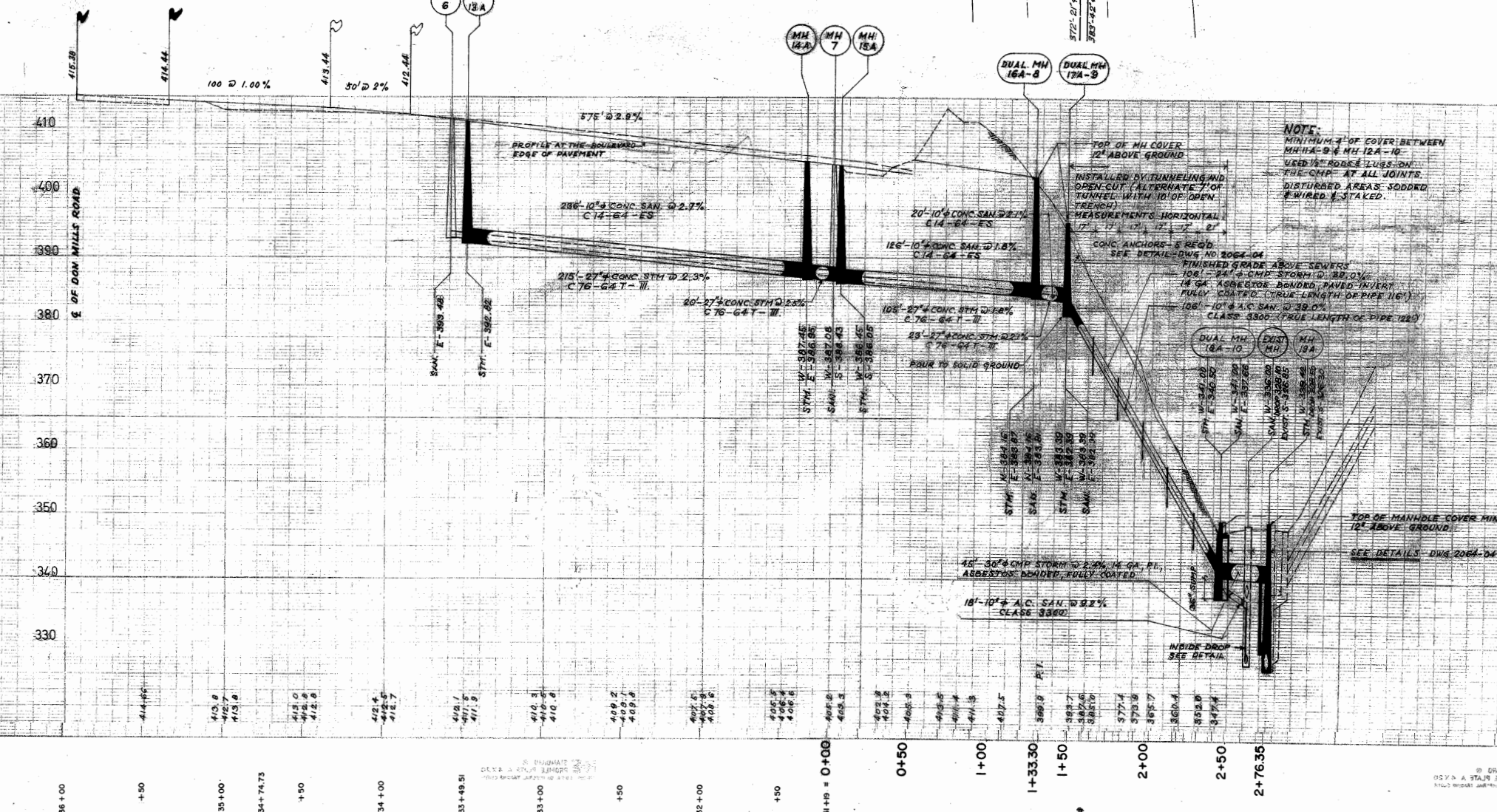
NOTES:

ALL SERVICES CONSTRUCTED TO THE BOROUGH OF NORTH YORK STANDARDS AND SPECIFICATIONS AND TO THE SATISFACTION OF THE COMMISSIONER OF PUBLIC WORKS.

WATERMAINS ARE 12" DUCTILE IRON PIPE WITH WALL THICKNESS OF 0.37". ALL JOINTS ARE TYTON OR EQUIVALENT.

MANHOLES ARE 4'x4' N.Y. STD. DWG. NO. S-58.B EXCEPT IF OTHERWISE NOTED.

HIGH BENCHING REQUIRED ON ALL MANHOLES EXCEPT FOR TYPE S-117-B.



SURFACE COURSE (ASPHALT) & BASE COURSE (ASPHALT) OVERLAY AS PER BOROUGH SPECIFICATIONS.

B.M. TOP OF S.A. 60' AT 246.5' TRAFFIC LIGHT ON N.Y. CORNER OF INTERSECTION OF DON MILLS ROAD & GATEWAY BLVD. NORTH YORK DATUM 1955

NOV 28	AS CONSTRUCTED	
REVISION		BY APP'D
E. D. RICHARD		
REGISTERED PROFESSIONAL ENGINEER		
CIVIL		
E. D. RICHARD		
PROVINCE OF ONTARIO		
ANDERSON ASSOCIATES LIMITED		
CONSULTING ENGINEERS		
194 WILSON AVENUE		
TORONTO, ONTARIO		
BOROUGH OF NORTH YORK		
DEPARTMENT OF PUBLIC WORKS		
STORM & SANITARY		
OUTFALL		
APPROVED		
JUL 20 1987		
BOROUGH OF NORTH YORK		
PUBLIC WORKS DEPT.		
DATE FEB - 1987		
DRAWN BY H.J.M./P.M.		
CHECKED BY E.D.R.		
206-4-03		
ST-391-R		

SUB DIV. 666 PHASE II

General Information	
Date: November 1, 2022	Report No. : R22-11-01-01
Project No. : PUD21-110	Address : 48 Grenoble Drive
Owner : Lifestyle Group of Companies	Region/Municipality: City of Toronto

Attendants			
	Name	Title	Contact Info.
Lithos Inspector	Keyvan Vahedi	Senior Project Coordinator	437-776-4086
Lithos Inspector	Pradeep Oleti	Construction Inspector	905-609-3435

Weather Condition			
☒ Sunny	☒ Cold	☐ Light Rain	☐ Windy
☐ Partly Cloudy	☐ Cool	☐ Heavy Rain	☐ Foggy
☐ Overcast	☐ Warm	☐ Light Snow	
Temperature : +6°C	☐ Hot	☐ Heavy Snow	

Existing Facilities at Project/Site
The subject property is occupied by a nine(9) story residential building .



General Information	
Date: November 1, 2022	Report No. : R22-11-01-01
Project No. : PUD21-110	Address : 48 Grenoble Drive
Owner : Lifestyle Group of Companies	Region/Municipality: City of Toronto

Background and Summary of Findings

Background:

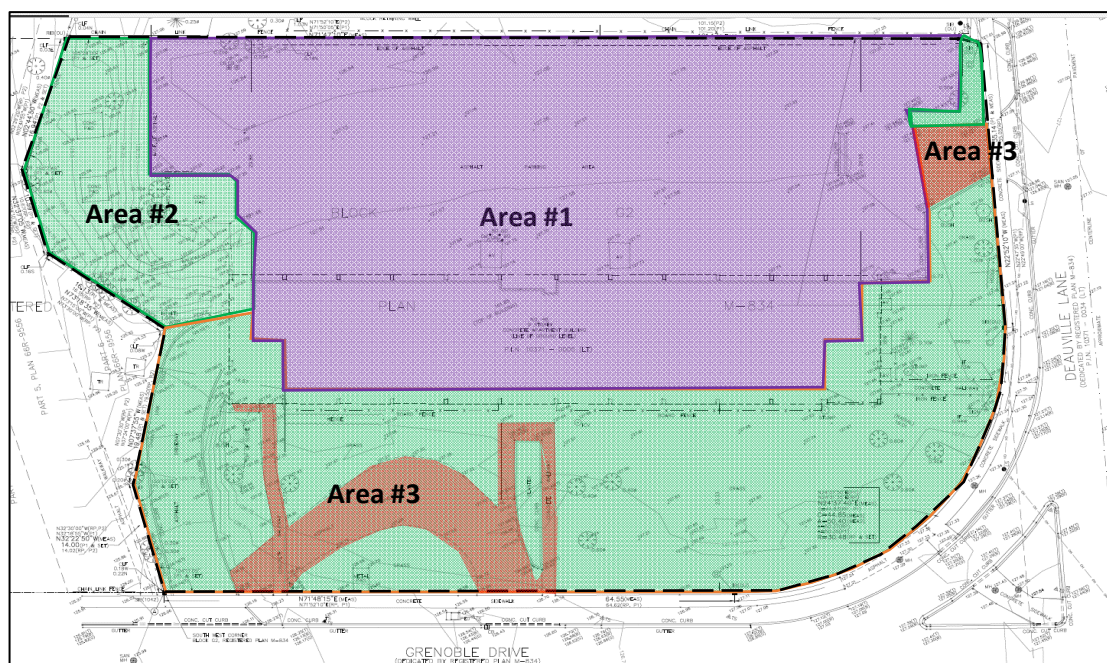
Further to our previous site inspection at 48 Grenoble Drive, on September 22nd, 2021, we conducted three (3) dye tests on the existing Storm and Sanitary within the site, in order to confirm the Storm and Sanitary discharge pattern within the subject site.

Based on the finding from our previous site investigation, the subject site consists of 3 areas as bellow:

Area #1 : All the storm runoff from this area is discharged into the existing storm network within the property; no storm outlet was visible within the building.

Area #2: This area includes unpaved areas within the property and all storm runoff within this area, infiltrates into the ground.

Area#3: This area includes paved areas within the property and all storm runoff within this area, flows overland and is captured by existing CBs along Grenoble Drive.



Summary of findings:

Area #1 consists of an existing nine (9) storey building and a parking area.

In order to confirm the Storm and Sanitary discharge pattern within Area#1, three (3) dye test conducted on the Storm and Sanitary network within the existing building, as well as existing catch basin within the parking area.

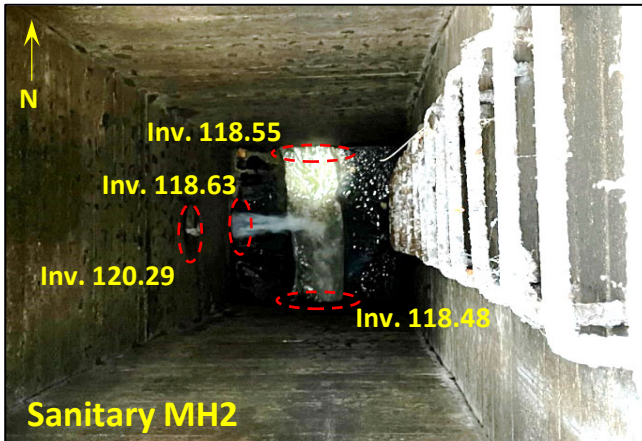
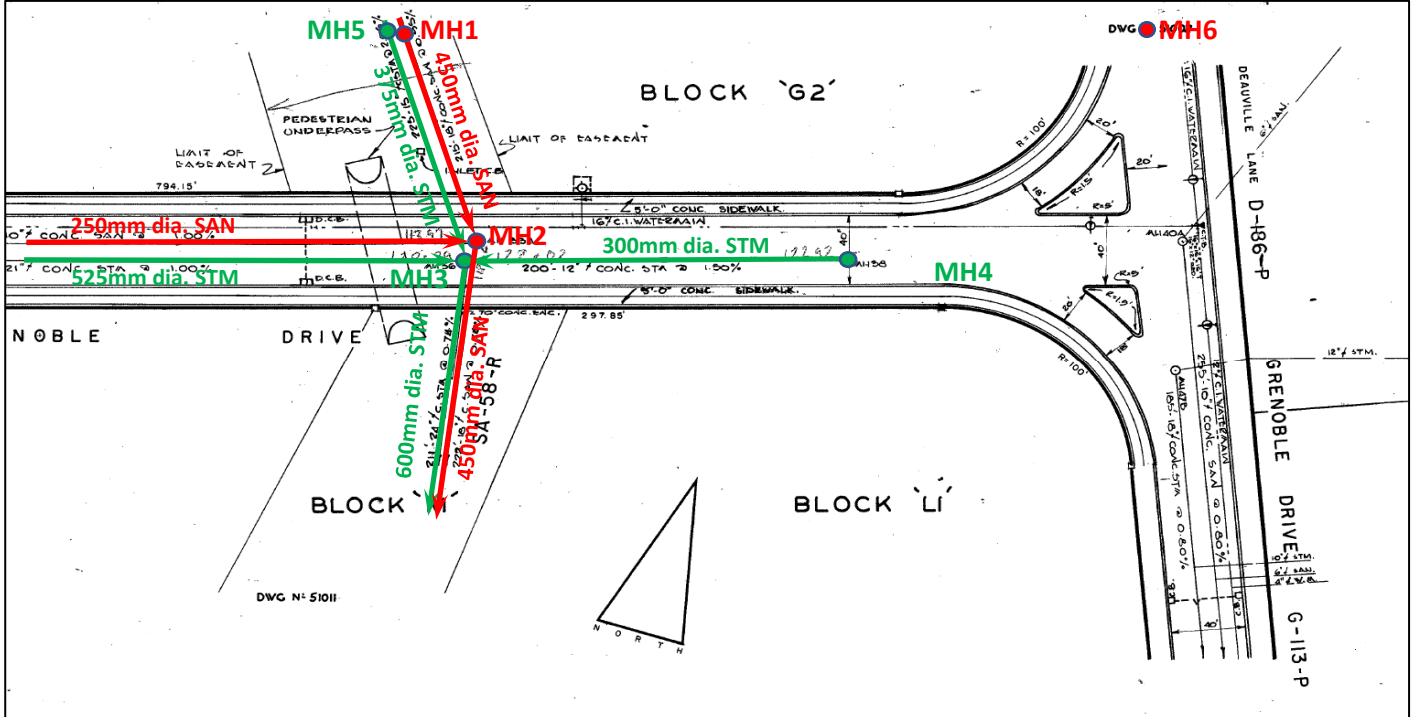
The results of the dye tests confirmed that:

- All Storm runoff from roof of the existing building is discharged into an existing 375mm dia. Storm Sewer, along the easment, west of the subject site.
- All Storm runoff from the Parking area is collected by an existing CB and discharged into an existing 375mm dia. Storm Sewer, along the easment, west of the subject site.
- All Sanitary discharge from the existing building is conveyed into an existing 450mm dia. Sanitary Sewer, along the easment, west of the subject site.

General Information

Date: November 1, 2022	Report No. : R22-11-01-01
Project No. : PUD21-110	Address : 48 Grenoble Drive
Owner : Lifestyle Group of Companies	Region/Municipality: City of Toronto

Existing Infrastructure (Storm and Sanitary) within the area of investigation



General Information

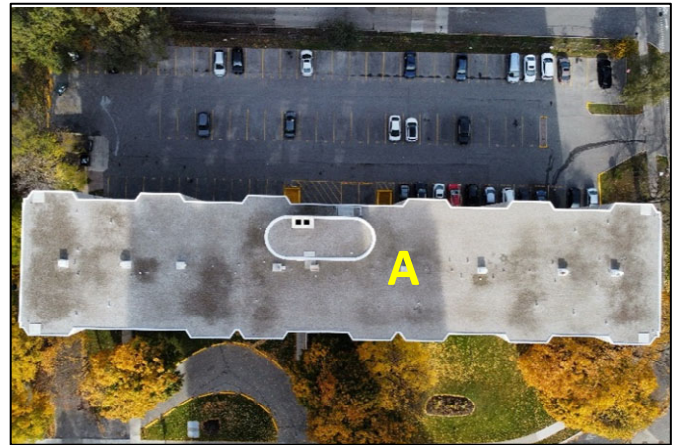
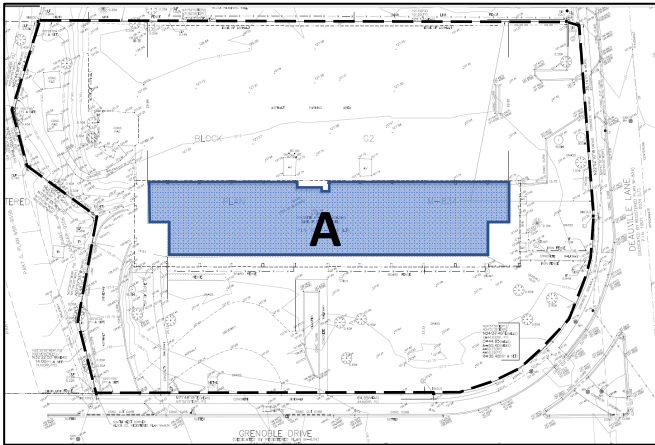
Date: November 1, 2022	Report No. : R22-11-01-01
Project No. : PUD21-110	Address : 48 Grenoble Drive
Owner : Lifestyle Group of Companies	Region/Municipality: City of Toronto

Investigation Details

Dye Test #1:

In order to identify/confirm the Storm runoff discharge pattern, within the existing building, a Dye Test conducted on one of the existing roof drains and the dye was observed at Storm MH3.

The result of the dye test confirmed that, all the storm runoff from the roof of the existing building is conveyed into the existing 375mm dia storm sewer along the Easement.



General Information

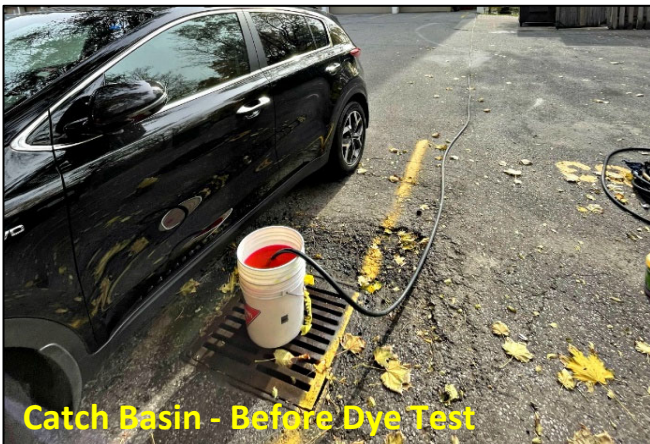
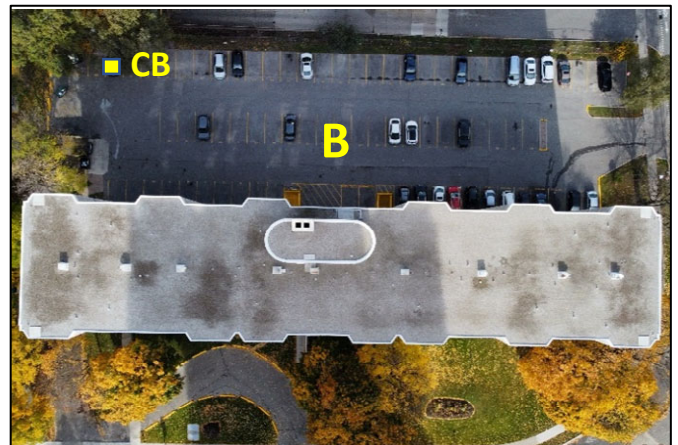
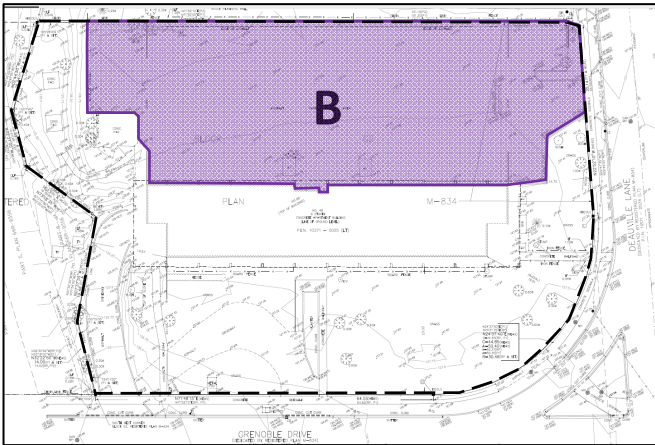
Date: November 1, 2022	Report No. : R22-11-01-01
Project No. : PUD21-110	Address : 48 Grenoble Drive
Owner : Lifestyle Group of Companies	Region/Municipality: City of Toronto

Investigation Details

Dye Test #2:

In order to identify/confirm the Storm runoff discharge pattern, within the existing Parking area, a Dye Test conducted on the existing CB within the parking area and the dye was observed at Storm MH3.

The result of the dye test confirmed that, all the storm runoff from the Parking area is conveyed into the existing 375mm dia storm sewer along the Easement.



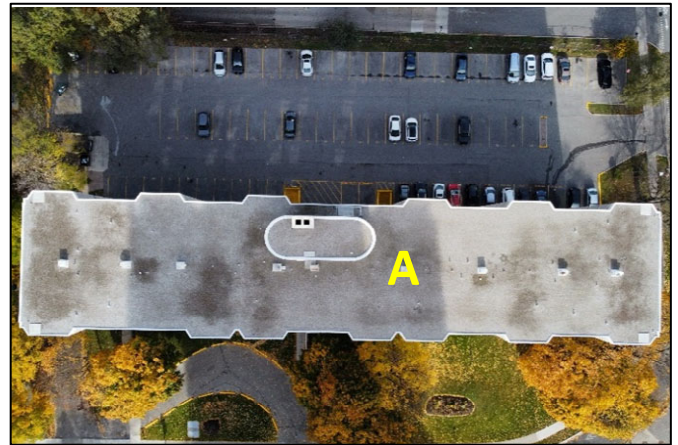
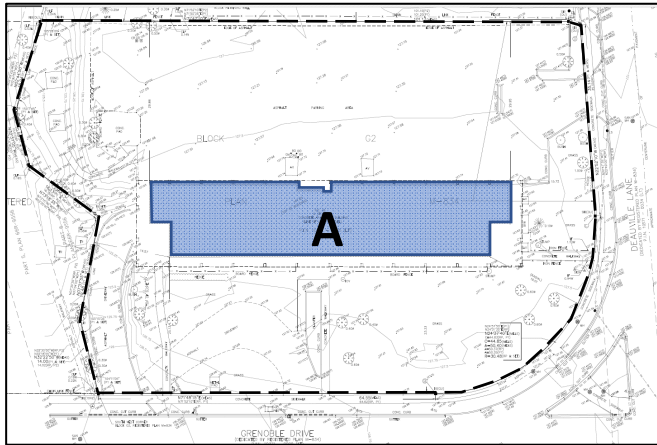
General Information	
Date: November 1, 2022	Report No. : R22-11-01-01
Project No. : PUD21-110	Address : 48 Grenoble Drive
Owner : Lifestyle Group of Companies	Region/Municipality: City of Toronto

Investigation Details

Dye Test #3:

In order to identify/confirm the Sanitary discharge pattern, within the existing building, a Dye Test conducted on one of sanitary sinks within the building and the dye was observed at Sanitary MH2.

The result of the dye test confirmed that, all the Sanitary discharge from the existing building is conveyed into the existing 450mm dia sanitary sewer along the Easement.



Roof Drain - Before Dye Test



Roof Drain - After Tye Test



MH2 - Before Dye Test



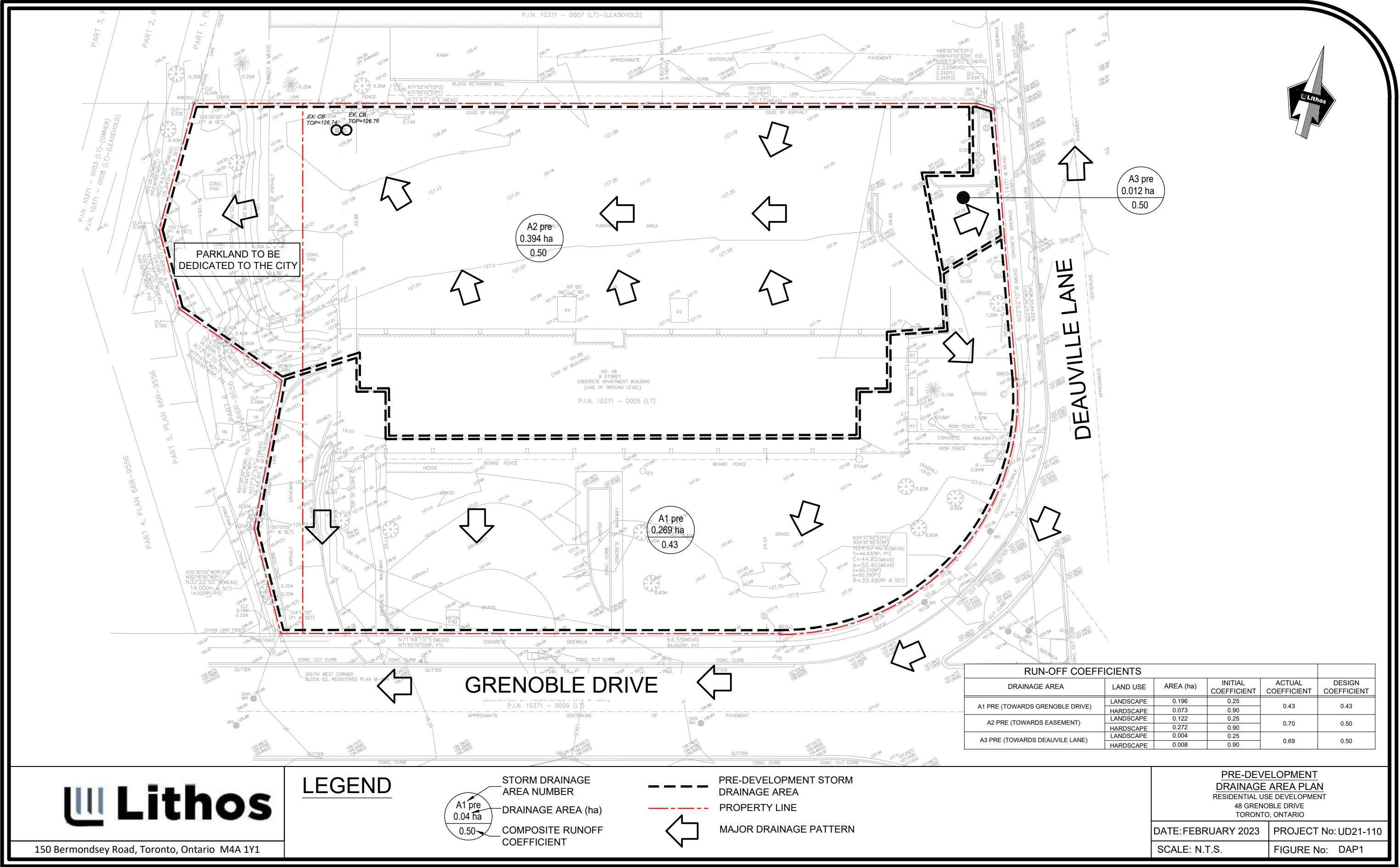
MH2 - After Dye Test

STUDIO TLA

PROJECT NUMBER		22-101		PROJECT NAME		48 Grenoble Dr.		STUDIO TLA					
DATE		February 6, 2023		COMPLETED BY		JCP							
CALCULATIONS FOR WATER COLLECTED vs. LANDSCAPE WATER REQUIREMENTS													
GENERAL INFO		All measures are in Metric Landscape Water Requirements (LWR) are based on regional evapotranspiration data (Etl), landscape coefficient per plant type (Kl), and irrigation efficiency (IE). Based on LEED v4, which refers to U.S. Environmental Protection Agency (EPA) WaterSense Water Budget Tool.											
Species Factor (Ks)		Plant water needs are determined as follows: North and East / shaded enter the 'Low' value (0.2 shrubs, 0.6 turf, and 0.1 Sedum) South and West / sunny enter the ' Avg' based on shade (0.5 shrubs, 0.7 turf, and 0 .2 Sedum)											
Density Factor (Kd)		Plant grouping:	Sparsely planted:	'Low' (0.5, shrubs, 0.6 mixed, 0.6 turf, and 0.6 Sedum mats)									
			Densely Planted:	'High' (1.0 shrubs, 1.3 mixed, 1.0 turf, and 1.0 Sedum Plugs)									
Microclimate Factor (Kmc)		Plant grouping exposure to wind, heat, reflected light:		NE / shaded: 'Low', see above SW / hot and gets the summer wind: 'Ave or High'									
Kl = Ks x Kd x Kmc, landscape coefficient for the type of plant in that hydrozone. Etl = Kl x 138.2 , local reference evapotranspiration for Greater Toronto Area, this example is for July. IE can be Drip, Sprinkler (Spray) or Efficient Flow Nozzles, irrigation Efficient. LWR (H)= area (m²) x (Etl / IE), landscape water requirement for each hydrozone.													
WATER COLLECTION (if applicable)										X			
Cistern:		5mm Retention of Storm Water for Irrigation Purposes					0.000	m³	0.000				
Part 2 - LWR													
Hydro Zone	Feature Area (sq. m.)	Species Factor	Density Factor	Microclimate	Landscape Coefficient (Kl)	Irrigation Efficiency (IE) Drip (.9), Low flow (0.75), Spray (.625)	LWR Average (liters)	LWR May	LWR June	LWR July	LWR August	LWR Sept	
Type	m²	Ks	Kd	Kmc									
Trees in Tree Pits*	129.000	0.500	1.000	0.500	0.250	0.750	4,702	4,369	5,371	5,943	4,747	3,079	
Shrubs	766.000	0.400	1.100	1.300	0.572	0.900	53,231	49,462	60,806	67,281	53,747	34,857	
Perennials	283.000	0.300	1.100	1.300	0.429	0.900	14,750	13,706	16,849	18,643	14,893	9,659	
Mixed	646.000	0.200	1.300	0.500	0.130	0.900	10,203	9,480	11,655	12,896	10,302	6,681	
Turfgrass	0.000	0.700	1.000	1.200	0.840	0.625	0	0	0	0	0	0	
Green Walls	0.000	0.300	1.100	1.200	0.396	0.900	0	0	0	0	0	0	
Sedum Mats	2106.000	0.500	1.000	1.000	0.500	0.900	127,928	118,872	146,133	161,694	129,168	83,772	
Total m²	3930.000						Subtotal (L) per month	210,812	195,889	240,813	266,456	212,856	138,048
							Net potable water (L) from Design Case per week	52,703	48,972	60,203	66,614	53,214	34,512
							Irrigation water use for 72 hours, (subtotal/7days)*3days	22,587	20,988	25,801	28,549	22,806	14,791
							5mm Retention for Irrigation Purposes (see X above)	0	0	0	0	0	0
							AVERAGE WATER REMAINING IN CISTERN AFTER 72 HR (May-Sept)	0	0	0	0	0	0
*Trees in Tree Pits, include 6.4 sq m/Tree													

Appendix C

Storm Analysis





Prepared By: Isaak Chlorotiris, P.E., M.A.Sc.
Reviewed by: John Pasalidis, P.Eng., M.A.Sc.

Rational Method Pre-Development Flow Calculation

48 Grenoble Drive

File No. UD21-110

City of Toronto

Date: February 2023

Area Number	Area (ha)	Actual Coefficient	Design Coefficient
A1 Pre – towards Grenoble Drive	0.269	0.43	0.43
A2 Pre – towards Easement	0.394	0.70	0.50
A3 Pre – towards Deauville Lane	0.012	0.69	0.50

Rational Method Calculation

A1 Pre – towards Grenoble Drive

Event 2-year IDF Data Set City of Toronto a = 21.80 c = -0.780

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A1 Pre	0.269	0.43	0.12	10	88.2	0.028	28.4

Event 5-year IDF Data Set City of Toronto a = 32.00 c = -0.790

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A1 Pre	0.269	0.43	0.12	10	131.8	0.042	42.4

Event 100-year IDF Data Set City of Toronto a = 59.70 c = -0.800

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A1 Pre	0.269	0.43	0.12	10	250.3	0.080	80.5

A2 Pre – towards Easement

Event 2-year IDF Data Set City of Toronto a = 21.80 c = -0.780

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A2 Pre	0.394	0.50	0.20	10	88.2	0.048	48.2

Event 5-year IDF Data Set City of Toronto a = 32.00 c = -0.790

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A2 Pre	0.394	0.50	0.20	10	131.8	0.072	72.1

Event 100-year IDF Data Set City of Toronto a = 59.70 c = -0.800

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A2 Pre	0.394	0.50	0.20	10	250.3	0.137	136.9

Rational Method Calculation

A3 Pre

Event 2-year IDF Data Set City of Toronto a = 21.80 c = -0.780

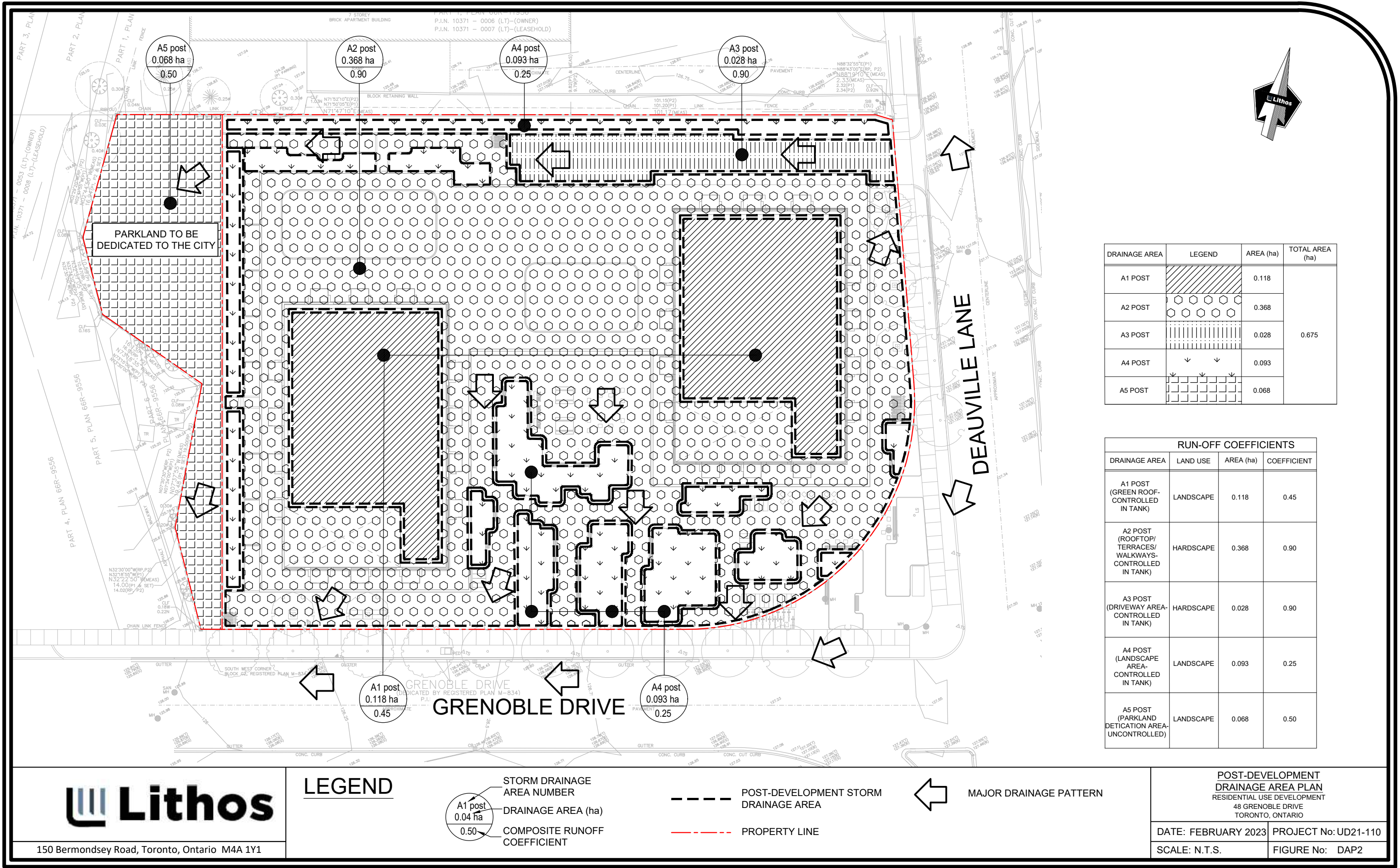
Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A3 Pre	0.012	0.50	0.01	10	88.2	0.001	1.5

Event 5-year IDF Data Set City of Toronto a = 32.00 c = -0.790

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A3 Pre	0.012	0.50	0.01	10	131.8	0.002	2.2

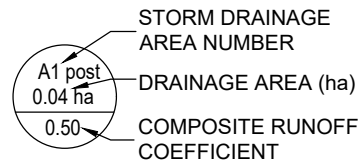
Event 100-year IDF Data Set City of Toronto a = 59.70 c = -0.800

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A3 Pre	0.012	0.50	0.01	10	250.3	0.004	4.2



150 Bermondsey Road, Toronto, Ontario M4A 1Y1

LEGEND



POST-DEVELOPMENT
DRAINAGE AREA PLAN
RESIDENTIAL USE DEVELOPMENT
48 GRENABLE DRIVE
TORONTO, ONTARIO

DATE: FEBRUARY 2023
SCALE: N.T.S.

PROJECT No: UD21-110
FIGURE No: DAP2

DRAINAGE AREA	LEGEND	AREA (ha)	TOTAL AREA (ha)
A1 POST		0.118	0.675
A2 POST		0.368	
A3 POST		0.028	
A4 POST		0.093	
A5 POST		0.068	

RUN-OFF COEFFICIENTS			
DRAINAGE AREA	LAND USE	AREA (ha)	COEFFICIENT
A1 POST (GREEN ROOF- CONTROLLED IN TANK)	LANDSCAPE	0.118	0.45
A2 POST (ROOFTOP/ TERRACES/ WALKWAYS- CONTROLLED IN TANK)	HARDSCAPE	0.368	0.90
A3 POST (DRIVEWAY AREA- CONTROLLED IN TANK)	HARDSCAPE	0.028	0.90
A4 POST (LANDSCAPE AREA- CONTROLLED IN TANK)	LANDSCAPE	0.093	0.25
A5 POST (PARKLAND DEDICATION AREA- UNCONTROLLED)	LANDSCAPE	0.068	0.50

 Modified Rational Method - Two Year Storm Site Flow and Storage Summary - towards Grenoble Drive City of Toronto										File No. UD21-110 Date: February 2023 Prepared By: Isaak Chlorotyris, P.E., M.A.Sc. Reviewed By: John Pasalidis, P.Eng., M.A.Sc.			
	Drainage Area A1 Post Green Roofs - Controlled In Underground Tank Area (A1) = 0.118 ha "C" = 0.45 AC1= 0.05 Tc = 10.0 min Time Increment = 5.0 min Max. Release Rate = 13.0 L/s			Drainage Area A2 Post Rooftops/Terraces/Walkways - Controlled In Underground Tank Area (A2) = 0.368 ha "C" = 0.90 AC2= 0.332 Tc = 10 min Time Increment = 5 min Max. Release Rate = 81.2 L/s		Drainage Area A3 Post Driveway area - Controlled In Underground Tank Area (A3) = 0.028 ha "C" = 0.90 AC3= 0.025 Tc = 10 min Time Increment = 5 min Max. Release Rate = 6.1 L/s		Drainage Area A4 Post Landscaped - Controlled In Underground Tank Area (A4) = 0.093 ha "C" = 0.25 AC4= 0.023 Tc = 10 min Time Increment = 5 min Max. Release Rate = 5.7 L/s		Total Site Total Site = A1 + A2 + A3 +A4 2-yr Pre-Development Site Release Rate = 28.4 L/s Uncontrolled Flow = 0.0 L/s Total Uncontrolled Release Rate Achieved = 0.0 L/s Design Controlled Release Rate (Pump) = 28.4 L/s			
	2-Year Design Storm									Total Site Release Rate Achieved = 28.4 L/s			
	a=	21.80									Max. Storage Tank Size = 46.57 m ³		
	c=	-0.78									Stor. Tank footprint Area = 74.20 m ²		
	I =	A(T) ^c											
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Time	Rainfall	Storm	Runoff	Storm	Runoff	Storm	Runoff	Storm	Runoff	Total Storm	Released Volume	Storage	Storage
	Intensity	Runoff (A1 Post)	Volume (A1 Post)	Runoff (A2 Post)	Volume (A2 Post)	Runoff (A3 Post)	Volume (A3 Post)	Runoff (A4 Post)	Volume (A4 Post)	Runoff Volume (4)+(6)+(8)+(10)=(11)"	(32.0/1000)*((1)*60)	Volume	Depth of Tank
(min)	(mm/hr)	(m ³ /s)	(m ³)	(m ³ /s)	(m ³)	(m ³ /s)	(m ³)	(m ³ /s)	(m ³)	(m ³)	(m ³)	(m ³)	(m)
10.0	88.2	0.013	7.78	0.081	48.73	0.006	3.67	0.006	3.43	63.61	17.04	46.6	0.63
15.0	64.3	0.009	8.50	0.059	53.28	0.004	4.01	0.004	3.75	69.55	25.56	44.0	0.59
20.0	51.4	0.008	9.06	0.047	56.76	0.004	4.28	0.003	4.00	74.09	34.08	40.0	0.54
25.0	43.2	0.006	9.52	0.040	59.62	0.003	4.49	0.003	4.20	77.82	42.60	35.2	0.47
30.0	37.4	0.006	9.90	0.034	62.06	0.003	4.68	0.002	4.37	81.01	51.12	29.9	0.40
35.0	33.2	0.005	10.25	0.031	64.20	0.002	4.84	0.002	4.52	83.80	59.64	24.2	0.33
40.0	29.9	0.004	10.55	0.028	66.11	0.002	4.98	0.002	4.65	86.30	68.16	18.1	0.24
45.0	27.3	0.004	10.83	0.025	67.85	0.002	5.11	0.002	4.78	88.56	76.68	11.9	0.16
50.0	25.1	0.004	11.08	0.023	69.44	0.002	5.23	0.002	4.89	90.64	85.20	5.4	0.07
55.0	23.3	0.003	11.32	0.021	70.91	0.002	5.34	0.002	4.99	92.56	93.72	0.0	0.00
60.0	21.8	0.003	11.54	0.020	72.28	0.002	5.45	0.001	5.09	94.35	102.24	0.0	0.00
65.0	20.5	0.003	11.74	0.019	73.56	0.001	5.54	0.001	5.18	96.03	110.76	0.0	0.00
70.0	19.3	0.003	11.93	0.018	74.77	0.001	5.63	0.001	5.26	97.61	119.28	0.0	0.00
75.0	18.3	0.003	12.12	0.017	75.92	0.001	5.72	0.001	5.34	99.10	127.80	0.0	0.00
80.0	17.4	0.003	12.29	0.016	77.00	0.001	5.80	0.001	5.42	100.52	136.32	0.0	0.00
85.0	16.6	0.002	12.46	0.015	78.04	0.001	5.88	0.001	5.49	101.87	144.84	0.0	0.00
90.0	15.9	0.002	12.61	0.015	79.02	0.001	5.95	0.001	5.56	103.15	153.36	0.0	0.00
95.0	15.2	0.002	12.76	0.014	79.97	0.001	6.03	0.001	5.63	104.39	161.88	0.0	0.00
100.0	14.6	0.002	12.91	0.013	80.88	0.001	6.09	0.001	5.69	105.57	170.40	0.0	0.00
105.0	14.1	0.002	13.05	0.013	81.75	0.001	6.16	0.001	5.75	106.71	178.92	0.0	0.00
110.0	13.6	0.002	13.18	0.013	82.59	0.001	6.22	0.001	5.81	107.81	187.44	0.0	0.00
115.0	13.1	0.002	13.31	0.012	83.40	0.001	6.28	0.001	5.87	108.87	195.96	0.0	0.00
120.0	12.7	0.002	13.44	0.012	84.19	0.001	6.34	0.001	5.93	109.89	204.48	0.0	0.00
125.0	12.3	0.002	13.56	0.011	84.95	0.001	6.40	0.001	5.98	110.89	213.00	0.0	0.00
130.0	11.9	0.002	13.68	0.011	85.68	0.001	6.46	0.001	6.03	111.85	221.52	0.0	0.00
135.0	11.6	0.002	13.79	0.011	86.40	0.001	6.51	0.001	6.08	112.78	230.04	0.0	0.00
140.0	11.3	0.002	13.90	0.010	87.09	0.001	6.56	0.001	6.13	113.68	238.56	0.0	0.00
145.0	11.0	0.002	14.01	0.010	87.77	0.001	6.61	0.001	6.18	114.57	247.08	0.0	0.00
150.0	10.7	0.002	14.11	0.010	88.42	0.001	6.66	0.001	6.22	115.42	255.60	0.0	0.00
155.0	10.4	0.002	14.22	0.010	89.06	0.001	6.71	0.001	6.27	116.26	264.12	0.0	0.00
160.0	10.1	0.001	14.31	0.009	89.69	0.001	6.76	0.001	6.31	117.07	272.64	0.0	0.00
165.0	9.9	0.001	14.41	0.009	90.30	0.001	6.80	0.001	6.36	117.87	281.16	0.0	0.00
170.0	9.7	0.001	14.51	0.009	90.89	0.001	6.85	0.001	6.40	118.65	289.68	0.0	0.00
175.0	9.5	0.001	14.60	0.009	91.47	0.001	6.89	0.001	6.44	119.40	298.20	0.0	0.00
180.0	9.3	0.001	14.69	0.009	92.04	0.001	6.94	0.001	6.48	120.15	306.72	0.0	0.00
185.0	9.1	0.001	14.78	0.008	92.60	0.001	6.98	0.001	6.52	120.87	315.24	0.0	0.00
190.0	8.9	0.001	14.87	0.008	93.14	0.001	7.02	0.001	6.56	121.58	323.76	0.0	0.00
195.0	8.7	0.001	14.95	0.008	93.68	0.001	7.06	0.001	6.59	122.28	332.28	0.0	0.00
200.0	8.5	0.001	15.04	0.008	94.20	0.001	7.10	0.001	6.63	122.96	340.80	0.0	0.00
205.0	8.4	0.001	15.12	0.008	94.71	0.001	7.14	0.001	6.67	123.63	349.32	0.0	0.00
210.0	8.2	0.001	15.20	0.008	95.22	0.001	7.17	0.001	6.70	124.29	357.84	0.0	0.00
215.0	8.1	0.001	15.28	0.007	95.71	0.001	7.21	0.001	6.74	124.94	366.36	0.0	0.00
220.0	7.9	0.001	15.35	0.007	96.20	0.001	7.25	0.001	6.77	125.57	374.88	0.0	0.00
225.0	7.8	0.001	15.43	0.007	96.67	0.001	7.28	0.001	6.81	126.19	383.40	0.0	0.00
230.0	7.6	0.001	15.50	0.007	97.14	0.001	7.32	0.000	6.84	126.80	391.92	0.0	0.00
235.0	7.5	0.001	15.58	0.007	97.60	0.001	7.35	0.000	6.87	127.41	400.44	0.0	0.00
240.0	7.4	0.001	15.65	0.007	98.06	0.001	7.39	0.000	6.90	128.00	408.96	0.0	0.00
245.0	7.3	0.001	15.72	0.007	98.50	0.001	7.42	0.000	6.93	128.58	417.48	0.0	0.00
250.0	7.2	0.001	15.79	0.007	98.94	0.000	7.46	0.000	6.96	129.15	426.00	0.0	0.00
255.0	7.1	0.001	15.86	0.006	99.37	0.000	7.49	0.000	7.00	129.72	434.52	0.0	0.00
260.0	6.9	0.001	15.93	0.006	99.80	0.000	7.52	0.000	7.03	130.27	443.04	0.0	0.00
265.0	6.8	0.001	16.00	0.006	100.22	0.000	7.55	0.000	7.05	130.82	451.56	0.0	0.00
270.0	6.7	0.001	16.06	0.006	100.63	0.000	7.58	0.000	7.08	131.36	460.08	0.0	0.00



Modified Rational Method - Five Year Storm
Site Flow and Storage Summary - towards Grenoble Drive
City of Toronto

File No. UD21-110
Date: February 2023
Prepared By: Isaak Chlorotyris, P.E., M.A.Sc.
Reviewed By: John Pasalidis, P.Eng., M.A.Sc.

5-Year Design Storm		Drainage Area A1 Post		Drainage Area A2 Post		Drainage Area A3 Post		Drainage Area A4 Post		Total Site			
		Green Roofs - Controlled In Underground Tank		Rooftops/Terraces/Walkways - Controlled In Underground Tank		Driveway area - Controlled In Underground Tank		Landscaped - Controlled In Underground Tank		Total Site = A1 + A2 + A3 +A4			
		Area (A1) = 0.118 ha "C" = 0.45 AC1= 0.05 Tc = 10.0 min Time Increment = 5.0 min		Area (A2) = 0.368 ha "C" = 0.90 AC2= 0.332 Tc = 10 min Time Increment = 5 min		Area (A3) = 0.028 ha "C" = 0.90 AC3= 0.025 Tc = 10 min Time Increment = 5 min		Area (A4) = 0.093 ha "C" = 0.25 AC4= 0.023 Tc = 10 min Time Increment = 5 min		2-yr Pre-Development Site Release Rate = 28.4 L/s			
		Max. Release Rate = 19.4 L/s		Max. Release Rate = 121.4 L/s		Max. Release Rate = 9.1 L/s		Max. Release Rate = 8.5 L/s		Uncontrolled Flow = 0.0 L/s Total Uncontrolled Release Rate Achieved = 0.0 L/s Design Controlled Release Rate (Pump) = 28.4 L/s			
		Total Site Release Rate Achieved = 28.4 L/s								Max. Storage Tank Size = 78.03 m³ Stor. Tank footprint Area = 74.20 m²			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Time	Rainfall	Storm	Runoff	Storm	Runoff	Storm	Runoff	Storm	Runoff	Total Storm	Released	Storage	Storage
(min)	(mm/hr)	Runoff (A1 Post)	Volume (A1 Post)	Runoff (A2 Post)	Volume (A2 Post)	Runoff (A3 Post)	Volume (A3 Post)	Runoff (A4 Post)	Volume (A4 Post)	Runoff Volume "(4)+(6)+(8)+(10)=(11)"	Volume	Volume	Depth of Tank
		(m³/s)	(m³)	(m³/s)	(m³)	(m³/s)	(m³)	(m³/s)	(m³)	(m³)	(m³)	(m³)	(m)
10.0	131.8	0.019	11.62	0.121	72.83	0.009	5.49	0.009	5.13	95.07	17.04	78.0	1.05
15.0	95.7	0.014	12.66	0.088	79.30	0.007	5.98	0.006	5.58	103.52	25.56	78.0	1.05
20.0	76.2	0.011	13.45	0.070	84.24	0.005	6.35	0.005	5.93	109.96	34.08	75.9	1.02
25.0	63.9	0.009	14.09	0.059	88.28	0.004	6.65	0.004	6.21	115.24	42.60	72.6	0.98
30.0	55.3	0.008	14.64	0.051	91.73	0.004	6.91	0.004	6.46	119.74	51.12	68.6	0.92
35.0	49.0	0.007	15.12	0.045	94.74	0.003	7.14	0.003	6.67	123.68	59.64	64.0	0.86
40.0	44.1	0.006	15.55	0.041	97.44	0.003	7.34	0.003	6.86	127.19	68.16	59.0	0.80
45.0	40.2	0.006	15.94	0.037	99.88	0.003	7.53	0.003	7.03	130.38	76.68	53.7	0.72
50.0	37.0	0.005	16.30	0.034	102.11	0.003	7.69	0.002	7.19	133.29	85.20	48.1	0.65
55.0	34.3	0.005	16.63	0.032	104.18	0.002	7.85	0.002	7.33	135.99	93.72	42.3	0.57
60.0	32.0	0.005	16.93	0.029	106.10	0.002	7.99	0.002	7.47	138.50	102.24	36.3	0.49
65.0	30.0	0.004	17.22	0.028	107.90	0.002	8.13	0.002	7.60	140.84	110.76	30.1	0.41
70.0	28.3	0.004	17.49	0.026	109.59	0.002	8.26	0.002	7.71	143.05	119.28	23.8	0.32
75.0	26.8	0.004	17.75	0.025	111.19	0.002	8.38	0.002	7.83	145.14	127.80	17.3	0.23
80.0	25.5	0.004	17.99	0.023	112.71	0.002	8.49	0.002	7.93	147.12	136.32	10.8	0.15
85.0	24.3	0.004	18.22	0.022	114.15	0.002	8.60	0.002	8.04	149.01	144.84	4.2	0.06
90.0	23.2	0.003	18.44	0.021	115.53	0.002	8.71	0.002	8.13	150.81	153.36	0.0	0.00
95.0	22.3	0.003	18.65	0.020	116.85	0.002	8.80	0.001	8.23	152.53	161.88	0.0	0.00
100.0	21.4	0.003	18.85	0.020	118.11	0.001	8.90	0.001	8.31	154.18	170.40	0.0	0.00
105.0	20.6	0.003	19.05	0.019	119.33	0.001	8.99	0.001	8.40	155.77	178.92	0.0	0.00
110.0	19.8	0.003	19.23	0.018	120.50	0.001	9.08	0.001	8.48	157.30	187.44	0.0	0.00
115.0	19.1	0.003	19.41	0.018	121.63	0.001	9.17	0.001	8.56	158.77	195.96	0.0	0.00
120.0	18.5	0.003	19.59	0.017	122.72	0.001	9.25	0.001	8.64	160.20	204.48	0.0	0.00
125.0	17.9	0.003	19.76	0.017	123.78	0.001	9.33	0.001	8.71	161.58	213.00	0.0	0.00
130.0	17.4	0.003	19.92	0.016	124.80	0.001	9.40	0.001	8.79	162.91	221.52	0.0	0.00
135.0	16.9	0.002	20.08	0.016	125.80	0.001	9.48	0.001	8.86	164.21	230.04	0.0	0.00
140.0	16.4	0.002	20.23	0.015	126.76	0.001	9.55	0.001	8.92	165.47	238.56	0.0	0.00
145.0	15.9	0.002	20.38	0.015	127.70	0.001	9.62	0.001	8.99	166.69	247.08	0.0	0.00
150.0	15.5	0.002	20.53	0.014	128.61	0.001	9.69	0.001	9.05	167.88	255.60	0.0	0.00
155.0	15.1	0.002	20.67	0.014	129.50	0.001	9.76	0.001	9.12	169.04	264.12	0.0	0.00
160.0	14.7	0.002	20.81	0.014	130.37	0.001	9.82	0.001	9.18	170.17	272.64	0.0	0.00
165.0	14.4	0.002	20.94	0.013	131.21	0.001	9.89	0.001	9.24	171.28	281.16	0.0	0.00
170.0	14.1	0.002	21.07	0.013	132.04	0.001	9.95	0.001	9.29	172.35	289.68	0.0	0.00
175.0	13.7	0.002	21.20	0.013	132.84	0.001	10.01	0.001	9.35	173.41	298.20	0.0	0.00
180.0	13.4	0.002	21.33	0.012	133.63	0.001	10.07	0.001	9.41	174.44	306.72	0.0	0.00
185.0	13.1	0.002	21.45	0.012	134.40	0.001	10.13	0.001	9.46	175.44	315.24	0.0	0.00
190.0	12.9	0.002	21.57	0.012	135.16	0.001	10.18	0.001	9.51	176.43	323.76	0.0	0.00
195.0	12.6	0.002	21.69	0.012	135.90	0.001	10.24	0.001	9.57	177.39	332.28	0.0	0.00
200.0	12.4	0.002	21.81	0.011	136.62	0.001	10.29	0.001	9.62	178.34	340.80	0.0	0.00
205.0	12.1	0.002	21.92	0.011	137.33	0.001	10.35	0.001	9.67	179.27	349.32	0.0	0.00
210.0	11.9	0.002	22.03	0.011	138.03	0.001	10.40	0.001	9.72	180.18	357.84	0.0	0.00
215.0	11.7	0.002	22.14	0.011	138.71	0.001	10.45	0.001	9.76	181.07	366.36	0.0	0.00
220.0	11.5	0.002	22.25	0.011	139.38	0.001	10.50	0.001	9.81	181.94	374.88	0.0	0.00
225.0	11.3	0.002	22.35	0.010	140.04	0.001	10.55	0.001	9.86	182.80	383.40	0.0	0.00
230.0	11.1	0.002	22.46	0.010	140.69	0.001	10.60	0.001	9.90	183.65	391.92	0.0	0.00
235.0	10.9	0.002	22.56	0.010	141.33	0.001	10.65	0.001	9.95	184.48	400.44	0.0	0.00
240.0	10.7	0.002	22.66	0.010	141.95	0.001	10.70	0.001	9.99	185.30	408.96	0.0	0.00
245.0	10.5	0.002	22.76	0.010	142.57	0.001	10.74	0.001	10.04	186.10	417.48	0.0	0.00
250.0	10.4	0.002	22.85	0.010	143.18	0.001	10.79	0.001	10.08	186.89	426.00	0.0	0.00
255.0	10.2	0.001	22.95	0.009	143.77	0.001	10.83	0.001	10.12	187.67	434.52	0.0	0.00
260.0	10.0	0.001	23.04	0.009	144.36	0.001	10.88	0.001	10.16	188.44	443.04	0.0	0.00
265.0	9.9	0.001	23.13	0.009	144.94	0.001	10.92	0.001	10.20	189.20	451.56	0.0	0.00
270.0	9.8	0.001	23.22	0.009	145.51	0.001	10.96	0.001	10.24	189.94	460.08	0.0	0.00



Modified Rational Method - Hundred Year Storm
Site Flow and Storage Summary - towards Grenoble Drive
City of Toronto

File No. UD21-110
Date: February 2023
Prepared By: Isaak Chlorotyris, P.E., M.A.Sc.
Reviewed By: John Pasalidis, P.Eng., M.A.Sc.

		Drainage Area A1 Post		Drainage Area A2 Post		Drainage Area A3 Post		Drainage Area A4 Post		Total Site			
		Green Roofs - Controlled In Underground Tank		Rooftops/Terraces/Walkways - Controlled In Underground Tank		Driveway area - Controlled In Underground Tank		Landscaped - Controlled In Underground Tank		Total Site = A1 + A2 + A3 +A4			
		Area (A1) = 0.118 ha "C" = 0.45 AC1= 0.05 Tc = 10.0 min Time Increment = 5.0 min		Area (A2) = 0.368 ha "C" = 0.90 AC2= 0.332 Tc = 10 min Time Increment = 5 min		Area (A3) = 0.028 ha "C" = 0.90 AC3= 0.025 Tc = 10 min Time Increment = 5 min		Area (A4) = 0.093 ha "C" = 0.25 AC4= 0.023 Tc = 10 min Time Increment = 5 min		2-yr Pre-Development Site Release Rate = 28.4 L/s			
		Max. Release Rate = 36.8 L/s		Max. Release Rate = 230.5 L/s		Max. Release Rate = 17.4 L/s		Max. Release Rate = 16.2 L/s		Uncontrolled Flow = 0.0 L/s Total Uncontrolled Release Rate Achieved = 0.0 L/s Design Controlled Release Rate (Pump) = 28.4 L/s			
100-Year Design Storm										Total Site Release Rate Achieved = 28.4 L/s			
a=	59.70									Max. Storage Tank Size = 174.37 m³			
c=	-0.80									Stor. Tank footprint Area = 74.20 m²			
l =	A(T) ^c												
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Time	Rainfall	Storm	Runoff	Storm	Runoff	Storm	Runoff	Storm	Runoff	Total Storm	Released	Storage	Storage
	Intensity	Runoff (A1 Post)	Volume (A1 Post)	Runoff (A2 Post)	Volume (A2 Post)	Runoff (A3 Post)	Volume (A3 Post)	Runoff (A4 Post)	Volume (A4 Post)	Runoff Volume "(4)+(6)+(8)+(10)=(11)"	Volume	Volume	Depth of Tank
(min)	(mm/hr)	(m³/s)	(m³)	(m³/s)	(m³)	(m³/s)	(m³)	(m³/s)	(m³)	(m³)	(m³)	(m³)	(m)
10.0	250.3	0.037	22.08	0.231	138.33	0.017	10.42	0.016	9.74	180.57	17.04	163.5	2.20
15.0	181.0	0.027	23.94	0.167	150.01	0.013	11.30	0.012	10.56	195.82	25.56	170.3	2.29
20.0	143.8	0.021	25.36	0.132	158.90	0.010	11.97	0.009	11.19	207.42	34.08	173.3	2.34
25.0	120.3	0.018	26.52	0.111	166.15	0.008	12.52	0.008	11.70	216.88	42.60	174.28	2.35
30.0	103.9	0.015	27.50	0.096	172.32	0.007	12.98	0.007	12.13	224.94	51.12	173.8	2.34
35.0	91.9	0.014	28.36	0.085	177.71	0.006	13.39	0.006	12.51	231.98	59.64	172.3	2.32
40.0	82.6	0.012	29.13	0.076	182.52	0.006	13.75	0.005	12.85	238.26	68.16	170.1	2.29
45.0	75.1	0.011	29.83	0.069	186.87	0.005	14.08	0.005	13.15	243.94	76.68	167.3	2.25
50.0	69.1	0.010	30.46	0.064	190.85	0.005	14.38	0.004	13.43	249.13	85.20	163.9	2.21
55.0	64.0	0.009	31.05	0.059	194.53	0.004	14.66	0.004	13.69	253.93	93.72	160.2	2.16
60.0	59.7	0.009	31.59	0.055	197.94	0.004	14.92	0.004	13.93	258.38	102.24	156.1	2.10
65.0	56.0	0.008	32.10	0.052	201.14	0.004	15.16	0.004	14.16	262.55	110.76	151.8	2.05
70.0	52.8	0.008	32.58	0.049	204.14	0.004	15.38	0.003	14.37	266.47	119.28	147.2	1.98
75.0	49.9	0.007	33.04	0.046	206.98	0.003	15.60	0.003	14.57	270.18	127.80	142.4	1.92
80.0	47.4	0.007	33.46	0.044	209.66	0.003	15.80	0.003	14.76	273.69	136.32	137.4	1.85
85.0	45.2	0.007	33.87	0.042	212.22	0.003	15.99	0.003	14.94	277.02	144.84	132.2	1.78
90.0	43.2	0.006	34.26	0.040	214.66	0.003	16.18	0.003	15.11	280.21	153.36	126.8	1.71
95.0	41.3	0.006	34.63	0.038	217.00	0.003	16.35	0.003	15.28	283.26	161.88	121.4	1.64
100.0	39.7	0.006	34.99	0.037	219.23	0.003	16.52	0.003	15.43	286.18	170.40	115.8	1.56
105.0	38.2	0.006	35.33	0.035	221.38	0.003	16.68	0.002	15.58	288.98	178.92	110.1	1.48
110.0	36.8	0.005	35.67	0.034	223.45	0.003	16.84	0.002	15.73	291.68	187.44	104.2	1.40
115.0	35.5	0.005	35.98	0.033	225.45	0.002	16.99	0.002	15.87	294.29	195.96	98.3	1.33
120.0	34.3	0.005	36.29	0.032	227.37	0.002	17.13	0.002	16.01	296.80	204.48	92.3	1.24
125.0	33.2	0.005	36.59	0.031	229.24	0.002	17.27	0.002	16.14	299.24	213.00	86.2	1.16
130.0	32.2	0.005	36.88	0.030	231.04	0.002	17.41	0.002	16.26	301.59	221.52	80.1	1.08
135.0	31.2	0.005	37.16	0.029	232.79	0.002	17.54	0.002	16.39	303.88	230.04	73.8	1.00
140.0	30.3	0.004	37.43	0.028	234.49	0.002	17.67	0.002	16.51	306.10	238.56	67.5	0.91
145.0	29.5	0.004	37.69	0.027	236.15	0.002	17.79	0.002	16.62	308.25	247.08	61.2	0.82
150.0	28.7	0.004	37.95	0.026	237.75	0.002	17.92	0.002	16.74	310.35	255.60	54.8	0.74
155.0	27.9	0.004	38.20	0.026	239.32	0.002	18.03	0.002	16.85	312.39	264.12	48.3	0.65
160.0	27.2	0.004	38.44	0.025	240.84	0.002	18.15	0.002	16.95	314.38	272.64	41.7	0.56
165.0	26.6	0.004	38.68	0.024	242.33	0.002	18.26	0.002	17.06	316.32	281.16	35.2	0.47
170.0	25.9	0.004	38.91	0.024	243.78	0.002	18.37	0.002	17.16	318.22	289.68	28.5	0.38
175.0	25.4	0.004	39.14	0.023	245.20	0.002	18.48	0.002	17.26	320.07	298.20	21.9	0.29
180.0	24.8	0.004	39.36	0.023	246.58	0.002	18.58	0.002	17.36	321.88	306.72	15.2	0.20
185.0	24.3	0.004	39.57	0.022	247.94	0.002	18.68	0.002	17.45	323.65	315.24	8.4	0.11
190.0	23.7	0.003	39.78	0.022	249.26	0.002	18.78	0.002	17.55	325.38	323.76	1.6	0.02
195.0	23.3	0.003	39.99	0.021	250.56	0.002	18.88	0.002	17.64	327.07	332.28	0.0	0.00
200.0	22.8	0.003	40.19	0.021	251.83	0.002	18.98	0.001	17.73	328.73	340.80	0.0	0.00
205.0	22.3	0.003	40.39	0.021	253.08	0.002	19.07	0.001	17.82	330.36	349.32	0.0	0.00
210.0	21.9	0.003	40.59	0.020	254.30	0.002	19.16	0.001	17.90	331.95	357.84	0.0	0.00
215.0	21.5	0.003	40.78	0.020	255.50	0.001	19.25	0.001	17.99	333.52	366.36	0.0	0.00
220.0	21.1	0.003	40.97	0.019	256.68	0.001	19.34	0.001	18.07	335.06	374.88	0.0	0.00
225.0	20.7	0.003	41.15	0.019	257.84	0.001	19.43	0.001	18.15	336.57	383.40	0.0	0.00
230.0	20.4	0.003	41.33	0.019	258.97	0.001	19.51	0.001	18.23	338.05	391.92	0.0	0.00
235.0	20.0	0.003	41.51	0.018	260.09	0.001	19.60	0.001	18.31	339.51	400.44	0.0	0.00
240.0	19.7	0.003	41.69	0.018	261.19	0.001	19.68	0.001	18.39	340.94	408.96	0.0	0.00
245.0	19.4	0.003	41.86	0.018	262.26	0.001	19.76	0.001	18.46	342.35	417.48	0.0	0.00
250.0	19.1	0.003	42.03	0.018	263.33	0.001	19.84	0.001	18.54	343.73	426.00	0.0	0.00
255.0	18.8	0.003	42.20	0.017	264.37	0.001	19.92	0.001	18.61	345.10	434.52	0.0	0.00
260.0	18.5	0.003	42.36	0.017	265.40	0.001	20.00	0.001	18.68	346.44	443.04	0.0	0.00
265.0	18.2	0.003	42.52	0.017	266.41	0.001	20.07	0.001	18.75	347.76	451.56	0.0	0.00
270.0	17.9	0.003	42.68	0.017	267.41	0.001	20.15	0.001	18.82	349.07	460.08	0.0	0.00



Modified Rational Method
Two Year Storm
Site Flow and Storage Summary
- towards Easement
48 Grenoble Drive

Drainage Area A5 Post

Uncontrolled area towards Easement

Area (A5) = **0.068** ha
Design Coefficient "C" = **0.50**
AC5 = **0.034**
Tc = **10.0** min
Time Increment = **5.0** min
Max. Release Rate = **8.3** L/s

2-Year Design Storm

a = 21.80
c = -0.78
I = A(T)^c

Type	Area (ha)	Actual Coefficient "C"
Landscaped	0.068	0.25
Hardscaped	0.000	0.90
Total Area (A5 Post)	0.068	0.25

2-yr Pre-Development Site
Release Rate towards Easement (A2-pre)= 48.2 L/s

Site Release Rate towards Easement (A6 Post)= 8.3 L/s

(1)	(2)	(3)	(4)
Time	Rainfall	Storm	Runoff
	Intensity	Runoff (A5 post)	Volume (A5 post)
(min)	(mm/hr)	(m ³ /s)	(m ³)
10.0	88.2	0.008	4.97
15.0	64.3	0.006	5.43
20.0	51.4	0.005	5.79
25.0	43.2	0.004	6.08
30.0	37.4	0.004	6.33
35.0	33.2	0.003	6.54
40.0	29.9	0.003	6.74
45.0	27.3	0.003	6.92
50.0	25.1	0.002	7.08
55.0	23.3	0.002	7.23
60.0	21.8	0.002	7.37
65.0	20.5	0.002	7.50
70.0	19.3	0.002	7.62
75.0	18.3	0.002	7.74
80.0	17.4	0.002	7.85
85.0	16.6	0.002	7.96
90.0	15.9	0.001	8.06
95.0	15.2	0.001	8.15
100.0	14.6	0.001	8.24
105.0	14.1	0.001	8.33
110.0	13.6	0.001	8.42
115.0	13.1	0.001	8.50
120.0	12.7	0.001	8.58
125.0	12.3	0.001	8.66
130.0	11.9	0.001	8.73
135.0	11.6	0.001	8.81
140.0	11.3	0.001	8.88
145.0	11.0	0.001	8.95
150.0	10.7	0.001	9.01
155.0	10.4	0.001	9.08
160.0	10.1	0.001	9.14
165.0	9.9	0.001	9.21

 Lithos		Modified Rational Method Five Year Storm Site Flow and Storage Summary - towards Easement 48 Grenoble Drive							
Drainage Area A5 Post Uncontrolled area towards Easement Area (A5) =0.068ha Design Coefficient "C" =0.50 AC5=0.034 Tc =10.0min Time Increment =5.0min Max. Release Rate =12.4L/s 5-Year Design Storm <table><tr><td>a=</td><td>32.00</td></tr><tr><td>c=</td><td>-0.79</td></tr><tr><td>I =</td><td>A(T)^c</td></tr></table>				a=	32.00	c=	-0.79	I =	A(T) ^c
a=	32.00								
c=	-0.79								
I =	A(T) ^c								
Type		Area (ha)	Actual Coefficient "C"						
Landscaped		0.068	0.25						
Hardscaped		0.000	0.90						
Total Area (A5 Post)		0.068	0.25						
2-yr Pre-Development Site Release Rate towards Easement (A2-pre)=48.2L/s Site Release Rate towards Easement (A6 Post)=12.4L/s									
(1)	(2)	(3)	(4)						
Time	Rainfall	Storm	Runoff						
	Intensity	Runoff (A5 post)	Volume (A5 post)						
(min)	(mm/hr)	(m³/s)	(m³)						
10.0	131.8	0.012	7.42						
15.0	95.7	0.009	8.08						
20.0	76.2	0.007	8.59						
25.0	63.9	0.006	9.00						
30.0	55.3	0.005	9.35						
35.0	49.0	0.005	9.66						
40.0	44.1	0.004	9.93						
45.0	40.2	0.004	10.18						
50.0	37.0	0.003	10.41						
55.0	34.3	0.003	10.62						
60.0	32.0	0.003	10.82						
65.0	30.0	0.003	11.00						
70.0	28.3	0.003	11.17						
75.0	26.8	0.003	11.33						
80.0	25.5	0.002	11.49						
85.0	24.3	0.002	11.64						
90.0	23.2	0.002	11.78						
95.0	22.3	0.002	11.91						
100.0	21.4	0.002	12.04						
105.0	20.6	0.002	12.16						
110.0	19.8	0.002	12.28						
115.0	19.1	0.002	12.40						
120.0	18.5	0.002	12.51						
125.0	17.9	0.002	12.62						
130.0	17.4	0.002	12.72						
135.0	16.9	0.002	12.82						
140.0	16.4	0.002	12.92						
145.0	15.9	0.001	13.02						
150.0	15.5	0.001	13.11						
155.0	15.1	0.001	13.20						
160.0	14.7	0.001	13.29						
165.0	14.4	0.001	13.38						

		Modified Rational Method Hundred Year Storm Site Flow and Storage Summary - towards Easement 48 Grenoble Drive													
Drainage Area A5 Post															
Uncontrolled area towards Easement															
Area (A5) =		0.068	ha												
Design Coefficient "C" =		0.50													
AC5=		0.034													
Tc =		10.0	min												
Time Increment =		5.0	min												
Max. Release Rate =		23.5	L/s												
<table><tr><th colspan="2">100-Year Design Storm</th></tr><tr><td>a=</td><td>59.70</td></tr><tr><td>c=</td><td>-0.80</td></tr><tr><td>I =</td><td>A(T)^c</td></tr></table>				100-Year Design Storm		a=	59.70	c=	-0.80	I =	A(T) ^c				
100-Year Design Storm															
a=	59.70														
c=	-0.80														
I =	A(T) ^c														
<table><tr><th>Type</th><th>Area (ha)</th><th>Actual Coefficient "C"</th></tr><tr><td>Landscaped</td><td>0.068</td><td>0.25</td></tr><tr><td>Hardscaped</td><td>0.000</td><td>0.90</td></tr><tr><td>Total Area (A5 Post)</td><td>0.068</td><td>0.25</td></tr></table>				Type	Area (ha)	Actual Coefficient "C"	Landscaped	0.068	0.25	Hardscaped	0.000	0.90	Total Area (A5 Post)	0.068	0.25
Type	Area (ha)	Actual Coefficient "C"													
Landscaped	0.068	0.25													
Hardscaped	0.000	0.90													
Total Area (A5 Post)	0.068	0.25													
2-yr Pre-Development Site Release Rate towards Easement (A2-pre)=48.2L/s Site Release Rate towards Easement (A6 Post)=23.5L/s															
(1)	(2)	(3)	(4)												
Time	Rainfall	Storm	Runoff												
	Intensity	Runoff (A5 post)	Volume (A5 post)												
(min)	(mm/hr)	(m³/s)	(m³)												
10.0	250.3	0.024	14.10												
15.0	181.0	0.017	15.29												
20.0	143.8	0.013	16.20												
25.0	120.3	0.011	16.94												
30.0	103.9	0.010	17.57												
35.0	91.9	0.009	18.12												
40.0	82.6	0.008	18.61												
45.0	75.1	0.007	19.05												
50.0	69.1	0.006	19.46												
55.0	64.0	0.006	19.83												
60.0	59.7	0.006	20.18												
65.0	56.0	0.005	20.50												
70.0	52.8	0.005	20.81												
75.0	49.9	0.005	21.10												
80.0	47.4	0.004	21.37												
85.0	45.2	0.004	21.63												
90.0	43.2	0.004	21.88												
95.0	41.3	0.004	22.12												
100.0	39.7	0.004	22.35												
105.0	38.2	0.004	22.57												
110.0	36.8	0.003	22.78												
115.0	35.5	0.003	22.98												
120.0	34.3	0.003	23.18												
125.0	33.2	0.003	23.37												
130.0	32.2	0.003	23.55												
135.0	31.2	0.003	23.73												
140.0	30.3	0.003	23.90												
145.0	29.5	0.003	24.07												
150.0	28.7	0.003	24.24												
155.0	27.9	0.003	24.40												
160.0	27.2	0.003	24.55												
165.0	26.6	0.002	24.70												



Water Balance Calculation

48 Grenoble Drive

File No. UD21-110

Date: February 2023

Prepared By: Isaak Chlorotiris, P.E., M.A.Sc.

Reviewed By: John Pasalidis, P.Eng., M.A.Sc.

Contributing Drainage Area	6073	m ²
Rainfall depth to be retained	5.0	mm
Total rainfall volume required at 5mm	30.37	m³

Initial Abstraction Calculations

Surface	Area (m ²)	IA (mm)	Volume (m ³)	
Green Roofs	1176	5.0	5.88	m ²
Landscape	934	5.0	4.67	m ³
Hardscape	3963	1.0	3.96	m ³
Total	6073		14.51	m ³

Water Volume provided by initial abstraction is	14.51	m³
Therefore Required Remaining Rainfall Volume to be retained	15.85	m³



Water Quality Calculations

48 Grenoble Drive

File No. UD21-110

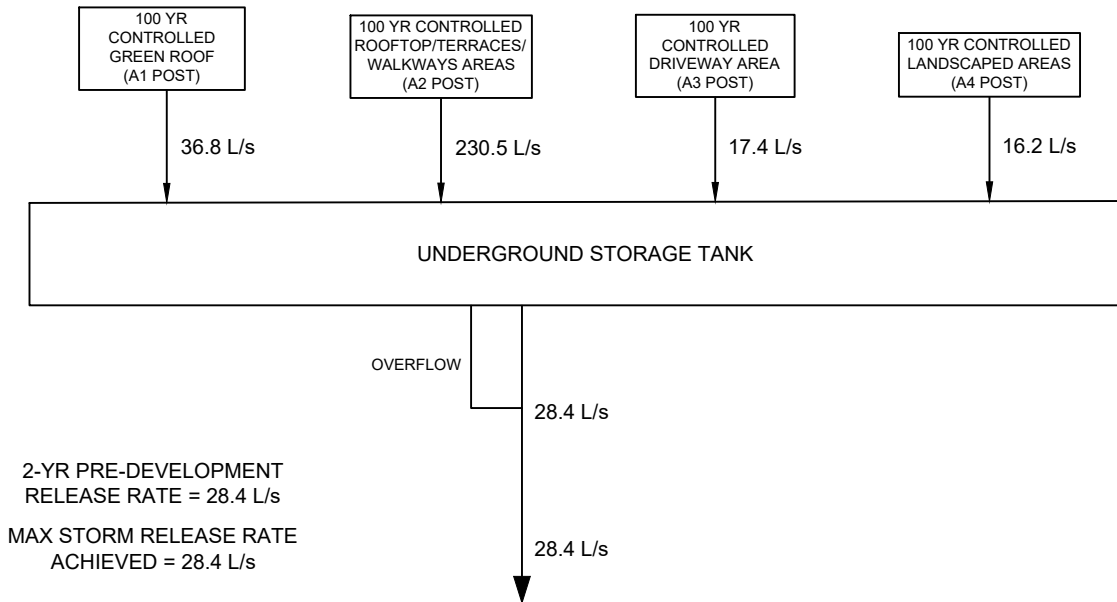
Date: February 2023

Prepared By: Isaak Chlorotiris, P.E., M.A.Sc.

Reviewed by: John Pasalidis, P.Eng., M.A.Sc.

Surface	Method	Effective TSS Removal	Area (ha)	% Area of Controlled Site	Overall TSS Removal
Rooftop/ Terraces/Green Roof/Walkways/Landscape/Hardscape	Inherent	80%	0.579	95%	76%
Driveway / Landscape Area	SPFD 0608	80%	0.028	5%	4%
Total			0.607	100%	80%

Note: Uncontrolled water does not account in the above calculations



QUANTITY CONTROL

Volume required for 100-year event = 174.37 m³

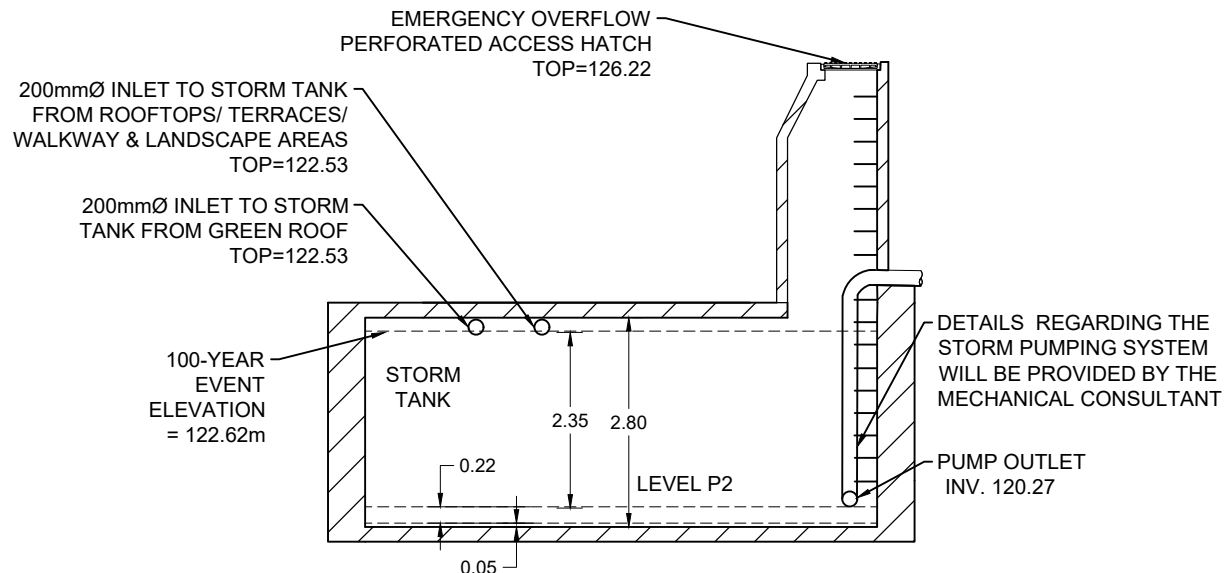
Additional Volume required to be stored for Water Balance = 14.51 m³

Additional Volume provided to be stored for Water Balance = 16.32 m³

Volume of Storage Tank provided = Refer to Mechanical Engineering Drawing

Tank Area=74.20 m²

NOTE: TANK DESIGN TO BE VERIFIED BY BUILDING MECHANICAL CONSULTANT



CONCEPTUAL FLOW SCHEMATIC

RESIDENTIAL USE DEVELOPMENT
48 GRENABLE DRIVE
TORONTO, ONTARIO

150 Bermondsey Road, Toronto, Ontario M4A 1Y1

DATE: FEBRUARY 2023

SCALE: N.T.S.

PROJECT No: PUD21-110

FIGURE No: FIG 3



Determining Number of Cartridges for Flow Based Systems

Date

3/8/2022

Black Cells = Calculation

Site Information

Project Name	48 Grenoble Drive
Project Location	Toronto, ON
OGS ID	Stormfilter - Revision 1
Drainage Area, Ad	0.07 ac (0.028 ha)
Impervious Area, Ai	0.07 ac
Pervious Area, Ap	0.00
% Impervious	100%
Runoff Coefficient, Rc	0.90
Treatment storm flow rate, Q_{treat}	0.05 cfs (1.4 L/s)
Peak storm flow rate, Q_{peak}	0.61 cfs (17.4 L/s)

Filter System

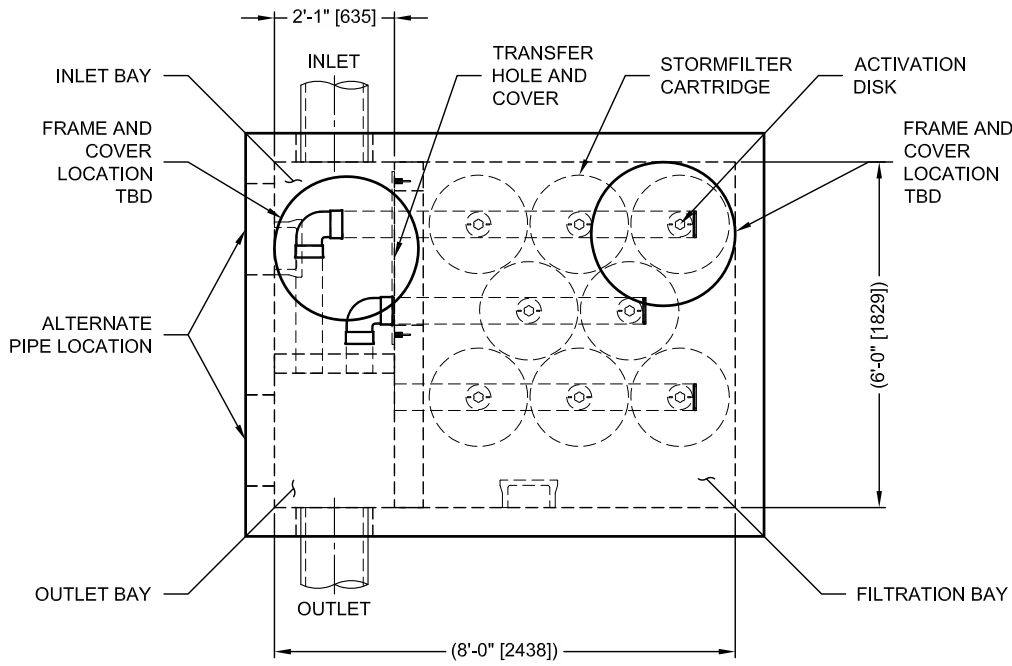
Filtration brand	StormFilter
Cartridge height	12 in
Specific Flow Rate	2.00 gpm/ft ²
Flow rate per cartridge	10.00 gpm

SUMMARY

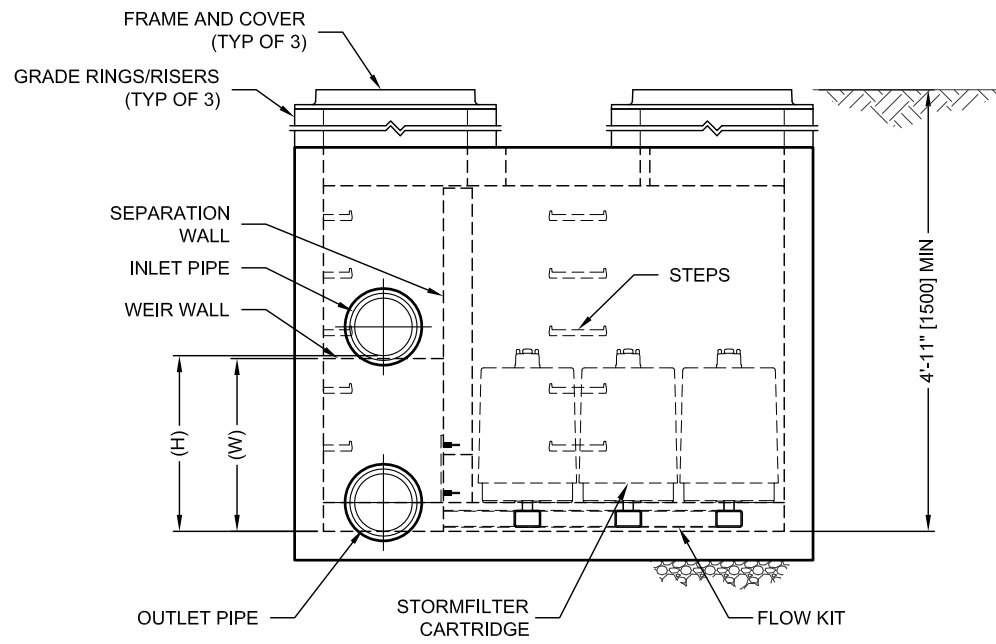
Number of Cartridges	3
Media Type	Perlite

Event Mean Concentration (EMC)	120 mg/L
Annual TSS Removal	80%
Percent Runoff Capture	90%

Recommend SF08608 vault or CIP



PLAN



ELEVATION



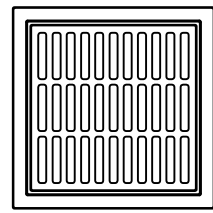
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING
U.S. PATENTS: 5,322,629; 5,524,576; 5,707,527; 5,985,157; 6,027,639; 6,649,048;
RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

STORMFILTER DESIGN NOTES

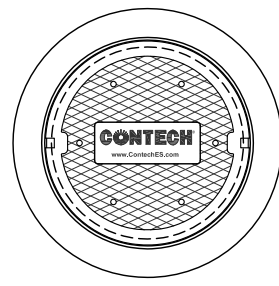
- STORMFILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCALLY APPROVED SURFACE AREA SPECIFIC FLOW RATE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD
- A 6' x 8' [1829 x 2438] PEAK DIVERSION STYLE STORMFILTER IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (8) AND IS AVAILABLE IN A LEFT INLET (AS SHOWN) OR A RIGHT INLET CONFIGURATION
- ALL PARTS AND INTERNAL ASSEMBLY PROVIDED BY CONTECH UNLESS NOTED OTHERWISE

CARTRIDGE SIZE (in. [mm])	27 [686]			18 [457]			LOW DROP		
RECOMMENDED HYDRAULIC DROP (H) (ft. [mm])	3.05 [930]			2.3 [701]			1.8 [549]		
HEIGHT OF WEIR (W) (ft. [mm])	3.00 [914]			2.25 [686]			1.75 [533]		
SPECIFIC FLOW RATE (gpm/sf [L/s/m ²])	2 [1.36]	1.67* [1.13]*	1 [0.68]	2 [1.36]	1.67* [1.13]*	1 [0.68]	2 [1.36]	1.67* [1.13]*	1 [0.68]
CARTRIDGE FLOW RATE (gpm [L/s])	22.5 [1.42]	18.79 [1.19]	11.25 [0.71]	15 [0.95]	12.53 [0.79]	7.5 [0.47]	10 [0.63]	8.35 [0.53]	5 [0.32]

* 1.67 gpm/sf [1.13 L/s/m²] SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB® (PSORB) MEDIA ONLY



FRAME AND GRATE
(24" SQUARE)
(NOT TO SCALE)



FRAME AND COVER
(30" ROUND)
(NOT TO SCALE)

SITE SPECIFIC
DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (cfs [L/s])			
PEAK FLOW RATE (cfs [L/s])			
RETURN PERIOD OF PEAK FLOW (yrs)			
CARTRIDGE FLOW RATE			
CARTRIDGE SIZE (27, 18, LOW DROP (LD))			
MEDIA TYPE (PERLITE, ZPG, PSORB)			
NUMBER OF CARTRIDGES REQUIRED			
INLET BAY RIM ELEVATION			
FILTER BAY RIM ELEVATION			
PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
NOTES/SPECIAL REQUIREMENTS:			

PERFORMANCE SPECIFICATION

FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7" [178].** FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **38 SECONDS**. SPECIFIC FLOW RATE SHALL BE **2 GPM/SF [1.36 L/s/m²] (MAXIMUM)**. SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF [13.39 L/s/m³] OF MEDIA (MAXIMUM)**.

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH () ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. ALTERNATE DIMENSIONS ARE IN MILLIMETERS [mm] UNLESS NOTED OTHERWISE.
4. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
5. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
6. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 10' [3048] AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.

INSTALLATION NOTES

- A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE.
- C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL SECTIONS AND ASSEMBLE STRUCTURE.
- D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
- E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
- F. CONTRACTOR TO REMOVE THE TRANSFER OPENING COVER WHEN THE SYSTEM IS BROUGHT ONLINE.

CONTECH®
ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

SFPD0608 (6' x 8')
PEAK DIVERSION STORMFILTER
STANDARD DETAIL



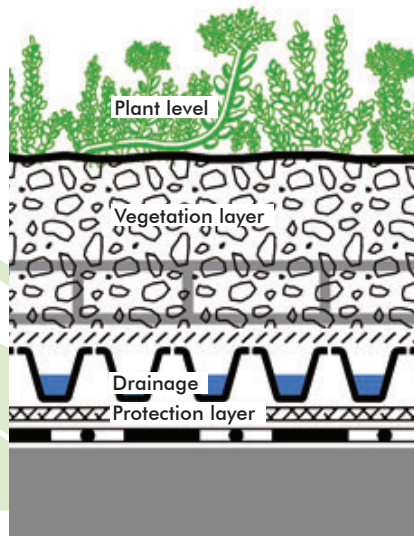
Plant Suggestions "Sedum Carpet"

Plants in small groups (groups of 3, 5 or 7)

Botanical Name	Common Name	Height (mm)	Blossom Colour	Blossom Period (month)
<i>Sedum album</i> varieties e.g. 'Coral Carpet' 'Murale'	White stonecrop varieties	50–100 50–100 50–100	white white pale-rose	6–8 6–8 6
<i>Sedum caucolicum</i>	Nettle-leaved goosefoot	100–150	rose	8–9
<i>Sedum floriferum</i> 'Weihenstep. Gold'	Gold sedum	100–150	yellow	6–7
<i>Sedum hybridum</i> 'Immergrünchen'	Hybrid stonecrop	100–150	yellow	7–8
<i>Sedum reflexum</i>	Crooked yellow stonecrop	200–250	yellow	6–7
<i>Sedum sexangulare</i>	Tasteless yellow stonecrop	50–100	yellow	6–7
<i>Sedum spurium</i> in varieties. e.g. 'Album Superbum' 'Fuldaglut' 'Roseum Superbum' 'Splendens' 'Variegatum'	Dragon's blood	100–150 100–150 100–150 100–150 100–150	white**	7–8 7–8 7–8 7–8 7–8

** infrequent blooming

Weight kg/m ²		Height mm
dry	water-saturated	
67	84	60
2	10	30
69	94	



Mixture of Sedum Cuttings according to plant suggestions "Sedum Carpet"

System Substrate "Sedum Carpet"

Safety Device "Fallnet®", if required
(attention to load requirements)

Filter Sheet SF

Floradrain® FD 25-E

Protection Mat SSM 45

Root Barrier WSF 40,
if waterproofing is not root-resistant

Build-up height:	ca. 90 mm
Weight, saturated:	ca. 95 kg/m ²
Water retention capacity:	ca. 25 l/m ²



System Build-ups with European Technical Assessment. Details on Page 15.



System Build-up with EPD verification. Details on Page 15.

Specification Suggestion

"Sedum Roof Plus" with Floradrain® FD 25-E

SPEC NOTE:

This guide specification gives general information about the ZinCo green roof assembly. It has to be clear, that the information that is shown must be understood as guide and recommendations.

It is possible that your green roof project need special technical requirements. Please contact us for further information regarding technical advice, specifications and budget cost.

ZinCo Canada Inc.

P.O.Box 29
Carlisle, ON Canada L0R 1H0
T. 1-905-690-1661
E. greenroof@zinco.ca
www.zinco.ca

PART 1 – GENERAL

TECHNICAL DATA

Depth:

120 -140 mm (5"-6")

Saturated weight:

130 - 155 kg/m² (27 – 32 lbs/ft²)

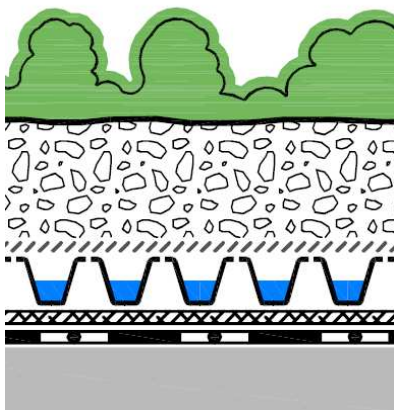
Water retention capacity:

44 - 51 L/m²

Slope:

2-5 degrees

SECTION



Section includes:

1. Plant Community: "Sedum Roof Plus"
2. Growing Medium ZinCo Blend-E.
Depth: 100 or 120 mm (3.0 or 4.0")
3. a. Filter Sheet ZinCo SF
b. Aquafleece AF300
4. Drainage Element ZinCo Floradrain® FD 25
5. Protection Mat ZinCo SSM45
6. Related Materials:
 - ZinCo Root Barrier WSF40
 - Inspection Chamber ZinCo KS10
 - Gravel Retain ZinCo KL100/120
 - Gravel Strip
 - ZinCo Irrigation Unit BM4

REFERENCES

- The ZinCo "Sedum Roof" assembly meets or exceed the requirements of the FLL-standards (Guideline for Planning, Execution and Upkeep of Green-Roof Sites, Release 2008).
- The ZinCo "Sedum Roof" meets or exceed the Toronto Green Roof Construction Standard (Toronto Municipal Code Chapter 492, Article IV).

DEFINITIONS

- **Green Roof:** A Green Roof is an innovative, multi-layered system that covers all types of waterproofed roof surfaces with growing medium and plant material.
- **Extensive Green Roof:** A vegetated ecological protection that is light weight, has a low growing medium depth, has a natural/native plant selection, and has low maintenance and low installation costs.
- **Sedum:** Sedum is a large and diverse group of durable Green Roof plants known for its fleshy succulent foliage and stalks of yellow, pink or white flowers. Sedum is very easy to care for, low maintenance plants and once established

are drought tolerant.

SUBMITTALS

- Submit signed shop drawings showing that the roofing system, green roof assembly, materials, perimeter and penetration details and fall protection are accepted by the green roof manufacturer to ensure that the green roof system meets the necessary performance requirements.
- Submit a certification showing that all the components of the green roof assembly are supplied and warranted by the green roof manufacturer.
- Submit an inspection report, signed by the roof contractor and the green roof contractor, resulting from the quality control of the roofing system installation prior to the installation of the green roof assembly indicating that the roofing system is installed correctly.
- Submit references which indicate that the green roof manufacturer as well as the green roof contractor has recently successfully completed projects of similar scope and nature.

QUALITY ASSURANCE

- **Installers Qualifications:** Work of this section shall be installed by a recognized green roof or landscape contractor, approved by ZinCo Canada Inc. The contractor shall have adequate equipment, skilled workers with extensive practical experience, skills and knowledge of plants horticulture techniques and overall landscape design requirements.
- Roof details such as flashing, roof edges, roof penetrations, outlets, roof fall and type of insulation must be adjusted to the Green Roof Assembly used. ZinCo Canada Inc. provides consultation and engineering to (landscape) architects, roof contractors and green roof contractors to finalize these adjustments before

Specification Suggestion

"Sedum Roof Plus" with Floradrain® FD 25-E

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construction of the roof commences, if requested.

- Prior to the installation of the green roof system, test the water tightness of the roofing system by flood testing for at least a 48 hour period or an electronic leak detection process performed by a qualified testing agency.
- Submit documentation certifying that the load bearing capacity of the roof and building construction is tested and approved by a structural engineer, with regard to the extra weight of the Green Roof assembly.

ENVIRONMENTAL CONDITIONS

- The plant community should be chosen in consideration of the climatic circumstances and hardiness zone. Please contact ZinCo Canada Inc. for more information.
- Proceed with planting between spring and early fall so as to enable plants to take root in order to survive the winter months.
- Provide a temporary fall protection (safety railing or fall arrest) during the installation to ensure a safe and healthy work environment.
- Provide a permanent fall protection (safety railing or fall arrest) for maintenance to ensure a safe and healthy work environment.

DELIVERY, STORAGE & HANDLING

- By storage on the roof makes sure that the load of the materials does not exceed the load bearing capacity of the roof and building construction
- Store the materials in a dry area, out of direct sunlight, protected from freezing, staining or damage.

- Stored plant materials have to be watched carefully. Watering the plants can be necessary during a long storage period.

WARRANTY

- Submit a 10-year (insurance backed) product manufacturing warranty according to the specifications of the green roof manufacturer which warrants all the components of the green roof assembly. (except the vegetation)
- Submit a 2-year workmanship warranty which warrants the installation of the green roof system according to the specifications.
- Submit a 2 year growing warranty to take effect immediately after the installation of the Green Roof. This warranty is to ensure that the vegetation properly encloses the roof area. After that a maintenance program has to be covering the full period of the warranty.

MAINTENANCE

- Provide a maintenance program for the duration of two growing seasons as per following maintenance measures:
 - Four visits in the first year.
 - Four visits in the second year.
 - The removal of coarse and unwanted weeds and the seedlings of trees; some 'newcomers' are quite acceptable.
 - The removal of vegetation from the gravel strips;
 - Visual inspection of the drain outlets; Maintaining a functioning drainage layer is critical to the establishment of the vegetation. Retained water will stagnate and is detrimental to proper plant growth;
 - Soil Testing & Fertilizing the vegetation with a slow released chemical fertilizer; - type of fertilizer: slow release N-P-K: 20-6-11 75 % coated.
 - recommended quantity: 25 gram

per square meter. Soil testing may be required.

- Replace plant material that dies, as necessary;
- Replace lost growing medium from erosion through foot traffic, wind damage, or nesting animals. Use ZinCo growing medium.
- Removal of unwanted debris to ensure no damage to the vegetation.
- Irrigation if necessary;

Submit maintenance report to the owner at the end of the growing season.

PART 2 - PRODUCTS

Specified green roof assembly:
ZinCo Floradrain ® FD25: Sedum Roof Plus

Supplier:

ZinCo Canada Inc.
P.O. Box 29
Carlisle, ON Canada, L0R 1H0

Phone: 905-690-1661
E-mail: greenroof@zinco.ca
Website: www.zinco.ca

1. ROOT BARRIER

- **ZinCo root barrier WSF 40** (Optional item if non root-resistant is waterproofing used.) made of special-polyethylene – Bitumen and Polystyrol resistant - Without plasticizer - UV-stabilized. Thickness: 0,38 mm. Weight: 320 g/m². Tensile strength: 40 – 47 N/mm². Density: 940 kg/m³.

2. SEPARATION/PROTECTIVE LAYER

(PLEASE CHOOSE CONVENTIONAL OR INVERTED ASSEMBLY)

(CONVENTIONAL ROOF ASSEMBLY)

- **ZinCo moisture retention and protection mat SSM45** made of recycled non-rotting fibers for water- and nutrient retention as well as a protection layer. Thickness: 5 mm. Weight approx.



Specification Suggestion

"Sedum Roof Plus" with Floradrain® FD 25-E

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470 g/m². Water retention capacity: 5 l/m². Bitumen resistant – Biologically and Chemically neutral. Penetration resistance: > 2000 N. Tensile strength length wise: >8.5 KN/m.

Or

(INVERTED ROOF ASSEMBLY)

- Air and vapour permeable membrane **ZinCo diffusion membrane TGV21** made of thermal consolidated Polypropylene. Bitumen resistant – Biologically and Chemically neutral. Vapour opening size $S_d \leq 0,01$ m) Thickness: 0,55 mm. Weight: 80 g/m². To be used as separation layer on inverted roofs and protection against small particle infiltration.

3. DRAINAGE – WATER STORAGE LAYER

- **ZinCo Drainage and water storage element Floradrain® FD25-E** made of 100% thermoformed recycled polyethylene, with water storage cells, openings for aeration and diffusion as well as a multidirectional drainage channel system on the underside. Bitumen resistant – Compressive strength: 270 kN/m². Water retention capacity: 3 l/m². Weight: approx. 1,7 kg/m². Dimensions: 1.00 x 2.00 x 0.025 m.

4. FILTER LAYER (UNIRRIGATED)

(PLEASE CHOOSE IRRIGATED OR NON-IRRIGATED ASSEMBLY)

(NON IRRIGATED ASSEMBLY)

- **ZinCo Filter Sheet SF** made of non-rotting thermal consolidated Polypropylene. Water flow rate: 70 l/(m²s) if there is a water column of 100 mm. Apparent Opening size: $d_{90\%} = 95 \mu\text{m}$. Weight: 100 g/m².

Or

(IRRIGATED ASSEMBLY)

- Highly efficient irrigation fleece **ZinCo Aquafleec AF300** made of polyacrylic fibers, attached to tear-resistant woven fabric made of PP, for its use in irrigated extensive green roof build-ups. Water flow rate: 20 L/(m²s). Water Retention Capacity 3-4 L/m². Thickness: 2.4 mm. Weight: 300 g/m².

5. GROWING MEDIUM

- **Growing medium for extensive Green Roofs - ZinCo Blend-E**, produced using light weight recycled or re-used materials and minerals, enriched with high quality compost elements, resistant to flying sparks, frost-resistant, stable structure. Specially engineered by ZinCo Canada and meets the FLL-Standards for Planning, Execution and Upkeep of Green Roof sites. Depth: 100 or 120 mm.

(PLEASE CHOOSE REQUIRED DEPTH)

Particle Size Distribution

Proportion of silting components ($d < 0.063$ mm):
 ≤ 15 Mass %

Density Measurements

Bulk Density (at max. water-holding capacity): 1100 – 1500 kg/m³

Compression Factor: <20% Vol. %

Water/Air Measurements

Total Pore Volume: ≥ 65 Vol. %

Maximum water-holding capacity: $\geq 35\%$ Vol. %

Air-filled porosity at max water-holding: ≥ 10 Vol. %

Water permeability (saturated hydraulic conductivity):
 ≥ 0.001 cm/sec

pH

6.5 – 9.5

Organic Measurements

Organic matter content: $\leq 8\%$ mass%

Nutrients

Phosphorus, P205 (CAL): ≤ 200 mg/L

Potassium, K2O (CAL): ≤ 700 mg/L

Magnesium, Mg (CaCl2): ≥ 200 mg/L

Nitrate + Ammonium (CaCl2): ≤ 80 mg/L

6. PLANT MATERIAL

(PLEASE CHOOSE ONE OF THE PLANTING OPTIONS)

SEDUM CUTTINGS

- **Sedum cuttings** shall be harvested from healthy, vigorous plants while in a vegetative growth mode. They shall range in length from 1/2" to 3" and possess sufficient rooting nodes to allow for rapid root development once sown.

PLUG PLANTS

- **Plug plants:** Plant material potted in 50 or 72 tray plugs in a mix of Sedums, Grasses and Herbs. Quantity: at 16 plants/m² or 18 plants/m² or 20 plants/m².

(PLEASE CHOOSE REQUIRED PLANT DENSITY)

PRE-GROWN VEGETATION MATS

- **Pre-cultivated Vegetation Mats** with firmly rooted, for extensive green roofs suitable plant species, pre-cultivated over one growing season in the field. The carrier material decomposes after time. Delivery weight: approx. 16–20 kg/m² (3-5 lbs/ft²). Height: ca. 20–25 mm (0.75 - 1 inch) Supplying quantity: minimum 2.00 m². Standard dimensions: ca. 1.20 m x 2.00 m. On request also mats in other dimensions or with non-decaying carriers are available.

Plant types:

The basis vegetation mats are 12–14 adapted Sedum types, e.g. Sedum album, Sedum acre, Sedum spurium, Sedum floriferum, Sedum kamschaticum, Sedum reflexum, Sedum sexangulare, and



Specification Suggestion

"Sedum Roof Plus" with Floradrain® FD 25-E

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Sedum hybridum. Various herbs and grasses are also available for extensive green roofs.

The coverage is at least 85% when shipped.

7. RELATED PRODUCTS

- **ZinCo inspection chamber KS 10** made of plastic coated galvanized steel with thermally insulated cover, resistant to compression. Height: 60 mm. To ensure accessibility of the roof drains at any time. Dimensions: 0.25 x 0.25 x 0.10 m. Weight: 3 kg.

- **ZinCo gravel retainer KL100/120** made of aluminum L-bracket with square slots for drainage. Designed as gravel retainer for gravel strips. Length: approx. 3 m. Height: 100 mm or 120 mm. Including joint connectors.

(PLEASE CHOOSE REQUIRED HEIGHT)

- **Gravel strip** to protect roofing details, using a 1"-2" round aggregate. Width: at least 30 cm. Depth: 100 or 120 mm.

(PLEASE CHOOSE REQUIRED DEPTH)

- Pre-assembled **Irrigation unit ZinCo BM4** in lockable stainless steel box for outdoor use for automated irrigation of green roofs. Contains: connection for water supply line 32 mm, filter, pressure regulator, connection for garden hose, irrigation time controller (with 9V battery, therefore no power supply required), 4 magnetic valves 1" including connectors for 32 mm tube and rain sensor. To be used in combination with Aquafleece AF300 and driplines.

- **ZinCo irrigation dripline 500-L2** in combination with the water distribution fleece AF300. Outer diameter: ca. 16 mm, with inside placed drippers, dripper spacings 100 mm, dripper capacity ca. 1 l/h, pressure-compensating.

PART 3 – EXECUTION

1. INSPECTION

- Clean up the waterproofing membrane carefully (well-swept)
- Careful inspection of the waterproofing membrane including seams, penetrations and details after flood testing or electronic leak detection. If the waterproofing system and the Green Roof system are not carried out by the same company, the acceptance of the method used for waterproofing quality should be agreed by all the parties. Identified defects are to be reported in written form. Do not proceed until corrected.

2. ROOT BARRIER

- Deliver and install the **ZinCo root barrier WSF40** on top of the non root-resistant waterproofing with a minimum overlap of 500 mm according to the manufacturer's instructions. The root barrier must be installed above the growing medium along the edges and roof penetrations.

3. SEPARATION / PROTECTIVE LAYER

(PLEASE CHOOSE CONVENTIONAL OR INVERTED ASSEMBLY)

(CONVENTIONAL ROOF ASSEMBLY)

Deliver and install the **ZinCo moisture retention and protection mat SSM45** directly on the top of the root barrier with a minimum overlap of 100 mm, according to the manufacturer's instructions. The separation sheet must be installed above the growing medium along the edges and at roof penetrations.

Or

(INVERTED ROOF ASSEMBLY)

- In the case of an inverted roof: Deliver and install the **ZinCo diffusion membrane TGV21** directly on the top of the insulation with a minimum overlap of 100 mm, according to the manufacturer's instructions. The separation sheet must be installed above the growing medium along the edges and at roof penetrations.

4. DRAINAGE & WATER STORAGE LAYER

- Deliver and install the **ZinCo Drainage and water storage element Floradrain® FD25-E** directly on the protection mat or diffusion membrane according to the manufacturer's instructions. Install the Floradrain elements butt jointed with the evaporation holes facing up and. Cut the drain elements in place along the edges and roof penetrations. Fill the water retention cups of the drain layer once with water.

5. FILTER SHEET

(PLEASE CHOOSE IRRIGATED OR NON-IRRIGATED ASSEMBLY)

- Deliver and install the **ZinCo filter sheet SF** on the drainage layer with a minimum overlap of 100 mm according to the manufacturer's instructions. The filter must be installed above the growing medium along the edges and roof penetrations. Cut the filter sheet in place along the edges and at roof penetrations.

Or

- Deliver and install the **ZinCo Aquafleece AF300** on the drainage layer with a minimum overlap of 100 mm according to the manufacturer's instructions. The fleece must be installed above the growing medium along the edges and roof penetrations. Cut the fleece sheet in place along the edges and at roof penetrations.



6. GROWING MEDIUM

- Deliver and install the **growing medium for extensive Green Roofs ZinCo Blend-E** on the filter sheet or Aqua fleece. Spread out the growing medium equally to a depth of 100 mm or 120 mm. Check the depth on several places to ensure the right thickness. A tolerance of 1 cm is acceptable. Small amounts of growing medium will be delivered in big bags. Larger amounts will be delivered by a blower truck.

7. PLANT MATERIAL

(PLEASE CHOOSE ONE OF THE PLANTING OPTIONS)

- Deliver and install the plant material in the growing medium according to the planting design and plant lists. Including one watering right after the installation.

SEDUM CUTTINGS:

Spread the sedum cuttings out over the growing medium at the recommended rate and apply them in the top 20 mm of the growing medium by raking. Cover the cuttings with a thin layer (10 mm) of compost mulch. Water the cuttings right after the installation.

PLUG PLANTS:

Take the plugs out of the plant trays and lay them out on the growing medium following the planting design. Dig a hole, the size of root ball and apply the plug in the hole. Cover the root ball with growing medium and compact it gently in place. Water the plugs right after the installation.

PRE-GROWN VEGETATION MAT:

Install mats same day as the delivery. Do not store without permission of the grower. Do not place in full sun. During hot sunny days water/cool of the soil layer with 15-25 minutes of pre-watering. Hot scorching soil burns the roots and might damage the Sedum mats.

Starting in the corner, carefully place each roll at location and unroll the mats over the entire roof area. Make sure that the mats are in contact with the growing medium. Water immediately for 30-60 minutes after installation.

After installation: Water the first month according to the grower's specification depending on the season and time of year using automatic timers.

8. RELATED PRODUCTS

- **ZinCo inspection chamber KS 10**
Deliver and install the ZinCo Inspection Chamber on top of the drainage layer above the roof outlets. Install the ZinCo filter sheet SF on the flange of the inspection chamber.
- **ZinCo gravel retainer KL100/120.**
Deliver and install the ZinCo gravel retainer on top of the filter fabric between the gravel strip and the growing medium.
- **Gravel strip**
Deliver and install a gravel strip along roof edges, flashing details and roof penetrations using a 1"-2" round aggregate. Depth: 100 or 120 mm.
- **ZinCo Irrigation Unit BM4**
Deliver and install ZinCo irrigation unit at the appropriate location on the roof. Hook up waterline and driplines and program the controller to the required settings.
- **ZinCo Dripline 500-L2**
Deliver and install ZinCo Dripline irrigation on top of the Aquafleece AF300. Fasten the dripline to the Aquafleece using velcro strips.

9. COMPLETION

- Upon completion, water the plant material and leave the site in a neat, clean and workmanlike condition.

10. MAINTENANCE

- Execute the maintenance program as described on page 2.

END OF SECTION