Proposed Estonian Cultural Centre

9-11 Madison Avenue, Toronto

FUNCTIONAL SERVICING AND SWM REPORT

Prepared for:

Kongats Architects
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Prepared by:

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File No. 2017-059

1 Purpose of Report

MGM Consulting Inc. has been retained by Kongats Architects to prepare a Functional Servicing and Stormwater Management Report to address the site-specific infrastructure required to support a proposed Site Plan Application for a development located in Toronto, which will involve the assembly of 2 separate properties, 9 and 11 Madison Avenue, Toronto.

The subject properties are located on the east side of Madison Avenue, between Bloor Street West and Lowther Avenue. The legal descriptions for the properties are Lot 35, PIN 21212-0027(LT), Lot 33 & 34, PIN 21212-0016 (LT), Registered Plan 66R-12977.

2 Existing Conditions

The subject property is approximately 0.159 hectares in size. The site fronts on Madison Avenue and is bordered by existing commercial & residential developments. The subject site is currently developed with Lot 35 having a single dwelling, paved driveway access and paved parking area. Lots 33 & 34 are currently being utilized as a paved parking lot, with paved driveway access to Madison Avenue.

The existing site has been indicated on Figure No.1.

Drainage within the site limits and immediate surrounding areas drain north to south towards the Madison Avenue right of way. Elevations within the site range from 116.10 m in the north east corner of the site to 115.22 m in the south west corner of the site.

The Madison Avenue right of way is currently developed as an urban roadway with wide sidewalks abutting concrete curbs.

Based on record drawings provided by the City of Toronto, existing municipal servicing relevant to the site includes:

- A 150 mm diameter pvc watermain within the Madison Avenue right of way along the west side of the road,
- A 375mm diameter concrete combined sewer within the Madison Avenue right of way along the road centerline,

The existing municipal servicing has been indicated in Drawing CV-2.

3 Development Scenario

The proposed redevelopment includes for a new 3 story building to be constructed in place of the existing asphalt parking lot, and a new 3 story addition on the existing single dwelling. The proposed building and addition will abut existing lot lines on the north, south and east sides.

The proposed redevelopment will have pedestrian access off Madison Avenue. The proposed site has been indicated on Figure No.2.

4 Proposed Site Grading

The proposed grading will match all existing grade elevations along the property limit. The overland flow direction will be safely conveyed through the proposed pedestrian access to the Municipal right-of way.

The grading has been indicated on Drawing CV-2.

5 Proposed Storm and Foundation Drainage System

The existing municipal servicing relevant to storm drainage is the 375 mm diameter concrete combined sewer that resides within the Madison Avenue right of way. At the location of the proposed storm connection from the site, the existing combined sewer invert elevation is in the order of 111.6 metres which is approximately 4.0 metres below the surface.

The proposed storm servicing will convey storm drainage from the site amenity areas and roof top areas to a proposed cistern which will provide the required on-site storage as required for peak rate controls, and a grey water supply for use in specific plumbing fixtures.

The proposed cistern is to be located outside the building at the basement floor elevation of 111.8m. Given the required storm sewer connection elevation of 112.0m, the storm discharge from the cistern to the municipal storm system is proposed to be pumped at a rate below the maximum allowable rate of 19.5 l/sec.

6 Groundwater Management

The proposed development includes for construction below grade which will impact groundwater during construction and long term. Pumping of groundwater will be required during construction in order to keep the excavation areas dry, and long term as required to maintain foundation drainage.

Based on analyses completed on similar projects in the City, groundwater discharge will typically not meet City storm sewer discharge criteria. Based on this, and pending confirmation by the Hydrogeologist, a groundwater sampling port, with a connection to the proposed sanitary service connection, is being proposed.

The maximum groundwater discharge rate used to assess the impact on the combined sewer system, as indicated in Section 15 of this report, is based on the maximum pump rate as specified by the mechanical engineer. At the time of the preparation of this report,

this information was not available. In absence of this information, an assumed maximum pump rate of 4.0 l/sec for long term groundwater discharge, has been included in the combined sewer impact analysis described in Section 15 of this report.

An external sampling port, which a discharge connection to the proposed sanitary inspection manhole, is indicated on appended Drawing CV-2.

7 Sanitary Servicing

Sanitary servicing for the site is proposed with the installation of a 200mm sanitary service connection discharging to the existing 375mm combined sewer on Madison Avenue.

Given the proposed elevation of the sanitary service connection and the elevations for proposed underground washrooms, pumping of sanitary flows from the lower levels of the building will be required.

8 Water Servicing

A new water service connection as required for domestic water supply and fire protection is proposed with a connection to existing an 150mm watermain on the west side of Madison Avenue.

Calculations for the required fire flow are provided in Appendix B based on the criteria provided by the Fire Underwriters Survey (FUS). As indicated, the minimum flow required is 9,000 l/min at 140 kPA.

Confirmation of the available flow at a residual pressure of 140 kPA is to be confirmed by pressure and flow testing of hydrants in close proximity to the proposed water service connection. At the time of writing this report, hydrant testing in the City of Toronto is prohibited and will have to be conducted after April 15th , per current City policy.

9 Utilities

Utilities including gas, hydro, cable, and telephone are located on Madison Avenue fronting the site which are suitable for servicing the building.

10 Proposed Grading and Impacts on External Drainage

The proposed structure will encompass the majority of the site area, therefore, the drainage from the rooftops will be conveyed to the proposed storm system described above. Grading at ground level for areas not covered by building components will convey major flows towards the Madison Avenue right of way, and as required to match existing

abutting properties. Proposed grading does not direct any surface flows towards abutting properties.

Proposed site grading is indicated on appended Drawing No. CV-2.

11 Stormwater Management Objectives

Stormwater management for the site is to be consistent with the objectives identified in the Wet Weather Flow Management Policy (WWFM) and in accordance with the Toronto Green Development Standard.

The Wet Weather Flow Management Policy of the City requires owners to "provide stormwater Management Plans and/or Stormwater Servicing Drawings for development applications that are based on achieving the level of control consistent with the Wet Weather Management Flow Master Plan" (Toronto 2003, Policy 4.6.2.1(1)). The policy guidelines set the SWM hierarchy to first consider Source Controls, then Conveyance Control and finally End-of-Pipe Controls. The developer is required to demonstrate their compliance with the Guidelines (Interim) and Criteria contained in the City's guideline document (Toronto 2006, page 4).

The Guidelines indicate "…the three key WWF Management Targets (Interim) are:

1. Water Balance (or annual runoff volume) – for erosion control, groundwater recharge and downstream habitat protection;
2. Water Quality – for protection of downstream water resources; and
3. Water Quantity – peak flow control for flood management and both peak flow and runoff volume controls to mitigate erosion impacts." (Toronto 2006, page 4)

The water balance targets require runoff from post-development conditions to be less than pre-development conditions and the maximum annual runoff volume shall be 50% to the total average annual rainfall. The minimum on-site retention shall be 5 mm from small design rainfall events.

Water quality objectives are to provide an enhanced level of protection with the removal of a minimum of 80% of the total suspended solids on an annual loading basis.
Water Quantity objectives are to control the post development flows from the site to the predevelopment flow rates (based on a maximum predevelopment imperviousness of 50%) for the 2 to 100 year storm events.

Beyond the above, the Toronto Green Development Standard identifies the following:

- Construction Activity - Greater Toronto Area Conservation Authorities on-site Erosion and Sediment Control Guidelines adhered to during construction and demolition activities,

- Stormwater Run-Off Suspended Solids Removal – on an annual loading basis, 80% of total suspended solids removed from all runoff leaving the site,

- Storm Run-Off: Disinfection – Runoff from the site that discharges directly into Lake Ontario or Waterfront Areas disinfected.

- Stormwater Run-Off: Erosion Control – Greater Toronto Area Conservation Authorities on-site Erosion and Sediment Control Guidelines adhered to for individual sites which discharge directly or are in close proximity to nature watercourses
- Stormwater Retention/Water Balance – Stormwater on-site retained to the same level of annual volume of overland runoff allowable under predevelopment conditions, and all runoff retained on the site from small rainfall events (typically 5 mm).

Stormwater Management calculations are provided in Appendix A.

12 Water Balance

Water balance objectives are achieved through evap/transpiration off of asphalt areas and conventional roof areas, through absorption/use on green roof areas, and through re-use of water collected in the proposed cistern as a grey water supply for use in specific plumbing fixtures. Preliminary water balance calculations provided in Appendix A indicate that the proposed features provide an estimated 5.0 mm of water balance, over the site area, which is equivalent to capturing an estimated 50% of the average annual rainfall depths.

Based on an average estimated occupancy of 300 persons, the estimated water usage for urinals and toilets is in the order of 3.5 cu.m. day (to be confirmed by the mechanical engineer). Based on this rate of use, the water retained in the bottom portion of proposed cistern for a grey water supply (3.0 cu.m) would be used within a period of approximately 21 hours.

13 Stormwater Quality Controls

The proposed site development area is 0.159 Ha. As per section 4b in the WWMFG, where sites are less than or equal to 0.3 ha, with a low potential of spills, TSS removal is not required.

14 Stormwater Rate Controls

Stormwater rate controls are required to control flows during the 2 to 100 year storm events, to below the 2 year flow rate based on a maximum site imperviousness of 0.50 which is calculated to be 0.0195 cms as indicated in the preliminary SWM calculations included in Appendix A.

Given the location and elevation of proposed cistern (111.8 m) and the available invert elevation of the storm sewer connection on Madison Avenue (112.0 m.), rate controls will need to be achieved through pumping from the proposed cistern at a rate below the calculated allowable post development flow rate.

As indicated in the preliminary stormwater management calculations included in Appendix A, the total required site storage during the 100 year storm event is in the order of 34.2 cu.m. This storage is to be provided within the proposed cistern located underground in the basement level of the proposed building.

15 Impact on the Combined Sewer System

The majority of the subject site is currently fully paved with an average runoff coefficient of 0.8, without any stormwater management controls, and as such, peak flows conveyed to the combined sewer system during the 2 and 100 year storm events based on a Tc of 10 minutes and using the City of Toronto rainfall intensity equations are calculated at .0312 cms and .0884 cms respectively.

With the implementation of SWM controls on the site, peak flows during the 2 and 100 year storm events are reduced to 0.0195 cms. The reduced storm flows when added to the calculated peak sanitary flow from the developed site of 0.0005 cms, (based on 180000 litres/floor area in hectares/day) and an estimated 0.004 l/sec for long term groundwater discharge, means that the maximum peak combined flows conveyed to the combined system during the 2 and 100 year storm events will be 0.024 cms, which is well below the existing flows conveyed to the City's combined sewer system.

16 Sediment and Erosion Control During Construction

The site development will encompass the entire boundary of the site. This site is, for all practical purposes, entirely covered with hard surfaces. Initial site works will be limited to the removal of the existing structures and the removal of hard surfacing materials.
At the stage of subsurface and foundation excavation, there could be some potential for sediment release; however, this operation will be limited by the size and configuration of the site.
To control any release of sediments the following measures should be incorporated into the site development procedures:

1. Catch basin sediment control measures (i.e. double wrapping with suitable geotextile) should be installed in catch basins near the site.

2. Any dewatering of the site should incorporate sediment and debris screens at the inlet of the pumping system and sediment settling facilities at discharge points, to prevent sediment discharges to the municipal drainage system.

3. Silt control fencing is to be installed around the perimeter of the site as required to contain sediments carried in storm runoff.

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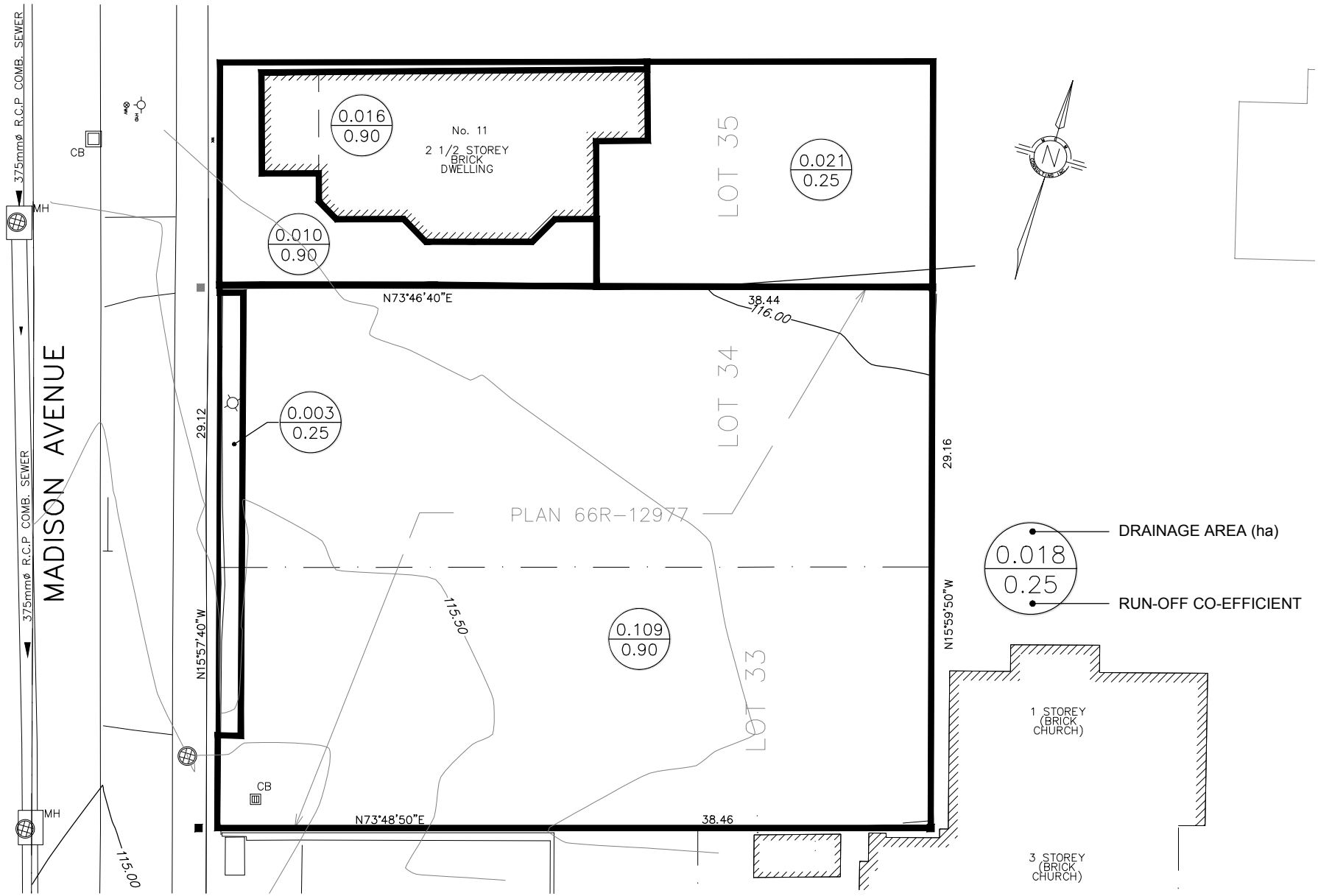

9 -11 MADISON AVENUE
PROPOSED ESTONIAN CULTURAL CENTRE

EXISTING DRAINAGE AREAS

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FIGURE 1

DATE: JAN.18, 2018
SCALE: NTS
DWG# 2017-059-C1-C2

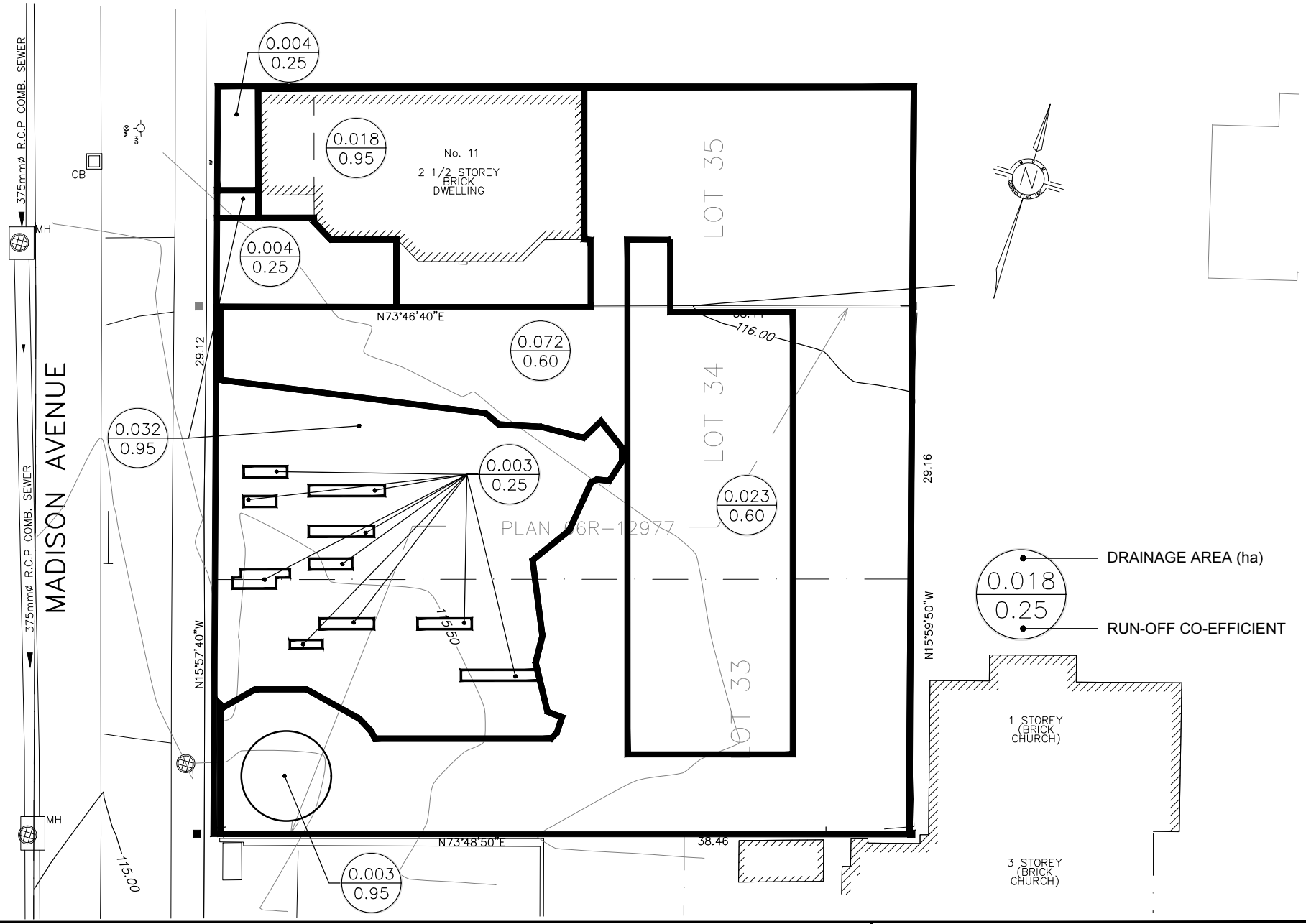

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FIGURE 2

DATE: MARCH 8, 2018
SCALE: NTS
DWG# 2017-059-C1-C2

APPENDIX A
STORMWATER MANAGEMENT CALCULATIONS

Appendix A
Detailted Stormwater Management Calculations

1.0 DRAINAGE CHARACTERISTICS

1.1 Existing Drainage Areas: (see Figure No. 1)

	Area (ha)	"c"	
Impervious Areas	0.135	0.90	
Pervious Areas	0.024	0.25	
Total	**0.159**	**0.80**	(weighted average)

1.2 Proposed Drainage Areas (see Figure No. 2)

	Area (ha)	"c"	
Attenuated Areas:			
Green Roof Areas	0.072	0.60	
Conventional Roof Areas	0.021	0.95	
Concrete Areas	0.032	0.95	
Grass/Landscape Areas	0.011	0.25	
Wood Deck	0.023	0.60	
Total Attenuated Areas	**0.159**	**0.69**	(weighted average)

2.0 Allowable Post Development Flows

Given that the exsiting site imperviousness exceeds 0.50, peak flows during the 2 to 100 year storm events are to be controlled to the 2 year rate based on a site imperviousness of 0.50.

Based on Tc = 10 minutes
Intensity 'I' = AT^c
For 2 year storm,
A = 21.8
c = -0.78
Therefore I = 88.2 mm/hr

Flow "Q" - cIA/360, where c = 0.50
Therefore Q allow = 0.0195 cms. 19.5 l/sec

3.0 Cistern Storage Calculations

Given the proposed cistern location, stormwater detained will be pumped to the proposed storm service connection location

Maximum Allowable Pump Rate 0.0195 cms. 19.5 l/sec

4.0 On-Site Storage Required

4.1 Two Year Storage Calculation

Rainfall Duration min.	s	2 Year Rainfall Intensity (I) mm/h	Attenuated Flow From Site m^3/s	Max. Pump Rate m^3/s	Aprox. Detention Volumes m^3
10	**600**	**88.2**	**0.0270**	**0.0195**	**4.5**
15	900	64.3	0.0197	0.0195	0.2
20	1200	51.4	0.0157	0.0195	-4.5

Based on the above, the required 2 year site storage = **4.5** **cu.m.**

Appendix A
Detailted Stormwater Management Calculations

4.2 100 Year Storage Calculation

Rainfall Duration min.	s	100 Year Rainfall Intensity (I) mm/h	Attenuated Flow From Site m^3/s	Max. Pump Rate m^3/s	Aprox. Detention Volumes m^3
10	**600**	**250.3**	**0.0766**	**0.0195**	**34.2**
15	900	181.0	0.0553	0.0195	32.3
20	1200	143.8	0.0440	0.0195	29.4

Based on the above, the required 100 year site storage = **34.2** **cu.m.**

5.0 On-Site Storage Provided

Based on the above, the proposed cistern will provide peak rate control storage, and a grey water supply to achieve the required water balance

Cistern Dimensions: 5.5m x 3.0 m x 2.5 m.

Bottom of cistern elevation =	111.80	m.
Water balance elevation =	112.00	m.
2 year storage elevation=	112.30	m.
100 year storage elevation=	114.10	m.

Water balance storage volume =	3.3
2 year storage volume =	4.9
100 year storage volume =	34.6

6.0 Water Balance Calculations

Target water balance objectives are to retain a min. of 5 mm depth of water over the site area

Water Re-use Provided:

Description	Area (sq.m.)	Initial Abstraction (mm)	Est. Volume (cu.m.)
Green Roof Areas	720	5	3.600
Cistern			3.300
Conventional Roof Areas	210	1	0.210
Concrete Areas	320	1	0.320
Grass/Landscape Areas	110	5	0.550
Wood Deck	230	1	0.230
Total			8.2

Pro-rated depth over the site area = 5.2 mm.
which is equivalen to capturing approximately 52% of the average annual rainfall depths

Appendix A
Detailted Stormwater Management Calculations

7.0 Summary of Stormwater Management

	Required	Provided	Units
Stormwater Rate Controls			
2 Year Storm Event	0.0195	0.0195	cms
100 Year Storm Event	0.0195	0.0195	cms
2 year storage	4.5	4.9	cu.m.
100 year storage	34.2	34.6	cu.m.
Water Balance	Capture 50% of avg. annual rainfall depths	Capture 52% of avg. annual rainfall depths	

APPENDIX B
FIRE FLOW CALCULATIONS

Proposed Estonian Cultural Centre
9-11 Madison Ave, Toronto
Preliminary Fire Flow Calculation

Fire Flow Calculation
Commercial Development

The FUS requires that a minimum water supply source 'F' be provided at 140 kPa
The min flow 'F' can be calculated as such:

$F=220C\sqrt{A}$
where:
F- Required fire flow in L/min
C- Coefficient related to construction
A- Total area in sq.m

C = 0.8 (Non-combustible construction)

For non-combustible construction, the area shall be a total of all floors (excluding basements at least 50 percent below grade) in the building being considered.

A = 2265 sq.m

Therefore,

F= 8376.19 L/min
= 8000.00 L/min (rounded to nearest 1000)

Modified Flow

F'=F*(1-f1)*(1-f2+f3)

where:
f1- Occupancy factor reduction
Low hazard occupancy, f1 = 25%

f2- Sprinkler protection factor reduction

f2 = 30%

where:
f3- Exposure factor addition
Exposure factor is not to exceed 75%
Separation between subject building and other structures, and associated charges are as follows:

Proposed Estonian Cultural Centre
9-11 Madison Ave, Toronto
Preliminary Fire Flow Calculation

	Distance (m)	Charge
North Side	3	25%
South Side	1	25%
East Side	1	25%
West Side	Road	0%
Total		**75%**

The total increase for exposures is 75%

The resulting required minimum modified flow, F' = **8700** l/min

Therefore a minimum flow of approximately **9000** L/min must be available at the nearest hydrant with a minimum pressure of 140 kPa.

Note: This fireflow calculation has been prepared as a guide only. Confirmation should be obtained from a Fire Protection professional for confirmation