PROPOSED

THREE STOREY W/ LOFT–MIXED USE

COMMERCIAL AND RESIDENTIAL BUILDING SITE

PART OF LOT 4 IN BLOCK A

R-PLAN 102

180 MAIN STREET

CITY OF OTTAWA

STORM DRAINAGE REPORT

REPORT R-822-100

T.L. MAK ENGINEERING CONSULTANTS LTD.

OCTOBER 2022

REFERENCE FILE NUMBER 822-100

Introduction

The proposed three storey with loft mixed use commercial/residential building site is located on the west side of Main Street, and situated north of Hazel Street and south of Oblats Avenue. Its legal property description is Part of Lot 4 in Block A Registered Plan 102 City of Ottawa in Ward 17 (Capital). At this time, the residential lot under consideration houses a 2-storey brick sided dwelling. The municipal address of the property is 180 Main Street.

The lot area of this site under consideration is approximately 303.72 square metres. This property is proposed for the development of a three (3)-storey mixed use building with a mezzanine above the third floor. The building contains six (6) total units, namely four (4) 1-bedroom units, one (1) 2-bedroom unit, and one (1) commercial unit. The 1st floor covers an area of approximately 199.0 m^2, in addition to a 73.0 m^2 mezzanine, for a total area of 272.0 m^2. The 2nd and 3rd floors covers an area of approximately 220.0 m^2 each. Lastly, the mezzanine/loft on the 4th floor is 123.0 m^2. As such, the total gross floor area of approximately 836.0 m^2. The stormwater outlet for this site is the existing 1350 mm diameter storm sewer located within the Main Street road right of way.

From storm-drainage criteria set by the staff at the City of Ottawa's Engineering Department, the allowable post-development runoff release rates shall not exceed the two (2)-year pre-development conditions. The allowable pre-development runoff coefficient is the calculated "C" existing value = 0.53 or C_{allow} = 0.5 maximum. If the uncontrolled storm-water runoff exceeds the specified requirements, then on-site storm-water management (SWM) control measures are necessary. The post-development runoff coefficient for this site is estimated at C = 0.89, which exceeds the pre-development C_{pre} = 0.5 (max) criteria for the Main Street storm sewer without on-site SWM control. Therefore, SWM measures are required. Refer to the attached Drainage Area Plan (Figure 1) as detailed in Appendix A. For Pre and Post site development characteristics, refer to Dwg. No. 822-100 D-1 for details.

This report will address and detail the grading, drainage, and storm-water management control measures required to develop this property. Based on the Proposed Site Grading and Servicing Plan (Dwg. No. 822-100 G-1), and on the Proposed Rooftop Storm-water Management Plan (Dwg. No. 822-100 SWM-1), the storm water of this lot will be controlled on site only by the building's flat rooftop.

The storm-water management calculations that follow will detail the extent of on-site SWM control to be implemented and the storage volume required on site to attain the appropriate runoff release that will conform to the City's established drainage criteria and requirements.

Because the site is located within a separated sewer shed, therefore, the approval exemption under Ontario Regulation 525/98 would apply since storm water discharges from this site will outlet flow into a storm sewer. Thus, an Environmental Compliance Approval (ECA) application will not be required to be submitted to the Ministry.

Site Data

1. Development Property Area

Post-Development Site Area Characteristics

Development Lot Area	= 303.72 m^2
Roof Surface Area	= 217.14 m^2
Gravel Area	= 41.14 m^2
Interlock Paver Area	= 39.82 m^2
Asphalt Area	= 5.62 m^2

$$C = \frac{(217.14 \times 0.9) + (41.14 \times 0.8) + (39.82 \times 0.9) + (5.62 \times 0.9)}{303.72}$$

$$C = \frac{269.234}{303.72}$$

$$C = 0.8865$$

Say "C" $= 0.89$

Therefore, the average post-development "C" for this site is 0.89.

2. Controlled Area Data (NODE #1)

Roof Surface Area	= 161.21 m^2
Total Storm-water Controlled Area	= 161.21 m^2

$$C = \frac{(161.21 \times 0.9)}{161.21}$$

$$C = \frac{145.09}{161.21}$$

$$C = 0.9$$

Say "C" $= 0.9$

Therefore, the post-development "C" for the controlled storm-water drainage area (flat roof top) is 0.90.

3. Uncontrolled Area Data

i. PROPOSED SITE (NODE #2)

Gravel Area	= 41.14 m^2
Roof Area	= 55.93 m^2
Interlock Paver Area	= 39.82 m^2
Asphalt Area	= 5.62 m^2
Total Storm-water Uncontrolled Area	= 142.51 m^2

$$C = \frac{(41.14 \times 0.8) + (55.93 \times 0.9) + (5.62 \times 0.9) + (39.82 \times 0.9)}{142.51}$$

$$C = \frac{124.148}{142.51}$$

$$C = 0.871$$

$$\text{Say } \text{“C”} = 0.87$$

Therefore, the average post-development “C” for the uncontrolled storm-water drainage area of 142.51 m^2 from this site is 0.87.

The total tributary area consisting of approximately 142.51 square metres will be out-letting off site uncontrolled from the proposed mixed use building site.

ii. SURFACE AREA DRAINING TO FRONT OF LOT (NODE #2)

Gravel Area	= 41.14 m^2
Roof Area	= 55.93 m^2
Interlock Paver Area	= 39.82 m^2
Asphalt Area	= 5.62 m^2
Total Area	= 142.51 m^2

$$C_2 = \frac{(41.14 \times 0.8) + (5.62 \times 0.9) + (39.82 \times 0.9) + (55.93 \times 0.9)}{142.51}$$

$$C_2 = \frac{124.148}{142.51}$$

$$C_2 = 0.871$$

$$\text{Say } \text{“}C_2\text{”} = 0.87 \text{ (NODE \#2)}$$

$$C_{100} = \frac{(41.14 \times 0.8 \times 1.25) + (5.62 \times 1.0) + (39.82 \times 1.0) + (55.93 \times 1.0)}{142.51}$$

$$= \frac{142.51}{142.51}$$

$$= 1.0$$

Therefore, $C_{100} = 1.0$ for (NODE #2)

iii. SURFACE AREA DRAINING TO REAR OF LOT

Total Area = 0 m^2

$$C_2 = 0$$

$$C_{100} = 0$$

The uncontrolled drainage area draining to the **rear** of the lot is 0 m^2 and the uncontrolled drainage area draining to the **front** of the lot is 142.51 m^2.

The SWM area to be controlled is 161.21 m^2. Refer to the attached "Drainage Area Plan" in Figure 1 of **Appendix A** for further details.

Pre-Development Flow Estimation

Maximum allowable off-site flow: two (2)-year storm

NODE #101

Pre-Development Site Area Characteristics

Development Lot Area	= 303.72 m^2
Asphalt Area	= 2.63 m^2
Concrete Area	= 7.23 m^2
Roof Area	= 74.33 m^2
Grass Area	= 150.09 m^2
Gravel Area	= 69.44 m^2

$$C = \frac{(74.33 \times 0.9) + (150.09 \times 0.2) + (2.63 \times 0.9) + (7.23 \times 0.9) + (69.44 \times 0.8)}{303.72}$$

$$C = \frac{161.341}{303.72}$$

$$C = 0.531$$

Say $C_{pre} = 0.53$

Use $C_{allow} = 0.5$ (max) allowable for redevelopment

T_c = D/V where D = 30.0 m, ΔH = 0.42 m, S = 1.4%, and V = 0.85 feet/second = 0.26 m/s

Therefore,

$T_c = \frac{30.0m}{0.26m/s}$

T_c = 1.92 minutes

Use T_c = 10 minutes

I_2 = 77.10 mm/hr [City of Ottawa, two (2)-year storm]

Using the Rational Method

Q = 2.78 (0.5) (77.10) (0.03)

Q = 3.22 L/s

Therefore, the total allowable flow off-site is 3.22 L/s.

The pre-development flow of the two (2)-year and 100-year storm event draining to the **front** of the lot is as follows:

Two (2)-Year Storm Event

Where, Tc = 10 min.

Node #101

$Q_{2pre} = 2.78\ (0.5)\ (77.10)\ (0.03)$

$= 3.22\ L/s$

100-Year Storm Event

$$C_{100pre} = \frac{(74.33 \times 1.0) + (150.09 \times 1.25 \times 0.2) + (7.23 \times 1.0) + (2.63 \times 1.0)\ (69.44 \times 1.25 \times 0.8)}{303.72}$$

$$= \frac{191.153}{303.72}$$

$C_{100pre} = 0.63$

$Q_{100pre} = 2.78\ (0.63)\ (178.6)\ (0.03)$

$= 9.38\ L/s$

The pre-development flow of the two (2)-year and 100-year storm event draining to the **rear** of the lot is as follows:

Where, Tc = 10 min.

$Q_{2pre} = 2.78\ (0.40)\ (77.10)\ (0)$

$= 0\ L/s$

$Q_{100pre} = 2.78\ (0.40)\ (178.6)\ (0)$

$= 0\ L/s$

A coloured Google image and aerial photography of these current pre-development conditions of the site is provided in **Appendix B** of this report for reference.

Post-Development Flow Estimation

Uncontrolled Drainage Areas

The post-development flow of the two (2)-year and 100-year storm event draining to the **front** of the lot is as follows:

Where, Tc = $10\ min.$; A = $142.51\ m^2$

Node #3

$Q_{2post} = 2.78\ (0.87)\ (77.10)\ (0.0143)$

$= 2.67\ L/s$

$Q_{100post} = 2.78\ (1.0)\ (178.6)\ (0.0143)$

$= 7.10\ L/s$

The post-development flow of the two (2)-year and 100-year storm event draining to the **rear** of the lot is as follows:

Where, Tc = 10 min.

$Q_{2post} = 2.78\ (0)\ (77.10)\ (0)$

$= 0\ L/s$

$Q_{100post} = 2.78\ (0)\ (178.6)\ (0)$

$= 0\ L/s$

For this site, because 142.51 square meters of the site area are drained uncontrolled off site, the net allowable discharge for this site into the existing storm sewer system using the two (2)-year storm event

criteria at C_{allow} = 0.5 (max) is calculated as follow: Q = 2.78 (0.5) (77.10) (0.03) – [2.78 (1.0) (178.6) (0.0143)] = 3.22 L/s – 7.10 L/s = –3.88 L/s. Therefore, according to this approach, the maximum allowable flow rate off site is 3.22 L/s and the net allowable controlled flow rate off-site is –3.88 L/s is the result.

Storm-Water Management Analysis

At this site for the proposed development, a controlled flow rate of 0.64 L/s for on-site storm water management detention volume storage calculation will be used for this SWM analysis. This is accomplished by proposing two (2) controlled roof drains to restrict flow from the building at a rate of 2 x 0.32 L/s = 0.64 L/s into the Main Street storm sewer. Controlled roof drain details are found on Dwg. No. 822-100 SWM-1 entitled Proposed Rooftop Stormwater Management Plan.

For this proposed development site, the total maximum allowable two (2)-year release rate of 3.22 L/s will be exceeded by 4.52 L/s since the control flow of 0.64 L/s from (2) roof drains plus uncontrolled post development 100-year flow to the front is 7.10 L/s totals to 7.74 L/s which is 4.52 L/s above the allowable. Therefore, a total flow of 7.74 L/s is expected to enter into the existing 1350 mm dia. Main Street storm sewer for storm events up to and including 100-year return period. In order to control runoff from this site the building flat roof top will be incorporated to provide stormwater attenuation. Stormwater will therefore be stored on site at the flat rooftop of the proposed apartment building which will be used for stormwater management (SWM) purposes.

The post-development inflow rate during the two (2)-year and 100-year storms for the (2) two rooftop areas can be calculated as follows.

Design Discharge Computation

Flat Rooftop Areas

To Calculate Roof Storage Requirements

The proposed flat roof of the apartment building on the property will incorporate two (2) roof drains to control flow off-site for this development property. The roof drain flow rate proposed is at 0.32 L/s (5.0 U.S. gal./min.) for Roof Drain #1 and for Roof Drain #2. The specified roof drain is the Watts “Adjustable Accutrol Weir” (Model # RD-100-A-ADJ) with weir opening in the closed position, which will allow a flow of 0.32 L/s under a head of 150 mm water above the drain for Roof Drain #1. At Roof Drain #2, the weir opening is also in the closed position which will allow a flow of 0.32 L/s under a head of 150 mm water above the drain. See **Appendix C** for Roof Drain details. Therefore, the stormwater flow that can be controlled from this rooftop and outletted off-site is 0.32 L/s + 0.32 L/s = 0.64 L/s. Refer to the Proposed Rooftop Stormwater Management Plan Dwg. 822-100 SWM-1 for roof drain details.

C = 0.9 will be used for sizing roof storage volume in this case.

Inflow rate (Q_A) = 2.78 CIA, where C = 0.9, A = surface area of roof, I = mm/hr

For Roof Area 1, Q_{A1} = 2.78 CIA

Two (2)-Year Event
C_2 = 0.90
A = 81.56 m^2
I = mm/hr

Q_1 = 2.78 (0.90) (0.0082 ha.) I = 0.0205I

100-Year Event
C_{100} = 1.0
A = 81.56 m^2
I = mm/hr

Q_1 = 2.78 (1.0) (0.0082 ha.) I = 0.0228I

For Roof Area 2, Q_{A2} = 2.78 CIA

Two (2)-Year Event
C_2 = 0.90
A = 79.65 m^2
I = mm/hr

Q_2 =2.78 (0.90) (0.008 ha.) I = 0.020I

100-Year Event
C_{100} = 1.0
A = 79.65 m^2
I = mm/hr

Q_2 = 2.78 (1.0) (0.008 ha.) I = 0.0223I

The summary results of the calculated inflow and the storage volume of the site and building's flat rooftop to store the two (2)-year and 100-year storm events are shown in **Tables 1 to 4** inclusive.

Table 5 summarizes the post-development design flows from the building roof top area as well as the type of roof drains, the maximum anticipated ponding depths, storage volumes required, and storage volumes provided for the two (2)-year and 100-year design events.

Table 5: Design Flow and Roof Drain Table

Roof Drain ID & Drainage Area (ha)	Number of Roof Drains	Watts Roof Drain Model ID (Weir Opening)	Controlled Flow per Drain (L/s)		Approximate Ponding Depth Above Drains (m)		Storage Volume Required (m^3)		Max. Storage Available (m^3)
			2 YR	100 YR	2 YR	100 YR	2 YR	100 YR	
RD-1 (0.0082 ha)	1	RD-100-A-ADJ (CLOSED)	0.32	0.32	0.10	0.15	0.92	3.46	3.96
RD-2 (0.0080 ha)	1	RD-100-A-ADJ (CLOSED)	0.32	0.32	0.10	0.15	0.87	3.35	3.95
Total Roof (0.0162 ha)	2	-	**0.64**	**0.64**	-	-	**1.79**	**6.81**	**7.91**

Erosion and Sediment Control

The contractor shall implement Best Management Practices to provide for protection of the receiving storm sewer during construction activities. These practices are required to ensure no sediment and/or associated pollutants are released to the receiving watercourse. These practices include installation of a "siltsack" catch basin sediment control device or equal in catch basins as recommended by manufacturer on-site and off-site within the Main Street road right of way adjacent to this property. Siltsack shall be inspected every 2 to 3 weeks and after every major storm. The deposits will be disposed of as per the requirements of the contract. See Dwg. #822-100 ESC-1 for details.

Conclusion

At this proposed residential site and to develop this lot to house a mixed use commercial/residential building on a 0.030 ha. parcel of land, the estimated allowable flow off-site is calculated at 3.22 L/s based on City of Ottawa Drainage and Stormwater Management (SWM) criteria controlled to a 2-year pre-development level. For on-site SWM attenuation, the flat roof top of the proposed mixed use building will be utilized and (2) controlled roof drains are incorporated each with a controlled release rate of 0.32 L/s (5.0 U.S. gal/min.). The controlled flow from this site totals to 0.64 L/s for the post development condition. The uncontrolled 2 year post development flow from the remainder of the site draining to the front is estimated at 2.67 L/s and 7.10 L/s for the 100 year event.

During the two (2)-year storm event for the flat rooftop storage, the ponding depth of rooftop area 1 and 2 is estimated at 100 mm at the drain and 0mm at the roof perimeter, assuming a 2.0% minimum roof pitch to the drain. The rooftop storage available at Roof Area 1 is 1.26 m^3 and the rooftop storage available at Roof Area 2 is 1.25 m^3, for a total of 2.51 m^3, which is greater than the required volume of 1.79 m^3.

During the 100-year storm event for the flat rooftop storage, the ponding depth of Roof Area 1 and 2 is estimated at 150 mm at the drain and 0mm at the roof perimeter, assuming a 2.0% minimum roof pitch to the drain. The rooftop storage available at Roof Area 1 is 3.96 m^3 and the rooftop storage available at Roof Area 2 is 3.95 m^3, for a total of 7.91 m^3, which is greater than the required volume of 6.81 m^3.

Therefore, by means of flat building rooftop storage and grading the site to the proposed grades as shown on the Proposed Grading and Servicing Plan and Proposed Rooftop Stormwater Management Plan Dwg. 822-100 G-1 and 822-100 SWM-1 respectively, the desirable two (2)-year storm and 100-year

storm event detention volume of 2.51 m^3 and 7.91 m^3 respectively will be available on site. Refer to **Appendix D** for detailed calculations of available storage volumes.

At this development site, for storm events up to the 100-year event the maximum post development flow draining off-site is the controlled roof top flow plus the 100-year uncontrolled flow from the site draining to the front of the lot totals to 7.74 L/s (0.64 L/s + 7.10 L /s) which is approximately 4.52 L/s greater than the allowable flow of 3.22 L/s.

In comparing the pre-development flow of the current site conditions to the post development flow, the SWM regulated flow plus uncontrolled flow from the proposed site under the post development conditions at the 2-Year event = 3.31 L/s and the 100-Year event = 7.74 L/s whereupon the post development flow events are approximately equal at the 2-Year event and less than the current 100-Year event pre-development flow estimate for the site at 2-Year $_{Pre}$ = 3.22 L/s and 100-Year $_{Pre}$ = 9.38 L/s. Therefore with this proposed development, stormwater flow off-site is considered improved from that of the existing conditions.

The building weeping tile drainage will outlet via its separate 200mm diameter PVC storm lateral. The roof drains will be outletted also via a separate 150mm PVC storm lateral which "wye" into the proposed 200mm dia. storm lateral, where upon both laterals are outletting stormwater directly to the existing Main Street 1350 mm diameter storm sewer via an existing 300 mm diameter PVC storm pipe pre-installed by the previously land owner in 2016. The City of Ottawa recommends that pressurized drain pipe material be used in the building for the roof drain leader pipe in the event of surcharging in the City combined sewer system. Refer to the proposed site grading and servicing plan Dwg. 822-100 for details.

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PROPOSED 180 MAIN STREET THREE STOREY MIXED USE BUILDING

DEVELOPMENT SITE

TABLE 1

TWO (2)-YEAR EVENT

REQUIRED BUILDING ROOF AREA 1 STORAGE VOLUME

t_c **TIME** (minutes)	**I 5-YEAR** (mm/hr)	**Q ACTUAL** (L/s)	**Q ALLOW** (L/s)	**Q STORED** (L/s)	**VOLUME STORED** (m^3)
5	102.80	2.11	0.32	1.79	0.54
10	77.10	1.58	0.32	1.26	0.76
15	63.30	1.30	0.32	0.98	0.88
20	52.03	1.07	0.32	0.75	0.90
25	45.15	0.93	0.32	0.61	0.92
30	39.90	0.82	0.32	0.50	0.90
35	36.06	0.74	0.32	0.42	0.88
40	32.87	0.68	0.32	0.36	0.86

Therefore, the required rooftop storage volume is 0.92 m^3.

PROPOSED 180 MAIN STREET THREE STOREY MIXED USE BUILDING

DEVELOPMENT SITE

TABLE 2

TWO (2)-YEAR EVENT

REQUIRED BUILDING ROOF AREA 2 STORAGE VOLUME

t_c TIME (minutes)	**I 100-YEAR** (mm/hr)	**Q ACTUAL** (L/s)	**Q ALLOW** (L/s)	**Q STORED** (L/s)	**VOLUME STORED** (m^3)
5	102.80	2.06	0.32	1.74	0.52
10	77.10	1.54	0.32	1.22	0.73
15	63.30	1.27	0.32	0.95	0.855
20	52.03	1.04	0.32	0.72	0.86
25	45.17	0.90	0.32	0.58	0.87
30	39.90	0.80	0.32	0.48	0.86
35	36.06	0.72	0.32	0.40	0.84
40	32.87	0.66	0.32	0.34	0.82

Therefore, the required storage volume is 0.87 m^3.

PROPOSED 180 MAIN STREET THREE STOREY MIXED USE BUILDING

DEVELOPMENT SITE

TABLE 3

100-YEAR EVENT

REQUIRED BUILDING ROOF AREA 1 STORAGE VOLUME

t_c TIME (minutes)	**I 100-YEAR** (mm/hr)	**Q ACTUAL** (L/s)	**Q ALLOW** (L/s)	**Q STORED** (L/s)	**VOLUME STORED** (m^3)
10	178.6	4.07	0.32	3.75	2.25
15	142.9	3.26	0.32	2.94	2.65
20	120.0	2.74	0.32	2.42	2.90
25	103.9	2.37	0.32	2.05	3.08
30	91.90	2.10	0.32	1.78	3.20
35	82.60	1.88	0.32	1.56	3.28
40	75.10	1.71	0.32	1.39	3.34
45	69.10	1.58	0.32	1.26	3.40
50	63.90	1.46	0.32	1.14	3.42
55	59.62	1.36	0.32	1.04	3.43
60	55.90	1.28	0.32	0.96	3.46
65	52.65	1.20	0.32	0.88	3.43
70	49.80	1.135	0.32	0.815	3.42

Therefore, the required storage volume is 3.46 m^3.

PROPOSED 180 MAIN STREET THREE STOREY MIXED USE BUILDING

DEVELOPMENT SITE

TABLE 4

100-YEAR EVENT

REQUIRED BUILDING ROOF AREA 2 STORAGE VOLUME

t_c TIME (minutes)	**I 100-YEAR** (mm/hr)	**Q ACTUAL** (L/s)	**Q ALLOW** (L/s)	**Q STORED** (L/s)	**VOLUME STORED** (m^3)
10	178.6	3.98	0.32	3.66	2.20
15	142.9	3.19	0.32	2.87	2.58
20	120.0	2.68	0.32	2.36	2.83
25	103.9	2.32	0.32	2.00	3.00
30	91.90	2.05	0.32	1.73	3.11
35	82.60	1.84	0.32	1.52	3.19
40	75.10	1.68	0.32	1.36	3.26
45	69.10	1.54	0.32	1.22	3.29
50	63.90	1.43	0.32	1.11	3.33
55	59.62	1.33	0.32	1.01	3.333
60	55.90	1.25	0.32	0.93	3.35
65	52.65	1.17	0.32	0.85	3.32
70	49.80	1.11	0.32	0.79	3.318

Therefore, the required storage volume is 3.35 m^3.

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COMMERCIAL AND RESIDENTIAL BUILDING SITE

PART OF LOT 4 IN BLOCK A

R-PLAN 102

180 MAIN STREET

CITY OF OTTAWA

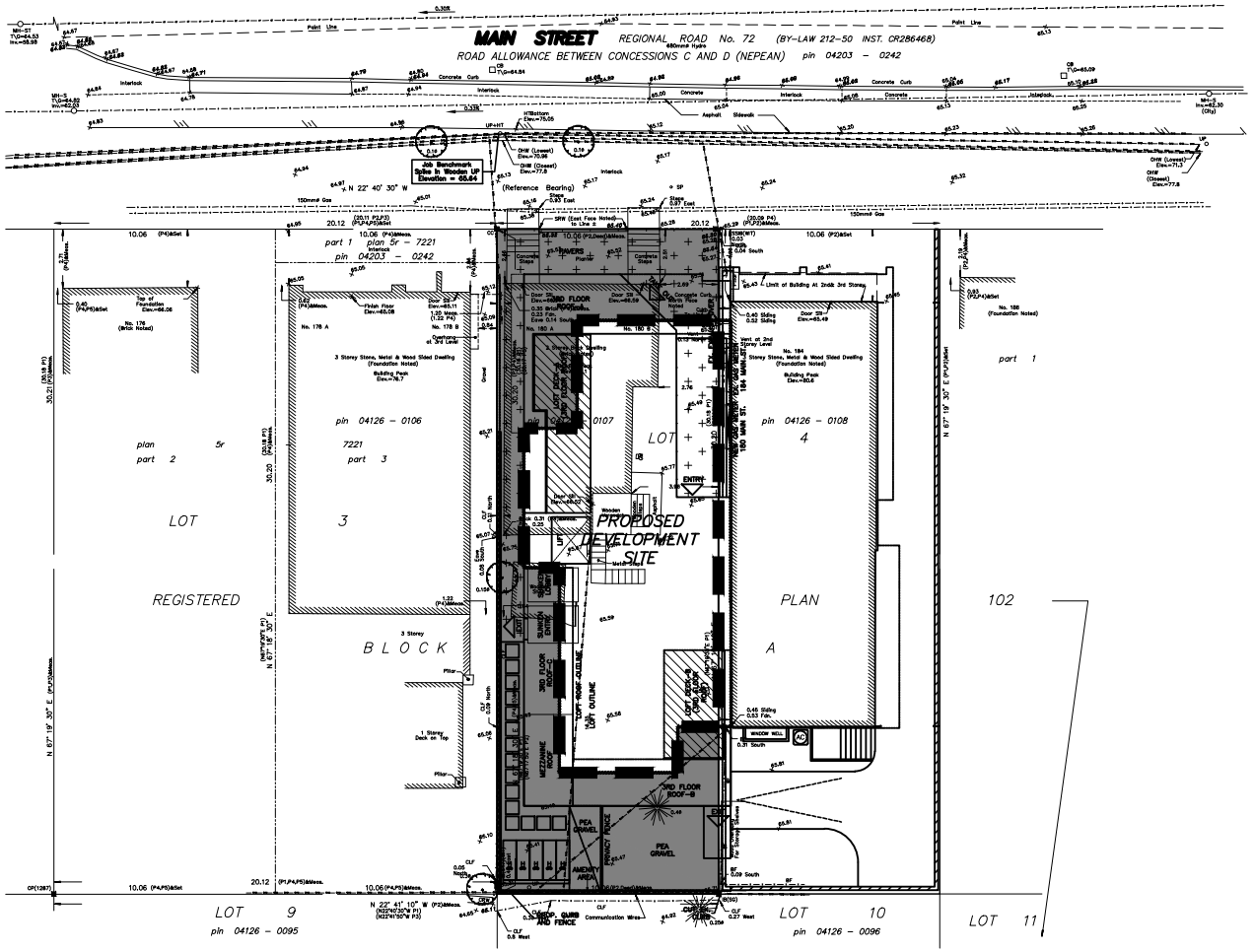
APPENDIX A

STORM DRAINAGE AREA PLAN

FIGURE 1

PROPOSED 180 MAIN STREET
SITE DEVELOPMENT
DRAINAGE AREA PLAN

N.T.S.



LEGEND

LIMIT OF CONTROLLED STORM
DRAINAGE AREA = 161.21 SQ. M

UNCONTROLLED STORM
DRAINAGE AREA = 142.51 SQ. M

TOTAL AREA = 303.72 SQ. M

POST-DEVELOPMENT SITE
AVERAGE "C" = 0.89

T.L. MAK ENGINEERING CONSULTANTS LTD.
CONSULTING ENGINEERS

PROJECT No.	DATE	DRAWING No.
822-100	OCTOBER 2022	FIGURE 1

PROPOSED

THREE STOREY W/ LOFT MIXED USE

COMMERCIAL AND RESIDENTIAL BUILDING SITE

PART OF LOT 4 IN BLOCK A

R-PLAN 102

180 MAIN STREET

CITY OF OTTAWA

APPENDIX B

SITE PRE-DEVELOPMENT CONDITION

GOOGLE IMAGE 2022

AND

AERIAL PHOTOGRAPHY 2021 (GEOOTTAWA)

2022


176
178
PROPOSED
DEVELOPMENT SITE
180
rue Main St.
rue Main St.
184
125
186

2021


176
178
PROPOSED
DEVELOPMENT SITE
180
(A)
184
186
125
rue Main St.

2021

PROPOSED

THREE STOREY W/ LOFT MIXED USE

COMMERCIAL AND RESIDENTIAL BUILDING SITE

PART OF LOT 4 IN BLOCK A

R-PLAN 102

180 MAIN STREET

CITY OF OTTAWA

APPENDIX C

PROPOSED ROOF DRAIN

DETAILS

WATTS®	Adjustable Accutrol Weir Tag: _____	Adjustable Flow Control for Roof Drains

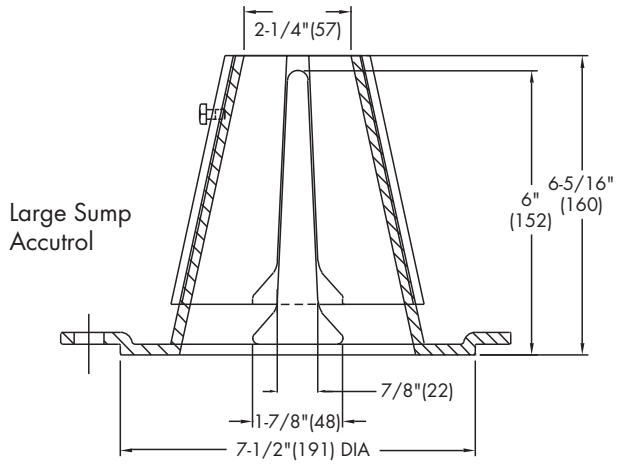
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

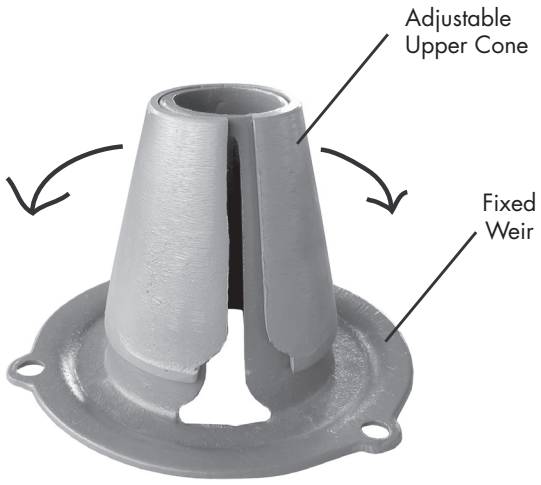
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2"of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3"of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm (per inch of head) x 2 inches of head] + 2-1/2 gpm (for the third inch of head) = 12-1/2 gpm.





1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	5	5	5	5	5

Job Name _____ Contractor _____

Job Location _____ Contractor's P.O. No. _____

Engineer _____ Representative _____

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PROPOSED

THREE STOREY W/ LOFT MIXED USE

COMMERCIAL AND RESIDENTIAL BUILDING SITE

PART OF LOT 4 IN BLOCK A

R-PLAN 102

180 MAIN STREET

CITY OF OTTAWA

APPENDIX D

DETAILED CALCULATIONS

FOR TWO (2)-YEAR AND 100-YEAR

AVAILABLE STORAGE VOLUME

AVAILABLE STORAGE VOLUME CALCULATIONS

Two (2)-Year Event

Roof Storage at Flat Roof Building

The flat Roof Area 1 and Roof Area 2 will be used for storm-water detention. Each roof area will be drained by a controlled drain designed for a release rate of 5.0 U.S.gal./min. or 0.32 L/s under a head of 100mm. Refer to Dwg. 822-100 SWM-1 for roof drain details.

Roof Storage Area 1 (NODE No. 1)
Available flat roof area for storage = 81.56 m^2, C = 0.9, @roof slope of 2.0% minimum or 100 mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.10\text{m})[36.83 + 4\,(9.65) + 0]}{6}$$

$$V = \frac{(0.10)\,(75.43)}{6}$$

$$V = 1.26\text{m}^3$$

The available Roof Area 1 storage volume of 1.26m^3 > required two (2)-year storage volume of 0.92 m^3 from Table 1.

Roof Storage Area 2 (NODE No.2)
Available flat roof area for storage = 79.65 m^2, C = 0.9, @roof slope of 2.0% minimum or 100 mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.10\text{m})[37.17 + 4\,(9.43) + 0]}{6}$$

$$V = \frac{(0.10)\,(74.89)}{6}$$

$$V = 1.25\text{m}^3$$

The available Roof Area 2 storage volume of 1.25 m^3 > required two (2)-year storage volume of 0.87 m^3 from Table 2.

Therefore, the ponding depth at the Roof Drain 1 and 2 locations is approximately 0.10 m (100 mm), and the two (2)-year level is estimated not to reach the roof perimeter of the building.

Hence, Roof Area 1 and Roof Area 2 of the proposed residential building flat rooftop storage are adequate to store the minimum required two (2)-year storm event volume of 1.79 m^3 given it can store up to 2.51 m^3.

AVAILABLE STORAGE VOLUME CALCULATIONS

100-Year Event

Roof Storage at Flat Roof Building

The flat Roof Area 1 to Roof Area 2 will be used for storm-water detention. Each roof area will be drained by a controlled drain designed for a release rate of 5.0 U.S.gal./min. or 0.32 L/s under a head of 150mm. refer to Dwg. 822-100 SWM-1 for roof drain details.

Roof Storage Area 1 (NODE No. 1)
Available flat roof area for storage = 81.56 m^2, C = 1.0, @roof slope of 2.0% minimum or 150 mm of fall from roof perimeter to roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.15\text{m})[81.56 + 4\ (19.20) + 0]}{6}$$

$$V = \frac{(0.15)\ (158.36)}{6}$$

$$V = 3.96\text{m}^3$$

The available Roof Area 1 storage volume of 3.96 m^3 > required 100-year storage volume of 3.46 m^3 from Table 3.

Roof Storage Area 2 (NODE No. 2)
Available flat roof area for storage = 79.65 m^2, C = 1.0, @roof slope of 2.0% minimum or 150mm of fall from roof perimeter to roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.15\text{m})[79.65 + 4\ (19.61) + 0]}{6}$$

$$V = \frac{(0.15)\ (158.09)}{6}$$

$$V = 3.95\text{m}^3$$

The available Roof Area 2 storage volume of 3.95 m^3 > required 100-year storage volume of 3.35 m^3 from Table 4.

Therefore, the ponding depth at the Roof Drain 1 and 2 locations is approximately 0.15m (150mm), and at the perimeter of the flat roof area is 0 mm above the roof perimeter surface. Accordingly, it is recommended that four (4) roof scuppers as shown on Dwg. 822-100 G-1 and 822-100 SWM-1 and the architect's roof plan be installed at the perimeter height of the rooftop for emergency overflow purposes in case of blockage from debris build up at the roof drain.

Hence, Roof Area 1 and Roof Area 2 of the proposed residential building flat rooftop storage are adequate to store the minimum required 100-year storm event volume of 6.81 m^3 given it can store up to 7.91 m^3.