

PROPOSED
SIX (6) STOREY APARTMENT BUILDING SITE
LOT 36
R-PLAN 114
342 ROOSEVELT AVENUE
CITY OF OTTAWA

STORM DRAINAGE REPORT

REPORT No. R-824-83

T.L. MAK ENGINEERING CONSULTANTS LTD.

AUGUST 2024

REFERENCE FILE NUMBER 824-83

Introduction

The proposed six (6) storey residential apartment building site is located on the west side of Roosevelt Avenue and situated south of Workman Avenue and north of Richmond Road. Its legal property description is Lot 36 Registered Plan 114 in City of Ottawa (Ward 15 Kitchissippi). Presently, the residential development site under consideration is occupied by a 2-storey brick residential building in which it is located near the front of the lot. The municipal address of the property is referenced as 342 Roosevelt Avenue.

The lot area under consideration is approximately 646.70 square metres. This property is proposed for the development of a (6) storey residential apartment building plus a basement. The approximate gross floor area at each floor will cover an area of 3,334 ft² (310.0 m) and for a total gross floor area of 23,339 square feet (2,169.0 square metres).

The apartment building will house a total of 30 apartment units, including thirteen (13) 2-bedroom units, eleven (11) 1-bedroom units and six (6) studio units. The storm water outlet for this site is the existing 450mm diameter storm sewer located within the Roosevelt Avenue 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 five (5)-year pre-development conditions because the existing storm pipe was built after 1970. The allowable pre-development runoff coefficient is the lesser of the calculated "C" existing value = 0.42 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 $C = 0.61$, which exceeds the calculated pre-development allowable $C_{pre} = 0.42$ criteria for the Roosevelt Avenue 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 also to the storm Drainage Area Plan Dwg. No. 824-83 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. 824-83 G-1), and on the Proposed Rooftop Storm-water Management Plan (Dwg. No. 824-83 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 where possible the appropriate runoff release that will conform to the City's established drainage criteria and review requirements.

Because the site will be connecting to and outletting into the separated Roosevelt Avenue storm sewer, therefore, the approval exemption under Ontario Regulations 525/98 would apply since storm water discharges from this site will outlet flow into a downstream storm sewer. Thus, an Environmental Compliance Application (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	=	646.70 m ²
Roof Surface Area	=	297.03 m ²
Concrete Area	=	34.32 m ²
Interlock Area	=	45.70 m ²
Grass Area	=	269.65 m ²

$$C = \frac{(297.03 \times 0.9) + (45.70 \times 0.9) + (34.32 \times 0.9) + (269.65 \times 0.2)}{646.70}$$

$$C = \frac{393.275}{646.70}$$

$$C = 0.608$$

Say "C" = 0.61

Therefore, the average post-development "C" for this site is 0.61.

2. Controlled Area Data (NODE #1 and NODE #2)

Roof Surface Area	=	297.03 m ²
Total Storm-water Controlled Area	=	297.03 m ²

$$C = \frac{(297.03 \times 0.9)}{297.03}$$

$$C = \frac{267.327}{297.03}$$

$$C = 0.9$$

Say "C" = 0.9

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

3. Uncontrolled Area Data (NODE #3)

PROPOSED SITE

Grass Area	=	269.65 m ²
Interlock Paver Area	=	45.70 m ²
Concrete Area	=	34.32 m ²
Total Storm-water Uncontrolled Area	=	349.67 m ²

$$C = \frac{(45.70 \times 0.9) + (269.65 \times 0.2) + (34.32 \times 0.9)}{349.67}$$

$$C = \frac{125.948}{349.57}$$

$$C = 0.3602$$

$$\text{Say "C"} = 0.36$$

Therefore, the average post-development "C" for the uncontrolled storm-water drainage area of 349.67 m² from this site is 0.36.

The total tributary area consisting of approximately 349.67 square metres will be out-letting off site uncontrolled from the residential apartment building site which is also the surface area draining to the front of the lot and outletting to the Roosevelt Avenue road right of way.

The uncontrolled drainage area draining to the front of the lot is 349.67 m² and the controlled drainage area from the available flat roof top is 297.03 m² which totals to 646.70 m².

The SWM area to be controlled is 297.03 m². 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: five (5)-year storm

Node #101

Pre-Development Site Area Characteristics

Development Lot Area	=	646.70 m ²
Asphalt Area	=	56.60 m ²
Roof Area	=	149.77 m ²
Grass Area	=	440.33 m ²

$$C_{5\text{pre}} = \frac{(149.77 \times 0.9) + (56.60 \times 0.9) + (440.33 \times 0.2)}{646.70}$$

$$C_{5pre} = \frac{273.799}{646.70}$$

$$C_{5pre} = 0.423$$

$$\text{Say } C_{5pre} = 0.42 > C_{5allow} = 0.5$$

∴ Use $C_{pre} = 0.42$ allowable for redevelopment

$$T_c = D/V \text{ where } D = 40.0\text{m}, \Delta H = 0.2\text{m}, S = 0.5\%, \text{ and } V = 0.52 \text{ feet/second} = 0.16 \text{ m/s}$$

Therefore,

$$T_c = \frac{40.0\text{m}}{0.16\text{m/s}}$$

$$T_c = 4.2 \text{ minutes}$$

Use $T_c = 10$ minutes

$$I_5 = 104.2 \text{ mm/hr [City of Ottawa, five (5)-year storm]}$$

Using the Rational Method

$$Q = 2.78 (0.42) (104.20) (0.06467)$$

$$Q = 7.87 \text{ L/s}$$

Therefore, the total allowable flow off-site is 7.87 L/s.

The pre-development flow of the five (5)-year and 100-year storm event draining off-site from the lot is as follows:

Where, $T_c = 10$ min.

$$Q_{5pre} = 2.78 \text{ CIA}$$

$$C_{5pre} = \frac{273.799}{646.70}$$

$$C_{5pre} = 0.423$$

Say, $C_{5pre} = 0.42$ all draining towards the front of the lot.

$$\begin{aligned} Q_{5pre} &= 2.78 (0.42) (104.20) (0.06467) \\ &= 7.87 \text{ L/s} \end{aligned}$$

$$C_{100\text{pre}} = \frac{(149.77 \times 1.0) + (56.60 \times 1.0) + (440.33 \times 0.2 \times 1.25)}{646.70}$$

$$C_{100\text{pre}} = \frac{316.453}{646.70}$$

$$C_{100\text{pre}} = 0.4893$$

Say, $C_{100\text{pre}} = 0.49$ all draining to the front of lot

$$Q_{100\text{pre}} = 2.78 (0.49) (178.6) (0.06467) \\ = 15.73 \text{ L/s}$$

Therefore under current site conditions the 5-year pre-development flow is estimated at 7.87 L/s and the 100 year pre-development flow is estimated at 15.73 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 five (5)-year and 100-year storm event draining off-site from the lot uncontrolled is as follows:

Where, $T_c = 10$ min.

Node #3

$$Q_{2\text{post}} = 2.78 \text{ CIA}$$

Post Development Area Draining to the **front** uncontrolled is:

Interlock Paver Area	=	45.70 m ²
Grass Area	=	269.65 m ²
Concrete Area	=	34.32m ²

$$A_{\text{Total}} = 349.67 \text{ m}^2$$

$$C_{5\text{post}} = \frac{(45.70 \times 0.9) + (269.65 \times 0.2) + (34.32 \times 0.9)}{349.67}$$

$$C_{5\text{post}} = \frac{125.948}{349.67}$$

$$C_{5\text{post}} = 0.36$$

Say, $C_{5\text{post}} = 0.36$ draining to the front of lot uncontrolled.

$$Q_{5\text{post}} = 2.78 (0.36) (104.2) (0.035)$$

$$= 3.65 \text{ L/s}$$

$$C_{100\text{post}} = \frac{(45.70 \times 1.0) + (269.65 \times 0.2 \times 1.25) + (34.32 \times 1.0)}{349.67}$$

$$C_{100\text{post}} = \frac{147.433}{349.67}$$

$$C_{100\text{post}} = 0.422$$

Say, $C_{100\text{post}} = 0.42$ draining to the front of lot uncontrolled

$$Q_{100\text{post}} = 2.78 (0.42) (178.6) (0.035)$$

$$= 7.30 \text{ L/s}$$

Therefore under post development condition, the 5-year uncontrolled flow off-site is estimated at 3.65 L/s and the 100 year uncontrolled flow is 7.30 L/s.

For this site, because 349.67 square meters of the site area is drained uncontrolled off site, the net allowable discharge for this site into the existing sewer system using the five (5)-year storm event criteria at $C_{\text{pre}} = 0.42$ is calculated as follow: $Q = \{2.78 (0.42) (104.2) (0.06467) - [2.78 (0.42) (178.6) (0.035)]\} = 7.87 \text{ L/s} - 7.30 \text{ L/s} = 0.57 \text{ L/s}$. Therefore, according to this approach, the maximum calculated allowable flow rate off site is 7.87 L/s and the net allowable controlled flow rate off-site is 0.57 L/s.

Storm-Water Management Analysis

Based on the above calculation from site information provided and given the small area size of the lot under consideration (646.70 m²) therefore to limit the maximum allowable flow off-site to 7.87 L/s the City of Ottawa Engineering Department recognized that this may not be achievable without a small flow exceedance.

For this proposed development, the building flat roof top will be used to provide Stormwater Management (SWM) attenuation for this site. Two (2) controlled roof drains are proposed to regulate flow off-site for on-site SWM measures to be incorporated with this proposed development.

The roof drain maximum flow rate proposed is set at 0.95 L/s (15.0 U.S. gal/min.) for Roof Drain #1 and for Roof Drain #2. Therefore, the total controlled roof drain flow off-site is 1.9 L/s during the 100-Year event.

Thus for this site, the 5-year maximum post development flow rate draining off-site is the uncontrolled flow from the lot plus controlled rooftop flow which equals to 5.39 L/s (3.65 L/s + 1.74 L/s) which is less than 7.87 L/s set by the SWM criteria for this site. During the 100 year event, the maximum post development flow rate off-site is estimated at 9.20 L/s (7.30 L/s + 1.90 L/s) which exceeds the allowable site flow of 7.87 L/s by 1.33 L/s.

Therefore for this proposed development site, the total maximum allowable five (5) year release rate of 7.87 L/s will not be exceeded since the estimated 5-Year post development flow is 5.39 L/s. For storm events up to and including the 100 year event the total maximum allowable release rate of 7.87 L/s will be exceeded by 1.33 L/s (estimated at 9.20 L/s) where the flow exceedance is 1.33 L/s for this site.

However, 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 5-year event = 5.39 L/s and the 100 year event = 9.20 L/s where both of the post development flow events are less than current pre-development flow estimate for the site at 5-Year $Q_{pre} = 7.87$ L/s and 100-Year $Q_{pre} = 15.73$ L/s. Therefore with this proposed development, stormwater flow is improved from that of the existing condition.

To the controlled drainage area (flat roof top of proposed building) the post-development inflow rate during the five (5)-year and 100-year storms for the (2) two flat 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 0.95 L/s (15.0 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 1/4 exposed position, which will allow a maximum flow of 0.95 L/s under a head of 150 mm water above the drain for roof drain #1 and drain #2. The weir opening in the 1/4 exposed position which will allow a flow of 0.87 L/s (13.75 U.S. gal./min.) under a head of 120 mm water above the drains during the 5-Year storm event. See Appendix C for Roof Drain details. Therefore, the storm-water flow from the (2) proposed roof drains that can be controlled from this rooftop and outletted off site is 1.74 L/s under a head of 120 mm and 1.9 L/s under a head of 150 mm. Refer to the Proposed Rooftop Stormwater Management Plan Dwg. 824-83 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 (NODE #1)

Five (5)-Year Event

$$C_5 = 0.90$$

$$A = 149.06 \text{ m}^2$$

$$I = \text{mm/hr}$$

$$Q_1 = 2.78 (0.90) (0.0149 \text{ ha.}) I = 0.0373 I$$

100-Year Event

$C_{100} = 1.0$

$A = 149.06 \text{ m}^2$

$I = \text{mm/hr}$

$Q_1 = 2.78 (1.0) (0.0149 \text{ ha.}) I = 0.0414 I$

For Roof Area 2, $Q = 2.78 \text{ CIA (NODE \#2)}$

Five (5)-Year Event

$C_5 = 0.90$

$A = 147.97 \text{ m}^2$

$I = \text{mm/hr}$

$Q_2 = 2.78 (0.90) (0.0148 \text{ ha.}) I = 0.0371 I$

100-Year Event

$C_{100} = 1.0$

$A = 149.97 \text{ m}^2$

$I = \text{mm/hr}$

$Q_2 = 2.78 (1.0) (0.0148 \text{ ha.}) I = 0.0412 I$

The summary results of the calculated inflow and the storage volume of the site and building’s flat rooftop to store the five (5)-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 five (5)-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)
			5 YR	100 YR	5 YR	100 YR	5 YR	100 YR	
RD-1 (0.0149 ha)	1	RD-100-A-ADJ (1/4 OPENING EXPOSED)	0.87	0.95	0.12	0.15	2.10	5.19	7.12
RD-2 (0.0148 ha)	1	RD-100-A-ADJ (1/4 OPENING EXPOSED)	0.87	0.95	0.12	0.15	2.09	5.15	7.42
Total Roof (0.0297 ha)	2	-	1.74	1.90	-	-	4.19	10.34	14.54

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 Roosevelt Avenue 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. #824-83 ESC-1 for details.

Conclusion

At this proposed residential site and to develop this lot to house a (6)-storey 30 unit apartment building on a 0.0647 ha. parcel of land, the estimated allowable flow off-site is calculated at 7.87 L/s based on City of Ottawa Drainage and Stormwater Management (SWM) criteria of 5-year pre-development flow at $C_{pre} = 0.42$. For on-site SWM attenuation, the flat roof top of the proposed apartment building will be utilized and (2) controlled roof drains are incorporated each with a controlled maximum release rate of 0.95 L/s (15.0 U.S. gal/min.). The controlled flow from this site totals to 1.74 L/s for the 5-Year post development condition and 1.9 L/s for the 100-Year post development condition. The uncontrolled 5-year post development flow from the remainder of the site is estimated at 3.65 L/s and 7.30 L/s for the 100-year event respectively.

During the five (5)-year storm event for the flat rooftop storage, the ponding depth of rooftop area 1 and 2 is estimated at 120 mm at the drain and 0mm at the roof perimeter, assuming a 1.5% minimum roof pitch to the drain. The rooftop storage available at Roof Area 1 is 3.49 m³ and the rooftop storage available at Roof Area 2 is 3.81 m³, for a total of 7.30 m³, which is greater than the required volume of 4.19 m³.

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 1.5% minimum roof pitch to the drain. The rooftop storage available at Roof Area 1 is 7.12 m³ and the rooftop storage available at Roof Area 2 is 7.42 m³, for a total of 14.54 m³, which is greater than the required volume of 10.34 m³.

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. 824-83 G-1 and 824-83 SWM-1 respectively, the desirable five (5)-year storm and 100-year storm event detention volume of 7.30 m³ and 14.54 m³ respectively will be available on site. Refer to Appendix D for detailed calculations of available storage volumes.

Thus for this development site, the 5-year maximum post development flow draining off-site is the controlled roof top flow plus the uncontrolled flow from the remainder of the site totals to 5.39 L/s (1.74 L/s + 3.65 L/s) which is less than the allowable 7.87 L/s. For event up to and including 100 year, the estimated maximum post development flow draining off-site is 9.20 L/s (1.90 L/s + 7.30 L/s) which exceeds the site allowable of 7.87 L/s by 1.33 L/s for this site.

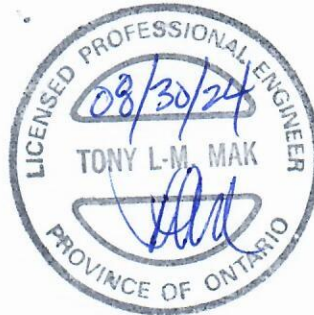
In comparing the pre-development flow of the current site conditions to the post development flow, the SWM regulated flow plus uncontrolled flow from the proposed site under the post development conditions at the 5-year event = 5.39 L/s and the 100 year event = 9.20 L/s where both of the post development flow events are less than current pre-development flow estimate for the site at 5-Year $p_{re} = 7.87$ L/s and 100-Year $p_{re} = 15.73$ L/s. Therefore with this proposed development, stormwater flow is improved from that of the existing condition.

The building weeping tile drainage will outlet via its separate 150mm diameter PVC storm lateral. The roof drains will be outletted also via a separate 150mm PVC storm lateral from the apartment building which "wye" into the proposed 150mm dia. weeping tile storm lateral, whereupon both laterals are outletting to the existing Roosevelt Avenue 450mm diameter storm sewer with only one (1) connection. 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 on the City storm sewer system. Refer to the proposed site grading and servicing plan Dwg. 824-83 G-1 for details.

PREPARED BY T.L. MAK ENGINEERING CONSULTANTS LTD.



TONY L. MAK, P.ENG.



PROPOSED 342 ROOSEVELT AVENUE SIX STOREY APARTMENT

BUILDING DEVELOPMENT SITE

TABLE 1

FIVE (5)-YEAR EVENT

REQUIRED BUILDING ROOF AREA 1 STORAGE VOLUME

ROOF DRAIN No. 1

t_c TIME (minutes)	I 5-YEAR (mm/hr)	Q ACTUAL (L/s)	Q ALLOW (L/s)	Q STORED (L/s)	VOLUME STORED (m³)
5	141.2	5.27	0.87	4.40	1.32
10	104.2	3.89	0.87	3.02	1.81
15	83.50	3.12	0.87	2.25	2.03
20	70.25	2.62	0.87	1.75	2.10
25	60.90	2.27	0.87	1.40	<u>2.10</u>
30	53.93	2.01	0.87	1.14	2.05
35	48.60	1.81	0.87	0.94	1.97
40	44.20	1.65	0.87	0.78	1.87
45	40.63	1.52	0.87	0.65	1.76
50	37.70	1.41	0.87	0.54	1.62

Therefore, the required rooftop storage volume is 2.10 m³.

PROPOSED 342 ROOSEVELT AVENUE SIX STOREY APARTMENT

BUILDING DEVELOPMENT SITE

TABLE 2

FIVE (5)-YEAR EVENT

REQUIRED BUILDING ROOF AREA 2 STORAGE VOLUME

ROOF DRAIN No. 2

t_c TIME (minutes)	I 5-YEAR (mm/hr)	Q ACTUAL (L/s)	Q ALLOW (L/s)	Q STORED (L/s)	VOLUME STORED (m³)
5	141.2	5.24	0.87	4.37	1.31
10	104.2	3.87	0.87	3.00	1.80
15	83.50	3.10	0.87	2.23	2.01
20	70.25	2.61	0.87	1.74	2.088
25	60.90	2.26	0.87	1.39	<u>2.09</u>
30	53.93	2.00	0.87	1.13	2.03
35	48.60	1.81	0.87	0.94	1.97
40	44.20	1.64	0.87	0.77	1.85
45	40.63	1.51	0.87	0.64	1.73
50	37.70	1.40	0.87	0.53	1.59

Therefore, the required storage volume is 2.09 m³.

PROPOSED 342 ROOSEVELT AVENUE SIX STOREY APARTMENT

BUILDING DEVELOPMENT SITE

TABLE 3

100-YEAR EVENT

REQUIRED BUILDING ROOF AREA 1 STORAGE VOLUME

ROOF DRAIN No. 1

t_c TIME (minutes)	I 100-YEAR (mm/hr)	Q ACTUAL (L/s)	Q ALLOW (L/s)	Q STORED (L/s)	VOLUME STORED (m³)
10	178.6	7.40	0.95	6.45	3.87
15	142.9	5.92	0.95	4.97	4.48
20	120.0	4.97	0.95	4.02	4.82
25	103.9	4.31	0.95	3.36	5.02
30	91.9	3.81	0.95	2.86	5.15
35	82.6	3.42	0.95	2.47	<u>5.19</u>
40	75.1	3.11	0.95	2.16	5.18
45	69.1	2.86	0.95	1.91	5.16
50	63.9	2.65	0.95	1.70	5.10

Therefore, the required storage volume is 5.19 m³.

PROPOSED 342 ROOSEVELT AVENUE SIX STOREY APARTMENT

BUILDING DEVELOPMENT SITE

TABLE 4

100-YEAR EVENT

REQUIRED BUILDING ROOF AREA 2 STORAGE VOLUME

ROOF DRAIN No. 2

t_c TIME (minutes)	I 100-YEAR (mm/hr)	Q ACTUAL (L/s)	Q ALLOW (L/s)	Q STORED (L/s)	VOLUME STORED (m³)
10	178.6	7.36	0.95	6.41	3.85
15	142.9	5.89	0.95	4.94	4.45
20	120.0	4.95	0.95	4.00	4.80
25	103.9	4.28	0.95	3.33	5.00
30	91.9	3.79	0.95	2.84	5.11
35	82.6	3.40	0.95	2.45	<u>5.15</u>
40	75.1	3.09	0.95	2.14	5.14
45	69.1	2.85	0.95	1.90	5.13
50	63.9	2.63	0.95	1.68	5.04

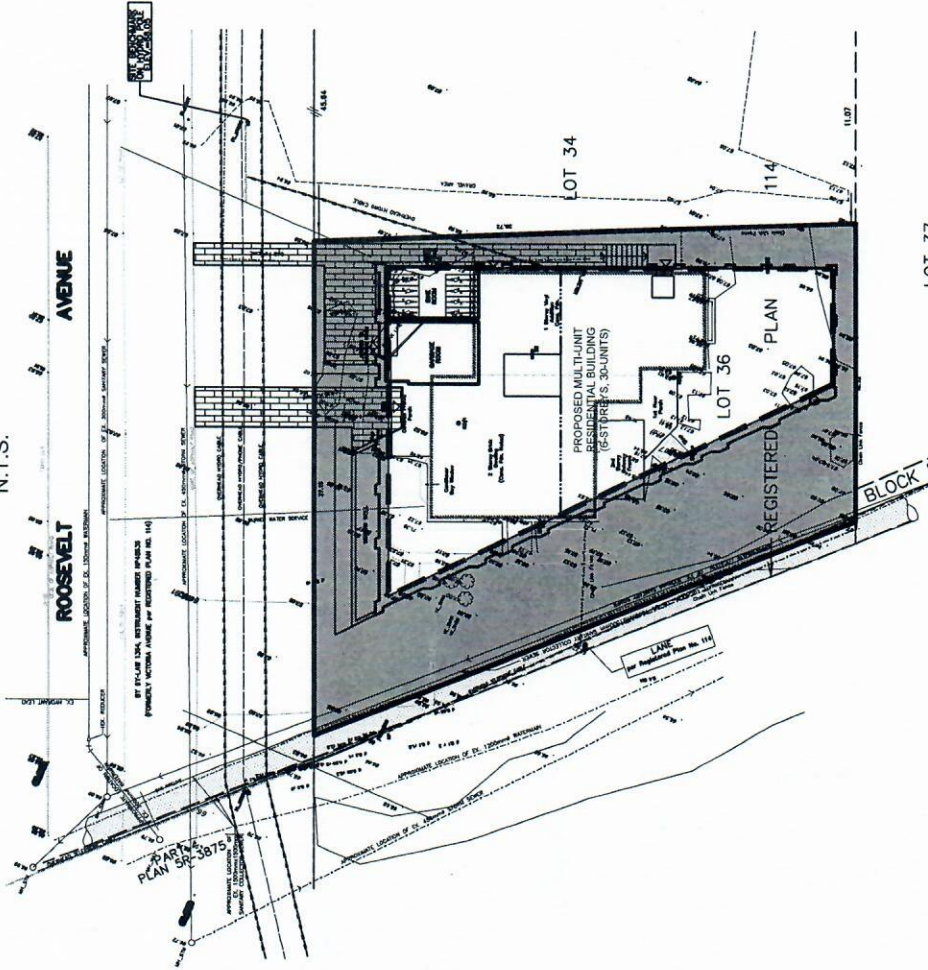
Therefore, the required rooftop storage volume is 5.15 m³.

PROPOSED
SIX (6) STOREY APARTMENT BUILDING SITE
LOT 36
R-PLAN 114
342 ROOSEVELT AVENUE
CITY OF OTTAWA

APPENDIX A
STORM DRAINAGE AREA PLAN
FIGURE 1

PROPOSED 342 ROOSEVELT AVENUE SITE DEVELOPMENT DRAINAGE AREA PLAN

N.T.S.



LEGEND

- LIMIT OF CONTROLLED STORM DRAINAGE AREA = 297.03 SQ. M
- UNCONTROLLED STORM DRAINAGE AREA = 349.67 SQ. M

TOTAL AREA = 646.70 SQ. M

POST-DEVELOPMENT SITE AVERAGE "C" = 0.61



T.L. MAK ENGINEERING CONSULTANTS LTD.
CONSULTING ENGINEERS

PROJECT No.	824-83	DATE	AUGUST 2024	DRAWING No.	FIGURE 1
-------------	--------	------	-------------	-------------	----------

**PROPOSED
SIX (6) STOREY APARTMENT BUILDING SITE
LOT 36
R-PLAN 114
342 ROOSEVELT AVENUE
CITY OF OTTAWA**

**APPENDIX B
SITE PRE-DEVELOPMENT CONDITION
GOOGLE IMAGE 2020
AND
AERIAL PHOTOGRAPHY 2022 (GEOOTTAWA)**







PROPOSED
SIX (6) STOREY APARTMENT BUILDING SITE
LOT 36
R-PLAN 114
342 ROOSEVELT AVENUE
CITY OF OTTAWA

APPENDIX C
PROPOSED ROOF DRAIN
DETAILS



Adjustable Accutrol Weir

Tag: _____

Adjustable Flow Control for Roof Drains

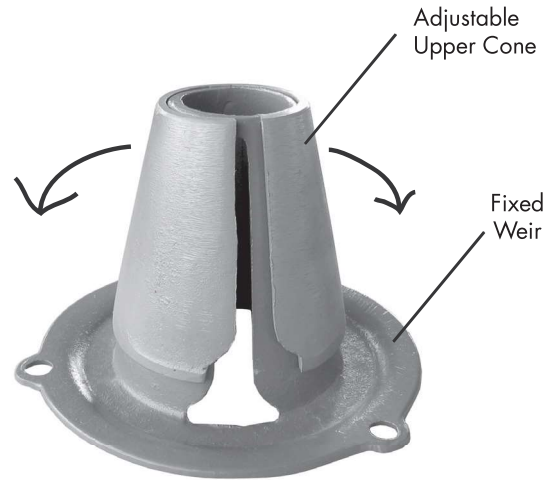
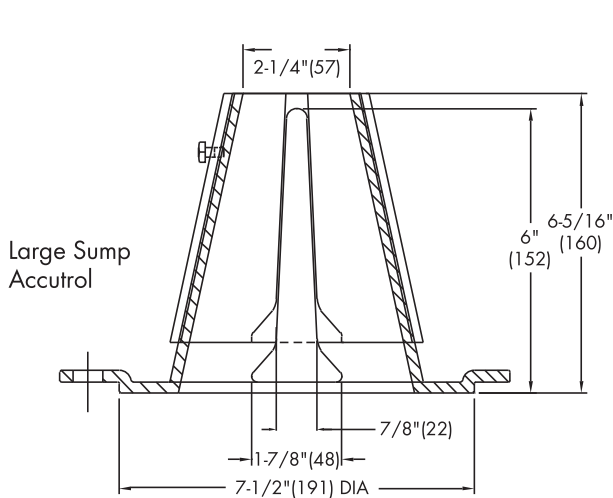
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

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 _____
 Job Location _____
 Engineer _____

Contractor _____
 Contractor's P.O. No. _____
 Representative _____

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

USA: Tel: (800) 338-2581 • Fax: (828) 248-3929 • Watts.com
 Canada: Tel: (905) 332-4090 • Fax: (905) 332-7068 • Watts.ca
 Latin America: Tel: (52) 81-1001-8600 • Fax: (52) 81-8000-7091 • Watts.com



**PROPOSED
SIX (6) STOREY APARTMENT BUILDING SITE
LOT 36
R-PLAN 114
342 ROOSEVELT AVENUE
CITY OF OTTAWA**

**APPENDIX D
DETAILED CALCULATIONS
FOR FIVE (5)-YEAR AND 100-YEAR
AVAILABLE STORAGE VOLUME**

AVAILABLE STORAGE VOLUME CALCULATIONS

Five (5)-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 13.75 U.S. gal./min. or 0.87 L/s under a head of 120 mm. Refer to Dwg. 824-83 SWM-1 for roof drain details.

Roof Storage Area 1 (NODE No. 1)

Available flat roof area for storage = 141.93 m², C = 0.9, @roof slope of 1.5% minimum or 120mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.12\text{m})[86.87 + 4(21.91) + 0]}{6}$$

$$V = \frac{(0.12)(174.51)}{6}$$

$$V = 3.49 \text{ m}^3$$

The available Roof Area 1 storage volume of 3.49 m³ > required five (5)-year storage volume of 2.10 m³ from Table 1.

Roof Storage Area 2 (NODE No.2)

Available flat roof area for storage = 146.54 m², C = 0.9, @roof slope of 1.5% minimum or 120mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.12\text{m})[92.63 + 4(24.53) + 0]}{6}$$

$$V = \frac{(0.12)(190.75)}{6}$$

$$V = 3.81 \text{ m}^3$$

The available Roof Area 2 storage volume of 3.81 m³ > required five (5)-year storage volume of 2.09 m³ from Table 2.

Therefore, the ponding depth at the Roof Drain 1 and 2 locations is approximately 0.12m (120mm), and the five (5)-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 five (5)-year storm event volume of 4.19 m³ given it can store up to 7.30 m³.

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 15.0 U.S. gal./min. or 0.95 L/s under a head of 150 mm. Refer to Dwg. 824-83 SWM-1 for roof drain details.

Roof Storage Area 1 (NODE No. 1)

Available flat roof area for storage = 141.93 m², C = 1.0, @roof slope of 1.5% 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.

$$V = \frac{(0.15\text{m})[141.93 + 4(35.76) + 0]}{6}$$

$$V = \frac{(0.15)(284.97)}{6}$$

$$V = 7.12 \text{ m}^3$$

The available Roof Area 1 storage volume of 7.12 m³ > required 100-year storage volume of 5.19 m³ from Table 3.

Roof Storage Area 2 (NODE No. 2)

Available flat roof area for storage = 146.54 m², C = 1.0, @roof slope of 1.5% 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.

$$V = \frac{(0.15\text{m})[146.54 + 4(37.59) + 0]}{6}$$

$$V = \frac{(0.15)(296.90)}{6}$$

$$V = 7.42 \text{ m}^3$$

The available Roof Area 2 storage volume of 7.42 m³ > required 100-year storage volume of 5.15 m³ from Table 4.

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 10.34 m³ given it can store up to 14.54 m³.

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 0mm above the roof perimeter surface. Accordingly, it is recommended that four (4) building perimeter roof scuppers as shown on Dwg. 824-83 G-1 and 824-83 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.