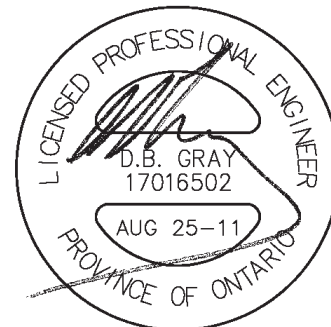


STORMWATER MANAGEMENT REPORT

288 Booth Street
Ottawa, Ontario

Report No. 10073-SWM

August 25, 2011



NOT VALID UNLESS
SIGNED & DATED

D. B. GRAY ENGINEERING INC.

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STORMWATER MANAGEMENT REPORT

288 Booth Street
Ottawa, Ontario

This report addresses the stormwater management requirements of a proposed seven-storey 54 unit apartment condominium building with ground floor commercial and a partial basement at 288 Booth Street at the corner of Somerset Street West in Ottawa.

This report forms part of the stormwater management design for the proposed development. Also refer to drawing SG-1 and SG-2 (Revision 2: Aug 25-11), prepared by D. B. Gray Engineering Inc.

WATER QUALITY:

During construction, an erosion and sediment control plan has been developed (see notes 2.1 to 2.2 on drawing SG-1. In summary: to filter out construction sediment geotextile fabric will be placed between the grate and frame of all existing catch basins adjacent to the site and all new catch basins as they are installed.

WATER QUANTITY:

The stormwater quantity control measures detailed in this report are based on the criteria that the release rate for post-development storm events is equal to or less than the flow produced by a five year storm using a runoff coefficient of 0.50 and a 20 minute time of concentration.

Calculations are based on the Rational Method. The runoff coefficients for the 100 year event were increased by 25% to maximum 1.00.

Stormwater will be stored within the development underground in catch basins, manholes and sewer pipes and in a cistern.

The runoff from the perimeter of the property and the car park ramp (Drainage Area I – 109 sq.m.) will be allowed to flow uncontrolled off the site.

An inlet control device (ICD) located at the outlet pipe of CB/MH-2 will control the release of stormwater off the site. The ICD will restrict the flow and force the stormwater to back up into the upstream sewer pipes, catch basin and manholes and into a cistern located under an outdoor bicycle storage. The ICD shall be a plug style with a round orifice with a trash basket design manufactured by Pedro Plastics (or approved equal) and shall be sized by the manufacturer for a discharge rate of 6.60 l/s at 2.23 m head. It is calculated that an orifice area of 1637 sq.mm. (±46 mm diameter) and a discharge coefficient of 0.61 will restrict the outflow rate to 6.60 l/s at a head of 2.23 m. Based on this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 4.93 l/s at 1.24 m.

Stormwater released through the ICD will be conveyed off the site via a 250mm storm sewer into a proposed 600mm municipal storm sewer on Somerset Street West.

It is not expected that a Ministry of Environment Certificate of Approval will be required for this stormwater management facility..

MAXIMUM PERMITTED FLOW:

The maximum permitted flow for the subject site is calculated as follows:

Area (A):	916 sq.m.
Time of Concentration (T):	20 minutes
Rainfall Intensity (Five Year Event) (i):	70 mm/hr
Runoff Coefficient (C):	0.50
Five Year Release Rate (2.78 AiC)	8.94 l/s

CONCLUSIONS:

WATER QUALITY:

An erosion and sediment control plan as been developed to be implemented during construction

WATER QUANTITY:

One Hundred Year Storm Event:

The maximum allowable release rate for the one hundred year storm event for the site is 8.94 l/s. The post-development release rate for the 100-year storm event is calculated to be 8.94 l/s. Therefore the maximum post development release rate for the 100-year storm event is equal to the maximum permitted release rate. A maximum stored volume of 22.46 cu.m. is required to achieve the post development release rate.

Five Year Storm Event:

The maximum allowable release rate for the five year storm event for the site is 8.94 l/s. The post-development release rate for the 5-year storm event is calculated to be 6.14 l/s. Therefore the maximum post development release rate for the 5-year storm event is less than the maximum permitted release rate. A maximum stored volume of 9.79 cu.m. is required to achieve the post development release rate.

Summary Tables

ONE HUNDRED YEAR EVENT				
Drainage Area	Maximum Release Rate l/s	Maximum Allowable Release Rate l/s	Volumes Stored cu.m.	Volumes Required cu.m.
AREA I (Uncontrolled Flow Off Site)	0.29	-	-	-
AREA II	8.65	-	22.02	22.02
TOTAL	8.94	8.94	22.02	22.02

FIVE YEAR EVENT				
Drainage Area	Maximum Release Rate l/s	Net Allowable Release Rate l/s	Volumes Stored cu.m.	Volumes Required cu.m.
AREA I (Uncontrolled Flow Off Site)	0.14	-	-	-
AREA II	6.42	-	9.37	9.37
TOTAL	6.56	8.94	9.37	9.37

STORMWATER MANAGEMENT CALCULATIONS

The orifice calculations are based on the following formula:

$$Q = C_d \times A_o \sqrt{2gh} \times 1000$$

where:

Q = flowrate in litres per second

C_d = coefficient of discharge

A_o = orifice area in sq.m.

g = 9.81 m/s²

h = head above orifice in meters

Storage calculations on the cistern are based on the following formula for volume of a rectangular prism:

$$V = A \times d$$

where:

V = volume in cu.m.

A = cistern area in sq.m.

d = ponding depth in meters

Calculations for sub-surface storage (manholes and sewer pipes) are based on the following formula for volume of a cylinder:

$$V = L \times \text{Pi} \times (d/2)^2$$

where:

V = volume in cu.m.

L = depth of water in manhole or length of pipe in meters

d = diameter of manhole (1.22 m) or pipe in meters

288 Booth St
Ottawa, Ontario

STORM WATER MANAGEMENT CALCULATIONS Rational Method

ONE HUNDRED YEAR EVENT

Maximum Allowable Release Rate

Area of Property (A):	916	sq.m.
Time of Concentration:	20	min.
Rainfall Intensity (i):	70	mm/hr (5 year event)
Runoff Coefficient (C):	0.50	
Release Rate:	8.94	l/s

DRAINAGE AREA I:

(Uncontrolled Flow Off Site):

			C
Roof Area:	0	sq.m.	1.00
Asphalt/Concrete Area:	0	sq.m.	1.00
Landscaped:	35	sq.m.	0.25
			<hr/>
Total Catchment Area	35	sq.m.	0.25
Area (A):	35	sq.m.	
Time of Concentration:	20	min.	
Rainfall Intensity (i):	120	mm/hr (100 year event)	
Runoff Coefficient (C):	0.25		
Flow Rate (2.78AiC):	0.29	l/s	

DRAINAGE AREA II (continued)

Time min.	i mm/hr	2.78AiC l/s	Release Rate l/s	Stored Rate l/s	Stored Volume cu.m.
5	243	54.53	8.65	45.88	13.76
10	179	40.12	8.65	31.47	18.88
15	143	32.11	8.65	23.46	21.11
20	120	26.95	8.65	18.30	21.96
25	104	23.33	8.65	14.68	22.02
30	92	20.64	8.65	11.99	21.58
35	83	18.55	8.65	9.90	20.80
40	75	16.88	8.65	8.23	19.76
45	69	15.52	8.65	6.86	18.53
50	64	14.37	8.65	5.72	17.16
55	60	13.40	8.65	4.75	15.66
60	56	12.56	8.65	3.91	14.07
65	53	11.83	8.65	3.18	12.40
70	50	11.19	8.65	2.54	10.65
75	47	10.62	8.65	1.97	8.85
80	45	10.11	8.65	1.46	7.00
85	43	9.65	8.65	1.00	5.10
90	41	9.24	8.65	0.59	3.17
95	39	8.86	8.65	0.21	1.20
100	38	8.52	8.52	0.00	0.00
105	36	8.20	8.20	0.00	0.00
110	35	7.91	7.91	0.00	0.00
115	34	7.64	7.64	0.00	0.00
120	33	7.39	7.39	0.00	0.00
125	32	7.16	7.16	0.00	0.00
130	31	6.94	6.94	0.00	0.00
135	30	6.74	6.74	0.00	0.00
140	29	6.55	6.55	0.00	0.00
145	28	6.37	6.37	0.00	0.00
150	28	6.20	6.20	0.00	0.00
180	24	5.37	5.37	0.00	0.00
210	21	4.75	4.75	0.00	0.00
240	19	4.27	4.27	0.00	0.00
270	17	3.89	3.89	0.00	0.00
300	16	3.57	3.57	0.00	0.00

FIVE YEAR EVENT

Maximum Allowable Release Rate

Area of Property (A):	916	sq.m.
Time of Concentration:	20	min.
Rainfall Intensity (i):	70	mm/hr (5 year event)
Runoff Coefficient (C):	0.50	

Release Rate: 8.94 l/s

DRAINAGE AREA I:

(Uncontrolled Flow Off Site):

			C
Roof Area:	0	sq.m.	0.90
Asphalt/Concrete Area:	0	sq.m.	0.90
Landscaped:	<u>35</u>	<u>sq.m.</u>	<u>0.20</u>

Total Catchment Area 35 sq.m. 0.20

Area (A):	35	sq.m.
Time of Concentration:	20	min.
Rainfall Intensity (i):	70	mm/hr (5 year event)
Runoff Coefficient (C):	0.20	

Flow Rate (2.78AiC): 0.14 l/s

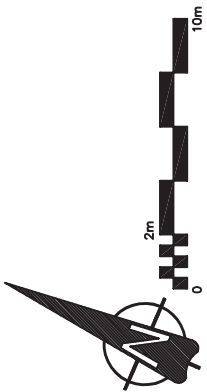
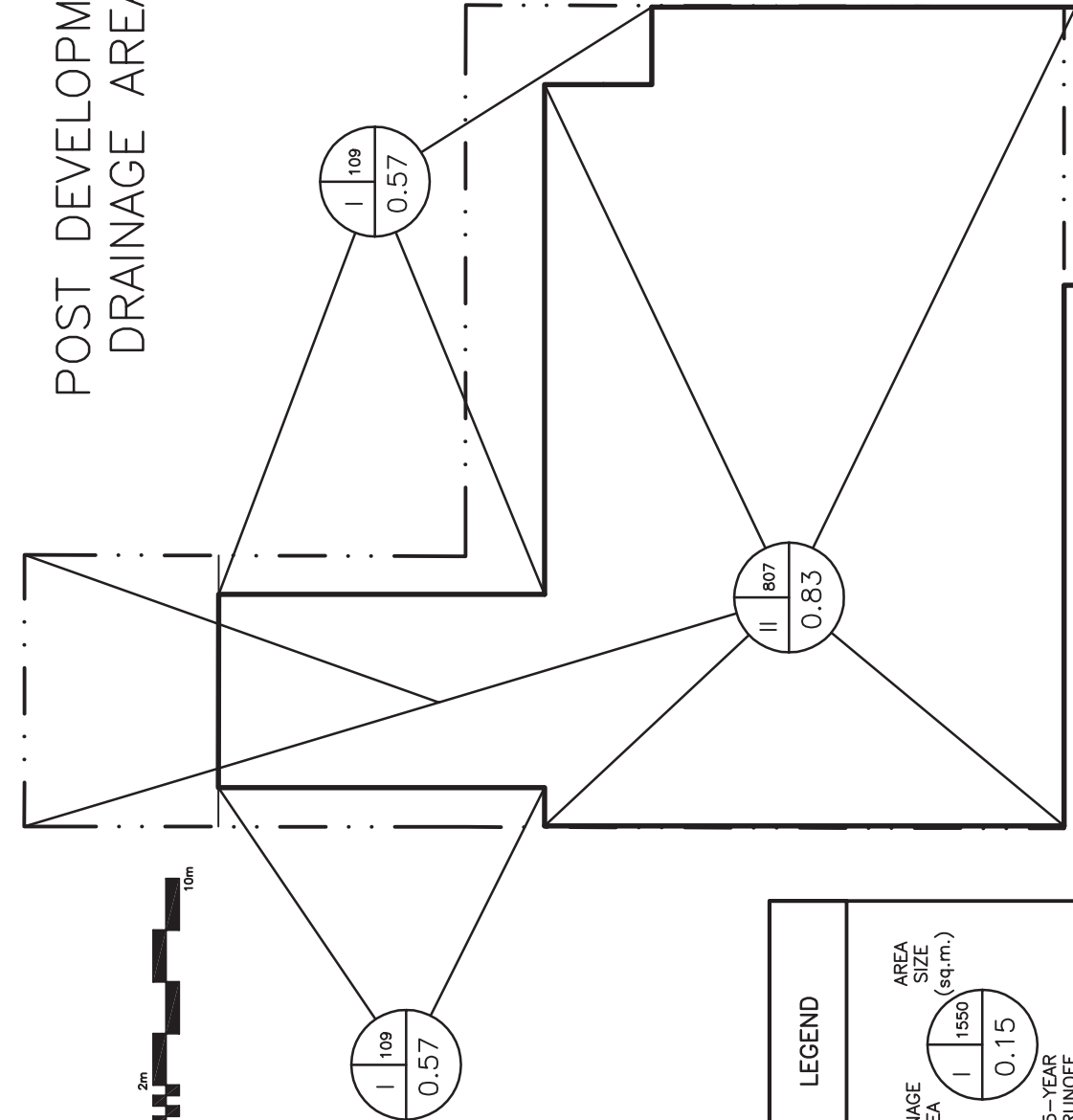
DRAINAGE AREA II (continued)

Time min.	i mm/hr	2.78AiC l/s	Release Rate l/s	Stored Rate l/s	Stored Volume cu.m.
5	141	28.45	6.42	22.03	6.61
10	104	21.00	6.42	14.58	8.75
15	84	16.84	6.42	10.42	9.37
20	70	14.16	6.42	7.73	9.28
25	61	12.27	6.42	5.85	8.77
30	54	10.87	6.42	4.44	8.00
35	49	9.78	6.42	3.35	7.04
40	44	8.91	6.42	2.48	5.95
45	41	8.19	6.42	1.76	4.76
50	38	7.59	6.42	1.16	3.49
55	35	7.08	6.42	0.65	2.16
60	33	6.64	6.42	0.22	0.78
65	31	6.26	6.26	0.00	0.00
70	29	5.92	5.92	0.00	0.00
75	28	5.62	5.62	0.00	0.00
80	27	5.35	5.35	0.00	0.00
85	25	5.11	5.11	0.00	0.00
90	24	4.90	4.90	0.00	0.00
95	23	4.70	4.70	0.00	0.00
100	22	4.52	4.52	0.00	0.00
105	22	4.35	4.35	0.00	0.00
110	21	4.20	4.20	0.00	0.00
115	20	4.06	4.06	0.00	0.00
120	19	3.92	3.92	0.00	0.00
125	19	3.80	3.80	0.00	0.00
130	18	3.69	3.69	0.00	0.00
135	18	3.58	3.58	0.00	0.00
140	17	3.48	3.48	0.00	0.00
145	17	3.39	3.39	0.00	0.00
150	16	3.30	3.30	0.00	0.00
180	14	2.86	2.86	0.00	0.00
210	13	2.53	2.53	0.00	0.00
240	11	2.28	2.28	0.00	0.00
270	10	2.07	2.07	0.00	0.00
300	9	1.91	1.91	0.00	0.00

POST DEVELOPMENT
DRAINAGE AREAS

BOOTH STREET

SOMERSET STREET



LEGEND	
DRAINAGE AREA	AREA SIZE (sq.m.)
I	1550
II	807
0.15	0.57
0.83	
5-YEAR RUNOFF COEFFICIENT	