Structural
Environmental
Services

STORMWATER MANAGEMENT REPORT

3996 Innes Road, Ottawa

Prepared by

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Revision 0
September 2022

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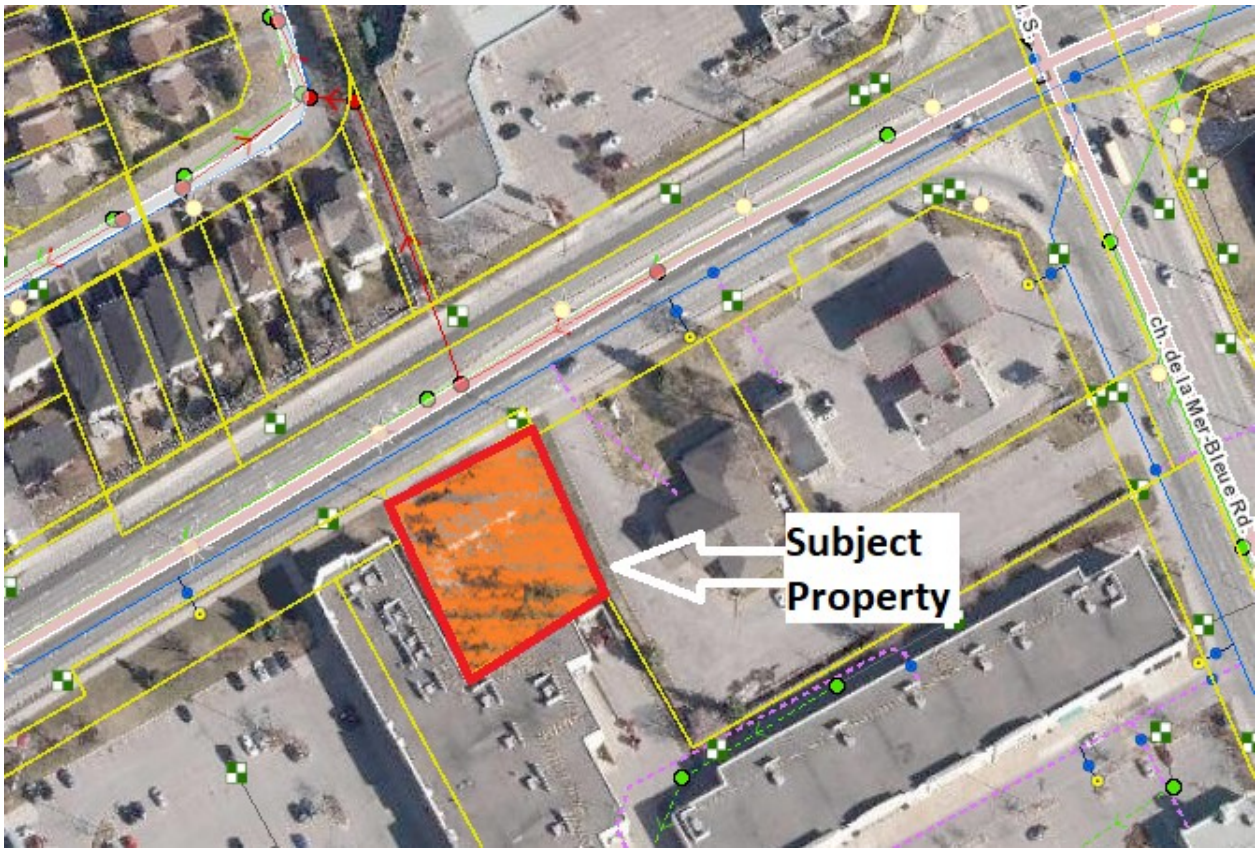
1. Introduction

The property at 3996 Innes Road is located close to intersection of Mer Bleue Road and Innes Rd. The existing lot is 0.15 hectare, currently, contains a one story buildings built in circa 1970. It is proposed that the existing building to be demolished and a new 5-storey commercial/residential building be constructed. Property at 3996 Innes Road is currently zoned as AM (Arterial Mainstreet Zoning) which suits for the purpose of proposed development.

This report will address the servicing requirements associated with the proposed development located at 3996 Innes Road within the City of Ottawa. This report is prepared in response to the request from City of Ottawa Planning department.

1.1. Existing Conditions:

The property measure a total area of approximately 0.15 hectare. The site is fronting 610mm diameter DI water main, 250mm diameter PVC sanitary main and 600mm diameter concrete storm main.



1.2. Guidelines, Previous Studies, And Reports

The following studies were utilized in the preparation of this report:

- Ottawa Sewer Design Guidelines,
  City of Ottawa, SDG002, October 2012.
  (City Standards)
  - Technical Bulletin ISTB-2018-01
    City of Ottawa, March 21, 2018.
    (ISTB-2018-01)
  - Technical Bulletin ISTB-2018-04
    City of Ottawa, June 27, 2018.
    (ISTB-2018-04)

- Ottawa Design Guidelines Water Distribution
  City of Ottawa, July 2010.
  (Water Supply Guidelines)
  - Technical Bulletin ISD-2010-2
    City of Ottawa, December 15, 2010.
    (ISD-2010-2)
  - Technical Bulletin ISDTB-2014-02
    City of Ottawa, May 27, 2014.
    (ISDTB-2014-02)
  - Technical Bulletin ISTB-2018-02
    City of Ottawa, March 21, 2018.
    (ISTB-2018-02)

- Design Guidelines for Sewage Works,
  Ministry of the Environment, 2008.
  (MOE Design Guidelines)

- Stormwater Planning and Design Manual,
  Ministry of the Environment, March 2003.
  (SWMP Design Manual)

- Ontario Building Code Compendium
  Ministry of Municipal Affairs and Housing Building Development Branch,
  January 1, 2012 Update. (OBC)

- Geotechnical Report
  Prepared by Paterson Group
  Report Number: PG5925-1
  Dated, November 17, 2021

2. Stormwater Design

2.1. Design Criteria

Design of the storm sewer system was completed in conformance with the City of Ottawa Design Guidelines for Sewage Works, Stormwater Management Planning, Design Manual Ontario Ministry of Environment and City of Ottawa Sewer Design Guideline, October 2012.

The site is currently contains a one-storey dwelling. There is no stormwater management on current property. Pre-development conditions will be considered as the lesser of current conditions or conditions resulting in a runoff coefficient of 0.5. Based on the existing ground cover, as show in table below, the pre-development runoff coefficient was considered to be 0.50, which is the C value for grass or vegetation. The 5 year storm event, time of concentration that will be calculated and store up to the 100 years storm event as per direction from the City of Ottawa Planning Department.

Area ID	Area (ha)	Runoff 'C'	A x C
Existing Dwelling	0.05	0.9	0.045
Existing Driveways	0.03	0.9	0.027
Grass or Landscape	0.07	0.1	0.007
Total Site Area (ha)	0.15	---	0.079

Existing C(avg) = 0.53
Therefore Predevelopment C = 0.5

During all construction activities, erosion and sediment shall be controlled by techniques outlined in Section 5 of this report.

2.2. Minor System Design Criteria

- The storm sewers designed based on the rational formula and the Manning's Equation under free flow conditions for the 5-year storm using 10 min time of concentration.
- Inflow rates into the minor system are limited to the pre-development rates for up to the 5-year storm, and are based on a time of concentration of 10 min.

2.3. Major System Design Criteria

- The major system has been designed to accommodate runoff of 100 year event and above to flow via overland and not to impact adjacent properties.

2.4. Runoff Coefficients

The area for runoff coefficients used for either pre-development or post-development conditions were based on actual areas measured in CAD. Runoff coefficients for surfaces such as roofs, were taken as 0.90, for driveway and parking area were taken as 0.90 due to asphalt used for paving, and for grass area taken as 0.20. Average runoff coefficient for post development is calculated as 0.76 Refer to appendixes for detail.

2.5. Time of concentration

The time of concentration is taken as 10 minutes as per the City of Ottawa Design Guideline.

2.6. Allowable Release Rate

The allowable release rate from the site was determined using the modified rational method with a 5 years storm, a runoff coefficient C=0.5, and a time of concentration of 10 minutes as follows;

- Time of Concentration = 10 minutes,
- Drainage Area = 0.15 ha

$$Q_{allow} = 2.78\ C\ I\ A$$

Where:

Q_{allow}	=	Allowable release rate to storm sewer (L/sec)
C	=	Runoff Coefficient (dimensionless) =0.5
I	=	Average Rainfall Intensity for return period (mm/hr)
	=	$998.071/(T_C+6.053)^{0.814}$ =104.20 mm/hr
T_C	=	Time of concentration (minutes)
A	=	Drainage Area (hectares) = 0.15

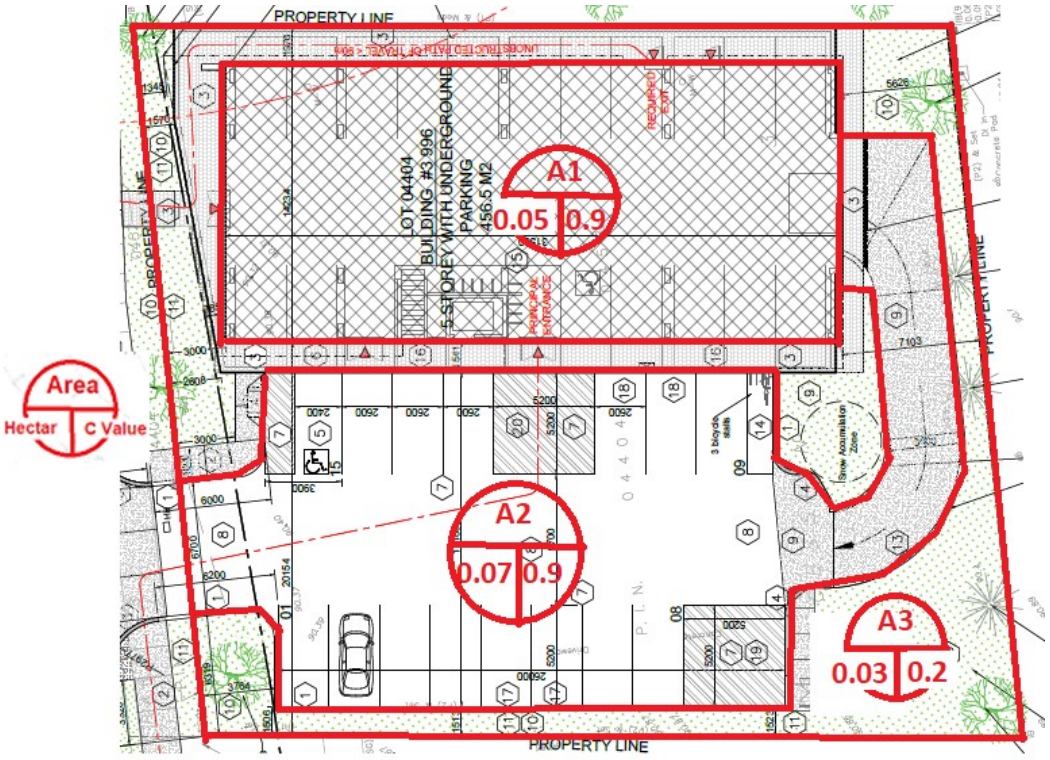
Q Allow = 21.72 L/sec

Therefore the allowable release rate from the site is 21.72 L/sec.

3. Stormwater Quantity Control

Post development storm water management design for this site includes 3 general areas; Grass area, Roof and Driveway area.

- Grass area will sheet drain to the front of the property as per natural drainage pattern.
- Drive way will be working as open storage area for retaining 5yr & 100yr storm event.
- Roof: Storm runoff during 5yrs and 100yrs storm event will be stored in parking and driveway area.



As ponds generally form the shape of the roof, the extend and depth of ponding resulting from the 100-year storm was determined using the following equation;

$$V=1/3 \times A \times d$$

Where:

V	=	Storage volume (cu. m.)
A	=	surface area of pond (sq.m.)
D	=	pond depth at peak (m)

Detail of calculation can be found in appendixes. Below is the summary of our calculation:

- Post-development flow rate shall be restricted to pre-development flow rate; 21.72 L/sec refer to section 2.6 for detail. Since the post-development grass area discharge is uncontrolled and discharges as per the natural drainage pattern, the grass discharge rate is deducted from allowable rate that will come up to 21.72 L/s – 1.74 L/s (grass area discharge) = 19.99 L/s. Therefore, post-development release rate will be restricted to 19.99 L/s.
- Based on the calculation, the maximum required storage for 5yr and 100yr storm event is 7.82 m^3 and 27.60 m^3 respectively.
- Side parking area is considered for providing required storage for 5yr and 100yr storm event. Based on maximum ponding height of 150mm, and based on cone formula, available storage will be 35m^3 which is satisfactory.

The discharge rate from above connected ponding area will be controlled via ICD which is selected based on Hydrovex flow regulator; 75VHV-1. Refer to appendix for additional information from the manufacturer. Refer to Grading plan attached this report for additional information.

4. Quality Control

Storm monitoring manhole will be installed inside the property line, prior to discharge to the storm main on Innes road. Refer to Grading/Servicing plan for detail. Quality control is not required due to the City of Ottawa storm water facility downstream of storm main.

5. Foundation/Footing Drain

Foundation drain is independently connected to storm main on Stewart Street. Please refer to Grading and Drainage plan.

6. Erosion and Sediment Control

Following methods will be unutilized to control erosion and sediment:

- Silt fence will be installed around the perimeter of the site and will be cleaned and maintained throughout construction. Silt fence will remain in place until the working areas have been stabilized and re-vegetated.
- Catch basins will have SILTSACKs or an approved equivalent installed under the grate during construction to protect from silt entering the storm sewer system.
- A mud mat will be installed at the construction access in order to prevent mud tracking onto adjacent roads.
- Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents:
    - Limit extent of exposed soils at any given time;

  - Re-vegetate exposed areas as soon as possible;
  - Minimize the area to be cleared and grubbed;
  - Protect exposed slopes with plastic or synthetic mulches;
  - Install silt fence to prevent sediment from entering existing ditches;
  - No refueling or cleaning of equipment near existing watercourses;
  - Provide sediment traps and basins during dewatering;
  - Install filter cloth between catch basins and frames;
  - Plan construction at proper time to avoid flooding;
  - Establish material stockpiles away from watercourses, so that barriers and filters may be installed.
- The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:
  - Verification that water is not flowing under silt barriers;
  - Clean and change filter cloth at catch basins.
- Construction and maintenance requirements for erosion and sediment controls to comply with Ontario Provincial Standard Specification OPSS 577, and City of Ottawa specifications.
- A visual inspection shall be completed daily on sediment control barriers and any damage repaired immediately. Care will be taken to prevent damage during construction operations.
- Refer to Erosion and Sediment control plan in appendix for more detail.

7. Conclusions

This report addresses the storm water management of the proposed site. The following list below itemizes the conclusions of this report.

- The allowable release rate for the site and required storage volume for 5year and 100year storm event calculated.
- Runoff from the roof and parking area will be retained in the parking and driveway area then discharged to the City storm system via an ICD
- During all construction activities, erosion and sedimentation shall be controlled be techniques outlined in this report.

Should you have any question, do not hesitate to let us know.

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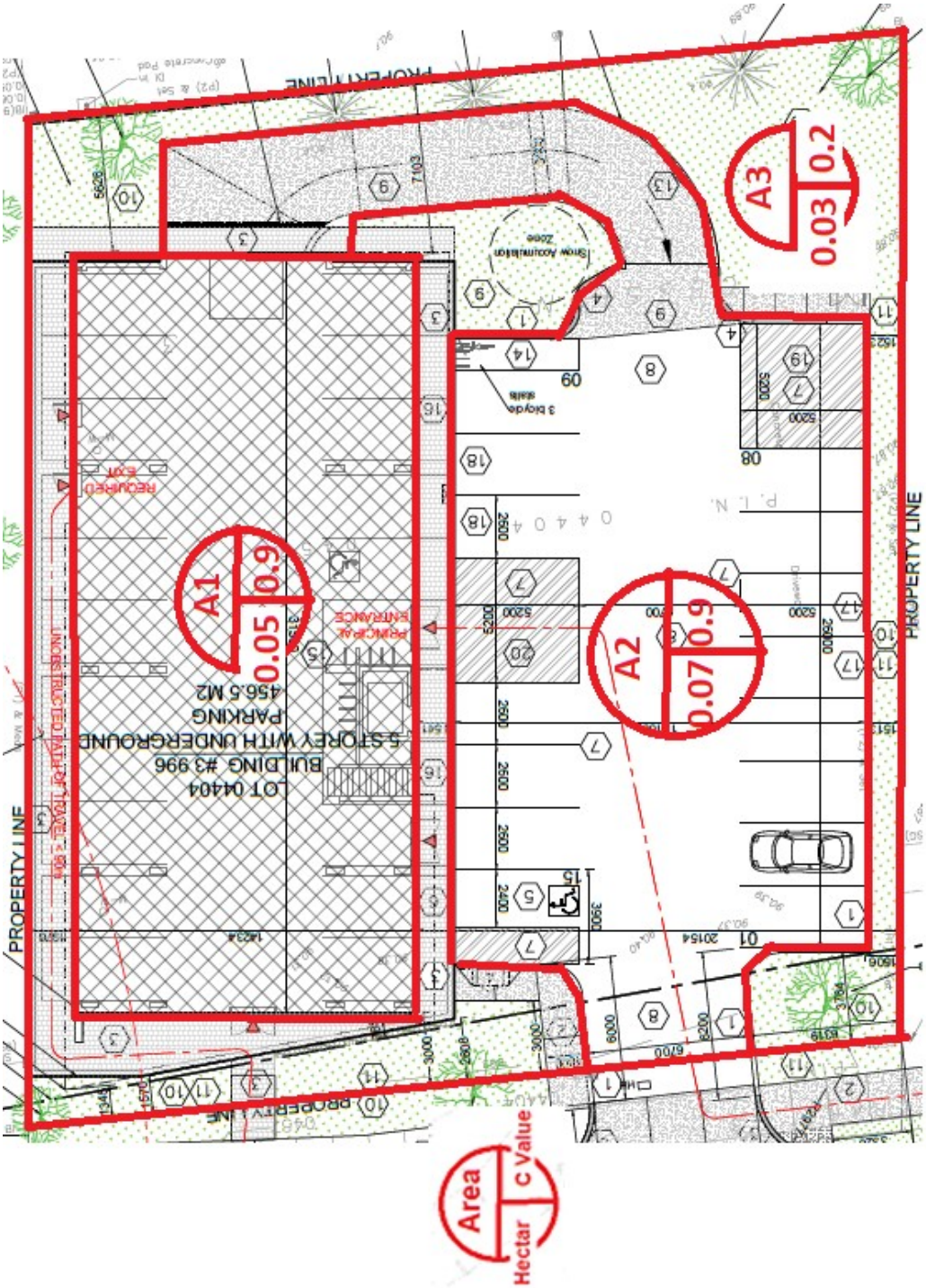
APPENDIX A:

Storm Drain Area


A1
0.9
0.05
A2
0.9
0.07
A3
0.2
0.03
Area
C Value
Hectar
PROPERTY LINE
PROPERTY LINE
PROPERTY LINE
LOT 04104
BUILDING #3 996
5 STOREY WITH UNDERGROUND
PARKING
456.5 M2
RECURED EXIT
PREMISE ENTRANCE
UNOBSTRUCTED PATH OF TRAVEL < 60m
Snow Accumulation Zone
3 bicycle stalls

APPENDIX B:

Stormwater Management Calculation

C(max equiv)	I (mm/h)	Area (ha)	Q(allow)
0.5	**104.2**	**0.150**	**21.72 L/s**
C (Un-controlled)			
0.2	**104.2**	**0.030**	**1.74 L/s**
		Q(allow)	**19.99 L/s**

Area ID	Area (ha)	C (5yr)	A x C	C (100yr) (Max of 1.0)	A x C	Type of Flow (Controlled/Uncontrolled)
A1: Proposed Building	0.050	0.9	0.05	1.00	0.05	Controlled
A2: Parking area	0.070	0.9	0.06	1.00	0.07	Controlled
A3: Grass area	0.030	0.2	0.01	0.25	0.01	Un-controlled
Total Site Area (ha)	0.15	---	0.11	---	0.13	Total

C(avg) 5-year = 0.76
C(avg) 100-year = 0.85

STORAGE CALCULATIONS

C(5 gr)	C(100 grl)	Area (ha)
0.76	0.85	0.150

Q(restricted) l/s = 19.99

t(c)min	I (mm/h)	Q(unrestricted) l/s	Q(restricted) l/s	Q(stored) l/s	V(stored) m³
5	141.2	44.74	19.99	24.76	7.43
10	104.2	33.02	19.99	13.03	7.82
15	83.6	26.48	19.99	6.49	5.85
20	70.3	22.26	19.99	2.28	2.73
25	60.9	19.30	19.99	-0.69	-1.03
30	53.9	17.09	19.99	-2.90	-5.21
35	48.5	15.38	19.99	-4.61	-9.68
40	44.2	14.00	19.99	-5.98	-14.36
45	40.6	12.88	19.99	-7.11	-19.20
50	37.7	11.93	19.99	-8.05	-24.16
55	35.1	11.13	19.99	-8.86	-29.22
60	32.9	10.44	19.99	-9.55	-34.37
65	31.0	9.84	19.99	-10.15	-39.58
70	29.4	9.31	19.99	-10.68	-44.85
75	27.9	8.84	19.99	-11.15	-50.17
80	26.6	8.42	19.99	-11.57	-55.53
85	25.4	8.04	19.99	-11.95	-60.93
90	24.3	7.70	19.99	-12.29	-66.36
95	23.3	7.39	19.99	-12.60	-71.82
100	22.4	7.10	19.99	-12.89	-77.31
105	21.6	6.84	19.99	-13.15	-82.82
110	20.8	6.60	19.99	-13.39	-88.36

Max Vol stored 7.82

STORAGE TABLE (100 Yr Storm)

t(c)min	I(100yr) mm/h	Q(actual) l/s	Q(restricted) l/s	Q(stored) l/s	V(stored) m³
5	242.7	86.0	20.0	66.0	19.81
10	178.6	63.3	20.0	43.3	25.98
15	142.9	50.6	20.0	30.7	27.60
20	120.0	42.5	20.0	22.5	27.04
25	103.8	36.8	20.0	16.8	25.23
30	91.9	32.6	20.0	12.6	22.64
35	82.6	29.3	20.0	9.3	19.50
40	75.1	26.6	20.0	6.6	15.96
45	69.1	24.5	20.0	4.5	12.12
50	64.0	22.7	20.0	2.7	8.05
55	59.6	21.1	20.0	1.1	3.79
60	55.9	19.8	20.0	-0.2	-0.63
65	52.6	18.7	20.0	-1.3	-5.17
70	49.8	17.6	20.0	-2.3	-9.82
75	47.3	16.7	20.0	-3.2	-14.56
80	45.0	15.9	20.0	-4.0	-19.39
85	43.0	15.2	20.0	-4.8	-24.28
90	41.1	14.6	20.0	-5.4	-29.24
95	39.4	14.0	20.0	-6.0	-34.25
100	37.9	13.4	20.0	-6.6	-39.31
105	36.5	12.9	20.0	-7.0	-44.41
110	35.2	12.5	20.0	-7.5	-49.56

Max Vol stored 27.60

APPENDIX C:

Drawings and General Specifications