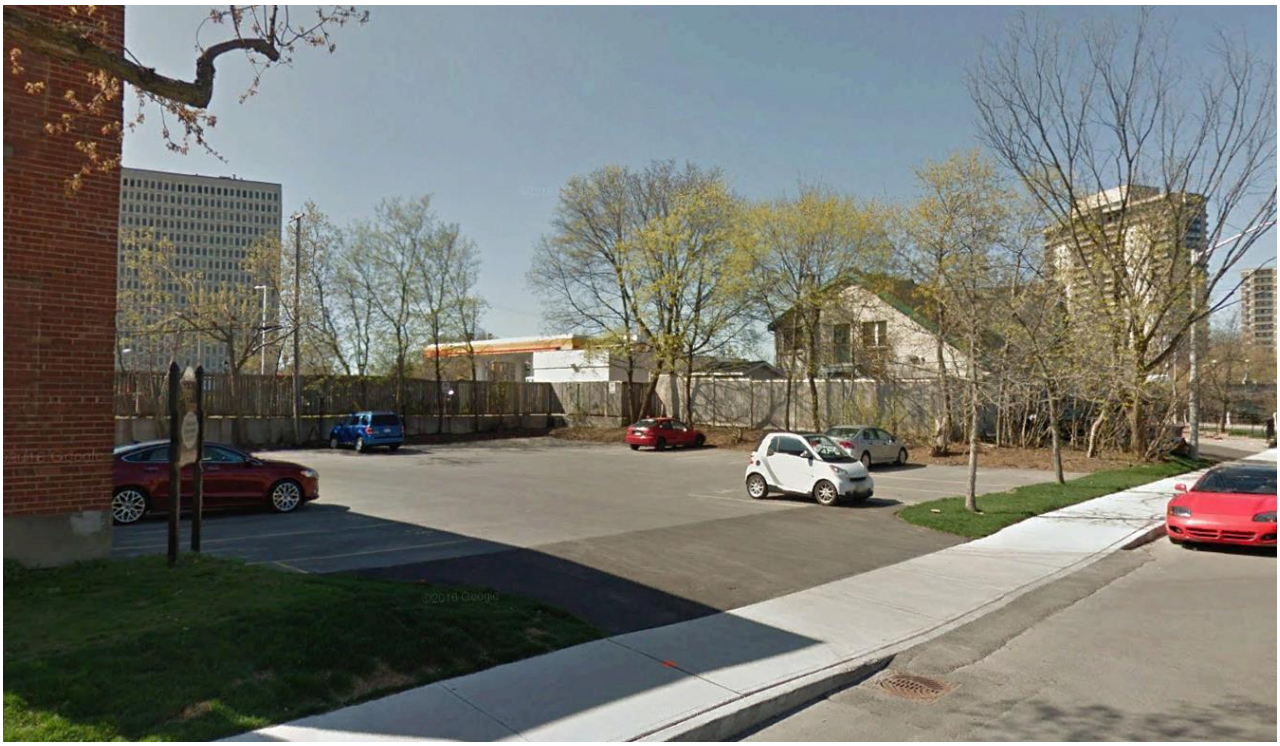
SERVICING & STORMWATER MANAGEMENT REPORT
20 MARK AVENUE



Project No.: CP-18-0171

City File No.: D07-12-18-0118

Prepared for:

Manor Park Management, c/o Anand Aggarwal
231 Brittany Drive, Unit D
Ottawa, ON
K1L 0R8

Prepared by:

McIntosh Perry Consulting Engineers Ltd.
115 Walgreen Road
Carp, ON K0A 1L0

July 30, 2018
Revised: November 30, 2018

McINTOSH PERRY

Executive Summary

Developing a site within the City of Ottawa requires meeting a predefined set of requirements outlined in the City of Ottawa Sewer Design Guidelines (SDG) - 2012 along with meeting the local conservation authority requirements (Rideau Valley Conservation Authority - RVCA) and provincial requirements (Ministry of Environmental and Climate Change – MOECC). Site specific requirements are discussed and outlined in the pre-consultation meeting with the City of Ottawa before the detailed design process is initiated.

This report describes an innovative and cost-efficient design solution for the site servicing (water, sanitary, and storm) and stormwater management (SWM) requirements in order to develop this site. The Rideau Valley Conservation Authority (RVCA) will not require quality protections at this time as the existing main further connects to a combined sewer. Catch basins located on site will have a sump of 0.6 as per OPSD 705.010 to however promote sedimentation of suspended solids.

Evaluation of the proposed site plan in addition to a review of the site grading and soil characteristics was completed. Our review identified that roof storage is the optimal design solution to meet the SWM requirements. The evaluation of proposed development, existing site characteristics and surrounding municipal infrastructure suggest that the roof retention will be a sufficient solution to the site constraints.

The proposed sanitary, storm and water services will utilize the existing infrastructure surrounding the site to service the development. Therefore, it is our professional opinion that this site located at 20 Mark Avenue is able to be developed and fully serviced for the proposed residential building development.

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1.0 PROJECT DESCRIPTION

1.1 Purpose

This report will address the servicing (water, sanitary, and storm) and stormwater management requirements (SWM) associated with the proposed development located at 20 Mark Avenue within the City of Ottawa, formerly City of Vanier.

1.2 Site Description

The property is located at 20 Mark Avenue. The legal description of the land is Plan 29, Part Lots 5 & 6. The land in question covers approximately 0.57 ha and is located on Mark Avenue; it is also located east of North River Road and north of Montreal Road. The Rideau River runs approximately 50m southwest of the site. The site is situated within the Rideau River Floodplain.

The existing site is currently serving as a parking lot and is not serviced. The current entrance to the site will be removed and replaced with a new private entrance, as per city standard SC8, to match existing conditions on Mark Avenue.

The proposed development consists of a 305 m², 3-storey residential building. Access to the site will be provided from Mark Avenue. Some at grade amenity space will be provided northeast of the proposed building.

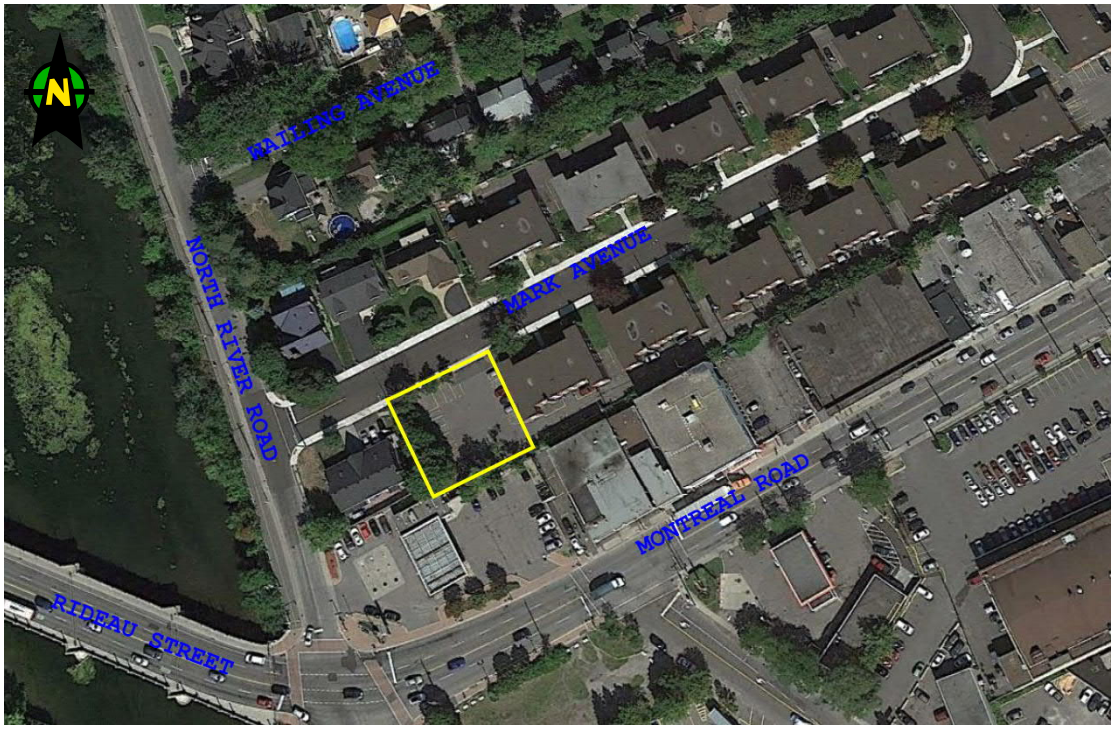

Figure 1: Key Map – 20 Mark Avenue, Vanier.

2.0 BACKGROUND STUDIES

Background studies that have been completed for the site include a review of the City of Ottawa as-built drawings, a topographical survey of the site, a geotechnical report and a Phase I & II Environmental Site Assessment (ESA).

As-built drawings of the existing services within the vicinity of the site were reviewed in order to determine proper servicing and stormwater management schemes for the site.

A topographic survey of the site was completed by Fairhall Moffatt & Woodland Ltd. dated October 25th, 2017 and can be found under separate cover.

The following reports have previously been completed and are available under separate cover:

- Geotechnical Investigation completed by Paterson Group dated July 30, 2018.
- Phase I ESA completed by Paterson Group dated July 24, 2018.
- Phase II ESA completed by Paterson Group dated July 25, 2018.

3.0 PRE-CONSULTATION SUMMARY

City of Ottawa Staff have been pre-consulted regarding this proposed development by email on March 12th, 2018. Specific design parameters to be incorporated within this design include the following:

- Control 5 through 100-year post-development flows to the 5-year pre-development flows with a combined C value to a maximum of 0.50 with a time of concentration of 10 minutes.

Correspondence with the City can be found in Appendix 'A'.

4.0 EXISTING SERVICES

The existing site is currently not serviced.

4.1 Mark Avenue

There is an existing 250mm diameter sanitary sewer as well as a 300mm diameter storm sewer located within Mark Avenue. The 300mm storm sewer services catch basins located on both sides of Mark Avenue and continues along Greensway avenue.

Also located within Mark Avenue is a 200mm diameter watermain. The watermain services the other properties located on Mark Avenue including the existing site.

Overhead utilities are available along the back of the property and gas services are available along the subject section of Mark Avenue.

A fire hydrant is located northwest of the property along the north boulevard of Mark Avenue.

5.0 SERVICING PLAN

5.1 Proposed Servicing Overview

The proposed storm, sanitary and water services will be connected via infrastructure within Mark Avenue. Services will be located along the front of the property.

5.2 Proposed Water Design

A new 150 mm PVC water lateral will be connected to the existing 200 mm PVC watermain within Mark Avenue, complete with a water valve located at the property line.

The proposed building will not be equipped with a sprinkler system; fire protection will be provided by the existing hydrant immediately across from the site along Mark Avenue. The required fire protection from the Ontario Building Code (OBC) is 2,700 L/min (See Appendix 'B' for calculation). The required fire protection from the Fire Underwriters Survey (FUS) is 8,000 L/min (provided for information purposes only).

The water demands for the new building have been calculated as per the Ottawa Design Guidelines. The demands have been calculated for a residential building. Residential demands are as follows: the average and maximum daily demands are 0.10 L/s and 0.24 L/s respectively. The maximum hourly demand was calculated as 0.53 L/s (Refer to Appendix 'B' for flow details). Boundary conditions have been provided by the City and a water model was carried out. The model determined that the entire fire flow would be provided by the hydrant along Mark Avenue. See Appendix 'B' for model results.

5.3 Proposed Sanitary Design

A new 150 mm diameter gravity sanitary service will be connected to the existing 250mm sanitary main within Mark Avenue.

The peak design flow for the proposed site was determined to be 0.13 L/s, however, for pipe design, a more conservative peak design flow of 0.45 L/s was used. This flow takes into account the infiltration of the entire area and is also calculated based on a 2.3p/p/u for residential area. Using the calculated peak design flow, the proposed 150 mm diameter lateral has sufficient capacity to convey the flows (See Appendix 'C' for detailed calculations). It is anticipated that there will be no issues with capacity constraints within the proposed lateral or within the existing sanitary main within the easement as the amount of flow leaving the site is minimal.

5.4 Proposed Storm Design

The majority of the site will consist of the proposed building. The balance of the site will consist of grassed and landscape areas as well as a paved site entrance. In pre-development conditions, the majority of the site slopes towards the south of the property. Some of the site runoff will flow towards the south, however the greater portion of the site runoff will be directed to a stormwater management (SWM) swale northwest of the building. The swale is connected to landscape catch basins where the runoff will be captured and further discharged into the existing infrastructure along Mark Avenue.

The roof will be equipped with two roof drains where runoff will be restricted before discharging to the proposed storm network and existing infrastructure along Mark Avenue.

The quantity of stromwater runoff will be restricted on the roof with the use of a roof drain device. The inlet control device will restrict the roof runoff to 1.32L/s and the total runoff to 13L/s. The total 100-yr post development stormwater runoff will be restricted to the 5-yr pre-development rate, as per the City's requirements. The stormwater management design will be further detailed in Section 6.0.

The site will be constructed with adequate grading to ensure major overflow to the front east corner of the site as well as a small portion to the south corner of the site. The direction and location of overland sheet flow has been indicated on the Site Grading Plan (C101).

5.5 Site Utilities

All relevant utility companies (telephone – Bell and Rogers, gas – Enbridge and hydro – Hydro Ottawa) will be contacted prior to construction in order to confirm adequate utility servicing for the site. The services are anticipated to be connected from the existing overhead infrastructure within the back of the property. Gas is anticipated to connect to the existing main along Mark Avenue.

5.6 Service Locations/Cover

The proposed sanitary, storm and water services will be placed under the grassed area along the front of the property. Hydro, telephone and cable will be primarily above ground connected to existing infrastructure located at the back of the property.

All minimum cover requirements are as per City of Ottawa Standards. Separation distances between the storm, water and sanitary sewer will be maintained as per Ministry of the Environment, Conservation and Parks (MECP) requirements.

6.0 PROPOSED STORMWATER MANAGEMENT

6.1 Design Criteria and Methodology

Stormwater management for this site will be maintained through positive drainage away from the proposed buildings and into a new underground storm sewer system within the site. This SWM plan will implement quantity control strategies. The storm runoff will enter the pipe system through a landscape catch basin (ECB) and a catch basin (CB) located on the site. The restricted stormwater runoff will be directed to the existing sewer within Mark Avenue; similarly, the majority of overland flow will also be directed towards Mark Avenue.

Through per-consultation with the Rideau Valley Conservation Authority (RVCA), no quality control will be required as the storm outlet is further than 2 kilometers from the site. The quantitative and qualitative properties of the storm runoff for both the pre and post-development flows are further detailed below.

6.2 Runoff Calculations

Runoff calculations presented in this report are derived using the Rational Method, given as:

$$Q = 2.78CIA \quad \text{(L/s)}$$

Where C = Runoff coefficient
I = Rainfall intensity in mm/hr (City of Ottawa IDF curves)
A = Drainage area in hectares

It is recognized that the rational method tends to overestimate runoff rates. As a by-product of using extremely conservative prediction method, any facilities that are sized using these results are expected to function as intended in real world conditions.

In conjunction with the City of Ottawa Sewer Design Guidelines the following coefficients were used to develop a balanced 'C' for each drainage area:

Asphalt, Building roofs, Concrete	0.90
Gravel	0.60
Grass, undeveloped areas	0.20

As per the City of Ottawa Sewer Design Guidelines, the 5-year balanced 'C' value must be increased by 25% for a 100-year storm event to a maximum of 1.0.

The pre-development and post-development flows shall both be calculated using a time of concentration (Tc) of 10 minutes.

6.2.1 Pre-Development Drainage

Pre-development drainage consists of the overland sheet flow runoff from the existing paved parking lot. There are currently no existing flow restrictions for the site. The existing drainage area is demonstrated as area A1 on drawing CP-18-0171 PRE (Appendix 'D').

Table 1: Pre-Development Runoff Summary

Area	Drainage Area (ha)	C (5-Yr)	C (100-Yr)	Tc (min)	Q (L/s) 5-Year	Q (L/s) 100-Year
A1	0.08	0.50	0.63	10	11.63	24.92
Total	0.08				11.63	24.92

(See Appendix 'F' for Calculations)

6.2.2 Post-Development Drainage

The post development drainage scheme for the proposed development consists of regions describing tributary areas for runoff to be captured and unrestricted runoff. Drawing CP-18-0171 POST (Appendix 'E') indicates the limits of drainage areas B1-B4.

Table 2: Post-Development Unrestricted Runoff Summary

Drainage Area ID	Total Area (ha)	C (5-Yr)	C (100-Yr)	Tc	Q (L/s) 5-Year	Q (L/s) 100-Year
B1	0.03	0.90	1.00	10	8.06	15.35
B2	0.02	0.23	0.28	10	1.01	2.13
B3	0.02	0.52	0.59	10	3.40	6.65
B4	0.01	0.59	0.66	10	2.19	4.26
Total	0.08				14.67	28.38

(See Appendix 'F' for Calculations)

Runoff from area B2 will sheet flow to a landscape catch basin and flow through a swale where it will be captured by a catch basin (CB1), located at the west corner of the property. Runoff from area B3-B4 will sheet flow unrestricted towards Mark Avenue. Area B1 will be captured and restricted via roof drains before entering the pipe system and outletting to the existing infrastructure along Mark Avenue. See Appendix 'F' for calculations. The restriction and quality runoff control will be further detailed in Sections 6.3 and 6.4.

6.3 Quantity Control

After discussion the quantity control criteria for the site with the City staff, the total post-development runoff for this site has to be restricted to meet the 5-year pre-development flow rate with a maximum runoff coefficient of 0.5. (See Appendix 'A' for pre-consultation notes). When calculating, the pre-development runoff was higher than 0.5. Therefore the 0.5 runoff coefficient was used to obtain runoff flow release rate.

Table 3: Allowable Release Rate

Area	Drainage Area (ha)	Balanced Runoff Coefficients (C) 5-yr	Q (L/s) 5-Year
A1	0.08	0.50	11.63

(See Appendix 'F' for Calculations)

Reducing post-development flows will be done by using roof drains. It will consequently create the need for roof storage. Runoff flows from area B1-B4 will be restricted as detailed in the table below.

Table 4: Post-Development Runoff Summary

	Post-Development Unrestricted (L/S)		Post-Development Restricted (L/S)		
Drainage Area ID	5-year	100-Year	5-Year	100-Year	Restricted/ Unrestricted
B1	8.06	15.35	0.42	0.78	Restricted
B2	1.01	2.13	1.01	2.13	Unrestricted
B3	3.40	6.65	3.40	6.65	
B4	2.19	4.26	2.19	4.26	
Total	9.07	17.47	7.03	13.81	

(See Appendix 'F' for Calculations)

Runoff flows from Area B2 will be captured by a landscape catch basin and a catch basin and will flow through the proposed network connecting to existing infrastructure. Area B3 will sheet flow towards the existing CB located north of the site along Mark Avenue and area B4 will flow in the conditions as pre-development. Runoff from area B1 will be captured and restricted via roof drain. The calculation process was done to yield the most optimal roof storage possible which resulted in flow falling just above the 5- year storm limit. The only other location the flow can be restricted is in drainage area B2. However, this would result in the flow being restricted to a rate below 6 L/s which puts the capture system at a higher risk of failure due to being clogged easily. As such, this option is not practical and thus only theoretical. The restricted flows will be directed towards the storm network before outletting to the existing infrastructure at a rate of 13.81L/s for the 100-year storm events, which is only slightly above the allowable release rate of 11.63L/s, calculated with a coefficient of 0.50. The restriction of the roof runoff flow will result in 65mm of ponding on 75% of the total roof area.

In the event that there is a rainfall above the 100-year storm event, or a blockage within the storm network, an emergency overland flow route has been provided such that the stormwater runoff will be conveyed towards the north corner of the site away from the building, and into Mark Avenue. An elevation difference of over 0.30m has been provided from the finished floor (57.46) of the building to the overland flow route elevation (56.78).

The table below details the required and provided storage volumes for 5-year and 100-year storm event to meet the requirements.

Table 5: On-Site Storage Summary

	5-yr Storm Event			100-yr Storm Event		
Area	Depth of Ponding (m)	Required Storage (m^3)	Available Storage (m^3)	Depth of Ponding (m)	Required Storage (m^3)	Available Storage (m^3)
B1	0.035	7.9	8.1	0.065	14.9	15.1

(See Appendix 'F' for Calculations)

6.4 Quality Control

The development of this lot will employ Best Management Practices (BMP's) wherever possible. The intent of implementing stormwater BMP's is to ensure that water quality and quantity concerns are addressed at all stages of development. Lot level BMP's typically include temporary retention of the parking lot runoff, minimizing ground slopes and maximizing landscaped areas. Some of these BMP's cannot be provided for this site due to site constraints and development requirements.

As per the discussions with the RVCA, the connection to the existing infrastructure along Mark Avenue is further than 2 kilometers away for the outlet and therefore will not require any quality protection at this time. The combination of the above BMP's and the proposed flow control measures will however still aid in the protection of the natural environment.

7.0 SEDIMENT EROSION CONTROL

The site-grading contractor is responsible for ensuring sediment control structures are installed in accordance with the Site Grading and Drainage Plan as indicated. Silt fences shall be installed on site before construction or earth-moving operations begin, as shown on the Site Grading and Drainage Plan.

Geosock is to be installed under the grates of all existing structures along the frontage of the site and any new structures immediately upon installation. The Geosock is to be removed only after all areas have been paved and vegetation has been established. Care shall be taken at the removal stage to ensure that any silt that has accumulated is properly handled and disposed of. Removal of silt fences without prior removal of the sediments shall not be permitted.

At the discretion of the project manager, municipal staff or conservation authority, additional silt control devices shall be installed at designated locations.

8.0 SUMMARY

- A new 305 m^2 3-storey residential building will be constructed centrally on the site located at 20 Mark Avenue.
- A new 150 mm diameter sanitary service will be installed and connected to the existing 250 mm diameter sewer within Mark Avenue.
- A new 50 mm diameter water lateral will be extended from the existing 150 mm diameter main within Mark Avenue.
- A new storm network will be installed onsite and will connect to the existing 300mm diameter storm sewer that services curb inlet catch basins within Mark Avenue.
- Storage for the 5 through 100-year storm events will be provided on the grassed area within the rear of the site.
- As per discussed with the Rideau Valley Conservation Authority staff, no quality protection is required. Nevertheless, best management practices will be employed.

9.0 RECOMMENDATIONS

Based on the information presented in this report dated November 2018, we recommend that City of Ottawa approve this Servicing and Stormwater Management Report in support of the proposed 3-storey residential building located at 20 Mark Avenue.

The sediment and erosion control plan outlined in Section 7.0 and detailed in the Grading and Drainage Plan notes are to be implemented by the contractor.

This report is respectfully being submitted for approval.

Ryan Kennedy, P.Eng.
Practice Area Lead, Land Development
McIntosh Perry Consulting Engineers
T: 613.836.2184 x 2243
E: r.kennedy@mcintoshperry.com

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10.0 STATEMENT OF LIMITATIONS

This report was produced for the exclusive use of Manor Park Management. The purpose of the report is to assess the existing stormwater management system and provide recommendations and designs for the post-construction scenario that are in compliance with the guidelines and standards from the Ministry of the Environment and Climate Change, City of Ottawa and local approval agencies. McIntosh Perry reviewed the site information and background documents listed in Section 2.0 of this report. While the previous data was reviewed by McIntosh Perry and site visits were performed, no field verification/measures of any information were conducted.

Any use of this review by a third party, or any reliance on decisions made based on it, without a reliance report is the responsibility of such third parties. McIntosh Perry accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this review.

The findings, conclusions and/or recommendations of this report are only valid as of the date of this report. No assurance is made regarding any changes in conditions subsequent to this date. If additional information is discovered or becomes available at a future date, McIntosh Perry should be requested to re-evaluate the conclusions presented in this report, and provide amendments, if required.

APPENDIX A: CITY OF OTTAWA PRE-CONSULTATION NOTES

McINTOSH PERRY

From: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Sent: June-12-18 7:43 AM
To: Laure-Anne Larose
Subject: RE: 20 Mark Avenue - Stormwater Management Criteria

Follow Up Flag: Follow up
Flag Status: Completed

Good morning Laure-Anne,

Controlled flow -1: 5 year storm event with a “C” factor of 0.5 and a TC of 10 min. (for events up to the 1:100 year storm event).

Richard Buchanan, CET

Project Manager, Development Approvals
Planning, Infrastructure and Economic Development Department
Planning & Growth Management Branch
City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27801
ottawa.ca/planning / ottawa.ca/urbanisme

From: Laure-Anne Larose <l.larose@mcintoshperry.com>
Sent: Monday, June 11, 2018 8:25 AM
To: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Subject: RE: 20 Mark Avenue - Stormwater Management Criteria

Good morning Richard,

Could you please confirm the storm water management criteria for the site located at 20 Mark Avenue?

Thank you,

Laure - Anne Larose, EIT
Engineering Intern
115 Walgreen Road, R.R. 3, Carp, ON K0A 1L0
T. 613.836.2184 (ext 2273) | **F.** 613.836.3742
l.larose@mcintoshperry.com | www.mcintoshperry.com

From: Laure-Anne Larose
Sent: April-12-18 4:31 PM
To: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Subject: 20 Mark Avenue - Stormwater Management Criteria

Good Afternoon,

We are currently working on the stormwater management for the site located at 20 Mark Avenue and a pre-consultation meeting has already took place. Following my review of the pre-consultation meeting, only some information was provided regarding the site criteria for stormwater management. Could you provide us with more details on the stormwater management criteria for this site?

We took the liberty of calculating a time of concentration based on the Airport formula as per the below for the site.

Tc = (3.26(1.1-c)L^0.5/S^0.33)

c = 0.80 (Balanced Runoff Coefficient)
L = 39 m (Watershed length)
S = 2.0% (Average slope of watershed)

The result of this calculation produced a time of concentration for the existing site of 5 minutes. With this in mind we are wondering if it would be possible to have a 10minutes time of concentration for pre-development flow.

Let us know your thoughts and we could potentially set up a quick phone call to discuss.

Thank you,

Laure - Anne Larose, EIT
Engineering Intern
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APPENDIX B: EXISTING WATERMAIN FLOW AND FIRE PROTECTION CALCULATIONS

McINTOSH PERRY

CP-18-0171 - 20 Mark Avenue

Project:	20 Mark Avenue
Project No.:	CP-18-0171
Designed By:	LAL
Checked By:	RPK
Date:	May 30, 2018

Ontario 2006 Building Code Compendium (Div. B - Part 3)

***Water Supply for Fire-Fighting* - Store/Office & Warhouse Building**

Building is classified as Group : D, E and F2 up to 2 Storeys (from table 3.2.2.55)
Building is of combustible construction with fire separations and fire resistance ratings provided in accordance with Subsection 3.2.2., including loadbearing walls, columns and arches. Noncombustible construction may be used in lieu of fire-resistance rating where permitted in Subsection 3.2.2.

From Div. B A-3.2.5.7. of the Ontario Building Code - 3. Building On-Site Water Supply:

(a) Q = K x V x Stot

where:
Q = minimum supply of water in litres
K = water supply coefficient from Table 1
V = total building volume in cubic metres
Stot = total of spatial coefficient values from the property line exposures on all sides as obtained from the formula:
Stot = 1.0 + [Sside1+Sside2+Sside3+…etc.]

K	**18**	(from Table 1 pg A-31) (Worst case occupancy {E / F2} 'K' value used)
V	**2,744**	(Total building volume in m³.)
Stot	**1.5**	(From figure 1 pg A-32)
Q =	**74,087.19 L**	

From Figure 1 (A-32)

Snorth	37.4	m	0.0
Seast	4	m	0.5
Ssouth	45+	m	0.0
Swest	10	m	0.0

*approximate distances

From Table 2: Required Minimum Water Supply Flow Rate (L/s)

2,700 L/min (if Q <108,000 L)
713 gpm

CMFO - Fire Underwriters Survey (FUS) Fire Calculations

Project:	20 Mark Avenue
Project No.:	CP-18-0171
Designed By:	LAL
Checked By:	RPK
Date:	April 13, 2018

McINTOSH PERRY

A. Determine The Coefficient Related To The Type Of Construction

From Part II of the Fire Underwriters Survey (1999) – Guide for Determination of Required Fire Flow Copyright I.S.O.:

F = 220 x C x √A Where:

F = Required fire flow in liters per minute

C = **Coefficient related to the type of construction.**

A = The total floor area in square meters (including all storey's, but excluding basements at least 50 percent below grade) in the building being considered.

The building is considered to be of ordinary construction type. Therefore,

C = 1.00

B. Determine Ground Floor Area

As provided by the Architect:

Floor Area (One Floor) = 307.27 m²

Total Floor Area = 921.81 m²

This floor area represents the final build-out of the development; as outlined on the Site Plan drawing.

C. Determine Height in Storeys

From Architectural Drawings:

Number of Storeys = 3.00

D. Calculate Required Fire Flow

F = 220 x C x √A

C = 1.00

A = 921.81

F = 220.00 X 1.00 X √ 921.81

F = 6,679.49 L/min.

F = **7,000.00 L/min.**

E. Determine Increase or Decrease Based on Occupancy

From note 2, Page 18 of the Fire Underwriter Survey:

Non-Combustible

-25%

Occupancy Decrease = -1,750.00 L/min.

F = 5,250.00 L/min.

F. Determine the Decrease, if any for Sprinkler Protection

From note 3, Page 18 of the Fire Underwriter Survey:

- The flow requirement may be reduced by up to 50% for complete automatic sprinkler protection depending upon adequacy of the system.
- The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards.
- Additional credit of 10% if water supply is standard for both the system and fire department hose lines
- If sprinkler system is fully supervised system, an additional 10% credit is granted
- The building will not be equipped with a fully automated sprinkler system
- Therefore 0% * 5,250 L/min

Reduction = 0.00 L/min.

G. Determine the Total Increase for Exposures

From note 4, Page 18 of the Fire Underwriter Survey:

- Exposure distance to the existing building to the east of the proposed building is approximately 4m. Building to the north is 37.4m and to the west is 10m
- There are no existing buildings surrounding the remainder of the site that are within 45m.
- Therefore the charge for exposure is 45% of the value obtained in Step D.
- Therefore 5,250 L/min x 45%

Increase = 2,362.50 L/min.

H. Determine the Total Fire Demand

- To the answer obtained in E, substract the value obtained in F and add the value obtained in G
- Fire flow should be no less than 2,000L/min. and the maximum value shoul not exceed 45,000L/min.
- The fire flow must be rounded to the nearest 1,000L/min.
- Therefore 5,250 L/min. - 0 L/min. + 2,362.50L/min

F = 7,612.50 L/min.

F = 8,000.00 L/min.

20 Mark Avenue - Water Demands

Project:	20 Mark Avenue
Project No.:	CP-18-0171
Designed By:	LAL
Checked By:	RPK
Date:	June 6, 2018
People:	2X 1Bed (1.4pers) + 10 x 2Beds (2.1 Pers)

McINTOSH PERRY

23.8

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	***350***	***L/c/d***
Industrial - Light	35,000	L/gross ha/d
Industrial - Heavy	55,000	L/gross ha/d
Shopping Centres	2,500	L/(1000m² /d
Hospital	900	L/(bed/day)
Schools	70	L/(Student/d)
Trailer Parks no Hook-Ups	340	L/(space/d)
Trailer Park with Hook-Ups	800	L/(space/d)
Campgrounds	225	L/(campsite/d)
Mobile Home Parks	1,000	L/(Space/d)
Motels	150	L/(bed-space/d)
Hotels	225	L/(bed-space/d)
Tourist Commercial	28,000	L/gross ha/d
Othe Commercial	28,000	L/gross ha/d
AVERAGE DAILY DEMAND	**0.10**	**L/s**

MAXIMUM DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	***2.5 x avg. day***	***L/c/d***
Industrial	1.5 x avg. day	L/gross ha/d
Commercial	1.5 x avg. day	L/gross ha/d
Institutional	1.5 x avg. day	L/gross ha/d
MAXIMUM DAILY DEMAND	**0.24**	**L/s**

MAXIMUM HOUR DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	***2.2 x max. day***	***L/c/d***
Industrial	1.8 x max. day	L/gross ha/d
Commercial	1.8 x max. day	L/gross ha/d
Institutional	1.8 x max. day	L/gross ha/d
MAXIMUM HOUR DEMAND	**0.53**	**L/s**

WATER DEMAND DESIGN FLOWS PER UNIT COUNT
CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010

From: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Sent: April-17-18 8:47 AM
To: Laure-Anne Larose
Subject: FW: 20 Mark Avenue - Boundary Conditions
Attachments: 20 Mark Ave April 2018.pdf

Hi Laure-Anne

The following are boundary conditions, HGL, for hydraulic analysis at 20 Mark Ave (zone 1E) assumed to be connected to the 203mm on Mark Ave (see attached PDF for location).

Minimum HGL = 109.1m

Maximum HGL = 118.3m; the maximum pressure is estimated to be above 80 psi. A pressure check at completion of construction is recommended to determine if pressure control is required.

Max Day + Fire Flow (133 L/s) = 105.0m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Richard Buchanan, CET

Project Manager, Development Approvals
Planning, Infrastructure and Economic Development Department
Planning & Growth Management Branch
City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27801
ottawa.ca/planning / ottawa.ca/urbanisme

From: Laure-Anne Larose <l.larose@mcintoshperry.com>
Sent: Friday, April 13, 2018 10:24 AM
To: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Subject: 20 Mark Avenue - Boundary Conditions

Hi Richard,

Please find below the water demands to obtain boundary conditions for 20 Mark Avenue. The development consist of a three storey residential building west of the property. The existing buildings located at 20 Mark Avenue are currently serviced from Mark Avenue. I have attached our fire flow demand requirement calculation and approximate location of service for your information.

1. Type of Development: Residential
2. Location of Service: New connection within Mark Avenue
3. Amount of Fire Flow Required: 8,000 L/min (FUS)
4. Average Daily Demand: 0.10 L/s
5. Maximum Daily Demand: 0.24 L/s
6. Maximum Hourly Demand: 0.53 L/s

Thank you,

Laure - Anne Larose, EIT

Engineering Intern
115 Walgreen Road, R.R. 3, Carp, ON K0A 1L0
T. 613.836.2184 (ext 2273) | **F.** 613.836.3742
l.larose@mcintoshperry.com | www.mcintoshperry.com

McINTOSH PERRY

Average Day

Label	Elevation (m)	Demand (L/min)	Hydraulic Grade (m)	Pressure (psi)
J-1	54.87	6.00	118.30	90.03

Peak Hourly

Label	Elevation (m)	Demand (L/min)	Hydraulic Grade (m)	Pressure (psi)
J-1	54.87	31.80	109.03	76.88

Max Day + Fire

Label	Is Fire Flow Run Balanced?	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (L/min)	Fire Flow (Available) (L/min)	Pressure (psi)	Elevation (m)	Demand (L/min)
H-4	True	True	8,000.00	19,049.28	72.00	54.28	0.00
J-1	False	False	8,000.00	(N/A)	71.13	54.87	14.40

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA
+1-203-755-1666

APPENDIX C: SANITARY SEWER CALCULATIONS

McINTOSH PERRY

1. BUILDING OCCUPANCY

The maximum number of bedroom units will be 12 units as per the floors plans and the attached unit break down from the Architect.

2. DAILY VOLUME IN LITRES

As per the extract of the City of Ottawa Sewer Design Guidelines, Appendix 4-A; Daily Sewage Flow for Dwellings;

- Each Dwelling unit of 1 bedrooms
    - 275 Liters/Dwelling/Day
- Each Dwelling unit of 2 bedrooms
    - 1100 Liters/Dwelling/Day

3. PEAK FLOW (Q/P)

- $Q_{2\text{-BED}}(p) = F_{2\text{-BED}} \times P_{2\text{-BED}}$ Where:

  $F_{1\text{-BED}}$ = 275 Litres/Dwelling/Day (as per City of Ottawa Sewer Design Guidelines)

  $P_{1\text{-BED}}$ = 2 Units (as per Site Plan)

- Therefore, $Q_{1\text{-BED}}(p) = (275) \times (2) =$ <u>550 L/Day (0.0064 L/sec)</u>
- $Q_{2\text{-BED}}(p) = F_{2\text{-BED}} \times P_{2\text{-BED}}$ Where:

  $F_{3\text{-BED}}$ = 1100 Litres/Dwelling/Day (as per City of Ottawa Sewer Design Guidelines)

  $P_{3\text{-BED}}$ = 10 Units (as per Site Plan)

- Therefore, $Q_{3\text{-BED}}(p) = (1{,}100) \times (10) =$ <u>11,000 L/Day (0.13 L/sec)</u>
- $Q_{TOTAL}(p) = Q_{1\text{-BED}} + Q_{2\text{-BED}}$ Where:

  $Q_{1\text{-BED}}$ = 550 L/Day

  $Q_{2\text{-BED}}$ = 11,000 L/Day

- Therefore, $Q_{TOTAL}(p) = (550) + (11{,}000) =$ **<u>11,550 L/Day (0.134 L/sec)</u>**

SANITARY SEWER DESIGN SHEET

PROJECT: 20 Mark Avenue
LOCATION: Ottawa
CLIENT: Anand Aggarwal

McINTOSH PERRY

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			FLOW	SEWER DATA								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	30	31
	AREA ID	FROM MH	TO MH	UNIT TYPES				AREA (ha)	POPULATION		PEAK FACTOR	PEAK FLOW (L/s)	AREA (ha)						PEAK FLOW (L/s)	AREA (ha)		FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	FLOW DEPTH (mm)	VELOCITY (actual) (m/s)	AVAILABLE CAPACITY	
				SF	SD	TH	APT		IND	CUM			INSTITUTIONAL		COMMERCIAL		INDUSTRIAL			IND	CUM										L/s	(%)
													IND	CUM	IND	CUM	IND	CUM													
	B3	BLDG	Ex. MAIN				12	0.02	27.6	27.6	4.00	0.45		0.00		0.00		0.00	0.00	0.02	0.02	0.01	0.45	7,374.51	13.26	1500	1.00	4.043	10.1	0.273	7374.06	99.99

Design Parameters:

Residential			ICI Areas			
SF	3.4	p/p/u				Peak Factor
TH/SD	2.7	p/p/u	INST	50,000	L/Ha/day	1.5
APT	2.3	p/p/u	COM	50,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
Harmon Formula = 1+(14/(4+P^0.5))
where P = population in thousands

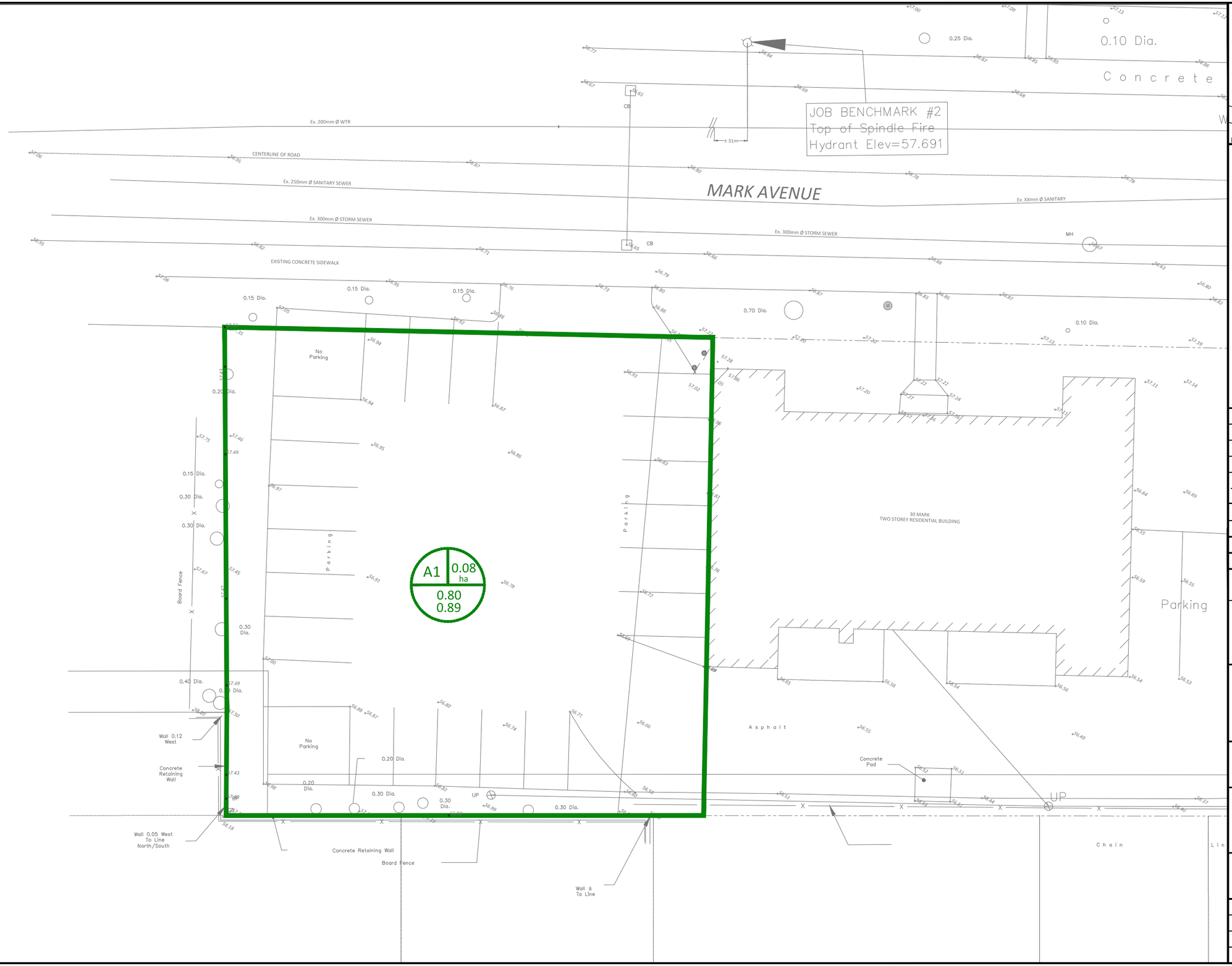
Designed: LAL
Checked: RPK
Project No.: CP-18-0171

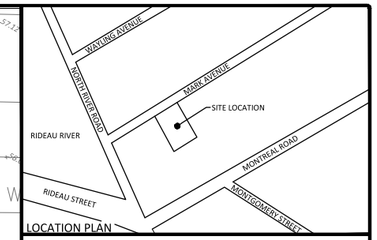
No.	Revision	Date
1.	ISSUED FOR REVIEW	2018-06-06

Date: 2018-05-30
Sheet No: 1 of 1

APPENDIX D: PRE-DEVELOPMENT DRAINAGE PLAN

McINTOSH PERRY





LOCATION PLAN

AREA
A1
0.08 ha
AREA SIZE (HECTARES)
0.80
5-YR RUNOFF COEFFICIENT
0.89
100-YR RUNOFF COEFFICIENT

FOR REVIEW ONLY
NOT FOR CONSTRUCTION

No.	Revision/Issue	Date
2	ISSUED FOR REVIEW	NOV 29/18
1	ISSUED FOR REVIEW	JUN 06/18

Check and verify all dimensions before proceeding with the work
Do not scale drawings

SCALE 1 : 100
0 2 4 6 8 10 Metres

McINTOSH PERRY
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Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

N

Stamp:

Client:
Manor Park Management
231 BRITTANY, SUITE D
OTTAWA, ON
K1L 0R8

Project:
20 MARK STREET
THREE STOREY RESIDENTIAL BUILDING
VANIER ON

Drawing Title:
PRE-DEVELOPMENT DRAINAGE AREA

Scale: 1:100	Project Number: CP-18-0171
Drawn by: L.A.L.	
Checked By: R.P.K.	Drawing Number: PRE
Designed By: L.A.L.	

FILENAME: H:\01 Project - Proposals\2018 Jobs\CP\CP-18-0171 Anand Aggarwal_Mark Manor_20 Mark Avenue\15 - Drawings\CP-18-0171-PRESENTATION.dwg
LAST SAVED: Wednesday, November 28, 2018 LAST SAVED BY: s.walton
LAST PLOTTED: Wednesday, November 28, 2018 LAST PLOTTED BY: s.walton

APPENDIX E: POST-DEVELOPMENT DRAINAGE PLAN

McINTOSH PERRY

JOB BENCHMARK #2
Top of Spindle Fire
Hydrant Elev=57.691

MARK AVENUE

Ex. 200mm Ø WTR
CENTERLINE OF ROAD
Ex. 250mm Ø SANITARY SEWER
Ex. 300mm Ø STORM SEWER
Ex. XXmm Ø SANITARY
EXISTING CONCRETE SIDEWALK
CB
MH
0.10 Dia.
Concrete
WV

MH 1A
T/G 57.01
INV=VB

CB1
T/G 56.88

MH 1
T/G 57.20

B1 | 0.03 ha | 0.90 | 1.00
B2 | 0.02 ha | 0.23 | 0.28
B3 | 0.02 ha | 0.52 | 0.59
B4 | 0.01 ha | 0.59 | 0.66

PROPOSED 3-STOREY BUILDING
305m²
U.S.F. = 55.02
F.F. = 57.46
RD

30 MARK
TWO STOREY RESIDENTIAL BUILDING

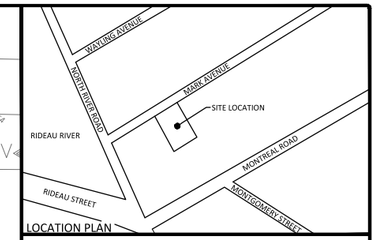
ECB1
T/G 56.95

LIMIT OF DEVELOPMENT AREA

Concrete Pad

Board Fence
Chain Link
Wall ± To Line

0.15 Dia.
0.20 Dia.
0.30 Dia.
0.40 Dia.
0.70 Dia.
UP



LOCATION PLAN

AREA
B1 | 0.03 ha (AREA SIZE (HECTARES))
0.90 — 5-YR RUNOFF COEFFICIENT
1.00 — 100-YR RUNOFF COEFFICIENT

FOR REVIEW ONLY
NOT FOR CONSTRUCTION

No.	Revision/Issue	Date
2	ISSUED FOR REVIEW	NOV 29/18
1	ISSUED FOR REVIEW	JUN 06/18

Check and verify all dimensions before proceeding with the work
Do not scale drawings

SCALE 1 : 100
0 2 4 6 8 10 Metres

McINTOSH PERRY
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N

Stamp:

Client:
Manor Park Management
231 BRITTANY, SUITE D
OTTAWA, ON
K1L 0R8

Project:
20 MARK STREET
THREE STOREY RESIDENTIAL BUILDING
VANIER ON

Drawing Title:
POST-DEVELOPMENT DRAINAGE AREAS

Scale: 1:100	Project Number: CP-18-0171
Drawn by: L.A.L.	
Checked By: R.P.K.	Drawing Number: POST
Designed By: L.A.L.	

FILENAME: H:\01 Project - Proposals\2018 Jobs\CP\CP-18-0171 Anand Aggarwal_Mark Manor_20 Mark Avenue\15 - Drawings\CP-18-0171-PRESENTATION.dwg
LAST SAVED: Wednesday, November 28, 2018 LAST SAVED BY: s.wilson
LAST PLOTTED: Wednesday, November 28, 2018 1:09:33 (PDT)

APPENDIX F: STORMWATER MANAGEMENT CALCULATIONS

McINTOSH PERRY

CP-18-0171 - 20 Mark Avenue - Runoff Calculations

Pre-Development Runoff Coefficient

Area	Drainage Area (ha)	Roof/Asphalt/ Concrete (m^2)	C	Gravel (m^2)	C	Treed/Grass Area (m^2)	C	Average C (5-year)	Average C (100-year)
A1	0.08	685	0.90	0	0.60	118	0.20	0.80	0.89

Pre-Development Runoff Calculations

					I (mm/hr)		Q (L/s)	
Area	Drainage Area (ha)	C (5-Yr)	C (100-Yr)	Tc (min)	5-Year	100-Year	5-Year	100-Year
A1	0.08	0.50	0.63	10	104.2	178.6	11.63	24.92
Total	**0.08**						**11.63**	**24.92**

Post-Development Runoff Coefficient

Area	Drainage Area (ha)	Roof/Asphalt/ Concrete (m^2)	C	Gravel (m^2)	C	Treed/Grass Area (m^2)	C	Average C (5-year)	Average C (100-year)
B1	0.03	309.2	0.90	0	0.60	0.0	0.20	0.90	1.00
B2	0.02	6.7	0.90	0	0.60	144.5	0.20	0.23	0.28
B3	0.02	103.0	0.90	0	0.60	123.6	0.20	0.52	0.59
B4	0.01	71.3	0.90	0	0.60	58.0	0.20	0.59	0.66

Post-Development Runoff Calculations

					I (mm/hr)		Q (L/s)	
Drainage Area ID	Total Area (ha)	C (5-Yr)	C (100-Yr)	Tc	5-Year	100-Year	5-Year	100-Year
B1	0.03	0.90	1.00	10	104.2	178.6	8.06	15.35
B2	0.02	0.23	0.28	10	104.2	178.6	1.01	2.13
B3	0.02	0.52	0.59	10	104.2	178.6	3.40	6.65
B4	0.01	0.59	0.66	10	104.2	178.6	2.19	4.26
Total	**0.08**						**14.67**	**28.38**

Post-Development Restricted Runoff Calculations

	Post-Development Unrestricted (L/S)		Post-Development Restricted (L/S)		
Drainage Area ID	5-year	100-Year	5-Year	100-Year	Restricted/ Unrestricted
B1	8.06	15.35	0.42	0.78	Restricted
B2	1.01	2.13	1.01	2.13	Unrestricted
B3	3.40	6.65	3.40	6.65	
B4	2.19	4.26	2.19	4.26	
Total	**9.07**	**17.47**	**7.03**	**13.81**	

CP-18-0171 - 20 Mark Avenue - Runoff Calculations

Storage Requirements for Area B1

5-Year Storm Event

Tc (min)	I (mm/hr)	Runoff (L/s) B1	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
80	26.6	2.05	0.42	1.63	7.8
85	25.4	1.96	0.42	1.54	7.9
90	24.3	1.88	0.42	1.46	7.9
95	23.3	1.80	0.42	1.38	7.9
100	22.4	1.73	0.42	1.31	7.9
105	21.6	1.67	0.42	1.25	7.9
110	20.8	1.61	0.42	1.19	7.9

Maximum Storage Required 5-year =	7.9	m^3

100-Year Storm Event

Tc (min)	I (mm/hr)	Runoff (L/s) B1	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
70	49.8	4.28	0.78	3.50	14.7
75	47.3	4.06	0.78	3.28	14.8
80	45.0	3.87	0.78	3.09	14.8
85	43.0	3.69	0.78	2.91	14.9
90	41.1	3.53	0.78	2.75	14.9
95	39.4	3.39	0.78	2.61	14.9
100	37.9	3.26	0.78	2.48	14.9
105	36.5	3.14	0.78	2.36	14.9
110	35.2	3.03	0.78	2.25	14.8
115	34.0	2.92	0.78	2.14	14.8

Maximum Storage Required 100-year =	14.9	m^3

Storage Occupied In Area B1

5-Year Storm Event

Roof Storage			
Location	*Area (m^2)	Depth (m)	Volume (m^3)
Roof Drain	231.90	0.035	8.1
		Total	**8.1**

Storage Available (m^3) =	8.1
Storage Required (m^3) =	7.9

100-Year Storm Event

Roof Storage			
Location	*Area (m^2)	Depth (m)	Volume (m^3)
Roof Drain	231.90	0.065	15.1
		Total	**15.1**

Storage Available (m^3) =	15.1
Storage Required (m^3) =	14.9

*Area is calcualted using 75% of the total roof area

Roof Drain Flow For Flat Roof (B1)

Flow Rate Vs. Build-Up (One Weir)	
Metric	
Depth (mm)	Flow (L/s)
15	0.18
20	0.24
25	0.30
30	0.36
35	0.42
40	0.48
45	0.54
50	0.60
55	0.66

*Roof Drain model to be Accutrol Weirs, See attached sheets

*Roof Drain Flow information taken from Watts Drainage website

Roof Drain Flow		
Flow (l/s)	Storage Depth (mm)	1 Roof Drains Flow (l/s)
0.18	15	0.18
0.24	20	0.24
0.30	25	0.30
0.36	30	0.36
0.42	**35**	0.42
0.48	40	0.48
0.54	45	0.54
0.60	50	0.60
0.66	55	0.66
0.72	60	0.72
0.78	**65**	**0.78**
0.84	70	0.84
0.90	75	0.90
0.96	80	0.96
1.02	85	1.02
1.08	90	1.08
1.14	95	1.14
1.20	100	1.20
1.26	105	1.26
1.32	110	1.32
1.38	115	1.38
1.44	120	1.44
1.50	125	1.50
1.56	130	1.56
1.62	135	1.62
1.68	140	1.68
1.74	145	1.74
1.80	150	1.80

Note: The flow leaving through a restricted roof drain is based on flow vs. head information

STORM SEWER DESIGN SHEET

PROJECT: Proposed Apartment Building
LOCATION: 20 Mark Avenue
CLIENT: Manor Park Management

McINTOSH PERRY

LOCATION				CONTRIBUTING AREA (ha)							RATIONAL DESIGN FLOW											SEWER DATA									
1	2	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
STREET	AREA ID	FROM MH	TO MH	C-VALUE		AREA			INDIV AC	CUMUL AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
	B2	ECB1	CB1	0.23		0.02			0.00	0.00	10.00	0.34	10.34	104.19	122.14	178.56	1.01				1.01	43.87	17.44	250			0.50	0.866	42.86	97.69%
		CB1	MH1						0.00	0.00	10.34	0.31	10.64	102.45	120.09	175.55	0.99				0.99	24.19	13.78	200			0.50	0.746	23.20	95.89%
	B3	MH1	Ex. MAIN	0.03		0.90			0.03	0.03	10.64	0.22	10.87	100.91	118.28	172.88	8.79				8.79	24.19	10.06	200			0.50	0.746	15.41	63.68%

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: L.A.L

Checked: R.P.K

Project No.: CP-18-0171

No.	Revision	Date
1.		

Date: 2018-04-30

Sheet No: 1 of 1