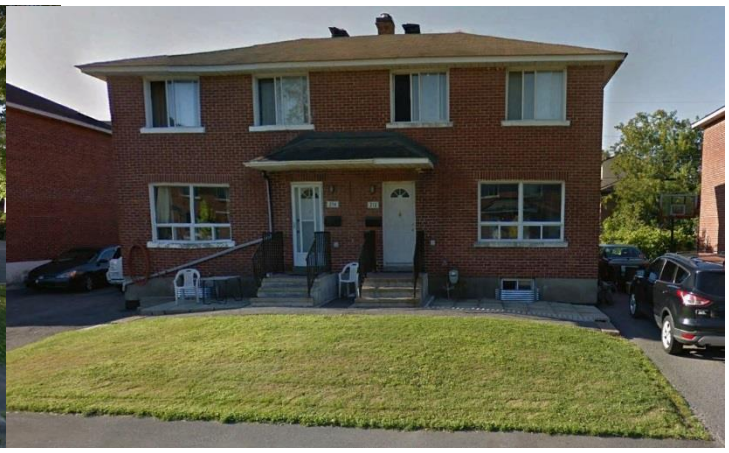
SERVICING AND STORMWATER MANAGEMENT REPORT



Project No.: CP-17-0395 – 208-214 Prince Albert Street

Prepared for:

Atelier 292 Architect Inc.
292 Main Street
Ottawa, Ontario
K1S 1E1

February 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) requires 80% of total suspended solids (TSS) be retained before outletting into a watercourse. Given the existing combined sewer, no protection will be required as the it is expected to be handled by the City's treatment system. Catch basins and maintenance manholes located on site will have a sump of 0.6m as per OPSD 705.010 to promote further sedimentation of suspended solids.

Evaluation of the proposed site in addition to a review of the site grading and soil characteristics was completed. Our review identified that the swale storage is the optimal design solution to meet the SWM requirements. The swale storage will contain stormwater runoff from the rear asphalt areas, roof and grass areas until the storm event subsides and flows reduce. This is achieved through the use of a restriction device placed within catch basin one located in the parking area at the rear of the site. The restricted runoff will drain to the existing infrastructure. These design elements will ensure that the water quality and quantity concerns are addressed at all stages of development.

The evaluation of the proposed development, existing site characteristics and surrounding municipal infrastructure suggests that the SWM design elements consisting of an inlet control device with consequential ponding will be sufficient solution to the site constraints. The proposed sanitary 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 208-214 Prince Albert Street is able to be developed and fully serviced for the proposed multi-unit residential building.

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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 associated with the proposed development located at 208-214 Prince Albert Street within the City of Ottawa.

1.2 Site Description

The property located at 208-214 Prince Albert Street (see Figure 1 for geographical reference). It is described as Plan 342, Lot 884-888-part and part Lot 889, City of Ottawa, Ontario. The land in question covers approximately 0.12 ha and is located west of the intersection of Lola Street and Prince Albert Street.

The existing site is currently developed with two residential dwellings. The dwellings are two storeys and contain two three-bedroom apartments each. The development consists of a two-storey with 50% sunken basement addition to each dwelling. The site is currently serviced with sanitary, storm and water services from infrastructure within Prince Albert Street. The existing services will be maintained through the development.

The proposed development consists of two 83 m² two storey additions. The existing driveway at 210-212 will be removed and repaved and the other driveways will remain. All accesses for the development will be provided from Prince Albert Street.

For the purpose of this report, the west building will be referred to as Building 1 and the east building will be referred to as Building 2.

Figure 1: Key Map: 208-214 Prince Albert Street, Ottawa

2.0 BACKGROUND STUDIES

Background studies that have been completed for the site include review of the City of Ottawa as-built drawings, a topographical survey of the site, a geotechnical report and a Phase I 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 Farley, Smith & Denis Surveying Ltd. dated April 3rd, 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 McIntosh Perry dated January, 2018.
- Phase I ESA completed by McIntosh Perry dated December 11th, 2017.

3.0 PRE-CONSULTATION SUMMARY

City of Ottawa Staff have been pre-consulted regarding this proposed development by e-mail on January 11th, 2018. Specific design parameters to be incorporated within this design include the following:

- Pre-development and post-development flows shall both be calculated using a time of concentration (Tc) of 10 minutes.
- Control 2 through 100-year post-development flows to the 2-year pre-development flows with a combined C value to a maximum of 0.50.

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

4.0 EXISTING SERVICES

This section provides a detailed account of the existing infrastructure within Prince Albert Street. Due to the location and orientation of the property, no other infrastructure is discussed.

There is an existing 225 mm diameter concrete combined sewer within Prince Albert Street. A 152 mm diameter watermain, within the northern lane of Prince Albert Street, services the surrounding area. A fire hydrant is located in the northern boulevard directly across from the site location.

The gas service is supplied by a 50 mm diameter main located within the northern boulevard of Prince Albert Street. Overhead hydro, Bell and Rogers are accessible from the back of the lot where a utility pole is located.

5.0 SERVICING PLAN

5.1 Proposed Servicing Overview

The overall servicing will be provided via service connections to the existing mains along Prince Albert Street. The water servicing will be extended from the 152mm diameter watermain and similarly the sanitary and storm services will extend from the 225mm diameter combined sewer. Details pertaining to the final proposed servicing locations have been reviewed and are shown on the proposed Site Servicing Plan included within the drawing package submission.

5.2 Proposed Water Design

A new 50 mm diameter copper water lateral will be connected to the existing 152 mm PVC watermain within Prince Albert Street, complete with a water valve located at the property line.

The proposed additions will not be equipped with sprinkler systems. The required fire protection derived from the Ontario Building Code (OBC) is 2,700 L/min, for each separate building, with a total of 5,400L/min for the combined site. (See Appendix 'B' for calculation).

The required fire protection from the Fire Underwriters Survey (FUS) is 11,000 L/min (provided for information purposes only.)

The water demands for each individual building including the addition have been calculated as per the Ottawa Design Guidelines – Water Distribution and are as follows: the average and maximum daily demands are 0.05 L/s and 0.13 L/s respectively. The maximum hourly demand was calculated as 0.29 L/s (Refer to Appendix 'B' for flow details). Boundary conditions have been requested, however were not available for the submission of this report.

5.3 Proposed Sanitary Design

A new 135 mm diameter gravity sanitary service will be connected to the existing 225 mm diameter combined sewer within Prince Albert Street. The sanitary service will be complete with two maintenance holes (MH1B/MH2B) including one just inside the property line as per the Ottawa Sewer Design Guidelines (SDG) SD002, October 2012, City of Ottawa, Clause 4.4.4.7 and City of Ottawa Sewer-Use By-Law 2003-514 (14).

The peak design flow for the proposed site was determined to be 0.75 L/s, therefore the proposed 135 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 Prince Albert Street as the amount of flow leaving the site is minimal.

5.4 Proposed Strom Design (Conveyance and Management)

Stormwater runoff will be conveyed by way of overland sheet flow from the south of the site to the north. Due to the configuration of the site, runoff from south portion of the site as will be directed through proposed

swales, running along the back-property line, and be capture trough a series of landscape catch basins. The runoff will then flow to a catch basin manhole where it will be restricted before outletting to the existing combined sewer within Prince Albert Street. The restriction will cause some ponding in the proposed swales. The site will be constructed with adequate grading to ensure that all areas on the site are able to reach a suitable outlet and to ensure that the post-development restrictions are achieved. Please see the Site Grading and Drainage Plans for detailed locations of the proposed stormwater infrastructure. The direction and location of overland sheet flow has also been indicated. The stormwater management design will be further detailed in Section 6.0.

5.5 Site Utilities

All relevant utility companies (telephone - Bell, gas – Enbridge and hydro – Hydro Ottawa) will be contacted prior to construction in order to confirm adequate utility servicing for the site. Existing utilities are present along Prince Albert Street and Lilas Private. The existing site connections are anticipated to be fed from the existing utilities (utility pole) at the back of the property and gas main within Prince Albert Street.

5.6 Service Locations

The proposed sanitary and water services will be placed under the parking lot between the two buildings and laneway as is typical in an urban development. Hydro and telephone will be primarily above ground connecting to existing infrastructure at the back of the properties. A gas line is anticipated to be extended between the two buildings and connected to existing main within Prince Albert Street. It is anticipated that the hydro, water and gas meter will be located on the east side of Building 1 and on the west of Building 2.

All minimum cover requirements are as per City of Ottawa Standards. Separation distances between the storm, water and sanitary services will be maintained as per the Ministry of the Environment 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 landscape catch basins (ECB's and TCB's) and catch basin manholes (CBMH's) located throughout the site. The restricted stormwater runoff will be directed to the existing combined sewer within Prince Albert Street; similarly, overland flow will be directed towards Prince Albert Street. The quantitative and qualitative properties of the storm runoff for both the pre- and post-development flows are further detailed below.

Stormwater Best Management Practices (SWM BMP's) will be implemented at the "Lot level", "Conveyance" and "End of Pipe" locations. These concepts will be explained further in Section 6.3. To summarize, roof water will be directed to grass surfaces which in turn, will be collected into proposed stormwater management swales

and further restricted. Through pre-consultation with the RVCA, it was also agreed that the City's treatment system would be sufficient to handle quality control and that no protection will be required.

6.2 Runoff Calculations

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

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

Where C = Runoff coefficient

I = Rainfall intensity in mm/hr (City of Kingston 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.

The following coefficients were used to develop an average C for each area:

Table 1: Average Runoff Coefficients (C)

Surface	Avg. C
Roofs/Concrete/Asphalt	0.90
Undeveloped and Grass	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.

As per the pre-consultation meeting with the City of Ottawa the time of concentration (Tc) used for pre-development and post-development flows shall 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 front half of the site being conveyed by curb and gutter and captured by two existing catch basins located north of Building 1, within Prince Albert Street. The remainder of the site runoff flows towards the back of the property and onto a private infrastructure (Lilas Private). There is currently no known flow restriction on site. The existing drainage area is demonstrated as Area A1 on the drawing CP-17-0395 PRE (Appendix 'D').

Table 2: Pre-Development Runoff Summary

Area	Drainage Area (ha)	Balanced Runoff Coefficient (C) 2-yr	Balanced Runoff Coefficient (C) 5-yr	Balanced Runoff Coefficient (C) 100-yr	2-Year Flow Rate (L/s)	5-Year Flow Rate (L/s)	100-Year Flow Rate (L/s)
A1	0.12	0.51	0.51	0.58	13.2	17.9	34.9
Total	**0.12**				**13.2**	**17.9**	**34.9**

(See Appendix 'F' for Calculations)

6.2.2 Post-Development Drainage

The post-development drainage scheme for the proposed development consists of four regions describing tributary areas for runoff to be captured and restricted and/or to be left unrestricted. Drawing CP-17-0395 POST (Appendix 'E') indicates the limits of the drainage areas B1 through B4.

Table 3: Post-Development Runoff Summary

Area	Drainage Area (ha)	Balanced Runoff Coefficient (C) 2-yr	Balanced Runoff Coefficient (C) 5-yr	Balanced Runoff Coefficient (C) 100-yr	2-Year Flow Rate (L/s)	5-Year Flow Rate (L/s)	100-Year Flow Rate (L/s)
B1	0.05	0.32	0.32	0.38	3.4	4.6	9.4
B2	0.02	0.90	0.90	1.00	3.6	4.9	9.3
B3	0.02	0.90	0.90	1.00	3.6	4.9	9.3
B4	0.03	0.64	0.64	0.72	4.6	6.3	12.1
Total	**0.12**				**15.3**	**20.7**	**40.2**

(See Appendix 'F' for Calculations)

Runoff from areas B1 through B3 will be captured by landscape catch basins and further restricted within CBMH1 before outletting to the existing storm system within Prince Albert Street. The total flow leaving the site will be controlled by inlet control device located within CBMH1. The restriction devices will account for the unrestricted flow leaving the site. See Appendix 'F' for calculations. This restriction and quality runoff control will be further detailed in Sections 6.3 and 6.4.

6.3 Quantity Control

After discussing the stormwater management criteria for the site with City staff, the total post-development runoff for this site has been restricted to match the 2-year pre-development flow rates with a combined C value

of 0.5. (See Appendix 'A' for pre-consultation notes). These values create the following allowable release rates and storage volumes for the development site.

Table 4: Allowable Release Rates

Area	Drainage Area (ha)	Balanced Runoff Coefficient (C) 2-yr	2-Year Flow Rate (L/s)
A1	0.12	0.50	**13.0**

(See Appendix 'F' for Calculations)

Reducing site flows will be achieved using an inlet control device, and will create the need for on-site storage. Runoff flows from areas B1 through B3 will be restricted as detailed in the table below.

Table 5: Post-Development Restricted Runoff Calculations

Area	Post-Development Unrestricted (L/s)			Post-Development (Restricted) (L/s)			
	2-yr	5-yr	100-yr	2-yr	5-yr	100-yr	
B1	3.4	4.6	9.4	6.0	6.0	6.0	*RESTRICTED*
B2	3.6	4.9	9.3				
B3	3.6	4.9	9.3				
B4	4.6	6.3	12.1	4.6	6.3	12.1	*UNRESTRICTED*
Total	**3.4**	**4.6**	**9.4**	**10.6**	**12.3**	**18.1**	

(See Appendix 'F' for Calculations)

Runoff from Areas B1 through B4 will be restricted at CBMH1 through a Hydrovex 75VHV-1 orifice plug (Design Head of 1.41). This orifice plug will restrict areas B1 through B4 to 6.0 L/s for the 2, 5 and 100-year storm events. The restriction creates a water surface elevation (WSEL) of 61.56 m for the 2-year storm, 61.59 m for the 5-year storm event and 61.66 m for the 100-year storm event. The storage for this area will be provided in the rear swales above structure ECB 1 and 2 as well as TCB 1. Table 5 details the required and provided storage volumes for the development.

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 storm water runoff will be conveyed towards the north driveways, on each side of the buildings, and into Prince Albert Street. An elevation difference of 0.3m minimum has been provided from the finished floor to the overland flow route elevation (61.72).

The following table summarizes the storage requirements during the 2, 5 and 100-year storm events to meet the required storage volumes.

Table 6: Storage Summary

Area	2-year required storage (m^3)	2-year available storage (m^3)	5-year required storage (m^3)	5-year available storage (m^3)	100-year required storage (m^3)	100-year available storage (m^3)
B1	2.8	3	35	5.6	15.4	16.3

(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 site will be serviced by the existing combined sewer within Prince Albert street thus no protection will be required, it is expected to be handled by the City's treatment system. 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

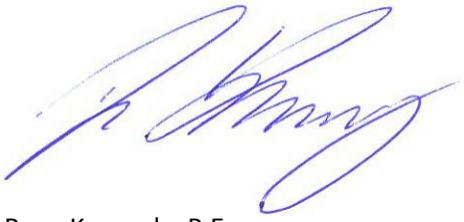
- Two new 83 m^2 additions will be constructed on the existing dwellings located at 208-214 Prince Albert Street.
- A new 135 mm diameter sanitary service will be installed and connected to the existing 225 mm diameter combined sewer within Prince Albert Street.
- A new 50 mm diameter water lateral will be extended from the existing 152 mm diameter main within Prince Albert Street.
- A new storm network will be installed onsite and will connect to the existing 225 mm combined sewer within Prince Albert Street.
- As discussed with the City of Ottawa staff, the stormwater management design will ensure that the post-development flow rates are restricted to the 2-year pre-development flow rate calculated with a C value of 0.5.
- Storage for the 2, through 100-year storm events will be provided within the rear yard above the proposed storm structures.
- As 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, we recommend that City of Ottawa approve this Servicing and Stormwater Management Report in support of the proposed development located at 208-214 Prince Albert Street.

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

10.0 STATEMENT OF LIMITATIONS

This report was produced for the exclusive use of Atelier 292 Architect Inc. 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: Curtis Melanson
Sent: January-31-18 9:52 AM
To: Laure-Anne Larose
Cc: Ryan Kennedy
Subject: FW: 208-214 Prince Albert

Curtis Melanson, C.E.T.

Practice Area Lead, Land Development
T. 613.836.2184 (ext 2240) | **F.** 613.836.3742 | **C.** 613.857.0784

From: Wu, John [mailto:John.Wu@ottawa.ca]
Sent: Wednesday, January 31, 2018 9:48 AM
To: Curtis Melanson <c.melanson@mcintoshperry.com>
Subject: RE: 208-214 Prince Albert

That means typical, but you can use smaller one. I have no issue that you can't meet the 1 L/S, but try your best.

From: Curtis Melanson [mailto:c.melanson@mcintoshperry.com]
Sent: Wednesday, January 31, 2018 9:41 AM
To: Wu, John <John.Wu@ottawa.ca>
Subject: RE: 208-214 Prince Albert

Hi John,
This is in the new City of Ottawa Standard Drawings, see note #1 on the attached.

Let me know your thoughts.

Thanks,

Curtis Melanson, C.E.T.

Practice Area Lead, Land Development
115 Walgreen Road, R.R. 3, Carp, ON K0A 1L0
T. 613.836.2184 (ext 2240) | **F.** 613.836.3742 | **C.** 613.857.0784
c.melanson@mcintoshperry.com | www.mcintoshperry.com

From: Wu, John [mailto:John.Wu@ottawa.ca]
Sent: Wednesday, January 31, 2018 9:35 AM
To: Curtis Melanson <c.melanson@mcintoshperry.com>
Subject: RE: 208-214 Prince Albert

How you get 6.0L/s minimum? You can go smaller using hydrovex type?

From: Curtis Melanson [mailto:c.melanson@mcintoshperry.com]
Sent: Wednesday, January 31, 2018 8:59 AM
To: Wu, John <John.Wu@ottawa.ca>
Subject: 208-214 Prince Albert

Hi John,

I have attached our current storm water calculations and a post-development drainage area plan for your preliminary review and discussion. As previously discussed, we are to match the 100-yer post development flows (40.2L/s) to the 2-year pre-development flows (13.2L/s) and retain all flows up to and including the 100 year on site. We will be designing the site to capture the backyard (Drainage Area B1) as well as the existing and proposed roofs (B2-B3). The area highlighted in yellow in the storage calcs is the existing area at the front of the site that the client would like to keep as is for cost savings (Drainage Area B4).

By leaving this area unrestricted we have a flow of 12.1L/s leaving the site during the 100-yr storm, therefore forcing us to restrict the remainder of the site to 1.0 L/s. As per the City guidelines/standards, we will go with the minimum restriction of 6.0 L/s which would have our site discharge a total of 18.1 L/s during the 100 year storm event which is above the 2 year pre development storm flow of 13 L/s. Please note that we will have reduced the 100 year flow from the site by almost half.

Can you please review and call me to discuss?

Thanks,

Curtis Melanson, C.E.T.

Practice Area Lead, Land Development
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McINTOSH PERRY

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APPENDIX B:
EXISTING WATERMAIN FLOW AND FIRE PROTECTION CALCULATIONS

McINTOSH PERRY

CP-17-0395 - 208-214 Prince Albert Street

Project:	208-214 Prince Albert Street
Project No.:	CP-17-0395
Designed By:	S.V.L.
Checked By:	R.P.K
Date:	February 20, 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 noncombustable construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2, including loadbearging walls, columns and arches.

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	**475**	(Total building volume in m³.)
Stot	**2.0**	(From figure 1 pg A-32)
Q =	**17,100.00 L**	

From Figure 1 (A-32)

Snorth	13.7	m	0.0
Seast	3	m	0.5
Ssouth	9.6	m	0.0
Swest	4.8	m	0.5

*approximate distances

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

2700 L/min (if Q >270,000 L)
713 gpm

209-214 Prince Albert Street - Fire Underwriters Survey (FUS) Fire Calculations

Project:	208-214 Prince Albert Street
Project No.:	CP-17-0395
Designed By:	S.V.L.
Checked By:	R.P.K.
Date:	February 20, 2018

1. From the Fire Underwriters Survey (1999)

From Part II – 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.

2. Determine Ground Floor Area

As provided by the Architect:

Floor Area (One Floor)	=	190.00	m²
Total Floor Area	**=**	**380.00**	**m²**

** for one building only

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

3. Calculate Required Fire Flow

F = 220 x C x √A

C = 1.50
A = 380.00
F = 220.00 X 1.50 X √ 380.00
F = 6,432.88 L/min.

4. Determine Height in Storeys

From Architectural Drawings:

Number of Storeys = 2.00

5. Determine Increase or Decrease Based on Occupancy

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

Low Hazard - Residential Dwelling
No Change

F = 6,432.88 L/min.

6. 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 entire building will be installed with a fully automated, standardized with the City of Ottawa Fire Department and fully supervised.
- Therefore 6,432.88 L/min to remain uchanged due to no sprinkler system in building

F = 6,432.88 L/min.

7. Determine the Total Increase for Exposures

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

- Exposure distances to the north & south of the proposed building is approximately 13.7m & 9.57m respectfully.
- Exposure distance to the west & east of the proposed building is approximately 4.8m & 3.0m respectfully.
- Therefore the charge for exposure is 75% of the value obtained in Step 5.
- 6,432.88 L/min + (6,432.88 L/min x 75%)

F = 11,257.55 L/min.

Therefore, after rounding to the nearest 1,000 L/min, the total required fire flow for the development is 11,000 L/min (291 GPM).

208-214 PRINCE ALBERT STREET - Water Demands

Project:	204-218 PRINCE ALBERT STREET
Project No.:	CP-17-0395
Designed By:	S.V.L.
Checked By:	R.P.K.
Date:	February 20, 2018
Site Area:	0.12 gross ha
Population:	1 bachelor, 1 2-bedroom, 2 3-bedroom, 1 4-bedroom
	(1 x 1.4 persons per unit) + (1 x 2.1) + (2 x 3.1) + (1 x 3.4)=
	13.00 persons

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/(1000m^2 /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	**0.053**	**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	**0.132**	**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	**0.290**	**L/s**

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

APPENDIX C:
SANITARY SEWER CALCULATIONS

McINTOSH PERRY

SANITARY SEWER DESIGN SHEET

PROJECT: CP-17-0395
LOCATION: City of Ottawa
CLIENT: Atelier 292 Architect

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
STREET	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	(ha)	IND	CUM			INSTITUTIONAL		COMMERCIAL		INDUSTRIAL			IND	CUM										L/s	(%)
													IND	CUM	IND	CUM	IND	CUM													
	B1	BLDG 1	MH2B				5	0.05	11.5	11.5	4.00	0.19								0.05	0.05	0.01	0.20	16.97	1.17	135	2.00	1.148	11.1	0.391	16.76	98.82
	B1	BLDG 2	MH2B				5	0.05	11.5	11.5	4.00	0.19								0.05	0.10	0.03	0.21	16.97	4.74	135	2.00	1.148	11.5	0.399	16.75	98.74
	B4	MH2B	MH1B				5	0.03	11.5	34.5	4.00	0.56								0.03	0.13	0.04	0.60	16.97	16.45	135	2.00	1.148	18.5	0.544	16.37	96.49
	B4	MH1B	Ex. COMBINED SEWER				5	0.03	11.5	46.0	4.00	0.75								0.03	0.16	0.04	0.79	16.97	8.27	135	2.00	1.148	21.1	0.593	16.18	95.34

Design Parameters:

Residential

SF	3.4	p/p/u
TH/SD	2.7	p/p/u
APT	2.3	p/p/u
Other	60	p/p/Ha

ICI Areas

			Peak Factor
INST	50,000	L/Ha/day	1.5
COM	50,000	L/Ha/day	1.5
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: SVL

Checked: RPK

Project No.: CP-17-0395

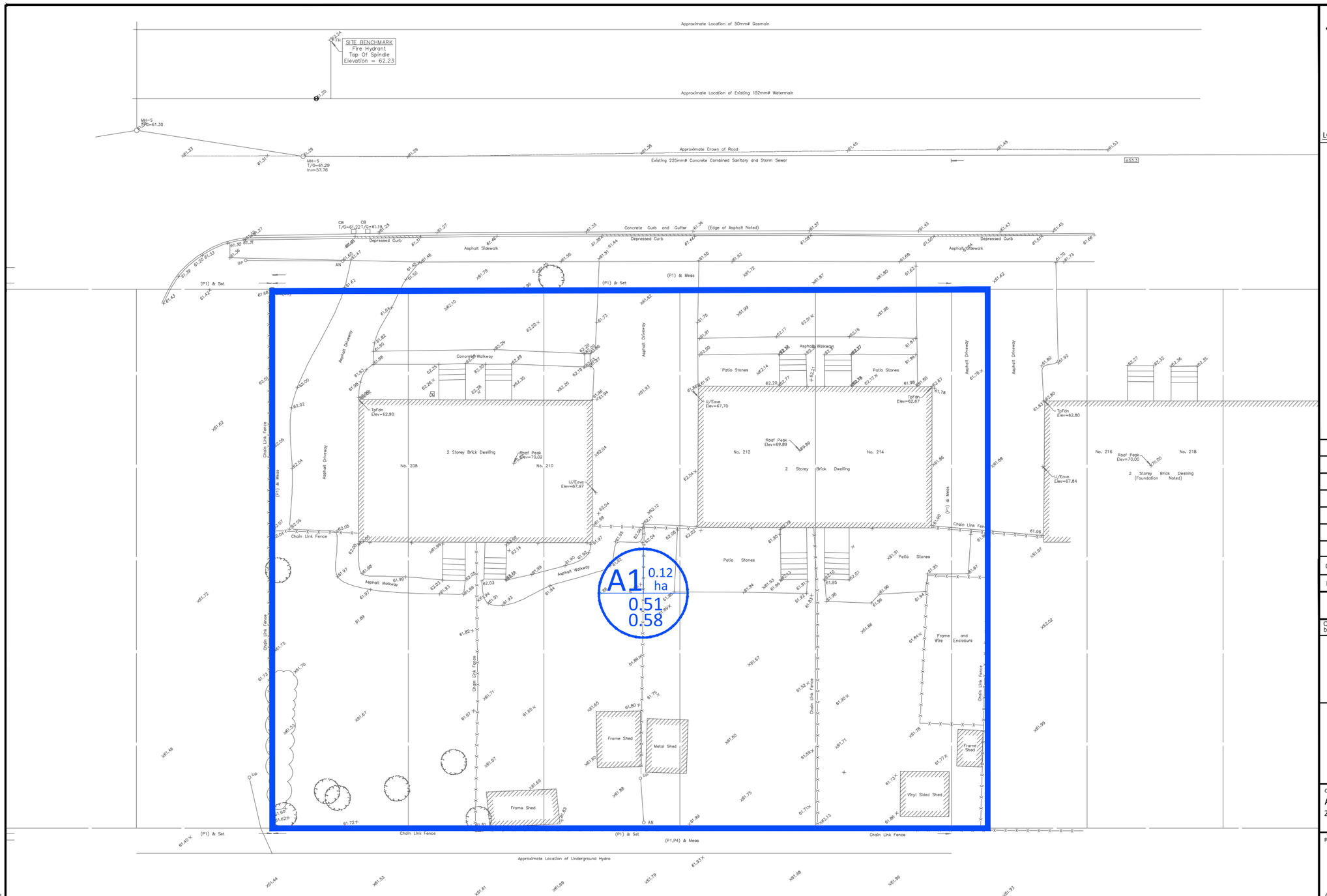
No.	Revision	Date
1.		

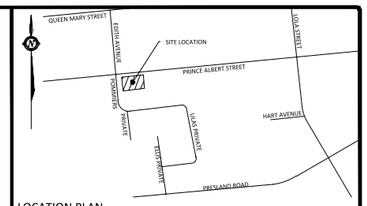
Date: 07/11/2017

Sheet No: 1 of 1

APPENDIX D:
PRE-DEVELOPMENT DRAINAGE PLAN

McINTOSH PERRY





LOCATION PLAN

AREA

B1 0.05 ha — AREA SIZE (HECTARES)

0.32 — 2-YR RUNOFF COEFFICIANT

0.38 — 100-YR RUNOFF COEFFICIANT

FOR REVIEW ONLY
NOT FOR CONSTRUCTION

No.	Revision/Issue	Date
01		

SCALE 1 : 100

0 2 4 6 8 10 Metres

Check and verify all dimensions before proceeding with the work

Do not scale drawings

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A 1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

Stamp:

Client:
ATELIER 292 ARCHITECT INC.
292 MAIN STREET, OTTAWA, ON K1S 1E1

Project:
208-214 PRINCE ALBERT STREET
ADDITION TO APARTMENT BUILDINGS
OTTAWA ONTARIO

Drawing Title:
PRE-DEVELOPMENT DRAINAGE AREA

Scale:	1:100
Drawn by:	LAL
Checked By:	RPK
Designed By:	LAL

Project Number: CP-17-0395

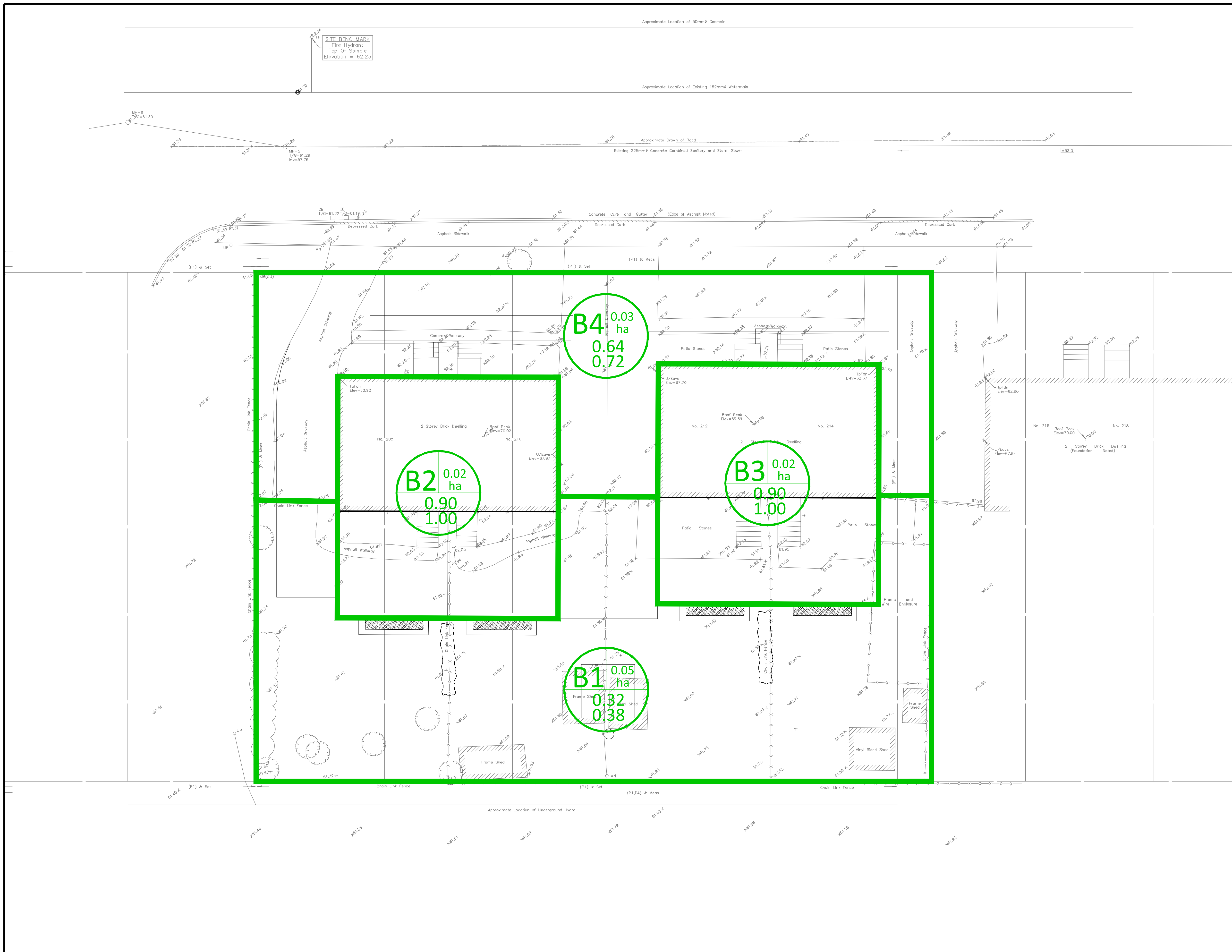
Drawing Number: PRE

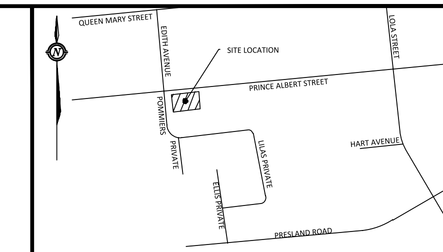
SHEET 1of 2

FILENAME: H:\01 Project - Proposals\2017 Jobs\CP\CP-17-0395 Atelier 292 Architect_OCH Prince Albert_208-214 Prince Albert\Civil\15 - Drawings\CP-17-0395 - PRESENTATION.dwg
LAST PLOTTED: Wednesday, February 21, 2018 11:34 AM by Lisa Lalonde
LAST PLOTTED: Wednesday, February 21, 2018 CTB: STANDARD

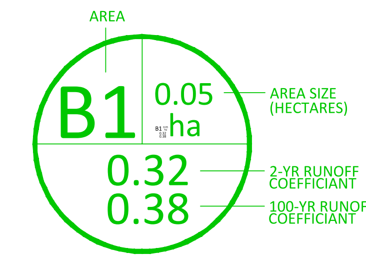
APPENDIX E:
POST-DEVELOPMENT DRAINAGE PLAN

McINTOSH PERRY





LOCATION PLAN



FOR REVIEW ONLY
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No.	Revision/Issue	Date
01		

SCALE 1 : 100
0 2 4 6 8 10 Metres

Check and verify all dimensions before proceeding with the work

Do not scale drawings

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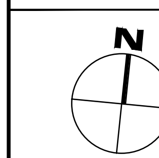

Stamp:

Client:
ATELIER 292 ARCHITECT INC.
292 MAIN STREET, OTTAWA, ON K1S 1E1

Project:
208-214 PRINCE ALBERT STREET
ADDITION TO APARTMENT BUILDINGS
OTTAWA ONTARIO

Drawing Title:
POST-DEVELOPMENT DRAINAGE AREAS

Scale:	1:100	Project Number:	CP-17-0395
Drawn by:	LAL		
Checked By:	RPK	Drawing Number:	POST
Designed By:	LAL	SHEET 2of 2	

APPENDIX F:
STORMWATER MANAGEMENT CALCULATIONS

McINTOSH PERRY

AVERAGE PRE-DEVELOPMENT RUNOFF COEFFICIENT CALCULATIONS

Area A1		EXISTING SITE - NON-DEVELOPMENT AREA					
Type	**C (2-yr)**	**C (5-yr)**	**C (100-yr)**	**Area (m²)**	**Product (2-yr)**	**Product (5-yr)**	**Product (100-yr)**
ASPHALT	0.90	0.90	1.00	205.7	185.1	185.1	205.7
BUILDING	0.90	0.90	1.00	240.9	216.8	216.8	240.9
CONCRETE	0.90	0.90	1.00	91.1	82.0	82.0	91.1
GRASS	0.20	0.20	0.25	676.0	135.2	135.2	169.0
Avg C	**0.51**	**0.51**	**0.58**	1213.7			

AVERAGE POST-DEVELOPMENT RUNOFF COEFFICIENT CALCULATIONS

Area B1		NORTH AREA					
Type	**C (2-yr)**	**C (5-yr)**	**C (100-yr)**	**Area (m²)**	**Product (2-yr)**	**Product (5-yr)**	**Product (100-yr)**
ASPHALT	0.90	0.90	1.00	87.3	78.6	78.6	87.3
BUILDING	0.90	0.90	1.00	0.0	0.0	0.0	0.0
CONCRETE	0.90	0.90	1.00	0.0	0.0	0.0	0.0
GRASS	0.20	0.20	0.25	412.2	82.4	82.4	103.1
Avg C	**0.32**	**0.32**	**0.38**				

Area B2		BUILDING 1					
Type	**C (2-yr)**	**C (5-yr)**	**C (100-yr)**	**Area (m²)**	**Product (2-yr)**	**Product (5-yr)**	**Product (100-yr)**
BUILDING	0.90	0.90	1.00	188.0	169.2	169.2	188.0
Avg C	**0.9**	**0.90**	**1.00**				

Area B3		BUILDING 2					
Type	**C (2-yr)**	**C (5-yr)**	**C (100-yr)**	**Area (m²)**	**Product (2-yr)**	**Product (5-yr)**	**Product (100-yr)**
BUILDING	0.9	0.90	1.00	187.0	168.3	168.3	187.0
Avg C	**0.9**	**0.90**	**1.00**				

Area B4		SOUTH AREA					
Type	**C (2-yr)**	**C (5-yr)**	**C (100-yr)**	**Area (m²)**	**Product (2-yr)**	**Product (5-yr)**	**Product (100-yr)**
ASPHALT	0.90	0.90	1.00	201.911	181.7	181.7	201.9
BUILDING	0.90	0.90	1.00	0	0.0	0.0	0.0
CONCRETE	0.90	0.90	1.00	12.314	11.1	11.1	12.3
GRASS	0.20	0.20	0.25	124.724	24.9	24.9	31.2
Avg C	**0.64**	**0.64**	**0.72**				

Time of concentration (min.)	2-Year (mm/hr)	5-Year (mm/hr)	100-Year (mm/hr)	
10.00	76.8	104.2	178.6	PRE-DEVELOPMENT
10.00	76.8	104.2	178.6	POST-DEVELOPMENT

PRE-DEVELOPMENT RUNOFF COEFFICIENT CALCULATIONS

Area	Drainage Area (ha)	Balanced Runoff Coefficient (C) 2-yr	Balanced Runoff Coefficient (C) 5-yr	Balanced Runoff Coefficient (C) 100-yr	2-Year Flow Rate (L/s)	5-Year Flow Rate (L/s)	100-Year Flow Rate (L/s)
A1	0.12	0.51	0.51	0.58	13.2	17.9	34.9
Total	**0.12**				**13.2**	**17.9**	**34.9**

POST-DEVELOPMENT RUNOFF COEFFICIENT CALCULATIONS

Area	Drainage Area (ha)	Balanced Runoff Coefficient (C) 2-yr	Balanced Runoff Coefficient (C) 5-yr	Balanced Runoff Coefficient (C) 100-yr	2-Year Flow Rate (L/s)	5-Year Flow Rate (L/s)	100-Year Flow Rate (L/s)
B1	0.05	0.32	0.32	0.38	3.4	4.6	9.4
B2	0.02	0.90	0.90	1.00	3.6	4.9	9.3
B3	0.02	0.90	0.90	1.00	3.6	4.9	9.3
B4	0.03	0.64	0.64	0.72	4.6	6.3	12.1
Total	**0.12**				**15.3**	**20.7**	**40.2**

REQUIRED RESTRICTED FLOW

Area	Drainage Area (ha)	Balanced Runoff Coefficient (C) 2-yr	2-Year Flow Rate (L/s)
A1	0.12	0.50	**13.0**

ACTUAL STORM WATER RUNOFF FROM SITE (L/s)

Area	Post-Development Unrestricted (L/s)			Post-Development (Restricted) (L/s)			
	2-yr	5-yr	100-yr	2-yr	5-yr	100-yr	
B1	3.4	4.6	9.4	6.0	6.0	6.0	*RESTRICTED*
B2	3.6	4.9	9.3				
B3	3.6	4.9	9.3				
B4	4.6	6.3	12.1	4.6	6.3	12.1	*UNRESTRICTED*
Total	**3.4**	**4.6**	**9.4**	**10.6**	**12.3**	**18.1**	

*** NOTE: Areas B2 and B3 will be capture and restricted within area B1**

STORAGE REQUIRMENTS FOR AREA B1

2-YEAR STORM EVENT

Tc	I (mm/hr)	Runoff (L/s) B1	Runoff (L/s) B2	Runoff (L/s) B3	Allowable Outflow (L/s)	Runoff To Be Stored (L/s)	Storage Required (m^3)
10	76.8	3.4	3.6	3.6	6.0	4.6	2.8
15	61.8	2.7	2.9	2.9	6.0	2.5	2.3
20	52.0	2.3	2.4	2.4	6.0	1.2	1.4
25	45.2	2.0	2.1	2.1	6.0	0.2	0.4
30	40.0	1.8	1.9	1.9	6.0	-0.5	-0.8

Maximum Storage Required (m^3) =	2.8

5-YEAR STORM EVENT

Tc	I (mm/hr)	Runoff (L/s) B1	Runoff (L/s) B2	Runoff (L/s) B3	Allowable Outflow (L/s)	Runoff To Be Stored (L/s)	Storage Required (m^3)
10	104.2	4.6	4.9	4.9	6.0	8.4	5.0
15	83.6	3.7	3.9	3.9	6.0	5.6	5.0
20	70.3	3.1	3.3	3.3	6.0	3.7	4.5
25	60.9	2.7	2.9	2.8	6.0	2.4	3.6
30	53.9	2.4	2.5	2.5	6.0	1.5	2.6

Maximum Storage Required (m^3) =	5.0

100-YEAR STORM EVENT

Tc	I (mm/hr)	Runoff (L/s) B1	Runoff (L/s) B2	Runoff (L/s) B3	Allowable Outflow (L/s)	Runoff To Be Stored (L/s)	Storage Required (m^3)
10	178.6	9.4	9.3	9.3	6.0	22.0	13.2
15	142.9	7.5	7.5	7.4	6.0	16.4	14.8
20	120.0	6.3	6.3	6.2	6.0	12.8	15.4
25	103.8	5.5	5.4	5.4	6.0	10.3	15.4
30	91.9	4.8	4.8	4.8	6.0	8.4	15.2
35	82.6	4.4	4.3	4.3	6.0	7.0	14.6
40	75.1	4.0	3.9	3.9	6.0	5.8	13.9
45	69.1	3.6	3.6	3.6	6.0	4.8	13.1
50	64.0	3.4	3.3	3.3	6.0	4.0	12.1
55	59.6	3.1	3.1	3.1	6.0	3.4	11.1

Maximum Storage Required (m^3) =	15.4

STORAGE OCCUPIED IN AREA B1

2-YEAR STORM EVENT

Ponding Area		Water Elev. (m) =		61.56	
Location	T/G	INV. (out)	Area (m^2)	Depth (m)	Volume (m^3)
Ponding Area 1	61.43	60.43	42.80	0.13	2.0
Ponding Area 2	61.45	60.45	27.71	0.11	1.0
				Total	3.0

Storage Available (m^3) =	3.0
Storage Required (m^3) =	2.8

5-YEAR STORM EVENT

Ponding Area		Water Elev. (m) =		61.59	
Location	T/G	INV. (out)	Area (m^2)	Depth (m)	Volume (m^3)
Ponding Area 1	61.43	60.43	60.59	0.16	3.5
Ponding Area 2	61.45	60.45	44.88	0.14	2.1
				Total	5.6

Storage Available (m^3) =	5.6
Storage Required (m^3) =	5.0

100-YEAR STORM EVENT

Ponding Area		Water Elev. (m) =		61.66	
Location	T/G	INV. (out)	Area (m^2)	Depth (m)	Volume (m^3)
Ponding Area 1	61.43	60.43	107.19	0.23	9.4
Ponding Area 2	61.45	60.45	89.60	0.21	6.9
				Total	16.3

Storage Available (m^3) =	16.3
Storage Required (m^3) =	15.4

STORM SEWER DESIGN SHEET

PROJECT: OTTAWA COMMUNITY HOUSING
LOCATION: Ottawa
CLIENT: ATELIER 292 ARCHITECTS
PAGE: 1 OF 1

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)			SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr)	
																								DIA	W	H			(L/s)	(%)
	B1	ECB1	TCB2	0.32		0.05			0.02	0.02	10.00	0.26	10.26	104.19	122.14	178.56	4.63				4.63	43.87	13.70	250			0.50	0.866	39.23	89.44%
	B1	TCB2	CBMH1	0.32		0.05			0.02	0.05	10.25	0.20	10.45	102.90	120.62	176.32	13.73				13.73	43.87	10.40	250			0.50	0.866	30.14	68.70%
	B1	ECB2	CBMH1	0.32		0.05			0.02	0.02	10.00	0.25	10.25	104.19	122.14	178.56	4.63				4.63	43.87	12.90	250			0.50	0.866	39.23	89.44%
	B2	CBMH1	MH1A	0.64		0.03			0.02	0.07	10.45	0.19	10.64	101.88	119.42	174.56	19.03				19.03	87.74	19.81	250			2.00	1.731	68.70	78.31%

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-17-0395

No.	Revision	Date
1.		

Date: 20/02/2018

Sheet No: 1 of 1