SERVICING AND STORMWATER MANAGEMENT REPORT

Project No.: 0CP-18-0056
Project Name.: 119-121 Beechwood Avenue – Two-storey Mixed Use Building

Prepared for:

BluePrint Builds Inc.
17 – 1010 Polytek Street
Ottawa, ON
K1J 9J1

Prepared by:

McIntosh Perry
115 Walgreen Road
Carp, ON
K0A 1L0

July, 2018

Revised: September 6, 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. As the site ultimately discharges over 2,000 m downstream, stormwater quality control is not required.

Evaluation of the proposed site in addition to a review of the site grading was completed. Our review identified that rooftop storage and surface ponding above the parking are the optimal design solutions to meet the SWM requirements. The rooftop storage will discharge into an unrestricted portion of the underground storm network. The flows from the storm network will be discharged into the municipal infrastructure within Chapleau Avenue.

The evaluation of the proposed development, existing site characteristics and surrounding municipal infrastructure suggests that the SWM design elements consisting of rooftop storage, parking area surface storage and quantity restriction will be a 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 119-121 Beechwood Avenue is able to be developed and fully serviced to support the proposed two-storey mixed-use 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 of the property located at 119-121 Beechwood Avenue within the City of Ottawa.

1.2 Site Description

The property is located at 119-121 Beechwood Avenue. It is described as Part of Lot 17 (North Beechwood Avenue), Registered Plan 74, City of Ottawa, Ontario. The land in question covers approximately 0.06 ha and is located southwest of the intersection of Putman Avenue and Beechwood Avenue.

The existing site is currently developed with a two-storey residential dwelling with two separated sheds and a two-storey commercial building with a parking lot. It is assumed that the existing site has storm, sanitary and water services. The existing services will be blanked as per City Standard drawing S11.4 and new services will be extended to the proposed building.

The proposed development consists of a two-storey mixed-use building with a foundation footprint of 159.1 m². Parking will be provided behind the building with a private approach that will replace the existing approach to the commercial building. The new private approach will conform to the City of Ottawa Private Approach By-Law (No. 2003-447).

Figure 1: Key Map: 119-121 Beechwood Avenue, Ottawa

2.0 BACKGROUND STUDIES

Background studies that have been completed for the site include review of the City of Ottawa as-built drawings, and a topographical survey of the site.

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 Annis, O'Sullivan, Vollebekk, dated February 18, 2016 and can be found under separate cover.

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

- Geotechnical Investigation by McIntosh Perry.
- Phase I ESA by McIntosh Perry.

3.0 PRE-CONSULTATION SUMMARY

City of Ottawa Staff have been pre-consulted regarding the proposed development in person on December 8, 2017. Specific design parameters to be incorporated within this design include the following:

- Pre-development and post-development flows shall each be calculated using a time of concentration (Tc) of 10 minutes.
- Control 5 through 100-year post-development flows to the 5 and 100-year pre-development flows, respectively, with a combined C value to a maximum of 0.50.
- The emergency overland flow shall be directed to the Chapleau Avenue right-of-way.

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

4.0 EXISTING SERVICES

The existing water and sanitary services for both existing developments are assumed to be extended from Beechwood Avenue and are to be removed and blanked as per City standard drawing S11.4. New laterals will be extended from municipal infrastructure within Chapleau Avenue. The following subsections describe the existing services within the Beechwood Avenue right-of-way and the Chapleau Avenue right-of-way.

4.1 Beechwood Avenue

There is an existing 300 mm diameter sanitary main as well as a 450 mm diameter storm sewer located within Beechwood Avenue. The sanitary sewer flows southward towards the Vanier Parkway while the storm sewer flows northwards towards Marier Avenue. The sanitary system follows Beechwood Avenue until the Vanier Parkway then flows north following the east bank of the Rideau River. The storm network flows northeast along Beechwood then flows north and outlets to the Ottawa River over 2,000 m from the subject site.

There is also a 127 mm diameter watermain within Beechwood Avenue that connects to a 200 mm diameter main at the intersection of Beechwood Avenue and Chapleau Avenue. A fire hydrant with an unobstructed path of travel is present approximately 40 m east of the subject site.

An abandoned 250 mm diameter gas main is present within the northern portion of the right-of-way as well as a 100 mm gas main just south of the abandoned line.

Hydro, cable and Bell service locations will need to be confirmed.

4.2 Chapleau Avenue

There is an existing 250 mm diameter sanitary main as well as a 300 mm diameter storm sewer located within Chapleau Avenue. Both the sanitary and storm sewers flow northwards towards Putman Avenue; from there the storm follows Putman Avenue eastward to connect to the Beechwood system while the sanitary sewer follows Putman Avenue westward.

There is also a 150 mm diameter watermain within the Chapleau Avenue right-of-way. The watermain services the fire hydrant located in front of 117 Beechwood Avenue on the northwestern corner of the intersection between Beechwood Avenue and Chapleau Avenue. Hydro, gas, cable and Bell service locations will need to be confirmed.

5.0 SERVICING PLAN

5.1 Proposed Servicing Overview

The overall servicing will be provided via service connections to the mains within Chapleau Avenue. The water service will be extended from the 150 mm diameter watermain. Similarly, the storm and sanitary services will be connected to the 300 mm diameter and 250 mm diameter mains, respectively. Service laterals will be located underneath the grassed area within the western portion of the site. Details pertaining to the final proposed servicing locations have been reviewed and are shown on the proposed Site Servicing Plan included within the submission package.

5.2 Proposed Water Design

A new 50 mm diameter copper water lateral complete with a water valve located at the property line will be connected to the existing 150 mm PVC watermain within Chapleau Avenue.

The proposed building will be equipped with a sprinkler system. Following Part 3 of the Ontario Building Code (OBC), the required fire protection is 2,700 L/min (See Appendix 'B' for calculation). The required fire protection from the Fire Underwriters Survey (FUS) is 3,000 L/min (provided for information purposes only).

The water demands for the new building have been calculated as per the Ottawa Design Guidelines – Water Distribution. The demands are as follows: the average and maximum daily demands are 0.02 L/s and 0.03 L/s respectively. The maximum hourly demand was calculated as 0.05 L/s (Refer to Appendix 'B' for flow details).

Boundary conditions have been provided by the City of Ottawa and are available in Appendix 'B'. A model has been undertaken using Bentley's WaterCAD and the results determine that the existing 150 mm watermain within Chapleau Avenue can adequately service the proposed development though a pressure reducing valve is required to make sure the pressure does not exceed 80 psi. The results are available in Appendix 'B' of this report.

5.3 Proposed Sanitary Design

A new 200 mm diameter gravity sanitary service will be connected to the existing 250 mm diameter sewer within Chapleau Avenue. The sanitary service will be complete with a maintenance manhole (SAN MH1A) 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 0.07 L/s. A 200 mm diameter pipe at the minimum slope of 0.32 percent slope has a capacity of 19.36 L/s, therefore the proposed 200 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 Chapleau Avenue as the amount of flow leaving the site is minimal.

5.4 Proposed Storm Design (Conveyance and Management)

Stormwater runoff will be conveyed by way of overland sheet flow into the proposed storm network which will discharge into the existing infrastructure within Chapleau Avenue. The roof will provide runoff storage by the use of roof drains and discharge into the unrestricted portion of the proposed underground storm network. Similarly, the runoff generated from the back of the site will sheet flow into the proposed storm network within the asphalt drive aisle/parking lot. An IPEX Tempest inlet control device within CB1 will restrict the flow to conform to City requirements. The frontage of the site and first six meters of the private approach will flow unrestricted due to the private approach By-Law No. 2003-447 and providing positive drainage away from the foundation of the building.

From discussions with the City of Ottawa and the Rideau Valley Conservation Authority (RVCA), quantity control will be provided. Quality control is expected to be handled by the existing infrastructure due to the network outletting over 2,000 meters downstream. Correspondence with the RVCA is available in Appendix 'A'. Further details and calculations pertaining to the quantity and quality of the stormwater management system are provided in Section 6.0.

5.5 Site Utilities

All relevant utility companies (telephone/cable – Bell/Rogers, 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 Chapleau Avenue and Beechwood Avenue. Utility services are anticipated to be fed from the existing utilities currently within the Chapleau Avenue right-of-way.

5.6 Service Locations

The proposed sanitary and water services will be placed under the grassed area in the western portion of the property. Hydro, cable, telephone and gas will be primarily placed in a common utility trench connecting to existing infrastructure along Chapleau Avenue.

Separation distances between the storm, water and sanitary 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 building 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 catch basin (CB) located within the north parking area that will be equipped with an inlet control device. The restricted stormwater runoff will be directed to the existing sewer within Chapleau Avenue; similarly, overland flow will be directed towards the Chapleau Avenue right-of-way. The quantitative properties of the storm runoff for both the pre- and post-development flows are further detailed below. No quality control will be implemented due to its expected handling by existing municipal infrastructure.

Stormwater Best Management Practices (SWM BMP's) will be implemented at the "Lot level", "Conveyance" and "End of Pipe" locations. To summarize, roof water will be directed to grass surfaces that in turn will be collected into the proposed swale. The swale will convey the runoff into the proposed storm network.

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 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.

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
Gravel	0.60
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 correspondence with City of Ottawa Staff the time of concentration (Tc) used for pre-development and post-development flows shall be 10 minutes.

6.2.1 Pre-Development Drainage

The existing site has been demonstrated as drainage area A1. Drawing CP-18-0056 PRE (Appendix 'D') indicates the limits of the drainage area. Existing conditions have the overland stormwater runoff flowing from high points located across the southern area of the property and draining north around the existing buildings and the eastwards towards Chapleau Avenue's Right-of-Way (ROW). Table 2 demonstrates the existing flow rates in pre-development conditions.

Table 2: Pre-Development Runoff Summary

Area ID	Drainage Area (ha)	Balanced Runoff Coefficient (C) 5-yr	Balanced Runoff Coefficient (C) 100-yr	5-Year Flow Rate (l/s)	100-Year Flow Rate (l/s)
A1	0.06	0.50	0.50	7.98	13.67
Total	0.06			7.98	13.67

(See Appendix 'F' for Calculations)

6.2.2 Post-Development Drainage

The post-development drainage plan was designed to retain runoff generated by a 100-year event onsite. Stormwater exceeding this amount is directed to the northwest corner of the property. The proposed drainage and overland flow directions are indicated on drawing CP-18-0056 POST (Appendix 'E'). Table 3, on the following page, displays the post-development runoff generated by the proposed site.

Table 3: Post-Development Runoff Summary

Area ID	Drainage Area (ha)	Balanced Runoff Coefficient (C) 5-yr	Balanced Runoff Coefficient (C) 100-yr	5-year Flow Rate (L/s)	100-year Flow Rate (L/s)
B1	0.01	0.89	0.99	1.59	3.03
B2	0.02	0.90	1.00	4.15	7.90
B3	0.03	0.78	0.87	7.41	14.20
Total	0.06			13.15	25.12

(See Appendix 'F' for Calculations)

Runoff from area B2 will be restricted before outletting to the existing storm system within Chapleau Avenue. The total flow generated from area B2 will be controlled by a Tempest LMF inlet control device (ICD) located within CB1. The restriction device will restrict the 100-yr runoff to the 5-yr pre-development flow rate while accounting for the proposed unrestricted flow from drainage area B1. See Appendix 'F' for calculations. This restriction will be further detailed in Section 6.3.

6.3 Quantity Control

After discussing the stormwater management criteria for the site with City of Ottawa staff, the 5 and 100-year post-development runoff for this site has been restricted to match the 5 and 100-year pre-development flow rate with a maximum C value of 0.5 (See Appendix 'A' for correspondence). These values create the following allowable release rates and storage volumes for the development site.

Table 4: Allowable Release Rate

Area	Drainage Area (ha)	Balanced Runoff Coefficient (C) 5-yr	Balanced Runoff Coefficient (C) 100-yr	5-Year Flow Rate (L/s)	100-Year Flow Rate (L/s)
A1	0.06	0.50	0.50	7.98	13.67

(See Appendix 'F' for Calculations)

Reducing site flows will be achieved using flow restrictions and will create the need for onsite storage. Runoff from areas B2 and B3 will be restricted as detailed in the Table 5 on the following page.

Table 5: Post-Development Restricted Runoff Calculations

Area ID	Post-Development Unrestricted (l/s)		Post-Development (Restricted) (l/s)		
	5-yr	100-yr	5-yr	100-yr	
B1	1.59	3.03	1.59	3.03	UNRESTRICTED
B2	4.15	7.90	0.60	1.20	RESTRICTED
B3	7.41	14.20	5.79	5.79	RESTRICTED
Total	13.15	25.12	7.98	10.02	

(See Appendix 'F' for Calculations)

Runoff from Area B2 will be restricted by two roof drains restricting the flows to 0.60 L/s and 1.20 L/s for the 5-year and 100-year storm events. Similarly, Runoff from Area B3 will be restricted at CB1 through a Tempest LMF ICD (Design Head of 1.75m). This ICD will restrict area B2 to 5.79 L/s for the 5 and 100-year storm events. The restriction creates a water surface elevation (WSEL) of 56.83 for the 5-year storm event and 56.88 for the 100-yr storm even. Table 6 below details the required and provided rooftop storage volumes for the development.

Table 6: Rooftop Storage Summary

Area	Depth of ponding (m) for 5-yr storm	5-year required storage (m^3)	5-yr available storage (m^3)	Depth of ponding (m) for 100-yr storm	100-year required storage (m^3)	100-year available storage (m^3)
B2	0.025	2.8	3.0	0.050	5.2	6.0

(See Appendix 'F' for Calculations)

Table 7 details the required storage before discharge into the municipal infrastructure within Chapleau Avenue.

Table 7: Site Storage Summary

Area	Depth of ponding (m) for 5-yr storm	5-year required storage (m^3)	5-yr available storage (m^3)	Depth of ponding (m) for 100-yr storm	100-year required storage (m^3)	100-year available storage (m^3)
B3	0.09	1.0	1.4	0.15	5.1	5.7

(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 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 existing municipal infrastructure is expected to handle the quality control requirements. Please refer to Appendix 'A' for correspondence with the RVCA and City of Ottawa. Due to the expectations outlined above no additional on-site quality treatment has been provided. The combination of the above BMP's and the proposed flow control measures will 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.

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 159.1 m^2 ground floor area two-storey mixed-use commercial and office building will be constructed centrally on the site located at 119-121 Beechwood Avenue.
- A new 200 mm diameter sanitary service and monitoring manhole will be installed and connected to the existing 250 mm diameter sewer within Chapleau Avenue.
- A new 50 mm diameter water lateral will be extended from the existing 150 mm diameter main within Chapleau Avenue.
- A new storm network will be installed onsite and will connect to the existing 300 mm storm sewer within Chapleau Avenue.
- As discussed with City of Ottawa staff, the stormwater management design will ensure that the post-development flow rates are restricted to the 5 & 100-year pre-development flow rates calculated with a maximum C value of 0.5.
- Storage for the 5 and 100-year storm events will be provided above the parking area and on the proposed flat roof.

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 BluePrint Builds Inc. development located at 119-121 Beechwood 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

Sean Leflar,
Civil Engineering Technologist, Land Development
McIntosh Perry Consulting Engineers
T: 613.836.2184 x 2252
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10.0 STATEMENT OF LIMITATIONS

This report was produced for the exclusive use of BluePrint Builds 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: CORRESPONDENCE

From: Sean Leflar
Sent: April 18, 2018 4:53 PM
To: Wessel, Shawn
Cc: Tyler Ferguson; Sandercott, Robert
Subject: RE: 119-121 Beechwood Avenue - Stormwater Management Criteria

Hello Shawn,

Thank you for the corrections, information and technical bulletins. I will continue forward as per your comments.

I appreciate your help on this matter. Enjoy your evening.

Regards,

Sean Leflar
Civil Engineering Technolgist
T. 613.836.2184 (ext 2252) | **F.** 613.836.3742

From: Wessel, Shawn <shawn.wessel@ottawa.ca>
Sent: April 18, 2018 4:35 PM
To: Sean Leflar <s.leflar@McIntoshPerry.com>
Cc: Tyler Ferguson <t.ferguson@mcintoshperry.com>; Sandercott, Robert <Robert.Sandercott@ottawa.ca>
Subject: RE: 119-121 Beechwood Avenue - Stormwater Management Criteria

Good afternoon Mr. Leflar.

Thank you for your email and inquiry.

Please see my comments below in red.

If you require additional information or clarification, please do not hesitate to contact me anytime.

Thank you

Regards,

Shawn Wessel, A.Sc.T.,rcji
Project Manager - Infrastructure Approvals
Gestionnaire de projet – Approbation des demandes d'infrastructures

Development Review Central Branch | Direction de l'examen des projets d'aménagement, Centrale
Planning, Infrastructure and Economic Development Department | Direction générale de la planification de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Ave. W. | 110, avenue Laurier Ouest, Ottawa ON K1P 1J1
(613) 580 2424 Ext. | Poste 33017
shawn.wessel@ottawa.ca

From: Sean Leflar <s.leflar@mcintoshperry.com>
Sent: Wednesday, April 18, 2018 4:06 PM
To: Wessel, Shawn <shawn.wessel@ottawa.ca>
Cc: Tyler Ferguson <t.ferguson@mcintoshperry.com>
Subject: 119-121 Beechwood Avenue - Stormwater Management Criteria

Good Afternoon,

I am starting up the civil design for a site located at 119-121 Beechwood Avenue and would like to take a moment and confirm the stormwater management criteria with you. The development consists of a two-storey mixed office and commercial building with an entrance to Chapleau Drive and 10 space parking lot. In pre-development conditions the lot had a two-storey commercial building with a parking lot and a two-storey residential dwelling with two separated sheds.

From my brief analysis of the site and surrounding area I have made a couple of assumptions on the stormwater management criteria. If you don't mind taking a look and correcting any incorrect assumptions.

Stormwater Management Criteria:

- A Pre-development Time of Concentration of 10 min. Correct
- Match the 5 and 100-year post-development flows to the 5 and 100-year pre-development flows, respectively. Correct. Please see attached Tech Bulletins

for 2018

- A maximum pre-development runoff coefficient of 0.5 shall be used.
  This is normally what we require although C should be calculated regardless unless in a combined sewer system area where we would then require C=0.4
- The emergency overland flow shall be directed to the Chapleau Drive right-of-way. Correct
- The minimum amount of freeboard between the overland flow elevation and the finished floor is to be 0.30 m:
  Please see attached Tech Bulletins for 2016 & 2018. Please also consider lowest opening and points made in guidelines regarding 0.30 m freeboard at rear of building if sufficient slope towards property line or street.

  2016 Tech Bulletin:

  Section 5.1.4 (page 5.4)

  The hydraulic grade line in the storm sewer must remain at least 0.3 m below the underside of adjacent building footing during the 100-year storm event.

  • The hydraulic grade line in the storm sewer must remain below the underside of footing of the adjacent building during the stress test event (100-year plus 20%).

  • In areas with no basements, the maximum hydraulic grade line shall ensure that all inlet control devices operate under free flow conditions during the 100-year storm event.

  • The water level in the major system must not touch any part of the building envelope, and must remain below the lowest building opening that is in the proximity of the flow route or ponding area, during the stress test event (100-year plus 20%). This test must be applied to all areas of the major system, including rear yards.

  • There must be at least 15 cm of vertical clearance between the spill elevation on the street and the ground elevation at the building envelope that is in the proximity of the flow route or ponding area.

  • The minor system for local roads shall be designed to accommodate a 2-year return period under free flow conditions.

  • The minor system for collector roads shall be designed to accommodate a 5-year return period under free flow conditions.

  Section 5.4.9.2 (page 5.31)

  • While rear yard grading will create low points and storage at each catch basin, the storage will not be considered in the available storage requirements. It will be assumed that all backyard flows in excess of the 2-year will flow towards the roads. Effective available storage will only be considered on streets and open space/park storage. Furthermore, there must be at least 30 cm of vertical clearance between the rear yard spill elevation and the ground elevation at the adjacent building envelope.

  Please also see 2018 version in the event that this any of these bullets have been revised this year.

- Runoff will be stored on site up to the 100-year storm event, then can be directed to the Chapleau Drive right-of-way. Correct. Please see attached Tech Bulletins for 2018

I have also provided a draft site plan for your reference.

Thank you for your time,

Sean Leflar

Civil Engineering Technolgist
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McINTOSH PERRY

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From: Sean Leflar
Sent: April 19, 2018 10:07 AM
To: Eric Lalande
Cc: Tyler Ferguson; Jamie Batchelor
Subject: RE: 119-121 Beechwood Avenue - Stormwater Quality Control Requirements

Hello Eric,

Thank you for the information, I will make sure to include a discussion related to the stormwater quality control within the servicing report.

Thank you for your help,

Sean Leflar
Civil Engineering Technolgist
T. 613.836.2184 (ext 2252) | **F.** 613.836.3742

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: April 19, 2018 10:02 AM
To: Sean Leflar <s.leflar@McIntoshPerry.com>
Cc: Tyler Ferguson <t.ferguson@mcintoshperry.com>; Jamie Batchelor <jamie.batchelor@rvca.ca>
Subject: RE: 119-121 Beechwood Avenue - Stormwater Quality Control Requirements

Hi Sean,

The municipal storm system outlets over 2000 metres from the site into the Ottawa River. As such, on-site quality control measures will not be required for this proposal. However, best management practices and opportunities to maximize infiltration on site are encouraged including opportunities for low impact design. Please provide discussion related to quality control in the servicing report.

Thank you,

Eric Lalande, MCIP, RPP
Planner, Rideau Valley Conservation Authority
613-692-3571 x1137

From: Sean Leflar <s.leflar@mcintoshperry.com>
Sent: Thursday, April 19, 2018 8:14 AM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Tyler Ferguson <t.ferguson@mcintoshperry.com>
Subject: 119-121 Beechwood Avenue - Stormwater Quality Control Requirements

Good Morning Eric,

I am working on the civil design for a development located at 119-121 Beechwood Avenue within the City of Ottawa. The development consists of a two-storey mixed use commercial and office building with a 10 space parking area in the back. We have consulted with the City of Ottawa and will be providing quantity control.

I have attached a draft site plan as well as a map showing the location of the site for your reference. If you don't mind, could you please review and let me know what kind of quality control the RVCA would require for this development?

Thank you,

Sean Leflar
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APPENDIX B: EXISTING WATERMAIN FLOW AND FIRE PROTECTION CALCULATIONS

McINTOSH PERRY

From: Sean Leflar
Sent: April 23, 2018 2:07 PM
To: Wessel, Shawn
Cc: Sandercott, Robert; Tyler Ferguson
Subject: RE: 119-121 Beechwood Avenue - Request for Boundary Conditions

Good Afternoon Mr. Wessel,

Thank you for the boundary conditions. Your assistance is greatly appreciated. I will add a note in the site servicing report about conducting a pressure check upon completion of construction.

Regards,

Sean Leflar
Civil Engineering Technolgist
T. 613.836.2184 (ext 2252) | **F.** 613.836.3742

From: Wessel, Shawn <shawn.wessel@ottawa.ca>
Sent: April 23, 2018 1:31 PM
To: Sean Leflar <s.leflar@McIntoshPerry.com>
Cc: Sandercott, Robert <Robert.Sandercott@ottawa.ca>; Tyler Ferguson <t.ferguson@mcintoshperry.com>
Subject: 119-121 Beechwood Avenue - Request for Boundary Conditions

Good afternoon Mr. Leflar.

Please find boundary conditions for 119-121 Beechwood for your use.

****The following information may be passed on to the consultant, but do NOT forward this e-mail directly.****

The following are boundary conditions, HGL, for hydraulic analysis at 119-121 Beechwood (zone 1E) assumed to be connected to the 127mm on Beechwood (Option 1) or 152mm on Chapleau (Option2) . (see attached PDF for location).

Minimum HGL = 108.9m, same for both options

Maximum HGL = 118.3m, same for both options. 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.

MaxDay + FireFlow (50L/s) = 105.5m, on Beechwood

MaxDay + FireFlow (50L/s) = 110.5m, on Chapleau

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.

If you require additional information or clarification, please do not hesitate to contact me anytime.

Thank you

Regards,

Shawn Wessel, A.Sc.T.,rcji
Project Manager - Infrastructure Approvals
Gestionnaire de projet – Approbation des demandes d'infrastructures

Development Review Central Branch | Direction de l'examen des projets d'aménagement, Centrale
Planning, Infrastructure and Economic Development Department | Direction générale de la planification de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
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P Please consider the environment before printing this email

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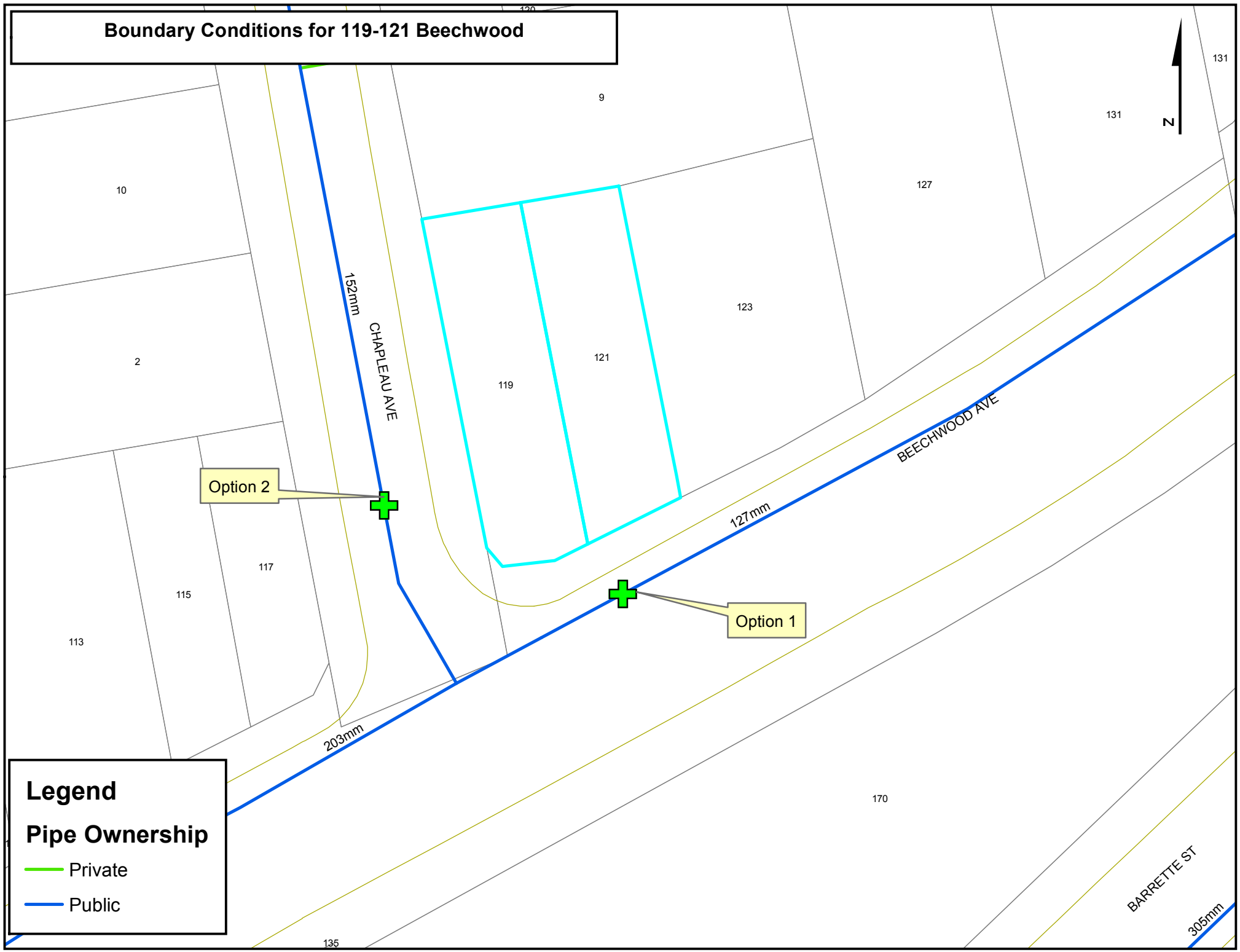
Boundary Conditions for 119-121 Beechwood
N
131
9
131
10
127
123
152mm
CHAPLEAU AVE
2
121
119
BEECHWOOD AVE
Option 2
127mm
117
115
Option 1
113
203mm
170
BARRETTE ST
305mm
135
Legend
Pipe Ownership
Private
Public

McINTOSH PERRY

CP-18-0056 - 119-121 BEECHWOOD AVENUE - Water Demands

Project:	119-121 BEECHWOOD AVENUE
Project No.:	CP-18-0056
Designed By:	S.V.L
Checked By:	R.P.K
Date:	04/19/2018
Site Area:	0.06 gross ha

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
Other Commercial	*28,000*	*L/gross ha/d*
AVERAGE DAILY DEMAND	0.02	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	0.03	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	0.05	L/s

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

McINTOSH PERRY

CP-18-0056 - 119-121 BEECHWOOD AVENUE - OBC Fire Calculations

Project:	119-121 BEECHWOOD AVENUE
Project No.:	CP-18-0056
Designed By:	S.V.L
Checked By:	R.P.K
Date:	04/19/2018

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

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

Building is classified as Group : D and E 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 loadbearing 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	31	(from Table 1 pg A-31) (Worst case occupancy {E / F2} 'K' value used)
V	1,296	(Total building volume in m³.)
Stot	1.6	(From figure 1 pg A-32)
Q =	63,269.88 L	

			From Figure 1 (A-32)
Snorth	19.806	m	0.0
Seast	0	m	0.5
Ssouth	11.506	m	0.0
Swest	8.888	m	0.1

*approximate distances

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

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

McINTOSH PERRY

CP-18-0056 - 119-121 BEECHWOOD AVENUE - Fire Underwriters Survey (FUS) Fire Calculations

Project:	119-121 BEECHWOOD AVENUE
Project No.:	CP-18-0056
Designed By:	S.V.L
Checked By:	R.P.K
Date:	04/19/2018

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.

A. Determine The Coefficient Related To The Type Of Construction

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) = 159.00 m²

A = 318.00 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 = 2.00

D. Calculate Required Fire Flow

F = 220 x C x √A

F = 220.00 X 1.00 x √ 318.00

F = 3,923.16 L/min.

F = 4,000.00 L/min. Rounded to the nearest 1,000 L/min.

E. Determine Increase or Decrease Based on Occupancy

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

Office and Mercantile Occupancy

No Change

Occupancy Decrease = 0.00 L/min.

F = 4,000.00 L/min.

CP-18-0056 - 119-121 BEECHWOOD AVENUE - Fire Underwriters Survey (FUS) Fire Calculations

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 entire building will be installed with a fully automated, standardized with the City of Ottawa Fire Department and fully supervised.
- Therefore the value obtained in Step E is reduced by 30% (The building is sprinklered with a standard system and fire department hose lines)

Reduction = 4,000.00 L/min. X 30%

Reduction = 1,200.00 L/min.

G. Determine the Total Increase for Exposures

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

- Exposure distance to the existing buildings to the north & south of the proposed building is approximately 21m & 28m respectfully.
- Exposure distance to the existing buildings to the east & west of the proposed building is approximately 4m & 17m respectfully.
- Therefore the charge for exposure is 12% of the value obtained in Step E.

Increase = 4,000.00 L/min. X 12%

Increase = 480.00 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.

F = 4,000.00 L/min. - 1,200.00 L/min. + 480.00 L/min.
F = 3,280.00 L/min.

Therefore, after rounding to the nearest 1,000 L/min, the total required fire flow for the development is 3,000 L/min (793 GPM).

Table 1					
WATER SUPPLY COEFFICIENT - K					
TYPE OF CONSTRUCTION	Classification by Group or Division in Accordance with Table 3.1.2.1. of the Building Code				
	A-2 B-1 B-2 B-3 C D	A-4 F-3	A-1 A-3	E F-2	F-1
Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2., including loadbearing walls, columns and arches.	10	12	14	17	23
Building is of noncombustible construction or of heavy timber construction conforming to Article 3.1.4.6. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	16	19	22	27	37
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.	18	22	25	31	41
Building is of combustible construction. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	23	28	32	39	53
Column 1	2	3	4	5	6

Table 3.2.2.55.
Maximum Building Area, Group D, up to 2 Storeys
Forming Part of Sentence 3.2.2.55.(1)

No. of *Storeys*	Maximum Area, m^2		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1 2	1 000 800	1 250 1 000	1 500 1 200
Column 1	2	3	4

Table 2	
OBC Part 3 Buildings	Required Minimum Water Supply Flow Rate (L/min)
One-storey building with building area not exceeding 600 m^2	1800
All other buildings	2700 (if Q ≤ 108,000 L)(1) 3600 (if Q > 108,000 L and ≤ 135,000 L)(1) 4500 (if Q > 135,000 L and ≤ 162,000 L)(1) 5400 (if Q > 162,000 L and ≤ 190,000 L)(1) 6300 (if Q > 190,000 L and ≤ 270,000 L)(1) 9000 (if Q > 270,000 L)(1)

Note to Table 2:
(1) $Q = KVS_{to}$, as referenced in Paragraph 3(a)

Avg. Day

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Hydraulic Grade (m)
WTR-CONN	54.95	0.00	89.92	118.30
BLDG	55.22	1.20	89.54	118.30

Peak Hourly

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Hydraulic Grade (m)
WTR-CONN	54.95	0.00	76.58	108.90
BLDG	55.22	3.00	76.20	108.90

Max Day + Fire Flow

Label	Is Fire Flow Run Balanced?	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (L/min)	Fire Flow (Available) (L/min)	Pressure (psi)	Elevation (m)
H-1	True	True	3,000.00	10,000.00	77.50	55.90
WTR-CONN	False	False	3,000.00	(N/A)	78.85	54.95
BLDG	False	False	3,000.00	(N/A)	78.47	55.22

APPENDIX C: SANITARY SEWER CALCULATIONS

SANITARY SEWER DESIGN SHEET

PROJECT: CP-18-0056
LOCATION: 119-121 BEECHWOOD AVE
CLIENT: BLUEPRINT BUILDS INC.

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		IND	CUM			INSTITUTIONAL		COMMERCIAL		INDUSTRIAL			IND	CUM										L/s	(%)
													IND	CUM	IND	CUM	IND	CUM													
	A-1	BLDG	MH#1A											0.00	0.06	0.06		0.00	0.05	0.06	0.06	0.02	0.07	19.36	4.56	200	0.32	0.597	9.3	0.141	19.29	99.64
		MH#1A	EX.MH-S											0.00		0.06		0.00	0.05	0.00	0.06	0.02	0.07	34.22	9.47	200	1.00	1.055	7.1	0.209	34.15	99.80

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: S.V.L
Checked: R.P.K
Project No.: CP-18-0056

No.	Revision	Date
1.	ISSUED FOR REVIEW	2018-07-03

Date: 2018-07-03
Sheet No: 1 of 1

APPENDIX D: PRE-DEVELOPMENT DRAINAGE PLAN

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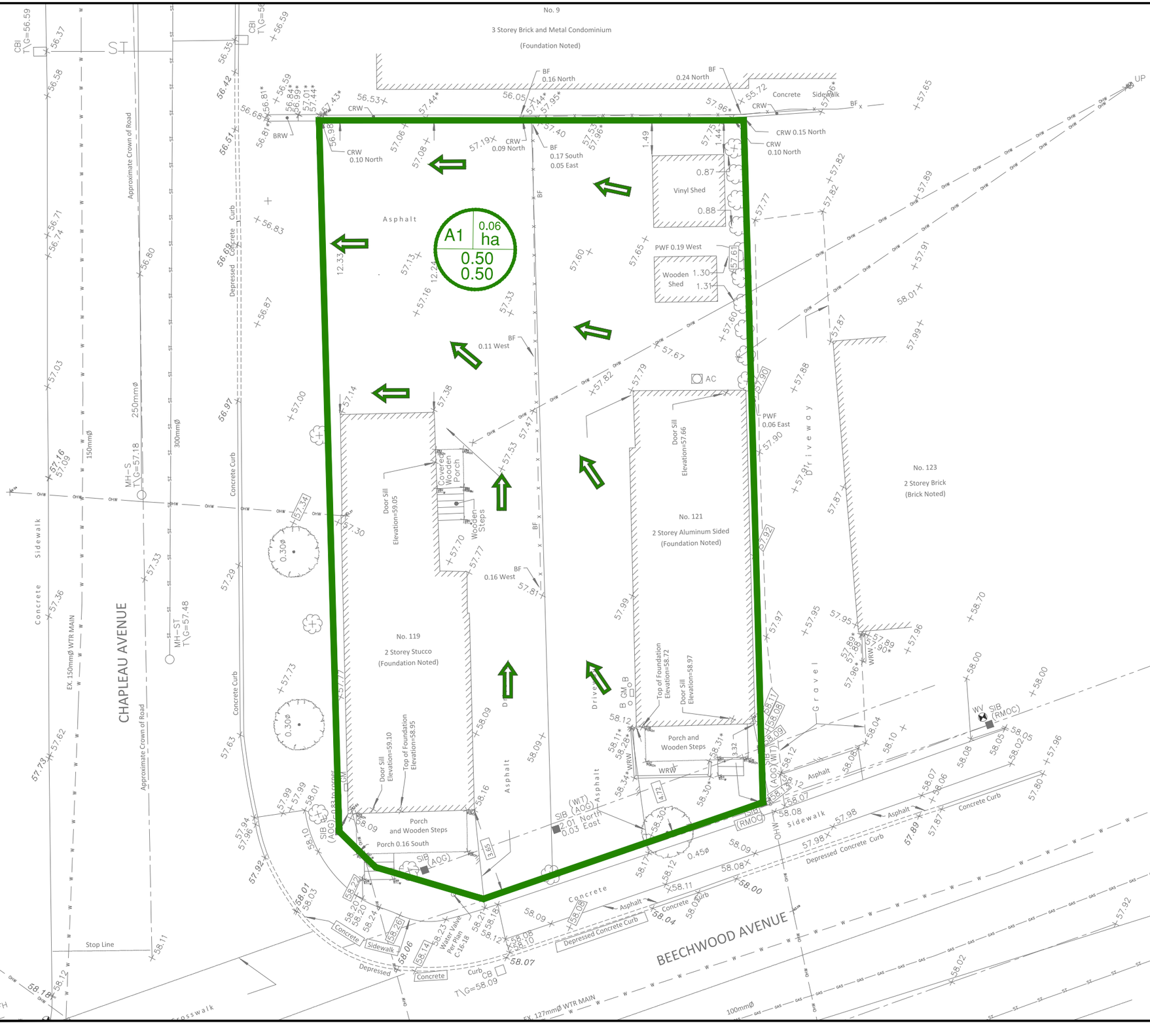
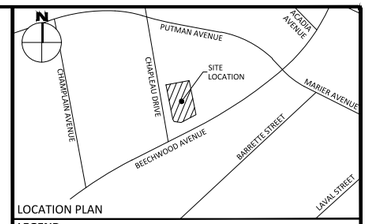
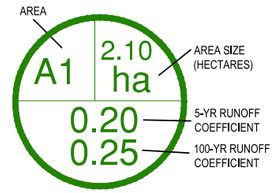




LOCATION PLAN

LEGEND



FOR REVIEW ONLY
NOT FOR CONSTRUCTION

No.	Revision/Issue	Date
02	ISSUED FOR SITE PLAN CONTROL	SEP. 06, 2018
01	ISSUED FOR COORDINATION	JUL. 26, 2018

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:
BLUEPRINT CONSTRUCTION SERVICES LTD.
17-1010 POLYTEK STREET
OTTAWA, ON K1J 9J1

Project:
119-121 BEECHWOOD AVENUE
TWO-STOREY MIXED OFFICE AND COMMERCIAL BUILDING
OTTAWA ONTARIO

Drawing Title:
PRE-DEVELOPMENT DRAINAGE AREA PLAN

Scale:	N.T.S.
Drawn by:	S.V.L.
Checked by:	R.P.K.
Designed By:	S.V.L.

Project Number: CP-18-0056

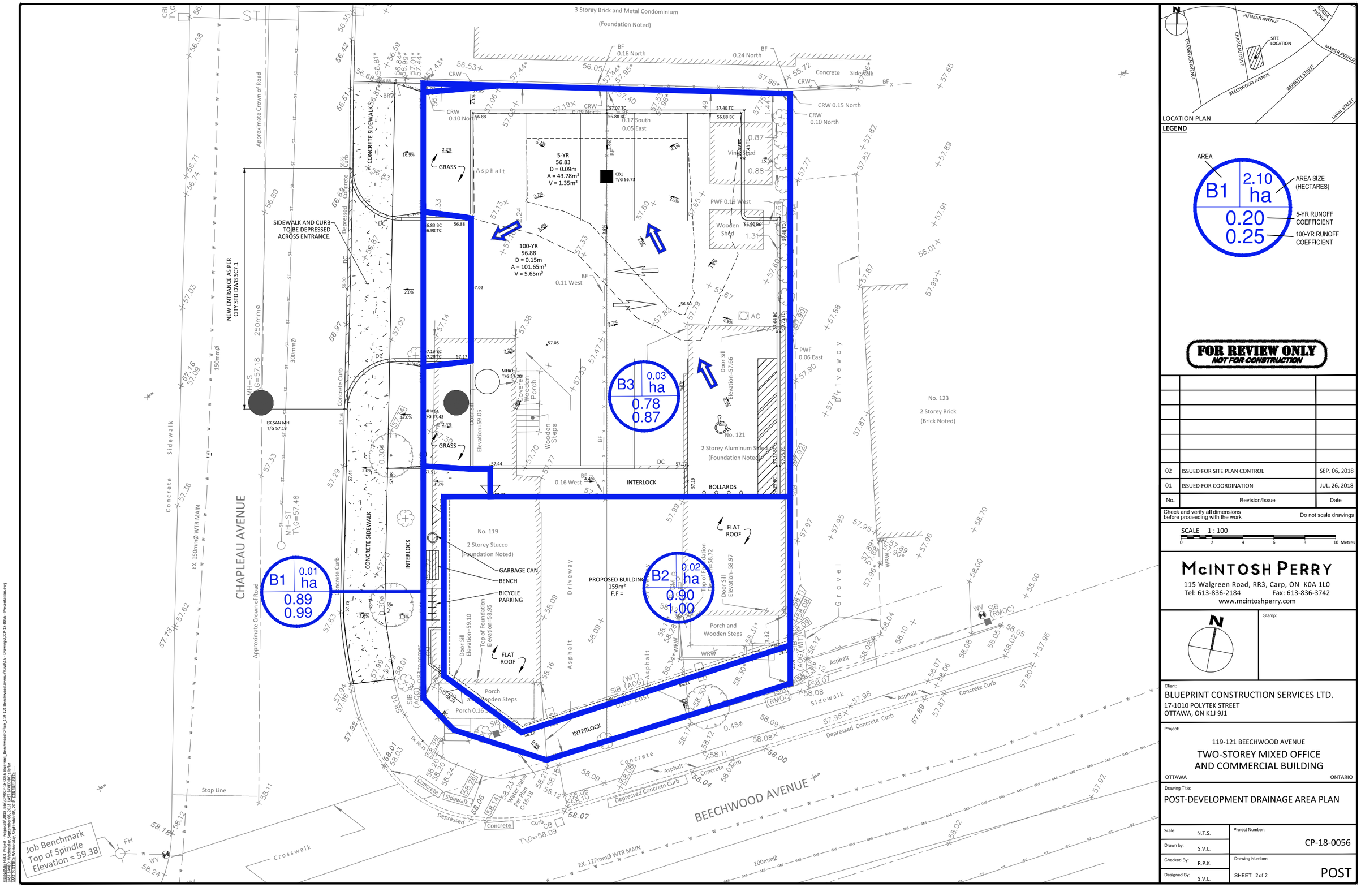
Drawing Number: PRE

SHEET 1of 2

FILENAME: H:\01 Project - Proposals\2018 Jobs\CP\0CP-18-0056 BluePrint_Beechwood Office_119-121 Beechwood Avenue\Civil\15 - Drawings\0CP-18-0056 - Presentation.dwg
LAST SAVED: Wednesday, September 05, 2018 LAST SAVED BY: s.leftar
PLOT PLOTTED: Wednesday, September 05, 2018 PLOTTED BY:

APPENDIX E: POST-DEVELOPMENT DRAINAGE PLAN

McINTOSH PERRY



LEGEND

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No.	Revision/Issue	Date
02	ISSUED FOR SITE PLAN CONTROL	SEP. 06, 2018
01	ISSUED FOR COORDINATION	JUL. 26, 2018

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

SCALE 1 : 100
0 2 4 6 8 10 Metres

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Project:
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TWO-STOREY MIXED OFFICE AND COMMERCIAL BUILDING
OTTAWA ONTARIO

Drawing Title:
POST-DEVELOPMENT DRAINAGE AREA PLAN

Scale:	N.T.S.	Project Number:	CP-18-0056
Drawn by:	S.V.L.		
Checked By:	R.P.K.	Drawing Number:	
Designed By:	S.V.L.	SHEET 2of 2	POST

FILENAME: H:\01 Project - Proposals\2018 Jobs\CP\OP-18-0056 Blueprint_Beechwood Office_119-121 Beechwood Avenue\Civil\15 - Drawings\OP-18-0056 - Presentation.dwg
LAST SAVED: Wednesday, September 05, 2018 LAST SAVED BY: rlefler
LAST PLOTTED: Wednesday, September 05, 2018 BY: RYAN LEFLER

APPENDIX F: STORMWATER MANAGEMENT CALCULATIONS

McINTOSH PERRY

CP-18-0056 - 119-121 BEECHWOOD AVENUE - RUNOFF CALCULATIONS

Pre-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	Average C (5-Year)	Average C (100-Year)
A1	0.06	453.15	0.90	0.00	0.60	97.66	0.20	0.78	0.87

Pre-Development Runoff Calculations

Drainage Area	Area (ha)	C (5-Year)	C (100-Year)	Tc (min)	I (mm/hr)		Q (L/s)	
					5-Year	100-Year	5-Year	100-Year
A1	0.06	0.50	0.50	10	104.2	178.6	7.98	13.67
Total	0.06						7.98	13.67

Post-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	Average C (5-Year)	Average C (100-Year)
B1	0.01	60.81	0.90	0.00	0.60	0.83	0.20	0.89	0.99
B2	0.02	159.06	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B3	0.03	271.32	0.90	0.00	0.60	58.80	0.20	0.78	0.87

Post-Development Runoff Calculations

Drainage Area	Area (ha)	C (5-Year)	C (100-Year)	Tc (min)	I (mm/hr)		Q (L/s)	
					5-Year	100-Year	5-Year	100-Year
B1	0.01	0.89	0.99	10	104.2	178.6	1.59	3.03
B2	0.02	0.90	1.00	10	104.2	178.6	4.15	7.90
B3	0.03	0.78	0.87	10	104.2	178.6	7.41	14.20
Total	0.06						13.15	25.12

Post-Development Restricted Runoff Calculations

Drainage Area	Unrestricted Flow (L/s)		Restricted Flow (L/s)		Storage Required (m^3)		Storage Provided (m^3)		
	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year	
B1	1.59	3.03	1.59	3.03	-	-	-	-	*UNRESTRICTED*
B2	4.15	7.90	0.60	1.20	2.79	5.15	2.98	5.96	*RESTRICTED*
B3	7.41	14.20	5.79	5.79	0.98	5.05	1.35	5.65	*RESTRICTED*
Total	13.15	25.12	7.98	10.02	3.77	10.20	4.33	11.61	

CP-18-0056 - 119-121 BEECHWOOD AVENUE - STORAGE REQUIREMENTS

Storage Requirements for Area B2

5-Year Storm Event

Tc (min)	I (mm/hr)	Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
30	53.9	2.15	0.60	1.55	2.78
35	48.5	1.93	0.60	1.33	2.79
40	44.2	1.76	0.60	1.16	2.78
45	40.6	1.62	0.60	1.02	2.75
50	37.7	1.50	0.60	0.90	2.70
55	35.1	1.40	0.60	0.80	2.63
60	32.9	1.31	0.60	0.71	2.56

Maximum Storage Required 5-Year (m^3) =	2.79

100-Year Storm Event

Tc (min)	I (mm/hr)	Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	178.6	7.90	1.20	6.70	4.02
15	142.9	6.32	1.20	5.12	4.61
20	120.0	5.31	1.20	4.11	4.93
25	103.8	4.59	1.20	3.39	5.08
30	91.9	4.06	1.20	2.86	5.15
35	82.6	3.65	1.20	2.45	5.15
40	75.1	3.32	1.20	2.12	5.09

Maximum Storage Required 100-Year (m^3) =	5.15

Storage Occupied In Area B2

5-Year Storm Event

Water Elevation (m) =				75% of Area (m^2)	Depth (m)	Head (m)	Volume (m^3)
Structure	T/G	Pipe dia.	INV. (out)				
ROOFTOP	-	-	-	119.3	0.025	-	3.0

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

100-YEAR STORM EVENT

Water Elevation (m) =				75% of Area (m^2)	Depth (m)	Head (m)	Volume (m^3)
Structure	T/G	Pipe dia.	INV. (out)				
ROOFTOP				119.3	0.050	0.00	6.0

Storage Available (m^3) =	6.0
Storage Required (m^3) =	5.2

CP-18-0056 - 119-121 BEECHWOOD AVENUE - ROOF DRAIN DISCHARGE

Roof Drain Flow For Flat Roof B2

Flow Rate Vs. Build-Up (One Weir)	
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

CALCULATING ROOF FLOW EXAMPLES

1 roof drain during a 5 year storm
elevation of water = 25mm
Flow leaving 1 roof drain = (1 x 0.30 L/s) = 0.30 L/s

1 roof drain during a 100 year storm
elevation of water = 50mm
Flow leaving 1 roof drain = (1 x 0.60 L/s) = 0.60 L/s

4 roof drains during a 5 year storm
elevation of water = 25mm
Flow leaving 4 roof drains = (4 x 0.30 L/s) = 1.20 L/s

4 roof drains during a 100 year storm
elevation of water = 50mm
Flow leaving 4 roof drains = (4 x 0.60 L/s) = 2.40 L/s

2 Roof Drains

	Roof Drain Flow		
	Flow (L/s)	Storage Depth (mm)	Total Flow (L/s)
	0.18	15	0.36
	0.24	20	0.48
5-Yr	0.30	25	0.60
	0.36	30	0.72
	0.42	35	0.84
	0.48	40	0.96
	0.54	45	1.08
100-Yr	0.60	50	1.20
	0.66	55	1.32
	0.72	60	1.44
	0.78	65	1.56
	0.84	70	1.68
	0.90	75	1.80
	0.96	80	1.92
	1.02	85	2.04
	1.08	90	2.16
	1.14	95	2.28
	1.20	100	2.40
	1.26	105	2.52
	1.32	110	2.64
	1.38	115	2.76
	1.44	120	2.88
	1.50	125	3.00
	1.56	130	3.12
	1.62	135	3.24
	1.68	140	3.36
	1.74	145	3.48
	1.80	150	3.60

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

CP-18-0056 - 119-121 BEECHWOOD AVENUE - STORAGE REQUIREMENTS

Storage Requirements for Area B3

5-Year Storm Event

Tc (min)	I (mm/hr)	B3 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	7.41	5.79	1.63	0.98
11	99.2	7.06	5.79	1.27	0.84
12	94.7	6.74	5.79	0.95	0.68
13	90.6	6.45	5.79	0.66	0.52
14	86.9	6.19	5.79	0.40	0.33
15	83.6	5.95	5.79	0.16	0.14
16	80.5	5.72	5.79	-0.06	-0.06

Maximum Storage Required 5-Year (m^3) =	0.98

100-Year Storm Event

Tc (min)	I (mm/hr)	B3 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	178.6	14.20	5.79	8.41	5.05
20	120.0	9.54	5.79	3.75	4.51
21	116.3	9.25	5.79	3.46	4.36
22	112.9	8.98	5.79	3.19	4.21
23	109.7	8.72	5.79	2.94	4.05
24	106.7	8.48	5.79	2.70	3.88
25	103.8	8.25	5.79	2.47	3.70

Maximum Storage Required 100-Year (m^3) =	5.05

Storage Occupied In Area B3

5-Year Storm Event

Water Elevation (m) =			56.83	Area (m^2)	Depth (m)	Head (m)	Volume (m^3)
Structure	T/G	Pipe dia.	INV. (out)				
CB1	56.73	0.250	55.002	43.8	0.10	1.70	1.4

Storage Available (m^3) = 1.4	*

Total Storage Available (m^3)=	1.4
Storage Required (m^3) =	1.0

100-YEAR STORM EVENT

Water Elevation (m) =			56.88	Area (m^2)	Depth (m)	Head (m)	Volume (m^3)
Structure	T/G	Pipe dia.	INV. (out)				
CB1	56.73	0.250	55.002	101.7	0.15	1.75	5.7

Storage Available (m^3) = 5.7	*

Total Storage Available (m^3)=	5.7
Storage Required (m^3) =	5.0

STORM SEWER DESIGN SHEET

PROJECT: CP-18-0056
LOCATION: 119-121 BEECHWOOD AVE.
CLIENT: BLUEPRINT BUILDS INC.

McINTOSH PERRY

LOCATION				CONTRIBUTING AREA (ha)								RATIONAL DESIGN 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	32
STREET	AREA ID	FROM MH	TO MH	C-VALUE						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)	
				0.20	0.50	0.60	0.70	0.80	0.90																DIA	W	H			(L/s)	(%)
		CB1	MH1	0.01					0.03	0.03	0.03	10.00	0.50	10.50	104.19	122.14	178.56	7.41				7.41	19.62	11.52	250			0.10	0.387	12.20	62.21%
																		IPEX LMF ICD TO RESTRICT FLOW TO 5.79 L/s													
		BLDG	MH1						0.02	0.01	0.01	10.00	0.14	10.14	104.19	122.14	178.56	4.15				4.15	33.98	5.59	250			0.30	0.671	29.83	87.80%
																		2 ROOF DRAINS TO RESTRICT FLOW TO 1.20 L/s													
		MH1	EX.MAIN									10.50	0.24	10.74	101.64	119.14	174.15				6.99	6.99	33.98	9.73	250			0.30	0.671	26.99	79.43%

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: S.V.L
Checked: R.P.K
Project No.: CP-18-0056

No.	Revision	Date
1.	ISSUED FOR REVIEW	2018-07-03

Date: 2018-07-03
Sheet No: 5 of 5