SERVICING & STORMWATER MANAGEMENT REPORT
OFFICE BUILDINGS – 1037 CARP ROAD

Project No.: CP-19-0125

City File No.: PC2019-0167

Prepared for:

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August 27, 2021

McINTOSH PERRY

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1.0 PROJECT DESCRIPTION

1.1 Purpose

McIntosh Perry (MP) has been retained by Project 1 Studios to prepare this Servicing and Stormwater Management Report in support of the Site Plan Control process for the proposed office building, located at 1037 Carp Road within the City of Ottawa (City File No. PC2019-0167).

The main purpose of this report is to present a servicing design for the development in accordance with the recommendations and guidelines provided by the City of Ottawa (City), the Mississippi Valley Conservation Authority (MVCA), and the Ministry of the Environment, Conservation and Parks (MECP). This report will address the water, sanitary and storm sewer servicing for the development, ensuring that existing and available services will adequately service the proposed development.

This report should be read in conjunction with the following drawing:

- CP-19-0125, C101 – Site Grading, Drainage Plan, and Servicing Plan

1.2 Site Description

The property is located at 1037 Carp Road. It is described as Plan 5R-4714, Part of Lot 23, Concession 12, Geographic Township of Goulbourn, City of Ottawa. The land in question covers approximately 0.27 ha and is located between Rothbourne Rd and Echowoods Ave. The development area for the proposed works is approximately 0.27 ha.

See Site Location Plan in ***Appendix 'A'*** for more details.

1.3 Existing Conditions and Infrastructure

The existing site is currently undeveloped and is made up of a gravel lane, trees and bushes. There are no sanitary, water or storm services currently on site. Storm water currently sheet flows to the east corner of the site where it is collected by a rear yard swale system which flows to an existing catchbasin.

Sewer and watermain mapping collected from the topographic survey completed by Fairhall Moffatt & Woodland Ltd. on December 2018 indicates that the following services exist across the property frontages within the adjacent municipal right-of-way:

- 200 mm diameter ductile iron watermain; and
- 150 mm diameter private polyethene sanitary forcemain.

1.4 Proposed Development and Statistics

The proposal is to develop a 2-storey office building. The building will contain 14 office units with a total area of 513.84 m^2.

2.0 BACKROUND STUDIES

2.1 Background Reports / Reference Information

As-built drawings of existing services, provided by the City of Ottawa Information centre, within the vicinity of the site were reviewed to identify infrastructure available to service the contemplated development. A topographic survey has been completed by Fairhall Moffatt & Woodland Ltd. on December 18th, 2021.

2.2 Applicable Guidelines and Standards

City of Ottawa:

- Ottawa Sewer Design Guidelines, City of Ottawa, SDG002, October 2012. (***Ottawa Sewer Guidelines***)
  - Technical Bulletin ISTB-2014-01 City of Ottawa, February 2014***. (ISTB-2014-01)***
  - Technical Bulletin ISTB-2018-01 City of Ottawa, January 2018***. (ISTB-2018-01)***
  - Technical Bulletin ISTB-2018-03 City of Ottawa, March 2018. ***(ISTB-2018-03)***
  - Technical Bulletin ISTB-2019-01 City of Ottawa, January 2019. ***(ISTB-2019-01)***
  - Technical Bulletin ISTB-2019-02 City of Ottawa, February 2019. ***(ISTB-2019-02)***
- Ottawa Design Guidelines – Water Distribution City of Ottawa, July 2010. (***Ottawa Water Guidelines***)
  - Technical Bulletin ISD-2010-2 City of Ottawa, December 15, 2010. ***(ISD-2010-2)***
  - Technical Bulletin ISDTB-2014-02 City of Ottawa, May 2014. **(ISDTB-2014-02)**
  - Technical Bulletin ISTB-2018-03 City of Ottawa, March 2018. ***(ISTB-2018-03)***

Ministry of Environment, Conservation and Parks:

- Stormwater Planning and Design Manual, Ministry of the Environment, March 2003. ***(MECP Stormwater Design Manual)***
- Design Guidelines for Sewage Works, Ministry of the Environment, 2008. (***MECP Sewer Design Guidelines***)

3.0 PRE-CONSULTATION SUMMARY

A pre-consultation meeting was conducted on November 26, 2019 regarding the proposed site. Specific design parameters to be incorporated within this design include the following:

- Pre-development and post-development flows shall be calculated using a time of concentration (Tc) of 10 minutes, respectively.
- Control 5 through 100-year post-development flows to the 5 through 100-year pre-development flows with a combined C value of lesser of the existing or 0.5.

The notes from this meeting can be found in ***Appendix 'B'***.

4.0 WATERMAIN

4.1 Existing Watermain

There is an existing 200 mm diameter ductile iron watermain within Carp Road. The watermain services the adjacent property as well as the fire hydrants along Carp Road. There also is an existing public hydrant in the right of way of the neighbouring property to the north.

4.2 Proposed Watermain

A new 150 mm diameter PVC watermain is proposed to service the site complete with a water valve located at the property line and will be connected to the existing 200 mm diameter watermain within Carp Road. The watermain is designed to have a minimum of 2.4 m cover.

The Fire Underwriters Survey 1999 (FUS) method was utilized to determine the required fire flow for the site. The 'C' factor (type of construction) for the FUS calculation was determined to be 1.0 (ordinary type construction). The total floor area ('A' value) for the FUS calculation was determined to be ***995.9 m²***. The results of the calculations yielded a required fire flow of ***6,000 L/min***. A fire flow of ***2700 L/min*** was calculated using the Ontario Building Code (OBC) requirements. The detailed calculations for the FUS and OBC can be found in ***Appendix 'C'***.

The water demands for the proposed building have been calculated to adhere to the *Ottawa Design Guidelines – Water Distribution* manual and can be found in ***Appendix 'C'***. The results have been summarized below:

Table 1: Water Demands

Site Area	0.27 ha
Office	75 L/(7m^2/d)
Average Day Demand (L/s)	0.07
Maximum Daily Demand (L/s)	0.10
Peak Hourly Demand (L/s)	0.18
OBC Fire Flow Requirement (L/s)	45.00
FUS Fire Flow Requirement (L/s)	100.00
Max Day + Fire Flow (L/s)	100.10

The City provided both the estimated minimum and maximum water pressures, as well as the estimated water pressure during fire flow demand for the demands indicated by the correspondence in ***Appendix 'C'***. As shown in **Table 2** below, the minimum and maximum pressures fall within the required range identified in the City of Ottawa Water Supply guidelines.

Table 2: Boundary Conditions Results

Scenario	m H2O	Pressure (kPa)
Minimum HGL	159.9	330.6
Maximum HGL	156.6	298.2
Maximum Daily + Fire Flow Demand (217 L/s)	156.4	296.3

To confirm the adequacy of fire flow to protect the proposed development, public and private fire hydrants within 150 m of the proposed building were accounted for per the City of Ottawa ISTB 2018-02 Appendix I, **Table 1**. As demonstrated below. A location map showing the hydrant proximities to the site can be found in ***Appendix 'C'***.

Table 3: Fire Protection Confirmation

Building	Fire Flow Demand (L/min.)	Fire Hydrant(s) within 75m	Fire Hydrant(s) within 150m	Combined Fire Flow (L/min.)
1037 Carp Road	6,000	2	1	10,450

Based on City guidelines the existing hydrants located in the vicinity can provide adequate fire protection for the site.

5.0 SANITARY DESIGN

5.1 Existing Sanitary Sewer

There is an existing private 150mm diameter concrete sanitary forcemain within the right of way, which is not available to service the site. This sewer is tributary to the Stittsville trunk sewer.

5.2 Proposed Sanitary Sewer

A new septic bed located within the south side yard will be installed and sized to accommodate the development. McIntosh Perry will coordinate with the Ottawa Septic System Office for the required permits and approvals. For further design information pertaining to the on-site sewage disposal system, please refer to the septic system application.

See *Sanitary Sewer Design* in ***Appendix 'D'*** of this report for more details.

6.0 PROPOSED STORMWATER MANAGEMENT

6.1 Design Criteria and Methodology

The existing site sheet drains to the rear of the property and is conveyed to the City sewers system via a swale and inlet catchbasin, as indicated by the pre consultation existing flow patters are to be maintained. Runoff from the parking lot and swales will be directed to a depressed storage area located at the northeast corner of the site. The flow will be restricted at the outlet of the depressed storage area before leaving the site. The emergency overland flow route for the proposed site will be directed south towards an adjacent drainage ditch. The quantitative and qualitative properties of the storm runoff for both the pre & 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 7.6.

In summary, the following design criteria have been employed in developing the stormwater management design for the site as directed by the MVCA and the City:

Quality Control

- Best management practices have been implemented to promote settling of suspended solids removal using grassed swales and a grassed depressed storage area.

Quantity Control

- Post-development flow 5/100-year is be restricted to match the 5/100-year pre-development flow with a maximum C value of 0.50.

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 result, the conservative calculation of runoff ensures that any SWM facility sized using this method is expected to function as intended.

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

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.

The time of concentration (Tc) used for pre-development and post-development shall be calculated with a minimum Tc of 10 minutes.

6.3 Pre-Development Drainage

Based on the criteria listed in Section 7.1, the development limit will be required to restrict the 5 and 100-year flows to ***10.57 L/s*** and ***22.56 L/s*** respectively.

It has been assumed that the existing development contained no stormwater management controls for flow attenuation. The estimated pre-development peak flows for the 5 and 100-year events are summarized below in ***Table 6***.

Table 4: Pre Development Runoff Summary

Drainage Area	Area (ha)	Q (L/s)	
		5-Year	100-Year
A1	0.27	10.57	22.56

See CP-19-0125 - *PRE* in ***Appendix 'E'*** for pre development drainage areas and ***Appendix 'G'*** for calculations.

6.4 Post-Development Drainage

The proposed site drainage limits are demonstrated on the Post-Development Drainage Area Plan. See CP-19-0125 - *POST* in ***Appendix 'F'*** of this report for more details. A summary of the Post-Development Runoff Calculations can be found below.

Table 5: Post-Development Runoff Summary

Drainage Area	Area (ha)	Runoff Coefficient (5-Year)	Runoff Coefficient (100-Year)	5-Year Peak Flow (L/s)	100-Year Peak Flow (L/s)
B1	0.05	0.90	1.00	13.40	25.52
B2	0.09	0.90	1.00	22.86	43.53
B3	0.08	0.20	0.25	4.90	10.49
B4	0.02	0.20	0.25	1.32	2.83
B5	0.01	0.20	0.25	0.60	1.29
B6	0.01	0.20	0.25	0.79	1.68
Total	**0.27**			**43.86**	**85.33**

See ***Appendix 'G'*** for calculations. Runoff for areas B1-B5 will be restricted before outletting off site. The flow will be restricted, and the required storage will be provided within the depressed storage area. The flow will be controlled by an inlet control device and weir at the outlet of the depressed storage area. The restriction device will account for the unrestricted flow (Area B6) leaving the site. This quantity and quality control will be further detailed in Sections 7.5 and 7.6.

6.5 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 total pre-development flow rate with a combined C value of 0.27. (See ***Appendix 'B'*** for pre-consultation notes). These values create the following allowable release rates and storage volumes for the development site.

See ***Appendix 'G'*** for calculations.

Reducing site flows will be achieved using flow restrictions and will create the need for onsite storage. Runoff from areas B1 to B5 will be restricted as shown in the table below.

Table 6: Post-Development Restricted Runoff Summary

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	13.40	25.52	14.89	31.89	17.69	31.73	18.88	33.23
B2	22.86	43.53						
B3	4.90	10.49						
B4	1.32	2.83						
B5	0.60	1.29						
B6	0.79	1.68	0.79	1.68				
Total	**43.86**	**85.33**	**15.67**	**33.58**				

See ***Appendix 'G'*** for calculations.

Runoff from Area B1 to B5 will be restricted through a combination of an 127 mm diameter orifice and a 1 m wide weir located at the outlet of the depressed storage area. The total flow leaving the depressed area will be ***14.89 L/s*** and ***31.89 L/s*** during the 5 and 100-year storm events, respectively. This will result in ponding depths of 25 and 36 cm for the 5 and 100-year storm events, respectively. Approximately ***31.70 m^3*** of storage will be required on site to attenuate flow to the established release rate of ***33.58 L/s***. Storage required for this area will be located in the depressed storage area. Runoff from area B6 will be unrestricted and flow towards the back of the site before traveling off site to the exiting swale. See below table for details of the required and provided storage volumes.

Table 7: Storage Summary

Drainage Area	Depth of Ponding (m)	Storage Required (m^3)	Storage Available (m^3)	Depth of Ponding (m)	Storage Required (m^3)	Storage Available (m^3)
	5-Year			100-Year		
B1-B5	0.25	17.69	18.88	0.36	31.73	33.23

See ***Appendix 'G'*** for calculations.

In the event that there is a rainfall above the 100-year storm event an emergency overland flow route has been provided so that the storm water runoff will be conveyed over the northeast wall of the storage area and flow off site directly to the existing swale at the back of the site.

6.6 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.

An orifice plug located at the outlet of the depressed storage area that will restrict flows from the site, causing temporary ponding within the depressed storage area. There will be an opportunity for particle settlement during this process. The City sewer system is tributary to the EcoWoods Pond where additional quality treatment is provided.

7.0 EROSION AND SEDIMENT CONTROL

7.1 Temporary Measures

Before construction begins, temporary silt fence, straw bale or rock flow check dams will be installed at all natural runoff outlets from the property. It is crucial that these controls be maintained throughout construction and inspection of sediment and erosion control will be facilitated by the Contractor or Contract Administration staff throughout the construction period.

Silt fences will be installed where shown on the final engineering plans, specifically along the downstream property limits. The Contractor, at their discretion or at the instruction of the City, Conservation Authority or the Contract Administrator shall increase the quantity of sediment and erosion controls on-site to ensure that the site is operating as intended and no additional sediment finds its way off site. The rock flow, straw bale & silt fence check dams and barriers shall be inspected weekly and after rainfall events. Care shall be taken to properly remove sediment from the fences and check dams as required. Fibre roll barriers are to be installed at all existing curb inlet catchbasins and filter fabric is to be placed under the grates of all existing catchbasins and manholes along the frontage of the site and any new structures immediately upon installation. The measures for the existing/proposed structures is to be removed only after all areas have been paved. 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.

Although not anticipated, work through winter months shall be closely monitored for erosion along sloped areas. Should erosion be noted, the Contractor shall be alerted and shall take all necessary steps to rectify the situation. Should the Contractor's efforts fail at remediating the eroded areas, the Contractor shall contact the City and/or Conservation Authority to review the site conditions and determine the appropriate course of action. As the ground begins to thaw, the Contractor shall place silt fencing at all required locations as soon as ground conditions warrant. Please see the *Site Grading, Drainage and Sediment & Erosion Control Plan* for additional details regarding the temporary measures to be installed and their appropriate OPSD references.

7.2 Permanent Measures

Rip-rap will be placed at all locations that have the potential for concentrated flow. It is crucial that the Contractor ensure that the geotextile is keyed in properly to ensure runoff does not undermine the rip rapped area. Additional rip rap is to be placed at erosion prone locations as identified by the Contractor / Contract Administrator / City or Conservation Authority.

It is expected that the Contractor will promptly ensure that all disturbed areas receive topsoil and seed/sod and that grass be established as soon as possible. Any areas of excess fill shall be removed or levelled as soon as possible and must be located a sufficient distance from any watercourse to ensure that no sediment is washed out into the watercourse. As the vegetation growth within the site provides a key component to the control of sediment for the site, it must be properly maintained once established. Once the construction is complete, it will be up to the landowner to maintain the vegetation and ensure that the vegetation is not overgrown or impeded by foreign objects.

8.0 SUMMARY

- A new 513.84 m^2 two storey office building will be constructed at 1037 Carp Road;
- The FUS method estimated fire flow indicated 6000 L/min is required for the proposed development;
- A new 150 mm diameter watermain will be installed to service the site, connecting to the watermain on Carp Road;
- A new septic system will be installed to service the proposed site;
- Stormwater will sheet flow towards proposed swales which will be directed towards the depressed storage area before outletting of site at the west property line;
- Storage for the 5 through 100-year storm events will be provided within the depressed storage area and be controlled with an orifice plug and weir; and
- The depressed storage area will promote particle settlement before entering the existing ditch off site.

9.0 RECOMMENDATION

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 Office Building at 1037 Carp Road.

This report is respectfully being submitted for approval.

Regards,

McIntosh Perry Consulting Engineers Ltd.

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10.0 STATEMENT OF LIMITATIONS

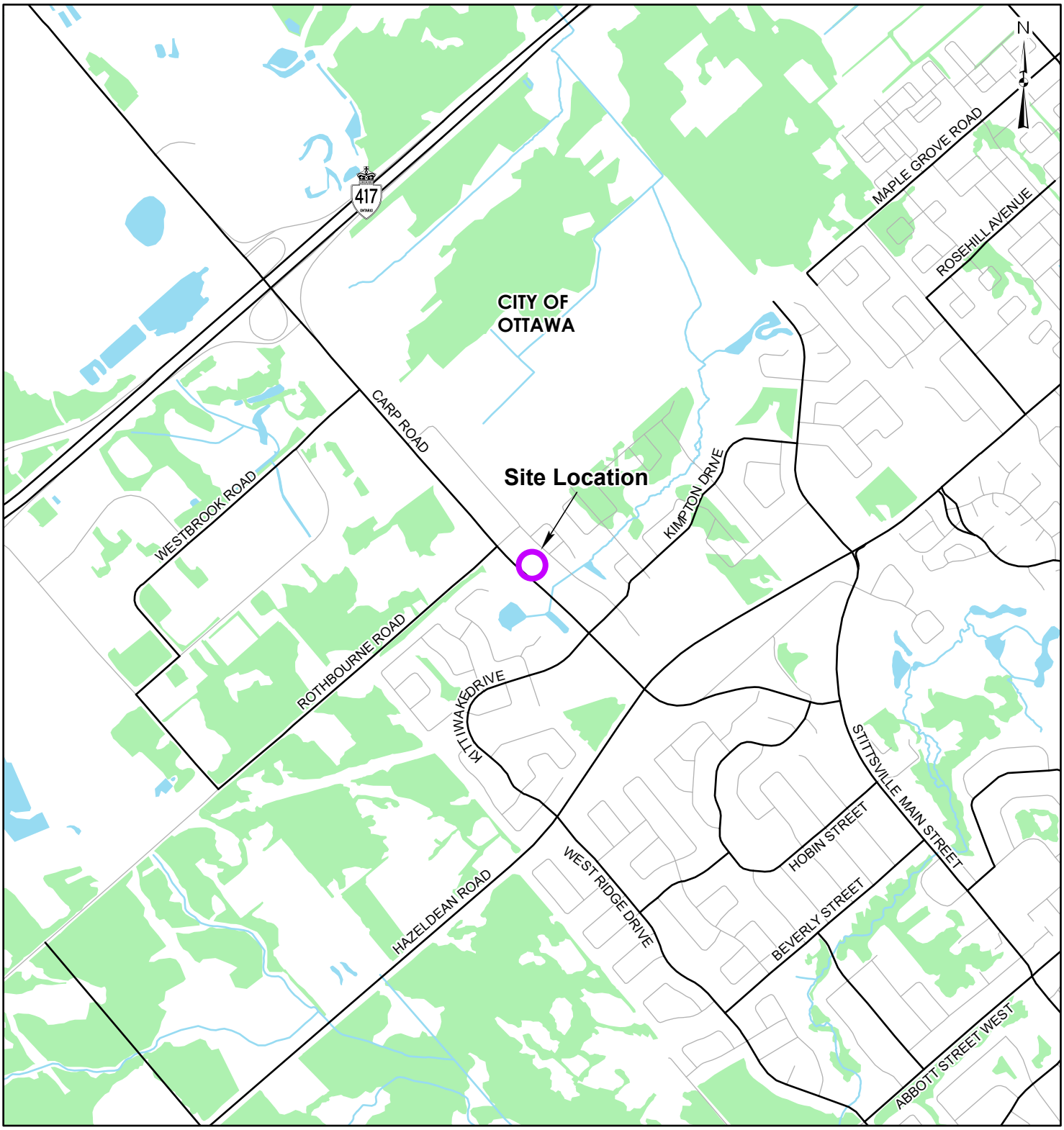
This report was produced for the exclusive use of Project 1 Studios. The purpose of the report is to assess the existing stormwater management system and provide recommendations and designs for the post-construction scenario that are in compliance with the guidelines and standards from the Ministry of the Environment, Conservation and Parks, 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
SITE LOCATION PLAN

McINTOSH PERRY



500 250 0 500

Scale 1:20,000 Metres

LEGEND

- Site Location
- Local Road
- Major Road
- Watercourse
- Waterbody
- Wooded Area

REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources and Forestry, 2021.

CLIENT: PROJECT 1 STUDIOS

PROJECT: PHASE I ESA
1037 CARP ROAD, OTTAWA, ON

TITLE: SITE LOCATION PLAN

McINTOSH PERRY
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PROJECT NO: CCO-19-0125	
Date	Aug., 18, 2021
GIS	EU
Checked By	BS

FIGURE: 1

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APPENDIX B
CITY OF OTTAWA PRE-CONSULTATION NOTES

McINTOSH PERRY

File Number: PC2019-0167
November 26, 2019

1037 Carp Road
Pre-application Consultation Meeting Notes

Location: Room 4102E, City Hall
Date: November 18, 2019

Attendees:	Colette Gorni, Planner, City of Ottawa Justin Armstrong, Engineering Intern (Infrastructure), City of Ottawa Josiane Gervais, Project Manager (Transportation), City of Ottawa Mark Richardson, Planning Forester, City of Ottawa Matthew Ippersiel, Planner (Urban Design), City of Ottawa Debbie Belfie, Planner, DG Belfie Planning and Development Consulting Ltd. Jim Bell, Architect, Jim Bell Architecture Design Inc.
Regrets:	Matthew Hayley, Environmental Planner, City of Ottawa Justyna Garbos, Planner (Parks), City of Ottawa

Comments from the Applicant

1. The applicant is proposing to construct two 2-storey office buildings and an associated parking lot. The buildings are to be developed in two phases.
2. At the time of purchase, the now-owner was informed that there were sanitary services on this portion of Carp Road. It was not until the applicant first requested a pre-application consultation meeting in August 2019, that they were made aware that the sanitary sewer along Carp Road is a trunk sanitary sewer and connection to a trunk is not possible. As a result, the site requires private services to be developed. A private septic system is proposed.
3. The Official Plan (OP) has policies that do not allow for private services in the public service area. However, there is an exception in the OP that allows for a single building comprised of a commercial use to connect to private services in certain situations.
4. The proposed development has been significantly scaled back in order to meet the requirements of the OP exception. The Phase 1 building is now much smaller than originally proposed.
5. The Phase 2 lands are to remain vacant until such a time that sanitary services are accessible. At this time, the Phase 1 Building may be expanded and/or redeveloped.

Planning Comments

1. This is a formal pre-application consultation meeting for a “New – Site Plan Control Application – Standard”. Application form, timeline and fees can be found here.

2. Cash-in-lieu of parkland will be required as a condition of approval, as per the Parkland Dedication By-law. Parks will take cash-in-lieu of parkland equivalent to 2% of the value of the development area.
3. Please look for more opportunities for tree retention. As the Phase 2 lands are not to be developed for quite some time, these trees should be retained in the meantime.
4. Ensure that dimensions related to zoning provisions are shown on site plan (i.e. parking stall size).
5. Provide a rationale for the private servicing in a public service area in the planning rationale. The exception should be identified, as well as reasoning for why it is necessary, and steps taken to address the OP policies.
6. Please reach out to the applicable Ward Councillor and set up a meeting to present plans for the site.

Urban Design Comments

6. There is general support for the site layout and especially for locating the building(s) towards the front property line to help frame the street.
7. The design team is strongly encouraged to include more or larger windows on the building façade facing Carp Road. Avoid having a predominantly blank wall face the public realm. Additional urban design comments will be provided once the elevations are provided. Please ensure they detail materials and colours.
8. Retaining a landscaping buffer at the rear of the property is a good gesture to the neighbouring residential buildings and it is a feature that should be retained in future plans.
9. As the rear of the building will effectively be facing towards and in close proximity to the side property line, consider what relationship it will create with the neighbouring property. As shown, the rear doors will open four feet from the property line. Will they connect to a paved walkway that wraps fully around the building? Will trees be retained in this location to screen it from the neighbouring property? Will there be a fence to screen the walkway?

Transportation Comments

1. Follow Traffic Impact Assessment Guidelines
    - Screening form to start, full Traffic Impact Assessment if any of the triggers on the screening form are satisfied.

- Start this process asap. The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
- Request base mapping asap if RMA is required. Contact Engineering Services (https://ottawa.ca/en/city-hall/planning-and-development/engineering-services)

2. ROW protection on Carp Rd between Stittsville urban area north limit and Hazeldean is 37.5m even.
3. Clear throat requirements for offices that are <5,000 m^2 on an arterial is 15m (see TAC Table 8.9.3).
4. Noise Impact Study required for the following:
    - Stationary (if there will be any exposed mechanical equipment due to the proximity to neighboring noise sensitive land uses)
5. On site plan:
    - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
    - Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).
    - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
    - Show lane/aisle widths.
    - Grey out any area that will not be impacted by this application.
6. AODA legislation is in effect for all organizations, please ensure that the design conforms to these standards (see attached checklist).

Feel free to contact Josiane Gervais, Transportation Project Manager, for follow-up questions.

Engineering Comments

Water

1. Water is available along Carp Road.

2. A watermain boundary condition request should be made for the proposed connection to the City watermain. As part of the request, anticipated domestic demands and FUS fireflow requirements (with calculations shown) should be provided along with a screenshot of the proposed connection location. The request can be sent to justin.armstrong@ottawa.ca.

Sanitary

3. Future sanitary sewer extensions along Carp Road have not been confirmed. If sanitary sewers are to be extended along Carp, extensions are not anticipated prior to 2031.

4. As there is no sanitary sewer available in Carp Road, the site will need to be serviced privately via a septic system. Although within the public service area, as per Section 2.3.2, Policy 14 of the Official Plan, where no provision for public services exists, the City may permit development on private services in defined Public Service Areas provided that it can be demonstrated to the satisfaction of the City that such development: a. Is proposed in a circumstance where public services are not currently technically or financially feasible; b. Can adequately be serviced by private individual services in accordance with Section 4.4; c. Is of a minor nature that consists of a single building comprising a commercial, institutional or public use; residential infilling within residential clusters; a farm severance as provided for in Section 3.7.3 of this Plan or other uses of similar nature and scale; d. Will not compromise the longer-term development of the area on public services. Items b. and c. will need to be demonstrated/justified as part of the site servicing submissions for the proposed development.

5. A Septic Impact Assessment is required in order to ensure that the proposed septic system does not contaminate the groundwater that is used as a source of drinking water in the surrounding area. The Septic Impact Assessment should confirm that the impact is acceptable and should identify the type of proposed septic system, level of treatment, amount of septic flow based on employment or building specs, impermeable land cover, proposed stormwater management/infiltration features, etc. There are several additional ‘tools’ to help ensure that there is sufficient nitrate dilution onsite specific for the Carp Road Corridor outlined in a memo dated September 26, 2016. If the consultant is unaware of the memo or for more details regarding the Septic Impact Assessment requirement, please contact Tessa Di Iorio at extension 17658 or at tessa.diiorio@ottawa.ca. If the septic system treats over 10,000 L/day, an ECA will be required and the MECP will review the Impact Assessment.

6. The size and location of the proposed building will likely be governed by the septic system’s ability to adequately treat the sewage flows (i.e. findings of the Septic

Impact Assessment – larger building = more sewage to treat) and required offsets between the proposed septic system and the proposed building, neighbouring lots/buildings, wells, etc.

7. Proof of approval from the Ottawa Septic System Office (OSSO) will be required for the proposed septic system.
8. Mississippi Valley Conservation Authority should be consulted regarding any requirements they may have.

Storm

9. Post-development peak flows for the site will need to be controlled to pre-development peak flows. The existing drainage patterns for the site must be maintained. It is imperative that additional runoff is not directed to any neighbouring property.

Feel free to Contact Justin Armstrong, Infrastructure Project Manager, for follow-up questions.

Forestry Comments

TCR requirements:

1. a Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City; an approved TCR is a requirement for Site Plan approval
2. any removal of privately-owned trees 10cm or larger in diameter requires a tree permit issued under the Urban Tree Conservation Bylaw; the permit is based on the approved TCR
3. any removal of City-owned trees will require the permission of Forestry Services who will also review the submitted TCR
4. for this site, the TCR may be combined with the Landscape Plan provided all information is clearly displayed
    a. if possible, please submit separate plans showing 1) existing tree inventory, and 2) a plan showing to be retained and to be removed trees with tree protection details
5. the TCR must list all trees on site by species, diameter and health condition – separate stands of trees may be combined using averages

6. Butternut trees are a regulated species under the Endangered Species Act and may be present on site – all butternut should be addressed within the TCR
7. the TCR must address all trees with a critical root zone that extends into the developable area – all trees that could be impacted by the construction that are outside the developable area need to be addressed.
8. trees with a trunk that crosses/touches a property line are considered co-owned by both property owners; permission from the adjoining property owner must be obtained prior to the removal of co-owned trees
9. If trees are to be removed, the TCR must clearly show where they are, and document the reason they can not be retained – please provide a plan showing retained and removed treed areas
10. All retained trees must be shown and all retained trees within the area impacted by the development process must be protected as per City guidelines listed on Ottawa.ca
    a. The location of tree protection fencing must be shown on a plan
    b. Include distance indicators from the trunk of the retained tree to the nearest part of the tree protection fencing
    c. Show the critical root zone of the retained trees
    d. If excavation will occur within the critical root zone, please show the limits of excavation and calculate the percentage of the area that will be disturbed
11. the City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees that will contribute to the design/function of the site.
12. Tree removal should be restricted to areas that are required for site development of this phase only.
13. Tree removal restrictions to accommodate for nesting birds will be in place from April 1 to August 15.
14. Please ensure newly planted trees have an adequate soil volume for their size at maturity.
15. For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca

File Number: PC2019-0167
November 26, 2019

Environmental Comments

1. The only trigger for an EIS is potential species at risk, namely the butternut tree. Accordingly, if the TCR includes butternut, an EIS is not required.

Sincerely,

Colette Gorni
Planner I
Development Review - West

APPENDIX C
WATERMAIN CALCULATIONS

McINTOSH PERRY

Boundary Conditions
1037 Carp Road

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	4	0.07
Maximum Daily Demand	6	0.10
Peak Hour	11	0.18
Fire Flow Demand #1	3,000	50.00

Location

Results

Connection 1 – Carp Rd.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	159.9	47.9
Peak Hour	156.6	43.2
Max Day plus Fire 1	156.4	42.8

[1] Ground Elevation = 126.2 m

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. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

McINTOSH PERRY

CCO-19-0125 - 1037 Carp Road - Water Demands

Project:	1037 Carp Road
Project No.:	CCO-19-0125
Designed By:	B.G.S
Checked By:	R.D.F
Date:	August 17, 2021
Site Area:	0.27 gross ha
Office Units	14 units
Office Area	525.00 m^2

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	*280*	*L/c/d*
Industrial - Light	*35,000*	*L/gross ha/d*
Industrial - Heavy	*55,000*	*L/gross ha/d*
Office	***75***	***L /(7m ^{2} /d)***
Amenity Space	*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	**3.91**	**L/min**
	5.63	**m^3/day**

MAXIMUM DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	2.8 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	**5.86**	**L/min**
	8.44	**m^3/day**

MAXIMUM HOUR DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	5.4 x avg. day	L/c/d
Industrial	1.8 x max. day	L/gross ha/d
Commercial	***1.8 x max. day***	***L/gross ha/d***
MAXIMUM HOUR DEMAND	**10.55**	**L/min**
	15.19	**m^3/day**

WATER DEMAND DESIGN FLOWS PER UNIT COUNT
CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010
FOR POPULATIONS BELOW 501, MOE DESIGN GUIDELINES FOR DRINKING WATER SYSTEMS USED

McINTOSH PERRY

CCO-19-0125 - 1037 Carp Road - OBC Fire Calculations

Project:	1037 Carp Road
Project No.:	CCO-19-0125
Designed By:	B.G.S
Checked By:	R.D.F
Date:	August 17, 2021

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

***Water Supply for Fire-Fighting* - Residential**

Building is classified as Group : C and F2 up to 2 Storeys

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

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	**10**	(from Table 1 pg A-31)
V	**2,689**	(Total building volume in m^3.)
Stot	**2.0**	(From figure 1 pg A-32)
Q =	**53,779.60 L**	

→

			From Figure 1 (A-32)
Snorth	2.5	m	0.5
Seast	9.5	m	0.0
Ssouth	30.1	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 < 108,000 L)
713 gpm

McINTOSH PERRY

CCO-22-1241 - 2025 Othello Ave - Fire Underwriters Survey

Project:	1037 Carp Road
Project No.:	CCO-19-0125
Designed By:	B.G.S
Checked By:	R.D.F
Date:	August 17, 2021

From the Fire Underwriters Survey (1999)

From Part II – Guide for Determination of Required Fire Flow Copyright I.S.O.:
Updated per City of Ottawa Technical Bulletin ISTB-2018-02

A. BASE REQUIREMENT (Rounded to the nearest 1000 L/min)

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.

Construction Type Ordinary Construction

C 1 **A** **995.9** m^2

Caluclated Fire Flow	**6,942.8 L/min**
	7,000.0 L/min

B. REDUCTION FOR OCCUPANCY TYPE (No Rounding)

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

Limited Combustible -15%

Fire Flow	**5,950.0 L/min**

C. REDUCTION FOR SPRINKLER TYPE (No Rounding)

Standard Water Supply Sprinklered -40%

Reduction	**-2,380.0 L/min**

D. INCREASE FOR EXPOSURE (No Rounding)

	Separation Distance (m)	Cons.of Exposed Wall	Length Exposed Adjacent Wall (m)	Height (Stories)	Length-Height Factor	
Exposure 1	10.1 to 20	Non-Combustible	43	1	43.0	13%
Exposure 2	10.1 to 20	Non-Combustible	12	2	24.0	12%
Exposure 3	30.1 to 45	Non-Combustible	43	1	43.0	5%
Exposure 4	30.1 to 45	Non-Combustible	12	1	12.0	5%
					% Increase*	**35%**

Increase*	**2,082.5 L/min**

E. Total Fire Flow (Rounded to the Nearest 1000 L/min)

Fire Flow	**5,652.5 L/min**
Fire Flow Required**	**6,000.0 L/min**

*In accordance with Part II, Section 4, the Increase for separation distance is not to exceed 75%
**In accordance with Section 4 the Fire flow is not to exceed 45,000 L/min or be less than 2,000 L/min

McINTOSH PERRY

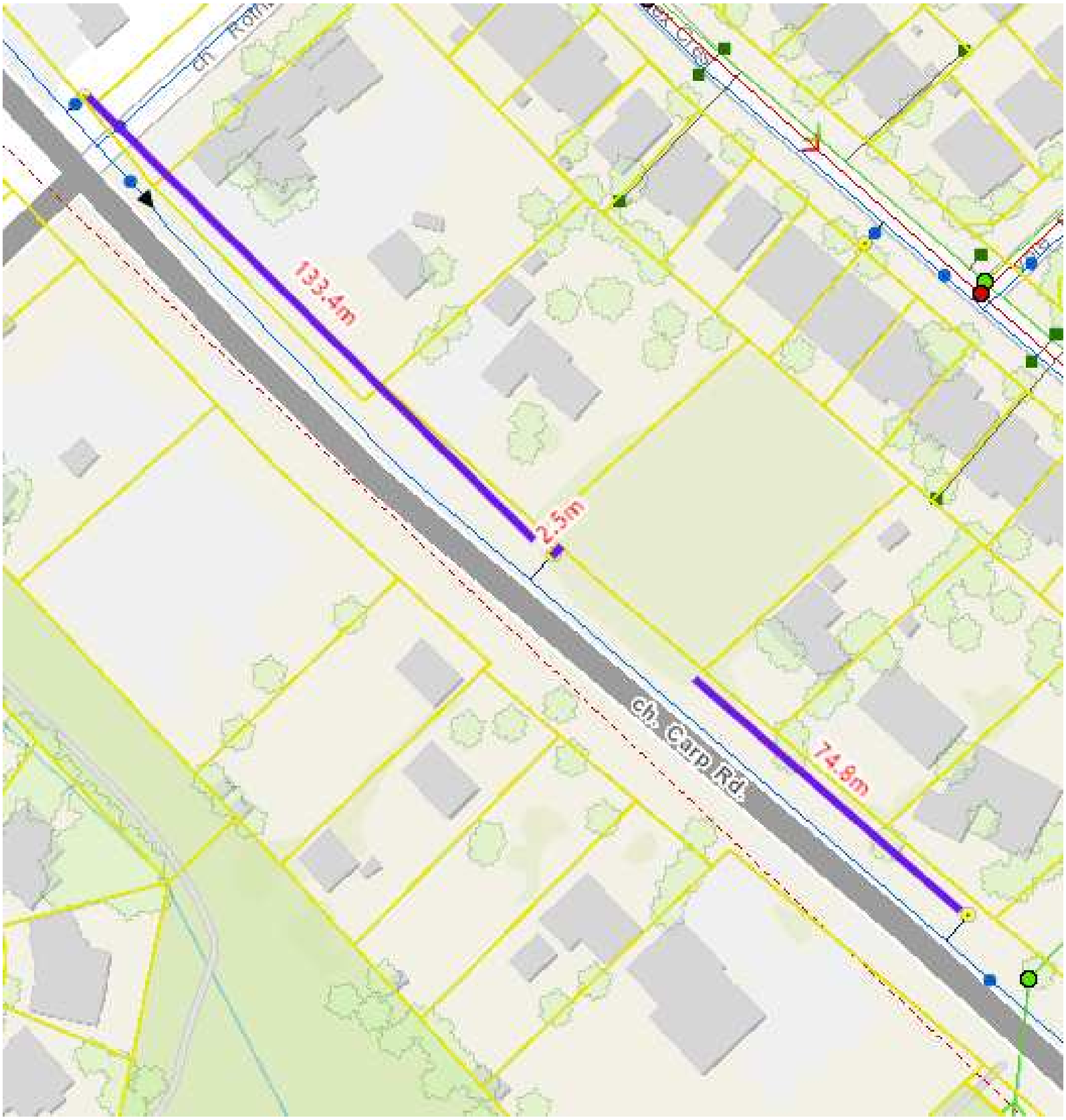
CCO-19-0125 - 1037 Carp Road - CITY OF OTTAWA BOUNDARY CONDITION RESULTS

Project:	1037 Carp Road
Project No.:	CCO-19-0125
Designed By:	B.G.S
Checked By:	R.D.F
Date:	August 17, 2021

Boundary Conditions Unit Conversion

Scenario	Height (m)	Elevation (m)	m H_2O	PSI	kPa
Avg. DD	159.9	126.2	33.7	47.9	330.6
Fire Flow (200 L/s)	156.6	126.2	30.4	43.3	298.2
Peak Hour	156.4	126.2	30.2	43.0	296.3

1037 Carp Road
Hydrant Proximities

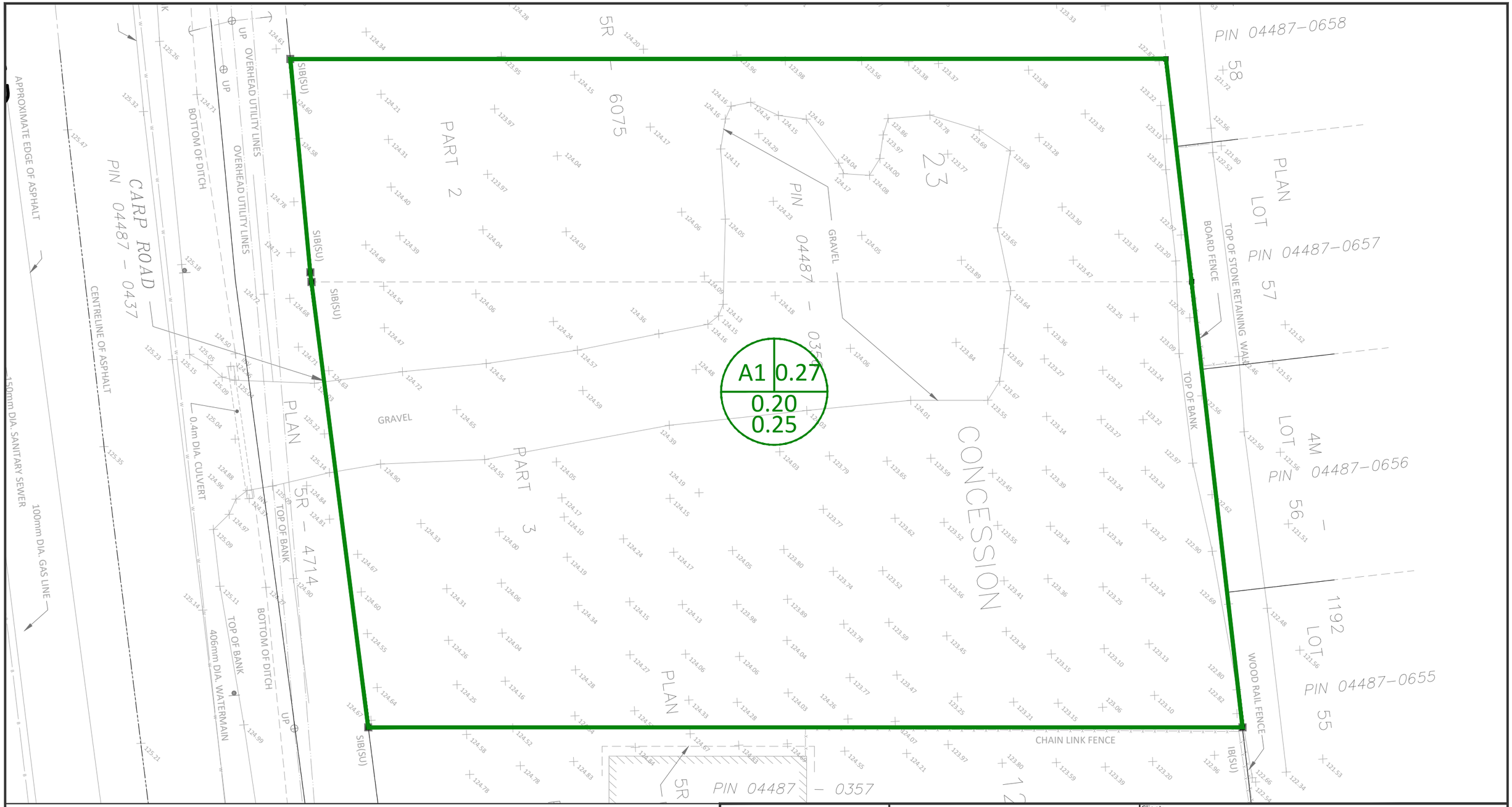


APPENDIX D
SANITARY CALCULATIONS

McINTOSH PERRY

APPENDIX E
PRE-DEVELOPMENT DRAINAGE PLAN

McINTOSH PERRY



SCALE 1 : 250

0 5 10 15 20 25 Metres

AREA I.D. | AREA (Ha)

A1 | 0.25

0.20

0.25

5yr & 100yr COEFFICIENT

N

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

Client: PROJECT 1 STUDIOS
300 - 260 ST. PATRICK STREET, OTTAWA, ON K1N 5K5

Project: PHASE 1 - OFFICE BUILDING
1037 CARP ROAD, OTTAWA, ON

Drawing Title: PRE-DEVELOPMENT DRAINAGE AREA PLAN

Drawn by:	Checked By:			Drawing Number:
B.G.S	R.D.F			PRE
Scale:	Project Number:			
1:250	CP-19-0125			
		No.	Revisions	Date

FILENAME: U:\Ottawa\01 Project - Proposal\2019 Jobs\CP\OCP-Projects\OCP-19-0125 Jim Bell_Office Buildings_1037 Carp Road\Civil\12 - Drawings\CP-19-0125_Presentation.dwg
LAST SAVED: Tuesday, April 20, 2021 LAST SAVED BY: B.Smyk
LAST PLOTTED: Wednesday, August 18, 2021 CTB FILE: ENG

APPENDIX F
POST-DEVELOPMENT DRAINAGE PLAN

McINTOSH PERRY

B1 0.05
0.90
1.00

B2 0.09
0.90
1.00

B3 0.08
0.20
0.25

B4 0.02
0.20
0.25

B5 0.01
0.20
0.25

B6 0.01
0.20
0.25

SCALE 1 : 250

0 5 10 15 20 25 Metres

AREA I.D. — AREA (Ha)

B1 0.25
0.20
0.25

5yr & 100yr COEFFICIENT

N

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300 - 260 ST. PATRICK STREET, OTTAWA, ON K1N 5K5

Project: PHASE 1 - OFFICE BUILDING
1037 CARP ROAD, OTTAWA, ON

Drawing Title: POST-DEVELOPMENT DRAINAGE AREA PLAN

Drawn by:	Checked By:			Drawing Number:
B.G.S	R.D.F			POST
Scale:	Project Number:			
1:250	CP-19-0125	No.	Revisions / Date	

APPENDIX G
STORMWATER MANAGEMENT CALCULATIONS

McINTOSH PERRY

CP-19-0125 - 1037 Carp Road - SWM Design

Pre-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	C_{AVG} 5-Year	C_{AVG} 100-Year
A1	0.27	0.00	0.90	0.00	0.60	2,705.68	0.20	0.20	0.25

Pre-Development Runoff Calculations

Drainage Area	Area (ha)	C 2&5-Year	C 100-Year	Tc (min)	I (mm/hr)		Q (L/s)	
					5-Year	100-Year	5-Year	100-Year
A1	0.27	0.20	0.25	10	104.2	178.6	15.67	33.58
Total	**0.27**						**15.67**	**33.58**

Post-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	C_{AVG} 5-Year	C_{AVG} 100-Year
B1	0.05	514.08	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B2	0.09	876.89	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B3	0.08	0.00	0.90	0.00	0.60	845.21	0.20	0.20	0.25
B4	0.02	0.00	0.90	0.00	0.60	228.01	0.20	0.20	0.25
B5	0.01	0.00	0.90	0.00	0.60	103.63	0.20	0.20	0.25
B6	0.01	0.00	0.90	0.00	0.60	135.59	0.20	0.20	0.25
Total	**0.27**								

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	0.05	0.90	1.00	10	104.2	178.6	13.40	25.52
B2	0.09	0.90	1.00	10	104.2	178.6	22.86	43.53
B3	0.08	0.20	0.25	10	104.2	178.6	4.90	10.49
B4	0.02	0.20	0.25	10	104.2	178.6	1.32	2.83
B5	0.01	0.20	0.25	10	104.2	178.6	0.60	1.29
B6	0.01	0.20	0.25	10	104.2	178.6	0.79	1.68
Total	**0.270**						**43.86**	**85.33**

Required Restricted Flow

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
Total	0.27	0.20	0.25	10	104.2	178.6	15.67	33.58

Post-development 5 & 100-year flows to match pre-development 5 & 100-year flows

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	13.40	25.52	14.89	31.89	17.69	31.73	18.88	33.23
B2	22.86	43.53						
B3	4.90	10.49						
B4	1.32	2.83						
B5	0.60	1.29						
B6	0.79	1.68	0.79	1.68				
Total	**43.86**	**85.33**	**15.67**	**33.58**				

CP-19-0125 - 1037 Carp Road - Site Storage

Storage Requirements for Areas B2-B7

5-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	B2 Runoff (L/s)	B3 Runoff (L/s)	B4 Runoff (L/s)	B5 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	13.40	22.86	4.90	1.32	0.60	14.89	28.19	16.91
12	94.7	12.18	20.78	4.45	1.20	0.55	14.89	24.26	17.47
14	86.9	11.18	19.07	4.09	1.10	0.50	14.89	21.05	17.69
16	80.5	10.35	17.65	3.78	1.02	0.46	14.89	18.38	17.64
18	75.0	9.64	16.45	3.52	0.95	0.43	14.89	16.11	17.40
20	70.3	9.04	15.41	3.30	0.89	0.40	14.89	14.16	16.99
22	66.1	8.51	14.51	3.11	0.84	0.38	14.89	12.46	16.45
24	62.5	8.04	13.72	2.94	0.79	0.36	14.89	10.97	15.79
26	59.3	7.63	13.02	2.79	0.75	0.34	14.89	9.65	15.05

Maximum Storage Required 5-Year (m^3) =	17.69

100-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	B2 Runoff (L/s)	B3 Runoff (L/s)	B4 Runoff (L/s)	B5 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	178.6	25.52	43.53	10.49	2.83	1.29	31.89	51.76	31.05
12	162.1	23.17	39.52	9.52	2.57	1.17	31.89	44.06	31.72
14	148.7	21.25	36.25	8.74	2.36	1.07	31.89	37.78	31.73
16	137.5	19.66	33.53	8.08	2.18	0.99	31.89	32.54	31.24
18	128.1	18.30	31.22	7.52	2.03	0.92	31.89	28.11	30.36
20	120.0	17.14	29.24	7.05	1.90	0.86	31.89	24.30	29.16
22	112.9	16.13	27.52	6.63	1.79	0.81	31.89	20.99	27.70
24	106.7	15.25	26.00	6.27	1.69	0.77	31.89	18.08	26.04
26	101.2	14.46	24.66	5.94	1.60	0.73	31.89	15.51	24.19
28	96.3	13.76	23.47	5.66	1.53	0.69	31.89	13.21	22.19

Maximum Storage Required 100-Year (m^3) =	31.73

5-Year Storm Event Storage Summary

	Water Elev. (m) =		123.05		
Location	INV. (out)	Area (m^2)	Depth (m)	Head (m)	Volume (m^3)
Dry Retention Pond	122.80	126.4	0.25	0.25	18.9

Storage Available (m^3) =	18.9	*
Storage Required (m^3) =	17.7	

100-Year Storm Event Storage Summary

	Water Elev. (m) =		123.16		
Location	INV. (out)	Area (m^2)	Depth (m)	Head (m)	Volume (m^3)
Dry Retention Pond	122.80	161.0	0.36	0.36	33.2

Storage Available (m^3) =	33.2	*
Storage Required (m^3) =	31.7	

*Available Storage calcualted from AutoCAD

CP-19-0125 - 1037 Carp Road - Outlet Control Device

For Orifice Flow, C= 0.60
For Weir Flow, C= 1.84

	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	122.80	X	123.12	X
center of crest elevation	122.86	X	X	X
orifice width / weir length	127 mm	X	1.00 m	X
weir height				X
orifice area (m^2)	0.013	X	x	X

Elevation Discharge Table - Storm Routing

Elevation	Orifice 1		Orifice 2		Weir 1		Weir 2		Total	
	H [m]	Q [m^3/s]	H [m]	Q [m^3/s]	H [m]	Q [m^3/s]	H [m]	Q [m^3/s]	Q [L/s]	
122.85	x	x	x	x	x	x	x	x	0.0	
122.86	x	x	x	x	x	x	x	x	0.0	
122.87	0.01	0.003	x	x	x	x	x	x	2.7	
122.88	0.02	0.004	x	x	x	x	x	x	4.3	
122.89	0.03	0.005	x	x	x	x	x	x	5.5	
122.90	0.04	0.006	x	x	x	x	x	x	6.4	
122.91	0.05	0.007	x	x	x	x	x	x	7.3	
122.92	0.06	0.008	x	x	x	x	x	x	8.0	
122.93	0.07	0.009	x	x	x	x	x	x	8.7	
122.94	0.08	0.009	x	x	x	x	x	x	9.3	
122.95	0.09	0.010	x	x	x	x	x	x	9.9	
122.96	0.10	0.010	x	x	x	x	x	x	10.5	
122.97	0.11	0.011	x	x	x	x	x	x	11.0	
122.98	0.12	0.011	x	x	x	x	x	x	11.5	
122.99	0.13	0.012	x	x	x	x	x	x	12.0	
123.00	0.14	0.012	x	x	x	x	x	x	12.4	
123.01	0.15	0.013	x	x	x	x	x	x	12.9	
123.02	0.16	0.013	x	x	x	x	x	x	13.3	
123.03	0.17	0.014	x	x	x	x	x	x	13.7	
123.04	0.18	0.014	x	x	x	x	x	x	14.1	
123.05	0.19	0.015	x	x	x	x	x	x	14.5	
123.06	0.20	0.015	x	x	x	x	x	x	14.9	5-Year
123.07	0.21	0.015	x	x	x	x	x	x	15.3	
123.08	0.22	0.016	x	x	x	x	x	x	15.7	
123.09	0.23	0.016	x	x	x	x	x	x	16.0	
123.10	0.24	0.016	x	x	x	x	x	x	16.4	
123.11	0.25	0.017	x	x	x	x	x	x	16.7	
123.12	0.26	0.017	x	x	x	x	x	x	17.1	
123.13	0.27	0.017	x	x	0.01	0.00	x	x	18.6	
123.14	0.28	0.018	x	x	0.02	0.00	x	x	22.1	
123.15	0.29	0.018	x	x	0.03	0.01	x	x	26.5	
123.16	0.30	0.018	x	x	0.04	0.01	x	x	31.9	100-Year
123.17	0.31	0.019	x	x	0.05	0.02	x	x	37.9	
123.18	0.32	0.019	x	x	0.06	0.03	x	x	44.5	

Notes:
1. For Orifice Flow, User is to Input an Elevation Higher than Crown of Orifice.
2. Orifice Equation: $Q = cA(2gh)^{1/2}$
3. Weir Equation: $Q = CLH^{3/2}$
4. These Computations Do Not Account for Submergence Effects Within the Pond Riser.
5. H for orifice equations is depth of water above the centroide of the orifice.
6. H for weir equations is depth of water above the weir crest.