SERVICING AND STORMWATER MANAGEMENT REPORT

Project No.: 0CP-16-0462 – 745 Mikinak Road

Prepared for:

CSV Architects
1066 Somerset St. W, Ottawa, ON K1Y 4T3

Prepared by:

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July, 2018

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1.0 PROJECT DESCRIPTION

1.1 Purpose

McIntosh Perry (MP) has been retained by CSV Architects (CSV Consultants Inc.) to prepare this Servicing and Stormwater Management Report in support of the Site Plan Control process for the proposed MHI Veterans House located at 745 Mikinak Road.

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 Rideau Valley Conservation Authority (RVCA) 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 drawings:

- CP-16-0462, C101 – Site Grading, Drainage Plan, Sediment & Erosion Control Plan, and
- CP-16-0462, C102 – Site Servicing Plan.

1.2 Site Description

The property is located at 745 Mikinak Road, located in within the former CFB Rockcliffe. It is described as Block 23 Registered Plan 4M-1581. The land in question covers approximately 0.46 ha and is located north of Mikinak Road, west of Moses Temisco Street and east of Michael Stoqua Street.

The existing site is part of the former CFB Rockcliffe Community; it is not currently developed. The site currently consists of some grassed area and some trees. The existing site has no sanitary or water services, however there are storm services within the northwest portion of the site that will be capped and blanked as per City Standard Drawing S11.4.

The proposed development consists of a 1,615 m², three storey Veteran's House. Parking, garden, dog walk and amenity areas will be provided throughout the site along with landscaping. There will be one site accesses for the development; a new entrance extending from Moses Temisco Street is proposed.

2.0 BACKGROUND STUDIES

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

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

A topographic survey of the site was completed by Farley, Smith & Denis Surveying LTD. dated June 25th, 2018 and can be found under separate cover.

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

- Geotechnical Investigation completed by McIntosh Perry dated July 2018.

3.0 PRE-CONSULTATION SUMMARY

City of Ottawa Staff have been pre-consulted regarding this proposed development in person on January 6th, 2017. 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.
- Control 5 through 100-year post-development flows to the 5-year pre-development flows with a combined C value of 0.70.
- Low Impact Development (LID) according to the requirements of the MSS

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

4.0 EXISTING SERVICES

There are no existing water or sanitary laterals servicing the site due to the undeveloped nature of the location on the CFB Rockliffe Community in pre-development conditions. Some storm services are present within the northwest portion of the site. The following subsections describe the existing services within the Mikinak Road right-of-way, the Moses Tenisco Avenue right-of-way and the Michael Stoqua Street right-of-way.

4.1 Mikinak Road

There is an existing 375 mm diameter sanitary main as well as a 2,400 mm diameter storm sewer located within Mikinak Road.

There is also a 300 mm PVC diameter watermain within the south boulevard. The watermain services the fire hydrants located along the south side of Mikinak Road.

Hydro, gas, cable and bell services will be contacted to determined serviceability from this right-of-way.

4.2 Moses Tenisco Street

There is an existing 250 mm diameter sanitary main as well as a 525mm diameter storm sewer increasing to a 750mm diameter storm sewer.

There is also a 200 mm diameter watermain within the eastern boulevard. The watermain services the fire hydrants located along the east side of Moses Tenisco Street.

Hydro, gas, cable and bell services will be contacted to determined serviceability from this right-of-way.

4.3 Michael Stoqua Street

There is an existing 250 mm diameter sanitary main as well as a 375mm diameter storm sewer increasing to a 600mm diameter storm sewer located within Michael Stoqua Street.

There is also a 200 mm diameter watermain within the east boulevard. The watermain services the fire hydrants located along the east side of Michael Stoqua Street.

Hydro, gas, cable and bell services will be contacted to determined serviceability from this right-of-way.

5.0 SERVICING PLAN

5.1 Proposed Servicing Overview

The overall servicing will be provided via the service connections to the mains along Moses Tenisco Street. The water servicing will be extended from the 200mm diameter watermain and similarly, the sanitary and storm services be extended from the existing 250mm diameter sanitary sewer main and the 525mm diameter storm sewer located on Moses Tenisco Street. Details pertaining to the final proposed servicing locations are shown on the proposed Site Servicing Plan included within the drawing package submission.

5.2 Proposed Water Design

A new 50 mm PVC diameter water lateral will be connected to the existing 200 mm PVC watermain within Moses Tenisco Street, complete with a water valve located at the property line. The proposed building will not be equipped with a sprinkler system. The required fire protection from the Ontario Building Code (OBC) is 2,700 L/min (See Appendix 'C' for calculation). The required fire protection from the Fire Underwriters Survey (FUS) is 11,000 L/min (provided for information purposes only).

The water demands for the new buildings have been calculated as per the Ottawa Design Guidelines – Water Distribution and are as follows: the average and maximum daily demands are 0.11 L/s and 0.27 L/s respectively. The maximum hourly demand was calculated as 0.70 L/s (Refer to Appendix 'C' for flow details). Boundary conditions have been provided by the City of Ottawa and can be found in Appendix 'C'.

5.3 Proposed Sanitary Design

A new 150 mm diameter gravity sanitary service will be connected to the existing 250 mm diameter sewer within Moses Tenisco Street. The sanitary service will be complete with a maintenance manhole (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 0.159 L/s, therefore the proposed 150 mm diameter lateral has sufficient capacity to convey the flows since a 150 mm diameter lateral at a slope of 2.0% has an available capacity of 48.39 L/s (See Appendix 'D' 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 Moses Tenisco Street as the amount of flow leaving the site is minimal.

5.4 Proposed Strom Design

Stormwater runoff will be conveyed by way of overland sheet flow from the north of the site to the southwest. Runoff will be concentrated within the asphalt parking areas, as well as the sunken garden area where it will flow towards inlets into an underground storm network. Some unrestricted runoff will be directed by overland sheet flow to an outlet discharging into the Micheal Stoqua Street right-of-way. The stormwater management design will be further detailed in Section 6.0.

5.5 Site Utilities

All relevant utility companies (telephone - Bell, gas – Enbridge Gas 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 the adjacent roads. The existing site connections are anticipated to be fed from the existing utilities currently within the right-of-way to the proposed site.

5.6 Service Locations/Cover

The proposed sanitary and water services will be placed on the east face of the proposed building towards the southern end of the site where they will tie into the existing 250 mm diameter sanitary and 200 mm diameter water mains within Moses Tennisco Street. The storm sewer will be under the entranceway as per typical urban development. Hydro, telephone, gas will be primarily placed in a common utility trench connecting to existing infrastructure along Resource Road. It is anticipated that the hydro, water and gas meter will be located at the centre of the building. The minimum cover for the sanitary, storm and water will be as follows:

Service	Minimum Cover
Sanitary Sewer	2.0m
Storm Sewer	2.0m
Watermain	2.4m

All minimum cover requirements are as per City of Ottawa Standards. 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 buildings and into a new underground storm sewer system within the site. This SWM plan will implement

quantity control strategies. The storm runoff will enter the pipe system through catchbasins (CB's), catchbasin manholes (CBMH's) and landscape catchbasins (LSCB) located throughout the site. The restricted stormwater runoff will be directed to the existing sewer within Moses Tenisco Street; alternatively, overland flow will be directed towards Michael Stoqua Street. In the Wateridge Village on Rockliffe master servicing plan outlines that the flows should be split between Moses Tenisco Street and Michael Stoqua Street. Contrarily, the approved block 22 development located north of the subject site will singularly discharge overland flow to Moses Tenisco requiring the subject development (block 23) to discharge the overland flow solely to Michael Stoqua Street. The quantitative and qualitative properties of the storm runoff for both the pre- and post-development flows are further detailed below.

Stormwater Best Management Practices (SWM BMP's) will be implemented at the "Lot level", "Conveyance" and "End of Pipe" locations. These concepts will be explained further in Section 6.3. To summarize, roof water will be directed to the storm network that will outlet into the existing infrastructure within Moses Tenisco Street right-of-way. Through correspondence with the Rideau Valley Conservation Authority (RVCA) the site is required to provide enhanced level of stormwater quality control, which will be provided by the stormwater pond as per the master servicing plan. A soakaway pit has also been proposed sized to infiltrate an equivalent amount of water as a 15mm storm event for its tributary area, which satisfies the water quality target as well as the infiltration target outlined in the master servicing plan. The soakaway pit has been designed with reference to the *LID Planning and Design Guide* by the Toronto Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC) (2010). Further details are provided in Sections 6.4.1 and 6.4.1.1.

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:

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 the pre-consultation meeting with the City of Ottawa the time of concentration (Tc) used for pre-development and post-development flows shall be calculated using a time of concentration (Tc) of 10 minutes.

6.2.1 Pre-Development Drainage

The existing site has been demonstrated as drainage area A1. Drawing CP-16-0462 PRE (Appendix 'E') indicates the limits of the drainage area. Existing conditions have the overland stormwater runoff flowing from the northeast to the southwest corner of the property. Table 1 demonstrates the existing flow rates in pre-development conditions.

Table 1: 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	0.46	0.20	0.25	26.6	57.0
Total	0.46			26.6	57.0

(See Appendix 'G' 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 southwest corner of the property. The proposed drainage areas are indicated on drawing CP-16-0462 POST (Appendix 'F'). Table 2 on the following page displays the post-development runoff generated by the proposed site.

Table 2: 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	0.086	0.90	1.00	22.5	42.8
B2	0.104	0.25	0.31	7.6	16.0
B3	0.065	0.36	0.43	6.7	13.9
B4	0.058	0.74	0.83	12.5	24.0
B5	0.050	0.69	0.78	10.1	19.4
B6	0.003	0.90	1.00	0.8	1.6
B7	0.093	0.25	0.31	6.8	14.2
Total	0.46			66.9	131.8

(See Appendix 'G' for Calculations)

Runoff from area B1 will be restricted by two roof drains before outletting to the existing storm system within Moses Tenisco Street. The restriction device will restrict the 100-yr runoff to the 5-yr pre-development flow rate. See Appendix 'G' 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 staff, the total post-development runoff for this site has been restricted to match the 5-year pre-development flow rates with a combined C value of 0.7 as per the *Former CFB Rockcliffe Master Servicing Study* (2015) by IBI Group (See Appendix 'B' for pre-consultation notes). These values create the following allowable release rates and storage volumes for the development site.

Table 3: Allowable Release Rate

Area	Drainage Area (ha)	Balanced Runoff Coefficient (C) 5-yr	5-Year Flow Rate (L/s)
A1	0.46	0.70	93.1

(See Appendix 'G' for Calculations)

Reducing site flows will be achieved using flow restrictions and will create the need for onsite storage. Runoff from area B1 will be restricted as detailed in the table on the following page.

Table 4: Post-Development Restricted Runoff

Area ID	Post-Development (Unrestricted) (l/s)		Post-Development (Restricted) (l/s)		
	5-yr	100-yr	5-yr	100-yr	
B1	22.5	42.8	1.0	1.7	RESTRICTED
B2	7.6	16.0	7.6	16.0	UNRESTRICTED
B3	6.7	13.9	6.7	13.9	
B4	12.5	24.0	12.5	24.0	
B5	10.1	19.4	10.1	19.4	
B6	0.8	1.6	0.8	1.6	
B7	6.8	14.2	6.8	14.2	
Total	66.9	131.8	45.4	90.7	

(See Appendix 'G' for Calculations)

Runoff from Area B1 will be restricted by two roof drains restricting the flows to 1.0 L/s and 1.7 L/s for the 5-year and 100-year storm events. The depth of rooftop storage for the 5 and 100-year storm events consist of 40mm and 70mm, respectively. Table 5 below details the required and provided rooftop storage volumes for the development.

Table 5: 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)
B1	0.040	23.3	26.3	0.070	44.6	46.0

(See Appendix 'G' for Calculations)

Runoff from areas B2 through B6 will flow unrestricted off-site by way of overland sheet flow that will inlet into the proposed storm network under the parking areas, dog park and sunken garden. The underground storm network will then discharge in to the existing infrastructure within Moses Tenisco Street. Contrarily, area B7 consists solely of unrestricted flow that will flow off-site via overland sheet flow into the Michael Stoqua Street right-of-way. As shown by comparison of the flows in Table 3 and Table 4, the 100-year post-development flow rates are below the 5-year pre-development rate.

6.4 Quality Control

The development of 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 include directing the runoff from the roof into a soakaway pit. Each

proposed catch basin will be equipped with a sump, which will provide an opportunity for initial filtration of any sediment by means of particle settlement.

Quality control is provided within the downstream SWM facility as per the *Former CFB Rockcliffe Master Servicing Study* (2015) by IBI Group. Although the runoff quality control will be provided downstream, each individual site has been tasked with further infiltration and quality targets as outlined by the *Former CFB Rockcliffe Redevelopment*: *Stormwater Management Existing Conditions Report & LID Pilot Project Scoping* by Aquafor Beech (2015). To achieve the individual lot targets for infiltration and erosion control (4mm) and water quality (15mm), a soakaway pit has been proposed and designed with reference to the *LID Planning and Design Guide* by TRCA/CVC (2010). Further details on the soakaway pit can be found within Sections 6.4.1 and its subsequent Subsections.

6.4.1 Soakaway Pit

As per the *Former CFB Rockcliffe Redevelopment: Stormwater Management Existing Conditions & LID Pilot Project Scoping* by Aquafor Beech (2015) the 4mm storm event is required to be infiltrated while the equivalent of the 15mm storm event must be treated at an enhanced level of total suspended solid removal (80%). To satisfy the targets, the proposed soakaway pit shall provide enough volume within the clear stone voids to infiltrate a volume of water equivalent to the 15mm event multiplied by the tributary area. An infiltration rate of 9.5mm/hr was used within the calculations based on information provided by the *Former CFB Rockcliffe Master Servicing Study* by IBI Group (2015). From review of the *Geotechnical Investigation completed* by McIntosh Perry the seasonally high groundwater elevation was determined to be 85.70.

6.4.1.1 Soakaway Pit Design

A Soakaway Pit has been designed for the site in order to meet the required infiltration and water quality target as per the *Former CFB Rockcliffe Redevelopment: Stormwater Management Existing Conditions & LID Pilot Project Scoping* by Aquafor Beech (2015). The Soakaway Pit will be constructed at the east side of the site within the parking and landscaped area. Storm runoff from the flat roof will be collected within the storm network and discharge into the soakaway pit. Runoff from both the sunken garden and the dog park have will also discharge into the soakaway pit. Due to extended purpose of the soakaway pit calculations have been shown in Appendix 'G' of this report showing the sizing procedure for a soakaway pit as per the *LID Planning and Design Guide* by TRCA/CVC (2010) but does not govern the design. The soakaway pit has been designed to meet the criteria noted in the following table:

Table 6: Soakaway Pit - MOECC Requirements

No.	Design Element	Criteria	Proposed Works
1	Water Table Depth	The seasonally high-water depth should be greater than 1m below the bottom of the soakaway pit	The water table depth is greater than 1m below the bottom of the soakaway (86.95) as per the geotechnical report. (85.70)

2	Depth to Bedrock	The depth to bedrock should be greater than 1m below the bottom of the soakaway pit	Depth of bedrock is greater than 1m below the bottom of the soakaway pit
3	Soils	Soil percolation rate should be greater than 15mm/hr	A soil percolation of 9.5 mm/hr has been used based on the *Former CFB Rockcliffe Master Servicing Study* by IBI Group.
4	Storage Volume	A minimum storage volume of 5 mm over the rooftop area should be accommodated in the soakaway pit without overflowing. The maximum target storage volume should be 20 mm over the rooftop area.	The maximum target storage of 20mm over the rooftop area will be used to ensure the required infiltration is met.
5	Location	>4m from the building	Soakaway pit is 3m from the building as outlined in the requirement by the *Former CFB Rockcliffe Redevelopment: Stormwater Management Existing Conditions & LID Pilot Project Scoping* by Aquafor Beech (2015).
6	Storage Media	Trench is comprised of clear stone (50 mm dimeter) with non-woven filter cloth lining the trench	Soakaway pit is specified to have 50mm clear stone and to be lined with geotextile.
7	Conveyance Pipe	The roof leader should extend into the soakaway pit for the full length of the pit. The extension of the roof leader should be perforated to allow water to fill the pit along the length of the pipe. The perforated pipe should be located near the surface of the trench.	The roof leader has been extended to run the full width of the soakaway pit with 200mm diameter perforated pipes every 1m o/c to fully disperse the runoff within the soakaway pit. The leader from the other contributing areas runs the majority of the length of the pipe and has also been included with 200mm diameter perforated pipes every 1m o/c to fully disperse the runoff.

6.4.1.2 Storage Configuration

The length of the trench will be maximized as the direction of flow is parallel with the Soakaway Pit. This will ensure proper distribution of water into the entire trench. The detailed design process has been described below:

- Maximum Allowable Soakaway Pit Depth (TRCA/CVC, 2010)

$$d_{r\,max} = \frac{i(t_s)}{V_r}$$

$d_{r\,max}$ = maximum allowable depth of the soakaway pit (mm)
i = Hydraulic conductivity of native soil (mm/hr)
t_s = Time to drain (48 hours)
V_r = Void space ration (Typically 0.4 for 50mm clear stone)

See Appendix 'G' for calculations.

Following the procedure outlined in the *LID Planning and Design Guide* by TRCA/CVC (2010), the minimum water quality volume to be treated based on the total area of the site has been determined by calculating the percent impervious of the post-development contributing areas. The weighted contributing imperviousness was calculated at 43%. Using Table 3.2 from the *SWM Planning & Design Manual* by the MOECC (2003) the required storage volume is 30 m^3/ha.

- Minimum Water Quality Volume

$$WQV = 30 \text{ x } A$$

WQV = Water Quality Volume (m^3)
30 = From Table 3.2 of the MOE SWMPDM (2003)
A = Area of the site (ha)

See Appendix 'G' for calculations.

Due to the modified purpose of the soakaway pit, the equation for the area of the soakaway pit as per the *LID Planning and Design Guide* by TRCA/CVC (2010) has been altered to address the difference in the infiltration volume as well as the depth available through on-site conditions. A comparison of the original equation and the modified has been provided below.

Equation as per TRCA/CVC (2010):

$$A = \frac{WQV}{d_{r\,max}(V_r)}$$

A = Area of Soakaway Pit (m^2)
WQV = Water Quality Volume (m^3)
$d_{r\,max}$ = Maximum Depth of Soakaway Pit (m)
V_r = Void Space Ratio for Aggregate (0.4)

Modified Equation:

$$A = \frac{V_{water}}{d(n)}$$

A = Area of Soakaway Pit (m^2)
V_{water} = Targer Volume of Water (m^3)
d = Actual Depth of Soakaway Pit (m)
n = Porosity (40%; Assumed)

See Appendix 'G' for calculations.

6.4.1.3 Maintenance Design Parameters

Maintenance will be required to ensure effective operation, longevity and aesthetic functioning of the SWMP and may include: sediment removal, trash removal, maintenance of vegetation and inspection of the inlet(s) and outlet(s).

Estimates of the longevity of infiltration SWMPs are based on professional opinion. Equation 7.1 and Table 7.4 from the MOE Stormwater Management Planning and Design Manual may be used as guidance for estimating longevity (based on monitoring results in literature and the native soil permeability). Recognizing the subjectiveness of Equation 7.1, there needs to be flexibility in assessing the lifespan of infiltration SWMPs based on site-specific information. As the majority of the site is made up of the proposed roof the runoff entering the SWM Area will have limited opportunity for carrying sediments to the infiltration structure.

Our recommendation for the SWM Area is to have annual inspections completed for the Soakaway pit including a CCTV of the pipe network within the SWM area. The inspection should note any sediment build-up, standing water or any trash on the within the structure. Based on the reviews maintenance may be required to ensure the SWM Area is functioning as designed.

7.0 SEDIMENT EROSION 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, MVCA 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 MVCA 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 both warrant and permit. 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.

8.0 SUMMARY

- A new 775 m^2 apartment building will be constructed centrally on the site located at 745 Mikinak Road.
- A new 150 mm diameter sanitary service and monitoring manhole will be installed and connected to the existing 250 mm diameter sewer within Mosis Tenisco Street.
- A new 50 mm diameter water lateral will be extended from the existing 200 mm diameter main within Mosis Tenisco Street.
- A new storm network will be installed onsite and will connect to the existing 525 mm storm sewer within Mosis Tenisco Street.
- As discussed with the City of Ottawa staff, the stormwater management design will ensure that the post-development flow rates are restricted to the 5-year pre-development flow rate.
- Storage for the 5- through 100-year storm events will be provided 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 apartment building at 745 Mikinak Road.

This report is respectfully being submitted for approval.

Regards,

McIntosh Perry Consulting Engineers Ltd.

Ryan Kennedy, P.Eng.
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10.0 STATEMENT OF LIMITATIONS

This report was produced for the exclusive use of CSV Architects. 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.

McINTOSH PERRY

APPENDIX A
SITE LOCATION MAP

McINTOSH PERRY

450 225 0 450

Scale 1:15,000 Metres

LEGEND

- Property Boundary
- Local Road
- Major Road
- Wooded Area
- Watercourse
- Waterbody

REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources and Forestry, 2018.

CLIENT: CSV ARCHITECTS

PROJECT: MHI VETERAN'S HOUSE
745 MIKINAK ROAD

TITLE: SITE LOCATION

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

PROJECT NO:	CP-16-0462
Date	Sep., 25, 2018
GIS	SK
Checked By	SL

FIGURE: 1

APPENDIX B
CITY OF OTTAWA PRE-CONSULTATION NOTES

McINTOSH PERRY

Pre-Consultation: Site Plan Application for Block 23 of the draft plan M for Phase 1B of Wateridge Village (Veterans House)

Address: 745 Mikinak Road

Date: Friday January 6 2017

Time: 2:00-3:00 pm

Location: 110 Laurier Ave, room 4103E

Invitees:

Suzanne Le – Multifaith Housing Initiative
Jessie Smith, Anthony Leaning – CSV Architects
Cynthia Jacques, Graeme Hussey – CCOC
Christopher Moise, Will Curry, Abdul Mottalib, Serene Shahzadeh, Erin O'Connell – City of Ottawa
Al Crosby, Maurice Hladik – Fairhaven CA
Don Lishman – Manor Park CA

Introduction:

- Formal pre-consultation to Veteran's house

Confirmation that Non-Disclosure Agreement has been signed

- Can details of the topic be talked about outside of the invitees?
    - No; because of disclosure issues of different proposals (sometimes many interested parties in a development)
    - Developers don't necessarily fully know everything about a project; premature to talk to the community

Overview of the Proposal

- Project: home for veterans living on streets
- 40 units, three storeys, bachelor suites
    - First floor: combination units (residential + community)
    - Second and third floors: residential
- Community space, mental health support, leaseholder rights, peer mentoring provided
- Multipurpose room (to lounge and meet people), kitchens in units and a communal kitchen for social purposes
- Amenity spaces inside and out: courtyard, dog area (number of residents with service dogs), gazebo, parking on west side, potentially a community garden
- Organizations such as Support our Troops supporting this development
- Intention: identify veterans stabilized in housing and invite them into the Veterans house, then bring in veterans from shelters
- Veterans can live in these units as long as they want
- People considered to live here must be veterans (Canadian forces experience necessary to be eligible)
- Units are better for veterans, and veterans eligible for PTSD dogs can have/will be given them

- The development is aiming for military-style culture, and making it apparent in the building so that veterans fall back into that mindset
- It takes seven years on average for veterans to become homeless from the time they leave the military
- Veterans on the streets are usually older, have higher education levels, and are more likely to be victims of crime than other homeless people

Questions:

- There is an existing tree in plan, what is the tree situation?
    - One tree on the corner on the street, which may be located in the existing right-of-way doesn't need to be retained
- What is the land use?
    - Low rise apartment, which fits under the current zoning
- Is it serviced?
    - Land being sold fully serviced, services start hitting Mikinak Road with Phase 1A
- When will units start being available?
    - Aim to start construction in Fall 2017, but depends on land transfer and funding, and construction will likely take about a year.
- Why was this plot chosen? What is the speed of servicing?
    - It depends on lot suitability: no single family homes (not suitable for the veterans), and the next phase of the project are high rises. This site is within phase 1B and is the most suitable lot designation. There is easy walkability and bus access.
- Architecturally, what are the roofs going to be?
    - Most likely flat roofs, but it hasn't been decided yet. AI: consider full sloping roof(s) for the design, capable of supporting solar panels in the future.
- Is there a basement?
    - No.
- Is there a civil engineer on board yet?
    - No.
- How is this project funded?
    - The funding is between the Federal Government and Multifaith Housing Initiative.
- Servicing on-going currently now for 1A but phase 1B of Wateridge will be next.

Preliminary comments from represented disciplines:

- Erin: Site plans should have more information, e.g.: street names; dimensions; cross sections, street details, and where proposed landscaping goes
- Surface parking location:
    - The Secondary Plan speaks to no more than one side of a surface parking lot abutting a Right-of-Way
    - The CDP for Rockcliffe talks about Mikinak with active street frontage
    - Parking should be accessed from one of the side streets, located in the rear with the building fronting onto Mikinak

- Suzanne: Rationale for parking in that location was because of sunlight; maximize sunlight for mental health, also buffer from street. For peacefulness and protection, ideally side streets were not desired.

- Christopher: The current use of the main street isn't complementary to the policy direction, so should be reorganized to address the City's concerns
- Erin: Parking counts should be reviewed based on recent changes to parking requirements.
- Cynthia: Providing 26 parking spaces seems a lot for 40 residents without a car, but it would be used for staff and visitor parking.
- Snow will be removed: protects the parking spaces, keeps them available
    - Site Plan control: should show snow storage area
- Christopher: Parking is currently adjacent to mixed-use area across the street which should be considered. City wants to see a logical transition between conceptual land uses
    - Issue: Veteran's house wants good sunshine
- This housing deals with people living rough on the streets
- Jessie and Suzanne: No fence, it is an apartment building, not a care facility
    - People have the right to come and go, locking them in is inappropriate
    - Veterans in this development should participate in the community; people with strong mental issues should already be in care facilities
    - Veterans who will end up living in this development will be selected, and will be people who will really benefit from this area
    - Fences only around the dog area so far
    - Fences will, however, be considered and installed in some areas
- Erin: Mikinak road aim is to create the best public realm for people
- Will: Servicing on side streets as opposed to Mikinak, both sides will have infrastructure to be serviced as part of Phase 1B of Wateridge
- Roads are raised in this location, so they will be 1.5 m higher than the site. The site needs to be filled for stormwater management purposes.
    - North of Mikinak, the street will be raised 1.5 m. South of Mikinak, 1.25 m. Either way, all sites require filling.
    - 1.5 m is the maximum permissible filling.
- Erin: Some requirements include: transportation memo, noise study (external), geotechnical report for the site to obtain a building permit, grading plan
- Landscape plan: refer to clay soils in the area, trees and other elements need to be a certain distance away from them
- Anthony: Intention: not a park, not for people from surrounding areas to come sit down in this site
- Dense trees along Mikinak (part of Phase 1A); check because it could affect setbacks. They are probably mature trees in the City right-of-way.
- Erin: refer to Waste guidelines: municipal waste pick-up; good to have direct access to street
    - Want to encourage recycling and garbage separation
- Site plan: show temporary snow and garbage pick-up: bins cannot be in right-of-way /parking, etc
    - Has to have their own designated, easily accessible, spot
- Anthony: Since the plan was developed according to Mikinak Road being the only street (side streets were not be defined yet), the plan will be re-examined
- Will: Consider servicing for hydro and gas, because the piping can be ugly
- Al: Wind and garbage?
    - The garbage room is interior
    - Some garbage can be blown away during transfer from bin to truck
- Cynthia: Technical zoning, lot line interpretation; is the front lot line the shortest one facing the street? Can the rear yard be treated as a front yard?

    - Can't have two front yards
- Property behind this one has same zoning as this site (four storey, height limit 16 m)
- Probably want a fence along the back
- No smoking site
    - Al: Issue: some people will try to use the property
- Anothony/Suzanne: The project isn't completely in public domain yet. The project is public and people do know about it, but details aren't known yet
    - Information about the project is on the website and the Facebook page (renderings, pictures, and plans)

Subject: Veterans House Pre-Consultation Follow up

Date: Tuesday, January 10, 2017 at 9:49:59 AM Eastern Standard Time

From: O'Connell, Erin <Erin.O'Connell@Ottawa.ca>

To: Suzanne Le <mhi.suzanne.le@gmail.com>, Jessie Smith <smith@csv.ca>, Anthony Leaning <leaning@csv.ca>, Cynthia Jacques <Cynthia.Jacques@ccochousing.org>, Moise, Christopher <christopher.moise@ottawa.ca>, Curry, William <William.Curry@ottawa.ca>, Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>, 'Al Crosby' <ac603@ncf.ca>, 'Don and Judy Lishman' <dlishman@sympatico.ca>, 'Maurice' <biomass4energy@sympatico.ca>

Attachments: image001.gif, Non-Disclosure Agreements.pdf, Veteran's House Pre Consultation Minutes.docx, Design Brief Mikinak Road.pdf, Terms of Reference - Planning Rationale.pdf, PC2017-0011 list.pdf

Good afternoon all,

Please see attached minutes following the formal pre-consultation for 745 Mikinak Road. Please advise if you would like a revision to the minutes or have anything further to add.

The list of required plans and studies is attached, as well as the NDAs, and the terms of reference for planning rationale/design brief, which can be combined as one document.

Please also note the following info to pass on to the consulting engineer:

- Sanitary, Storm and Water Services are permitted to be connected to either Michael Stoqua Street or Moses Tennisco Street, not both and not Mikinak Road.

- The development Block needs to be raised to an acceptable grade to facilitate Major Overland Spillage and meet SWM objectives. Permissible Grade raises are as per the Geotechnical Report for Phase 1B prepared by DST dated October 25, 2016.1

- Major Overland Spill point shall be directed to the ROW.

- Coordinate with the Local Conservation Authority and the Local MOE office to determine their requirements. Include correspondence in the SWM Report.
  .
- In order to obtain the information on the fire hydrant and watermain, you need to submit a request for a City of Ottawa water distribution network boundary condition. Please provide the following information:
    - Average Daily Demand (L/s)
    - Max Daily Demand (L/s)
    - Peak Hour Demand (L/s)
    - Fire Flow (L/s)
    - Type of Development
    - City of Ottawa Pressure Zone
    - Fire flow demand requirements shall be based on Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection 1999 as per the Ottawa Design Guidelines – Water Distribution, First Edition, Document WDG001, July 2010, City of Ottawa Clause 4.2.11.
    - Reductions, where applied to fire requirement demand calculation(s), need to be justified by the engineering consultant.

- The full 50% reduction for sprinklering is only available for monitored systems.
- Please provide a copy of the fire flow demand requirement calculations and water demand calculations (PDF format) for review.
- Please provide a watermain service connection location on a map (PDF).

I would encourage you to contact the Community Association contacts and Ward Councillor directly prior to application submission to determine if they feel additional public consultation is necessary and at what stage.

Feel free to advise if you have further questions/comments as the application progresses.

Sincerely,

Erin O'Connell, MCIP, RPP
Planner II
Development Review (Urban Services)
Urbaniste II
Examen des projects d'amenagement (Services urbains)

Planning, Infrastructure and Economic Development Department
City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27967
ottawa.ca/planning / ottawa.ca/urbanisme

Tyler Ferguson

From: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Sent: May-17-18 8:44 AM
To: Tyler Ferguson
Subject: RE: Veterans House - 745 Mikinak Road

Good Morning Tyler

As per the Former CFB Rockcliffe Master Servicing Study, your area is split in two areas with drainage going to each side street. The control for the site is based on a C factor of 0.7 for a 5 year flow. All flows are controlled on-site to a 5 year storm event for flows from storms up to the 1:100 year event. Flows in excess can spill over onto the roadway.

You will need to get a copy of the approved Study from our information center or from Canada Lands Development.

Richard Buchanan, CET

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

From: Tyler Ferguson <t.ferguson@mcintoshperry.com>
Sent: Wednesday, May 16, 2018 5:54 PM
To: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Cc: Curtis Melanson <c.melanson@mcintoshperry.com>
Subject: Veterans House - 745 Mikinak Road

Hi Richard,

We are working on the civil design for the Veterans House at 745 Mikinak Road. A pre-consultation meeting has already took place for the site. Would you be able to provide us the stormwater management criteria for this site? I have attached a copy of the preliminary site plan for reference. Let me know if you have any questions.

Thanks,

Tyler Ferguson, EIT
Engineering Intern
115 Walgreen Road, R.R. 3, Carp, ON K0A 1L0
T. 613.836.2184 (ext 2242) | **F.** 613.836.3742
t.ferguson@mcintoshperry.com | www.mcintoshperry.com
McINTOSH PERRY

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APPENDIX C
EXISTING WATERMAIN FLOW & FIRE CALCULATIONS

McINTOSH PERRY

McINTOSH PERRY

CP-16-0462 - 745 Mikanak Road - Water Demands

Project:	745 Mikanak Road
Project No.:	CP-16-0462
Designed By:	L-A.L.
Checked By:	R.P.K.
Date:	20/07/2018
Site Area:	50 1-Bedroom Apartments x 1.4 persons/unit = 70 person

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	***350***	***L/c/d***
Industrial - Light	35,000	L/gross ha/d
Industrial - Heavy	55,000	L/gross ha/d
Shopping Centres	2,500	L/(1000m² /d
Hospital	900	L/(bed/day)
Schools	70	L/(Student/d)
Trailer Parks no Hook-Ups	340	L/(space/d)
Trailer Park with Hook-Ups	800	L/(space/d)
Campgrounds	225	L/(campsite/d)
Mobile Home Parks	1,000	L/(Space/d)
Motels	150	L/(bed-space/d)
Hotels	225	L/(bed-space/d)
Tourist Commercial	28,000	L/gross ha/d
Othe Commercial	28,000	L/gross ha/d
AVERAGE DAILY DEMAND	**0.28**	**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	**0.71**	**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	**1.56**	**L/s**

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

McINTOSH PERRY

CP-16-0462 - 745 Mikanak Road - Fire Underwriters Survey (FUS) Fire Calculations

Project:	745 Mikanak Road
Project No.:	CP-16-0462
Designed By:	L-A.L.
Checked By:	R.P.K.
Date:	20/07/2018

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) = 773.47 m²

A = 2,320.40 m²

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

C. Determine Height in Storeys

From Architectural Drawings:

Number of Storeys = 3.00

D. Calculate Required Fire Flow

F = 220 x C x √A

F = 220.00 X 1.00 X √ 2320.40

F = 11,000.00 L/min. Rounded to the nearest 1000L/min.

E. Determine Increase or Decrease Based on Occupancy

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

Limited Combultible

-15%

Occupancy Decrease = 1,650.00 L/min.

F = 9,350.00 L/min.

CP-16-0462 - 745 Mikanak Road - 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 = 0.00 L/min.

G. Determine the Total Increase for Exposures

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

- Exposure distance to the existing buildings to the north & east of the proposed building is approximately 26.5m & 31.2m respectfully.
- There are no existing buildings surrounding the remainder of the site that are within 45m.
- Therefore the charge for exposure is 15% of the value obtained in Step E.

Increase = 1,402.50 L/min.

H. Determine the Total Fire Demand

- To the answer obtained in E, substract the value obtained in F and add the value obtained in G
- Fire flow should be no less than 2,000L/min. and the maximum value shoul not exceed 45,000L/min.

F = 9,350.00 L/min. - 0.00 L/min. + 1,402.50 L/min.
F = 10,752.50 L/min.
F = 11,000.00 L/min. Rounded to the nearest 1000L/min.

Therefore, the total required fire flow for the development is 11,000 L/min.

Tyler Ferguson

From: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Sent: July-10-18 8:55 AM
To: Laure-Anne Larose
Subject: FW: Boundary Condition Request - 745 Mikinak Rd.
Attachments: 745 Mikanak July 2018.pdf

Good Morning Laure-Anne,

The following are boundary conditions, HGL, for hydraulic analysis at 745 Mikanak (zone MONT) assumed to be connected to the 203mm on Moses Tenisco (see attached PDF for location).

Minimum HGL = 146.8m

Maximum HGL = 147.0m; 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 (417 L/s) = 120.0m

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

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

Richard Buchanan, CET

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

From: Laure-Anne Larose <l.larose@mcintoshperry.com>
Sent: Wednesday, July 04, 2018 10:45 AM
To: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Subject: Boundary Condition Request - 745 Mikinak Rd.

Hi Richard,

Please find below the water demands to obtain boundary conditions for 745 Mikinak Road. The development consist of a 3-storey residential building. The proposed development has been accounted for in the Former CFB Rockcliffe Master

Servicing Study (MSS) by IBI, dated August 2015 and in Phase 1B Wateridge Subdivision design. Attached are our fire flow demand requirement calculation and approximate location of service for your information.

1. Type of Development: Residential
2. Location of Service: New connection within Moses Tenisco Street
3. Amount of Fire Flow Required: 25,000 L/min (FUS)
4. Average Daily Demand: 0.11 L/s
5. Maximum Daily Demand: 0.27 L/s
6. Maximum Hourly Demand: 0.6 L/s

Thank you,

Laure-Anne Larose, EIT

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

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Average Day

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Hydraulic Grade (m)
J-1	87.12	16.80	84.97	146.98

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

Peak Hourly

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Hydraulic Grade (m)
J-1	87.12	93.60	84.03	146.32

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

Max Day + Fire Flow

ID	Label	Is Fire Flow Run Balanced?	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (L/min)	Fire Flow (Available) (L/min)	Pressure (psi)	Elevation (m)	Demand (L/min)
56	H-4	True	True	11,000.00	13,346.21	46.46	87.27	0.00
35	J-1	False	False	11,000.00	(N/A)	46.51	87.12	42.60

APPENDIX D
SANITARY SEWER CALCULATIONS

McINTOSH PERRY

McINTOSH PERRY

Project:	CP-16-0462 - 745 Mikinak Road
Designed By:	LAL
Checked By:	RPK
Date:	July 20, 2018

Re: Sanitary Flow Calculations

1. Building Occupancy

The maximum number of bedroom units will be 50 1-bedroom units as per unit break down from the Architect.

2. Daily Volume in Litres

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

- Each Dwelling unit of 1 bedroom
  = 275 Liters/Dwelling/Day

3. Peak Flow (Q/p)

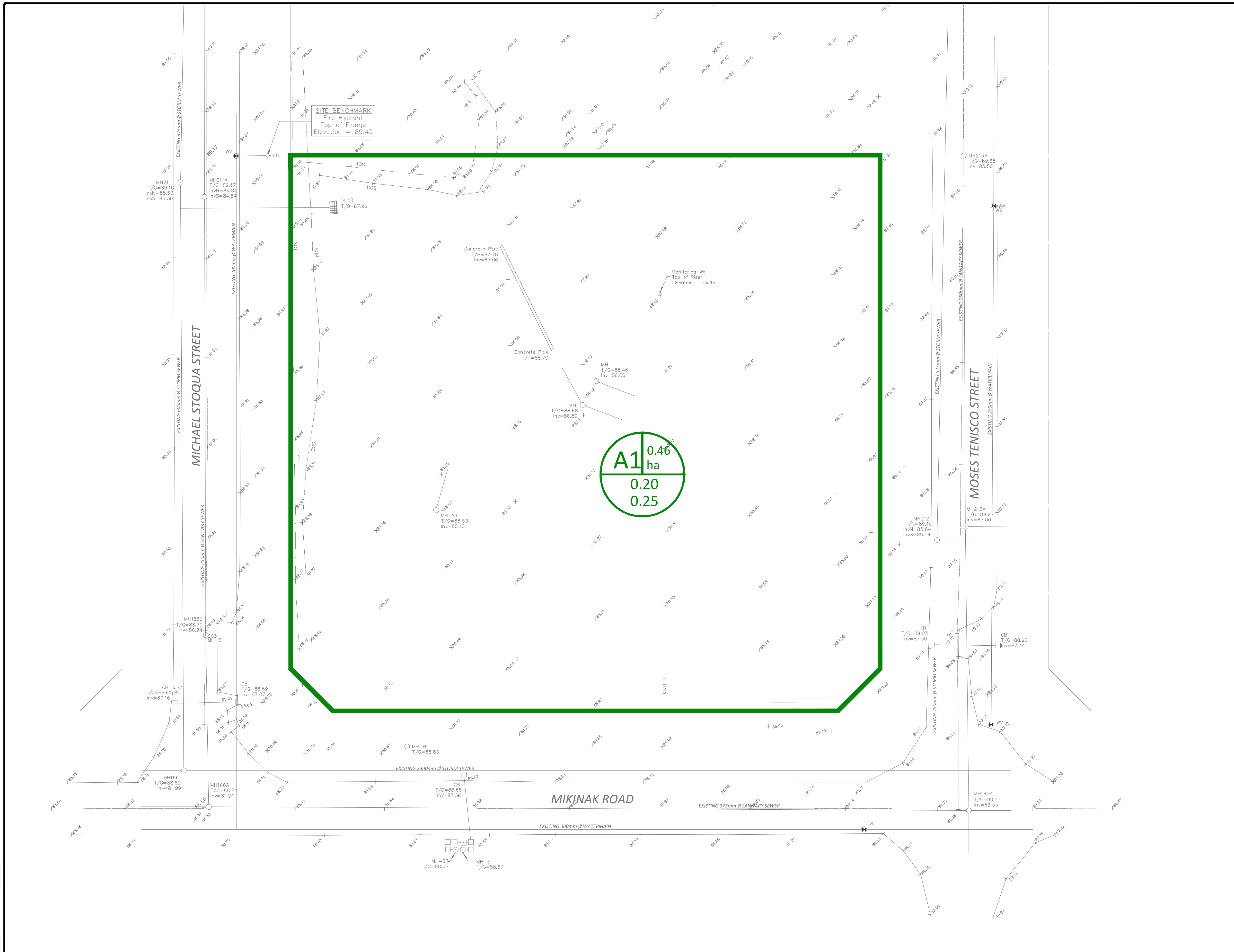
- Q(p) = F x P

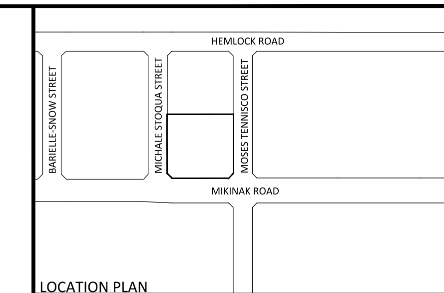
  Where:
  F = 275 Litres/Dwelling/Day (as per City of Ottawa Sewer Design Guidelines)
  P = 50 Units (as per Architect)
- Therefore, Q(p) = (275) x (50) = 13,750 L/Day (0.159 L/sec)

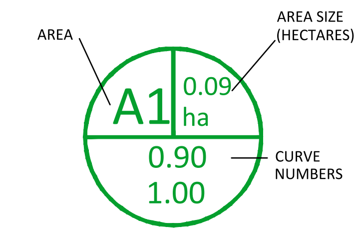
As per the Wateridge Village at Rockliffe Servicing Report the peak design flow for Block 23 was calculated at 6.63 L/s. The proposed site will have peak lows less than the original design and therefore it is anticipated that there will be no issues with capacity constraints within the existing sanitary main. Therefore, the existing 250mm diameter sanitary main within Moses Tenisco has the capacity to accommodate the new flows.

APPENDIX E
PRE-DEVELOPMENT PLAN

McINTOSH PERRY







FOR REVIEW ONLY
NOT FOR CONSTRUCTION

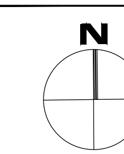
No.	Revision/Issue	Date
1	ISSUED FOR REVIEW	JUL 20/2018

Check and verify all dimensions before proceeding with the work

Do not scale drawings

SCALE 1 : 200 (0 – 10 – 20 Metres)

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



Stamp:

Client:
CSV ARCHITECTS
1066 SOMERSET ST WEST
OTTAWA, ONTARIO
K1Y 4Y3

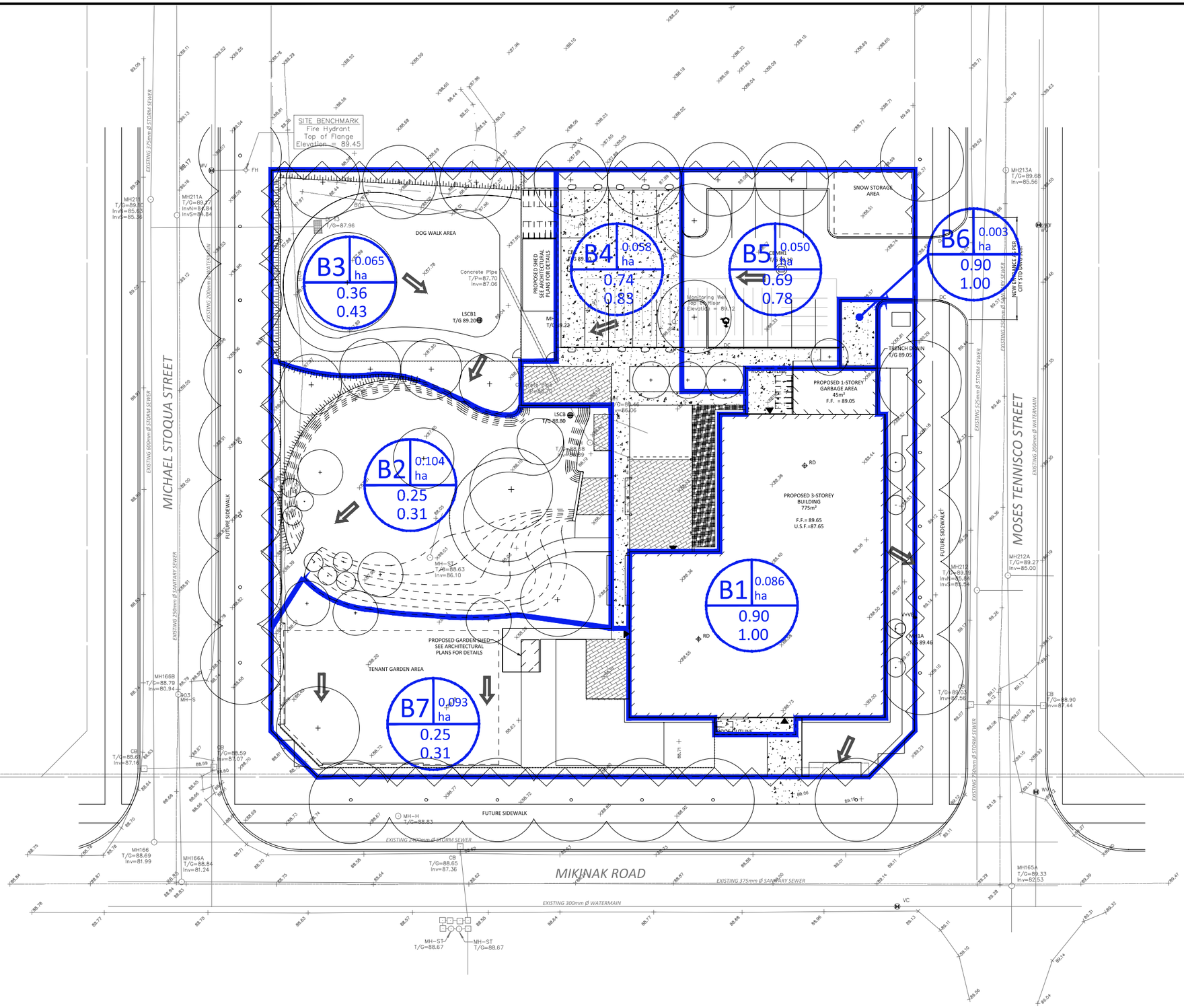
Project:
745 MIKINAK ROAD
MHI VETERAN'S HOUSE
OTTAWA ON

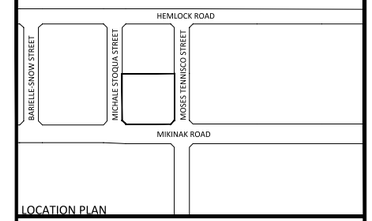
Drawing Title:
PRE-DEVELOPMENT
DRAINAGE AREA PLAN

Scale:	1:200	Project Number:	CP-16-0462
Drawn by:	L.A.L.		
Checked By:	R.P.K.	Drawing Number:	PRE
Designed By:	L.A.L.		

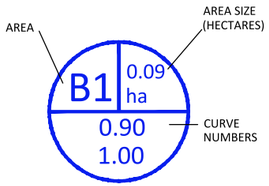
APPENDIX F
POST-DEVELOPMENT PLAN

McINTOSH PERRY





LOCATION PLAN



FOR REVIEW ONLY
NOT FOR CONSTRUCTION

No.	Revision/Issue	Date
2	ISSUED FOR SITE PLAN CONTROL	SEP. 24/2018
1	ISSUED FOR REVIEW	JUL. 20/2018

Check and verify all dimensions before proceeding with the work

Do not scale drawings

SCALE 1 : 200

0 10 20 Metres

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

N

Stamp:

Client:
CSV ARCHITECTS
1066 SOMERSET ST WEST
OTTAWA, ONTARIO
K1Y 4Y3

Project:
745 MIKINAK ROAD
MHI VETERAN'S HOUSE
OTTAWA ON

Drawing Title:
POST-DEVELOPMENT DRAINAGE AREA PLAN

Scale:	1:200	Project Number:	CP-16-0462
Drawn by:	L.A.L.		
Checked By:	R.P.K.	Drawing Number:	POST
Designed By:	L.A.L.		

FILENAME: H:\01 Project - Proposals\2016 Jobs\CP\CP-16-0462 CSV_Veterans House_Mikinak Road Ottawa\15 - Drawings\DCP-16-0462-PRESENTATION.dwg
LAST SAVED: Friday, September 21, 2018 LAST SAVED BY: s.Mar
LAST PLOTTED: Monday, September 24, 2018 11:51 (AM)

APPENDIX G
STORMWATER MANAGEMENT CALCULATIONS

McINTOSH PERRY

CP-16-0462 - 745 Mikinak Road - Runoff Calculations

Pre-Development Runoff Coefficient

Area	Drainage Area (ha)	Roof/Asphalt/ Concrete (m^2)	C	Gravel (m^2)	C	Treed/Grass Area (m^2)	C	Average C (5-year)	Average C (100-year)
A1	0.46	0	0.90	0	0.60	4594	0.20	0.20	0.25

Pre-Development Runoff Calculations

					I (mm/hr)		Q (L/s)	
Area	Drainage Area (ha)	C (5-Yr)	C (100-Yr)	Tc (min)	5-Year	100-Year	5-Year	100-Year
A1	0.46	0.20	0.25	10	104.2	178.6	26.6	57.0
Total	0.46						26.6	57.0

Allowable Release Rate As Per Criteria

				I (mm/hr)	Q (L/s)
Area	Drainage Area (ha)	C (5-Yr)	Tc (min)	5-Year	5-Year
A1	0.46	0.70	10	104.2	93.1
Total	0.46				93.1

Post-Development Runoff Coefficient

Area	Drainage Area	Roof/Asphalt/	C	Gravel (m^2)	C	Treed/Grass Area	C	Average C (5-	Average C
B1	0.086	861.4	0.90	0.0	0.60	0.0	0.20	0.90	1.00
B2	0.104	48.0	0.90	52.4	0.60	939.0	0.20	0.25	0.31
B3	0.065	71.0	0.90	131.3	0.60	443.0	0.20	0.36	0.43
B4	0.058	449.4	0.90	0.0	0.60	135.2	0.20	0.74	0.83
B5	0.050	353.5	0.90	0.0	0.60	150.0	0.20	0.69	0.78
B6	0.003	31.4	0.90	0.0	0.60	0.0	0.20	0.90	1.00
B7	0.093	56.5	0.90	22.5	0.60	848.0	0.20	0.25	0.31

Post-Development Runoff Calculations

					I (mm/hr)		Q (L/s)	
Drainage Area	Total Area (ha)	C	C (100-	Tc	5-Year	100-Year	5-Year	100-Year
B1	0.086	0.90	1.00	10	104.2	178.6	22.5	42.8
B2	0.104	0.25	0.31	10	104.2	178.6	7.6	16.0
B3	0.065	0.36	0.43	10	104.2	178.6	6.7	13.9
B4	0.058	0.74	0.83	10	104.2	178.6	12.5	24.0
B5	0.050	0.69	0.78	10	104.2	178.6	10.1	19.4
B6	0.003	0.90	1.00	10	104.2	178.6	0.8	1.6
B7	0.093	0.25	0.31	10	104.2	178.6	6.8	14.2
Total	0.46						66.9	131.8

Post-Development Restricted Runoff Calculations

	Post-Development				
Drainage Area	Unrestricted Flow (L/S)		Restricted Flow (L/S)		
ID	5-year	100-Year	5-Year	100-Year	
B1	22.5	42.8	1.0	1.7	RESTRICTED
B2	7.6	16.0	7.6	16.0	UNRESTRICTED
B3	6.7	13.9	6.7	13.9	
B4	12.5	24.0	12.5	24.0	
B5	10.1	19.4	10.1	19.4	
B6	0.8	1.6	0.8	1.6	
B7	6.8	14.2	6.8	14.2	
Total	66.9	131.8	45.4	90.7	

CP-16-0462 - 745 Mikinak Road - STORAGE REQUIREMENTS

Storage Requirements for Area B1

5-Year Storm Event

Tc (min)	I (mm/hr)	Runoff (L/s) B1	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
110	20.8	4.5	1.0	3.5	23.3
120	19.5	4.2	1.0	3.2	23.3
130	18.3	3.9	1.0	3.0	23.3
140	17.3	3.7	1.0	2.8	23.2
150	16.4	3.5	1.0	2.6	23.1

Maximum Storage Required 5-year =	23.3	m^3

100-Year Storm Event

Tc (min)	I (mm/hr)	Runoff (L/s) B1	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
90	41	9.8	1.7	8.2	44.1
100	38	9.1	1.7	7.4	44.4
110	35	8.4	1.7	6.8	44.6
120	33	7.9	1.7	6.2	44.6
130	31	7.4	1.7	5.7	44.6
140	29	7.0	1.7	5.3	44.5
150	28	6.6	1.7	4.9	44.4
160	26	6.3	1.7	4.6	44.2
170	25	6.0	1.7	4.3	44.0
180	24	5.7	1.7	4.0	43.7

Maximum Storage Required 100-year =	44.6	m^3

5-Year Storm Event

Roof Storage			
Location	Area (m^2)	Depth (m)	Volume (m^3)
Roof Drain	657.17	0.04	26.3

Storage Available (m^3) = 26.3
Storage Required (m^3) = 23.3

100-YEAR STORM EVENT

Roof Storage			
Location	Area (m^2)	Depth (m)	Volume (m^3)
Roof Drain	657.17	0.07	46.0

Storage Available (m^3) = 46.0
Storage Required (m^3) = 44.6

Roof Drain Flow For Flat Roof (B2)

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

*Roof Drain model to be Accutrol Weirs, See attached sheets
*Roof Drain Flow information taken from Watts Drainage website

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

Roof Drain Flow		
Flow (l/s)	Storage Depth (mm)	2 Roof Drains Flow (l/s)
0.18	15	0.36
0.24	20	0.48
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
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

SOAKAWAY PIT SIZING

Soakaway Pit Sizing as per TRCA/CVC LID Planning and Design Guide (2010)
Maximum allowable depth:

Equation;

$$d_{r\,max} = \frac{i(t_s)}{V_r}$$

where;
$d_{r\,max}$ = maximum allowable depth of the soakway pit (mm)
i = hydraulic conductivity of native soil (mm/hr)
t_s = Time to drain (48 hours)
V_r = Void space ratio (Typically 0.4 for 50mm clear stone)

$$d_{r\,max} = \frac{9.5(48)}{0.4}$$

$d_{r\,max}$ = 1140 mm
1.14 m

Stone Reservoir Depth (d_r)		
Top of Trench (Maximum):	87.48 m	(outlet invert)
Bottom of Trench (Maximum):	86.95 m	(1m above groundwater)
Depth of Infiltration Trench :	0.53 m	

Imperviousness Calculation for Contributing Flows:

Contributing Drainage Areas: B1, B3, B4

Equation;

$$\text{Impervious (\%)} = \frac{(C-0.2)}{0.7}$$

where;
C= calculated runoff coefficient

Area ID	C	Imperviouness (%)	A (m^2)	A (%) of Contributing
B1	0.90	100%	861.42	34%
B2	0.25	7%	1039.35	41%
B3	0.36	23%	645.28	25%
		$A_{c\,total}$=	2546.05	

Weighted Contributing Imperviousness = 43%

Minimum water quality volume:

Equation;

WQV= 30 x A
= 30 x 0.45
WQV= 13.78 m^3

where;
WQV= water quality volume
30= in m^3/ha; From Table 3.2 of the MOE SWMPDM (2003)
A= Area of site (ha)

Minimum target infiltration:

Infiltration Target: 4.00 mm over the whole site
Tributary Area (m^2): 2,546.05 m^2
$V_{w\,min}$= 10.18 m^3

Minimum water quality target:

Target: 15.00 mm over the whole site
Tributary Area (m^2): 2,546.05 m^2
$V_{w\,min}$= 38.19 m^3

Therefore;

V_{water}= 38.19 m^3

Area required for the proposed soakaway pit:

Equation: (modified from TRCA/CVC LID Planning & Design Guide (2010).)

$$A = \frac{V_{water}}{(d \times n)}$$

A= 179.81 m^2

Assumed porosity (n): 40%
Actual Depth of Soakaway Pit: 0.53 m

STORM SEWER DESIGN SHEET

PROJECT: 745 Mikinak Road
LOCATION: Ottawa, ON
CLIENT: CSV Architects

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 (100yr)	
				0.25	0.20	0.60	0.75	0.80	1.00																DIA	W	H			(L/s)	(%)
															Roof Drains to Restrict Roof Flows to 1.70 L/s for the 100-year event:														
	B1	ROOF	TEE (SOAK)						0.086	0.086	0.086	10.00	0.12	10.12	104.19	122.14	178.56	24.94	42.74		1.70	1.70	62.04	8.61	250			1.00	1.224	60.34	97.26%
	B2	LSCB2	MH1	0.094			0.005		0.005	0.032	0.032	10.00	0.16	10.16	104.19	122.14	178.56	9.32	15.97			15.97	46.01	8.72	250			0.55	0.908	30.04	65.29%
	B3	LSCB1	MH1	0.044			0.013		0.007	0.028	0.028	10.00	0.07	10.07	104.19	122.14	178.56	8.11	13.90			13.90	115.73	10.01	250			3.48	2.284	101.83	87.99%
		MH1	TEE (SOAK)									10.23	0.31	10.55	102.98	120.71	176.46				29.87	29.87	62.04	22.97	250			1.00	1.224	32.17	51.85%
		TEE (SOAK)	CBMH1									10.55	0.10	10.64	101.40	118.85	173.72				31.57	31.57	62.04	7.16	250			1.00	1.224	30.47	49.11%
	B4	CB1	CBMH1	0.014					0.045	0.048	0.048	10.00	0.44	10.44	104.19	122.14	178.56	14.00	23.99			23.99	43.87	22.97	250			0.50	0.866	19.88	45.32%
	B5	CBMH1	TEE	0.015					0.035	0.039	0.039	10.64	0.08	10.73	100.91	118.28	172.89	10.97	18.79		55.56	74.35	87.74	8.51	250			2.00	1.731	13.38	15.25%
	B6	T-DRAIN	TEE						0.003	0.003	0.003	10.00	0.17	10.17	104.19	122.14	178.56	0.91	1.56			1.56	34.22	10.45	200			1.00	1.055	32.66	95.44%
		TEE	*EX.MAIN*									10.73	0.08	10.81	100.51	117.81	172.19				75.91	75.91	87.74	8.72	250			2.00	1.731	11.82	13.48%

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-16-0462

No.	Revision	Date
1.	ISSUED FOR REVIEW	2018-07-20
2.	REVISED AS PER CLC COMMENTS	2018-09-24
3.	REVISED AS PER CITY COMMENTS	2019-01-31

Date: 2019-01-31
Sheet No: 5 of 5

APPENDIX H
CITY OF OTTAWA DESIGN CHECKLIST

McINTOSH PERRY

City of Ottawa

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

Criteria	Location (if applicable)
• Executive Summary (for larger reports only).	N/A
• Date and revision number of the report.	On Cover
• Location map and plan showing municipal address, boundary, and layout of proposed development.	Appendix E
• Plan showing the site and location of all existing services.	Site Servicing Plan (C102)
• Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	1.1 Purpose 1.2 Site Description 6.0 Stormwater Management
• Summary of pre-consultation meetings with City and other approval agencies.	Appendix A
• Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	1.1 Purpose 1.2 Site Description 6.0 Stormwater Management
• Statement of objectives and servicing criteria.	3.0 Pre-Consultation Summary

• Identification of existing and proposed infrastructure available in the immediate area.	N/A
• Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)
• Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)
• Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
• Proposed phasing of the development, if applicable.	N/A
• Reference to geotechnical studies and recommendations concerning servicing.	Section 2.0 Backround Studies
• All preliminary and formal site plan submissions should have the following information: o Metric scale o North arrow (including construction North) o Key plan o Name and contact information of applicant and property owner o Property limits including bearings and dimensions o Existing and proposed structures and parking areas o Easements, road widening and rights-of-way o Adjacent street names	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)

4.2 Development Servicing Report: Water

Criteria	Location (if applicable)
• Confirm consistency with Master Servicing Study, if available	N/A
• Availability of public infrastructure to service proposed development	N/A
• Identification of system constraints	N/A
• Identify boundary conditions	N/A
• Confirmation of adequate domestic supply and pressure	N/A
• Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Appendix B
• Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	N/A
• Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
• Address reliability requirements such as appropriate location of shut-off valves	N/A
• Check on the necessity of a pressure zone boundary modification.	N/A
• Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	N/A

• Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	N/A
• Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
• Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Appendix B
• Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

Criteria	Location (if applicable)
• Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	N/A
• Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
• Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
• Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 5.2 Sanitary Sewer

• Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	N/A
• Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	N/A
• Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 5.2 Sanitary Sewer
• Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A
• Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
• Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
• Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
• Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

Criteria	Location (if applicable)
• Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 6.0 Stormwater Management
• Analysis of available capacity in existing public infrastructure.	N/A
• A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Pre & Post-Development Plans
• Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5-year event (dependent on the receiving sewer design) to 100-year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 6.0 Stormwater Management
• Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 6.0 Stormwater Management
• Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 6.0 Stormwater Management
• Set-back from private sewage disposal systems.	N/A
• Watercourse and hazard lands setbacks.	N/A
• Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	N/A
• Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
• Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5-year return period) and major events (1:100-year return period).	Appendix F

• Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Site Grading, Drainage, Sediment & Erosion Control Plan
• Calculate pre-and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 6.0 Stormwater Management Appendix F
• Any proposed diversion of drainage catchment areas from one outlet to another.	Section 6.0 Stormwater Management
• Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Section 6.0 Stormwater Management
• If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	Appendix A
• Identification of potential impacts to receiving watercourses	N/A
• Identification of municipal drains and related approval requirements.	N/A
• Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 6.0 Stormwater Management
• 100-year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)
• Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A

• Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 7.0 Sediment & Erosion Control
• Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
• Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

Criteria	Location (if applicable)
• Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	N/A
• Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
• Changes to Municipal Drains.	N/A
• Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

Criteria	Location (if applicable)
• Clearly stated conclusions and recommendations	Section 8.0 Summary Section 9.0 Recommendations
• Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	All are stamped
• All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	All are stamped