

SERVICING AND STORMWATER MANAGEMENT REPORT



Project Name: 7 Tristan Court – Proposed Buildings

Project No.: CP-18-0453

Prepared for:

BBS Construction Ltd.
1805 Woodward Drive
Ottawa, ON
K2C 0P9

Prepared by:

McIntosh Perry
115 Walgreen Road
Carp, ON
K0A 1L0

Rev01 – January 16, 2020

McINTOSH PERRY

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1.0 PROJECT DESCRIPTION

1.1 Purpose

This report will address the servicing (water, sanitary, and storm) and stormwater management requirements associated with the proposed development located at 7 Tristan Court within the City of Ottawa.

1.2 Site Description

The proposed development in question involves the following 3 properties; 35 Gifford Street (PIN 046280099), 7 Tristan Court (PIN 046280099), and 2005 Merivale Road (PIN 0456280099). The lands in this vicinity are zoned as general industrial "IH1". The land in question covers approximately 1.89 ha and is located near the intersection of Tristan Court and Bongard Avenue. It is important to note that a gas easement passes directly through the site.

The existing site is currently developed and is made up of 4 warehouse/storage buildings surrounded by an asphalt drive and parking lot. The existing site is fully serviced through way of Tristan court.

The proposed development consists of one new 1,246m² warehouse building located towards the back of the site and a 2-storey 201m² office addition which will be built adjacent to one of the existing storage buildings. As part of the development the area around the new warehouse building will be paved and several new parking spaces installed.

Figure 1: Key Map: 7 Tristan Court, Ottawa



2.0 BACKGROUND STUDIES

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

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

A topographic survey of the site was completed by Farley, Smith & Denis Surveying Ltd. dated December 2, 2019 and can be found under separate cover.

A geotechnical report of the site was completed by Paterson Group dated December 20, 2019 and can be found under separate cover.

3.0 PRE-CONSULTATION SUMMARY

Specific design parameters to be incorporated within this design include the following:

- The post-development release rate is to be controlled to the 5-year pre-development rate.
- The pre-development c-value shall not exceed 0.5.
- A minimum Tc of 10 minutes shall be used.

4.0 EXISTING SERVICES

There is an existing 600mm to 675mm diameter storm sewer within Tristan Court fronting the site. There is also a 300mm diameter watermain and a 250mm diameter sanitary main within Tristan Court.

The site is currently serviced with existing sanitary, water, and storm pipes as the site is currently developed with existing buildings. There is an existing 150mm diameter watermain onsite which services the buildings and the fire hydrant. The watermain is capped just beyond the fire hydrant. There is an existing sanitary line and maintenance holes within the site however the pipe sizes are unknown. The existing storm network has a series of pipes and structures to drain the existing site.

5.0 SERVICING PLAN

It should be noted that the proposed warehouse at the rear of the site will not require service laterals. In addition, there is an existing gas easement located southwest of the proposed warehouse. No proposed pipes or structures are permitted within this easement.

5.1 Water Servicing

A new 150mm diameter PVC water service will connect to the end of the currently capped water service located on the site this will lead to a new proposed fire hydrant.

The Fire Underwriters Survey 1999 (FUS) method was utilized to determine the required fire flow for the site. The results of the calculations yielded a required fire flow of 7,000 L/min for the proposed warehouse and 4,000 for the proposed addition. A fire flow of 9,000 L/min and 2,700 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 warehouse and the addition 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

Average Day Demand (L/s)	0.77
Maximum Daily Demand (L/s)	1.15
Peak Hourly Demand (L/s)	2.07
OBC Fire Flow Requirement (L/s)	150.00
OBC Fire Flow Requirement – Addition (L/s)	45.00
FUS Fire Flow Requirement (L/s)	116.67
FUS Fire Flow Requirement – Addition (L/s)	66.67
Max Day + Fire Flow (FUS) (L/s)	117.82
Max Day + Fire Flow (FUS) - Addition (L/s)	67.82

Boundary conditions have been provided by the City of Ottawa for the current conditions and are available in Appendix 'C'. A water model was completed using Bentley's WaterCAD based on the boundary conditions. The results determined that the proposed 150mm watermain can adequately service the proposed development and provide sufficient fire flow since Hydrant H-1 and H-2 produced available fire flows of 11,360 L/min and 7,638 L/min. Refer to drawing for more details. The results are available in Appendix 'C' of this report.

Prior to connecting to the municipal water distribution system, it is essential to determine whether the system has adequate capacity and that the overall impact to the existing system is minimal. A WaterCAD model was generated to determine the capacity, pressure and size of pipes required to service the proposed site. Three (3) different scenarios were analyzed within the model, namely average day, maximum day + fire flow and peak hourly demands. A layout of the WaterCAD model has been attached in Appendix C.

5.2 Sanitary Servicing

The new warehouse building will not have any sanitary services while the office addition will be serviced through the existing building. The proposed addition will have a peak flow of 0.038L/s which is considered negligible and therefore it is anticipated that there will be no issues with capacity constraints within the existing sanitary main.

5.3 Storm Servicing

As noted above, there is an existing gas easement located southwest of the proposed warehouse. No proposed pipes or structures are permitted within this easement. As such, site runoff within the development area will sheet flow on the surface towards the south corner of the site to a new grassed swale prior to outletting through a pipe network connected to the storm main within Tristan Court.

6.0 STORMWATER MANAGEMENT

Stormwater management for the warehouse building and addition will be maintained through positive drainage away from the buildings and to the new or existing storm networks. This SWM plan will protect the receiving storm systems by implementing velocity and quantity control strategies. Stormwater from the warehouse portion of the development will be restricted prior to outletting the site. The proposed office building on the site will utilize roof drains and roof storage in order to restrict the flow leaving the top section of the site. The quantitative and qualitative properties of the storm runoff for both the pre- and post-development flows are further detailed below.

6.1 Design Methodology

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

$$Q = C I A$$

Where;

- $Q = 2.78 \text{ CIA (L/s)}$
- $C = \text{Runoff coefficient}$
- $I = \text{Rainfall intensity in mm/hr.}$
- $A = \text{Drainage area in hectares}$

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

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

Building roofs, asphalt & concrete	0.90
Grass & undeveloped areas	0.20
Gravel	0.60

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

6.2 Site Drainage

6.2.1 Pre-Development Drainage

The existing site has been demonstrated as drainage area A1 and A2. Area A1 is the rear portion of the site in which the new warehouse is proposed. Area A2 is the new addition. Drawing CP-18-0453 PRE (Appendix 'D') indicates the limits of these drainage areas.

Table 1: Pre-Development Runoff Calculations

Drainage Area	Area (ha)	C 5-Year	C 100-Year	Tc (min)	I (mm/hr)		Q (L/s)	
					5-Year	100-Year	5-Year	100-Year
A1	0.96	0.64	0.78	20	70.3	120.0	119.63	250.20
A2	0.02	0.90	1.00	20	70.3	120.0	3.53	6.70
Total	0.98						123.16	256.90

(See Appendix 'F' for calculations)

6.2.2 Post-Development Drainage

The proposed site has been demonstrated as drainage areas B1-B5. Drawing CP-18-0453 Post (Appendix 'E') indicates the limits of these drainage areas. Areas B1 to B4 represent the new warehouse area. Area B5 represents the new addition. For calculation and simplicity purposes, the calculations have been split up.

Table 2: Post-Development Runoff Calculations (Warehouse area)

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
B1	0.10	0.64	0.72	10	104.2	178.6	18.74	36.21
B2	0.01	0.20	0.25	10	104.2	178.6	0.67	1.44
B3	0.02	0.20	0.25	10	104.2	178.6	1.14	2.44
B4	0.83	0.76	0.88	10	104.2	178.6	181.26	361.61
Total	0.96						201.81	401.70

(See Appendix 'F' for calculations)

Runoff from areas B1-B4 will be restricted prior to flowing to the existing storm sewer in Tristan Court. The total flow leaving the site will be controlled by an orifice plate located at the outlet pipe of the grassed swale.

Table 3: Post-Development Runoff Calculations (Addition)

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
B5	0.02	0.90	1.00	10	104.2	178.6	5.24	9.98
Total	0.02						5.24	9.98

(See Appendix 'F' for calculations)

Runoff from B5 will be restricted through roof storage and two roof drains located on the proposed building addition. (See Appendix 'F' for calculations). These restrictions of runoff will be further detailed in Sections 6.3 and 6.4.

6.3 Quantity Control

The total post-development runoff for this site has been restricted to match the required flows. These values create the following allowable release rates and storage volume for the development site.

Table 4: Required Restricted Flow (Warehouse area)

Drainage Area	Area (ha)	C 5-Year	C 100-Year	Tc (min)	I (mm/hr)		Q (L/S)	
					5-Year	100-Year	5-Year	100-Year
A1	0.96	0.50	0.50	20	70.3	120.0	93.68	159.95

(See Appendix 'F' for calculations)

Reducing site flows will be achieved through flow restrictions and will create the need for onsite storage. Runoff from areas B1 through B4 will be restricted and storage provided as detailed in the table below.

Table 5: Post-Development (Warehouse area)

Drainage Area	Unrestricted Flow (L/s)		Restricted Flow (L/s)		Storage Required (m³)		Storage Provided (m³)	
	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year
B1	18.74	36.21	18.74	36.21	0.00	0.00	0.00	0.00
B2	0.67	1.44	0.67	1.44	0.00	0.00	0.00	0.00
B3	1.14	2.44	1.14	2.44	0.00	0.00	0.00	0.00
B4	181.26	361.61	42.14	52.40	96.09	241.15	98.60	238.16
Total	201.81	401.70	62.69	92.50	96.09	241.15	98.60	238.16

(See Appendix 'F' for calculations)

Runoff from Areas B1 through B4 will be restricted at MH1 by way of a 150mm diameter orifice plate. This will restrict flow to 21.88L/s and 52.40 L/s for the 5 and 100-year storm events, respectively. The restriction for Areas B1 through B4 creates a water surface elevation (WSEL) of 89.37 m for the 5-year storm event and 89.82 m for the 100-year storm event. The storage for these areas will be provided by a storm pond located at the south end of the site.

Similarly, the runoff from the northern area of the site has been restricted to match pre-development flows through the use of roof drains. These values create the following allowable release rates and storage volume for the development site.

Table 6: Required Restricted Flow (Addition)

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
A2	0.02	0.50	0.50	20	70.3	120.0	1.96	3.35

(See Appendix 'F' for calculations)

Reducing the site flow will be achieved by using 2 roof drains to create storage on the roof of the proposed office addition. Runoff from areas B5 will be restricted and storage provided as detailed in the table below.

Table 7: Post-Development Restricted Runoff Calculations (Addition)

Drainage Area	Unrestricted Flow (L/s)		Restricted Flow (L/s)		Storage Required (m³)		Storage Provided (m³)	
	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year
B5	5.24	9.98	0.72	1.32	3.61	7.20	4.52	7.54
Total	5.24	9.98	0.72	1.32	3.61	7.20	4.52	7.54

(See Appendix 'F' for calculations)

Runoff from Area B5 will be restricted by two roof drains located on the roof of the proposed office building addition. This will restrict flow to 0.72L/s and 1.32 L/s for the 5 and 100-year storm events, respectively. The restriction for Area B4 creates a ponding depth 30mm for the 5-year storm event and 55mm for the 100-year storm event.

6.4 Quality Control

The development of this lot will employ Best Management Practices (BMP's) wherever possible. The intent of implementing stormwater BMP's is to ensure that water quality and quantity concerns are addressed at all stages of development. Lot level BMP's typically include temporary retention of the parking lot runoff, minimizing ground slopes and maximizing landscaped areas.

The Rideau Valley Conservation Authority (RVCA) has been consulted in regards to treatment requirements for the proposed development. There appears to be a stormwater facility downstream of the site where the runoff will outlet. It is assumed this facility will provide the required treatment and no onsite treatment units are required. Details on the stormwater facility were not available at the time of this submission however the City of Ottawa has been consulted with regards to the facility (refer to Appendix 'A' for correspondence).

7.0 SEDIMENT EROSION CONTROL

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

Inlet Sediment Control Devices are to be placed in all existing structures along the frontage of the site and any new structures immediately upon installation. The SCD's are 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.

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

8.0 SUMMARY

- A new 201m² office building is to be constructed on the site.
- A new 1259m² one storey warehouse building is to be constructed at the rear of the site.
- A new 150mm diameter water lateral will be extended from the existing 150 mm diameter water service located in the drive aisle to service the new fire hydrant.
- A new storm sewer network and stormwater storage area will be constructed and will connect into the existing 600mm diameter storm sewer located within Tristan Court.

9.0 RECOMMENDATIONS

We respectfully recommend that:

This report and the associated Site Grading, Drainage and Sediment & Erosion Control Plan along with the Site Servicing Plan be approved for engineering details.

The sediment and erosion control plan outlined in Section 7.0 and detailed on the Site Grading, Drainage and Sediment & Erosion Control Plan notes are to be implemented by the contractor.

This report is respectfully being submitted for approval.



Charissa Hampel, E.I.T.
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McIntosh Perry
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Ryan Kennedy, P.Eng.
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10.0 STATEMENT OF LIMITATIONS

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

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

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

APPENDIX A
CITY OF OTTAWA PRE-CONSULTATION NOTES

Charissa Hampel

From: Mark Kauhanen <Mark.Kauhanen@bbsconstruction.ca>
Sent: March 12, 2019 4:51 PM
To: Curtis Melanson
Cc: Gerald Morin
Subject: FW: Pre-Consultation Follow-up - 7 Tristan / 35 Gifford
Attachments: Study and Plan List - 7 Tristan.pdf

Good Afternoon Curtis,

See below / attached from the City regarding Morin Bros' expansion as per the pre-consultation meeting we had. The planner was on holidays so we just received this now.

Could you please update your proposal as necessary.

Let me know if you have any question or need to discuss.

Regards,
Mark

Mark Kauhanen
Design Manager



Cell: 613-795-1088

www.bbsconstruction.ca



From: Marsh, Amanda <Amanda.Marsh@ottawa.ca>
Sent: Tuesday, March 12, 2019 4:47 PM
To: Mark Kauhanen <Mark.Kauhanen@bbsconstruction.ca>
Subject: Pre-Consultation Follow-up - 7 Tristan / 35 Gifford

Hi Mark,

Apologies for the delay in getting these to you. As a follow up to our pre-consultation meeting on February 21, 2019 for 7 Tristan / 35 Gifford, please find attached the required plans and studies list for the development of an approximately 1,861 square metre warehouse, 270 square metre office or storage infill building connection, and a loading dock at the noted addresses. Please refer to the City's [guide](#) to preparing studies and plans. I have also included below items that were discussed during this meeting and follow-up comments on the proposed development.

Policies/Designations of the Site

- Official Plan (OP) Designation – Urban Employment Area ([Section 3.6.5](#))
- Zoning – [IH1](#) – Heavy Industrial Subzone 1
 - Warehouse and Office are permitted uses within this zoning

- Relief from the interior side yard setbacks (7.5 metres) and the rear yard setback (7.5 metres) are required as 3 metres is proposed.
- The subject lands are located within the airport vicinity development zone
- Parking is to be provided at the rates specified for Area C per Schedule 1A which are the below.
 - Warehouse – 0.8/100 square metres of gross floor area
 - Office – 2.4/100 square metres of gross floor area
- Bicycle parking is to be provided in accordance with [Section 111](#).
 - Warehouse – 1/2000 square metres of gross floor area
 - Office – 1/250 square metres of gross floor area
- Loading is to be provided and designed in accordance with [Section 113](#).

Planning Comments

- The proposed development is subject to Site Plan Control approval. As noted within our meeting, there are proposed amendments to the Site Plan Control By-law, Public Notification and Consultation Policy, and fee schedule. These amendments were heard at Planning Committee on February 14, 2019 and were then heard at Council on February 27, 2019.
 - Under the amended rules, the type of application would be New – Complex. A ‘Complex’ type of application includes public consultation. Additional information on this can be found within the agenda for Council [here](#).
 - Confirmation of the amended By-law’s effective date is being sought and a follow-up will be provided.
- The subject lands are located immediately adjacent to an active Via Rail line.
 - There are guidelines for development in proximity to rail operations, created by the Railway Association of Canada and the Federation of Canadian Municipalities, which generally requires a 30-metre setback from the property line to a building face. It is recommended that you be in touch as soon as possible with Via and any other necessary parties to understand their requirements for development adjacent to the rail line.
- Parkland dedication may be required for the development, in accordance with the City’s Parkland Dedication By-law, which can be found [here](#).

Infrastructure Comments (Eric Surprenant)

- It is understood the warehouse is intended to be unheated/unserviced and is for the purpose of storing drywall
- An MECP Environmental Compliance Approval will be required. Please contact Ontario Ministry of the Environment, Conservation and Parks, Ottawa District Office to arrange a pre-submission consultation:
For I/C/I applications: Christina Des Rochers
(613) 521-3450, ext. 231
Christina.Desrochers@ontario.ca
- Phase 1 ESAs and Phase 2 ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.
- With respect to fire routes, Jennifer Therkelsen is to be circulated to ensure any proposed fire route is established formally through the passing of By-law.
- An FUS calculation needs to be completed for the site.
- Ensure the plans show any additional infrastructure proposed.
- Clearance letters from all easement holders (pipelines, etc.) will be required for the proposed development.
- The Servicing Study Guidelines for Development Applications are available [here](#).
- Servicing and site works shall be in accordance with the following documents:
 - Ottawa Sewer Design Guidelines (October 2012)
 - Ottawa Design Guidelines – Water Distribution (2010)
 - Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
 - City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
 - City of Ottawa Environmental Noise Control Guidelines (January, 2016)

- City of Ottawa Park and Pathway Development Manual (2012)
- City of Ottawa Accessibility Design Standards (2012)
- Ottawa Standard Tender Documents (latest version)
- Ontario Provincial Standards for Roads & Public Works (2013)
- Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).
- The Stormwater Management Criteria for the subject site is to be based on the following:
 - The following applies to new / proposed development and additional lands being added to the site.
 - There is an existing storm sewer in the adjacent right of way (Tristan / Gifford).
 - The post-development release rate is to be controlled to the pre-development release rate for the 5-yr storm for the new development. The pre-development release rate shall be calculated using:
 - The IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997.
 - The pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less.
 - The pre-development time of concentration or a minimum 'Tc' of 10 minutes, whichever is higher.
 - Onsite storm runoff, in excess of the 5-yr storm release rate, must be detained on site.
- Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:
 - Location of service
 - Type of development and the amount of fire flow required (as per FUS, 1999).
 - Average daily demand: ____ l/s.
 - Maximum daily demand: ____ l/s.
 - Maximum hourly daily demand: ____ l/s.

Transportation Comments (Rosanna Baggs)

- 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 as soon as possible.
 - The Applicant is advised that an 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).
- On the site plan:
 - Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements (ie all new or impacted loading bays) and at all access (entering and exiting and going in both directions). Please show these on a separate drawing.
 - 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.

Please note that these pre-consultation comments are valid for one year. If you submit a development application after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change.

Finally, prior to making a complete submission, it is encouraged that you discuss the proposal with the area Councillor and local community associations.

If you have any questions regarding the above, please don't hesitate to contact me.

Best,
Amanda

Amanda Marsh

Planner

Development Review

Planning, Infrastructure and Economic Development

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,

Charissa Hampel

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: December 17, 2019 9:31 AM
To: Charissa Hampel
Subject: RE: 7 Tristan Court - Proposed Warehouse

Hi Charissa,

It would appear that the site outlets to a downstream stormwater management facility. Please confirm that water quality protection is provided by this facility in your stormwater management report. This will satisfy the RVCA's water quality protection requirements.

Thank you,

Eric Lalande, MCIP, RPP

Planner, Rideau Valley Conservation Authority
613-692-3571 x1137

From: Charissa Hampel <c.hampel@mcintoshperry.com>
Sent: Monday, December 16, 2019 11:03 AM
To: Eric Lalande <eric.lalande@rvca.ca>
Subject: 7 Tristan Court - Proposed Warehouse

Hi Eric,

I am currently working on a development at 7 Tristan Court within the City of Ottawa. The development will consist of a new Warehouse at the rear portion of the site. I have attached a site plan for your reference. Could you please let me know the quality control requirements for the site.

Thanks,

Charissa Hampel, EIT

Engineering Intern

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member

APPENDIX B WATERMAIN CALCULATIONS

McINTOSH PERRY

CP-18-0453 - TRISTIAN COURT - Addition - Water Demands

Project:	TRISTIAN COURT - Addition
Project No.:	CP-18-0453
Designed By:	SPG
Checked By:	RPK
Date:	12/09/2019
Site Area:	1.89 gross ha

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	350	L/c/d
<i>Industrial - Light</i>	<i>35,000</i>	<i>L/gross ha/d</i>
Industrial - Heavy	55,000	L/gross ha/d
Shopping Centres	2,500	L/(1000m ² /d)
Hospital	900	L/(bed/day)
Schools	70	L/(Student/d)
Trailer Parks no Hook-Ups	340	L/(space/d)
Trailer Park with Hook-Ups	800	L/(space/d)
Campgrounds	225	L/(campsite/d)
Mobile Home Parks	1,000	L/(Space/d)
Motels	150	L/(bed-space/d)
Hotels	225	L/(bed-space/d)
Tourist Commercial	28,000	L/gross ha/d
Othe Commercial	28,000	L/gross ha/d
AVERAGE DAILY DEMAND	0.77	L/s

MAXIMUM DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	2.5 x avg. day	L/c/d
<i>Industrial</i>	<i>1.5 x avg. day</i>	<i>L/gross ha/d</i>
Commercial	1.5 x avg. day	L/gross ha/d
Institutional	1.5 x avg. day	L/gross ha/d
MAXIMUM DAILY DEMAND	1.15	L/s

MAXIMUM HOUR DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	2.2 x max. day	L/c/d
<i>Industrial</i>	<i>1.8 x max. day</i>	<i>L/gross ha/d</i>
Commercial	1.8 x max. day	L/gross ha/d
Institutional	1.8 x max. day	L/gross ha/d
MAXIMUM HOUR DEMAND	2.07	L/s

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

McINTOSH PERRY

CP-18-0453 - TRISTIAN COURT - Warehouse - Fire Underwriters Survey (FUS) Fire Calculations

1 of 2

Project:	TRISTIAN COURT - Warehouse
Project No.:	CP-18-0453
Designed By:	SPG
Checked By:	RPK
Date:	12/09/2019

From the Fire Underwriters Survey (1999)

From Part II – Guide for Determination of Required Fire Flow Copyright I.S.O.:

$F = 220 \times C \times \sqrt{A}$ 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 = 0.80

B. Determine Ground Floor Area

As provided by the Architect:

Floor Area (One Floor) = 1,259.00 m²

A = 1,259.00 m²

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

C. Determine Height in Storeys

From Architectural Drawings:

Number of Storeys = 1.00

D. Calculate Required Fire Flow

$F = 220 \times C \times \sqrt{A}$

F = 220.00 X 0.80 X $\sqrt{1259.00}$

F = 6,244.90 L/min.

E. Determine Increase or Decrease Based on Occupancy

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

No Change

Occupancy Decrease = 0.00 L/min.

F = 6,244.90 L/min.

McINTOSH PERRY

CP-18-0453 - TRISTIAN COURT - Warehouse - Fire Underwriters Survey (FUS) Fire Calculations

2 of 2

F. Determine the Decrease, if any for Sprinkler Protection

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

- No sprinkler System is present on the site therefore no decrease.

$$\text{Reduction} = 0.00 \text{ L/min.}$$

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 of the proposed building is roughly 33m meters
- 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.

$$\text{Increase} = 6,244.90 \text{ L/min.} \times 15\%$$

$$\text{Increase} = 936.74 \text{ L/min.}$$

H. Determine the Total Fire Demand

- To the answer obtained in E, subtract 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 should not exceed 45,000L/min.

$$\begin{aligned} F &= 6,244.90 \text{ L/min.} - 0.00 \text{ L/min.} + 936.74 \text{ L/min.} \\ F &= 7,181.64 \text{ L/min.} \end{aligned}$$

Therefore, after rounding to the nearest 1,000 L/min, the total required fire flow for the development is 7,000 L/min (1,849 GPM).

McINTOSH PERRY

CP-18-0453 - TRISTIAN COURT - Addition - Fire Underwriters Survey (FUS) Fire Calculations

1 of 2

Project:	TRISTIAN COURT - Addition
Project No.:	CP-18-0453
Designed By:	SPG
Checked By:	RPK
Date:	12/09/2019

From the Fire Underwriters Survey (1999)

From Part II – Guide for Determination of Required Fire Flow Copyright I.S.O.:

$F = 220 \times C \times \sqrt{A}$ 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 = 0.80

B. Determine Ground Floor Area

As provided by the Architect:

Floor Area (One Floor) = 201.00 m²

A = 201.00 m²

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

C. Determine Height in Storeys

From Architectural Drawings:

Number of Storeys = 2.00

D. Calculate Required Fire Flow

$F = 220 \times C \times \sqrt{A}$

F = 220.00 X 0.80 X $\sqrt{201.00}$

F = 2,495.23 L/min.

E. Determine Increase or Decrease Based on Occupancy

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

No Change

Occupancy Decrease = 0.00 L/min.

F = 2,495.23 L/min.

McINTOSH PERRY

CP-18-0453 - TRISTIAN COURT - Addition - Fire Underwriters Survey (FUS) Fire Calculations

2 of 2

F. Determine the Decrease, if any for Sprinkler Protection

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

- No sprinkler System is present on the site therefore no decrease.

$$\text{Reduction} = 0.00 \text{ L/min.}$$

G. Determine the Total Increase for Exposures

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

- The building located to the west of the proposed building is within 3 meters.
- Both the south and east faces of the proposed buildings are located within 10 meters of existing buildings.
- The building located to the north of the proposed building is located within 30 meters.
- Therefore the charge for exposure is 75% of the value obtained in Step E.

$$\text{Increase} = 2,495.23 \text{ L/min.} \times 75\%$$

$$\text{Increase} = 1,871.42 \text{ L/min.}$$

H. Determine the Total Fire Demand

- To the answer obtained in E, subtract 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 should not exceed 45,000L/min.

$$\begin{aligned} F &= 2,495.23 \text{ L/min.} - 0.00 \text{ L/min.} + 1,871.42 \text{ L/min.} \\ F &= 4,366.65 \text{ L/min.} \end{aligned}$$

Therefore, after rounding to the nearest 1,000 L/min, the total required fire flow for the development is 4,000 L/min (1,056 GPM).

McINTOSH PERRY

CP-18-0453 - TRISTIAN COURT - Warehouse - OBC Fire Calculations

Project:	TRISTIAN COURT - Warehouse
Project No.:	CP-18-0453
Designed By:	SPG
Checked By:	RPK
Date:	12/09/2019

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

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

Building is classified as Group : F2 up to 2 Storeys

Building is of noncombustible construction or of heavy timber construction conforming to Article 3.1.4.6. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.

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

$$(a) Q = K \times V \times Stot$$

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:

$$Stot = 1.0 + [S_{side1} + S_{side2} + S_{side3} + \dots \text{etc.}]$$

K	27	(from Table 1 pg A-31) (Worst case occupancy {E / F2} 'K' value used)
V	10,748	(Total building volume in m ³ .)
Stot	1.0	(From figure 1 pg A-32)
Q =	290,203.18 L	

					From Figure 1 (A-32)
Snorth	33	m	0.0		
Seast	59	m	0.0		
Ssouth	63	m	0.0		
Swest	88	m	0.0		
*approximate distances					

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

9000 L/min (if Q > 270,000 L)
2378 gpm

McINTOSH PERRY

CP-18-0453 - TRISTIAN COURT - Addition - OBC Fire Calculations

Project:	TRISTIAN COURT - Addition
Project No.:	CP-18-0453
Designed By:	SPG
Checked By:	RPK
Date:	12/09/2019

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

Water Supply for Fire-Fighting - Addition

Building is classified as Group : F3 up to 2 Storeys

Building is of noncombustible construction or of heavy timber construction conforming to Article 3.1.4.6. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.

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

$$(a) Q = K \times V \times Stot$$

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:

$$Stot = 1.0 + [S_{side1} + S_{side2} + S_{side3} + \dots \text{etc.}]$$

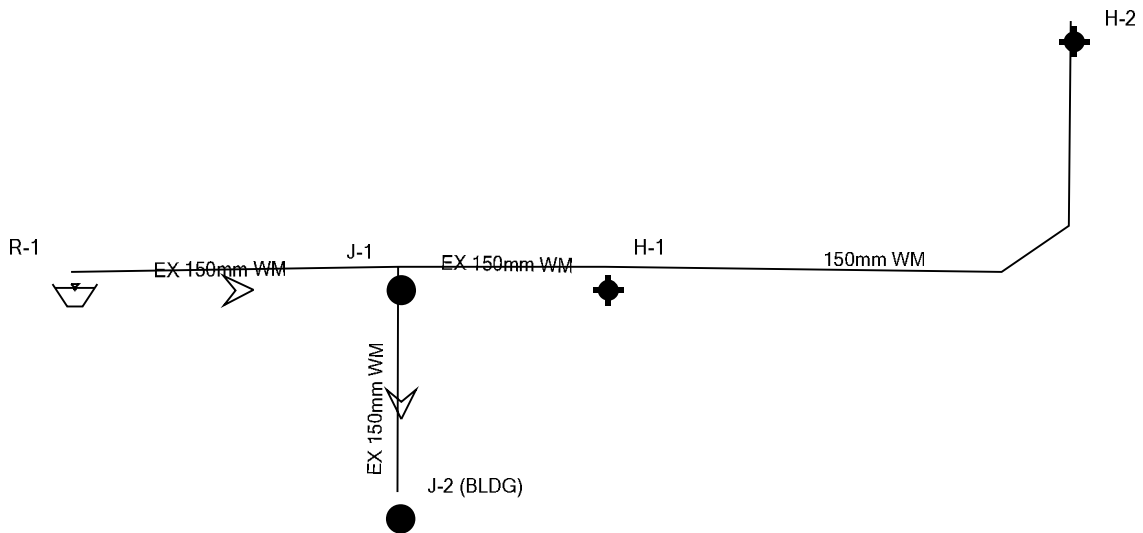
K	19	(from Table 1 pg A-31) (Worst case occupancy {E / F2} 'K' value used)
V	1,327	(Total building volume in m ³ .)
Stot	2.0	(From figure 1 pg A-32)
Q =	50,410.80 L	

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

2700 L/min (if Q < 108,000 L)
713 gpm

			From Figure 1 (A-32)
Snorth	23	m	0.00
Seast	4	m	0.50
Ssouth	8	m	0.15
Swest	0	m	0.50
*approximate distances			

Max Day + Fire Flow



Average Day

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Hydraulic Grade (m)
J-1	88.05	0.00	54.58	126.50
J-2 (BLDG)	88.44	46.20	54.02	126.50

Peak Hourly

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Hydraulic Grade (m)
J-1	88.05	0.00	65.36	134.10
J-2 (BLDG)	88.44	124.20	64.80	134.09

Max Day + Fire Flow

Label	Is Fire Flow Run Balanced?	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (L/min)	Fire Flow (Available) (L/min)	Pressure (psi)
H-1	True	True	7,000.00	11,390.66	55.50
H-2	True	True	7,000.00	7,638.14	55.22
J-1	False	False	7,000.00	(N/A)	55.29
J-2 (BLDG)	False	False	7,000.00	(N/A)	54.73

Elevation (m)	Demand (L/min)	Pressure (Residual Lower Limit) (psi)
87.90	0.00	20.00
88.10	0.00	20.00
88.05	0.00	20.00
88.44	69.00	20.00

APPENDIX C SANITARY CALCULATIONS

Project:	CP-19-0453 – TRISTIAN COURT
Designed By:	S.P.G
Checked By:	C.D.H.
Date:	December 20, 2019

Re: Sanitary Flow Calculations

1. Building Occupancy

The maximum number of people will be 44 people as per the floors plans and occupancy loading for office buildings in the OBC.

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 person per liters a day
= 75 Liters/Person/Day

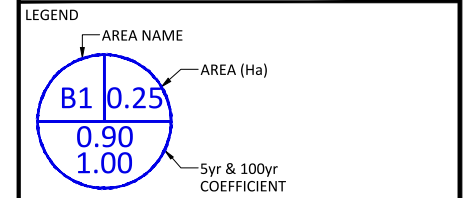
3. Peak Flow (Q/p)

- $Q(p) = F \times P$
Where:
F = 75 Litres/Person/Day (as per City of Ottawa Sewer Design Guidelines)
P = 44 people (as per Site Plan)
- Therefore, $Q(p) = (75) \times (44) = \underline{3,300 \text{ L/Day (0.038 L/sec)}}$

The proposed site will have a peak flow of 0.038L/s which is considered negatable and therefore it is anticipated that there will be no issues with capacity constraints within the existing sanitary main.

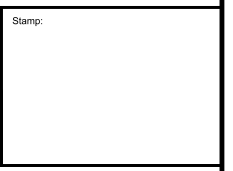
APPENDIX D
PRE-DEVELOPMENT DRAINAGE PLAN

APPENDIX E
POST-DEVELOPMENT DRAINAGE PLAN

[illegible]

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

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



Project:

PROPOSED BUILDINGS
7 TRISTAN COURT

Scale:	1:500	Project Number:	CP-18-0453
Drawn By:			
Checked By:	R.P.K.	Drawing Number:	C101
Designed By:			

D07-I2-XX-XXXX

XXXXXX

APPENDIX F
STORMWATER MANAGEMENT CALCULATIONS

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CP-18-0453 - Tristan Court - Runoff Calculations Warehouse Area

1 of 6

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	0.96	1,232.39	0.90	8,360.94	0.60	0.00	0.20	0.64	0.78

Pre-Development Runoff Calculations

Drainage Area	Area (ha)	C 5-Year	C 100-Year	Tc (min)	I (mm/hr)		Q (L/s)	
					5-Year	100-Year	5-Year	100-Year
A1	0.96	0.64	0.78	20	70.3	120.0	119.63	250.20
Total	0.96						119.63	250.20

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	0.10	633.63	0.90	0.00	0.60	383.46	0.20	0.64	0.72
B2	0.01	0.00	0.90	0.00	0.60	115.87	0.20	0.20	0.25
B3	0.02	0.00	0.90	0.00	0.60	196.79	0.20	0.20	0.25
B4	0.83	4,299.52	0.90	3,980.28	0.60	0.00	0.20	0.76	0.88

Post-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
B1	0.10	0.64	0.72	10	104.2	178.6	18.74	36.21
B2	0.01	0.20	0.25	10	104.2	178.6	0.67	1.44
B3	0.02	0.20	0.25	10	104.2	178.6	1.14	2.44
B4	0.83	0.76	0.88	10	104.2	178.6	181.26	361.61
Total	0.96						201.81	401.70

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
A1	0.96	0.50	0.50	20	70.3	120.0	93.68	159.95

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	18.74	36.21	18.74	36.21	0.00	0.00	0.00	0.00
B2	0.67	1.44	0.67	1.44	0.00	0.00	0.00	0.00
B3	1.14	2.44	1.14	2.44	0.00	0.00	0.00	0.00
B4	181.26	361.61	41.88	52.40	96.40	241.15	98.60	238.16
Total	201.81	401.70	62.43	92.50	96.40	241.15	98.60	238.16

McINTOSH PERRY

CP-18-0453 - Tristan Court - STORAGE REQUIREMENTS WAREHOUSE AREA

2 of 6

Storage Requirements for Area B2

5-Year Storm Event

Tc (min)	I (mm/hr)	B4 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m³)
10	104.2	181.26	41.88	139.38	83.63
15	83.6	145.36	41.88	103.49	93.14
20	70.3	122.21	41.88	80.34	96.40
25	60.9	105.94	41.88	64.06	96.09
30	53.9	93.82	41.88	51.94	93.49
35	48.5	84.40	41.88	42.53	89.31
40	44.2	76.87	41.88	34.99	83.98
45	40.6	70.68	41.88	28.80	77.77
50	37.7	65.50	41.88	23.63	70.88
55	35.1	61.10	41.88	19.23	63.45
60	32.9	57.31	41.88	15.43	55.57

Maximum Storage Required 5-Year (m³) = 96.40

100-Year Storm Event

Tc (min)	I (mm/hr)	B4 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m³)
10	178.6	361.61	52.40	309.21	185.52
15	142.9	289.38	52.40	236.98	213.28
20	120.0	242.92	52.40	190.51	228.62
25	103.8	210.31	52.40	157.90	236.85
30	91.9	186.05	52.40	133.64	240.56
35	82.6	167.23	52.40	114.83	241.15
40	75.1	152.18	52.40	99.78	239.47
45	69.1	139.84	52.40	87.43	236.07
50	64.0	129.52	52.40	77.11	231.34
55	59.6	120.75	52.40	68.34	225.54
60	55.9	113.20	52.40	60.79	218.85

Maximum Storage Required 100-Year (m³) = 241.15

5-Year Storm Event Storage Summary

Water Elev. (m) =	89.37		
INV. (out)	Area (m²)	Depth (m)	Volume (m³)
88.50		0.87	98.5

Storage Available (m³) = 98.5

Storage Required (m³) = 96.4

100-Year Storm Event Storage Summary

Water Elev. (m) =	89.82		
INV. (out)	Area (m²)	Depth (m)	Volume (m³)
88.50		1.32	243.8

Storage Available (m³) = 243.8

Storage Required (m³) = 241.1

McINTOSH PERRY

CP-18-0453 - Tristan Court - ORIFICE CALCULATIONS WAREHOUSE AREA

3 of 6

LOCATION: SOUTH

For Orifice Flow, C= 0.6

For Weir Flow, C= 3.33

	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	88.50			
center of crest elevation	88.58			
orifice width / weir length	150 mm			
orifice height				
orifice area (m ²)	0.018	0.000		

Elevation Discharge Table - Storm Routing

Elevation	Orifice 1		Orifice 2		Weir 1		Weir 2		Total Q [l/s]
	H [m]	Q [m ³]	H [m]	Q [m ³]	H [m]	Q [m ³]	H [m]	Q [m ³]	
88.50	x	x							0.00
89.35	0.78	0.041							41.35
89.36	0.79	0.042							41.61
89.37	0.80	0.042							41.88
89.38	0.81	0.042							42.14
89.39	0.82	0.042							42.40
89.40	0.83	0.043							42.66
89.41	0.84	0.043							42.92
89.42	0.85	0.043							43.17
89.43	0.86	0.043							43.43
89.44	0.87	0.044							43.68
89.45	0.88	0.044							43.93
89.46	0.89	0.044							44.18
89.47	0.90	0.044							44.43
89.48	0.91	0.045							44.68
89.49	0.92	0.045							44.92
89.50	0.93	0.045							45.17
89.51	0.94	0.045							45.41
89.52	0.95	0.046							45.66
89.53	0.96	0.046							45.90
89.54	0.97	0.046							46.14
89.55	0.98	0.046							46.37
89.56	0.99	0.047							46.61
89.57	1.00	0.047							46.85
89.58	1.01	0.047							47.08
89.59	1.02	0.047							47.32
89.60	1.03	0.048							47.55
89.61	1.04	0.048							47.78
89.62	1.05	0.048							48.01
89.63	1.06	0.048							48.24
89.64	1.07	0.048							48.47
89.65	1.08	0.049							48.69
89.66	1.09	0.049							48.92
89.67	1.10	0.049							49.15
89.68	1.11	0.049							49.37
89.69	1.12	0.050							49.59
89.70	1.13	0.050							49.81
89.71	1.14	0.050							50.03
89.72	1.15	0.050							50.25
89.73	1.16	0.050							50.47
89.74	1.17	0.051							50.69
89.75	1.18	0.051							50.91
89.76	1.19	0.051							51.13
89.77	1.20	0.051							51.34
89.78	1.21	0.052							51.55
89.79	1.22	0.052							51.77
89.80	1.23	0.052							51.98
89.81	1.24	0.052							52.19
89.82	1.25	0.052							52.40
89.83	1.26	0.053							52.61
89.84	1.27	0.053							52.82
89.85	1.28	0.053							53.03
89.86	1.29	0.053							53.24
89.87	1.30	0.053							53.45
89.88	1.31	0.054							53.65

- 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 flow calculated in Bentley's FlowMaster - Trapezoidal Channel at 0.1%, 3:1 side slopes, roughness coeff. Of 0.035
4. These Computations Do Not Account for Submergence Effects Within the Pond Riser.
5. H for orifice equations is depth of water above the centroid of the orifice.
6. H for weir equations is depth of water above the weir crest.

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CP-18-0453 - Tristan Court - Runoff Calculations Addition

4 of 6

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
A2	0.02	201.00	0.90	0.00	0.60	0.00	0.20	0.90	1.00

Pre-Development Runoff Calculations

Drainage Area	Area (ha)	C 5-Year	C 100-Year	Tc (min)	I (mm/hr)		Q (L/s)	
					5-Year	100-Year	5-Year	100-Year
A2	0.02	0.50	0.50	20	70.3	120.0	1.96	3.35
Total	0.02						1.96	3.35

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
B5	0.02	201.00	0.90	0.00	0.60	0.00	0.20	0.90	1.00

Post-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
B5	0.02	0.90	1.00	10	104.2	178.6	5.24	9.98
Total	0.02						5.24	9.98

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
B5	5.24	9.98	0.72	1.32	3.61	7.20	4.52	7.54
Total	5.24	9.98	0.72	1.32	3.61	7.20	4.52	7.54

ROOF DRAIN FLOW FOR FLAT ROOF

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
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

5 roof drain during a 5 year storm

elevation of water = 30mm

Flow leaving 5 roof drain = $(5 \times 0.36 \text{ L/s}) = 1.80 \text{ L/s}$

5 roof drain during a 100 year storm

elevation of water = 55mm

Flow leaving 5 roof drain = $(5 \times 0.66 \text{ L/s}) = 3.30 \text{ L/s}$

Roof Drain Flow		
	Flow (l/s)	2 Roof Drains Flow (l/s)
5-YR	0.18	0.36
	0.24	0.48
	0.30	0.60
	0.36	0.72
	0.42	0.84
100-YR	0.48	0.96
	0.54	1.08
	0.60	1.20
	0.66	1.32
	0.72	1.44
	0.78	1.56
	0.84	1.68
	0.90	1.80
	0.96	1.92
	1.02	2.04
	1.08	2.16
	1.14	2.28
	1.20	2.40
	1.26	2.52
	1.32	2.64
	1.38	2.76
	1.44	2.88
	1.50	3.00
	1.56	3.12
	1.62	3.24
	1.68	3.36
	1.74	3.48
	1.80	3.60

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

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Storage Requirements for Area B5

5-Year Storm Event

Tc (min)	I (mm/hr)	B5 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	104.2	5.24	0.72	4.52	2.71
15	83.6	4.20	0.72	3.48	3.13
20	70.3	3.53	0.72	2.81	3.38
25	60.9	3.06	0.72	2.34	3.51
30	53.9	2.71	0.72	1.99	3.59
35	48.5	2.44	0.72	1.72	3.61
40	44.2	2.22	0.72	1.50	3.60
45	40.6	2.04	0.72	1.32	3.57
50	37.7	1.89	0.72	1.17	3.52
55	35.1	1.77	0.72	1.05	3.45
60	32.9	1.66	0.72	0.94	3.37

Maximum Storage Required 5-Year (m³) = 3.61

100-Year Storm Event

Tc (min)	I (mm/hr)	B5 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	178.6	9.98	1.20	8.78	5.27
15	142.9	7.98	1.20	6.78	6.11
20	120.0	6.70	1.20	5.50	6.60
25	103.8	5.80	1.20	4.60	6.90
30	91.9	5.13	1.20	3.93	7.08
35	82.6	4.61	1.20	3.41	7.17
40	75.1	4.20	1.20	3.00	7.20
45	69.1	3.86	1.20	2.66	7.18
50	64.0	3.57	1.20	2.37	7.12
55	59.6	3.33	1.20	2.13	7.03
60	55.9	3.12	1.20	1.92	6.92

Maximum Storage Required 100-Year (m³) = 7.20

STORAGE OCCUPIED IN AREA B2

5-Year Storm Event

Location	T/G	INV. (out)	75% of Area (m ²)	Depth (m)	Volume (m ³)
ROOF	N/A	N/A	150.8	0.030	4.5
Total					4.5

Storage Available (m³) = 4.5

Storage Required (m³) = 3.6

100-YEAR STORM EVENT

Location	T/G	INV. (out)	75% of Area (m ²)	Depth (m)	Volume (m ³)
ROOF	N/A	N/A	150.8	0.050	7.5
Total					7.5

Storage Available (m³) = 7.5

Storage Required (m³) = 7.2

McINTOSH PERRY

CLIENT: BBS CONSTRUCTION LTD.

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: C.D.H.	No. 1.	Revision ISSUED FOR SITE PLAN CONTROL	Date 2020-01-14
		Checked: R.P.K.			
		Project No.: CP-18-0453			
					Sheet No: 1 of 1

APPENDIX G
CITY OF OTTAWA DESIGN CHECKLIST

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)
<ul style="list-style-type: none"> Executive Summary (for larger reports only). 	N/A
<ul style="list-style-type: none"> Date and revision number of the report. 	On Cover
<ul style="list-style-type: none"> Location map and plan showing municipal address, boundary, and layout of proposed development. 	Appendix E
<ul style="list-style-type: none"> Plan showing the site and location of all existing services. 	Site Servicing Plan (C102)
<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Summary of pre-consultation meetings with City and other approval agencies. 	Appendix A
<ul style="list-style-type: none"> 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 defensible design criteria. 	1.1 Purpose 1.2 Site Description 6.0 Stormwater Management
<ul style="list-style-type: none"> Statement of objectives and servicing criteria. 	3.0 Pre-Consultation Summary

<ul style="list-style-type: none"> • Identification of existing and proposed infrastructure available in the immediate area. 	N/A
<ul style="list-style-type: none"> • 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)
<ul style="list-style-type: none"> • 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)
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • Proposed phasing of the development, if applicable. 	N/A
<ul style="list-style-type: none"> • Reference to geotechnical studies and recommendations concerning servicing. 	Section 2.0 Background Studies
<ul style="list-style-type: none"> • All preliminary and formal site plan submissions should have the following information: <ul style="list-style-type: none"> ○ Metric scale ○ North arrow (including construction North) ○ Key plan ○ Name and contact information of applicant and property owner ○ Property limits including bearings and dimensions ○ Existing and proposed structures and parking areas ○ Easements, road widening and rights-of-way ○ Adjacent street names 	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)

4.2 Development Servicing Report: Water

Criteria	Location (if applicable)
<ul style="list-style-type: none"> Confirm consistency with Master Servicing Study, if available 	N/A
<ul style="list-style-type: none"> Availability of public infrastructure to service proposed development 	N/A
<ul style="list-style-type: none"> Identification of system constraints 	N/A
<ul style="list-style-type: none"> Identify boundary conditions 	N/A
<ul style="list-style-type: none"> Confirmation of adequate domestic supply and pressure 	N/A
<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design 	N/A
<ul style="list-style-type: none"> Address reliability requirements such as appropriate location of shut-off valves 	N/A
<ul style="list-style-type: none"> Check on the necessity of a pressure zone boundary modification. 	N/A
<ul style="list-style-type: none"> 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

<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • Description of off-site required feeder mains, 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
<ul style="list-style-type: none"> • Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines. 	Appendix B
<ul style="list-style-type: none"> • 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)
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • Confirm consistency with Master Servicing Study and/or justifications for deviations. 	N/A
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • Description of existing sanitary sewer available for discharge of wastewater from proposed development. 	Section 5.2 Sanitary Sewer

<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • Description of proposed sewer network including sewers, pumping stations, and forcemains. 	Section 5.2 Sanitary Sewer
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development. 	N/A
<ul style="list-style-type: none"> • Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity. 	N/A
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • Special considerations such as contamination, corrosive environment etc. 	N/A

4.4 Development Servicing Report: Stormwater Checklist

Criteria	Location (if applicable)
<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Analysis of available capacity in existing public infrastructure. 	N/A
<ul style="list-style-type: none"> A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern. 	Pre & Post-Development Plans
<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Description of the stormwater management concept with facility locations and descriptions with references and supporting information. 	Section 6.0 Stormwater Management
<ul style="list-style-type: none"> Set-back from private sewage disposal systems. 	N/A
<ul style="list-style-type: none"> Watercourse and hazard lands setbacks. 	N/A
<ul style="list-style-type: none"> Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed. 	N/A
<ul style="list-style-type: none"> Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists. 	N/A
<ul style="list-style-type: none"> 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

<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • Any proposed diversion of drainage catchment areas from one outlet to another. 	Section 6.0 Stormwater Management
<ul style="list-style-type: none"> • Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities. 	Section 6.0 Stormwater Management
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • Identification of potential impacts to receiving watercourses 	N/A
<ul style="list-style-type: none"> • Identification of municipal drains and related approval requirements. 	N/A
<ul style="list-style-type: none"> • Descriptions of how the conveyance and storage capacity will be achieved for the development. 	Section 6.0 Stormwater Management
<ul style="list-style-type: none"> • 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)
<ul style="list-style-type: none"> • Inclusion of hydraulic analysis including hydraulic grade line elevations. 	N/A

<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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)
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • Application for Certificate of Approval (CofA) under the Ontario Water Resources Act. 	N/A
<ul style="list-style-type: none"> • Changes to Municipal Drains. 	N/A
<ul style="list-style-type: none"> • 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)
<ul style="list-style-type: none">Clearly stated conclusions and recommendations	Section 8.0 Summary Section 9.0 Recommendations
<ul style="list-style-type: none">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
<ul style="list-style-type: none">All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	All are stamped