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Proposed 4-Storey Residential Development 355, 357, 359 & 361 Nelson Street

Development Servicing Study and Stormwater Management Report

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PROPOSED 4-STOREY RESIDENTIAL DEVELOPMENT
355, 357, 359 & 361 NELSON STREET

DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT

Prepared by:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

October 27, 2017

Ref: R-2017-139
Novatech File No. 116018

October 27, 2017

A.F. Martins Construction
35 Linden Terrace
Ottawa, ON
K1S 1Z1

Attention: Ms. Tina Campagna

Dear Ms. Campagna:

Re: Development Servicing Study and Stormwater Management Report
Proposed 4-storey Residential Development
355, 357, 359 & 361 Nelson Street
Ottawa, ON
Novatech File No.: 116018

Enclosed herein is a copy of the 'Development Servicing Study and Stormwater Management Report' for the proposed residential development located at 355, 357, 359 and 361 Nelson Street, in the City of Ottawa. This report addresses the approach to site servicing and stormwater management and is submitted in support of a site plan control application.

Please contact the undersigned, should you have any questions or require additional information.

Yours truly,

NOVATECH

François Thauvette, P. Eng.
Senior Project Manager | Land Development & Public Sector Engineering

cc: Abdul Mottalib (City of Ottawa)
Vincent Alcaide (Alcaide Webster Architects Inc.)
Eugen Sieber (Quadrant Engineering)

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

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1.0 INTRODUCTION

The new 4-storey residential development is being proposed by A. F. Martins Construction and Novatech has been retained to complete the site servicing and stormwater management design for this project.

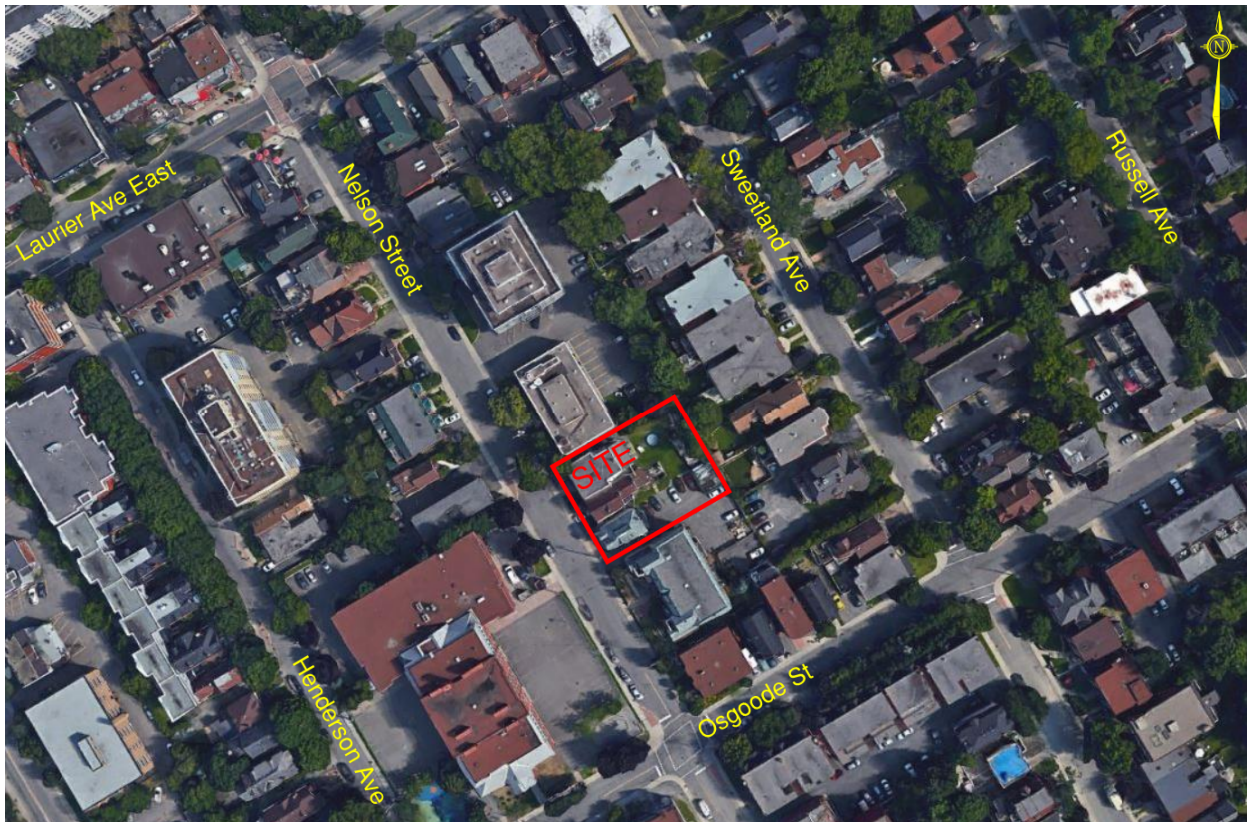
1.1 Purpose

This report addresses the approach to site servicing and stormwater management and is being submitted in support of a site plan control application.

1.2 Location and Site Description

The site to be re-developed is located at 355, 357, 359 and 361 Nelson Street, between Osgoode Street and Laurier Avenue East. Three (3) residential buildings, including a small rear-yard parking area, currently occupy these properties. The properties will be merged into a single parcel approximately 0.105 ha in size. The subject site is surrounded by residential properties to the north, south and east. Franco Jeunesse Public School is located across the street to the west.

Figure 1 – **Aerial Plan** provides an aerial view of the site.



The legal description of the site is designated as Part of Lot 8 and all of Lot 9 (East Side Nelson Street), Registered Plan 14349, City of Ottawa.

1.3 Pre-Consultation Information

A pre-consultation meeting was held with the City of Ottawa on October 27, 2016, at which time the client was advised of the general submission requirements. Refer to **Appendix A** for a copy of the correspondence from the City of Ottawa.

Based on a review of **O. Reg. 525/98: Approval Exemptions**, an MOECC Environmental Compliance Approval (ECA) is anticipated to be required because the storm flows from this site are ultimately being directed into a combined sewer in Somerset Street East. A pre-consultation meeting has not been held with the Ministry of the Environment and Climate Change (MOECC).

The subject site is located within the jurisdiction of the Rideau Valley Conservation Authority (RVCA). Based on discussions with the RVCA and the City of Ottawa, stormwater quality control will not be required for this development as the storm sewer flows are ultimately being directed into a combined sewer.

1.4 Proposed Development

The proposed development is being constructed A. F. Martins Construction and will consist of a 4-storey residential building with a total of 27 apartment units, complete with rear-yard parking and outdoor amenity space. The proposed building will be serviced by extending new services to the municipal sewers and watermain in Nelson Street. Drainage of the rear-yard area will be achieved by installing a new catchbasin and extending a new sewer to the municipal storm sewer in Nelson Street. The existing buildings will be demolished to accommodate the proposed development. Construction will proceed as a single phase. Refer to the subsequent sections of the report and to the enclosed plans for further details.

1.5 Reference Material

[1] The 'Geotechnical Investigation – Proposed Residential Building – 355 - 361 Nelson Street (Ref. No. PG4059-LET.01), prepared by Paterson Group on April 6, 2017.

2.0 SITE SERVICING

The objective of the site servicing design is to conform to the requirements of the City of Ottawa, to provide suitable sewage outlets and to ensure that a domestic water supply and appropriate fire protection are provided to meet the needs of the proposed building. Servicing criteria, expected sewage flows and water demands for the proposed development have been established using the City of Ottawa design guidelines for sewer systems and water distribution. Refer to the subsequent sections of the report for further details.

The City of Ottawa Servicing Study Guidelines for Development Applications requires a Development Servicing Study Checklist to confirm that each applicable item is deemed complete and ready for review by City of Ottawa Infrastructure Approvals. A completed checklist is enclosed in **Appendix B** of the report.

2.1 Sanitary Sewage

The proposed 4-storey residential building will be serviced by a new 200mm dia. sanitary service connected to the existing 300mm dia. sanitary sewer in Nelson Street.

The City of Ottawa design criteria were used to calculate the theoretical sanitary flows for the proposed 4-storey residential building. The following design criteria were taken from Section 4

– 'Sanitary Sewer Systems' and Appendix 4-A - 'Daily Sewage Flow For Various Types of Establishments' of the City of Ottawa Sewer Design Guidelines:

- Residential Units (Studio or 1-Bedroom): 1.4 people per unit
- Residential Units (2-Bedroom): 2.1 people per unit
- Average Daily Residential Sewage Flow: 350 L/person/day
- Residential Peaking Factor = 4.0 (Harmon Equation)
- Infiltration Allowance: 0.28 L/s/ha x 0.105 ha site = 0.03 L/s

Table 1 identifies the theoretical sanitary flows for the residential building based on the above design criteria.

Table 1: **Theoretical Post-Development Sanitary Flows**

Type of Use (Residential Units)	Units	Design Population	Average Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Total Flow (L/s)
1-Bedroom	8	12	0.05	4.0	0.20	0.20
2-Bedroom	19	40	0.16	4.0	0.64	0.64
Total	27	52	0.21	-	0.84	0.87*

*Includes Infiltration allowance (0.03 L/s)

A 200mm dia. sanitary gravity service at a minimum slope of 1.0% has a full flow conveyance capacity of 34.2 L/s and will have sufficient capacity to convey the theoretical sanitary flows.

2.2 Water

The proposed 4-storey residential building will be serviced by a new 150mm dia. water service connected to the existing 200mm dia. watermain in Nelson Street. The proposed water service will be sized to provide both the required domestic water demand and fire flow. A shut-off valve will be provided on the proposed service at the property line. The water meter will be in the mechanical room inside the building; while the remote meter will be located on the exterior face of the building, near the main entrance.

In order to determine if the existing 200mm dia. watermain in Nelson Street has adequate capacity to accommodate the proposed development a hydraulic analysis was completed based on boundary conditions provided by the City of Ottawa.

2.2.1 Domestic Water Demand

The City of Ottawa design criteria were used to calculate the theoretical water demand for the proposed 4-storey residential building. The following design criteria were taken from Section 4 – 'Water Distribution Systems' of the Ottawa Design Guidelines – Water Distribution and Table 3-3 from the MOE design guidelines for drinking water systems:

- Residential Units (Studio or 1 Bedroom): 1.4 people per unit
- Residential Units (2 Bedroom): 2.1 people per unit
- Average Daily Residential Water Demand: 270-450 L/person/day (use 450 L/person/day)

Peaking Factors for Drinking Water Systems Fewer than 500 people interpolated from MOE Table 3-3:

- Maximum Day Factor = 8.7 x Average Day Demand
- Peak Hour Factor = 13.0 x Average Day Demand

Watermain Operating Pressure Range:

- Normal operating pressure are to range between 345 kPa (50 psi) and 552 kPa (80 psi) under Max Day demands
- Minimum system pressures are to be 276 kPa (40 psi) under Peak Hour demands
- Minimum system pressures are to be 140 kPa (20 psi) under Max Day + Fire Flow demands

Table 2 identifies the theoretical domestic water demands for the building based on the above design criteria.

Table 2: **Theoretical Water Demand for Proposed Development**

Type of Use (Residential Units)	Units	Design Population	Average Day Demand (L/s)	Max Day Demand (L/s)	Peak Hour Demand (L/s)
1-Bedroom	8	12	0.06	0.52	0.78
2-Bedroom	19	40	0.21	1.83	2.73
Total	27	52	0.27	2.35	3.51

2.2.1.1 Water Supply for Fire-Fighting

The proposed building will be fully sprinklered and supplied with a fire department siamese connection. The siamese connection will be located near the main building entrance, within 45m of the existing fire hydrant in front of 315 Nelson Street.

The Fire Underwriters Survey (FUS) was used to estimate fire flow requirements for the proposed building. Ordinary construction was used in the calculations based on information provided by the architect. Based on preliminary FUS calculations, the fire flow requirements for the building are expected to be in the order of 2,114 USGPM (or 8,000 L/min). The fire flow requirements include both sprinkler system and hose allowances in accordance with the OBC and NFPA 13. The sprinkler system will be designed by the fire protection (sprinkler) contractor as this process involves detailed hydraulic calculations based on building layout, pipe runs, head losses, fire pump requirements, etc. Booster pumps will be required to provide adequate service pressure on the upper floors. Refer to **Appendix C** for a copy of the FUS fire flow calculations.

The hydraulic model EPANET was used for the purpose of analyzing the performance of the proposed watermain for two theoretical conditions:

1) Maximum Day + Fire Flow Demand
2) Peak Hour Demand

A schematic representation of the hydraulic network depicts the node and pipe numbers used in the model. The model is based on hydraulic boundary conditions provided by the City of Ottawa. The model indicates that acceptable pressure will exist throughout the watermain system under the specified design conditions. **Table 2A** and **Table 2B** summarize the hydraulic model results. Refer

to **Appendix C** for City of Ottawa boundary conditions, the hydraulic modeling schematic, modeling results and FUS Fire Flow calculations.

Table 2A: Maximum Day + Fire Flow Demand

Operating Condition	Minimum System Pressure	Maximum System Pressure
A Max Day demand of 2.35 L/s at Node N2 (Building) + a Fire Flow of 133 L/s at Node N4 (Hydrant)	A minimum system pressure of 306.95 kPa (44.52 psi) is available at Node N4 (Hydrant)	A maximum system pressure of 373.76 kPa (54.21 psi) is available at Node N1 (Service Connection)

Table 2B: Peak Hour Demand

Operating Condition	Minimum System Pressure	Maximum System Pressure
A Peak Hour demand of 3.51 L/s at Node N2 (Building)	A minimum system pressure of 359.05 kPa (52.08 psi) is available at Node N4 (Hydrant)	A maximum system pressure of 394.36 kPa (57.20 psi) is available at Node N1 (Service Connection)

The model indicates that the existing 200mm dia. municipal watermain in Nelson Street will provide adequate system pressures for both 'Max Day + Fire Flow' and 'Peak Hour' conditions, within the normal operating pressure ranges specified by the City of Ottawa. A check under Max HGL conditions was also run and system pressures were below 80 psi. Refer to **Appendix C** for City of Ottawa boundary conditions, the hydraulic modeling schematic, modeling results and FUS calculations.

2.3 Storm and Stormwater Management

The proposed 4-storey residential building will be serviced by a new 200mm dia. storm service connected to the existing 450mm dia. storm sewer in Nelson Street. A second storm connection to the municipal storm sewer will be required to drain the rear-yard and paved parking area. The approach for the stormwater management design is discussed in the subsequent sections of the report.

2.3.1 Stormwater Management Criteria and Objectives

The criteria and objectives for the proposed stormwater management design are as follows:

- Minimize the impact on the existing 450mm dia. storm sewer in Nelson Street by reducing the post-development storm flows from the site, when compared to current conditions.
- Maximize the use of on-site storage, both on the building roof and within the paved parking area at the back of the property.
- Control the post-development flows from the site to an allowable 1:2-year release rate specified by the City of Ottawa, based on a runoff coefficient of C=0.4 and a rainfall intensity based on a time of concentration t_c=10 minutes (City of Ottawa IDF curves). Control post-development flows for storms up to and including the 1:100-year design event.
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

2.3.2 Pre-Development Conditions and Allowable Release Rate

The uncontrolled pre-development flows for the 0.105 ha site were calculated using the Rational Method to be 19.5 L/s during the 1:5-year design event and 37.6 L/s during the 1:100-year design event. Refer to **Appendix D** for detailed calculations. There are currently no water quantity or water quality control measures being provided on site.
The allowable 1:2-year release rate for the site, as specified by the City of Ottawa, was calculated using the Rational Method to be approximately 9.0 L/s, based on a runoff coefficient of C=0.4 and a rainfall intensity based on a time of concentration t_c=10 minutes (City of Ottawa IDF curves). Refer to **Appendix D** for detailed calculations.

2.3.3 Post-Development Conditions

To mitigate the stormwater related impacts due to the increase in imperviousness of the site, stormwater runoff will be attenuated using control flow roof drains. In addition to this, stormwater runoff from the rear-yard and parking lot will be attenuated by using an inlet control device (ICD) installed within the on-site storm sewer system.

Although most the runoff from the site will be controlled; due to the existing grades and proposed grading design, runoff from a portion of the site (front yard and a small portion of the side yards will sheet drain directly off site.

2.3.3.1 Area A-1 – Uncontrolled Direct Runoff to Nelson Street

The uncontrolled post-development flow from this sub-catchment area was calculated using the Rational Method to be approximately 1.2 L/s during the 1:5-year design event and 2.5 L/s during the 1:100-year design event. Refer to **Appendix D** for SWM calculations.

2.3.3.2 Area A-2 – Controlled Runoff from Rear Yard

The post-development flow from this sub-catchment area will be attenuated using an ICD installed in the outlet pipe of CBMH 2. Stormwater runoff from this sub-catchment area will be temporarily stored within the storm sewer system and on the surface of the paved parking area prior to being discharged into the municipal storm sewer system.

Table 3 summarizes the post-development design flow from this sub-catchment area as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 1:5 year and the 1:100 year design events.

Table 3: Design Flow and Inlet Control Device Table

Design Event	Drainage Area A-2				
	IPEX LMF Type ICD	Design Flow (L/s)	Ponding Elevation (m)	Storage Vol. Required (m^3)	Max Storage Provided (m^3)
1:5 Year	Tempest Vortex	2.1 L/s	-	4.4 m^3	9.5 m^3
1:100 Year	Tempest Vortex	3.4 L/s	69.00 m	9.3 m^3	

Refer to **Appendix D** for SWM calculations and to **Appendix E** for ICD information.

2.3.3.3 Area A-3 – Controlled Flow from Building Roof

The post-development flow from this sub-catchment area will be attenuated by using four (4) Watts adjustable 'Accutrol' control flow roof drains (model number RD-100-A-ADJ) prior to being directed to the proposed storm service.

Table 3A summarizes the post-development design flows from this sub-catchment area as well as the type of roof drains, the maximum anticipated ponding depths, storage volumes required and storage volumes provided for both the 1:5 year and the 1:100 year design events.

Table 3A: Design Flow and Roof Drain Table

Roof Drain ID & Drainage Area (ha)	Number of Roof Drains	Watts Roof Drain Model ID (Weir Opening)	Controlled Flow per Drain (L/s)		Approximate Ponding Depth Above Drains (m)		Storage Volume Required (m^3)		Max. Storage Available (m^3)
			1:5 Year	1:100 Year	1:5 Year	1:100 Year	1:5 Year	1:100 Year	
RD-1 (0.012 ha)	1	RD-100-A-ADJ (Closed)	0.76	0.76	0.07	0.10	1.6	4.2	4.8
RD-2 (0.010 ha)	1	RD-100-A-ADJ (Closed)	0.76	0.76	0.07	0.10	1.2	3.2	3.8
RD-3 (0.011 ha)	1	RD-100-A-ADJ (Closed)	0.76	0.76	0.08	0.11	1.4	3.7	3.9
RD-4 (0.010 ha)	1	RD-100-A-ADJ (Closed)	0.76	0.76	0.07	0.10	1.2	3.2	4.0
Total Roof (0.043 ha)	**4**	**-**	**3.04**	**3.04**	**-**	**-**	**5.4**	**14.3**	**16.5**

Refer to **Appendix D** for detailed SWM calculations. Refer to **Appendix F** for roof drain information. As indicated in the table above, the building roof will provide sufficient storage for both the 1:5 year and 1:100 year design events.

2.3.3.4 Area A-3 – Comparison of Site Flows (Pre-Development vs. Post-Development)

Table 4 compares the post-development flows from sub-catchment areas (Areas A-1, A-2 and A-3) to both the uncontrolled pre-development flows and to the allowable release rate specified by the City of Ottawa for both the 1:5 year and the 1:100 year design events.

Table 4: Stormwater Flow Comparison Table

Design Event	Drainage Areas A-1, A-2 and A-3						
	Pre-Development Conditions		Post-Development Conditions				
	Uncontrolled Flow (L/s)	Allowable Release Rate (L/s)	A-1 Flow (L/s)	A-2 Flow (L/s)	A-3 Flow (L/s)	Total Flow (L/s)	Reduction in Flow (L/s or %)*
1:5 Year	19.5	9.0	1.2	2.1	3.0	6.3	13.2 or 68%
1:100 Year	37.6	9.0	2.5	3.4	3.0	8.9	28.7 or 76%

*Reduced flow compared to pre-development uncontrolled conditions

As indicated in the table above, the 1:5 year post-development flows from the site will be less than the allowable release rate specified by the City of Ottawa. During the 1:100 year design event, the site flows will match the allowable release requested by the City.
As indicated in the table above, the 1:100-year post-development flows from the site will not exceed the allowable release rate specified by the City of Ottawa. During the 1:5-year design event, the site flows will be slightly less than the allowable release for the site. Furthermore, both the 1:5-year and 1:100-year post-development design events represent significant reductions in total site flow rate when compared to the respective pre-development conditions.

2.3.3.5 Stormwater Quality Control

The subject site is located within the jurisdiction of the Rideau Valley Conservation Authority (RVCA). Based on discussions with the RVCA and City of Ottawa, stormwater quality control will not be required for this development as the storm sewer flows are ultimately directed into a combined sewer in Somerset Street East. Despite the small parking lot at the back of the property, most of the development (building rooftop, landscaping and rear-yard amenity areas) are deemed clean for protecting surface water and aquatic habitat.

3.0 SITE GRADING

The site to be developed is relatively flat with elevations ranging from 69.6m+/- to 69.0m+/-. The elevations along the back of the property are slightly higher (0.4m+/-) than the elevations along the front property line, while the elevations along the north property line are also slightly higher than those along the south property line. The intent is to match into the existing elevations along the property lines. A short retaining wall (less than 0.5m in height) will be required along a portion of the rear-yard. The elevation of the main building entrance will be set at 69.12m to ensure barrier-free access from the proposed sidewalk along Nelson Street. Stairs and an elevator are being proposed within the building to provide access to the upper floors. The exit at the back of the building (internal stairwell) is set at an elevation of 69.37m to accommodate the elevations within the rear-yard. Refer to the enclosed Grading and Erosion & Sediment Control Plan for details.

3.1 Major System Overflow Route

In the case of a major rainfall event exceeding the design storms provided for, the stormwater located within the rear yard parking lot and amenity space will overflow towards Nelson Street, via the paved laneway on the south side of the building. The major system overflow route is shown on the enclosed Grading and Erosion & Sediment Control Plan.

4.0 GEOTECHNICAL INVESTIGATIONS

A Geotechnical Investigation Report has been prepared by Paterson Group for the proposed project. Refer to the Geotechnical Report[1] for subsurface conditions, construction recommendations and geotechnical inspection requirements.

5.0 EROSION AND SEDIMENT CONTROL

To mitigate erosion and to prevent sediment from entering the storm sewer system, temporary erosion and sediment control measures will be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Filter bags will be placed under the grates of nearby catchbasins, manholes and will remain in place until vegetation has been established and construction is completed.
- Silt fencing will be placed per OPSS 577 and OPSD 219.110 along the surrounding construction limits;
- Mud mat(s) will be installed at the site entrances. Location(s) to be determined by the contractor in the field.
- Street sweeping and cleaning will be performed, as required, to suppress dust and to provide safe and clean roadways adjacent to the construction site.
- On-site dewatering is to be directed to a sediment trap and/or gravel splash pad and discharged safely to an approved outlet as directed by the engineer.
- Based on the findings of the Geotechnical Investigation Report[1] a temporary MOE Permit to Take Water (PTTW) is not expected to be required.

The erosion and sediment control measures will be implemented prior to construction and will remain in place during all phases of construction. Regular inspection and maintenance of the erosion control measures will be undertaken.

6.0 CONCLUSION

This report has been prepared in support of a site plan control application for the proposed 4-storey residential development located at 355, 357, 359 and 361 Nelson Street.

The conclusions are as follows:

- The existing buildings and paved parking areas will be demolished to accommodate the proposed development.
- The proposed building will be serviced by the municipal watermain, sanitary and storm sewers in Nelson Street.
- The building will be sprinklered and supplied with a fire department siamese connection. The siamese connection will be located within 45m of an existing municipal fire hydrant located in front of the building immediately to the north of the subject site.
- The site flows from sub-catchment area A-1 will be uncontrolled. Runoff from Area A-2 will be controlled as much as possible by using an ICD within the outlet pipe of the on-site storm sewer system; while a total of four (4) Watts adjustable Accutrol roof drains will control post-development flows from sub-catchment area A-3.
- The total post-development site flow (from Areas A-1, A-2 and A-3) will be approximately 8.9 L/s during the 1:100 year design event, which is less than the allowable release rate of 9.0 L/s. During the 1:5 year design event, the total site flows will be over-controlled to approximately 6.3 L/s. Post-development flows are being reduced by 28.7 L/s (or 76%) during the 1:100 year event and by approximately 13.2 L/s (or 68%) during the 1:5 year design event when compared to current conditions.
- Regular inspection and maintenance of the storm sewer system, including the ICD and the controlled flow roof drains is recommended to ensure that the storm drainage system is clean and operational.
- Temporary erosion and sediment control measures are to be implemented during all phases of construction.

It is recommended that the proposed site servicing and stormwater management design be approved for implementation.

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Prepared by:

François Thauvette, P. Eng.
Senior Project Manager,
Land Development & Public Sector Engineering

APPENDIX A

Correspondence

Francois Thauvette

From: Kayla Blakely
Sent: Tuesday, November 08, 2016 9:37 AM
To: tinacampagna@sympatico.ca; valcaide@awa-arch.ca
Cc: Greg Mignon
Subject: FW: Preconsultation follow-up - 355 to 361 Nelson Street
Attachments: StudyPlanListSitePlan.pdf; 355-361 Nelson Street-General -Pre-consultation follow up.rtf

Good morning Tina & Vincent,

Please find attached, for your information, the submission requirements and additional comments received from the City following the pre-consultation meeting. We will review the requirements. Please do not hesitate to contact Greg or myself if you have any questions.

Regards,

Kayla Blakely, Planner
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 | Fax: 613.254.5867

From: Gauthier, Steve [mailto:Steve.Gauthier@ottawa.ca]
Sent: Monday, November 07, 2016 5:23 PM
To: Kayla Blakely <k.blakely@novatech-eng.com>; Nina Maher <n.maher@novatech-eng.com>
Subject: Preconsultation follow-up - 355 to 361 Nelson Street

Hi Kayla and Nina,

Attached are the submission requirements.

My apologies for the delay.

Steve Gauthier RPP
Planner | Urbaniste
Development Review | Examen des projets d'aménagement
Planning, Infrastructure and Economic Development | Urbanisme, infrastructure et développement économique
City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27889
ottawa.ca/planning / ottawa.ca/urbanisme

APPLICANT'S STUDY AND PLAN IDENTIFICATION LIST

Legend: **S** indicates that the study or plan is required with application submission.
A indicates that the study or plan may be required to satisfy a condition of approval/draft approval.

For information and guidance on preparing required studies and plans refer to:

http://ottawa.ca/en/development-application-review-process-0/guide-preparing-studies-and-plans

S/A	Number of copies	ENGINEERING		S/A	Number of copies
S	55	1. Site Servicing Plan	2. Assessment of Adequacy of Public Services / Site Servicing Brief	S	6
S	55	3. Grade Control and Drainage Plan	4. Geotechnical Study / Slope Stability Study	S	4
	2	5. Parking Study	6. Groundwater Impact Study		6
	5	7. Servicing Options Report	8. Wellhead Protection Study		6
	9	9. Transportation Overview and Parking Study	10. Erosion and Sediment Control Plan (can be combined with Grade Control and Drainage Plan)	S	6
S	6	11. Storm Water Management Report	12. Hydro geological and Terrain Analysis		8
	3	13. Hydraulic Water main Analysis	14. Noise / Vibration Study		3
	35	15. Roadway Modification Design Plan	16. Confederation Line Proximity Study		9

S/A	Number of copies	PLANNING / DESIGN / SURVEY		S/A	Number of copies
	50	17. Draft Plan of Subdivision	18. Plan Showing Layout of Parking Garage		2
	30	19. Draft Plan of Condominium	20. Planning Rationale / Design Brief	S	3
S	55	21. Site Plan	22. Minimum Distance Separation (MDS)		3
	20	23. Concept Plan Showing Proposed Land Uses and Landscaping	24. Agrology and Soil Capability Study		5
	3	25. Concept Plan Showing Ultimate Use of Land	26. Cultural Heritage Impact Statement		3
S	55	27. Landscape Plan	28. Archaeological Resource Assessment Requirements: **S** (site plan) **A** (subdivision, condo)		3
S	2	29. Survey Plan	30. Shadow Analysis		3
S	3	31. Architectural Building Elevation Drawings (dimensioned)	32. Design Brief (includes the Design Review Panel Submission Requirements)		Available online
	6	33. Wind Analysis			

S/A	Number of copies	ENVIRONMENTAL		S/A	Number of copies
S	5	34. Phase 1 Environmental Site Assessment	35. Impact Assessment of Adjacent Waste Disposal/Former Landfill Site		6
A	5	36. Phase 2 Environmental Site Assessment (depends on the outcome of Phase 1)	37. Assessment of Landform Features		7
	4	38. Record of Site Condition	39. Mineral Resource Impact Assessment		4
	10	40. Tree Conservation Report	41. Environmental Impact Statement / Impact Assessment of Endangered Species		11
	4	42. Mine Hazard Study / Abandoned Pit or Quarry Study			

S/A	Number of copies	ADDITIONAL REQUIREMENTS		S/A	Number of copies
		43.	44.		

Meeting Date: October 27, 2016

Application Type: *Site Plan Control*

File Lead (Assigned Planner): Steve Gauthier

Infrastructure Approvals Project Manager: Abdul Mottalib

Site Address (Municipal Address): 355-361 Nelson Street

*Preliminary Assessment: 1☐ 2☐ 3☐ 4☐ 5☐

*One (1) indicates that considerable major revisions are required before a planning application is submitted, while five (5) suggests that proposal appears to meet the City's key land use policies and guidelines. **This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.**

It is important to note that the need for additional studies and plans may result during application review. If following the submission of your application, it is determined that material that is not identified in this checklist is required to achieve complete application status, in accordance with the Planning Act and Official Plan requirements, the Planning and Growth Management Department will notify you of outstanding material required within the required 30 day period. Mandatory pre-application consultation will not shorten the City's standard processing timelines, or guarantee that an application will be approved. It is intended to help educate and inform the applicant about submission requirements as well as municipal processes, policies, and key issues in advance of submitting a formal development application. This list is valid for one year following the meeting date. If the application is not submitted within this timeframe the applicant must again pre-consult with the Planning and Growth Management Department.

Date of Pre-consultation: October 27, 2016

Pre-consultation follow up for 355-361 Nelson Street

Site: Residential Development

Capacity issues for sewers

Please find the Servicing Study Guidelines" in the attachment and prepare the servicing study accordingly. For capacity issue, please see section 3.2.1 page 3-3 and follow this section. A completed checklist with corresponding references from the servicing study is mandatory for the completeness of the study. Please add a completed checklist in the report.

ServicingGuideli nes_ final_Dec...

Sanitary sewer capacity

The allowable release rate should be based on the existing Zoning Designation using the City's Sewer Guidelines. If the proposal will have a greater flow than the allowable, then please do an analysis of the City's sanitary sewer system as per servicing guidelines to determine available capacity in the City's sanitary sewer system.

Required information for Water boundary conditions (not required if you're using existing service)

Boundary conditions are required to confirm that the require fire flows can be achieved as well as availability of the domestic water pressure on the city street in front of the development. Please use Table 3-3 of the MOE Design Guidelines for Drinking-Water System to determine Maximum Day and Maximum Hour peaking factors for 0 to 500 persons and use Table 4.2 of the Ottawa Design Guidelines, Water Distribution for 501 to 3,000 persons.

1. Location of Service
2. Street Number & Name
3. Type of development and units
4. Amount of fire flow required ___l/s (Calculation as per the FUS Method).
5. Average daily demand:-l/s
6. Maximum daily demand:-l/s
7. Maximum hourly daily demand:-l/s

Please note proposed development will require 2 separate service connections from the city watermains if the basic day demand is greater than 50m^3/day to avoid the creation of a vulnerable service area. Two water meters will be required for two service connections and the service connections will have to be looped.

Utility conflict with the proposed servicing

- It is the consultant's sole responsibility to investigate the existing utilities in the proposed servicing area while preparing the Servicing and Grading Plans to avoid any conflict with the proposed services and will require a note stating this on the servicing plan.

Stormwater Management criteria connecting into the combined sewer system (Quantity control criteria)

- Total (storm +sanitary) allowable release rate will be 2 year pre-development rate.
- C Coefficient of runoff will need to be determined **as per existing conditions** but in no case more than 0.4
- TC =20 minutes or can be calculated ,
- TC should not be less than 10 minute, since the IDF curves become unrealistic less than 10min.
- Any storm events greater than 2 year, up to 100 year, and including 100 year storm event must be detained on site.

Implementation considerations

- Accounting for external overland drainage if any
- Use of standard ICDs
- Requirement for ICD plans
- Requirement for plans showing 100-year and stress-test ponding limits

Studies required for Site Plan application

- Serviceability Study
- Stormwater Management Report
- Geotechnical Study
- ESA-Phase 1 Study, needs to be prepared as per current MOE regulation not as per CSA standards
- ESA-Phase 2, Depend on the Phase I recommendation if required needs to be prepared as per current MOE regulation not as per CSA standard

- Plans required;
    - Site Servicing Plan (Plan and Profile's for all services requiring MOE ECA)
    - Grade Control and Drainage Plan
    - Erosion and Sediment Control Plan

MOECC SWM Requirement:

- Connecting to a combined sewer, SWM requires an MOE application
- Multiple parcels using same servicing, storm sewer requires an MOE application

Please contact Ontario Ministry of the Environment and Climate Change, Ottawa District Office to arrange a pre-submission consultation:

- For residential applications: Charlie Primeau, (613) 521-3450, ext. 251, Charlie.Primeau@ontario.ca

Relevant information

1. Servicing & site works shall be in accordance with the following documents:

   - ⇨ Ottawa Sewer Design Guidelines (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 (2004)
   - ⇨ City of Ottawa Environmental Noise Control Guidelines (2006)
   - ⇨ City of Ottawa Park and Pathway Development Manual (2012)
   - ⇨ City of Ottawa Accessibility Design Standards (2012)
   - ⇨ Ottawa Standard Tender Documents (2015)
   - ⇨ Ontario Provincial Standards for Roads & Public Works (2015)

2. Record drawings and utility plans can be purchased from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).

Regards,

Abdul

Mohammad Abdul Mottalib, M. Sc., M. Eng., P. Eng.
Sr. Engineer Infrastructure Applications
Development Review Services Branch, Urban Services Unit
Planning, Infrastructure and Economic Development Department
Services de la planification, de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Ave. West / 110, avenue Laurier Ouest
Ottawa K1P 1J1
Tel. 613-580-2424 ext. 27798
Fax. 613-560-6006
E-mail: Abdul.Mottalib@ottawa.ca

APPENDIX B

Development Servicing Study 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

N/A ☐ Executive Summary (for larger reports only).

☑ Date and revision number of the report.

☑ Location map and plan showing municipal address, boundary, and layout of proposed development.

☑ Plan showing the site and location of all existing services.

☑ 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.

☑ Summary of Pre-consultation Meetings with City and other approval agencies.

N/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.

☑ Statement of objectives and servicing criteria.

☑ 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).

☑ 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.

N/A ☐ 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.

☑ Reference to geotechnical studies and recommendations concerning servicing.

☑ All preliminary and formal site plan submissions should have the following information:

- 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

4.2 Development Servicing Report: Water

N/A ☐ Confirm consistency with Master Servicing Study, if available

☑ Availability of public infrastructure to service proposed development

☑ Identification of system constraints

☑ Identify boundary conditions

☑ Confirmation of adequate domestic supply and pressure

☑ 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.

☑ 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

☑ Address reliability requirements such as appropriate location of shut-off valves

N/A ☐ Check on the necessity of a pressure zone boundary modification.

☑ 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

☑ 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.

☑ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.

☑ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

4.3 Development Servicing Report: Wastewater

☑ 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.

☑ 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.

☑ Description of existing sanitary sewer available for discharge of wastewater from proposed development.

☑ 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.

N/A ☐ 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.

☑ Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

☑ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)

☑ Analysis of available capacity in existing public infrastructure.

☑ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.

☑ 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.

N/A ☐ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.

☑ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.

N/A ☐ Set-back from private sewage disposal systems.

N/A ☐ Watercourse and hazard lands setbacks.

☑ 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.

- [x] Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- [ ] N/A Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- [x] 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.
- [ ] N/A Any proposed diversion of drainage catchment areas from one outlet to another.
- [x] Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- [ ] N/A 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.
- [ ] N/A Identification of potential impacts to receiving watercourses
- [ ] N/A Identification of municipal drains and related approval requirements.
- [x] Descriptions of how the conveyance and storage capacity will be achieved for the development.
- [x] 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.
- [ ] N/A Inclusion of hydraulic analysis including hydraulic grade line elevations.
- [x] Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- [ ] N/A 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.

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:

NOTED ☐ 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.)

4.6 Conclusion Checklist

☑ Clearly stated conclusions and recommendations

TBD ☐ 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 draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

APPENDIX C

Water Demands, Boundary Conditions, Schematic of the Hydraulic Model, Hydraulic Modeling Results and FUS Calculations

Francois Thauvette

From: Wu, John <John.Wu@ottawa.ca>
Sent: Tuesday, October 24, 2017 4:00 PM
To: Francois Thauvette
Subject: RE: 355-361 Nelson Street - Request for WM boundary conditions
Attachments: 355 Nelson Oct 2017.pdf

Here it comes:

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

The following are boundary conditions, HGL, for hydraulic analysis at 355 Nelson St (zone 1W) assumed to be connected to the 203 mm on Nelson St (see attached PDF for location).

Minimum HGL = 106.6 m

Maximum HGL = 115.6 m

Max Day + Fire Flow = 104.5 m

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.

John

From: Francois Thauvette [mailto:f.thauvette@novatech-eng.com]
Sent: Tuesday, October 24, 2017 8:41 AM
To: Wu, John <John.Wu@ottawa.ca>
Subject: RE: 355-361 Nelson Street - Request for WM boundary conditions

Hi John,

Do you know when we can expect to receive the WM boundary conditions from the City? Our client is anxious to submit the documents for SPA and we require this information to complete our servicing report.

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 219 | Cell: 613.276.0310 | Fax: 613.254.5867

From: Francois Thauvette
Sent: Thursday, October 19, 2017 9:38 AM
To: Wu, John <John.Wu@ottawa.ca>; Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Subject: 355-361 Nelson Street - Request for WM boundary conditions

Hi Abdul and John,

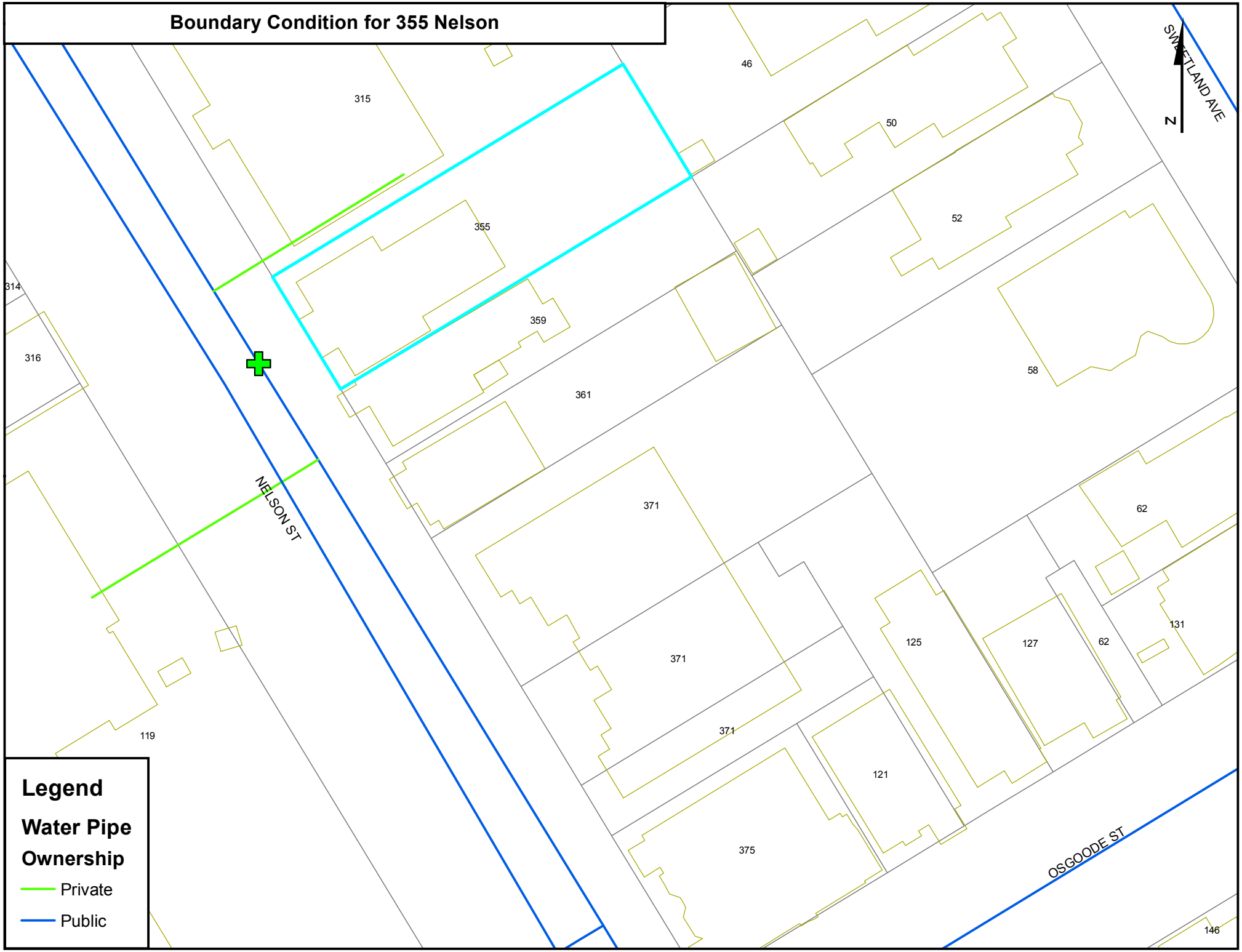
Please provide the municipal WM boundary conditions for the existing 200mm dia. watermain in Nelson Street. Based on preliminary calculations, using the City of Ottawa and MOE design guidelines for drinking water systems, the water demands for the proposed 4-storey residential building located at 355 Nelson Street are as follows:

· Average Day Demand = 0.27 L/s (based on design population of 52 residents x 450 L/cap/day, per City Design Guidelines)
· Max Day Demand = 2.35 L/s (Avg. Demand x 8.7, per MOE Table 3.3)
· Peak Hour Demand = 3.51 L/s (Avg. Demand x 13.0, per MOE Table 3.3)
· Fire Flow = 133 L/s (based on FUS calculations for a sprinklered building with ordinary construction). Refer to the attached FUS calculations sheet.

Please review and provide municipal watermain boundary conditions.

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 219 | Cell: 613.276.0310 | Fax: 613.254.5867


Boundary Condition for 355 Nelson
315
46
50
52
355
359
361
58
314
316
371
62
NELSON ST
371
125
127
62
131
371
119
121
375
OSGOODE ST
146
SWITZERLAND AVE
N
Legend
Water Pipe
Ownership
Private
Public

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 116018
Project Name: 355 Nelson Street
Date: 19/10/2017
Input By: Stephen Matthews
Reviewed By: François Thauvette

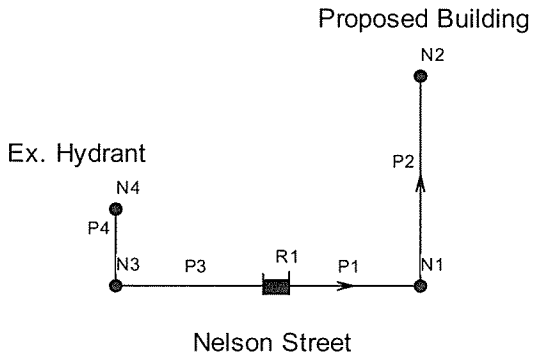
Legend: Input by User; No Information or Input Required

Building Description: 4 Storey residential building
Ordinary construction

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**					
	Coefficient related to type of construction C	Wood frame		1.5	1	
		Ordinary construction	Yes	1		
		Non-combustible construction		0.8		
		Fire resistive construction (< 3 hrs)		0.7		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	449			
		Number of Floors/Storeys	4			
		Area of structure considered (m^2)			**1,796**	
	F	**Base fire flow without reductions**				**9,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible	Yes	-25%	-25%	**6,750**
		Limited combustible		-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**					
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-2,700**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	No	-10%		
				Cumulative Total	**-40%**	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	0 - 3 m		25%	**4,388**
		East Side	20.1 - 30 m		10%	
		South Side	3.1 - 10 m		20%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**65%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**8,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**133**
				or	USGPM	2,114
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	960

355 Nelson Street

Day 1, 12:00 AM



Residential Development - 355 Nelson St.

Max Day + Fire Flow Demand
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc N1	66.4	0	104.5	38.1	373.76	54.21
Junc N2	69.12	2.35	104.5	35.38	347.08	50.34
Junc N3	66.6	0	102.84	36.24	355.51	51.56
Junc N4	70	133	101.29	31.29	306.95	44.52
Resvr R1	104.5	-135.35	104.5	0	0.00	0.00

Max Day + Fire Flow Demand
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	4.3	200	110	2.35	0.07	0.06
Pipe P2	10	150	100	2.35	0.13	0.29
Pipe P3	15.5	200	110	133	4.23	107.01
Pipe P4	3	150	100	133	7.53	518.4

Residential Development - 355 Nelson St.

Peak Hour Demand
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc N1	66.4	0	106.6	40.2	394.36	57.20
Junc N2	69.12	3.51	106.59	37.47	367.58	53.31
Junc N3	66.6	0	106.6	40	392.40	56.91
Junc N4	70	0	106.6	36.6	359.05	52.08
Resvr R1	106.6	-3.51	106.6	0	0.00	0.00

Peak Hour Demand
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	4.3	200	110	3.51	0.11	0.13
Pipe P2	10	150	100	3.51	0.2	0.62
Pipe P3	15.5	200	110	0	0	0
Pipe P4	3	150	100	0	0	0

Residential Development - 355 Nelson St.

Max HGL check
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc N1	66.4	0	115.6	49.2	482.65	70.00
Junc N2	69.12	3.51	115.59	46.47	455.87	66.12
Junc N3	66.6	0	115.6	49	480.69	69.72
Junc N4	70	0	115.6	45.6	447.34	64.88
Resvr R1	115.6	-3.51	115.6	0	0.00	0.00

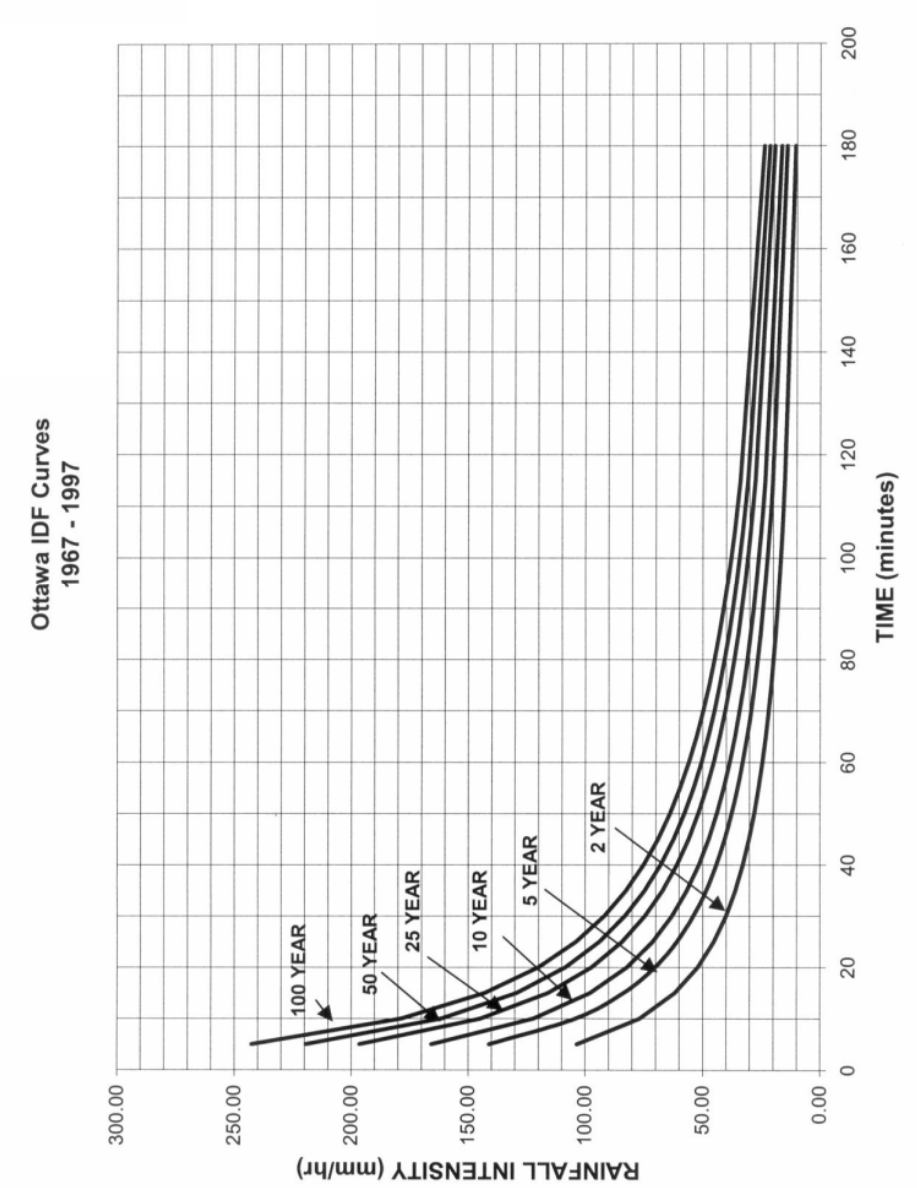
Max HGL check
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	4.3	200	110	3.51	0.11	0.13
Pipe P2	10	150	100	3.51	0.2	0.62
Pipe P3	15.5	200	110	0	0	0
Pipe P4	3	150	100	0	0	0

APPENDIX D

IDF Curves and SWM Calculations

APPENDIX 5-A OTTAWA INTENSITY DURATION FREQUENCY (IDF) CURVE



RATIONAL METHOD

The Rational Method was used to determine the allowable release rate, pre-development and post-development runoff for the site. The equation is as follows:

Q=2.78 CIA
Where:
Q is the runoff in L/s
C is the weighted runoff coefficient*
I is the rainfall intensity in mm/hr**
A is the area in hectares

*The weighted runoff coefficient is determined for each of the catchment areas as follows:

$$C = \frac{(A_{perv} \times C_{perv}) + (A_{imp} \times C_{imp})}{A_{tot}}$$

Where:
A_{perv} is the pervious area in hectares
C_{perv} is the pervious area runoff coefficient (C_{perv}=0.20)
A_{imp} is the impervious area in hectares
C_{imp} is the impervious area runoff coefficient (C_{imp}=0.90)
A_{tot} is the catchment area (A_{perv} + A_{imp}) in hectares

Note: Increase the C values above by 25% for the 1:100 year event (max. C_{imp}=1.0).

** The 1:2 year rainfall intensity was determined to be 76.8 mm/hr. based on a time of concentration of 10 minutes as specified by the City of Ottawa. The 1:5 year rainfall intensity was determined to be 104.2 mm/hr., while the 1:100 year rainfall intensity used in the calculations below is 178.6 mm/hr., based on a time of concentration of 10 minutes.

PRE-DEVELOPMENT CALCULATIONS:

Drainage Area = 0.105 ha
Impervious Area = 0.066 ha
Pervious Area = 0.039 ha
Runoff Coefficient (C_{5yr}) = 0.64
Runoff Coefficient (C_{100yr}) = 0.72
Intensity (I_5) = 104.2 mm/hr.
Intensity (I_{100}) = 178.6 mm/h

$$C_{5\,yr} = \frac{(0.066 \times 0.90) + (0.039 \times 0.2)}{0.105} = 0.64$$

$$C_{100\,yr} = \frac{(0.066 \times 1.0) + (0.039 \times 0.25)}{0.105} = 0.72$$

Q_5= 2.78 CIA
Q_5= 2.78 x 0.64 x 104.2 x 0.105
Q_5= 19.5 L/s

Q_{100}= 2.78 CIA
Q_{100}= 2.78 x 0.72 x 178.6 x 0.105
Q_{100}= 37.5 L/s

ALLOWABLE RELEASE RATE CALCULATIONS:

Drainage Area = 0.105 ha
Runoff Coefficient (C_{allow}) = 0.4
Intensity (I_{allow}) = 76.8 mm/hr

Q_{allow}= 2.78 CIA
Q_{allow}= 2.78 x 0.4 x 76.8 x 0.105
Q_{allow}= 9.0 L/s

POST-DEVELOPMENT CALCULATIONS (A-1):

Drainage Area (AH) = 0.014 ha
Impervious Area = 0.002 ha
Pervious Area = 0.012 ha
Runoff Coefficient (C_{5yr}) = 0.30
Runoff Coefficient (C_{100yr}) = 0.36
Intensity (I_5) = 104.2 mm/hr
Intensity (I_{100}) = 178.6 mm/h

$$C_{5\,yr} = \frac{(0.002 \times 0.90) + (0.012 \times 0.2)}{0.014} = 0.30$$

Q_5= 2.78 CIA
Q_5= 2.78 x 0.30 x 104.2 x 0.014
Q_5= 1.2 L/s

$$C_{100\,yr} = \frac{(0.002 \times 1.0) + (0.012 \times 0.25)}{0.014} = 0.36$$

Q_{100}= 2.78 CIA
Q_{100}= 2.78 x 0.36 x 178.6 x 0.014
Q_{100}= 2.5 L/s

POST-DEVELOPMENT CALCULATIONS (A-2):

Drainage Area (AH) = 0.046 ha
Impervious Area = 0.029 ha
Pervious Area = 0.017 ha
Runoff Coefficient (C_{5yr}) = 0.64
Runoff Coefficient (C_{100yr}) = 0.72
Intensity (I_5) = 104.2 mm/hr
Intensity (I_{100}) = 178.6 mm/h

$$C_{5\,yr} = \frac{(0.029 \times 0.90) + 4}{0.016} = 0.64$$

Q_5= 2.78 CIA
Q_5= 2.78 x 0.64 x 104.2 x 0.046
Q_5= 8.5 L/s

$$C_{100\,yr} = \frac{(0.029 \times 1.0) + (0.017 \times 0.25)}{0.046} = 0.72$$

Q_{100}= 2.78 CIA
Q_{100}= 2.78 x 0.72 x 178.6 x 0.046
Q_{100}= 16.5 L/s

Proposed Residential Building
355, 357, 359 & 361 Nelson Street

Pre - Development										
Description	Area (ha)	$A_{impervious}$ (ha) C=0.9	$A_{pervious}$ (ha) C=0.2	Weighted C_{w5}	Weighted C_{w100}	1:5 Year Flow (L/s)	1:100 Year Flow (L/s)	Allowable C_{value}	Total Allowable Flow	
									5 year (L/s)	100 year (L/s)
Total Site Area	0.105	0.066	0.039	0.64	0.72	19.5	37.6	0.4	9.0	9.0

Post - Development : Uncontrolled Site								
Area	Description	Area (ha)	A_{imp} (ha) C=0.9	A_{perv} (ha) C=0.2	C_5	C_{100}	Uncontrolled Flow (L/s)	
							5 year	100 year
A-1	Direct Runoff to Nelson Street	0.014	0.002	0.012	0.30	0.36	1.2	2.5
A-2	Controlled Rear Yard Flow	0.046	0.029	0.017	0.64	0.72	8.5	16.5
A-3	Controlled Flow Building Roof	0.045	0.045	0.000	0.90	1.00	11.7	22.3
	Summed Area Check:	0.105					T_c = 10mins	T_c = 10mins

Post - Development : Total Flows for Controlled Site + Uncontrolled Runoff						
Area	Description	Flow (L/s)		Storage Required (m^3)		Provided (m^3)
		5 year	100 year	5 year	100 year	
A-1	Direct Runoff to Nelson Street	1.2	2.5	-	-	-
A-2	Controlled Rear Yard Flow	2.1	3.4	4.4	9.3	9.5
A-3	Controlled Flow Building Roof	3.0	3.0	5.4	14.4	16.6
	Totals :	**6.3**	**8.9**	**9.9**	**23.7**	**26.2**
	Over Controlled:	2.6	0.0			

Proposed Residential Building
Novatech Project No. 116018
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-1 Direct Runoff to Nelson Street

OTTAWA IDF CURVE

Area =	0.014	ha	Qallow =	1.2	L/s
C =	0.30		Vol(max) =	0.0	m^3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	1.65	0.43	0.13
10	104.19	1.22	0.00	0.00
15	83.56	0.98	-0.24	-0.22
20	70.25	0.82	-0.40	-0.48
25	60.90	0.71	-0.51	-0.76
30	53.93	0.63	-0.59	-1.06
35	48.52	0.57	-0.65	-1.37
40	44.18	0.52	-0.70	-1.68
45	40.63	0.47	-0.74	-2.00
50	37.65	0.44	-0.78	-2.33
55	35.12	0.41	-0.81	-2.66
60	32.94	0.38	-0.83	-2.99
65	31.04	0.36	-0.85	-3.33
70	29.37	0.34	-0.87	-3.67
75	27.89	0.33	-0.89	-4.01
80	26.56	0.31	-0.91	-4.35
85	25.37	0.30	-0.92	-4.69
90	24.29	0.28	-0.93	-5.04

Proposed Residential Building
Novatech Project No. 116018
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-1 Direct Runoff to Nelson Street

OTTAWA IDF CURVE

Area =	0.014	ha	Qallow =	2.5	L/s
C =	0.36		Vol(max) =	0.0	m^3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	3.37	0.89	0.27
10	178.56	2.48	0.00	0.00
15	142.89	1.99	-0.50	-0.45
20	119.95	1.67	-0.81	-0.98
25	103.85	1.44	-1.04	-1.56
30	91.87	1.28	-1.21	-2.17
35	82.58	1.15	-1.33	-2.80
40	75.15	1.04	-1.44	-3.45
45	69.05	0.96	-1.52	-4.11
50	63.95	0.89	-1.59	-4.78
55	59.62	0.83	-1.65	-5.46
60	55.89	0.78	-1.71	-6.14
65	52.65	0.73	-1.75	-6.83
70	49.79	0.69	-1.79	-7.52
75	47.26	0.66	-1.83	-8.21
80	44.99	0.63	-1.86	-8.91
85	42.95	0.60	-1.88	-9.61
90	41.11	0.57	-1.91	-10.32

Proposed Residential Building
Novatech Project No. 116018
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-2 Controlled Runoff from Rear-Yard

OTTAWA IDF CURVE

Area =	0.046	ha	Qallow =	2.1	L/s
C =	0.64		Vol(max) =	4.43	m^3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	11.58	9.51	2.85
10	104.19	8.54	6.47	3.88
15	83.56	6.85	4.78	4.30
20	70.25	5.76	3.69	4.43
25	60.90	4.99	2.92	4.39
30	53.93	4.42	2.35	4.23
35	48.52	3.98	1.91	4.01
40	44.18	3.62	1.55	3.73
45	40.63	3.33	1.26	3.41
50	37.65	3.09	1.02	3.05
55	35.12	2.88	0.81	2.67
60	32.94	2.70	0.63	2.27
65	31.04	2.55	0.48	1.86
70	29.37	2.41	0.34	1.42
75	27.89	2.29	0.22	0.98
80	26.56	2.18	0.11	0.52
85	25.37	2.08	0.01	0.05
90	24.29	1.99	-0.08	-0.42

Proposed Residential Building
Novatech Project No. 116018
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-2 Controlled Runoff from Rear-Yard

OTTAWA IDF CURVE

Area =	0.046	ha	Qallow =	3.4	L/s
C =	0.72		Vol(max) =	9.30	m^3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	22.43	19.03	5.71
10	178.56	16.51	13.11	7.86
15	142.89	13.21	9.81	8.83
20	119.95	11.09	7.69	9.23
25	103.85	9.60	6.20	9.30
30	91.87	8.49	5.09	9.17
35	82.58	7.63	4.23	8.89
40	75.15	6.95	3.55	8.51
45	69.05	6.38	2.98	8.05
50	63.95	5.91	2.51	7.53
55	59.62	5.51	2.11	6.97
60	55.89	5.17	1.77	6.36
65	52.65	4.87	1.47	5.72
70	49.79	4.60	1.20	5.05
75	47.26	4.37	0.97	4.36
80	44.99	4.16	0.76	3.64
85	42.95	3.97	0.57	2.91
90	41.11	3.80	0.40	2.16

SURFACE STORAGE AT A-2						
LOCATION	5 YEAR AREA	5 YEAR DEPTH	5 YEAR VOLUME	100 YEAR AREA	100 YEAR DEPTH	100 YEAR VOLUME
CBMH 1	47.0	0.15	2.35	47.0	0.15	2.35
		Sub Total	**2.35**		**Sub Total**	**2.35**

Stormwater Storage Volumes for Areas A-2

Description		Pipe Diameter (mm)	Pipe Length (m)	Depth to Invert (m)	Storage Volume (m3)	Cumulative Volume (m3)*
Pipe Storage		609.6	10.0	N/A	2.92	2.92
Catchbasin Manhole Storage	CBMH 1	N/A	N/A	1.39	2.46	5.37
	CBMH 2	N/A	N/A	1.58	1.79	7.16
			Pipe and Structure storage =			**7.16**

Proposed Residential Building
Novatech Project No. 116018
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-3 **Controlled Roof Drain #1**

OTTAWA IDF CURVE

Area =	0.012	ha	Qallow =	0.76	L/s
C =	0.90		Vol(max) =	1.6	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	4.24	3.48	1.04
10	104.19	3.13	2.37	1.42
15	83.56	2.51	1.75	1.57
20	70.25	2.11	1.35	1.62
25	60.90	1.83	1.07	1.60
30	53.93	1.62	0.86	1.55
35	48.52	1.46	0.70	1.46
40	44.18	1.33	0.57	1.36
45	40.63	1.22	0.46	1.24
50	37.65	1.13	0.37	1.11
55	35.12	1.05	0.29	0.97
60	32.94	0.99	0.23	0.82
65	31.04	0.93	0.17	0.67
70	29.37	0.88	0.12	0.51
75	27.89	0.84	0.08	0.35
90	24.29	0.73	-0.03	-0.17
105	21.58	0.65	-0.11	-0.71
120	19.47	0.58	-0.18	-1.26

Proposed Residential Building
Novatech Project No. 116018
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-3 **Controlled Roof Drain #1**

OTTAWA IDF CURVE

Area =	0.012	ha	Qallow =	0.76	L/s
C =	1.00		Vol(max) =	4.2	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	8.10	7.34	2.20
10	178.56	5.96	5.20	3.12
15	142.89	4.77	4.01	3.61
20	119.95	4.00	3.24	3.89
25	103.85	3.46	2.70	4.06
30	91.87	3.06	2.30	4.15
35	82.58	2.75	1.99	4.19
40	75.15	2.51	1.75	4.19
45	69.05	2.30	1.54	4.17
50	63.95	2.13	1.37	4.12
55	59.62	1.99	1.23	4.06
60	55.89	1.86	1.10	3.98
65	52.65	1.76	1.00	3.89
70	49.79	1.66	0.90	3.78
75	47.26	1.58	0.82	3.67
90	41.11	1.37	0.61	3.30
105	36.50	1.22	0.46	2.88
120	32.89	1.10	0.34	2.43

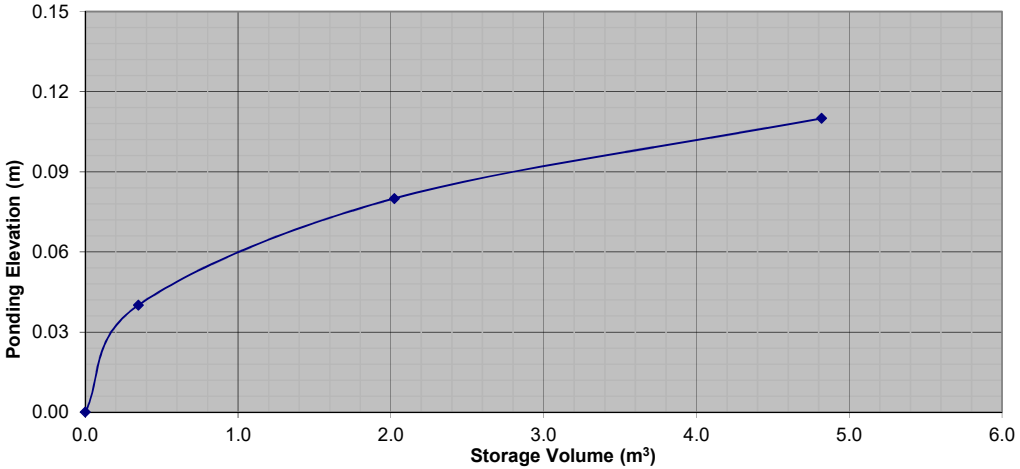
Watts Accutrol Flow Control Roof Drains: RD-100-A-ADJ set to Closed

Design Event	Flow/Drain (L/s)	Total Flow (L/s)	Ponding (cm)	Storage (m^3) Required	Storage (m^3) Provided
1:5 Year	0.76	0.76	7	1.6	4.8
1:100 Year	0.76	0.76	10	4.2	4.8

Roof Drain Storage Table for Area RD 1

Elevation	Area RD 1	Total Volume
m	m^2	m^3
0.00	0	0
0.04	17.3	0.3
0.08	66.5	2.0
0.11	120.0	4.8

Stage Storage Curve: Area A-3
Controlled Roof Drain #1



Proposed Residential Building
Novatech Project No. 116018
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-3 **Controlled Roof Drain #2**

OTTAWA IDF CURVE

Area =	0.010	ha	Qallow =	0.76	L/s
C =	0.90		Vol(max) =	1.2	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	3.53	2.77	0.83
10	104.19	2.61	1.85	1.11
15	83.56	2.09	1.33	1.20
20	70.25	1.76	1.00	1.20
25	60.90	1.52	0.76	1.15
30	53.93	1.35	0.59	1.06
35	48.52	1.21	0.45	0.95
40	44.18	1.11	0.35	0.83
45	40.63	1.02	0.26	0.69
50	37.65	0.94	0.18	0.55
55	35.12	0.88	0.12	0.39
60	32.94	0.82	0.06	0.23
65	31.04	0.78	0.02	0.07
70	29.37	0.73	-0.03	-0.11
75	27.89	0.70	-0.06	-0.28
90	24.29	0.61	-0.15	-0.82
105	21.58	0.54	-0.22	-1.39
120	19.47	0.49	-0.27	-1.97

Proposed Residential Building
Novatech Project No. 116018
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-3 **Controlled Roof Drain #2**

OTTAWA IDF CURVE

Area =	0.010	ha	Qallow =	0.76	L/s
C =	1.00		Vol(max) =	3.2	m3

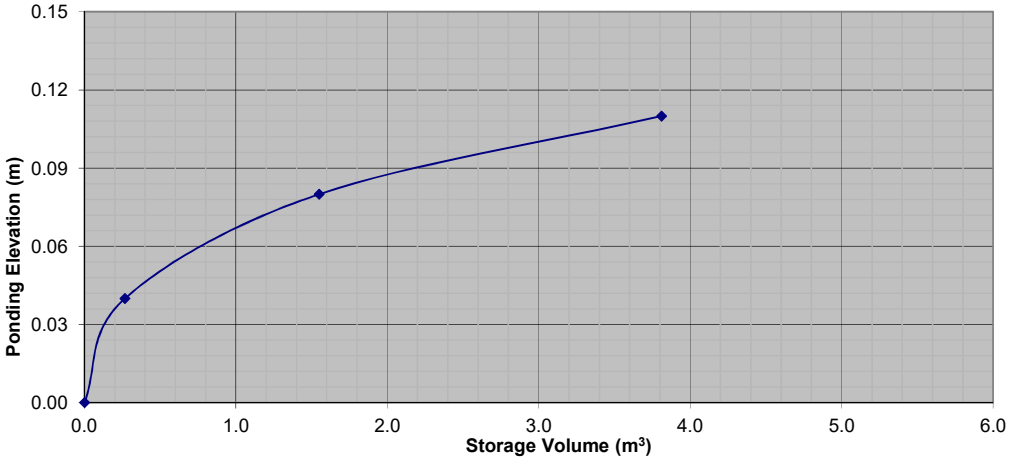
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	6.75	5.99	1.80
10	178.56	4.96	4.20	2.52
15	142.89	3.97	3.21	2.89
20	119.95	3.33	2.57	3.09
25	103.85	2.89	2.13	3.19
30	91.87	2.55	1.79	3.23
35	82.58	2.30	1.54	3.22
40	75.15	2.09	1.33	3.19
45	69.05	1.92	1.16	3.13
50	63.95	1.78	1.02	3.05
55	59.62	1.66	0.90	2.96
60	55.89	1.55	0.79	2.86
65	52.65	1.46	0.70	2.74
70	49.79	1.38	0.62	2.62
75	47.26	1.31	0.55	2.49
90	41.11	1.14	0.38	2.07
105	36.50	1.01	0.25	1.60
120	32.89	0.91	0.15	1.11

Watts Accutrol Flow Control Roof Drains:		RD-100-A-ADJ set to Closed			
Design Event	**Flow/Drain (L/s)**	**Total Flow (L/s)**	**Ponding (cm)**	**Storage (m^3) Required**	**Provided**
1:5 Year	0.76	0.76	7	1.2	3.8
1:100 Year	0.76	0.76	10	3.2	3.8

Roof Drain Storage Table for Area RD 2

Elevation	Area RD 2	Total Volume
m	m^2	m^3
0.00	0	0
0.04	13.4	0.3
0.08	50.7	1.6
0.11	100.0	3.8

Stage Storage Curve: Area A-3
Controlled Roof Drain #2



Proposed Residential Building
Novatech Project No. 116018
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-3 **Controlled Roof Drain #3**

OTTAWA IDF CURVE

Area =	0.011	ha	Qallow =	0.76	L/s
C =	0.90		Vol(max) =	1.4	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	3.89	3.13	0.94
10	104.19	2.87	2.11	1.26
15	83.56	2.30	1.54	1.39
20	70.25	1.93	1.17	1.41
25	60.90	1.68	0.92	1.37
30	53.93	1.48	0.72	1.30
35	48.52	1.34	0.58	1.21
40	44.18	1.22	0.46	1.09
45	40.63	1.12	0.36	0.97
50	37.65	1.04	0.28	0.83
55	35.12	0.97	0.21	0.68
60	32.94	0.91	0.15	0.53
65	31.04	0.85	0.09	0.37
70	29.37	0.81	0.05	0.20
75	27.89	0.77	0.01	0.03
90	24.29	0.67	-0.09	-0.49
105	21.58	0.59	-0.17	-1.05
120	19.47	0.54	-0.22	-1.61

Proposed Residential Building
Novatech Project No. 116018
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-3 **Controlled Roof Drain #3**

OTTAWA IDF CURVE

Area =	0.011	ha	Qallow =	0.76	L/s
C =	1.00		Vol(max) =	3.7	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	7.42	6.66	2.00
10	178.56	5.46	4.70	2.82
15	142.89	4.37	3.61	3.25
20	119.95	3.67	2.91	3.49
25	103.85	3.18	2.42	3.62
30	91.87	2.81	2.05	3.69
35	82.58	2.53	1.77	3.71
40	75.15	2.30	1.54	3.69
45	69.05	2.11	1.35	3.65
50	63.95	1.96	1.20	3.59
55	59.62	1.82	1.06	3.51
60	55.89	1.71	0.95	3.42
65	52.65	1.61	0.85	3.31
70	49.79	1.52	0.76	3.20
75	47.26	1.45	0.69	3.08
90	41.11	1.26	0.50	2.68
105	36.50	1.12	0.36	2.24
120	32.89	1.01	0.25	1.77

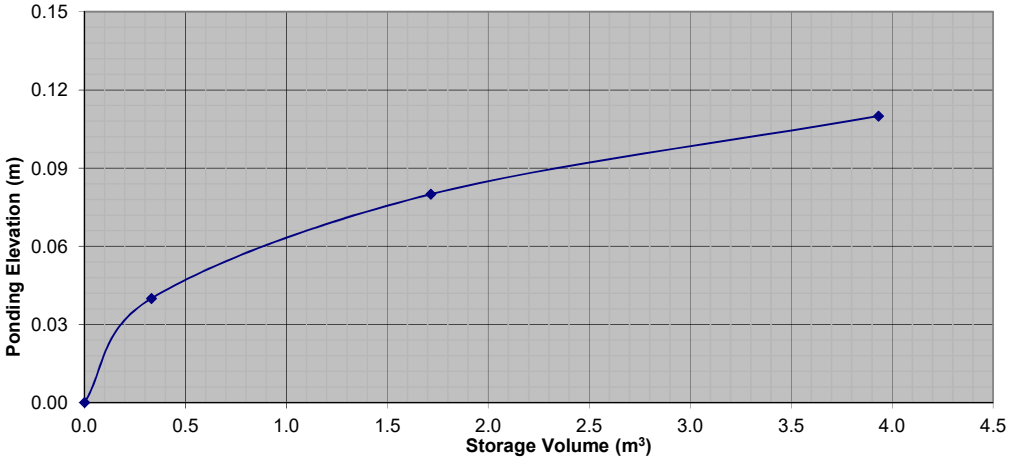
Watts Accutrol Flow Control Roof Drains: RD-100-A-ADJ set to Closed

Design Event	Flow/Drain (L/s)	Total Flow (L/s)	Ponding (cm)	Storage (m^3) Required	Storage (m^3) Provided
1:5 Year	0.76	0.76	8	1.4	3.9
1:100 Year	0.76	0.76	11	3.7	3.9

Roof Drain Storage Table for Area RD 3

Elevation	Area RD 3	Total Volume
m	m^2	m^3
0.00	0	0
0.04	16.6	0.3
0.08	52.6	1.7
0.11	95.2	3.9

Stage Storage Curve: Area A-3
Controlled Roof Drain #3



Proposed Residential Building
Novatech Project No. 116018
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-3 **Controlled Roof Drain #4**

OTTAWA IDF CURVE

Area =	0.010	ha	Qallow =	0.76	L/s
C =	0.90		Vol(max) =	1.2	m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	3.53	2.77	0.83
10	104.19	2.61	1.85	1.11
15	83.56	2.09	1.33	1.20
20	70.25	1.76	1.00	1.20
25	60.90	1.52	0.76	1.15
30	53.93	1.35	0.59	1.06
35	48.52	1.21	0.45	0.95
40	44.18	1.11	0.35	0.83
45	40.63	1.02	0.26	0.69
50	37.65	0.94	0.18	0.55
55	35.12	0.88	0.12	0.39
60	32.94	0.82	0.06	0.23
65	31.04	0.78	0.02	0.07
70	29.37	0.73	-0.03	-0.11
75	27.89	0.70	-0.06	-0.28
90	24.29	0.61	-0.15	-0.82
105	21.58	0.54	-0.22	-1.39
120	19.47	0.49	-0.27	-1.97

Proposed Residential Building
Novatech Project No. 116018
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-3 **Controlled Roof Drain #4**

OTTAWA IDF CURVE

Area =	0.010	ha	Qallow =	0.76	L/s
C =	1.00		Vol(max) =	3.2	m3

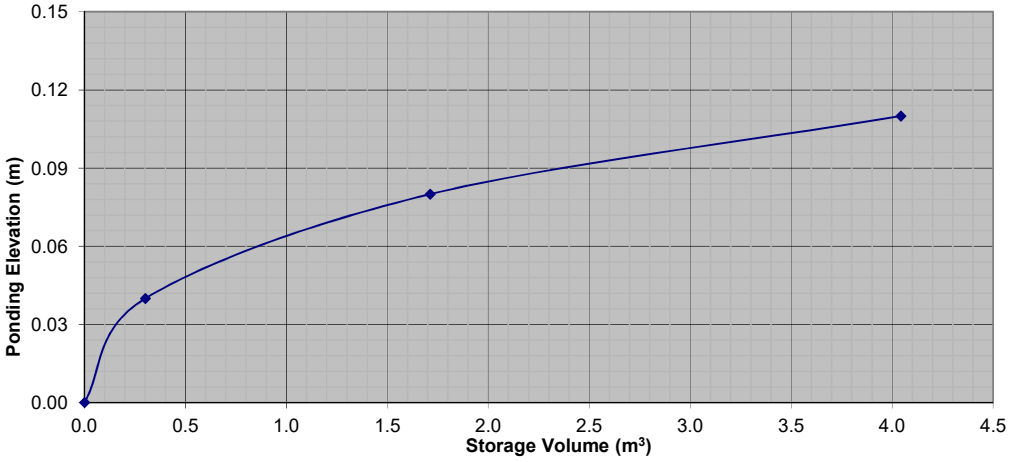
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	6.75	5.99	1.80
10	178.56	4.96	4.20	2.52
15	142.89	3.97	3.21	2.89
20	119.95	3.33	2.57	3.09
25	103.85	2.89	2.13	3.19
30	91.87	2.55	1.79	3.23
35	82.58	2.30	1.54	3.22
40	75.15	2.09	1.33	3.19
45	69.05	1.92	1.16	3.13
50	63.95	1.78	1.02	3.05
55	59.62	1.66	0.90	2.96
60	55.89	1.55	0.79	2.86
65	52.65	1.46	0.70	2.74
70	49.79	1.38	0.62	2.62
75	47.26	1.31	0.55	2.49
90	41.11	1.14	0.38	2.07
105	36.50	1.01	0.25	1.60
120	32.89	0.91	0.15	1.11

Watts Accutrol Flow Control Roof Drains:		RD-100-A-ADJ set to Closed			
Design Event	**Flow/Drain (L/s)**	**Total Flow (L/s)**	**Ponding (cm)**	**Storage (m^3) Required**	**Provided**
1:5 Year	0.76	0.76	7	1.2	4.0
1:100 Year	0.76	0.76	10	3.2	4.0

Roof Drain Storage Table for Area RD 4

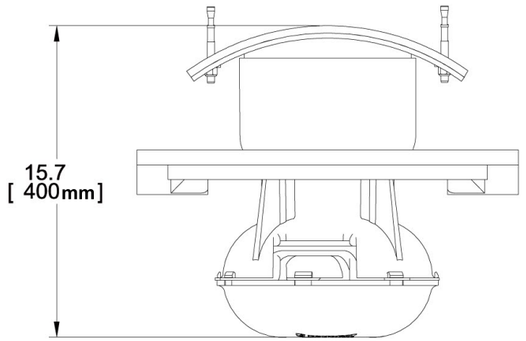
Elevation	Area RD 4	Total Volume
m	m^2	m^3
0.00	0	0
0.04	15.1	0.3
0.08	55.4	1.7
0.11	100.0	4.0

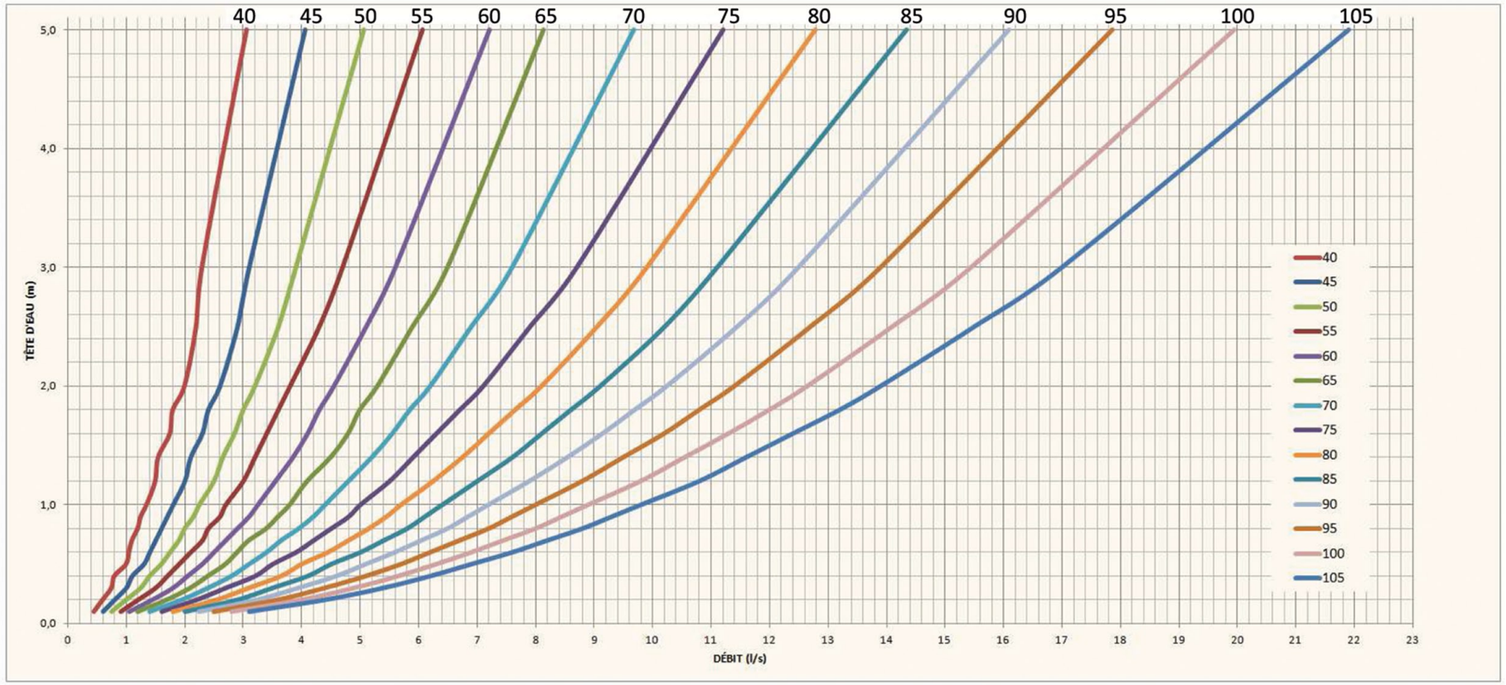
Stage Storage Curve: Area A-3
Controlled Roof Drain #4

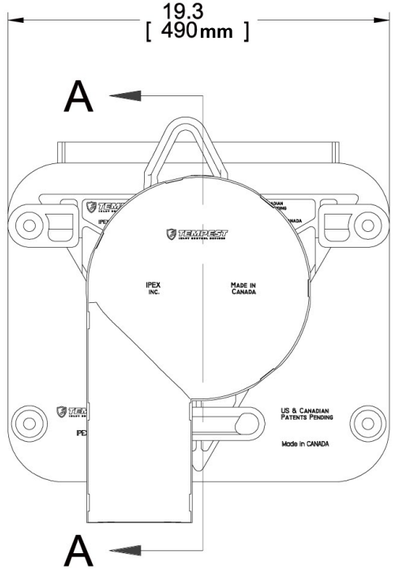


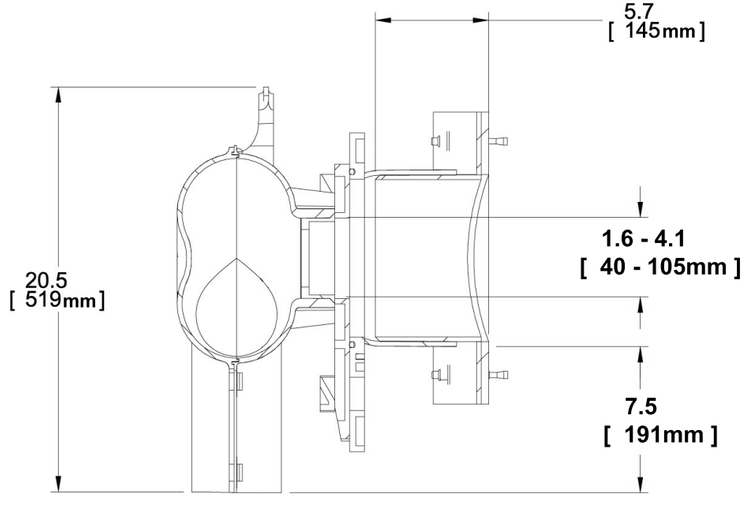
APPENDIX E

IPEX INLET CONTROL DEVICE INFORMATION

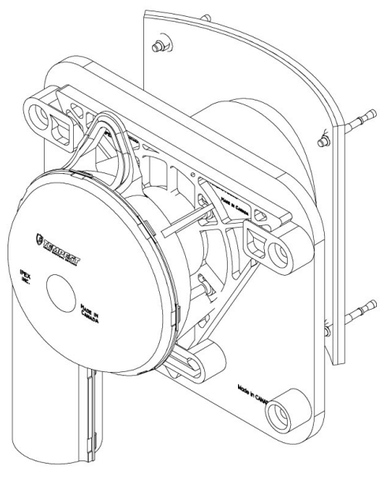








SECTION A-A



IPEX Product development engineering 3 Place du commerce, Suite 101 Île des Soeurs, Montréal, QC, H3E 1H7 Canada Tel 514 769 2200 www.ipexna.com			
PROJECTION	UNITS in [mm]	TITLE Tempest LMF round CB assembly [VORTEX]	SIZE B / SCALE(S) 1/8 / 1-2014

IPEX Tempest™ Inlet Control Devices

Municipal Technical Manual Series

Vol. I, 2nd Edition

PRODUCT INFORMATION: TEMPEST LOW, MEDIUM FLOW (LMF) ICD

Purpose

To control the amount of storm water runoff entering a sewer system by allowing a specified flow volume out of a catch basin or manhole at a specified head. This approach conserves pipe capacity so that catch basins downstream do not become uncontrollably surcharged, which can lead to basement floods, flash floods and combined sewer overflows.

Product Description

Our LMF ICD is designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter and larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 14 preset flow curves, the LMF ICD has the ability to provide flow rates: 2lps – 17lps (31gpm – 270gpm)

Product Function

The LMF ICD vortex flow action allows the LMF ICD to provide a narrower flow curve using a larger orifice than a conventional orifice plate ICD, making it less likely to clog. When comparing flows at the same head level, the LMF ICD has the ability to restrict more flow than a conventional ICD during a rain event, preserving greater sewer capacity.

Product Construction

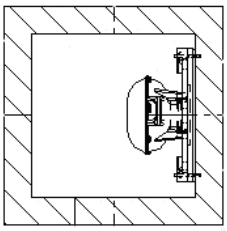
Constructed from durable PVC, the LMF ICD is light weight 8.9 Kg (19.7 lbs).

Product Applications

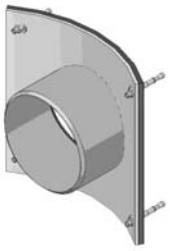
Will accommodate both square and round applications:

Square Application

Universal Mounting Plate



Round Application



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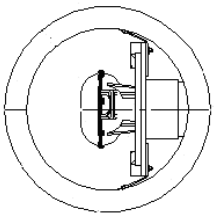
Spigot CB Wall Plate

=

Universal Mounting Plate Hub Adapter



PRODUCT INSTALLATION

Instructions to assemble a TEMPEST LMF ICD into a Square Catch Basin:

STEPS:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device.
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal mounting plate and has created a seal.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST LMF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification.
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the mounting plate and has created a seal.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut back the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

APPENDIX F

CONTROLLED FLOW
ROOF DRAIN INFORMATION

WATTS® DRAINAGE

Adjustable Accutrol Weir

Tag: RD-100-A-ADJ

Adjustable Flow Control for Roof Drains

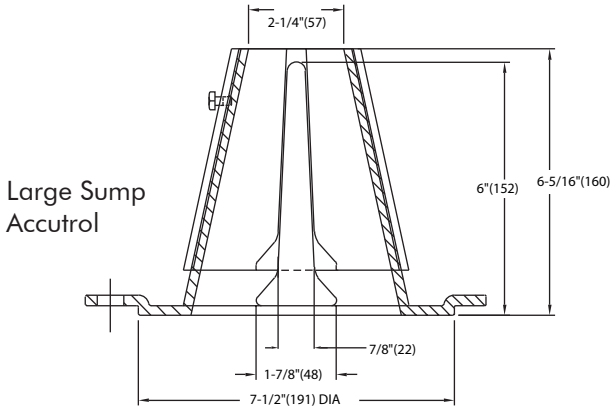
ADJUSTABLE ACCUTROL(for Large Sump Roof Drains only)

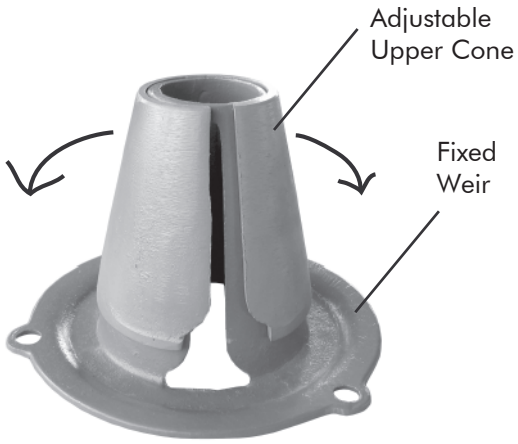
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2" of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3" of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm(per inch of head) x 2 inches of head] + 2-1/2 gpm(for the third inch of head) = 12-1/2 gpm.





1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	Head of Water					
	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	10	10	10	10	10

Job Name _____ Contractor _____

Job Location _____ Contractor's P.O. No. _____

Engineer _____ Representative _____

WATTS® DRAINAGE
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CANADA