

**Nepean Street
Residential Development
96 Nepean Street
Ottawa, Ontario
Servicing Design Brief**

**NEPEAN STREET RESIDENTIAL DEVELOPMENT
96 NEPEAN STREET
OTTAWA, ONTARIO**

SERVICING DESIGN BRIEF

Prepared by:

**NOVATECH ENGINEERING CONSULTANTS LTD.
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**File No.: 111153
Report Reference No.: R-2011-183
November 25, 2011**

November 25, 2011

City of Ottawa
Planning and Growth Management Department
Development Review (Urban) Services Branch
Infrastructure Approvals Division
110 Laurier Avenue West, 4th Floor
Ottawa ON, K1P 1J1

Attention: Mr. Joshua White

Dear Sir:

**Reference: Nepean Street Residential Development
96 Nepean Street
Servicing Design Brief
Our File No.: 111153**

Enclosed herein is the Servicing Design Brief for the proposed Nepean Street Residential Development at 96 Nepean Street, located on the south side of Nepean Street between Metcalfe Street and O'Connor Street. This brief is submitted in support of the rezoning and site plan applications for the site and outlines how the site will be serviced with sanitary, storm and watermain.

Trusting this report is adequate for your purposes. Should you have any questions, or require additional information, please contact us.

Yours truly,

NOVATECH ENGINEERING CONSULTANTS LTD.



Greg MacDonal, P.Eng
Senior Project Manager

JAG/jag

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12373-11 Claridge Lts 43-46 RP2996 T F Topographical Survey

1.0 INTRODUCTION

The proposed Nepean Street Residential Development (96 Nepean Street) is located on the south side of Nepean Street, mid-block between O'Connor Street and Metcalfe Street in the City of Ottawa; as shown in Figure 1 – Key Plan. The proposed development will consist of a 27-storey high-rise building with 201 units (197 condominium units and 4 townhome units). Also, a total of approximately 161 underground parking spaces will be provided on 6 levels of underground parking. Refer to Figure 2 – Site Plan for details.

As identified in the City of Ottawa's Zoning By-law (ZBL), this site is currently designated as R5B [482] F(3.0) – Residential Fifth Density Subzone B, Exception 482, with a floor Space Index (FSI) of 3.0. The purpose of the Residential Fifth Density Zone is to allow a wide mix of medium and high density residential units. The zoning amendment will revise the site's current 482 exception designation to permit the proposed development as shown in the site plan. Specific details are provided in a Planning Rationale submitted as part of the ZBL Amendment application.

The subject site is approximately 0.12 ha in area which is currently occupied by a privately-owned surface parking lot that is open to the public. Refer to Figure 3 – Existing Conditions.

This servicing design brief will outline how the site will be serviced with sanitary, storm and watermain; and will demonstrate that adequate municipal capacity is available within the existing infrastructure to service the development.

2.0 SANITARY SEWER

The development will be serviced by a 150 mm dia. sanitary service that will connect to the existing 225 mm dia. sanitary sewer on Nepean Street. The proposed sanitary service connection to the building will be equipped with a full-port backwater valve.

The proposed development flows are based on the City of Ottawa Sewer Design Guidelines (excerpts in Appendix A). The flows are comprised of residential, retail, and office space as presented below and are compared to the design flows based on current zoning.

Sanitary Flows Under Proposed Development

Nepean Residential

Population = 197 units x 1.8 persons/unit + 4 units x 2.7 persons/unit = 365 persons

$Q_{SAN} = 365 \text{ persons} \times 350 \text{ L/person/day} = 127,890 \text{ L/day}$

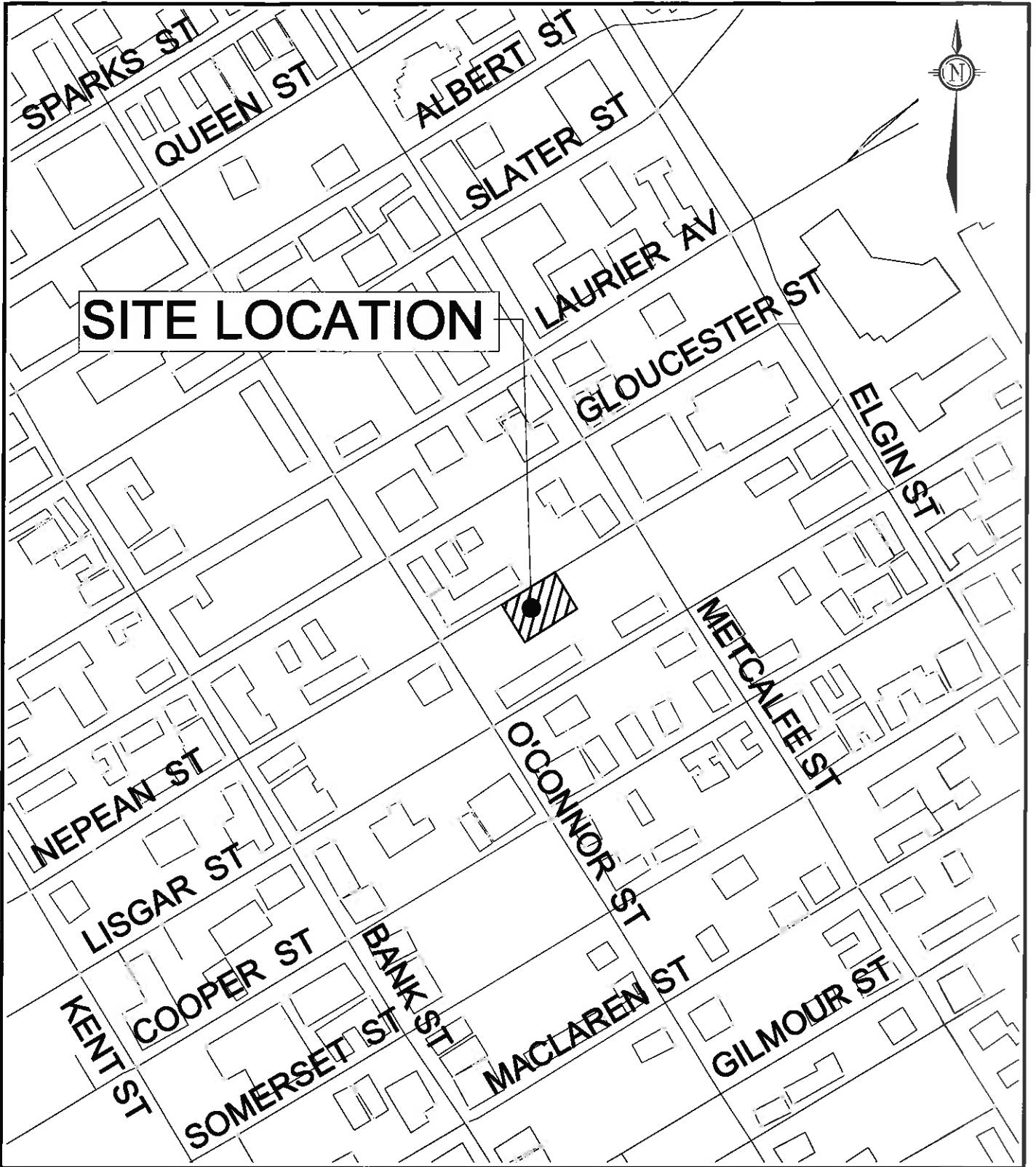
Average Sanitary Flow = 127,890 L/day = 1.48 L/sec

Peak Sanitary Flow = 5.92 L/sec (with PF = 4.04 ∴ use 4.0 ⇒ max)

Therefore,

Total Average Sanitary Flow = 1.48 L/sec

Total Peak Sanitary Flow = 5.92 L/sec



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CITY OF OTTAWA

NEPEAN STREET RESIDENTIAL DEVELOPMENT
96 NEPEAN STREET

KEY PLAN

OCT. 2011

111153

FIGURE 1

Sanitary Flows Under Current Zoning

Currently, the site is zoned R5B [482] F(3.0), a mix of medium and high density residential uses. Zoning flows are calculated using the City's general population densities from Table 4.1 of the City of Ottawa Sewer Design Guidelines as follows:

Site Area = 0.12 ha

Population Density = 1800 people/ha

Population = 0.12 ha x 1800 people/ha = 220 people

Average Sanitary Flow = 220 people * 350L/person/day = 76,872.6 L/day = 0.89 L/sec

Peak Sanitary Flow = 3.56 L/sec (with PF = 4.13 ∴ use 4.0 ⇒ max)

Therefore,

Total Average Sanitary Flow = 0.89 L/sec

Total Peak Sanitary Flow = 3.56 L/sec

The development sanitary flows under the proposed zoning are higher than the flows under existing zoning. An assessment of the receiving sewers follows.

Existing Peak Flow = 3.56 L/sec

Proposed Peak Flow = 5.92 L/sec

Difference = 2.36 L/sec

The receiving sewer on Nepean Street is a 225mm diameter pipe at 0.73% with a capacity of 38.4 L/sec. The additional flow of 2.36 L/sec represents 6% of the pipe capacity. An assessment of the downstream sewer on Nepean Street reveals adequate capacity to accept this additional flow. Detailed calculations are provided in Appendix C.

3.0 STORMWATER

Stormwater flows from the site are currently conveyed to the existing storm sewer system overland. As part of this development, all stormwater will be controlled on site and discharged via a 200 mm dia. storm service that will connect to the existing 450 mm dia. storm sewer on Nepean Street. The proposed storm service connection to the building will be equipped with a backwater valve.

The City will require that on-site stormwater management be implemented to control post-development stormwater discharge for both the 5 & 100 year storm events based on an allowable runoff coefficient (C) of 0.50, a time of concentration (t_c) of 20 minutes, and a 5-year storm event. Stormwater management will be achieved through the use of rooftop controls. Should surplus storage be required, stormwater management alternatives such as storage tanks will be implemented.

The site will be graded such that flows in excess of the 100-year storm event will be conveyed overland to Nepean Street. Erosion and sediment control measures will be implemented during all phases of construction and inspected regularly.

A detailed stormwater management report addressing these requirements is also submitted under separate cover as part of the site plan application.

4.0 WATERMAIN

4.1 Domestic Water Demand

The proposed development will be serviced by a 200 mm dia. water service that will connect to the existing 300 mm dia. watermain on Nepean Street. A shut off valve will be provided at the property line of the site as per City of Ottawa Specifications. The water meter will be located in the basement level mechanical room of the building. A remote receptacle will be located at the surface near the entrance to the building on the exterior.

Estimated domestic water demands for the development are roughly the same as the proposed development sanitary flows listed above in Section 2.0.

Average daily demand (L/sec): $Q_{\text{WATER}} = 127,890 \text{ L/day} \div 86,400 \text{ sec/day} = 1.48 \text{ L/sec}$

Using a peak factor of 2.5, the maximum daily demand yields: $Q_{\text{WATER}} = 3.70 \text{ L/sec}$

Using a peak factor of 2.2, the maximum hour demand yields: $Q_{\text{WATER}} = 8.14 \text{ L/sec}$

According to hydrant test results, the watermain in the street can deliver in the range of 990 igpm (75 L/sec) at a dynamic pressure greater than 48 psi. A copy of the watermain data is attached in Appendix B.

4.2 Fire Demand

Section 4.2.11 of the City of Ottawa Water Design Guidelines reads:

“When calculating the fire flow requirements and affected pipe sizing, designers shall use the method developed by the Fire Underwriters Survey.”, and

“The requirements for levels of fire protection on private property are covered in Section 7.2.11 of the Ontario Building Code.”

It is our understanding that the Fire Underwriters Survey is used to assess the performance of the water distribution system on a “City Block” basis rather than an individual building basis. The Ontario Building Code governs the assessment of fire demand for individual buildings.

Section 7.2.11.1 of the Ontario Building Codes states that the design, construction, installation and testing of fire service mains and water service pipe combined with fire service mains shall be in conformance with NFPA 24.

NFPA 24 is the standard for the “Installation of Private Fire Service Mains and their Appurtenances”. Chapter 13 of NFPA 24 discusses sizing the private service fire mains for fire protection systems which shall be approved by the authority having jurisdiction, considering the following factors:

- Construction and Occupancy of the building
- Fire Flow and Pressure of the Water Required
- Adequacy of the Water Supply

Specific to this project the buildings will be sprinklered per Section 3.2.2.45 of the Ontario Building Code (OBC). Section 3.2.5.7 of the OBC requires that an adequate water supply for fire fighting be provided to each building, and references Appendix A of the OBC. Sentence 3 of Section A 3.2.5.7 of the OBC (Appendix A) states that NFPA 13 be used for determining both sprinkler and hose stream demands for a sprinklered building.

Section 3.2.5.13 of the OBC requires that the sprinkler system be designed in accordance with NFPA 13. NFPA 13R may be used for residential buildings up to 4 storeys, however NFPA 13 will be used in this case which is a more conservative approach.

The design of the sprinkler system is completed by a Fire Protection Engineer, or typically computed by the sprinkler contractor and approved by the Fire Protection Engineer. The process involves detailed hydraulic calculations based on building layout, pipe runs, head losses, fire pump requirements, etc. At this stage in the development process, e.g. Site Plan Submission, these details are not available. However, using Chapter 7 of NFPA 13, it is possible to provide a fairly accurate estimate of the fire demand for the building. This estimate is provided below.

NFPA Chapter 7 Calculation

27 Storey Residential Building – Light Hazard

6 Level Underground Parking – Ordinary Hazard (Group 1)

Typical Floor area = 7,341 ft²

Section 7.2.3 of NFPA 13, “Water Demand Requirements – Hydraulic Calculation Methods” is used to estimate the hose stream demand and the sprinkler demand. The water demand for sprinklers is estimated using the most remote area in the building. Figure 7.2.3.1.2 – Area/Density Curves is used for the worst case scenario, which in this case is the Ordinary Hazard Classification in the underground parking garage. For this classification, Figure 7.2.3.1.2 provides a density of 0.15 gpm/ft² using a coverage of 1500 ft², or 225 gpm (US).

Table 7.2.3.1.1 is used to determine the hose stream demand. For Ordinary Hazard a total combined inside and outside hose stream demand of 250 gpm is required. Typically, 150 gpm would be drawn off the hydrant and 100 gpm off the hose cabinets.

Therefore, total estimated demand would be 225 gpm + 250 gpm = 475 gpm. Adding an allowance for head losses through out the sprinkler system, an estimated fire demand of between 550 – 600 gpm, or say 600 USgpm (2,270 L/min) would be required. According to the fire hydrant data provided by the City, the 300 mm watermain on Nepean Street can deliver in the range of 1,000 l gpm (1,200 USgpm) under normal conditions and 2,000 l gpm (2,400 USgpm) at 20 psi residual. The building will also be equipped with a fire pump, if necessary, to provide the minimum residual pressure at the sprinkler heads.

Reference material from NFPA 13 is contained in Appendix B.

5.0 CONCLUSIONS

Based on the foregoing, adequate sanitary, storm and water services are available to support this development.

NOVATECH ENGINEERING CONSULTANTS LTD.

Prepared by:



Justin Gauthier, B.Eng.
Junior Engineer

Prepared by:

David Smith, B.Eng.

Reviewed by:



Greg MacDonald, P.Eng.
Senior Project Manager

APPENDIX A
Excerpts from Ottawa Sewer Design Guidelines

SECTION 4

SANITARY SEWER SYSTEMS

specifically the downtown core. The construction of new combined sewer systems is no longer permitted in the City of Ottawa other than for the replacement of existing combined sewers within the City's defined Combined Sewer Area (see Section 5.1.6).

New storm drainage systems cannot be connected to existing combined sewers except as an interim measure where sewer separation is to be ultimately implemented or where circumstances allow no other alternative.

Section 5 discusses combined sewers in greater detail since their design must consider peak storm flows.

4.2.4 Private Sanitary Servicing

Private servicing consists mainly of private sewage collection and treatment systems on individual lots and do not form part of these guidelines.

4.3 GENERAL POPULATION DENSITIES

Pre-zoned Land – When lands are zoned for a specific residential use and detailed information is not available, the following population densities shall apply:

Table 4.1 Population Densities

Unit Type (Min Lot Area M ²)	Zoning (And all similar zonings)	Persons per unit ¹	Units per net ha avg. ²	Persons (per net ha) ³	Persons (per gross ha) ⁴
Res-Single Family (600)	R1A-B*	3.4	16.7	57	34
Res-Single Family (501)	R1C-E*	3.4	20.0	68	41
Res-Single Family (441)	R1F-H*	3.4	22.7	77	47
Res-Single Family (360)	R1I-K*	3.4	27.8	94	57
Res-Single Family (270)	R1L-N*	3.4	37.1	126	76
Res-Single Family (197)	R1P-Q*	3.4	50.8	173	105
Res-Semi-detached (278)	R2A-B*	2.7	36.0	97	59
Res-Semi-detached (232)	R2C*	2.7	43.1	116	71
Res-Semi-detached (180)	R2D-E*, G*	2.7	55.6	150	91
Res-Semi-detached (135)	R2F*	2.7	74.1	200	121
Townhouse (170)	R3F*, R4A-B*	2.7	58.8	159	96
Townhouse (110)	R3M*	2.7	90.9	246	149
Res-Duplex (441)	R2A-C*	2.3	45.4	104	63
Res-Duplex (360)	R2D*, R3F-G*	2.3	55.6	128	77
Res-Duplex (270)	R2E-F*, R3K*	2.3	74.1	170	103
Res-Duplex (197)	R2G*, R4F*	2.3	101.6	234	141
Res-Triplex (557)	R3A-C*	2.3	53.9	124	75

SECTION 4

SANITARY SEWER SYSTEMS

Unit Type (Min Lot Area M ²)	Zoning (And all similar zonings)	Persons per unit ¹	Units per net ha avg. ²	Persons (per net ha) ³	Persons (per gross ha) ⁴
Res-Triplex (330)	R3D-E*, H-J*, L*, N*, R4C-E*	2.3	90.9	209	127
Apartments:					
Low Density		1.8	100	180	
Medium Density		1.8	300	540	
High Density		1.8	1000	1800	
Very High Density ⁵		1.8	1000 +	1800 +	

*) former City of Ottawa zoning designation.

1) from 1996 census data.

2) new suburban construction, 5-year average (1997-2001), except apartments data which is based on site plans & duplex density which is an assumed average.

3) "net ha" refers to population densities per hectare of purely residential land (i.e. area of the building lots only including private parking and roads but excluding all public road rights-of-way and all other non-residential uses such as parks, stormwater management facilities, commercial developments, schools, community centres, etc.).

4) "gross ha" refers to population densities per hectare of residential and all other non-residential land uses such as streets, schools and parks. Numbers provided apply to large subdivision situations. For smaller residential situations the persons per gross ha will be higher, about 75% of the persons per net ha.

5) apartment densities in the downtown have been as high as 4,000 units/net ha. Proposals with a units/net ha density greater than 1000 will be evaluated on a case-by-case basis.

Development Proposed Land – When the number and type of housing units within a proposed development are known, the calculation of population for the proposed development shall be based on the following:

Table 4.2 Per Unit Populations

Unit Type	Persons Per Unit
Single Family	3.4
Semi-detached	2.7
Duplex	2.3
Townhouse (row)	2.7
Apartments:	
Bachelor	1.4
1 Bedroom	1.4
2 Bedroom	2.1
3 Bedroom	3.1
Average Apt.	1.8

4.4.1 Calculation of Peak Design Flows

The formulae and parameters to be applied in the calculation of peak design flows (standard peak flow design parameters) for new or infill developments are illustrated in Figure 4.3 and described as follows:

Figure 4.3 Peak Flow Design Parameters Summary

AVERAGE WASTEWATER FLOWS:	
Residential Average Flow:	350 L/c/day
Commercial Average Flow:	50,000 L/gross ha/d
Institutional Average Flow:	50,000 L/gross ha/d
Average Light Industrial Flow:	35,000 L/gross ha/d
Average Heavy Industrial Flow:	55,000 L/gross ha/d
PEAKING FACTORS:	
Residential Peak factor:	Harmon Equation
$P.F. = 1 + \left(\frac{14}{4 + \left(\frac{P}{1000} \right)^{\frac{1}{2}}} \right) * K$	
	where: P=Population
	K=Correction Factor = 1
Commercial Peak factor:	1.5
Institutional Peak factor:	1.5
Industrial Peak Factor:	Per Figure in Appendix 4-B
PEAK EXTRANEIOUS FLOWS: (design event)	
Infiltration Allowance:	0.28 L/s/effective gross ha (for all areas)
Less than 10 ha.	
Foundation Drain Allowance:	5.0 L/s/gross ha (if necessary for existing partially separated and combined areas only)
10 ha – 100 ha	
Foundation Drain Allowance:	3.0 L/s/gross ha (if necessary for existing partially separated and combined areas only)
Greater than 100 ha	
Foundation Drain Allowance:	2.0 L/s/gross ha (if necessary for existing partially separated and combined areas only)

APPENDIX B
Hydrant Flow Data/ Fire Fighting Information

Justin Gauthier

From: Hannewyk, Joseph [Joseph.Hannewyk@ottawa.ca]
Sent: Friday, November 04, 2011 2:43 PM
To: j.gauthier@novatech-eng.com
Subject: ff6120 FW: Hydrant Flow Data Request (Nepean Street - B)
Attachments: SKMBT_C552D11103107310.pdf; ffm6120.jpg; ff6120.pdf

Importance: High

Follow Up Flag: Follow up
Flag Status: Completed

See attached.

Joseph Hannewyk C.E.T.
Water Resources Analyst, Environmental Engineering
Environmental Services
City of Ottawa

Tel: (613) 580-2424 ext.22617

Fax: (613) 728-4183

Mail Code: #06-65

From: Crowder, Murray
Sent: 2011/10/31 07:50
To: Hannewyk, Joseph
Subject: FW: Hydrant Flow Data Request (Nepean Street - B)
Importance: High

From: Justin Gauthier [<mailto:j.gauthier@novatech-eng.com>]
Sent: October 31, 2011 7:42 AM
To: Crowder, Murray
Subject: Hydrant Flow Data Request (Nepean Street - B)
Importance: High

Hi Murray,

We are currently working on a Site Plan located at 96 Nepean Street. I send this e-mail requesting that you please provide me with hydrant flow data (static, fire flows @ 20 psi, etc.) for the following hydrants:

H079, H214, H242 on O'Connor;
H215, H081, H103 on Nepean;
H104, H102, H098 on Metcalfe;
H216, H218, H105 on Lisgar.

Refer to attached sketch for hydrant locations, they are located on City of Ottawa grid 366-030 & 366-031.

Could you please also send me the sketch from your program showing the watermain sizes you have on file for the above-mentioned streets around the site, as you have in the past (if you have it for SAN & STM as well), thanks in advance.

I'm in a little bit of a rush for the information, so a quick response would be greatly appreciated.

Should you have any questions, or require additional information, don't hesitate to contact me.

Regards,

Justin Gauthier, B.A.Sc.

EIT

Novatech Engineering Consultants Ltd.

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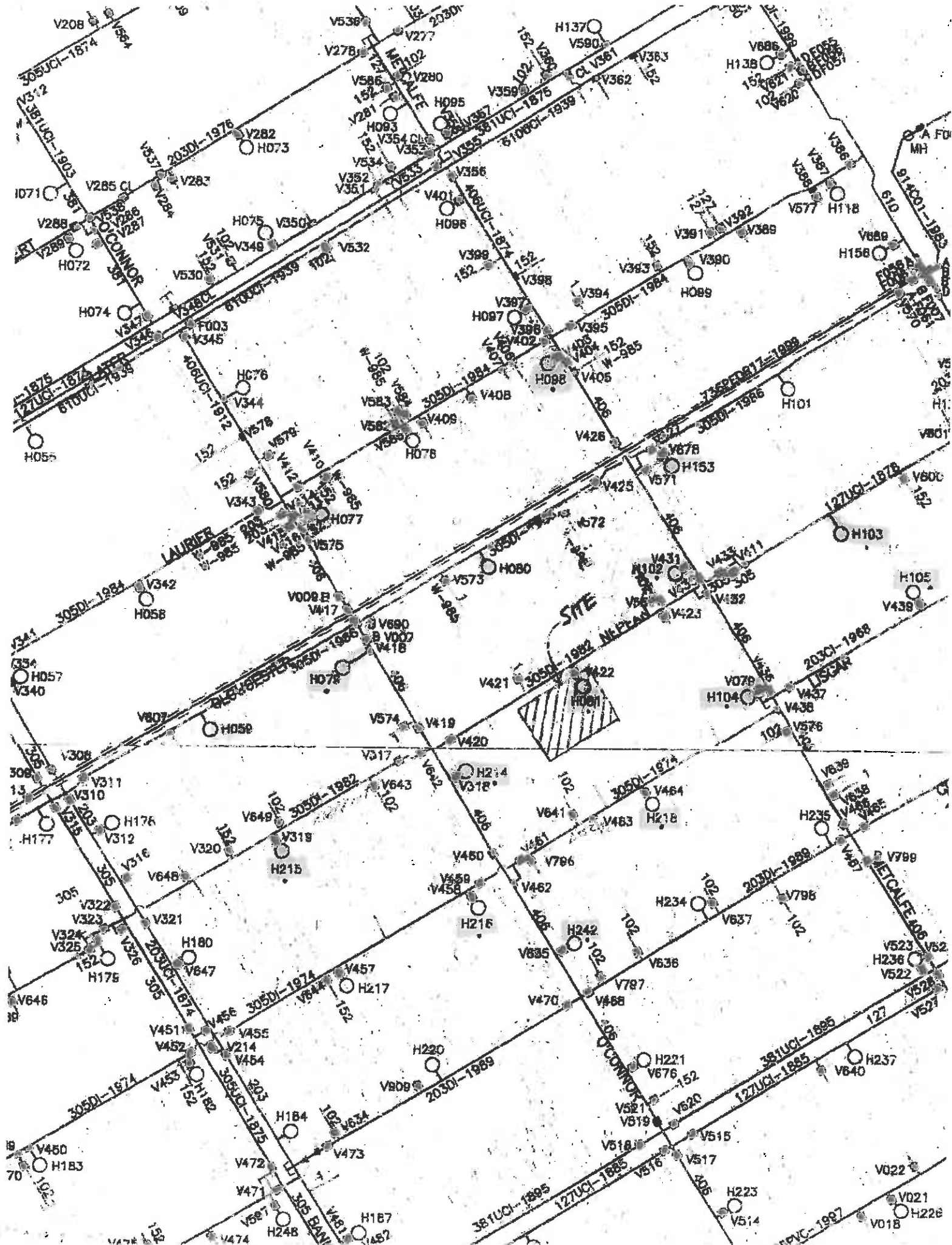
Email: j.gauthier@novatech-eng.com

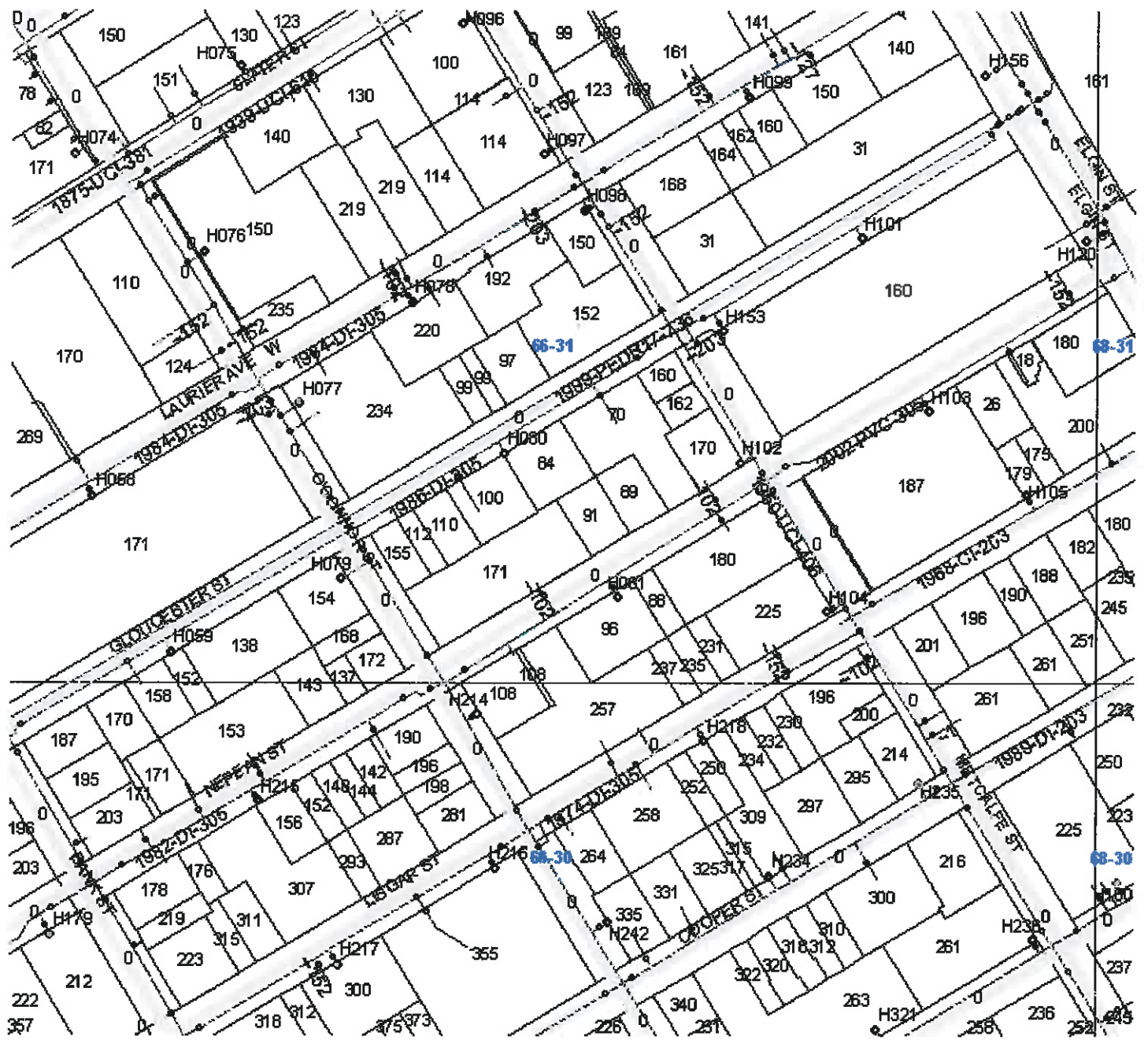
Website: www.novatech-eng.com

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FAX TRANSMISSION FORM - Supply Pressure/Flow Capacity

City of Ottawa
 Transportation Utilities and Public Works
 Customer Service & Operational Support
 951 Clyde Avenue
 Ottawa, On, K1Z 5A6
Joseph Hannewyk
Water Resources Analyst

email: joseph.hannewyk@ottawa.ca
 phone 560-6065 x22617

To: Justin Gauthier
Company: Novatech Engineering Consultants Ltd.
Tel: 254-9643x217
Fax: 254-5867
Location: Nepean @ Metcalfe
Request_dt: 11/11/04-14:25:05
Email: j.gauthier@novatech-eng.com

Pressure Only ? (Y):

Request Line Ref# 6120

Date/Time: 11/11/04-14:37:53
 Our File: 49-01-2006
 1 of 2 Page(s)

fax 728-4183

Inspection Date	Flow Hydrant	Residual Hydrant	Pressure (psi)		Preferred Response Method:	
			Static	Dynamic	Pitot	Actual @ 20 psi
2011/08/26	6631081	6631103	60	>50	50	990
2011/08/26	6631103	6631081	58	>48	50	990

Note: the computed flows are approximate and performed for hydrant colour coding purposes, thus these values are not intended for design purposes.

Ref# 6120

6-4.5.9* For individual fasteners, the loads determined in 6-4.5.6 shall not exceed the allowable loads provided in Figure 6-4.5.9.

The type of fasteners used to secure the bracing assembly to the structure shall be limited to those shown in Figure 6-4.5.9. For connections to wood, through bolts with washers on each end shall be used. Holes for through bolts shall be $1/16$ in. (1.6 mm) greater than the diameter of the bolt.

Exception No. 1: Where it is not practical to install through bolts due to the thickness of the member or inaccessibility, lag screws shall be permitted. Holes shall be pre-drilled $1/8$ in. (3.2 mm) smaller than the maximum root diameter of the lag screw.

Exception No. 2: Other fastening methods are acceptable for use if certified by a registered professional engineer to support the loads determined in accordance with the criteria in 6-4.5.9. Calculations shall be permitted where required by the authority having jurisdiction.

6-4.5.10 Sway bracing assemblies shall be listed for a maximum load rating. The loads shall be reduced as shown in Table 6-4.5.10 for loads that are less than 90 degrees from vertical.

Exception: Where sway bracing utilizing pipe, angles, flats, or rods as shown in Table 6-4.5.8 is used, the components do not require listing. Bracing fittings and connections used with those specific materials shall be listed.

Table 6-4.5.10 Allowable Horizontal Load on Brace Assemblies Based on the Weakest Component of the Brace Assembly

Brace Angle	Allowable Horizontal Load
30–40 degrees from vertical	Listed load rating divided by 2.000
45–59 degrees from vertical	Listed load rating divided by 1.414
60–89 degrees from vertical	Listed load rating divided by 1.155
90 degrees from vertical	Listed load rating

6-4.5.11 Bracing shall be attached directly to feed and cross mains. Each run of pipe between changes in direction shall be provided with both lateral and longitudinal bracing.

Exception: Pipe runs less than 12 ft (3.6 m) in length shall be permitted to be supported by the braces on adjacent runs of pipe.

6-4.5.12 A length of pipe shall not be braced to sections of the building that will move differentially.

6-4.6 Restraint of Branch Lines.

6-4.6.1* Restraint is considered a lesser degree of resisting loads than bracing and shall be provided by use of one of the following:

- (1) A listed sway brace assembly
- (2) A wraparound U-hook satisfying the requirements of 6-4.5.3, Exception No. 3
- (3) No. 12, 440-lb (200-kg) wire installed at least 45 degrees from the vertical plane and anchored on both sides of the pipe
- (4) Other approved means

Wire used for restraint shall be located within 2 ft (610 mm) of a hanger. The hanger closest to a wire restraint shall be of a type that resists upward movement of a branch line.

6-4.6.2 The end sprinkler on a line shall be restrained against excessive vertical and lateral movement.

6-4.6.3* Where upward or lateral movement would result in an impact against the building structure, equipment, or finish materials, branch lines shall be restrained at intervals not exceeding 30 ft (9 m).

6-4.6.4* Sprig-ups 4 ft (1.2 m) or longer shall be restrained against lateral movement.

6-4.7 Hangers and Fasteners Subject to Earthquakes.

6-4.7.1 C-type clamps (including beam and large flange clamps) used to attach hangers to the building structure in areas subject to earthquakes shall be equipped with a restraining strap. The restraining strap shall be listed for use with a C-type clamp or shall be a steel strap of not less than 16 gauge thickness and not less than 1 in. (25.4 mm) wide for pipe diameters 8 in. (203 mm) or less and 14 gauge thickness and not less than $1\frac{1}{4}$ in. (31.7 mm) wide for pipe diameters greater than 8 in. (203 mm). The restraining strap shall wrap around the beam flange not less than 1 in. (25.4 mm). A lock nut on a C-type clamp shall not be used as a method of restraint. A lip on a "C" or "Z" purlin shall not be used as a method of restraint.

Where purlins or beams do not provide an adequate lip to be secured by a restraining strap, the strap shall be through-bolted or secured by a self-tapping screw.

6-4.7.2 C-type clamps (including beam and large flange clamps), with or without restraining straps, shall not be used to attach braces to the building structure.

6-4.7.3 Powder-driven fasteners shall not be used to attach braces to the building structure.

Exception: Powder-driven fasteners shall be permitted where they are specifically listed for service in resisting lateral loads in areas subject to earthquakes.

6-4.7.4 Powder-driven fasteners shall not be used to attach hangers to the building structure where the systems are required to be protected against earthquakes using a horizontal force factor exceeding $0.50 W_p$, where W_p is the weight of the water-filled pipe.

Exception: Powder-driven fasteners shall be permitted where they are specifically listed for horizontal force factors in excess of $0.50 W_p$.

Chapter 7 Design Approaches

7-1 General.

7-1.1 Water demand requirements shall be determined from the occupancy hazard fire control approach of Section 7-2.

Exception: Special design approaches as permitted in Section 7-9.

7-1.2 For buildings with two or more adjacent occupancies that are not physically separated by a barrier or partition capable of delaying heat from a fire in one area from fusing sprinklers in the adjacent area, the required sprinkler protection for the more demanding occupancy shall extend 15 ft (4.6 m) beyond its perimeter.

7-2 Occupancy Hazard Fire Control Approach.

7-2.1 Occupancy Classifications.

7-2.1.1 Occupancy classifications for this standard relate to sprinkler installations and their water supplies only. They shall not be used as a general classification of occupancy hazards.

7-2.1.2 Occupancies or portions of occupancies shall be classified according to the quantity and combustibility of contents, the expected rates of heat release, the total potential for energy release, the heights of stockpiles, and the presence of flammable and combustible liquids, using the definitions contained in Section 1-4. Classifications are as follows:

Light hazard

Ordinary hazard (Groups 1 and 2)

Extra hazard (Groups 1 and 2)

Special occupancy hazard (see Section 7-10)

7-2.2 Water Demand Requirements — Pipe Schedule Method.

7-2.2.1 Table 7-2.2.1 shall be used in determining the minimum water supply requirements for light and ordinary hazard occupancies protected by systems with pipe sized according to the pipe schedules of Section 8-5. Pressure and flow requirements for extra hazard occupancies shall be based on the hydraulic calculation methods of 7-2.3. The pipe schedule method shall be permitted only for new installations of 5000 ft² (465 m²) or less or for additions or modifications to existing pipe schedule systems sized according to the pipe schedules of Section 8-5. Table 7-2.2.1 shall be used in determining the minimum water supply requirements.

Exception No. 1: The pipe schedule method shall be permitted for use in systems exceeding 5000 ft² (465 m²) where the flows required in Table 7-2.2.1 are available at a minimum residual pressure of 50 psi (3.4 bar) at the highest elevation of sprinkler.

Exception No. 2: The pipe schedule method shall be permitted for additions or modifications to existing extra hazard pipe schedule systems.

7-2.2.2 The lower duration value of Table 7-2.2.1 shall be acceptable only where remote station or central station water-flow alarm service is provided.

7-2.2.3* The residual pressure requirement of Table 7-2.2.1 shall be met at the elevation of the highest sprinkler. (See the Exceptions to 7-2.2.1).

7-2.2.4 The lower flow figure of Table 7-2.2.1 shall be permitted only where the building is of noncombustible construction or the potential areas of fire are limited by building size or compartmentation such that no open areas exceed 3000 ft² (279 m²) for light hazard or 4000 ft² (372 m²) for ordinary hazard.

Table 7-2.2.1 Water Supply Requirements for Pipe Schedule Sprinkler Systems

Occupancy Classification	Minimum Residual Pressure Required (psi)	Acceptable Flow at Base of Riser (Including Hose Stream Allowance) (gpm)	Duration (minutes)
Light hazard	15	500–750	30–60
Ordinary hazard	20	850–1500	60–90

For SI units, 1 gpm = 3.785 L/min; 1 psi = 0.0689 bar.

7-2.3 Water Demand Requirements — Hydraulic Calculation Methods.

7-2.3.1 General.

7-2.3.1.1* The minimum water supply requirements for a hydraulically designed occupancy hazard fire control sprinkler system shall be determined by adding the hose stream demand from Table 7-2.3.1.1 to the water supply for sprinklers determined in 7-2.3.1.2. This supply shall be available for the minimum duration specified in Table 7-2.3.1.1.

Exception No. 1: An allowance for inside and outside hose shall not be required where tanks supply sprinklers only.

Exception No. 2: Where pumps taking suction from a private fire service main supply sprinklers only, the pump need not be sized to accommodate inside and outside hose. Such hose allowance shall be considered in evaluating the available water supplies.

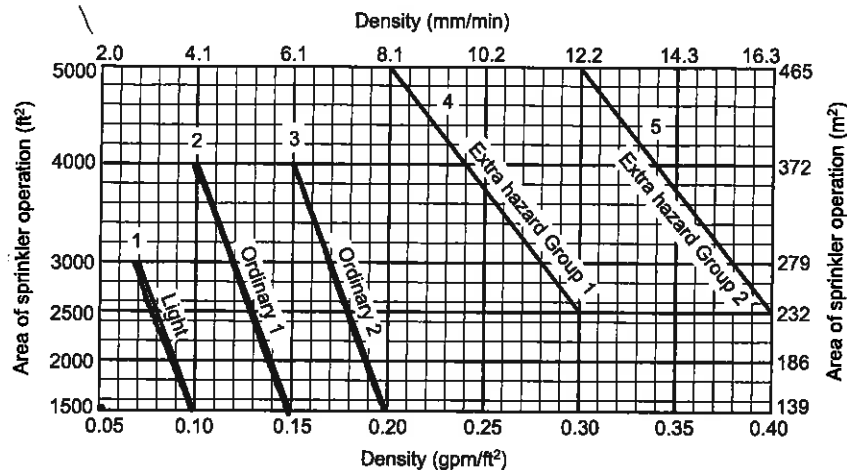
7-2.3.1.2 The water supply for sprinklers only shall be determined either from the area/density curves of Figure 7-2.3.1.2 in accordance with the method of 7-2.3.2 or be based upon the room design method in accordance with 7-2.3.3, at the discretion of the designer. For special areas under consideration, as described in 7-2.3.4, separate hydraulic calculations shall be required in addition to those required by 7-2.3.2 or 7-2.3.3.

Table 7-2.3.1.1† Hose Stream Demand and Water Supply Duration Requirements for Hydraulically Calculated Systems

Occupancy or Commodity Classification	Inside Hose (gpm)	Total Combined Inside and Outside Hose (gpm)	Duration (minutes)
Light hazard	0, 50, or 100	100	30
Ordinary hazard	0, 50, or 100	250	60-90
Extra hazard	0, 50, or 100	500	90-120
Rack storage, Class I, II, and III commodities up to 12 ft (3.7 m) in height	0, 50, or 100	250	90
Rack storage, Class IV commodities up to 10 ft (3.1 m) in height	0, 50, or 100	250	90
Rack storage, Class IV commodities up to 12 ft (3.7 m) in height	0, 50, or 100	500	90
Rack storage, Class I, II, and III commodities over 12 ft (3.7 m) in height	0, 50, or 100	500	90
Rack storage, Class IV commodities over 12 ft (3.7 m) in height and plastic commodities	0, 50, or 100	500	120
General storage, Class I, II, and III commodities over 12 ft (3.7 m) up to 20 ft (6.1 m)	0, 50, or 100	500	90
General storage, Class IV commodities over 12 ft (3.7 m) up to 20 ft (6.1 m)	0, 50, or 100	500	120
General storage, Class I, II, and III commodities over 20 ft (6.1 m) up to 30 ft (9.1 m)	0, 50, or 100	500	120
General storage, Class IV commodities over 20 ft (6.1 m) up to 30 ft (9.1 m)	0, 50, or 100	500	150
General storage, Group A plastics ≤ 5 ft (1.5 m)	0, 50, or 100	250	90
General storage, Group A plastics over 5 ft (1.5 m) up to 20 ft (6.1 m)	0, 50, or 100	500	120
General storage, Group A plastics over 20 ft (6.1 m) up to 25 ft (7.6 m)	0, 50, or 100	500	150

For SI units, 1 gpm = 3.785 L/min.

Figure 7-2.3.1.2 Area/density curves.



7-2.3.1.3 Regardless of which of the two methods is used, the following restrictions shall apply:

(a) For areas of sprinkler operation less than 1500 ft² (139 m²) used for light and ordinary hazard occupancies, the density for 1500 ft² (139 m²) shall be used. For areas of sprinkler operation less than 2500 ft² (232 m²) for extra hazard occupancies, the density for 2500 ft² (232 m²) shall be used.

(b) *For buildings having unsprinklered combustible concealed spaces (as described in 5-13.1.1 and 5-13.7), the minimum area of sprinkler operation shall be 3000 ft² (279 m²).

Exception No. 1: Combustible concealed spaces filled entirely with noncombustible insulation.

*Exception No. 2: *Light or ordinary hazard occupancies where noncombustible or limited combustible ceilings are directly attached to the bottom of solid wood joists so as to create enclosed joist spaces 160 ft³ (4.8 m³) or less in volume.*

*Exception No. 3: *Concealed spaces where the exposed surfaces have a flame spread rating of 25 or less and the materials have been demonstrated to not propagate fire in the form in which they are installed in the space.*

(c) Water demand of sprinklers installed in racks or water curtains shall be added to the ceiling sprinkler water demand at the point of connection. Demands shall be balanced to the higher pressure. (See Chapter 8.)

(d) Water demand of sprinklers installed in concealed spaces or under obstructions such as ducts and cutting tables need not be added to ceiling demand.

(e) Where inside hose stations are planned or are required, a total water allowance of 50 gpm (189 L/min) for a single hose station installation or 100 gpm (378 L/min) for a multiple hose station installation shall be added to the sprinkler requirements. The water allowance shall be added in 50-gpm (189-L/min) increments beginning at the most remote hose station, with each increment added at the pressure required by the sprinkler system design at that point.

(f) When hose valves for fire department use are attached to wet pipe sprinkler system risers in accordance with 5-15.5.2, the water supply shall not be required to be added to standpipe demand as determined from NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*.

Exception No. 1: Where the combined sprinkler system demand and hose stream allowance of Table 7-2.3.1.1 exceeds the requirements of NFPA 14, Standard for the Installation of Standpipe and Hose Systems, this higher demand shall be used.

Exception No. 2: For partially sprinklered buildings, the sprinkler demand, not including hose stream allowance, as indicated in Table 7-2.3.1.1 shall be added to the requirements given in NFPA 14, Standard for the Installation of Standpipe and Hose Systems.

(g) Water allowance for outside hose shall be added to the sprinkler and inside hose requirement at the connection to the city water main or a yard hydrant, whichever is closer to the system riser.

(h) The lower duration values in Table 7-2.3.1.1 shall be permitted where remote station or central station waterflow alarm service is provided.

(i) Where pumps, gravity tanks, or pressure tanks supply sprinklers only, requirements for inside and outside hose need not be considered in determining the size of such pumps or tanks.

7-2.3.1.4 Total system water supply requirements shall be determined in accordance with the hydraulic calculation procedures of Section 8-4.

7-2.3.2 Area/Density Method.

7-2.3.2.1 The water supply requirement for sprinklers only shall be calculated from the area/density curves in Figure 7-2.3.1.2 or from Section 7-10 where area/density criteria is specified for special occupancy hazards. When using Figure 7-2.3.1.2, the calculations shall satisfy any single point on the appropriate area/density curve as follows:

- (1) Light hazard area/density curve 1
- (2) Ordinary hazard (Group 1) area/density curve 2
- (3) Ordinary hazard (Group 2) area/density curve 3
- (4) Extra hazard (Group 1) area/density curve 4
- (5) Extra hazard (Group 2) area/density curve 5

It shall not be necessary to meet all points on the selected curve.

Exception: Sprinkler demand for storage occupancies as determined in Sections 7-3 through 7-8.

7-2.3.2.2 For protection of miscellaneous storage, miscellaneous tire storage, and storage up to 12 ft (3.7 m) in height, the discharge criteria in Table 7-2.3.2.2 shall apply.

APPENDIX C
Detailed Sanitary Sewer Calculations

APPENDIX D
Servicing Study Guidelines Checklist

Development Servicing Study Checklist

4.1 General Content	Addressed (Y/N/NA)	Section	Comments
Executive Summary (for larger reports only).	NA		
Date and revision number of the report.	Y	Cover	
Location map and plan showing municipal address, boundary, and layout of proposed development.	Y		Figures 1, 2 and 3
Plan showing the site and location of all existing services.	Y		Figures 2 and 3
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.	Y	1.0	
Summary of Pre-consultation Meetings with City and other approval agencies.	N		
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.	Y	2.0 - 4.0	
Statement of objectives and servicing criteria.	Y		Addressed in Section 2.0, 3.0. 4.0.
Identification of existing and proposed infrastructure available in the immediate area.	Y		Figures 2 and 3
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).	NA		
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 neighboring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	N		Will be addressed in Site plan application.

Development Servicing Study Checklist

4.1 General Content	Addressed (Y/N/NA)	Section	Comments
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.	NA		
Proposed phasing of the development, if applicable.	NA		
Reference to geotechnical studies and recommendations concerning servicing.	N		
All preliminary and formal site plan submissions should have the following information:			
Metric scale	Y	ALL	
North arrow (including construction North)	Y	ALL	
Key plan	Y	ALL	
Name and contact information of applicant and property owner	Y	ALL	
Property limits including bearings and	Y	ALL	
Existing and proposed structures and parking	Y	ALL	
Easements, road widening and rights-of-way	Y	ALL	
Adjacent street names	Y	ALL	

Development Servicing Study Checklist

4.2 Water	Addressed (Y/N/NA)	Section	Comments
Confirm consistency with Master Servicing Study, if available.	Y	5.0	Also refer to Appendix B for Hydrant Flow data.
Availability of public infrastructure to service proposed development.	Y		Figures 2 and 3
Identification of system constraints.	Y	4.0	
Identify boundary conditions.	Y	4.0	
Confirmation of adequate domestic supply and pressure.	Y	4.0	
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.	Y	4.0	
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.	Y	4.0	
Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design.	NA		
Address reliability requirements such as appropriate location of shut-off valves.	Y	4.0	
Check on the necessity of a pressure zone boundary modification.	NA		
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.	Y	4.0	
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.	Y	4.0	
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.	NA		
Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Y	4.0	
Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N		Figure 3 shows main.

Development Servicing Study Checklist

4.3 Wastewater	Addressed (Y/N/NA)	Section	Comments
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).	Y	2.0	
Confirm consistency with Master Servicing Study and/or justifications for deviations.	Y	2.0	
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.	Y	2.0	
Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Y	2.0	
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)	Y	2.0	
Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Y	2.0	
Description of proposed sewer network including sewers, pumping stations, and forcemains.	Y	2.0	Figures 2 and 3
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).	NA		
Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	NA		
Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	NA		
Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	NA		
Special considerations such as contamination, corrosive environment etc.	NA		

Development Servicing Study Checklist

4.4 Stormwater	Addressed (Y/N/NA)	Section	Comments
Description of drainage outlets and downstream constraints including legality of outlet (i.e. municipal drain, right-of-way, watercourse, or private property).	Y	3.0	
Analysis of the available capacity in existing public infrastructure.	Y	3.0	
A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns and proposed drainage patterns.	Y		Figures 2 and 3
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.	Y	3.0	
Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	NA		
Description of stormwater management concept with facility locations and descriptions with references and supporting information.	Y	3.0	
Set-back from private sewage disposal systems.	NA		
Watercourse and hazard lands setbacks.	NA		
Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	NA		
Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	Y	3.0	
Storage requirements (complete with calcs) and conveyance capacity for 5 yr and 100 yr events.	Y	3.0	
Identification of watercourse within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	NA		
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.	Y	3.0	
Any proposed diversion of drainage catchment areas from one outlet to another.	NA		
Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and SWM facilities.	Y	3.0	
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.	NA		

Development Servicing Study Checklist

4.4 Stormwater	Addressed (Y/N/NA)	Section	Comments
Identification of municipal drains and related approval requirements.	NA		
Description of how the conveyance and storage capacity will be achieved for the development.	Y	3.0	
100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Y	3.0	
Inclusion of hydraulic analysis including HGL elevations.	N		
Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Y	3.0	
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.	NA		
Identification of fill constrains related to floodplain and geotechnical investigation.	NA		

Development Servicing Study Checklist

4.5 Approval and Permit Requirements	Addressed (Y/N/NA)	Section	Comments
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.	NA		
Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N		
Changes to Municipal Drains.	N		
Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	NA		

4.6 Conclusion	Addressed (Y/N/NA)	Section	Comments
Clearly stated conclusions and recommendations.	Y	5.0	
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.	NA		
All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario.	Y	5.0	