Assessment of Adequacy of Site Services
1+19 Sir John A MacDonald Parkway, Ottawa, Ontario

Type of Document:
Final Submission

Client:
National Capital Commission
40 Elgin Street
Ottawa, ON K1P 1C7

Project Number:
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November 26, 2019

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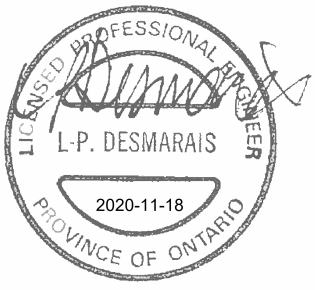

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Table of Contents

List of Tables

1 Introduction

EXP Services Inc. has been retained by the National Capital Commission to prepare an Assessment of Adequacy of Public Services to satisfy the City of Ottawa's (City) Zoning Amendment Application Process. This study will review the site's existing sanitary and water consumption rates as well as identify anticipated water consumption, sewage generation, storm servicing and storm water management criteria.

There are six proposed sites located between Forward Avenue and Slidell Street, between the Sir John A. MacDonald Parkway and Burnside avenue (See figure 1.1). The existing site is zoned as General Open Space and R5. It is proposed that each of the six sites would have a typical floor height of three metres and 3 stories per building. The proposed zoning for all six parcels is R1.

The objective of this report is to demonstrate that the proposed re-zoning and development can be supported by existing infrastructure.

2 Guidelines, Previous Studies, and Reports

Various documents were referred to in preparing the current report including:

- City of Ottawa Sewer Design Guidelines, October 2012
- City of Ottawa Water Distribution Design Guidelines, July 2010
- Fire Underwriters Survey, Water Supply for Public Fire Protection, 1999
- Ontario Building Code

3 Wastewater Servicing

The proposed developments are located within the West Nepean Collector Sewer Area. Most of the sewers in this area have been separated from combined sewers to sanitary and storm sewers. It is proposed to service Parcels 1, 2 and 3 from the existing 300mm diameter sanitary sewer extending from Emmerson Avenue and Hinchey Avenue. It is proposed that parcels 4, 5, and 6 will be serviced from the existing 375mm diameter sanitary sewer on Burnside Avenue.

Given that the site is currently open space, the development will increase the dry weather wastewater discharge into the existing sewers above the current discharge rate. Monitoring data to be provided by the City in order to evaluate the capacity of the existing sewers within the study area.

Faucet aerators for taps, and low flow toilets can be utilized to minimize discharge into the sanitary sewers.

3.1 Existing Conditions

The proposed development area is currently zoned as open space, and therefore does not discharge wastewater into the existing sewer system.

3.2 Proposed Conditions

It is expected the proposed lots will be occupied by embassy buildings. The peak sanitary flows for commercial/institutional developments can be approximated using the City Guidelines and Ontario Building Code as follows.

Buildings

Parcel 1

Population: 1 person per 9.3m^2 (OBC Section 3.1.16.1)

Population = 3597m^2 / 9.3m^2	= 387
Average Domestic Flow = 75L/person/day x (1/86,400 sec/day) (OBC Table 8.2.1.3B)	= 0.34 L/sec
Peak Factor =	= 1.5
Peak Domestic Flow = 0.279 L/sec x 3.61	**= 0.50 L/sec**

Infiltration

Parcel 1

Infiltration flow = 0.33 L/s/ha x 0.5996	= 0.20 L/sec

Peak Sanitary Flow:

Parcel 1

Peak Flow = 0.50 + 0.20	**= 0.70 L/sec**

The estimated peak sanitary flow from each of the proposed buildings are tabulated below.

Table 3-1: Peak Sanitary Flows

Description	Floor Area (m^2)	Population	Peak Domestic (L/sec)	Infiltration (L/sec)	Peak Sanitary (L/sec)
Parcel 1	3597	387	0.50	0.20	**0.70**
Parcel 2	2517	271	0.35	0.14	**0.49**
Parcel 3	2499	269	0.35	0.14	**0.49**
Parcel 4	2436	262	0.34	0.13	**0.47**
Parcel 5	2211	238	0.31	0.12	**0.43**
Parcel 6	2205	237	0.31	0.12	**0.43**

4 Water Servicing

The 6 proposed residential buildings at 1 + 19 Sir John A. MacDonald Parkway is located within the City's 1W Pressure Zone. The proposed development is bound by an existing 1067mm diameter watermain along Scott street to the south, and a large 1981mm watermain to the east along Slidell St. and Bayview Rd. Tunney's Pasture Federal Government complex is located to the west, which consists of a private watermain network.

The domestic water demands are estimated below, utilizing parameters from the City Water Distribution Design Guidelines. The following summarizes the parameters used.

Parcel 1

- Average daily water consumption = 75L/person/day
- Number of residents = 387
- Maximum Day Factor = 2.5 x Avg. Day
- Maximum Hour Factor = 2.2 x Max. Day

The average, maximum day and peak hour domestic (residential) demands for the building are as follows:

- Average Day = 75 x 387 / 86,400 sec/day = 0.34 L/sec
- Maximum Day = 2.5 x 0.34 = 0.85 L/sec
- Peak Hour = 2.2 x 0.85 = 1.87 L/sec

The estimated water demand for each building was calculated in Table 4-1 below.

Table 4-1: Estimated Water Demand

Description	Area (ha)	Population	Avg. Day (L/sec)	Max Day (L/sec)	Peak Hour (L/sec)
Parcel 1	0.5996	387	0.34	0.85	1.87
Parcel 2	0.4201	271	0.24	0.59	1.29
Parcel 3	0.4164	269	0.23	0.58	1.28
Parcel 4	0.4058	262	0.23	0.57	1.25
Parcel 5	0.3687	238	0.21	0.52	1.14
Parcel 6	0.3675	237	0.21	0.51	1.13

Water for fire protection will be available utilizing existing fire hydrants located on Burnside Avenue between Hinchey Ave. and Slidell St. The required fire flows for the proposed site was estimated based on the Fire Underwriters Survey. See Table 4-2 for a summary of required fire flow for parcel 1. Table 4-3 indicates the required fire flow for each individual site.

The following equation from the latest version of the Fire Underwriters Survey (1999) was used for calculation of the supply rates required to be supplied by the hydrant.

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

Where:

F = the required fire flow in litres per minute

C = coefficient related to the type of construction

A = the total floor area in square metres

Table 4-2: Summary of Required Fire Flow Protection for Parcel 1

Item	Design Value
Floors Above Grade	3 floors
Construction Coefficient	= 1.0
Fire Protection Type	= none
Building Height (m)	= 9.0
Building Area (sq.m.)	= 1199.0
F=220C$\sqrt{A}$	= 13,000
Reduction due to low occupancy	-15%
Increase due to separation	0%
Fire Flow Requirement	= 11,000 L/min or 175 L/sec

Table 4-3: Summary of Required Fire Flow per Parcel

Description	Building Area (m2)	F=220C√A (L/min)	Reduction (Residential Construction) (%)	Separation Increase (%)	Fire Flow Requirement (L/min)/(L/sec)
Parcel 1	3597	13,000	15	0	11,000/175
Parcel 2	2517	11,000	15	5	10,000/167
Parcel 3	2496	11,000	15	14	11,000/175
Parcel 4	2436	11,000	15	17	11,000/175
Parcel 5	2211	10,000	15	22	11,000/175
Parcel 6	2205	10,000	15	11	10,000/167

Water for fire protection will be taken from the existing hydrants on Burnside Avenue between Hinchey Ave. and Slidell St. Boundary conditions have been requested from the City in order to establish available fire flow to each site.

Based on boundary conditions provided by the City, based on the fire flow requirements noted in Table 4-4 below, the estimated pressures under max day plus fire flow conditions were estimated at pressures between 32.01 psi and 71.00 psi.

Table 4-4: Estimated Fire Flow Pressures at Building

Location #	Ground Elevation (m)	Max Day + Fire Flow HGL (m)	Minimum Peak Hour HGL	Maximum Peak Hour HGL	Max Day + Fire Flow Pressure kPa(psi)	Peak Hour Pressure kPa(psi)	
						Minimum	Maximum
1	58.750	90	107.3	115	307(44)	476(69)	552(80)
2	62.500	85	107.3	115	221(32)	439(64)	515(75)
3	63.400	101	107.3	115	369(53)	431(62)	506(73)
4	61.750	102	107.3	115	395(57)	447(65)	522(76)
5	58.000	105	107.3	115	461(67)	484(70)	559(81)
6	57.100	107	107.3	115	490(71)	492(71)	568(82)

As shown in Table 4-4 above, the estimated pressures at the buildings meet the minimum allowable pressures of 20psi (140kPa) under maximum day plus fire flow conditions as required by the City's Water Distribution Guidelines (WDG002). Also, the estimated pressures at the buildings meet the minimum allowable pressures of 40psi (345kPa) under peak hour conditions. However, locations 1, 5, and 6 are above 80 psi and will require pressure reducers as per the Water Distribution Guidelines(WDG002).

5 Stormwater Management

The proposed development is currently bound by a 375mm diameter storm sewer on Forward Avenue, a 300mm diameter storm sewer on Hinchey Ave., and a 300mm diameter storm sewer on Burnside Avenue.

The following parameters will be used to determine the allowable release rates from the proposed sites to the existing storm sewers on Forward Ave., Hinchey Ave., and Burnside Ave. using the Rational Formula:

$Q_{5ALLOW} = 2.78\ C_{AVG}\ I_T\ A$

Where:

Q_{5ALLOW}	=	5-year Peak Allowable Discharge (L/sec)
C_{ALLOW}	=	Allowable Runoff Coefficient (dimensionless)
I_T	=	Average Rainfall Intensity (mm/hr)
A	=	Drainage Area (hectares)

Using a time of concentration (T_C) of 10 minutes and a runoff coefficient of 0.50, the allowable release rate (Q_{5ALLOW}) from the site is determined for the 5-year storm (City of Ottawa Guidelines), I_5, using the IDF Curve as follows:

Parcel 1

I_5	=	$998.071/ (10+6.053)^{0.814}$	= 104.19 mm/hr
Q_{5ALLOW}	=	2.78 (0.50) (104.29 mm/hr) (0.05996)	= 8.7 L/sec

The allowable release rate for the proposed development on parcel 1 will be limited to 8.7 L/sec based on the 5-year storm. To control runoff from the site it will be necessary to limit post-development flows for all storm return periods up to the 100-year event using onsite inlet controls, as noted in the following sections. The allowable release rates for all sites are identified in Table 5-1 below.

Table 5-1: Summary of Allowable Release Rates

Description	Area (ha)	C	Tc (min)	I (mm/hr)	Q_{Allow} (L/sec)
Parcel 1	0.5996	0.5	10	104.19	86.8
Parcel 2	0.4201	0.5	10	104.19	60.8
Parcel 3	0.4164	0.5	10	104.19	60.3
Parcel 4	0.4058	0.5	10	104.19	58.8
Parcel 5	0.3687	0.5	10	104.19	53.4
Parcel 6	0.3675	0.5	10	104.19	53.2

As a result of the changes onsite the overall post development runoff coefficient will increase over existing conditions. The increase in runoff will be the result of changes due to site development (i.e. additional hard surfaces, roof areas and hard landscaping).

Using a time of concentration (TC) of 10 minutes and an average runoff coefficient of 0.20 for grassed areas and 0.90 for hard surfaces, the post-development runoff rates from the site was determined for the 5-year and 100-year storm using the Rational Method as follows:

$I_5 = 998.071 / (Tc + 6.053)^{0.814} = 104.19$ mm/hr

$I_{100} = 1735.688 / (Tc + 6.014)^{0.820} = 178.56$ mm/hr

$Q_{5POST} = 2.78 \times C_{AVG} \times 104.19$ mm/hr x Area

$Q_{100\ POST} = 2.78 \times C_{AVG} * 25\% \times 178.56$ mm/hr x Area

Based on the storm drainage areas the 5-year and 100-year post-development runoff rates are calculated and summarized in the Table 5-2 below.

Table 5-2: Summary of Post Development Flows

Description	Area No.	Area (ha)	Runoff Coeff		5-yr Free Flow (Controlled) (L/s)		100-yr Free Flow (Controlled) (L/s)	
			(5-yr)	(100-yr)				
Parcel 1	A1	0.5996	0.44	0.55	77.02		164.99	**(86.8)**
Parcel 2	A2	0.4201	0.54	0.67	65.66	**(60.8)**	140.65	**(60.8)**
Parcel 3	A3	0.4164	0.55	0.69	66.27	**(60.3)**	141.97	**(60.3)**
Parcel 4	A4	0.4058	0.65	0.82	76.97	**(58.8)**	164.88	**(58.8)**
Parcel 5	A5	0.3687	0.57	0.71	61.04	**(53.4)**	130.76	**(53.4)**
Parcel 6	A6	0.3675	0.57	0.71	60.42	**(53.2)**	129.42	**(53.2)**

(100.00) Denotes controlled flow.

Table 5-3 below summarizes the controlled release rates for each area and the corresponding storage requirements. Calculation of the onsite storage for each site has been conducted using the parking surface area with a maximum ponding depth of 0.15m.

Table 5-3: Summary of Storage Requirements

Description	Area (ha)	Controlled Release Rate (L/s)		Storage Required (m^3)		Storage Provided (m^3)
		5-yr	100-yr	5-yr	100-yr	Surface
Parcel 1	0.5996	0.44	0.55	5.01	46.14	56.67
Parcel 2	0.4201	0.54	0.67	8.47	47.35	59.99
Parcel 3	0.4164	0.55	0.69	8.88	49.39	62.29
Parcel 4	0.4058	0.65	0.82	13.42	66.05	85.58
Parcel 5	0.3687	0.57	0.71	7.10	42.69	56.91
Parcel 6	0.3675	0.57	0.71	7.02	42.43	54.39

Table 5-3 above indicates that there should be sufficient storage and detention using on site parking areas for each building with a maximum ponding depth of 0.15m. Additional storage could be provided by retaining water on the building rooftops using restricted flow roof drains.

6 Conclusions

The following summarizes our findings

- Proposed peak domestic flows have been calculated using the City Sewer Design guidelines for each of the six buildings and are summarized in Table 3-1. Peak flows range from 0.70 to 0.43 l/s.
- Flow monitoring data has been requested from the City to determine the existing capacity of sanitary sewers in this area.
- It is expected that the peak flow from the buildings will not negatively impact the existing sanitary sewer.
- Domestic water demands have been calculated using the City Water Distribution guidelines for each of the six buildings and are summarized in Table 4-1. Peak hour flows range from 1.87 to 1.13 l/s.
- Required fire flow protection has been calculated using the Fire Underwriters Survey (FUS 1999).
- A summary of factors causing reductions or increases in required fire flow have been summarized in Table 4-2 for the building located on parcel 1.
- Required fire flows have been calculated for each of the six buildings and are summarized in Table 4-3.

- Boundary conditions have been requested from the City to review the available fire flow and determine if there is sufficient capacity.
- Post-development allowable release rates have been calculated for each site and are summarized in Table 5-1.
- 5-Year and 100-Year post development runoff rates were calculated and summarized in Table 5-2.
- Controlled release rates and storage requirements have been calculated for each site and are summarized in Table 5-3.
- Table 5-3 shows that there should be sufficient storage and detention on site using the parking areas and a maximum ponding depth of 0.15m.