S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS

Technical Memorandum

To:	City of Burlington & Region of Halton	**From:**	C.Dougan
		Date:	7-June-2019
		Pages:	4 + 2 (attached)
		Job #:	16149
Re:	2069-2079 Lakeshore Road & 383-385 Pearl Street Burlington		

Introduction

S.Llewellyn & Associates Limited has been retained by Lakeshore (Burlington) Inc. to provide consulting engineering services for the proposed development located at 2069-2079 Lakeshore Road and 383-385 Pearl Street in the City of Burlington. This memorandum is to outline the changes to the functional servicing strategy based on the preliminary site plan revisions prepared by Turner Fleischer Architects Inc. dated June 5th, 2019. The proposed development will remain to consist of demolishing three existing residential/commercial buildings and construct a 29-storey high-rise tower. The proposed building has been revised to consist of a total of 276 residential units, 666m^2 of retail space and 165m^2 of live/work units from the previous concept of 280 residential units, 675m^2 of retail space and 280m^2 of live/work units respectively.

Stormwater Management

Since the overall layout of the proposed site has stayed consistent with the previously submitted preliminary site plan dated August 8th, 2018, the stormwater management strategy for the proposed development will remain with what has been proposed in the Functional Servicing Report prepared by S.Llewellyn & Associates Limited dated August 8th, 2018.

Sanitary Sewer Servicing

The sanitary discharge for the site estimated for the subject lands has been revised to reflect the unit changes mentioned above. See Table 1 and 2 below for details.

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Table 1- Post-Development Sanitary Sewer Discharge (Residential Units)				
Population [A]	Avg. Demand [B] (l/s)	Peaking Factor [C]	Infiltration [D] (l/s)	**Peak Flow [E] (l/s)**
988 persons	3.14	3.80	0.072	**12.00**

[A] Population = (78 x 1 bdr units x 2 cap/bdr) + (172 x 2 bdr units x 2 cap/bdr) + (24 x 3 bdr units x 2 cap/bdr) = 988 persons
[B] Average demand = 275 l/cap/day x population
[C] Peaking Factor = $1+((14/(4+P^{0.5}))$ with P expressed in thousands Min=2.0
[D] Infiltration flow based on 0.286 l/ha/sec infiltration rate x Site Area (0.25 hectares)
[E] Peak Flow = (Average Flow x Peaking Factor) + Infiltration

Table 2- Post-Development Sanitary Sewer Discharge (Retail Units & Live/Work Units)					
Total Gross Floor Area [A] (ha)	Population [B]	Avg. Demand [C] (l/s)	Peaking Factor [D]	Infiltration [E] (l/s)	**Peak Flow [F] (l/s)**
0.083	8 persons	0.024	3.54	0.072	**0.16**

[A] Total Gross Floor Area = GFA of retail unit ($666m^2$) + GFA of live/work unit ($165m^2$) = $831m^2$
[B] Light Commercial Areas = 90 persons/hectare
[C] Average demand = 24.75 m^3/ha/day x total floor area
[D] Peaking Factor = $0.80(1+((14/(4+P^{0.5}))))$ with P expressed in thousands Min=2.0
[E] Infiltration flow based on 0.286 l/ha/sec infiltration rate x Site Area (0.25 hectares)
[F] Peak Flow = (Average Flow x Peaking Factor) + Infiltration

Total Sanitary Sewer Discharge = 12.00 l/s + 0.16 l/s
Total Sanitary Sewer Discharge = 12.16 l/s

It is proposed to service the subject lands with a 200mmø sanitary sewer at 2.0% grade. The 200mmø sanitary service will connect to the existing 200mmø sanitary sewer along Pearl Street. The proposed sanitary service will contain a capacity of 46 l/s. Therefore, the sanitary demand for the proposed development will not be adversely affected due to the preliminary site plan revisions.

Domestic and Fire Water Supply Servicing

Domestic Demand

The water demand for the proposed development has been revised to reflect the unit changes mentioned above. See Table 3 and 4 below for details.

Table 3 - Post-Development Domestic Water Demand (Residential Units)					
Population [A]	Average Daily Demand [B] (l/s)	Max. Daily Peaking Factor [C]	Max. Hourly Peaking Factor [D]	**Max. Daily Demand [E] (l/s)**	**Max. Hourly Demand [F] (l/s)**
988 persons	3.14	2.25	4	**7.07**	**12.56**

[A] Population = (82 x 1 bdr units x 2 cap/bdr) + (178 x 2 bdr units x 2 cap/bdr) + (18 x 3 bdr units x 2 cap/bdr) = 988 persons
[B] Average Daily Demand = 275 l/cap/day x population
[C] Max. Daily Peaking Factor = 2.25 (refer to sentence 2.4.1 in the Halton Region Water & Wastewater Linear Design Manual)
[D] Max. Hourly Peaking Factor = 4.00 (refer to Table 2-2 in the Halton Region Water & Wastewater Linear Design Manual)
[E] Max. Daily Demand = Average Daily Demand x Max. Daily Peaking Factor
[F] Max. Hourly Demand = Average Daily Demand x Max. Hourly Peaking Factor

Table 4 - Post-Development Domestic Water Demand (Retail Units & Live/Work Units)					
Total Gross Floor Area [A] (ha)	Average Daily Demand [B] (l/s)	Max. Daily Peaking Factor [C]	Max. Hourly Peaking Factor [D]	**Max. Daily Demand [E] (l/s)**	**Max. Hourly Demand [F] (l/s)**
0.083	0.024	2.25	2.25	**0.054**	**0.054**

[A] Total Gross Floor Area = GFA of retail unit (666m^2) + GFA of live/work unit (165m^2) = 831m^2
[B] Average Daily Demand = 24.75 m^3/ha/day x total floor area
[C] Max. Daily Peaking Factor = 2.25 (refer to sentence 2.4.1 in the Halton Region Water & Wastewater Linear Design Manual)
[D] Max. Hourly Peaking Factor = 2.25 (refer to Table 2-2 in the Halton Region Water & Wastewater Linear Design Manual)
[E] Max. Daily Demand = Average Daily Demand x Max. Daily Peaking Factor
[F] Max. Hourly Demand = Average Daily Demand x Max. Hourly Peaking Factor

Total Max. Daily Demand = 7.07 l/s + 0.054 l/s
Total Max. Daily Demand = 7.12 l/s

Total Max. Hourly Demand = 12.56 l/s + 0.054 l/s
Total Max. Hourly Demand = 12.61 l/s

Fire Flow Demand

The fire flow demand for the development has been revised based on the modifications to the gross floor areas of the building. Fire flow demands for development are governed by a number of guidelines and criteria, such as the Water Supply for Public Fire Protection (Fire Underwriters Survey, 1999), Ontario Building Code (OBC), and various codes and standards published by the National Fire Protection Association (NFPA). Since the FUS criteria provides adjustment for sprinklered buildings (OBC does not), the FUS method was used to determine the fire flow demand for the proposed development.

The condominium building is anticipated to be a fire-resistive construction building (C=0.6), with non-combustible occupancy (-25% correction) and sprinkler system (-50% correction). Exposure corrections are based on the following:
North Face: 25% correction (0m to 3m)
South Face: 10% correction (20.1m to 30m)
East Face: 25% correction (0m to 3m)
West Face: 10% correction (20.1m to 30m)

Based on the hydrant flow test conducted by Jackson Waterworks, the theoretical maximum available flow rate is **345 l/s**. It is estimated that the required fire flow for the proposed development will be **150 l/s**. Therefore, the water distribution system still has adequate pressure and capacity to service the subject site based on the revised preliminary site plan revisions.

Conclusions

Based on the information provided herein, it is concluded that the revisions to the preliminary site plan prepared by Turner Fleischer Architects Inc., will not adversely affect the functional servicing strategy for the subject lands.

We trust the information enclosed herein is satisfactory. Should you have any questions please do not hesitate to contact our office.

Prepared by:

S. LLEWELLYN & ASSOCIATES LIMITED

C.Dougan, Dip. T.

S.Llewellyn, P.Eng

FIRE FLOW DEMAND REQUIREMENTS - FIRE UNDERWRITERS SURVEY (FUS GUIDELINES)

Project Number: 16149
Project Name: 2069 Lakeshore Road
Date: Jun-19

Fire flow demands for the FUS method is based on information and guidance provided in "Water Supply for Public Protection" (Fire Underwriters Survey, 1999).

An estimate of the fire flow required is given by the following formula:

$$F = 220\,C\sqrt{A} \qquad \textbf{(1)}$$

where:

F the required fire flow in litres per minute
C coefficient related to the type of construction
= 1.5 for wood frame construction (structure essentially all combustible).
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls)
= 0.6 for fire-resistive construction (fully protected frame, floors, roof)
A Total floor area in square metres

				(1)		(2)			(3)		(4)		Final Adjusted Fire Flow	
Building / Location	# of Storeys	**Total GFA (m^2)**	Type of Construction	***Fire Flow "F"***		***Occupancy***			***Sprinkler***		***Exposure***			
				(l/min)	(l/s)	%	Adjustment (l/min)	**Adjusted Fire Flow (l/min)**	%	Adjustment (l/min)	%	Adjustment (l/min)	**(l/min)**	**(l/s)**
Condominium	**29**	**6045**	**0.6**	10000	166.7	**-25**	-2500.0	**7500.0**	**-50**	-3750.0	70	5250.0	**9000**	**150**

(2) Occupancy	
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	No Charge
Free Burning	15%
Rapid Burning	25%

(3) Sprinkler

Minimum credit for systems designed to NFPA 13 is 30%.

If the domestic and fire services are supplied by the same municipal water system, then take an additional 10%.

If the sprinkler system is fully supervised (ie. annunciator panel that alerts the Fire Dept., such as a school), then an additional 10% can be taken. Maximum credit = 50%.

(4) Exposure		
0 to 3m	25%	
3.1 to 10m	20%	Calculate for all
10.1 to 20m	15%	sides. Maximum
20.1 to 30m	10%	charge shall not
30.1 to 45m	5%	exceed 75%

Side	Exposure (m)	Charge (%)
North =	**3**	**25**
South =	**28**	**10**
East =	**1**	**25**
West =	**23**	**10**
Total Expoure =		***70***

JACKSON WATERWORKS

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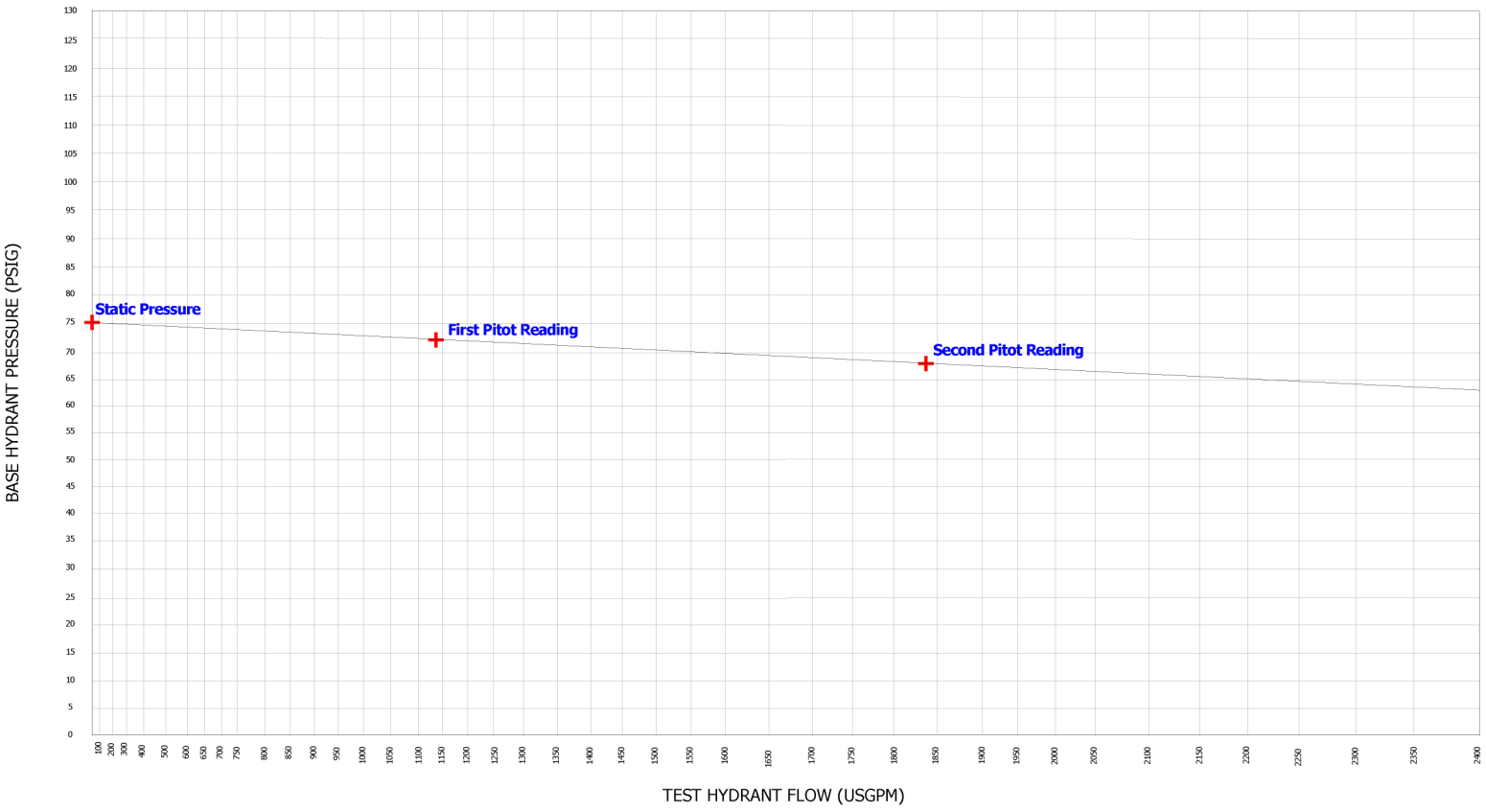
FIRE HYDRANT FLOW TEST RESULTS



No. of Ports Open	Port Dia. (in)	Pitot Reading (psig)	Pitot Conversion (usgpm) Conversion Factor = 0	Residual Pressure (psig)
1	2.50	46	1138	72
2	2.50	30/30	1838	68
THEORETICAL FLOW @ 20psi			5474	

Test Date	12 January 2017
Test Time	2:00pm
Pipe Diameter (in)	8
Static Pressure (psig)	75

SITE INFORMATION	
Site Name, Developer Name & Engineer	421 Brant Street Inc.
Site Address/Municipality	Pearl Street, Burlington (Region of Halton)
Location of Test Hydrant	414 Pearl Street
Location of Base Hydrant	390 Pearl Street
Comments	Testing has been completed in accordance with NFPA-291 guidelines wherever and whenever possible and practical. Conversion factors for pitot tube readings have been used depending on hose nozzle internal design and installation profile. Refer to attached cover letter for additional information.
Verified By	Mark Schmidt

221 Sherman Avenue North, Hamilton, Ontario L8L 6N2