11 YORKVILLE PARTNERS INC.

11-25 YORKVILLE AVENUE & 16-18 CUMBERLAND STREET

FUNCTIONAL SERVICING REPORT

AUGUST 22, 2019

11-25 YORKVILLE AVENUE & 16-18 CUMBERLAND STREET

FUNCTIONAL SERVICING REPORT

11 YORKVILLE PARTNERS INC.

FUNCTIONAL SERVICING REPORT - DRAFT

PROJECT NO.: 17M-01494
DATE: AUGUST, 2019

WSP CANADA GROUP LIMITED
100 COMMERCE VALLEY DRIVE WEST
THORNHILL, ON, CANADA L3T 0A1

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SIGNATURES

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APPENDICES

1 INTRODUCTION

1.1 SCOPE OF MUNICIPAL SERVICING

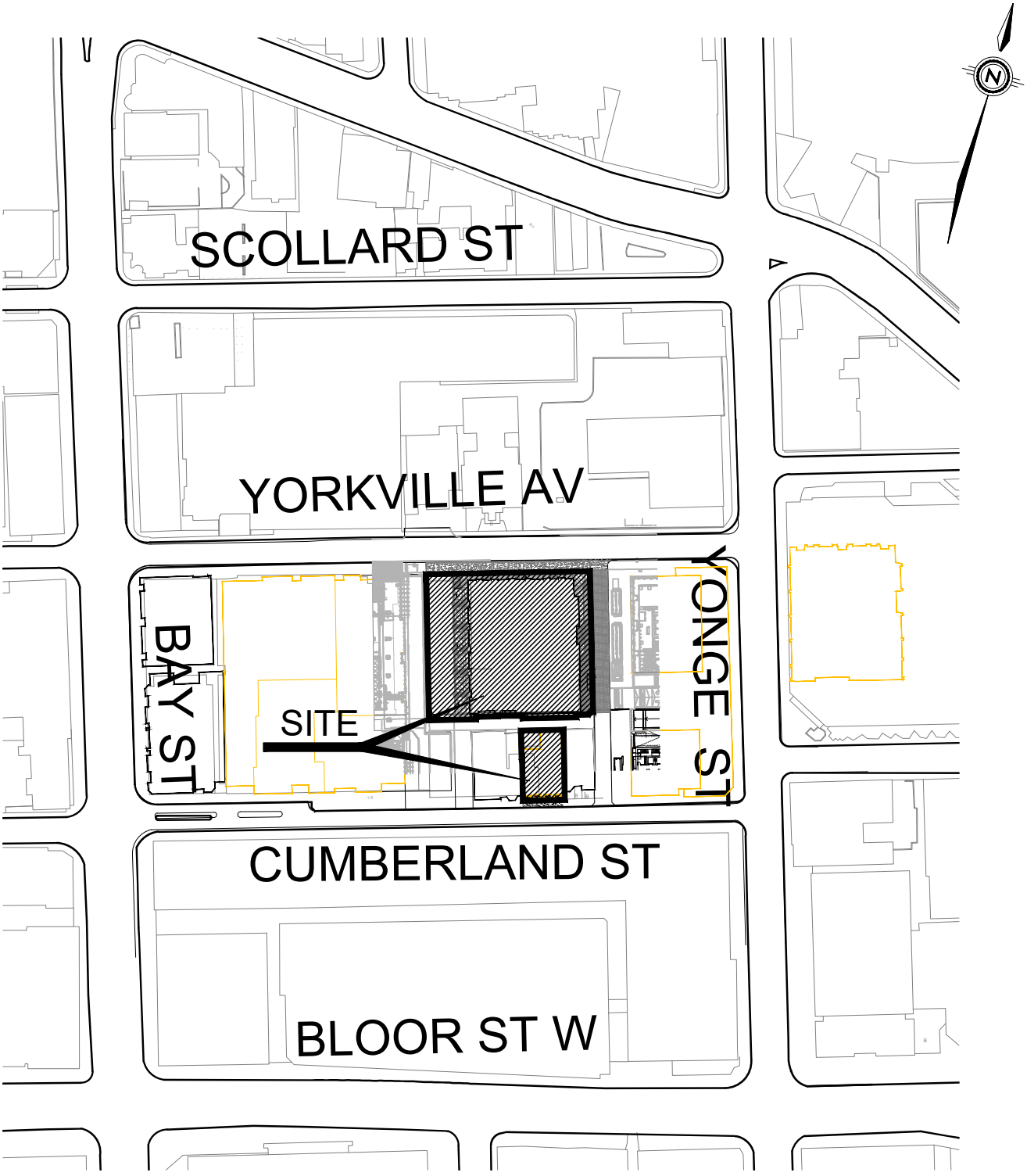
WSP Canada Group Limited (WSP) has been retained by 11 Yorkville Partnership Inc. to prepare a Functional Servicing Report (FSR) in support of the proposed development of 11-25 Yorkville Avenue and 16-18 Cumberland Street in the City of Toronto (herein referred to as Buildings A and B, respectively, or 'site'). The site is located on the south side of Yorkville Avenue just west of Yonge Street and on the north side of Cumberland just west of Yonge Street. The site area is approximately 0.24 ha for Building A and approximately 0.04 ha for Building B for a total site area of approximately 0.28ha. As shown in Figures 1 and 2, the site is bound by Yorkville Avenue to the north, city-owned laneways to the south and east and a 71-storey building (pre-construction) to the west. It is assumed that the existing buildings are serviced by existing infrastructure in the municipal right-of-way (ROW). The purpose of this report is to outline how water, sanitary and storm servicing will be provided for the redevelopment of the site.

1.2 EXISTING CONDITIONS

Currently, 11 Yorkville Avenue is occupied by a 10-storey commercial building with an underground parking structure at its rear. 17 Yorkville Avenue is occupied by a three-storey commercial building with a small backyard area. 19 Yorkville Avenue and 21 Yorkville are both occupied by four-storey commercial buildings. 16 Cumberland Street is occupied by a two-storey commercial building and 18 Cumberland Street is occupied by a two-storey commercial building. We have assumed that all existing buildings have existing services to the municipal sewers. SUE investigation is being undertaken to confirm the existing service connection location and is included in Appendix F of this report. Please refer to Figure 2 for the Pre-Development Plan.

1.3 PROPOSED DEVELOPMENT

The proposed development consists of one 62-storey mixed-use tower (Building A) and one two-storey retail (Building B). Building A will have four (4) below-grade parking levels, 674 residential units and approximately 2,486m^2 of retail space. Privately-Owned Public Space (POPS) and park area will be located west of Building A. Building B will have one below-grade concourse level and two above-ground levels, with a total of 839 m^2 of retail space. All service connections for Building A will be provided from existing infrastructure on Yorkville Avenue and for Building B, service connections will be provided from Cumberland Street. All vehicle access to Building A will be provided by an entrance at the north east corner of the site that will run along the east side of the site and pass underneath the building to reach the underground parking entrance. Please refer to Figure 3 for the Proposed Development Plan.



CLIENT

11 YORKVILLE PARTNERSHIP INC.

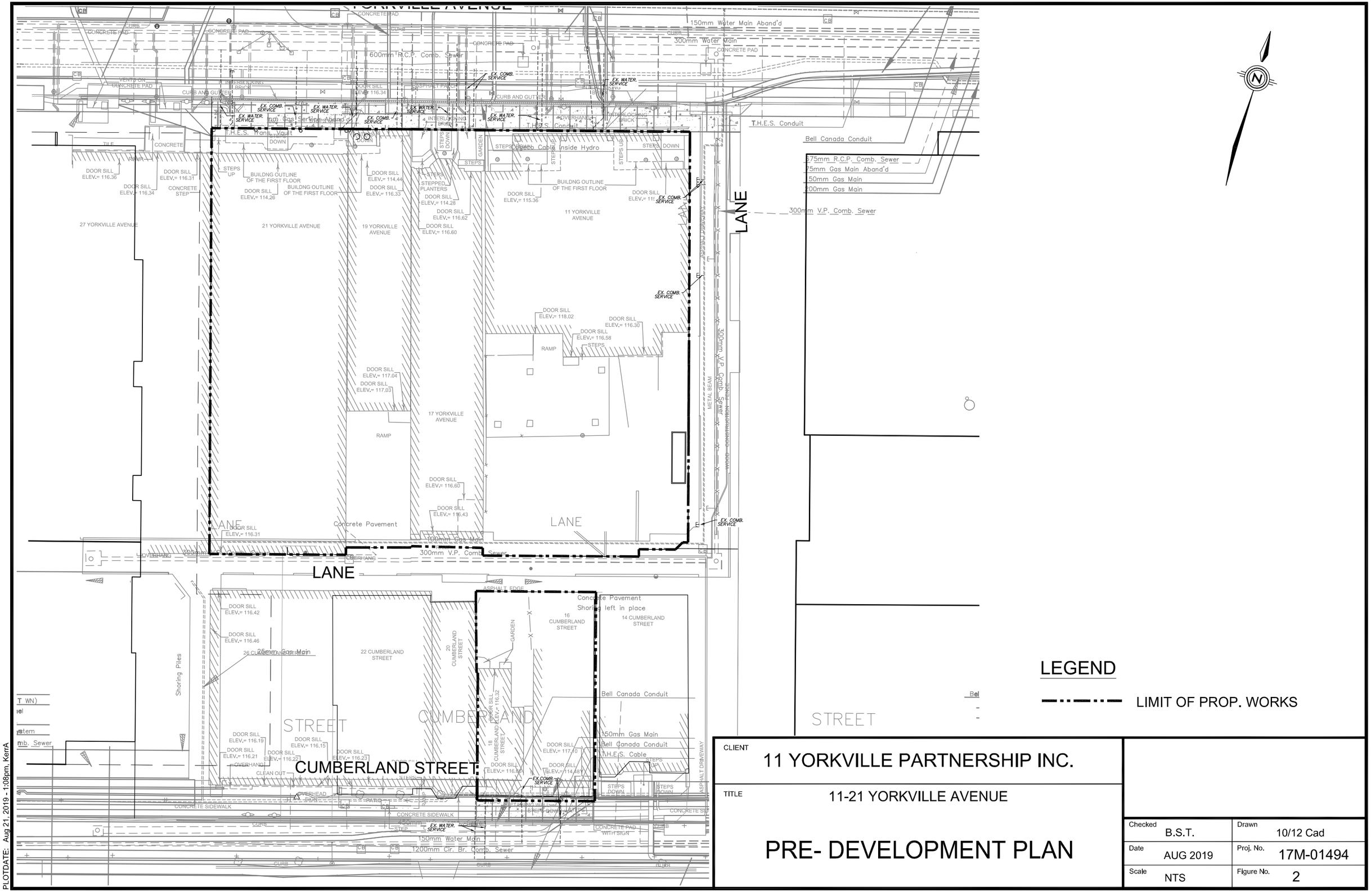
TITLE

11-21 YORKVILLE AVENUE

LOCATION PLAN

wsp

Checked	B.S.T.	Drawn	10/12 Cad
Date	AUG 2019	Proj. No.	17M-01494
Scale	NTS	Figure No.	1



LEGEND

LIMIT OF PROP. WORKS

CLIENT	11 YORKVILLE PARTNERSHIP INC.
TITLE	11-21 YORKVILLE AVENUE
	PRE- DEVELOPMENT PLAN

Checked	B.S.T.	Drawn	10/12 Cad
Date	AUG 2019	Proj. No.	17M-01494
Scale	NTS	Figure No.	2

PLOTDATE: Aug 21, 2019 - 1:08pm, KenA

PARK

PROPOSED 62-STOREY BUILDING (BUILDING A)

PROPOSED TWO-STOREY RETAIL (BUILDING B)

LANE

LANE

LANE

LANE

CUMBERLAND STREET

STREET

STREET

600mm R.C.P. Comb. Sewer

T.H.E.S. Trans. Vault

T.H.P.S. Conduit

Cogeco Cable Inside Hydro

T.H.E.S. Conduit

Bell Canada Conduit

75mm Gas Main Aband'd

150mm Gas Main

200mm Gas Main

300mm V.P. Comb. Sewer

300mm V.P. Comb. Sewer

100mm Gas Main

300mm V.P. Comb. Sewer

Concrete Pavement

Concrete Pavement

Shoring left in place

Shoring Piles

25mm Gas Main

Bell Canada Conduit

150mm Gas Main

Bell Canada Conduit

T.H.E.S. Cable

1200mm Cir. Br. Comb. Sewer

EX. COMB. SERVICE

EX. WATER. SERVICE

CB

LEGEND

LIMIT OF PROP. WORKS

CLIENT

11 YORKVILLE PARTNERSHIP INC.

TITLE

11-21 YORKVILLE AVENUE

PROPOSED DEVELOPMENT PLAN

Checked	B.S.T.	Drawn	10/12 Cad
Date	AUG 2019	Proj. No.	17M-01494
Scale	NTS	Figure No.	3

PLOTDATE: Aug 21, 2019 - 1:08pm, KerrA

2 SANITARY SEWAGE SYSTEM

2.1 EXISTING CONDITIONS

The existing sewers in the vicinity of the site are a 600 and 675 mm diameter V.P. combined sewer on Yorkville Avenue, and a 300 mm diameter V.P. combined sewer along the public lanes to the east and south of Building A, as shown on Figure 2. The 600 and 675 mm V.P. combined sewer on Yorkville Avenue flows east towards Yonge Street. The 300 mm diameter V.P. combined sewer in the public lane flows east, then north to join the combined sewer on Yorkville Avenue. In addition, there is a 450mm V.P. combined sewer on Cumberland Street and a 1200mm brick combined sewer on Cumberland Street. The 450mm combined sewer flows east and discharges into the 1200mm combined sewer.

The SUE investigation completed by T2UE on January 29, 2019 indicated that there are nine existing combined sewer services to the 11-21 Yorkville Ave property, and two combined sewer services to the 16-18 Cumberland St property. All existing combined sewer services will be removed or abandoned as directed by Toronto Water. Please find all existing combined sewer services on Figure 2 and SUE investigation results on Appendix F.

2.2 DESIGN PARAMETERS

The following sanitary design criteria have been taken from City of Toronto, Design Criteria for Sewers and Watermain, November 2009:

- 240 L/cap/day average day flow generation rate for residential use on an existing sewer system
- 250 L/cap/day average day flow generation rate for commercial use on an existing sewer system
- Population densities of 2.7 person per suite for existing apartment buildings;
- 1.4 people per single bedroom or studios, 2.1 people per two-bedroom unit and 3.1 people per three bedroom unit.
- Peaking Factor
    - Residential Harmon, Harmon Peaking Factor = $1+14/(4+p^{0.5})$, where p = population in thousands.
    - Institutional/Commercial (included in average flow)
- Infiltration = 0.26 L/s/ha (Dry Weather)
- Foundation Drainage = 3.0 L/s/ha (Wet Weather)

2.3 EXISTING FLOWS TO THE SANITARY SEWER SYSTEM

Using the design criteria noted in Section 2.2, the sanitary flows from the existing buildings are calculated in Table 2.1:

Table 2.1 – Existing Sanitary Flows to Yorkville Avenue

Address	Gross Floor Area (GFA)	Site Area	Population	Average Commercial Flow (250 L/cap/d)	Infiltration Allowance (0.26 L/s/ha)	Total Existing Sanitary Flow
	(m^2)	(ha)	(ppl)	(L/s)	(L/s)	(L/s)
11 Yorkville Avenue	7700	0.119	85	0.25	0.03	0.28
17 Yorkville Avenue	1158	0.045	13	0.04	0.01	0.05
19 Yorkville Avenue	1004	0.040	12	0.03	0.01	0.05
21 Yorkville Avenue	3140	0.083	35	0.10	0.02	0.12
Subtotal - Ex Bldg A	**13,002**	**0.287**	**145**	**0.42**	**0.07**	**0.49**
16 Cumberland Street	828	0.021	10	0.03	0.01	0.03
18 Cumberland Street	477	0.015	6	0.02	0.00	0.02
Subtotal - Ex Bldg B	**1305**	**0.036**	**16**	**0.05**	**0.01**	**0.06**
Total	**14,307**	**0.323**	**161**	**0.47**	**0.08**	**0.55**

The total sanitary flow from the existing development was calculated to be 0.55 L/s.

2.4 PROPOSED SANITARY FLOWS

The projected sanitary flows from the development have been estimated using the design criteria outlined in Table 2.2:

Table 2.2 – Proposed Sanitary Flows from Site – Dry Weather

Building	Building A	Building B	Site Total
Residential units	674	0	674
Total Residential Population	1,189	0	1,189
Total Commercial Population	28	10	38
Avg Sanitary Design Flow (L/s)	3.38	0.03	3.41
Residential Peaking Factor	3.75	N/A	3.74
Commercial Peaking Factor	1.00	1.00	1.00
Peak Sanitary Design Flow (L/s)	12.47	0.03	12.50
Infiltration Allowance (0.26 L/s/ha)	0.07	0.01	0.08
Permanent Dewatering Pump Rate (L/s)	6.30	0.63	6.93
Total Sanitary Flow from Site	**18.84**	**0.67**	**19.51**
Net increase in Flow (post - pre)	**18.35**	**0.61**	**18.96**

For more detailed calculation refer to Appendix A.

Based on the calculated sanitary flows found in Table 2.2, the site will generate 19.51 L/s of sanitary flow. Building A will discharge to the existing 600 mm combined sewer along Yorkville Avenue through one proposed 300 mm diameter sanitary service connection. A 300mm sanitary connection was selected to match the mechanical sanitary service design inside the building. The proposed 300mm sanitary services inside the building was advised by mechanical consultant based on Ontario Building Code requirements. A letter confirming the service sizing in included in Appendix E. Building B will discharge flow to the existing 450 mm combined sewer along Cumberland Street south of the building via a proposed 100 mm diameter sanitary service connection. Final sizing of the sanitary connection will be determined at the detailed design stage for

Building B. Sanitary control maintenance holes will be installed immediately inside the property line for both Buildings A and B, which will be accessible at all times to City staff. Installation of these connections will be coordinated with the City of Toronto connections department. All other internal plumbing will meet Ontario Building Code standards.

2.5 COMPLIANCE WITH MOECC PROCEDURE F-5-5

It is proposed to discharge sanitary and storm flows from Building A to the existing 675 mm combined sewer on Yorkville Avenue and discharge sanitary and storm flows from Building B to the existing 450mm combined sewer on Cumberland Street. MOECC procedure F-5-5 requires that the total flow in the combined sewer system not increase as a result of the proposed development.

Table 2.3 – Comparison of Pre- and Post-Development Discharge to Yorkville Combined Sewer – Building A

	Pre-Development Flow	Post-Development Flow	Net Change
Sanitary	0.49 L/s	18.84 L/s	18.35 L/s
Storm (2-Year)	25.9 L/s	20.5 L/s	-32.0 L/s
Total	53.39 L/s	39.34 L/s	**-14.05 L/s**

Table 2.4 – Comparison of Pre- and Post-Development Discharge to Cumberland Combined Sewer – Building B

	Pre-Development Flow	Post-Development Flow	Net Change
Sanitary	0.06 L/s	0.67 L/s	0.61 L/s
Storm (2-Year) Note – Storm to Cumberland	7.9 L/s	2.4 L/s	-5.5 L/s
Total	7.96L/s	3.07 L/s	-4.89 L/s

As shown in the table above, there is a net decrease of 14.05 L/s in the total flow draining to the existing Yorkville Ave combined sewer system, and a net decrease of 4.89 L/s in the total flow draining to the Cumberland Street combined sewer system as a result of the proposed development. Therefore, the development is compliance with MOECC Procedure F-5-5 since wet weather flow to the receiving combined sewer is decreased by proposed development.

2.6 ANALYSIS OF DOWNSTREAM COMBINED SEWERS

The City of Toronto has provided copies of the City's Dorsch model data and Sewer Atlas Maps for the combined sewers on Yorkville Avenue, Yonge Street, Cumberland Street and the surrounding network of pipes. Those copies of the Dorsch model and Sewer Atlas Maps are provided in Appendix C and are only used as a reference to complete the design sheet for pre and post development. The design sheets and sanitary drainage area plan can be found in Appendix A.

A dry weather downstream sewer analysis was completed for the pre-development and post-development conditions for combined sewer systems in both Yorkville Avenue and Cumberland Street. Pipe capacities Avenue remain below 6% for combined sewer in Yorkville Avenue and remain below 0.6% for combined sewer in Cumberland Street in both the pre-development and post-development conditions. This demonstrates that the existing combined sewer system in both Yorkville Avenue and Cumberland Street are capable of accommodating dry weather flow from the proposed development.

A 2-year storm wet weather downstream analysis was completed for the pre-development and post-development conditions for combined sewer systems in both Yorkville Avenue and Cumberland Street. As demonstrated in the Section 2.5 of this report there is a net reduction of flow to the receiving combined sewers during a 2-year or greater storm event. The wet-weather downstream combined sewer design sheet Table 1.2 shows that the flow is reduced in all downstream sewer sections for existing combined sewer system in Yorkville Avenue. The wet-weather downstream combined sewer design sheet Table 2.2 also shows that the discharge is reduced in all sewer sections for existing combined sewer system in Cumberland Street. Therefore, the proposed development will improve the condition in the receiving sewers during wet weather events.

Since the increase in dry weather flows does not cause any surcharging and the proposed development will reduce wet weather flows, WSP has concluded that the downstream sewer system is adequate for the proposed redevelopment and no downstream sewer improvements are required to service this development.

2.7 GROUNDWATER DISCHARGE

The client has retained EXP to complete a Hydrogeological Investigation for the site dated March 13, 2018, updated July 15, 2019, in support of the proposed development. The results of the investigation show that groundwater will be collected in the building's permanent foundation drainage system at a rate of 20m^3/d (0.23L/s) for Building A and 9.0m^3/d (0.10 L/s) for Building B (Building B is only discussed in the original March 13, 2018 report, and not in the July 15, 2019 update). The investigation shows the groundwater tested on site did not meet the City's sewer use by-law for storm sewers in a number of categories and did not meet the City's sewer use by-law for sanitary sewers for total suspended solids (TSS). It is proposed that groundwater from the site will be discharged to the sanitary/combined sewer system after treating to remove TSS to meet the sewer use By-Law. The proposed treatment system is a settling chamber to settle out TSS. The treatment system will not have any backwash to the City's sewer system. The mechanical engineer for the project has

proposed a groundwater sump pump with a maximum discharge rate of 6.30 L/s for Building A to the receiving combined sewers on Yorkville Avenue and 0.63 L/s for Building B to the receiving combined sewers on Cumberland Street respectively. A letter confirming this maximum groundwater pump rate has been included in Appendix E of this report. The proposed site plan includes a proposed groundwater sampling port immediately upstream of the sanitary control manhole. An application for the temporary and permanent groundwater discharge will be made directly to Toronto Water once the mechanical systems for the building have been fully designed. The property owner will enter into Sewer Discharge Agreement with Toronto Water, Environmental Monitoring and Protection for the permanent discharge of groundwater into the City combined sewer.

It should be noted that the 6.30 L/s of pumped groundwater flow for Building A and 0.63 L/s of pumped groundwater flow for Building B has been included in the post development combined sewer design sheets (discussed in Section 2.6).

2.8 CONSTRUCTION DEWATERING

During construction the estimated dewatering requirement for the site is approximately 333m^3/d (3.85L/s) for Building A and 14m^3/d (0.16L/s for Building B), as per the findings of the site Hydrogeological Investigation prepared by EXP, dated March 13, 2018, updated July 15, 2019 (Building B is only discussed in the original March 13, 2018 report, and not in the July 15, 2019 update). The groundwater tested on site did not meet the City's sewer use by-law for storm sewers in a number of categories and did not meet the City's sewer use by-law for sanitary sewers for total suspended solids (TSS). It is proposed that construction dewatering from the site will be discharged to the sanitary/combined sewer system after treatment to remove TSS to meet the sewer use By-Law.

Looking specifically at Building A, the receiving combined sewer system on Yorkville has capacity to accept 18.84L/s of flow from the site during permanent conditions (design flow + infiltration flows + permanent groundwater flows), as demonstrated in Section 2.7 of this report and therefore can accommodate the construction dewatering flow rate in the interim condition. The construction dewatering flow rate (3.85L/s) in the interim condition is well under the ultimate condition total flow rate (permanent dewatering flow rate + infiltration flow rate + design flow rate, 18.84 L/s). The pump for construction dewatering will be specified by the contractor at a later date. The contractor will be required to select a pump that has a pump rate no greater than the permanent discharge rate (18.84L/s) to dewater the site with no negative impacts to the downstream receiving sewers. The owner plans to discharge construction dewatering to the sanitary/combined sewer and the specifics will be reviewed and confirm with Toronto Water at the time of the Private Water Discharge Application.

Looking specifically at Building B, the receiving combined sewer system on Cumberland Street has capacity to accept 0.67L/s of flow from the site during permanent conditions (design flow + infiltration flows + permanent groundwater flows), as demonstrated in Section 2.5 of this report and therefore can accommodate the construction dewatering flow rate in the interim condition. The construction dewatering flow rate (0.16L/s) in the interim condition is well under the ultimate condition total flow rate (permanent dewatering flow rate + infiltration flow rate + design flow rate, 0.67 L/s). The

pump for construction dewatering will be specified by the contractor at a later date. The contractor will be required to select a pump that has a pump no greater than the permanent discharge rate (0.69L/s) to dewater the site with no negative impacts to the downstream receiving sewers. The owner plans to discharge construction dewatering to the sanitary/combined sewer and the specifics will be reviewed and confirm with Toronto Water at the time of the Private Water Discharge Application.

BREAK INTO EX. COMB. SEWER AND CONNECT

EX. 600Ø R.C.P. COMB. SEWER

PROP. 7.1m 300Ø SAN @ 2.0%

PROP 300mm SAN PLUG

EX. SERVICES CONNECTION TO BE REMOVED OR ABANDONED AS DIRECTED BY TORONTO WATER

PROP CONTROL MH TO BE INSTALLED WITHIN PROPERTY LINE.

PARK

PROP 200mm GROUNDWATER SAMPLING PORT

EX. SERVICES CONNECTION TO BE REMOVED OR ABANDONED AS DIRECTED BY TORONTO WATER

PROPOSED 62-STOREY BUILDING (BUILDING A)

EX. SERVICES CONNECTION TO BE REMOVED OR ABANDONED AS DIRECTED BY TORONTO WATER

LANE

PROP. 200mm GROUNDWATER SAMPLING PORT

PROP. CONTROL MH TO BE INSTALLED WITHIN PROPERTY LINE.

PROPOSED TWO-STOREY RETAIL (BUILDING B)

BREAK INTO EX. COMB. SEWER AND CONNECT

EX. SERVICES CONNECTION TO BE REMOVED OR ABANDONED AS DIRECTED BY TORONTO WATER

PROP. 2.7m 100Ø SAN @ 2.0%

EX. 450Ø R.C.P. COMB. SEWER

EX. 1200Ø TRUNKSEWER

LEGEND

- LIMIT OF PROP. WORKS
- ROOF OUTLINE
- P1 LEVEL OUTLINE
- EX. COMBINED SEWER
- PROP. SAN CONNECTION

CLIENT: 11 YORKVILLE PARTNERSHIP INC.

TITLE: 11-21 YORKVILLE AVENUE

SANITARY SERVICING PLAN

Checked: B.S.T.	Drawn: 10/12 Cad
Date: AUG 2019	Proj. No.: 17M-01494
Scale: NTS	Figure No.: 4

PLOTDATE: Aug 21, 2019 - 1:09pm, KerrA

3 WATER SUPPLY AND APPURTENANCES

3.1 EXISTING CONDITIONS

Existing watermains in the vicinity of the site include a 300 mm watermain on Yorkville Avenue and a 150 mm watermain on Cumberland Street. There is an existing fire hydrant on the north-west corner of Yorkville Avenue and Yonge Street.

3.2 DESIGN PARAMETERS

The following design criteria have been taken from the City of Toronto, Design Criteria for Sewers and Watermain, November 2009:

- Water demand rate of 191 L/person/day for proposed developments;
- Population densities of 1.4 person per unit for one bedroom units;
- Population densities of 1.4 person per unit for studio units;
- Population densities of 2.1 person per unit for two bedroom units;
- Population densities of 3.1 person per unit for three bedroom units;
- Population densities of 2.7 person per unit for existing apartment buildings;
- Peak Hour Factor of Residential (apartments) = 2.50;
- Maximum Day Factor of Residential (apartments) = 1.30;
- Peak Hour Factor of Commercial = 1.20;
- Maximum Day Factor of Commercial = 1.10;
- Retail Equivalent Population of 1.1 people / 100m^2 per floor space;

3.3 DOMESTIC WATER DEMAND

The domestic water demands for the proposed development were calculated using the criteria's outlined by the City of Toronto's, design criteria for sewers and watermains, November 2009. The projected water demands for the proposed development have been estimated in Table 3.1:

Table 3.1 – Design Criteria and Projected Domestic Water Demands from Site

Average Water Consumption Rate	191 litres/person/day
Residential 1 Bedroom Unit & Population Density	424 units / 1.4 people per unit
Residential 2 Bedroom Unit & Population Density	180 units / 2.1 people per unit
Residential 3 Bedroom Unit & Population Density	70 units / 3.1 people per unit
Total Residential Units – Building A	674 units
Total Residential Equivalent Population – Building A	1189 people
Commercial Floor Area – Building A	2,486 m^2
Commercial Floor Area – Building B	839 m^2
Commercial Population Density	1.1 people per 100 m^2 of floor area
Total Commercial Equivalent Population – Building A	28 people
Total Commercial Equivalent Population – Building B	10 people
Peaking Factors	Residential = 2.50 for Peak Hour, 1.30 for Maximum Day Commercial = 1.20 for Peak Hour, 1.10 for Maximum Day
Average Water Demand - Building A	2.69 L/s
Average Water Demand - Building B	0.02 L/s
Peak Water Demands - Building A	**Peak Hour = 6.65 L/s, Maximum Day = 3.49L/s**
Peak Water Demands - Building B	**Peak Hour = 0.03 L/s, Maximum Day = 0.02 L/s**
Peak Water Demands – Site	**Peak Hour = 6.67 L/s, Maximum Day = 3.51 L/s**

The average day water demand for Building A will be 2.69 L/s and the average day demand for Building B will be 0.02 L/s. The peak hour and maximum day water demands are 6.65 L/s and 3.49 L/s for Building A and 0.03 L/s and 0.02 L/s for Building B, respectively. Please refer to Appendix B for detailed calculations of the domestic water demands.

3.4 PROPOSED WATER SERVICE

For Building A, the proposed water service connections will include two (2) 200 mm diameter fire lines with one (1) 150 mm domestic branch connecting into the north side of the building from the existing 300 mm diameter watermain along Yorkville Avenue. Two separate fire connections separated by a valve and box will satisfy section 3.29.7(4) of the Ontario Building Code, which requires two separate fire connections for buildings exceeding 84.0m in height. Building B will be serviced by one (1) 150 mm shared water line at the south side of the building which will connect to the existing 150 mm watermain on Cumberland Street. In accordance with City standards, water meters and detector check valves will be installed as close to the property line as possible for all domestic connections, and will be accessible from inside the buildings. All other internal plumbing will meet O.B.C. standards. Refer to Figure 5 – Water Servicing Plan for an illustration of the proposed servicing.

3.5 HYDRANT FLOW TEST

The required fire flow for the site was calculated based on the Fire Underwriters Survey (FUS) requirements. The calculations are based on the largest floor area, in addition to 25% of the floor area above, and 25% of the floor area below as the proposed building will be fire-resistive with vertical openings being adequately protected for a one hour fire. The required fire flow calculations are shown in Appendix B and are summarized in Table 3.2 below:

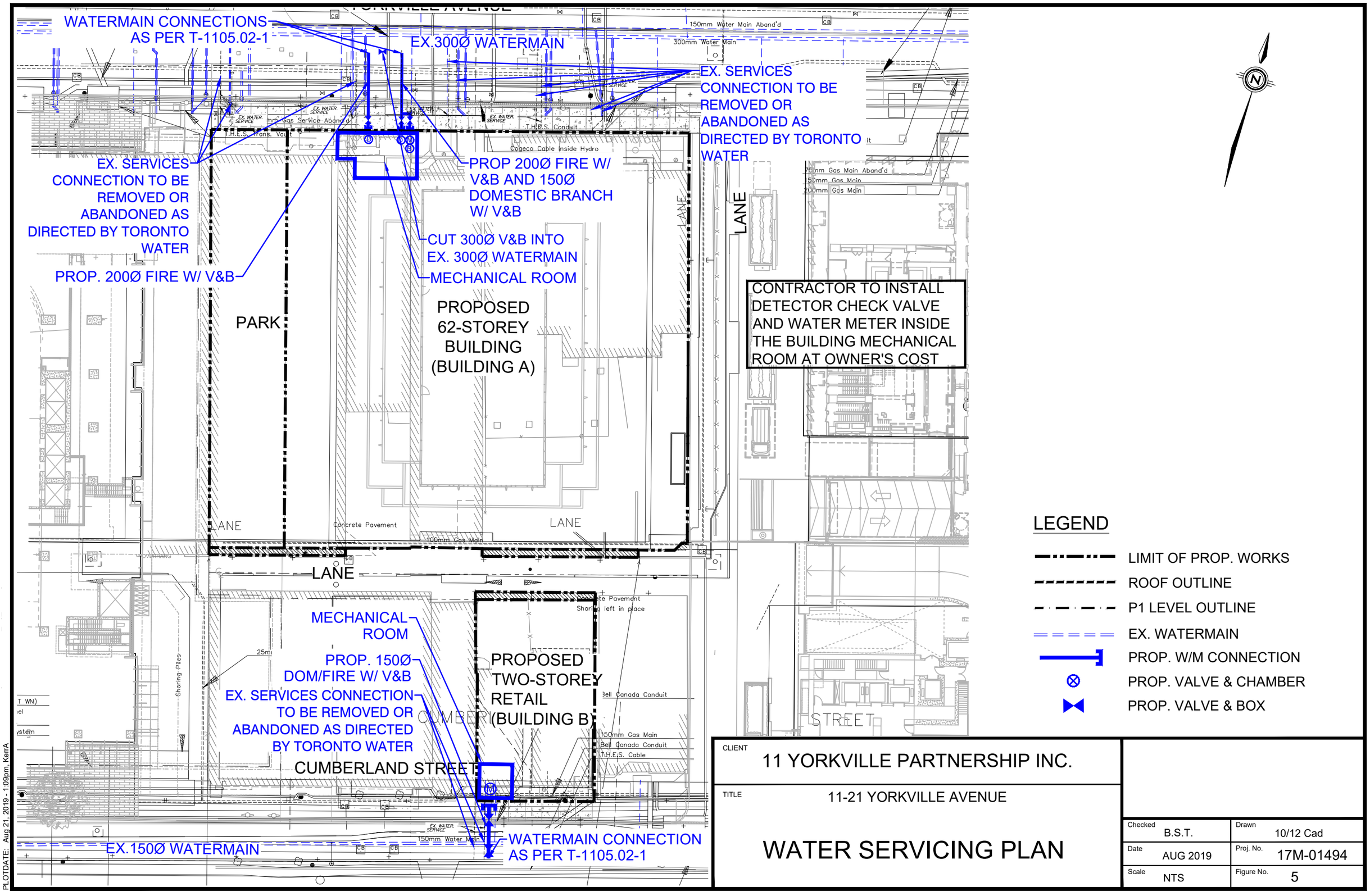
Table 3.2– FUS Fire Flow for Proposed Development

Site	Required Fire Flow	
	USGPM	L/s
Building A	1,732	109
Building B	920	58

A hydrant flow test was completed for the 300mm watermain on Yorkville Avenue in May 2018 by WSP Canada Group Limited. The results of this test have been included for reference and can be found in Appendix C. The available fire flow was recorded at 3800 USGPM (95L/s) at a minimum pressure of 140 kpa (20 psi). The available fire flow is greater than the FUS fire flow for Building A calculated above. Therefore, the watermain on Yorkville Avenue adjacent to the site has adequate capacity to support the water demand of the proposed development.

A hydrant flow test was completed for the 150mm watermain on Cumberland Street in May 2019 by WSP Canada Group Limited. The results of this test have been included for reference and can be found in Appendix C. The available fire flow was recorded at 1500 USGPM (240L/s) at a minimum pressure of 140 kpa (20 psi). The available fire flow is greater than the FUS fire flow for Building B calculated above. Therefore, the watermain on Cumberland Street adjacent to the site has adequate capacity to support the water demand of the proposed development.

The hydrant flow tests preformed by WSP Canada Group Limited on Yorkville Avenue and Cumberland Street were performed in accordance with NFPA 291. A copy of WSP's hydrant flow testing procedure and hydrant flow test sample calculation sheet are included in Appendix C of this report.



LEGEND

- LIMIT OF PROP. WORKS
- ROOF OUTLINE
- P1 LEVEL OUTLINE
- EX. WATERMAIN
- PROP. W/M CONNECTION
- PROP. VALVE & CHAMBER
- PROP. VALVE & BOX

CLIENT
11 YORKVILLE PARTNERSHIP INC.

TITLE
11-21 YORKVILLE AVENUE

WATER SERVICING PLAN

Checked	B.S.T.	Drawn	10/12 Cad
Date	AUG 2019	Proj. No.	17M-01494
Scale	NTS	Figure No.	5

PLOTDATE: Aug 21, 2019 - 1:09pm, KerrA

4 STORM DRAINAGE AND STORM DRAINAGE

4.1 STORMWATER MANAGEMENT REPORT

In support of the Rezoning Application for Building A and Building B and the Site Plan Application for Building A WSP has prepared a separate Storm Water Management Report. The report titled Stormwater Management Report – 11-25 Yorkville Avenue, dated August 22, 2019, contains a more detailed analysis of the stormwater management controls being proposed as part of this development. This Functional Servicing Report summarizes key components of the stormwater management.

4.2 EXISTING CONDITIONS

The existing site is currently occupied by commercial buildings, covering the majority of the site. The existing site area for Building A is approximately 0.24ha and the existing site area for Building B is approximately 0.04ha. Since the runoff coefficient from the existing site exceeds 0.50, a runoff coefficient of 0.50 was used in the pre-development condition to determine the allowable release rate to the municipal storm sewers. Based on the site areas and a 2-year rainfall intensity of 88.2 mm/hour (for a time of concentration of 10 minutes), the allowable 2-year pre-development release rate from the proposed development is 29.4 L/s for Building A and 4.4 L/s for Building B. The existing site is estimated to have a current runoff coefficient of 0.90 with an existing storm flow rate of 52.9 L/s for Building A and 7.9 L/s for Building B. Based on the existing topographic information, there are no external flows entering the site in its existing condition.

WSP is not aware of any existing stormwater management control on the site and therefore all flows currently leave the site uncontrolled. There are a number of existing combined sanitary and storm services for the site. The existing services are shown on Figure 6.

4.3 PROPOSED DEVELOPMENT

Building A and Building B will each have proposed stormwater cisterns which will collect stormwater runoff generated from the proposed site. A sump will be provided to detain stormwater to be re-used on site to satisfy water balance requirements. The proposed method to achieve water balance for Building A is irrigation of trees in Silva Cells. The proposed water balance for Building B will be determined when that portion of the development goes to Site Plan Application (currently Building B is included in the rezoning application only).

The City's WWFMG state that the maximum allowable discharge to a municipal sewer system is the 2-year pre-development flow rate for events of up to and including 100-year intensity. Based on this requirement, the cisterns will be

sized to retain the water captured onsite during a 100-year storm and release at a maximum of the 2-year pre-development rate. Building A will be serviced by a proposed 200 mm storm service connection which will direct flow to the existing 675 mm diameter combined sewer on Yorkville Avenue. Building B will be serviced by a 100mm storm service connection which will direct flow to the existing 450mm diameter combined sewer on Cumberland Ave as shown on Figure 6.

Using the Manning formula with an 'n' of 0.013 and a slope of 2.0%, a 200 mm diameter storm connection can convey a flow of 48.4 L/s, while a 100 mm diameter storm connection can convey a flow of 7.6 L/s, conveyances which are sufficient to meet the allowable respective release rates of 29.4 L/s and 4.4 L/s for Buildings A and B. A 100 mm orifice tube will be placed upstream of the control manhole located at Building A to regulate the flow below the allowable maximum discharge rate. For Building B, a 3-inch (76 mm) diameter SXH Hydrobrake valve has been selected to control runoff from the cistern before entering the control manhole.

4.4 WATER BALANCE

The City of Toronto has recently implemented the Wet Weather Flow Guidelines which require a water balance approach to storm runoff and have set as a minimum standard for the retention of all flows from a 5mm storm event utilizing infiltration, evaporation and rainwater reuse. In order to meet the water balance requirements, the developer is proposing to construct cisterns on the parking garage for Building A and Building B. Stormwater collected in the water balance chamber can be reused via evapotranspiration through trees in proposed Silva Cells. For Building A, the water balance requirement of 39.0m^3 must be used within 72 hrs of a storm event. The propose Silva Cells are capable of accepting 39.2m^3 of water, which will satisfy the water balance requirement. For Building B, the required water balance volume is 1.79m^3 and 1.79m^3 is provided. Refer to the Stormwater Management Report for further details.

4.5 STORMWATER QUANTITY CONTROLS

4.5.1 ALLOWABLE OUTFLOW

The 2-year pre-development peak flow was calculated using the rational method with an inlet time of 10 minutes and a run-off coefficient of 0.5. The allowable release rate from the sites were calculated to be 29.4L/s for Building A based on an area of 0.24ha and 4.4L/s for Building B based on an area of 0.04ha. Modelling of the proposed cisterns shows that in a 2-year storm event the actual release rates from the tank is 14.1L/s for Building A and 2.4L/s for Building B. Please note that in addition there is a small area (approximately 168m^2) from the Building A lands that will drain to the municipal sewer system uncontrolled. The uncontrolled flow for the 2-year storm event is 3.6L/s. Refer to the Stormwater Management Report for further details.

4.5.2 REQUIRED STORAGE

As per City requirements, both the minor and major storm events will be controlled to below the 2-year pre-development rate. The development will require cisterns on the below-ground levels to control the storm flow and release stormwater at the maximum allowable rates. In order to achieve the control of the 100-year storm event, the required storage of the cisterns will be 86.7 m^3 for Building A and 12.4 m^3 for Building B. The storage volume provided is 260m^2 for Building A and 16m^3 for Building B.

The modified rational method was used to determine the storage required to control the post development flows down to the allowable release rates. Refer to Stormwater Management Report for the calculations.

4.6 STORMWATER QUALITY CONTROLS

The City of Toronto's Wet Weather Flow Management Guidelines (WWMFG) requires that all new developments provide long term removal of 80% of Total Suspended Solids (TSS) on an average annual basis.

The proposed roof areas for the development will not be prone to sediment generation and can therefore be considered clean for the purposes of storm water quality control. Building A is covered by mostly roof, with some at-grade hardscape and landscaping (POPS), so there will be some at–grade sediment-generating surfaces or activities. Water quality is proposed to be provided by a Jellyfish Filter Unit (JF4-2-1). Building B is covered mostly by roof. Each site has been designed to achieve the required 80% TSS removal. Please refer to the Stormwater Management Report for more details.

4.7 PROPOSED STORM SERVICE – MINOR DRAINAGE SYSTEM

As previously mentioned and in coordination with the Stormwater Management Report, Building A will be serviced by a 200 mm diameter PVC storm connection connecting to the existing 675 mm diameter combined sewer on Yorkville Avenue. Building B will be serviced by a 100 mm diameter PVC storm connection connecting to the existing 450 mm diameter combined sewer Cumberland Street. Flow controls will restrict the outflows from both cisterns to the allowable release rates described above.

Installation of these connections will be coordinated with the City of Toronto connections department. All other internal plumbing will meet O.B.C. standards.

4.8 PROPOSED STORM SERVICE – MAJOR STORM DRAINAGE SYSTEM

The major storm drainage will be stored on site and released to the minor storm system at a maximum of the allowable release rate from the respective buildings, as indicated in Section 4.5.1 Allowable Outflow. The cisterns will accommodate both the water retention and quantity control, and are currently sized as described in Section 4.5.2. The flow controls will control the flow to below the maximum allowable release rate, allowing the storm water to drain by gravity to the control manholes, then to the municipal sewers.

Discharge from the new roof drainage systems and stormwater runoff from the various impervious roof/outdoor amenity and terrace surfaces of the buildings will be directed to the cisterns below ground. The area drains and trench drains will be sized to convey the 100-year storm event to the cisterns without any overflow for all storm events up to the 100-year storm event. The area drains and trench drains will connect through the garage slab to the mechanical storm drainage system inside the buildings which will direct all flows to the cisterns. The building structures will be designed to support the storm water cisterns under the most critical loading conditions (i.e. when cistern is full).

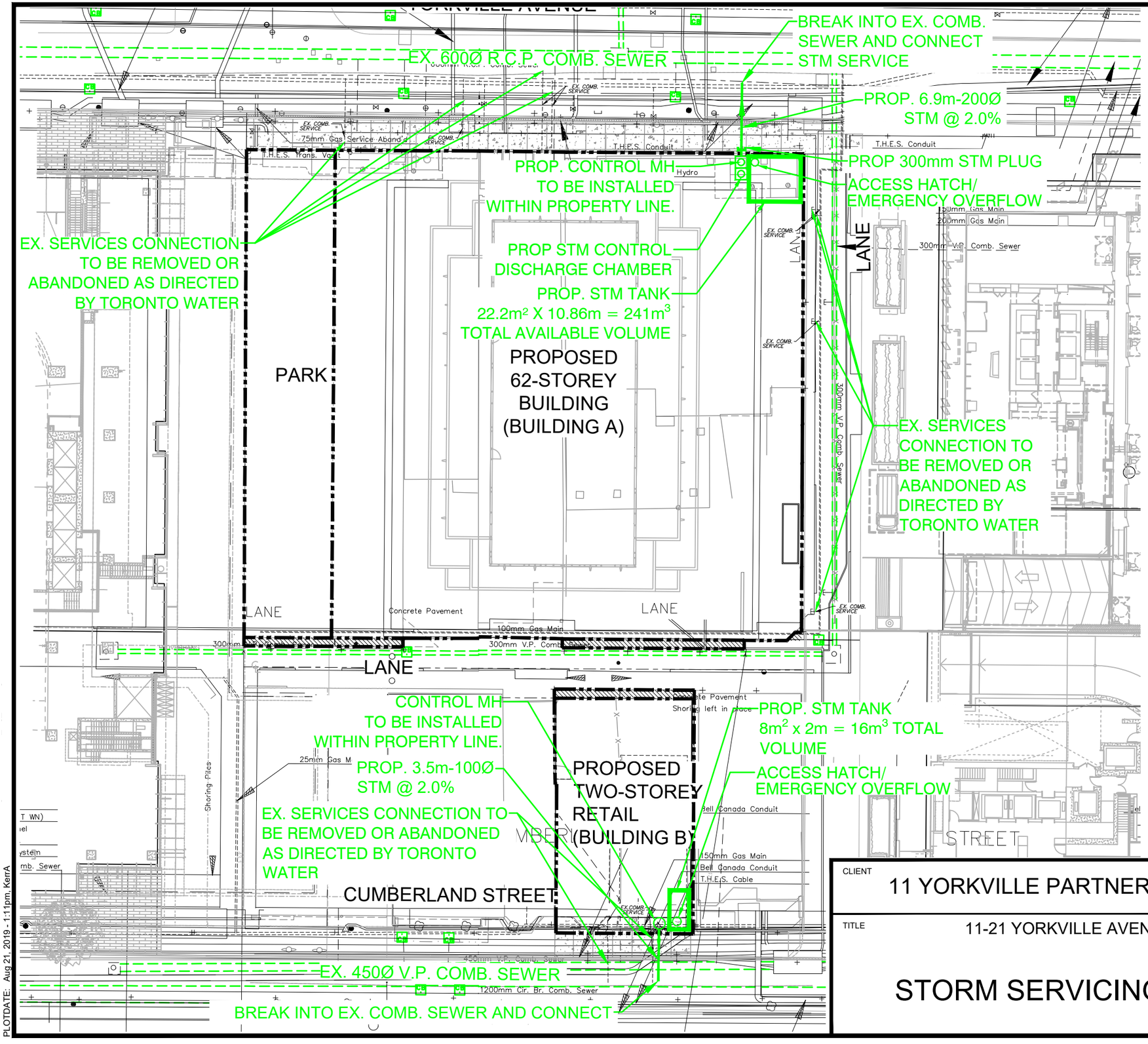
For storms larger than the 100-year design storm, or if the cisterns outlets become blocked, the excess water in the cistern will be directed via an overflow hatch onto the grade and drained via the overland flow route to the municipal R.O.W.

4.9 ANALYSIS OF DOWNSTREAM STORM SEWERS

Storm flow from Building A will be directed to the Yorkville Avenue combined sewer. The Yorkville Avenue receiving sewers, including the storm flow from Building A are analyzed in Section 2.6.

The storm flow from Building B will be directed to the Cumberland Avenue combined sewer. The Cumberland Street receiving sewer, including the storm flow from Building B are analyzed in Section 2.6.

Since the development will reduce wet weather flow in receiving sewers for all storm events WSP has concluded that no downstream storm sewer improvements are required as a result of this development.



LEGEND

- LIMIT OF PROP. WORKS
- ROOF OUTLINE
- P1 LEVEL OUTLINE
- EX. COMBINED SEWER
- PROP. STORM CONNECTION

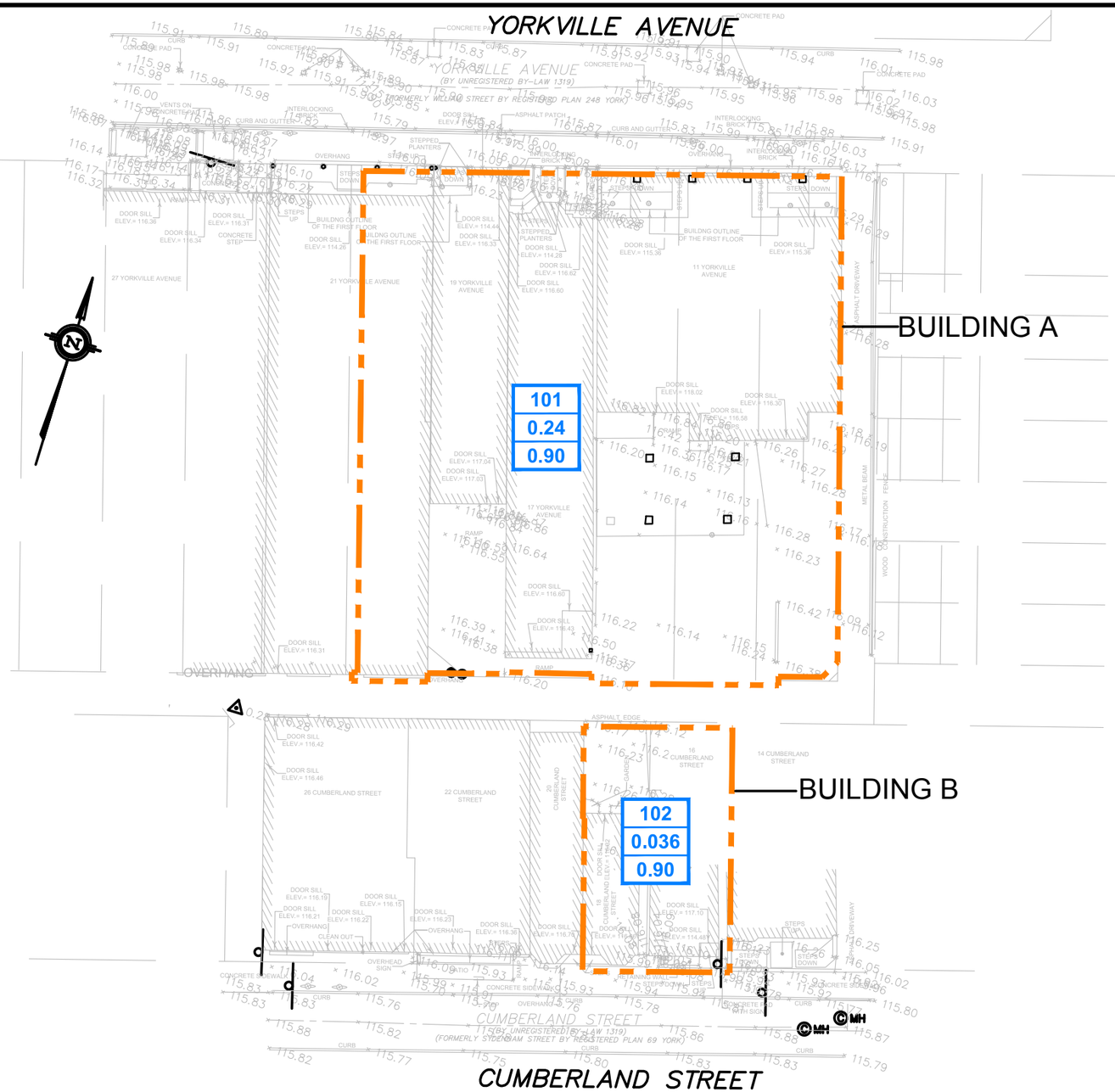
CLIENT
11 YORKVILLE PARTNERSHIP INC.

TITLE
11-21 YORKVILLE AVENUE

STORM SERVICING PLAN

Checked B.S.T.	Drawn 10/12 Cad
Date AUG 2019	Proj. No. 17M-01494
Scale NTS	Figure No. 6

PLOTDATE: Aug 21, 2019 - 1:11pm, KerrA



LEGEND

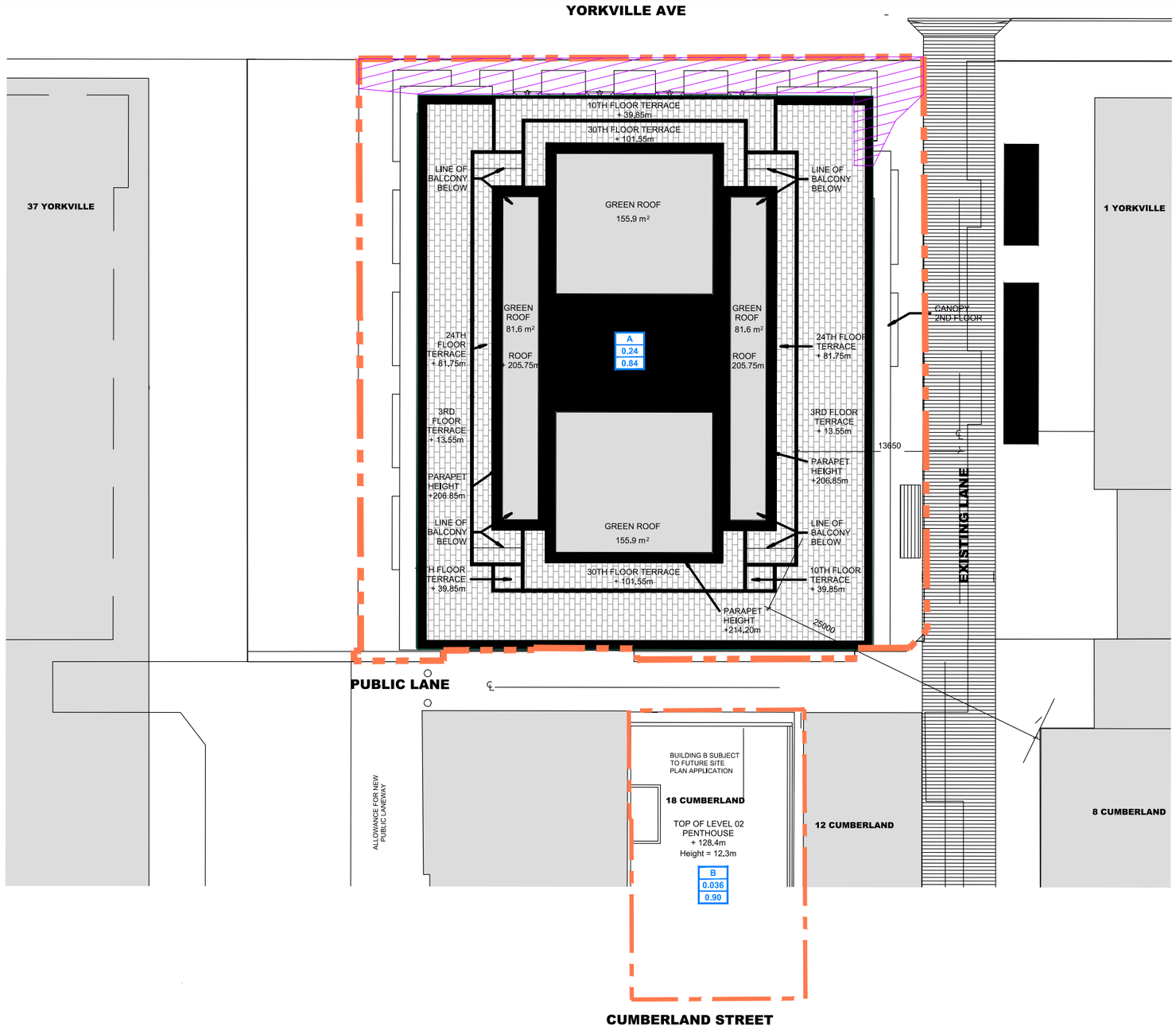
- PROPERTY BOUNDARY
- 101 — SUBCATCHMENT ID
- 0.24 — AREA (HA)
- 0.90 — RUNOFF COEFFICIENT

CLIENT	11 YORKVILLE PARTNERS INC.
TITLE	11–25 YORKVILLE AVE. & 16–18 CUMBERLAND ST.
	EXISTING CONDITIONS

wsp

Checked SP	Drawn NM	
Date AUGUST 2019	Proj. No. 17M–01494	
Scale AS SHOWN	Figure No. 6A	Gr.No. -

2019.07.29 FIGURE 2 - Existing Conditions.dwg 11 Yorkville Existing Conditions JJ\1441 Projects by Job Number\2017\17M-01494-00 11 Yorkville Ave\CAD\ Aug 14, 2019 - 4:22pm



LEGEND

- PROPERTY BOUNDARY
- SUBCATCHMENT ID (A)
- AREA (HA) (0.24)
- RUNOFF COEFFICIENT (0.82)
- UNCONTROLLED DRAINAGE

0 5 10 15 20m

CLIENT: 11 YORKVILLE PARTNERS INC.

TITLE: 11–25 YORKVILLE AVE. & 16–18 CUMBERLAND ST.

PROPOSED CONDITIONS

Checked: SP	Drawn: NM
Date: AUGUST 2019	Proj. No.: 17M–01494
Scale: AS SHOWN	Figure No.: 6B Gr.No.: -

2019.07.29 FIGURE 3 - Proposed Conditions.dwg 11 Yorkville Proposed J:\1441 Projects by Job Number\2017\17M-01494-00 11 Yorkville Ave\CAD\ Aug 14, 2019 - 4:25pm

5 CONCLUSIONS

5.1 SANITARY

The existing 600 and 675 mm diameter combined sewer on Yorkville Avenue and the existing 450 mm diameter combined sewer in the Cumberland Street south of Building B both have sufficient capacity to convey the projected peak sanitary flows. Building A will discharge to the existing 600 mm combined sewer along Yorkville Avenue through one 200 mm diameter sanitary service connection. Building B will discharge flow to the existing 450 mm combined sewer in the Cumberland Street south of the building via a 100 mm diameter sanitary service connection. Sanitary control maintenance holes will be installed immediately inside the property lines and will be fitted with backflow prevention devices. The control manholes will be accessible from the outside per City standards. The building sanitary systems will be designed to operate under municipal sewer surcharge conditions.

The downstream combined sewers can adequately accommodate the proposed redevelopment. No downstream combined sewer improvements are required to service the proposed development.

5.2 WATER

Building A will be serviced by two 200 mm diameter PVC fire connections into the existing 300 mm watermain on Yorkville Avenue. One fire connection will have a 150 mm domestic branch. The two fire connections will be separated by a proposed valve. Building B will be serviced by one shared 150 mm diameter connection, which will connect to the existing 150 mm watermain on Cumberland Street. A water meter and a detector check valve will be installed as close to the property line as possible within both buildings. All internal plumbing will meet Ontario Building Code standards. A hydrant flow test on Yorkville Avenue has demonstrated sufficient water to provide both domestic water and fire protection for Building A. A hydrant flow test on Cumberland Street has demonstrated sufficient water to provide both domestic water and fire protection for Building B.

5.3 STORM

Building A will be serviced by a 200 mm diameter PVC storm connection along the north side of the building and connect into the existing 675 mm combined sewer. Building B will be serviced by a 100 mm diameter PVC storm connection along the south side of the building connecting to the existing 450 mm diameter combined sewer on Cumberland Street. Storm control maintenance holes will be installed immediately inside the property lines. The control manholes will be accessible from the outside per City standard. The building storm systems will be designed to operate under municipal sewer surcharge conditions.

The proposed development will reduce the storm flows coming from the site to the existing combined sewer system to a 2-year pre-development release rate during all storms up to, and including, the 100-year event. Therefore, WSP has concluded that there will be no negative impacts to the existing combined sewer system as a result of this development.

APPENDIX

A-1 THEORETICAL SANITARY SEWAGE FLOWS & SANITARY DESIGN SHEETS & SANITARY DRAINAGE AREA PLAN (7A) -YORKVILLE AVENUE

APPENDIX A
THEORETICAL SANITARY SEWAGE FLOWS

Project: 11 Yorkville Avenue
Job No.: 17M-01494
Date: August 21, 2019

A. Existing Development

Address	Gross Floor Area (GFA)[1]	Site Area	Population[2]	Average Commercial Flow (250 L/cap/d)	Infiltration Allowance (0.26 L/s/ha)	Total Existing Sanitary Flow
	(m^2)	(ha)	(ppl)	(L/s)	(L/s)	(L/s)
11 Yorkville Avenue	7700	0.119	85	0.25	0.03	0.28
17 Yorkville Avenue	1158	0.045	13	0.04	0.01	0.05
19 Yorkville Avenue	1004	0.040	12	0.03	0.01	0.05
21 Yorkville Avenue	3140	0.083	35	0.10	0.02	0.12
Subtotal - Ex Bldg A	**13,002**	**0.287**	**145**	**0.42**	**0.07**	**0.49**
16 Cumberland Street	828	0.021	10	0.03	0.01	0.03
18 Cumberland Street	477	0.015	6	0.02	0.00	0.02
Subtotal - Ex Bldg B	**1305**	**0.036**	**16**	**0.05**	**0.01**	**0.06**
Total	**14,307**	**0.323**	**161**	**0.47**	**0.08**	**0.55**

Note 1: Approximate GFA for existing commercial buildings

B. Proposed Development

Residential Unit Type	Total Residential Units	Persons per Unit	Total Residential Population
Building A			
1B, 1B+D & Studio Units	424	1.4	594
2B Units	180	2.1	378
3B Units	70	3.1	217
Total Residential	**674**	**-**	**1,189**
Commercial Type	**GFA (m^2)**	**Density (ppl/100m^2)**	**Total Commercial Population**
Building A			
Retail	2,486	1.1	**28**
Building B			
Retail	839	1.1	**10**
Total Commercial	**3,326**	**-**	**38**

Proposed Flow

Building / Unit Type	Population	Site Area (ha)	Average Flow (240L/cap/d - Residential) (250L/cap/d - Commercial) (L/s)	Harmon Peaking Factor	Peak Sanitary Design Flow (L/s)	Infiltration (0.26L/s/ha) (L/s)	Permanent Dewatering Rate (Pumped Rate) (L/s)	Total Peak Flow (L/s)
Building A - Residential	1,189	N/A	3.30	3.75	12.39	N/A	N/A	N/A
Building A - Retail	28	N/A	0.08	1.00	0.08	N/A	N/A	N/A
Subtotal - Building A	**1,217**	**0.287**	**3.38**	**N/A**	**12.47**	**0.07**	**6.30**	**18.84**
Building B - Retail	10	N/A	0.03	1.00	0.03	N/A	N/A	N/A
Subtotal - Building B	**10**	**0.036**	**0.03**	**N/A**	**0.03**	**0.01**	**0.63**	**0.67**
SITE TOTAL	**1,227**	**0.323**	**3.41**	**N/A**	**12.50**	**0.08**	**6.93**	**19.51**

Total Peak Flow (Building A) = 18.84 L/s
Increase in Peak Flow (Building A) = 18.35 L/s

Total Peak Flow (Building B) = 0.67 L/s
Increase in Peak Flow (Building B) = 0.61 L/s

Total Peak Flow (Site Total) = 19.51 L/s
Increase in Peak Flow (Site Total) = 18.96 L/s

Note 1: 1.4 people per 1B & 1B+D & Studio Unit, 2.1 people per 2B Unit, and 3.1 people per 3B Unit per City of Toronto Design Criteria for Sewers and Watermain, November 2009, page 35
Note 2: Commercial Flow rate based on proposed populations and 1.1 persons/100m2 per City of Toronto Design Criteria for Sewers and Watermain, November 2009, page 34

Peaking Factor = Harmon Formula

Average Daily Flow
Residential flow is based on 240 L/cap/d, per City of Toronto Design Criteria for Sewers and Watermain
Commercial flow is based on 250 L/cap/d, per City of Toronto Design Criteria for Sewers and Watermain

APPENDIX A
EXISTING COMBINED SEWER ANALYSIS
PRE-DEVELOPMENT DRY WEATHER
CITY OF TORONTO

TABLE D.1.1

PRE-DEVELOPMENT CONDITIONS - DRY WEATHER

Sanitary Flows

n= 0.013

Residential Avg.Daily Flow = 240 L/d
Commercial Avg.Daily Flow = 250 L/d

Extraneous Flows

Infiltration Allowance = 0.260 L/s/ha

COMBINED SEWERSHED AREA: 25.930 ha

Design Sheet No **1 of 2**
Project: **11 Yorkville**
Project no.: **17M-01494**

		SANITARY FLOW CALCULATIONS													Extraneous Flows			BASED ON CITY OF TORONTO ARCHIVE							
		Segment				Cumulative				SANITARY FLOW															
Description / Location / Dissemination Blocks	PIPE ID	Area A (ha)	Population			Area A (ha)	Population			PEAKING FACTOR	Res	Emp	Infiltration Allowance	**Acc SAN Flow**	STM Flow DQ 2 YEAR	**Accm STM**	**TOTAL COMBINED FLOW**	LENGTH	ACTUAL PIPE SIZE	PIPE AREA (AF)	SLOPE	CAPACITY	VELOCITY	TIME OF FLOW	% Full
			Res	ICI	Total		Res	ICI	Total	M	(L/s)	(L/s)	(L/s)	**(L/s)**	**(L/s)**	**(L/s)**	**(L/s)**	(m)	(mm)	(m2)	(%)	(L/s)	(m/s)	(min)	
Zone 1 from west along Yorkville (4354)		0.511	49	40	89	0.511	49	40	89	4.000	0.54	0.12	0.13	**0.79**			**0.79**								
Existing 17/19/21 Yorkville		0.168	0	60	60	0.168	0	60	60	4.000	0.00	0.17	0.04	**0.22**			**0.22**								
Yorkville Avenue	4355	0.517	132	21	153	1.196	181	121	302	4.000	2.01	0.35	0.13	**2.49**			**2.49**	66.4	600	0.283	0.37	**373.49**	1.32	0.84	0.7%
Existing 11 Yorkville		0.119	0	85	85	0.119	0	85	85	4.000	0.00	0.25	0.03	**0.28**			**0.28**								
Yorkville Avenue	4356	0.138	0	15	16	1.453	181	221	403	4.000	2.01	0.64	0.04	**2.68**			**2.68**	20.4	675	0.358	0.36	**504.35**	1.41	1.59	0.5%
Existing 16-18 Cumberland		0.036	0	16	16	0.036	0	16	16	4.000	0.00	0.05	0.01	**0.06**											
Laneway		0.035	0	0	0	0.071	0	16	16	4.000	0.00	0.05	0.01	**0.06**			**0.06**	72.1	300	0.071	0.51	**69.06**	0.98	1.23	0.1%
Laneway		0.269	108	0	108	0.340	108	16	124	4.000	1.20	0.05	0.07	**1.32**			**1.32**	58.9	300	0.071	0.53	**70.40**	1.00	0.99	1.9%
Yorkville Avenue	4357	0.210	84	0	84	2.002	373	237	611	4.000	4.14	0.69	0.05	**4.88**			**4.88**	42.1	675	0.358	0.45	**563.88**	1.58	0.45	0.9%
Yorkville Avenue	4358	0.014	6	0	6	2.017	378	237	617	4.000	4.20	0.69	0.00	**4.89**			**4.89**	15.5	600	0.283	0.56	**459.48**	1.63	0.16	1.1%
Zone 2 from south along Yonge (4359)		0.435	38	30	68	0.435	38	30	68	4.000	0.42	0.09	0.11	**0.62**			**0.62**								
Yonge Street	4360	0.059	15	1	16	2.511	431	268	701	4.000	4.79	0.77	0.02	**5.58**			**5.58**	27.4	675	0.358	0.30	**460.41**	1.29	0.35	1.2%
Zone 3 from east along Collier (5569)		0.504	54	34	88	0.504	54	34	88	4.000	0.60	0.10	0.13	**0.83**			**0.83**								
Yonge Street	4361	0.211	74	3	77	3.225	559	304	866	3.949	6.13	0.88	0.05	**7.07**			**7.07**	55.2	750	0.442	0.51	**795.04**	1.80	0.51	0.9%
Zone 5 from west along Scollard (4367)		1.607	565	19	584	1.607	565	19	584	3.946	6.19	0.05	0.42	**6.67**			**6.67**								
Zone 4 from west along Scollard (4367)		2.875	551	135	686	2.875	551	135	686	3.952	6.05	0.39	0.75	**7.19**			**7.19**								
Yonge Street	4368	0.000	0	0	0	7.708	1,675	458	2,136	3.644	16.96	1.33	0.00	**18.29**			**18.29**	28.0	750	0.442	4.17	**2273.38**	5.15	0.09	0.8%

PRE-DEVELOPMENT CONDITIONS - DRY WEATHER

Sanitary Flows

n= 0.013

Residential Avg.Daily Flow = 240 L/d
Commercial Avg.Daily Flow = 250 L/d

Extraneous Flows

Infiltration Allowance = 0.260 L/s/ha

COMBINED SEWERSHED AREA: 25.930 ha

Design Sheet No **1 of 2**
Project: **11 Yorkville**
Project no.: **17M-01494**

		SANITARY FLOW CALCULATIONS													Extraneous Flows			BASED ON CITY OF TORONTO ARCHIVE							
		Segment				Cumulative				SANITARY FLOW															
Description / Location / Dissemination Blocks	PIPE ID	Area A (ha)	Population			Area A (ha)	Population			PEAKING FACTOR	Res	Emp	Infiltration Allowance	**Acc SAN Flow**	STM Flow DQ 2 YEAR	**Accm STM**	**TOTAL COMBINED FLOW**	LENGTH	ACTUAL PIPE SIZE	PIPE AREA (AF)	SLOPE	CAPACITY	VELOCITY	TIME OF FLOW	% Full
			Res	ICI	Total		Res	ICI	Total	M	(L/s)	(L/s)	(L/s)	**(L/s)**	**(L/s)**	**(L/s)**	**(L/s)**	(m)	(mm)	(m2)	(%)	(L/s)	(m/s)	(min)	
Zone 6 from east along Church (5539)		0.613	140	30	170	0.613	140	30	170	4.000	1.56	0.09	0.16	**1.80**			**1.80**								
Zone 7 from west along Davenport (4352)		9.829	2,997	228	3,225	9.829	2,997	228	3,225	3.443	28.66	0.66	2.56	**31.88**			**31.88**								
Yonge Street	4369	0.393	43	31	75	18.542	4,855	748	5,606	3.257	43.92	2.16	0.10	**46.19**			**46.19**	50.9	900	0.636	1.41	**2149.63**	3.38	0.25	2.1%
Yonge Street	4370	0.282	69	12	82	18.824	4,924	760	5,688	3.251	44.47	2.20	0.07	**46.74**			**46.74**	40.2	900	0.636	1.14	**1932.88**	3.04	0.22	2.4%
Yonge Street	4371	0.084	17	5	22	18.908	4,941	764	5,710	3.250	44.60	2.21	0.02	**46.84**			**46.84**	9.4	900	0.636	1.22	**1999.55**	3.14	0.05	2.3%
Zone 8 from north along Yonge (4387)		6.390	2,341	60	2,401	6.390	2,341	60	2,401	3.532	22.97	0.17	1.66	**24.80**			**24.80**								
Easement	4388	0.321	69	16	86	25.619	7,351	841	8,197	3.086	63.02	2.43	0.08	**65.53**			**65.53**	55.8	1500	1.767	3.70	**13597.24**	7.69	0.12	0.5%
Easement	4389	0.310	55	19	74	25.930	7,406	860	8,271	3.083	63.42	2.49	0.08	**65.99**			**65.99**	67.1	1500	1.767	0.95	**6889.88**	3.90	0.29	1.0%

Notes: * *Residential and employment populations derived from site areas and population densities as outlined in City of Toronto Design Criteria for Sewers and Watermains*
* *Sewer information based on City of Toronto archive drawings*
* *See Figure 7 for combined sewer tributary areas*

APPENDIX A
EXISTING COMBINED SEWER ANALYSIS
POST-DEVELOPMENT DRY WEATHER
CITY OF TORONTO

TABLE D.1.2

POST-DEVELOPMENT CONDITIONS - DRY WEATHER

Sanitary Flows

n= 0.013

Residential Avg.Daily Flow = 240 L/d
Commercial Avg.Daily Flow = 250 L/d

Extraneous Flows

Infiltration Allowance = 0.260 L/s/ha

COMBINED SEWERSHED AREA: 25.894 ha

Design Sheet No **1 of 2**
Project: **11 Yorkville**
Project no.: **17M-01494**

		SANITARY FLOW CALCULATIONS															Extraneous Flows			BASED ON CITY OF TORONTO ARCHIVE							
		Segment					Cumulative				SANITARY FLOW															
Description / Location / Dissemination Blocks	PIPE ID	Area A (ha)	Population			Pumped GW Discharge Rate (L/s)	Area A (ha)	Population			PEAKING FACTOR	Res	Emp	Infiltration Allowance	Pumped GW Discharge Rate	**Acc SAN Flow**	STM Flow DQ 2 YEAR	**Accm STM**	**TOTAL COMBINED FLOW**	LENGTH	ACTUAL PIPE SIZE	PIPE AREA (AF)	SLOPE	CAPACITY	VELOCITY	TIME OF FLOW	% Full
			Res	ICI	Total			Res	ICI	Total	M	(L/s)	(L/s)	(L/s)		**(L/s)**	**(L/s)**	**(L/s)**	**(L/s)**	(m)	(mm)	(m2)	(%)	(L/s)	(m/s)	(min)	
Zone 1 from west along Yorkville (4354)		0.511	49	40	89	0.00	0.511	49	40	89	4.000	0.54	0.12	0.13	0.00	**0.79**			**0.79**								
Building A		**0.287**	**1,189**	**28**	**1,217**	**6.30**	**0.287**	**1,189**	**28**	**1,217**	**3.750**	**12.39**	**0.08**	**0.07**	**6.30**	**18.84**			**18.84**								
Yorkville Avenue	4355	0.517	132	21	153	0.00	1.315	1,370	89	1,459	3.708	14.11	0.26	0.13	6.30	**20.80**			**20.80**	66.4	600	0.283	0.37	**373.49**	1.32	0.84	5.6%
Yorkville Avenue	4356	0.138	0	15	16	0.00	1.453	1,370	104	1,475	3.708	14.11	0.30	0.04	6.30	**20.74**			**20.74**	20.4	675	0.358	0.36	**504.35**	1.41	1.59	4.1%
Laneway		0.035	0	0	0	0.00	0.035	0	0	0	4.000	0.00	0.00	0.01	0.00	**0.01**			**0.01**	72.1	300	0.071	0.51	**69.06**	0.98	1.23	0.0%
Laneway		0.269	108	0	108	0.00	0.304	108	0	108	4.000	1.20	0.00	0.07	0.00	**1.27**			**1.27**	58.9	300	0.071	0.53	**70.40**	1.00	0.99	1.8%
Yorkville Avenue	4357	0.210	84	0	84	0.00	1.967	1,562	104	1,667	3.667	15.91	0.30	0.05	6.30	**22.56**			**22.56**	42.1	675	0.358	0.45	**563.88**	1.58	0.45	4.0%
Yorkville Avenue	4358	0.014	6	0	6	0.00	1.981	1,567	104	1,673	3.666	15.96	0.30	0.00	6.30	**22.56**			**22.56**	15.5	600	0.283	0.56	**459.48**	1.63	0.16	4.9%
Zone 2 from south along Yonge (4359)		0.435	38	30	68	0.00	0.435	38	30	68	4.000	0.42	0.09	0.11	0.00	**0.62**			**0.62**								
Yonge Street	4360	0.059	15	1	16	0.00	2.475	1,620	135	1,757	3.655	16.45	0.39	0.02	6.30	**23.16**			**23.16**	27.4	675	0.358	0.30	**460.41**	1.29	0.35	5.0%
Zone 3 from east along Collier (5569)		0.504	54	34	88	0.00	0.504	54	34	88	4.000	0.60	0.10	0.13	0.00	**0.83**			**0.83**								
Yonge Street	4361	0.211	74	3	77	0.00	3.190	1,748	171	1,922	3.630	17.63	0.50	0.05	6.30	**24.48**			**24.48**	55.2	750	0.442	0.51	**795.04**	1.80	0.51	3.1%
Zone 5 from west along Scollard (4367)		1.607	565	19	584	0.00	1.607	565	19	584	3.946	6.19	0.05	0.42	0.00	**6.67**			**6.67**								
Zone 4 from west along Scollard (4367)		2.875	551	135	686	0.00	2.875	551	135	686	3.952	6.05	0.39	0.75	0.00	**7.19**			**7.19**								
Yonge Street	4368	0.000	0	0	0	0.00	7.672	2,864	325	3,192	3.459	27.52	0.94	0.00	6.30	**34.77**			**34.77**	28.0	750	0.442	4.17	**2273.38**	5.15	0.09	1.5%

POST-DEVELOPMENT CONDITIONS - DRY WEATHER

Sanitary Flows

n= 0.013

Residential Avg.Daily Flow = 240 L/d
Commercial Avg.Daily Flow = 250 L/d

Extraneous Flows

Infiltration Allowance = 0.260 L/s/ha

COMBINED SEWERSHED AREA: 25.894 ha

Design Sheet No **1 of 2**
Project: **11 Yorkville**
Project no.: **17M-01494**

		SANITARY FLOW CALCULATIONS															Extraneous Flows			BASED ON CITY OF TORONTO ARCHIVE						
		Segment					Cumulative				SANITARY FLOW														
Description / Location / Dissemination Blocks	PIPE ID	Area A (ha)	Population			Pumped GW Discharge Rate (L/s)	Area A (ha)	Population			PEAKING FACTOR	Res	Emp	Infiltration Allowance	Pumped GW Discharge Rate	**Acc SAN Flow**	STM Flow DQ 2 YEAR	**Accm STM**	**TOTAL COMBINED FLOW**	LENGTH	ACTUAL PIPE SIZE	PIPE AREA (AF)	SLOPE	CAPACITY	VELOCITY	TIME OF FLOW	% Full
			Res	ICI	Total			Res	ICI	Total	M	(L/s)	(L/s)	(L/s)		**(L/s)**	**(L/s)**	**(L/s)**	**(L/s)**	(m)	(mm)	(m2)	(%)	(L/s)	(m/s)	(min)	
Zone 6 from east along Church (5539)		0.613	140	30	170	0.00	0.613	140	30	170	4.000	1.56	0.09	0.16	0.00	**1.80**			**1.80**								
Zone 7 from west along Davenport (4352)		9.829	2,997	228	3,225	0.00	9.829	2,997	228	3,225	3.443	28.66	0.66	2.56	0.00	**31.88**			**31.88**								
Yonge Street	4369	0.393	43	31	75	0.00	18.506	6,044	615	6,662	3.168	53.18	1.78	0.10	6.30	**61.36**			**61.36**	50.9	900	0.636	1.41	**2149.63**	3.38	0.25	2.9%
Yonge Street	4370	0.282	69	12	82	0.00	18.788	6,113	627	6,744	3.163	53.71	1.81	0.07	6.30	**61.90**			**61.90**	40.2	900	0.636	1.14	**1932.88**	3.04	0.22	3.2%
Yonge Street	4371	0.084	17	5	22	0.00	18.872	6,130	631	6,766	3.162	53.84	1.83	0.02	6.30	**61.99**			**61.99**	9.4	900	0.636	1.22	**1999.55**	3.14	0.05	3.1%
Zone 8 from north along Yonge (4387)		6.390	2,341	60	2,401	0.00	6.390	2,341	60	2,401	3.532	22.97	0.17	1.66	0.00	**24.80**			**24.80**								
Easement	4388	0.321	69	16	86	0.00	25.584	8,540	708	9,253	3.022	71.70	2.05	0.08	0.00	**73.83**			**73.83**	55.8	1500	1.767	3.70	**13597.24**	7.69	0.12	0.5%
Easement	4389	0.310	55	19	74	0.00	25.894	8,595	727	9,327	3.020	72.09	2.10	0.08	0.00	**74.28**			**74.28**	67.1	1500	1.767	0.95	**6889.88**	3.90	0.29	1.1%

Notes:
* *Residential and employment populations derived from site areas and population densities as outlined in City of Toronto Design Criteria for Sewers and Watermains*
* *Sewer information based on City of Toronto archive drawings*
* *See Figure 7 for combined sewer tributary areas*

APPENDIX A
EXISTING COMBINED SEWER ANALYSIS
PRE-DEVELOPMENT DRY WEATHER
CITY OF TORONTO

TABLE D.2.1

PRE-DEVELOPMENT CONDITIONS - WET WEATHER - 2 YEAR STORM EVENT

Sanitary Flows

Residential Avg.Daily Flow = 240 L/d
Commercial Avg.Daily Flow = 250 L/d

Extraneous Flows

Infiltration Allowance = 3.000 L/s/ha

n= 0.013

COMBINED SEWERSHED AREA: 25.930 ha

Design Sheet No **1 of 2**
Project: **11 Yorkville**
Project no.: **17M-01494**

		SANITARY FLOW CALCULATIONS													Extraneous Flows								BASED ON CITY OF TORONTO ARCHIVE							
Description / Location / Dissemination Blocks	PIPE ID	Segment				Cumulative				SANITARY FLOW					STORM TRIBUTARY AREA	RUNOFF COEF.	A X C	ACCUM. A X C	Tc	INTENSITY	**Accm STM**	**TOTAL COMBINED FLOW**	LENGTH	ACTUAL PIPE SIZE	PIPE AREA (AF)	SLOPE	CAPACITY	VELOCITY	TIME OF FLOW	% Full
		Area A (ha)	Population			Area A (ha)	Population			PEAKING FACTOR	Res (L/s)	Emp (L/s)	Infiltration Allowance (L/s)	**Acc SAN Flow (L/s)**	**(ha)**	**C**			(min.)	(mm/hr)	**(L/s)**	**(L/s)**	(m)	(mm)	(m2)	(%)	(L/s)	(m/s)	(min)	
			Res	ICI	Total		Res	ICI	Total	M																			
Zone 1 from west along Yorkville (4354)		0.511	49	40	89	0.511	49	40	89	4.000	0.54	0.12	1.53	**2.19**	0.511	0.90	0.46	0.46	10.00	88.19	**112.64**	**114.83**	134.8					1.50	1.50	
Existing 17/19/21 Yorkville		0.168	0	60	60	0.168	0	60	60	4.000	0.00	0.17	0.51	**0.68**	0.168	0.90	0.15	0.15	10.00	88.19	**37.15**	**37.83**								
Yorkville Avenue	4355	0.517	132	21	153	1.196	181	121	302	4.000	2.01	0.35	1.55	**3.91**	0.517	0.90	0.47	1.08	11.50	79.09	**236.69**	**240.59**	66.4	600	0.283	0.37	**373.49**	1.32	0.84	64.4%
Existing 11 Yorkville		0.119	0	85	85	0.119	0	85	85	4.000	0.00	0.25	0.36	**0.60**	0.119	0.90	0.11	0.11	10.00	88.19	**26.19**	**26.80**								
Yorkville Avenue	4356	0.138	0	15	16	1.453	181	221	403	4.000	2.01	0.64	0.41	**3.06**	0.138	0.90	0.12	1.31	12.34	74.87	**272.14**	**275.20**	20.4	675	0.358	0.36	**504.35**	1.41	1.59	54.6%
Existing 16-18 Cumberland		0.036	0	16	16	0.036	0	16	16	4.000	0.00	0.05	0.11	**0.15**	0.000	0.90	0.00	0.00	10.00	88.19	**0.00**	**0.15**								
Laneway		0.035	0	0	0	0.071	0	16	16	4.000	0.00	0.05	0.10	**0.15**	0.035	0.90	0.03	0.03	10.00	88.19	**7.66**	**7.81**	72.1	300	0.071	0.51	**69.06**	0.98	1.23	11.3%
Laneway		0.269	108	0	108	0.340	108	16	124	4.000	1.20	0.05	0.81	**2.05**	0.269	0.90	0.24	0.27	11.23	80.56	**61.26**	**63.32**	58.9	300	0.071	0.53	**70.40**	1.00	0.99	89.9%
Yorkville Avenue	4357	0.210	84	0	84	2.002	373	237	611	4.000	4.14	0.69	0.63	**5.45**	0.210	0.90	0.19	1.77	13.93	68.10	**335.09**	**340.55**	42.1	675	0.358	0.45	**563.88**	1.58	0.45	60.4%
Yorkville Avenue	4358	0.014	6	0	6	2.017	378	237	617	4.000	4.20	0.69	0.04	**4.93**	0.014	0.90	0.01	1.78	14.37	66.45	**329.32**	**334.25**	15.5	600	0.283	0.56	**459.48**	1.63	0.16	72.7%
Zone 2 from south along Yonge (4359)		0.435	38	30	68	0.435	38	30	68	4.000	0.42	0.09	1.31	**1.81**	0.435	0.90	0.39	0.39	10.00	88.19	**96.05**	**97.86**	94.4					1.50	1.05	
Yonge Street	4360	0.059	15	1	16	2.511	431	268	701	4.000	4.79	0.77	0.18	**5.74**	0.059	0.90	0.05	2.23	14.53	65.88	**407.98**	**413.73**	27.4	675	0.358	0.30	**460.41**	1.29	0.35	89.9%
Zone 3 from east along Collier (5569)		0.504	54	34	88	0.504	54	34	88	4.000	0.60	0.10	1.51	**2.21**	0.504	0.90	0.45	0.45	10.00	88.19	**111.18**	**113.38**	118.1					1.50	1.31	
Yonge Street	4361	0.211	74	3	77	3.225	559	304	866	3.949	6.13	0.88	0.63	**7.65**	0.211	0.90	0.19	2.87	14.89	64.65	**515.97**	**523.62**	55.2	750	0.442	0.51	**795.04**	1.80	0.51	65.9%
Zone 5 from west along Scollard (4367)		1.607	565	19	584	1.607	565	19	584	3.946	6.19	0.05	4.82	**11.07**	1.607	0.90	1.45	1.45	10.00	88.19	**354.61**	**365.68**	378.2					1.50	4.20	
Zone 4 from west along Scollard (4367)		2.875	551	135	686	2.875	551	135	686	3.952	6.05	0.39	8.63	**15.07**	2.875	0.60	1.73	1.73	10.00	88.19	**422.96**	**438.03**	463.1					1.50	5.15	
Yonge Street	4368	0.000	0	0	0	7.708	1,675	458	2,136	3.644	16.96	1.33	0.00	**18.29**	0.000	0.90	0.00	6.04	15.40	62.97	**1057.80**	**1076.08**	28.0	750	0.442	4.17	**2273.38**	5.15	0.09	47.3%

PRE-DEVELOPMENT CONDITIONS - WET WEATHER - 2 YEAR STORM EVENT

Sanitary Flows

Residential Avg.Daily Flow = 240 L/d
Commercial Avg.Daily Flow = 250 L/d

Extraneous Flows

Infiltration Allowance = 3.000 L/s/ha

n= 0.013

COMBINED SEWERSHED AREA: 25.930 ha

Design Sheet No **1 of 2**
Project: **11 Yorkville**
Project no.: **17M-01494**

		SANITARY FLOW CALCULATIONS													Extraneous Flows								BASED ON CITY OF TORONTO ARCHIVE							
		Segment				Cumulative				SANITARY FLOW																			
Description / Location / Dissemination Blocks	PIPE ID	Area A (ha)	Population			Area A (ha)	Population			PEAKING FACTOR	Res	Emp	Infiltration Allowance	Acc SAN Flow	STORM TRIBUTARY AREA	RUNOFF COEF.	A X C	ACCUM. A X C	Tc	INTENSITY	Accm STM	TOTAL COMBINED FLOW	LENGTH	ACTUAL PIPE SIZE	PIPE AREA (AF)	SLOPE	CAPACITY	VELOCITY	TIME OF FLOW	% Full
			Res	ICI	Total		Res	ICI	Total	M	(L/s)	(L/s)	(L/s)	(L/s)	(ha)	C			(min.)	(mm/hr)	(L/s)	(L/s)	(m)	(mm)	(m2)	(%)	(L/s)	(m/s)	(min)	
Zone 6 from east along Church (5539)		0.613	140	30	170	0.613	140	30	170	4.000	1.56	0.09	1.84	**3.48**	0.613	0.90	0.55	0.55	10.00	88.19	**135.16**	**138.64**	667.6					1.50	7.42	
Zone 7 from west along Davenport (4352)		9.829	2,997	228	3,225	9.829	2,997	228	3,225	3.443	28.66	0.66	29.49	**58.81**	9.829	0.90	8.85	8.85	10.00	88.19	**2168.77**	**2227.58**	141.5					1.50	1.57	
Yonge Street	4369	0.393	43	31	75	18.542	4,855	748	5,606	3.257	43.92	2.16	1.18	**47.26**	0.393	0.90	0.35	15.79	17.42	57.21	**2511.58**	**2558.85**	50.9	900	0.636	1.41	**2149.63**	3.38	0.25	119.0%
Yonge Street	4370	0.282	69	12	82	18.824	4,924	760	5,688	3.251	44.47	2.20	0.85	**47.52**	0.282	0.90	0.25	16.05	17.67	56.57	**2523.60**	**2571.12**	40.2	900	0.636	1.14	**1932.88**	3.04	0.22	133.0%
Yonge Street	4371	0.084	17	5	22	18.908	4,941	764	5,710	3.250	44.60	2.21	0.25	**47.07**	0.084	0.90	0.08	16.12	17.89	56.03	**2511.10**	**2558.17**	9.4	900	0.636	1.22	**1999.55**	3.14	0.05	127.9%
Zone 8 from north along Yonge (4387)		6.390	2,341	60	2,401	6.390	2,341	60	2,401	3.532	22.97	0.17	19.17	**42.31**	2.803	0.90	2.52	2.52	10.00	88.19	**618.44**	**660.75**	619.6					1.50	6.88	
Easement	4388	0.321	69	16	86	25.619	7,351	841	8,197	3.086	63.02	2.43	0.96	**66.41**	0.321	0.90	0.29	18.93	17.94	55.90	**2942.58**	**3008.99**	55.8	1500	1.767	3.70	**13597.24**	7.69	0.12	22.1%
Easement	4389	0.310	55	19	74	25.930	7,406	860	8,271	3.083	63.42	2.49	0.93	**66.84**	0.310	0.90	0.28	19.21	18.06	55.61	**2970.36**	**3037.20**	67.1	1500	1.767	0.95	**6889.88**	3.90	0.29	44.1%

Notes:
* *Residential and employment populations derived from site areas and population densities as outlined in City of Toronto Design Criteria for Sewers and Watermains*
* *Sewer information based on City of Toronto archive drawings*
* *See Figure 7 for combined sewer tributary areas*
* *Existing and Proposed storm flow for 16-18 Cumberland (Building B) are to Cumberland Ave*

APPENDIX A
EXISTING COMBINED SEWER ANALYSIS
POST-DEVELOPMENT DRY WEATHER
CITY OF TORONTO

TABLE D.2.2

POST-DEVELOPMENT CONDITIONS - WET WEATHER - 2 YEAR STORM EVENT

Sanitary Flows

Residential Avg.Daily Flow = 240 L/d
Commercial Avg.Daily Flow = 250 L/d

Extraneous Flows

Infiltration Allowance = 3.000 L/s/ha

n= 0.013

Design Sheet No **1 of 2**
Project: **11 Yorkville**
Project no.: **17M-01494**

COMBINED SEWERSHED AREA: **25.894 ha**

		SANITARY FLOW CALCULATIONS															Extraneous Flows										BASED ON CITY OF TORONTO ARCHIVE							
Description / Location / Dissemination Blocks	PIPE ID	Segment					Cumulative				SANITARY FLOW						STORM TRIBUTARY AREA	RUNOFF COEF.	A X C	ACCUM. A X C	Tc	INTENSITY	INC. CONTROLLED STORM FLOW	ACCUM. CONTROLLED STORM FLOW	Accm STM	TOTAL COMBINED FLOW	LENGTH	ACTUAL PIPE SIZE	PIPE AREA (AF)	SLOPE	CAPACITY	VELOCITY	TIME OF FLOW	% Full
		Area A (ha)	Population			Pumped GW Discharge Rate (L/s)	Area A (ha)	Population			PEAKING FACTOR	Res	Emp	Infiltration Allowance	Pumped GW Discharge Rate	Acc SAN Flow																	
			Res	ICI	Total			Res	ICI	Total	M	(L/s)	(L/s)	(L/s)		(L/s)	(ha)	C			(min.)	(mm/hr)	(L/s)	(L/s)	(L/s)	(L/s)	(m)	(mm)	(m2)	(%)	(L/s)	(m/s)	(min)	
Zone 1 from west along Yorkville (4354)		0.511	49	40	89	0.00	0.511	49	40	89	4.000	0.54	0.12	1.53	0.00	**2.19**	0.511	0.90	0.46	0.46	10.00	88.19	0.00	0.00	**112.64**	**114.83**	134.8					1.50	1.50	
Building A		**0.287**	**1,189**	**28**	**1,217**	**6.30**	**0.287**	**1,189**	**28**	**1,217**	**3.750**	**12.39**	**0.08**	**0.86**	**6.30**	**19.63**	**0.016**	**0.90**	**0.01**	**0.01**	**10.00**	**88.19**	**19.00**	**19.00**	**19.00**	**38.63**								
Yorkville Avenue	4355	0.517	132	21	153	0.00	1.315	1,370	89	1,459	3.708	14.11	0.26	1.55	6.30	**22.21**	0.517	0.90	0.47	0.94	11.50	79.09	0.00	19.00	**225.53**	**247.74**	66.4	600	0.283	0.37	**373.49**	1.32	0.84	66.3%
Yorkville Avenue	4356	0.138	0	15	16	0.00	1.453	1,370	104	1,475	3.708	14.11	0.30	0.41	6.30	**21.12**	0.138	0.90	0.12	1.08	12.34	74.87	0.00	19.00	**243.35**	**264.47**	20.4	675	0.358	0.36	**504.35**	1.41	1.59	52.4%
Laneway		0.035	0	0	0	0.00	0.035	0	0	0	4.000	0.00	0.00	0.10	0.00	**0.10**	0.035	0.90	0.03	0.03	10.00	88.19	0.00	0.00	**7.66**	**7.76**	72.1	300	0.071	0.51	**69.06**	0.98	1.23	11.2%
Laneway		0.269	108	0	108	0.00	0.304	108	0	108	4.000	1.20	0.00	0.81	0.00	**2.01**	0.269	0.90	0.24	0.27	11.23	80.56	0.00	0.00	**61.26**	**63.27**	58.9	300	0.071	0.53	**70.40**	1.00	0.99	89.9%
Yorkville Avenue	4357	0.210	84	0	84	0.00	1.967	1,562	104	1,667	3.667	15.91	0.30	0.63	6.30	**23.14**	0.210	0.90	0.19	1.54	13.93	68.10	0.00	19.00	**310.63**	**333.76**	42.1	675	0.358	0.45	**563.88**	1.58	0.45	59.2%
Yorkville Avenue	4358	0.014	6	0	6	0.00	1.981	1,567	104	1,673	3.666	15.96	0.30	0.04	6.30	**22.60**	0.014	0.90	0.01	1.55	14.37	66.45	0.00	19.00	**305.91**	**328.51**	15.5	600	0.283	0.56	**459.48**	1.63	0.16	71.5%
Zone 2 from south along Yonge (4359)		0.435	38	30	68	0.00	0.435	38	30	68	4.000	0.42	0.09	1.31	0.00	**1.81**	0.435	0.90	0.39	0.39	10.00	88.19	0.00	0.00	**96.05**	**97.86**	94.4					1.50	1.05	
Yonge Street	4360	0.059	15	1	16	0.00	2.475	1,620	135	1,757	3.655	16.45	0.39	0.18	6.30	**23.32**	0.059	0.90	0.05	2.00	14.53	65.88	0.00	19.00	**384.93**	**408.25**	27.4	675	0.358	0.30	**460.41**	1.29	0.35	88.7%
Zone 3 from east along Collier (5569)		0.504	54	34	88	0.00	0.504	54	34	88	4.000	0.60	0.10	1.51	0.00	**2.21**	0.504	0.90	0.45	0.45	10.00	88.19	0.00	0.00	**111.18**	**113.38**								
Yonge Street	4361	0.211	74	3	77	0.00	3.190	1,748	171	1,922	3.630	17.63	0.50	0.63	6.30	**25.06**	0.211	0.90	0.19	2.64	14.89	64.65	0.00	19.00	**493.70**	**518.76**	55.2	750	0.442	0.51	**795.04**	1.80	0.51	65.2%
Zone 5 from west along Scollard (4367)		1.607	565	19	584	0.00	1.607	565	19	584	3.946	6.19	0.05	4.82	0.00	**11.07**	1.607	0.90	1.45	1.45	10.00	88.19	0.00	0.00	**354.61**	**365.68**	378.2					1.50	4.20	
Zone 4 from west along Scollard (4367)		2.875	551	135	686	0.00	2.875	551	135	686	3.952	6.05	0.39	8.63	0.00	**15.07**	2.875	0.60	1.73	1.73	10.00	88.19	0.00	0.00	**422.96**	**438.03**	463.1					1.50	5.15	
Yonge Street	4368	0.000	0	0	0	0.00	7.672	2,864	325	3,192	3.459	27.52	0.94	0.00	6.30	**34.77**	0.000	0.90	0.00	5.81	15.40	62.97	0.00	19.00	**1036.61**	**1071.37**	28.0	750	0.442	4.17	**2273.38**	5.15	0.09	47.1%

POST-DEVELOPMENT CONDITIONS - WET WEATHER - 2 YEAR STORM EVENT

Sanitary Flows

Residential Avg.Daily Flow = 240 L/d
Commercial Avg.Daily Flow = 250 L/d

Extraneous Flows

Infiltration Allowance = 3.000 L/s/ha

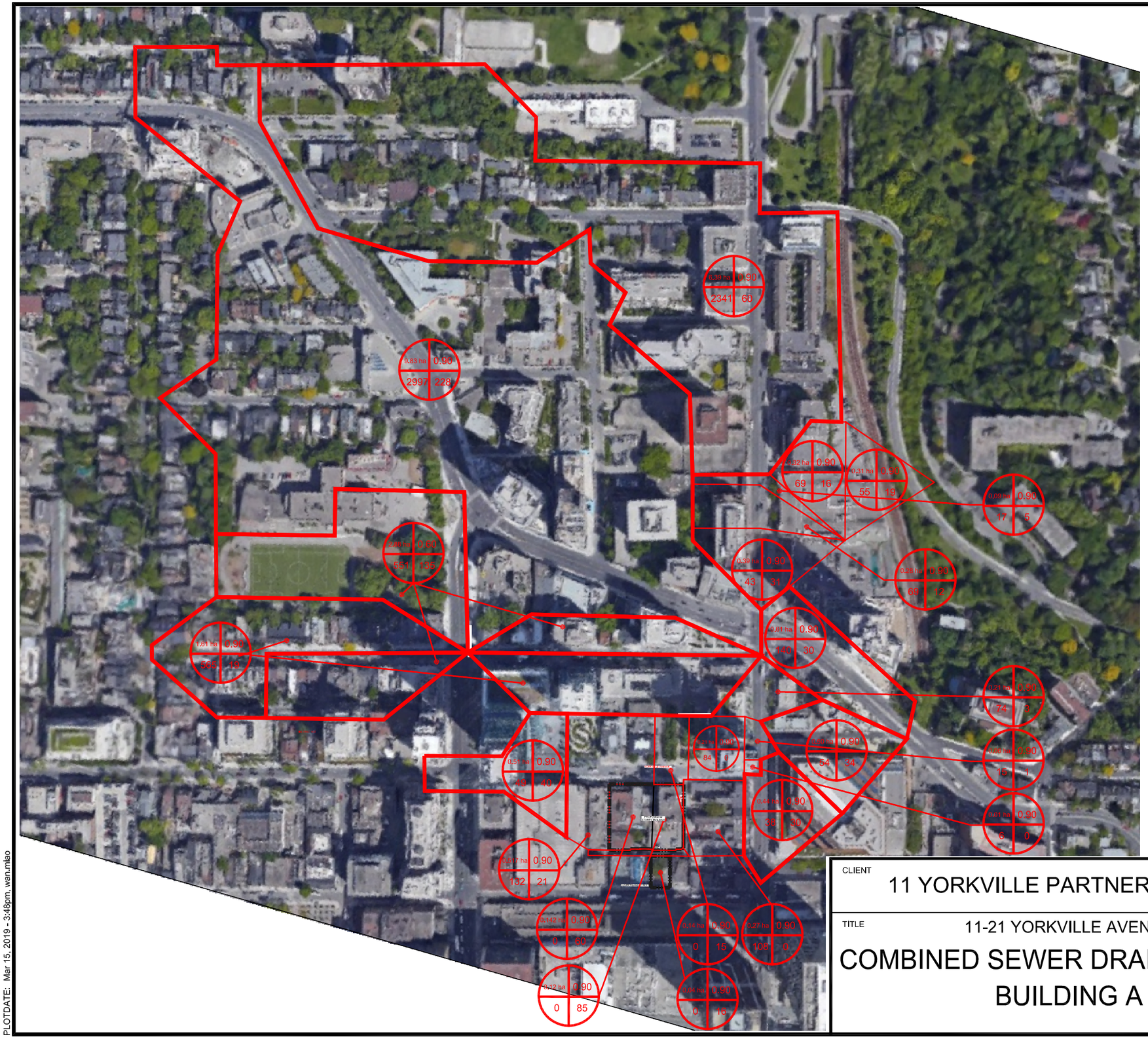
COMBINED SEWERSHED AREA: **25.894 ha**

n= 0.013

Design Sheet No **1 of 2**
Project: **11 Yorkville**
Project no.: **17M-01494**

		SANITARY FLOW CALCULATIONS															Extraneous Flows									BASED ON CITY OF TORONTO ARCHIVE							
		Segment					Cumulative				SANITARY FLOW																					
Description / Location / Dissemination Blocks	PIPE ID	Area A (ha)	Population			Pumped GW Discharge Rate (L/s)	Area A (ha)	Population			PEAKING FACTOR	Res	Emp	Infiltration Allowance	Pumped GW Discharge Rate	**Acc SAN Flow**	STORM TRIBUTARY AREA	RUNOFF COEF.	A X C	ACCUM. A X C	Tc	INTENSITY	INC. CONTROLLED STORM FLOW	ACCUM. CONTROLLED STORM FLOW	**Accm STM**	**TOTAL COMBINED FLOW**	LENGTH	ACTUAL PIPE SIZE	PIPE AREA (AF)	SLOPE	CAPACITY	VELOCITY	TIME OF FLOW	% Full
			Res	ICI	Total			Res	ICI	Total	M	(L/s)	(L/s)	(L/s)		**(L/s)**	**(ha)**	**C**			(min.)	(mm/hr)	**(L/s)**	**(L/s)**	**(L/s)**	**(L/s)**	(m)	(mm)	(m2)	(%)	(L/s)	(m/s)	(min)	
Zone 6 from east along Church (5539)		0.613	140	30	170	0.00	0.613	140	30	170	4.000	1.56	0.09	1.84	0.00	**3.48**	0.613	0.90	0.55	0.55	10.00	88.19	0.00	0.00	**135.16**	**138.64**	667.6					1.50	7.42	
Zone 7 from west along Davenport (4352)		9.829	2,997	228	3,225	0.00	9.829	2,997	228	3,225	3.443	28.66	0.66	29.49	0.00	**58.81**	9.829	0.90	8.85	8.85	10.00	88.19	0.00	0.00	**2168.77**	**2227.58**	141.5					1.50	1.57	
Yonge Street	4369	0.393	43	31	75	0.00	18.506	6,044	615	6,662	3.168	53.18	1.78	1.18	6.30	**62.44**	0.393	0.90	0.35	15.56	17.42	57.21	0.00	19.00	**2494.07**	**2556.51**	50.9	900	0.636	1.41	**2149.63**	3.38	0.25	118.9%
Yonge Street	4370	0.282	69	12	82	0.00	18.788	6,113	627	6,744	3.163	53.71	1.81	0.85	6.30	**62.67**	0.282	0.90	0.25	15.82	17.67	56.57	0.00	19.00	**2506.50**	**2569.17**	40.2	900	0.636	1.14	**1932.88**	3.04	0.22	132.9%
Yonge Street	4371	0.084	17	5	22	0.00	18.872	6,130	631	6,766	3.162	53.84	1.83	0.25	6.30	**62.22**	0.084	0.90	0.08	15.89	17.89	56.03	0.00	19.00	**2494.34**	**2556.56**	9.4	900	0.636	1.22	**1999.55**	3.14	0.05	127.9%
Zone 8 from north along Yonge (4387)		6.390	2,341	60	2,401	0.00	6.390	2,341	60	2,401	3.532	22.97	0.17	19.17	6.30	**48.61**	2.803	0.90	2.52	2.52	10.00	88.19	0.00	0.00	**618.44**	**667.05**	619.6					1.50	6.88	
Easement	4388	0.321	69	16	86	0.00	25.584	8,540	708	9,253	3.022	71.70	2.05	0.96	6.30	**81.01**	0.321	0.90	0.29	18.70	17.94	55.90	0.00	19.00	**2925.90**	**3006.91**	55.8	1500	1.767	3.70	**13597.24**	7.69	0.12	22.1%
Easement	4389	0.310	55	19	74	0.00	25.894	8,595	727	9,327	3.020	72.09	2.10	0.93	6.30	**81.43**	0.310	0.90	0.28	18.98	18.06	55.61	0.00	19.00	**2953.87**	**3035.29**	67.1	1500	1.767	0.95	**6889.88**	3.90	0.29	44.1%

Notes:
* *Residential and employment populations derived from site areas and population densities as outlined in City of Toronto Design Criteria for Sewers and Watermains*
* *Sewer information based on City of Toronto archive drawings*
* *See Figure 7 for combined sewer tributary areas*
* *Existing and Proposed storm flow for 16-18 Cumberland (Building B) are to Cumberland Ave*



LEGEND

0.09 ha 0.90
92 92

- AREA
- DRAINAGE COEFFICIENT
- ICI POPULATION
- RESIDENTIAL POPULATION
- LIMIT OF PROP. WORKS

CLIENT
11 YORKVILLE PARTNERSHIP INC.

TITLE
11-21 YORKVILLE AVENUE

COMBINED SEWER DRAINAGE PLAN BUILDING A

Checked	B.S.T.	Drawn	10/12 Cad
Date	MAR. 2018	Proj. No.	17M-01494
Scale	NTS	Figure No.	7A

PLOTDATE: Mar 15, 2019 - 3:48pm, wan.miao

APPENDIX

A-2 THEORETICAL SANITARY SEWER FLOWS & SANITARY DESIGN SHEETS & SANITARY DRAINAGE AREA PLAN (7B) – CUMBERLAND STREET

EXISTING COMBINED SEWER ANALYSIS - CUMBERLAND STREET
PRE-DEVELOPMENT DRY WEATHER
CITY OF TORONTO

TABLE D.1.1

PRE-DEVELOPMENT CONDITIONS - DRY WEATHER

Design Sheet No **1 of 4**
Project: **11 Yorkville**
Project no.: **17M-01494**

11 Yorkville Development

Grey Rows are not downstream of the site and therefore the flow in these legs is unaffected by the proposed development

Residential S.F. Homes =	3.5	persons per unit
Residential Semi-Detached/Townhomes =	2.7	persons per unit
Apartment and condo =	400	persons per hectare
Retail =	1.1	persons per 100m^2
Hospital =	1	person per 30m^2
ICI (industrial, commercial, institutional) =	86	persons per ha
Medium Density =	270	persons per hectare

Sanitary Flows

Proposed Residential Avg.Daily Flow =	450	L/cap/day
Existing Residential Avg.Daily Flow =	240	L/cap/day
Existing Commercial Avg.Daily Flow =	250	L/cap/day
Existing Church Avg. Daily Flow =	250	L/cap/day

Extraneous Flows

Infiltration =	0.260	L/s/ha

n= 0.013

			SANITARY FLOW CALCULATIONS													Extraneous Flows			BASED ON CITY OF TORONTO ARCHIVE							
			Segment				Cumulative				SANITARY FLOW															
Description / Location / Dissemination Blocks	FROM MH	TO MH	Area A (ha)	Population			Area A (ha)	Population			PEAKING FACTOR (RES	Res	Emp	Infiltration Allowance	**Acc SAN Flow**	STM Flow DQ 2 YEAR	**Accm STM**	**TOTAL COMBINED FLOW**	LENGTH	ACTUAL PIPE SIZE	PIPE AREA (AF)	SLOPE	CAPACITY	VELOCITY	TIME OF FLOW	% Full
				Res	ICI	Total		Res	ICI	Total	M	(L/s)	(L/s)	(L/s)	**(L/s)**	**(L/s)**	**(L/s)**	**(L/s)**	(m)	(mm)	(m2)	(%)	(L/s)	(m/s)	(min)	
26-32 Cumberland St	EX.MH1	EX.MH2	0.036	0	5	5	0.036	0	5	5	4.000	0.00	0.01	0.01	**0.02**			**0.02**								
EX CB on Cumberland St (south of 26-32 Cumberland St)	EX.MH1	EX.MH2	0.050	0	0	0	0.050	0	0	0	4.000	0.00	0.00	0.01	**0.01**			**0.01**								
22 Cumberland St	EX.MH1	EX.MH2	0.029	0	4	4	0.029	0	4	4	4.000	0.00	0.01	0.01	**0.02**			**0.02**								
20 Cumberland St	EX.MH1	EX.MH2	0.036	0	5	5	0.036	0	5	5	4.000	0.00	0.01	0.01	**0.02**			**0.02**								
Ex. 16-18 Cumberland St	EX.MH1	EX.MH2	0.036	0	16	16	0.036	0	16	16	4.000	0.00	0.05	0.01	**0.06**			**0.06**								
12-14 Cumberland St	EX.MH1	EX.MH2	0.040	0	5	5	0.040	0	5	5	4.000	0.00	0.01	0.01	**0.02**			**0.02**								
8, 6A, 6B, 6C Cumberland St	EX.MH1	EX.MH2	0.032	0	4	4	0.032	0	4	4	4.000	0.00	0.01	0.01	**0.02**			**0.02**								
Subtotal	EX.MH1	EX.MH2	--	--	--	--	0.259	0	39	39	4.000	0.00	0.11	0.07	**0.18**			**0.18**	91.3	450	0.159	0.25	**142.55**	0.90	1.70	0.1%
External Drainage on 4 Cumberland St, Yonge St and Asquith Ave	EXT.	EX.MH2	0.970	0	107	107	0.970	0	107	107	4.000	0.00	0.31	0.25	**0.56**			**0.56**								
Cumberland St	EX.MH2	EX. MH3 - 1200mm TRUCK SEWER	0.000	0	0	0	1.229	0	145	145	4.000	0.00	0.42	0.32	**0.74**			**0.74**	6.3	300	0.071	7.50	**264.83**	3.75	0.03	0.3%

Notes:
* *Residential and employment populations derived from site areas and population densities as outlined in City of Toronto Design Criteria for Sewers and Watermains*
* *Sewer information based on City of Toronto archive drawings*
* See Figure 7B for combined sewer tributary areas

EXISTING COMBINED SEWER ANALYSIS - CUMBERLAND STREET
POST-DEVELOPMENT DRY WEATHER
CITY OF TORONTO

TABLE D.1.2

POST-DEVELOPMENT CONDITIONS - DRY WEATHER

Design Sheet No **2 of 4**
Project: **11 Yorkville**
Project no.: **17M-01494**

11 Yorkville Development

Grey Rows are not downstream of the site and therefore the flow in these legs is unaffected by the proposed development

Residential S.F. Homes =	3.5	persons per unit
Residential Semi-Detached/Townhomes =	2.7	persons per unit
Apartment and condo =	400	persons per hectare
Retail =	1.1	persons per 100m^2
Hospital =	1	person per 30m^2
ICI (industrial, commercial, institutional) =	86	persons per ha
Medium Density =	270	persons per hectare

Sanitary Flows

Proposed Residential Avg.Daily Flow =	450	L/cap/day
Existing Residential Avg.Daily Flow =	240	L/cap/day
Existing Commercial Avg.Daily Flow =	250	L/cap/day
Existing Church Avg. Daily Flow =	250	L/cap/day
Extraneous Flows		
Infiltration =	0.260	L/s/ha
n=	0.013	

	SANITARY FLOW CALCULATIONS																Extraneous Flows			BASED ON CITY OF TORONTO ARCHIVE							
			Segment					Cumulative					SANITARY FLOW														
Description / Location / Dissemination Blocks	FROM MH	TO MH	Area A (ha)	Population			Pumped GW Discharge Rate (L/s)	Area A (ha)	Population			Cumulative Pumped GW Discharge Rate (L/s)	PEAKING FACTOR (RES	Res	Emp	Infiltration Allowance	Acc SAN Flow	STM Flow DQ 2 YEAR	Accm STM	TOTAL COMBINED FLOW	LENGTH	ACTUAL PIPE SIZE	PIPE AREA (AF)	SLOPE	CAPACITY	VELOCITY	TIME OF FLOW	% Full
				Res	ICI	Total			Res	ICI	Total		M	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(m)	(mm)	(m2)	(%)	(L/s)	(m/s)	(min)	
26-32 Cumberland St	EX.MH1	EX.MH2	0.036	0	5	5		0.036	0	5	5		4.000	0.00	0.01	0.01	**0.02**			**0.02**								
EX CB on Cumberland St (south of 26-32 Cumberland St)	EX.MH1	EX.MH2	0.050	0	0	0		0.050	0	0	0		4.000	0.00	0.00	0.01	**0.01**			**0.01**								
22 Cumberland St	EX.MH1	EX.MH2	0.029	0	4	4		0.029	0	4	4		4.000	0.00	0.01	0.01	**0.02**			**0.02**								
20 Cumberland St	EX.MH1	EX.MH2	0.036	0	5	5		0.036	0	5	5		4.000	0.00	0.01	0.01	**0.02**			**0.02**								
Proposed Building B	EX.MH1	EX.MH2	0.036	0	10	10	0.63	0.036	0	10	10	0.63	4.000	0.000	0.05	0.01	**0.69**			**0.69**								
12-14 Cumberland St	EX.MH1	EX.MH2	0.040	0	5	5		0.040	0	5	5		4.000	0.00	0.01	0.01	**0.02**			**0.02**								
8, 6A, 6B, 6C Cumberland St	EX.MH1	EX.MH2	0.032	0	4	4		0.032	0	4	4		4.000	0.00	0.01	0.01	**0.02**			**0.02**								
Subtotal	EX.MH1	EX.MH2	--	--	--	--		0.259	0	31	33	0.63	4.000	0.00	0.12	0.07	**0.81**			**0.81**	91.3	450	0.159	0.25	**142.55**	0.90	1.70	**0.6%**
External Drainage on 4 Cumberland St, Yonge St and Asquith Ave	EXT.	EX.MH2	0.97	0.000	107	107		0.970	0	107	107		4.00	0.00	0.31	0.25	**0.56**			**0.56**								
Cumberland St	EX.MH2	EX. MH3 - 1200mm TRUCK SEWER	0.000	0	0	0		1.229	0	138	138	0.63	4.000	0.00	0.40	0.32	**1.35**			**1.35**	6.3	300	0.071	7.50	**264.83**	3.75	0.03	**0.5%**

Notes:
* *Residential and employment populations derived from site areas and population densities as outlined in City of Toronto Design Criteria for Sewers and Watermains*
* *Sewer information based on City of Toronto archive drawings*
* *See Figure 7B for combined sewer tributary areas*

EXISTING COMBINED SEWER ANALYSIS - CUMBERLAND STREET
PRE-DEVELOPMENT WET WEATHER
CITY OF TORONTO

TABLE D.2.1

PRE-DEVELOPMENT CONDITIONS - WET WEATHER - 2 YEAR STORM EVENT

Design Sheet No **3 of 4**
Project: **11 Yorkville**
Project no.: **17M-01494**

11 Yorkville Development

Grey Rows are not downstream of the site and therefore the flow in these legs is unaffected by the proposed development

Residential S.F. Homes =	3.5	persons per unit
Residential Semi-Detached/Townhomes =	2.7	persons per unit
Apartment and condo =	400	persons per hectare
Retail =	1.1	persons per 100m^2
Hospital =	1	person per 30m^2
ICI (industrial, commercial, institutional) =	86	persons per ha
Medium Density =	270	persons per hectare

Sanitary Flows

Proposed Residential Avg.Daily Flow =	450	L/cap/day
Existing Residential Avg.Daily Flow =	240	L/cap/day
Existing Commercial Avg.Daily Flow =	250	L/cap/day
Existing Church Avg. Daily Flow =	250	L/cap/day
Extraneous Flows		
Infiltration =	3.000	L/s/ha
n=	0.013	

SANITARY FLOW CALCULATIONS | Extraneous Flows | BASED ON CITY OF TORONTO ARCHIVE

Description / Location / Dissemination Blocks	FROM MH	TO MH	Segment Area A (ha)	Segment Population Res	Segment Population ICI	Segment Population Total	Cumulative Area A (ha)	Cumulative Population Res	Cumulative Population ICI	Cumulative Population Total	SANITARY FLOW PEAKING FACTOR M	SANITARY FLOW Res (L/s)	SANITARY FLOW Emp (L/s)	SANITARY FLOW Infiltration Allowance (L/s)	**Acc SAN Flow (L/s)**	STORM TRIBUTARY AREA (ha)	RUNOFF COEF. C	A X C	ACCUM. A X C	Tc (min.)	INTENSITY (mm/hr)	**Accm STM (L/s)**	**TOTAL COMBINED FLOW (L/s)**	LENGTH (m)	ACTUAL PIPE SIZE (mm)	PIPE AREA (AF) (m2)	SLOPE (%)	CAPACITY (L/s)	VELOCITY (m/s)	TIME OF FLOW (min)	% Full
26-32 Cumberland St	EX.MH1	EX.MH2	0.036	0	5	5	0.036	0	5	5	4.000	0.00	0.00	0.11	**0.11**	0.036	0.90	0.03	0.03	10.00	88.19	**7.94**	**8.05**								
EX CB on Cumberland St (south of 26-32 Cumberland St)	EX.MH1	EX.MH2	0.050	0	0	0	0.050	0	0	0	4.000	0.00	0.00	0.15	**0.15**	0.050	0.90	0.05	0.05	10.00	88.19	**11.03**	**11.18**								
22 Cumberland St	EX.MH1	EX.MH2	0.029	0	4	4	0.029	0	4	4	4.000	0.00	0.00	0.09	**0.09**	0.029	0.90	0.03	0.03	10.00	88.19	**6.40**	**6.49**								
20 Cumberland St	EX.MH1	EX.MH2	0.036	0	5	5	0.036	0	5	5	4.000	0.00	0.00	0.11	**0.11**	0.036	0.90	0.03	0.03	10.00	88.19	**7.90**	**8.01**								
Ex. 16-18 Cumberland St	EX.MH1	EX.MH2	0.036	0	16	16	0.036	0	16	16	4.000	0.00	0.04	0.11	**0.15**	0.036	0.90	0.03	0.03	10.00	88.19	**7.94**	**8.10**								
12-14 Cumberland St	EX.MH1	EX.MH2	0.040	0	5	5	0.040	0	5	5	4.000	0.00	0.00	0.12	**0.12**	0.040	0.90	0.04	0.04	10.00	88.19	**8.83**	**8.95**								
8, 6A, 6B, 6C Cumberland St	EX.MH1	EX.MH2	0.032	0	4	4	0.032	0	4	4	4.000	0.00	0.00	0.10	**0.10**	0.032	0.90	0.03	0.03	10.00	88.19	**7.06**	**7.16**								
Subtotal	EX.MH1	EX.MH2	0.259	--	--	--	0.259	0	39	39	4.000	0.00	0.04	0.78	**0.82**	0.259	0.90	0.23	0.23	10.00	88.19	**57.10**	**57.92**	91.3	450	0.159	0.50	**201.60**	1.27	1.20	28.7%
External Drainage on 4 Cumberland St, Yonge St and Asquith Ave	EXT.	EX.MH2	0.970	0	107	107	0.970	0	107	107	4.000	0.00	0.30	2.91	**3.21**	0.970	0.90	0.87	0.87	10.00	88.19	**214.03**	**217.24**								
Cumberland St	EX.MH2	EX. MH3 - 1200mm TRUCK SEWER	0.000	0	0	0	1.229	0	145	145	4.000	0.00	0.34	3.69	**4.03**	1.229	0.90	1.11	1.11	11.20	80.72	**248.18**	**252.21**	6.3	300	0.071	7.50	**264.83**	3.75	0.03	95.2%

Notes:
* *Residential and employment populations derived from site areas and population densities as outlined in City of Toronto Design Criteria for Sewers and Watermains*
* *Sewer information based on City of Toronto archive drawings*
* *See Figure 7B for combined sewer tributary areas*
* *Existing and Proposed storm flow for 16-18 Cumberland (Building B) are to Cumberland Ave combined sewer (no storm avaliable)*

EXISTING COMBINED SEWER ANALYSIS
POST-DEVELOPMENT WET WEATHER
CITY OF TORONTO

TABLE D.2.2

POST-DEVELOPMENT CONDITIONS - WET WEATHER - 2 YEAR STORM EVENT

Design Sheet No **4 of 4**
Project: **11 Yorkville**
Project no.: **17M-01494**

11 Yorkville Development

Grey Rows are not downstream of the site and therefore the flow in these legs is unaffected by the proposed development

Residential S.F. Homes =	3.5	persons per unit
Residential Semi-Detached/Townhomes =	2.7	persons per unit
Apartment and condo =	400	persons per hectare
Retail =	1.1	persons per 100m^2
Hospital =	1	person per 30m^2
ICI (industrial, commercial, institutional) =	86	persons per ha
Medium Density =	270	persons per hectare

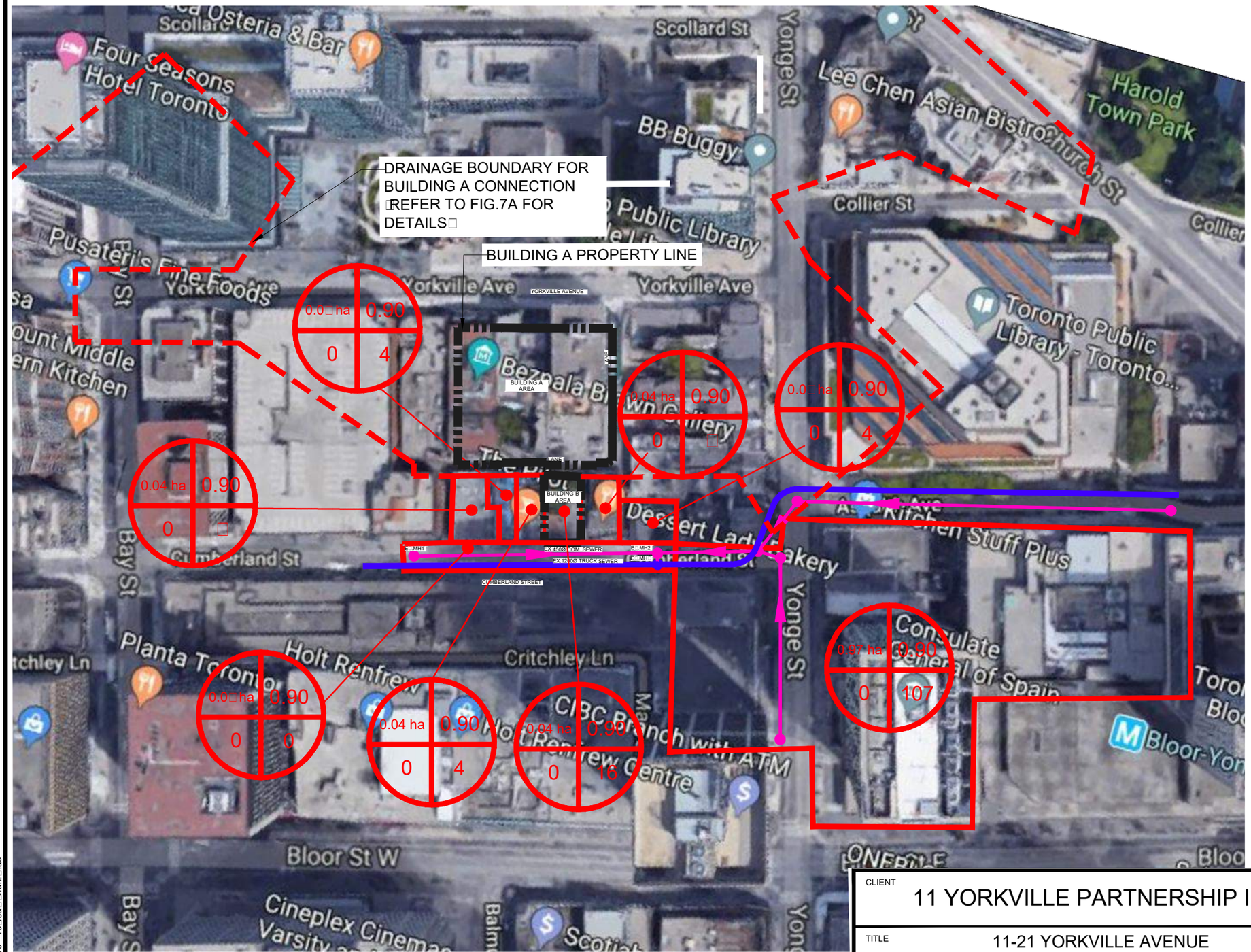
Sanitary Flows

Proposed Residential Avg.Daily Flow =	450	L/cap/day
Existing Residential Avg.Daily Flow =	240	L/cap/day
Existing Commercial Avg.Daily Flow =	250	L/cap/day
Existing Church Avg. Daily Flow =	250	L/cap/day
Extraneous Flows		
Infiltration =	3.000	L/s/ha
n=	0.013	

SANITARY FLOW CALCULATIONS | Extraneous Flows | BASED ON CITY OF TORONTO ARCHIVE

Description / Location / Dissemination Blocks	FROM MH	TO MH	Segment: Area A (ha)	Segment: Population Res	Segment: Population ICI	Segment: Population Total	Segment: Pumped GW Discharge Rate	Cumulative: Area A (ha)	Cumulative: Population Res	Cumulative: Population ICI	Cumulative: Population Total	Cumulative: Pumped GW Discharge Rate	SANITARY FLOW: PEAKING FACTOR	SANITARY FLOW: Res	SANITARY FLOW: Emp	SANITARY FLOW: Infiltration Allowance	**Acc SAN Flow**	STORM TRIBUTARY AREA	RUNOFF COEF.	A X C	ACCUM. A X C	Tc	INTENSITY	Incremental Controlled Storm	Accm Controlled Storm	Accm STM	**TOTAL COMBINED FLOW**	LENGTH	ACTUAL PIPE SIZE	PIPE AREA (AF)	SLOPE	CAPACITY	VELOCITY	TIME OF FLOW	% Full
			(ha)	Res	ICI	Total	Rate	(ha)	Res	ICI	Total	Rate	M	(L/s)	(L/s)	(L/s)	**(L/s)**	**(ha)**	**C**			(min.)	(mm/hr)	(L/s)	(L/s)	**(L/s)**	**(L/s)**	(m)	(mm)	(m2)	(%)	(L/s)	(m/s)	(min)	
26-32 Cumberland St	EX.MH1	EX.MH2	0.036	0	5	5		0.036	0	5	5		4.000	0.00	0.01	0.11	**0.12**	0.036	0.90	0.03	0.03	10.00	88.19	0.00	0.00	**7.94**	**8.07**								
EX CB on Cumberland St (south of 26-32 Cumberland St)	EX.MH1	EX.MH2	0.050	0	0	0		0.050	0	0	0		4.000	0.00	0.00	0.15	**0.15**	0.050	0.90	0.05	0.05	10.00	88.19	0.00	0.00	**11.03**	**11.18**								
22 Cumberland St	EX.MH1	EX.MH2	0.029	0	4	4		0.029	0	4	4		4.000	0.00	0.01	0.09	**0.10**	0.029	0.90	0.03	0.03	10.00	88.19	0.00	0.00	**6.40**	**6.50**								
20 Cumberland St	EX.MH1	EX.MH2	0.036	0	5	5		0.036	0	5	5		4.000	0.00	0.01	0.11	**0.12**	0.036	0.90	0.03	0.03	10.00	88.19	0.00	0.00	**7.90**	**8.02**								
Proposed Building B	EX.MH1	EX.MH2	0.036	0	10	10	0.63	0.036	0	10	10	0.63	4.000	0.000	0.05	0.11	**0.79**	0.036	0.90	0.03	0.03	10.00	88.19	2.40	2.40	**2.40**	**3.19**								
12-14 Cumberland St	EX.MH1	EX.MH2	0.040	0	5	5		0.040	0	5	5		4.000	0.00	0.01	0.12	**0.13**	0.040	0.90	0.04	0.04	10.00	88.19	0.00	0.00	**8.83**	**8.96**								
8, 6A, 6B, 6C Cumberland St	EX.MH1	EX.MH2	0.032	0	4	4		0.032	0	4	4		4.000	0.00	0.01	0.10	**0.11**	0.032	0.90	0.03	0.03	10.00	88.19	0.00	0.00	**7.06**	**7.17**								
Subtotal	EX.MH1	EX.MH2	0.259	--	--	--		0.259	--	33	33		--	0.00	0.11	0.78	**1.52**	0.259	0.90	0.23	0.23	10.00	88.19	0.00	2.40	**51.56**	**53.08**	91.3	450	0.159	0.50	**201.60**	1.27	1.20	26.3%
External Drainage on 4 Cumberland St, Yonge St and Asquith Ave	EXT.	EX.MH2	0.970	0	107	107		0.970	0	107	107		4.000	0.00	0.30	2.91	**3.21**	0.970	0.90	0.87	0.87	10.00	88.19	0.00	0.00	**214.03**	**217.24**								
Cumberland St	EX.MH2	EX. MH3 - 1200mm TRUCK SEWER	0.000	0	0	0		1.229	0	139	139	0.63	4.000	0.00	0.41	3.69	**4.73**	1.229	0.90	1.11	1.11	11.20	80.72	0.00	2.40	**240.95**	**248.08**	6.3	300	0.071	7.50	**264.83**	3.75	0.03	93.7%

Notes:
* *Residential and employment populations derived from site areas and population densities as outlined in City of Toronto Design Criteria for Sewers and Watermains*
* *2 year controlled storm from proposed building B is 2.40 L/s based on Stormwater Management Report by WSP*
* *Sewer information based on City of Toronto archive drawings*
* *See Figure 7B for combined sewer tributary areas*
* *Existing and Proposed storm flow for 16-18 Cumberland (Building B) are to Cumberland Ave combined sewer (no storm avaliable)*



LEGEND

AREA
DRAINAGE COEFFICIENT
ICI POPULATION
RESIDENTIAL POPULATION

LIMIT OF PROP. WORKS

DRAINAGE BOUNDARY FOR BUILDING A
REFER TO FIG.7A FOR DETAILS

CLIENT
11 YORKVILLE PARTNERSHIP INC.

TITLE
11-21 YORKVILLE AVENUE

COM. SEWER DRAINAGE PLAN BUILDING B

Checked B.S.T.	Drawn 10/12 Cad
Date MAR. 201	Proj. No. 17M-01494
Scale NTS	Figure No. 7B

PLOTDATE Mar 06 2019 - 10:10a wan.iao

APPENDIX

B DOMESTIC WATER DEMAND, AND FUS FIRE FLOW CALCULATIONS

THEORETICAL DOMESTIC WATER DEMAND CALCULATIONS
APPENDIX B

Project: 11 Yorkville Avenue
Job No.: 17M-01494
Date: August 21, 2019

Proposed Development

Unit Type	Gross Floor Area (m^2)	Bedrooms # units	Population[1, 2]	Average Water Demand[3] (191 L/cap/d)		Peaking Factor[4]		Peak Water Demand	
				(L/s)	(m^3/day)	Peak Hour	Max. Day	Peak Hour (L/s)	Max. Day (L/s)
1 Bedroom Unit	-	424	594	1.31	113.45	2.50	1.30	3.28	1.71
2 Bedroom Unit	-	180	378	0.84	72.20	2.50	1.30	2.09	1.09
3 Bedroom Unit	-	70	217	0.48	41.45	2.50	1.30	1.20	0.62
Retail - Building A	2,486	-	28	0.06	5.35	1.20	1.10	0.07	0.07
Total - Building A	**2,486**	**674**	**1217**	**2.69**	**232.45**	**-**	**-**	**6.65**	**3.49**
Retail - Building B	839	-	10	0.02	1.91	1.20	1.10	0.03	0.02
Total - Building B	**839**	**-**	**10**	**0.02**	**1.91**	**-**	**-**	**0.03**	**0.02**
Total - Site	**3,326**	**674**	**1227**	**2.71**	**234.36**	**-**	**-**	**6.67**	**3.51**

Note 1: Population equivalent for apartments or condominiums per City of Toronto Design Criteria for Sewers and Watermain:

1 bedroom	1.4 person / unit
2 bedroom	2.1 person / unit
3 bedroom	3.1 person / unit
Townhouse	2.7 person / unit

For 1 bedroom + Den and 2 bedroom + Den, we interpolated.

Note 2: 1.1 people per 100 m^2 of commercial retail space, per City of Toronto Design Criteria for Sewers and Watermain

3.3 people per 100 m^2 of office space, per City of Toronto Design Criteria for Sewers and Watermain

Note 3: Water Demand for Multi-Unit Buildings, per City of Toronto Design Criteria for Sewers and Watermain

Note 4: Peaking Factor for apartments and and commercial uses are per City of Toronto Design Criteria for Sewers and Watermain

APPENDIX B

FIRE FLOW CALCULATIONS
Building A

Project: **11 Yorkville Avenue**
Job No.: **17M-01494**
Date: **###############**

Fire flow required for a given area based on Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection (1999)

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

where

F = Fire flow in Litres per minute (Lpm)
C = coefficient related to the type of construction
A = total floor area in square metres

Calculations per FUS

1. *Estimate of Fire Flow*
C = 0.6 for fire resistive construction
A = 2489 m^2

F = 7,000 Lpm (ROUNDED TO NEAREST 1000L/min)

2. *Occupancy Reduction*
25% reduction based on low hazard occupancy

25% reduction of 7000 Lpm = 1,750 Lpm
F = 7000 - 1750 = 5,250 Lpm

3. *Sprinkler Reduction*
30% reduction for NFPA Sprinkler System[2]

30% reduction of 5250 Lpm = 1,575 Lpm
F = 5250 - 1575 = 3,675 Lpm

4. *Separation Charge*

Face	Distance (m)	Charge			
West Side	20.20	10%			
East Side	18.00	15%			
North Side	20.50	10%			
South Side	6.20	20%			
	Total	55%	of	5,250	= 2,888 Lpm

F = 3675 + 2888
F = 6,563 Lpm (2,000 Lpm < F < 45,000 Lpm; OK)
F = 1,732 US GPM

Notes

1. If vertical openings and exterior vertical communications are properly protected, (one hour rating) consider only the area of the largest floor plus 25 % of each of the two immediately adjoining floors.
2. Sprinkler protection.

APPENDIX B

FIRE FLOW CALCULATIONS
Building B

Project: **11 Yorkville Avenue**
Job No.: **17M-01494**
Date: **###############**

Fire flow required for a given area based on Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection (1999)

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

where

F = Fire flow in Litres per minute (Lpm)
C = coefficient related to the type of construction
A = total floor area in square metres

Calculations per FUS

1. *Estimate of Fire Flow*
C = 0.6 for fire resistive construction
A = 455.3 m^2

F = 3,000 Lpm (ROUNDED TO NEAREST 1000L/min)

2. *Occupancy Reduction*
25% reduction based on low hazard occupancy

25% reduction of 3000 Lpm = 750 Lpm
F = 3000 - 750 = 2,250 Lpm

3. *Sprinkler Reduction*
30% reduction for NFPA Sprinkler System[2]

30% reduction of 2250 Lpm = 675 Lpm
F = 2250 - 675 = 1,575 Lpm

4. *Separation Charge*

Face	Distance (m)	Charge				
West Side	0.00	25%				
East Side	0.00	25%				
North Side	6.20	20%				
South Side	12.50	15%				
	Total	85%	of	2,250	=	1,913 Lpm

F = 1575 + 1913
F = 3,488 Lpm (2,000 Lpm < F < 45,000 Lpm; OK)
F = 920 US GPM

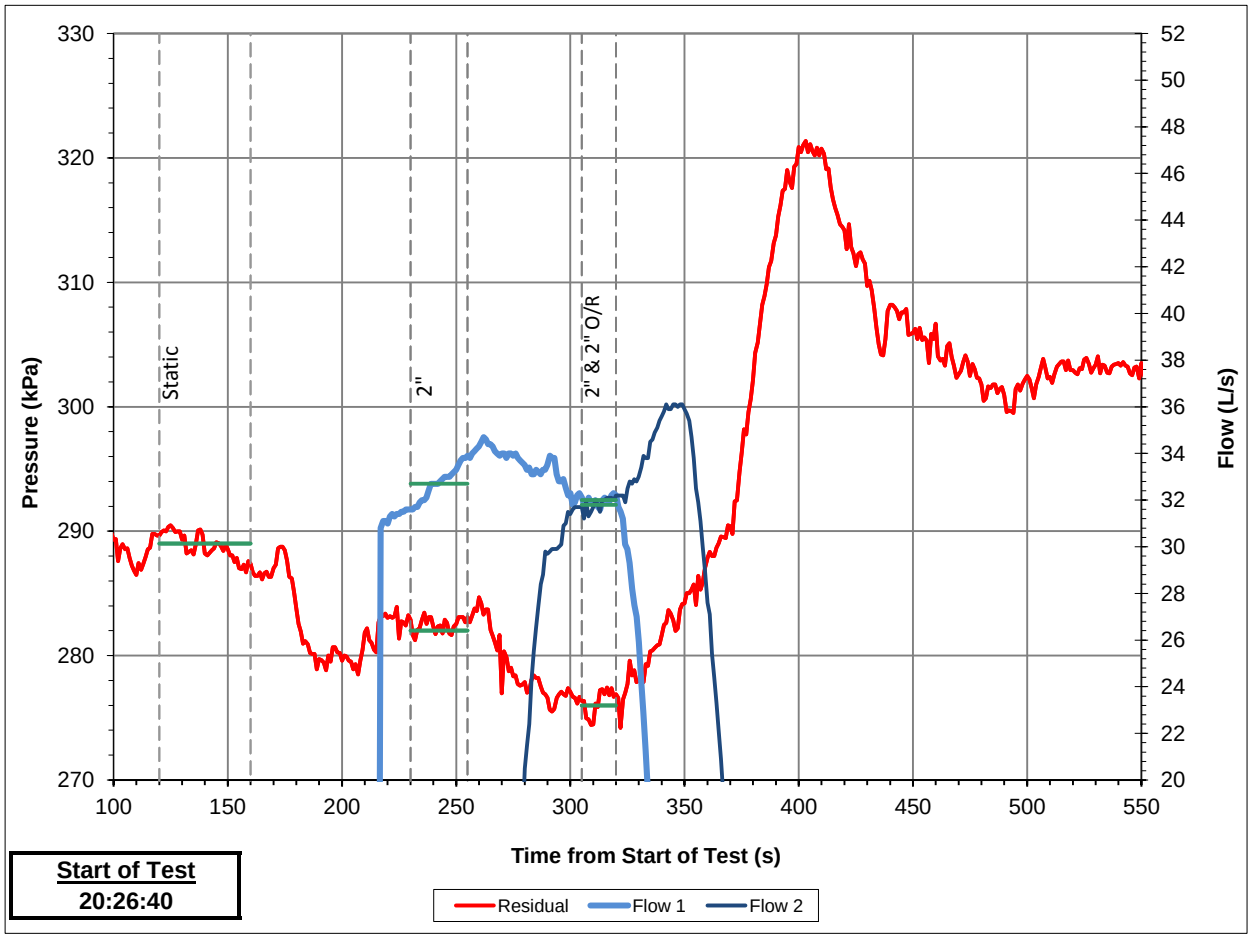
Notes

1. If vertical openings and exterior vertical communications are properly protected, (one hour rating) consider only the area of the largest floor plus 25 % of each of the two immediately adjoining floors.
2. Sprinkler protection.

APPENDIX

C HYDRANT FLOW TEST RESULTS

Test 01 - 60 Yorkville Ave.



Subject Watermain Details				Subject Hydrant Details	
Diameter:	300 mm	**Material:**	PVC	**Residual:**	HY1363290
Area:	0.071 m2			**Flow Hydrant 1:**	HY1363325
				Flow Hydrant 2:	

TABLE A: TESTED PRESSURES AND FLOWS

Point	Time		Residual 1		Flow Hydrant (HY1363325)				Total Flow		Velocity
			S3 on Residual:		Port 1 (S1)		Port 2 (S2)				
	Start	Finish	(kPa)	(psi)	(L/s)	(GPM)	(L/s)	(GPM)	(L/s)	(GPM)	(m/s)
Static	120	160	289	41.9	0.0	0	0.0	0	0.0	0	0.0
2"	230	255	282	40.9	32.7	518	0.0	0	32.7	518	0.5
2"			0	0.0	0.0	0	0.0	0	0.0	0	0.0
1" + 2"			0	0.0	0.0	0	0.0	0	0.0	0	0.0
2" + 2"	305	320	276	40.0	32.0	507	31.8	504	63.6	1008	0.9

60 Yorkville Ave.

HYDRANT FLOW TEST RESULTS

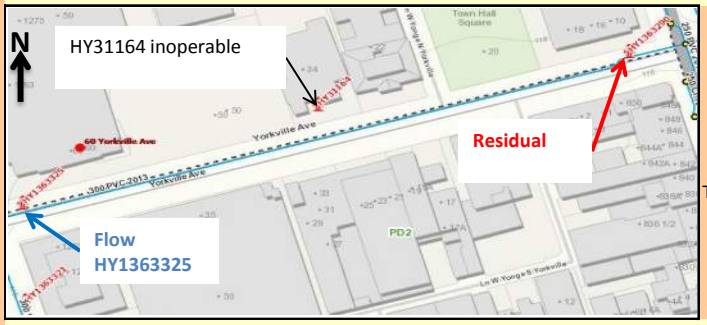
Date: 04/May/18 Time: 20:26 (hh/mm)

Tested By: Jovan

Municipality: City of Toronto

Operator: Joe, Sasha

Test No: **01**



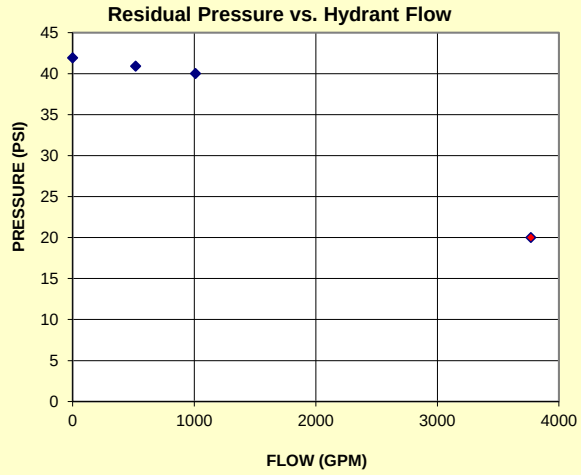
Conditions before Test (STATIC)

Residual Hydrant:	41.9 psi	289 kPa
Hydrant that will Flow:	41.9 psi	289 kPa
Δ pressure:	0.0 psi	0 kPa
Elevation Difference: (Flow El. - Residual El.)	0.0 ft	0.0 m

Test Notes:

TEST		TEST FLOW		RESIDUAL PRESSURE (psi)		Minimum Residual P_r (psi)	Fire Flow at Minimum Residual, Q_r (USGPM)	Fire Flow at Minimum Residual, Q_r (L/s)	3% Pressure Drop Achieved?
Port Size (in)	Nozzle Pressure (psi)	(USGPM)	(L/s)	Monitoring Hydrant	Flow Hydrant (Corrected) *				
STATIC	n/a	0	0	41.9	41.9				
Single Port Tests									
2	11.0	518.0	32.7	40.9	40.9	20	2720	172	NO
2						20			
Two Port Test									
1						20			
2									
Two Port Test									
2	10.4	504.0	31.8	40	40.0	20	3769	238	YES
2	10.6	507.0	32.0						

* Pressure correction is equal to the elevation difference. Column 2 (and Table A) show the nozzle pressure while flowing.



Results			
Static Pressure		Flow at 20 psi (140kPa)*	
(psi)	(kPa)	(gpm)	(L/s)
41.9	289	3800	240

* Results carried to nearest 50 gpm or 100 gpm if over 1000 gpm

Hydrant Classification as per NFPA 291			
Class	AA	Color	BLUE

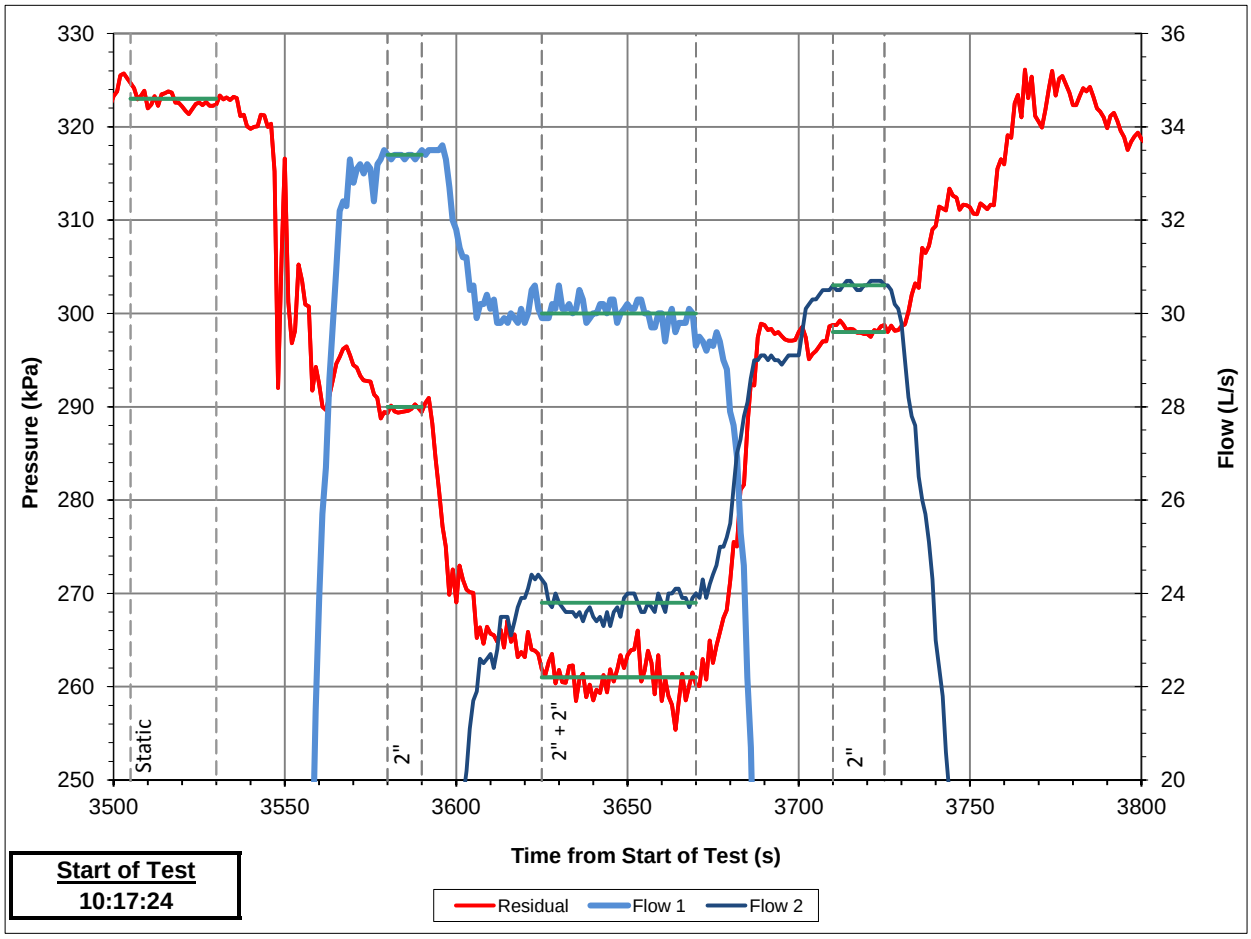
Water Discharged During Test:	6800 L

Rounded up to closest 100L

DISCLAIMER FOR FIRE FLOW TESTS

While WSP makes every effort to ensure that the information contained herein is accurate and up to date, WSP is not responsible for unintended or incorrect use of the data and information described and/or contained herein. The user must make his/her own determination as to its accuracy and suitability. The information is representative for a dynamic water system that may change over time.

Test 2 - 70 Cumberland St. (HY1363276)



Subject Watermain Details

Diameter:		**Material:**	N/A
Area:	N/A		

Subject Hydrant & Valve Details

Residual:	HY1363276
Flow Hydrant:	HY1363287

TABLE A: TESTED PRESSURES AND FLOWS

Point	Time		Residual		Flow Hydrant (HY1363287)				Total Flow		Velocity
			S3 on Residual:		Port 1 (S1)		Port 2 (S2)				
	Start	Finish	(kPa)	(psi)	(L/s)	(GPM)	(L/s)	(GPM)	(L/s)	(GPM)	(m/s)
Static	3505	3530	323	46.8	0.0	0	0.0	0	0.0	0	N/A
2"	3580	3590	290	42.1	33.4	529	0.0	0	33.4	529	N/A
2"	3710	3725	298	43.2	0.0	0	30.6	485	30.6	485	N/A
1" + 2"			0	0.0	0.0	0	0.0	0	0.0	0	N/A
2" + 2"	3625	3670	261	37.9	30.0	476	23.8	377	53.8	853	N/A

70 Cumberland St. (HY1363276)

HYDRANT FLOW TEST RESULTS

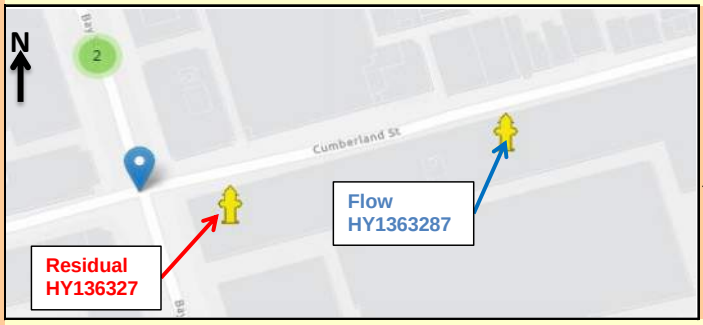
Date: 27/May/19 Time: 10:17 (hh/mm)

Municipality: City of Toronto

Operator: Bill

Tested By: Jovan

Test No: **2**



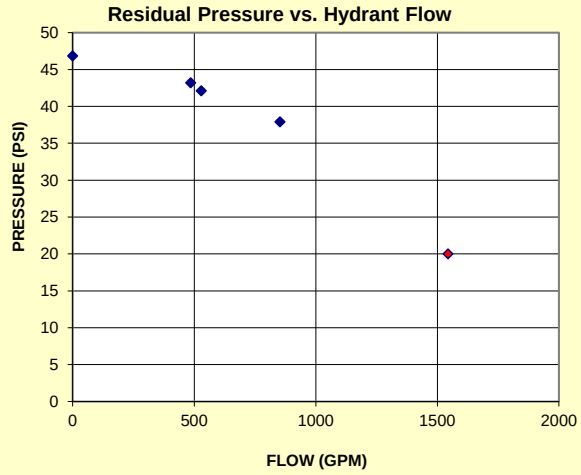
Conditions before Test (STATIC)

Residual Hydrant:	46.8 psi	323 kPa
Hydrant that will Flow:	46.8 psi	323 kPa
Δ pressure:	0.0 psi	0 kPa
Elevation Difference: (Flow El. - Residual El.)	0.0 ft	0.0 m

Test Notes:

TEST		TEST FLOW		RESIDUAL PRESSURE (psi)		Minimum Residual P_r (psi)	Fire Flow at Minimum Residual, Q_r (USGPM)	Fire Flow at Minimum Residual, Q_r (L/s)	19% Pressure Drop Achieved?
Port Size (in)	Nozzle Pressure (psi)	(USGPM)	(L/s)	Monitoring Hydrant	Flow Hydrant (Corrected) *				
STATIC	n/a	0	0	46.8	46.8				
Single Port Tests									
2	11.5	529.0	33.4	42.1	42.1	20	1348	85	NO
2	9.7	485.0	30.6	43.2	43.2	20	1425	90	NO
Two Port Test									
1						20			
2									
Two Port Test									
2	5.8	377.0	23.8	37.9	37.9	20	1544	97	YES
2	9.3	476.0	30.0						

* Pressure correction is equal to the elevation difference. Column 2 (and Table A) show the nozzle pressure while flowing.



Results			
Static Pressure		Flow at 20 psi (140kPa)*	
(psi)	(kPa)	(gpm)	(L/s)
46.8	323	1500	95

* Results carried to nearest 50 gpm or 100 gpm if over 1000 gpm

Hydrant Classification as per NFPA 291			
Class	A	Color	GREEN

Water Discharged During Test:	7900 L

Rounded up to closest 100L

DISCLAIMER FOR FIRE FLOW TESTS

While WSP makes every effort to ensure that the information contained herein is accurate and up to date, WSP is not responsible for unintended or incorrect use of the data and information described and/or contained herein. The user must make his/her own determination as to its accuracy and suitability. The information is representative for a dynamic water system that may change over time.

WSP HYDRANT FLOW TEST PROCEDURE

Data Collection

To achieve the highest accuracy that is practically possible, WSP Canada Inc. (WSP) uses the latest generation of pitotless nozzle (nozzle), which allows for very steady flow readings. An Additel 681 digital pressure logger or a Huba Control pressure sensor coupled with a Cla-Val E-log or datalogger is used to record flows throughout the test, allowing for a flow accuracy of +/- 0.2 L/s and +/- 0.6 L/s on the 1" and 2" nozzles, respectively.

Residual pressures will be logged at a neighbouring hydrant using the same sensor-logger combination. If a suitable residual hydrant is not available, a sensor-logger pair is installed on an external hose bib of an adjacent property.

After energising and flushing the residual hydrants, sensors with data loggers will be plumbed to the residual hydrant ports. Sensors will remain on the hydrants for the duration of the test to record pressure data.

Figure 1 shows the setup of the flow measurement kit. A gate valve is attached to each of the hydrant ports as well as a fire hose directing flow to the nozzle and diffuser. The nozzle diameters contract from 2.5" down to sizes of 1" and 2"; for a given flow rate, the contraction creates a given pressure. Pressures are conveyed through a sensing line that runs from each nozzle to the pressure measurement housing. The pressure measurement housing plumbs to a sight gauge, a pressure sensor, and a bleed valve.

One data logger is used per flowing port to measure the pressure from the nozzle sensing lines; this pressure data is later converted to flow and plotted overtop of residual pressures.

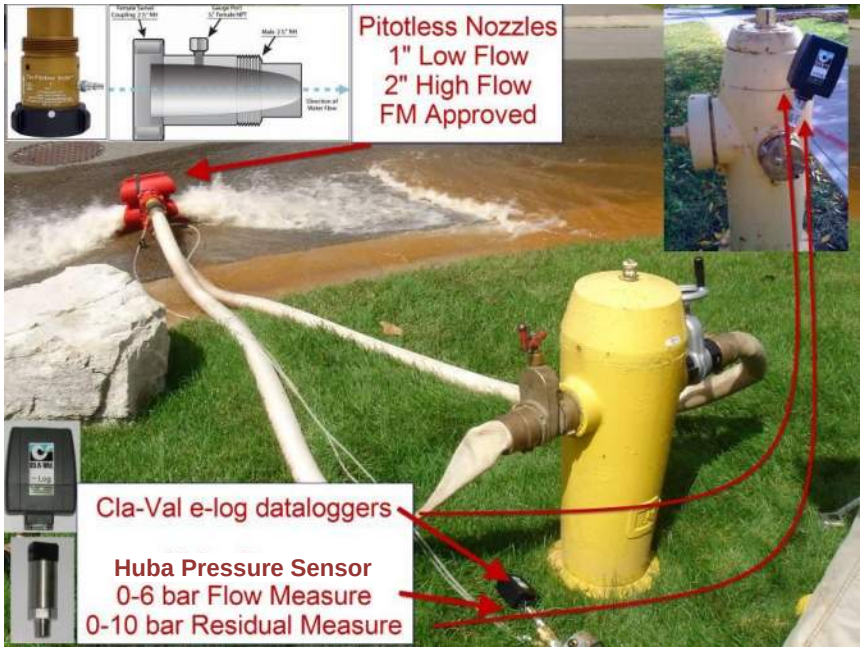


Figure 1 - Flow Measurement Kit

Depending on watermain capacity, each test can provide up to four (4) separate data points: flow through 1", 2", 1" & 2" and 2" & 2" nozzles. These four points in turn produce four separate flow vs pressure points which are used to extrapolate the capacity of the hydrant.

Analysis

Figure 2 provides an example Results Summary Sheet. The graph shown on **Figure 2** shows three (3) data series: pressure at the residual hydrant shown in red, as well as the two flow nozzle pressure data

converted into nozzle flows shown in dark blue and light blue. Information that can be taken from Figure 2 includes:

A. **Static Pressure:** A stable static pressure reading is taken at the beginning of every test.

B. **Initial Hydrant Flushing:** Every energised hydrant is flushed to remove stagnant water from the hydrant lateral and keep it from entering the system. For the instance shown on the graph, the initial flushing of the flow hydrant appears as a small transient pressure at nearby residual hydrants.

C. **Transient Event – 1 X 2" Nozzle Flow:** The first gate valve is opened to allow 2" nozzle flow.

D. **Data Point – 2" Nozzle:** Pressures and flow are allowed to stabilise to ensure an accurate reading. The readings are taken as the averages across the reading window, shown on the graph as horizontal green lines.

E. **Transient Event – 2 X 2" Nozzle Flows:** The second gate valve is opened to allow 2" nozzle flow. Opening the valve slowly minimises the magnitude of pressure drops and fluctuations.

F. **Data Point – 2" & 2" Nozzle Flows:** Following a stabilisation period, the averages for the flows and pressures are again taken across the reading window. Note that variations between the two ports are typically caused by the discharge hose arrangement.

G. **Transient Event – one 2" Nozzle Closed:** The first gate valve is closed to allow a second 2" port test to take place.

H. **Data Point – Second 2" Nozzle Flow:** Following a stabilisation period, readings are averaged for flow and residual pressures, shown again by the horizontal green line.

I. **Transient Event – Closing of 2" Nozzles:** Second gate valves is gradually closed to avoid large upsurges throughout the system. Despite efforts to avoid upsurges, small pressure spikes are registered at residual hydrants, which highlight the importance of slow valve operation.

J. **Test Data Transferred to Worksheet:** The data points are summarized and prior to transferring to the Hydrant Test Worksheet.

K. **Test Details:** The heading of the backside of the results sheet provides general details of the test such as Date, Time, Municipality, Municipal Operator, WSP Staff and Test Number.

L. **Test Map:** Operations map snapshots provides location of flowing and residual pressure hydrants.

M. **Extrapolated Flow:** Flow is extrapolated to 20 psi according to NFPA 291 by the following equation:

$$Q_R = Q_F \times \frac{h_r^{0.54}}{h_f^{0.54}}$$

Where: Q_R=flow predicted at desired residual pressure
Q_F=total flow measured during test
h_r=pressure drop to desired residual pressure
h_f=pressure drop measured during test

N. **Pressure Drop:** The percent pressure drop is determined and only either the point with the greatest percentage drop or the average of all drops greater than 25% are used extrapolate to 20 psi (140kPa) for hydrant grading purposes.

O. **Hydrant Curve:** The tested points are plotted on a pressure vs Flow graph. The rating point is also shown on the curve.

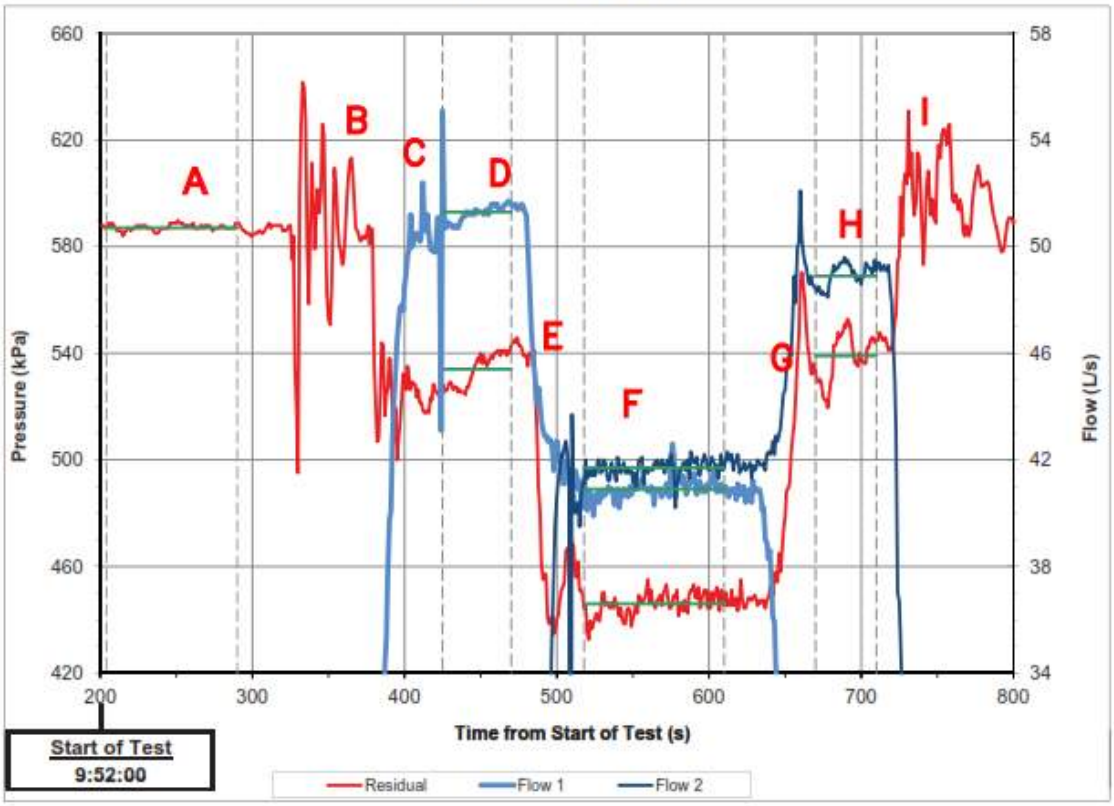
P. **NFPA clasification:** The final test results show both the static pressure and the rated flow with the associated NFPA 291 classification and colour coding according to the following table.

Hydrant Marking		Range (gpm)		Range (L/s)	
class	Color	min	max	min	max
Class AA	Blue	1500	1000000	94.6	63090.2
Class A	Green	1000	1499	63.1	94.5
Class B	Orange	500	999	31.5	63.0
Class C	Red	0	500	0	31.5

Q. **Water Discharged During Test:** This number is approximate and calculated using the data acquired from the flow data logger. It is possible that more or less water was flowed; however this provides a good approximation.

FIGURE 2: Example Test Sheet

TEST 04 - Byron St H4100



Subject Watermain Details			
Diameter:	150 mm	Material:	N/A
Area:	0.018 m2		

Subject Hydrant Details	
Flow Residual:	
Flow Hydrant 1:	H4100
Flow Hydrant 2:	

J

Point	Time		Residual 1		Flow Hydrant (H4100)				Total Flow		Velocity
			PL-1 on		Port 1 (<S1>)		Port 2 (<S2>)				
	Start	Finish	(kPa)	(psi)	(L/s)	(GPM)	(L/s)	(GPM)	(L/s)	(GPM)	(m/s)
Static	204	290	587	85.1	0.0	0	0.0	0	0.0	0	0.0
2"	425	470	534	77.5	51.3	813	0.0	0	51.3	813	2.9
2"	670	710	539	78.2	0.0	0	48.9	775	48.9	775	2.8
1" + 2"			0	0	0.0	0	0.0	0	0.0	0	0.0
2" + 2"	518	610	446	64.7	40.9	648	41.7	661	83.4	1322	4.7

FIGURE 2: Example Test Sheet (Con't)

Byron St H4100

HYDRANT FLOW TEST RESULTS

K

Date: 10/Jun/11 Time: 9:52 (hh/mm)

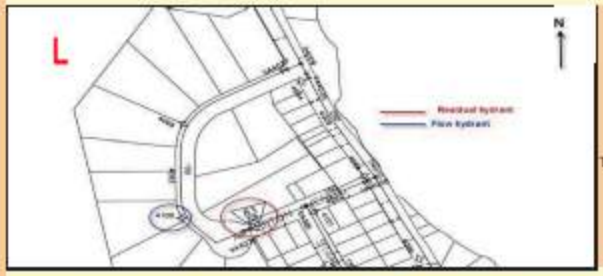
Municipality: Ballantrae - Stouffville

Operator: J. Redshaw

Tested By: A. Sinclair

Test No: 04

L



Initial Conditions

Pressure @ Residual:	85.1 psi	587 kPa
Pressure @ Flow:	85.1 psi	587 kPa
Δ pressure:	0.0 psi	0 kPa
Elevation Difference: (Flow El. - Residual El.)	0.0 ft	0.0 m

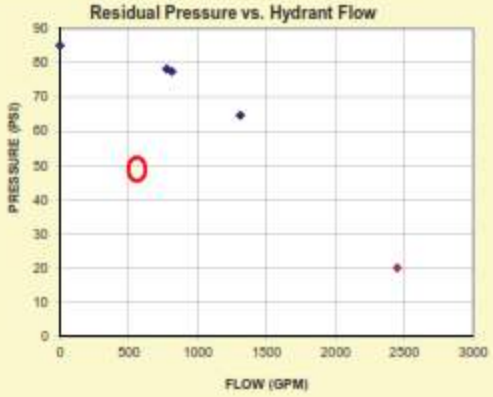
Test Notes:

M N

Nozzle		FLOW		RESIDUAL PRESSURE (psi)					
Size (in)	Pressure Flow Gauge (psi)	(USGPM)	(L/s)	Monitoring Hydrant	Flowing Hydrant*	Minimum Residual P. (psi)	Fire Flow at Minimum Residual, Q, (USGPM)	Fire Flow at Minimum Residual, Q, (L/s)	24% Pressure Drop Achieved?
STATIC		0	0	85.1	85.1				
Single Port Tests									
2	27.2	613.0	38.3	77.5	77.5	20	2567	163	NO
2	24.7	775.0	48.9	76.2	76.2	20	2597	164	NO
Two Port Test									
1						20			
2									
Two Port Test									
2	17.3	646.0	40.9	64.7	64.7	20	2446	154	YES
2	18	661.0	41.7						

*gain/loss in pressure due to elevation difference between flow & monitoring hydrants

O



Results			
Static Pressure		Flow at 20 psi (140kPa)*	
(psi)	(kPa)	(gpm)	(L/s)
85.1	587	2400	151

* Results carried to nearest 50 gpm or 100 gpm if over 1000 gpm

P

Hydrant Classification as per NFPA 291			
Class	AA	Color	BLUE

Water Discharged During Test:	21700 L

Rounded up to closest 100L

Q

DISCLAIMER FOR FIRE FLOW TESTS

While WSP makes every effort to ensure that the information contained herein is accurate and up to date, WSP is not responsible for unintended or incorrect use of the data and information described and/or contained herein. The user must make his/her own determination as to its accuracy and suitability. The information is representative for a dynamic water system that may change over time.

WSP Canada Inc. 800 Cochrane Drive, 5th Floor, Markham, Ontario L3R 5K3 111-15387-00 Tel.: (905) 475-7270

HYDRANT TEST SHEET CALCULATIONS

Methodology for Determining Discharge

NFPA 291 (2016) section 4.7.1 and 2 outlines the procedure for determining discharge. It states:

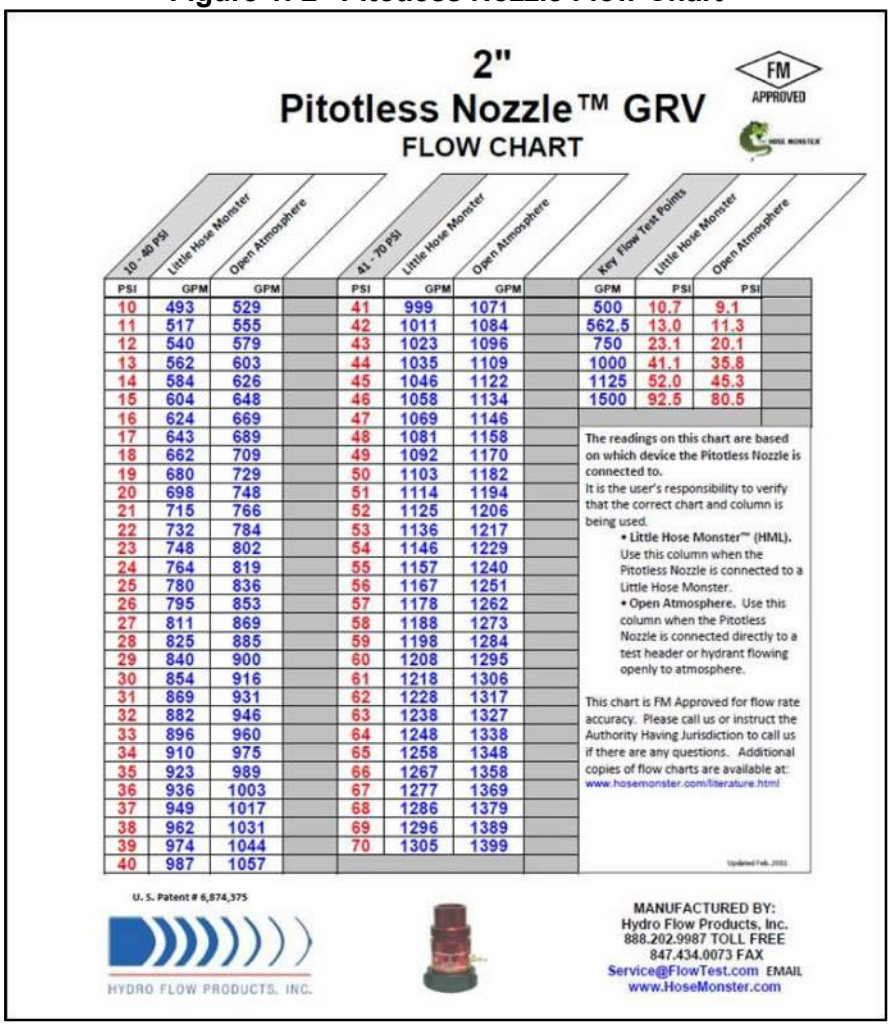
4.7.1 *"At the hydrants used for flow during the test, the discharge from the open butts are determined from measurements of the diameter of the outlets flowed, the pitot pressure (velocity head) of the streams as indicated by the pitot gauge readings, and the coefficient of the outlet being flowed.."*

4.7.2 *"If flow tubes (stream straighteners) are being utilized, a coefficient of 0.95 is suggested unless the coefficient of the tube is known."*

In our case, instead of a coefficient, our equipment supplier Hose Monster provides a chart that lists the flow rates at different pressures for their engineered 2" nozzle discharging through the Little Hose Monster diffuser, which is the set-up WSP uses. The chart is approved by FM Global (certified as FM approved) so the data can be relied upon.

The advantage of using this method to capture flow data is that it eliminates uncertainties associated with estimating hydrant discharge coefficients, especially since the internals of the hydrants are largely unknown. The chart is shown below:

Figure 1: 2" Pitotless Nozzle Flow Chart



2"
Pitotless Nozzle™ GRV
FLOW CHART

FM APPROVED

10 - 40 PSI			41 - 70 PSI			Key Flow Test Points		
	Little Hose Monster	Open Atmosphere		Little Hose Monster	Open Atmosphere		Little Hose Monster	Open Atmosphere
PSI	GPM	GPM	PSI	GPM	GPM	GPM	PSI	PSI
10	493	529	41	999	1071	500	10.7	9.1
11	517	555	42	1011	1084	562.5	13.0	11.3
12	540	579	43	1023	1096	750	23.1	20.1
13	562	603	44	1035	1109	1000	41.1	35.8
14	584	626	45	1046	1122	1125	52.0	45.3
15	604	648	46	1058	1134	1500	92.5	80.5
16	624	669	47	1069	1146			
17	643	689	48	1081	1158			
18	662	709	49	1092	1170			
19	680	729	50	1103	1182			
20	698	748	51	1114	1194			
21	715	766	52	1125	1206			
22	732	784	53	1136	1217			
23	748	802	54	1146	1229			
24	764	819	55	1157	1240			
25	780	836	56	1167	1251			
26	795	853	57	1178	1262			
27	811	869	58	1188	1273			
28	825	885	59	1198	1284			
29	840	900	60	1208	1295			
30	854	916	61	1218	1306			
31	869	931	62	1228	1317			
32	882	946	63	1238	1327			
33	896	960	64	1248	1338			
34	910	975	65	1258	1348			
35	923	989	66	1267	1358			
36	936	1003	67	1277	1369			
37	949	1017	68	1286	1379			
38	962	1031	69	1296	1389			
39	974	1044	70	1305	1399			
40	987	1057						

The readings on this chart are based on which device the Pitotless Nozzle is connected to.
It is the user's responsibility to verify that the correct chart and column is being used.

- **Little Hose Monster™ (HML).** Use this column when the Pitotless Nozzle is connected to a Little Hose Monster.
- **Open Atmosphere.** Use this column when the Pitotless Nozzle is connected directly to a test header or hydrant flowing openly to atmosphere.

This chart is FM Approved for flow rate accuracy. Please call us or instruct the Authority Having Jurisdiction to call us if there are any questions. Additional copies of flow charts are available at: www.hosemonster.com/literature.html

U. S. Patent # 6,874,375

HYDRO FLOW PRODUCTS, INC.

MANUFACTURED BY:
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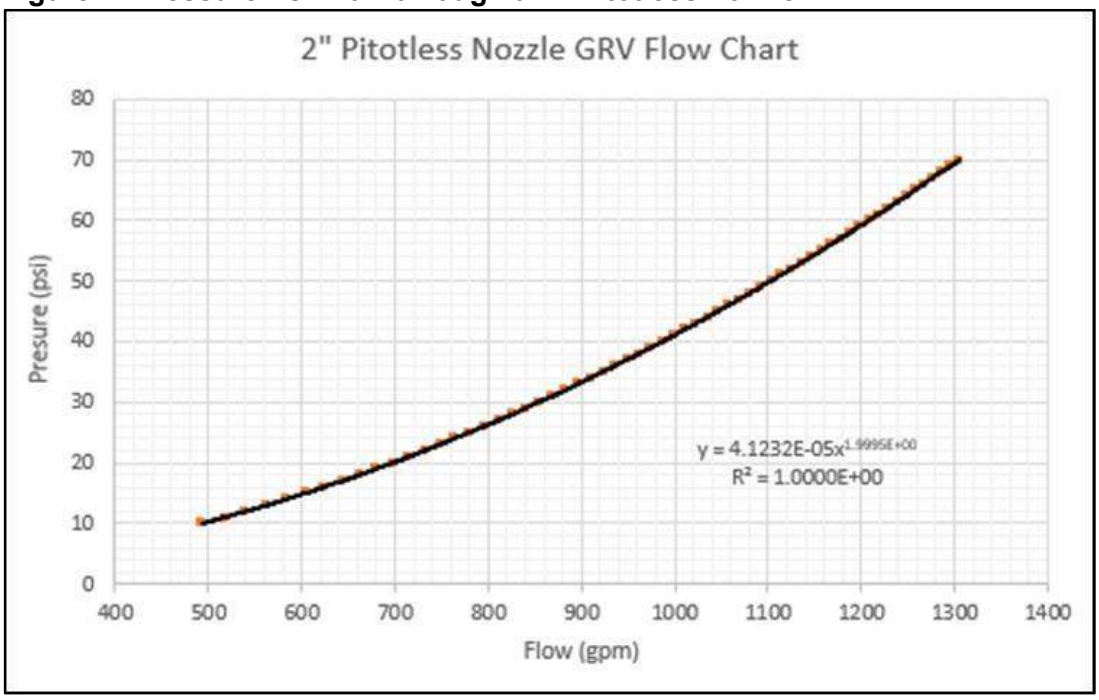
888.202.9987 TOLL FREE
847.434.0073 FAX
Service@FlowTest.com EMAIL
www.HoseMonster.com

When plotted in a graph, the chart yields the figure below:

Figure 2: Pressure Vs. Flow through a 2" Pitotless nozzle.



The resulting best fit trend line yields the following equation:

Eq. 1: $$y = 4.1232 \times 10^{-5}\, x^{1.9995}$$

Where: y = pressure in psi
x = flow in gpm

This equation can be used to calculate the flows through the nozzle based on the discharge pressure.

Calculation for Flow at 20 psi

According to the 2016 edition of the NFPA 291, section 4.10.1.2, the formula below can be used to compute the discharge at the specified residual pressure; typically 20psi (140kPa):

Eq. 2: $$Q_R = Q_F \times \frac{h_r^{0.54}}{h_f^{0.54}}$$

Where: Q_R = flow predicted at desired residual pressure, I.e. flow at 20psi.
Q_F = total flow measured during the test.
h_r = pressure drop to desired residual pressure.
h_f = pressure drop measured during the test.

With the above information we can verify the results from the hydrant test sheets.

TEST 1 – Hydrant Test on Rymal Road.

This section outlines the procedure for calculating the values shown in the data sheet below. Note that you may observe slight variances in the calculated values; while the sheet displays

suppressed decimal places, the most precise values, which are often up to several decimal places are used in the calculations.

The single port test is repeated. These are two (2) separate tests (flows should not be added), whereas the two-port test has two ports flowing simultaneously so the two flows should be added.

Figure 3: Rymal Road Calculation Sheet Data table

Nozzle		FLOW		RESIDUAL PRESSURE (psi)		Minimum Residual P, (psi)	Fire Flow at Minimum Residual, Q, (USGPM)	Fire Flow at Minimum Residual, Q, (L/s)	3% Pressure Drop Achieved?
Size (in)	Pressure Flow Gauge (psi)	(USGPM)	(L/s)	Monitoring Hydrant	Flowing Hydrant*				
STATIC		0	0	64.1	64.1				
Single Port Tests									
2	19.1	682.0	43.0	63.8	63.8	20	9977	629	NO
2	19.1	682.0	43.0	63.8	63.8	20	9977	629	NO
Two Port Test									
1						20			
2									
Two Port Test									
2	16.9	642.0	40.5	61.8	61.8	20	6318	399	YES
2	16.9	642.0	40.5						

Calculations for Discharge

Equation 1 can be used to calculate the discharge flow rates through the nozzle. Using the values from b) below as an example, we get the following:

$\boldsymbol{y = 4.123 \times 10^{-5}\, X^{1.9995}}$

$\boldsymbol{19.1 = 4.123 \times 10^{-5}\, X^{1.9995}}$

$\boldsymbol{\therefore X = 682\ gpm}$

a) Static pressure (flow = 0 gpm) = 64.1 psi

b) Single port test 1; pressure at nozzle = 19.1 psi
   Flow (Q_F) = 682 gpm

c) Single port test 2; pressure at nozzle = 19.1 psi
   Flow (Q_F) = 682 gpm

d) Two port test; pressure at nozzle 1 = 16.9 psi
   Flow = 641 gpm
   Two port test; pressure at nozzle 2 = 16.9 psi
   Flow = 641 gpm
   Total flow measured during two port test (Q_F) = 641 + 641 = 1282 gpm

Theoretical flows at 20 psi

We can use Equation 2 to calculate the theoretical flows at 20psi. Using values from a) and b) above, we have:

Q_F = 682 gpm
h_r = 44.1 psi (static pressure at 64.1 psi – 20 psi)
h_f = 0.3 psi (static pressure at 64.1 psi – 63.8 psi residual pressure)

$$Q_R = Q_F \times \frac{h_r^{0.54}}{h_f^{0.54}}$$

$$= 682 \times \left(\frac{44.1}{0.3}\right)^{0.54}$$

$$= 10,096\ gpm \approx 636\ L/s$$

Following this procedure, the calculated theoretical flows at 20 psi for each test is as follows:

b) Single port test 1 = 10,096 gpm (636 L/s)
c) Single port test 2 = 10,096 gpm (636 L/s)
d) Two port test = 6,317gpm (399 L/s)

TEST 2 – Hydrant Test on Dakota Boulevard.

Figure 3: Dakota Boulevard Calculation Sheet Data table

Nozzle		FLOW		RESIDUAL PRESSURE (psi)		Minimum Residual P, (psi)	Fire Flow at Minimum Residual, Q, (USGPM)	Fire Flow at Minimum Residual, Q, (L/s)	3% Pressure Drop Achieved?
Size (in)	Pressure Flow Gauge (psi)	(USGPM)	(L/s)	Monitoring Hydrant	Flowing Hydrant*				
STATIC		0	0	63.7	63.7				
Single Port Tests									
2	20.4	705.0	44.5	62.2	62.2	20	4398	277	NO
2	18.2	666.0	42.0	63.4	63.4	20	10349	653	NO
Two Port Test									
1						20			
2									
Two Port Test									
2	15.2	609.0	38.4	61.5	61.5	20	6219	392	YES
2	15.8	621.0	39.2						

Using the aforementioned procedure for calculating the theoretical flows at 20psi, for the two port test we get:

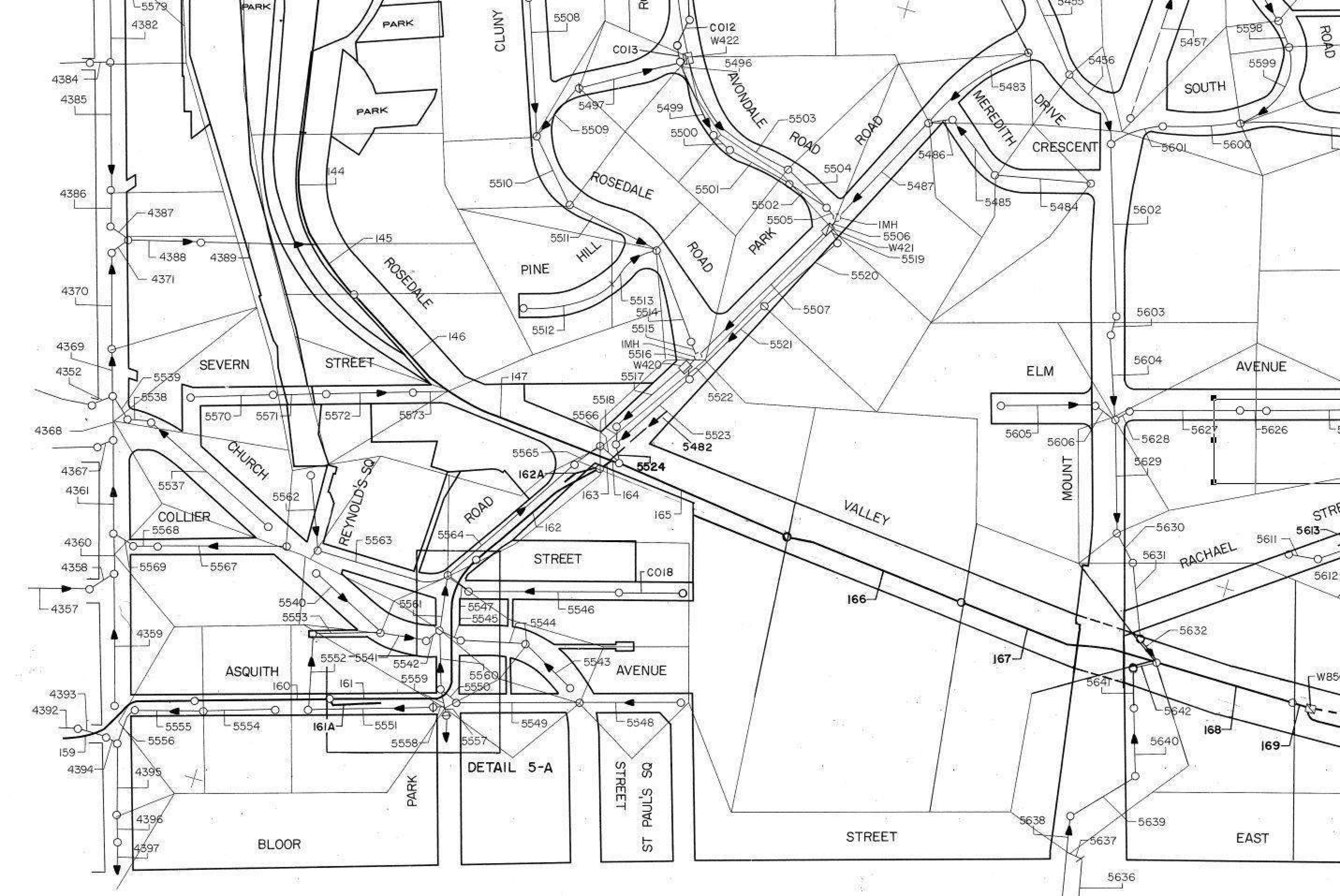
Total flow measured during two port test (Q_F) = 608 + 620 = <u>1228 gpm</u>

Theoretical flow at 20psi = 6168gpm (389 L/s)
These results serve to verify the correctness of WSP's calculation sheets.

Although a pressure drop of 25% would be ideal for extrapolation purposes as per NFPA 291, 4.3.6, it may not be practical to flow more than one hydrant at a time due to the volume of water being discharged, as well as the operator's comfort level and available staff/equipment. As a result, we use the condition of largest flow and greatest pressure (two port test) drop with the understanding that the available flow at 140kPa is an extrapolated estimate from the observed test conditions. The two port test typically yields a much lower extrapolated flow at 20psi than the single port test.

APPENDIX

D CITY OF TORONTO DORSCH MODEL SHEETS & SEWER ATLAS MAPS



DETAIL 5-A
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CLUNY
AVONDALE ROAD
ROAD
PARK ROAD
ROSEDALE ROAD
ROSEDALE
PINE HILL
MEREDITH CRESCENT
DRIVE
SOUTH
ROAD
SEVERN STREET
CHURCH
COLLIER
REYNOLD'S SQ
ROAD
STREET
ASQUITH AVENUE
BLOOR STREET EAST
PARK
ST PAUL'S SQ
STREET
VALLEY
ELM AVENUE
MOUNT
RACHAEL
IMH
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W420
W422
C012
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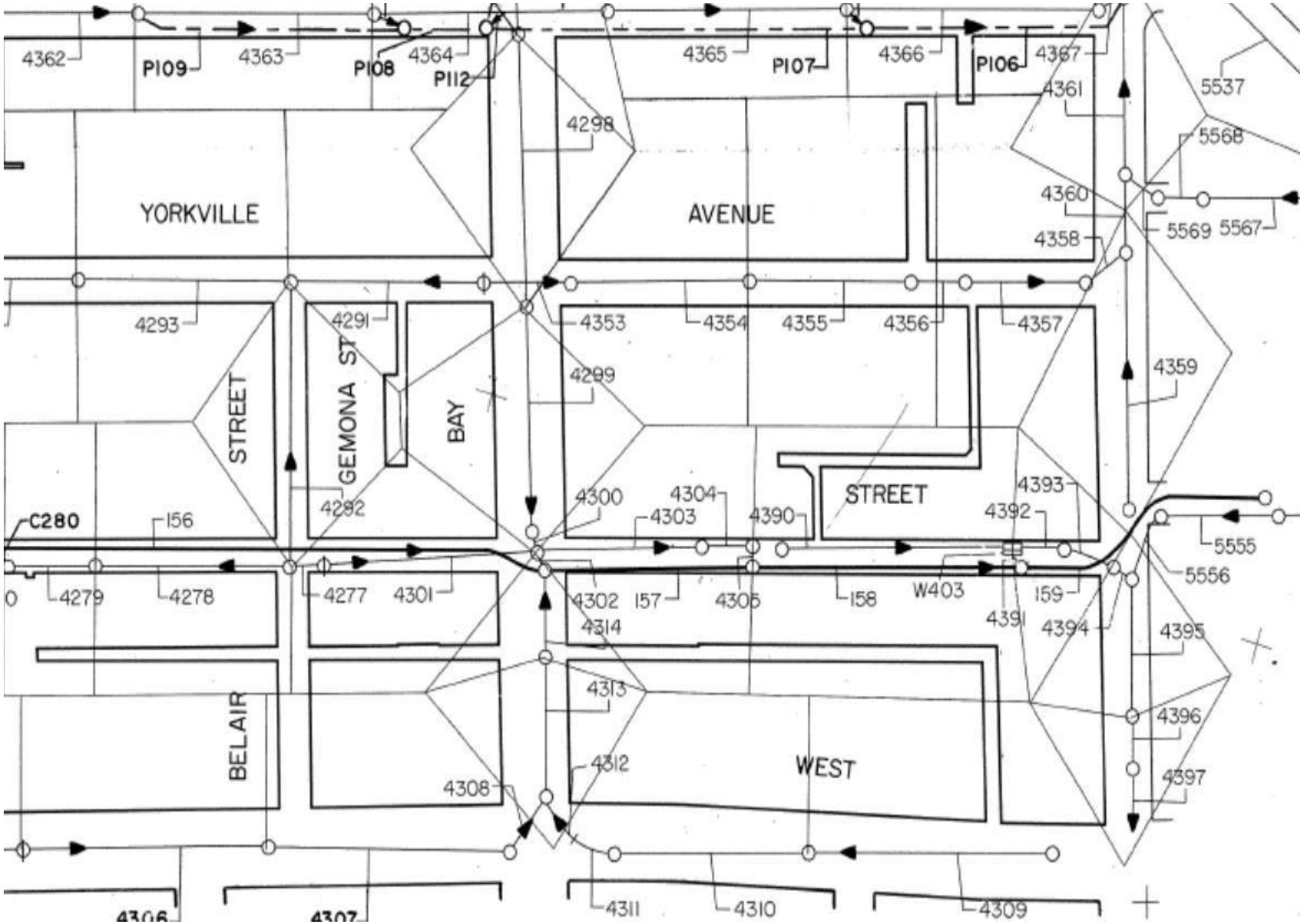
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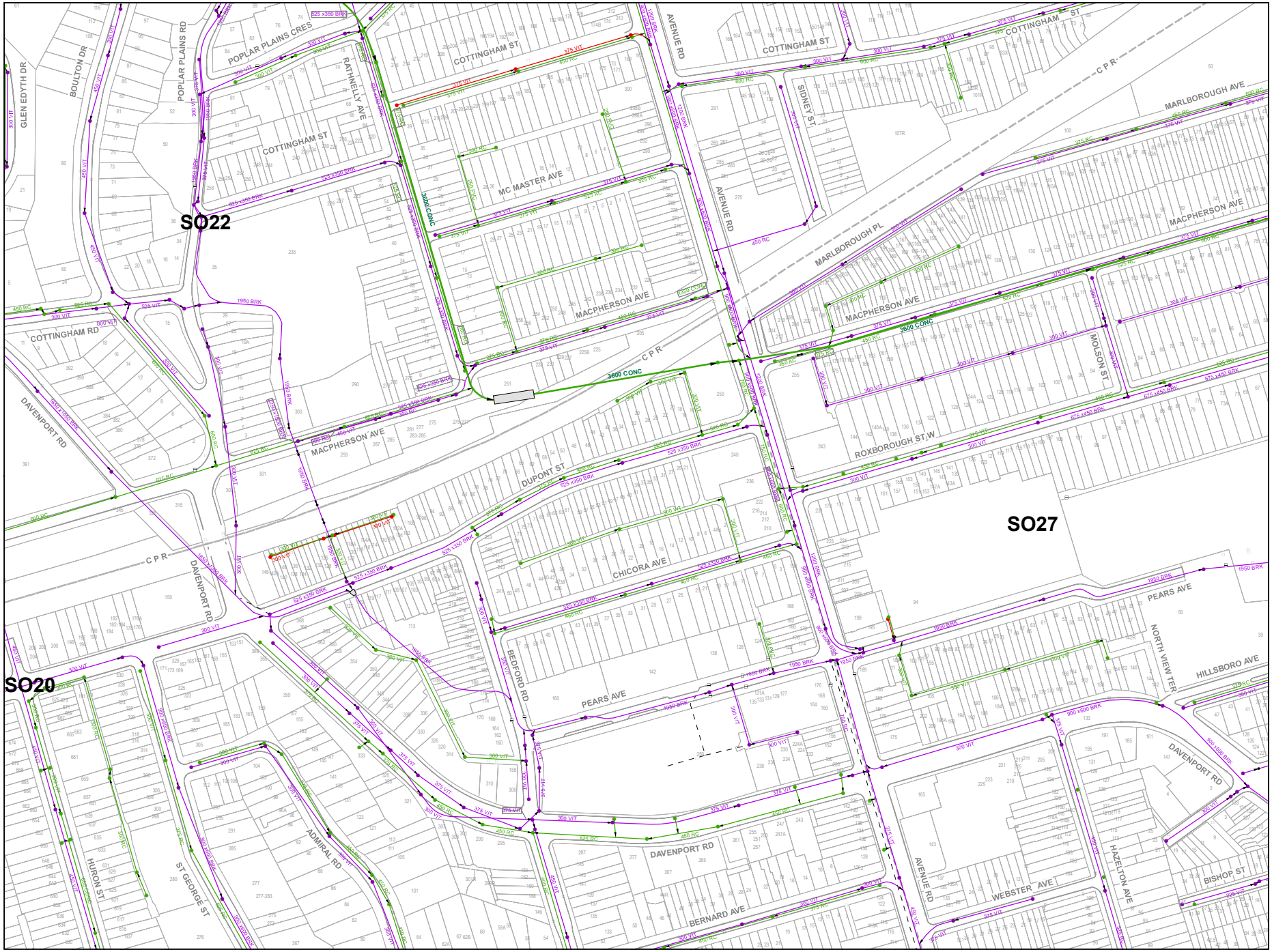
SOUTH CALCULATION AREA

```
 4356  CIRCULAR          0.69/0.69  INFLOW  4355                OUTFLOW  4357          B.NO.  86700                EXIST. COMB.0004356
       YU 112.238  YL 112.165   QF   532   DQ       0   QDLM    1  VNIGHT0.22  DUC   0.14   DLC   0.18   QLM    366   CAP 0000165
       SU 116.048  SL 116.142   AF 0.373   DQD    0.0   HDLM 0.02  HNIGHT0.00  DUS  -2.98   DLS  -3.10   RAIN   8MS2   QLM/8600069
+
       RES     44  A     0.0    VF  1.42   GAMMA 0.93   VDLM 0.30  VNORM 0.0   HUM   0.83   HLM   0.87   QRQLM  366   DY  0000007
       IW     0.0  L     20.4   S  1/ 280   N   0.0130  SCOD 004   DWB   0.0   YUM 113.06   YLM 113.04   VLM   1.43   DH  0000005
+

 4357  CIRCULAR          0.69/0.69  INFLOW  4356                OUTFLOW  4358          B.NO.  86700                EXIST. COMB.0004357
       YU 112.147  YL 111.958   QF   596   DQ     144   QDLM    1  VNIGHT0.25  DUC   0.20   DLC   0.32   QLM    479   CAP 0000117
       SU 116.142  SL 116.155   AF 0.373   DQD    0.3   HDLM 0.02  HNIGHT0.00  DUS  -3.10   DLS  -3.18   RAIN   8MS2   QLM/8600080
+
       RES     44  A     0.54   VF  1.60   GAMMA 0.93   VDLM 0.35  VNORM 0.0   HUM   0.89   HLM   1.01   QRQLM  478   DY  0000019
       IW     0.0  L     42.1   S 1/ 223   N   0.0130  SCOD 004   DWB   0.0   YUM 113.04   YLM 112.97   VLM   1.65   DH  0000012
+

 4358  CIRCULAR          0.69/0.69  INFLOW  4357                OUTFLOW  4360          B.NO.  86700                EXIST. COMB.0004358
       YU 111.918  YL 111.830   QF   669   DQ       0   QDLM    1  VNIGHT0.28  DUC   0.36   DLC   0.42   QLM    469   CAP 0000200
       SU 116.155  SL 116.249   AF 0.373   DQD    0.0   HDLM 0.02  HNIGHT0.00  DUS  -3.18   DLS  -3.31   RAIN   8MS2   QLM/8600070
+
       RES     44  A     0.0    VF  1.79   GAMMA 0.93   VDLM 0.38  VNORM 0.0   HUM   1.05   HLM   1.11   QRQLM  468   DY  0000009
       IW     0.0  L     15.5   S 1/ 177   N   0.0130  SCOD 004   DWB   0.0   YUM 112.97   YLM 112.94   VLM   1.35   DH  0000006

 4359  CIRCULAR          0.38/0.38  INFLOW                    - OUTFLOW  4360          B.NO.  85630                EXIST. COMB.0004359
       YU 112.707  YL 112.079   QF   160   DQ     130   QDLM    0  VNIGHT0.22  DUC  -0.07   DLC   0.51   QLM    111   CAP 0000049
       SU 116.109  SL 116.249   AF 0.113   DQD    0.2   HDLM 0.01  HNIGHT0.00  DUS  -3.10   DLS  -3.28   RAIN   8MS2   QLM/8600069
+
       RES     32  A     0.45   VF  1.41   GAMMA 1.00   VDLM 0.25  VNORM 0.0   HUM   0.31   HLM   0.89   QRQLM  111   DY  0000063
       IW     0.0  L     80.5   S 1/ 128   N   0.0130  SCOD 004   DWB   0.0   YUM 113.01   YLM 112.97   VLM   1.29   DH  0000059

 4360  CIRCULAR          0.69/0.69  INFLOW  4359  4358          OUTFLOW  4361          B.NO.  85640                EXIST. COMB.0004360
   *   YU 111.772  YL 111.689   QF   489   DQ       0   QDLM    1  VNIGHT0.20  DUC   0.45   DLC   0.45   QLM    568   CAP 0000078
       SU 116.249  SL 116.219   AF 0.373   DQD    0.0   HDLM 0.02  HNIGHT0.01  DUS  -3.34   DLS  -3.39   RAIN   8MS2   QLM/8601016
+
       RES     32  A     0.0    VF  1.31   GAMMA 1.00   VDLM 0.31  VNORM 0.0   HUM   1.14   HLM   1.14   QRQLM  567   DY  0000008
       IW     0.0  L     27.4   S 1/ 330   N   0.0130  SCOD 004   DWB   0.0   YUM 112.91   YLM 112.83   VLM   1.52   DH  0000000

 4361  CIRCULAR          0.77/0.76  INFLOW  4360  5569          OUTFLOW  4368          B.NO.  85650                EXIST. COMB.0004361
   *   YU 111.625  YL 111.345   QF   819   DQ      83   QDLM    1  VNIGHT0.28  DUC   0.44   DLC   0.60   QLM    635   CAP 0000184
       SU 116.219  SL 115.725   AF 0.453   DQD    0.1   HDLM 0.02  HNIGHT0.00  DUS  -3.39   DLS  -3.02   RAIN   8MS2   QLM/8600078
+
       RES     32  A     0.29   VF  1.81   GAMMA 1.00   VDLM 0.39  VNORM 0.0   HUM   1.20   HLM   1.36   QRQLM  634   DY  0000028
       IW     0.0  L     55.2   S 1/ 197   N   0.0130  SCOD 004   DWB   0.0   YUM 112.83   YLM 112.70   VLM   1.86   DH  0000015

 4362  CIRCULAR          0.38/0.38  INFLOW                    OUTFLOW  4363  P109    B.NO.  69670                EXIST. COMB.0004362
   *   YU 114.207  YL 113.902   QF   112   DQ     169   QDLM    0  VNIGHT0.15  DUC  -0.10   DLC   0.03   QLM    162   CAP 0000049
       SU 116.417  SL 116.682   AF 0.113   DQD    0.5   HDLM 0.02  HNIGHT0.00  DUS  -1.93   DLS  -2.37   RAIN   8MS2   QLM/8601045
+
       RES     53  A     0.81   VF  0.99   GAMMA 0.70   VDLM 0.27  VNORM 0.0   HUM   0.28   HLM   0.41   QRQLM  162   DY  0000031
       IW     0.0  L     79.3   S 1/ 260   N   0.0130  SCOD 001   DWB   0.0   YUM 114.48   YLM 114.32   VLM   1.43   DH  0000014
```

Contractions used in HVM output...

1st line: pipe number, cross-section, pipe size...width/height(m), inflow and outflow pipes, block number, sewer type, pipe no.

2nd line: YU, YL = upper and lower invert elevations (m)



Toronto Sewer Atlas

Manhole
- Combined
- Dual
- Sanitary
- Storm
- Foundation

Control Manhole
- Combined
- Dual
- Sanitary
- Storm

Outfall
- Outfall

Sewer Pump Station
- Sewer Pump Station

Catchbasin
- Other
- Twin Inlet Catchbasin

Sewer
- Foundation Drain
- Combined
- Sanitary
- Storm
- Combined Trunk
- Sanitary Trunk
- Storm Trunk
- Abandoned Sewer
- River
- Highway
- Curb
- Large Chamber
- Wards Boundary

0 50 100 150 200 Metres

Third Edition
Date: 01/09/2010

General Notes:
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- These maps are for planning purpose only and must not be used for construction, or as a replacement for a utility locate.
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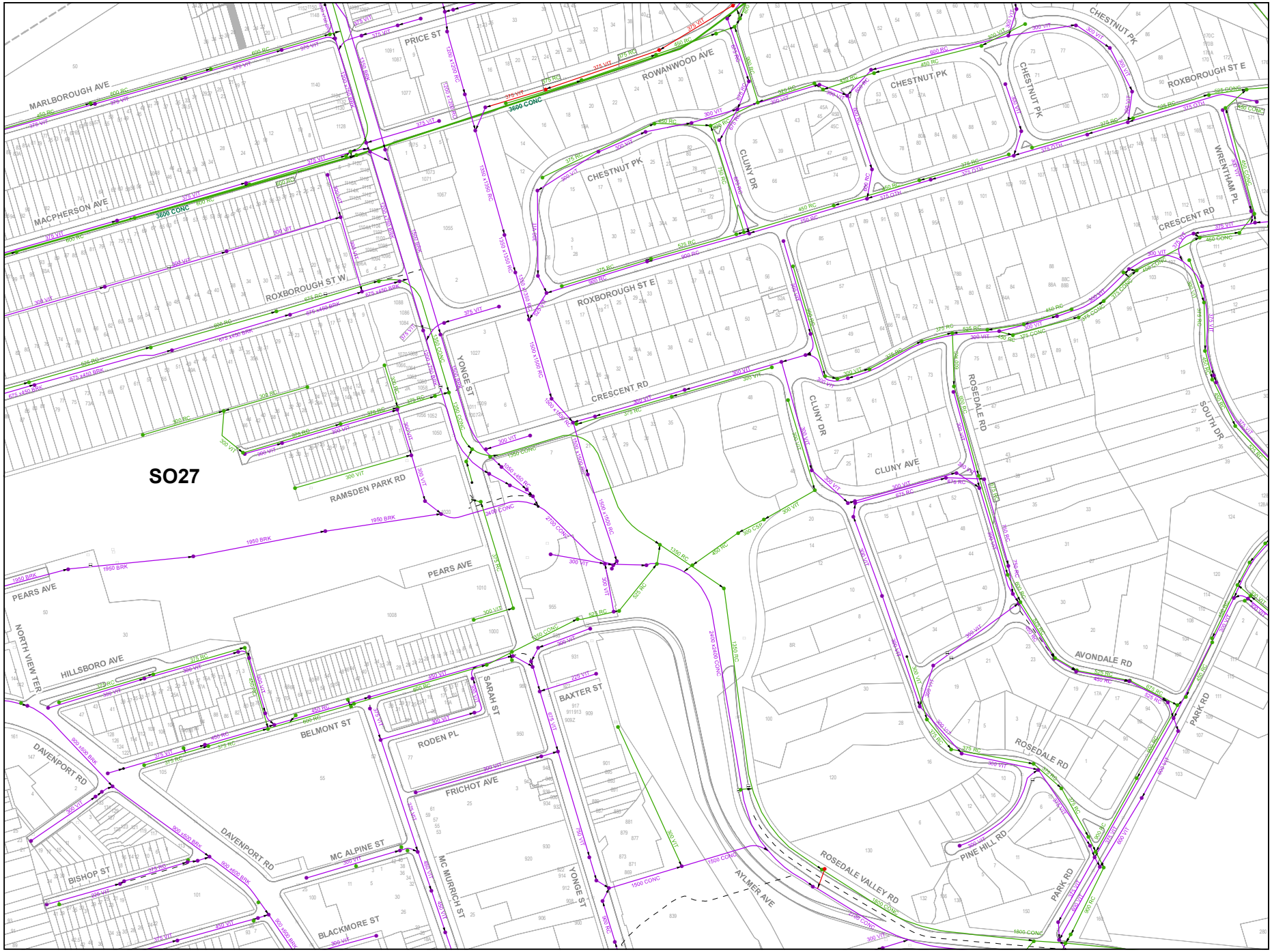
- Any discrepancies, inaccuracies, errors and/or omissions in the maps should be reported to Toronto Water, Water Infrastructure Management. (18th Floor, Metro Hall, 55 John St, Toronto, ON, M5V 3C6) (Tel: 416-392-3957)

N W E S

580	612	646
581	613	647
582	614	648



Toronto Sewer Atlas

Large Chamber

Manhole
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- Dual
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- Storm
- Foundation

Control Manhole
- Combined
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Outfall
- Outfall

Sewer Pump Station
- Sewer Pump Station

Catchbasin
- Other
- Twin Inlet Catchbasin

Sewer
- Foundation Drain
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- Sanitary

- Storm
- Combined Trunk
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0 50 100 150 200 Metres

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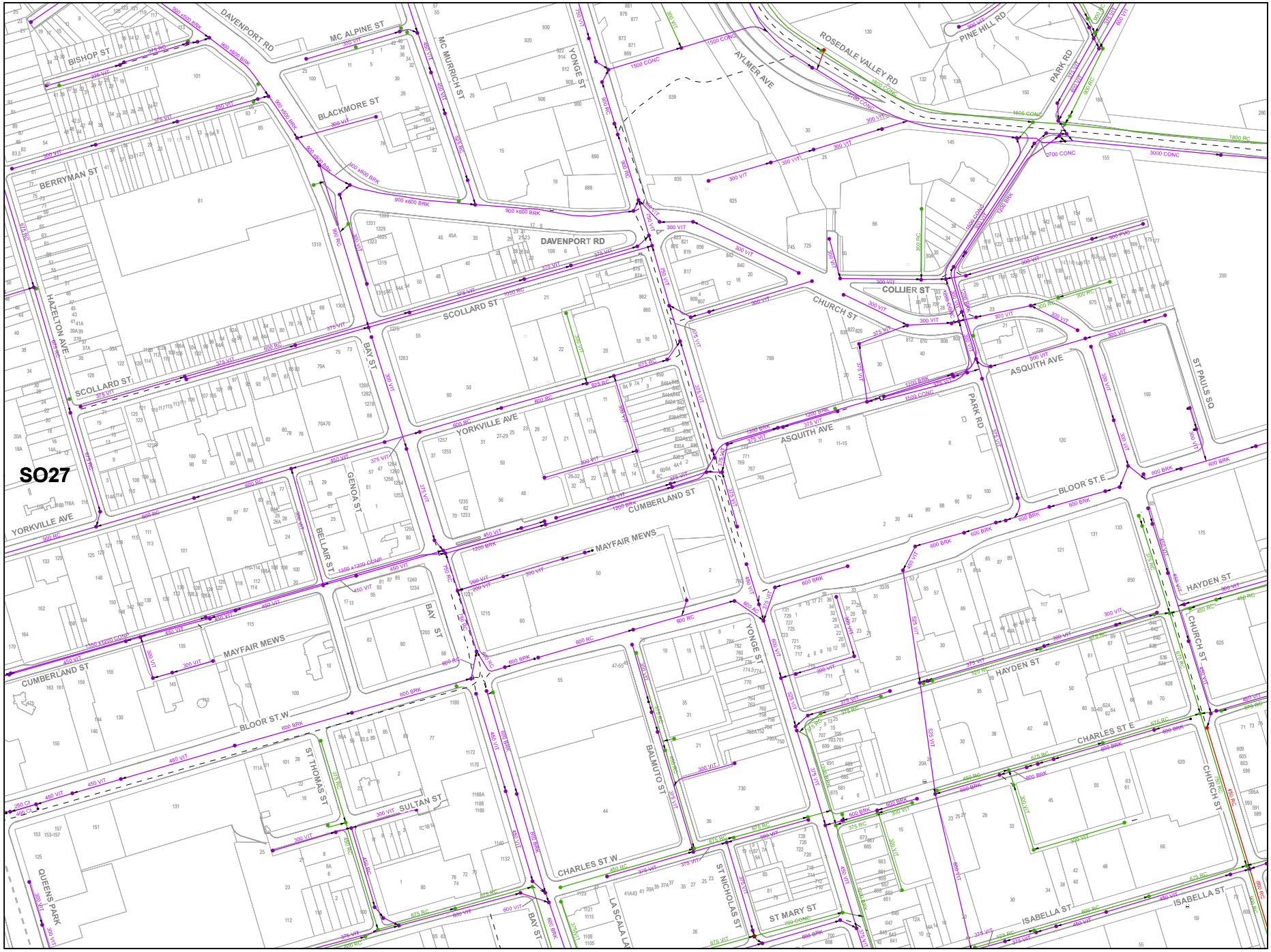
N W E S

612	646	681
613	647	682
614	648	683



Toronto Sewer Atlas

Large Chamber

Manhole
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0 50 100 150 200 Metres

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N W E S

613	647	682
614	648	683
615	649	684

TORONTO SEWER SYSTEM STUDY AREA 8

SOUTH CALCULATION AREA

145 CIRCULAR 2.44/2.44 INFLOW 144 4389 OUTFLOW 146 B.NO. 67270 EXIST. COMB. 145

YU 94.069 YL 93.609 QF 23963 DQ 23 QDLM 350 VNIGHT1.09 DUC -0.57 DLC -0.58 QLM 20959 CAP 3004

SU 99.119 SL 99.296 AF 4.668 DQD 0.2 HDLM 0.20 HNIGHT0.07 DUS -3.18 DLS -3.83 RAIN 8MS2 QLM/QF 0.87

RES 234 A 0.08 VF 5.13 GAMMA 1.00 VDLM 1.95 VNORM 0.0 HUM 1.87 HLM 1.86 QRQLM 20460 DY 0.46

IW 0.0 L 53.3 S 1/ 116 N 0.0130 SCOD 112 DWB 0.0 YUM 95.94 YLM 95.47 VLM 5.52 DH 0.01

4355 CIRCULAR 0.61/0.61 INFLOW 4354 OUTFLOW 4356 B.NO. 86700 EXIST. COMB. 4355

YU 112.546 YL 112.302 QF 388 DQ 219 QDLM 1 VNIGHT0.21 DUC -0.00 DLC 0.15 QLM 379 CAP 9

SU 116.130 SL 116.048 AF 0.292 DQD 0.4 HDLM 0.02 HNIGHT0.00 DUS -2.98 DLS -2.98 RAIN 8MS2 QLM/QF 0.98

RES 44 A 0.82 VF 1.33 GAMMA 0.93 VDLM 0.30 VNORM 0.0 HUM 0.61 HLM 0.76 QRQLM 378 DY 0.24

IW 0.0 L 66.4 S 1/ 272 N 0.0130 SCOD 004 DWB 0.0 YUM 113.15 YLM 113.06 VLM 1.42 DH -0.15

4356 CIRCULAR 0.69/0.69 INFLOW 4355 OUTFLOW 4357 B.NO. 86700 EXIST. COMB. 4356

YU 112.238 YL 112.165 QF 532 DQ 0 QDLM 1 VNIGHT0.22 DUC 0.14 DLC 0.18 QLM 366 CAP 165

SU 116.048 SL 116.142 AF 0.373 DQD 0.0 HDLM 0.02 HNIGHT0.00 DUS -2.98 DLS -3.10 RAIN 8MS2 QLM/QF 0.69

RES 44 A 0.0 VF 1.42 GAMMA 0.93 VDLM 0.30 VNORM 0.0 HUM 0.83 HLM 0.87 QRQLM 366 DY 0.07

IW 0.0 L 20.4 S 1/ 280 N 0.0130 SCOD 004 DWB 0.0 YUM 113.06 YLM 113.04 VLM 1.43 DH -0.05

4357 CIRCULAR 0.69/0.69 INFLOW 4356 OUTFLOW 4358 B.NO. 86700 EXIST. COMB. 4357

YU 112.147 YL 111.958 QF 596 DQ 144 QDLM 1 VNIGHT0.25 DUC 0.20 DLC 0.32 QLM 479 CAP 117

SU 116.142 SL 116.155 AF 0.373 DQD 0.3 HDLM 0.02 HNIGHT0.00 DUS -3.10 DLS -3.18 RAIN 8MS2 QLM/QF 0.80

RES 44 A 0.54 VF 1.60 GAMMA 0.93 VDLM 0.35 VNORM 0.0 HUM 0.89 HLM 1.01 QRQLM 478 DY 0.19

IW 0.0 L 42.1 S 1/ 223 N 0.0130 SCOD 004 DWB 0.0 YUM 113.04 YLM 112.97 VLM 1.65 DH -0.12

4358 CIRCULAR 0.69/0.69 INFLOW 4357 OUTFLOW 4360 B.NO. 86700 EXIST. COMB. 4358

YU 111.918 YL 111.830 QF 669 DQ 0 QDLM 1 VNIGHT0.28 DUC 0.36 DLC 0.42 QLM 469 CAP 200

SU 116.155 SL 116.249 AF 0.373 DQD 0.0 HDLM 0.02 HNIGHT0.00 DUS -3.18 DLS -3.31 RAIN 8MS2 QLM/QF 0.70

RES 44 A 0.0 VF 1.79 GAMMA 0.93 VDLM 0.38 VNORM 0.0 HUM 1.05 HLM 1.11 QRQLM 468 DY 0.09

IW 0.0 L 15.5 S 1/ 177 N 0.0130 SCOD 004 DWB 0.0 YUM 112.97 YLM 112.94 VLM 1.35 DH -0.06

4359 CIRCULAR 0.38/0.38 INFLOW - OUTFLOW 4360 B.NO. 85630 EXIST. COMB. 4359

YU 112.707 YL 112.079 QF 160 DQ 130 QDLM 0 VNIGHT0.22 DUC -0.07 DLC 0.51 QLM 111 CAP 49

SU 116.109 SL 116.249 AF 0.113 DQD 0.2 HDLM 0.01 HNIGHT0.00 DUS -3.10 DLS -3.28 RAIN 8MS2 QLM/QF 0.69

RES 32 A 0.45 VF 1.41 GAMMA 1.00 VDLM 0.25 VNORM 0.0 HUM 0.31 HLM 0.89 QRQLM 111 DY 0.63

IW 0.0 L 80.5 S 1/ 128 N 0.0130 SCOD 004 DWB 0.0 YUM 113.01 YLM 112.97 VLM 1.29 DH -0.59

4360 CIRCULAR 0.69/0.69 INFLOW 4359 4358 OUTFLOW 4361 B.NO. 85640 EXIST. COMB. 4360

YU 111.772 YL 111.689 QF 489 DQ 0 QDLM 1 VNIGHT0.20 DUC 0.45 DLC 0.45 QLM 568 CAP -78

SU 116.249 SL 116.219 AF 0.373 DQD 0.0 HDLM 0.02 HNIGHT0.01 DUS -3.34 DLS -3.39 RAIN 8MS2 QLM/QF 1.16

RES 32 A 0.0 VF 1.31 GAMMA 1.00 VDLM 0.31 VNORM 0.0 HUM 1.14 HLM 1.14 QRQLM 567 DY 0.08

IW 0.0 L 27.4 S 1/ 330 N 0.0130 SCOD 004 DWB 0.0 YUM 112.91 YLM 112.83 VLM 1.52 DH 0.00

4361 CIRCULAR 0.77/0.76 INFLOW 4360 5569 OUTFLOW 4368 B.NO. 85650 EXIST. COMB. 4361

YU 111.625 YL 111.345 QF 819 DQ 83 QDLM 1 VNIGHT0.28 DUC 0.44 DLC 0.60 QLM 635 CAP 184

SU 116.219 SL 115.725 AF 0.453 DQD 0.1 HDLM 0.02 HNIGHT0.00 DUS -3.39 DLS -3.02 RAIN 8MS2 QLM/QF 0.78

RES 32 A 0.29 VF 1.81 GAMMA 1.00 VDLM 0.39 VNORM 0.0 HUM 1.20 HLM 1.36 QRQLM 634 DY 0.28

IW 0.0 L 55.2 S 1/ 197 N 0.0130 SCOD 004 DWB 0.0 YUM 112.83 YLM 112.70 VLM 1.86 DH -0.15

4368 CIRCULAR 0.77/0.76 INFLOW 4367 4361 P106 OUTFLOW 4369 B.NO. 85660 EXIST. COMB. 4368

YU 111.336 YL 110.187 QF 2329 DQ 0 QDLM 3 VNIGHT0.80 DUC 0.21 DLC 0.94 QLM 1397 CAP 931

SU 115.725 SL 115.237 AF 0.453 DQD 0.0 HDLM 0.02 HNIGHT0.00 DUS -3.42 DLS -3.35 RAIN 8MS2 QLM/QF 0.60

RES 32 A 0.0 VF 5.14 GAMMA 1.00 VDLM 1.04 VNORM 0.0 HUM 0.97 HLM 1.70 QRQLM 1393 DY 1.15

IW 0.0 L 28.0 S 1/ 24 N 0.0130 SCOD 004 DWB 0.0 YUM 112.30 YLM 111.89 VLM 3.09 DH -0.74

4369 CIRCULAR 0.92/0.91 INFLOW 4368 4352 5539 OUTFLOW 4370 B.NO. 85670 EXIST. COMB. 4369

YU 110.123 YL 109.409 QF 2203 DQ 53 QDLM 10 VNIGHT0.53 DUC 0.56 DLC 0.31 QLM 2572 CAP -368

SU 115.237 SL 113.954 AF 0.649 DQD 0.1 HDLM 0.04 HNIGHT0.01 DUS -3.64 DLS -3.32 RAIN 8MS2 QLM/QF 1.17

RES 32 A 0.19 VF 3.39 GAMMA 0.98 VDLM 0.94 VNORM 0.0 HUM 1.47 HLM 1.22 QRQLM 2562 DY 0.71

IW 0.0 L 50.9 S 1/ 71 N 0.0130 SCOD 004 DWB 0.0 YUM 111.60 YLM 110.63 VLM 3.96 DH 0.25

4370 CIRCULAR 0.92/0.91 INFLOW 4369 OUTFLOW 4371 B.NO. 85670 EXIST. COMB. 4370

YU 109.324 YL 108.867 QF 1982 DQ 149 QDLM 10 VNIGHT0.48 DUC 0.40 DLC 0.05 QLM 2683 CAP -699

SU 113.954 SL 114.503 AF 0.649 DQD 0.2 HDLM 0.04 HNIGHT0.01 DUS -3.32 DLS -4.67 RAIN 8MS2 QLM/QF 1.35

RES 32 A 0.53 VF 3.05 GAMMA 0.98 VDLM 0.88 VNORM 0.0 HUM 1.31 HLM 0.96 QRQLM 2673 DY 0.46

IW 0.0 L 40.2 S 1/ 88 N 0.0130 SCOD 004 DWB 0.0 YUM 110.63 YLM 109.83 VLM 4.13 DH 0.35

4371 CIRCULAR 0.92/0.91 INFLOW 4370 OUTFLOW 4388 B.NO. 85670 EXIST. COMB. 4371

YU 108.836 YL 108.721 QF 2052 DQ 0 QDLM 10 VNIGHT0.49 DUC 0.08 DLC 0.0 QLM 2683 CAP -630

SU 114.503 SL 114.463 AF 0.649 DQD 0.0 HDLM 0.04 HNIGHT0.01 DUS -4.67 DLS -4.83 RAIN 8MS2 QLM/QF 1.31

RES 32 A 0.0 VF 3.16 GAMMA 0.98 VDLM 0.90 VNORM 0.0 HUM 0.99 HLM 0.91 QRQLM 2673 DY 0.12

IW 0.0 L 9.4 S 1/ 82 N 0.0130 SCOD 004 DWB 0.0 YUM 109.83 YLM 109.63 VLM 4.13 DH 0.08

4388 CIRCULAR 1.53/1.52 INFLOW 4387 4371 OUTFLOW 4389 B.NO. 85670 EXIST. COMB. 4388

YU 108.623 YL 106.590 QF 13944 DQ 127 QDLM 16 VNIGHT1.20 DUC -0.99 DLC -0.99 QLM 3704 CAP 10240

SU 114.463 SL 110.967 AF 1.812 DQD 0.1 HDLM 0.04 HNIGHT0.01 DUS -5.31 DLS -3.85 RAIN 8MS2 QLM/QF 0.27

RES 19 A 0.44 VF 7.70 GAMMA 0.98 VDLM 1.44 VNORM 0.0 HUM 0.53 HLM 0.53 QRQLM 3688 DY 2.03

IW 0.0 L 55.8 S 1/ 27 N 0.0130 SCOD 008 DWB 0.0 YUM 109.15 YLM 107.12 VLM 6.56 DH 0.01

4389 CIRCULAR 1.53/1.52 INFLOW 4388 OUTFLOW 145 B.NO. 85670 EXIST. COMB. 4389

YU 95.526 YL 94.886 QF 7136 DQ 51 QDLM 16 VNIGHT0.61 DUC -0.33 DLC 0.20 QLM 3733 CAP 3403

SU 110.967 SL 99.119 AF 1.812 DQD 0.0 HDLM 0.05 HNIGHT0.01 DUS -14.25 DLS -2.51 RAIN 8MS2 QLM/QF 0.52

RES 19 A 0.18 VF 3.94 GAMMA 0.98 VDLM 0.90 VNORM 0.0 HUM 1.19 HLM 1.72 QRQLM 3717 DY 0.64

IW 0.0 L 67.1 S 1/ 105 N 0.0130 SCOD 009 DWB 0.0 YUM 96.71 YLM 96.61 VLM 3.97 DH -0.53

Contractions used in HVM output...

1st line: pipe number, cross-section, pipe size...width/height(m), inflow and outflow pipes, block number, sewer type, pipe no.

2nd line: YU, YL = upper and lower invert elevations (m)

QF = full flow capacity (L/sec)

DQ = maximum storm runoff from tributary area (L/sec)

QDLM = peak DWF at lower end (L/sec)

VNIGHT = night DWF velocity (m/sec)

DUC, DLC = difference between maximum HGL elevation and section crown elevation at upper and lower ends (m)

(-ve means partial fill)

QLM = maximum flow rate at lower end (L/sec) under a 2yr storm

CAP = free capacity at lower end when loaded by QLM

3rd line: SU, SL = upper and lower surface elevations (m)

AF = cross-sectional area (m2)

DQD = DWF from tributary area (L/sec)

HDLM = flow depth corresponding to QDLM (m)

HNIGHT = night DWF depth (m)

RAIN = storm corresponding to QLM... 8MS2 = 8th Study Area, 2yr model storm

QLM/QF = ratio of maximum flow rate at lower end to full-flow capacity

4th line: RES = population density (residents/ha)

A = tributary area (ha)

VF = flow velocity corresponding to QF (m/sec)

GAMMA = imperviousness ratio

VDLM = flow velocity corresponding to QDLM (m/sec)

VNORM = normal flow velocity for QDLM (m/sec)

HUM, HLM = maximum flow depths above invert at upper and lower ends

QRQLM = portion of storm flow within QLM (L/sec)

DY = difference between upper and lower invert elevations (m)

5th line: IW = industrial/large water inflow (L/sec)

L = segment length (m)

S = slope of pipe

N = Manning's n

SCOD = surface code of tributary area

DWB = backwater build-up under QDLM (m)

YUM, YLM = maximum HGL elevations at upper and lower ends

VLM = flow velocity corresponding to QLM (m/sec)

DH = indicator whether HGL is steeper or flatter than pipe slope

= (YUM-YLM) - DY

APPENDIX

E MECHANICAL LETTERS

M.V. SHORE
ASSOCIATES (1993) LIMITED

Consulting Professional Engineers

July 26, 2019 Project no: 19-002

Attention: **Executive Director, Engineering & Construction Services**
16/F, 55 John Street, Toronto, ON M5V 3C6
c/o: **Avi Bachar, P.Eng. PMP**
Manager, Development Engineering
Engineering and Construction Services

cc: **General Manager, Toronto Water**
c/o: **Manager, Environmental Monitoring & Protection Unit**
30 Dee Ave, Toronto ON M9N 1S8

Address: **11 Yorkville Avenue, Toronto**

Dear Sir or Madame;

This letter is to confirm that the designed pumped discharge rate from the storm water cistern to the discharge chamber will be a maximum flow rate no greater than 14.1L/S (225gpm).

For additional information, please contact the undersigned.

LICENSED PROFESSIONAL ENGINEER
C.W.B. CHAN
7446503
PROVINCE OF ONTARIO

.....
Bill Chan, P.Eng.

Seal

1200 Eglinton Avenue East • Suite 402 • Don Mills • Ontario • Canada • M3C 1H9
Phone: (416) 443-1995 • Fax: (416) 443-1415
email: mvs@mvshore.com

M.V. SHORE
ASSOCIATES (1993) LIMITED

Consulting Professional Engineers

April 30, 2018 (revised Aug 21, 2019) Project no: 17-052 (19-002)

Attention: **Executive Director, Engineering & Construction Services**
16/F, 55 John Street, Toronto, ON M5V 3C6
c/o: **Avi Bachar, P.Eng. PMP**
Manager, Development Engineering
Engineering and Construction Services

cc: **General Manager, Toronto Water**
c/o: **Manager, Environmental Monitoring & Protection Unit**
30 Dee Ave, Toronto ON M9N 1S8

Address: **11 Yorkville Avenue, Toronto**

Dear Sir or Madame;

This letter is to confirm that the permanent Private Water Drainage system from ground water will be collected and discharged into sanitary control manholes, at a maximum daily peak flow rate of:-

- High-rise building: 20m³/day (average 0.23L/s or 3.65USgpm) per figure provided in Hydrogeological Assessment Report prepared by EXP Services Ltd dated March 13, 2018 and updated July 15, 2019))
- Commercial building: 9.0m³/day (average 0.1L/s or 1.6USgpm) per figure provided in Hydrogeological Assessment Report prepared by EXP Services Ltd dated March 13, 2018)

Groundwater pumps will be provided and sized to handle the above flow rate:-

- High-rise building: pump will be sized at 6.3 L/s (100 Usgpm) and is expected to run approximately 0.88 hours per day.
- Commercial building: pump will be sized at 0.63 L/s (10 Usgpm) and is expected to run approximately 3.85 hours per day.

Groundwater pump for each building will discharge water to their respective sanitary control manhole.

This daily peak flow rate will be used for assessing capacity for the peak discharge flow into the City's combined sewer system.

1200 Eglinton Avenue East • Suite 402 • Don Mills • Ontario • Canada • M3C 1H9
Phone: (416) 443-1995 • Fax: (416) 443-1415
email: mvs@mvshore.com

M.V. SHORE
ASSOCIATES (1993) LIMITED

Consulting Professional Engineers

Once the proposed ground water daily peak flow rate of 20m³/day for the high-rise building and 9m³/day for the commercial building is approved by Engineering Construction Services (ECS), City of Toronto, the Property Owner will not be allowed to amend this flow rate in the future. Should there be any amendment to the daily peak flow rate in the future, the Property Owner shall re-submit either the updated pump schedule or a revised letter to ECS. In addition, the sewer capacity will need to be re-assessed.

For additional information, please contact the undersigned.

LICENSED PROFESSIONAL ENGINEER
C.W.B. CHAN
7446503
PROVINCE OF ONTARIO

.....
Bill Chan, P.Eng.

Seal

1200 Eglinton Avenue East • Suite 402 • Don Mills • Ontario • Canada • M3C 1H9
Phone: (416) 443-1995 • Fax: (416) 443-1415
email: mvs@mvshore.com

M.V. SHORE
ASSOCIATES (1993) LIMITED
Consulting Professional Engineers

To Whom it May Concern

March 13, 2019

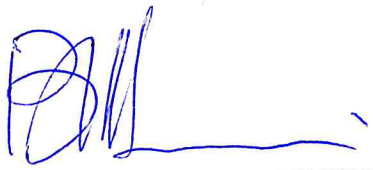
RE: **11 Yorkville Avenue – Toronto**

Ref. No: 19-002

SUBJECT: **Private Water Drainage System**

This letter is to confirm that the permanent Private Water Drainage System for ground water will be provided with a treatment system, including a settling tank/chamber, prior to discharge to the sanitary control manhole. Also ground water sampling access port and water meter will be provided in accordance to Toronto Standard T-709.020 and T-709.010.

M. V. SHORE ASSOCIATES (1993) LIMITED



Bill Chan, P.Eng.

BC:a

1200 Eglinton Avenue East • Suite 402 • Don Mills • Ontario • Canada • M3C 1H9
Phone: (416) 443-1995 • Fax: (416) 443-1415
email: mvs@mvshore.com

M.V. SHORE
ASSOCIATES (1993) LIMITED
Consulting Professional Engineers

To Whom it May Concern

March 13, 2019

RE: **11 Yorkville Avenue – Toronto**

Ref. No: 19-002

SUBJECT: **Sanitary Drainage Pipe**

Based on the current Ontario Building Code, the estimated sanitary drainage rate of 7,000 FU or 680 IGPM requires drainage pipe size of:-

- 300mm diameter @ 2%, or;
- 375mm diameter @ 1%

M. V. SHORE ASSOCIATES (1993) LIMITED

.....

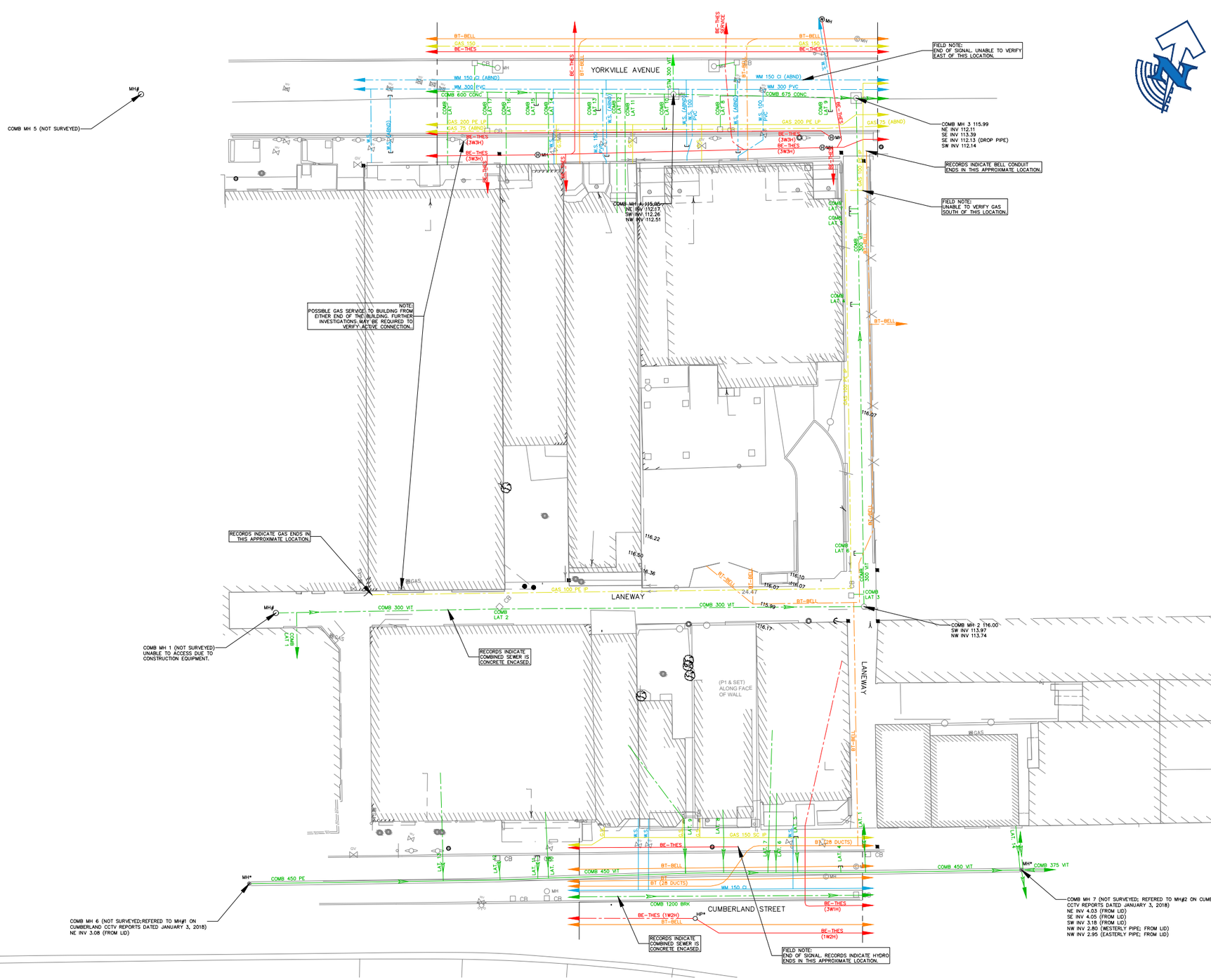
Bill Chan, P.Eng.

BC:a

1200 Eglinton Avenue East • Suite 402 • Don Mills • Ontario • Canada • M3C 1H9
Phone: (416) 443-1995 • Fax: (416) 443-1415
email: mvs@mvshore.com

APPENDIX

F SUE INVESTIGATION RESULTS



KEY PLAN

NOT TO SCALE

GENERAL NOTES

1. T2UE'S SUE FIELD INVESTIGATION WAS PERFORMED JANUARY, 2019. CHANGES TO UTILITIES THAT OCCURRED FOLLOWING OUR INVESTIGATION MAY NOT BE SHOWN. CONSIDERATION SHOULD BE GIVEN TO UPDATING THIS PLAN PRIOR TO FINAL DESIGN AND CONSTRUCTION.

2. LIMIT OF INVESTIGATION: AS SHOWN ON THE DRAWING.

3. FIELD VERIFICATION OF UTILITIES WAS COMPLETED USING A COMBINATION OF ELECTROMAGNETIC PIPE AND CABLE LOCATE EQUIPMENT.

4. EMPTY CONDUITS, SERVICES, LATERALS TO BUILDINGS, ABANDONED FACILITIES SUCH AS STREET LIGHT CABLES, WITHIN THE INVESTIGATION AREA MAY NOT BE SHOWN ON THE DRAWING.

5. T2UE USED AVAILABLE MEANS IN AN ATTEMPT TO DETERMINE THE LOCATION OF UNDOCUMENTED UTILITIES HOWEVER CANNOT BE RESPONSIBLE FOR FINDING ALL UNDOCUMENTED UTILITIES.

6. SURVEY OF T2UE'S UNDERGROUND UTILITY INFORMATION WAS NOT COMPLETED AND UTILITY ALIGNMENTS ARE BASED ON FIELD OBSERVATIONS.

7. THE BASEPLAN WAS PROVIDED BY THE CLIENT, THEREFORE T2UE IS NOT RESPONSIBLE FOR ITS ACCURACY.

8. UTILITY OWNERSHIP, MATERIAL, SIZES AND FLOW SHOWN ON DRAWING ARE BASED ON RECORDS INFORMATION RECEIVED, FIELD INVESTIGATION AND PROFESSIONAL JUDGEMENT.

9. UTILITY WIDTHS ON THE DRAWING ARE BASED ON RECORDS RECEIVED.

LEGEND

GAS	GAS
G.S.	GAS SERVICE
WM	WATER
W.S.	WATER SERVICE
SAN	SANITARY SEWER
SAN LAT.	SANITARY LATERAL
STM	STORM SEWER
STM LAT.	STORM LATERAL
BE	BURIED ELECTRIC
BE-SL	BURIED ELECTRIC STREET LIGHT
BE-TL	BURIED ELECTRIC TRAFFIC LIGHT
UNK	UNKNOWN
FOC	FIBRE OPTIC CABLE
TV	CABLE TV
BT	BURIED TELECOMMUNICATIONS
o/h	OVERHEAD WIRE
	FIELD VERIFIED (NOT SURVEYED)
	BASED ON RECORDS UNABLE TO FIELD VERIFY
	CONTINUATION ARROW
	FLOW ARROW
	END CAP
*	NOT SURVEYED, LOCATION BASED ON FIELD OBSERVATION
#	NOT SURVEYED, LOCATION BASED ON RECORD INFORMATION

REVISIONS	DISCLAIMER.	PREPARED BY.		DATE (MM/DD/YY)	PROJECT.	CLIENT.
	THIS DRAWING HAS BEEN PREPARED FOR THE USE OF T2UE'S CLIENT AND MAY NOT BE USED, REPRODUCED OR RELIED UPON BY THIRD PARTIES, EXCEPT AS AGREED BY T2UE AND ITS CLIENT, AS REQUIRED BY LAW OR FOR USE BY GOVERNMENT REVIEWING AGENCIES. T2UE ACCEPTS NO RESPONSIBILITY, AND DENIES ANY LIABILITY WHATSOEVER, TO ANY PARTY THAT MODIFIES THIS DRAWING WITHOUT T2UE'S EXPRESS WRITTEN CONSENT.	T2 utility engineers 1-855-222-T2UE | WWW.T2UE.COM	THE ENGINEER'S SEAL HEREON IS TO CERTIFY THAT THE UTILITIES SHOWN HAVE BEEN INVESTIGATED IN ACCORDANCE WITH STANDARD SUE INDUSTRY PRACTICES. ALL OTHER INFORMATION HEREON HAS BEEN PROVIDED BY OTHERS AND IS NOT A PART OF THIS CERTIFICATION.	DRAWN J.ROBINSON 01/29/19 CHECKED E.MORGAN 01/30/19 APPROVED	YORKVILLE AVENUE & CUMBERLAND STREET PROPERTIES	METROPIA
					DRAWING. UTILITY MAPPING INVESTIGATION	PROJECT NO. 61001407
				SCALE 1:250 0 5 10m		SHEET NO. 1 OF 1