11 YORKVILLE PARTNERSHIP INC.

11-21 YORKVILLE AVENUE

FUNCTIONAL SERVICING REPORT -

MARCH 23, 2018

11 YORKVILLE AVENUE

FUNCTIONAL SERVICING REPORT - DRAFT

11 YORKVILLE PARTNERSHIP INC.

FUNCTIONAL SERVICING REPORT - DRAFT

PROJECT NO.: 17M-01494
DATE: MARCH 23, 2018

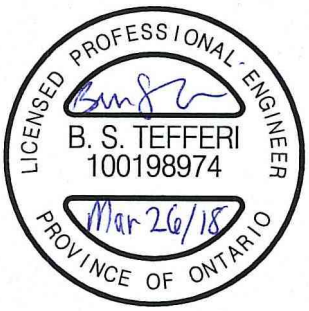
WSP CANADA GROUP LIMITED
100 COMMERCE VALLEY DRIVE WEST
THORNHILL, ON, CANADA L3T 0A1

WSP.COM

SIGNATURES

PREPARED BY

Beniam Tefferi, P.Eng.
Project Engineer



REVIEWED BY

Patrice Desdunes, P.Eng.
Project Manager

This report was prepared by WSP Canada Group Limited for the account of 11 YORKVILLE PARTNERSHIP INC., in accordance with the professional services agreement. The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects WSP Canada Group Limited's best judgement in light of the information available to it at the time of preparation. Any use which a third party, other than the City of Toronto, makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP Canada Group Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report.

The original of the technology-based document sent herewith has been authenticated and will be retained by WSP for a minimum of ten years. Since the file transmitted is now out of WSP's control and its integrity can no longer be ensured, no guarantee may be given with regards to any modifications made to this document.

TABLE OF CONTENTS

APPENDICES

1 INTRODUCTION

1.1 SCOPE OF MUNICIPAL SERVICING

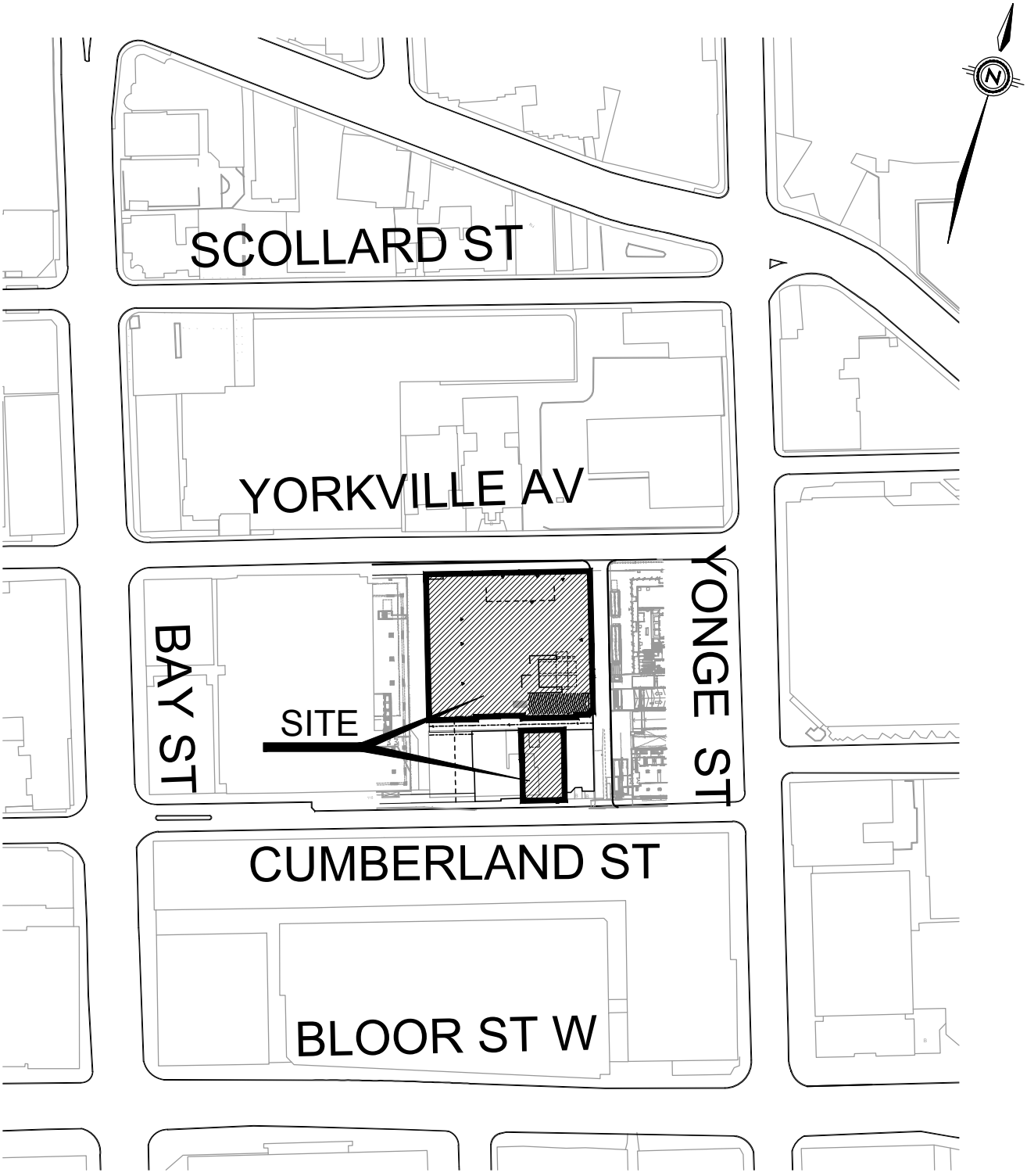
WSP Canada Group Limited (WSP) has been retained by 11 Yorkville Partnership Inc. to prepare a Functional Servicing Report (FSR) in support of the proposed development of 11-21 Yorkville Avenue and 16-18 Cumberland Street in the City of Toronto (herein referred to as Buildings A and B, respectively, 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 total site area is approximately 0.32 ha. 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 four-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. 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, 716 residential units and approximately 3,818 m^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 846 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 directed to both Cumberland Street and the laneway on the north side. 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.

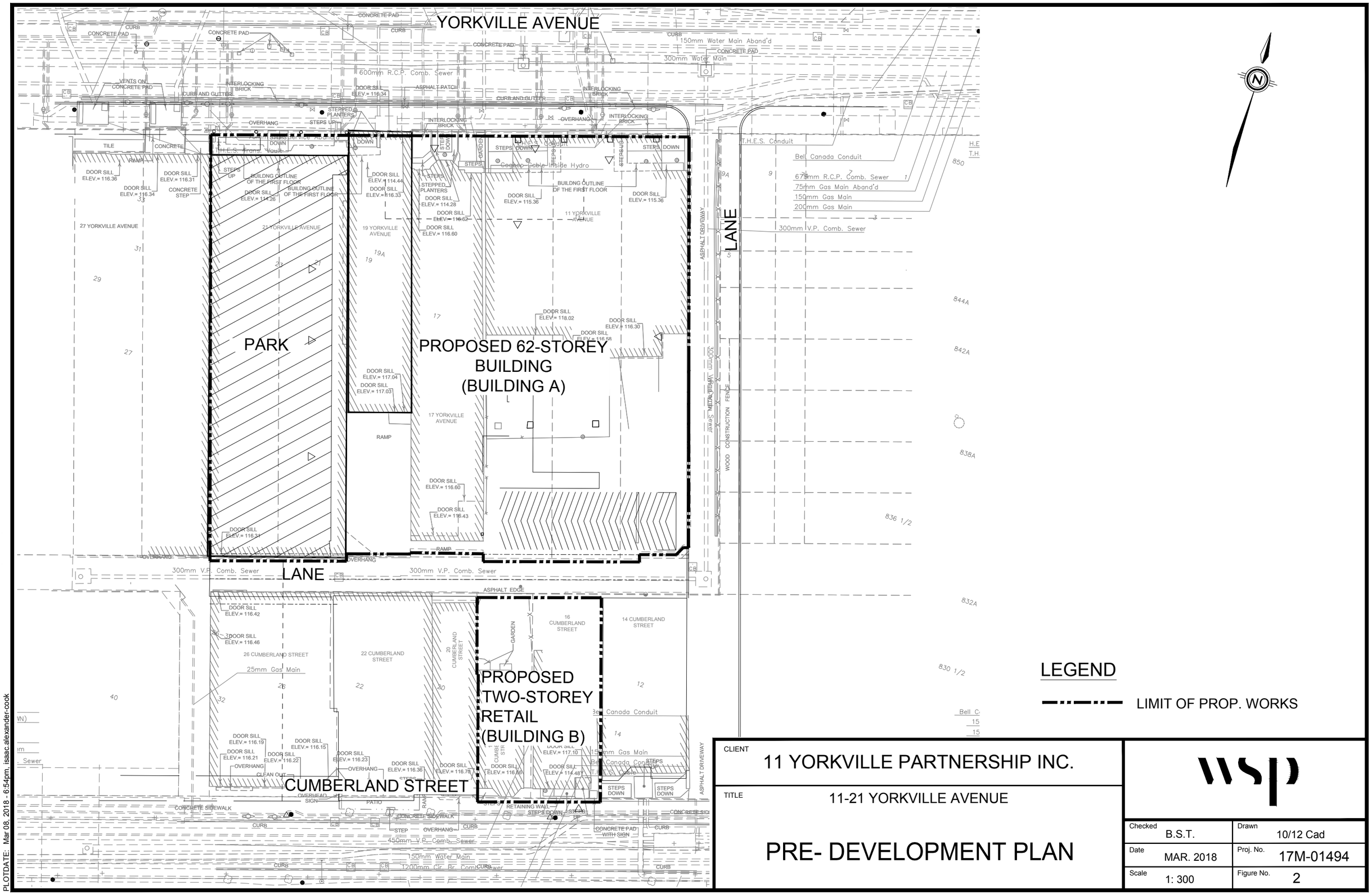
TITLE

11-21 YORKVILLE AVENUE

LOCATION PLAN

wsp

Checked	B.S.T.	Drawn	10/12 Cad
Date	MAR. 2018	Proj. No.	17M-01494
Scale	NTS	Figure No.	1



CLIENT
11 YORKVILLE PARTNERSHIP INC.

TITLE
11-21 YORKVILLE AVENUE

PRE- DEVELOPMENT PLAN

wsp

Checked B.S.T.	Drawn 10/12 Cad
Date MAR. 2018	Proj. No. 17M-01494
Scale 1: 300	Figure No. 2

PLOTDATE: Mar 08, 2018 - 6:54pm, isaac.alexander-cook

YORKVILLE AVENUE

150mm Water Main Aband'd

300mm Water Main

600mm R.C.P. Comb. Sewer

METAL GRATE AIR SHAFT

CISTERN

ROOF OUTLINE

MECHANICAL ROOM

P1 LEVEL OUTLINE

PARK

PROPOSED 62-STOREY BUILDING (BUILDING A)

RESIDENTS ENTRANCE

RAMP TO UNDERGROUND PARKING

LANE

LANEWAY

T.H.E.S. Conduit

Bell Canada Conduit

675mm R.C.P. Comb. Sewer

75mm Gas Main Aband'd

150mm Gas Main

200mm Gas Main

300mm V.P. Comb. Sewer

300mm V.P. Comb. Sewer

LANE

CENTERLINE OF LANE

EXISTING LANE

METAL GRATE AIR SHAFT

EXISTING 2-STOREY BUILDING

EXISTING 2-STOREY BUILDING

25mm Gas Main

ALLOWANCE FOR NEW PUBLIC LANEWAY

PROPOSED TWO-STOREY RETAIL (BUILDING B)

Canada Conduit

Canada Conduit

CUMBERLAND STREET

450mm V.P. Comb. Sewer

150mm Water Main

1200mm Cir. Br. Comb. Sewer

LEGEND

- LIMIT OF PROP. WORKS
- ROOF OUTLINE
- P1 LEVEL OUTLINE

CLIENT

11 YORKVILLE PARTNERSHIP INC.

TITLE

11-21 YORKVILLE AVENUE

PROPOSED DEVELOPMENT PLAN

wsp

Checked B.S.T.	Drawn 10/12 Cad
Date MAR. 2018	Proj. No. 17M-01494
Scale 1: 300	Figure No. 3

PLOTDATE: Mar 08, 2018 - 6:54pm, isaac.alexander-cook

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.

2.2 DESIGN PARAMETERS

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

- 450 L/cap/day average day flow generation rate for residential use (new development on an existing combined sewer system)
- 240 L/cap/day average day flow generation rate for existing residential use
- 250 L/cap/day average day flow generation rate for existing commercial use
- 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

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	0.077	85	0.25	0.02	0.27
17 Yorkville Avenue	1158	0.039	13	0.04	0.01	0.05
19 Yorkville Avenue	1004	0.025	12	0.03	0.01	0.04
21 Yorkville Avenue	3140	0.079	35	0.10	0.02	0.12
16 Cumberland Street	828	0.021	10	0.03	0.01	0.03
18 Cumberland Street	477	0.016	6	0.02	0.00	0.02
Total	**14,307**	**0**	**161**	**0.47**	**0.07**	**0.53**

The total sanitary flow from the existing development was calculated to be 0.53 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 – Sanitary Design Criteria & Proposed Sanitary Flows to Yorkville Avenue

Residential Sanitary Demand Rate	450 litres/person/day
Residential Population Density	1.4 people per studio and one bedroom units 2.1 people per two bedroom units 3.1 people per three bedroom units
Commercial Population Density	1.1 people per 100 m^2
Residential units	716 units
Residential studio/1 bedroom units	426 units
Residential 2 bedroom units	218 units
Residential 3 bedroom units	72 units
Total Residential Population	1279 people
Total Commercial Population	42 people
Residential Peaking Factor	$1+14/(4+p^{0.5})$, where p = population in thousands = 3.73
Commercial Peaking Factor	1.0 - Retail Peak is offset from Residential Peak – therefore Peak Flow = Peak Residential + Average Retail
Permanent Dewatering Rate	2.37 L/s
Average Res. Sanitary Flow from Site	6.66 L/s
Infiltration Allowance (0.26 L/s/ha)	0.08 L/s
Peak Residential Sanitary Flow from Site	24.84 L/s
Total Commercial Sanitary Flow	0.15 L/s
Total Sanitary Flow from Site	**27.44 L/s**
Net increase in Flow (post - pre)	**26.91 L/s**

Based on the calculated sanitary flows found in Table 2.2, the site will generate 27.44 L/s of sanitary flow. Building A will discharge to the existing 675 mm combined sewer along Yorkville Avenue through one 200 mm diameter residential sanitary service connection and one 100 mm diameter commercial sanitary connection. Building B will discharge flow to the existing 300 mm combined sewer in the laneway north of the building via a 100 mm diameter sanitary service connection. This combined sewer ultimately connects to the combined sewer on Yorkville Avenue. 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 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 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. Pipe capacities remain below 5% in both the pre-development and post-development conditions. This demonstrates that the existing sewer system is capable of accommodating dry weather flow from the proposed development.

Since the theoretical flows from the proposed development do not negatively impact the existing sewer system as demonstrated in the post-development design sheets, 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.

2.6 COMPLIANCE WITH MOECC PROCEDURE F-5-5

It is proposed to discharge both sanitary and storm flows to the existing 675 mm combined sewer on Yorkville Avenue. 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 combined sewer

	Pre-Development Flow	Post-Development Flow	Net Change
Sanitary	0.5 L/s	27.4 L/s	26.9 L/s
Storm	72.5 L/s	31.9 L/s	-40.6 L/s
Total	73.0 L/s	59.3 L/s	**-13.7 L/s**

As shown in the table above, there is a net decrease of 13.7 L/s in the total flow draining to the existing combined sewer system as a result of the proposed development. Therefore, no capital improvements to the municipal combined sewer system are required since flow conditions in the existing combined sewer are improved in post-development.

2.7 GROUNDWATER DISCHARGE

The client has retained the services of a hydrogeological specialist to study the discharge rate and quality of the foundation on the site and provide recommendations. A draft hydrogeological report was completed by EXP Services Inc. (EXP) on February, 28 2018 under a separate cover.

As stated in EXP's report, groundwater levels encountered in the monitoring wells at ground level ranged from approximately 3.19 to 3.40 meters below ground surface (mbgs). Shallow monitoring wells installed below ground revealed perched groundwater levels ranging from 0.44 mbgs to 5.33 mbgs, and deep monitoring wells revealed groundwater at depths ranging from 15.8 to 27.45 mbgs. The analytical results for the groundwater samples showed that the groundwater quality will meet the "Guidelines Limits for Sanitary & Combined Sewers Discharge" with the exception for Total Suspended Solids (TSS). This typically means that elevated concentrations of metals and inorganic parameters exceeding the Guideline Limits for Sanitary Sewer Discharge. Thus, groundwater will be discharged to the combined sewer.

As stated in the report, the total construction dewatering for the site is 286 m^3/day or 3.31 L/s and the permanent foundation drainage rate for the site is 205 m^3/day or 2.37 L/s to the combined sewer. The permanent foundation drainage rate of 2.37 L/s was added to the total sanitary flow calculation in Table 2.2 above and to the combined sewer analysis in Appendix A.

This additional flow to the sanitary system has been added to the external sanitary capacity analysis in Appendix A. As stated in the previous section, the capacity of the combined sewer does not exceed 5% full as a result of the proposed development. Based on this capacity, the external sanitary system can accommodate the additional groundwater rate.

Groundwater will be pumped to the bottom of the sanitary control manhole and then will flow by gravity into the municipal sewer. Sampling ports will be installed upstream of the control manholes and will be accessible from outside at any time, to allow City staff to monitor groundwater. This will ensure the water does not exceed the sanitary quality sewer discharge limits established by the City of Toronto.

YORKVILLE AVENUE

BREAK INTO EX. COMB. SEWER AND CONNECT

EX. 600Ø R.C.P. COMB. SEWER

PROP. 10.0m - 200Ø SAN @ 2.0% - RESIDENTIAL

BREAK INTO EX. COMB. SEWER AND CONNECT

PROP. 10.0m - 300Ø SAN @ 2.0% - COMMERCIAL

CANOPY ABV

CONTROL MH

T.H.E.S. Conduit

H.E.P.C. Trans. Vault

METAL GRATE AIR SHAFT

ROOF OUTLINE

CONTROL MH

T.H.E.S. Conduit

Bell Canada Conduit

675mm R.C.P. Comb. Sewer

75mm Gas Main (Assana's

PROP. CONTROL MH TO BE INSTALLED WITHIN PROPERTY LINE.

PROP. CONTROL MH TO BE INSTALLED WITHIN PROPERTY LINE.

PROP. 200mm GROUNDWATER SAMPLING PORT

P1 LEVEL OUTLINE

PARK

PROPOSED 62-STOREY BUILDING (BUILDING A)

RESIDENTS ENTRANCE

CANOPY ABV

300mm V.P. Comb. Sewer

300mm V.P. Comb. Sewer

LANE

300mm V.P. Comb. Sewer

PROP. 3.5m - 100Ø SAN @ 2.0%

BREAK INTO EX. COMB. SEWER AND CONNECT

PROP. CONTROL MH TO BE INSTALLED WITHIN PROPERTY LINE.

PROPOSED TWO-STOREY RETAIL (BUILDING B)

PROP. 200mm GROUNDWATER SAMPLING PORT

Bell Canada Conduit

Gas Main

Bell Canada Conduit

T.H.E.S. Cable

CUMBERLAND STREET

450mm V.P. Comb. Sewer

1200mm Cir. Br. Comb. Sewer

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

wsp

Checked B.S.T.	Drawn 10/12 Cad
Date MAR. 2018	Proj. No. 17M-01494
Scale 1: 300	Figure No. 4

PLOTDATE: Mar 26, 2018 - 8:12pm, tefferib

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 sanitary 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 = 2.48;
- Maximum Day Factor of Residential = 1.65;
- 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	426 units / 1.4 people per unit
Residential 2 Bedroom Unit & Population Density	218 units / 2.1 people per unit
Residential 3 Bedroom Unit & Population Density	72 units / 3.1 people per unit
Total Residential Units – Building A	716 units
Total Residential Equivalent Population – Building A	1279 people
Commercial Floor Area – Building A	3818 m^2
Commercial Floor Area – Building B	846 m^2
Commercial Population Density	1.1 people per 100 m^2 of floor area
Total Commercial Equivalent Population – Building A	42 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	2.92 L/s
Average Water Demand - Building B	0.02 L/s
Peak Water Demands - Building A	**Peak Hour = 7.18 L/s, Maximum Day = 3.78 L/s**
Peak Water Demands - Building B	**Peak Hour = 0.03 L/s, Maximum Day = 0.02 L/s**
Peak Water Demands – Site	**Peak Hour = 7.21 L/s, Maximum Day = 3.81 L/s**

The average day water demand for Building A will be 2.92 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 7.18 L/s and 3.78 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 each 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. The westerly 150 mm branch will supply residential flow while the easterly 150 mm branch will supply commercial flow. 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.

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 A and are summarized in Table 3.2 below:

Table 3.2– FUS Fire Flow for Proposed Development

Site	Required Fire Flow (L/s)	
	USGPM	L/s
Building A	1801	114
Building B	920	58

Due to the winter season, hydrant flow testing has not yet been completed for the proposed development. Once the testing season re-opens after April, hydrant flow tests will be scheduled on both the existing 300 mm watermain on Yorkville Avenue and the existing 150 mm diameter watermain on Cumberland Street to assess the available capacity of the systems. The results of the hydrant flow tests will be compared with the calculated maximum day plus fire demands of the proposed Buildings A and B.

YORKVILLE AVENUE

WATERMAIN CONNECTIONS AS PER T-1105.02-1

PROP. 200Ø FIRE W/ V&B AND 150Ø DOMESTIC BRANCH W/ V&B - RESIDENTIAL

300mm Water Main

EX.300Ø WATERMAIN

CUT 300Ø V&B INTO EX. 300Ø WATERMAIN

PROP. 200Ø FIRE W/ V&B AND 150Ø DOMESTIC BRANCH W/ V&B - COMMERCIAL

700mm Gas Service Vault

H.E.S. Trans. Vault

H.H.E.S. Conduit

ROOF OUTLINE

MECHANICAL ROOM

150mm Gas Main

200mm Gas Main

LANE

CONTRACTOR TO INSTALL DETECTOR CHECK VALVE AND WATER METER INSIDE THE BUILDING MECHANICAL ROOM AT OWNER'S COST

P1 LEVEL OUTLINE

PARK

PROPOSED 62-STOREY BUILDING (BUILDING A)

LANE

PROPOSED TWO-STOREY RETAIL (BUILDING B)

MECHANICAL ROOM

25mm Gas Main

Canada Conduit

Canada Conduit

E.S. Cable

CUMBERLAND STREET

PROP. 150Ø DOM/FIRE W/ V&B

WATERMAIN CONNECTION AS PER T-1105.02-1

EX.150Ø WATERMAIN

150mm Water Main

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

wsp

Checked B.S.T.	Drawn 10/12 Cad
Date MAR. 2018	Proj. No. 17M-01494
Scale 1: 300	Figure No. 5

PLOTDATE: Mar 26, 2018 - 4:12pm, SoltanianE

4 STORM DRAINAGE AND STORM DRAINAGE

4.1 EXISTING CONDITIONS

The existing site is currently occupied by commercial buildings, covering the majority of the site. 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 area of 0.323 ha and the 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 was calculated to be 39.6 L/s (35.2 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 72.5 L/s. Based on the existing topographic information, there are no external flows entering the site in its existing condition.

4.2 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 irrigation, car washing, or toilet flushing of commercial spaces.

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 the 2-year pre-development rate to the proposed 200 mm storm service connection which will direct flow to the existing 600 mm diameter combined sewer on Yorkville Avenue (Building A) and to the existing 300 mm diameter combined sewer in the laneway (Building B) 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 35.2 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.

4.3 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 P1 level parking garage for Building A and concourse level for Building B. Stormwater collected in the sumps can be reused for irrigation, car washing, or toilet flushing of commercial spaces. Refer to the Stormwater Management Report for further details.

4.4 STORMWATER QUANTITY CONTROLS

4.4.1 ALLOWABLE OUTFLOW

The 2-year pre-development peak flow was calculated using the rational method with an inlet time of 10 minutes, a site area of 0.323 ha, and a run-off coefficient of 0.5. The allowable release rate from the sites were calculated to be 39.6 L/s. Refer to Stormwater Management Report for more details.

4.4.2 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 165 m^3 for Building A and 16 m^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.

4.5 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. Building B is covered mostly by roof. Please refer to the Stormwater Management Report for more details.

4.6 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 600 mm diameter combined sewer on Yorkville Avenue. Building B will be serviced by a 100 mm diameter PVC storm connection connecting to the existing 300 mm diameter combined sewer in the laneway north of the building. Flow controls will restrict the outflows from both cisterns to the allowable levels.

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

4.7 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 rate of 39.6 L/s for the site, as indicated in Section 4.4.1 Allowable Outflow. The cisterns will accommodate both the water retention and quantity control, and are currently sized to accommodate 181 m^3 of total storage. 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 becomes 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.

4.8 ANALYSIS OF DOWNSTREAM STORM 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 and in the laneway. 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.

As mentioned in Section 2.6 above, storm flows decreased from pre- to post-development as a result of the proposed development. The total pre-development storm flow from the site was calculated to be approximately 72.5 L/s and the total post-development storm flow was calculated to be 31.7 L/s, which results in a net reduction of 40.6 L/s.

Since the proposed site is reducing storm flows contributing to the combined sewer system compared to existing conditions, no downstream wet-weather flow analysis is necessary for the development.

Since the theoretical flows from the proposed development do not negatively impact the existing storm sewer system as demonstrated in the post-development design sheets, 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.

YORKVILLE AVENUE

BREAK INTO EX. COMB. SEWER AND CONNECT STM SERVICE

PROP. 10.0m-200Ø STM @ 2.0%

EX. 600Ø R.C.P. COMB. SEWER

ACCESS HATCH/ EMERGENCY OVERFLOW

PROP. CONTROL MH TO BE INSTALLED WITHIN PROPERTY LINE.

PROP. STM TANK 5.3mx3.6x9.0m = 172m3 TOTAL AVAILABLE VOLUME

P1 LEVEL OUTLINE

PARK

PROPOSED 62-STORey BUILDING (BUILDING A)

LANE

675mm R.C.P. Comb. Sewer
75mm Gas Main Asana's
150mm Gas Main
200mm Gas Main
300mm V.P. Comb. Sewer

T.H.E.S. Conduit

CANOPY ABV

CONTROL MH

ROOF OUTLINE

METAL GRATE AIR SHAFT

RESIDENTS ENTRANCE

300mm V.P. Comb. Sewer

300mm V.P. Comb. Sewer

LANE

BREAK INTO EX. COMB. SEWER AND CONNECT

• EX. 300Ø V.P. COMB. SEWER

PROP. 3.5m-100Ø STM @ 2.0%

CONTROL MH TO BE INSTALLED WITHIN PROPERTY LINE.

PROP. STM TANK 8m^2 x 2m = 16m^3 TOTAL VOLUME

ACCESS HATCH/ EMERGENCY OVERFLOW

PROPOSED TWO-STOREY RETAIL (BUILDING B)

CUMBERLAND STREET

450mm V.P. Comb. Sewer

1200mm Cir. Br. Comb. Sewer

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

wsp

Checked B.S.T.	Drawn 10/12 Cad
Date MAR. 2018	Proj. No. 17M-01494
Scale 1: 300	Figure No. 6

PLOTDATE: Mar 26, 2018 - 8:16pm, tefferib

5 CONCLUSIONS

5.1 SANITARY

The existing 600 and 675 mm diameter combined sewer on Yorkville Avenue and the existing 300 mm diameter combined sewer in the laneway north of Building B both have sufficient capacity to convey the projected peak sanitary flows. Building A will discharge to the existing 675 mm combined sewer along Yorkville Avenue through one 200 mm diameter residential sanitary service connection and one 100 mm diameter commercial sanitary connection. Building B will discharge flow to the existing 300 mm combined sewer in the laneway north 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. Each fire connection will have one 150 mm domestic branch. 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. The two fire connections will be separated by a proposed valve, as required. Once hydrant flow testing has been completed in the spring, the results will be compared with the calculated maximum day plus fire demands from the proposed development.

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 600 mm combined sewer. Building B will be serviced by a 100 mm diameter PVC storm connection along the north side of the building connecting to the existing 300 mm diameter combined sewer in the laneway. 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

THEORETICAL SANITARY SEWAGE FLOWS & SANITARY DESIGN SHEETS & SANITARY DRAINAGE AREA PLAN (SDR-1)

APPENDIX A
THEORETICAL SANITARY SEWAGE FLOWS

Project: 11 Yorkville Avenue
Job No.: 17M-01494
Date: March 27, 2018

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	0.077	85	0.25	0.02	0.27
17 Yorkville Avenue	1158	0.039	13	0.04	0.01	0.05
19 Yorkville Avenue	1004	0.025	12	0.03	0.01	0.04
21 Yorkville Avenue	3140	0.079	35	0.10	0.02	0.12
16 Cumberland Street	828	0.021	10	0.03	0.01	0.03
18 Cumberland Street	477	0.016	6	0.02	0.00	0.02
Total	**14,307**	**0**	**161**	**0.47**	**0.07**	**0.53**

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	426	1.4	**597**
2B Units	218	2.1	**458**
3B Units	72	3.1	**224**
Total Residential	**716**	**-**	**1,279**
Commercial Type	**GFA (m^2)**	**Density (ppl/100m^2)**	**Total Commercial Population**
Retail	3,818	1.1	**42**
Building B			
Retail	845.88	1.1	**10**
Total Commercial	**4,664**	**-**	**52**

72.5
-31.9
40.6

Proposed Flow

Unit Type	Gross Floor Area (m^2)	Site Area (ha)	Residential Population[1]	Average Residential Flow (450 L/cap/d) (L/s)	Average Residential Flow (450 L/cap/d) (m^3/day)	Harmon Peaking Factor	Peak Residential Flow (L/s)	Permanent Dewatering Rate (L/s)	Total Commerical Sanitary Flow (250 L/cap/day) (L/s)	Infiltration Allowance (0.26 L/s/ha) (L/s)	Total Peak Flow[(2)] (L/s)
Residential	49,001	0.323	1279	6.661	575.6	**3.729**	24.84	2.37	0.15	0.08	**27.44**
		Total Average Flow		**6.66**	**575.55**						

Total Peak Flow = 27.44 L/s
Increase in Peak Flow = 26.91 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 450 L/cap/d, per City of Toronto Design Criteria for Sewers and Watermain, November 2009, page 37

ZONE/PIPES AREAS

	Land Use (hectares)				Population		
Drainage Zone	Total	Residential	Commercial	Institutional	Residential	Commercial	Institutional
Zone 1	0.510508	0.120457	0.201715	0.188336	49	23	17
Zone 2	0.435289	0.09281	0	0.342479	38	0	30
Zone 3	0.503855	0.133519	0.062196	0.30814	54	7	27
Zone 4	2.875343	1.377012	0.183792	1.314539	551	21	114
Zone 5	1.607135	1.41228	0.029974	0.164881	565	4	15
Zone 6	0.612568	0.348386	0.264182	0	140	30	0
Zone 7	9.829049	7.491855	1.08288	1.254314	2997	120	108
Zone 8	6.390357	5.851752	0.538605	0	2341	60	0
Total	22.764104	16.828071	2.363344	3.572689	6735	265	311

EQUIVALENT POPULATION DENSITIES BASED ON LAND USE:		
RESIDENTIAL	400	persons/ha
INDUSTRIAL	136	persons/ha
OFFICES	330	persons/ha
COMMERCIAL & RETAIL	110	persons/ha
SCHOOLS & CHURCHES	86	persons/ha
HOTELS	400	persons/ha
APARTMENTS	400	persons/ha

	Land Use (hectares)			
Pipe Number	Residential	Commercial	Institutional	Length
11 Yorkville Location Part A	0.162733	0	0	179.34
4355	0.350873	0	0.188336	
11 Yorkville Location Part B	0.162137	0	0	200.84
4356	0.162137	0.117831	0	
16/18 Cumberland	0	0.035629	0	
4357	0.459412	0	0	
4358	0.01417	0	0	
4360	0.038128	0.005599	0.015256	
4361	0.103988	0.026128	0	
4368	0	0	0	
4369	0.107153	0.285402	0	
4370	0.172994	0.10889	0	
4371	0.042091	0.042056	0	
4388	0.172365	0.148568	0	
4389	0.136272	0.173877	0	

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

TABLE D.1.1

D./ PRE-DEVELOPMENT CONDITIONS - DRY WEATHER

Sanitary Flows

Proposed Residential Avg.Daily Flow = 450 L/d n= 0.013
Existing Residential Avg.Daily Flow = 240 L/d
Existing Commercial Avg.Daily Flow = 250 L/d

Extraneous Flows

Infiltration Allowance = 0.260 L/s/ha

COMBINED SEWERSHED AREA: 22.764 ha

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

		SANITARY FLOW CALCULATIONS													STM SEWER FLOW			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	0.544	0.116	0.133	**0.79**			**0.79**								
17/19/21 Yorkville		0.163	65	0	66	0.673	114	40	155	4.000	1.268	0.116	0.042	**1.43**			**1.43**								
Yorkville Avenue	4355	0.539	140	21	162	1.212	254	61	317	4.000	2.827	0.176	0.140	**3.14**			**3.14**	66.4	600	0.283	0.37	**373.49**	1.32	0.84	0.8%
11 Yorkville		0.162	65	0	65	1.375	319	61	382	4.000	3.548	0.176	0.042	**3.77**			**3.77**								
Yorkville Avenue	4356	0.280	65	13	78	1.655	384	74	460	4.000	4.268	0.213	0.073	**4.55**			**4.55**	20.4	675	0.358	0.36	**504.35**	1.41	1.59	0.9%
Yorkville Avenue	4357	0.459	184	0	184	2.114	568	74	644	3.945	6.224	0.213	0.119	**6.56**			**6.56**	42.1	675	0.358	0.45	**563.88**	1.58	0.45	1.2%
Yorkville Avenue	4358	0.014	6	0	6	2.128	574	74	650	3.943	6.282	0.213	0.004	**6.50**			**6.50**	15.5	600	0.283	0.56	**459.48**	1.63	0.16	1.4%
Zone 2 from south along Yonge (4359)		0.435	38	30	68	2.563	612	104	718	3.928	6.672	0.300	0.113	**7.09**			**7.09**								
Yonge Street	4360	0.059	15	1	16	2.622	627	104	734	3.922	6.829	0.302	0.015	**7.15**			**7.15**	27.4	675	0.358	0.30	**460.41**	1.29	0.35	1.6%
Zone 3 from east along Collier (5569)		0.504	54	34	88	3.126	681	138	822	3.901	7.379	0.400	0.131	**7.91**			**7.91**								
Yonge Street	4361	0.130	42	3	45	3.256	722	141	867	3.887	7.799	0.408	0.034	**8.24**			**8.24**	55.2	750	0.442	0.51	**795.04**	1.80	0.51	1.0%
Zone 5 from west along Scollard (4367)		1.607	565	19	584	4.864	1,287	160	1,451	3.727	13.327	0.463	0.418	**14.21**			**14.21**								
Zone 4 from west along Scollard (4367)		2.875	551	135	686	7.739	1,838	295	2,137	3.614	18.456	0.854	0.748	**20.06**			**20.06**								
Yonge Street	4368	0.000	0	0	0	7.739	1,838	295	2,137	3.614	18.456	0.854	0.000	**19.31**			**19.31**	28.0	750	0.442	4.17	**2273.38**	5.15	0.09	0.8%
Zone 6 from east along Church (5539) and Zone 7 from west along Davenport (4352)		10.442	3,137	258	3,395	18.180	4,975	553	5,532	3.247	44.875	1.601	2.715	**49.19**			**49.19**								

D./ PRE-DEVELOPMENT CONDITIONS - DRY WEATHER

Sanitary Flows

Proposed Residential Avg.Daily Flow = 450 L/d n= 0.013
Existing Residential Avg.Daily Flow = 240 L/d
Existing Commercial Avg.Daily Flow = 250 L/d

Extraneous Flows

Infiltration Allowance = 0.260 L/s/ha

COMBINED SEWERSHED AREA: 22.764 ha

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

		SANITARY FLOW CALCULATIONS													STM SEWER FLOW			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)	
Yonge Street	4369	0.393	43	31	75	18.573	5,018	585	5,607	3.244	45.214	1.691	0.102	**47.01**			**47.01**	50.9	900	0.636	1.41	**2149.63**	3.38	0.25	2.2%
Yonge Street	4370	0.282	69	12	82	18.855	5,087	597	5,689	3.238	45.759	1.726	0.073	**47.56**			**47.56**	40.2	900	0.636	1.14	**1932.88**	3.04	0.22	2.5%
Yonge Street	4371	0.084	17	5	22	18.939	5,104	601	5,711	3.237	45.892	1.739	0.022	**47.65**			**47.65**	9.4	900	0.636	1.22	**1999.55**	3.14	0.05	2.4%
Zone 8 from north along Yonge (4387)		6.390	2,341	60	2,401	25.329	7,445	661	8,112	3.081	63.713	1.913	1.661	**67.29**			**67.29**								
Easement	4388	0.321	69	16	86	25.650	7,514	678	8,198	3.077	64.221	1.960	0.083	**66.27**			**66.27**	55.8	1500	1.767	3.70	**13597.24**	7.69	0.12	0.5%
Easement	4389	0.310	55	19	74	25.961	7,569	697	8,272	3.074	64.623	2.016	0.081	**66.72**			**66.72**	67.1	1500	1.767	0.95	**6889.88**	3.90	0.29	1.0%
To Rosedale Valley Combined Sewer Trunk														**502.38**			**502.38**								

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.2.1

D./ POST-DEVELOPMENT CONDITIONS - DRY WEATHER

Sanitary Flows

Proposed Residential Avg.Daily Flow = 450 L/d
Existing Residential Avg.Daily Flow = 240 L/d
Existing Commercial Avg.Daily Flow = 250 L/d

n= 0.013

Extraneous Flows

Infiltration Allowance = 0.260 L/s/ha

COMBINED SEWERSHED AREA: 22.764 ha

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

		SANITARY FLOW CALCULATIONS													STM SEWER FLOW			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 Allowance1	**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	0.544	0.116	0.133	**0.79**			**0.79**								
Yorkville Avenue	4355	0.539	140	21	162	1.050	189	61	251	4.000	2.104	0.176	0.140	**2.42**			**2.42**	66.4	600	0.283	0.37	**373.49**	1.32	0.84	0.6%
11 Yorkville		0.323	1,279	42	1,321	1.373	1,468	103	1,572	3.686	15.035	0.297	**2.269**	**17.60**			**17.60**								
Yorkville Avenue	4356	0.280	65	13	78	1.653	1,533	116	1,650	3.673	15.641	0.335	0.073	**16.05**			**16.05**	20.4	675	0.358	0.36	**504.35**	1.41	1.59	3.2%
16/18 Cumberland Street		0.034	0	10	10	0.034	0	10	1,660	4.000	0.000	0.029	0.109	**0.14**			**0.14**								
Yorkville Avenue	4357	0.459	184	0	184	0.493	184	10	1,844	4.000	2.042	0.029	0.119	**2.19**			**2.19**	42.1	675	0.358	0.45	**563.88**	1.58	0.45	0.4%
Yorkville Avenue	4358	0.014	6	0	6	0.508	189	10	1,850	4.000	2.105	0.029	0.004	**2.14**			**2.14**	15.5	600	0.283	0.56	**459.48**	1.63	0.16	0.5%
Zone 2 from south along Yonge (4359)		0.435	38	30	68	0.943	227	40	1,918	4.000	2.527	0.116	0.113	**2.76**			**2.76**								
Yonge Street	4360	0.059	15	1	16	1.002	243	41	1,934	4.000	2.696	0.118	0.015	**2.83**			**2.83**	27.4	675	0.358	0.30	**460.41**	1.29	0.35	0.6%
Zone 3 from east along Collier (5569)		0.504	54	34	88	1.506	297	75	2,022	4.000	3.296	0.216	0.131	**3.64**			**3.64**								
Yonge Street	4361	0.130	42	3	45	1.636	338	77	2,067	4.000	3.759	0.224	0.034	**4.02**			**4.02**	55.2	750	0.442	0.51	**795.04**	1.80	0.51	0.5%
Zone 5 from west along Scollard (4367)		1.607	565	19	584	3.243	903	96	2,651	3.828	9.605	0.279	0.418	**10.30**			**10.30**								
Zone 4 from west along Scollard (4367)		2.875	551	135	686	6.118	1,454	231	3,337	3.689	14.903	0.670	0.748	**16.32**			**16.32**								
Yonge Street	4368	0.000	0	0	0	6.118	1,454	231	3,337	3.689	14.903	0.670	0.000	**15.57**			**15.57**	28.0	750	0.442	4.17	**2273.38**	5.15	0.09	0.7%
Zone 6 from east along Church (5539) and Zone 7 from west along Davenport (4352)		10.442	3,137	258	3,395	16.560	4,591	489	6,732	3.279	41.820	1.416	2.715	**45.95**			**45.95**								

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

TABLE D.2.1

D./ POST-DEVELOPMENT CONDITIONS - DRY WEATHER

Sanitary Flows

Proposed Residential Avg.Daily Flow = 450 L/d n= 0.013
Existing Residential Avg.Daily Flow = 240 L/d
Existing Commercial Avg.Daily Flow = 250 L/d

Extraneous Flows

Infiltration Allowance = 0.260 L/s/ha

COMBINED SEWERSHED AREA: 22.764 ha

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

		SANITARY FLOW CALCULATIONS													STM SEWER FLOW			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 Allowance1	**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)	
Yonge Street	4369	0.393	43	31	75	16.952	4,634	521	6,807	3.275	42.163	1.507	0.102	**43.77**			**43.77**	50.9	900	0.636	1.41	**2149.63**	3.38	0.25	2.0%
Yonge Street	4370	0.282	69	12	82	17.234	4,703	533	6,889	3.270	42.716	1.542	0.073	**44.33**			**44.33**	40.2	900	0.636	1.14	**1932.88**	3.04	0.22	2.3%
Yonge Street	4371	0.084	17	5	22	17.319	4,720	537	6,911	3.268	42.850	1.555	0.022	**44.43**			**44.43**	9.4	900	0.636	1.22	**1999.55**	3.14	0.05	2.2%
Zone 8 from north along Yonge (4387)		6.390	2,341	60	2,401	23.709	7,061	597	9,312	3.103	60.863	1.729	1.661	**64.25**			**64.25**								
Easement	4388	0.321	69	16	86	24.030	7,130	614	9,398	3.099	61.376	1.776	0.083	**63.24**			**63.24**	55.8	1500	1.767	3.70	**13597.24**	7.69	0.12	0.5%
Easement	4389	0.310	55	19	74	24.340	7,185	633	9,472	3.096	61.781	1.831	0.081	**63.69**			**63.69**	67.1	1500	1.767	0.95	**6889.88**	3.90	0.29	0.9%
To Rosedale Valley Combined Sewer Trunk														**466.43**			**466.43**								

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 8 for combined sewer tributary areas*

APPENDIX A

TABLE D.1.2

A./ PRE-DEVELOPMENT CONDITIONS - 2-yr WET WEATHER

Sanitary Flows

Proposed Residential Avg.Daily Flow = 450 L/d
Existing Residential Avg.Daily Flow = 240 L/d
Existing Commercial Avg.Daily Flow = 250 L/d

Extraneous Flows

Infiltration Allowance = 0.260 L/s/ha
Foundation Drainage Allowance = 3.0 L/s/ha ss than 10 ha)

COMBINED SEWERSHED AREA: 22.764 ha

Manning's n= 0.013
C = 0.5
2 YEAR
a= 21.800
b= -0.780
I= 88.19

Design Sheet No **1 of 6**
Project: **11 Yorkville**
Project no.: **17M-01494**

		SANITARY FLOW CALCULATIONS														STM SEWER FLOW								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	Emp	Infiltration Allowance	Foundation Drainage	Acc SAN Flow															
			Res	ICI	Total		Res	ICI	Total	M	(L/s)	(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 1 from west along Yorkville (4354)		0.511	49	40	89	0.511	49	40	89	4.000	0.544	0.116	0.133	1.532	**2.32**	0.51	0.90	0.46	0.46	10.0	88.189	**116.3**	**118.61**	134.8					1.50	1.50	
11 Yorkville Location Part A		0.163	65	0	66	0.673	114	40	155	4.000	1.268	0.116	0.042	0.488	**1.91**	0.16	0.90	0.15	0.61	12.0	76.535	**133.1**	**135.01**	179.3					1.50	1.99	
Yorkville Avenue	4355	0.539	140	21	162	1.050	189	61	251	4.000	2.104	0.176	0.140	1.618	**4.04**	0.54	0.90	0.49	1.09	12.8	72.608	**227.4**	**231.43**	66.4	600	0.283	0.37	**373.49**	1.32	0.84	62.0%
11 Yorkville Location Part B		0.162	65	0	65	1.212	254	61	316	4.000	2.824	0.176	0.042	0.486	**3.53**	0.16	0.90	0.15	1.24	15.1	64.072	**227.5**	**231.02**	200.8					1.50	2.23	
Yorkville Avenue	4356	0.280	65	13	78	1.330	254	74	329	4.000	2.824	0.213	0.073	0.840	**3.95**	0.28	0.90	0.25	1.49	15.3	63.282	**270.5**	**274.40**	20.4	675	0.358	0.36	**504.35**	1.41	0.24	54.4%
Yorkville Avenue	4357	0.459	184	0	184	1.789	438	74	513	4.000	4.866	0.213	0.119	1.378	**6.58**	0.46	0.90	0.41	1.90	15.7	61.882	**337.9**	**344.48**	42.1	675	0.358	0.45	**563.88**	1.58	0.45	61.1%
Yorkville Avenue	4358	0.014	6	0	6	1.803	444	74	519	4.000	4.929	0.213	0.004	0.043	**5.19**	0.01	0.90	0.01	1.92	15.9	61.400	**337.5**	**342.70**	15.5	600	0.283	0.56	**459.48**	1.63	0.16	74.6%
Zone 2 from south along Yonge (4359)		0.435	38	30	68	2.239	482	104	587	3.983	5.328	0.300	0.113	1.306	**7.05**	0.44	0.90	0.39	2.31	18.8	53.857	**356.6**	**363.65**	262.0					1.50	2.91	
Yonge Street	4360	0.059	15	1	16	2.298	497	104	603	3.976	5.487	0.302	0.015	0.177	**5.98**	0.06	0.90	0.05	2.36	19.2	53.077	**359.5**	**365.51**	27.4	675	0.358	0.30	**460.41**	1.29	0.35	79.4%
Zone 3 from east along Collier (5569)		0.504	54	34	88	2.801	551	138	691	3.952	6.048	0.400	0.131	1.512	**8.09**	0.50	0.90	0.45	2.81	22.4	46.996	**379.5**	**387.59**	291.3					1.50	3.24	
Yonge Street	4361	0.130	42	3	45	2.932	592	141	736	3.935	6.476	0.408	0.034	0.390	**7.31**	0.13	0.90	0.12	2.93	22.9	46.177	**388.4**	**395.71**	55.2	750	0.442	0.51	**795.04**	1.80	0.51	49.8%
Zone 5 from west along Scollard (4367)		1.607	565	19	584	4.539	1,157	160	1,320	3.758	12.083	0.463	0.418	4.821	**17.79**	1.61	0.90	1.45	4.38	28.1	39.430	**495.3**	**513.12**	463.1					1.50	5.15	
Zone 4 from west along Scollard (4367)		2.875	551	135	686	7.414	1,708	295	2,006	3.638	17.265	0.854	0.748	8.626	**27.49**	2.88	0.60	1.73	6.10	33.2	34.579	**605.6**	**633.10**	463.1					1.50	5.15	
Yonge Street	4368	0.000	0	0	0	7.414	1,708	295	2,006	3.638	17.265	0.854	0.000	0.000	**18.12**	0.00	0.90	0.00	6.10	33.3	34.505	**604.3**	**622.44**	28.0	750	0.442	4.17	**2273.38**	5.15	0.09	27.4%
Zone 6 from east along Church (5539) and Zone 7 from west along Davenport (4352)		10.442	3,137	258	3,395	17.856	4,845	553	5,401	3.258	43.846	1.601	2.715	31.325	**79.49**	10.44	0.90	9.40	15.50	40.7	29.496	**1312.1**	**1391.60**	667.6					1.50	7.42	
Yonge Street	4369	0.393	43	31	75	18.248	4,888	585	5,476	3.254	44.186	1.691	0.102	1.178	**47.16**	0.39	0.90	0.35	15.85	41.0	29.355	**1335.6**	**1382.76**	50.9	900	0.636	1.41	**2149.63**	3.38	0.25	64.3%
Yonge Street	4370	0.282	69	12	82	18.530	4,958	597	5,558	3.248	44.734	1.726	0.073	0.846	**47.38**	0.28	0.90	0.25	16.11	41.2	29.232	**1351.3**	**1398.68**	40.2	900	0.636	1.14	**1932.88**	3.04	0.22	72.4%
Yonge Street	4371	0.084	17	5	22	18.614	4,974	601	5,580	3.247	44.867	1.739	0.022	0.252	**46.88**	0.08	0.90	0.08	16.18	41.2	29.205	**1356.4**	**1403.26**	9.4	900	0.636	1.22	**1999.55**	3.14	0.05	70.2%
Zone 8 from north along Yonge (4387)		6.390	2,341	60	2,401	25.005	7,315	661	7,981	3.088	62.751	1.913	1.661	19.171	**85.50**	6.39	0.90	5.75	21.93	49.9	25.190	**1585.7**	**1671.19**	774.9					1.50	8.61	
Easement	4388	0.321	69	16	86	25.325	7,384	678	8,067	3.084	63.262	1.960	0.083	0.963	**66.27**	0.32	0.90	0.29	22.22	50.0	25.142	**1603.5**	**1669.81**	55.8	1500	1.767	3.70	**13597.24**	7.69	0.12	12.3%
Easement	4389	0.310	55	19	74	25.636	7,439	697	8,141	3.081	63.665	2.016	0.081	0.930	**66.69**	0.31	0.90	0.28	22.50	50.3	25.030	**1616.4**	**1683.14**	67.1	1500	1.767	0.95	**6889.88**	3.90	0.29	24.4%
To Rosedale Valley Combined Sewer Trunk															**558.71**							**15000.5**	**15559.19**								

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 SAN-1 for combined sewer tributary areas*

APPENDIX A

TABLE D.2.2

A./ POST-DEVELOPMENT CONDITIONS - 2-yr WET WEATHER

Sanitary Flows

Proposed Residential Avg.Daily Flow = 450 L/d
Existing Residential Avg.Daily Flow = 240 L/d
Existing Commercial Avg.Daily Flow = 250 L/d

Extraneous Flows

Infiltration Allowance = 0.260 L/s/ha
Foundation Drainage Allowance = 3.0 L/s/ha ss than 10 ha)

COMBINED SEWERSHED AREA: 22.764 ha

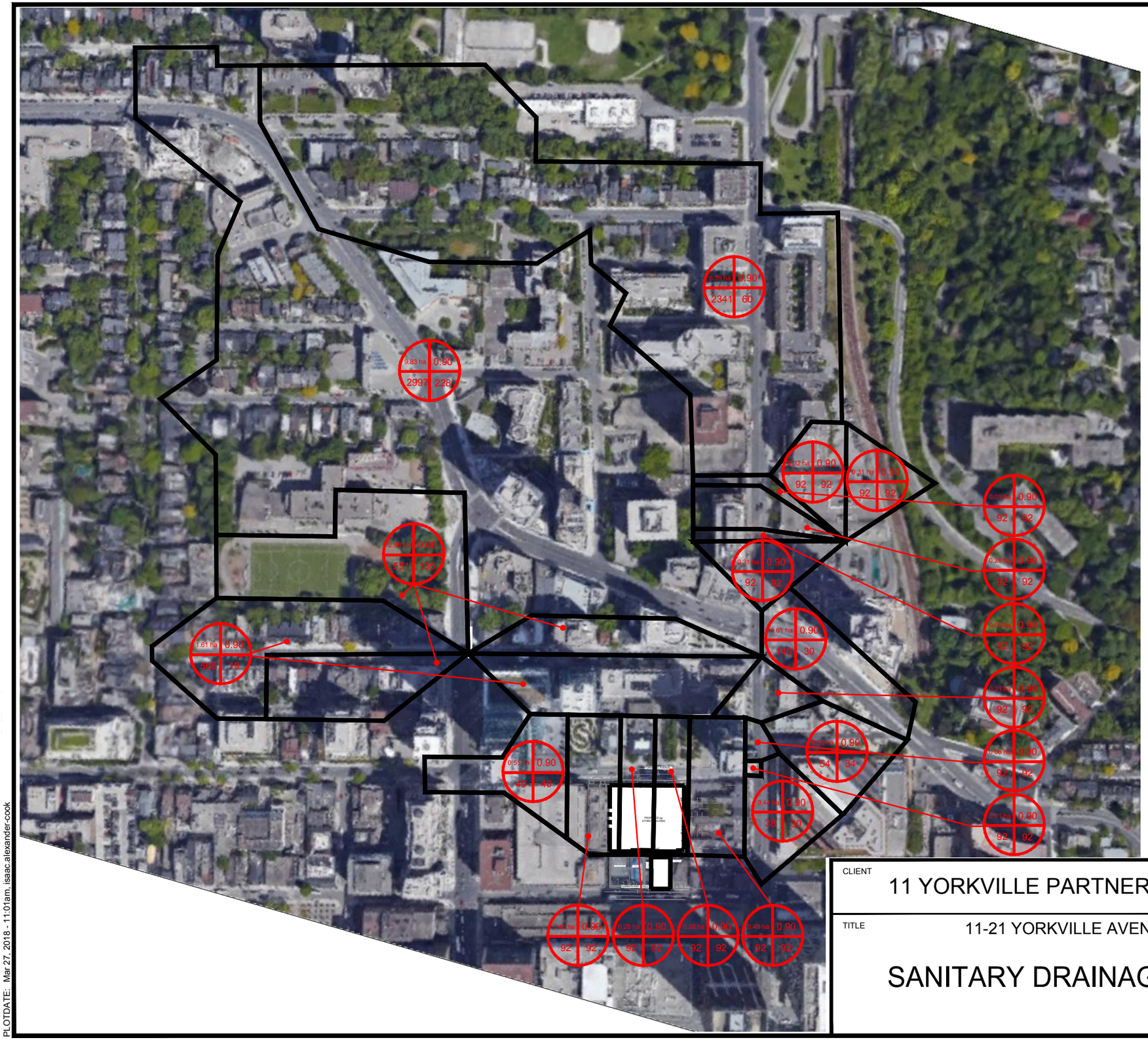
Manning's n= 0.013
C = 0.5

	2 YEAR
a=	21.800
b=	-0.780
I=	88.19

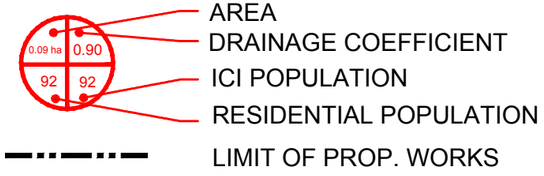
Design Sheet No **1 of 6**
Project: **11 Yorkville**
Project no.: **17M-01494**

		SANITARY FLOW CALCULATIONS														STM SEWER FLOW								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	Foundation Drainage	**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)	**(L/s)**	**(ha)**	**C**			(min.)	(mm/hr)	**(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	0.544	0.116	0.133	1.532	**2.32**	0.51	0.90	0.46	0.46	10.0	88.189	**116.3**	**118.61**	134.8					1.50	1.50	
Yorkville Avenue	4355	0.539	140	21	162	1.050	189	61	251	4.000	2.104	0.176	0.140	1.618	**4.04**	0.54	0.90	0.49	0.94	10.8	82.825	**224.6**	**228.61**	66.4	600	0.283	0.37	**373.49**	1.32	0.84	61.2%
11 Yorkville		0.323	1,096	43	1,139	1.373	1,285	104	1,390	3.727	13.307	0.300	0.084	2.269	**15.96**	0.32	0.90	0.29	1.24	13.1	71.571	**253.8**	**269.73**	200.8					1.50	2.23	
Yorkville Avenue	4356	0.280	65	13	78	1.330	254	74	329	4.000	2.824	0.213	0.073	0.840	**3.95**	0.28	0.90	0.25	1.49	13.3	70.557	**301.2**	**305.15**	20.4	675	0.358	0.36	**504.35**	1.41	0.24	60.5%
16/18 Cumberland Street		0.034	0	10	10	0.034	0	10	10	4.000	0.000	0.029	0.009	0.10	**0.14**	0.03	0.90	0.03	0.03	10.0	88.189	**7.7**	**7.89**								
Yorkville Avenue	4357	0.459	184	0	184	1.789	438	74	513	4.000	4.866	0.213	0.119	1.378	**6.58**	0.46	0.90	0.41	1.90	13.8	68.769	**375.2**	**381.75**	42.1	675	0.358	0.45	**563.88**	1.58	0.45	67.7%
Yorkville Avenue	4358	0.014	6	0	6	1.803	444	74	519	4.000	4.929	0.213	0.004	0.043	**5.19**	0.01	0.90	0.01	1.91	13.9	68.156	**374.3**	**379.51**	15.5	600	0.283	0.56	**459.48**	1.63	0.16	82.6%
Zone 2 from south along Yonge (4359)		0.435	38	30	68	2.239	482	104	587	3.983	5.328	0.300	0.113	1.306	**7.05**	0.44	0.90	0.39	2.31	16.8	58.770	**388.8**	**395.90**	262.0					1.50	2.91	
Yonge Street	4360	0.059	15	1	16	2.298	497	104	603	3.976	5.487	0.302	0.015	0.177	**5.98**	0.06	0.90	0.05	2.36	17.2	57.820	**391.4**	**397.36**	27.4	675	0.358	0.30	**460.41**	1.29	0.35	86.3%
Zone 3 from east along Collier (5569)		0.504	54	34	88	2.801	551	138	691	3.952	6.048	0.400	0.131	1.512	**8.09**	0.50	0.90	0.45	2.81	20.4	50.537	**407.8**	**415.94**	291.3					1.50	3.24	
Yonge Street	4361	0.130	42	3	45	2.932	592	141	736	3.935	6.476	0.408	0.034	0.390	**7.31**	0.13	0.90	0.12	2.93	20.9	49.571	**416.7**	**424.03**	55.2	750	0.442	0.51	**795.04**	1.80	0.51	53.3%
Zone 5 from west along Scollard (4367)		1.607	565	19	584	4.539	1,157	160	1,320	3.758	12.083	0.463	0.418	4.821	**17.79**	1.61	0.90	1.45	4.38	26.1	41.761	**524.4**	**542.21**	463.1					1.50	5.15	
Zone 4 from west along Scollard (4367)		2.875	551	135	686	7.414	1,708	295	2,006	3.638	17.265	0.854	0.748	8.626	**27.49**	2.88	0.60	1.73	6.10	31.2	36.288	**635.4**	**662.87**	463.1					1.50	5.15	
Yonge Street	4368	0.000	0	0	0	7.414	1,708	295	2,006	3.638	17.265	0.854	0.000	0.000	**18.12**	0.00	0.90	0.00	6.10	31.3	36.206	**633.9**	**652.06**	28.0	750	0.442	4.17	**2273.38**	5.15	0.09	28.7%
Zone 6 from east along Church (5539) and Zone 7 from west along Davenport (4352)		10.442	3,137	258	3,395	17.856	4,845	553	5,401	3.258	43.846	1.601	2.715	31.325	**79.49**	10.44	0.90	9.40	15.50	38.7	30.673	**1364.3**	**1443.82**	667.6					1.50	7.42	
Yonge Street	4369	0.393	43	31	75	18.248	4,888	585	5,476	3.254	44.186	1.691	0.102	1.178	**47.16**	0.39	0.90	0.35	15.85	39.0	30.519	**1388.4**	**1435.57**	50.9	900	0.636	1.41	**2149.63**	3.38	0.25	66.8%
Yonge Street	4370	0.282	69	12	82	18.530	4,958	597	5,558	3.248	44.734	1.726	0.073	0.846	**47.38**	0.28	0.90	0.25	16.11	39.2	30.385	**1404.4**	**1451.82**	40.2	900	0.636	1.14	**1932.88**	3.04	0.22	75.1%
Yonge Street	4371	0.084	17	5	22	18.614	4,974	601	5,580	3.247	44.867	1.739	0.022	0.252	**46.88**	0.08	0.90	0.08	16.18	39.2	30.355	**1409.6**	**1456.53**	9.4	900	0.636	1.22	**1999.55**	3.14	0.05	72.8%
Zone 8 from north along Yonge (4387)		6.390	2,341	60	2,401	25.005	7,315	661	7,981	3.088	62.751	1.913	1.661	19.171	**85.50**	6.39	0.90	5.75	21.93	47.9	26.004	**1636.8**	**1722.32**	774.9					1.50	8.61	
Easement	4388	0.321	69	16	86	25.325	7,384	678	8,067	3.084	63.262	1.960	0.083	0.963	**66.27**	0.32	0.90	0.29	22.22	48.0	25.953	**1655.1**	**1721.39**	55.8	1500	1.767	3.70	**13597.24**	7.69	0.12	12.7%
Easement	4389	0.310	55	19	74	25.636	7,439	697	8,141	3.081	63.665	2.016	0.081	0.930	**66.69**	0.31	0.90	0.28	22.50	48.3	25.832	**1668.1**	**1734.83**	67.1	1500	1.767	0.95	**6889.88**	3.90	0.29	25.2%
To Rosedale Valley Combined Sewer Trunk															**569.37**							**15578.5**	**16147.89**								

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 SAN-1 for combined sewer tributary areas*



LEGEND



CLIENT
11 YORKVILLE PARTNERSHIP INC.

TITLE
11-21 YORKVILLE AVENUE

SANITARY DRAINAGE PLAN

wsp

Checked B.S.T.	Drawn 10/12 Cad
Date MAR. 2018	Proj. No. 17M-01494
Scale NTS	Figure No. SAN-1

PLOTDATE: Mar 27, 2018 - 11:01am, isaac.alexander-cook

APPENDIX

B DOMESTIC WATER DEMAND, HYDRANT FLOW TESTING RESULTS AND FUS FIRE FLOW CALCULATIONS

THEORETICAL DOMESTIC WATER DEMAND CALCULATIONS
APPENDIX B

Project: 11 Yorkville Avenue
Job No.: 17M-01494
Date: March 25, 2018

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		426	597	1.32	114.03	2.50	1.30	3.299	1.716
2 Bedroom Unit		218	458	1.01	87.48	2.50	1.30	2.531	1.316
3 Bedroom Unit		72	224	0.50	42.78	2.50	1.30	1.238	0.644
Retail - Building A	3,818	-	42	0.09	8.02	1.20	1.10	0.111	0.102
	Total - Building A	**716**	**1321**	**2.92**	**252.31**	**-**	**-**	**7.18**	**3.78**
Retail - Building B	846	-	10	0.02	1.91	1.20	1.10	0.027	0.024
	Total - Building B	**-**	**10**	**0.02**	**1.91**	**-**	**-**	**0.03**	**0.02**
	Total - Site	**716**	**1331**	**2.94**	**254.22**	**-**	**-**	**7.21**	**3.81**

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: **March 25, 2018**

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 = 2983.36 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: **March 25, 2018**

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 = 462.99 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*

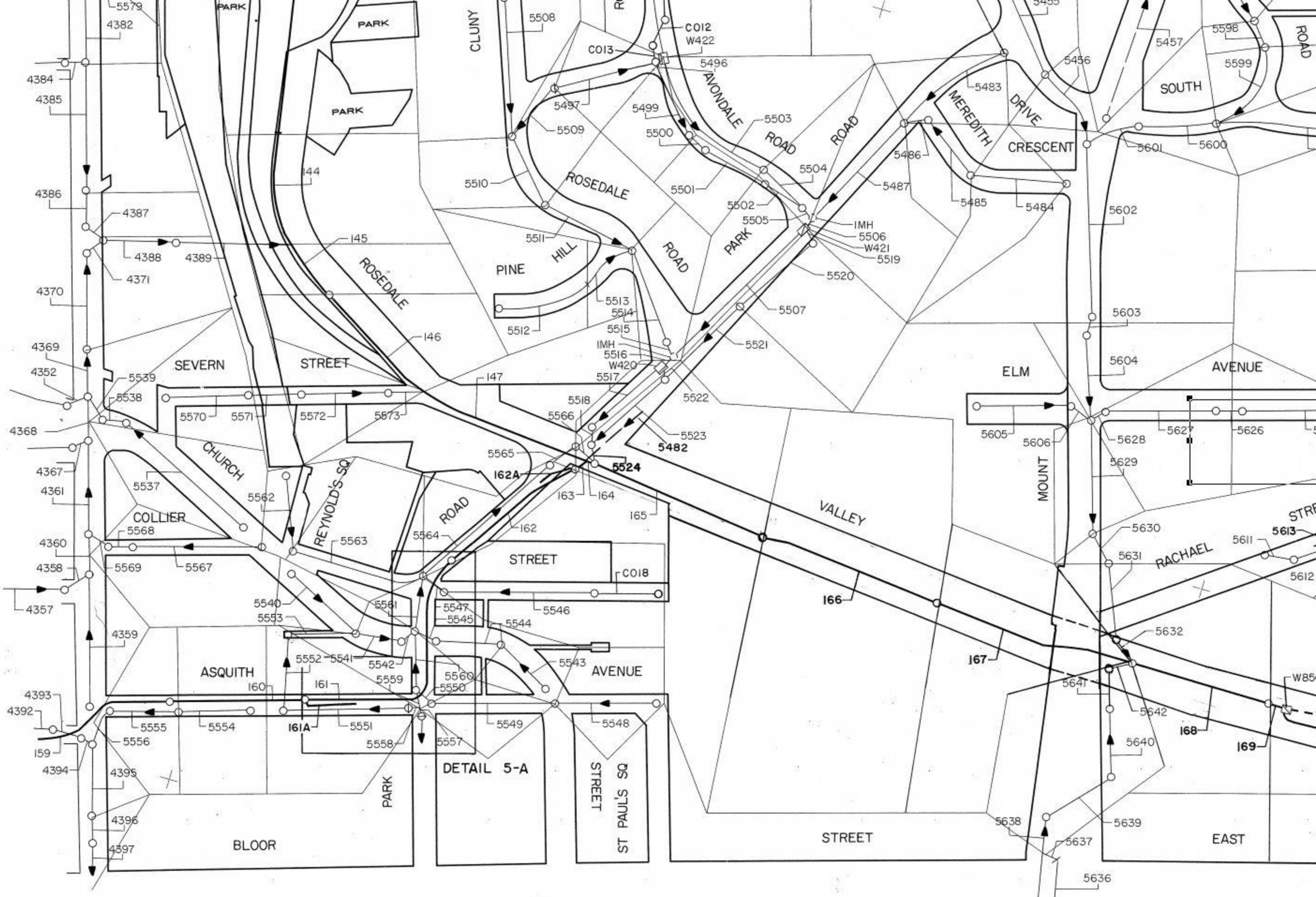
Face	Distance (m)	Charge				
West Side	0.00	25%				
East Side	0.00	25%				
North Side	6.20	20%				
South Side	12.50	15%				
	Total	85%	of	2,250	=	1,913 Lpm

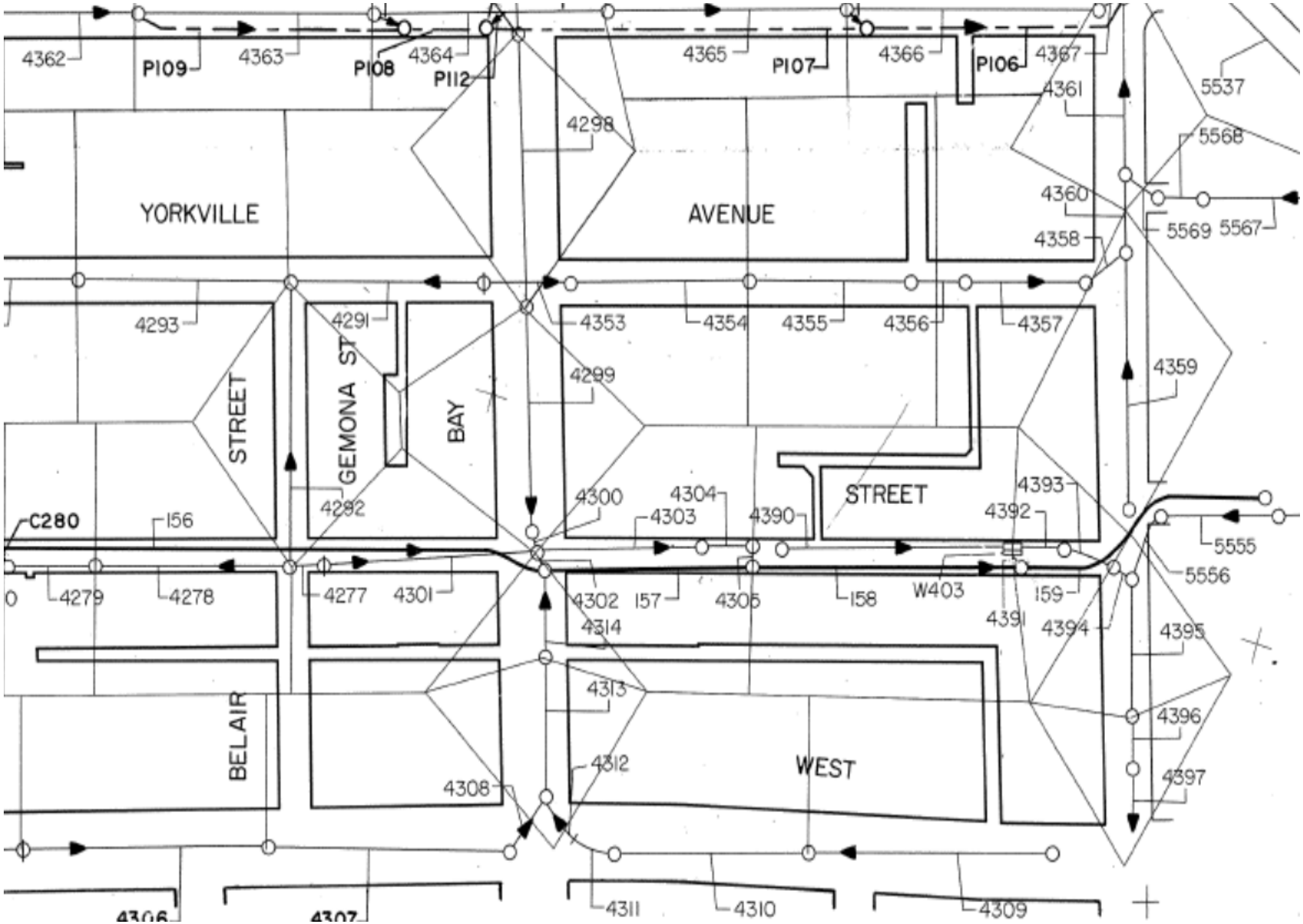
F = 1575 + 1913
F = 3,488 Lpm (2,000 Lpm < F < 45,000 Lpm; OK)
F = 920 US GPM

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.

C CITY OF TORONTO DORSCH MODEL SHEETS & SEWER ATLAS MAPS


PARK
PARK
PARK
CLUNY
5579
4382
4384
4385
5508
C012
W422
C013
5496
5497
5499
5509
5500
AVONDALE
ROAD
ROAD
5503
5504
5501
5510
ROSEDALE
5502
5505
IMH
5506
W421
5519
5511
HILL
ROAD
PARK
5520
5507
5521
5512
5513
5514
5515
IMH
5516
W420
5517
5522
5518
5566
5523
5482
5524
5565
162A
163
164
165
162
5564
5563
REYNOLD'S SQ
ROAD
STREET
C018
5540
5553
5561
5547
5545
5544
5546
5543
AVENUE
5542
5559
5560
5550
5552
5541
5555
5554
161A
5551
5558
5557
5549
5548
PARK
DETAIL 5-A
STREET
ST PAUL'S SQ
STREET
VALLEY
166
167
168
169
5638
5637
5636
5639
EAST
5641
5642
5640
5632
5630
5631
RACHAEL
5611
5613
5612
MOUNT
5628
5629
5627
5626
ELM
5605
5606
5604
AVENUE
5603
5602
5601
5600
5599
5598
5457
5456
5455
SOUTH
5483
MEREDITH
DRIVE
CRESCENT
5486
5487
5485
5484
ROAD
144
145
146
147
4386
4387
4388
4389
4371
4370
4369
4352
5539
5538
4368
5570
5571
5572
5573
SEVERN
STREET
CHURCH
4367
4361
5537
5562
COLLIER
5568
4360
4358
5569
5567
4357
4359
ASQUITH
160
161
4393
4392
159
4394
4395
4396
4397
5556
BLOOR


4362
P109
4363
P108
4364
P112
4365
P107
4366
P106
4367
4361
5537
5568
4298
YORKVILLE
AVENUE
4360
5569
5567
4358
4293
4291
4353
4354
4355
4356
4357
4359
4299
STREET
GEMONA ST
BAY
4300
4304
4303
4390
STREET
4393
4392
C280
156
4282
5555
5556
4279
4278
4277
4301
4302
157
4305
158
W403
159
4391
4394
4395
4314
4313
4396
BELAIR
4312
WEST
4308
4397
4311
4310
4309

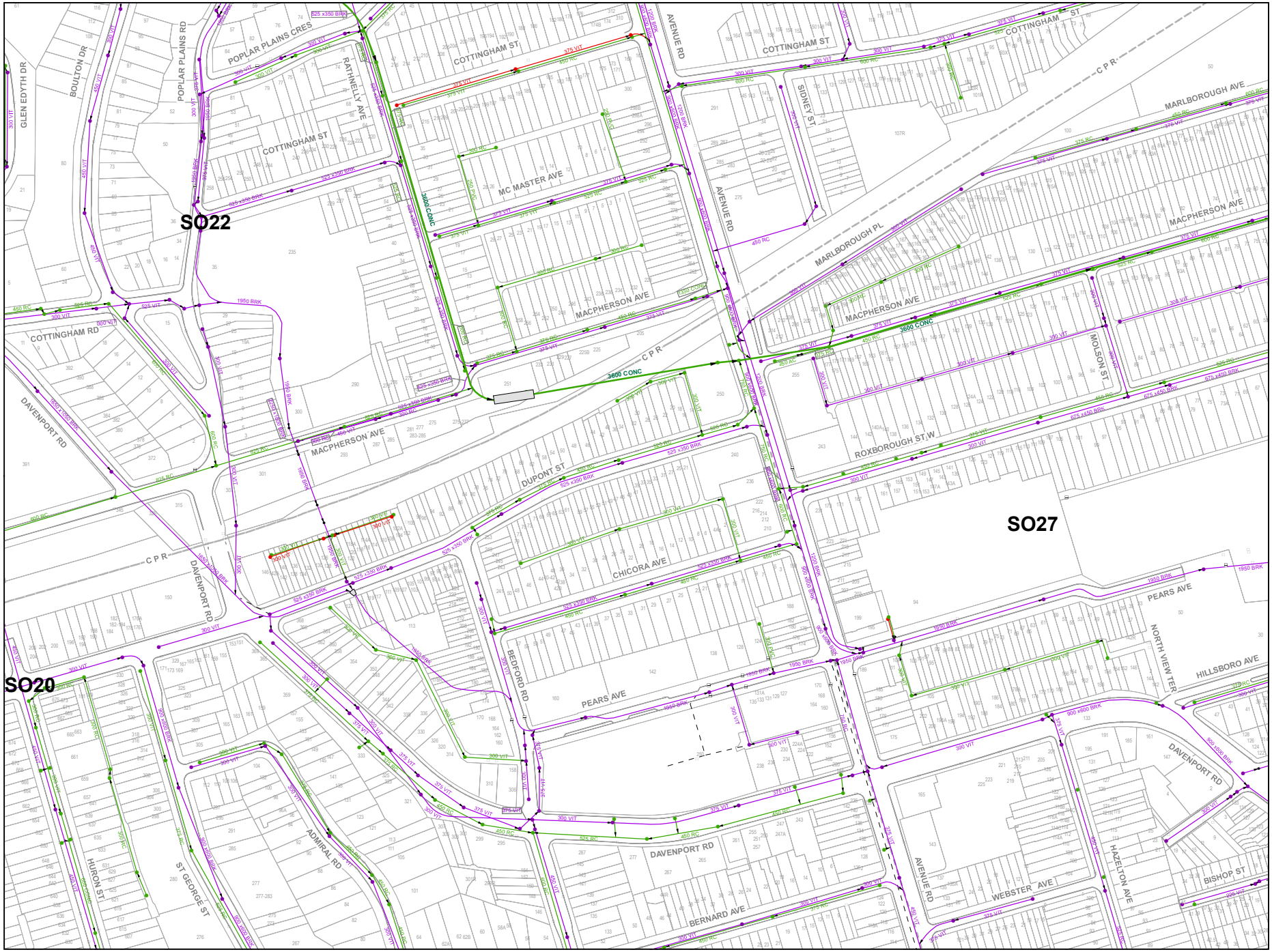
SOUTH CALCULATION AREA

```
 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

Large Chamber

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
- Wards Boundary

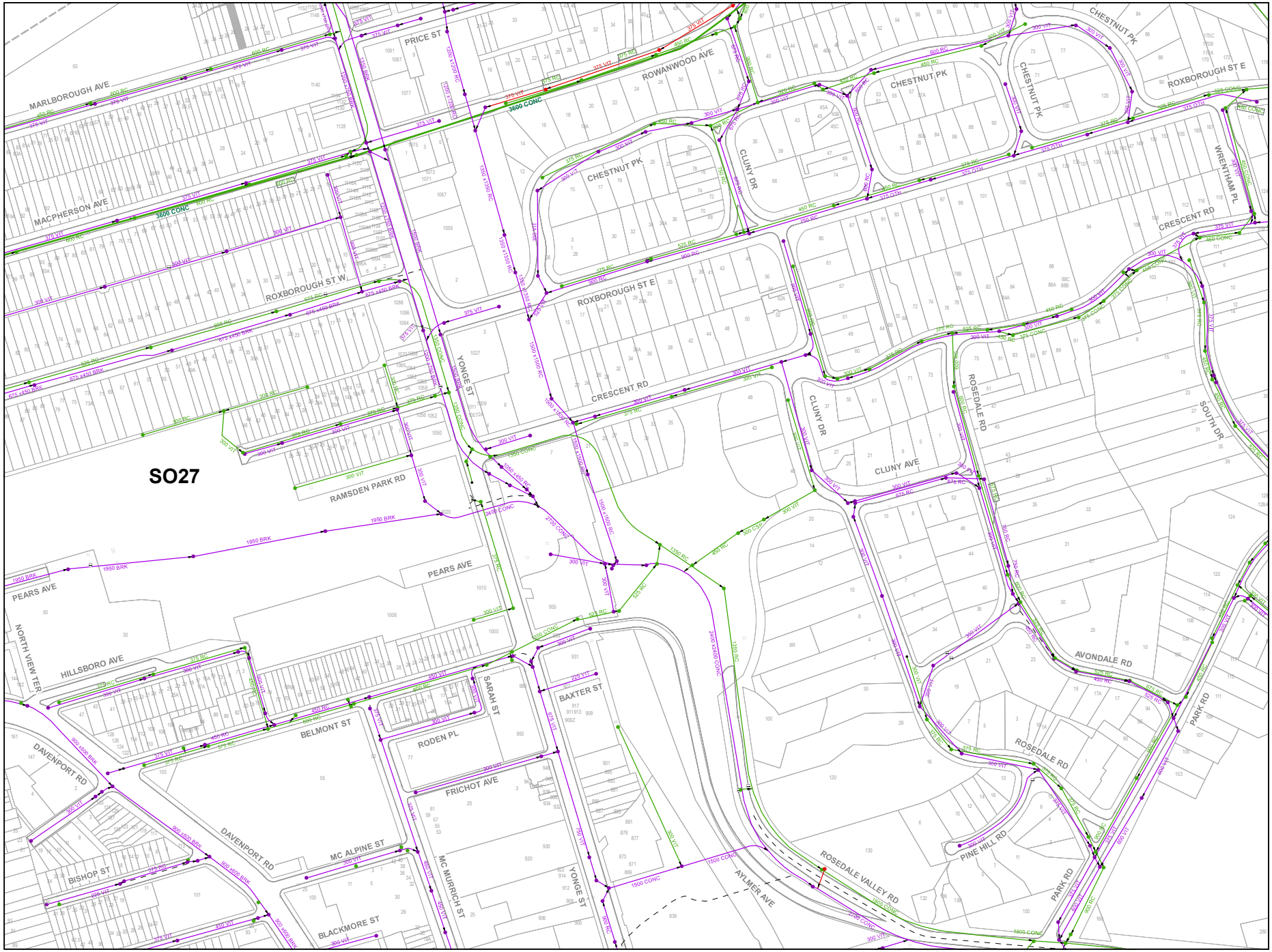
0 50 100 150 200 Metres

Third Edition
Date: 01/09/2010

General Notes:
- The maps were prepared based on the most current data available to Toronto Water as of the Map Source Date.
- These maps are for planning purpose only and must not be used for construction, or as a replacement for a utility locate.
- This drawing is not to be reproduced in whole or in part without the express written permission of the City.
- 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
- 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
- Wards Boundary

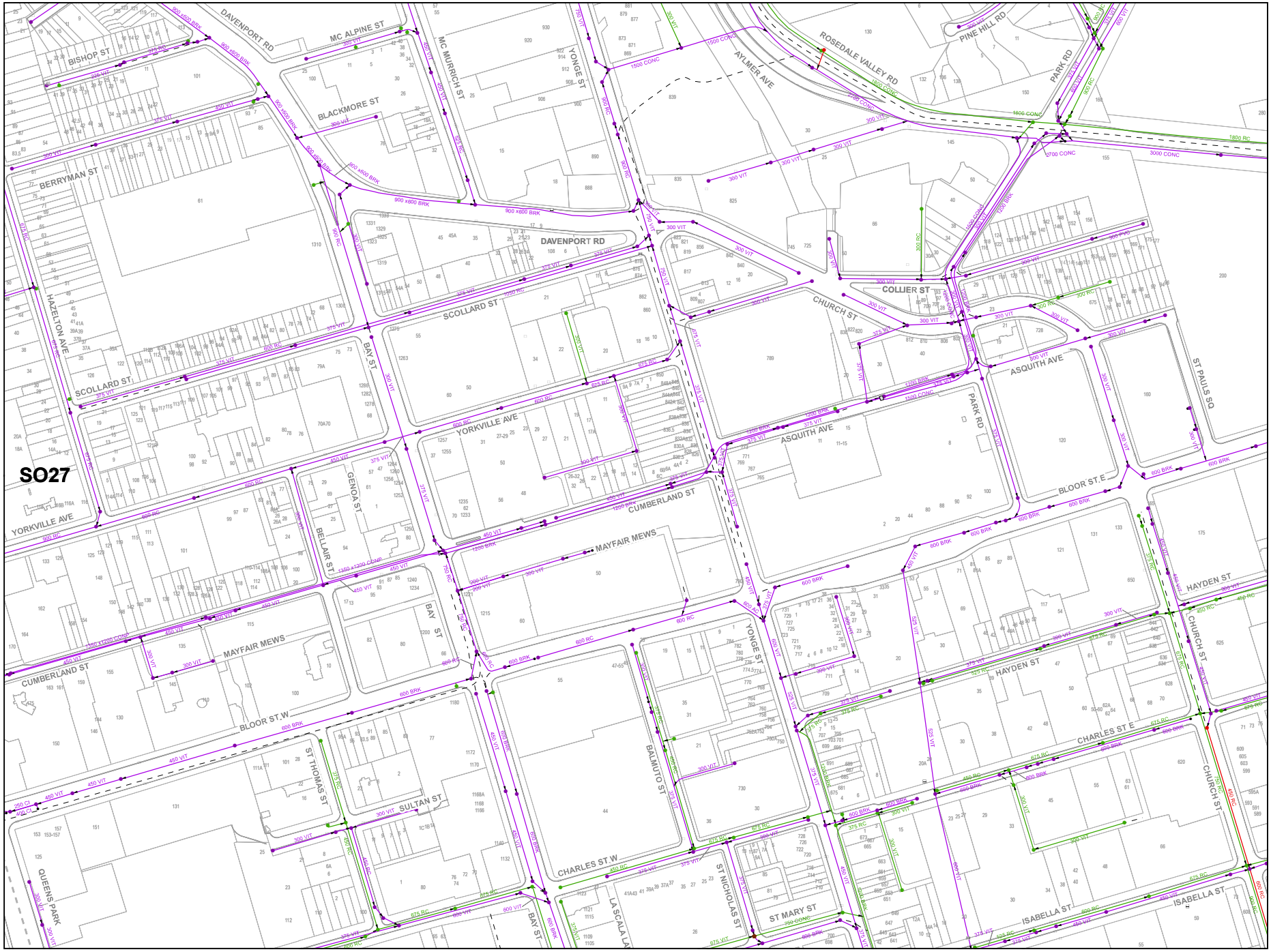
0 50 100 150 200 Metres

Third Edition
Date: 01/09/2010

General Notes:
- The maps were prepared based on the most current data available to Toronto Water as of the Map Source Date.
- These maps are for planning purpose only and must not be used for construction, or as a replacement for a utility locate.
- This drawing is not to be reproduced in whole or in part without the express written permission of the City.
- 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

612	646	681
613	647	682
614	648	683



Toronto Sewer Atlas

Large Chamber

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
- Wards Boundary

0 50 100 150 200 Metres

Third Edition
Date: 01/09/2010

General Notes:
- The maps were prepared based on the most current data available to Toronto Water as of the Map Source Date.
- These maps are for planning purpose only and must not be used for construction, or as a replacement for a utility locate.
- This drawing is not to be reproduced in whole or in part without the express written permission of the City.
- 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

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