

Draft Functional Servicing Report – Queen/Spadina Integrated Transit Oriented Communities

378 Queen Street West
165-177 Spadina Avenue
443-455 Queen Street West
Toronto Ontario M5T 2C4

Issued for Rezoning

Contract RFS-2019-NAFC-110

PO 214244

HDRProject 10206938



Ontario Line Technical Advisor

TORONTO, ONTARIO

May 31, 2021

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Abbreviations

BMP	Best Management Practice
DRM	Design Requirements Manual
HGL	Hydraulic Grade Line
HGRA	High Volume Groundwater Recharge Areas
IBC	Initial Business Case
IDF	Intensity-Duration-Frequency
IO	Infrastructure Ontario
MECP	Ministry of the Environment, Conservation and Parks
OGS	Oil and Grit Separator
OL	Ontario Line
RCD	Reference Concept Design
SWM	Stormwater Management
SUE	Subsurface Utility Engineering
TGS	Toronto Green Standard
TMC681	Toronto Municipal Code Chapter 681
TOC	Transit Oriented Communities
TSS	Total Suspended Solids
TRCA	Toronto and Region Conservation Authority
WWFMG	Wet Weather Flow Management Guidelines

1 Introduction

The Province of Ontario is planning to build a new 15.5 km rapid transit line serving the City of Toronto. The development of this line is being managed jointly by Metrolinx, the Provincial Transit Agency responsible for the Greater Toronto and Hamilton Area, and Infrastructure Ontario (IO). Transit-Oriented Communities are proposed at the Ontario Line Stations to integrate high density, mixed-used developments with transit infrastructure.

HDR Inc. has been retained by Metrolinx to prepare a Functional Servicing Report to assess the servicing requirements related to the proposed Ontario Line Transit-Oriented Communities (TOC) at the intersection of Queen Street West and Spadina Avenue in the City of Toronto. This Functional Servicing Report provides a preliminary study for water distribution, electrical service, sanitary sewage, and storm drainage for the developments of the above-mentioned site.

A Stormwater Management Report outlining the proposed stormwater management strategy for this site has been prepared by OneTeam under a separate cover. In preparation of this report, OneTeam staff reviewed the available information for existing utilities and the associated Ontario Line Reference Concept Design (RCD) plans.

1.1 Site Description

There are two proposed developments at the intersection of Queen Street West and Spadina Avenue. The subject site, Site E (378 Queen Street West/ 165-177 Spadina Avenue) is at the northeast corner, and Site F (443-455 Queen Street West) is situated at the southwest corner of the intersection of Queen Street West and Spadina Avenue, where the Ontario Line transit station is proposed.

The existing site consists of a three-storey mixed-use building at Site E that spans north from Queen Street West to Bulwer Street. The existing site conditions at subject Site F include a two-storey commercial building (TD Bank) at the immediate southwest corner of the intersection that extends south along Spadina Avenue from Queen Street West to Graffiti Alley, as well as three two-story attached commercial buildings and associated parking lots west of the TD Bank building. **Figure 1** shows an aerial map of the subject site locations.

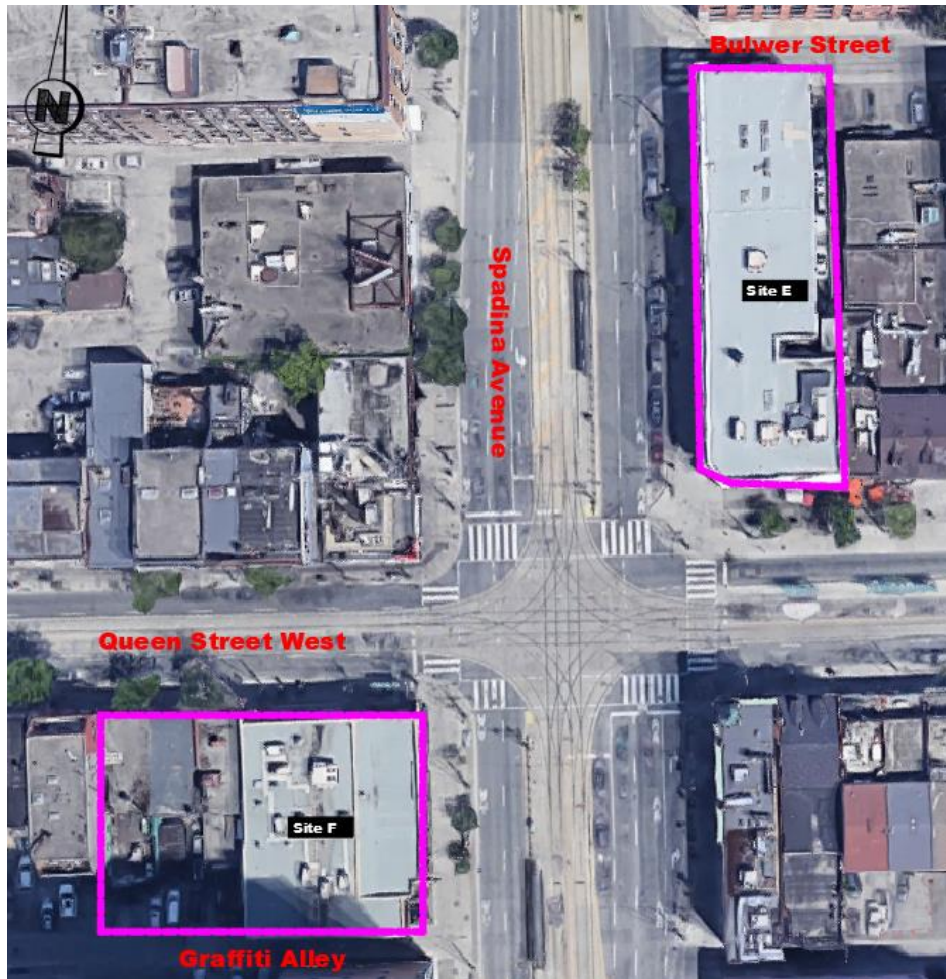


Figure 1-1. Aerial Map of Subject Site Locations

1.2 Proposed Development

Based on the preliminary Reference Concept Design, the proposed development at these locations consists of a fifteen-storey building with two additional levels for mechanical and two underground levels at Site E, and a fourteen-storey building with one additional level mechanical and two underground levels at Site F.

The development of Site E will be mixed-use residential with transit infrastructure. The proposed design will provide 95 residential units ranging from studios to 3-bedrooms, with 149 bicycle parking spaces and no vehicle parking. The additional residential units will all be provided above the existing heritage buildings whereas transit and commercial space will occupy the main level and the two levels below grade.

The fourteen-storey development of Site F will be mixed-use residential with transit infrastructure and commercial use occupying about one-fourth of the total gross floor area. Transit infrastructure will occupy the main level and the two underground levels, whereas retail space will be provided on the main, first, second, and third levels. This development will also provide 122 residential units ranging from studios to 3-bedrooms as well as 228 bicycle parking spaces in the underground levels, with no vehicle parking proposed.

2 Site Condition

2.1 Existing Topography

The existing sites are situated on relatively flat terrain with a three-storey mixed-use building at Site E, and four attached two-storey commercial buildings at Site F.

Site E has an approximate area of 0.10 Ha with a concrete sidewalk to the north of the proposed development, a concrete sidewalk and trees to the west and south, and a two-storey commercial building and asphalt driveway to the east. The site generally slopes to the south.

Site F has an approximate area of 0.16 Ha with concrete sidewalk to the north, concrete sidewalk and trees to the east, asphalt pavement to the south, and two-storey attached commercial buildings to the west. The site generally slopes to the south.

2.2 Existing Utility Information

The existing utility information surrounding the sites is provided on the Site Servicing Plan attached in Appendix A. Note that all existing utility information is based on Quality Levels B, C and D Subsurface Utility Engineering (SUE) investigation that was carried out in 2020. Prior to detailed design and construction, it is recommended that OneTeam and Development Co. confirm the existing underground and aerial utilities and the vertical elevation information. At the time when this report is prepared, the sewer capacity information was not available.

2.3 Proposed Site Grading

The proposed site grading at Site E will maintain the existing gentle slope to the south as the existing three-storey mixed-use building/ facade will remain as is. The proposed grading at Site F will also be a relatively gentle slope to the south upon completion, with the proposed grade anticipated to be the minimum sufficient to drain stormwater from the development site to meet the City of Toronto Toronto-East York design guidelines. A preliminary Grading Plan is attached in **Appendix A**.

3 Water Supply and Appurtenances

3.1 Existing Condition

Based on presently available information, the two-storey commercial building (TD Bank) immediately southwest at subject site F is currently serviced by a single water service connection to its east that connects to the existing 300mm watermain line along Queen Street West. The three attached two-storey commercial buildings west of the bank building are each serviced by water service connections to their north, tapping into the mainline 300 mm watermain along Queen Street West.

Available SUE surveys of the area do not appear to show any water service connections to the existing site E but do show an existing network of mainline 300 mm watermains along Queen Street West and Spadina Avenue. Further investigation on-site may be required.

3.2 Water Supply

Under the Ontario Building Code (OBC), every dwelling unit shall be supplied with a water distribution system where drinking water is available (Section 9.31.3.1). The OBC also states that every water distribution system shall be connected to a watermain that is part of the municipal drinking water system unless otherwise stated in OBC Article 7.1.5.3.

The OBC also requires that both office space and residential space be built from non-combustible construction, and sprinklered, unless otherwise stated in Subsection 3.2.6 and 3.2.2.7 of the Code. In addition, the OBC does not require fire hydrants within a building but mandates that a hydrant is located within 90m horizontally of any portion of a building perimeter which is required to face a street.

The watermain network will be designed and constructed to the City of Toronto's *Design Criteria for Sewers and Watermains (2019)*. A Site Servicing Plan in **Appendix A** has been prepared to show the potential locations of the watermain service connections to the developments. The water demand for the proposed sites was calculated per the City of Toronto's *Design Criteria for Sewers and Watermains (2019)* and using site statistics provided by the architect. Calculation summaries for Site E and F are provided in **Table 3-1** and **Table 3-2**, respectively, and detailed water demand calculations can be found in **Appendix B**.

Table 3-1. Site E Development Water Demand Calculation Summary

Parameter/ Items	Residential	Commercial
Average Day Water Consumption Rate	191 L/capita/day	191 L/capita/day
Total Site Area	975 m ²	
Total GFA	6662 m ²	0 m ²
Residential units	92	n/a
Residential/ commercial population	160	n/a
Peaking factor	2.5	n/a
Average Water Demand from Site	0.4 L/s	0 L/s
Peak Water Demand from Site	0.9 L/s	0 L/s

Table 3-2. Site F Development Water Demand Calculation Summary

Parameter/ Items	Residential	Commercial
Average Day Water Consumption Rate	191 L/capita/day	191 L/capita/day
Total Site Area	1556 m ²	
Total GFA	8034 m ²	1914 m ²
Residential units	122	n/a
Residential/ commercial population	212	21
Peaking factor	2.5	1.2
Average Water Demand from Site	0.5 L/s	0.05 L/s
Peak Water Demand from Site	1.2 L/s	0.1 L/s

The estimated fire flow requirements were calculated based on recommendations by the *Fire Underwriters Survey Water Supply for Public Fire Protection (1999)* and the City of Toronto’s Fire flow requirement. This was determined to be 28,450 L/min for both the Site E and Site F developments. Detailed calculations can be found in **Appendix B**.

The proposed Site E development will be serviced by a 200 mm domestic watermain service and a 250 mm fire watermain service that connect to a proposed 300mm watermain connection. The 300 mm watermain connection will connect to the existing 400 mm watermain trunk along Spadina Avenue just west of the building.

The proposed Site F development will be serviced by a 200 mm domestic watermain service and a 250 mm fire watermain service that connect to a proposed 300 mm watermain connection. The 300 mm watermain connection will connect to the existing 300mm watermain trunk along Queen Street West just north of the building.

The water meters will be in the sprinkler or mechanical rooms inside the buildings, and further coordination with the City of Toronto is required to confirm the existing watermain network capacity necessary to support the water demand of these two sites.

3.3 Hydrant Flow Test

At the time of writing this report, no watermain pressure information was available. Consequently, it is recommended to conduct a hydrant flow test during the detailed

design stage to confirm the adequacy of the watermain pressure to support the proposed development.

4 Sanitary Servicing

4.1 Existing Condition

Available SUE surveys of the area do not appear to show any sanitary service connections to the existing site E or F. However, the surveys do show an existing network of 250 mm sanitary sewers along Queen Street West and Bulwer Street, and a 1050 mm x 1500 mm egg-shaped brick combined storm/sanitary sewer along Spadina Avenue. Further investigation on site is required to confirm the existing servicing laterals.

4.2 Proposed Sanitary Flow

Sanitary flows for the proposed developments are per the design parameters from the City of Toronto's *Design Criteria for Sewers and Watermains (2019)* and site statistics provided by the architect. **Table 4-1** and **Table 4-2** summarize the sanitary flow calculations for the proposed development on Site E and F respectively. Detailed sanitary flow calculations are included in **Appendix C**.

Table 4-1. Site E Development Sanitary Demand Calculation Summary

Parameter/ Items	Residential	Commercial
Sanitary Demand Rate	450 L/capita/day	0 L/capita/day
Commercial Average Flow	n/a	180 000 L/floor ha/day
Total GFA	6662 m ²	0 m ²
Peaking Factor	4.2	n/a
Peak Sanitary Flow	0.86 L/s	n/a
Groundwater Discharge to Sanitary Sewer	0.03 L/s	
Maximum Cumulative Flow with Peaking Factor	3.63 L/s	

Table 4-2. Site F Development Sanitary Demand Calculation Summary

Parameter/ Items	Residential	Commercial
Sanitary Demand Rate	450 L/capita/day	0 L/capita/day
Commercial Average Flow	n/a	180 000 L/floor ha/day
Total GFA	8034 m ²	1914 m ²
Peaking Factor	4.1	n/a
Peak Sanitary Flow	1.10 L/s	0.40 L/s
Groundwater Discharge to Sanitary Sewer	0.04 L/s	
Maximum Cumulative Flow with Peaking Factor	4.97 L/s	

4.3 Sanitary Service Connection

The proposed Site E development will be serviced by a 250 mm sanitary sewer connection to the existing 1050 mm x 1500 mm egg shaped brick combined sewer west of the building on Spadina Avenue.

The proposed Site F development will be serviced by a 250 mm sanitary sewer connection to the existing 600 mm x 900 mm egg shaped brick combined sewer north of the building on Queen Street West.

A Site Servicing Plan in **Appendix A** has been prepared to show the potential locations of the sanitary service connections to support the developments. Future coordination with the City of Toronto is required to confirm the existing sanitary sewer network capacity to accommodate the proposed development.

5 Storm Drainage and Stormwater Management

5.1 Existing Condition

Currently, the site is occupied by two low-rise buildings at the proposed locations, at the southwest and northeast corners of the intersection. Spadina Avenue slopes from north to south, while Queen Street West slopes from east to west.

Minor flow within the vicinity of the site is captured via a number of catch basins and conveyed into existing storm sewers, which includes 600 mm sewer and 825 mm sewer along Spadina Avenue and 425 mm sewer and 525 mm sewer along Queen Street. In addition to those, there is also a 1050 mm x 1500 mm combined sewer along Spadina Avenue and a 600 mm x 900 mm combined sewer along Queen Street. Please refer to the attached existing conditions drainage plan **Appendix D**.

Spadina Avenue slopes continuously from north to south for more than 5 kms, creating a large drainage area for the major flow at the intersection of Queen Street and Spadina Avenue. The major flow along Spadina Avenue runs from north of Queen Street towards Lake Ontario.

At the time when this report was prepared, The City is working on the InfoWorks model for this area, and is currently not available. With limited information that is currently available, its not possible to further comment on where the existing buildings are draining.

5.2 Stormwater Management Criteria

Stormwater management requirements are specified by the authorities having jurisdiction over the Project. These requirements apply to all locations where the proposed design will influence or be influenced by surface water runoff. The stormwater management design criteria are described below and supplemented by the Project Specific Output Specifications (PSOS). The key criteria applicable to this Project are summarized in the following sections.

5.2.1 Quality Control

- Provide a long-term average removal of 80% of total suspended solids (TSS) from the storm runoff of additional impervious areas (TRCA Guidelines).
- Provide a long-term average removal of 80% of total suspended solids (TSS) on an annual loading basis from all the storm runoff leaving the site (WWFMG, TGS).
 - o Oil-Grit Separator (OGS) devices are credited with a maximum of 50% TSS removal (WWFMG, TRCA).

5.2.2 Quality/ Flood Control

- Protect against surface flooding from ponding on streets during the 100-year event. Consult Toronto Water – Sewer Asset Planning Section for developments within the City’s chronic basement flooding areas (WWFMG).
- Drainage discharged to the municipal storm sewer must be controlled to the peak release rate from the lower of:

- o the existing conditions peak flow from design event with a 2-year return period assuming a runoff coefficient of 0.5, if the existing imperviousness is greater than 50%; and,
- o the existing capacity of the storm sewer (WWFMG).
- In absence of an approved or adequate overland flow route, all flow from the 2-year up to the 100-year return storm events shall be stored on-site and released at the allowable release rate as defined above (WWFMG).
- Peak flows should be calculated using the intensity-duration-frequency (IDF) information in the WWFMG.

5.2.3 Water Balance

- Retain all runoff from the 5 mm rainfall event on site through infiltration, evaporation, and/or rainwater reuse (WWFMG, TGS - Tier 1).
- Retain all runoff from the 10 mm rainfall event on site through infiltration, evaporation, and/or rainwater reuse (TGS - Tier 2).
- For sites located in high volume groundwater recharge areas (HGRA), pre-development groundwater recharge rates should be maintained (TRCA).

5.2.4 Erosion Control

- For infill/redevelopment sites (<2 ha), where the site does not drain to a sensitive watercourse, erosion control should be provided through the retention of a small design rainfall event (typically 5 mm). This is often achieved by satisfying the water balance retention requirement (WWFMG, TRCA).
- For new large development sites (> 5 ha) discharge directly and/or in proximity (within 100 m) of natural watercourses, it is required to complete an Erosion Analysis Report to determine the erosion control criteria for the sites (WWFMG).
- For sites where it is not feasible (this condition must be reviewed and agreed by City staff) to complete an erosion analysis study report, it is typically required that runoff from a 25 mm design storm shall be detained on-site and released over a minimum of 24 hours (WWFMG).

5.3 Stormwater Management Plan

As per the applicable SWM criteria summarized in **Section 5.2**, it is required to provide water balance, as well as quantity, quality and erosion control for the proposed Queen/Spadina development sites. The stormwater best management practices (BMP) considered for the site include green roofs, underground detention/retention tanks, and oil/grit separator (OGS) units. The Proposed Drainage Plan is presented in **Appendix D**.

All building openings should be protected from flooding. During detailed design, the depth of overland flow at these locations should be calculated using dual drainage models to confirm that all openings to the buildings will have sufficient freeboard above the maximum water elevation during a 100-year storm event. The Reference Concept Design (RCD) satisfies stormwater management (SWM) and drainage requirements for the Proposed Queen/Spadina Sites as follows:

- **Quantity Control:**

Storage tank units with orifice control are proposed in the first underground level to provide quantity control.

- **Quality Control:**

Quality control for each site will be provided via the proposed green roof and an Oil Grit Separator unit.

- **Water Balance:**

Green roof and water reuse are proposed to satisfy the 10 mm retention requirement. Summary of the required storage is presented in Table 5-1 below:

Table 5-1. Summary of the Required Storage

ID	Site Area (ha)		Proposed Green Roof (ha)	Required Storage Volume for Quantity Control (m ³)	Required Storage Volume for Water Balance Reuse (m ³)
	Exist.	Prop.			
Site E	0.10	0.10	0.0236	31.0	8.5
Site F	0.16	0.16	0.0568	51.0	13.7

For details of the stormwater management requirement and design, refer to the Stormwater Management Report under a separate cover,

6 Site Utilities

Sites E and F will both be serviced by utilities provided by Toronto Hydro, Enbridge Gas, and telecommunications providers. Future utility coordination is required with each utility company to determine the feasibility, requirements, and connection locations for their respective service.

6.1 Electrical Service

Electrical service will be provided by Toronto Hydro and surveys currently shows that there are existing Toronto Hydro conduits in the approximate location of Sites E and F. The existing three-story mixed-use building at Site E is currently serviced by an existing electrical line just west of it, on Spadina Avenue. The two-story commercial buildings at Site F are currently serviced by the existing electrical line along Queen Street West, except for the commercial building at the immediate southwest corner, serviced by two connections to the existing electrical line along Spadina Avenue. The developer is to initiate discussions with Toronto Hydro to determine the connection requirements and locations of electrical service to the proposed Site E and F developments.

6.2 Gas Service

Gas service will be provided by Enbridge Gas. Available SUE surveys of the area indicate that the existing building at Site E is currently serviced by three gas connections to the existing 150 mm gas main along Spadina Avenue, just east of the building. The existing commercial buildings at Site F are each serviced by a gas connection to the existing 100 mm gas main, whereas the building immediately southwest of the corner is serviced by the existing 100 mm gas main along Spadina Avenue, east of the building. It is recommended that the existing gas servicing laterals be maintained for future developments. The developer is to initiate discussions with Enbridge Gas to determine the connection requirements and to confirm the locations of gas service to the proposed Site B and D developments.

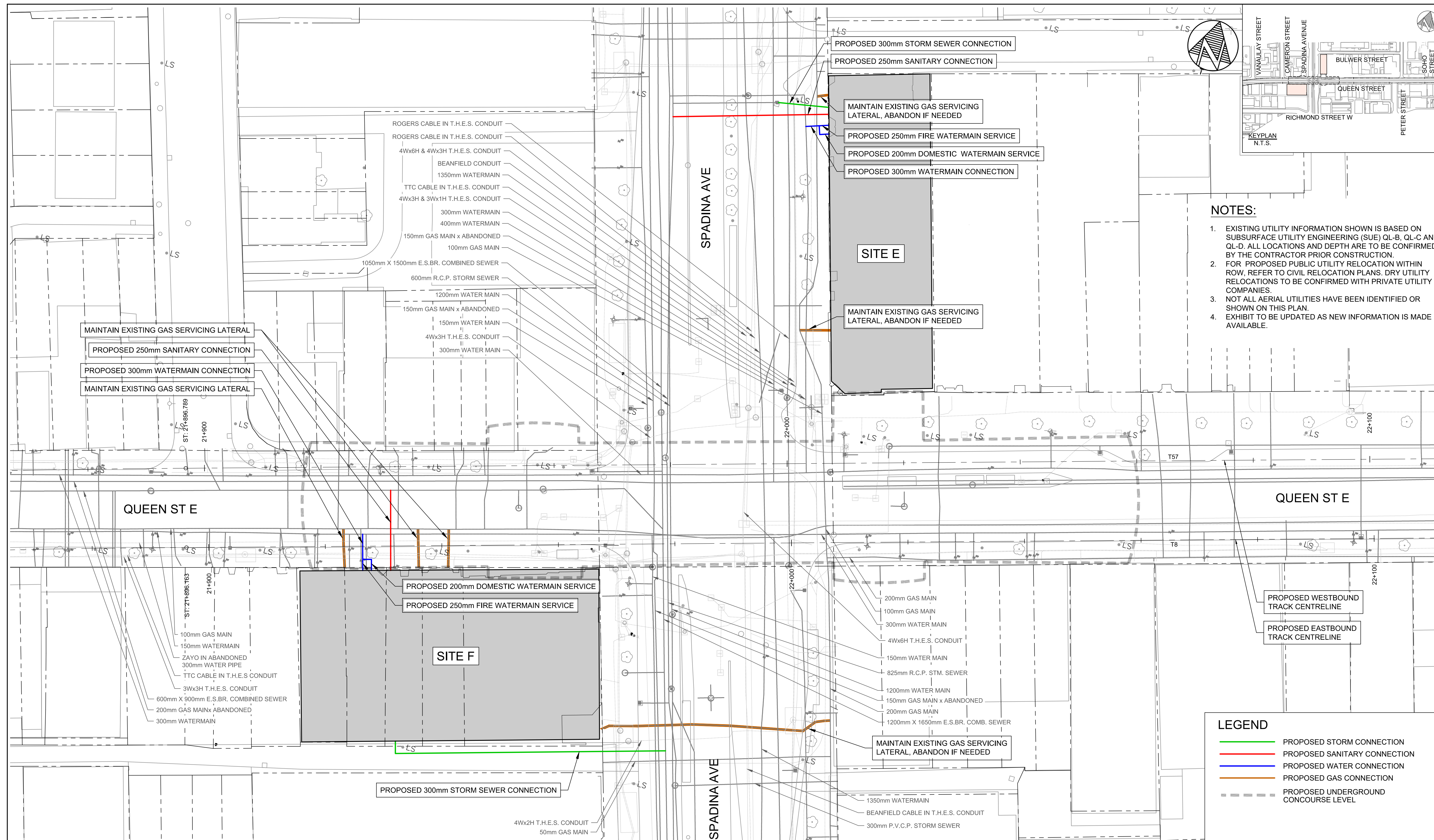
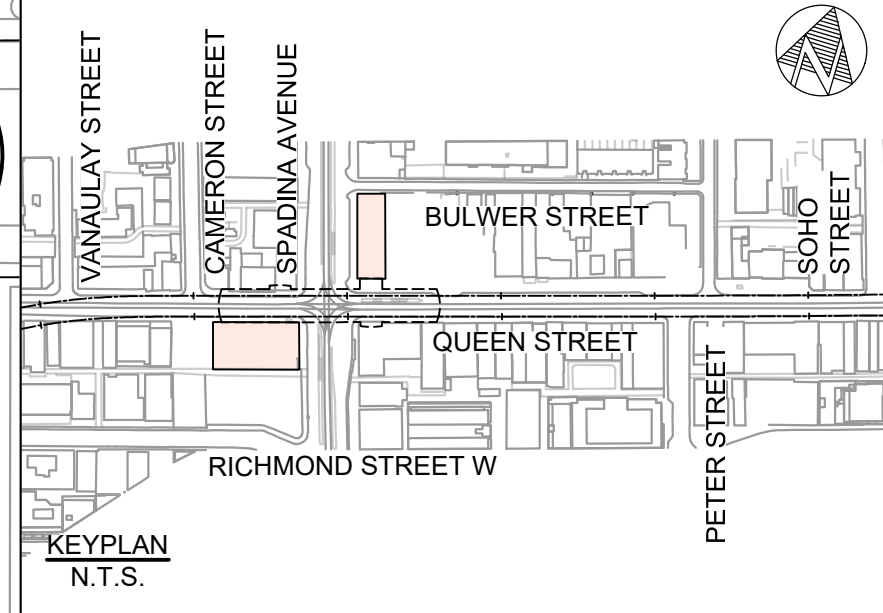
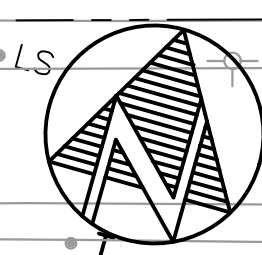
6.3 Communication

Surveys currently show cables from Rogers, Beanfield, Zayo, and Bell traversing the extent of both subject sites. The developer is to coordinate with the relevant telecommunication systems provider to determine connection requirements.

7 Conclusions and Summary

A Site Servicing plan has been prepared to support the rezoning submission for the proposed development at the intersection of Queen Street West and Spadina Avenue in the City of Toronto as part of the Ontario Line Transit Oriented Communities. Due to the limitation in the available existing utility information, this report focuses on the proposed developments water demand, sanitary demand, and stormwater management design requirements. Coordination and data collection with City of Toronto is on-going throughout this project to review the existing sewage capacity in order to accommodate the proposed developments. OneTeam is arranging a flow monitor program to take place in 2021 to review the existing sewage capacity and water pressure in the proximity of the proposed developments.

Appendix A. Site Servicing Plan and Grading Plan



NOTES:

- EXISTING UTILITY INFORMATION SHOWN IS BASED ON SUBSURFACE UTILITY ENGINEERING (SUE) QL-B, QL-C AND QL-D. ALL LOCATIONS AND DEPTH ARE TO BE CONFIRMED BY THE CONTRACTOR PRIOR CONSTRUCTION.
- FOR PROPOSED PUBLIC UTILITY RELOCATION WITHIN ROW, REFER TO CIVIL RELOCATION PLANS. DRY UTILITY RELOCATIONS TO BE CONFIRMED WITH PRIVATE UTILITY COMPANIES.
- NOT ALL AERIAL UTILITIES HAVE BEEN IDENTIFIED OR SHOWN ON THIS PLAN.
- EXHIBIT TO BE UPDATED AS NEW INFORMATION IS MADE AVAILABLE.

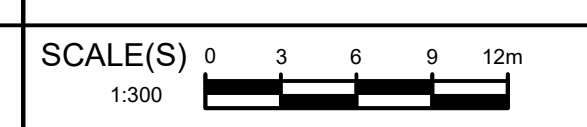
LEGEND

- PROPOSED STORM CONNECTION
- PROPOSED SANITARY CONNECTION
- PROPOSED WATER CONNECTION
- PROPOSED GAS CONNECTION
- - - PROPOSED UNDERGROUND CONCOURSE LEVEL

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PLOTTED BY: USER

REVISIONS	REVISIONS
1	4
2	5
3	6

RCD
NOT FOR CONSTRUCTION



STATUS



DESIGNED	M.LI	2020/12/08
DRAWN	H.WANG	2020/09/09
CHECKED	M.LI	2020/12/08
APPROVED	APPROVED	2020/12/08

ONTARIO LINE SUBWAY

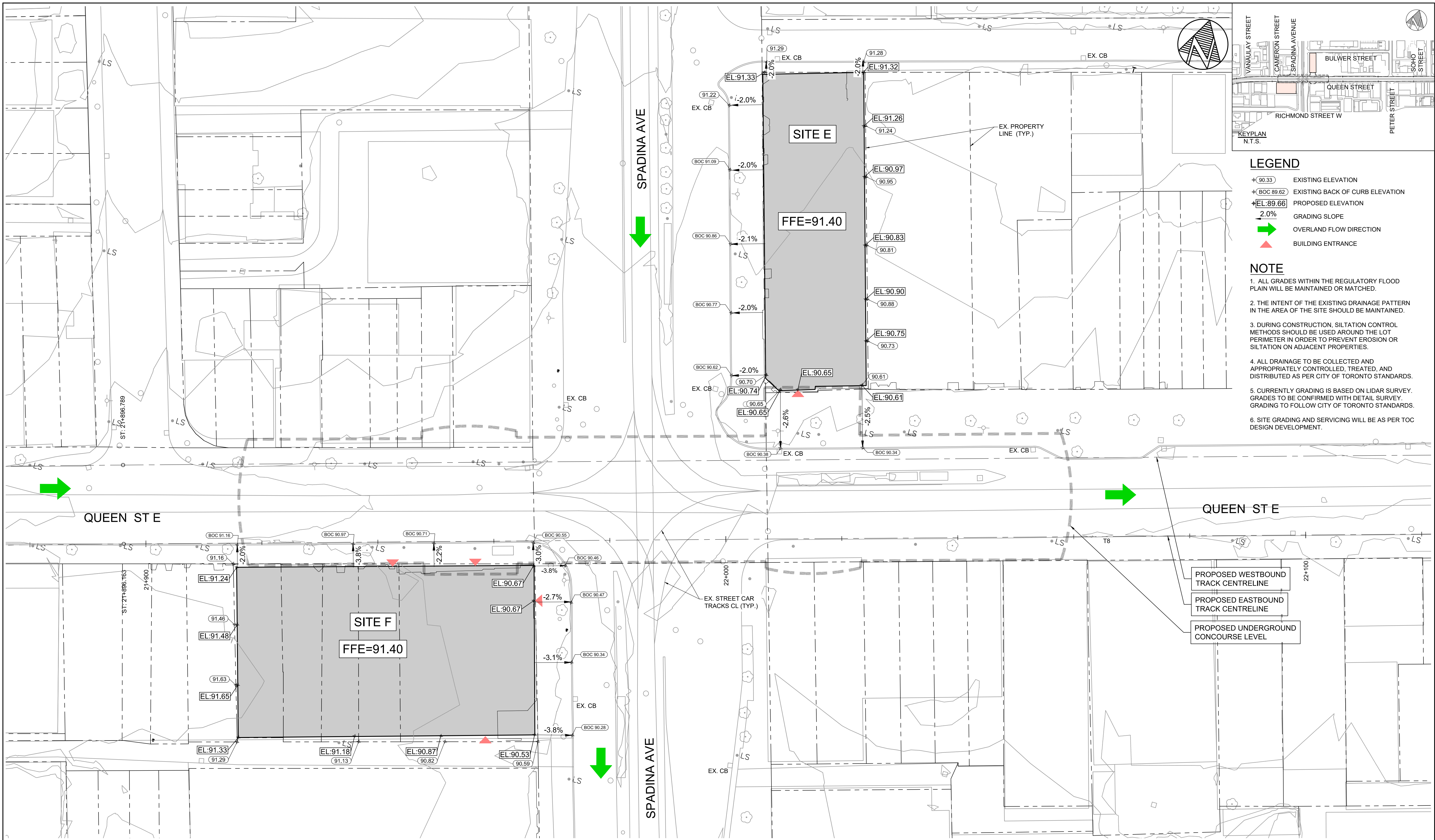
TITLE: **TOC QUEEN-SPADINA STATION SERVICING PLAN**

Plot Date: _____

METROLINX Infrastructure Ontario

Dwg. No. SS0300-02-SF140

Sheet No. _____



- LEGEND**
- ⊕ 90.33 EXISTING ELEVATION
 - ⊕ BOC 89.62 EXISTING BACK OF CURB ELEVATION
 - ⊕ EL:89.66 PROPOSED ELEVATION
 - 2.0% GRADING SLOPE
 - ➔ OVERLAND FLOW DIRECTION
 - ▲ BUILDING ENTRANCE
- NOTE**
1. ALL GRADES WITHIN THE REGULATORY FLOOD PLAIN WILL BE MAINTAINED OR MATCHED.
 2. THE INTENT OF THE EXISTING DRAINAGE PATTERN IN THE AREA OF THE SITE SHOULD BE MAINTAINED.
 3. DURING CONSTRUCTION, SILTATION CONTROL METHODS SHOULD BE USED AROUND THE LOT PERIMETER IN ORDER TO PREVENT EROSION OR SILTATION ON ADJACENT PROPERTIES.
 4. ALL DRAINAGE TO BE COLLECTED AND APPROPRIATELY CONTROLLED, TREATED, AND DISTRIBUTED AS PER CITY OF TORONTO STANDARDS.
 5. CURRENTLY GRADING IS BASED ON LIDAR SURVEY. GRADES TO BE CONFIRMED WITH DETAIL SURVEY. GRADING TO FOLLOW CITY OF TORONTO STANDARDS.
 6. SITE GRADING AND SERVICING WILL BE AS PER TOC DESIGN DEVELOPMENT.

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REVISIONS	REVISIONS
1	4
2	5
3	6

RCD
NOT FOR CONSTRUCTION

SCALE(S) 0 3 6 9 12m
1:300

STATUS



DESIGNED S. KHORSHID 2020/12/08
 DRAWN H. WANG 2020/09/09
 CHECKED M. LI 2020/12/08
 APPROVED APPROVED 2020/12/08

ONTARIO LINE SUBWAY
 TITLE
TOC
QUEEN-SPADINA STATION
 GRADING PLAN

Plot Date:

METROLINX
 Infrastructure Ontario

Dwg. No. GR0300-02-SF140

Sheet No.

Appendix B. Water Demand Calculation

DESIGN CALCULATION
Water Demand and Fire Flow Demand

Location: Queen and Spadina TOC
 Site E

Items	Water Demand Calculation		Remark
Site Parameters			
Average Day Water Consumption Rate	191 l/capita/day		Multi-unit high-rise = 191 litres / capita /day (City of Toronto Design Criteria for Sewers and Watermain)
Total Site Area	975 Sq.m		
Total GFA	Residential	Commercial	
	6662	0	Sq.m
Residential Units	95	n/a	
Residential/Commercial Population	165	0	Residential: 1.74 people /unit , Commercial: 1.1 people /100sq. m
Peaking Factor	Residential	Commercial	
Minimum hour	0.84	0.84	
Peak Hour	2.5	1.2	
Maximum Day Factor	1.3	1.1	
Friction Factors			
300mm to 600mm	120.0 'C' Factor		
	Residential	Commercial	
Average Consumption Rate	0.4L/s	0L/s	Population x Average consumption
Maximum Day Flow Rate	0.5L/s	0L/s	Population x Average consumption x Maximum Day Factor
Peak Hour Flow Rate	0.9L/s	0L/s	Population x Average consumption x Peak Hour Factor
Items	Fire Flow Demand Calculation		Remark
Fire Flow Requirement (City of Toronto)	28450.0 L/min		[number of hydrants] x [5,690 l/min]
High-rise residential & Commercial over two stories	19000.0 L/min		
Duration	5.0 hours		
Minimum number of hydrants	4.0 hydrants		(City of Toronto Design Criteria for Sewers and Watermain)
Average Spacing between hydrants	90.0m		
Maximum distance from access point of a building or lot to a hydrant	55.0m		
Fire Flow Requirement (Fire Underwriter's Survey Guideline)	17956.6 L/min		$F=220 C * A^{0.5}$ (Fire Underwriter's Survey Guidelines)
			F= the required fire flow in L/min C= the coefficient related to the type of construction A= the total floor area in square metres (All floors excluding Basement, under 2-Storeys) Coefficient related to Construction=1.0
	minus: 15%	2693.5 L/min	<u>Occupancy hazard reduction of surcharge</u> Non-combustible Limited combustible Combustible Free burning Rapid burning
	minus: 50%	7631.6 L/min	Apply Reduction for Automatic sprinklers designed to NFPA 13 (30%), systems with water supply (10%) and system with electronic supervision (10%)
Fire Flow (F)	28450.0 L/min		Takes the largest flow between City's requirement and Fire Underwriter's Survey Guideline

DESIGN CALCULATION
Water Demand and Fire Flow Demand

Location: Queen Spadina TOC
 Site F

Items	Water Demand Calculation		Remark
Site Parameters			
Average Day Water Consumption Rate	191 l/capita/day		Multi-unit high-rise = 191 litres / capita /day (City of Toronto Design Criteria for Sewers and Watermain)
Total Site Area	1556 Sq.m		
Total GFA	Residential	Commercial	
	8034	1914	Sq.m
Residential Units	122	n/a	
Residential/Commercial Population	212	21	Residential: 1.74 people /unit , Commercial: 1.1 people /100sq. m
Peaking Factor	Residential	Commercial	
Minimum hour	0.84	0.84	
Peak Hour	2.5	1.2	
Maximum Day Factor	1.3	1.1	
Friction Factors			
300mm to 600mm	120.0 'C' Factor		
	Residential	Commercial	
Average Consumption Rate	0.5L/s	0.05L/s	Population x Average consumption
Maximum Day Flow Rate	0.6L/s	0.1L/s	Population x Average consumption x Maximum Day Factor
Peak Hour Flow Rate	1.2L/s	0.1L/s	Population x Average consumption x Peak Hour Factor
Items	Fire Flow Demand Calculation		Remark
Fire Flow Requirement (City of Toronto)	28450.0 L/min		[number of hydrants] x [5,690 l/min]
High-rise residential & Commercial over two stories	19000.0 L/min		
Duration	5.0 hours		
Minimum number of hydrants	4.0 hydrants		(City of Toronto Design Criteria for Sewers and Watermain)
Average Spacing between hydrants	90.0m		
Maximum distance from access point of a building or lot to a hydrant	55.0m		
Fire Flow Requirement (Fire Underwriter's Survey Guideline)	21942.7 L/min		$F=220 C *A^{0.5}$ (Fire Underwriter's Survey Guidelines)
			F= the required fire flow in L/min C= the coefficient related to the type of construction A= the total floor area in square metres (All floors excluding Basement, under 2-Storeys) Coefficient related to Construction=1.0
	minus: 15%	3291.4 L/min	<u>Occupancy hazard reduction of surcharge</u> Non-combustible Limited combustible Combustible Free burning Rapid burning
	minus: 50%	9325.7 L/min	Apply Reduction for Automatic sprinklers designed to NFPA 13 (30%), systems with water supply (10%) and system with electronic supervision (10%)
Fire Flow (F)	28450.0 L/min		Takes the largest flow between City's requirement and Fire Underwriter's Survey Guideline

Appendix C. Sanitary Flow Demand Calculation

**DESIGN CALCULATION
Sanitary Flow Demand**

 Location: Queen and Spadina TOC
 Site E

Items	Water Demand Calculation		Remark
Site Parameters			
Average waste water flow	450	l/capita/day	Multi-unit high-rise = 450 litres / capita /day <i>(City of Toronto Design Criteria for Sewers and Watermain)</i>
Commercial average flow	180000	l/floor hectare/day	Commercial = 180000 litres/ floor hectare / day <i>(City of Toronto Design Criteria for Sewers and Watermain)</i>
Total Site Area	975	Sq.m	
Total GFA	Residential	Commercial	
	6662	0	Sq.m
Residential Units	95	n/a	
Residential/Commercial Population	165	0	Residential: 1.74 people /unit , Commercial: 1.1 people /100sq. m
Peaking Factor	Residential	Commercial	
Residential peak factor (PF=)	4.2	n/a	<i>Commercial peak factor is included in average flow</i>
Extraneous Flow			
Infiltration allowance (< 10 ha)	0.26	l/s/ha	
Residential Flow	0.86	l/s	
Commercial Flow	0.00	l/s	
Infiltration Flow	0.03	l/s	
Maximum Cumulative Flow with peaking factor	3.63	l/s	

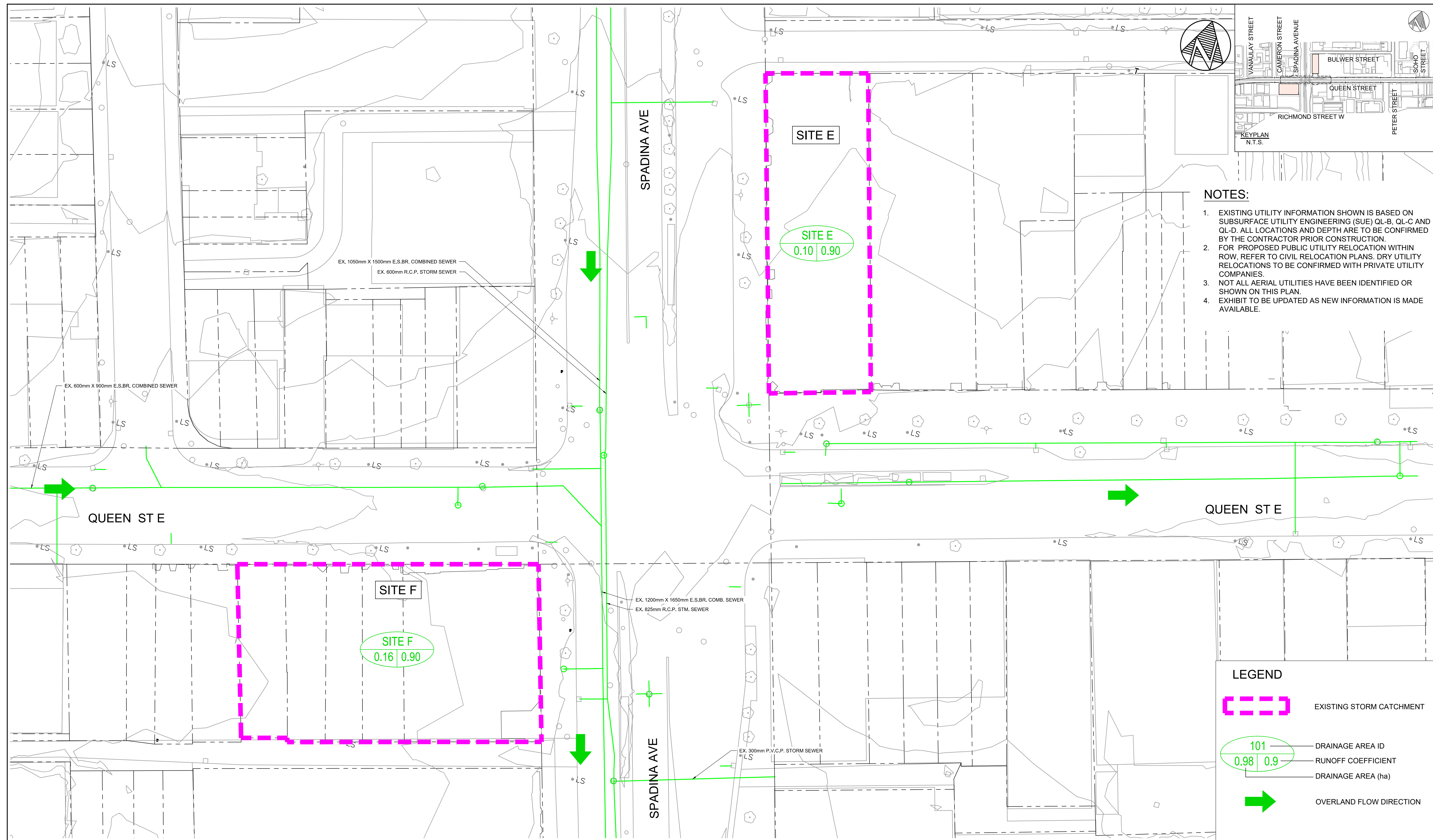
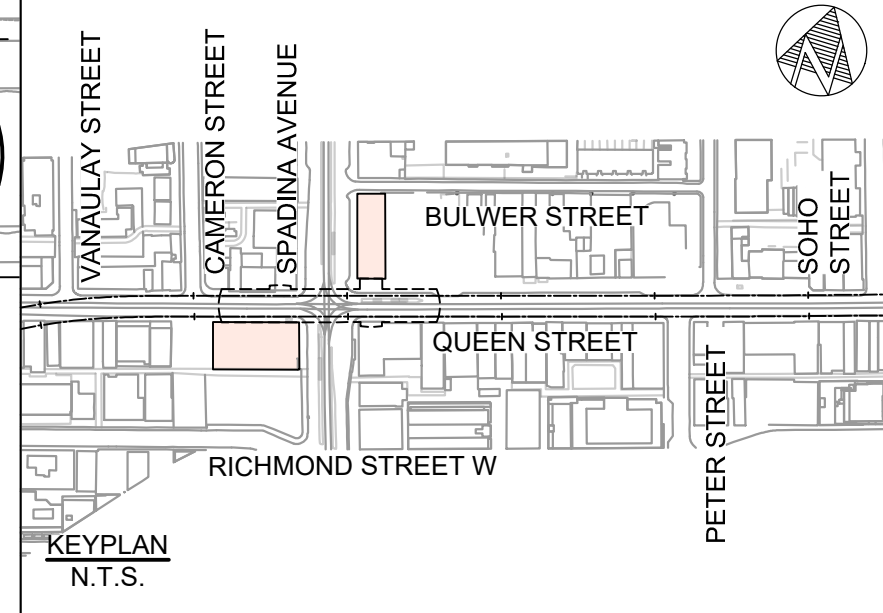
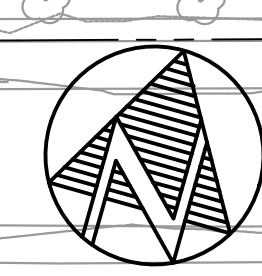
**DESIGN CALCULATION
Sanitary Flow Demand**

 Location: Queen and Spadina TOC
 Site F

P

Items	Water Demand Calculation		Remark
Site Parameters			
Average waste water flow	450	l/capita/day	Multi-unit high-rise = 450 litres / capita /day <i>(City of Toronto Design Criteria for Sewers and Watermain)</i>
Commercial average flow	180000	l/floor hectare/day	Commercial = 180000 litres/ floor hectare / day <i>(City of Toronto Design Criteria for Sewers and Watermain)</i>
Total Site Area	1556	Sq.m	
Total GFA	Residential	Commercial	
	8034	1914	Sq.m
Residential Units	122	n/a	
Residential/Commercial Population	212	21	Residential: 1.74 people /unit , Commercial: 1.1 people /100sq. m
Peaking Factor	Residential	Commercial	
Residential peak factor (PF=)	4.1	n/a	<i>Commercial peak factor is included in average flow</i>
Extraneous Flow			
Infiltration allowance (< 10 ha)	0.26	l/s/ha	
Residential Flow	1.10	l/s	
Commercial Flow	0.40	l/s	
Infiltration Flow	0.04	l/s	
Maximum Cumulative Flow with peaking factor	4.97	l/s	

Appendix D. Drainage Plans



NOTES:

1. EXISTING UTILITY INFORMATION SHOWN IS BASED ON SUBSURFACE UTILITY ENGINEERING (SUE) QL-B, QL-C AND QL-D. ALL LOCATIONS AND DEPTH ARE TO BE CONFIRMED BY THE CONTRACTOR PRIOR CONSTRUCTION.
2. FOR PROPOSED PUBLIC UTILITY RELOCATION WITHIN ROW, REFER TO CIVIL RELOCATION PLANS. DRY UTILITY RELOCATIONS TO BE CONFIRMED WITH PRIVATE UTILITY COMPANIES.
3. NOT ALL AERIAL UTILITIES HAVE BEEN IDENTIFIED OR SHOWN ON THIS PLAN.
4. EXHIBIT TO BE UPDATED AS NEW INFORMATION IS MADE AVAILABLE.

LEGEND

- EXISTING STORM CATCHMENT
- DRAINAGE AREA ID
RUNOFF COEFFICIENT
DRAINAGE AREA (ha)
- OVERLAND FLOW DIRECTION

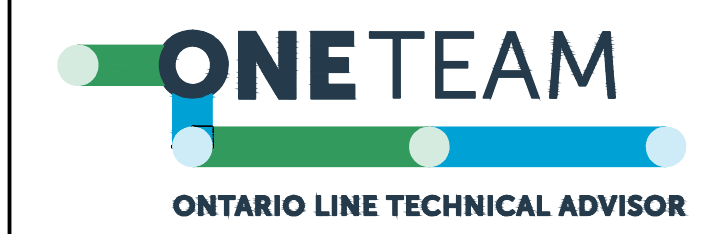
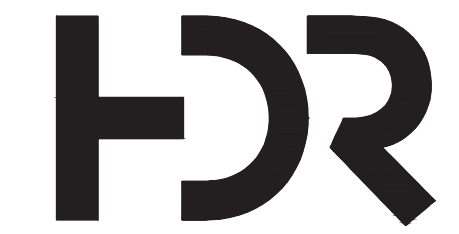
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3		6	

RCD
NOT FOR CONSTRUCTION

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STATUS



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 DRAWN H. WANG 2020/09/09
 CHECKED M. LI 2020/12/08
 APPROVED APPROVED 2020/12/08

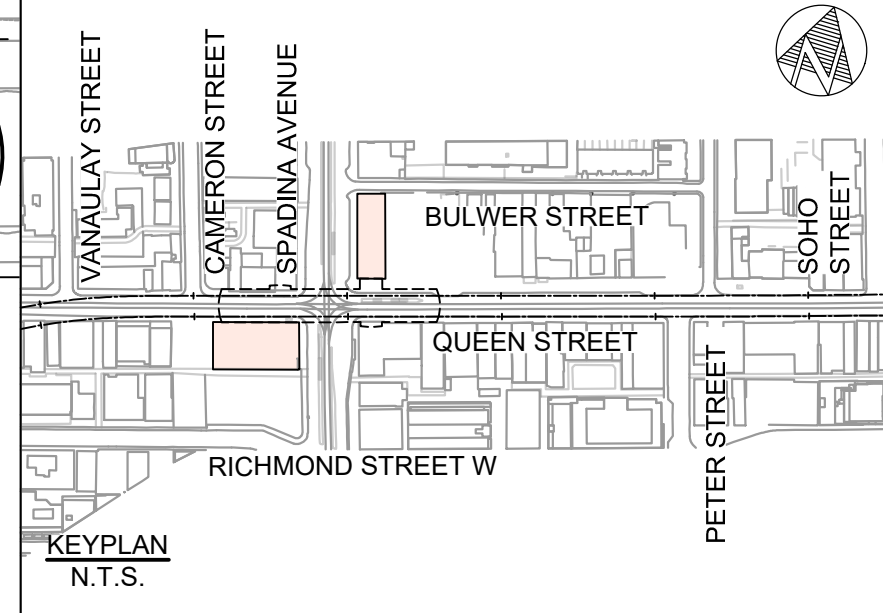
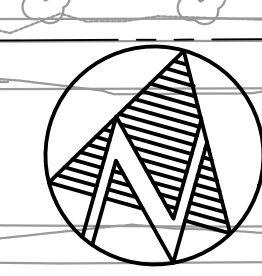
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TITLE
**TOC
QUEEN-SPADINA STATION
EXISTING DRAINAGE PLAN**

Plot Date: _____

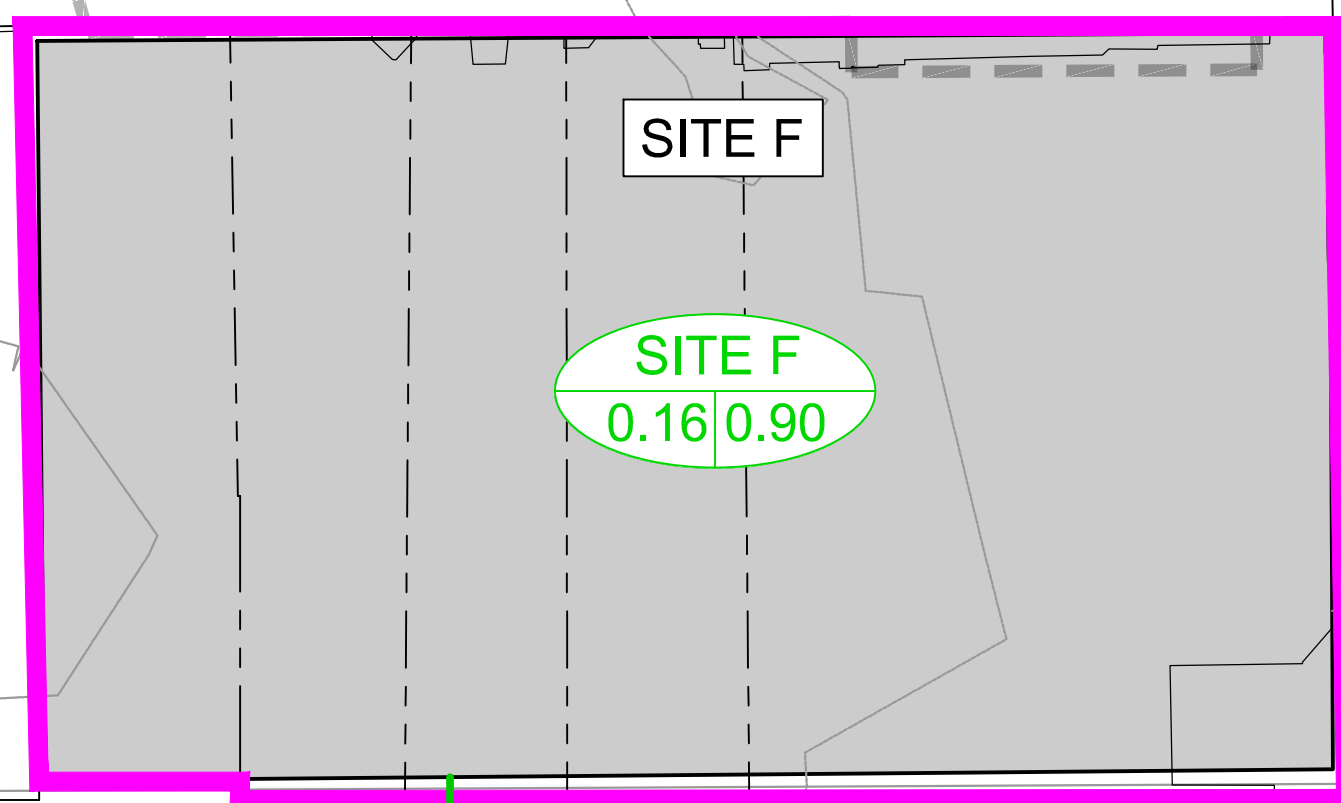
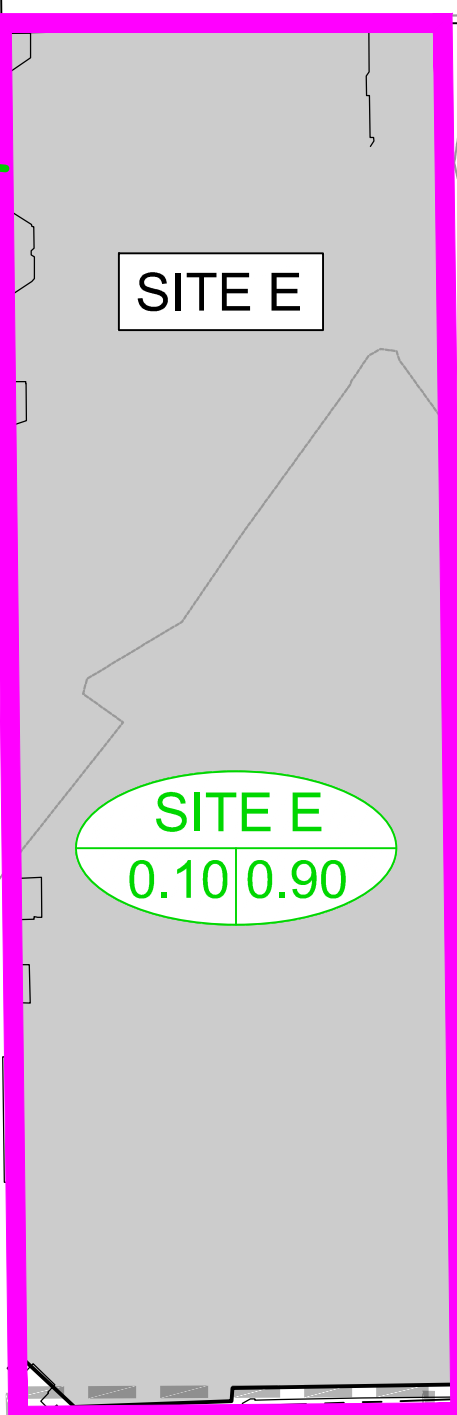
METROLINX
Infrastructure Ontario

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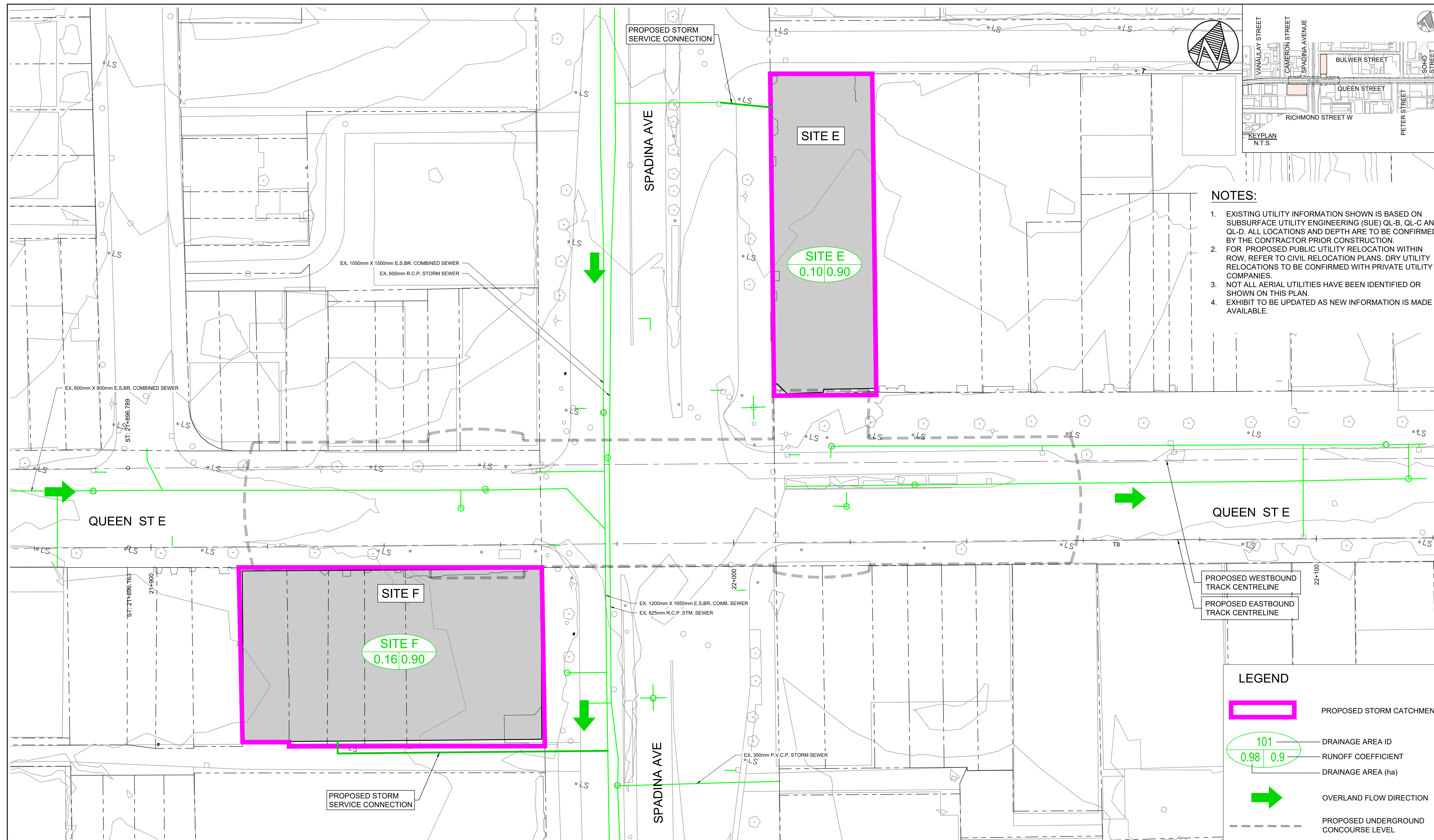
NOTES:

1. EXISTING UTILITY INFORMATION SHOWN IS BASED ON SUBSURFACE UTILITY ENGINEERING (SUE) QL-B, QL-C AND QL-D. ALL LOCATIONS AND DEPTH ARE TO BE CONFIRMED BY THE CONTRACTOR PRIOR CONSTRUCTION.
2. FOR PROPOSED PUBLIC UTILITY RELOCATION WITHIN ROW, REFER TO CIVIL RELOCATION PLANS. DRY UTILITY RELOCATIONS TO BE CONFIRMED WITH PRIVATE UTILITY COMPANIES.
3. NOT ALL AERIAL UTILITIES HAVE BEEN IDENTIFIED OR SHOWN ON THIS PLAN.
4. EXHIBIT TO BE UPDATED AS NEW INFORMATION IS MADE AVAILABLE.



LEGEND

- PROPOSED STORM CATCHMENT
- DRAINAGE AREA ID
RUNOFF COEFFICIENT
DRAINAGE AREA (ha)
- OVERLAND FLOW DIRECTION
- PROPOSED UNDERGROUND CONCOURSE LEVEL



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REVISIONS		REVISIONS	
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2		5	
3		6	

RCD
NOT FOR CONSTRUCTION

SCALE(S) 0 3 6 9 12m
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STATUS



DESIGNED	S. KHORSHID	2020/12/08
DRAWN	H. WANG	2020/09/09
CHECKED	M. LI	2020/12/08
APPROVED	APPROVED	2020/12/08

ONTARIO LINE SUBWAY
TITLE
TOC
QUEEN-SPADINA STATION
PROPOSED DRAINAGE PLAN

Plot Date:

METROLINX
Infrastructure Ontario

Dwg. No. DR0300-02-SF141

Sheet No.