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APPROVED
By Allison Hamlin at 1:18 pm, May 05, 2022

Robinson
Land Development

Maritime-Ontario 8800 Campeau Drive Kanata West Business Park Servicing and Stormwater Management Report

Prepared For:

Maritime-Ontario Freight Lines Limited

Prepared By:

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Project No. 20027
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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

TABLE OF CONTENTS CONTINUED

LEGAL NOTIFICATION

This report was prepared by Robinson Land Development for the account of **Maritime-Ontario Freight Lines Limited**.

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1.0 INTRODUCTION

Robinson Land Development have been retained by Maritime-Ontario Freight Lines Limited to prepare a servicing and stormwater management design for a proposed development located at 8800 Campeau Drive within the Kanata West Business Park (KWBP). The subject site is proposed to be developed into a distribution warehouse and associated parking lot. The property is located north of Campeau Drive and west of Upper Canada Street (refer to **Figure 1 – Key Plan** following page 1).

The subject site is located within the Phase 5 limits of the KWBP. Servicing and stormwater management requirements for Phase 5 have been updated and outlined in the report titled *Design Brief, Kanata West Business Park – Phase 5, 425 Huntmar Drive*, prepared by IBI Group, dated October 2019 (herein referred to as the *IBI Report*). This report will detail the proposed means of servicing the site and provide details on how to meet the stormwater management requirements outlined in the *IBI Report*.

Pre-consultation notes from the City of Ottawa have been provided in **Appendix A** for reference.

2.0 EXISTING CONDITIONS

The 7.04 hectare subject site is zoned Business Park Industrial Zone (IP13[2166]-h) and is currently undeveloped. The site is bounded by Mineral Extraction Zone (ME) land to the west (existing quarry), Agricultural Zone (AG) land to the north, an undeveloped industrial parcel and Upper Canada Street to the east and Campeau Drive to the south.

The subject site is contained within Block 37, 38 and 39 of the KWBP Master Plan. The KWBP – Phase 5 area includes the construction of Upper Canada Street (from Campeau Drive to Palladium Drive) and the registration of the blocks adjacent to the proposed roadway (i.e. the subject site). As part of the Phase 5 registration, previous Blocks 37, 38 and 39 have been complied into a single parcel, currently referred to as Block 7 (refer to *Figure 6 – Draft Plan*, prepared by IBI Group, in **Appendix A**).

Municipal infrastructure has been installed within the Campeau Drive right-of-way, adjacent to the subject site, as follows:

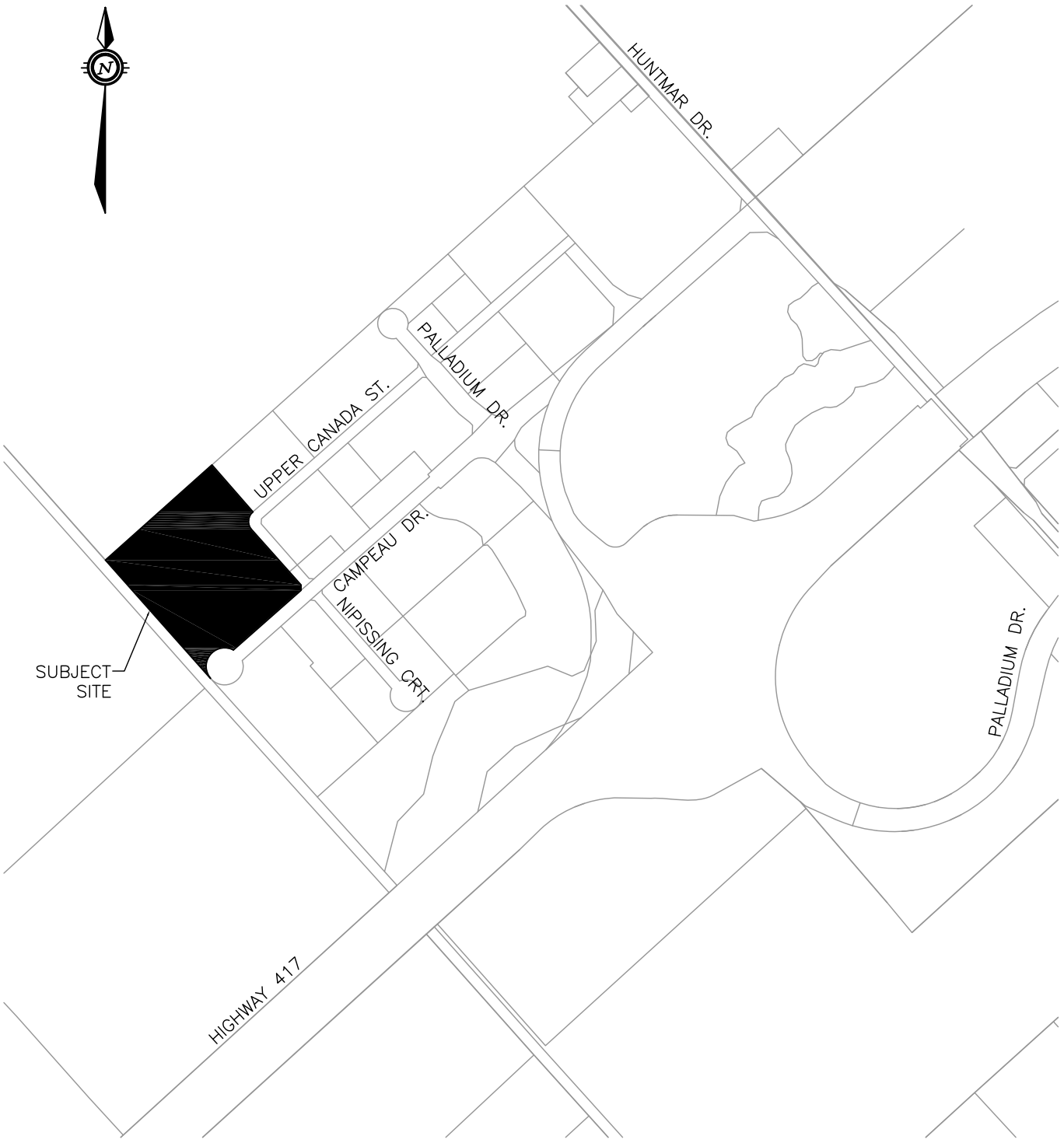
- 250 mm diameter watermain
- 250 mm diameter sanitary sewer
- 1050 mm diameter to 1200 mm diameter storm sewers

Municipal infrastructure has been installed within the Upper Canada Street right-of-way, adjacent to the subject site, as follows:

- 250 mm diameter watermain
- 250 mm diameter sanitary sewer
- 1500 mm diameter to 1650 mm diameter storm sewers

Refer to following KWBP – Phase 5 design drawings, prepared by IBI Group, in **Appendix A** for more details:

- *General Plan of Services, Drawing No. 100*
- *Campeau Drive from STA 19+780 to STA 20+110, Drawing No. 101*
- *Upper Canada Street from Campeau Drive to STA 0+410, Drawing No. 109*



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scale N.T.S.	8800 CAMPEAU DRIVE, KWBP	project no. 20027
date 01/11/20		
drawn by BLM	KEY PLAN	FIG 1.0

3.0 DEVELOPMENT PROPOSAL

The Owner is proposing to develop the subject site into a distribution warehouse and associated parking lot. The proposed building will include approximately 60,000 square feet of warehouse space and an additional 18,720 square feet of office space. The proposed parking lot will include an area for 134 office staff parking spaces, accessed via an entrance connection to Campeau Drive. A secondary entrance connection will provide access to the portion of the parking lot designated for 59 'day cab' tractor parking spaces. A third four lane entrance connection will provide access to the warehouse building. Refer to the Site Plan, prepared by McRobie Architects, in **Appendix B** for more details.

The proposed development will be provided with new water and sanitary services and also include a new storm sewer system to control the site's stormwater to the requirements outlined in the *IBI Report* (refer to **Figure 2 – General Plan of Services** following page 2).

4.0 WATER SERVICING

The subject site will receive water supply via a 200 mm diameter watermain connection to the existing 250 mm diameter watermain on Campeau Drive. An existing 250 mm diameter watermain is also available along Upper Canada Street. Refer to *Figure 4 – Proposed Water Distribution Plan*, prepared by IBI Group for Phase 5 of the KWBP in **Appendix C**. In accordance with the *IBI Report* and City of Ottawa design guidelines, the following watermain design criteria have been utilized for the subject site:

- Minimum Pressure During Peak Hour 276 kPa (40 psi)
- Minimum Pressure During Maximum Day Plus Fire 140 kPa (20 psi)
- Maximum Pressure in Unoccupied Areas 689 kPa (100 psi)
- Maximum Pressure in Occupied Areas 552 kPa (80 psi)

4.1 Boundary Conditions

The City of Ottawa provided boundary conditions for the subject site at the proposed connection to the existing 250 mm diameter watermain on Campeau Drive (refer to **Appendix C**). The boundary conditions have been summarized in **Table 1** below:

Table 1 – Boundary Conditions

Demand Scenario	Head (m)	Pressure (psi)
Maximum HGL	161.4	80.2
Peak Hour	156.3	72.9
Max Day Plus Fire	122.6	25.1

4.2 Fire Protection

Two existing hydrants are available on the north-west side of Campeau Drive across the frontage of the subject site. The existing hydrant located approximately 50 metres south-west of Upper Canada Street will be required to be relocated as part of the proposed development works as the hydrant is in conflict with the proposed entrance connection to Campeau Drive. Two existing hydrants are also available on the north-east side of Upper Canada Street, adjacent to the eastern property boundary of the site.

WAREHOUSE BUILDING

OFFICE BUILDING

UPPER CANADA STREET

CAMPEAU DRIVE

LEGEND

- PROPERTY BOUNDARY
- PROPOSED STORM SYSTEM
- PROPOSED SANITARY SYSTEM
- PROPOSED WATER SYSTEM
- EXISTING STORM SYSTEM
- EXISTING SANITARY SYSTEM
- EXISTING WATER SYSTEM

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scale N.T.S.	MARITIME–ONTARIO, KWBP	project no. 20027
date 27/05/21	GENERAL PLAN OF SERVICES	FIG 2
drawn by BLM		

Fire protection for the subject site will be provided by a proposed on-site hydrant which will receive water supply via the proposed 200 mm diameter watermain connection to the existing 250 mm diameter watermain on Campeau Drive. The proposed hydrant will be located within a landscaped island to the front of the main entrance, within 45 metres of the proposed siamese connection for the building.

The required fire flow for the subject site was calculated using the Fire Underwriter's Survey (FUS) long form (refer to **Appendix C**). Based on the building construction, occupancy and ground floor area, the required fire flow is 8,000 Lpm (133 L/s).

4.3 Hydraulic Model Results

The hydraulic model results for Maximum HGL, Peak Hour and Maximum Day + FF have been calculated and summarized in **Table 2** below.

Table 2 – Hydraulic Model Results

Criteria	Boundary Conditions – Head (m)	Modelling Results (psi or Lpm)	Allowable Pressure Range
Peak Hour	156.3	68.5	40 – 80 psi
Max Pressure	161.4	75.8	< 80 psi
Max Day + Fire	122.6	11,556	@ 20 psi

As indicated in **Table 2** above, it has been demonstrated that the subject site can be adequately serviced for both domestic and fire flow demands. Refer to the hydraulic model outputs provided in **Appendix C**.

As noted in *Section 2.4* of the *IBI Report*, pressure reducing valves will be required for all buildings located in Phase 5 of the KWBP since the calculated pressures were expected to be greater than 80 psi (552 kPa). However, as indicated in **Table 2** above, the modelled maximum pressure condition for the subject site has been calculated to be 75.8 psi and therefore a pressure reducing valve (PRV) will not be required.

5.0 SANITARY SERVICING

5.1 Design Criteria

Sanitary flows from the KWBP are conveyed east via the Campeau Drive sanitary sewer system before ultimately being conveyed to the Signature Ridge Pump Station (SRPS) north of Highway 417. Refer to *Figure 5 – Wastewater Plan*, prepared by IBI Group, in **Appendix D**. The municipal sanitary sewer system for Phase 5 of the KWBP has been designed (by IBI Group) based on recommendations from the following reports:

- Kanata West Master Servicing Study (KWMSS), 2006
- City of Ottawa Sewer Design Guidelines, 2012
- Ministry of the Environment Design Guidelines for Sewage Works, 2008
- City of Ottawa Technical Bulletin ISTB-2018-01

The subject site (i.e. Block 7) has been identified as light industrial land use on the *Sanitary Drainage Area Plan,* prepared by IBI Group for the KWBP, provided in **Appendix D**. In keeping with the sanitary sewer design criteria outlined in *Section 3.3* of the *IBI Report*, the following design parameters have been implemented for the subject site:

- Light Industrial Flow: 28,000 L/ha/d

- Peaking Factor: 4.5 (MOE Chart – City of Ottawa Appendix 4-B.1)
- Infiltration Allowance: 0.33 L/s/ha
- Minimum Velocity: 0.60 m/s
- Maximum Velocity: 3.0 m/s

As noted in the *IBI Report*, the Phase 5 lands have been designed to outlet to the existing 300 mm diameter sanitary sewer on Campeau Drive, west of the Palladium Drive roundabout. The sanitary flows to be generated from Block 7 (formerly Block 37, 38, 39) have been allocated within pipe run MH151A to MH150A on Upper Canada Street as noted on the *Sanitary Sewer Design Sheet*, prepared by IBI Group, provided in **Appendix D**.

5.2 Proposed Design

The *IBI Report* has allocated sanitary flows from the subject site within the 250 mm diameter sanitary sewer on Upper Canada Street, however, it is proposed to outlet sanitary flows to the existing 250 mm diameter sanitary sewer on Campeau Drive for the following reasons:

- The orientation of the proposed building and site layout (i.e. main building entrance facing Campeau Drive and entrance connections via Campeau Drive) facilitate a straight-line connection from the building mechanical room to the existing sewer on Campeau Drive.
- In order to maintain a common sewer trench (water, sanitary and storm) and single road cut (for water and sanitary connections), the proposed sanitary sewer outlet must also be to Campeau Drive.

Sanitary flows generated from the subject site will be conveyed by a proposed 200 mm diameter sanitary sewer system to the existing 250 mm diameter sanitary sewer on Campeau Drive (between EXMH99A and EXMH100A). Using the parameters noted above, the peak sanitary design flow for the site has been calculated to be 12.59 L/s. The existing pipe runs on Campeau Drive, EX99A to EX100A and EX100A to EX101A, will have 31.82 L/s and 42.38 L/s of excess capacity respectively after the addition of 12.59 L/s of sanitary flow from the subject site. Therefore, the existing 250 mm diameter sanitary sewer on Campeau Drive (upstream of Upper Canada Street) will have adequate capacity to convey the peak sanitary design flows from the subject site. The proposed sanitary sewers have been designed in accordance with current City of Ottawa standards and in keeping with the design criteria outlined in the *IBI Report*. Refer to the sanitary sewer design sheet in **Appendix D** for more details.

6.0 STORM SERVICING

Storm drainage from the subject site (i.e. Block 37, 38, 39) has been allocated within the existing 1200 mm diameter storm sewer on Campeau Drive, downstream of EXMH101, as indicated on the *storm sewer design sheet*, prepared by IBI Group, provided in **Appendix E.** The existing 1200 mm diameter storm sewer on Campeau Drive conveys stormwater south on Nipissing Court, before being conveyed to the Pond 6 West Facility and ultimately discharging into Feedmill Creek. Refer to *Figure 8 – Proposed Storm Sewer Plan*, prepared by IBI Group, in **Appendix E**. Stormwater runoff from the subject site will be captured by surface inlet grates and conveyed via the proposed on-site storm sewer system to EXMH101 on Campeau Drive. The on-site storm sewers range from 250 mm to 900 mm in diameter and have been designed to convey the full 5 year peak flow and be within the acceptable full flow velocity range of 0.80 m/s to 3.0 m/s in accordance with City of Ottawa standards and the *IBI Report*. Refer to the storm sewer design sheet and Storm Drainage Area Plan (DWG. 20027-STM1) in **Appendix F** for more details.

A secondary storm sewer system is proposed to convey drainage from the roof area to a proposed infiltration gallery (refer to **Section 7.5 - Infiltration**) located within the parking lot. The secondary storm sewer system has been designed to have capacity to convey the roof flows provided by the Mechanical Engineer (refer to roof flow correspondence in **Appendix F**). In the event that infiltration into the surrounding soil is not being achieved (i.e. fine sediment accumulation or abnormally high groundwater table), stormwater would bypass through the infiltration gallery via the proposed storm pipes and outlet to the storm sewer system at downstream STMMH 200 without impacting any on-site infrastructure. In the event of a blockage within the infiltration gallery, a 375 mm diameter overflow/ bypass pipe has also been provided above the top of the storage media. The overflow/ bypass pipe has been designed to have capacity to convey the fixed flow from the roof area and would convey drainage directly from STMMH 303 to STMMH 304 if a blockage were to occur. The proposed 900 mm diameter storm sewer downstream of STMMH 200 has been designed to have capacity to convey the full 5 year peak storm from the roof area, however, full to partial infiltration is expected to occur. Refer to **Figure 3 – Roof Drainage Area Plan** and the infiltration gallery storm sewer design sheet in **Appendix F** for more details.

7.0 STORMWATER MANAGEMENT DESIGN

7.1 Design Criteria

A dual drainage design, minor and major system, has been utilized for the KWBP. The *IBI Report* provides updated stormwater management design criteria for the Phase 5 portion of the development. The design criteria were prepared in accordance with current City of Ottawa Design Guidelines and with the following overarching reports prepared for the KWBP:

- Kanata West Master Servicing Study (KWMSS), prepared by Stantec and CCI/IBI Group, dated 2006.
- Kanata West Business Park Stormwater Management Report and Pond 6 West Design Brief, prepared by IBI Group, dated November 2015.
- Addendum Report: Kanata West Business Park Stormwater Management Report and Pond 6 East Design Brief, prepared by IBI Group, dated November 2015.

7.2 Minor System

Stormwater runoff from the subject site, which is captured by the proposed on-site storm sewer system, will be conveyed to EXMH101 on Campeau Drive. The minor system design of the KWBP conveys the drainage south via the existing storm sewer system on Nipissing Court, to the Pond 6 West Facility and ultimately to Feedmill Creek. The minor system capture for the proposed blocks tributary to the Pond 6 West Facility is based on the 5 year, 3 hour Chicago simulated flow in accordance with the overarching reports for the KWBP. The subject site (denoted as Area 101A on the *Storm Drainage Area Plan*, prepared by IBI Group, provided in **Appendix E**) has been allocated the following minor system design parameters:

Table 3 – Drainage Area Design Parameters

Area ID	Area (ha)	Minor System Capture (L/s)	Required Storage Volume (m^3)
101A	7.03	1230	780

Notes:
1. Subject site is denoted as Area 101A on the *Storm Drainage Area Plan*, prepared by IBI Group, in **Appendix E**.
2. Parameters as per *Table 4.2* of the *IBI Report*, provided in **Appendix E**.

In accordance with the design criteria outlined in the *IBI Report*, the minor system from the subject site must be restricted to a rate of 1230 L/s for all events up to an including the 100 design storm. In order to control the site's runoff to less than the allowable release rate of 1230 L/s, inlet control devices (ICDs) are proposed to be installed within the outlets of the on-site catch basins. Refer to **Section 7.3 – Release Rates** for more details.

7.3 Release Rates

As noted above, runoff from the subject site must be controlled to a rate of 1230 L/s for all storm events up to and including the 100 year design storm in accordance with the *IBI Report*. In order to control the site's runoff, inlet control devices (ICDs) are proposed to be installed within the outlets of the on-site catch basins. The ICDs have been sized based on the 100 year head (measured from the 100 year ponding elevation to the centreline of orifice elevation) and an allowable outflow. Refer to the ICD calculations in **Appendix F** for more details.

Drainage from the roof areas will be collected by multiple roof drains and conveyed by the internal building plumbing to the secondary storm sewer system (refer to **Section 6.0 – Storm Servicing**) to the proposed infiltration gallery (refer to **Section 7.5 – Infiltration**) located in the parking lot area. The mechanical design has utilized a conventional drained roof with no flow controls, therefore, the building roofs have been analyzed as free flow areas. Refer to the Flow Control Roof Drainage Declaration in **Appendix F**.

Areas of the subject site which cannot be captured by the on-site storm sewer system will flow "uncontrolled" off-site during storm events. Drainage will be conveyed "uncontrolled" to Campeau Drive, Upper Canada Street, to the north and to the west. These free flow areas must be accounted for in the overall release rate for the site. Select drainage areas must be "overcontrolled" in order to compensate for the "uncontrolled" areas. As a result, surface ponding will occur during the 2 year design event for some drainage areas. The areas where 2 year surface ponding will occur have been limited to areas subject transport truck traffic only. The drawdown times (i.e. time until no surface ponding) for the 2 year ponding areas have been estimated to be between 4.5 and 10.2 minutes. Refer to the complete 2 year drawdown time calculations provided in **Appendix F** for more details. A summary of the on-site release rates for the 100 year design event has been provided in **Table 4** below:

Table 4 – Summary of Release Rates

Drainage Area	100 Year Release Rate (L/s)
STM1	105
STM2	60
STM3	80
STM4	55
STM5	105
STM6	60
STM7	60
STM8	30
STM9	55
STM10	30
STM11	25
STM12	40
STM13	30
STM14	25
STM15 + STM16	20
STM17	20
STM18 (ROOF 1)	28.2[*1]
STM19 (ROOF 2)	325.3[*1]
FF1 (CAMPEAU)	23.2
FF2 (UPPER CANADA)	16.4
FF3 (NORTH)	17.7
FF4 (WEST)	14.7
Total =	1225.5
Allowable[*2] =	1230.0
Δ =	4.5

Notes:
1. Roof areas are assumed to be free flow.
2. Allowable release rate as per *IBI Report*.

As noted in **Table 4** above, the 100 year outflow from the subject site of 1225.5 L/s is less than the allowable rate of 1230 L/s and therefore has been designed in keeping with the *IBI Report*.

7.4 Major System/ Quantity Control

Overland flow from the majority of the KWBP is conveyed from west to east, ultimately to Huntmar Drive (refer to the *SWMHYMO Schematic*, prepared by IBI Group, in **Appendix E**). For the subject site (drainage area 101A), overland flow from the individual on-site ponding areas will cascade south-east, via the parking lot and entrance connections, to Campeau Drive and ultimately to Huntmar Drive. The on-site major system has been designed to pond stormwater to a maximum depth of 0.30 metres before “overtopping” in accordance with City of Ottawa design standards. A minimum freeboard of 0.30 metres has been provided between the spillover elevations and the adjacent building finished floor elevation.

In accordance with the *IBI Report*, individual blocks within the KWBP are to provide on-site quantity storage control for up to and including the 100 year design storm event (in excess of the allowable release rate of 1230 L/s for the subject site). The *IBI Report* has allocated a required storage volume of 780 m^3 for the subject site (refer to **Table 3** above). Required storage volumes have been calculated for each individual drainage area based on the allowable release rates noted in **Table 4** above. A summary of the required and provided 100 year storage volumes for the on-site drainage areas have been provided in **Table 5** below.

Table 5 – Summary of 100 Year Storage Volumes

Drainage Area	100 Year Required Storage Volume (m^3)	100 Year Provided Storage Volume (m^3)
STM1	234.2	265.3
STM2	182.7	200.8
STM3	172.5	184.7
STM4	110.8	122.2
STM5	260.1	269.7
STM6	180.0	180.2
STM7	143.6	146.1
STM8	72.2	78.1
STM9	2.8	3.7
STM10	15.7	16.6
STM11	15.1	15.7
STM12	4.3	4.6
STM13	15.7	16.6
STM14	13.4	15.7
STM15 + STM16	0.0[*4]	0.0[*4]
STM17	0.0[*4]	0.0[*4]
STM17 (ROOF 1)	0.0	0.0
STM18 (ROOF 2)	0.0	0.0
FF1 (CAMPEAU)	0.0	0.0
FF2 (UPPER CANADA)	0.0	0.0
FF3 (EAST)	0.0	0.0
FF4 (NORTH)	0.0	0.0
FF5 (WEST)	0.0	0.0
Total =	**780.0[*1]**	**1520**

Notes:

1. Required storage volume of 780 m^3 as per *IBI Report*.
2. Provide storage volumes calculated using Civil3D by Autodesk.
3. Provided storage volumes include surface storage only (i.e. no pipe storage).
4. Areas experience no surface ponding during the 100 year event, therefore, no provided surface storage has been considered although surface storage is available.

As noted in **Table 5** above, adequate on-site quantity control has been provided for all storm events up to and including the 100 year design storm in keeping with the *IBI Report*. Refer to the storage volume tables provided in **Appendix F** for more details. The outflows from the

drainage areas within the landscape areas (STM15, STM16, STM17) have been optimized to eliminate surface ponding for all storm events up to and including the 100 year design storm. Although surface storage will not be required for these drainage areas (for events up to and including the 100 year design storm), quantity storage volume is available as noted on the storage volume tables provided in **Appendix F**.

7.5 Infiltration

The Carp River Watershed/Subwatershed Study (CRWS) provided water balance calculations and outlined infiltration targets within the subwatershed area from the stormwater management perspective, based on soil characteristics. Following the CRWS, infiltration targets for the Kanata West development were established within the KWMSS. That study indicated that a range of 70 to 100 mm/year of runoff be infiltrated from the western portion of the KWBP site. The KWMSS also indicated that post development infiltration rates are to be increased by 25% above these pre-development rates to compensate for areas (i.e. roadway corridors) that cannot provide infiltration. In keeping with the *IBI Report* and overarching reports for the KWBP, each block will be required to provide engineered infiltration measures (such as infiltration galleries fed by roof drains) to achieve the required infiltration rates as outlined within the KWMSS. For the subject site, a target infiltration range of 87.5 mm/year to 125 mm/year is required (i.e. 70 to 100 mm/year + 25%).

Drainage from the roof areas will be captured by multiple roof drains (designed by Mechanical Engineer with no flow controls, refer to Flow Control Roof Drainage Declaration in **Appendix E**) and conveyed via the secondary storm sewer system to a proposed infiltration gallery located within the parking lot. The proposed infiltration gallery has been designed using guidelines from the *Low Impact Development Stormwater Management Planning and Design Guide (*herein referred to as the *LID Manual)*. The proposed infiltration gallery has also been sized to have capacity to detain roof drainage for the 95th percentile storm event for the Ottawa area. Rainfall data has been referenced from the report titled *Runoff Volume Control Targets for Ontario Final Report,* prepared by Aquafor Beech Ltd. and Earthfx Inc. for the Ministry of the Environment & Climate Change (currently known as the Ministry of the Environment, Conservation and Parks), dated October 2016 (herein referred to as the *Aquafor Beech Report*).

Required Storage Volume:

95th Percentile Daily Volume = 0.0279 m (*Aquafor Beech Report Table 3.16, **Appendix E***)

Roof Area = 7,126.82 m^2

Required Storage Volume = (0.0279 m) x (7,126.82 m^2) = **198.84 m^3**

Provided Storage Volume:

Infiltration Gallery Bottom Area = 897.0 m^2 (69.0 m length x 13.0 m width)

Infiltration Gallery Depth = 0.60 m (measured from header invert to gallery bottom)

Infiltration Gallery Storage Media Porosity = 0.40 (50 mm diameter clear stone)

Provided Storage Volume = (897.0 m^2) x (0.6 m) x (0.40) = **215.3 m^3**

As calculated above, the proposed infiltration gallery has been designed to provide 215.3 m^3 of storage volume which is greater than the 95th percentile daily rainfall volume for the Ottawa area.

Infiltration Target:

Target Infiltration Rate = 87.5 mm/yr to 125 mm/yr
Average Annual Precipitation = 0.925 to 0.950 m (*Aquafor Beech Report Figure 3.41,* ***Appendix E***)
Roof Area = 7,126.82 m^2
Site Area = 70,353.28 m^2

Maximum Average Annual Precipitation = (0.95 m) x (7,126.82 m^2) = 6,770.48 m^3

Maximum Average Site Infiltration Rate = (6,770.48 m^3) / (70,353.28 m^2) x 1000 = 96.2 mm/yr

Maximum Effective Site Infiltration Rate = (96.2 mm/yr) x (0.95) = **91.39 mm/yr**

Minimum Average Annual Precipitation = (0.925 m) x (7,126.82 m^2) = 6,592.31 m^3

Minimum Average Site Infiltration Rate = (6,592.31 m^3) / (70,353.28 m^2) x 1000 = 93.70 mm/yr

Minimum Effective Site Infiltration Rate = (93.70 mm/yr) x (0.95) = **89.02 mm/yr**

Based on precipitation data from the *Aquafor Beech Report* and site parameters (i.e. total site and roof areas), the minimum effective site infiltration rate has been calculated to be 89.02 mm/year which is within the acceptable range outlined in the *IBI Report* and overarching studies for the area. It should be noted that the infiltration rate calculations for the subject site only consider roof drainage (in keeping with the *IBI Report*) and do not account for the approximately 0.85 hectares of pervious area where natural infiltration of runoff at source will occur.

Section 4.4 of the *LID Manual* states that the maximum allowable depth of a stone reservoir can be calculated using the following equation:

$d_{max} = i * t / V_r$

where:

d_{max} = maximum stone reservoir depth (mm)
i = infiltration rate for native soils (mm/hr)
V_r = void ratio (0.4 for clear stone)
t = time to drain (48 hrs recommended)

Based on the findings of the Geotechnical Investigation prepared by Paterson Group (Table 6 – Estimated Percolation Rates), the native soil percolation time (T) for the subject site has been field verified to be 6 to 10 mins/cm. Refer to relevant percolation rate and borehole information provided in **Appendix E**. The infiltration rate can then be calculated as the inverse of the percolation time (i.e. infiltration rate = 1/T).

6 mins/cm x (1/ 60 mins/hr) x (1/ 10 mm/cm) = 0.01 hr/mm
10 mins/cm x (1/ 60 mins/hr) x (1/ 10 mm/cm) = 0.017 hr/mm
Infiltration $Rate_{max}$ = 1 / 0.01 = 100 mm/hr
Infiltration $Rate_{min}$ = 1 / 0.017 = 60 mm/hr
Infiltration $Rate_{avg}$ = 80 mm/hr

To account for potential reductions in soil permeability a safety correction factor must be incorporated to determine the design infiltration rate to be used in calculations. Since the soil profile is continuous at the location of the proposed infiltration gallery, a safety correction factor of 2.5 is applicable (source: wiki.sustainabletechnologies.ca/infiltration).

Design Infiltration Rate = 80 / 2.5 = **32 mm/hr**

d_{max} = (32 mm/hr) x (48 hrs) / 0.40 = 3840 mm = **3.84 m**

The proposed infiltration gallery depth of 0.6 m is less than the maximum allowable depth of 3.84 m calculated using the equation from the *LID Manual*. For applications with an underdrain, the maximum depth is measured below the invert of the underdrain pipe.

Section 4.4 of the *LID Manual* also states that the required footprint surface area of a stone reservoir can be calculated using the following equation:

$A_f = WQV / (d * V_r)$

where:

A_f = footprint surface area (m^2)
WQV = water quality volume (m^3)
d = stone reservoir depth (m)
V_r = void ratio (0.40 for clear stone)

A = (198.84 m^3) / (0.6 m x 0.40) = **828.5 m^2**

The proposed infiltration gallery footprint area of 897.0 m^2 is more than the required footprint area of 828.5 m^2 calculated using the equation from the *LID Manual*. To be conservative, infiltration through the gallery bottom has only been considered, however, lateral infiltration through the sides is expected to occur. Based on the calculations above, it can be concluded that the infiltration gallery has been designed in accordance with the *LID Manual* for depth and footprint area.

Groundwater:

For optimal performance of infiltration practices, a minimum separation of 1.0 metre between the bottom of the infiltration facility and the seasonal high groundwater table is desired. As detailed in the Geotechnical Investigation and Geotechnical Response to City Comments Memorandums (prepared by Paterson Group and provided in **Appendix E**), pre-development groundwater levels were measured periodically throughout spring months at the on-site monitoring well constructed at BH 1-21 as well as within the piezometers installed in the other on-site boreholes. The seasonally high groundwater was generally encountered at elevations ranging from 105.20 to 106.00 m. It is anticipated that the elevated groundwater levels observed within the boreholes have been influenced by surface water collected within the on-site drainage ditches which have no proper outlet. It should be further noted that any perched pre-development groundwater will be pumped out of the open excavations during construction to enable proper compaction of the bedding layers and installation of the service pipes and infiltration gallery. The dewatering work during construction is expected to remove the perched water within the subject site.

The elevation of the post-development long-term water table may not be accurately predicted in areas outside of the radius of influence of permanent structures and site servicing. However, based on the proximity of the proposed infiltration gallery to the storm sewer and the hydraulic conductivity of the silty sand to sandy silt encountered across the subject site, it is anticipated

that the long-term groundwater table across the subject site will be lowered to the approximate invert elevation of the storm sewer along the adjacent section of Upper Canada Street which ranges from approximately 101.20 m to 100.90 m. This groundwater lowering condition has been observed at several developed blocks within the KWBP in areas of similar soil conditions (refer to Geotechnical Response to City Comments Memorandums in **Appendix E**).

The bottom of the proposed infiltration facility is set at an elevation of 103.54 m, which is greater than 1.0 metre from the expected long-term water table elevation of 101.20 m to 100.90 m. Therefore, sufficient separation between the bottom of the storage media and the groundwater table will be provided in keeping with current infiltration design standards. It should be noted that the function of an infiltration gallery may be limited during seasonal high groundwater conditions, however, the infiltration practice is still feasible during the remainder of the year when groundwater levels are lower.

Overflow/ Bypass

In the event that infiltration into the surrounding soil is not being achieved (i.e. fine sediment accumulation or abnormally high groundwater table), stormwater would bypass through the infiltration gallery via the proposed storm pipes and outlet to the storm sewer system at downstream STMMH 200 without impacting any on-site infrastructure. In the event of a blockage within the infiltration gallery, a 375 mm diameter overflow/ bypass pipe has been provided above the top of the storage media. The overflow/ bypass pipe has also been designed to have capacity to convey the fixed flow from the roof area and would convey drainage directly from STMMH 303 to STMMH 304 if a blockage were to occur (refer to the infiltration gallery storm sewer design sheet in **Appendix F**). As previously noted in **Section 6.0**, the storm sewer downstream of STMMH 200 has been designed to have capacity to convey the full 5 year peak flow from the roof area in the event that an overflow does occur.

Bedrock

Based on the available geological mapping, bedrock is expected at a depth of 5 m to 15 m below the existing ground surface. In addition, practical refusal to dynamic cone penetration testing was encountered in boreholes BH 2-21 and BH 1 (2014) at geodetic elevations of 98.46 and 97.38 m, respectively. Given that the bottom of the proposed infiltration facility is set at an elevation of 103.54 m, over 1.0 metre separation to bedrock will be provided in accordance with design standards. Refer to Geotechnical Response to City Comments Memorandum in **Appendix E**.

The overall design of the infiltration gallery as it relates to the design infiltration rate, factor of safety and site constraints should be reviewed by the Geotechnical Consultant prior to construction.

7.6 Hydraulic Grade Line (HGL) Analysis

As noted in *Section 4.6* of the *IBI Report*, the hydraulic grade line (HGL) within the storm sewers of the KWBP is dictated by water levels in Feedmill Creek and water levels in the Pond 6 West and Pond 6 East facilities. A summary of the 100 year HGL analysis for the KWBP – Phase 5 has been provided in *Table 4.10* of the *IBI Report* (refer to **Appendix E**). Due to the permanent water level within the Pond 6 West and Pond 6 East Facilities, some of the storm sewers within the KWBP will be partially submerged, which includes the outlet for the subject site (i.e. existing storm sewer on Campeau Drive downstream of EXMH101). To account for this, the *IBI Report* has analysed the submerged sewers within the KWBP system with a 25% sediment accumulation. Refer to *Section 4.6.3* of the *IBI Report* for more details.

An HGL analysis has been prepared for the proposed on-site storm sewer system based on a connection to EXMH101 on Campeau Drive at a 100 year HGL elevation of 103.57 m (modelled by IBI Group using 100 year 12 hour SCS storm event). The HGL analysis determined that the HGL would remain below the top of grate/cover elevations of the on-site storm manholes and catch basins. The HGL will be contained within the storm sewer between STMMH 208 to STMMH 201 and therefore is not of concern for the proposed building service connection. The overflow outlet from the infiltration gallery, downstream of STMMH 304, will connect to STMMH 200 above the HGL elevation and therefore is not expected to impact the performance of the infiltration practices. Refer to the HGL computation sheet in **Appendix F** for more details.

In the event that the on-site storm sewers are surcharged, stormwater runoff will be conveyed to a proper outlet (i.e. Campeau Drive right-of-way) via the major overland flow route (refer to **Section 7.4**) without impacting the on-site building or neighbouring properties.

7.7 Quality Control

The Pond 6 West Facility is located at the western edge of the KWBP, north of Feedmill Creek. The facility provides water quality (and quantity) control for the development west of Palladium Drive (refer to *Figure 2 – Post-Development SWM Drainage Boundaries Overall Site*, prepared by IBI Group, in **Appendix E**). The facility discharges to Feedmill Creek in accordance with the *Kanata West Business Park Stormwater Management Report and Pond 6 West Design Brief*, prepared by IBI Group. Additional on-site quality control is not required for the subject site as the minor storm system is tributary to the Pond 6 West Facility.

8.0 EROSION AND SEDIMENT CONTROL

Prior to construction and until vegetation has been re-established in disturbed areas, erosion and sediment control measures must be implemented to mitigate the impact on receiving watercourses and existing infrastructure. The following erosion and sediment control (ESC) measures have been proposed for the subject site:

- Limiting the extent of exposed soils at any given time.
- Erosion and sediment control measures shall be maintained until vegetation has been re-established in all disturbed areas. Re-vegetate disturbed areas in accordance with approved Landscape Plan as soon as possible.
- Stockpile soil away (15 metres or greater) from watercourses, drainage features and top of steep slopes.
- Installation of silt sacks between frame and cover on all proposed and existing catch basins and open cover storm manholes until construction is completed.
- Silt fence to be installed and maintained along the property boundaries.
- Install mud mats at all construction entrances.
- During active construction periods, visual inspections shall be undertaken on a weekly basis and after major storm events (>25mm of rain in 24 hour period) on ESC and any damage repaired immediately.
- ESC shall also be assessed (and repaired as required) following significant snowmelt events.
- Visual inspections shall also be undertaken in anticipation of large storm events (or a series of rainfall and/or snowmelt days) that could potentially yield significant runoff volumes.
- Care shall be taken to prevent damage to ESC during construction operations.

- In some cases, barriers may be removed temporarily to accommodate construction operations. The affected barriers shall be reinstated immediately after construction operations are completed.
- ESC should be adjusted during construction to adapt to site features as the site becomes developed.
- ESC shall be cleaned of accumulated sedimentation as required and replaced as necessary.
- During the course of construction, if the Engineer believes that additional prevention methods are required to control erosion and sedimentation, the Contractor shall implement additional measures, as required, to the satisfaction of the Engineer.
- Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification (OPSS) 805.

Refer to the Erosion and Sediment Control Plan (DWG. 20027-ESC1) provided in **Appendix B** for more details.

9.0 CONCLUSIONS

This servicing and stormwater management report has been prepared to support the Site Plan Application for the development of the property located at 8800 Campeau Drive, within the KWBP. The report has detailed the proposed means of servicing the site and provided details on how to meet the stormwater management requirements in accordance with City of Ottawa standards and the overarching IBI Reports prepared for the KWBP. The proposed servicing and stormwater management designs will be achieved by implementing the following key features:

- Domestic water supply will be provided by a 200 mm diameter watermain connection to the existing 250 mm diameter watermain on Campeau Drive.
- Water supply for fire protection will be provided by a proposed on-site hydrant.
- Sanitary flows will be conveyed to the existing 250 mm diameter sanitary sewer on Campeau Drive via a proposed 200 mm diameter sanitary sewer.
- Stormwater runoff (minor system) will be conveyed by the proposed storm sewer system to EXMH101 on Campeau Drive.
- Stormwater outflows for all storm events up to and including the 100 year design storm will be controlled in accordance with the *IBI Report*.
- On-site storage will be provided for all storm events up to and including the 100 year design storm event.
- Major overland flows will be conveyed to Campeau Drive.
- A proposed infiltration gallery, fed by roof drains, will be utilized to meet the infiltration targets for the site.
- Quality control will be provided by the existing Pond 6 West Facility.
- Erosion and sediment control measures will be implemented prior to construction and maintained until vegetation has been re-established in disturbed areas.

Report Prepared By:

Brandon MacKechnie, P.Eng.
Project Engineer

Report Reviewed By:

Sean Czaharynski, P.Eng.
Practice Area Lead – Land Development

Watermain Analysis Prepared By:

Pat Leblanc, P.Eng.
Senior Project Manager

Appendix A

Pre-Consultation Notes

KWBP Figure 6 – Draft Plan (prepared by IBI Group)

KWBP General Plan of Services (prepared by IBI Group)

KWBP Campeau Drive from STA 19+780 to STA 20+410 (prepared by IBI Group)

KWBP Upper Canada Street from Campeau Drive to STA 0+410 (prepared by IBI Group)

Jill Sparling

From: David McRobie
Sent: September-28-20 10:44 AM
To: Jill Sparling
Subject: FW: Pre-Consultation Follow-Up: Maritime Ontario (Kanata West Business Park)
Attachments: Pre-con Applicant's Study and Plan Identification List.pdf

Her name is Laurel McCreight.

David McRobie FRAIC OAA OAQ AAA
President
MCROBIE
ARCHITECTS + INTERIOR DESIGNERS

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From: Derek Howe <derek.howe@taggart.ca>
Sent: September-25-20 10:39 AM
To: David McRobie <McRobie@mcrobie.com>
Subject: FW: Pre-Consultation Follow-Up: Maritime Ontario (Kanata West Business Park)

This is who you should request – she is really good.
Derek

From: McCreight, Laurel <Laurel.McCreight@ottawa.ca>
Sent: October 23, 2019 10:51 AM
To: dplumb@realinc-scs.com; dplumb.can@gmail.com
Cc: Derek Howe <derek.howe@taggart.ca>; Emily McGirr <emily.mcgirr@taggart.ca>
Subject: Pre-Consultation Follow-Up: Maritime Ontario (Kanata West Business Park)

Hi David,

Please refer to the below regarding the Pre-Application Consultation Meeting held on Thursday October 17, 2019 for the property at the far west end of the Kanata West Business Park north of Campeau Drive for a Site Plan Control Application for Maritime Ontario (warehouse and office). I have also attached the required Plans & Study List for application submission.

Below are staff's preliminary comments based on the information available at the time of pre-consultation meeting:

Planning / Urban Design

- Phase 5 of the Kanata West Business Park must be registered prior to receiving site plan approval.
    - An address will be assigned as part of the subdivision registration.
- Emphasis on landscaping along the street edge to provide a green buffer to the parking lot will be important.
- Pedestrian circulation on site from parking areas to the buildings should be clearly defined.

- Please include sidewalks along the frontage of the site.
- Examples of similar developments (Moncton and Brampton) as discussed in the meeting are welcome examples of the level of detail and attention to landscaping, site layout and building design.

Engineering

- The Stormwater Management Criteria for the subject site is to be in accordance with Kanata West Business Park Phase 5 Design Brief, prepared by IBI Group (latest revision). The Phase 5 registration documents are currently under review by the City of Ottawa. Flows to the storm sewer in excess of the allocated storm release rate, up to and including the 100-year storm event, must be detained on site.
- The sanitary sewer release rate for the subject site is to be in accordance with Kanata West Business Park Phase 5 Design Brief, prepared by IBI Group (latest revision).
- Proposed connection locations for sanitary and storm services are to be in accordance with Kanata West Business Park Phase 5 Design Brief, prepared by IBI Group (latest revision
- Provide the following information for water main boundary conditions:
    1. Location map with water service connection location
    2. Average daily demand (l/s)
    3. Maximum daily demand (l/s)
    4. Maximum hourly demand (l/s)
    5. Fire flow demand (provide fire detailed flow calculations based on the fire underwriters survey method)
    6. If you are proposing any exterior light fixtures, all must be included and approved as part of the site plan approval. Therefore, the lights must be clearly identified by make, model and part number. All external light fixtures must meet the criteria for full cut-off classification as recognized by the Illuminating Engineering Society of North America (IESNA or IES), and must result in minimal light spillage onto adjacent properties (as a guideline, 0.5 fc is normally the maximum allowable spillage). In order to satisfy these criteria, the applicant must provide certification from an acceptable professional engineer. The location of all exterior fixtures, a table showing the fixture types (including make, model, part number), and the mounting heights must be included on a plan.
- An MECP Environmental Compliance Approval (Industrial Sewage Works) will be required for the proposed development assuming “storage of goods or materials” will occur at the proposed warehouse.

Please contact Infrastructure Project Manager, Julie Candow for follow-up questions.

Transportation

- Follow Traffic Impact Assessment Guidelines
    - Screening form to start, full Traffic Impact Assessment if any of the triggers on the screening form are satisfied.
    - Start this process asap. The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
- It would be beneficial if the TIA forecasting includes reference to existing Bantree site in terms of site generated traffic.
- Corner triangles as per OP Annex 1 - Road Classification and Rights-of-Way at the following locations on the final plan will be required (measure on the property line/ROW protected line; no structure above or below this triangle):
    - Local Road to Local Road: 3 m x 3 m
- Sight triangle as per Zoning by-law is 6 m x 6 m (measure on the curb line).
- Based upon TAC (Figure 8.8.2), the minimum corner clearance for a local road is 15m.
- Review the Private Approach By-law to define:
    - The number of accesses (based upon frontage size);
    - The allowable width of private approach (desired max. 9m, exception can be granted for “transport loading areas”);

    - The required distance between private approaches (min. 9 m).
- Consider separating heavy vehicles and passenger vehicles on site and at accesses.
- On site plan:
    - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
    - Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).
    - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
    - Show lane/aisle widths.
    - Provide dedicated pedestrian paths.
    - Sidewalk is to be provided along the site frontages and continuous across accesses as per City Specification 7.1.
    - Grey out any area that will not be impacted by this application.

Please contact Transportation Project Manager, Josiane Gervais for follow-up questions.

Other

Please refer to the links to "Guide to preparing studies and plans" and fees for general information. Additional information is available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting informationcentre@ottawa.ca.

These pre-consultation comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.

Please do not hesitate to contact me if you have any questions.

Regards,
Laurel

Laurel McCreight MCIP, RPP
Planner
Development Review West
Urbaniste
Examen des demandes d'aménagement ouest

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 16587
ottawa.ca/planning / ottawa.ca/urbanisme

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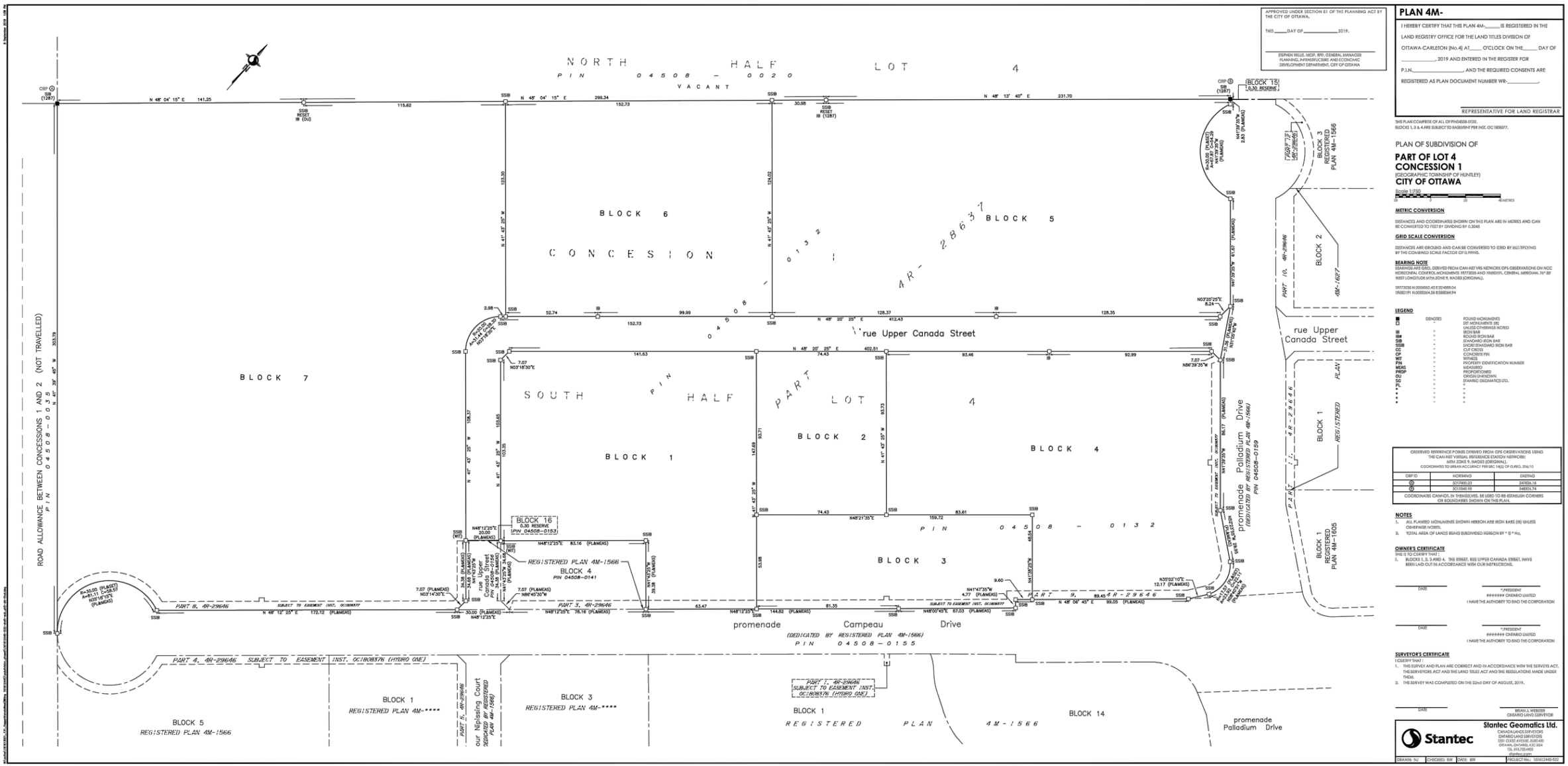

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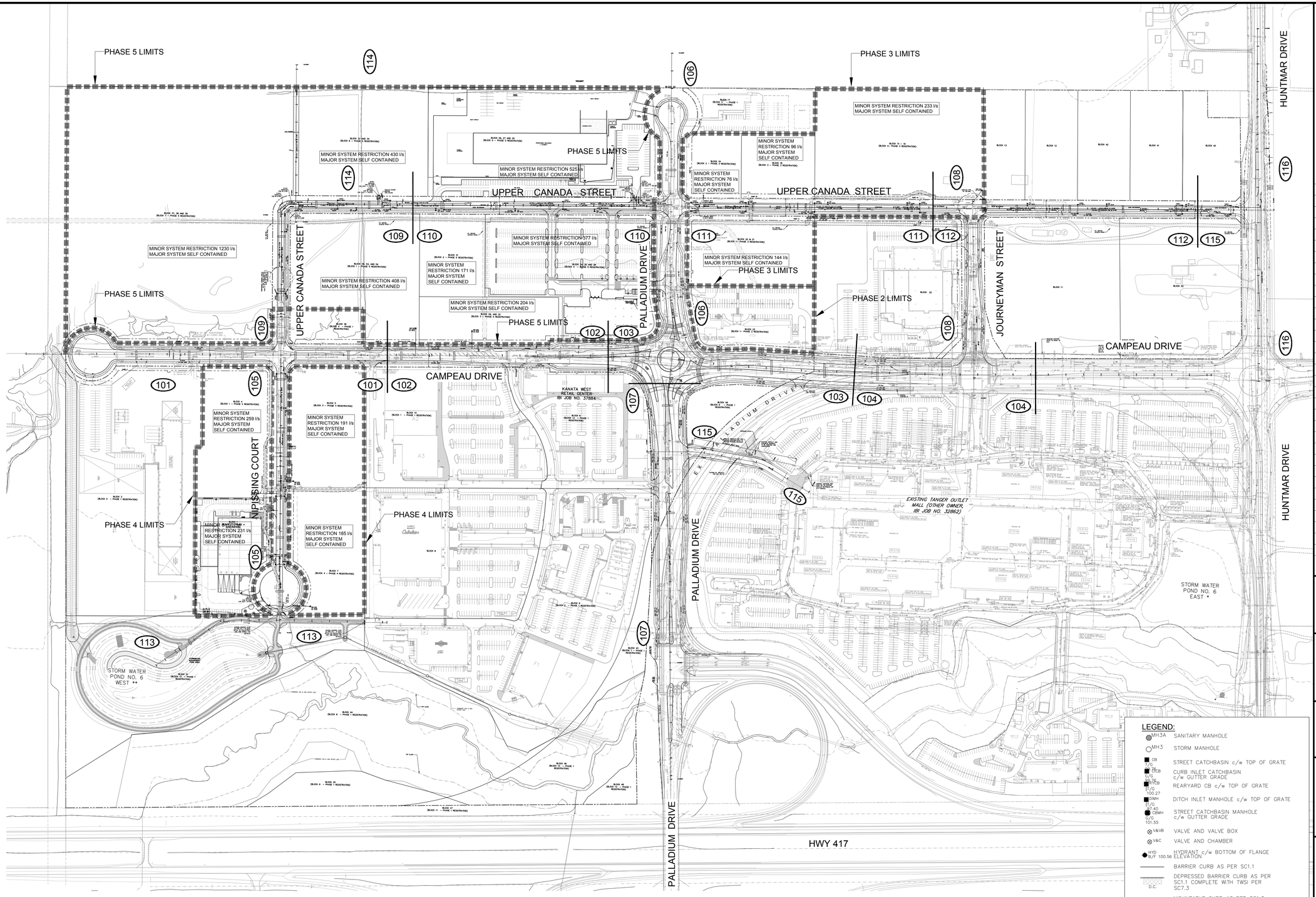
Project Title: KANATA WEST BUSINESS PARK

Drawing Title: DRAFT PLAN

Sheet No.: FIGURE 6



NOTES:

* REFER TO KANATA WEST BUSINESS PARK STORMWATER MANAGEMENT REPORT AND POND 6 EAST DESIGN REPORT. 337 HUNTMAR DRIVE TANGER OUTLET CENTERS REPORT 32862.5.2.3 REVISION 4 NOVEMBER 2014.

** REFER TO KANATA WEST BUSINESS PARK STORMWATER MANAGEMENT REPORT AND POND 6 WEST DESIGN BRIEF REPORT 14289.5.2.3 SEPTEMBER 2015.

SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR STANTEC GEOMATICS

FOR EXTENT OF EXISTING CONSTRUCTION REFER TO DRAWING 14289-100A

No.	REVISIONS	By	Date
31	ADD SERVICE CONNECTIONS FOR BLOCKS 5 AND 6	LME	20: 06:17
30	ISSUED FOR CONSTRUCTION PHASE 4 AND 5	LME	20: 05:27
29	ISSUED FOR TENDER PHASE 4 AND 6	LME	20: 02:12
28	REVISED AS PER PHASE 5 COMMENTS	LME	19: 10: 25
27	ISSUED FOR PHASE 5 REGISTRATION	LME	19: 09: 10
26	ISSUED FOR PHASE 3 CONSTRUCTION	LME	19: 08: 15
25	REVISED AS PER PHASE 4 COMMENTS	LME	19: 07: 25
24	REVISED AS PER PHASE 4 COMMENTS	LME	19: 07: 22
23	REVISED AS PER PHASE 4 COMMENTS	LME	19: 06: 24
22	ISSUED FOR PHASE 4 REGISTRATION	LME	19: 04: 25
21	REVISED AS PER PHASE 3 COMMENTS	LME	19: 03: 08
20	REVISED AS PER PHASE 3 COMMENTS	LME	19: 02: 11
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15	REVISED FOR PHASE 2 REGISTRATION	LME	18: 04: 20
14	REVISED DWA CHAMBER IN BLK 10 & RELOCATE HYD. BLK 35/36	LME	16: 05: 05
13	ISSUED AS PER REVISED CARPENTERS UNION	LME	16: 04: 25
12	REVISE HYDRANT ON UPPER CANADA ST. AT BLOCK 36 P/L	LME	16: 04: 20
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9	ISSUED FOR CONSTRUCTION	LME	16: 01: 19
8	ISSUED FOR MYLARS	LME	16: 01: 12
7	ISSUED TO TAGGART	LME	15: 12: 14
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5	REVISED AS PER CITY COMMENTS	LME	15: 10: 15
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3	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	LME	15: 06: 19
2	REVISED AS PER CITY COMMENTS	LME	15: 04: 08
1	ISSUED TO CITY FOR APPROVAL	LME	14: 11: 27

LEGEND:

- MH3A — SANITARY MANHOLE
- MH3 — STORM MANHOLE
- CB — STREET CATCHBASIN c/w TOP OF GRATE
- CBCB — CURB INLET CATCHBASIN c/w GUTTER GRADE
- RYCB — REARYARD CB c/w TOP OF GRATE
- DMH — DITCH INLET MANHOLE c/w TOP OF GRATE
- CBMH — STREET CATCHBASIN MANHOLE c/w GUTTER GRADE
- V&VB — VALVE AND VALVE BOX
- V&C — VALVE AND CHAMBER
- HYD — HYDRANT c/w BOTTOM OF FLANGE ELEVATION
- BARRIER CURB AS PER SC1.1
- DEPRESSED BARRIER CURB AS PER SC1.1 COMPLETE WITH TWSI PER SC7.3
- MOUNTABLE CURB AS PER SC1.3
- PROPOSED CONCRETE SIDEWALK
- REQUIRED FILL BELOW ROAD SUBGRADE
- CLAY DYKES
- HGL — HYDRAULIC GRADE LINE
- (111) — DRAWING NUMBER
- TEMPORARY 3.0m GRAVEL ACCESS ROAD

TAGGART REALTY MANAGEMENT

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
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Project Title

KANATA WEST BUSINESS PARK PHASE 5

L. M. ERION
13379508
2020/06/17
PROVINCE OF ONTARIO

Drawing Title

GENERAL PLAN OF SERVICES

Scale: 1:2000

Design	Date
LME	NOV. 2014
Drawn	Checked
DPS	TRB
Project No.	Drawing No.
14289	100

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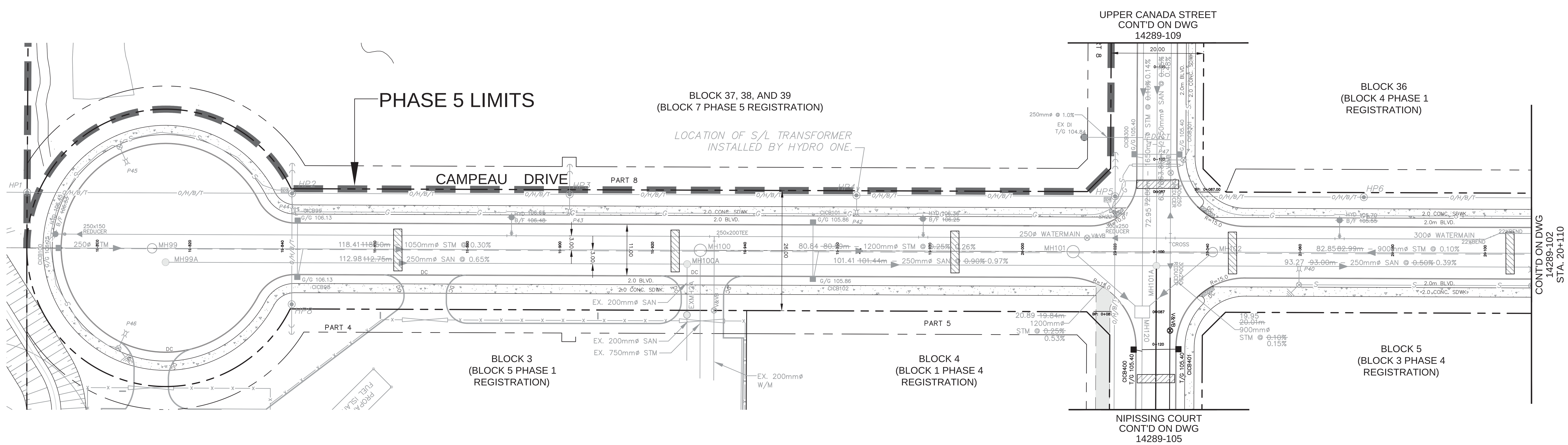

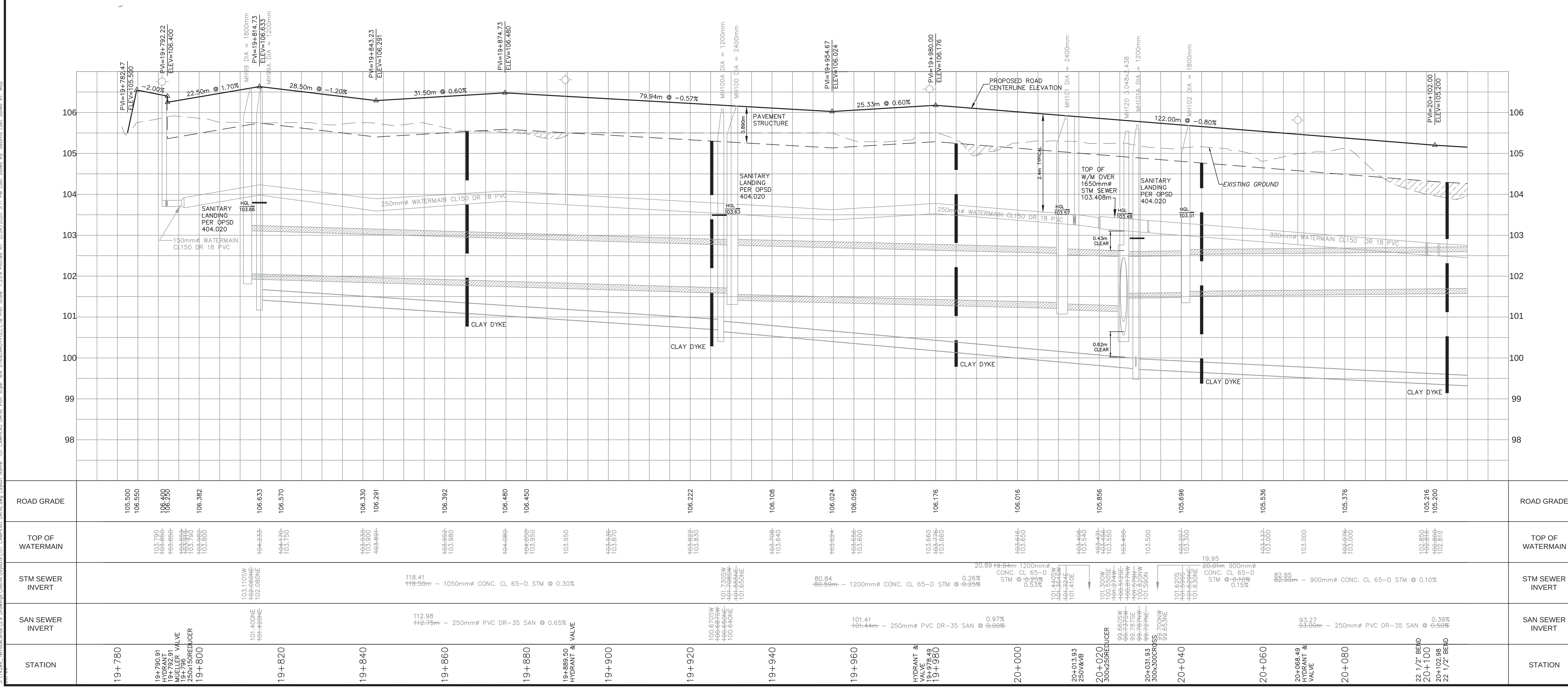

LEGEND:

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- MH3 STORM MANHOLE
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- CICB G/G 99.76 CURB INLET CATCHBASIN c/w GUTTER GRADE
- RYCB T/G 100.27 REARYARD CB c/w TOP OF GRATE
- DIMH T/G 97.40 DITCH INLET MANHOLE c/w TOP OF GRATE
- CBMH G/G 101.55 STREET CATCHBASIN MANHOLE c/w GUTTER GRADE
- V&VB VALVE AND VALVE BOX
- V&C VALVE AND CHAMBER
- HYD B/F 100.56 HYDRANT c/w BOTTOM OF FLANGE ELEVATION
- BARRIER CURB AS PER SC1.1
- D.C. DEPRESSED BARRIER CURB AS PER SC1.1 COMPLETE WITH TWSI PER SC7.3
- MOUNTABLE CURB AS PER SC1.3
- PROPOSED CONCRETE SIDEWALK
- REQUIRED FILL BELOW ROAD SUBGRADE
- CLAY DYKES
- HGL 103.54 HYDRAULIC GRADE LINE
- TEMPORARY 3.0m GRAVEL ACCESS ROAD

FOR EXTENT OF EXISTING CONSTRUCTION REFER TO DRAWING 14289-100A

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7	ISSUED FOR MYLARS	LME	16:01:12
6	ISSUED TO TAGGART	LME	15:12:14
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2	REVISED AS PER CITY COMMENTS	LME	15:04:08
1	ISSUED TO CITY FOR APPROVAL	LME	14:11:27

TAGGART REALTY MANAGEMENT

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Project Title

KANATA WEST BUSINESS PARK PHASE 5

LICENSED PROFESSIONAL ENGINEER
L. M. ERION
13379508
2020/05/27
PROVINCE OF ONTARIO

Drawing Title

CAMPEAU DRIVE

FROM STA 19+780 TO STA 20+110

Scale
HORIZ. SCALE 1:500
VERT. SCALE 1:50

Design	Date
LME	NOV. 2014
Drawn	Checked
DPS	TRB
Project No.	Drawing No.
14289	101

D07-16-14-0003_P5

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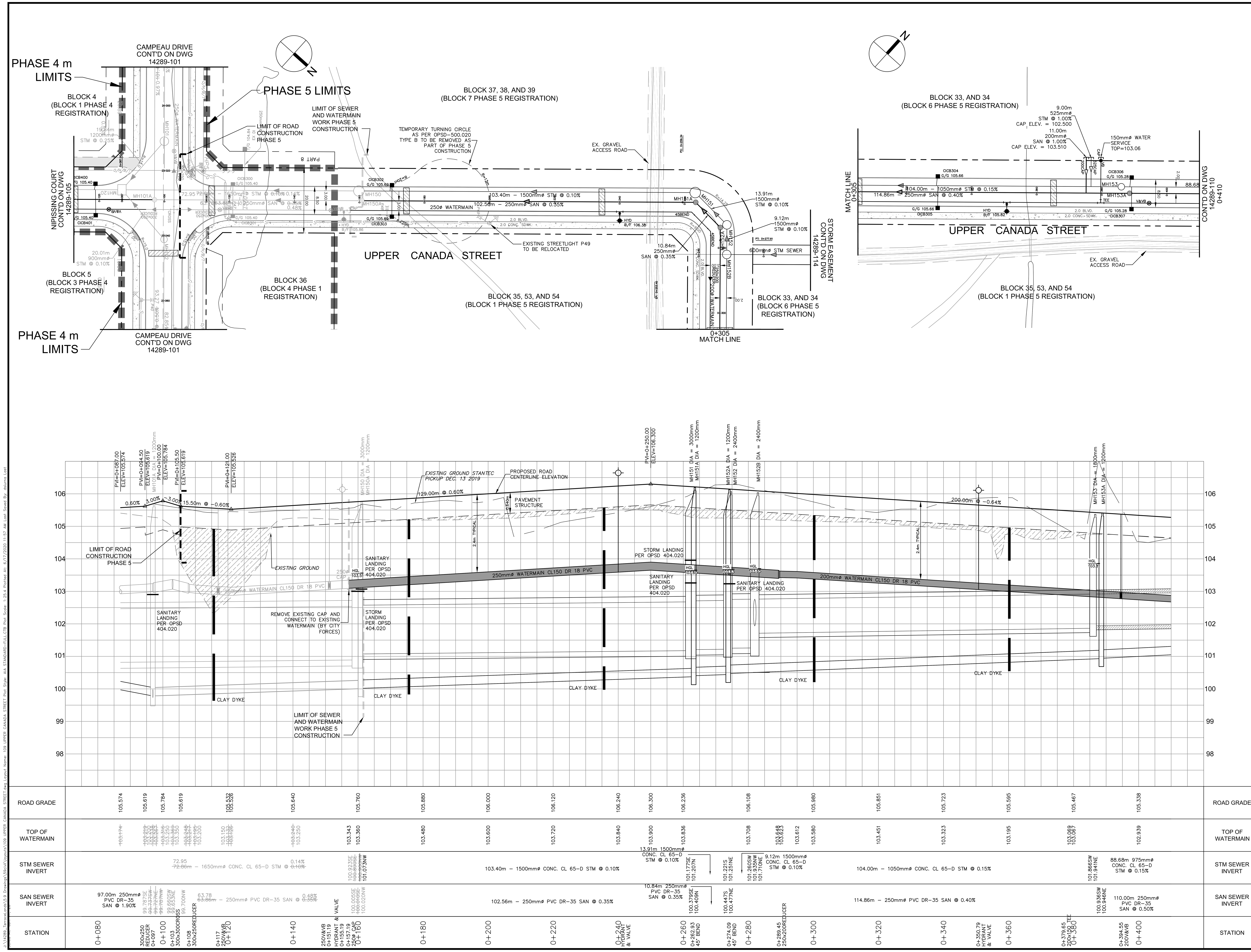

ROAD GRADE	TOP OF WATERMAIN	STM SEWER INVERT	SAN SEWER INVERT	STATION
ROAD GRADE	TOP OF WATERMAIN	STM SEWER INVERT	SAN SEWER INVERT	STATION

LEGEND:
- MH3A SANITARY MANHOLE
- MH3 STORM MANHOLE
- STREET CATCHBASIN c/w TOP OF GRATE
- CURB INLET CATCHBASIN c/w GUTTER GRADE
- REARYARD CB c/w TOP OF GRATE
- DITCH INLET MANHOLE c/w TOP OF GRATE
- STREET CATCHBASIN MANHOLE c/w GUTTER GRADE
- VALVE AND VALVE BOX
- VALVE AND CHAMBER
- HYDRANT c/w BOTTOM OF FLANGE ELEVATION
- BARRIER CURB AS PER SC1.1
- DEPRESSED BARRIER CURB AS PER SC1.1 COMPLETE WITH TWSI PER SC7.3
- MOUNTABLE CURB AS PER SC1.3
- PROPOSED CONCRETE SIDEWALK
- REQUIRED FILL BELOW ROAD SUBGRADE
- CLAY DYKES
- HYDRAULIC GRADE LINE
- TEMPORARY 3.0m GRAVEL ACCESS ROAD

FOR EXTENT OF EXISTING CONSTRUCTION REFER TO DRAWING 14289-100A

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10	RELOCATE V&VB, HYDRANT AND CAP AT BLOCK 35/36	LME	16:05:05
9	REVISED LIMIT BLK 36, RELOCATE V&VB, HYDRANT AND CAP.	LME	16:04:20
8	ISSUED FOR CONSTRUCTION	LME	16:01:19
7	ISSUED FOR MYLARS	LME	16:01:12
6	ISSUED TO TAGGART	LME	15:12:14
5	REVISED AS PER CITY COMMENTS	LME	15:10:15
4	REVISE PHASE 1 LIMITS	LME	15:08:19
3	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	LME	15:06:19
2	REVISED AS PER CITY COMMENTS	LME	15:04:08
1	ISSUED TO CITY FOR APPROVAL	LME	14:11:27

TAGGART REALTY MANAGEMENT

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title
KANATA WEST BUSINESS PARK PHASE 5

LICENSED PROFESSIONAL ENGINEER L. M. ERION 13379508 2020/06/17 PROVINCE OF ONTARIO

Drawing Title
UPPER CANADA STREET
FROM CAMPEAU DRIVE to STA. 0+410

Scale
HORIZ. SCALE 1:500
VERT. SCALE 1:50

Design	Date
LME	NOV. 2014
Drawn	Checked
DPS	TRB
Project No.	Drawing No.
14289	109

D07-16-14-0003_P5

#17661

Appendix B

Site Plan
(prepared by McRobie Architects)

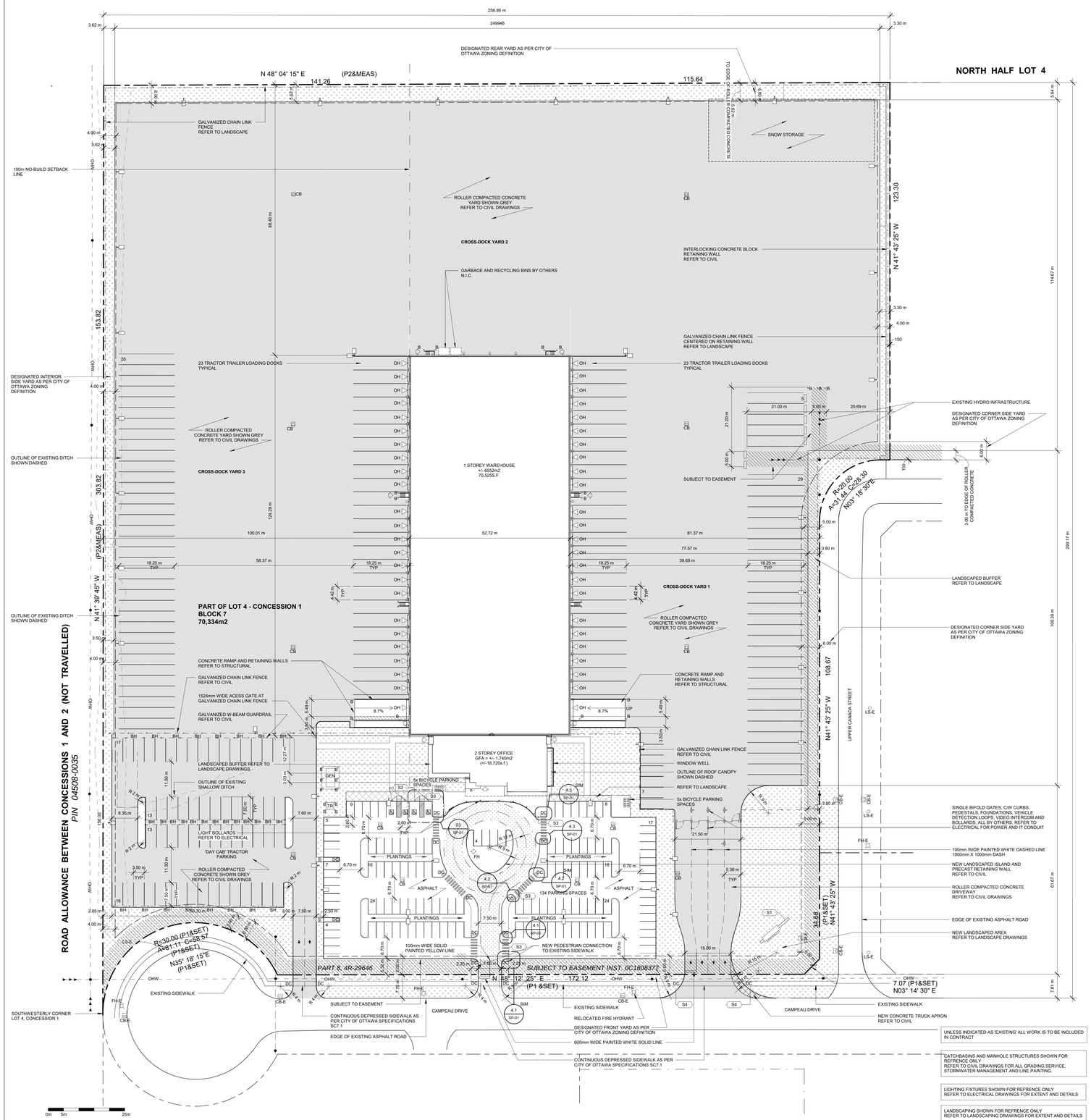
Servicing Plans
(DWG. 20027-S1, S2)

Grading Plans
(DWG. 20027-GR1, GR2, GR3)

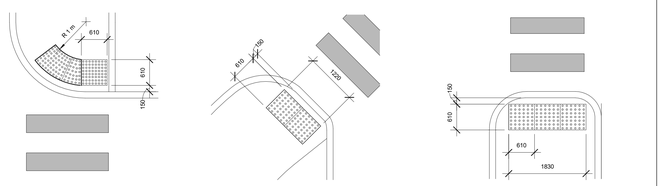
Erosion and Sediment Control Plan
(DWG. 20027-ESC1)

Notes & Details
(DWG. 20027-N1)

Existing Conditions and Removals Plan
(DWG. 20027-R1)



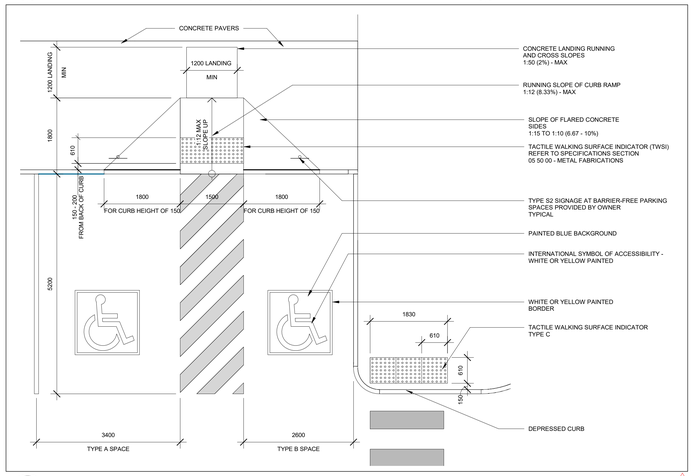
05 SP-01 SITE PLAN
Scale: 1 : 500



4.1 SP-01 TWSI - TYPE A
Scale: 1 : 50

4.2 SP-01 TWSI - TYPE B
Scale: 1 : 50

4.3 SP-01 TWSI - TYPE C
Scale: 1 : 50



03 SP-01 TYPICAL DETAIL - DEPRESSED CURB AND TWSI AT BARRIER-FREE PARKING STALL
Scale: 1 : 50

CITY OF OTTAWA ZONING BYLAW 2008-250	REQUIRED	PROVIDED
MINIMUM LOT AREA	750m2	70,334m2
MINIMUM LOT WIDTH	NO MINIMUM	297.6m
MINIMUM LOT COVERAGE	55%	+/- 10.3%
SETBACKS	FRONT YARD: 6m	FRONT YARD: 59.83m
	INTERIOR SIDE YARD: 4m	INTERIOR SIDE YARD: 100m
	CORNER SIDE YARD: 6m	CORNER SIDE YARD: 81.37m
	REAR YARD: 6m	REAR YARD: 88.4m
MAXIMUM FLOOR SPACE INDEX	2.0	+/- 0.103
MAXIMUM BUILDING HEIGHT	22m	12.38m
MINIMUM WIDTH OF LANDSCAPE	ABUTTING A STREET: 3m ALL OTHER CASES: NO MINIMUM	ABUTTING A STREET: 3m (CAMPEAU), 5.32m (UPPER CANADA) ALL OTHER CASES: 1.52m
ACCESSORY SALES AND DISPLAY AREA	MAXIMUM 25% OF THE GROSS FLOOR AREA OF THE PROPOSED BUILDING	N/A
MINIMUM PARKING WAREHOUSE: 0.6/100m2 OF GFA	WAREHOUSE: 58 SPACES	134 SPACES
BARRIER FREE PARKING TYPE A: MINIMUM 3.4m WIDE TYPE B: MINIMUM 2.6m WIDE MINIMUM ACCESS AISLE: 1.5m	4 SPACES (2 TYPE A + 2 TYPE B)	4 SPACES (2 TYPE A + 2 TYPE B)
MINIMUM BICYCLE PARKING WAREHOUSE: 1/1000m2 OF GFA	7 SPACES	10 SPACES
LOADING SPACES	2 SPACES	48 SPACES

02 SP-01 ZONING TABLE
Scale:N/A

SITE PLAN INFORMATION

UNDERLYING TOPOGRAPHICAL INFORMATION IS AS PER A PLAN PREPARED BY STANTEC GEOMATICS LTD, ONTARIO LAND SURVEYORS DATED DECEMBER 20TH, 2019 OF PART OF LOT 4 CONCESSION 1, GEOGRAPHIC TOWNSHIP OF HUNTLEY.

ABBREVIATIONS

AODA : ACCESSIBILITY FOR ONTARIANS WITH DISABILITIES
TWSI : TACTILE WALKING SURFACE INDICATOR
N.I.C. : NOT IN CONTRACT

SIGNAGE

S1 NEW ILLUMINATED MONUMENT SIGN
S2 AODA COMPLIANT VERTICAL PARKING SIGN TYPICAL AT EACH AODA PARKING SPACE
S3 FIRE ROUTE SIGNAGE
S4 'AUTHORIZED USE ONLY' OVERHEAD SIGN

NOTE: ALL SIGNAGE, POSTS, AND FOUNDATIONS N.I.C.

LINE OF SETBACK AS PER ZONING BY-LAW
PROPERTY LINE
SUBJECT TO HYDRO EASEMENT
OHW EXISTING OVERHEAD WIRES
EXISTING UTILITY POLE
NEW WALL MOUNTED LIGHT FIXTURE REFER TO ELECTRICAL
NEW EXTERIOR LIGHT STANDARD REFER TO ELECTRICAL
GEN GENERATOR - REFER TO ELECTRICAL
TR TRANSFORMER - REFER TO ELECTRICAL
BH POST-MOUNTED BLOCK HEATER OUTLETS - DUAL RECEPTACLE - REFER TO ELECTRICAL
LS-E EXISTING LIGHT STANDARD
NEW SITE LIGHTING FIXTURE REFER TO ELECTRICAL
PRECAST CONCRETE PAVERS - REFER TO LANDSCAPE
FIRE ROUTE AS PER OBC
SOD, REFER TO LANDSCAPE PLAN
NEW SHRUBS, REFER TO LANDSCAPE PLAN
NEW TREE, REFER TO LANDSCAPE PLAN
GALVANIZED CHAIN LINK FENCE
GALVANIZED W-BEAM GUARDRAIL ON STEEL POSTS REFER TO CIVIL
BUILDING ENTRANCE
B 203mm DIAMETER CONCRETE-FILLED BOLLARD REFER TO STRUCTURAL DETAIL D03-16/S002
OH OVERHEAD DOOR
SC SIAMESE FIRE DEPARTMENT CONNECTION REFER TO MECHANICAL
FH NEW FIRE HYDRANT REFER TO CIVIL
FH-E EXISTING FIRE HYDRANT
CB NEW CATCH BASIN - REFER TO CIVIL
CB-E EXISTING CATCH BASIN
BARRIER FREE PARKING STALL - REFER TO CIVIL FOR LINE PAINTING
NEW HORIZONTAL BICYCLE PARKING - REFER TO LANDSCAPE FOR BIKE RACKS
CROSSWALK PAINT MARKINGS - REFER TO CIVIL FOR LINE PAINTING
610mm DEEP TACTILE WALKING SURFACE INDICATOR (TWSI) -PROFILE TO MATCH EXTENT OF DEPRESSED CURB -TYPICAL ALL DEPRESSED CURBS UNLESS OTHERWISE INDICATED. REFER TO DETAIL 4.1, 4.2, 4.3 ON SP-01
DC DEPRESSED CURB - REFER TO DETAIL 03/SP-01

01 SP-01 SITE PLAN NOTES, LEGEND, AND ABBREVIATIONS
Scale:N/A

MCROBIE
ARCHITECTS + INTERIOR DESIGNERS

OTTAWA, ONTARIO

CONSULTANTS

CLELAND JARDINE ENGINEERING LTD.
STRUCTURAL ENGINEERS
200 - 580 TERRY FOX DRIVE, KANATA, ON, K2L 4B9
TEL: 613-591-1333

MCKEE ENGINEERING
MECHANICAL & ELECTRICAL ENGINEERS
1785 WOODWARD DRIVE, OTTAWA, ON, K2C 0P9
TEL: 613-723-9585

ROBINSON CONSULTANTS INC.
CIVIL ENGINEERS
200 - 350 PALLADIUM DRIVE, OTTAWA, ON, K2V 1A8
TEL: 613-592-6060

LEVSTEK CONSULTANTS INC.
LANDSCAPE ARCHITECTS
5871 HUGH CRESCENT, OSGOODE, ON, K0A 2W0
TEL: 613-826-0518

North

Revisions

Revision Number	Description	Date
1	ISSUED FOR SITE PLAN APPLICATION	2020-12-16
2	ISSUED FOR COORDINATION	2021-03-08
3	ISSUED FOR COORDINATION	2021-03-19
4	ISSUED FOR COORDINATION	2021-03-23
5	ISSUED FOR PERMIT	2021-04-07
6	ISSUED FOR COORDINATION	2021-05-31
7	ISSUED IN RESPONSE TO CITY COMMENTS	2021-06-05
8	ISSUED FOR TENDER	2021-06-11

Project

MARITIME-ONTARIO OTTAWA FACILITY

8800 CAMPEAU DRIVE.
OTTAWA, ON

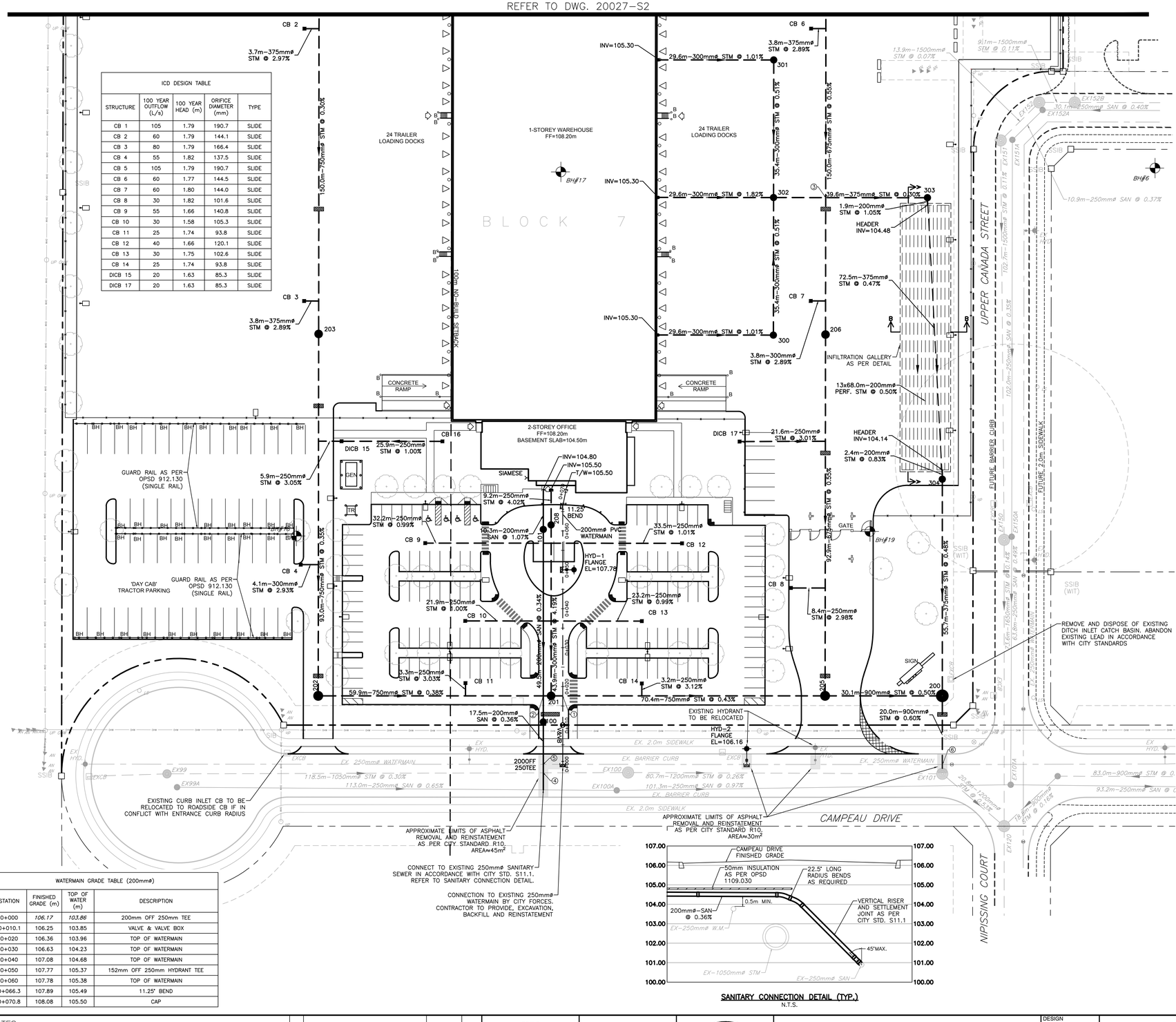
Drawing

SITE PLAN

Scale: As indicated
Stamp
Drawn: RH
Checked: DM
Project No.: 19-247
Drawing No.: SP-01
Date: 2020/07/21

2021-06-10 12:23:50 PM

MATCHLINE
REFER TO DWG. 20027-S2



ICD DESIGN TABLE				
STRUCTURE	100 YEAR OUTFLOW (L/s)	100 YEAR HEAD (m)	ORIFICE DIAMETER (mm)	TYPE
CB 1	105	1.79	190.7	SLIDE
CB 2	60	1.79	144.1	SLIDE
CB 3	80	1.79	166.4	SLIDE
CB 4	55	1.82	137.5	SLIDE
CB 5	105	1.79	190.7	SLIDE
CB 6	60	1.77	144.5	SLIDE
CB 7	60	1.80	144.0	SLIDE
CB 8	30	1.82	101.6	SLIDE
CB 9	55	1.66	140.8	SLIDE
CB 10	30	1.58	105.3	SLIDE
CB 11	25	1.74	93.8	SLIDE
CB 12	40	1.66	120.1	SLIDE
CB 13	30	1.75	102.6	SLIDE
CB 14	25	1.74	93.8	SLIDE
DICB 15	20	1.63	85.3	SLIDE
DICB 17	20	1.63	85.3	SLIDE

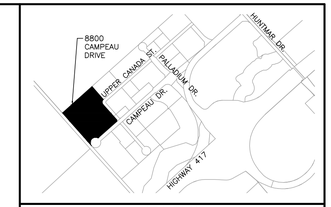
WATERMAIN GRADE TABLE (200mmø)			
STATION	FINISHED GRADE (m)	TOP OF WATER (m)	DESCRIPTION
0+000	*106.17*	*103.86*	200mm OFF 250mm TEE
0+010.1	106.25	103.85	VALVE & VALVE BOX
0+020	106.36	103.96	TOP OF WATERMAIN
0+030	106.63	104.23	TOP OF WATERMAIN
0+040	107.08	104.68	TOP OF WATERMAIN
0+050	107.77	105.37	152mm OFF 250mm HYDRANT TEE
0+060	107.78	105.38	TOP OF WATERMAIN
0+066.3	107.89	105.49	11.25° BEND
0+070.8	108.08	105.50	CAP

STORM MANHOLE TABLE				
STRUCTURE	STRUCTURE SIZE	T/G ELEV	INVERT	GRATE
200	2400mmø	105.88	NW=103.82 SW=102.04 SE=101.98	S24.1
201	1500mmø	106.37	SW=102.67 NW=103.24 NE=102.64	S24.1
202	1800mmø	106.43	NW=102.96 NE=102.90	S24.1
203	1500mmø	106.35	NW=103.32 SE=103.29	S24.1
204	1500mmø	106.46	SE=103.76	S24.1
205	1800mmø	106.23	NW=102.42 SW=102.34 NE=102.19	S24.1
206	1500mmø	106.33	NW=102.96 SE=102.93	S24.1
207	1500mmø	106.46	SE=103.78	S24.1
208	1200mmø	106.66	NW=105.13 SE=105.08	S24.1
300	1200mmø	106.44	NW=104.94 SW=105.00	S24.1
301	1200mmø	106.47	SE=104.94 SW=105.00	S24.1
302	1200mmø	106.55	SE=104.76 NE=104.68 NW=104.76 SW=104.76	S24.1
303	1200mmø	106.76	SW=104.56 SE=104.50 SE=105.18	S24.1
304	1200mmø	106.48	NW=104.12 SE=104.09 NW=104.84	S24.1
EX101	2400mmø	105.88	SW=101.44 E=101.41 NW=101.86	S24.1

SANITARY MANHOLE TABLE				
STRUCTURE	STRUCTURE SIZE	T/G ELEV	INVERT	GRATE
100	1200mmø	106.28	NW=104.49 SE=104.46	S24
101	1200mmø	108.28	SE=104.66 NW=104.69	S24

CATCH BASIN TABLE				
STRUCTURE	STRUCTURE SIZE	T/G ELEV	INVERT	GRATE
CB 1	600x600mm	106.42	NE=104.74	S19
CB 2	600x600mm	106.32	NE=104.64	S19
CB 3	600x600mm	106.22	NE=104.54	S19
CB 4	600x600mm	106.15	NE=104.47	S19
CB 5	600x600mm	106.42	NE=104.74	S19
CB 6	600x600mm	106.32	NE=104.64	S19
CB 7	600x600mm	106.22	NE=104.54	S19
CB 8	600x600mm	105.95	NE=104.27	S19
CB 9	600x600mm	107.10	NE=105.42	S19
CB 10	600x600mm	106.64	NE=105.13	S19
CB 11	600x600mm	106.06	SE=104.38	S19
CB 12	600x600mm	107.10	SW=105.42	S19
CB 13	600x600mm	106.64	SW=104.96	S19
CB 14	600x600mm	106.06	SE=104.38	S19
CB 16	600x600mm	106.61	SW=105.41	S19
DICB 15	600x600mm	106.42	SW=104.67 NE=105.15	403.010
DICB 17	600x600mm	106.50	NE=104.75	403.010

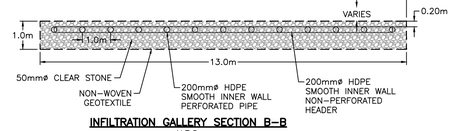
SEWER CROSSING TABLE		
CROSSING No.	INVERTS (m)	SEPARATION (m)
1	WATER INV.=103.77	0.27
	STM OBV.=103.50	
2	SAN INV.=104.51	0.96
	STM OBV.=103.55	
3	STM INV.=104.64	0.70
	STM OBV.=103.94	
4	SAN INV.=104.41	1.41
	EX STM OBV.=103.00	
5	SAN INV.=104.42	0.54
	EX WATER OBV.=103.88	
6	EX WATER INV.=103.28	0.38
	STM OBV.=102.90	



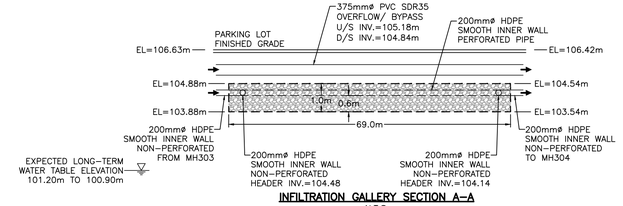
KEY PLAN

LEGEND

- PROPERTY BOUNDARY
- CATCH BASIN
- STORM SEWER & MANHOLE
- SANITARY SEWER & MANHOLE
- WATERMAIN
- HYDRANT
- VALVE & VALVE BOX
- SIAMESE CONNECTION
- EXISTING CATCH BASIN
- EXISTING STORM SEWER & MANHOLE
- EXISTING SANITARY SEWER & MANHOLE
- EXISTING WATERMAIN
- EXISTING HYDRANT
- EXISTING VALVE & VALVE BOX
- 100m NO-BUILD SETBACK
- CLAY SEAL
- BOREHOLE
- CROSSING NUMBER
- GALVANIZED CHAIN LINK FENCE (REFER TO SITE PLAN)
- GALVANIZED W-BEAM GUARDRAIL (OPSD 912.130)
- BUILDING ENTRANCE (REFER TO SITE PLAN)
- BOLLARD (REFER TO SITE PLAN)
- POST-MOUNTED BLOCK HEATER (REFER TO SITE PLAN)
- LIGHT STANDARD (REFER TO SITE PLAN)
- JERSEY BARRIER (REFER TO SITE PLAN)
- TWSI (REFER TO SITE PLAN)
- PROPOSED TREE (REFER TO LANDSCAPE PLAN)



INFILTRATION GALLERY SECTION B–B
N.T.S.



INFILTRATION GALLERY SECTION A–A
N.T.S.

SANITARY CONNECTION DETAIL (TYP.)
N.T.S.

NOTES

THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NO.	REVISION DESCRIPTION	DATE	BY
6	REVISED PER COMMENTS	17/01/22	BLM
5	REVISED PER COMMENTS	09/08/21	SMC
4	ISSUED FOR TENDER	11/06/21	SMC
3	REVISED PER COMMENTS	28/05/21	SMC
2	ISSUED FOR PROGRESS REVIEW	22/03/21	SMC
1	ISSUED FOR SITE PLAN APPLICATION	02/12/20	SMC

SCALE
0 5m 10m 20m
HORIZONTAL 1:500

LICENSED PROFESSIONAL ENGINEER
Jan. 17/22
B. L. MACKECHNIE
100199554
PROVINCE OF ONTARIO

Robinson Land Development
350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

DESIGN	BLM
CHECKED	SMC
DRAWN	BLM
CHECKED	SMC
APPROVED	SMC

MARITIME-ONTARIO FREIGHT LINES LIMITED

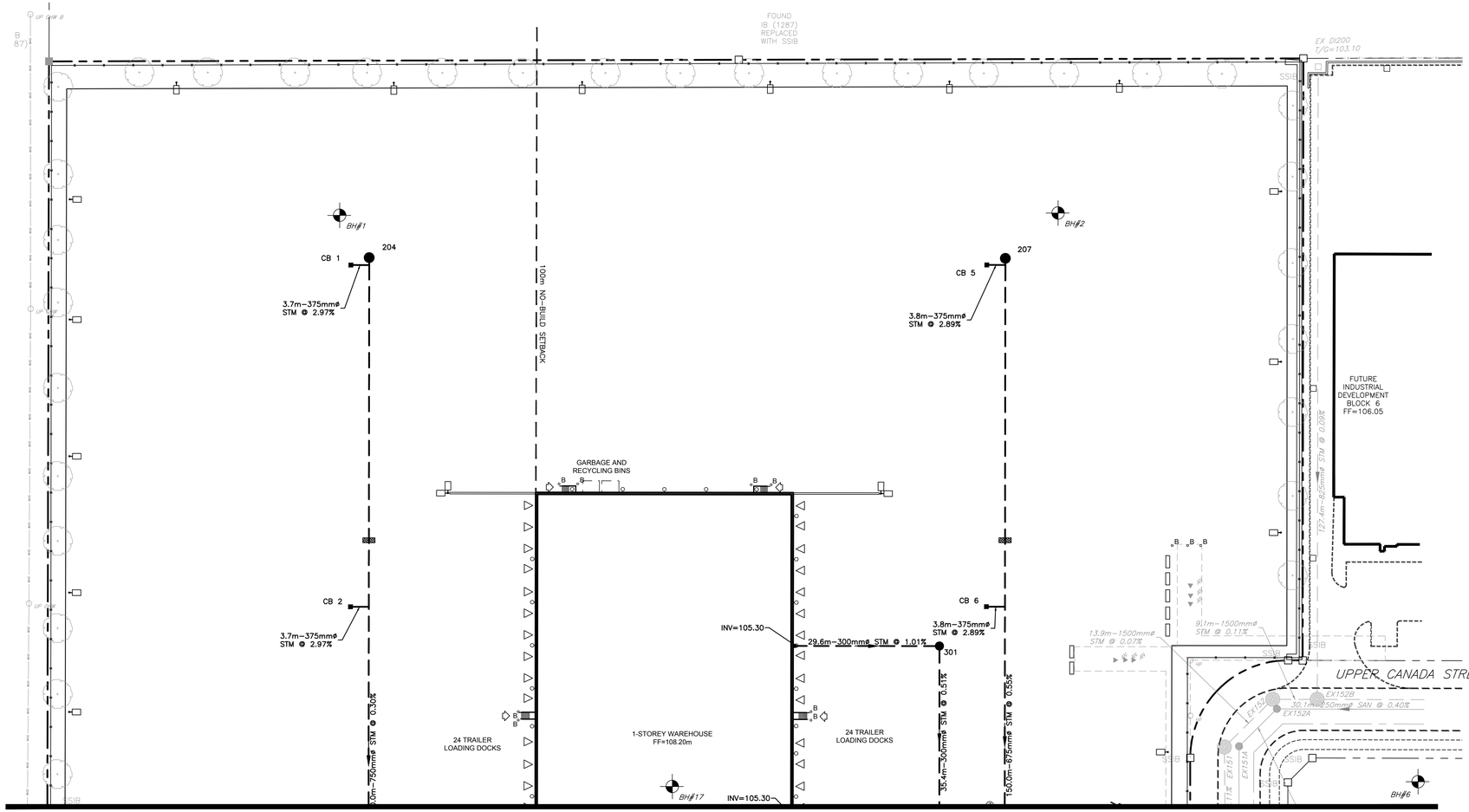
KANATA WEST BUSINESS PARK
8800 CAMPEAU DRIVE, OTTAWA, ON

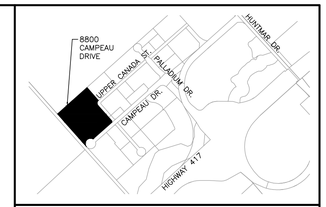
SERVICING PLAN

PROJECT No.	20027
SURVEY	STANTEC
DATED	JANUARY 2022
DWG. No:	20027-S1

D07-12-20-0189

#18376





KEY PLAN

STORM MANHOLE TABLE				
STRUCTURE	STRUCTURE SIZE	T/G ELEV	INVERT	GRATE
200	2400mmø	105.88	NW=103.82 SW=102.04 SE=101.98	S24.1
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205	1800mmø	106.23	NW=102.42 SW=102.34 NE=102.19	S24.1
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EX101	2400mmø	105.88	SW=101.44 E=101.41 NW=101.86	S24.1
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CB 5	600x600mm	106.42	NE=104.74	S19
CB 6	600x600mm	106.32	NE=104.64	S19
CB 7	600x600mm	106.22	NE=104.54	S19
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CB 9	600x600mm	107.10	NE=105.42	S19
CB 10	600x600mm	106.64	NE=105.13	S19
CB 11	600x600mm	106.06	SE=104.38	S19
CB 12	600x600mm	107.10	SW=105.42	S19
CB 13	600x600mm	106.64	SW=104.96	S19
CB 14	600x600mm	106.06	SE=104.38	S19
CB 16	600x600mm	106.61	SW=105.41	S19
DICB 15	600x600mm	106.42	SW=104.67 NE=105.15	403.010
DICB 17	600x600mm	106.50	NE=104.75	403.010

ICD DESIGN TABLE				
STRUCTURE	100 YEAR OUTFLOW (L/s)	100 YEAR HEAD (m)	ORIFICE DIAMETER (mm)	TYPE
CB 1	105	1.79	190.7	SLIDE
CB 2	60	1.79	144.1	SLIDE
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CB 7	60	1.80	144.0	SLIDE
CB 8	30	1.82	101.6	SLIDE
CB 9	55	1.66	140.8	SLIDE
CB 10	30	1.58	105.3	SLIDE
CB 11	25	1.74	93.8	SLIDE
CB 12	40	1.66	120.1	SLIDE
CB 13	30	1.75	102.6	SLIDE
CB 14	25	1.74	93.8	SLIDE
DICB 15	20	1.63	85.3	SLIDE
DICB 17	20	1.63	85.3	SLIDE

LEGEND

- PROPERTY BOUNDARY
- CATCH BASIN
- STORM SEWER & MANHOLE
- SANITARY SEWER & MANHOLE
- WATERMAIN
- HYDRANT
- VALVE & VALVE BOX
- SIAMESE CONNECTION
- EXISTING CATCH BASIN
- EXISTING STORM SEWER & MANHOLE
- EXISTING SANITARY SEWER & MANHOLE
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- EXISTING HYDRANT
- EXISTING VALVE & VALVE BOX
- 100m NO-BUILD SETBACK
- CLAY SEAL
- BOREHOLE
- (1) CROSSING NUMBER
- GALVANIZED CHAIN LINK FENCE (REFER TO SITE PLAN)
- GALVANIZED W-BEAM GUARDRAIL (OPSD 912.130)
- BUILDING ENTRANCE (REFER TO SITE PLAN)
- ∘B BOLLARD (REFER TO SITE PLAN)
- ∘BH POST-MOUNTED BLOCK HEATER (REFER TO SITE PLAN)
- LIGHT STANDARD (REFER TO SITE PLAN)
- JERSEY BARRIER (REFER TO SITE PLAN)
- TWSI (REFER TO SITE PLAN)
- PROPOSED TREE (REFER TO LANDSCAPE PLAN)

NOTES

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1	ISSUED FOR SITE PLAN APPLICATION	02/12/20	SMC

SCALE
0 5m 10m 20m
HORIZONTAL 1:500

LICENSED PROFESSIONAL ENGINEER
Jan 17/22
B.L. MACKECHNIE
100199554
PROVINCE OF ONTARIO

Robinson Land Development
350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

DESIGN	BLM
CHECKED	SMC
DRAWN	BLM
CHECKED	SMC
APPROVED	SMC

MARITIME-ONTARIO FREIGHT LINES LIMITED

KANATA WEST BUSINESS PARK
8800 CAMPEAU DRIVE, OTTAWA, ON

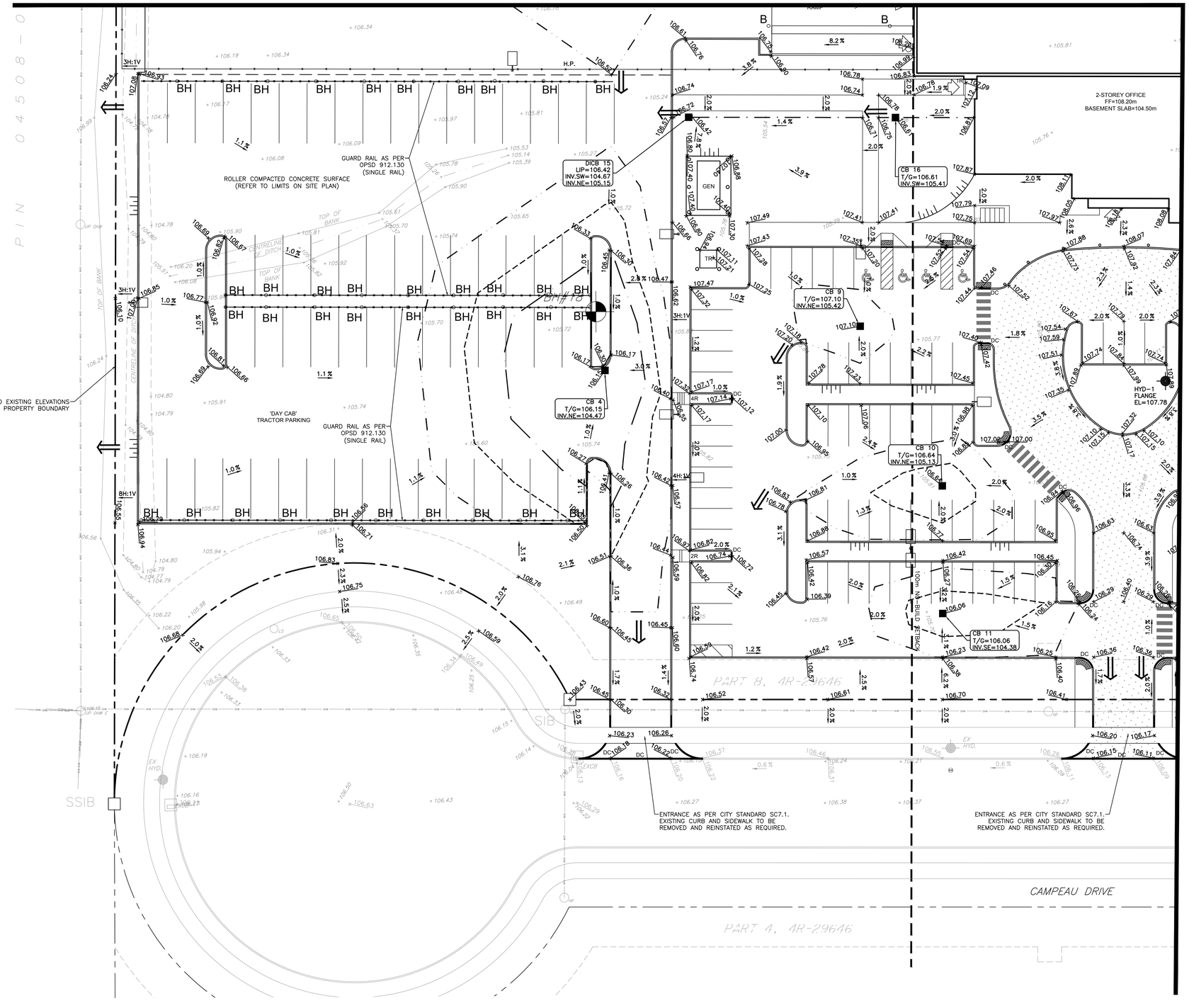
SERVICING PLAN

PROJECT No.	20027
SURVEY	STANTEC
DATED	JANUARY 2022
DWG. No:	20027-S2

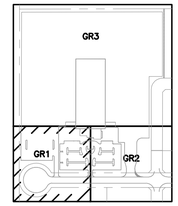
D07-12-20-0189

#18376

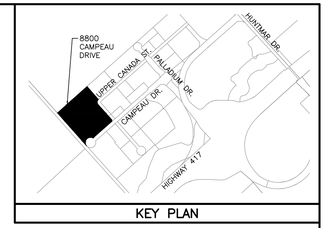
MATCHLINE
REFER TO DWG. 20027-GR3



MATCHLINE
REFER TO DWG. 20027-GR2



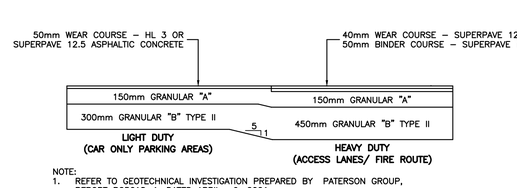
DRAWING KEY PLAN



KEY PLAN

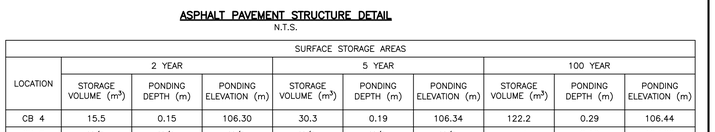
LEGEND

× 106.00	EXISTING ELEVATION
× 107.00	PROPOSED GRADE
2.0%	PROPOSED DRAINAGE SLOPE AND DIRECTION
× 107.00	IBI GROUP DESIGN GRADE
	PROPERTY BOUNDARY
	CATCH BASIN
	EXISTING CATCH BASIN
	EXISTING HYDRANT
	SWALE
H.P.	HIGH POINT
DC	DEPRESSED CURB
	TERRACING (3H:1V MAX.)
	100m NO-BUILD SETBACK
	2 YEAR PONDING LIMIT
	5 YEAR PONDING LIMIT
	100 YEAR PONDING LIMIT
	BOREHOLE
	BUILDING ENTRANCE (REFER TO SITE PLAN)
	GALVANIZED CHAIN LINK FENCE (REFER TO SITE PLAN)
	GALVANIZED W-BEAM GUARDRAIL (OPSD 912.130)
∘B	BOLLARD (REFER TO SITE PLAN)
∘BH	POST-MOUNTED BLOCK HEATER (REFER TO SITE PLAN)
	LIGHT STANDARD (REFER TO SITE PLAN)
	TWSI (REFER TO SITE PLAN)
	MAJOR OVERLAND FLOW ROUTE
	HEAVY DUTY ASPHALT LIMITS



NOTE:
1. REFER TO GEOTECHNICAL INVESTIGATION PREPARED BY PATERSON GROUP, REPORT PG5618-1, DATED APRIL 9, 2021.
2. REFER TO LIMITS OF INSTALLATION ON SITE PLAN.

ROLLER COMPACTED CONCRETE PAVEMENT STRUCTURE DETAIL
N.T.S.



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ASPHALT PAVEMENT STRUCTURE DETAIL
N.T.S.

SURFACE STORAGE AREAS

LOCATION	2 YEAR			5 YEAR			100 YEAR		
	STORAGE VOLUME (m^3)	PONDING DEPTH (m)	PONDING ELEVATION (m)	STORAGE VOLUME (m^3)	PONDING DEPTH (m)	PONDING ELEVATION (m)	STORAGE VOLUME (m^3)	PONDING DEPTH (m)	PONDING ELEVATION (m)
CB 4	15.5	0.15	106.30	30.3	0.19	106.34	122.2	0.29	106.44
CB 9	N/A	N/A	N/A	N/A	N/A	N/A	3.7	0.10	107.20
CB 10	N/A	N/A	N/A	1.8	0.09	106.73	16.6	0.19	106.83
CB 11	N/A	N/A	N/A	2.1	0.09	106.15	15.7	0.18	106.24
DICB 15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CB 16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NOTES
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SCALE
0 2m 4m 10m
HORIZONTAL 1:250

LICENSED PROFESSIONAL ENGINEER
Jan. 13/22
B.L. MACKECHNIE
100199554
PROVINCE OF ONTARIO

Robinson Land Development
350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

DESIGN	BLM
CHECKED	SMC
DRAWN	BLM
CHECKED	SMC
APPROVED	SMC

MARITIME-ONTARIO FREIGHT LINES LIMITED

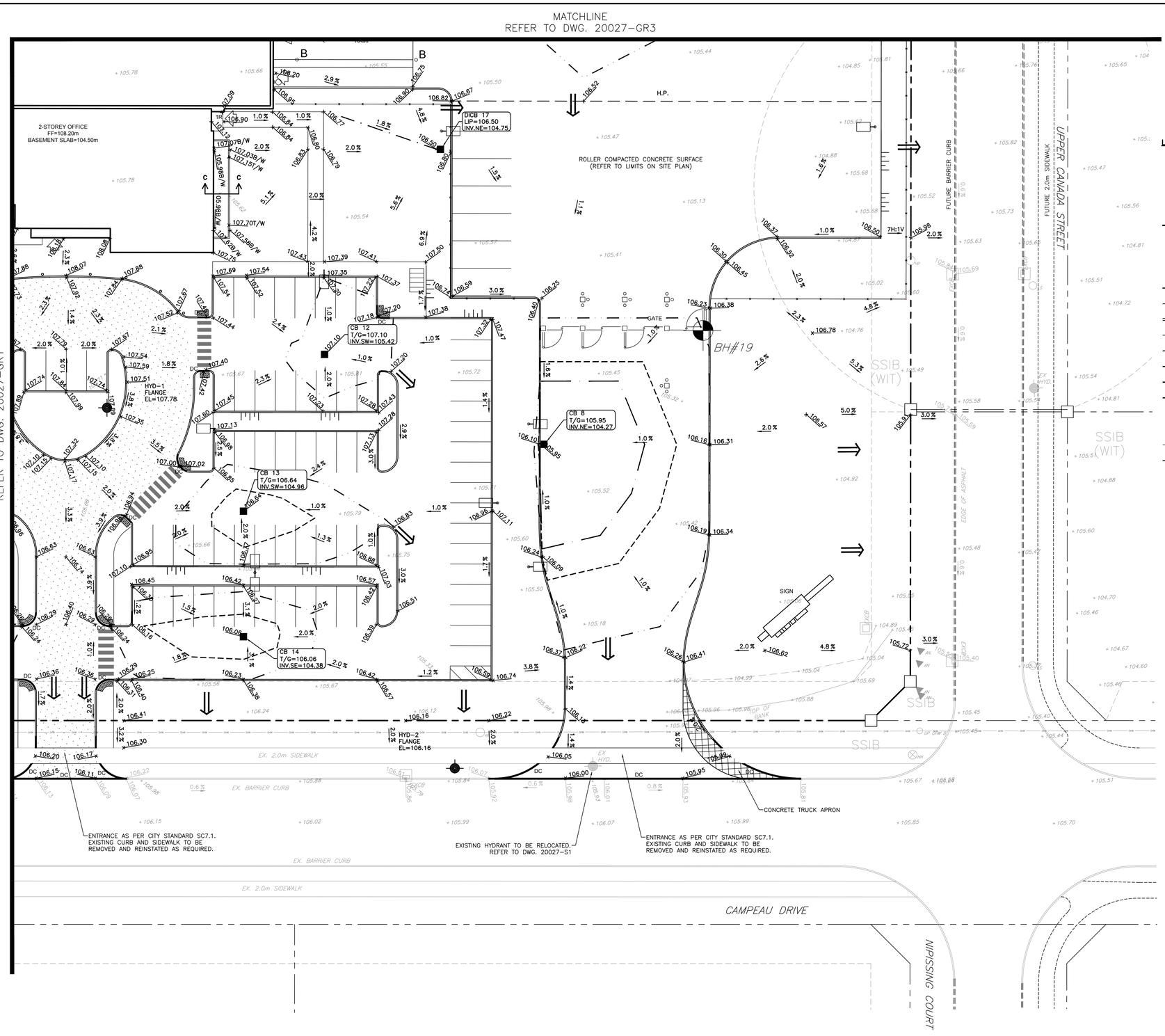
KANATA WEST BUSINESS PARK
8800 CAMPEAU DRIVE, OTTAWA, ON

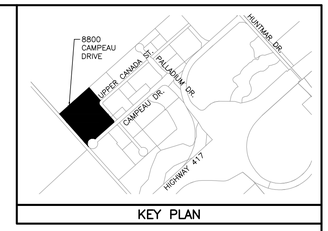
GRADING PLAN

PROJECT No.	20027
SURVEY	STANTEC
DATED	JANUARY 2022
DWG. No:	20027-GR1

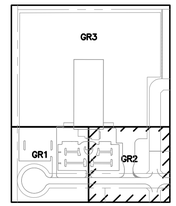
D07-12-20-0189

#18376





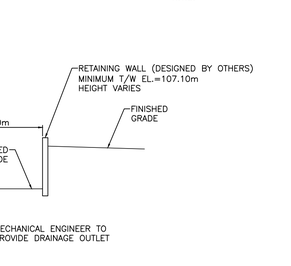
KEY PLAN



DRAWING KEY PLAN

LEGEND

- EXISTING ELEVATION
- PROPOSED GRADE
- PROPOSED DRAINAGE SLOPE AND DIRECTION
- IBI GROUP DESIGN GRADE
- PROPERTY BOUNDARY
- CATCH BASIN
- EXISTING CATCH BASIN
- EXISTING HYDRANT
- SWALE
- HIGH POINT
- DEPRESSED CURB
- TERRACING (3H:1V MAX.)
- 100m NO-BUILD SETBACK
- 2 YEAR PONDING LIMIT
- 5 YEAR PONDING LIMIT
- 100 YEAR PONDING LIMIT
- BOREHOLE
- BUILDING ENTRANCE (REFER TO SITE PLAN)
- GALVANIZED CHAIN LINK FENCE (REFER TO SITE PLAN)
- GALVANIZED W-BEAM GUARDRAIL (OPSD 912.130)
- BOLLARD (REFER TO SITE PLAN)
- POST-MOUNTED BLOCK HEATER (REFER TO SITE PLAN)
- LIGHT STANDARD (REFER TO SITE PLAN)
- TWSI (REFER TO SITE PLAN)
- MAJOR OVERLAND FLOW ROUTE
- HEAVY DUTY ASPHALT LIMITS



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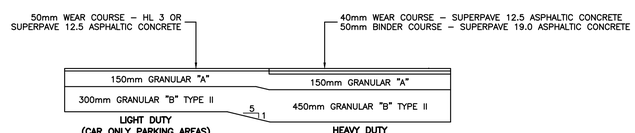
ROLLER COMPACTED CONCRETE PAVEMENT STRUCTURE DETAIL
N.T.S.

WINDOW WELL SECTION C-C
N.T.S.



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ASPHALT PAVEMENT STRUCTURE DETAIL
N.T.S.

LOCATION	SURFACE STORAGE AREAS								
	2 YEAR			5 YEAR			100 YEAR		
	STORAGE VOLUME (m^3)	PONDING DEPTH (m)	PONDING ELEVATION (m)	STORAGE VOLUME (m^3)	PONDING DEPTH (m)	PONDING ELEVATION (m)	STORAGE VOLUME (m^3)	PONDING DEPTH (m)	PONDING ELEVATION (m)
CB 8	9.9	0.13	106.08	22.3	0.17	106.12	78.1	0.26	106.21
CB 12	N/A	N/A	N/A	N/A	N/A	N/A	4.6	0.10	107.20
CB 13	N/A	N/A	N/A	1.8	0.09	106.73	16.6	0.19	106.83
CB 14	N/A	N/A	N/A	2.1	0.09	106.15	15.7	0.18	106.24
DICB 17	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NOTES

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SCALE
0 2m 4m 10m
HORIZONTAL 1:250

LICENSED PROFESSIONAL ENGINEER
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MARITIME-ONTARIO
FREIGHT LINES LIMITED

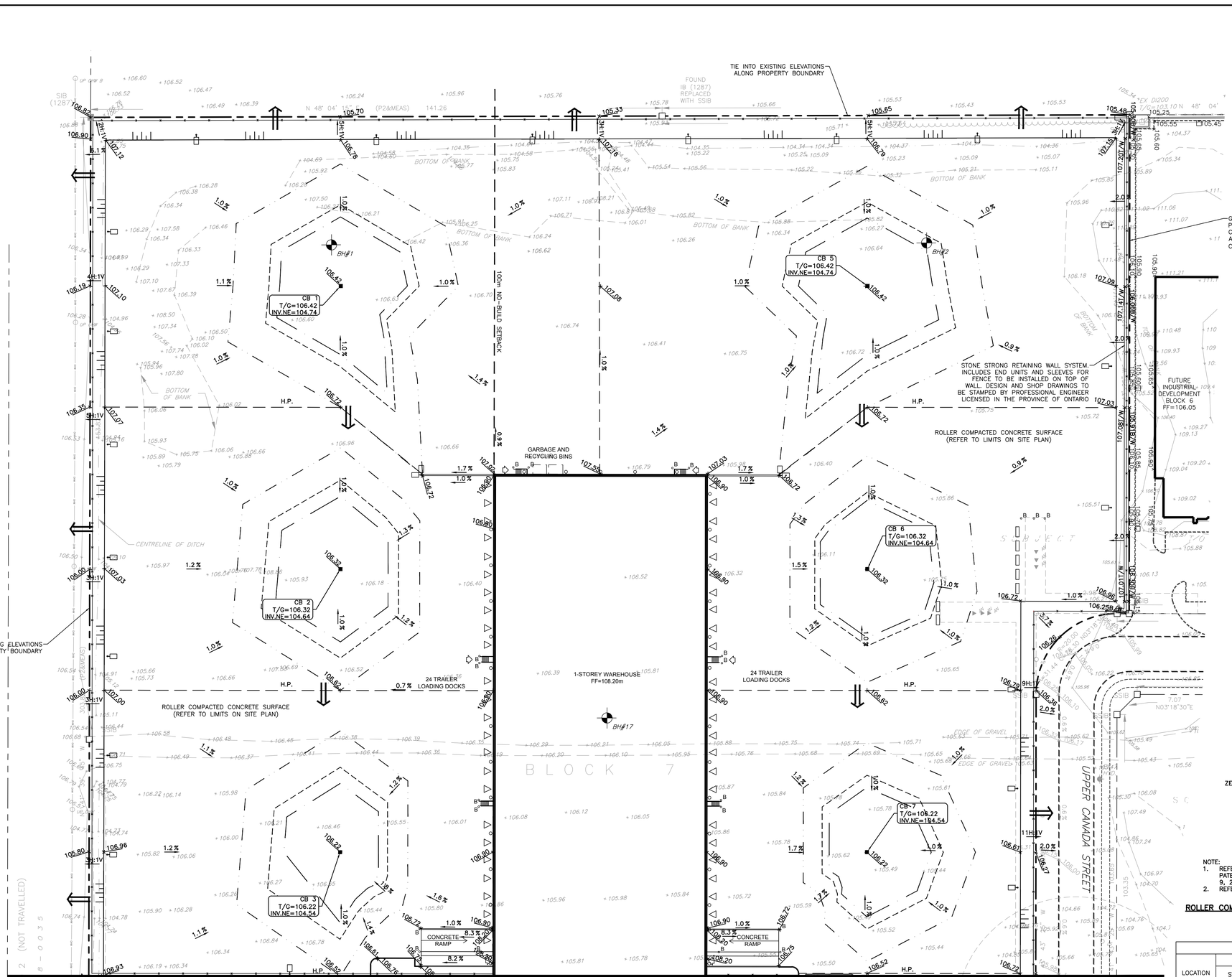
KANATA WEST BUSINESS PARK
8800 CAMPEAU DRIVE, OTTAWA, ON

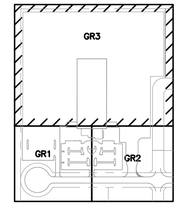
GRADING PLAN

PROJECT No.	20027
SURVEY	STANTEC
DATED	JANUARY 2022
DWG. No:	20027-GR2

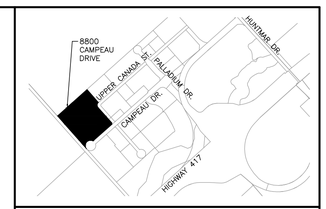
D07-12-20-0189

#18376





DRAWING KEY PLAN



KEY PLAN

LEGEND

- EXISTING ELEVATION
- PROPOSED GRADE
- PROPOSED DRAINAGE SLOPE AND DIRECTION
- IBI GROUP DESIGN GRADE
- PROPERTY BOUNDARY
- CATCH BASIN
- EXISTING CATCH BASIN
- EXISTING HYDRANT
- SWALE
- HIGH POINT
- DEPRESSED CURB
- TERRACING (3H:1V MAX.)
- RETAINING WALL
- 100m NO-BUILD SETBACK
- 2 YEAR PONDING LIMIT
- 5 YEAR PONDING LIMIT
- 100 YEAR PONDING LIMIT
- BOREHOLE
- BUILDING ENTRANCE (REFER TO SITE PLAN)
- GALVANIZED CHAIN LINK FENCE (REFER TO SITE PLAN)
- GALVANIZED W-BEAM GUARDRAIL (OPSD 912.130)
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- MAJOR OVERLAND FLOW ROUTE
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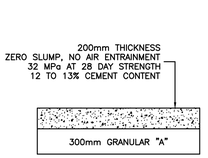

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ROLLER COMPACTED CONCRETE PAVEMENT STRUCTURE DETAIL
N.T.S.

SURFACE STORAGE AREAS

LOCATION	2 YEAR			5 YEAR			100 YEAR		
	STORAGE VOLUME (m^3)	PONDING DEPTH (m)	PONDING ELEVATION (m)	STORAGE VOLUME (m^3)	PONDING DEPTH (m)	PONDING ELEVATION (m)	STORAGE VOLUME (m^3)	PONDING DEPTH (m)	PONDING ELEVATION (m)
CB 1	46.9	0.17	106.59	78.6	0.20	106.62	265.3	0.30	106.72
CB 2	43.4	0.18	106.50	79.2	0.22	106.54	200.8	0.30	106.62
CB 3	29.9	0.17	106.39	63.4	0.21	106.43	184.7	0.30	106.52
CB 5	49.1	0.17	106.59	92.5	0.21	106.63	269.7	0.30	106.72
CB 6	40.3	0.17	106.49	65.2	0.19	106.51	180.2	0.28	106.60
CB 7	30.4	0.16	106.38	50.9	0.19	106.41	146.1	0.27	106.49

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SCALE
0 5m 10m 20m
HORIZONTAL 1:500

LICENSED PROFESSIONAL ENGINEER
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DESIGN	BLM
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CHECKED	SMC
APPROVED	SMC

MARITIME-ONTARIO FREIGHT LINES LIMITED

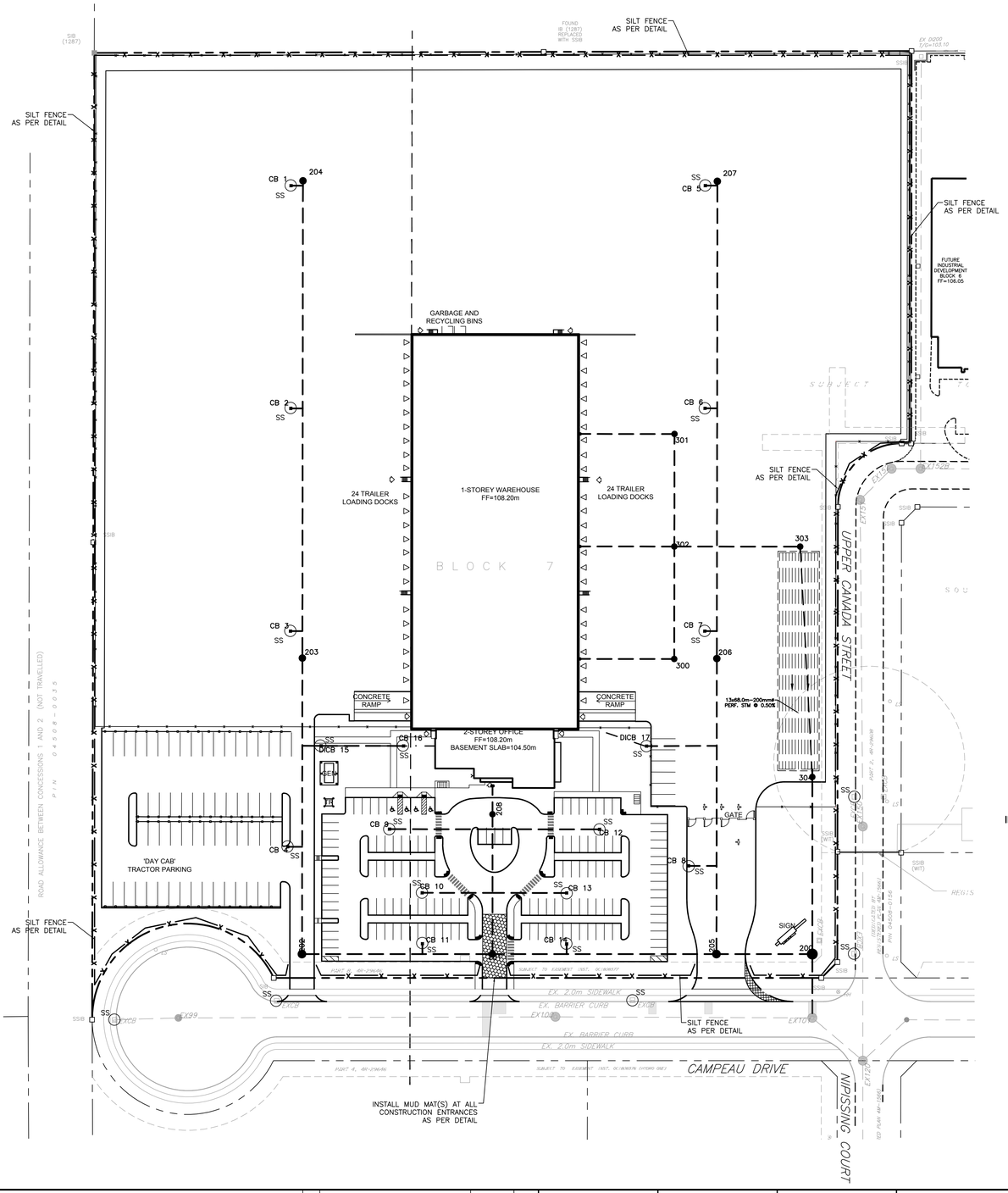
KANATA WEST BUSINESS PARK
8800 CAMPEAU DRIVE, OTTAWA, ON

GRADING PLAN

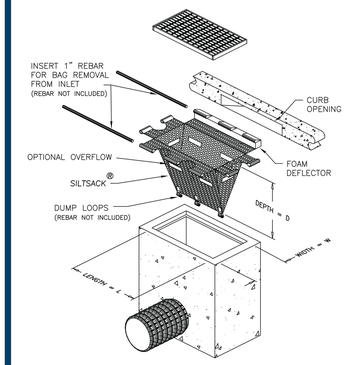
PROJECT No.	20027
SURVEY	STANTEC
DATED	JANUARY 2022
DWG. No:	20027-GR3

D07-12-20-0189

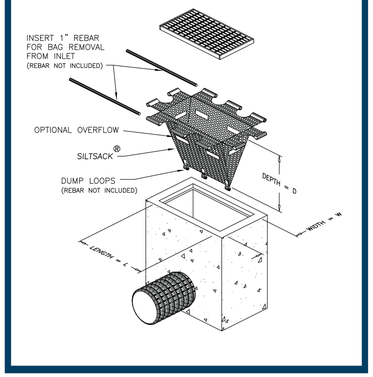
#18376



Typical Siltsack® Construction - Type A

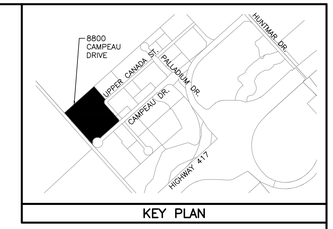


Typical Siltsack® Construction - Type B



INFILTRATION GALLERY NOTES:

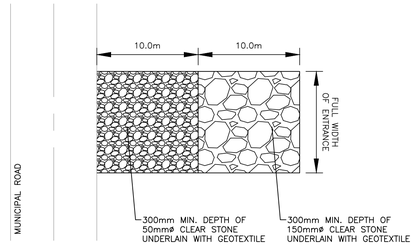
1. INFILTRATION GALLERY SHALL BE CONSTRUCTED TOWARDS THE END OF THE DEVELOPMENT CONSTRUCTION PERIOD IN ORDER TO NOT CONTAMINATE THE PRACTICE.
2. SMEARING OF THE NATIVE MATERIAL AT THE INTERFACE WITH THE GALLERY FLOOR MUST BE AVOIDED AND/OR CORRECTED BY RAKING OR ROTO-TILLING.
3. COMPACTION OF THE GALLERY BOTTOM MUST BE MINIMIZED.



KEY PLAN

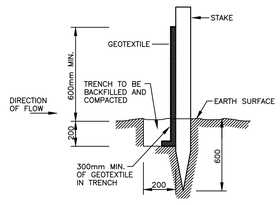
LEGEND

- PROPERTY BOUNDARY
- CATCH BASIN
- EXISTING CATCH BASIN
- STORM SEWER & MANHOLE
- EXISTING STORM SEWER & MANHOLE
- 100m NO-BUILD SETBACK
- SILT FENCE
- SS SILT SACK UNDER FRAME AND COVER

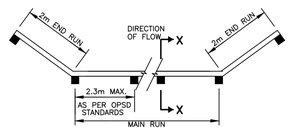


NOTES:
1. MUD MAT TO BE UNDERLAIN WITH A GEOTEXTILE FABRIC.
2. SEDIMENT SHALL BE CLEANED FROM MUNICIPAL RIGHT-OF-WAYS AS REQUIRED.
3. STORM INLETS IN CLOSE VICINITY TO MUD MAT SHALL BE PROTECTED WITH INLET CONTROL MEASURES.

MUD MAT DETAIL
N.T.S.



SECTION X-X
N.T.S.



SILT FENCE BARRIER DETAIL
N.T.S.

NOTES:

1. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE ULTIMATE RECEIVING WATERCOURSE DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
2. LIMIT THE EXTENT OF EXPOSED SOILS AT ANY GIVEN TIME.
3. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED UNTIL VEGETATION HAS BEEN RE-ESTABLISHED IN ALL DISTURBED AREAS. RE-VEGETATE DISTURBED AREAS IN ACCORDANCE WITH APPROVED LANDSCAPE PLAN AS SOON AS POSSIBLE.
4. STOCKPILE SOIL AWAY (15 METRES OR GREATER) FROM WATERCOURSES, DRAINAGE FEATURES AND TOP OF STEEP SLOPES.
5. SILT SACKS ARE TO BE PLACED UNDERNEATH THE FRAME AND COVER OF ALL PROPOSED AND EXISTING CATCH BASINS AND OPEN COVER STORM MANHOLES UNTIL CONSTRUCTION IS COMPLETED.
6. A SILT FENCE BARRIER SHALL BE INSTALLED AS PER OPSD 219.1100 WHERE INDICATED AND MAINTAINED AS REQUIRED.
7. DURING ACTIVE CONSTRUCTION PERIODS, VISUAL INSPECTIONS SHALL BE UNDERTAKEN ON A WEEKLY BASIS AND AFTER MAJOR STORM EVENTS (>25mm RAIN IN 24 HOUR PERIOD) ON SEDIMENT CONTROL BARRIERS AND ANY DAMAGE REPAIRED IMMEDIATELY.
8. EROSION AND SEDIMENT CONTROL BARRIERS SHALL ALSO BE ASSESSED (AND REPAIRED AS REQUIRED) FOLLOWING SIGNIFICANT SNOWMELT EVENTS.
9. VISUAL INSPECTIONS SHALL ALSO BE UNDERTAKEN IN ANTICIPATION OF LARGE STORM EVENTS (OR A SERIES OF RAINFALL AND/OR SNOWMELT DAYS) THAT COULD POTENTIALLY YIELD SIGNIFICANT RUNOFF VOLUMES.
10. CARE SHALL BE TAKEN TO PREVENT DAMAGE TO EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION OPERATIONS.
11. IN SOME CASES, BARRIERS MAY BE REMOVED TEMPORARILY TO ACCOMMODATE THE CONSTRUCTION OPERATIONS. THE AFFECTED BARRIERS SHALL BE REINSTATED IMMEDIATELY AFTER CONSTRUCTION OPERATIONS ARE COMPLETED.
12. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE ADJUSTED AS REQUIRED AS THE SITE BECOMES DEVELOPED.
13. SEDIMENT CONTROL DEVICES SHALL BE CLEANED OF ACCUMULATED SEDIMENTATION AS REQUIRED AND REPLACED AS NECESSARY.
14. DURING THE COURSE OF CONSTRUCTION, IF THE ENGINEER BELIEVES THAT ADDITIONAL PREVENTION METHODS ARE REQUIRED TO CONTROL EROSION AND SEDIMENTATION, THE CONTRACTOR SHALL IMPLEMENT ADDITIONAL MEASURES, AS REQUIRED, TO THE SATISFACTION OF THE ENGINEER.
15. CONSTRUCTION AND MAINTENANCE REQUIREMENTS FOR EROSION AND SEDIMENT CONTROLS ARE TO COMPLY WITH OPSS 805.
16. MUD MATS SHALL BE INSTALLED AT ALL CONSTRUCTION ENTRANCES.

NOTES

THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

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SCALE
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HORIZONTAL 1:750

LICENSED PROFESSIONAL ENGINEER
Jan 13/22
B. L. MACKECHNIE
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DESIGN	BLM
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DRAWN	BLM
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APPROVED	SMC

MARITIME-ONTARIO FREIGHT LINES LIMITED

KANATA WEST BUSINESS PARK
8800 CAMPEAU DRIVE, OTTAWA, ON

EROSION AND SEDIMENT CONTROL PLAN

PROJECT No.	20027
SURVEY	STANTEC
DATED	JANUARY 2022
DWG. No:	20027-ESC1

D07-12-20-0189

#18376

GENERAL NOTES:

1. ALL WORKS AND MATERIALS SHALL CONFORM TO THE LATEST REVISIONS OF THE STANDARDS AND SPECIFICATIONS OF THE CITY OF OTTAWA AND ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS), AS AMENDED BY THE CITY OF OTTAWA.
2. THE CONTRACTOR SHALL CONFIRM THE LOCATION OF ALL EXISTING UTILITIES WITHIN THE SITE AND ADJACENT WORK AREAS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OR REPLACEMENT OF ANY SERVICES OR UTILITIES DISTURBED DURING CONSTRUCTION, TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION.
3. ALL DIMENSIONS AND ELEVATIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER.
4. DESIGN ELEVATIONS GIVEN ARE TO BE ADHERED TO WITH NO CHANGES WITHOUT PRIOR WRITTEN APPROVAL BY ROBINSON LAND DEVELOPMENT.
5. ANY AREAS BEYOND THE LIMIT OF THE SITE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION AT THE CONTRACTOR'S EXPENSE.
6. RELOCATION OF EXISTING SERVICES AND/OR UTILITIES SHALL BE AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER AT THE EXPENSE OF THE CONTRACTOR.
7. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE "OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS". THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
8. ALL CONSTRUCTION SIGNAGE MUST CONFORM TO THE M.T.O. MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (LATEST AMENDMENT).
9. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
10. THE SUPPORT OF ALL UTILITIES SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
11. THE CONTRACTOR WILL BE RESPONSIBLE FOR ADDITIONAL BEDDING OR ADDITIONAL STRENGTH PIPE IF THE MAXIMUM TRENCH WIDTH, AS SPECIFIED BY OPSD, IS EXCEEDED.
12. ALL NECESSARY CLEARING AND GRUBBING SHALL BE COMPLETED BY THE CONTRACTOR. REVIEW WITH CONTRACT ADMINISTRATOR AND THE CITY OF OTTAWA PRIOR TO AND TREE CUTTING.
13. REFER TO GEOTECHNICAL INVESTIGATION PREPARED BY PATERSON GROUP, REPORT NO. PG5618–1, DATED MAY 11, 2021.
14. THE CONTRACTOR IS RESPONSIBLE FOR AND SHALL PROVIDE FOR DEWATERING, SUPPORT AND PROTECTION OF EXCAVATIONS AND TRENCHING AS WELL AS RELEASE OF ANY PUMPED GROUNDWATER IN A CONTROLLED AND APPROVED MANNER.
15. DO NOT CONSTRUCT USING DRAWINGS THAT ARE NOT MARKED "ISSUED FOR CONSTRUCTION".
16. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
17. CLAY SEALS SHALL BE INSTALLED WITHIN SEWER TRENCHES IN ACCORDANCE WITH CITY STANDARD S8.

STORM SEWERS:

1. ALL REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.2 (LATEST AMENDMENT). ALL NON–REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.1 (LATEST AMENDMENT). PIPE SHALL BE JOINTED WITH STD. RUBBER GASKETS AS PER CSA A257.3 (LATEST AMENDMENT).
2. ALL STORM SEWER TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. S6 AND S7 CLASS 'B' UNLESS OTHERWISE SPECIFIED. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY PROJECT GEOTECHNICAL ENGINEER.
3. ALL PVC STORM SEWERS ARE TO BE SDR 35 APPROVED PER C.S.A. B182.2 OR LATEST AMENDMENT, UNLESS OTHERWISE SPECIFIED.
4. STORM MANHOLE FRAME AND COVERS SHALL BE AS PER CITY OF OTTAWA STD. S24.1.
5. STORM SEWER MANHOLES SERVING SEWERS LESS THAN 900mm SHALL BE CONSTRUCTED WITH A 300mm SUMP. FOR STORM SEWERS 900mm AND OVER USE BENCHING IN ACCORDANCE WITH OPSD 701.021.
6. THE STORM SEWER CLASSES HAVE BEEN DESIGNED BASED ON BEDDING CONDITIONS SPECIFIED ABOVE. WHERE THE SPECIFIED TRENCH WIDTH IS EXCEEDED, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE ADDITIONAL BEDDING, A DIFFERENT TYPE OF BEDDING OR A HIGHER PIPE STRENGTH AT HIS OWN EXPENSE AND SHALL ALSO BE RESPONSIBLE FOR EXTRA TEMPORARY AND/OR PERMANENT REPAIRS MADE NECESSARY BY THE WIDENED TRENCH.

SANITARY SEWERS:

1. ALL SANITARY SEWERS SHALL BE PVC SDR 35, IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS.
2. SANITARY SEWER TRENCH AND BEDDING SHALL BE AS PER CITY OF OTTAWA STD. S6 AND S7, CLASS 'B' BEDDING UNLESS OTHERWISE NOTED.
3. ALL SANITARY SERVICES ARE TO BE EQUIPPED WITH APPROVED BACKWATER VALVES.
4. SANITARY MANHOLE FRAME AND COVERS SHALL BE AS PER CITY OF OTTAWA STD. S24.
5. SANITARY SEWER MANHOLES SHALL BE BENCHED AS PER OPSD 701.021.
6. SANITARY PRE–CAST MANHOLE SHALL BE CONSTRUCTED WITH A HIGHER PERCENTAGE OF SILICA FUME IN THE CONCRETE TO MAKE IT MORE DENSE AND LESS SUSCEPTIBLE TO CORROSION OR PINHOLE LEAKS.
7. FOR SANITARY MANHOLES, DEPENDING ON THE ELEVATION OF THE GROUNDWATER TABLE, AND BASED ON THE RECOMMENDATION OF THE PROJECT GEOTECHNICAL CONSULTANT, CRETEX SEALS, OR A SIMILAR PRODUCT, SHALL BE INSTALLED IN THE PRE–CAST MANHOLE SECTION TO JUST BELOW THE MANHOLE FRAME TO PREVENT INFILTRATION.
8. CONTRACTOR SHALL PERFORM LEAKAGE TESTING, IN THE PRESENCE OF THE CONSULTANT, FOR SANITARY SEWERS IN ACCORDANCE WITH OPSS 410 AND OPSS 407. CONTRACTOR SHALL PERFORM VIDEO INSPECTION OF ALL STORM AND SANITARY SEWERS. A COPY OF THE VIDEO AND INSPECTION REPORT SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW.
9. IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S11, SANITARY SERVICE CONNECTION REQUIRES APPROVED CONTROLLED SETTLEMENT JOINT.

WATER SUPPLY:

1. ALL PVC WATERMAINS SHALL BE EQUAL TO AWWA C–900 CLASS 150, SDR 18, OR APPROVED EQUAL.
2. WATERMAIN TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W17, UNLESS OTHERWISE SPECIFIED. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY PROJECT GEOTECHNICAL ENGINEER.
3. ALL PVC WATERMAINS SHALL BE INSTALLED WITH A 10 GAUGE STRANDED COPPER TWU OR RWU TRACER WIRE IN ACCORDANCE WITH CITY OF OTTAWA STD. W36.
4. CATHODIC PROTECTION IS REQUIRED ON ALL METALLIC FITTINGS AS PER CITY OF OTTAWA STD. W40 AND W42.
5. CONTRACTOR TO SUPPLY HYDRANT EXTENSION TO ADJUST THE LENGTH OF HYDRANT BARREL IF REQUIRED.
6. FIRE HYDRANTS SHALL BE INSTALLED AS PER CITY OF OTTAWA STD. W19, AND LOCATED AS PER CITY STD. W18.
7. VALVE IN BOXES SHALL BE INSTALLED AS PER CITY OF OTTAWA STD. W24.
8. WATERMAIN IN FILL AREAS TO BE INSTALLED WITH RESTRAINED JOINTS AS PER CITY OF OTTAWA STD. W25.5 AND W25.6.
9. THRUST BLOCKING OF WATERMAIN TO BE INSTALLED AS PER CITY OF OTTAWA STD. W25.3 AND W25.4.
10. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY CAPS, PLUGS AND BLOW–OFFS AND NOZZLES REQUIRED FOR TESTING AND DISINFECTION OF THE WATERMAIN.
11. INSULATION FOR WATERMAIN CROSSING OVER AND BELOW SEWER SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. W25.2 AND W25, RESPECTIVELY, WHERE WATERMAIN COVER IS LESS THAN 2.4m.
12. AS PER CITY GUIDELINE, THE MINIMUM VERTICAL CLEARANCE BETWEEN WATERMAIN AND SEWER / UTILITY IS 0.25m FOR CROSSING OVER THE SEWER, AS PER CITY STD. W25.2. FOR CROSSING UNDER SEWER, ADEQUATE STRUCTURAL SUPPORT FOR THE SEWERS IS REQUIRED TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING. THE LENGTH OF WATER PIPE SHALL BE CENTERED AT THE POINT OF CROSSING SO THAT THE JOINTS WILL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER AS PER CITY STD. W25.
13. CONNECTION TO EXISTING WATERMAIN TO BE PERFORMED BY CITY FORCES. CONTRACTOR TO PROVIDE LABOUR, EQUIPMENT AND MATERIAL REQUIRED FOR EXCAVATION, BEDDING AND REINSTATEMENT.
14. SWABBING, DISINFECTION, AND HYDROSTATIC TESTING TO BE CONDUCTED AS PER CITY OF OTTAWA STANDARDS IN THE PRESENCE OF A CITY INSPECTOR AND/OR CONSULTANT.

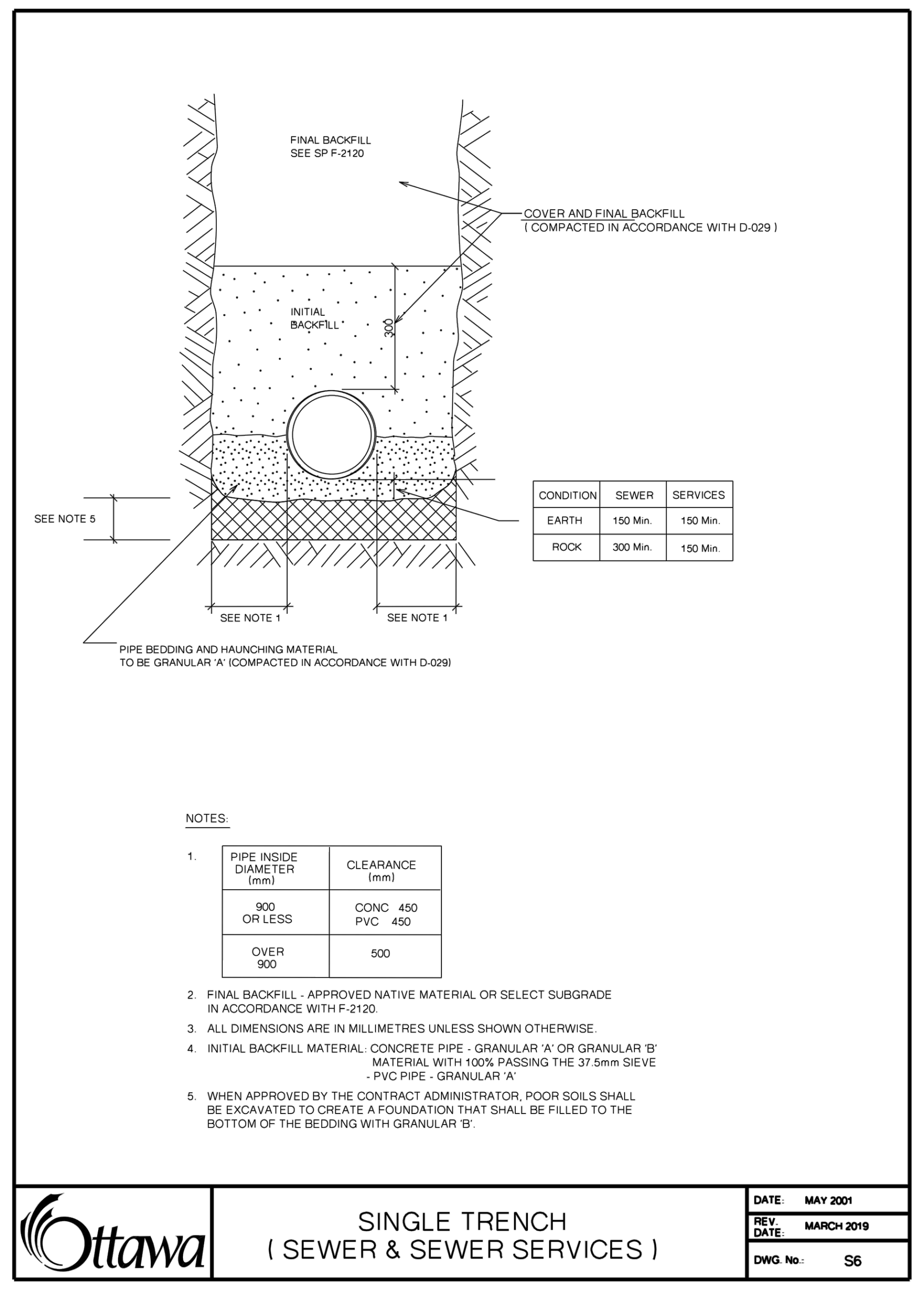
ROADWORK SPECIFICATIONS:

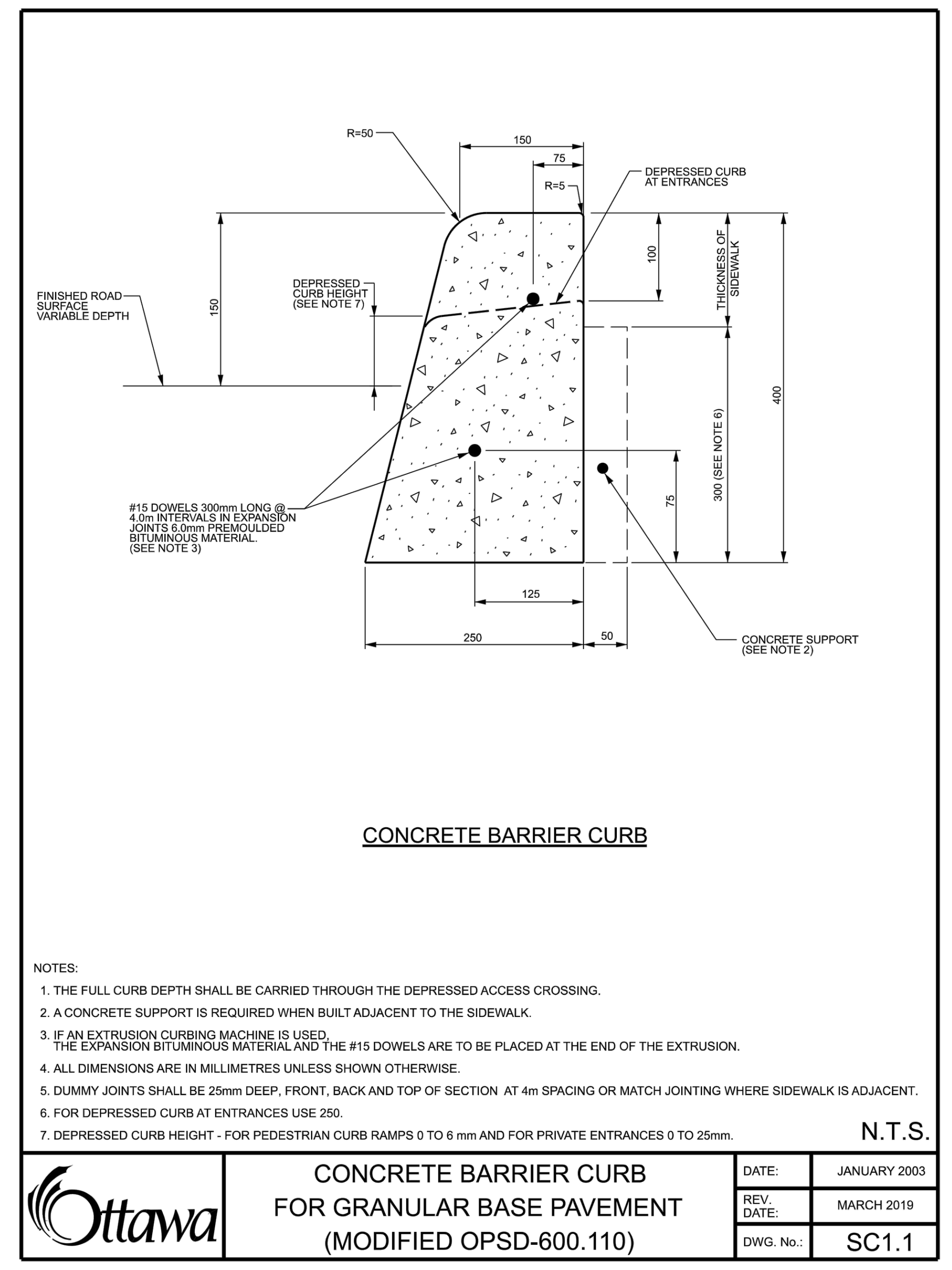
1. CONCRETE CURB SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. SC1.1 (BARRIER CURB). PROVISION SHALL BE MADE FOR CURB DEPRESSIONS AT SIDEWALKS AND DRIVEWAYS.
2. ALL BARRIER CURB TO BE 150mm ABOVE FINISHED ASPHALT GRADE UNLESS OTHERWISE NOTED.
3. CONCRETE SIDEWALK SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. SC3 AND SC1.4.
4. TWSIs SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF OTTAWA STD. SC7.3.
5. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. R10 AND OPSD 509.010, OPSS 310.
6. GRANULAR "A" SHALL BE PLACED TO A MINIMUM THICKNESS OF 300mm AROUND ALL STRUCTURES WITHIN PAVEMENT AREA.
7. ALL GRANULAR FOR ROADS SHALL BE COMPACTED TO A MINIMUM OF 98% STANDARD PROCTOR DENSITY.
8. ASPHALT WEAR COURSE SHALL NOT BE PLACED UNTIL THE VIDEO INSPECTION OF SEWERS & NECESSARY REPAIRS HAVE BEEN CARRIED OUT TO THE SATISFACTION OF THE ENGINEER.
9. SUB–EXCAVATE SOFT AREAS AND FILL WITH GRANULAR 'B' COMPACTED IN MAXIMUM 300mm LIFTS.
10. PEDESTRIAN CURB RAMP WITH BOULEVARD SHALL BE ACCORDANCE WITH CITY OF OTTAWA STD. SC7.
11. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW–CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW ASPHALT.
12. PAVEMENT DESIGN AS PER GEOTECHNICAL RECOMMENDATIONS:

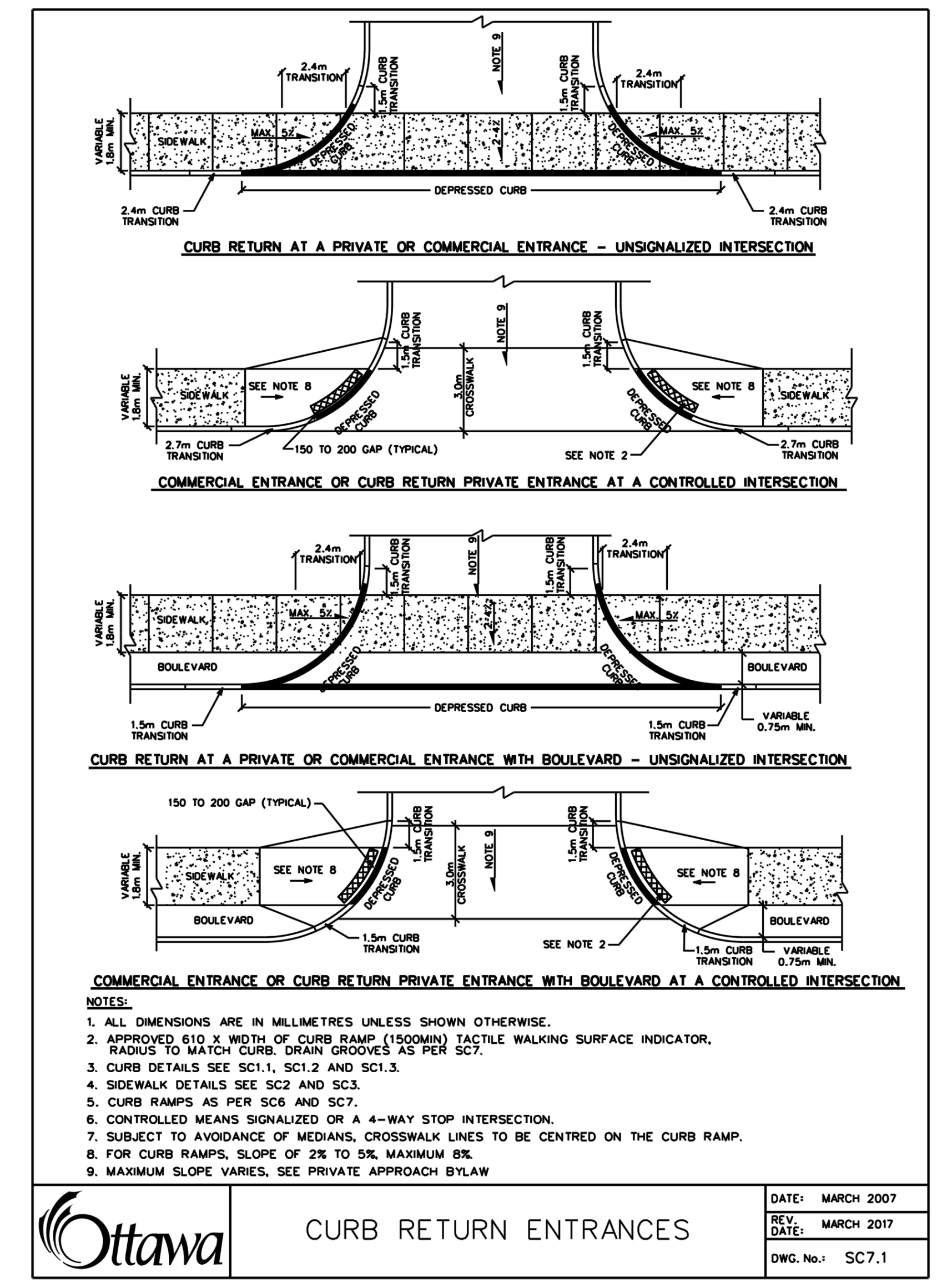
LIGHT DUTY (CAR ONLY PARKING AREAS)
- 50mm WEAR COURSE – HL–3 OR SUPERPAVE 12.5 ASPHALTIC CONCRETE
- 150mm BASE – OPSS GRANULAR "A" CRUSHED STONE
- 300mm SUBBASE – OPSS GRANULAR "B" TYPE II
- SUBGRADE – EITHER FILL, IN SITU SOIL OR OPSS GRANULAR "B" TYPE I OR II MATERIAL PLACED OVER IN SITU SOIL OR FILL

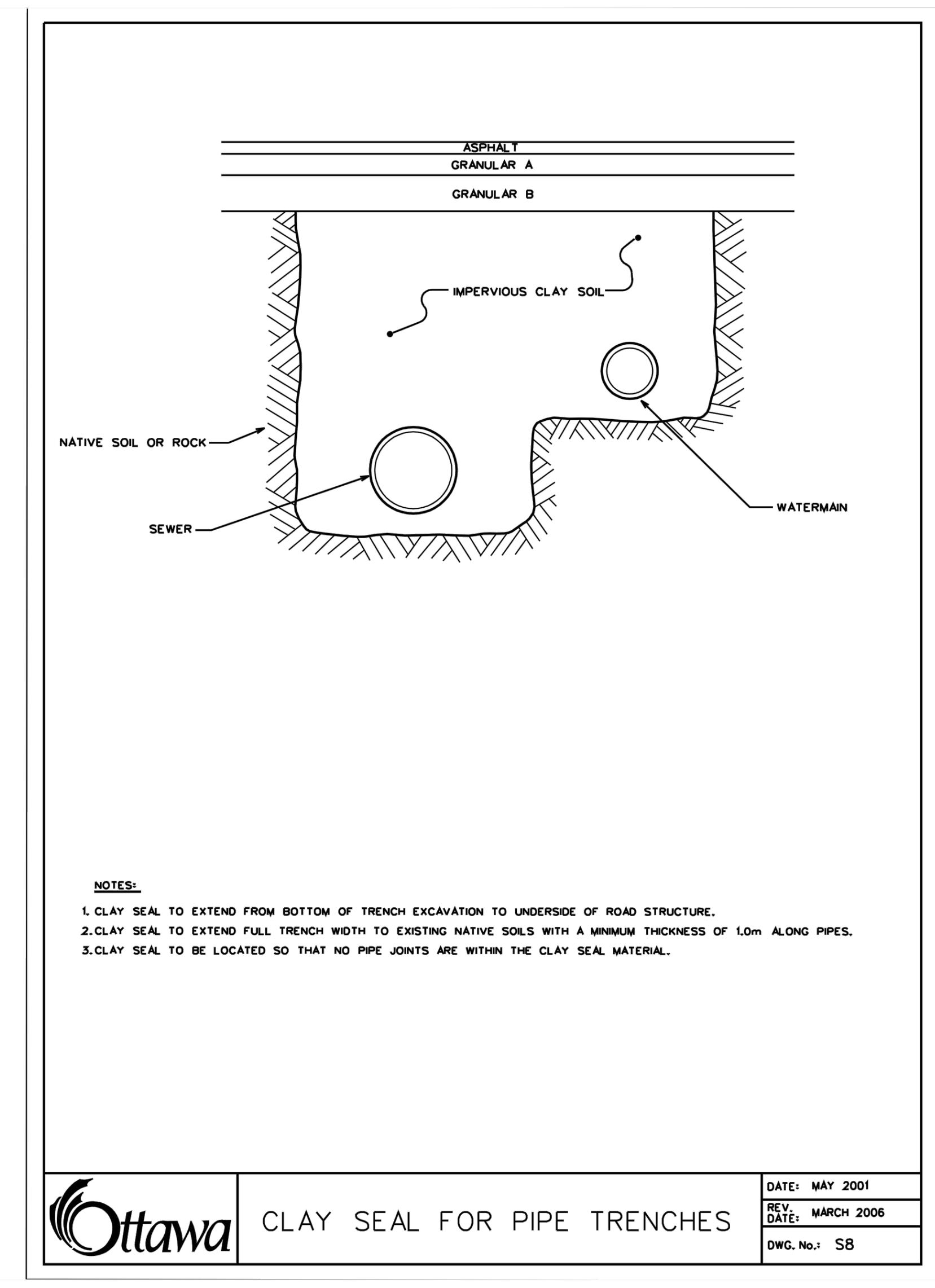
HEAVY DUTY (ACCESS LANES AND HEAVY TRUCK PARKING AREAS)
- 40mm WEAR COURSE – SUPERPAVE 12.5 ASPHALTIC CONCRETE
- 50mm BINDER COURSE – SUPERPAVE 19.0 ASPHALTIC CONCRETE
- 150mm BASE – OPSS GRANULAR "A" CRUSHED STONE
- 450mm SUBBASE – OPSS GRANULAR "B" TYPE II
- SUBGRADE – EITHER FILL, IN SITU SOIL OR OPSS GRANULAR "B" TYPE I OR II MATERIAL PLACED OVER IN SITU SOIL OR FILL

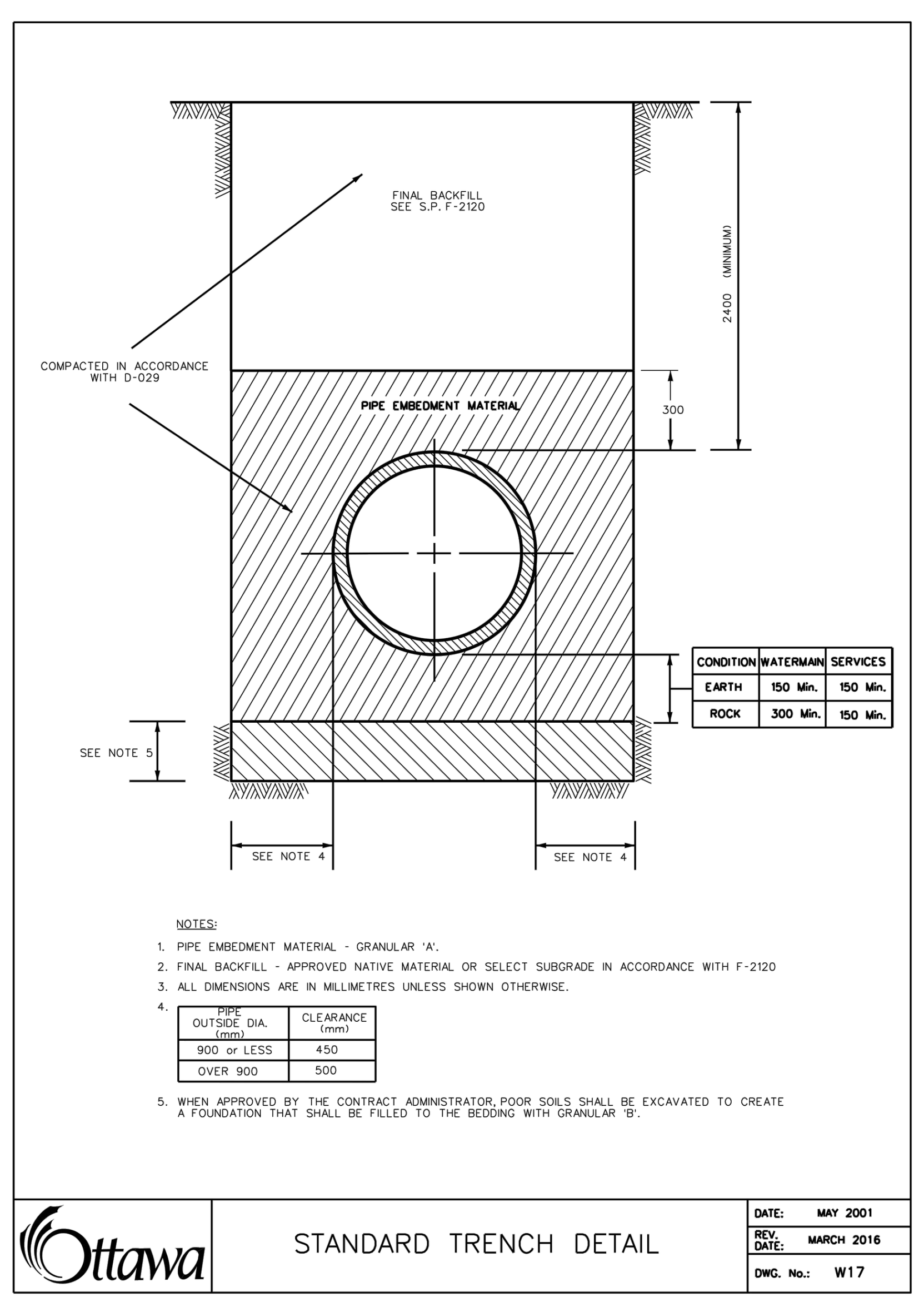
ROLLER COMPACTED CONCRETE (AS PER SITE PLAN)
- 200mm THICKNESS, ZERO SLUMP, NO AIR ENTRAINMENT, 32 MPa AT 28 DAY STRENGTH, 12 TO 13% CEMENT CONTENT
- 300mm BASE – OPSS GRANULAR "A" CRUSHED STONE

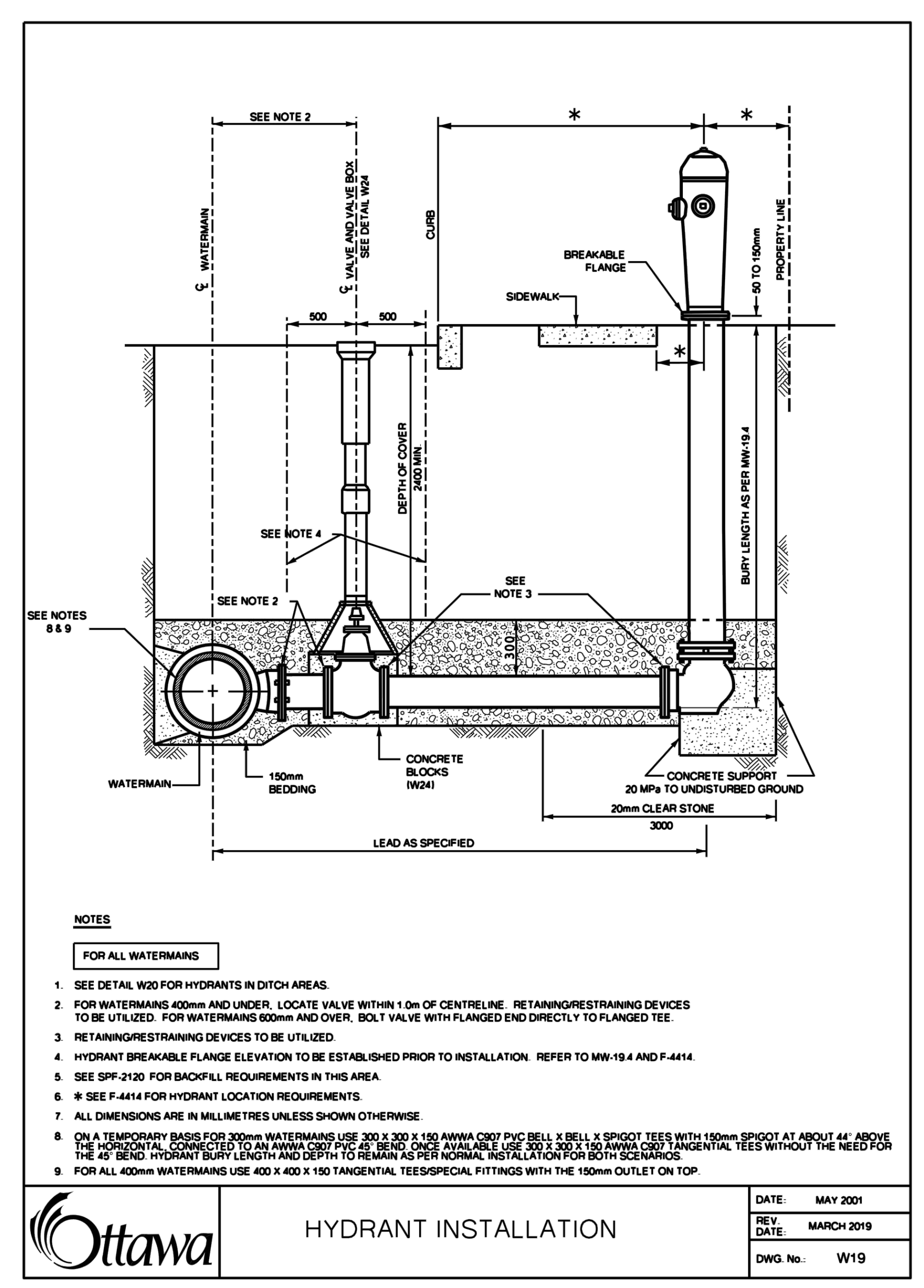


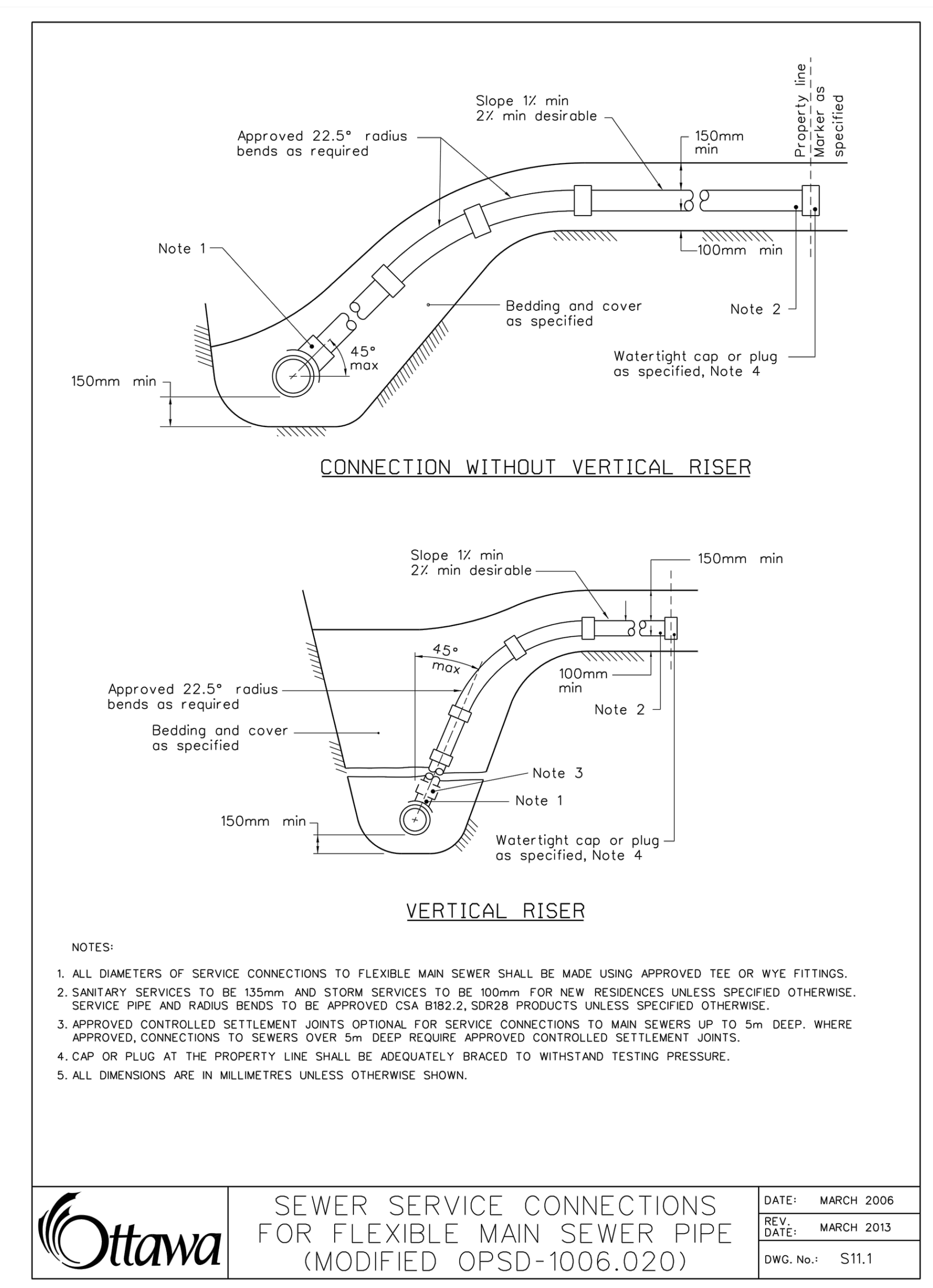


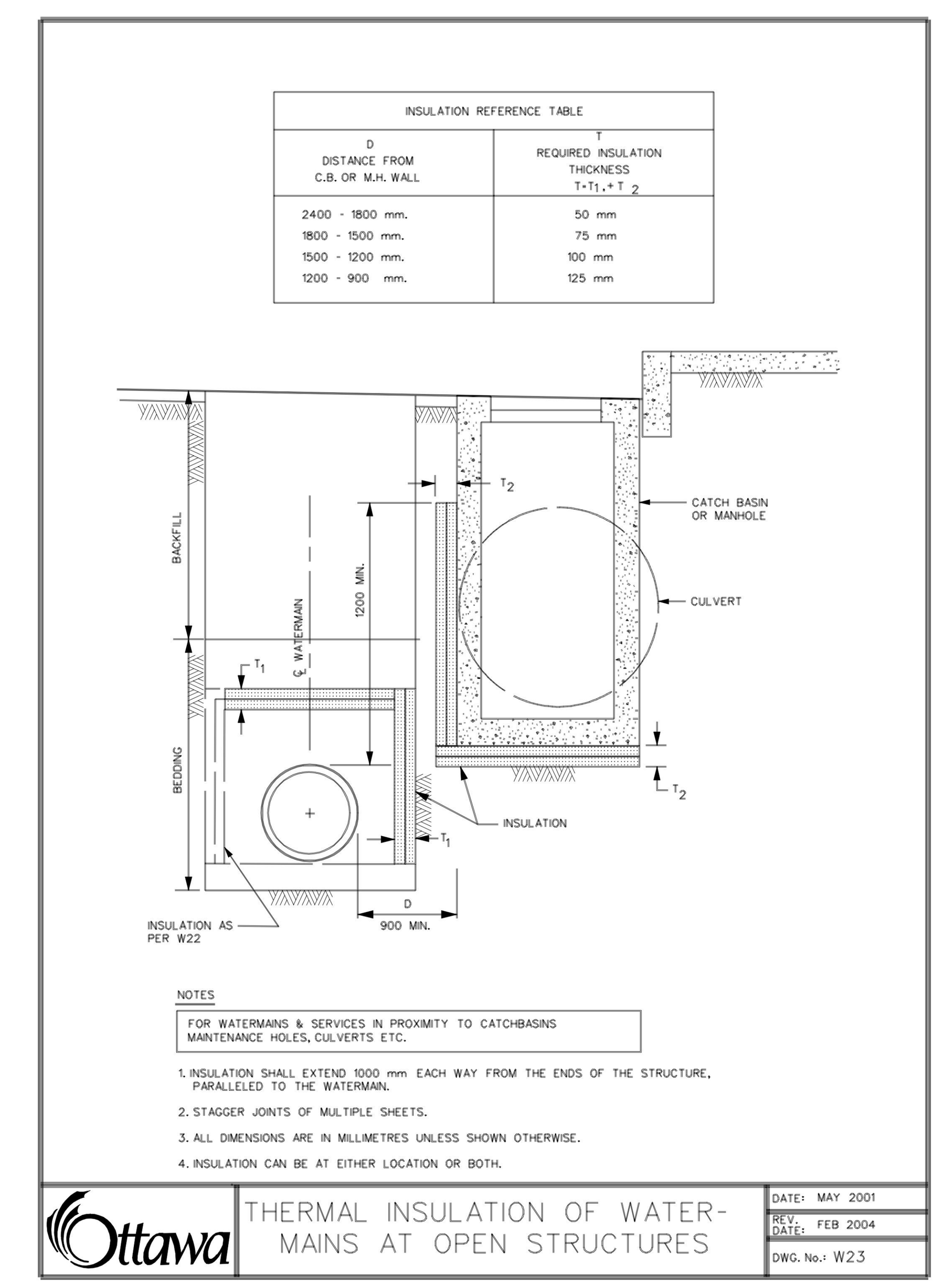












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SCALE

LICENSED PROFESSIONAL ENGINEER
Jan. 17/22
B.L. MACKECHNIE
100199554
PROVINCE OF ONTARIO

Robinson
Land Development
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(613) 592-6060 rcii.com

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MARITIME-ONTARIO
FREIGHT LINES LIMITED

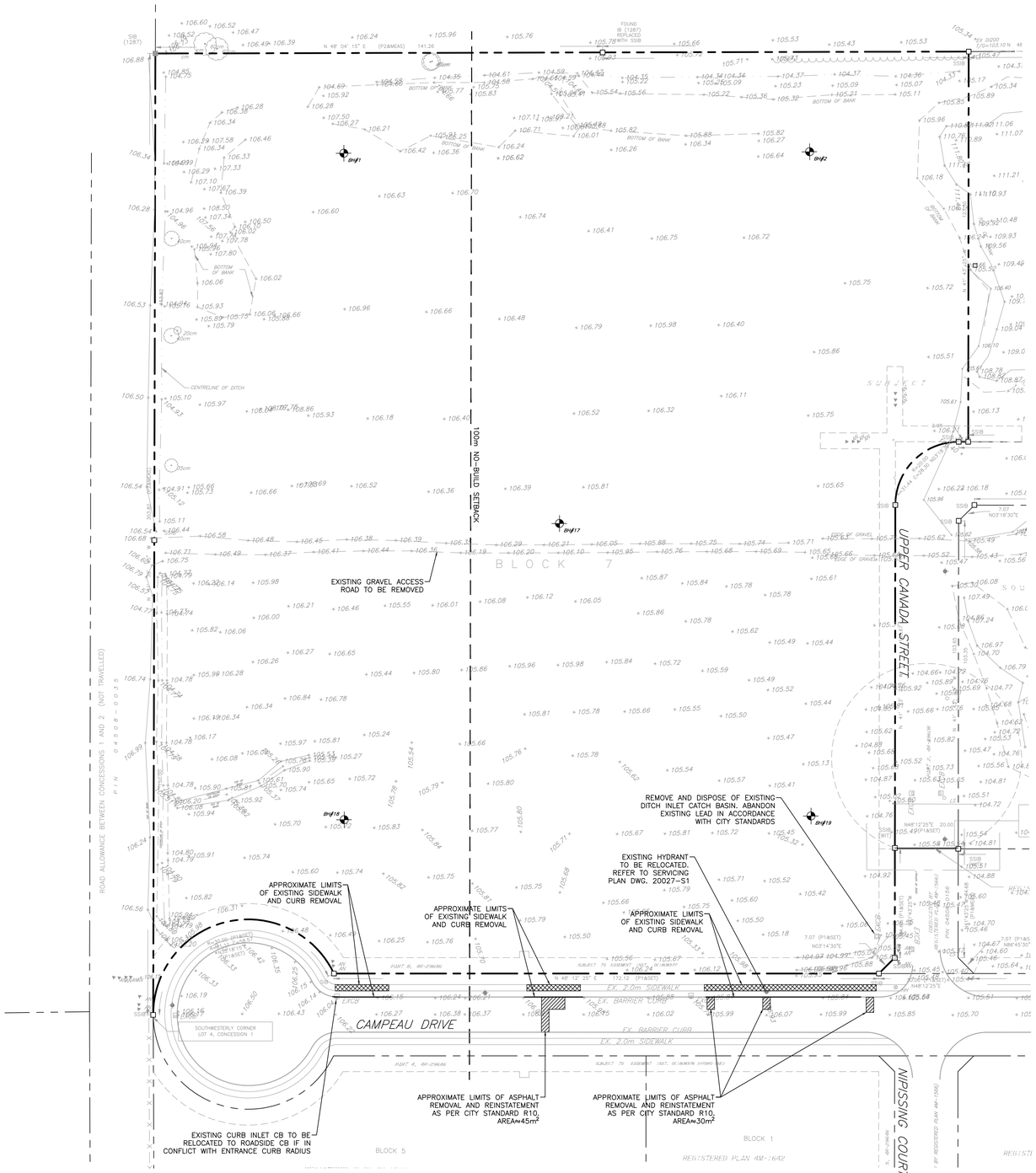
KANATA WEST BUSINESS PARK
8800 CAMPEAU DRIVE, OTTAWA, ON

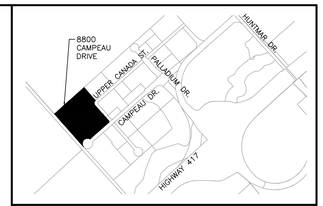
NOTES & DETAILS

PROJECT No.	20027
SURVEY	STANTEC
DATED	JANUARY 2022
DWG. No:	20027-N1

D07-12-20-0189

#18376





KEY PLAN

LEGEND

- PROPERTY BOUNDARY
- × 106.00 EXISTING ELEVATION
- EXISTING DITCH
- EXISTING CATCH BASIN
- EXISTING STORM SEWER & MANHOLE
- EXISTING SANITARY SEWER & MANHOLE
- EXISTING WATERMAIN
- EXISTING HYDRANT
- EXISTING VALVE & VALVE BOX
- 100m NO-BUILD SETBACK
- BOREHOLE
- EXISTING CURB REMOVAL
- EXISTING ASPHALT REMOVAL
- EXISTING SIDEWALK REMOVAL

NOTES:

1. THE CONTRACTOR SHALL CONFIRM THE LOCATION OF ALL EXISTING UTILITIES WITHIN THE SITE AND ADJACENT WORK AREAS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OR REPLACEMENT OF ANY SERVICES OR UTILITIES DISTURBED DURING CONSTRUCTION, TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION.
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5. ALL NECESSARY CLEARING AND GRUBBING SHALL BE COMPLETED BY THE CONTRACTOR, REVIEW WITH CONTRACT ADMINISTRATOR AND THE CITY OF OTTAWA PRIOR TO AND TREE CUTTING.
6. REFER TO GEOTECHNICAL INVESTIGATION PREPARED BY PATERSON GROUP, REPORT NO. PG5618-1, DATED MAY 11, 2021.
7. ALL EXISTING ASPHALT TO BE SAW-CUT.
8. REINSTATE ROAD CUTS IN ACCORDANCE WITH CITY STANDARD R10.

NOTES

THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

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MARITIME-ONTARIO FREIGHT LINES LIMITED

KANATA WEST BUSINESS PARK
8800 CAMPEAU DRIVE, OTTAWA, ON

EXISTING CONDITIONS AND REMOVALS PLAN

PROJECT No.	20027
SURVEY	STANTEC
DATED	JANUARY 2022
DWG. No:	20027-R1

D07-12-20-0189

#18376

Appendix C

KWBP Figure 4 – Water Distribution Plan (prepared by IBI Group)

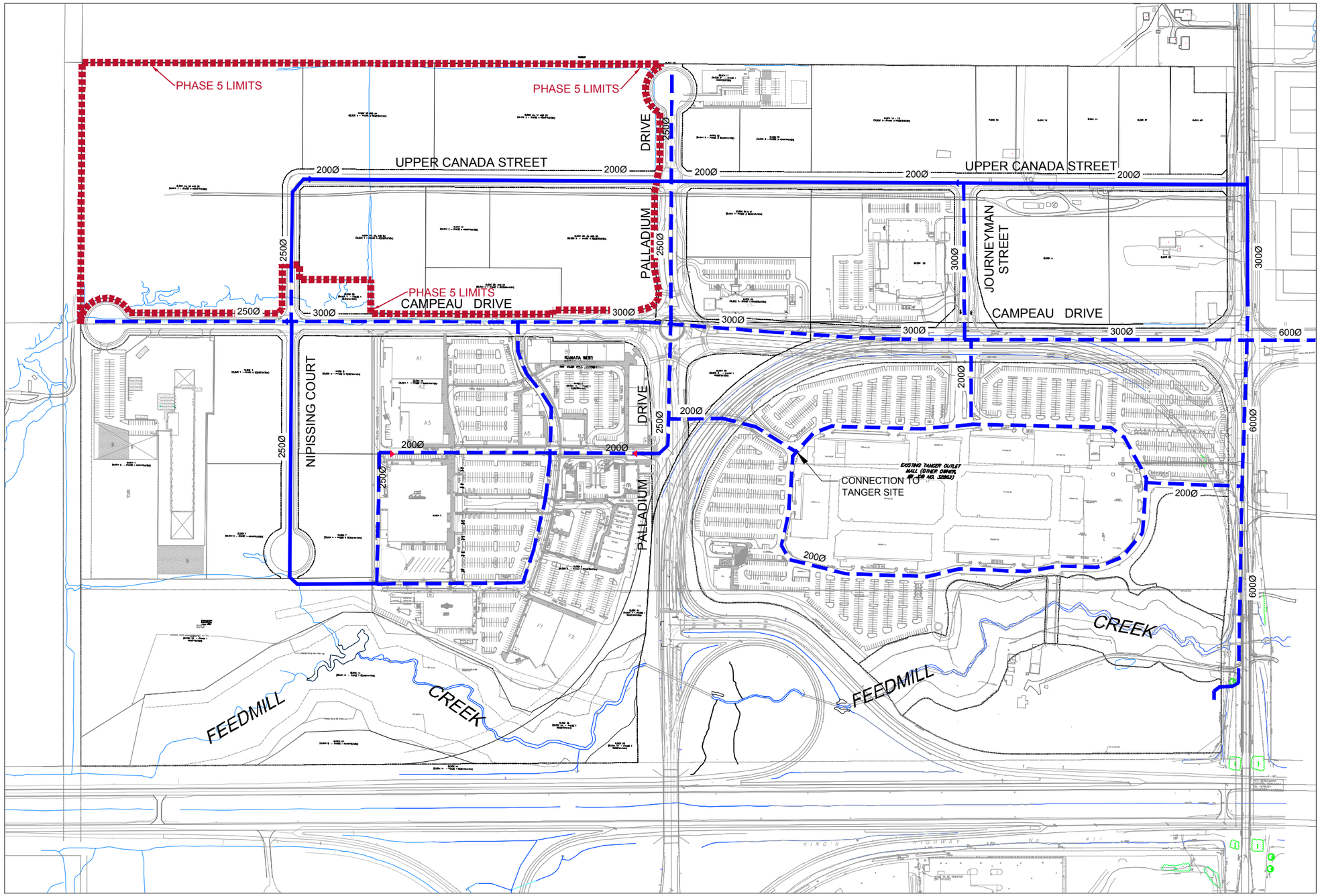
Boundary Conditions

Boundary Condition Model

FUS Long Form

Water Model Outputs

Watermain Design Sheet



LEGEND

- 300Ø EXISTING WATERMAIN AND DIAMETER
- 300Ø PROPOSED WATERMAIN AND DIAMETER
- 300Ø FUTURE WATERMAIN AND DIAMETER

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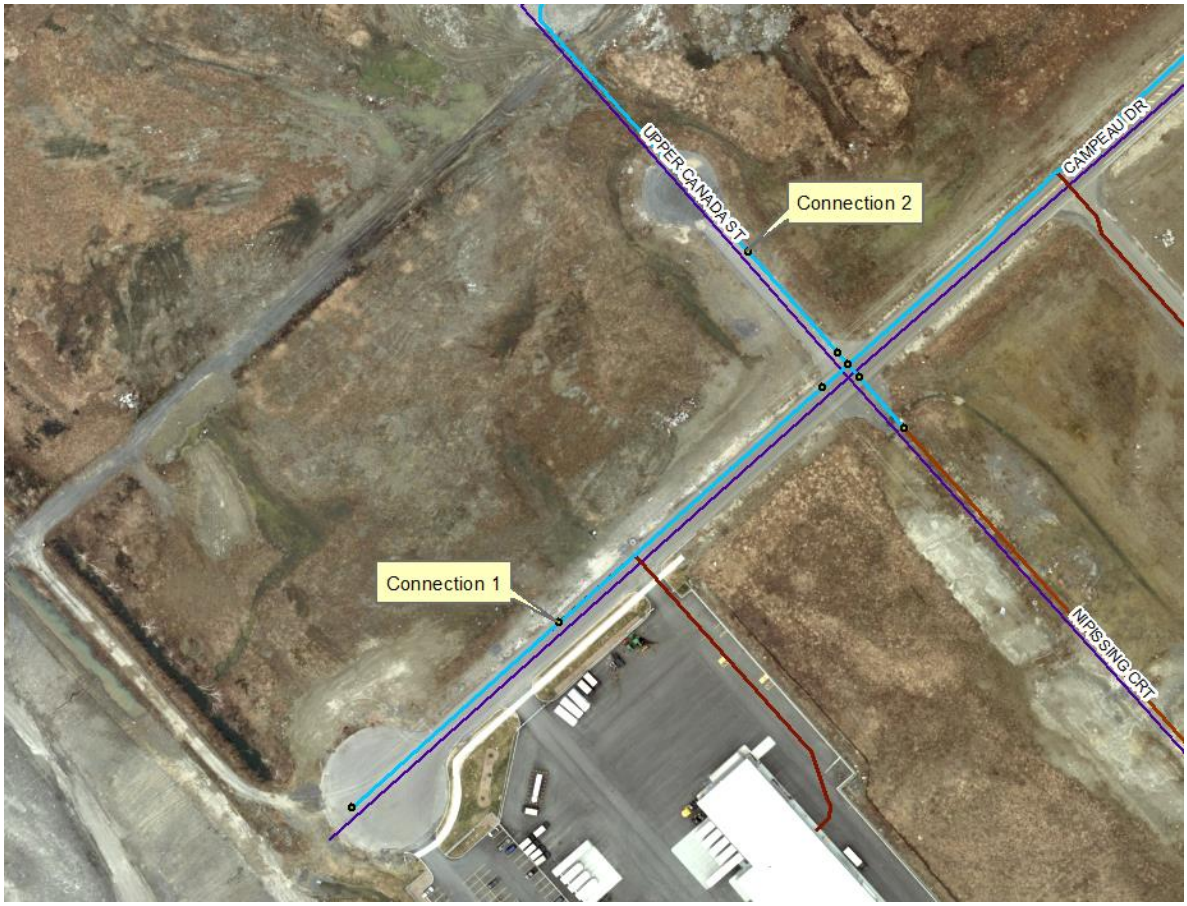
Scale	Project Title	Drawing Title	Sheet No.
IBI N.T.S.	KANATA WEST BUSINESS PARK	PROPOSED WATER DISTRIBUTION PLAN	FIGURE 4

Boundary Conditions
8800 Campeau Drive

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	161	2.69
Maximum Daily Demand	242	4.03
Peak Hour	436	7.26
Fire Flow Demand #1	9,000	150.00

Location



Results

Connection 1 – Campeau Dr.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.4	80.2
Peak Hour	156.3	72.9
Max Day plus Fire 1	122.6	25.1

[1] Ground Elevation = 104.98 m

Connection 2 – Upper Canada St.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.4	80.2
Peak Hour	156.3	72.9
Max Day plus Fire 1	136.0	44.1

[1] Ground Elevation = 104.99 m

Notes

1. A second connection to the watermain is required since the basic day demand is above 50m^3/d.
2. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    a. If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
    b. Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

FUS Fire Flow Calculations

Robinson Consultants

Project #: 20027
Project Name: Maritime Ontario - Kanata West
Date: 27-Oct-20

Calculations Based on 1999 Publication "Water Supply for Public Fire Protection" by Fire Underwriters' Survey (FUS)

Building Type/Description/Name: Commercial Warehouse

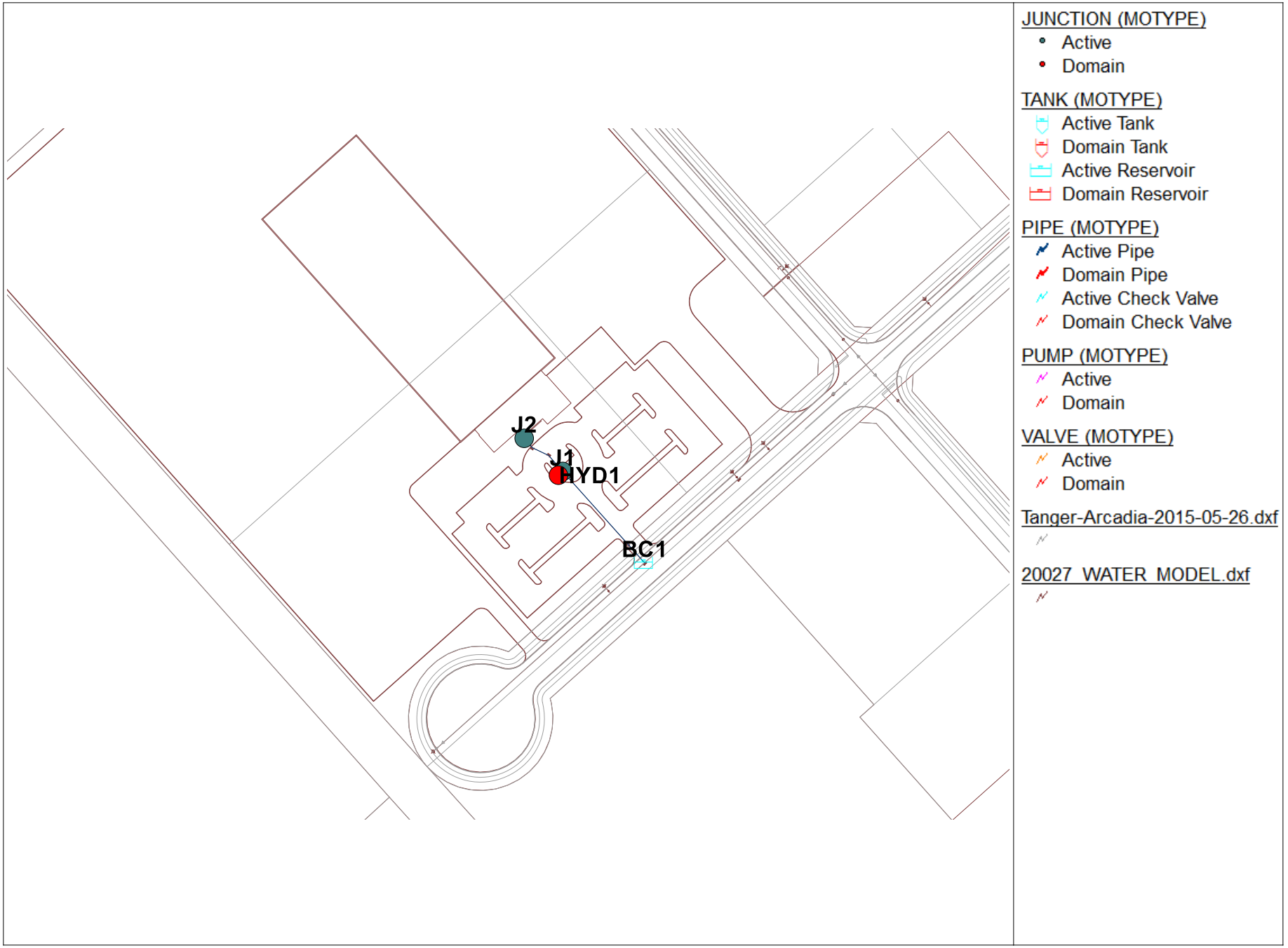
Table A: Fire Underwriters Survey Determination of Required Fire Flow - Long Method

Step	Task	Term	Options	Multiplier Associated with Option	Choose:	Value Used	Unit	Total Fire Flow (L/min)
		Framing Material						
1	**Choose Frame Used for Construction of Unit**	Coefficient related to type of construction (C)	Wood Frame	1.5	Fire resistive construction (> 2 hrs)	0.6	m	
			Ordinary Construction	1				
			Non-combustible construction	0.8				
			Fire resistive construction (< 2 hrs)	0.7				
			Fire resistive construction (> 2 hrs)	0.6				
		Floor Space Area						
2	**Choose Type of Housing (if TH, Enter Number of Units per TH Block)**	Type of Housing	Single Family	1	Other (comm, ind, etc.)	1	Units	
			Townhouse - indicate # of units	1				
			Other (comm, ind, etc.)	1				
2.2	**# of Storeys**	Number of Floors/Storeys in the Unit (do not include basement):			2	2	Storeys	
2.3	**Length-height factor**	Length	North Side	52.7	Length-Height factor	105.4	m.Storeys	
			East Side	142.3	Length-Height factor	284.6	m.Storeys	
			South Side	52.7	Length-Height factor	105.4	m.Storeys	
			West Side	142.3	Length-Height factor	284.6	m.Storeys	
3	**Enter Ground Floor Area of One Unit**	Enter Ground Floor Area (A) of One Unit Only:			7130	7702	Area in Square Metres (m^2)	
		Measurement Units	Square Feet (ft^2)	0.09290304	Square Metres (m2)			
			Square Metres (m^2)	1				
			Hectares (ha)	10,000				
4	**Obtain Required Fire Flow Without Reductions**	Required Fire Flow (without reductions or increases per FUS) (F=220*C*√A), round to nearest 1000 L/min						**12000**
5	**Apply Factors Affecting Burning**	**Reductions/Increases Due to Factors Affecting Burning**						
5.1	**Choose Combustibility of Building Contents**	Occupancy content hazard reduction or surcharge	Non-combustible	-0.25	Combustible	0	N/A	**12000**
			Limited Combustible	-0.15				
			Combustible	0				
			Free burning	0.15				
			Rapid Burning	0.25				
5.2	**Choose Reduction Due to Presence of Sprinklers**	Sprinkler reduction	Complete Automatic Sprinkler Protection	-0.5	Complete Automatic Sprinkler Protection	-0.5	N/A	**-6000**
			None	0				
5.3	**Choose Separation Distance Between Units**	Exposure Distance Between Units	North Side	50	5%	0.2	N/A	**2400**
			East Side	50	5%			
			South Side	50	5%			
			West Side	50	5%			
6	**Obtain Required Fire Flow, Duration & Volume**	***Total Required Fire Flow, rounded to nearest 1000 L/min:***						**8000**
		Total Required Fire Flow (above) in L/s:						**133.333333**
		Required Duration of Fire Flow (hrs)						**2**
		Required Volume of Fire Flow (m^3)						**960**

Note: The most current FUS document should be referenced before design to ensure that the above figures are consistent with the intent of the Guidelines

Legend	
	Drop down menu - choose option, or enter value
	No information, No input required

MARATIME



Prepared By:

Date: 26/11/2020 10:01:10 AM

		ID	Demand (Lpm)	Elevation (m)	Head (m)	Pressure (psi)
1		HYD1	0.00	107.78	161.40	76.22
2		J1	0.00	107.20	161.40	77.04
3		J2	161.40	108.10	161.39	75.76

		ID	Demand (Lpm)	Elevation (m)	Head (m)	Pressure (psi)
1		HYD1	0.00	107.78	156.28	68.94
2		J1	0.00	107.20	156.28	69.77
3		J2	435.60	108.10	156.27	68.47

		ID	Total Demand (Lpm)	Critical Fire Node ID	Adjusted Fire-Flow (Lpm)	Available Flow at Hydrant (Lpm)
1		HYD1	6,959.95	HYD1	11,556.07	11,556.43

		ID	Design Flow (Lpm)
1		HYD1	11,556.07

		ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness
1		P1	BC1	J1	51.01	203.00	110.00
2		P2	J1	HYD1	2.39	152.00	100.00
3		P3	J1	J2	21.49	203.00	110.00

WATERMAIN DESIGN SHEET

Maritime Ontario - Kanata West

Project No. 20027

TABLE

Junction Node Number	RESIDENTIAL POPULATION ACTUAL COUNT				NON-RES		AVG. DAILY DEMAND (l/s)				MAX. DAILY DEMAND (l/s)				MAX. HOURLY DEMAND (l/s)			
	Low Density	Medium Density	High Density	Total Population	COMM. (HA)	INST. (HA)	RES.	IND.	INST.	TOTAL	RES.	IND.	INST.	TOTAL	RES.	IND.	INST.	TOTAL
J1					6.64			2.69		2.69		4.03		4.03		7.26		7.26
Total					6.64			2.69		2.69		4.03		4.03		7.26		7.26

Residential Densities

Low Density (SFH's) =	3.4	cap/unit
Medium Density (Townhouses) =	2.7	cap/unit
High Density (Apartments) =	1.8	cap/unit

Avg. Daily Demand:			Max. Daily Demand:		Max. Hourly Demand:	
Residential =	350	L/cap/day	2.5	x Avg. Day	2.2	x Max. Day
Commercial =	60000	L/ha/day	1.5	x Avg. Day	1.8	x Max. Day
Institutional =	15000	L/ha/day	1.5	x Avg. Day	1.8	x Max. Day
Industrial Light =	35000	L/ha/day	1.5	x Avg. Day	1.8	x Max. Day

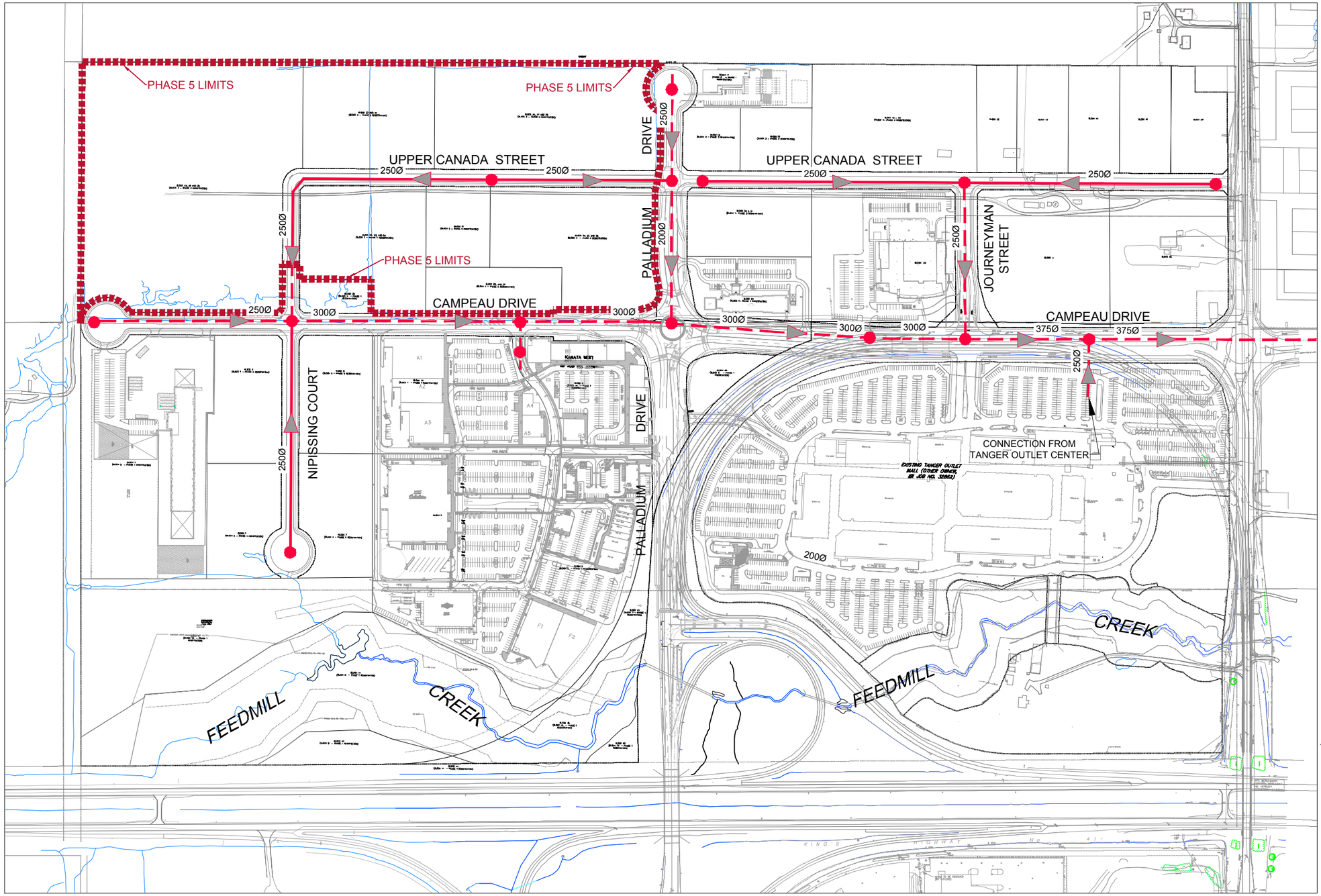
Appendix D

KWBP Figure 5 – Wastewater Plan
(prepared by IBI Group)

KWBP Sanitary Drainage Area Plan
(prepared by IBI Group)

KWBP Sanitary Sewer Design Sheet
(prepared by IBI Group)

Sanitary Sewer Design Sheet



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LEGEND

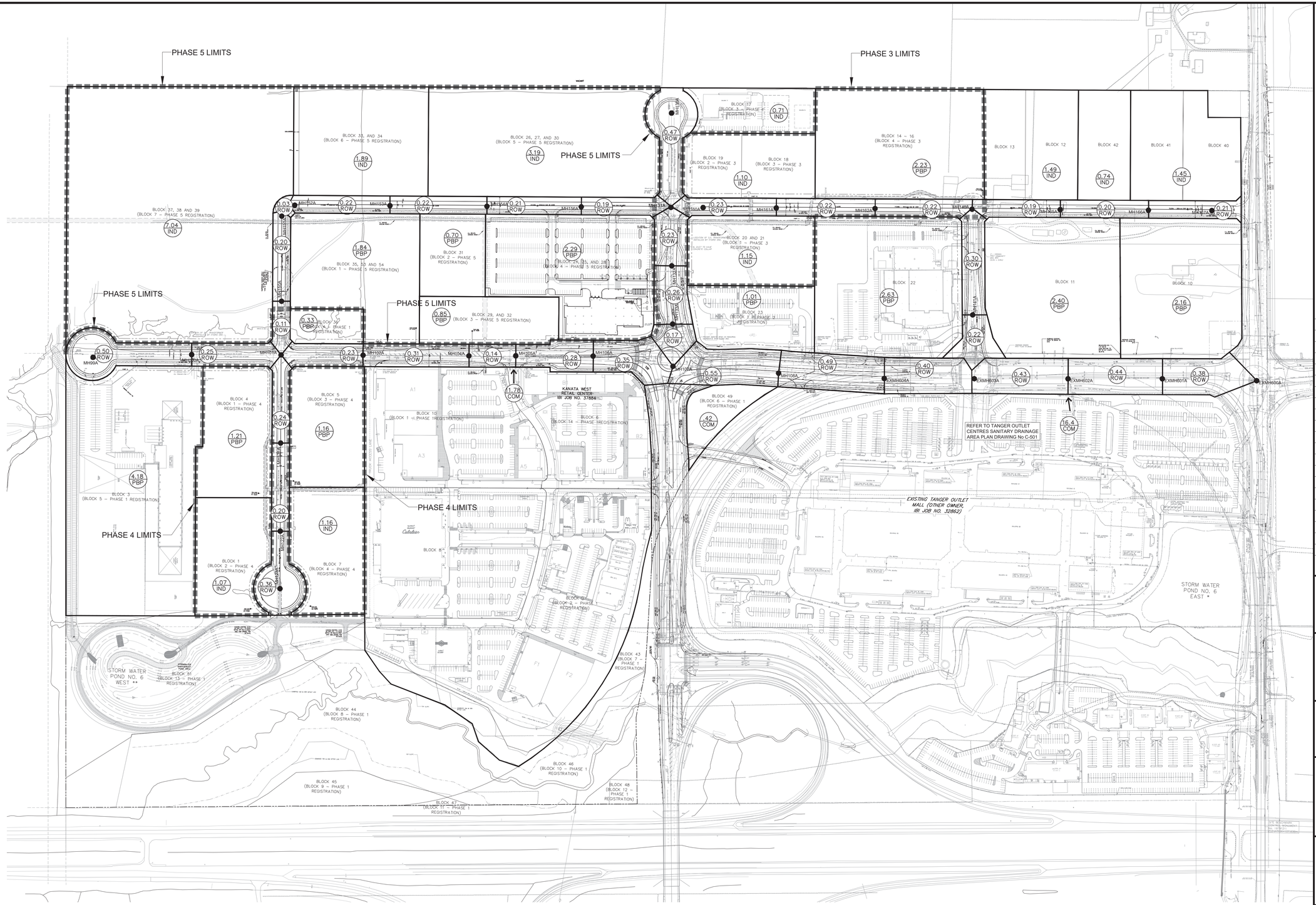
300Ø EXISTING WASTE WATER AND DIAMETER

300Ø PROPOSED WASTE WATER AND DIAMETER

J:\14289_TerraceLands\5.9 Drawings\59civil\current\Phase 5 Figures\14289-Figures-2019-09-11.dwg Sheet Set: ####

Plot Style: AIA STANDARD COLOR-HALF.CTB Plot Scale: 0.039:1 Plotted At: Sep. 11, 19 8:27 AM Printed By: DON SIURNA Last Saved By: DSIURNA Last Saved At: Sep. 11, 19

Scale	Project Title	Drawing Title	Sheet No.
IBI N.T.S.	KANATA WEST BUSINESS PARK	PROPOSED WASTEWATER PLAN	FIGURE 5



LEGEND:

- 5.14 / P.B.P. — AREA IN HECTARES / LAND USE TYPE
- PBP — PRESTIGE BUSINESS PARK - 35 000 l/s/ha
- IND — LIGHT INDUSTRIAL - 35 000 l/s/ha
- COM — COMMERCIAL - 50 000 l/S/ha
- ROW — RIGHT OF WAY (INFILTRATION FLOW ONLY)
- DRAINAGE AREA LIMITS
- MH601A — SANITARY MANHOLE & NUMBER
- SANITARY SEWER & FLOW DIRECTION

No.	REVISIONS	By	Date
20			
19			
18			
17			
16			
15	ISSUED FOR PHASE 5 REGISTRATION	LME	19: 09: 10
14	REVISED AS PER PHASE 4 COMMENTS	LME	19: 07: 25
13	REVISED AS PER PHASE 4 COMMENTS	LME	19: 07: 22
12	REVISED AS PER PHASE 4 COMMENTS	LME	19: 06: 24
11	ISSUED FOR PHASE 4 REGISTRATION	LME	19: 04: 25
10	REVISED AS PER PHASE 3 COMMENTS	LME	19: 03: 08
9	ISSUED FOR PHASE 3 TENDER	LME	19: 01: 11
8	REVISED AS PER PHASE 3 COMMENTS	LME	18: 12: 14
7	REVISED FOR PHASE 3 REGISTRATION	LME	18: 09: 14
6	REVISED FOR PHASE 2 REGISTRATION	LME	18: 04: 20
5	REVISED AS PER CITY COMMENTS	LME	15: 11: 05
4	REVISED AS PER CITY COMMENTS	LME	15: 10: 15
3	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	LME	15: 06: 19
2	REVISED AS PER CITY COMMENTS	LME	15: 04: 08
1	ISSUED TO CITY FOR APPROVAL	LME	14: 11: 27

TAGGART REALTY MANAGEMENT

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

KANATA WEST BUSINESS PARK PHASE 5

LICENSED PROFESSIONAL ENGINEER
L. M. ENGEL
13379508
2019/09/10
PROVINCE OF ONTARIO

Drawing Title

SANITARY DRAINAGE AREA PLAN

Scale
1:2000

Design	Date
LME	NOV. 2014
Drawn	Checked
DPS	TRB
Project No.	Drawing No.
14289	501

D07-16-14-0003_P5

#17661

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IBI GROUP
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: KANATA WEST BUSINESS PARK
LOCATION: 333 HUNTMAR DRIVE
CLIENT: TAGGART

LOCATION				RESIDENTIAL									ICI AREAS								INFILTRATION ALLOWANCE			FIXED FLOW	TOTAL FLOW	PROPOSED SEWER DESIGN							
				UNIT TYPES				AREA	POPULATION		PEAK FACTOR	PEAK FLOW	AREA (Ha)							PEAK FLOW	AREA (Ha)		FLOW			CAPACITY	LENGTH	DIA	SLOPE	VELOCITY (full)	VELOCITY (actual)	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	PRESTIGE BUISNESS PK		COMMERCIAL		INDUSTRIAL			(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	(m/s)	L/s	(%)
													IND	CUM	IND	CUM	IND	CUM	PF													
KANATA WEST BUSINESS PARK - Block number based on overall concept plan of subdivision																																	
Upper Canada Street	**Blocks 31**	**MH154A**	**MH153A**										**0.70**	**0.70**				**0.00**	**1.50**	**0.34**	**0.92**	**0.92**	**0.30**	**0.00**	**0.64**	**43.87**	**110.00**	**250**	**0.50**	**0.866**	**0.301**	**43.22**	**98.53**
	Blocks 35, 53, 54												**1.84**	**2.54**				**0.00**	**1.50**	**1.23**	**2.06**	**2.98**		**0.00**	**1.23**								
	Blocks 33, 34	**MH153A**	**MH152A**														**1.89**	**1.89**	**5.90**	**4.52**	**1.89**	**4.87**	**1.61**	**0.00**	**7.36**	**39.24**	**114.86**	**250**	**0.40**	**0.774**	**0.543**	**31.88**	**81.24**
		MH152A	**MH151A**											**2.54**				**1.89**	**5.90**	**5.75**	**0.03**	**4.90**	**1.62**	**0.00**	**7.37**	**36.70**	**10.84**	**250**	**0.35**	**0.724**	**0.562**	**29.33**	**79.92**
	Blocks 37, 38, 39	**MH151A**	**MH150A**											**2.54**			**7.04**	**8.93**	**4.50**	**17.51**	**7.24**	**12.14**	**4.01**	**0.00**	**21.52**	**36.70**	**102.56**	**250**	**0.35**	**0.724**	**0.753**	**15.18**	**41.37**
		MH150A	*MH101A*											*2.54*				*8.93*	*4.50*	*17.51*	*0.11*	*12.25*	*4.04*	*0.00*	*21.56*	*36.70*	*63.86*	*250*	*0.35*	*0.724*	*0.753*	*15.15*	*41.27*
Campeau Drive	*Blocks 3*	*MH99A*	*MH100A*										*4.18*	*4.18*						*2.03*	*4.68*	*4.68*	*1.54*	*0.00*	*3.58*	*50.02*	*112.75*	*250*	*0.65*	*0.987*	*0.570*	*46.44*	*92.85*
		MH100A	*MH101A*											*4.18*						*2.03*	*0.25*	*4.93*	*1.63*	*0.00*	*3.66*	*51.91*	*101.44*	*250*	*0.70*	*1.024*	*0.571*	*48.25*	*92.95*
Nipissing Court	**Blocks 1, 7**	**MH123A**	**MH122A**														**2.23**	**2.23**	**6.25**	**5.65**	**2.59**	**2.59**	**0.85**	**0.00**	**6.50**	**50.02**	**65.18**	**250**	**0.65**	**0.987**	**0.607**	**43.52**	**87.00**
		MH122A	**MH121A**															**2.23**	**6.25**	**5.65**	**0.20**	**2.79**	**0.92**	**0.00**	**6.57**	**50.02**	**100.00**	**250**	**0.65**	**0.987**	**0.607**	**43.45**	**86.87**
	Blocks 4, 5	**MH121A**	**MH101A**										**2.37**	**2.37**				**2.23**	**6.25**	**6.80**	**2.61**	**5.40**	**1.78**	**0.00**	**8.58**	**85.51**	**97.00**	**250**	**1.90**	**1.688**	**1.038**	**76.93**	**89.97**
Campeau Drive	*Block 36*	*MH101A*	*MH103A*										*0.33*	*9.42*				*11.16*	*4.75*	*26.05*	*0.56*	*23.14*	*7.64*	*0.00*	*33.69*	*43.87*	*93.00*	*250*	*0.50*	*0.866*	*0.952*	*10.18*	*23.20*
	Block 32, 54	*MH103A*	*MH104A*										*1.00*	*10.42*				*11.16*	*4.75*	*26.54*	*1.31*	*24.45*	*8.07*	*0.00*	*34.61*	*43.87*	*120.00*	*250*	*0.50*	*0.866*	*0.952*	*9.26*	*21.11*
Campeau Drive	*Block 29, 32*	*MH104A*	*MH105A*										*0.85*	*11.27*				*11.16*	*4.75*	*26.95*	*0.99*	*25.44*	*8.40*	*0.00*	*35.35*	*43.87*	*53.11*	*250*	*0.50*	*0.866*	*0.952*	*8.52*	*19.42*
KWRC	*Blocks 6, 8, 9, 10*		*MH 105A*												*11.78*	*11.78*				*5.73*	*11.78*	*11.78*	*3.89*	*0.00*	*9.61*	*39.24*	*12.01*	*250*	*0.40*	*0.774*	*0.601*	*29.62*	*75.50*
Campeau Drive		*MH105A*	*MH106A*											*11.27*		*11.78*		*11.16*	*4.75*	*32.68*	*0.28*	*37.50*	*12.38*	*0.00*	*45.05*	*59.68*	*87.77*	*300*	*0.35*	*0.818*	*0.877*	*14.63*	*24.51*
	Block 24	*MH106A*	*MH107A*										*0.75*	*12.02*		*11.78*		*11.16*	*4.75*	*33.04*	*1.10*	*38.60*	*12.74*	*0.00*	*45.78*	*59.68*	*90.92*	*300*	*0.35*	*0.818*	*0.900*	*13.90*	*23.29*
Upper Canada Street	**Blocks 26, 27, 30**	**MH154A**	**MH156A**														**3.19**	**3.19**	**5.50**	**7.11**	**3.40**	**3.40**	**1.12**	**0.00**	**8.23**	**50.02**	**107.00**	**250**	**0.65**	**0.987**	**0.692**	**41.79**	**83.55**
		MH156A	**MH131A**															**3.19**	**5.50**	**7.11**	**0.19**	**3.59**	**1.18**	**0.00**	**8.29**	**50.02**	**101.71**	**250**	**0.65**	**0.987**	**0.692**	**41.73**	**83.42**
Palladium Drive	*Blocks 17*	*MH130A*	*MH131A*											*0.00*			*0.71*	*0.71*	*5.50*	*1.58*	*1.18*	*1.18*	*0.39*	*0.00*	*1.97*	*50.02*	*106.00*	*250*	*0.65*	*0.987*	*0.467*	*48.05*	*96.06*
Palladium Drive		*MH131A*	*MH132A*											*0.00*				*3.90*	*5.25*	*8.29*	*0.23*	*5.00*	*1.65*	*0.00*	*9.94*	*43.87*	*67.35*	*250*	*0.50*	*0.866*	*0.672*	*33.92*	*77.33*
	Block 23, 24, 25, 28	*MH132A*	*MH133A*										*3.30*	*3.30*				*3.90*	*5.25*	*9.90*	*3.56*	*8.56*	*2.82*	*0.00*	*12.72*	*43.87*	*71.26*	*250*	*0.50*	*0.866*	*0.730*	*31.14*	*71.00*
		MH133A	*MH107A*											*3.30*				*3.90*	*5.25*	*9.90*	*0.17*	*8.73*	*2.88*	*0.00*	*12.78*	*107.45*	*42.79*	*250*	*3.00*	*2.121*	*1.304*	*94.67*	*88.11*
Campeau Drive	*Block 49*	*MH107A*	*MH108A*											*15.32*	*0.42*	*12.20*		*15.06*	*4.40*	*40.22*	*0.97*	*48.30*	*15.94*	*0.00*	*56.16*	*59.68*	*120.00*	*300*	*0.35*	*0.818*	*0.900*	*3.52*	*5.90*
		MH108A	*EX604A*											*15.32*		*12.20*		*15.06*	*4.40*	*40.22*	*0.49*	*48.79*	*16.10*	*0.00*	*56.32*	*59.68*	*120.00*	*300*	*0.35*	*0.818*	*0.900*	*3.36*	*5.63*
	Block 22	*MH 604A*	*MH 603A*										*2.63*	*17.95*		*12.20*		*15.06*	*4.40*	*41.50*	*3.03*	*51.82*	*17.10*	*0.00*	*58.60*	*62.51*	*102.12*	*300*	*0.38*	*0.857*	*0.942*	*3.91*	*6.26*
Upper Canada Street	**Blocks 18, 19, 20, 21**	**MH160A**	**MH161A**											**0.00**			**2.25**	**2.25**	**5.75**	**5.24**	**2.48**	**2.48**	**0.82**	**0.00**	**6.06**	**58.86**	**83.00**	**250**	**0.90**	**1.162**	**0.714**	**52.80**	**89.70**
	Block 14- 16	**MH161A**	**MH162A**										**2.23**	**2.23**				**2.25**	**5.75**	**6.32**	**2.45**	**4.93**	**1.63**	**0.00**	**7.95**	**50.02**	**112.00**	**250**	**0.65**	**0.987**	**0.692**	**42.07**	**84.10**
		MH162A	**MH140A**											**2.23**				**2.25**	**5.75**	**6.32**	**0.22**	**5.15**	**1.70**	**0.00**	**8.02**	**63.57**	**110.98**	**250**	**1.05**	**1.255**	**0.772**	**55.55**	**87.38**
Upper Canada Street	**Blocks 40, 41**	**MH167A**	**MH166A**											**0.00**			**1.45**	**1.45**	**6.25**	**3.67**	**1.66**	**1.66**	**0.55**	**0.00**	**4.22**	**51.91**	**72.00**	**250**	**0.70**	**1.024**	**0.611**	**47.69**	**91.87**
	Block 42	**MH166A**	**MH165A**											**0.00**			**0.74**	**2.19**	**5.70**	**5.06**	**0.94**	**2.60**	**0.86**	**0.00**	**5.91**	**50.02**	**100.00**	**250**	**0.65**	**0.987**	**0.607**	**44.10**	**88.17**
	Blocks 12, 13	**MH165A**	**MH140A**											**0.00**			**1.49**	**3.68**	**5.30**	**7.90**	**1.68**	**4.28**	**1.41**	**0.00**	**9.31**	**39.24**	**99.02**	**250**	**0.40**	**0.774**	**0.601**	**29.92**	**76.26**
Journeyman Street		*MH140A*	*MH141A*											*2.23*				*5.93*	*5.00*	*13.10*	*0.30*	*9.73*	*3.21*	*0.00*	*16.31*	*31.02*	*120.00*	*250*	*0.25*	*0.612*	*0.612*	*14.71*	*47.43*
		MH141A	*MH (84)*											*2.23*				*5.93*	*5.00*	*13.10*	*0.22*	*9.95*	*3.28*	*0.00*	*16.38*	*31.02*	*40.30*	*250*	*0.25*	*0.612*	*0.612*	*14.64*	*47.20*
		Stub	*MH 603A*											*2.23*				*5.93*	*5.00*	*13.10*	*0.00*	*9.95*	*3.28*	*0.00*	*16.38*	*31.63*	*32.98*	*250*	*0.26*	*0.624*	*0.624*	*15.26*	*48.22*
Campeau Drive	*Block 11*	*MH 603A*	*MH 602A*										*2.40*	*22.58*		*12.20*		*20.99*	*3.80*	*49.22*	*2.83*	*64.60*	*21.32*	*0.00*	*70.54*	*103.47*	*105.24*	*375*	*0.32*	*0.908*	*0.973*	*32.93*	*31.83*
	Tanger Outlet Centres	*MH 602A*	*MH 601A*											*22.58*	*16.40*	*28.60*		*20.99*	*3.80*	*57.19*	*16.84*	*81.44*	*26.88*	*0.00*	*84.07*	*109.75*	*107.73*	*375*	*0.36*	*0.963*	*1.059*	*25.68*	*23.40*
	Block 52	*MH 601A*	*MH 600A*										*2.16*	*24.74*		*28.60*		*20.99*	*3.80*	*58.24*	*2.54*	*83.98*	*27.71*	*0.00*	*85.95*	*109.75*	*106.95*	*375*	*0.36*	*0.963*	*1.059*	*23.79*	*21.68*
Campeau Drive	*Block XX*	*MH XXX*	*MH XXX*	*Light Grey = Constructed Sewer*																													

Design Parameters:

Residential

SF	3.4	p/p/u
TH/SD	2.7	p/p/u
APT	1.8	p/p/u
Other	60	p/p/Ha

ICI Areas

			Peak Factor (PF)
P.B.P.	28,000	L/Ha/day	1.5
COM	28,000	L/Ha/day	1.5
IND	35,000	L/Ha/day	MOE Chart

Notes:

1. Manning's coefficient (n) = 0.013
2. Demand (per capita): 280 L/day 300 L/day
3. Infiltration allowance: 0.33 L/s/Ha 0.4 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5)) K=0.8
   where P = population in thousands

Designed: LME

Checked:

Dwg. Reference: 14289-501

No.	Revision	Date
1.	City submission No. 1	2014-11-25
2.	City submission No. 2	2015-04-08
3.	City submission No. 3	2015-06-18
4.	City submission No. 4	2015-10-15
5.	Revised for Phase 2 Registration	2018-04-19
6.	Revised for Phase 3 Registration	2018-09-14
7.	Revised per City Comments (Phase 3)	2018-12-14
8.	Revised for Phase 4 Registration	2019-04-26
9.	Revised for Phase 4 Registration Comments	2019-06-24
10.	Revised for Phase 5 Registration	2019-09-11
11.	Revised per City comments for Phase 5 Registration	2019-10-25

File Reference:	Date:	Sheet No:
14289.5.7.1	2018-04-19	1 of 1

SANITARY SEWER DESIGN SHEET
for
MARITIME-ONTARIO
8800 CAMPEAU DRIVE, KWBP

LOCATION			AREA (ha)		INDUSTRIAL FLOW				PIPE						
STREET	FROM MH	TO MH	INDIVIDUAL	CUMM.	PEAK FACTOR	PEAK IND. FLOW (L/s)	EXTRAN. FLOW (L/s)	PEAK DESIGN FLOW (L/s)	LENGTH (m)	DIAMETER (mm)	SLOPE (%)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	EXCESS CAPACITY (L/s)	PERCENT FULL
TO CAMPEAU DRIVE SANITARY SEWER															
PARKING LOT	BLDG	101	7.04	7.04	4.50	10.27	2.32	12.59	10.3	201.16	1.07	34.49	1.09	21.90	36.50
PARKING LOT	101	100	0.00	7.04	4.50	10.27	2.32	12.59	49.5	201.16	0.34	19.44	0.61	6.85	64.76
PARKING LOT	100	MAIN	0.00	7.04	4.50	10.27	2.32	12.59	17.5	201.16	0.36	20.01	0.63	7.42	62.93
CAMPEAU DRIVE	*EX99A*	*EX100A*	*4.18*	*11.22*		*12.30*	*3.86*	*16.17*	*113.0*	*250.00*	*0.65*	*47.99*	*0.98*	*31.82*	*33.69*
CAMPEAU DRIVE	*EX100A*	*EX101A*	*0.00*	*11.22*		*12.30*	*3.95*	*16.25*	*101.3*	*250.00*	*0.97*	*58.63*	*1.19*	*42.38*	*27.72*

DESIGN PARAMETERS

Average Daily Flow =		L/person/day
Comm./Inst. Flow =		L/s/ha
Light Industrial Flow =	28000	L/ha/d
Maximum Residential Peak Factor =	4.0	
Harmon - Correction Factor (K) =	0.8	
Peaking Factor =	4.5	(MOE Chart - City of Ottawa Appendix 4-B.1)
Extraneous Flow =	0.33	L/s/ha
Minimum Full Flow Velocity =	0.60	m/s
Maximum Full Flow Velocity =	3.0	m/s
Manning's Coefficient (n) =	0.013	

Notes:
1. Sanitary sewer design parameters in accordance IBI Report for KWBP - Phase 5
2. Refer to drawing Campeau Drive from STA 19+780 to STA 20+110, Drawing No. 101, prepared by IBI Group.
3. Refer to KWBP sanitary sewer design sheet, prepared by IBI Group.

Appendix E

KWBP Storm Sewer Design Sheet (prepared by IBI Group)

KWBP Figure 8 – Proposed Storm Sewer Plan (prepared by IBI Group)

KWBP Storm Drainage Area Plan (prepared by IBI Group)

KWBP Table 4.2 – Drainage Area Parameters (prepared by IBI Group)

KWBP SWMHYMO Schematic (prepared by IBI Group)

KWBP Table 4.10 – Summary of Hydraulic Grade Line (prepared by IBI Group)

Aquafor Beech Report Excerpts

Geotechnical Correspondence

KWBP Figure 2 – Post-Development SWM Drainage Boundaries Overall Site (prepared by IBI Group)

IBI GROUP

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

STORM SEWER DESIGN SHEET

PROJECT: KANATA WEST BUSINESS PARK
LOCATION: 333 HUNTMAR DRIVE
CLIENT: TAGGART

LOCATION				AREA (Ha)											RATIONAL DESIGN FLOW												SEWER DATA								
STREET	AREA ID	FROM MH	TO MH	C= 0.20	C= 0.57	C= 0.57	C= 0.61	C= 0.68	C= 0.68	C= 0.70	C= 0.85	C= 0.85	C= 0.90	C= 0.90	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (Syr) (L/s)	(%)
KANATA WEST BUSINESS PARK - Block numbers based on overall concept plan of subdivision																																		
Journeyman St.		*MH140*	*MH141*												*0.00*	*19.28*	*16.32*			*79.51*	*93.10*	*135.92*	*1,533.17*												
						0.13				*0.32*					*0.83*	*2.96*	*16.32*	*0.95*	*17.27*	*79.51*	*93.10*	*135.92*			*402.03*		*1,935.2*	*2,784.1*	*107.00*	*1350*			*0.25*	*1.884*	*848.9*	*30.5%*
		MH141	*MH141B*												*0.00*	*19.28*	*17.27*			*76.88*	*90.00*	*131.37*	*1,482.33*												
										0.13					*0.25*	*3.21*	*17.27*	*0.54*	*17.81*	*76.88*	*90.00*	*131.37*			*421.81*		*1,904.1*	*2,156.5*	*47.35*	*1350*			*0.15*	*1.460*	*252.4*	*11.7%*
Journeyman St.		*Stub*	*MH 603*												*0.00*	*19.28*	*17.81*			*75.46*	*88.33*	*128.92*	*1,454.94*												
															0.00	*3.21*	*17.81*	*0.33*	*18.14*	*75.46*	*88.33*	*128.92*			*413.95*		*1,868.9*	*1,363.9*	*18.02*	*1350*			*0.06*	*0.923*	*-505.0*	*-37.0%*
Campeau Drive		*603*	*602*												*0.00*	*47.54*	*19.70*			*70.93*	*83.00*	*121.11*	*3,372.06*												
												0.26			*0.61*	*15.30*	*19.70*	*0.71*	*20.41*	*70.93*	*83.00*	*121.11*			*1,853.06*		*5,225.1*	*3,971.3*	*92.77*	*1500*			*0.29*	*2.177*	*-1253.8*	*-31.6%*
		602	*601*												*0.00*	*47.54*	*20.41*			*69.37*	*81.18*	*118.44*	*3,298.20*												
												0.32			*0.76*	*16.06*	*20.41*	*0.53*	*20.94*	*69.37*	*81.18*	*118.44*			*1,901.67*		*5,199.9*	*4,362.8*	*76.05*	*1500*			*0.35*	*2.392*	*-837.0*	*-19.2%*
Tanger	*Blocks 10, 11*	*601*	*9*								*4.56*				*10.78*	*58.32*	*20.94*			*68.26*	*79.87*	*116.52*	*3,980.92*												
												0.78			*1.84*	*17.90*	*20.94*	*0.87*	*21.80*	*68.26*	*79.87*	*116.52*			*2,085.72*		*6,066.6*	*5,730.3*	*96.86*	*1950*			*0.15*	*1.859*	*-336.4*	*-5.9%*
Tanger		*9*	*12*										*3.24*		*8.11*	*66.43*	*21.80*			*66.52*	*77.83*	*113.53*	*4,418.87*												
															0.00	*17.90*	*21.80*	*0.81*	*22.62*	*66.52*	*77.83*	*113.53*			*2,032.17*	*18.00*	*6,469.0*	*5,749.5*	*90.76*	*1950*			*0.15*	*1.865*	*-719.6*	*-12.5%*
Tanger		*12*	*13*										*1.81*		*4.53*	*70.95*	*22.62*			*64.99*	*76.03*	*110.89*	*4,611.14*												
															0.00	*17.90*	*22.62*	*0.22*	*22.83*	*64.99*	*76.03*	*110.89*			*1,984.84*	*18.00*	*6,614.0*	*5,749.5*	*24.54*	*1950*			*0.15*	*1.865*	*-864.5*	*-15.0%*
Tanger		*13*	*Pond 6E*										*4.11*		*10.28*	*81.24*	*22.83*			*64.59*	*75.56*	*110.20*	*5,246.78*												
														0.84	*2.10*	*20.00*	*22.83*	*0.08*	*22.92*	*64.59*	*75.56*	*110.20*			*2,204.06*	*153.00*	*7,603.8*	*7,005.7*	*9.99*	*2100*			*0.15*	*1.959*	*-598.1*	*-8.5%*
KANATA WEST BUSINESS PARK																																			
Upper Canada St.	Block31,33,34	**MH154**	**MH153**								**2.59**				**6.12**	**6.12**	**12.70**			**91.81**	**107.56**	**157.14**	**561.88**												
						0.32									**0.51**	**0.51**	**12.70**	**1.70**	**14.40**	**91.81**	**107.56**	**157.14**			**79.68**		**641.6**	**905.5**	**120.00**	**975**			**0.15**	**1.175**	**263.92**	**29.15%**
Upper Canada St.	**Blocks 35, 53, 54**	**MH153**	**MH152B**								**1.82**				**4.30**	**10.42**	**14.40**			**85.54**	**100.18**	**146.32**	**891.39**												
						0.16									**0.25**	**0.76**	**14.40**	**1.10**	**15.51**	**85.54**	**100.18**	**146.32**			**111.29**		**1002.7**	**1,103.3**	**81.80**	**1050**			**0.15**	**1.234**	**100.65**	**9.12%**
	External Drainage	**DI200**	**MH152B**	14.53											**8.08**	**8.08**	**30.00**	**2.48**	**32.48**	**53.93**	**63.05**	**91.87**	**435.66**					**435.7**	**473.6**	**127.45**	**825**			**0.10**	**0.858**	**37.89**	**8.00%**
Upper Canada St.		**MH152B**	**MH152**												**0.00**	**18.50**	**14.40**			**85.54**	**100.18**	**146.32**	**1,582.43**												
															0.00	**0.76**	**14.40**	**1.07**	**15.47**	**85.54**	**100.18**	**146.32**			**111.29**		**1693.7**	**2,332.0**	**81.80**	**1500**			**0.10**	**1.278**	**638.30**	**27.37%**
	Blocks 39	**MH152**	**MH151**												**0.00**	**18.50**	**15.47**			**82.07**	**96.11**	**140.33**	**1,518.31**												
															0.00	**0.76**	**15.47**	**0.18**	**15.65**	**82.07**	**96.11**	**140.33**			**106.74**		**1625.0**	**2,332.0**	**13.91**	**1500**			**0.10**	**1.278**	**706.98**	**30.32%**
		MH151	**MH150**												**0.00**	**18.50**	**15.65**			**81.51**	**95.45**	**139.37**	**1,507.97**												
						0.17									**0.27**	**1.03**	**15.65**	**1.35**	**17.00**	**81.51**	**95.45**	**139.37**			**143.55**		**1651.5**	**2,332.0**	**103.40**	**1500**			**0.10**	**1.278**	**680.50**	**29.18%**
		MH150	**MH120**												**0.00**	**18.50**	**17.00**			**77.61**	**90.86**	**132.64**	**1,435.79**												
						0.20									**0.32**	**1.35**	**17.00**	**0.89**	**17.89**	**77.61**	**90.86**	**132.64**			**178.65**		**1614.4**	**3,006.9**	**72.86**	**1650**			**0.10**	**1.362**	**1392.42**	**46.31%**
Campeau Drive	*Block 3*	*MH99*	*MH100*								*4.18*				*9.88*	*9.88*	*11.70*			*96.00*	*112.49*	*164.38*	*948.19*												
									0.36						*0.68*	*0.68*	*11.70*	*1.13*	*12.83*	*96.00*	*112.49*	*164.38*			*111.87*		*1060.1*	*1,560.3*	*118.50*	*1050*			*0.30*	*1.746*	*500.29*	*32.06%*
		MH100	*MH101*												*0.00*	*9.88*	*12.83*			*91.29*	*106.95*	*156.24*	*901.68*												
							0.27								*0.46*	*1.14*	*12.83*	*0.76*	*13.59*	*91.29*	*106.95*	*156.24*			*177.87*		*1079.6*	*2,073.9*	*80.84*	*1200*			*0.26*	*1.776*	*994.37*	*47.95%*
	Block 37, 38, 39	*MH101*	*MH120*								*7.03*				*16.61*	*26.49*	*15.50*			*81.98*	*95.99*	*140.17*	*2,171.48*												
															0.00	*1.14*	*15.50*	*0.14*	*15.64*	*81.98*	*95.99*	*140.17*			*159.57*		*2331.0*	*2,961.0*	*20.89*	*1200*			*0.53*	*2.536*	*630.00*	*21.28%*
Campeau Drive	*Block 32, 29*	*MH104*	*MH103*								*0.85*				*2.01*	*2.01*	*11.25*			*98.02*	*114.88*	*167.89*	*196.89*												
							0.66								*1.12*	*1.12*	*11.25*	*2.33*	*13.58*	*98.02*	*114.88*	*167.89*			*187.90*		*384.8*	*473.6*	*120.00*	*825*			*0.10*	*0.858*	*88.76*	*18.74%*
	Block 36	*MH103*	*MH102*								*0.33*				*0.78*	*2.79*	*13.58*			*88.44*	*103.60*	*151.33*	*246.61*												
															0.00	*1.12*	*13.58*	*1.52*	*15.10*	*88.44*	*103.60*	*151.33*			*169.37*		*416.0*	*597.2*	*82.99*	*900*			*0.10*	*0.909*	*181.24*	*30.35%*
		MH102	*MH120*												*0.00*	*2.79*	*15.10*			*83.23*	*97.47*	*142.33*	*232.08*												
															0.00	*1.12*	*15.10*	*0.37*	*15.47*	*83.23*	*97.47*	*142.33*			*159.30*		*391.4*	*597.2*	*20.01*	*900*			*0.10*	*0.909*	*205.85*	*34.47%*
Nipissing Court	*Blocks 4, 5*	*MH120*	*MH121*								*2.37*				*5.60*	*53.38*	*17.89*			*75.25*	*88.09*	*128.57*	*4,016.75*												
						0.26									*0.41*	*4.02*	*17.89*	*0.74*	*18.63*	*75.25*	*88.09*	*128.57*			*516.40*		*4533.2*	*6,120.8*	*88.44*	*1950*			*0.17*	*1.985*	*1587.62*	*25.94%*
		MH121	*MH122*		*0.21*										*0.33*	*53.71*	*18.63*			*73.40*	*85.92*	*125.38*	*3,942.57*												
															0.00	*4.02*	*18.63*	*0.73*	*19.36*	*73.40*	*85.92*	*125.38*			*503.61*		*4446.2*	*7,119.4*	*100.84*	*1950*			*0.23*	*2.309*	*2673.27*	*37.55%*
	Blocks 1, 7	*MH122*	*MH123*						*0.35*		*2.23*				*5.93*	*59.64*	*19.36*			*71.69*	*83.90*	*122.43*	*4,275.61*												
															0.00	*4.02*	*19.36*	*0.77*	*20.13*	*71.69*	*83.90*	*122.43*			*491.73*		*4767.3*	*6,638.9*	*99.19*	*1950*			*0.20*	*2.154*	*1871.57*	*28.19%*
Future	*Blocks 8, 9*	*MH (215)*	*MH123*								*11.78*				*27.84*	*27.84*	*20.70*	*0.24*	*20.94*	*68.75*	*80.45*	*117.37*	*1,913.77*					*1,913.8*	*3,006.9*	*20.00*	*1650*			*0.10*	*1.362*	*1093.09*	*36.35%*
West Pond Outlet		*MH123*	*Outlet*												*0.00*	*87.48*	*20.13*			*69.97*	*81.88*	*119.47*	*6,121.06*												
															0.00	*4.02*	*20.13*	*0.87*	*21.00*	*69.97*	*81.88*	*119.47*			*479.86*		*6600.9*	*10,648.2*	*119.64*	*2400*			*0.17*	*2.280*	*4047.31*	*38.01%*
Future	*Blocks X,X*	*MH XX*	*MHXX*	*Grey = Constructed*																															

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

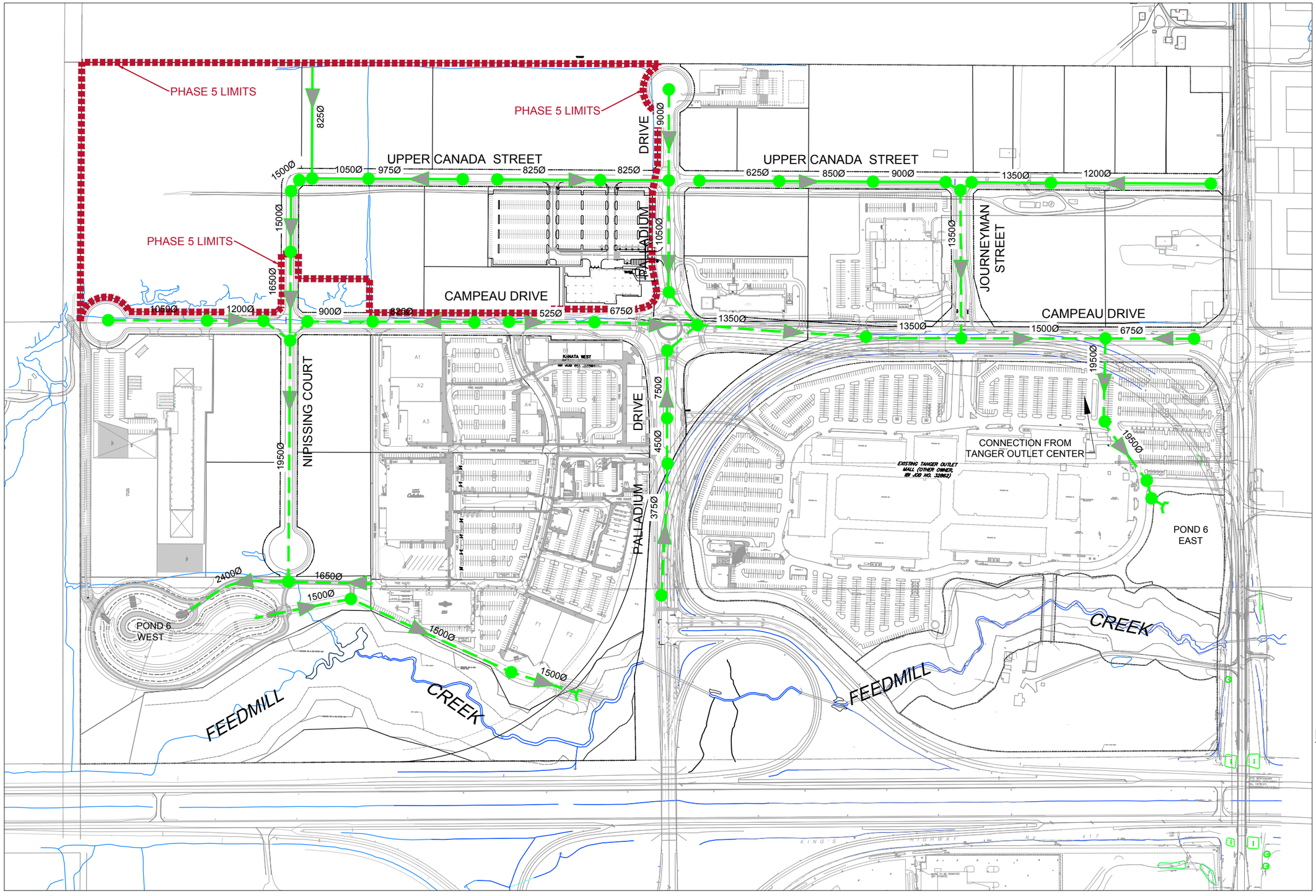
Notes:
1. Mannings coefficient (n) = 0.013

2. The Storm Sewer Design Sheet is for the rational method storm sewer design only, release rates for the individual blocks are included in Table 4.1 of the Design Brief, Kanata West Business Park, 333 Huntmar Drive, by IBI Group November 2015

Designed: LME
Checked:
Dwg. Reference: 14289-500

No.	Revision	Date
1.	City submission No. 1	2014-11-25
2.	City submission No. 2	2015-04-08
3.	City submission No. 3	2015-06-18
4.	City submission No. 4	2015-10-15
5.	City submission No. 5	2015-11-04
6.	Revised for Phase 2 Regristration	2018-04-19
7.	Revised for Phase 3 Regristration	2018-09-14
8.	Revised per City comments	2018-12-14
9.	Revised per City comments	2019-03-08
10.	Revised for Phase 4 Registration	2019-04-25
11.	Revised per comments for Phase 4 Registration	2019-06-24
12.	Revised for Phase 5 Registration	2019-09-10
13.	Revised per City comments for Phase 5 Registration	2019-10-24
14.	Revised per City comments for Phase 5 Registration	2019-11-06

File Reference: 14289.5.7.1 | **Date:** 2019-11-06 | **Sheet No:** 2 of 2



LEGEND

300Ø EXISTING STORM SEWER AND DIAMETER

300Ø PROPOSED STORM SEWER AND DIAMETER

J:\14289_TerraceLands\5.9 Drawings\59civil\current\Phase 5 Figures\14289-Fig8-2019-09-11.dwg Sheet Set: ####

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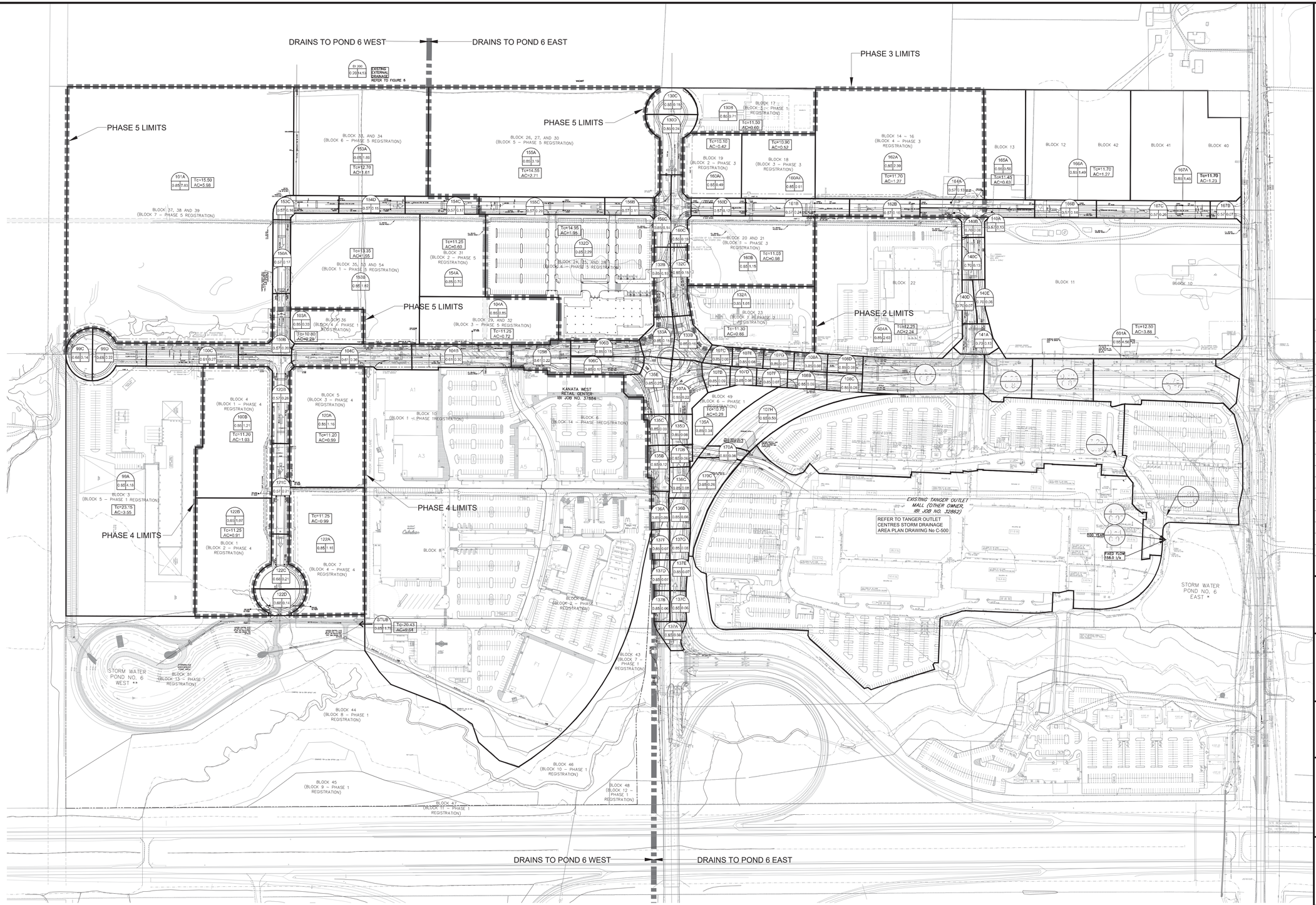
Scale	Project Title	Drawing Title	Sheet No.
IBI N.T.S.	KANATA WEST BUSINESS PARK	PROPOSED STORM SEWER PLAN	FIGURE 8



LEGEND:

- DRAINAGE AREA LIMITS
- MH601 — STORM MANHOLE & NUMBER
- STORM SEWER & FLOW DIRECTION
- 604A / 0.85 | 2.63 — AREA ID, AREA IN HECTARES, RUNOFF COEFFICIENT
- EMERGENCY OVERLAND FLOW ROUTE
- Tc=11.70 / AC=1.23 — ESTIMATED TIME OF CONCENTRATION IN MINUTES, PRODUCT OF AREA AND RUNOFF COEFFICIENT

EXISTING TANGER OUTLET CENTRE

- 0.56 / 0.85 — AREA IN HECTARES, RUNOFF COEFFICIENT

No.	REVISIONS	By	Date
20			
19			
18			
17			
16			
15	ISSUED FOR PHASE 5 REGISTRATION	LME	19: 09: 10
14	REVISED AS PER PHASE 4 COMMENTS	LME	19: 07: 25
13	REVISED AS PER PHASE 4 COMMENTS	LME	19: 07: 22
12	REVISED AS PER PHASE 4 COMMENTS	LME	19: 06: 24
11	ISSUED FOR PHASE 4 REGISTRATION	LME	19: 04: 25
10	REVISED AS PER PHASE 3 COMMENTS	LME	19: 03: 08
9	ISSUED FOR PHASE 3 TENDER	LME	19: 01: 11
8	REVISED AS PER PHASE 3 COMMENTS	LME	18: 12: 14
7	REVISED FOR PHASE 3 REGISTRATION	LME	18: 09: 14
6	REVISED FOR PHASE 2 REGISTRATION	LME	18: 04: 20
5	REVISED AS PER CITY COMMENTS	LME	15: 11: 05
4	REVISED AS PER CITY COMMENTS	LME	15: 10: 15
3	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	LME	15: 06: 19
2	REVISED AS PER CITY COMMENTS	LME	15: 04: 08
1	ISSUED TO CITY FOR APPOVAL	LME	14: 11: 27

TAGGART REALTY MANAGEMENT

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Project Title

KANATA WEST BUSINESS PARK PHASE 5

L. M. ENGEL — 100161508 — 2019/09/10 — PROVINCE OF ONTARIO

Drawing Title

STORM DRAINAGE AREA PLAN

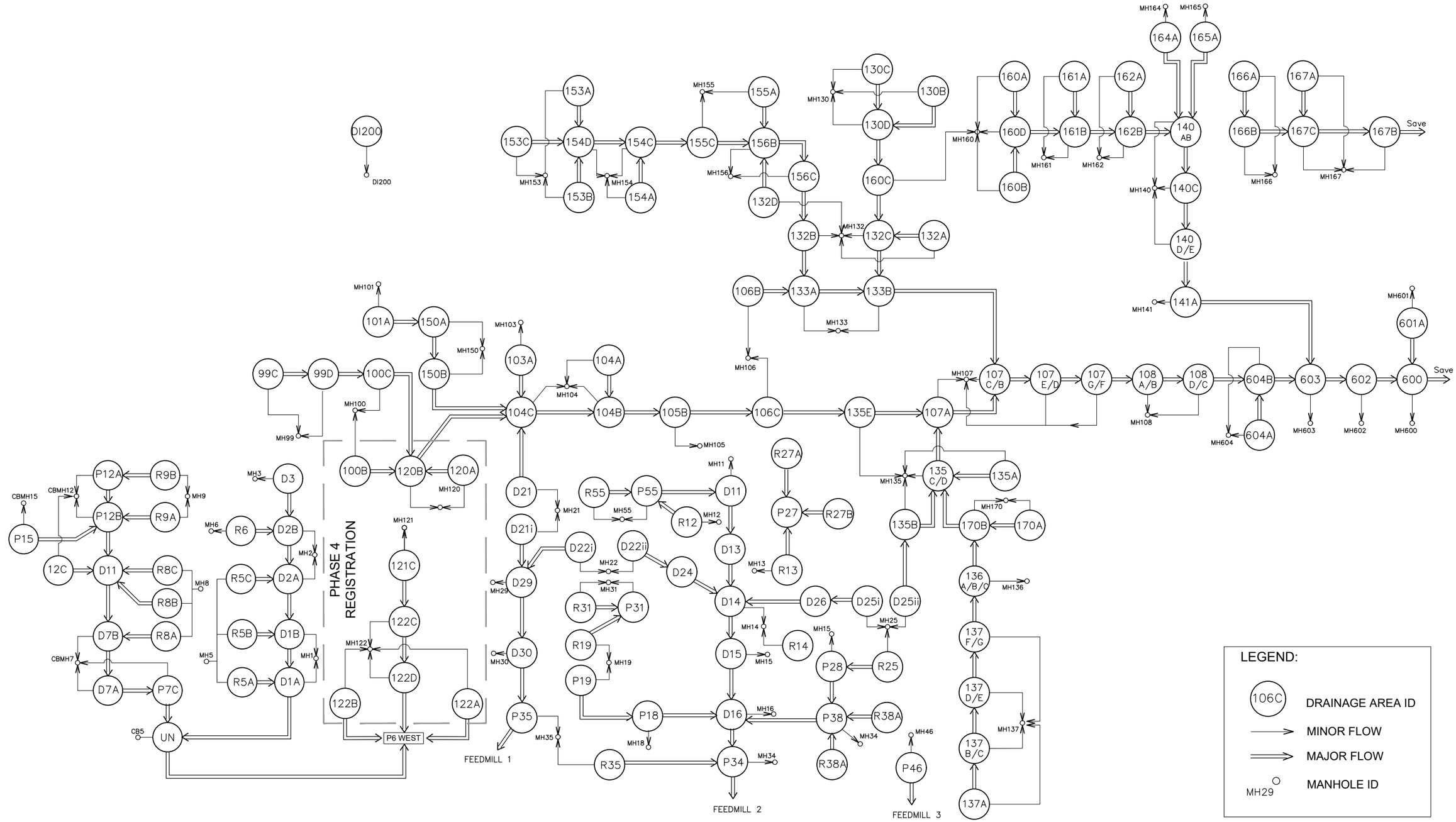
Scale: 1:2000

Design	Date
LME	NOV. 2014
Drawn	Checked
DPS	TRB
Project No.	Drawing No.
14289	500

D07-16-14-0003_P5

#17661

Area ID	Area (ha)	IMP (%)		LGI (m)	AVAILABLE/REQUIRED STORAGE (cu-m)	MINOR SYSTEM CAPTURE (l/s)
		TIMP	XIMP			
101A	**7.03**	**0.93**	**0.93**	**327**	**780**	**1230**
150A	**0.17**	**0.53**	**0.53**	**83**	**n/a**	**31**
150B	**0.2**	**0.53**	**0.53**	**75**	**7**	**37**
UPS Site modelled as per approved report "Design Brief UPS Canada Inc. 8825 Campeau Drive (IBI Group, January 2017)						
99C	0.14	0.69	0.69	30	44	33
99D	0.22	0.69	0.69	60	21	45
100C	0.27	0.59	0.59	103	13	49
100B	1.21	0.93	0.93	155	117	259
120A	1.16	0.93	0.93	214	75	191
120B	0.26	0.53	0.53	100	7	45
103A	0.33	0.93	0.93	56	20	104
104C	0.36	0.59	0.59	135	17	62
Kanata West Retail Centre modelled as per approved report "Design Brief Kanata West Retail Centre 3015, 3075 and 3095 Palladium Drive" (IBI Group, July 2017)						
121C	0.21	0.53	0.53	101	49	37
122B	1.07	0.93	0.93	149	103	231
122A	1.16	0.93	0.93	216	73	185
122C	0.21	0.69	0.69	60	21	46
122D	0.14	0.69	0.69	30	24	31
153A	**1.89**	**0.93**	**0.93**	**119**	**190**	**430**
153B	**1.82**	**0.93**	**0.93**	**129**	**180**	**408**
153C	**0.16**	**0.53**	**0.53**	**79**	**n/a**	**29**
154D	**0.15**	**0.53**	**0.53**	**76**	**n/a**	**29**
154A	**0.70**	**0.93**	**0.93**	**81**	**70**	**171**
154C	**0.17**	**0.57**	**0.57**	**82**	**48**	**33**
155C	**0.29**	**0.57**	**0.57**	**141**	**60**	**50**
155A	**3.19**	**0.93**	**0.93**	**160**	**480**	**525**
132D	**2.29**	**0.93**	**0.93**	**157**	**360**	**377**
156B	**0.11**	**0.57**	**0.57**	**56**	**5**	**22**
156C	0.14	0.93	0.93	82	7	40
132B	0.15	0.93	0.93	80	9	43
130C	0.15	0.93	0.93	30	15	41
130B	0.71	0.93	0.93	101	120	111
130D	0.24	0.93	0.93	67	15	62
160C	0.15	0.93	0.93	81	n/a	43
132A	1.01	0.93	0.93	117	132	187
132C	0.15	0.93	0.93	77	4	43
104A	**0.85**	**0.93**	**0.93**	**95**	**90**	**204**
104B	0.3	0.71	0.71	111	65	75
105B	0.22	0.93	0.93	65	n/a	57
106C	0.17	0.93	0.93	82	1	110
135E	0.25	0.93	0.93	50	11	80
106B	0.15	0.93	0.93	82	1	58
133A	0.15	0.93	0.93	57	19	48
133B	0.16	0.93	0.93	57	n/a	74
137A	0.08	0.93	0.93	33	n/a	38
137B/C	0.12	0.93	0.93	36	n/a	57



J:\14289_TerraceLands\5.9 Drawings\59swm\Figures\PH5 REGISTRATION\Swmhymo Schematic-PH5.dwg Sheet Set: ####

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Scale

IBI

N.T.S.

Project Title

KANATA WEST BUISINESS PARK
PHASE 5 REGISTRATION

Drawing Title

OVERALL
SWMHYMO SCHEMATIC

Sheet No.

Table 4.10 Summary of Hydraulic Grade Line during the 100 year 12 hour SCS Storm and 100 year 3 hour Chicago Storm

LOCATION		MH	FINISHED FLOOR ELEVATION (M)	100 YEAR 12 HOUR SCS		100 YEAR 3 HOUR CHICAGO		100 YEAR 12 HOUR SCS +20%		100 YEAR 3 HOUR CHICAGO +20%	
				HGL (M)	FB (M)	HGL (M)	FB (M)	HGL (M)	FB (M)	HGL (M)	FB (M)
POND 6 WEST	NIPISSING COURT	P6WEST	**N/A**	103.26	N/A	102.93	N/A	103.71	N/A	103.28	N/A
		123	**105.37 (T/G)**	103.28	2.09	102.94	2.43	103.73	1.64	103.30	2.07
		122	**106.20**	103.34	2.86	102.97	3.23	103.76	2.44	103.32	2.88
		121	**106.20**	103.40	2.90	103.03	3.27	103.78	2.52	103.34	2.96
		120	**106.30**	103.48	2.83	103.07	3.23	103.83	2.47	103.41	2.89
	UPPER CANADA ST	150	**106.00**	103.51	2.49	103.09	2.91	103.86	2.14	103.45	2.55
		151	**106.00**	103.60	2.40	103.14	2.86	103.91	2.09	103.54	2.46
		152	**105.90**	103.63	2.27	103.17	2.73	103.92	1.98	103.58	2.32
		152B	**105.85**	103.65	2.20	103.19	2.66	103.93	1.92	103.60	2.25
		153	**105.85**	103.81	2.04	103.34	2.51	104.03	1.82	103.74	2.11
		154	**105.80**	103.82	1.98	103.35	2.45	104.05	1.75	103.76	2.04
	CAMPEAU DR.	99	**106.70**	103.66	3.04	103.16	3.54	103.91	2.79	103.56	3.14
		100	**106.75**	103.60	3.15	103.16	3.60	103.87	2.88	103.54	3.21
		101	**106.60**	103.57	3.03	103.13	3.47	103.88	2.72	103.51	3.09
		102	**106.00**	103.51	2.49	103.08	2.92	103.85	2.15	103.44	2.57
		103	**105.85**	103.63	2.22	103.25	2.60	103.95	1.90	103.54	2.31
		104	**105.45**	103.71	1.74	103.33	2.12	104.01	1.44	103.62	1.83
POND 6 EAST	CAMPEAU DR.	P6EAST	**N/A**	98.40	N/A	98.37	N/A	98.55	N/A	98.48	N/A
		13	**100.42 (T/G)**	98.50	1.92	98.44	1.98	98.71	1.71	98.56	1.86
		12	**101.30 (T/G)**	98.71	2.59	98.56	2.74	98.96	2.34	98.77	2.53
		9	**101.38 (T/G)**	98.96	2.42	98.77	2.61	99.30	2.08	99.07	2.31
		600	**102.60**	99.51	3.09	99.22	3.38	100.02	2.58	99.78	2.82
		601	**102.60**	99.43	3.17	99.21	3.39	99.93	2.67	99.69	2.91
		602	**102.70**	100.00	2.70	99.72	2.98	100.70	2.00	100.39	2.31
		603	**103.30**	100.47	2.83	100.16	3.14	101.32	1.98	100.94	2.36
		604	**103.30**	100.84	2.47	100.52	2.78	101.87	1.43	101.42	1.88
		108	**104.00**	101.06	2.94	100.76	3.24	102.24	1.76	101.73	2.27
		107	**104.00**	101.30	2.70	101.02	2.98	102.64	1.36	102.07	1.93
		106	**105.10**	101.34	3.76	101.09	4.01	102.78	2.32	102.14	2.96
		105	**105.45**	101.42	4.03	101.41	4.04	102.93	2.52	102.16	3.29
	JOURNEYMAN ST	141	**102.70**	100.58	2.12	100.26	2.44	101.44	1.26	101.05	1.65
		140	**102.70**	100.70	2.00	100.37	2.33	101.57	1.13	101.17	1.53
	UPPER CANADA ST	164	**102.90**	100.70	2.20	100.38	2.52	101.57	1.33	101.17	1.73
		165	**102.90**	100.72	2.18	100.39	2.51	101.59	1.31	101.19	1.71
		166	**102.55**	100.75	1.80	100.56	1.99	101.62	0.93	101.21	1.34
		167	**102.20**	100.79	1.41	100.55	1.65	101.63	0.57	101.22	0.98
		163	**102.90**	100.75	2.15	100.43	2.47	101.62	1.28	101.22	1.68
		162	**103.25**	100.99	2.26	100.65	2.60	101.87	1.38	101.45	1.80
		161	**103.90**	101.09	2.81	100.74	3.16	101.97	1.93	101.54	2.36
		160	**104.25**	101.29	2.96	100.89	3.36	102.17	2.08	101.72	2.53
	PALLADIUM DR	134	**104.60**	101.45	3.15	101.14	3.46	102.86	1.74	102.18	2.42
		135	**104.60**	101.77	2.83	101.42	3.18	103.24	1.36	102.38	2.22
		136	**105.42 (T/G)**	102.51	2.91	102.56	2.86	103.86	1.57	102.59	2.84
		137	**107.79 (T/G)**	104.57	3.22	104.65	3.14	105.13	2.66	104.65	3.14
		133	**104.00**	101.48	2.52	101.21	2.79	102.86	1.14	102.29	1.71
		132	**104.00**	101.71	2.29	101.45	2.55	103.11	0.89	102.55	1.45
		131	**105.10**	101.80	3.30	101.54	3.56	103.23	1.87	102.66	2.44
		130	**104.95**	101.81	3.14	101.56	3.39	103.30	1.65	102.68	2.27
	UPPER CANADA ST	156	**104.36 (T/G)**	102.03	2.33	101.83	2.53	103.50	0.86	102.93	1.43
		155	**104.93 (T/G)**	102.19	2.74	102.13	2.80	103.65	1.28	103.08	1.85

(Model Files: 14289-100YRSCS-2019-08-27.out, 32862-100YRSCS-2019-08-27.out, 14289-100YRCHI-2019-08-27.out, 32862-100YRCHI-2019-08-27.out, 14289-100YRSCS20%-2019-08-27.out, 32862-100YRSCS20%-2019-08-27.out, 14289-100YRCHI20%-2019-08-27.out, 32862-100YRCHI20%-2019-08-27.out)

The hydraulic grade line will be at least 1.41m below the T/G or finished floor elevation within the proposed Phase 5 of the KWBP. A summary of all results of the computer simulations are presented within **Appendix C**. It should be noted that the Kanata West Business Park will be comprised of typical commercial type buildings constructed using slab on grade foundation type (ie no basement).

Table 3.16 - 90th and 95th Percentile event daily rainfall volumes from daily climate data collected proximal to the City of Ottawa.

Station Name	Annual Average		Number of Years in Analysis	90th Percentile Daily Volume (mm)				95th Percentile Daily Volume (mm)			
				All Rainfall Events		Apr. 1st - Oct. 31st		All Rainfall Events		Apr. 1st - Oct. 31st	
	Precipitation* (mm)	Oct. to Apr. Rainfall) (mm)		2 mm Cut-off	5 mm Cut-off	2 mm Cut-off	5 mm Cut-off	2 mm Cut-off	5 mm Cut-off	2 mm Cut-off	5 mm Cut-off
OTTAWA CDA	910	583	36	21.2	25.8	21.8	25.8	27.2	31.4	27.4	31.8
OTTAWA MACDONALD-CARTIER INT'L A	935	580	36	22.0	26.6	22.6	26.8	28.6	34.4	29.0	35.0
Average	922	581	36	21.6	26.2	22.2	26.3	27.9	32.9	28.2	33.4

3.7.3.3 Windsor

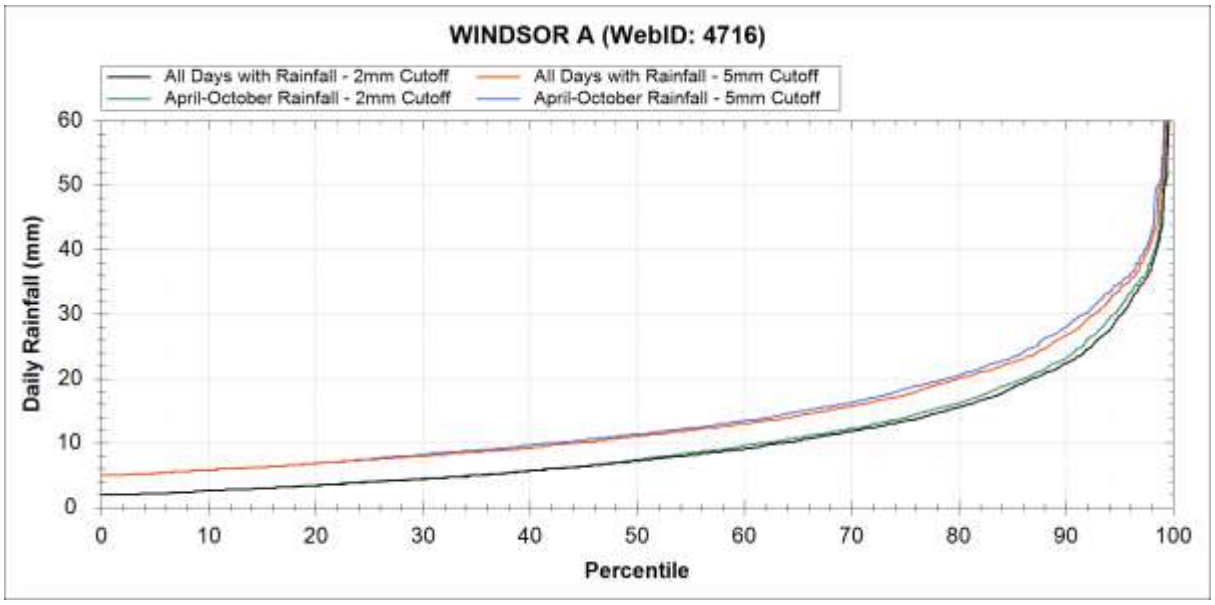


Figure 3.59 - Daily rainfall frequency curves derived from daily rainfall data at ECCC climate station WINDSOR A.

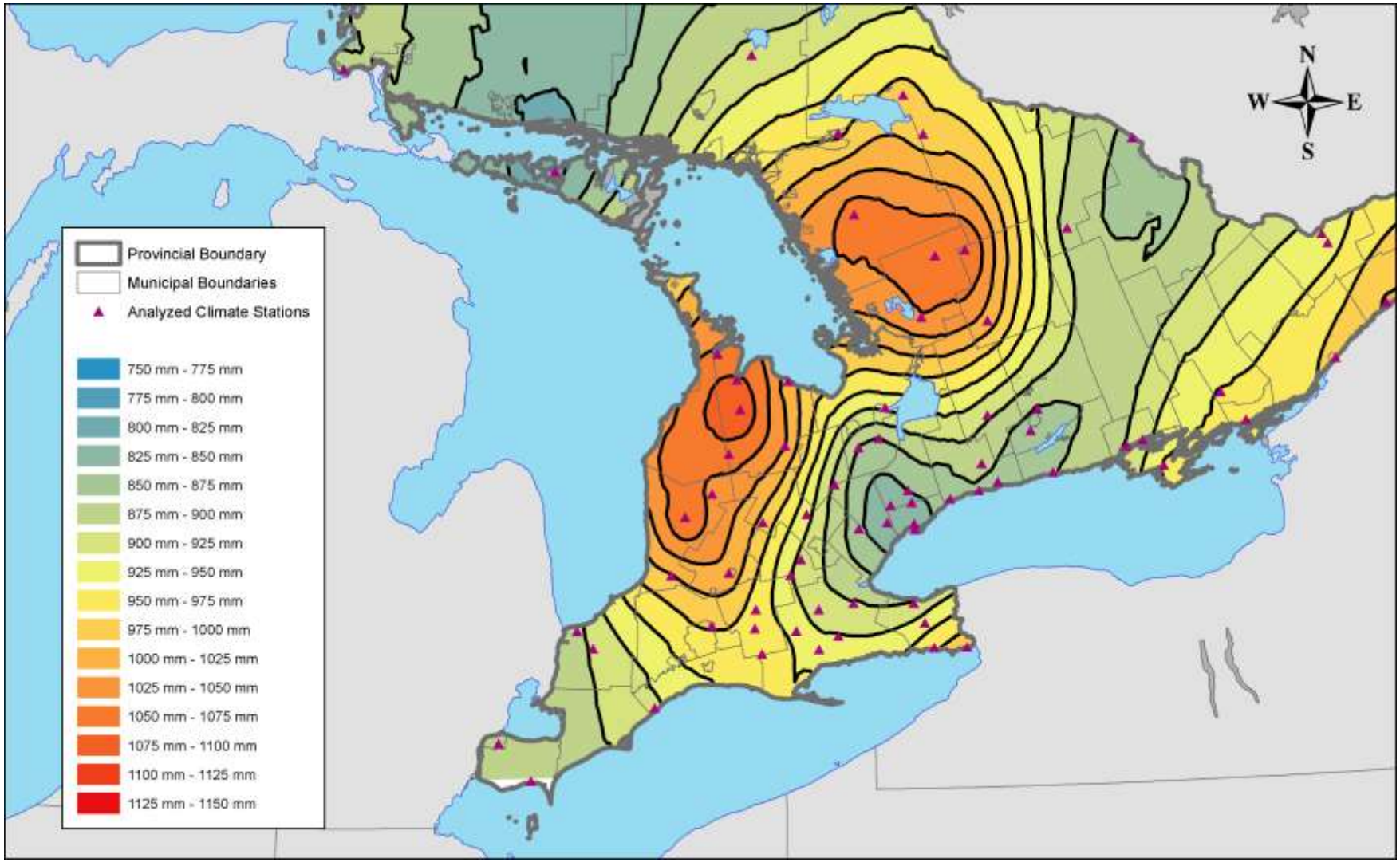


Figure 3.41 - Average annual precipitation in southern Ontario (1970-2005).

Grain Size Distribution Sieve Analysis

Grain size distribution (sieve analysis) was also completed on two (2) selected soil samples. The results of the grain size analysis are summarized in Table 2 and presented on the Grain-Size Distribution Testing Results sheets in Appendix 1.

Table 1 - Summary of Grain Size Distribution Analysis

Test Hole	Sample	Gravel (%)	Sand (%)	Silt and Clay (%)
BH 1-21	SS5	0.0	12.4	87.6
BH 3-21	SS6	1.0	38.4	60.6

4.3 Groundwater

Groundwater level readings were recorded on March 31, April 12 and May 7, 2021. The groundwater level readings are presented in the Soil Profile and Test Data sheets in Appendix 1 and summarized in Table 2. It should be noted that groundwater levels are subject to seasonal fluctuations, therefore, the groundwater levels could vary at the time of construction.

Based on available design plans, the proposed finished floor elevation in the office is 108.2 m and the underground level underside of footing elevation is 3.7 m below the finished floor elevation, corresponding to a geodetic elevation of 104.5 m.

Table 2 - Summary of Groundwater Levels

Borehole Number	Ground Elev. (m)	Groundwater Levels (m)		Recording Date
		Depth	Elevation	
BH 1-21	105.80	0.30	**105.50**	Mar. 31, 2021
		0.65	**105.15**	April 12, 2021
		0.57	**105.23**	May 7, 2021
BH 2-21	106.18	0.68	**105.50**	Mar. 31, 2021
		0.73	**105.45**	April 12, 2021
		0.68	**105.50**	May 7, 2021

Table 2 - Summary of Groundwater Levels cont.				
BH 3-21	106.59	0.62	**105.97**	Mar. 31, 2021
		0.93	**105.66**	April 12, 2021
		0.86	**105.73**	May 7, 2021
BH 1	105.99	1.5	104.49	Jan. 15, 2014
BH 2	104.99	1.8	103.19	Jan. 15, 2014
BH 17	105.68	2.0	103.68	Jan. 15, 2014
BH 18	105.53	1.5	104.03	Jan. 15, 2014
BH 19	105.08	2.0	103.08	Jan. 15, 2014

Table 4 - Recommended Flexible Pavement Structure - Car Only Parking Areas	
Thickness (mm)	**Material Description**
50	**Wear Course** - HL 3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill	

Table 5 - Recommended Flexible Pavement Structure - Access Lanes and Heavy Truck Parking/loading Areas	
Thickness (mm)	**Material Description**
40	**Wear Course -** Superpave 12.5 Asphaltic Concrete
50	**Binder Course -** Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill	

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material. The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable vibratory equipment.

5.8 Hydraulic Conductivity Testing

Hydraulic conductivity testing was completed at borehole BH 1-21 which was outfitted with a monitoring well and screened within the silty sand to sandy silt and glacial till layers. Rising head and falling head testing ("slug testing") was completed within the soil strata in accordance with ASTM Standard Test Method D4404 - Field Procedure for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers.

Following the completion of the slug testing, the test data was analyzed as per the method set out by Hvorslev (1951). Assumptions inherent in the Hvorslev method include a homogeneous and isotropic aquifer of infinite extent with zero-storage assumption, and a screen length significantly greater than the monitoring well diameter. The assumption regarding aquifer storage is considered to be appropriate for groundwater flow through the overburden aquifer. The assumption regarding screen length and well diameter is considered to be met based on the screen length of 3 m and the well diameter of 0.051 m at borehole BH 1-21.

While the idealized assumptions regarding aquifer extent, homogeneity, and isotropy are not strictly met in this case (or in any real-world situation), it has been our experience that the Hvorslev method produces effective point estimates of hydraulic conductivity in conditions similar to those encountered at the subject site.

The Hvorslev analysis is based on the line of best fit through the field data (hydraulic head recovery vs. time), plotted on a semi-logarithmic scale. In cases where the initial hydraulic head displacement is known with relative certainty, such as in this case where a physical slug has been introduced/removed, the line of best fit is considered to pass through the origin.

Based on the above test methods, the monitoring wells screened in the overburden soils displayed a hydraulic conductivity value ranging from **4.6×10^{-6} to 1.34×10^{-5} m/sec**. The values measured within the monitoring well are generally consistent with similar material Paterson has encountered on other sites and typical published values for silty sand and sandy silt. These values typically range from 1×10^{-4} to 1×10^{-6} m/sec. The results from the hydraulic conductivity testing are attached to the current report.

5.9 Percolation Rates

Infiltration galleries are anticipated to be located beneath the roller compacted concrete pavement structure within the subject site. Paterson completed hydraulic conductivity testing at borehole BH 1-21 in order to establish hydraulic conductivity and percolation time of in-situ materials.

It is anticipated that a silty sand to sandy silt will be encountered at the base of the infiltration galleries during the installation and will affect the rate of stormwater infiltration into the underlying material. The results of the hydraulic conductivity testing were used to determine the estimated percolation rates of the in-situ soils using the approximate relationship between infiltration rate and hydraulic conductivity, as described in the Draft LID Guidance Document, dated December 2019. Based on this relationship, the estimated percolation rate (T-Time) was estimated to be within the ranges in Table 5.

Table 6 - Estimated Percolation Rates

Material	Hydraulic Conductivity - k (m/sec)	Percolation (T-time) - (mins/cm)
Silty Fine Sand to Sandy Silt	**1.3×10^{-5} to 4.6×10^{-6}**	**6 to 10**

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Commercial Development
8800 Campeau Drive - Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5618

REMARKS

HOLE NO. BH 1-21

BORINGS BY CME 55 Power Auger **DATE** 2021 March 15

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	105.80
TOPSOIL 0.08		AU	1				
FILL: Brown silty clay trace sand and gravel 0.46							
Compact brown **SILTY SAND** to **SANDY SILT**		SS	2	58	23	1	104.80
1.83		SS	3	33	13	2	103.80
Compact to loose grey **SILTY SAND** to **SANDY SILT**		SS	4	50	17		
		SS	5	42	9	3	102.80
		SS	6	33	5	4	101.80
4.52							
GLACIAL TILL: Grey silty sand to sandy silt some gravel, trace clay, cobbles and boulders		SS	7	50	1	5	100.80
		SS	8	50	33		
5.94							
End of Borehole							
(GWL @ 0.30 m depth - March 31, 2021)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Commercial Development
8800 Campeau Drive - Ottawa, Ontario

DATUM Geodetic

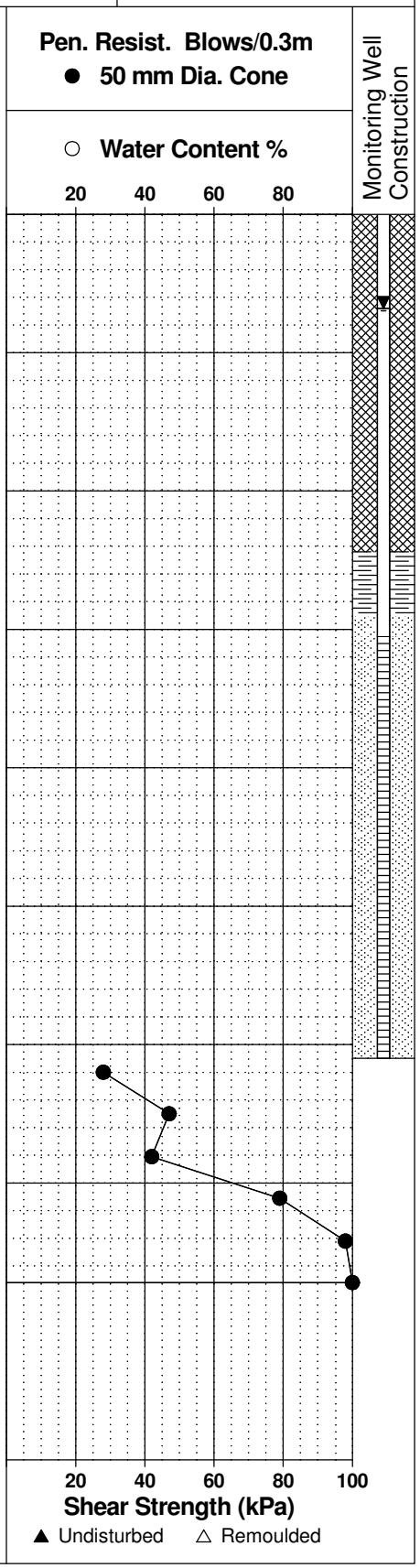
FILE NO. PG5618

REMARKS

HOLE NO. BH 2-21

BORINGS BY CME 55 Power Auger **DATE** 2021 March 15

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	106.18
TOPSOIL 0.10		AU	1				
FILL: Brown silty clay with sand and gravel 0.36							
Loose to compact brown **SILTY SAND** to **SANDY SILT**		SS	2	25	6	1	105.18
		SS	3	42	18	2	104.18
2.13							
Loose to firm grey **SILTY SAND** to **SANDY SILT**		SS	4	42	9	3	103.18
		SS	5	50	9		
		SS	6	50	6	4	102.18
		SS	7	42	11	5	101.18
5.64		SS	8	58	20		
GLACIAL TILL: Compact grey silty sand to sandy silt some gravel, trace clay, cobbles and boulders 6.10						6	100.18
Dynamic Cone Penetration Test commenced at 6.10 m depth.						7	99.18
7.72							
End of Borehole							
Practical refusal to DCPT at 7.72 m depth							
(GWL @ 0.68 m depth - March 31, 2021)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Commercial Development
8800 Campeau Drive - Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5618

REMARKS

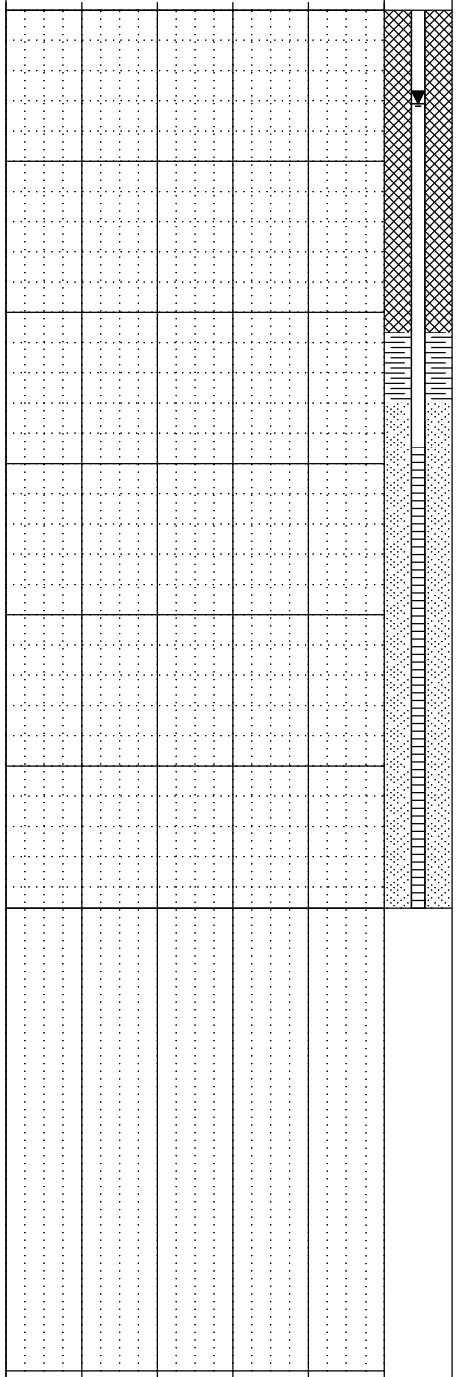
HOLE NO. BH 3-21

BORINGS BY CME 55 Power Auger **DATE** 2021 March 15

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	106.59
TOPSOIL 0.08		AU	1				
FILL: Brown silty clay with sand, trace gravel and topsoil 0.30							
Compact brown **SILTY SAND** to **SANDY SILT**		SS	2	25	3	1	105.59
- Dense by 1.7 m depth		SS	3	67	20	2	104.59
2.13							
Compact to loose grey **SILTY SAND** to **SANDY SILT**		SS	4	50	12	3	103.59
		SS	5	50	11		
		SS	6	50	5	4	102.59
		SS	7	33	8	5	101.59
		SS	8	67	W		
5.94							
End of Borehole							
(GWL @ 0.62 m depth - March 31, 2021)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80



20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Commercial Development - Huntmar Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

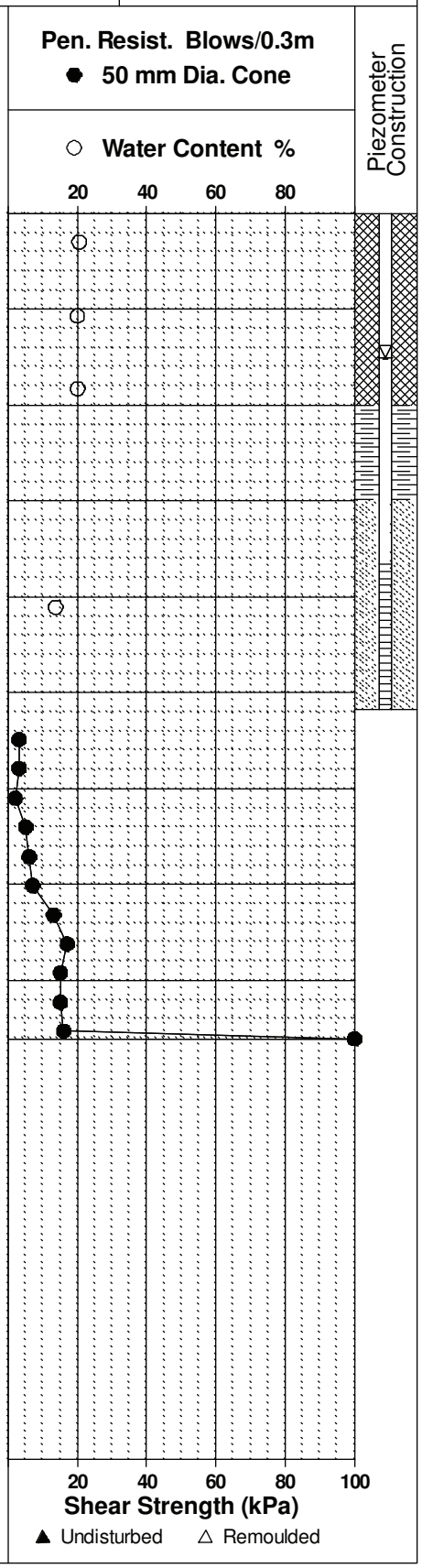
FILE NO. PG3115

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** January 15, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	105.99
TOPSOIL 0.28		AU	1				
Compact, brown **SILTY FINE SAND**		SS	2	71	11	1	104.99
- grey by 1.5m depth		SS	3	54	11	2	103.99
2.97		SS	4	25	13	3	102.99
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders		SS	5	58	3	4	101.99
		SS	6	67	17		
5.18		SS	7	50	3	5	100.99
Dynamic Cone Penetration Test commenced at 5.18m depth.						6	99.99
Inferred **GLACIAL TILL**						7	98.99
8.61						8	97.99
End of Borehole							
Practical DCPT refusal at 8.61m depth							
(GWL @ 1.5m depth based on field observations)							



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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Commercial Development - Huntmar Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG3115

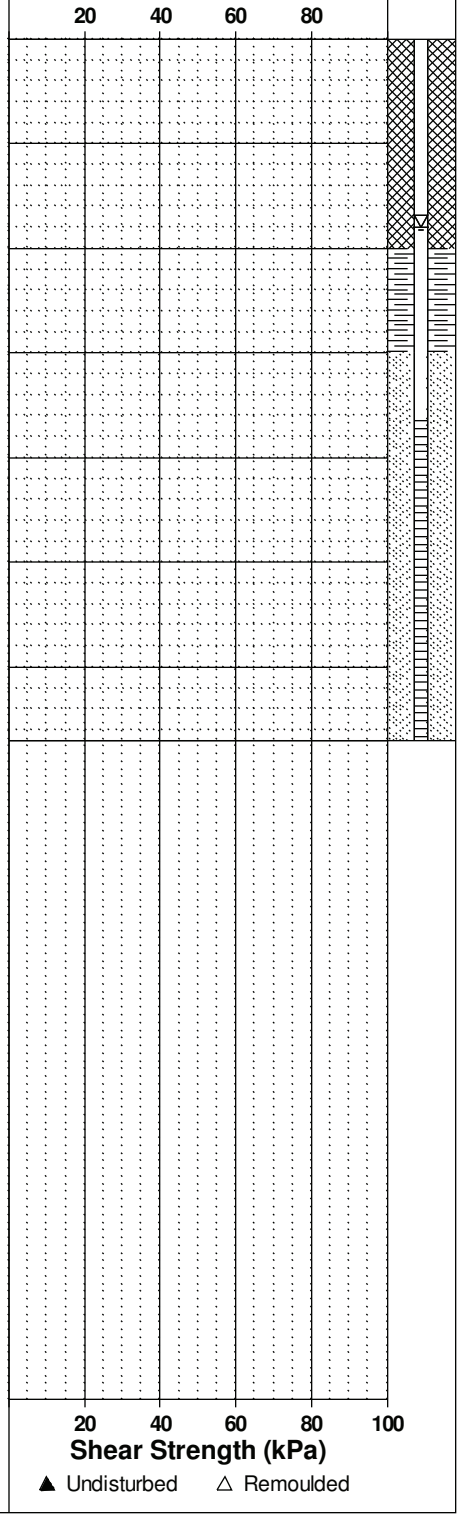
REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** January 15, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	104.99
TOPSOIL 0.36		AU	1				
Brown **SILTY CLAY,** trace sand 0.69		AU	2				
		SS	3	100	14	1	103.99
		SS	4	83	12	2	102.99
Compact, brown **SILTY FINE SAND**		SS	5	71	8		
- grey by 3.0m depth		SS	6	58	9	3	101.99
		SS	7	54	6	4	100.99
		SS	8	58	10	5	99.99
		SS	9	58	12		
6.02						6	98.99
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders, trace clay 6.70		SS	10	67	24		
End of Borehole							
(GWL @ 1.8m depth based on field observations)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %



Piezometer Construction

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Commercial Development - Huntmar Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG3115

REMARKS

HOLE NO. BH17

BORINGS BY CME 55 Power Auger **DATE** January 15, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	105.68
TOPSOIL 0.30							
		SS	1	83	10	1	104.68
		SS	2	54	8	2	103.68
		SS	3	67	2		
Loose, grey **SILTY FINE SAND**		SS	4	62	3	3	102.68
		SS	5	67	8	4	101.68
		SS	6	67	5	5	100.68
		SS	7	54	2		
6.00						6	99.68
GLACIAL TILL: Grey silty sand with clay, gravel, cobbles and boulders 6.70		SS	8	50	3		
End of Borehole							
(GWL @ 2.0m depth based on field observations)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Commercial Development - Huntmar Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG3115

REMARKS

HOLE NO. BH18

BORINGS BY CME 55 Power Auger **DATE** January 15, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	105.53
TOPSOIL 0.20		AU	1				
		SS	2	83	11	1	104.53
		SS	3	62	13	2	103.53
Compact to loose, brown **SILTY FINE SAND**		SS	4	67	9		
- grey by 3.0m depth		SS	5	58	7	3	102.53
		SS	6	58	10	4	101.53
		SS	7	71	7	5	100.53
		SS	8	67	6		
		SS	9	50	3	6	99.53
6.70							
End of Borehole							
(GWL @ 1.5m depth based on field observations)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Commercial Development - Huntmar Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG3115

REMARKS

HOLE NO. BH19

BORINGS BY CME 55 Power Auger **DATE** January 15, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	105.08
TOPSOIL 0.23							
		SS	1	62	12	1	104.08
		SS	2	71	1	2	103.08
Compact o very loose, brown **SILTY FINE SAND**		SS	3	62	1		
- grey-brown by 2.2m depth		SS	4	67	8	3	102.08
- trace gravel below 3.0m depth		SS	5	83	1	4	101.08
- grey by 3.7m depth		SS	6	25	3	5	100.08
5.26							
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders		SS	7	100	14	6	99.08
		SS	8	100	32		
6.70							
End of Borehole							
(GWL @ 2.0m depth based on field observations)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

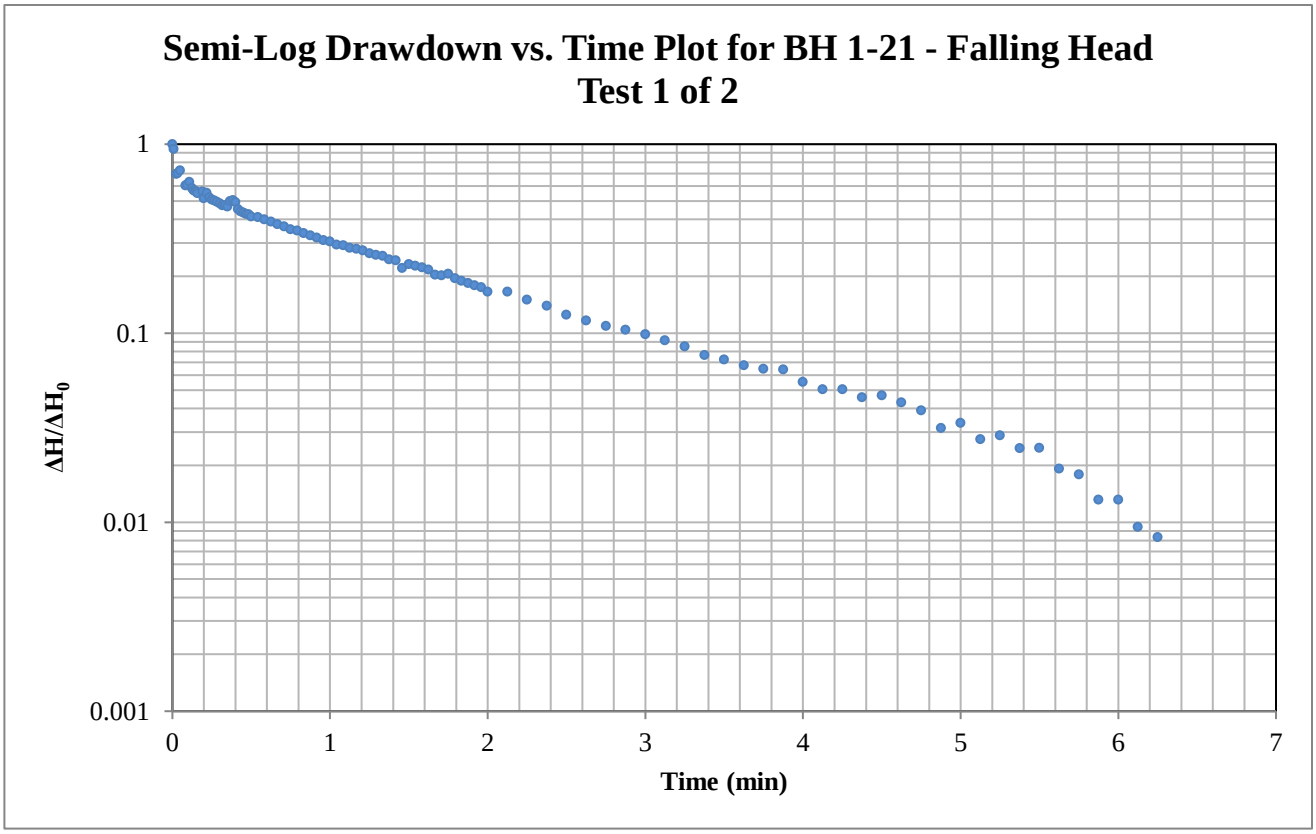
Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

Report: PG5673

Hvorslev Hydraulic Conductivity Analysis

Project: Maritime Ontario c/o Realinc-SCS - 8800 Campeau Drive
Test Location: BH 1-21
Test: 1 of 2 Falling Head
Date: May 7, 2021



Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F}\frac{1}{t^*}\ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 4.00025

Well Parameters:

L	3.048	m	Saturated length of screen or open hole
D	0.0508	m	Diameter of well
r_c	0.0254	m	Radius of well

Data Points (from plot):

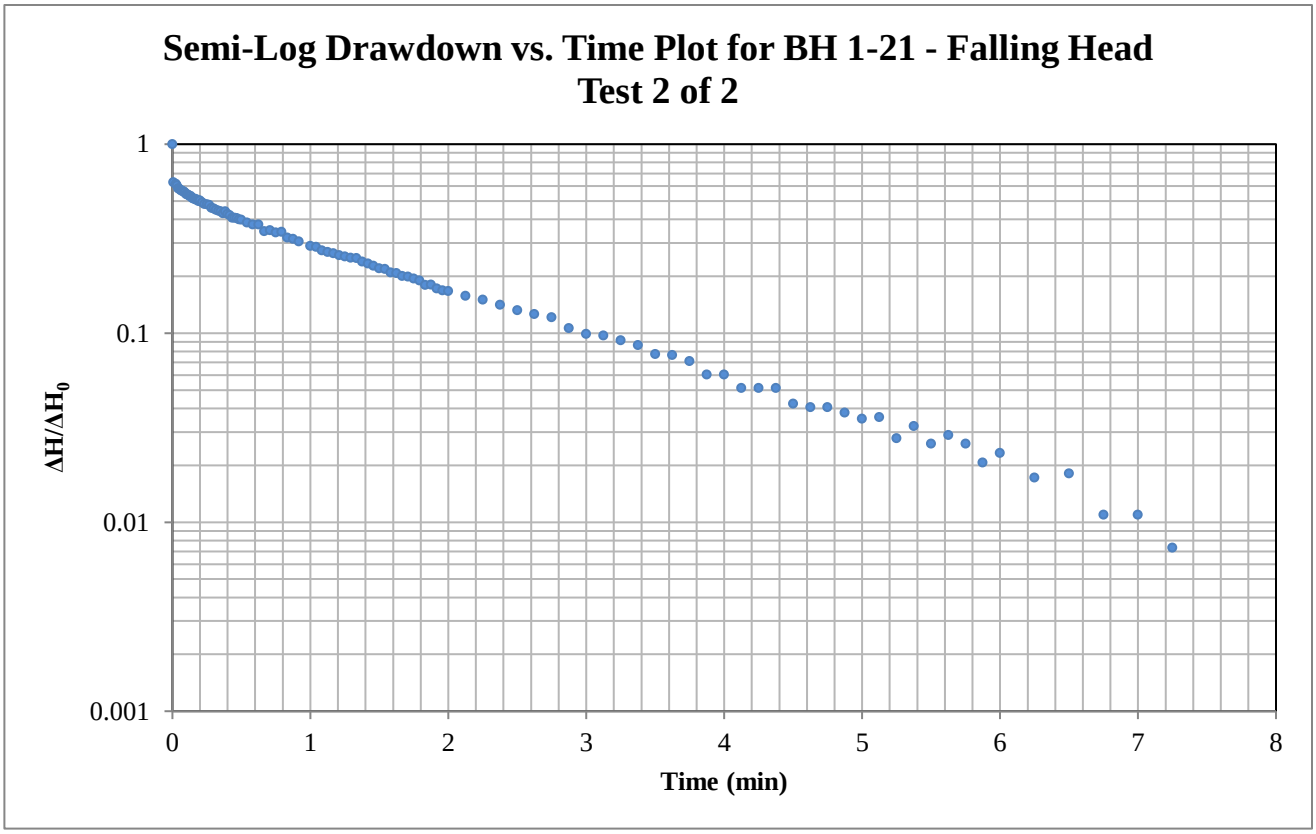
t*: 0.679 minutes $\Delta H^*/\Delta H_0$: 0.37

Horizontal Hydraulic Conductivity
K = 1.24E-05 m/sec

Report: PG5673

Hvorslev Hydraulic Conductivity Analysis

Project: Maritime Ontario c/o Realinc-SCS - 8800 Campeau Drive
Test Location: BH 1-21
Test: 2 of 2 Falling Head
Date: May 7, 2021



Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F}\frac{1}{t^*}\ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 4.00025

Well Parameters:

L	3.048	m	Saturated length of screen or open hole
D	0.0508	m	Diameter of well
r_c	0.0254	m	Radius of well

Data Points (from plot):

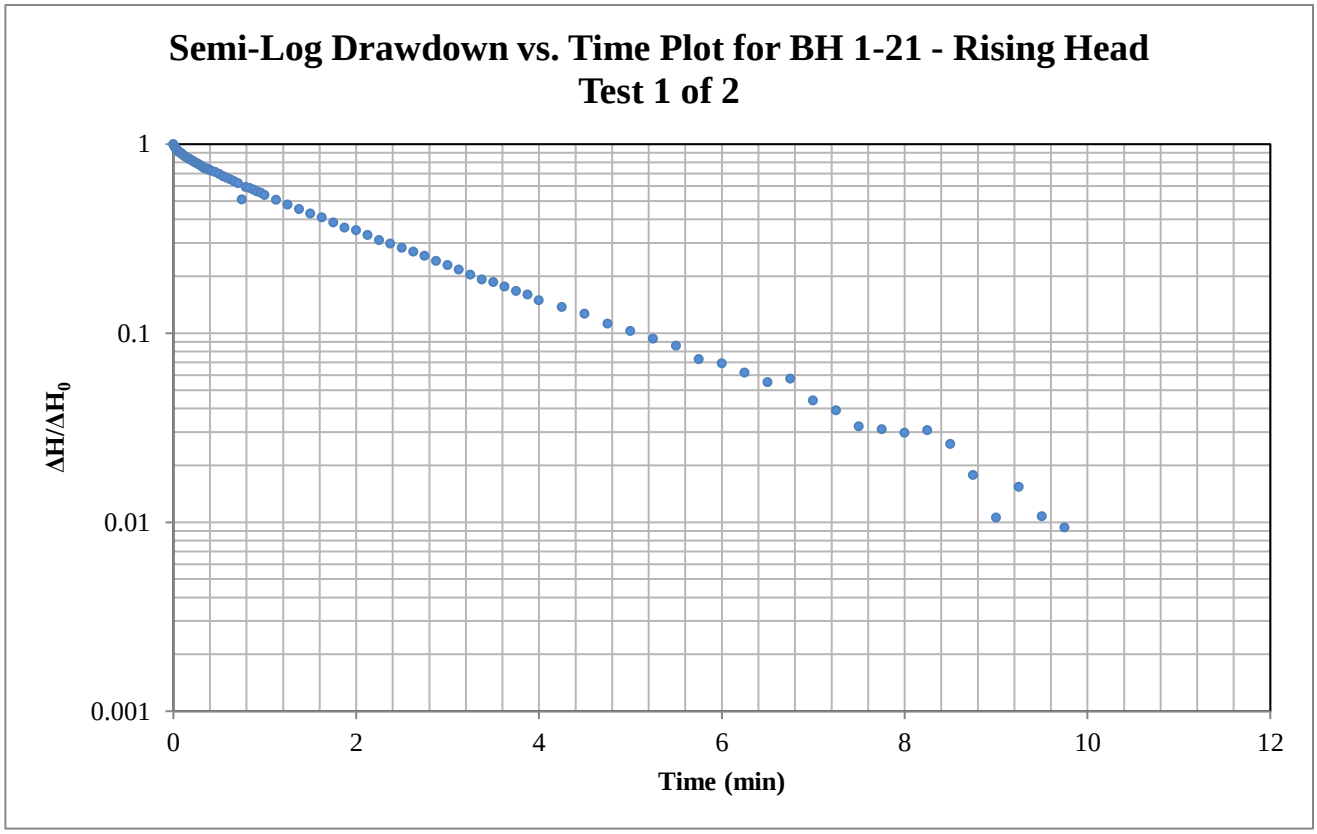
t*: 0.628 minutes $\Delta H^*/\Delta H_0$: 0.37

Horizontal Hydraulic Conductivity
K = 1.34E-05 m/sec

Report: PG5673

Hvorslev Hydraulic Conductivity Analysis

Project: Maritime Ontario c/o Realinc-SCS - 8800 Campeau Drive
Test Location: BH 2-21
Test: 1 of 2 Rising Head
Date: May 7, 2021



Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F}\frac{1}{t^*}\ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 4.00025

Well Parameters:

L	3.048	m	Saturated length of screen or open hole
D	0.0508	m	Diameter of well
r_c	0.0254	m	Radius of well

Data Points (from plot):

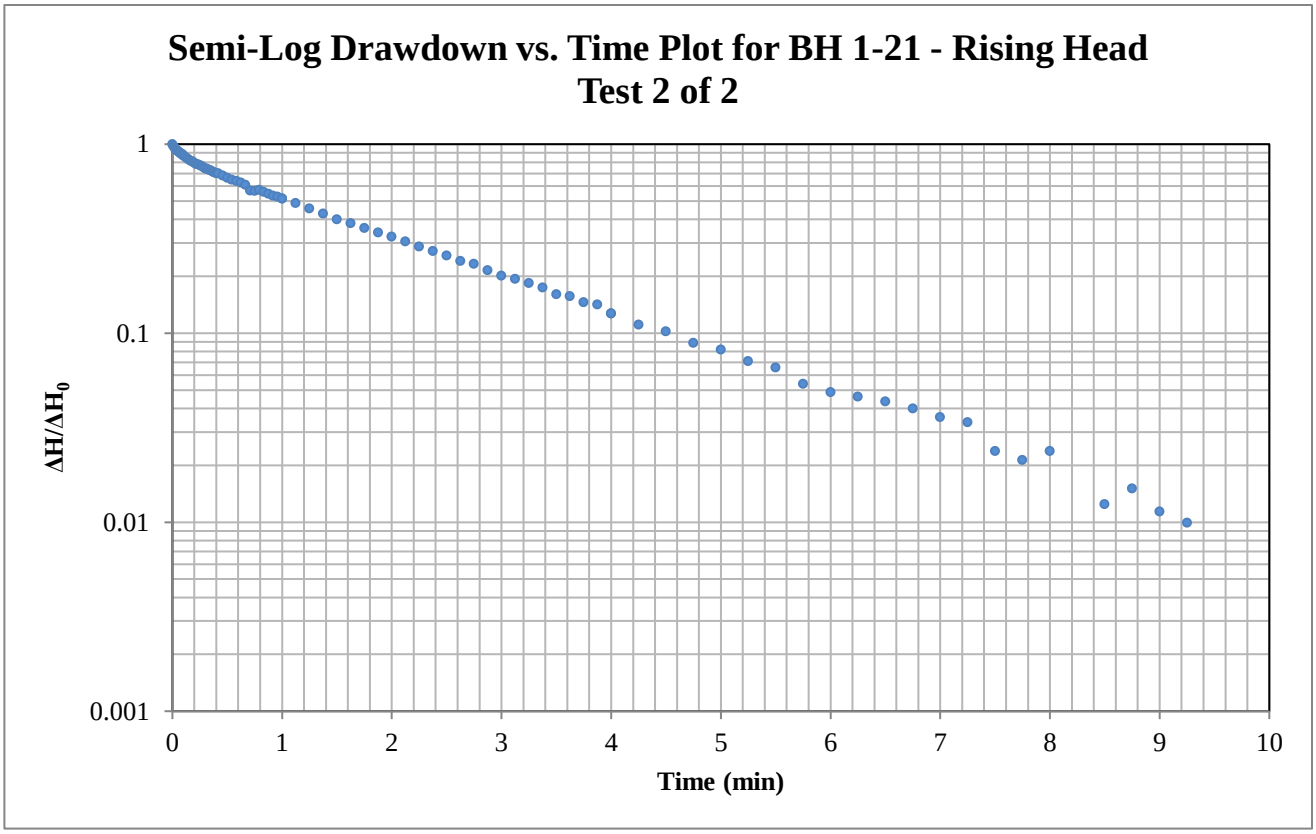
t*: 1.841 minutes $\Delta H^*/\Delta H_0$: 0.37

Horizontal Hydraulic Conductivity
K = 4.56E-06 m/sec

Report: PG5673

Hvorslev Hydraulic Conductivity Analysis

Project: Maritime Ontario c/o Realinc-SCS - 8800 Campeau Drive
Test Location: BH 2-21
Test: 2 of 2 Rising Head
Date: May 7, 2021



Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F}\frac{1}{t^*}\ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 4.00025

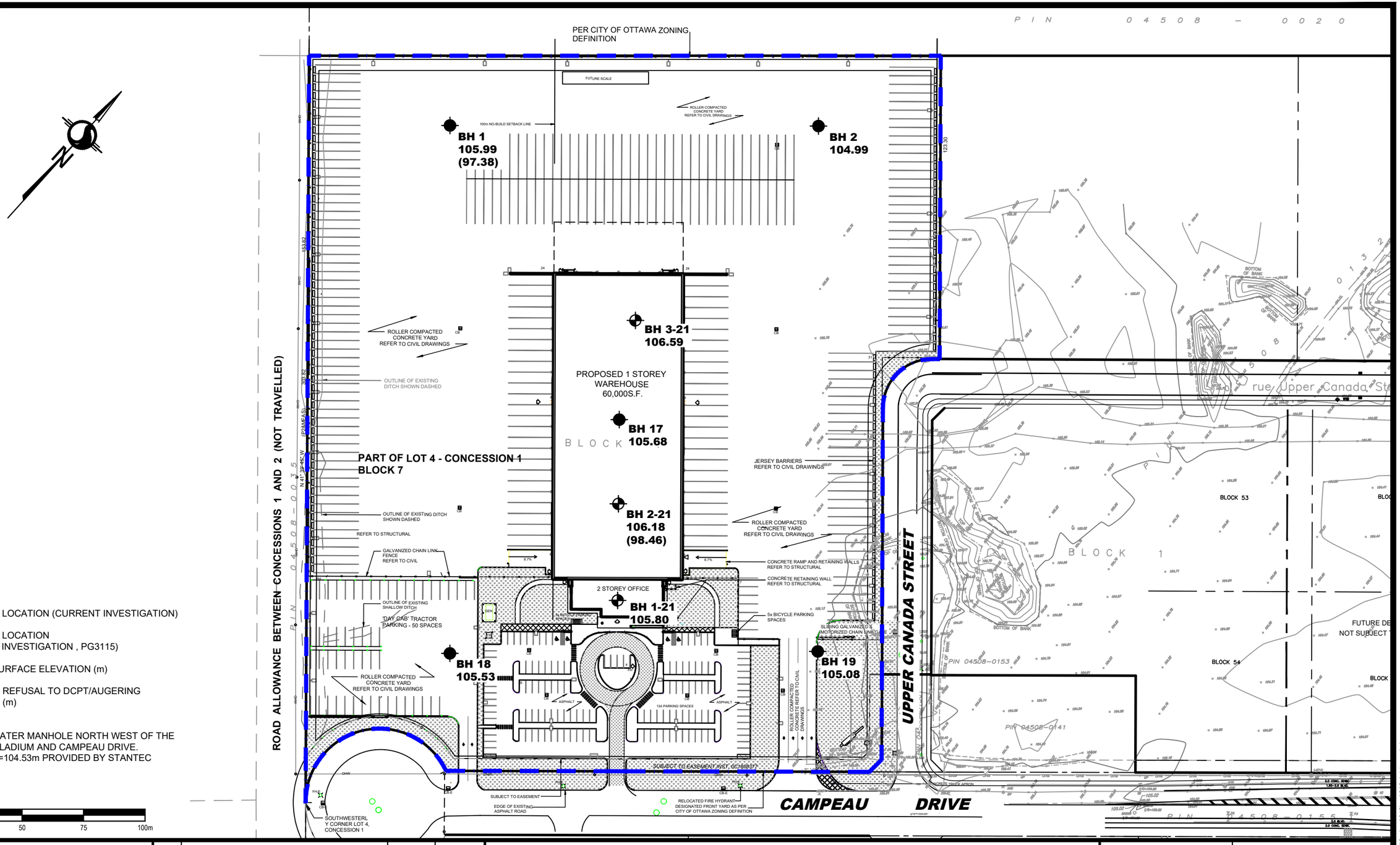
Well Parameters:

L	3.048	m	Saturated length of screen or open hole
D	0.0508	m	Diameter of well
r_c	0.0254	m	Radius of well

Data Points (from plot):

t*: 1.705 minutes $\Delta H^*/\Delta H_0$: 0.37

Horizontal Hydraulic Conductivity
K = 4.93E-06 m/sec



LEGEND:

- BOREHOLE LOCATION (CURRENT INVESTIGATION)
- BOREHOLE LOCATION (PREVIOUS INVESTIGATION , PG3115)
- 105.99 GROUND SURFACE ELEVATION (m)
- (97.38) PRACTICAL REFUSAL TO DCPT/AUGERING ELEVATION (m)

TBM-TOP OF STORM WATER MANHOLE NORTH WEST OF THE INTERSECTION OF PALLADIUM AND CAMPEAU DRIVE. GEODETIC ELEVATION=104.53m PROVIDED BY STANTEC GEOMATICS LTD.

SCALE: 1:1500

0 25 50 75 100m

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
1	BH 1-21 TO 3-21 ADDED	18/03/2021	NP

MARITIME ONTARIO

GEOTECHNICAL INVESTIGATION

PROPOSED WAREHOUSE AND OFFICE BUILDINGS - KANATA WEST BUSINESS PARK - BLOCK 4 - CAMPEAU DR.

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1500	Date: 11/2020
Drawn by: NFRV	Report No.: PG5618-1 REV.1
Checked by: NP	Dwg. No.: PG5618-1
Approved by: DJG	Revision No.: 1

p:\autocad drawings\geotechnical\pg56xx\pg5618\pg5618-1 thlp rev1.dwg

patersongroup

consulting engineers

memorandum

re: **Geotechnical Response to City Comments**
Proposed Commercial Development
8800 Campeau Drive - Ottawa

to: Maritime Ontario c/o Realinc-SCS - **Mr. David Plumb** - dplumb@realinc-scs.com

date: May 11, 2021

file: PG5618-MEMO.01 Revision 1

Further to your request and authorization, Paterson Group (Paterson) prepared the following memorandum to provide geotechnical responses to city comments regarding the proposed commercial development at the aforementioned site. This memorandum should be read in conjunction with Paterson Geotechnical Report PG5618-1 Revision 3 dated May 11, 2021.

Servicing and Stormwater Management Report Comments

Comment 34: *Per the Geotechnical Report: "The percolation rate was interpreted from the hydraulic conductivity which was estimated based on previous investigations within the area and on experience".*

Comment 35: *Per the Draft December 2019 LID Guidance Document (which has been circulated publicly for comment): "Infiltration Rate – The rate at which stormwater moves from the surface into the soil, typically measured in inches per hour, millimeters, centimeters or meters per second. It is critical to note that that* ***infiltration rate and hydraulic conductivity are two different concepts and that conversion from one parameter to another cannot be done through unit conversion (see hydraulic conductivity and saturated hydraulic conductivity).*** *Typically, saturated hydraulic conductivity is used to calculate the infiltration rate to be used as a design input based on the approximate relationships and often include an infiltration reduction factor (or safety factor)"*

Comment 36: Please request confirmation of the site specific infiltration rate from the Geotechnical Engineer re the definition above.

Response to Comments 34, 35 & 36: Please refer to sections 5.8 Hydraulic Conductivity Testing and 5.9 Percolation Rates of Paterson Group Report PG5618 Revision 3, dated May 11, 2021. Hydraulic conductivity testing was carried out at borehole BH 1-21 on May 7, 2021. The hydraulic conductivity of the in-situ soils was determined based on the results of the rising head and falling head testing ("slug testing") carried out at borehole BH 1-21. The hydraulic conductivity values were then used to determine the infiltration rates of the in-situ soils using Figure C1: Approximate relationship between infiltration rate and hydraulic conductivity, as described in the Draft December 2019 LID Guidance Document.

Geotechnical Investigation, Prepared by Paterson Group, Report PG5618-1, dated November 24, 2020 Report Comments

Comment 45: *Please provide a memo that grading plans have been reviewed and meets grade raise restrictions.*

Response: Please refer to Paterson Group memorandum PG5618-MEMO.02, dated May 6, 2021. A silty clay deposit was not encountered during the geotechnical investigation and therefore no permissible grade raises restrictions have been provided for the subject site. Based on a review of the most recent grading plans and the soils present at the subject site, the grading is considered acceptable from a geotechnical perspective.

Comment 46: *Please Provide confirmation of the seasonal high groundwater elevation.*

Response: Please refer to section 4.3 Groundwater of Paterson Group Report PG5618 Revision 3, dated May 11, 2021. Groundwater levels were measured periodically throughout the spring months at the monitoring well constructed at borehole BH 1-21 as well as within the flexible piezometers installed in the remaining boreholes, seasonal high groundwater was generally encountered at geodetic elevations ranging from 105.2 to 106.0 m.

However, it is anticipated that the elevated groundwater levels observed within boreholes BH 1-21 through BH 3-21 have been influence by surface water collected within the adjacent drainage ditch which runs along the western limit of the subject site. Therefore, groundwater levels are expected to be lowered within the immediate area of the drainage ditch if a culvert is installed to allow flow to continue toward the adjacent ditch along the access road.

Comment 47: *Please demonstrate in the next design submission how the base of the storage media is a minimum 1 m from the seasonally high groundwater table, as per Ministry requirements.*

Response: Upon review of the civil drawings, the base of the proposed infiltration gallery will be located at a geodetic elevation of 103.6 m. Based on the measured groundwater levels within boreholes BH 1-21 through BH 3-21 the seasonally high groundwater is anticipated to be located at an approximate geodetic elevation of 105 to 106 m. However, as previously discussed, it is anticipated that the elevated groundwater levels have been influenced by the neighbouring quarry.

Based on the observed colour and consistency of the recovered soil samples, the long-term groundwater table is anticipated to be located at an approximated geodetic elevation of 104 to 104.5 m. Further, it is anticipated that the localized long-term groundwater level will be lowered due to development of the site and adjacent roadway, which will provide sufficient separation between the storage media and the groundwater table.

Comment 48: *The depth from the bottom of the infiltration practice to the bedrock should be greater than or equal to 1 meter, per Ministry requirements. Please provide confirmation that this will be achieved.*

Response: Based on the available geological mapping, bedrock is expected at a depth of 5 to 15 m below the existing ground surface. In addition, practical refusal to dynamic cone penetration testing was encountered in boreholes BH 2-21 and BH 1 (2014) at geodetic elevations of 98.46 and 97.38 m, respectively. Upon review of the civil drawings, the bottom of the infiltration system will be located at geodetic elevation 103.6 m. Therefore, the depth from the bottom of the infiltration system to the bedrock will be greater than 1 m, as per Ministry requirements.

Comment 49: *Please provide a note about construction the infiltration gallery under the compacted Concrete Surface, and recommendations for constructions.*

Response: It is anticipated that the infiltration system will be designed to support the temporary loading during construction of the roller compacted concrete structure as well as the heavy truck traffic loads.

Where the infiltration system subgrade consists of a silty sand which is observed to be in a loose state of compactness, the material should be proof compacted using suitable vibratory equipment making several passes under dry conditions and above freezing temperatures and which is approved by Paterson at the time of construction. If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material.

Comment 50: *Please confirm the design for Roller Compacted Concrete Surface.*

Response: Please refer to Section 5.7 Pavement Structure, Table 3 - Recommended Roller Compacted Concrete Pavement Structure - Heavy Truck Access Lanes, Parking and Loading Areas. The roller compacter concrete pavement structure will consist of an approximate 200 mm thickness of zero slump, 32 MPa at 28 day strength concrete which is underlain by an approximate 300 mm thickness OPSS Granular A crushed stone base.

We trust that the current submission meets your immediate requirements.

Best Regards,

Paterson Group Inc.

Kevin A. Pickard, EIT

David J. Gilbert, P.Eng.

Paterson Group Inc.

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28 Concourse Gate
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63 Gibson Street
North bay – Ontario – P1B 8Z4
Tel: (705) 472-5331 Fax: (705) 472-2334

patersongroup **memorandum**

consulting engineers

re: **Geotechnical Response to City Comments - Second Submission**
Proposed Commercial Development
8800 Campeau Drive - Ottawa

to: Maritime Ontario c/o Realinc-SCS - **Mr. David Plumb** - dplumb@realinc-scs.com

date: July 30, 2021

file: PG5618-MEMO.04

Further to your request and authorization, Paterson Group (Paterson) prepared the following memorandum to provide geotechnical responses to second submission comments from the City of Ottawa (dated July 26, 2021) regarding the proposed commercial building at the aforementioned site. This memorandum should be read in conjunction with Paterson Geotechnical Report PG5618-1 Revision 3 dated May 11, 2021 and Paterson Memorandum PG5618-MEMO.01 Revision 1 dated May 11, 2021.

Engineering

Maritime-Ontario, 8800 Campeau Drive, KWBP, Servicing and Stormwater Management Report, Dated December 2020

Comment 9: *Please provide confirmation of the seasonal high groundwater elevation (seasonal high water is typical during the spring freshet).*

Geotech Response - First Submission: *Please refer to section 4.3 Groundwater of Paterson Group Paterson Group Report PG5618 Revision 3, dated May 11, 2021. Groundwater levels were measured periodically throughout the spring months at the monitoring well constructed at borehole BH 1-21 as well as within the flexible piezometers installed in the remaining boreholes, seasonal high groundwater was generally encountered at geodetic elevations fanging from **105.2** to **106.0 m**.*

*However, it is anticipated that the elevated groundwater levels observed within boreholes BH 1-21 through BH 3-21 have been influenced by **surface water collected within the adjacent drainage ditch** which runs along the western limit of the subject site. Therefore, groundwater levels are expected to be lowered within the immediate area of the drainage ditch if a culvert is installed to allow flow to continue toward the adjacent ditch along the access road.*

Geotech Response - First Submission: *Upon review of the civil drawings, the base of the proposed infiltration gallery will be located at a geodetic elevation of 103.6 m. Based on the measured groundwater levels within boreholes BH 1-21 through BH 3-21 the seasonally high groundwater is anticipated to be located at an approximate geodetic elevation of 105 to 106 m. However, as previously discussed, it is anticipated that the elevated groundwater levels have been influenced by the neighbouring quarry.*

Based on the observed colour and consistency of the recovered soil samples, the long-term groundwater table is anticipated to be located at an approximated geodetic elevation of 104 to 104.5 m. Further, it is anticipated that the localized long-term groundwater level will be lowered due to development of the site and adjacent roadway, which will provide sufficient separation between the storage media and the groundwater table.

***Robinson Response**: The function of an infiltration gallery may be limited during seasonally high groundwater conditions, **however, infiltration is still feasible during the remainder of the year when groundwater levels are lower.** The groundwater level on the property is expected to become lower over time once the site is developed as the sewer service trenches are lower than the infiltration gallery and the foundation drainage system includes two duplex sump pump systems that have been designed to maintain the groundwater level below the basement slab.*

***City 2nd Review**: The long term groundwater elevation and future seasonal high groundwater elevation have not been declared and as such, it is not clear how MECP guidelines are met and it is not clear how this proposed LID will achieve the infiltration target (or whether the design may result in groundwater directed into the receiving STM sewer and downstream SWMF).*

- *Based on the information received to date, the City is concerned that the long and short-term groundwater will submerge the LID and the LID will not function as designed.*

  Paterson Response: Paterson does not expect that the long-term groundwater level will negatively influence the operation of the LID system. It is expected that hardscaping and development of the subject site will result in lowering of the groundwater table due to the introduction of a stormwater management system which will limit the amount of surface water contributing to the current elevated groundwater level observed across the site. This groundwater lowering condition has been observed at several developed blocks within the Kanata West Business Park in areas of similar soil conditions.

- *It's not clear from the Geotech response whether surface water in the adjacent ditch entered the boreholes BH 1-21 through BH 3-21 via the surface or via groundwater. Please clarify.*

  Paterson Response: It is anticipated that the surface water within the drainage ditch has contributed to raising the groundwater table across the undeveloped site. The groundwater levels observed at borehole locations BH 1-21 through 3-21 reflect this elevated water table. As noted previously, the development of the subject site will result in significantly less surface water from rain event and snow melt perched within the subject site. It is expected that the hardscaping and presence of granular bedding below service pipes will provide an outlet for perched water, which will lower the seasonal high and long-term groundwater elevations to at or near the lowest service pipe invert elevations (approximately 102 to 101.8 m).

- Are the "elevated groundwater levels" influenced by the quarry or the adjacent drainage ditch? Please clarify how the ditch and quarry impact groundwater levels and how this has been considered in the long term estimates.

  Paterson Response: The source of the elevated groundwater levels has not been confirmed. However, several potential sources have been identified which could contribute to the elevated groundwater table observed within the western portion of the subject site. Paterson has incorporated the potential for an elevated groundwater level within the design recommendations for the subject building (i.e. waterproofing and sump pump drainage recommendations for basement level). It should be further noted that the development of the site, which will include stormwater management services will have a positive impact on controlling the groundwater elevation at a lower depth.

- *It's not clear how infiltration is feasible in the long term and especially when the groundwater is at its seasonal high. The building's proposed underground level underside of footing (per the Geotech Memo) is at 104.5 m.* ***If*** *the long-term groundwater around the LID is at elevation of 104.5 m then the infiltration practice is submerged and groundwater would be directed to the downstream SWMF (the proposed invert of the LID downstream subdrain invert is 104.21 m, which is lower than the underground level underside of footing at 104.5 m). As such, in the long and short term, the LID will not achieve any infiltration (nor will it perform at all as an infiltration facility) and its not clear whether the design will cause groundwater to be directed to the STM sewers and SWMF.*

  Paterson Response: As previously noted, it is expected that development of the subject site will result in lowering of the groundwater table due to the introduction of a stormwater management system which will limit the amount of surface water contributing to the current elevated groundwater level observed across the site. It is further expected that the hardscaping and presence of granular bedding below service pipes will provide an outlet for perched water, which will lower the seasonal high and long-term groundwater elevations to at or near the lowest service pipe invert elevations (approximately 102 to 101.8 m). This condition has been observed at several developed blocks within the Kanata West Business Park in areas of similar soil conditions.

- *As per the first review: a groundwater mounding analysis is required where the seasonally high water table (or bedrock) is less than 1 m from the bottom of the facility. Please reference the February 2021 LID Guidance Document re when a mounding analysis is required*.

  Paterson Response: It is expected that hardscaping and presence of granular bedding below service pipes will provide an outlet for perched water and will result in lowering of the seasonal high and long-term groundwater elevations to at or near the lowest service pipe invert elevations (approximately 102 to 101.8 m). Based on a long-term groundwater elevation of 102 m and a seasonal high groundwater elevation of 102.5 m, a separation of 1m from the bottom of the LID facility and the seasonally high water table is expected.

- *As per the first review: explore whether the invert of the gallery can be raised and whether the footprint of the gallery needs to be increased to meet the KWMSS infiltration targets while also complying with MECP guidelines.*

  Paterson Response: This comment has been acknowledged.

- *Is it worth exploring any other opportunities onsite to infiltrate stormwater to demonstrate compliance with the MECP guidelines?*

  Paterson Response: This comment has been acknowledged.

- *If the site requires an MECP ECA, then please demonstrate the 1 m clearance.*

  Paterson Response: This comment has been acknowledged.

We trust that the current submission meets your immediate requirements.

Best Regards,

Paterson Group Inc.

Kevin A. Pickard, EIT

July 30, 2021

David J. Gilbert, P.Eng.

Paterson Group Inc.

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154 Colonnade Road South
Ottawa – Ontario – K2E 5S9
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Ottawa Laboratory
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Ottawa – Ontario – K2E 7T7
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Northern Office and Laboratory
63 Gibson Street
North bay – Ontario – P1B 8Z4
Tel: (705) 472-5331 Fax: (705) 472-2334

patersongroup
consulting engineers

memorandum

re: **Geotechnical Response to City Comments - Third Submission**
Proposed Commercial Development
8800 Campeau Drive - Ottawa

to: Maritime Ontario c/o Realinc-SCS - **Mr. David Plumb** - dplumb@realinc-scs.com

date: November 18, 2021

file: PG5618-MEMO.05

Further to your request and authorization, Paterson Group (Paterson) prepared the following memorandum to provide geotechnical responses to the third submission city comments as well as comments resulting from the October 15, 2021 meeting with the City of Ottawa regarding the proposed commercial building at the aforementioned site. This memorandum should be read in conjunction with Paterson Geotechnical Report PG5618-1 Revision 4 dated November 24, 2021 and Paterson Memorandums PG5618-MEMO.01 Revision 1 dated May 11, 2021 and PG5618-MEMO.04 dated July 27, 2021.

Comments from October 15, 2021 Meeting with City of Ottawa

Comment 1: *As discussed at the meeting on Friday October 15th, the design package will be revised to provide more details to justify the long-term groundwater elevation and whether the interim groundwater* ***elevation will result in groundwater conveyed to the downstream storm sewer system via the proposed LID practice. Please read through the following and ensure that the signed and stamped report from the geotechnical engineer addresses the concerns raised below:***

Paterson Response: Upon review of the civil drawings, it is understood that the base of the proposed infiltration gallery will be located at an approximate geodetic elevation of 103.6 m and that the outlet pipe (STM MH 304), is to have an invert elevation of 104.2 m which connects to STM MH 200 before entering into the City storm sewer. It should be noted that it is expected that the bedding layer below this storm pipe alignment will provide a sufficient outlet for any water currently perched at a higher elevation in the area of the infiltration gallery. The invert of the storm pipe at STM MH 200 is 102.0 m elev., which is the expected long-term elevation of the groundwater level in this area upon completion of the development.

It should be further noted that any pre-development groundwater, which has established above design invert level will be pumped out of the open excavation during construction to enable proper compaction of the bedding layer for the service pipes and placement of the service pipe and infiltration gallery. The dewatering work during construction is expected to remove the perched water within the subject site.

It is acknowledged that the elevation of the post-development long-term water table may not be accurately predicted in areas outside of the radius of influence of permanent structures and site servicing. However, based on the proximity of the proposed infiltration gallery to the storm sewer and the hydraulic conductivity of the silty sand to sandy silt encountered across the subject site, it is anticipated that the long-term groundwater table across the subject site will be lowered to the approximate invert elevation of the storm sewer which ranges from approximately 101.2 to 100.9 m along the adjacent section of Upper Canada Street.

Based on the above, long-term and seasonal high groundwater level under post-development conditions is not expected to be conveyed to the downstream storm sewer system and SWMF. The current revision of our report has been updated to include the abovenoted discussion in Subsection 6.5.

Comment 1 Continued:

- *It is not clear whether the MWs were constructed properly given the following response from the Geotech Engineer:*

  "section 4.3 Groundwater of Paterson Group Report PG5618 Revision 3, dated May 11, 2021… Groundwater Levels were measured periodically throughout the spring months at the monitoring well constructed at borehole BH 1-21 as well as within the flexible piezometers installed in the remaining boreholes, seasonal high groundwater was generally encountered at geodetic elevations ranging from 105.2 to 106.0. However, it is anticipated that the elevation groundwater levels observed within boreholes BH 1-21 through BH 3-21 have been influenced by surface water collected within the adjacent drainage ditch which runs along the western limit of the subject site. Therefore, groundwater levels are expected to be lowered within the immediate are of the drainage ditch if a culvert is installed to allow flow to continue toward the adjacent ditch along the access road".

Paterson Response: The monitoring well at borehole BH 1-21 was constructed as per the typical detail described below:

- Slotted 51 mm diameter PVC screen at the base of the borehole.
- 51 mm diameter PVC riser pipe from the top of the screen to the ground surface.
- No. 3 silica sand backfill within annular space around screen.
- Bentonite hole plug directly above PVC slotted screen.
- Clean Backfill from top of bentonite plug to the ground surface.

The groundwater observation detailed in the excerpt above is noting the influence of poor surface drainage that is present due to the blocked outlet of the adjacent drainage ditch. The well construction is as per industry standard and acceptable. However, the pre-development groundwater level noted in this area is being influenced by this poor drainage and it is expected that development of the subject block will have a great reduction on the surface water that is being collected within this existing drainage ditch, so Paterson has noted this impact since it is relevant to the discussion seasonally high groundwater levels.

- ❑ *It appears that there is only one MW (BH 1-21). The rest of the data was collected from the flexible pipes in BHs, which is not an acceptable method for determining the water table. Properly constructed, screened and sealed MWs should always be used.*

Paterson Response: Groundwater levels were measured periodically throughout the spring at the monitoring well installed at borehole BH 1-21 as well as the piezometers installed in the remaining boreholes. As per the Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa, piezometers consisting of HDPE or PVC tubing with slotted opening can be installed in boreholes to enable monitoring of the groundwater levels. In addition to recorded groundwater levels, the long-term groundwater level can also be inferred from the colour and water content of the samples.

- ❑ *It is not possible to predict the post-construction water table. The installation of sewers and the reduction in recharge will likely lower the water table but we do not know by how much. Furthermore, depending on the hydraulic conductivity, the lowering of the water table due to sewers could be localized around the sewers, and may not be throughout the development.*

Paterson Response: It is acknowledged that the elevation of the post-development water table will be difficult to accurately determine. However, the post-development water table in the vicinity of the proposed structures and utilities will be governed by their invert elevations at a given location based on past experience with developments in similar soil conditions. Therefore, it is anticipated that the post-development water table at the proposed LID practice location will be governed the invert level of the nearby existing services located along Upper Canada Street.

- ❑ *Consultants should be following the City's LID Technical Guidance Report, prepared in discussions with the consulting industry, CAs and MECP. Note that Section 2.3.3 of this reports that **pre-development** water table elevations should be used in design. The report also describes the MWs and how to take water levels.*

Paterson Response: This comment has been acknowledged.

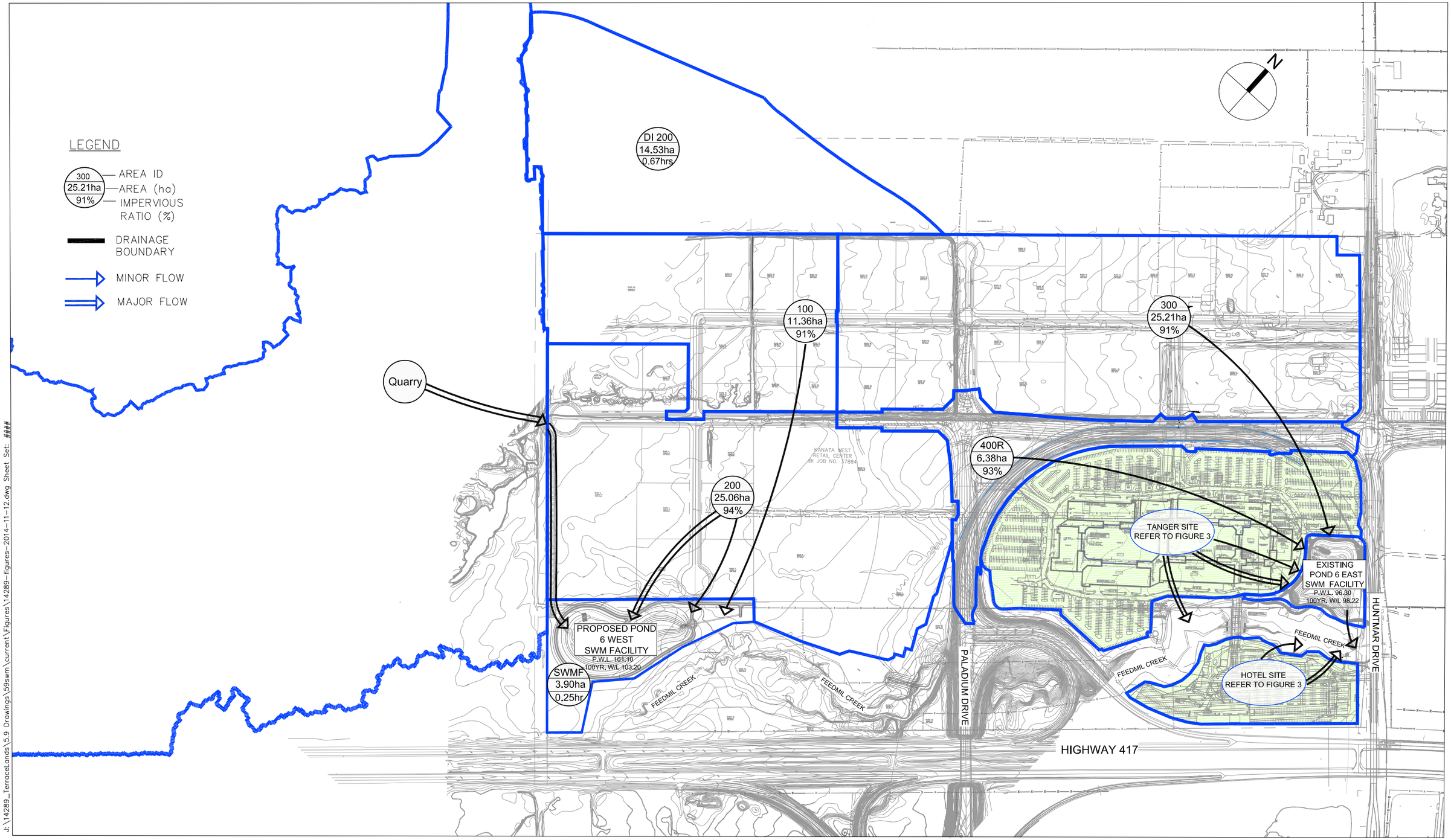
Best Regards,

Paterson Group Inc.

Kevin A. Pickard, EIT

December 13, 2021

David J. Gilbert, P.Eng.



J:\14289_TerraceLands\5.9 Drawings\59swm\current\Figures\14289-figures-2014-11-12.dwg Sheet Set: ####

Plot Style: ---- Plot Scale: 1:1 Plotted At: Sep. 28, 15 10:17 AM Printed By: SLAVICA VUKIC Last Saved By: SVUKIC Last Saved At: Sep. 28, 15

IBI GROUP

Scale

N.T.S.

Project Title

TANGER OUTLETS CENTRE STORMWATER MANAGEMENT FACILITY

Drawing Title

POST-DEVELOPMENT SWM DRAINAGE BOUNDARIES OVERALL SITE

Sheet No.

FIGURE 2

Appendix F

Storm Sewer Design Sheet

Storm Drainage Area Plan
(DWG. 20027-STM1)

Flow Control Roof Drainage Declaration

Roof Flow Correspondence

Figure 3 – Roof Drainage Area Plan

Infiltration Gallery Storm Sewer Design Sheet

Runoff Coefficient Calculations

Free Flow Calculations

ICD Calculations

2 Year Drawdown Time Calculations

Storage Volume Tables

HGL Computation Sheet

STORM SEWER DESIGN SHEET
for
MARITIME-ONTARIO, CAMPEAU DRIVE, KWBP

LOCATION				AREA (ha)		INDIV. 2.78AR	ACCUM. 2.78AR	TIME OF CONC. (min)	5 YR RAINFALL INTENSITY (mm/hr)	5 YR PEAK FLOW (L/s)	PROPOSED SEWER						
DRAINAGE AREA	STREET NAME	FROM MH	TO MH	TOTAL AREA	C						PIPE DIA. (mm)	GRADE (%)	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min)	PERCENT FULL
STM1	PARKING LOT	CB 1	MAIN	0.90	0.90	2.25	2.25	10.00	104.19	234.64	366.4	2.97	3.7	284.36	2.70	0.02	83%
STM2	PARKING LOT	CB 2	MAIN	0.63	0.90	1.58	1.58	10.00	104.19	164.15	366.4	2.97	3.7	284.36	2.70	0.02	58%
STM3	PARKING LOT	CB 3	MAIN	0.67	0.90	1.68	1.68	10.00	104.19	174.93	366.4	2.89	3.8	280.50	2.66	0.02	62%
	PARKING LOT	204	203	0.00	0.00	0.00	5.51	10.02	104.07	573.06	762.0	0.30	150.0	636.77	1.40	1.79	90%
STM4	PARKING LOT	CB 4	MAIN	0.44	0.82	1.01	1.01	10.00	104.19	105.44	299.4	2.93	4.1	164.75	2.34	0.03	64%
STM16	LANDSCAPE	CB 16	DICB 15	0.02	0.28	0.02	0.02	10.00	104.19	1.78	251.5	1.00	25.9	60.46	1.22	0.35	3%
STM15	LANDSCAPE	DICB 15	MAIN	0.05	0.25	0.04	0.05	10.35	102.36	5.38	251.5	3.05	5.9	105.59	2.13	0.05	5%
	PARKING LOT	203	202	0.00	0.00	0.00	6.57	11.81	95.50	627.53	762.0	0.35	93.0	687.79	1.51	1.03	91%
STM11	PARKING LOT	CB 11	MAIN	0.12	0.70	0.23	0.23	10.00	104.19	23.44	251.5	3.03	3.3	105.24	2.12	0.03	22%
	PARKING LOT	202	201	0.00	0.00	0.00	6.80	12.84	91.25	620.13	762.0	0.38	59.9	716.67	1.57	0.64	87%
STM5	PARKING LOT	CB 5	MAIN	0.96	0.89	2.38	2.38	10.00	104.19	248.50	366.4	2.89	3.8	280.50	2.66	0.02	89%
STM6	PARKING LOT	CB 6	MAIN	0.62	0.89	1.54	1.54	10.00	104.19	160.49	366.4	2.89	3.8	280.50	2.66	0.02	57%
STM7	PARKING LOT	CB 7	MAIN	0.54	0.90	1.35	1.35	10.00	104.19	140.47	299.4	2.89	3.8	163.62	2.32	0.03	86%
	PARKING LOT	207	206	0.00	0.00	0.00	5.27	10.03	104.05	548.70	686.0	0.55	150.0	651.51	1.76	1.42	84%
STM17	LANDSCAPE	DICB 17	MAIN	0.07	0.27	0.05	0.05	10.00	104.19	5.06	251.5	3.01	21.6	104.89	2.11	0.17	5%
STM8	PARKING LOT	CB 8	MAIN	0.32	0.68	0.60	0.60	10.00	104.19	62.65	251.5	2.98	8.4	104.37	2.10	0.07	60%
	PARKING LOT	206	205	0.00	0.00	0.00	5.92	11.45	97.13	575.34	686.0	0.55	92.9	651.51	1.76	0.88	88%
STM18	PARKING LOT	BLDG	208	0.06	0.90	0.14	0.14	10.00	104.19	14.83	251.5	4.02	9.2	121.27	2.44	0.06	12%
STM9	PARKING LOT	CB 9	MAIN	0.10	0.85	0.22	0.22	10.00	104.19	23.40	251.5	0.99	32.2	60.16	1.21	0.44	39%
STM12	PARKING LOT	CB 12	MAIN	0.08	0.89	0.20	0.20	10.00	104.19	20.91	251.5	1.01	33.5	60.76	1.22	0.46	34%
STM13	PARKING LOT	CB 13	MAIN	0.11	0.79	0.25	0.25	10.00	104.19	26.19	251.5	0.99	23.2	60.16	1.21	0.32	44%
STM10	PARKING LOT	CB 10	MAIN	0.11	0.79	0.25	0.25	10.00	104.19	26.24	251.5	1.00	21.9	60.46	1.22	0.30	43%
STM10	PARKING LOT	208	201	0.00	0.00	0.00	1.07	10.44	101.91	109.14	299.4	4.19	43.9	197.02	2.80	0.26	55%

STORM SEWER DESIGN SHEET
for
MARITIME-ONTARIO, CAMPEAU DRIVE, KWBP

LOCATION				AREA (ha)		INDIV. 2.78AR	ACCUM. 2.78AR	TIME OF CONC. (min)	5 YR RAINFALL INTENSITY (mm/hr)	5 YR PEAK FLOW (L/s)	PROPOSED SEWER						
DRAINAGE AREA	STREET NAME	FROM MH	TO MH	TOTAL AREA	C						PIPE DIA. (mm)	GRADE (%)	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min)	PERCENT FULL
STM14	PARKING LOT	CB 14	MAIN	0.10	0.81	0.21	0.21	10.00	104.19	22.34	251.5	3.12	3.2	106.79	2.15	0.02	21%
	PARKING LOT	201	205	0.00	0.00	0.00	8.08	13.48	88.83	717.83	762.0	0.43	70.4	762.36	1.67	0.70	94%
	PARKING LOT	205	200	0.00	0.00	0.00	14.00	14.18	86.31	1208.73	914.0	0.50	30.1	1335.22	2.04	0.25	91%
STM19	PARKING LOT	304	200	0.66	0.90	1.64	1.64	10.00	104.19	170.85	366.4	0.48	55.7	114.32	1.08	0.86	
	PARKING LOT	200	*EX101*	0.00	0.00	0.00	15.64	14.42	85.46	1337.01	914.0	0.60	20.0	1462.66	2.23	0.15	91%

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations. $I = 998.071 / (T + 6.053)^{0.814}$ (T= time in minutes)
2. Peak Flow = Accummulated 2.78AR x Rainfall Intensity
3. Full Flow Velocity: MIN. = 0.80 m/s; MAX. = 3.0 m/s (City of Ottawa Sewer Design Guidelines, v.2012)

NOTES

THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NO.	REVISION DESCRIPTION	DATE	BY
4	REVISED PER COMMENTS	17/01/22	BLM
3	REVISED PER COMMENTS	09/08/21	SMC
2	REVISED PER COMMENTS	28/05/21	SMC
1	ISSUED FOR SITE PLAN APPLICATION	02/12/20	SMC

SCALE

HORIZONTAL 1:750

LICENSED PROFESSIONAL ENGINEER
Jan. 17/22
B.L. MACKECHNIE
100199554
PROVINCE OF ONTARIO

Robinson Land Development
350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

DESIGN	BLM
CHECKED	SMC
DRAWN	BLM
CHECKED	SMC
APPROVED	SMC

MARITIME-ONTARIO FREIGHT LINES LIMITED

KANATA WEST BUSINESS PARK
8800 CAMPEAU DRIVE, OTTAWA, ON

STORM DRAINAGE AREA PLAN

PROJECT No.	20027
SURVEY	STANTEC
DATED	JANUARY 2022
DWG. No.	20027-STM1

#18376

D07-12-20-0189

FLOW CONTROL ROOF DRAINAGE DECLARATION

THIS FORM TO BE COMPLETED BY THE MECHANICAL AND STRUCTURAL ENGINEERS RESPONSIBLE FOR DESIGN

Permit Application No.
D07-12-20-0189

Project Name: Maritime Ontario

Building Location: 8800 Campeau Drive

Municipality: Ottawa

The roof drainage system has been designed in accordance with the following criteria: (please check one of the following).

M1. ✔ Conventionally drained roof (no flow control roof drains used).

M2. **0** Flow control roof drains meeting the following conditions have been incorporated in this design:

(a) the maximum drain down time does not exceed 24h,
(b) one or more scuppers are installed so that the maximum depth of water on the roof cannot exceed 150mm,
(c) drains are located not more than 15m from the edge of roof and not more than 30m from adjacent drains, and
(d) there is at least one drain for each 900 sq.m.

M3. **0** A flow control drainage system that does not meet the minimum drainage criteria described in M2 has been incorporated in this design.

PROFESSIONAL SEAL APPLIED BY:

Practitioner's Name: Andrew Lawton

Firm: McKee Engineering

Phone#: 613-723-9585

City: Ottawa Province: Ontario

Mechanical Engineer's Seal

S1. **0** The design parameters incorporated into the overall structural design are consistent with the information provided by the Mechanical Engineer in M2. Loads due to rain are not considered to act simultaneously with loads due to snow as per Sentence 4.1.7.3 (3) OBC.

S2. **0** The structure has been designed incorporating the additional structural loading due to rain acting simultaneously with the snow load. The design parameters are consistent with the control flow drainage system designed by the mechanical engineer.

S3 ✔ The structure has not been designed for flow control roof drains, consistent with the information provided in M1 above.

PROFESSIONAL SEAL APPLIED BY:

Practitioner's Name: Colin Davies, P.Eng.

Firm: Cleland Jardine Engineering Ltd.

Phone#: 613-591-1533

City: Ottawa Province: Ontario

Structural Engineer's Seal

Brandon Mackechnie

Subject: FW: 19-247 - M-O - Kanata North Business Park - Weeping Tile Pumps(MK 20071)

From: Andrew Lawton <andrew.lawton@mckeeottawa.ca>
Sent: May 19, 2021 8:46 AM
To: Sean Czaharynski <sczaharynski@rcii.com>
Cc: Jill Sparling <Sparling@mcrobie.com>
Subject: RE: 19-247 - M-O - Kanata North Business Park - Weeping Tile Pumps(MK 20071)

"CAUTION: External Sender"
Hi Sean,

For the Cross Dock: 37.6 l/s
For the Office: 19.5 l/s

Andrew Lawton, P.Eng.
President

Andrew.Lawton@mckeeottawa.ca
1785 Woodward Drive
Ottawa, ON K2C 0P9
Tel: (613) 723-9585 Ext 105
Fax: (613) 723-9584

www.mckeeottawa.ca

From: Sean Czaharynski <sczaharynski@rcii.com>
Sent: May 19, 2021 7:45 AM
To: Andrew Lawton <andrew.lawton@mckeeottawa.ca>
Cc: Jill Sparling <Sparling@mcrobie.com>
Subject: RE: 19-247 - M-O - Kanata North Business Park - Weeping Tile Pumps(MK 20071)

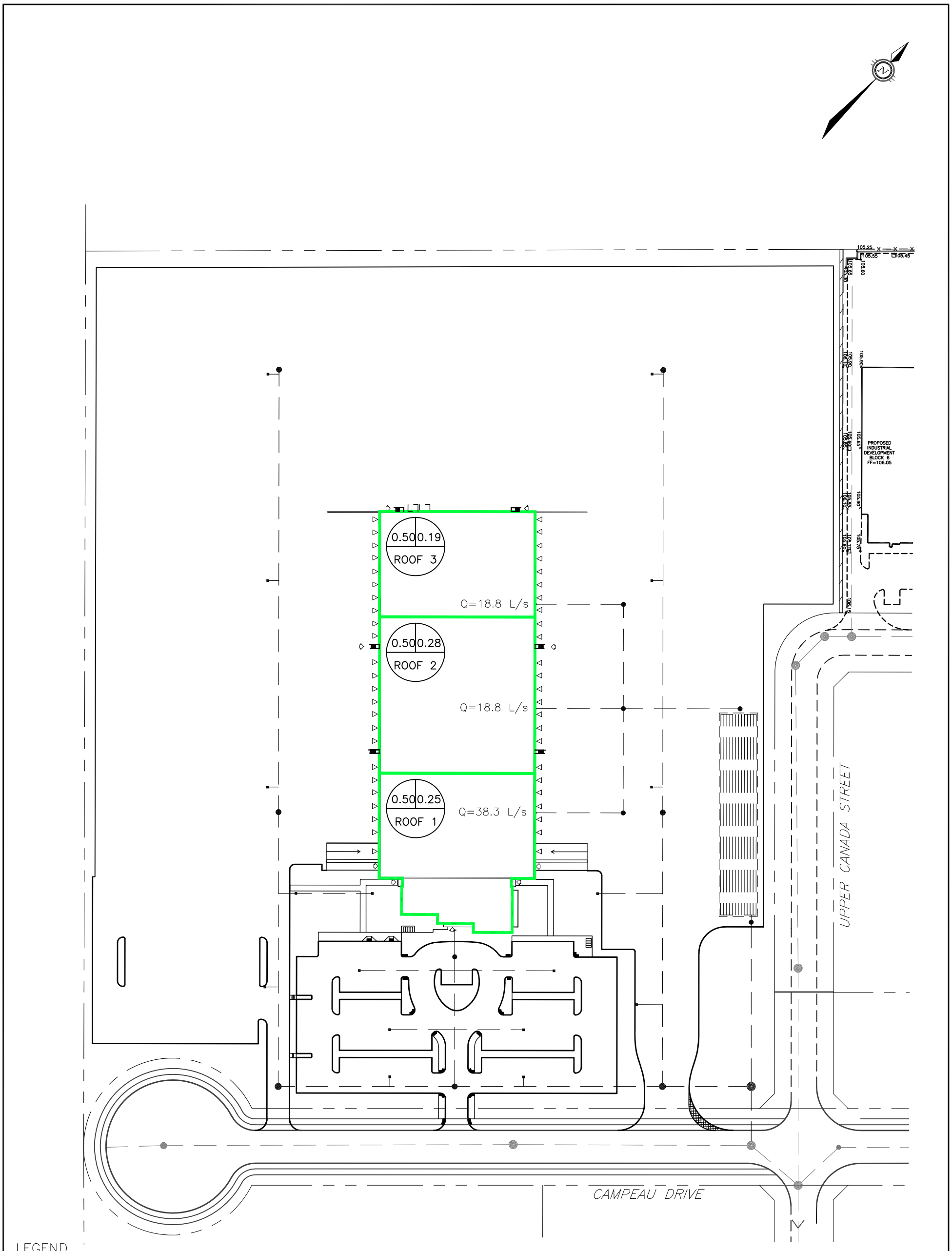
Morning Andrew

Can you tell me what your design flowrate from the uncontrolled roof drains are?

I want to include that in our storm drainage section of our design report.

Thanks,

Sean Czaharynski, P.Eng. | Manager - Land Development
Robinson Land Development
350 Palladium Drive, Suite 210, Ottawa ON, K2V 1A8
T.(613) 592-6060 ext. 152 | rcii.com



LEGEND

PROPERTY BOUNDARY

ROOF DRAINAGE AREA BOUNDARY

RUNOFF COEFFICIENT

0.9 | 0.30 ← AREA (ha)

ROOF 1

DRAINAGE AREA

Robinson
Land Development

scale N.T.S.	MARITIME–ONTARIO, KWBP	project no. 20027
date 27/05/21		
drawn by BLM	ROOF DRAINAGE AREA PLAN	FIG 3

STORM SEWER DESIGN SHEET - INFILTRATION GALLERY
for
MARITIME-ONTARIO, CAMPEAU DRIVE, KWBP

LOCATION				AREA (ha)		INDIV. 2.78AR	ACCUM. 2.78AR	TIME OF CONC. (min)	5 YR RAINFALL INTENSITY*1 (mm/hr)	5 YR PEAK FLOW*2 (L/s)	FIXED FLOW*4 (L/s)	PROPOSED SEWER						
DRAINAGE AREA	STREET NAME	FROM MH	TO MH	TOTAL AREA	C							PIPE DIA. (mm)	GRADE (%)	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY*3 (m/s)	TIME OF FLOW (min)	PERCENT FULL
ROOF1	PARKING LOT	RD1	300	0.25	0.90	0.63	0.63	10.00	104.19	65.17	38.30	299.4	1.01	29.6	96.73	1.37	0.36	40%
	PARKING LOT	300	302	0.00	0.00	0.00	0.63	10.36	102.33	64.01	38.30	299.4	0.51	35.4	68.74	0.98	0.60	56%
ROOF2	PARKING LOT	RD2	302	0.28	0.90	0.70	0.70	10.00	104.19	72.99	18.80	299.4	1.82	29.6	129.85	1.84	0.27	14%
ROOF3	PARKING LOT	RD3	301	0.19	0.90	0.48	0.48	10.00	104.19	49.53	18.80	299.4	1.01	29.6	96.73	1.37	0.36	19%
	PARKING LOT	301	302	0.00	0.00	0.00	0.48	10.36	102.33	48.65	18.80	299.4	0.51	35.4	68.74	0.98	0.60	27%
	PARKING LOT	302	303	0.00	0.00	0.00	1.80	10.96	99.37	179.00	75.90	366.4	0.30	39.6	90.38	0.86	0.77	84%
	PARKING LOT	303	HEADER	INFILTRATION GALLERY														
	PARKING LOT	HEADER	304															
	PARKING LOT	304	200	0.00	0.00	0.00	1.80	11.73	95.85	172.67	75.90	366.4	0.48	55.7	114.32	1.08	0.86	66%
	BYPASS PIPE	*303*	*304*	*0.00*	*0.00*	*0.00*	*1.80*	*11.73*	*95.85*	*172.67*	*75.90*	*366.4*	*0.47*	*72.5*	*113.12*	*1.07*	*1.13*	*67%*

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations. $I = 998.071 / (T + 6.053)^{0.814}$ (T= time in minutes)
2. Peak Flow = Accummulated 2.78AR x Rainfall Intensity
3. Full Flow Velocity: MIN. = 0.80 m/s; MAX. = 3.0 m/s (City of Ottawa Sewer Design Guidelines, v.2012)
4. Fixed flow corresponds to roof flows provided by Mechancial Engineer. Refer to Appendix F.

Runoff Coefficient Calculations

Development Condition	Impervious Area (ha)	Pervious Area (ha)	Gravel Area (ha)	Total Area (ha)	C	C (100 YR)	Percent Impervious (%)
PRE	0.00	6.96	0.08	7.04	0.21	0.26	1.2
POST	6.19	0.85	0.00	7.04	0.82	1.00	87.9

Sub-Drainage Area Runoff Coefficient Calculations

Drainage Area ID	Impervious Area (ha)	Pervious Area (ha)	Gravel Area (ha)	Total Area (ha)	C	C (100 YR)	Percent Impervious (%)
STM1	0.90	0.00	0.00	0.90	0.90	1.00	100.0
STM2	0.63	0.00	0.00	0.63	0.90	1.00	100.0
STM3	0.67	0.00	0.00	0.67	0.90	1.00	100.0
STM4	0.39	0.05	0.00	0.44	0.82	1.00	89.1
STM5	0.95	0.01	0.00	0.96	0.89	1.00	98.5
STM6	0.61	0.01	0.00	0.62	0.89	1.00	98.4
STM7	0.54	0.00	0.00	0.54	0.90	1.00	100.0
STM8	0.22	0.10	0.00	0.32	0.68	0.85	69.1
STM9	0.09	0.01	0.00	0.10	0.85	1.00	92.6
STM10	0.10	0.02	0.00	0.11	0.79	0.99	85.0
STM11	0.08	0.03	0.00	0.12	0.70	0.88	71.5
STM12	0.08	0.00	0.00	0.08	0.89	1.00	99.1
STM13	0.10	0.02	0.00	0.11	0.79	0.99	84.8
STM14	0.08	0.01	0.00	0.10	0.81	1.00	87.0
STM15	0.00	0.05	0.00	0.05	0.25	0.31	7.3
STM16	0.00	0.02	0.00	0.02	0.28	0.34	10.8
STM17	0.01	0.06	0.00	0.07	0.27	0.34	9.8
STM18 (ROOF 1)	0.06	0.00	0.00	0.06	0.90	1.00	100.0
STM19 (ROOF 2)	0.66	0.00	0.00	0.66	0.90	1.00	100.0
FF1 (CAMPEAU)	0.03	0.07	0.00	0.10	0.38	0.47	25.7
FF2 (UPPER CANADA)	0.00	0.13	0.00	0.13	0.20	0.25	0.0
FF3 (NORTH)	0.00	0.14	0.00	0.14	0.20	0.25	0.0
FF4 (WEST)	0.00	0.12	0.00	0.12	0.20	0.25	0.0

Runoff Coefficients:

C impervious = 0.90

C pervious = 0.20

C gravel = 0.80

C_{100} = C * 1.25 (Max. 1.0)

Free Flow Calculations - FF1 (CAMPEAU)

Given:

Area (ha) = 0.10
C = 0.38
C (100 YR) = 0.47

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)
5 Year	5	141.2	14.7
	10	**104.2**	**10.8**
	15	83.6	8.7
	20	70.3	7.3
	25	60.9	6.3
	30	53.9	5.6
100 Year	5	242.7	31.5
	10	**178.6**	**23.2**
	15	142.9	18.6
	20	120.0	15.6
	25	103.8	13.5
	30	91.9	11.9

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method. Q=2.78CiA
3. C (100 YR) = C + 25% (Max. 1.0)

Free Flow Calculations - FF2 (UPPER CANADA)

Given:

Area (ha) = 0.13
C = 0.20
C (100 YR) = 0.25

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)
5 Year	5	141.2	10.3
	10	**104.2**	**7.6**
	15	83.6	6.1
	20	70.3	5.1
	25	60.9	4.5
	30	53.9	4.0
100 Year	5	242.7	22.2
	10	**178.6**	**16.4**
	15	142.9	13.1
	20	120.0	11.0
	25	103.8	9.5
	30	91.9	8.4

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method. Q=2.78CiA
3. C (100 YR) = C + 25% (Max. 1.0)

Free Flow Calculations - FF4 (WEST)

Given:

Area (ha) = 0.12
C = 0.20
C (100 YR) = 0.25

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)
5 Year	5	141.2	9.3
	10	**104.2**	**6.8**
	15	83.6	5.5
	20	70.3	4.6
	25	60.9	4.0
	30	53.9	3.5
100 Year	5	242.7	19.9
	10	**178.6**	**14.7**
	15	142.9	11.7
	20	120.0	9.9
	25	103.8	9.5
	30	91.9	7.5

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method. Q=2.78CiA
3. C (100 YR) = C + 25% (Max. 1.0)

Free Flow Calculations - FF3 (NORTH)

Given:

Area (ha) = 0.14
C = 0.20
C (100 YR) = 0.25

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)
5 Year	5	141.2	11.2
	10	**104.2**	**8.3**
	15	83.6	6.6
	20	70.3	5.6
	25	60.9	4.8
	30	53.9	4.3
100 Year	5	242.7	24.1
	10	**178.6**	**17.7**
	15	142.9	14.2
	20	120.0	11.9
	25	103.8	9.5
	30	91.9	9.1

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method. Q=2.78CiA
3. C (100 YR) = C + 25% (Max. 1.0)

Free Flow Calculations - STM18 (ROOF 1)

Given:

Area (ha) = 0.06
C = 0.90
C (100 YR) = 1.00

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)
5 Year	5	141.2	20.1
	10	**104.2**	**14.8**
	15	83.6	11.9
	20	70.3	10.0
	25	60.9	8.7
	30	53.9	7.7
100 Year	5	242.7	38.4
	10	**178.6**	**28.2**
	15	142.9	22.6
	20	120.0	19.0
	25	103.8	16.4
	30	91.9	14.5

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method. Q=2.78CiA
3. C (100 YR) = C + 25% (Max. 1.0)

Free Flow Calculations - STM19 (ROOF 2)

Given:

Area (ha) = 0.66
C = 0.90
C (100 YR) = 1.00

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)
5 Year	5	141.2	231.5
	10	**104.2**	**170.8**
	15	83.6	137.0
	20	70.3	115.2
	25	60.9	99.9
	30	53.9	88.4
100 Year	5	242.7	442.2
	10	**178.6**	**325.3**
	15	142.9	260.3
	20	120.0	218.5
	25	103.8	189.2
	30	91.9	167.4

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method. Q=2.78CiA
3. C (100 YR) = C + 25% (Max. 1.0)

Inlet Control Device Calculations

Structure	Drainage Area	Outlet Pipe Inv. Elev. (m)	Outlet Pipe Diam. (m)	C/L Orifice Elev. (m)	T/G Elev. (m)	Max. Ponding Depth (m)	Max. Ponding Elev. (m)	Max. Head (m)	100 Yr. Ponding Depth (m)	100 Yr. Ponding Elev. (m)	100 Yr. Head (m)	100 Yr. Outflow (L/s)	Orifice Area (m^2)	Orifice Diameter (mm)	Orifice Type
CB 1	STM1	104.74	0.375	104.93	106.42	0.30	106.72	1.79	"100 Year El. = Maximum El."			105.0	0.029	190.7	Circular, slide
CB 2	STM2	104.64	0.375	104.83	106.32	0.30	106.62	1.79	"100 Year El. = Maximum El."			60.0	0.016	144.1	Circular, slide
CB 3	STM3	104.54	0.375	104.73	106.22	0.30	106.52	1.79	"100 Year El. = Maximum El."			80.0	0.022	166.4	Circular, slide
CB 4	STM4	104.47	0.300	104.62	106.15	0.30	106.45	1.83	0.29	106.44	1.82	55.0	0.015	137.5	Circular, slide
CB 5	STM5	104.74	0.375	104.93	106.42	0.30	106.72	1.79	"100 Year El. = Maximum El."			105.0	0.029	190.7	Circular, slide
CB 6	STM6	104.64	0.375	104.83	106.32	0.30	106.62	1.79	0.28	106.60	1.77	60.0	0.016	144.5	Circular, slide
CB 7	STM7	104.54	0.300	104.69	106.22	0.30	106.52	1.83	0.27	106.49	1.80	60.0	0.016	144.0	Circular, slide
CB 8	STM8	104.27	0.250	104.40	105.95	0.27	106.22	1.83	0.26	106.21	1.82	30.0	0.008	101.6	Circular, slide
CB 9	STM9	105.42	0.250	105.55	107.10	0.10	107.20	1.66	"100 Year El. = Maximum El."			55.0	0.016	140.8	Circular, slide
CB 10	STM10	105.13	0.250	105.26	106.64	0.19	106.83	1.58	"100 Year El. = Maximum El."			30.0	0.009	105.3	Circular, slide
CB 11	STM11	104.38	0.250	104.51	106.06	0.30	106.36	1.86	0.18	106.24	1.74	25.0	0.007	93.8	Circular, slide
CB 12	STM12	105.42	0.250	105.55	107.10	0.10	107.20	1.66	"100 Year El. = Maximum El."			40.0	0.011	120.1	Circular, slide
CB 13	STM13	104.96	0.250	105.09	106.64	0.19	106.83	1.75	"100 Year El. = Maximum El."			30.0	0.008	102.6	Circular, slide
CB 14	STM14	104.38	0.250	104.51	106.06	0.30	106.36	1.86	0.18	106.24	1.74	25.0	0.007	93.8	Circular, slide
DICB 15	STM15	104.67	0.250	104.80	106.42	0.30	106.72	1.93	0.00	106.42	1.63	20.0	0.006	85.3	Circular, slide
DICB 17	STM17	104.75	0.250	104.88	106.50	0.30	106.80	1.93	0.00	106.50	1.63	20.0	0.006	85.3	Circular, slide
								Total =				800.0			

Notes:

1. Maximum ponding depth is measured from the maximum ponding elevation to the T/G elevation; 100 year ponding depth is measured from the 100 year ponding elevation to the T/G elevation.
2. Maximum head is measured from the maximum ponding elevation to the centreline of orifice elevation; 100 year head is measured from the 100 year ponding elevation to the centreline of orifice elevation.
3. Orifice Area = (Q/1000) / 0.62(2*9.81*H_{100})^0.5
4. Orifice area calculated using 100 year head values.

2 Year Surface Ponding Analysis

Structure	Drainage Area	T/G Elev. (m)	2 Yr. Ponding Elev. (m)	2 Yr. Ponding Depth[*1] (m)	2 Yr. Req'd Surface Storage Volume[*2] (m^3)	ICD Outflow[*3] (m^3/s)	Time to Drain[*4] (mins)
CB 1	STM1	106.42	106.59	0.17	40.8	0.105	6.5
CB 2	STM2	106.32	106.50	0.18	36.6	0.060	10.2
CB 3	STM3	106.22	106.39	0.17	29.4	0.080	6.1
CB 4	STM4	106.15	106.30	0.15	14.9	0.055	4.5
CB 5	STM5	106.42	106.59	0.17	46.9	0.105	7.4
CB 6	STM6	106.32	106.49	0.17	35.0	0.060	9.7
CB 7	STM7	106.22	106.38	0.16	26.1	0.060	7.3
CB 8	STM8	105.95	106.08	0.13	9.7	0.030	5.4
CB 9	STM9	107.10	107.10	0.00	0.0	0.055	0.0
CB 10	STM10	106.64	106.64	0.00	0.0	0.030	0.0
CB 11	STM11	106.06	106.06	0.00	0.0	0.025	0.0
CB 12	STM12	107.10	107.10	0.00	0.0	0.040	0.0
CB 13	STM13	106.64	106.64	0.00	0.0	0.030	0.0
CB 14	STM14	106.06	106.06	0.00	0.0	0.025	0.0
DICB 15	STM15	106.42	106.42	0.00	0.0	0.020	0.0
DICB 17	STM17	106.50	106.50	0.00	0.0	0.020	0.0

Notes:

1. 2 year ponding depth is measured from the 2 year ponding elevation to the T/G elevation.
2. Peak storage volume required. Refer to storage volume tables.
3. Refer to ICD calculations.
4. Time to drain surface storage volume = (surface storage volume) / (ICD outflow) / 60

Storage Volume Calculations - STM1 (CB 1)

Given:

Area (ha) = 0.90
C = 0.90
C (100 YR) = 1.00

Release Rate (L/s) = 105.0
Available Storage Volume (m^3) = 265.3

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	233.2	105.0	128.2	38.5
	10	**76.8**	**173.0**	**105.0**	**68.0**	**40.8**
	15	61.8	139.1	105.0	34.1	30.7
	20	52.0	117.2	105.0	12.2	14.6
	25	45.2	101.7	105.0	-3.3	-4.9
	30	40.0	90.2	105.0	-14.8	-26.7
5 Year	5	141.2	317.9	105.0	212.9	63.9
	10	**104.2**	**234.6**	**105.0**	**129.6**	**77.8**
	15	83.6	188.2	105.0	83.2	74.9
	20	70.3	158.2	105.0	53.2	63.8
	25	60.9	137.1	105.0	32.1	48.2
	30	53.9	121.4	105.0	16.4	29.6
100 Year	5	242.7	607.3	105.0	502.3	150.7
	10	178.6	446.8	105.0	341.8	205.1
	15	142.9	357.5	105.0	252.5	227.3
	20	**120.0**	**300.1**	**105.0**	**195.1**	**234.2**
	25	103.8	259.8	105.0	154.8	232.3
	30	91.9	229.9	105.0	124.9	224.8

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM2 (CB 2)

Given:

Area (ha) = 0.63
C = 0.90
C (100 YR) = 1.00

Release Rate (L/s) = 60.0
Available Storage Volume (m^3) = 200.8

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	163.2	60.0	103.2	31.0
	10	**76.8**	**121.0**	**60.0**	**61.0**	**36.6**
	15	61.8	97.3	60.0	37.3	33.6
	20	52.0	82.0	60.0	22.0	26.4
	25	45.2	71.2	60.0	11.2	16.7
	30	40.0	63.1	60.0	3.1	5.6
5 Year	5	141.2	222.4	60.0	162.4	48.7
	10	104.2	164.2	60.0	104.2	62.5
	15	**83.6**	**131.6**	**60.0**	**71.6**	**64.5**
	20	70.3	110.7	60.0	50.7	60.8
	25	60.9	95.9	60.0	35.9	53.9
	30	53.9	85.0	60.0	25.0	44.9
100 Year	15	142.9	250.1	60.0	190.1	171.1
	20	120.0	210.0	60.0	150.0	180.0
	25	**103.8**	**181.8**	**60.0**	**121.8**	**182.7**
	30	91.9	160.8	60.0	100.8	181.5
	35	82.6	144.6	60.0	84.6	177.6
	40	75.1	131.5	60.0	71.5	171.7

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM3 (CB 3)

Given:

Area (ha) =	0.67	Release Rate (L/s) =	80.0
C =	0.90		
C (100 YR) =	1.00	Available Storage Volume (m^3) =	184.7

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	173.9	80.0	93.9	28.2
	10	**76.8**	**128.9**	**80.0**	**48.9**	**29.4**
	15	61.8	103.7	80.0	23.7	21.3
	20	52.0	87.4	80.0	7.4	8.8
	25	45.2	75.8	80.0	-4.2	-6.3
	30	40.0	67.2	80.0	-12.8	-23.0
5 Year	5	141.2	237.0	80.0	157.0	47.1
	10	**104.2**	**174.9**	**80.0**	**94.9**	**57.0**
	15	83.6	140.3	80.0	60.3	54.3
	20	70.3	117.9	80.0	37.9	45.5
	25	60.9	102.2	80.0	22.2	33.4
	30	53.9	90.5	80.0	10.5	19.0
100 Year	10	178.6	333.1	80.0	253.1	151.9
	15	142.9	266.6	80.0	186.6	167.9
	20	**120.0**	**223.8**	**80.0**	**143.8**	**172.5**
	25	103.8	193.7	80.0	113.7	170.6
	30	91.9	171.4	80.0	91.4	164.5
	35	82.6	154.0	80.0	74.0	155.5

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM4 (CB 4)

Given:

Area (ha) =	0.44	Release Rate (L/s) =	55.0
C =	0.82		
C (100 YR) =	1.00	Available Storage Volume (m^3) =	135.7

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	**5**	**103.6**	**104.8**	**55.0**	**49.8**	**14.9**
	10	76.8	77.7	55.0	22.7	13.6
	15	61.8	62.5	55.0	7.5	6.8
	20	52.0	52.7	55.0	-2.3	-2.8
	25	45.2	45.7	55.0	-9.3	-13.9
	30	40.0	40.5	55.0	-14.5	-26.1
5 Year	5	141.2	142.9	55.0	87.9	26.4
	10	**104.2**	**105.4**	**55.0**	**50.4**	**30.3**
	15	83.6	84.6	55.0	29.6	26.6
	20	70.3	71.1	55.0	16.1	19.3
	25	60.9	61.6	55.0	6.6	9.9
	30	53.9	54.6	55.0	-0.4	-0.8
100 Year	10	178.6	219.3	55.0	164.3	98.6
	15	142.9	175.5	55.0	120.5	108.5
	20	**120.0**	**147.3**	**55.0**	**92.3**	**110.8**
	25	103.8	127.6	55.0	72.6	108.9
	30	91.9	112.9	55.0	57.9	104.1
	35	82.6	101.4	55.0	46.4	97.5

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM5 (CB 5)

Given:

Area (ha) = 0.96
C = 0.89
C (100 YR) = 1.00

Release Rate (L/s) = 105.0
Available Storage Volume (m^3) = 269.7

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	247.0	105.0	142.0	42.6
	10	**76.8**	**183.2**	**105.0**	**78.2**	**46.9**
	15	61.8	147.3	105.0	42.3	38.1
	20	52.0	124.1	105.0	19.1	22.9
	25	45.2	107.7	105.0	2.7	4.1
	30	40.0	95.5	105.0	-9.5	-17.1
5 Year	5	141.2	336.7	105.0	231.7	69.5
	10	**104.2**	**248.5**	**105.0**	**143.5**	**86.1**
	15	83.6	199.3	105.0	94.3	84.9
	20	70.3	167.5	105.0	62.5	75.1
	25	60.9	145.2	105.0	40.2	60.4
	30	53.9	128.6	105.0	23.6	42.5
100 Year	15	142.9	383.1	105.0	278.1	250.3
	20	120.0	321.6	105.0	216.6	259.9
	25	**103.8**	**278.4**	**105.0**	**173.4**	**260.1**
	30	91.9	246.3	105.0	141.3	254.3
	35	82.6	221.4	105.0	116.4	244.4
	40	75.1	201.4	105.0	96.4	231.5

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM6 (CB 6)

Given:

Area (ha) = 0.62
C = 0.89
C (100 YR) = 1.00

Release Rate (L/s) = 60.0
Available Storage Volume (m^3) = 221.7

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	159.5	60.0	99.5	29.9
	10	**76.8**	**118.3**	**60.0**	**58.3**	**35.0**
	15	61.8	95.1	60.0	35.1	31.6
	20	52.0	80.1	60.0	20.1	24.2
	25	45.2	69.6	60.0	9.6	14.4
	30	40.0	61.7	60.0	1.7	3.0
5 Year	5	141.2	217.5	60.0	157.5	47.2
	10	104.2	160.5	60.0	100.5	60.3
	15	**83.6**	**128.7**	**60.0**	**68.7**	**61.8**
	20	70.3	108.2	60.0	48.2	57.8
	25	60.9	93.8	60.0	33.8	50.7
	30	53.9	83.1	60.0	23.1	41.5
100 Year	15	142.9	247.7	60.0	187.7	168.9
	20	120.0	207.9	60.0	147.9	177.5
	25	**103.8**	**180.0**	**60.0**	**120.0**	**180.0**
	30	91.9	159.2	60.0	99.2	178.6
	35	82.6	143.1	60.0	83.1	174.6
	40	75.1	130.2	60.0	70.2	168.6

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM7 (CB 7)

Given:

Area (ha) =	0.54	Release Rate (L/s) =	60.0
C =	0.90		
C (100 YR) =	1.00	Available Storage Volume (m^3) =	200.5

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	139.6	60.0	79.6	23.9
	10	**76.8**	**103.5**	**60.0**	**43.5**	**26.1**
	15	61.8	83.3	60.0	23.3	20.9
	20	52.0	70.1	60.0	10.1	12.2
	25	45.2	60.9	60.0	0.9	1.3
	30	40.0	54.0	60.0	-6.0	-10.8
5 Year	5	141.2	190.3	60.0	130.3	39.1
	10	**104.2**	**140.5**	**60.0**	**80.5**	**48.3**
	15	83.6	112.6	60.0	52.6	47.4
	20	70.3	94.7	60.0	34.7	41.6
	25	60.9	82.1	60.0	22.1	33.1
	30	53.9	72.7	60.0	12.7	22.9
100 Year	10	178.6	267.5	60.0	207.5	124.5
	15	142.9	214.0	60.0	154.0	138.6
	20	**120.0**	**179.7**	**60.0**	**119.7**	**143.6**
	25	103.8	155.6	60.0	95.6	143.3
	30	91.9	137.6	60.0	77.6	139.7
	35	82.6	123.7	60.0	63.7	133.8

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM8 (CB 8)

Given:

Area (ha) =	0.32	Release Rate (L/s) =	30.0
C =	0.68		
C (100 YR) =	0.85	Available Storage Volume (m^3) =	86.7

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	62.3	30.0	32.3	9.7
	10	**76.8**	**46.2**	**30.0**	**16.2**	**9.7**
	15	61.8	37.1	30.0	7.1	6.4
	20	52.0	31.3	30.0	1.3	1.5
	25	45.2	27.2	30.0	-2.8	-4.3
	30	40.0	24.1	30.0	-5.9	-10.7
5 Year	5	141.2	84.9	30.0	54.9	16.5
	10	**104.2**	**62.6**	**30.0**	**32.6**	**19.6**
	15	83.6	50.2	30.0	20.2	18.2
	20	70.3	42.2	30.0	12.2	14.7
	25	60.9	36.6	30.0	6.6	9.9
	30	53.9	32.4	30.0	2.4	4.4
100 Year	10	178.6	134.2	30.0	104.2	62.5
	15	142.9	107.4	30.0	77.4	69.7
	20	**120.0**	**90.2**	**30.0**	**60.2**	**72.2**
	25	103.8	78.1	30.0	48.1	72.1
	30	91.9	69.0	30.0	39.0	70.3
	35	82.6	62.1	30.0	32.1	67.3

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM9 (CB 9)

Given:

Area (ha) =	0.10	Release Rate (L/s) =	55.0
C =	0.85		
C (100 YR) =	1.00	Available Storage Volume (m^3) =	3.7

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	23.3	55.0	-31.7	-9.5
	10	76.8	17.3	55.0	-37.7	-22.6
	15	61.8	13.9	55.0	-41.1	-37.0
	20	52.0	11.7	55.0	-43.3	-52.0
	25	45.2	10.1	55.0	-44.9	-67.3
	30	40.0	9.0	55.0	-46.0	-82.8
5 Year	5	141.2	31.7	55.0	-23.3	-7.0
	10	104.2	23.4	55.0	-31.6	-19.0
	15	83.6	18.8	55.0	-36.2	-32.6
	20	70.3	15.8	55.0	-39.2	-47.1
	25	60.9	13.7	55.0	-41.3	-62.0
	30	53.9	12.1	55.0	-42.9	-77.2
100 Year	**5**	**242.7**	**64.3**	**55.0**	**9.3**	**2.8**
	10	178.6	47.3	55.0	-7.7	-4.6
	15	142.9	37.8	55.0	-17.2	-15.4
	20	120.0	31.8	55.0	-23.2	-27.9
	25	103.8	27.5	55.0	-27.5	-41.3
	30	91.9	24.3	55.0	-30.7	-55.2

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM10 (CB 10)

Given:

Area (ha) =	0.11	Release Rate (L/s) =	30.0
C =	0.79		
C (100 YR) =	0.99	Available Storage Volume (m^3) =	16.6

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	26.1	30.0	-3.9	-1.2
	10	76.8	19.3	30.0	-10.7	-6.4
	15	61.8	15.6	30.0	-14.4	-13.0
	20	52.0	13.1	30.0	-16.9	-20.3
	25	45.2	11.4	30.0	-18.6	-27.9
	30	40.0	10.1	30.0	-19.9	-35.8
5 Year	**5**	**141.2**	**35.6**	**30.0**	**5.6**	**1.7**
	10	104.2	26.2	30.0	-3.8	-2.3
	15	83.6	21.0	30.0	-9.0	-8.1
	20	70.3	17.7	30.0	-12.3	-14.8
	25	60.9	15.3	30.0	-14.7	-22.0
	30	53.9	13.6	30.0	-16.4	-29.6
100 Year	5	242.7	76.4	30.0	46.4	13.9
	10	**178.6**	**56.2**	**30.0**	**26.2**	**15.7**
	15	142.9	45.0	30.0	15.0	13.5
	20	120.0	37.8	30.0	7.8	9.3
	25	103.8	32.7	30.0	2.7	4.0
	30	91.9	28.9	30.0	-1.1	-1.9

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM11 (CB 11)

Given:

Area (ha) =	0.12	Release Rate (L/s) =	25.0
C =	0.70		
C (100 YR) =	0.88	Available Storage Volume (m^3) =	53.6

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	23.3	25.0	-1.7	-0.5
	10	76.8	17.3	25.0	-7.7	-4.6
	15	61.8	13.9	25.0	-11.1	-10.0
	20	52.0	11.7	25.0	-13.3	-16.0
	25	45.2	10.2	25.0	-14.8	-22.3
	30	40.0	9.0	25.0	-16.0	-28.8
5 Year	**5**	**141.2**	**31.8**	**25.0**	**6.8**	**2.0**
	10	104.2	23.4	25.0	-1.6	-0.9
	15	83.6	18.8	25.0	-6.2	-5.6
	20	70.3	15.8	25.0	-9.2	-11.0
	25	60.9	13.7	25.0	-11.3	-16.9
	30	53.9	12.1	25.0	-12.9	-23.2
100 Year	5	242.7	68.3	25.0	43.3	13.0
	10	**178.6**	**50.2**	**25.0**	**25.2**	**15.1**
	15	142.9	40.2	25.0	15.2	13.7
	20	120.0	33.7	25.0	8.7	10.5
	25	103.8	29.2	25.0	4.2	6.3
	30	91.9	25.8	25.0	0.8	1.5

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM12 (CB 12)

Given:

Area (ha) =	0.08	Release Rate (L/s) =	40.0
C =	0.89		
C (100 YR) =	1.00	Available Storage Volume (m^3) =	4.6

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	20.8	40.0	-19.2	-5.8
	10	76.8	15.4	40.0	-24.6	-14.8
	15	61.8	12.4	40.0	-27.6	-24.8
	20	52.0	10.4	40.0	-29.6	-35.5
	25	45.2	9.1	40.0	-30.9	-46.4
	30	40.0	8.0	40.0	-32.0	-57.5
5 Year	5	141.2	28.3	40.0	-11.7	-3.5
	10	104.2	20.9	40.0	-19.1	-11.5
	15	83.6	16.8	40.0	-23.2	-20.9
	20	70.3	14.1	40.0	-25.9	-31.1
	25	60.9	12.2	40.0	-27.8	-41.7
	30	53.9	10.8	40.0	-29.2	-52.5
100 Year	**5**	**242.7**	**54.5**	**40.0**	**14.5**	**4.3**
	10	178.6	40.1	40.0	0.1	0.1
	15	142.9	32.1	40.0	-7.9	-7.1
	20	120.0	26.9	40.0	-13.1	-15.7
	25	103.8	23.3	40.0	-16.7	-25.0
	30	91.9	20.6	40.0	-19.4	-34.9

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM13 (CB 13)

Given:

Area (ha) =	0.11	Release Rate (L/s) =	30.0
C =	0.79		
C (100 YR) =	0.99	Available Storage Volume (m^3) =	16.6

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	26.0	30.0	-4.0	-1.2
	10	76.8	19.3	30.0	-10.7	-6.4
	15	61.8	15.5	30.0	-14.5	-13.0
	20	52.0	13.1	30.0	-16.9	-20.3
	25	45.2	11.4	30.0	-18.6	-28.0
	30	40.0	10.1	30.0	-19.9	-35.9
5 Year	**5**	**141.2**	**35.5**	**30.0**	**5.5**	**1.6**
	10	104.2	26.2	30.0	-3.8	-2.3
	15	83.6	21.0	30.0	-9.0	-8.1
	20	70.3	17.7	30.0	-12.3	-14.8
	25	60.9	15.3	30.0	-14.7	-22.0
	30	53.9	13.6	30.0	-16.4	-29.6
100 Year	5	242.7	76.3	30.0	46.3	13.9
	10	**178.6**	**56.1**	**30.0**	**26.1**	**15.7**
	15	142.9	44.9	30.0	14.9	13.4
	20	120.0	37.7	30.0	7.7	9.2
	25	103.8	32.6	30.0	2.6	3.9
	30	91.9	28.9	30.0	-1.1	-2.0

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM14 (CB 14)

Given:

Area (ha) =	0.10	Release Rate (L/s) =	25.0
C =	0.81		
C (100 YR) =	1.00	Available Storage Volume (m^3) =	54.5

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	22.2	25.0	-2.8	-0.8
	10	76.8	16.5	25.0	-8.5	-5.1
	15	61.8	13.2	25.0	-11.8	-10.6
	20	52.0	11.2	25.0	-13.8	-16.6
	25	45.2	9.7	25.0	-15.3	-23.0
	30	40.0	8.6	25.0	-16.4	-29.5
5 Year	**5**	**141.2**	**30.3**	**25.0**	**5.3**	**1.6**
	10	104.2	22.3	25.0	-2.7	-1.6
	15	83.6	17.9	25.0	-7.1	-6.4
	20	70.3	15.1	25.0	-9.9	-11.9
	25	60.9	13.1	25.0	-11.9	-17.9
	30	53.9	11.6	25.0	-13.4	-24.2
100 Year	5	242.7	64.3	25.0	39.3	11.8
	10	**178.6**	**47.3**	**25.0**	**22.3**	**13.4**
	15	142.9	37.9	25.0	12.9	11.6
	20	120.0	31.8	25.0	6.8	8.1
	25	103.8	27.5	25.0	2.5	3.8
	30	91.9	24.3	25.0	-0.7	-1.2

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM15 + STM16 (DICB 15)

Given:

Area (ha) =	0.07	Release Rate (L/s) =	20.0
C =	0.26		
C (100 YR) =	0.32	Available Storage Volume (m^3) =	18.3

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	5.4	20.0	-14.6	-4.4
	10	76.8	4.0	20.0	-16.0	-9.6
	15	61.8	3.2	20.0	-16.8	-15.1
	20	52.0	2.7	20.0	-17.3	-20.7
	25	45.2	2.4	20.0	-17.6	-26.4
	30	40.0	2.1	20.0	-17.9	-32.2
5 Year	5	141.2	7.4	20.0	-12.6	-3.8
	10	104.2	5.5	20.0	-14.5	-8.7
	15	83.6	4.4	20.0	-15.6	-14.0
	20	70.3	3.7	20.0	-16.3	-19.6
	25	60.9	3.2	20.0	-16.8	-25.2
	30	53.9	2.8	20.0	-17.2	-30.9
100 Year	5	242.7	15.9	20.0	-4.1	-1.2
	10	178.6	11.7	20.0	-8.3	-5.0
	15	142.9	9.4	20.0	-10.6	-9.5
	20	120.0	7.9	20.0	-12.1	-14.5
	25	103.8	6.8	20.0	-13.2	-19.8
	30	91.9	6.0	20.0	-14.0	-25.1

Notes:

1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

Storage Volume Calculations - STM17 (DICB 17)

Given:

Area (ha) =	0.07	Release Rate (L/s) =	20.0
C =	0.27		
C (100 YR) =	0.34	Available Storage Volume (m^3) =	16.0

Design Event	Time (min)	Rainfall Intensity (mm/hr)	Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
2 Year	5	103.6	5.0	20.0	-15.0	-4.5
	10	76.8	3.7	20.0	-16.3	-9.8
	15	61.8	3.0	20.0	-17.0	-15.3
	20	52.0	2.5	20.0	-17.5	-21.0
	25	45.2	2.2	20.0	-17.8	-26.7
	30	40.0	1.9	20.0	-18.1	-32.5
5 Year	5	141.2	6.9	20.0	-13.1	-3.9
	10	104.2	5.1	20.0	-14.9	-9.0
	15	83.6	4.1	20.0	-15.9	-14.3
	20	70.3	3.4	20.0	-16.6	-19.9
	25	60.9	3.0	20.0	-17.0	-25.6
	30	53.9	2.6	20.0	-17.4	-31.3
100 Year	5	242.7	14.7	20.0	-5.3	-1.6
	10	178.6	10.8	20.0	-9.2	-5.5
	15	142.9	8.7	20.0	-11.3	-10.2
	20	120.0	7.3	20.0	-12.7	-15.3
	25	103.8	6.3	20.0	-13.7	-20.5
	30	91.9	5.6	20.0	-14.4	-26.0

Notes:

1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Provided and available storage volume values have been calculated using Civil3D by Autodesk.
3. Flow calculated using the Rational Method. Q=2.78CiA
4. C (100 YR) = C + 25% (Max. 1.0)
5. Available storage volume corresponds to the maximum surface storage volume available before 'overtopping'.

HYDRAULIC GRADE LINE COMPUTATION FORM

From Manhole	To Manhole	U/S Invert	D/S Invert	U/S Obvert	D/S Obvert	Slope	TW	Diameter D_o	Area	Hydraulic Radius	5 Year Peak Flow Q_o	Length L_o	Velocity V_o	Velocity Head $V_o^2/2g$	Friction Slope Sf_o	Friction Loss H_f	Angle of Deflection at U/S MH	Bend Loss Coefficient	Hydraulic Loss at MH*[1]	EGL_o	EGL_i	HGL_o	HGL_i	Ground Elev.	Surcharge Depth	Free Board
		m	m	m	m	m/m	m	m	m^2	m	m^3/s	m	m/s	m	m/m	m	degrees		m	m	m	m	m	m	m	m
EX101	200	101.98	101.86	102.89	102.77	0.0060	103.57	0.914	0.66	0.23	1.337	20.0	2.04	0.21	0.0050	0.100	90	1.32	0.2795	103.78	104.16	103.57	103.95	106.10	1.06	2.15
200	205	102.19	102.04	103.10	102.95	0.0050	103.95	0.914	0.66	0.23	1.209	30.1	1.84	0.17	0.0041	0.124	0	0.02	0.0035	104.12	104.25	103.95	104.08	106.23	0.97	2.15
205	201	102.64	102.34	103.40	103.10	0.0043	104.08	0.762	0.46	0.19	0.718	70.4	1.57	0.13	0.0038	0.269	0	0.02	0.0025	104.20	104.47	104.08	104.35	106.37	0.95	2.02
201	202	102.90	102.67	103.66	103.43	0.0038	104.35	0.762	0.46	0.19	0.620	59.9	1.36	0.09	0.0029	0.171	90	1.32	0.1245	104.44	104.74	104.35	104.64	106.43	0.98	1.79
202	203	103.29	102.96	104.05	103.72	0.0035	104.64	0.762	0.46	0.19	0.628	93.0	1.38	0.10	0.0029	0.272	0	0.02	0.0019	104.74	105.01	104.64	104.92	106.35	0.87	1.43
203	204	103.76	103.32	104.52	104.08	0.0029	104.92	0.762	0.46	0.19	0.573	150.0	1.26	0.08	0.0024	0.365	0	0.02	0.0016	105.00	105.36	104.92	105.28	106.46	0.76	1.18
EX101	200	101.98	101.86	102.89	102.77	0.0060	103.57	0.914	0.66	0.23	1.337	20.0	2.04	0.21	0.0050	0.100	90	1.32	0.2795	103.78	104.16	103.57	103.95	106.10	0.88	2.16
200	205	102.19	102.04	103.10	102.95	0.0050	103.95	0.914	0.66	0.23	1.209	30.1	1.84	0.17	0.0041	0.124	0	0.02	0.0035	104.12	104.25	103.95	104.08	106.23	1.02	1.97
205	201	102.64	102.34	103.40	103.10	0.0043	104.08	0.762	0.46	0.19	0.718	70.4	1.57	0.13	0.0038	0.269	90	1.32	0.1668	104.20	104.64	104.08	104.51	106.37	0.98	1.81
201	208	104.98	103.24	105.28	103.54	0.0396	104.51	0.299	0.07	0.07	0.109	43.9	1.55	0.12	0.0129	0.566	0	0.02	0.0025	104.64	105.20	104.51	105.08	107.85	-0.20	2.77
208	BLDG	105.50	105.04	105.75	105.29	0.0500	105.08	0.252	0.05	0.06	0.015	9.2	0.30	0.00	0.0006	0.006	0	0.02	0.0001	105.09	105.09	105.08	105.09	108.18	-0.67	3.09
EX101	200	101.98	101.86	102.89	102.77	0.0060	103.57	0.914	0.66	0.23	1.337	20.0	2.04	0.21	0.0050	0.100	90	1.32	0.2795	103.78	104.16	103.57	103.95	106.10	0.88	2.16
200	205	102.19	102.04	103.10	102.95	0.0050	103.95	0.914	0.66	0.23	1.209	30.1	1.84	0.17	0.0041	0.124	90	1.32	0.2284	104.12	104.48	103.95	104.30	106.23	1.02	1.97
205	206	102.93	102.42	103.62	103.11	0.0055	104.30	0.686	0.37	0.17	0.575	92.9	1.56	0.12	0.0043	0.399	0	0.02	0.0025	104.43	104.83	104.30	104.70	106.33	1.09	1.63
206	207	103.78	102.96	104.47	103.65	0.0055	104.70	0.686	0.37	0.17	0.549	150.0	1.48	0.11	0.0039	0.586	0	0.02	0.0022	104.82	105.40	104.70	105.29	106.46	0.83	1.17
EX101	200	101.98	101.86	102.89	102.77	0.0060	103.57	0.914	0.66	0.23	1.337	20.0	2.04	0.21	0.0050	0.100	0	0.02	0.0042	103.78	103.89	103.57	103.67	106.10	0.88	2.16
200	304	HGL is contained within storm sewer																								

Notes:
1. From "Sewer Bend Loss Coefficient Design Chart", Appendix 6-B, City of Ottawa Sewer Design Guidelines, 2004

Designed: BLM	**Project:** Maritime-Ontario Distribution Warehouse
Checked:	**Location:** 8800 Campeau Drive, KWBP, Ottawa, ON
Dwg. Reference:	**Project No.:** 20027 / **Date:** 17-Jan-22 / **Page** 1 of 1

From "Sewer Bend Loss Coefficient Design Chart", Appendix 6-B, City of Ottawa Sewer Design Guidelines, 2004

Deflection Angle	Bend Loss Coefficient
0	0.02
30	0.22
50	0.46
90	1.32