PROJECT: 119777-5.2.2

# 2900 WOODROFFE AVENUE PAD A SERVICING AND STORMWATER MANAGEMENT DESIGN BRIEF

Prepared for Chris Flemming Developments by IBI Group

May 8, 2019

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# 1 INTRODUCTION

IBI Group has been retained by Chris Flemming Developments, c/o the Owner, Woodroffe Square Inc., to provide civil engineering services to support a new pad in the Mulligan Centre Shopping Centre.

This Site Servicing Brief outlines the detailed design for extending storm, sanitary, and water services to Building Pad A, a proposed two storey 467.2 sq. m (233.6 x 2) stand-alone building, located in the existing Mulligan Centre shopping plaza near the intersection of Woodroffe Avenue and Longsfields Drive. The existing shopping center is bound by residential developments to the north and west, commercial lands to the south, and Woodroffe Avenue to the east. Refer to site location map in Figure 1.

The 0.95 Ha property is known as 2900-2910 Woodroffe Avenue and is Block 102 on Registered Plan 4M-796 in the City of Ottawa. It is zoned LC (2127). A copy of the Site Plan prepared by P-Squared Concepts Inc. is included in **Appendix A**.

# 2 WATER DISTRIBUTION

### 2.1 Existing Conditions

The subject lands currently contains 2 commercial buildings and they are serviced by an onsite private watermain and fire protection is provided with an onsite private hydrant.

A 200mm diameter watermain on Longfields Ave provides the connection to the existing municipal water distribution system.

#### 2.2 Design Criteria

The following design criteria, which were extracted from the City's Water Distribution Design Guidelines, were used to estimate the water demand requirements for the site:

Peak Hourly Demand = 1.8 X ADD Fire Demand	= 4500 l/1000sm/day = 66.7 l/s (as per Fire Underwriters
	Survey – calculations provided in <b>Appendix B</b> )

Required Hydraulic Gradients are defined by the City of Ottawa Water Distribution Guidelines:

•	Minimum – max hour	276 kPa
•	Minimum – max day and fire	140 kPa
•	Maximum pressure	552 kPa

A site boundary condition was provided by the City of Ottawa, and the hydraulic gradients for the site are provided below. Correspondence of the boundary conditions is provided in **Appendix B**.

٠	Maximum Day plus Fire Flow	125.4 m
٠	Minimum HGL (Peak Hour)	126.5 m
٠	Maximum HGL	132.6 m



IBI

Project Title

2900 WOODROFFE AVENUE

OTTAWA, ONTARIO

SITE LOCATION

FIGURE 1

The water demand for the building was calculated using the City of Ottawa guidelines (2500l/d for each 1000 sm of office space). Based on a building with 467.2sm, the expected water demand for the proposed building is:

•	Average Daily Demand	0.0135 l/s
•	Maximum Daily Demand	0.02 l/s
•	Peak Hourly Demand	0.024 l/s

### 2.3 Hydraulic Calculation

The main level and second floor finished floor elevations for the new building will be approximately 92.3 and 95.7meters respectively. Under the Minimum HGL condition, the hydraulic head is 126.5m as provided by the City of Ottawa, the head difference to the main level is 34.2m and 30.8m to the second level, which converts to a water pressure inside the building of 335 and 302 kPa respectively, which exceeds the minimum requirement of 276 kPa per the City guidelines.

Under the Maximum HGL condition the water pressure is calculated for the main level finished floor, elevation 92.3m. The head difference between maximum HGL 132.6 and the main level finished floor (92.3m) is 40.3m, which equates to a water pressure of 395 kPa, which is less than the maximum allowed of 552 kPa per City guidelines. Therefore, pressure reducing valves are not required.

A required fire flow rate of 66.7 I/s has been determined using the methodology from the Fire Underwriters Survey (FUS) 1999, a copy of the calculation is included in **Appendix B**. The 66.7 I/s fire flow was provided to the City in order to determine the HGL condition for the maximum day plus fire condition as shown in Section 2.2. The Maximum Day plus Fire Flow head is 125.4m, and the hydrant elevation is assumed to be 92.7m, the head difference is 32.7, which equates to an available pressure of 320 kPa, which exceeds the minimum of 140 kPa per City guidelines. Accordingly, there will be sufficient fire flow pressure available for the site.

### 2.4 Proposed Water Plan

The water service for Pad A will be provided through a proposed 50mm diameter type K copper line connected to the existing 150 mmØ private watermain network located in the existing parking lot. Fire protection will be provided by existing hydrant located in the parking lot. See Drawing C-001 in **Appendix B** for details.

# **3 SANITARY SEWERS**

The existing plaza is serviced by a series of 200 mmØ sanitary sewers which discharge into a 250 mmØ outlet sewer which is located in a servicing block and connects to the 300 mmØ sanitary sewer in Woodpark Way. The above is illustrated on the original site servicing plan, a copy of which is included in **Appendix C**.

Unfortunately, we are unable to locate the original sewer design sheets. However, based on the sewer design parameters used at the time of the original design, the 0.95 Ha commercial site would have been designed to accommodate a design volume of 50,000 I/Ha/d, a peak factor of 1.5, and an infiltration rate of 0.28 I/s/Ha. Which equates to  $(0.95 \times 50,000) \times 1.5/86400) + (0.95 \times 0.28) = 0.824 + 0.266 = 1.09$  I/s. The existing 250 mmØ outlet sewer was installed with a slope of 0.5% and has a capacity of 43.8 I/s, which is ample to accommodate the site.

The addition of 467.2 sq. m of office space (Real Estate Office) to accommodate approximately 21 staff will have a very limited increase in flow. Using the City's Sewer Design Guidelines, Appendix 4A, employees for an office are anticipated to have a demand of 75 l/d for the 21 people. Using a peak factor of 1.5 this equates to 0.027 l/s which will have no significant impact on the onsite or offsite sewers.

To service the new building a 150 mmØ service will be extended to the existing 200 mmØ sewer. Due to the limited depth of cover, the sewer has been designed with a slope of 0.65% and will require thermal installation. See details on Servicing Plan C-001, a copy of the sanitary service design sheet is included in **Appendix C**.

## 4 STORM SEWERS AND STORMWATER MANAGEMENT

The existing plaza is serviced by a series of 300 and 325 mmØ storm sewers which discharge into a 450 mmØ outlet sewer which is located in an existing servicing block connecting to the 1500 mmØ storm sewer in Woodpark Way. The above is illustrated on the original Site Servicing Plan which is included in **Appendix C**. The existing system was designed to meet the local design criteria of 64 I/s/Ha, and an orifice is located in existing MH6 which limits the site to 53 I/s. The original Ponding Plan for the site is included in **Appendix D** which illustrates a total surface storage of 296 m<sup>3</sup>.

The proposed pad is located on the existing asphalt surface and therefore, no increase in runoff coefficient due to the transition from asphalt to roof. A small section of existing grassed area will be replaced with a walkway along the rear of the building and providing a pedestrian link to the Woodroffe Avenue sidewalk. This area between the curb and the sidewalk is a depressed landscape area with mature trees and shrubs. The area is approximately 0.3 to 0.5 m below the curbs on site and 0.5 to 0.8 m below the City sidewalk and does not have a direct connection to the onsite storm system.

From reviewing old plans this former ditch was not "urbanized" when the storm sewers were installed along Woodroffe Avenue. Since this area has mature maintained landscaping, we propose to leave the area as is, except for the installation of the linking walkway.

The new pad will have the roof drains controlling flow from the roof to 1.26 l/s (2 drains @ 0.63 l/s each). An updated tributary area plan C-500 has been prepared and is included in **Appendix D**.

Since the existing storm sewer system has an ICD controlling flow from the site to 64 I/s/Ha and no significant change is proposed to the tributary area or the associated runoff coefficient. We do not propose any modifications to the ICD and we do not expect any negative impact on the local and downstream storm system due to the proposed pad addition. Nor do we anticipate any negative impact on the current onsite roadway.

We have included an updated modified rational method calculation in **Appendix D** demonstrating when adding the new pad, the original ponding volumes remain sufficient to accommodate the rate.

The Site Servicing Plan in **Appendix C** illustrates the proposed 200 mmØ service lateral to servicing the building. A copy of the local storm sewer design sheet is included in **Appendix D**.

# 5 GRADING

The area which the building is proposed is located at the high end of the site topography. The original Ponding Plan noted the limits of ponding at 91.90 m and the proposed building FF elevation of 92.3 provides sufficient freeboard from the ponding elevation. Minor regrading of the asphalt parking lot adjacent to the building is proposed to facilitate transition from the existing asphalt surface to the proposed walkway around the building. Drawing 200 in **Appendix E** illustrates the proposed regrading works around the pad.

There are no off-site grading proposed for this project other than the pedestrian link noted above.

Gemtec Geotechnical Report dated May 3, 2019 provides details on the existing soils within the development. The report provides recommendations which include but are not limited to the following:

- The permissible grade raise in the area of the proposed building is limited to a maximum elevation of 92.70m.
- Fill placed below the foundations to meet OPSS Granular 'B' Type II placed in 200 mm lifts compacted to 95% SPMDD.
- Pavement Structure:

ACCESS LANES AND HEAVY TRUCK PARKING AREAS	CAR PARKING AREAS
40 mm superpave 12.5 mm 60 mm superpave 19 mm	50 mm superpave 12.5 mm
150 mm Granular 'A' 450 mm Granular 'B' Type II	150 mm Granular 'A' 300 mm Granular 'B' Type II

The grading plan does not propose grades above 92.45 meters near the building, therefore, no grade raise issues are expected. The Site Servicing Plan notes the above pavement structure is to be followed unless directed otherwise by the Geotechnical Engineer.

# 6 SEDIMENT AND EROSION CONTROL PLAN

To reduce the possibility of sediment loads entering the existing storm sewer system during construction, a continuous row of silt bags will be placed around the perimeter of the construction limits, in addition, existing catchbasins in the vicinity of the proposed construction will have a silt bag placed in the structure. The sediment control measures should be maintained on a regular basis and remain in place until the area is repaved and vegetation is established in the landscape areas. See Drawing C-900 in **Appendix E**.

# 7 RECOMMENDATIONS

This servicing and stormwater management design brief has demonstrated the proposed site plan can be serviced by connecting to existing storm, sanitary, and watermain pipes in the existing parking lot of the shopping plaza. The existing services have sufficient capacity to accommodate the proposed expansion. On-site stormwater management is provided by an existing ICD limiting flow to 64 I/s/Ha. The construction of storm, and sanitary sewers, and watermain for the proposed building can be completed in conformance with the City of Ottawa standards. Adherence to the sediment and erosion control plan during construction will minimize harmful impacts on downstream systems.

Since this site is serviced by one connection to the municipal system and the site is owned by single owner, we believe it does not require an ECA for the construction of the service laterals. However, the Owner will be required to obtain a Commence Work Notification for the servicing and a Water Permit for the water service connection to the existing main.

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Demetrius Tannedopoulos, P. Eng. Director, Ottawa Office Lead

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IBI GROUP PROJECT: 119777-5.2.2 2900 WOODROFFE AVENUE PAD A SERVICING AND STORMWATER MANAGEMENT DESIGN BRIEF Prepared for Chris Flemming Developments

# **APPENDIX A**

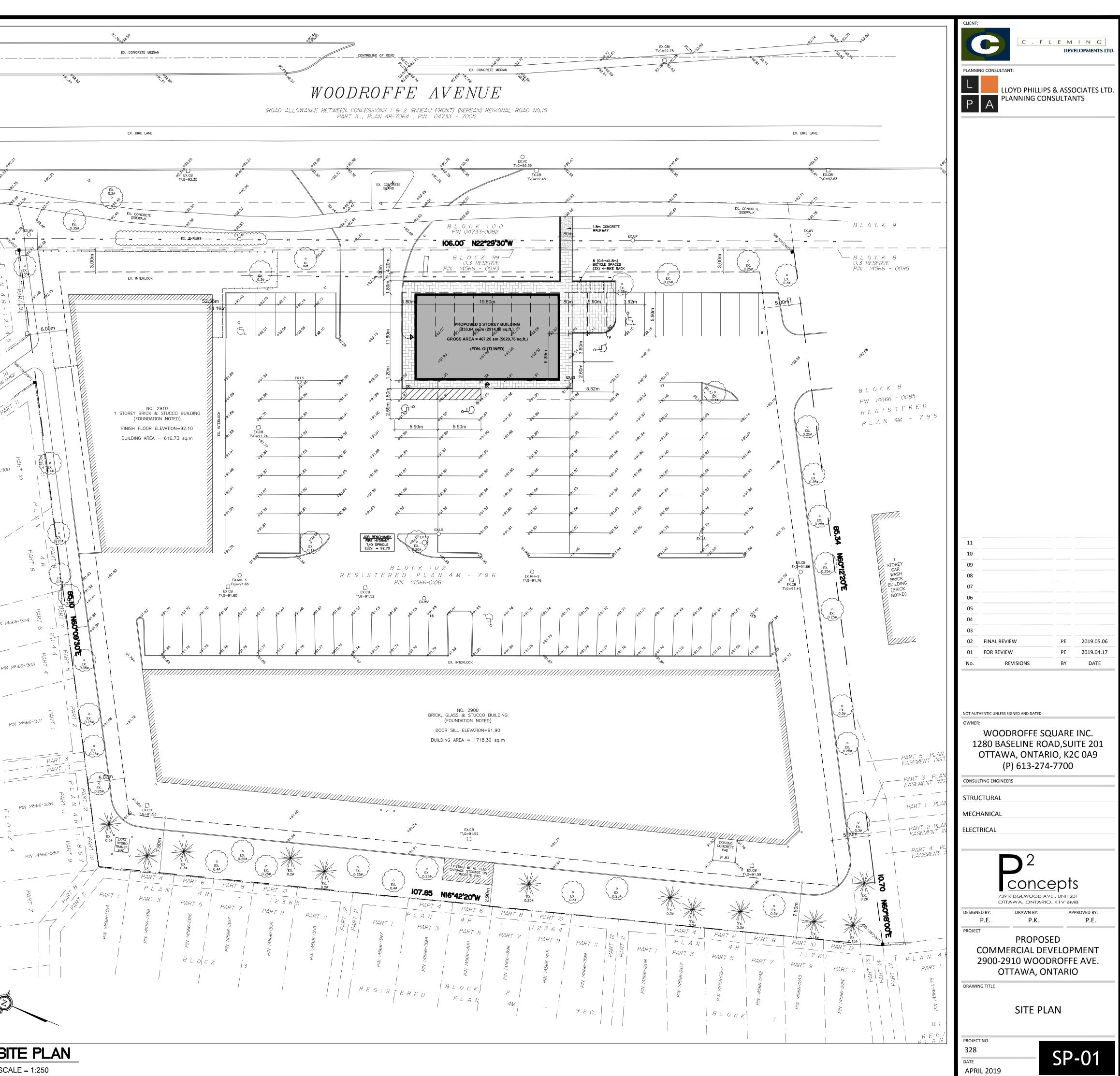
• Site Plan

Register	)2 Survey Prepar			Dated:			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
City of C	red Plan 4M-796 Annis, O'Sulliv Ottawa	an, Vollebel	kk Ltd.	26 Febru	uary 2019		×92, k5 ×82, ×82
City of C	Ottawa - Zoning By-law 2008-250						<sup>ي</sup> ن <sup>2</sup>
			Required		Provided		
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Min. Rea	ar Yard Setback		7.50 m		7.50 m		*92.21
	erior Yard Setback		5.00 m		5.00 m		9 <sup>1,33</sup>
Max. Bu	ilding Height		12.50 m			(New Bldg.) Existing 2900) Existing 2910)	
	oor Space Index		-		0.29		
	ndscape Width - Abutting Street		3.00 m		4.20 m		C K 99 RESERVE
Min. Par	rking Lot Landscape Area		15% OF PA AREA (457 641.33 sq.1	72.55)	48.02% 2195.84 so	ą.m	
	rking Lot Landscape Buffer - Front (NNE) Yar		3.00 m		4.20 m		[→ []EX. [> . ]359
	rking Lot Landscape Buffer - Right (SSE)Yard		3.00 m		2.90 m	(Existing)	
	rking Lot Landscape Buffer - Left (WSW) Yarc rking Lot Landscape Buffer - Rear (WSW) Yar		3.00 m		2.80 m	(Existing) (Existing)	D - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
	hicle Parking Spaces	<u>u</u>	3.00 m 97		6.00 m 112	(Existing)	
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	e Enclosure				0		1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (
Min. Set	tback - From Lot Line Abutting Street		9.00 m		83.20 m	(Existing)	PiN N.
	tback - From Lot Line - Right Yard		3.00 m		51.33 m	(Existing)	of the second se
	tback - From Lot Line - Left Yard		3.00 m		47.67 m	(Existing)	
	tback - From Lot Line - Rear Yard ight of Opague Screen		3.00 m 2.00 m		2.90 m 3.35 m	(Existing) (Existing)	
	5 1 5					( )/	
	<u></u>						て 12 元 1300 - 1
Parking	Calcualtions	<u> </u>	Vehicle	Required	Bicycle	Required	PIN 14566-1300 -4
		Area	Parking	Vehicle	Parking	Bicycle	
Existing	Building - 2900 Woodroffe	(sq.m)	Rate	Spaces	Rate	Spaces	-
Unit 1A	Barrhaven Music Academy	113.15	3.4 / 100	3.85	1 / 1500	0.07543	
Unit 1B	Alterna Savings - ATM only	30.47	-	-	1 1 / 960	0.12188	
	1 for 1 pizza (take out, delivery)	01.20	5/100	4 72	1 / 250		
Unit 2	1 for 1 pizza (take out, delivery) Cuts For Kids Hair Salon	94.38 113.38	5 / 100 3.4 / 100	4.72	1 / 250	0.37752	
	1 for 1 pizza (take out, delivery)Cuts For Kids Hair SalonVacant	94.38 113.38 79.89	5 / 100 3.4 / 100 5 / 100	4.72 3.85 3.99			PAR
Unit 2 Unit 3 Unit 4 Unit 5	Cuts For Kids Hair SalonVacantBarrhaven Veterinary Clinic	113.38 79.89 211.81	3.4 / 100 5 / 100 4 / 100	3.85 3.99 8.47	1 / 250 1 / 500 1 / 250 1 / 2000	0.37752 0.22676 0.31956 0.10591	μ-  
Unit 2 Unit 3 Unit 4 Unit 5 Unit 6A	Cuts For Kids Hair SalonVacantBarrhaven Veterinary ClinicLyra Drycleaners	113.38 79.89 211.81 66.52	3.4 / 100 5 / 100 4 / 100 3.4 / 100	3.85         3.99         8.47         2.26	1 / 250 1 / 500 1 / 250 1 / 2000 1 / 500	0.37752 0.22676 0.31956 0.10591 013304	α τ τ τ τ τ
Unit 2 Unit 3 Unit 4 Unit 5 Unit 6A Unit 6B	Cuts For Kids Hair SalonVacantBarrhaven Veterinary ClinicLyra DrycleanersPhysioVive	113.38 79.89 211.81 66.52 121.33	3.4 / 100         5 / 100         4 / 100         3.4 / 100         4 / 100	3.85         3.99         8.47         2.26         4.85	1 / 250 1 / 500 1 / 250 1 / 2000 1 / 500 1 / 1000	0.37752 0.22676 0.31956 0.10591 013304 0.12133	α α
Unit 2 Unit 3 Unit 4 Unit 5 Unit 6A	Cuts For Kids Hair SalonVacantBarrhaven Veterinary ClinicLyra Drycleaners	113.38 79.89 211.81 66.52	3.4 / 100 5 / 100 4 / 100 3.4 / 100	3.85         3.99         8.47         2.26	1 / 250 1 / 500 1 / 250 1 / 2000 1 / 500	0.37752 0.22676 0.31956 0.10591 013304	
Unit 2 Unit 3 Unit 4 Unit 5 Unit 6A Unit 6B Unit 7	Cuts For Kids Hair SalonVacantBarrhaven Veterinary ClinicLyra DrycleanersPhysioViveBrother Chiu Chinese (take out, delivery)	113.38         79.89         211.81         66.52         121.33         96.52	3.4 / 100         5 / 100         4 / 100         3.4 / 100         4 / 100         5 / 100	3.85         3.99         8.47         2.26         4.85         4.83	1 / 250 1 / 500 1 / 250 1 / 2000 1 / 500 1 / 1000 1 / 250	0.37752 0.22676 0.31956 0.10591 013304 0.12133 0.38608	τ Ο α τ- Ο μ χ 2 σ. PIN 14566-1304
Unit 2 Unit 3 Unit 4 Unit 5 Unit 6A Unit 6B Unit 7 Unit 8 Unit 9 Unit 10	Cuts For Kids Hair SalonVacantBarrhaven Veterinary ClinicLyra DrycleanersPhysioViveBrother Chiu Chinese (take out, delivery)Dr. Charles Cao - DentistPho Haven (50% take out, delivery)Dr. Abbud Medical Clinic/Pharmacy	113.3879.89211.8166.52121.3396.52115.47132.10203.45	3.4 / 100         5 / 100         4 / 100         3.4 / 100         4 / 100         5 / 100         4 / 100         5 / 100         4 / 100         5 / 100         4 / 100         5 / 100         4 / 100	3.85         3.99         8.47         2.26         4.85         4.83         4.62         6.61         8.14	1 / 250 1 / 500 1 / 250 1 / 2000 1 / 2000 1 / 500 1 / 1000 1 / 250 4 / 1000 1 / 250 1 / 1000	0.37752           0.22676           0.31956           0.10591           013304           0.12133           0.38608           0.11547           0.52840           0.20345	
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Unit 2 Unit 3 Unit 4 Unit 5 Unit 6A Unit 6B Unit 7 Unit 7 Unit 7 Unit 10 Unit 10 Unit 11 Existing Unit 1 Unit 2 Unit 3 Unit 4	Cuts For Kids Hair SalonVacantBarrhaven Veterinary ClinicLyra DrycleanersPhysioViveBrother Chiu Chinese (take out, delivery)Dr. Charles Cao - DentistPho Haven (50% take out, delivery)Dr. Abbud Medical Clinic/PharmacySherwin WilliamsBuilding - 2910 WoodroffeBarrhaven Market (take-out)Lulu Shawarma & Grill (take-out, delivery)Little Scholars Montessori Daycare	113.38         79.89         211.81         66.52         121.33         96.52         115.47         132.10         203.45         333.70         278.88         123.89	3.4 / 100         5 / 100         4 / 100         3.4 / 100         4 / 100         5 / 100         4 / 100         5 / 100         4 / 100         5 / 100         5 / 100         5 / 100         5 / 100         5 / 100         5 / 100	3.85         3.99         8.47         2.26         4.85         4.83         4.62         6.61         8.14         11.35         13.94         6.19	1 / 250 1 / 500 1 / 250 1 / 2000 1 / 2000 1 / 500 1 / 1000 1 / 250 4 / 1000 1 / 250 1 / 250 1 / 250 1 / 250 1 / 250	0.37752         0.22676         0.31956         0.10591         013304         0.12133         0.38608         0.11547         0.52840         0.20345         1.33480	E 0 ∞ F- 0 N × Z PIN 14566-1304 PIN 14566-1303 0 PIN 14566-1303
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Unit 2 Unit 3 Unit 4 Unit 5 Unit 6A Unit 6B Unit 6B Unit 7 Unit 8 Unit 9 Unit 10 Unit 11 Existing Unit 1 Unit 2 Unit 3 Unit 3 Unit 4 New Bu Unit 1	Cuts For Kids Hair Salon         Vacant         Barrhaven Veterinary Clinic         Lyra Drycleaners         PhysioVive         Brother Chiu Chinese (take out, delivery)         Dr. Charles Cao - Dentist         Pho Haven (50% take out, delivery)         Dr. Abbud Medical Clinic/Pharmacy         Sherwin Williams         Building - 2910 Woodroffe         Barrhaven Market (take-out)         Lulu Shawarma & Grill (take-out, delivery)         Little Scholars Montessori Daycare         xillding         ReMax (office)	113.38         79.89         211.81         66.52         121.33         96.52         115.47         132.10         203.45         333.70         278.88         123.89         204.99	3.4 / 100 5 / 100 4 / 100 3.4 / 100 4 / 100 5 / 100 4 / 100 5 / 100 4 / 100 3.4 / 100 3.4 / 100 5 / 100 5 / 100 5 / 100 2 / 100	3.85         3.99         8.47         2.26         4.85         4.83         4.62         6.61         8.14         11.35         13.94         6.19         4.10         11.21         97.37	1 / 250 1 / 500 1 / 250 1 / 2000 1 / 2000 1 / 2000 1 / 200 1 / 200 1 / 250 4 / 1000 1 / 250 1 / 250 1 / 250 1 / 250 1 / 250	0.37752 0.22676 0.31956 0.10591 013304 0.12133 0.38608 0.11547 0.52840 0.20345 1.33480 1.11552 0.49556 0.81996 1.86912 8.35	E 0 ∞ F C I> X Z D PIN 14566-1304 PIN 14566-1303 PIN 14566-1303
Unit 2 Unit 3 Unit 4 Unit 5 Unit 6A Unit 6B Unit 6B Unit 7 Unit 8 Unit 9 Unit 10 Unit 11 Existing Unit 1 Unit 2 Unit 3 Unit 3 Unit 4 New Bu Unit 1 Total Pa	Cuts For Kids Hair Salon         Vacant         Barrhaven Veterinary Clinic         Lyra Drycleaners         PhysioVive         Brother Chiu Chinese (take out, delivery)         Dr. Charles Cao - Dentist         Pho Haven (50% take out, delivery)         Dr. Abbud Medical Clinic/Pharmacy         Sherwin Williams         Building - 2910 Woodroffe         Barrhaven Market (take-out)         Lulu Shawarma & Grill (take-out, delivery)         Little Scholars Montessori Daycare         xillding         ReMax (office)	113.38         79.89         211.81         66.52         121.33         96.52         115.47         132.10         203.45         333.70         278.88         123.89         204.99	3.4 / 100 5 / 100 4 / 100 3.4 / 100 4 / 100 5 / 100 4 / 100 5 / 100 4 / 100 3.4 / 100 3.4 / 100 5 / 100 5 / 100 5 / 100 2 / 100	3.85         3.99         8.47         2.26         4.85         4.83         4.62         6.61         8.14         11.35         13.94         6.19         4.10         11.21         97.37	1 / 250 1 / 500 1 / 250 1 / 2000 1 / 2000 1 / 2000 1 / 200 1 / 200 1 / 250 4 / 1000 1 / 250 1 / 250 1 / 250 1 / 250 1 / 250	0.37752 0.22676 0.31956 0.10591 013304 0.12133 0.38608 0.11547 0.52840 0.20345 1.33480 1.11552 0.49556 0.81996 1.86912 8.35	E 0 ∞ F C I> X Z D PIN 14566-1304 PIN 14566-1303 PIN 14566-1303
Unit 2 Unit 3 Unit 4 Unit 5 Unit 6A Unit 6B Unit 6B Unit 7 Unit 8 Unit 9 Unit 10 Unit 11 Existing Unit 1 Unit 2 Unit 3 Unit 4 New Bu Unit 1 Site & B Lot Area	Cuts For Kids Hair Salon         Vacant         Barrhaven Veterinary Clinic         Lyra Drycleaners         PhysioVive         Brother Chiu Chinese (take out, delivery)         Dr. Charles Cao - Dentist         Pho Haven (50% take out, delivery)         Dr. Abbud Medical Clinic/Pharmacy         Sherwin Williams         Building - 2910 Woodroffe         Barrhaven Market (take-out)         Lulu Shawarma & Grill (take-out, delivery)         Little Scholars Montessori Daycare         Jilding         ReMax (office)         arking Spaces Required	113.38         79.89         211.81         66.52         121.33         96.52         115.47         132.10         203.45         333.70         278.88         123.89         204.99	3.4 / 100 5 / 100 4 / 100 3.4 / 100 4 / 100 5 / 100 4 / 100 5 / 100 4 / 100 3.4 / 100 3.4 / 100 5 / 100 5 / 100 5 / 100 2 / 100	3.85         3.99         8.47         2.26         4.85         4.83         4.62         6.61         8.14         11.35         13.94         6.19         4.10         11.21         97.37	1 / 250 1 / 250 1 / 250 1 / 2000 1 / 2000 1 / 2000 1 / 200 1 / 250 4 / 1000 1 / 250 1 / 250 2 / 250 1 / 250 1 / 250 2 / 250 1 / 250 2 / 250 1 / 250 2 / 250	0.37752 0.22676 0.31956 0.10591 013304 0.12133 0.38608 0.11547 0.52840 0.20345 1.33480 1.11552 0.49556 0.81996 1.86912 8.35 8 .06 sq.m	E 0 ∞ F C I> X Z D PIN 14566-1304 PIN 14566-1303 PIN 14566-1303
Unit 2 Unit 3 Unit 4 Unit 5 Unit 6A Unit 6B Unit 7 Unit 8 Unit 7 Unit 10 Unit 10 Unit 11 Existing Unit 1 Unit 2 Unit 3 Unit 4 New Bu Unit 4 New Bu Unit 1 Site & B Lot Area Existing	Cuts For Kids Hair Salon         Vacant         Barrhaven Veterinary Clinic         Lyra Drycleaners         PhysioVive         Brother Chiu Chinese (take out, delivery)         Dr. Charles Cao - Dentist         Pho Haven (50% take out, delivery)         Dr. Abbud Medical Clinic/Pharmacy         Sherwin Williams         Building - 2910 Woodroffe         Barrhaven Market (take-out)         Lulu Shawarma & Grill (take-out, delivery)         Little Scholars Montessori Daycare         uilding         ReMax (office)         arking Spaces Required         Building Areas         Building Areas	113.38         79.89         211.81         66.52         121.33         96.52         115.47         132.10         203.45         333.70         278.88         123.89         204.99	3.4 / 100 5 / 100 4 / 100 3.4 / 100 4 / 100 5 / 100 4 / 100 5 / 100 4 / 100 3.4 / 100 3.4 / 100 5 / 100 5 / 100 5 / 100 2 / 100	3.85         3.99         8.47         2.26         4.85         4.83         4.62         6.61         8.14         11.35         13.94         6.19         4.10         11.21         97.37	1 / 250 1 / 250 1 / 250 1 / 2000 1 / 2000 1 / 2000 1 / 200 1 / 200 1 / 250 4 / 1000 1 / 250 1 / 250	0.37752 0.22676 0.31956 0.10591 013304 0.12133 0.38608 0.11547 0.52840 0.20345 1.33480 1.33480 1.11552 0.49556 0.81996 1.86912 8.35 8 .06 sq.m .30 sq.m	Т. О. Ф. Г. О. Ф. 2 2 3 3 4 5 1 1 1 1 1 1 1 1 1 1 1 1 1
Unit 2 Unit 3 Unit 4 Unit 5 Unit 6A Unit 6B Unit 7 Unit 8 Unit 9 Unit 10 Unit 10 Unit 11 Existing Unit 1 Unit 2 Unit 3 Unit 4 New Bu Unit 3 Unit 4 New Bu Unit 1 Site & B Lot Area Existing Existing	Cuts For Kids Hair Salon         Vacant         Barrhaven Veterinary Clinic         Lyra Drycleaners         PhysioVive         Brother Chiu Chinese (take out, delivery)         Dr. Charles Cao - Dentist         Pho Haven (50% take out, delivery)         Dr. Abbud Medical Clinic/Pharmacy         Sherwin Williams         Building - 2910 Woodroffe         Barrhaven Market (take-out)         Lulu Shawarma & Grill (take-out, delivery)         Little Scholars Montessori Daycare         arking Spaces Required         Building Areas         Building Area         Puilding Area - 2910 Woodroffe	113.38         79.89         211.81         66.52         121.33         96.52         115.47         132.10         203.45         333.70         278.88         123.89         204.99	3.4 / 100 5 / 100 4 / 100 3.4 / 100 4 / 100 5 / 100 4 / 100 5 / 100 4 / 100 3.4 / 100 3.4 / 100 5 / 100 5 / 100 5 / 100 2 / 100	3.85         3.99         8.47         2.26         4.85         4.83         4.62         6.61         8.14         11.35         13.94         6.19         4.10         11.21         97.37	1 / 250 1 / 250 1 / 250 1 / 2000 1 / 2000 1 / 2000 1 / 200 1 / 250 4 / 1000 1 / 250 1 / 250	0.37752 0.22676 0.31956 0.10591 013304 0.12133 0.38608 0.11547 0.52840 0.20345 1.33480 1.11552 0.49556 0.81996 1.86912 8.35 8 .06 sq.m 30 sq.m 73 sq.m	С О Ф Г- С I> X Z PIN 14566-1304 PIN 14566-1303 PIN 14566-1303 PIN 14566-1303 PIN 14566-1303 PIN 14566-1303 PIN 14566-1303 PIN 14566-1304
Unit 2 Unit 3 Unit 4 Unit 5 Unit 6A Unit 6B Unit 6B Unit 7 Unit 8 Unit 9 Unit 10 Unit 11 Existing Unit 1 Unit 2 Unit 3 Unit 4 New Bu Unit 1 Site & B Lot Area Existing Existing New Bui	Cuts For Kids Hair Salon         Vacant         Barrhaven Veterinary Clinic         Lyra Drycleaners         PhysioVive         Brother Chiu Chinese (take out, delivery)         Dr. Charles Cao - Dentist         Pho Haven (50% take out, delivery)         Dr. Abbud Medical Clinic/Pharmacy         Sherwin Williams         Building - 2910 Woodroffe         Barrhaven Market (take-out)         Lulu Shawarma & Grill (take-out, delivery)         Little Scholars Montessori Daycare         uilding         ReMax (office)         arking Spaces Required         Building Areas         Building Areas	113.38         79.89         211.81         66.52         121.33         96.52         115.47         132.10         203.45         333.70         278.88         123.89         204.99	3.4 / 100 5 / 100 4 / 100 3.4 / 100 4 / 100 5 / 100 4 / 100 5 / 100 4 / 100 3.4 / 100 3.4 / 100 5 / 100 5 / 100 5 / 100 2 / 100	3.85         3.99         8.47         2.26         4.85         4.83         4.62         6.61         8.14         11.35         13.94         6.19         4.10         11.21         97.37	1 / 250 1 / 250 1 / 250 1 / 2000 1 / 2000 1 / 2000 1 / 200 1 / 250 4 / 1000 1 / 250 1 / 250 2 3 . 6	0.37752 0.22676 0.31956 0.10591 013304 0.12133 0.38608 0.11547 0.52840 0.20345 1.33480 1.33480 1.11552 0.49556 0.81996 1.86912 8.35 8 .06 sq.m .30 sq.m	Т. С. Ф. Т. С. Т. Х. 2 2 3 4 5 1 1 1 1 1 1 1 1 1 1 1 1 1

Site Gross Floor Area

SITE PLAN SP-01 SCALE = 1:250

2802.31 sq.m



**IBI GROUP** PROJECT: 119777-5.2.2 2900 WOODROFFE AVENUE PAD A SERVICING AND STORMWATER MANAGEMENT DESIGN BRIEF Prepared for Chris Flemming Developments

# **APPENDIX B**

- FUS Calculation
- Boundary ConditionsC-001 Site Servicing Plan

#### Fire Flow Requirement from Fire Underwriters Survey - 2900 Woodroffe

### Building

Floor Area of Lar Tota	gest building <sub>_</sub> Il Floor Area	467 467					
F = 220C√A							
		_					
C 0.8		C =		wood frame			
A 467	m <sup>2</sup>			ordinary non-combustible			
F 3.803	l/min			fire-resistive			
- )	l/min		0.0				
Occupancy Adjustme	<u>ent</u>		-25%	non-combustible			
				limited combustible			
Use	-15%			combustible			
Adjustment	-600	l/min		free burning rapid burning			
Fire flow	3,400		+23 /0	Tapid burning			
Sprinkler Adjustment			-30%	system conforming to	NFPA 13		
				complete automatic s			
Use	0%						
Adjustment	0	l/min					
Exposure Adjustmen	t			Separation (	-		
	<b>o</b> <i>i</i> :			0 to 3m			
Building Face	Separation	Charge		3.1 to 10m 10.1 to 20m	+20% +15%		
north	40	5%		20.1 to 30m	+15%		
east	30	5%		30.1 to 45m	+5%		
south	37	5%					
west	27	10%					
Total		25%					
Adjustment		850	l/min				
Fire flow		4,250					
Use		4,000 67					

### **BOUNDARY CONDITIONS**



#### **Boundary Conditions For: 2900 Woodroffe Ave**

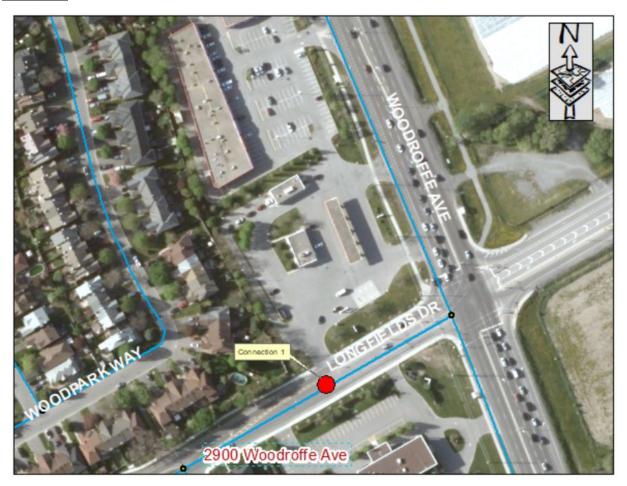
#### Date of Boundary Conditions: 2019-Mar-27

#### **Provided Information:**

Scenario	Demand		
	L/min	L/s	
Average Daily Demand	0.6	0.01	
Maximum Daily Demand	1.2	0.02	
Peak Hour	1.2	0.02	
Fire Flow #1 Demand	4,000	66.7	

#### Number Of Connections: 1

#### Location:



### **BOUNDARY CONDITIONS**



#### **Results:**

#### Connection #: 1

Demand Scenario	Head (m)	Pressure <sup>1</sup> (psi)
Maximum HGL	132.6	56.3
Peak Hour	126.5	47.5
Max Day Plus Fire (4,000) L/min	125.4	46.0

#### <sup>1</sup>Elevation: **93.036 m**

#### Notes:

**1)** 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.

### **DRAWING NOTES**

#### 1.0 GENERAL

1.1 CONTRACTOR TO VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION.

1.2 DO NOT SCALE DRAWINGS

1.3 CONTRACTOR TO REPORT ALL DISCOVERIES OF ERRORS, OMISSIONS OR DISCREPANCIES TO THE ARCHITECT OR DESIGN ENGINEER AS APPLICABLE.

1.4 USE ONLY THE LATEST REVISED DRAWINGS OR THOSE THAT ARE MARKED "ISSUED FOR CONSTRUCTION" 1.5 ALL CONSTRUCTION SHALL COMPLY WITH CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.

1.6 THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS AND SPECIFICATIONS.

1.7 FOR LEGAL SURVEY INFORMATION REFER TO REGISTERED PLAN. 1.8 REFER TO SITE PLAN BY P-SQUARED CONCEPTS INC.

1.9 CONTRACTOR TO IMPLEMENT FROSION AND SEDIMENT CONTROL MEASURES AS IDENTIFIED IN THE EROSION AND SEDIMENT CONTROL PLAN TO THE SATISFACTION OF THE CITY OF OTTAWA, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.). DURING ALL PHASES OF THE SITE PREPARATION AND CONSTRUCTION THE MEASURES ARE TO BE MAINTAINED TO THE SATISFACTION OF THE ENGINEER AND CITY OF OTTAWA IN ACCORDANCE WITH THE BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL, SHOULD ANY ADDITIONAL MEASURES BE REQUIRED TO ADDRESS FIELD CONDITIONS THEY SHALL BE INSTALLED AS DIRECTED BY THE ENGINEER OR THE CITY OF OTTAWA. SUCH ADDITIONAL MEASURES MAY INCLUDE BUT NOT BE LIMITED TO INSTALLATION OF FILTER CLOTHS ACROSS MANHOLE AND CATCHBASIN LIDS TO PREVENT SEDIMENT FROM ENTERING THE STRUCTURE AND INSTALLATION AND MAINTENANCE OF A LIGHT DUTY SILT FENCE BARRIER AS REQUIRED.

1.10 ALL IRON WORK ELEVATIONS SHOWN ARE APPROXIMATE AND ARE SUBJECT TO MINOR ADJUSTMENTS AS DETERMINED BY THE ENGINEER.

1.11 ALL CONCRETE CURBS AND SIDEWALKS TO CONFORM TO O.P.S. AND CONSTRUCTED TO CITY STANDARDS.

ALL ONSITE CURBS TO BE BARRIER TYPE, WITH DEPRESSIONS AS NOTED. 1.12 ALL CONCRETE SHALL BE "NORMAL PORTLAND CEMENT" IN ACCORDANCE WITH O.P.S.S. 1350 AND SHALL ACHIEVE A MINIMUM STRENGTH OF 30MPa AT 28 DAYS.

1.13 ALL CONSTRUCTION TRAFFIC TO ACCESS SITE FROM WOODROFFE AVENUE.

1.14 FOR GEOTECHNICAL REPORT SEE GEOTECHNICAL INVESTIGATION PROPOSED COMMERCIAL BUILDING -2900 WOODROFFE AVENUE, BY GEMTEC CONSULTING ENGINEERS AND SCIENTISTS.

1.15 CONTRACTOR TO PROTECT EXISTING INFRASTRUCTURE AND PROPERTY SUCH AS TREES, PARKING METERS, SIDEWALKS, CURBS, ASPHALT, AND STREET SIGNS FROM DAMAGE DURING CONSTRUCTION. CONTRACTOR TO PAY THE COST TO REINSTATE OR REPLACE ANY DAMAGED INFRASTRUCTURE OR PROPERTY TO THE SATISFACTION OF THE CITY.

1.16 THE POSITION OF POLE LINES, CONDUITS, WATERMAIN, SEWERS, AND OTHER UNDERGROUND AND ABOVEGROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT UARANTEED. BEFORE STARTING WORK THE CONTRACTOR SHALL INFORM ITSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, SHALL PROTECT ALL UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

1.17 CONTRACTOR TO SUPPLY SUITABLE FILL MATERIAL WHERE REQUIRED TO ROUGH GRADE THE SITE. ALL IMPORTED FILL MATERIAL TO BE CERTIFIED AS ACCEPTABLE BY THE GEOTECHNICAL ENGINEER.

1.18 CONTRACTOR TO HAUL EXCESS MATERIAL OFFSITE AS NECESSARY TO GRADE SITE TO MEET THE PROPOSED GRADES. ALL EXCESS MATERIAL TO BE HAULED OFFSITE AND DISPOSED OF AT AN APPROVED DUMP SITE. SHOULD THE CONTRACTOR DISCOVER ANY HAZARDOUS MATERIAL. CONTRACTOR IS TO NOTIFY ENGINEER. ENGINEER TO DETERMINE APPROPRIATE DISPOSAL METHOD/LOCATION.

1.19 FILL MATERIAL WITHIN THE PARKING LOT AND BUILDING PAD AREAS, AND SUPPORTING BUILDING FOUNDATIONS SHALL BE COMPACTED TO 98% STANDARD MODIFIED PROCTOR DENSITY AND TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER.

1.20 ALL COMPACTION METHODS TO BE PERFORMED TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER TO INCLUDE BUT NOT BE LIMITED TO THE THICKNESS OF LIFTS, AND COMPACTION EQUIPMENT USED.

1.21 ALL DISTURBED BOULEVARDS TO BE REINSTATED WITH SOD ON 100mm TOPSOIL. 1.22 UTILITY DUCTS TO BE INSTALLED PRIOR TO ROAD BASE CONSTRUCTION.

1.23 CLAY DIKES TO BE INSTALLED WHERE INDICATED ON THE DRAWINGS OR AS APPROVED AND DIRECTED BY THE GEOTECHNICAL ENGINEER ALL IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS AND SPECIFICATIONS. 1.24 ALL UTILITY BOXES (i.e. PEDESTALS, TRANSFORMERS, ETC) ARE TO BE INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF THE CITY OF OTTAWA'S "GUIDELINES FOR UTILITY PEDESTALS WITHIN THE ROAD RIGHT OF WAY"

#### 2.0 SANITARY

2.1 ALL SANITARY SEWER MAINS TO BE CSA CERTIFIED, BELL AND SPIGOT TYPE, ONLY FACTORY FITTINGS TO BE USED. SEWER TO BE INSTALLED AS PER OSPD 1005.01. SANITARY SEWER MATERIALS TO BE: 250mmØ AND SMALLER - PVC DR 35

2.2 ALL SANITARY MAINTENANCE HOLES TO BE 1.2m DIAMETER AS PER CITY OF OTTAWA STANDARDS COMPLETE WITH BENCHING, RUNGS, FRAME AND COVER, DROP PIPES AND LANDINGS WHERE NEEDED.

2.3 SANITARY MANHOLE COVERS TO BE CITY OF OTTAWA STD. S25 (MOD. OPSD. 401.020). SANITARY MANHOLE COVER TO BE CLOSED COVER TYPE, AS PER CITY STANDARD S24

2.4 SANITARY SEWER LEAKAGE TEST AND CCTV INSPECTION SHALL BE COMPLETED AS PER CITY SPECIFICATIONS PRIOR TO INSTALLATION OF BASE COURSE ASPHALT

2.5 ANY SANITARY SEWER WITH LESS THAN 2.0m COVER REQUIRES THERMAL INSULATION AS PER CITY OF OTTAWA STANDARD W22, OR AS APPROVED BY THE ENGINEER.

2.6 CONNECTION TO THE EXISTING SANITARY SEWER TO BE INCLUDED IN THE COST FOR SANITARY SEWER STALLATION. THIS INCLUDES REINSTATEMENT OF ROAD CU

#### 3.0 STORM

3.1 ALL STORM SEWERS TO BE CSA CERTIFIED, BELL AND SPIGOT TYPE. ALL STORM SEWERS TO BE INSTALLED PER MANUFACTURER'S INSTRUCTIONS, ONLY FACTORY FITTINGS TO BE USED. STORM SEWER MATERIALS TO BE: 375mmØ AND SMALLER - PVC DR 35 450mmØ AND LARGER - 100-D REINFORCED CONCRETE

3.2 ALL STORM MAINTENANCE HOLES TO BE SIZED IN ACCORDANCE WITH THE PLANS AND AS PER CITY OF OTTAWA STANDARDS COMPLETE WITH BENCHING, RUNGS, AND FRAME AND COVER.

3.3 STORM MH COVERS TO BE OPEN TYPE, AS PER CITY STANDARD S24, FRAMES TO BE PER CITY OF OTTAWA STD. S25. CONTRACTOR TO INSTALL FILTER FABRIC UNDER STORM MH COVER UNTIL SODDING IS COMPLETE. 3.4 STORM MAINTENANCE HOLES TO BE OPSD, SIZE AS SPECIFIED, TAPER TOP. 3.5 ALL CATCH BASINS TO BE AS PER OPSD 705.010, FRAME & FISH TYPE GRATE AS PER CITY OF OTTAWA STD.

3.6 150mm DIAMETER SOCK-WRAPPED PERFORATED PVC SUBDRAINS TO BE INSTALLED AT THE LIMIT OF THE HEAVY DUTY ROAD STRUCTURE WHERE IT MEETS THE LIGHT DUTY ROAD STRUCTURE AND AT ALL CB'S IN

HEAVY DUTY ROADS AS IDENTIFIED ON PLAN. SUBDRAINS TO DISCHARGE TO CB'S AS SHOWN. 3.7 ANY STORM SEWER WITH LESS THAN 2.0m COVER REQUIRES THERMAL INSULATION AS PER CITY OF OTTAWA STANDARD W22, OR AS APPROVED BY THE ENGINEER.

3.8 CONNECTION TO THE EXISTING STORM SEWER TO BE INCLUDED IN THE COST FOR STORM SEWER

INSTALLATION. THIS INCLUDES REINSTATEMENT OF ROAD CUT TO CITY STANDARDS. 3.9 CONTRACTOR TO PROVIDE IPEX-TEMPEST MHF ICD'S SHOP DRAWINGS, OR EQUIVALENT, FOR ENGINEERS REVIEW PRIOR TO ORDERING ICD'S.

4.0 WATER

4.1 ALL WATERMAINS TO BE PVC DR 18, WITH MINIMUM COVER OF 2.4m AND INSTALLED PER CITY OF OTTAWA STANDARDS. ALL DOMESTIC WATER SERVICES ARE TO BE 50mmØ.

4.2 THRUST BLOCKS TO BE INSTALLED AT ALL BENDS, TEES, AND CAPS ALL AS PER OPSD 1103.01 AND 1103.02. 4.3 CONTRACTOR TO CONDUCT PRESSURE AND LEAKAGE TESTING OF ALL WATERMAINS AND DISINFECT AND CHLORINATE ALL WATERMAINS TO THE SATISFACTION OF M.O.E. AND THE CITY OF OTTAWA. 4.4 TRACER WIRE TO BE INSTALLED ALONG THE FULL LENGTH OF WATERMAIN AND ATTACHED TO EACH MAIN

STOP AS PER CITY OF OTTAWA STANDARDS. 4.5 ALL COMPONENTS OF THE WATER DISTRIBUTION SYSTEM SHALL BE CATHODICALLY PROTECTED AS PER CITY OF OTTAWA STANDARDS.

4.6 ALL VALVES & VALVE BOXES AND CHAMBERS, HYDRANTS, AND HYDRANT VALVES AND ASSEMBLIES SHALL

BE INSTALLED AS PER CITY OF OTTAWA STANDARDS. 4.7 ANY WATERMAIN WITH LESS THAN 2.4m COVER REQUIRES THERMAL INSULATION AS PER CITY OF OTTAWA

STANDARD W22, OR AS APPROVED BY THE ENGINEER. 4.8 CONTRACTOR IS RESPONSIBLE FOR ACQUIRING THE WATER PERMIT FROM THE CITY OF OTTAWA AND

PAYMENT OF ANY FEES ASSOCIATED WITH SECURING THE WATER PERMIT. OWNER IS RESPONSIBLE FOR REIMBURSING THE CONTRACTOR FOR THE ACTUAL COST OF ACQUIRING THE WATER PERMIT.

4.9 CONNECTION TO EXISTING WATERMAIN TO BE INCLUDED IN THE COST FOR THE WATERMAIN INSTALLATION. THIS COST INCLUDES REINSTATEMENT OF ROAD CUTS TO CITY STANDARDS

5.0 PARKING LOT AND WORK IN PUBLIC RIGHTS OF WAY

5.1 CONTRACTOR TO REINSTATE ROAD CUTS PER CITY OF OTTAWA STANDARD R-10. 5.2 THE CONTRACTOR SHALL PREPARE A TRAFFIC MANAGEMENT PLAN FOR REVIEW AND APPROVAL BY THE CITY OF OTTAWA. CONTRACTOR TO MAINTAIN TRAFFIC FLOW DURING THE ENTIRE CONSTRUCTION PERIOD. MAINTENANCE OF ROAD CUTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. PROVISION OF FLAGMEN, DETOURS AS NECESSARY, BARRICADES AND SIGNS TO THE FULL SATISFACTION OF THE ENGINEER AND ROAD AUTHORITY SHALL BE THE CONTRACTOR'S RESPONSIBILITY.

5.3 CONTRACTOR TO PREPARE SUBGRADE, INCLUDING PROOFROLLING, TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER PRIOR TO THE COMMENCEMENT OF PLACEMENT OF GRANULAR B MATERIAL 5.4 FILL TO BE PLACED AND COMPACTED PER THE GEOTECHNICAL REPORT REQUIREMENTS

5.5 CONTRACTOR TO SUPPLY, PLACE AND COMPACT GRANULAR B MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOETCHNICAL ENGINEER, CONTRACTOR TO PROVIDE ENGINEER WITH SAMPLES OF GRANULAR B MATERIAL FOR TESTING AND CERTIFICATION FROM THE GEOTECHNICAL ENGINEER THAT THE MATERIAL MEETS THE GRADATION REQUIREMENTS SPECIFIED IN THE GEOTECHNICAL REPORT. 5.6 GRANULAR A MATERIAL TO BE PLACED ONLY UPON APPROVAL BY THE GEOTECHNICAL ENGINEER OF GRANULAR B PLACEMENT.

5.7 CONTRACTOR TO SUPPLY, PLACE AND COMPACT GRANULAR A MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOETCHNICAL ENGINEER. CONTRACTOR TO PROVIDE ENGINEER WITH SAMPLES OF GRANULAR A MATERIAL FOR TESTING AND CERTIFICATION FROM THE GEOTECHNICAL ENGINEER THAT THE MATERIAL MEETS THE GRADATION REQUIREMENTS SPECIFIED IN THE GEOTECHNICAL REPORT.

5.8 ASPHALT MATERIAL TO BE PLACED ONLY UPON APPROVAL BY THE GEOTECHNICAL ENGINEER OF GRANULAR A PLACEMENT. 5.9 CONTRACTOR TO SUPPLY, PLACE AND COMPACT ASPHALT MATERIAL IN ACCORDANCE WITH THE

RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEER. CONTRACTOR TO PROVIDE ENGINEER WITH SAMPLES OF ASPHALT MATERIAL FOR TESTING AND CERTIFICATION FROM THE GEOTECHNICAL ENGINEER THAT THE MATERIAL MEETS THE REQUIREMENTS SPECIFIED IN THE GEOTECHNICAL REPORT.

5.10 CONTRACTOR IS RESPONSIBLE FOR ESTABLISHING LINE AND GRADE IN ACCORDANCE WITH THE PLANS, AND FOR PROVIDING THE ENGINEER WITH VERIFICATION PRIOR TO PLACEMENT.

5.11 DITCHES DISTURBED DURING CULVERT INSTALLATION AND GRADING OPERATIONS ARE TO BE REINSTATED TO THEIR ORIGINAL CONDITION AND FLOWLINE GRADES.

5.12 ALL EXCESS MATERIAL TO BE HAULED OFFSITE AND DISPOSED OF AT AN APPROVED DUMP SITE. SHOULD THE CONTRACTOR DISCOVER ANY HAZARDOUS MATERIAL, CONTRACTOR IS TO NOTIFY ENGINEER. ENGINEER TO DETERMINE APPROPRIATE DISPOSAL METHOD/LOCATION.

5.13 PAVEMENT STRUCTURE (MATERIAL TYPES AND THICKNESSES) FOR HEAVY DUTY AND LIGHT DUTY AREAS TO BE AS SPECIFIED IN THE GEOTECHNICAL REPORT AND SHOWN ON THE PLANS

PAVEMENT STRUCTURE

CAR ONLY PARKING AREAS:

50mm WEAR COURSE – SUPERPAVE 12.5 150mm BASE – OPSS GRANULAR "A" CRUSHED STONE 300mm SUBBASE – OPSS GRANULAR "B" TYPE II

HEAVY TRUCK PARKING AREAS AND ACCESS LANES:

40mm WEAR COURSE – SUPERPAVE 12.5

60mm BINDER COURSE - SUPERPAVE 19.0 150mm BASE COURSE - OPSS GRANULAR "A" CRUSHED STONE

450mm SUBBASE – OPSS GRANULAR "B" TYPE II

 $\longrightarrow \longrightarrow \longrightarrow$ 

1.3%

<\_\_\_\_

× 104.62

×104.40 (s)

×104.50 (s)HP

104.60 *103.59* ×

86.45 EX ×

105.30 т/w×

103.50 в/W×

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-

<u>LEGEND:</u> MH3A SANITARY MANHOLE MH3A EXISTING SANITARY MANHOLE OMH3 STORM MANHOLE MH3 EXISTING STORM MANHOLE CB T/G 99.76 EXISTING STREET CATCHBASIN CB T/G 99.76 CATCHBASIN c/w TOP OF GRATE *CICB* EXISTING CURB INLET CATCHBASIN RYCB T/G 99.76 REAR YARD CATCHBASIN c/w GUTTER GRADE ⊗ V&VB EXISTING VALVE AND VALVE BOX GECB REAK TARD LINE T/G 100.25 C/W TOP OF GRATE 3000) REAR YARD "END" CATCHBASIN ⊗ V&C EXISTING VALVE AND CHAMBER  $\oplus_{B/F}^{HYD}$  EXISTING HYDRANT CATCHBASIN MANHOLE c/w TOP OF GRATE /G 101.55 EXISTING BARRIER CURB Ø<sup>V&VB</sup> VALVE AND VALVE BOX D.C. EXISTING DEPRESSED BARRIER CURB ⊗<sup>v&c</sup> VALVE AND CHAMBER EXISTING CONCRETE SIDEWALK HYD B/F 100.56 HYDRANT c/w BOTTOM OF FLANGE ELEVATION ---- 250mmØ SUBDRAIN \_\_\_\_\_\_\_\_ DEPRESSED BARRIER CURB AS PER SC1.1 SIAMESE CONNECTION (IF REQUIRED) BARRIER CURB AND GUTTER AS PER SC1.2 M MOUNTABLE CURB AS PER SC1.3 METER (RM) REMOTE METER PROPOSED CONCRETE SIDEWALK 200mm SAN SANITARY SEWER & FLOW DIRECTION PRV PRESSURE REDUCING VALVE **(B)** 825mmø STM STORM SEWER & FLOW DIRECTION WATERMAIN IDENTIFICATION 2000 WATERMAIN WATERMAIN (1)PIPE CROSSING IDENTIFICATION 2000 RED 1500 WATERMAIN REDUCER

---- PROPERTY LINE

PROPOSED MAIL BOX

F.F.E.=106.30 U.S.F.=104.30 

INLET CONTROL DEVICE LOCATION

()

PROTECTIVE BOLLARD

HEAVY DUTY ASPHALT / FIRE ROUTE

PROPOSED SWALE C/W FLOW DIRECTION PROPOSED DITCH C/W FLOW DIRECTION AND SLOPE SLOPE C/W FLOW DIRECTION MAJOR OVERLAND FLOW ROUTE PROPOSED SPOT GRADE PROPOSED SWALE GRADE PROPOSED SWALE HIGH POINT LOT CORNER GRADE C/W EXISTING GROUND TIE INTO EXISTING GRADE FULL STATIC PONDING GRADE 🚥 RETAINING WALL TOP OF RETAINING WALL PROPOSED BOTTOM OF RETAINING WALL TERRACING 3:1 MAXIMUM UNLESS NOTED OTHERWISE PRELIMINARY ROOF DRAIN LOCATION

CLAY DYKES PER S8

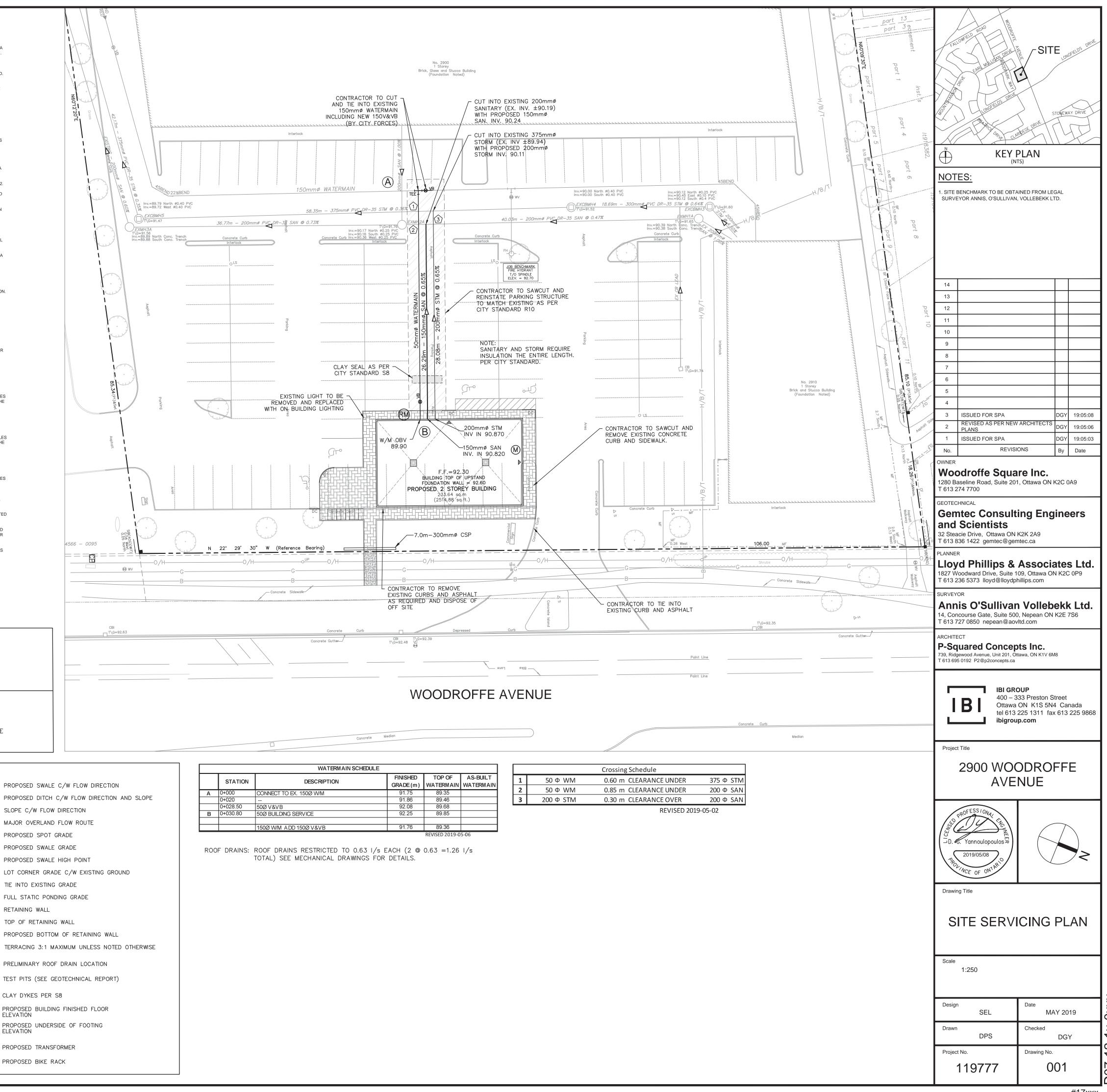
ELEVATION

PROPOSED UNDERSIDE OF FOOTING ELEVATION

PROPOSED TRANSFORMER PROPOSED BIKE RACK

WATERMAIN SCHEDULE					
	STATION	DESCRIPTION	FINISHED GRADE(m)	TOP OF WATERMAIN	AS-BUILT WATERMAI
Α	0+000	CONNECT TO EX. 150Ø W/M	91.75	89.35	
	0+020		91.86	89.46	
	0+028.50	50Ø V&VB	92.08	89.68	
В	0+030.80	50Ø BUILDING SERVICE	92.25	89.85	
		150Ø W/M ADD 150Ø V&VB	91.76	89.36	
				REVISED 2019-0	5-06

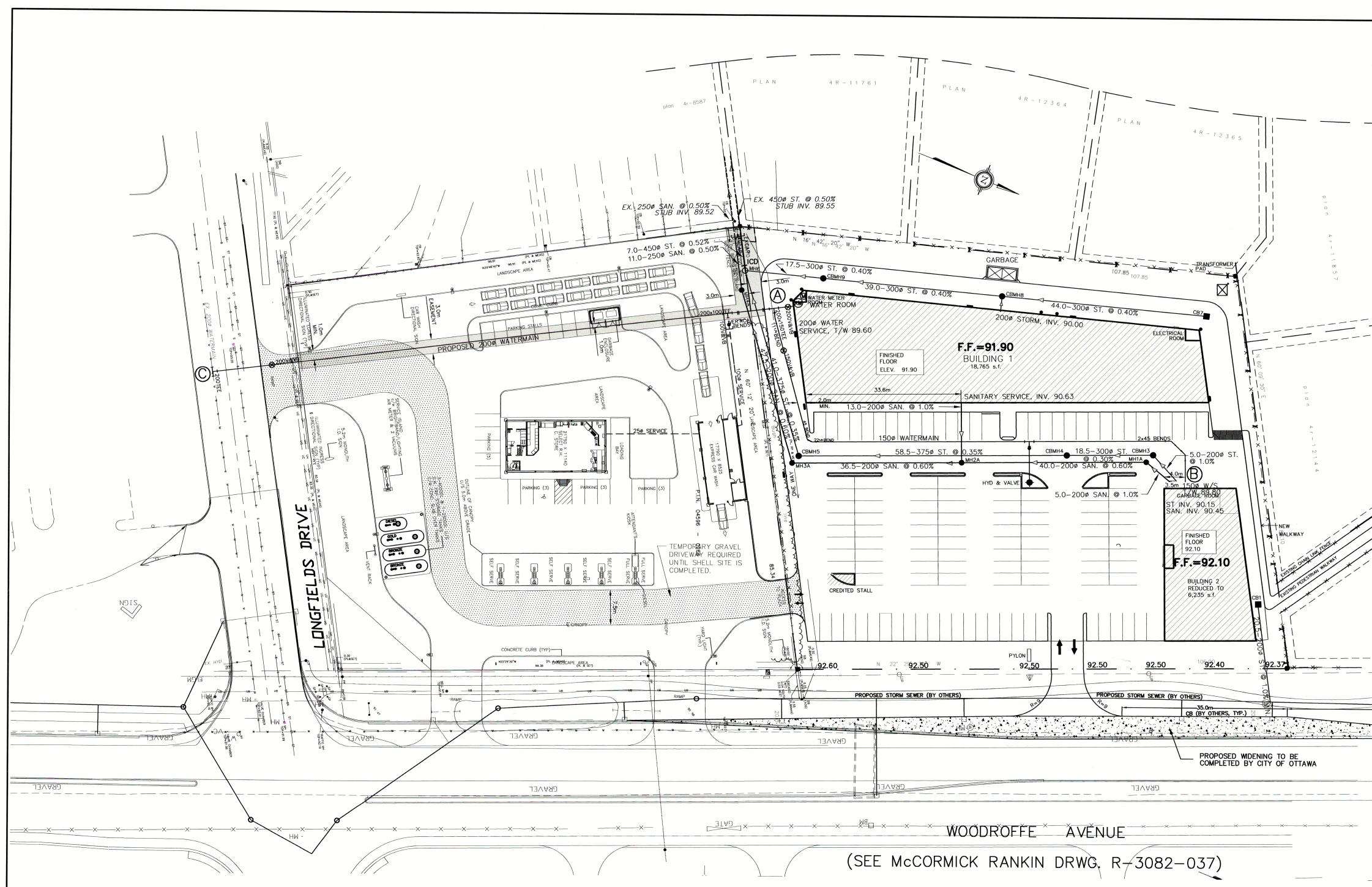
		Cros
1	50 Φ WM	0.60
2	50 Φ WM	0.85
3	200 ¢ STM	0.30



IBI GROUP PROJECT: 119777-5.2.2 2900 WOODROFFE AVENUE PAD A SERVICING AND STORMWATER MANAGEMENT DESIGN BRIEF Prepared for Chris Flemming Developments

# **APPENDIX C**

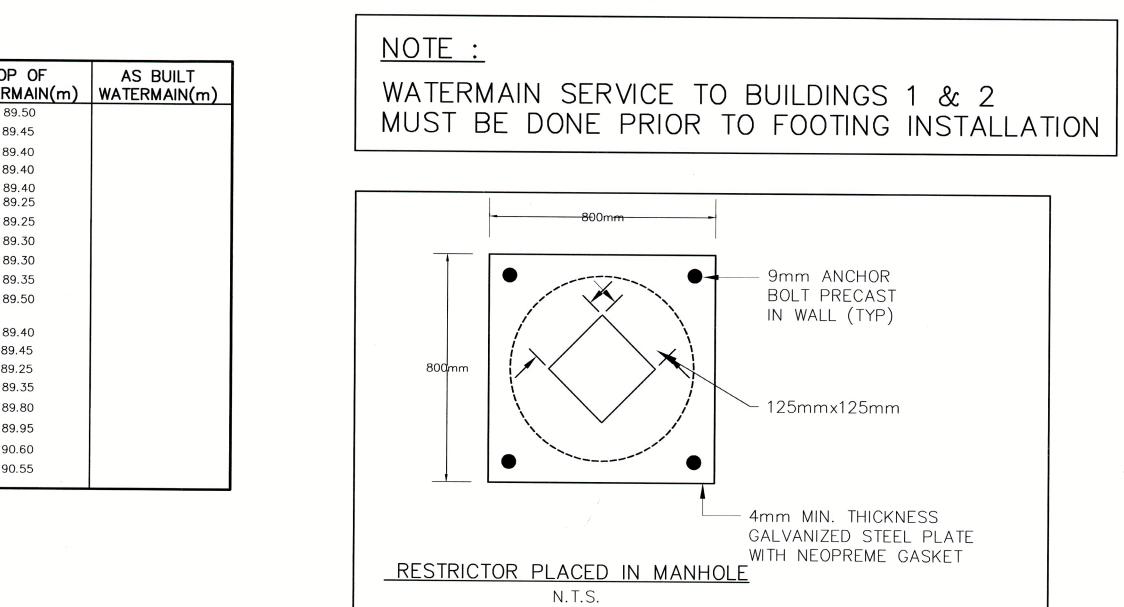
- 3356-LD-100 Original Site Servicing Plan
- Sanitary Sewer Design Sheet



			_		
	SANITA	RY SEV	VER SCH	HEDULE	
LOCATION		INVERT	ELEVAT	IONS (m)	
	NORTH	SOUTH	EAST	WEST	TOP COVER
MH1A		90.40	90.40		91.65
MH2A	90.16	90.15		90.50	91.65
MH3A	89.93			89.86	91.55
MH4A			89.60	89.58	91.80
EXSAN			86.52		92.00

	STOR	M SEWE	R SCH	EDULE	
LOCATION		INVERT	ELEVAT	IONS (m)	
	NORTH	SOUTH	EAST	WEST	TOP COVER
CB1				90.65	91.80
СВМНЗ		90.06		90.10	91.65
CBMH4	90.00	90.00			91.65
CBMH5	89.80			89.75	91.55
MH6	89.63		89.60	89.60	91.70
CB7		90.15			91.55
СВМН8	89.97	89.90			91.60
СВМН9	89.75	89.70			91.60
					A MILECONTROL AND A MILECONTROL

		WAT	ERMAIN SCHEDU	LE
	STATION	DESCRIPTION	FINISHED GRADE(m)	TOP WATERM
	0+000	BUILDING	91.90	89.
	0+001.5	200V&VB	91.85	89.4
A	0+004.5	200x150TEE	91.80	89.4
	0+006.5	11 1/4° BEND	91.80	89.4
	0+010 0+030	150V&VB 45° BEND	91.80 91.65	89. 89.
	0+031.5	22 1/2° BEND	91.65	89.
	0+078.5	HYDRANT & VALVE	91.70	89.
	0+109.2	45° BEND	91.70	89.
B	0+113.5	45° BEND	91.75	89.
	0+117	BUILDING	91.90	89.
A	0+000	200×150TEE	91.80	89.4
	0+003	45' VERTICAL BEND	91.85	89.4
	0+004.5	45° VERTICAL BEND	91.85	89.2
	0+007.5	45' VERTICAL BEND	91.95	89.3
	0+009	45° VERTICAL BEND	92.20	89.8
	0+014.5	200x100TEE	92.35	89.9
	0+110	200V&VB	93.00	90.6
$\square$	0+123	200x200TEE	92.95	90.5



	NO.DATEBYREVISION0.01:06:14ISSUED FOR TENDER
	1. 01:06:27 REVISED AS PER CLIENT
	2.01:07:06REVISED PER NEW ARCHITECT F3.01:07:10REVISED WM THROUGH SHELL L
	4.01:07:13REVISED AS PER SWM5.01:08:07REVISED AS PER CIRCULATION
	6.01:08:30REVISED HEAVY DUTY ASPHALT7.01:09:20REVISED AS PER CITY
	7.         01:10:01         LOWER SITE 100mm
	<ul> <li>NOTES :</li> <li>ALL WATERMAINS TO BE CONSTRUCTED IN ACCORDANCE WITH LATEST REVISIONS TO CITY SPECIFICATIONS AND DRAWINGS.</li> <li>INSULATION TO BE PROVIDED AT CATCHBASINS PER R.M.O.C. STANDARD DRAWING WSD-23.</li> <li>CATHODIC PROTECTION TO BE PROVIDED TO R.M.O.C. STANDARDS AND SPECIFICATIONS.</li> <li>ALL BENDS, TEES, AND CAPS ARE TO BE RESTRAINED PER REM.O.C. STANDARDS AND SPECIFICATIONS.</li> <li>ALL BENDS, TEES, AND CAPS ARE TO BE RESTRAINED PER REM.O.C. STANDARDS AND SPECIFICATIONS.</li> <li>ALL BENDS, TEES, AND CAPS ARE TO BE RESTRAINED PER REM.O.C. STANDARDS AND SPECIFICATIONS.</li> <li>ALL BENDS, TEES, AND CAPS ARE TO BE RESTRAINED PER REMOVED TO AND APPROVE THE CITY, FILL TO BE PLACED TO DEOM MINIMUM ADVE THE OT OF THE WATERWAIN CRADES AND COMPACTED TO MINIMUM BOY 100X STANDARD PROCTOR IN 0.30M LIFTS. TESTS SHALL BE TAKEN ALONG THE CENTRE OF THE LIFT. SHALL BE TAKEN ALONG THE CENTRE OF THE LIFT. TESTS SHALL BE TAKEN ALONG THE CENTRE OF THE LIFT. ALL TEES, HORIZONTAL BENDS, AND BRANCH VALLYES IN FILL AREAS TO BE TIED WITH THRUST RESTRAINING JOINTS AND THRUST BLOCKS AS APPROPRIATE.</li> <li>ALL SEWER CONSTRUCTION IN ACCORDANCE WITH THE LATEST REVISIONS TO CITY STANDARDS.</li> <li>ALL SANITARY &amp; STORM SERVICES TO HAVE A MINIMUM 1.0% SLOPE.</li> <li>ALL PRES WITH LESS THAN 1.5m COVER TO BE INSULATED SOMM RIGD STYROFOAM INSULATION.</li> </ul>
D PROPOSED STORM SEWER (BY OTHERS) 50.0m	
PROPOSED STORM SEWER (BY OTHERS)	THE LOCATION OF UTILITIES IS APPROXIMATE ONLY, AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITED SAND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE DURING CONSTRUCTION.
PROPOSED STORM SEWER (BY OTHERS)	ONLY, AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE DURING
PROPOSED STORM SEWER (BY OTHERS)	ONLY, AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE DURING CONSTRUCTION.
PROPOSED STORM SEWER (BY OTHERS)	ONLY, AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE DURING CONSTRUCTION.
PROPOSED STORM SEWER (BY OTHERS)	ONLY, AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADECOUNTE PROFECTION FROM DAMAGE DURING CONSTRUCTION.
PROPOSED STORM SEWER (BY OTHERS)	ONLY, AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSUMING THE MUNICIPAL AUTHORITIES AND UTLITY COMPANIES CONCERNED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE DURING CONSTRUCTION.
PROPOSED STORM SEWER (BY OTHERS)	ONLY, AND UTLITY COMPARES CONCERNED. AUTHORITES AND UTLITY COMPARES CONCERNED. ADEQUATE PROVECTION FROM DAMAGE DURING CONSTRUCTION.
PROPOSED STORM SEWER (BY OTHERS)	ONLY, AN DE EXACT LOCATION SHOULD BE DETERMINED BY CONJUNCTION THE COMPARIES CONCERNED. THE CONTRACTOR SHOULD BE ADEQUATE PROTECTION FROM DAMAGE DURING CONSTRUCTION
PROPOSED STORM SEWER (BY OTHERS)	ONLY, AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTION THE WINGPAL AUTHORITIES AND UTLITY COMPANIES CONCERNICOL ADDUATE PROVE TION FROM DAMAGE DURING ONSTRUCTION.
PROPOSED STORM SEWER (BY OTHERS)	ONLY, AND THE EXACT LOCATION SHOULD BE         DETERMINE BY CONSUME THE MUNICIPAL         AUHORITIES AND UTUTY COMPARES CONCERNED.         Indeparts for the first of the



# IBI GROUP

400-333 Preston Street Ottawa, Ontario K1S 5N4 Canada tel 613 225 1311 fax 613 225 9868 **ibigroup.com** 

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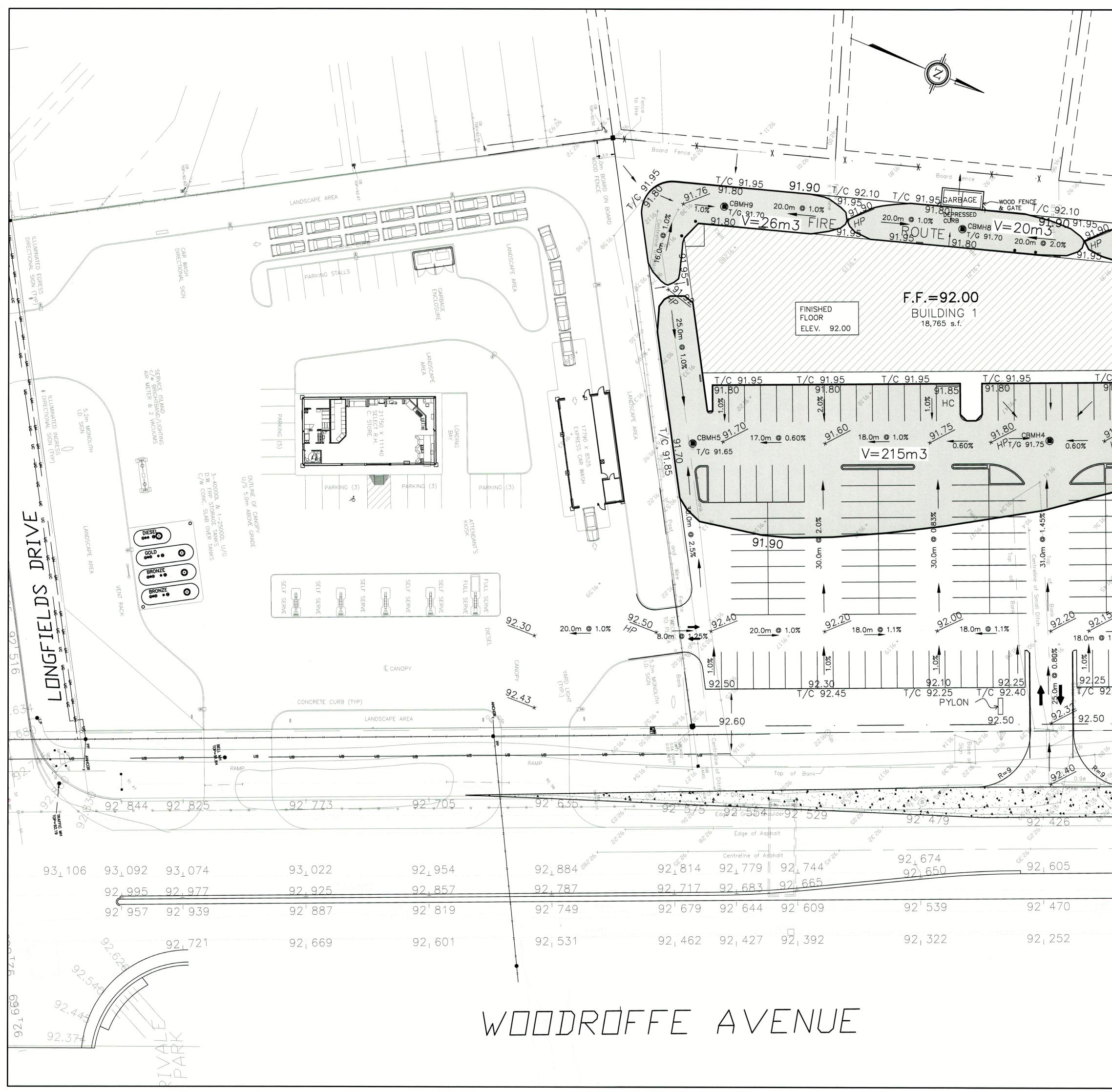
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### SANITARY SEWER DESIGN SHEET

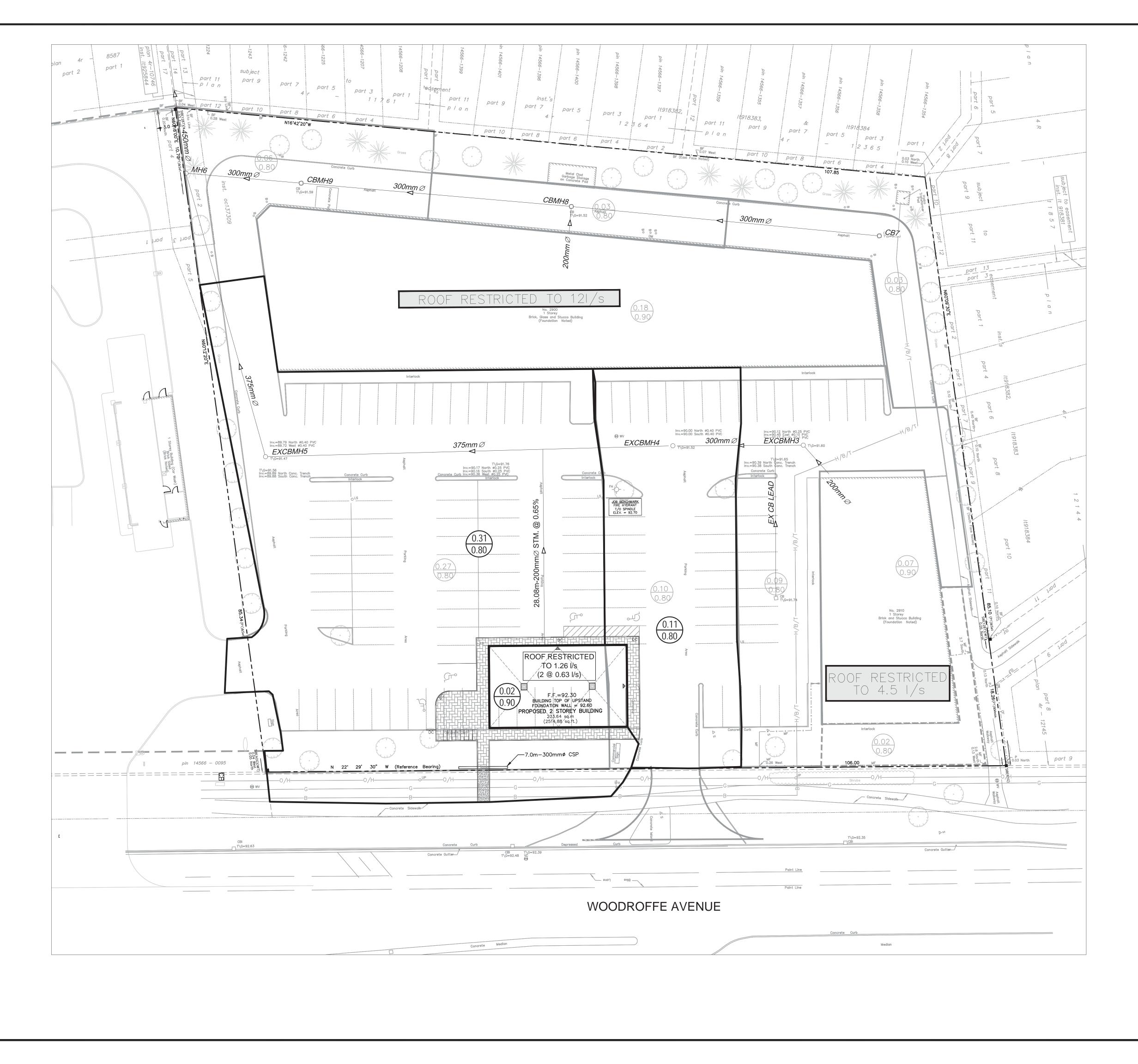
2900 Woodroffe CITY OF OTTAWA IBI GROUP PROJECT: 119777-5.2.2 2900 WOODROFFE AVENUE PAD A SERVICING AND STORMWATER MANAGEMENT DESIGN BRIEF Prepared for Chris Flemming Developments

# **APPENDIX D**

- 3356-LD-300 Original Ponding Plan
- C-500 Storm Drainage Area Plan
- Modified Rational Method Design Sheet
- Storm Service Design Sheet



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	PONDING SCALE: 1: 300	G PLAN
	DRAWN: M.M.	DATE: JUNE '01
	DESIGN: K.HOTOVEC CHECKED: R.W.W.	DATE: JUNE '01 DATE: JUNE '01
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KEY PLAN	
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OWNER	
Woodroffe Square Inc.	
1280 Baseline Road, Suite 201, Ottawa ON K2C 0A9	
T 613 274 7700	
GEOTECHNICAL	
Gemtec Consulting Engineers	
and Scientists 32 Steacie Drive, Ottawa ON K2K 2A9	
T 613 836 1422 gemtec@gemtec.ca	
PLANNER	
Lloyd Phillips & Associates Ltd	I.
1827 Woodward Drive, Suite 109, Ottawa ON K2C 0P9 T 613 236 5373 Iloyd@lloydphillips.com	
SURVEYOR	
Annis O'Sullivan Vollebekk Ltd	
	- 1
14, Concourse Gate, Suite 500, Nepean ON K2E 7S6	•
T 613 727 0850 nepean@aovltd.com	-
T 613 727 0850 nepean@aovltd.com	•
T 613 727 0850 nepean@aovltd.com ARCHITECT P-Squared Concepts Inc. 739, Ridgewood Avenue, Unit 201, Ottawa, ON K1V 6M8	•
T 613 727 0850 nepean@aovltd.com ARCHITECT P-Squared Concepts Inc.	•
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T 613 727 0850 nepean@aovltd.com ARCHITECT <b>P-Squared Concepts Inc.</b> 739, Ridgewood Avenue, Unit 201, Ottawa, ON K1V 6M8 T 613 695 0192 P2@p2concepts.ca IBI GROUP 400 – 333 Preston Street Ottawa ON K1S 5N4 Canada	
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#### STORMWATER MANAGEMENT

### Formulas and Descriptions

$$\begin{split} &i_{2yr} = 1:2 \text{ year Intensity} = 732.951 / (T_c + 6.199)^{0.810} \\ &i_{5yr} = 1:5 \text{ year Intensity} = 998.071 / (T_c + 6.053)^{0.814} \\ &i_{100yr} = 1:100 \text{ year Intensity} = 1735.688 / (T_c + 6.014)^{0.820} \\ &T_c = \text{Time of Concentration (min)} \\ &C = \text{Average Runoff Coefficient} \\ &A = \text{Area (Ha)} \\ &Q = \text{Flow} = 2.78\text{CiA (L/s)} \end{split}$$

### Maximum Allowable Release Rate

Restricted Flowrate (based on 64 L/s/Ha)

A <sub>site</sub> = 0.83 Ha Q<sub>restricted</sub> = 53.12 L/s

#### MODIFIED RATIONAL METHOD (100-Year, 5-Year & 2-Year Ponding)

				ai i onanig,		Ducing and Arres	us of s	1				Dura in a ma	no of o	7			
Drainage Area	roof a	1				Drainage Area	roof a					Drainage Area	roof a				
Area (Ha)	0.172	2				Area (Ha)	0.172	2				Area (Ha)	0.172	2			
C =	1.00	0 Restricted Flow Q <sub>r</sub> (L	/s)=	12.00		C =	0.90	) Restricted Flow Q <sub>r</sub> (I	_/s)=	12.00		C =	0.90	) Restricted Flow Q <sub>r</sub> (I	_/s)=	12.00	
		100-Year Pondin	ng					5-Year Ponding	g					2-Year Ponding	9		
T <sub>c</sub> Variable	i <sub>100yr</sub>	Peak Flow Q <sub>p</sub> =2.78xCi <sub>100yr</sub> A	<b>Q</b> <sub>r</sub>	$Q_p - Q_r$	Volume 100yr	T <sub>c</sub> Variable	İ <sub>5yr</sub>	Peak Flow Q <sub>p</sub> =2.78xCi <sub>5yr</sub> A	<b>Q</b> <sub>r</sub>	<b>Q</b> <sub>p</sub> - <b>Q</b> <sub>r</sub>	Volume 5yr	T <sub>c</sub> Variable	i <sub>2yr</sub>	Peak Flow Q <sub>p</sub> =2.78xCi <sub>2yr</sub> A	Q <sub>r</sub>	$Q_p - Q_r$	Volume 2yr
(min)	(mm/hour)	(L/s)	(L/s)	(L/s)	(m <sup>3</sup> )	(min)	(mm/hour)	(L/s)	(L/s)	(L/s)	(m <sup>3</sup> )	(min)	(mm/hour)	(L/s)	(L/s)	(L/s)	(m <sup>3</sup> )
30	91.87	43.88	12.00	31.88	57.378	16	80.46	34.59	12.00	22.59	21.68	11	73.17	31.45	12.00	19.45	12.84
32	87.89	41.97	12.00	29.97	57.551	18	74.97	32.23	12.00	20.23	21.84	13	66.93	28.77	12.00	16.77	13.08
34	84.27	40.25	12.00	28.25	57.622	19	72.53	31.17	12.00	19.17	21.86	14	64.23	27.61	12.00	15.61	13.11
36	80.96	38.67	12.00	26.67	57.604	20	70.25	30.20	12.00	18.20	21.84	15	61.77	26.55	12.00	14.55	13.10
38	77.93	37.22	12.00	25.22	57.505	22	66.15	28.43	12.00	16.43	21.69	17	57.42	24.68	12.00	12.68	12.93
		Stor	and $(m^3)$					Stor	<b>200</b> (m <sup>3</sup> )					Stor	and $(m^3)$		

		Sto	orage (m <sup>3</sup> )					Sto	orage (m <sup>3</sup> )				Sto	orage (m <sup>3</sup> )		
	Overflow	Required	Surface	Sub-surface	Balance	_	Overflow	Required	Surface	Sub-surface	Balance	Overflow	Required	Surface	Sub-surface	Balance
	0.00	57.62	64.43	0.00	0.00		0.00	21.86	64.43	0.00	0.00	0.00	13.11	64.43	0.00	0.00
* Accume reaften ato	rade of 150mm ave	r 75% of flat roof														

\* Assume roof top storage of 150mm over 75% of flat roof

PROJECT:	2900 Woodroffe
DATE:	8/05/2019
FILE:	119777-5.7
REV #:	1
DESIGNED BY:	S.L.
CHECKED BY:	D.Y.

	reef					Drainaga Araa	roof k					Droinaga Araa	roof b	T			
<b>rainage Area</b> rea (Ha)	0.06					<b>Drainage Area</b> Area (Ha)	0.06					<b>Drainage Area</b> Area (Ha)	0.062	4			
=		0 Restricted Flow Q <sub>r</sub> (L	/s)=	4.50	l	C =	0.00		/s)=	4.50		C =		Restricted Flow Q <sub>r</sub> (L	/s)=	4.50	
_	1.0	100-Year Pondii	•	4.50			0.3	5-Year Pondin		4.00			0.30	2-Year Ponding		4.50	
T		Peak Flow	ly		Volumo	T		Peak Flow	<u>y</u>		Volumo			2-Teal Foliuli	y		Volumo
ر Variable	i <sub>100yr</sub>	$Q_p = 2.78 \times Ci_{100yr} A$	Q <sub>r</sub>	$Q_p - Q_r$	Volume 100yr	ا <sub>د</sub> Variable	i <sub>5yr</sub>	$Q_p = 2.78 \times Ci_{5vr} A$	Q <sub>r</sub>	$Q_p - Q_r$	Volume 5yr	Variable	i <sub>2yr</sub>	$Q_p = 2.78 \times Ci_{2vr} A$	Q <sub>r</sub>	$Q_p - Q_r$	Volume 2vr
(min)	(mm/hour)	(L/s)	(L/s)	(L/s)	(m <sup>3</sup> )	(min)	(mm/hour)	(L/s)	(L/s)	(L/s)	$(m^3)$	(min)	(mm/hour)	,	(L/s)	(L/s)	2yr (m <sup>3</sup> )
30	91.87	15.73	4.50	11.23	20.218	15	83.56	12.88	4.50	8.38	7.54	10	76.81	(L/s) 11.84	4.50	7.34	4.40
32	87.89	15.05	4.50	10.55	20.256	17	77.61	11.96	4.50	7.46	7.61	12	69.89	10.77	4.50	6.27	4.52
33	86.03	14.73	4.50	10.23	20.262	18	74.97	11.55	4.50	7.05	7.62	13	66.93	10.32	4.50	5.82	4.54
34	84.27	14.43	4.50	9.93	20.258	19	72.53	11.18	4.50	6.68	7.61	14	64.23	9.90	4.50	5.40	4.54
36	80.96	13.86	4.50	9.36	20.228	21	68.13	10.50	4.50	6.00	7.56	16	59.50	9.17	4.50	4.67	4.48
		Stor	<b>age</b> (m <sup>3</sup> )					Sto	rage (m³)					Stor	<b>age</b> (m <sup>3</sup> )		
	Overflow	Required	Surface	Sub-surface	Balance		Overflow	Required	Surface	Sub-surface	Balance	-	Overflow	Required	Surface	Sub-surface	Balance
	0.00	20.26	23.10	0.00	0.00		0.00	7.62	23.10	0.00	0.00		0.00	4.54	23.10	0.00	0.00
Assume roof top sto		over 75% of flat roof						-						-			
-	-																
	<b>r</b>					Dueine and Arres						Dueine and Arrest		1			
rainage Area	0.02					Drainage Area	0.02					Drainage Area	roof c 0.023	ł			
ea (Ha) -		0 Restricted Flow Q <sub>r</sub> (L	/e)=	1.06	1	Area (Ha)	0.02		[ /s)=	1.06		Area (Ha)		Restricted Flow Q <sub>r</sub> (L	/s)=	1.06	
=	1.0	-	-	1.26		C =	0.9		-	1.26		C =	0.90			1.26	
		100-Year Pondi	ng					5-Year Pondin	g					2-Year Ponding	g		
T <sub>c</sub>	<b>i</b> <sub>100yr</sub>	Peak Flow	Q,	$Q_p - Q_r$	Volume	T <sub>c</sub>	i <sub>5yr</sub>	Peak Flow	Q,	$Q_p - Q_r$	Volume	T <sub>c</sub>	i <sub>2yr</sub>	Peak Flow	Q,	$Q_p - Q_r$	Volume
Variable		$Q_p = 2.78 \times Ci_{100yr} A$			100yr (m <sup>3</sup> )	Variable		$Q_p = 2.78 \times Ci_{5yr} A$			5yr (m <sup>3</sup> )	Variable		$Q_p = 2.78 \times Ci_{2yr} A$	(1 (-)		2yr (m <sup>3</sup> )
(min)	( <i>mm/hour</i> )	(L/s) 4.78	(L/s)	(L/s) 3.52	8.665	(min) 21	(mm/hour)	(L/s) 3.97	<b>(L/s)</b> 1.26	<b>(L/s)</b> 2.71	3.42	(min)	( <i>mm/hour)</i> 61.77	(L/s) 3.60	<b>(L/s)</b> 1.26	(L/s) 2.34	2.11
<u>41</u> 43	73.83 71.35	4.78	1.26 1.26	3.36	8.673	23	68.13 64.29	3.75	1.26	2.71	3.42	15 17	57.42	3.35	1.26	2.09	2.11
44	70.18	4.55	1.26	3.29	8.675	23	62.54	3.65	1.26	2.39	3.44	18	55.49	3.23	1.20	1.97	2.13
											3.44						
45	69.05	4.47	1.26	3.21	8.674	25	60.90	3.55	1.26	2.29	3.44	19	53.70	3.13	1.26	1.87	2.13
45 47	69.05 66.91	4.47 4.33	1.26 1.26	3.21 3.07	8.674 8.668	25 27	60.90 57.88	3.55 3.37	1.26 1.26	2.29	3.44	21	53.70 50.48	3.13 2.94	1.26 1.26	1.87 1.68	2.13 2.12
		4.33	1.26					3.37	1.26					2.94	1.26		
	66.91	4.33 Stor	1.26 <b>rage</b> (m <sup>3</sup> )	3.07	8.668		57.88	3.37 <b>Sto</b>	1.26 <b>rage</b> (m <sup>3</sup> )	2.11	3.42		50.48	2.94 Stor	1.26 <b>age</b> (m <sup>3</sup> )	1.68	2.12
	66.91	4.33 Stor Required	1.26 age (m <sup>3</sup> ) Surface	3.07 Sub-surface	8.668 Balance		57.88 Overflow	3.37 Sto Required	1.26 rage (m <sup>3</sup> ) Surface	2.11 Sub-surface	3.42 Balance		50.48 Overflow	2.94 Stor Required	1.26 age (m <sup>3</sup> ) Surface	1.68 Sub-surface	2.12 Balance
47	66.91 Overflow 0.00	4.33 Stor	1.26 <b>rage</b> (m <sup>3</sup> )	3.07	8.668		57.88	3.37 <b>Sto</b>	1.26 <b>rage</b> (m <sup>3</sup> )	2.11	3.42		50.48	2.94 Stor	1.26 <b>age</b> (m <sup>3</sup> )	1.68	2.12
47	66.91 Overflow 0.00	4.33 Stor Required 8.67	1.26 age (m <sup>3</sup> ) Surface	3.07 Sub-surface	8.668 Balance		57.88 Overflow	3.37 Sto Required	1.26 rage (m <sup>3</sup> ) Surface	2.11 Sub-surface	3.42 Balance		50.48 Overflow	2.94 Stor Required	1.26 age (m <sup>3</sup> ) Surface	1.68 Sub-surface	2.12 Balance
47	66.91 Overflow 0.00	4.33 Stor Required 8.67	1.26 age (m <sup>3</sup> ) Surface	3.07 Sub-surface	8.668 Balance		57.88 Overflow	3.37 Sto Required	1.26 rage (m <sup>3</sup> ) Surface	2.11 Sub-surface	3.42 Balance		50.48 Overflow	2.94 Stor Required	1.26 age (m <sup>3</sup> ) Surface	1.68 Sub-surface	2.12 Balance
47 Assume roof top sto	66.91 Overflow 0.00 orage of 150mm o	4.33 Stor Required 8.67 over 75% of flat roof	1.26 rage (m <sup>3</sup> ) Surface 8.74	3.07 Sub-surface 0.00	8.668 Balance	27	57.88 Overflow 0.00	3.37 Sto Required 3.44	1.26 rage (m <sup>3</sup> ) Surface 8.74	2.11 Sub-surface 0.00	3.42 Balance	21	50.48 <b>Overflow</b> 0.00	2.94 Stor Required 2.13	1.26 rage (m <sup>3</sup> ) Surface 8.74	1.68 Sub-surface 0.00	2.12 Balance
47 Assume roof top sto Prainage Area	66.91 Overflow 0.00 orage of 150mm o Parking lo	4.33 Stor Required 8.67 over 75% of flat roof <b>t</b> Qf=1.26+4.5+12=	1.26 age (m <sup>3</sup> ) Surface	3.07 Sub-surface 0.00	8.668 Balance	27 Drainage Area	57.88 Overflow 0.00 Parking lot	3.37 Sto Required 3.44 t Qf=1.26+4.5+12=	1.26 rage (m <sup>3</sup> ) Surface	2.11 Sub-surface 0.00	3.42 Balance	21 Drainage Area	50.48 Overflow 0.00 Parking lot	2.94 Stor Required 2.13 Qf=1.26+4.5+12=	1.26 age (m <sup>3</sup> ) Surface	1.68 Sub-surface 0.00	2.12 Balance
47 Assume roof top sto <b>rainage Area</b> rea (Ha)	66.91 <b>Overflow</b> 0.00 orage of 150mm of <b>Parking lo</b> 0.63	4.33 <b>Stor</b> <b>Required</b> 8.67 over 75% of flat roof <b>t</b> Qf=1.26+4.5+12= 0	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76	3.07 Sub-surface 0.00	8.668 Balance 0.00	27	57.88 Overflow 0.00 Parking lot 0.63	3.37 Sto Required 3.44 t Qf=1.26+4.5+12=	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76	2.11 Sub-surface 0.00	3.42 Balance	21	50.48 Overflow 0.00 Parking lot 0.630	2.94 Stor Required 2.13 Qf=1.26+4.5+12=	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76	1.68 Sub-surface 0.00	2.12 Balance 0.00
47 Assume roof top sto P <b>rainage Area</b> rea (Ha)	66.91 <b>Overflow</b> 0.00 orage of 150mm of <b>Parking lo</b> 0.63	4.33 Stor Required 8.67 over 75% of flat roof <b>t</b> Qf=1.26+4.5+12=	1.26 <b>rage</b> (m <sup>3</sup> ) <b>Surface</b> 8.74 17.76	3.07 Sub-surface 0.00	8.668 Balance 0.00	27 <b>Drainage Area</b> Area (Ha)	57.88 Overflow 0.00 Parking lot 0.63	3.37 Sto Required 3.44 t Qf=1.26+4.5+12=	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 L/s)=	2.11 Sub-surface 0.00	3.42 Balance	21 <b>Drainage Area</b> Area (Ha)	50.48 Overflow 0.00 Parking lot 0.630	2.94 Stor Required 2.13 Qf=1.26+4.5+12=	1.26 <b>age</b> (m <sup>3</sup> ) <b>Surface</b> 8.74 17.76	1.68 Sub-surface 0.00	2.12 Balance 0.00
47 Assume roof top sto <b>Prainage Area</b> rea (Ha) =	66.91 Overflow 0.00 orage of 150mm c Parking lo 0.63 1.0	4.33 Stor Required 8.67 over 75% of flat roof Qf=1.26+4.5+12= 0 Restricted Flow Q <sub>r</sub> (L 100-Year Pondin Peak Flow	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 _/s)= ng	3.07 Sub-surface 0.00 5 53.00	8.668 Balance 0.00	27 <b>Drainage Area</b> Area (Ha)	57.88 Overflow 0.00 Parking lot 0.63 0.8	3.37 Sto Required 3.44 Qf=1.26+4.5+12= 0 0 Restricted Flow Q <sub>r</sub> (	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 L/s)= g	2.11 Sub-surface 0.00 53.00	3.42 Balance	21 <b>Drainage Area</b> Area (Ha)	50.48 Overflow 0.00 Parking lot 0.630 0.80	2.94 Stor Required 2.13 Qf=1.26+4.5+12= Restricted Flow Q <sub>r</sub> (L	1.26 <b>age</b> (m <sup>3</sup> ) <b>Surface</b> 8.74 17.76 _/s)= g	1.68 Sub-surface 0.00 53.00	2.12 Balance 0.00
47 Assume roof top sto <b>rainage Area</b> ea (Ha)	66.91 <b>Overflow</b> 0.00 orage of 150mm of <b>Parking lo</b> 0.63	4.33 Stor Required 8.67 over 75% of flat roof Qf=1.26+4.5+12= 0 Restricted Flow Q <sub>r</sub> (L 100-Year Pondin Peak Flow	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 _/s)= ng	3.07 Sub-surface 0.00	8.668 Balance 0.00	27 Drainage Area Area (Ha) C =	57.88 Overflow 0.00 Parking lot 0.63	3.37 Sto Required 3.44 Qf=1.26+4.5+12= 0 Restricted Flow Q <sub>r</sub> ( 5-Year Pondin	1.26 <b>rage</b> (m <sup>3</sup> ) <b>Surface</b> 8.74 17.76 L/s)=	2.11 Sub-surface 0.00	3.42 Balance 0.00 Volume 5yr	21 Drainage Area Area (Ha) C =	50.48 Overflow 0.00 Parking lot 0.630	2.94 Stor Required 2.13 Qf=1.26+4.5+12= Restricted Flow Q <sub>r</sub> (L 2-Year Ponding	1.26 <b>age</b> (m <sup>3</sup> ) <b>Surface</b> 8.74 17.76	1.68 Sub-surface 0.00	2.12 Balance 0.00 Volume 2yr
47 Assume roof top sto rainage Area ea (Ha) = T <sub>c</sub>	66.91 Overflow 0.00 0.00 0.00 0.00 0.00 0.03 0.63 1.0	4.33 Stor Required 8.67 over 75% of flat roof Qf=1.26+4.5+12= 0 Restricted Flow Q <sub>r</sub> (L 100-Year Pondin	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 _/s)= ng	3.07 Sub-surface 0.00 5 53.00	8.668 Balance 0.00 Volume	27 Drainage Area Area (Ha) C = T <sub>c</sub>	57.88 Overflow 0.00 Parking lot 0.63 0.8	3.37 Sto Required 3.44 Qf=1.26+4.5+12= 0 Restricted Flow Q <sub>r</sub> ( 5-Year Pondin Peak Flow	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 L/s)= g	2.11 Sub-surface 0.00 53.00	3.42 Balance 0.00 Volume	21 Drainage Area Area (Ha) C = T <sub>c</sub>	50.48 Overflow 0.00 Parking lot 0.630 0.80	2.94 Stor Required 2.13 Qf=1.26+4.5+12= Restricted Flow Q <sub>r</sub> (L 2-Year Ponding Peak Flow	1.26 <b>age</b> (m <sup>3</sup> ) <b>Surface</b> 8.74 17.76 _/s)= g	1.68 Sub-surface 0.00 53.00	2.12 Balance 0.00 Volume
47 Assume roof top sto rainage Area ea (Ha) = T <sub>c</sub> Variable (min) 40	66.91 Overflow 0.00 orage of 150mm of Parking lo 0.63 1.0 <i>i</i> <sub>100yr</sub> <i>(mm/hour)</i> 75.15	4.33 Stor Required 8.67 over 75% of flat roof Qf=1.26+4.5+12= 0 Restricted Flow Q <sub>r</sub> (L 100-Year Pondin Peak Flow Q <sub>p</sub> =2.78xCi 100yr A (L/s) 131.61	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 _/s)= Q <sub>r</sub> (L/s) 53.00	3.07 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 96.37	8.668 Balance 0.00 Volume 100yr (m <sup>3</sup> ) 231.29	27 Drainage Area Area (Ha) C = T <sub>c</sub> Variable (min) 18	57.88 Overflow 0.00 Parking lot 0.63 0.8 0.8 i <sub>5yr</sub> (mm/hour) 74.97	3.37         Sto         Required         3.44         0         Qf=1.26+4.5+12=         0         0         Restricted Flow Qr (         5-Year Pondin         Peak Flow         Qp=2.78xCi 5yr A         (L/s)         105.04	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 L/s)= <b>g</b> <b>Q</b> <sub>r</sub> (L/s) 53.00	2.11 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 69.80	3.42 Balance 0.00 Volume 5yr (m <sup>3</sup> ) 75.39	21 Drainage Area Area (Ha) C = T <sub>c</sub> Variable (min) 13	50.48 <b>Overflow</b> 0.00 <b>Parking lot</b> 0.630 0.80 <i>i</i> <sub>2yr</sub> (mm/hour) 66.93	2.94 Stor Required 2.13 Qf=1.26+4.5+12= Restricted Flow Q <sub>r</sub> (L 2-Year Ponding Peak Flow Q <sub>p</sub> =2.78xCi <sub>2yr</sub> A (L/s) 93.78	1.26 •age (m <sup>3</sup> ) Surface 8.74 17.76 _/s)= g Q <sub>r</sub> <u>(L/s)</u> 53.00	1.68 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 58.54	2.12 Balance 0.00 Volume 2yr (m <sup>3</sup> ) 45.66
47 Assume roof top sto rainage Area ea (Ha) = T <sub>c</sub> Variable (min) 40 42	66.91 Overflow 0.00 prage of 150mm c 0.63 0.63 1.0 <i>i</i> <sub>100yr</sub> <i>(mm/hour)</i> 75.15 72.57	4.33 Stor Required 8.67 over 75% of flat roof Qf=1.26+4.5+12= 0 Restricted Flow Q <sub>r</sub> (L 100-Year Pondin Peak Flow Q <sub>p</sub> =2.78xCi 100yr A (L/s) 131.61 127.10	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 _/s)= ng Q, (L/s) 53.00 53.00	3.07 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 96.37 91.86	8.668 Balance 0.00 Volume 100yr (m <sup>3</sup> ) 231.29 231.48	27 Drainage Area Area (Ha) C = T <sub>c</sub> Variable (min) 18 20	57.88 Overflow 0.00 Parking log 0.63 0.8 0.8 0.8 1 ₅yr (mm/hour) 74.97 70.25	3.37         Sto         Required         3.44         0         Qf=1.26+4.5+12=         0         0         Restricted Flow Qr (         5-Year Pondin         Peak Flow         Qp=2.78xCi 5yr A         (L/s)         105.04         98.43	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 L/s)= <b>g</b> <b>Q</b> , (L/s) 53.00 53.00	2.11 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 69.80 63.19	3.42 Balance 0.00 Volume 5yr (m <sup>3</sup> ) 75.39 75.83	21 Drainage Area Area (Ha) C = T <sub>c</sub> Variable (min) 13 15	50.48 <b>Overflow</b> 0.00 <b>Parking lot</b> 0.630 0.80 <i>i</i> <sub>2yr</sub> (mm/hour) 66.93 61.77	2.94 Stor Required 2.13 Qf=1.26+4.5+12= Restricted Flow Q <sub>r</sub> (L 2-Year Ponding Peak Flow Q <sub>p</sub> =2.78xCi <sub>2yr</sub> A (L/s) 93.78 86.54	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 _/s)= g Q, (L/s) 53.00 53.00	1.68 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 58.54 51.30	2.12 Balance 0.00 Volume 2yr (m <sup>3</sup> ) 45.66 46.17
47 Assume roof top sto rainage Area ea (Ha) = T <sub>c</sub> Variable (min) 40 42 43	66.91 Overflow 0.00 orage of 150mm c Parking lo 0.63 1.0 <i>i</i> <sub>100yr</sub> <i>(mm/hour)</i> 75.15 72.57 71.35	4.33 Stor Required 8.67 over 75% of flat roof Qf=1.26+4.5+12= 0 Restricted Flow Q <sub>r</sub> (L 100-Year Pondin Peak Flow Q <sub>p</sub> =2.78xCi <sub>100yr</sub> A (L/s) 131.61 127.10 124.97	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 _/s)= ng Q <sub>r</sub> <u>(L/s)</u> 53.00 53.00 53.00	3.07 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 96.37 91.86 89.73	8.668 Balance 0.00 Volume 100yr (m <sup>3</sup> ) 231.29 231.48 231.50	27 <b>Drainage Area</b> Area (Ha) C = <b>T</b> <sub>c</sub> <b>Variable</b> (min) 18 20 21	57.88 Overflow 0.00 Parking log 0.63 0.8 0.8 1 5yr (mm/hour) 74.97 70.25 68.13	3.37         Sto         Required         3.44         Qf=1.26+4.5+12=         0         Restricted Flow Qr (         5-Year Pondin         Peak Flow         Qp=2.78xCi 5yr A         (L/s)         105.04         98.43         95.46	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 L/s)= <b>g</b> Q <sub>r</sub> (L/s) 53.00 53.00 53.00	2.11 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 69.80 63.19 60.22	3.42 Balance 0.00 Volume 5yr (m <sup>3</sup> ) 75.39 75.83 75.83	21 <b>Drainage Area</b> Area (Ha) C = <b>T</b> <sub>c</sub> <b>Variable</b> (min) 13 15 16	50.48 <b>Overflow</b> 0.00 <b>Parking lot</b> 0.630 0.80 <i>i</i> <sub>2yr</sub> (mm/hour) 66.93 61.77 59.50	2.94 Stor Required 2.13 Qf=1.26+4.5+12= Restricted Flow Q <sub>r</sub> (L 2-Year Ponding Peak Flow Q <sub>p</sub> =2.78xCi <sub>2yr</sub> A (L/s) 93.78 86.54 83.37	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 _/s)= g Q <sub>r</sub> <u>(L/s)</u> 53.00 53.00 53.00	1.68         Sub-surface         0.00         53.00         Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s)         58.54         51.30         48.13	2.12 Balance 0.00 Volume 2yr (m <sup>3</sup> ) 45.66 46.17 46.21
47 Assume roof top sto rainage Area rea (Ha) = T <sub>c</sub> Variable (min) 40 42 43 43 44	66.91           Overflow           0.00           Drage of 150mm c           Parking lo           0.63           1.0           i 100yr           (mm/hour)           75.15           72.57           71.35           70.18	4.33           Stor           Required           8.67           over 75% of flat roof           Image: transform of transformation of transformatio of transformation of transformation of transformation	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 /s)= Ng Q <sub>r</sub> (L/s) 53.00 53.00 53.00 53.00	3.07 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 96.37 91.86 89.73 87.67	8.668 Balance 0.00 Volume 100yr (m <sup>3</sup> ) 231.29 231.48 231.50 231.46	27 <b>Drainage Area</b> Area (Ha) C = <b>T</b> <sub>c</sub> <b>Variable</b> (min) 18 20 21 22	57.88 Overflow 0.00 Parking lot 0.63 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	3.37         Sto         Required         3.44         0         Qf=1.26+4.5+12=         0         0         Restricted Flow Qr (         5-Year Pondin         Peak Flow         Qp=2.78xCi 5yr A         (L/s)         105.04         98.43         95.46         92.68	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 L/s)= <b>g</b> <b>Q</b> <sub>r</sub> (L/s) 53.00 53.00 53.00 53.00	2.11 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 69.80 63.19 60.22 57.44	3.42 Balance 0.00 Volume 5yr (m <sup>3</sup> ) 75.39 75.83 75.83 75.82	21 <b>Drainage Area</b> Area (Ha) C = <b>T</b> <sub>c</sub> <b>Variable</b> (min) 13 15 16 17	50.48 <b>Overflow</b> 0.00 <b>Parking lot</b> 0.630 0.80 <i>i</i> <sub>2yr</sub> (mm/hour) 66.93 61.77 59.50 57.42	2.94 Stor Required 2.13 Qf=1.26+4.5+12= Restricted Flow Q <sub>r</sub> (L 2-Year Ponding Peak Flow Q <sub>p</sub> =2.78xCi <sub>2yr</sub> A (L/s) 93.78 86.54 83.37 80.45	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 /s)= g Q <sub>r</sub> (L/s) 53.00 53.00 53.00 53.00	1.68         Sub-surface         0.00         53.00         Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s)         58.54         51.30         48.13         45.21	2.12 Balance 0.00 Volume 2yr (m <sup>3</sup> ) 45.66 46.17 46.21 46.11
47 Assume roof top sto rainage Area ea (Ha) = T <sub>c</sub> Variable (min) 40 42 43	66.91 Overflow 0.00 orage of 150mm c Parking lo 0.63 1.0 <i>i</i> <sub>100yr</sub> <i>(mm/hour)</i> 75.15 72.57 71.35	4.33 Stor Required 8.67 over 75% of flat roof Qf=1.26+4.5+12= 0 Restricted Flow Q <sub>r</sub> (L 100-Year Pondin Peak Flow Q <sub>p</sub> =2.78xCi <sub>100yr</sub> A (L/s) 131.61 127.10 124.97	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 _/s)= ng Q <sub>r</sub> <u>(L/s)</u> 53.00 53.00 53.00	3.07 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 96.37 91.86 89.73	8.668 Balance 0.00 Volume 100yr (m <sup>3</sup> ) 231.29 231.48 231.50	27 <b>Drainage Area</b> Area (Ha) C = <b>T</b> <sub>c</sub> <b>Variable</b> (min) 18 20 21	57.88 Overflow 0.00 Parking log 0.63 0.8 0.8 1 5yr (mm/hour) 74.97 70.25 68.13	3.37         Sto         Required         3.44         Qf=1.26+4.5+12=         0         Restricted Flow Qr (         5-Year Pondin         Peak Flow         Qp=2.78xCi 5yr A         (L/s)         105.04         98.43         95.46	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 L/s)= <b>g</b> Q <sub>r</sub> (L/s) 53.00 53.00 53.00	2.11 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 69.80 63.19 60.22	3.42 Balance 0.00 Volume 5yr (m <sup>3</sup> ) 75.39 75.83 75.87	21 <b>Drainage Area</b> Area (Ha) C = <b>T</b> <sub>c</sub> <b>Variable</b> (min) 13 15 16	50.48 <b>Overflow</b> 0.00 <b>Parking lot</b> 0.630 0.80 <i>i</i> <sub>2yr</sub> (mm/hour) 66.93 61.77 59.50	2.94 Stor Required 2.13 Qf=1.26+4.5+12= Restricted Flow Q <sub>r</sub> (L 2-Year Ponding Peak Flow Q <sub>p</sub> =2.78xCi <sub>2yr</sub> A (L/s) 93.78 86.54 83.37	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 _/s)= g Q <sub>r</sub> <u>(L/s)</u> 53.00 53.00 53.00	1.68         Sub-surface         0.00         53.00         Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s)         58.54         51.30         48.13	2.12 Balance 0.00 Volume 2yr (m <sup>3</sup> ) 45.66 46.17 46.21 46.11
47 Assume roof top sto rainage Area ea (Ha) = T <sub>c</sub> Variable (min) 40 42 43 44	66.91           Overflow           0.00           Drage of 150mm c           Parking lo           0.63           1.0           i 100yr           (mm/hour)           75.15           72.57           71.35           70.18	4.33         Stor         Required         8.67         over 75% of flat roof $t$ Qf=1.26+4.5+12=         0         0         Restricted Flow Q <sub>r</sub> (L <b>Peak Flow</b> $Q_p$ = 2.78xCi 100yr A         (L/s)         131.61         127.10         124.97         122.91         119.03	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 _/s)= ng Q <sub>r</sub> (L/s) 53.00 53.00 53.00 53.00 53.00	3.07 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 96.37 91.86 89.73 87.67	8.668 Balance 0.00 Volume 100yr (m <sup>3</sup> ) 231.29 231.48 231.50 231.46	27 <b>Drainage Area</b> Area (Ha) C = <b>T</b> <sub>c</sub> <b>Variable</b> (min) 18 20 21 22	57.88 Overflow 0.00 Parking lot 0.63 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	3.37         Sto         Required         3.44         t       Qf=1.26+4.5+12=         0       Restricted Flow Qr (         5-Year Pondin         Peak Flow         Q $p=2.78xCi_{5yr}A$ (L/s)       105.04         98.43       95.46         92.68       87.63	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 L/s)= <b>g</b> <b>Q</b> <sub>r</sub> (L/s) 53.00 53.00 53.00 53.00 53.00	2.11 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 69.80 63.19 60.22 57.44	3.42 Balance 0.00 Volume 5yr (m <sup>3</sup> ) 75.39 75.83 75.83 75.82	21 <b>Drainage Area</b> Area (Ha) C = <b>T</b> <sub>c</sub> <b>Variable</b> (min) 13 15 16 17	50.48 <b>Overflow</b> 0.00 <b>Parking lot</b> 0.630 0.80 <i>i</i> <sub>2yr</sub> (mm/hour) 66.93 61.77 59.50 57.42	2.94 Stor Required 2.13 Qf=1.26+4.5+12= Restricted Flow Q <sub>r</sub> (L 2-Year Ponding <i>Peak Flow</i> <i>Q<sub>p</sub></i> =2.78xCi <sub>2yr</sub> A (L/s) 93.78 86.54 83.37 80.45 75.24	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 _/s)= g Q <sub>r</sub> (L/s) 53.00 53.00 53.00 53.00 53.00	1.68         Sub-surface         0.00         53.00         Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s)         58.54         51.30         48.13         45.21	2.12 Balance 0.00 Volume 2yr (m <sup>3</sup> ) 45.66 46.17 46.21
47 Assume roof top sto Prainage Area rea (Ha) = T <sub>c</sub> Variable (min) 40 42 43 43 44	66.91           Overflow           0.00           Drage of 150mm c           Parking lo           0.63           1.0           i 100yr           (mm/hour)           75.15           72.57           71.35           70.18	4.33         Stor         Required         8.67         over 75% of flat roof $t$ Qf=1.26+4.5+12=         0         0         Restricted Flow Q <sub>r</sub> (L <b>Peak Flow</b> $Q_p$ = 2.78xCi 100yr A         (L/s)         131.61         127.10         124.97         122.91         119.03	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 /s)= Ng Q <sub>r</sub> (L/s) 53.00 53.00 53.00 53.00	3.07 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 96.37 91.86 89.73 87.67	8.668 Balance 0.00 Volume 100yr (m <sup>3</sup> ) 231.29 231.48 231.50 231.46	27 <b>Drainage Area</b> Area (Ha) C = <b>T</b> <sub>c</sub> <b>Variable</b> (min) 18 20 21 22	57.88 Overflow 0.00 Parking lot 0.63 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	3.37         Sto         Required         3.44         t       Qf=1.26+4.5+12=         0       Restricted Flow Qr (         5-Year Pondin         Peak Flow         Q $p=2.78xCi_{5yr}A$ (L/s)       105.04         98.43       95.46         92.68       87.63	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 L/s)= <b>g</b> <b>Q</b> <sub>r</sub> (L/s) 53.00 53.00 53.00 53.00	2.11 Sub-surface 0.00 53.00 Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s) 69.80 63.19 60.22 57.44	3.42 Balance 0.00 Volume 5yr (m <sup>3</sup> ) 75.39 75.83 75.83 75.82	21 <b>Drainage Area</b> Area (Ha) C = <b>T</b> <sub>c</sub> <b>Variable</b> (min) 13 15 16 17	50.48 <b>Overflow</b> 0.00 <b>Parking lot</b> 0.630 0.80 <i>i</i> <sub>2yr</sub> (mm/hour) 66.93 61.77 59.50 57.42	2.94 Stor Required 2.13 Qf=1.26+4.5+12= Restricted Flow Q <sub>r</sub> (L 2-Year Ponding <i>Peak Flow</i> <i>Q<sub>p</sub></i> =2.78xCi <sub>2yr</sub> A (L/s) 93.78 86.54 83.37 80.45 75.24	1.26 rage (m <sup>3</sup> ) Surface 8.74 17.76 /s)= g Q <sub>r</sub> (L/s) 53.00 53.00 53.00 53.00	1.68         Sub-surface         0.00         53.00         Qf+Q <sub>p</sub> -Q <sub>r</sub> (L/s)         58.54         51.30         48.13         45.21	2.12 Balance 0.00 Volume 2yr (m <sup>3</sup> ) 45.66 46.17 46.21 46.11

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### IBI GROUP

400-333 Preston Street Ottawa, Ontario K1S 5N4 Canada tel 613 225 1311 fax 613 225 9868 ibigroup.com

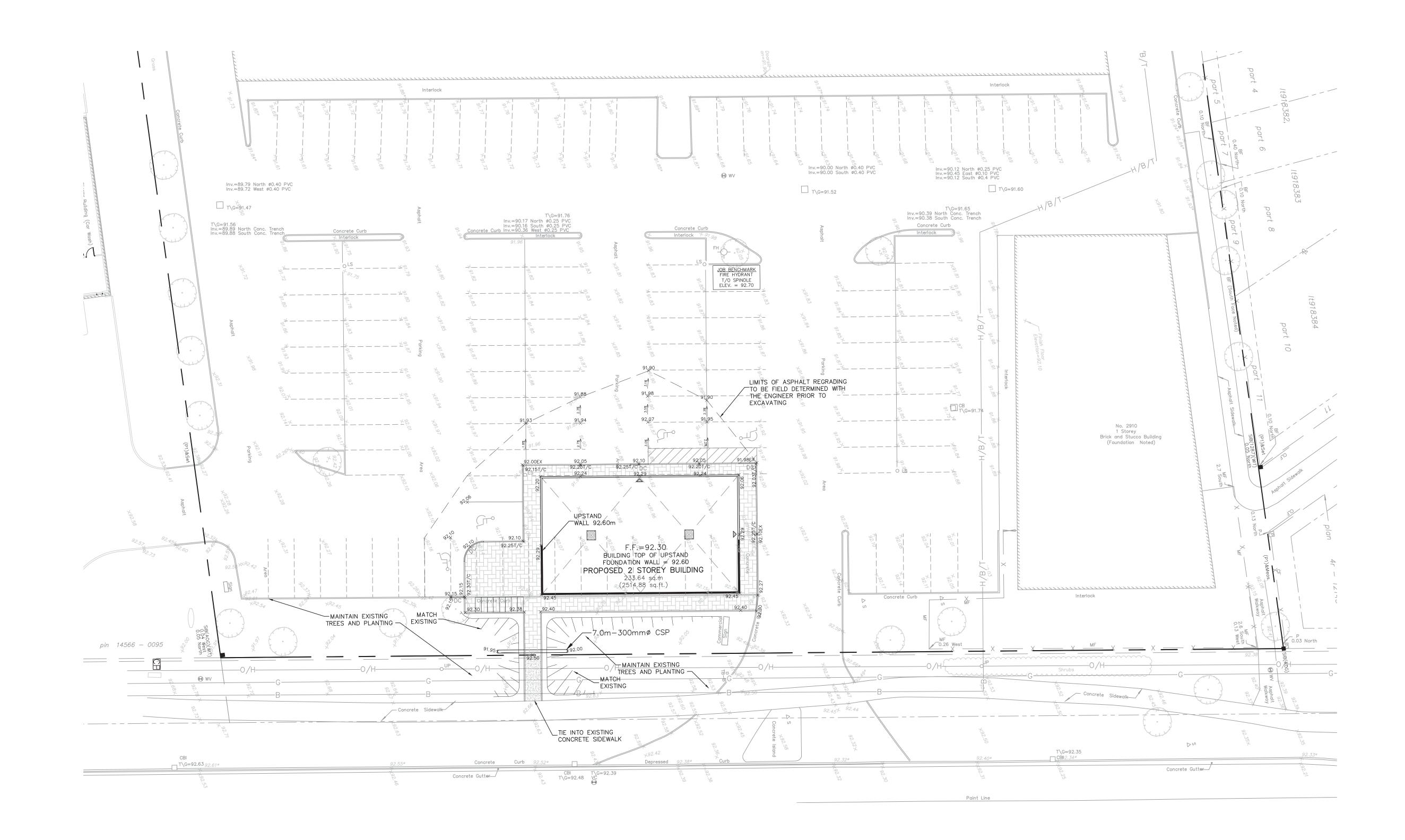
LOCATI	NC					ARE	A (Ha)										F	RATIONAL	DESIGN FL	OW									S	EWER DATA	A			
	E	Та	C=	C= C:	= C	C= C=	C=	C=	C= C=	C=	IND	CUM	INLET	TIME	TOTAL	i (2)	i (5)	i (10)	i (100)	2yr PEAK	5yr PEAK	10yr PEAK	100yr PEAK	FIXED	DESIGN	CAPACITY	LENGTH		PIPE SIZE (m	m)	SLOPE	VELOCITY	AVAIL (	CAP (2yr)
	From	То	0.20	0.25 0.4	40 0.	.50 0.57	0.65	0.69 (	0.70 0.80	0.90 2	2.78AC 2	2.78AC	(min)	IN PIPE	(min)	(mm/hr)	(mm/hr)	(mm/hr)	(mm/hr)	FLOW (L/s	) FLOW (L/s	) FLOW (L/s)	FLOW (L/s)	FLOW (L/s)	FLOW (L/s)	(L/s)	(m)	DIA	W	Н	(%)	(m/s)	(L/s)	(%)
										0.07	0.40	0.40	40.00		10.04	70.04	101.10	100.11	470.50	10.15	40.05	04.00	04.07	4.50	4.50	70.50	0.00				4.50	0.000		00.000/
Existing Storm	Bldg 1	CBMH3								0.07		0.18	10.00	0.04	10.04	76.81	104.19	122.14	178.56	13.45	18.25	21.39	31.27	4.50	4.50	72.58	6.00	200			4.50	2.238	68.08	93.80%
Existing Storm	CBMH3	CBMH4							0.09		0.20	0.20	10.04	0.28	10.33	76.63	103.96	121.86	178.15	15.34	20.81	24.39	35.66	4.50	19.84	80.71	18.69	300			0.64	1.106	60.87	75.42%
Proposed Storm	Pad A	CBMH4/5								0.02	0.06	0.06	10.00	0.55	10.55	76.81	104.19	122.14	178.56	4.42	6.00	7.03	10.28	1.26	1.26	27.59	28.08	200			0.65	0.851	26.33	95.43%
Existing Storm	CBMH4	CBMH5							0.11		0.24	0.44	10.55	1.01	11.56	74,76	101.37	118.82	173.68	33.25	45.09	52.85	77.25	5.76	39.01	109.75	58.35	375			0.36	0.963	70.74	64.45%
Existing Storm	CBMH5	CBMH6							0.31		0.69	1.13	11.56	0.72	12.28	71.29	96.61	113.22	165.45	80.86	109.58	128.42	187.66	5.76	86.62	108.21	41.00	375			0.35	0.949	21.59	19.95%
Existing Storm	CBMH8	СВМН9							0.06		0.13	0.13	10.00	0.74	10.74	76.81	104.19	122.14	178.56	10.25	13.90	16.30	23.83	12.00	22.25	63.80	39.00	300			0.40	0.874	41.55	65.13%
Existing Storm	CBMH9	CBMH6							0.06			0.27	10.74	0.33	11.08	74.06	100.42	117.70	172.04	19.77	26.80	31.41	45.91	12.00	31.77	63.80	17.50	300			0.40	0.874	32.04	50.21%
Existing Storm	CBMH6	Woodpark									0.00	1.40	12.28	0.59	12.87	69.03	93.52	109.57	160.09	96.72	131.03	153.52	224.31	53.00	53.00	210.32	45.00	450			0.50	1.281	157.32	74.80%
Definitions:			Notes:										Designed:		SEL				No.						Revision							Date		
Q = 2.78CiA, where:			1. Manr	nings coeffic	cient (n)	) = 0.013	}												1.					Site Servi	cing Study							April 25, 2019	9	
Q = Peak Flow in Litres per Second (L	s)																																	
A = Area in Hectares (Ha)													Checked:		DY																			
i = Rainfall intensity in millimeters per																																		
[i = 732.951 / (TC+6.199)^0.810]	2 YEAR																																	
[i = 998.071 / (TC+6.053)^0.814]	5 YEAR												Dwg. Refer	ence:	N/A																			
[i = 1174.184 / (TC+6.014)^0.816]	10 YEAR																			File	Reference:					Date:						Sheet No:		
[i = 1735.688 / (TC+6.014)^0.820]	100 YEAR	R																		119	777.5.7.1				2	2019-04-25						1 of 1		

### STORM SEWER DESIGN SHEET

2900 WOODROFFE City of Ottawa **IBI GROUP** PROJECT: 119777-5.2.2 2900 WOODROFFE AVENUE PAD A SERVICING AND STORMWATER MANAGEMENT DESIGN BRIEF Prepared for Chris Flemming Developments

# **APPENDIX E**

- C-200 Grading Plan
  C-900 Sediment and Erosion Control Plan





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NOTES:

- 1. SILT FENCE TO BE ERECTED PRIOR TO EARTH WORKS BEING COMMENCED. SILT FENCE TO BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED AND OR PAVEMENT/WALKWAYS COMPLETED.
- 2. STRAW BALE SEDIMENT TRAPS TO BE CONSTRUCTED IN EXISTING ROAD SIDE DITCHES. TRAPS TO REMAIN AND BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED.
- 3. SILT SACK CATCHBASIN INSERTS TO BE PLACED UNDER COVER OF ALL CATCHBASINS. SILT SACK IN STREET CB'S AND MANHOLES TO REMAIN UNTIL BASE COURSE ASPHALT IS LAID. ALL CATCHBASINS TO BE REGULARLY INSPECTED AND CLEANED, AS NECESSARY, UNTIL SOD AND CURBS ARE CONSTRUCTED.
- 4. CONTRACTOR TO PROVIDE DETAILS ON LOCATION(S) AND DESIGN OF DEWATERING TRAP(S) PRIOR TO COMMENCING WORK. CONTRACTOR ALSO RESPONSIBLE FOR MAINTAINING TRAP(S) AND ADJUSTING SIZE(S) IF DEEMED REQUIRED BY THE ENGINEER DURING CONSTRUCTION.
- 5. THE SEDIMENT AND EROSION CONTROL MEASUREMENTS MAY BE MODIFIED IN THE FIELD AT THE DISCRETION OF THE CITY OF OTTAWA SITE INSPECTOR OR CONSERVATION AUTHORITY.

THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATER COURSE, DURING CONSTRUCTION ACTIVITIES. THIS INCLUDES LIMITING THE AMOUNT OF EXPOSED SOIL, USING FILTER CLOTH UNDER THE GRATES OF MANHOLES AND INSTALLING SILT FENCES, SILT SACKS AND OTHER EFFECTIVE SEDIMENT TRAPS. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE **EROSION AND SEDIMENT CONTROL MEASURES** AND/OR MAINTAIN THEM THAT THEY MAY BE SUBJECT TO PENALTIES IMPOSED BY APPLICABLE REGULATORY AGENCIES.

