



Town of Cobourg

STORMWATER ANAGEMENT AND SERVICING REPORT

Balder Corporation
325 University Avenue West

June 2019
20021

Disclaimer

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TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	<i>SCOPE OF THE SWM AND SERVICING REPORT</i>	1
1.2	<i>SITE LOCATION</i>	1
1.3	<i>Stormwater Management Plan Objectives</i>	2
1.4	<i>SWM Design Criteria – GRCA</i>	2
2	EXISTING CONDITIONS	2
2.1	<i>General</i>	2
2.2	<i>Rainfall Information</i>	3
2.3	<i>Peak Flow rates under existing conditions</i>	3
2.4	<i>Allowable Flow Rate</i>	4
3	POST-DEVELOPMENT CONDITIONS	4
3.1	<i>General</i>	4
3.2	<i>Peak Flow Rates under Proposed Condition</i>	4
4	PROPOSED SWM PLAN	5
4.1	<i>Water Quantity Control Requirement</i>	5
4.2	<i>Water Quality Control</i>	5
5	EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION	6
6	SITE SERVICING	6
6.1	<i>existing municipal services</i>	7
6.2	<i>proposed site service connections</i>	7
6.3	<i>Assessment of Existing Municipal Service</i>	8
6.3.1	<i>Adequacy of Existing Storm and Sanitary Sewers</i>	8
6.3.2	<i>Adequacy of Existing Water mains</i>	9
7	CONCLUSIONS	9
7.1	<i>Stormwater Management Plan</i>	9
7.2	<i>Site Servicing requirement</i>	9

LIST OF FIGURES AND TABLES

Figure 1: Proposed Development SWM Study Area	1
Table 1: Areas of Proposed Sub-Catchment	3
Table 2: Values of a and c Parameters for the GRCA	3
Table 3: Pre-Development Flow Rates (L/s)	4
Table 4: Post-Development Peak Flow Rates (L/s).....	5
Table 5: Required Stormwater Storage Volume	5
Table 6: TSS Removal Assessment of Study Area.....	6
Table 7: Site Servicing Requirement	7

APPENDICES

APPENDIX A	STORMWATER PEAK FLOW RATES AND STORAGE CALCULATIONS
APPENDIX B	SANITARY AND WATER DEMAND CALCULATIONS
APPENDIX B	HYDRANT FLOW TEST AND WATERMAIN ADEQUACY ASSESSMENT
APPENDIX D	FIGURES AND DRAWINGS
	„ FIG-02- EXISTING DRAINAGE PLAN
	„ FIG-03- PROPOSED DRAINAGE PLAN
	„ DWG C01- PRELIMINARY SITE GRADING PLAN
	„ DWG C02- PRELIMINARY SITE SERVICING PLAN

1 INTRODUCTION

1.1 SCOPE OF THE SWM AND SERVICING REPORT

LEA Consulting Ltd. has been retained by Balder Corporation, to prepare a Functional Servicing and Stormwater Management Brief for proposed new build of a 4-storey residential building located at 325 University Avenue West in the Town of Cobourg. This stormwater management and servicing brief shall:

- „ Examine the potential water quantity and quality impacts of the proposed development and summarize how each will be addressed in accordance with the Ganaraska Region Conservation Authority (GRCA), 2014.
- „ Review the water supply, storm and sanitary servicing requirement of the proposed development, and propose a preliminary site servicing plan.

1.2 SITE LOCATION

The proposed development site is located at the southwest quadrant of University Avenue West and William Street. The study area consists of the existing dwellings and vegetated lands. It is bounded by William Street to the east, single houses to the west, undeveloped property to the south, and University Street West to the north, contributory to Cobourg Creek watershed and under the jurisdiction of Ganaraska Region Conservation Authority (GRCA). Study area access, currently via University Avenue and is approximately 0.485 ha.

The location, surroundings, and layout of study area shown below in Figure 1.



1.3 STORMWATER MANAGEMENT PLAN OBJECTIVES

The objectives of the stormwater management plan are as follows:

- „ Determine site specific stormwater management requirements to ensure that the development project is in conformance with the *Technical and Engineering Guidelines for Stormwater Management Submission* issued by Ganaraska Region Conservation Authority (GRCA);
- „ Preparing a stormwater management plan documenting the strategy along with the technical information necessary for the sizing of the proposed stormwater management measures.

1.4 SWM DESIGN CRITERIA – GRCA

The GRCA has issued the *Technical and Engineering Guidelines for Stormwater Management Submission*, (December 2014) to provide direction on how to manage rainfall and runoff inside watersheds. A summary of the stormwater management criteria applicable to this project is as follows:

- „ Water Quality: water quality control, outflow from SWM facilities must meet enhanced level requirements (80% removal of total suspended solids); and
- „ Water Quantity Control and Discharge to Municipal Infrastructure: Runoff from the 5-year to 100-year design storms must not exceed the peak runoff rate from the site under pre-development conditions. The allowable release rate to the municipal storm sewer system from the development site is the 5-year pre-development flow rate.

2 EXISTING CONDITIONS

2.1 GENERAL

The site is currently occupied by four properties consist of dwelling, single houses and vegetated areas. Under existing condition, the majority of site drains towards the University Avenue West at north of the site. The southern part of the site drains towards the south and southwest corner of the site towards the adjacent properties.

For purpose of SWM analysis and calculating the allowable release rate from the proposed development, the site is divided into two sub-catchment areas based on the drainage pattern under existing condition, i.e.

- „ Sub-Catchment C1: Northern part of the site which drains to the University Avenue west;
- „ Sub-Catchment C2: Southern part of the site which drains to the adjacent properties;

Sub-catchment areas and runoff coefficients are summarized in Table 1 on the next page.

Table 1: Areas of Proposed Sub-Catchment

Sub-catchment No	Catchment Description	Catchment Area (m ²)	Runoff Coefficient
C1	Northern part of the site	3785	0.43
C2	Southern part of the site	1071	0.35

Under current condition, the eastern area of the property 395 William Street drains to the study area as an external flow. Drainage area boundaries, overland flow routes, grading and land use details under existing conditions are illustrated on Fig. 2 in Appendix D.

Based on our review of topographic survey and site observation, there is no on-site stormwater management under existing condition.

2.2 RAINFALL INFORMATION

The rainfall runoff and intensity under existing and proposed conditions are calculated using the following equations:

Rational Formula:	$Q = 2.78CIA$ (L/s)
Where:	C: runoff coefficient
	I: rainfall intensity (mm/hr)
	A: drainage area (ha)
IDF Curve Equation:	$I = a/(b+T_c)$ (Yarnell Equation)
Where:	I: rainfall intensity (mm/hr)
	T_c : time of concentration (min)
	a, b: parameters

The parameters (a and b) for use in beyond Clarington are defined in Appendix B of the *Technical and Engineering Guidelines for Stormwater Management Submission* and are summarized in Table 2.

Table 2: Values of a and c Parameters for the GRCA

Return Period (Year)	2	5	10	25	50r	100
a	1778	2464	2819	3886	4750	5588
b	13	16	16	18	24	28

An initial time of concentration, T, of 15 minutes is recommended in the GRCA document for normal residential and industrial developments.

2.3 PEAK FLOW RATES UNDER EXISTING CONDITIONS

Based on the existing site condition and rainfall parameters, the Rational Method is adopted to calculate peak flows at different design storm events. The calculated peak flow rates for the site in the pre-development condition are summarized below in Table 3. Detailed calculations are provided in Appendix A.

Table 3: Pre-Development Flow Rates (L/s)

Sub-catchment No	Sub-Catchment	Return Period (Year)					
		2	5	10	25	50	100
C1	Northern part of the site	28.9	36.1	41.3	53.5	55.3	59.1
C2	Southern part of the site	6.6	8.3	9.5	12.3	12.7	13.6

2.4 ALLOWABLE FLOW RATE

As mentioned in section 1.2, the site is located within the Cobourg Creek watershed. Based on the *Technical and Engineering Guideline for Stormwater Management Submission* by GRCA, Table 3.1, the allowable release rate to the municipal storm sewer system from the proposed redevelopment would be in accordance with 5-year pre-development flow rate.

Since under post development condition only one storm service connection to the University Avenue will be provided for entire site, to maintain the existing drainage condition of University Avenue, the storm flow from the site will be overcontrolled under post-development condition. Therefore, according to the GRCA criteria, the allowable release rate to the University Avenue storm sewer from the proposed development would be based on the 5-year pre-development flow rate of sub-catchment C1. In other words, the maximum flow rate from the entire site will be limited to 36.1 L/s under proposed condition

3 POST-DEVELOPMENT CONDITIONS

3.1 GENERAL

The proposed development consists of construction of a 4-storey residential building on the north, new parking lots on south and new driveway on the west of the site. The existing 2-storey building on the south-east will be remained.

During rainfall events, the runoff from the building will be captured by buildings' roof drains, conveyed through the internal piping and discharged directly to the proposed stormwater storage on the proposed driveway. Runoff from the rest of the site will be collected by proposed catch basins and swales, conveyed through the storm pipes, discharged to the proposed stormwater storage on the new driveway, controlled by an orifice, and ultimately outlet to the existing municipal storm sewer on the University Avenue West.

Catchment area, drainage pattern and overland flow route for proposed condition are illustrated in Fig. 3, in Appendix D.

Based on the proposed land use, the composite runoff coefficients are estimated at 0.62 for the proposed development. Refer to Appendix A for details.

3.2 PEAK FLOW RATES UNDER PROPOSED CONDITION

Based on the proposed site condition and rainfall parameters, the Rational Method is adopted to calculate peak flows at different design storm events. The calculated peak flow rates for total site area and external

drainage area under post-development condition are summarized in Table 4. Detailed calculations are provided in Appendix A.

Table 4: Post-Development Peak Flow Rates (L/s)

Sub-catchment No	Sub-Catchment	Return Period (Year)					
		2	5	10	25	50	100
C	Proposed site	55.1	69.0	78.9	102.2	105.7	112.8

4 PROPOSED SWM PLAN

4.1 WATER QUANTITY CONTROL REQUIREMENT

As noted in Section 2.4, the allowable discharge rate to the municipal sewer system from the site is estimated to be 36.1 L/s, which is equivalent to 5-yr existing flow from the 78% of the site area to the existing municipal sewer on the University Avenue West.

Based on the post-development condition, the stormwater detention requirements at different storm events are estimated in Appendix A and summarized in Table 5 below

Table 5: Required Stormwater Storage Volume

Sub-catchment No	Sub-Catchment	Target Release Rate (L/S)	Storage Volume (m ³)	
			Required	Provided
C	Proposed site	36.1	85.9	90.0

An underground Stormwater storage (S-29 Triton Chambers) is proposed on the new driveway for entire site. The location and footprint of underground storages are shown on the DWG C01-site Grading Plan and DWG C02-site Servicing Plan. Typical sections of chamber are presented in Appendix A.

An 120mm orifice plate will be installed at the inlet of OGS unit to control the discharging flow from storage to the existing municipal storm sewer in the University Avenue West.

The final type and exact location of the cistern will be determined by consultation with the geotechnical and mechanical designer in the next stage of design.

Typical sections of chamber and the orifice size calculation is presented in Appendix A.

4.2 WATER QUALITY CONTROL

In order to achieve the long-term average removal of 80% of Total Suspended Solids (TSS) on an annual basis from all runoff leaving the site, the following quality control measures will be provided:

Based on the SWM design criteria, the building rooftop area is not subject to vehicular traffic, and the application of sand and de-icing salt constituents, petroleum hydrocarbons and heavy metals. As such, the stormwater generated from the roof area is considered clean for the purposes of water quality control.

Under the post-development conditions, rooftop areas, will remove TSS from the rainfall runoff. Table 6 provides a preliminary estimate of TSS removal level of stormwater leaving the site.

Table 6: TSS Removal Assessment of Study Area

Land Use	Area (m ²)	TSS Removal Efficiency (%)	Composite TSS Removal Efficiency (%)
Roof	1300	80	20.5
Concrete and Asphalt	1380	0	0
Permeable pavement	1860	80	29.4
Landscape and vegetated Area	920	80	14.5
OGS	3372	50	33.2
Total	5066*		>80.0

*External flow drainage area included

To achieve a TSS removal of 80%, a stormwater quality treatment facility (CDS model PMSU2015-4) is proposed. Sizing details are provided in Appendix A. This quality treatment unit will be installed before the inlet of storage tank within the new driveway.

5 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

During site construction, it is recommended that all erosion and sediment control Best Management Practices (BMPs) shall be constructed and maintained in accordance with the Greater Golden Horseshoe Area Conservation Authorities' (GGHA CAs) Erosion & Sediment Control Guidelines for Urban Construction (December 2006). In brief, the measures below are proposed to be provided on site during the entire period of construction:

- „ Siltation control fence along the perimeter of the construction site before commencement of construction;
- „ Sediment control measures to prevent silt entry at all the existing catch basins;
- „ Granular mud-mats at all construction egress locations;
- „ An inspection and monitoring program following the GGHA CA's Erosion and Sediment Control Guidelines for Urban Construction (December 2006).

6 SITE SERVICING

The purpose of this site servicing report is to review the site servicing requirement of the proposed development, and propose a site servicing plan, including water supply, sanitary and storm services. Refer to Dwg. C02 - Site Servicing Plan for details of the proposed site service connections.

6.1 EXISTING MUNICIPAL SERVICES

Base on the survey and Town's records, the existing underground sewers and watermains in the vicinity of the proposed development area include the followings:

University Ave.:

- „ a 150mm dia. PVC watermain;
- „ a 600mm dia. CONC sanitary sewer line
- „ a 300mm CONC storm sewer line
- „ a 900mm CONC storm sewer line

William Street:

- „ an 200mm dia. CI watermain;
- „ a 300mm dia. CONC storm sewer line;
- „ a 200mm dia. PVC sanitary sewer line.

Margaret Street:

- „ a 150mm dia. CI watermain;
- „ a 300mm storm sewer line;
- „ a 200mm dia. PVC sanitary sewer line.

6.2 PROPOSED SITE SERVICE CONNECTIONS

Design Parameters

The sanitary demands for the proposed site are based on the following Town of Cobourg design guidelines:

- „ Sanitary demand rate of 364 L/person/day for new residential development;
- „ Population densities of 1.62 person/unit for apartment;
- „ Infiltration Allowance of 0.26 L/s/ha; and,
- „ Peaking Factor based on the Harmon Equation.

The domestic water demands for the proposed site are based on the following criteria:

- „ Water demand rate of 191 L/person/day for domestic consumption.
- „ Population densities of 1.62 person/unit for apartment;
- „ Peaking Factor for drinking-water systems serving fewer than 500 people– 9.4 (Peak Hour) and 6.3 (Maximum Day).

The demand and peaking factors are based on the Ministry of Environment *Design Guidelines for Drinking-Water Systems, 2008*.

Based on the design criteria and project statistics of proposed development provided by the architect, sanitary flow and water demand are estimated in Appendices B and summarized below in Table 7. Storm flow discharge rates have been provided in the previous section of this report.

Table 7: Site Servicing Requirement

Building	Sanitary Flow rate (l/s)	Water Demand (l/s)
New Residential Building	1.97	118.3

Through discussion with design team, the locations and sizes of the proposed site service connections for new residential building have been determined to satisfy the requirements of the Town of Cobourg. In summary:

Sanitary Service: A 200mm dia. sanitary service connection will be installed to service the proposed residential development and discharge to the existing 600mm concrete sanitary sewer on University Avenue West

Storm Service: A new control manhole MH1 and new 250mm PVC storm service connection and will be installed to provide servicing for the proposed development and discharged to the proposed storm manhole No. MH2 and the existing 300mm storm sewer on University Avenue West.

Water service:

Based on the hydrant flow test results, the existing watermain on the university Avenue West is not adequate to provide water service to the proposed development site. Therefore, the water and fire services will be provided from William Street as follows:

- Domestic Water Service: An 100mm dia. PVC domestic water service connection will be installed to service the proposed building. The domestic water service connection will be connected to the proposed 150 mm dia. fire protection water service connection with a tee-connection.
- Fire Protection Service: A new 150mm dia. fire protection service will be installed at the eastern entrance of the site and connect to the existing 200mm PVC watermain on the University Avenue West.

Refer to Dwg. C-02-site servicing plan in Appendix D for details of proposed service connections.

6.3 ASSESSMENT OF EXISTING MUNICIPAL SERVICE

The capacity of existing municipal water mains and sewers shall be reviewed based on the site servicing requirement, sewer model and hydrant flow test data.

6.3.1 Adequacy of Existing Storm and Sanitary Sewers

Sanitary: Based on the Town's record drawings, the full flow capacity of the existing 600mm sanitary sewer on University Avenue West at the north of the development site is estimated at 307.0 L/s. Therefore, it is anticipated to be adequate to accommodate the sanitary flow (1.19 L/s) from the proposed development.

Storm: Based on the Town's record drawings, the full flow capacity of the existing 300mm storm sewer on University Avenue West at the north of the development site is estimated at 71.1 L/s. Furthermore, under post-development condition, the storm water discharge from the site to the University Avenue West is to be maintained as the existing condition and an overcontrolled discharge is provided through the proposed stormwater management plan. Therefore, the existing 300mm storm sewer on the University Avenue West would be adequate to accommodate 36.1 L/s flow from the proposed development.

6.3.2 Adequacy of Existing Water mains

In order to evaluate the adequacy of the existing watermain located on University Avenue West and William street, a hydrant flow test was conducted by Classic Fire Protection on May 23rd, 2019. Test results are included in Appendix G

Based on the Town's record drawings and GIS data, the existing fire hydrant at the University Avenue West and the northwest of the site is connected to the 200mm watermain on the William St. but, the field test has shown that there is not any connection between watermain on the William Street and fire hydrant at the northwest of the site. Therefore, the hydrant flow test is conducted on the existing 200mm watermain on William Street to assess the available water pressure.

As shown by the test readings, the available water pressure ranges from 68 psi with a flow of 852.7 US GPM to 65 psi with a flow of 1460.4 US GPM during the flow test with a static pressure of 72 psi. At the design water demand of 118.3 L/s (or 1874.6 US GPM) generated from the proposed site, the extrapolated flow test results show a residual pressure of 60.3 psi, which is greater than the minimum requirement of 20 psi (150 kPa). Therefore, adequate water supply and pressure are available to serve the proposed building.

The hydrant flow test results are presented in the Appendix C.

7 CONCLUSIONS

7.1 STORMWATER MANAGEMENT PLAN

- Water Quantity: On-site storage volume of approximately 90 m³ will be provided in order to control the post development 100-year stormwater flows to 5-yr pre-development flow to the existing municipal sewer on the University Avenue West. An underground Triton S-29 stormwater chamber is proposed to satisfy the on-site storage requirement.
- Water Quality: An oil/grit separator is required to satisfy the MOE's 80% TSS removal.

Temporary Erosion and Sediment Control during Construction

- Temporary erosion and sediment control measures should be provided before construction and maintained during construction in accordance with the GGHA CA's Erosion & Sediment Control Guidelines for Urban Construction and other requirements.

7.2 SITE SERVICING REQUIREMENT

- Sanitary Service: The sanitary service for proposed development will provided by a new 200 mm sanitary service connected to the existing 600mm sanitary sewer on University Avenue West. Based on the size and slope of the receiving municipal sanitary sewer, there is sufficient flow capacity within the existing sanitary sewers on University avenue to accommodate the proposed development.
- Storm Service: The proposed storm service connection for this site will be a 250mm PVC pipe that connects to the proposed manhole MH2 on the south side of University Avenue West.

- Water Services: New water service for the proposed building will consist of a 100mm domestic water and a 150mm fire service connection. The total water demand for the development is 118.3 L/s (or 1874.6 USGPM).

Prepared By:
LEA Consulting Ltd.




Farshid Morshedi, P.Eng.
Project Engineer

APPENDIX A

Stormwater Peak Flow and Storage Calculations




 LEA Consulting Ltd. Consulting Engineers and Planners	Land Use		
	Prepared:	F.M.	Page No. A-01
	Checked:	R.B.	
Project: 315-325 University Avenue West Town of Cobourg	Proj. #	20021	
	Date:	03-Jun-19	

EXISTING CONDITION:

Existing Land Use	Area (m ²)
Sub.Catchment (C1)	
Building	1062
Vegetated Area	2723
Total	3785
Sub.Catchment (C2)	
Building	168
Vegetated Area	903
Total	1071
Total Site Area	4856
External Drainage Area	210
Total Drainage Area	5066

POST DEVELOPMENT CONDITION:

Proposed Land Use	Area (m ²)
Building and Concrete	1909
Asphalt	377
Permeable paving	1860
Landscaped Area	710
Total Site Area	4856
External Drainage Area	210
Total Drainage Area	5066

 LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation		
	Prepared:	F.M.	Page No. A-02
	Checked:	R.B.	
Project: 315-325 University Avenue West Town of Cobourg	Proj. #	20021	
	Date:	03-Jun-19	

Pre-Development Composite Runoff Coefficient "C"

Sub-Catchment C1

Land Use	Area (ha)	C	Composite "C"
Building	0.106	0.90	
Landscaped Area	0.272	0.25	
Total	0.379		0.43

Imperviousness: **0.28**

Sub-Catchment C2


Land Use	Area (ha)	C	Composite "C"
Building	0.017	0.90	
Landscaped Area	0.090	0.25	
Total	0.107		0.35

Imperviousness: **0.16**

Post-Development Composite Runoff Coefficient "C"

Land Use	Area (ha)	C	Composite "C"
Building and Concrete	0.191	0.90	
Asphalt	0.038	0.90	
Permeable paving	0.186	0.45	
Landscaped Area	0.071	0.25	
External Drainage Area	0.021	0.25	
Total	0.507		0.62

Imperviousness: **0.45**

 LEA Consulting Ltd. Consulting Engineers and Planners	Pre-Development Peak Flow Rates Calculation			
	Prepared:	F.M.	Page No.	A-03
	Checked:	R.B.		
Project: 315-325 University Avenue West Town of Cobourg	Proj. #	20021		
	Date:	03-Jun-19		

Rational Formulae: $Q = 2.78 CIA (L/s)$

Time of Concentration: 15 minutes as per GRCA Guidelines

Rainfall Intensity: $I = a/(b+T_c)$

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Sub-Catchment C1

Site Area: 0.379 ha

Runoff Coefficient : 0.43 Pre-development condition

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under existing site conditions (L/s):	28.9	36.1	41.3	53.5	55.4	59.1

Sub-Catchment C2


Site Area: 0.107 ha

Runoff Coefficient : 0.35 Pre-development condition

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under existing site conditions (L/s):	6.6	8.3	9.5	12.3	12.8	13.6

In order to maintain the existing drainage condition of the University Ave. W. the storm flow from the site will be overcontrolled under post-development condition Therefore, the 5-year flow from the only sub-catchment C1 is considered as the allowable discharge rate from the proposed development site to the existing municipal sewer on the University Avenue West.

 LEA Consulting Ltd. Consulting Engineers and Planners	Pre-Development Peak Flow Rates Calculation		
	Prepared:	F.M.	Page No. A-04
	Checked:	R.B.	
Project: 315-325 University Avenue West Town of Cobourg	Proj. #	20021	
	Date:	03-Jun-19	

Rational Formulae: $Q = 2.78 CIA (L/s)$


Site Area: 0.507 ha
 Time of Concentration: 15 minutes as per GRCA Guidelines
 Runoff Coefficient : 0.62 Pre-development condition

Rainfall Intensity: $I = a/(b+T^c)$

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	63.50	79.48	90.94	117.76	121.79	129.95

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Under existing site conditions (L/s):	55.1	69.0	78.9	102.2	105.7	112.8


 LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (2-Year Storm)			
	Prepared:	F.M.	Page No.	A-05
	Checked:	R.B.		
Project: 315-325 University Avenue West Town of Cobourg	Proj. #	20021		
	Date:	03-Jun-19		

Total Drainage Area (ha) = 0.507 ha
 Drainage Area Composite C = 0.62
 Allowable Release Rate (5-year) = 36.14 L/s
 Return Period = 2 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m ³)	Release Rate (L/s)	Release Flow Volume (m ³)	Required Storage Volume (m ³)
15	63.50	55.12	49.60	36.14	32.52	17.08
17	59.27	51.44	52.47	36.14	36.86	15.61
19	55.56	48.23	54.98	36.14	41.20	13.78
21	52.29	45.39	57.19	36.14	45.53	11.66
23	49.39	42.87	59.16	36.14	49.87	9.29
25	46.79	40.61	60.92	36.14	54.20	6.72
27	44.45	38.58	62.50	36.14	58.54	3.96
29	42.33	36.74	63.93	36.14	62.88	1.05
31	40.41	35.07	65.24	36.14	67.21	-1.97
33	38.65	33.55	66.43	36.14	71.55	-5.12
35	37.04	32.15	67.52	36.14	75.89	-8.37
37	35.56	30.86	68.52	36.14	80.22	-11.70
39	34.19	29.68	69.45	36.14	84.56	-15.11
41	32.93	28.58	70.30	36.14	88.89	-18.59
43	31.75	27.56	71.10	36.14	93.23	-22.13
45	30.66	26.61	71.84	36.14	97.57	-25.73

Required Storage Volume = 17.08 m³


 LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (5-Year Storm)			
	Prepared:	F.M.	Page No.	A-06
	Checked:	R.B.		
Project: 315-325 University Avenue West Town of Cobourg	Proj. #	20021		
	Date:	03-Jun-19		

Total Drainage Area (ha) = 0.507 ha
 Drainage Area Composite C = 0.62
 Allowable Release Rate (5-year) = 36.14 L/s Overcontrolled
 Return Period = 5 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m ³)	Release Rate (L/s)	Release Flow Volume (m ³)	Required Storage Volume (m ³)
15	79.48	68.99	62.09	36.14	32.52	29.57
17	74.67	64.81	66.10	36.14	36.86	29.24
19	70.40	61.10	69.66	36.14	41.20	28.46
21	66.59	57.80	72.83	36.14	45.53	27.30
23	63.18	54.84	75.68	36.14	49.87	25.81
25	60.10	52.16	78.24	36.14	54.20	24.04
27	57.30	49.74	80.57	36.14	58.54	22.03
29	54.76	47.53	82.69	36.14	62.88	19.81
31	52.43	45.50	84.64	36.14	67.21	17.43
33	50.29	43.65	86.42	36.14	71.55	14.87
35	48.31	41.93	88.06	36.14	75.89	12.17
37	46.49	40.35	89.58	36.14	80.22	9.36
39	44.80	38.88	90.99	36.14	84.56	6.43
41	43.23	37.52	92.30	36.14	88.89	3.41
43	41.76	36.25	93.52	36.14	93.23	0.29
45	40.39	35.06	94.66	36.14	97.57	-2.91
47	39.11	33.95	95.73	36.14	101.90	-6.17
49	37.91	32.90	96.73	36.14	106.24	-9.51
51	36.78	31.92	97.68	36.14	110.58	-12.90

Required Storage Volume = 29.57 m³


 LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (10-Year Storm)		
	Prepared:	F.M.	Page No. A-07
	Checked:	R.B.	
Project: 315-325 University Avenue West Town of Cobourg	Proj. #	20021	
	Date:	03-Jun-19	

Total Drainage Area (ha) = 0.507 ha
 Drainage Area Composite C = 0.62
 Allowable Release Rate (5-year) = 36.14 L/s Overcontrolled
 Return Period = 10 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m ³)	Release Rate (L/s)	Release Flow Volume (m ³)	Required Storage Volume (m ³)
15	90.94	78.93	71.04	36.14	32.52	38.52
17	85.42	74.14	75.63	36.14	36.86	38.77
19	80.54	69.91	79.69	36.14	41.20	38.49
21	76.19	66.13	83.32	36.14	45.53	37.79
23	72.28	62.74	86.58	36.14	49.87	36.71
25	68.76	59.68	89.52	36.14	54.20	35.32
27	65.56	56.90	92.18	36.14	58.54	33.64
29	62.64	54.37	94.61	36.14	62.88	31.73
31	59.98	52.06	96.83	36.14	67.21	29.62
33	57.53	49.93	98.87	36.14	71.55	27.32
35	55.27	47.98	100.75	36.14	75.89	24.86
37	53.19	46.17	102.49	36.14	80.22	22.27
39	51.25	44.49	104.10	36.14	84.56	19.54
41	49.46	42.93	105.60	36.14	88.89	16.71
43	47.78	41.47	106.99	36.14	93.23	13.76
45	46.21	40.11	108.30	36.14	97.57	10.73
47	44.75	38.84	109.52	36.14	101.90	7.62
49	43.37	37.64	110.67	36.14	106.24	4.43
51	42.07	36.52	111.75	36.14	110.58	1.17

Required Storage Volume = 38.77 m³


 LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (25-Year Storm)			
	Prepared:	F.M.	Page No.	A-08
	Checked:	R.B.		
Project: 315-325 University Avenue West Town of Cobourg	Proj. #	20021		
	Date:	03-Jun-19		

Total Drainage Area (ha) = 0.507 ha
 Drainage Area Composite C = 0.62
 Allowable Release Rate (5-year) = 36.14 L/s Overcontrolled
 Return Period = 25 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m ³)	Release Rate (L/s)	Release Flow Volume (m ³)	Required Storage Volume (m ³)
15	117.76	102.21	91.99	36.14	32.52	59.47
17	111.03	96.37	98.30	36.14	36.86	61.44
19	105.03	91.16	103.92	36.14	41.20	62.72
21	99.64	86.48	108.97	36.14	45.53	63.44
23	94.78	82.27	113.53	36.14	49.87	63.66
25	90.37	78.44	117.66	36.14	54.20	63.46
27	86.36	74.95	121.42	36.14	58.54	62.88
29	82.68	71.76	124.87	36.14	62.88	61.99
31	79.31	68.83	128.03	36.14	67.21	60.82
33	76.20	66.14	130.95	36.14	71.55	59.40
35	73.32	63.64	133.64	36.14	75.89	57.75
37	70.65	61.33	136.14	36.14	80.22	55.92
39	68.18	59.17	138.47	36.14	84.56	53.91
41	65.86	57.17	140.63	36.14	88.89	51.74
43	63.70	55.29	142.66	36.14	93.23	49.43
45	61.68	53.54	144.55	36.14	97.57	46.98
47	59.78	51.89	146.33	36.14	101.90	44.43
49	58.00	50.34	148.00	36.14	106.24	41.76
51	56.32	48.88	149.58	36.14	110.58	39.00

Required Storage Volume = 63.66 m³


 LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (50-Year Storm)			
	Prepared:	F.M.	Page No.	A-09
	Checked:	R.B.		
Project: 315-325 University Avenue West Town of Cobourg	Proj. #	20021		
	Date:	03-Jun-19		

Total Drainage Area (ha) = 0.507 ha
 Drainage Area Composite C = 0.62
 Allowable Release Rate (5-year) = 36.1 L/s Overcontrolled
 Return Period = 50 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m ³)	Release Rate (L/s)	Release Flow Volume (m ³)	Required Storage Volume (m ³)
15	121.79	105.71	95.14	36.14	32.52	62.62
17	115.85	100.56	102.57	36.14	36.86	65.71
19	110.47	95.88	109.30	36.14	41.20	68.10
21	105.56	91.62	115.44	36.14	45.53	69.91
23	101.06	87.72	121.05	36.14	49.87	71.18
25	96.94	84.14	126.21	36.14	54.20	72.01
27	93.14	80.84	130.96	36.14	58.54	72.42
29	89.62	77.79	135.35	36.14	62.88	72.47
31	86.36	74.96	139.43	36.14	67.21	72.22
33	83.33	72.33	143.21	36.14	71.55	71.66
35	80.51	69.88	146.74	36.14	75.89	70.85
37	77.87	67.59	150.04	36.14	80.22	69.82
39	75.40	65.44	153.13	36.14	84.56	68.57
41	73.08	63.43	156.03	36.14	88.89	67.14
43	70.90	61.53	158.76	36.14	93.23	65.53
45	68.84	59.75	161.33	36.14	97.57	63.76
47	66.90	58.07	163.75	36.14	101.90	61.85
49	65.07	56.48	166.04	36.14	106.24	59.80
51	63.33	54.97	168.21	36.14	110.58	57.63
53	61.69	53.54	170.27	36.14	114.91	55.36
55	60.13	52.19	172.22	36.14	119.25	52.97
57	58.64	50.90	174.07	36.14	123.59	50.48

Required Storage Volume = 72.47 m³


 LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (100 - Year Storm)			
	Prepared:	F.M.	Page No.	A-010
	Checked:	R.B.		
Project: 315-325 University Avenue West Town of Cobourg	Proj. #	20021		
	Date:	03-Jun-19		

Total Drainage Area (ha) = 0.507 ha
 Drainage Area Composite C = 0.62
 Allowable Release Rate (5-year) = 36.14 L/s Overcontrolled
 Return Period = 100 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m ³)	Release Rate (L/s)	Release Flow Volume (m ³)	Required Storage Volume (m ³)
15	129.95	112.79	101.51	36.14	32.52	68.99
17	124.18	107.78	109.94	36.14	36.86	73.08
19	118.89	103.19	117.64	36.14	41.20	76.44
21	114.04	98.98	124.72	36.14	45.53	79.19
23	109.57	95.10	131.24	36.14	49.87	81.37
25	105.43	91.51	137.27	36.14	54.20	83.07
27	101.60	88.18	142.86	36.14	58.54	84.32
29	98.04	85.09	148.06	36.14	62.88	85.18
31	94.71	82.21	152.90	36.14	67.21	85.69
33	91.61	79.51	157.43	36.14	71.55	85.88
35	88.70	76.99	161.67	36.14	75.89	85.78
37	85.97	74.62	165.65	36.14	80.22	85.43
39	83.40	72.39	169.39	36.14	84.56	84.83
41	80.99	70.29	172.92	36.14	88.89	84.03
43	78.70	68.31	176.24	36.14	93.23	83.01
45	76.55	66.44	179.39	36.14	97.57	81.82
47	74.51	64.67	182.37	36.14	101.90	80.47
49	72.57	62.99	185.19	36.14	106.24	78.95
51	70.73	61.39	187.87	36.14	110.58	77.29
53	68.99	59.88	190.41	36.14	114.91	75.50
55	67.33	58.44	192.84	36.14	119.25	73.59
57	65.74	57.06	195.15	36.14	123.59	71.56
59	64.23	55.75	197.35	36.14	127.92	69.43

Required Storage Volume = 85.88 m³

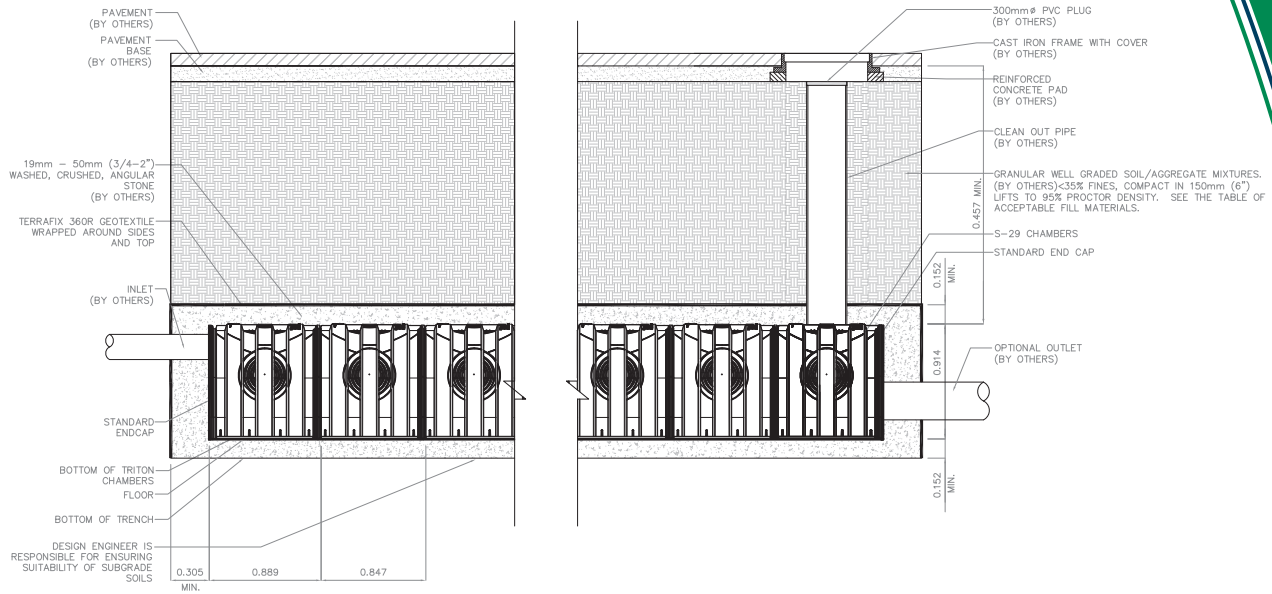
 LEA Consulting Ltd. Consulting Engineers and Planners	Orifice Tube Size Calculation (at OGS)			
	Prepared:	F.M.	Page No.	A-011
	Checked:	R.B.		
Project: 315-325 University Avenue West Town of Cobourg	Proj. #	20021		
	Date:	03-Jun-19		

Orifice Discharge Formula: $Q = CA \times \text{sqrt}(2gh)$

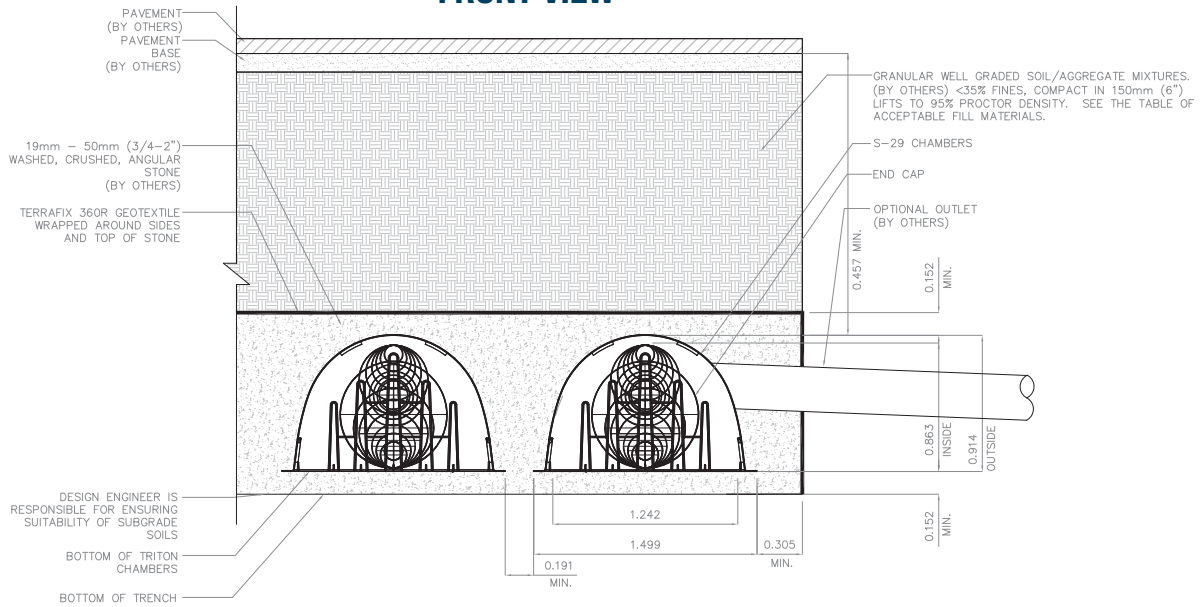
Calculate Approximate Diameter Knowing Max. Q & Depth			Calculate Flows Assumed Diameter			For
Max. Flow:	36.1	l/s	Diameter:	120	mm	
100-yr Depth:	0.88	m	Area:	0.011	m ²	
Req'd Area:	0.011	m ²	Coeff:	0.8	pipe	
Req'd Dia.:	120	mm	Gravitational Accel:	9.81	m/s ²	
Orifice C/L Elev.:	80.670	m	Invert	80.61	m	
H.W.L	81.490	m				

Depth (m)	Head (m)	Q (m ³ /s)	Elevation (m)	Remarks
0			80.610	Orifice Invert
0.06	0.00	0.0	80.670	Center Elev. of Orifice
0.12	0.06	9.8	80.730	Top Elev. of Orifice
0.20	0.14	15.0	80.810	
0.30	0.24	19.6	80.910	
0.35	0.29	21.6	80.960	
0.40	0.34	23.4	81.010	
0.45	0.39	25.0	81.060	
0.50	0.44	26.6	81.110	
0.55	0.49	28.1	81.160	
0.60	0.54	29.5	81.210	
0.65	0.59	30.8	81.260	
0.70	0.64	32.1	81.310	
0.75	0.69	33.3	81.360	
0.80	0.74	34.5	81.410	
0.85	0.79	35.6	81.460	
0.85	0.79	35.7	81.463	
0.88	0.82	36.4	81.493	H.W.L
0.93	0.87	37.4	81.543	
0.90	0.84	36.8	81.513	

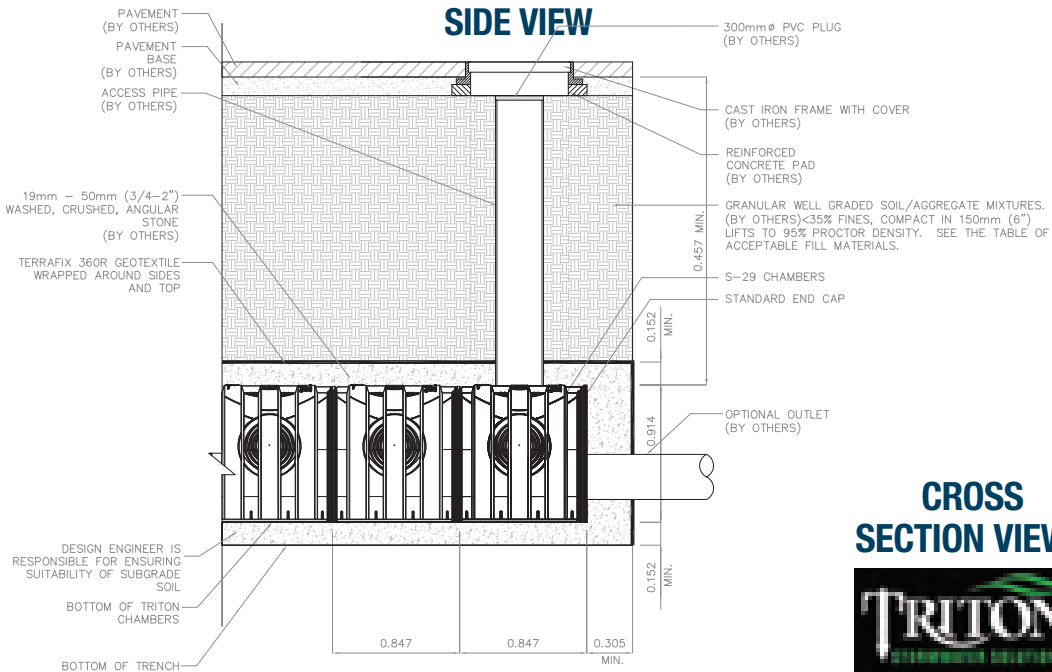
HEADER ROW



FRONT VIEW



SIDE VIEW



CROSS SECTION VIEWS





**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION**



Project Name: 235 University Ave
Location: Cobourg, ON
OGS #: OGS

Engineer: Lea Consulting Ltd
Contact: Mahdi Noori
Report Date: 2-May-19

Area 0.37 ha
Weighted C 0.52
CDS Model 2015-4

Rainfall Station # 211
Particle Size Distribution FINE
CDS Treatment Capacity 20 l/s

<u>Rainfall Intensity¹</u> <u>(mm/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (l/s)</u>	<u>Treated Flowrate (l/s)</u>	<u>Operating Rate (%)</u>	<u>Removal Efficiency (%)</u>	<u>Incremental Removal (%)</u>
1.0	10.4%	19.9%	0.5	0.5	2.7	98.1	10.2
1.5	8.9%	28.8%	0.8	0.8	4.0	97.7	8.7
2.0	8.1%	36.9%	1.1	1.1	5.4	97.3	7.9
2.5	7.3%	44.2%	1.3	1.3	6.7	96.9	7.1
3.0	5.6%	49.9%	1.6	1.6	8.1	96.5	5.4
3.5	5.1%	55.0%	1.9	1.9	9.4	96.2	4.9
4.0	4.1%	59.0%	2.1	2.1	10.8	95.8	3.9
4.5	3.2%	62.2%	2.4	2.4	12.1	95.4	3.1
5.0	3.3%	65.5%	2.7	2.7	13.5	95.0	3.1
6.0	6.4%	71.9%	3.2	3.2	16.2	94.2	6.0
7.0	4.7%	76.6%	3.7	3.7	18.9	93.4	4.4
8.0	4.1%	80.7%	4.3	4.3	21.6	92.7	3.8
9.0	2.8%	83.5%	4.8	4.8	24.3	91.9	2.5
10.0	2.0%	85.5%	5.3	5.3	27.0	91.1	1.8
15.0	7.3%	92.8%	8.0	8.0	40.5	87.3	6.4
20.0	3.7%	96.5%	10.7	10.7	54.0	83.4	3.1
25.0	2.5%	99.1%	13.4	13.4	67.5	79.5	2.0
30.0	0.2%	99.3%	16.0	16.0	80.9	75.7	0.1
35.0	0.5%	99.7%	18.7	18.7	94.4	71.8	0.3
40.0	0.3%	100.0%	21.4	19.8	100.0	65.0	0.2
45.0	0.0%	100.0%	24.1	19.8	100.0	57.8	0.0
50.0	0.0%	100.0%	26.7	19.8	100.0	52.0	0.0

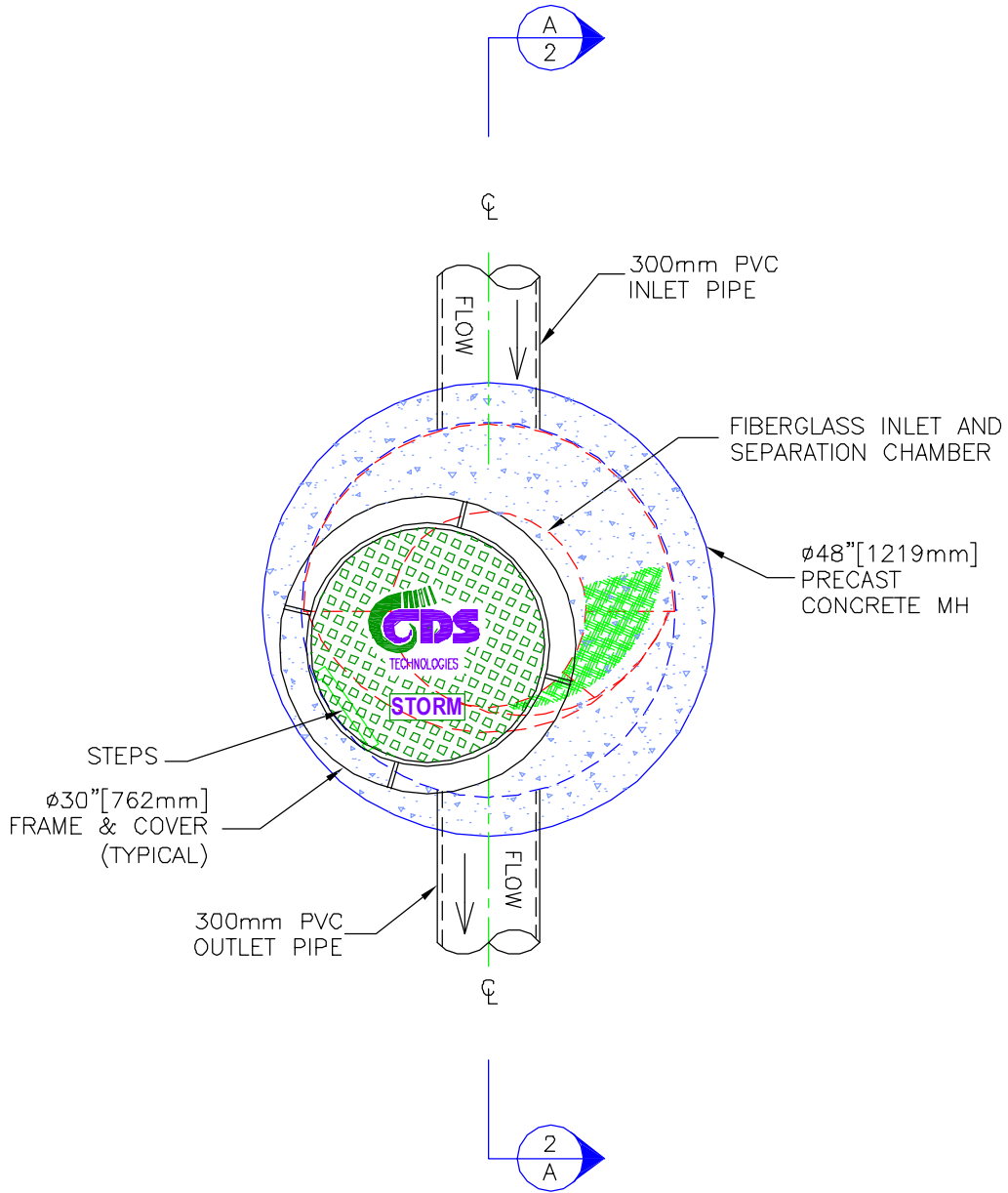
94.4

Removal Efficiency Adjustment² = 6.5%
Predicted Net Annual Load Removal Efficiency = 87.9%
Predicted Annual Rainfall Treated = 99.3%

1 - Based on 32 years of hourly rainfall data from Canadian Station 6166418, Peterborough ON
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.



PLAN VIEW



CDS MODEL PMSU20_15_4m STORMWATER TREATMENT UNIT



PROJECT NAME
CITY, STATE

JOB# XX-##-###

DATE ##/##/##

DRAWN INITIALS

APPROV.

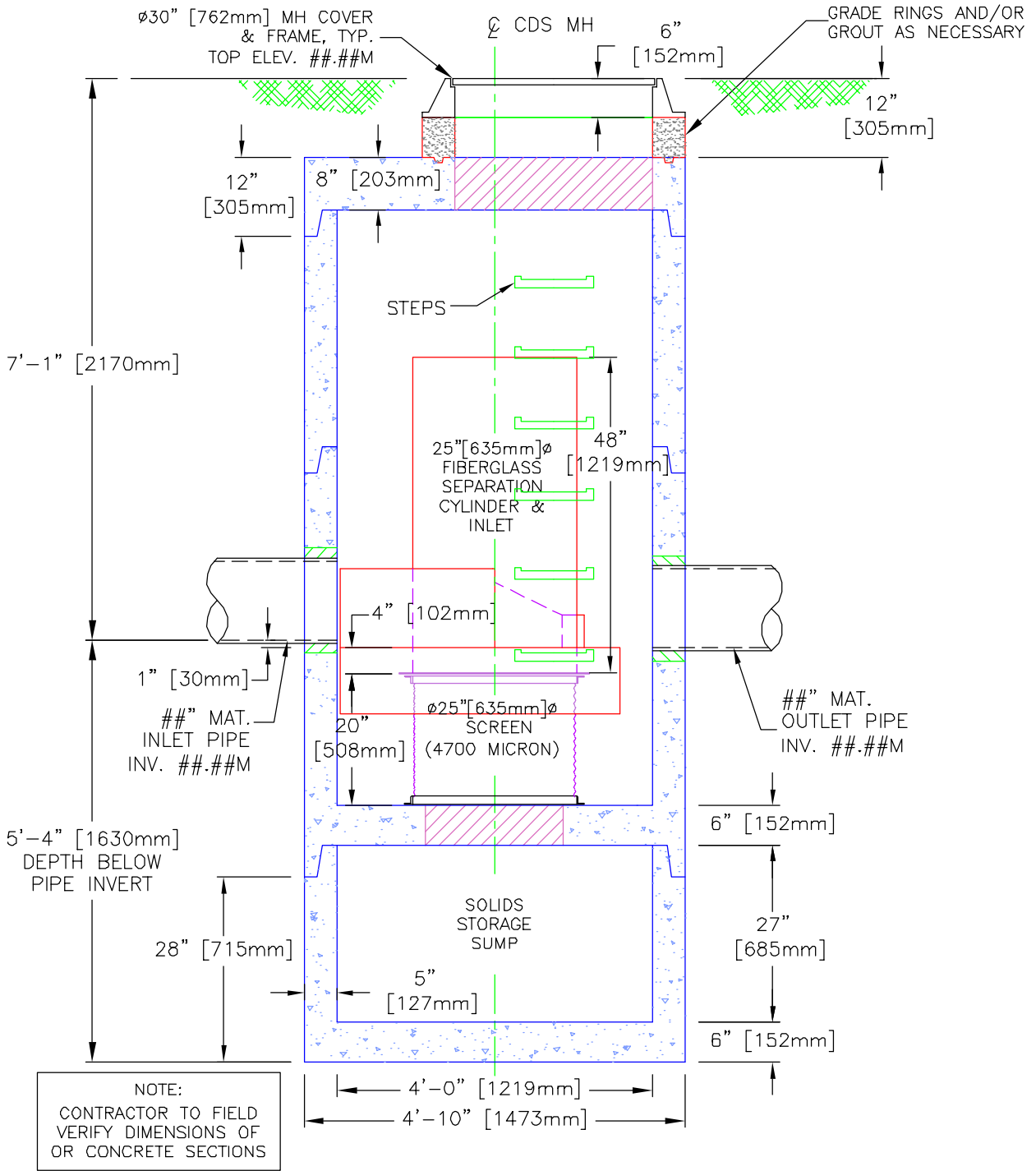
SCALE
1" = 2'

SHEET

1



SECTION A-A ELEVATION VIEW



**CDS MODEL PMSU20_15_4m
STORMWATER TREATMENT UNIT**



PROJECT NAME
CITY, STATE

JOB#	XX-##-###
DATE	##/##/##
DRAWN	INITIALS
APPROV.	

SCALE
1" = 2'


SHEET

2

APPENDIX B

Sanitary and Water Demand Calculations



 LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation		
	Prepared:	F.M.	Page No. B-1
	Checked:	R.B.	
Project: 325 University Avenue West, Town of Cobourg	Proj. #	20021	
	Date:	03-Jun-19	

Proposed New Golden Plough Lodge

POPULATION CALCULATION

(Based on the Architect Statistics)

Site Area 4854.7 m²
 Number of Townhoused 71.0 units

Proposed Building Type	Density (P.P.U)	Population
Residential	1.62	115.02
Total		115.02

SANITARY FLOW CALCULATION

(Based on the Town of Cobourg Design Guidelines)

Harmon Peaking Factor: $K_H=1+(14/(4+(P/1000)^{0.5}))$

Peaking Factor (K_H) 4.23


Max. Peaking factor based on Town of Cobourg Design Guidelines 3.80

Average Daily Wastewater Flow 364 L/cap/day

Total Domestic Flow 1.84 L/sec

Infiltration Allowance (@ 0.26 L/sec/ha) 0.13 L/sec

Design Flow **1.97 L/sec**

 LEA Consulting Ltd. Consulting Engineers and Planners	Water Demand Calculation			
	Prepared:	F.M.	Page No.	B-2
	Checked:	R.B.		
Project: 325 University Avenue West, Town of Cobourg	Proj. #	20021		
	Date:	03-Jun-19		

Proposed New Golden Plough Lodge

This calculation is following the "Water Supply for Public Fire Protection" by Fire Underwriters Survey.

Formula: $F = 220C\sqrt{A}$
 where F = the required fire flow in litres per minute
 C = coefficient related to the type of construction.
 = 0.8 for fire non-combustible construction
 A = the total floor area in square metres. For fire resistive buildings, consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors.

STEP 1 According to the building stats, Area (m²)

1st Floor adjoining	1206
2nd Floor largest	1303
3rd Floor adjoining	1303
A	1930

Therefore, F = 8000 l/min

STEP 2 Occupancy reduction:

For occupancies with a low contents fire hazard, the reduction rate is 25%,

Therefore: F = 6000 l/min

Reduction for sprinkler protection:

Using the NFPA sprinkler system, a reduction rate of 30% is used.

Therefore: F = 4200 l/min

STEP 3 Separation charge:

Charge for the separations on each side:


Separation	Charge
more than 45m	0% South
30.1 to 45 m	5% North
10.1 to 20m	15% East
3.1 to 10 m	20% West

Total charge in % 40%

Total charge in l/min 2400

STEP 4 Required Fire Flow:

	7000 l/min
or	116.67 l/s
or	1849 US GPM

 LEA Consulting Ltd. Consulting Engineers and Planners	Water Demand Calculation			
	Prepared:	F.M.	Page No.	B-3
	Checked:	R.B.		
Project: 325 University Avenue West, Town of Cobourg	Proj. #	20021		
	Date:	03-Jun-19		

Proposed Retirement Residence and Clinic Development

Total Population: 115 (See Page E-01)

Peak Hour Demand Calculation:

(Based on the MOE Design Guidelines for Drinking Water Systems)

Residential Per Capital Demand (multi-unit)	191 L/cap/day
Peaking Factor	9.40
Peak Hour Demand	2.39 L/sec

Maximum Day Demand Calculation:

(Based on the MOE Design Guidelines for Drinking Water Systems)

Residential Per Capital Demand (multi-unit)	191 L/cap/day
Peaking Factor	6.30
Maximum Day Demand	1.60 L/sec

Fire Flow for High Rise Residential: 116.7 L/sec


Max. Day Demand plus Fire Flow: 118.3 L/sec

Design Water Demand	118.3 L/sec
	1874.6 US GPM

APPENDIX C

Hydrant Flow test and Watermain Adequacy Assessment



 LEA Consulting Ltd. Consulting Engineers and Planners	Residual Pressure			
	Prepared:	F.M.	Page No.	D-04
	Checked:	R.B.		
Project: St. Leo- St. Louis catholic School Replacement City of Toronto	Proj. #	19050		
	Date:	03-Jun-19		

**Hydrant Test Readings (200mm watermain, 325 University Ave.)
 undertaken on May 23, 2019, by Classic Fire Protection Inc.**

Flow	Residual Pressure	
0 US GPM	70 psi	
852.7 US GPM	68 psi	
1460.4 US GPM	65 psi	
5397.8 US GPM	20 psi	Focus Fire Protection Estimate

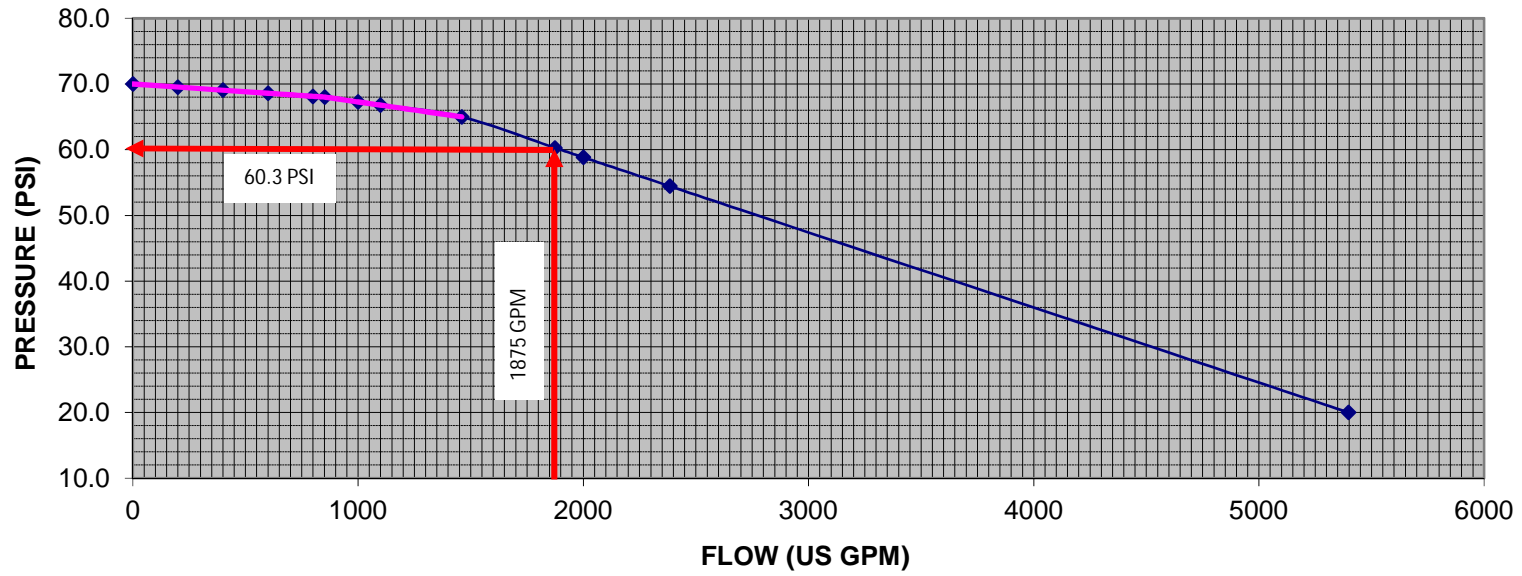
Interpolated

Flow (US GPM)	Residual Pressure (psi)
0	70.0
200	69.5
400	69.1
600	68.6
800	68.1
852.7	68.0
1000	67.3
1100	66.8
1460.4	65.0
1875	60.3
2000	58.8
2384	54.4
5397.8	20.0

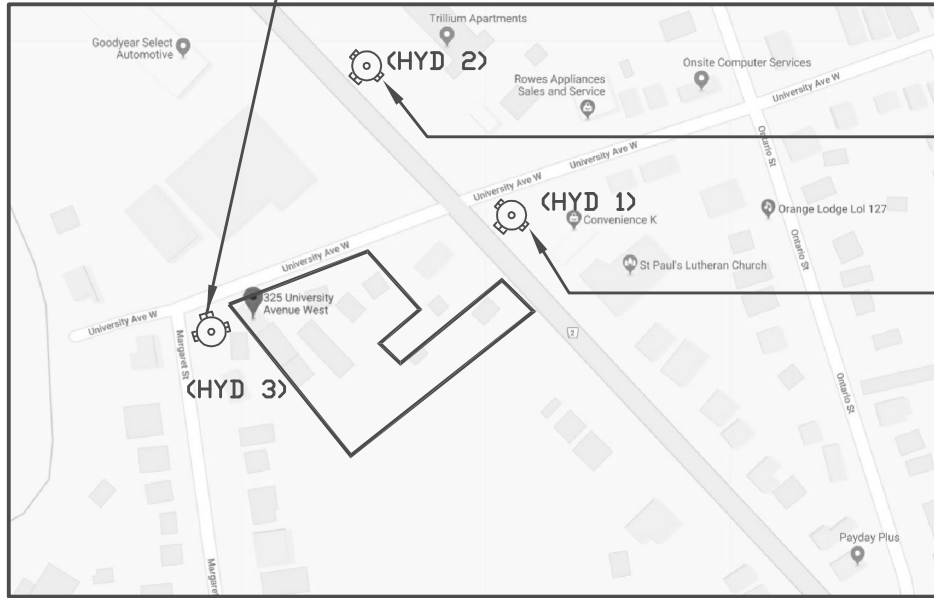
Existing 200mm Watermain on William St., Town of Cobourg

FLOW TEST CHART (BASED ON CLASSICFIRE PROTECTION TEST, May 23, 2019)

Page: D-05

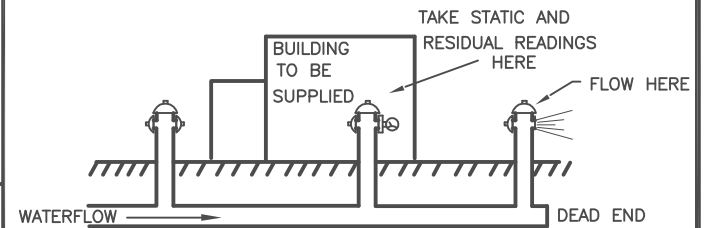
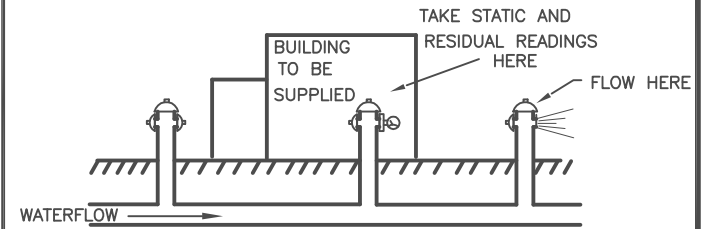
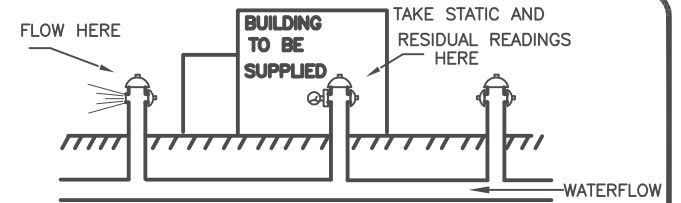


ORIGINAL FIRE HYDRANT TO BE TESTED (GPM), BUT DUE TO ON-SITE ISSUE IT WAS ALTERED



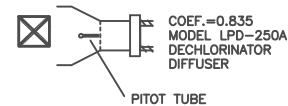
FIRE HYDRANT (GPM)

FIRE HYDRANT (PSI)



TEST:	PLAY PIPE	C=	STATIC(PSI)	RESIDUAL(PSI)	PITOT(PSI)	FLOW(USGPM)
	1x1 1/8					
	2x1 1/8					
	3x1 1/8					
	4x1 1/8					
	1x1 3/4					
	2x1 3/4					
	3x1 3/4					
	4x1 3/4					
TWO HYDRANT TEST (BETWEEN HYD 1 TO 2)						
1	1x2 1/2	.835	70	68	47.5	852.7
	2x2 1/2	.835	70	65	25	1460.4
	3x2 1/2					
	4x2 1/2					
SINGLE HYDRANT TEST (HYD 3)						
2	1x2 1/2	.835	72		10	492.3

OUTLET TYPE



Client:

Location:

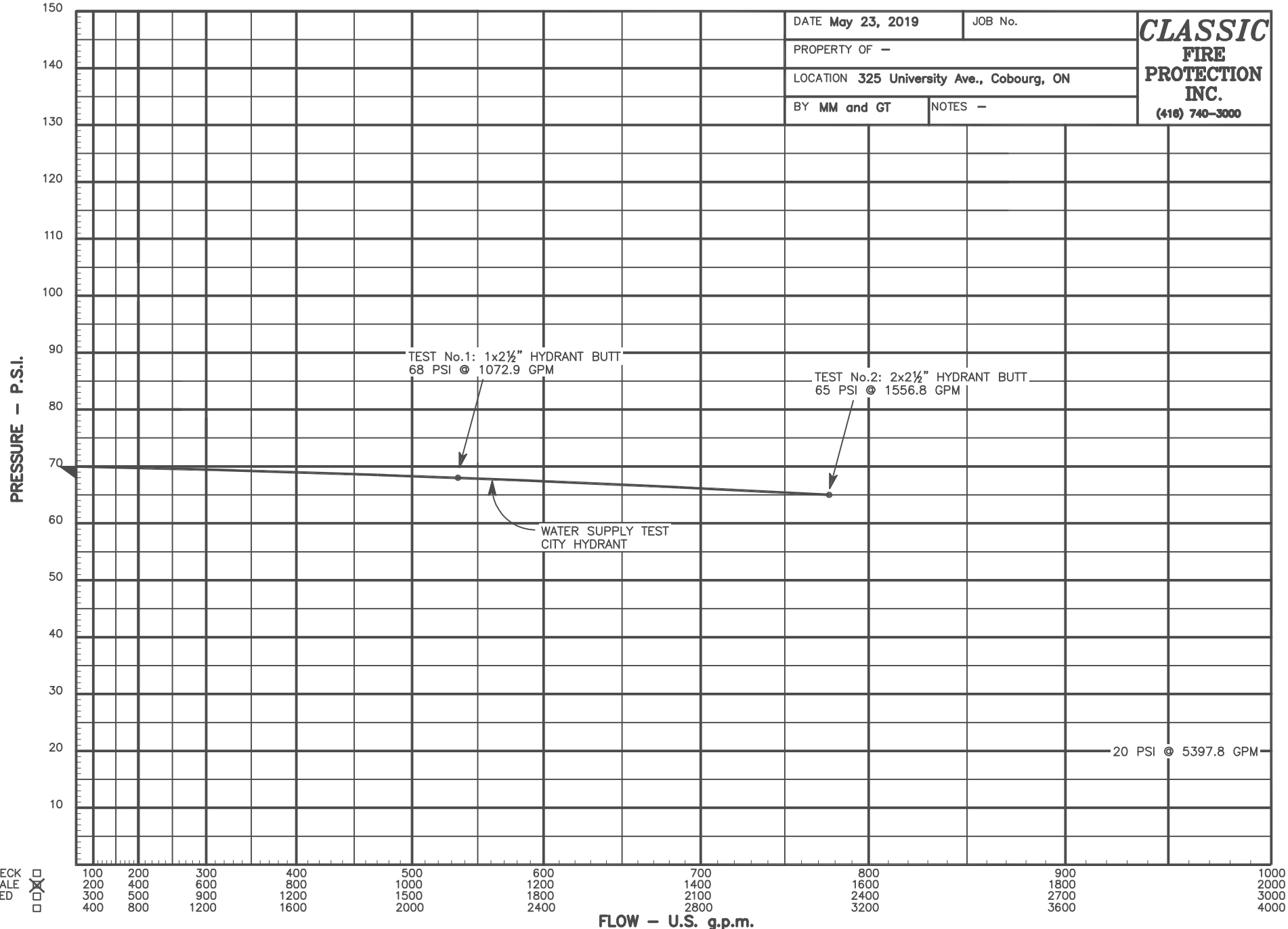
**325 University Ave.
Cobourg, ON**

1988
CLASSIC
FIRE PROTECTION INC.
645 GARYRAY DR.
North York, ON
M9L 1P9
(416) 740-3000
Web: www.classicfire.com

WATER SUPPLY GRAPH

DATE May 23, 2019	JOB No.
PROPERTY OF —	
LOCATION 325 University Ave., Cobourg, ON	
BY MM and GT	NOTES —

**CLASSIC
FIRE
PROTECTION
INC.**
(416) 740-3000



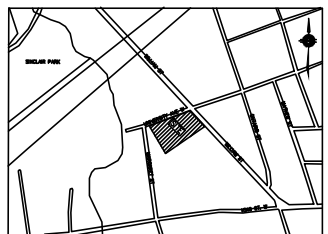
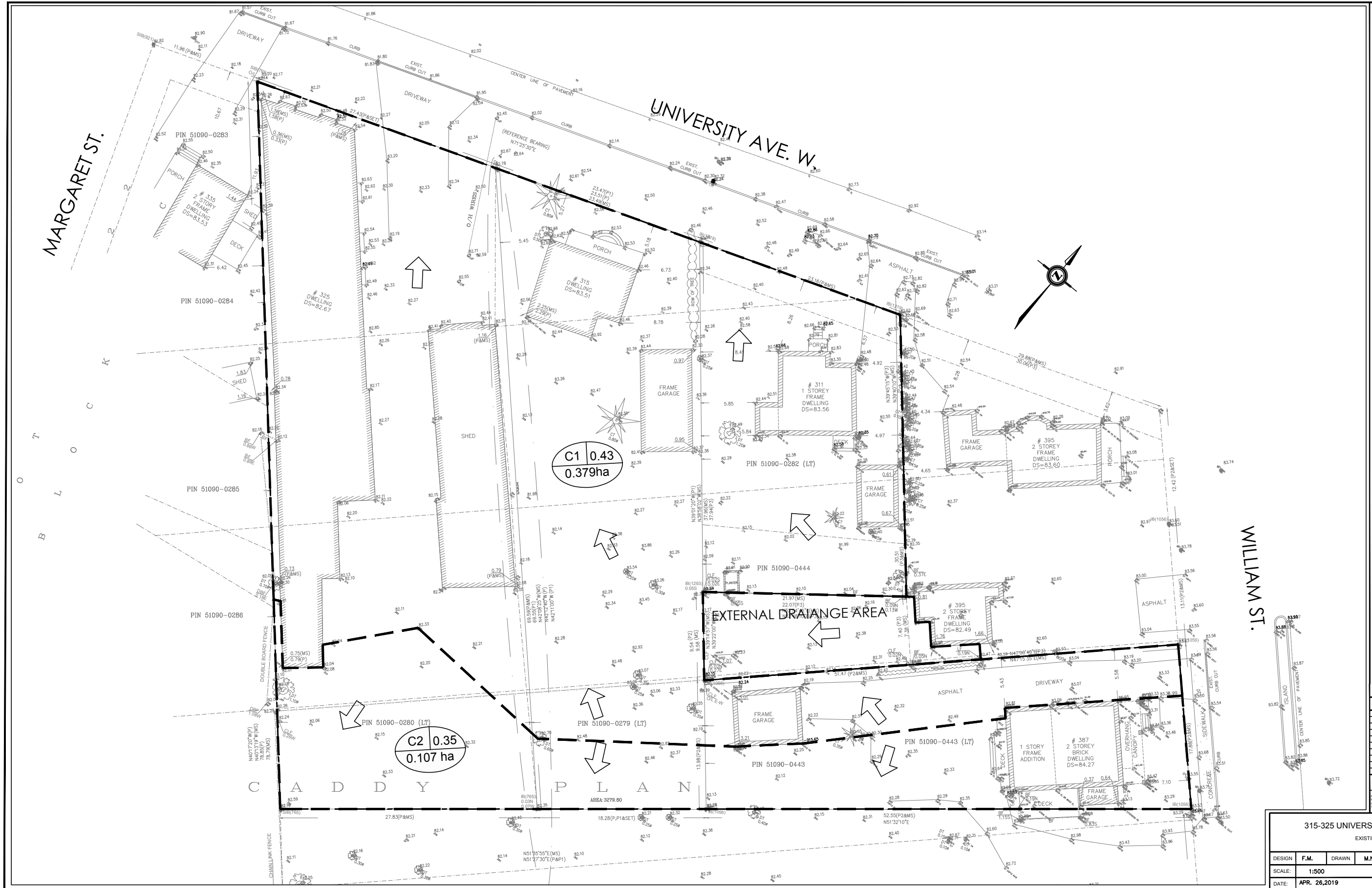
CHECK SCALE USED 100 200 300 400 500 600 800 1000 1200 1500 1800 2000 2400 2800 3200 3600 4000

FLOW - U.S. g.p.m.

APPENDIX D

Figures and Drawings





LEGEND

- EXISTING MANHOLE
- EXISTING CATCH BASIN
- EXISTING DITCH INLET
- EXISTING ANCHOR POLE
- EXISTING UTILITY POLE
- EXISTING LIGHT STANDARD
- EXISTING GAS METER
- EXISTING GAS VALVE
- EXISTING WATER VALVE
- EXISTING FIRE HYDRANT
- EXISTING TREE
- PROPOSED TREE
- PROPERTY LINE
- SUB-CATCHMENT BOUNDARY
- OVERLAND FLOW ROUTE
- CATCHMENT ID/IMPERVIOUS DRAINAGE AREA (Iq)

No.	DATE	DESCRIPTION
1	04/05/2019	ISSUED FOR TRA SUBMISSION
2	04/06/2019	ISSUED FOR SPA SUBMISSION

225 Commons Drive, Suite 202
 Scarborough, Ontario
 M1B 4Y6, Canada
 Tel: (416) 491-0215 Fax: (416) 491-0220

USA Consulting Ltd.
 Consulting Engineers
 and Planners
 www.usacon.com

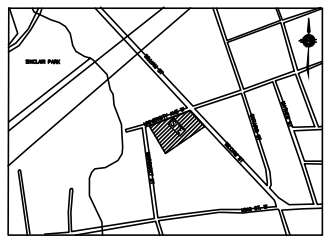
315-325 UNIVERSITY AVENUE REDEVELOPMENT
 EXISTING DRAINAGE PLAN

DESIGN	F.M.	DRAWN	M.N.	CHECKED	R.B.	CONTRACT No.	20021	
SCALE:	1:500						DRAWING NUMBER	FIG. 2
DATE:	APR. 26, 2019							

MARGARET ST.

UNIVERSITY AVE. W.

WILLIAM ST.

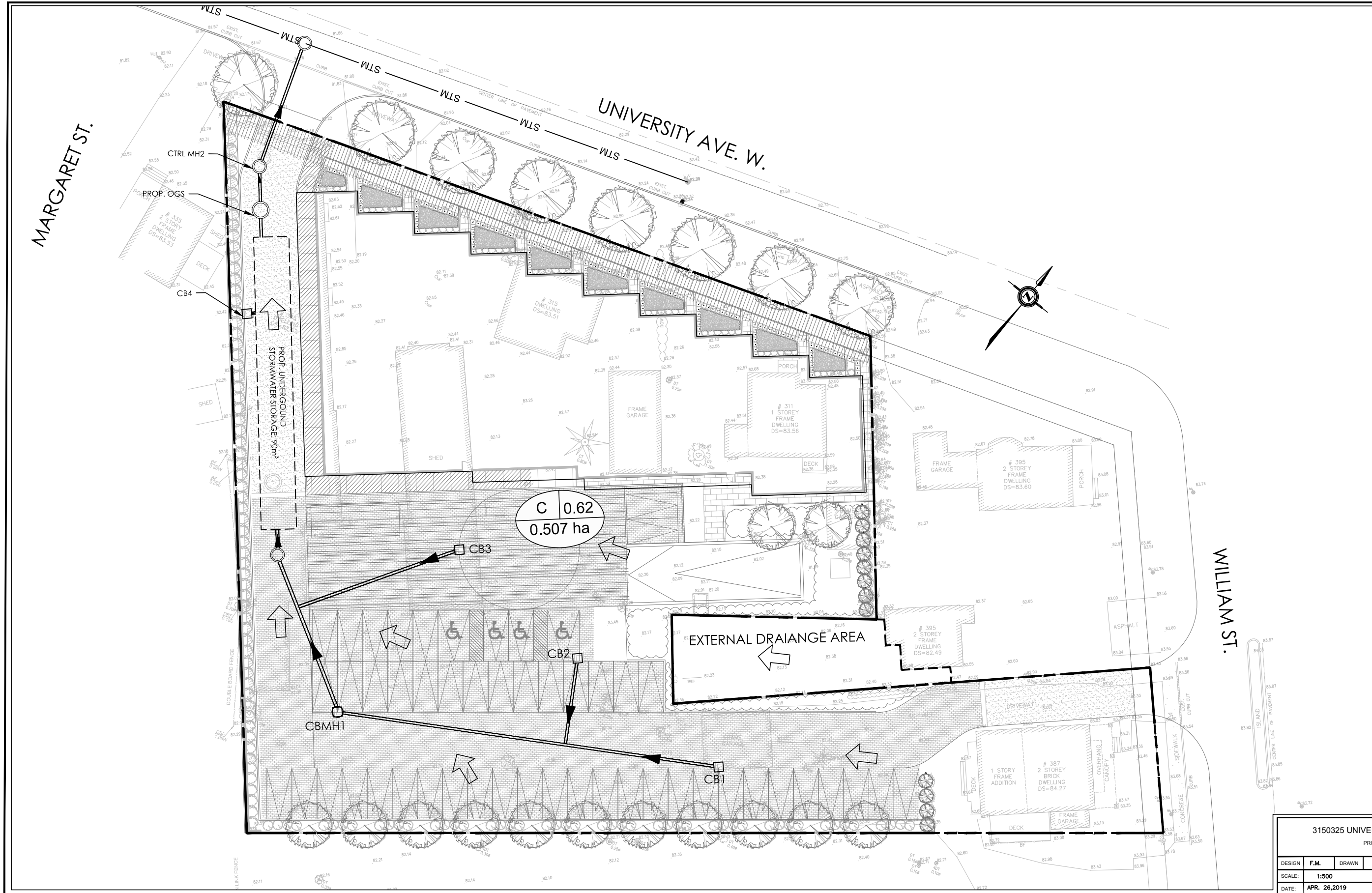


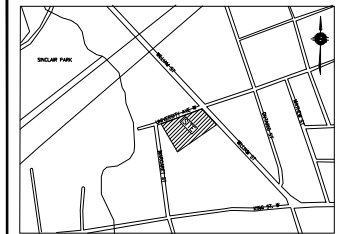
- LEGEND**
- EXISTING MANHOLE
 - EXISTING CATCH BASIN
 - EXISTING DITCH INLET
 - EXISTING ANCHOR POLE
 - EXISTING UTILITY POLE
 - EXISTING LIGHT STANDARD
 - EXISTING GAS METER
 - EXISTING GAS VALVE
 - EXISTING WATER VALVE
 - EXISTING FIRE HYDRANT
 - EXISTING TREE
 - PROPOSED TREE
 - EXISTING STORM SEWER
 - PROPOSED STORM SEWER
 - PROPOSED CATCHBASIN
 - PROPOSED CATCHBASIN MANHOLE
 - PROPOSED MANHOLE
 - PROPOSED OGS
 - PROPOSED U/G SWM STORAGE
 - PROPERTY LINE
 - DRAINAGE AREA BOUNDARY
 - OVERLAND FLOW ROUTE
 - CATCHMENT ID/IMPERVIOUS DRAINAGE AREA (ID)

No.	DATE	DESCRIPTION
1	04/05/2019	ISSUED FOR TRA SUBMISSION
2	04/06/2019	ISSUED FOR SPA SUBMISSION

3150325 UNIVERSITY AVENUE REDEVELOPMENT
PROPOSED DRAINAGE PLAN

DESIGN	F.M.	DRAWN	M.N.	CHECKED	R.B.	CONTRACT No.	20021
SCALE:	1:500		DRAWING NUMBER		FIG. 2		
DATE:	APR. 26, 2019						





LEGEND

- PROP. STORM CATCHBASIN
- ⊕ PROP. STORM CATCHBASIN MANHOLE
- PROP. STORM MANHOLE
- ◇ AD PROP. AREA DRAIN

EX.82.49 EX. ELEVATION

82.49 PROP. ELEVATION

82.30 T/W PROP. TOP OF WALL ELEVATION

82.30 T/G PROP. TOP OF GRATE ELEVATION

GENERAL NOTES

- CONTRACTOR MUST CHECK & VERIFY ALL DIMENSIONS ON THE JOB.
- DO NOT SCALE DRAWINGS.
- THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION.
- ELEVATIONS SHOWN GEODETIC DRIVEN FROM TOWN OF COBOURG BENCH MARK #00121U2300 . ELEVATION 82.92M.

No.	DATE	DESCRIPTION
1	04/03/2019	ISSUED FOR ZBA SUBMISSION
2	04/04/2019	ISSUED FOR SPA SUBMISSION

222 Commerce Drive, Suite 202
 Markham, Ontario
 L3R 9W3, Canada
 Tel: (905)470-0215 Fax: (905)475-0100
 www.LJL.ca



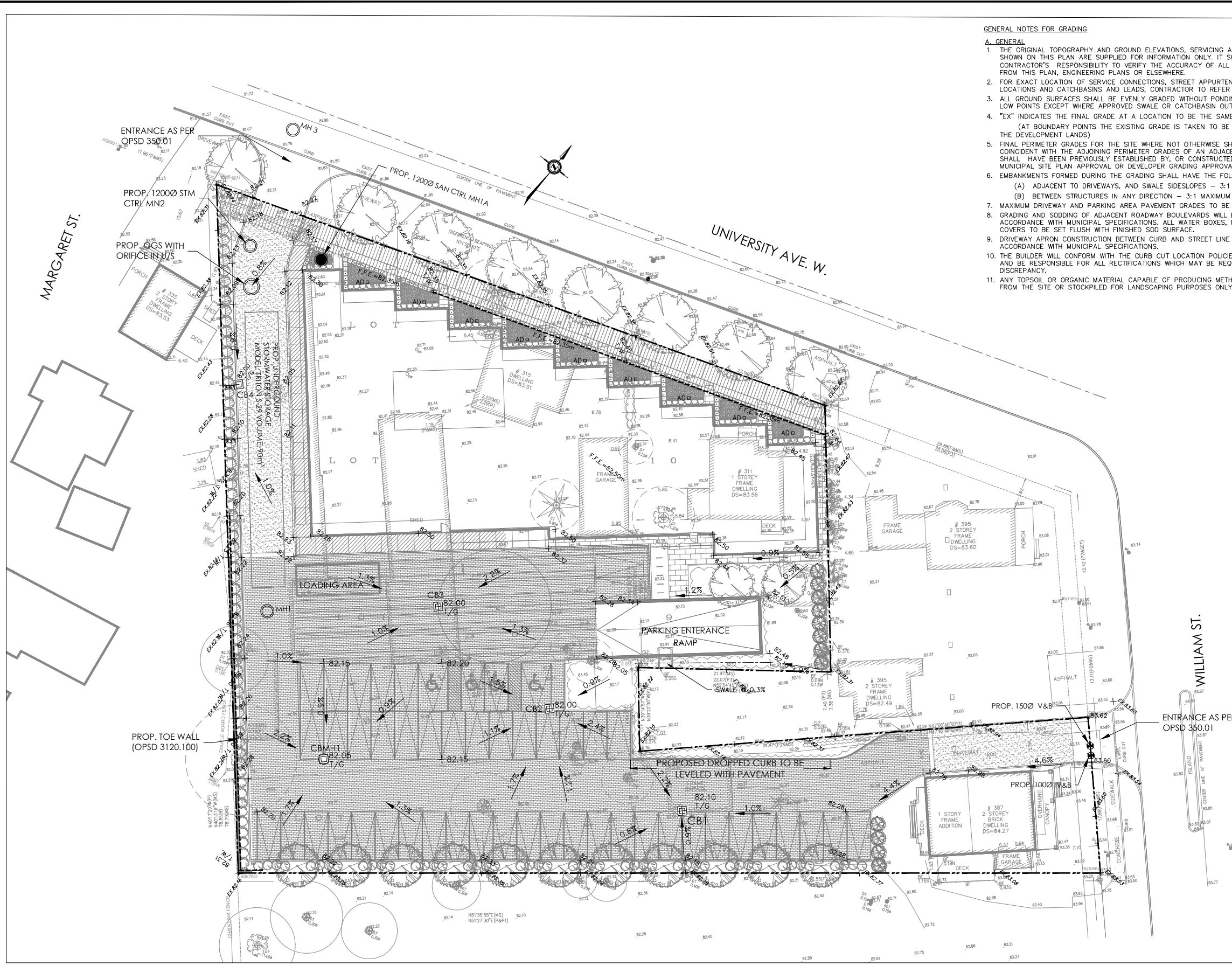
325 UNIVERSITY AVE. RESIDENTIAL DEVELOPMENT
PRELIMINARY SITE GRADING PLAN

DESIGN	A.W.	DRAWN	A.W.	CHECKED	F.M.	CONTRACT No.
SCALE:	1:200 (FULL SIZE)		DRAWING NUMBER		C-01	
DATE:	APR. 26, 2019		DRAWING NUMBER		C-01	

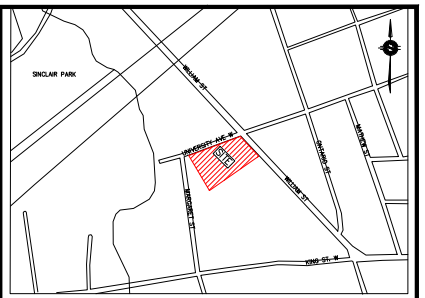
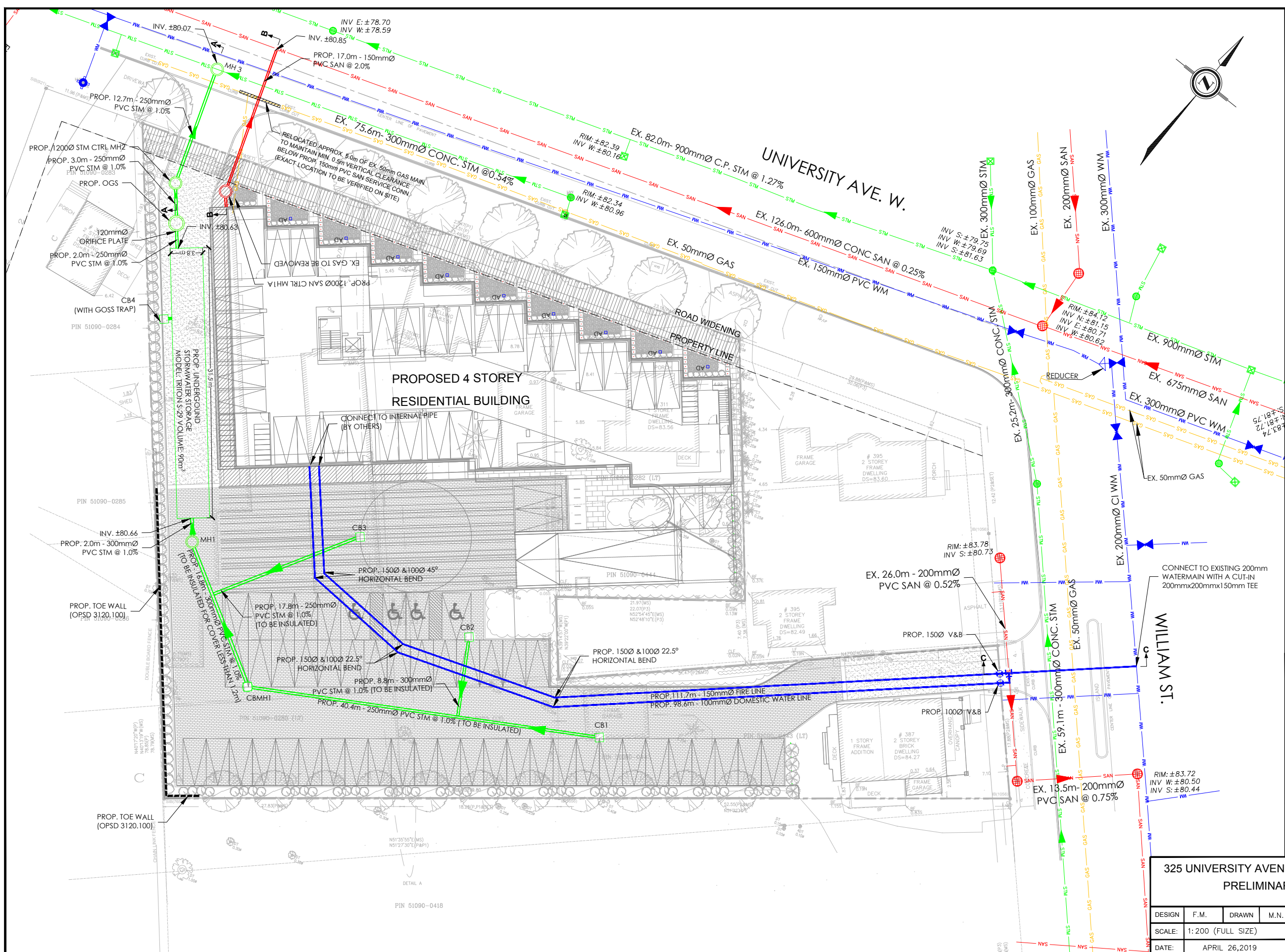
GENERAL NOTES FOR GRADING

A. GENERAL

- THE ORIGINAL TOPOGRAPHY AND GROUND ELEVATIONS, SERVICING AND SURVEY INFORMATION SHOWN ON THIS PLAN ARE SUPPLIED FOR INFORMATION ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE ACCURACY OF ALL INFORMATION OBTAINED FROM THIS PLAN, ENGINEERING PLANS OR ELSEWHERE.
- FOR EXACT LOCATION OF SERVICE CONNECTIONS, STREET APPURTENANCES, DRIVEWAY LOCATIONS AND CATCHBASINS AND LEADS, CONTRACTOR TO REFER TO ENGINEERING PLANS.
- ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCHBASIN OUTLETS ARE PROVIDED.
- "EX" INDICATES THE FINAL GRADE AT A LOCATION TO BE THE SAME AS THE EXISTING GRADE.
(AT BOUNDARY POINTS THE EXISTING GRADE IS TAKEN TO BE IMMEDIATELY ADJOINING THE DEVELOPMENT LANDS)
- FINAL PERIMETER GRADES FOR THE SITE WHERE NOT OTHERWISE SHOWN HEREON SHALL BE COINCIDENT WITH THE ADJOINING PERIMETER GRADES OF AN ADJACENT LOT OR BLOCK WHICH SHALL HAVE BEEN PREVIOUSLY ESTABLISHED BY, OR CONSTRUCTED IN ACCORDANCE WITH A MUNICIPAL SITE PLAN APPROVAL OR DEVELOPER GRADING APPROVAL.
- EMBANKMENTS FORMED DURING THE GRADING SHALL HAVE THE FOLLOWING MAXIMUM GRADES:
(A) ADJACENT TO DRIVEWAYS, AND SWALE SIDESLOPES - 3:1 MAXIMUM SLOPE;
(B) BETWEEN STRUCTURES IN ANY DIRECTION - 3:1 MAXIMUM SLOPE.
- MAXIMUM DRIVEWAY AND PARKING AREA PAVEMENT GRADES TO BE 5.0%.
- GRADING AND SODDING OF ADJACENT ROADWAY BOULEVARDS WILL BE PERFORMED IN ACCORDANCE WITH MUNICIPAL SPECIFICATIONS. ALL WATER BOXES, MANHOLE AND CHAMBER COVERS TO BE SET FLUSH WITH FINISHED SOB SURFACE.
- DRIVEWAY APRON CONSTRUCTION BETWEEN CURB AND STREET LINE TO BE BY CONTRACTOR IN ACCORDANCE WITH MUNICIPAL SPECIFICATIONS.
- THE BUILDER WILL CONFORM WITH THE CURB CUT LOCATION POLICIES OF THE MUNICIPALITY AND BE RESPONSIBLE FOR ALL RECTIFICATIONS WHICH MAY BE REQUIRED DUE TO DISCREPANCY.
- ANY TOPSOIL OR ORGANIC MATERIAL CAPABLE OF PRODUCING METHANE WILL BE REMOVED FROM THE SITE OR STOCKPILED FOR LANDSCAPING PURPOSES ONLY.



DATE: 03. 2019 14:36
 PROJECT: 325 UNIVERSITY AVE. RESIDENTIAL DEVELOPMENT
 DRAWING: C-01 PRELIMINARY SITE GRADING PLAN



- LEGEND**
- EXISTING STORM MANHOLE
 - EXISTING STORM CATCHBASIN MANHOLE
 - EXISTING SANITARY MANHOLE
 - EXISTING CATCHBASIN
 - EXISTING WATER VALVE
 - EXISTING FIRE HYDRANT
 - EXISTING STORM SEWER
 - EXISTING SANITARY SEWER
 - EXISTING WATER MAIN
 - EXISTING GAS MAIN
 - PROPERTY LINE
 - EXISTING TREE
 - PROPOSED STORM MANHOLE
 - PROPOSED SANITARY MANHOLE
 - PROPOSED WATER MAIN
 - PROPOSED SANITARY SERVICE CONNECTION
 - PROPOSED STORM SERVICE CONNECTION
 - PROPOSED FIRE HYDRANT
 - PROPOSED WATER VALVE & BOX
 - PROPOSED CATCH BASIN
 - PROPOSED TOE WALL
 - AD PROPOSED AREA DRAIN

- GENERAL NOTES**
- CONTRACTOR MUST CHECK & VERIFY ALL DIMENSIONS ON THE JOB.
 - DO NOT SCALE DRAWINGS.
 - ALL DRAWINGS, SPECIFICATIONS AND RELATED DOCUMENTS ARE THE COPYRIGHT PROPERTY OF THE ARCHITECT AND MUST BE RETURNED UPON REQUEST. REPRODUCTION OF DRAWINGS, SPECIFICATIONS AND RELATED DOCUMENTS IN PART OR IN WHOLE IS FORBIDDEN WITHOUT THE WRITTEN PERMISSION OF THE ARCHITECT.
 - THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNTIL SIGNED BY THE ARCHITECT.
 - BOUNDARIES: PART OF LOTS 8, 9, 10 & 11 / BLOCK B, CADDY PLAN
 - ENCROACHMENT: NOTE THE POSITION OF THE FENCES IN RELATION TO THE EASTERLY/WESTERLY BOUNDARIES; THEY ARE LOCATED OVER THE SUBJECT BOUNDARIES TO THE EXTENT SHOWN ON THE PLAN.
 - BEARING: BEARING ARE ASTRONOMIC AND ARE REFERRED TO THE SOUTHERLY LIMIT OF UNIVERSITY AVENUE HAVING A BEARING OF N71°25'30"E AS SHOWN ON PLAN 39R-2336
 - ELEVATIONS: ELEVATIONS SHOWN GEODETIC DRIVEN FROM TOWN OF COBORO BENCH MARK #01212300, ELEVATION 82.92M
 - DISTANCES: DISTANCES AND COORDINATES ARE IN METERS AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048. DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 1.00021.
 - ALL EXISTING FEATURE TO REMAIN UNLESS OTHERWISE NOTED.

No.	DATE	DESCRIPTION
1	06/05/2019	ISSUED FOR ZBA

625 Cochran Drive, Suite 900
Markham, Ontario
L3R 9R9, Canada
Tel: (905) 470-0516 Fax: (905) 470-0202
www.LEA.ca

LEA Consulting Ltd.
Consulting Engineers
and Planners

Professional Engineer
E. MORSHED
19072058
MAY 24 2019
PROFESSIONAL ENGINEER

**325 UNIVERSITY AVENUE W. RESIDENTIAL DEVELOPMENT
PRELIMINARY SITE SERVICING PLAN**

DESIGN	F.M.	DRAWN	M.N.	CHECKED	R.B.	CONTRACT No.	20021	
SCALE:	1:200 (FULL SIZE)						DRAWING NUMBER	C-02
DATE:	APRIL 26, 2019							

DRAWING NAME: P:\2021\Markham\Contract Drawings\C-02-Site Servicing Plan.dwg

