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Bayside Apartments, Barrie

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

Vitmont Holdings (Barrie) Inc.

Document Control

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Date:

**January 13,
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Issue	Date	Description
1	September 4, 2020	Issued for Site Plan Approval
2	January 13, 2021	Site Plan Approval (2 nd Submission)

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1 Introduction

Tatham Engineering Limited (Tatham) has been retained by Vitmont Holdings (Barrie) Inc. to prepare a Functional Servicing and Stormwater Management (FSR/SWM) Report in support of a Site Plan Approval (SPA) application for the Bayside Apartments project, which is a proposed mixed-use development located at 79 Collier Street in the City of Barrie (City).

1.1 SITE DESCRIPTION & SURROUNDING LAND USE

The site is located at the southwest corner of the existing signalized intersection of Collier Street and Mulcaster Street and is bound by Collier Street to the north, Mulcaster Street to the east, an existing laneway to the south and an existing commercial development to the west. The location of the property is illustrated on the Site Location Plan (Figure 1), below. Under existing conditions, the site consists of parking and landscaped areas with an existing heritage structure located to the southeast corner of the site. The total site area is approximately 0.16 ha.

The subject site is located within the Lake Simcoe Region Conservation Authority (LSRCA) watershed but is not located within the LSRCA regulated area.

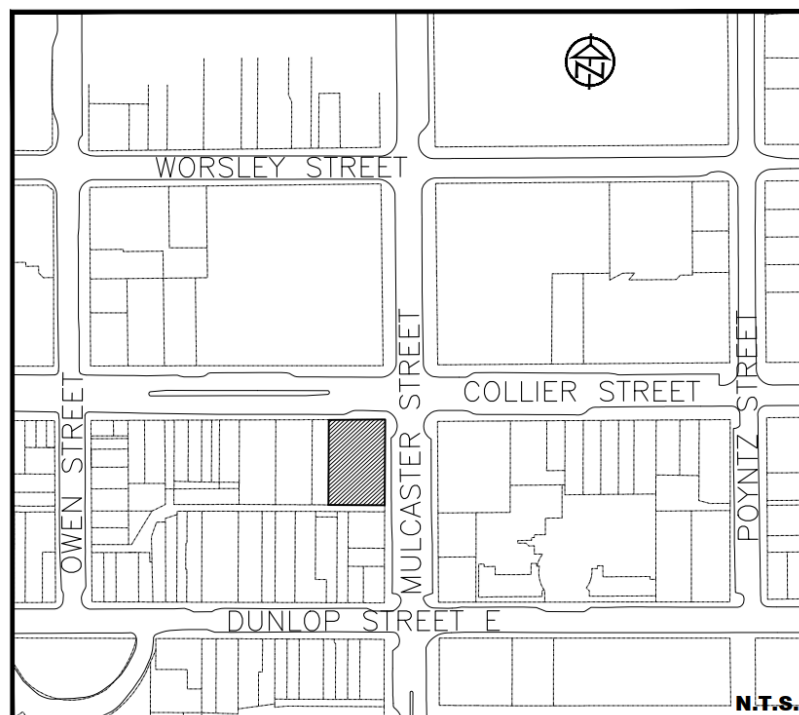


Figure 1: Site Location Plan



1.2 OBJECTIVES

The objective of this report is to present an overall servicing strategy to demonstrate that the proposed development can be serviced appropriately. This report will also document the SWM strategy for the site, demonstrating that the proposed development will not adversely affect local surface water conditions.

1.3 GUIDELINES & BACKGROUND INFORMATION

This report was prepared in accordance with local and provincial guidelines, including the following publications:

- The Ministry of the Environment, Conservation and Parks (MECP, formerly known as Ministry of Environment) *Stormwater Management Practices Planning and Design Manual* (2003);
- The Ministry of the Environment, Conservation and Parks (MECP, formerly known as Ministry of Environment) *Lake Simcoe Protection Plan* (LSPP) (2009);
- Lake Simcoe Region Conservation Authority (LSRCA) *Technical Guidelines for SWM Submissions* (2016);
- Lake Simcoe Region Conservation Authority (LSRCA) *Phosphorous Offsetting Policy* (2019);
- City of Barrie *Storm Drainage and Stormwater Management Policies and Design Guidelines* (2009);
- City of Barrie *Sanitary Sewage Collection System Policies and Design Guideline* (2017); and;
- City of Barrie Engineering Department *Water Transmission and Distribution Policies and Design Guidelines* (2017).

Information relating to existing topography, ground cover and drainage patterns was obtained through a review of relevant background studies, available plans, base mapping and topographic survey.

1.4 PROPOSED DEVELOPMENT

The proposed development consists of a 17-storey mixed-use building with commercial and amenity areas, underground and above ground parking areas and 136 residential units. Access will be provided from Collier Street.

The proposed development will be serviced by municipal water, sanitary and storm systems. Improvements along the site frontage will be implemented as shown on the site plan and engineering drawings. All existing water and sanitary services to the property will be permanently capped/cut off at the main to the satisfaction of the City of Barrie.



2 Water Supply & Distribution

2.1 EXISTING WATER SYSTEM

The site is located in the downtown area of the City, which is fully serviced by the municipal water system. There is an existing 300 mm dia. watermain in Collier Street and a 150 mm dia. watermain in Mulcaster Street which provide water supply and fire protection for the area including the subject property. There is one existing fire hydrant located at the southeast corner of the intersection of Collier Street and Mulcaster Street.

Relevant municipal record documents are provided in Appendix A.

2.2 PROPOSED WATER SYSTEM

The proposed development will be serviced with a 150 mm dia. domestic water service and a dedicated 200 mm dia. fire service provided to the building connected from the existing 300 mm dia. watermain on Collier Street. An additional fire hydrant will also be provided on Collier Street. Additional details are provided on the Site Servicing Plan (Drawing SS-1) provided in Appendix F.

2.3 PROPOSED RESIDENTIAL DESIGN FLOWS

The estimated population for the proposed development is 227 persons (applying the high density unit population factor of 1.67 people per unit) as per the City's engineering standards. Demands generated by the commercial areas were calculated by applying a rate of 28 m³/ha/day for 404 m² of commercial area. Water system demands were estimated by applying Maximum Day Factor and Peak Rate factors from Table 3-1 of the MOE Design Guidelines for Drinking Water Systems. Detailed calculations are provided in Appendix B.

The estimated water system demands are:

- Average Day Demand - Residential (ADD): 227 persons x 225 L/person/day = 51,102 L/day = 0.59 L/s;
- Average Day Demand - Commercial (ADD): 404 m² x 28 m³/ha/day = 1,131 L/day = 0.01 L/s;
- Maximum Daily Demand (MDD) Residential + Commercial: 52,233 L/day x 2.75 = 143,641 L/day = 1.66 L/s; and
- Peak Hourly Demand (PHD) Residential + Commercial: 52,233 L/day x 4.13 = 215,723 L/day = 2.50 L/s



2.4 FIRE PROTECTION

Firefighting water demands have been estimated for the building using the Water Supply Public Fire Protection (1999) prepared by Fire Underwriters Survey (FUS). The required fire flow has been estimated at 133 L/s. Detailed calculations are provided in Appendix B.

A fire hydrant flow test was conducted using two nearby fire hydrants located on Collier Street as documented in Appendix B. Applying the equation provided in section 4.3.2. of the City's Water Transmission and Distribution Policies and Design Guidelines, the estimated fire flow available at 20 psi is 2,307 USgpm (145.4 L/s), which is greater than the required maximum water demand of 134.66 L/s (MDD + fire flow).

Details of the internal sprinkler system and demands calculated by the mechanical engineering consultant have not yet been provided. Therefore, should the mechanical engineering consultant require additional information, or should the firefighting requirements change, our assessment will be updated accordingly.



3 Sanitary Sewer Collection

3.1 SANITARY SYSTEM

The downtown area of Barrie is serviced with a municipal sanitary sewer collection system that conveys flows to the Barrie Wastewater Treatment Facility (WWTF) located at the west end of Kempenfelt Bay on Lake Simcoe.

There is an existing 250 mm dia. sanitary sewer located in Mulcaster Street which collects and conveys flows south to Dunlop Street. The existing pipe has a full flow capacity of 144.43 L/s. No existing sanitary sewers are located within Collier Street along the frontage of the subject site. Municipal record documents are provided in Appendix A, for reference.

The proposed development will discharge sanitary sewage to an existing sanitary maintenance hole on Mulcaster Street via a new 250 mm dia. sanitary sewer. An additional sanitary maintenance hole will also be constructed between the main and the building to provide a sampling location, as per City standards and is depicted on Drawing SS-1.

The full flow capacity of the 250 mm dia. sanitary service lateral is 84.09 L/s which can accommodate the design peak flow of 2.47 L/s from the proposed development as per calculations provided below. Sanitary flows generated by the commercial areas were calculated using the minimum average design flow rate of 28 m³/ha/day based on a commercial area of 404 m². Peak Hour Flow was determined after applying a calculated peaking hour factor using the Harmon formula as per City of Barrie standards.

Estimated sanitary design flows:

- Average Day Design Flow (Residential): 1.67 ppu x 136 units = 227 persons x 225 L/cap/day = 51,102 L/day = 0.59 L/s; and
- Average Day Design Flow (Commercial): 404 m² x 28 m³/ha/day = 1,131 L/day = 0.01 L/s and;
- Peak Hour Flow (incl. infiltration and commercial) = 210,816 L/day = 2.44 L/s

Therefore, there is satisfactory capacity in the proposed service connection. It is anticipated the City will input the sanitary flows generated from the proposed development into its SewerCAD model to confirm there is satisfactory overall capacity in its sanitary sewer network. Based on our previous work in the area, it is understood that the capacity in the existing downstream infrastructure is sufficient to accommodate the proposed development.

Additional details are provided in Appendix C.



4 Stormwater Management

4.1 DESIGN CRITERIA

This SWM plan is subject to the review and approval of the City of Barrie and the Lake Simcoe Region Conservation Authority (LSRCA). Applicable SWM design criteria for the proposed development are presented below.

4.1.1 Stormwater Quality Control

Typically, water quality controls must be provided to satisfy the *MECP SWM Practices Planning and Design Manual*. This corresponds to providing Enhanced Protection Level water quality protection of 80% long-term suspended solids removal. However, as the majority of runoff from the site is generated from the rooftops, which is considered to be clean, water quality controls are not required.

4.1.2 Stormwater Quantity Control

The City requires that post-development peak flow rates be controlled to pre-development levels at any given outlet location to ensure no adverse impacts for downstream landowners. As such, water quantity controls will be provided to attenuate post-development peak flow rates to pre-development levels. In addition, as stormwater runoff generated from the site will discharge directly into the Mulcaster Street storm sewer, post-development peak flows will be controlled to the 5-year pre-development peak flow rate.

4.1.3 Water Balance

As the development area is over 500 m², the proposed development is categorized as a “major development” under the LSPP, which requires that best efforts be demonstrated towards maintaining pre-development infiltration rates in the post-development scenario through the completion of a water balance assessment.

Based on the impervious nature of the existing and proposed conditions site, we assume a water balance will not be required, or will be completed by others.

4.1.4 Phosphorous Budget

The proposed development will also be subject to the Lake Simcoe Phosphorous Offsetting Policy (LSPOP), which requires all major development to control 100% of the phosphorous generated from the site. Any remaining phosphorous load that cannot be controlled/removed will require a cash contribution for off-site mitigation.



4.2 EXISTING CONDITIONS

Under existing conditions, the 0.16 ha site drains to two distinct outlets. The western portion of the proposed site drains southwest via overland flow to the existing parking lot behind the neighbouring property (Catchment 102). The remaining area is conveyed east via catchbasins and storm sewers to the existing storm sewer in Mulcaster Street (Catchments 101 + 103). Existing drainage patterns are shown on Drawing DP-1.

The rational method has been used to calculate peak flow rates under pre-development conditions. The results are summarized in Table 1 while detailed calculations are provided in Appendix D.

Table 1: Pre-Development Peak Flow Rates

DESIGN STORM	EAST TO MULCASTER STREET (m ³ /s)	WEST OUTLET (m ³ /s)
2-Year	0.05	0.01
5-Year	0.07	0.02
10-Year	0.08	0.02
25-Year	0.09	0.02
50-Year	0.11	0.03
100-Year	0.12	0.03

4.3 PROPOSED CONDITIONS

Under proposed conditions, the total impervious area of the site increases from 0.12 ha to 0.16 ha and has been modeled as two separate Catchments (201 and 202), each with a runoff coefficient of 0.95. Catchment 201 consists of 0.14 ha of predominately rooftop area. Runoff generated from Catchment 201 will be collected internally and will discharge to the existing Mulcaster storm sewer. Catchment 202 consists of 0.02 ha of impervious area. Runoff generated from Catchment 202 will continue to drain uncontrolled to the neighbouring parking lot, as per existing conditions.

Proposed drainage patterns are shown on Drawing DP-2 provided in Appendix F.



4.3.1 Water Quantity

As the majority of site generated runoff (Catchment 201) will discharge to the existing storm sewer network, the modified rational method was used to quantify the storage volume required to control the post-development peak flow rates to 5-year pre-development release rate (i.e.. existing peak flow contributing to the existing storm sewer system). A summary of the post-development peak flow rates and storage volumes are provided in Table 2. Detailed calculations are provided in Appendix D.

Table 2: Post Development Peak Flow Rates to Mulcaster Street

DESIGN STORM	CATCHMENT 201 (UNCONTROLLED) (m ³ /s)	CATCHMENT 201 (CONTROLLED) (m ³ /s)	STORAGE VOLUME REQUIRED (m ³)
2-Year	0.06	0.05 (0.05)	3.8
5-Year	0.08	0.06 (0.06)	5.0
10-Year	0.09	0.06 (0.07)	7.6
25-Year	0.11	0.06 (0.09)	13.6
50-Year	0.13	0.06 (0.11)	17.3
100-Year	0.13	0.06 (0.12)	21.0

Note: Values presented in italics denote existing condition peak flow rates.

As shown, a maximum storage volume of 21.0 m³ is required to control post-development flow rates from the 100-year storm to the 5-year pre-development release rate (0.06 m³/s). The required storage will be provided by a cistern located within the building. Collected runoff (not including greywater) will be controlled to the maximum permissible release rate (0.06 m³/s) via an orifice plate or pump which will be designed by the mechanical engineering consultant and reviewed by Tatham to ensure the cistern meets the design criteria.

Attenuated peak flow rates will discharge via a 300 mm storm sewer connection to the existing Mulcaster Street storm sewer, as depicted on Drawing SS-1. A Storm sewer design sheet has been prepared for the proposed storm sewer connection and is provided in Appendix D.

Runoff generated from the western portion of the proposed development which includes the access ramp (Catchment 202) will flow uncontrolled towards the west outlet. As shown in Table 3, post-development peak flow rates contributing to this outlet are equal to or less than pre-development peak flow rates for all storm events. Detailed calculations are provided in Appendix D.



Table 3: Post Development Peak Flow Rates to West Outlet

DESIGN STORM	EXISTING CONDITIONS CATCHMENT 102 (m ³ /s)	PROPOSED CONDITIONS CATCHMENT 202 (m ³ /s)
2-Year	0.01	0.01
5-Year	0.02	0.01
10-Year	0.02	0.01
25-Year	0.02	0.02
50-Year	0.03	0.02
100-Year	0.03	0.02

4.3.2 Water Quality

As previously mentioned, water quality controls for the proposed development are not required as the vast majority of the runoff from the site is generated from the rooftops and is considered clean.

4.3.3 Water Balance

As previously mentioned, it is assumed the existing conditions annual infiltration volume is negligible due to the level of impervious land cover across the property. As the subject property is to be constructed with zero setbacks, there is no opportunity to provide infiltration-based controls on the site.

4.3.4 Phosphorous Budget

In order to comply with LSPOP requirements, a phosphorous budget for the site has been completed using the Low Impact Development Treatment Train Tool (LID TTT) developed by the LSRCA, Credit Valley Conservation (CVC) and the Toronto and Region Conservation Authority (TRCA). Based on our previous discussions with the LSRCA, it is understood that based on the lack of available space on the site due to the zero setback, high-density development, implementation of phosphorous reduction controls will not be enforced. Rather, the site will be required to pay an offsetting fee.



Existing Conditions

Under existing conditions, the site has been modelled using one land use category (impervious) for the purpose of the phosphorous budget calculations. A total of 0.16 ha been modelled as impervious area.

Applying the relevant loading rates, the pre-development phosphorous load is 0.28 kg/year.

Proposed Conditions

Under proposed conditions, the site has been modelled as two land use categories (rooftop and impervious). A total of 0.02 ha has been modelled as impervious area while 0.14 ha has been modelled as rooftop.

Applying the relevant loading rate, the post-development phosphorous load is 0.13 kg/year.

A summary of the phosphorous loading rates for each scenario is provided in Table 3 below. Additional details and outputs are provided in Appendix E. As shown, phosphorous loading reduces under proposed conditions as the majority of land use is rooftop which produces relatively clean runoff and lower phosphorous levels.

Table 4: Phosphorous Loading Summary

SCENARIO	AREA	PHOSPHOROUS LOADING (kg/year)
Pre-Development	0.16	0.28
Post-Development	0.16	0.13

4.4 SWM FACILITY MAINTENANCE

Ongoing maintenance of SWM facilities is necessary to ensure continued effectiveness. The cistern and rooftop drains should be inspected regularly and particularly after large rainfall events to ensure the system and all of its component parts are functioning properly and are in good repair.



5 Siltation & Erosion Control Plan

Siltation and erosion controls will be implemented for all construction activities, including earthworks, material stockpiling, pavement construction and grading operations. Details of the sedimentation and erosion control plan are included on Drawing RM-1 and are summarized as follows:

- heavy duty silt control fences will be erected to control sediment movement to abutting properties and the Mulcaster and Collier Street right-of-way;
- a stone mud mat will be installed at the construction entrance from Mulcaster; and
- regular inspection of control measures will be implemented and repairs made as necessary during construction.



6 Grading & Landscaping

The grading of the proposed development will match to the existing grades along the limits of the development. The site will be graded to suit the existing boundary conditions on the boulevard to the north and the existing service road to the south. Refer to the Site Grading Plan (Drawing SG-1) provided in Appendix F for additional details.



7 Utilities

All utilities (electrical, gas, telecommunications) are available from Collier Street and can be provided to the proposed development.



8 Summary

8.1 WATER SUPPLY & DISTRIBUTION

The site will be serviced with a 150 mm dia. domestic water service and a dedicated 200 mm dia. fire service from the existing 300 mm dia. watermain on Collier Street.

8.2 SANITARY SEWER COLLECTION

The site will be serviced via a 250 mm dia. sanitary sewer lateral connected to the existing 250 mm dia. sanitary sewer located on Mulcaster Street.

8.3 SWM PLAN

The proposed Stormwater Management Plan demonstrates the proposed development will not result in negative impacts with respect to stormwater management. Peak flows will be controlled to the existing 5-year flow rates by an orifice plate or pump which will be determined by the mechanical engineer. Water quantity controls to attenuate post development peak flow rates will be provided by a cistern. Controlled runoff from the cistern and be collected and conveyed via the new 300 mm dia. storm service connection then discharge into the existing 600 mm dia. storm sewer on Mulcaster street. Water quality controls are not required as the runoff generated from the site is from the rooftop and considered clean.

8.4 SILTATION & EROSION CONTROL

Siltation and erosion controls will be provided with the proper construction mitigation efforts.

8.5 GRADING & LANDSCAPING

The grading of the proposed development will match to existing perimeter grades along the limits of the development.

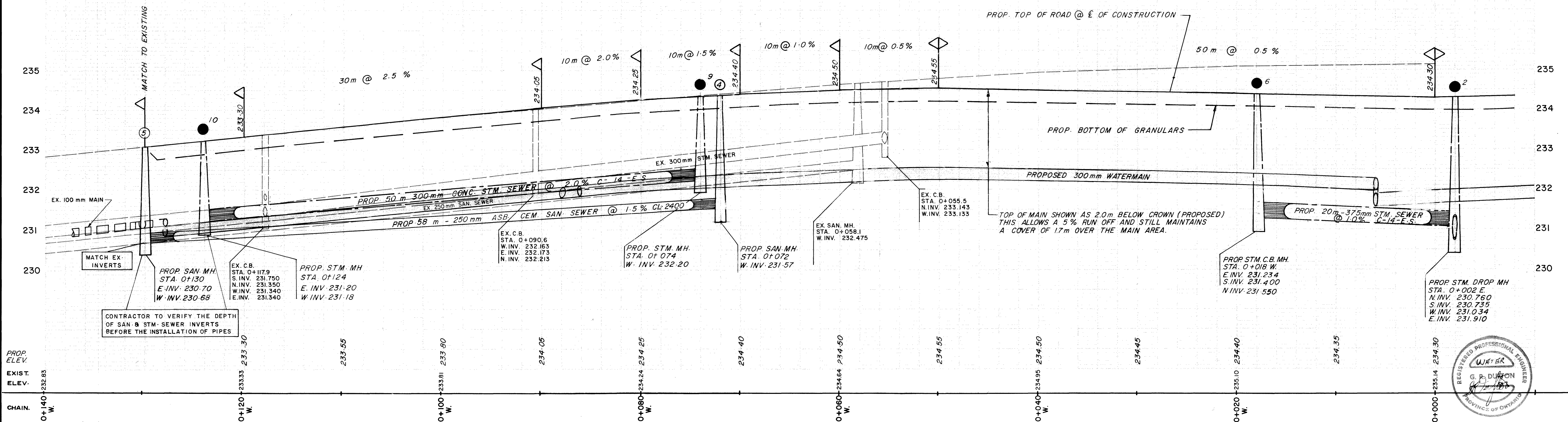
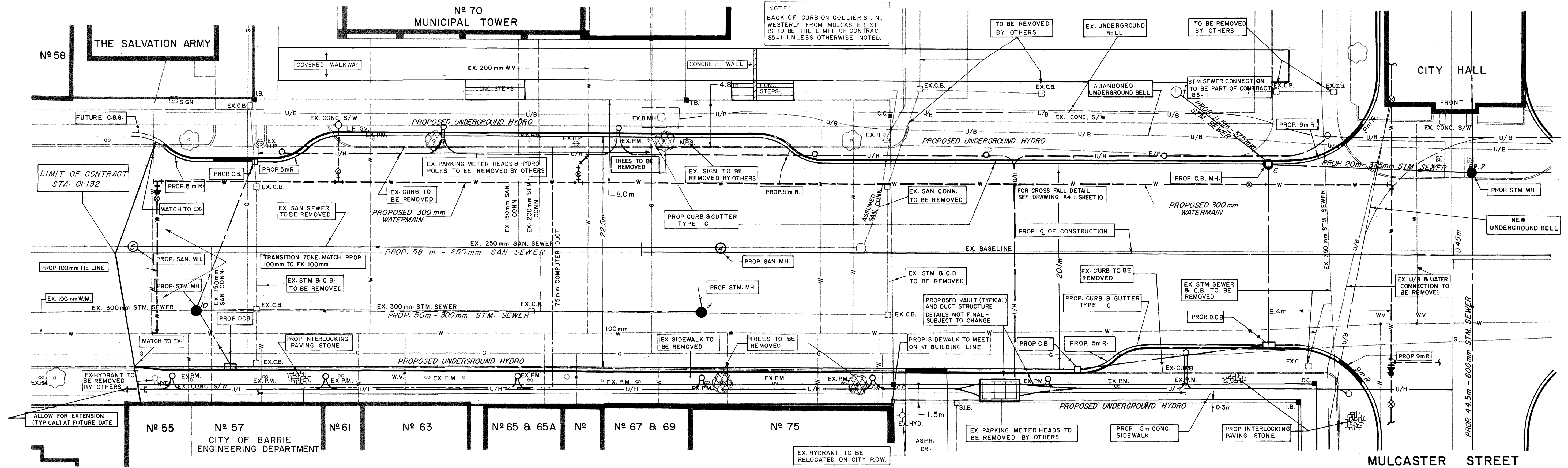
8.6 UTILITIES

All utilities (electrical, gas and telecommunications) are available from Collier Street and will be provided to the proposed development.



Appendix A: Municipal Infrastructure Record Documents

COLLIER STREET



GENERAL NOTES

ALL TO BE IN ACCORDANCE WITH CURRENT CITY OF BARRIE STANDARDS AND SPECIFICATIONS AND TO THE SATISFACTION OF THE ENGINEERING DEPARTMENT.

ALL UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

ALL UTILITIES TO BE RELOCATED BY THE UTILITY CONCERNED. CONTRACTOR TO CO-ORDINATE.

ALL WATERMAIN TO BE LOCATED 1.7m BELOW FINISHED GROUND ELEVATION.

ALL SEWER CONNECTIONS ARE APPROXIMATE
AND SHOULD BE VERIFIED.

WATER MAIN TO BE A DEPTH OF 2m[±] TO
AVOID CATCHBASIN CONNECTIONS.

PARTIAL RECONSTRUCTION BETWEEN THE BACK
OF CURB AND PROPERTY LINE IS TO BE COVERED
UNDER CONTRACT 85-1, BUT FINAL REINSTATEMENT
IS TO BE BY OTHERS.

FOR ROAD BASE SEE DETAIL SHEET NR 10

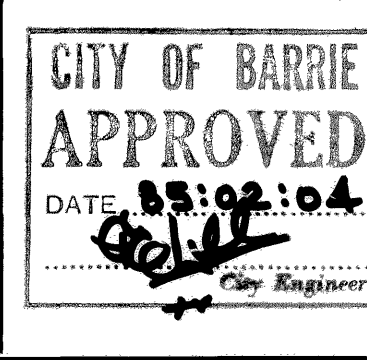
BENCH MARKS

235.920 - TOP OF SOUTHWEST CORNER OF 1st. ENT. STEP
AT COLLIER ST. ENTRANCE TO CITY HALL .

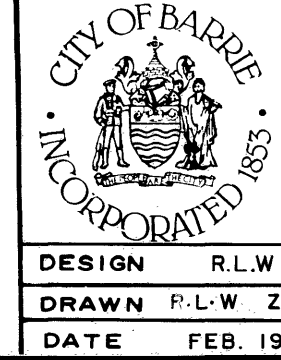
232.266 - SET BM. - TOP OF SOUTHWEST CORNER CONC.
BASE OF FLAG POLE AT SOUTHEAST CORNER
OF POST OFFICE AT OWEN. & COLLIER ST.

235.017 - TOP OF SOUTHEAST CORNER OF 1st. ENT. STEP
TO AMERICAN HOTEL .

N#	REVISIONS	DATE	APPROVED
1	NORTH SIDE WALKWAY & CITY HALL STA C+0+18 W TO BE C.B TOP MH.	85/29/03	P. E. L.
2	WATER ON MULCASTER ST NORTH MOVED EAST 4.8m	85/4/4	909
3	REVISION OF CURB, CURB RADIIUSES & D.C.B. LOCATIONS	85/04/04	909
4	RELOCATION OF UNDERGROUND HYDRO ON SOUTH SIDE OF COLLIER.	85/04/23	D.E.K.
5	RELOCATION OF UNDERGROUND HYDRO ON SOUTH SIDE OF COLLIER.	85/04/23	R.L.W.
6		85/05/06	



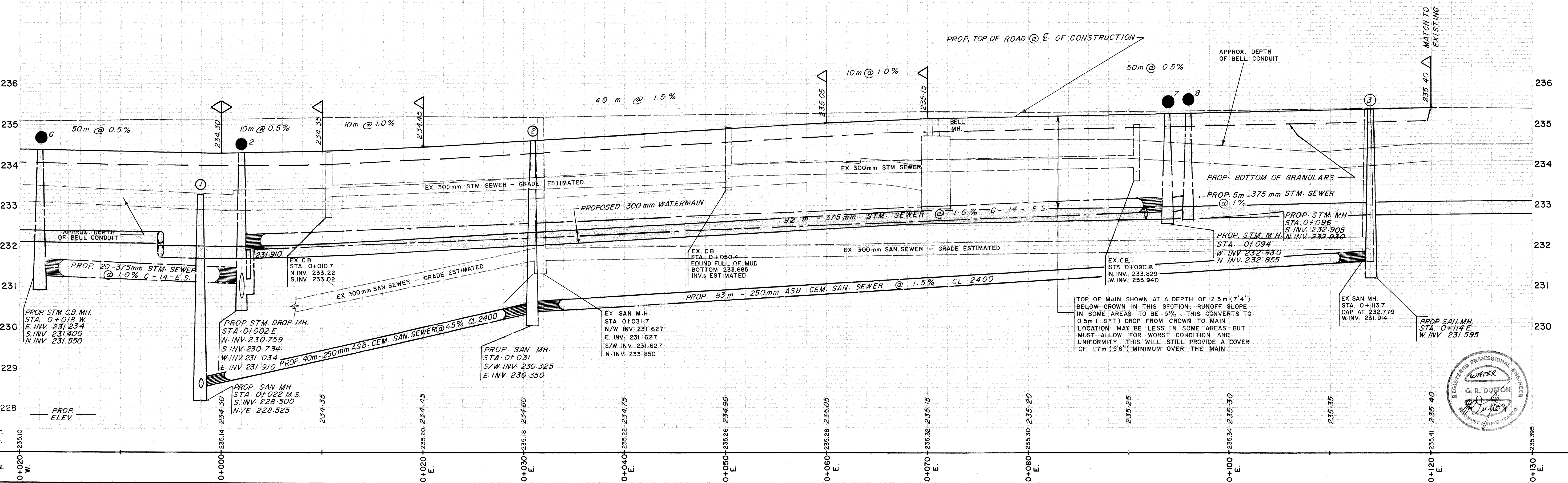
COLLIER STREET
PROPOSED RECONSTRUCTION
STA. 0+000 TO STA. 0+140 W.



CITY of BARRIE
ENGINEERING DEPARTMENT

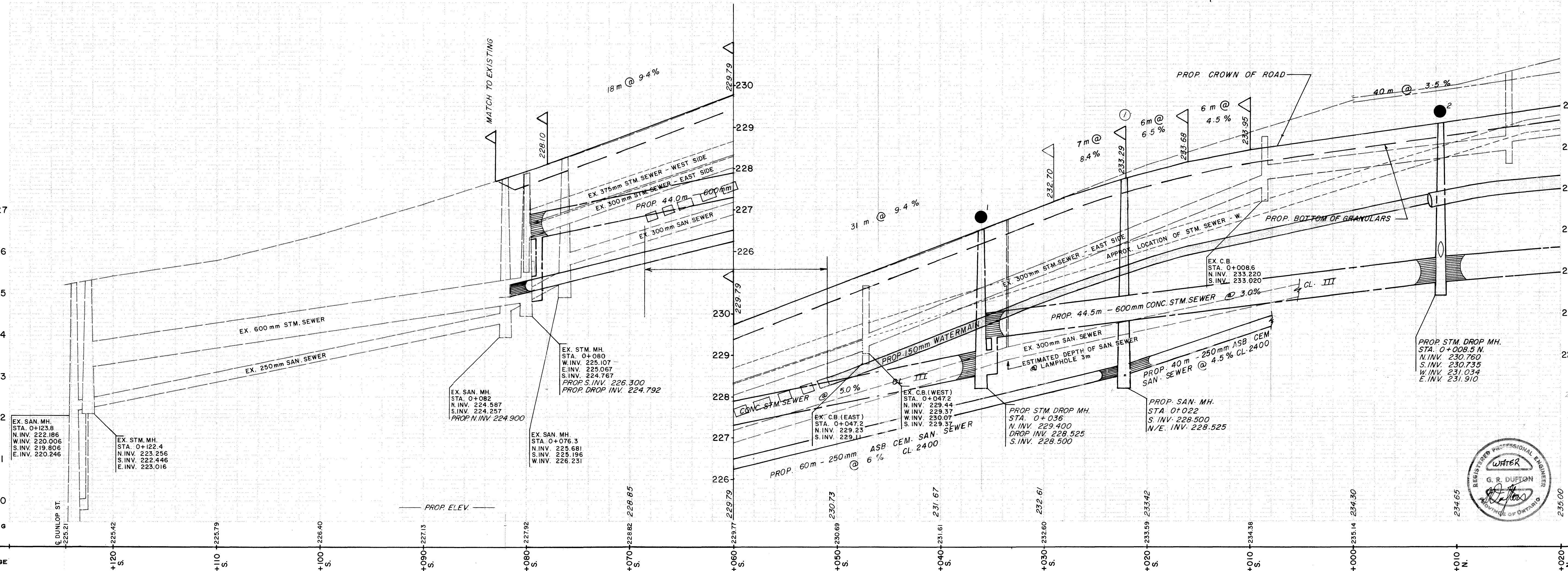
DESIGN	R.L.W.	SCALE	HOR. 1:200	VERT. 1:50
DRAWN	R.L.W. Z.M.S.	CHECKED	DRAWING NO 84-1	
DATE	FEB. 1983	SHEET NO		

**UNITED
CHURCH**



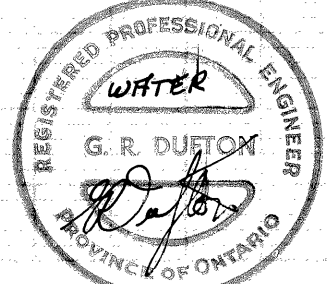
DESIGN R.L.W.		SCALE HOR. 1:200		VERT. 1:50	
DRAWN R.L.W. Z.M.S		CHECKED		DRAWING NO.	
DATE NOV. 1982		SHEET NO. 4		84 - 1	

A horizontal line with a break symbol (two parallel slanted lines) in the middle, indicating a break in the line.



DESIGN	R.L.W.	SCALE	HOR. 1:200	VERT. 1:50
DRAWN	R.L.W.	Z.M.S.	CHECKED	DRAWING NO.
DATE	JAN. 1984		SHEET NO. 6	84-1

A diagram of a thin plate with a central hole. A vertical crack is shown on the left side of the hole, and a horizontal crack is shown on the right side of the hole. The cracks are represented by two parallel lines meeting at the hole.



DESIGN	R.L.W.	SCALE	HOR. 1:200	VERT. 1:50
DRAWN	Z.M.S. R.L.W.	CHECKED	DRAWING NO 84-1	
DATE	JAN. 1984	SHEET NO 7		

Appendix B: Water Demand Calculations



Project:	Bayside Apartments, Barrie	Date:	January 5, 2021
File No.:	420373	Designed:	DJR
Subject:	Water Demand Calculations	Checked	NM
Revisions:			

Bayside Apartments Mixed-Use Development

Residential

Number of Units =	136	units
Population per Unit =	1.67	ppu
Population =	227	persons
Domestic Water Demand =	225	L/person/day
Average Daily Demand (Residential)=	51,102	L/day
	0.59	L/s

Commercial

Commercial Area	404	m ²
Commercial Daily Water Demand	28	m ³ /ha/day
Average Daily Demand (Commercial)	1,131.20	L/day
	0.01	L/s

Total Average Daily Demand (Residential + Commercial) =	52,233	L/day
	0.60	L/s

Maximum Day Factor =	2.75	From MOE Design Guidelines for Drinking Water Systems - Table 3-1
Peak Rate Factor =	4.13	From MOE Design Guidelines for Drinking Water Systems - Table 3-1

Maximum Daily Demand =	143,641	L/day
	1.66	L/s
Peak Hourly Demand =	215,723	L/day
	2.50	L/s



Project:	79 Collier Street	Date:	January 5, 2021
File No.:	420373	Designed:	DJR
Subject:	Preliminary Fire Flow Calculations	Checked	NM
Revisions:			

Fire Underwriters Survey Fire Flow Calculations
Long Method

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

Step	Description	Term	Options	Multiplier Associated with Option	Choose	Value used	Unit	Total Fire Flow (L/min)	
1	Frame Use for Construction of Unit	Coefficient related to type of construction (C)	Framing Material						
			Wood Frame	1.5	Fire resistive construction (> 2 hrs)	0.8	-	N/A	
			Ordinary Construction	1					
			Non-combustible construction	0.8					
			Fire resistive construction (< 2 hrs)	0.7					
Fire resistive construction (> 2 hrs)	0.6								
2	Type of Housing (if Tow House, enter number of units per TH block)	Type of Housing	Floor Space Area						
			Single Family	1		0	Units	N/A	
			Townhouse / Apartment- inform # of units	1		1			
			Other (Comm. Ind., etc.)	1		0			
2.1	Number of Storeys	Number of Floors / Storeys in the unit (do not include basement)				17	Storeys	N/A	
3	Floor Area	Largest Floor Area				1102	m ²	N/A	
		Ground Floor Area = Largest Floor + 25% of 2 immediately adjoining floors	Square Feet (ft2)	0.093	Square metres	1378			
			Square Metres (m ²)	1					
			Hectares (ha)	10000					
4	Required Fire Flow without Reductions or Increases	Required Fire Flows without Reductions or Increases per FUS): (FF= 220 x C x A ^{0.5})					L/min	7,000	
5	Factors Affecting Burning	Reductions / Increases Due to Factors Affecting Burning							
5.1	Combustibility of Building Contents	Occupancy content hazard reduction or surcharge	Non-combustible	-0.25	Limited combustible	-0.15	N/A	0	(1,050)
			Limited combustible	-0.15					
			Combustible	0.00					
			Free burning	0.15					
			Rapid burning	0.25					
5.2	Reduction Due to Presence of Sprinklers	Sprinkler reduction	Complete automatic sprinkler protection	-0.3	Automatic Sprinkler System	-0.3	N/A	0	(2,100)
			None	0					
5.3	Separation Distance Between Units	Exposure distance between units	North Side	20.1-30	0.1	0.7	m	0	4,165
			East Side	3.1-10	0.2				
			South Side	3.1-10	0.2				
			West Side	3.1-10	0.2				
Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:								0	8,000
6	Required Fire Flow, Duration and Volume	Total Required Fire Flow (above) in L/s:						0	133
		Required Duration of Fire Flow of 8,000 L/min (hrs):						2.25	
		Required volume for Fire Flow of 8,000 L/min (m ³):						1,080	



79 Collier Street

CITY OF BARRIE

Tatham File No. 420373

AVAILABLE FIRE FLOW AT 20 P.S.I.

TEST 1

$$QA = QT (ha/ht)^{0.5}$$

From City of Barrie "Water transmission and Distribution Policies and Design Guidelines" page 4

Value

Where QA = Flow at 20 P.S.I.

QT = Flow at Test

ha= Pressure Drop Available

ht = Pressure Drop at Test

68-20 =

68-66 =

471

48

2

GPM from Fire Flow Test by Vipond

P.S.I.

P.S.I.

QA= 2,307.42 GPM
145.37 L/s

TEST 2

$$QA = QT (ha/ht)^{0.5}$$

From City of Barrie "Water transmission and Distribution Policies and Design Guidelines" page 4

Value

Where QA = Flow at 20 P.S.I.

QT = Flow at Test

ha= Pressure Drop Available

ht = Pressure Drop at Test

68-20 =

68-64 =

608

48

4

GPM from Fire Flow Test by Vipond

P.S.I.

P.S.I.

QA= 2,106.17 GPM
132.69 L/s

FLOW TEST RESULTS



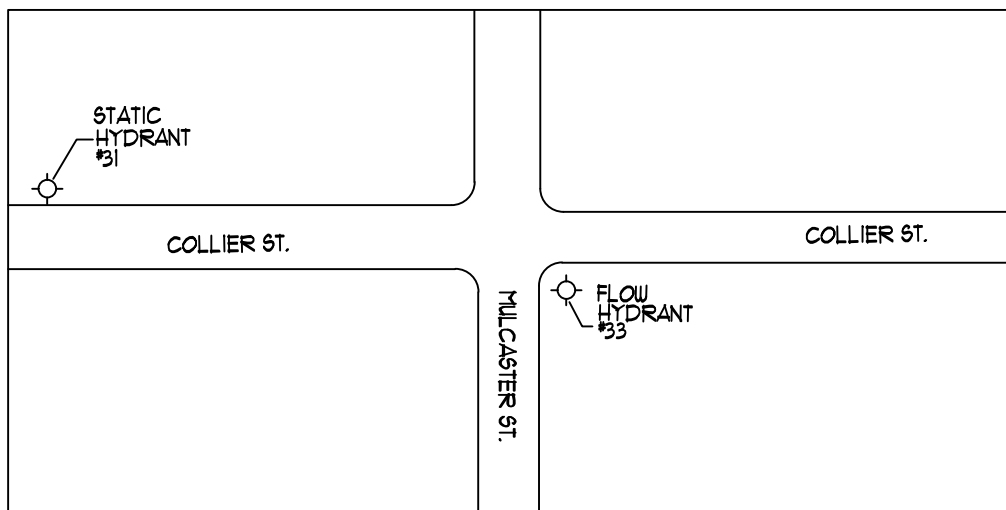
DATE : JUNE 16, 2020 TIME : 10:30 AM

LOCATION : MULCASTER STREET & COLLIER STREET

BARRIE

ONTARIO

TEST BY : VIPOND FIRE PROTECTION AND LOCAL PUC



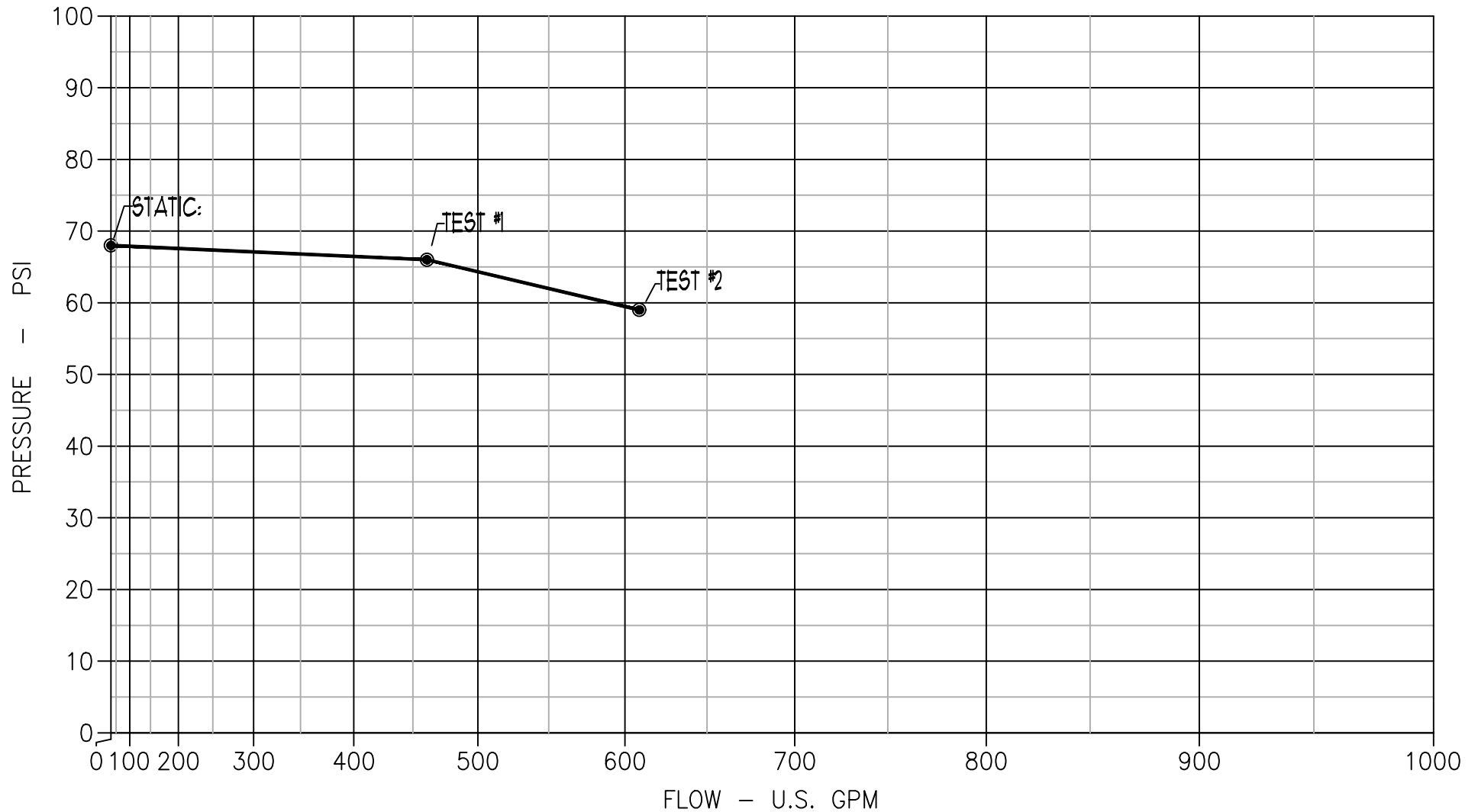
STATIC PRESSURE : 68 PSI UNDERGROUND TYPE & SIZE : N/A

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	1 3/4"	0.995	66	28	471
2	2	2 1/2"	0.90	64	13	608



MULCASTER STREET & COLLIER STREET	BY :	LEN K.
BARRIE	VIPOND OFFICE :	BARRIE
ONTARIO	TEST BY :	VIPOND & PUC
	DATE :	JUNE 26, 2020

STATIC:		RESIDUAL:		FLOW:
<u>68</u> PSI	TEST#1	<u>66</u> PSI	@	<u>471</u> GPM
	TEST#2	<u>64</u> PSI	@	<u>608</u> GPM



Appendix C: Sanitary Sewage Design Calculations

SANITARY SEWER DESIGN SHEET

Location - 79 Collier Street
 Municipality - Barrie
 Project No. - 420373
 Designed By - LB
 Date - August 6, 2020
 Revised By - DJR
 Date - January 5, 2021
 Checked - NM



FLOW CRITERIA

LAND USE	AVERAGE FLOW	PEAKING FACTOR
RESIDENTIAL	225 L/cap/d	HARMON
COMMERCIAL	28 m ³ /ha/day	$M = 1 + \frac{14}{4+p^{0.5}}$
PEOPLE/UNIT (HIGH DENSITY)	1.67 cap/unit	
INFILTRATION	0.10 L/ha/s	

LOCATION OF SECTION	AREA LABEL	FROM UPSTREAM	TO DOWNSTREAM	NUMBER OF UNITS	POPULATION	CUMULATIVE POP.	PEAKING FACTOR	COMMERCIAL AREA	SITE AREA	CUMULATIVE AREA	AVERAGE FLOW				PEAK FLOW				PROPOSED SEWER					
											RESIDENTIAL	COMMERCIAL	INFILTRATION	TOTAL	RESIDENTIAL	COMMERCIAL	INFILTRATION	TOTAL	LENGTH	DIAMETER	GRADE	FULL FLOW CAP.	FULL FLOW VELOCITY	PEAK FLOW VELOCITY
		MH #	MH #	Ea.	CAP.	CAP.		ha	ha	ha	l/s	l/s	l/s	l/s	l/s	l/s	l/s	l/s	m	mm	%	l/s	m/s	m/s
Bayside Apartments	A1	N/A	Prop. SANMH	136	227	227	4.13	0.04	0.16	0.16	0.59	0.01	0.02	0.62	2.44	0.01	0.02	2.47	11.6	250	2.00%	84.09	1.71	0.76
Existing Sanitary Sewer (Based on Available As-Built Drawing 1985-001-007)		EX. SANMH	EX. SANMH																	250	5.90%	144.43	2.94	0.00

Appendix D: Stormwater Management Calculations



Project:	79 Collier Street	Date:	September 2, 2020
File No.:	420373	Designed By:	LB
Subject:	Rational Method Design Calculations	Checked By:	NM

PRE DEVELOPMENT ANALYSIS

CATCHMENT 101

Runoff Coefficient (Municipal Standard)

2 Year	0.78	
5 Year	0.78	
10 Year	0.78	
25 Year	0.85	=C ₅ *1.10
50 Year	0.93	=C ₅ *1.20
100 Year	0.97	=C ₅ *1.25

Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.781	0.766	0.76	0.757	0.751	0.759

2 Year	168.10 mm/hr	T _c =	1.27
5 Year	217.35 mm/hr	T _c =	1.27
10 Year	251.16 mm/hr	T _c =	1.27
25 Year	288.47 mm/hr	T _c =	1.27
50 Year	323.30 mm/hr	T _c =	1.27
100 Year	343.00 mm/hr	T _c =	1.27

Drainage Area 0.120 ha

Peak Runoff Rate - Rational Method (Q=CiA/360)

2 Year	0.043 m ³ /s
5 Year	0.056 m³/s
10 Year	0.065 m ³ /s
25 Year	0.082 m ³ /s
50 Year	0.100 m ³ /s
100 Year	0.111 m ³ /s

CATCHMENT 103

Runoff Coefficient (Municipal Standard)

2 Year	0.95	
5 Year	0.95	
10 Year	0.95	
25 Year	1.00	=C ₅ *1.10
50 Year	1.00	=C ₅ *1.20
100 Year	1.00	=C ₅ *1.25

Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.781	0.766	0.76	0.757	0.751	0.759

POST DEVELOPMENT ANALYSIS

CATCHMENT 201

Runoff Coefficient (Municipal Standard)

2 Year	0.95	
5 Year	0.95	
10 Year	0.95	
25 Year	1.00	=C ₅ *1.10
50 Year	1.00	=C ₅ *1.20
100 Year	1.00	=C ₅ *1.25

Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.781	0.766	0.76	0.757	0.751	0.759

2 Year	169.65 mm/hr	T _c =	1.20
5 Year	219.33 mm/hr	T _c =	1.20
10 Year	253.42 mm/hr	T _c =	1.20
25 Year	290.97 mm/hr	T _c =	1.20
50 Year	326.19 mm/hr	T _c =	1.20
100 Year	345.81 mm/hr	T _c =	1.20

Drainage Area 0.140 ha

Peak Runoff Rate - Rational Method (Q=CiA/360)

		Q_{TARG}	
2 Year	0.063	0.0483	0.014 m ³ /s
5 Year	0.081	0.0625	0.019 m ³ /s
10 Year	0.094	0.0625	0.031 m ³ /s
25 Year	0.113	0.0625	0.051 m ³ /s
50 Year	0.127	0.0625	0.064 m ³ /s
100 Year	0.134	0.0625	0.072 m ³ /s

**Q_{TARG} = sum of
existing 5-year peak
flow rates from
Catchment 101 and 103**

Required Storage Volumes

Dur.	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
5	3.8	5.0	7.6	11.9	14.6	16.8
10	2.2	3.2	7.1	13.6	17.3	21.0
15	-1.5	-1.4	3.3	11.3	15.8	20.5
20	-6.2	-7.3	-1.9	7.1	12.2	17.6
25	-11.4	-13.9	-8.0	1.9	7.4	13.4
30	-17.0	-21.0	-14.7	-4.0	1.8	8.3



Project:	79 Collier Street	Date:	September 2, 2020
File No.:	420373	Designed By:	LB
Subject:	Rational Method Design Calculations	Checked By:	NM

2 Year	186.60 mm/hr	$T_c = 0.52$
5 Year	240.80 mm/hr	$T_c = 0.52$
10 Year	278.03 mm/hr	$T_c = 0.52$
25 Year	317.97 mm/hr	$T_c = 0.52$
50 Year	357.47 mm/hr	$T_c = 0.52$
100 Year	376.07 mm/hr	$T_c = 0.52$

Drainage Area 0.010 ha

Peak Runoff Rate - Rational Method ($Q=CiA/360$)

2 Year	0.005 m ³ /s
5 Year	0.006 m³/s
10 Year	0.007 m ³ /s
25 Year	0.009 m ³ /s
50 Year	0.010 m ³ /s
100 Year	0.010 m ³ /s



Project:	79 Collier Street	Date:	September 2, 2020
File No.:	420373	Designed By:	LB
Subject:	Rational Method Design Calculations	Checked By:	NM

PRE DEVELOPMENT ANALYSIS

CATCHMENT 102 (TO EXISTING SERVICE ROAD)

Runoff Coefficient (Municipal Standard)

2 Year	0.95	
5 Year	0.95	
10 Year	0.95	
25 Year	1.00	=C ₅ *1.10
50 Year	1.00	=C ₅ *1.20
100 Year	1.00	=C ₅ *1.25

Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.781	0.766	0.76	0.757	0.751	0.759

2 Year	150.91 mm/hr	T _C	=	2.15
5 Year	195.53 mm/hr	T _C	=	2.15
10 Year	226.13 mm/hr	T _C	=	2.15
25 Year	260.76 mm/hr	T _C	=	2.15
50 Year	291.45 mm/hr	T _C	=	2.15
100 Year	311.55 mm/hr	T _C	=	2.15

Drainage Area 0.030 ha

Peak Runoff Rate - Rational Method (Q=CiA/360)

2 Year	0.012 m ³ /s
5 Year	0.015 m ³ /s
10 Year	0.018 m ³ /s
25 Year	0.022 m ³ /s
50 Year	0.024 m ³ /s
100 Year	0.026 m ³ /s

POST DEVELOPMENT ANALYSIS

CATCHMENT 202 (TO EXISTING SERVICE ROAD)

Runoff Coefficient (Municipal Standard)

2 Year	0.95	
5 Year	0.95	
10 Year	0.95	
25 Year	1.00	=C ₅ *1.10
50 Year	1.00	=C ₅ *1.20
100 Year	1.00	=C ₅ *1.25

Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.78	0.766	0.76	0.757	0.751	0.759

2 Year	145.57 mm/hr	T _C	=	2.47
5 Year	188.74 mm/hr	T _C	=	2.47
10 Year	218.34 mm/hr	T _C	=	2.47
25 Year	252.08 mm/hr	T _C	=	2.47
50 Year	281.53 mm/hr	T _C	=	2.47
100 Year	301.62 mm/hr	T _C	=	2.47

Drainage Area 0.020 ha

Peak Runoff Rate - Rational Method (Q=CiA/360)

2 Year	0.008 m ³ /s
5 Year	0.010 m ³ /s
10 Year	0.012 m ³ /s
25 Year	0.014 m ³ /s
50 Year	0.016 m ³ /s
100 Year	0.017 m ³ /s



Project:	79 Collier Street	Date:	September 2, 2020
File No.:	420373	Designed By:	LB
Subject:	Rational Method Design Calculations	Checked By:	NM

RUNOFF COEFFICIENTS

CATCHMENT 101 (EXISTING CONDITION)

<i>Land Use</i>	<i>RC</i>	<i>Area (ha)</i>
Impervious Area	0.95	0.090
Lawn	0.25	0.030
	Total	0.120
Weighted RC	<u>0.78</u>	

CATCHMENT 102 (EXISTING CONDITION)

<i>Land Use</i>	<i>RC</i>	<i>Area (ha)</i>
Impervious Area	0.95	0.030
Weighted RC	<u>0.95</u>	

CATCHMENT 103 (EXISTING CONDITION)

<i>Land Use</i>	<i>RC</i>	<i>Area (ha)</i>
Impervious Area	0.95	0.0100
Weighted RC	<u>0.95</u>	

CATCHMENT 201 (PROPOSED CONDITION)

<i>Land Use</i>	<i>RC</i>	<i>Area (ha)</i>
Impervious Area	0.95	0.1400
Weighted RC	<u>0.95</u>	

CATCHMENT 202 (PROPOSED CONDITION)

<i>Land Use</i>	<i>RC</i>	<i>Area (ha)</i>
Impervious Area	0.95	0.0200
Weighted RC	<u>0.95</u>	

TIME OF CONCENTRATION

CATCHMENT 101 (EXISTING CONDITION)

Slope = 13 %
Length 30 m
RC= 0.78
Area= 0.120 ha

Airport Method	tc= 2.49 minutes
Bransby Williams Method	tc= 1.27 minutes
tc=	<u>1.27</u> minutes

CATCHMENT 102 (EXISTING CONDITION)

Slope = 9 %
Length 41.2 m
RC= 0.95
Area= 0.030 ha

Airport Method	tc= 1.52 minutes
Bransby Williams Method	tc= 2.15 minutes
tc=	<u>2.15</u> minutes

CATCHMENT 103 (EXISTING CONDITION)

Slope = 0.5 %
Length 5 m
RC= 0.95
Area= 0.010 ha

Airport Method	tc= 1.37 minutes
Bransby Williams Method	tc= 0.52 minutes
tc=	<u>0.52</u> minutes

CATCHMENT 201 (PROPOSED CONDITION)

Slope = 0.5 %
Length 15 m
RC= 0.95
Area= 0.140 ha

Airport Method	tc= 2.38 minutes
Bransby Williams Method	tc= 1.20 minutes
tc=	<u>1.20</u> minutes

CATCHMENT 202 (PROPOSED CONDITION)

Slope = 8.5 %
Length 45 m
RC= 0.95
Area= 0.020 ha

Airport Method	tc= 1.62 minutes
Bransby Williams Method	tc= 2.47 minutes
tc=	<u>2.47</u> minutes

STORM SEWER DESIGN SHEET #1 - 5 YEAR



IDF Curve Coefficients

Storm	A	B	C
2 Year	-	-	-
5 Year	853.600	4.700	0.766
25 Year	-	-	-
100 Year	-	-	-

Manning's Coefficient

CSP	0.024
Conc.	0.013
PVC	0.013

Project Name: Bayside Apartments, Barrie

Project Number: 420373

Municipality: Barrie

Designed By: LB

Date: 08-16-2020

Checked By: NM

Date:

Revision Number:

Approved:

PHASE	LOCATION OF SECTION	AREA LABEL	UPSTREAM MAINTENANCE HOLE	DOWNSTREAM MAINTENANCE HOLE	TRIBUTARY AREA - A	RUNOFF COEFFICIENT - C	INDIVIDUAL A x C	CUMULATIVE AREA	CUMULATIVE A x C	TIME OF CONCENTRATION	RAINFALL INTENSITY	PEAK FLOW	MANNING'S ROUGHNESS COEFFICIENT	LENGTH	SLOPE	DIAMETER	FULL FLOW VELOCITY	FULL FLOW CAPACITY	ACTUAL VELOCITY	TIME OF FLOW	CALCULATED PIPE DIAMETER	TIME OF CONCENTRATION
			MH No.	MH No.	ha					min.	mm/hr	cms		m	m/m	mm	m/s	cms	m/s	min	mm	min
	From Site			Prop. STMMH1	0.160	0.95	0.152	0.160	0.152	10.00	108.92	0.063	0.013	15.9	0.0200	300	1.93	0.137	1.77	0.15	224	10.15
Existing Storm Sewer as per City of Barrie As-Built (1985-001-007)			EX. STMMH	EX. STMMH									0.013	44.0	0.0490	600	4.81	1.359	0.00			

Notes:

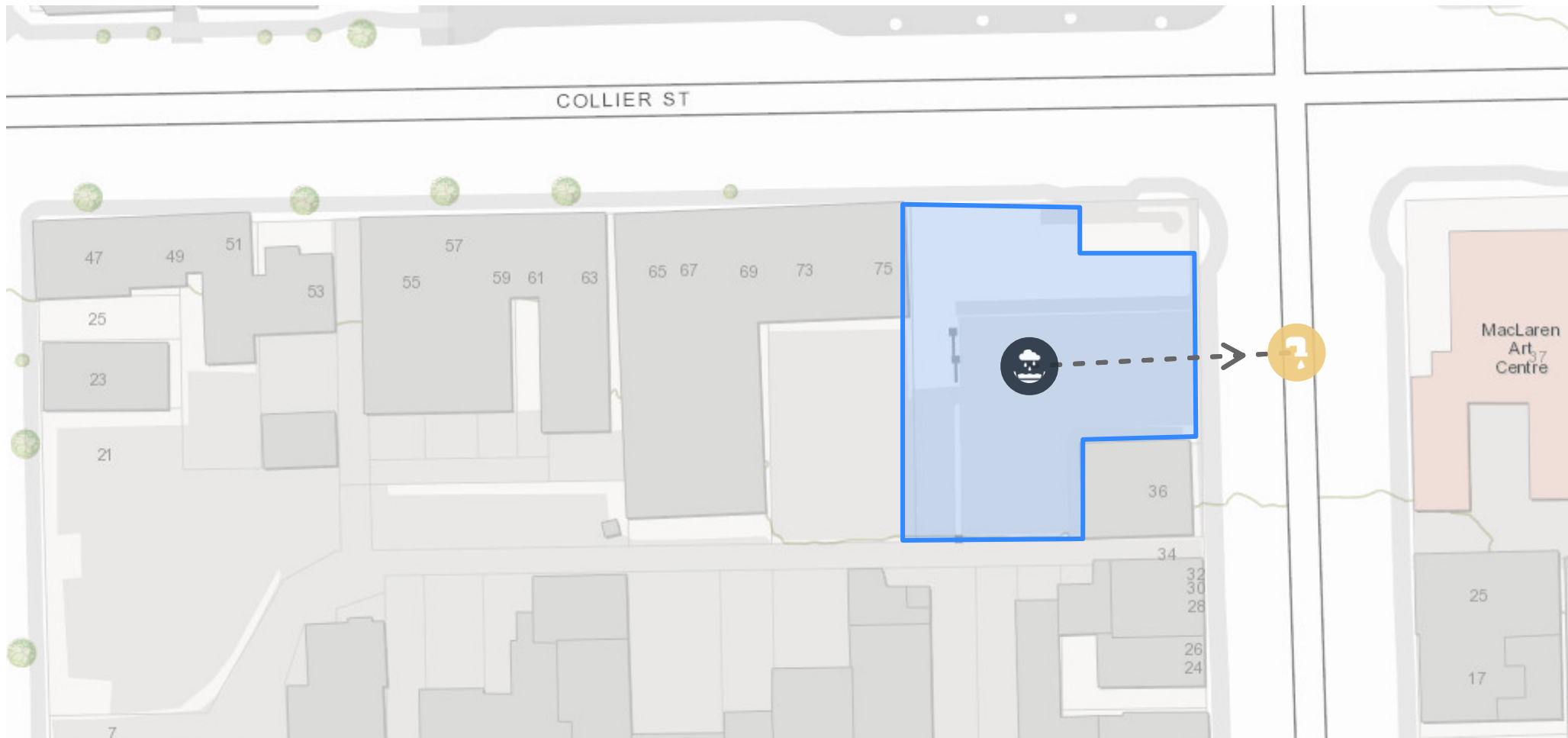
Peak flow shown is 5-year peak flow rate as per Rational Method Design Calculations Sheet for Catchment 201

T:\2020 PROJECTS\420373 - 79 Collier Street - Site Plan Application - Barrie\Design\SWM\420373 - Storm Sewer Design Sheet.xls

1 of 1

Appendix E: Phosphorous Budget Calculations

Map | Pre-Development



Summary

Site	Project Name	Project Title	Storm Type
Pre-Development	79 Collier Street	Phosphorous Budget	avg-annual

Water Balance | Pre-Development

Catchment	Site Area	Site Rainfall In	Site Infiltration	Site Evapotranspiration	External Outflow	Rainfall Reduction
		(mm) (m ³)	(mm) (m ³)	(mm) (m ³)	(mm) (m ³)	(mm) (%)
1	0.16 ha	944.70 mm 1,492.63 m ³	0.00 mm 0.00 m ³	185.30 mm 292.77 m ³	759.49 mm 1,200.00 m ³	185.21 mm 19.60 %
TOTAL	0.16 ha	944.70 mm 1,492.63 m ³	0.00 mm 0.00 m ³	185.30 mm 292.77 m ³	759.49 mm 1,200.00 m ³	185.21 mm 19.60 %

Loading Summary TSS | Pre Development

Catchment	Total Catchment TSS Removal	Peak Outflow	Generated	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Average Concentration (mg/l)	Average Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catchment 1	0.000 %	0.022 m ³ /s	1,200.000 m ³	1,204.000 m ³
			90.000 mg/l	89.701 mg/l
			108.000 kg	108.000 kg
Total	0.000 %	0.022 m ³ /s	1,200.000 m ³	1,204.000 m ³
			90.000 mg/l	89.701 mg/l
			108.000 kg	108.000 kg

Loading Summary TP | Pre Development

Catchment	Total Catchment TP Removal	Peak Outflow	Generated	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Average Concentration (mg/l)	Average Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catchment 1	0.000 %	0.022 m ³ /s	1,200.000 m ³	1,204.000 m ³
			0.230 mg/l	0.229 mg/l
			0.276 kg	0.276 kg
Total	0.000 %	0.022 m ³ /s	1,200.000 m ³	1,204.000 m ³
			0.230 mg/l	0.229 mg/l
			0.276 kg	0.276 kg

Peak Flow | Pre-Development

Catchment	Element	Description	Peak outflow
1	101	PEAK RUNOFF FLOW from	0.02 m ³ /s
	Mulcaster	MAXIMUM FLOW at	0.022 m ³ /s

TSS - Catchment 1

Name	LID Type (removal)	Peak Outflow	Incoming	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Concentration (mg/l)	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
101	0 %	0.02 m ³ /s	1,492.626 m ³	1,200.000 m ³
			90.000 mg/l	90.000 mg/l
			134.336 kg	108.000 kg
Mulcaster	0 %	0.022 m ³ /s	1,204.000 m ³	1,204.000 m ³
			89.701 mg/l	89.701 mg/l
			108.000 kg	108.000 kg

TP - Catchment 1

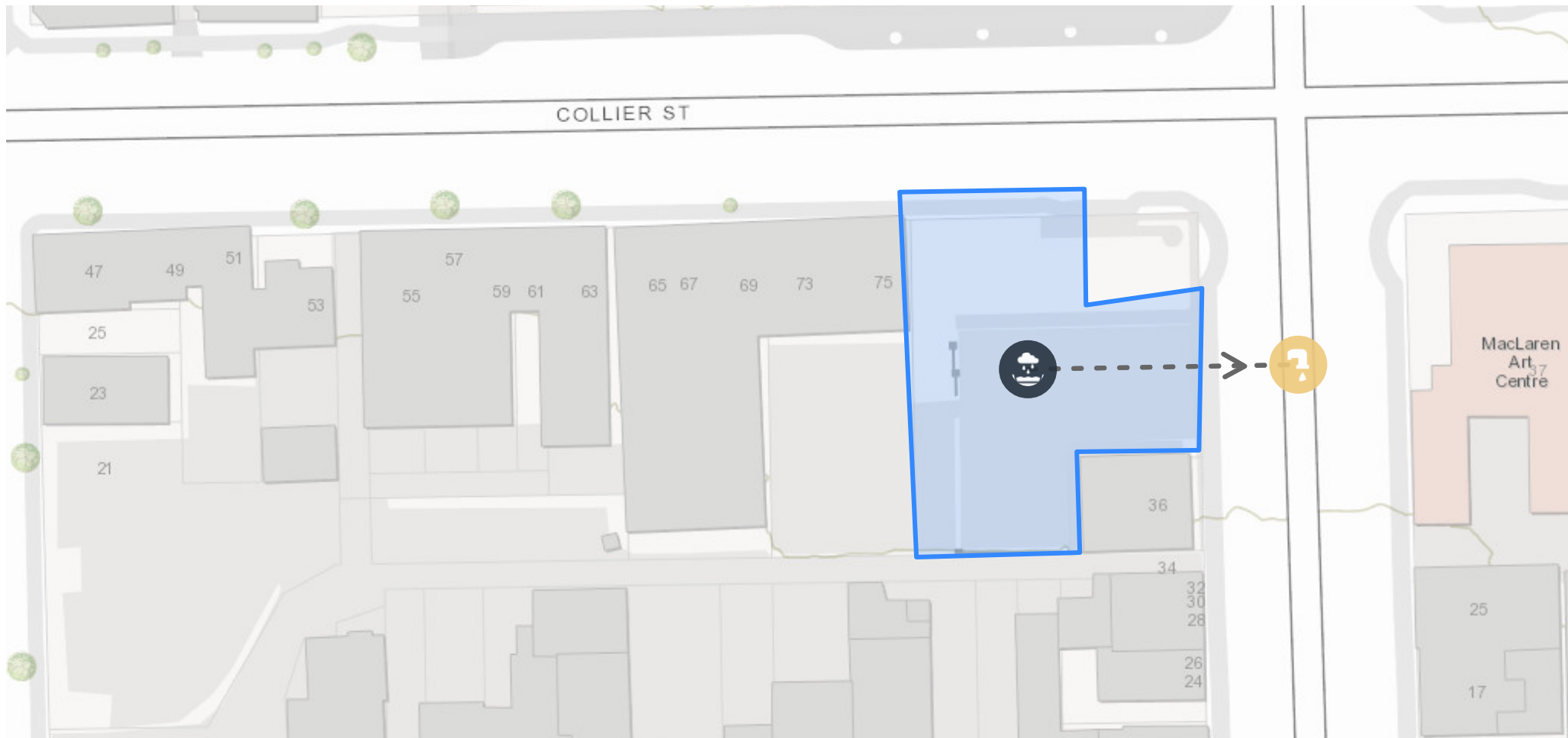
Name	LID Type	Peak Outflow	Incoming	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Concentration (mg/l)	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
101	0 %	0.02 m ³ /s	1,492.626 m ³	1,200.000 m ³
			0.230 mg/l	0.230 mg/l
			0.343 kg	0.276 kg
Mulcaster	0 %	0.022 m ³ /s	1,204.000 m ³	1,204.000 m ³
			0.229 mg/l	0.229 mg/l
			0.276 kg	0.276 kg

Field	Value
Subcatchment name	101
Catchment	1
Total AREA (HA)	0.158
Impervious area (HA)	0.158
Roof area (HA)	0
Landscaped area (HA)	0
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.1
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	2.54
Weighted Curve Number	0

Mulcaster

Field	Value
Name	Mulcaster
Catchment	1
Outfall Elevation (m)	229

Map | Post-Development



Summary

Site	Project Name	Project Title	Storm Type
Pre-Development			
Post-Development	79 Collier Street	Phosphorous Budget	avg-annual

Water Balance | Post-Development

Catchment	Site Area	Site Rainfall In	Site Infiltration	Site Evapotranspiration	External Outflow	Rainfall Reduction
		(mm) (m ³)	(mm) (m ³)	(mm) (m ³)	(mm) (m ³)	(mm) (%)
1	0.16 ha	944.70 mm 1,502.07 m ³	0.00 mm 0.00 m ³	185.31 mm 294.64 m ³	761.01 mm 1,210.00 m ³	183.69 mm 19.44 %
TOTAL	0.16 ha	944.70 mm 1,502.07 m ³	0.00 mm 0.00 m ³	185.31 mm 294.64 m ³	761.01 mm 1,210.00 m ³	183.69 mm 19.44 %

Loading Summary TSS | Post Development

Catchment	Total Catchment TSS Removal	Peak Outflow	Generated	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Average Concentration (mg/l)	Average Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catchment 1	0.000 %	0.022 m ³ /s	1,210.000 m ³	1,211.000 m ³
			16.960 mg/l	16.946 mg/l
			20.522 kg	20.522 kg
Total	0.000 %	0.022 m ³ /s	1,210.000 m ³	1,211.000 m ³
			16.960 mg/l	16.946 mg/l
			20.522 kg	20.522 kg

Loading Summary TP | Post Development

Catchment	Total Catchment TP Removal	Peak Outflow	Generated	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Average Concentration (mg/l)	Average Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catchment 1	0.000 %	0.022 m ³ /s	1,210.000 m ³	1,211.000 m ³
			0.107 mg/l	0.107 mg/l
			0.129 kg	0.129 kg
Total	0.000 %	0.022 m ³ /s	1,210.000 m ³	1,211.000 m ³
			0.107 mg/l	0.107 mg/l
			0.129 kg	0.129 kg

Peak Flow | Post-Development

Catchment	Element	Description	Peak outflow
1	201	PEAK RUNOFF FLOW from	0.02 m ³ /s
	Mulcaster	MAXIMUM FLOW at	0.022 m ³ /s

Loading TSS | Post Development

TSS - Catchment 1

Name	LID Type (removal)	Peak Outflow	Incoming	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Concentration (mg/l)	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
201	0 %	0.02 m ³ /s	1,502.073 m ³	1,210.000 m ³
			16.960 mg/l	16.960 mg/l
			25.475 kg	20.522 kg
Mulcaster	0 %	0.022 m ³ /s	1,211.000 m ³	1,211.000 m ³
			16.946 mg/l	16.946 mg/l
			20.522 kg	20.522 kg

TP - Catchment 1

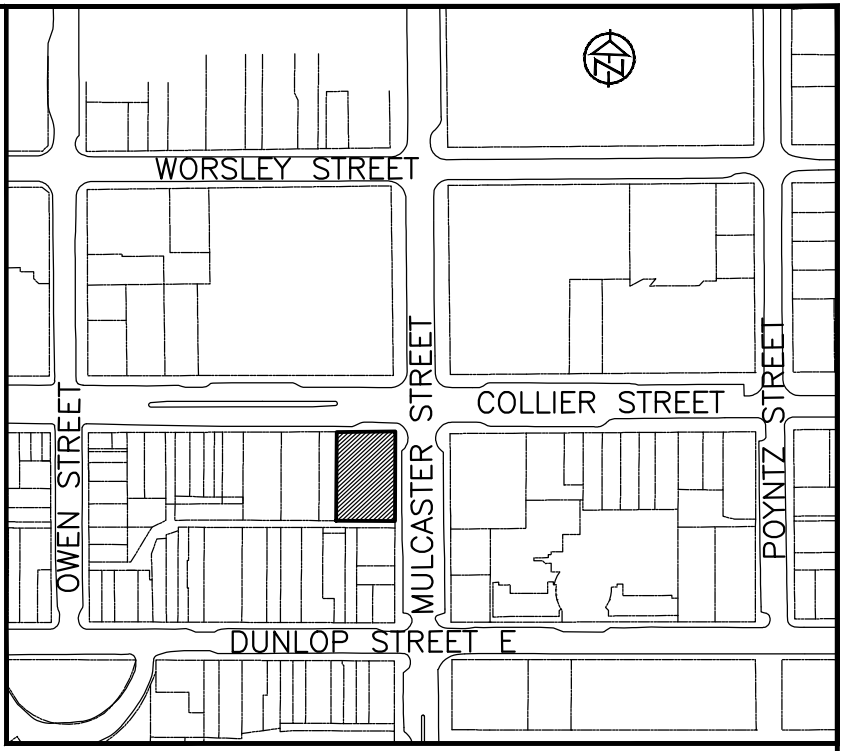
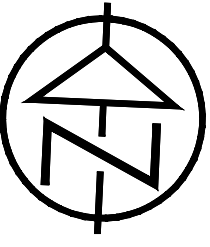
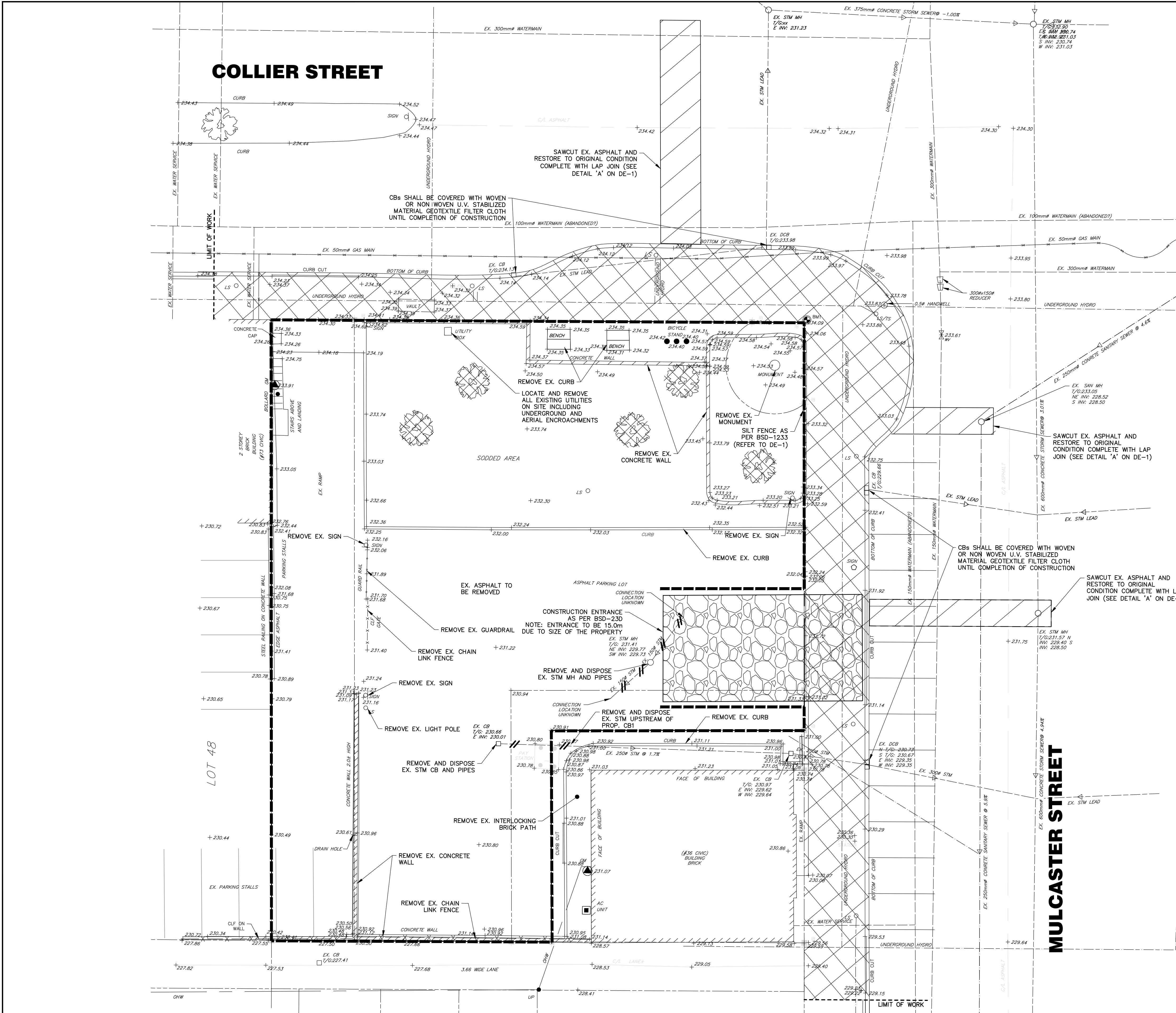
Name	LID Type	Peak Outflow	Incoming	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Concentration (mg/l)	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
201	0 %	0.02 m ³ /s	1,502.073 m ³	1,210.000 m ³
			0.107 mg/l	0.107 mg/l
			0.160 kg	0.129 kg
Mulcaster	0 %	0.022 m ³ /s	1,211.000 m ³	1,211.000 m ³
			0.107 mg/l	0.107 mg/l
			0.129 kg	0.129 kg

Field	Value
Subcatchment name	201
Catchment	1
Total AREA (HA)	0.159
Impervious area (HA)	0.01908
Roof area (HA)	0.139920000000000002
Landscaped area (HA)	0
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.1
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	2.54
Weighted Curve Number	0

Mulcaster

Field	Value
Name	Mulcaster
Catchment	1
Outfall Elevation (m)	229

Appendix F: Drawings



KEY PLAN
N.T.S.

SEC

LEGEND

- EXISTING PROPERTY LINE
- EXISTING LOT LINE
- EXISTING CENTERLINE
- EXISTING EDGE OF ASPHALT
- EXISTING SANITARY SEWER/SIZE
- EXISTING SANITARY SERVICE
- EXISTING WATERMAIN/SIZE
- EXISTING WATER SERVICE
- EXISTING STORM SEWER/SIZE
- EXISTING CONTOUR
- EXISTING SPOT ELEVATION
- EXISTING CABLE PEDESTAL
- EXISTING BELL PEDESTAL
- EXISTING BELL MAINTENANCE HOLE
- EXISTING HYDRO POLE
- EXISTING DECIDUOUS TREE
- EXISTING SANITARY MAINTENANCE HOLE/NUMBER
- EXISTING HYDRANT AND VALVE
- EXISTING WATER VALVE
- EXISTING STORM MAINTENANCE HOLE
- EXISTING CATCHBASIN
- SERVICES TO BE REMOVED
- SILT FENCE
- TREE TO BE REMOVED
- CONSTRUCTION ENTRANCE MAT
- CONCRETE SIDEWALK AND CURB REMOVAL
- ASPHALT REMOVAL

ACTIVITY:	EST. START DATE:	EST. END DATE:
1. INSTALL EROSION SEDIMENT CONTROLS	JULY 30, 2021	AUG. 03, 2021
2. REMOVALS	AUG. 03, 2021	AUG. 15, 2021
3. SERVICING AND FOUNDATION POURING	AUG. 16, 2021	SEPT. 15, 2021
4. FINE GRADING	SUMMER 2022	

NOTES:

- ALL SEDIMENT CONTROL MEASURES MUST BE INSTALLED PRIOR TO CONSTRUCTION.
- ALL SEDIMENT CONTROLS TO REMAIN IN PLACE UNTIL COMPLETION OF CONSTRUCTION INCLUDING ALL LANDSCAPING WORKS.
- MAINTAIN AND PROTECT ALL EXISTING MUNICIPAL SERVICES AND UTILITIES EXCEPT WHERE OTHERWISE NOTED.
- ALL EXISTING WATER SERVICES ARE TO BE DECOMMISSIONED AND DISCONNECTED BY CUTTING OFF AT THE WATERMAIN (COMPLETED BY CITY WATER OPERATIONS)
- THE FOLLOWING ITEMS ARE TO BE REMOVED FROM FRONTAGE OF SITE ON COLLIER ST AND MULCASTER ST:
 - ASPHALT SURFACE
 - CONCRETE SIDEWALK
 - ALL STREET TREES
 - ALL LIGHT STANDARDS
 - ALL STREET SIGNS

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DRAWING REFERENCES
SURVEY INFORMATION SHOWN ON THIS PLAN PREPARED BY C.A. MACDONALD SURVEYING INC., RECEIVED MARCH 31, 2020.
SITE PLAN PREPARED BY MCL ARCHITECTS DATED SEPT 1, 2020

BENCHMARKS
BM1: TOP OF CONCRETE PIN
ELEVATION: 234.09
VERTICAL BENCHMARK: 00119673109 (2nd ORDER)
ELEVATION: 220.21
HORIZONTAL BENCHMARK: 00119673109 (2nd ORDER)
NORTHING: 4915700.133 EASTING: 604482.056
HORIZONTAL BENCHMARK: 03120040004 (2nd ORDER)
NORTHING: 4917039.523 EASTING: 607010.380

No.	REVISION DESCRIPTION	DATE
1.	SPA - 1ST SUBMISSION	SEPT 4/20
2.	SPA - 2ND SUBMISSION	JAN 13/21

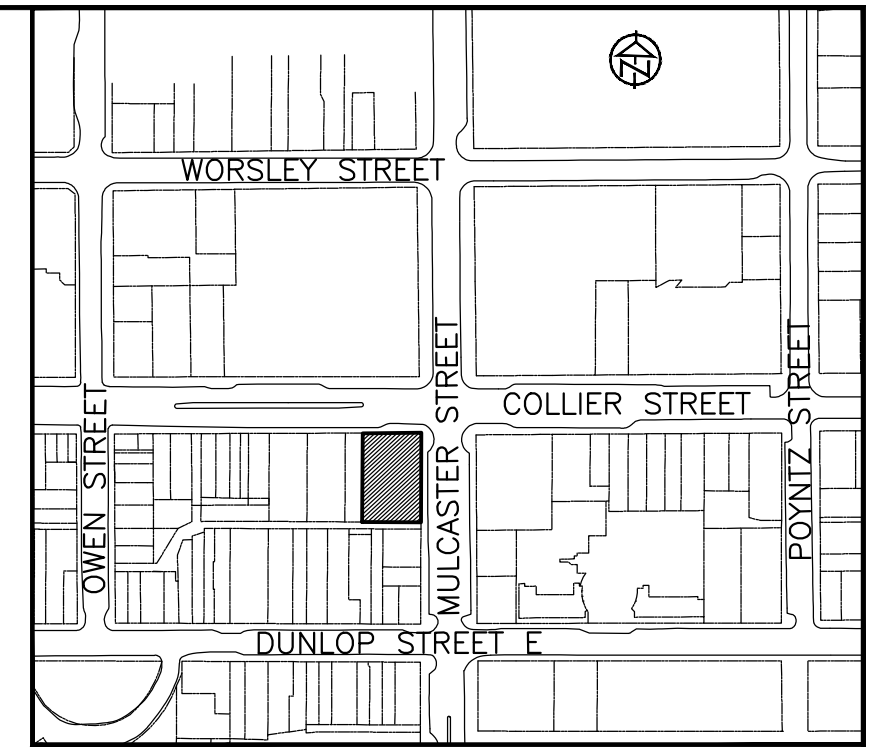
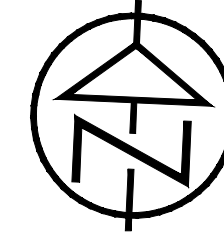
ENGINEER STAMP

**BAYSIDE APARTMENTS
79 COLLIER STREET
CITY OF BARRIE**

REMOVALS

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DRAWN: LCG	DATE: SEPT 2020	
CHECK: NM	SCALE: 1:150	

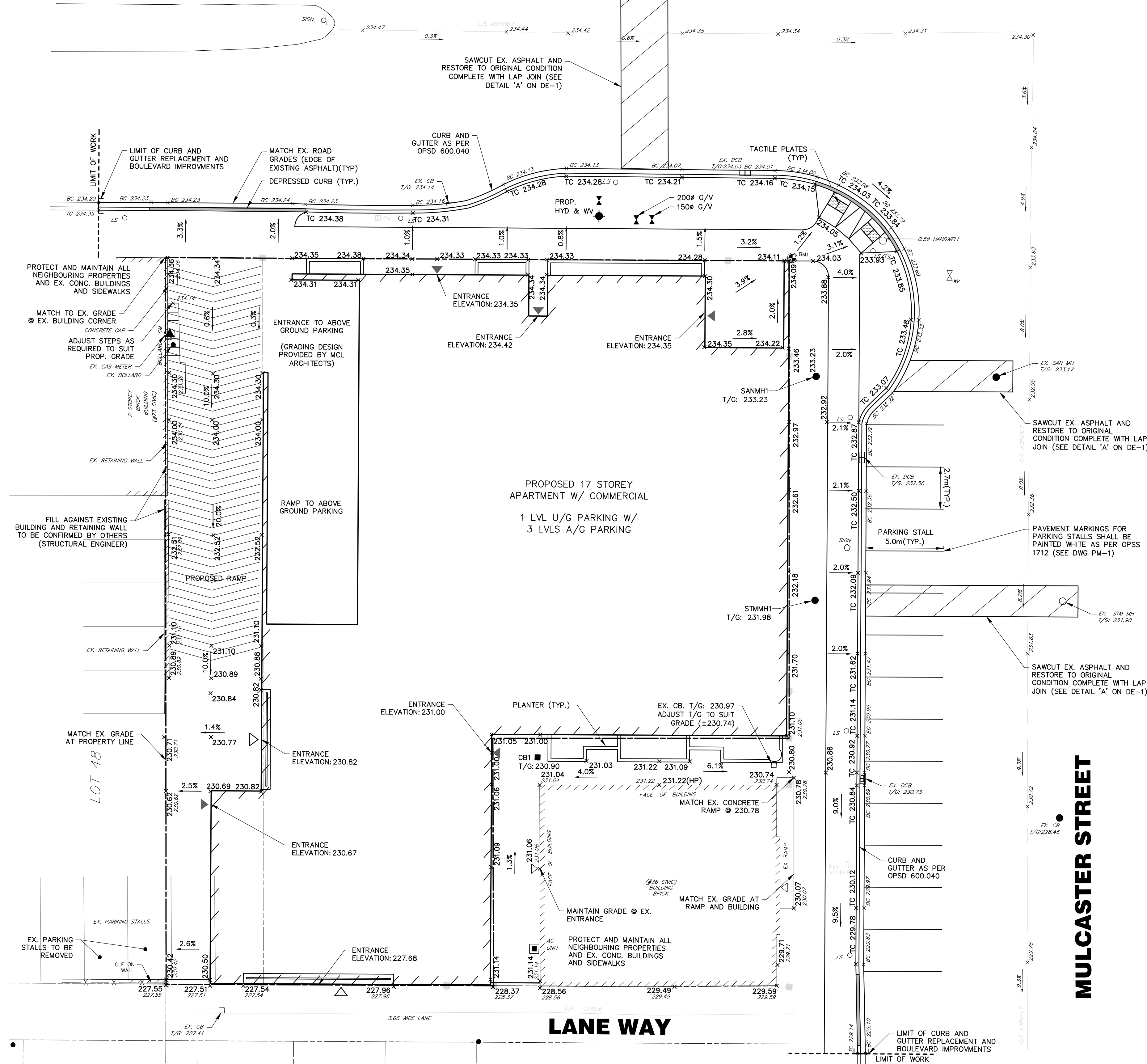
COLLIER STREET



KEY PLAN
N.T.S.

LEGEND

EXISTING PROPERTY LINE	---
EXISTING LOT LINE	---
EXISTING CENTERLINE	---
EXISTING EDGE OF ASPHALT	---
EXISTING CONTOUR	--- 230.00 ---
EXISTING SPOT ELEVATION	x 231.12
PROPOSED SPOT ELEVATION	x 232.20
EXISTING IRON BAR	■
EXISTING CABLE PEDESTAL	⊠ CABLE PED
EXISTING BELL PEDESTAL	⊠ BELL PED
EXISTING BELL MAINTENANCE HOLE	○ BELL MH
EXISTING HYDRO POLE	○ HP
PROPOSED HYDRO POLE	● HP
EXISTING HYDRANT AND VALVE	⬢ HYD & WV
PROPOSED HYDRANT	⬢ HYD
EXISTING SANITARY MAINTENANCE HOLE	○ EX. SAN MH
PROPOSED SANITARY MAINTENANCE HOLE/NUMBER	● SAN MH
EXISTING STORM MAINTENANCE HOLE/NUMBER	○ EX. STM MH
EXISTING CATCHBASIN MAINTENANCE HOLE/NUMBER	□ EX. CBMH
EXISTING CATCHBASIN	□ EX. CB
EXISTING DOUBLE CATCHBASIN	□ EX. DCB
PROPOSED CATCHBASIN	● CBMH
PROPOSED STORM MAINTENANCE HOLE/NUMBER	● STM MH
PROPOSED CATCHBASIN MAINTENANCE HOLE/NUMBER	○ CBMH
PROPOSED CATCHBASIN	■ CB
PROPOSED DOUBLE CATCHBASIN	■ DCB
EXISTING OVERLAND DRAINAGE DIRECTION	➔
PROPOSED BUILDING	▬
DEPRESSED CURB	▬
OVERHEAD DOOR	▷
ENTRANCE DOOR	▶
EXISTING ENTRANCE DOOR	▷



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No.	REVISION DESCRIPTION	DATE
1.	SPA - 1ST SUBMISSION	SEPT 4/20
2.	SPA - 2ND SUBMISSION	JAN 13/21

ENGINEER STAMP

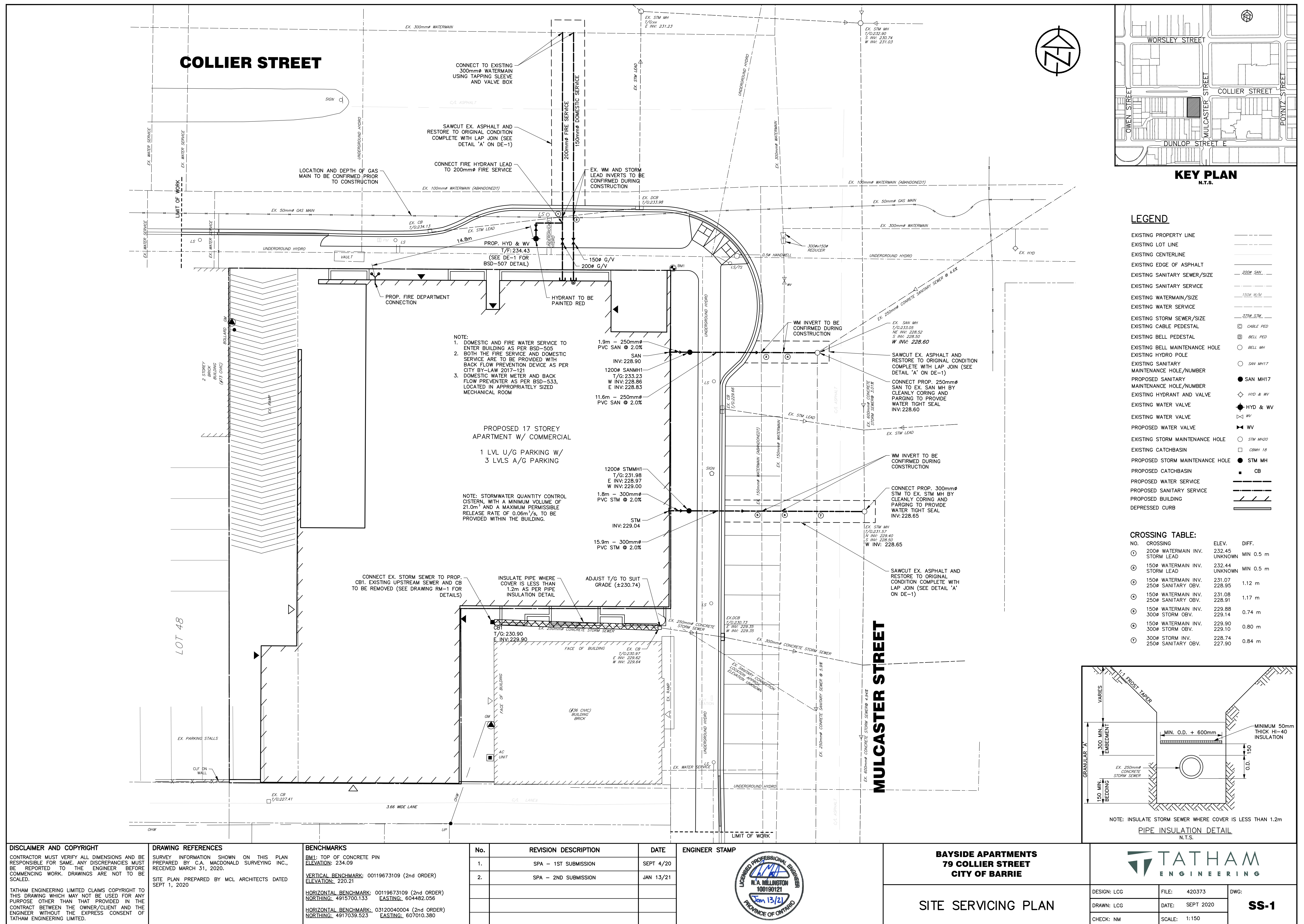


BAYSIDE APARTMENTS
79 COLLIER STREET
CITY OF BARRIE

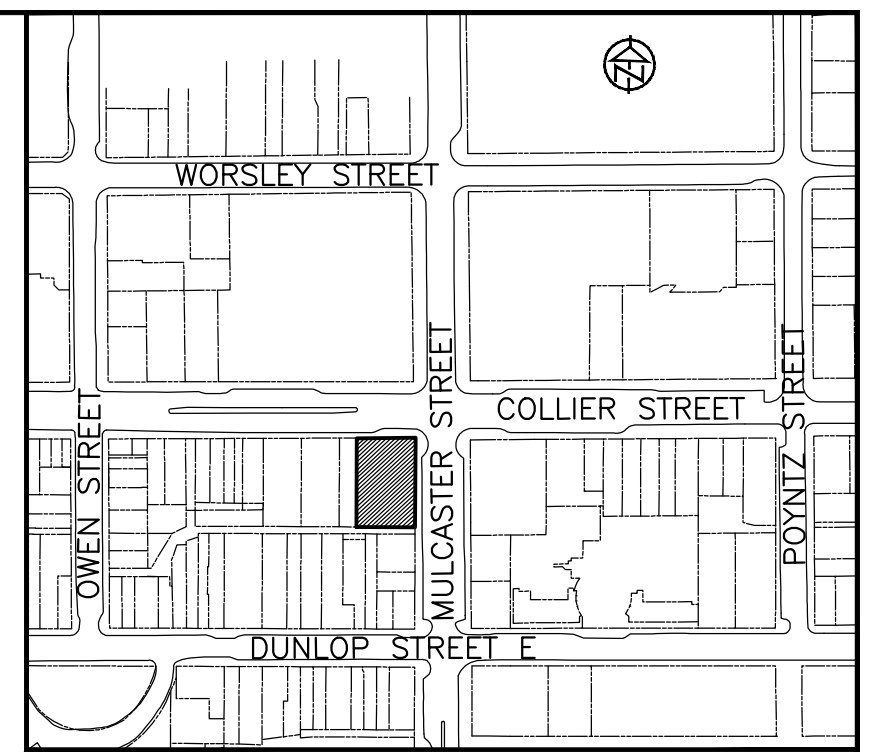
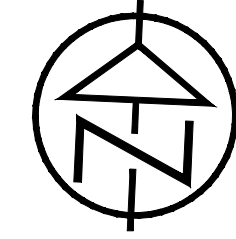
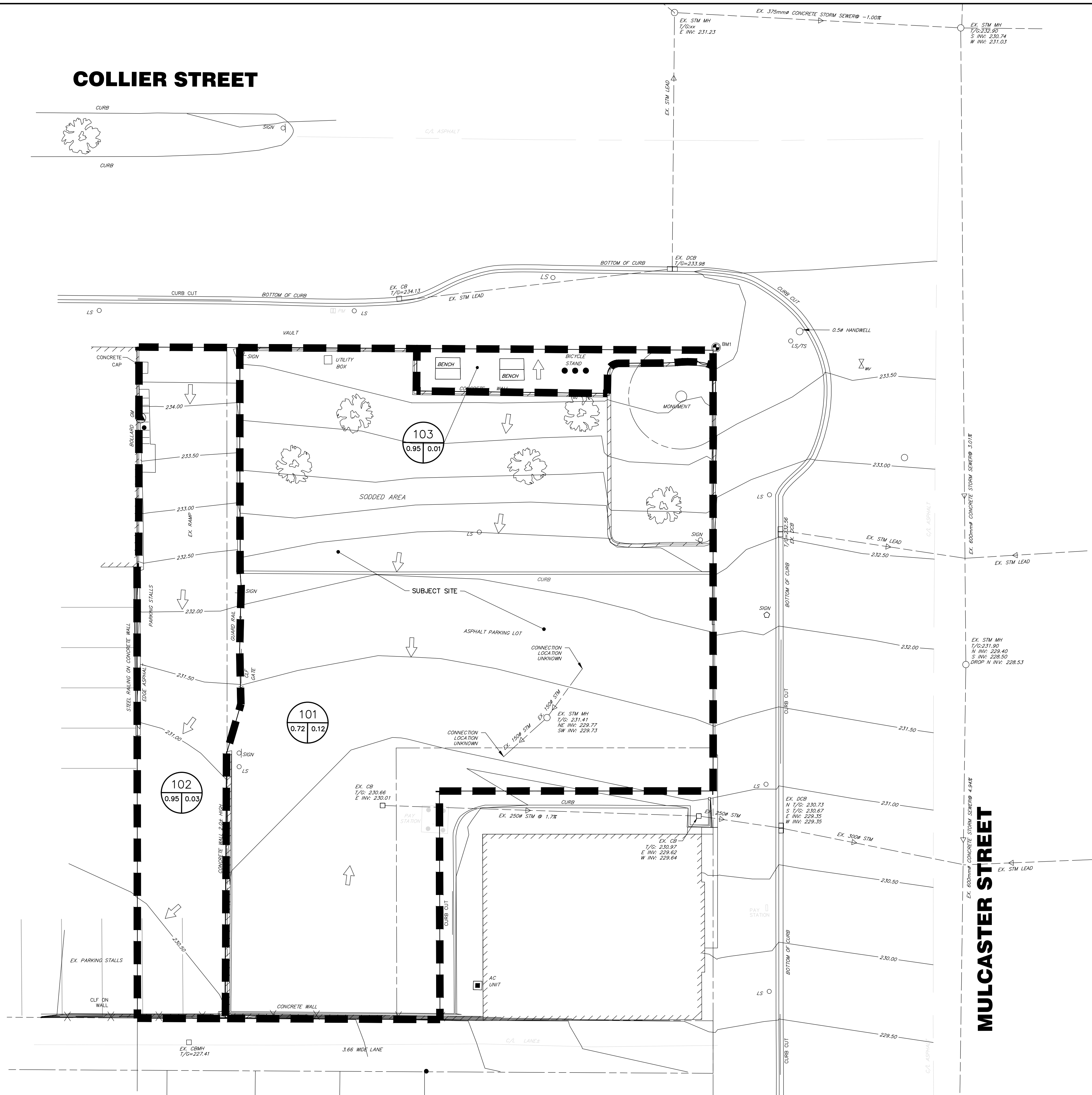
SITE GRADING PLAN



DESIGN: LCG	FILE: 420373	DWG:
DRAWN: LCG	DATE: SEPT 2020	SG-1
CHECK: NM	SCALE: 1:150	



COLLIER STREET



KEY PLAN
N.T.S.

LEGEND	
	PRE-DEVELOPMENT DRAINAGE AREA
	CATCHMENT ID
	AREA (Ha)
	RUNOFF COEFFICIENT
	EXISTING CONTOURS (0.50m INTERVALS)
	EXISTING PROPERTY LINES
	SUBJECT LANDS
	EXISTING OVERLAND FLOW DIRECTION
	EXISTING STORM SEWERS

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NORTHING: 4917039.523 EASTING: 607010.380

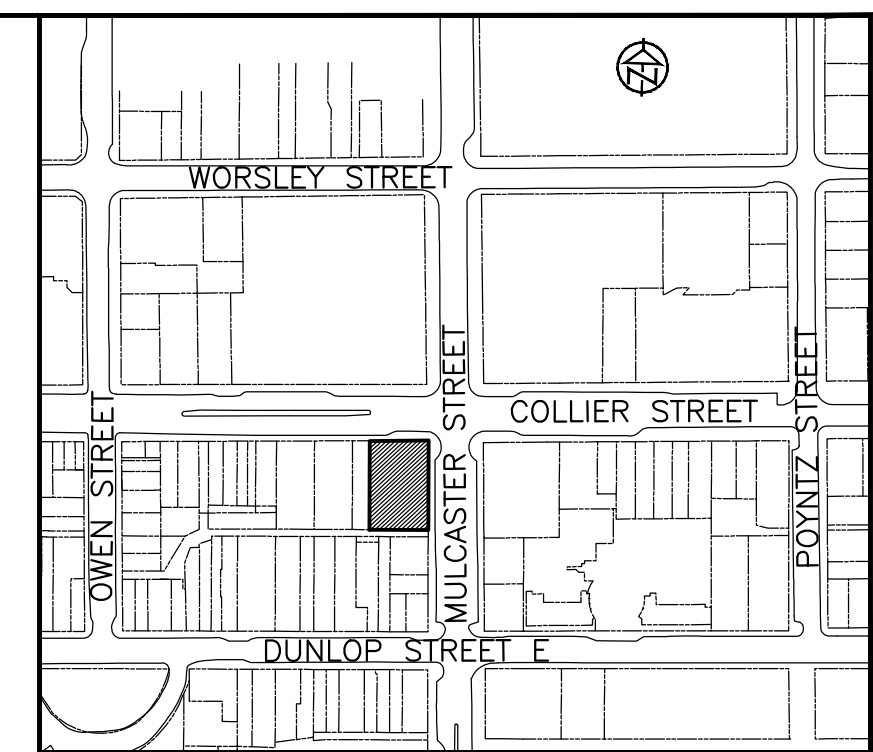
No.	REVISION DESCRIPTION	DATE
1.	SPA - 1ST SUBMISSION	SEPT 4/20
2.	SPA - 2ND SUBMISSION	JAN 13/21

ENGINEER STAMP

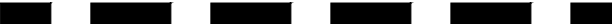
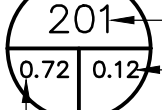
**BAYSIDE APARTMENTS
79 COLLIER STREET
CITY OF BARRIE**

**PRE-DEVELOPMENT
DRAINAGE PLAN**

		DWG: DP-1
DESIGN: LB	FILE: 420373	
DRAWN: LB	DATE: APRIL 2020	
CHECK: NM	SCALE: 1:150	

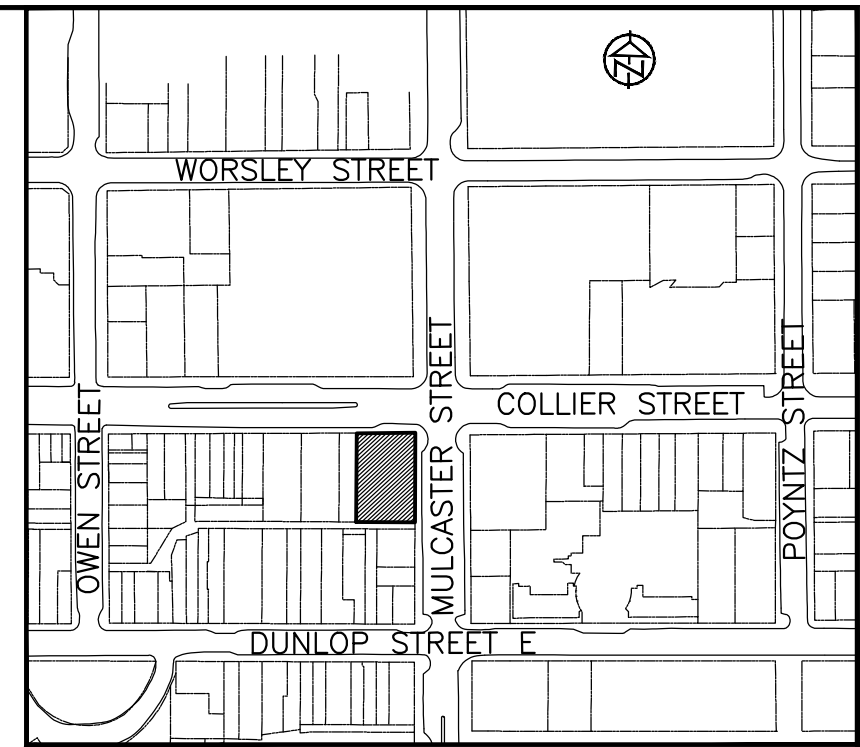
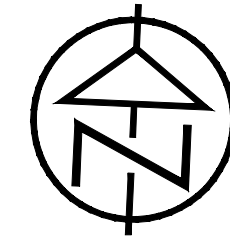
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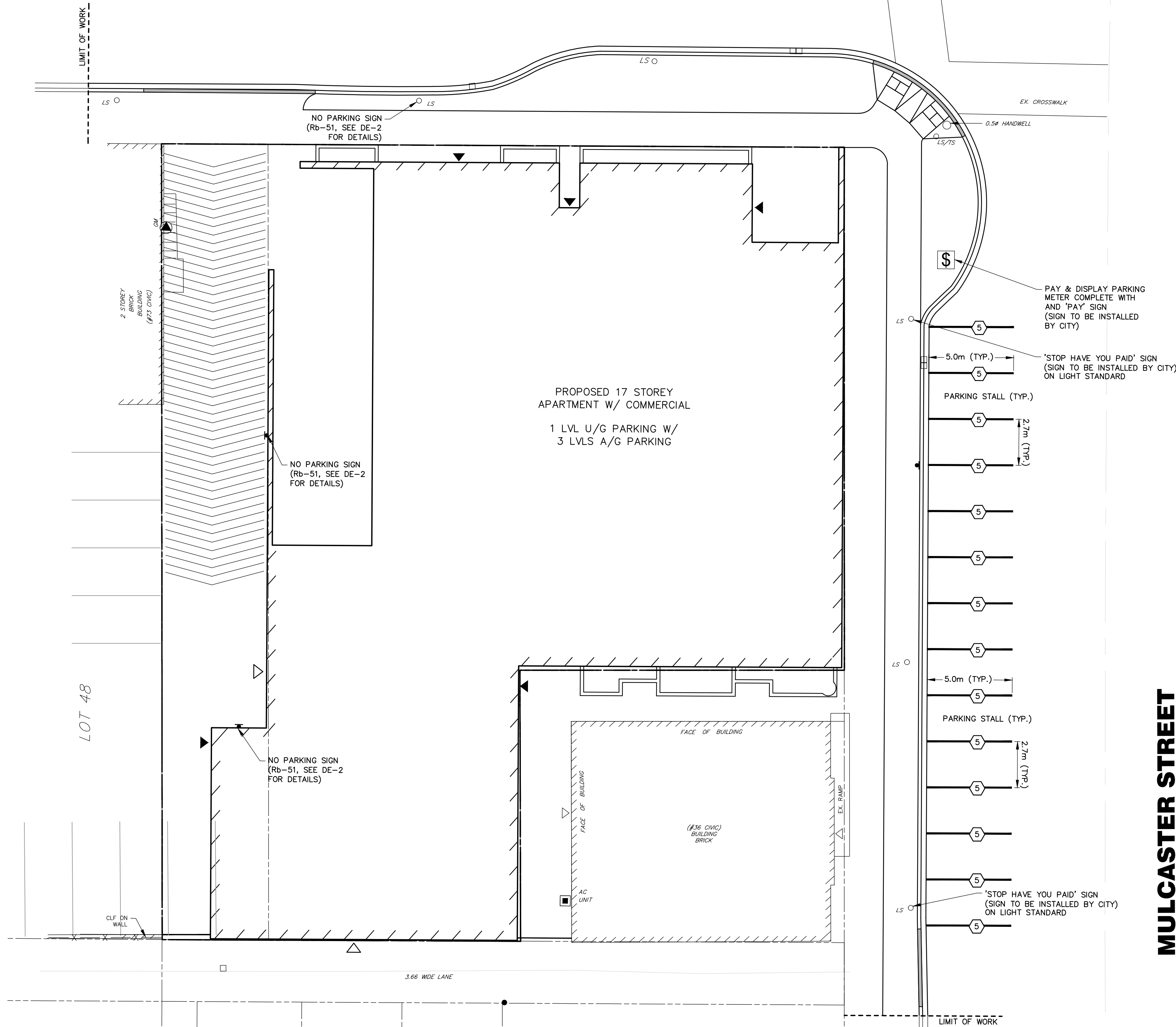
	POST DEVELOPMENT DRAINAGE AREA
	CATCHMENT ID
	AREA (Ha)
	RUNOFF COEFFICIENT
	EXISTING CONTOURS (0.50m INTERVALS)
	EXISTING PROPERTY LINES
	SUBJECT LANDS
	EXISTING OVERLAND FLOW DIRECTION
	PROPOSED OVERLAND FLOW DIRECTION
	EXISTING STORM SEWERS
	PROPOSED STORM SEWERS

Drawing Name: 420373-DP-2.dwg, Plotted: Jan 13, 2021

COLLIER STREET



KEY PLAN
N.T.S.



1	SOLID YELLOW,10cm
2	SOLID DOUBLE YELLOW,10cm
3	363 BROKEN YELLOW,10cm
4	SOLID YELLOW,20cm
5	SOLID WHITE,10cm
6	333 BROKEN WHITE,10cm
7	363 BROKEN WHITE,10cm
8	393 BROKEN WHITE,10cm
9	SOLID WHITE,20cm
10	111 BROKEN WHITE,10cm
11	333 BROKEN WHITE,20cm
12	333 BROKEN WHITE,30cm
13	SOLID WHITE,30cm
14	SOLID WHITE,45cm
15	SOLID WHITE,60cm
20	SYMBOLS
[]	LIMITS OF MARKINGS

- NOTES:
1. 333, 363, 393, Denotes Pavement Marking Spacing (ie., 3 m line, 3 m gap, 3 m line)
 2. ① Denotes PAVEMENT MARKING, PAINT
 3. [] Denotes PAVEMENT MARKING, TEMPORARY
 4. △ Denotes PAVEMENT MARKING, TEMPORARY-REMOVABLE
 5. ② Denotes PAVEMENT MARKING, DURABLE

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SITE PLAN PREPARED BY MCL ARCHITECTS DATED SEPT 1, 2020

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HORIZONTAL BENCHMARK: 03120040004 (2nd ORDER)
NORTHING: 4917039.523 EASTING: 607010.380

No.	REVISION DESCRIPTION	DATE
1.	SPA - 1ST SUBMISSION	SEPT 4/20
2.	SPA - 2ND SUBMISSION	JAN 13/21

ENGINEER STAMP



BAYSIDE APARTMENTS
79 COLLIER STREET
CITY OF BARRIE



PAVEMENT MARKING PLAN

DESIGN: LCG	FILE: 420373	DWG:
DRAWN: LCG	DATE: SEPT 2020	PM-1
CHECK: NM	SCALE: 1:150	

1. GRADE AND CROSSFALL ADJUSTMENT OF MAINTENANCE HOLE AND CATCH BASIN FRAMES WILL BE MADE USING PRODUCTS SPECIFICALLY MANUFACTURED FOR THAT PURPOSE.

2. ADJUSTMENT UNITS MUST BE CERTIFIED TO MEET ALL PERTINENT C.P.S. C.A. AND MTO-MCM UNITS, OR OTHER INDUSTRY GUIDELINES FOR MATERIALS, PERFORMANCE AND USE AS APPLICABLE.

3. ADJUSTMENT UNITS AND JOINTS WILL BE SEALED AND OR PROVED IN COMPLIANCE WITH MANUFACTURERS' SPECIFICATIONS AND GUIDELINES.

4. MORTAR IS USED FOR LEVELING OF PRECAST UNITS ONLY. THE THICKNESS OF MORTAR WILL BE 10mm TO FILL ALL Voids CREATED BY IRREGULARITIES IN THE PRECAST UNITS TO ENSURE AN EVEN SURFACE ONLY.

Barrie

STANDARD DETAIL

GENERAL NOTES
ROADWORKS

REV. NO. 1

DATE: OCT 2017

SCALE: N.T.S.

APPROVED

BSD-N2

Director of Engineering

Barrie

STANDARD DETAIL

TYPICAL TRENCH RESTORATION

REV. NO. 1

DATE: OCT 2017

SCALE: N.T.S.

APPROVED

BSD-330

Director of Engineering

Barrie

STANDARD DETAIL

MAINTENANCE HOLE AND CATCH BASIN
ADJUSTMENT UNITS

REV. NO. 3

DATE: NOV 2019

SCALE: N.T.S.

APPROVED

BSD-41

Director of Engineering

Barrie

STANDARD DETAIL

MAINTENANCE HOLE AND CATCH BASIN
ADJUSTMENT UNITS

REV. NO. 3

DATE: NOV 2019

SCALE: N.T.S.

APPROVED

BSD-41

Director of Engineering

KEY PLAN
N.T.S.

City of Barrie

STANDARD DETAIL

GENERAL NOTES - WATERMAIN

REV. NO. 2

DATE: MAY 2015

SCALE: N.T.S.

APPROVED

BSD-500

Director of Engineering

Barrie

STANDARD DETAIL

CITY OF BARRIE STANDARD
CONSTRUCTION
ENTRANCE MAT

REV. NO. 1

DATE: OCT 2017

SCALE: N.T.S.

APPROVED

BSD-23D

Director of Engineering

Barrie

STANDARD DETAIL

SILTATION CONTROL
FENCING

REV. NO. 2

DATE: OCT 2017

SCALE: N.T.S.

APPROVED

BSD-1233

Director of Engineering

City of Barrie

STANDARD DETAIL

GENERAL NOTES - STORM SEWER

REV. NO. 1

DATE: MAY 2015

SCALE: N.T.S.

APPROVED

BSD-500

Director of Engineering

City of Barrie

STANDARD DETAIL

GENERAL NOTES

REV. NO. 1

DATE: MAY 2015

SCALE: N.T.S.

APPROVED

BSD-500

Director of Engineering

City of Barrie

STANDARD DETAIL

GENERAL NOTES
SANITARY SEWERS

REV. NO. 1

DATE: MAY 2015

SCALE: N.T.S.

APPROVED

BSD-500

Director of Engineering

Barrie

STANDARD DETAIL

TYPICAL SERVICE ENTRY
100mm TO 300mm
DIAMETER PIPE

REV. NO. 1

DATE: FEB 2015

SCALE: N.T.S.

APPROVED

BSD-505

Director of Engineering

Barrie

STANDARD DETAIL

Typical Meter Installation for
Domestic Services Requiring
By-passes

REV. NO. 3

DATE: MAY 2019

SCALE: N.T.S.

APPROVED

BSD-533

Director of Engineering

Barrie

STANDARD DETAIL

Tracer Wire Detail

REV. NO. 3

DATE: MAY 2019

SCALE: N.T.S.

APPROVED

BSD-515

Director of Engineering

Barrie

STANDARD DETAIL

TYPICAL 100mm SUBDRAIN
DETAIL

REV. NO. 1

DATE: APR 2019

SCALE: N.T.S.

APPROVED

BSD-315

Director of Engineering

Barrie

STANDARD DETAIL

Standard Hydrant and
Valve Installation

REV. NO. 2

DATE: APR 2019

SCALE: N.T.S.

APPROVED

BSD-507

Director of Engineering

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No. REVISION DESCRIPTION DATE ENGINEER STAMP

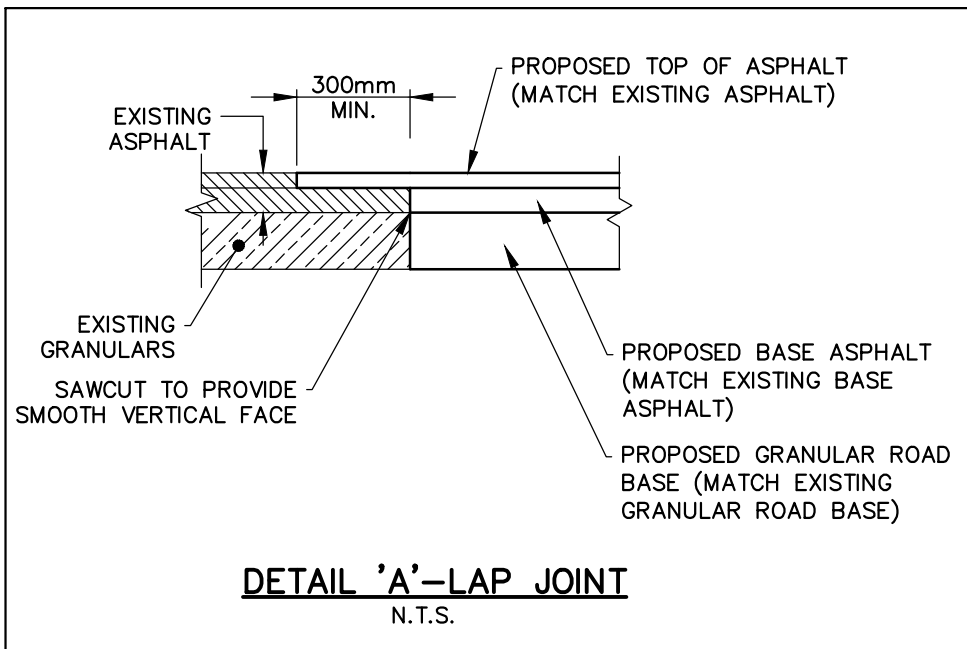
1.	SPA - 1ST SUBMISSION	SEPT 4/20	
2.	SPA - 2ND SUBMISSION	JAN 13/21	

BAYSIDE APARTMENTS
79 COLLIER STREET
CITY OF BARRIE

DETAILS

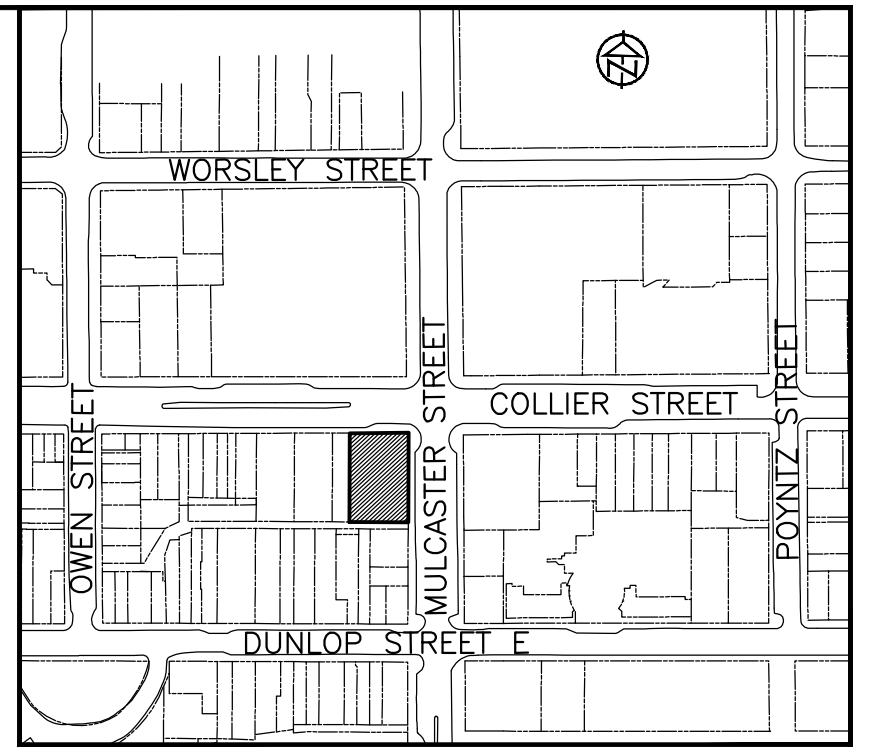
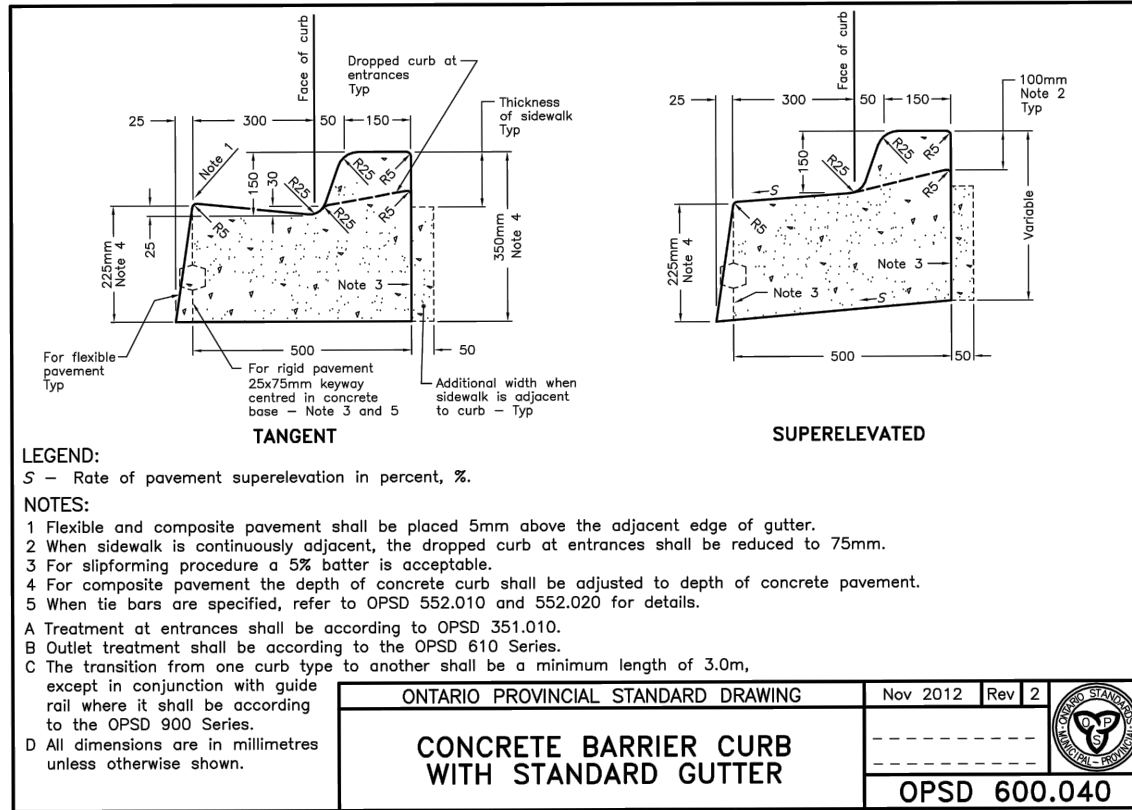
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DRAWN: LCG	DATE: SEPT 2020	DE-1
CHECK: NM	SCALE: 1:150	

Drawing Name: 420373-DE-1.dwg, Plotted: Jan 12, 2021

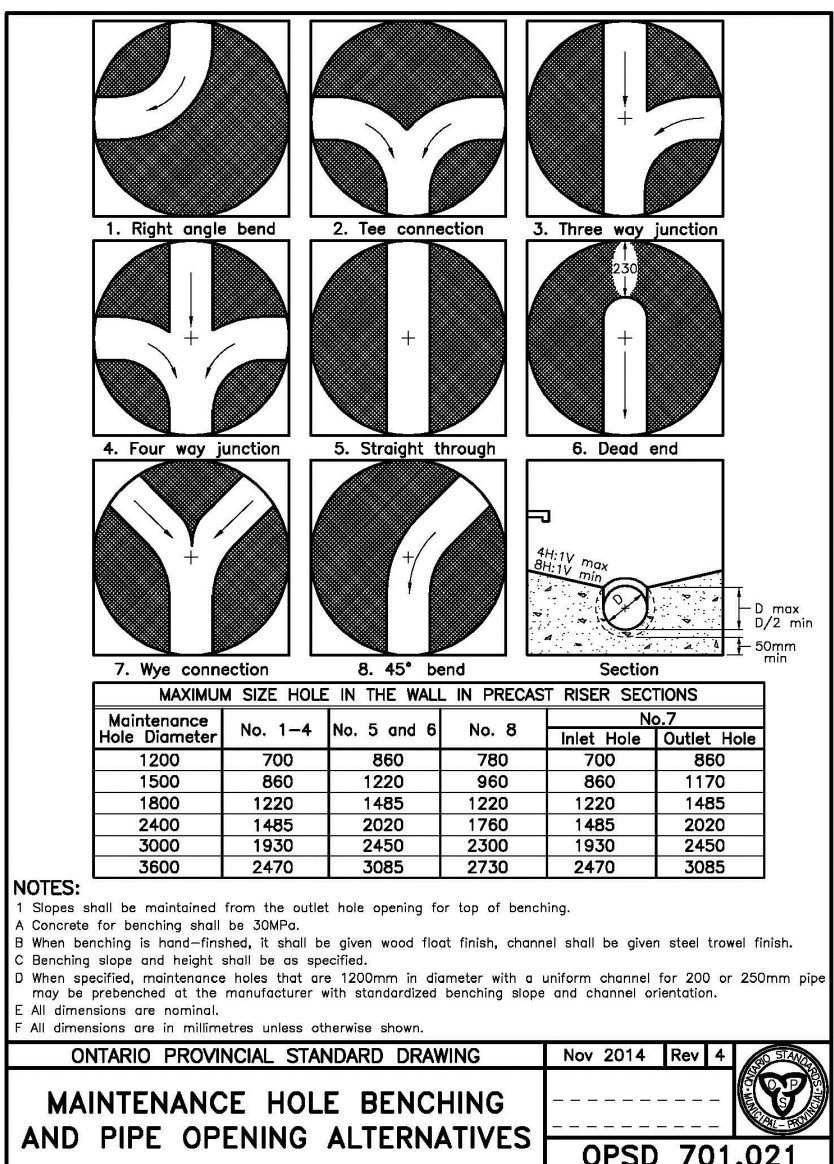
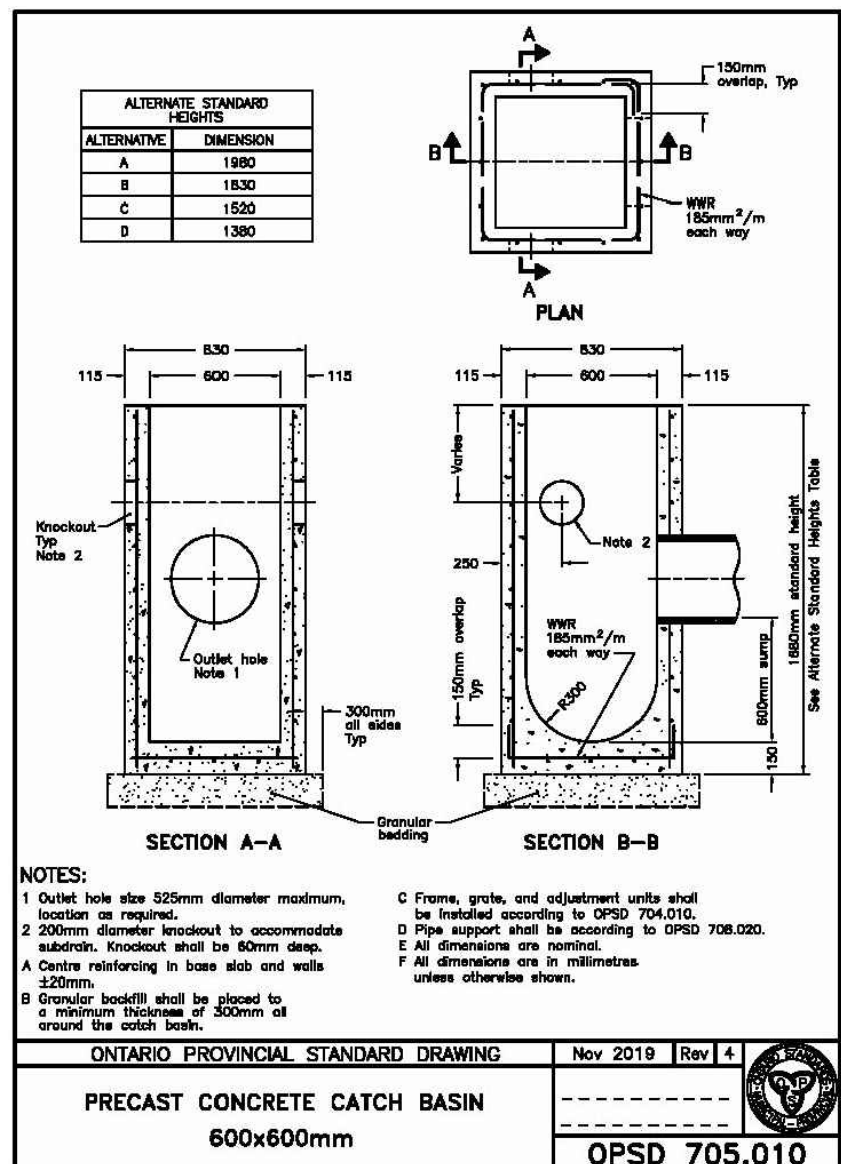
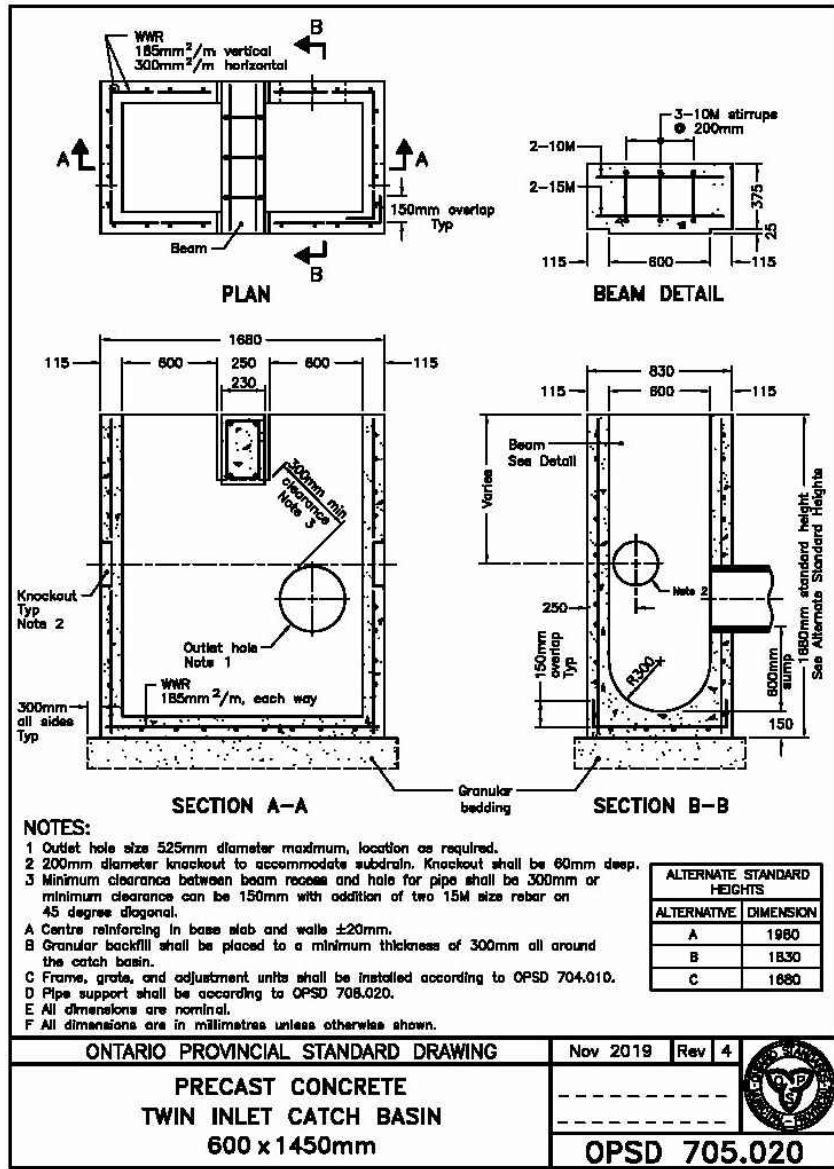
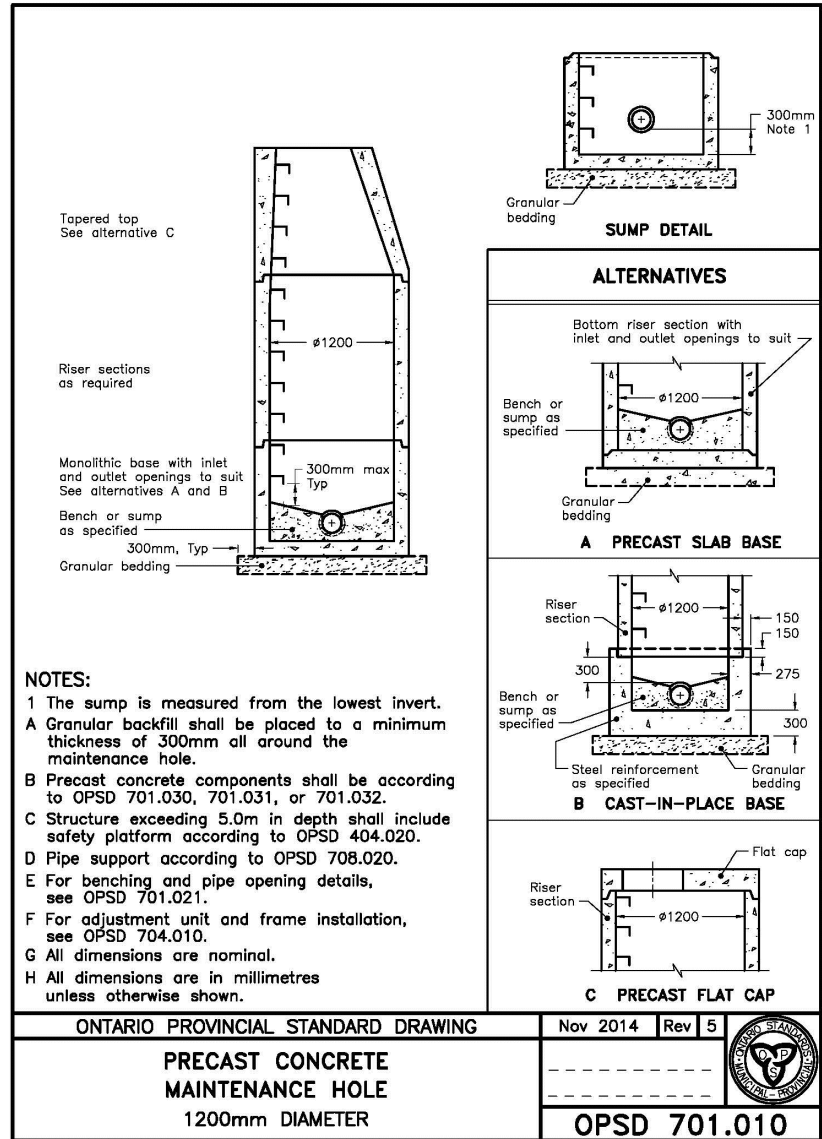


NO PARKING Sign
Rb-51 30 cm x 30 cm
Rb-151 60 cm x 60 cm
Font N/A
Colour Interdictory Symbol - Red Reflective
Legend & Border - Black
Background - White Reflective

NO PARKING (Rb-51) TO BE INSTALLED IN ACCORDANCE WITH THE ONTARIO TRAFFIC MANUAL



KEY PLAN
N.T.S.



STORM SEWER DESIGN SHEET (5-YEAR STORM)

Location - 79 Collier Street
Municipality - Barrie
Project No. - 420373
Designed By - LB
Date - August 6, 2020
Revised By - DJR
Date - January 5, 2021
Checked - NM

IDF Curve Coefficients			
Storm	A	B	C
2 Year	-	-	-
5 Year	853.600	4.700	0.766
25 Year	-	-	-
100 Year	-	-	-

Manning's Coefficient	
CSP	0.024
Conc.	0.013
PVC	0.013

PHASE	LOCATION OF SECTION	AREA LABEL	UPSTREAM MAINTENANCE HOLE	DOWNSTREAM MAINTENANCE HOLE	TRIBUTARY AREA - A	RUNOFF COEFFICIENT - C	INDIVIDUAL A x C	CUMULATIVE AREA	CUMULATIVE A x C	TIME OF CONCENTRATION	RAINFALL INTENSITY	PEAK FLOW	MANING'S ROUGHNESS COEFFICIENT	LENGTH	SLOPE	DIAMETER	FULL FLOW VELOCITY	FULL FLOW CAPACITY	ACTUAL VELOCITY	TIME OF FLOW	CALCULATED PIPE DIAMETER	TIME OF CONCENTRATION
			MH No.	MH No.	ha					min.	mm/hr	cms		m	m/m	mm	m/s	cms	m/s	min	mm	min
	From Site			Prop. STMMH1	0.160	0.95	0.152	0.160	0.152	10.00	108.92	0.063	0.013	15.9	0.0200	300	1.93	0.137	1.77	0.15	224	10.15
	Existing Storm Sewer as per City of Barrie As-Built (1985-001-007)		EX. STMMH	EX. STMMH									0.013	44.0	0.0490	600	4.81	1.359	0.00			

Notes:
Peak flow shown is 5-year peak flow rate as per Rational Method Design Calculations Sheet for Catchment 201



SANITARY SEWER DESIGN SHEET

Location - 79 Collier Street
Municipality - Barrie
Project No. - 420373
Designed By - LB
Date - August 6, 2020
Revised By - DJR
Date - January 5, 2021
Checked - NM

LAND USE		AVERAGE FLOW		PEAKING FACTOR	
RESIDENTIAL	COMMERCIAL	PEOPLE/UNIT (HIGH DENSITY)	INFILTRATION	RESIDENTIAL	COMMERCIAL
225	28	1.67	0.10	L/cap/d	m³/ha/day
				cap/unit	L/ha/s

LOCATION OF SECTION	AREA LABEL	FROM UPSTREAM	TO DOWNSTREAM	NUMBER OF UNITS	POPULATION	CUMULATIVE POP.	PEAKING FACTOR	COMMERCIAL AREA	SITE AREA	CUMULATIVE AREA	AVERAGE FLOW				PEAK FLOW				PROPOSED SEWER					
											RESIDENTIAL	COMMERCIAL	INFILTRATION	TOTAL	RESIDENTIAL	COMMERCIAL	INFILTRATION	TOTAL	LENGTH	DIAMETER	GRADE	FULL FLOW CAP.	FULL FLOW VELOCITY	PEAK FLOW VELOCITY
		MH #	MH #	Ea.	CAP.	CAP.		ha	ha	ha	l/s	l/s	l/s	l/s	l/s	l/s	l/s	l/s	m	mm	%	l/s	m/s	m/s
Bayside Apartments	A1	N/A	Prop. SANMH	136	227	227	4.13	0.04	0.16	0.16	0.59	0.01	0.02	0.62	2.44	0.01	0.02	2.47	11.6	250	2.00%	84.09	1.71	0.76
Existing Sanitary Sewer (Based on Available As-Built Drawing 1985-001-007)																								
		EX. SANMH	EX. SANMH																	250	5.90%	144.43	2.94	0.00



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DRAWING REFERENCES

SURVEY INFORMATION SHOWN ON THIS PLAN PREPARED BY C.A. MACDONALD SURVEYING INC., RECEIVED MARCH 31, 2020.
SITE PLAN PREPARED BY MCL ARCHITECTS DATED SEPT 1, 2020

BENCHMARKS

B.M1: TOP OF CONCRETE PIN
ELEVATION: 234.09
VERTICAL BENCHMARK: 00119673109 (2nd ORDER)
ELEVATION: 220.21
HORIZONTAL BENCHMARK: 00119673109 (2nd ORDER)
NORTHING: 4915700.133 EASTING: 604482.056
HORIZONTAL BENCHMARK: 03120040004 (2nd ORDER)
NORTHING: 4917039.523 EASTING: 607010.380

No.	REVISION DESCRIPTION	DATE
1.	SPA - 1ST SUBMISSION	SEPT 4/20
2.	SPA - 2ND SUBMISSION	JAN 13/21

ENGINEER STAMP



BAYSIDE APARTMENTS
79 COLLIER STREET
CITY OF BARRIE

DETAILS



DESIGN: LCG	FILE: 420373	DWG:
DRAWN: LCG	DATE: SEPT 2020	DE-2
CHECK: NM	SCALE: 1:150	