



Enhancing our communities



17 Jacobs Terrace, City of Barrie

FUNCTIONAL SERVICING REPORT

Tonlu Holdings Ltd.

Document Control

File:

421391

Date:

August
19, 2021

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Issue	Date	Description
0	July 19, 2021	Issued for Client Review
1	August 19, 2021	Issued for ZBA (First Submission)

Document Contents

1	Introduction	1
1.1	Site Description & Surrounding Land Use.....	1
1.2	Proposed Development.....	1
1.3	Objectives	2
1.4	Guidelines & Background Information	2
1.5	Jacobs Terrace Reconstruction.....	3
2	Water Supply & Distribution	4
2.1	Existing Water System	4
2.2	Proposed Water System	4
2.3	Proposed Demands	4
2.4	Fire Protection	5
3	Sanitary Sewer Collection	6
3.1	Existing Sanitary System	6
3.2	Proposed Sanitary System	6
3.3	External Sanitary System	7
4	Preliminary Stormwater Management Plan	8
4.1	Design Criteria	8
4.2	Existing Conditions.....	9
4.3	Proposed Conditions	9
4.4	SWM Facility Maintenance	11
5	Siltation & Erosion Control Plan	12
6	Grading & Landscaping	13
7	Utilities.....	14
8	Summary.....	15



8.1	Water Supply & Distribution.....	15
8.2	Sanitary Sewer Collection	15
8.3	Stormwater Management Plan.....	15
8.4	Siltation & Erosion Control	15
8.5	Grading & Landscaping	15
8.6	Utilities	15

Tables

Table 1: Pre-Development Peak Flow Rates	9
Table 2: Post-Development Peak Flow Rates	10
Table 3: Phosphorous Loading Summary	11

Figures

Figure 1: Site Location Plan	2
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Appendices

Appendix A: Site Plan
Appendix B: Water Demand Calculations
Appendix C: Sanitary Sewage Design Calculations
Appendix D: Stormwater Management Calculations
Appendix E: Phosphorous Budget Calculations
Appendix F: Drawings



1 Introduction

Tatham Engineering Limited (Tatham) has been retained by Tonlu Holdings Ltd. to prepare a Functional Servicing Report (FSR) in support of a Zoning By-Law Amendment (ZBA) application in support of the redevelopment of 17 Jacobs Terrace located in the City of Barrie (City).

This report presents a municipal servicing strategy, covering:

- Water supply and distribution;
- Sanitary sewage collection;
- Drainage and stormwater management;
- Grading and landscaping; and
- Utility servicing.

1.1 SITE DESCRIPTION & SURROUNDING LAND USE

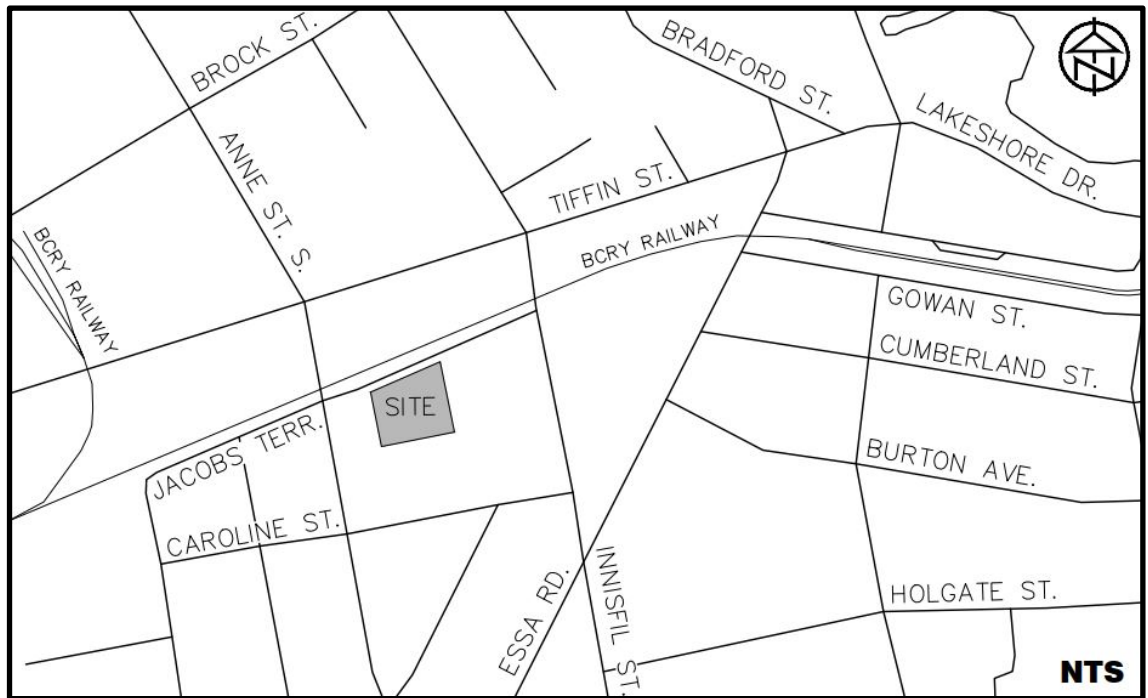
The site is located approximately 50 m east of the existing signalized intersection of Anne Street South and Jacobs Terrace and it is bound by Jacobs Terrace to the north, existing industrial buildings to the east and west, and existing development along Caroline Street to the south. The location of the property is illustrated on the Site Location Plan (Figure 1), overleaf. Under existing conditions, the site consists of a gravel parking lot with an existing commercial business. The total site area is approximately 0.91 ha. The site topography is generally flat with slopes of approximately 1% towards the northeast.

1.2 PROPOSED DEVELOPMENT

The proposed development consists of two towers (24 and 26 storeys) with a total of 565 residential units and 580 parking spaces. There will also be workspace on the ground floor of the west tower and a community space on the ground floor of the east tower. The development will be accessed from Jacobs Terrace. The proposed site plan is provided in Appendix A.

The proposed development will be serviced by municipal water, sanitary, and stormwater systems. 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.



Figure 1: Site Location Plan

1.3 OBJECTIVES

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

1.4 GUIDELINES & BACKGROUND INFORMATION

This report has been 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 Guidelines* (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.

1.5 JACOBS TERRACE RECONSTRUCTION

It is our understanding the Jacobs Terrace Right-of-Way (ROW) between Innisfil Street and Anne Street South will be reconstructed prior to, or part of, the subject development. It is anticipated the reconstruction will include new/extended watermain, sanitary and storm services. As the preliminary or detailed design of this reconstruction has not yet been prepared, the servicing scheme presented in this report and as depicted on the Preliminary Site Servicing Plan (Drawing SS-1) is conceptual and will be confirmed during detailed design.



2 Water Supply & Distribution

2.1 EXISTING WATER SYSTEM

The site is located in an area of the City which is serviced by the municipal water system. There is an existing 150 mm dia. watermain on Jacobs Terrace extending from Innisfil Street, which provides water supply and fire protection for the area. There is one existing fire hydrant located at the southwest corner of the intersection of Innisfil Street and Jacobs Terrace (approximately 100 m from the subject site).

2.2 PROPOSED WATER SYSTEM

The proposed development will be serviced with a 150 mm dia. domestic water service and a dedicated 150 mm dia. fire service provided to the buildings. The existing 150 mm dia. watermain within Jacobs Terrace will be extended to the frontage of the property to provide these services. An additional fire hydrant will also be provided on site. Additional information is provided on the Preliminary Site Servicing Plan (Drawing SS-1) provided in Appendix F. The final water system design will be confirmed during the detailed design stage, in conjunction with the detailed design of Jacobs Terrace reconstruction.

2.3 PROPOSED DEMANDS

The estimated population for the proposed development is 965 persons (applying the high-density unit population factor of 1.67 persons per unit as per the City's engineering standards). Demands generated by the workspace and community space have been estimated by applying a rate of 28 m³/ha/day for 643 m² 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.

The estimated water system demands are:

- Average Day Demand (ADD), Residential: 966 persons x 225 L/person/day = 206,775 L/day = 2.46 L/s;
- Average Day Demand (ADD), Community Area: 643 m² x 28 m³/ha/day = 1,800 L/day = 0.02 L/s;
- Maximum Daily Demand (MDD), Residential + Community Area: 208,575 L/day x 2.75 = 573,581 L/day = 6.81 L/s; and
- Peak Hourly Demand (PHD) Residential + Community Area: 208,575 L/day x 4.13 = 861,415 L/day = 10.23 L/s.



2.4 FIRE PROTECTION

Firefighting water demands have been estimated for the site using Water Supply Public Fire Protection (1999) prepared by the Fire Underwriters Survey (FUS). The required fire flow has been estimated at 117 L/s. Detailed calculations provided in Appendix B.

A fire hydrant flow test was conducted using two nearby fire hydrants located at Jacobs Terrace and Innisfil 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 2,040 USgpm (128.50 L/s), which is greater than the required maximum water demand of 123.81 L/s (MDD + fire flow).

Details of the internal sprinkler systems 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 EXISTING SANITARY SYSTEM

The site is located in an area of the City 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.

Currently, the existing sanitary sewer on Jacobs Terrace terminates at the neighbouring property, approximately 50 m from the subject site. The existing 300 mm dia. sanitary sewer will be extended approximately 75 m to the frontage of the site. The existing sewer connects downstream to an existing 300 mm dia. sanitary sewer located on Innisfil Street, which then collects and conveys flows north to the existing 750 mm dia. Hotchkiss Creek sanitary trunk sewer. The trunk sewer conveys sewage flows towards the Barrie WWTF. This is depicted in Drawing SAN-1 provided in Appendix F. The existing 300 mm dia. sewer on Innisfil Street, which conveys flows to the trunk sewer, has a full flow capacity of 97.84 L/s. This is calculated in the Sanitary Sewer Design Sheet provided in Appendix C.

3.2 PROPOSED SANITARY SYSTEM

The proposed development will discharge sanitary sewage to the future 200 mm dia. sanitary sewer on Jacobs Terrace via a new 200 mm dia. sanitary service from the site. A sanitary maintenance hole will be provided on the property line to provide a sampling location, as per City standards and is depicted on Drawing SS-1.

The full flow capacity of the 200 mm dia. sanitary service lateral is 24.30 L/s, which can accommodate the design peak flow rate of 9.38 L/s from the proposed development as per calculations provided below. Peak flows have been estimated as per the following:

- Average Day Design Flow, Residential: $1.67 \text{ ppu} \times 550 \text{ units} = 966 \text{ persons} \times 225 \text{ L/cap/day} = 206,775 \text{ L/day} = 2.46 \text{ L/s}$;
- Average Day Design Flow, Community Area: $643 \text{ m}^2 \times 28 \text{ m}^3/\text{ha/day} = 1800 \text{ L/day} = 0.02 \text{ L/s}$; and
- Peak Hour Flow (incl. infiltration and community area) = $801,792 \text{ L/day} = 9.52 \text{ L/s}$.

Therefore, there is satisfactory capacity in the proposed service connection to service the development, as shown in the Sanitary Sewer Design Sheet.



3.3 EXTERNAL SANITARY SYSTEM

At the request of the City, we have completed a capacity analysis of the existing sanitary system from the proposed site to the Hotchkiss Creek sanitary trunk sewer. The analysis includes all existing developments, the proposed development, and the future development located at 272 Innisfil Street.

The peak flow contributing to this section of sanitary sewer on Innisfil Street is 13.47 L/s which includes the proposed development at 17 Jacobs Terrace, the future development at 272 Innisfil Street and the existing properties. Therefore, there is sufficient capacity within the existing sanitary sewer in Innisfil Street to convey flows to the existing 750 mm sanitary trunk sewer at Hotchkiss Creek. Additional details are provided on Drawing SAN-1 and calculations are provided in Appendix C.



4 Preliminary Stormwater Management Plan

4.1 DESIGN CRITERIA

This preliminary 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

Water quality controls must be provided to satisfy the MECP's Stormwater Management Practices Planning and Design Manual. This corresponds to providing Enhanced Protection Level water quality protection of 80% total suspended solids (TSS) removal.

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 future Jacobs Terrace storm sewers, 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. Therefore, best efforts must be demonstrated to maintaining pre-development infiltration rates in the post-development scenario through the completion of a water balance assessment.

A water balance assessment has been completed by DS Consultants Ltd. as part of the Hydrogeological Investigation.

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 0.91 ha site drains north via overland flow towards the Jacobs Terrace right-of-way. The site has been modelled as Catchment 101 with a runoff coefficient of 0.84. Existing drainage patterns are shown on the Pre-Development Drainage Plan (Drawing DP-1) provided in Appendix F.

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	NORTHEAST OUTLET (CATCHMENT 101) [m ³ /s]
2-Year	0.18
5-Year	0.23
10-Year	0.27
25-Year	0.35
50-Year	0.42
100-Year	0.46

4.3 PROPOSED CONDITIONS

Under proposed conditions, the total impervious area of the site decreases from 0.79 ha to 0.75 ha. The site has been modeled as Catchment 201 with a runoff coefficient of 0.77. Runoff generated from Catchment 201 will be collected internally and will discharge to a future Jacobs Terrace storm sewer.

Proposed drainage patterns are shown on the Post-Development Drainage Plan (Drawing DP-2) provided in Appendix F.

4.3.1 Water Quantity

As all site generated runoff (Catchment 201) will discharge to the future storm sewer network, the modified rational method was used to quantify the storage volume required to control the post-development peak flow rates to the 5-year pre-development release rate (expected to be the capacity of the proposed Jacobs Terrace storm sewer). 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

DESIGN STORM	CATCHMENT 201 (CONTROLLED) [m ³ /s]	STORAGE VOLUME REQUIRED [m ³]
2-Year	0.09 (<i>0.18</i>)	50.4
5-Year	0.11 (<i>0.23</i>)	68.7
10-Year	0.13 (<i>0.27</i>)	79.3
25-Year	0.18 (<i>0.35</i>)	95.4
50-Year	0.20 (<i>0.42</i>)	122.0
100-Year	0.23 (<i>0.46</i>)	146.0

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

As shown, a maximum storage volume of 146.0 m³ is required to control post-development flow rates from the 100-year storm to the 5-year pre-development release rate (0.23 m³/s). The required storage will be provided by an underground stormwater storage system located beneath the landscaping area between the building entrances. Collected runoff (not including greywater) will be controlled to the maximum permissible release rate (0.23 m³/s) via the 350 mm dia. outlet pipe.

Attenuated peak flows will discharge via a 450 mm dia. storm sewer connection to the proposed storm sewer within Jacobs Terrace, 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.

4.3.2 Water Quality

Enhanced level water quality control (corresponding to 80% TSS removal) is required for the site. Water quality controls will be provided for Catchment 201 via a jellyfish filter unit. The jellyfish filter unit is located immediately downstream of the underground stormwater storage unit and has been sized to provide 89% TSS removal. Sizing calculations have been provided in Appendix D.

4.3.3 Phosphorous Budget

In order to comply with LSPOP requirements, a phosphorous budget for the site has been completed using the loading rates and removal efficiencies from the MECP Phosphorous Budget tool through a spreadsheet method, summarized below in Table 3.



Existing Conditions

Under existing conditions, the site has been modelled as a single land use category (high intensity development – commercial/industrial) for the purpose of the phosphorous budget calculations.

Applying the relevant loading rate of 1.82 kg/ha/year, the pre-development phosphorous load is 1.66 kg/year.

Proposed Conditions

Under proposed conditions, the site has also been modelled as a single land use category (high intensity development – residential) with a loading rate of 1.32 kg/ha/year. The proposed site will include an underground stormwater storage system (25% removal efficiency) and a jellyfish filter unit (59% removal efficiency), resulting in a total removal efficiency of 69.25%.

Applying the relevant loading rate, the post-development phosphorous load with controls is 0.3 kg/year.

A summary of the phosphorous loading rates for each scenario is provided in Table 3. Additional details and outputs are provided in Appendix E. As shown, phosphorous loading is reduced under proposed conditions.

Table 3: Phosphorous Loading Summary

SCENARIO	AREA (ha)	PHOSPHOROUS LOADING (kg/year)
Pre-Development	0.91	1.66
Post-Development (Without Controls)	0.91	1.20
Post Development (With Controls)	0.91	0.37

4.4 SWM FACILITY MAINTENANCE

Ongoing maintenance of SWM facilities is necessary to ensure continued effectiveness. The storage tank and jellyfish filter unit should be inspected regularly and particularly after large rainfall events to ensure the system and all 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 will be provided during detailed design and are summarized as follows:

- Heavy duty silt control fences will be erected to control sediment movement to abutting properties and the Jacobs Terrace right-of-ways;
- A stone mud mat will be installed at the construction entrances from Jacobs Terrace; 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 Preliminary Site Grading Plan (Drawing SG-1) provided in Appendix F for additional details.



7 Utilities

We have requested comment from all relevant utility companies (Alectra, Bell, Rogers and Enbridge) to confirm utility servicing is available for the proposed development. We are awaiting responses, but do not expect issues related to utility servicing for 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 150 mm dia. fire service from the existing 150 mm dia. watermain on Jacobs Terrace.

8.2 SANITARY SEWER COLLECTION

The site will be serviced via a 200 mm dia. sanitary sewer lateral connected to a future 200 mm dia. sanitary sewer on Jacobs Terrace. There is sufficient capacity in downstream existing sewers to convey sewage flow to the Hotchkiss Creek trunk sewer.

8.3 STORMWATER MANAGEMENT PLAN

The preliminary SWM plan demonstrates the proposed development will not result in negative impacts with respect to stormwater. Post-development peak flows will be controlled to the existing 5-year flow rates via an underground stormwater storage system. Controlled runoff from the site will be conveyed to the future storm sewer on Jacobs Terrace. Water quality controls will be provided by the underground stormwater storage system and a jellyfish filter unit.

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

We have requested comment from all relevant utility companies (Alectra, Bell, Rogers and Enbridge) to confirm servicing availability and are awaiting responses.



Appendix A: Site Plan

Appendix B: Water Demand Calculations



Project:	17 Jacobs Terrace	Date:	June 19, 2021
File No.:	421391	Designed:	JLM
Subject:	Water Demand Calculations	Checked	DJR
Revisions:			

17 Jacobs Terrace Mixed-Use Development

Residential

Number of Units =	565	units
Population per Unit =	1.67	ppu
Population =	944	persons
Domestic Water Demand =	225	L/person/day
Average Daily Demand (Residential)=	212,299	L/day
	2.46	L/s

Commercial

Commercial Area	643	m ²
Commercial Daily Water Demand	28	m ³ /ha/day
Average Daily Demand (Commercial)	1,800.40	L/day
	0.02	L/s

Total Average Daily Demand (Residential + Commercial) =	214,099	L/day
	2.48	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 =	588,773	L/day
	6.81	L/s

Peak Hourly Demand =	884,229	L/day
	10.23	L/s



Project:	17 Jacobs Terrace	Date:	June 19, 2021
File No.:	421391	Designed:	JLM
Subject:	Preliminary Fire Flow Calculations	Checked:	DJR
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		295				
			Other (Comm. Ind., etc.)	1		0				
2.1	Number of Storeys	Number of Floors / Storeys in the unit (do not include basement)					26	Storeys	N/A	
3	Floor Area	Largest Floor Area				1587	m ²	N/A		
		Ground Floor Area = Largest Floor + 25% of 2 immediately adjoining floors	Square Feet (ft2)	0.093	Square metres	2257				
			Square Metres (m²)	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	8,000		
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	(1,200)
			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	(2,400)
			None		0					
5.3	Separation Distance Between Units	Exposure distance between units	North Side		20.1-30	0.1	0.45	m	0	3,060
			East Side		10.1 - 20	0.15				
			South Side		20.1-30	0.1				
			West Side		20.1-30	0.1				
Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:									0	7,000
6	Required Fire Flow, Duration and Volume	Total Required Fire Flow (above) in L/s:							0	117
		Required Duration of Fire Flow of 7,000 L/min (hrs):						2.25		
		Required volume for Fire Flow of 7,000 L/min (m³):						945		

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

70-20 =

68-72 =

408

50

2

GPM from Fire Flow Test by Vipond

P.S.I.

P.S.I.

QA = 2,040.00 GPM
128.52 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

70-20 =

70-68 =

533

50

2

GPM from Fire Flow Test by Vipond

P.S.I.

P.S.I.

QA = 2,665.00 GPM
167.90 L/s

TEST 3

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

70-20 =

70-68 =

950

50

2

GPM from Fire Flow Test by Vipond

P.S.I.

P.S.I.

QA = 4,750.00 GPM
299.25 L/s

FLOW TEST RESULTS



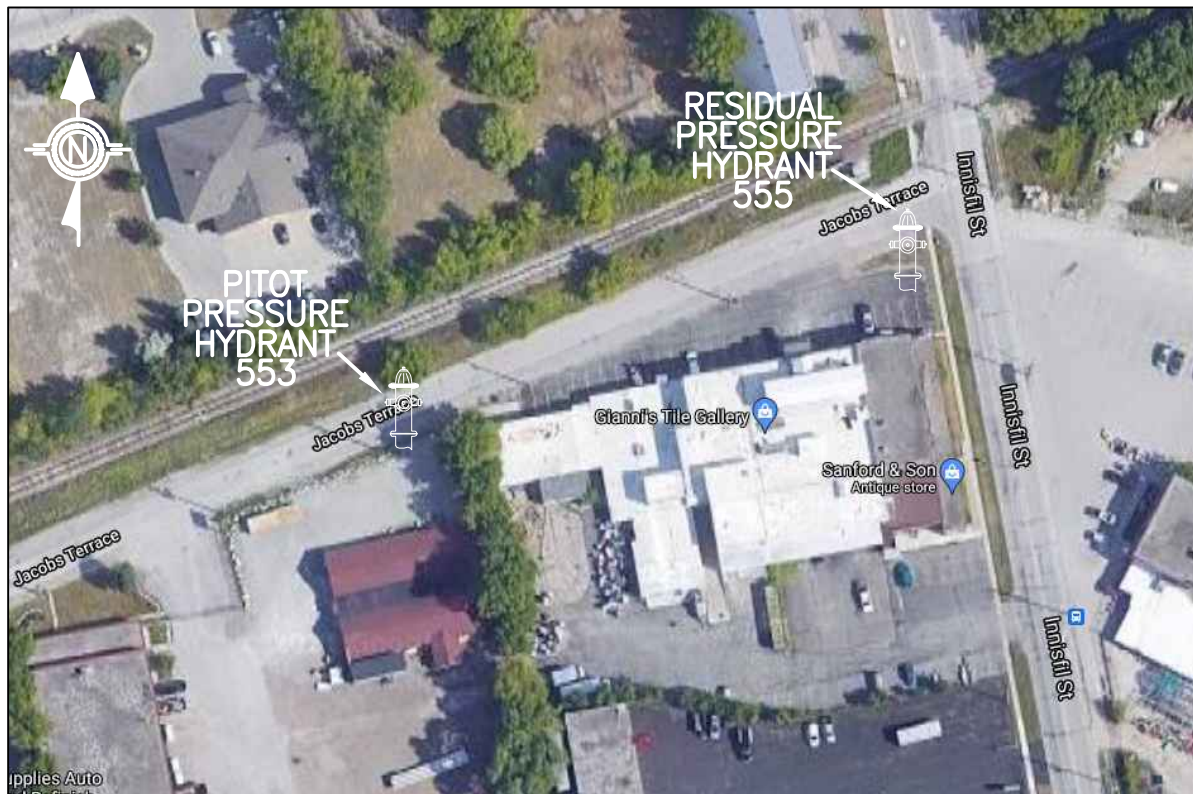
DATE : MAY 27, 2021 TIME : 11:00 AM

LOCATION : JACOBS TERR.

CITY OF BARRIE

ONTARIO

TEST BY : VIPOND FIRE PROTECTION AND LOCAL PUC



STATIC PRESSURE : 70 PSI

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	68	21	408
2	1	2-1/2	0.90	68	10	533
3	2	2-1/2	0.90	68	2	950



JACOBS TERR.

CITY OF BARRIE

ONTARIO

BY : LEN K./RILEY P.

OFFICE : BARRIE

TEST BY : VIPOND & PUC

DATE : MAY 27, 2021

STATIC:

70 PSI

RESIDUAL:

TEST#1

68 PSI

@

408 GPM

TEST#2

68 PSI

@

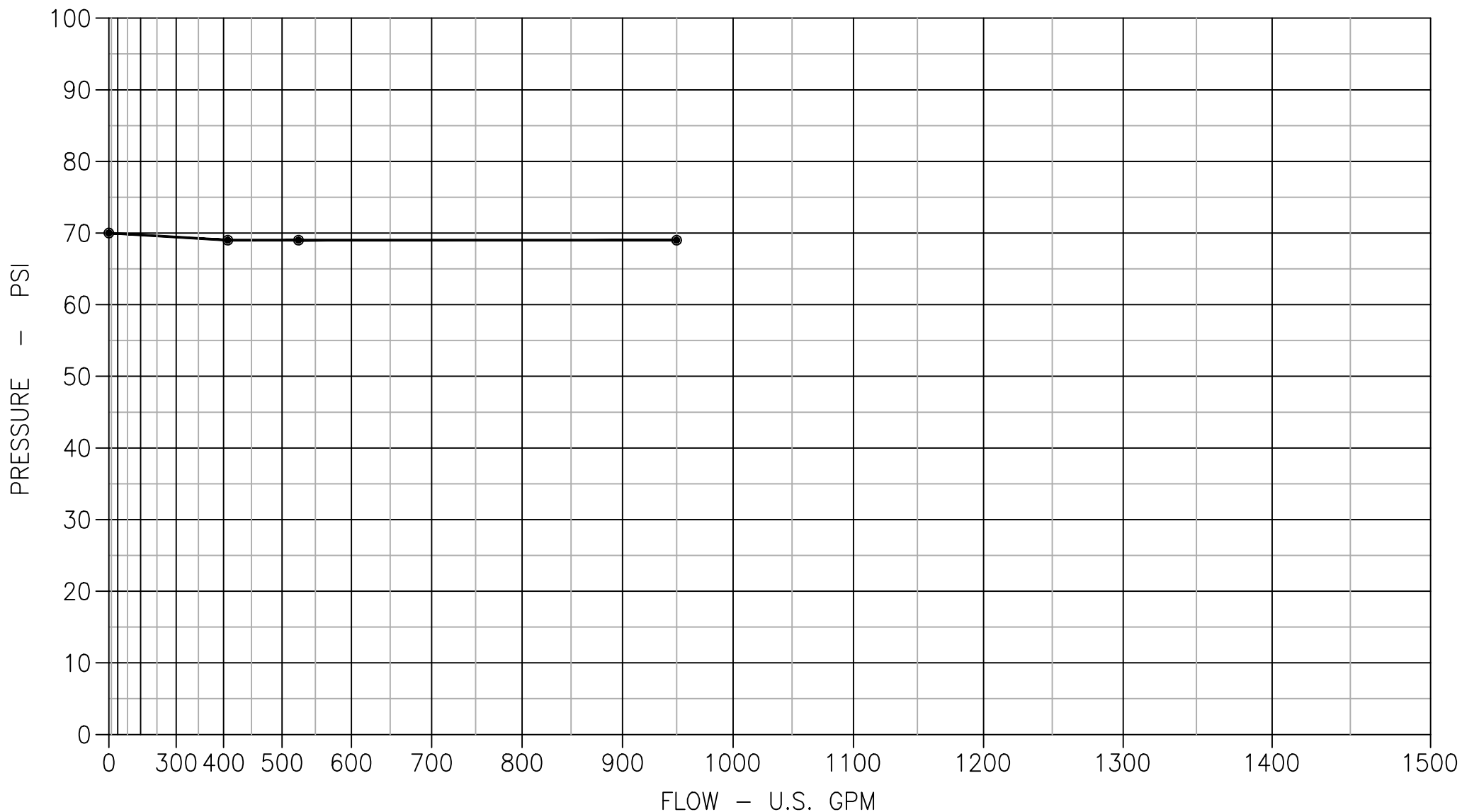
533 GPM

TEST#3

68 PSI

@

950 GPM



Appendix C: Sanitary Sewage Design Calculations



Sanitary Sewer Design Sheet

Version Number:1

Version Date:August 17, 2021

Project Information

17 Jacobs Terrace	421391
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Drawing Reference

421391 SAN-1	July 26-21
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Prepared By

JLM/DR	July 26-21
--------	------------

Reviewed By

NM	July 26-21
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Municipality

City of Barrie

Population Density

Capita per Unit	Low	Medium	High
	3.13	2.34	1.67

Infiltration

Infiltration (L/s/ha)	0.1
-----------------------	-----

Flow

Development Type	Average (L/cap/day)	Peaking Factor
Residential	225	Harmon
Development Type	Average (L/ha/day)	Peaking Factor
Institution	28,000	2
Commercial	28,000	2
Industrial High Intensity	55,000	-
Industrial Low Intensity	50,000	-

Manning's Coefficient

Pipe Material	Value
Concrete	0.013
PVC	0.013
Applied	0.013

Engineer Stamp

--

Street Name	Area Label/ID	Upstream Maintenance Hole	Downstream Maintenance Hole	Development Type	Population Density	Number of Units	Population (cap)	Accumulated Population (cap)	Peaking Factor	Area (ha)	Cumulative Area (ha)	Average Flow (L/s)			Peak Flow (L/s)			Proposed Sanitary Sewer							
												Development	Infiltration	Total	Development	Infiltration	Total	Sewer Length (m)	Sewer Slope (%)	Actual Sewer Diameter (mm)	Full Flow Velocity (m/s)	Full Flow Capacity (L/s)	Actual Velocity (m/s)	Calculated Sewer Diameter (mm)	Percentage of Full Flow Capacity (%)
Jacobs Terrace (421391 Site)	101	PR. SAN MH1	4509	Commercial				0.0	2.00	0.06	0.06	0.02	0.01	0.03	0.04	0.01	0.05								
Jacobs Terrace (421391 Site)	101	PR. SAN MH1	4509	Residential	High	565	943.6	943.6	3.82	1.39	1.39	2.46	0.14	2.60	9.38	0.14	9.52	76.5	0.5%	200	0.77	24.30	0.69	141	39.2%
Jacobs Terrace (272 Innisfil Street)	102	4509	7892	Residential	High	164	273.9	1217.4	3.74	0.99	2.44	3.19	0.24	3.44	12.09	0.24	12.33	59.4	0.5%	300	0.97	68.38	0.70	158	18.0%
Innisfil Street	103i	infil	7892	Residential		0		0.0	4.50	0.17	0.17	0.00	0.02	0.02	0.00	0.02	0.02								
Innisfil Street	103	7892	4540	Commercial				1217.4	2.00	0.18	2.79	3.25	0.28	3.53	12.20	0.28	12.48	88.6	0.9%	300	1.30	91.74	0.87	142	13.6%
Tiffin Street	104i	infil	4508	Residential		0		0.0	4.50	0.93	0.93	0.00	0.09	0.09	0.00	0.09	0.09								
Tiffin Street	104	4508	7899	Institution				0.0	2.00	0.24	1.17	0.08	0.12	0.19	0.16	0.12	0.27	108.8	0.4%	250	0.76	37.39	0.23	39	0.7%
Tiffin Street	105i	infil	7899	Residential		0		0.0	4.50	0.23	0.23	0.00	0.02	0.02	0.00	0.02	0.02								
Tiffin Street	105	7899	4540	Commercial				0.0	2.00	0.52	1.92	0.25	0.19	0.44	0.49	0.19	0.68	112.0	0.4%	250	0.75	36.84	0.29	56	1.9%
Innisfil Street	106	4540	4313	Residential		0		1217.4	3.74	0.09	4.80	3.49	0.48	3.97	12.69	0.48	13.17	64.9	1.3%	300	1.57	111.14	1.02	135	11.9%
Innisfil Street	107	4313A	4313	Residential	Low	2	6.3	6.3	4.43	0.32	0.32	0.02	0.03	0.05	0.07	0.03	0.10								
Innisfil Street	108	4313	7902	Commercial				1223.7	2.00	0.25	5.36	3.59	0.54	4.13	12.93	0.54	13.47	57.7	1.0%	300	1.38	97.84	0.93	143	13.8%
Essa Road (421406 Site)	201	PR. SAN MH2	8305	Commercial				0.0	2.00	0.07	0.07	0.02	0.01	0.03	0.05	0.01	0.06								
Essa Road (421406 Site)	201	PR. SAN MH2	8305	Residential	High	1284	2144.3	2144.3	3.56	1.79	1.79	5.58	0.18	5.76	19.89	0.18	20.07	58.1	1.1%	500	2.00	393.13	1.03	164	5.1%

Notes

- Proposed invert based on Pearson FSR
- Invert data assumed; to be confirmed via utility investigation during detailed design
- Invert data from as-builts
- Invert data from GIS CAD drawing
- Proposed invert based on as-builts

Catchments denoted with "i" for infiltration only

Appendix D: Stormwater Management Calculations

Modified Rational Method Calculation

Project Details

17 Jacobs Terrace	421391
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Prepared By

JLM	August 5, 2021
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Municipality

City of Barrie

Pre-Development Analysis

Catchment ID:	101
Catchment Area (ha):	0.91
Runoff Coefficient:	0.84
Time of Concentration (min):	10.00

Post-Development Analysis

	Controlled	Uncontrolled
Catchment ID:	201	
Catchment Area (ha):	0.91	
Runoff Coefficient:	0.77	
Time of Concentration (min):	11.26	

Design Storm	2YR	5YR	10YR	25YR	50YR	100YR	Design Storm	2YR	5YR	10YR	25YR	50YR	100YR
A	678	854	976	1146	1236	1426	i (mm/hr)	78	102	119	139	154	170
B	4.70	4.70	4.70	4.92	4.70	5.27	201 Runoff C	0.77	0.77	0.77	0.85	0.92	0.96
C	0.78	0.77	0.76	0.76	0.75	0.76	Q (m³/s)	0.15	0.20	0.23	0.30	0.36	0.41
i (mm/hr)	83	109	127	148	164	180	i (mm/hr)	0.00	0.00	0.00	0.00	0.00	0.00
Runoff C	0.84	0.84	0.84	0.92	1.00	1.00	Runoff C	0.00	0.00	0.00	0.00	0.00	0.00
Q (m³/s)	0.18	0.23	0.27	0.35	0.42	0.46	Q (m³/s)	0.00	0.00	0.00	0.00	0.00	0.00

Peak Runoff Rate (m³/s) - Rational Method ($Q = CiA/360$)

Storm	Q _{EXISTING}	Q _{NO CONTROLS}	Q _{UNCONTROLLED}	Q _{CONTROLLED}	Q _{TOTAL}	Q _{REDUCTION}
2YR	0.177	0.152	0.000	0.085	0.085	0.067 m³/s
5YR	0.232	0.200	0.000	0.110	0.110	0.090 m³/s
10YR	0.270	0.233	0.000	0.129	0.129	0.104 m³/s
25YR	0.348	0.300	0.000	0.175	0.175	0.125 m³/s
50YR	0.417	0.362	0.000	0.204	0.204	0.158 m³/s
100YR	0.458	0.415	0.000	0.229	0.229	0.186 m³/s

Required Storage Volumes (m³) - Modified Rational Method ($V_p = Q_p \times D - Q_o \times ((D + t_c)/2)$)

Dur. (min)	2YR	5YR	10YR	25YR	50YR	100YR
5	26.0	34.2	38.9	44.9	58.5	66.9
10	43.3	57.7	66.3	79.7	101.2	118.3
15	49.5	66.6	76.7	92.7	117.8	139.4
20	50.4	68.7	79.3	95.4	122.0	146.0
25	48.3	66.8	77.3	92.1	119.1	144.1
30	44.4	62.5	72.3	84.9	111.6	136.7
35	39.2	56.4	65.3	75.0	100.8	125.4
40	33.0	49.0	56.8	63.1	87.7	111.3
45	26.1	40.6	47.1	49.7	72.7	95.1
50	18.6	31.5	36.5	35.1	56.2	77.1
55	10.6	21.7	25.2	19.4	38.6	57.7
60	2.3	11.4	13.2	3.0	20.0	37.1
65	-6.4	0.6	0.7	-14.1	0.5	15.6

Visual OTTHYMO Model Parameter Calculations (NasHYD)

Project Details

17 Jacobs Terrace	421391
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Data Sources

Detailed Soil Survey Reports for Ontario, LSRCA Technical Guidelines for Stormwater Management Submissions (2016), MTO Drainage Management Manual (1997)

Prepared By

DJR	August 10, 1991
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Pre-Development Condition

Watershed:	LSRCA
Catchment ID:	101
Catchment Area (ha):	0.91
Impervious %:	86%

Average Curve Number (CN), Runoff Coefficient (C) and Initial Abstraction (IA)

Soil Symbol		Tis												
Soil Series		Tioga												
Hydrologic Soils Group		A												
Soil Texture		Sand Loam												
Runoff Coefficient Type		1												
Area (ha)		0.91												
Percentage of Catchment		100%												
Land Cover Category	IA	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C	
Impervious	2	0.79	98	0.95										
Gravel	3		76	0.09										
Woodland	10	0.09	32	0.08										
Pasture/Lawns	5	0.04	49	0.10										
Meadows	8		38	0.09										
Cultivated	7		62	0.22										
Waterbody	12		50	0.05										
Average CN		90.40												
Average C		0.84												
Average IA		2.95												

Time to Peak Calculations

Max. Catchment Elev. (m):	230.51
Min. Catchment Elev. (m):	229.16
Catchment Length (m):	143
Catchment Slope (%):	0.94%
Method: Bransby-Williams Formula	
Time of Concentration (mins):	8.32

Summary

Catchment CN:	90.4
Catchment C:	0.84
Catchment IA (mm):	2.95
Time of Concentration (hrs):	0.14
Catchment Time to Peak (hrs):	0.09
Catchment Time Step (mins):	1.11

Visual OTTHYMO Model Parameter Calculations (NasHYD)

Project Details

17 Jacobs Terrace	421391
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Prepared By

DJR	August 10, 1991
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Data Sources

Detailed Soil Survey Reports for Ontario, LSRCA Technical Guidelines for Stormwater Management Submissions (2016), MTO Drainage Management Manual (1997)

Post Development Condition

Watershed:	LSRCA
Catchment ID:	201
Catchment Area (ha):	0.91
Impervious %:	82%

Average Curve Number (CN), Runoff Coefficient (C) and Initial Abstraction (IA)

Soil Symbol		Tis											
Soil Series		Tioga											
Hydrologic Soils Group		A											
Soil Texture		Sand Loam											
Runoff Coefficient Type		1											
Area (ha)		0.95											
Percentage of Catchment		104%											
Land Cover Category	IA	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C
Impervious	2	0.75	98	0.95									
Gravel	3		76	0.09									
Woodland	10		32	0.08									
Pasture/Lawns	5	0.16	49	0.10									
Meadows	8		38	0.09									
Cultivated	7		62	0.22									
Waterbody	12		50	0.05									
Average CN		85.48											
Average C		0.77											
Average IA		2.42											

Time to Peak Calculations

Max. Catchment Elev. (m):	230.51
Min. Catchment Elev. (m):	229.35
Catchment Length (m):	180
Catchment Slope (%):	0.64%
Method: Bransby-Williams Formula	
Time of Concentration (mins):	11.31

Summary

Catchment CN:	89.0
Catchment C:	0.80
Catchment IA (mm):	2.52
Time of Concentration (hrs):	0.19
Catchment Time to Peak (hrs):	0.13
Catchment Time Step (mins):	1.51

	Project :	17 Jacobs Terrace	Designed By:	DJR
	File:	421391	Checked By:	NM
	Municipality:	City of Barrie	Date:	2021-08-17

Proposed SWM Facility Preliminary Volume Table

Active Pool	StormTank
Side Slopes	0
Bottom Elev.	227.00
Module Footprint (m ²)	170.00
Void Ratio	0.97

Water Level Elev.	Depth	Areas		Storage	
(m)	(m)	Area (m ²)	Avg. Area (m ²)	Stage (m ³)	Cumulative Total (m ³)
227.00	0.00	System Invert		0.0	0.0
227.05	0.05			8.20	8.2
227.10	0.10			8.20	16.4
227.15	0.15			8.20	24.6
227.20	0.20			8.20	32.8
227.25	0.25			8.20	41.0
227.30	0.30			8.20	49.2
227.35	0.35			8.20	57.4
227.40	0.40			8.20	65.6
227.45	0.45			8.20	73.8
227.50	0.50			8.20	82.0
227.55	0.55			8.20	90.2
227.60	0.60			8.20	98.4
227.65	0.65			8.20	106.6
227.70	0.70			8.20	114.8
227.75	0.75			8.20	123.0
227.80	0.80			8.20	131.2
227.85	0.85			8.20	139.4
227.90	0.90	Top of Module		8.20	147.6

Note: Volume estimated based on StormTank Module 20 (Model 2036)



Project:	17 Jacobs Terrace	Designed By:	DJR
File:	421391	Checked By:	NM
Municipality:	City of Barrie	Date:	2021-08-17

Proposed SWM Facility Preliminary Discharge Table

ORIFICE CONTROL #1

Orifice Plate

diameter = 350 mm
area = 0.0962 m²
Orifice C = 0.63
Invert = 227.00 m

WEIR CONTROL

Overflow Weir

Length of Weir N/A m
Weir Sill Elevation N/A m
Weir constant K 1.6
Side Slope (H:V) 4

Orifice Equation $Q = C \times A \times (2gH)^{0.5}$

where

Q = flow rate (cms) A = area of opening(sq. m)

C = constant

H = net head on the orifice

g = Acceleration due to gravity

Weir Equation

$Q = K \times L \times H^{1.5}$

where

Q = flow rate (cms)

K = constant

L = length (m)

H = head on the weir (m)

Water Level (m)	Orifice Plate		Emergency Spillway		Hydraulic Control	Total Discharge (cms)
	Head (m)	Discharge (m ³)	Head (m)	Discharge (m ³)		
227.00	0.00	0.000	0.00	0.0000	Orifice Plate	0.000
227.05	0.05	0.002	0.00	0.0000	Orifice Plate	0.002
227.10	0.10	0.009	0.00	0.0000	Orifice Plate	0.009
227.15	0.15	0.020	0.00	0.0000	Orifice Plate	0.020
227.20	0.20	0.034	0.00	0.0000	Orifice Plate	0.034
227.25	0.25	0.051	0.00	0.0000	Orifice Plate	0.051
227.30	0.30	0.069	0.00	0.0000	Orifice Plate	0.069
227.35	0.35	0.087	0.00	0.0000	Orifice Plate	0.087
227.40	0.40	0.104	0.00	0.0000	Orifice Plate	0.104
227.45	0.45	0.121	0.00	0.0000	Orifice Plate	0.121
227.50	0.50	0.136	0.00	0.0000	Orifice Plate	0.136
227.55	0.55	0.164	0.00	0.0000	Orifice Plate	0.164
227.60	0.60	0.175	0.00	0.0000	Orifice Plate	0.175
227.65	0.65	0.185	0.00	0.0000	Orifice Plate	0.185
227.70	0.70	0.195	0.00	0.0000	Orifice Plate	0.195
227.75	0.75	0.204	0.00	0.0000	Orifice Plate	0.204
227.80	0.80	0.212	0.00	0.0000	Orifice Plate	0.212
227.85	0.85	0.221	0.00	0.0000	Orifice Plate	0.221
227.90	0.90	0.229	0.00	0.0000	Orifice Plate	0.229

Note: Total discharge calculated by Smith equation used for partially full pipes



Project:	17 Jacobs Terrace	Designed By:	DJR
File:	421391	Checked By:	NM
Municipality:	City of Barrie	Date:	2021-08-17

Proposed SWM Facility Preliminary Stage-Storage-Discharge Table

Water Level (m)	PIPE FLOW	WEIR FLOW			
	Orifice Plate Discharge (m ³ /s)	Overflow Discharge (m ³ /s)	Hydraulic Control	Total Discharge (m ³ /s)	Total Storage (m ³)
227.00	0.0000	0.0000	Orifice Plate	0.000	0.0
227.05	0.0021	0.0000	Orifice Plate	0.002	8.2
227.10	0.0089	0.0000	Orifice Plate	0.009	16.4
227.15	0.0199	0.0000	Orifice Plate	0.020	24.6
227.20	0.0342	0.0000	Orifice Plate	0.034	32.8
227.25	0.0508	0.0000	Orifice Plate	0.051	41.0
227.30	0.0686	0.0000	Orifice Plate	0.069	49.2
227.35	0.0866	0.0000	Orifice Plate	0.087	57.4
227.40	0.1043	0.0000	Orifice Plate	0.104	65.6
227.45	0.1209	0.0000	Orifice Plate	0.121	73.8
227.50	0.1364	0.0000	Orifice Plate	0.136	82.0
227.55	0.1644	0.0000	Orifice Plate	0.164	90.2
227.60	0.1750	0.0000	Orifice Plate	0.175	98.4
227.65	0.1850	0.0000	Orifice Plate	0.185	106.6
227.70	0.1945	0.0000	Orifice Plate	0.195	114.8
227.75	0.2036	0.0000	Orifice Plate	0.204	123.0
227.80	0.2123	0.0000	Orifice Plate	0.212	131.2
227.85	0.2206	0.0000	Orifice Plate	0.221	139.4
227.90	0.2286	0.0000	Orifice Plate	0.229	147.6

Appendix E: Phosphorous Budget Calculations



PROJECT	17 Jacobs Terrace	FILE	421391
		DATE	2021-07-16
SUBJECT	Phosphorus Budget Assessment	DESIGNED	DR/JLM
		CHECKED	NM

Phosphorus Loading

LAND USE CATEGORY	Existing Phosphorous Loading Rate (kg/ha/year)	Future Phosphorous Loading Rate (kg/ha/year)	Existing		Proposed	
			Existing Area (ha)	Existing Phosphorous Loading (kg/year)	Area (ha)	Phosphorous Load (kg/year)
Cropland	0.19	0.19	0.00	0.00	0.00	0.00
Hay-Pasture	0.07	0.07	0.00	0.00	0.00	0.00
Turf-Sod	0.12	0.12	0.00	0.00	0.00	0.00
High Intensity Development - C/I	1.82	1.82	0.91	1.66	0.00	0.00
High Intensity Development - R	1.32	1.32	0.00	0.00	0.91	1.20
Low Intensity Development	0.13	0.13	0.00	0.00	0.00	0.00
Quarry	0.08	0.08	0.00	0.00	0.00	0.00
Unpaved Road	0.83	0.83	0.00	0.00	0.00	0.00
Forest	0.05	0.05	0.00	0.00	0.00	0.00
Transition	0.06	0.06	0.00	0.00	0.00	0.00
Wetland	0.05	0.05	0.00	0.00	0.00	0.00
Open Water	0.26	0.26	0.00	0.00	0.00	0.00
Total			0.91	1.66	0.91	1.20

Controls

Area contributing to Infiltration control	Removal Efficiency (%)		Proposed	
	Underground Storage	Jellyfish Filter	Area (ha)	Phosphorous Load (kg/year)
High Intensity Development - Commercial (60% of Rooftop)	25%	59%	0.91	0.37
Total Phosphorous (No Controls)				1.20
Total Phosphorous (With Controls)				0.37

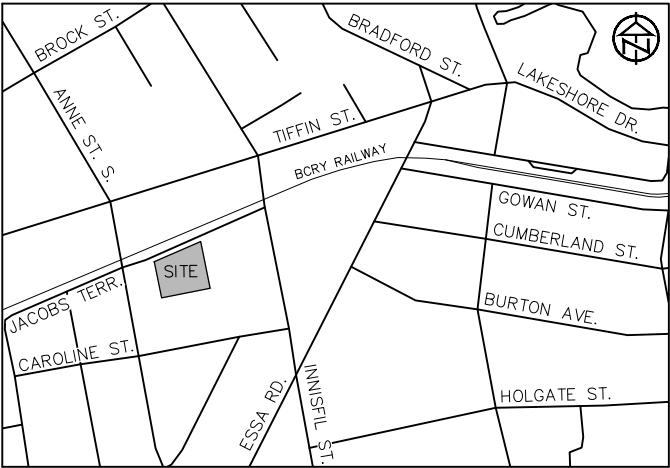
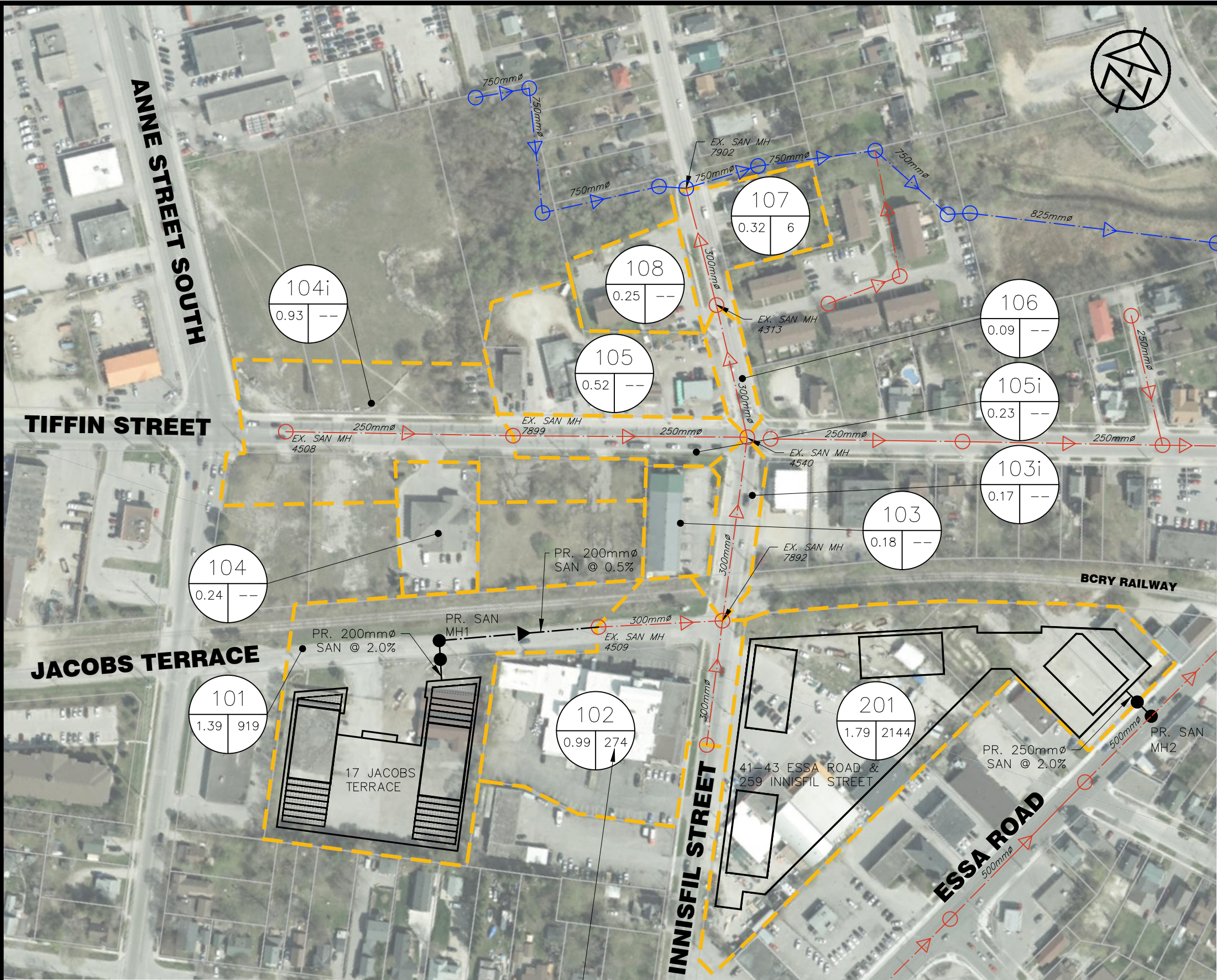
Summary

Existing Phosphorous Load	1.66	kg/year
Post Development Phosphorous Load (no controls)	1.20	kg/year
Decrease	0.46	kg/year
Post Development Phosphorous Load (with controls)	0.37	kg/year

Phosphorous Offsetting Policy

Post Development Phosphorous Load (no controls)	0.37	kg/year
Offset Calculation (2.5 * P deficit * \$35,000)	\$ 32,319.79	

Appendix F: Drawings



KEY PLAN
NTS

LEGEND

101	SANITARY CATCHMENT ID
1.39 919	POPULATION (PERSONS)
	AREA (ha)
---	SANITARY CATCHMENT BOUNDARY
---	EXISTING SANITARY TRUNK SEWER
○ EX. SAN MH 4509	EXISTING SANITARY MAINTENANCE HOLE
---	EXISTING SANITARY SEWER
● PR. SAN MH1	PROPOSED SANITARY MAINTENANCE HOLE
---	PROPOSED SANITARY SEWER

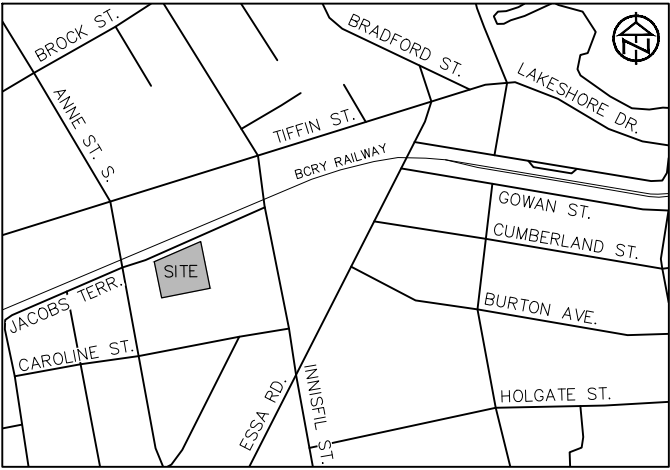
NOTE: POPULATION FOR CATCHMENT 102 AS PER REZONING D14-1689 FOR PROPOSED SITE AT 272 INNISFIL ST.



17 JACOBS TERRACE
CITY OF BARRIE
SANITARY CATCHMENT PLAN

DWG. No.
SAN-1

SCALE: 1:2000	DRAWN: JLM	DATE: JUL/21	JOB NO. 421391
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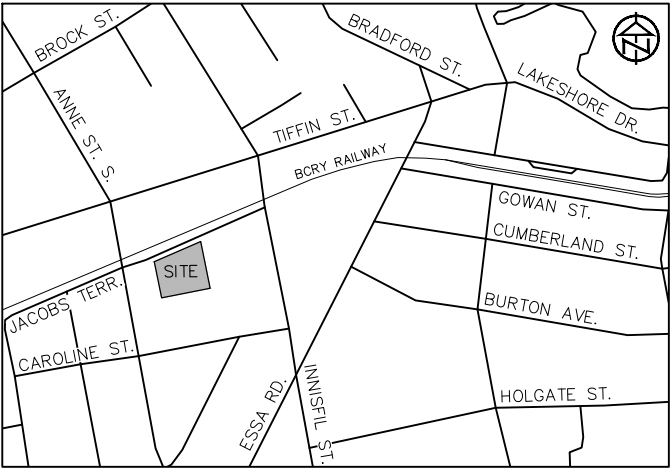
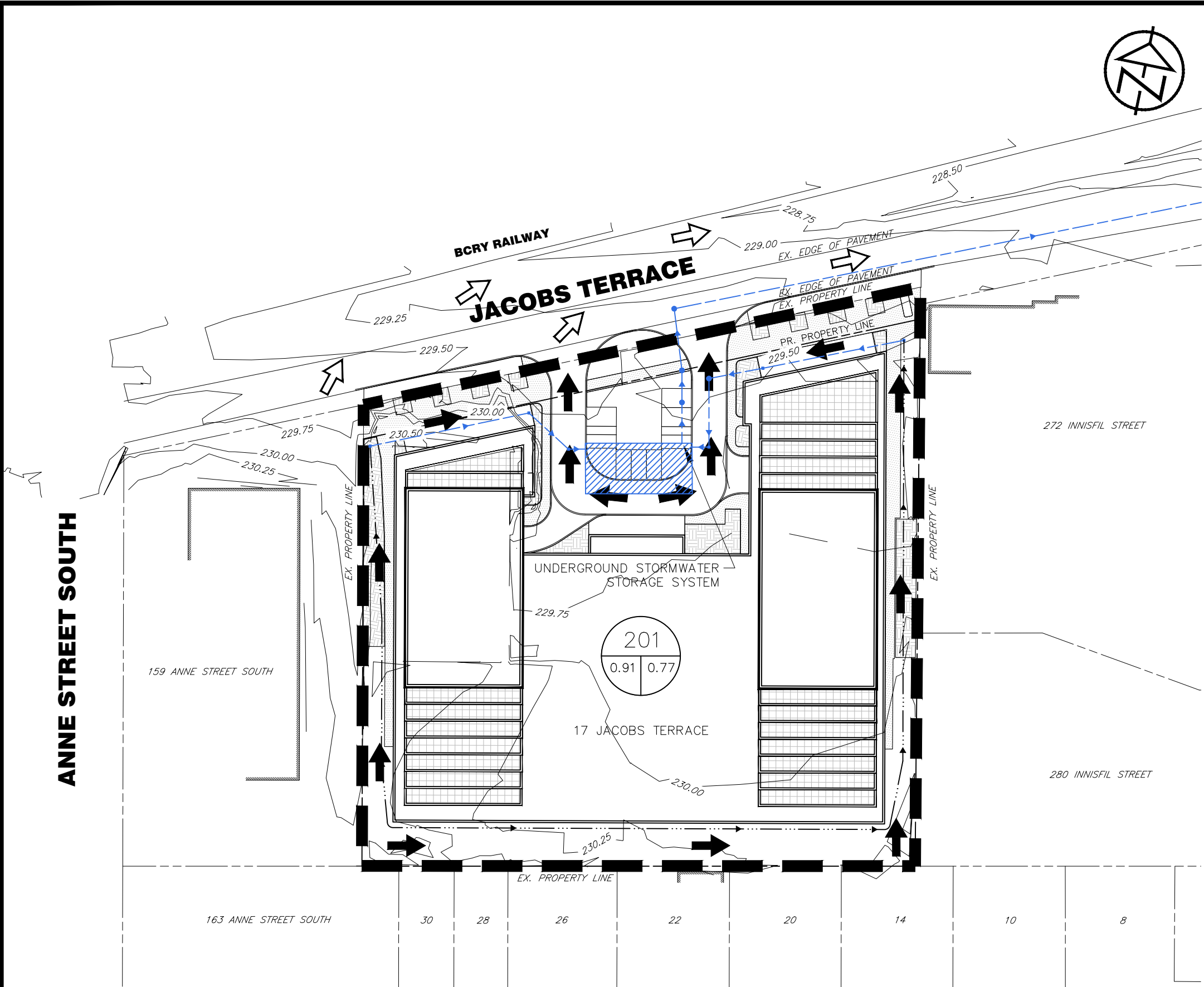


KEY PLAN
NTS

LEGEND

- 230.00 — EXISTING ELEVATION CONTOURS (0.25 m INTERVALS)
- ↖ EXISTING CONDITIONS OVERLAND FLOW DIRECTION
- - - PRE-DEVELOPMENT CATCHMENT BOUNDARY
- 101 PRE-DEVELOPMENT CATCHMENT ID
- 0.91 0.84 RUNOFF COEFFICIENT
- PRE-DEVELOPMENT CATCHMENT AREA (ha)

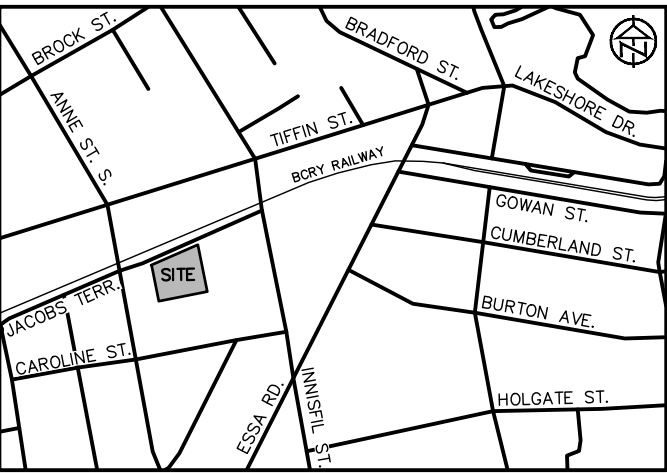
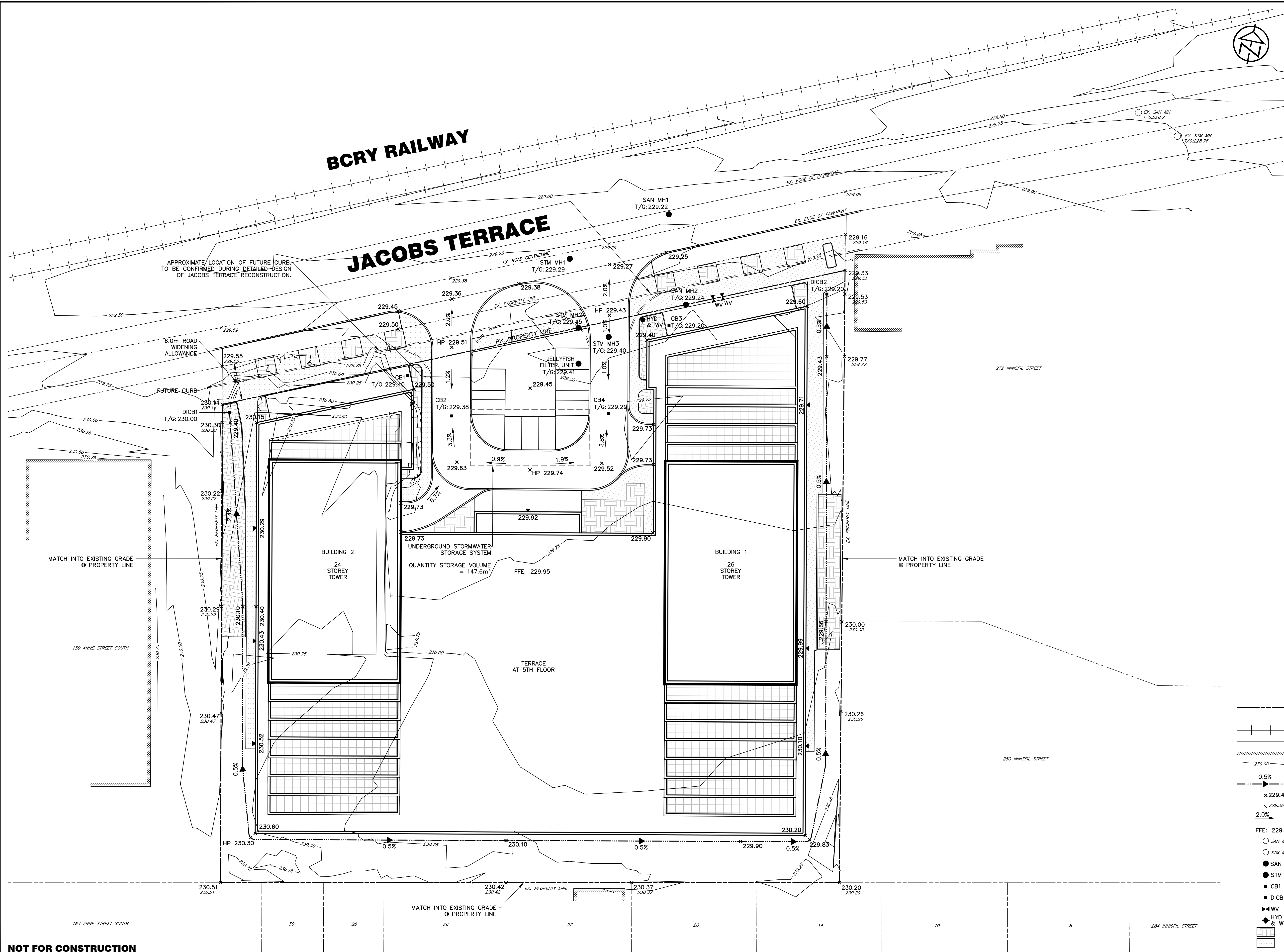
	17 JACOBS TERRACE CITY OF BARRIE PRE-DEVELOPMENT DRAINAGE PLAN			DWG. No. DP-1
	SCALE: 1: 750	DRAWN: JLM	DATE: JUL/21	JOB NO. 421391



KEY PLAN
NTS

- LEGEND**
- EXISTING ELEVATION CONTOURS (0.25 m INTERVALS)
 - EXISTING CONDITIONS OVERLAND FLOW DIRECTION
 - PROPOSED CONDITIONS OVERLAND FLOW DIRECTION
 - POST-DEVELOPMENT CATCHMENT BOUNDARY
 - POST-DEVELOPMENT CATCHMENT ID
 - RUNOFF COEFFICIENT
 - POST-DEVELOPMENT CATCHMENT AREA (ha)
 - PROPOSED STORM SEWER
 - PROPOSED SWALE

	17 JACOBS TERRACE CITY OF BARRIE POST-DEVELOPMENT DRAINAGE PLAN		DWG. No. DP-2
	SCALE: 1: 750	DRAWN: JLM	DATE: JUL/21



KEY PLAN
NTS

- NOTES
1. EXISTING AND PROPOSED SERVICING IN JACOBS TERRACE TO BE CONFIRMED DURING DETAILED DESIGN OF JACOBS TERRACE RECONSTRUCTION.
 2. EXISTING SAN MH AND STM MH INVERTS BASED ON PEARSON PSR FOR RESIDENTIAL CONDO @ 272 INNISFIL ST., PROJECT No. 19009, DRAWINGS FIG. 3 AND FIG. 5 DATED AUGUST 2019. INVERTS FOR THESE AND EXISTING SAN MH AT INTERSECTION OF INNISFIL ST. AND JACOBS TERRACE TO BE CONFIRMED VIA UTILITY INVESTIGATION DURING DETAILED DESIGN.

- LEGEND
- EXISTING PROPERTY LINE
 - EXISTING ROAD CENTRELINE
 - EXISTING BARRIE-COLLINGWOOD (BCRY) RAILWAY
 - EXISTING EDGE OF PAVEMENT
 - EXISTING BUILDING
 - EXISTING ELEVATION CONTOURS (0.25m INTERVALS)
 - PROPOSED SWALE AND SLOPE
 - PROPOSED SPOT ELEVATION (m)
 - EXISTING SPOT ELEVATION (m)
 - PROPOSED SLOPE
 - FINISHED FLOOR ELEVATION (m)
 - EXISTING SANITARY MAINTENANCE HOLE
 - EXISTING STORM MAINTENANCE HOLE
 - PROPOSED SANITARY MAINTENANCE HOLE
 - PROPOSED STORM MAINTENANCE HOLE
 - PROPOSED CATCH BASIN
 - PROPOSED DITCH INLET CATCH BASIN
 - PROPOSED WATER VALVE
 - PROPOSED FIRE HYDRANT AND WATER VALVE
 - PROPOSED LANDSCAPING
 - PROPOSED SIDEWALK

NOT FOR CONSTRUCTION

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BENCHMARKS
ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE RELATED TO CITY OF BARRIE BENCHMARK No. 03120080023, HAVING AN ELEVATION OF 226.540 METRES.

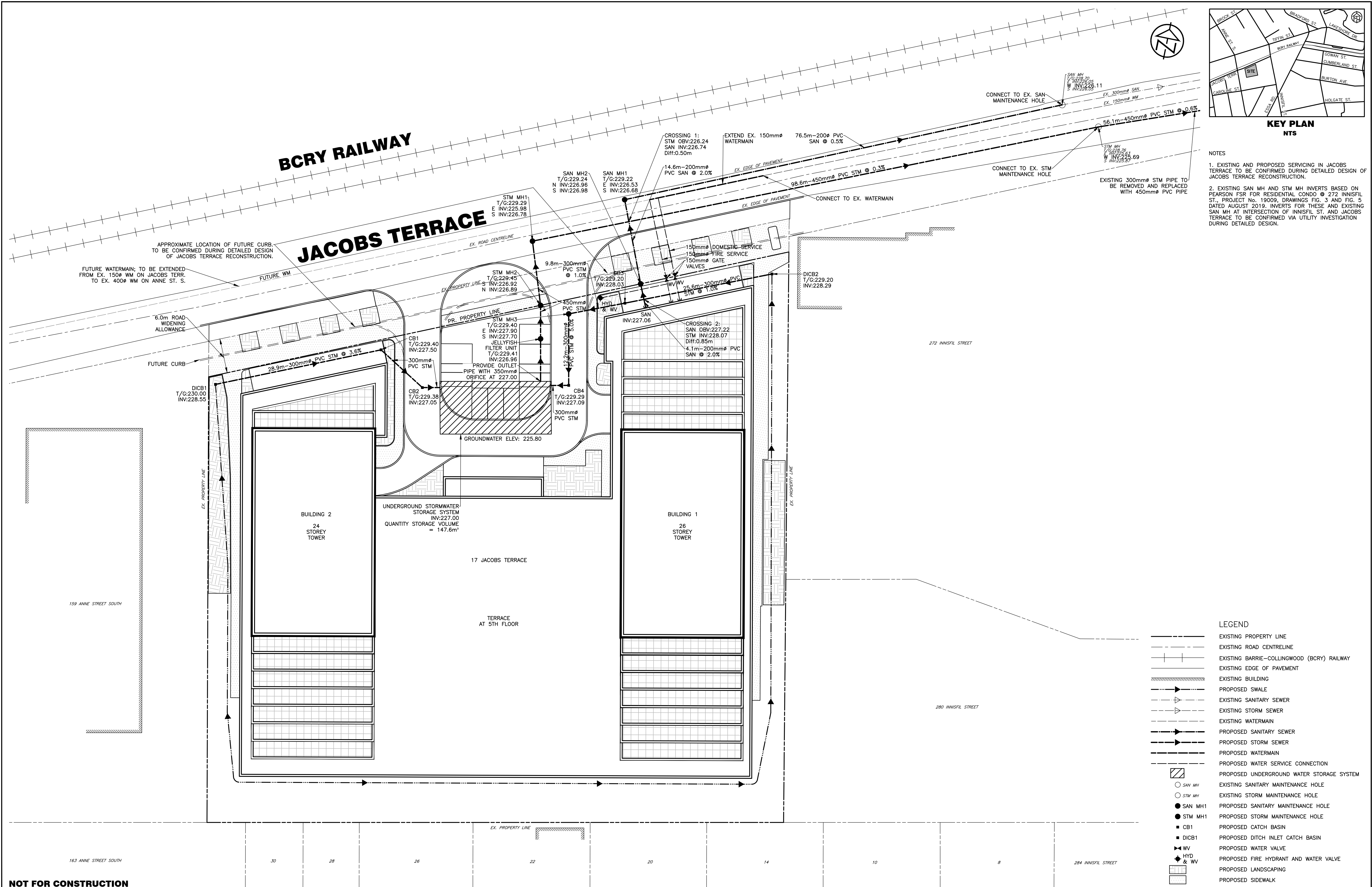
DRAWING REFERENCES
SITE PLAN PREPARED BY ARCHITECTURE UNFOLDED DATED JUNE 21, 2021.
TOPOGRAPHIC SURVEY COMPLETED BY KRCMAR DATED MAY 13, 2021.

No.	REVISION DESCRIPTION	DATE	ENGINEER STAMP
1.	ISSUED FOR CLIENT REVIEW	JUL 7/21	
2.	ISSUED FOR ZBA (FIRST SUBMISSION)	AUG 19/21	

17 JACOBS TERRACE
CITY OF BARRIE

PRELIMINARY SITE GRADING
PLAN

DESIGN: DR	FILE: 421391	DWG:
DRAWN: JLM	DATE: JUL 2021	SG-1
CHECK: NM	SCALE: 1:300	



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17 JACOBS TERRACE CITY OF BARRIE
PRELIMINARY SITE SERVICING PLAN

 TATHAM ENGINEERING		
	FILE: 421391	DWG: SS-1
	DATE: JUL 2021	
	SCALE: 1:300	