

STORMWATER MANAGEMENT & SERVICING REPORT

SUMMIT REIT
500 VETERAN'S DRIVE
CITY OF BARRIE
COUNTY OF SIMCOE



PEARSON
ENGINEERING

PEARSONENG.COM

(Revised December 2022)

September 2022

22078



TABLE OF CONTENTS

1. INTRODUCTION	1
1.1. TERMS OF REFERENCE	1
2. WATER SUPPLY AND DISTRIBUTION	1
2.1. DOMESTIC WATER DESIGN CRITERIA	1
2.2. FIRE FLOW REQUIREMENTS	2
3. SANITARY SERVICING	2
3.1. SANITARY DESIGN CRITERIA	2
3.2. INTERNAL SANITARY SEWER SYSTEM	3
4. STORMWATER MANAGEMENT	3
4.1. ANALYSIS METHODOLOGY	3
4.2. EXISTING CONDITIONS	3
2.3 PROPOSED STORM DRAINAGE SYSTEM	4
4.3. STORMWATER QUANTITY CONTROL	4
4.4. STORMWATER QUALITY CONTROL	5
5. WATER BALANCE	5
6. PHOSPHORUS	6
7. CONCLUSIONS	7



APPENDICES

Appendix A – Water Servicing and Fire Flow Calculations

Appendix B – Sanitary Servicing Calculations

Appendix C – Stormwater Management Calculations

Appendix D – Water Balance Calculations

Appendix E – Phosphorus Calculations

Appendix F – StormTech Chamber Information

Appendix G – Engineering Drawings

LIST OF FIGURES & DRAWINGS

FIG-1	Site Location Plan
SG-1	Site Grading Plan
SS-1	Site Servicing Plan
STM-1	Pre-Development Storm Catchment Plan
STM-2	Post-Development Storm Catchment Plan
EPR-1	Environmental Protection and Removals Plan



STORMWATER MANAGEMENT & SERVICING REPORT

500 VETERAN'S DRIVE, BARRIE

1. INTRODUCTION

PEARSON Engineering Ltd. has been retained by Summit Reit (Client) to prepare a Stormwater Management Report (SWM Report) in support of the proposed building addition (project) to the Canplas Industries facility located at 500 Veteran's Drive in the City of Barrie (City). The Project site fronts onto Caplan Avenue to the north, Veterans Drive to the east, and existing industrial properties to the south and west and can be seen on Figure 1.

The Project site is located at the southwest corner of the intersection of Veteran's Drive and Caplan Avenue and is within the existing Mapleview West Industrial Park Phase II subdivision. Drawings for the subdivision were completed by Richardson Engineering Ltd. in 2003 which included the design of a downstream wet SWM Pond located west of Reid Drive which will provide quantity and quality control for the subdivision at an allowable runoff coefficient of 0.75.

The site consists of an existing building with parking area to the north and loading bays to the west. The project proposes a 6,968 m² building addition south of the 20,090 m² existing building including twelve (12) additional loading docks along the west side.

1.1. TERMS OF REFERENCE

The intent of this SWM Report is to:

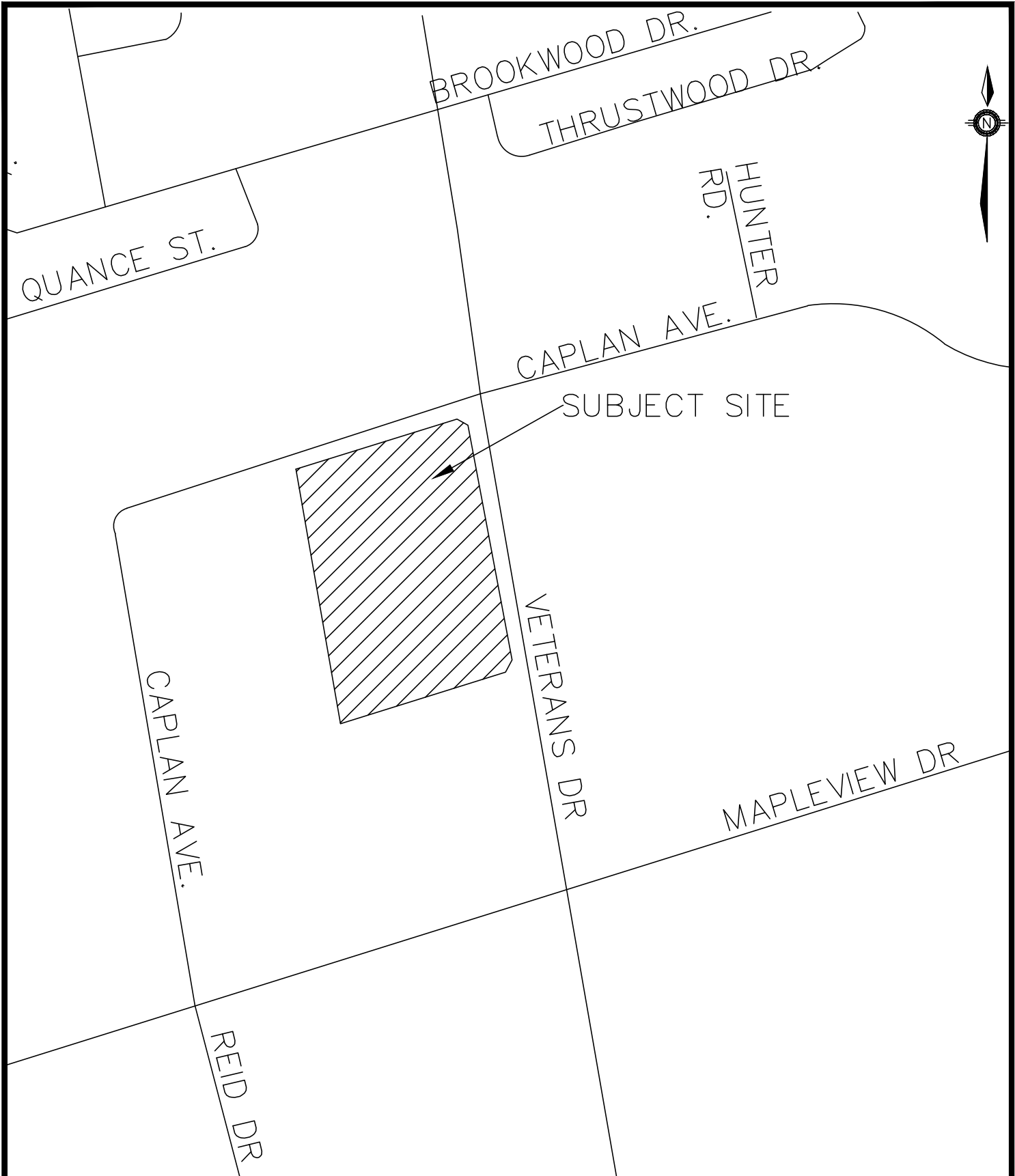
- Identify the existing site characteristics including any external drainage conditions;
- Illustrate the design of the stormwater conveyance system, capable of accommodating both minor and major storm flows from the site;
- Incorporate the appropriate Best Management Practices for controlling on-site erosion and sedimentation during construction while ultimately ensuring that the post-development release of stormwater is of adequate quality; and
- Summarize this design in a technically comprehensive and concise manner.

2. WATER SUPPLY AND DISTRIBUTION

2.1. DOMESTIC WATER DESIGN CRITERIA

The existing building is about 20,000 m² and is serviced by a 100 mm diameter domestic water service from the existing 400 mm diameter watermain on Veterans Drive. The proposed development is to have a 6,968 m² building addition with associated parking and loading bays. Utilizing the Ministry of Environment, Conservation and Parks (MECP) light industrial flow data of 35,000 L/ha/day, an Average Day Demand (ADD) of 0.28 L/s was calculated for the building addition. A Peak Rate factor of 4.00 was used in calculating a Peak Hour Demand of 1.13 L/s for the proposed addition. The proposed warehouse addition is to include one water closet which is to be serviced by extending the domestic service internally through the building. Therefore, the increase in water consumption due to the addition is anticipated to be nominal although calculations have been completed as per the MECP guidelines. Calculations for the domestic water requirements for the site can be found in Appendix A. Refer to Drawing SS-1 for the existing water servicing layout.

P: \Autodesk Vault\Working Folders\22078 - Summit Reit, 500 Veterans Dr., Barrie\Engineering\22078 - BASE.dwg Layout:FIG-1 Plotted Sep 12, 2022 @ 3:20pm by nparmar @ PEARSON ENGINEERING LTD.



SUMMIT REIT
500 VETERANS DRIVE
CITY OF BARRIE

SITE LOCATION PLAN



PEARSON
ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	NW	HORIZ SCALE	NTS	PROJECT #	22078
DRAWN BY	NP	VERT SCALE	NTS	DRAWING #	FIG-1
CHECKED BY	MWD	DATE	AUGUST 2022	REVISION #	0



2.2. FIRE FLOW REQUIREMENTS

The existing building is currently serviced by a 200 mm diameter fire main supplied from Veterans Drive with a sprinkler system designed as per OBC. The required Fire Underwriters Survey (FUS) assessment was used to calculate the required fire flow and was determined to be approximately 283 L/s (4,488 GPM). The building construction consists of a structure made of non-combustible exterior materials, a free burning contents factor, and a sprinklered water system. The building addition will be designed with fire sprinklers designed by a Sprinkler Designer to meet OBC requirements and connected to the existing building's sprinkler system. The footprint area of both existing and proposed building is 27,058 m². As per City of Barrie Standards, the minimum required fire flow is 333 L/s (5,278 GPM) for industrial sites. The calculations mentioned above indicate that the required City of Barrie fire flow of 333 L/s (5,278 GPM) governs. Fire flow calculations are included in Appendix A.

A hydrant flow test was completed by Novus Fire Protection Consulting Inc. in October 2022 indicating that a static pressure of 55 psi was available at the existing hydrant on Veterans Drive, south of Caplan Avenue. This flow test also resulted in a flow that can be supplied of approximately 110 L/s (1,744 GPM) at a residual pressure of 50 psi from the existing hydrant. Through extrapolation of the hydrant results, it was determined that 302 L/s (4,780 GPM) of flow is available at a minimum residual pressure of 20 psi for the proposed development.

Given that the hydrant on Veterans can supply 302 L/s, which is more than the FUS requirements (283 l/s) for the site, the available fire flow meets FUS requirements. Under the most recent City of Barrie Standards, fire flow requirements are listed at 333 L/s (5,278 GPM) of which the City system can supply 91% of the City Standard. Given that the project is a building addition to an existing building that is approximately 15 years old and that the City System was not previously designed to meet the current standards, the 91% of City standards is deemed reasonable when noting the sprinkler system meets FUS and will be designed as per OBC requirements. Refer to the fire flow calculations/information that can be found in Appendix A.

3. SANITARY SERVICING

3.1. SANITARY DESIGN CRITERIA

The proposed development is to have a building addition of 6,968 m² with associated parking lots and loading bays. Utilizing the MECF light industrial flow data, a water use of 35,000 L/ha/day, an Average Daily Flow (ADF) of 0.28 L/s was calculated. Using a Peaking Factor of 4.00 for this project and an infiltration allowance of 0.07 L/s, a peak flow of 1.20 L/s was calculated for the proposed development. However, the proposed warehouse addition is scheduled to include 1 bathroom which would produce flows less than calculated using the building addition size and is expected to have a nominal increase in sewage flows from the existing condition.

The proposed building addition is to be serviced by 200 mm diameter sanitary pipe connected to the existing unused 200 mm sanitary lateral on the east side of the site. The existing lateral will convey flows to the existing 250 mm diameter sanitary sewer on Veteran's Drive that has a capacity of 39.90 L/s at a slope of 0.45%. Therefore, the calculated peak flow of 1.06 L/s is approximately 0.81% of the existing Veterans Drive sanitary sewer's capacity. However, the expected peak flows from the one bathroom are expected to be much less and are not expected to have any adverse effects on the existing sanitary sewer system. Sanitary design flow calculations can be found in Appendix B.



3.2. INTERNAL SANITARY SEWER SYSTEM

It is proposed that the sanitary sewers be constructed in accordance with the City of Barrie and the MECP guidelines to service the Project. The proposed building addition is to include one new bathroom to be serviced by the existing sanitary sewer lateral to Veterans Drive. The Project's sanitary sewer system will convey flow via a 200 mm gravity sanitary sewer from the site and connect to the existing 200 mm diameter sanitary sewer lateral from Veteran's Drive. Refer to Drawing SS-1 for the sanitary servicing layout.

4. STORMWATER MANAGEMENT

A key component of the development is the need to address environmental and related SWM issues. These are examined in a framework aimed at meeting the City, Nottawasaga Valley Conservation Authority (NVCA) and Ministry of the Environment, Conservation and Parks (MECP) requirements. This SWM Report focuses on the necessary measures to satisfy the MECP's SWM requirements.

It is understood the objectives of the SWM plan are to:

- Protect life and property from flooding and erosion
- Maintain water quality for ecological integrity, recreational opportunities etc.
- Protect and maintain groundwater flow regime(s).
- Protect aquatic and fishery communities and habitats.
- Maintain and protect significant natural features.

4.1. ANALYSIS METHODOLOGY

The design of the SWM Facilities for this site has been conducted in accordance with:

- The Ministry of the Environment Stormwater Management Planning and Design Manual, March 2003
- City of Barrie, Storm Drainage and Stormwater Management Policies and Design Guidelines – February 2022
- Nottawasaga Valley Conservation Authority Technical Guidelines for Stormwater Management – December 2013

4.2. EXISTING CONDITIONS

The existing project site is located within the NVCA watershed and consists of an industrial building with associated parking lot to the north and loading dock area west of the building. The majority of the site's building and paved areas drain into an existing storm sewer system which outlets through a headwall to an existing swale southwest of the existing loading area to a municipal drainage channel along the west property which ultimately drains to an existing downstream SWM Pond on Reid Drive for the Mapleview West Industrial Park Phase II subdivision. The remaining undeveloped area south of the existing building flows by sheet flow into an existing swale adjacent to the south property line, which is conveyed to the downstream SWM Pond. A small grassed area east of the building drains uncontrolled to Veteran's Drive. Details of existing drainage conditions are shown on Drawing STM-1 in Appendix G.

The downstream SWM Pond was designed by Richardson Engineering Ltd. and provided an allowable runoff coefficient for the site of 0.75. The Richardson storm catchment plan for the subdivision dated October 2003 can be seen in Appendix C.



According to the Geotechnical Investigation completed by Pinchin. dated July 2022, the majority of the project site is comprised of gravel and sand and minor till with an estimated coefficient of permeability of 10^{-1} to 10^{-5} .

Allowable peak flows for the proposed development were calculated using the runoff coefficient of 0.75 taken from the Richardson Engineering Ltd. drawing and can be seen in Table 1 below. Detailed calculations are included in Appendix C.

Table 1: Allowable Peak Flows (m³/s)

	2 year	5 year	10 year	25 year	50 year	100 year
Total Allowable Flow (m ³ /s)	0.91	1.20	1.39	1.79	2.16	2.47

2.3 PROPOSED STORM DRAINAGE SYSTEM

The post development drainage for the development will generally follow pre-development conditions. The existing storm sewer will be extended, and the existing concrete headwall will be relocated to the south corner of the site at the new outlet location. The paved surfaces and concrete pad will drain to the proposed storm sewer and catchbasin system sized for the 5-year storm event. The proposed building addition will drain to underground storage chambers for infiltration. Any stormwater that doesn't infiltrate will overflow to the storm sewer. The storm sewer will outlet to the existing drainage channel and ultimately to the downstream SWM Pond. The grassed area south and east of the proposed building addition will drain overland to a swale conveying the stormwater west towards the existing drainage channel.

In the event of a storm greater than the 100-year storm, an overland flow route has been provided allowing storm runoff to drain by overland flow through the site to the southeast corner of the proposed parking lot where it will be conveyed to the existing drainage channel. Post development storm drainage patterns are shown on Drawing STM-2.

4.3. STORMWATER QUANTITY CONTROL

The proposed development will increase the imperviousness of the site and as such the post-development peak flows will increase. As previously mentioned, the proposed development drains westerly to the existing SWM Pond on Reid Drive. The calculated post-development runoff coefficient of 0.75 is equal to allowable runoff coefficient of 0.75 as per the Richardson Engineering Ltd. storm catchment plan and therefore no onsite quantity control measures are proposed.

By comparing Table 2 below with Table 1 it can be seen that all post-development peak flows are less than allowable values. Detailed peak flow calculations can be seen in Appendix C.

Table 2: Post Development Peak Flows

	2 year	5 year	10 year	25 year	50 year	100 year
Existing Area (m ³ /s)	0.64	0.84	0.97	1.25	1.52	1.73
Proposed Area (m ³ /s)	0.24	0.32	0.37	0.48	0.58	0.66
Total Peak Flow (m³/s)	0.88	1.16	1.34	1.73	2.09	2.39



4.4. STORMWATER QUALITY CONTROL

The Ministry of the Environment, Conservation and Parks (MECP) in March 2003 issued a “Stormwater Management Planning and Design Manual”. This manual has been adopted by a variety of agencies including the City of Barrie. The Stormwater Quality Control objective will be to ensure Enhanced Protection quality control as stated in the MECP manual. To achieve enhanced protection, permanent and temporary control of erosion and sediment transport are proposed.

4.4.1. PERMANENT QUALITY CONTROL

The developments active parking facilities pose a risk to stormwater quality through the collection of grit, salt, sand and oils on the paved surfaces. According to the storm catchment plan completed by Richardson Engineering Ltd., the downstream SWM pond has been sized to provide quality/erosion control for the project site area at a runoff coefficient of 0.75. Therefore, no additional onsite quality controls are proposed.

4.4.2. DURING CONSTRUCTION ACTIVITIES

During construction, earth grading and excavation will create the potential for soil erosion and sedimentation. It is imperative that effective environmental and sedimentation controls are in place and maintained throughout the duration of construction activities to ensure stormwater runoff's quality.

Therefore, the following recommendations shall be implemented and maintained during construction to achieve acceptable stormwater runoff quality:

- Installation of silt fence along the entire perimeter of the site to reduce sediment migration onto surrounding properties.
- Installation of a construction entrance mat to minimize transportation of sediment onto roadways.
- Restoration of exposed surfaces with vegetative and non-vegetative material as soon as construction schedules permit, the duration of which is not to exceed 30 days.
- Reduce stormwater drainage velocities where possible.
- Minimize the amount of existing vegetation removed.

5. WATER BALANCE

Since the post development state will increase the imperviousness of the site, considerations were taken in regards to groundwater recharge. Under existing conditions the development area (proposed building addition and parking lot extension) had an annual recharge volume of 2,554 m³. With the increased imperviousness of the site, this recharge will be reduced to 0 m³, resulting in a deficit volume of 2,554 m³. As per the Hydrogeological Report by Pinchin Ltd. Dated September 6, 2022, the pre-development recharge was calculated at 2,266 m³ which is a difference of 8% which was considered nominal, therefore the higher volume of 2,554 m³ was used in the calculations.



In order to mitigate the deficit, the rooftop area of the proposed building addition will be conveyed to an underground infiltration gallery. As per the Geotechnical report completed by Pinchin Ltd. Dated July 29, 2020, the infiltration gallery is located near Monitoring Well 5 which shows the infiltration will be located within a layer of fill underlain by a layer of sand. The seasonally high groundwater elevation is approximately 5.6 m to 7.1 m below existing ground and as such, the minimum MECP separation of 1.0 m to the groundwater can be achieved.

To infiltrate 2,554 m³ annually, a rainfall depth of 4 mm is required which results in a storage volume of 28 m³. However, City of Barrie guidelines state that a minimum of the 5 mm storm across the project site is required for water balance which results in a storage volume of 52 m³. Therefore, an underground infiltration gallery with a total storage volume of 52 m³ has been proposed and water balance for the site is achieved. Water balance calculations can be found in Appendix D.

6. PHOSPHORUS

Local conservation authorities have determined the importance of reducing phosphorus levels in water courses in this area. As such, best efforts are to be employed in order to reduce phosphorus levels being contributed from the site.

Under existing conditions, the project area consists of an undeveloped grassed area which generates approximately 0.12 kg of phosphorus annually. With the increased impervious area of the site, this will be increased to approximately 1.52 kg of phosphorus annually if uncontrolled. A treatment train approach will be implemented to reduce the post-development phosphorous load. Rooftop runoff from the proposed building addition will be conveyed to underground infiltration chambers via roof leader. The proposed parking area will drain to catchbasins complete with 600 mm deep sediment sump to capture larger sediment particles. Grassed swales adjacent to the property line will convey stormwater to the site's outlet in the southwest corner, and ultimately to a downstream wet pond. According to NVCA standards, the typical phosphorus reduction is 70% for the rooftop infiltration and 85% for the wet detention ponds. The following Table 3 details the anticipated phosphorus loadings for the pre and post development conditions.

Table 3: Phosphorus Loadings

	Total P (kg)
Pre-Development	0.12
Uncontrolled Post Development	1.52
Controlled Post Development	0.13

Detailed calculations can be found in Appendix E.



7. CONCLUSIONS

The proposed development's runoff coefficient is less than the allowable for the design of the subdivision and therefore the downstream wet SWM Pond will provide quantity and quality control for the site and no additional onsite controls are proposed.

Water balance for the site will be achieved by the underground infiltration chambers which will infiltrate rooftop runoff from the proposed building addition

Phosphorous levels leaving the site will be reduced by the site's treatment train consisting of underground infiltration and grass swales.

All of which is respectfully submitted,

PEARSON ENGINEERING LTD.

Taylor Arkell, P. Eng
Senior Project Manager

Mike Dejean, P.Eng.
Partner, Manager of Engineering Services



APPENDIX A

WATER SERVICING AND FIRE FLOW CALCULATIONS

500 Veteran's Drive Water Flow Calculations

Design Criteria:

Average Water Consumption Rate (Q): 35,000 L/ha/d
 Peak Rate Factor (Max Hour): 4.00 (From Section 3.4.4: MECP Design Guidelines for Drinking-Water Systems)
 Max Day Factor: 2.00 (From Section 3.4.4: MECP Design Guidelines for Drinking-Water Systems)

Site Data:

Description	Density	Flow Rate	Peaking Factors
Industrial Building	6,968 m ²	35,000 L/ha/d	Max Day Factor 2.00 Peak Rate Factor 4.00 (From MECP Manual based on Industrial Land Use)

Calculate Average Day Demand

ADD = 35,000 x 0.70
 ADD = 24,387 L/day
 ADD = 0.28 L/s

Calculate Max Day Flow

MDF = 0.28 x 2.00
 MDF = 0.56 L/s

Calculate Peak Hour Demand

PHD = 0.28 x 4.00
 PHD = 1.13 L/s

500 Veteran's Drive Fire Flow Calculations

Required fire flow calculations as per the Fire Underwriters Survey's Water Supply for Public Fire Protection - 1999:

Location:	500 Veteran's Drive, Barrie	
OBC Occupancy:	Industrial Building - Group F	
Building Foot Print:	27,058 m ²	
# of Stories:	1	Industrial Building

Date: 2022-12-16
Project: 500 Veteran's Drive
Project Number: 22078

Construction Class	Charge
Wood Frame	1.5
Ordinary	1.0
Non-Combustible	0.8
Fire Resistive	0.6

Construction Class: Non-Combustible

Automated Sprinkler Protection:	Credit	Total
NFPA 13 sprinkler standard	Yes	30%
Standard Water Supply	Yes	10%
Fully Supervised System	Yes	10%
		50%

Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

Contents Factor: Free Burning

Charge: 15%

Exposure 1 (north) Ex. Commercial	Distance to Exposure Building (m) Length - Height	> 45.1	0%
Exposure 2 (east) Ex. Commercial	Distance to Exposure Building (m) Length - Height	> 45.1	0%
Exposure 3 (south) Ex. Commercial	Distance to Exposure Building (m) Length - Height	> 45.1	0%
Exposure 4 (west) Ex. Commercial	Distance to Exposure Building (m) Length - Height	> 45.1	0%

Separation	Charge
0 - 3.0 m	25%
3.1 - 10.0 m	20%
10.1 - 20.0 m	15%
20.1 - 30.0 m	10%
30.1 - 45.0 m	5%
> 45.1 m	0%

Total: 0% *no more than 75%

Are Buildings Contiguous? No

Fire Resistant Building: Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating?

Calculations: C = 0.8 Non-Combustible

$$RFF = 220 \times C \times \sqrt{A}$$

Note: Total floor area is largest floor (Lvl 3) plus 25% of two adjoining floors (Lvl 4-5).

A = 27,058 m²

Where: RFF = required fire flow in liters per minute

C = Coefficient related to the type of construction

A = the total floor area in square meters (excluding basements in building considered)

RFF = 28,951 L/min
Round to Nearest 1000 L/min
RFF = 29,000 L/min

*Must be > 2000 L/min or < 45,000 L/min

Correction Factors:

Occupancy w. Contents Factor	E =	4,350	L/min
Fire Flow Adjusted for Occupancy	F =	33,350	L/min
Reduction For Sprinkler	F =	16,675	L/min
Fire Flow w/ Sprinkler Reduction	F =	16,675	L/min
Exposure Charge	G =	0	L/min
Fire Flow w/ Exposure Charge	F =	16,675	L/min

As per "Water Supply for Public Fire Protection" pg.20 note H:

$$RFF = E - F + G$$

$$RFF = 33350 \text{ L/min} - 16675 \text{ L/min} + 0 \text{ L/min}$$

$$RFF = 16,675 \text{ L/min}$$

Required Fire Flow: RFF = 16,675 L/min

Round to Nearest 1000 L/min
RFF = 17,000 L/min

RFF = 4,488 GPM

RFF = 283 L/s

MAP PAGE: - LOC: - MAPART EDITION: -

STREET: VETERANS DRIVE NO: 500

CROSS STREET: CAPLAN AVENUE

CITY: BARRIE

TEST BY: NOVUS TIME: 2:30 PM DATE: OCT. 24/22

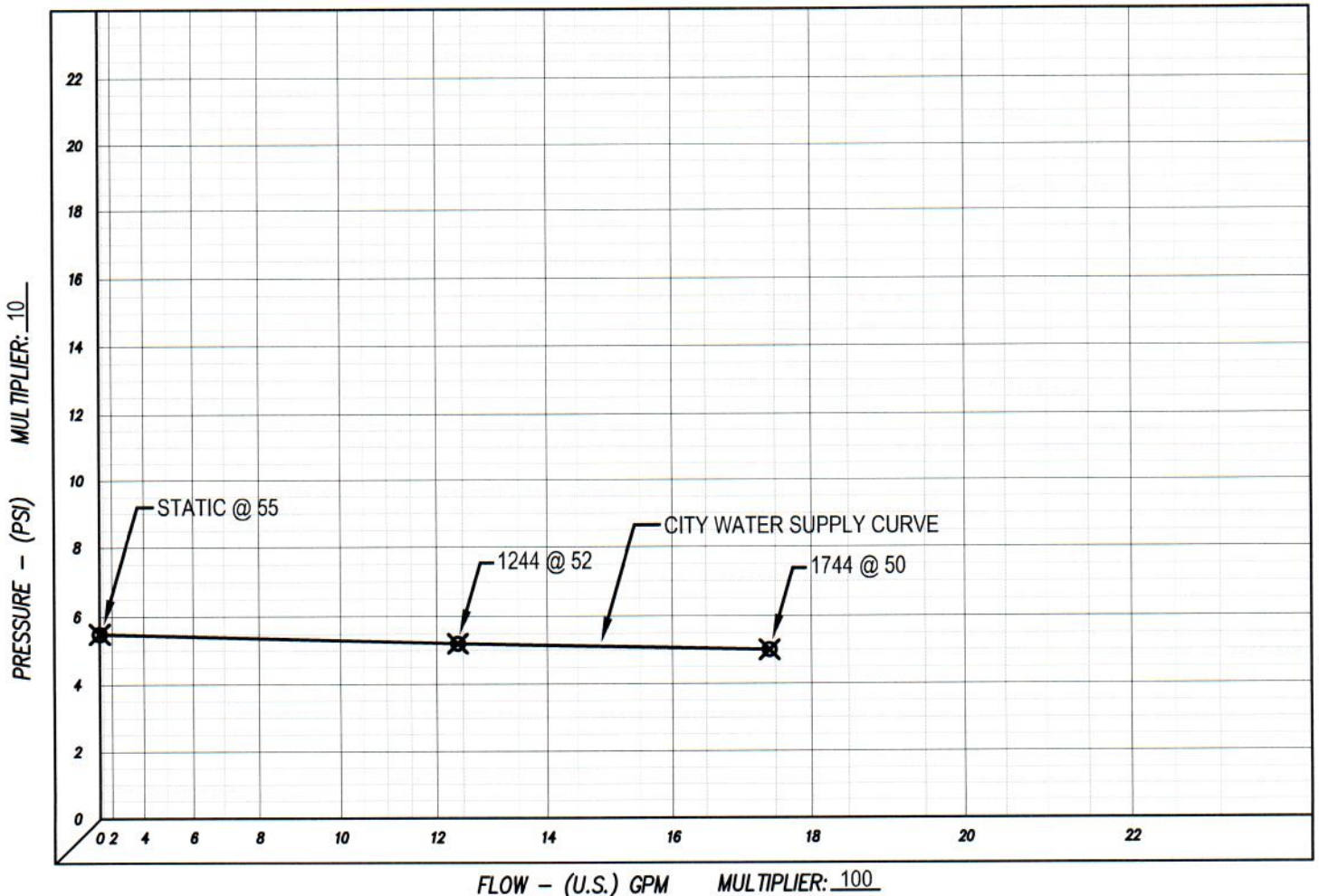
JOB NO: 22-351

TEST DATA

STATIC PRESSURE: 55 psi
 Flow #1 1244 gpm (US) 52 psi
 Flow #2 1744 gpm (US) 50 psi
 Flow #3 _____ gpm (US) _____ psi
 Flow #4 _____ gpm (US) _____ psi
 Flow #5 _____ gpm (US) _____ psi

PUMP DATA

CHURN PRESSURE: _____ psi
 Flow #1 _____ gpm (US) _____ psi
 Flow #2 _____ gpm (US) _____ psi
 Flow #3 _____ gpm (US) _____ psi
 Flow #4 _____ gpm (US) _____ psi
 Flow #5 _____ gpm (US) _____ psi





Fire Protection Consulting Inc.

MAP PAGE: - LOC: - MAPART EDITION: -

STREET: VETERANS DRIVE NO: 500

CROSS STREET: CAPLAN AVENUE

CITY: BARRIE

TEST BY: NOVUS TIME: 2:30 PM DATE: OCT. 24/22

JOB NO: 22-351

STATIC PRESSURE: 55 psi

TEST #	No. OF OUTLETS	ORIFICE SIZE	PITOT READING	FLOW (USGPM)	TOTAL FLOW (USGPM)	RESIDUAL PRESSURE (PSI)	HYDRANT TYPE	HYDRANT COEFF.
1	1	2 1/2	46	1244	1244	52		-
2	2	2 1/2	26+28	856+888	1744	50		-
3								
4								

WATER MAIN DATA:-

DIAMETER: -

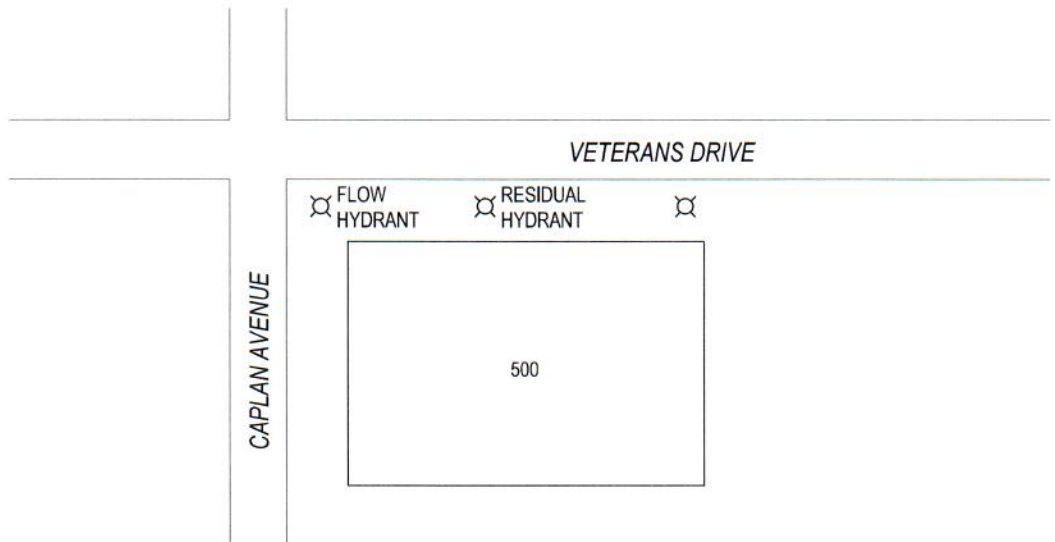
TEST HYDRANT LOCATION

FLOW: CORNER OF VETERANS DRIVE AND CAPLAN AVENUE

FLOW:

RESIDUAL: 500 VETERANS DRIVE

COMMENTS: SPECIAL CONDITIONS



MAP PAGE: - LOC: - MAPART EDITION: -

STREET: VETERANS DRIVE NO: 500

CROSS STREET: CAPLAN AVENUE

CITY: BARRIE

TEST BY: NOVUS TIME: DATE:

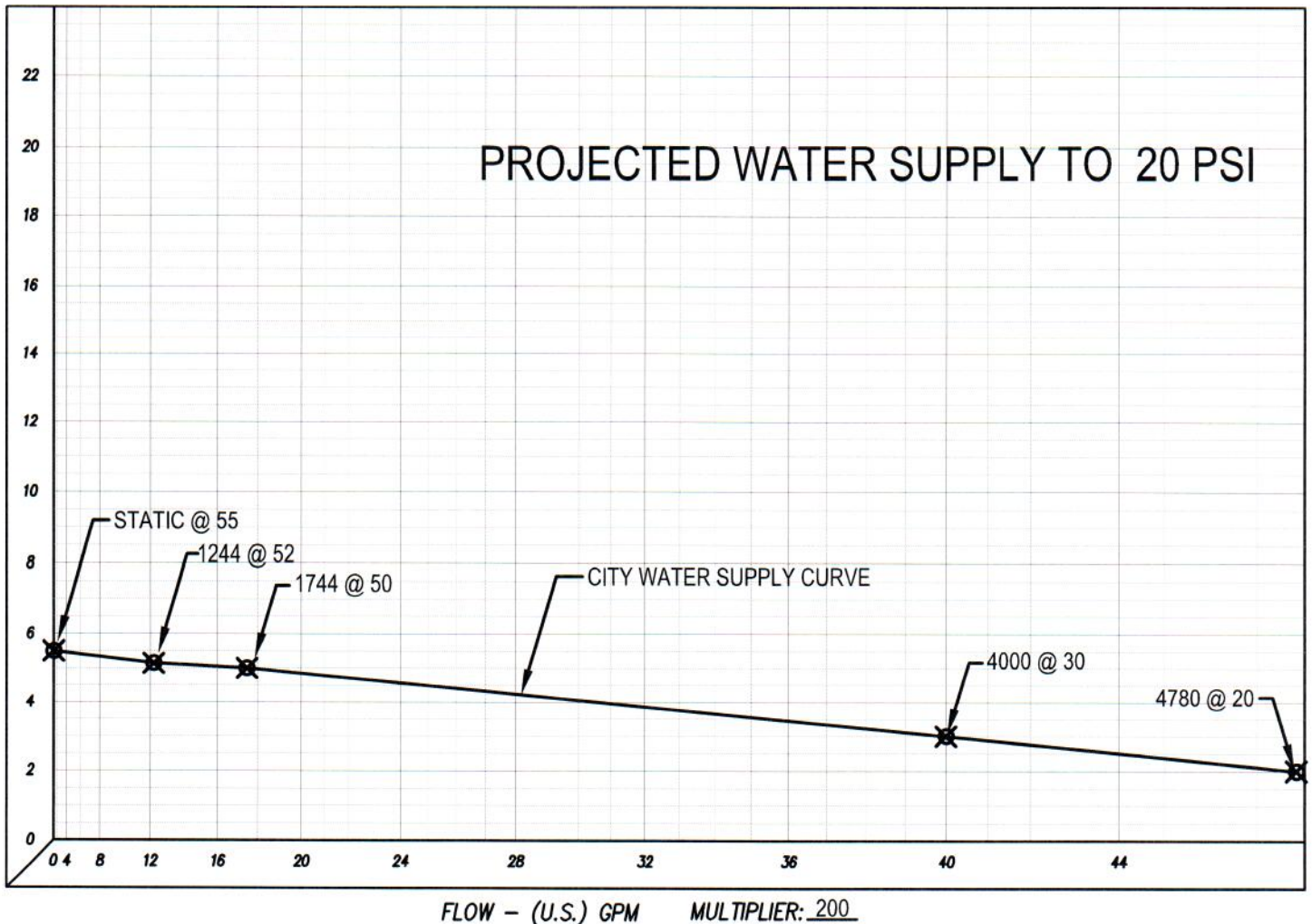
JOB NO: 22-351

TEST DATA

STATIC PRESSURE: 55 psi
 Flow #1 1244 gpm (US) 52 psi
 Flow #2 1744 gpm (US) 50 psi
 Flow #3 4000 gpm (US) 30 psi
 Flow #4 4780 gpm (US) 20 psi
 Flow #5 gpm (US) psi

PUMP DATA

CHURN PRESSURE: psi
 Flow #1 gpm (US) psi
 Flow #2 gpm (US) psi
 Flow #3 gpm (US) psi
 Flow #4 gpm (US) psi
 Flow #5 gpm (US) psi





APPENDIX B

SANITARY SERVICING CALCULATIONS

500 Veteran's Drive Sanitary Flow Calculations

Design Criteria

Average Water Consumption Rate (Q): 35,000 L/ha/d
 Peak Flow $Q_p = P * Q * M / 86400$
 Peaking Factor (Harmon Formula) $M = 1 + (14 / (4 + (P / 1000) ^ 0.5)$ Where, 2 <= "M" <= 4
 Infiltration Allowance 0.10 L/ha/s

Site Data

Description	Density	Flow Rate
Industrial Building	6,968 m ²	35,000 L/ha/d

Calculate Average Daily Demand

ADD = 35,000 x 0.70
 ADD = 24,387 L/day
 ADD = 0.28 L/s

Calculate Peaking Factor

$M = 1 + \frac{14}{4 + \frac{1}{1,000}^{0.5}}$

M = 4.00 Use Max Peaking Factor 4

Infiltration Allowance = 0.10 x 0.70
 = 0.07 L/s

Calculate Peak Flow

Qp = 0.28 x 4.00 + 0.07
 = 1.20 L/s



APPENDIX C

STORMWATER MANAGEMENT CALCULATIONS

**500 Veteran's Drive
Calculation of Runoff Coefficients**

Runoff Coefficient	=	0.25	0.90	0.95	0.08	0.9	Weighted Runoff Coefficient
Surface Cover	=	Grass	Asphalt	Building	Forest	Conc.	
1	52683	24383	9004	19296	0	0	0.62
<u>Post Development</u>	<u>Total Area (m²)</u>	<u>Area (m²)</u>	<u>Area (m²)</u>	<u>Area (m²)</u>	<u>Area (m²)</u>	<u>Area (m²)</u>	
1 (Ex. Site)	34905	7178	8431	19296	0	0	0.79
2	10558	73	2398	6967	0	1120	0.93
3	7220	7220	0	0	0	0	0.25
Post Total	52683	14471	10829	26263	0	1120	0.75



500 Veteran's Drive Allowable Peak Flows

Storm (yrs)	City of Barrie		
	Coeff A	Coeff B	Coeff C
2	678.09	4.70	0.78
5	853.61	4.70	0.77
10	975.87	4.70	0.76
25	1146.28	4.92	0.76
50	1236.15	4.70	0.75
100	1426.41	5.27	0.76

Modified Rational Method
 $Q = CiCIA / 360$

Where:

- Q - Flow Rate (m³/s)
- C - Runoff Coefficient
- I - Storm Intensity (mm/hr)
- A - Area (ha.)
- Ci - Peaking Coefficient

Area Number	Total Site Area
Area	5.27 ha
Runoff Coefficient	0.75
Time of Concentration	10 min
Return Rate	2 year
Peaking Coefficient (Ci)	1.00
Rainfall Intensity	83.1 mm/hr
Allowable Peak Flow	0.91 m³/s

Return Rate	5 year
Peaking Coefficient (Ci)	1.00
Rainfall Intensity	108.9 mm/hr
Allowable Peak Flow	1.20 m³/s

Return Rate	10 year
Peaking Coefficient (Ci)	1.00
Rainfall Intensity	126.5 mm/hr
Allowable Peak Flow	1.39 m³/s

Return Rate	25 year
Peaking Coefficient (Ci)	1.10
Rainfall Intensity	148.2 mm/hr
Allowable Peak Flow	1.79 m³/s

Return Rate	50 year
Peaking Coefficient (Ci)	1.20
Rainfall Intensity	164.2 mm/hr
Allowable Peak Flow	2.16 m³/s

Return Rate	100 year
Peaking Coefficient (Ci)	1.25
Rainfall Intensity	180.2 mm/hr
Allowable Peak Flow	2.47 m³/s



500 Veteran's Drive Post-Development Peak Flows

Storm (yrs)	City of Barrie		
	Coeff A	Coeff B	Coeff C
2	678.09	4.70	0.78
5	853.61	4.70	0.77
10	975.87	4.70	0.76
25	1146.28	4.92	0.76
50	1236.15	4.70	0.75
100	1426.41	5.27	0.76

Modified Rational Method
 $Q = C_i C_i A / 360$

Where:

- Q - Flow Rate (m³/s)
- C - Runoff Coefficient
- I - Storm Intensity (mm/hr)
- A - Area (ha.)
- C_i - Peaking Coefficient

Area Number	Existing Area	Proposed Area
Area	3.49 ha	1.78 ha
Runoff Coefficient	0.79	0.59
Time of Concentration	10 min	10 min
Return Rate	2 year	2 year
Peaking Coefficient (C _i)	1.00	1.00
Rainfall Intensity	83.1 mm/hr	83.1 mm/hr
Post Development Peak Flow	0.64 m ³ /s	0.24 m ³ /s

Return Rate	5 year	5 year
Peaking Coefficient (C _i)	1.00	1.00
Rainfall Intensity	108.9 mm/hr	108.9 mm/hr
Post Development Peak Flow	0.84 m ³ /s	0.32 m ³ /s

Return Rate	10 year	10 year
Peaking Coefficient (C _i)	1.00	1.00
Rainfall Intensity	126.5 mm/hr	126.5 mm/hr
Post Development Peak Flow	0.97 m ³ /s	0.37 m ³ /s

Return Rate	25 year	25 year
Peaking Coefficient (C _i)	1.10	1.10
Rainfall Intensity	148.2 mm/hr	148.2 mm/hr
Post Development Peak Flow	1.25 m ³ /s	0.47 m ³ /s

Return Rate	50 year	50 year
Peaking Coefficient (C _i)	1.20	1.20
Rainfall Intensity	164.2 mm/hr	164.2 mm/hr
Post Development Peak Flow	1.52 m ³ /s	0.57 m ³ /s

Return Rate	100 year	100 year
Peaking Coefficient (C _i)	1.25	1.25
Rainfall Intensity	180.2 mm/hr	180.2 mm/hr
Post Development Peak Flow	1.73 m ³ /s	0.66 m ³ /s

$Q = 0.0028 \cdot C \cdot I \cdot A$ (cms)
 C = RUNOFF COEFFICIENT
 $I = \text{RAINFALL INTENSITY} = \frac{A}{(\text{Time} + B)^C}$
 A = AREA (ha)

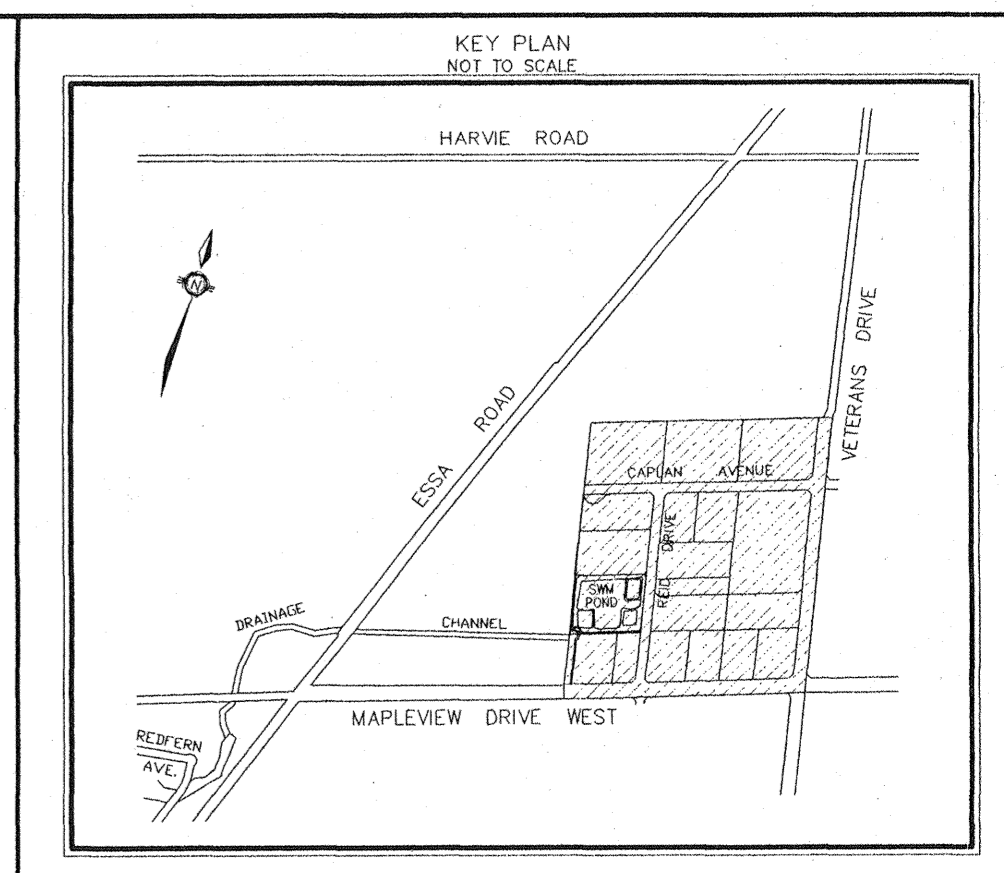
500 Veteran's Drive Storm Sewer Pipe Design Sheet 5-Year Storm Event

DATE: 14-Sep-22
 FILE: 22078
 CONTRACT/PROJECT 500 Veteran's Drive

Areas	MANHOLE		LENGTH (m)	INCREMENT			TOTAL CA	FLOW TIME (min)		I (mm/h)	TOTAL Q (cms)	S (%)	D (mm)	Q FULL (cms)	V FULL (m/s)	% FULL
	FROM	TO		C	A	CA		TO	IN							
	-	EX DCBMH		STM MH1	51.0	0.81		2.95	2.39							
-	STM CB1	TEE	28.4	0.90	0.24	0.22	0.22	10.00	0.24	108.92	0.07	2.00	300.0	0.14	1.94	48%
-	STM MH1	STM CBMH	53.1	0.00	0.00	0.00	2.60	15.65	0.64	84.89	0.61	0.30	750.0	0.61	1.38	101%
-	STM CB2	TEE	3.8	0.90	0.11	0.10	0.01	10.00	0.03	108.92	0.00	2.00	300.0	0.14	1.94	2%
-	STM CAP	STM MH2	4.3	0.95	0.69	0.66	0.66	10.00	0.05	108.92	0.20	0.50	525.0	0.30	1.40	65%
-	STM MH2	STM CBMH	45.0	0.00	0.00	0.00	0.66	10.05	0.49	108.63	0.20	0.50	600.0	0.43	1.54	46%
-	STM CBMH	OUTLET	36.7	0.00	0.00	0.00	3.27	10.54	0.36	105.95	0.96	0.35	900.0	1.07	1.68	90%

Note:

1. Ex. 600 mm storm sewer for the existing site area does not have sufficient capacity based on peak flows calculated using catchment plan by Richardson Engineering Ltd., dated October 2003
2. Flow time for the existing pipe was calculated based on the length and slope of the existing storm pipes.



- LEGEND**
- CATCHMENT BOUNDARY
 - 12.91
5.75 AREA
STORM ID. NO. & RUN-OFF CO-EF.
 - SURFACE FLOW DIRECTION
 - STORM LATERAL AND PLUG
 - PROP. STORM MANHOLE
 - ◻ PROP. CATCHBASIN
 - ◻ PROP. DOUBLE CATCHBASIN
 - EX. STORM MANHOLE
 - EX. STORM SEWER

NOTES

VERTICAL BENCHMARKS
 V010865478: ELEVATION 312.502
 IRON BAR WITH BRASS CAP ON WEST SIDE VETERANS DRIVE 650m SOUTH OF MAPLEVIEW DRIVE WEST. BENCH MARK IS SET 10.15m WEST OF C/L OF ROAD 50m SOUTH OF ENTRANCE TO #675 VETERANS DRIVE (BARRIE PRODUCE)
 V010865451: ELEVATION 300.306
 CONC. HEADWALL ON EAST SIDE OF REDFERN AVE. TABLE IS SET HORIZONTALLY IN EAST FACE, 150m NORTH OF DYER BLVD 16.3m EAST OF C/L OF ROAD, 52cm WEST OF SOUTH END, 42cm BELOW TOP OF WALL.

HORIZONTAL BEARING NOTE:
 BEARINGS HEREIN ARE GRID BEARINGS AND ARE DERIVED FROM MNR CONTROL MONUMENT G3187001 (N4909644.399 E60354.554) & MONUMENT G31820053 (N4908053.302 E603963.132) AND ARE BASED ON NAD83

DISTANCE NOTE:
 DISTANCES SHOWN HEREON ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.9996664.

NO.	REVISIONS	DATE	APPROVED

CITY OF BARRIE APPROVED

DATE: Nov. 17 2003

R. D. ...
 DIRECTOR OF ENGINEERING

MAPLEVIEW WEST INDUSTRIAL PARK PHASE II

STORM DRAINAGE PLAN

CITY OF BARRIE ENGINEERING DEPARTMENT

SCALE HOR: 1:1500 VERT: ... DRAWING NO. 2003-19
 DESIGN REL DRAWN GEM CAD SHEET NO. STM2
 REVIEWED L.H.B. DATE OCTOBER 2003

RICHARDSON ENGINEERING & CONSULTING ENGINEERS

Unit 11, 4 Cedar Pointe Drive
 Barrie, Ontario L4N 5R7
 Tel: (705) 728-9392
 Fax: (705) 727-7774
 E-mail: engineer@richardson.on.ca



APPENDIX D

WATER BALANCE CALCULATIONS



**500 Veteran's Lane
Pre Development Water Balance**

Catchment Designation	Site			
	Grassed	Impervious	Total	
Area	10485	0	10485	
Pervious Area	10485	0	10485	
Impervious Area	0	0	0	
Infiltration Factors				
Topography Infiltration Factor	0.3	0.0		(From MOE Table 3.1 for Rolling Land)
Soil Infiltration Factor	0.3	0.0		(From MOE Table 3.1 for an average value between
Land Cover Infiltration Factor	0.1	0.0		Medium combinations of clay and loam and Open
MOE Infiltration Factor	0.7	0.0		sandy loam)
Actual Infiltration Factor	0.7	0.0		
Run-Off Coefficient	0.3	1.0		
Runoff from Impervious Surfaces*	0.0	0.95		
Inputs (per Unit Area)				
Precipitation	914	914		(Precipitation values from Lake Simcoe Climate Data,
Run-On	0.0	0.0		dated April 2017)
Other Inputs	0.0	0.0		
Total Inputs	914	914		
Outputs (per Unit Area)				
Precipitation Surplus	348.0	868.3	348	(Evapotranspiration values from Lake Simcoe Climate
Net Surplus	348.0	868.3	348	
Evapotranspiration	566.0	45.7	566	
Infiltration	243.6	0.0	244	
Rooftop Infiltration	0.0	0.0	0	
Total Infiltration	243.6	0.0	244	
Runoff Pervious Areas	104.4	0.0	104	
Runoff Impervious Areas	0.0	868.3	868	
Total Runoff	104.4	868.3	973	
Total Outputs	914.0	914.0	1828	
Difference (Inputs - Outputs)	0.0	0.0	0	
Inputs (Volumes)				
Precipitation	9583	0	9583	
Run-On	0	0	0	
Other Inputs	0	0	0	
Total Inputs	9583	0	9583	
Outputs (Volumes)				
Precipitation Surplus	3649	0	3649	
Net Surplus	3649	0	3649	
Evapotranspiration	5935	0	5935	
Infiltration	2554	0	2554	
Rooftop Infiltration	0	0	0	
Total Infiltration	2554	0	2554	
Runoff Pervious Areas	1095	0	1095	
Runoff Impervious Areas	0	0	0	
Total Runoff	1095	0	1095	
Total Outputs	9583	0	9583	
Difference (Inputs - Outputs)	0	0	0	

Note:

1. Highlighted cells are input cells.



**500 Veteran's Lane
Post Development Water Balance (Without Infiltration)**

Catchment Designation	Site			
	Grassed	Impervious	Building	Total
Area	0	3518	6967	10485
Pervious Area	0	0	0	0
Impervious Area	0	3518	6967	10485
Infiltration Factors				
Topography Infiltration Factor	0.3	0.0	0.0	
Soil Infiltration Factor	0.3	0.0	0.0	
Land Cover Infiltration Factor	0.1	0.0	0.0	
MOE Infiltration Factor	0.7	0.0	0.0	
Actual Infiltration Factor	0.7	0.0	0.0	
Run-Off Coefficient	0.3	1.0	1.0	
Runoff from Impervious Surfaces*	0.0	0.95	0.95	
Inputs (per Unit Area)				
Precipitation	914	914	914	914
Run-On	0	0	0	0
Other Inputs	0	0	0	0
Total Inputs	914	914	914	914
Outputs (per Unit Area)				
Precipitation Surplus	348.0	868.3	868.3	868.3
Net Surplus	348.0	868.3	868.3	868.3
Evapotranspiration	566.0	45.7	45.7	45.7
Infiltration	243.6	0.0	0.0	0.0
Rooftop Infiltration	0.0	0.0	0.0	0.0
Total Infiltration	243.6	0.0	0.0	0.0
Runoff Pervious Areas	104.4	0.0	0.0	0.0
Runoff Impervious Areas	0.0	868.3	868.3	868.3
Total Runoff	104.4	868.3	868.3	868.3
Total Outputs	914.0	914.0	914.0	914.0
Difference (Inputs - Outputs)	0.0	0.0	0.0	
Inputs (Volumes)				
Precipitation	0	3215	6368	9583
Run-On	0	0	0	0
Other Inputs	0	0	0	0
Total Inputs	0	3215	6368	9583
Outputs (Volumes)				
Precipitation Surplus	0	3055	6049	9104
Net Surplus	0	3055	6049	9104
Evapotranspiration	0	161	318	479
Infiltration	0	0	0	0
Rooftop Infiltration	0	0	0	0
Total Infiltration	0	0	0	0
Runoff Pervious Areas	0	0	0	0
Runoff Impervious Areas	0	3055	6049	9104
Total Runoff	0	3055	6049	9104
Total Outputs	0	3215	6368	9583
Difference (Inputs - Outputs)	0	0	0	0

(From MOE Table 3.1 for Rolling Land)
(From MOE Table 3.1 for an average value between Medium combinations of clay and loam and Open sandy loam)

(Precipitation values from Lake Simcoe Climate Data, dated April 2017)

(Evapotranspiration values from Lake Simcoe Climate Data, dated April 2017)

Note:

1. Highlighted cells are input cells.



**500 Veteran's Lane
Post Development Water Balance (With Infiltration)**

Catchment Designation	Site			
	Grassed	Impervious	Building (With Infiltration)	Total
Area	0	3518	6967	10485
Pervious Area	0	0	0	0
Impervious Area	0	3518	6967	10485
Infiltration Factors				
Topography Infiltration Factor	0.3	0	0	
Soil Infiltration Factor	0.3	0	0	
Land Cover Infiltration Factor	0.1	0	0	
MOE Infiltration Factor	0.7	0	0	
Actual Infiltration Factor	0.7	0	0	
Run-Off Coefficient	0.3	1	1	
Runoff from Impervious Surfaces*	0.0	0.95	0.95	
Inputs (per Unit Area)				
Precipitation	914	914	914	914
Run-On	0	0	0	0
Other Inputs	0	0	0	0
Total Inputs	914	914	914	914
Outputs (per Unit Area)				
Precipitation Surplus	348.0	868.3	868.3	868.3
Net Surplus	348.0	868.3	501.7	624.7
Evapotranspiration	566.0	45.7	45.7	45.7
Infiltration	243.6	0.0	0.0	0.0
Rooftop Infiltration	0.0	0.0	366.6	243.6
Total Infiltration	243.6	0.0	366.6	243.6
Runoff Pervious Areas	104.4	0.0	0.0	0.0
Runoff Impervious Areas	0.0	868.3	501.7	624.7
Total Runoff	104.4	868.3	501.7	624.7
Total Outputs	914.0	914.0	914.0	914.0
Difference (Inputs - Outputs)	0.0	0.0	0.0	0.0
Inputs (Volumes)				
Precipitation	0	3215	6368	9583
Run-On	0	0	0	0
Other Inputs	0	0	0	0
Total Inputs	0	3215	6368	9583
Outputs (Volumes)				
Precipitation Surplus	0	3055	6049	9104
Net Surplus	0	3055	3495	6550
Evapotranspiration	0	161	318	479
Infiltration	0	0	0	0
Rooftop Infiltration	0	0	2554	2554
Total Infiltration	0	0	2554	2554
Runoff Pervious Areas	0	0	0	0
Runoff Impervious Areas	0	3055	3495	6550
Total Runoff	0	3055	3495	6550
Total Outputs	0	3215	6368	9583
Difference (Inputs - Outputs)	0	0	0	0

(From MOE Table 3.1 for Rolling Land)
(From MOE Table 3.1 for an average value between Medium combinations of clay and loam and Open sandy loam)

(Precipitation values from Lake Simcoe Climate Data, dated April 2017)

(Evapotranspiration values from Lake Simcoe Climate Data, dated April 2017)

Depth of rainfall over the rooftop required to be infiltrated to achieve water balance.

Note:
1. Highlighted cells are input cells.

500 Veteran's Drive Water Balance Calculations

Annual Rainfall Depth Required

$$\text{Depth of Rainfall Required} = 366.6 \text{ m}^3 \quad (\text{From Post-Development Water Balance (With Infiltration)})$$

Find Percent of Annual Rainfall that Required Rainfall Depth represents:

$$\begin{aligned} \text{Annual Rainfall for Study Area} &= 914.0 \text{ mm} \\ \text{\% Annual Rainfall} &= \frac{366.6}{914} \text{ mm} \\ &= 40\% \end{aligned}$$

As per Figure C.2, assuming depth of precipitation will be 4 mm.

$$\begin{aligned} \text{Roof Top Area} &= 6,967 \text{ m}^2 \\ \text{Rainfall Depth} &= 4 \text{ mm} \\ \text{Storage Volume Required} &= A \times D \\ &= 6,967 \times 4 \\ &= 28 \text{ m}^3 \end{aligned}$$

Minimum Infiltration Volume as per City of Barrie Storm Drainage and Stormwater Management Policies and Design Guidelines Section 4.1.3 is as follows:

$$\begin{aligned} \text{Storage Volume Required} &= \text{Development Area} \times 5 \text{ mm} \\ &= 10,485 \times 0.005 \\ &= 52 \text{ m}^3 \end{aligned}$$

It is proposed to infiltrate the 5 mm storm event over the rooftop area, resulting in a storage volume of 52 m³.



APPENDIX E

PHOSPHORUS CALCULATIONS

500 Veteran's Drive Phosphorus Budget

As per NVCA Phosphorus budget tool,

$$\begin{aligned} \text{Industrial/ Commercial Export coefficient} &= T_{pi} \times \text{Precip} \times P_j \times R_v \times 10^{-2} \\ &= 1.38 \end{aligned}$$

$$\begin{aligned} \text{Where, } T_{pi} &= 0.41 \\ \text{Precipitation} &= 932.9 \\ P_j &= 0.61 \\ R_v &= 0.59 \end{aligned}$$

	Hay / Pasture	High Intensity Commercial/Industrial	Unpaved Road	Forest
Phosphorus Export (kg/ha/year)	0.08	1.38	0.83	0.06

Pre-Development Condition

	Hay / Pasture	High Intensity Commercial/Industrial	Unpaved Road	Forest
Area (ha)	1.55	0.00	0.00	0.00
Total P (kg)	0.12	0.00	0.00	0.00
Total Pre-Development P (kg)		0.12		

Post-Development Condition (Uncontrolled):

	Hay / Pasture	High Intensity Commercial/Industrial	Unpaved Road	Forest
Area (ha):	0.72	1.06	0.00	0.00
Total P (kg) :	0.06	1.46	0.00	0.00
Total Uncontrolled Post-Development (kg):		1.52		

Post-Development Condition (Controlled):

<u>Untreated Area</u>	Hay / Pasture	High Intensity Commercial/Industrial	Unpaved Road	Forest
Area (ha):	0.72	0.36	0.00	0.00
Total P (kg) :	0.06	0.50	0.00	0.00
<u>Area Draining to Underground Storage</u>				
Area (ha):	0.00	0.70	0.00	0.00
Total P (kg) :	0.00	0.96	0.00	0.00
<u>Soakaway Infiltration</u>				
Total P (kg):		0.96		
Soakaway Infiltration Proficiency (%):		70		
P Removed (kg):		0.67		
P Remaining (kg):		0.29		
<u>Wet Detention Ponds</u>				
Total P (kg):		0.84		
Wet Detention Ponds Proficiency (%):		85		
P Removed (kg):		0.72		
P Remaining (kg):		0.13		
Total Post-Development P (kg):		0.13		



APPENDIX F

STORMTECH CHAMBER INFORMATION

StormTech® SC-740 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.



Nominal Chamber Specifications (not to scale)

Size (L x W x H)
85.4" x 51" x 30"
2,170 mm x 1,295 mm x 762 mm

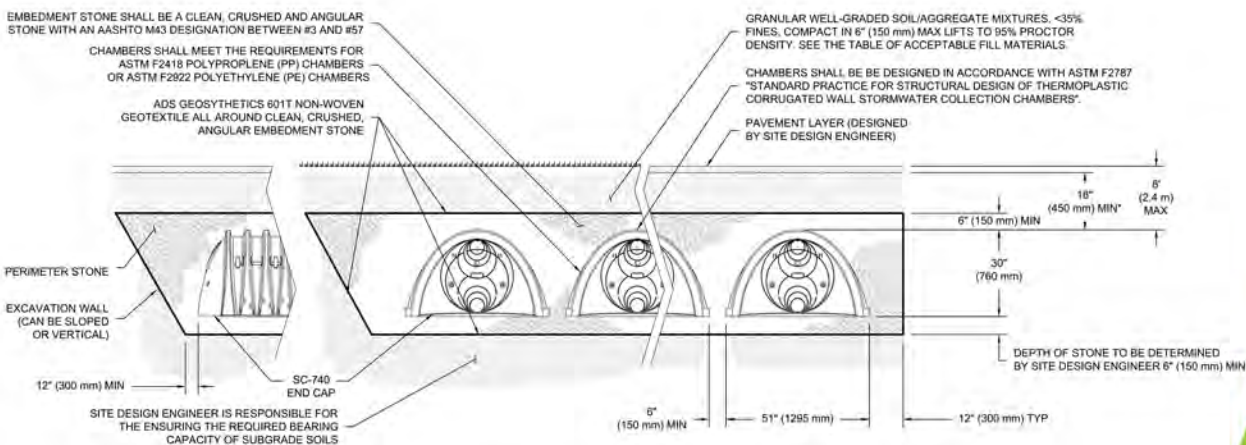
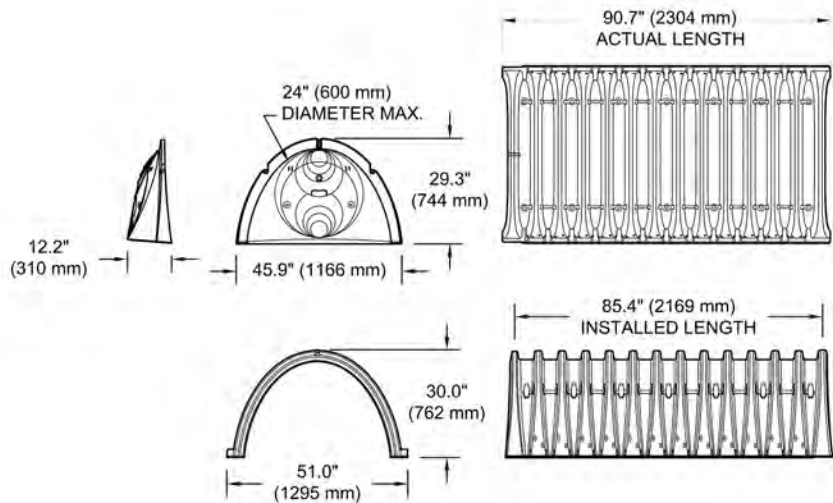
Chamber Storage
45.9 ft³ (1.30 m³)

Min. Installed Storage*
74.9 ft³ (2.12 m³)

Weight
74.0 lbs (33.6 kg)

Shipping
30 chambers/pallet
60 end caps/pallet
12 pallets/truck

*Assumes 6" (150 mm) stone above, below and between chambers and 40% stone porosity.



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

StormTech SC-740 Specifications

Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft ³ (m ³)	Total System Cumulative Storage ft ³ (m ³)
42 (1067)	45.90 (1.300)	74.90 (2.121)
41 (1041)	45.90 (1.300)	73.77 (2.089)
40 (1016)	45.90 (1.300)	72.64 (2.057)
39 (991)	45.90 (1.300)	71.52 (2.025)
38 (965)	45.90 (1.300)	70.39 (1.993)
37 (940)	45.90 (1.300)	69.26 (1.961)
36 (914)	45.90 (1.300)	68.14 (1.929)
35 (889)	45.85 (1.298)	66.98 (1.897)
34 (864)	45.69 (1.294)	65.75 (1.862)
33 (838)	45.41 (1.286)	64.46 (1.825)
32 (813)	44.81 (1.269)	62.97 (1.783)
31 (787)	44.01 (1.246)	61.36 (1.737)
30 (762)	43.06 (1.219)	59.66 (1.689)
29 (737)	41.98 (1.189)	57.89 (1.639)
28 (711)	40.80 (1.155)	56.05 (1.587)
27 (686)	39.54 (1.120)	54.17 (1.534)
26 (660)	38.18 (1.081)	52.23 (1.479)
25 (635)	36.74 (1.040)	50.23 (1.422)
24 (610)	35.22 (0.977)	48.19 (1.365)
23 (584)	33.64 (0.953)	46.11 (1.306)
22 (559)	31.99 (0.906)	44.00 (1.246)
21 (533)	30.29 (0.858)	41.85 (1.185)
20 (508)	28.54 (0.808)	39.67 (1.123)
19 (483)	26.74 (0.757)	37.47 (1.061)
18 (457)	24.89 (0.705)	35.23 (0.997)
17 (432)	23.00 (0.651)	32.96 (0.939)
16 (406)	21.06 (0.596)	30.68 (0.869)
15 (381)	19.09 (0.541)	28.36 (0.803)
14 (356)	17.08 (0.484)	26.03 (0.737)
13 (330)	15.04 (0.426)	23.68 (0.670)
12 (305)	12.97 (0.367)	21.31 (0.608)
11 (279)	10.87 (0.309)	18.92 (0.535)
10 (254)	8.74 (0.247)	16.51 (0.468)
9 (229)	6.58 (0.186)	14.09 (0.399)
8 (203)	4.41 (0.125)	11.66 (0.330)
7 (178)	2.21 (0.063)	9.21 (0.264)
6 (152)	0 (0)	6.76 (0.191)
5 (127)	0 (0)	5.63 (0.160)
4 (102)	0 (0)	4.51 (0.128)
3 (76)	0 (0)	3.38 (0.096)
2 (51)	0 (0)	2.25 (0.064)
1 (25)	0 (0)	1.13 (0.032)

Note: Add 1.13 ft³ (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage ft ³ (m ³)	Chamber and Stone Foundation Depth in. (mm)		
		6 (150)	12 (300)	18 (450)
SC-740 Chamber	45.9 (1.3)	74.9 (2.1)	81.7 (2.3)	88.4 (2.5)

Note: Assumes 6" (150 mm) stone above chambers, 6" (150 mm) row spacing and 40% stone porosity.

Amount of Stone Per Chamber

English Tons (yds ³)	Stone Foundation Depth		
	6"	12"	16"
SC-740	3.8 (2.8)	4.6 (3.3)	5.5 (3.9)
Metric Kilograms (m ³)	150 mm	300 mm	450 mm
SC-740	3,450 (2.1)	4,170 (2.5)	4,490 (3.0)

Note: Assumes 6" (150 mm) of stone above and between chambers.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	6 (150)	12 (300)	18 (450)
SC-740	5.5 (4.2)	6.2 (4.7)	6.8 (5.2)

Note: Assumes 6" (150 mm) of row separation and 18" (450 mm) of cover. The volume of excavation will vary as depth of cover increases.

Working on a project?

Visit us at www.stormtech.com and utilize the Design Tool

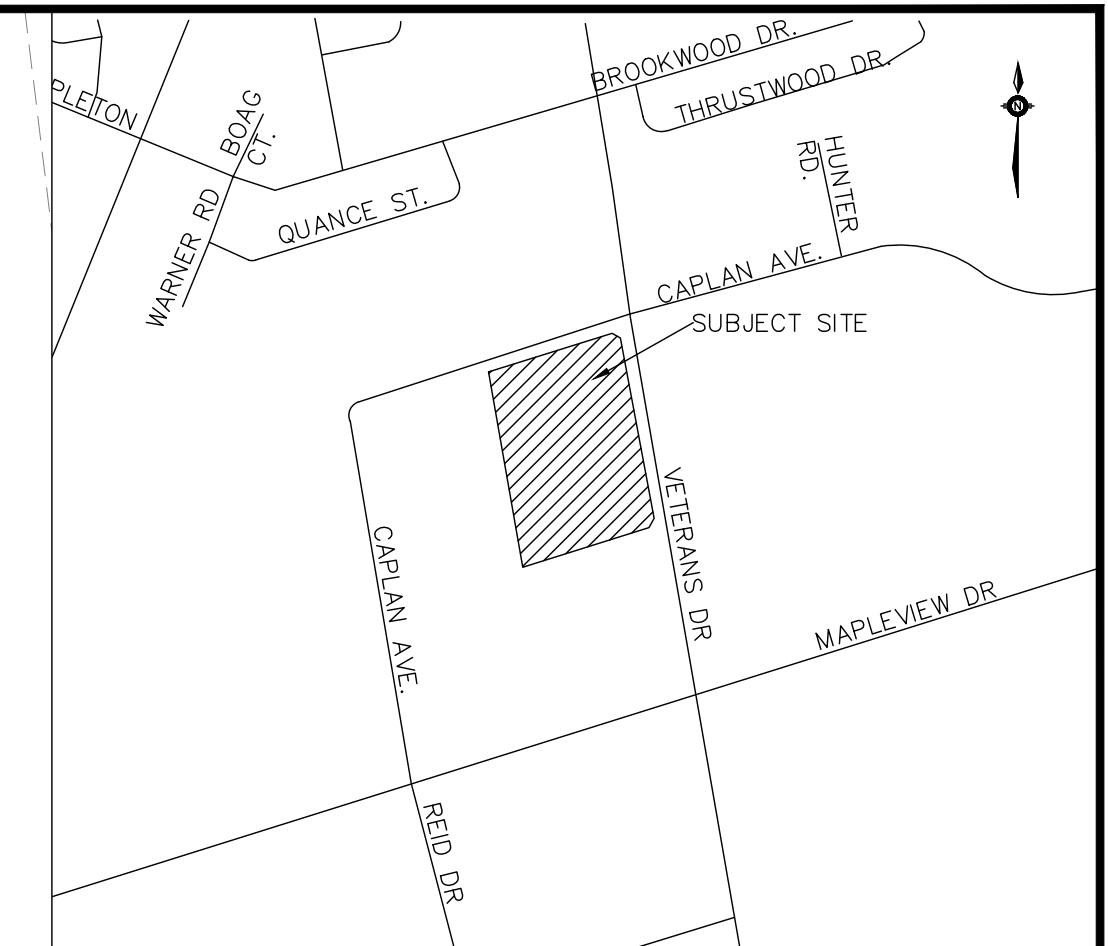
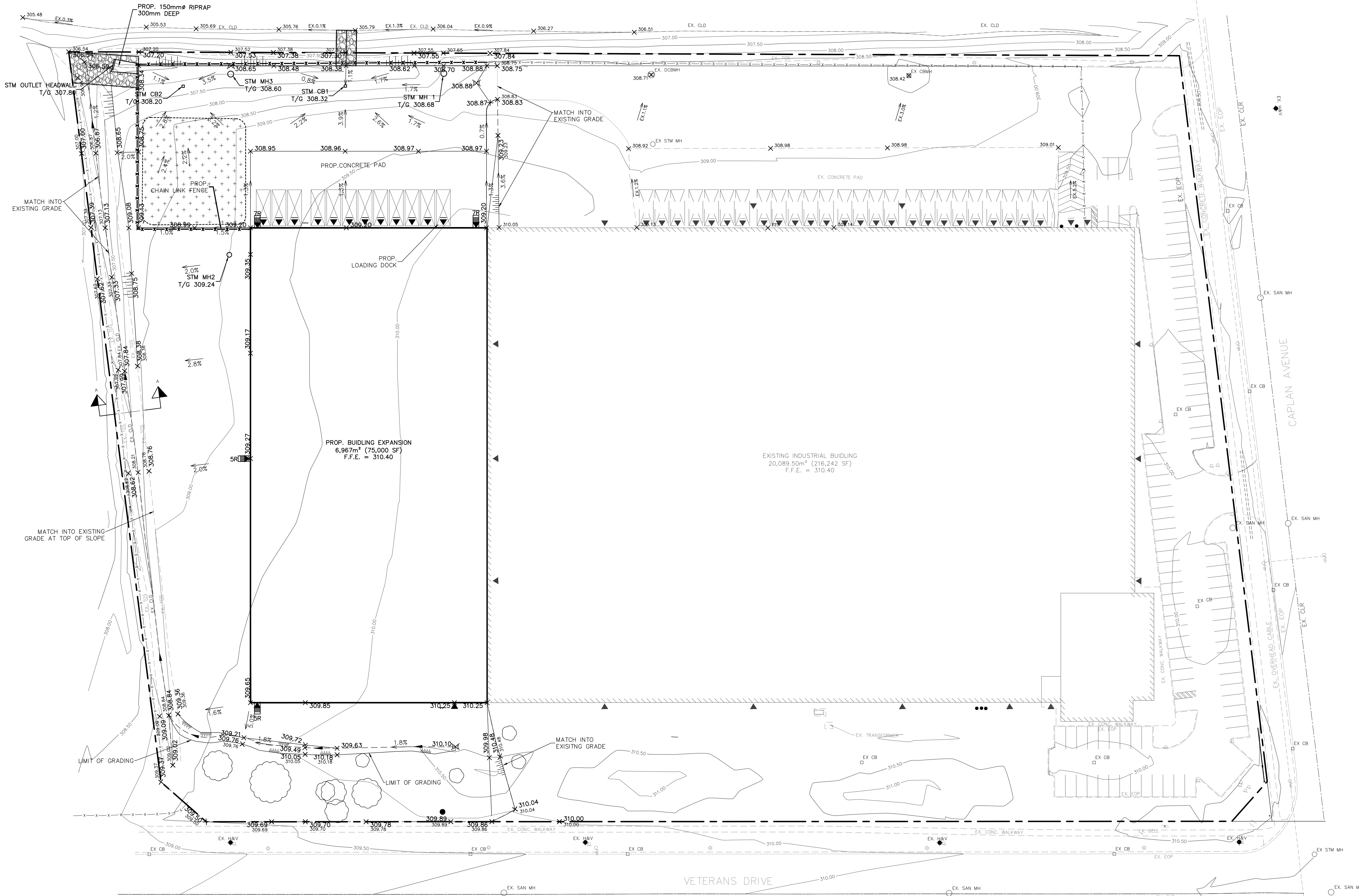




APPENDIX G

ENGINEERING DRAWINGS

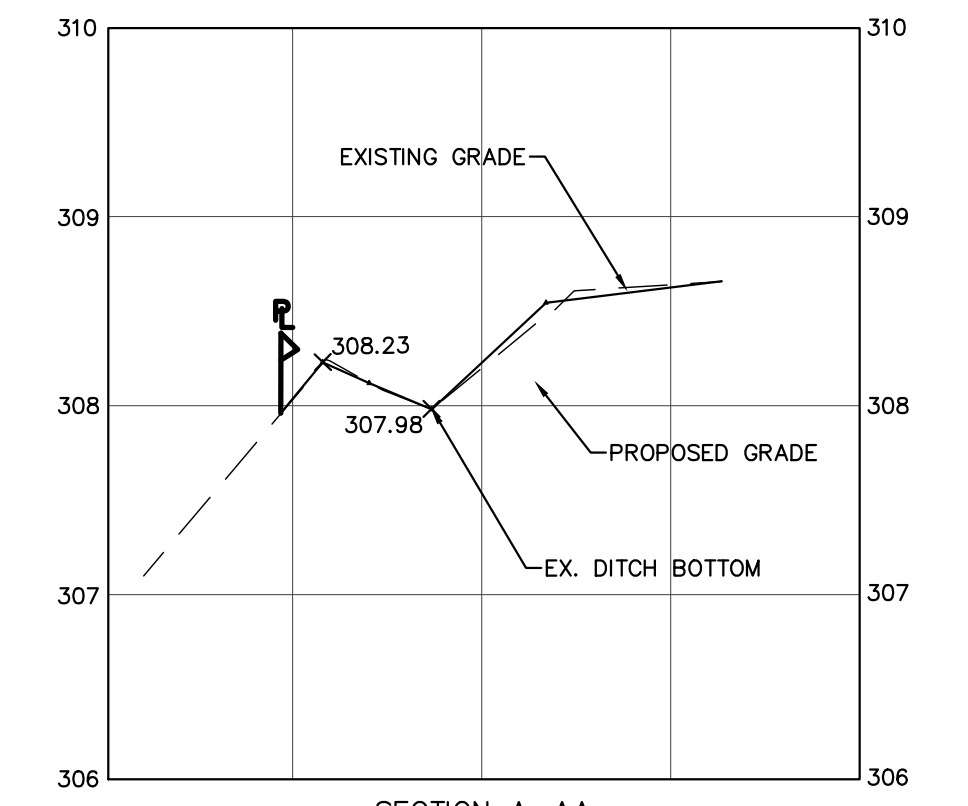
P:\AutoCAD\Working\Folders\22078 - Summit Reit, 500 Veterans Dr., Barrie\Engineering\22078 - BASE.dwg Layout:50-1 Plotted Dec 16, 2022 @ 3:23pm by mwls @ PEARSON ENGINEERING LTD.



KEYMAP
N.T.S.

LEGEND

- CB CATCH BASIN
- DCB DOUBLE CATCH BASIN
- ⊙ CBMH CATCH BASIN
- MH STORM MANHOLE
- SMH SANITARY MANHOLE
- SERVICE CAP
- ◆ HYD. FIRE HYDRANT
- ▼ VB WATER VALVE
- CS CURB STOP W/ SERVICE
- × 254.63 PROPOSED ELEVATION
- 254.09 EXISTING ELEVATION
- 1.5% PROPOSED DIRECTION AND GRADE
- BACK OF CURB
- EDGE OF PAVEMENT
- CURB CUT LOCATION
-) (HIGH POINT
- SIGNS
- ☀ STREET LIGHT
- ||||| MAX 3:1 SLOPE
- ▣ PROP. SNOW STORAGE AREA



SECTION A-AA
EXISTING DITCH
HORIZ: 1:200
VERT: 1:20

NOTE:
ALL ASPHALT AREA TO BE HEAVY
DUTY AS PER ND-1

NO.	REVISION NOTE	DATE	BY
1.	AS PER 1ST SUBMISSION COMMENTS	12/16/22	AV

BENCHMARK
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM (CGVD28: 78) AND AREDERIVED FROM BENCH MARK NO. 03120080060 HAVING A PUBLISHED ELEVATION OF 307.474 METRES AND NO. 03120030018 HAVINH A PUBLISHED ELEVATION OF 306.589 METRES.

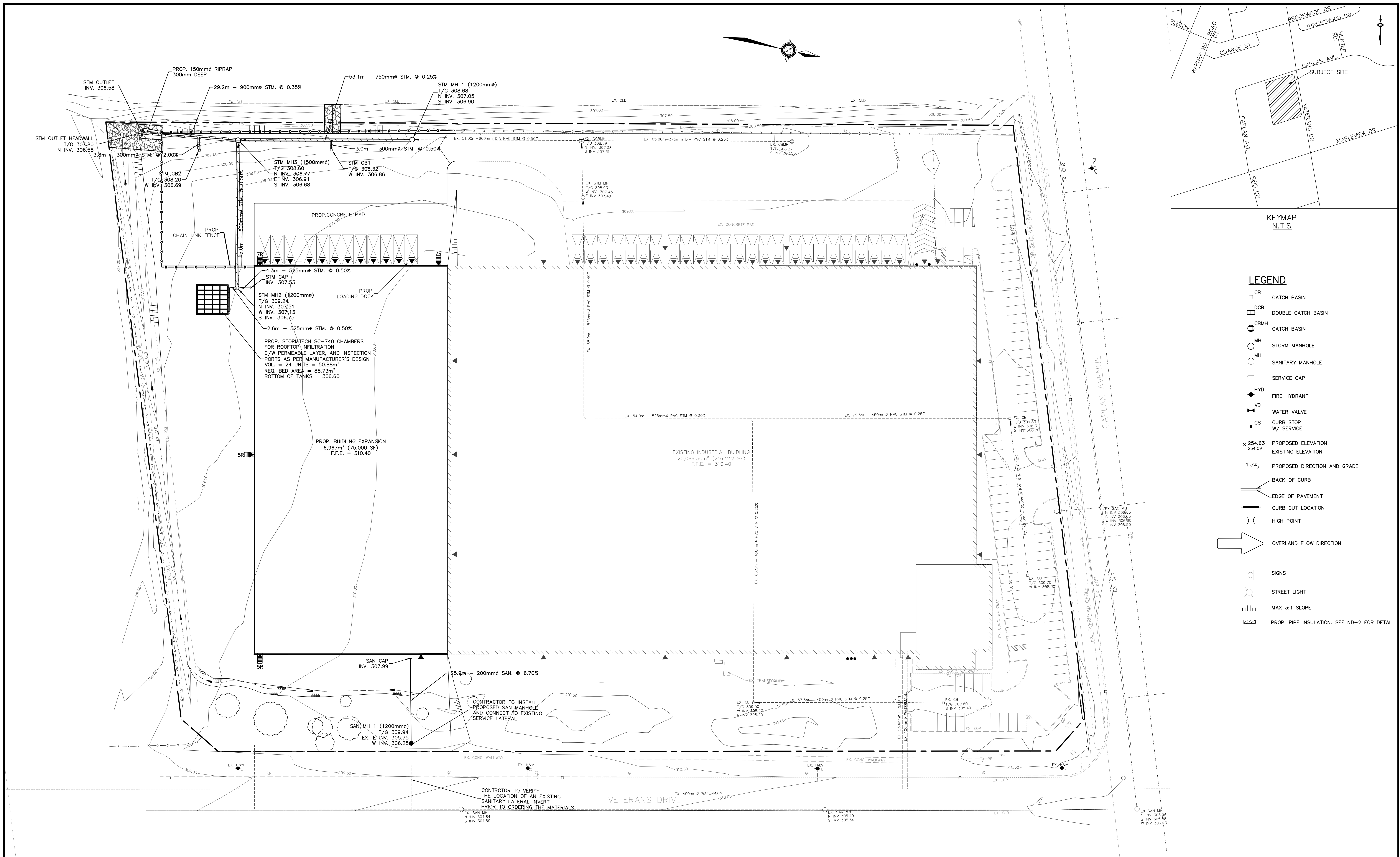


SUMMIT REIT
500, VETERANS DRIVE
CITY OF BARRIE

SITE GRADING PLAN

DESIGNED BY	NW	HORIZ SCALE	1:500	PROJECT #	22078
DRAWN BY	NP	VERT SCALE	N/A	DRAWING #	SG-1
CHECKED BY	MWD	DATE	AUGUST 2022	REVISION #	1

P:\AutoCAD\Working_Folders\Engineering\22078 - Summit Reit, 500 Veterans Dr., Barrie\Engineering\22078 - BASE.dwg Layout:SS-1 Plotted Dec 16, 2022 @ 3:24pm by mwls @ PEARSON ENGINEERING LTD.



NO.	REVISION NOTE	DATE	BY
1.	AS PER 1ST SUBMISSION COMMENTS	12/16/22	AV

BENCHMARK
 ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM (CGVD28: 78) AND ARE DERIVED FROM BENCH MARK NO. 03120080060 HAVING A PUBLISHED ELEVATION OF 307.474 METRES AND NO. 03120030018 HAVING A PUBLISHED ELEVATION OF 306.589 METRES.



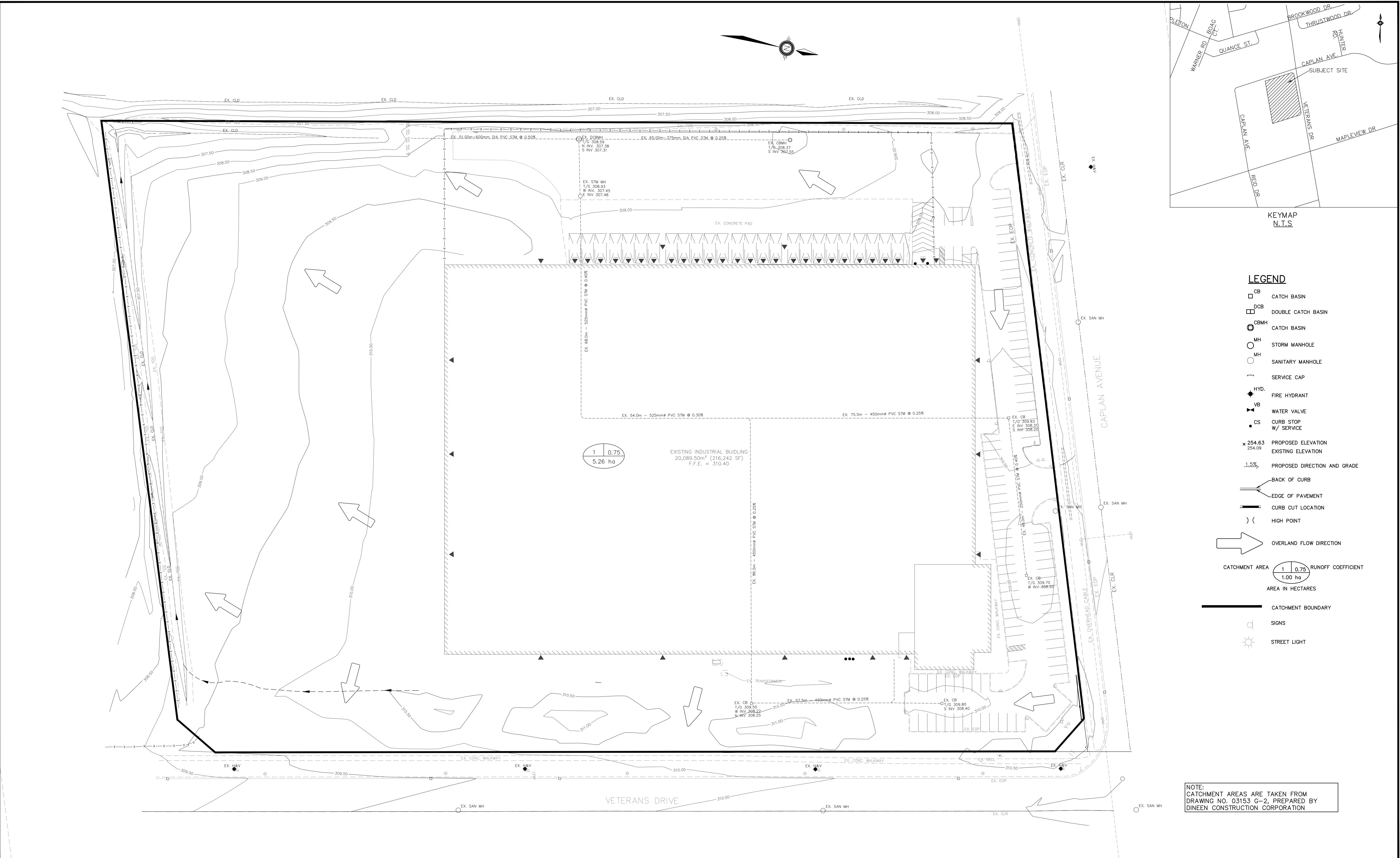
SUMMIT REIT
500, VETERANS DRIVE
CITY OF BARRIE

SITE SERVICING PLAN

PEARSON ENGINEERING
 PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	NW	HORIZ SCALE	1:500	PROJECT #	22078
DRAWN BY	NP	VERT SCALE	N/A	DRAWING #	SS-1
CHECKED BY	MWD	DATE	AUGUST 2022	REVISION #	1

P:\AutoCAD\Working_Folders\Engineering\22078 - BASE.dwg Layout:STM-1 Plotted Dec 16, 2022 @ 3:24pm by mwells @ PEARSON ENGINEERING LTD.



- LEGEND**
- CB CATCH BASIN
 - ▣ DCB DOUBLE CATCH BASIN
 - ⊙ CBMH CATCH BASIN
 - MH STORM MANHOLE
 - MH SANITARY MANHOLE
 - SERVICE CAP
 - ◆ HYD. FIRE HYDRANT
 - ▼ VB WATER VALVE
 - CS CURB STOP W/ SERVICE
 - × 254.63 PROPOSED ELEVATION
 - 254.59 EXISTING ELEVATION
 - 1.5% PROPOSED DIRECTION AND GRADE
 - BACK OF CURB
 - EDGE OF PAVEMENT
 - CURB CUT LOCATION
 -) (HIGH POINT
 - ➔ OVERLAND FLOW DIRECTION
 - CATCHMENT AREA (1 | 0.75) RUNOFF COEFFICIENT
 - 1.00 ha AREA IN HECTARES
 - CATCHMENT BOUNDARY
 - ⊙ SIGNS
 - ☀ STREET LIGHT

NOTE: CATCHMENT AREAS ARE TAKEN FROM DRAWING NO. 03153 G-2. PREPARED BY DINEEN CONSTRUCTION CORPORATION

NO.	REVISION NOTE	DATE	BY
1.	AS PER 1ST SUBMISSION COMMENTS	12/16/22	AV

BENCHMARK
 ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM (CGVD28:78) AND ADERIVED FROM BENCH MARK NO. 03120080060 HAVING A PUBLISHED ELEVATION OF 307.474 METRES AND NO. 03120030018 HAVING A PUBLISHED ELEVATION OF 306.589 METRES.



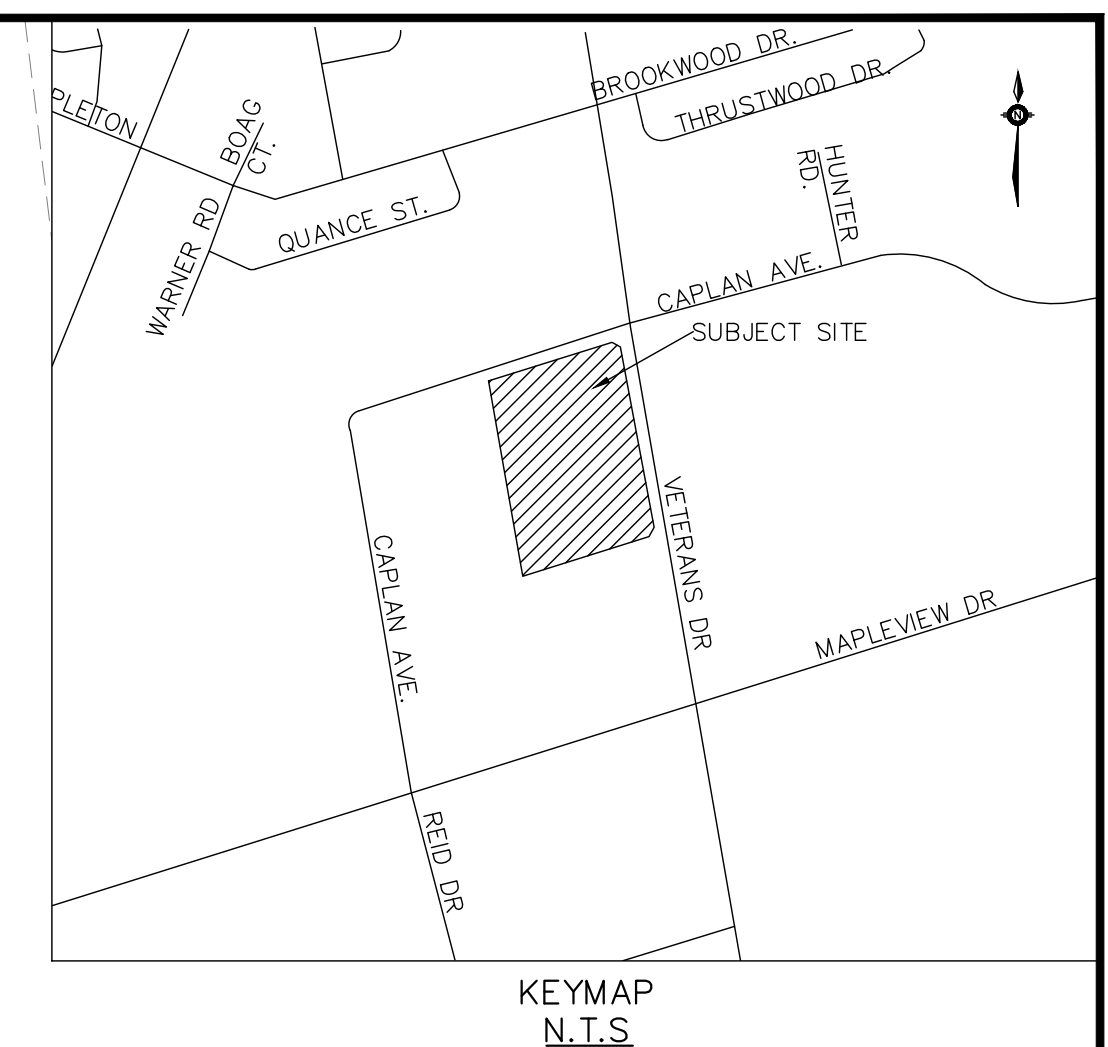
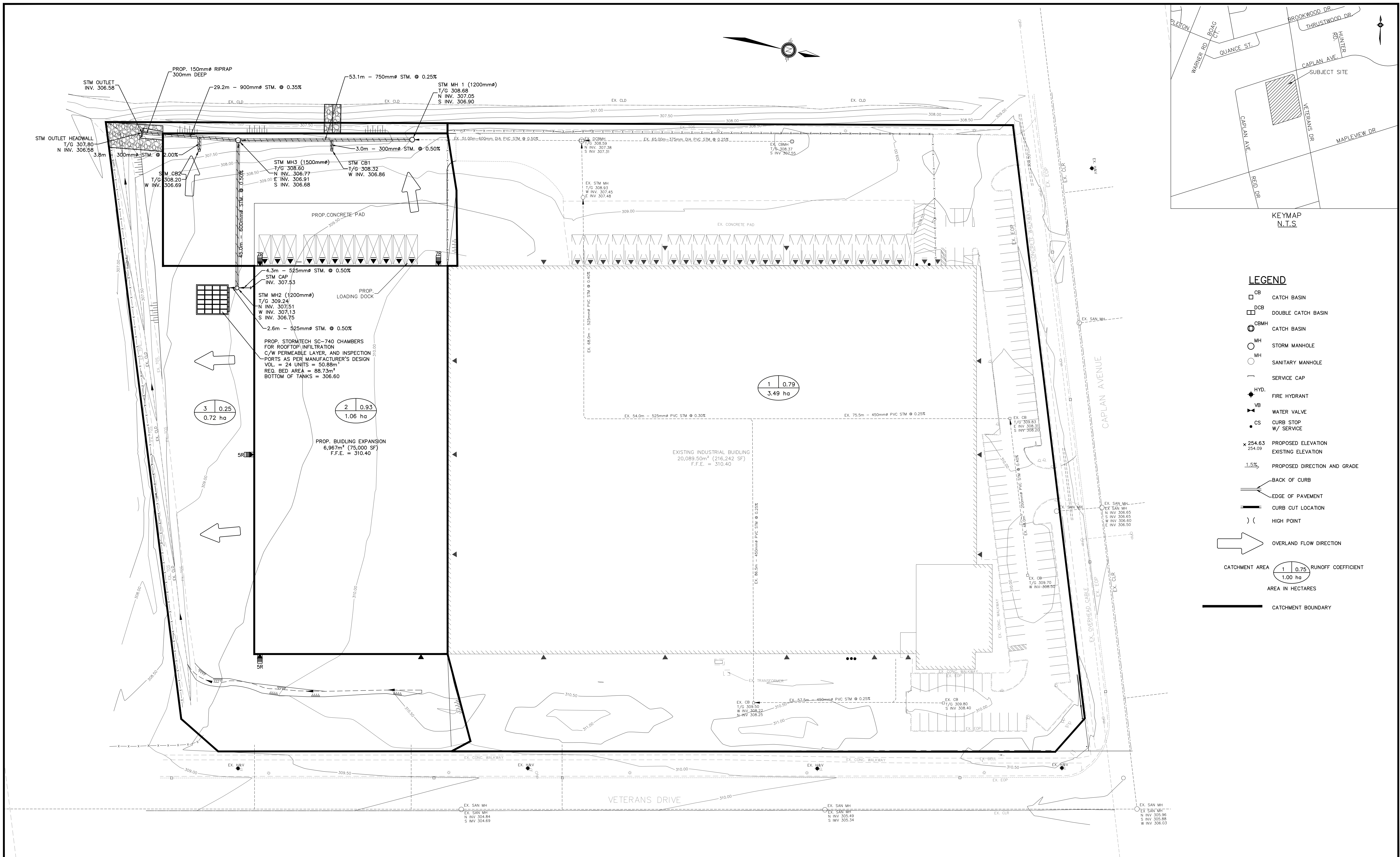
SUMMIT REIT
 500, VETERANS DRIVE
 CITY OF BARRIE

PRE-DEVELOPMENT STORM
 CATCHMENT PLAN

PEARSON ENGINEERING
 PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	NW	HORIZ SCALE	1:500	PROJECT #	22078
DRAWN BY	NP	VERT SCALE	N/A	DRAWING #	STM-1
CHECKED BY	MWD	DATE	AUGUST 2022	REVISION #	1

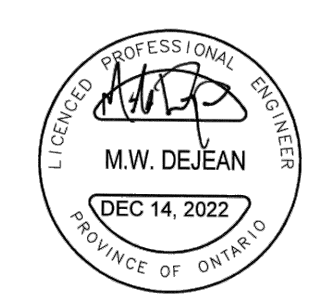
P:\Projects\2022\500 Veterans Dr. - Summit Reit. 500 Veterans Dr. - Barrie\Engineering\22078 - BASE.dwg Layout:STM-2 Plotted Dec 16, 2022 @ 3:25pm by mwells @ PEARSON ENGINEERING LTD.



- LEGEND**
- CB CATCH BASIN
 - DCB DOUBLE CATCH BASIN
 - CBMH CATCH BASIN
 - MH STORM MANHOLE
 - SMH SANITARY MANHOLE
 - SERVICE CAP
 - ◆ HYD. FIRE HYDRANT
 - ▼ VB WATER VALVE
 - CS CURB STOP W/ SERVICE
 - × 254.63 PROPOSED ELEVATION
 - 254.09 EXISTING ELEVATION
 - 1.5% PROPOSED DIRECTION AND GRADE
 - BACK OF CURB
 - EDGE OF PAVEMENT
 - CURB CUT LOCATION
 -) (HIGH POINT
 - ➔ OVERLAND FLOW DIRECTION
 - CATCHMENT AREA (1 | 0.75) RUNOFF COEFFICIENT
 - 1.00 ha AREA IN HECTARES
 - CATCHMENT BOUNDARY

NO.	REVISION NOTE	DATE	BY
1.	AS PER 1ST SUBMISSION COMMENTS	12/16/22	AV

BENCHMARK
 ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM (CGVD28:78) AND ADERIVED FROM BENCH MARK NO. 03120080060 HAVING A PUBLISHED ELEVATION OF 307.474 METRES AND NO. 03120030018 HAVING A PUBLISHED ELEVATION OF 306.589 METRES.



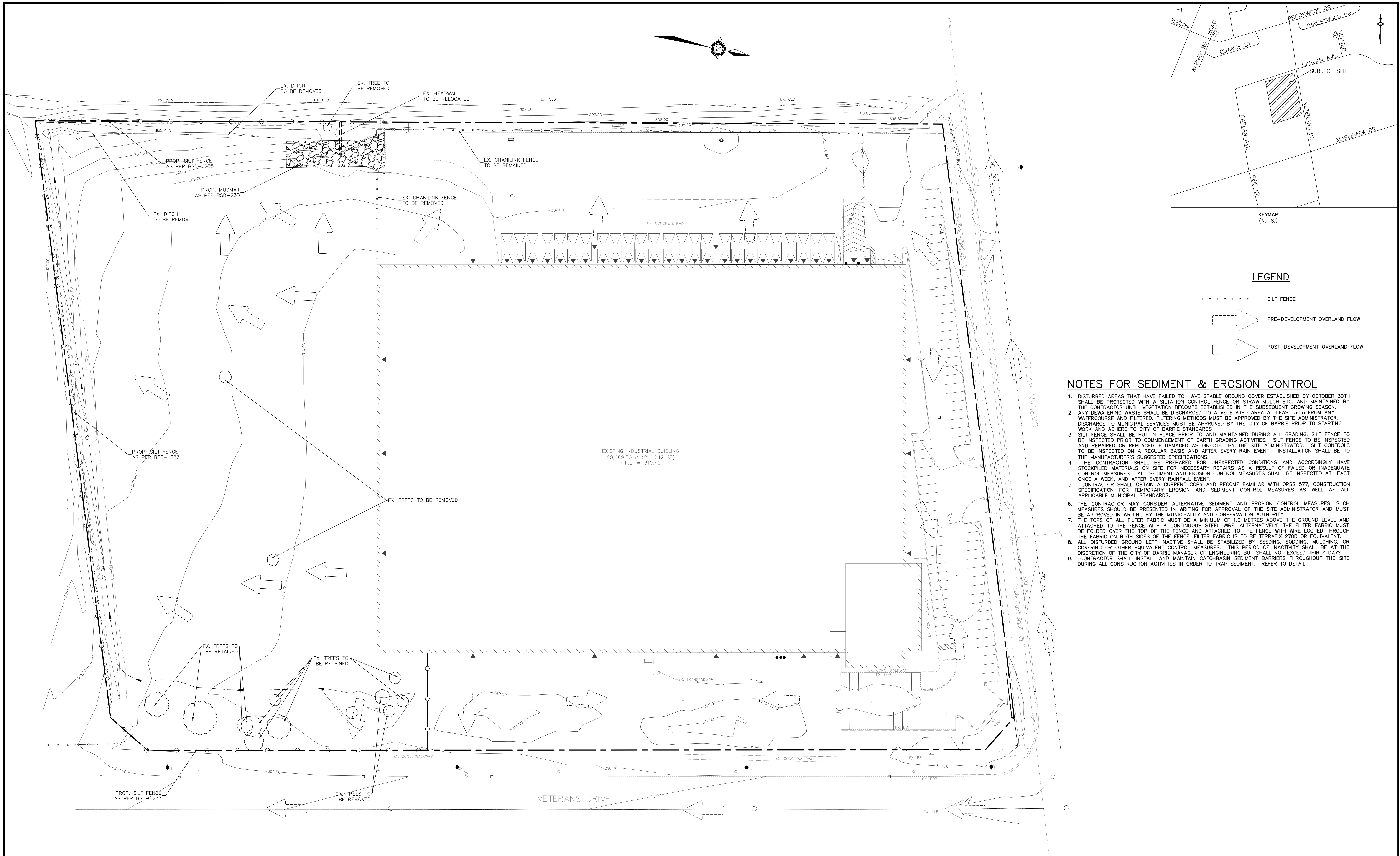
SUMMIT REIT
 500, VETERANS DRIVE
 CITY OF BARRIE

POST DEVELOPMENT STORM
 CATCHMENT PLAN

PEARSON ENGINEERING
 PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	NW	HORIZ SCALE	1:500	PROJECT #	22078
DRAWN BY	NP	VERT SCALE	N/A	DRAWING #	STM-2
CHECKED BY	MWD	DATE	AUGUST 2022	REVISION #	1

P:\Projects\2022\500 Veterans Dr., Barrie\Engineering\22078 - BASE.dwg Layout:EP-1 Plotted Dec 16, 2022 @ 3:26pm by mwls @ PEARSON ENGINEERING LTD.



LEGEND

- SILT FENCE
- PRE-DEVELOPMENT OVERLAND FLOW
- POST-DEVELOPMENT OVERLAND FLOW

NOTES FOR SEDIMENT & EROSION CONTROL

1. DISTURBED AREAS THAT HAVE FAILED TO HAVE STABLE GROUND COVER ESTABLISHED BY OCTOBER 30TH SHALL BE PROTECTED WITH A SILTATION CONTROL FENCE, OR STRAW MULCH ETC. AND MAINTAINED BY THE CONTRACTOR UNTIL VEGETATION BECOMES ESTABLISHED IN THE SUBSEQUENT GROWING SEASON.
2. ANY DEWATERING WASTE SHALL BE DISCHARGED TO A VEGETATED AREA AT LEAST 30m FROM ANY WATERCOURSE AND FILTERED. FILTERING METHODS MUST BE APPROVED BY THE SITE ADMINISTRATOR. DISCHARGE TO MUNICIPAL SERVICES MUST BE APPROVED BY THE CITY OF BARRIE PRIOR TO STARTING WORK AND ADHERE TO CITY OF BARRIE STANDARDS.
3. SILT FENCE SHALL BE PUT IN PLACE PRIOR TO AND MAINTAINED DURING ALL GRADING. SILT FENCE TO BE INSPECTED PRIOR TO COMMENCEMENT OF EARTH GRADING ACTIVITIES. SILT FENCE TO BE INSPECTED AND REPAIRED OR REPLACED IF DAMAGED AS DIRECTED BY THE SITE ADMINISTRATOR. SILT CONTROLS TO BE INSPECTED ON A REGULAR BASIS AND AFTER EVERY RAIN EVENT. INSTALLATION SHALL BE TO THE MANUFACTURER'S SUGGESTED SPECIFICATIONS.
4. THE CONTRACTOR SHALL BE PREPARED FOR UNEXPECTED CONDITIONS AND ACCORDINGLY HAVE STOCKPILED MATERIALS ON SITE FOR NECESSARY REPAIRS AS A RESULT OF FAILED OR INADEQUATE CONTROL MEASURES. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE A WEEK, AND AFTER EVERY RAINFALL EVENT.
5. CONTRACTOR SHALL OBTAIN A CURRENT COPY AND BECOME FAMILIAR WITH OPSS 577, CONSTRUCTION SPECIFICATION FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES AS WELL AS ALL APPLICABLE MUNICIPAL STANDARDS.
6. THE CONTRACTOR MAY CONSIDER ALTERNATIVE SEDIMENT AND EROSION CONTROL MEASURES. SUCH MEASURES SHOULD BE PRESENTED IN WRITING FOR APPROVAL OF THE SITE ADMINISTRATOR AND MUST BE APPROVED IN WRITING BY THE MUNICIPALITY AND CONSERVATION AUTHORITY.
7. THE TOPS OF ALL FILTER FABRIC MUST BE A MINIMUM OF 1.0 METRES ABOVE THE GROUND LEVEL AND ATTACHED TO THE FENCE WITH A CONTINUOUS STEEL WIRE. ALTERNATIVELY, THE FILTER FABRIC MUST BE FOLDED OVER THE TOP OF THE FENCE AND ATTACHED TO THE FENCE WITH WIRE LOOPED THROUGH THE FABRIC ON BOTH SIDES OF THE FENCE. FILTER FABRIC IS TO BE TERRAFIX 270R OR EQUIVALENT.
8. ALL DISTURBED GROUND LEFT INACTIVE SHALL BE STABILIZED BY SEEDING, SODDING, MULCHING, OR COVERING OR OTHER EQUIVALENT CONTROL MEASURES. THIS PERIOD OF INACTIVITY SHALL BE AT THE DISCRETION OF THE CITY OF BARRIE MANAGER OF ENGINEERING BUT SHALL NOT EXCEED THIRTY DAYS.
9. CONTRACTOR SHALL INSTALL AND MAINTAIN CATCHBASIN SEDIMENT BARRIERS THROUGHOUT THE SITE DURING ALL CONSTRUCTION ACTIVITIES IN ORDER TO TRAP SEDIMENT. REFER TO DETAIL.

NO.	REVISION NOTE	DATE	BY
1.	AS PER 1ST SUBMISSION COMMENTS	12/16/22	AV

BENCHMARK
 ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM (CGVD28:78) AND DERIVED FROM BENCH MARK NO. 03120080060 HAVING A PUBLISHED ELEVATION OF 307.474 METRES AND NO. 03120030018 HAVING A PUBLISHED ELEVATION OF 306.589 METRES.



SUMMIT REIT
 500, VETERANS DRIVE
 CITY OF BARRIE

EROSION AND SEDIMENT CONTROL PLAN

PEARSON ENGINEERING
 PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	NW	HORIZ SCALE	1:500	PROJECT #	22078
DRAWN BY	NP	VERT SCALE	N/A	DRAWING #	EP-1
CHECKED BY	MWD	DATE	AUGUST 2022	REVISION #	1