

# STORMWATER MANAGEMENT & SERVICING REPORT

**MULTI-TENANT COMMERCIAL DEVELOPMENT**  
2822 CARP ROAD, CARP  
CITY OF OTTAWA



**PEARSON**  
**ENGINEERING LTD.**

PEARSONENG.COM

December 2020

19124



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# STORMWATER MANAGEMENT & SERVICING REPORT

## COMMERCIAL DEVELOPMENT, 2822 CARP ROAD

### 1. INTRODUCTION

PEARSON Engineering Ltd. (Pearson) has been retained by Argue Construction Inc. (Client) to prepare a Stormwater Management (SWM) & Servicing Report (Report) in support of the proposed Industrial Development (Project), located in the village of Carp in the City of Ottawa (City). The project proposes to develop two (2) multi-tenant commercial buildings.

The subject property is approximately 1.01 ha in size and currently mostly vacant with a 1-storey brick dwelling on the north side of the site. The existing site is relatively flat and generally drains to the southwest towards Carp road and northeast towards an existing drainage course. The site is bound by Carp Road to the southwest a proposed access road to the southeast, farmland to the northwest, and an existing industrial site and farmland to the northwest. The location of the site can be seen on Figure 1.

#### 1.1. TERMS OF REFERENCE

The intent of this SWM & Servicing Report is to:

- Identify the existing site characteristics including any external drainage conditions;
- Illustrate the design of the stormwater conveyance and detention 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

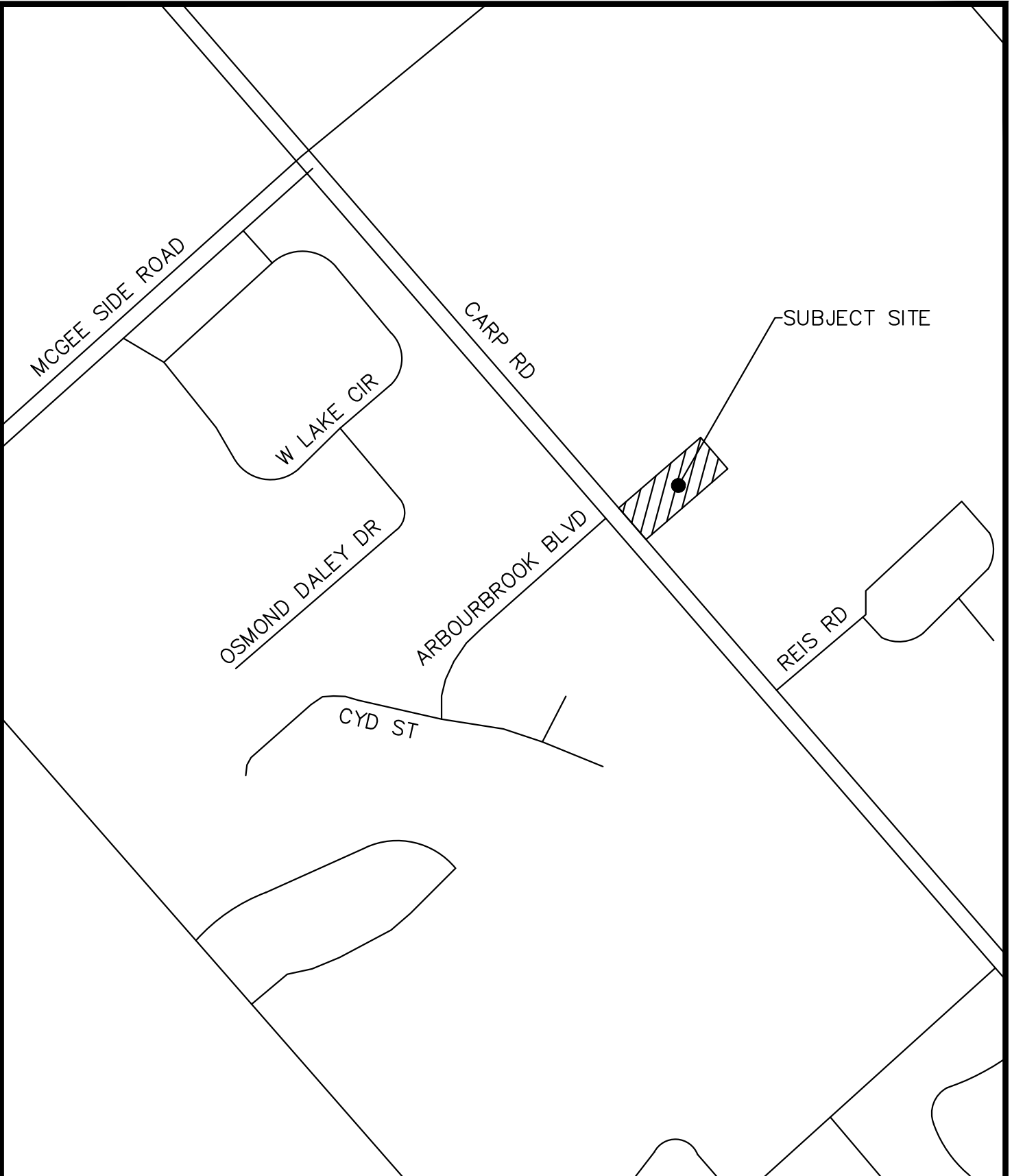
The Project will be serviced by a proposed well for domestic water supply and designed as per City standards. The proposed well is to be located in the parking lot island east of Building 1. The site will be serviced by connecting to the proposed well with a water service to each building. The water system for this Project is intended for domestic and firefighting use. The proposed layout of the watermain can be seen on Drawing SGS-1 in Appendix E.

### 3. SANITARY SERVICING OVERVIEW

The design of the sanitary sewage system is intended to minimize the impact to the environment, and more specifically to minimize the impact on the ground water and surface water systems. The *Ontario Building Code* (OBC) requirements have been considered in determining the sanitary servicing requirements for this Project. The design daily sewage flow was based on the established flows outlined in Table 8.2.1.3.B. of the OBC. The proposed units were calculated using the Service Station flows based on the assumed building uses. A total flow of 7,170 L/d was calculated for the proposed commercial development. Refer to the sanitary flow calculations in Appendix A for details.

The effluent will be treated using a Level 4 Tertiary Treatment system conforming to the OBC. The specified treatment unit to provide this will be a Biofilter and Denitrifying treatment system provided by Waterloo Biofilter. Full details of the system can be found within Appendix A. The maximum influent concentrations used in the design are the typical domestic strength characteristics.

P:\Autodesk Vault\Working Folders\19124 - Argue, 2822 Carp Rd, Carp\Engineering\19124 - BASE.dwg Layout:FIG-1 Plotted Nov 20, 2020 @ 11:51am by mwells @ PEARSON ENGINEERING LTD.



**MULTI-TENANT COMMERCIAL BLDGS**  
**2822 CARP ROAD**  
**CITY OF OTTAWA**

**SITE LOCATION PLAN**



**PEARSON**  
**ENGINEERING LTD.**

PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	NW/MWD	HORIZ SCALE	HORIZ	PROJECT #	19124
DRAWN BY	NW	VERT SCALE	VERT	DRAWING #	FIG-1
CHECKED BY	GMP	DATE	SEPTEMBER 2020	REVISION #	0



### **3.1. PROPOSED SUBSURFACE EFFLUENT DISTRIBUTION SYSTEM**

GEMTEC Consulting Engineers and Scientists Ltd. completed a Geotechnical Investigation, dated October 2020 for the project site. The report included seven boreholes ranging from a depth of 3.0 m to 5.0 m below ground surface and did not encounter any groundwater except in Borehole 20-03 at 1.4 m below the existing ground surface. The report concluded that the soils had an average infiltration rate of 8 min/cm to 20 min/cm for the Loamy Sand between the borehole locations. As such, a T-time of 20 min/cm was selected for septic bed sizing.

A Type 'A' Dispersal Bed has been designed as per OBC 8.7.7 for 7,170 L/day of sanitary design flow. The effective surface area required depth of the filter medium, and particle size of required sand shall conform to OBC 8.7.7.1 paragraph (5) which states that the maximum loading shall not exceed 50 L/m<sup>2</sup>. Imported sand conforming to the requirements shall be installed to ensure sufficient effluent distribution as well as to reduce the risk of lateral movement of the flows near the top of the bed. The required base area of the filter medium shall be installed as per OBC 8.7.7.1 paragraph (5). Furthermore, a stone layer shall be installed as per OBC 8.7.7.1 paragraph (6) to allow for proper distribution of the effluent flows. Please refer to Appendix B for the required and provided stone and sand area calculations.

Further design details can be found included in Appendix A.

## **4. STORMWATER MANAGEMENT**

A key component of the development is the need to address environmental and related SWM issues to meet the City of Ottawa, Mississippi Valley Conservation Authority (MVCA), and Ministry of the Environment, Conservation, and Parks (MECP) requirements. SWM parameters have evolved from an understanding of the location and sensitivity of the site's natural systems and this 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.
- Incorporate Low Impact Development (LID) practices to promote infiltration and reduce phosphorus levels to downstream watercourses.

### **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
- Mississippi Valley Conservation Authority, Regulation Policies, Updated September 2019
- City of Ottawa, Sewer Design Guidelines, Second Edition, October 2012

In order to design the facilities to meet these requirements, it is essential to select the appropriate modeling methodology for the storm system design. Given the size of the site, the Modified Rational Method is appropriate for the design for the SWM system.



#### 4.2. EXISTING CONDITIONS

The subject property is approximately 1.01 ha in size and currently mostly vacant with a 1-storey brick dwelling on the north side of the site. An existing gravel access road from Carp Road extends through the site to access the area to the rear of the property. The site is bound by Carp Road to the southwest a proposed access road to the southeast, farmland to the northwest, and an existing industrial site and farmland to the northwest. The existing site is relatively flat and generally drains to the southwest towards Carp Road and northeast towards an existing drainage course. A catchment along the southwest side of the property is approximately 0.59 ha in size and drains to the existing drainage ditch on Carp Road, ultimately draining southeast to the Huntley Creek. The remaining 0.42 ha drains northeast towards the rear of the property. Details of existing storm drainage conditions can be seen on Drawing STM-1 in Appendix E.

Allowable peak flows for the site were calculated using the site's current conditions and can be seen in Table 2 below. Detailed calculations for the existing drainage conditions can be found in Appendix B.

**Table 1: Pre-Development Peak Flows**

	<b>2 Year Storm</b>	<b>5 Year Storm</b>	<b>10 Year Storm</b>	<b>25 Year Storm</b>	<b>50 Year Storm</b>	<b>100 Year Storm</b>
Peak Flow to Carp Road (m <sup>3</sup> /s)	0.04	0.05	0.06	0.08	0.10	0.11
Peak Flow to Northeast (m <sup>3</sup> /s)	0.02	0.03	0.03	0.04	0.05	0.06
<b>Total Site Peak Flow (m<sup>3</sup>/s)</b>	<b>0.06</b>	<b>0.08</b>	<b>0.09</b>	<b>0.12</b>	<b>0.15</b>	<b>0.17</b>

#### 4.3. PROPOSED CONDITIONS

The post-development storm drainage for the project site will generally follow pre-development conditions. The majority of the proposed drainage from the project will be conveyed northwesterly via overland sheet flow to a SWM pond located in the east corner of the site. Before being conveyed into the SWM Pond, the flows from the majority of the parking and building areas will be conveyed through a grassed drainage channel. Peak flows released from the SWM pond will be conveyed through a Hickenbottom outlet structure to an existing drainage ditch on Carp Road. The drainage from the rooftops of the buildings will be conveyed via roof leaders to the parking area to be conveyed via overland sheet flow. The eastern edge of the project site will drain uncontrolled along the property line towards Carp Road. A small portion of the northern and western edges of the site will drain uncontrolled towards the existing agricultural land and tree line as they do in pre-development. Refer to Drawing STM-2 in Appendix E for the proposed drainage patterns.

#### 4.4. STORMWATER QUANTITY CONTROL

The proposed development will increase the imperviousness of the site and as such the post-development peak flows will increase. Considerations were taken to reduce post-development peak flows to pre-development values. Given the size of the site, the Modified Rational Method will be used to determine the SWM release rates. It is important to quantify the increase in stormwater runoff rates and attenuate these increases. The calculated post-development runoff coefficient of 0.55 is greater than the pre-development runoff coefficient of 0.28. Runoff coefficient calculations can be found in Appendix B.



The Project's building rooftops and gravel parking area will drain via overland flow to a grass drainage channel. Quantity control on site will be provided through the use of a proposed SWM pond located on the southwest corner of the site adjacent to Carp Road. Stormwater from all storm events will enter the pond via overland flow through the grassed drainage channel located north of the pond. A 200 mm diameter orifice tube located within a hickenbottom outlet structure and a 18.00 m wide emergency overflow weir over the side berm will control outflow from the pond and reduce it to lower than pre-development values for all storm events.

The proposed SWM pond has been designed with 4:1 side slope as per MECP guidelines. Calculations contained in Appendix C indicate that 224 m<sup>3</sup> of quantity control storage volume in the SWM pond is required to reduce post-development peak flows for the 2-year to the 100-year storm events. The dry pond has a storage volume of 224 m<sup>3</sup> at an elevation of 115.31, providing approximately 0.25 m of freeboard to the top of berm. Table 2 shows the Stage-Storage-Discharge (SSD) values for the proposed SWM pond.

**Table 2: Pond Release Rates and Water Levels**

	<b>2 Year Storm</b>	<b>5 Year Storm</b>	<b>10 Year Storm</b>	<b>25 Year Storm</b>	<b>50 Year Storm</b>	<b>100 Year Storm</b>
Peak Flow (m <sup>3</sup> /s)	0.037	0.047	0.051	0.059	0.065	0.072
Storage Volume (m <sup>3</sup> )	61	86	106	147	190	224
Ponding Elevation (m)	115.05	115.10	115.14	115.21	115.26	115.31

Table 3 below summarizes the post-development peak flows for the site. As can be seen by comparing Table 1 and Table 3, post-development peak flows are at or below pre-development values.

**Table 3: Post-Development Peak Flows**

	<b>2 Year Storm</b>	<b>5 Year Storm</b>	<b>10 Year Storm</b>	<b>25 Year Storm</b>	<b>50 Year Storm</b>	<b>100 Year Storm</b>
Uncontrolled Flow(m <sup>3</sup> /s)	0.01	0.01	0.01	0.01	0.02	0.02
Controlled Flow to Carp Road (m <sup>3</sup> /s)	0.04	0.05	0.05	0.06	0.07	0.07
<b>Total Site Flow (m<sup>3</sup>/s)</b>	<b>0.05</b>	<b>0.06</b>	<b>0.06</b>	<b>0.07</b>	<b>0.09</b>	<b>0.09</b>

#### **4.5. STORMWATER QUALITY CONTROL**

The 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 Ottawa. The objective of the Stormwater Quality Control 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 and are discussed in the following sections.



#### ***4.5.1. PERMANENT QUALITY CONTROL***

The development's driveway and parking areas pose a potential risk to stormwater quality through the collection of grit, sand, and oils on the paved surfaces. The MECP standard stipulates a Total Suspended Solids (TSS) removal of at least 80% in order to treat to the MECP's Enhanced Level Protection standard. Typically, an Oil/Grit Separator (OGS) would be utilized to treat stormwater runoff to the required values. However, due to no storm sewer located on the site, quality control will be provided through infiltration in the SWM pond. The runoff from the proposed site is to be directed through a vegetated grassed drainage channel where stormwater will be infiltrated prior to entering the main area of the SWM pond.

#### ***4.5.2. QUALITY CONTROL 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 in which surfaces are disturbed/exposed shall not exceed 30 days;
- Reduce stormwater drainage velocities where possible; and,
- Minimize the amount of existing vegetation removed.

#### **4.6. WATER BALANCE**

Since the post-development state will increase the imperviousness of the site, considerations were taken in regard to groundwater recharge. Under pre-development conditions, the majority of the project site consists of pasture and shrubs, which infiltrates approximately 2,132 m<sup>3</sup> annually over the grassed areas. With the increased imperviousness of the site, this recharge will be reduced to 737 m<sup>3</sup>, resulting in a deficit volume of 1,395 m<sup>3</sup>.

In order to infiltrate an additional 1,395 m<sup>3</sup> annually, a yearly rainfall depth of approximately 263.7 mm from the controlled area is required to be infiltrated resulting in a storage volume of 26.3 m<sup>3</sup>. This percentage of annual rainfall occurs for rain events of 3 mm or less. Water balance will be achieved through the use of infiltration volume in the bottom of the proposed SWM pond. The SWM Pond have been sized to infiltrate 3 mm over the controlled area and requires a total volume of 26.3 m<sup>3</sup> of storage for the development. The SWM Pond has been designed to have a total of 27.0 m<sup>3</sup> of infiltration storage below the hickenbottom orifice. Detailed calculations can be found in Appendix C.





## **5. MAINTENANCE OF SWM FACILITIES**

### **5.1. GRASSED DRAINAGE CHANNEL**

Enhanced grass swales require minimal maintenance once the vegetation has established. Vehicles should not drive or park on the vegetated area, and light mowing equipment should be utilized in order to avoid soil compaction which will reduce the infiltration capacity of the underlying soil. Grass should be cut to a height of 75 mm to 150 mm.

The swales should be inspected twice a year or after a major storm event (greater than the 25 mm storm) for damage or channelization. If any trash/debris is observed during inspections, it should be removed. Sediment buildup with a depth in excess of 25 mm should be removed during dry weather.

### **5.2. STORMWATER MANAGEMENT POND**

The stormwater management (SWM) pond should be inspected on a monthly basis and after significant rainfall events. With the inclusion of the channel upstream of the SWM pond, it is not anticipated that any significant sediment loading will occur in the SWM pond. However, it is recommended that upon visual inspection of significant sediment buildup, that this material be removed. Similarly, trash removal, when applicable, should be done on a routine basis to ensure the proper ongoing functioning of the outlet control structure. If permanent water is noticed, the outlet structure should be inspected for clogging. The vegetation should be allowed to grow without grass cutting. The grass in the remaining area of the pond should not be cut unless absolutely necessary for aesthetic reasons.

### **5.3. ORIFICE TUBE**

The orifice tube controlling flows towards Carp Road is located in the hickenbottom outlet structure and should be inspected monthly during the first year of operation and in the spring and fall thereafter. Any standing water observed during inspection of the catchbasin manhole that does not drain away may indicate a blocked orifice tube. The orifice tube should be kept clear of debris and any offending debris should be removed. Access to the orifice tube can be achieved through the hickenbottom outlet structure.



## 6. CONCLUSIONS

The proposed development water supply will be from a drilled well on site to service both buildings. Sanitary services for the development will be conveyed and treated using a proposed septic bed system.

Quantity control for the development is provided in the SWM pond allowing post-development peak flows to be released at pre-development values.

A treatment train approach is implemented consisting of the grassed drainage channel and the proposed SWM pond to obtain quality control for the site. Water balance for the site will be achieved through the use of the SWM pond.

All of which is respectfully submitted,

**PEARSON ENGINEERING LTD.**

Gary Pearson, P. Eng  
Principal

Mike Dejean, P.Eng.  
Manager of Engineering Services





**APPENDIX A**

**SANITARY SERVICING CALCULATIONS**

## Argue, 2822 Carp Rd, Ottawa Sanitary Flow Calculations

### Design Criteria

Flow per capita (Q): 28,000 L/gross ha/d  
 Peak Flow:  $Q_p = P * Q * M / 86,400$   
 Peaking Factor (Harmon Formula):  $M = 1 + (( 14 / ( 4 + ( P / 1000 ) ^ 0.5 ) ) x 0.8)$  2 <= "M" <= 4  
 Infiltration Allowance: 0.33 L/s/effective gross ha (for all areas)

### Design Daily Sewage Flow:

Building	Description (As per OBC 8.2.1.3.B)	Flow (L/d)
<b>Service Stations (No Vehicle Washing)</b>		
(a) per Water Closet, and;	950 L/d per W.C. = 950 L/d x 7 W.C.'s =	6,650
(ii) per Vehicle Served.	20 L/d per Veh. Served = 20 L/d x 26 Veh. =	520
<b>Total Design Flow (Q) =</b>		<b>7,170</b> L/d

### Calculate Average Daily Demand

ADD = 7,170 L/d  
 ADD = 0.08 L/s

### Calculate Peaking Factor

$M = 1 + \frac{14}{4 + \frac{0}{1,000}^{0.5}} \times 0.8$

M = 3.80

Infiltration Allowance = 0.33 x 1.01 ha  
 = 0.33 L/s

### Calculate Peak Flow

Qp (w. Infiltration Allowance) = 0.08 x 3.80 + 0.33  
 = 0.65 L/s

## Argue, 2822 Carp Rd, Ottawa Calculation of Septic Design Flows - Type A Dispersal Bed

### Design Daily Sewage Flow:

Building	Description (As per OBC 8.2.1.3.B)	Flow (L/d)
<b>Service Stations (No Vehicle Washing)</b>		
(a) per Water Closet, and;	950 L/d per W.C. = 950 L/d x 7 W.C.'s =	6,650
(ii) per Vehicle Served.	20 L/d per Veh. Served = 20 L/d x 26 Veh. =	520
<b>Total Design Flow (Q) =</b>		<b>7,170</b> L/d

### Septic Design

#### **Septic Tank:**

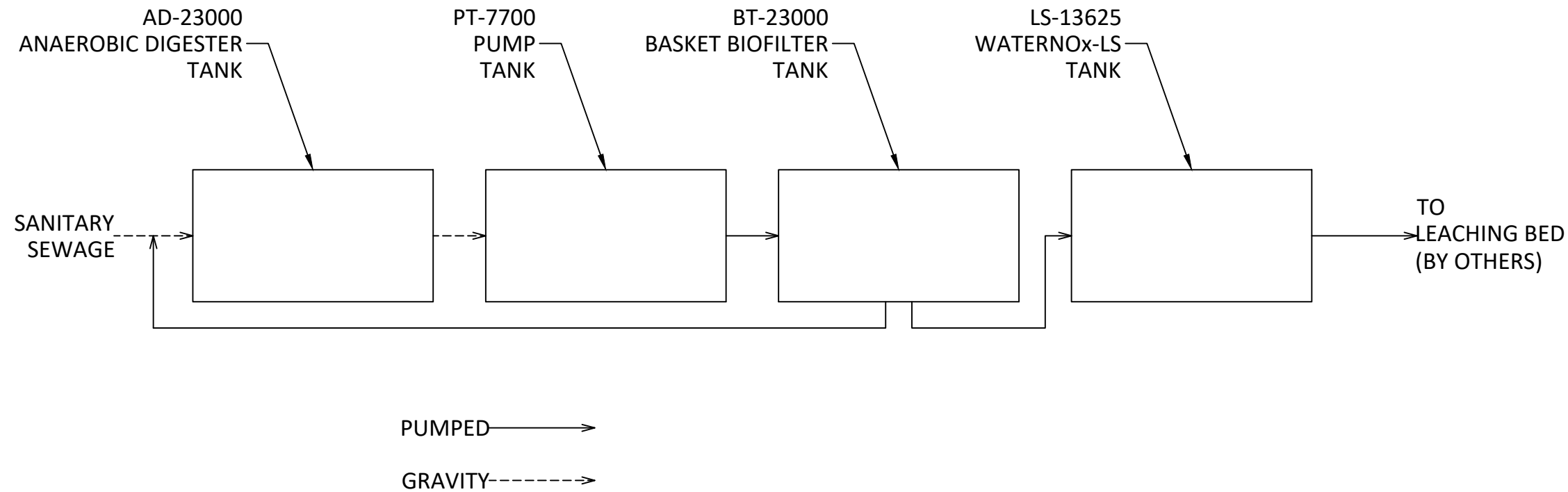
Required (OBC 8.2.2.3. (1))	$Q \times 3 =$	21,510	L/d
Provided	23,000 L Tank = Precast Concrete Septic Tank	<b>23,000</b>	<b>L/d</b>

#### **Type A Dispersal Bed:**

To accept 7,170 L/d As per OBC 8.7.7.

Stone Area - Required	$A = Q / B = 7,170 / 50 =$	143	$m^2$	OBC 8.7.7.1.(6)
Stone Area - Provided	$A = L \times W = 12.5 \text{ m} \times 12.0 \text{ m} =$	<b>150</b>	<b><math>m^2</math></b>	
Sand Area - Required	$A = QT / 400 = (7,170 \times 20) / 400 =$	359	$m^2$	OBC 8.7.7.1.(5)
Sand Area - Provided	$A = L \times W = 28.0 \text{ m} \times 15.6 \text{ m} =$	<b>437</b>	<b><math>m^2</math></b>	

# PRELIMINARY SCHEMATIC ONLY



## NOTES:

1. THIS IS A PRELIMINARY SCHEMATIC FOR A WATERLOO BIOFILTER SEWAGE TREATMENT SYSTEM. THIS IS FOR PLANNING PURPOSES ONLY AND IS NOT AN ENGINEERED DESIGN.

2. THE PEAK SEWAGE FLOW FOR THIS FACILITY IS 7,710 L/day. PEAK FLOWS ARE EXPECTED TO OCCUR INFREQUENTLY.

3. THE RAW SEWAGE IS EXPECTED TO HAVE THE FOLLOWING CHARACTERISTICS:

BOD = 190 mg/L  
TSS = 210 mg/L  
TKN = 50 mg/L

IT IS ALSO ASSUMED THAT THERE IS SUFFICIENT ALKALINITY FOR THOROUGH NITRIFICATION.

4. WASTEWATER FROM THE FACILITY FLOWS BY GRAVITY INTO AN AD-23000 SINGLE COMPARTMENT ANAEROBIC DIGESTER TANK. THE INLET OF THE TANK IS EQUIPPED WITH AN INNERTUBE. THE OUTLET IS EQUIPPED WITH AN EFFLUENT FILTER.

5. THE ANAEROBIC DIGESTER TANK EFFLUENT FLOWS BY GRAVITY INTO A PT-7700 PUMP TANK. THE PUMP TANK IS EQUIPPED WITH A SUBMERSIBLE EFFLUENT PUMP OPERATING ON A TIMER.

6. THE PUMP IN THE PUMP TANK DOSES THE SEWAGE TO A BT-23000 SINGLE COMPARTMENT BASKET BIOFILTER TANK HOUSING TWO (2) BASKETS FILLED WITH BIOFILTER MEDIUM. THE SEWAGE IS EVENLY DISTRIBUTED OVER THE SURFACE OF THE MEDIUM AND TREATED AS IT TRICKLES THROUGH THE INTERIOR OF THE MEDIUM. A SMALL, LOW VOLTAGE AIR FAN AND PASSIVE VENTING PROMOTES AEROBIC CONDITIONS. THE TANK IS EQUIPPED WITH TWO (2) SUBMERSIBLE EFFLUENT PUMPS OPERATING ON SEPARATE TIMERS.

7. THE FIRST PUMP IN THE BASKET BIOFILTER TANK RECIRCULATES A PORTION OF THE EFFLUENT TO THE INLET OF THE AD-23000.

8. THE SECOND PUMP IN THE BASKET BIOFILTER TANK PUMPS THE EFFLUENT TO A LS-13625 DOUBLE COMPARTMENT WATERNOx-LS TANK. THE FIRST COMPARTMENT OF THE TANK IS FILLED WITH DENITRIFYING MEDIUM. THE EFFLUENT FROM THE FIRST COMPARTMENT FLOWS BY GRAVITY INTO THE SECOND COMPARTMENT AND OVER TOP OF A BASKET FILLED WITH BIOFILTER MEDIUM. THE SECOND COMPARTMENT IS ALSO EQUIPPED WITH A SUBMERSIBLE EFFLUENT PUMP.

9. THE PUMP IN THE SECOND COMPARTMENT OF THE WATERNOx-LS TANK PUMPS THE FINAL EFFLUENT TO A LEACHING BED (BY OTHERS).

10. ALL PUMPS ARE RUN BY A WATERLOO SMART PANEL. THE WATERLOO SMART PANEL PROVIDES REMOTE MONITORING, CONTROL, AND DATA LOGGING OVER A STABLE WIRELESS CELLULAR NETWORK. THIS FUNCTIONALITY ALLOWS FOR REAL TIME OPERATIONAL ADJUSTMENTS TO OPTIMIZE SYSTEM PERFORMANCE. THE WATERLOO SMART PANEL ALSO IMMEDIATELY NOTIFIES THE SERVICE PROVIDER OF A PUMP FAILURE OR HIGH LEVEL ALARM, PROVIDING THEM WITH VITAL INFORMATION TO LIMIT SITE VISITS WHILE KEEPING THE SYSTEM OPERATING PROPERLY.

11. BY ADHERING TO BEST MANAGEMENT PRACTICES (PROVIDING THE APPROPRIATE STRENGTH SEWAGE, PERFORMING ROUTINE MAINTENANCE, LIMITING TOXINS ENTERING THE SYSTEM) THE WATERLOO BIOFILTER TREATMENT SYSTEM OUTLINED IN THIS SCHEMATIC IS DESIGNED FOR THE FOLLOWING EFFLUENT OBJECTIVES.

cBOD = 10 mg/L  
TSS = 10 mg/L  
TOTAL NITROGEN ≥ 75% REMOVAL



PO BOX 400, 143 DENNIS STREET, ROCKWOOD ON N0B 2K0  
TEL: 519-856-0757 FAX: 519-856-0759  
EMAIL: INFO@WATERLOO-BIOFILTER.COM

TITLE: PROCESS SCHEMATIC

PROJECT: 2822 CARP ROAD - OTTAWA

FOR: PEARSON ENGINEERING

PROJECT NUMBER: ON-C-2016-0190-8	SEWAGE FLOW: 7,170 L/day	CONFIGURATION: BASKETS w/ LS	DATE: DECEMBER 4, 2020
DRAWN BY: B. STRAW	PERCOLATION RATE: N/A	DISCHARGE: TYPE A	1 OF 1



## **APPENDIX B**

# **STORMWATER MANAGEMENT CALCULATIONS**

### Argue, 2822 Carp Rd, Ottawa Calculation of Runoff Coefficients

Runoff Coefficient	=	0.20	0.90	0.90	0.70	0.90	Weighted Runoff Coefficient
Surface Cover	=	Grass	Asphalt	Building	Gravel	Conc.	
<b>Pre-Development</b>	Total Area (m <sup>2</sup> )	Area (m <sup>2</sup> )	Area (m <sup>2</sup> )	Area (m <sup>2</sup> )	Area (m <sup>2</sup> )	Area (m <sup>2</sup> )	
1	5897	4654	60	155	1017	11	0.31
2	4219	3949	0	0	269	0	0.23
Pre Total	10115	8604	60	155	1287	11	0.28
<b>Post-Development</b>	Total Area (m <sup>2</sup> )	Area (m <sup>2</sup> )	Area (m <sup>2</sup> )	Area (m <sup>2</sup> )	Area (m <sup>2</sup> )	Area (m <sup>2</sup> )	
1	8755	2203	0	1200	5224	128	0.60
2	1360	1294	0	0	66	0	0.22
Post Total	10115	3497	0	1200	5290	128	0.55



## Argue, 2822 Carp Rd, Ottawa Pre-Development Peak Flows

City of Ottawa  
Storm Event (yrs)      Coeff A      Coeff B      Coeff C      Modified Rational Method  
Q = CiCIA / 360

2	732.951	6.199	0.81
5	998.071	6.053	0.81
10	1174.184	6.014	0.82
25	1402.884	6.018	0.82
50	1569.580	6.014	0.82
100	1735.688	6.014	0.82

Where:

- Q - Flow Rate (m<sup>3</sup>/s)
- C - Rational Method Runoff Coefficient
- I - Storm Intensity (mm/hr)
- A - Area (ha.)
- Ci - Peaking Coefficient

	Area Draining to Carp Road	Area Draining to SE Ditch
Area Number	1	2
Area	0.59 ha	0.42 ha
Runoff Coefficient	0.31	0.23
Time of Concentration	10 min	10 min
Return Rate	2 year	2 year
Peaking Coefficient (Ci)	1.00	1.00
Rainfall Intensity	76.8 mm/hr	76.8 mm/hr
Pre-Development Peak Flow	0.04 m <sup>3</sup> /s	0.02 m <sup>3</sup> /s
Return Rate	5 year	5 year
Peaking Coefficient (Ci)	1.00	1.00
Rainfall Intensity	104.2 mm/hr	104.2 mm/hr
Pre-Development Peak Flow	0.05 m <sup>3</sup> /s	0.03 m <sup>3</sup> /s
Return Rate	10 year	10 year
Peaking Coefficient (Ci)	1.00	1.00
Rainfall Intensity	122.1 mm/hr	122.1 mm/hr
Pre-Development Peak Flow	0.06 m <sup>3</sup> /s	0.03 m <sup>3</sup> /s
Return Rate	25 year	25 year
Peaking Coefficient (Ci)	1.10	1.10
Rainfall Intensity	144.7 mm/hr	144.7 mm/hr
Pre-Development Peak Flow	0.08 m <sup>3</sup> /s	0.04 m <sup>3</sup> /s
Return Rate	50 year	50 year
Peaking Coefficient (Ci)	1.20	1.20
Rainfall Intensity	161.5 mm/hr	161.5 mm/hr
Pre-Development Peak Flow	0.10 m <sup>3</sup> /s	0.05 m <sup>3</sup> /s
Return Rate	100 year	100 year
Peaking Coefficient (Ci)	1.25	1.25
Rainfall Intensity	178.6 mm/hr	178.6 mm/hr
Pre-Development Peak Flow	0.11 m <sup>3</sup> /s	0.06 m <sup>3</sup> /s

## Argue, 2822 Carp Rd, Ottawa Post-Development Peak Flows

City of Ottawa  
Storm Event (yrs)      Coeff A      Coeff B      Coeff C      Modified Rational Method  
Q = CiCIA / 360

2	<b>732.951</b>	<b>6.199</b>	<b>0.81</b>
5	<b>998.071</b>	<b>6.053</b>	<b>0.81</b>
10	<b>1174.184</b>	<b>6.014</b>	<b>0.82</b>
25	<b>1402.884</b>	<b>6.018</b>	<b>0.82</b>
50	<b>1569.580</b>	<b>6.014</b>	<b>0.82</b>
100	<b>1735.688</b>	<b>6.014</b>	<b>0.82</b>

Where:

- Q - Flow Rate (m<sup>3</sup>/s)
- C - Rational Method Runoff Coefficient
- I - Storm Intensity (mm/hr)
- A - Area (ha.)
- Ci - Peaking Coefficient

	Uncontrolled Area	Controlled Area to SWM Pond
Area Number	Area 1	Area 2
Area	0.14 ha	0.88 ha
Runoff Coefficient	0.22	0.60
Time of Concentration	10 min	10 min
Return Rate	2 year	2 year
Peaking Coefficient (Ci)	1.00	1.00
Rainfall Intensity	76.8 mm/hr	76.8 mm/hr
Post-Development Peak Flow	0.01 m <sup>3</sup> /s	0.11 m <sup>3</sup> /s
Return Rate	5 year	5 year
Peaking Coefficient (Ci)	1.00	1.00
Rainfall Intensity	104.2 mm/hr	104.2 mm/hr
Post-Development Peak Flow	0.01 m <sup>3</sup> /s	0.15 m <sup>3</sup> /s
Return Rate	10 year	10 year
Peaking Coefficient (Ci)	1.00	1.00
Rainfall Intensity	122.1 mm/hr	122.1 mm/hr
Post-Development Peak Flow	0.01 m <sup>3</sup> /s	0.18 m <sup>3</sup> /s
Return Rate	25 year	25 year
Peaking Coefficient (Ci)	1.10	1.10
Rainfall Intensity	144.7 mm/hr	144.7 mm/hr
Post-Development Peak Flow	0.01 m <sup>3</sup> /s	0.23 m <sup>3</sup> /s
Return Rate	50 year	50 year
Peaking Coefficient (Ci)	1.20	1.20
Rainfall Intensity	161.5 mm/hr	161.5 mm/hr
Post-Development Peak Flow	0.02 m <sup>3</sup> /s	0.28 m <sup>3</sup> /s
Return Rate	100 year	100 year
Peaking Coefficient (Ci)	1.25	1.25
Rainfall Intensity	178.6 mm/hr	178.6 mm/hr
Post-Development Peak Flow	0.02 m <sup>3</sup> /s	0.33 m <sup>3</sup> /s

## Argue, 2822 Carp Rd, Ottawa Stage-Storage-Discharge Table

Elevation (m)	Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Cum. Vol. (m <sup>3</sup> )	Orifice Tube Head (m)	Orifice Tube Flow (m <sup>3</sup> /s)	Weir Head (m)	Weir Flow (m <sup>3</sup> /s)	Total Flow (m <sup>3</sup> /s)
<b>Infiltration Volume</b>								
114.57	98	0	0	0.000	0.000	0.000	0.000	0.000
114.60	103	3	3	0.000	0.000	0.000	0.000	0.000
114.65	111	5	8	0.000	0.000	0.000	0.000	0.000
114.70	120	6	14	0.000	0.000	0.000	0.000	0.000
114.75	129	6	20	0.000	0.000	0.000	0.000	0.000
114.80	138	7	27	0.000	0.000	0.000	0.000	0.000
<b>Quantity Control Volume</b>								
114.82	142	3	0	0.000	0.000	0.000	0.000	0.000
114.85	178	5	5	0.000	0.000	0.000	0.000	0.000
114.90	227	10	15	0.000	0.000	0.000	0.000	0.000
114.95	283	13	28	0.030	0.019	0.000	0.000	0.019
115.00	345	16	43	0.080	0.031	0.000	0.000	0.031
115.05	413	19	62	0.130	0.040	0.000	0.000	0.040
115.10	487	23	85	0.180	0.047	0.000	0.000	0.047
115.15	571	26	111	0.230	0.053	0.000	0.000	0.053
115.20	665	31	142	0.280	0.059	0.000	0.000	0.059
115.25	768	36	178	0.330	0.064	0.000	0.000	0.064
115.30	880	41	219	0.380	0.069	0.000	0.000	0.069
115.35	1000	47	266	0.430	0.073	0.000	0.000	0.073
115.40	1097	52	319	0.480	0.077	0.000	0.000	0.077
115.45	1154	56	375	0.530	0.081	0.020	0.087	0.168
115.50	1245	60	435	0.580	0.085	0.070	0.567	0.652
115.55	1375	65	500	0.630	0.088	0.120	1.272	1.360
115.56	1411	14	514	0.640	0.089	0.130	1.434	1.523

Orifice Tube	
Diameter	200 mm
Invert Elevation	114.82
Orifice Constant	0.80
Orifice Centroid	114.92
Orifice Flow Formula	$0.80\pi(D/2000)^2 \times (2 \times 9.81 \times H)^{0.5}$

Emergency Overflow Weir	
Width	18.00 m
Invert of Weir	115.43 m
Weir Flow Formula	$1.7WH^{1.5}$





# APPENDIX C

## WATER BALANCE CALCULATIONS

## Argue, 2822 Carp Rd, Ottawa Water Balance Calculations

### Pre-Development Recharge

Precipitation data taken from Environment Canada information for the City of Ottawa.

$$\text{Yearly Precipitation} = 885.0 \text{ mm}$$

Using Table 3.1 of the MOE's SWM Planning & Design Manual, the infiltration amount is approximately 28.0% of the precipitation value for Pasture and Shrubs for Fine Sandy Loam. Using site specific rainfall data, the infiltration can be calculated:

$$\begin{aligned} \text{Pasture \& Shrubs} &= 0.86 \text{ ha} \\ \text{Annual Site Area Recharge Volume} &= (0.86 \text{ x } 0.28) \text{ x } 885.0 \\ &= 2,132 \text{ m}^3 \end{aligned}$$

Therefore, 2132 m<sup>3</sup> per year of recharge volume is required for the proposed project.

### Post-Development Recharge

Using Table 3.1 of the MOE's SWM Planning & Design Manual, the infiltration amount for Urban Lawns is approximately 24% for Fine Sandy Silt.

$$\begin{aligned} \text{Urban Lawn} &= 0.35 \text{ ha} \\ \text{Annual Site Area Recharge Volume} &= (0.35 \text{ x } 0.24) \text{ x } 885.0 \\ &= 737 \text{ m}^3 \end{aligned}$$

Therefore, post-development infiltration deficit is as follows:

$$\begin{aligned} \text{Deficit Volume} &= \text{Pre Development} - \text{Post Development} \\ &= 2,132 - 737 \\ &= 1,395 \text{ m}^3 \end{aligned}$$

### Recharge Basin

Find the depth of annual rainfall required to infiltrate 1395 m<sup>3</sup> from the area into the ground.

$$\begin{aligned} \text{Area contributing to the infiltration locations} &= 8,755 \text{ m}^2 \\ \text{Infiltration Deficit} &= 1,395 \text{ m}^3 \end{aligned}$$

### Annual Precipitation Depth Required

$$\begin{aligned} \text{Req'd Precipitation Depth} &= \frac{1,395 \text{ m}^3}{8,755 \text{ m}^2} \\ &= 159.4 \text{ mm} \end{aligned}$$

Assuming the average runoff for the contributing area is 0.60 the following yearly precipitation depth is required to get 159.4 mm of runoff.

$$\begin{aligned} \text{Precipitation Depth} &= \frac{159.4}{0.60} \text{ mm} \\ &= 263.7 \text{ mm} \end{aligned}$$

Find Percent of Annual Precipitation that Required Precipitation Depth represents:

$$\begin{aligned} \text{Annual Precipitation for Study Area} &= 885.0 \text{ mm} \\ \text{\% Annual Rainfall} &= \frac{263.7}{885.0} \text{ mm} \\ &= 30\% \end{aligned}$$

From MOE Figure C-2, 30% of annual rainfall occurs for storm events of 3.0 mm or less.

$$\begin{aligned} \text{Contributing Area} &= 8,755 \text{ m}^2 \\ \text{Precipitation Depth} &= 3.0 \text{ mm} \\ \text{Storage Volume Required} &= A \times D \\ &= 8,755 \times 3.0 \\ &= 26.3 \text{ m}^3 \\ \text{Volume Provided In Bottom of Pond} &= 27.0 \text{ m}^3 \end{aligned}$$

Therefore, water balance for the site has been achieved through the use of the proposed SWM Pond.

**Argue, 2822 Carp Rd, Ottawa**  
**SWM Pond Infiltration Calculations**

**Storage Volume Required Using 3 mm Storm Event as per Water Balance Calculations:**

Contributing Area (A)	=	8,755	m <sup>2</sup>	
Storm Event (D)	=	3.0	mm	
Total Volume Required (V)	=	A x D		
	=	8,755	x	3.0
	=	26.3	m <sup>3</sup>	
<b>SWM Pond Volume Provided (V)</b>	<b>=</b>	<b>27.0</b>	<b>m<sup>3</sup></b>	

**MECP Maximum Allowable Soakaway Pit Depth:**

Percolation (P)	=	61.2	mm/hr	
Drawdown Time (T)	=	36	hr	(Estimated Percolation Rate from the GEMTEC, Geotechnical Report, dated October 2020)
Maximum Depth (d)	=	$\frac{PT}{1000}$		
	=	2.20	m	
<b>SWM Pond Depth Provided</b>	<b>=</b>	<b>0.25</b>	<b>m</b>	

**MECP Required Soakaway Pit Bottom Area:**

Percolation (P)	=	61	mm/hr	
Porosity Of The Storage Material (n)	=	0.40	(for Clear Stone)	
Runoff Volume to be Infiltrated (V)	=	26.3	m <sup>3</sup>	
Retention Time ( $\Delta t$ )	=	36	hr	
Soakaway Pit Bottom Area Required (A)	=	$\frac{1000V}{Pn\Delta t}$		
	=	29.8	m <sup>2</sup>	
<b>Total SWM Pond Bottom Area Provided</b>	<b>=</b>	<b>97.7</b>	<b>m<sup>2</sup></b>	

Therefore, the proposed SWM Pond will be adequate for providing water balance to the site.





**APPENDIX D**

**DEVELOPMENT SERVICING STUDY CHECKLIST**

## 4. Development Servicing Study Checklist

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The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

### 4.1 General Content

- Executive Summary (for larger reports only).
- Date and revision number of the report.
- Location map and plan showing municipal address, boundary, and layout of proposed development.
- Plan showing the site and location of all existing services.
- Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.
- Summary of Pre-consultation Meetings with City and other approval agencies.
- Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defensible design criteria.
- Statement of objectives and servicing criteria.
- Identification of existing and proposed infrastructure available in the immediate area.
- Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).

- Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.
- Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.
- Proposed phasing of the development, if applicable.
- Reference to geotechnical studies and recommendations concerning servicing.
- All preliminary and formal site plan submissions should have the following information:
  - Metric scale
  - North arrow (including construction North)
  - Key plan
  - Name and contact information of applicant and property owner
  - Property limits including bearings and dimensions
  - Existing and proposed structures and parking areas
  - Easements, road widening and rights-of-way
  - Adjacent street names

## 4.2 Development Servicing Report: Water

- Confirm consistency with Master Servicing Study, if available
- Availability of public infrastructure to service proposed development
- Identification of system constraints
- Identify boundary conditions
- Confirmation of adequate domestic supply and pressure
- Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.
- Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.
- Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design
- Address reliability requirements such as appropriate location of shut-off valves
- Check on the necessity of a pressure zone boundary modification.

- Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range
- Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.
- Description of off-site required feeder mains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.
- Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.
- Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

### 4.3 Development Servicing Report: Wastewater

- Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).
- Confirm consistency with Master Servicing Study and/or justifications for deviations.
- Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.
- Description of existing sanitary sewer available for discharge of wastewater from proposed development.
- Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)
- Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.
- Description of proposed sewer network including sewers, pumping stations, and forcemains.

- Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).
- Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.
- Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.
- Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.
- Special considerations such as contamination, corrosive environment etc.

#### 4.4 Development Servicing Report: Stormwater Checklist

- Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)
- Analysis of available capacity in existing public infrastructure.
- A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.
- Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.
- Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.
- Description of the stormwater management concept with facility locations and descriptions with references and supporting information.
- Set-back from private sewage disposal systems.
- Watercourse and hazard lands setbacks.
- Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.
- Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.

- Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.
- Any proposed diversion of drainage catchment areas from one outlet to another.
- Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.
- Identification of potential impacts to receiving watercourses
- Identification of municipal drains and related approval requirements.
- Descriptions of how the conveyance and storage capacity will be achieved for the development.
- 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.
- Inclusion of hydraulic analysis including hydraulic grade line elevations.
- Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.
- Identification of fill constraints related to floodplain and geotechnical investigation.

## 4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

- Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.
- Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.
- Changes to Municipal Drains.
- Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

## 4.6 Conclusion Checklist

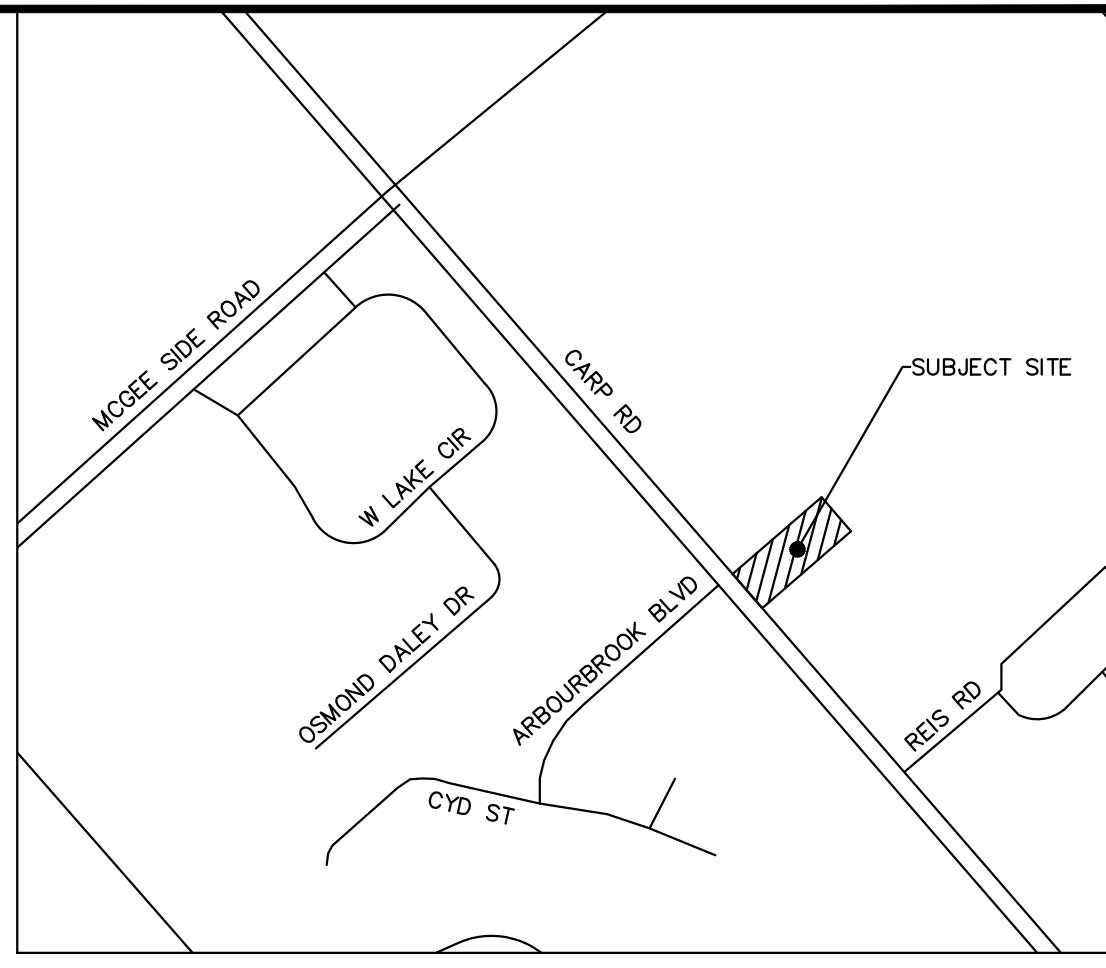
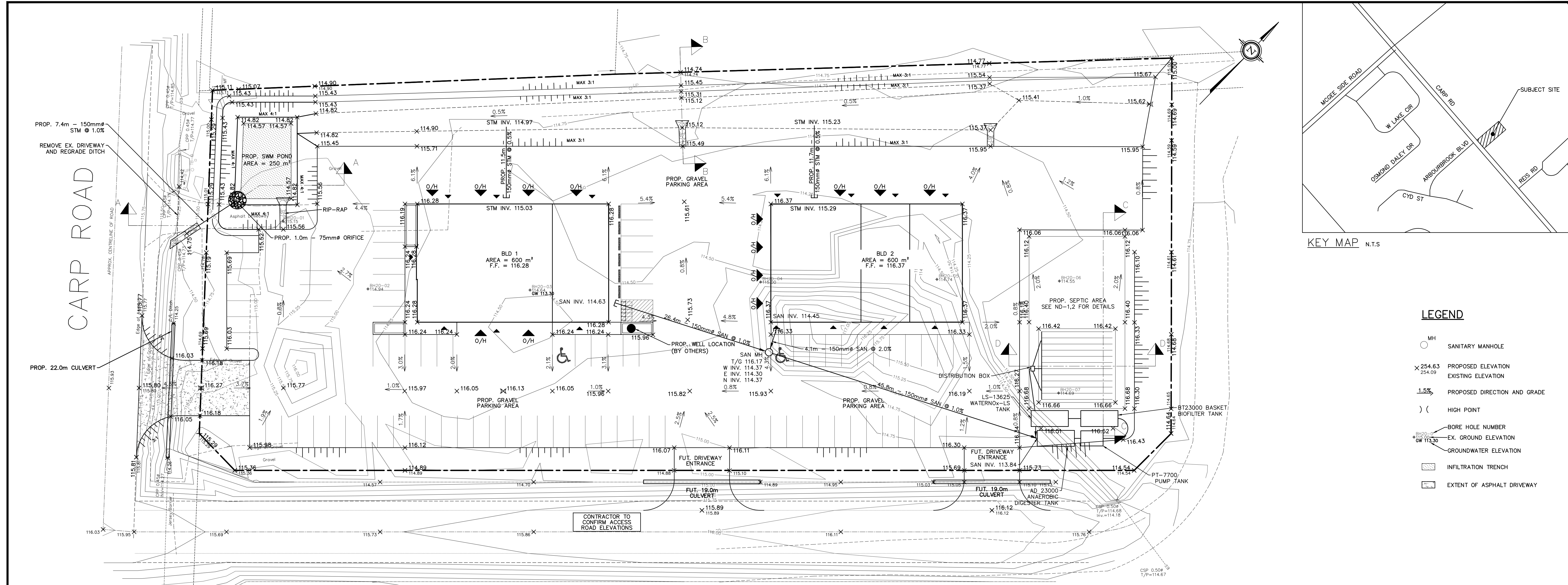
- Clearly stated conclusions and recommendations
- Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.
- All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario



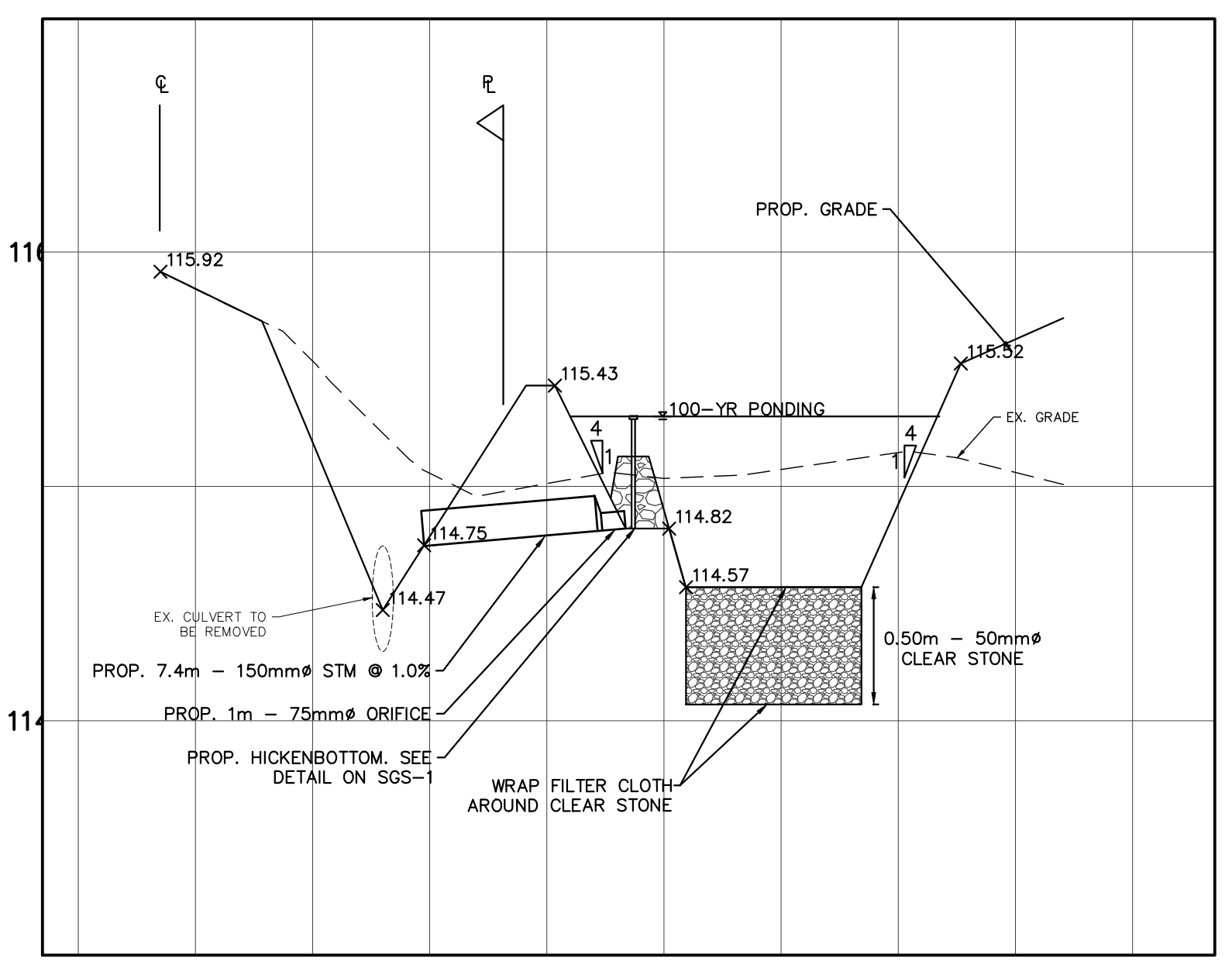
**APPENDIX E**

**PEARSON ENGINEERING DRAWINGS**

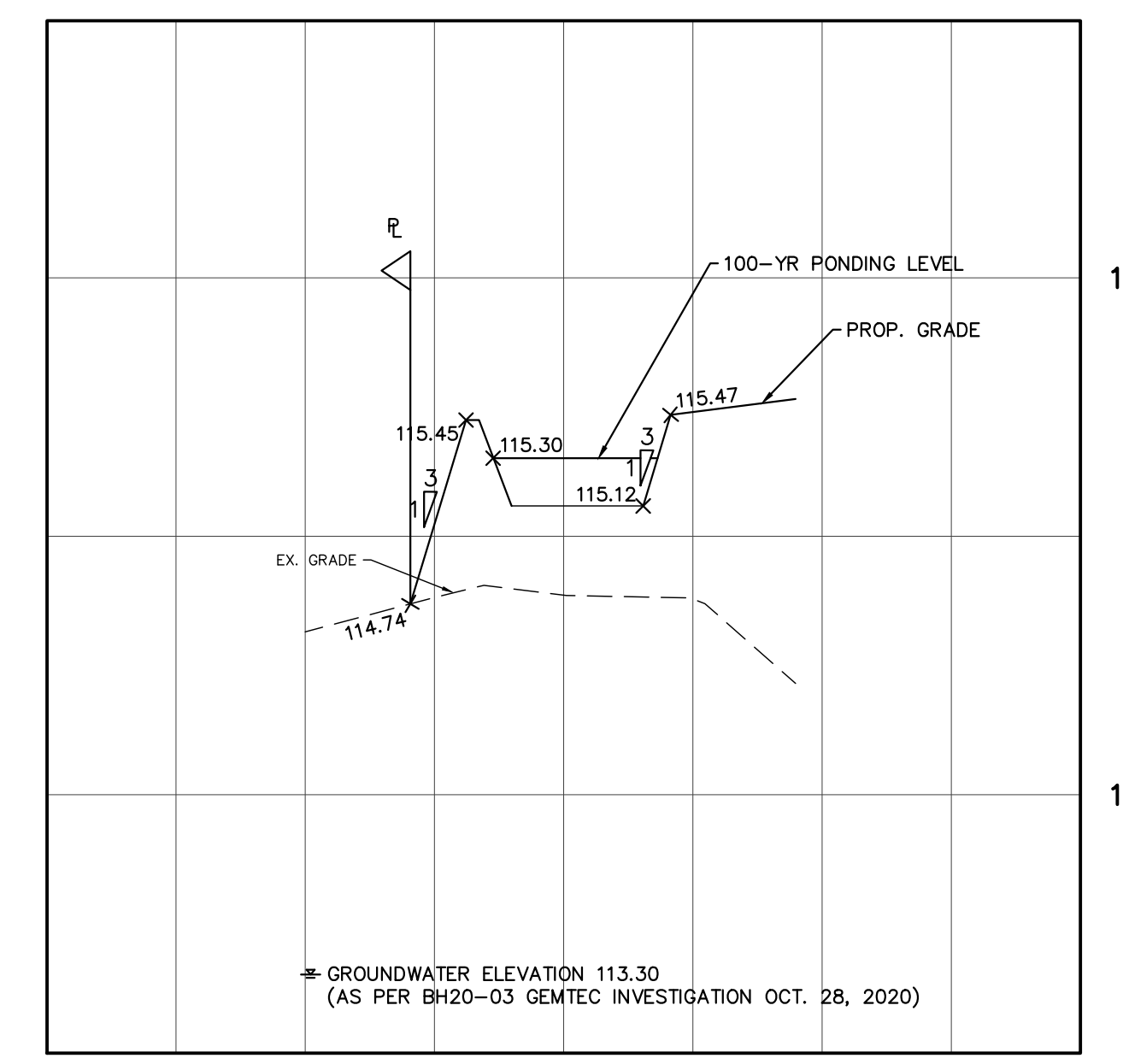




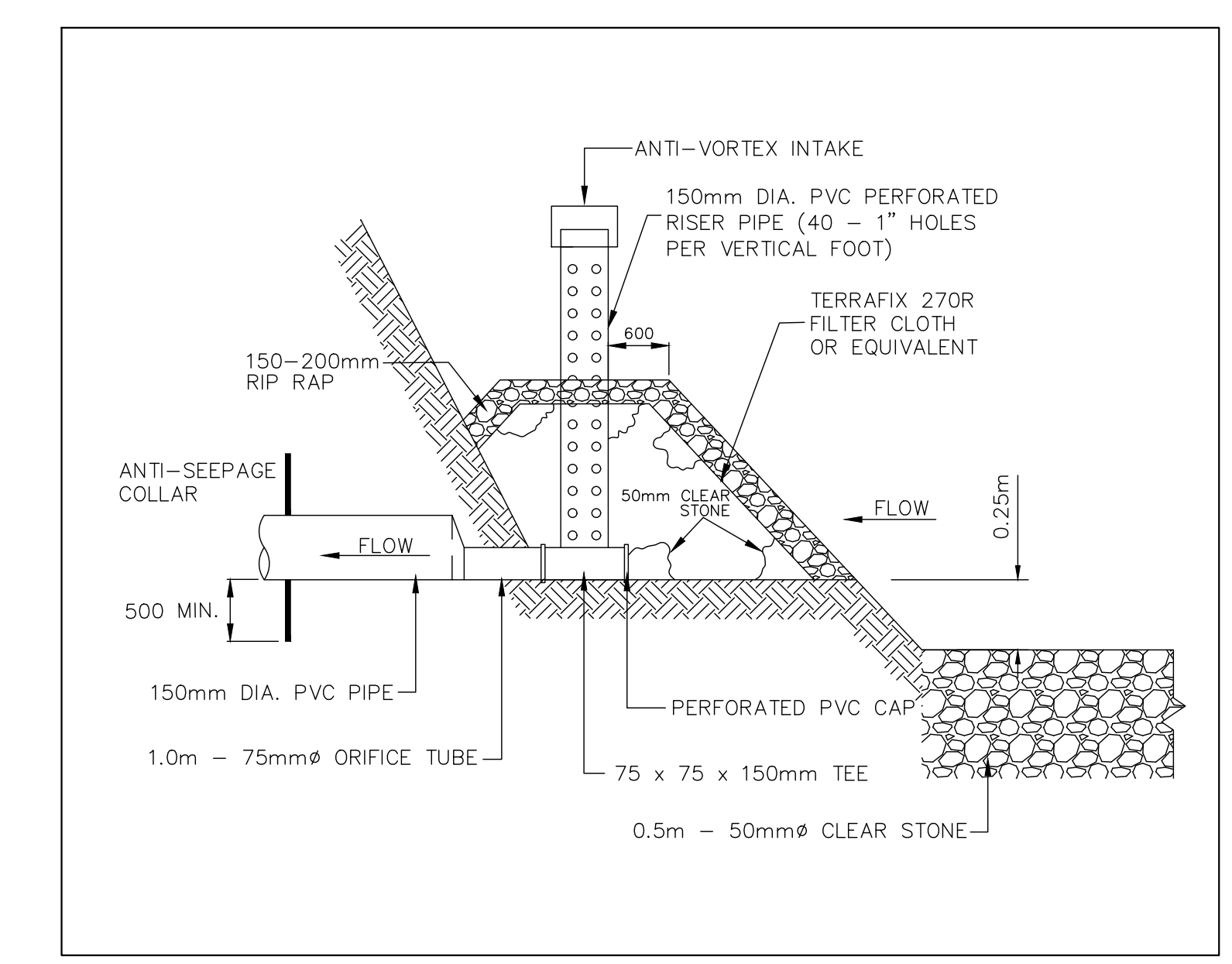
- LEGEND**
- MH SANITARY MANHOLE
  - × 254.63 PROPOSED ELEVATION
  - 254.09 EXISTING ELEVATION
  - 1.5% PROPOSED DIRECTION AND GRADE
  - )( HIGH POINT
  - BORE HOLE NUMBER
  - EX. GROUND ELEVATION
  - GROUNDWATER ELEVATION
  - ▭ INFILTRATION TRENCH
  - ▭ EXTENT OF ASPHALT DRIVEWAY



SECTION A-A  
HORIZONTAL SCALE 1:250  
VERTICAL SCALE 1:50



SECTION B-B  
HORIZONTAL SCALE 1:250  
VERTICAL SCALE 1:50

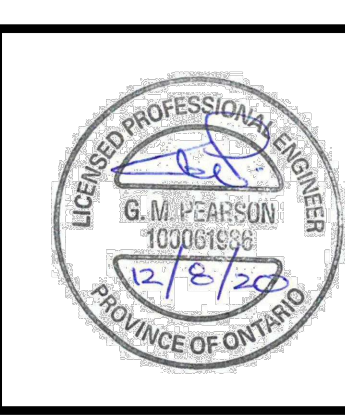


HICKENSBOTTOM DETAIL  
N.T.S.

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NO.	REVISION NOTE	DATE	BY

**BENCHMARK**  
ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO BENCHMARK 68U001/CGVD28 GEODETIC DATUM.  
BEARINGS ARE GRID, DERIVED FROM THE SOUTHWESTERLY LIMIT OF PART 1 PLAN 4R-30382 SHOWN TO BE N41°38'40"W THERON AND ARE REFERRED TO THE CENTRAL MERIDIAN OF MTM ZONE 9 (76°30' WEST LONGITUDE) NAD-83 (ORIGINAL)



MULTI-TENANT COMMERCIAL BLDGS  
2822 CARP ROAD  
CITY OF OTTAWA

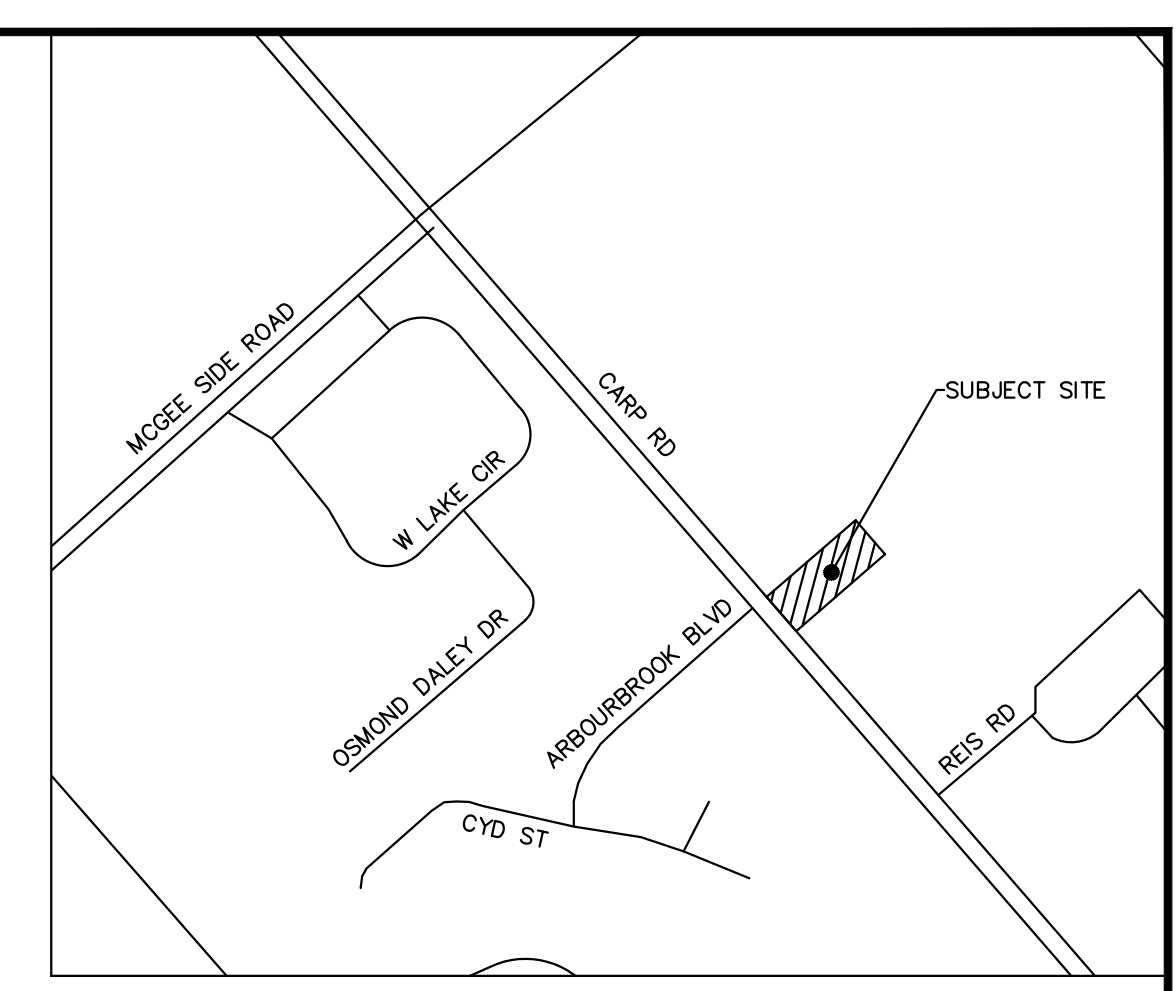
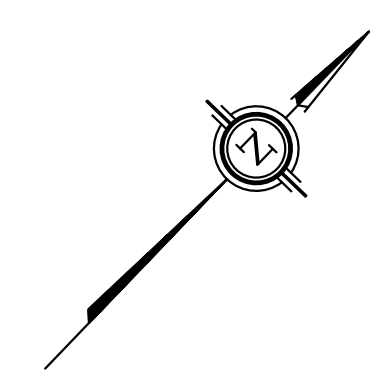
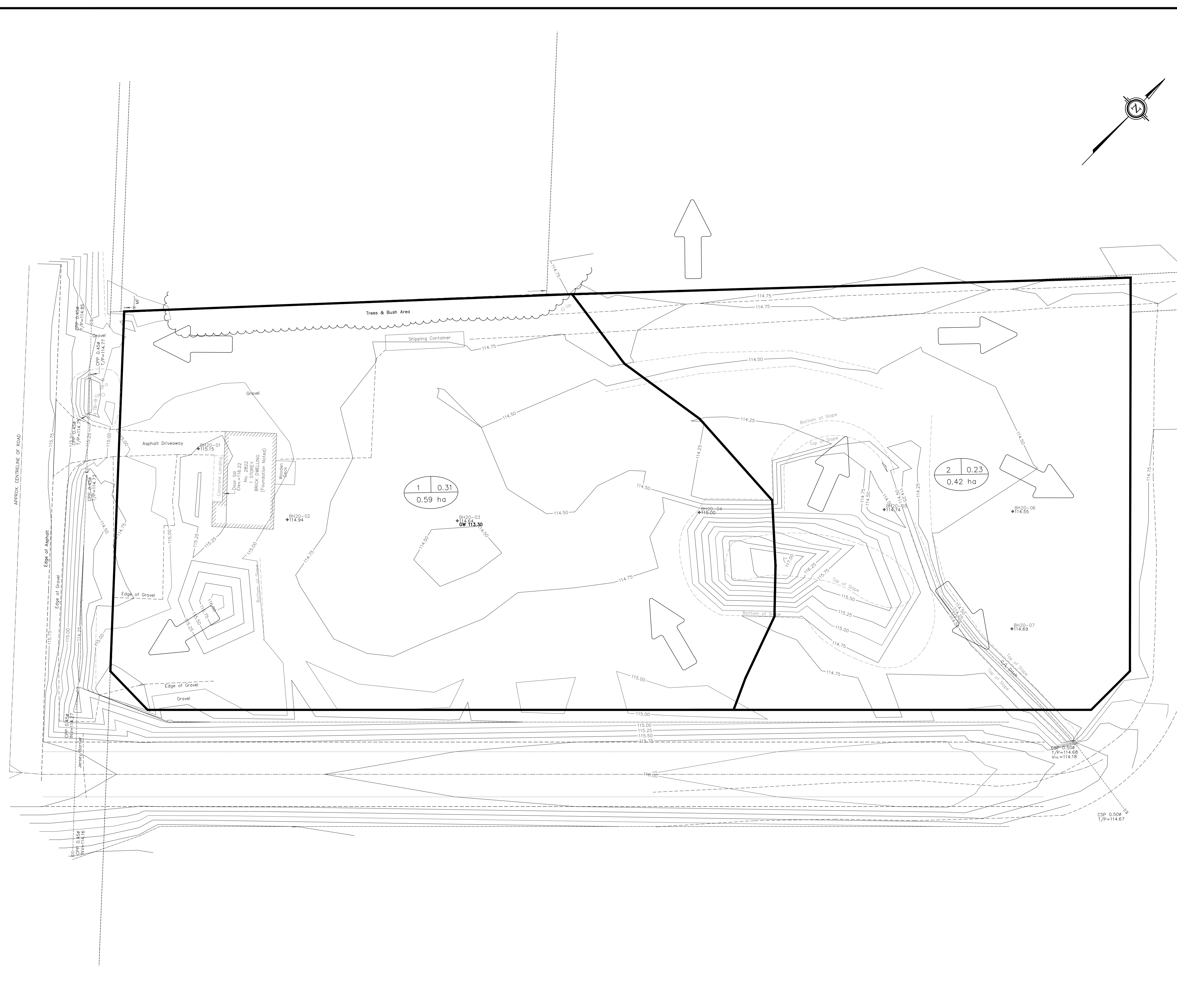
**GRADING AND SERVICING PLAN**

**PEARSON ENGINEERING LTD.**  
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	NW/MWD	HORIZ SCALE	1:300	PROJECT #	19124
DRAWN BY	NW	VERT SCALE	N/A	DRAWING #	SGS-1
CHECKED BY	GMP	DATE	SEPTEMBER 2020	REVISION #	0

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CARP ROAD



KEY MAP N.T.S.

**LEGEND**

- OVERLAND FLOW DIRECTION
- CATCHMENT AREA 

1	0.75
1.00 ha	

 RUNOFF COEFFICIENT
- AREA IN HECTARES
- CATCHMENT BOUNDARY

NO.	REVISION NOTE	DATE	BY

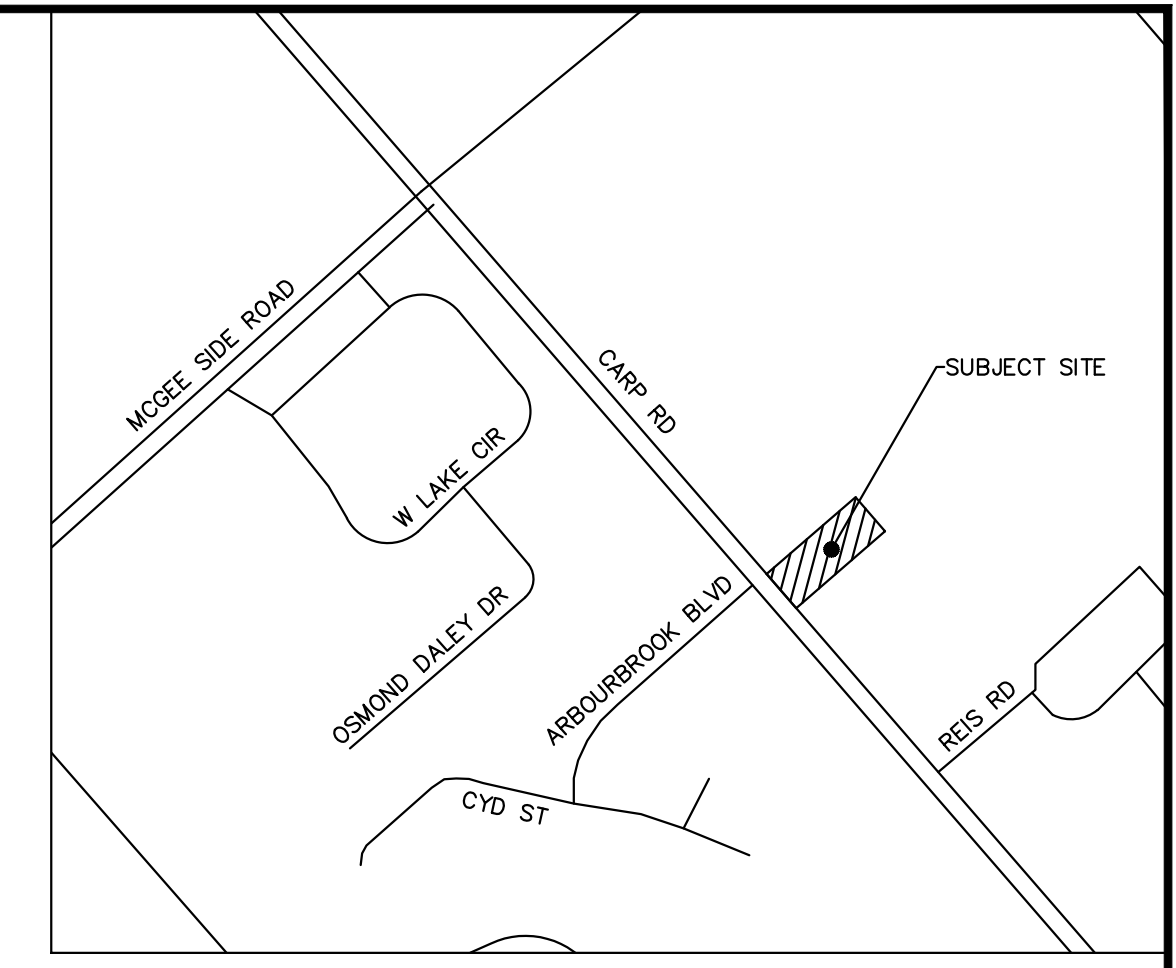
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 ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO BENCHMARK 68U001/CGVD28 GEODETIC DATUM.  
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MULTI-TENANT COMMERCIAL BLDGS  
 2822 CARP ROAD  
 CITY OF OTTAWA

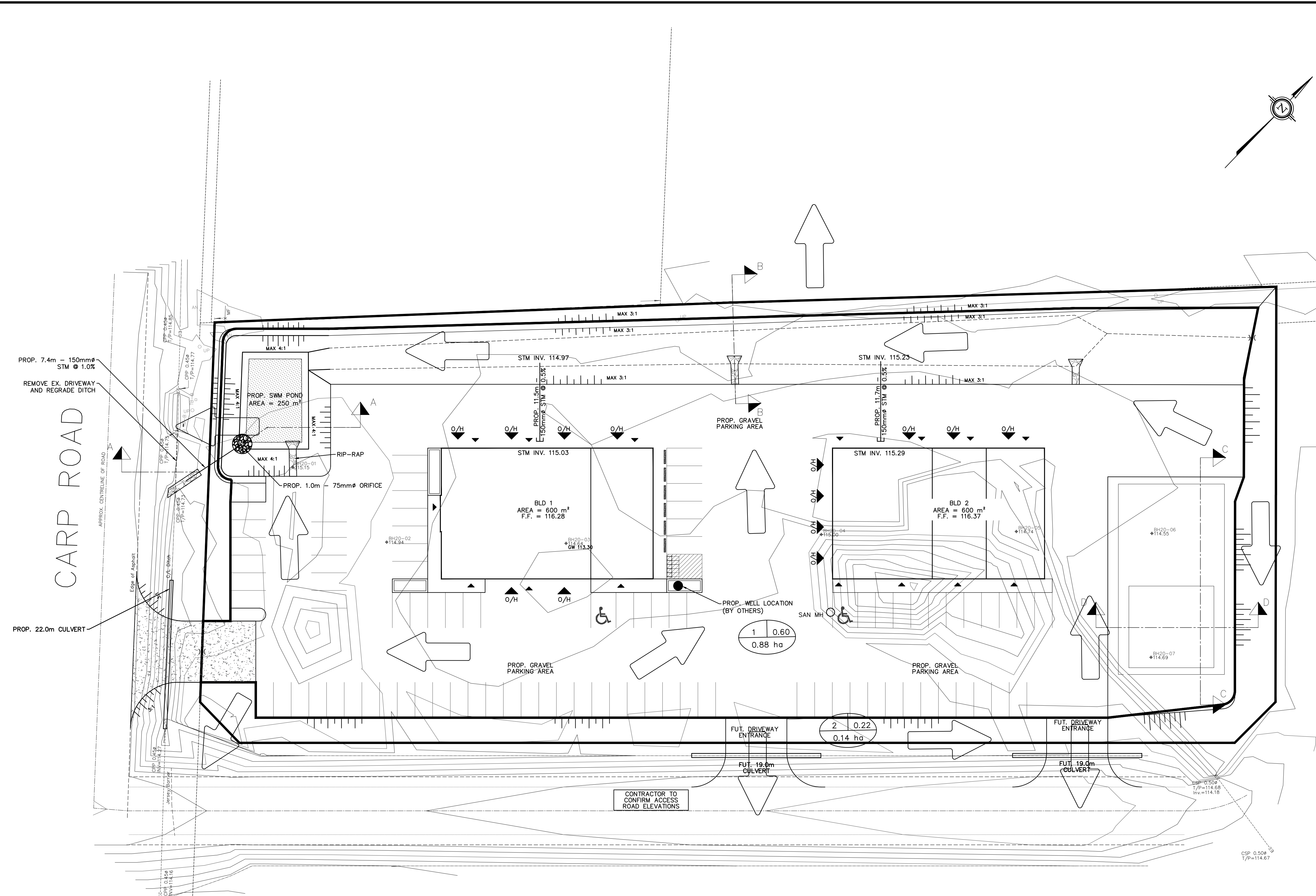
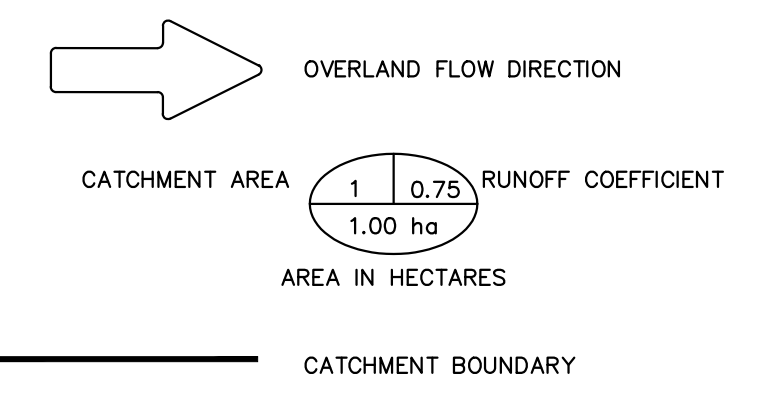
PRE-DEVELOPMENT STORM  
 CATCHMENT PLAN

		<b>PEARSON ENGINEERING LTD.</b>			
		PEARSONENG.COM PH. 705.719.4785			
DESIGNED BY	NW/MWD	HORIZ SCALE	1:300	PROJECT #	19124
DRAWN BY	NW	VERT SCALE	N/A	DRAWING #	STM-1
CHECKED BY	GMP	DATE	SEPTEMBER 2020	REVISION #	0



KEY MAP N.T.S.

**LEGEND**



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NO.	REVISION NOTE	DATE	BY

**BENCHMARK**  
 ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO BENCHMARK 68U001/CGVD28 GEODETIC DATUM.  
 BEARINGS ARE GRID, DERIVED FROM THE SOUTHWESTERLY LIMIT OF PART 1 PLAN 4R-30382 SHOWN TO BE N41°38'40"W THERON AND ARE REFERRED TO THE CENTRAL MERIDIAN OF MTM ZONE 9 (76°30' WEST LONGITUDE) NAD-83 (ORIGINAL)



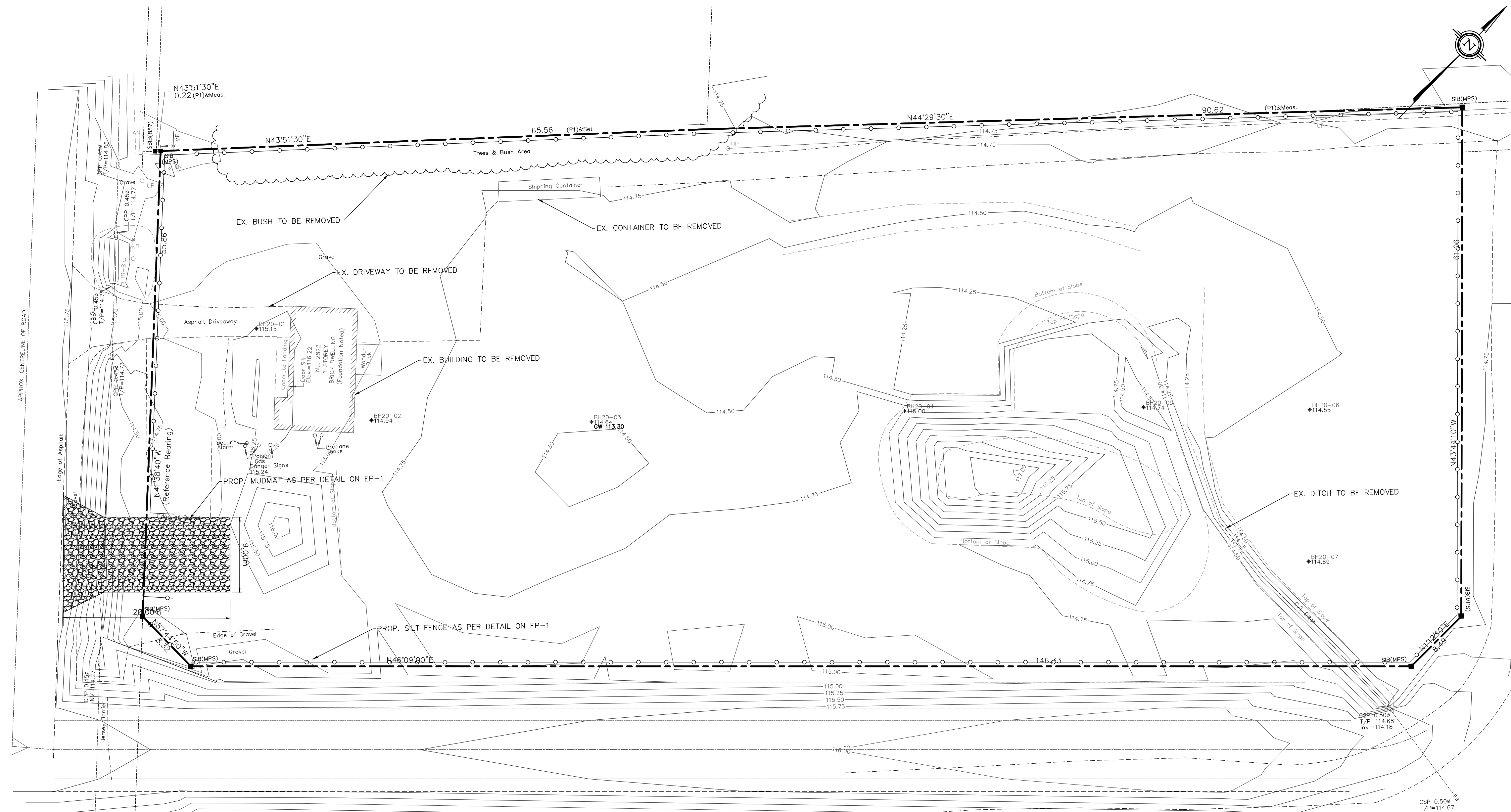
MULTI-TENANT COMMERCIAL BLDGS  
 2822 CARP ROAD  
 CITY OF OTTAWA

POST-DEVELOPMENT STORM  
 CATCHMENT PLAN

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CARP ROAD



KEY MAP N.T.S.

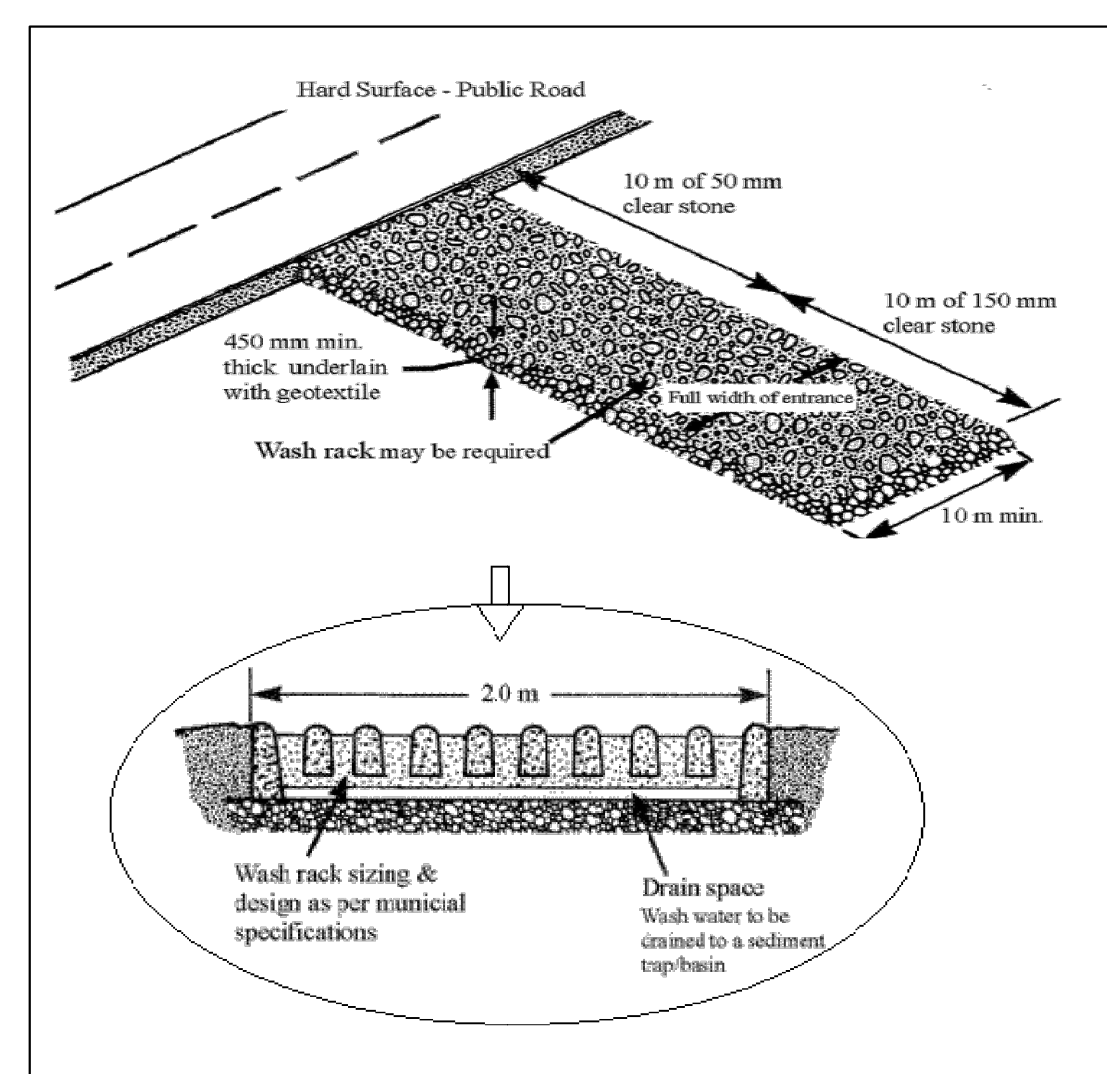
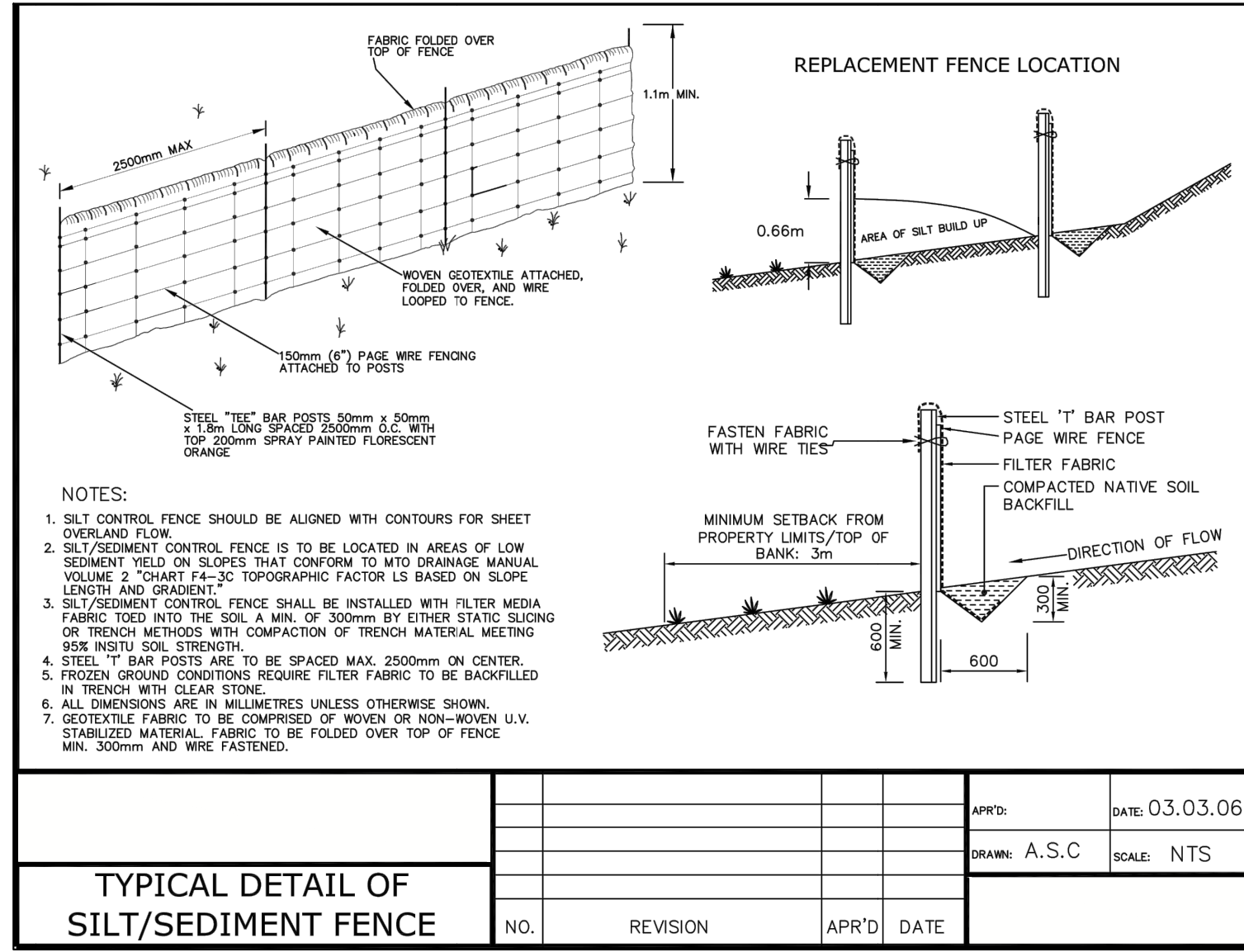
LEGEND  
 SILT FENCE

NOTES FOR SEDIMENT & EROSION CONTROL

- 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.
- 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.
- 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 RECOMMENDED SPECIFICATIONS.
- 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.
- 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.
- THE CONTRACTOR MAY CONSIDER ALTERNATIVE SEDIMENT AND EROSION CONTROL MEASURES. THIS PERIOD OF INACTIVITY SHALL BE AT THE DISCRETION OF THE CITY OF OTTAWA'S MANAGER OF ENGINEERING BUT SHALL NOT EXCEED THIRTY DAYS OR SUCH LONGER PERIOD DEEMED ADVISABLE BY THE CITY OF OTTAWA'S MANAGER OF ENGINEERING.
- THE TOPS OF ALL FILTER FABRIC MUST BE A MINIMUM OF 1.0 METRE 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.
- ALL DISTURBED GROUND LEFT FOR MORE THAN 30 DAYS 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 OTTAWA'S MANAGER OF ENGINEERING BUT SHALL NOT EXCEED THIRTY DAYS OR SUCH LONGER PERIOD DEEMED ADVISABLE BY THE CITY OF OTTAWA'S MANAGER OF ENGINEERING.
- CONTRACTOR RESPONSIBLE FOR MUD TRACKING, PREVENTION, AND MAINTENANCE ON CARP ROAD.
- ROADS TO BE LEFT IN A BROOM SWEEP CONDITION AT THE END OF EACH WORK DAY.

SEQUENCE OF CONSTRUCTION

- ENGINEER TO BE NOTIFIED PRIOR TO INITIATION OF ANY ON SITE WORKS.
- SILT FENCE AS PER DETAIL FOUND ON EP-1 AND ARE TO BE INSTALLED PRIOR TO THE COMMENCEMENT OF ANY WORKS ON SITE.
- VEGETATION REMOVAL MAY COMMENCE AFTER ALL SILT FENCE IS INSTALLED AND APPROVED BY THE ENGINEER.
- COMMENCE WITH EARTH WORKS AND SITE SERVICING.
- INSTALLATION OF PROPOSED INFILTRATION FACILITIES AT THE TIME OF LANDSCAPING WORKS.
- EROSION CONTROL MEASURES TO BE MAINTAINED AS DIRECTED BY THE ENGINEER DURING THE CONSTRUCTION PERIOD. ADDITIONAL CONTROL MEASURES MAY BE REQUIRED AT THE DISCRETION OF THE ENGINEER.
- ALL DISTURBED GROUND LEFT INACTIVE FOR MORE THAN 30 DAYS SHALL BE STABILIZED WITH SEEDS, SOD, MULCH OR OTHER ADEQUATE COVERING, AS INSTRUCTED BY THE ENGINEER.



NO.	REVISION	APPR'D	DATE	BY

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MULTI-TENANT COMMERCIAL BLDGS  
 2822 CARP ROAD  
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EROSION AND REMOVALS PLAN

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