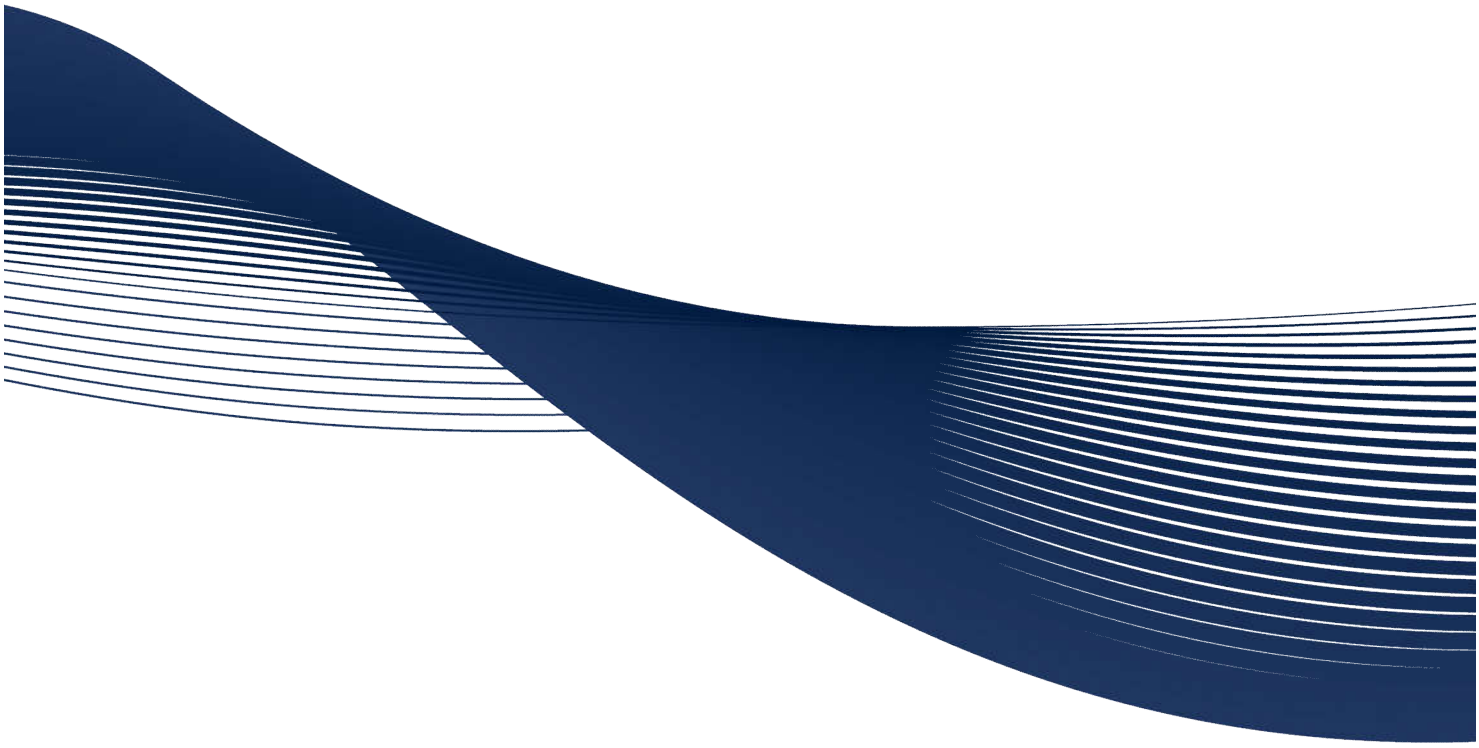
TIME DEVELOPMENT GROUP

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

390 – 376 Derry Road West

City of Mississauga

Project No.: UD16-0522



DECEMBER 2017

COLE ENGINEERING GROUP LTD.

HEAD OFFICE
70 Valleywood Drive
Markham, ON CANADA L3R 4T5
T. 905.940.6161 | 416.987.6161
F. 905.940.2064 | www.ColeEngineering.ca

GTA WEST OFFICE
151 Superior Boulevard, Units 1 & 2
Mississauga, ON CANADA L5T 2L1
T. 905.364.6161
F. 905.364.6162

PREPARED BY:

COLE ENGINEERING GROUP LTD.

Luis Vieira
Senior Designer
Urban Development (ICI)

COLE ENGINEERING GROUP LTD.

Samantha Rayner, E.I.T.
Water Resources Designer
Water Management

CHECKED BY:

COLE ENGINEERING GROUP LTD.

LICENSED PROFESSIONAL ENGINEER
S. K. LEE
100212879
PROVINCE OF ONTARIO

Jacky SK Lee, P.Eng.
Project Engineer
Urban Development (ICI)

COLE ENGINEERING GROUP LTD.

LICENSED PROFESSIONAL ENGINEER
C. D. SHENG
100117409
PROVINCE OF ONTARIO

Chaodong Sheng, M.Sc., P.Eng.
Senior Water Resources Engineer
Water Management

AUTHORIZED FOR ISSUE BY:

COLE ENGINEERING GROUP LTD.

Neil Short
Business Unit Leader
Urban Development (ICI)

Issues and Revisions Registry

Identification	Date	Description of Issued and/or Revision
Final Report	December 2017	For Client Review

Statement of Conditions

This Report/Study (the "Work") has been prepared at the request of, and for the exclusive use of, the Owner/Client, and its affiliates (the "Intended User"). No one other than the Intended User has the right to use and rely on the Work without first obtaining the written authorization of Cole Engineering Group Ltd. and its Owner. Cole Engineering Group Ltd. expressly excludes liability to any party except the intended User for any use of, and/or reliance upon, the work.

Table of Contents

1 Introduction 1
1.1 Background 1
1.2 Site Description 1
2 Site Proposal 1
3 Terms of Reference and Methodology 2
3.1 Terms of Reference 2
3.2 Methodology: Stormwater Drainage and Management 2
3.3 Methodology: Sanitary Discharge 2
3.4 Methodology: Water Usage 3
4 Stormwater Management and Drainage 3
4.1 Design Criteria 3
4.2 Existing Conditions 4
4.3 Proposed Conditions 4
4.3.1 General 4
4.3.2 Quantity Control 5
4.3.3 Stormwater Quality Control 6
4.3.4 Water Balance 6
4.3.5 Proposed Storm Connection 7
5 Sanitary Drainage System 7
5.1 Existing Sanitary Drainage System 7
5.2 Existing Sanitary Flows 7
5.3 Proposed Sanitary Flows 7
5.4 Proposed Sanitary Connection 8
6 Water Supply System 8
6.1 Existing System 8
6.2 Proposed Water Supply Requirements 8
6.3 Proposed Watermain Connection 8
7 Site Grading 9
7.1 Existing Grades 9
7.2 Proposed Grades 9
8 Conclusions and Recommendations 9

LIST OF TABLES

Table 3.1 Sanitary Flows 2
Table 3.2 Water Usage 3
Table 4.1 Target Input Parameters 4
Table 4.2 Target Peak Flows 4
Table 4.3 Post-Development Input Parameters 5
Table 4.4 Post-Development Quantity Control 5
Table 5.1 Equivalent Population Calculations 7

LIST OF FIGURES

FIG1 Location Plan ..... Appendix A
FIG2 Aerial Plan ..... Appendix A
DAP-1 Pre-Development Storm Drainage Area ..... Appendix B
DAP-2 Post-Development Storm Drainage Area ..... Appendix B
SDP-1 Post-Development Sanitary Drainage Area Plan ..... Appendix B

LIST OF DRAWINGS

SS-01 Site Servicing Plan ..... Appendix E
SG-01 Conceptual Grading Plan ..... Appendix E
ESC-01 Erosion and Sediment Control Plan ..... Appendix E
DD-01 Drawing Details ..... Appendix E
DD-02 Drawing Details ..... Appendix E

APPENDICES

Appendix A Background Information

Appendix B Stormwater Data Analysis

Appendix C Sanitary Data Analysis

Appendix D Water Data Analysis

Appendix E Statement of Limiting Conditions and Assumptions

1 Introduction

1.1 Background

Cole Engineering Group Ltd. (Cole Engineering) was retained by Time Development Group to prepare a Functional Servicing and Stormwater Management (FSR / SWM) Report in support of a Draft Plan of Subdivision and Site Plan application for a proposed residential development, in the City of Mississauga. The purpose of this report is to provide site-specific information for the City's review with respect to the proposed roadway and Avenue infrastructure required to support the proposed development regarding stormwater drainage, sanitary sewers and water supply.

We have obtained information from the City regarding existing storm, sanitary and water services on Crestwood Road for where it is anticipated the proposed development will connect to.

The following documents were also reviewed:

- Plan and profile Drawing No. 22637-D, prepared by Region of Peel., dated March 1993;
- Plan and profiles Drawing No. 23125-D and 23126-D, prepared by Region of Peel., dated July 1999;
- Plan and profiles 36374-D, prepared by Skira & Associates Ltd., dated June 2005;
- Plan and profiles 31929-D, prepared by Urban Ecosystems Ltd., dated June 1998;
- Topographic survey prepared by KRCMAR Surveyors Ltd., dated July 5, 2016; and,
- Site plan and site statistics prepared by AJ Tregebov Architect, dated May 2017.

1.2 Site Description

The subject development site is 2.57 ha in area and, is located on the south side of Derry Road West. The closest intersection is at Derry Road West and McLaughlin.

The site is bound by Derry Road West to the north, and existing residential properties on the east, south and west. The site currently consists of two existing residential dwellings; 390 and 376 Derry Road West, which will be demolished to facilitate the proposed development.

Refer to **Figures FIG 1** and **FIG 2** in **Appendix A** for the location and aerial plans of the site.

The site is located in an urban area in the City of Mississauga with a network of municipal infrastructure including roads, sewers, watermains and utilities available to service the proposed development.

2 Site Proposal

The proposed subdivision will include 126 townhouse units and two commercial buildings with proposed laneways within the site to gain access to the residential and commercial developments. The proposed laneways will consist of a 6.0 m wide road width throughout the entire site. Refer to the Site Plan in **Appendix A**.

3 Terms of Reference and Methodology

3.1 Terms of Reference

The Terms of Reference used for the scope of this report were based on current Region of York Transportation and Works Department Water and Wastewater Branch Standards and the Town of Richmond Hill Standards and Specifications Manual.

3.2 Methodology: Stormwater Drainage and Management

The following report provides a review of the pre- and post-development site conditions and comments on opportunities to reduce post-development peak flows. Other requirements set by the City of Mississauga, Ministry of the Environment and Climate Change (MOECC), and Credit Valley Conservation Authority (CVC) will also be discussed. The following SWM criteria are to be applied:

Water Quantity

Post-development peak flows for all storms up to and including the 100-year event should be controlled to pre-development rates.

Water Quality

Enhanced Level 1 Protection, with a long-term average removal of 80% of the Total Suspended Solids (TSS) must be achieved on an annual loading basis.

Water Balance

Runoff resulting from a 3 mm rainfall event must be retained on-site through the use of Low Impact Development (LID) practices including infiltration, evapotranspiration and/or water reuse measures.

3.3 Methodology: Sanitary Discharge

The sanitary sewage discharge from the site will be determined using sanitary sewer design sheets that consider the land use and building statistics as supplied by the design team. The calculated values provide peak sanitary flow discharge with infiltration considerations.

The estimated sanitary discharge flows from the proposed site will be calculated based on the criteria shown in **Table 3.1** below.

Table 3.1 Sanitary Flows

Usage	Design Flow	Units	Persons Per Unit
Residential	302.8	Litres / Person / Day	ROW dwellings = 175 Persons/ha Single Family Dwellings = 50 Persons/ha
Commercial	302.8	Litres / Person / Day	50 Persons/ha

Based on the calculated peak flows, the adequacy of the existing infrastructure to support the proposed development will be discussed.

3.4 Methodology: Water Usage

The domestic water usage will be calculated based on the Region's standards.

Specifically, the proposed water system will be designed to satisfy the following demand conditions:

- Average consumption rate;
- Max day factor; and,
- Peak hour factor.

The domestic water usage was based on the Region's design criteria for water demand and is summarized in **Table 3.2** below.

Table 3.2 Water Usage

	Usage	Water Demand	Units
Residential	Average Consumption Rate	280	Litres / Capita / Day
	Max Day Factor	2.0	Litres / Capita / Day
	Peak Hour Factor	3.0	Litres / Capita / Day
Commercial	Average Consumption Rate	300	Litres / Employee / Day
	Max Day Factor	1.4	Litres / Employee / Day
	Peak Hour Factor	3.0	Litres / Employee / Day

Fire suppression flow calculations were undertaken in accordance with the Region fire suppression standards. Pressure and flow testing to determine the adequacy of the existing watermain to support the proposed development with fire suppression in accordance with the Fire Underwriters Survey (FUS) Guidelines will be discussed in the subsequent **Section 6 Water Supply System**.

4 Stormwater Management and Drainage

4.1 Design Criteria

The proposed development will be designed to meet the design criteria of the City of Mississauga, Credit Valley Conservation (CVC) and the standards of the Province of Ontario as set out in the Ministry of the Environment and Climate Change's (MOECC) 2003 Stormwater Management Planning and Design (SWMPD) Manual. The following design criteria will be reviewed:

- Post-development peak flows for all storms up to and including the 100-year event should be controlled to pre-development rates as per the City's standards;
- Stormwater should be treated to Enhanced (Level 1) Protection Levels as defined in the Ministry of Environmental (MOE) SWMPD Manual as per the CVC requirements;
- Minimum on-site retention of 3 mm of runoff through infiltration, evapotranspiration and/or re-use; and,
- The City's Intensity-Duration-Frequency (IDF) data is to be used for analysis.

4.2 Existing Conditions

Under existing conditions, the subject site (2.57 ha) is currently occupied by two residential dwellings, 376 and 390 Derry Road West, in the City of Mississauga. Major flows from the site are conveyed overland, with the majority of the site (2.49 ha) draining south through neighbouring residential properties into the existing 825 mm diameter storm sewer on Oaktree Circle. A small portion of the site (0.08 ha) drains through neighbouring residential properties to the southeast into a 750 mm diameter existing storm sewer on Arrowsmith Drive. The existing storm sewers ultimately converge and discharge stormwater through a 1050 mm diameter on Arrowsmith Drive from the subdivision into the local storm sewer network. The existing drainage area plan is illustrated in **Figure DAP-1** provided in **Appendix B**.

Composite runoff coefficients were calculated for each pre-development drainage area using runoff coefficient values for 0.25 for pervious and 0.9 for impervious land use types. A time of concentration of 15 minutes was used in accordance with the City's design criteria. Input parameters used to model the pre-development conditions are summarized in **Table 4.1**.

Table 4.1 Target Input Parameters

Catchment	Drainage Area (ha)	C	Tc (min)
A1 Pre	2.49	0.30	15
A2 Pre	0.08	0.25	15
Total	**2.57**	**0.30**	**15**

Rational Method calculations were performed using the City's Intensity-Duration-Frequency (IDF) data in order to determine the peak runoff rates resulting from pre-development site conditions. The peak runoff rates provided in **Table 4.2** below will be used as the target release rates from the subject site during each storm event. Detailed pre-development flow calculations are included in **Appendix B.**

Table 4.2 Target Peak Flows

Catchment	Peak Flow Rational Method (L/s)					
	2-year	5-year	10-year	25-year	50-year	100-year
A1 Pre	124.0	166.7	205.3	235.8	263.2	291.2
A2 Pre	3.5	4.6	5.7	6.6	7.3	8.1
Total	**127.4**	**171.3**	**211.0**	**242.3**	**270.5**	**299.4**

4.3 Proposed Conditions

4.3.1 General

The proposed site will consist of 126 townhouses, a commercial building with adjacent parking lot and multiple laneways. Based on the proposed grading scheme of the site, the new development will comprise a total of three internal drainage areas. Drainage Area A1 Post and A2 Post will be discharged at a controlled rate into the existing storm sewer on Oaktree Circle. A 0.05 ha portion of the site, A3 Post, will drain uncontrolled via overland flow to Derry Road West. A temporary 710 mm diameter culvert is proposed along Derry Road West, running the length of subject site, to replace the existing roadside ditch.

The proposed culvert was sized to accommodate the same flow capacity that was available within the existing ditch. See FlowMaster outputs in **Appendix B** for details.

Composite runoff coefficients were calculated for each drainage area using a runoff coefficient of 0.90 for impervious areas, and 0.25 for pervious areas. Post-development drainage areas and runoff coefficients are illustrated in **Figure DAP-2** found in **Appendix B.** The relevant drainage parameters of the post-development drainage areas are provided in **Table 4.3** below.

Table 4.3 Post-Development Input Parameters

Drainage Area	Drainage Area(ha)	Composite C	Tc(min.)
A1 Post	2.138	0.78	15
A2 Post	0.385	0.66	15
A3 Post	0.048	0.42	15

4.3.2 Quantity Control

In order to meet the City's design criteria, post-development peak flows from each storm event must be controlled to the corresponding pre-development release rates. Modified Rational Method calculations were completed to determine the peak flows for each storm event. Results for the minor system storm event (5-year) up to the major system storm event (100-year) are summarized in **Table 4.4** below. The detailed post-development quantity control calculations are provided in **Appendix B**.

Table 4.4 Post-Development Quantity Control

Storm Event	Target Flows (L/s)	Release Rate From Orifice #1 (L/s)	Underground Storage Used (m^3)	Release Rate From Orifice #2 (L/s)	Overland Flow Rate (L/s)	Super Pipe Storage Used (m^3)	Uncontrolled Release Rate (L/s)	Total Release Rate (L/s)
2-year	127.4	6.9	36.5	161.0	0	145.8	3.4	127.4
5-year	171.3	7.9	52.6		5.8	194.7	4.6	171.3
10-year	211.0	9.1	66.4		44.4	239.3	5.6	211.0
25-year	242.3	9.9	78.0		74.9	274.3	6.4	242.3
50-year	270.5	10.8	88.3		102.3	306.0	7.2	270.5
100-year	299.4	11.8	98.9		130.4	338.5	8.0	299.4

The quantity control criteria, as per the City's standards, require that post-development flows for all storm events be controlled to pre-development levels. Quantity control storage volume is to be provided by an underground storage facility located below a landscaped green space in drainage area A2 Post, and oversized storm sewers located below the roadway in drainage area A1 Post.
As shown in **Table 4.4**, the maximum required storage in drainage area A2 Post during a 100-year storm event is 98.9 m³, which will be achieved through the use of 49 StormTech SC-740 (or approved equivalent) underground storage chambers. A 75 mm diameter orifice plate is proposed to be installed downstream of the proposed StormTech underground storage facility at MH13, therefore maximizing the available storage in the chambers.

A second orifice control, consisting of a 210 mm diameter orifice control plate, is proposed to be installed on the downstream side of MH3, in order to control post-development discharge to the 5-year predevelopment target rate prior to discharging into the existing storm sewer on Oaktree Circle. Discharge not conveyed within the proposed storm sewer network will be conveyed through the overland flow route towards Oaktree Circle. The proposed 1500 mm diameter over-sized storm sewer will provide the remaining storage required to attenuate the differences in peak flows, therefore providing up to an additional 447.3 m³ storage available on site. The proposed stormwater management system in conjunction with the proposed grading and servicing retains enough runoff volume on site in order to reduce the post-development peak flows from the entire site to the pre-development peak flow targets. All detailed calculations related to quantity control can be found in **Appendix B.**

4.3.3 Stormwater Quality Control

Stormwater treatment must meet Enhanced (Level 1) Protection as defined by the Ministry of the Environment and Climate Change's (MOECC) 2003 Stormwater Management Planning and Design (SWMPD) Manual. Quality control is to be provided by a combination of rooftop and landscaped areas, as well as the use of two (2) OGS units and Isolator Row located in the storage chambers. Runoff from rooftops and landscaped areas is considered inherently 'clean' as these areas will not be exposed to oil and grit. Runoff from the asphalt/pavement areas of A2 Post will be treated using a combination of a StormTech Isolator Row and Contech CDS unit, PMSU2015_4 (or approved equivalent) prior to discharging into the storm sewer network on the subject site. An additional Contech CDS unit, PMSU3030_6 (or approved equivalent) will be located upstream of the connection to the municipal storm sewer system, therefore treating runoff from all asphalt/pavement located within drainage area A1 Post. The combination of rooftop and landscaped areas, and the proposed treatment units will provide an overall TSS removal of 82% for the subject site. Refer to water quality calculations provided in **Appendix B**.

4.3.4 Water Balance

Water balance criteria for the Credit Valley Conversation Authority require the on-site attenuation of 3 mm of rainfall over the total site area to be achieved through the use of Low Impact Development (LID) practices. A 3 mm rainfall over the entire site equates to a required water balance volume of 77.0 m³. Based on initial abstraction values of the site, using 1.0 mm for roof and asphalt surfaces and 5.0 mm for landscaping areas, the site will provide 48.1 m³ of initial abstraction under post-development conditions. Therefore, an additional 28.9 m³ is required to meet the 3.0 mm water balance requirement.

In order to retain the remaining stormwater volume on-site, underground storage chambers with an underlying stone depth of 0.5 m is proposed. An additional 34.0 m³ of water will be retained onsite through the stone underlying the storage chamber system which will allow runoff to be infiltrated into the soil within 48 hours.

The proposed infiltration gallery was sized using the CVC/TRCA Low Impact Development Planning and Design Guide (2011). A stone void ratio of 40% and soil infiltration rate of 12 mm/hr was assumed based on the site's sandy silt soils, as determined within in the Preliminary Geotechnical Investigation prepared by Fisher Environmental Limited (November 2016). Groundwater elevations in this area are approximately 2.3 m below the proposed infiltration storage.

The overall water balance retention provided is 82.1 m^3, therefore exceeding the minimum volume of 77.0 m^3. Refer to **Appendix B** for detailed water balance and infiltration calculations.

4.3.5 Proposed Storm Connection

The proposed storm connection will discharge to the existing 750mm diameter storm sewer on Oaktree Circle via a 375 mm diameter storm sewer @ 2.0% grade. Refer to **Drawing SS-01** in **Appendix E**.

5 Sanitary Drainage System

5.1 Existing Sanitary Drainage System

According to the information collected and outlined under **Section 1.1**, there is an existing 250 mm diameter municipal sanitary sewer located on the south side of Oaktree Circle and an existing 250 mm diameter municipal sanitary sewer located on the north side of Derry Road.

5.2 Existing Sanitary Flows

The existing site contains two single residential houses fronting Derry Road. Sanitary peak flow generated from the existing site is 0.59 L/s. Refer to sanitary flow calculations in **Appendix C**.

5.3 Proposed Sanitary Flows

The anticipated sanitary discharge flows for the proposed site were calculated based on the design criteria outlined in **Table 3.1**, along with the proposed site statistics found in **Appendix A**. The number of proposed residential units and commercial area along with peaking factors were considered in the analysis in order to evaluate the adequacy of the existing municipal infrastructure. The design inputs for the site is shown in **Table 5.1** below.

Table 5.1 Equivalent Population Calculations

Unit Size	Number of Units	Area (ha)	Persons (ppu) Persons Per ha (ppuha)	Total Persons
Single Residential Houses	124		2.7 ppu	334
Commercial		0.033	50 ppha	1.7

The sanitary discharge flow was calculated using the Region guidelines of 302.8 litres/capita/day for residential flows. An infiltration rate of 0.20 L/s/ha was also incorporated into the calculation in accordance with the Region's standards. Based on the above criteria, a net peak design flow of 5.30 L/s was calculated for the subject property. Refer to **Appendix C** for detailed calculations.

5.4 Proposed Sanitary Connection

The proposed development will contain a network of 250 mm diameter sanitary sewers which were designed utilizing the Region's design criteria. Derry Road is a regional road therefore the sanitary connection will connect to the existing 250 mm diameter sanitary sewer along Oaktree Circle, through a proposed 250 mm diameter sanitary service connection at 2.0% connecting with a proposed sanitary manhole. Refer to **Drawing SS-01** in **Appendix E** for the proposed sanitary connection.

6 Water Supply System

6.1 Existing System

The proposed development will contain a network of 200 mm diameter watermains which were designed utilizing the Region's design criteria. According to the information reviewed as stated within **Section 1.1**, there is an existing 200 mm PVC watermain located along Oaktree Circle and an existing 50 mm diameter copper watermain located on the south side of Derry Road. An existing fire hydrant is located directly in front of House 339, on Oaktree Circle and in front of 389 Oaktree Circle. A hydrant flow test was completed on May 30, 2017, and the results were compared against the domestic and fire flow demands from proposed development in order to assess the adequacy of the existing water infrastructure.

6.2 Proposed Water Supply Requirements

The estimated water consumption was calculated based on the occupancy rates shown in **Table 3.2** in **Section 3.4**, based on the Region of Peel's Engineering Design Criteria. It is anticipated that an average daily consumption of approximately 94,240 L/day (1.09 L/s), a max daily demand of 188,182 L/day (131 L/min), min hourly demand of 3,298 L/hr and a peak hourly demand of 11,780 L/hr (3.27 L/s) will be required to service this development with domestic water. Detailed calculations are found in **Appendix D**.

According to our calculations, a minimum fire suppression flow of approximately 14,000 L/min (3,700 USGPM) at a pressure of 140 kPa (20 PSI) will be required for the proposed site. Refer to the detailed calculations found in **Appendix D**.

The results from hydrant test conducted on Oaktree Circle adjacent to the proposed development shows that approximately 14,196 L/min (3,750 USGPM) is available at a pressure of 20 PSI. Based on the results of this test, it is anticipated that the existing watermain infrastructure on Oaktree Circle will meet sufficient fire suppression capacity, adequate to service the proposed development.

6.3 Proposed Watermain Connection

A proposed 200 mm watermain will be running through the site in order to service the proposed development, both in terms of fire and domestic demands. The watermain will ultimately connect to the existing 200 mm diameter watermain adjacent to the site on Oaktree Circle. Refer to **Drawing SS-01** in **Appendix E**.

7 Site Grading

7.1 Existing Grades

Under pre-development conditions, the site generally slopes from north-east to south-west. Site grades are lowest at the south-west corner of the site. Along the boundary limits of the south, east and small area the west consists of a small 3 to 1 berm allowing the overland flow route to between the berm on the west and south at the south-west corner.

7.2 Proposed Grades

Under proposed conditions, the proposed grades along the boundaries of the site will meet the existing elevations of the adjacent land surrounding the subject site. The proposed road vertical grades are at an average grade of 0.5 - 0.7% with connectivity to Derry Road West. Proposed grades along the roads adjacent to the boundary limits will ensure that the drainage within the site is self-contained and does not enter the adjacent lands. Areas where the proposed grades are higher than the existing grades; retaining walls will be used to contain the flows within the site. A small area in the north adjacent to Derry Road will be uncontrolled and directed to the existing municipal sewer. The emergency overland flow will ultimately flow northwest from the south side of the property and the north end of the property will flow south. The overland flow route will be directed to Oaktree Circle between the property limits on the west and the 10-unit townhouse block. Refer to **Drawings SG-01** in **Appendix E**.

8 Conclusions and Recommendations

Based on our investigation, we conclude and recommend the following:

Storm Drainage

Based on the above analysis, storage provided within the proposed underground storage facility and over-sized storm sewer in conjunction with the proposed orifice controls is sufficient in order to control post-development peak flows to the corresponding pre-development targets flows. Quality control will be provided via inherently 'clean' rooftop areas and landscape areas in combination with an Isolator Row and CDS units (or approved equivalent) to achieve the minimum TSS removal of 80%. Water balance mitigation is achieved through initial abstraction on site, as well as increased stone depth proposed beneath the underground storage facility to allowing for additional infiltration. Results of the analysis provided in this report indicate that the proposed measures will effectively meet the SWM criteria set forth by the City, TRCA and MOECC.

Sanitary Sewers

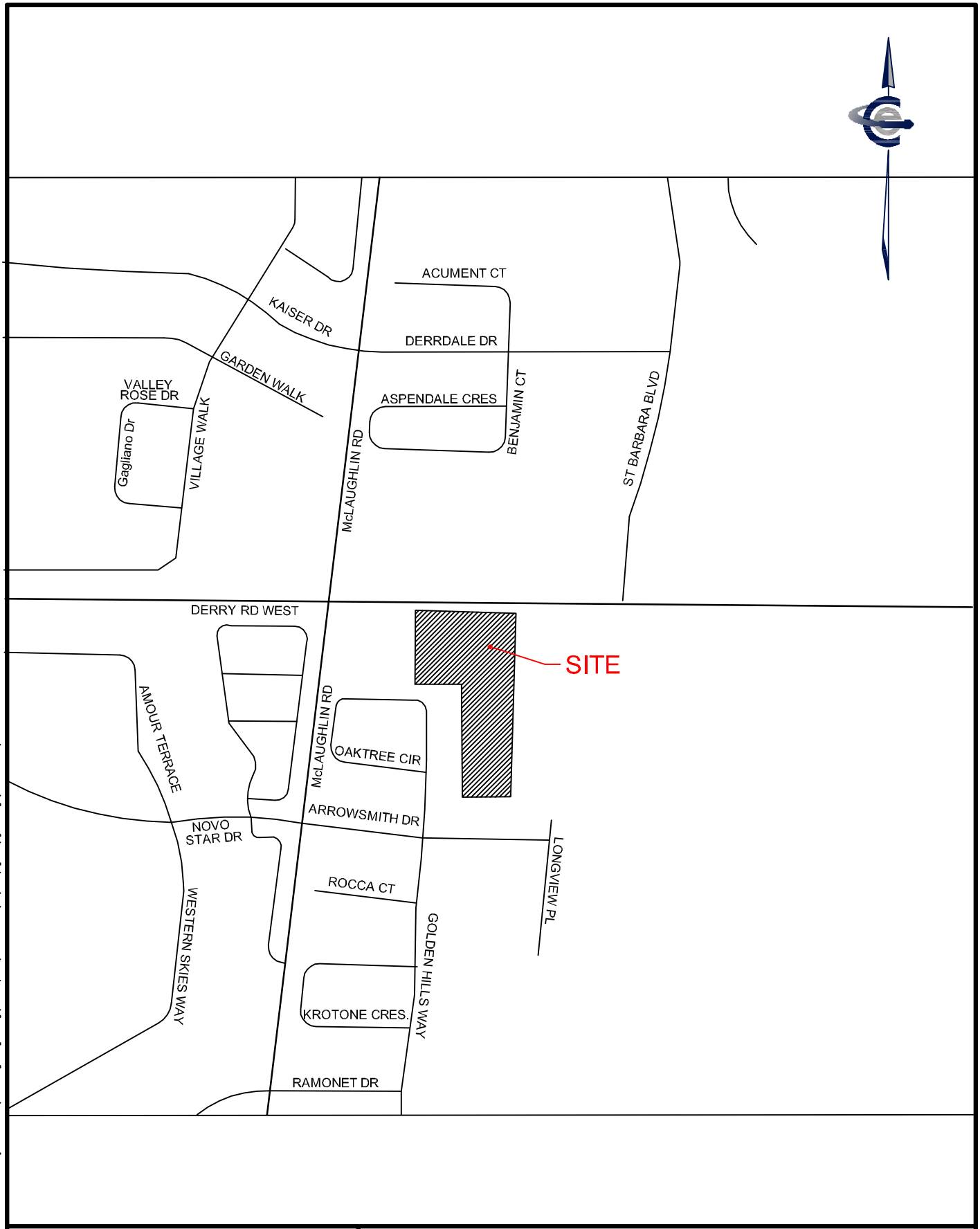
The expected sanitary discharge flow from the site is approximately 5.30 L/s. The sanitary flows will be directed to the existing 250 mm diameter sanitary sewer along Oaktree Circle, through a network of 250 mm diameter PVC sewers, designed according to the Region standards.

Water Supply

Water supply for the site will be provided from the existing 200 mm PVC watermain located along Oaktree Circle. It is anticipated that an average daily consumption of approximately 94,240 L/day (1.09 L/s), a max daily demand of 188,182 L/day, min hourly demand of 3,298 L/hr and a peak hourly demand of 11,780 L/hr (3.27 L/s) will be required to service this development with domestic water. A minimum fire suppression flow of approximately 14,000 L/min (3,700 USGPM) at a pressure of 140 kPa (20 PSI) will be required for the proposed site. The site will be serviced by a series of 200 mm ø PVC watermains.

Site Grading

The proposed grading of the site will match the existing grades where possible. To the extent practical, the site flows will be accommodated by the SWM system up to and including the 100-year storm event. The proposed grades along the boundaries of the site will meet the existing elevations of the adjacent land surrounding the subject site. The proposed road vertical grades are at an average grade of 0.5 - 0.7% with connectivity to Derry Road West. Proposed grades along the roads adjacent to the boundary limits will ensure that the drainage within the site is self-contained and does not enter the adjacent lands. Areas where the proposed grades are higher than the existing grades; retaining walls will be used to contain the flows within the site. The emergency overland flow will ultimately flow North West from the south side of the property and the north end of the property will flow south. The overland flow route will be directed to Oaktree Circle between the property limits on the west and the 10-unit townhouse block.



COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

LOCATION PLAN

RESIDENTIAL DEVELOPMENT
390 & 376 DERRY ROAD,
MISSISSAUGA, ONTARIO

DATE:	JUNE 2017	PROJECT No.:	UD16-0522
SCALE:	N.T.S.	FIGURE No.:	FIG 1

S:\2016 Projects\UD\CT\UD16-0522 TimeDev_390&376DerryRd-SPA_MS\300-Design-Engineering\305-Reports\FSR 2017 06(Jun) 19\Figures\figures.dwg (Aerial Plan)

COLE ENGINEERING

70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

AERIAL PLAN

RESIDENTIAL DEVELOPMENT
390 & 376 DERRY ROAD,
MISSISSAUGA, ONTARIO

DATE:	JUNE 2017	PROJECT No.:	UD16-0522
SCALE:	N.T.S.	FIGURE No.:	FIG 2

APPENDIX A
Background Information

LEGAL DESCRIPTION

PART OF LOT 10
CONCESSION 1
WEST OF HURONTARIO STREET

CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL

BOUNDARY AND BUILDING SURVEY BY:
THAM SURVEYING LIMITED
ONTARIO LAND SURVEYORS

SITE DATA

LOT AREA: (2 PARCELS) 25,716 sq. m. 2.57 ha.
390 DERRY RD + 376 DERRY RD.

SUMMARY OF RESIDENTIAL UNITS

LANE TOWN HOUSES	126
PROPOSAL:	APPROX. 49 UPH

TOTAL GFA:
LANE TOWNHOUSES: 23,411 Sq.M. (252,000 Sq.Ft.)

COMMERCIAL

COMMERCIAL LAND: Stage 1 = 0.17 ha.
Stage 2 = 0.23 ha.

SETBACKS

	MIN.
NORTH SIDE (DERRY ROAD)	3,0 m.
FRONT YARDS	6.0 m.
REAR YARDS	7.5 m.
FLANKING YARDS	1,2-3.0 m.
SOUTH SIDE: OAKTREE CIRCLE / ARROWSMITH DR	7.4 m./ 11.7 m.

PARKING

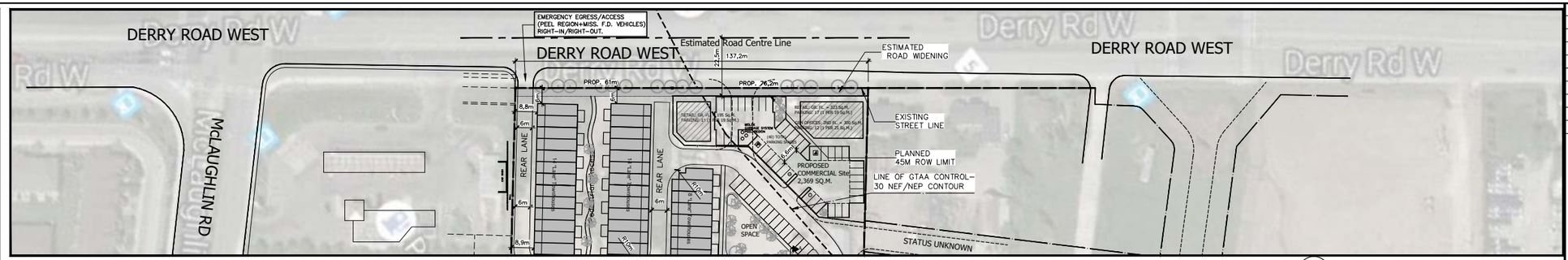
PARKING STANDARD:
SPACE TYPICAL DIMENSIONS: 2.60M X 5.20M
PARALLEL PARKING DIMENSIONS: 2.60M X 6.70M
DRIVEWAYS: 6.0 M MIN.

VISITOR PARKING:
REQUIRED: 0.2 Per Unit = 26 SPACES
PROVIDED: Total 28 Spaces
North Lot (15), Lane Space (6), Lay-By Space (7)

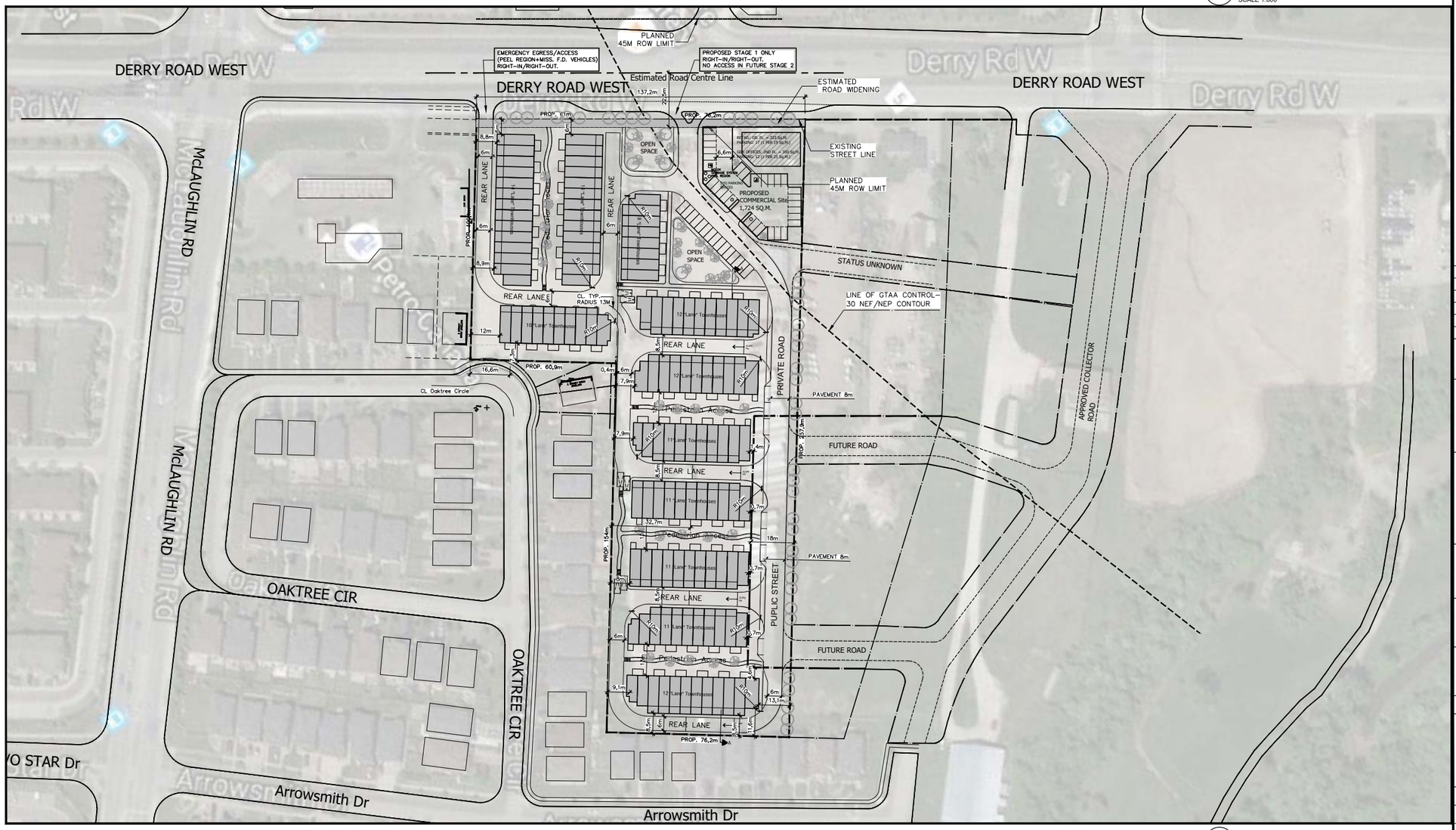
LAND USE:

BUILDINGS: 9404 Sq.M. (37% of Land Area)
ROADS: 5855 Sq.M. (23% of Land Area)
LANDSCAPE: 10457 Sq.M. (40% of Land Area)

3 SITE STATISTICS
SCALE N.T.S.



2 SITE PLAN @ STAGE 2
SCALE 1:800



1 SITE PLAN - STAGE 1
SCALE 1:800

DATE	No.	REVISION

DATE	No.	ISSUE

- CONTRACTOR TO VERIFY ALL DIMENSIONS ON THE SITE AND REPORT ANY DISCREPANCY TO THE ARCHITECT BEFORE PROCEEDING WITH THE WORK.
- ALL DRAWINGS ARE THE PROPERTY OF THE ARCHITECT AND MUST BE RETURNED AT THE COMPLETION OF WORK.
- THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNTIL COUNTERSIGNED.

ARCHITECT:
AJ TREGEBOV *ARCHITECT*
8888 KEELE STREET
TORONTO, ON L4K 2N2

PHONE: 905 -738 1226
FAX: 905 -738 -1215

CONSULTANTS:
CIVIL:
VALDOR ENGINEERING INC.
661 Chrislea Rd., suite 11
Woodbridge, ON
T: 905.264.0054 F: 905.264.0069

LANDSCAPE:
exp SERVICES INC.
220 Commerce valley Dr. West, Suite 500
Markham, ON L3T 0A8
T:905.695.3217 F:

TIME DEVELOPMENT GROUP
7100 Woodbine Ave
Markham, ON L3R 5J2
T:905.604.5766 F:

PROJECT NAME:
390-376 DERRY ROAD WEST, Mississauga, Ontario

DRAWING TITLE:
SITE PLAN & STATISTICS STAGE 1 & 2

PRINT DATE: 09-JUNE-2017

ONTARIO ASSOCIATION of ARCHITECTS
ALAN J. TREGEBOV LICENCE 3606

NORTH

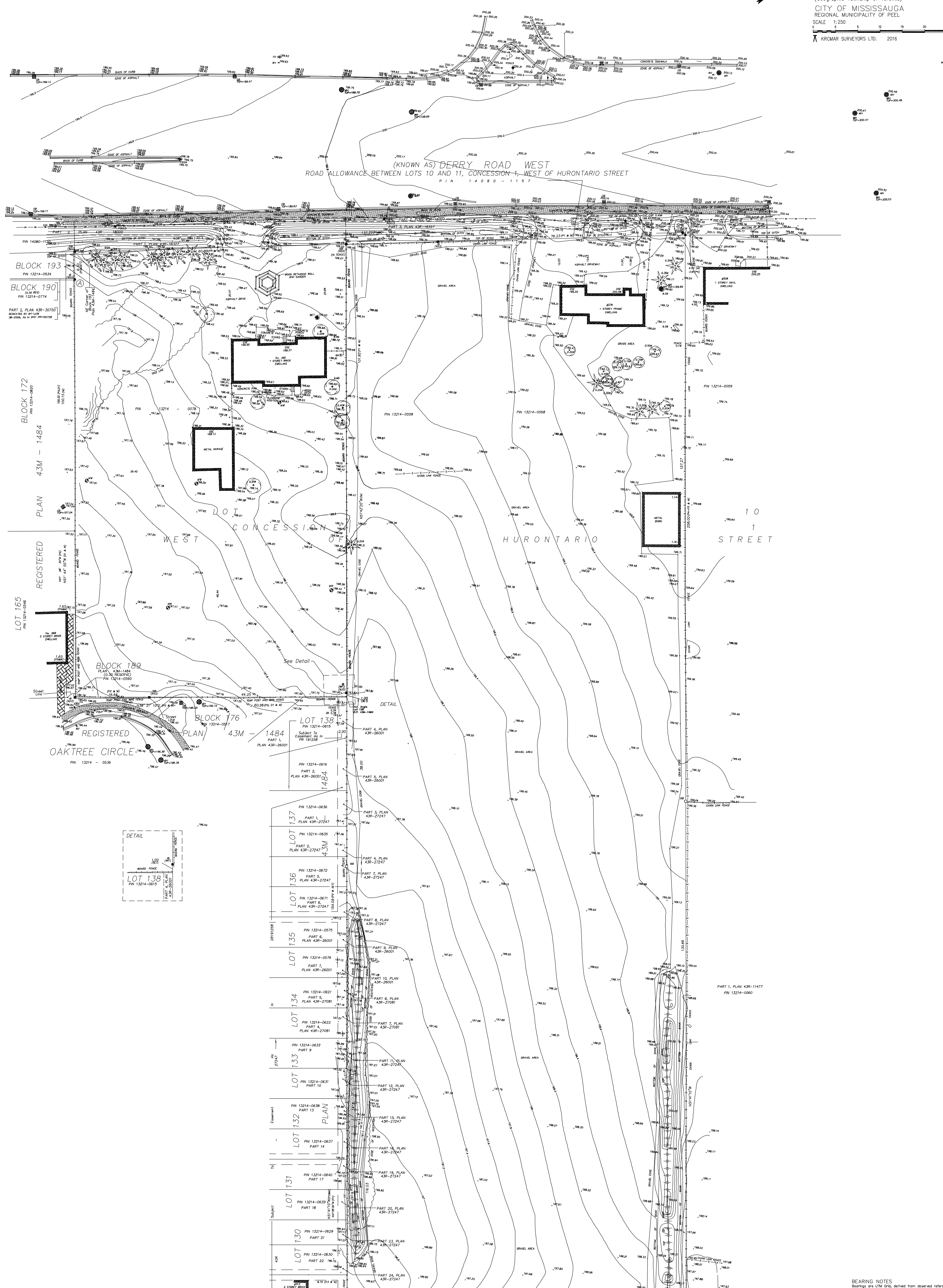
PROJ. No.: 940	REVISION NO:
SCALE: 1:800	DWG NO. A-100
DRAWN: LEA	
DATE:	

PLAN OF SURVEY SHOWING
TOPOGRAPHIC DETAIL OF
PART OF LOT 10
CONCESSION 1
WEST OF HURONTARIO STREET
(Geographic Township of Toronto)

CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL

SCALE 1:250

KRCMAR SURVEYORS LTD. 2016



LEGEND

■	denotes Survey Monument Found
□	denotes Survey Monument Set
SSIB	denotes Short Standard Iron Bar
SIB	denotes Standard Iron Bar
IB	denotes Iron Bar
WIT	denotes Witness
M	denotes Measured
P1	denotes Plan 43R–18327
P2	denotes Plan 43M–1484
P3	denotes Plan 43R–27247
P4	denotes Plan 43R–11477
P5	denotes Plan 43R–25781
D1	denotes Instrument RO1035199
Calc1	denotes Resultant of D1 & P1
865	denotes John McMillan, O.L.S.
922	denotes Schaeffer Dzaldov Bennett Ltd., O.L.S.
923	denotes Tarasick McMillan Ltd., O.L.S.
DSE	denotes Door Sill Elevation
GSE	denotes Garage Sill Elevation
OU	denotes Origin Unknown
GM	denotes Gas Meter
GV	denotes Gas Valve/Key
WV	denotes Water Valve/Key
FH	denotes Fire Hydrant
AN	denotes Anchor Point
POU	denotes Utility Pole
PDLS	denotes Light Standard
POLP	denotes Light Post
POTL	denotes Traffic Signal Pole
HW	denotes Hand Well
-OH-	denotes Overhead Utility Wires
MH	denotes Maintenance Hole Elevation at Top Centre
CB	denotes Catch Basin Elevation at Top Centre
	denotes Sign
×123.46	denotes Spot Elevation
SAPLING	denotes Deciduous Sapling
SAPLING	denotes Coniferous Sapling
TB	denotes Terminal Box

For bearing comparisons, the following rotations were applied:

P2 – 0°57'30" counter–clockwise
P4 – 0°59'00" counter–clockwise

BEARING NOTES
Bearings are UTM Grid, derived from observed reference points A and B, by Real Time Network observations, UTM Zone 17, NAD83(CSRS)(1997).

DISTANCE NOTES – METRIC
Distances and coordinates are in metres and can be converted to feet by dividing by 0.3048.

Distances are ground and can be converted to grid by multiplying by the combined scale factor of 0.999706.

ELEVATIONS
Elevations are geodetic and refer to City of Mississauga Vertical Benchmark No. 1050 having a elevation of 194.056m.

CONTOURS
Contours shown hereon are drawn at 0.20 metre intervals.

SURVEYOR'S CERTIFICATE
I CERTIFY THAT:

1. This survey and plan are correct and in accordance with the Surveys Act and the Surveyors Act and the regulations made under them.
2. The survey was completed on June 29, 2016

July 5, 2016

Date — Tom Krcmar, O.L.S.

INTEGRATION DATA

Observed reference points derived from GPS observations using a Real Time Network and are referred to UTM Zone 17 (81° west longitude) NAD83(CSRS)(1997).

Urban accuracy per Sec. 14(2), O.Reg. 216/10.

POINT ID	NORTHING	EASTING
A	4832380.46	603593.40
B	4832383.19	603911.65

CAUTION: COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
1980214

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR. In accordance with Regulation 1026, Section 29(3).

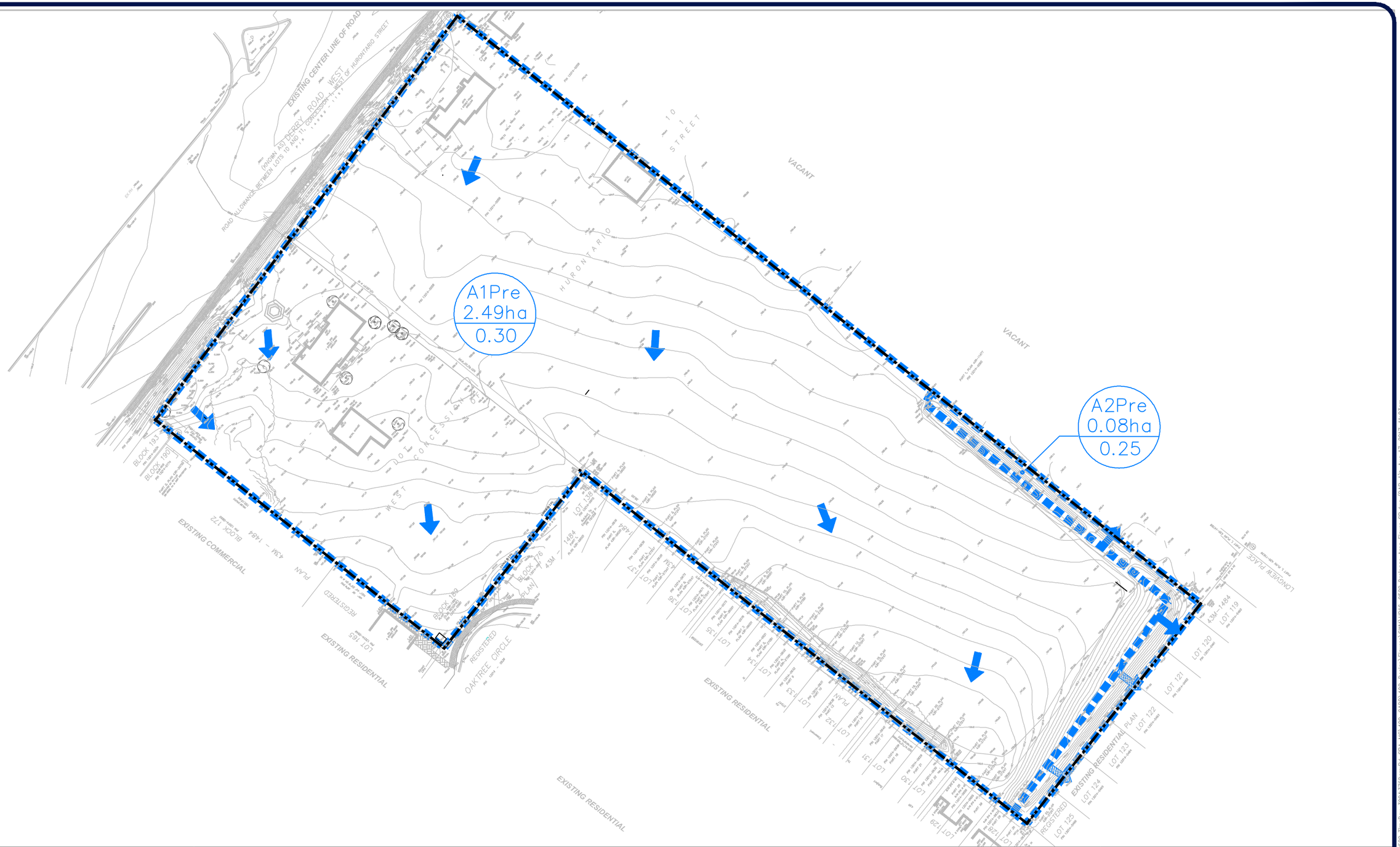
PLAN AVAILABLE AT www.ProtectYourBoundaries.ca

FIELD: AB	DRAWN: RM	CHECKED: SR	JOB NO: 16-088
DWG NAME: 16-088BT01	PLOT INFO: July 5, 2016		WORK ORDER NO: 18723

1137 Centre Street Thornhill ON L4J 3M6 905.738.0053 F 905.738.9221 www.krcmar.ca

KRCMAR

APPENDIX B
Stormwater Data Analysis



COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

LEGEND

- PROPERTY BOUNDARY
- DRAINAGE AREA BOUNDARY
- OVERLAND FLOW DIRECTION

A1Pre / 1.13ha / 0.28
- DRAINAGE AREA ID
- DRAINAGE AREA (HECTARES)
- RUNOFF COEFFICIENT

PRE-DEVELOPMENT STORM DRAINAGE AREA

376 & 390 DERRY ROAD WEST
MISSISSAUGA, ONTARIO

DATE:	AUGUST 2017	PROJECT No.	UD16-0522
SCALE:	1 : 1000	FIGURE No.	DAP-1

COLE ENGINEERING

Prepared By: S.Rayner, EIT

Rational Method
Target Flow Calculations- Pre- Development
376 & 390 Derry Road
File No.UD16-0522
Date: August 2017

Time of Concentration Calculation

Area Number	Area (ha)	C	Time of Concentration (min)
A1 Pre	2.49	0.30	15
A2 Pre	0.08	0.25	15
Total	**2.57**	**0.30**	**15**

Formula: $I = \frac{A}{(T+b)^C}$

	A,B,C	Constants
	T	Time of concentration
	I	Rainfall intensity

Rational Method Calculation

Event 2 yr

IDF Data Set Based on Mississauga Design Criteria

A = 610.00
B = 4.60
C = 0.7800

Area Number	A (ha)	C	AC	Time of Concentration (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1 Pre	2.49	0.30	0.75	15.00	59.9	0.124	124.0
A2 Pre	0.08	0.25	0.02	15.00	59.9	0.003	3.5
Total	**2.57**	**0.30**	**0.77**	**15.00**	**59.9**	**0.127**	**127.4**

Event 5 yr

IDF Data Set Based on Mississauga Design Criteria

A = 820.00
B = 4.60
C = 0.7800

Area Number	A (ha)	C	AC	Time of Concentration (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1 Pre	2.49	0.30	0.75	15.00	80.5	0.167	166.7
A2 Pre	0.08	0.25	0.02	15.00	80.5	0.005	4.6
Total	**2.57**	**0.30**	**0.77**	**15.00**	**80.5**	**0.171**	**171.3**

Event 10 yr

IDF Data Set Based on Mississauga Design Criteria

A = 1010.00
B = 4.60
C = 0.7800

Area Number	A (ha)	C	AC	Time of Concentration (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1 Pre	2.49	0.30	0.75	15.00	99.2	0.205	205.3
A2 Pre	0.08	0.25	0.02	15.00	99.2	0.006	5.7
Total	**2.57**	**0.30**	**0.77**	**15.00**	**99.2**	**0.211**	**211.0**

Event 25 yr

IDF Data Set Based on Mississauga Design Criteria

A = 1160.00
B = 4.60
C = 0.7800

Area Number	A (ha)	C	AC	Time of Concentration (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1 Pre	2.49	0.30	0.75	15.00	113.9	0.236	235.8
A2 Pre	0.08	0.25	0.02	15.00	113.9	0.007	6.6
Total	**2.57**	**0.30**	**0.77**	**15.00**	**113.9**	**0.242**	**242.3**

Event 50 yr

IDF Data Set Based on Mississauga Design Criteria

A = 1300.00
B = 4.70
C = 0.7800

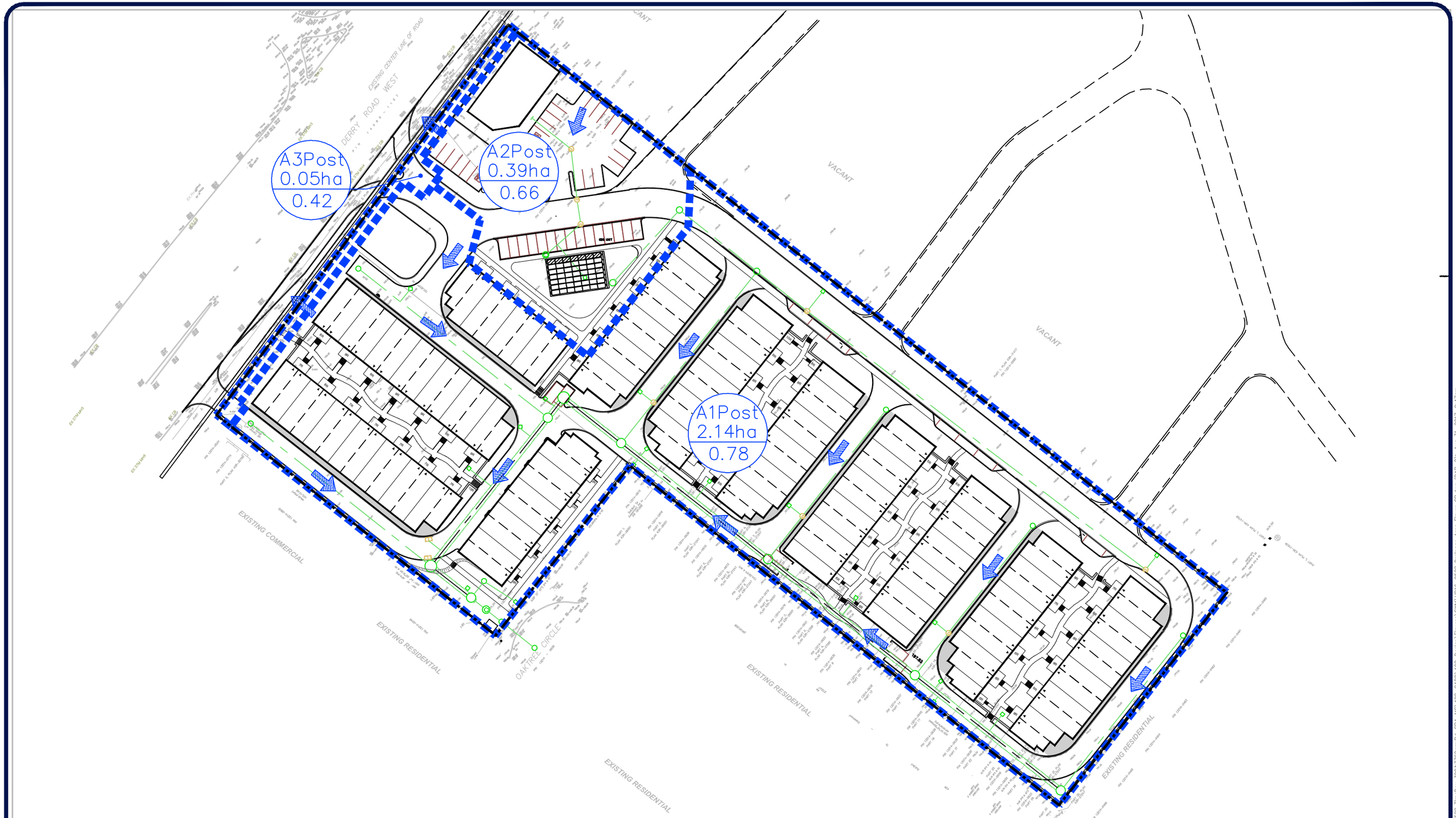
Area Number	A (ha)	C	AC	Time of Concentration (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1 Pre	2.49	0.30	0.75	15.00	127.1	0.263	263.2
A2 Pre	0.08	0.25	0.02	15.00	127.1	0.007	7.3
Total	**2.57**	**0.30**	**0.77**	**15.00**	**127.1**	**0.271**	**270.5**

Event 100 yr

IDF Data Set Based on Mississauga Design Criteria

A = 1450.00
B = 4.90
C = 0.7800

Area Number	A (ha)	C	AC	Time of Concentration (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1 Pre	2.49	0.30	0.75	15.00	140.7	0.291	291.2
A2 Pre	0.08	0.25	0.02	15.00	140.7	0.008	8.1
Total	2.57	0.30	0.77	15.00	140.7	0.299	299.4



COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

LEGEND

- PROPERTY BOUNDARY
- DRAINAGE AREA BOUNDARY
- OVERLAND FLOW DIRECTION

A1Post
1.13ha
0.28

- DRAINAGE AREA ID
- DRAINAGE AREA (HECTARES)
- RUNOFF COEFFICIENT

POST-DEVELOPMENT STORM DRAINAGE AREA

376 & 390 DERRY ROAD WEST
MISSISSAUGA, ONTARIO

DATE:	AUGUST 2017	PROJECT No.	UD16-0522
SCALE:	1 : 1000	FIGURE No.	DAP-2

COLE ENGINEERING

Prepared By: S.Rayner, EIT

Post Development Composite Runoff Coefficient

376 & 390 Derry Road
File No.UD16-0522
Date: August 2017

Area A1 Post- Controlled

	(ha)		
Total Area:	2.138		
Impervious:	1.759	**Coefficient:**	0.9
Landscaping:	0.379	**Coefficient:**	0.25
Composite C:	**0.78**		
Percent Impervious	**82.26%**		

Area A2 Post- Controlled

	(ha)		
Total Area:	0.385		
Impervious:	0.240	**Coefficient:**	0.9
Landscaping:	0.145	**Coefficient:**	0.25
Composite C:	**0.66**		
Percent Impervious	**62.35%**		

Area A3 Post- Uncontrolled

	(ha)		
Total Area:	0.048		
Impervious:	0.013	**Coefficient:**	0.9
Landscaping:	0.035	**Coefficient:**	0.25
Composite C:	**0.42**		
Percent Impervious	**26.78%**		

COLE ENGINEERING

Rational Method
Target Flow Calculations- 2 Year Post Development
376 & 390 Derry Road
File No.UD16-0522
Date: August 2017

Controlled Areas

Drainage Areas	A2 Post	
Area (A1) =	**0.39**	ha
"C" =	**0.66**	
AC1=	**0.25**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Controlled Release Rate (R1) = (From Orifice #1)	**6.9**	L/s
Max. Storage Volume Required=	**36.5**	m³
Max. Storage in Chambers =	**111.64**	m³

Controlled Areas

Drainage Areas	A1 Post	
Area (A2) =	**2.14**	ha
"C" =	**0.78**	
AC2=	**1.68**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Controlled Release Rate (R2) =	**124.0**	L/s
Max. Storage Volume Required=	**145.8**	m³
Max. Storage Provided in Super Pipe=	**447.23**	m³

Uncontrolled Site Area

Drainage Areas	A3 Post	
Area (A3) =	**0.048**	ha
"C" =	**0.42**	
AC3=	**0.02**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Max. Release (R3) =	**3.4**	L/s
2-Year Target Release Rate =	**127.44**	**L/s**
Uncontrolled Release Rate =	**3.39**	**L/s**
Available Release Rate =	**124.05**	**L/s**
Flow Conveyed in STM (5-Yr Target) =	**124.05**	**L/s**
Flow Overland =	**0.00**	**L/s**
Total Site Release Rate =	**127.44**	**L/s**

Two Year Design Storm

a=	610.00
b=	4.60
c=	0.7800
i =	$A/(T+b)^c$

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Time	**Rainfall Intensity**	**Storm Runoff**	**Runoff Volume**	**Allowable Release Volume**	**Storage Volume**	**Storm Runoff**	**Runoff Volume**	**Total Storm Runoff (A1 +A2)**	**Allowable Release Volume**	**Storage Volume**	**Storm Runoff**	**Runoff Volume**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3/s)**	**(m^3)**
		(3)=AC*(2)/360	**(4)=(3)*(1)*60**	**(5)=(R1)/1000*(1)*60**	**(6)=(4)-(5)**	**(7)=AC*(2)/360**	**(8)=(7)*(1)*60**	**(9)=(5)+(8)**	**(10)=(R2)/1000*(1)*60**	**(11)=(9)-(10)**	**(12) = [(2)*AC] / 360**	**(13) = (1)*(12)*60**
15.0	59.9	0.042	37.8	6.2	31.6	0.279	251.2	257.4	111.6	145.8	0.0034	3.05
25.0	43.4	0.030	45.7	10.4	35.3	0.202	303.6	313.9	186.1	127.8	0.0025	3.68
35.0	34.6	0.024	51.0	14.5	36.5	0.161	338.7	353.2	260.5	92.7	0.0020	4.11
45.0	29.0	0.020	55.0	18.6	36.3	0.135	365.3	383.9	334.9	49.0	0.0016	4.43
55.0	25.2	0.018	58.2	22.8	35.4	0.117	386.9	409.6	409.4	0.3	0.0014	4.70
65.0	22.3	0.016	61.0	26.9	34.0	0.104	405.1	432.0	483.8	0.0	0.0013	4.92
75.0	20.1	0.014	63.3	31.1	32.3	0.094	421.0	452.0	558.2	0.0	0.0011	5.11
85.0	18.3	0.013	65.5	35.2	30.3	0.085	435.0	470.2	632.6	0.0	0.0010	5.28
95.0	16.9	0.012	67.4	39.3	28.0	0.079	447.7	487.0	707.1	0.0	0.0010	5.43
105.0	15.6	0.011	69.1	43.5	25.6	0.073	459.2	502.7	781.5	0.0	0.0009	5.57
115.0	14.6	0.010	70.7	47.6	23.1	0.068	469.9	517.5	855.9	0.0	0.0008	5.70
125.0	13.7	0.010	72.2	51.8	20.4	0.064	479.7	531.5	930.4	0.0	0.0008	5.82
135.0	13.0	0.009	73.6	55.9	17.7	0.060	488.9	544.8	1004.8	0.0	0.0007	5.93
145.0	12.3	0.009	74.9	60.0	14.8	0.057	497.5	557.6	1079.2	0.0	0.0007	6.04
155.0	11.7	0.008	76.1	64.2	11.9	0.054	505.7	569.8	1153.7	0.0	0.0007	6.14
165.0	11.1	0.008	77.2	68.3	8.9	0.052	513.4	581.7	1228.1	0.0	0.0006	6.23
175.0	10.6	0.007	78.3	72.5	5.9	0.050	520.7	593.1	1302.5	0.0	0.0006	6.32
185.0	10.2	0.007	79.4	76.6	2.8	0.048	527.7	604.3	1376.9	0.0	0.0006	6.40
195.0	9.8	0.007	80.4	80.7	0.0	0.046	534.3	615.1	1451.4	0.0	0.0006	6.49
205.0	9.4	0.007	81.4	84.9	0.0	0.044	540.7	625.6	1525.8	0.0	0.0005	6.56
215.0	9.1	0.006	82.3	89.0	0.0	0.042	546.9	635.9	1600.2	0.0	0.0005	6.64
225.0	8.8	0.006	83.2	93.2	0.0	0.041	552.8	645.9	1674.7	0.0	0.0005	6.71
235.0	8.5	0.006	84.0	97.3	0.0	0.040	558.4	655.7	1749.1	0.0	0.0005	6.78
245.0	8.2	0.006	84.9	101.4	0.0	0.038	563.9	665.4	1823.5	0.0	0.0005	6.84
255.0	8.0	0.006	85.7	105.6	0.0	0.037	569.2	674.8	1897.9	0.0	0.0005	6.91
265.0	7.8	0.005	86.4	109.7	0.0	0.036	574.4	684.1	1972.4	0.0	0.0004	6.97
275.0	7.5	0.005	87.2	113.9	0.0	0.035	579.3	693.2	2046.8	0.0	0.0004	7.03
285.0	7.3	0.005	87.9	118.0	0.0	0.034	584.2	702.2	2121.2	0.0	0.0004	7.09
295.0	7.1	0.005	88.6	122.1	0.0	0.033	588.9	711.0	2195.7	0.0	0.0004	7.15
305.0	7.0	0.005	89.3	126.3	0.0	0.032	593.4	719.7	2270.1	0.0	0.0004	7.20
315.0	6.8	0.005	90.0	130.4	0.0	0.032	597.9	728.3	2344.5	0.0	0.0004	7.26
325.0	6.6	0.005	90.6	134.6	0.0	0.031	602.2	736.8	2419.0	0.0	0.0004	7.31

COLE ENGINEERING

Rational Method
Target Flow Calculations- 5 Year Post Development
376 & 390 Derry Road
File No.UD16-0522
Date: August 2017

Controlled Areas

Drainage Areas	A2 Post	
Area (A1) =	**0.39**	ha
"C" =	**0.66**	
AC1=	**0.25**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Controlled Release Rate (R1) = (From Orifice #1)	**7.9**	L/s
Max. Storage Volume Required=	**52.6**	m³
Max. Storage in Chambers =	**111.64**	m³

Controlled Areas

Drainage Areas	A1 Post	
Area (A2) =	**2.14**	ha
"C" =	**0.78**	
AC2=	**1.68**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Controlled Release Rate (R2) =	**166.8**	L/s
Max. Storage Volume Required=	**194.7**	m³
Max. Storage Provided in Super Pipe=	**447.2**	m³

Uncontrolled Site Area

Drainage Areas	A3 Post	
Area (A3) =	**0.048**	ha
"C" =	**0.42**	
AC3=	**0.02**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Max. Release (R3) =	**4.6**	L/s

Five Year Design Storm

a=	820.00
b=	4.60
c=	0.7800
I =	$A/(T+b)^c$

5-Year Target Release Rate =	**171.31**	**L/s**
Uncontrolled Release Rate =	**4.6**	**L/s**
Available Release Rate =	**166.8**	**L/s**
Flow Conveyed in STM (5-Yr Target) =	**161.0**	**L/s**
Flow Overland =	**5.8**	**L/s**
Total Site Release Rate =	**171.3**	**L/s**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Time	**Rainfall Intensity**	**Storm Runoff**	**Runoff Volume**	**Allowable Release Volume**	**Storage Volume**	**Storm Runoff**	**Runoff Volume**	**Total Storm Runoff (A1 +A2)**	**Allowable Release Volume**	**Storage Volume**	**Storm Runoff**	**Runoff Volume**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3/s)**	**(m^3)**
		(3)=AC*(2)/360	**(4)=(3)*(1)*60**	**(5)=(R1)/1000*(1)*60**	**(6)=(4)-(5)**	**(7)=AC*(2)/360**	**(8)=(7)*(1)*60**	**(9)=(5)+(8)**	**(10)=(R2)/1000*(1)*60**	**(11)=(9)-(10)**	**(12) = [(2)*AC] / 360**	**(13) = (1)*(12)*60**
15.0	80.5	0.056	50.8	7.1	43.7	0.375	337.7	344.8	150.1	194.7	0.0046	4.10
25.0	58.4	0.041	61.4	11.9	49.6	0.272	408.1	419.9	250.1	169.8	0.0033	4.95
35.0	46.5	0.033	68.5	16.6	51.9	0.217	455.3	471.8	350.2	121.7	0.0026	5.53
45.0	39.0	0.027	73.9	21.3	52.6	0.182	491.0	512.4	450.2	62.1	0.0022	5.96
55.0	33.8	0.024	78.3	26.1	52.2	0.158	520.1	546.1	550.3	0.0	0.0019	6.31
65.0	30.0	0.021	81.9	30.8	51.1	0.140	544.6	575.4	650.3	0.0	0.0017	6.61
75.0	27.0	0.019	85.2	35.6	49.6	0.126	565.9	601.4	750.4	0.0	0.0015	6.87
85.0	24.6	0.017	88.0	40.3	47.7	0.115	584.8	625.1	850.4	0.0	0.0014	7.10
95.0	22.7	0.016	90.6	45.0	45.5	0.106	601.8	646.9	950.5	0.0	0.0013	7.30
105.0	21.0	0.015	92.9	49.8	43.1	0.098	617.3	667.1	1050.6	0.0	0.0012	7.49
115.0	19.6	0.014	95.0	54.5	40.5	0.092	631.6	686.1	1150.6	0.0	0.0011	7.67
125.0	18.4	0.013	97.0	59.3	37.8	0.086	644.9	704.1	1250.7	0.0	0.0010	7.83
135.0	17.4	0.012	98.9	64.0	34.9	0.081	657.2	721.2	1350.7	0.0	0.0010	7.98
145.0	16.5	0.012	100.6	68.7	31.9	0.077	668.8	737.6	1450.8	0.0	0.0009	8.12
155.0	15.7	0.011	102.3	73.5	28.8	0.073	679.8	753.2	1550.8	0.0	0.0009	8.25
165.0	15.0	0.010	103.8	78.2	25.6	0.070	690.1	768.3	1650.9	0.0	0.0008	8.38
175.0	14.3	0.010	105.3	83.0	22.4	0.067	700.0	782.9	1750.9	0.0	0.0008	8.50
185.0	13.7	0.010	106.7	87.7	19.0	0.064	709.3	797.0	1851.0	0.0	0.0008	8.61
195.0	13.2	0.009	108.1	92.4	15.7	0.061	718.3	810.7	1951.0	0.0	0.0007	8.72
205.0	12.7	0.009	109.4	97.2	12.2	0.059	726.9	824.0	2051.1	0.0	0.0007	8.82
215.0	12.2	0.009	110.6	101.9	8.7	0.057	735.1	837.0	2151.1	0.0	0.0007	8.92
225.0	11.8	0.008	111.8	106.7	5.2	0.055	743.0	849.7	2251.2	0.0	0.0007	9.02
235.0	11.4	0.008	113.0	111.4	1.6	0.053	750.7	862.1	2351.2	0.0	0.0006	9.11
245.0	11.1	0.008	114.1	116.1	0.0	0.052	758.1	874.2	2451.3	0.0	0.0006	9.20
255.0	10.7	0.008	115.1	120.9	0.0	0.050	765.2	886.1	2551.3	0.0	0.0006	9.29
265.0	10.4	0.007	116.2	125.6	0.0	0.049	772.1	897.7	2651.4	0.0	0.0006	9.37
275.0	10.1	0.007	117.2	130.4	0.0	0.047	778.8	909.1	2751.4	0.0	0.0006	9.45
285.0	9.9	0.007	118.2	135.1	0.0	0.046	785.3	920.4	2851.5	0.0	0.0006	9.53
295.0	9.6	0.007	119.1	139.8	0.0	0.045	791.6	931.4	2951.6	0.0	0.0005	9.61
305.0	9.4	0.007	120.0	144.6	0.0	0.044	797.7	942.3	3051.6	0.0	0.0005	9.68
315.0	9.1	0.006	120.9	149.3	0.0	0.043	803.7	953.0	3151.7	0.0	0.0005	9.75
325.0	8.9	0.006	121.8	154.1	0.0	0.042	809.5	963.6	3251.7	0.0	0.0005	9.83

COLE ENGINEERING

Rational Method
Target Flow Calculations- 10 Year Post Development
376 & 390 Derry Road
File No.UD16-0522
Date: August 2017

Controlled Areas

Drainage Areas	A2 Post	
Area (A1) =	**0.39**	ha
"C" =	**0.66**	
AC1=	**0.25**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Controlled Release Rate (R1) = (From Orifice #1)	**9.1**	L/s
Max. Storage Volume Required=	**66.4**	m³
Max. Storage in Chambers =	**111.64**	m³

Controlled Areas

Drainage Areas	A1 Post	
Area (A2) =	**2.14**	ha
"C" =	**0.78**	
AC2=	**1.68**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Controlled Release Rate (R2) =	**205.4**	L/s
Max. Storage Volume Required=	**239.3**	m³
Max. Storage Provided in Super Pipe=	**447.2**	m³

Uncontrolled Site Area

Drainage Areas	A3 Post	
Area (A3) =	**0.048**	ha
"C" =	**0.42**	
AC3=	**0.02**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Max. Release (R3) =	**5.6**	L/s

Ten Year Design Storm

a=	1010.00
b=	4.60
c=	0.7800
i =	A/(T+b)^c

10-Year Target Release Rate =	**211.00**	**L/s**
Uncontrolled Release Rate =	**5.6**	**L/s**
Available Release Rate =	**205.4**	**L/s**
Flow Conveyed in STM (5-Yr Target) =	**161**	**L/s**
Flow Overland =	**44.4**	**L/s**
Total Site Release Rate =	**211.0**	**L/s**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Time	**Rainfall Intensity**	**Storm Runoff**	**Runoff Volume**	**Allowable Release Volume**	**Storage Volume**	**Storm Runoff**	**Runoff Volume**	**Total Storm Runoff (A1 +A2)**	**Allowable Release Volume**	**Storage Volume**	**Storm Runoff**	**Runoff Volume**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3/s)**	**(m^3)**
		(3)=AC*(2)/360	**(4)=(3)*(1)*60**	**(5)=(R1)/1000*(1)*60**	**(6)=(4)-(5)**	**(7)=AC*(2)/360**	**(8)=(7)*(1)*60**	**(9)=(5)+(8)**	**(10)=(R2)/1000*(1)*60**	**(11)=(9)-(10)**	**(12) = [(2)*AC] / 360**	**(13) = (1)*(12)*60**
15.0	99.2	0.070	62.6	8.2	54.4	0.462	415.9	424.1	184.9	239.3	0.0056	5.05
25.0	71.9	0.050	75.6	13.7	62.0	0.335	502.6	516.3	308.1	208.2	0.0041	6.10
35.0	57.3	0.040	84.4	19.1	65.3	0.267	560.7	579.9	431.3	148.5	0.0032	6.81
45.0	48.1	0.034	91.0	24.6	66.4	0.224	604.8	629.4	554.6	74.8	0.0027	7.34
55.0	41.7	0.029	96.4	30.0	66.4	0.194	640.6	670.6	677.8	0.0	0.0024	7.77
65.0	36.9	0.026	100.9	35.5	65.4	0.172	670.8	706.3	801.0	0.0	0.0021	8.14
75.0	33.2	0.023	104.9	41.0	63.9	0.155	697.0	738.0	924.3	0.0	0.0019	8.46
85.0	30.3	0.021	108.4	46.4	62.0	0.141	720.3	766.7	1047.5	0.0	0.0017	8.74
95.0	27.9	0.020	111.5	51.9	59.7	0.130	741.3	793.1	1170.7	0.0	0.0016	9.00
105.0	25.9	0.018	114.4	57.3	57.1	0.121	760.4	817.7	1294.0	0.0	0.0015	9.23
115.0	24.2	0.017	117.1	62.8	54.3	0.113	778.0	840.8	1417.2	0.0	0.0014	9.44
125.0	22.7	0.016	119.5	68.3	51.3	0.106	794.3	862.5	1540.4	0.0	0.0013	9.64
135.0	21.4	0.015	121.8	73.7	48.1	0.100	809.5	883.2	1663.7	0.0	0.0012	9.82
145.0	20.3	0.014	124.0	79.2	44.8	0.095	823.8	903.0	1786.9	0.0	0.0011	10.00
155.0	19.3	0.014	126.0	84.6	41.4	0.090	837.3	921.9	1910.2	0.0	0.0011	10.16
165.0	18.4	0.013	127.9	90.1	37.8	0.086	850.0	940.1	2033.4	0.0	0.0010	10.32
175.0	17.6	0.012	129.7	95.6	34.2	0.082	862.1	957.7	2156.6	0.0	0.0010	10.46
185.0	16.9	0.012	131.5	101.0	30.5	0.079	873.7	974.7	2279.9	0.0	0.0010	10.60
195.0	16.2	0.011	133.1	106.5	26.7	0.076	884.7	991.2	2403.1	0.0	0.0009	10.74
205.0	15.6	0.011	134.7	111.9	22.8	0.073	895.3	1007.2	2526.3	0.0	0.0009	10.87
215.0	15.1	0.011	136.2	117.4	18.9	0.070	905.4	1022.8	2649.6	0.0	0.0009	10.99
225.0	14.5	0.010	137.7	122.9	14.9	0.068	915.2	1038.1	2772.8	0.0	0.0008	11.11
235.0	14.1	0.010	139.1	128.3	10.8	0.066	924.6	1052.9	2896.0	0.0	0.0008	11.22
245.0	13.6	0.010	140.5	133.8	6.7	0.064	933.7	1067.5	3019.3	0.0	0.0008	11.33
255.0	13.2	0.009	141.8	139.2	2.6	0.062	942.5	1081.7	3142.5	0.0	0.0007	11.44
265.0	12.8	0.009	143.1	144.7	0.0	0.060	951.0	1095.7	3265.7	0.0	0.0007	11.54
275.0	12.5	0.009	144.3	150.2	0.0	0.058	959.2	1109.4	3389.0	0.0	0.0007	11.64
285.0	12.1	0.009	145.5	155.6	0.0	0.057	967.2	1122.9	3512.2	0.0	0.0007	11.74
295.0	11.8	0.008	146.7	161.1	0.0	0.055	975.0	1136.1	3635.4	0.0	0.0007	11.83
305.0	11.5	0.008	147.9	166.5	0.0	0.054	982.6	1149.1	3758.7	0.0	0.0007	11.93
315.0	11.2	0.008	149.0	172.0	0.0	0.052	990.0	1161.9	3881.9	0.0	0.0006	12.01
325.0	11.0	0.008	150.0	177.5	0.0	0.051	997.1	1174.6	4005.2	0.0	0.0006	12.10

COLE ENGINEERING

Rational Method
Target Flow Calculations- 25 Year Post Development
376 & 390 Derry Road
File No.UD16-0522
Date: August 2017

Controlled Areas

Drainage Areas	A2 Post	
Area (A1) =	**0.39**	ha
"C" =	**0.66**	
AC1=	**0.25**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Controlled Release Rate (R1) = (From Orifice #1)	**9.9**	L/s
Max. Storage Volume Required=	**78.0**	m³
Max. Storage in Chambers =	**111.64**	m³

Controlled Areas

Drainage Areas	A1 Post	
Area (A2) =	**2.14**	ha
"C" =	**0.78**	
AC2=	**1.68**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Controlled Release Rate (R2) =	**235.9**	L/s
Max. Storage Volume Required=	**274.3**	m³
Max. Storage Provided in Super Pipe=	**447.2**	m³

Uncontrolled Site Area

Drainage Areas	A3 Post	
Area (A3) =	**0.048**	ha
"C" =	**0.42**	
AC3=	**0.02**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Max. Release (R3) =	**6.4**	L/s

Twenty-Five Year Design Storm

a=	1160.00
b=	4.60
c=	0.7800
I =	A/(T+b)^c

25-Year Target Release Rate =	**242.34 L/s**
Uncontrolled Release Rate =	**6.4 L/s**
Available Release Rate =	**235.9 L/s**
Flow Conveyed in STM (5-Yr Target) =	**161.0 L/s**
Flow Overland =	**74.9 L/s**
Total Site Release Rate =	**242.3 L/s**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Time	**Rainfall Intensity**	**Storm Runoff**	**Runoff Volume**	**Allowable Release Volume**	**Storage Volume**	**Storm Runoff**	**Runoff Volume**	**Total Storm Runoff (A1 +A2)**	**Allowable Release Volume**	**Storage Volume**	**Storm Runoff**	**Runoff Volume**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3/s)**	**(m^3)**
		(3)=AC*(2)/360	**(4)=(3)*(1)*60**	**(5)=(R1)/1000*(1)*60**	**(6)=(4)-(5)**	**(7)=AC*(2)/360**	**(8)=(7)*(1)*60**	**(9)=(5)+(8)**	**(10)=(R2)/1000*(1)*60**	**(11)=(9)-(10)**	**(12) = [(2)*AC] / 360**	**(13) = (1)*(12)*60**
15.0	113.9	0.080	71.9	8.9	63.0	0.531	477.7	486.6	212.3	274.3	0.0064	5.80
25.0	82.6	0.058	86.9	14.9	72.0	0.385	577.3	592.1	353.8	238.3	0.0047	7.01
35.0	65.8	0.046	96.9	20.8	76.1	0.307	644.0	664.8	495.4	169.4	0.0037	7.82
45.0	55.2	0.039	104.5	26.7	77.8	0.257	694.7	721.4	636.9	84.5	0.0031	8.43
55.0	47.8	0.034	110.7	32.7	78.0	0.223	735.7	768.4	778.5	0.0	0.0027	8.93
65.0	42.4	0.030	115.9	38.6	77.3	0.198	770.4	809.0	920.0	0.0	0.0024	9.35
75.0	38.2	0.027	120.5	44.6	75.9	0.178	800.5	845.1	1061.5	0.0	0.0022	9.72
85.0	34.8	0.024	124.5	50.5	74.0	0.162	827.3	877.8	1203.1	0.0	0.0020	10.04
95.0	32.0	0.022	128.1	56.4	71.7	0.149	851.4	907.8	1344.6	0.0	0.0018	10.33
105.0	29.7	0.021	131.4	62.4	69.0	0.139	873.3	935.7	1486.1	0.0	0.0017	10.60
115.0	27.8	0.019	134.4	68.3	66.1	0.129	893.5	961.8	1627.7	0.0	0.0016	10.84
125.0	26.1	0.018	137.3	74.3	63.0	0.122	912.2	986.5	1769.2	0.0	0.0015	11.07
135.0	24.6	0.017	139.9	80.2	59.7	0.115	929.7	1009.9	1910.8	0.0	0.0014	11.28
145.0	23.3	0.016	142.4	86.1	56.2	0.109	946.1	1032.3	2052.3	0.0	0.0013	11.48
155.0	22.2	0.016	144.7	92.1	52.6	0.103	961.6	1053.7	2193.8	0.0	0.0013	11.67
165.0	21.2	0.015	146.9	98.0	48.9	0.099	976.3	1074.3	2335.4	0.0	0.0012	11.85
175.0	20.2	0.014	149.0	104.0	45.0	0.094	990.2	1094.1	2476.9	0.0	0.0011	12.02
185.0	19.4	0.014	151.0	109.9	41.1	0.090	1003.4	1113.3	2618.4	0.0	0.0011	12.18
195.0	18.6	0.013	152.9	115.8	37.1	0.087	1016.1	1131.9	2760.0	0.0	0.0011	12.33
205.0	17.9	0.013	154.7	121.8	33.0	0.084	1028.3	1150.0	2901.5	0.0	0.0010	12.48
215.0	17.3	0.012	156.5	127.7	28.8	0.081	1039.9	1167.6	3043.1	0.0	0.0010	12.62
225.0	16.7	0.012	158.2	133.7	24.5	0.078	1051.1	1184.8	3184.6	0.0	0.0009	12.76
235.0	16.2	0.011	159.8	139.6	20.2	0.075	1061.9	1201.5	3326.1	0.0	0.0009	12.89
245.0	15.7	0.011	161.4	145.5	15.8	0.073	1072.4	1217.9	3467.7	0.0	0.0009	13.02
255.0	15.2	0.011	162.9	151.5	11.4	0.071	1082.5	1233.9	3609.2	0.0	0.0009	13.14
265.0	14.7	0.010	164.3	157.4	6.9	0.069	1092.2	1249.6	3750.8	0.0	0.0008	13.26
275.0	14.3	0.010	165.8	163.4	2.4	0.067	1101.7	1265.1	3892.3	0.0	0.0008	13.37
285.0	13.9	0.010	167.2	169.3	0.0	0.065	1110.9	1280.2	4033.8	0.0	0.0008	13.48
295.0	13.6	0.010	168.5	175.2	0.0	0.063	1119.8	1295.1	4175.4	0.0	0.0008	13.59
305.0	13.2	0.009	169.8	181.2	0.0	0.062	1128.5	1309.7	4316.9	0.0	0.0007	13.70
315.0	12.9	0.009	171.1	187.1	0.0	0.060	1137.0	1324.1	4458.4	0.0	0.0007	13.80
325.0	12.6	0.009	172.3	193.1	0.0	0.059	1145.2	1338.3	4600.0	0.0	0.0007	13.90

COLE ENGINEERING

Rational Method
Target Flow Calculations- 50 Year Post Development
376 & 390 Derry Road
File No.UD16-0522
Date: August 2017

Controlled Areas

Drainage Areas	A2 Post	
Area (A1) =	**0.39**	ha
"C" =	**0.66**	
AC1=	**0.25**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Controlled Release Rate (R1) = (From Orifice #1)	**10.8**	L/s
Max. Storage Volume Required=	**88.3**	m³
Max. Storage in Chambers =	**111.64**	m³

Controlled Areas

Drainage Areas	A1 Post	
Area (A2) =	**2.14**	ha
"C" =	**0.78**	
AC2=	**1.68**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Controlled Release Rate (R2) =	**263.3**	L/s
Max. Storage Volume Required=	**306.0**	m³
Max. Storage Provided in Super Pipe=	**447.2**	m³

Uncontrolled Site Area

Drainage Areas	A3 Post	
Area (A3) =	**0.048**	ha
"C" =	**0.42**	
AC3=	**0.02**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Max. Release (R3) =	**7.2**	L/s

Fifty Year Design Storm

a=	1300.00
b=	4.70
c=	0.7800
I =	A/(T+b)^c

50-Year Target Release Rate =	**270.51**	**L/s**
Uncontrolled Release Rate =	**7.2**	**L/s**
Available Release Rate =	**263.3**	**L/s**
Flow Conveyed in STM (5-Yr Target) =	**161**	**L/s**
Flow Overland =	**102.3**	**L/s**
Total Site Release Rate =	**270.5**	**L/s**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Time	**Rainfall Intensity**	**Storm Runoff**	**Runoff Volume**	**Allowable Release Volume**	**Storage Volume**	**Storm Runoff**	**Runoff Volume**	**Total Storm Runoff (A1 +A2)**	**Allowable Release Volume**	**Storage Volume**	**Storm Runoff**	**Runoff Volume**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3/s)**	**(m^3)**
		(3)=AC*(2)/360	**(4)=(3)*(1)*60**	**(5)=(R1)/1000*(1)*60**	**(6)=(4)-(5)**	**(7)=AC*(2)/360**	**(8)=(7)*(1)*60**	**(9)=(5)+(8)**	**(10)=(R2)/1000*(1)*60**	**(11)=(9)-(10)**	**(12) = [(2)*AC] / 360**	**(13) = (1)*(12)*60**
15.0	127.1	0.089	80.2	9.7	70.5	0.592	533.2	543.0	237.0	306.0	0.0072	6.47
25.0	92.3	0.065	97.1	16.2	80.9	0.430	645.2	661.4	395.0	266.4	0.0052	7.83
35.0	73.6	0.052	108.4	22.7	85.7	0.343	720.3	743.0	553.0	190.0	0.0042	8.74
45.0	61.8	0.043	117.0	29.2	87.8	0.288	777.3	806.4	711.0	95.5	0.0035	9.43
55.0	53.5	0.038	123.9	35.6	88.3	0.250	823.4	859.1	869.0	0.0	0.0030	9.99
65.0	47.4	0.033	129.8	42.1	87.6	0.221	862.4	904.5	1026.9	0.0	0.0027	10.47
75.0	42.7	0.030	134.9	48.6	86.3	0.199	896.3	944.9	1184.9	0.0	0.0024	10.88
85.0	39.0	0.027	139.4	55.1	84.3	0.182	926.3	981.4	1342.9	0.0	0.0022	11.24
95.0	35.9	0.025	143.5	61.6	81.9	0.167	953.4	1014.9	1500.9	0.0	0.0020	11.57
105.0	33.3	0.023	147.2	68.0	79.1	0.155	978.0	1046.1	1658.9	0.0	0.0019	11.87
115.0	31.1	0.022	150.6	74.5	76.1	0.145	1000.7	1075.2	1816.9	0.0	0.0018	12.15
125.0	29.2	0.020	153.7	81.0	72.7	0.136	1021.7	1102.7	1974.9	0.0	0.0017	12.40
135.0	27.6	0.019	156.7	87.5	69.2	0.129	1041.4	1128.8	2132.9	0.0	0.0016	12.64
145.0	26.1	0.018	159.5	94.0	65.5	0.122	1059.8	1153.7	2290.9	0.0	0.0015	12.86
155.0	24.9	0.017	162.1	100.4	61.6	0.116	1077.1	1177.6	2448.9	0.0	0.0014	13.07
165.0	23.7	0.017	164.6	106.9	57.6	0.110	1093.6	1200.5	2606.9	0.0	0.0013	13.27
175.0	22.7	0.016	166.9	113.4	53.5	0.106	1109.2	1222.6	2764.9	0.0	0.0013	13.46
185.0	21.7	0.015	169.1	119.9	49.3	0.101	1124.1	1244.0	2922.8	0.0	0.0012	13.64
195.0	20.9	0.015	171.3	126.4	44.9	0.097	1138.3	1264.7	3080.8	0.0	0.0012	13.82
205.0	20.1	0.014	173.3	132.8	40.5	0.094	1151.9	1284.8	3238.8	0.0	0.0011	13.98
215.0	19.4	0.014	175.3	139.3	36.0	0.090	1165.0	1304.3	3396.8	0.0	0.0011	14.14
225.0	18.7	0.013	177.2	145.8	31.4	0.087	1177.6	1323.4	3554.8	0.0	0.0011	14.29
235.0	18.1	0.013	179.0	152.3	26.7	0.084	1189.7	1342.0	3712.8	0.0	0.0010	14.44
245.0	17.5	0.012	180.8	158.8	22.0	0.082	1201.4	1360.2	3870.8	0.0	0.0010	14.58
255.0	17.0	0.012	182.5	165.2	17.2	0.079	1212.7	1378.0	4028.8	0.0	0.0010	14.72
265.0	16.5	0.012	184.1	171.7	12.4	0.077	1223.7	1395.4	4186.8	0.0	0.0009	14.85
275.0	16.1	0.011	185.7	178.2	7.5	0.075	1234.3	1412.5	4344.8	0.0	0.0009	14.98
285.0	15.6	0.011	187.3	184.7	2.6	0.073	1244.6	1429.3	4502.8	0.0	0.0009	15.11
295.0	15.2	0.011	188.8	191.2	0.0	0.071	1254.7	1445.8	4660.8	0.0	0.0009	15.23
305.0	14.8	0.010	190.3	197.6	0.0	0.069	1264.4	1462.0	4818.7	0.0	0.0008	15.35
315.0	14.5	0.010	191.7	204.1	0.0	0.067	1273.9	1478.0	4976.7	0.0	0.0008	15.46
325.0	14.1	0.010	193.1	210.6	0.0	0.066	1283.1	1493.7	5134.7	0.0	0.0008	15.57

COLE ENGINEERING

Rational Method
Target Flow Calculations- 100 Year Post Development
376 & 390 Derry Road
File No.UD16-0522
Date: August 2017

Controlled Areas

Drainage Areas	A2 Post	
Area (A1) =	**0.39**	ha
"C" =	**0.66**	
AC1=	**0.25**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Controlled Release Rate (R1) = (From Orifice #1)	**11.8**	L/s
Max. Storage Volume Required=	**98.9**	m³
Max. Storage in Chambers =	**111.64**	m³

Controlled Areas

Drainage Areas	A1 Post	
Area (A2) =	**2.14**	ha
"C" =	**0.78**	
AC2=	**1.68**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Controlled Release Rate (R2) =	**291.4**	L/s
Max. Storage Volume Required=	**338.5**	m³
Max. Storage Provided in Super Pipe=	**447.2**	m³

Uncontrolled Site Area

Drainage Areas	A3 Post	
Area (A3) =	**0.048**	ha
"C" =	**0.42**	
AC3=	**0.02**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Max. Release (R3) =	**8.0**	L/s

100-Year Target Release Rate =	**299.4 L/s**
Uncontrolled Release Rate =	**8.0 L/s**
Available Release Rate=	**291.4 L/s**
Flow Conveyed in STM (5-Yr Target)=	**161 L/s**
Flow Overland =	**130.4 L/s**
Total Site Release Rate =	**299.4 L/s**

100 Year Design Storm

a=	1450.00
b=	4.90
c=	0.7800
i =	$A/(T+b)^c$

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Time	**Rainfall Intensity**	**Storm Runoff**	**Runoff Volume**	**Allowable Release Volume**	**Storage Volume**	**Storm Runoff**	**Runoff Volume**	**Total Storm Runoff (A1 +A2)**	**Allowable Release Volume**	**Storage Volume**	**Storm Runoff**	**Runoff Volume**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3/s)**	**(m^3)**
		(3)=AC*(2)/360	**(4)=(3)*(1)*60**	**(5)=(R1)/1000*(1)*60**	**(6)=(4)-(5)**	**(7)=AC*(2)/360**	**(8)=(7)*(1)*60**	**(9)=(5)+(8)**	**(10)=(R2)/1000*(1)*60**	**(11)=(9)-(10)**	**(12) = [(2)*AC] / 360**	**(13) = (1)*(12)*60**
15.0	140.7	0.099	88.8	10.6	78.2	0.656	590.1	600.7	262.3	338.5	0.0080	7.16
25.0	102.4	0.072	107.7	17.7	90.0	0.477	715.9	733.6	437.1	296.5	0.0058	8.69
35.0	81.8	0.057	120.4	24.8	95.6	0.381	800.3	825.1	611.9	213.1	0.0046	9.71
45.0	68.7	0.048	130.0	31.9	98.2	0.320	864.2	896.1	786.8	109.3	0.0039	10.49
55.0	59.6	0.042	137.8	38.9	98.9	0.278	916.0	955.0	961.6	0.0	0.0034	11.12
65.0	52.8	0.037	144.4	46.0	98.4	0.246	959.8	1005.8	1136.4	0.0	0.0030	11.65
75.0	47.6	0.033	150.1	53.1	97.0	0.222	997.7	1050.8	1311.3	0.0	0.0027	12.11
85.0	43.4	0.030	155.2	60.2	95.0	0.202	1031.4	1091.6	1486.1	0.0	0.0025	12.52
95.0	40.0	0.028	159.8	67.3	92.5	0.186	1061.7	1129.0	1661.0	0.0	0.0023	12.89
105.0	37.1	0.026	163.9	74.3	89.6	0.173	1089.3	1163.7	1835.8	0.0	0.0021	13.22
115.0	34.7	0.024	167.7	81.4	86.3	0.162	1114.7	1196.1	2010.6	0.0	0.0020	13.53
125.0	32.6	0.023	171.3	88.5	82.8	0.152	1138.2	1226.7	2185.5	0.0	0.0018	13.81
135.0	30.7	0.022	174.6	95.6	79.0	0.143	1160.2	1255.8	2360.3	0.0	0.0017	14.08
145.0	29.1	0.020	177.7	102.7	75.0	0.136	1180.8	1283.5	2535.2	0.0	0.0016	14.33
155.0	27.7	0.019	180.6	109.7	70.9	0.129	1200.3	1310.0	2710.0	0.0	0.0016	14.57
165.0	26.4	0.019	183.4	116.8	66.5	0.123	1218.6	1335.5	2884.8	0.0	0.0015	14.79
175.0	25.3	0.018	186.0	123.9	62.1	0.118	1236.1	1360.0	3059.7	0.0	0.0014	15.00
185.0	24.2	0.017	188.5	131.0	57.5	0.113	1252.8	1383.7	3234.5	0.0	0.0014	15.20
195.0	23.3	0.016	190.9	138.1	52.8	0.108	1268.7	1406.7	3409.3	0.0	0.0013	15.40
205.0	22.4	0.016	193.2	145.1	48.0	0.104	1283.9	1429.0	3584.2	0.0	0.0013	15.58
215.0	21.6	0.015	195.4	152.2	43.2	0.101	1298.5	1450.7	3759.0	0.0	0.0012	15.76
225.0	20.9	0.015	197.5	159.3	38.2	0.097	1312.6	1471.9	3933.9	0.0	0.0012	15.93
235.0	20.2	0.014	199.5	166.4	33.2	0.094	1326.1	1492.5	4108.7	0.0	0.0011	16.10
245.0	19.5	0.014	201.5	173.5	28.1	0.091	1339.2	1512.7	4283.5	0.0	0.0011	16.25
255.0	19.0	0.013	203.4	180.5	22.9	0.088	1351.9	1532.4	4458.4	0.0	0.0011	16.41
265.0	18.4	0.013	205.3	187.6	17.6	0.086	1364.1	1551.7	4633.2	0.0	0.0010	16.56
275.0	17.9	0.013	207.0	194.7	12.3	0.083	1376.0	1570.7	4808.1	0.0	0.0010	16.70
285.0	17.4	0.012	208.8	201.8	7.0	0.081	1387.5	1589.3	4982.9	0.0	0.0010	16.84
295.0	17.0	0.012	210.5	208.9	1.6	0.079	1398.7	1607.6	5157.7	0.0	0.0010	16.98
305.0	16.5	0.012	212.1	215.9	0.0	0.077	1409.6	1625.5	5332.6	0.0	0.0009	17.11
315.0	16.1	0.011	213.7	223.0	0.0	0.075	1420.2	1643.2	5507.4	0.0	0.0009	17.24
325.0	15.7	0.011	215.2	230.1	0.0	0.073	1430.5	1660.6	5682.2	0.0	0.0009	17.36

COLE ENGINEERING

Prepared by: S.Rayner, EIT

Orifice Control #1 Calculation

376 & 390 Derry Road
File No.UD16-0522
Date: August 2017

Orifice Equation

$$Q = C \times A \times \sqrt{2 \times g \times h}$$

Storm Event	Drainage Area ID	Orifice Location	Orifice Coefficient	Diameter of Orifice (mm)	Orifice Invert (m)	Headwater Elevation (m)	Total Head (m)	Area of Orifice (m^2)	Release Rate (L/s)
2-Year	A2 Post	Downstream at Control Manhole	0.63	75	196.63	196.98	0.31	0.004	6.9
5-Year	A2 Post	Downstream at Control Manhole	0.63	75	196.63	197.08	0.41	0.004	7.9
10-Year	A2 Post	Downstream at Control Manhole	0.63	75	196.63	197.21	0.54	0.004	9.1
25-Year	A2 Post	Downstream at Control Manhole	0.63	75	196.63	197.31	0.64	0.004	9.9
50-Year	A2 Post	Downstream at Control Manhole	0.63	75	196.63	197.44	0.77	0.004	10.8
100-Year	A2 Post	Downstream at Control Manhole	0.63	75	196.63	197.59	0.92	0.004	11.8

Prepared By: S.Rayner, EIT

Table 7: Orifice Design #2 for 5-year Discharge Rate
Site Flow and Storage Summary

376 & 390 Derry Road
File No.UD16-0522
Date: August 2017

CONTROL ORIFICE DESIGN

$$Q = C \times A \times \sqrt{2 \times g \times h}$$

Orifice Coefficient (C)	=	0.63	(Plate)
Acceleration due to gravity (g)	=	9.81	(m/s/s)
Orifice Invert	=	193.60	(m)
High Water Level	=	196.48	(m)
Orifice diameter	=	210.00	(mm)
Cross section area of orifice (A)	=	0.0346	(sq.m.)
Head (H)	=	2.78	(m)
Actual Discharge (Q)	=	161.0	(L/s)

Target flow = 166.8 l/s (5-year pre-dev Flow) to discharge into storm sewer

Project: **376 & 390 Derry Road West**

StormTech
Detention • Retention • Recharge
Subsurface Stormwater Management℠

Chamber Model -	SC-740	
Units -	**Metric**	Click Here for Imperial
Number of chambers -	49	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	196.70	m
Amount of Stone Above Chambers -	305	mm
Amount of Stone Below Chambers -	500	mm
Area of system -	172	sq.meters

☑ Include Perimeter Stone in Calculations

Min. Area - 153.885 sq.meters

StormTech SC-740 Cumulative Storage Volumes

Height of System *(mm)*	Incremental Single Chamber *(cubic meters)*	Incremental Total Chamber *(cubic meters)*	Incremental Stone *(cubic meters)*	Incremental Ch & St *(cubic meters)*	Cumulative Chamber *(cubic meters)*	Elevation *(meters)*
1575	0.00	0.00	1.75	1.75	146.58	198.27
1549	0.00	0.00	1.75	1.75	144.83	198.25
1524	0.00	0.00	1.75	1.75	143.08	198.22
1499	0.00	0.00	1.75	1.75	141.34	198.20
1473	0.00	0.00	1.75	1.75	139.59	198.17
1448	0.00	0.00	1.75	1.75	137.84	198.15
1422	0.00	0.00	1.75	1.75	136.10	198.12
1397	0.00	0.00	1.75	1.75	134.35	198.10
1372	0.00	0.00	1.75	1.75	132.60	198.07
1346	0.00	0.00	1.75	1.75	130.85	198.05
1321	0.00	0.00	1.75	1.75	129.11	198.02
1295	0.00	0.00	1.75	1.75	127.36	198.00
1270	0.00	0.08	1.72	1.79	125.61	197.97
1245	0.00	0.23	1.66	1.88	123.82	197.94
1219	0.01	0.39	1.59	1.98	121.94	197.92
1194	0.02	0.84	1.41	2.25	119.95	197.89
1168	0.02	1.11	1.30	2.41	117.70	197.87
1143	0.03	1.32	1.22	2.54	115.29	197.84
1118	0.03	1.49	1.15	2.64	112.75	197.82
1092	0.03	1.64	1.09	2.73	110.11	197.79
1067	0.04	1.76	1.04	2.80	107.38	197.77
1041	0.04	1.88	1.00	2.88	104.58	197.74
1016	0.04	2.02	0.94	2.96	101.70	197.72
991	0.04	2.12	0.90	3.02	98.75	197.69
965	0.04	2.20	0.87	3.06	95.73	197.67
940	0.05	2.28	0.84	3.11	92.67	197.64
914	0.05	2.36	0.80	3.16	89.55	197.61
889	0.05	2.43	0.77	3.21	86.39	197.59
864	0.05	2.50	0.75	3.25	83.18	197.56
838	0.05	2.57	0.72	3.29	79.93	197.54
813	0.05	2.63	0.70	3.32	76.64	197.51
787	0.05	2.68	0.67	3.36	73.32	197.49
762	0.06	2.74	0.65	3.39	69.96	197.46
737	0.06	2.79	0.63	3.42	66.57	197.44
711	0.06	2.84	0.61	3.45	63.15	197.41
686	0.06	2.88	0.60	3.47	59.70	197.39
660	0.06	2.92	0.58	3.50	56.23	197.36
635	0.06	2.96	0.56	3.52	52.73	197.34
610	0.06	2.99	0.55	3.54	49.20	197.31
584	0.06	3.02	0.54	3.56	45.66	197.28
559	0.06	3.05	0.53	3.58	42.11	197.26
533	0.06	3.06	0.52	3.58	38.53	197.23
508	0.00	0.00	1.75	1.75	34.94	197.21
483	0.00	0.00	1.75	1.75	33.20	197.18
457	0.00	0.00	1.75	1.75	31.45	197.16
432	0.00	0.00	1.75	1.75	29.70	197.13
406	0.00	0.00	1.75	1.75	27.95	197.11
381	0.00	0.00	1.75	1.75	26.21	197.08
356	0.00	0.00	1.75	1.75	24.46	197.06
330	0.00	0.00	1.75	1.75	22.71	197.03
305	0.00	0.00	1.75	1.75	20.97	197.00
279	0.00	0.00	1.75	1.75	19.22	196.98
254	0.00	0.00	1.75	1.75	17.47	196.95
229	0.00	0.00	1.75	1.75	15.72	196.93
203	0.00	0.00	1.75	1.75	13.98	196.90
178	0.00	0.00	1.75	1.75	12.23	196.88
152	0.00	0.00	1.75	1.75	10.48	196.85
127	0.00	0.00	1.75	1.75	8.74	196.83
102	0.00	0.00	1.75	1.75	6.99	196.80
76	0.00	0.00	1.75	1.75	5.24	196.78
51	0.00	0.00	1.75	1.75	3.49	196.75
25	0.00	0.00	1.75	1.75	1.75	196.73

COLE ENGINEERING

Prepared By: S.Rayner, EIT

Water Quality Calculations

376 & 390 Derry Road
File No.UD16-0522
Date: August 2017

Catchment	Surface	Treatment	Effective TSS	Area (ha)	% Area of Site	Overall TSS Removal
A1 Post	Asphalt/Impervious Area	CDS Unit	50%	0.82	32%	16%
	Landscape	Inherent	100%	0.38	15%	15%
	Rooftop	Inherent	100%	0.94	37%	37%
A2 Post	Landscape	Inherent	100%	0.04	1%	1%
	Asphalt/Impervious Area	Untreated	0%	0.01	1%	0%
A3 Post	Landscape	Inherent	100%	0.15	6%	6%
	Asphalt/Impervious Area	CDS Unit/ StormTech Isolator Row	75%	0.21	8%	6%
	Rooftop	Inherent	100%	0.03	1%	1%
Total	**-**	**-**	**-**	**2.57**	**100.0%**	**82%**

Treatment Train TSS Removal Approach:

$$R = A + B - [(A \times B) / 100] \qquad \text{(Equation 4-1)}$$

Where:

R = Total TSS Removal Rate

A = TSS Removal Rate of the First or Upstream BMP

B = TSS Removal Rate of the Second or Downstream BMP

*As per 'New Jersey Stormwater Best Management Practices Manual' Equation 4-1 (February 2004) - see attached

TSS Removal:

CDS Unit (Rate 1) =	50	%
StormTech Isolator Row (Rate 2) =	50	%

Total Removal :

R_{inf} = Rate 1 + Rate 2 - [(Rate 1 x Rate 2)/100]

R_{inf} = 75.0 %

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

Project Name: 376 &390 Derry Rd.
Location: Milton, ON
OGS #: OGS

Engineer: **Cole Engineering Group Ltd.**
Contact: Samantha Rayner, E.I.T
Report Date: 15-Aug-17

Area	0.39	ha	**Rainfall Station #**	204	
Weighted C	0.66		**Particle Size Distribution**	FINE	
CDS Model	2015-4		**CDS Treatment Capacity**	20	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
1.0	11.0%	20.4%	0.7	0.7	3.6	97.8	10.7
1.5	10.1%	30.5%	1.1	1.1	5.3	97.3	9.8
2.0	9.6%	40.1%	1.4	1.4	7.1	96.8	9.3
2.5	7.9%	48.0%	1.8	1.8	8.9	96.3	7.7
3.0	6.4%	54.4%	2.1	2.1	10.7	95.8	6.1
3.5	4.4%	58.8%	2.5	2.5	12.5	95.3	4.2
4.0	4.2%	63.0%	2.8	2.8	14.3	94.8	4.0
4.5	3.7%	66.7%	3.2	3.2	16.0	94.3	3.5
5.0	3.3%	70.0%	3.5	3.5	17.8	93.8	3.1
6.0	5.6%	75.6%	4.2	4.2	21.4	92.7	5.1
7.0	4.0%	79.6%	4.9	4.9	24.9	91.7	3.7
8.0	3.5%	83.1%	5.7	5.7	28.5	90.7	3.2
9.0	2.2%	85.3%	6.4	6.4	32.1	89.7	2.0
10.0	1.7%	87.0%	7.1	7.1	35.6	88.6	1.5
15.0	6.3%	93.3%	10.6	10.6	53.5	83.5	5.3
20.0	2.3%	95.6%	14.1	14.1	71.3	78.4	1.8
25.0	1.8%	97.3%	17.7	17.7	89.1	73.3	1.3
30.0	0.8%	98.2%	21.2	19.8	100.0	65.7	0.6
35.0	0.9%	99.0%	24.7	19.8	100.0	56.3	0.5
40.0	0.3%	99.3%	28.3	19.8	100.0	49.2	0.1
45.0	0.5%	99.8%	31.8	19.8	100.0	43.8	0.2
50.0	0.2%	100.0%	35.3	19.8	100.0	39.4	0.1
							92.9

Removal Efficiency Adjustment[2] = 6.5%

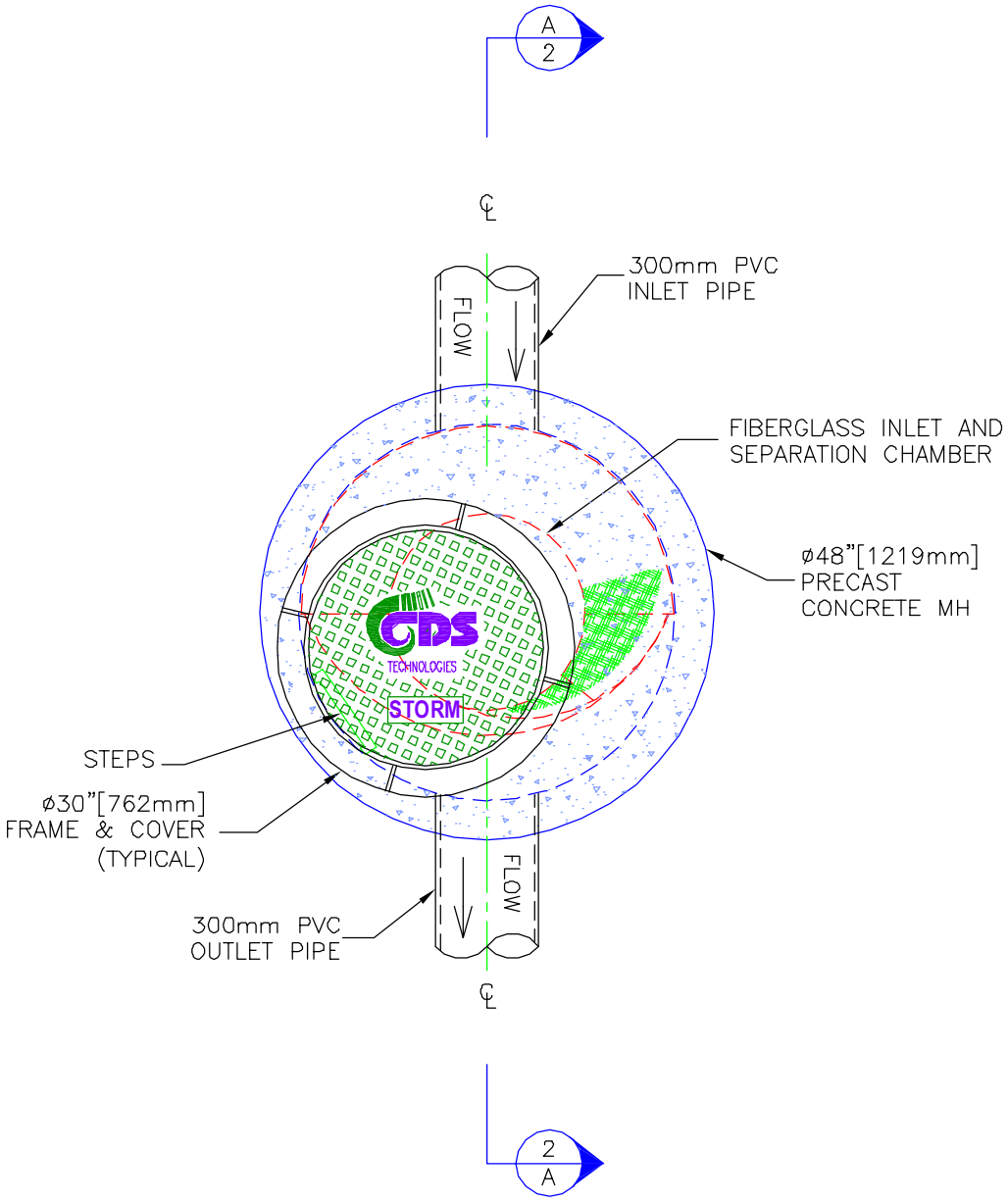
Predicted Net Annual Load Removal Efficiency = 86.4%

Predicted Annual Rainfall Treated = 98.1%

1 - Based on 44 years of hourly rainfall data from Canadian Station 6158733, Toronto ON (Airport)

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

PLAN VIEW

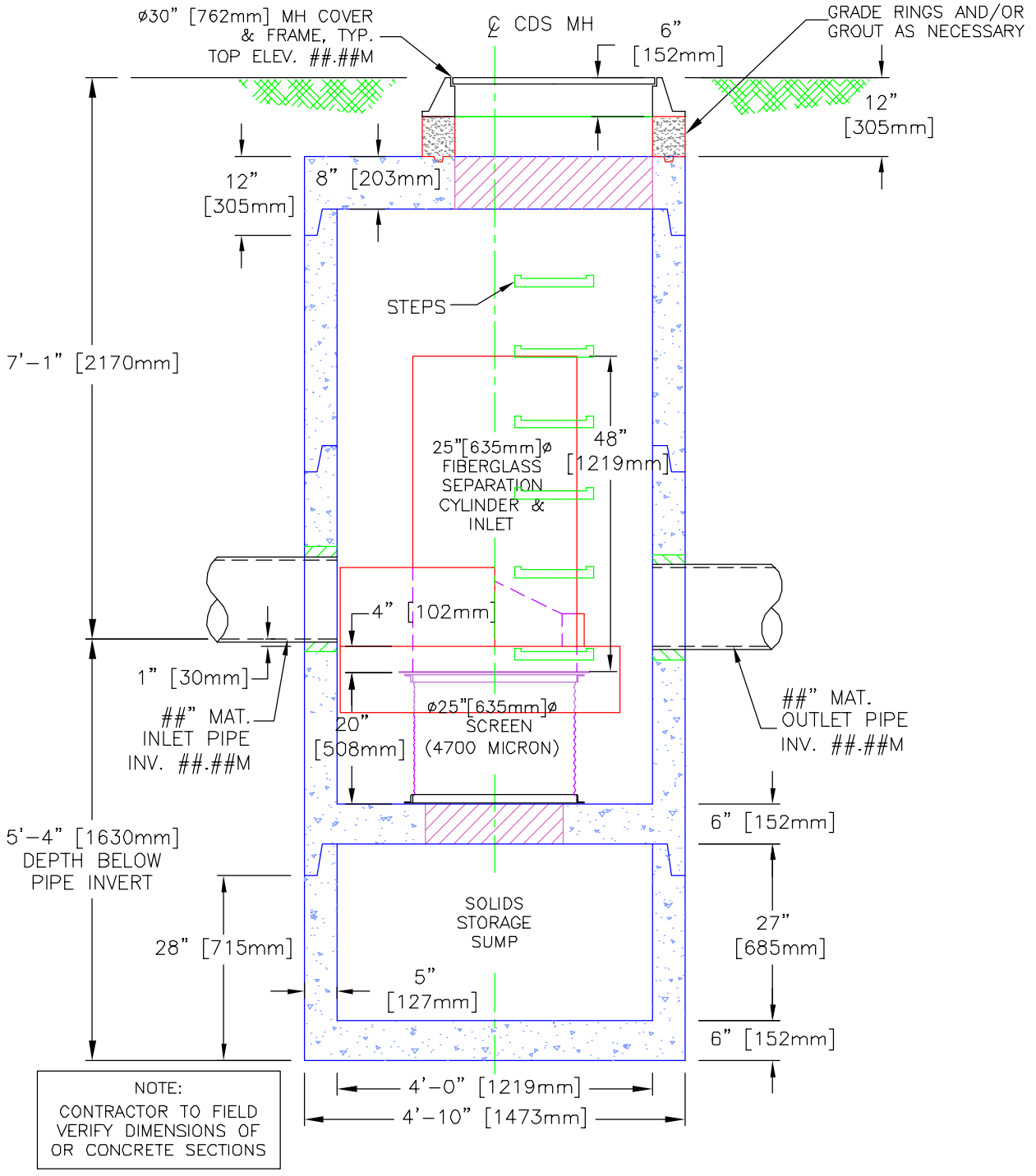


CDS MODEL PMSU20_15_4m
STORMWATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# XX-##-###	SCALE 1" = 2'
		DATE ##/##/##	SHEET 1
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

SECTION A–A
ELEVATION VIEW



NOTE:
CONTRACTOR TO FIELD VERIFY DIMENSIONS OF OR CONCRETE SECTIONS

CDS MODEL PMSU20_15_4m
STORMWATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# XX–##–###	SCALE 1" = 2'
		DATE ##/##/##	SHEET 2
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

Annual TSS Removal Efficiency Using Historical Weather Data

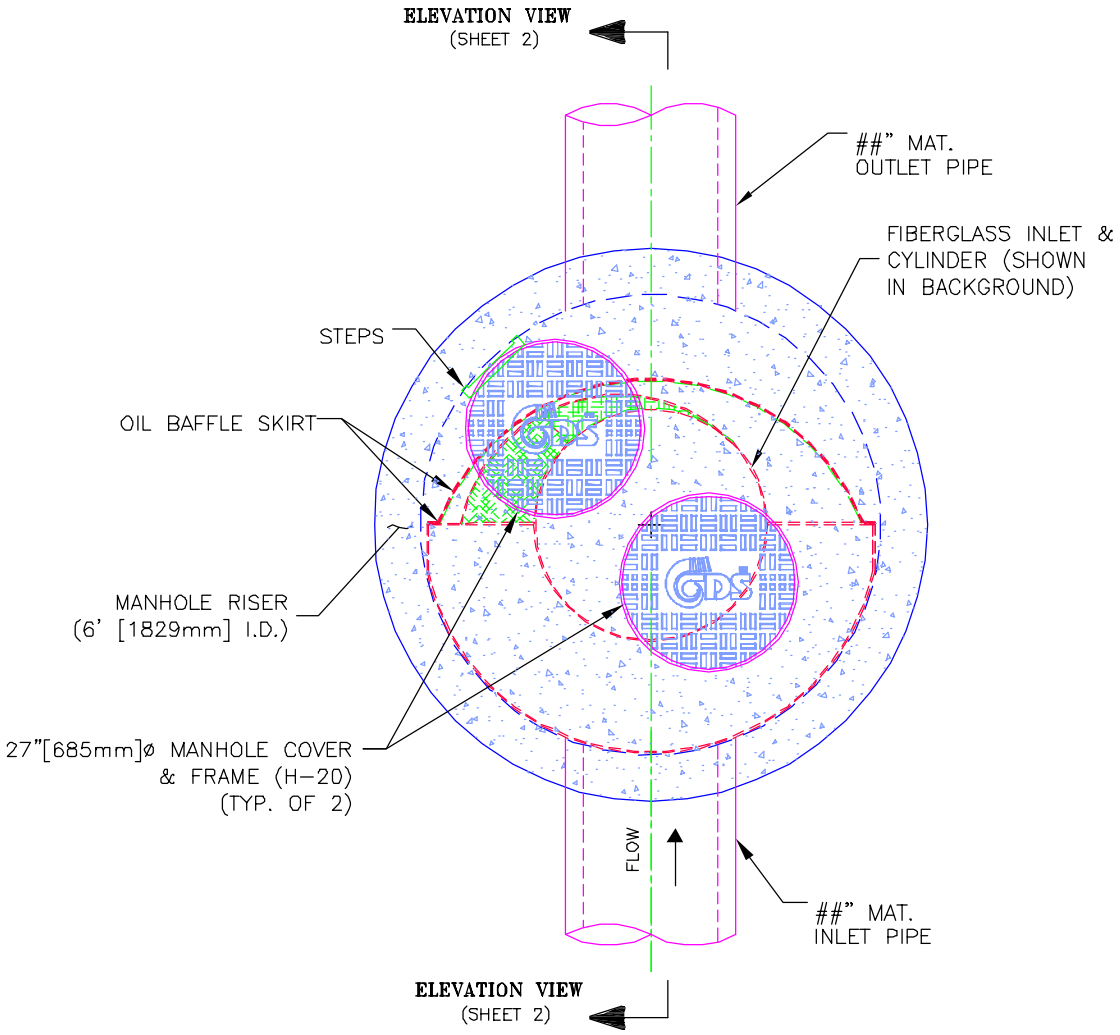
Area (ha) =	2.52		**Engineer:**	**Cole Engineering Group**
C =	0.80		**Contact:**	Samantha Rayner, E.I.T.
Rational Conv.	2.775	converts from m3/s to l/s	**Report Date:**	21-Jun-17
CDS Model:	PMSU3030-6			
Flowrate =	85	l/s	**Site:**	376 / 390 Derry Road
Weather Station:	6158350		**Location:**	Mississauga, ON
PSD:	FINE		**OGS ID:**	OGS

Rainfall Intensity Range (mm/hr)	*Total Rainfall* (mm)*	*Rainfall intensity mm/hr (I)*	*Runoff Rate Per The Rational Method (l/s) Q = C x I x A x 2.77*	*Rainfall Volume %*	*CDS Flow Rate (l/s)*	*Operating Rate*	*Efficiency** (%)*	*Relative Efficiency (%)*
0.0 - 0.5	620.70	0.5	2.8	7.3%	2.8	0.03	97.9	7.1
0.5 - 1.0	791.80	1.0	5.6	9.4%	5.6	0.07	97.0	9.1
1.0 - 1.5	809.20	1.5	8.4	9.6%	8.4	0.10	96.0	9.2
1.5 - 2.0	765.50	2.0	11.2	9.1%	11.2	0.13	95.1	8.7
2.0 - 2.5	546.70	2.5	14.0	6.5%	14.0	0.16	94.1	6.1
2.5 -3.0	512.90	3.0	16.8	6.1%	16.8	0.20	93.2	5.7
3.0 - 4.0	840.50	4.0	22.4	10.0%	22.4	0.26	91.3	9.1
4.0 - 5.0	644.80	5.0	28.0	7.6%	28.0	0.33	89.4	6.8
5.0 - 6.0	505.30	6.0	33.6	6.0%	33.6	0.39	87.5	5.3
6.0 - 7.0	430.30	7.0	39.2	5.1%	39.2	0.46	85.7	4.4
7.0 - 8.0	302.10	8.0	44.8	3.6%	44.8	0.53	83.8	3.0
8.0 - 9.0	167.40	9.0	50.3	2.0%	50.3	0.59	81.9	1.6
9.0 - 10.0	275.00	10.0	55.9	3.3%	55.9	0.66	80.0	2.6
10.0 - 11.0	198.10	11.0	61.5	2.3%	61.5	0.72	78.1	1.8
11.0 - 12.0	160.70	12.0	67.1	1.9%	67.1	0.79	76.2	1.4
12.0 - 13.0	136.50	13.0	72.7	1.6%	72.7	0.86	74.3	1.2
13.0 - 15.0	150.10	15.0	83.9	1.8%	83.9	0.99	70.6	1.3
15.0 - 20.0	366.60	20.0	111.9	4.3%	85.0	1.00	53.3	2.3
20.0 - 25.0	70.80	25.0	139.9	0.8%	85.0	1.00	42.7	0.3
25.0 - 30.0	111.90	30.0	167.8	1.3%	85.0	1.00	35.5	0.5
30.0 -35.0	0.00	35.0	195.8	0.0%	85.0	1.00	30.5	0.0
35.0 - 40.0	38.70	40.0	223.8	0.5%	85.0	1.00	26.7	0.1
	8445.60							

TSS Removal:	**87.7%**
Efficiency Adjustment:	**6.5%**
Net Annual TSS Removal:	**81.2%**
Net Annual Volume Treated:	**96.4%**

1) Historical Data including years 1982 to 1998 from Ontario Climate Centre
2) CDS Efficiency based on testing conducted at the University of Central Florida
3) Adjustment for use of 60 minute time step data on site with a time of concentration less than 30 minutes
4) CDS design flowrate and scaling based on standard manufacturer model & product specifications

PLAN VIEW

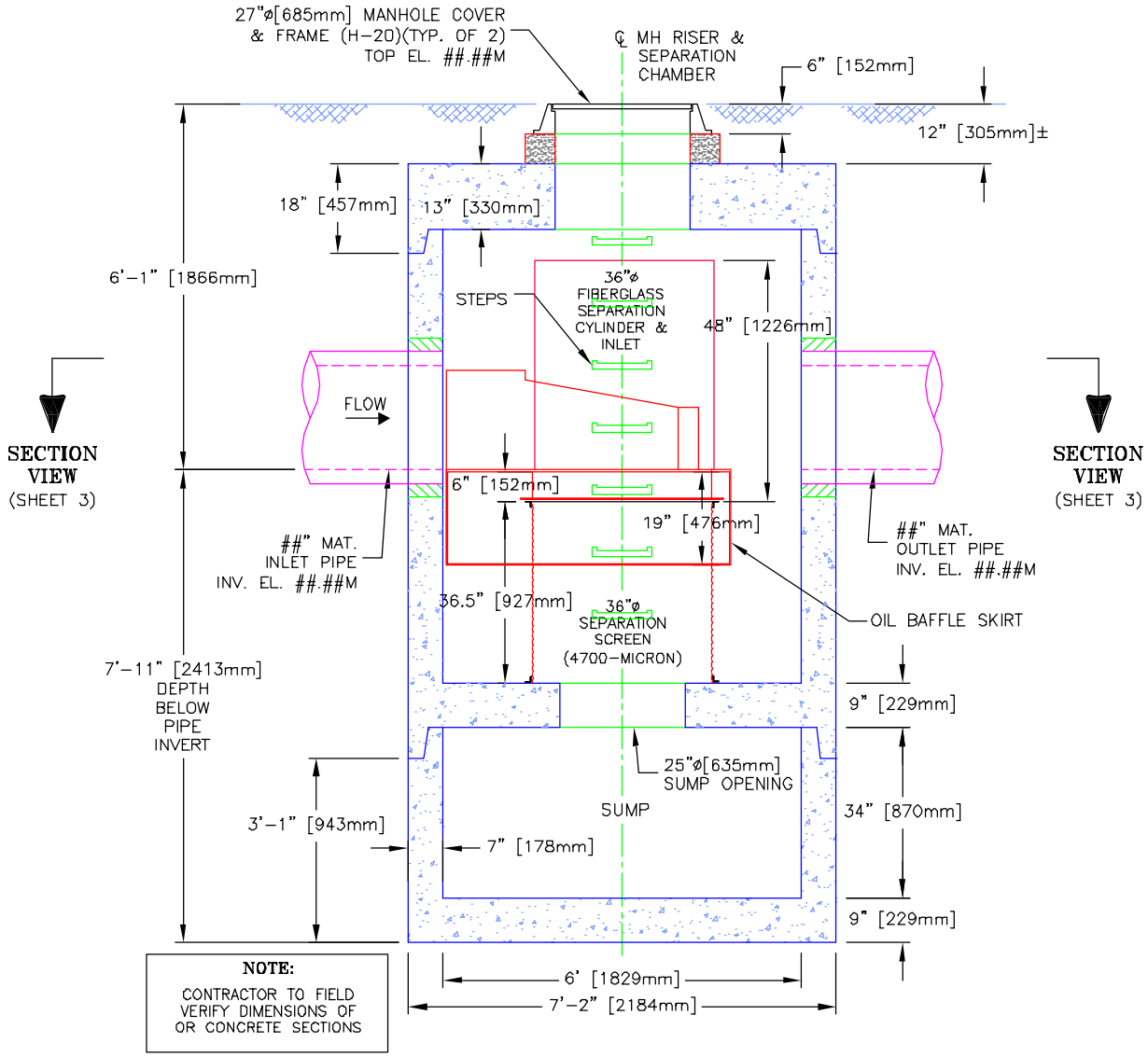


CDS MODEL PMSU30_30m, 3.0 CFS TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# CAN-##-###	SCALE 1" = 2.5'
		DATE ##/##/##	SHEET 1
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

ELEVATION VIEW



CDS MODEL PMSU30_30m, 3.0 CFS TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# CAN-##-###	SCALE 1" = 3'
		DATE ##/##/##	SHEET 2
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

COLE ENGINEERING

Prepared By: S.Rayner, EIT

Water Balance Calculation

376 & 390 Derry Road
File No.: UD16-0522
Date: August 2017

Contributing Drainage Area	25715	m^2
Rainfall depth to be retained	3.0	mm
Total rainfall volume at 5mm	**77.0**	m^3

Initial Abstraction:

Surface	Area (m^2)	IA (mm)	Volume (m^3)
Impervious Roof	9945	1.00	9.9
Paved Surface	10173	1.00	10.2
Landscape	5596	5.00	28.0
Total	**25715**	**-**	**48.1**

Total Retention Volume

Retention via Initial Abstraction =	48.1	m^3
Retention via Infiltration Trench =	34.0	m^3
Total Provided Retention Volume =	**82.1**	**m^3**

COLE ENGINEERING

Prepared by: S.Rayner, EIT

Infiltration Footprint

376 & 390 Derry Road
File No.: UD16-0522
Date: August 2017

Water balance storage in stone below StormTech chambers		Infiltration rate	Maximum depth for 48hr drawdown	Proposed Depth	Minimum bottom area for 48hr drawdown	Minimum footprint	Provided footprint
	(m^3)	(mm/hr)	(m)	(m)	(m^2)	(m^2)	(m^2)
Stored Volume	34.0	12	1.44	0.50	147.57	170.00	172

CVC & TRCA LID SWM Guidelines (p.4-57)
(Used to calculate the maximum depth for infiltration with a 48hr drawdown time)

$$d = \frac{i \times ts}{1000 \times Vr}$$

where;

d = Maximum depth of Soakawy Pit
V = Runoff volume to be infiltrated (m^3)
ts = Drawdown time (s)

CVC & TRCA LID SWM Guidelines (p.4-58)
(Used to calculate the footprint of the Infiltration trenches)

$$A = \frac{WQV}{Dr * Vr}$$

where;

A = Bottom area of infiltration trench (m^2)
Vr = Void Space Ratio
Dr = Stone Reservoir Depth
WQV = Water volume (m^3)

COLE ENGINEERING

Prepared by: S.Rayner, EIT

Roadside Culvert Sizing Calculation

376 & 390 Derry Road
File No.UD16-0522
Date: August 2017

Approximate Existing Swale (Based on FlowMaster Model)

Length Along Property (m)	Depth (m)	Bottom Width (m)	Maximum Flow Capacity (m^3/s)	Velocity (m/s)
240	0.4	0.8	0.52	1.28

Approximate Culvert Sizing

Length of Culvert	Culvert Diameter (mm)
240	0.71

FlowMaster- Existing Roadside Ditch Capacity

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.01000	m/m
Normal Depth	0.40	m
Left Side Slope	0.55	m/m (H:V)
Right Side Slope	0.55	m/m (H:V)
Bottom Width	0.80	m

Results

Discharge	0.52	m^3/s
Flow Area	0.41	m^2
Wetted Perimeter	1.71	m
Hydraulic Radius	0.24	m
Top Width	1.24	m
Critical Depth	0.33	m
Critical Slope	0.01990	m/m
Velocity	1.28	m/s
Velocity Head	0.08	m
Specific Energy	0.48	m
Froude Number	0.71	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.40	m
Critical Depth	0.33	m
Channel Slope	0.01000	m/m

FlowMaster- Existing Roadside Ditch Capacity

GVF Output Data

Critical Slope	0.01990	m/m

APPENDIX C
Sanitary Data Analysis

COLE ENGINEERING

REGION OF PEEL

SANITARY SEWER DESIGN SHEET
PROPOSED CONDITIONS
376 - 390 Derry Road West

PREPARED BY: PS
CHECKED BY: AR
DATE: August 2017
PAGE: 1 of 1

LOCATION	SECTION		PROPOSED					EXISTING		FLOW								SEWER DESIGN						
	FROM MH	TO MH	SECTION AREA (ha.)	COMM POP. @ 50 ppha	RES Towns @ 2.7 ppu	Single Family @ 50 ppha	TOTAL POP. (persons)	SECTION AREA (ha.)	SECTION POP. (persons)	TOTAL ACCUM. PROP. POP. (persons)	TOTAL ACCUM. EX. POP. (persons)	TOTAL ACCUM. POP. (persons)	AVERAGE FLOW @ 302.8 L/c/d (L/s)	HARMON PEAKING FACTOR	PEAK FLOW (L/s)	TOTAL ACCUM. AREA (ha.)	INFILT. @ 0.20 L/s/ha. (L/s)	TOTAL DESIGN FLOW (L/s)	PIPE LENGTH (m)	PIPE DIA. (mm)	SLOPE (%)	FULL FLOW CAPACITY n = 0.013 (L/sec)	FULL FLOW VELOCITY (m/sec)	ACTUAL VELOCITY (m/sec)	PERCENT FULL (%)
Existing			2.57					2.57	5		5	5	0.02	4.44	0.08	2.57	0.51	**0.59**							
Proposed Development			2.57	0.03	124		336			336	0	336	1.18	4.06	4.78	2.57	0.51	**5.30**	10.0	250	2.00	85.42	1.72	0.95	6%

APPENDIX D
Water Data Analysis

COLE ENGINEERING
Experience Enhancing Excellence

DOMESTIC WATER DEMAND

Project:	376-390 Derry Road West	Proj. #	UD16-0522
Date:	Oct-17		
Calc'ed by:	LMV		

Note:
Based on the Region of Peel Standards and the Ontario Building Code, Part 8 "Sewage Systems", OBC Table 8.2.1.3.A and 8.2.1.3.B

	Site Component	Site					
Residential Occupancy Data	Studio / 1 / 1+d bed units						
	People per unit	*1.4*					
	2 bed units / 2+D						
	People per unit	*2.1*					
	3 bed units						
	People per unit	*3.1*					
	4 bed units						
	People per unit	*3.6*					
	Townhouse units	124					
	People per unit	*2.7*					
	Hotel Room						
	Person per room	*1.0*					
Commercial Occupancy Data	Retail GFA (m2)	330.7 sq m					
	person / ha	*50.0*					
	Office (m2)						
	person / 100 m2						
	blank						
	blank						

Unit Quantity by Site Component	Water Demand	Units	Equivalent Population (persons)					
Residential Occupancies								
Apartments, Condominiums, Other Multi-family Dwellings	280	L/person/day	334.8	-	-	-	-	-
Hotels and Motels (excluding bars and restaurants), a) Regular	280	L/room/day	0.0	-	-	-	-	-
Not used	-	-	-	-	-	-	-	-
Other Occupancies								
Commercial or Retail	300	L/person/day	1.7	-	-	-	-	-
Office Building	300	L/9.3m2 of floor area/day	-	-	-	-	-	-
Not used	-	-	-	-	-	-	-	-

Daily Flow Rate (L/d)								
Residential Occupancies								
Apartments, Condominiums, Other Multi-family Dwellings		93,744.00	93,744.00	0	0	0	0	0
Hotels and Motels (excluding bars and restaurants), a) Regular		0	0.00	0	0	0	0	0
Not used		0	0	0	0	0	0	0
Other Occupancies								
Commercial or Retail		496.10	496.10	0	0	0	0	0
Office Building		0	0	0	0	0	0	0
Not used		0	0	0	0	0	0	0
		Total Flow						
Average day (L/d)		**94,240.10**	94,240.10	0.00	0.00	0.00	0.00	0.00
Average day (L/s)		**1.09**	1.09	0.00	0.00	0.00	0.00	0.00
Max. day (L/d)		**188,182.53**	188,182.53	0.00	0.00	0.00	0.00	0.00
Min. hour (L/hr)		**3,298.40**	3,298.40	0.00	0.00	0.00	0.00	0.00
Peak hour (L/hr)		**11,780.01**	11,780.01	0.00	0.00	0.00	0.00	0.00
Peak hour (L/s)		**3.27**	3.27	0.00	0.00	0.00	0.00	0.00

Peaking Factors			
Land Use	Minimum Hour	Peak Hour	Maximum Day
Residential	0.84	3.00	2.00
Commercial / Retail	0.84	3.00	1.40

COLE ENGINEERING
Experience Enhancing Excellence

FIRE FLOW CALCULATION

Project:	376-390 Derry Road West	Project #	UD16-0522
Date:	Aug-17		
Calc'ed by:	LMV		

Fire Resistive Construction:	NO	Site Component:	Townhouse					
The following calculations are for the proposed development and are based on the largest floorplate area. The FUS requires that a minimum water supply source 'F' be provided at 150KPa. The minimum flow 'F' can be calculated as such:	**Total Floor Area**	Largest Floor Area (m2)	771					
		Area Above (m2)	771					
		Area Below (m2)	771					
		Total Floor Area (m2)	2313					
$F = 220C\sqrt{A}$	**Flow (F)**	C (dimensionless)	1.5					
		A (m2)	2313					
		F (L/min)	16000					
F = Required fire flow L/min	**Reduction Factor**	F (L/min)	16000					
C = Coefficient related to construction		f_1 (dimensionless)	0.85					
A = Total area in m^2		F' = F x f_f (L/min)	13600					
		f_1 = occupancy factor; ie, Residential, f_1 = 0.85; for Retail or Commercial, f_1 = 1.00						
'Calculations, formulas and factors are as per Fire Underwriter's Survey (FUS) Water Supply for Public Fire Protection	**Sprinkler and Exposure Increase or Decrease**	f_2 (sprinkler factor)						
		North Side						
		East Side						
		South Side						
		West Side						
		f_3	0%					
		f_3 = Exposure factor not to exceed 75%, determined as per FUS Guide Item 4, page 18)						

F' (L/min)	**13600**						
S = F' * f_2 *(L/min)*	**0**						
E = F' * f_3 *(L/min)*	**0**						

F''=F'-S+E (L/min) rounded to nearest 1,000	**14000**						
F''(L/s)	**233**						
F''(USGPM)	**3700**						

Table 1

Sprinkler Reduction Factor (f_2)		
No Sprkinkler System	Sprinklered	Sprink. + Supervised
0%	30%	50%

Table 2

Construction Type "C" Factor			
Wood Frame	Ordinary Construction	Non-Combustible	Fire Resistive
1.5	1	0.80	0.60

Table 3

Occupancy Factor (f_1)				
Rapid Burning	Free Burning	Combustible	Limited Combustible	Non-Combust.
25%	15%	0%	-15%	-25%

Table 4

Exposure Charge					
0 to 3m	3.1 to 10m	10.1 to 20m	20.1 to 30m	30.1 to 45m	> 45m
25%	20%	15%	10%	5%	0

HYDRANT FLOW TEST FORM

COLE ENGINEERING
Experience Enhancing Excellence

Project No: UD16-0522 Date: May 30, 2017

Site Location: 389 Oaktree Circle Hydrants Opened by: Peel

Mississauga Tested By: Mirko S, Eric H.

1) Required photos:

- [x] Site Id & Date
- [x] Location Overview
- [x] Other
- [x] Condition of Flow Hydrant
- [x] Condition of Residual Hydrant

2) Test Data

Time of Test: 10:00

Location of Test: (Flow) on Oaktree Circle south of site, eastern sidewalk (in front of 339 Oaktree)

(Residual) in corner of Oaktree Circle, northern sidewalk (in front of 389 Oaktree)

Main Size: 200mm

Static Pressure: 50 psi

	Number of Outlets & Orifice Size	Pitot Pressure	Flow (USGPM)	Residual Pressure
1	1 x 2.5"	37	1020	45
2	2 x 2.5"	22	1575	44
3				
4				

3) Calculations

$Q = 29.83\ cd^2\sqrt{p}$

Where c- cofficient of discharge (1 in smooth pipe)
d- pipe diameter (inches)
p- pitot reading (psi)
Q- flow (USGPM)

$Q_1 = (29.83)(0.9)(2.5")^2\sqrt{37}$

$= 1020.65$

$Q_1 \sim 1020$ USGPM

$Q_T = 2(29.83)(0.9)(2.5")^2\sqrt{22}$

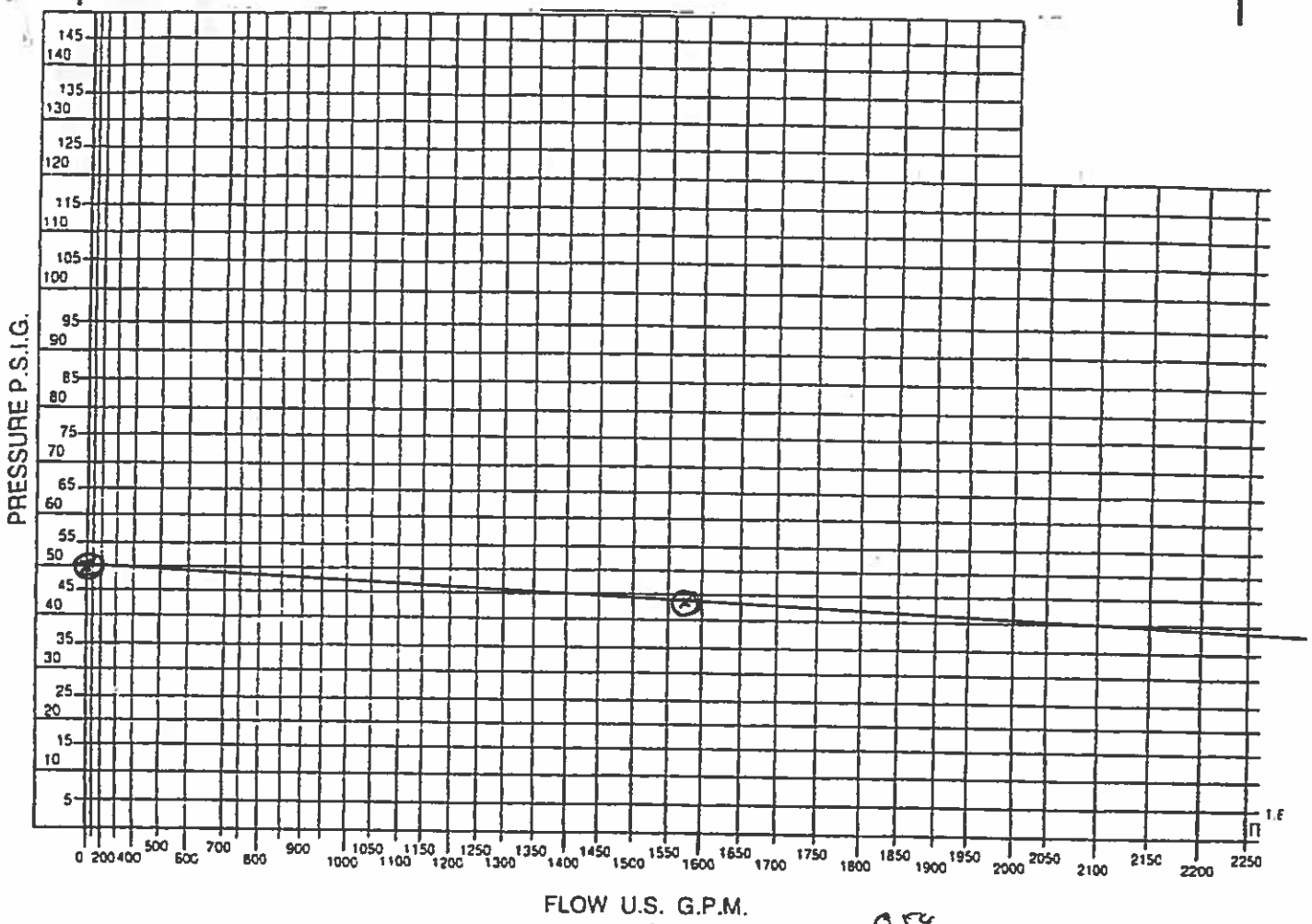
$= 1574.04$

$Q_T \sim 1575$ USGPM

Note: Hydrants tested according to NFPA 291: Recommended Practice for Fire Flow Testing and Marking of Hydrants

U016-0522
May 30, 2017

4) Plot



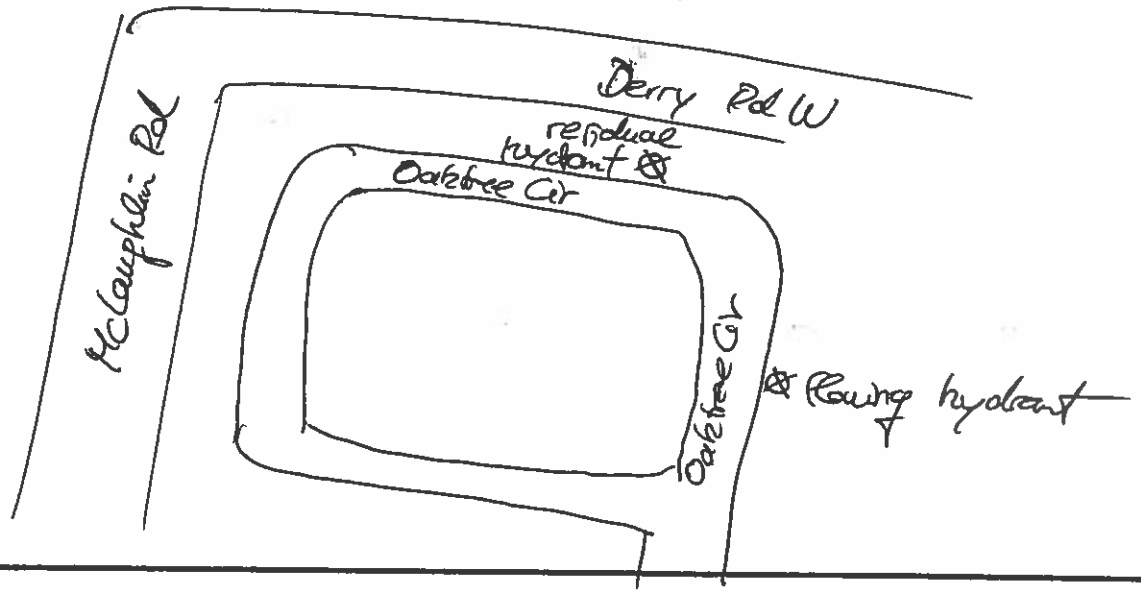
Q_{avail} @ 20psi $= Q_T((P_S - P_A)/(P_S - P_R))^{0.54}$

$= 1574.04((50-20)/(50-44))^{0.54}$

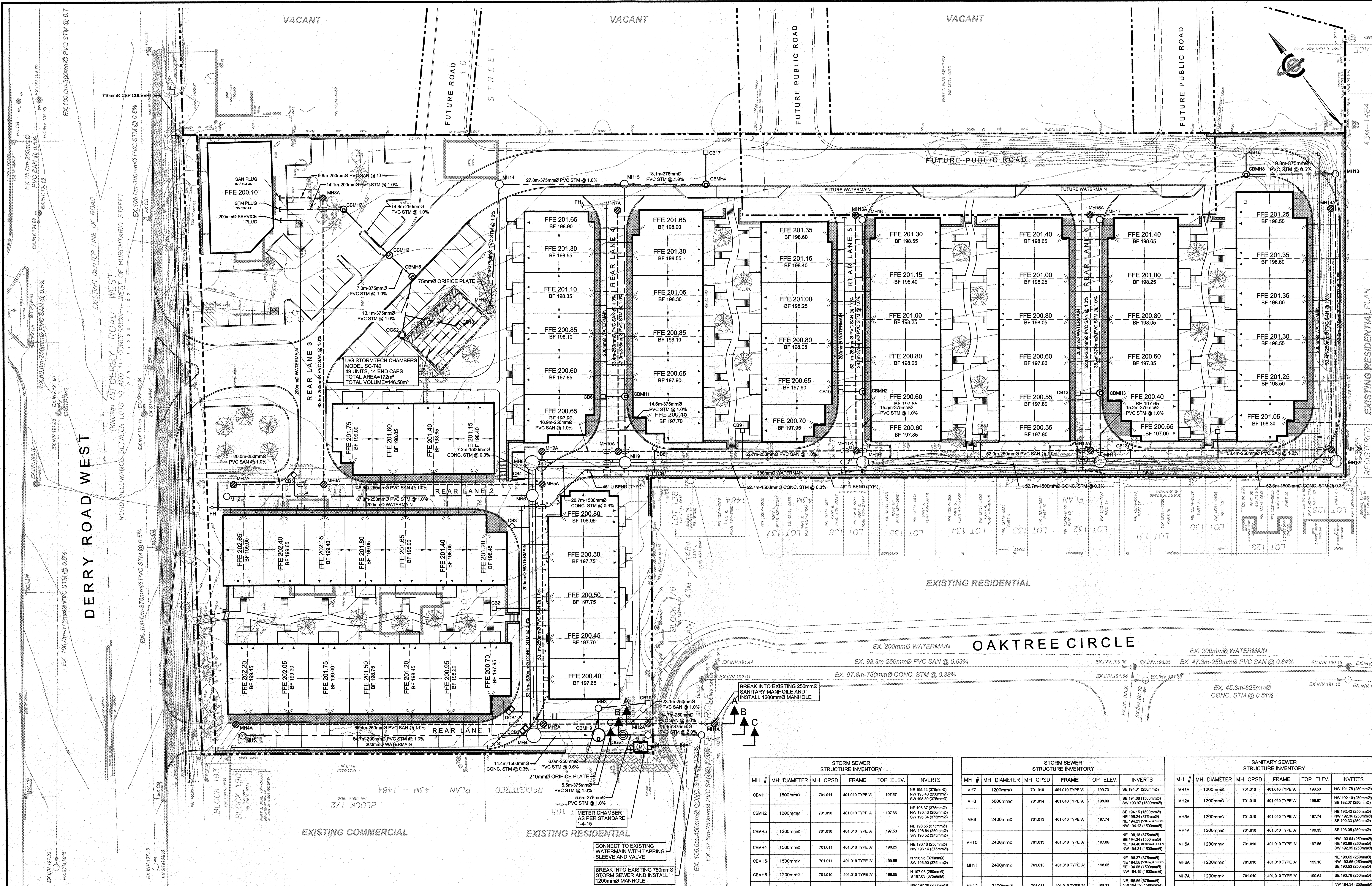
$= 3753.70$

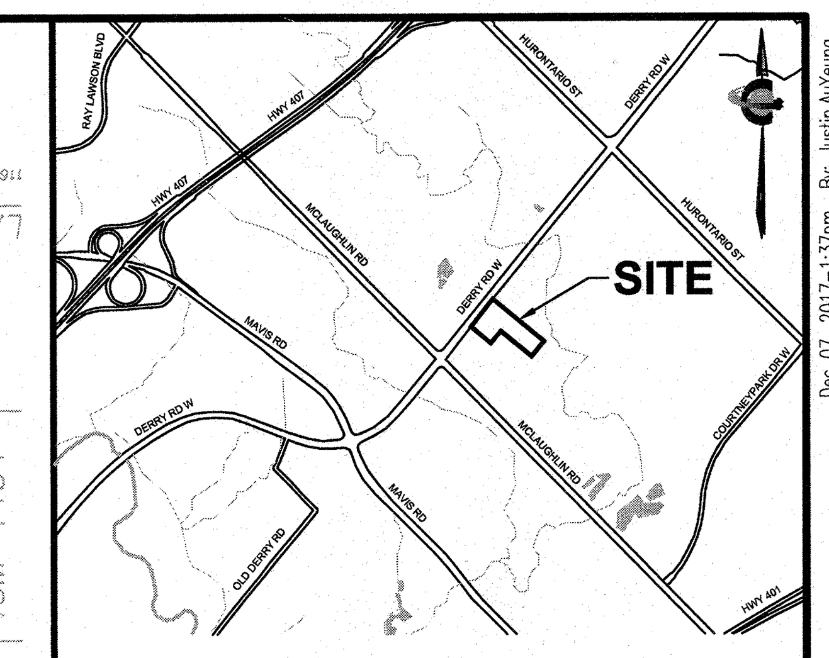
$Q_{avail} \approx 3750$ USGPM

5) Site sketch & Comments



APPENDIX E
Engineering Plans





LOCATION PLAN
N.T.S.

LEGEND

- PROPERTY LINE
- OUTLINE OF BUILDING
- STORM SEWER (750mmØ +)
- STORM SEWER (675mmØ -)
- SANITARY SEWER
- WATERMAIN
- STORM SERVICE
- SANITARY SERVICE
- WATER SERVICE
- LOT LINE
- UNIT LINE
- PROPOSED FIRE HYDRANT
- PROPOSED STORM MAINTENANCE HOLE
- PROPOSED SANITARY MAINTENANCE HOLE
- PROPOSED CATCH BASIN
- PROPOSED CATCH BASIN MAINTENANCE HOLE

PIPE CROSSING INFORMATION

PIPE CROSSING SYMBOL

1. WM INV. 195.76 STM OBV. 193.30	2. WM INV. 195.73 SAN OBV. 192.68	3. STM INV. 193.60 SAN OBV. 192.64	4. WM INV. 195.96 STM OBV. 195.57
5. WM INV. 196.10 SAN OBV. 193.16	6. STM INV. 193.80 SAN OBV. 193.30	7. STM INV. 193.90 SAN OBV. 193.28	8. STM INV. 193.94 WM OBV. 193.44
9. SAN. INV. 193.28 WM OBV. 192.78	10. STM INV. 195.26 SAN OBV. 193.62	11. STM INV. 194.13 WM OBV. 193.63	12. SAN INV. 193.84 WM OBV. 193.34
13. STM INV. 196.20 SAN OBV. 194.17	14. STM INV. 194.32 WM OBV. 193.82	15. SAN INV. 194.40 WM OBV. 193.90	16. STM INV. 196.38 SAN OBV. 194.73
17. STM INV. 194.37 WM OBV. 193.87	18. SAN INV. 194.96 WM OBV. 194.46	19. STM INV. 197.30 SAN OBV. 194.50	20. WM INV. 197.28 SAN OBV. 193.86
21. WM INV. 198.33 STM OBV. 194.40	22. WM INV. 196.58 STM OBV. 197.33		

CATCHBASIN STRUCTURE INVENTORY

CB #	CB OPSD	FRAME	TOP ELEV.	INVERTS
CB2	705.010	400.010	199.02	193.88 (300mmØ)
CB3	705.010	400.010	197.84	193.58 (250mmØ)
CB4	705.010	400.010	198.11	195.05 (250mmØ)
CB5	705.010	400.010	199.40	194.52 (250mmØ)
CB6	705.010	400.010	197.57	195.53 (250mmØ)
CB7	705.010	400.010	197.65	195.70 (250mmØ)
CB8	705.010	400.010	197.79	193.70 (250mmØ)
CB9	705.010	400.010	198.97	194.82 (250mmØ)
CB10	705.010	400.010	197.66	196.48 (250mmØ)
CB11	705.010	400.010	199.41	195.95 (250mmØ)

CATCHBASIN STRUCTURE INVENTORY

CB #	CB OPSD	FRAME	TOP ELEV.	INVERTS
CB12	705.010	400.010	197.51	196.66 (250mmØ)
CB13	705.010	400.010	197.62	196.06 (250mmØ)
CB14	705.010	400.010	197.69	196.06 (250mmØ)
CB15	705.010	400.010	199.08	196.13 (250mmØ)
CB16	705.010	400.010	198.27	197.22 (250mmØ)
CB17	705.010	400.010	198.25	196.20 (250mmØ)
CB18	705.010	400.010	199.80	196.88 (250mmØ)
CB19	705.010	400.010	195.40	195.00 (250mmØ)
DCB1	705.010	400.010	197.58	193.82 (300mmØ)
DCB2	705.010	400.010	197.57	193.27 (300mmØ)

STORM SEWER STRUCTURE INVENTORY

MH #	MH DIAMETER	MH OPSD	FRAME	TOP ELEV.	INVERTS
CBMH1	1500mmØ	701.011	401.010 TYPE 'A'	197.57	NE 195.42 (375mmØ) NW 195.48 (250mmØ) SW 195.39 (375mmØ)
CBMH2	1200mmØ	701.010	401.010 TYPE 'A'	197.66	NE 196.37 (375mmØ) NW 196.43 (250mmØ) SW 196.34 (375mmØ)
CBMH3	1200mmØ	701.010	401.010 TYPE 'A'	197.53	NE 196.55 (375mmØ) NW 196.64 (250mmØ) SW 196.52 (375mmØ)
CBMH4	1500mmØ	701.011	401.010 TYPE 'A'	198.25	NE 196.16 (250mmØ) NW 196.16 (375mmØ)
CBMH5	1500mmØ	701.011	401.010 TYPE 'A'	199.55	N 196.96 (375mmØ) SW 196.90 (375mmØ)
CBMH6	1200mmØ	701.010	401.010 TYPE 'A'	199.55	N 197.06 (250mmØ) S 197.03 (375mmØ)
CBMH7	1200mmØ	701.010	401.010 TYPE 'A'	199.65	NW 197.26 (200mmØ) S 197.21 (250mmØ)
CBMH8	1500mmØ	701.011	401.010 TYPE 'A'	198.27	NE 197.17 (250mmØ) SE 197.06 (375mmØ)
CBMH9	2400mmØ	701.013	401.010 TYPE 'A'	196.58	NW 193.62 (1500mmØ) NE 194.80 (250mmØ) NE 193.68 (200mmØ DROP) SE 193.59 (375mmØ)
MH1	1200mmØ	701.010	401.010 TYPE 'A'	196.54	NW 192.36 (375mmØ)
MH2	1200mmØ	701.010	401.010 TYPE 'A'	196.75	NW 193.45 (375mmØ) NW 192.63 (300mmØ DROP) SE 192.60 (375mmØ)
MH3	1200mmØ	701.010	401.010 TYPE 'A'	196.44	SE 194.89 (250mmØ) SW 194.83 (250mmØ)
MH4	3000mmØ	701.014	401.010 TYPE 'A'	197.66	NW 194.86 (300mmØ) NE 193.75 (1500mmØ) NW 193.69 (250mmØ DROP) SE 193.66 (1500mmØ)
MH5	1200mmØ	701.010	401.010 TYPE 'A'	199.38	SE 195.51 (300mmØ)
MH6	2400mmØ	701.013	401.010 TYPE 'A'	197.89	NW 193.63 (250mmØ) NE 193.94 (1500mmØ) SW 193.91 (1500mmØ)

STORM SEWER STRUCTURE INVENTORY

MH #	MH DIAMETER	MH OPSD	FRAME	TOP ELEV.	INVERTS
MH7	1200mmØ	701.010	401.010 TYPE 'A'	199.73	SE 194.31 (250mmØ)
MH8	3000mmØ	701.014	401.010 TYPE 'A'	198.03	SE 194.06 (1500mmØ) SW 193.97 (1500mmØ)
MH9	2400mmØ	701.013	401.010 TYPE 'A'	197.74	SE 194.15 (1500mmØ) NE 195.24 (375mmØ) NE 194.21 (300mmØ DROP) NW 194.12 (1500mmØ)
MH10	2400mmØ	701.013	401.010 TYPE 'A'	197.86	NE 196.18 (375mmØ) SE 194.34 (1500mmØ) NE 194.40 (300mmØ DROP) NW 194.31 (1500mmØ)
MH11	2400mmØ	701.013	401.010 TYPE 'A'	198.05	NE 196.37 (375mmØ) NE 194.58 (300mmØ DROP) SE 194.68 (1500mmØ) NW 194.49 (1500mmØ)
MH12	2400mmØ	701.013	401.010 TYPE 'A'	198.33	NE 196.56 (375mmØ) NW 194.52 (1500mmØ) NE 194.61 (300mmØ DROP)
MH13	1500mmØ	701.011	401.010 TYPE 'A'	199.04	NE 196.63 (375mmØ) W 196.69 (375mmØ)
MH14	1500mmØ	701.011	401.010 TYPE 'A'	199.10	SW 196.35 (375mmØ) SE 196.26 (375mmØ)
MH15	1500mmØ	701.011	401.010 TYPE 'A'	198.54	NW 195.98 (375mmØ) SE 195.98 (375mmØ) SW 195.89 (375mmØ)
MH16	1200mmØ	701.010	401.010 TYPE 'A'	198.39	SW 196.75 (375mmØ)
MH17	1200mmØ	701.010	401.010 TYPE 'A'	198.38	SW 196.94 (375mmØ)
MH18	1200mmØ	701.010	401.010 TYPE 'A'	198.53	NW 196.96 (375mmØ) SW 196.87 (375mmØ)
OGS1	1800mmØ	701.012	401.010 TYPE 'A'	196.62	NW 193.54 (375mmØ) SE 193.51 (375mmØ)
OGS2	1500mmØ	701.011	401.010 TYPE 'A'	199.73	NE 196.77 (375mmØ) S 196.71 (375mmØ)

SANITARY SEWER STRUCTURE INVENTORY

MH #	MH DIAMETER	MH OPSD	FRAME	TOP ELEV.	INVERTS
MH1A	1200mmØ	701.010	401.010 TYPE 'A'	196.53	NW 191.78 (250mmØ)
MH2A	1200mmØ	701.010	401.010 TYPE 'A'	196.67	NW 192.10 (250mmØ) SE 192.07 (250mmØ)
MH3A	1200mmØ	701.010	401.010 TYPE 'A'	197.74	NE 192.42 (250mmØ) NW 192.36 (250mmØ) SE 192.33 (250mmØ)
MH4A	1200mmØ	701.010	401.010 TYPE 'A'	199.35	SE 193.05 (250mmØ)
MH5A	1200mmØ	701.010	401.010 TYPE 'A'	197.86	NW 193.04 (250mmØ) NE 192.98 (250mmØ) SW 192.95 (250mmØ)
MH6A	1200mmØ	701.010	401.010 TYPE 'A'	199.10	NE 193.62 (250mmØ) NW 193.56 (250mmØ) SE 193.53 (250mmØ)
MH7A	1200mmØ	701.010	401.010 TYPE 'A'	199.64	SE 193.76 (250mmØ)
MH8A	1200mmØ	701.010	401.010 TYPE 'A'	199.74	NW 194.34 (250mmØ) SW 194.25 (250mmØ)
MH9A	1200mmØ	701.010	401.010 TYPE 'A'	198.01	SE 193.15 (250mmØ) SW 193.06 (250mmØ)
MH10A	1200mmØ	701.010	401.010 TYPE 'A'	197.70	NE 193.40 (250mmØ) SE 193.34 (250mmØ) NW 193.32 (250mmØ)
MH11A	1200mmØ	701.010	401.010 TYPE 'A'	197.83	SE 193.90 (250mmØ) NE 193.96 (250mmØ) NW 193.87 (250mmØ)
MH12A	1200mmØ	701.010	401.010 TYPE 'A'	197.65	SE 194.45 (250mmØ) NE 194.51 (250mmØ) NW 194.42 (250mmØ)
MH13A	1200mmØ	701.010	401.010 TYPE 'A'	198.15	NE 195.08 (250mmØ) NW 194.99 (250mmØ)
MH14A	1200mmØ	701.010	401.010 TYPE 'A'	198.45	SW 195.62 (250mmØ)
MH15A	1200mmØ	701.010	401.010 TYPE 'A'	198.45	SW 195.03 (250mmØ)
MH16A	1200mmØ	701.010	401.010 TYPE 'A'	198.44	SW 194.48 (250mmØ)
MH17A	1200mmØ	701.010	401.010 TYPE 'A'	198.61	SW 193.94 (250mmØ)

LIST OF DRAWINGS

SG-01 - SITE GRADING PLAN
SS-01 - SITE SERVICING PLAN
EC-01 - EROSION AND SEDIMENT CONTROL PLAN - STAGE 1
DD-01 - DETAIL DRAWING

SITE PLAN INFORMATION

AJ TREGEBOV ARCHITECT
40 ST. CLAIR AVENUE EAST, SUITE 303
TORONTO, ONTARIO, M4T 1M9
PHONE: (647) 352-3350
E-MAIL: XXX@XXX

SURVEYOR INFORMATION

KRCMAR
1137 CENTRE STREET, SUITE 304
THORNHILL, ONTARIO, L4J 3M6
PHONE: (905) 738-0058
FAX: (905) 738-9221
E-MAIL: XXX@XXX

BENCHMARK INFORMATION:
ELEVATIONS ARE GEODETIC AND REFER TO THE CITY OF MISSISSAUGA VERTICAL BENCHMARK NO. 1050 HAVING AN ELEVATION OF 194.056m.

NO.	REVISION	DATE	BY
1	ISSUED FOR FIRST SUBMISSION	DEC 7, 2017	JAY

LICENSED PROFESSIONAL ENGINEER
S. K. LEE
100212879
Dec 07, 2017
PROVINCE OF ONTARIO

CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL

376 & 390 DERRY ROAD WEST
PART OF LOT 10, CONCESSION 1

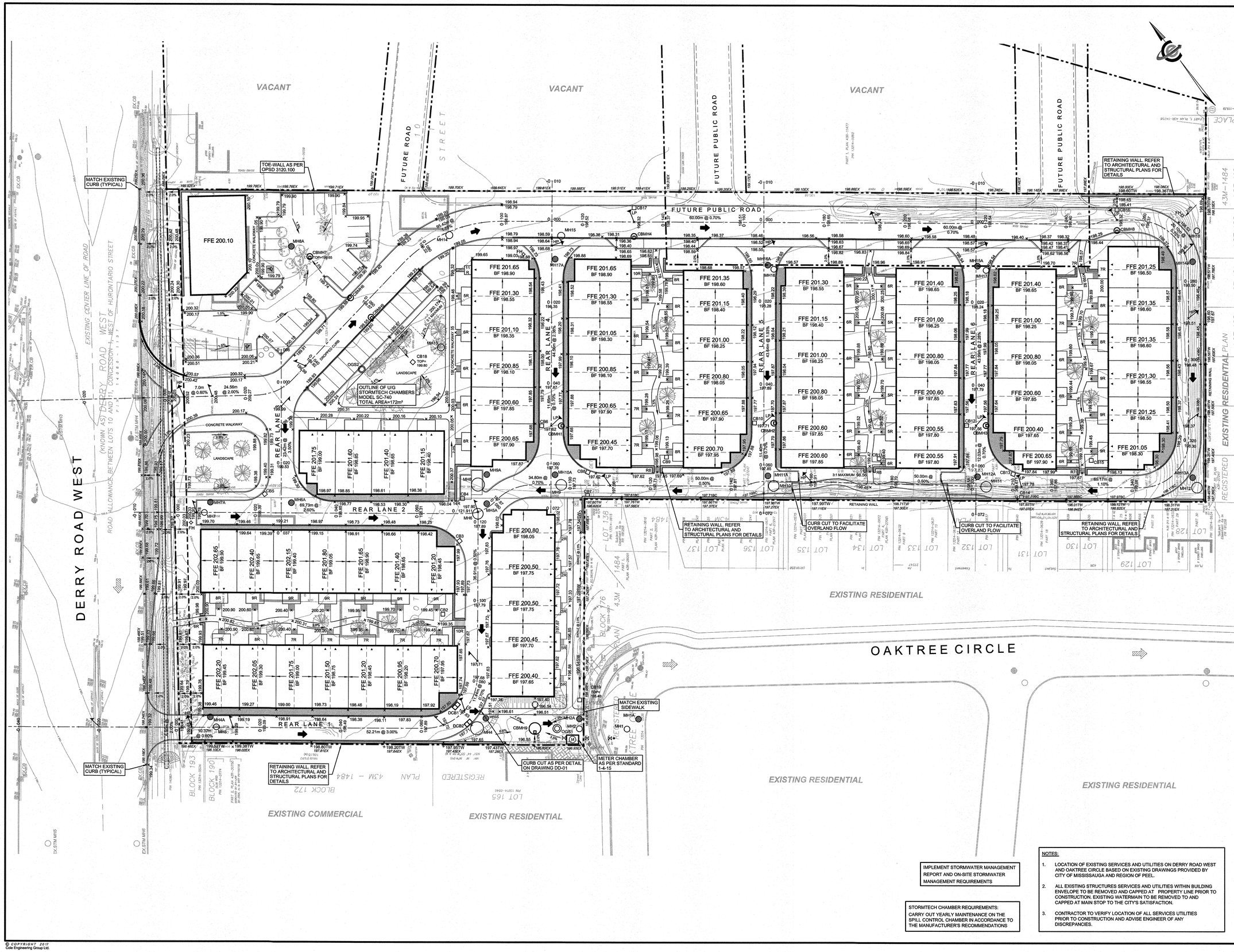
SITE SERVICING PLAN

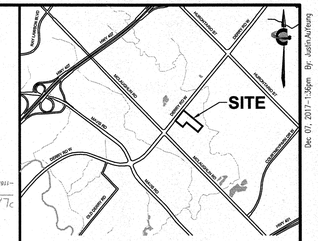
COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

DESIGNED BY: LMV	DATE: MAY 2017	CHECKED BY: JL
DRAWN BY: JAY	PROJECT No. UD16-0522	DRAWING No. SS-01
SCALE: 1:400		

5.0 0 5.0m 10.0m 15.0m 20.0m 25.0m

S:\2016 Projects\UD\CI\UD16-0522 TimeDev_390&376DerryRd-SPA_MS\400-CADD\402-Design\Sheets\UD16-0522 SS-01.dwg (SS-01)





Dec. 07, 2017 - 1:36pm By: Justin.Aufrecht

LEGEND

PROPERTY LINE	
PROPOSED GRADE	×149.50
EXISTING GRADE	×149.33EX
PROPOSED STORM MANHOLE	○
PROPOSED CATCH BASIN	□
PROPOSED OIL-GRIT SEPARATOR	◎
PROPOSED GRADE (TOP OF WALL)	×149.89TW
PROPOSED GRADE (BOTTOM OF SWALE)	×147.58SW
PROPOSED DOUBLE CATCH BASIN	□□
PROPOSED SANITARY MANHOLE	●
PROPOSED FIRE HYDRANT	◇ FH
PROPOSED SIAMESE CONNECTION	○→
PROPOSED GRADE (TOP OF CURB)	×149.65TC
PROPOSED GRADE (BOTTOM OF CURB)	×149.50BC
EXISTING STORM MANHOLE	◌
EXISTING SANITARY MANHOLE	●
EXISTING CATCH BASIN	□
EMERGENCY OVERLAND FLOW ROUTE	←
EXISTING OVERLAND FLOW ROUTE	▨
PROPOSED RETAINING WALL	▬

LIST OF DRAWINGS

SG-01 - SITE GRADING PLAN
SS-01 - SITE SERVICING PLAN
EC-01 - EROSION AND SEDIMENT CONTROL PLAN - STAGE 1
DD-01 - DETAIL DRAWING

SITE PLAN INFORMATION

AJ TREGEBOV ARCHITECT
40 ST. CLAIR AVENUE EAST, SUITE 303
TORONTO, ONTARIO, M4T 1M9
PHONE: (647) 352-3350
E-MAIL: XXX@XXX

SURVEYOR INFORMATION

KRCMAR
1137 CENTRE STREET, SUITE 304
THORNHILL, ONTARIO, L4J 3M6
PHONE: (905) 738-0058
FAX: (905) 738-9221
E-MAIL: XXX@XXX

BENCHMARK INFORMATION:
ELEVATIONS ARE GEODETIC AND REFER TO THE CITY OF MISSISSAUGA VERTICAL BENCHMARK NO. 1050 HAVING AN ELEVATION OF 194.050m.

NO.	REVISION	DATE	BY
1	ISSUED FOR FIRST SUBMISSION	DEC 7, 2017	JAY

S. K. LEE
100212879
Dec 07, 2017
LICENSED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO

CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL

376 & 390 DERRY ROAD WEST
PART OF LOT 10, CONCESSION 1

SITE GRADING PLAN

COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T 416.987.8181 / 905.940.8181 F 905.940.2064

DESIGNED BY: LMV	DATE: MAY 2017	CHECKED BY: JL
DRAWN BY: JAY	PROJECT No. UD16-0522	DRAWING No. SG-01
SCALE: 1:400		

5.0 0 5.0m 10.0m 15.0m 20.0m 25.0m

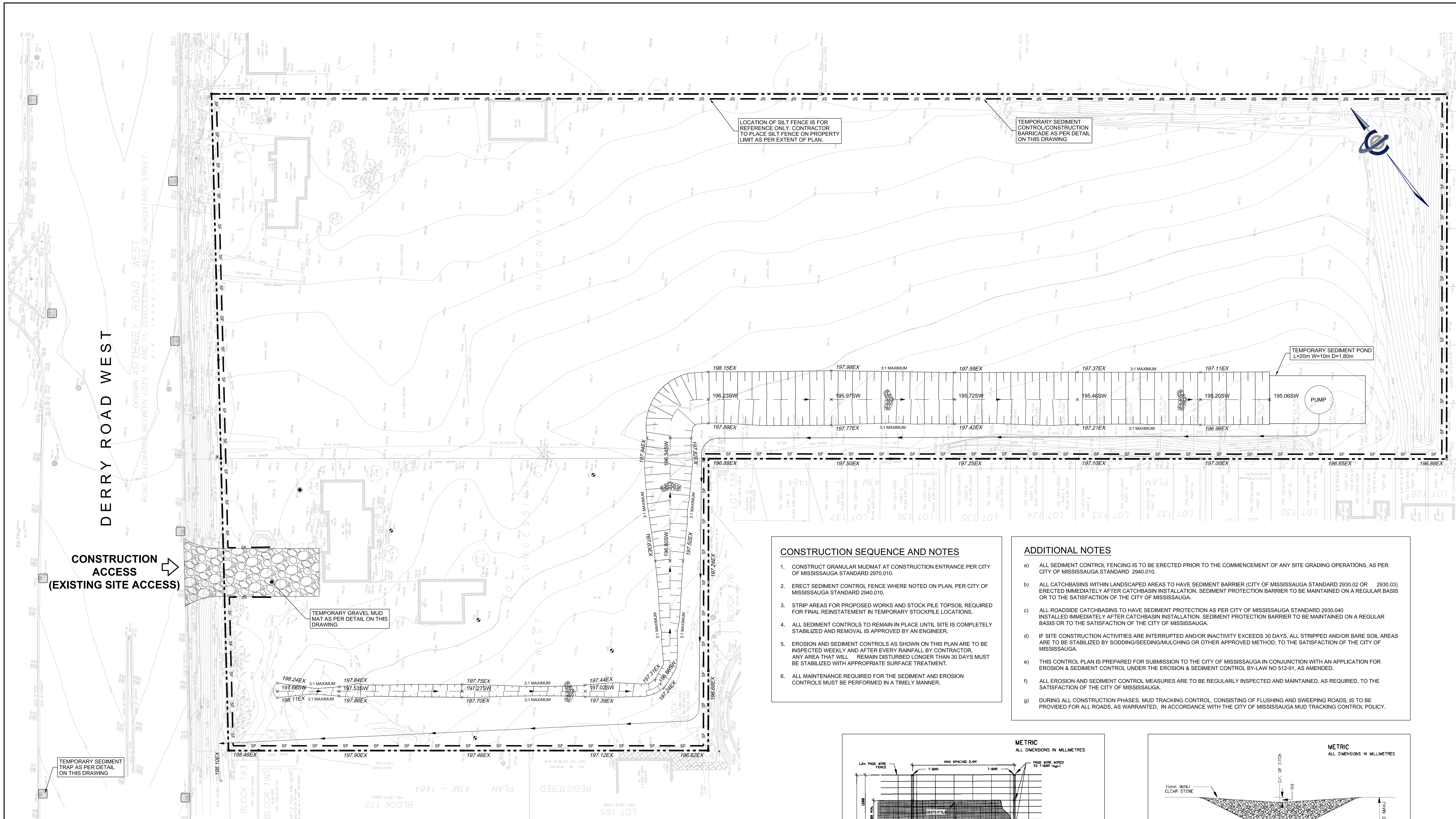
IMPLEMENT STORMWATER MANAGEMENT REPORT AND ON-SITE STORMWATER MANAGEMENT REQUIREMENTS

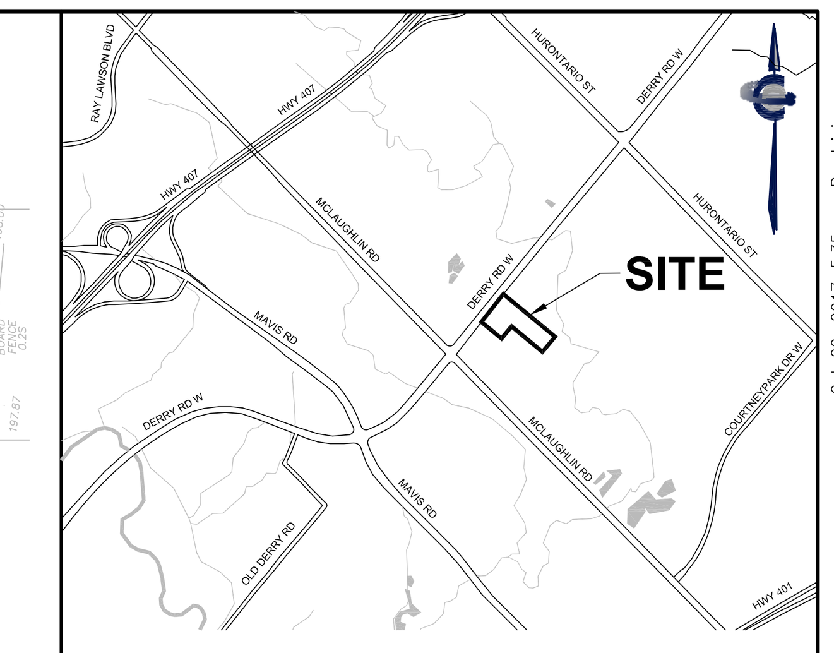
STORMTECH CHAMBER REQUIREMENTS:
CARRY OUT YEARLY MAINTENANCE ON THE SPILL CONTROL CHAMBER IN ACCORDANCE TO THE MANUFACTURER'S RECOMMENDATIONS

NOTES:

1. LOCATION OF EXISTING SERVICES AND UTILITIES ON DERRY ROAD WEST AND OAKTREE CIRCLE BASED ON EXISTING DRAWINGS PROVIDED BY CITY OF MISSISSAUGA AND REGION OF PEEL.
2. ALL EXISTING STRUCTURES SERVICES AND UTILITIES WITHIN BUILDING ENVELOPE TO BE REMOVED AND CAPPED AT PROPERTY LINE PRIOR TO CONSTRUCTION. EXISTING WATERMAIN TO BE REMOVED TO AND CAPPED AT MAIN STOP TO THE CITY'S SATISFACTION.
3. CONTRACTOR TO VERIFY LOCATION OF ALL SERVICES UTILITIES PRIOR TO CONSTRUCTION AND ADVISE ENGINEER OF ANY DISCREPANCIES.

S:\2016 Projects\UD\UD16-0522 TimeDev_390&376DerryRd-SPA_MO\400-CAD\402-Design\Sheets\UD16-0522 SG-01.dwg [SG-01]





LOCATION PLAN
N.T.S.

LEGEND

PROPERTY LINE	
TEMPORARY SEDIMENT CONTROL FENCE	SF
TEMPORARY CONSTRUCTION ACCESS	
TEMPORARY SEDIMENT TRAP	
TEMPORARY GRAVEL MUD MAT	
TEMPORARY ROCK CHECK DAM	

CONSTRUCTION SEQUENCE AND NOTES

1. CONSTRUCT GRANULAR MUDMAT AT CONSTRUCTION ENTRANCE PER CITY OF MISSISSAUGA STANDARD 2970.010.
2. ERECT SEDIMENT CONTROL FENCE WHERE NOTED ON PLAN, PER CITY OF MISSISSAUGA STANDARD 2940.010.
3. STRIP AREAS FOR PROPOSED WORKS AND STOCK PILE TOPSOIL REQUIRED FOR FINAL REINSTATEMENT IN TEMPORARY STOCKPILE LOCATIONS.
4. ALL SEDIMENT CONTROLS TO REMAIN IN PLACE UNTIL SITE IS COMPLETELY STABILIZED AND REMOVAL IS APPROVED BY AN ENGINEER.
5. EROSION AND SEDIMENT CONTROLS AS SHOWN ON THIS PLAN ARE TO BE INSPECTED WEEKLY AND AFTER EVERY RAINFALL BY CONTRACTOR. ANY AREA THAT WILL REMAIN DISTURBED LONGER THAN 30 DAYS MUST BE STABILIZED WITH APPROPRIATE SURFACE TREATMENT.
6. ALL MAINTENANCE REQUIRED FOR THE SEDIMENT AND EROSION CONTROLS MUST BE PERFORMED IN A TIMELY MANNER.

ADDITIONAL NOTES

a) ALL SEDIMENT CONTROL FENCING IS TO BE ERECTED PRIOR TO THE COMMENCEMENT OF ANY SITE GRADING OPERATIONS, AS PER CITY OF MISSISSAUGA STANDARD 2940.010.

b) ALL CATCHBASINS WITHIN LANDSCAPED AREAS TO HAVE SEDIMENT BARRIER (CITY OF MISSISSAUGA STANDARD 2930.02 OR 2930.03) ERECTED IMMEDIATELY AFTER CATCHBASIN INSTALLATION. SEDIMENT PROTECTION BARRIER TO BE MAINTAINED ON A REGULAR BASIS OR TO THE SATISFACTION OF THE CITY OF MISSISSAUGA.

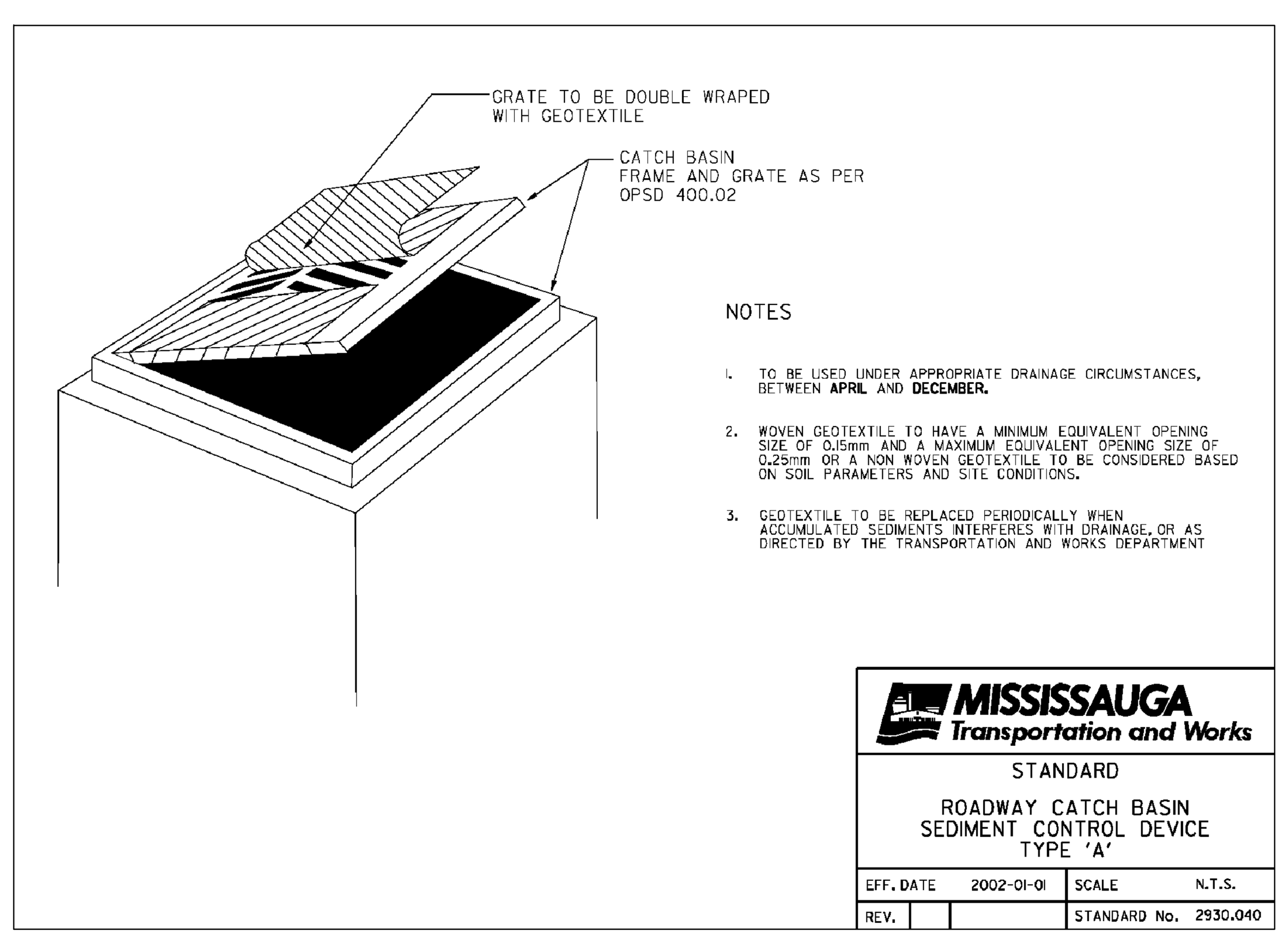
c) ALL ROADSIDE CATCHBASINS TO HAVE SEDIMENT PROTECTION AS PER CITY OF MISSISSAUGA STANDARD 2930.040 INSTALLED IMMEDIATELY AFTER CATCHBASIN INSTALLATION. SEDIMENT PROTECTION BARRIER TO BE MAINTAINED ON A REGULAR BASIS OR TO THE SATISFACTION OF THE CITY OF MISSISSAUGA.

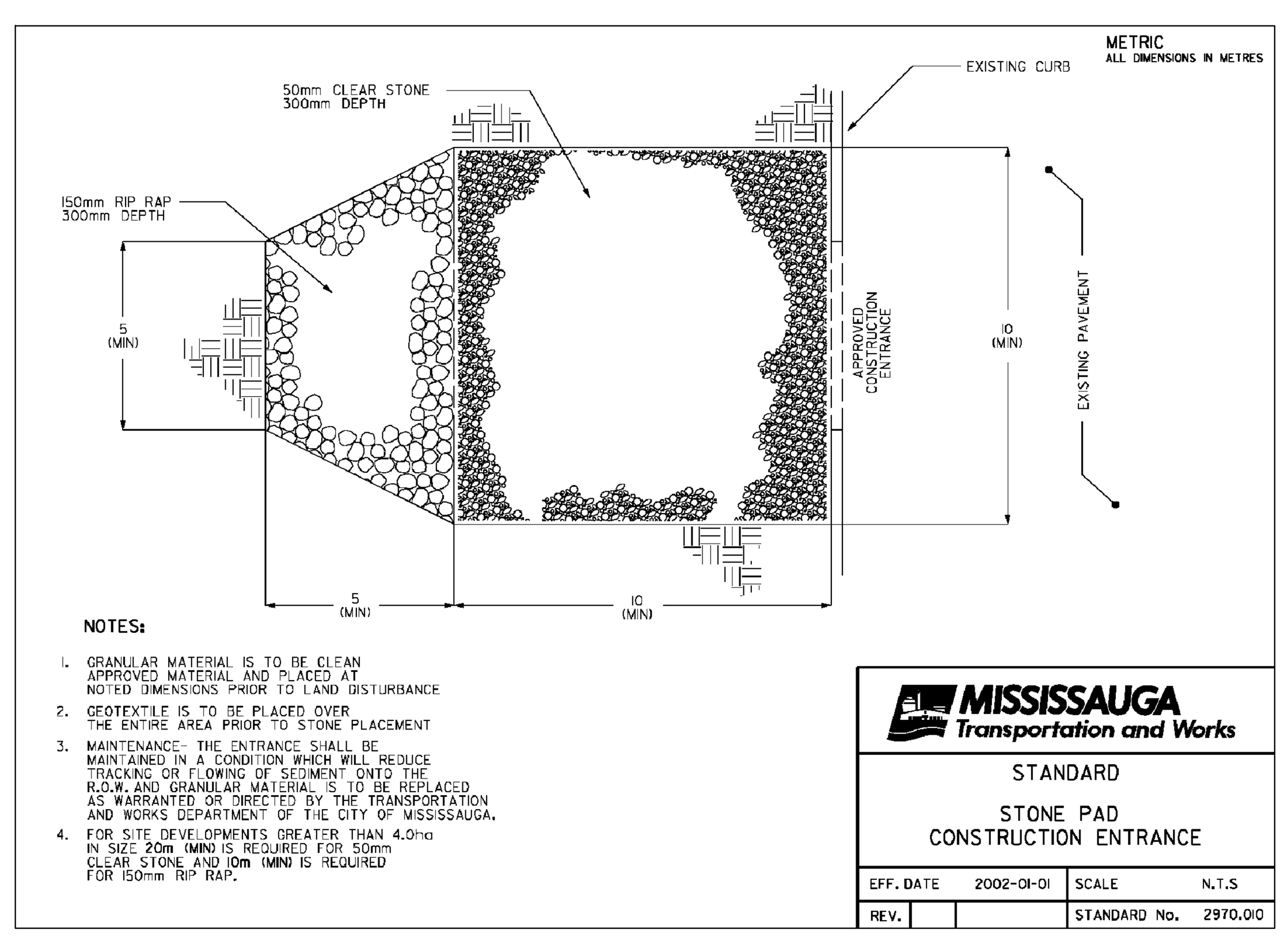
d) IF SITE CONSTRUCTION ACTIVITIES ARE INTERRUPTED AND/OR INACTIVITY EXCEEDS 30 DAYS, ALL STRIPPED AND/OR BARE SOIL AREAS ARE TO BE STABILIZED BY SODDING/SEEDING/MULCHING OR OTHER APPROVED METHOD, TO THE SATISFACTION OF THE CITY OF MISSISSAUGA.

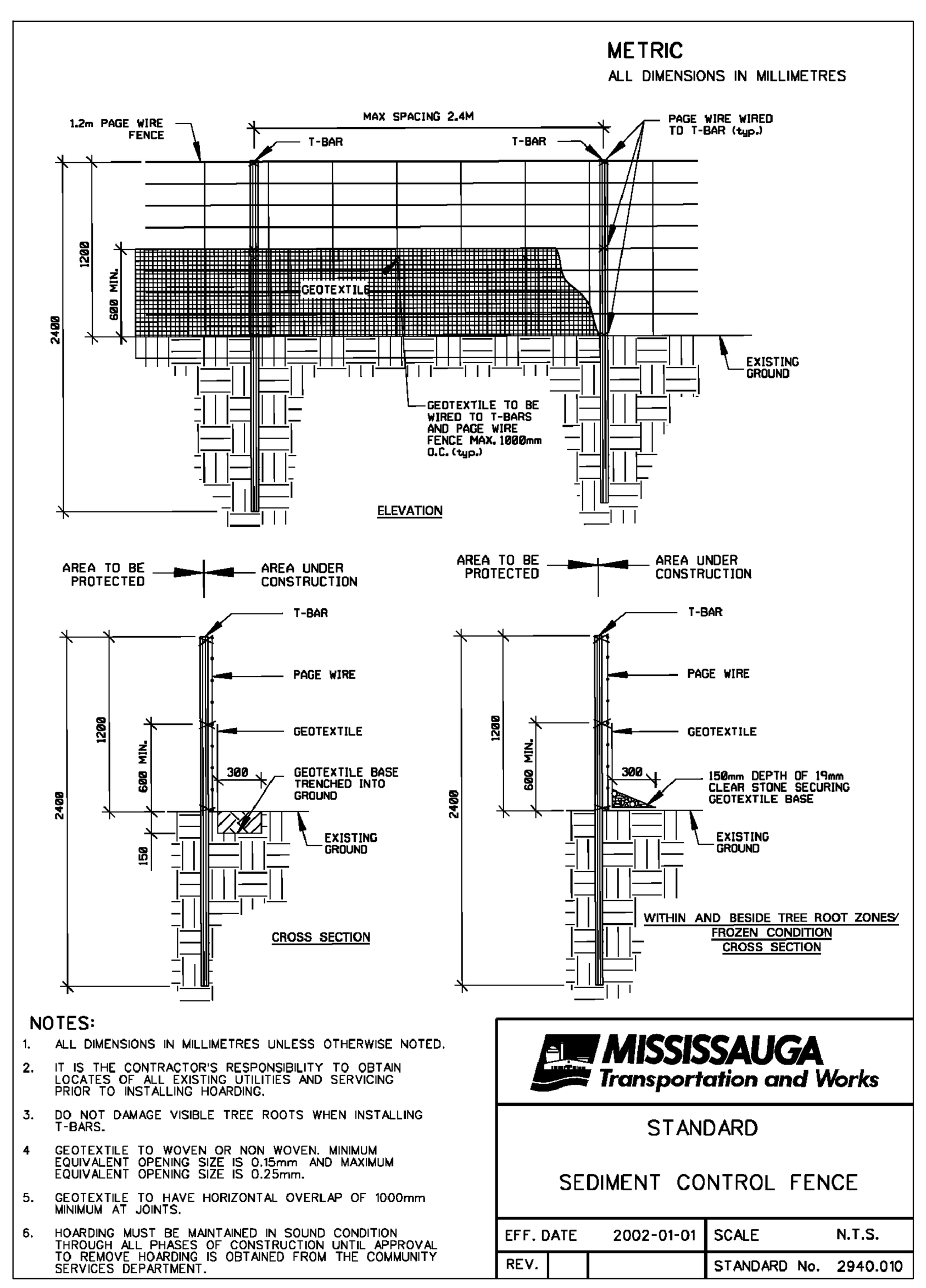
e) THIS CONTROL PLAN IS PREPARED FOR SUBMISSION TO THE CITY OF MISSISSAUGA IN CONJUNCTION WITH AN APPLICATION FOR EROSION & SEDIMENT CONTROL UNDER THE EROSION & SEDIMENT CONTROL BY-LAW NO 512-91, AS AMENDED.

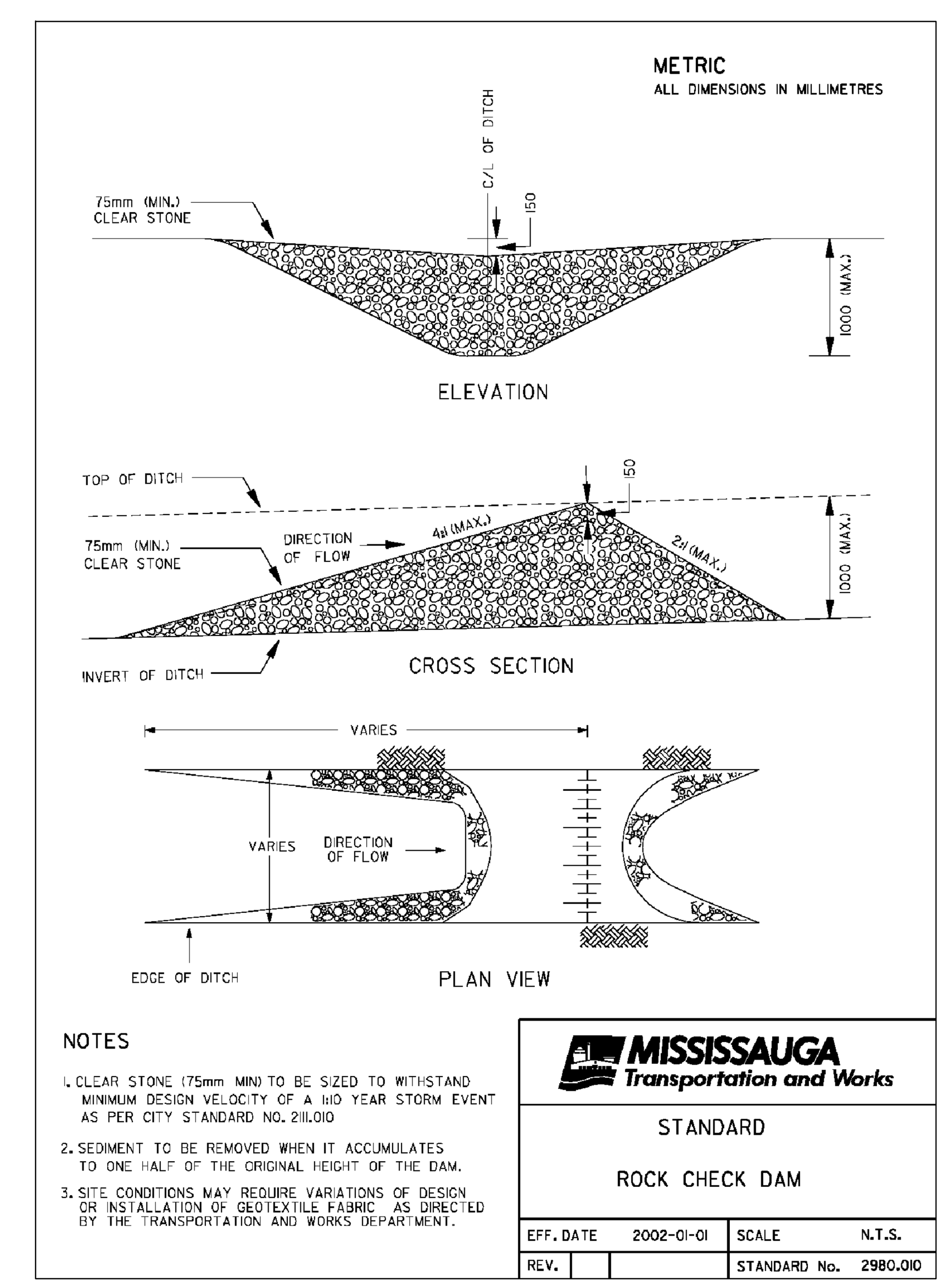
f) ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE REGULARLY INSPECTED AND MAINTAINED, AS REQUIRED, TO THE SATISFACTION OF THE CITY OF MISSISSAUGA.

g) DURING ALL CONSTRUCTION PHASES, MUD TRACKING CONTROL, CONSISTING OF FLUSHING AND SWEEPING ROADS, IS TO BE PROVIDED FOR ALL ROADS, AS WARRANTED, IN ACCORDANCE WITH THE CITY OF MISSISSAUGA MUD TRACKING CONTROL POLICY.









LIST OF DRAWINGS

SG-01 - SITE GRADING PLAN
SS-01 - SITE SERVICING PLAN
EC-01 - EROSION AND SEDIMENT CONTROL PLAN - STAGE 1
DD-01 - DETAIL DRAWING

SITE PLAN INFORMATION

AJ TREGEBOV ARCHITECT
40 ST. CLAIR AVENUE EAST, SUITE 303
TORONTO, ONTARIO, M4T 1M9
PHONE: (647) 352-3350
E-MAIL: XXX@XXX

SURVEYOR INFORMATION

KRCMAR
1137 CENTRE STREET, SUITE 304
THORNHILL, ONTARIO, L4J 3M6
PHONE: (905) 738-0058
FAX: (905) 738-9221
E-MAIL: XXX@XXX

BENCHMARK INFORMATION:
ELEVATIONS ARE GEODETIC AND REFER TO THE CITY OF MISSISSAUGA VERTICAL BENCHMARK NO. 1050 HAVING AN ELEVATION OF 194.056m.

NO.	REVISION	DATE	BY
1	ISSUED FOR DISCUSSION	JUN 23, 2017	LMV

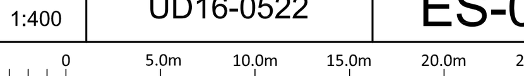
CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL

376 & 390 DERRY ROAD WEST
PART OF LOT 10, CONCESSION 1

EROSION CONTROL PLAN

COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

DESIGNED BY: LMV	DATE: MAY 2017	CHECKED BY:
DRAWN BY: ND	PROJECT No. UD16-0522	DRAWING No. ES-01
SCALE: 1:400		



S:\2016 Projects\UD\ICI\UD16-0522 TimeDev_390&376DerryRd-SPA_MS\400-CADD\402-Design\Sheets\UD16-0522 EC-01.dwg (EC-01)

GENERAL NOTES:

1. ALL WORK SHALL BE CARRIED OUT IN COMPLIANCE WITH THE APPLICABLE HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.
2. ALL THE CONSTRUCTION WORK FOR THIS PROJECT SHALL COMPLY WITH THE STANDARD DRAWINGS AND SPECIFICATIONS OF THE CITY OF MISSISSAUGA, REGIONAL MUNICIPALITY OF PEEL, ONTARIO BUILDING CODE AND THE ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS.WHERE CONFLICTS EXIST BETWEEN THESE STANDARDS CLARIFICATION IS TO BE SOUGHT FROM THE ENGINEER.
3. THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THIS CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES WITH ALL OTHER CONTRACTORS AND PREVENT CONSTRUCTION CONFLICTS.
4. THE INFORMATION SHOWN FOR EXISTING UTILITIES AND SERVICES WAS PROVIDED BY OTHERS. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES PRIOR TO AND DURING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE LOCATED AND VERIFIED BY EACH UTILITY AND / OR THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK. ANY VARIANCE IS TO BE IMMEDIATELY REPORTED TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTOR TO CONFIRM UTILITY AND SERVICES LOCATIONS AND NOTIFY THE ENGINEER OF CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTORS EXPENSE.
5. THE CONTRACTOR IS RESPONSIBLE TO OBTAIN ALL REQUIRED PERMITS (OTHER THEN BUILDING PERMITS) REQUIRED TO START CONSTRUCTION.
6. THE CONTRACTOR IS RESPONSIBLE TO COORDINATE CONSTRUCTION ACTIVITIES WITH MISSISSAUGA TRANSIT, MALL MANAGEMENT AND OPERATIONS AND THE REQUIRED RELEVANT MUNICIPAL AUTHORITIES. LOST TIME DUE TO FAILURE TO DO SO WILL BE AT THE CONTRACTOR'S EXPENSE.

SITE GRADING:

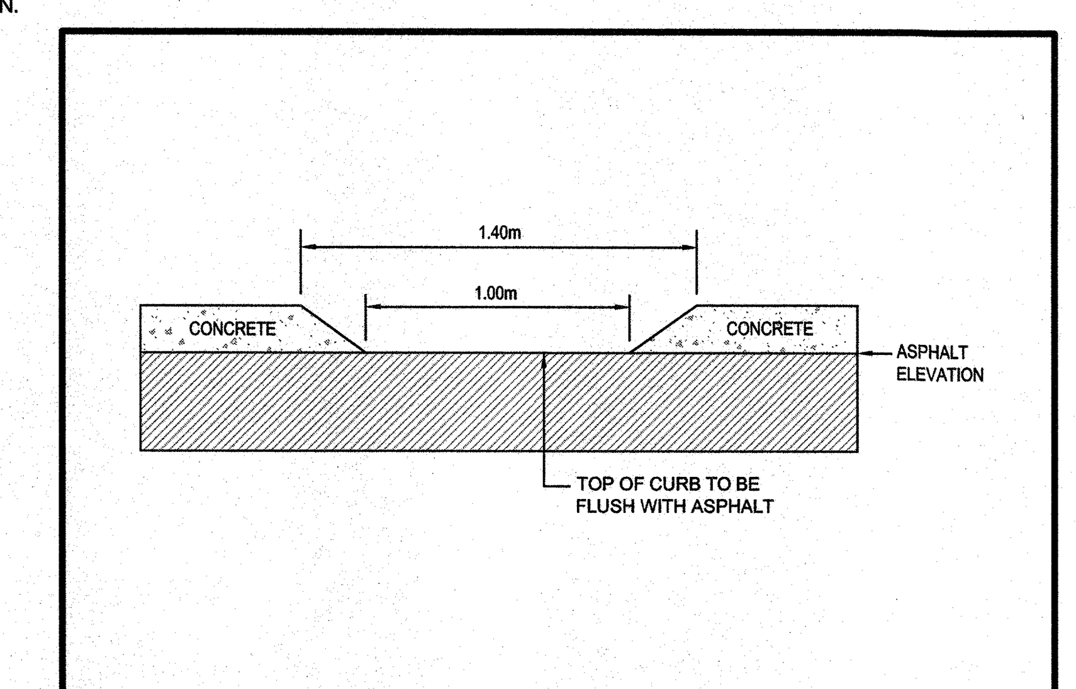
1. ALL DISTURBED GRASSED AREAS SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER WITH SOD ON MIN 100mm TOPSOIL. THE RELOCATION OF TREES AND SHRUBS SHALL BE SUBJECT TO APPROVAL BY THE PROJECT LANDSCAPE ARCHITECT OR ENGINEER.
2. ALL DISTURBED HARD SURFACE AREAS TO BE RESTORED TO ORIGINAL CONDITION ON BETTER.
3. ALL GRANULAR BASE AND SUB-BASE MATERIALS SHALL BE GRADED AND COMPACTED AS PER THE GEOTECHNICAL REPORT.
4. THE PAVEMENT STRUCTURE SHALL BE CONSTRUCTED OF THE FOLLOWING MINIMUM THICKNESSES OF MATERIALS AS PER THE GEOTECHNICAL REPORT.
5. PROVIDE SUBDRAINS, MINIMUM LENGTH OF 3.0m, EXTENDING FROM ALL CATCHBASINS AND CATCHBASIN MANHOLES TO DRAIN THE GRANULAR SUB-BASE LAYER.
6. ALL BARRIER CURB WITHIN THE SITE TO BE CONSTRUCTED AS PER OPSD 600.110, UNLESS OTHERWISE SPECIFIED.
7. TRENCH BACKFILL WITHIN THE RIGHT OF WAY SHALL BE UNSHRINKABLE FILL WHERE REQUIRED BY THE MUNICIPALITY AND SHALL EXTEND TO THE BASE OF ASPHALT.
8. INSPECTIONS: ALL WORK ON THE MUNICIPAL RIGHT OF WAY AND EASEMENTS TO BE INSPECTED BY THE MUNICIPALITY PRIOR TO BACKFILLING. ALL WORK RELATING TO WATERMAINS AND SEWERS TO BE INSPECTED BY THE MUNICIPALITY WHEN REQUIRED BY THE MUNICIPALITY.
9. REFER TO SITE PLAN FOR DIMENSIONS AND SITE DETAILS.
10. LAP JOINTS ARE TO BE USED WHERE PROPOSED ASPHALT MEETS EXISTING ASPHALT. ALL JOINTS MUST BE SEALED.
11. TRANSITIONS WITHIN THE SUBGRADE WITHIN 1.2m FROM THE TOP OF PAVEMENT SHOULD INCLUDE 3H:1V TRANSITIONS.
12. EMBANKMENTS TO BE SLOPED AT MAX. 3:1, UNLESS OTHERWISE SPECIFIED.
13. ALL PAVEMENT MARKING, LINE PAINTING, DIRECTIONAL LINES/ARROWS ETC. SHALL BE PLACED IN ACCORDANCE WITH THE ARCHITECTURAL SITE PLAN OR THE OWNER'S TRAFFIC ENGINEERING CONSULTANT'S DRAWINGS. LINE PAINTING AND DIRECTIONAL SYMBOLS SHALL BE APPLIED WITH A MINIMUM OF TWO COATS OF ORGANIC SOLVENT BASED PAINT IN ACCORDANCE WITH OPSS 1712.
14. WHERE APPLICABLE THE CONTRACTOR IS TO SUBMIT SHOP DRAWINGS FOR THE RETAINING WALL (INCLUDE RAILINGS IF APPLICABLE) TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. SHOP DRAWINGS MUST BE SITE SPECIFIC, SIGNED AND SEALED BY A LICENSED STRUCTURAL ENGINEER. THE CONTRACTOR WILL ALSO BE REQUIRED TO SUPPLY STRUCTURAL AND GEOTECHNICAL CERTIFICATION OF THE AS-CONSTRUCTED RETAINING WALL TO THE ENGINEER PRIOR TO FINAL ACCEPTANCE.
15. THE CONTRACTOR SHALL PROVIDE TO THE ENGINEER 1 (ONE) SET OF AS CONSTRUCTED SITE SERVICING, GRADING, AND SITE ELECTRICAL DRAWINGS. BASED ON A SURVEY PREPARED BY AN O.L.S.

WATER:

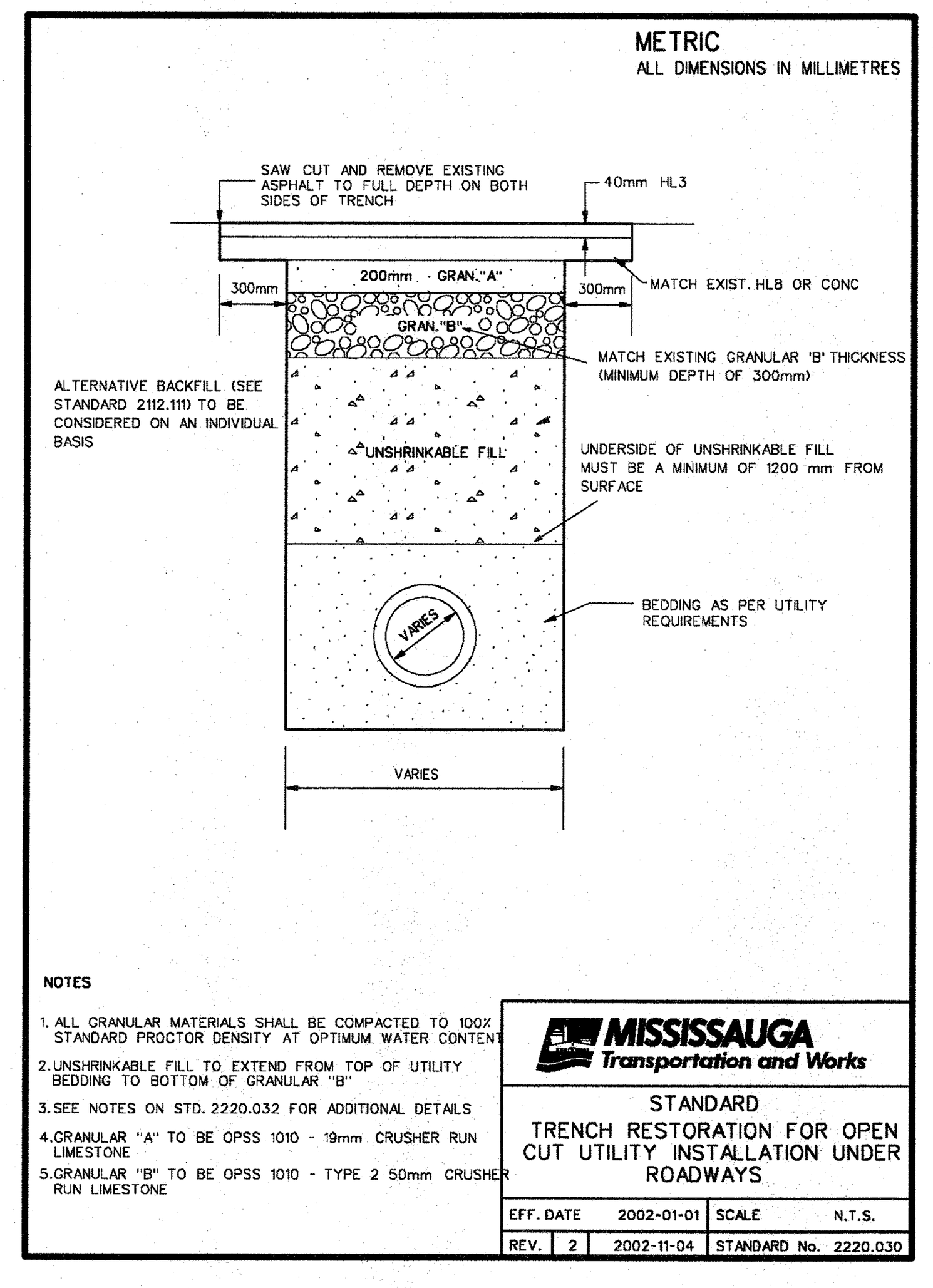
1. ALL MATERIALS AND CONSTRUCTION METHODS MUST CORRESPOND TO THE CURRENT PEEL PUBLIC WORKS STANDARDS AND SPECIFICATIONS.
2. WATERMAIN AND/OR WATER SERVICE MATERIALS 100mm (4") AND LARGER MUST BE PVC DR18.
3. WATERMAINS AND/OR WATER SERVICES ARE TO HAVE A MINIMUM COVER OF 1.7m (5'6") WITH A MINIMUM HORIZONTAL SPACING OF 1.2m (4') FROM THEMSELVES AND ALL OTHER UTILITIES.
4. PROVISIONS FOR FLUSHING WATER LINES PRIOR TO TESTING ETC. MUST BE PROVIDED WITH AT LEAST A 50mm (2") OUTLET ON 100mm (4") AND LARGER LINES. COPPER LINES ARE TO HAVE FLUSHING POINTS AT THE END, THE SAME SIZE AS THE LINE. THEY MUST ALSO BE HOSED OR PIPED TO ALLOW THE WATER TO DRAIN ON TO A PARKING LOT OR DOWN A DRAIN. ON FIRE LINES, FLUSHING OUTLET TO BE 100mm (4") DIAMETER MIN. ON A HYDRANT.
5. ALL CURB STOPS TO BE 3.0m (10') OFF THE FACE OF THE BUILDING UNLESS OTHERWISE NOTED.
6. HYDRANT AND VALVE SET TO REGION STANDARD 1-6-1 DIMENSION A AND B, 0.7m (2") AND 0.9m (3") AND TO HAVE PUMPER NOZZLE.
7. WATERMAINS TO BE INSTALLED TO GRADES AS SHOWN ON APPROVED SITE PLAN. COPY OF GRADE SHEET MUST BE SUPPLIED TO INSPECTOR PRIOR TO COMMENCEMENT OF WORK, WHERE REQUESTED BY INSPECTOR.
8. WATERMAINS MUST HAVE A MINIMUM VERTICAL CLEARANCE OF 0.3m (12") OVER AND 0.5m (20") UNDER SEWERS AND ALL OTHER UTILITIES WHEN CROSSING.
9. ALL PROPOSED WATER PIPING MUST BE ISOLATED FROM EXISTING LINES IN ORDER TO ALLOW INDEPENDENT PRESSURE TESTING AND CHLORINATING FROM EXISTING SYSTEMS.
10. ALL LIVE TAPPING AND OPERATION OF REGION WATER VALVES SHALL BE ARRANGED THROUGH THE REGIONAL INSPECTOR ASSIGNED OR BY CONTACTING THE OPERATIONS AND MAINTENANCE DIVISION.

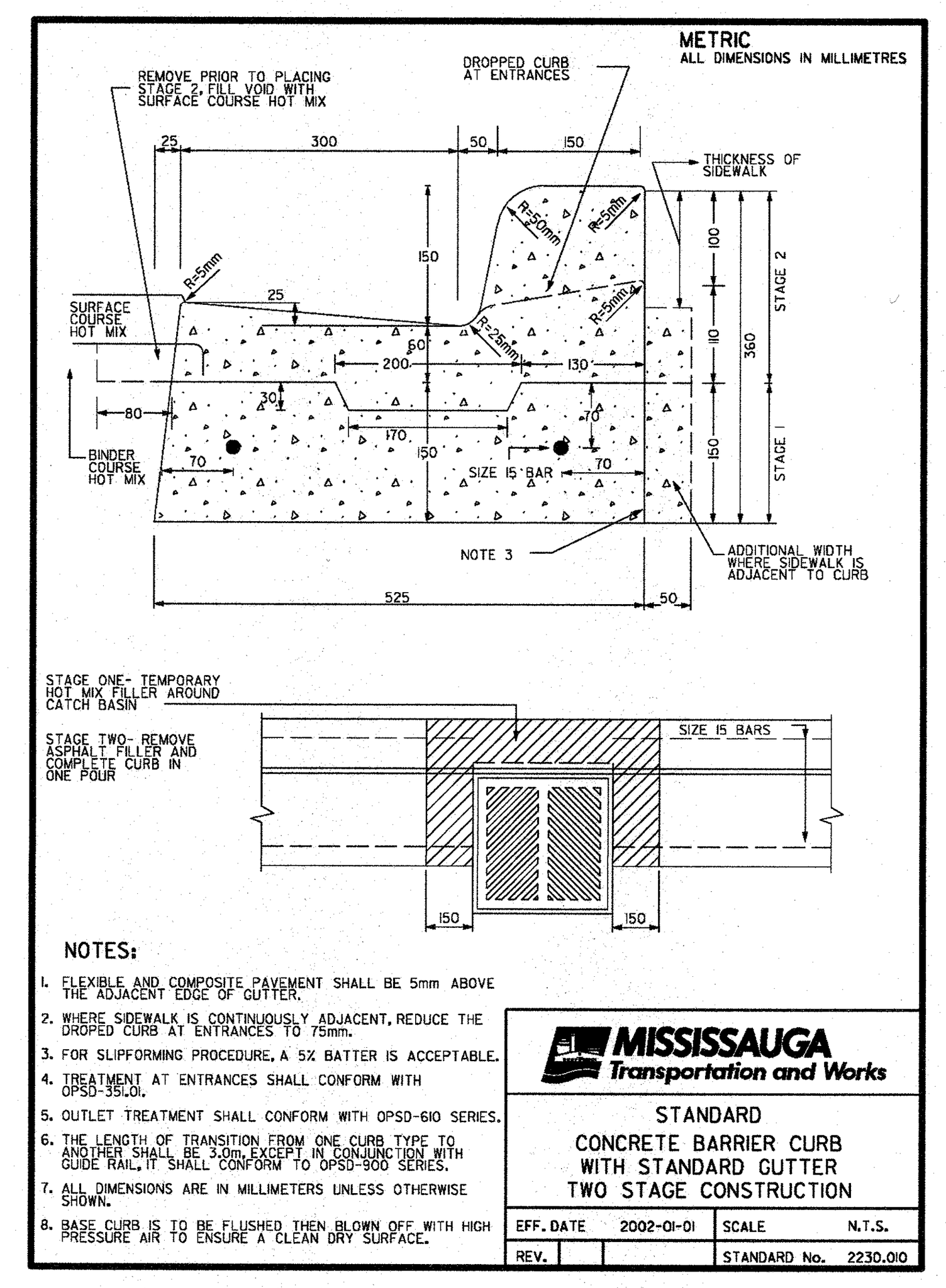
STORM AND SANITARY SEWERS:

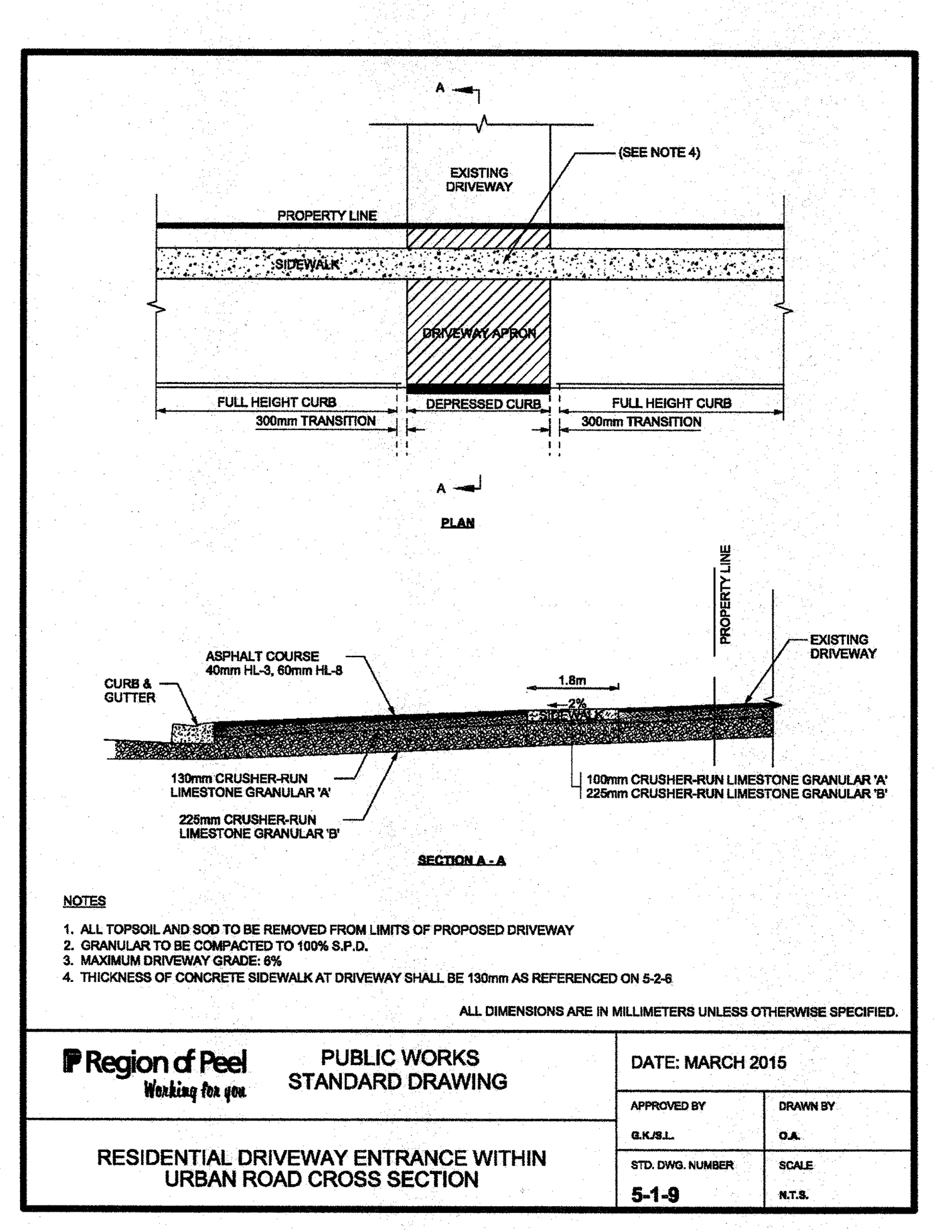
1. MANHOLES SHALL BE AS PER OPSD 701.010, 701.011; FRAMES AND COVERS SHALL BE AS PER OPSD 401.010. SAFETY PLATFORMS TO BE INSTALLED WHERE DEPTH EXCEEDS 5.0m.
2. SINGLE CATCHBASINS SHALL BE AS PER OPSD 705.010, WITH FRAMES AND COVERS AS PER OPSD 400.020. DOUBLE CATCHBASINS SHALL BE AS PER OPSD 705.020.
3. CONCRETE PIPE SEWER BEDDING SHALL BE CLASS 'B' AS PER OPSD 802.030, PVC PIPE SEWER BEDDING SHALL BE CLASS 'B' AS PER OPSD 802.030 TO TOP OF SEWER. NATIVE BACKFILL TO BE COMPACTED TO A MIN. 98% STANDARD PROCTOR DENSITY, WITH A MINIMUM 300mm SAND COVER OVER PIPE.
4. ALL STORM SEWER PIPES UP TO 450mm DIA. SHALL BE PVC SDR-35 OR APPROVED EQUIVALENT. ALL STORM SEWER PIPES 525mm DIA. AND LARGER SHALL BE CONCRETE AND EQUAL TO C.S.A. SPECIFICATIONS A257.2 REINFORCED CLASS 65-D OR LATEST AMENDMENT UNLESS OTHERWISE SPECIFIED.
5. ALL SANITARY PVC SEWER PIPES SHALL BE SDR-35 EQUAL CSA SPECIFICATIONS B182.2-M1990 OR LATEST AMENDMENT UNLESS OTHERWISE NOTED.
6. ALL MANHOLE, CATCH BASIN AND SERVICE EXCAVATIONS TO BE BACKFILLED IN ACCORDANCE WITH THE GEOTECHNICAL REPORT.
7. ALL CATCH BASINS AND CATCH BASIN MANHOLES ARE TO INCLUDE SUBDRAIN TREATMENT AS PER DETAIL ON DETAIL DRAWINGS.
8. ALL BLIND CONNECTIONS TO MATCH THE SPRINGLINE OF THE CATCH BASIN LEAD TO THE SPRINGLINE OF THE STORM PIPE. OTHERWISE INSTALL THE CATCH BASIN LEAD AT A MAXIMUM 2.00% AND DROP INTO PIPE.
9. UNLESS NOTED OTHERWISE, CATCHBASIN LEADS SHALL BE 200mmØ AT MINIMUM 1.00% TO MAXIMUM 5.00% SLOPE THE CONTRACTOR IS TO PROVIDE RISERS AS REQUIRED.
10. CATCHBASIN INVERTS TO BE 1.5m BELOW GRADE UNLESS OTHERWISE SPECIFIED.
11. ALL MAHOLES TO BE BENCHED IN ACCORDANCE WITH OPSD 701.021
12. THE CONTRACTOR IS TO PROVIDE CCTV CAMERA INSPECTIONS OF ALL SANITARY AND STORM SEWERS, INCLUDING PICTORIAL REPORT, TWO (2) CD COPIES IN A FORMAT SATISFACTORY TO THE ENGINEER. ALL SEWERS ARE TO BE FLUSHED PRIOR TO CAMERA INSPECTION.

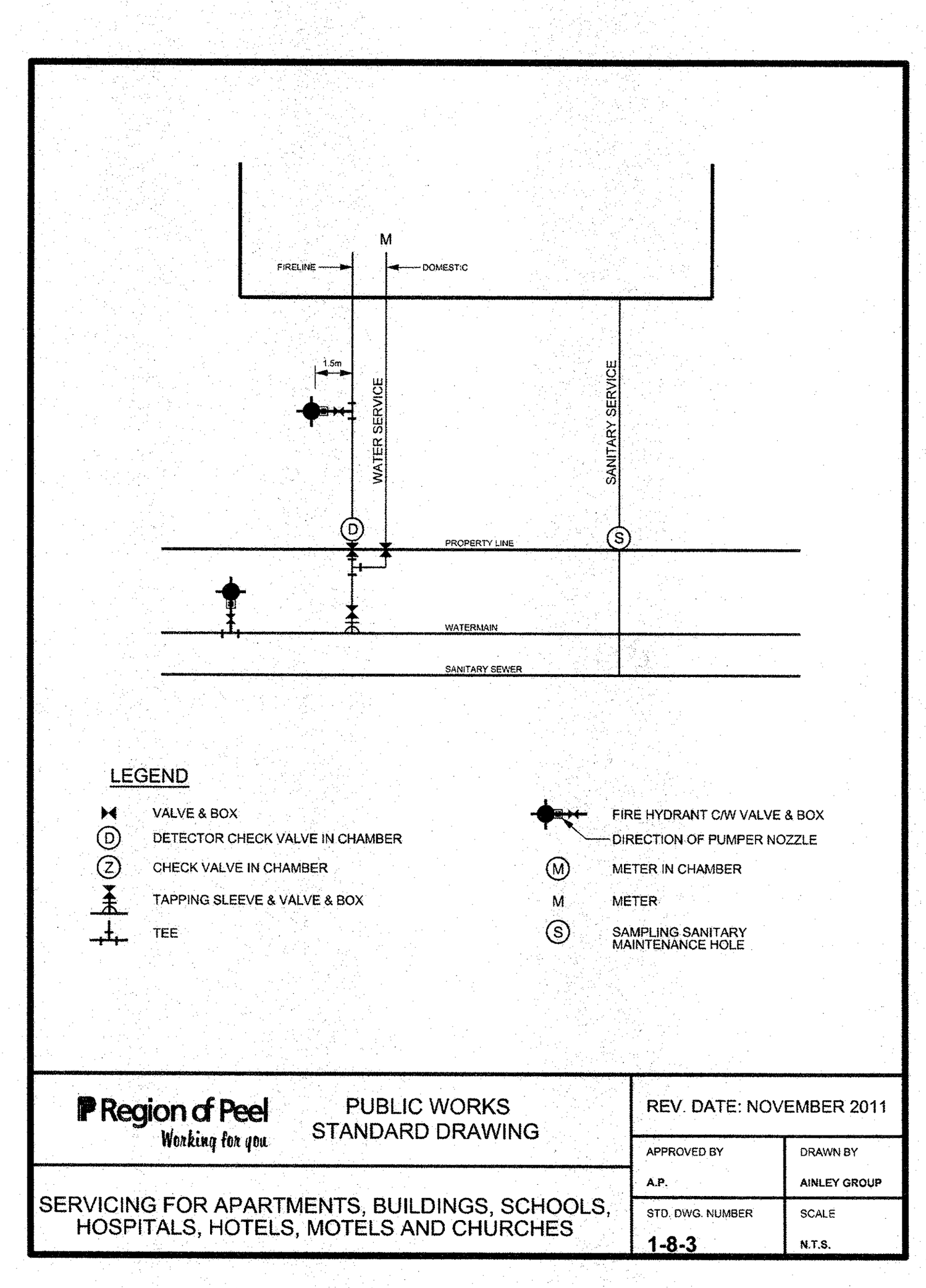


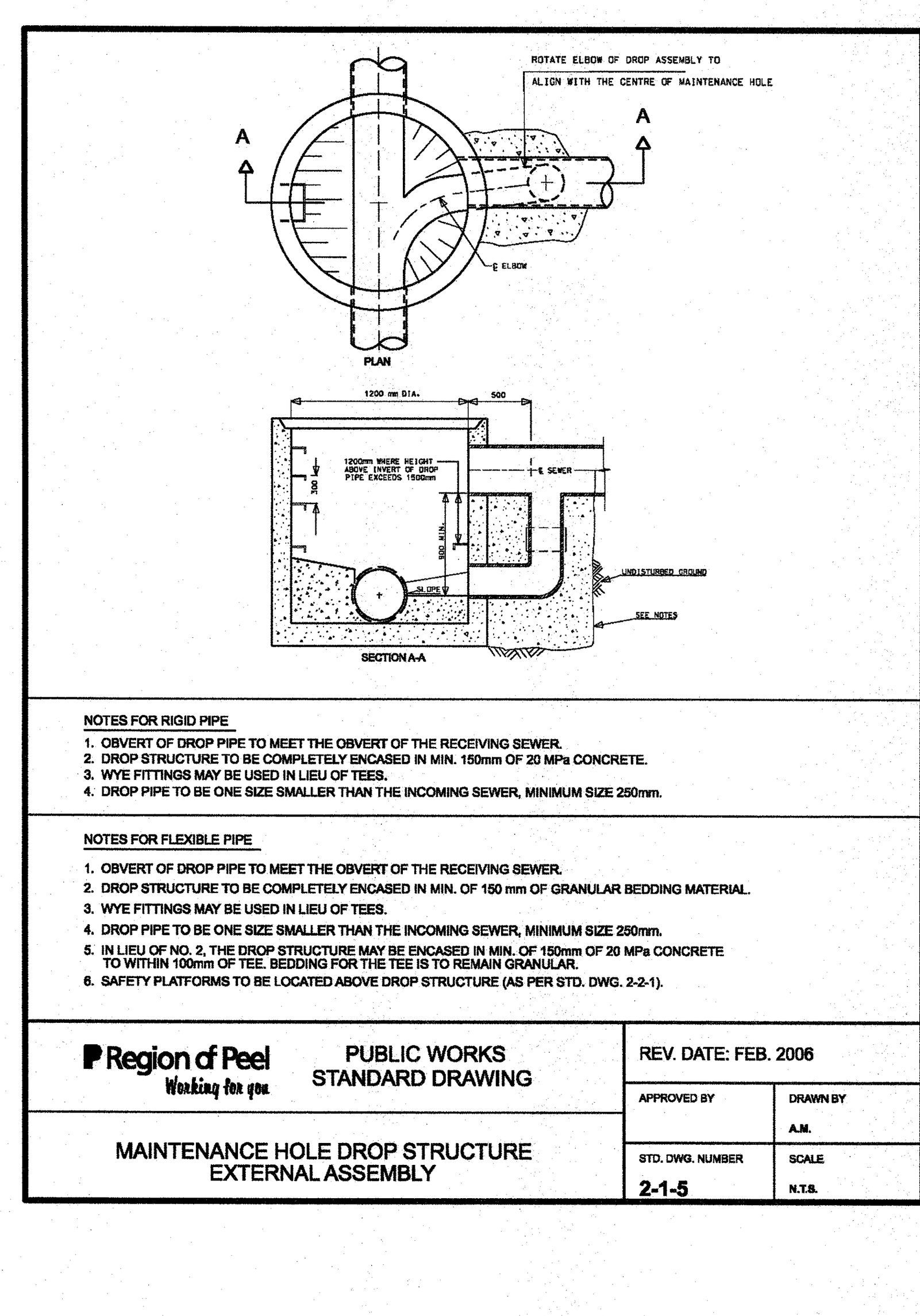
TYPICAL CURB BREAK DETAIL | N.T.S.

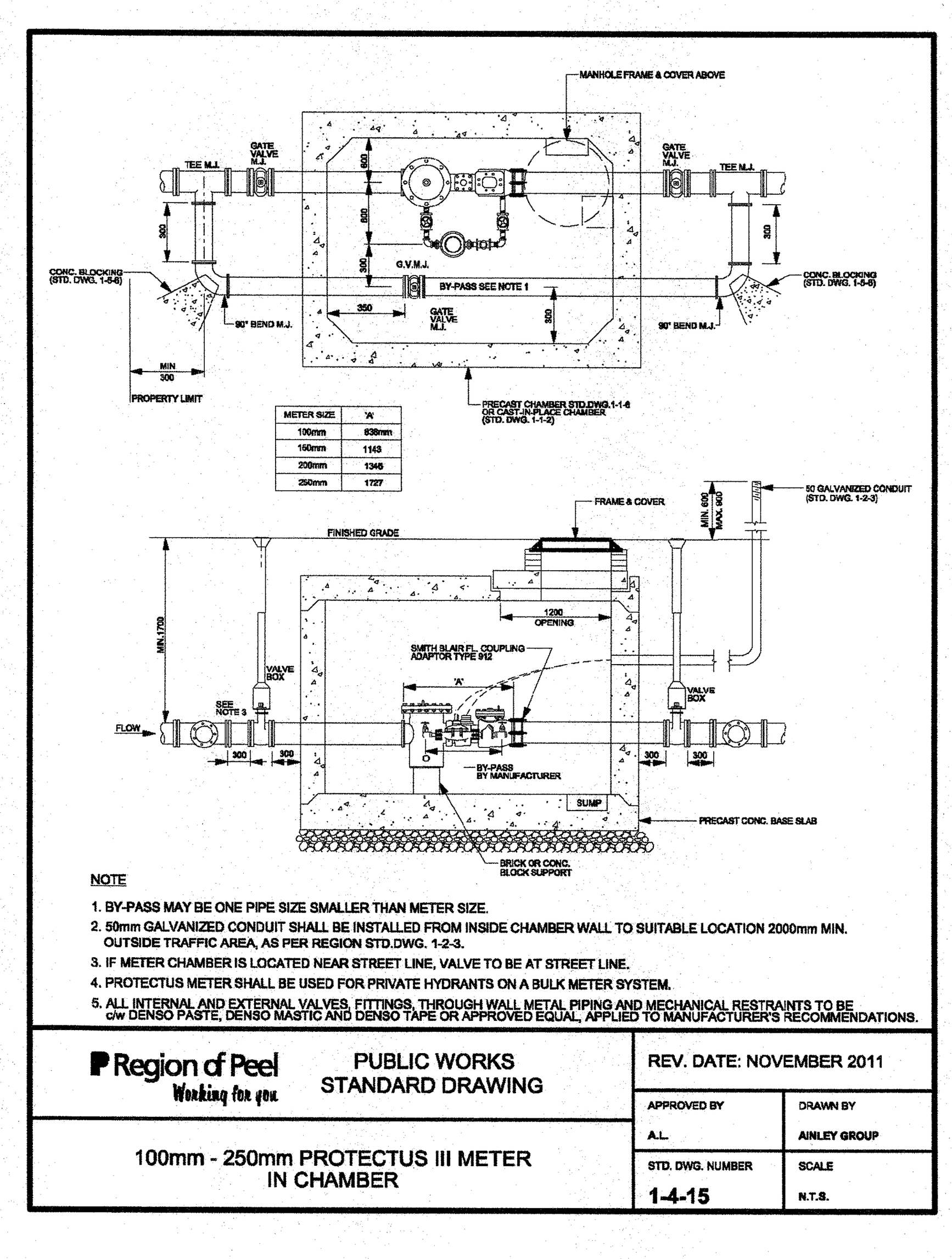




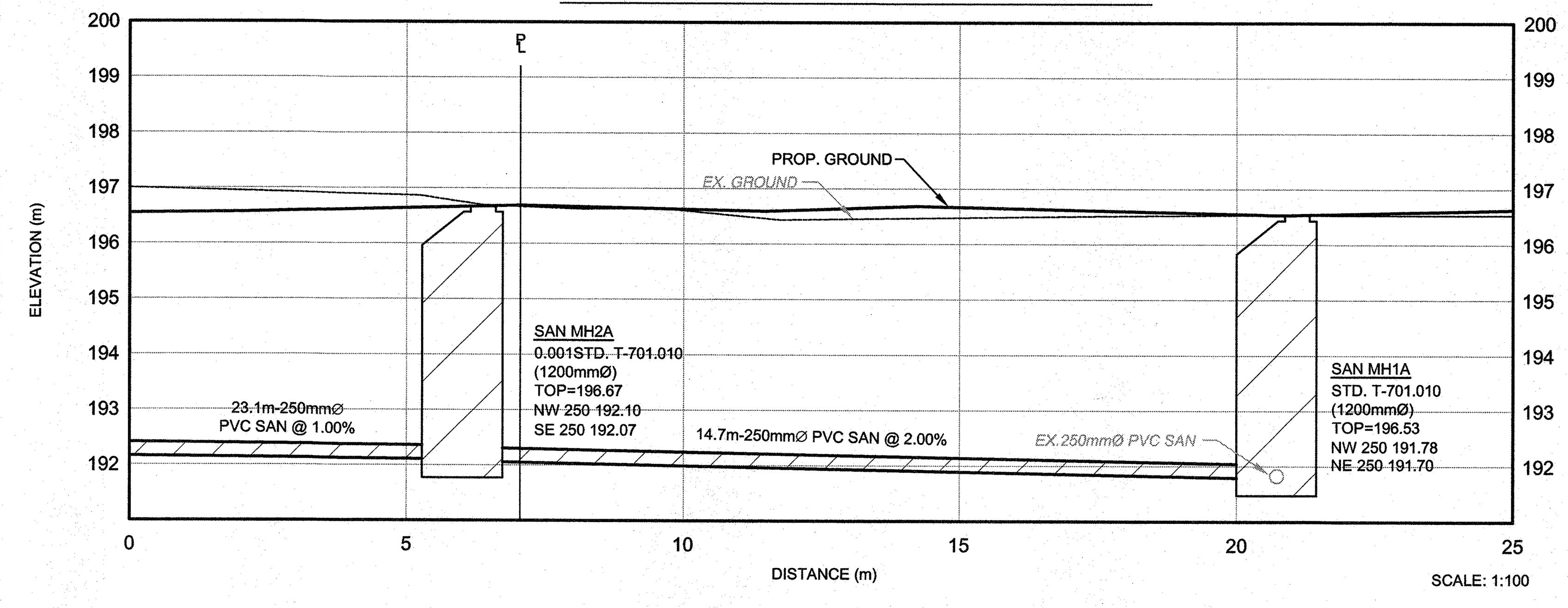




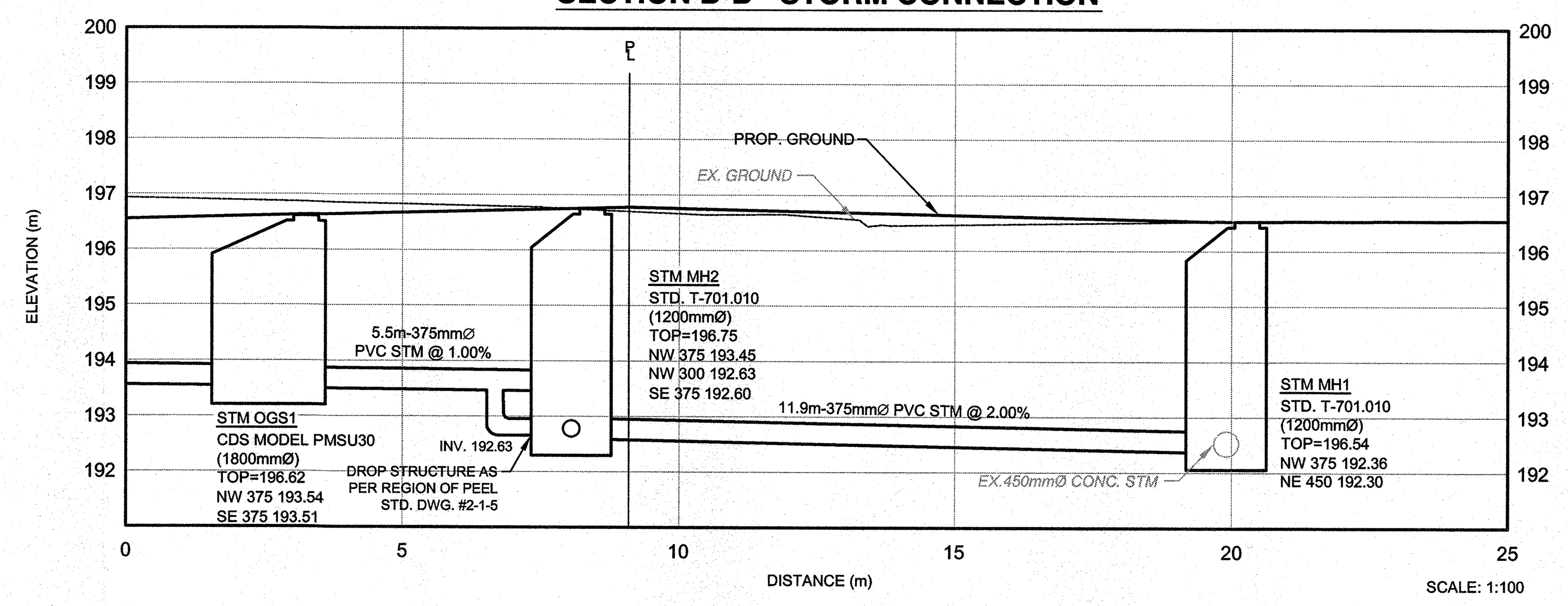




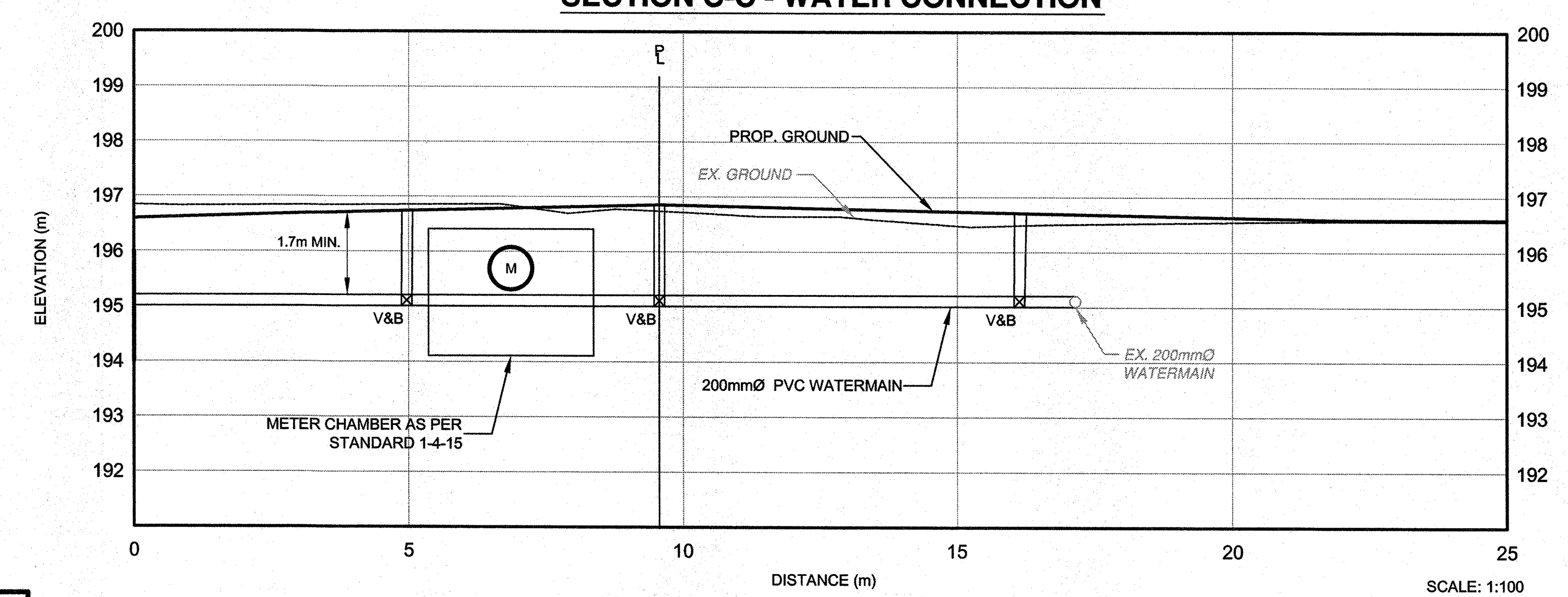
SECTION A-A - SANITARY CONNECTION

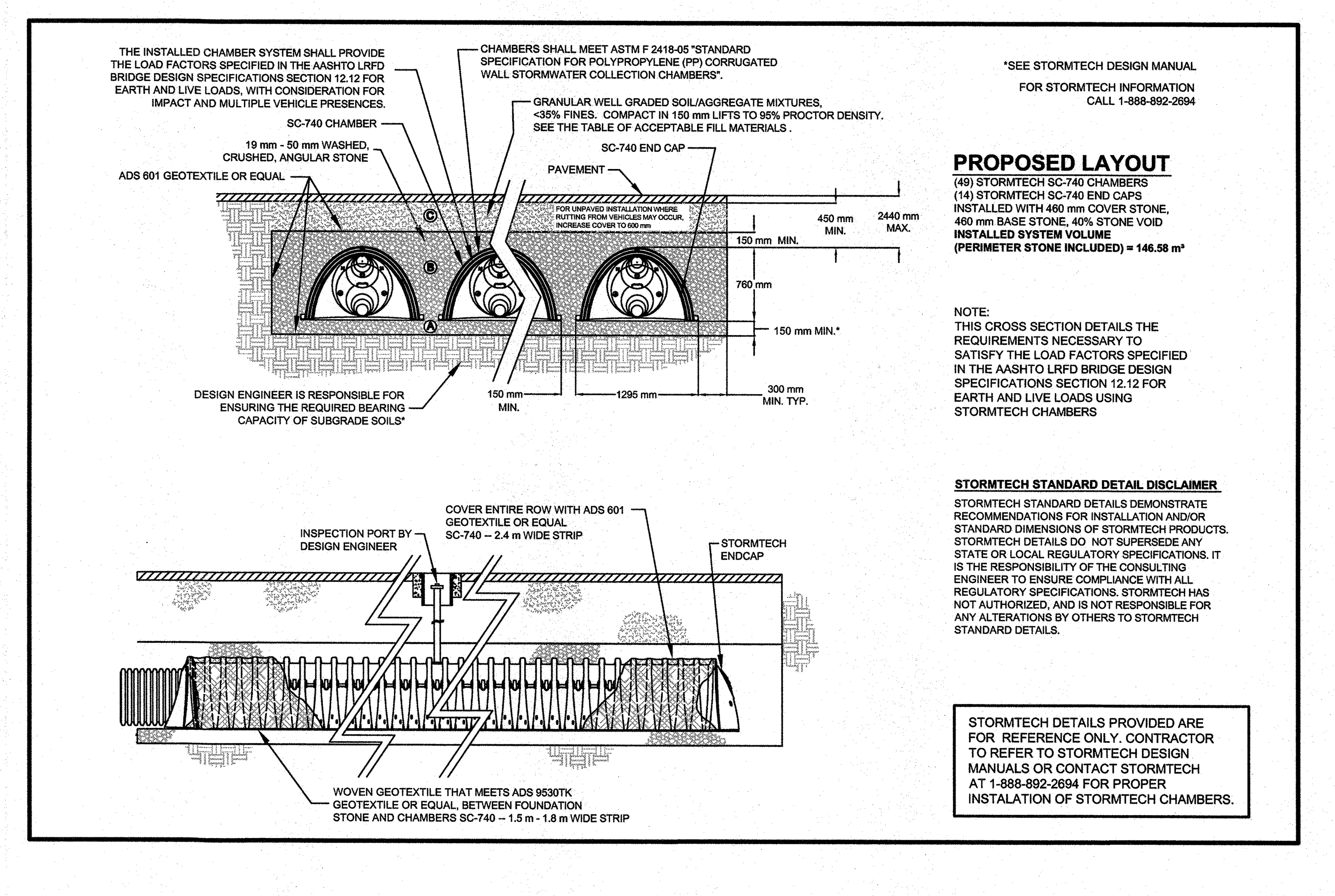


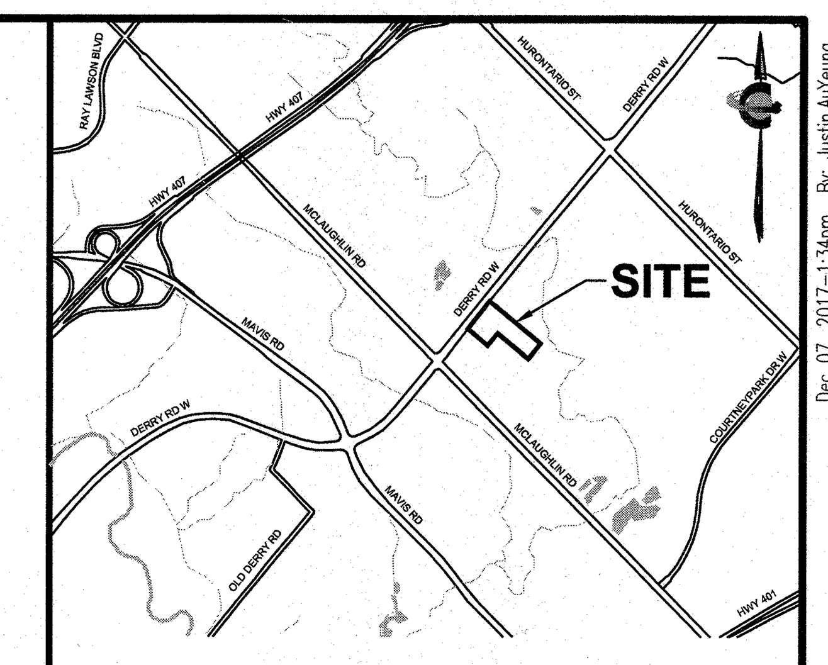
SECTION B-B - STORM CONNECTION



SECTION C-C - WATER CONNECTION







LOCATION PLAN
N.T.S.

LEGEND

LIST OF DRAWINGS
SG-01 - SITE GRADING PLAN
SS-01 - SITE SERVICING PLAN
EC-01 - EROSION AND SEDIMENT CONTROL PLAN - STAGE 1
DD-01 - DETAIL DRAWING

SITE PLAN INFORMATION
AJ TREGEBOV ARCHITECT
40 ST. CLAIR AVENUE EAST, SUITE 303
TORONTO, ONTARIO, M4T 1M9
PHONE: (647) 352-3350
E-MAIL: XXX@XXX

SURVEYOR INFORMATION
KRCMAR
1137 CENTRE STREET, SUITE 304
THORNHILL, ONTARIO, L4J 3M6
PHONE: (905) 738-0058
FAX: (905) 738-9221
E-MAIL: XXX@XXX

BENCHMARK INFORMATION:
ELEVATIONS ARE GEODETIC AND REFER TO THE CITY OF MISSISSAUGA VERTICAL BENCHMARK NO. 1050 HAVING AN ELEVATION OF 194.056m.

NO.	REVISION	DATE	BY
1	ISSUED FOR FIRST SUBMISSION	DEC 7, 2017	JAY

LICENSED PROFESSIONAL ENGINEER S. K. LEE 100212879 Dec 07, 2017 PROVINCE OF ONTARIO

CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL

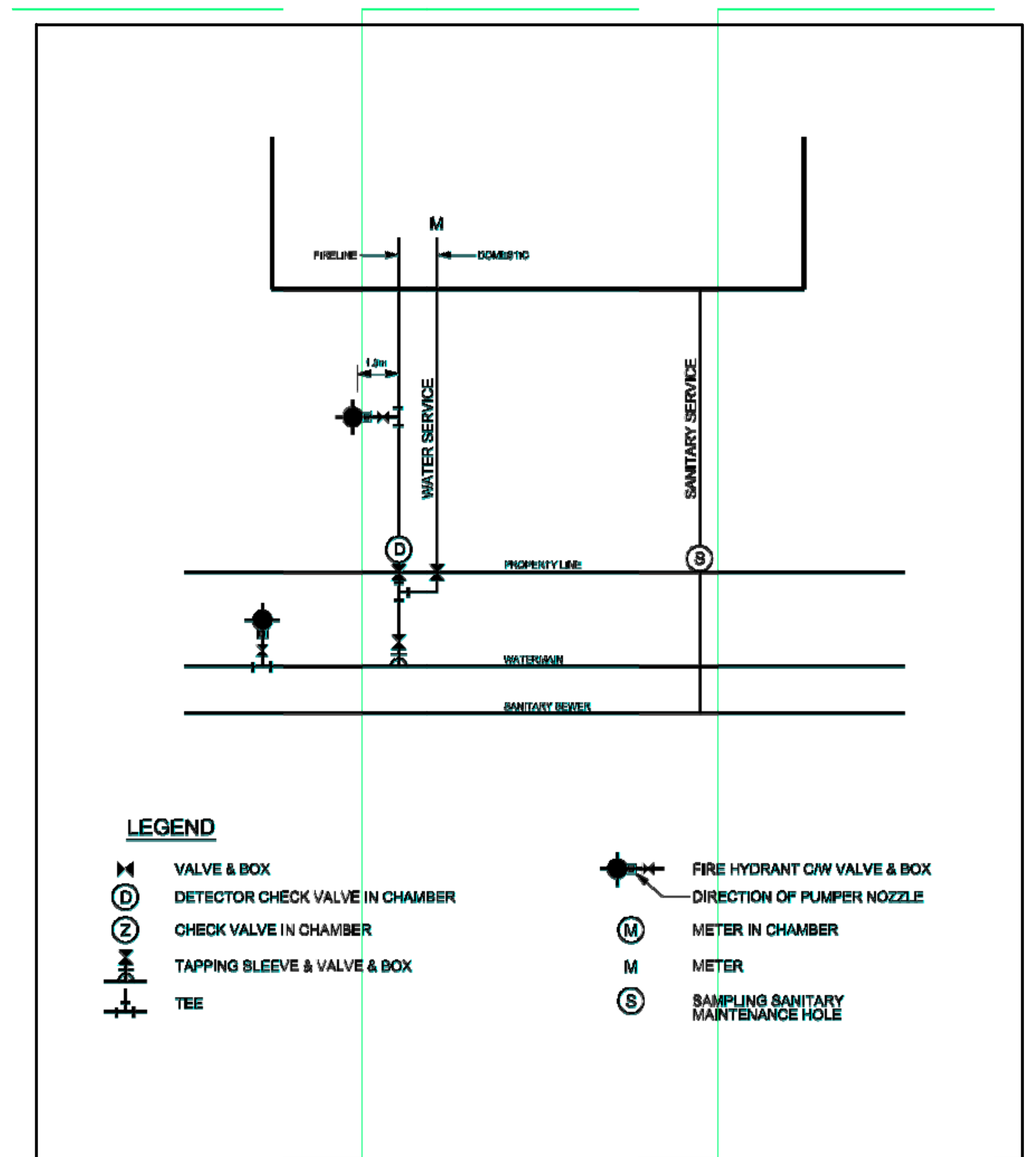
376 & 390 DERRY ROAD WEST
PART OF LOT 10, CONCESSION 1

DETAIL DRAWING

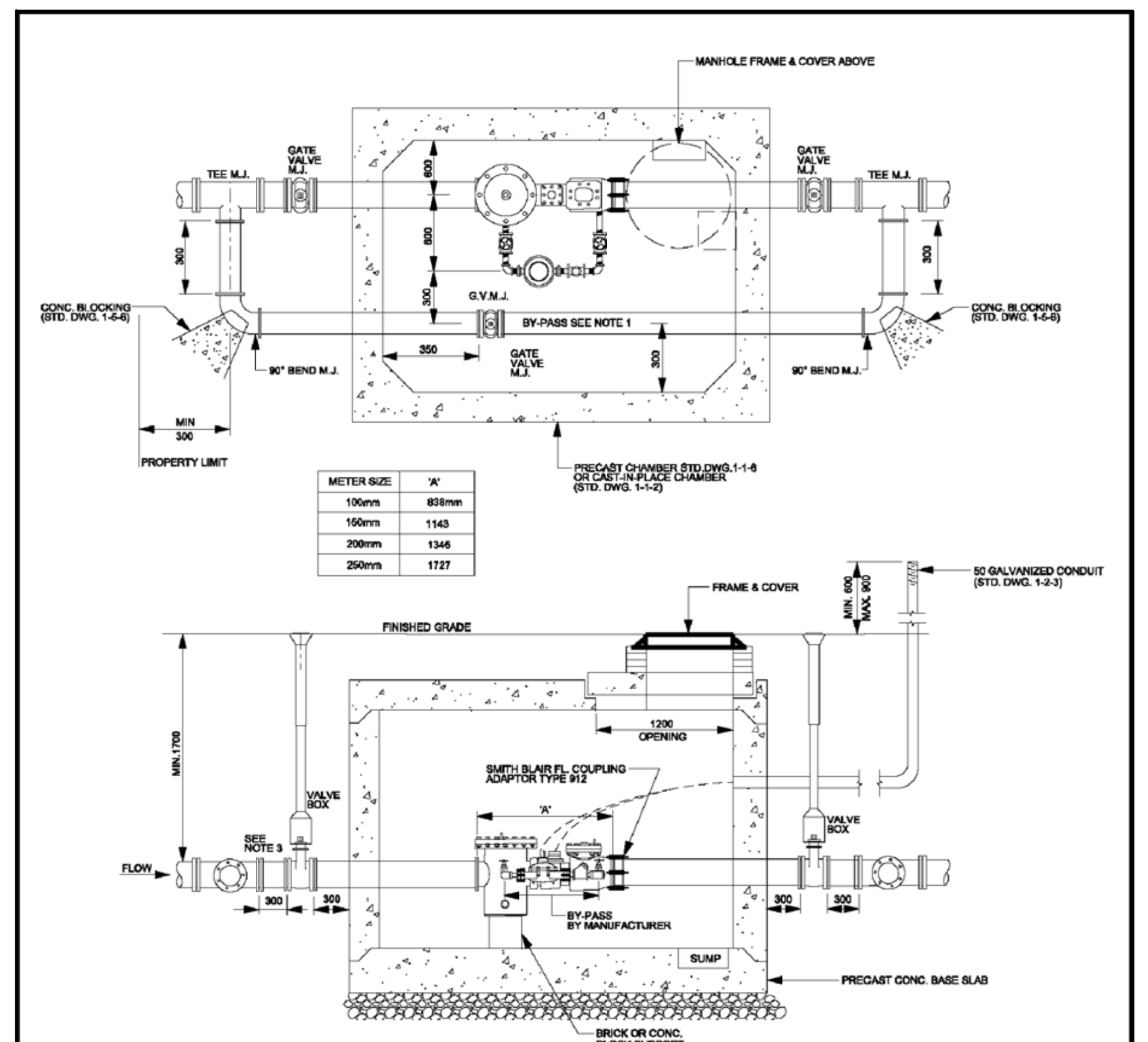
COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

DESIGNED BY: LMV	DATE: MAY 2017	CHECKED BY: JL
DRAWN BY: JAY	PROJECT No.	DRAWING No.
SCALE:	UD16-0522	DD-01

S:\2016 Projects\UD\C\UD16-0522 TimeDev_390&376DerryRd-SPA_MS\400-CADD\402-Design\Sheets\UD16-0522 DD-01.dwg (DD-01)

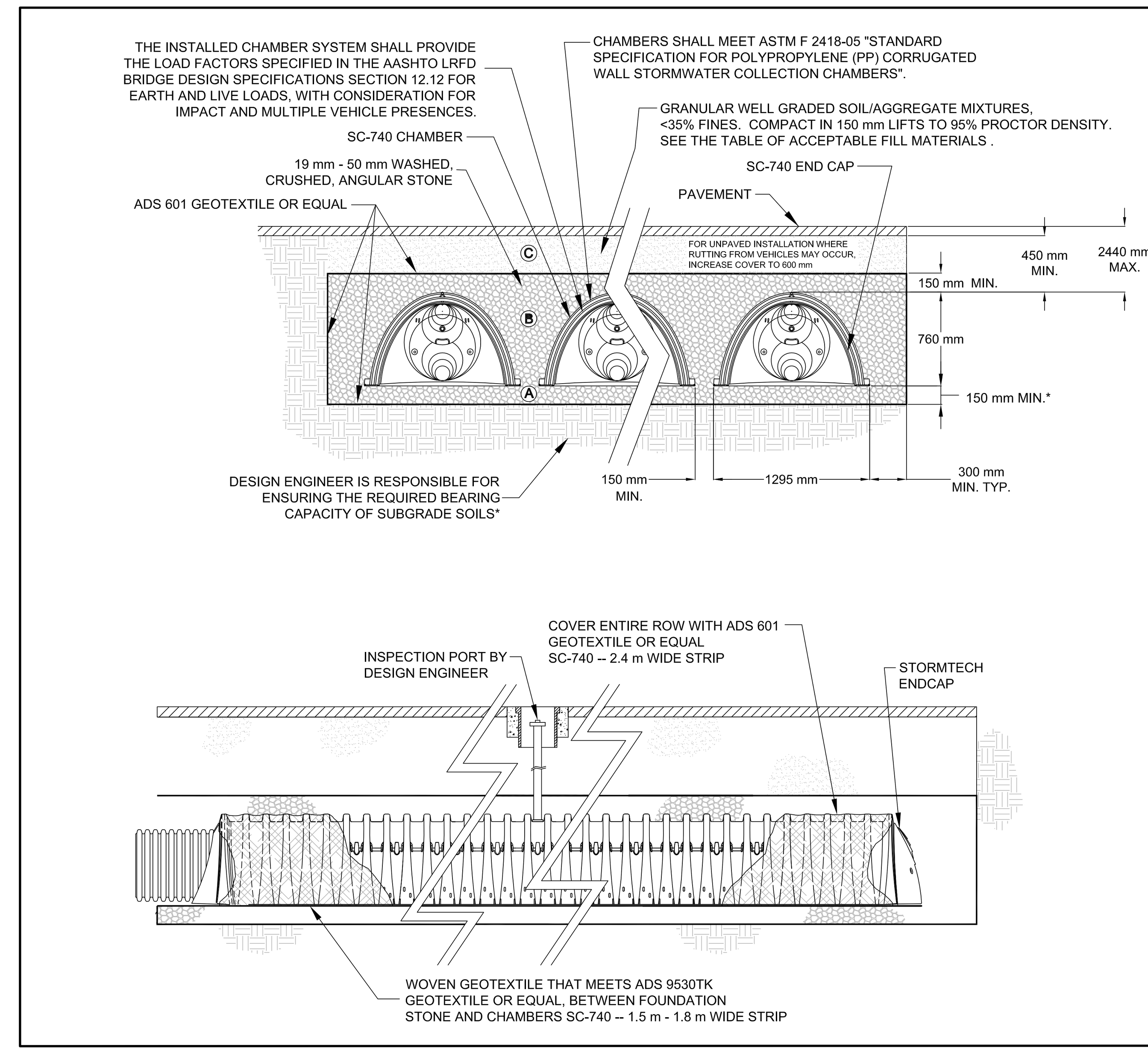


Region of Peel *Working for you*	PUBLIC WORKS STANDARD DRAWING	REV. DATE: NOVEMBER 2011
		APPROVED BY: A.P. / DRAWN BY: AINLEY GROUP
SERVICING FOR APARTMENTS, BUILDINGS, SCHOOLS, HOSPITALS, HOTELS, MOTELS AND CHURCHES		STD. DWG. NUMBER: 1-8-3 / SCALE: N.T.S.



NOTE
1. BY-PASS MAY BE ONE PIPE SIZE SMALLER THAN METER SIZE.
2. 50mm GALVANIZED CONDUIT SHALL BE INSTALLED FROM INSIDE CHAMBER WALL TO SUITABLE LOCATION 2000mm MIN. OUTSIDE TRAFFIC AREA, AS PER REGION STD.DWG. 1-2-3.
3. IF METER CHAMBER IS LOCATED NEAR STREET LINE, VALVE TO BE AT STREET LINE.
4. PROTECTUS METER SHALL BE USED FOR PRIVATE HYDRANTS ON A BULK METER SYSTEM.
5. ALL INTERNAL AND EXTERNAL VALVES, FITTINGS, THROUGH WALL METAL PIPING AND MECHANICAL RESTRAINTS TO BE c/w DENSO PASTE, DENSO MASTIC AND DENSO TAPE OR APPROVED EQUAL, APPLIED TO MANUFACTURER'S RECOMMENDATIONS.

Region of Peel *Working for you*	PUBLIC WORKS STANDARD DRAWING	REV. DATE: NOVEMBER 2011
		APPROVED BY: A.L. / DRAWN BY: AINLEY GROUP
100mm - 250mm PROTECTUS III METER IN CHAMBER		STD. DWG. NUMBER: 1-4-15 / SCALE: N.T.S.



*SEE STORMTECH DESIGN MANUAL

FOR STORMTECH INFORMATION CALL 1-888-892-2694

PROPOSED LAYOUT

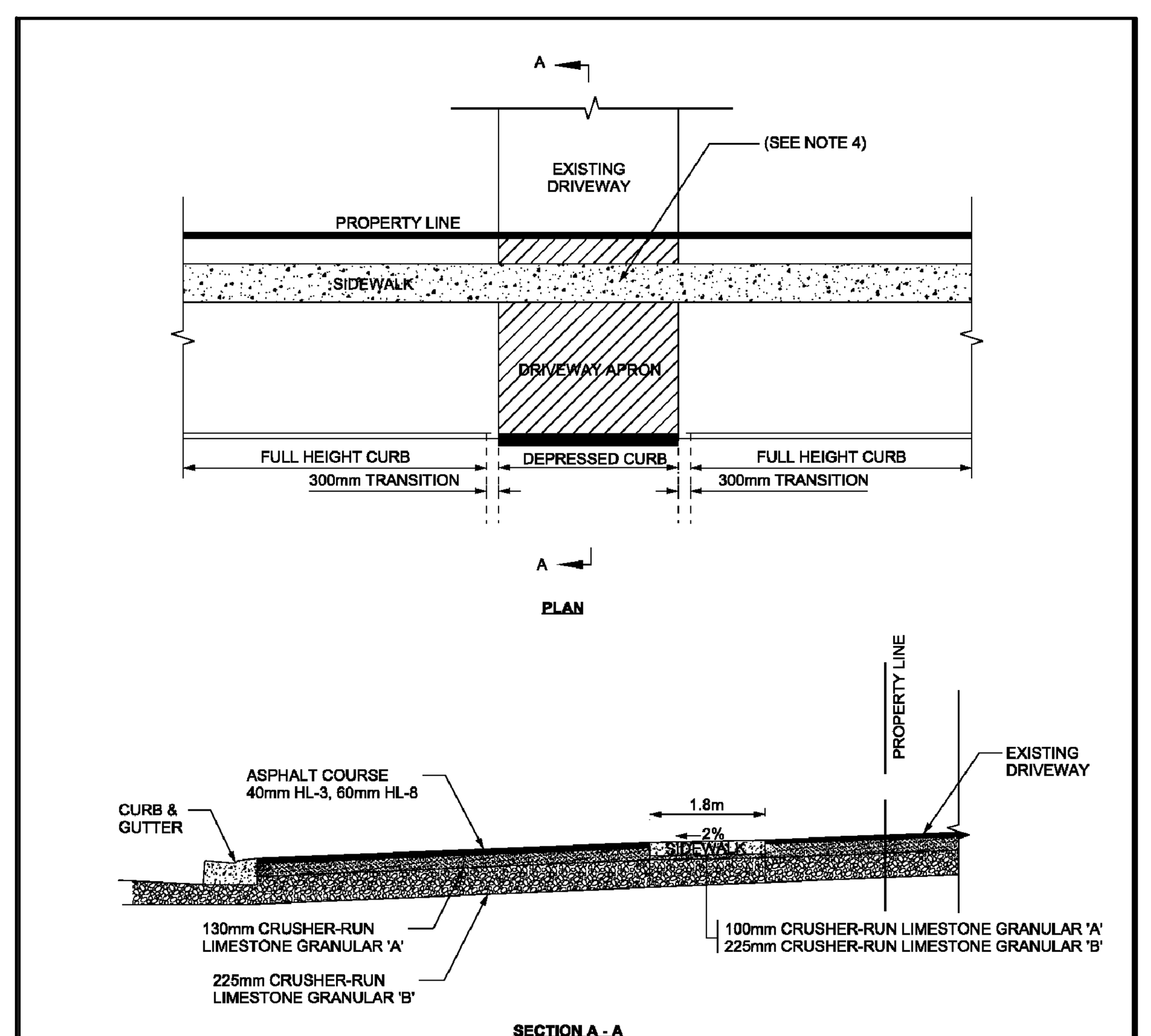
(49) STORMTECH SC-740 CHAMBERS
(14) STORMTECH SC-740 END CAPS
INSTALLED WITH 460 mm COVER STONE, 460 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME (PERIMETER STONE INCLUDED) = 146.58 m³

NOTE:
THIS CROSS SECTION DETAILS THE REQUIREMENTS NECESSARY TO SATISFY THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS USING STORMTECH CHAMBERS

STORMTECH STANDARD DETAIL DISCLAIMER

STORMTECH STANDARD DETAILS DEMONSTRATE RECOMMENDATIONS FOR INSTALLATION AND/OR STANDARD DIMENSIONS OF STORMTECH PRODUCTS. STORMTECH DETAILS DO NOT SUPERSEDE ANY STATE OR LOCAL REGULATORY SPECIFICATIONS. IT IS THE RESPONSIBILITY OF THE CONSULTING ENGINEER TO ENSURE COMPLIANCE WITH ALL REGULATORY SPECIFICATIONS. STORMTECH HAS NOT AUTHORIZED, AND IS NOT RESPONSIBLE FOR ANY ALTERATIONS BY OTHERS TO STORMTECH STANDARD DETAILS.

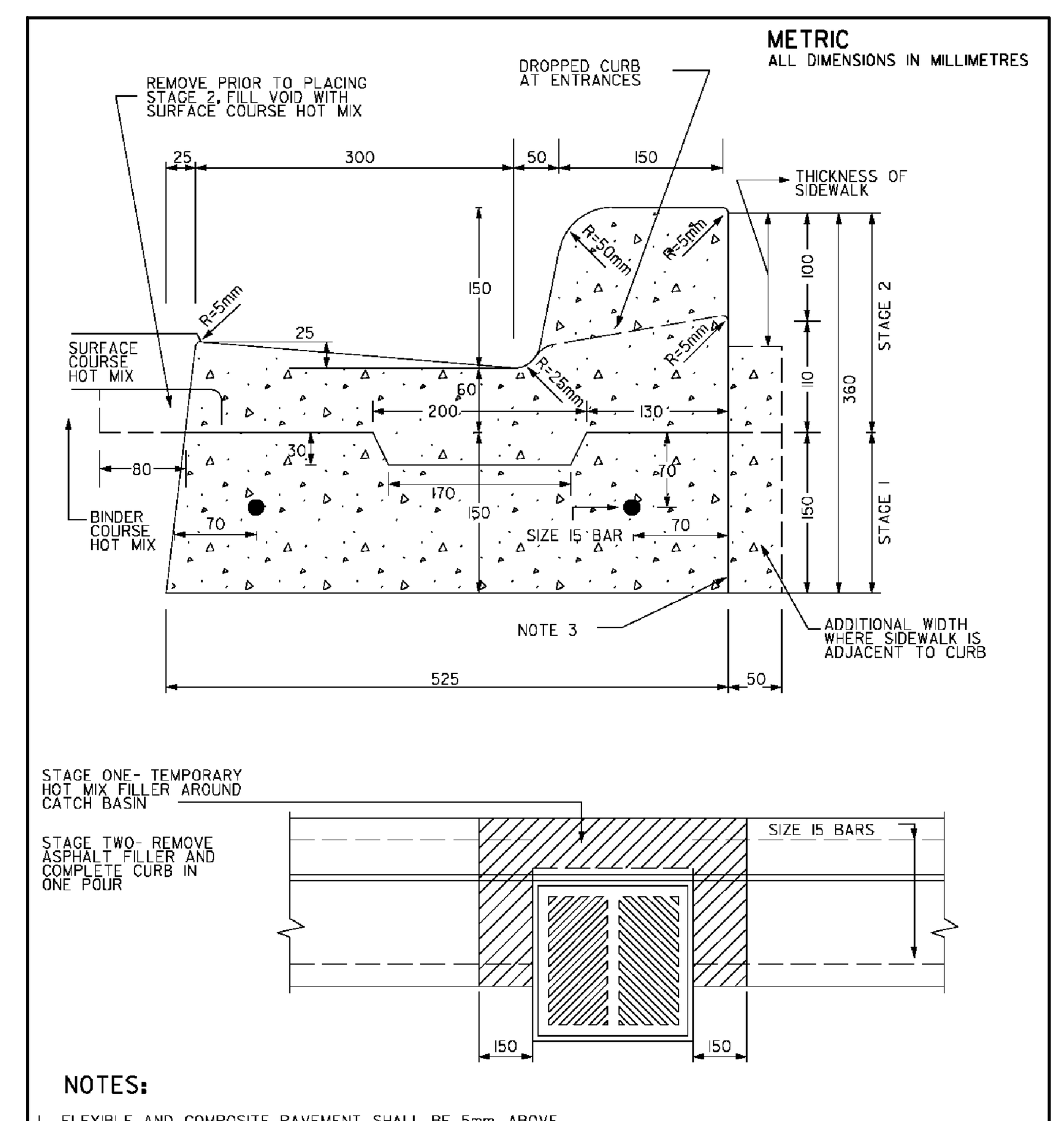
STORMTECH DETAILS PROVIDED ARE FOR REFERENCE ONLY. CONTRACTOR TO REFER TO STORMTECH DESIGN MANUALS OR CONTACT STORMTECH AT 1-888-892-2694 FOR PROPER INSTALATION OF STORMTECH CHAMBERS.



NOTES
1. ALL TOPSOIL AND SOD TO BE REMOVED FROM LIMITS OF PROPOSED DRIVEWAY
2. GRANULAR TO BE COMPACTED TO 100% S.P.D.
3. MAXIMUM DRIVEWAY GRADE: 6%
4. THICKNESS OF CONCRETE SIDEWALK AT DRIVEWAY SHALL BE 130mm AS REFERENCED ON 5-2-6

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.

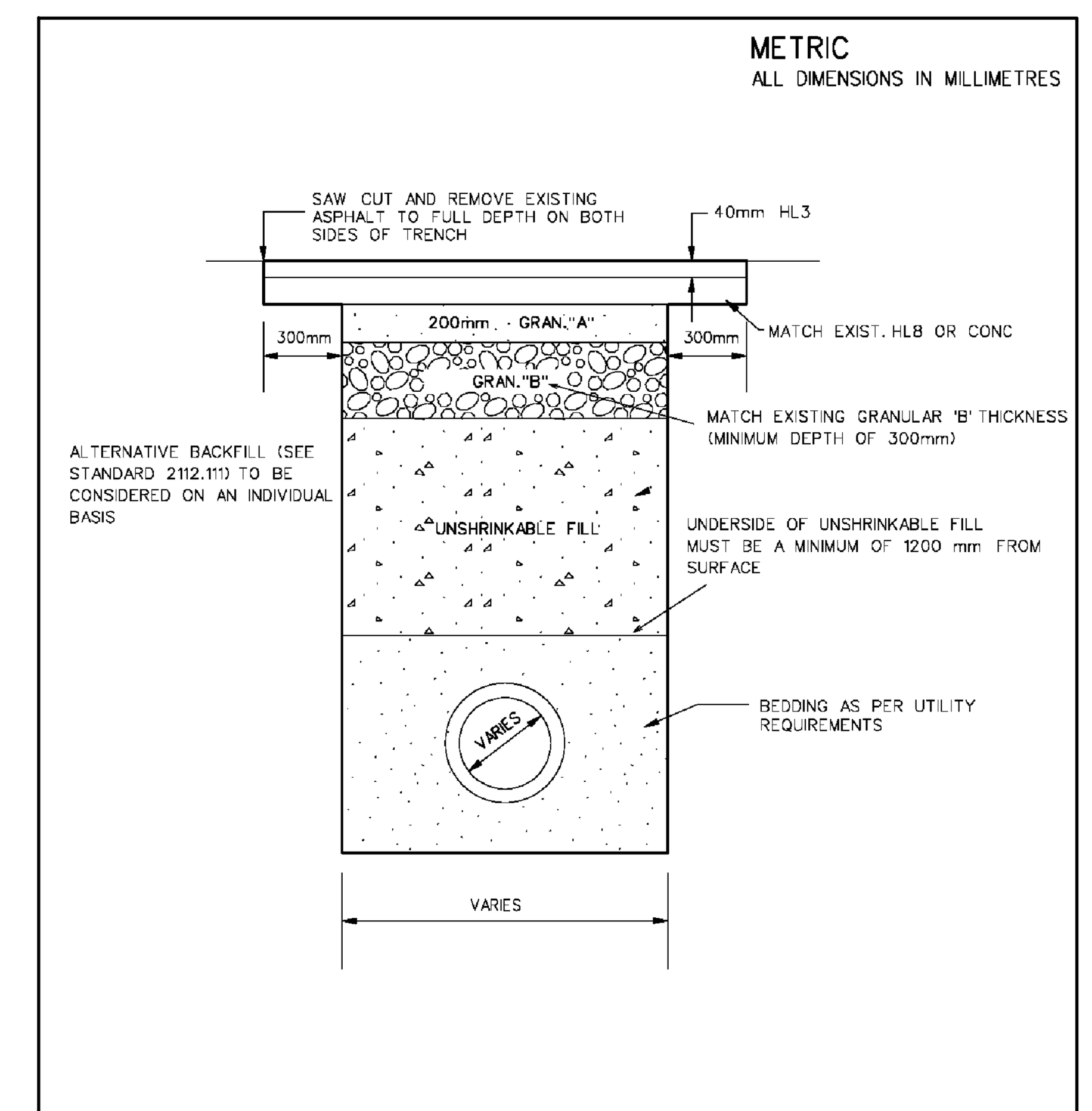
Region of Peel *Working for you*	PUBLIC WORKS STANDARD DRAWING	DATE: MARCH 2015
		APPROVED BY: G.K.B.L. / DRAWN BY: O.A.
RESIDENTIAL DRIVEWAY ENTRANCE WITHIN URBAN ROAD CROSS SECTION		STD. DWG. NUMBER: 5-1-9 / SCALE: N.T.S.



MISSISSAUGA *Transportation and Works*

STANDARD
CONCRETE BARRIER CURB WITH STANDARD GUTTER TWO STAGE CONSTRUCTION

EFF. DATE	2002-01-01	SCALE	N.T.S.
REV.		STANDARD No.	2230.010



NOTES
1. ALL GRANULAR MATERIALS SHALL BE COMPACTED TO 100% STANDARD PROCTOR DENSITY AT OPTIMUM WATER CONTENT
2. UNSHRINKABLE FILL TO EXTEND FROM TOP OF UTILITY BEDDING TO BOTTOM OF GRANULAR "B"
3. SEE NOTES ON STD. 2220.032 FOR ADDITIONAL DETAILS
4. GRANULAR "A" TO BE OPSS 1010 - 19mm CRUSHER RUN LIMESTONE
5. GRANULAR "B" TO BE OPSS 1010 - TYPE 2 50mm CRUSHER RUN LIMESTONE

MISSISSAUGA *Transportation and Works*

STANDARD
TRENCH RESTORATION FOR OPEN CUT UTILITY INSTALLATION UNDER ROADWAYS

EFF. DATE	2002-01-01	SCALE	N.T.S.
REV. 2	2002-11-04	STANDARD No.	2220.030

LOCATION PLAN
N.T.S.

LEGEND

LIST OF DRAWINGS
SG-01 - SITE GRADING PLAN
SS-01 - SITE SERVICING PLAN
EC-01 - EROSION AND SEDIMENT CONTROL PLAN - STAGE 1
DD-01 - DETAIL DRAWING

SITE PLAN INFORMATION
AJ TREGEBOV ARCHITECT
40 ST. CLAIR AVENUE EAST, SUITE 303
TORONTO, ONTARIO, M4T 1M9
PHONE: (647) 352-3350
E-MAIL: XXX@XXX

SURVEYOR INFORMATION
KRCMAR
1137 CENTRE STREET, SUITE 304
THORNHILL, ONTARIO, L4J 3M6
PHONE: (905) 738-0058
FAX: (905) 738-9221
E-MAIL: XXX@XXX

BENCHMARK INFORMATION:
ELEVATIONS ARE GEODETIC AND REFER TO THE CITY OF MISSISSAUGA VERTICAL BENCHMARK NO. 1050 HAVING AN ELEVATION OF 194.056m.

NO.	REVISION	DATE	BY
1	ISSUED FOR DISCUSSION	JUN 23, 2017	LMV

CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL

376 & 390 DERRY ROAD WEST
PART OF LOT 10, CONCESSION 1

DETAIL DRAWING

COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5

DESIGNED BY: LMV	DATE: MAY 2017	CHECKED BY:
DRAWN BY: ND	PROJECT No. UD16-0522	DRAWING No. DD-02
SCALE:		

APPENDIX F
Statement Of Limiting Conditions And Assumptions

Statement of Limiting Conditions and Assumptions

1. This Report/Study (the "Work") has been prepared at the request of, and for the exclusive use of, the Owner, and its affiliates (the "Intended Users"). No one other than the Intended Users has the right to use and rely on the Work without first obtaining the written authorization of Cole Engineering Group Ltd. (Cole Engineering) and its Owner.

2. Cole Engineering expressly excludes liability to any party except the Intended Users for any use of, and/or reliance upon, the Work.

3. Cole Engineering notes that the following assumptions were made in completing the Work:

   a) the land use description(s) supplied to us are correct;
   b) the surveys and data supplied to Cole Engineering by the Owner are accurate;
   c) market timing, approval delivery and secondary source information is within the control of Parties other than Cole Engineering; and
   d) there are no encroachments, leases, covenants, binding agreements, restrictions, pledges, charges, liens or special assessments outstanding, or encumbrances which would significantly affect the use or servicing.

   Investigations have not been carried out to verify these assumptions. Cole Engineering deems the sources of data and statistical information contained herein to be reliable, but we extend no guarantee of accuracy in these respects.

4. Cole Engineering accepts no responsibility for legal interpretations, questions of survey, opinion of title, hidden or inconspicuous conditions of the property, toxic wastes or contaminated materials, soil or sub-soil conditions, environmental, engineering or other factual and technical matters disclosed by the Owner, the Client, or any public agency, which by their nature, may change the outcome of the Work. Such factors, beyond the scope of this Work, could affect the findings, conclusions and opinions rendered in the Work. We have made disclosure of related potential problems that have come to our attention. Responsibility for diligence with respect to all matters of fact reported herein rests with the Intended Users.

5. Cole Engineering practices engineering in the general areas of infrastructure and transportation. It is not qualified to and is not providing legal or planning advice in this Work.

6. The legal description of the property and the area of the site were based upon surveys and data supplied to us by the Owner. The plans, photographs, and sketches contained in this report are included solely to aide in visualizing the location of the property, the configuration and boundaries of the site, and the relative position of the improvements on the said lands.

7. We have made investigations from secondary sources as documented in the Work, but we have not checked for compliance with by-laws, codes, agency and governmental regulations, etc., unless specifically noted in the Work.

8. Because conditions, including capacity, allocation, economic, social, and political factors change rapidly and, on occasion, without notice or warning, the findings of the Work expressed herein, are as of the date of the Work and cannot necessarily be relied upon as of any other date without subsequent advice from Cole Engineering.

9. The value of proposed improvements should be applied only with regard to the purpose and function of the Work, as outlined in the body of this Work. Any cost estimates set out in the Work are based on construction averages and subject to change.

10. Neither possession of the Work, nor a copy of it, carries the right of publication. All copyright in the Work is reserved to Cole Engineering. The Work shall not be disclosed, produced or reproduced, quoted from, or referred to, in whole or in part, or published in any manner, without the express written consent of Cole Engineering and the Owner.

11. The Work is only valid if it bears the professional engineer's seal and original signature of the author, and if considered in its entirety. Responsibility for unauthorized alteration to the Work is denied.