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2380 and 2396 Cléroux Crescent City of Ottawa

SITE SERVICING AND STORMWATER MANAGEMENT REPORT

Bridor Developments

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3	March 15, 2023	Final Report
4	June 5, 2023	Final Report
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6	November 20, 2023	Final Report
7	December 5, 2023	Final Report

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1 Introduction

Blanchard Letendre Engineering Ltd. (BL Engineering) was originally retained by Bridor Developments (Bridor) to complete site servicing and stormwater management (SWM) designs for the proposed site development located at 2380 and 2396 Cléroux Crescent in Ottawa. In January 2023, Tatham Engineering Limited (Tatham) was retained by Bridor to replace BL Engineering as the Engineer of Record for the project moving forward.

We note that the underground storage chambers that were previously proposed have been replaced with a dry SWM facility. A hydrologic model, Visual Otthymo Version 6.0 (VO6), has also been prepared to replace the rational method calculations previously submitted by BL Engineering, to further refine the SWM quantity control storage volume required. BL Engineering's latest Site Servicing and SWM Report, dated May 5, 2022, is provided in Appendix F for reference.

This report and detailed engineering drawings have been prepared based on the Site Plan prepared by P-Square Concepts and the site survey completed by Stantec Geomatics Ltd.



2 Site Plan

The site includes both 2380 and 2396 Cléroux Crescent in Ottawa and is bounded by Cléroux Crescent to the north, Orient Park Drive to the east, and developed residential properties to the south and west. As per the aerial photo (Figure 1) below, both lots within the existing 0.84 ha site consist of an existing residential dwelling, a stand-alone garage structure, and treed and grassed land. 2380 Cléroux Crescent has a paved driveway onto Cléroux Crescent, whereas 2396 Cléroux Crescent has paved driveways onto both Cléroux Crescent and Orient Park Drive. The existing dwellings and garage structures are proposed to be demolished prior to construction. The land will be developed with two new residential apartment buildings with underground and aboveground parking areas and shared entrances and drive aisles.

Figure 1: Existing Site Location



3 Stormwater Management

3.1 EXISTING SITE DRAINAGE CONDITIONS

In the existing condition, the majority of the site drains uncontrolled towards the southwest corner where runoff is captured by an existing catchbasin and conveyed south, within a municipal servicing easement, to an existing 375 mm diameter storm sewer on Orient Park Drive, via an existing 300 mm diameter storm sewer located (between 2488 and 2490 Orient Park Drive). The 300 mm diameter storm sewer is stubbed approximately 3 metres within the site. Refer to Drawing C400 for the existing condition site drainage plan.

3.2 EXISTING CONDITION HYDROLOGIC ANALYSIS

A Visual OTTHYMO hydrologic model (VO6) scenario was developed to quantify the existing condition peak flows from the site.

The drainage area delineation was determined based on the topographic survey, which was completed in July 2016. Existing condition land uses were established based on our review of online aerial photography and field reconnaissance.

A summary of all hydrologic parameters established for the existing condition hydrologic model has been included in Appendix A.

The geotechnical investigation report identified a layer of reddish-brown silty sand across the site ranging in thickness from approximately 0.3 m to 0.8 m overlying a deep deposit of silty clay. On this basis, a hydrologic soil group 'C' was selected for determining the hydrologic parameters and reflects the predominant silty clay soil underlying the development.

The peak flow for the 5-year storm event was calculated for the 3-hour Chicago, 6-hour Chicago and 24-hour SCS Type II design storms using IDF data derived from Meteorological Services of Canada (MSC) rainfall data taken from the MacDonald-Cartier Airport. Detailed calculations and Visual OTTHYMO modeling output are included in Appendix A with the results summarized below in Table 1.



Table 1: Existing Condition Peak Flow Summary

DESIGN STORM	DRAINAGE AREA 101 0.84 ha (m ³ /s)		
	3-hr CHI	6-hr CHI	24-hr SCS Type II
5-Year	0.045	0.051	0.070

3.3 PROPOSED STORMWATER MANAGEMENT PLAN

The proposed development will consist of two new 3-storey residential apartment buildings with above and underground parking and hard and softscape areas. Blocks A will consist of 40 units and a footprint of 1,192 m². Block B will consist of 41 units and a footprint of 1,184 m². One drive aisle, with access to Cléroux Crescent and Orient Park Drive, will be shared by both apartment buildings. Since the runoff coefficient will increase in the proposed condition, due to an increase in imperviousness, post-development stormwater quantity control will be implemented. Water quality control is also required.

The SWM design has been developed to follow the existing site topography. As the property naturally drains towards the southwest corner and the Orient Park Drive storm sewer, the proposed SWM plan will also outlet to the existing storm sewer system on Orient Park Drive via the existing 300 mm diameter storm sewer stub. The emergency overland flow route has been designed to convey emergency flows eastward into the Orient Park Drive right of way via the proposed southeast site entrance.

Runoff generated within the proposed development will be directed to and captured by a series of on-site drainage structures and will be conveyed to a private dry SWM facility capable of providing adequate SWM quantity control of runoff, prior to being conveyed to an oil grit separator capable of providing adequate SWM quality control of runoff and discharging to the existing storm sewer on Orient Park Drive. The post-development drainage areas have been delineated according to the proposed grading plan. In order to attenuate post-development peak flow rates to the allowable release rate, runoff will be controlled by an orifice plate flow control installed in DICBMH4 immediately upstream of the OGS, which will restrict the flow rate that is discharged into the municipal storm sewer on Orient Park Drive. By restricting flow, onsite stormwater detention will be provided within the dry SWM facility. The combined controlled and uncontrolled post-development peak flow rate from the site during the 100-year storm event will be reduced to the allowable 5-year pre-development peak flow rate. The proposed SWM facility and OGS are described in further detail in the following sections.



3.4 WATER QUANTITY CONTROL

3.4.1 Dry SWM Facility and Control Structure

Water quantity control for the site will be provided in a proposed dry SWM facility. Under the proposed condition, 0.71 ha (including the area of the facility) with a combined imperviousness of 66% will drain to the dry SWM facility. The maximum active storage volume provided is 272 m³ at an active storage depth of 0.85 m. The active storage volume provided is sufficient to attenuate the post-development peak flow rate from the 100-year storm event to the allowable 5-year pre-development peak flow rate.

The dry SWM facility will be fitted with multiple outlet controls which are summarized as follows:

- A storm pond control maintenance hole equipped with a ditch inlet frame and grate (DICBMH4) to protect the orifice control and outlet pipe from damage and to prevent blockages;
- An 80 mm diameter orifice flow control discharging into a 250 mm storm outlet pipe;
- An emergency spillout elevation of 80.45 m located at the southeast site entrance to safely direct emergency storm flows from the dry SWM facility, to Orient Park Drive in case of a storm exceeding the 100-year design storm or in case of a blockage; and
- A minimum 0.3 m of freeboard measured from the top of the active 100-year dry pond storage and the emergency spillout elevation.

The proposed dry SWM facility configuration, outlet structure and emergency spillout are illustrated on Drawing C200 included at the back of this report.

3.4.2 Proposed Condition Hydrologic Analysis

A VO6 model scenario was developed to quantify the proposed condition peak flow from the site. The peak flow for the 100-year storm event was calculated for the 3-hour Chicago, 6-hour Chicago, and 24-hour SCS Type II design storms using the previously described IDF data.

The drainage area delineation for the contributing lands was completed utilizing the available topographic information combined with the proposed site grading illustrated on Drawing C200. Proposed surface cover and existing soil type were used to establish curve numbers and other hydrologic parameters used in the hydrologic model. Summaries of all hydrologic parameters and stage-storage-discharge tables established for the post development hydrologic model, have been included in Appendix A.

The time to peak values for the individual drainage areas were calculated using either the Bransby Williams and Airport Methods for runoff coefficient “C” values greater than and less than 0.4, respectively.



Peak runoff rates as well as the SWM facility operating characteristics are shown in the tables below and the results of the modelling are included in Appendix A.

Table 2: Proposed Condition Peak Flow Summary

DESIGN STORM	DRAINAGE AREAS 201 AND 202 CONTROLLED 0.70 ha (m ³ /s)			DRAINAGE AREAS 203 AND 204 UNCONTROLLED 0.14 ha (m ³ /s)			TOTAL SITE AREA CONTROLLED + UNCONTROLLED 0.84 ha (m ³ /s)		
	3-hr CHI	6-hr CHI	24-hr SCS TYPE II	3-hr CHI	6-hr CHI	24-hr SCS TYPE II	3-hr CHI	6-hr CHI	24-hr SCS TYPE II
5-Year	0.021	0.021	0.021	0.0109	0.011	0.011	0.028	0.032	0.032
100-Year	0.023	0.023	0.023	0.017	0.019	0.025	0.039 (0.045)	0.041 (0.051)	0.047 (0.070)

Notes: - (0.100) refers to existing condition 5-year peak flow rate.

Table 3: Proposed Dry SWM Facility Operating Characteristics

DESIGN STORM	SWM FACILITY DISCHARGE (m ³ /s)			SWM FACILITY STORAGE (m ³)			SWM FACILITY WATER LEVEL (m)		
	3-hr CHI	6-hr CHI	24-hr SCS TYPE II	3-hr CHI	6-hr CHI	24-hr SCS TYPE II	3-hr CHI	6-hr CHI	24-hr SCS TYPE II
5-Year	0.021	0.021	0.021	113	105	105	79.89	79.86	79.86
100-Year	0.023	0.023	0.023	252	258	247	80.25	80.27	80.24

A comparison of the existing and proposed condition peak flow summaries confirms the proposed dry SWM facility will attenuate the post-development peak flow rate from the 100-year storm event to the allowable 5-year pre-development peak flow rate.

3.4.3 Roof Drainage

Each proposed building structure consists of a pitched roof. Roof runoff will outlet to the surface via a series of downspouts and will be directed to the internal storm system and controlled by the orifice plate in DICBMH4.



3.4.4 Ramp Drainage

Runoff from the underground parking ramps will be captured by trench drains located on the outside of each garage door and at the bottom of each ramp and conveyed to an internal storm sewer that is directly connected to the storm outlet from the site.

3.4.5 Foundation Drainage

Water collected by the building foundation drains will be pumped to the internal storm sewers and routed through the dry LID SWM facility. Based on our review of the geotechnical report and considering the impacts of constructing deep services and the dry LID SWM facility within the site, which will lower the local groundwater elevation, negligible flows from the foundation drain are expected and will not impact the design of either the internal storm sewers or the dry LID SWM facility.

3.5 WATER QUALITY CONTROL

The proposed water quality treatment objective under the proposed condition is to provide MECP enhanced level treatment including 80% TSS removal from on-site runoff.

Water quality control for the development will be provided by a Stormceptor Model EFO4 OGS located immediately downstream of control structure DICBMH4. The unit has been sized to treat a minimum of 90% of annual runoff and provide 80% TSS removal based on a fine particle size distribution. The specified Stormceptor Model EFO4 will provide 84% TSS removal from the contributing drainage areas.

The Stormceptor EFO Sizing Report is included in Appendix A. The above confirms the SWM plan for the site exceeds the City's and the MECP's requirements for enhanced level water quality protection.



4 Sanitary Sewer Design

4.1 EXISTING SITE CONDITION

Both existing lots within the site are serviced by separate 135mm diameter sanitary services which are connected to the existing 250mm diameter concrete sanitary sewer on Cléroux Crescent. The existing services will be abandoned, grouted, and capped at the property line.

4.2 PROPOSED SANITARY SERVICE

The new residential apartment buildings, which include 40 units in Block A and 41 units in Block B, will each discharge to a 150 mm diameter sanitary service connected to a 200 mm diameter PVC sanitary sewer and discharging to the existing municipal sanitary sewer on Orient Park Drive via the 250 mm diameter sanitary sewer stub located along the south property limit. The proposed building services and sanitary sewer will have a minimum slope of 1.0% for adequate self flushing. A monitoring manhole (SAN MH2) is proposed at the existing 250 mm stub to provide a connection between the new 200 mm service and the existing 250 mm diameter sewer. Refer to drawing C300 - Site Servicing Plan for the proposed sanitary servicing details.

Based on the City of Ottawa Sanitary Design Guidelines, the sanitary peak flows were evaluated as follows; Block A: 1.01 L/s and Block B: 1.02 L/s. As per the City specific design parameters, the sanitary flow was evaluated based on the new building footprint and the total site area for each individual building. The proposed sanitary services were sized to convey the above peak flows and the proposed sanitary sewer was sized to convey the total combined peak flow of 2.02 L/s from both buildings. Refer to Appendix B for the sanitary sewer design calculation and design parameters set by the City of Ottawa.



5 Water Supply and Fire Protection

5.1 EXISTING SITE CONDITION

Both existing lots located within the site are serviced by separate 19 mm diameter water services which are connected to the existing 305 mm diameter ductile iron watermain on Cléroux Crescent. The existing services will be abandoned and blanked at the main.

There are five municipal fire hydrants within 150 m of the site, on Innes Road, Cléroux Crescent, and Orient Park Drive, which can be used for fire protection for the proposed development. The contributions of the existing nearby fire hydrants toward the proposed development's required fire flow are described in further detail in the sections below.

5.2 DOMESTIC WATER DEMANDS

The domestic water demands for the proposed development were calculated based on the City of Ottawa Design Guidelines. An average water demand of 280 L/c/d was utilized and daily and hourly peaking factors of 2.5 and 2.2 respectively were applied. The water demands for the proposed buildings are summarized in Table 4.

Table 4: Domestic Water Demands

	BLOCK A	BLOCK B	UNITS
Average Water Demand	19,012	19,600	L/d
Maximum Daily	47,530	49,000	L/d
Maximum Hourly	104,566	107,800	L/d

Refer to Appendix C for the water demand calculations.

5.3 PROPOSED DOMESTIC WATER SERVICES

Each new building will be serviced by a separate water connection as was suggested by City reviewers. Both services will be connected to the existing 305 mm diameter ductile iron watermain on Cléroux Crescent. Refer to Drawing C300 – Site Servicing Plan for the proposed water service details.

The Fixture Method from Section 7 of the OBC and a fixture count of 471.5 (worst case scenario from Block B) were used to size the new water services. Assuming all fixtures are being used at the same time, the required water service capacity is 7.53 L/s. As such, a 100 mm diameter PVC



DR-18 water service is proposed for each building and shall be confirmed by the mechanical engineer at the building permit phase. The above service capacity does not include allowances for fire fighting, irrigation, etc. Refer to Appendix C for the required water service capacity and sizing calculations.

5.4 FIRE PROTECTION

The required fire flow rate was calculated in accordance with the 2020 Fire Underwriters Survey (FUS). This method is based on the type of building construction and the floor area of the building to be protected while accounting for reductions and surcharges related to combustibility of contents and the presence of a sprinkler system as well as building exposure of surrounding structures. The required fire flow rate is 10,000 L/min for either of the proposed buildings. Refer to Appendix C for the fire flow calculations.

Each building is located within 90 m of a hydrant and therefore are compliant with OBC requirements. Fire flow protection will be provided by the following four existing hydrants, which are within 150 m (uninterrupted path) of the proposed buildings:

- One Class AA blue bonnet hydrant located 25 m from each proposed building (25 m east of Block A and 25 m north of Block B) on the south side of Cléroux Crescent;
- One Class AA blue bonnet hydrant located no further than 120 m from the proposed buildings (74 m northwest of Block A and 120 m northwest of Block B) on the south side of Innes Road;
- One Class AA blue bonnet hydrant located no further than 135 m from the proposed buildings (135 m southeast of Block A and 70 m southeast of Block B) on the south side of Cléroux Crescent; and
- One Class AA blue bonnet hydrant located no further than 140 m from the proposed buildings (140 m east of Block A and 95 m east of Block B) on the south side of Orient Park Drive.

All fire hydrant bonnets are color coded to indicate the available flow at a residual pressure of 150 kPa (20 psi), in accordance with the NFPA 291 Fire Flow Testing and Marking of Hydrants Code. The four existing hydrants near the site consist of blue bonnet hydrants, and as such are Class AA-rated hydrants. As is summarized in Table 5, the required 10,000 L/min fire flow to either of the proposed buildings is available from the four existing hydrants.



Table 5: Hydrants Required for Fire Flow

HYDRANT CLASS	DISTANCE TO BUILDING (m) ¹	CONTRIBUTION TO REQUIRED FIRE FLOW (L/min)	NUMBER OF USABLE NEARBY HYDRANTS	MAXIMUM FLOW TO BE CONSIDERED (L/min)	CUMULATIVE MAXIMUM FLOW TO BE CONSIDERED (L/min)
AA	≤ 75	5,700	1	5,700	17,100
AA	> 75 & ≤ 150	3,800	3	11,400	

Notes: 1. Distance of contributing hydrant from the structure, measured in accordance with NFPA 1.

A hydrant flow test is recommended to verify the available fire flow, pressure, and overall fire protection.



6 Erosion and Sediment Control

During construction, sediment and erosion controls will be implemented around the site to reduce the potential for any sediment mobilizing off site. The construction and maintenance of erosion and sediment controls must comply with the Ontario Provision Standard Specification OPSS 577. Refer to Drawing C100 - Erosion and Sediment Control for additional details.



7 Summary

7.1 STORMWATER MANAGEMENT

The stormwater management design for the site will reduce the 100-year post-development peak flow to the allowable 5-year pre-development peak flow rate, thereby meeting the City's requirements. The post-development release rate from the controlled portion of the site will be restricted by an orifice plate flow control located in DICBMH4. The combined 100-year post-development controlled, and uncontrolled peak flow will be reduced below the allowable 5-year pre-development peak flow rate prior to discharging into to the existing municipal storm sewer system on Orient Park Drive via the existing 300 mm diameter storm sewer (located within the municipal easement which extents from the site's south property limit to Orient Park Drive). Stormwater quantity control will be achieved with 272 m³ of active surface storage in the dry SWM facility. MECP enhanced level stormwater quality control will be provided with a Stormceptor Model EFO4 OGS located immediately downstream of control structure DICBMH4.

7.2 SANITARY SERVICE

The estimated combined sanitary flow for the site is 2.02 L/s. The proposed development will be serviced via new 150 mm diameter sanitary building services and a 200 mm diameter sanitary sewer connecting to the existing municipal sanitary sewer system on Orient Park Drive via the existing 250 mm diameter sanitary sewer (located within the municipal easement which extents from the site's south property limit to Orient Park Drive).

7.3 WATER SERVICE

Each new building will be serviced with a new 100 mm diameter PVC DR-18 water service connected to the existing 305 mm diameter ductile iron watermain on Cléroux Crescent. The Block A water demands resulted in an average water demand of 19,012 L/d, a maximum daily demand of 47,530 L/d, and a peak hourly demand of 104,566 L/d. The Block B water demands resulted in an average water demand of 19,600 L/d, a maximum daily demand of 49,000 L/d, and a peak hourly demand of 107,800 L/d. The required fire flow rate is 10,000 L/min. A sprinkler system is not proposed in either of the new buildings. There are four fire hydrants surrounding the site that will provide adequate fire protection.



Appendix A: Stormwater Management Calculations

Visual OTTHYMO Model Parameter Calculations (NasHYD)

Project Details

Project Number	523650
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Data Sources

Detailed Soil Survey Reports for Ontario, MTO Drainage Management Manual (1997)

Prepared By

Name	HY
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Pre-Development Condition

Watershed:	N/A
Catchment ID:	101
Catchment Area (ha):	0.84
Impervious %:	13%

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

Soil Symbol	C												
Soil Series	Clay												
Hydrologic Soils Group	C												
Soil Texture	Clay												
Runoff Coefficient Type	3												
Area (ha)	0.84												
Percentage of Catchment	100%												
Land Cover Category	IA	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C
Impervious	2	0.11	98	0.95									
Gravel	3		89	0.44									
Woodland	10		73	0.42									
Pasture/Lawns	5	0.73	79	0.45									
Meadows	8		76	0.44									
Cultivated	7		82	0.60									
Waterbody	12		50	0.05									
Average CN	81.49												
Average C	0.52												
Average IA	4.61												

Time to Peak Calculations

Max. Catchment Elev. (m):	83.60
Min. Catchment Elev. (m):	76.80
Catchment Length (m):	108
Catchment Slope (%):	6.30%
Method:	Bransby-Williams Formula
Time of Concentration (mins):	4.34

Summary

Catchment CN:	81.5
Catchment C:	0.52
Catchment IA (mm):	4.61
Time of Concentration (hrs):	0.07
Catchment Time to Peak (hrs):	0.05
Catchment Time Step (mins):	0.58

Visual OTTHYMO Model Parameter Calculations (NasHYD)

Project Details

Project Number	523650
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Data Sources

Detailed Soil Survey Reports for Ontario, MTO Drainage Management Manual (1997)

Prepared By

Name	HY
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Pre-Development Condition

Watershed:	N/A
Catchment ID:	201
Catchment Area (ha):	0.64
Impervious %:	70%

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

Soil Symbol	C												
Soil Series	Clay												
Hydrologic Soils Group	C												
Soil Texture	Clay												
Runoff Coefficient Type	3												
Area (ha)	0.63												
Percentage of Catchment	98%												
Land Cover Category	IA	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C
Impervious	2	0.44	98	0.95									
Gravel	3		89	0.38									
Woodland	10		73	0.35									
Pasture/Lawns	5	0.20	79	0.40									
Meadows	8		76	0.38									
Cultivated	7		82	0.55									
Waterbody	12		50	0.05									
Average CN	93.52												
Average C	0.79												
Average IA	2.98												

Time to Peak Calculations

Max. Catchment Elev. (m):	83.60
Min. Catchment Elev. (m):	81.00
Catchment Length (m):	80
Catchment Slope (%):	3.25%
Method:	Bransby-Williams Formula
Time of Concentration (mins):	3.77

Summary

Catchment CN:	92.1
Catchment C:	0.78
Catchment IA (mm):	2.94
Time of Concentration (hrs):	0.06
Catchment Time to Peak (hrs):	0.04
Catchment Time Step (mins):	0.50

Visual OTTHYMO Model Parameter Calculations (NasHYD)

Project Details

Project Number	523650
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Data Sources

Detailed Soil Survey Reports for Ontario, MTO Drainage Management Manual (1997)

Prepared By

Name	HY
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Pre-Development Condition

Watershed:	N/A
Catchment ID:	202
Catchment Area (ha):	0.07
Impervious %:	38%

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

Soil Symbol	C												
Soil Series	Clay												
Hydrologic Soils Group	C												
Soil Texture	Clay												
Runoff Coefficient Type	3												
Area (ha)	0.08												
Percentage of Catchment	114%												
Land Cover Category	IA	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C
Impervious	2	0.03	98	0.95									
Gravel	3		89	0.38									
Woodland	10		73	0.35									
Pasture/Lawns	5	0.05	79	0.40									
Meadows	8		76	0.38									
Cultivated	7		82	0.55									
Waterbody	12		50	0.05									
Average CN	86.13												
Average C	0.61												
Average IA	3.88												

Time to Peak Calculations

Max. Catchment Elev. (m):	83.20
Min. Catchment Elev. (m):	81.20
Catchment Length (m):	75
Catchment Slope (%):	2.67%
Method:	Bransby-Williams Formula
Time of Concentration (mins):	4.58

Summary

Catchment CN:	98.4
Catchment C:	0.69
Catchment IA (mm):	4.43
Time of Concentration (hrs):	0.08
Catchment Time to Peak (hrs):	0.05
Catchment Time Step (mins):	0.61

Visual OTTHYMO Model Parameter Calculations (NasHYD)

Project Details

Project Number	523650
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Data Sources

Detailed Soil Survey Reports for Ontario, MTO Drainage Management Manual (1997)

Prepared By

Name	HY
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Pre-Development Condition

Watershed:	N/A
Catchment ID:	203
Catchment Area (ha):	0.12
Impervious %:	

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

Soil Symbol	C												
Soil Series	Clay												
Hydrologic Soils Group	C												
Soil Texture	Clay												
Runoff Coefficient Type	3												
Area (ha)	0.12												
Percentage of Catchment	100%												
Land Cover Category	IA	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C
Impervious	2		98	0.95									
Gravel	3		89	0.44									
Woodland	10		73	0.42									
Pasture/Lawns	5	0.12	79	0.45									
Meadows	8		76	0.44									
Cultivated	7		82	0.60									
Waterbody	12		50	0.05									
Average CN	79.00												
Average C	0.45												
Average IA	5.00												

Time to Peak Calculations

Max. Catchment Elev. (m):	81.60
Min. Catchment Elev. (m):	76.90
Catchment Length (m):	48
Catchment Slope (%):	9.79%
Method:	Bransby-Williams Formula
Time of Concentration (mins):	2.14

Summary

Catchment CN:	79.0
Catchment C:	0.45
Catchment IA (mm):	5.00
Time of Concentration (hrs):	0.04
Catchment Time to Peak (hrs):	0.02
Catchment Time Step (mins):	0.29

Visual OTTHYMO Model Parameter Calculations (NasHYD)

Project Details

Project Number	523650
----------------	--------

Data Sources

Detailed Soil Survey Reports for Ontario, MTO Drainage Management Manual (1997)

Prepared By

Name	HY
------	----

Pre-Development Condition

Watershed:	N/A
Catchment ID:	204
Catchment Area (ha):	0.01
Impervious %:	100%

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

Soil Symbol	C												
Soil Series	Clay												
Hydrologic Soils Group	C												
Soil Texture	Clay												
Runoff Coefficient Type	3												
Area (ha)	0.01												
Percentage of Catchment	100%												
Land Cover Category	IA	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C
Impervious	2	0.01	98	0.95									
Gravel	3		89	0.54									
Woodland	10		73	0.52									
Pasture/Lawns	5		79	0.55									
Meadows	8		76	0.54									
Cultivated	7		82	0.70									
Waterbody	12		50	0.05									
Average CN	98.00												
Average C	0.95												
Average IA	2.00												

Time to Peak Calculations

Max. Catchment Elev. (m):	82.30
Min. Catchment Elev. (m):	79.85
Catchment Length (m):	18
Catchment Slope (%):	13.61%
Method:	Bransby-Williams Formula
Time of Concentration (mins):	0.96

Summary

Catchment CN:	98.0
Catchment C:	0.95
Catchment IA (mm):	2.00
Time of Concentration (hrs):	0.02
Catchment Time to Peak (hrs):	0.01
Catchment Time Step (mins):	0.13



Project :	2380 & 2396 CLÉROUX CRES
File No.	523650
Date:	Jan-23
Designed By:	HY
Checked By:	GC
Subject:	Dry SWM Facility

Modified CN* Calculation

Catchment 101		
100-yr 24hr Rainfall Depth:	111.9	mm
CN (AMC II):	81.5	
CN (AMC III):	91.0	
S:	25.1	
IA:	4.6	
IA*:	5.0	
Q:	86.6	
S*:	25.7	
CN3*:	90.8	
CN2*:	81.1	

Catchment 201		
100-yr 24hr Rainfall Depth:	111.9	mm
CN (AMC II):	92.1	
CN (AMC III):	96.4	
S:	9.5	
IA:	2.9	
IA*:	1.9	
Q:	101.2	
S*:	8.3	
CN3*:	96.8	
CN2*:	93.0	

Catchment 202		
100-yr 24hr Rainfall Depth:	111.9	mm
CN (AMC II):	98.4	
CN (AMC III):	99.3	
S:	1.8	
IA:	4.4	
IA*:	0.4	
Q:	109.8	
S*:	-2.3	
CN3*:	100.9	
CN2*:	102.1	

Catchment 203		
100-yr 24hr Rainfall Depth:	111.9	mm
CN (AMC II):	79.0	
CN (AMC III):	89.6	
S:	29.4	
IA:	5.0	
IA*:	4.4	
Q:	84.4	
S*:	28.4	
CN3*:	89.9	
CN2*:	79.5	

Catchment 204		
100-yr 24hr Rainfall Depth:	111.9	mm
CN (AMC II):	98.0	
CN (AMC III):	99.1	
S:	2.3	
IA:	2.0	
IA*:	0.5	
Q:	109.2	
S*:	0.7	
CN3*:	99.7	
CN2*:	99.4	



Project :	2380 & 2396 CLÉROUX CRES
File No.	523650
Date:	Jan-23
Designed By:	HY
Checked By:	GC
Subject:	Dry SWM Facility Discharge Table

OUTLET CONTROL

Orifice Control

	Orifice	Pipe
Orifice Size (mm):	80	250
Cross-Sectional Area (sq.m):	0.005027	0.049087
Orifice Coefficient:	0.61	0.80
Invert Elevation (m):	77.40	77.40
Outlet Pipe Size (mm):	250	250

STAGE DISCHARGE TABLE & CONTROL STRUCTURE CONFIGURATION

Water Level	80 mm dia. Orifice		250 PVC	Total Discharge	Active Storage
	Head	Discharge	Capacity		
(m)	(m)	(cms)	(cms)	(cms)	(cm)
79.45	2.01	0.019	0.090	0.019	0.0
79.50	2.06	0.019	0.090	0.019	10.5
79.55	2.11	0.020	0.090	0.020	21.6
79.60	2.16	0.020	0.090	0.020	33.3
79.65	2.21	0.020	0.090	0.020	45.6
79.70	2.26	0.020	0.090	0.020	58.6
79.75	2.31	0.021	0.090	0.021	72.3
79.80	2.36	0.021	0.090	0.021	86.7
79.85	2.41	0.021	0.090	0.021	101.8
79.90	2.46	0.021	0.090	0.021	117.6
79.95	2.51	0.022	0.090	0.022	134.2
80.00	2.56	0.022	0.090	0.022	151.5
80.05	2.61	0.022	0.090	0.022	169.6
80.10	2.66	0.022	0.090	0.022	188.5
80.15	2.71	0.022	0.090	0.022	208.2
80.20	2.76	0.023	0.090	0.023	228.7
80.25	2.81	0.023	0.090	0.023	250.1
80.30	2.86	0.023	0.090	0.023	272.4
80.35	2.91	0.023	0.090	0.023	295.5
80.40	2.96	0.023	0.090	0.023	319.5
80.45	3.01	0.024	0.090	0.024	344.4
80.50	3.06	0.024	0.090	0.024	370.3
80.55	3.11	0.024	0.090	0.024	397.1
80.60	3.16	0.024	0.090	0.024	424.9

Proposed Condition (Controlled area)

Design Storm	Dry SWM Facility Operating Characteristics		
	Storage (m ³)	Total Outflow (m ³ /s)	Water Level (m)
5yr 24hr SCS	105	0.021	79.86
5yr 3hr Chicago	113	0.021	79.89
5yr 6hr Chicago	105	0.021	79.86
100yr 24hr SCS	247	0.023	80.24
100yr 3hr Chicago	252	0.023	80.25
100yr 6hr Chicago	258	0.023	80.27



Project :	2380 & 2396 CLÉROUX CRES
File No.	523650
Date:	Jan-23
Designed By:	HY
Checked By:	GC
Subject:	Dry SWM Facility

Dry SWM Facility

Elevation	Depth	Increasing Area	Accum Area	Volume	Quality Volume	Quantity Volume
(m)	(m)	(m ²)	(m ²)	(m ³)	(m ³)	(m ³)
79.45	0.00	0.00	203.65	0.00	0.00	0.00
79.50	0.05	11.97	215.62	10.48	0.00	10.48
79.55	0.10	12.31	227.93	11.09	0.00	21.57
79.60	0.15	12.65	240.59	11.71	0.00	33.28
79.65	0.20	13.00	253.58	12.35	0.00	45.63
79.70	0.25	13.34	266.92	13.01	0.00	58.64
79.75	0.30	13.68	280.60	13.69	0.00	72.33
79.80	0.35	14.02	294.63	14.38	0.00	86.71
79.85	0.40	14.36	308.99	15.09	0.00	101.80
79.90	0.45	14.71	323.69	15.82	0.00	117.61
79.95	0.50	15.05	338.74	16.56	0.00	134.17
80.00	0.55	15.39	354.13	17.32	0.00	151.49
80.05	0.60	15.73	369.86	18.10	0.00	169.59
80.10	0.65	16.07	385.94	18.89	0.00	188.49
80.15	0.70	16.42	402.35	19.71	0.00	208.19
80.20	0.75	16.76	419.11	20.54	0.00	228.73
80.25	0.80	17.10	436.21	21.38	0.00	250.11
80.30	0.85	17.44	453.65	22.24	0.00	272.35
80.35	0.90	17.78	471.43	23.13	0.00	295.48
80.40	0.95	18.12	489.55	24.02	0.00	319.50
80.45	1.00	18.47	508.02	24.94	0.00	344.44
80.50	1.05	18.81	526.83	25.87	0.00	370.31
80.55	1.10	19.15	545.98	26.82	0.00	397.13
80.60	1.15	19.49	565.47	27.78	0.00	424.91



Project: 2380 & 2396 CLÉROUX CRES	Date: Mar-23
File No.: 523650	Designed: HY
Subject: Swale Capacity Calcs.	Checked GC

West Swale Capacity for Drainage Area 201

Swale Characteristics

Design Storms
100 year flow (m ³ /s)
0.240

<u>Channel Depth</u>	<u>Channel Type</u>	<u>Manning's N</u>	<u>Base Width</u>	<u>Side Slopes</u>	<u>Min. Slope</u>	<u>Total Area</u>	<u>Area Contributing</u>
0.30 m	Grass Ditch	0.035	0.00 m	3H : 1V	2.50%	0.620	0.080

Storm Conditions		Swale Flow Conditions					
Return Period	Peak Flow (m ³ /s)	Flow Depth	Area (m ²)	WP	R	Q (m ³ /s)	V (m/s)
100-year storm	0.052	0.150	0.07	0.95	0.07	0.052	0.78
Comments:		Therefore the proposed swale has sufficient capacity to safely convey the 100-year storm.					



Project: 2380 & 2396 CLÉROUX CRES	Date: Mar-23
File No.: 523650	Designed: HY
Subject: Swale Capacity Calcs.	Checked GC

East Swale Capacity for Drainage Area 202

Swale Characteristics

Design Storms
100 year flow (m ³ /s)
0.025

<u>Channel Depth</u>	<u>Channel Type</u>	<u>Manning's N</u>	<u>Base Width</u>	<u>Side Slopes</u>	<u>Min. Slope</u>	<u>Total Area</u>	<u>Area Contributing</u>
0.30 m	Grass Ditch	0.035	0.00 m	3H : 1V	3.50%	0.080	0.040

Storm Conditions		Swale Flow Conditions					
Return Period	Peak Flow (m ³ /s)	Flow Depth	Area (m ²)	WP	R	Q (m ³ /s)	V (m/s)
100-year storm	0.015	0.100	0.03	0.63	0.05	0.021	0.70

Comments: Therefore the proposed swale has sufficient capacity to safely convey the 100-year storm.



File No. 523650
 Project: Proposed Apartment Buildings
 Project Address: 2380 & 2396 CLÉROUX CRES
 Client: Bridor Development

Date: January 23, 2023
 Designed: HY
 Checked: GC
 Drawing Reference: STM-1

**STORM WATER MANAGEMENT DESIGN SHEET
 SEWER DESIGN**

LOCATION			AREA (ha)			FLOW					STORM SEWER DATA							
WATERSHED / STREET	From MH	To MH	C = 0.30	C = 0.80	C = 0.95	Indiv. 2.78AC	Accum. 2.78AC	Time of Conc. (min.)	Rainfall Intensity (mm/hr)	Peak Flow Q (l/s)	Pipe Diameter (mm)	Type	Slope (%)	Length (m)	Capacity Full (L/s)	Velocity Full (m/s)	Time of Flow (min.)	Ratio (Q/Q _{FULL})
A1	CB1	CBMH2	0.030	0.000	0.019	0.08	0.08	10.00	104.19	7.85	250	PVC	0.50%	24.0	42.05	0.86	0.47	0.19
A2	CBMH2	CBMH3	0.000	0.000	0.061	0.16	0.24	10.47	101.79	24.02	250	PVC	0.50%	23.5	42.05	0.86	0.46	0.57
A3	ROOF DRAIN	CBMH3	0.000	0.000	0.047	0.12	0.12	10.00	104.19	12.93	250	PVC	4.00%	12.6	118.94	2.42	0.09	0.11
A4	CBMH3	POND	0.000	0.000	0.059	0.16	0.52	10.92	99.55	51.33	375	PVC	0.50%	17.1	123.98	1.12	0.25	0.41
A5	ROOF DRAIN	POND	0.000	0.000	0.047	0.12	0.12	10.00	104.19	12.93	250	PVC	2.00%	4.0	84.10	1.71	0.04	0.15
A6	CB7	CB6	0.043	0.000	0.092	0.28	0.28	10.00	104.19	29.05	250	PVC	0.50%	23.5	42.05	0.86	0.46	0.69
A7	CB6	POND	0.002	0.000	0.012	0.03	0.31	10.46	101.84	31.82	250	PVC	0.50%	20.1	42.05	0.86	0.39	0.76
	POND	OGS	0.000	0.000	0.000	0.00	0.00	0.00	0.00	23.00	250	PVC	2.30%	16.0	90.19	1.84	0.15	0.26
	OGS	CBMH5	0.000	0.000	0.000	0.00	0.00	0.00	0.00	23.00	250	PVC	6.50%	13.0	151.61	3.09	0.07	0.15
A8	EX CB	CBMH5	0.120	0.000	0.000	0.10	0.10	10.00	104.19	10.43	250	PVC	0.50%	16.8	42.05	0.86	0.33	0.25
A9	TTRENCH D	STMMH8	0.000	0.000	0.004	0.01	0.01	10.00	104.19	1.10	250	PVC	2.00%	19.1	84.10	1.71	0.19	0.01
	TRENCH D	TEE	0.000	0.000	0.001	0.00	0.00	10.00	104.19	0.28	250	PVC	4.00%	12.6	118.94	2.42	0.09	0.00
	STMMH8	CBMH5	0.00	0.00	0.00	0.00	0.01	10.19	103.22	1.36	250	PVC	4.80%	64.4	130.29	2.65	0.40	0.01

DESIGN PARAMETERS NOTES

Runoff Coefficient (C)
 Grass 0.30
 Gravel 0.80
 Asphalt / rooftop 0.90

Q = 2.78 AIC, where
 Q = Peak flow in Litres per second (L/s)
 A = Area in hectares (ha)
 I = Rainfall Intensity (mm/hr)
 C = Runoff Coefficient

Ottawa Macdonald-Cartier International Airport IDF curve
 $I_5 = 998.071 / (T_c + 6.053)^{0.814}$
 Min. velocity = 0.76 m/s
 Manning's "n" = 0.013



File No. 523650
Project: Proposed Apartment Buildings
Project Address: 2380 & 2396 CLÉROUX CRES
Client: Bridor Development

Date: January 23, 2023
Designed: HY
Checked: GC
Drawing Reference: STM-1

STORM WATER MANAGEMENT DESIGN SHEET
SEWER DESIGN

LOCATION		MANHOLE INFORMATION					
From MH	To MH	Up Invert (m)	Down Invert (m)	T/G Up Stream (m)	T/G Down Stream	Up Depth obv (m)	Down Depth obv (m)
CB1	CBMH2	79.90	79.78	82.25	82.25	2.10	2.22
CBMH2	CBMH3	79.72	79.60	82.25	82.00	2.28	2.15
CBMH3	POND	79.54	79.45	82.00		2.08	
CB7	CB6	79.52	79.40	80.30	80.35	0.53	0.70
CB6	POND	79.40	79.30	80.35		0.70	
DICBMH4	OGS	77.40	77.04	79.45	80.60	1.80	3.31
OGS	CBMH5	76.89	76.05	80.60	77.20	3.46	0.90
EX CB	CBMH5	75.00	74.97	76.90	77.20	1.65	1.98
TRENCH D	STMMH8	78.98	78.60	79.80	82.33	0.57	3.48
STMMH8	CBMH5	78.54	76.60	82.33	77.20	3.54	0.35

PRE SCS

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```

V   V   I   SSSSS  U   U   A   L           (v 6.1.2001)
V   V   I   SS     U   U   A A  L
V   V   I   SS     U   U   AAAAA L
V   V   I   SS     U   U   A   A  L
  VV    I   SSSSS  UUUUU  A   A  LLLLL

```

```

  000  TTTTT  TTTTT  H   H  Y   Y  M   M  000  TM
  0   0   T    T    H   H  Y Y  MM MM  0   0
  0   0   T    T    H   H  Y   M   M  0   0
  000   T    T    H   H  Y   M   M  000

```

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Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\V02\voin.dat

Output filename:

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Summary filename:

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DATE: 03-14-2023

TIME: 01:53:47

USER:

COMMENTS: _____

```

*****
** SIMULATION : Run 01           **
*****

```

W/E COMMAND	HYD ID	DT min	AREA ha	' Qpeak ' cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	------------------	--------------	------------	------	--------------

START @ 0.00 hrs

READ STORM 5.0

[Ptot= 49.09 mm]

fname :

C:\Users\JAsh\AppData\Local\Temp\32c22fd1-2756-40a4-8db2-313c3547e793\a83aa445-7986-4108-a295-abaadc

remark: Ottawa Macdonald Cartier SCS 24 2yr

*

** CALIB NASHYD 0101 1 5.0 0.84 0.04 12.00 19.30 0.39 0.000
[CN=81.5]
[N = 3.0:Tp 0.17]

*

=====

V V I SSSSS U U A L (v 6.1.2001)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
WV I SSSSS UUUUU A A LLLLL

000 TTTTT TTTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
000 T T H H Y M M 000

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Summary filename:

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DATE: 03-14-2023

TIME: 01:53:47

USER:

COMMENTS: _____

 ** SIMULATION : Run 02 **

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	--------------	--------------	------------	------	--------------

START @ 0.00 hrs

 READ STORM 5.0
 [Ptot= 65.91 mm]
 fname :

C:\Users\JAsh\AppData\Local\Temp\32c22fd1-2756-40a4-8db2-313c3547e793\5aca6ac2-ef25-4c6b-b023-6eea58

remark: Ottawa Macdonald Cartier SCS 24 5yr

*
 ** CALIB NASHYD 0101 1 5.0 0.84 0.07 12.00 31.48 0.48 0.000
 [CN=81.5]
 [N = 3.0:Tp 0.17]
 *

=====
 =====

V	V	I	SSSSS	U	U	A	L				(v 6.1.2001)
V	V	I	SS	U	U	A	A	L			
V	V	I	SS	U	U	A	A	A	A	A	L
V	V	I	SS	U	U	A	A	L			
VV		I	SSSSS	UUUUU	A	A	LLLLL				

000	TTTTT	TTTTT	H	H	Y	Y	M	M	000	TM	
0	0	T	T	H	H	Y	Y	MM	MM	0	0
0	0	T	T	H	H	Y	M	M	0	0	
000	T	T	H	H	Y	M	M	000			

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Summary filename:

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DATE: 03-14-2023

TIME: 01:53:47

USER:

COMMENTS: _____

** SIMULATION : Run 03 **

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	--------------	--------------	------------	------	--------------

START @ 0.00 hrs

READ STORM 5.0
[Ptot= 77.00 mm]
fname :

C:\Users\JAsh\AppData\Local\Temp\32c22fd1-2756-40a4-8db2-313c3547e793\937e7433-4342-40da-96a5-67c3cd
remark: Ottawa Macdonald Cartier SCS 24 10yr

*
** CALIB NASHYD 0101 1 5.0 0.84 0.09 12.00 40.15 0.52 0.000
[CN=81.5]
[N = 3.0:Tp 0.17]
*

=====

V	V	I	SSSSS	U	U	A	L				(v 6.1.2001)
V	V	I	SS	U	U	A	A	L			
V	V	I	SS	U	U	AAAAA	L				
V	V	I	SS	U	U	A	A	L			
V	V	I	SSSSS	UUUUU	A	A	LLLLL				

000	TTTTT	TTTTT	H	H	Y	Y	M	M	000	TM	
0	0	T	T	H	H	Y	Y	MM	MM	0	0
0	0	T	T	H	H	Y	M	M	0	0	
000	T	T	H	H	Y	M	M	000			

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Summary filename:

C:\Users\JAsh\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\47b3e90-6d5b-4b5b-a0dd-45c31ff72924\scenari

DATE: 03-14-2023

TIME: 01:53:47

USER:

COMMENTS: _____

** SIMULATION : Run 04 **

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	--------------	--------------	------------	------	--------------

START @ 0.00 hrs

READ STORM 5.0
[Ptot= 91.08 mm]
fname :

C:\Users\JAsh\AppData\Local\Temp\32c22fd1-2756-40a4-8db2-313c3547e793\8677e260-0877-4303-925b-23f854

remark: Ottawa Macdonald Cartier SCS 24 25yr

*
** CALIB NASHYD 0101 1 5.0 0.84 0.12 12.00 51.69 0.57 0.000
[CN=81.5]
[N = 3.0:Tp 0.17]
*

=====
=====

```

V   V   I   SS   U   U   A   A   L
V   V   I   SS   U   U   AAAAA L
V   V   I   SS   U   U   A   A   L
  WV   I   SSSSS UUUUU A   A   LLLLL

```

```

000   TTTTT   TTTTT   H   H   Y   Y   M   M   000   TM
0   0   T       T   H   H   Y   Y   MM  MM  0   0
0   0   T       T   H   H   Y       M   M  0   0
000   T       T   H   H   Y       M   M  000

```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYM0 6.1\V02\voin.dat

Output filename:

C:\Users\JAsh\AppData\Local\Civica\XH5\2c2d2be-418b-4c4d-a4c4-d228733f752c\f68a9a6e-b8dc-491f-bbd5-38b0c62db25c\scenari

Summary filename:

C:\Users\JAsh\AppData\Local\Civica\XH5\2c2d2be-418b-4c4d-a4c4-d228733f752c\f68a9a6e-b8dc-491f-bbd5-38b0c62db25c\scenari

DATE: 03-14-2023

TIME: 01:53:47

USER:

COMMENTS: _____

```

*****
** SIMULATION : Run 05          **
*****

```

W/E COMMAND	HYD ID	DT	AREA	Qpeak	Tpeak	R.V.	R.C.	Qbase
		min	ha	cms	hrs	mm		cms

START @ 0.00 hrs

```

-----
READ STORM          5.0
[ Ptot=101.52 mm ]
fname :

```

C:\Users\JAsh\AppData\Local\Temp\32c22fd1-2756-40a4-8db2-313c3547e793\55c88cf1-c07d-4de2-b4c7-fa9ea9

remark: Ottawa Macdonald Cartier SCS 24 50yr

```

*
** CALIB NASHYD      0101  1  5.0   0.84   0.14 12.00  60.54 0.60   0.000
   [CN=81.5          ]
   [ N = 3.0:Tp 0.17]
*

```

```

=====
=====

```

```

V  V  I  SSSSS  U  U  A  L          (v 6.1.2001)
V  V  I  SS    U  U  A  A  L
V  V  I  SS    U  U  AAAAA  L
V  V  I  SS    U  U  A  A  L
  W  I  SSSSS  UUUUU  A  A  LLLLL

```

```

  000  TTTTT  TTTTT  H  H  Y  Y  M  M  000  TM
  0  0  T  T  H  H  Y  Y  MM  MM  0  0
  0  0  T  T  H  H  Y  M  M  0  0
  000  T  T  H  H  Y  M  M  000

```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\V02\voin.dat

Output filename:

C:\Users\JAsh\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\f81c5622-08d5-48bf-bca3-1eb71c45cbd7\scenari

Summary filename:

C:\Users\JAsh\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\f81c5622-08d5-48bf-bca3-1eb71c45cbd7\scenari

DATE: 03-14-2023

TIME: 01:53:47

USER:

COMMENTS: _____

```

*****
** SIMULATION : Run 06          **
*****

```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	--------------	--------------	------------	------	--------------

START @ 0.00 hrs

 READ STORM 5.0

[Ptot=111.87 mm]

fname :

C:\Users\JAsh\AppData\Local\Temp\32c22fd1-2756-40a4-8db2-313c3547e793\e20e7578-d439-4ffb-8edc-8fe258

remark: Ottawa Macdonald Cartier SCS 24 100yr

*

** CALIB NASHYD	0101	1	5.0	0.84	0.16	12.00	69.51	0.62	0.000
[CN=81.5]								
[N = 3.0:Tp 0.17]									

*

FINISH

=====
 =====

PRE CHI

=====

```

V   V   I   SSSSS  U   U   A   L           (v 6.1.2001)
V   V   I   SS     U   U   A A  L
V   V   I   SS     U   U   AAAAA L
V   V   I   SS     U   U   A   A  L
  VV    I   SSSSS  UUUUU  A   A  LLLLL

```

```

  000  TTTTT  TTTTT  H   H  Y   Y  M   M  000  TM
  0   0   T    T    H   H  Y Y  MM MM  0   0
  0   0   T    T    H   H  Y   M   M  0   0
  000   T    T    H   H  Y   M   M  000

```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\V02\voin.dat

Output filename:

C:\Users\JAsh\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\51d2b20a-c962-46f2-b46d-0bcb89b18572\scenari

Summary filename:

C:\Users\JAsh\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\51d2b20a-c962-46f2-b46d-0bcb89b18572\scenari

DATE: 03-14-2023

TIME: 01:49:08

USER:

COMMENTS: _____

```

*****
** SIMULATION : Run 01           **
*****

```

W/E COMMAND	HYD ID	DT min	AREA ha	' Qpeak ' cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	------------------	--------------	------------	------	--------------

START @ 0.00 hrs

CHIC STORM 10.0

[Ptot= 42.51 mm]

*

** CALIB NASHYD 0101 1 5.0 0.84 0.05 1.17 14.98 0.35 0.000

[CN=81.5]

[N = 3.0:Tp 0.17]

*

=====

```

V V I SSSSS U U A L (v 6.1.2001)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

```

```

000 TTTTT TTTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y M M 0 0
000 T T H H Y M M 000

```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\V02\voin.dat

Output filename:

C:\Users\JAsh\AppData\Local\Civica\XH5\2c2d2be-418b-4c4d-a4c4-d228733f752c\8106252e-7f91-4954-a690-56795e9b7e1d\scenari

Summary filename:

C:\Users\JAsh\AppData\Local\Civica\XH5\2c2d2be-418b-4c4d-a4c4-d228733f752c\8106252e-7f91-4954-a690-56795e9b7e1d\scenari

DATE: 03-14-2023

TIME: 01:49:08

USER:

COMMENTS: _____

```

*****
** SIMULATION : Run 02 **
*****

```


W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	--------------	--------------	------------	------	--------------

START @ 0.00 hrs

 CHIC STORM 10.0
 [Ptot= 49.04 mm]

*

** CALIB NASHYD 0101 1 5.0 0.84 0.05 2.17 19.27 0.39 0.000
 [CN=81.5]
 [N = 3.0:Tp 0.17]

*

FINISH

=====
 =====

POST SCS

=====

```

V   V   I   SSSSS  U   U   A   L           (v 6.1.2001)
V   V   I   SS     U   U   A A  L
V   V   I   SS     U   U   AAAAA L
V   V   I   SS     U   U   A   A  L
  VV    I   SSSSS  UUUUU  A   A  LLLLL

```

```

  000  TTTTT  TTTTT  H   H  Y   Y  M   M   000  TM
  0   0   T    T    H   H   Y Y  MM MM  0   0
  0   0   T    T    H   H   Y   M   M  0   0
  000   T    T    H   H   Y   M   M  000

```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\V02\voin.dat

Output filename:

C:\Users\hyu\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\dead66f3-c7bd-44fa-ab3e-b90bcaf4653d\scenario

Summary filename:

C:\Users\hyu\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\dead66f3-c7bd-44fa-ab3e-b90bcaf4653d\scenario

DATE: 06/01/2023

TIME: 09:53:18

USER:

COMMENTS: _____

```

*****
** SIMULATION : Run 01           **
*****

```

W/E COMMAND	HYD ID	DT min	AREA ha	' Qpeak ' cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	------------------	--------------	------------	------	--------------

START @ 0.00 hrs

READ STORM 5.0

[Ptot= 49.09 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\a83aa445-7986-4108-a295-abaadc5

remark: Ottawa Macdonald Cartier SCS 24 2yr

*

** CALIB NASHYD 0135 1 5.0 0.12 0.01 12.00 17.68 0.36 0.000

[CN=79.5]

[N = 3.0:Tp 0.17]

*

READ STORM 5.0

[Ptot= 49.09 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\a83aa445-7986-4108-a295-abaadc5

remark: Ottawa Macdonald Cartier SCS 24 2yr

*

* CALIB STANDHYD 0139 1 5.0 0.01 0.00 12.00 39.00 0.79 0.000

[I%=99.0:S%= 2.00]

*

ADD [0135+ 0139] 0149 3 5.0 0.13 0.01 12.00 19.32 n/a 0.000

*

READ STORM 5.0

[Ptot= 49.09 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\a83aa445-7986-4108-a295-abaadc5

remark: Ottawa Macdonald Cartier SCS 24 2yr

*

* CALIB STANDHYD 0138 1 5.0 0.07 0.01 12.00 27.26 0.56 0.000

[I%=38.0:S%= 2.00]

*

READ STORM 5.0

[Ptot= 49.09 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\a83aa445-7986-4108-a295-abaadc5

remark: Ottawa Macdonald Cartier SCS 24 2yr

*

* CALIB STANDHYD 0133 1 5.0 0.64 0.07 12.00 38.88 0.79 0.000

[I%=70.0:S%= 2.00]

*

ADD [0133+ 0138] 0134 3 5.0 0.71 0.08 12.00 37.73 n/a 0.000

*

** Reservoir

```

OUTFLOW:          0136  1  5.0   0.71   0.02 12.17  37.73  n/a   0.000
*
ADD [ 0136+ 0149] 0150  3  5.0   0.84   0.03 12.00  34.88  n/a   0.000
*

```

```

=====
=====

```

```

V  V  I  SSSSS  U  U  A  L          (v 6.1.2001)
V  V  I  SS    U  U  A  A  L
V  V  I  SS    U  U  AAAAA  L
V  V  I  SS    U  U  A  A  L
  W  I  SSSSS  UUUUU  A  A  LLLLL

```

```

000  TTTTT  TTTTT  H  H  Y  Y  M  M  000  TM
0  0  T  T  H  H  Y  Y  MM  MM  0  0
0  0  T  T  H  H  Y  M  M  0  0
000  T  T  H  H  Y  M  M  000

```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\V02\voin.dat

Output filename:

C:\Users\hyu\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\3e1f6bf3-ccfb-4f8c-872e-40caa5f9ed93\scenario

Summary filename:

C:\Users\hyu\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\3e1f6bf3-ccfb-4f8c-872e-40caa5f9ed93\scenario

DATE: 06/01/2023

TIME: 09:53:18

USER:

COMMENTS: _____

```

*****
** SIMULATION : Run 02          **
*****

```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	--------------	--------------	------------	------	--------------

START @ 0.00 hrs

READ STORM 5.0

[Ptot= 65.91 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\5aca6ac2-ef25-4c6b-b023-6eea581

remark: Ottawa Macdonald Cartier SCS 24 5yr

*

** CALIB NASHYD 0135 1 5.0 0.12 0.01 12.00 29.24 0.44 0.000

[CN=79.5]

[N = 3.0:Tp 0.17]

*

READ STORM 5.0

[Ptot= 65.91 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\5aca6ac2-ef25-4c6b-b023-6eea581

remark: Ottawa Macdonald Cartier SCS 24 5yr

*

* CALIB STANDHYD 0139 1 5.0 0.01 0.00 12.00 52.71 0.80 0.000

[I%=99.0:S%= 2.00]

*

ADD [0135+ 0139] 0149 3 5.0 0.13 0.01 12.00 31.05 n/a 0.000

*

READ STORM 5.0

[Ptot= 65.91 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\5aca6ac2-ef25-4c6b-b023-6eea581

remark: Ottawa Macdonald Cartier SCS 24 5yr

*

* CALIB STANDHYD 0138 1 5.0 0.07 0.01 12.00 42.49 0.64 0.000

[I%=38.0:S%= 2.00]

*

READ STORM 5.0

[Ptot= 65.91 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\5aca6ac2-ef25-4c6b-b023-6eea581

remark: Ottawa Macdonald Cartier SCS 24 5yr

*

* CALIB STANDHYD 0133 1 5.0 0.64 0.10 12.00 54.09 0.82 0.000

[I%=70.0:S%= 2.00]

*

ADD [0133+ 0138] 0134 3 5.0 0.71 0.11 12.00 52.95 n/a 0.000

*

** Reservoir

OUTFLOW: 0136 1 5.0 0.71 0.02 12.33 52.94 n/a 0.000

*

ADD [0136+ 0149] 0150 3 5.0 0.84 0.03 12.00 49.55 n/a 0.000

*

=====

V V I SSSSS U U A L (v 6.1.2001)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

000 TTTTT TTTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y M M 0 0
000 T T H H Y M M 000

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\V02\voin.dat

Output filename:

C:\Users\hyu\AppData\Local\Civica\XH5\2c2d2be-418b-4c4d-a4c4-d228733f752c\20983300-3dd2-4350-9aff-ecc9603591ad\scenario

Summary filename:

C:\Users\hyu\AppData\Local\Civica\XH5\2c2d2be-418b-4c4d-a4c4-d228733f752c\20983300-3dd2-4350-9aff-ecc9603591ad\scenario

DATE: 06/01/2023

TIME: 09:53:18

USER:

COMMENTS: _____

** SIMULATION : Run 03 **

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	--------------	--------------	------------	------	--------------

START @ 0.00 hrs

 READ STORM 5.0
 [Ptot= 77.00 mm]
 fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\937e7433-4342-40da-96a5-67c3cdf

remark: Ottawa Macdonald Cartier SCS 24 10yr

*
 ** CALIB NASHYD 0135 1 5.0 0.12 0.01 12.00 37.56 0.49 0.000
 [CN=79.5]
 [N = 3.0:Tp 0.17]

*
 READ STORM 5.0
 [Ptot= 77.00 mm]
 fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\937e7433-4342-40da-96a5-67c3cdf

remark: Ottawa Macdonald Cartier SCS 24 10yr

*
 * CALIB STANDHYD 0139 1 5.0 0.01 0.00 12.00 61.78 0.80 0.000
 [I%=99.0:S%= 2.00]

*
 ADD [0135+ 0139] 0149 3 5.0 0.13 0.01 12.00 39.42 n/a 0.000

*
 READ STORM 5.0
 [Ptot= 77.00 mm]
 fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\937e7433-4342-40da-96a5-67c3cdf

remark: Ottawa Macdonald Cartier SCS 24 10yr

*
 * CALIB STANDHYD 0138 1 5.0 0.07 0.01 12.00 51.81 0.67 0.000
 [I%=38.0:S%= 2.00]

*
 READ STORM 5.0
 [Ptot= 77.00 mm]
 fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\937e7433-4342-40da-96a5-67c3cdf

remark: Ottawa Macdonald Cartier SCS 24 10yr

*

```

* CALIB STANDHYD      0133  1  5.0   0.64   0.12 12.00  64.33 0.84   0.000
  [I%=70.0:S%= 2.00]
*
*  ADD [ 0133+ 0138]  0134  3  5.0   0.71   0.13 12.00  63.10 n/a   0.000
*
** Reservoir
  OUTFLOW:           0136  1  5.0   0.71   0.02 12.50  63.09 n/a   0.000
*
*  ADD [ 0136+ 0149]  0150  3  5.0   0.84   0.04 12.00  59.42 n/a   0.000
*

```

```

=====
=====

```

```

V  V  I  SSSSS  U  U  A  L          (v 6.1.2001)
V  V  I  SS    U  U  A  A  L
V  V  I  SS    U  U  AAAAA  L
V  V  I  SS    U  U  A  A  L
  VV   I  SSSSS  UUUUU  A  A  LLLLL

```

```

000  TTTTT  TTTTT  H  H  Y  Y  M  M  000  TM
0  0  T  T  H  H  Y  Y  MM  MM  0  0
0  0  T  T  H  H  Y  M  M  0  0
000  T  T  H  H  Y  M  M  000

```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\V02\voin.dat

Output filename:

C:\Users\hyu\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\cb864a73-4fb4-4f10-b511-fe2fc736f640\scenario

Summary filename:

C:\Users\hyu\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\cb864a73-4fb4-4f10-b511-fe2fc736f640\scenario

DATE: 06/01/2023

TIME: 09:53:18

USER:

COMMENTS: _____

 ** SIMULATION : Run 04 **

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	--------------	--------------	------------	------	--------------

START @ 0.00 hrs

READ STORM 5.0

[Ptot= 91.08 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\8677e260-0877-4303-925b-23f8544

remark: Ottawa Macdonald Cartier SCS 24 25yr

*

** CALIB NASHYD 0135 1 5.0 0.12 0.02 12.00 48.70 0.53 0.000

[CN=79.5]

[N = 3.0:Tp 0.17]

*

READ STORM 5.0

[Ptot= 91.08 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\8677e260-0877-4303-925b-23f8544

remark: Ottawa Macdonald Cartier SCS 24 25yr

*

* CALIB STANDHYD 0139 1 5.0 0.01 0.00 12.00 73.31 0.80 0.000

[I%=99.0:S%= 2.00]

*

ADD [0135+ 0139] 0149 3 5.0 0.13 0.02 12.00 50.60 n/a 0.000

*

READ STORM 5.0

[Ptot= 91.08 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\8677e260-0877-4303-925b-23f8544

remark: Ottawa Macdonald Cartier SCS 24 25yr

*

* CALIB STANDHYD 0138 1 5.0 0.07 0.01 12.00 64.05 0.70 0.000

[I%=38.0:S%= 2.00]

*

READ STORM 5.0

[Ptot= 91.08 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\8677e260-0877-4303-925b-23f8544

remark: Ottawa Macdonald Cartier SCS 24 25yr

```

*
* CALIB STANDHYD      0133  1  5.0   0.64   0.15 12.00  77.52 0.85   0.000
  [I%=70.0:S%= 2.00]
*
  ADD [ 0133+ 0138] 0134  3  5.0   0.71   0.16 12.00  76.19 n/a   0.000
*
** Reservoir
  OUTFLOW:           0136  1  5.0   0.71   0.02 12.50  76.18 n/a   0.000
*
  ADD [ 0136+ 0149] 0150  3  5.0   0.84   0.04 12.00  72.22 n/a   0.000
*
FINISH

```

```

=====
=====
=====
=====

```

```

V  V  I  SSSSS  U  U  A  L          (v 6.1.2001)
V  V  I  SS    U  U  A  A  L
V  V  I  SS    U  U  AAAAA L
V  V  I  SS    U  U  A  A  L
  W  I  SSSSS  UUUUU  A  A  LLLLL

```

```

  000  TTTTT  TTTTT  H  H  Y  Y  M  M  000  TM
  0  0  T  T  H  H  Y  Y  MM MM  0  0
  0  0  T  T  H  H  Y  M  M  0  0
  000  T  T  H  H  Y  M  M  000

```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\V02\voin.dat

Output filename:

C:\Users\hyu\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\3592b175-6811-4e92-acdf-1c90c60f3294\scenario

Summary filename:

C:\Users\hyu\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\3592b175-6811-4e92-acdf-1c90c60f3294\scenario

DATE: 06/01/2023

TIME: 09:53:18

USER:

COMMENTS: _____

** SIMULATION : Run 05 **

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	--------------	--------------	------------	------	--------------

START @ 0.00 hrs

READ STORM 5.0

[Ptot=101.52 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\55c88cf1-c07d-4de2-b4c7-fa9ea96

remark: Ottawa Macdonald Cartier SCS 24 50yr

*

** CALIB NASHYD	0135	1	5.0	0.12	0.02	12.00	57.29	0.56	0.000
-----------------	------	---	-----	------	------	-------	-------	------	-------

[CN=79.5]

[N = 3.0:Tp 0.17]

*

READ STORM 5.0

[Ptot=101.52 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\55c88cf1-c07d-4de2-b4c7-fa9ea96

remark: Ottawa Macdonald Cartier SCS 24 50yr

*

* CALIB STANDHYD	0139	1	5.0	0.01	0.00	12.00	81.82	0.81	0.000
------------------	------	---	-----	------	------	-------	-------	------	-------

[I%=99.0:S%= 2.00]

*

ADD [0135+ 0139]	0149	3	5.0	0.13	0.02	12.00	59.17	n/a	0.000
-------------------	------	---	-----	------	------	-------	-------	-----	-------

*

READ STORM 5.0

[Ptot=101.52 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\55c88cf1-c07d-4de2-b4c7-fa9ea96

remark: Ottawa Macdonald Cartier SCS 24 50yr

*

* CALIB STANDHYD 0138 1 5.0 0.07 0.02 12.00 73.35 0.72 0.000
 [I%=38.0:S%= 2.00]

*
 READ STORM 5.0
 [Ptot=101.52 mm]
 fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\55c88cf1-c07d-4de2-b4c7-fa9ea96

remark: Ottawa Macdonald Cartier SCS 24 50yr

*
 * CALIB STANDHYD 0133 1 5.0 0.64 0.17 12.00 87.39 0.86 0.000
 [I%=70.0:S%= 2.00]

*
 ADD [0133+ 0138] 0134 3 5.0 0.71 0.19 12.00 86.00 n/a 0.000

*
 ** Reservoir
 OUTFLOW: 0136 1 5.0 0.71 0.02 12.58 85.99 n/a 0.000

*
 ADD [0136+ 0149] 0150 3 5.0 0.84 0.04 12.00 81.84 n/a 0.000

*

=====
 =====

V V I SSSSS U U A L (v 6.1.2001)
 V V I SS U U A A L
 V V I SS U U AAAAA L
 V V I SS U U A A L
 VV I SSSSS UUUUU A A LLLLL

000 TTTTT TTTTT H H Y Y M M 000 TM
 O O T T H H Y Y MM MM O O
 O O T T H H Y M M O O
 000 T T H H Y M M 000

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

Output filename:

C:\Users\hyu\AppData\Local\Civica\H5\2c2d2be-418b-4c4d-a4c4-d228733f752c\4fd264b8-2922-458d-bc51-3b763d71b179\scenario

Summary filename:

C:\Users\hyu\AppData\Local\Civica\H5\2c2d2be-418b-4c4d-a4c4-d228733f752c\4fd264b8-

2922-458d-bc51-3b763d71b179\scenario

DATE: 06/01/2023

TIME: 09:53:18

USER:

COMMENTS: _____

** SIMULATION : Run 06 **

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	--------------	--------------	------------	------	--------------

START @ 0.00 hrs

READ STORM 5.0

[Ptot=111.87 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\20e7578-d439-4ffb-8edc-8fe2588

remark: Ottawa Macdonald Cartier SCS 24 100yr

*

** CALIB NASHYD 0135 1 5.0 0.12 0.02 12.00 66.02 0.59 0.000

[CN=79.5]

[N = 3.0:Tp 0.17]

*

READ STORM 5.0

[Ptot=111.87 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\20e7578-d439-4ffb-8edc-8fe2588

remark: Ottawa Macdonald Cartier SCS 24 100yr

*

* CALIB STANDHYD 0139 1 5.0 0.01 0.00 12.00 90.33 0.81 0.000

[I%=99.0:S%= 2.00]

*

ADD [0135+ 0139] 0149 3 5.0 0.13 0.02 12.00 67.89 n/a 0.000

*

READ STORM 5.0

[Ptot=111.87 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\20e7578-d439-4ffb-8edc-8fe2588

remark: Ottawa Macdonald Cartier SCS 24 100yr

*
* CALIB STANDHYD 0138 1 5.0 0.07 0.02 12.00 82.68 0.74 0.000
[I%=38.0:S%= 2.00]

*
READ STORM 5.0
[Ptot=111.87 mm]
fname :

C:\Users\hyu\AppData\Local\Temp\12248615-8112-417f-91a8-a724e4ef5224\e20e7578-d439-4ffb-8edc-8fe2588

remark: Ottawa Macdonald Cartier SCS 24 100yr

*
* CALIB STANDHYD 0133 1 5.0 0.64 0.19 12.00 97.26 0.87 0.000
[I%=70.0:S%= 2.00]

*
ADD [0133+ 0138] 0134 3 5.0 0.71 0.21 12.00 95.82 n/a 0.000

*
** Reservoir
OUTFLOW: 0136 1 5.0 0.71 0.02 12.58 95.81 n/a 0.000

*
ADD [0136+ 0149] 0150 3 5.0 0.84 0.05 12.00 91.49 n/a 0.000

*

POST CHI

=====

```

V   V   I   SSSSS U   U   A   L           (v 6.1.2001)
V   V   I   SS    U   U   A A  L
V   V   I   SS    U   U   AAAAA L
V   V   I   SS    U   U   A   A  L
  VV    I   SSSSS UUUUU A   A  LLLLL

```

```

000  TTTTT  TTTTT  H   H  Y   Y  M   M  000  TM
0   0   T    T    H   H   Y Y  MM MM  0   0
0   0   T    T    H   H   Y   M   M  0   0
000   T    T    H   H   Y   M   M  000

```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\V02\voin.dat

Output filename:

C:\Users\hyu\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\ba4b3151-3434-4d95-884c-1dfe096b7b54\scenario

Summary filename:

C:\Users\hyu\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\ba4b3151-3434-4d95-884c-1dfe096b7b54\scenario

DATE: 06/01/2023

TIME: 09:53:27

USER:

COMMENTS: _____

```

*****
** SIMULATION : Ottawa 100yr 3hr Chicago **
*****

```

W/E COMMAND	HYD ID	DT min	AREA ha	' Qpeak ' cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
-------------	--------	-----------	------------	------------------	--------------	------------	------	--------------

START @ 0.00 hrs

```

CHIC STORM                10.0
[ Ptot= 71.66 mm ]
*
* CALIB STANDHYD          0054  1  5.0   0.01   0.00  1.00  70.29  0.98   0.000
[ I%=99.0:S%= 2.00 ]
*
CHIC STORM                10.0
[ Ptot= 71.66 mm ]
*
* CALIB NASHYD            0055  1  5.0   0.12   0.02  1.08  33.50  0.47   0.000
[ CN=79.5                ]
[ N = 3.0:Tp 0.17 ]
*
ADD [ 0054+ 0055 ]      0149  3  5.0   0.13   0.02  1.08  36.33  n/a    0.000
*
CHIC STORM                10.0
[ Ptot= 71.66 mm ]
*
* CALIB STANDHYD          0051  1  5.0   0.64   0.25  1.00  59.40  0.83   0.000
[ I%=70.0:S%= 2.00 ]
*
CHIC STORM                10.0
[ Ptot= 71.66 mm ]
*
* CALIB STANDHYD          0056  1  5.0   0.07   0.02  1.00  47.32  0.66   0.000
[ I%=38.0:S%= 2.00 ]
*
ADD [ 0051+ 0056 ]      0053  3  5.0   0.71   0.27  1.00  58.21  n/a    0.000
*
** Reservoir
OUTFLOW:                  0052  1  5.0   0.71   0.02  1.75  58.20  n/a    0.000
*
ADD [ 0149+ 0052 ]      0150  3  5.0   0.84   0.04  1.17  54.82  n/a    0.000
*

```

```

=====
=====

```

```

V  V  I  SSSSS  U  U  A  L                (v 6.1.2001)
V  V  I  SS    U  U  A  A  L
V  V  I  SS    U  U  AAAAA  L
V  V  I  SS    U  U  A  A  L
  WV  I  SSSSS  UUUUU  A  A  LLLLL

```

```

000  TTTTT  TTTTT  H  H  Y  Y  M  M  000  TM
0  0  T  T  H  H  Y  Y  MM  MM  0  0
0  0  T  T  H  H  Y  M  M  0  0
000  T  T  H  H  Y  M  M  000

```



```

*
* CALIB STANDHYD      0051  1  5.0    0.64    0.25  2.00  69.30  0.84   0.000
  [I%=70.0:S%= 2.00]
*
  CHIC STORM                10.0
  [ Ptot= 82.32 mm ]
*
* CALIB STANDHYD      0056  1  5.0    0.07    0.02  2.00  56.43  0.69   0.000
  [I%=38.0:S%= 2.00]
*
  ADD [ 0051+ 0056]  0053  3  5.0    0.71    0.27  2.00  68.03  n/a   0.000
*
** Reservoir
  OUTFLOW:                0052  1  5.0    0.71    0.02  2.75  68.03  n/a   0.000
*
  ADD [ 0149+ 0052]  0150  3  5.0    0.84    0.04  2.08  64.37  n/a   0.000
*

```

```

=====
=====

```

```

V  V  I  SSSSS  U  U  A  L          (v 6.1.2001)
V  V  I  SS    U  U  A  A  L
V  V  I  SS    U  U  AAAAA  L
V  V  I  SS    U  U  A  A  L
  VV  I  SSSSS  UUUUU  A  A  LLLLL

```

```

  000  TTTTT  TTTTT  H  H  Y  Y  M  M  000  TM
  0  0  T  T  H  H  Y  Y  MM  MM  0  0
  0  0  T  T  H  H  Y  M  M  0  0
  000  T  T  H  H  Y  M  M  000

```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYM0 6.1\V02\voin.dat

Output filename:

C:\Users\hyu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\0f30a6d4-6b80-4051-9316-a065cb681355\scenario

Summary filename:

C:\Users\hyu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\0f30a6d4-6b80-4051-9316-a065cb681355\scenario

DATE: 06/01/2023

TIME: 09:53:27

=====

V V I SSSSS U U A L (v 6.1.2001)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

000 TTTTT TTTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
000 T T H H Y M M 000

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\V02\voin.dat

Output filename:

C:\Users\hyu\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\47c7f878-1036-49da-9920-545bcf030f6f\scenario

Summary filename:

C:\Users\hyu\AppData\Local\Civica\XH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\47c7f878-1036-49da-9920-545bcf030f6f\scenario

DATE: 06/01/2023

TIME: 09:53:28

USER:

COMMENTS: _____

** SIMULATION : Ottawa 5yr 6hr Chicago **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 5.0

[Ptot= 65.91 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\ef1fc03d-078b-4574-9ae8-73c77ad1d7f6\5aca6ac2-ef25-4c6b-b023-6eea581

remark: Ottawa Macdonald Cartier SCS 24 5yr

*

* CALIB STANDHYD 0054 1 5.0 0.01 0.00 12.00 52.71 0.80 0.000
[I%=99.0:S%= 2.00]

*

READ STORM 5.0

[Ptot= 65.91 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\ef1fc03d-078b-4574-9ae8-73c77ad1d7f6\5aca6ac2-ef25-4c6b-b023-6eea581

remark: Ottawa Macdonald Cartier SCS 24 5yr

*

* CALIB NASHYD 0055 1 5.0 0.12 0.01 12.00 29.24 0.44 0.000
[CN=79.5]
[N = 3.0:Tp 0.17]

*

ADD [0054+ 0055] 0149 3 5.0 0.13 0.01 12.00 31.05 n/a 0.000

*

READ STORM 5.0

[Ptot= 65.91 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\ef1fc03d-078b-4574-9ae8-73c77ad1d7f6\5aca6ac2-ef25-4c6b-b023-6eea581

remark: Ottawa Macdonald Cartier SCS 24 5yr

*

* CALIB STANDHYD 0051 1 5.0 0.64 0.10 12.00 54.09 0.82 0.000
[I%=70.0:S%= 2.00]

*

READ STORM 5.0

[Ptot= 65.91 mm]

fname :

C:\Users\hyu\AppData\Local\Temp\ef1fc03d-078b-4574-9ae8-73c77ad1d7f6\5aca6ac2-ef25-4c6b-b023-6eea581

remark: Ottawa Macdonald Cartier SCS 24 5yr

*

* CALIB STANDHYD 0056 1 5.0 0.07 0.01 12.00 42.49 0.64 0.000
[I%=38.0:S%= 2.00]

*

ADD [0051+ 0056] 0053 3 5.0 0.71 0.11 12.00 52.95 n/a 0.000

*

** Reservoir

OUTFLOW: 0052 1 5.0 0.71 0.02 12.33 52.94 n/a 0.000

Stormceptor® EF Sizing Report

**STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION**

06/01/2023

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Project Name:	2380 & 2396 Cleroux Cres
Project Number:	523650
Designer Name:	Guillaume Courtois
Designer Company:	Tatham Engineering
Designer Email:	gcourtois@tathameng.com
Designer Phone:	613-747-3636
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Site Name:	
------------	--

Drainage Area (ha):	0.71
% Imperviousness:	66.00

Runoff Coefficient 'c': 0.69

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	15.95
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	21.00
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Net Annual Sediment (TSS) Load Reduction Sizing Summary	
Stormceptor Model	TSS Removal Provided (%)
EFO4	84
EFO6	92
EFO8	96
EFO10	98
EFO12	100

Recommended Stormceptor EFO Model: EFO4
Estimated Net Annual Sediment (TSS) Load Reduction (%): 84
Water Quality Runoff Volume Capture (%): > 90



Stormceptor® EF Sizing Report

THIRD-PARTY TESTING AND VERIFICATION

► **Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

► **Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

► The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5



Stormceptor® EF Sizing Report

Upstream Flow Controlled Results

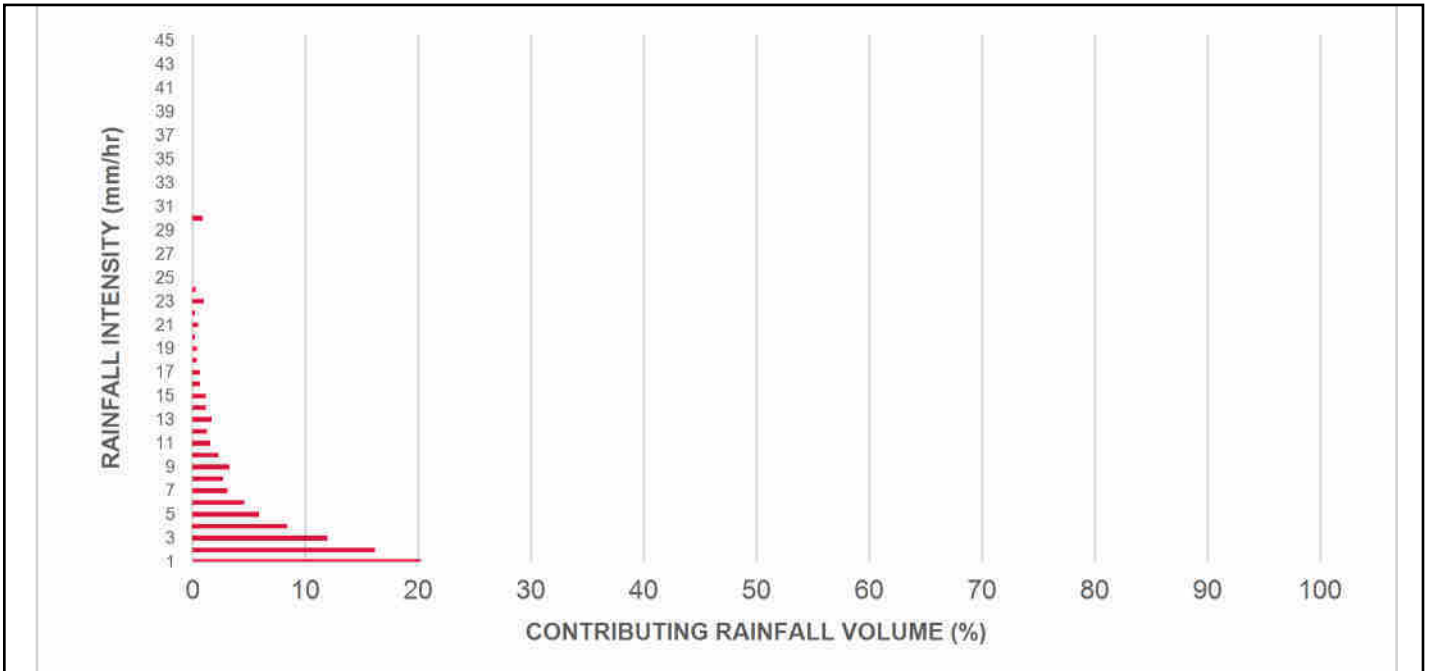
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m ²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.6	8.6	0.69	41.0	34.0	100	8.6	8.6
1	20.3	29.0	1.37	82.0	69.0	100	20.3	29.0
2	16.2	45.2	2.75	165.0	137.0	92	14.9	43.9
3	12.0	57.2	4.12	247.0	206.0	83	10.0	53.9
4	8.4	65.6	5.50	330.0	275.0	80	6.7	60.6
5	5.9	71.6	6.87	412.0	343.0	77	4.6	65.2
6	4.6	76.2	8.24	495.0	412.0	73	3.4	68.6
7	3.1	79.3	9.62	577.0	481.0	70	2.1	70.7
8	2.7	82.0	10.99	659.0	550.0	67	1.8	72.5
9	3.3	85.3	12.36	742.0	618.0	65	2.2	74.7
10	2.3	87.6	13.74	824.0	687.0	64	1.5	76.2
11	1.6	89.2	15.11	907.0	756.0	63	1.0	77.2
12	1.3	90.5	16.49	989.0	824.0	63	0.8	78.0
13	1.7	92.2	17.86	1072.0	893.0	62	1.1	79.1
14	1.2	93.5	19.23	1154.0	962.0	62	0.8	79.8
15	6.5	100.0	20.61	1236.0	1030.0	61	4.0	83.8
16	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
17	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
18	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
19	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
20	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
21	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
22	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
23	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
24	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
25	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
30	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
35	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
40	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
45	0.0	100.0	21.00	1260.0	1050.0	60	0.0	83.8
Estimated Net Annual Sediment (TSS) Load Reduction =								84 %

Climate Station ID: 6105978 Years of Rainfall Data: 20

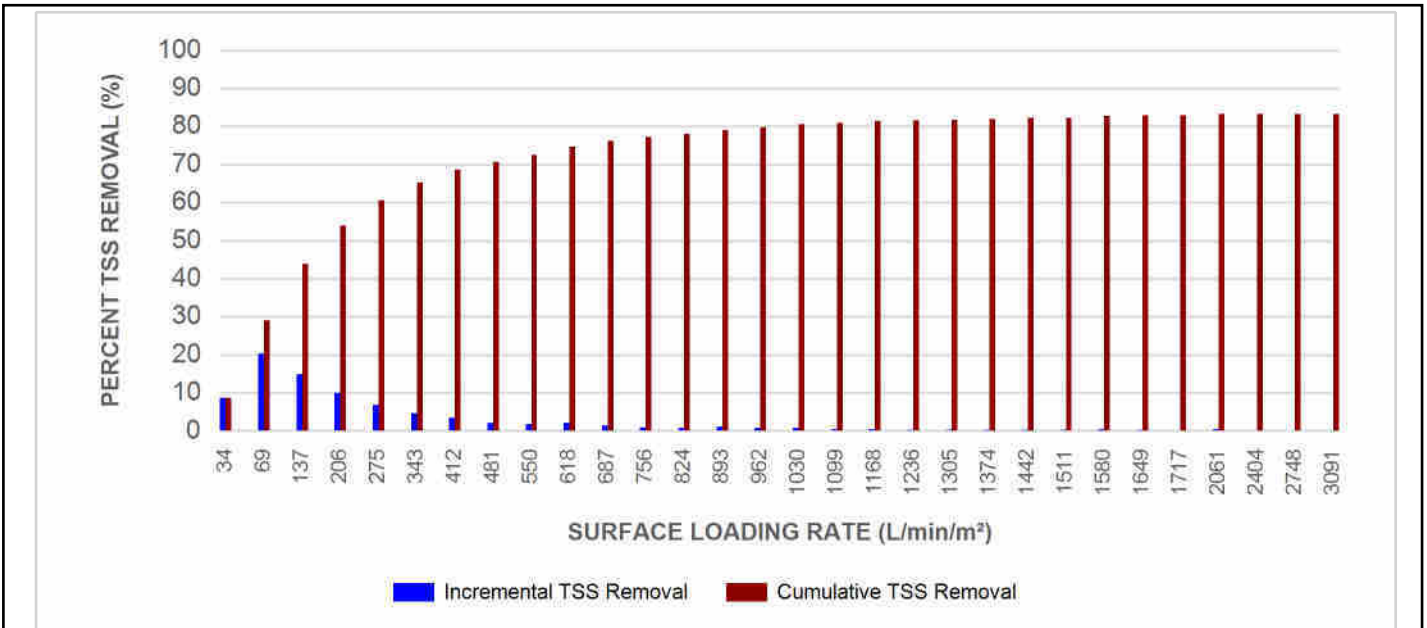


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RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Stormceptor® EF Sizing Report

Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

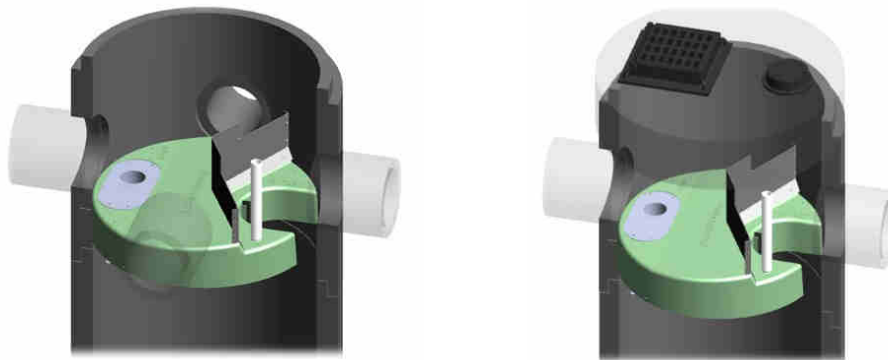
► Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

DESIGN FLEXIBILITY

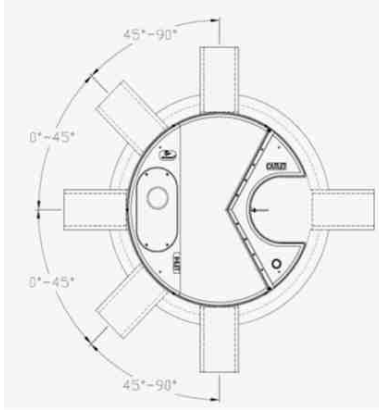
► Stormceptor® EF and EFO offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

► While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, Stormceptor® EFO has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.



Stormceptor® EF Sizing Report



INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1.

For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft ³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit <http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef>

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit <http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef>



**STANDARD PERFORMANCE SPECIFICATION FOR
“OIL GRIT SEPARATOR” (OGS) STORMWATER QUALITY TREATMENT DEVICE**

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program’s **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m ³ sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m ³ sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m ³ sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m ³ sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m ³ sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall



Stormceptor® EF Sizing Report

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m² to 1400 L/min/m², and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m² and 1400 L/min/m² shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m² shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m², and shall be calculated using a simple proportioning formula, with 1400 L/min/m² in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m².

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**.

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m².

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators**, with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

Stormceptor® EF Sizing Report

assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m² to 2600 L/min/m²) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

*

ADD [0149+ 0052] 0150 3 5.0 0.84 0.03 12.00 49.55 n/a 0.000

*

FINISH

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Appendix B: Sanitary Service Calculations

File No. 523650
Project: Proposed Apartment Buildings
Project Address: 2380 & 2396 Cleroux Crescent
Client: Bridor Developments

Date: November 20, 2023
Designed: GC
Checked: JA
Drawing Reference: C300

SANITARY DESIGN SHEET
SEWER DESIGN

LOCATION			RESIDENTIAL AREA AND POPULATION					COMMERCIAL		INDUSTRIAL			INSTITUTIONAL		C+I+I	INFILTRATION			TOTAL FLOW (l/s)	PIPE					MANHOLE			
STREET	FROM MH	TO MH	AREA (Ha)	POP.	CUMMULATIVE		PEAK FACT.	PEAK FLOW (l/s)	AREA (Ha)	ACCU. AREA (Ha)	AREA (Ha)	ACCU. AREA (Ha)	PEAK FACT.	AREA (Ha)	ACCU. AREA (Ha)	PEAK FLOW (l/s)	TOTAL AREA (Ha)	ACCU. AREA (Ha)		INFILT. FLOW (l/s)	LENGTH (m)	DIA. (mm)	MATERAIL	SLOPE (%)	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)	UP INVERT (m)	DOWN INVERT (m)
					AREA (Ha)	POP.																						
SITE	PROP. BLDG A	SAN MH1	0.45	67.9	0.45	67.9	4.0	0.88	0.000	0.000	0.00	0.00	7.0	0.0	0.0	0.00	0.45	0.45	0.13	1.01	9.6	150	PVC	1.00%	15.23	0.86	78.60	78.50
SITE	PROP. BLDG B	SAN MH1	0.39	70.0	0.39	70.0	4.0	0.91	0.000	0.000	0.00	0.00	7.0	0.0	0.0	0.00	0.39	0.39	0.11	1.02	15.0	150	PVC	1.00%	15.23	0.86	78.65	78.50
	SAN MH1	SAN MH2	0.000	0.0	0.84	137.9	4.0	1.79	0.000	0.000	0.00	0.00	7.0	0.0	0.0	0.00	0.00	0.84	0.23	2.02	64.4	200	PVC	4.80%	71.86	2.29	78.38	75.29

DESIGN PARAMETERS NOTES

Average Daily Flow = 280 L/p/day
 Commercial and Institutional Flow = 280000 L/ha/da
 Industrial Flow = 35000 L/ha/da
 Maximum Residential Peak Flow = 4
 Connection and Institutional Peak Factor = 1.5

Industrial Peak Factor = 7 as per Appendix 4-B
 Extraneous Flow = 0.28 L/s/ha
 Minimum Velocity = 0.76 m/s
 Mannings n = 0.013

Appendix C: Water Supply and Fire Protection Calculations

File No. 523650
Project: Proposed Apartment Buildings
Project Address: 2380 & 2396 Cleroux Crescent
Client: Bridor Developments

Date: November 20, 2023
Designed: GC
Checked: JA
Drawing Reference: C300

ANTICIPATED WATER DEMANDS

Population			
Appartments:	Person Per Unit	Block A	Block B
Bachelor =	1.4	0	0
1 Bedroom =	1.4	23	23
2 Bedroom =	2.1	17	18
3 Bedroom =	3.1	0	0
		67.90	70.00

	<u>Block A</u>	<u>Block B</u>	
Average Daily Demand Per Capita =	280	280	L/c/d
Average Daily Demand =	19012	19600	L/d
	0.22	0.23	L/s
Maximum Daily Peak Factor =	2.5	2.5	* As per City of Ottawa
Maximum Daily Residential =	47530	49000	L/d
	0.55	0.57	L/s
Maximum Hourly Peak Factor =	2.2	2.2	* As per City of Ottawa
Maximum Hourly Residential =	104566	107800	L/d
	1.21	1.25	L/s

REQUIRED WATER SERVICE CAPACITY FOR EACH BUILDING (BASED ON WORST CASE - BUILDING B)

Fixture Count per Building					
	1 Bedroom	2 Bedroom	Unit Counts	WSFU	Total
WC Flush Tank	1	1	41	2	82
Sinks	2	2	82	1	82
Bathub	1	1	41	4	164
Diswasher	1	1	41	1.5	61.5
Washing Machine	1	1	41	2	82
					471.5

Total fixture units:	471.5	(as per OBC Table 7.6.3.2.A)
Conversion of fixture units to equivalent gpm:	119	gpm
Required Pipe Capacity =	650,303	L/d
=	7.53	L/s

WATER SERVICE SIZING

$Q = VA$ Where: $V =$ Design velocity of 1.5m/s x 3600 = 5400m/h (as per OBC guidelines)
 $A =$ area of pipe = $(\pi/4) \times D^2$
 $Q =$ water supply flow rate to be accounted for in m^3/h

Minimum pipe diameter for each building:	$d = (4Q/\pi V)^{1/2}$	(derived from $Q = VA$ formula)
	$d = 0.080$	m
	$d = 80$	mm
Proposed pipe diameter for each building:	100	mm



FUS Fire Flow Calculations (Block A)

Tatham File no. : 523650
 Project: 2380 & 2396 Cleroux Crescent
 Date: 31-May-23
 Designed by: GC
 Checked by: JA

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

Where:

- RFF = the Required Fire Flow in litres per minutes (LPM)
- C = the Construction Coefficient is related to the type of construction of the building
- A = the Total Effective Floor Area (effective building area) in square metres of the building

Determine the Construction Coefficient (C)

1	Choose frame used for building	Coefficient C related to the type of construction	Type V Wood Frame Construction	1.5	Type II Noncombustible Construction	0.8
			Type IV-A Mass Timber Construction	0.8		
			Type IV-B Mass Timber Construction	0.9		
			Type IV-C Mass Timber Construction	1.0		
			Type IV-D Mass Timber Construction	1.5		
			Type III Ordinary Construction	1.0		
			Type II Noncombustible Construction	0.8		
			Type I Fire Resistive Construction	0.6		

Determine Total Effective Floor Area (A)

Option 1							
The Construction coefficient is greater or equal to 1	FALSE	100% of all floor area (Excluding basements at least 50% below grade)			Total Effective Area	0	sq.m.
Option 2							
The Construction coefficient is less than 1	TRUE	Are vertical openings in the building protected? (Per NBC Division B, Section 3.5. Vertical Transportation)			NO	Are the floor areas uniform throughout the building	
		Unprotected Vertical Openings, Uniform Floor Area					
TRUE	Number of Floors	3	Area of Floor(s)	1,193	Total Effective Area	2,983	sq.m.
Unprotected Vertical Openings, Dissimilar Floor Area							
FALSE	Area of 2 largest adjoining floors		Area of floors above 2 largest adjoining floors (up to a maximum of 8 floors)		Total Effective Area	0	sq.m.
Protected Vertical Openings, Uniform Floor Area							
FALSE	Number of Floors		Area of Floor(s)		Total Effective Area	0	sq.m.
Protected Vertical Openings, Dissimilar Floor Area							
FALSE	Area of the largest floor		Area of floor directly above largest floor		Total Effective Area	0	sq.m.
			Area of floor directly below largest floor				

Determine the Required Fire Flow

3	Obtain Required Fire Flow	$RFF = 220C\sqrt{A}$	Required Fire Flow	10,000	L/min
				166.7	L/s

Reduction or Surcharge Due to Factors Affecting Burning

4	Choose combustibility of contents	Occupancy hazard reduction or surcharge	Non-combustible	-0.25	Limited combustible	-0.15		
			Limited combustible	-0.15				
			Combustible	0				
			Free burning	0.15			8,500	L/min
			Rapid burning	0.25			141.7	L/s
5	Choose reduction for sprinklers	Sprinkler reduction	Sprinklers conforming to NFPA13 (wet or dry system)	-0.30	NO	0		
			Water supply is standard for both the system and fire department hose lines (siamese connection)	-0.10	NO	0		
			Fully supervised system (electronic monitoring system on at all times)	-0.10	NO	0		
			All buildings within 30m of the proposed structure are confirmed to have a sprinkler system	-0.25	NO	0	8,500	L/min
						141.7	L/s	

Exposure Adjustment Charge

6	Exposure distance between units	North side	Over 30m	Length - Height Value (assumed worst case for exposed building facing wall)	>100	Exposure Adjustment Charge	0	
		East side	20.1 to 30m		>100	Exposure Adjustment Charge	0.04	
		South side	20.1 to 30m		>100	Exposure Adjustment Charge	0.04	
		West side	10.1 to 20m		>100	Exposure Adjustment Charge	0.08	
		Cumulative Required Fire Flow						
							164.3	L/s

Total Required Fire Flow

7	Obtain fire flow, duration	Minimum required fire flow rate (rounded to nearest 1000)		10,000	L/min
		Minimum required fire flow rate		166.7	L/s
		Required duration of fire flow		2	Hrs



FUS Fire Flow Calculations (Block B)

Tatham File no. : 523650
 Project: 2380 & 2396 Cleroux Crescent
 Date: 31-May-23
 Designed by: GC
 Checked by: JA

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

Where:

- RFF = the Required Fire Flow in litres per minutes (LPM)
- C = the Construction Coefficient is related to the type of construction of the building
- A = the Total Effective Floor Area (effective building area) in square metres of the building

Determine the Construction Coefficient (C)

1	Choose frame used for building	Coefficient C related to the type of construction	Type V Wood Frame Construction	1.5	Type II Noncombustible Construction	0.8
			Type IV-A Mass Timber Construction	0.8		
			Type IV-B Mass Timber Construction	0.9		
			Type IV-C Mass Timber Construction	1.0		
			Type IV-D Mass Timber Construction	1.5		
			Type III Ordinary Construction	1.0		
			Type II Noncombustible Construction	0.8		
			Type I Fire Resistive Construction	0.6		

Determine Total Effective Floor Area (A)

Option 1							
The Construction coefficient is greater or equal to 1	FALSE	100% of all floor area (Excluding basements at least 50% below grade)			Total Effective Area	0	sq.m.
Option 2							
The Construction coefficient is less than 1	TRUE	Are vertical openings in the building protected? (Per NBC Division B, Section 3.5. Vertical Transportation)			NO	Are the floor areas uniform throughout the building	
		Unprotected Vertical Openings, Uniform Floor Area					
TRUE	Number of Floors	3	Area of Floor(s)	1,184	Total Effective Area	2,960	sq.m.
Unprotected Vertical Openings, Dissimilar Floor Area							
FALSE	Area of 2 largest adjoining floors	Area of floors above 2 largest adjoining floors (up to a maximum of 8 floors)		Total Effective Area			
		Protected Vertical Openings, Uniform Floor Area					
FALSE	Number of Floors	Area of Floor(s)		Total Effective Area			
		Protected Vertical Openings, Dissimilar Floor Area					
FALSE	Area of the largest floor	Area of floor directly above largest floor		Total Effective Area			
		Area of floor directly below largest floor		0 sq.m.			

Determine the Required Fire Flow

3	Obtain Required Fire Flow	$RFF = 220C\sqrt{A}$	Required Fire Flow	10,000	L/min
				166.7	L/s

Reduction or Surcharge Due to Factors Affecting Burning

4	Choose combustibility of contents	Occupancy hazard reduction or surcharge	Non-combustible	-0.25	Limited combustible	-0.15		
			Limited combustible	-0.15				
			Combustible	0				
			Free burning	0.15			8,500	L/min
			Rapid burning	0.25			141.7	L/s
5	Choose reduction for sprinklers	Sprinkler reduction	Sprinklers conforming to NFPA13 (wet or dry system)	-0.30	NO	0		
			Water supply is standard for both the system and fire department hose lines (siamese connection)	-0.10	NO	0		
			Fully supervised system (electronic monitoring system on at all times)	-0.10	NO	0		
			All buildings within 30m of the proposed structure are confirmed to have a sprinkler system	-0.25	NO	0	8,500	L/min
						141.7	L/s	

Exposure Adjustment Charge

6	Exposure distance between units	North side	Over 30m	Length - Height Value (assumed worst case for exposed building facing wall)	>100	Exposure Adjustment Charge	0	
		East side	20.1 to 30m		>100	Exposure Adjustment Charge	0.04	
		South side	20.1 to 30m		>100	Exposure Adjustment Charge	0.04	
		West side	10.1 to 20m		>100	Exposure Adjustment Charge	0.08	
		Cumulative Required Fire Flow						
							164.3	L/s

Total Required Fire Flow

7	Obtain fire flow, duration	Minimum required fire flow rate (rounded to nearest 1000)		10,000	L/min
		Minimum required fire flow rate		166.7	L/s
		Required duration of fire flow		2	Hrs



Water Pressure Calculations (Block A)

Tatham File No. : 523650
Project : 2380 & 2396 Cleroux Crescent
Date : November 20, 2023
Designed by : GC
Reviewed by : JA

Piezometric Head Equation (Derived from Bernoulli's Equation)

$$h = \frac{p}{\gamma} + z$$

Where:

h = HGL (m)

p = Pressure (Pa)

γ = Specific weight (N/m³) =

9810

z = Elevation of centreline of pipe (m) =

80.62

Water Pressure at Cleroux Crescent Connection			
HGL (m)		Pressure	
		kPa	psi
Max Day	131	494.23	71.68
Peak Hour	127	454.99	65.99
Max. Day + Fire =	123.1	416.73	60.44

Hazen Williams Equation

$$h_f = \frac{10.67 \times Q^{1.85} \times L}{C^{1.85} \times d^{4.87}}$$

Where:

h_f = Head loss over the length of pipe (m)

Q = Volumetric flow rate (m³/s)

L = Length of pipe (m)

C = Pipe roughness coefficient

d = Pipe diameter (m)

Scenario 1: maximum daily demand

Q (L/s)	0.55	
C	150	
L (m.)	17.3	
I.D. (mm)	100	
V (m/s)	0.07	
h_f (m)	0.00	
Head Loss (psi)	0.00	
Pressure (psi)	71.68	
Service Obv. @ Street Connection (m)	80.67	
Service Obv. @ Building Connection (m)	80.45	
Pressure Adjustment (psi)	0.31	(due to service elevation difference from street to building)
Adjusted Min. Pressure (psi)	71.99	(must not be less than 50 psi; must not be more than 80 psi)

Scenario 2: maximum hourly demand

Q (L/s)	1.21	
C	150	
L (m.)	17.3	
I.D. (mm)	100	
V (m/s)	0.15	
h_f (m)	0.01	
Head Loss (psi)	0.01	
Pressure (psi)	65.98	
Service Obv. @ Street Connection (m)	80.67	
Service Obv. @ Building Connection (m)	80.45	
Pressure Adjustment (psi)	0.31	(due to service elevation difference from street to building)
Adjusted Min. Pressure (psi)	66.30	(must not be less than 40 psi; must not be more than 80 psi)



Water Pressure Calculations (Block B)

Tatham File No. : 523650
 Project : 2380 & 2396 Cleroux Crescent
 Date : November 20, 2023
 Designed by : GC
 Reviewed by : JA

Piezometric Head Equation (Derived from Bernoulli's Equation)

$$h = \frac{p}{\gamma} + z$$

Where:

h = HGL (m)

p = Pressure (Pa)

γ = Specific weight (N/m³) =

9810

z = Elevation of centreline of pipe (m) =

81.01

Water Pressure at Cleroux Crescent Connection			
HGL (m)		Pressure	
		kPa	psi
Max Day	131	490.40	71.13
Peak Hour	127	451.16	65.44
Max. Day + Fire =	123.1	412.90	59.89

Hazen Williams Equation

$$h_f = \frac{10.67 \times Q^{1.85} \times L}{C^{1.85} \times d^{4.87}}$$

Where:

h_f = Head loss over the length of pipe (m)

Q = Volumetric flow rate (m³/s)

L = Length of pipe (m)

C = Pipe roughness coefficient

d = Pipe diameter (m)

Scenario 1: maximum daily demand

Q (L/s)	0.57	
C	150	
L (m.)	12.5	
I.D. (mm)	100	
V (m/s)	0.07	
h_f (m)	0.00	
Head Loss (psi)	0.00	
Pressure (psi)	71.13	
Service Obv. @ Street Connection (m)	81.06	
Service Obv. @ Building Connection (m)	80.10	
Pressure Adjustment (psi)	1.37	(due to service elevation difference from street to building)
Adjusted Min. Pressure (psi)	72.49	(must not be less than 50 psi; must not be more than 80 psi)

Scenario 2: maximum hourly demand

Q (L/s)	1.25	
C	150	
L (m.)	12.5	
I.D. (mm)	100	
V (m/s)	0.16	
h_f (m)	0.00	
Head Loss (psi)	0.01	
Pressure (psi)	65.43	
Service Obv. @ Street Connection (m)	81.06	
Service Obv. @ Building Connection (m)	80.10	
Pressure Adjustment (psi)	1.37	(due to service elevation difference from street to building)
Adjusted Min. Pressure (psi)	66.80	(must not be less than 40 psi; must not be more than 80 psi)

Appendix D: Boundary Conditions

Boundary Conditions 2396 Cleroux Street

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	31	0.51
Maximum Daily Demand	76	1.27
Peak Hour	167	2.79
Fire Flow Demand #1	10,000	166.67

Location



Results

Connection 1 – Cleroux St.

Demand Scenario	Head (m)	Pressure ¹ (psi)
Maximum HGL	131.0	67.8
Peak Hour	127.0	62.2
Max Day plus Fire 1	123.1	56.6

Ground Elevation = 83.2 m

Connection 2 – Orient Park Dr.

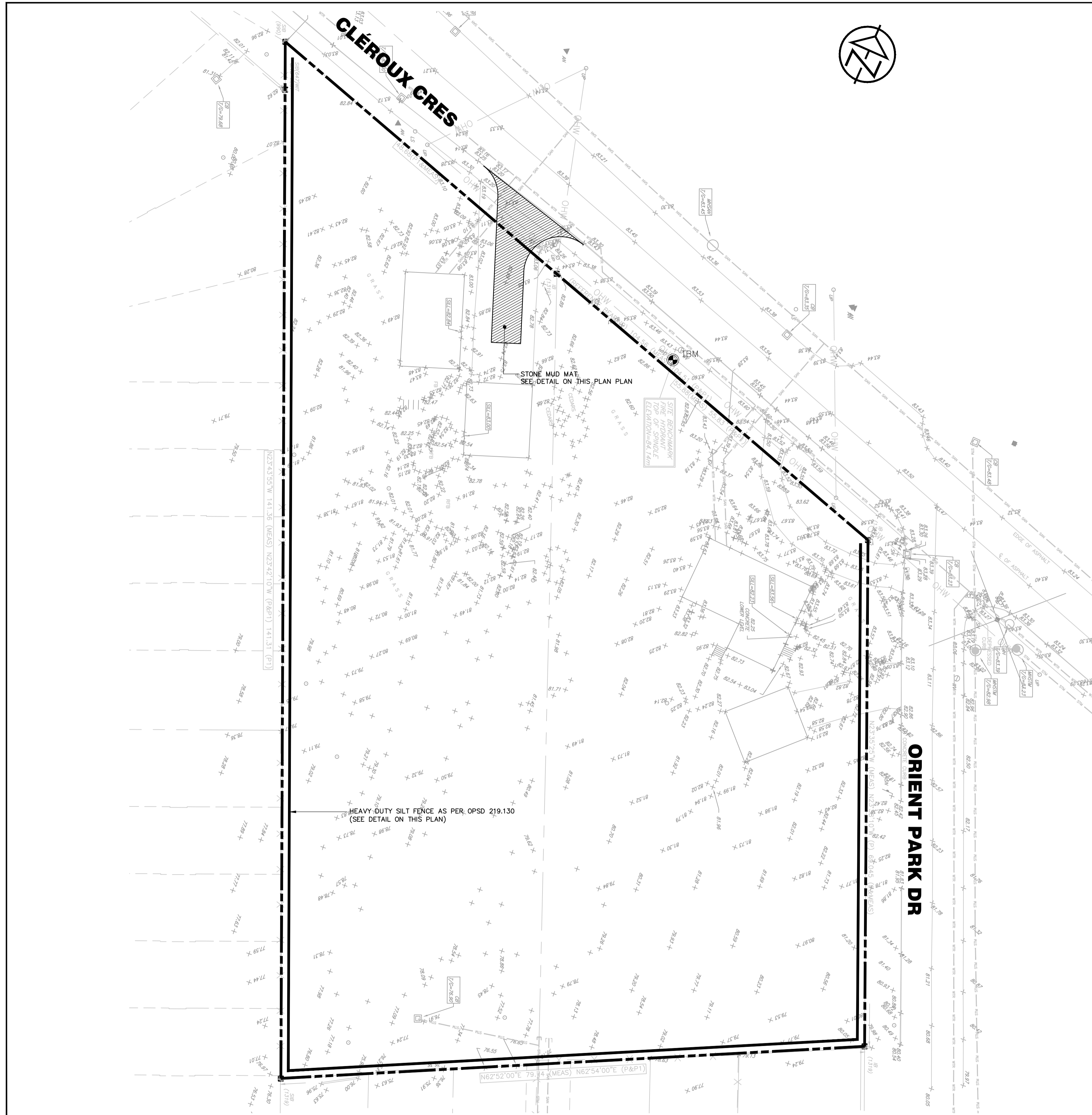
Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	131.0	70.2
Peak Hour	127.0	64.6
Max Day plus Fire 1	120.1	54.8

Ground Elevation = 81.6 m

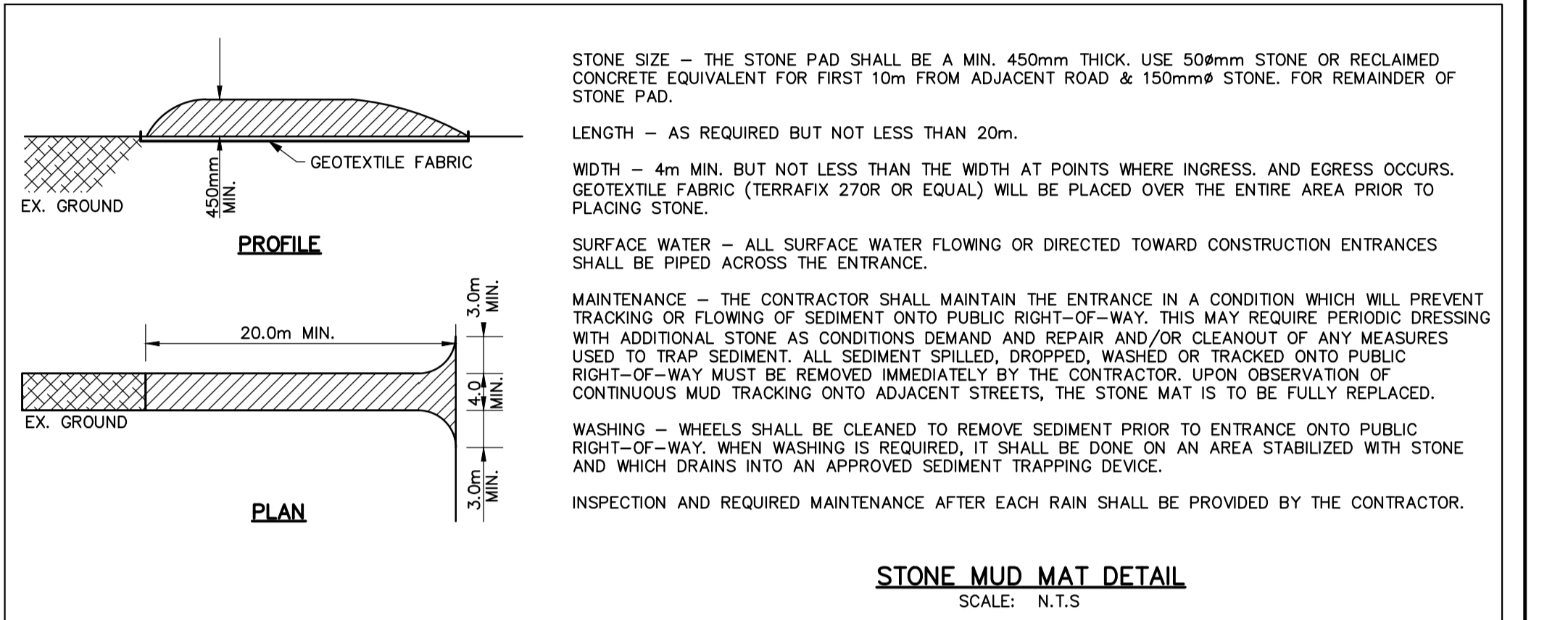
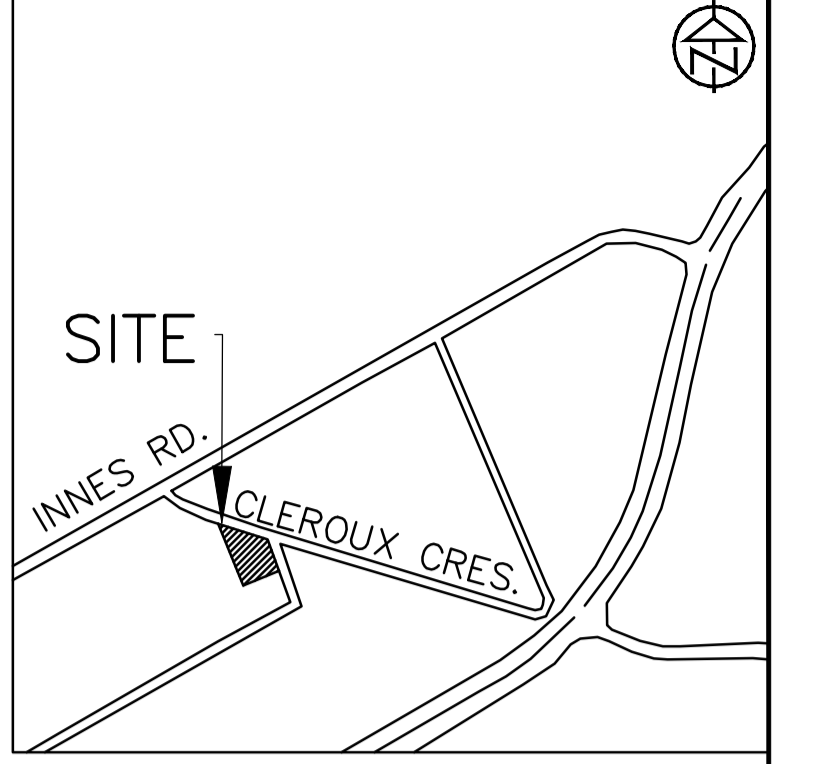
Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

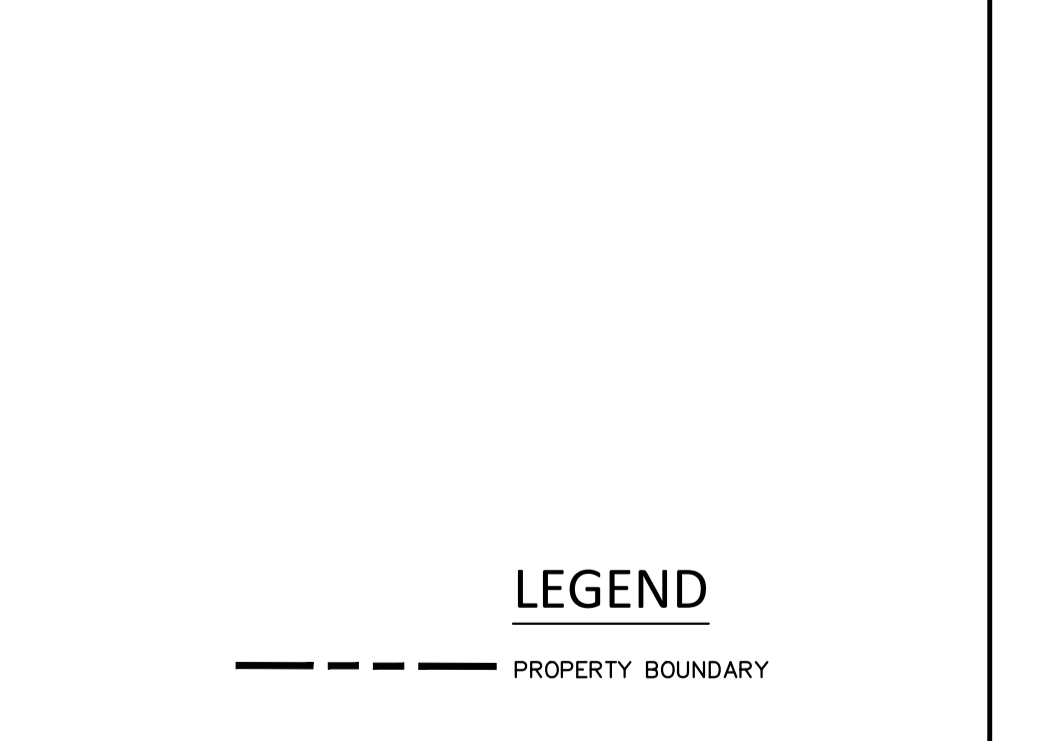
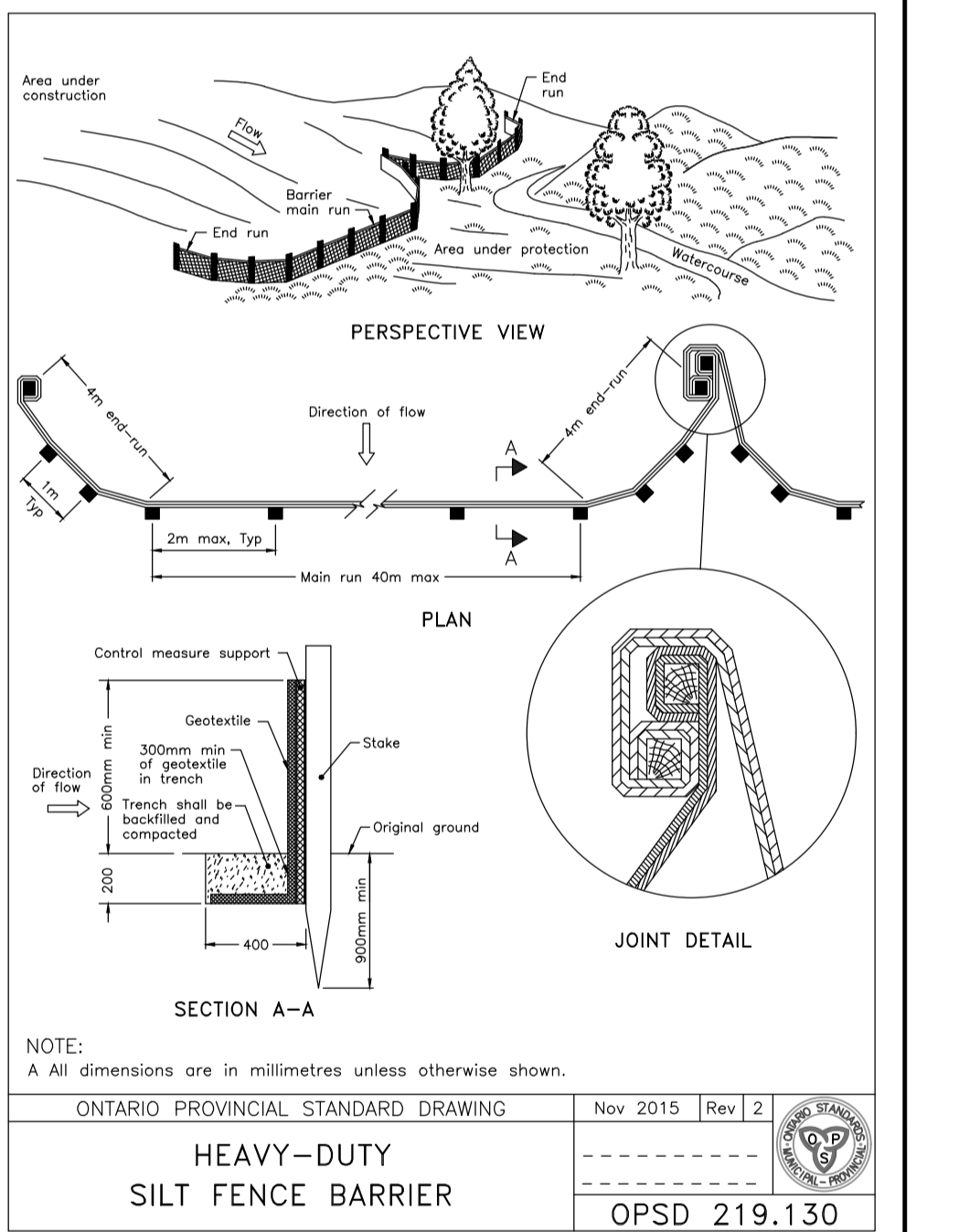
Appendix E: Engineering Drawings



- GENERAL NOTES**
- CONTRACTOR TO INSTALL AND MAINTAIN SILT FENCE AT LOCATIONS SHOWN OR AS DIRECTED BY THE ENGINEER.
 - CONTRACTOR TO ARRANGE PRE-CONSTRUCTION MEETING WITH ENGINEER AFTER PLACING ALL SILTATION CONTROL WORKS.
 - SILTATION AND EROSION CONTROL WORKS MUST BE INSTALLED PRIOR TO CONSTRUCTION.
 - ALL SEDIMENT CONTROL WORKS MUST BE CLEANED AND MAINTAINED AFTER EACH MAJOR STORM EVENT OR AS DEEMED NECESSARY BY THE ENGINEER.
 - THE CONTRACTOR WILL INSPECT THE SEDIMENT AND EROSION CONTROL MEASURES WEEKLY AND AFTER EACH MAJOR STORM EVENT. THE CONTRACTOR WILL NOTIFY THE ENGINEER OF CORRECTIVE ACTIONS REQUIRED AS SOON AS DEFICIENCIES ARE NOTED. THE CONTRACTOR MAINTAINS ULTIMATE RESPONSIBILITY TO ENSURE PROPER SEDIMENT AND EROSION CONTROL MEASURES ARE IMPLEMENTED AND MAINTAINED. ALL DEFICIENCIES AND CORRECTIVE MEASURES WILL BE DOCUMENTED IN A WEEKLY INSPECTION REPORT. A COPY OF THE WEEKLY INSPECTION REPORT WILL BE PROVIDED TO THE ENGINEER.
 - IF CONSTRUCTION IS INTERRUPTED AND/OR INACTIVITY EXCEEDS 30 DAYS, THEN STOCKPILED, STRIPPED OR EXPOSED AREAS MUST BE STABILIZED BY HYDROSEEDING AND ANY OTHER APPROPRIATE GEOTEXTILE MATERIAL, IF REQUIRED.
 - REMOVAL OF ALL SILT FENCES AT THE END OF CONSTRUCTION TO BE APPROVED BY THE ENGINEER AFTER THE SITE HAS STABILIZED.
 - ALL SILT FENCE TO OPSD 219.130.
 - CLEARING OF VEGETATION AND TREE COVER IS TO OCCUR OUTSIDE OF BIRD BREEDING SEASON AS RECOMMENDED BY ENVIRONMENT CANADA (APRIL 15 - AUGUST 15)
 - ALL SIDE SLOPES 3:1 OR GREATER ARE TO BE STABILIZED IMMEDIATELY WITH HYDROSEED (USING A NATIVE SEED MIX) UNLESS OTHERWISE NOTED. USE OF AN EROSION CONTROL BLANKET SUCH AS TERRAFIX S-100 (OR APPROVED EQUAL) IS RECOMMENDED IF CONSTRUCTION OCCURS OUTSIDE OF THE GROWING SEASON.



- SCHEDULE OF CONSTRUCTION WORKS**
- IMPLEMENTATION OF EROSION CONTROL MEASURES AS SPECIFIED ON THIS PLAN
 - REMOVALS AS SPECIFIED ON THIS PLAN
 - TOPSOIL STRIPPING AND STOCKPIILING
 - EARTH EXCAVATION AND GRADING



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5.	RE-ISSUED FOR SPA	DEC 2023	

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2380 & 2396 CLÉROUX CRESCENT
CITY OF OTTAWA

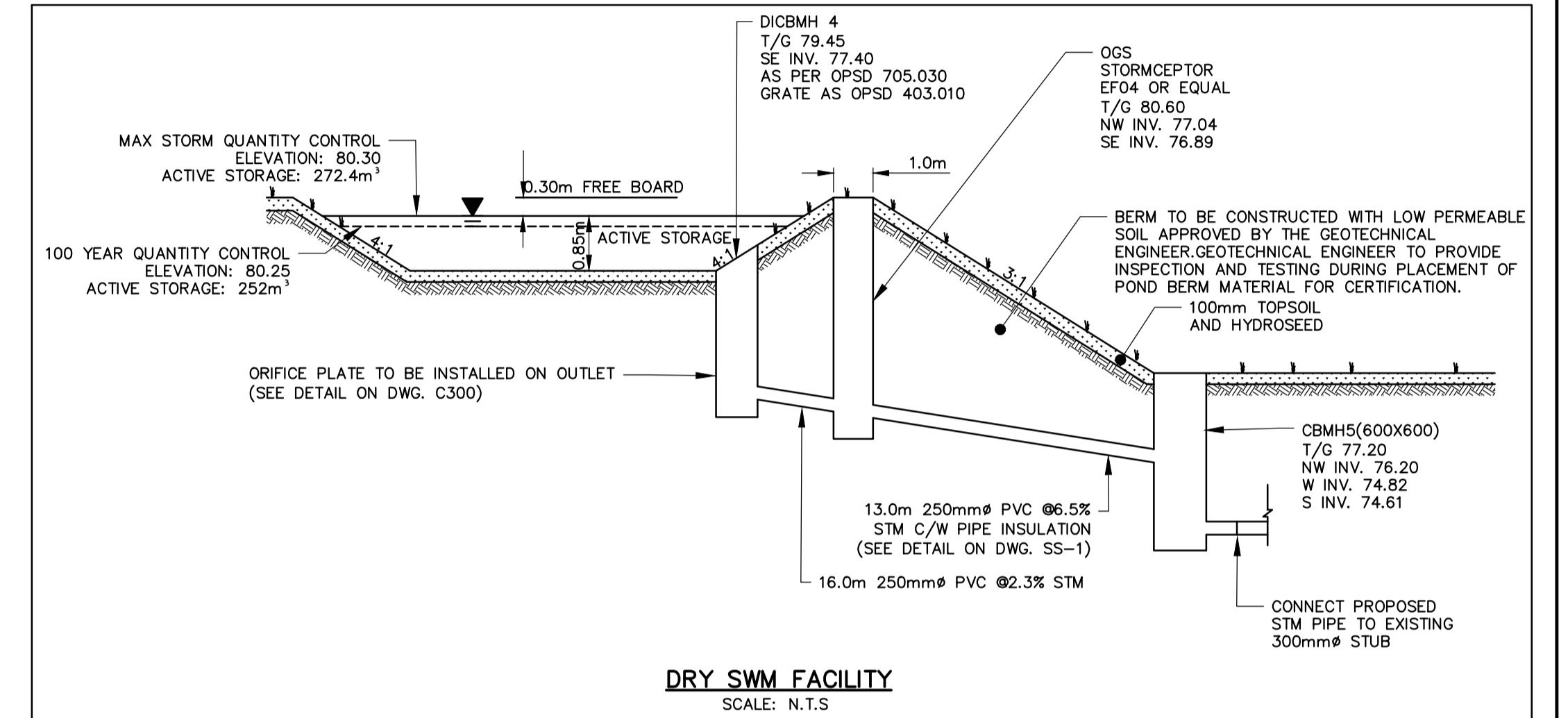
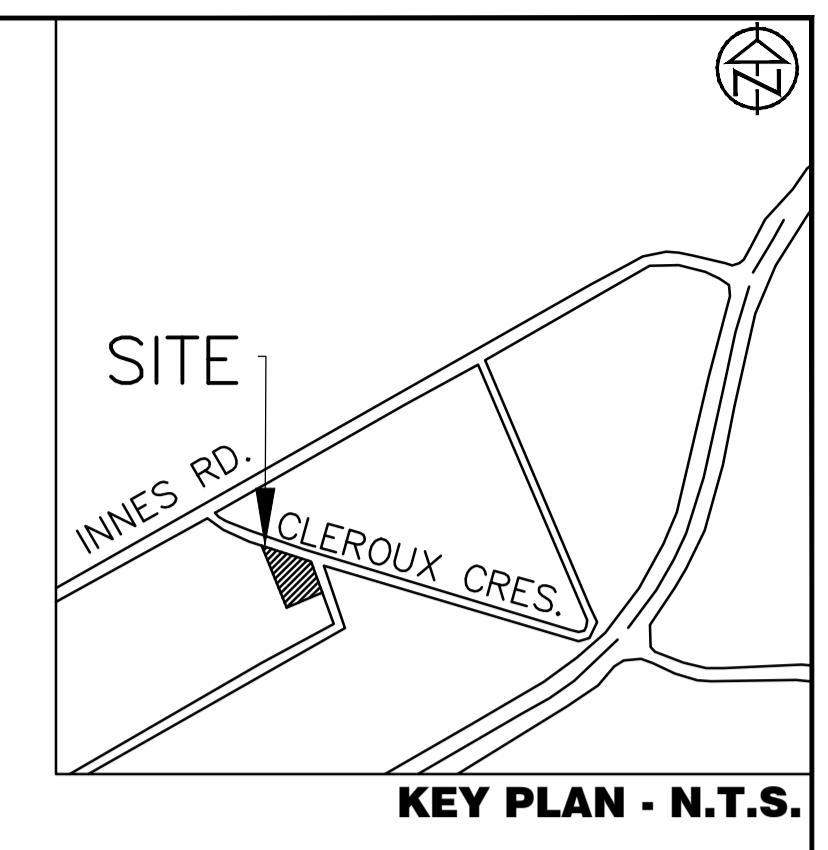
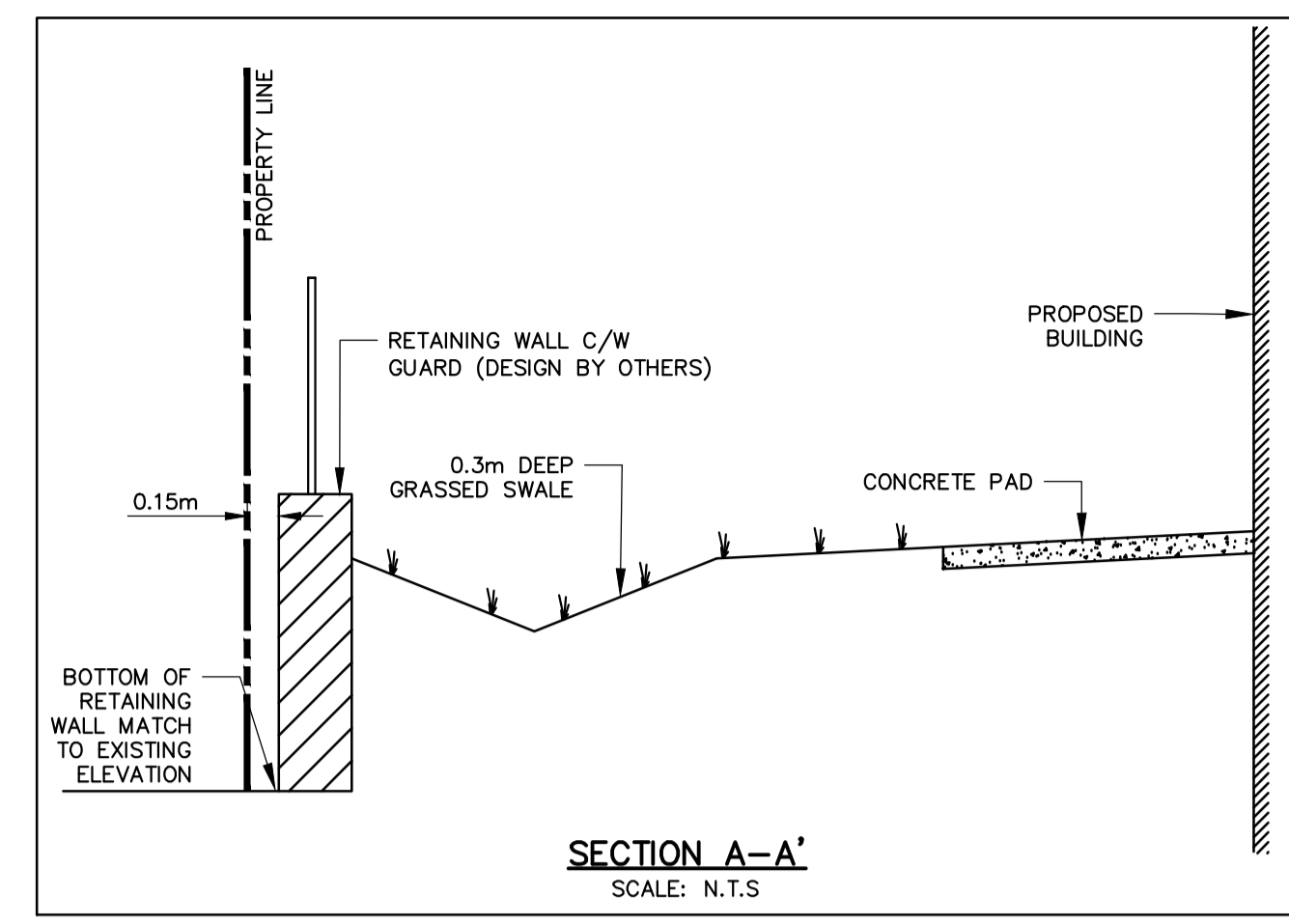
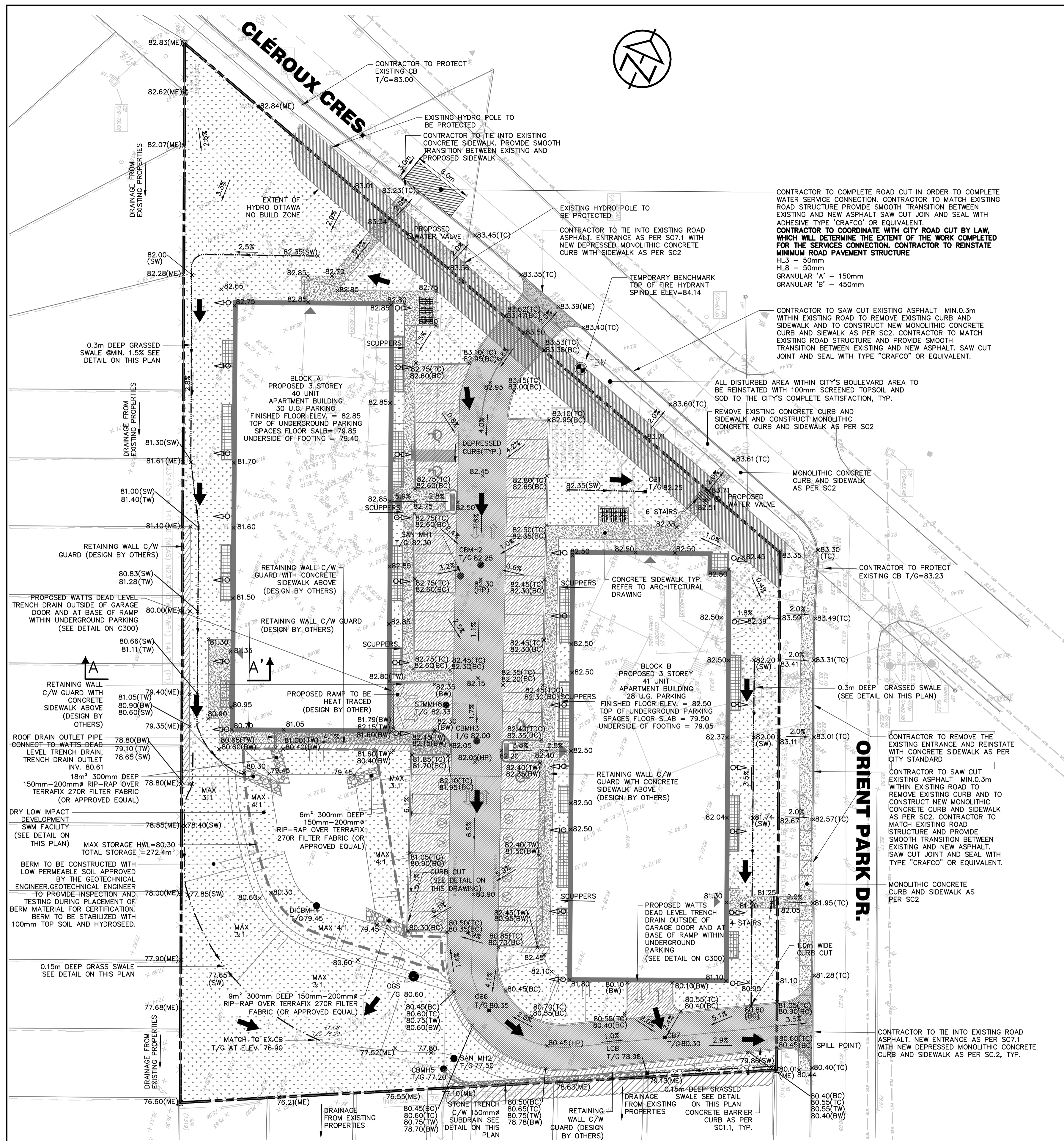
SITE SILTATION AND EROSION CONTROL PLAN

TATHAM ENGINEERING

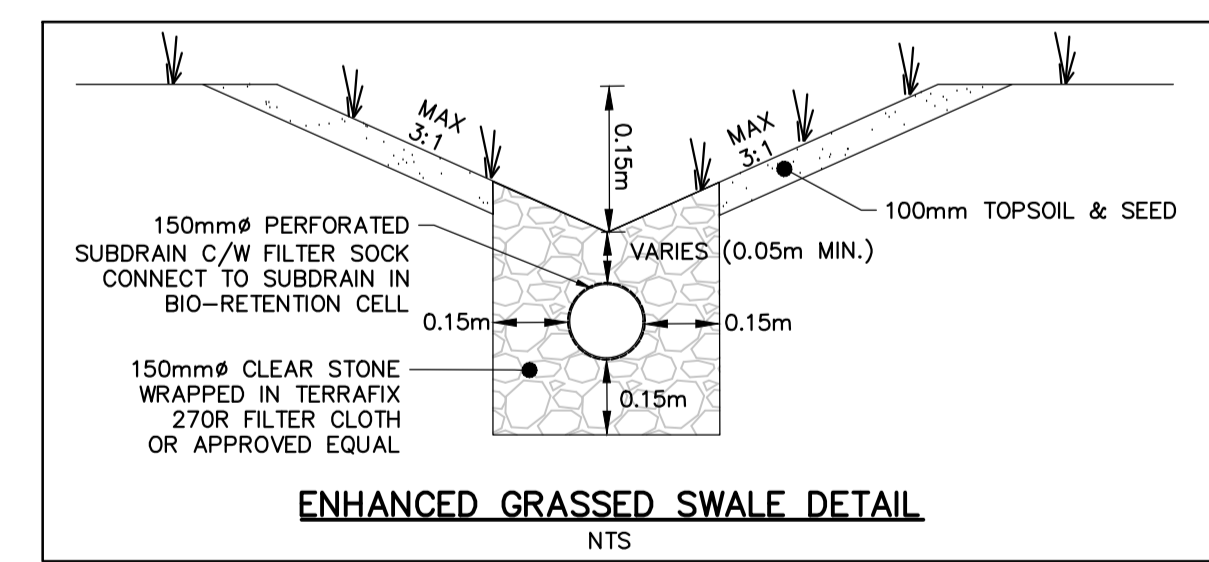
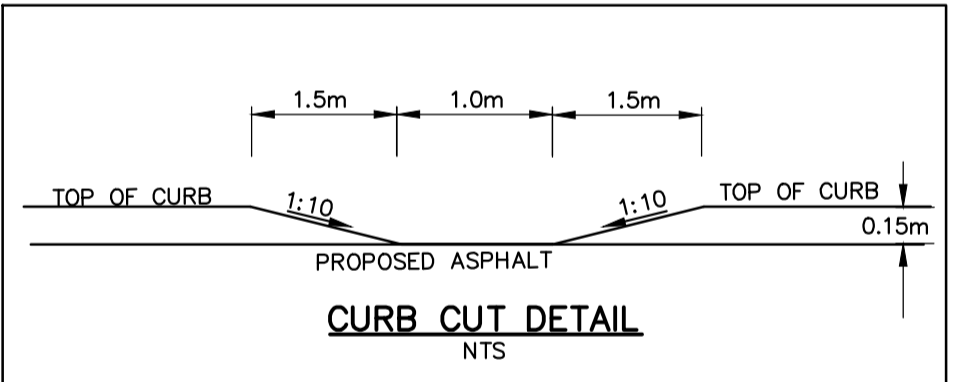
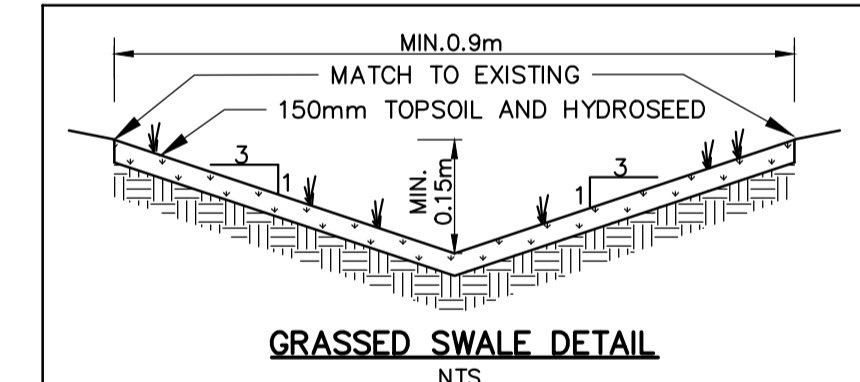
DESIGN: HY
DRAWN: HY
CHECK: GC

FILE: 523650
DATE: JAN 2023
SCALE: 1:300

DWG:
C100



PAVEMENT STRUCTURE			
Course	Compaction Requirement	Light Duty	Heavy Duty
Surface Course Asphalt	OPSS 310	50mm HL3 or HL5	40mm HL3 or HL5
Binder Course Asphalt	OPSS 310		50mm HL8(2 lifts)
Granular Base	100% SPMD(D)(ASTM-D698)	150mm OPSS 1010 Granular A	150mm OPSS 1010 Granular A
Granular Subbase	98% SPMD(D)(ASTM-D698)	300mm OPSS 1010 Granular B	450mm OPSS 1010 Granular B



LEGEND

- CB PROPOSED CATCHBASIN
- LCB PROPOSED LAWN CATCHBASIN
- CBMH PROPOSED CATCHBASIN MANHOLE
- DICBMH PROPOSED DITCH INLET CATCHBASIN MANHOLE
- STMMH PROPOSED STORM MANHOLE
- SANMH PROPOSED SANITARY MANHOLE
- OGS PROPOSED OIL GRIT SEPARATOR
- PROPOSED TOP OF RETAINING WALL
- PROPOSED BOTTOM OF RETAINING WALL
- PROPOSED BOTTOM OF SWALE
- PROPOSED TOP OF DEPRESSED CURB
- PROPOSED TOP OF CURB
- PROPOSED BOTTOM OF CURB
- PROPOSED DOOR ENTRANCE/EXIT
- PROPOSED OVERLAND FLOW ROUTE
- PROPOSED DOWNSPOUT LOCATION
- PROPOSED ELEVATION
- PROPOSED ELEVATION MATCH EXISTING
- PROPOSED TOP OF CURB
- PROPOSED BOTTOM OF CURB
- EXISTING COUNTEROUR
- PROPERTY BOUNDARY

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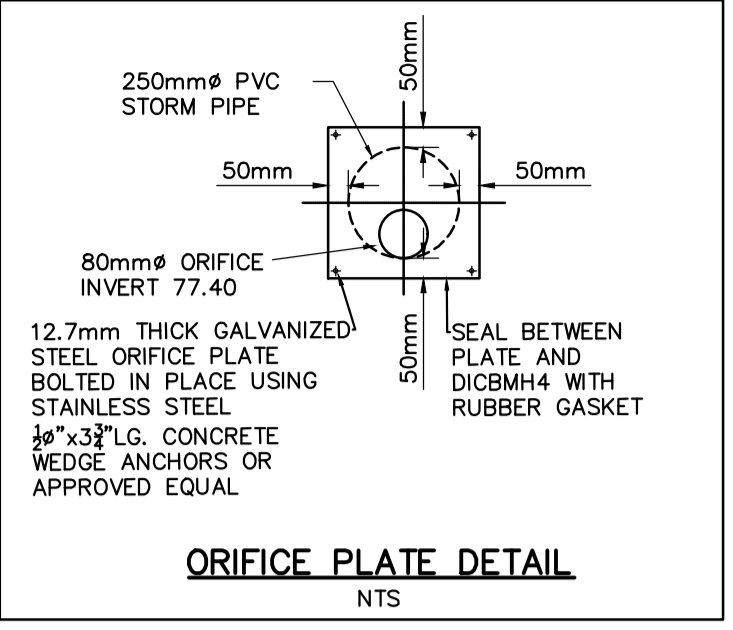
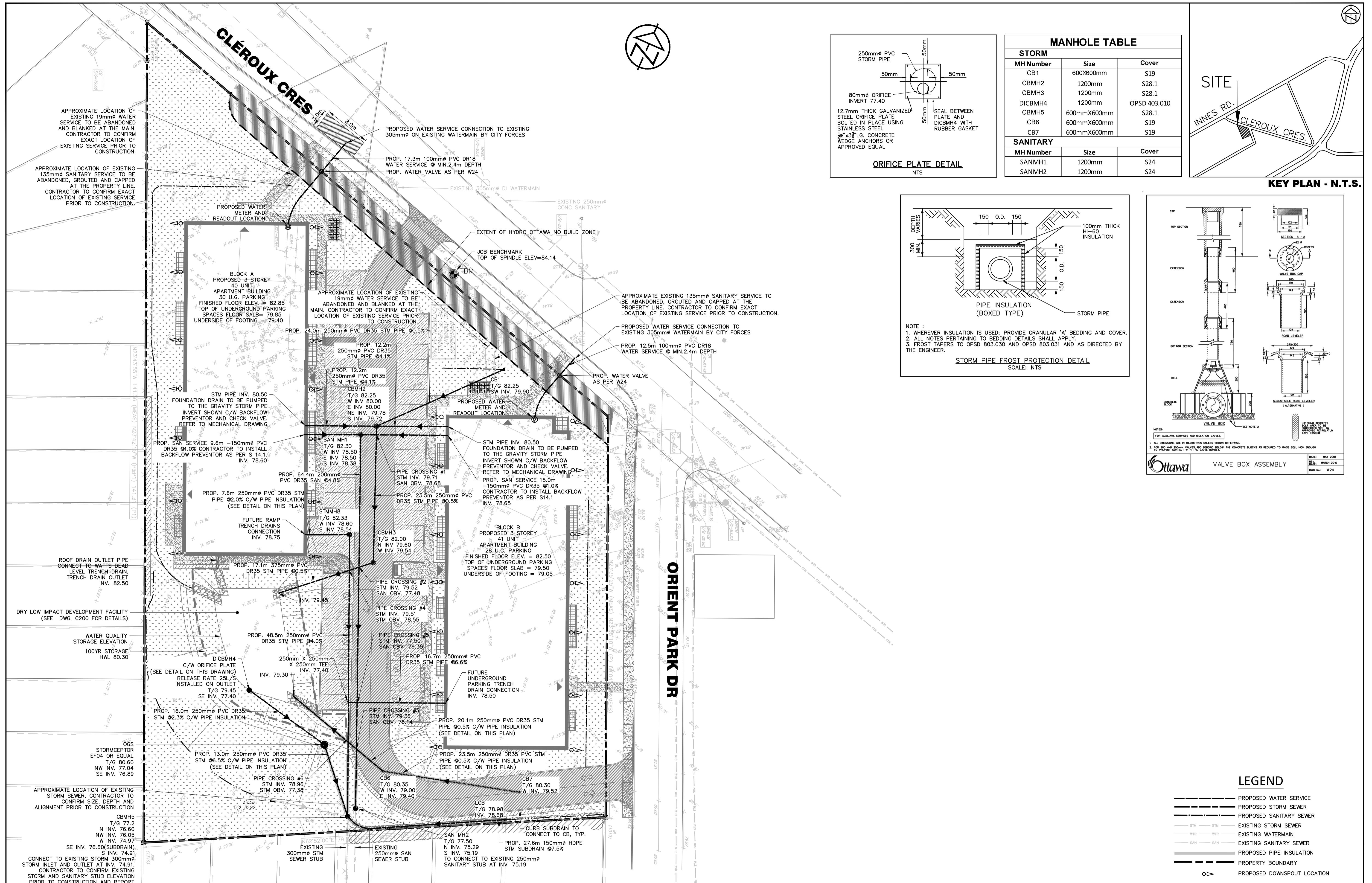


BRIDOR DEVELOPMENTS
2380 & 2396 CLÉROUX CRESCENT
CITY OF OTTAWA
SITE GRADING PLAN

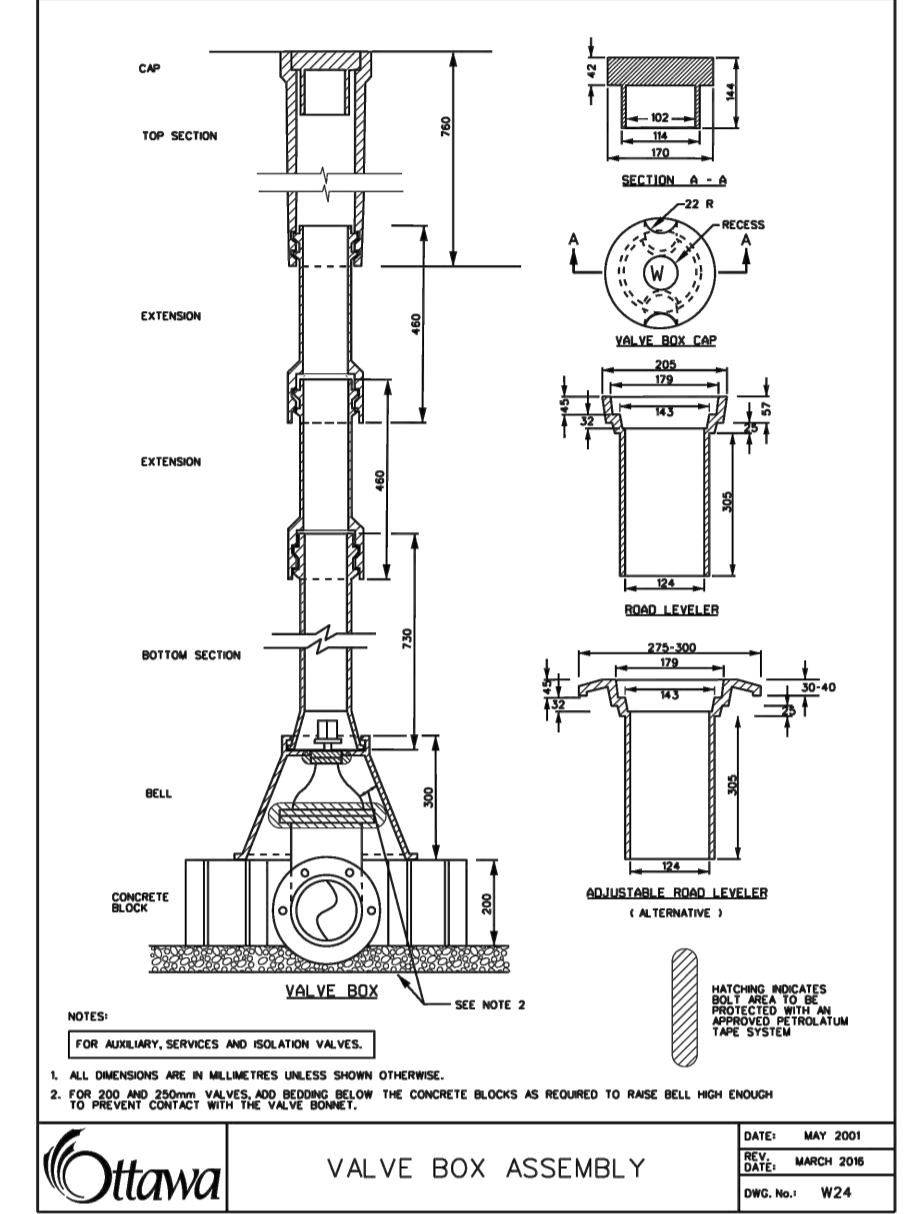
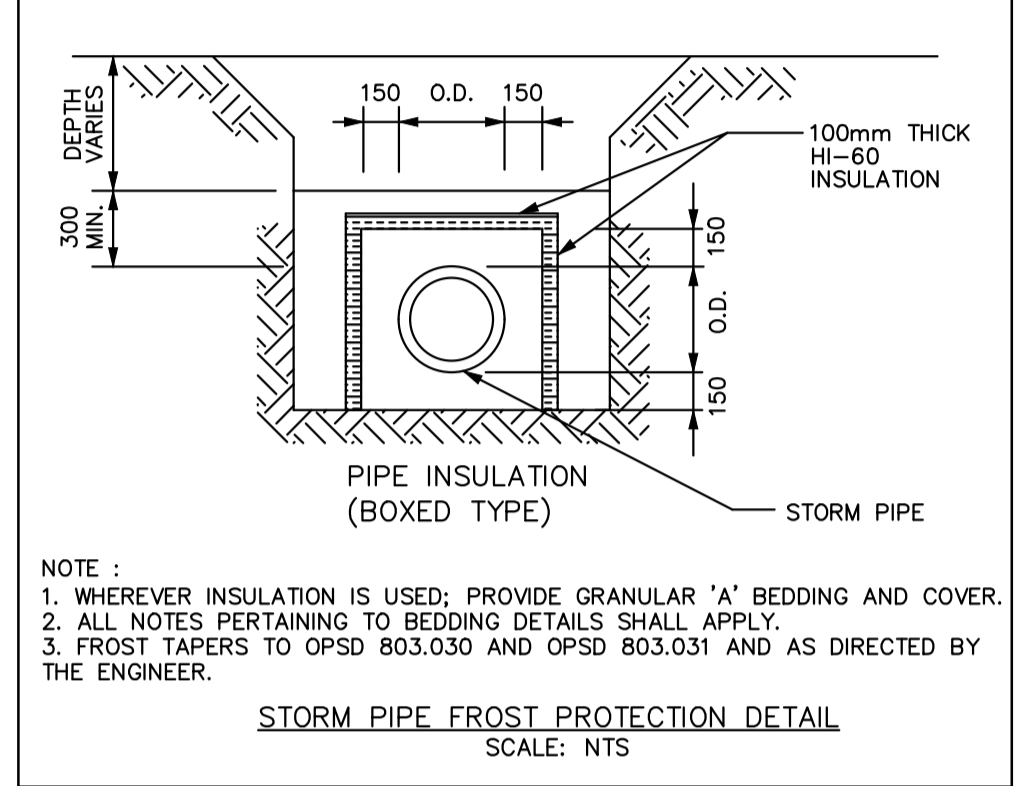
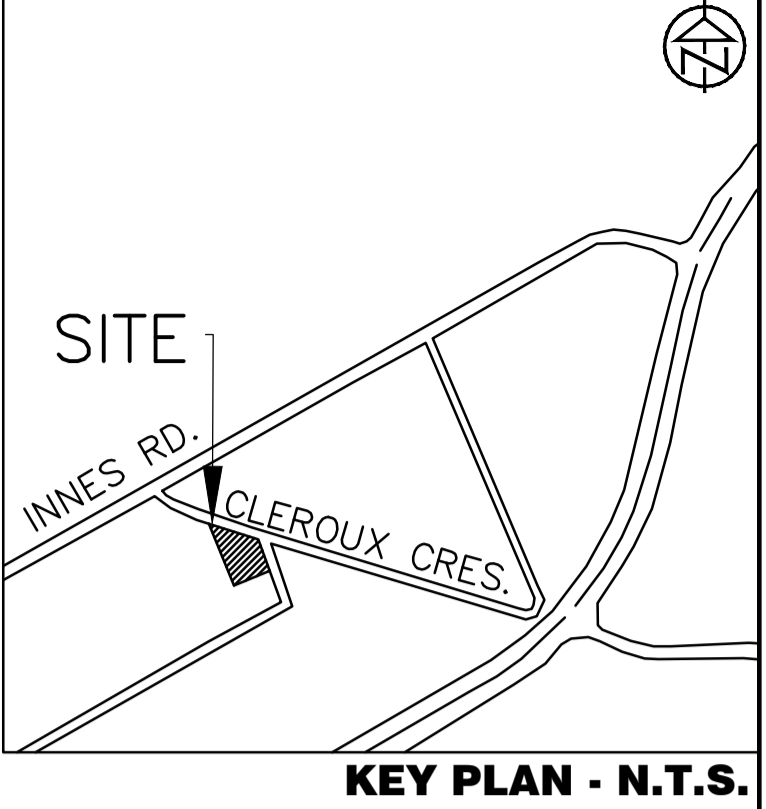
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DRAWN: HY DATE: JAN 2023
CHECK: GC SCALE: 1:300
C200

D07-12-21-0081

PLAN# 18569



MANHOLE TABLE		
STORM		
MH Number	Size	Cover
CB1	600x600mm	S19
CBMH2	1200mm	S28.1
CBMH3	1200mm	S28.1
DICBMH4	1200mm	OPSD 403.010
CBMH5	600mmX600mm	S28.1
CB6	600mmX600mm	S19
CB7	600mmX600mm	S19
SANITARY		
MH Number	Size	Cover
SANMH1	1200mm	S24
SANMH2	1200mm	S24



LEGEND

- PROPOSED WATER SERVICE
- PROPOSED STORM SEWER
- PROPOSED SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING WATERMAIN
- EXISTING SANITARY SEWER
- PROPOSED PIPE INSULATION
- PROPERTY BOUNDARY
- PROPOSED DOWNSPOUT LOCATION

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5.	RE-ISSUED FOR SPA	DEC 2023	

ENGINEER STAMP

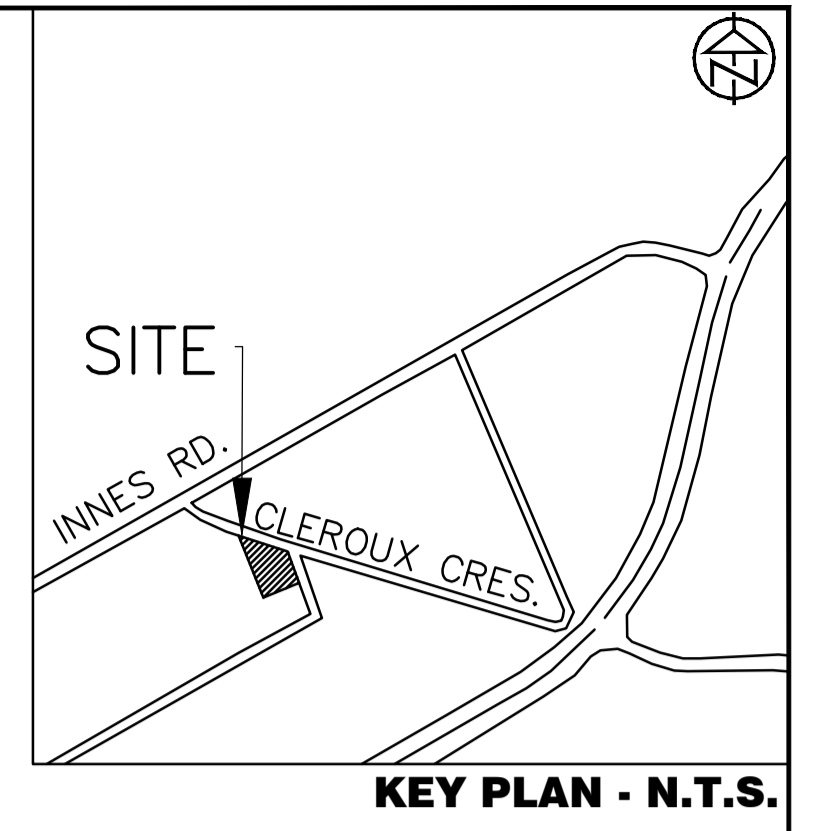
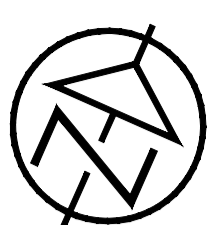
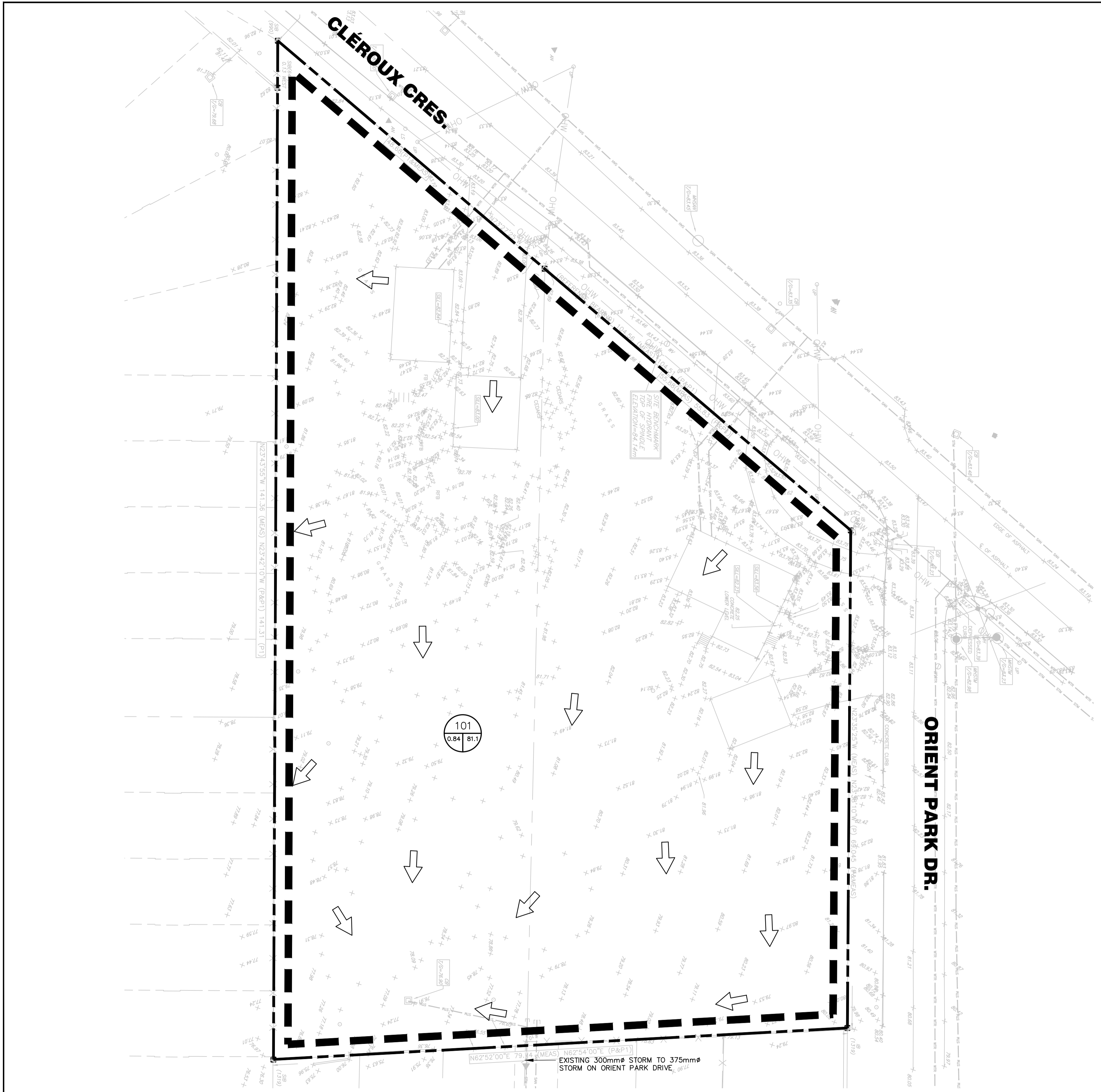
 J. R. ASH
 100123062
 PROVINCE OF ONTARIO

BRIDOR DEVELOPMENTS
2380 & 2396 CLÉROUX CRESCENT
CITY OF OTTAWA

SITE SERVICING PLAN

TATHAM ENGINEERING

DESIGN: HY FILE: 523650 DWG:
 DRAWN: HY DATE: JAN 2023 **C300**
 CHECK: GC SCALE: 1:300



LEGEND

- SUBJECT PROPERTY BOUNDARY
- DRAINAGE AREA BOUNDARY
- EXISTING CONDITION DRAINAGE DIRECTION
- DRAINAGE AREA ID
- CN*
- AREA (ha.)

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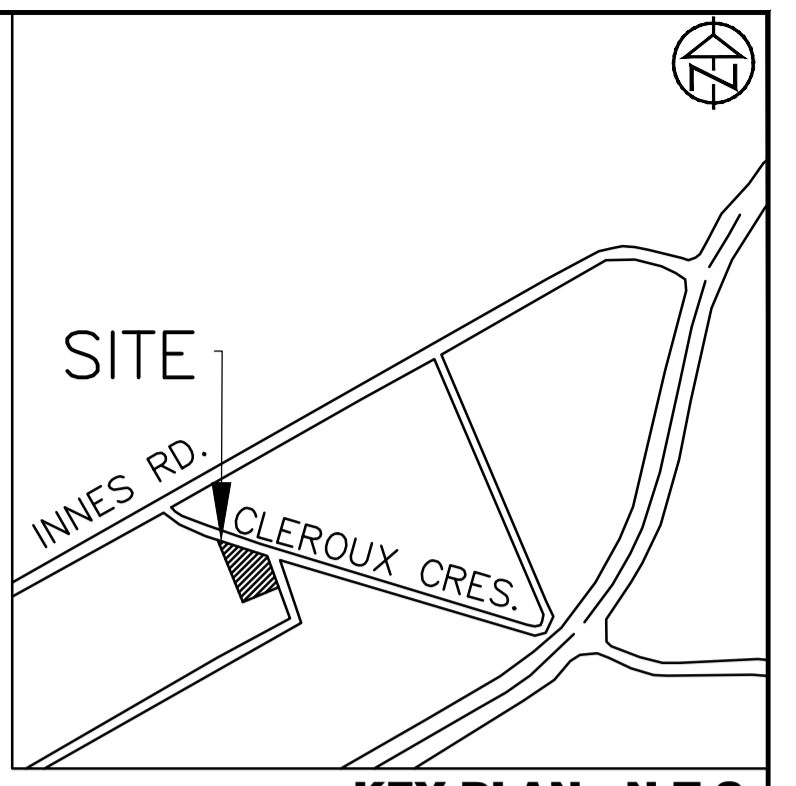
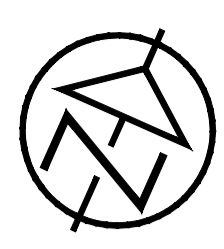
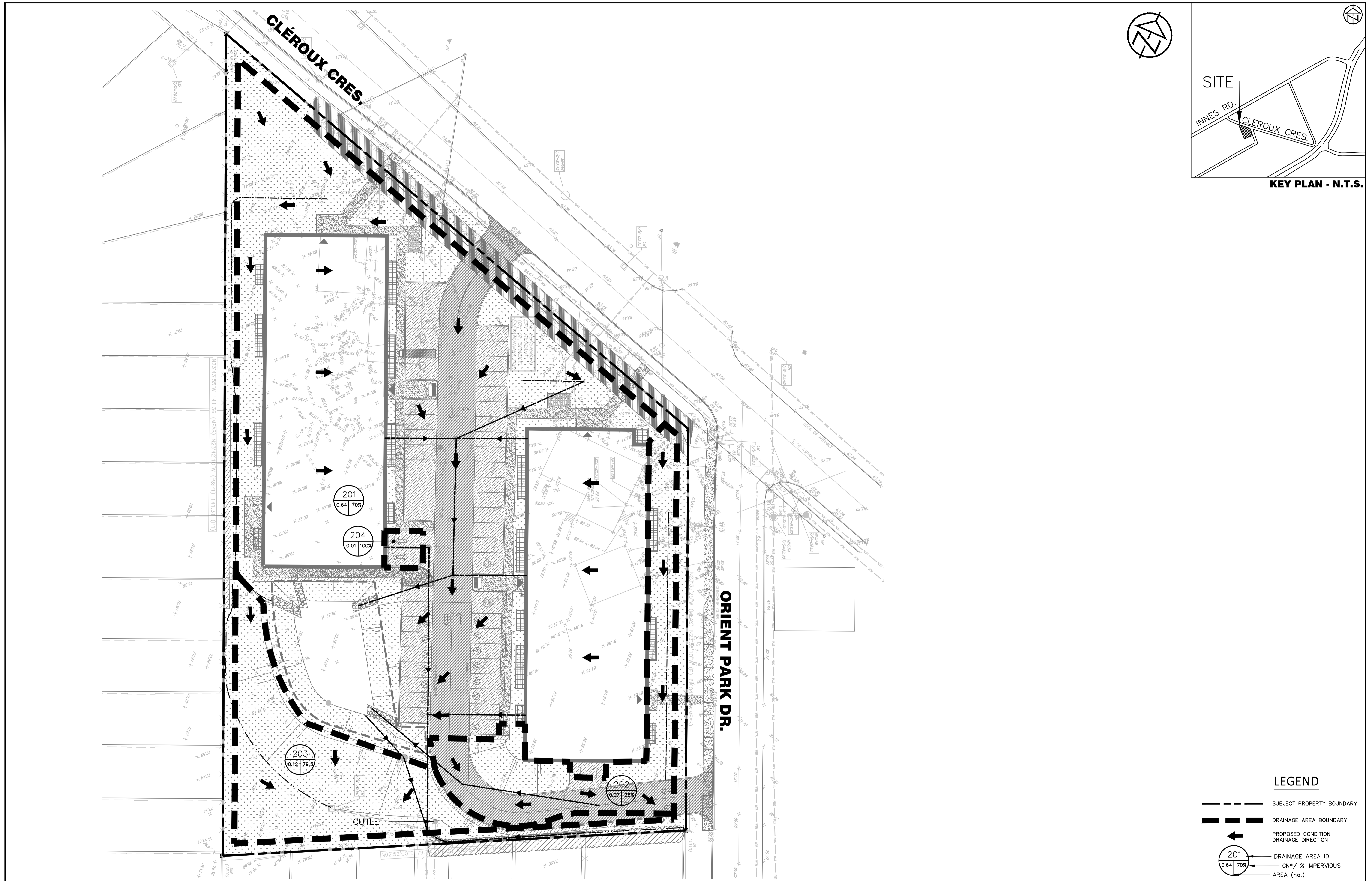
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4.	RE-ISSUED FOR SPA	AUG 2023	
5.	RE-ISSUED FOR SPA	DEC 2023	

BRIDOR DEVELOPMENTS
2380 & 2396 CLÉROUX CRESCENT
CITY OF OTTAWA

EXISTING CONDITION
SITE DRAINAGE PLAN

TATHAM ENGINEERING

DESIGN: HY	FILE: 523650	DWG: C400
DRAWN: HY	DATE: JAN 2023	
CHECK: GC	SCALE: 1:300	



KEY PLAN - N.T.S.

LEGEND

- SUBJECT PROPERTY BOUNDARY
- DRAINAGE AREA BOUNDARY
- PROPOSED CONDITION DRAINAGE DIRECTION
- DRAINAGE AREA ID
CN* / % IMPERVIOUS
AREA (ha.)

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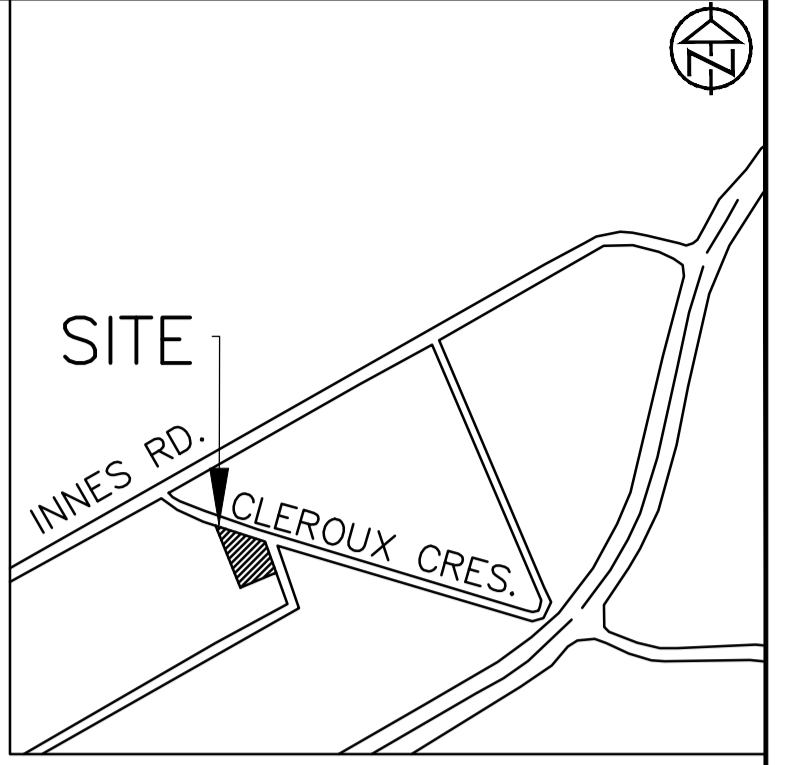
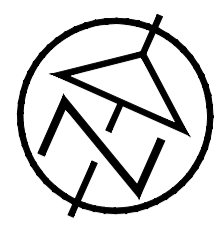
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5.	RE-ISSUED FOR SPA	DEC 2023

ENGINEER STAMP

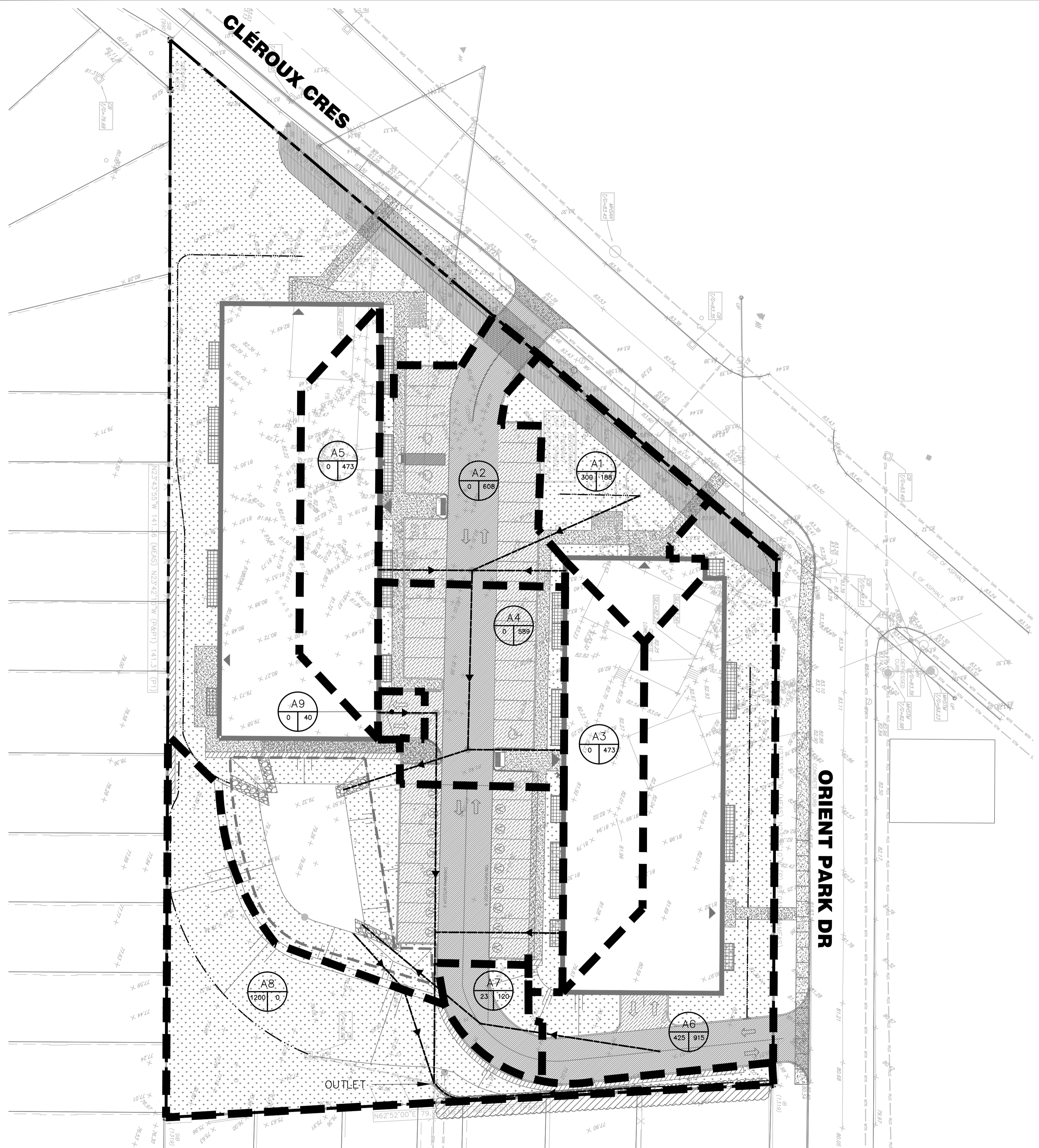
BRIDOR DEVELOPMENTS
2380 & 2396 CLÉROUX CRESCENT
CITY OF OTTAWA

PROPOSED CONDITION
SITE DRAINAGE PLAN

DESIGN: HY	FILE: 523650	DWG: C401
DRAWN: HY	DATE: JAN 2023	
CHECK: GC	SCALE: 1:300	



KEY PLAN - N.T.S.



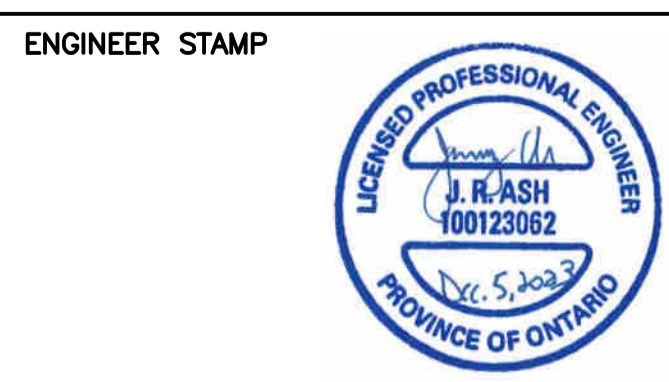
LEGEND

- SUBJECT PROPERTY BOUNDARY
- DRAINAGE AREA BOUNDARY
- PROPOSED CONDITION DRAINAGE DIRECTION
- DRAINAGE AREA ID
- IMPERVIOUS AREA (m²)
- PERVIOUS AREA (m²)

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BRIDOR DEVELOPMENTS
2380 & 2396 CLÉROUX CRESCENT
CITY OF OTTAWA

STORM DRAINAGE PLAN

TATHAM ENGINEERING

DESIGN: HY	FILE: 523650	DWG:
DRAWN: HY	DATE: JAN 2023	C402
CHECK: GC	SCALE: 1:300	

**Appendix F:
BL Engineering Site Servicing and
SWM Report
(May 5, 2022)**

SITE SERVICING AND STORMWATER MANAGEMENT REPORT

Project Address – 2380 & 2396 Cleroux Cres., Orleans, Ontario

Owner/Client: Bridor Development
Address: 996-B St-Augustin Rd, Embrun ON
City file Number:

By Blanchard Letendre Engineering Ltd.
Date – May 05, 2022
Our File Reference: 20-305

Previous Submission
October 14, 2020
February 04, 2022

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Appendix A – Stormwater Design

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Appendix C – Watermain Design

Appendix D – Stormwater Underground Chamber & Stormwater Treatment Unit

Appendix E – Boundary Conditions

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1.0 INTRODUCTION

Blanchard Letendre Engineering Ltd. (BLEL) was retained by Bridor Development. to complete their site servicing and stormwater management for the new proposed site located at 2380 – 2396 Cleroux Crescent in Ottawa. This report summarized proposed site servicing and stormwater management and should be read in conjunction with the engineering drawings prepare by BLEL.

This report and site servicing plan have been prepared based on the site plan proposed by P-Square Concepts and the site survey completed by Annis O’Sullivan Vollebekk. The information contained herein is based on the provided drawings and if there is any discrepancy with the survey or site plan, BLEL should be informed in order to verify the information and complete the changes if required.

2.0 SITE PLAN

The proposed site is to be located in Orleans, Ontario. As per the aerial picture in figure 1, the existing site consist of and green space area with two (2) existing houses with garage that will be demolished prior to construction. The property located at 2380 – 2396 Cleroux Cres., consist of approximately 0.839ha of undeveloped land. The land will be developed with two (2) new residential apartments building with underground parking with shared entrance and parking.



Figure 1- Existing site at 2308 - 2396 Cleroux Cres. Orleans, Ontario

3.0 STORM WATER MANAGEMENT

3.1 Existing Site Condition

The existing site currently has no stormwater management nor storm service connection. The site currently drains uncontrolled towards the surrounding roads, Cleroux Crescent and Orient Park as where the stormwater generated from the site is captured by the road site catchbasin. The south-west corner of the property drains uncontrolled towards the neighbouring backyards. An existing city catchbasin is installed in the corner with captures and conveys the stormwater towards the existing storm stub in the south easement. The existing property naturally grades south towards the existing neighbourhood backyard. There is an existing subdivision adjacent to property on the west and south portions. Refer to BL Engineering drawing C400 for the pre-development drainage area and existing grading showing the current drainage of the site.

3.2 Proposed Storm Water Management

The development of the site will consist of constructing two (2) new three (3) storeys residential buildings. The site will be modified by adding two (2) new 1016 square meter building, asphalt parking and driving and amities areas. As the runoff coefficient will increase due to addition of hard surfaces, post-development stormwater quantity and quality will be implemented.

The site stormwater management has been prepared in correlation with the existing site grading. To minimize the fill and site work required, the stormwater management has been developed to follow the existing site grading. As the property naturally drains south towards the neighbour's backyard, the proposed site work has been prepared to limit the work at the south-west corner while maintaining the stormwater outlet to City storm sewer in the easement at the south end of the property. The overland flow route has also been designed to convey the storm runoff towards Oriental Park. By limiting the work at the south-west corner, where the biggest elevation drops occurs, the use of retaining walls near the neighbour's backyard won't be as intrusive.

The stormwater generated by the new hard surfaces will be directed to a series of catchbasins which will capture and covey the water runoff to existing the 300mm diameter storm sewer stub located in the easement at the south end portion of the property between 2492 and 2490 Orient Park Dr. The catchment areas have been delineated as per the proposed grading plan. Refer to Appendix 'A', for the catchment area and runoff coefficient. In order to respect the 5 year pre-development allowable release rate, the outlet will be controlled by a inlet control devise and limit the flow outletting to City storm sewer in the easement. By throttling the flow, stormwater retention will be completed with the use of underground storage which was designed to hold the 100 year storm event. Refer to Appendix 'A' for the stormwater flow and storage calculations.

3.3 Proposed Storm Water Management

The pre-development flow of the 5-year storm was calculated using a 5-year storm and a 10-minute time of concentration for the affected area. The pre-development flow of the 100-year storm was calculated using a 100-year storm and a 10-minute time of concentration for the affected area. From intensity duration curves established for the Ottawa area, the intensity was evaluated at of 104.2 mm/hr for the 5yr predevelopment flow and 178.6mm/hr for the 100-year predevelopment flow. A run-off coefficient of 0.50 was used as per the evaluated, see Appendix 'A' – Pre-Development Drainage Area table.

Using the Rational Method and considering the tributary areas of the proposed (see Appendix 'A'), the pre-development allowable release rate for the site was evaluated at **102.08 L/s**. See also the Storm Sewer Design Sheet in Appendix 'A'.

$$\begin{aligned}\text{Allowable Release Rate (Q)} &= 2.78CIA \text{ (L/s)} \\ I_5 &= 998.071 / (Tc + 6.053)^{0.814} \\ C &= 0.50 \\ I &= 104.2 \text{ mm/hr} \\ Tc &= 10 \text{ min} \\ \text{Total} &= 0.839 \text{ ha} \\ \text{Allowable Release Rate} &= 121.53 \text{ L/s}\end{aligned}$$

As the site will outlet to the existing storm sewer stub located in the easement between 2492 and 2490 Orient Park Dr., the existing 300mm diameter sewer stub previously installed only has a full flow capacity of 96.70 L/s. As the proposed site will have some underground chambers, the release rate was lowered to 50% of the allowable release rate. Therefore, the site total release rate has been designed to meet the maximum flow of **60.76 L/s** to the existing 300mm diameter storm stub on Oriental Park.

3.4 Proposed Stormwater Quantity Control

The proposed stormwater management for the site will be achieved primarily through the use of underground pipe storage and infiltration gallery. The grading of the site has been designed to direct the stormwater towards the series of catchbasins connected to the underground stormwater chambers before outleting south into the existing 300mm diameter storm city stubs that ultimately connect to the 375mm sewer on Orient Park Dr. The proposed underground stormwater chambers and catchbasins are shown on the attached drawings in Appendix 'E'.

The proposed site has been graded to outlet overland onto Oriental Park Dr. on the south-east side of the property. As the site naturally grades from the north side to the south side, the grades have been adjusted to suit this profile and minimize the grade raise of the site. All catchment areas were

designed to directed the stormwater overland to a series of cathcbasins, landscaping drains and subdrains which will capture and convey the stormwater to Oriental Park Dr.

The stormwater generated from site will be discharged to the existing storm sewer stub on Orient Park Dr. and be controlled using orifices plates installed in manhole MHCB02 and the landscape catchbasin, LCB14, which will throttle the flow direct to the municipal sewer. The combined flow restrictors will release a total of **58.53 L/s** with a maximum head of 1.92m (HWL = 80.22) at MHCB02 and 0.86m (HWL = 76.65) at LCB14 during the 100 year event. As the flow will be restricted stormwater storage will be required. A total of 70.82m³ is required for the watershed 05 and 175.65m³ is for the remaining watersheds. This storage will be provided with underground stormwater chambers and infiltration gallery as the property natural slopes does not promote overland storage. The underground storage and infiltration gallery have been designed to hold and convey the stormwater water to the sewer located at in the easement on Oriental Park. Using a void area of 40% in the gravel, the infiltration gallery will provide a total of 73.8 m³ and the underground chambers will provide 176 m³ which will hold more than the required storage. Refer to the underground chambers in Appendix 'D'.

The two (2) underground parking ramp will be drained with separate catchbasin that will capture and convey the storm water generated from the ramps to the storm sewer downstream of the inlet control devices. These areas were left uncontrolled towards the city main stub.

3.4.1 Roof Drainage

The proposed roofs are flat roof with roof drains. Drain and scuppers will be installed to drain the water onto the pavement area uncontrolled.

3.4.2 Underground Chambers

The underground storage chambers have been designed to hold and convey the stormwater generated from area A1, A2, A3, A4, A6, A9 and A10. Area A6 is being captured by three landscape catchbasins and a subdrain. The underground chambers have been designed to hold the stormwater runoff under the proposed parking/ driving area. The chambers, which have been designed as per the manufacturer, were designed to also provide some filtration which is favorable for the final site TSS. A total of 176.00 m³ will be provided by the underground chambers. The chambers will be connected to the proposed manhole catchbasin which will facilitates the maintenance of the chambers. The maintenance of the chambers is to be in accordance with the manufacture. Refer to Appendix "D" for Stormwater Storage Chambers.

3.4.3 Infiltration Gallery

The infiltration gallery has been design to hold and convey the stormwater generated from the site area A5. The infiltration gallery has been designed to hold the stormwater runoff generated from the grass area that drains towards the adjacent property south. The infiltration gallery will have a total length of 82m and stretch all along the south portion of the property. The infiltration gallery volume was calculated using an area of 1.5m heigh by 1.5m wide with a void ration of 40%. A total of 73.80 m³ will be provided by the infiltration gallery. The infiltration gallery will be connected to the proposed manhole catchbasin manhole MH01.

3.5 Proposed Stormwater Quality Control

A water quality control requirement of 80% TSS removal was set by the City of Ottawa. In order to meet the requirements, a storm treatment unit will be installed and the downstream end of the system. Using the Stormceptor sizing software, the EF06 was selected. The software generated report has been attached (See Appendix "D").

4.0 SANITARY SEWER DESIGN

4.1 Existing Site Conditions

The existing site is currently being service by a two separate residential service connected to the the houses on the two parcels which are connected to the existing 250mm diameter sanitary on Cleroux Crescent. The existing connection will be abandoned at the property line as the new connections will be completed at the north end portion of the property where and existing sanitary stub was previously installed in the city right away between 2492 and 2490 Orient Park Dr.

4.2 Existing Site Conditions

The two new residential apartment building, which proposes 40 units each will discharge to the city main sewer stub on Orient Park Dr. via two new 150mm diameter sanitary services connected to the 200mm diameter sewer proposed between the two new buildings. The services will be discharged into the new sewer before being conveyed north to the existing 250mm diameter sanitary stub in the city easement between 2492 and 2490 Orient Park Dr. The proposed 150mm diameter service will be installed at a minimum of 1.00% slope directly to the new private sewer. A monitoring manhole is proposed at the sanitary stub which will also be a drop structure considering the change in elevation on the property. Refer to drawing C300 – Site Servicing Plan for the existing and proposed sanitary service.

Based on the City of Ottawa Sanitary Design Guidelines, the sanitary peak loads were evaluated as follow; Block A: **1.15 L/s** and Block B: **1.12L/s** for a total of **2.27 L/s** which is below the allowable flow of 7.0L/s as per the City of Ottawa property boundaries. As per the City specific design parameters, the sanitary flow was evaluated based on the new building footprint and the total site area for each individual building. Refer to Appendix 'B' for the sanitary sewer design calculation and design parameters set by the City of Ottawa.

5.0 WATER CONNECTION DESIGN

5.1 Existing Site Conditions

The existing site is currently being service by a two separate 19mm diameter water service which services the existing two houses on the parcels and are connected to the existing 305mm diameter watermain on Cleroux Crescent. The existing connection will be removed and where two new connection will be installed to service the two new buildings. There is currently two (2) city fire hydrant, one (1) at the south façade of the property and the other at the north-west. The hydrants on south is located on the north side of Cleroux Crescent and the other is located on the north side of Orient Park Dr, both within the 90m radius from the building entrance. Refer to drawing C300 – Site Servicing Plan for the existing and proposed water services and city existing infrastructure.

5.2 Proposed Domestic Water Service

The new residential apartment buildings water services were sized based on the City of Ottawa Design Guidelines and the AWWA Standards. Based on the number of fixtures proposed and on the average water demand for residential developments the daily water consumption was evaluated for the proposed building. As per the city guidelines, the average water demand per person of **350L/c/d** was applied to the population of the new building. The daily and hourly peak factor of **2.5** and **2.2** respectively were applied to the water demand as stated in the City of Ottawa guideline. By using the average demand and peaking factors, the daily water demand for the new buildings were evaluated as follow:

	BLOCK A	BLOCK B	UNITS
Average Water Demand =	22050.00	22540.00	L/d
Maximum Daily =	55125.00	56350.50	L/d
Maximum Hourly =	121275.00	123970.50	L/d
Total Domestic Flow =	1.40	1.43	L/s
Total Fire Flow =	166.67	161.67	L/s

Refer to Appendix ‘C’ for the water flow calculation sheet.

The proposed buildings will be serviced with a new 100mm water service that will be connected to the existing 305mm watermain on Cleroux Crescent. The two new building will be connected to the new 100mm service via separate 50mm diameter water service. Each service will connect into the proposed mechanical room of the buildings. As per the City standard, two water service will be teed off the existing watermain on Cleroux with an isolation valve in between to allow maintenance on the city watermain without interrupting the water for the site.

5.3 Proposed Fire Demand

As the new residential buildings will not have a sprinkler system, the new services were sized to supply only the domestic flow. Based on the Ontario building code calculations, the water flow

was evaluated at **166.67L/s** for Block A and **161.67L/s** for Block B. Refer to Appendix 'C' for the fire flow calculation sheet. As there is two existing water hydrants located within the 90m radius from the building main entrances, there will be no new private hydrant installed on the property.

5.4 Water Capacity Comments

The boundary conditions and HGL for hydraulic analysis for 2396 Cleroux Crescent was obtained from the city. See attached copy in Appendix 'E'. From the boundary conditions, the minimum HGL was evaluated at 131.0 m for the water main elevation at 83.2m and a maximum pressure estimate of 67.8 psi.

6.0 EROSION AND SEDIMENT CONTROL

During the construction, sediment and erosion protect will be implemented around the property to prevent any sediments from leaching off site. The construction and maintenance of the sediment controls must comply with the Ontario Provision Standard Specification OPSS 577. Refer to drawing C100 – Erosion and Sediment Control for the perimeter fence proposed.

7.0 CONCLUSION AND LIMITATION OF REPORT

7.1 Stormwater Management

The stormwater management proposed for the site will maintain the site to its pre-development release rate conditions and meet the requirements from the City of Ottawa. The post development release rate will be maintained to its pre-development rate of **60.76 L/s** through flow restrictors installed in the sewers before outletting to the sewer main on Oriental Park. Stormwater quantity control will be achieved with 176m³ of underground chamber and 73.8 m³ in the infiltration gallery. The stormwater quality control will be met through the use of a stormwater treatment unit and isolator rows in the underground chambers.

7.2 Sanitary Service

The current site will be serviced with three new 200mm sanitary sewer located in the easement south of the property. The estimated sanitary flow of; Block A: **1.15 L/s** and Block B: **1.12L/s** a for the new connections will be directed to the existing sanitary sewer along the easement of Oriental Park.

7.3 Water Service

Currently the existing buildings on site are serviced with an existing 19mm diameter water service that will be replaced with a 100mm diameter water services to connected to the existing 305mm diameter main on Cleroux Crescent. The existing connections will be removed. The water demand for building was evaluated at: Block A: **1.40 L/s** and Block B: **1.43L/s** and the fire flow demand

at Block A: **166.67 L/s** and Block B: **161.67 L/s**. Sprinkler system are not proposed for the site. There is also two (2) fire located around the property within 90m from every entrance doors.

8.0 LIMITATION

This report was prepared for **Bridor Development.**, and is only applicable for the property at 2380-2396 Cleroux Crescent, Ottawa.

Any changes to the existing site may require a review by Blanchard Letendre engineering Ltd. to ensure all information is consistent with the proposed design.

Should you have any questions, please do not hesitate to contact the undersigned.

Sincerely Yours,



Guillaume Brunet, P. Eng.

APPENDIX “A”

Stormwater Management Design

File No.	20-305	Date:	May 5, 2022
Project:	Proposed Apartment Buildings	Designed:	Guillaume Brunet
Project Address:	2396 Cleroux Crescent, Ottawa	Checked:	Guillaume Brunet
Client:	Bridor Development	Drawing Reference:	C200 & C300

PRE-DEVELOPMENT DRAINAGE AREA (AFFECTED AREA)

Catchment Area	Runoff Coefficient			Total Area (ha)	Combined C
	C = 0.3	C = 0.80	C = 0.90		
E-01	0.671	0.000	0.168	0.839	0.42
TOTAL	0.671	0.000	0.168	0.839	0.42

POST-DEVELOPMENT DRAINAGE AREA

Catchment Area	Runoff Coefficient			Total Area (ha)	Combined C
	C = 0.30	C = 0.80	C = 0.90		
WS-01	0.074	0.000	0.011	0.085	0.38
WS-02	0.033	0.000	0.070	0.103	0.71
WS-03	0.021	0.000	0.060	0.081	0.74
WS-04	0.015	0.000	0.063	0.078	0.78
WS-05	0.200	0.000	0.020	0.220	0.35
WS-06	0.052	0.000	0.000	0.052	0.30
WS-07- Ramp	0.000	0.000	0.005	0.005	0.90
WS-08 - Ramp	0.000	0.000	0.013	0.013	0.90
WS-09 - Roof	0.000	0.000	0.102	0.102	0.90
WS-10 - Roof	0.000	0.000	0.102	0.102	0.90
TOTAL	0.395	0.000	0.444	0.839	0.62

RUNOFF COEFFICIENT (C)

Grass	0.30
Gravel	0.80
Asphalt / rooftop	0.90

File No. 20-305
Project: Proposed Apartment Buildings
Project Address: 2396 Cleroux Crescent, Ottawa
Client: Bridor Development

Date: May 5, 2022
Designed: Guillaume Brunet
Checked: Guillaume Brunet
Drawing Reference: C200 & C300

STORM WATER MANAGEMENT DESIGN SHEET
SEWER DESIGN

LOCATION		AREA (ha)			FLOW					STORM SEWER DATA								
WATERSHED / STREET	From MH	To MH	C = 0.30	C = 0.80	C = 0.90	Indiv. 2.78AC	Accum. 2.78AC	Time of Conc. (min.)	Rainfall Intensity (mm/hr)	Peak Flow Q (L/s)	Pipe Diameter (mm)	Type	Slope (%)	Length (m)	Capacity Full (L/s)	Velocity Full (m/s)	Time of Flow (min.)	Ratio (Q/Q _{FULL})
WS-06	LCB10	MHCB08	0.052	0.000	0.000	0.03	0.03	10.00	104.19	3.01	250	PVC	0.40%	20.8	37.6	0.77	0.45	0.08
	MHCB08	MHCB02	0.000	0.000	0.000	0.00	0.03	10.45	101.86	2.95	250	PVC	1.00%	16.0	59.47	1.21	0.22	0.05
	LCB13	MHCB06	0.000	0.000	0.000	0.00	0.00	10.00	104.19	0.00	250	PVC	0.40%	18.0	37.6	0.77	0.39	0.00
WS-01	LCB12	LCB07	0.000	0.000	0.000	0.00	0.00	10.00	104.19	0.00	250	PVC	0.25%	31.0	29.73	0.61	0.85	0.00
	LCB07	MHCB06	0.074	0.000	0.011	0.07	0.07	10.85	99.89	6.83	250	PVC	0.40%	15.5	37.61	0.77	0.34	0.18
	MHCB06	MHCB05	0.000	0.000	0.000	0.00	0.07	11.19	98.30	6.72	250	PVC	1.00%	19.3	59.47	1.21	0.27	0.11
WS-02 + WS-10	MHCB05	MHCB04	0.033	0.000	0.172	0.45	0.52	11.46	97.09	50.18	250	PVC	1.00%	14.7	59.5	1.21	0.20	0.84
WS-03 + WS-09	MHCB04	MHCB03	0.021	0.000	0.162	0.42	0.93	11.66	96.18	89.70	450	PVC	0.25%	21.0	142.6	0.90	0.39	0.63
WS-04	MHCB03	MHCB02	0.015	0.000	0.063	0.17	1.10	12.05	94.49	103.80	450	PVC	0.25%	21.5	142.55	0.90	0.40	0.73
	MHCB02	MHCB01	0.000	0.000	0.000	0.00	1.10	12.45	92.82	101.97	450	PVC	1.00%	7.6	285.11	1.79	0.07	0.36
WS-05	LCB14	MHCB01	0.200	0.000	0.020	0.16	1.29	12.52	92.54	119.25	250	PVC	1.00%	9.2	59.47	1.21	0.13	2.01
	MHCB01	STORMCEPTOR	0.000	0.000	0.000	0.00	1.29	12.65	92.03	118.59	300	PVC	1.00%	3.2	96.70	1.37	0.04	1.23
	STORMCEPTOR	CITY	0.000	0.000	0.000	0.00	1.29	12.68	91.87	118.39	300	PVC	1.00%	16.1	96.7	1.37	0.20	1.22

DESIGN PARAMETERS NOTES

Runoff Coefficient (C)
 Grass 0.30
 Gravel 0.80
 Asphalt / rooftop 0.90

Q = 2.78 AIC, where
 Q = Peak flow in Litres per second (L/s)
 A = Area in hectares (ha)
 I = Rainfall Intensity (mm/hr)
 C = Runoff Coefficient

Ottawa Macdonald-Cartier International Airport IDF curve
 $I_3 = 998.071 / (T_c + 6.053)^{0.814}$
 Min. velocity = 0.76 m/s
 Manning's "n" = 0.013
 * From City of Ottawa Stub in Easement

File No. 20-305
Project: Proposed Apartment Buildings
Project Address: 2396 Cleroux Crescent, Ottawa
Client: Bridor Development

Date: May 5, 2022
Designed: Guillaume Brunet
Checked: Guillaume Brunet
Drawing Reference: C200 & C300

STORM WATER MANAGEMENT DESIGN SHEET
SEWER DESIGN

LOCATION		MANHOLE INFORMATION						
From MH	To MH	Up Invert (m)	Down Invert (m)	T/G Up Stream (m)	T/G Down Stream	Up Depth obv (m)	Down Depth obv (m)	Up Depth inv (m)
LCB10	MHCB08	78.54	78.45	81.80	80.20	3.01	1.50	3.01
MHCB08	MHCB02	78.21	78.05	80.20	80.71	1.74	2.41	1.74
LCB13	MHCB06	80.37	80.29	82.42	82.75	1.80	2.21	1.80
LCB12	LCB07	81.23	81.16	82.40	82.60	0.92	1.19	0.92
LCB07	MHCB06	80.36	80.29	82.60	82.75	1.99	2.21	1.99
MHCB06	MHCB05	80.09	79.90	82.75	82.20	2.41	2.05	2.41
MHCB05	MHCB04	79.62	79.42	82.20	81.90	2.33	2.23	2.33
MHCB04	MHCB03	78.46	78.41	81.90	81.30	2.99	2.44	3.19
MHCB03	MHCB02	78.35	78.30	81.30	80.71	2.50	1.96	2.50
MHCB02	MHCB01	76.08	76.00	80.71	78.20	4.18	1.75	4.18
LCB14	MHCB01	75.24	75.15	76.65	78.20	1.16	2.80	1.41
MHCB01	STORMCEPTOR	74.91	74.88	78.20	78.00	2.99	2.82	3.29
STORMCEPTOR	CITY	74.82	74.73	78.00	77.40	2.88	2.37	2.88

File No.	20-305	Date:	May 5, 2022
Project:	Proposed Apartment Buildings	Designed:	Guillaume Brunet
Project Address:	2396 Cleroux Crescent, Ottawa	Checked:	Guillaume Brunet
Client:	Bridor Development	Drawing Reference:	C200 & C300

STORM WATER MANAGEMENT DESIGN SHEET
5 YEAR STORM EVENT

PRE-DEVELOPMENT STORMWATER MANAGEMENT

Runoff	Catchment Area	Area		ΣR_5
Un-Controlled	EWS-01	0.839	ha	R=
	Total Uncontrolled =	0.839	ha	$\Sigma R =$
				0.42
				0.42

PRE-DEVELOPMENT ALLOWABLE RELEASE RATE

$$Q = 2.78CIA \text{ (L/s)}$$

$$I_5 = 998.071 / (Tc + 6.053)^{0.814}$$

C =	0.50	up to a maximum of 0.5 as per City of Ottawa Sewer Design Guidelines
I =	104.2	mm/hr
Tc =	10	min
Total =	0.839	ha
Allowable Release Rate=	121.53	L/s

Allowable Release Rate= 96.70 L/s * As per City 300mm Diameter Stub installed at 1.00%

Allowable Release Rate= 60.76 L/s * 50% of Pre-Development Flow due to underground storage

POST-DEVELOPMENT STORMWATER MANAGEMENT

Runoff	Catchment Area	Area		ΣR_5	ΣR_{100}
Controlled	WS-01	0.085	ha	R=	0.38
	WS-02	0.103	ha	R=	0.71
	WS-03	0.081	ha	R=	0.74
	WS-04	0.078	ha	R=	0.78
	WS-05	0.220	ha	R=	0.35
	WS-06	0.052	ha	R=	0.30
	WS-09 - Roof	0.102	ha	R=	0.90
	WS-10 - Roof	0.102	ha	R=	0.90
	Total Controlled =	0.822	ha	$\Sigma R =$	0.61
					0.73
Un-controlled	WS-07 - Ramp	0.005	ha	R=	0.90
	WS-08 - Ramp	0.013	ha	R=	0.90
	Total Un-Controlled =	0.017	ha	$\Sigma R =$	0.90
				1.00	
				1.00	

$$I_5 = 998.071 / (Tc + 6.053)^{0.814}$$

* WS-09 will not be accounted for as it will remain unaffected

Time (min)	Intensity (mm/hr)	REQUIRED STORAGE (A1, A2, A3, A4, A6, A9, A10)			REQUIRED STORAGE (A5)			Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate (L/s)	Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate (L/s)		
10	104.2	127.97	64.78	20.00	28.24	0.00	39.46	1.30	60.76
15	83.6	102.63	74.37	20.00	22.65	0.00	39.46	1.05	21.05
20	70.3	86.29	79.54	20.00	19.04	0.00	39.46	0.88	20.88
25	60.9	74.80	82.19	20.00	16.51	0.00	39.46	0.76	20.76
30	53.9	66.24	83.22	20.00	14.62	0.00	39.46	0.67	20.67
35	48.5	59.59	83.14	20.00	13.15	0.00	39.46	0.61	20.61
40	44.2	54.27	82.25	20.00	11.98	0.00	39.46	0.55	20.55
45	40.6	49.90	80.73	20.00	11.01	0.00	39.46	0.51	20.51
50	37.7	46.25	78.74	20.00	10.21	0.00	39.46	0.47	20.47
60	32.9	40.46	73.66	20.00	8.93	0.00	39.46	0.41	20.41
70	29.4	36.08	67.52	20.00	7.96	0.00	39.46	0.37	20.37
80	26.6	32.62	60.60	20.00	7.20	0.00	39.46	0.33	20.33
90	24.3	29.83	53.09	20.00	6.58	0.00	39.46	0.30	20.30
500	6.3	7.71	0.00	20.00	1.70	0.00	39.46	0.08	20.08
720	4.7	5.75	0.00	20.00	1.27	0.00	39.46	0.06	20.06
1440	2.7	3.28	0.00	20.00	0.72	0.00	39.46	0.03	20.03

$$\text{Storage Volume} = (\text{Controlled Runoff} - \text{Controlled RR})/1000 * (\text{Time} * 60s)$$

STORMWATER STORAGE REQUIREMENTS

Total Storage Required = 83.22 m³
Underground Chambers = 176.00 m³
Total Available Storage = 175.00 m³

Total Storage Required = 0.00 m³
Infiltration Gallery = 73.80 m³
Total Available Storage = 73.80 m³

Inlet Control Device Parameters

Product Orifice Plate at MHC02
Invert Level = 78.30 masl.
HWL = 1.92 m from inv.
HWL = 80.22 masl.
Orifice Dia. = 82 mm
Orifice Invert = 78.30 masl.
Orifice Area = 0.0053 m²
ICD Centerline = 78.45 masl.
HWL Head = 1.91 m from centerline
C = 0.61
Controlled Release = 20.00 L/s

Inlet Control Device Parameters

Product Orifice Plate at LCB14
Invert Level = 75.74 masl.
HWL = 0.86 m from inv.
HWL = 76.60 masl.
Orifice Dia. = 142 mm
Orifice Invert = 75.74 masl.
Orifice Area = 0.0158 m²
ICD Centerline = 75.89 masl.
HWL Head = 0.84 m from centerline
C = 0.61
Controlled Release = 39.46 L/s

File No. 20-305
Project: Proposed Apartment Buildings
Project Address: 2396 Cleroux Crescent, Ottawa
Client: Bridor Development

Date: May 5, 2022
Designed: Guillaume Brunet
Checked: Guillaume Brunet
Drawing Reference: C200 & C300

STORM WATER MANAGEMENT DESIGN SHEET
100 YEAR STORM EVENT

PRE-DEVELOPMENT STORMWATER MANAGEMENT

Runoff	Catchment Area	Area		R=	ΣR _s
Un-Controlled	EWS-01	0.839	ha	R=	0.42
	Total Uncontrolled =	0.839	ha	Σ R=	0.42

PRE-DEVELOPMENT ALLOWABLE RELEASE RATE

$Q = 2.78CIA \text{ (L/s)}$

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$

C = 0.50 up to a maximum of 0.5 as per City of Ottawa Sewer Design Guidelines
 I = 104.2 mm/hr
 Tc = 10 min
 Total = 0.839 ha
Allowable Release Rate= 121.53 L/s

Release Rate= 96.70 L/s * As per City 300mm Diameter Stub installed at 1.00%

Allowable Release Rate= 60.76 L/s * 50% of Pre-Development Flow due to underground storage

POST-DEVELOPMENT STORMWATER MANAGEMENT

Runoff	Catchment Area	Area		R=	ΣR _s	ΣR ₁₀₀
Controlled	WS-01	0.085	ha	R=	0.38	0.47
	WS-02	0.103	ha	R=	0.71	0.89
	WS-03	0.081	ha	R=	0.74	0.93
	WS-04	0.078	ha	R=	0.78	0.98
	WS-05	0.220	ha	R=	0.35	0.44
	WS-06	0.052	ha	R=	0.30	0.38
	WS-09 - Roof	0.102	ha	R=	0.90	1.00
	WS-10 - Roof	0.102	ha	R=	0.90	1.00
	Total Controlled =	0.822	ha	Σ R=	0.61	0.73
Un-controlled	WS-07 - Ramp	0.005	ha	R=	0.90	1.00
	WS-08 - Ramp	0.013	ha	R=	0.90	1.00
	Total Un-Controlled =	0.017	ha	Σ R=	0.90	1.00

$I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

Time (min)	Intensity (mm/hr)	REQUIRED STORAGE (A1, A2, A3,A4,A6,A9, A10)			REQUIRED STORAGE (A5)			Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
		Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate (L/s)	Controlled Runoff (L/s)	Storage Volume (m ³)	Controlled Release Rate (L/s)		
10	178.6	219.31	119.59	20.00	48.40	70.82	38.53	2.23	60.76
15	142.9	175.51	139.96	20.00	38.73	1.70	38.53	1.79	21.79
20	120.0	147.33	152.79	20.00	32.51	0.00	38.53	1.50	21.50
25	103.8	127.55	161.32	20.00	28.15	0.00	38.53	1.30	21.30
30	91.9	112.84	167.11	20.00	24.90	0.00	38.53	1.15	21.15
35	82.6	101.43	171.00	20.00	22.38	0.00	38.53	1.03	21.03
40	75.1	92.30	173.51	20.00	20.37	0.00	38.53	0.94	20.94
45	69.1	84.81	174.99	20.00	18.72	0.00	38.53	0.86	20.86
50	64.0	78.55	175.65	20.00	17.33	0.00	38.53	0.80	20.80
60	55.9	68.65	175.15	20.00	15.15	0.00	38.53	0.70	20.70
90	41.1	50.49	164.67	20.00	11.14	0.00	38.53	0.51	20.51
120	32.9	40.40	146.90	20.00	8.92	0.00	38.53	0.41	20.41
360	13.7	16.85	0.00	20.00	3.72	0.00	38.53	0.17	20.17
500	10.5	12.92	0.00	20.00	2.85	0.00	38.53	0.13	20.13
720	7.8	9.61	0.00	20.00	2.12	0.00	38.53	0.10	20.10

Storage Volume = (Controlled Runoff - Controlled RR)/1000 * (Time*60s)

STORMWATER STORAGE REQUIREMENTS

Total Storage Required = 175.65 m³
 Underground Chambers = 176.00 m³
Total Available Storage = 175.00 m³

Total Storage Required = 70.82 m³
 Infiltration Gallery = 73.80 m³
Total Available Storage = 73.80 m³

Inlet Control Device Parameters

Product Orifice Plate at MHC B 02
 Invert Level = 78.30 masl.
 HWL = 1.92 m from inv.
 HWL = 80.22 masl.
 Orifice Dia. = 82 mm
 Orifice Invert = 78.30 masl.
 Orifice Area = 0.0053 m²
 ICD Centerline = 78.45 masl.
 HWL Head = 1.91 m from centerline
 C = 0.61
 Controlled Release = 20.00 L/s

Inlet Control Device Parameters

Product Orifice Plate at LCB14
 Invert Level = 75.74 masl.
 HWL = 0.86 m from inv.
 HWL = 76.60 masl.
 Orifice Dia. = 142 mm
 Orifice Invert = 75.74 masl.
 Orifice Area = 0.0158 m²
 ICD Centerline = 75.89 masl.
 HWL Head = 0.84 m from centerline
 C = 0.61
 Controlled Release = 39.46 L/s

APPENDIX “B”

Sanitary Design

File No. 20-305
Project: Proposed Apartment Buildings
Project Address: 2396 Cleroux Crescent, Ottawa
Client: Bridor Development

Date: May 5, 2022
Designed: Guillaume Brunet
Checked: Guillaume Brunet
Drawing Reference: C200 & C300

SANITARY DESIGN SHEET
SEWER DESIGN

LOCATION			RESIDENTIAL AREA AND POPULATION						COMMERCIAL		INDUSTRIAL			INSTITUTIONAL		C+I+I	INFILTRATION			TOTAL FLOW	PIPE						MANHOLE	
STREET	FROM MH	TO MH	AREA (Ha)	POP.	CUMMULATIVE		PEAK FACT.	PEAK FLOW (l/s)	AREA (Ha)	ACCU. AREA (Ha)	AREA (Ha)	ACCU. AREA (Ha)	PEAK FACT.	AREA (Ha)	ACCU. AREA (Ha)	PEAK FLOW (l/s)	TOTAL AREA (Ha)	ACCU. AREA (Ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	LENGTH (m)	DIA. (mm)	MATERAIL	SLOPE (%)	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)	UP INVERT (m)	DOWN INVERT (m)
					AREA (Ha)	POP.																						
SITE	PROP. BLDG A	SAN MH02	0.450	63.0	0.45	63.0	4.0	1.02	0.000	0.000	0.00	0.00	7.0	0.0	0.0	0.00	0.45	0.45	0.13	1.15	8.4	150	PVC	2.00%	21.54	1.22	78.67	78.50
SITE	PROP. BLDG B	SAN MH02	0.389	62.3	0.39	62.3	4.0	1.01	0.000	0.000	0.00	0.00	7.0	0.0	0.0	0.00	0.39	0.39	0.11	1.12	17.4	150	PVC	2.00%	21.54	1.22	78.85	78.50
	SAN MH02	SAN MH01	0.000	0.0	0.84	125.3	4.0	2.03	0.000	0.000	0.00	0.00	7.0	0.0	0.0	0.00	0.00	0.84	0.23	2.27	65.3	200	PVC	1.20%	35.93	1.14	76.38	75.60

DESIGN PARAMETERS NOTES

Average Daily Flow = 350 L/p/day
 Commercial and Institutional Flow = 50000 L/ha/da
 Industrial Flow = 35000.00 L/ha/da
 Maximum Residential Peak Flow = 4
 Connection and Institutional Peak Factor = 1.5

Industrial Peak Factor = 7 as per Appendix 4-B
 Extraneous Flow = 0.28 L/s/ha
 Minimum Velocity = 0.76 m/s
 Mannings n = 0.013

Appartments:
 Bachelor = 1.4
 1 Bedroom = 1.4 Building A Building B
 2 Bedroom = 2.1 10 12
 3 Bedroom = 3.1

APPENDIX “C”

Watermain Design

File No.	20-305	Date:	19/03/2021
Project:	Proposed Apartment Buildings	Designed:	Guillaume Brunet
Project Address:	2396 Cleroux Crescent, Ottawa	Checked:	Guillaume Brunet
Client:	Bridor Development	Drawing Reference:	C200 & C300

WATER CONSUMPTION CALCULATION

	BLOCK A	BLOCK B	
Total Building Floor Area =	1016	1016	m ²
Site Total Area =	0.4195	0.4195	ha
Total Population =	63.00	64.40	ea.
Average Demand Per People =	350	350	L/c/d
Average Water Demand =	22050.00	22540.00	L/d
Maximum Daily Peak Factor =	2.5	2.5	* As per City of Ottawa
Maximum Daily Residential =	55125.00	56350.00	L/d
Maximum Hourly Peak Factor =	2.2	2.2	* As per City of Ottawa
Maximum Hourly Residential =	121275.00	123970.00	L/d
Total Domestic Flow =	1.40	1.43	L/s
Total Fire Flow =	166.67	161.67	L/s

Apartments:	Person Per Unit	Building A	Building B
Bachelor =	1.4	0	0
1 Bedroom =	1.4	30	28
2 Bedroom =	2.1	10	12
3 Bedroom =	3.1	0	0
		63.00	64.40

BLOCK A	1 Bedroom	2 Bedroom	Unit Counts	WSFU	Total
Unrinal Flush Tank	1	1	40	2	80
Sinks	2	2	80	1	80
Bathub	1	1	40	4	160
Diswasher	1	1	40	1.5	60
Washing Machine	1	1	40	2	80
Total					460

BLOCK B	1 Bedroom	2 Bedroom	Unit Counts	WSFU	Total
Unrinal Flush Tank	1	1	40	2	80
Sinks	2	2	80	1	80
Bathub	1	1	40	4	160
Diswasher	1	1	40	1.5	60
Washing Machine	1	1	40	2	80
Total					460

File No.	20-305	Date:	18/02/2021
Project:	Proposed Apartment Buildings	Designed:	Guillaume Brunet
Project Address:	2396 Cleroux Crescent, Ottawa	Checked:	Guillaume Brunet
Client:	Bridor Development	Drawing Reference:	C200 & C300

BLOCK A

Term	Options	Multiplier	Choose:	Value	unit	Fire Flow		
Coefficient C related to the type of construction	Wood Frame	1.5	Non-combustible construction	0.8				
	Ordinary Construction	1.0						
	Non-combustible construction	0.8						
	Fire resistive construction <2 hrs	0.7						
	Fire resistive construction >2 hrs	0.6						
Type of housing	Single family dwelling	0	Building - no. of units per floor	14	unit			
	Townhouse - no. of units	0						
	Building - no. of units per floor	0						
	Number of floors excluding the basement					3	floor	
	Floor space per unit	1				1,016	1,016	sq.m.
Required fire flow	Fire Flow = 220 x C x Area^{0.5}				L/min	9,717		
					L/s	162		
Occupancy hazard reduction or surcharge	Non-combustible	-0.25	Limited combustible	-0.15				
	Limited combustible	-0.15						
	Combustible	0						
	Free burning	0.15				L/min	8,259	
	Rapid burning	0.25				L/s	138	
Sprinkler reduction	Sprinklers (NFPA13)	-0.30	False	0				
	Water supply is standard for both the system and fire department hose lines	-0.10	False	0	L/min	7,433		
	Fully supervised system	-0.10	True	-0.1	L/s	124		
Exposure distance between units	North side	Over 45m	0					
	East side	20.1 to 30m	0.1					
	South side	20.1 to 30m	0.1		L/min	10,035		
	West side	10.1 to 20m	0.15	0.35	L/s	167		
Minimum required fire flow rate (rounded to nearest 100)					L/min	10,000		
Minimum required fire flow rate					L/s	167		
Required duration of fire flow					min	30		

B
BLANCHARD LETENDRE
ENGINEERING

File No.	20-305	Date:	19/03/2021
Project:	Proposed Apartment Buildings	Designed:	Guillaume Brunet
Project Address:	2396 Cleroux Crescent, Ottawa	Checked:	Guillaume Brunet
Client:	Bridor Development	Drawing Reference:	C200 & C300

BLOCK B

Term	Options	Multiplier	Choose:	Value	unit	Fire Flow		
Coefficient C related to the type of construction	Wood Frame	1.5	Non-combustible construction	0.8				
	Ordinary Construction	1.0						
	Non-combustible construction	0.8						
	Fire resistive construction <2 hrs	0.7						
	Fire resistive construction >2 hrs	0.6						
Type of housing	Single family dwelling	0	Building - no. of units per floor	14	unit			
	Townhouse - no. of units	0						
	Building - no. of units per floor	0						
	Number of floors excluding the basement						3	floor
	Floor space per unit	1					1,016	1,016
Required fire flow	Fire Flow = 220 x C x Area^{0.5}				L/min	9,717		
					L/s	162		
Occupancy hazard reduction or surcharge	Non-combustible	-0.25	Limited combustible	-0.15				
	Limited combustible	-0.15						
	Combustible	0						
	Free burning	0.15					L/min	8,259
	Rapid burning	0.25					L/s	138
Sprinkler reduction	Sprinklers (NFPA13)	-0.30	False	0				
	Water supply is standard for both the system and fire department hose lines	-0.10	False	0	L/min	7,433		
	Fully supervised system	-0.10	True	-0.1	L/s	124		
Exposure distance between units	North side	Over 45m	0					
	East side	20.1 to 30m	0.1					
	South side	20.1 to 30m	0.1		L/min	9,663		
	West side	20.1 to 30m	0.1	0.3	L/s	161		
Minimum required fire flow rate (rounded to nearest 100)					L/min	9,700		
Minimum required fire flow rate					L/s	162		
Required duration of fire flow					min	30		

APPENDIX “D”

Underground Chambers & Stormwater Treatment Unit

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER:	HAIDER NASRULLAH 647-850-9417 HAIDER.NASRULLAH@ADS-PIPE.COM
ADS SALES REP:	MICHAEL REID 613-882-4186 MICHAEL.REID@ADS-PIPE.COM
PROJECT NO:	S230845
ADS SITE COORDINATOR:	MATTHEW BEGHIN 519-710-3687 MATTHEW.BEGHIN@ADS-PIPE.COM



2396 CLEROUX CRESCENT

OTTAWA, ON.

MC-4500 STORMTECH CHAMBER SPECIFICATIONS

- CHAMBERS SHALL BE STORMTECH MC-4500.
- CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
- CHAMBERS SHALL BE CERTIFIED TO CSA B184, "POLYMERIC SUB-SURFACE STORMWATER MANAGEMENT STRUCTURES", AND MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
- CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
- THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE CSA S6 CL-625 TRUCK AND THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
- CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
- REQUIREMENTS FOR HANDLING AND INSTALLATION:
 - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
 - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 75 mm (3").
 - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/IN/IN. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 23° C / 73° F), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
- ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
 - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
 - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
 - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
- CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-4500 CHAMBER SYSTEM

- STORMTECH MC-4500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
- STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
- CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
 - STONESHOOTER LOCATED OFF THE CHAMBER BED.
 - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
 - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
- THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
- JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
- MAINTAIN MINIMUM - 230 mm (9") SPACING BETWEEN THE CHAMBER ROWS.
- INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 300 mm (12") INTO CHAMBER END CAPS.
- EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE WELL GRADED BETWEEN ¾" AND 2" (20-50 mm).
- STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 300 mm (12") BETWEEN ADJACENT CHAMBER ROWS.
- STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
- THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
- ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

- STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
- THE USE OF EQUIPMENT OVER MC-4500 CHAMBERS IS LIMITED:
 - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
 - NO RUBBER TIRE LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
 - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
- FULL 900 mm (36") OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT

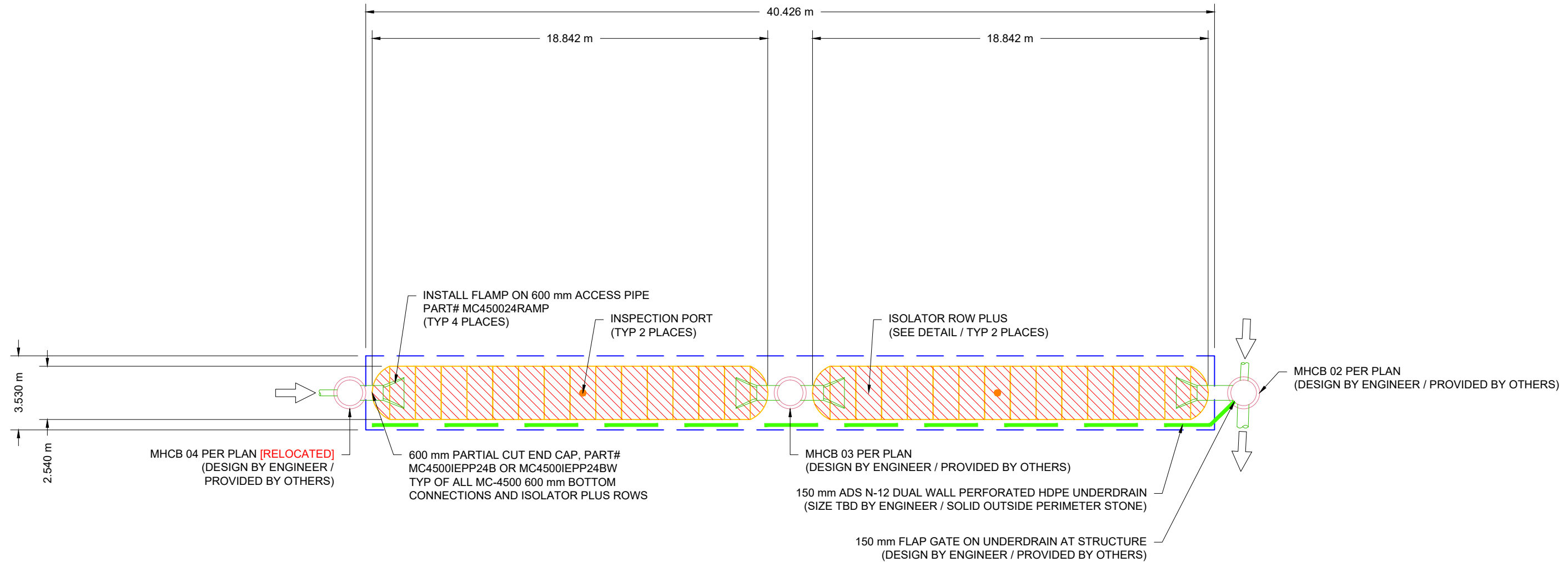
28	STORMTECH MC-4500 CHAMBERS
4	STORMTECH MC-4500 END CAPS
305	STONE ABOVE (mm)
229	STONE BELOW (mm)
40	% STONE VOID
170.9	INSTALLED SYSTEM VOLUME (m³) (PERIMETER STONE INCLUDED)
142.7	SYSTEM AREA (m²)
87.9	SYSTEM PERIMETER (m)

PROPOSED ELEVATIONS

82.051	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):
80.679	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):
80.527	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):
80.527	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):
80.527	MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT):
80.222	TOP OF STONE:
79.917	TOP OF MC-4500 CHAMBER:
78.451	600 mm ISOLATOR ROW PLUS INVERT:
78.393	BOTTOM OF MC-4500 CHAMBER:
78.164	BOTTOM OF STONE:

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECHNICAL NOTE 6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.



2396 CLEROUX CRESCENT

OTTAWA, ON.

DATE: 12/23/21 DRAWN: MAD
PROJECT #: S230845 CHECKED: RWD

DATE	DRWN	CHKD	DESCRIPTION
02/03/22	RCT	RCT	NEW PLAN W/4500'S

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SCALE = 1 : 200

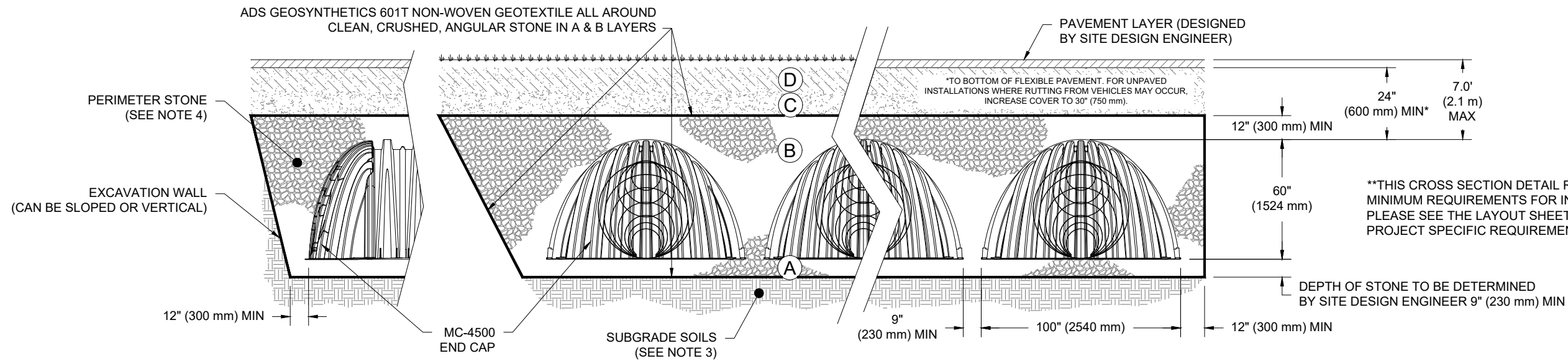
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ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	FINAL FILL: FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	INITIAL FILL: FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	AASHTO M145 ¹ A-1, A-2-4, A-3 OR AASHTO M43 ¹ 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	EMBEDMENT STONE: FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE AASHTO M43 ¹ 3, 4	NO COMPACTION REQUIRED.
A	FOUNDATION STONE: FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE AASHTO M43 ¹ 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. ^{2,3}

PLEASE NOTE:

- THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
- STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
- WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
- ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

- CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
- MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
- THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
- PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
- REQUIREMENTS FOR HANDLING AND INSTALLATION:
 - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
 - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
 - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

2396 CLEROUX CRESCENT

OTTAWA, ON.

DATE: 12/23/21

DRAWN: MAD

PROJECT #: S230845

CHECKED: RWD

02/03/22

DATE

RCT

DRWN

CHKD

DESCRIPTION

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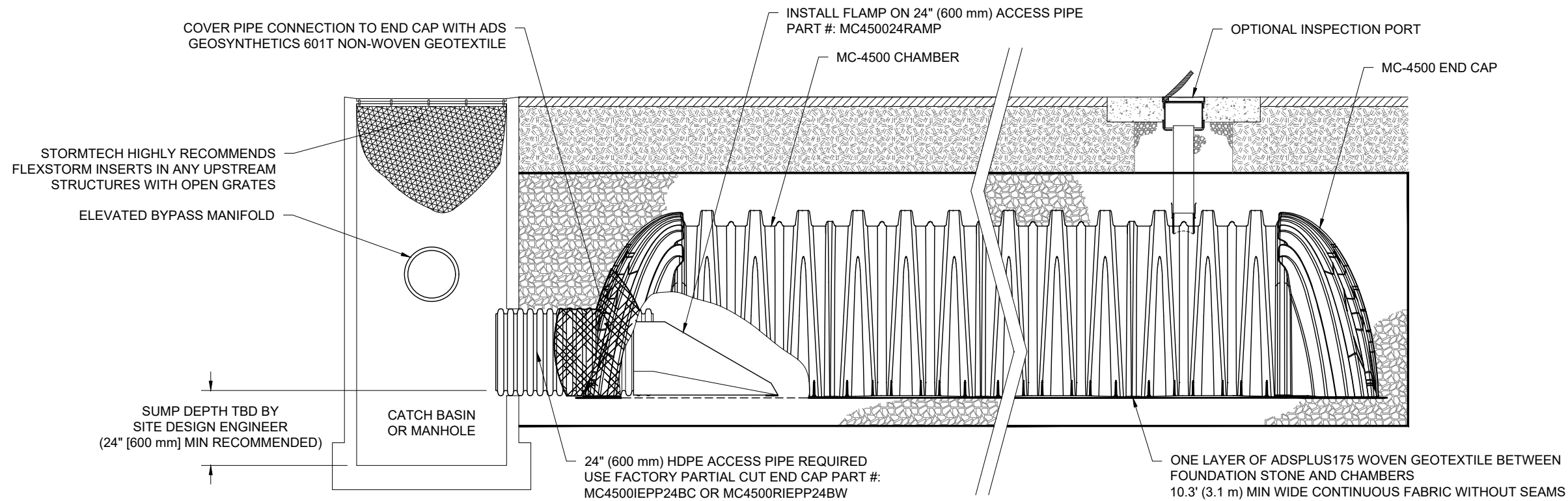
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3
SHEET
5

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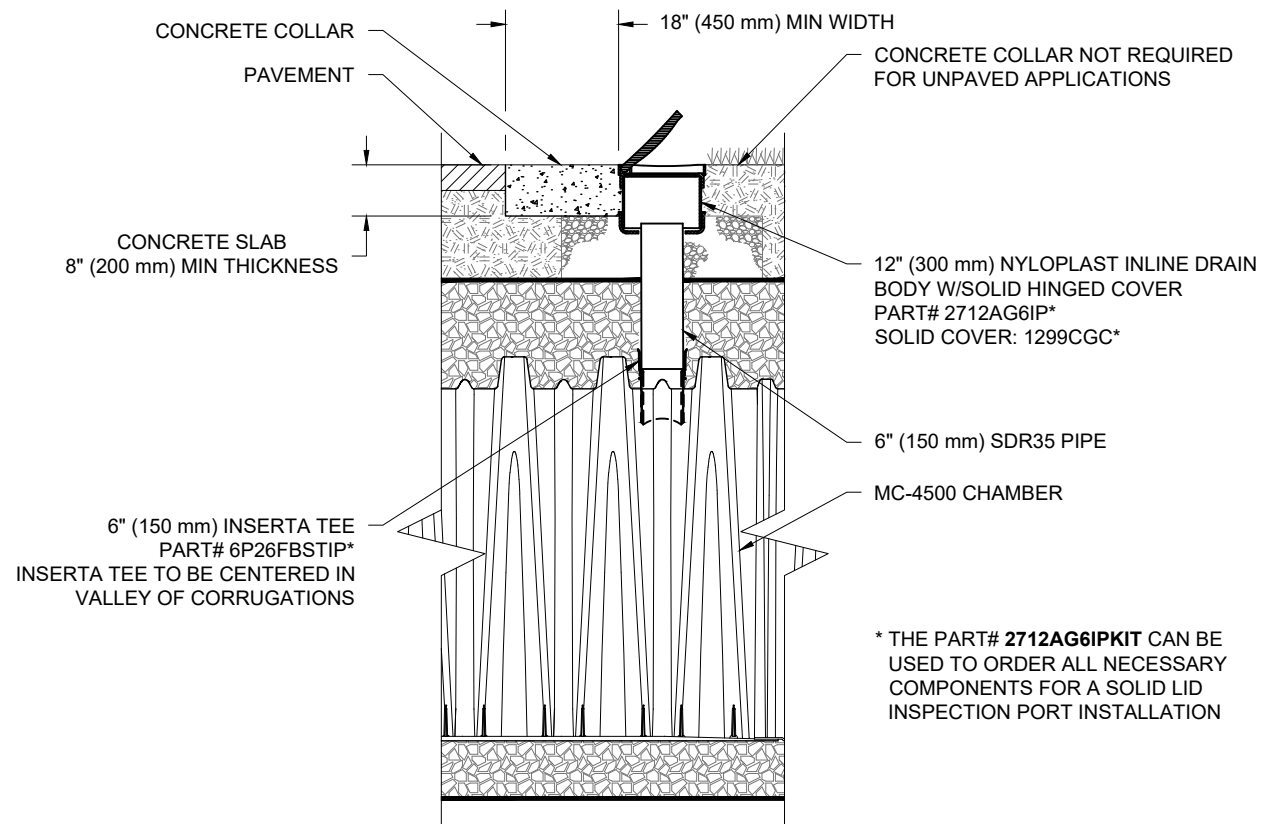
MC-4500 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

- STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
 - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
 - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
 - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
 - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
 - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
 - B. ALL ISOLATOR PLUS ROWS
 - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
 - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
 - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
 - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
 - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
 - B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
 - C. VACUUM STRUCTURE SUMP AS REQUIRED
- STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.
- STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



MC-4500 6" (150 mm) INSPECTION PORT DETAIL
NTS

2396 CLEROUX CRESCENT
OTTAWA, ON.
DATE: 12/23/21 DRAWN: MAD
PROJECT #: S230845 CHECKED: RWD

DATE	DESCRIPTION
02/03/22	RCT DRWN CHKD
	RCT NEW PLAN W/4500'S

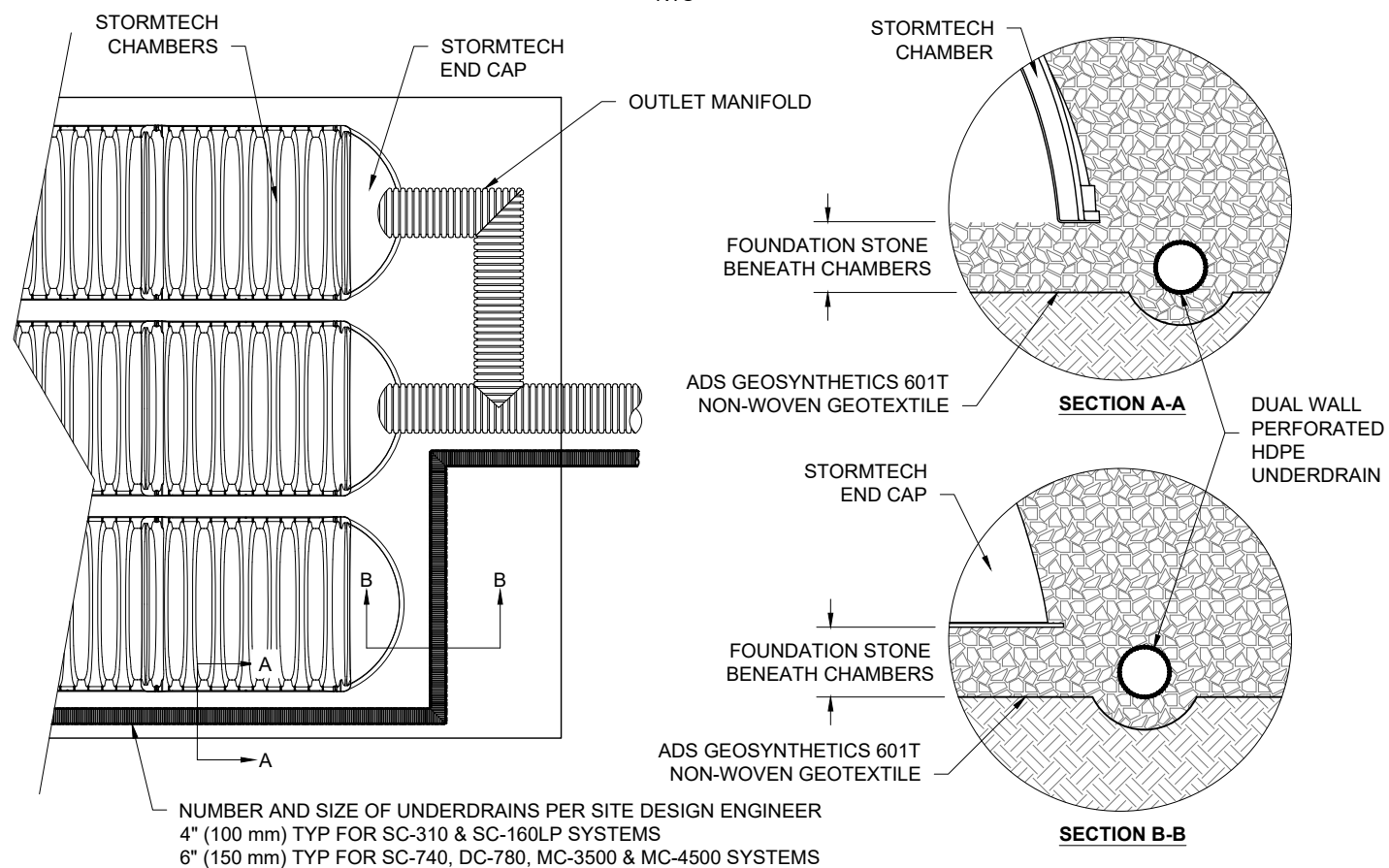
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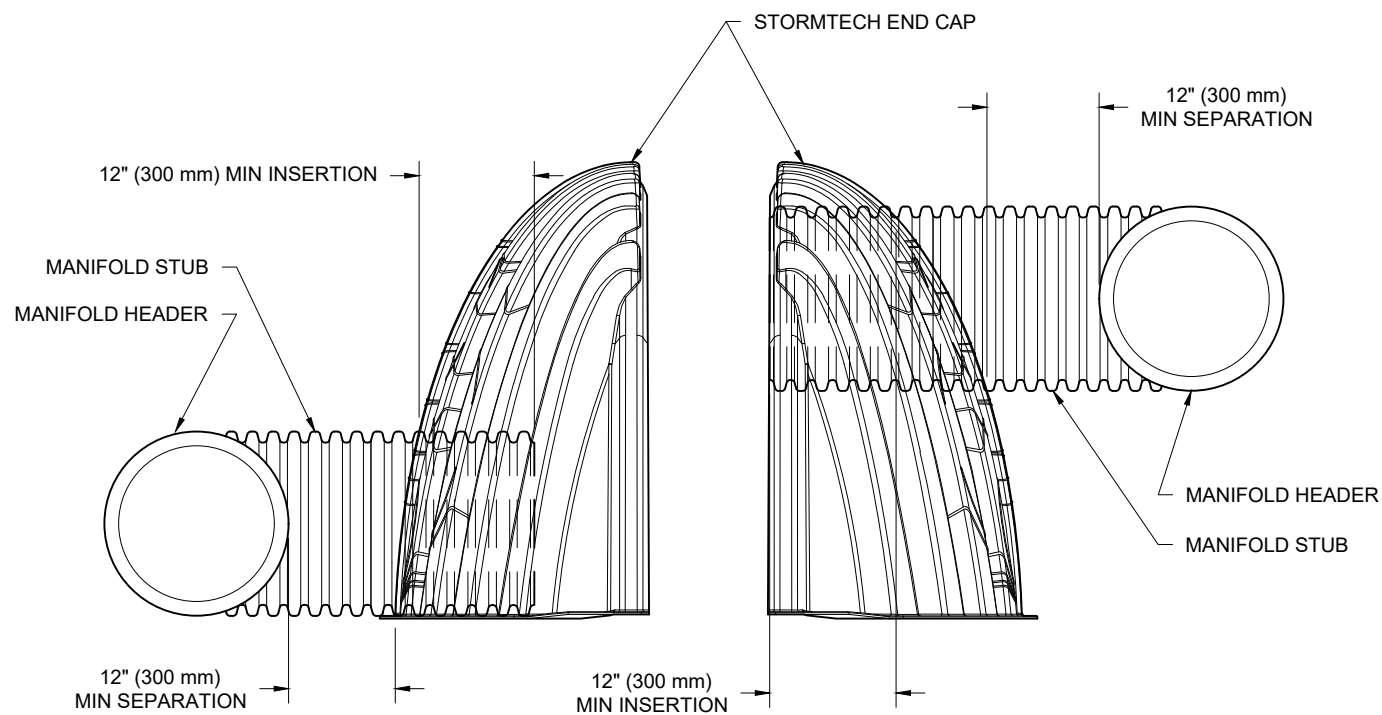
UNDERDRAIN DETAIL

NTS



MC-SERIES END CAP INSERTION DETAIL

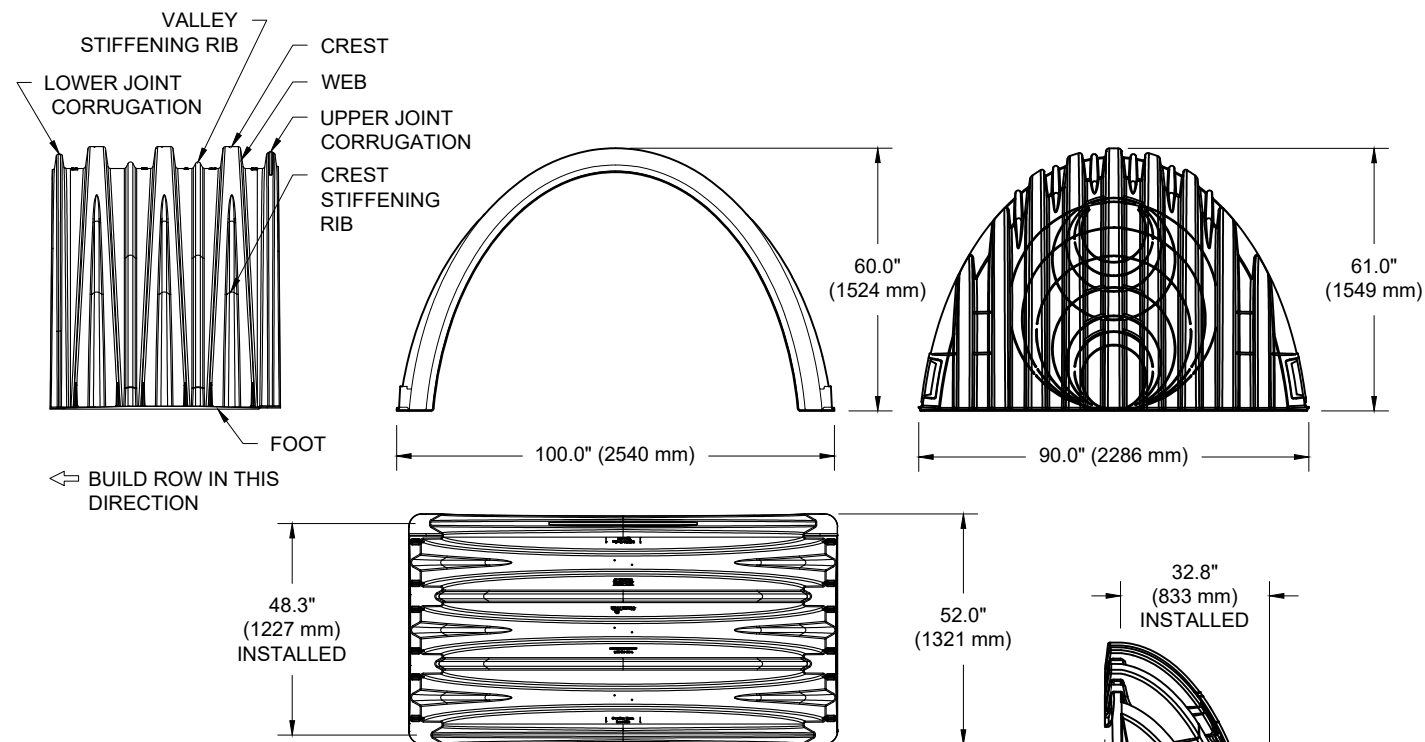
NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

MC-4500 TECHNICAL SPECIFICATION

NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m ³)
MINIMUM INSTALLED STORAGE*	162.6 CUBIC FEET	(4.60 m ³)
WEIGHT (NOMINAL)	125.0 lbs.	(56.7 kg)

NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m ³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m ³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
 PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
 END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC4500IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC4500IEPP06B	---	---	0.86" (22 mm)
MC4500IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC4500IEPP08B	---	---	1.01" (26 mm)
MC4500IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC4500IEPP10B	---	---	1.33" (34 mm)
MC4500IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC4500IEPP12B	---	---	1.55" (39 mm)
MC4500IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC4500IEPP15B	---	---	1.70" (43 mm)
MC4500IEPP18T	---	29.36" (746 mm)	---
MC4500IEPP18TW	18" (450 mm)	---	---
MC4500IEPP18B	---	---	1.97" (50 mm)
MC4500IEPP18BW	---	---	---
MC4500IEPP24T	---	23.05" (585 mm)	---
MC4500IEPP24TW	24" (600 mm)	---	---
MC4500IEPP24B	---	---	2.26" (57 mm)
MC4500IEPP24BW	---	---	---
MC4500IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC4500IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC4500IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL

CUSTOM PREFABRICATED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

2396 CLEROUX CRESCENT
 OTTAWA, ON.

DATE: 12/23/21
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DESCRIPTION
 NEW PLAN W/4500'S

DATE 02/03/22
 RCT DRWN CHKD

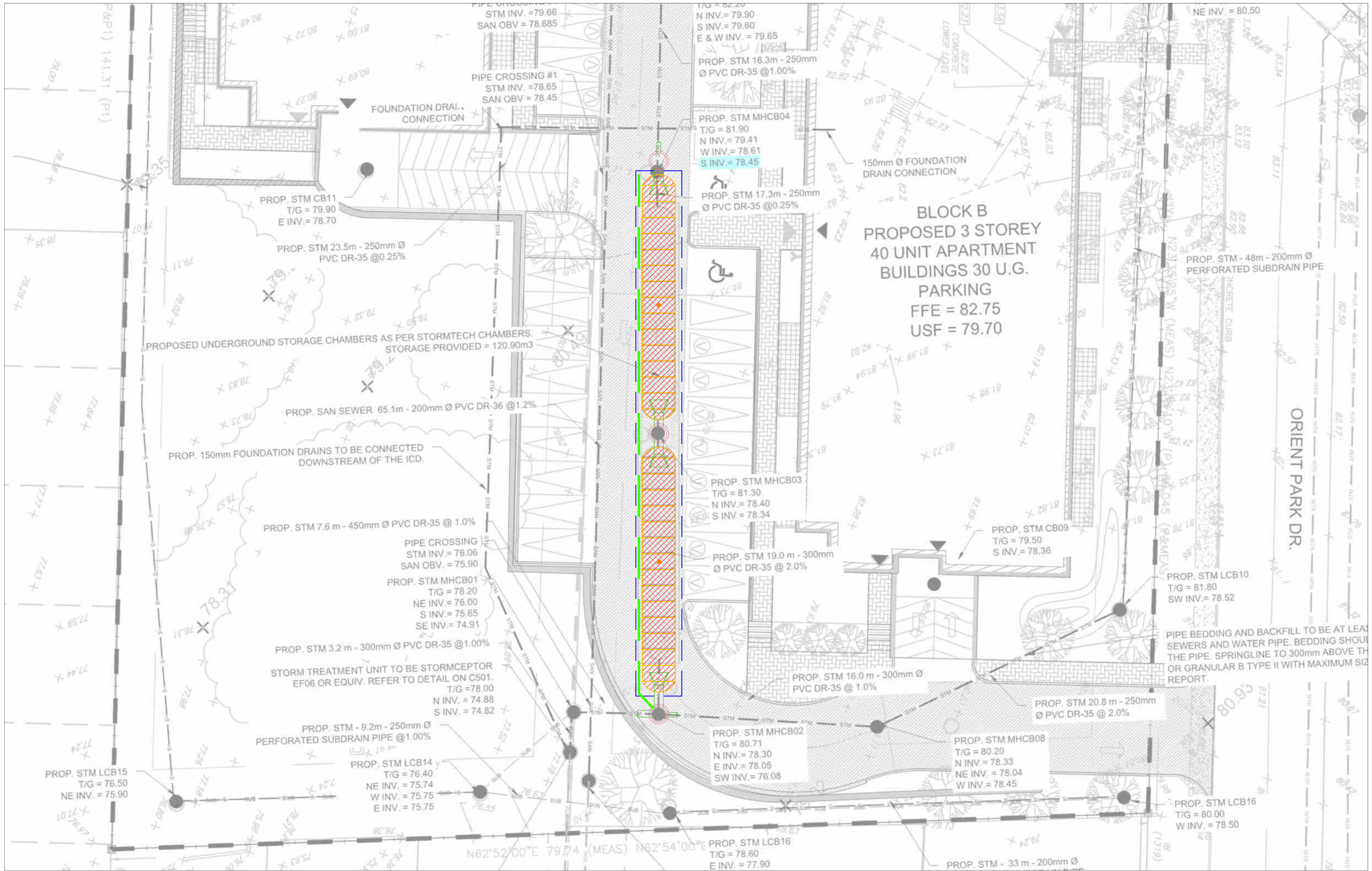
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ADS

5 SHEET
 OF 5

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BLOCK B
PROPOSED 3 STOREY
40 UNIT APARTMENT
BUILDINGS 30 U.G.
PARKING
FFE = 82.75
USF = 79.70

ORIENT PARK DR.

PROPOSED UNDERGROUND STORAGE CHAMBERS AS PER STORMTECH CHAMBERS.
STORAGE PROVIDED = 120.90m³

PROP. 150mm FOUNDATION DRAINS TO BE CONNECTED
DOWNSTREAM OF THE ICD.

PIPE BEDDING AND BACKFILL TO BE AT LEAST
SEWERS AND WATER PIPE. BEDDING SHOULD
BE 300mm ABOVE THE PIPE. SPRINGLINE TO 300mm ABOVE THE
PIPE OR GRANULAR B TYPE II WITH MAXIMUM SIZE
AS PER REPORT.

PROP. STM LCB16
T/G = 78.60
E INV. = 77.90

PROP. STM LCB14
T/G = 76.40
NE INV. = 75.74
W INV. = 75.75
E INV. = 75.75

PROP. STM LCB15
T/G = 76.50
NE INV. = 75.90

PROP. STM MHC B02
T/G = 80.71
N INV. = 78.30
E INV. = 78.05
SW INV. = 76.08

PROP. STM MHC B08
T/G = 80.20
N INV. = 78.33
NE INV. = 78.04
W INV. = 78.45

PROP. STM - 9.2m - 250mm Ø
PERFORATED SUBDRAIN PIPE @1.00%

PROP. STM 3.2 m - 300mm Ø PVC DR-35 @1.00%

PROP. STM MHC B01
T/G = 78.20
NE INV. = 76.00
S INV. = 75.65
SE INV. = 74.91

PROP. STM 7.6 m - 450mm Ø PVC DR-35 @1.0%

PROP. SAN SEWER. 65.1m - 200mm Ø PVC DR-36 @1.2%

PROP. STM 23.5m - 250mm Ø
PVC DR-35 @0.25%

PROP. STM CB11
T/G = 79.90
E INV. = 78.70

PROP. STM 19.0 m - 300mm
Ø PVC DR-35 @ 2.0%

PROP. STM MHC B03
T/G = 81.30
N INV. = 78.40
S INV. = 78.34

PROP. STM 17.3m - 250mm
Ø PVC DR-35 @0.25%

PROP. STM MHC B04
T/G = 81.90
N INV. = 79.41
W INV. = 78.61
S INV. = 78.45

PROP. STM 16.3m - 250mm
Ø PVC DR-35 @1.00%

PROP. STM 20.8 m - 250mm
Ø PVC DR-35 @ 2.0%

PROP. STM CB09
T/G = 79.50
S INV. = 78.36

PROP. STM LCB10
T/G = 81.80
SW INV. = 78.52

PROP. STM 16.0 m - 300mm Ø
PVC DR-35 @ 1.0%

PROP. STM - 48m - 200mm Ø
PERFORATED SUBDRAIN PIPE

PIPE CROSSING #1
STM INV. = 78.65
SAN OBV = 78.45

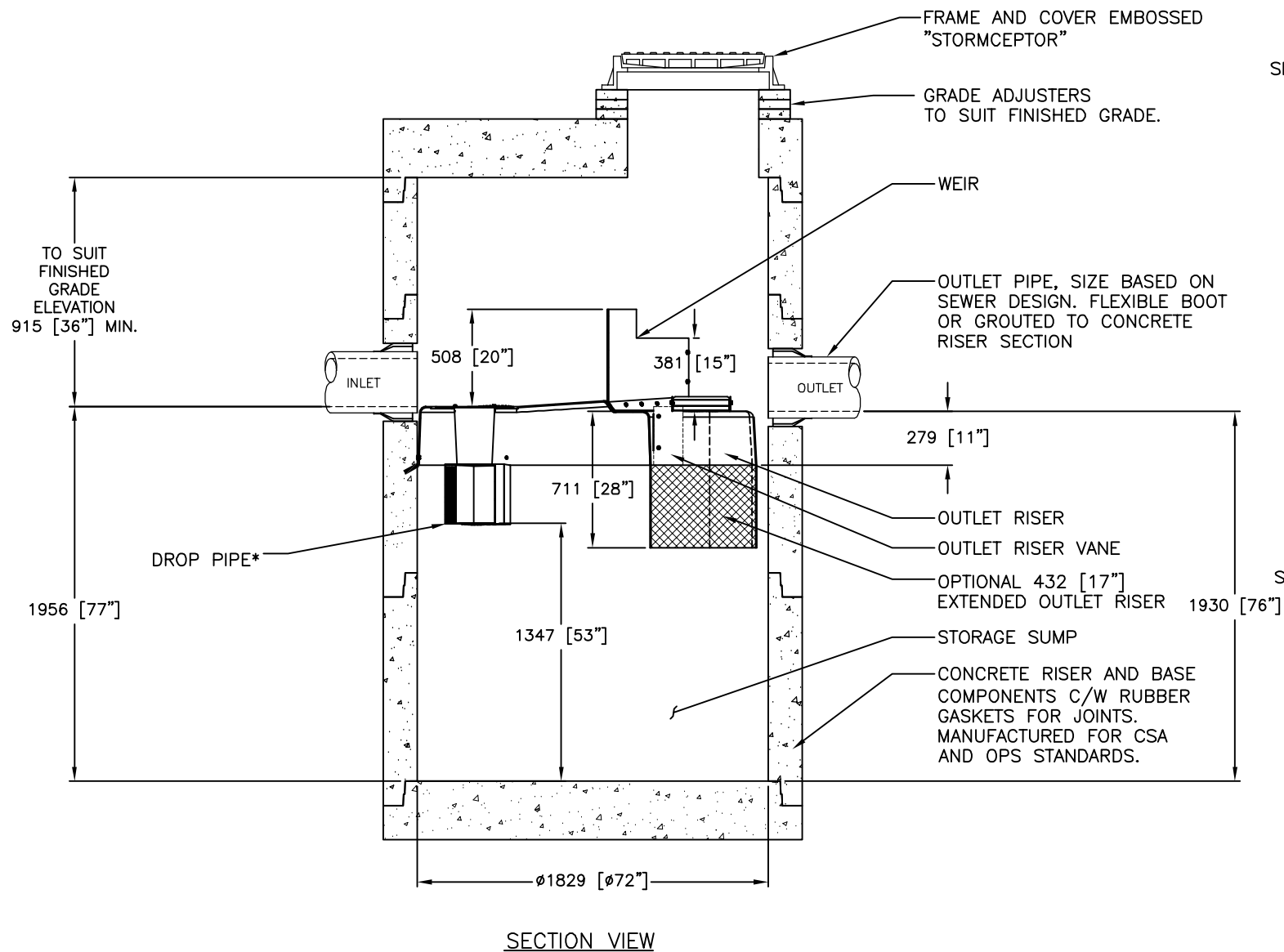
FOUNDATION DRAIN
CONNECTION

150mm Ø FOUNDATION
DRAIN CONNECTION

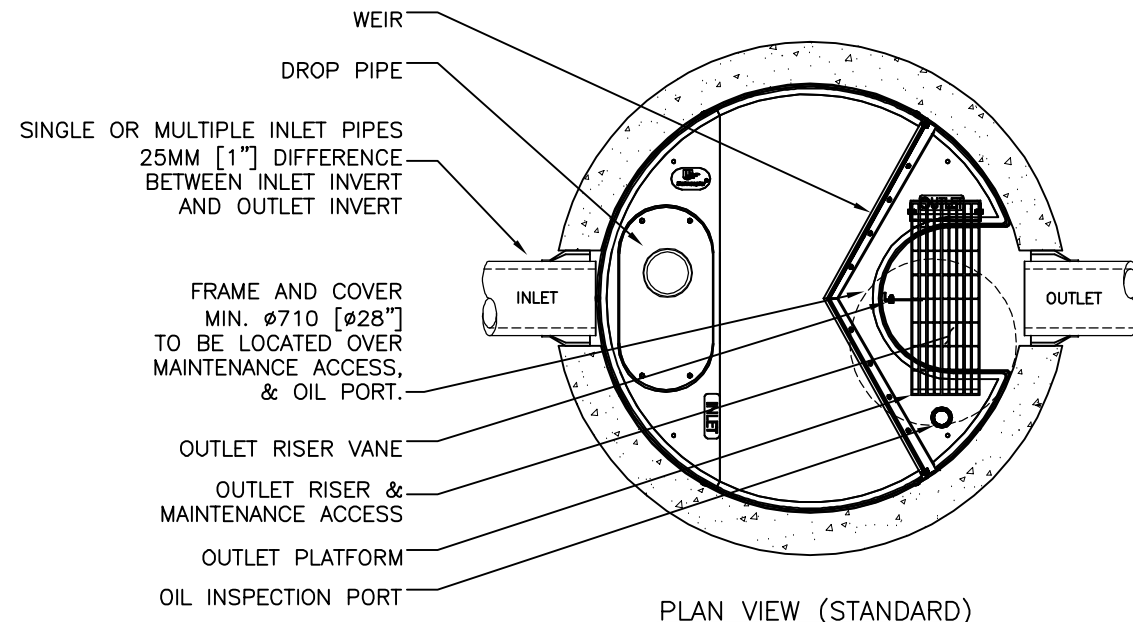
NE INV. = 80.50

P&P1) 141.31 (P1)

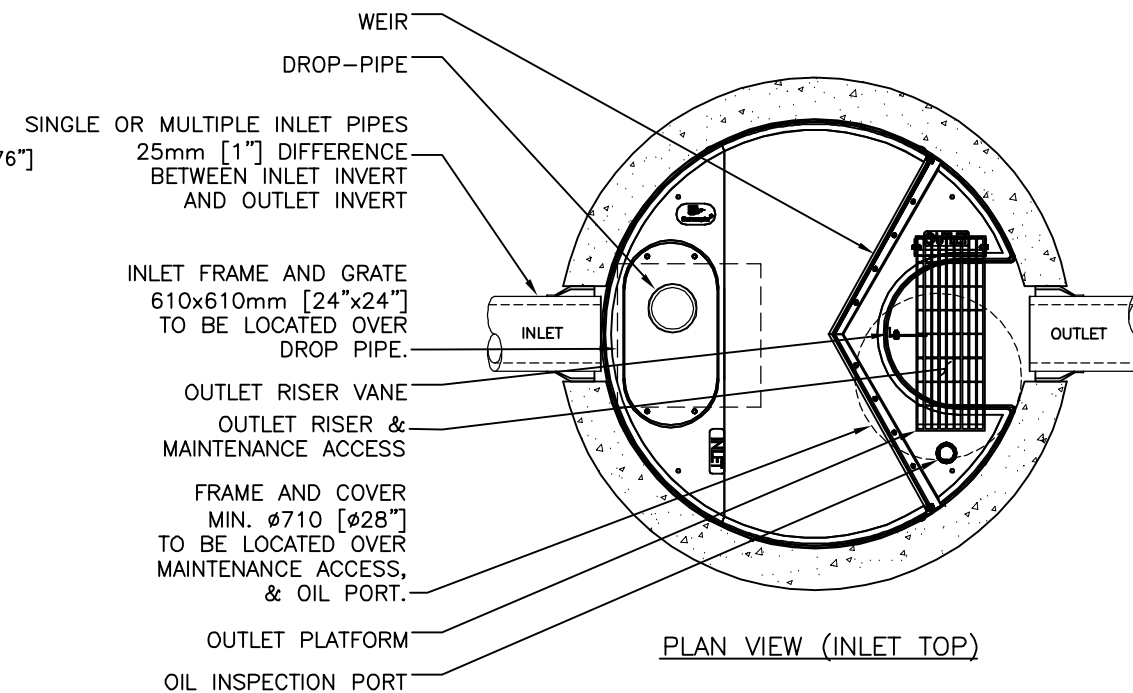
DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

GENERAL NOTES:

- * MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m² (27.9 gpm/ft²) FOR STORMCEPTOR EF6 AND 535 L/min/m² (13.1 gpm/ft²) FOR STORMCEPTOR EFO6 (OIL CAPTURE CONFIGURATION).
- 1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
- 2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
- 3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
- 4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
- 5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

- A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
- C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
- D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
- E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

STANDARD DETAIL NOT FOR CONSTRUCTION

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

SITE SPECIFIC DATA REQUIREMENTS					
STORMCEPTOR MODEL	EFO6				
STRUCTURE ID	*				
HYDROCARBON STORAGE REQ'D (L)	*				
WATER QUALITY FLOW RATE (L/s)	*				
PEAK FLOW RATE (L/s)	*				
RETURN PERIOD OF PEAK FLOW (yrs)	*				
DRAINAGE AREA (HA)	*				
DRAINAGE AREA IMPERVIOUSNESS (%)	*				
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*
* PER ENGINEER OF RECORD					

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MARK	DATE	REVISION DESCRIPTION	BY
###	###/###/###	OUTLET PLATFORM	JSK
###	###/###/###	INITIAL RELEASE	JSK
###	###/###/###		

DATE:	10/13/2017	
DESIGNED:	JSK	DRAWN:
CHECKED:	BSF	APPROVED:
PROJECT No.:	EFO6	SEQUENCE No.:
SHEET:	1 OF 1	



Chamber Model -
 Units -
 Number of Chambers -
 Number of End Caps -
 Voids in the stone (porosity) -
 Base of Stone Elevation -
 Amount of Stone Above Chambers -
 Amount of Stone Below Chambers -

MC-4500
Metric
28
4
40 %
78.16 m
305 mm
229 mm

Include Perimeter Stone in Calculations

142.7 sq.meters Min. Area - 107.736 sq.meters

Height of System (mm)	Incremental Single Chamber (cubic meters)	Incremental Single End Cap (cubic meters)	Incremental Chambers (cubic meters)	Incremental End Cap (cubic meters)	Incremental Stone (cubic meters)	Incremental Chamber, End Cap and Stone (cubic meters)	Cumulative System (cubic meters)	Elevation (meters)
2057	0.00	0.00	0.00	0.00	1.450	1.45	170.73	80.22
2032	0.00	0.00	0.00	0.00	1.450	1.45	169.28	80.20
2007	0.00	0.00	0.00	0.00	1.450	1.45	167.83	80.17
1981	0.00	0.00	0.00	0.00	1.450	1.45	166.39	80.15
1956	0.00	0.00	0.00	0.00	1.450	1.45	164.94	80.12
1930	0.00	0.00	0.00	0.00	1.450	1.45	163.49	80.09
1905	0.00	0.00	0.00	0.00	1.450	1.45	162.04	80.07
1880	0.00	0.00	0.00	0.00	1.450	1.45	160.59	80.04
1854	0.00	0.00	0.00	0.00	1.450	1.45	159.14	80.02
1829	0.00	0.00	0.00	0.00	1.450	1.45	157.69	79.99
1803	0.00	0.00	0.00	0.00	1.450	1.45	156.24	79.97
1778	0.00	0.00	0.00	0.00	1.450	1.45	154.79	79.94
1753	0.00	0.00	0.03	0.00	1.440	1.47	153.34	79.92
1727	0.00	0.00	0.09	0.00	1.410	1.51	151.87	79.89
1702	0.00	0.00	0.13	0.01	1.390	1.53	150.37	79.87
1676	0.01	0.00	0.17	0.01	1.380	1.55	148.84	79.84
1651	0.01	0.00	0.21	0.01	1.360	1.58	147.28	79.82
1626	0.01	0.00	0.36	0.01	1.300	1.67	145.70	79.79
1600	0.02	0.00	0.53	0.01	1.230	1.77	144.03	79.76
1575	0.02	0.00	0.63	0.02	1.190	1.84	142.26	79.74
1549	0.03	0.01	0.72	0.02	1.150	1.89	140.41	79.71
1524	0.03	0.01	0.80	0.02	1.120	1.94	138.52	79.69
1499	0.03	0.01	0.86	0.03	1.090	1.98	136.58	79.66
1473	0.03	0.01	0.92	0.03	1.070	2.02	134.60	79.64
1448	0.03	0.01	0.98	0.03	1.040	2.06	132.58	79.61
1422	0.04	0.01	1.03	0.04	1.020	2.09	130.52	79.59
1397	0.04	0.01	1.08	0.04	1.000	2.12	128.43	79.56
1372	0.04	0.01	1.12	0.04	0.980	2.15	126.31	79.54
1346	0.04	0.01	1.17	0.05		2.18	124.16	79.51
1321	0.04	0.01	1.21	0.05	0.950	2.20	121.98	79.48
1295	0.04	0.01	1.25	0.05		2.23	119.78	79.46
1270	0.05	0.01	1.29	0.06	0.910	2.25	117.55	79.43
1245	0.05	0.01	1.32	0.06		2.28	115.29	79.41
1219	0.05	0.02	1.36	0.06	0.880	2.30	113.01	79.38
1194	0.05	0.02	1.39	0.06		2.32	110.72	79.36
1168	0.05	0.02	1.42	0.07	0.850	2.34	108.40	79.33
1143	0.05	0.02	1.45	0.07		2.36	106.05	79.31
1118	0.05	0.02	1.48	0.07	0.830	2.38	103.70	79.28
1092	0.05	0.02	1.51	0.07		2.40	101.32	79.26
1067	0.05	0.02	1.53	0.08	0.810	2.41	98.92	79.23
1041	0.06	0.02	1.56	0.08		2.43	96.51	79.21
1016	0.06	0.02	1.58	0.08	0.780	2.45	94.08	79.18
991	0.06	0.02	1.61	0.08		2.46	91.63	79.15
965	0.06	0.02	1.63	0.09	0.760	2.48	89.17	79.13
940	0.06	0.02	1.65	0.09		2.49	86.69	79.10
914	0.06	0.02	1.67	0.09	0.740	2.51	84.19	79.08
889	0.06	0.02	1.69	0.09		2.52	81.69	79.05
864	0.06	0.02	1.71	0.09	0.730	2.53	79.17	79.03
838	0.06	0.02	1.73	0.10		2.55	76.63	79.00
813	0.06	0.02	1.75	0.10	0.710	2.56	74.09	78.98
787	0.06	0.03	1.77	0.10		2.57	71.53	78.95
762	0.06	0.03	1.78	0.10	0.690	2.58	68.96	78.93
737	0.06	0.03	1.80	0.10		2.59	66.38	78.90
711	0.06	0.03	1.81	0.10	0.680	2.60	63.79	78.88
686	0.07	0.03	1.83	0.11		2.61	61.19	78.85
660	0.07	0.03	1.84	0.11	0.670	2.62	58.58	78.82
635	0.07	0.03	1.86	0.11		2.63	55.96	78.80
610	0.07	0.03	1.87	0.11	0.660	2.64	53.33	78.77
584	0.07	0.03	1.88	0.11		2.65	50.69	78.75
559	0.07	0.03	1.90	0.11	0.650	2.65	48.05	78.72
533	0.07	0.03	1.91	0.11		2.66	45.39	78.70
508	0.07	0.03	1.92	0.12	0.640	2.67	42.73	78.67
483	0.07	0.03	1.93	0.12		2.68	40.06	78.65
457	0.07	0.03	1.94	0.12	0.630	2.68	37.38	78.62
432	0.07	0.03	1.95	0.12		2.69	34.70	78.60
406	0.07	0.03	1.96	0.12	0.620	2.69	32.01	78.57
381	0.07	0.03	1.96	0.12		2.70	29.32	78.55
356	0.07	0.03	1.97	0.12	0.610	2.70	26.62	78.52
330	0.07	0.03	1.98	0.12		2.71	23.91	78.49
305	0.07	0.03	1.99	0.12	0.610	2.72	21.20	78.47
279	0.07	0.03	1.99	0.12		2.72	18.49	78.44
254	0.07	0.03	2.00	0.13	0.600	2.73	15.77	78.42
229	0.00	0.00	0.00	0.00		1.45	13.04	78.39
203	0.00	0.00	0.00	0.00	1.450	1.45	11.59	78.37
178	0.00	0.00	0.00	0.00		1.45	10.14	78.34
152	0.00	0.00	0.00	0.00	1.450	1.45	8.69	78.32
127	0.00	0.00	0.00	0.00		1.45	7.25	78.29
102	0.00	0.00	0.00	0.00	1.450	1.45	5.80	78.27
76	0.00	0.00	0.00	0.00		1.45	4.35	78.24
51	0.00	0.00	0.00	0.00	1.450	1.45	2.90	78.21
25	0.00	0.00	0.00	0.00		1.45	1.45	78.19

APPENDIX “E”

Boundary Conditions

Boundary Conditions 2396 Cleroux Street

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	31	0.51
Maximum Daily Demand	76	1.27
Peak Hour	167	2.79
Fire Flow Demand #1	10,000	166.67

Location



Results

Connection 1 – Cleroux St.

Demand Scenario	Head (m)	Pressure ¹ (psi)
Maximum HGL	131.0	67.8
Peak Hour	127.0	62.2
Max Day plus Fire 1	123.1	56.6

Ground Elevation = 83.2 m

Connection 2 – Orient Park Dr.

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	131.0	70.2
Peak Hour	127.0	64.6
Max Day plus Fire 1	120.1	54.8

Ground Elevation = 81.6 m

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

APPENDIX “F”

Engineering Drawings

EROSION AND SEDIMENT CONTROL MEASURES:

** CONTRACTOR IS RESPONSIBLE FOR ALL INSTALLATION, MONITORING, REPAIR AND REMOVAL OF ALL EROSION AND SEDIMENT CONTROL FEATURES **

1. PRIOR TO START OF CONSTRUCTION:

- 1.1. PRIOR TO THE REMOVAL OF ANY VEGETATIVE COVER, MOVING OF ANY SOIL, AND CONSTRUCTION:
 - 1.1.1. INSTALL SILT FENCE IMMEDIATELY DOWNSTREAM FROM AREAS TO BE DISTURBED (SEE PLAN FOR LOCATION).
 - 1.1.2. INSTALL GEOSOCK INSERTS WITH AN OVERFLOW IN ALL THE DOWNSTREAM CATCH BASINS AND MANHOLES.
 - 1.1.3. INSTALL SILTSACK FILTERS IN ALL CONCRETE CATCH BASIN STRUCTURES.
 - 1.1.4. INSPECT MEASURES IMMEDIATELY AFTER INSTALLATION.

2. DURING CONSTRUCTION:

- 2.1. WORK TO BE DONE IN THE VICINITY OF MAJOR WATERWAYS TO BE CARRIED OUT FROM JULY TO SEPTEMBER ONLY.
- 2.2. MINIMIZE THE EXTENT OF DISTURBED AREAS AND THE DURATION OF EXPOSURE.
- 2.3. PROTECT DISTURBED AREAS FROM RUNOFF.
- 2.4. PROVIDE TEMPORARY COVER SUCH AS SEEDING OR MULCHING IF DISTURBED AREA WILL NOT BE REHABILITATED WITHIN 30 DAYS.
- 2.5. INSPECT SILT FENCE, FILTER CLOTHS, AND CATCH BASIN SUMPS WEEKLY AND AFTER EVERY MAJOR STORM EVENT. CLEAN AND REPAIR WHEN NECESSARY.
- 2.6. PLAN TO BE REVIEWED AND REVISED AS REQUIRED DURING CONSTRUCTION.
- 2.7. EROSION CONTROL FENCING TO BE ALSO INSTALLED AROUND THE BASE OF ALL STOCKPILES.
- 2.8. DO NOT LOCATE TOPSOIL PILES AND EXCAVATION MATERIAL CLOSER THAN 2.5m FROM ANY PAVED SURFACE, OR ONE WHICH IS TO BE PAVED BEFORE PILE IS REMOVED. ALL TOPSOIL PILES ARE TO BE SEEDED IF THEY ARE TO REMAIN ON SITE LONG ENOUGH FOR SEEDS TO GROW (30 DAYS).

- 2.9. CONTROL WIND-BLOWN DUST OFF SITE TO ACCEPTABLE LEVELS BY SEEDING TOPSOIL PILES AND OTHER AREAS TEMPORARILY (PROVIDE WATERING AS REQUIRED).
 - 2.10. ALL EROSION CONTROL STRUCTURE TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN STABILIZED EITHER BY PAVING OR RESTORATION OF VEGETATIVE GROUND COVER.
 - 2.11. NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY THIS CONSULTING ENGINEER AND THE CITY DEPARTMENT OF PUBLIC WORKS. TO PREVENT UNNECESSARY SEDIMENT DISCHARGE, THE CONTRACTOR IS PERMITTED TO PLACE ADDITIONAL SEDIMENT AND EROSION CONTROL MEASURES IN A TIMELY MANNER, IF REQUIRED. THE CONTRACTOR TO ADVISE CONSULTANT ONCE INSTALLED FOR INSPECTION.
 - 2.12. CONTRACTOR RESPONSIBLE FOR CITY ROADWAY AND SIDEWALK TO BE CLEANED OF ALL SEDIMENT FROM VEHICULAR TRACKING ETC. AT THE END OF EACH WORK DAY.
 - 2.13. PROVIDE GRAVEL ENTRANCE WHEREVER EQUIPMENT LEAVES THE SITE TO PREVENT MUD TRACKING ONTO PAVED SURFACES. GRAVEL BED SHALL BE A MINIMUM OF 15m LONG, 4m WIDE AND 0.3m DEEP AND SHALL CONSIST OF COARSE (50mm CRUSHER-RUN LIMESTONE). MAINTAIN GRAVEL ENTRANCE IN CLEAN CONDITION.
 - 2.14. DURING WET CONDITIONS, TIRES OF ALL VEHICLES/EQUIPMENT LEAVING THE SITE ARE TO BE SCRAPPED.
 - 2.15. ANY MUD/MATERIAL TRACKED ONTO THE ROAD SHALL BE REMOVED IMMEDIATELY BY HAND OR RUBBER TIRE LOADER.
 - 2.16. TAKE ALL NECESSARY STEPS TO PREVENT BUILDING MATERIAL, CONSTRUCTION DEBRIS OR WASTE BEING SPILLED OR TRACKED ONTO ADJUTING PROPERTIES OR PUBLIC STREETS DURING CONSTRUCTION AND PROCEED IMMEDIATELY TO CLEAN UP ANY AREAS SO AFFECTED.
- 3. AFTER CONSTRUCTION:**
- 3.1. PROVIDE PERMANENT COVER CONSISTING OF TOPSOIL AND SEED TO DISTURBED AREA.
 - 3.2. REMOVE STRAW BALE FLOW CHECK DAMS, SILT FENCES AND FILTER CLOTHS ON CATCH BASINS AND MANHOLE COVERS AFTER DISTURBED AREAS HAVE BEEN REHABILITATED AND STABILIZED.
 - 3.3. INSPECT AND CLEAN CATCH BASIN SUMPS AND STORM SEWERS.

LEGEND:

- EXISTING PROPERTY LINE TO REMAIN
- - - PROPOSED EASEMENT
- PROPOSED TERRACING (3:1 MIN.)
- ▽ PROPOSED DOOR ENTRANCE/EXIT
- +50.00 PROPOSED ELEVATION
- +50.00HP PROPOSED HIGH POINT ELEVATION
- +50.00SW PROPOSED SWALE ELEVATION
- +50.00EX MATCH INTO EXISTING ELEVATION
- +50.00SD PROPOSED SIDEWALK
- +50.19 EXISTING ELEVATION
- PROPOSED OVERLAND MAJOR FLOW ROUTE
- PROPOSED SILT FENCE AS PER OPSD 219.110
- PROPOSED 100mm PERFORATED SUBDRAIN
- PROPOSED STORM SEWER
- PROPOSED SANITARY SEWER
- PROPOSED WATERMAIN
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- PROPOSED CATCHBASIN/MANHOLE/CATCH-BASIN
- PROPOSED CURB STOP
- PROPOSED PIPE INSULATION
- PROPOSED 100 YEAR HIGH WATER LEVEL
- STORM WATERSHED EXTENT
- WATERSHED NAME
- RUNOFF COEFFICIENT
- AREA IN HECTARES
- PROPOSED GRASS AREA
- PROPOSED CONCRETE FEATURES/SLAB
- PROPOSED HEAVY DUTY ASPHALT
- PROPOSED LIGHT DUTY ASPHALT
- PROPOSED GRAVEL AREA
- PROPOSED RIP RAP AS PER OPSD 810.010
- PROPOSED WATER METER
- PROPOSED ACCESS GATE
- PROPOSED GROWING FIELD

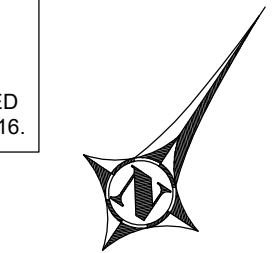
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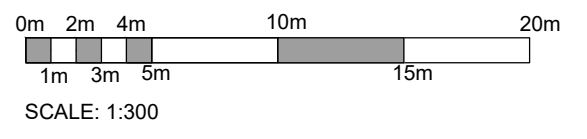


CONTRACTOR TO INSTALL FILTER FABRIC UNDER CITY COVERS.
 NO CHEAP FILTER FABRIC UNDER THE COVER THAT THE
 CONTRACTOR WILL NEVER MAINTAIN. FILTER FABRIC TO BE AS PER
 SILTSACK BY TERRAFIX AS REQUESTED BY THE CITY

SITE BENCHMARK
 FIRE HYDRANT TOP OF SPINDLE
 ELEV = 81.14
 TOPOGRAPHICAL PLANT OF SURVEY PREPARED
 BY STANTEC CONSULTING DATING JULY 19, 2016.



CONTRACTOR TO INSTALL FILTER FABRIC UNDER CITY COVERS.
 NO CHEAP FILTER FABRIC UNDER THE COVER THAT THE
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ENGINEERING STAMP

#6		
#7		
#8		
#9		
#4		
#3	ISSUED AS PER CITY COMMENTS	05/05/2022
#2	ISSUED FOR SPA	04/02/2022
#1	ISSUED FOR SPA	19/03/2021
NO. REVISION		DATE (DDMMYYYY)

BLANCHARD LETENDRE ENGINEERING

767, Notre Dame, Local 42, Embrun, Ontario,
 (613) 693-0700 K0A 1R1 blengineering.ca

CLIENT:

BRIDOR DEVELOPMENTS
 996-B ST. AUGUSTIN RD.
 EMBRUN, ON

PROJECT:

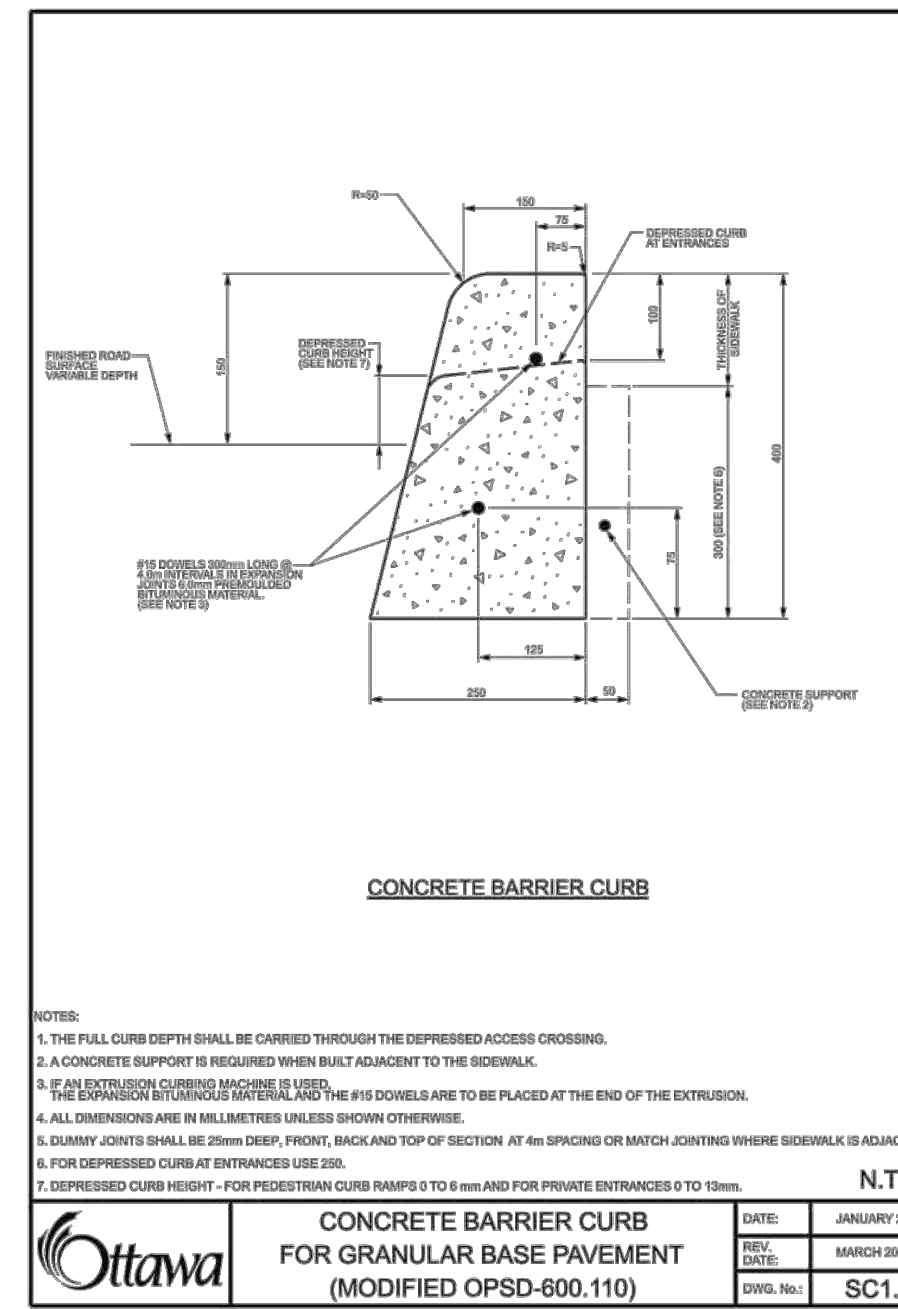
NEW RESIDENTIAL DEVELOPMENT
 2396 CLEROUX CRES,
 OTTAWA, ON

DRAWING:

SEDIMENT & EROSION CONTROL PLAN

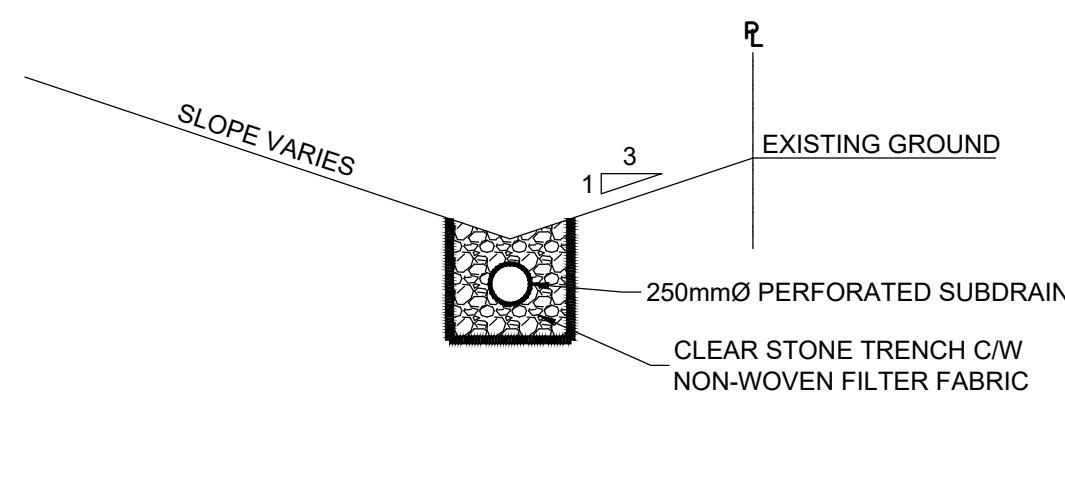
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DATE:	02-20-2022	
SCALE:	1:300	
PROJECT NUMBER:	20-305	

- LEGEND:**
- EXISTING PROPERTY LINE TO REMAIN
 - PROPOSED EASEMENT
 - PROPOSED TERRACING (3:1 MIN)
 - PROPOSED DOOR ENTRANCE/EXIT
 - PROPOSED ELEVATION
 - PROPOSED HIGH POINT ELEVATION
 - PROPOSED SWALE ELEVATION
 - MATCH INTO EXISTING ELEVATION
 - PROPOSED SIDEWALK
 - EXISTING ELEVATION
 - PROPOSED OVERLAND MAJOR FLOW ROUTE
 - PROPOSED SILT FENCE AS PER OPSD 210 110
 - PROPOSED 100mm PERFORATED SUBDRAIN
 - PROPOSED SANITARY SEWER
 - PROPOSED STORM SEWER
 - PROPOSED WATERMAIN
 - EXISTING SANITARY SEWER
 - EXISTING WATERMAIN
 - PROPOSED CATCHBASIN/MANHOLE/CATCH BASIN
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 - STORM WATERSHED EXTENT
 - WATERSHED NAME
 - RUNOFF COEFFICIENT
 - AREA IN HECTARES
 - PROPOSED GRASS AREA
 - PROPOSED CONCRETE FEATURES/SLAB
 - PROPOSED HEAVY DUTY ASPHALT
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 - PROPOSED GRAVEL AREA
 - PROPOSED RIP RAP AS PER OPSD 810.010
 - PROPOSED WATER METER
 - PROPOSED ACCESS GATE
 - PROPOSED GROWING FIELD



MANHOLE TABLE		
MH Number	Size (diameter)	Cover
MH00	1200mm	525, 524.1
MH01	1200mm	525, 524.1
MHC802	1200mm	525, 528.1
MHC803	1200mm	525, 528.1
MHC804	1200mm	525, 528.1
MHC805	1200mm	525, 528.1
MHC806	1200mm	525, 528.1
MHC808	1200mm	525, 528.1
LCB07, 10, 13, 14, 15, 16, 17	530 AND 531	

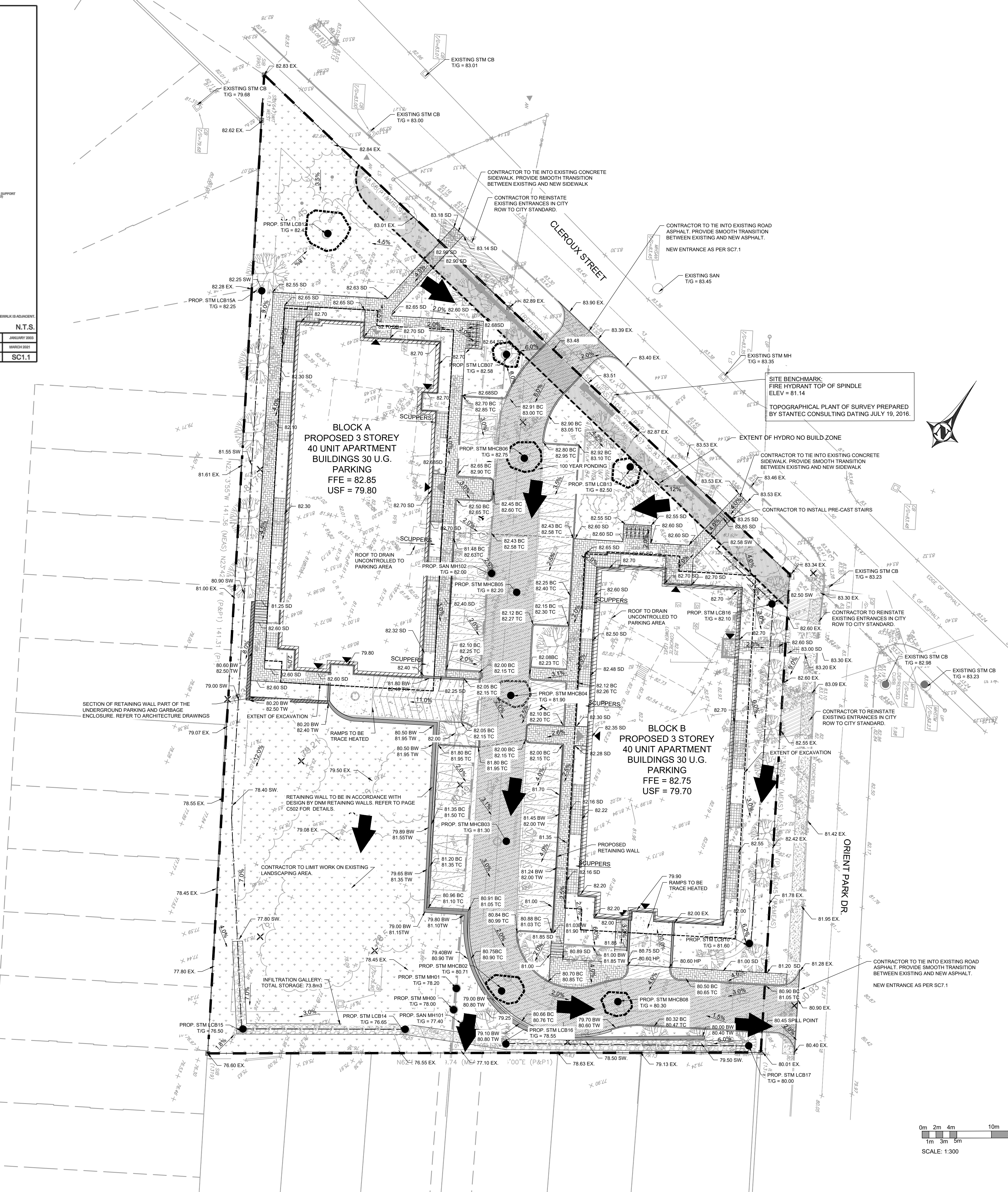
MANHOLE TABLE		
MH Number	Size (diameter)	Cover
MH101	1200mm	524, 525 / OPSD 404.010
MH102	1200mm	524, 525 / OPSD 404.010



COURSE	MATERIAL	THICKNESS (mm)	
		AUTOMOBILE PARKING	TRUCK ROUTE (HEAVY TRAFFIC)
SURFACE	HL.3 AC (PO 58-28)	50	40
BINDER	HL.8 AC (PO 58-28)	-	50
BASECOURSE	GRANULAR "A"	150	150
SUBBASE	GRANULAR "B" TYPE II	300	450

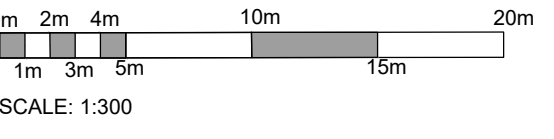
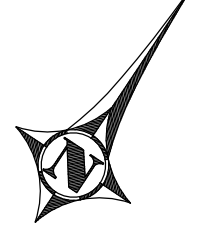
NOTE:

- IN PREPARATION FOR PAVEMENT CONSTRUCTION AT THIS SITE, ANY SURFICIAL OR NEAR SURFACE/SUBGRADE LEVEL TOPSOIL AND ANY SOFT, WET OR DELIQUESCIENT MATERIALS SHOULD BE REMOVED FROM THE PROPOSED PAVED AREAS. THE EXPOSED SUBGRADE SHOULD BE INSPECTED AND APPROVED BY GEOTECHNICAL PERSONNEL AND ANY SOFT AREAS EVENT SHOULD BE SUBCROPPED AND REPLACED WITH SUITABLE EARTH BORROW APPROVED BY THE GEOTECHNICAL ENGINEER. THE SUBGRADE SHOULD BE SHAPED AND CROWNED TO PROMOTE DRAINAGE OF THE SITE DRAINAGE STRUCTURES. FOLLOWING APPROVAL OF THE PREPARATION OF THE SUBGRADE, THE PAVEMENT GRANULARS MAY BE PLACED.



SITE BENCHMARK:
FIRE HYDRANT TOP OF SPINDLE
ELEV = 81.14

TOPOGRAPHICAL PLANT OF SURVEY PREPARED BY STANTEC CONSULTING DATING JULY 19, 2016



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ENGINEERING STAMP



#	ISSUED AS PER CITY COMMENTS	DATE
#3		05/05/2022
#2	ISSUED FOR SPA	04/12/2022
#1	ISSUED FOR SPA	19/03/2021
NO.	REVISION	DATE (DDMMYYYY)

BLANCHARD LETENDRE ENGINEERING

767, Notre Dame, Local 42, Embrun, Ontario, (613) 693-0700, k04 191, blngengineering.ca

CLIENT:

BRIDOR DEVELOPMENTS
996-8 ST. AUGUSTIN RD.
EMBRUN, ON

PROJECT:

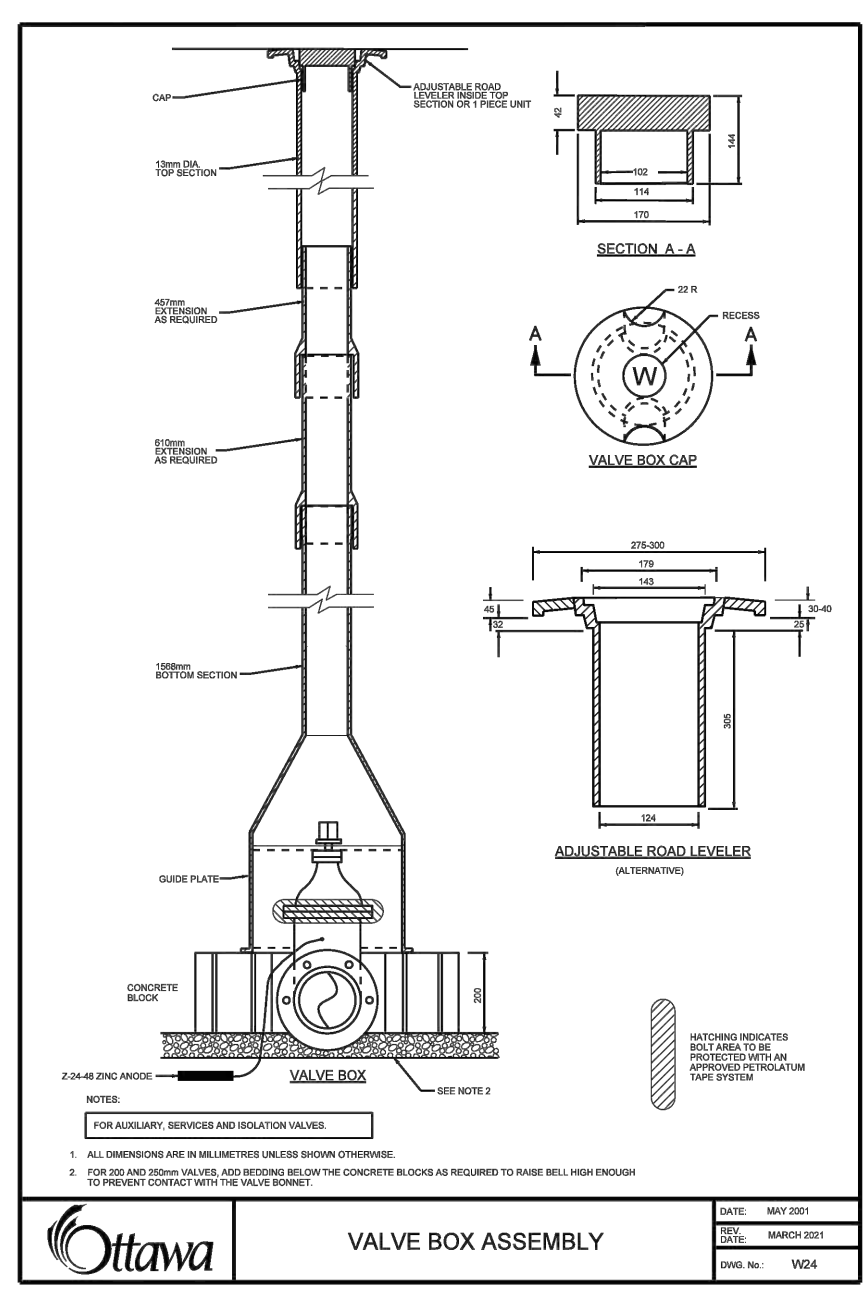
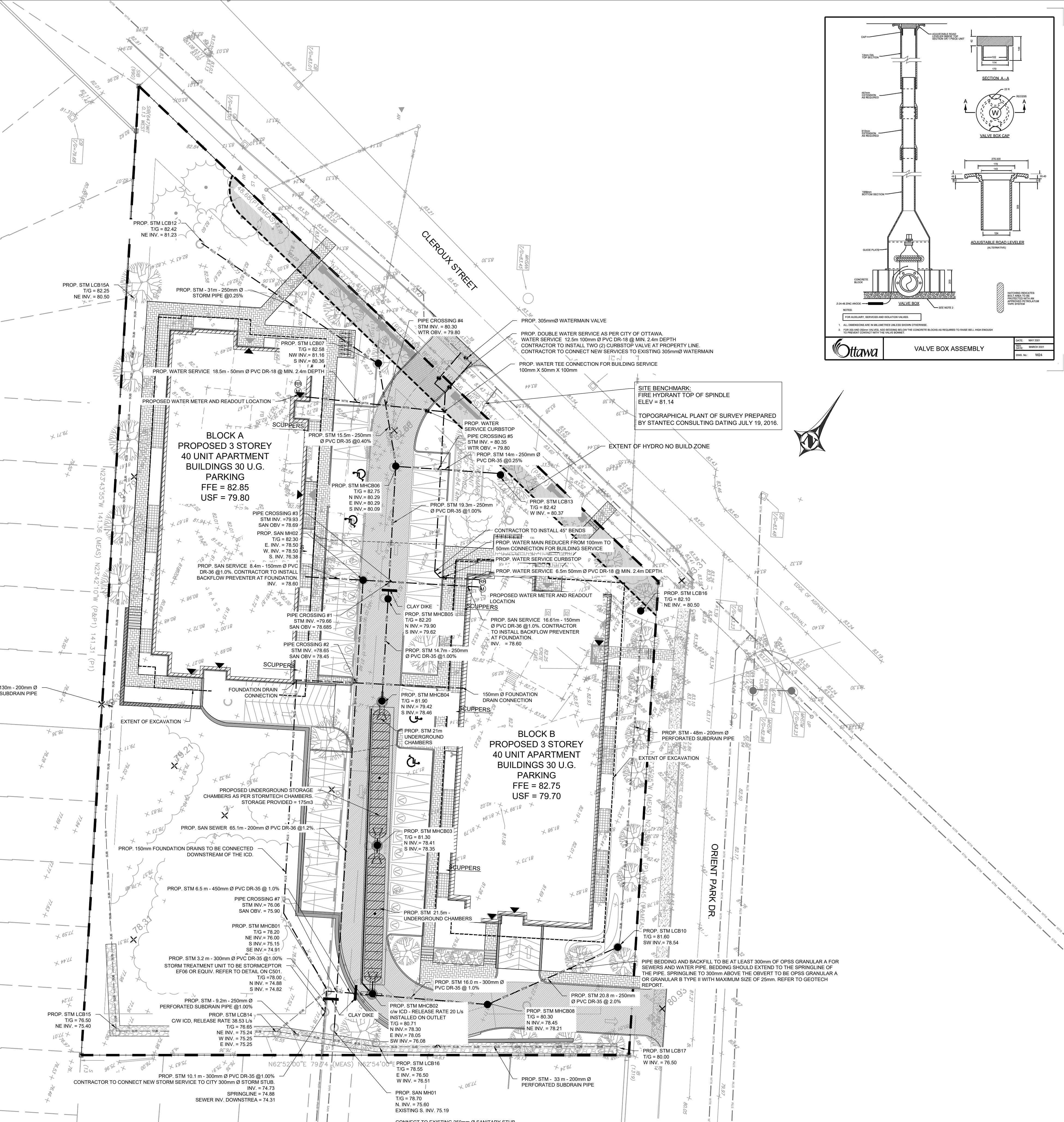
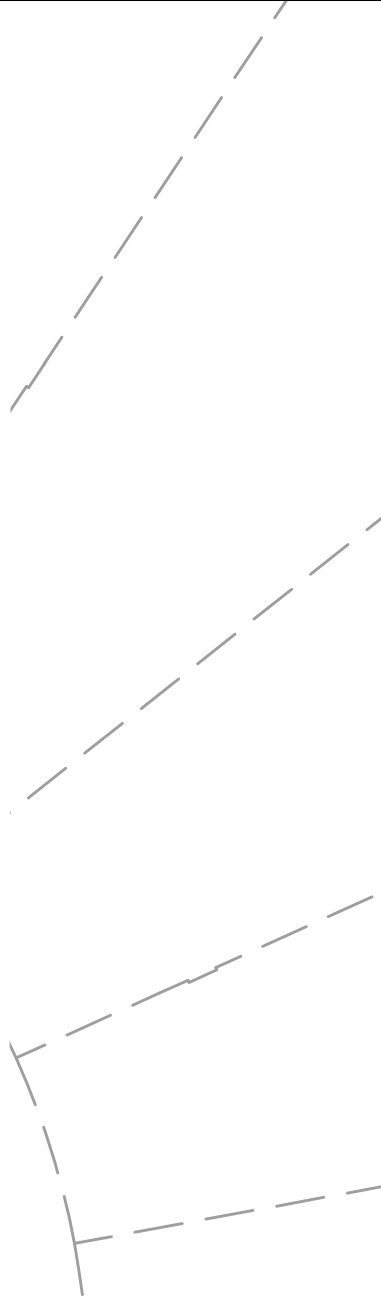
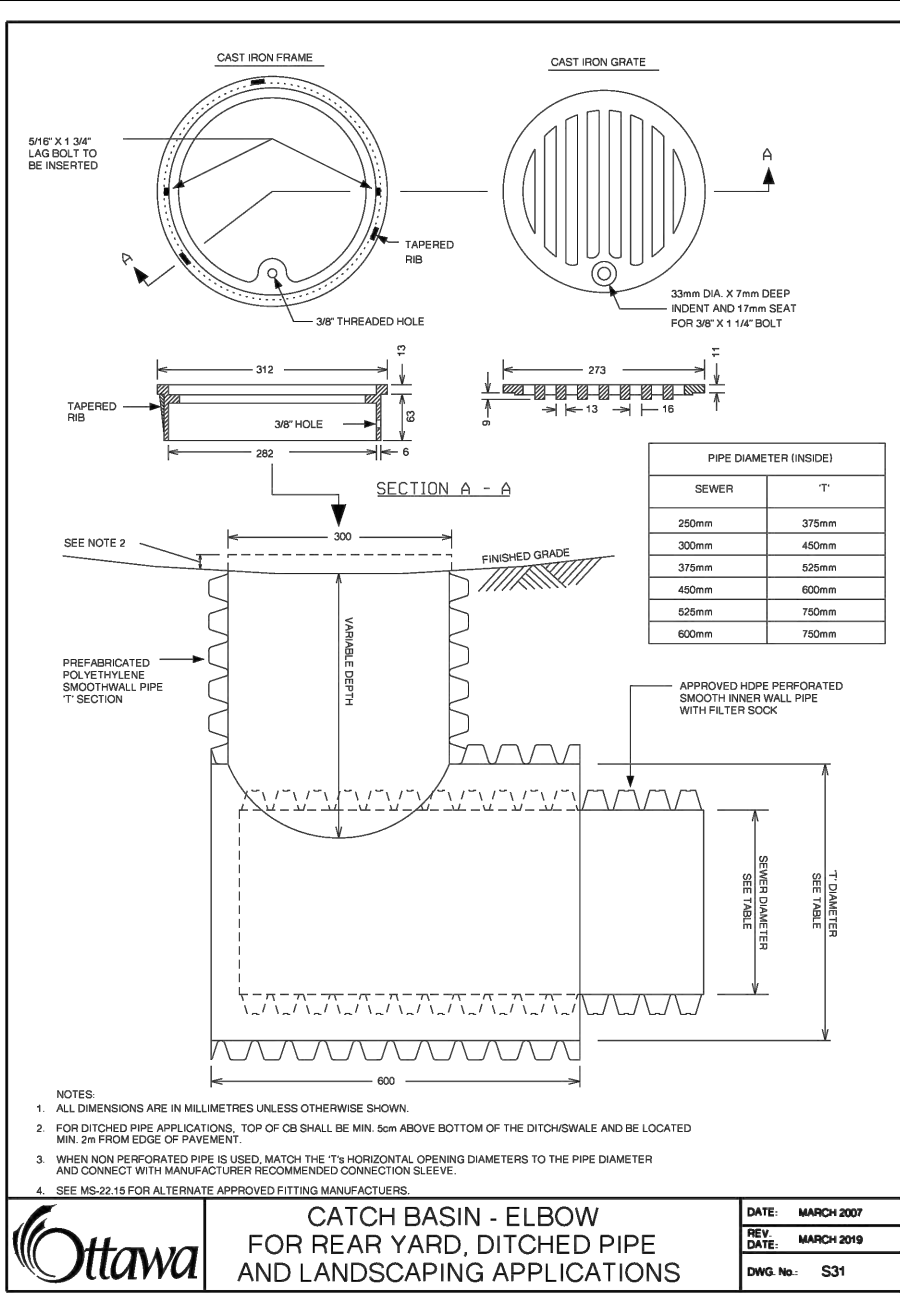
NEW RESIDENTIAL DEVELOPMENT
2396 CLEROUX CRES,
OTTAWA, ON

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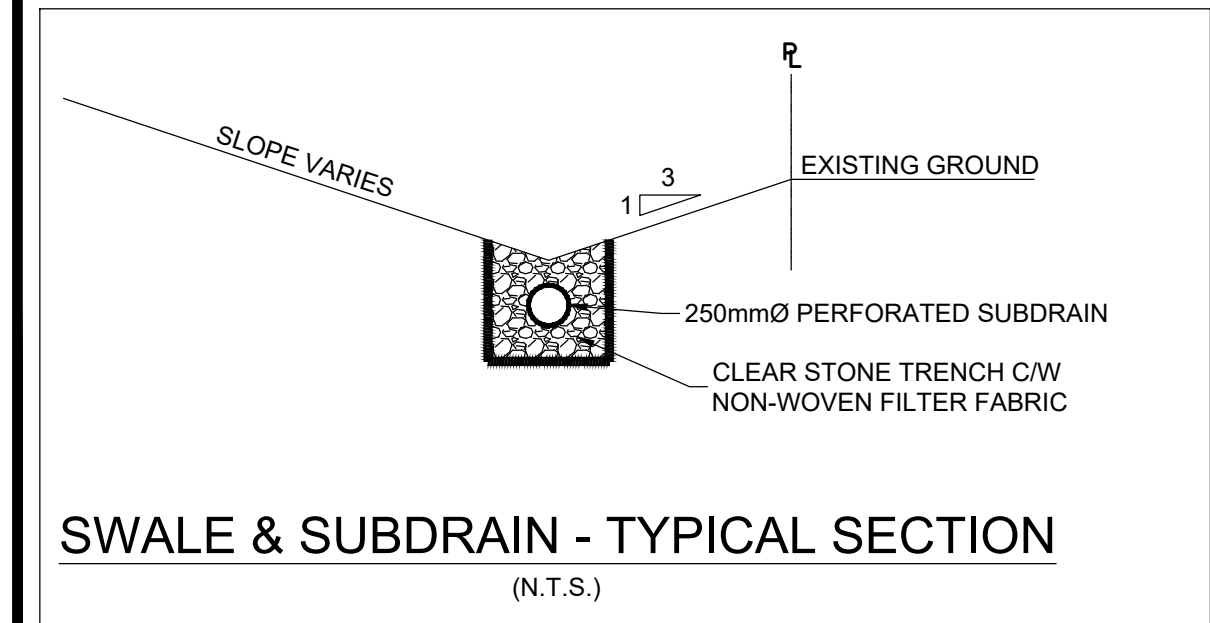
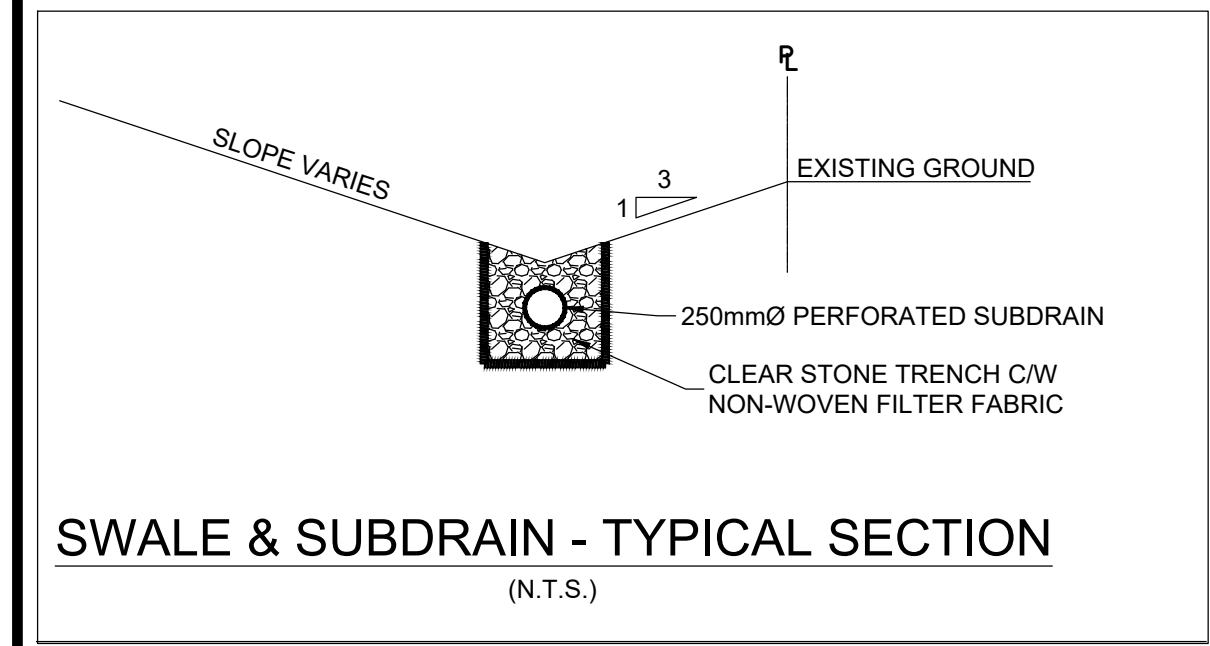
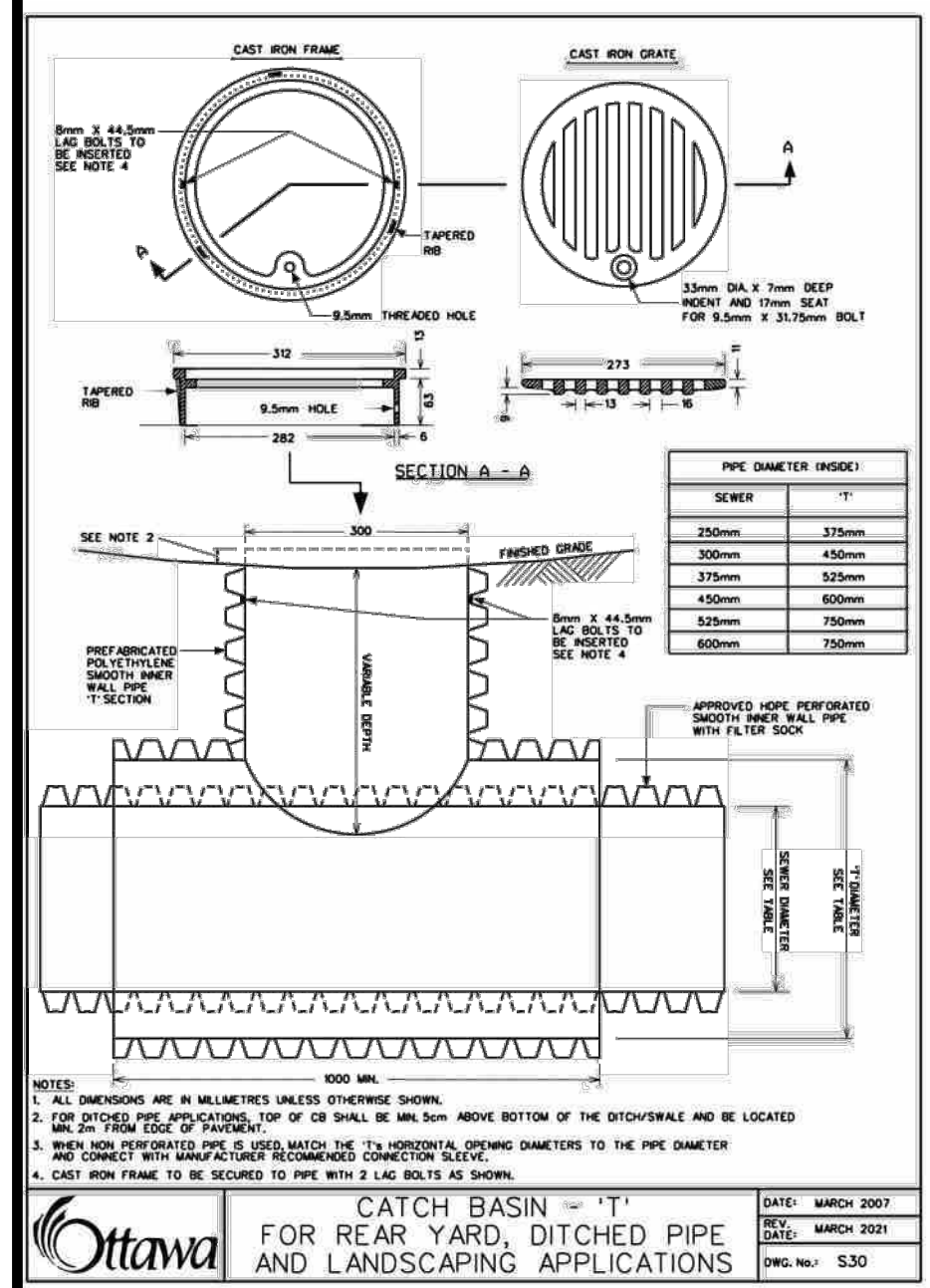
SITE GRADING PLAN

PAPER FORMAT:	24x36	PAGE: C200
DRAWN BY:	BF + GB	
CHECKED BY:	GB	
DATE:	02-2022	
SCALE:	1:300	
PROJECT NUMBER:	20-305	

- LEGEND:**
- EXISTING PROPERTY LINE TO REMAIN
 - PROPOSED EASEMENT
 - PROPOSED TERRACING (3:1 MIN.)
 - PROPOSED DOOR ENTRANCE/EXIT
 - +50.00 PROPOSED ELEVATION
 - +50.00SW PROPOSED SWALE ELEVATION
 - +50.00EX MATCH INTO EXISTING ELEVATION
 - +50.00SD PROPOSED SIDEWALK EXISTING ELEVATION
 - 0.15 EXISTING ELEVATION
 - PROPOSED OVERLAND MAJOR FLOW ROUTE
 - PROPOSED SILT FENCE AS PER OPSD 219.110
 - PROPOSED 100mm PERFORATED SUBDRAIN
 - PROPOSED STORM SEWER
 - PROPOSED SANITARY SEWER
 - PROPOSED WATERMAIN
 - EXISTING SANITARY SEWER
 - EXISTING WATERMAIN
 - PROPOSED CATCH BASIN/MANHOLE/CATCH BASIN
 - PROPOSED CURB STOP
 - PROPOSED PIPE INSULATION
 - PROPOSED 100 YEAR HIGH WATER LEVEL
 - STORM WATERSHED EXTENT
 - WATERSHED NAME
 - RUNOFF COEFFICIENT
 - AREA IN HECTARES
 - PROPOSED GRASS AREA
 - PROPOSED CONCRETE FEATURES/SLAB
 - PROPOSED HEAVY DUTY ASPHALT
 - PROPOSED LIGHT DUTY ASPHALT
 - PROPOSED GRAVEL AREA
 - PROPOSED RIP RAP AS PER OPSD 810.010
 - PROPOSED WATER METER
 - PROPOSED ACCESS GATE
 - PROPOSED GROWING FIELD



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ENGINEERING STAMP

NO.	REVISION	DATE (DDMMYYYY)
#3	ISSUED AS PER CITY COMMENTS	05/06/2022
#2	ISSUED FOR SPA	04/02/2022
#1	ISSUED FOR SPA	19/03/2021

BLANCHARD LETENDRE ENGINEERING
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 (613) 693-0700 K0A 1R1 blngengineering.ca

CLIENT:
BRIDOR DEVELOPMENTS
 996-B ST. AUGUSTIN RD.
 EMBRUN, ON

PROJECT:
NEW RESIDENTIAL DEVELOPMENT
 2396 CLEROUX CRES,
 OTTAWA, ON

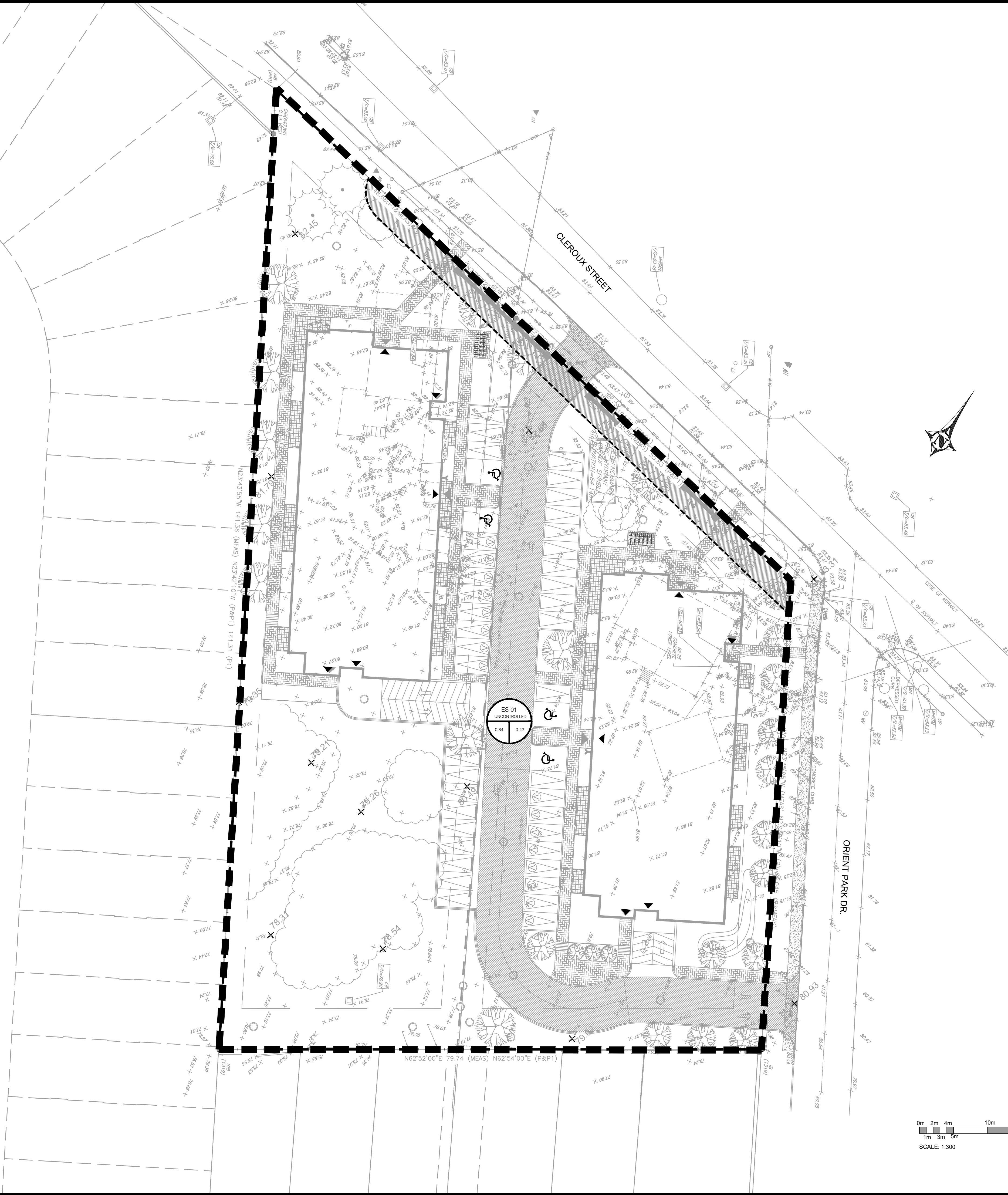
DRAWING:
SITE SERVICING PLAN

PAPER FORMAT:	24x36	PAGE:
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CHECKED BY:	GB	
DATE:	02-2022	
SCALE:	1:300	
PROJECT NUMBER:	20-305	

DWG # 18569

LEGEND:

- EXISTING PROPERTY LINE TO REMAIN
- - - PROPOSED EASEMENT
- PROPOSED TERRACING (3:1 MIN)
- ▼ PROPOSED DOOR ENTRANCE/EKT
- +50.00 PROPOSED ELEVATION
- +50.00HP PROPOSED HIGH POINT ELEVATION
- +50.00SW PROPOSED SWALE ELEVATION
- +50.00EX MATCH INTO EXISTING ELEVATION
- +50.00SD PROPOSED SIDEWALK ELEVATION
- 70.19 EXISTING ELEVATION
- PROPOSED OVERLAND MAJOR FLOW ROUTE
- PROPOSED 3/1% FENCE AS PER OPSD 219 110
- PROPOSED 100mm PERFORATED SUBDRAIN
- PROPOSED STORM SEWER
- PROPOSED SANITARY SEWER
- PROPOSED WATERMAN
- EXISTING SANITARY SEWER
- EXISTING WATERMAN
- PROPOSED CATCH-BASIN-MANHOLE/CATCH-BASIN
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- PROPOSED ACCESS GATE
- PROPOSED GROWING FIELD



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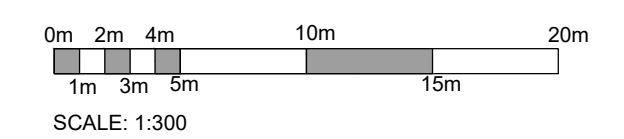
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BRIDOR DEVELOPMENTS
996-B ST. AUGUSTIN RD.
EMBRUN, ON

PROJECT:
NEW RESIDENTIAL DEVELOPMENT
2396 CLEROUX CRES,
OTTAWA, ON

DRAWING:
PRE-DEVELOPMENT DRAINAGE

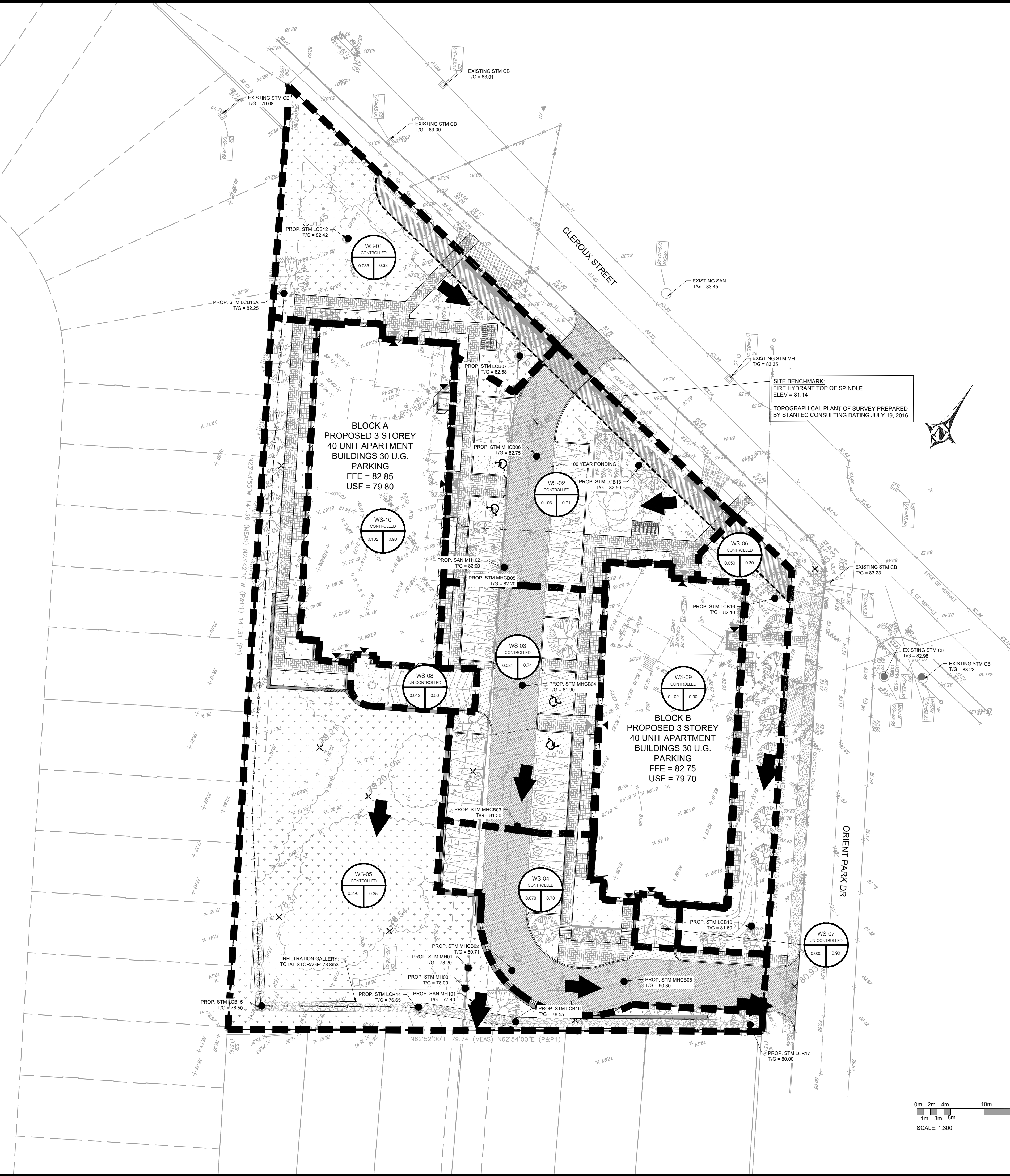
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CHECKED BY:	GB
DATE:	02-2022
SCALE:	1:300
PROJECT NUMBER:	20-305

PAGE:
C400



LEGEND:

- EXISTING PROPERTY LINE TO REMAIN
- - - PROPOSED EASEMENT
- - - PROPOSED TERRACING (0.1 MIN)
- ▼ PROPOSED DOOR ENTRANCE/EKT
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- PROPOSED ACCESS GATE
- ▨ PROPOSED GROWING FIELD



ENGINEERING STAMP

LICENSED PROFESSIONAL ENGINEER
G. L. BRUNET
100191036
30/11/2021
PROVINCE OF ONTARIO

#3	ISSUED AS PER CITY COMMENTS	05/06/2022
#2	ISSUED FOR SPA	04/02/2022
#1	ISSUED FOR SPA	19/03/2021
NO. REVISION	DATE (DDMMYYYY)	

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996-B ST. AUGUSTIN RD.
EMBRUN, ON

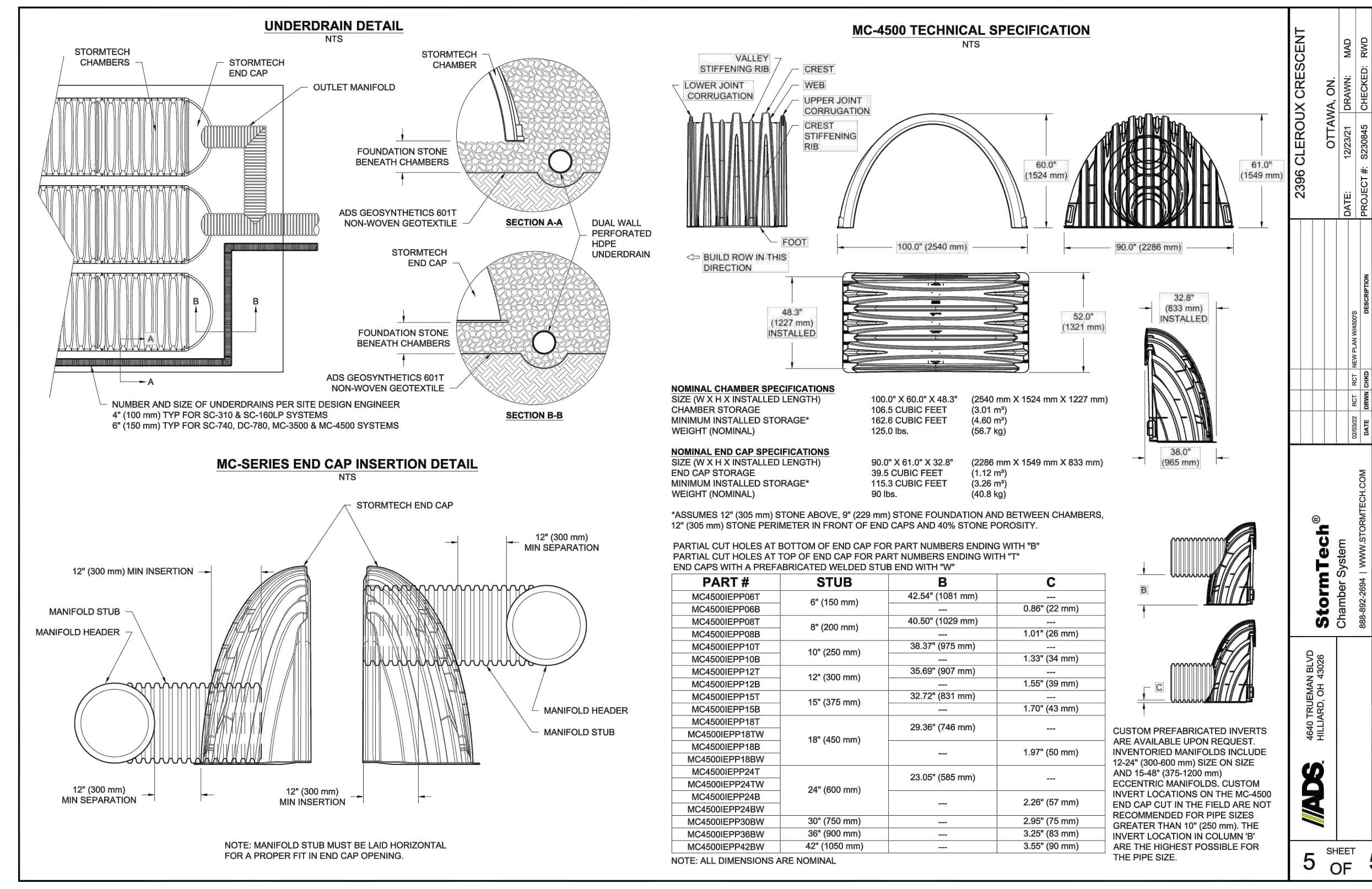
PROJECT:
NEW RESIDENTIAL DEVELOPMENT
2396 CLEROUX CRES,
OTTAWA, ON

DRAWING:
POST DEVELOPMENT STORAGE AREA

PAPER FORMAT: 24x36
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CHECKED BY: GB
DATE: 02-2022
SCALE: 1:300
PROJECT NUMBER: 20-305

PAGE:
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DWG # 18569

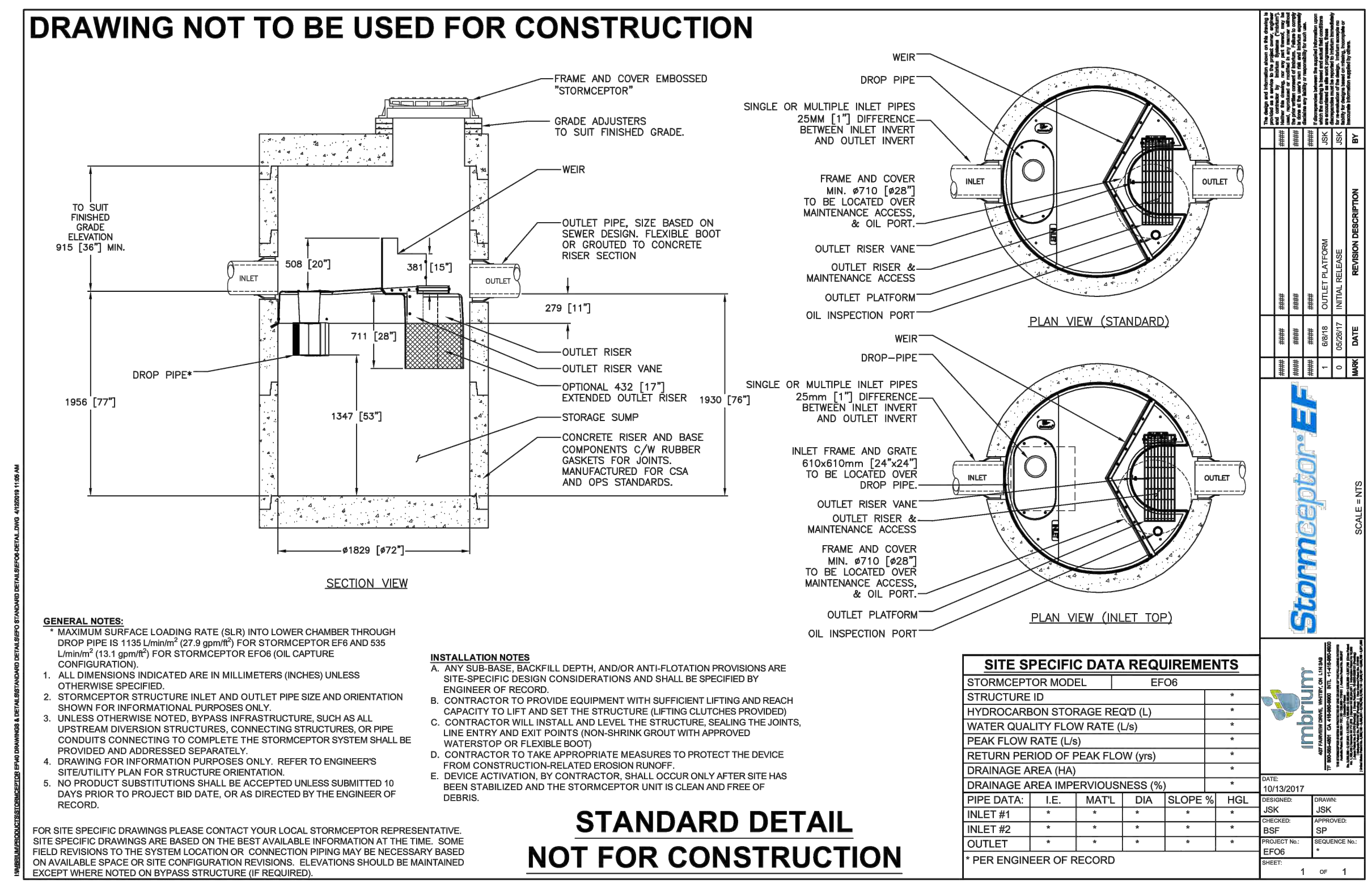


2396 CLEROUX CRESCENT
 OTTAWA, ON.
 DATE: 02/23/2022
 PROJECT #: 2020060
 CHECKED BY: RMD
 DRAWN BY: BF+GB
 REVISIONS:
 1. 02/23/2022
 2. 02/23/2022
 3. 02/23/2022
 4. 02/23/2022
 5. 02/23/2022

StormTech
 4640 TREBANA BLVD
 MISSISSAUGA, ON L4W 5J6

ADS
 1200 UNIVERSITY AVE. SUITE 100
 MISSISSAUGA, ON L4W 1M1

5 SHEET
 OF 5



#	REVISION	DATE (DDMMYYYY)
#3	ISSUED AS PER CITY COMMENTS	05/06/2022
#2	ISSUED FOR SPA	04/02/2022
#1	ISSUED FOR SPA	19/03/2021



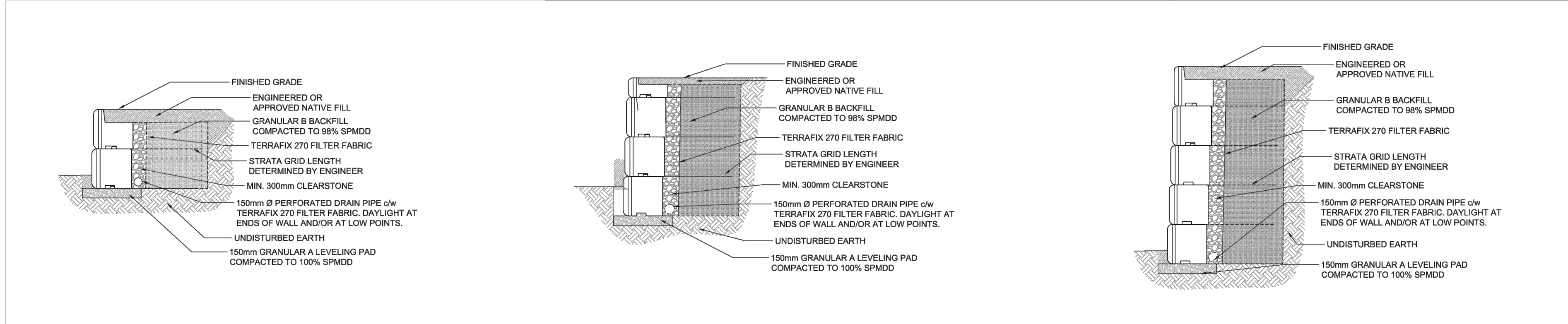
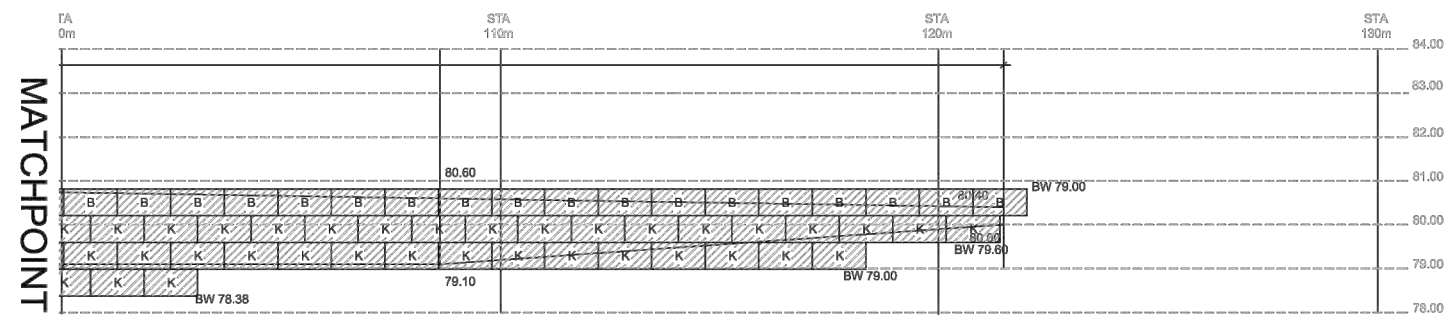
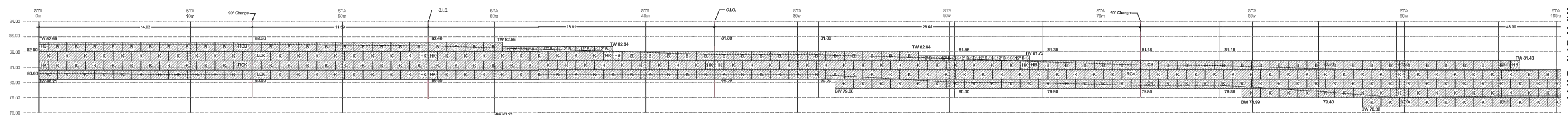
CLIENT:
 BRIDOR DEVELOPMENTS
 996-B ST. AUGUSTIN RD.
 EMBRUN, ON

PROJECT:
 NEW RESIDENTIAL DEVELOPMENT
 2396 CLEROUX CRES.
 OTTAWA, ON

DRAWING:
 DETAILS - 1

PAPER FORMAT: 24x36	PAGE: C501
DRAWN BY: BF + GB	
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DATE: 02-2022	
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PROJECT NUMBER: 20-305	

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DNM Stone Terra™ PRELIMINARY BLOCK COUNT

12" BENCH	12FB	12
FULL BENCH	B	83
HALF BENCH	HB	4
LEFT BENCH	LCB	1
RIGHT BENCH	RCB	1
12" KEYED	12FK	0
FULL KEYED	K	264
HALF KEYED	HK	9
LEFT KEYED	LCK	3
RIGHT KEYED	RCK	2
SG350 - 5 ROLLS		

- GENERAL NOTES:**
- THE FOLLOWING NOTES SHALL GOVERN UNLESS NOTED OTHERWISE ON THE DRAWINGS.
 - THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL PROJECT DRAWINGS AND CONTRACT DOCUMENTS.
 - PRIOR TO COMMENCING WORK THE CONTRACTOR WILL VERIFY ALL MEASUREMENTS AND CONDITIONS ON SITE AND REPORT TO THE ENGINEER ANY DISCREPANCIES OR UNSATISFACTORY CONDITIONS THAT MAY AFFECT THE PROPER COMPLETION OF WORK.
 - SEE FIELD CONSTRUCTION MANUAL FOR INSTALLATION DETAILS.
 - DRAWINGS ARE METRIC AND NOT TO BE SCALED.
 - OUTSIDE CURVES WILL REQUIRE BACKS OF BLOCKS TO BE TRIMMED.
 - CONTRACTORS CONSTRUCTION LOADS MUST NOT EXCEED THE ABOVE DESIGN LOADS. DESIGN LOADS MAY ONLY BE APPLIED AFTER THE WALL HAS BEEN INSTALLED AND APPROVED.
- SOIL AND BACKFILL:**
- SPECIFIED SOIL BEARING CAPACITY MUST BE VERIFIED BY A GEOTECHNICAL ENGINEER PRIOR TO COMMENCING CONSTRUCTION OF THE FOUNDATION. CONDITIONS FOUND TO BE UNSATISFACTORY IN BEARING CAPACITY MUST BE REPORTED TO THE PROJECT GEOTECHNICAL ENGINEER.
 - FOUNDATIONS MUST BEAR ON SUITABLE MATERIAL.
 - BACKFILL TO BE INSTALLED AND COMPACTED IN LIFTS NOT GREATER THAN 200mm WHERE HEAVY EQUIPMENT IS USED AND 150mm WHERE HAND OPERATED EQUIPMENT IS USED. HAND OPERATED EQUIPMENT MUST BE USED WHEN WITHIN 1m OF THE WALL.

REVISIONS/ISSUED:

NO.	DATE	DESCRIPTION

100 MATHESON BLVD., UNIT #201,
 MISSISSAUGA, ON L4Z 1A7
 Phone: (905) 840-5052
 Fax: (905) 873-9012



4705 16TH STREET
 KING, ON L7B 4E4
 Phone: (905) 864-9858
 Fax: (905) 864-9818

PROJECT: OUGD DEVELOPMENTS

LOCATION: 996-B ST. AUGUSTIN RD. EMBRUN, ON

DRAWING DESCRIPTION: ELEVATION, CROSS SECTIONS, & LAYOUT

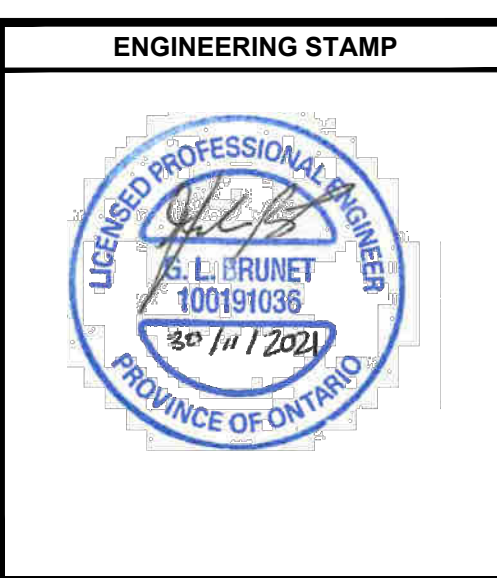
REFERENCE: BASED ON INFORMATION FOUND ON GRADING PLANS AND CROSS-SECTION DRAWN BY: BF-02/DATE: 02-2021

DRAWN BY: DS CHECKED BY:

DATE STARTED: 2021-02-26

PROJECT NO: EST12897

SHEET NO: 1



#3	ISSUED AS PER CITY COMMENTS	05/06/2022
#2	ISSUED FOR SPA	04/02/2022
#1	ISSUED FOR SPA	19/03/2021
NO.	REVISION	DATE (DDMMYYYY)

BLANCHARD LETENDRE ENGINEERING
 767, Notre Dame, Local 42, Embrun, Ontario,
 (613) 693-0700 K0A 1R1 blngengineering.ca

CLIENT:
BRIDOR DEVELOPMENTS
 996-B ST. AUGUSTIN RD.
 EMBRUN, ON

PROJECT:
NEW RESIDENTIAL DEVELOPMENT
 2396 CLEROUX CRES,
 OTTAWA, ON

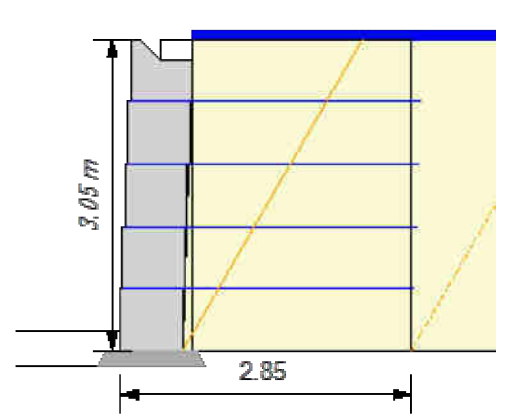
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DETAILS - 1

PAPER FORMAT: 24x36	PAGE: C502
DRAWN BY: BF + GB	
CHECKED BY: GB	
DATE: 02-2022	
SCALE:	
PROJECT NUMBER: 20-305	



REA Analysis

Project: Olgin Development
 Location: Ottawa
 Designer: ds
 Date: 2021-02-26
 Section: Section 1
 Design Method: CAN_CSA_S6
 Design Unit: StoneTerra



SOIL PARAMETERS

Reinforced Soil:	30 deg	0.00 kNpsm	18.85 kNpc/m
Retained Soil:	30 deg	0.00 kNpsm	18.85 kNpc/m
Foundation Soil:	30.00 deg	0.00 kNpsm	18.85 kNpc/m
Leveling Pad:	Crushed Stone		

GEOMETRY

Design Height:	3.05 m	Live Load:	2.40 kNpsm
Wall Batter/Tilt:	2.4/ 0.00 deg	Live Load Offset:	0.00 m
Embedment:	0.20 m	Live Load Width:	6.00 m
Leveling Pad Depth:	0.15 m	Dead Load:	0.00 kNpsm
Slope Angle:	0.0 deg	Dead Load Offset:	0.0 m
Slope Length:	0.0 m	Dead Load Width:	0.00 m
Slope Toe Offset:	0.0 m	Leveling Pad Width:	0.91 m



RESULTS

CDR Sliding:	1.54 (fn)	CDR Bearing:	3.61
Eccentricity (e/L):	0.13	Bearing:	83.09; srcv 71.37
FoS Connection:	1.68		

ID	Height	Length	Geogrid	T _a (Ta*RI)	% C _{vrg}	EP (Pa)	LL (Pa)	DL (Pa)	T _{max}	CDR	Str	T _{allow}	C _n	CDR Pk	CDR POI	CDR Slidg	Grid
4	2.44	2.85	SG350	32.04	100	3.30	1.25	0.00	4.54	7.05	11.31	2.49	1.74(3.30)	93.20	0.93		
3	1.83	2.85	SG350	32.04	100	5.85	0.83	0.00	6.68	4.80	15.62	2.34	2.64(5.85)	29.74	1.26		
2	1.22	2.85	SG350	32.04	100	8.77	0.83	0.00	9.59	3.34	19.93	2.08	3.33(8.77)	14.87	1.59		
1	.61	2.85	SG350	32.04	100	11.68	0.83	0.00	12.51	2.56	21.06	1.68	2.74(11.68)	9.07(1.54)	1.91		

Column Descriptions:
 Ta: allowable geogrid strength
 Rc %: percent coverage for geosynthetics
 EP (Pa) internal active earth pressure
 LL (Pa) earth pressure due to live load surcharge
 DL (Pa) earth pressure due to dead load surcharge
 T_{max} maximum earth pressure on geosynthetic layer
 FS_{str} factor of safety on geogrid strength (Ta/T_{max})
 Ta on allowable tension on the connection
 FS_{Pkn}, factor of safety on the connection (Ta c_n/T_{max})
 FS_{PO}, factor of safety on pullout (Ta pullout/(T_{max} - LL)
 Grid Embedment, depth of embedment beyond the theoretical failure plane.

