SITE SERVICING AND STORMWATER MANAGEMENT REPORT

Project Address – 5574 Rockdale Road, Vars

Owner/Client:	**Mr. JP Bergeron**
Address:	**880 Smith Road, Navan ON, K4B 1N9**
City file Number:	**D07-12-14-0007**

By Blanchard Letendre Engineering Ltd.
Date – August 24, 2020
Our File Reference: 19-276

Previous Submission Completed by BL Engineering
March 26, 2020
Previous Submission Completed by A. Dagenais & Assoc. Inc.
April 30, 2019
December 8, 2017
September 9th, 2015
July 29, 2015
September 17, 2014
April 10th, 2014
November 11th, 2013

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APPENDIX TABLE

1.0 INTRODUCTION

Blanchard Letendre Engineering Ltd. (BLEL) was retained by JP Bergeron. to finalize their site servicing and stormwater management for their proposed site located at 5574 Rockdale Road in Vars. 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 design prepare by A. Dagenais Associates Ltd. and the site survey completed by Annis O'Sullivan Vollebekk,. The information contained herein is based on the provided drawings and report 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.

A Dagenais & Assoc. Inc., ere previously retained by JP Bergeron to provide revised site development drawings and a storm water management report for the proposed residential project. As A Dagenais & Assoc. Inc., has been acquired by BL Engineering, this report is a summary of data, calculations, design and support documentation required for the site services of this project.

2.0 SITE PLAN

The proposed site is to be located in Vars Ottawa, Ontario. As per the aerial picture in figure 1, the existing site consist of and green space area on the west side of the property. The property located at 5574 Rockdale, Vars consist of approximately 1.77ha of undeveloped land and will consist of two area, affect area (0.61ha) and un unaffected area (1.16ha).

Figure 1- Existing site at 5574 Rockdale Rd, Vars, Ontario

3.0 STORM WATER MANAGEMENT

3.1 Balance Flow Requirements

The site consists of approximately 1.777 ha of vacant land.

The site is proposed to be considered in three parts:

1- An affected area that will include a laneway, parking, proposed building and a storm water management swale;
2- An uncontrolled swale to service potential future development, will remain grass and be considered unaffected (Area A8);
3- An unaffected area to remain entirely as is (Area A9).

The unaffected area, consisting of Area A9 in the storm water management plan, is being considered for future development (such as a second building) which will require storm water management practices to be constructed along with the future building.

Since the unaffected area is divided from the roadside ditch by 5 residential properties and it is uncertain if any one of them will be available for use to convey a controlled flow, the uncontrolled swale (Area A8) is being proposed as an option for future storm water management design. We therefore proposed to direct stormwater from the proposed development exclusively to the swale on the south side of the laneway. Due to the proposed site layout and topography, some allowances for Phase 2 post development flow contributions to the affected area are included in the storm water management scheme.

The proposed storm water management will consider management of the affected area, controlling up the 100-year storm based on 5-year pre-development flows. Only design flows assuming contribution from post-Phase 2 developments will be used in design, however the lower interim flows have been included in the appendices for reference.

The pre-development flow of the 5-year storm was calculated using a 5-year storm and a 20-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 20-minute time of concentration for the affected area. The pre-development flows for the swale and the unaffected area were calculated using a 20-minute times of concentration, as well as 5-year and 100-year storms depending on the subject design storm. From intensity duration curves established for the Ottawa area (see Appendix F) the intensity of 104.20mm/hr for the 5yr predevelopment flow and 178.60mm/hr for the 100-year predevelopment flow. A run-off coefficient of 0.3 was used as per City Design Guidelines (for grass areas).

The post-development flows were based on 5 and 100 years storm events with a time concentration of 10 minutes for the affected area and 20 minutes for the unaffected areas. From intensity duration curves established for the Ottawa area, a copy included in Appendix 'F', we established rain intensities of I = 104.4 mm/hr (5 years) and I = 179.0 mm/hr (100 years) correspondingly. A runoff coefficient of 0.30 for the soft surfaces and 0.90 for the hard surfaces were used for a 5-year storm event. For the 100-year storm we have increased the coefficients by 25% as per City`s Sewer Guidelines, meaning 0.375 for soft; except for hard surfaces that were limited at 0.95.

Using the Rational Method and considering the tributary areas of the proposed development or affected area (see Appendix ‘B’), we calculated the pre and post development flows. See also the Storm Sewer Design Sheet in Appendix ‘D’.

3.2 One hundred Year Storm Event

In the Storm Sewer Design sheet, the pre-development flow was calculated as 202.71 L/s. The affected area was found to have a predevelopment flow of 65.95 L/s. We have an uncontrolled area, (Area A7) releasing storm water at 2.42 L/s. Area's A1-A6 will surface drain to the controlled swale on the south side of the private approach. The permitted flow from the swale is **63.53L/s** [65.95L/s – 2.42L/s = 63.53L/s].

The proposed design flow restriction will be achieved with an IPEX ICD at CB#1, (with a head of 0.29 m) at for a restricted flow of 63.53 L/s. Therefore, the total release flow will be 63.53L/s. For IPEX chart, see Appendix “G”.

3.2.1 Roof Drain calculations

The proposed roofs are pitched; therefore, roof drains are not proposed.

3.2.2 Storage calculations

The total flow into CB#1 during a 100-year storm event will be the total flow from areas A1-A6. Therefore, the flow is 202.71 L/s for a 100 years storm which is being limited to **63.53 L/s**. The ICD by IPEX (Type D) has a head of 0.29m (77.56) (Ponding elevation) – 77.27m (outlet) = 0.29 m). Based on the restricted flow and rainfall intensity, the accumulated volume generated by this restriction would be 88.82 cu. m. See Appendix “E” for Stormwater Storage.

3.2.3 Structure Storage

The volume is proposed to be stored in the swale. The shape of the swale is proposed to be constructed with 3H:1V side walls and a ‘flat’ bottom (minimum 2% cross fall from bottom of walls to centerline of swale). Average slope has been shown on the site development drawing.

Ponding capacity of the swale has been calculated as the sum of the capacity of sections of the swale. The capacity of each section has been calculated as the length of the section crossed with the average area of the section. The average area of each section was calculated using the cross-sectional area of the swale at the upstream and the downstream end of each section.

The cross-sectional area of the swale at section ends is dependent on ponding elevation in the swale. Through computations and using AutoCAD volumes, the 100-year ponding elevation was found to be 77.56m. The resulting ponding attributes have been summarized in the following table:

Section	Ponding Elevation (m)	Swale Elevation (m)	Average Area (sq m)	Length (m)	Volume (cu m)	Capacity (cu m)
1	77.56	77.28	0.331	10.000	3.310	3.310
2	77.56	77.30	1.061	10.000	10.605	13.915
3	77.56	77.32	1.593	10.000	15.928	29.843
4	77.56	77.34	1.384	10.000	13.843	43.685
5	77.56	77.36	1.237	10.000	12.365	56.050
6	77.56	77.38	1.057	10.000	10.565	66.615
7	77.56	77.40	0.935	10.000	9.345	75.960
8	77.56	77.42	0.847	10.000	8.470	84.430
9	77.56	77.44	0.847	10.000	8.470	92.900
10	77.56	77.46	0.535	7.978	4.268	97.168
11	77.56	77.48	0.288	10.664	3.066	100.234
12	77.56	77.50	0.112	12.083	1.348	101.583
13	77.56	77.52	0.040	30.975	1.227	102.809
14	77.56	77.58	0.040	20.94	0.271	103.080
				Target Storage		**88.82**

**Note: The table was constructed beginning at the outlet. Section 14 is adjacent to the South West corner of the property.*

Therefore, the surface storage capacity is 103.080/88.82*100 = 116% of the required volume.

3.3 Five Year Storm Event

In the Storm Sewer Design sheet, the pre-development flow was calculated as 104.2 L/s. The affected area was found to have a predevelopment flows of 65.95L/s. We have an uncontrolled area, (Area A7) releasing storm water at 1.13 L/s. Area's A1-A6 will surface drain to the controlled swale on the south side of the private approach. The permitted flow from the swale is 65.69L/s and will be restricted to 63.53L/s as per section 3.2 of this report.

3.3.1 Storage calculations

The total flow into CB#1 during a 5-year storm event will be the total flow from areas A1-A6. Therefore, the flow is 96.28 L/s for a 5 years storm which is being limited to 63.53 L/s. The total storage required under the 5 year storm event was estimated at 19.65 cu. m which will be stored in the swale that provides the storage for the 100 year storm event.

3.4 Trench Drain and Pump

The proposed elevation at the bottom of the ramp will be lower than the adjacent swale elevations, and therefore must be pumped.

The system will be designed to accommodate a 1hr storm assuming pump failure at the onset of the storm, as well as a water level in the pit at a level only just insufficient to engage the alarm.

3.4.1 Pump Selection

A 1HP sump pump by Flotec is capable of pumping 5.75L/s (5468 GPH) with a maximum head of 2.22m (7.29ft). Therefore, we propose alternating Flotec 1HP pumps with float actuated control panel.

3.4.2 Pit design

The discharge pipe must exit the pump chamber above the 100-year ponding elevation. We propose a 2.0% slope on the discharge pipe, draining towards the swale. This will provide a pipe invert at the pump chamber of 77.78. We therefore propose a pump inlet elevation of 75.56m (77.78 -2.21 = 75.56). The proposed pump has a 3 1/2" clearance from bottom of pit to pump inlet, therefore the pit sump will be at an elevation of 75.49m.

The OFF float will be installed at 4" (elev = 75.59), ON float at 14" (elev = 75.79), and a high alarm float at 17" (elev = 75.86).

Additional flow reserve volume to was accounted for (up to the 100-year design storm) sufficient to provide a 1hr response time in case of pump failure.

Considering flooding would begin to occur at an elevation of 75.79, there would therefore be a reserve depth of 1.32m (77.18 – 75.79 = 1.32m). Assuming a water elevation in the pit just below the high-water alarm float level at the commencement of the storm would be the worst-case scenario. For a 3.6m diameter pit, there would be a reserve capacity of 13.44 cu m before flooding. A 60-minute storm would generate 13.39cu m of water (Refer to tables in Appendix "E").

Therefore the proposed 3.6m diameter precast concrete manhole shall be used as a sump pit, or equivalent volume. Assuming a 1.8m monolithic base, the underside of transition slab would be at an elevation of 77.29m. A 1.2m diameter riser with a height of 0.9m, 1.2m diameter flat top, 6" leveling ring and 6" frame and grate would bring the top of grate elevation to 79.08m. Refer to site development drawings for finished grade elevations (see appendix "A").

3.5 Quality Control

A water quality control requirement of 80% TSS removal was set by the South Nation Conservation Authority. We propose to achieve this requirement by means of an "end of the line" treatment unit. We are proposing a Stormceptor unit. Using the Stormceptor sizing software, the STC 300 unit was selected. The software generated report has been attached (See Appendix "G").

3.6 Phase 2 Considerations

As Phase 2 of the development is not proposed in the near future with the client, no work proposed will be completed during the Phase 1. A catch basin with its own ICD to control phase 2 will be proposed but only be installed when Phase 2 is constructed. An STC will also be proposed for phase 2 and will be sized accordingly when the new site plan will be completed by the client.

4.0 SANITARY SEWER DESIGN

As per Part 8 of the Ontario Building Code (See Appendix "H"), Table 8.2.1.3.A,

Apartments, Based on Occupant Load	275 L/c/d
Occupancy, Based on Subsection 3.1.17	2 people per bedroom
Therefore:	

6 x 2 bedrooms x 2 people per room =	24 people
6 x 1 bedrooms x 2 people per room =	12 people
Total=	**36 people**

Therefore, the total daily design sanitary sewage flow for this development is 9900 L/d [275L/c/d x 36 people = 9900 L/d].

4.1 Septic Tank

Since the building will have a residential use, the volume of the septic tank must be at least 2 times the daily design sanitary sewage flow as per sentence 8.2.2.3.(1) of the OBC.

Tank Volume = 2 x 9900 =19 800 L

Therefore, we will use a standard Boucher Precast Concrete Limited (or equivalent) 5000gal (22 500 L) concrete septic tank c/w Polylok PL122 or equivalent effluent filter. See details on plan.

4.2 Tertiary Treatment Units

The Ottawa Septic System Office has included a requirement of tertiary treatment based on expected sewage characteristics of senior citizens. The proposed treatment unit is the EnviroSeptic Treatment System (BMEC 13-03-365).

The design parameters were provided by the EnviroSeptic product representative and attached in Appendix “L”. The proposed design parameters were reviewed and it is our professional opinion that they are suitable for the proposed site and design flow. During construction, the final designed will be completed by EnviroSeptic which will signed off their final design.

4.3 Area Bed Design

The area bed will be a sand layer with the EnviroSeptic pipes contained within it. The bed will have dimensions 17.38m X 9.45m and a total contact surface of 164.19 sq m.

4.3.1 Stone layer

The EnviroSeptic System does not have a stone later.

4.3.2 Extended Area (Base of the septic sand)

The proposed sand layer shall be 700mm thick and have an area not less than the greater of:

1-Area Bed (164.19 sq m);

Or

2-A=QT/850 = (9900)(6)/850 = 70 sq m

The minimum required size of the sand layer is therefore a matching area and footprint of the sand layer. (The percolation rate of the native soil "T=6" was obtained from the geotechnical report by Morey Assoc. Ltd. for this site, dated Sept. 2013, file # 013300).

4.4 Pumping Station

A pumping chamber is required for dosing purposes only. Mechanical Engineer and plumber to take note of proposed pipe invert at exterior side of foundation wall. Gravity drainage of basement fixtures or floor drains may not be possible and an internal sewage pit should be considered.

The EnviroSeptic system does not follow OBC requirements for dosing 75% of the volume of the distribution piping. We are proposing a demand dosing system designed to dose 1238L each cycle for approximately 8 cycles per day. We propose a dose rate of 1.25L/s for total dosing time in excess of 15 minutes in order to prevent dosing in excess of 75L/min, which is not suitable for this system.

The pump chamber is proposed to be constructed of 1.2m diameter concrete casing. With a cross sectional area of 1.131 sq m, the required working depth of the pump chamber will be 1.1m.

We are proposing a 0.1m elevation difference between the bottom of the chamber and the pump inlet, a 1.1m working depth, and a 0.16m buffer between high float and alarm float. We also propose the alarm float elevation to match the inlet elevation of 77.96. With a top of grate elevation of 78.54, we are therefore proposing a total pump chamber height of 1.93m.

With an inlet elevation of 76.76 and an outlet elevation of 78.18, the head on the pump will be 1.47m. With a flow of 1.25L/s (19.8GPM), a Meyer’s SRM4 series pump is more than sufficient to be used as the dosing pump. When used in combination with EnviroSeptic, a dosing pump must be installed with a velocity reducer and differential venting.

4.5 Elevations of structures

The proposed area bed will outlet to the west at an elevation 77.65. The footer of the proposed bed will be set back from the outlet by approximately 3m. With a contact surface at a slope of 1%, the elevation of the contact surface at the footer will be 77.68m. Continuing at 1% up to the header, the elevation of the contact surface at the header (17.38m @ 1.0%) will be 77.85. Working up from there, we have the following table of elevations of structures for the septic system:

Structure	Inlet Elevation	Outlet Elevation	Underside Elevation of Structure	Top Elevation of Structure	F/G Elevation
BLDG	N/A	78.13	N/A	N/A	N/A
Tank	78.09	78.01	75.83	78.40	78.54
Pump	77.96	78.18	76.78	78.40	78.54
header	78.15	N/A	N/A	N/A	78.75
CS@header	N/A	N/A	77.85	N/A	N/A
footer	77.98	N/A	N/A	N/A	78.58
CS @footer	N/A	N/A	77.68	N/A	N/A

5.0 WATER CONNECTION DESIGN

5.1 Domestic water requirements

Based on the preliminary concept of having 12 units, 6 of which are to be 2-bedroom units and 6 of which are to be 1-bedroom units, and following the city of Ottawa design guidelines for water distribution, we have a design water demand as follows:

6 rooms at 2.1 people per room for 12.6 people
6 rooms at 1.4 people per room for 8.4 people

The predicted population of this building would therefore be 21 people. As the population estimated is higher with the sanitary calculation, a population of 36 people was used for the design. The guideline specifies a design flow of 350L/c/day. The total demand would therefore be 7350L/d, which translates to an average daily demand of 0.085L/s. Therefore: ADD = 0.085L/s; MDD = 0.213L/s; MHD = 0.468L/s

5.2 Fire Flow Requirements

The required fire flow was calculated using the OBC 2012 Section 12 method.

Q=KVS

-Combustible construction is assumed, therefore K=18
-Each floor is to have an area of approximately 598 sq m. Assuming a storey height of 3m, the building volume is therefore approximately 3600 cu m
-The location of the building is not within 12m of any other existing or proposed structure, therefore S = 1.

Q = (18)(3600)(1) = 64,800

Therefore, a fire flow of 45L/s is required. In order for a fire flow of 45L/s to be maintained for the required 30 minutes, an on-site fire water storage tank will be required. The required storage for on-site fire water shall be 81,000L.

We therefore propose the use of two 50,000L precast concrete tanks. Two 50,000L tanks will provide a total of 100,000L of on-site water storage which is 123.5% (100,000/81,000 * 100% = 123.5%) of the required fire water. Tanks are to be installed with a low-level alarm at an elevation of 50% of the tanks. Refer to drawing C300 for water suppressions tank location.

5.3 Design Flow

The design flow shall be the greater of the Maximum Hourly Demand (MHD); or the combined Fire Flow plus Maximum Daily Demand. Since Fire Flow shall be provided by on-site water storage, the design flow shall be taken as the greater of the MHD or the MDD. Therefore:

Design Flow = 0.468L/s

We are proposing a 150mm diameter private main with a 150x50x50 pre-manufactured tee servicing the proposed building and a second branch capped for future use. The branch to the building is proposed to be reduced to a 50mm service lateral between the tee and the building. Considering the flow in the building lateral will consist of the building's domestic demand only, it will be sized using the MDD alone.

5.4 Water Capacity Comments

The boundary conditions and HGL for hydraulic analysis for 5574 Rockdale Road were obtained from the city. See attached copy in Appendix “J”. From the boundary conditions, we noted that we have a minimum pressure check of 108.4 m and for the estimated water main elevation of 75.80 m, a maximum pressure estimate of 46.31 psi.

An HGL table was used to tabulate the characteristics of the private main and service (See appendix "J"), including friction and elevation losses and available pressure. As per the table, the friction loss servicing this building is 1.82psi [46.31psi - 44.49psi = 1.82psi]. There is also an approximately 0.25psi friction loss from water meter to furthest fixture, and a total elevation difference of 9.57m (31.4ft) from the water main to the shower head on the top floor. The head loss for elevation will be 13.60psi [31.4ft x 0.433 = 13.60psi], for a total pressure loss of 15.67psi to service this building. The available pressure at the furthest fixture will therefore be 30.74psi, which is adequate.

6.0 CONCLUSION

In our opinion, the proposed development project, including the design recommendations provided in this report and on the Site Development Drawings, meets the approval requirements for the applicable approval agencies as well as the 2003 MOE requirements.

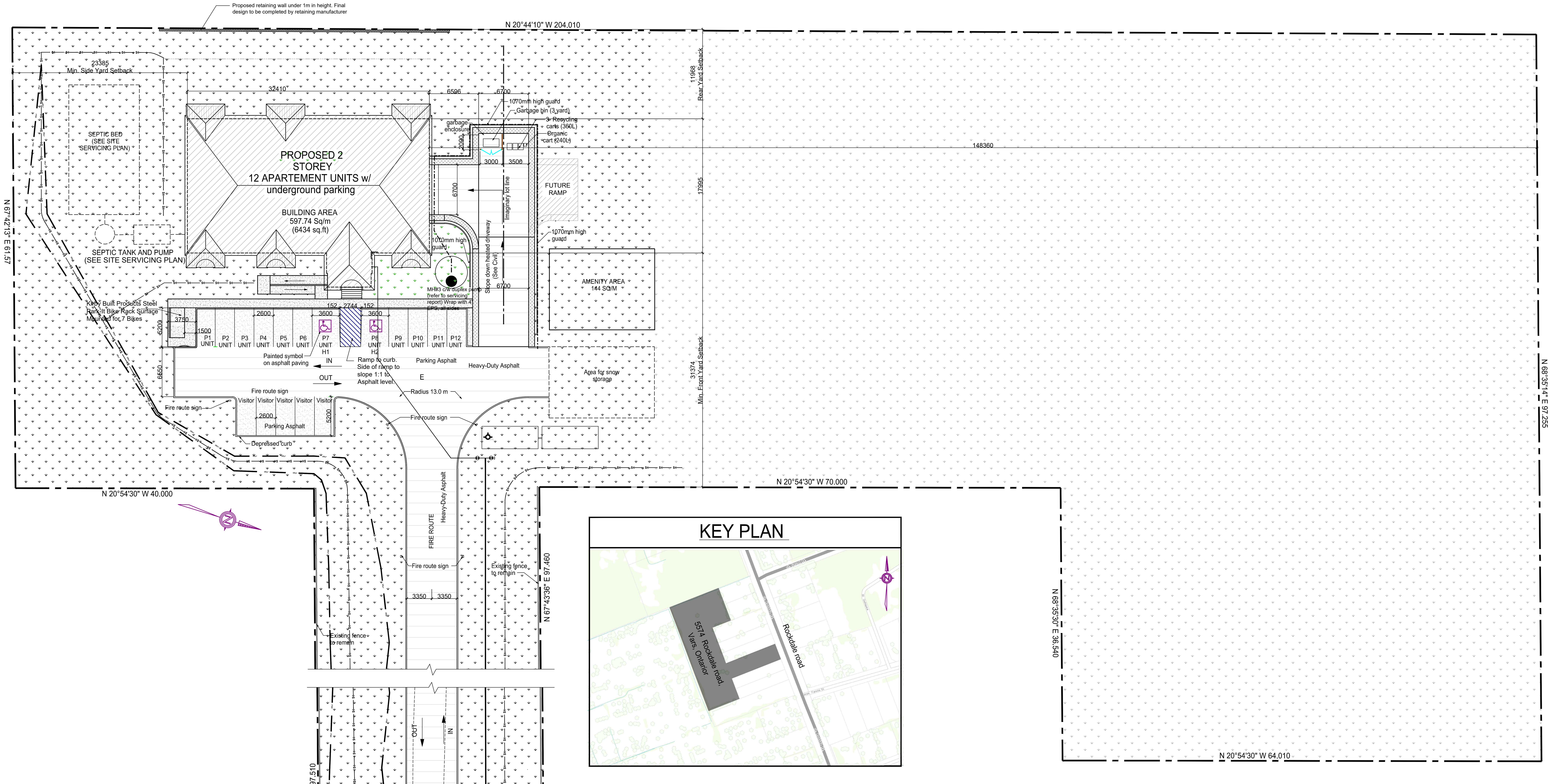
Should you have any questions, please do not hesitate to contact the undersigned.

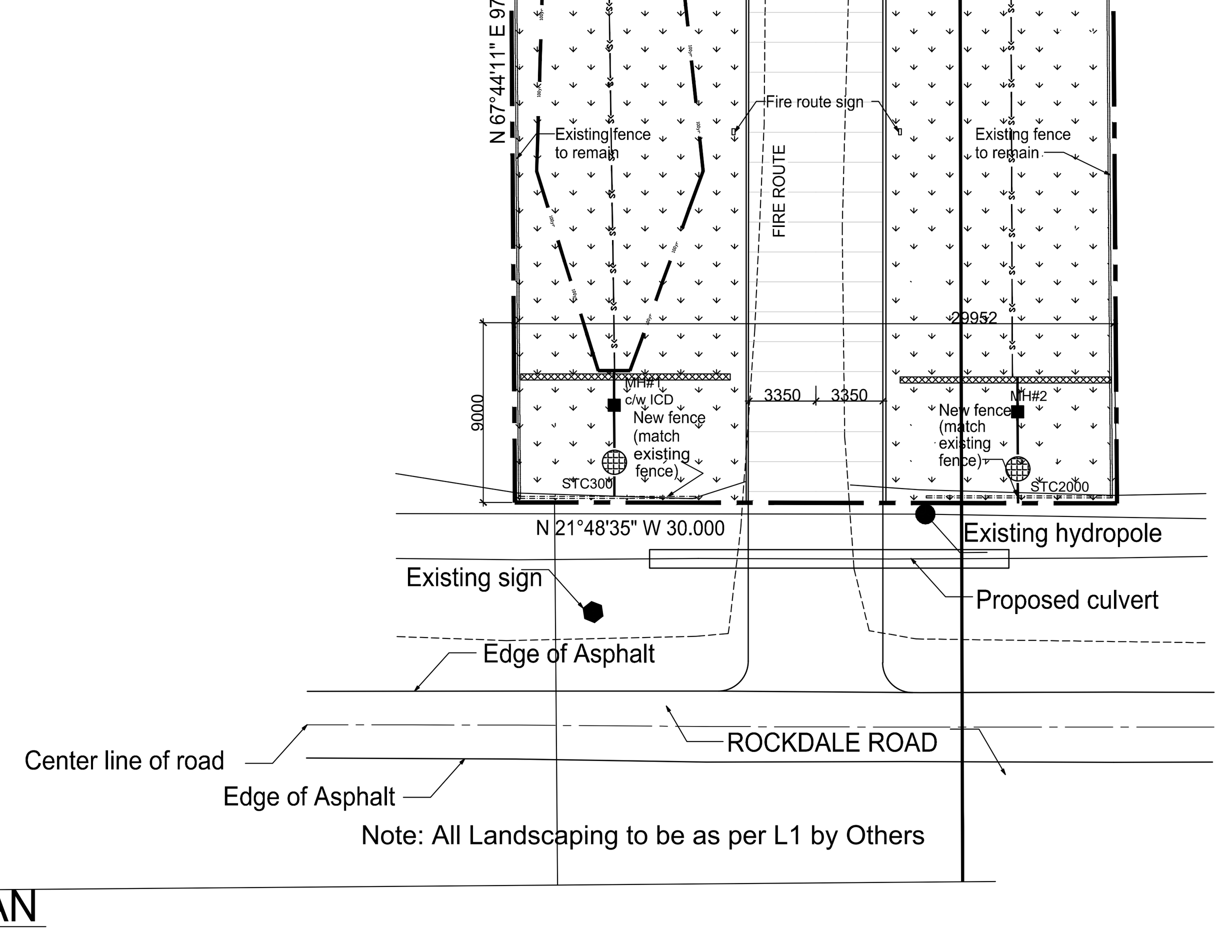
Sincerely Yours,

Guillaume Brunet, P. Eng.

Benjamin Falconer, E.I.T.

APPENDIX "A"
Site Development Drawings





Note: All Landscaping to be as per L1 by Others

SITE PLAN

Scale: 1 :300

PROPERTY BOUNDARY DERIVES FROM SURVEY DONE BY DUTRISAC SURVEYING INC. DATED JULY 5TH 2005

PART 5 OF LOT 24
CONCESSION 7
REGISTERED PLAN 4R20412
CUMBERLAND
CITY OF OTTAWA

1m 3m 5m 7m 9m 15m
0m 2m 4m 6m 8m 10m 20m 30m

SCALE BAR

NOTE: ALL LANDSCAPING SHALL BE AS SHOWN ON L1

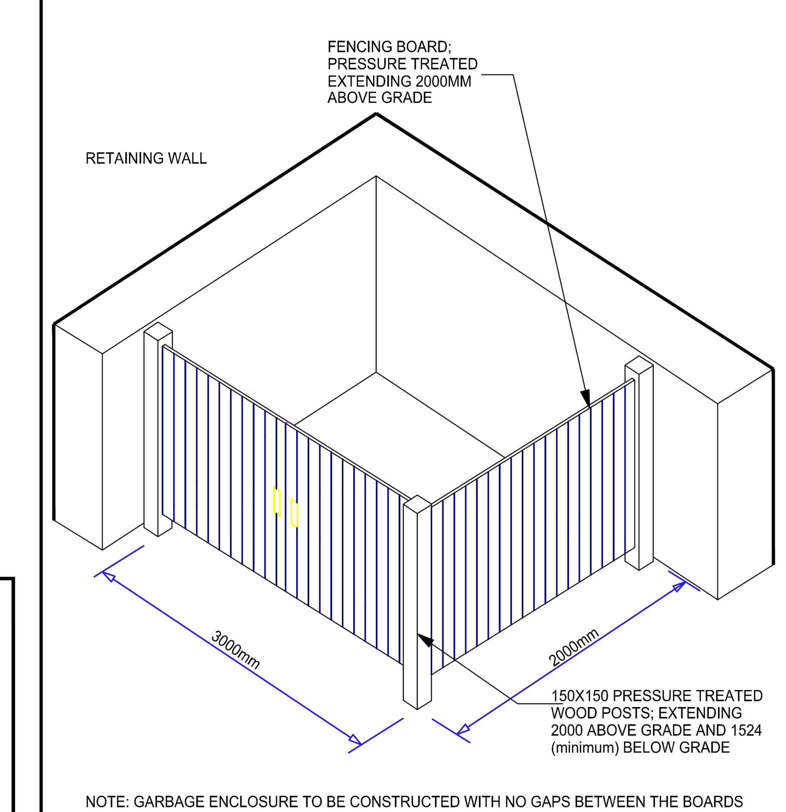
DATA

PROJECT : BUILDING OF 12 RESIDENTIAL APARTEMENT UNITS 2 storey + elevator with basement garage (15 parkings)	
ZONING	- V3E
BUILDING SIZE	- 32.410 m x 17.995 m (irregular)
BUILDING AREA	- 6453 SQ/FT (599.50 m2)
LOT AREA -	17765.7 sq.m
MIN. LOT AREA REQ'D -	900 sq.m
LOT WIDTH -	Irregular: min. 29.952m
MIN. LOT WIDTH REQ'D -	24.0 m
FRONT YARD -	Irregular: Min. 31.374m
MIN. FRONT YARD REQ'D -	9.0 m
SIDE YARD -	34.310 m
MIN. SIDE YARD REQ'D -	3.5 m
REAR YARD -	11.968 m
MIN. REAR YARD REQ'D -	11.0 m
LANDSCAPE OPEN SPACE -	35.37 %
LANDSCAPE OPEN SPACE REQ. -	25 %
LOT COVERAGE -	3.36 %
MAX. LOT COVERAGE -	25 %
BUILDING HEIGHT -	10.103m
MAX. BUILDING HEIGHT -	15.0 m
DENSITY -	6.75 units per hectare
MAXIMUM DENSITY -	99 units per hectare
AMENITY AREA PROVIDED	416 sq/m
SIDE YARD AMENITY	235 sq/m
REAR YARD AMENITY	181 sq/m

AMENITY AREA REQUIRED	6 sq/m per unit (20 x 12 units = 240 sq/m) 10% of gross floor area (10% x 597.94 = 59.79 sq/m) Total - 240 sq/m + 59.79 sq/m = 299.79 sq/m
NUMBER OF PARKING FOR UNITS	GARAGE 16 parking in building + 12 exterior parking = 28 Parking
NUMBER OF PARKING REQUIRED FOR UNITS-	1 Parking x 12 = 12 Parkings
NUMBER OF VISITOR PARKING	5 Parkings
NUMBER OF VISITOR PARKING REQUIRED	0.2 Parking x 12 = 2.4 Parkings
TOTAL NUMBER OF PROVIDED PARKINGS	28 + 5 = 33 Parkings
TOTAL NUMBER OF REQUIRED PARKINGS	12 + 2.4 = 14.4 Parkings

LEGEND :

PROPOSED BUILDING	GREEN (SOD & SEED)
BALCONY	HEAVY ASPHALT PAVEMENT
SIDEWALK CONCRETE OR INTERLOCK	LIGHT ASPHALT PAVEMENT
	RETAINING WALL



NOTE: GARBAGE ENCLOSURE TO BE CONSTRUCTED WITH NO GAPS BETWEEN THE BOARDS

GARBAGE ROOM ENCLOSURE

PROPOSED SANITARY
PROPOSED STORM
EXISTING WATERMAIN
PROPOSED WATERMAIN
PROPOSED SWALE
SEDIMENT & EROSION PROTECTION FENCE
250mm PERFORATED SUB-DRAIN
PROPERTY LINE
100 YEAR PONDING
5 YEAR PONDING
PROPOSED CURB
RETAINING WALL
TOP OF SLOPE
BOTTOM OF SLOPE
MAJOR OVERLAND FLOW ROUTE
PROPOSED GRADE
EXISTING GRADE
EXISTING CATCH BASIN MAN HOLE
CURB STOP
WATER METER
REMOTE WATER METER
EXISTING HYDROPOLE TO REMAIN
PROPOSED CATCH BASIN MAN HOLE
EXISTING CATCH BASIN
PROPOSED CATCH BASIN
FIRE HYDRANT
50:1 (2% SLOPE) Refer to plan
DIRECTION OF SLOPE

DENOTES:
LP LOW POINT
HP HIGHPOINT
FFE FINISHED FLOOR ELEVATION
BSE BASEMENT (TOP OF) SLAB ELEV.
TFW TOP OF FOUNDATION WALL
USF UNDERSIDE OF FOOTING
TRW TOP OF RETAINING WALL
UP UTILITY POLE
DC DEPRESSED CURB
* TOP OF CURB
INV PIPE INVERT

ENGINEERING STAMP

NO.	REVISION	DATE (DD/MM/YYYY)
#8		
#7		
#6		
#5		
#4		
#3		
#2		
#1	FOR CITY COMMENTS 7	24 / 08 / 2020

BLANCHARD LETENDRE ENGINEERING
767, Notre Dame, Local 42, Embrun, Ontario, K0A 1W1
(613) 693-0700 blengineering.ca

CLIENT:
BERGERON CONSTRUCTION
172 ST.-THOMAS ROAD
VARS, ON, K0A 3H0

PROJECT:
12 UNIT APARTMENT BUILDING
5574 ROCKDALE ROAD
VARS, ON

DRAWING:
SITE PLAN

PAPER FORMAT:	610x915
DRAWN BY:	XX
CHECKED BY:	XX
DATE:	08-2020
SCALE:	AS SHOWN
PROJECT NUMBER:	19-276

PAGE:
SP1

APPENDIX “B”
Tributary Areas

BLANCHARD LETENDRE
ENGINEERING

File No.	19-276	**Date:**	August 24, 2020
Project:	New 12 Units Apartment Building	**Designed:**	Guillaume Brunet
Project Address:	5574 Rockdlade Rd. Vars	**Checked:**	Guillaume Brunet
Client:	Bergeron Construction	**Drawing Reference:**	C200 & C300

PRE-DEVELOPMENT DRAINAGE AREA (UNAFFECTED AREA)

Catchment Area	**Runoff Coefficient**			**Total Area (ha)**	**Combined C**
	C = 0.3	**C = 0.80**	**C = 0.90**		
UNAFFECTED	1.020	0.000	0.000	1.020	0.30
TOTAL	1.020	0.000	0.000	1.020	0.30

PRE-DEVELOPMENT DRAINAGE AREA (AFFECTED AREA)

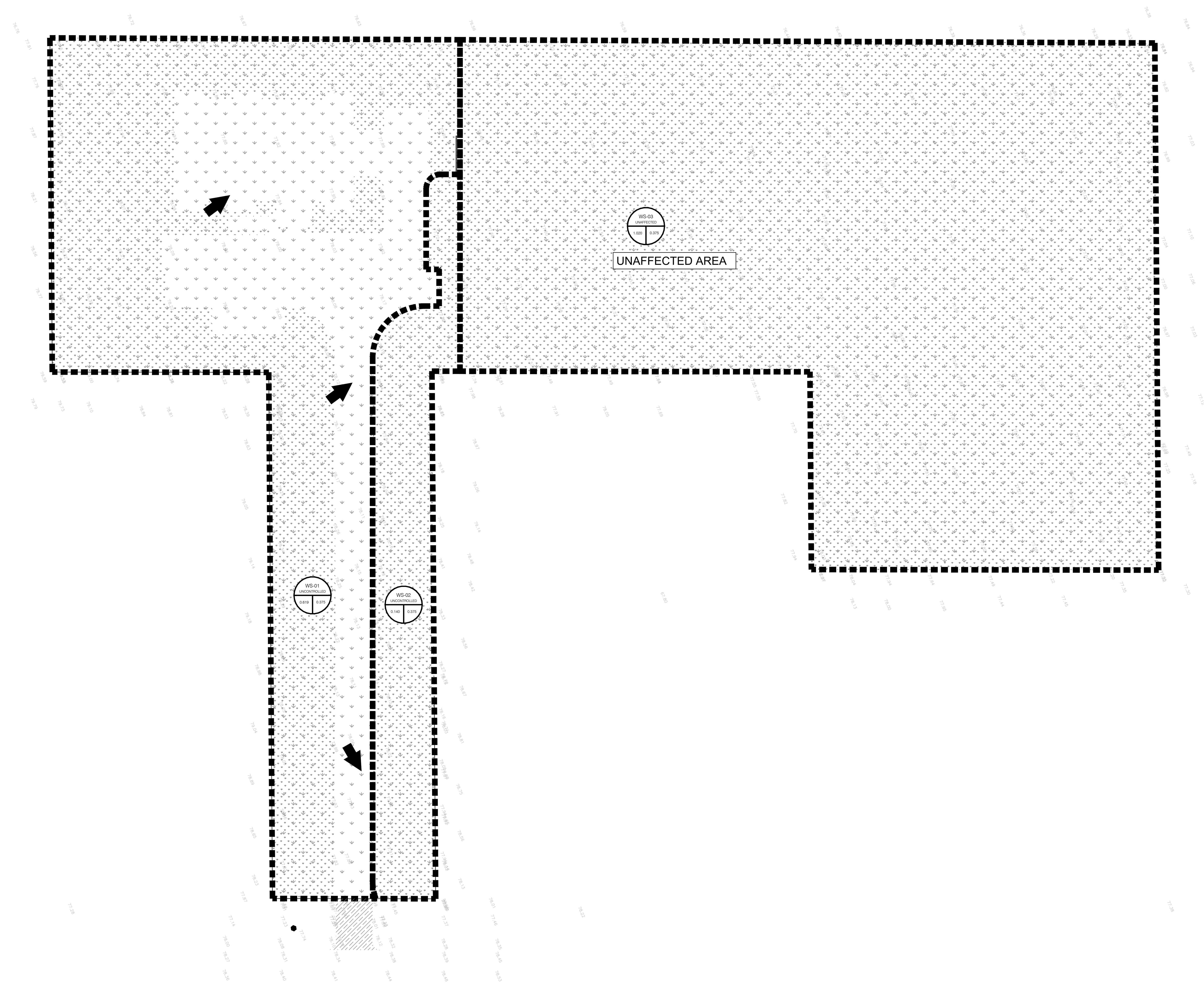
Catchment Area	**Runoff Coefficient**			**Total Area (ha)**	**Combined C**
	C = 0.3	**C = 0.80**	**C = 0.90**		
E-01	0.619	0.000	0.000	0.619	0.30
E-02	0.140	0.000	0.000	0.140	0.30
TOTAL	0.759	0.000	0.000	0.759	0.30

POST-DEVELOPMENT DRAINAGE AREA

Catchment Area	**Runoff Coefficient**			**Total Area (ha)**	**Combined C**
	C = 0.30	**C = 0.80**	**C = 0.90**		
WS-01	0.273	0.000	0.090	0.363	0.45
WS-02	0.018	0.000	0.003	0.021	0.39
WS-03	0.018	0.000	0.024	0.042	0.64
WS-04	0.010	0.000	0.085	0.095	0.84
WS-05	0.000	0.000	0.022	0.022	0.90
WS-06	0.036	0.000	0.027	0.063	0.56
WS-07	0.013	0.000	0.000	0.013	0.30
WS-08	0.140	0.000	0.000	0.140	0.30
WS-09	1.020	0.000	0.000	1.020	0.30
TOTAL	1.528	0.000	0.251	1.779	0.38

RUNOFF COEFFICIENT (C)

Grass	0.30
Gravel	0.80
Asphalt / rooftop	0.90



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
- × 70.19 EXISTING ELEVATION
- PROPOSED OVERLAND MAJOR FLOW ROUTE
- PROPOSED SILT FENCE AS PER OPSD 219.110
- PROPOSED 100mmØ PERFORATED SUBDRAIN
- STM PROPOSED STORM SEWER
- SAN PROPOSED SANITARY SEWER
- WTR PROPOSED WATERMAIN
- SAN EXISTING SANITARY SEWER
- WTR EXISTING WATERMAIN
- PROPOSED CATCHBASIN-MANHOLE/CATCHBASIN
- PROPOSED CURB STOP
- PROPOSED PIPE INSULATION
- PROPOSED 100 YEAR HIGH WATER LEVEL
- STORM WATERSHED EXTENT
- WS-XX / CONTROLLED / AREA / RUNOFF: WATERSHED NAME; RUNOFF COEFFICIENT; AREA IN HECTARES
- PROPOSSED 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
- (M) PROPOSED WATER METER
- PROPOSED ACCESS GATE
- PROPOSED GROWING FIELD

ENGINEERING STAMP

LICENSED PROFESSIONAL ENGINEER
G. L. BRUNET
100191036
24/08/2020
PROVINCE OF ONTARIO

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BLANCHARD LETENDRE
ENGINEERING
767, Notre Dame, Local 42, Embrun, Ontario, K0A 1W1
(613) 693-0700
blengineering.ca

CLIENT:

BERGERON CONSTRUCTION
172 ST.-THOMAS ROAD
VARS, ON, K0A 3H0

PROJECT:

12 UNIT APARTMENT BUILDING
5574 ROCKDALE ROAD
VARS, ON

DRAWING:

PRE DEVELOPMENT STORM DRAINAGE PLAN

PAPER FORMAT:	24x36
DRAWN BY:	BF + GB
CHECKED BY:	GB
DATE:	03-2020
SCALE:	1:500
PROJECT NUMBER:	19-276

PAGE:

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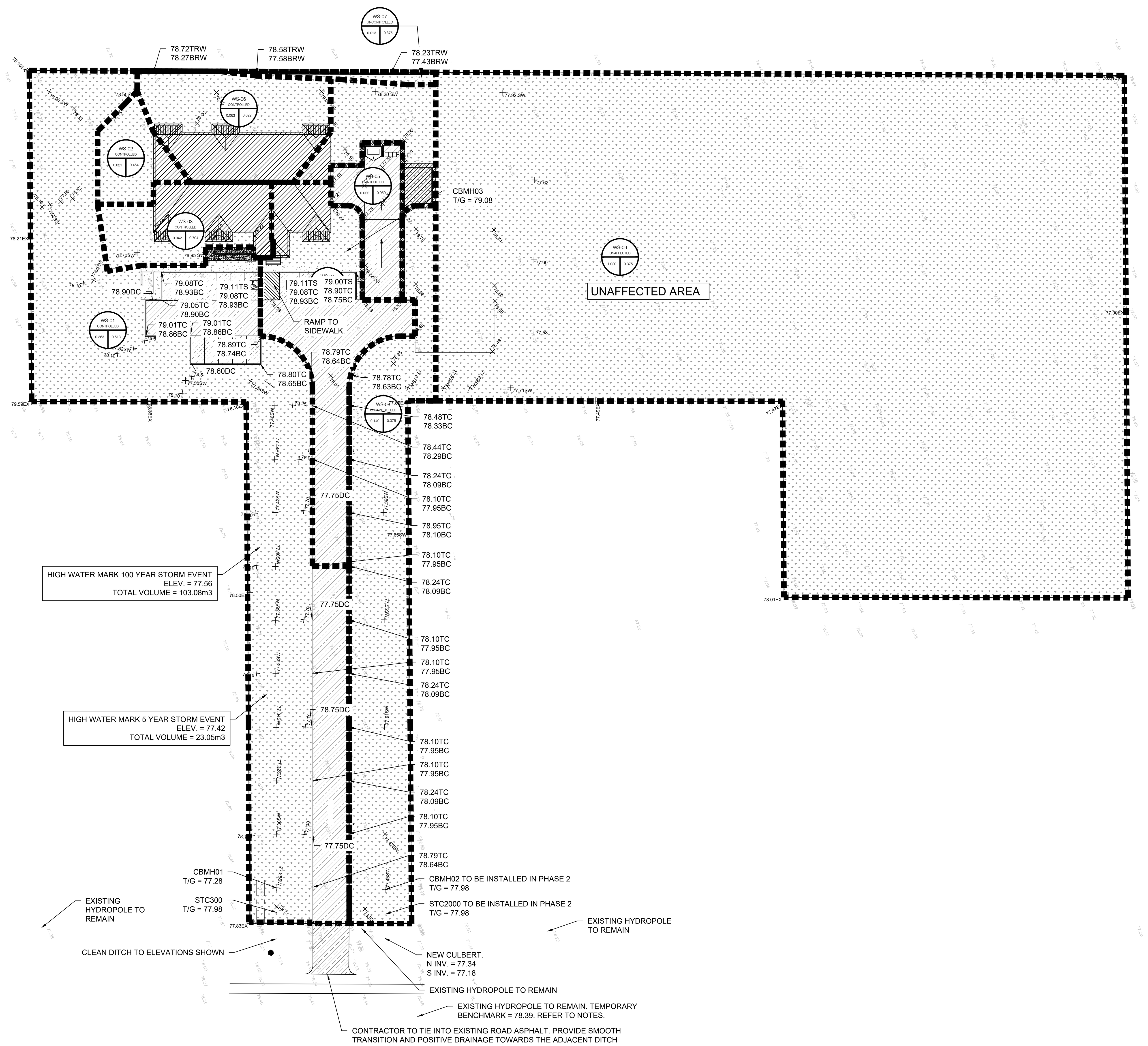

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POST DEVELOPMENT STORM DRAINAGE PLAN

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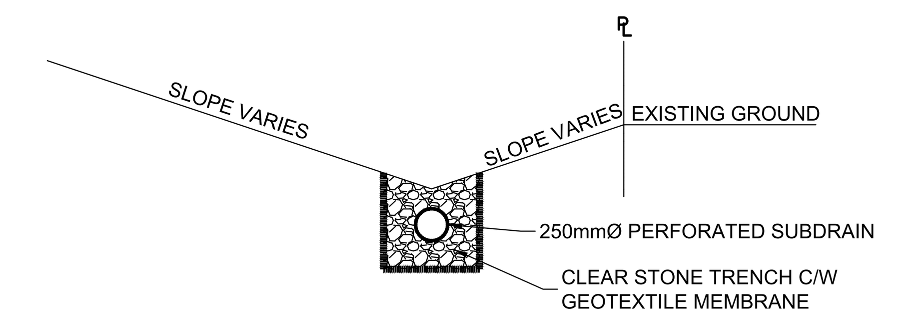
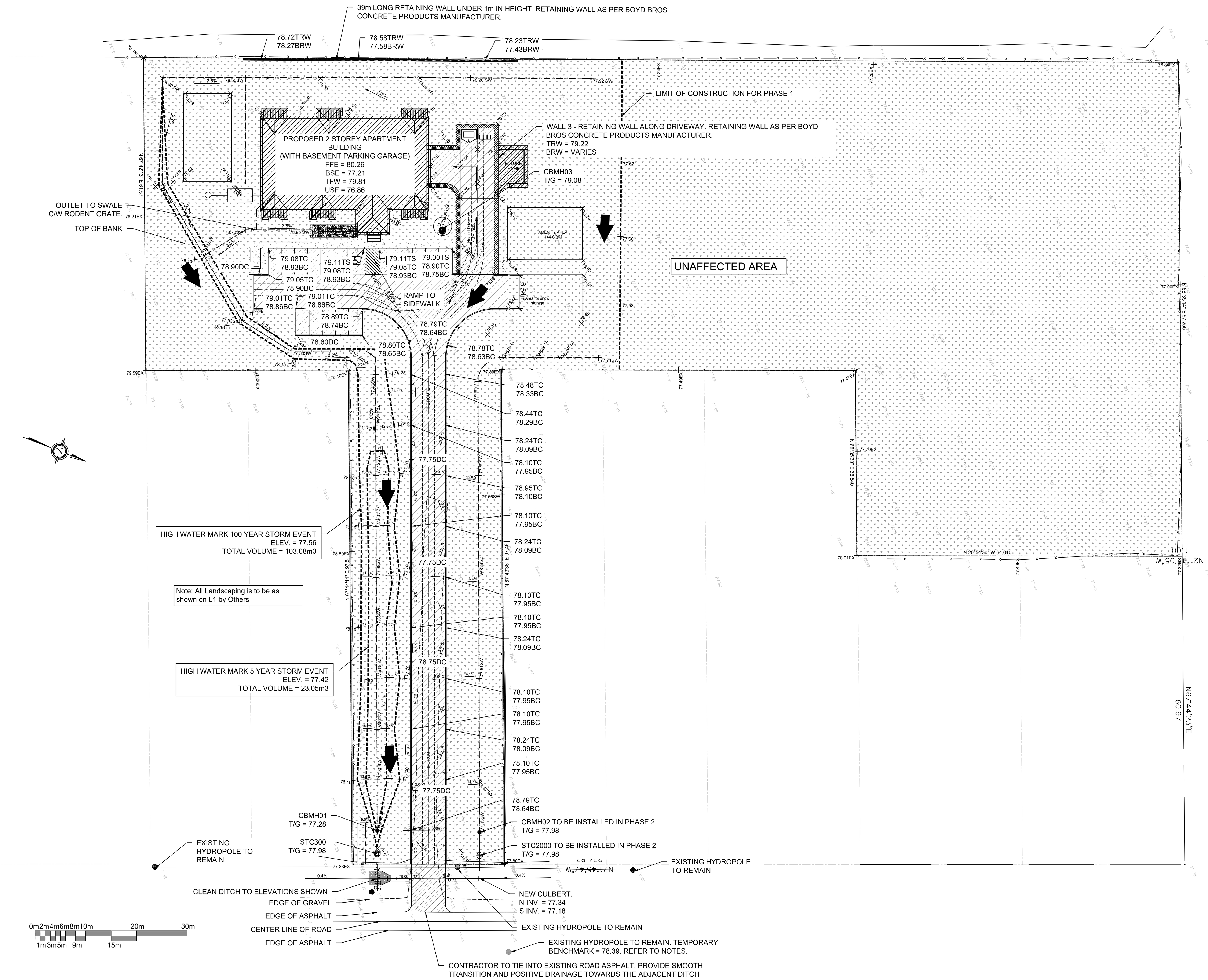
APPENDIX "C"
Surface Ponding & Drainage Diagram



SWALE & SUBDRAIN - TYPICAL SECTION

(N.T.S.)

Section	Ponding Elevation (m)	Swale Elevation (m)	Average Area (sq m)	Length (m)	Volume (cu m)	Capacity (cu m)
1	77.56	77.28	0.331	10.000	3.310	3.310
2	77.56	77.30	1.061	10.000	10.605	13.915
3	77.56	77.32	1.593	10.000	15.928	29.843
4	77.56	77.34	1.384	10.000	13.843	43.685
5	77.56	77.36	1.237	10.000	12.365	56.050
6	77.56	77.38	1.057	10.000	10.565	66.615
7	77.56	77.40	0.935	10.000	9.345	75.960
8	77.56	77.42	0.847	10.000	8.470	84.430
9	77.56	77.44	0.847	10.000	8.470	92.900
10	77.56	77.46	0.535	7.978	4.268	97.168
11	77.56	77.48	0.288	10.664	3.066	100.234
12	77.56	77.50	0.112	12.083	1.348	101.583
13	77.56	77.52	0.040	30.975	1.227	102.809
14	77.56	77.56	0.040	20.94	0.271	103.080
				Target Storage		88.82



1. Elevations shown on plans are geodetic in meters and taken from topographical survey drawing by Arpentage Dutrisac Surveying Inc. July 2013.

2. Project T.B.M. (Temporary Benchmark). Nail in Utility Pole on East side of Rockdale Road Elev. = 78.39.

3. All water works to respect requirements of the City of Ottawa and to conform to the latest revision of Standard Tendering Documents as prepared by city.

4. All catch basin manholes and sewers work to be constructed as per the requirements of the City of Ottawa.

5. Pipes sizes shall be as shown on drawing.

6. Pipes material to be as follows:
- storm sewer - PVC SDR28
- watermain - PVC DR18
- sanitary sewer - SDR 35
- sub-drain - flexible perforated heavy duty polyethylene pipe c/w polyester sock filter by BIG'O' or equivalent.

7. All water services shall have 2.4 m frost cover minimum.

8. Existing services and utilities shown on this drawing are taken from best available records but are not complete. Contractor is required to check in field for location and all elevation of pipes and check with utility companies before digging or ordering any material. Advise engineer of any discrepancies for recommendations and directions, prior to ordering any materials or starting any work.

9. Geotechnical Report, perform by Morey Associates Ltd. (report# 013300, written September 2013), forms part of our specifications and requirements. Contractor must be fully cognizant of its content and respect its recommendations.

10. Stormwater Management Report by Blanchard Letendre Engineering Ltd., forms part of our specifications and requirements. The contractor must be fully cognizant of its content and respect its recommendations.

11. All plumbing and electrical work to be coordinated with civil engineering.

12. Notify engineer for inspection prior to backfilling or covering any pipes or appurtenances.

13. Contractor to respect grading around building to be 0.15m minimum below top of foundation or any siding or finish wall material.

14. All works for private approach including any temporary construction access to the site lane shall be constructed in accordance with requirements of the City of Ottawa standards.

15. Contractor to prevent erosion and sedimentation damages by installing geosocks under cover of existing down stream catch basins and also take necessary measures to prevent erosion and sediment deposit on adjacent property. Provide also straw wall with pickets & geotextile at perimeter of property.

16. All pipe bedding to be as per the City of Ottawa requirements and as specified in geotechnical report.

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18. MH#1 & MH#2 are to be as per OPSD 705.010. MH#3 is to be as per OPSD 701.015 complete with transition slab, 1200mm diameter riser and 1200mm diameter precast flat cap.

19. All catch basin manholes shall be cleaned and empty annually for the purpose of capturing sediment.

20. Refer to site plan by Blanchard Letendre Engineering Ltd. for details of curb radius, dimensions of lanes, parking stalls, set back requirements and site data.

21. Location of street water is approximate and contractor to verify the exact distance and elevation.

22. Contractor to perform all testing verification, cleaning and preparation as per the requirements of the City of Ottawa before final approval.

23. Major overland flow is @ an elevation of 77.65 m.

24. Proposed grade elevations to match existing elevations at property line or as per plan.

25. All proposed grades greater than 7% are proposed average grades. Contractor to use construct slope using terracing.

26. Floor drains are to be drained into an oil grit interceptor prior to discharged a septic system

LEGEND:

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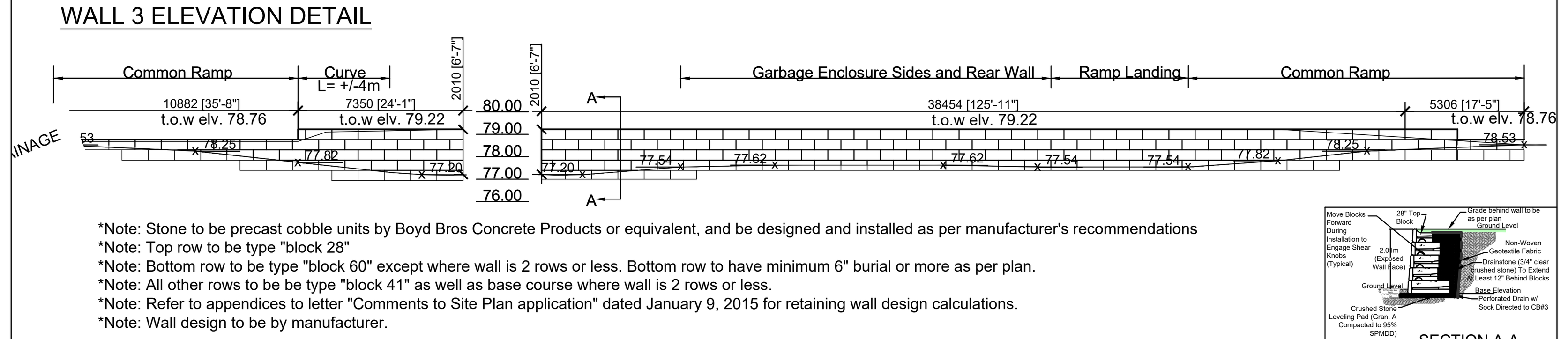
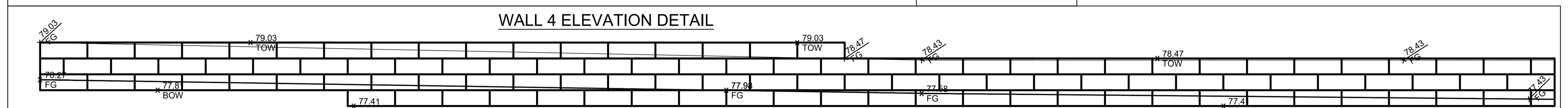
- PROPOSED WATER METER
- PROPOSED ACCESS GATE
- PROPOSED GROWING FIELD

WALL 3 ELEVATION DETAIL

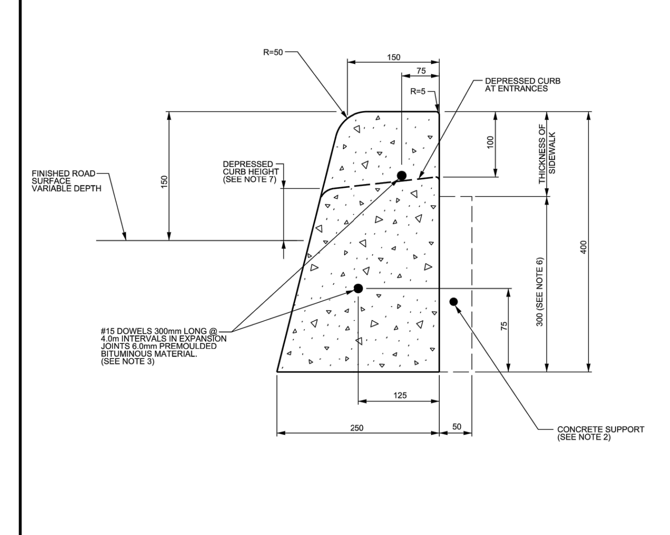


*Note: Stone to be precast cobble units by Boyd Bros Concrete Products or equivalent, and be designed and installed as per manufacturer's recommendations
*Note: Top row to be type "block 28"
*Note: Bottom row to be type "block 60" except where wall is 2 rows or less. Bottom row to have minimum 6" burial or more as per plan.
*Note: All other rows to be be type "block 41" as well as base course where wall is 2 rows or less.
*Note: Refer to appendices to letter "Comments to Site Plan application" dated January 9, 2015 for retaining wall design calculations.
*Note: Wall design to be by manufacturer.

WALL 4 ELEVATION DETAIL



*Note: Stone to be precast cobble units by Boyd Bros Concrete Products or equivalent, and be designed and installed as per manufacturer's recommendations
*Note: Bottom row to be type "block 60" except where wall is 2 rows or less. Bottom row to have minimum 6" burial or more as per plan.
*Note: All other rows to be be type "block 41" as well as base course where wall is 2 rows or less.
*Note: Cross section A-A in Wall 3 Cross section applies Wall 4 as well.
*Note: Wall design to be by manufacturer.



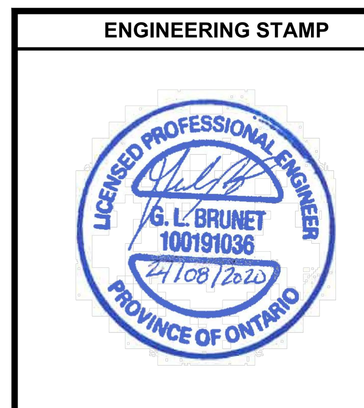
CONCRETE BARRIER CURB

N.T.S.

CONCRETE BARRIER CURB
FOR GRANULAR BASE PAVEMENT
(MODIFIED OPSD-600.110)

SC1.1

ENGINEERING STAMP



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767, Notre Dame, Local 42, Embrun, Ontario, K0A 1W1
(613) 693-0700 blengineering.ca

CLIENT:

BERGERON CONSTRUCTION
172 ST.-THOMAS ROAD
VARS, ON, K0A 3H0

PROJECT:

12 UNIT APARTMENT BUILDING
5574 ROCKDALE ROAD
VARS, ON

DRAWING:

SITE GRADING PLAN

PAPER FORMAT:	24x36
DRAWN BY:	BF + GB
CHECKED BY:	GB
DATE:	03-2020
SCALE:	1:500
PROJECT NUMBER:	19-276

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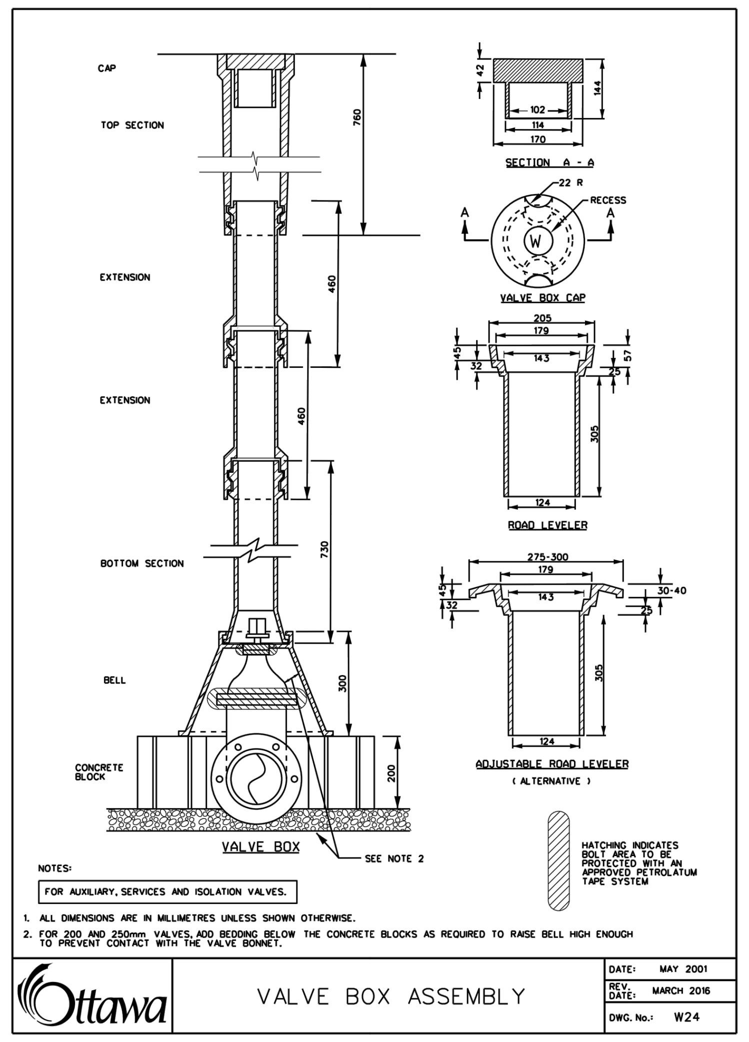
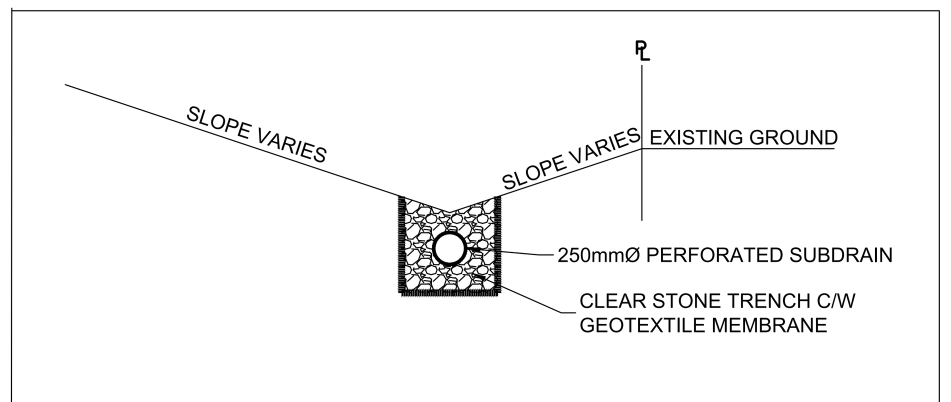
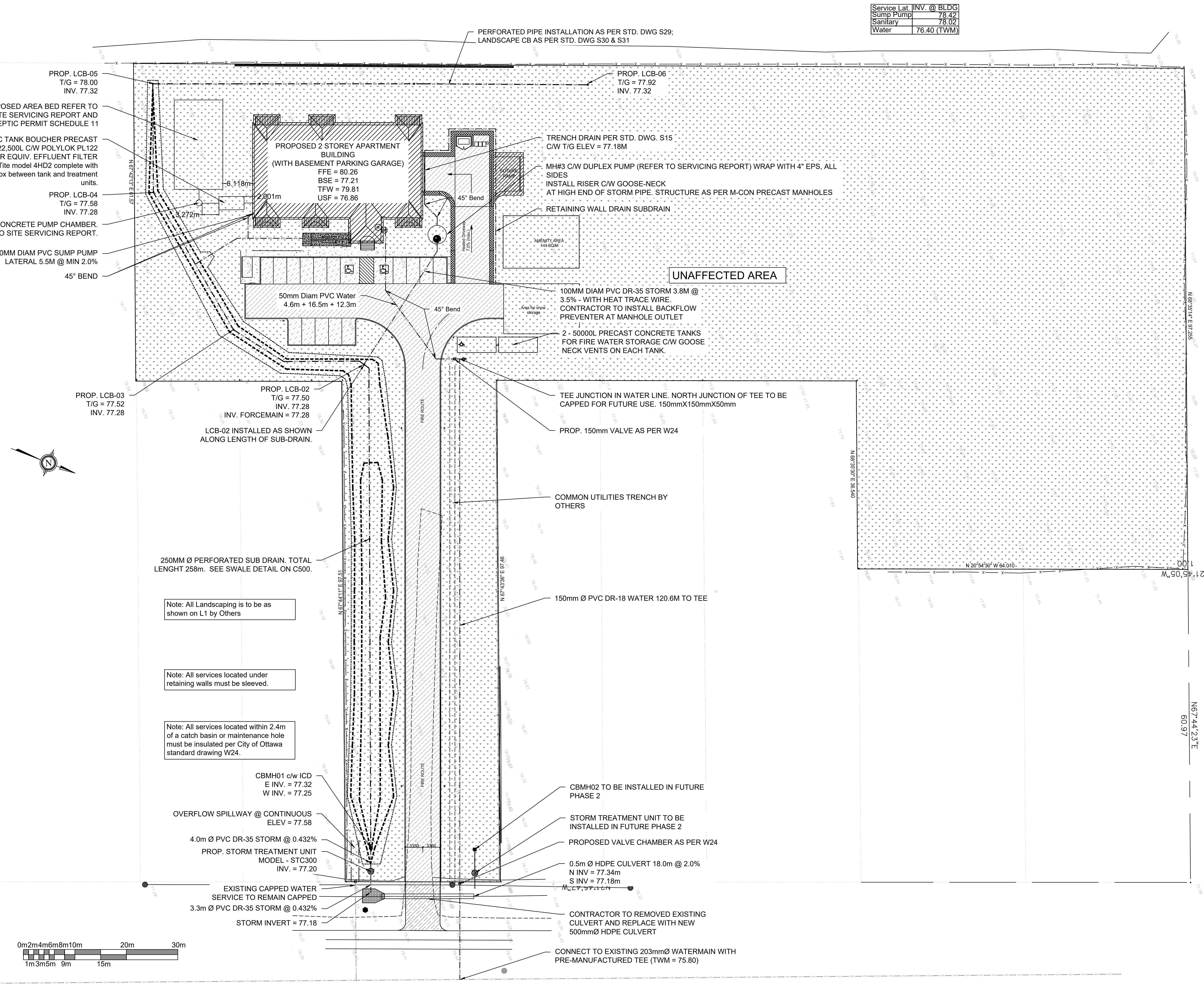




SWALE & SUBDRAIN - TYPICAL SECTION

(N.T.S.)



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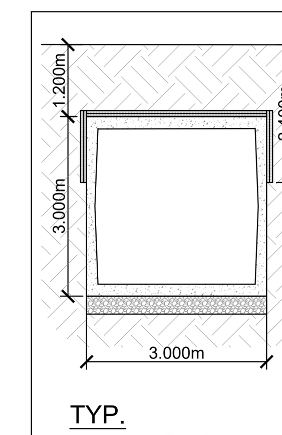


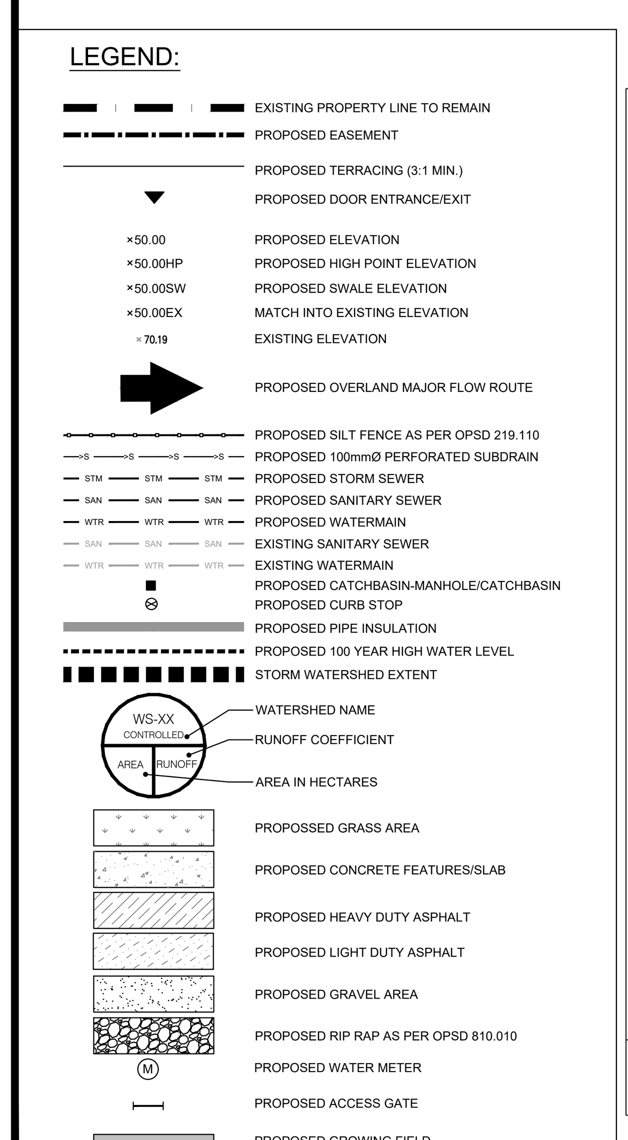
TYP. UNDERGROUND WATER STORAGE INSULATION

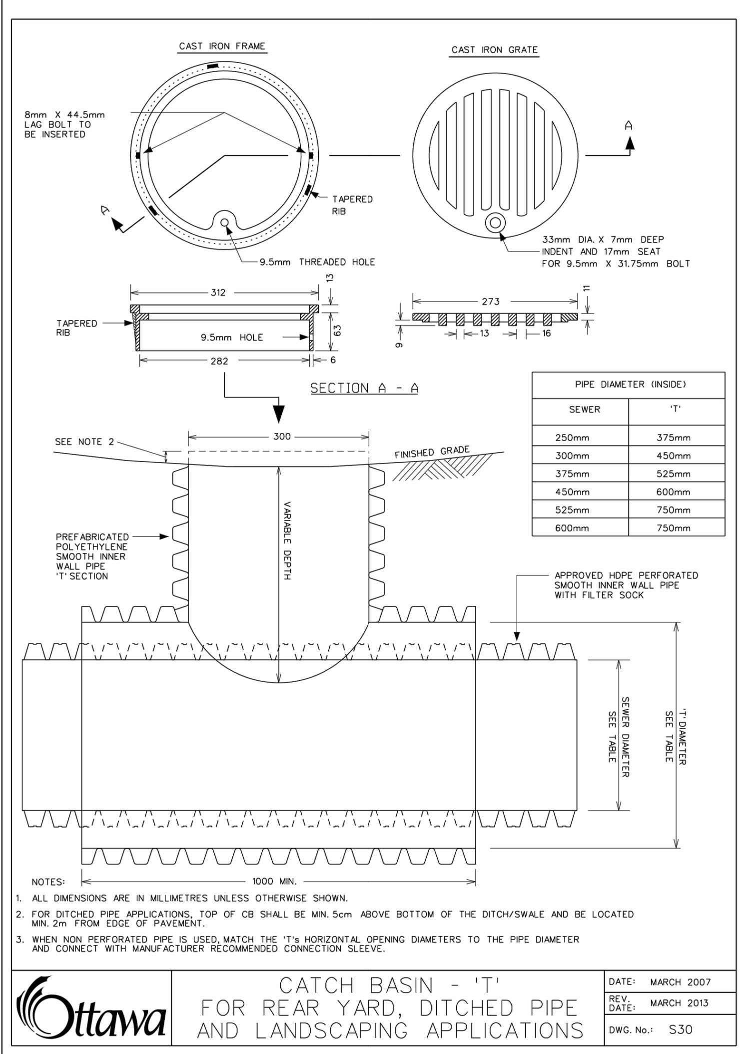
TANK NOTES:

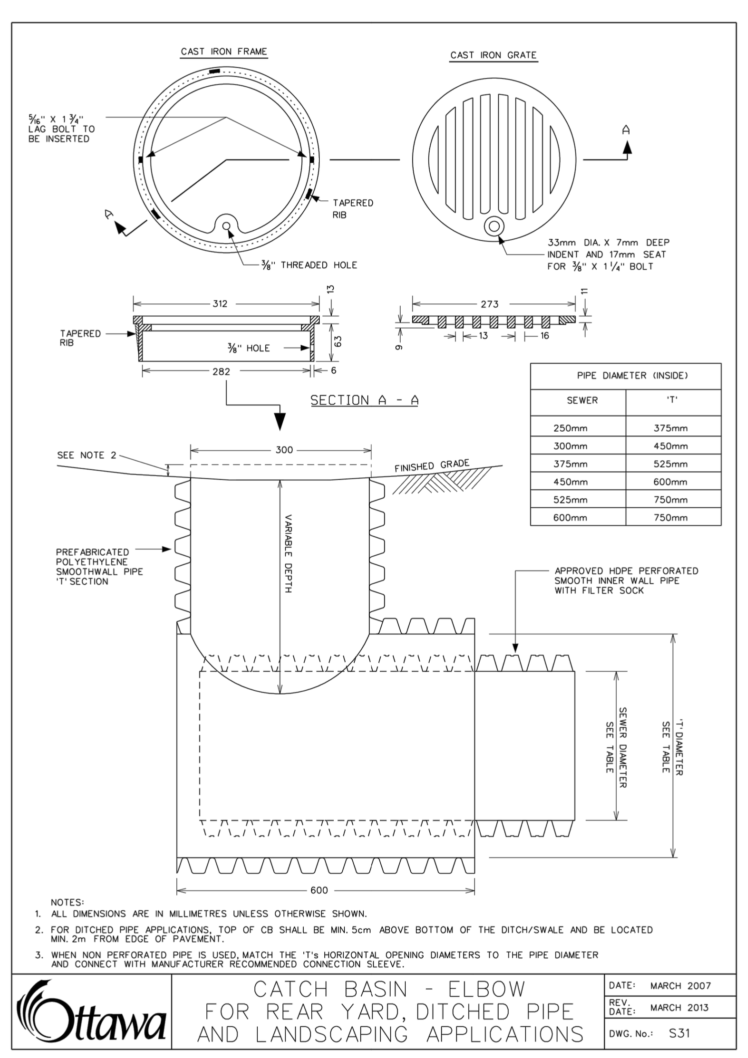
1) TWO 50000L PRECAST CONCRETE TANKS BY WILKINSON HEAVY PRECAST LTD. (OR EQUIVALENT) TO BE USED FOR FIRE WATER STORAGE. TANKS ARE TO BE CONNECTED WITH EACH OTHER WITH 200mm PIPE. HYDRANT TO BE INSTALLED DIRECTLY ABOVE TANK AS SHOWN ON C300.

2) TANKS TO BE COVERED IN 4" OF RIGID INSULATION IN A "U" SHAPE UP TOP A DEPTH OF 2.4m UNDER FINISHED GRADE.

3) TANKS TO BE INSTALLED IN ACCORDANCE WITH RECOMMENDED INSTALLATION PROCEDURES AS SEEN IN WILKINSON INSTALLATION GUIDELINES AND LIFTING ASSEMBLY INSTRUCTIONS.







WATER SERVICE PROFILE FOR 5574 ROCKDALE ROAD					
CHAINAGE(m)	LOCATION	FIN. GRADE	TOP OF PIPE	FROST COVER(M)	COMMENTS
0.000	CITY SERVICES	78.20	75.80	2.40	150MM DIA. PRIVATE MAIN
9.712	EDGE OF ASHPALT	78.39	75.20	3.19	
10.000	0+10	78.38	75.19	3.19	
16.134	CL OF DITCH	77.35	74.95	2.40	
19.171	CURB STOP	77.98	74.96	3.02	
20.000	0+20	77.98	75.01	2.97	
24.936	TRW @ HEADWALL	77.98	75.28	2.70	
25.236	SWALE @ HEADWALL	77.71	75.30	2.41	
30.000	0+30	77.72	75.30	2.42	
40.000	0+40	77.74	75.30	2.44	
50.000	0+50	77.76	75.30	2.46	
60.000	0+60	77.78	75.30	2.48	
70.000	0+70	77.80	75.30	2.50	
80.000	0+80	77.82	75.30	2.52	
90.000	0+90	77.84	75.30	2.54	
100.000	1+00	77.86	75.30	2.56	
110.000	1+10	77.89	75.30	2.59	
119.210	C/L SWALE	77.66	75.25	2.41	
120.000	1+20	78.48	75.23	3.25	
120.618	MAIN TEE	78.35	75.94	2.41	150X150X150 TEE
123.393	1500 TO 50 REDUCER	78.70	76.00	2.70	& 50MM SHUT OFF VALVE
124.143	EDGE OF ASPHALT	78.63	76.00	2.63	
125.244	BEND	78.55	76.00	2.55	
130.000	1+30	78.75	76.00	2.75	
140.000	1+40	78.57	76.00	2.57	
141.738	BEND	78.57	76.00	2.57	
148.148	EDGE OF SIDEWALK	78.93	76.00	2.93	
149.489	START OF GRASS	79.10	76.00	3.10	
150.000	1+50	79.10	76.00	3.10	
154.836	AT BUILDING	79.22	76.00	3.22	

ENGINEERING STAMP

LICENSED PROFESSIONAL ENGINEER
G. L. BRUNET
100191036
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5574 ROCKDALE ROAD
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DRAWING:

SITE SERVICING PLAN

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PROJECT NUMBER:	19-276

PAGE: C300

APPENDIX “D”
Storm Water Design Sheet

BLANCHARD LETENDRE
ENGINEERING

File No.	19-276	**Date:**	August 24, 2020
Project:	New 12 Units Apartment Building	**Designed:**	Guillaume Brunet
Project Address:	5574 Rockdlade Rd. Vars	**Checked:**	Guillaume Brunet
Client:	Bergeron Construction	**Drawing Reference:**	C200 & C300

STORM WATER MANAGEMENT DESIGN SHEET
5 YEAR STORM EVENT

PRE-DEVELOPMENT STORMATER MANAGEMENT

Runoff	Catchment Area	Area			$\sum R_5$
Un-Controlled	EWS-01	0.619	ha	R=	0.30
	EWS-02	0.140	ha	R=	0.30
	Total Uncontrolled =	**0.759**	**ha**	**∑R=**	**0.24**

PRE-DEVELOPMENT ALLOWABLE RELEASE RATE

Q = 2.78CIA (L/s)

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

C =	0.30	up to a maximum of 0.5 as per City of Ottawa Sewer Design Guidelines
I =	104.2	mm/hr
Tc =	10	min
Total =	0.759	ha
Allowable Release Rate=	**65.95**	L/s

POST-DEVELOPMENT STORMATER MANAGEMENT

Runoff	Catchment Area	Area			$\sum R_5$	$\sum R_{100}$
Controlled	WS-01	0.363	ha	R=	0.45	0.56
	WS-02	0.021	ha	R=	0.39	0.48
	WS-03	0.042	ha	R=	0.64	0.80
	WS-04	0.095	ha	R=	0.84	1.00
	WS-05	0.022	ha	R=	0.90	1.00
	WS-06	0.063	ha	R=	0.56	0.70
	Total Contolled =	**0.606**	**ha**	**∑R=**	**0.55**	**0.67**
Un-controlled	WS-07	0.013	ha	R=	0.30	0.38
	WS-08	0.140	ha	R=	0.30	0.38
	WS-09*	1.020	ha	R=	0.30	0.38
	Total Un-Controlled =	**0.153**	**ha**	**∑R=**	**0.27**	**0.34**

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

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

		REQUIRED STORAGE					PIT STORAGE (PARKING RAMP)		
Time (min)	**Intensity (mm/hr)**	**Controlled Runoff (L/s)**	**Storage Volume (m^3)**	**Controlled Release Rate (L/s)**	**Uncontrolled Runoff (L/s)**	**Total Release Rate (L/s)**	**Controlled Runoff (L/s)**	**Storage Volume (m^3)**	**Controlled Release Rate (L/s)**
10	104.2	96.28	19.65	63.53	1.13	64.66	6.93	4.16	0.00
15	83.6	77.21	12.31	63.53	0.91	64.44	5.56	5.00	0.00
20	70.3	64.92	1.66	63.53	0.76	64.30	4.68	5.61	0.00
25	60.9	56.27	0.00	63.53	0.66	64.20	4.05	6.08	0.00
30	53.9	49.83	0.00	63.53	0.58	64.12	3.59	6.46	0.00
35	48.5	44.83	0.00	63.53	0.53	64.06	3.23	6.78	0.00
40	44.2	40.83	0.00	63.53	0.48	64.01	2.94	7.06	0.00
45	40.6	37.54	0.00	63.53	0.44	63.98	2.70	7.30	0.00
50	37.7	34.79	0.00	63.53	0.41	63.94	2.51	7.52	0.00
60	32.9	30.44	0.00	63.53	0.36	63.89	2.19	7.89	0.00
70	29.4	27.14	0.00	63.53	0.32	63.85	1.95	8.21	0.00
80	26.6	24.55	0.00	63.53	0.29	63.82	1.77	8.49	0.00
90	24.3	22.44	0.00	63.53	0.26	63.80	1.62	8.73	0.00
500	6.3	5.80	0.00	63.53	0.07	63.60	0.42	12.54	0.00
720	4.7	4.33	0.00	63.53	0.05	63.59	0.31	13.46	0.00
1440	2.7	2.47	0.00	63.53	0.03	63.56	0.18	N/A	N/A

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

STORMATER STORAGE REQUIREMENTS

Total Storage Required =	**19.65 m^3**
Surface Storage =	103.08 m^3
Total Available Storage =	103.08 m^3

BLANCHARD LETENDRE
ENGINEERING

File No.	19-276	**Date:**	August 24, 2020
Project:	New 12 Units Apartment Building	**Designed:**	Guillaume Brunet
Project Address:	5574 Rockdlade Rd. Vars	**Checked:**	Guillaume Brunet
Client:	Bergeron Construction	**Drawing Reference:**	C200 & C300

STORM WATER MANAGEMENT DESIGN SHEET
100 YEAR STORM EVENT

PRE-DEVELOPMENT STORMATER MANAGEMENT

Runoff	Catchment Area	Area			$\sum R_5$
Un-Controlled	EWS-01	0.619	ha	R=	0.30
	EWS-02	0.140	ha	R=	0.30
	Total Uncontrolled =	**0.759**	**ha**	**∑R=**	**0.24**

PRE-DEVELOPMENT ALLOWABLE RELEASE RATE

Q = 2.78CIA (L/s)

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

C =	0.30	up to a maximum of 0.5 as per City of Ottawa Sewer Design Guidelines
I =	104.2	mm/hr
Tc =	10	min
Total =	0.759	ha
Allowable Release Rate=	**65.95**	L/s

POST-DEVELOPMENT STORMATER MANAGEMENT

Runoff	Catchment Area	Area			$\sum R_5$	$\sum R_{100}$
Controlled	WS-01	0.363	ha	R=	0.45	0.56
	WS-02	0.021	ha	R=	0.39	0.48
	WS-03	0.042	ha	R=	0.64	0.80
	WS-04	0.095	ha	R=	0.84	1.00
	WS-05	0.022	ha	R=	0.90	1.00
	WS-06	0.063	ha	R=	0.56	0.70
	Total Contolled =	**0.606**	**ha**	**∑R=**	**0.55**	**0.67**
Un-controlled	WS-07	0.013	ha	R=	0.30	0.38
	WS-08	0.140	ha	R=	0.30	0.38
	WS-09*	1.020	ha	R=	0.30	0.38
	Total Un-Controlled =	**0.153**	**ha**	**∑R=**	**0.03**	**0.34**

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

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

		REQUIRED STORAGE					PIT STORAGE (PARKING RAMP)		
Time (min)	**Intensity (mm/hr)**	**Controlled Runoff (L/s)**	**Storage Volume (m^3)**	**Controlled Release Rate (L/s)**	**Uncontrolled Runoff (L/s)**	**Total Release Rate (L/s)**	**Controlled Runoff (L/s)**	**Storage Volume (m^3)**	**Controlled Release Rate (L/s)**
10	178.6	202.71	83.51	63.53	2.42	65.95	11.88	7.13	0.00
15	142.9	162.23	88.82	63.53	1.94	65.47	9.51	8.56	0.00
20	120.0	136.18	87.17	63.53	1.63	65.16	7.98	9.58	0.00
25	103.8	117.90	81.54	63.53	1.41	64.94	6.91	10.37	0.00
30	91.9	104.30	73.37	63.53	1.25	64.78	6.11	11.01	0.00
35	82.6	93.75	63.45	63.53	1.12	64.65	5.50	11.54	0.00
40	75.1	85.31	52.26	63.53	1.02	64.55	5.00	12.00	0.00
45	69.1	78.39	40.11	63.53	0.94	64.47	4.60	12.41	0.00
50	64.0	72.61	27.21	63.53	0.87	64.40	4.26	12.77	0.00
60	55.9	63.46	0.00	63.53	0.76	64.29	3.72	13.39	0.00
90	41.1	46.67	0.00	63.53	0.56	64.09	2.74	14.77	0.00
120	32.9	37.34	0.00	63.53	0.45	63.98	2.19	15.76	0.00
360	13.7	15.58	0.00	63.53	0.19	63.72	0.91	19.73	0.00
500	*10.5*	11.94	0.00	63.53	0.14	63.68	0.70	21.01	0.00
720	7.8	8.88	0.00	63.53	0.11	63.64	0.52	22.50	0.00
1440	4.4	5.05	0.00	63.53	0.06	63.60	0.30	N/A	N/A

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

STORMATER STORAGE REQUIREMENTS

Total Storage Required =	**88.82 m^3**
Dry PondStorage =	103.08 m^3
Total Available Storage =	**103.08 m^3**

APPENDIX "E"
Stormwater Storage

Hydrograph Table # 1

Ponding Calculations for the Swale (Phase 1)

Hydrograph for a 5 year storm

Time (min.)	Intensity (I) (mm/hr)	Q=0.923i (L/s)	Restriction (L/s)	Net Flow accumulation (L/s)		Ponding (L)
5	140	129.22	59.47	69.75		20925.000
10	**104.4**	**96.3612**	**59.47**	**36.8912**		**22134.720**
15	85.6	79.0088	59.47	19.5388		17584.920
20	72	66.456	59.47	6.986		8383.200
30	53.9	49.7497	59.47	-9.7203		-17496.540
40	45	41.535	59.47	-17.935		-43044.000
50	38.5	35.5355	59.47	-23.9345		-71803.500
60	32	29.536	59.47	-29.934		N/A
120	18.9	17.4447	59.47	N/A		N/A
360	8.4	7.7532	59.47	N/A		N/A
720	4.8	4.4304	59.47	N/A		N/A
1440	2.6	2.3998	59.47	N/A		N/A

Ponding Calculations for the Swale (Phase 1)

Hydrograph for a 100 year storm

Time (min.)	Intensity (I) (mm/hr)	Q=1.032i (L/s)	Restriction (L/s)	Net Flow accumulation (L/s)		Ponding (L)
5	242.6	250.3632	59.47	190.8932		57267.960
10	179	184.728	59.47	125.258		75154.800
15	**146.8**	**151.4976**	**59.47**	**92.0276**		**82824.840**
30	91.9	94.8408	59.47	35.3708		63667.440
40	76	78.432	59.47	18.962		45508.800
50	65	67.08	59.47	7.61		22830.000
60	53.2	54.9024	59.47	-4.5676		-16443.360
120	31.5	32.508	59.47	-26.962		N/A
360	14.5	14.964	59.47	N/A		N/A
720	8	8.256	59.47	N/A		N/A
1440	4.3	4.4376	59.47	N/A		N/A

Hydrograph Table # 2

Ponding Calculations for the Pit

Hydrograph for a 5 year storm

Time (min.)	Intensity (I) (mm/hr)	Q=0.066i (L/s)	Restriction (L/s)	Net Flow accumulation (L/s)		Ponding (L)
5	140	9.24	0	9.24		2772.000
10	104.4	6.8904	0	6.8904		4134.240
15	85.6	5.6496	0	5.6496		5084.640
20	72	4.752	0	4.752		5702.400
30	53.9	3.5574	0	3.5574		6403.320
40	45	2.97	0	2.97		7128.000
50	38.5	2.541	0	2.541		7623.000
60	32	2.112	0	2.112		7603.200
120	18.9	1.2474	0	1.2474		8981.280
360	8.4	0.5544	0	0.5544		11975.040
720	4.8	0.3168	0	0.3168		13685.760
1440	2.6	0.1716	0	N/A		N/A

Ponding Calculations for the Pit

Hydrograph for a 100 year storm

Time (min.)	Intensity (I) (mm/hr)	Q=0.07i (L/s)	Restriction (L/s)	Net Flow accumulation (L/s)		Ponding (L)
5	242.6	16.982	0	16.982		5094.600
10	179	12.53	0	12.53		7518.000
15	146.8	10.276	0	10.276		9248.400
30	91.9	6.433	0	6.433		11579.400
40	76	5.32	0	5.32		12768.000
60	53.2	3.724	0	3.724		13406.400
75	47.26	3.3082	0	3.3082		14886.900
120	31.5	2.205	0	2.205		15876.000
360	14.5	1.015	0	1.015		21924.000
720	8	0.56	0	0.56		24192.000
1440	4.3	0.301	0	N/A		N/A

APPENDIX "F"
Intensity Duration Curves

5.4.2 IDF Curves and Equations

An IDF (Intensity Duration Frequency) curve is a statistical description of the expected rainfall intensity for a given duration and storm frequency. In Ottawa, the IDF curve is derived from Meteorological Services of Canada (MSC) rainfall data taken from the Macdonald-Cartier airport. Rainfall collected from 1967 to 1997 was analyzed using the Gumbel Distribution. The following Table 5.1 shows the analysis results provided by MSC. The IDF equations have been derived on the basis of a regression equation of the form:

$$Intensity = \left[\frac{A}{(Td + C)^B}\right]$$

where:

Intensity = mm/hr

Td = time of duration (min)

A,B,C = regression constants for each return period

Table 5.1 Ottawa IDF Table: 1967 to 1997

Time (min)	2 year (mm/hr)	5 year (mm/hr)	10 year (mm/hr)	25 year (mm/hr)	50 year (mm/hr)	100 year (mm/hr)
5	102.80	140.20	165.00	196.00	219.00	242.60
10	77.10	104.40	122.50	145.30	162.20	179.00
15	63.30	85.60	100.40	119.10	133.00	146.80
30	39.90	53.90	63.10	74.70	83.40	91.90
60	24.20	32.00	37.10	43.60	48.50	53.20
120	14.30	18.90	22.00	25.80	28.70	31.50
360	6.20	8.40	9.90	11.70	13.10	14.50
720	3.60	4.80	5.60	6.60	7.30	8.00
1440	2.00	2.60	3.00	3.50	3.90	4.30

IDF curve equations (Intensity in mm/hr)

100 year Intensity	$= 1735.688 / (\text{Time in min} + 6.014)^{0.820}$
50 year Intensity	$= 1569.580 / (\text{Time in min} + 6.014)^{0.820}$
25 year Intensity	$= 1402.884 / (\text{Time in min} + 6.018)^{0.819}$
10 year Intensity	$= 1174.184 / (\text{Time in min} + 6.014)^{0.816}$
5 year Intensity	$= 998.071 / (\text{Time in min} + 6.053)^{0.814}$
2 year Intensity	$= 732.951 / (\text{Time in min} + 6.199)^{0.810}$

The IDF curves based on the above equations can be found in Appendix 5-A

5.4.3 Design Storms

Computer modeling requires the input of a design storm. The design storm is then used to generate a runoff hydrograph to determine how an area will respond and perform. Numerous types of design storms can be used ranging from historical storms to IDF curve-derived storms. This section briefly discusses the various types of design storms.

5.4.3.1 Application to Hydrologic Models

The design storms presented herein are meant to be used in hydrologic models to simulate runoff from events of various return frequencies. When choosing a design storm, the designer should perform a sensitivity analysis using various storms and use the one that is most conservative.

As noted below, the Chicago distribution is one of the most used storms for urban runoff applications. When dealing with rural areas, the SCS Type II storm is preferred. The AES storm can also be used for urban applications; however, care must be taken when choosing the type of distribution. As a rule of thumb, the 30% distribution should be used unless historical data proves otherwise.

When using a design storm, the designer must be careful in choosing the right storm time step. The storm's duration should be greater than twice the basin's time of concentration. A time step that is too small may overestimate peak flows. Should it be required to maintain a storm time step less than 10 minutes, consideration should be given to averaging the peak intensities to a 10-minute or greater average.

Some historical storms are also presented below and are to be used as a check of how various systems function during extreme events. It is not the intent of these guidelines to require that these storms be used for design purposes.

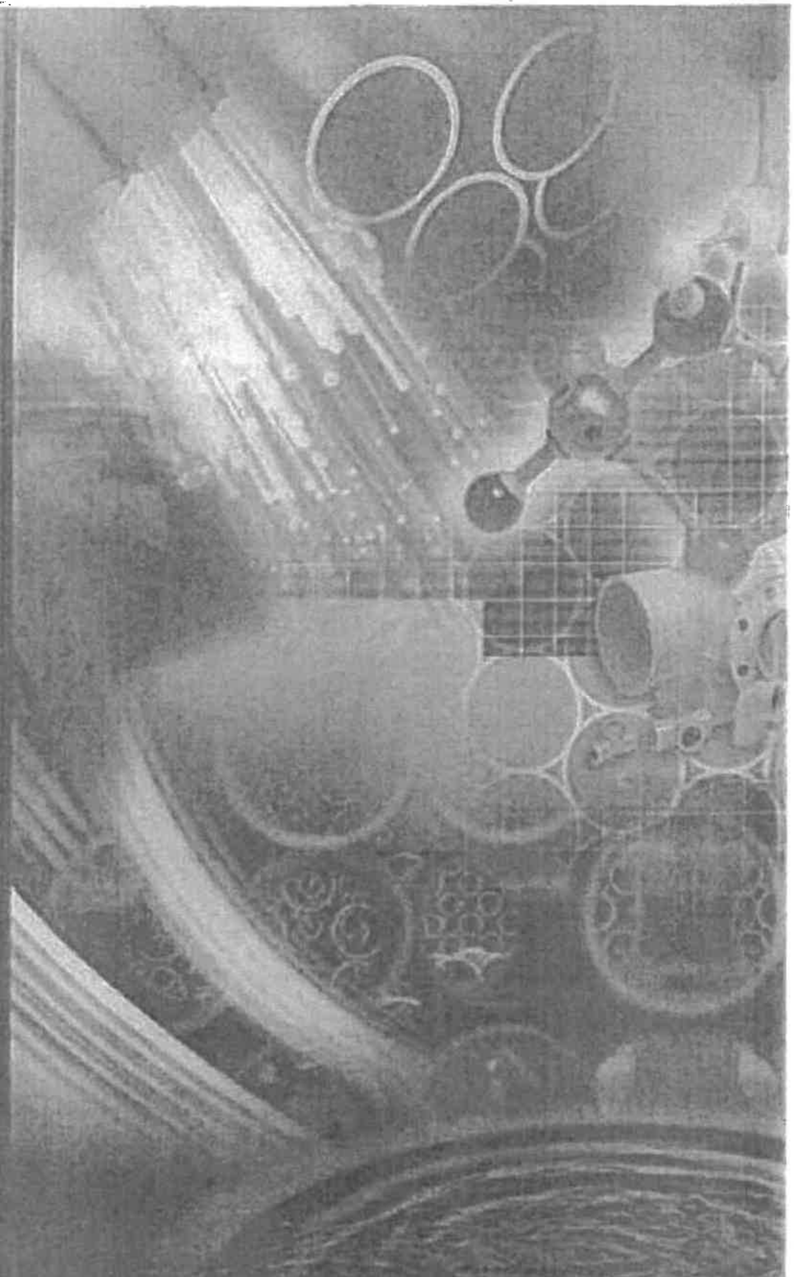
5.4.3.2 Chicago Design Storm

The Chicago storm distribution was developed by C.J. Keifer and H. Chu and is based on 25 years of rainfall record in the city of Chicago. This storm distribution, which is derived with IDF curves, is generally applied to urban basins where peak runoff rates are largely influenced by peak rainfall intensities.

APPENDIX “G”
ICD Data table
& STC Design Brief

Volume III:
TEMPEST™ INLET CONTROL DEVICES

Municipal Technical Manual Series



SECOND EDITION

LMF (Low to Medium Flow) ICD

HF (High Flow) ICD

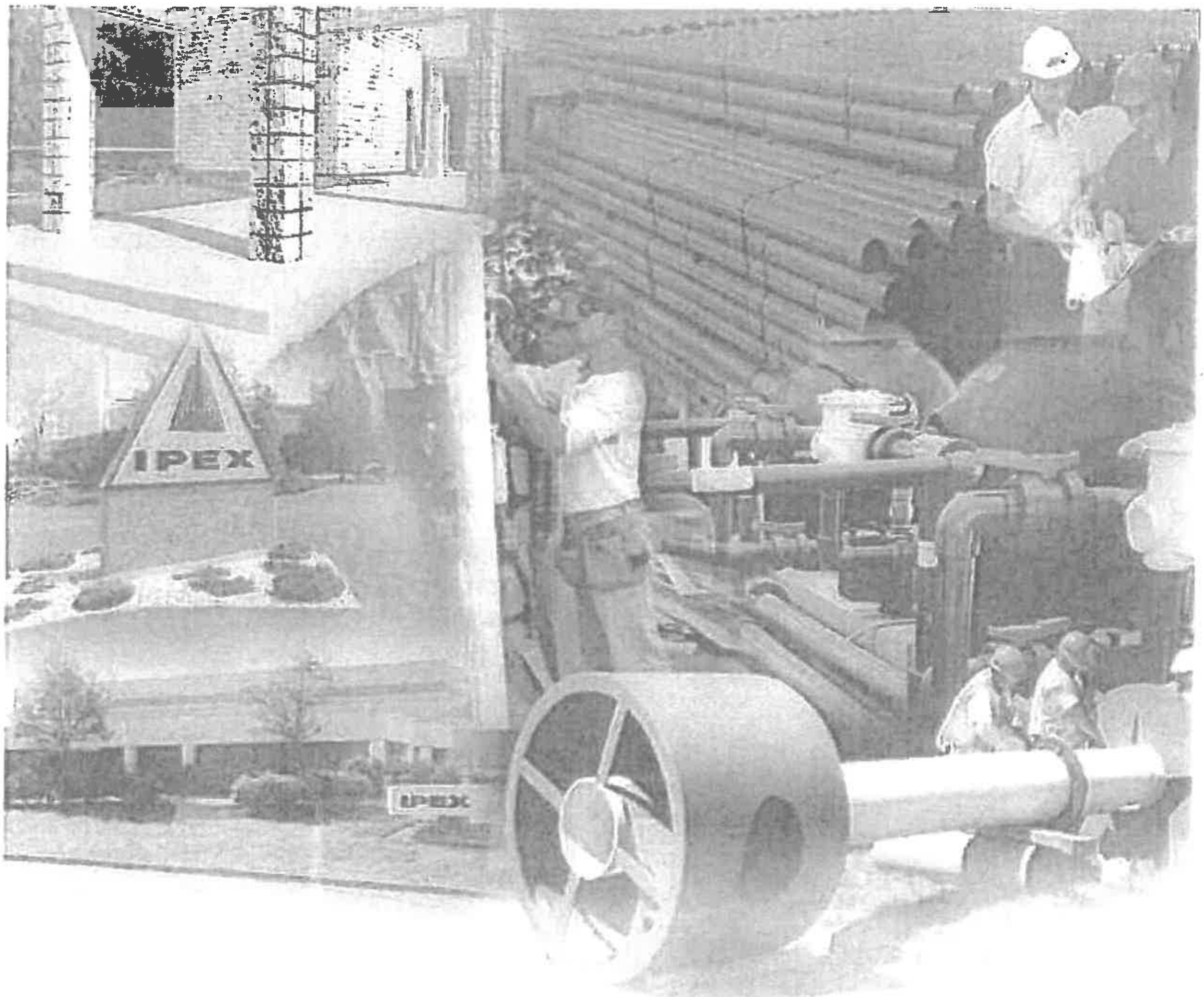
MHF (Medium to High Flow) ICD

IPEX

IPEX Tempest™ Inlet Control Devices

Municipal Technical Manual Series

Vol. I, 2nd Edition



About IPEX

At IPEX, we have been manufacturing non-metallic pipe and fittings since 1951. We formulate our own compounds and maintain strict quality control during production. Our products are made available for customers thanks to a network of regional stocking locations throughout North America. We offer a wide variety of systems including complete lines of piping, fittings, valves and custom-fabricated items.

More importantly, we are committed to meeting our customers' needs. As a leader in the plastic piping industry, IPEX continually develops new products, modernizes manufacturing facilities and acquires innovative process technology. In addition, our staff take pride in their work, making available to customers their extensive thermoplastic knowledge and field experience. IPEX personnel are committed to improving the safety, reliability and performance of thermoplastic materials. We are involved in several standards committees and are members of and/or comply with the organizations listed on this page.

For specific details about any IPEX product, contact our customer service department.

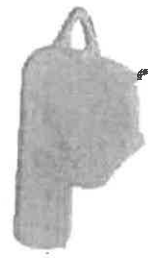
CONTENTS

TEMPEST INLET CONTROL DEVICES Technical Manual

About IPEX

NOTE: Do not use or test the [illegible] in this manual with compressed [illegible] or other gases including air-over-water-boosters

PRODUCT INFORMATION: TEMPEST LOW, MEDIUM FLOW (LMF) ICD



Purpose

To control the amount of storm water runoff entering a sewer system by allowing a specified flow volume out of a catch basin or manhole at a specified head. This approach conserves pipe capacity so that catch basins downstream do not become uncontrollably surcharged, which can lead to basement floods, flash floods and combined sewer overflows.

Product Description

Our LMF ICD is designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter and larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 14 preset flow curves, the LMF ICD has the ability to provide flow rates: 2lps – 17lps (31gpm – 270gpm)

Product Function

The LMF ICD vortex flow action allows the LMF ICD to provide a narrower flow curve using a larger orifice than a conventional orifice plate ICD, making it less likely to clog. When comparing flows at the same head level, the LMF ICD has the ability to restrict more flow than a conventional ICD during a rain event, preserving greater sewer capacity.

Product Construction

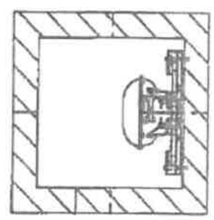
Constructed from durable PVC, the LMF ICD is light weight 8.9 Kg (19.7 lbs).

Product Applications

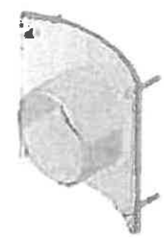
Will accommodate both square and round applications:

Square Application

Universal Mounting Plate



Round Application



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Spigot CB Wall Plate

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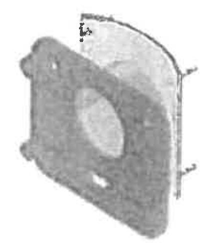
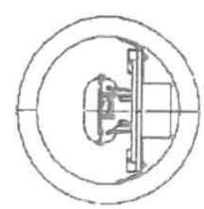


Universal Mounting Plate Hub Adapter



NOTE: Do not use or test the products in this with air or other gases including air-over-water-boosters

Chart 1: LMF 14 Preset Flow Curves

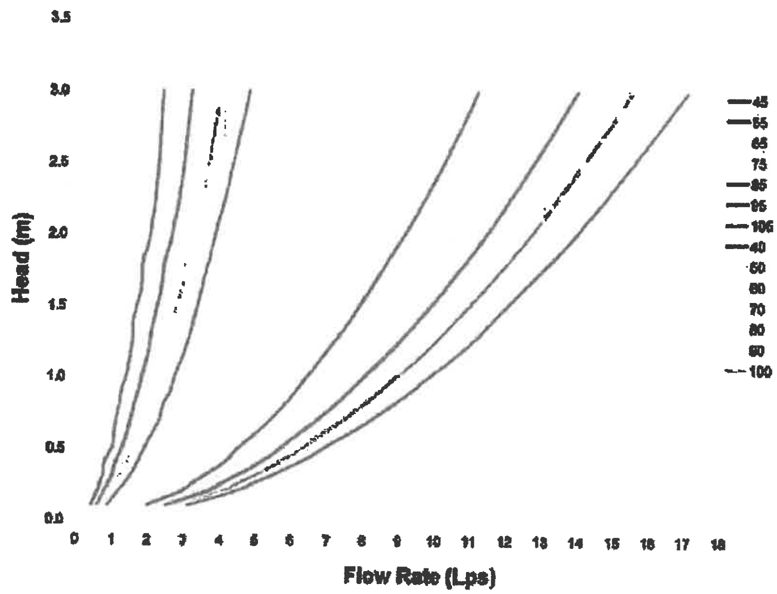
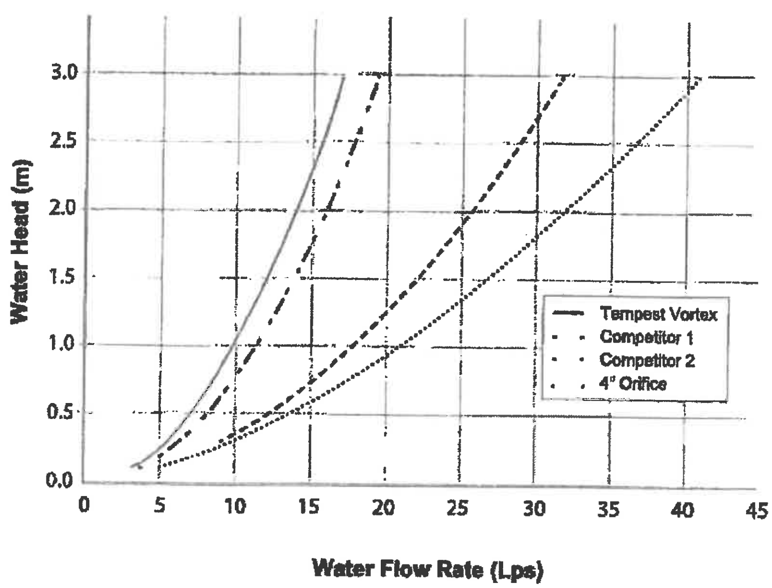


Chart 2: LMF Flow vs. ICD Alternatives



NOTE: Do not or test the products in manual with other gases including air-over-water-boosters

PRODUCT INSTALLATION

Instructions to assemble a TEMPEST LMF ICD into a Square Catch Basin:

STEPS:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device.
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal mounting plate and has created a seal.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST LMF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification.
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the mounting plate and has created a seal.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut back the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

NOTE: Do not use or test the products with compressed or other

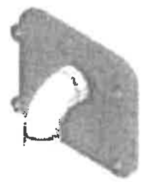
PRODUCT INFORMATION: TEMPEST HF & MHF ICD

Product Description

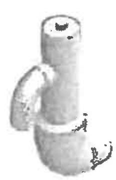
Our HF, HF Sump and MHF ICD's are designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter or larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 5 preset flow curves, these ICDs have the ability to provide constant flow rates: 9lps (143 gpm) and greater

Product Function



TEMPEST HF (High Flow): designed to manage moderate to higher flows 15 L/s (240 gpm) or greater and prevent the propagation of odour and floatables. With this device, the cross-sectional area of the device is larger than the orifice diameter and has been designed to limit head losses. The HF ICD can also be ordered without flow control when only odour and floatable control is required.



TEMPEST HF (High Flow) Sump: The height of a sewer outlet pipe in a catch basin is not always conveniently located. At times it may be located very close to the catch basin floor, not providing enough sump for one of the other TEMPEST ICDs with universal back plate to be installed. In these applications, the HF Sump is offered. The HF Sump offers the same features and benefits as the HF ICD; however, is designed to raise the outlet in a square or round catch basin structure. When installed, the HF sump is fixed in place and not easily removed. Any required service to the device is performed through a clean-out located in the top of the device which can be often accessed from ground level.

TEMPEST MHF (Medium to High Flow): The MHF plate or plug is designed to control flow rates 9 L/s (143 gpm) or greater. It is not designed to prevent the propagation of odour and floatables.

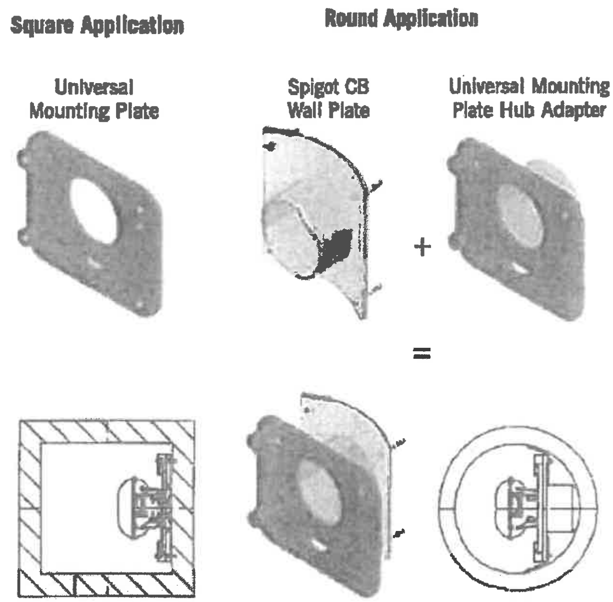
Product Construction

The HF, HF Sump and MHF ICDs are built to be light weight at a maximum weight of 6.8 Kg (14.6 lbs).

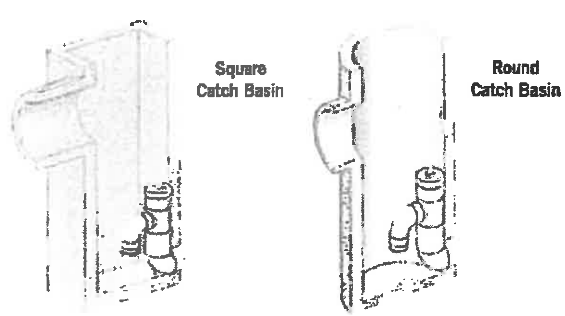
Product Applications

The HF and MHF ICD's are available to accommodate both square and round applications:

HF ICD MHF ICD

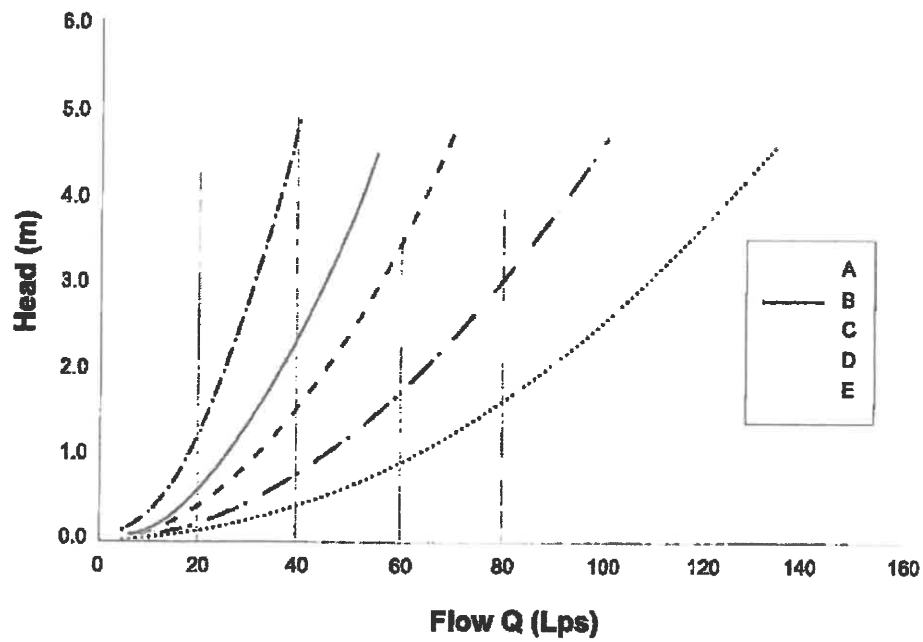


The HF Sump is available to accommodate low to no sump applications in both square and round catch basins:



NOTE: Do not use or test the products in manual with compressed or other gases air-over-water-boosters

Chart 3: HF & MHF Preset Flow Curves



NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

PRODUCT INSTALLATION

Instructions to assemble a TEMPEST HF or MHF ICD into a Square Catch Basin:

1. Materials and tooling verification:
   - Tooling: Impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal wall mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal wall mounting plate and has created a seal.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST HF or MHF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification.
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the round catch basin spigot adaptor to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the spigot CB wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot CB wall plate and the catch basin wall.
6. Put solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the wall mounting plate and has created a seal.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

Instructions to assemble a TEMPEST HF Sump into a Square or Round Catch Basin:

STEPS:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, mastic tape and metal strapping
   - Material: (2) concrete anchor 3/8 x 3-1/2, (2) washers, (2) nuts, HF Sump pieces (2).
2. Apply solvent cement to the spigot end of the top half of the sump. Apply solvent cement to the hub of the bottom half of the sump. Insert the spigot of the top half of the sump into the hub of the bottom half of the sump.
3. Install the 8" spigot of the device into the outlet pipe. Use the mastic tape to seal the device spigot into the outlet pipe. You should use a level to be sure that the fitting is standing at the vertical.
4. Use an impact drill with a 3/8" concrete bit to make a series of 2 holes along each side of the body throat. The depth of the hole should be between 1-1/2" to 2-1/2". Clean the concrete dust from the 2 holes.
5. Install the anchors (2) in the holes by using a hammer. Put the nuts on the top of the anchors to protect the threads when you hit the anchors. Remove the nuts from the ends of the anchors.
6. Cut the metal strapping to length and connect each end of the strapping to the anchors. Screw the nuts in place with a maximum torque of 40 N.m (30 lbf-ft). The device should be completely flush with the catch basin wall.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control where specified. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook shall be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above shall not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices shall consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

NOTE: Do n't use or test the products in this manual wit... ...d air or other gases including air-over-water-boosters

NOTE: Do not use or test the products in this [illegible] with compressed air or other gases [illegible]

SALES AND CUSTOMER SERVICE

Canadian Customers call IPEX Inc.
Toll free: (866) 473-9462
www.ipexinc.com

U.S. Customers call IPEX USA LLC
Toll free: (800) 463-9572
www.ipexamerica.com

About the IPEX Group of Companies

As leading suppliers of thermoplastic piping systems, the IPEX Group of Companies provides our customers with some of the largest and most comprehensive product lines. All IPEX products are backed by more than 50 years of experience. With state-of-the-art manufacturing facilities and distribution centers across North America, we have established a reputation for product innovation, quality, end-user focus and performance.

Markets served by IPEX group products are:

- Electrical systems
- Telecommunications and utility piping systems
- PVC, CPVC, PP, ABS, PEX, FR-PVDF and PE pipe and fittings (1/4" to 48")
- Industrial process piping systems
- Municipal pressure and gravity piping systems
- Plumbing and mechanical piping systems
- PE Electrofusion systems for gas and water
- Industrial, plumbing and electrical cements
- Irrigation systems

Products manufactured by IPEX Inc. and distributed in the United States by IPEX USA LLC.

Tempest™ is a trademark of IPEX Branding Inc.

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IPEX

Stormceptor®

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	23/07/2015
Project Name	12 Unit Residential
Project Number	013-286
Location	Vars

Designer Information

Company	A. Dagenais
Contact	Michael

Notes

N/A

Drainage Area

Total Area (ha)	0.61
Imperviousness (%)	41

The Stormceptor System model STC 300 achieves the water quality objective removing 85% TSS for a Fine (organics, silts and sand) particle size distribution and 99% runoff volume.

Rainfall

Name	OTTAWA MACDONALD-CARTIER INT'L A
State	ON
ID	6000
Years of Records	1967 to 2003
Latitude	45°19'N
Longitude	75°40'W

Water Quality Objective

TSS Removal (%)	80
Runoff Volume (%)	95

Upstream Storage

Storage (ha-m)	Discharge (L/s)
0.000	00.000
0.013	33.070

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %	Runoff Volume %
STC 300	85	99
STC 750	88	100
STC 1000	90	100
STC 1500	90	100
STC 2000	92	100
STC 3000	93	100
STC 4000	94	100
STC 5000	94	100
STC 6000	96	100
STC 9000	97	100
STC 10000	97	100
STC 14000	98	100

Stormceptor®

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)								
Particle Size μm	Distribution %	Specific Gravity	Settling Velocity m/s		Particle Size μm	Distribution %	Specific Gravity	Settling Velocity m/s
20	20	1.3	0.0004					
60	20	1.8	0.0016					
150	20	2.2	0.0108					
400	20	2.65	0.0647					
2000	20	2.65	0.2870					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor version 1.0
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 300 is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 750 to STC 6000 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 300	STC 750 to STC 6000	STC 9000 to STC 14000
Single inlet pipe	75 mm	25 mm	75 mm
Multiple inlet pipes	75 mm	75 mm	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Imbrium Systems Inc., 1-800-565-4801.

APPENDIX “H”
Ontario Building Code

8.2.1.3. Sewage System Design Flows

(1) For *residential occupancies*, the total daily design *sanitary sewage* flow shall be at least the value in Column 2 as determined from Table 8.2.1.3.A. (See Appendix A.)

(2) For all other *occupancies*, the total daily design *sanitary sewage* flow shall be at least the value in Column 2 as determined from Table 8.2.1.3.B. (See Appendix A.)

(3) Where a *building* contains more than one establishment, the total daily design *sanitary sewage* flow shall be the sum of the total daily design *sanitary sewage* flow for each establishment.

(4) Where an *occupancy* is not listed in Table 8.2.1.3.B., the highest of metered flow data from at least 3 similar establishments shall be acceptable for determining the total daily design *sanitary sewage* flow.

Table 8.2.1.3.A.
Residential Occupancy
Forming Part of Sentence 8.2.1.3.(1)

Residential Occupancy	Volume, litres
Apartments, Condominiums, Other Multi-family Dwellings - per person(1)	275
Boarding Houses	
(a) Per person,	
(i) with meals and laundry facilities, or,	200
(ii) without meal or laundry facilities, and	150
(b) Per non-resident staff per 8 hour shift	40
Boarding School - per person	300
Dwellings	
(a) 1 bedroom dwelling	750
(b) 2 bedroom dwelling	1 100
(c) 3 bedroom dwelling	1 600
(d) 4 bedroom dwelling	2 000
(e) 5 bedroom dwelling	2 500
(f) Additional flow for(2)	
(i) each bedroom over 5,	500
(ii) (A) each 10 m^2 (or part of it) over 200 m^2 up to 400 m^2 (3),	100
(B) each 10 m^2 (or part of it) over 400 m^2 up to 600 m^2 (3), and	75
(C) each 10 m^2 (or part of it) over 600 m^2 (3), or	50
(iii) each fixture unit over 20 fixture units	50
Hotels and Motels (excluding bars and restaurants)	
(a) Regular, per room	250
(b) Resort hotel, cottage, per person	500
(c) Self service laundry, add per machine	2 500
Work Camp/Construction Camp, semi-permanent per worker	250
Column 1	2

Notes to Table 8.2.1.3.A.:

(1) The *occupant load* shall be calculated using Subsection 3.1.17.
(2) Where multiple calculations of *sanitary sewage* volume is permitted, the calculation resulting in the highest flow shall be used in determining the design daily *sanitary sewage* flow.
(3) Total finished area, excluding the area of the finished *basement*.

(3) Tanks referred to in Sentences (1) and (2) are not required to conform to the requirements of Clause 10.2.(j) of CSA B66 "Design, Material, and Manufacturing Requirements for Prefabricated Septic Tanks and Sewage Holding Tanks".

(4) Sentence (2) does not apply to a tank that is an integral part of a prefabricated Class 1 *sewage system*.

(5) Access openings shall be located to facilitate the pumping of all compartments and the servicing of the inlet and outlet of each compartment not accessible by removal of the tank top or part of it.

(6) A tank shall not be covered by *soil* or *leaching bed fill* having a depth greater than the maximum depth of burial that the tank is designed to withstand.

(7) A tank shall be securely anchored when located in an area subject to flooding or where *ground water* levels may cause hydrostatic pressures.

8.2.2.3. Septic Tanks

(1) The minimum *working capacity* of a *septic tank* shall be the greater of 3 600 L and,
(a) in *residential occupancies*, twice the daily design *sanitary sewage* flow, or
(b) in non-*residential occupancies*, three times the daily design *sanitary sewage* flow.

(2) Every *septic tank* shall be constructed in such a manner that any *sanitary sewage* flowing through the tank will pass through at least 2 compartments.

(3) The *working capacity* of the compartments required in Sentence (2) shall be sized such that,
(a) the first compartment is at least 1.3 times the daily design *sanitary sewage* flow but in no case less than 2 400 L, and
(b) each subsequent compartment shall be at least 50% of the first compartment.

(4) Where multiple tanks are to be used to meet the requirements of Sentences (2) and (3), the tanks shall be connected in series such that,
(a) the first tank in the series shall have at least a capacity as calculated in Clause (3)(a), however at no time shall a tank having a *working capacity* of less than 3 600 L be used,
(b) all additional tanks after the first tank, excluding pump or dosing tanks shall have at least a *working capacity* equal to the volume required by Clause (3)(b),
(c) the pipe between the outlet of one tank and the inlet of the next tank in the series shall have a minimum slope of 2 percent,
(d) there shall be no partitions in the tank except where a partition is required to maintain the structural integrity of the tank, in which case openings within the partition shall be provided to allow the free movement of *sanitary sewage* throughout the tank, and
(e) all piping between tanks shall be continuous and shall be connected to the tank through the use of flexible watertight seals that will permit differential movement between the tanks.

(5) Partitions separating the *septic tank* into compartments shall extend at least 150 mm above the liquid level at the outlet, and there shall be one or more openings through or above the partition.

(6) The openings required between compartments referred to in Sentence (2) shall have a total cross-sectional area of at least three times the area of the inlet pipe and be located between the top and a level 150 mm above the liquid level at the outlet to provide for the free flow of air between compartments.

(7) *Sanitary sewage* shall pass from one compartment to another of the *septic tank* as follows:
(a) by means of a device similar to that described in CSA B66, "Design, Material, and Manufacturing Requirements for Prefabricated Septic Tanks and Sewage Holding Tanks" for outlet devices, or
(b) through two or more openings through the partition located in a horizontal line, and evenly spaced across the width of the partition, centred at approximately 40% of the liquid depth below the surface of the liquid, and having a total area of between three and five times that of the cross-sectional area of the inlet pipe.

(8) A *septic tank* shall be of such design and construction as will permit the collection and holding of *sanitary sewage* in it to a depth of not less than 1 000 mm, except that a depth of not less than 900 mm is permitted where the excavation is in rock, or to avoid rupture or displacement of the tank due to *ground water* pressure.

(9) Except as provided in Sentences (10) and (11), every *septic tank* shall be installed in such a manner that the access openings are located not more than 300 mm below the ground surface.

(10) Where the top of the *septic tank* is located more than 300 mm below the ground surface, it shall be equipped with risers that extend from the access opening of the *septic tank* to within 300 mm of the ground surface.

(11) Where risers are used they shall conform to the requirements of CSA B66, "Design, Material, and Manufacturing Requirements for Prefabricated Septic Tanks and Sewage Holding Tanks", and shall have adequate access openings to allow for regular maintenance of the *septic tank*.

8.2.2.4. Holding Tanks

(1) All *holding tanks* shall be of such design and construction as will allow the complete removal of solid matter that can be expected to settle in the *holding tank* through an apparatus or device suitable for allowing the contents of the *holding tank* to be removed from the *holding tank*.

(2) A *holding tank* shall have a *working capacity* of not less than 9 000 L.

(3) Where two or more tanks are used to meet the requirement of Sentence (2), they shall be deemed to be one *holding tank* provided they are connected in such a manner as will allow the *sanitary sewage* contained in them to flow between the tanks.

(4) The *working capacity* of the tanks described in Sentence (3) shall not include any portion of any tank that cannot be completely drained due to the manner in which the connections are made.

Section 8.3. Class 1 Sewage Systems

8.3.1. General Requirements

8.3.1.1. Scope

(1) This Section applies to the *construction* of a Class 1 *sewage system*.

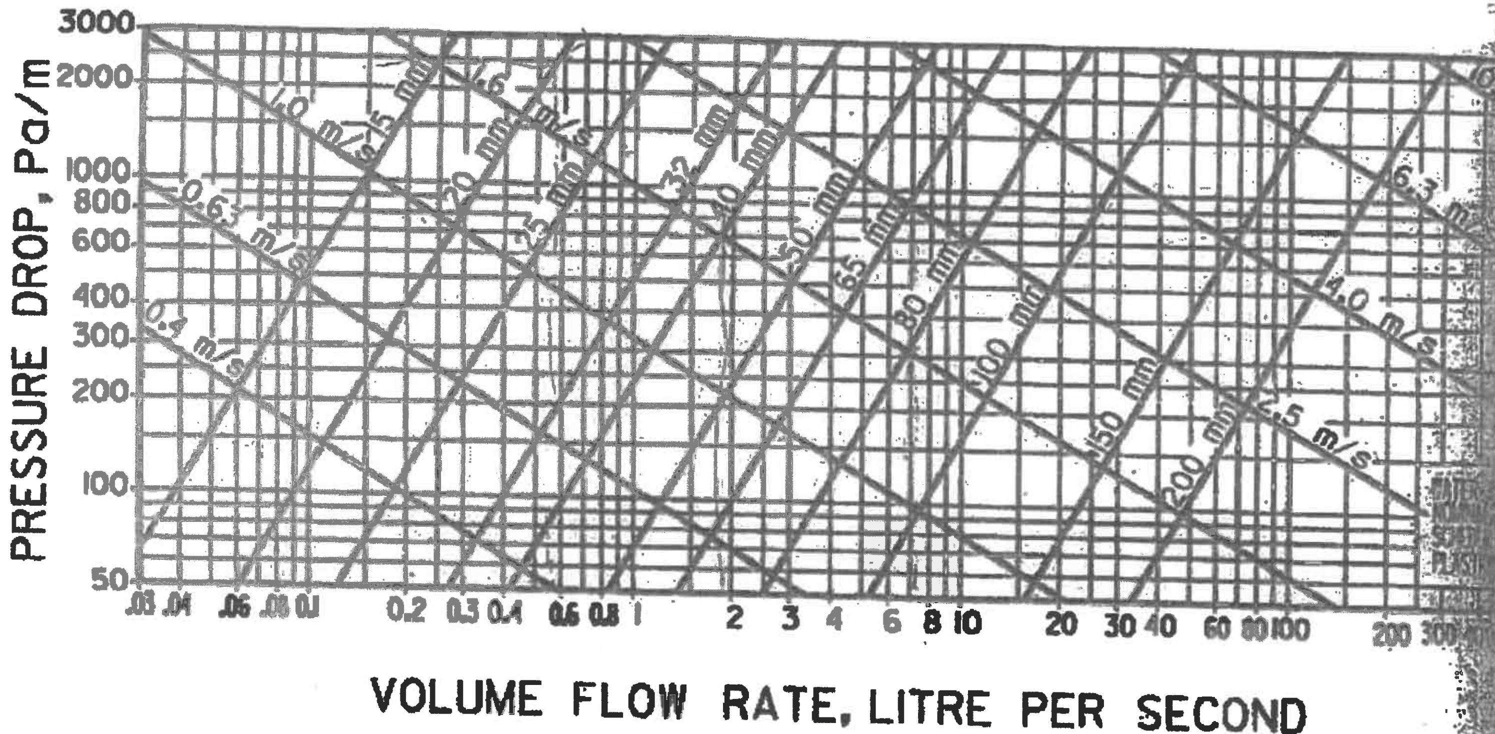
8.3.1.2. Application

(1) Except as provided in Sentence (2), a Class 1 *sewage system* shall be designed to receive only human body waste for disposal.

(2) Where the *sewage system* is specifically designed for the biological decomposition of non-waterborne biodegradable kitchen wastes or requires the addition of small quantities of plant matter to improve the decomposition of human body waste, it may receive such wastes in addition to human body waste.

(3) Where the *sewage system* is designed with a drain for the removal of excess liquid, then the *sewage system* shall drain to a Class 3, 4, or 5 *sewage system*.

APPENDIX “I”
ASHRAE TABLES &
OTTAWA SEWER CAPACITY TABLES



Notes: 1. The chart is based on straight tees, i.e., branches A, B and C are the same size.

2. Pressure loss in desired circuit is obtained by selecting proper curve according to illustrations, determining the flow at the circled branch and multiplying the pressure loss for the same size elbow at the flow rate in the circled branch by the equivalent elbows indicated.

3. When the size of an outlet is reduced the equivalent chart do not apply. Therefore, the maximum loss for any will not exceed 2 elbow equivalents at the maximum flow any branch of the tee.

4. The top curve of the chart is the average of 4 curves, circuits illustrated.

Fig. 3 Friction Loss for Water in Plastic Pipe (Schedule 80)

Hydraulic Elements of Smooth Walled Circular Sewers Flowing Full: 200 - 375 mm Diameter (n=0.013)

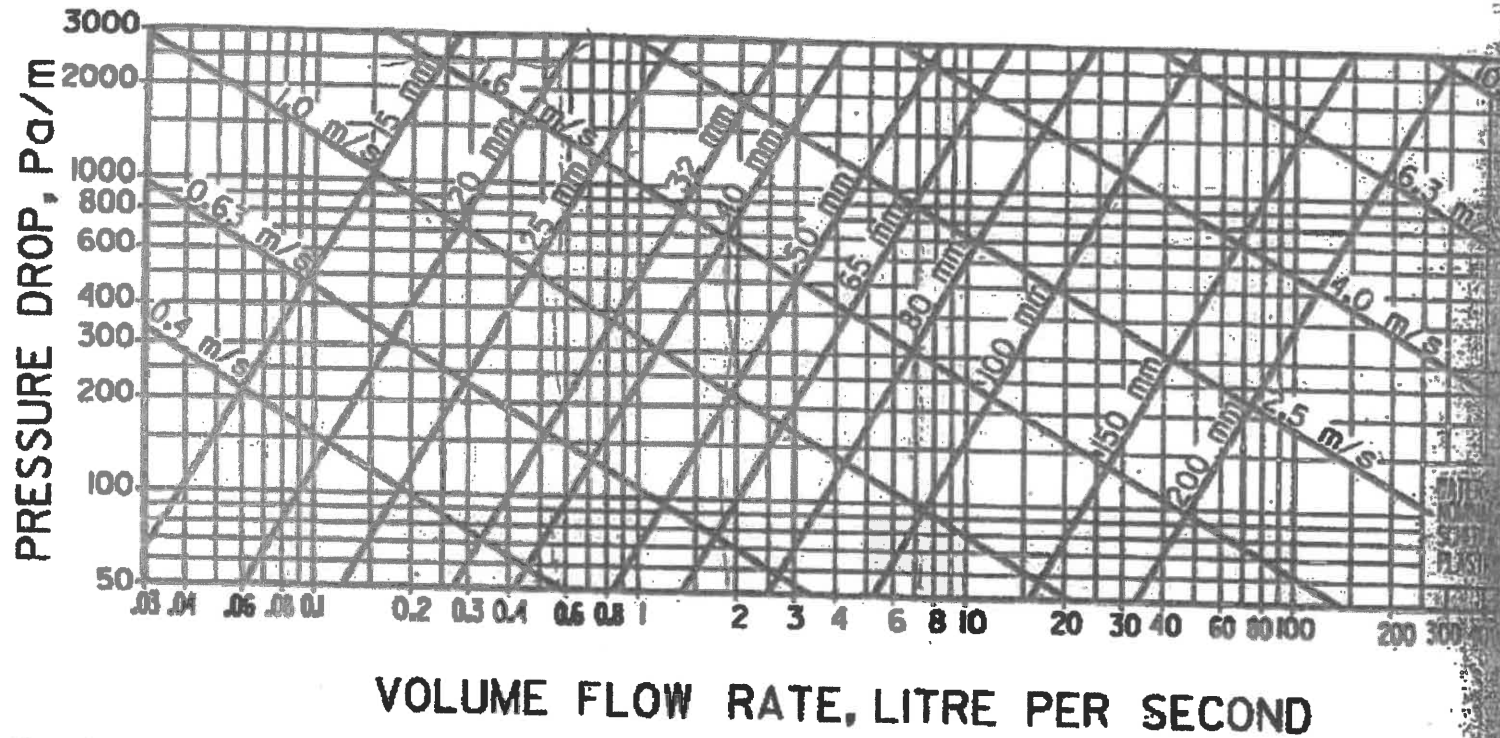
	FLOW (L/s)							
Actual (mm)	[illegible]		[illegible]		[illegible]		[illegible]	
Nominal (mm)	[illegible]		[illegible]		[illegible]		[illegible]	
S (%)	Q	V	Q	V	Q	V	Q	V
[illegible]	[illegible]	[illegible]						
7	[illegible]	2.78						
6	[illegible]	[illegible]	151.55	[illegible]				
5	[illegible]	[illegible]	[illegible]	2.74				
4.7	74.18	[illegible]	134.50	[illegible]	[illegible]	3.07		
4	[illegible]	2.11	[illegible]	[illegible]	[illegible]	2.77		
3.5	[illegible]	1.97	118.06	[illegible]	[illegible]	[illegible]	342.30	[illegible]
3	[illegible]	[illegible]	107.45	2.12	174.73	[illegible]	318.51	2.78
2	[illegible]	[illegible]	[illegible]	[illegible]	142.67	[illegible]	[illegible]	2.27
1	[illegible]	1.05	[illegible]	[illegible]	[illegible]	[illegible]	182.01	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	1.10	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	171.58	1.51
[illegible]	31.73	[illegible]	[illegible]	1.14	[illegible]	[illegible]	[illegible]	1.49
[illegible]	[illegible]	[illegible]	[illegible]	1.12	[illegible]	1.27	[illegible]	1.47
[illegible]	[illegible]	[illegible]	[illegible]	1.11	[illegible]	[illegible]	[illegible]	1.45
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.19	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.17	[illegible]	[illegible]
0.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	27.60	[illegible]	[illegible]	[illegible]	[illegible]	1.12	[illegible]	[illegible]
[illegible]	27.27	[illegible]	[illegible]	[illegible]	[illegible]	1.11	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.11
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	0.72	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	0.71	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]					[illegible]	[illegible]	[illegible]	[illegible]
[illegible]					[illegible]	[illegible]	[illegible]	[illegible]
0.17							[illegible]	[illegible]
0.16							[illegible]	[illegible]
0.15							[illegible]	[illegible]
0.14							65.44	[illegible]

APPENDIX 6-A SEWER CAPACITY TABLES

Hydraulic Elements of Smooth Walled Circular Sewers Flowing Full: 450 - 675 mm Diameter (n=0.013)

	FLOW (L/s)							
Actual (mm)	457.2		[illegible]		[illegible]		[illegible]	
Nominal (mm)	450		[illegible]		[illegible]		675	
Slope (%)	Q	V	Q	V	Q	V	Q	V
2.75	[illegible]	[illegible]						
2.5	470.25?	[illegible]						
2.25	444.16?	2.71	[illegible]	[illegible]				
2	[illegible]	[illegible]	[illegible]	[illegible]				
[illegible]	[illegible]	[illegible]	672.66?	2.75	876.0	[illegible]		
[illegible]	[illegible]	[illegible]	601.94?	[illegible]	[illegible]	[illegible]		
1.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.76	[illegible]	[illegible]
1.5	[illegible]	2.22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.4	[illegible]	2.14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.3	[illegible]	2.07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.71
1.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.9	[illegible]	1.72	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.85	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.8	[illegible]	[illegible]	401.25?	[illegible]	[illegible]	[illegible]	[illegible]	2.12?
0.75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.65	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.77	[illegible]	[illegible]
0.6	[illegible]	1.40	[illegible]	[illegible]	[illegible]	1.70	[illegible]	[illegible]
0.55	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.45	[illegible]	1.22?	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	170.83?	1.04	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.32	[illegible]	1.02	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.31	[illegible]	1.01	[illegible]	1.12	[illegible]	1.22	[illegible]	[illegible]
0.3	152.91?	0.99	245.34?	1.10	[illegible]	1.20	[illegible]	1.30
0.29	150.17?	[illegible]	[illegible]	[illegible]	[illegible]	1.18	472.2?	[illegible]
0.28	[illegible]	[illegible]	237.41?	[illegible]	[illegible]	1.16	[illegible]	[illegible]
0.27	[illegible]	0.94	233.19?	1.04	[illegible]	1.14	[illegible]	[illegible]
0.26	[illegible]	0.92	228.77	1.02	[illegible]	1.12	447.1	[illegible]
0.25	146.72?	[illegible]	[illegible]	[illegible]	[illegible]	1.10	[illegible]	[illegible]
0.24	143.71?	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.23	[illegible]	[illegible]	215.17?	[illegible]	[illegible]	[illegible]	[illegible]	1.14
0.22	[illegible]	[illegible]	[illegible]	0.94?	200.4	[illegible]	411.3?	1.11
0.21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.01?	[illegible]	[illegible]
0.195	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.97	[illegible]	[illegible]
0.19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.18	[illegible]	0.77	[illegible]	[illegible]	[illegible]	[illegible]	372.1?	[illegible]
0.17	[illegible]	0.75?	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.16	116.67?	0.72	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.15	115.20?	0.70	173.76?	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.132	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.12	[illegible]	[illegible]	[illegible]	0.70?	[illegible]	[illegible]	[illegible]	[illegible]
0.113	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.111	[illegible]	0.60	[illegible]	0.67	[illegible]	0.72	282.2?	[illegible]
0.10			[illegible]	[illegible]	205.1	[illegible]	280.7?	[illegible]

APPENDIX "I"
ASHRAE TABLES &
OTTAWA SEWER CAPACITY TABLES



Notes: 1. The chart is based on straight tees, i.e., branches A, B and C are the same size.

2. Pressure loss in desired circuit is obtained by selecting proper curve according to illustrations, determining the flow at the circled branch and multiplying the pressure loss for the same size elbow at the flow rate in the circled branch by the equivalent elbows indicated.

3. When the size of an outlet is reduced the equivalent chart do not apply. Therefore, the maximum loss for any will not exceed 2 elbow equivalents at the maximum flow any branch of the tee.

4. The top curve of the chart is the average of 4 curves, circuits illustrated.

Fig. 3 Friction Loss for Water in Plastic Pipe (Schedule 80)

Hydraulic Elements of Smooth Walled Circular Sewers Flowing Full:
200 - 375 mm Diameter (n=0.013)

	FLOW (L/s)							
Actual (mm)	203.2		254		304.8		381	
Nominal (mm)	200		250		300		375	
S (%)	Q	V	Q	V	Q	V	Q	V
[illegible]	[illegible]	[illegible]						
7	[illegible]	2.76						
6	[illegible]	[illegible]	151.56	[illegible]				
5	[illegible]	[illegible]	[illegible]	2.74				
4.7	74.16	[illegible]	134.50	[illegible]	[illegible]	[illegible]		
4	[illegible]	2.11	[illegible]	[illegible]	[illegible]	2.77		
3.5	64.01	1.97	118.06	[illegible]	[illegible]	[illegible]	342.30	[illegible]
3	59.56	1.83	107.25	2.12	174.72	2.39	316.51	2.76
2	48.56	1.49	87.74	1.73	142.67	[illegible]	[illegible]	2.27
1	34.32	1.05	62.04	1.22	100.88	1.38	182.91	1.60
0.95	[illegible]	[illegible]	60.47	1.19	[illegible]	1.35	178.35	1.56
0.9	32.40	[illegible]	[illegible]	1.16	[illegible]	[illegible]	173.62	1.52
0.88	32.12	[illegible]	58.20	1.15	[illegible]	1.30	171.60	1.51
0.86	31.73	[illegible]	57.55	1.14	[illegible]	[illegible]	169.62	1.49
0.84	31.36	0.97	56.88	1.12	92.48	1.27	167.64	1.47
0.82	[illegible]	[illegible]	56.16	1.11	[illegible]	[illegible]	[illegible]	1.45
0.8	30.60	0.94	55.49	1.10	90.23	1.24	163.60	1.43
0.78	30.32	[illegible]	54.79	[illegible]	89.10	1.22	161.44	1.42
0.76	[illegible]	[illegible]	[illegible]	1.07	[illegible]	1.21	[illegible]	1.40
0.74	29.43	0.91	[illegible]	[illegible]	[illegible]	1.19	157.35	1.38
0.72	29.03	0.90	[illegible]	1.04	[illegible]	1.17	155.21	[illegible]
0.7	28.63	[illegible]	51.91	1.02	84.40	[illegible]	[illegible]	1.34
0.68	28.22	[illegible]	51.16	1.01	83.19	1.14	150.83	1.32
0.66	27.80	[illegible]	50.40	[illegible]	81.96	1.12	148.60	[illegible]
0.64	27.37	[illegible]	49.63	[illegible]	80.71	1.11	146.33	[illegible]
0.62	26.94	[illegible]	48.85	[illegible]	79.43	1.09	144.02	[illegible]
0.6	26.50	0.82	48.06	[illegible]	78.14	1.07	[illegible]	1.24
0.58	26.05	0.80	47.25	0.93	76.83	[illegible]	[illegible]	[illegible]
0.56	[illegible]	0.79	46.43	0.92	75.49	1.04	[illegible]	1.20
0.54	25.14	[illegible]	45.59	0.90	74.13	1.02	134.41	1.18
0.52	24.67	0.76	44.74	0.88	72.75	1.00	[illegible]	1.16
0.5	24.19	0.75	43.87	0.87	71.34	0.98	[illegible]	1.13
0.48	23.71	0.73	42.98	0.85	[illegible]	0.96	126.72	1.11
0.46	23.21	0.72	42.08	0.83	[illegible]	0.94	124.05	[illegible]
[illegible]	22.70	[illegible]	[illegible]	[illegible]	[illegible]	0.91	[illegible]	[illegible]
0.42	22.17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.40	21.64	0.67	39.24	0.77	[illegible]	0.87	[illegible]	[illegible]
0.38	21.09	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	0.72	[illegible]	[illegible]	[illegible]	[illegible]
0.34	[illegible]	0.61	[illegible]	0.71	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0.60	[illegible]	[illegible]	[illegible]	[illegible]	103.47	[illegible]
[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]	[illegible]	49.42	[illegible]	[illegible]	[illegible]
[illegible]					46.12	[illegible]	[illegible]	0.72
[illegible]					[illegible]	[illegible]	[illegible]	[illegible]
0.17							[illegible]	[illegible]
0.16							73.15	[illegible]
0.15							[illegible]	[illegible]
0.14							68.44	[illegible]

Hydraulic Elements of Smooth Walled Circular Sewers Flowing Full:
450 - 675 mm Diameter (n=0.013)

	FLOW (L/s)							
Actual (mm)	457.2		[illegible]		[illegible]		[illegible]	
Nominal (mm)	450		525		600		675	
S (%)	Q	V	Q	V	Q	V	Q	V
2.75	[illegible]	[illegible]						
2.5	470.28	[illegible]						
2.25	444.16	2.71	[illegible]	[illegible]				
2	[illegible]	2.56	[illegible]	[illegible]				
1.87	[illegible]	2.48	672.66	2.76	876.0	[illegible]		
1.7	[illegible]	2.40	601.94	2.69	[illegible]	2.94		
1.6	376.28	2.35	587.91	2.64	810.3	2.78	[illegible]	[illegible]
1.5	364.28	2.22	566.40	2.48	784.6	2.65	1074.8	2.81
1.4	351.96	2.14	553.26	2.38	757.9	2.30	1037.4	2.81
1.3	339.15	2.07	511.35	2.35	730.4	2.50	999.9	2.71
1.2	325.82	1.99	491.46	2.20	701.7	2.40	960.6	2.60
1.1	311.95	1.90	470.56	2.11	671.8	2.30	919.7	2.49
1	297.43	1.81	448.66	2.01	640.5	2.19	876.9	2.37
0.9	282.17	1.72	425.63	1.90	607.7	2.08	831.9	2.25
0.85	274.22	1.67	413.64	1.85	590.5	2.02	808.5	2.19
0.8	266.03	1.62	401.35	1.80	572.9	1.96	784.4	2.12
0.75	257.59	1.57	388.58	1.74	554.7	1.90	759.4	2.06
0.7	248.85	1.52	375.37	1.68	535.9	1.84	733.7	1.99
0.65	239.80	1.46	361.72	1.62	516.4	1.77	707.0	1.91
0.6	230.39	1.40	347.53	1.56	496.2	1.70	679.3	1.84
0.55	220.58	1.34	332.73	1.49	475.1	1.63	650.4	1.76
0.5	210.32	1.28	317.25	1.42	452.9	1.55	620.1	1.68
0.45	199.53	1.22	300.97	1.35	429.7	1.47	588.3	1.59
0.4	188.11	1.15	283.76	1.27	405.1	1.39	554.6	1.50
0.35	175.96	1.07	265.43	1.19	378.9	1.30	[illegible]	1.40
0.33	170.88	1.04	257.73	1.15	[illegible]	1.26	[illegible]	1.36
0.32	168.25	1.02	253.80	1.14	362.4	1.24	496.1	1.34
0.31	165.60	1.01	249.80	1.12	356.6	1.22	488.3	1.32
0.3	162.91	0.99	245.74	1.10	350.8	1.20	480.3	1.30
0.29	160.17	0.98	241.61	1.08	344.9	1.18	472.2	1.28
0.28	157.38	0.96	237.41	1.06	338.9	1.16	464.0	1.26
0.27	154.55	0.94	233.13	1.04	332.8	1.14	455.7	1.23
0.26	151.66	0.92	228.77	1.02	326.6	1.12	447.1	1.21
0.25	148.72	0.91	224.33	1.00	320.3	1.10	438.5	1.19
0.24	145.71	0.89	219.80	0.98	313.8	1.08	429.6	1.16
0.23	142.64	0.87	215.17	0.96	307.2	1.05	420.6	1.14
0.22	139.51	0.85	210.44	0.94	300.4	1.03	411.3	1.11
0.21	136.30	0.83	205.60	0.92	293.5	1.01	401.9	1.09
0.195	131.34	0.80	198.12	0.89	282.8	0.97	387.2	1.05
0.19	[illegible]	0.79	[illegible]	[illegible]	279.2	0.96	[illegible]	1.03
0.18	[illegible]	0.77	190.35	0.85	271.8	0.93	372.1	1.01
0.17	122.63	0.75	184.99	0.83	264.1	0.90	361.6	0.98
0.16	118.97	0.72	179.46	0.80	256.2	0.88	350.8	0.95
0.15	115.20	0.70	173.76	0.78	248.1	0.85	339.6	0.92
0.14	[illegible]	0.68	[illegible]	0.75	239.7	0.82	[illegible]	0.89
0.132	[illegible]	[illegible]	[illegible]	0.73	[illegible]	[illegible]	318.6	0.86
0.12	[illegible]	[illegible]	[illegible]	0.70	221.9	0.76	[illegible]	0.82
0.113	[illegible]	[illegible]	[illegible]	0.67	215.3	0.74	294.8	[illegible]
0.111	[illegible]	[illegible]	149.48	0.67	213.4	0.73	292.2	0.79
0.10			[illegible]	0.64	[illegible]	[illegible]	[illegible]	0.75

APPENDIX “J”
BOUNDARY CONDITIONS
& HGL

Michael Jans

From:	Alvey, Harry [Harry.Alvey@ottawa.ca]
Sent:	August-07-13 1:07 PM
To:	'Michael Jans'
Cc:	Fitzpatrick, Anne
Subject:	RE: 5574 Rockdale, vars

Good Afternoon Michael;

Here are the water boundary conditions as you requested;

The boundary conditions depend strongly on pump selection. Ignoring fires, minimum pressure actually occurs during basic (average) demand conditions when the duty pump is running. During peak hour or fire conditions, the duty pump does not operate. Larger capacity pumps with higher discharge pressures operate during these conditions.

Boundary conditions at the site are as follows:

Basic Day average= 115.4 m
Minimum pressure during Basic Day = 108.4m
Peak Hour on Max Day = 119.3 m

The system is not designed to supply the required fire demand. The development will need to consider the fire supply limitation, adjust building design accordingly, and/or provide additional on-site fire fighting measures. Below I have provided two boundary conditions based on fire flows that would result in the range of roughly 20 psi and above at the property.

FF = 95 L/s, Max Day + Fire = 93.6 m (~21 psi)
FF = 90 L/s, Max Day + Fire = 98.3 m (~28 psi)

For the record, a 3 hour fire flow of 95 L/s at max day would drop the pump station clearwells to 30% full, assuming a starting point of 75%.

If you have any questions or need any additional information let me know.

Sincerely;

Harry

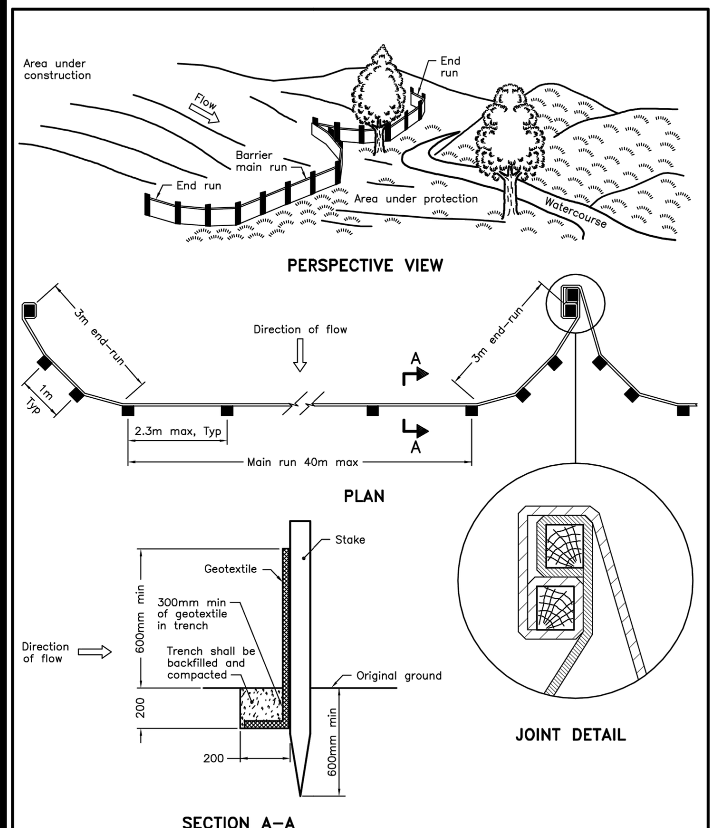
Harry R. Alvey
Senior Infrastructure Approval Engineer
Development Review Rural Services

Hydraulic Analysis

Location	Chainage	Diameter	Friction	TWM	F/G	Cover	Fric loss	Elev loss	Pressure
Main	0	150	0.013053	75.80	78.2	2.40			46.31
EA	9.7122	150	0.013053	75.20	78.39	3.19	0.126777		46.18322
0+10	10	150	0.013053	75.19	78.38	3.19	0.003757		46.17947
CL ditch	16.134	150	0.013053	74.95	77.35	2.40	0.08007		46.0994
Valve	19.171	150	0.013053	74.96	77.98	3.02	0.039643		46.05975
0+20	20	150	0.013053	75.01	77.98	2.97	0.010821		46.04893
wall (high side)	24.936	150	0.013053	75.28	77.98	2.70	0.064432		45.9845
Wall (low side)	25.2356	150	0.013053	75.30	77.71	2.41	0.003911		45.98059
0+30	30	150	0.013053	75.30	77.72	2.42	0.062192		45.9184
0+40	40	150	0.013053	75.30	77.74	2.44	0.130534		45.78786
0+50	50	150	0.013053	75.30	77.76	2.46	0.130534		45.65733
0+60	60	150	0.013053	75.30	77.78	2.48	0.130534		45.5268
0+70	70	150	0.013053	75.30	77.8	2.50	0.130534		45.39626
0+80	80	150	0.013053	75.30	77.82	2.52	0.130534		45.26573
0+90	90	150	0.013053	75.30	77.84	2.54	0.130534		45.13519
0+100	100	150	0.013053	75.30	77.86	2.56	0.130534		45.00466
0+110	110	150	0.013053	75.30	77.89	2.59	0.130534		44.87413
C\L Swale	119.21	150	0.013053	75.25	77.66	2.41	0.120222		44.7539
0+120	120	150	0.013053	75.23	78.48	3.25	0.010312		44.74359
Main Tee	120.618	150	0.013053	75.94	78.35	2.41	0.008067		44.73552
E/A	124.143	50	0.007252	76.00	78.63	2.63	0.025563		44.70996
bend	125.244	50	0.007252	76.00	78.55	2.55	0.007984		44.70198
0+130	130	50	0.007252	76.00	78.75	2.75	0.03449		44.66749
0+140	140	50	0.007252	76.00	78.57	2.57	0.072519		44.59497
bend	141.738	50	0.007252	76.00	78.93	2.93	0.012604		44.58237
S/W	148.148	50	0.007252	76.00	78.93	2.93	0.046485		44.53588
grass	149.489	50	0.007252	76.00	79.1	3.10	0.009725		44.52616
0+150	150	50	0.007252	76.00	79.1	3.10	0.003706		44.52245
BLDG	154.836	50	0.007252	76.00	79.22	3.22	0.03507		44.48738
FF	175.585	25	0.007252	85.37			0.150469	13.59518	30.74173

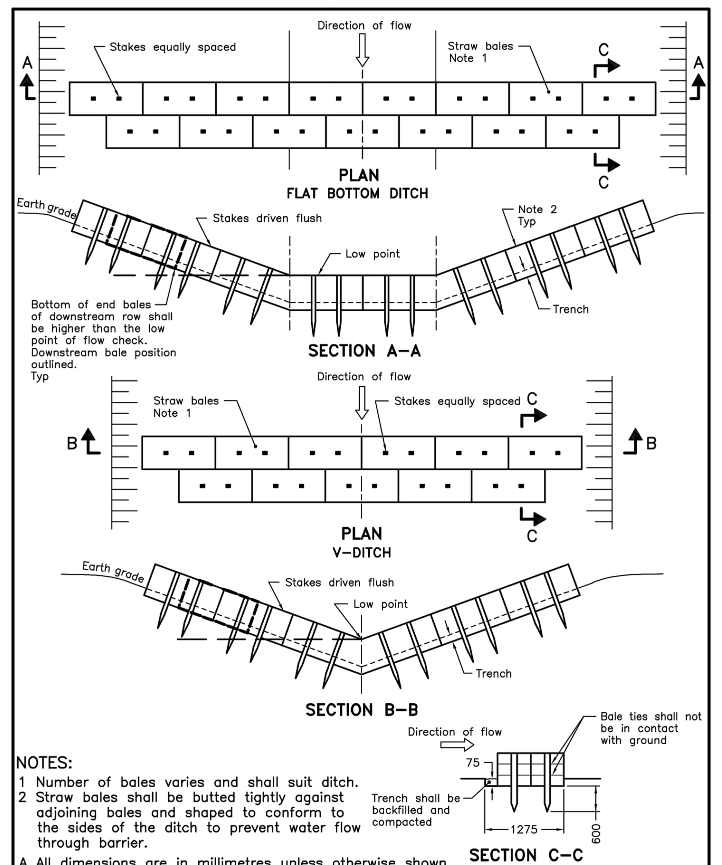
APPENDIX "K"

EROSION AND SEDIMENT CONTROL



NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
LIGHT-DUTY SILT FENCE BARRIER		OPSD 219.110



NOTES:
1 Number of bales varies and shall suit ditch.
2 Straw bales shall be butted tightly against adjoining bales and shaped to conform to the sides of the ditch to prevent water flow through barrier.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
STRAW BALE FLOW CHECK DAM		OPSD 219.180

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:**

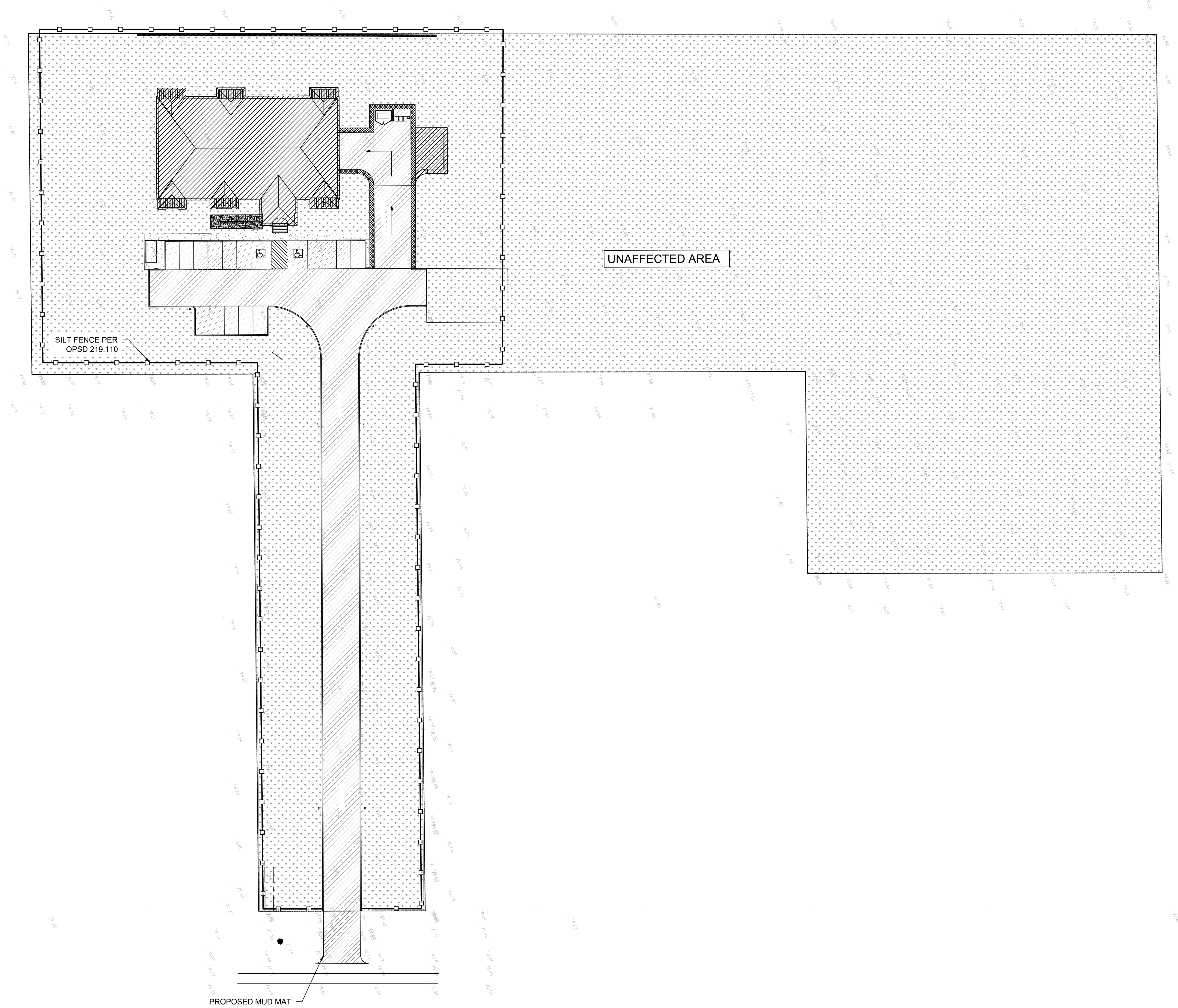
2.1. WORK TO BE DONE IN THE VICINITY OF MAJOR WATERWAYS TO BE CARRIED OUT FROM JULY TO SEPTEMBER ONLY.
2.2. MINIMIZE THE EXTENT OF DISTURBED AREAS AND THE DURATION OF EXPOSURE.
2.3. PROTECT DISTURBED AREAS FROM RUNOFF.
2.4. PROVIDE TEMPORARY COVER SUCH AS SEEDING OR MULCHING IF DISTURBED AREA WILL NOT BE REHABILIATED 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 SCRAPED.
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 ABUTTING 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
× 70.19	EXISTING ELEVATION
	PROPOSED OVERLAND MAJOR FLOW ROUTE
	PROPOSED SILT FENCE AS PER OPSD 219.110
>S >S >S >S	PROPOSED 100mmØ PERFORATED SUBDRAIN
STM STM STM	PROPOSED STORM SEWER
SAN SAN SAN	PROPOSED SANITARY SEWER
WTR WTR WTR	PROPOSED WATERMAIN
SAN SAN SAN	EXISTING SANITARY SEWER
WTR WTR WTR	EXISTING WATERMAIN
	PROPOSED CATCHBASIN-MANHOLE/CATCHBASIN
	PROPOSED CURB STOP
	PROPOSED PIPE INSULATION
	PROPOSED 100 YEAR HIGH WATER LEVEL
	STORM WATERSHED EXTENT
WS-XX	WATERSHED NAME
CONTROLLED	RUNOFF COEFFICIENT
AREA / RUNOFF	AREA IN HECTARES
	PROPOSSED 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
(M)	PROPOSED WATER METER
	PROPOSED ACCESS GATE
	PROPOSED GROWING FIELD



ENGINEERING STAMP

NO.	REVISION	DATE (DD/MM/YYYY)
#8		
#7		
#6		
#5		
#4		
#3		
#2	ISSUED FOR CITY COMMENTS 7	24 / 08 / 2020
#1	ISSUED FOR CITY COMMENTS 6	26 / 03 / 2020

BLANCHARD LETENDRE
ENGINEERING
767, Notre Dame, Local 42, Embrun, Ontario, K0A 1W1
(613) 693-0700
blengineering.ca

CLIENT:
BERGERON CONSTRUCTION
172 ST.-THOMAS ROAD
VARS, ON, K0A 3H0

PROJECT:
12 UNIT APARTMENT BUILDING
5574 ROCKDALE ROAD
VARS, ON

DRAWING:
SEDIMENT AND EROSION CONTROL PLAN

PAPER FORMAT:	24x36
DRAWN BY:	BF + GB
CHECKED BY:	GB
DATE:	03-2020
SCALE:	1:500
PROJECT NUMBER:	19-276

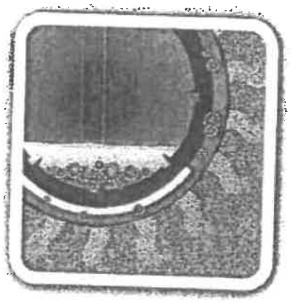
PAGE:
C100

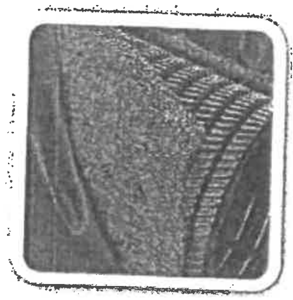
APPENDIX “L”
ENVIRO SEPTIC DESIGN PARA

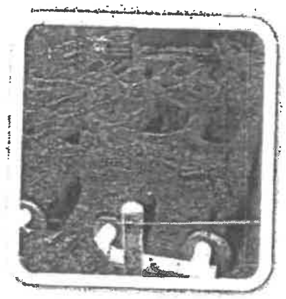
ADVANCED

ENVIRO))SEPTIC®

We reinvent the way to treat and evacuate wastewater



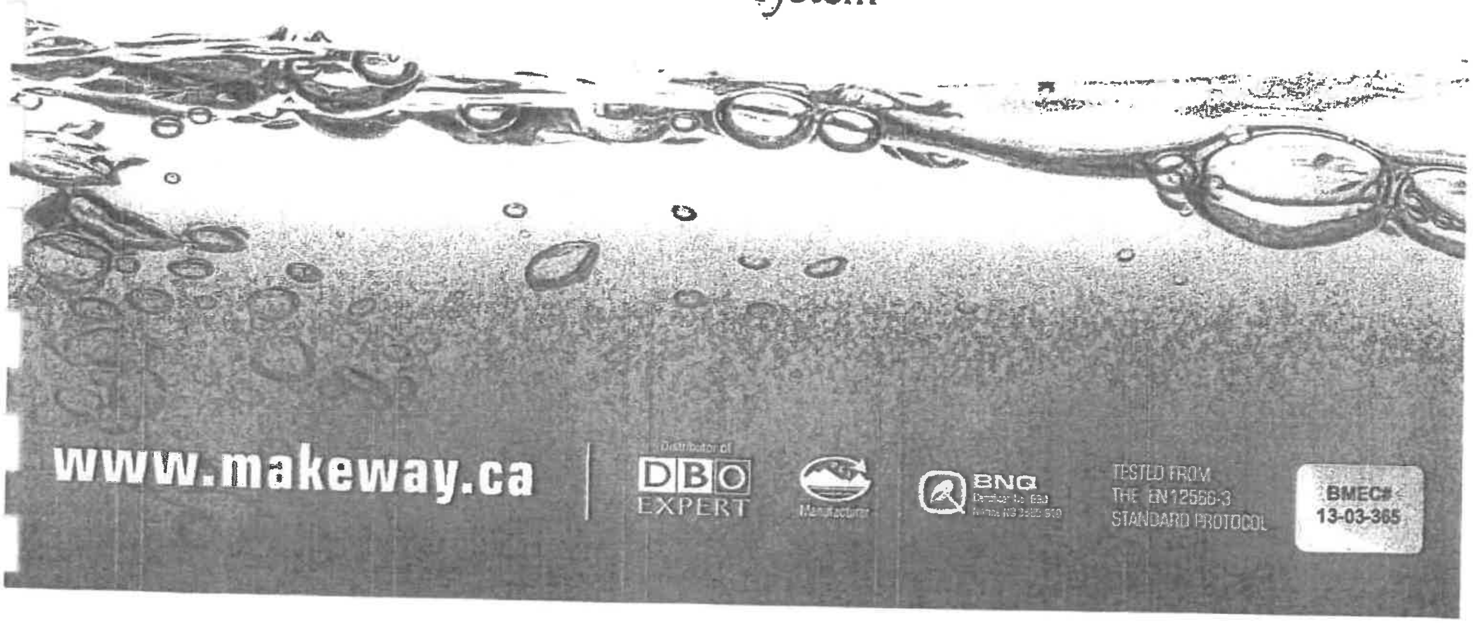




Biological and ecological treatment system

No moving parts | No electricity | No mantle

The simplest, most cost effecient tertiary quality
Class 4 system



Approved as an alternative to a Class 4 System producing Tertiary Quality Effluent

Over 100,000 systems installed!

Approved in Canada, the USA, Mexico and Europe

The Enviro-Septic® System is easy to install, does not require a stone layer, does not require a mantle, does not require hydro if gravity flow is achieved, no moving parts, no media to replace, and now is priced similar to that of a conventional, pipe and stone system.

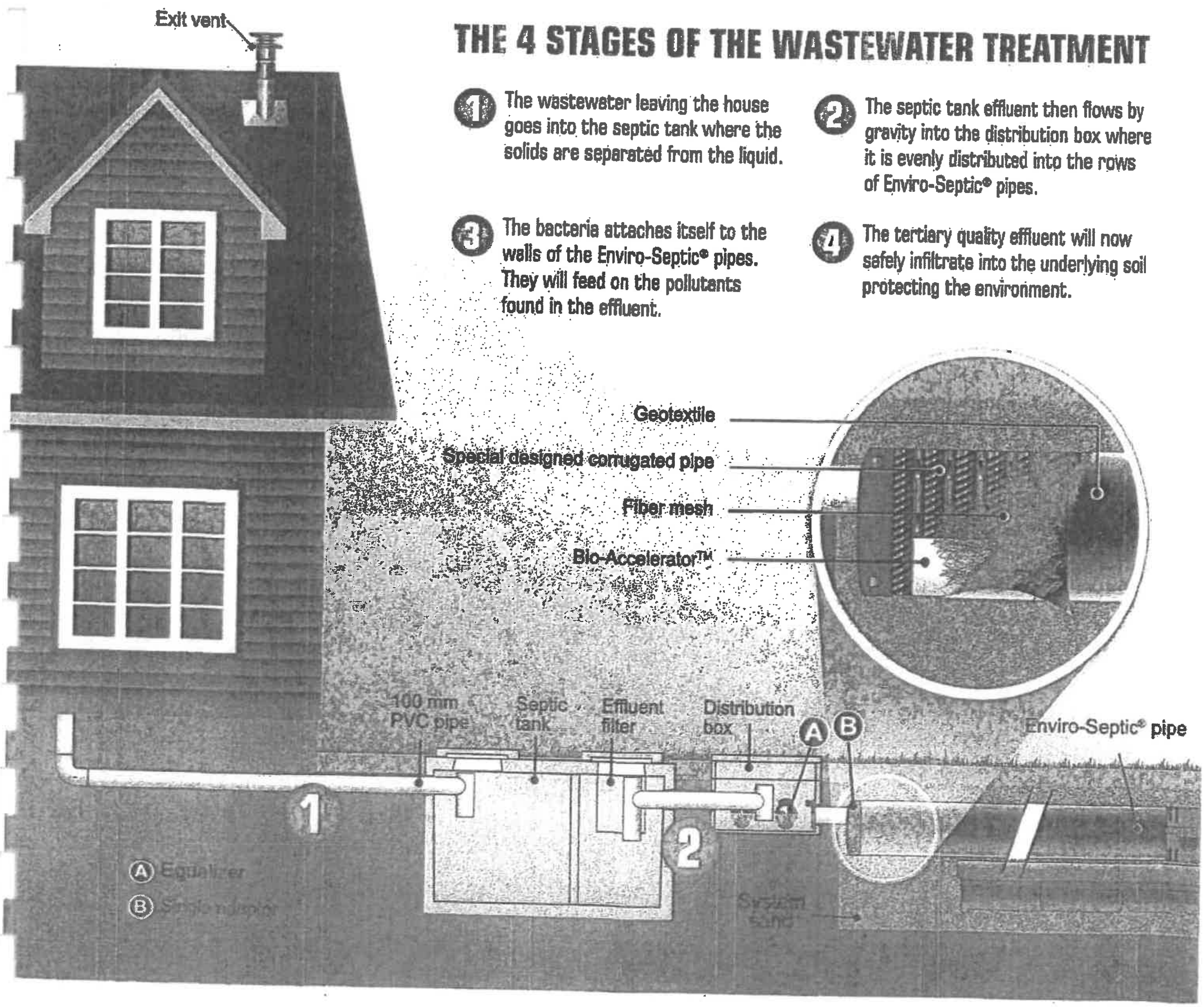
The system requires system sand which is readily available at most sand and gravel suppliers across Ontario. In some case System Sand is priced below filter sand or septic sand.

Looking for a cost effective and efficient system that produces tertiary quality effluent?

BMEC Authorization & Design Information Available

THE 4 STAGES OF THE WASTEWATER TREATMENT

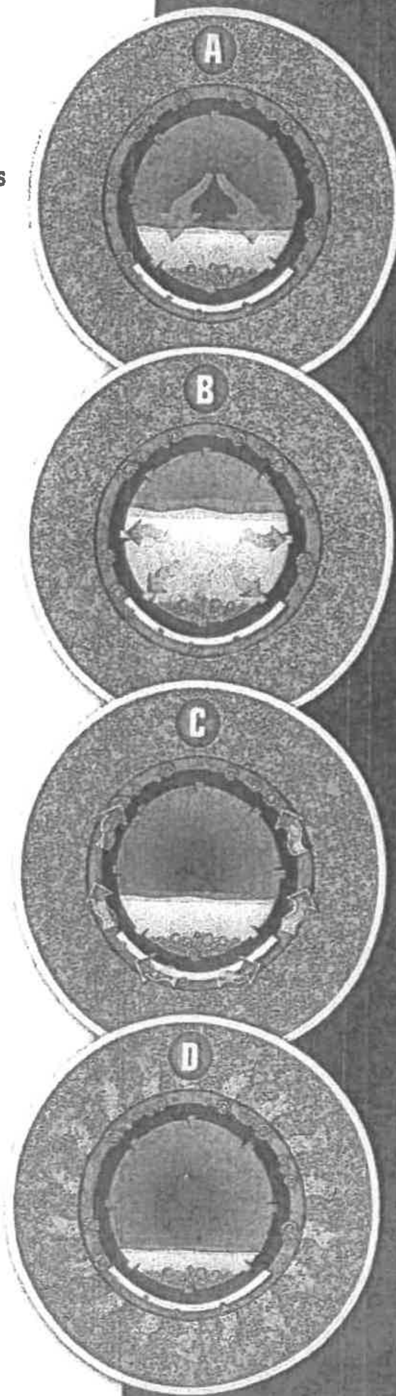
1. The wastewater leaving the house goes into the septic tank where the solids are separated from the liquid.
2. The septic tank effluent then flows by gravity into the distribution box where it is evenly distributed into the rows of Enviro-Septic® pipes.
3. The bacteria attaches itself to the walls of the Enviro-Septic® pipes. They will feed on the pollutants found in the effluent.
4. The tertiary quality effluent will now safely infiltrate into the underlying soil protecting the environment.



The Enviro-Septic® pipe is a patented product comprised of four components

- A cylindrical pipe made of high density polyethylene. The walls of the pipe are corrugated to increase the surface area for heat transfer. They are also perforated in order to let the effluent flow out. Each corrugation has a unique notched design which encourages the flow of air around the pipe. The flow of air is necessary for the proliferation of the bacteria that is responsible for the treatment of the wastewater.
- The Bio-Accelerator™ allows for a fast ramp-up time.
- A randomly oriented fiber mesh covers the pipe, facilitates the supply of oxygen and acts as a support structure for the biomass.
- A non-woven geotextile membrane is sewn around the pipe to prevent sand from entering the pipe.

ENVIRO-SEPTIC® PROCESS



A The wastewater from the septic tank will flow by gravity into a distribution box equipped with equalizers. From the distribution box the wastewater is evenly distributed into the rows of Enviro-Septic® pipe.

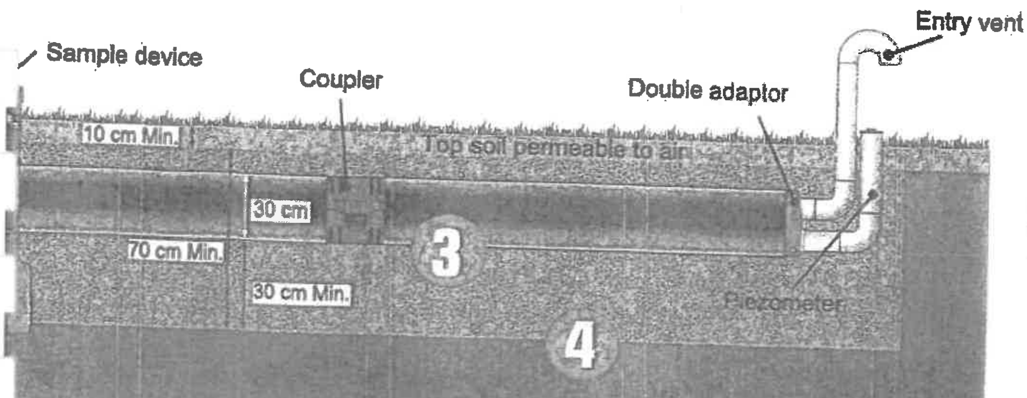
The effluent arriving into the Enviro-Septic® pipe is cooled to ground temperature. The corrugations of the pipe facilitate this process by providing a large surface area for heat exchange. The system acts as an underground radiator. The cooling process encourages the separation of greases and some of the suspended solids. The solids, that are lighter than water, float to the surface as foam. The heavier solids will end up at the bottom of the pipe to create scum. These solids remain inside the pipe and helps prevent the soil from becoming clogged.

B The effluent leaves the pipe through the perforations found on the entire circumference of the pipe. Afterwards, it works its way through the mat of plastic fibers where the bacteria have settled to treat the additional amount of suspended solids. The mat of plastic fibers is conditioned by the liquid level fluctuations inside the pipe, which is caused by the peak periods of water use in the house. This aerobic/anaerobic condition encourages the proliferation of the bacteria performing the treatment.

This process is similar to the deterioration of a wood picket fence. The deterioration always starts at the ground level where the humidity conditions change from day to day, and where the bacteria accelerate the wood's deterioration.

C The effluent travels through the geo-textile where another layer of bacteria is forming on the internal surface. By capillary action, the geotextile and the surrounding sand gather and distribute the effluent on the pipe's circumference, which facilitates the evacuation of water to the surrounding ground. This phenomenon can be compared to the wick of an oil lamp in which the fuel moves towards the area where the combustion occurs.

D The treatment continues as the effluent passes through the system sand that surrounds the Enviro-Septic® pipe. When the water finally reaches the receiving soil, almost all of the contaminants have been removed from the water. It thus infiltrates into the ground much more easily, to be evacuated from the site.

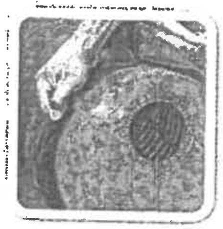


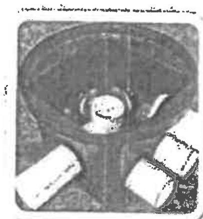
Enviro-Septic® System advantages

- Due to the multiple configurations possible, it offers a large design flexibility.
- The installation is quick, easy, and does not require any special tools or filtering media that require periodic replacement.
- It can be installed in sloped areas without the need of supplementary embankments. This reduces the costs and provides an aesthetically pleasing finished product.
- Excellent QUALITY/DURABILITY/PRICE ratio.
- No mantle required

Enviro-Septic® System characteristics

- It makes it possible to build an effective infiltration system having a longer service life compared to traditional systems.
- The installation is quick, easy, and does not require any special tools.
- A system that forgives! The round shape of the biomat which has established on the circumference of the pipe encourages the rejuvenation of the treatment and evacuation capacities following improper use of the system.
- A tested technology: more than 100 000 installations to date in North America.



SYSTÈME ENVIRO)SEPTIC SYSTEM

MAKE WAY

Enviro-Septic Configuration Simulator - BMEC Authorization of September 25th 2008

For leaching bed Version 1.3

Project Name: Apartment Building

Designer Name: Bergeron Const.

21/05/2015

Line	Information required or element calculated	Enter proper information in the green cells	Units	Then validate the configuration	Instructions / comments
1	Soil percolation time (T-Time)	6	Min/cm	OK	Enter the receiving soil T-Time.
2	Enter Enviro-Septic System Design Flow	9900	L/d	OK	Enter the Enviro-Septic System Design Flow as determined from 8.2.1.3 of the Ontario On-Site Sewage Systems Code.
3	*S_{min} - Minimum Vertical Separation*	0.6	m		Minimum Vertical Separation as measured from the bottom of the Enviro-Septic System sand to: High ground water table or Bedrock or Soil with a percolation time (T) greater than 50 cm/min.
4	Dept of the receiving soil	1.2	m	OK	Enter the dept of the receiving soil from the surface (original grade) to: High ground water table or Bedrock or Soil with a percolation time (T) greater than 50 cm/min. If receiving soil has a T-Time > 50 min/cm, enter 0.
5	Dept of the excavation	0.6	m	OK	Enter the dept at which the base of the system will be installed. If imported sand is used under the Enviro-Septic System, enter the dept at which the imported sand is installed. If the system or the imported sand layer are installed at the surface (original grade), the value is 0 .
6	Natural Slope of the ground	1	%	OK	The slope must be 25 % or less. For a flat land, the slope is 0%.
7	*D_S - Dept of receiving soil under the excavation*	0.6	m	OK	This value represent the thickness of receiving soil remaining after excavation before the high ground water table or bedrock or soil with a percolation time (T) greater than 50 cm/min.
8	I_S -Thickness of the imported sand layer (if used)	0	m	OK	Enter the dept of receiving soil still in place after installation between the base of the system or the imported sand layer and the high ground water table or bedrock or soil with a percolation time (T) greater than 50 cm/min.
9	*S_O - Separation distance*	0.6	m	OK	This value represent the thickness of soil and imported sand (when used) between the system base and the ground water table or bedrock or soil with a percolation time (T) greater than 50 cm/min.
10	*Minimum number of Enviro-Septic Pipes*	110	ESP		This value represent the minimum number of Enviro-Septic pipes required to treat the daily flow of Septic Tank Effluent using formula Q/90.
11	*Minimum length of Enviro-Septic Pipes*	335.5	m		This value represent the minimum length of Enviro-Septic pipes required to treat the daily flow of Septic Tank Effluent using formula 3,05*(Q/90).
12	*Minimum Enviro-Septic Contact Area*	148.5	m^2		This value represent the minimum Enviro-Septic contact Area using formula QT/400
13	Number of rows of Enviro-Septic Pipes	20	Rows	OK	Enter the number of rows of the configuration wanted.
14	Number of Enviro-Septic Pipes per row	5.5	ESP	OK	Enter the number of pipes per row for the configuration wanted. This number should equal or greater than 2 without going over 10.
15	*Total number of Enviro-Septic Pipes*	110	ESP	OK	This value represent the product of the number of rows by the number of pipes per rows (line 12 x line 13). An error message will appear if the result is smaller than the minimum number of pipes required shown at line 10.

16	*Total length of Enviro-Septic Pipes*	335.5	m		This value represent the product of the total number of pipes required by the length of one pipe.
17	*Total length of a row of Enviro-Septic Pipes*	16.78	m		This value represent the product of the number of pipes per row by the lenght of one pipe.
18	Number of sections	1	section(s)	OK	The number of section chosen must allow even distribution of rows between sections (Ex. 9 rows can be divided in 3 section of 3 rows, but 8 rows can't be divided in 3 sections).
19	*Suggested E_{CC}*	*0.5*			Suggested Center to Center spacing calculated automatically based on an equal distribution of the rows of pipes. The minimum value is 0,45 m.
20	E_{CC} - Center to Center Spacing	0.45	m	OK	Enter the Center to Center Spacing. The minimum ECC is 0,45 m
21	*Suggested E L*	*0.45*			Suggested Lateral extension spacing calculated automatically based on the Center to Center Spacing. The minimum value is 0,45 m. When Ecc is 0,9 m or above, EL is half Ecc.
22	E L - Lateral Extension Distance	0.45	m	OK	Lateral extension spacing needs to be 0,45 or more.
23	*N/A*	N/A			When slope is more than 3%, the Lateral extension spacing is larger downhill than uphill. The EL2 is calculated automatically and is equal to the Center to Center Spacing.
24	*Suggested E_E*	*0.3*			Suggested Extremity extension spacing calculated automatically based on the Center to Center Spacing. The minimum value is 0,3 m. When Ecc is 0,9 m or above, EE is half Ecc. - 0,15 m.
25	E_E - Extremity Extension Distance	0.3	m	OK	Extremity extension spacing needs to be 0,3 or more.
26	*L - Length of one section of the Enviro-Septic System*	17.38	m		This value represent the length of a row of pipes plus the two Extremity Extension Distances
27	*W - Width of one section of the Enviro-Septic System*	9.45	m		This value represent the width of a section including the Center to Center Spacing and the Lateral Spacing.
28	*Total Enviro-Septic Contact Area per section*	164.19	m^2		This value represent the total Enviro-Septic Contact Area for each independant section.
28	***Total Enviro-Septic Contact Area***	164.19	m^2	OK	This value represent the total Enviro-Septic Contact Area.
29	*Hydraulic Loading Rate (HLR)*	60.29	$L/m^2.d$		The Hydraulic Loading Rate represent the volume of water per square meter per day based on the Total Design Daily Flow and the Total Enviro-Septic Contact Area.
30	*Lateral height of the system if partially or completely above ground*	0.30	m	Partially Above Ground System	This value represents the height of the system above ground on the limit of the contact area or, in other words, where the 1:3 lateral backfill starts. The height may be a little bit more in the center of the system to keep a small slope on top for rainwater evacuation.
31	*S_E - Total length of System Sand Extension*	N/A	m		The value represents the length of the down slope sand extension when it is required (for slope above 10 %)
32	*W2 - Width of the Enviro-Septic System including System Sand Extension*	N/A			The value represents the width of the system including sand extension when it is required (for slope above 10 %)
33	*Estimation of the Volume of System Sand Required*	90.8	m^3		The volume of system sand required is the product of the length by the width by the number of section and by the thickness of the sand layer from which we subtract the volume of the Enviro-Septic Pipes.
34	*Estimation of the Volume of Imported Sand Required*	0.0	m^3		The volume of imported sand required is the product of the length by the width by the number of section and by the thickness of the imported sand layer enter on line 6.
35	**Final Configuration Validation**			OK	"OK/ will be shown when all Enviro-Septic design rules of the configuration simulator have been met.

Attention: The designer is responsible to conform to all applicable laws and to all Enviro-Septic design rules. This simulator is provided free of charge as a configuration development tool and the user understands that DBO Expert inc. cannot be held responsible for errors or omissions because of this service.

SYSTÈME ENVIROSEPTIC SYSTEM

DBO EXPERT MAKEWAY ENVIRONMENTAL TECHNOLOGIES INC

Project:	Apartment Building
Designer:	Bergeron Const.
Date:	21/05/2015

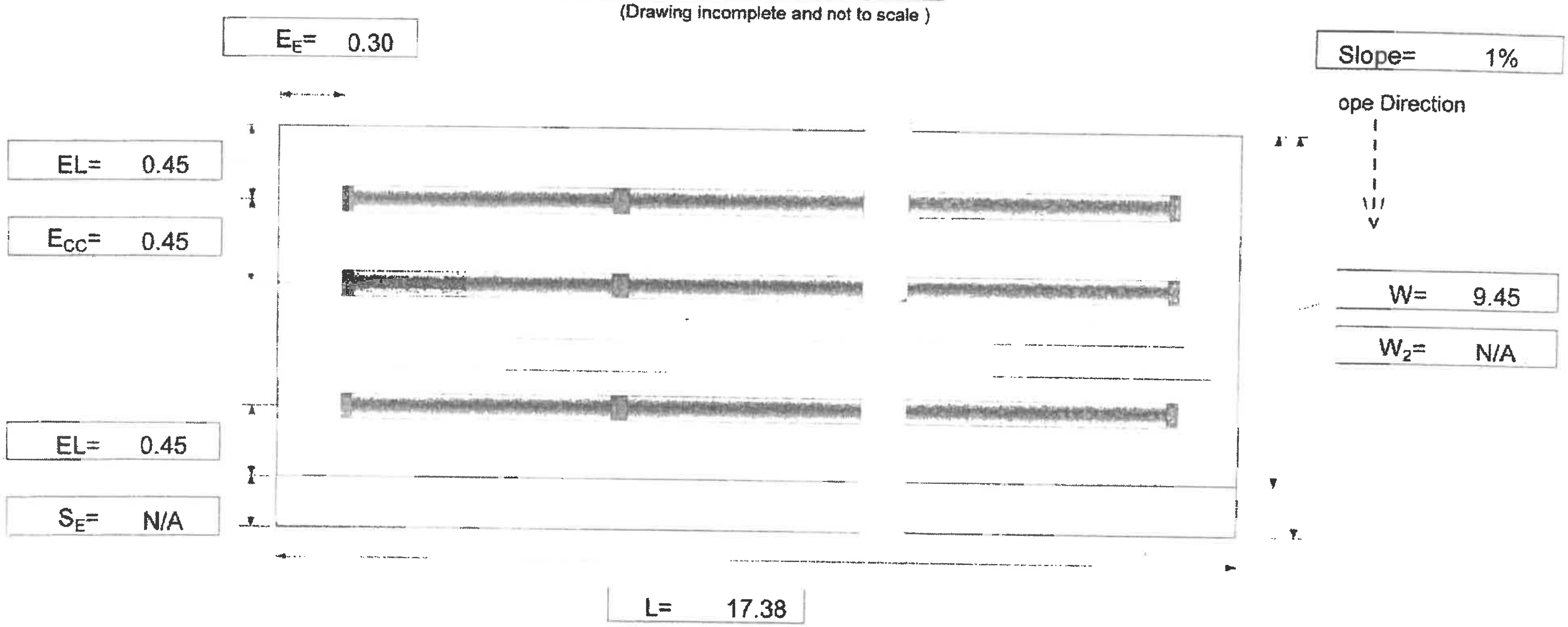
Element	Value	Units
Soil percolation time (T-Time)	6	Min/cm
Enviro-Septic System Design Flow	9900	L/d
Number of rows of Enviro-Septic Pipes	20	Rows
Number of Enviro-Septic Pipes per row	5.5	ESP
Total number of Enviro-Septic Pipes	110	ESP
Total length of Enviro-Septic Pipes	16.775	m
Number of sections	1	section(s)
Total Enviro-Septic Contact Area	164.2	m^2
Hydraulic Loading Rate (HLR)	60.3	$L/m^2.d$
Estimation of the Volume of System Sand Required	90.8	m^3
Estimation of the Volume of Imported Sand Required	0.0	m^3

Number of sections: 1

Legend	
D_S	Depth of receiving soil before limiting condition
E_{CC}	Center to Center Spacing
E_E	Extremity Extension Distance
E_L	Lateral Extension Distance
E_{L1}	Lateral Extension Distance Up-hill (Sloped system)
E_{L2}	Lateral Extension Distance Down-hill (Sloped system)
I_S	Thickness of imported sand layer
L	Length of one section of the Enviro-Septic System
S_D	Separation distance under the system
S_E	Sand Extension - Slope of more than 10%
S_{Min}	Minimum Vertical Separation distance form the base of the system to Rock, Clay or Water Table
W_1	Width of one section of the Enviro-Septic System
W_2	Width Enviro-Septic System with Sand Extension (when applicable)

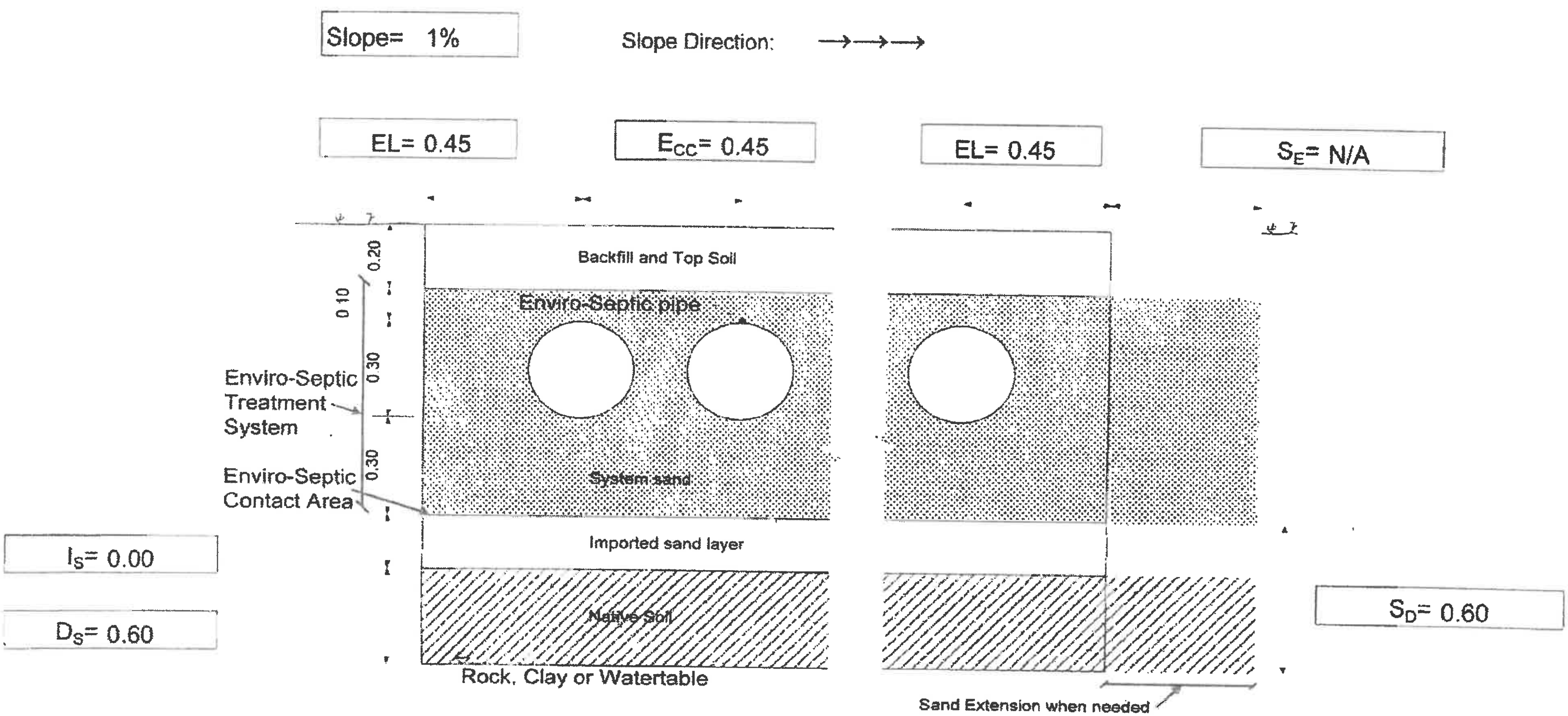
Top view of system (One section if multiple section system)

(Drawing incomplete and not to scale)



System Cross section (One section if multiple section system)

(Drawing incomplete and not to scale)



Attention: **The designer is responsible to conform to all applicable laws and to all Enviro-Septic design rules. This simulator is provided free of charge as a configuration development tool and the user understands that DBO Expert inc. cannot be held responsible for errors or omissions because of this service.**

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Ontario
Building Materials Evaluation Commission
Commission d'évaluation des matériaux de construction

Date of Authorization	July 26, 2001
BMEC Authorization Number	BMEC 01-08-260
BMEC Application	A2000-19
BMEC Application Number	A 2006-15
Date of Amendment	July 27, 2006

AUTHORIZATION REPORT – The Whitewater Area Bed System

1. Applicant

Delta Environmental Products
P.O. Box 969
Denham Springs, LA
USA, 70727

Tel: 800 219-9183
Fax: 225 664-9467

2. Manufacturing

Delta Environmental Products, Inc.
8285 Florida Blvd
Denham Springs, LA, USA, 70726

Canwest Tanks & Ecological Systems.
11975 Old Yale Road Surrey
BC, V3W 3X4

3. Description

The Whitewater Area Bed System primarily consists of a pre-treatment tank, a tertiary treatment unit, an effluent filter and an area bed.

Delta Environmental Products Inc.'s tertiary treatment units permitted for use with this system are referenced in the Supplementary Guidelines to the Building Code, as amended, as meeting tertiary quality effluent criteria, and include models FD 50 FF, DF 60 FF, DF 75 FF, DF 100 FF, DF 150 FF and DF 150 x 2.

An effluent filter is required downstream of the treatment unit. The specification of the effluent filter may vary depending on the area bed system design, and the filter models permitted for use with this Area Bed are located in Section 4.1. of this authorization.

The area bed is comprised of two parts: the stone layer and the sand layer. The sand layer of an area bed is sized in consideration of the soil it rests on, and under certain conditions it may be required to be laterally extended. This lateral sand extension is known as the mantle.

The effluent is sent to the stone layer, either by gravity or by a pump, via a pipe. This pipe leads from the treatment unit and terminates at the distribution box or header. From the distribution box or header, the effluent is sent to a series of perforated distribution pipes that run through the stone layer.

4. Authorization Requested

The applicant seeks to have the Whitewater Area Bed System, which incorporates a treatment unit designed so that the effluent meets the tertiary effluent quality criteria referenced in Table 8.6.2.2.A. of the Building Code, authorized for use as a Class 4 System that is connected to an absorption system other than the leaching bed as referred to in Article 8.6.1.2. of the Building Code.

5. Assessment

Reports and assessment provided by the applicant demonstrate that if the Whitewater Area Bed System is constructed, installed, operated, maintained and monitored in accordance with the limitations of the manufacturer specifications and conditions stated in this authorization, a level of performance equivalent to that required of a class 4 sewage systems will be provided.

The following reports were submitted and reviewed are:

1. Whitewater Systems Owners Manual, Models DF 50, DF 60, DF 75, DF100 or DF 150.
2. Technical Background Information Memo relating to Canwest Tanks & Ecological Systems dated September 18, 2000.
3. CAN/CSA-B66-00 - Prefabricated Septic Tanks and Sewage Holding Tanks, Plumbing Products and Materials - a National Standard of Canada.
4. Operations, Specifications & Test Data on the Free Access Sand Filter - July 1999, including a February 16, 1998, NSF International Report on the Delta Environmental Products Inc. DF-40M and Free Access Sand Filter. Tested under the provisions of ANSI/NSF Standard 40.
5. The "Supplemental (Canadian Version) Owner's / Operator's Manual" dated September 1999, which incorporates a schedule of required maintenance to be conducted on the system every six (6), twelve (12) and twenty four (24) months.

6. NSF International Report on the evaluation of Delta products Inc., model DF 40- Wastewater Treatment System.
7. Whitewater Installation Operation and Maintenance Manuals.
8. Whitewater Service / Maintenance Agreement.
9. Whitewater Inspection Work Order.
10. Whitewater Treatment Units Pre-treatment Sizes, dated July 17, 2006.
11. Sample Drawings, Gunnell Engineering Ltd, dated July 7, 2006.

6. Authorization

A. The Area Bed System is authorized as an equivalent to other Class 4 sewage systems as referenced to in Section 8.7. "Leaching Beds" of the Building Code; all other requirements pertaining to the design, installation and construction are subject to the regulations of the Building Code, and to the following terms and conditions.

1.0. Definitions

A word or phase used in this Authorization has the following meaning for the purposes of this Authorization:

Area Bed means the part of a leaching bed comprised of a stone layer and the underlying unsaturated sand layer intended to further treat and distribute the effluent, and does not include the area referred to as the mantle.

Contact Area means the area of infiltrative surface, directly below the area bed, required to absorb the treated effluent into the underlying native soil, but does not include the area where the mantle, if required, comes into contact with the native soil.

Extended Contact Area means the area of the sand bed, as extended, and mantle, where required, to meet the necessary lateral extension such that the effluent is absorbed into the underlying soil

Infiltrative Surface means the area of interface where effluent migrates downward from the sand layer of the area bed and, if necessary, the mantle and passes into the native soil or leaching bed fill.

Mantle means the lateral extension of the area bed using imported leaching bed fill having a T time of 15 min/cm or less, but does not include the area referred to as the area bed, necessary to provide an area of hydraulic catchments in any direction in which the effluent entering the leaching bed fill will move horizontally such that effluent is treated and absorbed.

Raised or Partially Raised Area Bed means a sewage system in which any part of the area bed is above the natural ground elevation.

Uniform Distribution means the even dispersal of effluent throughout all areas of an area bed and adjoining mantle, if required, as it migrates down from the stone layer to the underlying sand layer to either the native soil or mantle comprised of imported soil.

Vertical Separation means the depth of unsaturated soil below a leaching bed as measured from the bottom of the absorption trench or the bottom of the stone layer to a limiting surface such as high ground water table, rock or soil with a percolation time greater than 50 min/cm.

2.0 Installation Requirements

2.1. This Authorization is valid only for Delta Environmental Products Inc.

2.2. Only Delta Environmental Products Inc. manufacturer trained and authorized agents or employees shall install, maintain and service the area bed system.

2.3. The Area Bed System shall be installed as per the manufacturer's installation instructions.

2.4. The Service and Maintenance Agreement prescribed by Sentence 8.9.2.3.(2) of the Building Code requires that the persons authorized by the manufacturer to service and maintain Area Bed System and who have entered into the agreement with the person operating the treatment unit, and shall:

2.4.1. conduct and record at least once during every twelve month period, an inspection and servicing as specified by the manufacturer of the Delta treatment unit, and provide a copy to the person operating the Area Bed System;

2.4.2. provide a copy of the Delta Environmental Products operation and maintenance manual revised, to the person operating the Area Bed System and to the authority having jurisdiction at the time of the permit application;

2.4.3. conduct sampling and testing in accordance with the requirements of Clauses 8.9.2.4.(1)(a) and (b) of the Building Code;

2.4.3.1. once during the first 12 months after the Area Bed is put into use, and

2.4.3.2. thereafter, once during every 48 month period after the previous sampling has been completed.

2.4.4. promptly submit the sampling test results to the person operating the Area Bed System.

2.5. Delta Environmental Products Inc. shall retain records of the sampling test results for each Area Bed System received pursuant to the terms and conditions set out in 2.4. above, for a period of 10 years and shall promptly forward copies of those records to a chief building official upon request.

3.0 System Requirements

3.1. All pipe connections in the system (i.e. treatment units, accessory treatment units, tanks, pumps and filters) where incorporated, shall be flexible and watertight.

3.2. The Delta Environmental Products Inc. treatment units used in the system shall use the daily design flows as referenced in Table 3.2.1. "Daily Design Flow",

Table 3.2.1.
Daily Design Flow

Treatment Unit Models	Flow Range measured in Litres	Minimum Pre-treatment Tank Size measured in Litres
DF 50	850 to 1900	1140
DF 60	1900 to 2300	1140
DF 75	2300 to 2900	1360
DF 100	2900 to 3800	1810
DF 150	3800 to 5700	3400
DF 150 x 2	5700 to 10 000	6800
Column 1	Column 2	Column 3

4.0. Design

4.1. The Area Bed System treatment units shall be fitted with an a bottomless sand filter or a BK-2000 filter, except

4.1.1. where the distribution of the effluent to the area bed is pressurized, GAG Sim/Tech 100 micron pressure filter, model number STF-100 and STF-100AZ, or a 100 micron Vortex filter shall be used.

4.2. An absorption system comprised of a stone layer overlying a sand layer and having a total minimum depth of 500 mm, and:

4.2.1. the stone layer shall be a minimum depth of 200 mm, and

4.2.2. the sand layer shall be a minimum depth of 250 mm and have a percolation time of 6 to10 min/cm.

4.3. The stone layer required by 4.2. above, shall have a minimum area as specified by the manufacturer but not less than:

4.3.1. where the total daily design sanitary sewage flow does not exceed 3000 L, the area shall be such that the loading on the surface of the stone layer does not exceed 75 L/m² per day, or

4.3.2. where the total daily design sanitary sewage flow exceeds 3000 L, the area shall be such that the loading on the surface of the stone layer does not exceed 50 L/m² per day.

4.4. The stone layer shall be rectangular in shape, with the long dimension parallel to the site contours.

4.5. The stone layer required by the terms and conditions set out in 4.2. above, shall be protected with a permeable geo-textile fabric in such a manner so as to prevent soil or leaching bed fill from entering the stone.

4.6. The bottom of the stone layer shall be at all points vertically separated at least 600 mm from the high ground water table, rock or soil with a T time of 6 or less, or greater than 50 min/cm; except:

4.6.1. where the underlying soil has a T time of between 6 and 50 min/cm, the bottom of the stone layer at all points may be reduced to 450 mm to rock, high water table, and soil having a T time of 50 min/cm.

4.7. The effluent shall be evenly distributed over the stone layer to within 600 mm of the perimeter edge of the stone layer using distribution pipes in accordance with the Building Code Appendix A-8.7.5.3.(2); or other means that achieves even distribution to within 600 mm of the perimeter edge of the stone layer.

4.8. The sand layer shall have a minimum area that is the greater of;

4.8.1. the area of the stone layer required by the terms and conditions set out in 4.4. above,

4.8.2. where the sand layer is installed in soil having a T time of 15 min/cm or less, the loading rate at the base of the area bed, shall be calculated using the formula $A = QT/850$ ($L/m^2/day$), or

4.8.3. where the sand layer is installed in or on soil having a T time of greater than 15 min/cm, that the sand layer be extended using imported leaching bed fill having a T time of not more than 15 min/cm, the construction of the extended sand layer, including the area bed and mantle shall:

4.8.3.1. be of a depth of at least 250 mm,

4.8.3.2. extend at least 15 m beyond the perimeter of the treatment unit, or distribution pipes if utilized, in any direction that the effluent entering the soil will move horizontally,

4.8.3.3. be calculated using the formula A = QT/400 or by using the example calculations as they are provided, in Table 4.8.3.3. "Combined Area Bed and Mantle Loading Rates", and

4.8.3.4. be rectangular in shape.

Where:

A is the area of contact in m^2 between the base of the sand layer and the underlying native soil,
Q is the total daily design sanitary sewage flow in litres, and
T is the percolation time of the underlying native soil in min/cm to a maximum of 50.

Table 4.8.3.3.

Combined Area Bed and Mantle Loading Rates Example Calculations

Loading Rate A = QT/400	
T of the native soil.	Loading rate (L/m^2/day)
≤ 15	27
20	20
30	13
40	10
≥50	8
Column 1	Column 2

(c) the Applicant, or the material, system or building design that is the subject matter of this Authorization, has failed to comply with any of the terms and conditions set out in this Authorization; or

(d) any Building Code provision relevant to this Authorization has been amended or remade.

5. Where the BMEC receives additional information concerning the material, system or building design authorized herein, the BMEC may review this Authorization and the BMEC may after the review amend or revoke this Authorization as in the opinion of the BMEC may be necessary.

Dated at Toronto this 27 day of July 2006.

BUILDING MATERIALS EVALUATION COMMISSION

Edward Link, P. Eng.
Vice-Chair, BMEC

4.9. Any Area Bed System that must be raised to meet the vertical separation distances required by the terms and conditions set out in 4.6. of this Authorization, shall meet the mantle requirements of the terms and conditions set out in 4.8., regardless of the T time of the native soil.

B.General Conditions

1. The use of the Area Bed System and as described in the specific terms and conditions set out in 6.A. must comply with the *Building Code Act, 1992* (the "Act") as amended or re-enacted from time to time and except as specifically authorized herein, with the Building Code.

2. A copy of this Authorization shall accompany each application for a building permit and shall be maintained on the site of the construction with the building permit.

3. The Applicant named in Part 1 hereof shall promptly notify the BMEC of:

   (a) the failure of the Applicant, or of the material, system or building design that is the subject matter of this Authorization, to comply with any of the terms and conditions set out in 6.A. above; or

   (b) the occurrence of any of the events described in conditions 6.B.4.(a) and (b)(ii) below.

4. The BMEC may amend or revoke this Authorization where it determines that:

   (a) any change has been made to:

      (i) the material, system or building design that is the subject matter of this Authorization;

      (ii) the address of the applicant specified in Part 1 of this Authorization; or,

      (iii) the ownership of the applicant specified in Part 1 of this Authorization.

   (b) the use of the material, system or building design authorized herein;

      (i) does not comply with the Act any relevant legislation as they may be amended or re-enacted from time to time; or

      (ii) provides an unsatisfactory level of performance, in situ.

Stormceptor Sizing Detailed Report

PCSWMM for Stormceptor

Project Information

Date	23/07/2015
Project Name	12 Unit Residential
Project Number	013-286
Location	Vars

Stormwater Quality Objective

This report outlines how Stormceptor System can achieve a defined water quality objective through the removal of total suspended solids (TSS). Attached to this report is the Stormceptor Sizing Summary.

Stormceptor System Recommendation

The Stormceptor System model STC 300 achieves the water quality objective removing 85% TSS for a Fine (organics, silts and sand) particle size distribution and 99% runoff volume.

The Stormceptor System

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for all rainfall events, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Stormceptor is the only oil and sediment separator on the market sized to remove TSS for a wide range of particle sizes, including fine sediments (clays and silts), that are often overlooked in the design of other stormwater treatment devices.

Small storms dominate hydrologic activity, US EPA reports

"*Early efforts in stormwater management focused on flood events ranging from the 2-yr to the 100-yr storm. Increasingly stormwater professionals have come to realize that small storms (i.e. < 1 in. rainfall) dominate watershed hydrologic parameters typically associated with water quality management issues and BMP design. These small storms are responsible for most annual urban runoff and groundwater recharge. Likewise, with the exception of eroded sediment, they are responsible for most pollutant washoff from urban surfaces. Therefore, the small storms are of most concern for the stormwater management objectives of ground water recharge, water quality resource protection and thermal impacts control.*"

"*Most rainfall events are much smaller than design storms used for urban drainage models. In any given area, most frequently recurrent rainfall events are small (less than 1 in. of daily rainfall).*"

"Continuous simulation offers possibilities for designing and managing BMPs on an individual site-by-site basis that are not provided by other widely used simpler analysis methods. Therefore its application and use should be encouraged."

– US EPA Stormwater Best Management Practice Design Guide, Volume 1 – General Considerations, 2004

Design Methodology

Each Stormceptor system is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology from up-to-date local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective.

The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing (summary of analysis presented in Appendix 2):

- Site parameters
- Continuous historical rainfall, including duration, distribution, peaks (Figure 1)
- Interevent periods
- Particle size distribution
- Particle settling velocities (Stokes Law, corrected for drag)
- TSS load (Figure 2)
- Detention time of the system

The Stormceptor System maintains continuous positive TSS removal for all influent flow rates. Figure 3 illustrates the continuous treatment by Stormceptor throughout the full range of storm events analyzed. It is clear that large events do not significantly impact the average annual TSS removal. There is no decline in cumulative TSS removal, indicating scour does not occur as the flow rate increases.

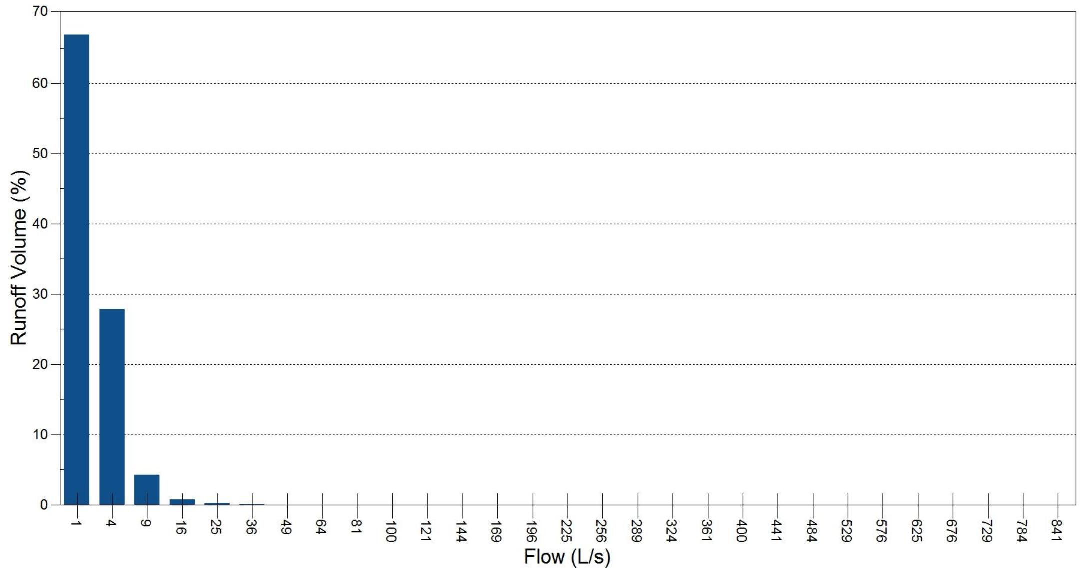


Figure 1. Runoff Volume by Flow Rate for OTTAWA MACDONALD-CARTIER INT'L A – ON 6000, 1967 to 2003 for 0.61 ha, 41% impervious. Small frequent storm events represent the majority of annual rainfall volume. Large infrequent events have little impact on the average annual TSS removal, as they represent a small percentage of the total annual volume of runoff.

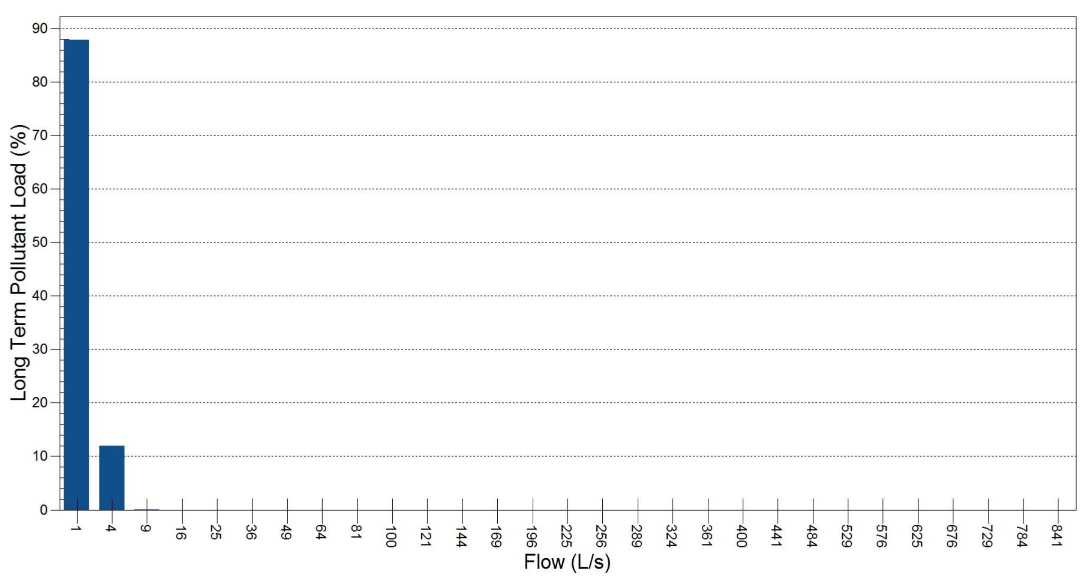
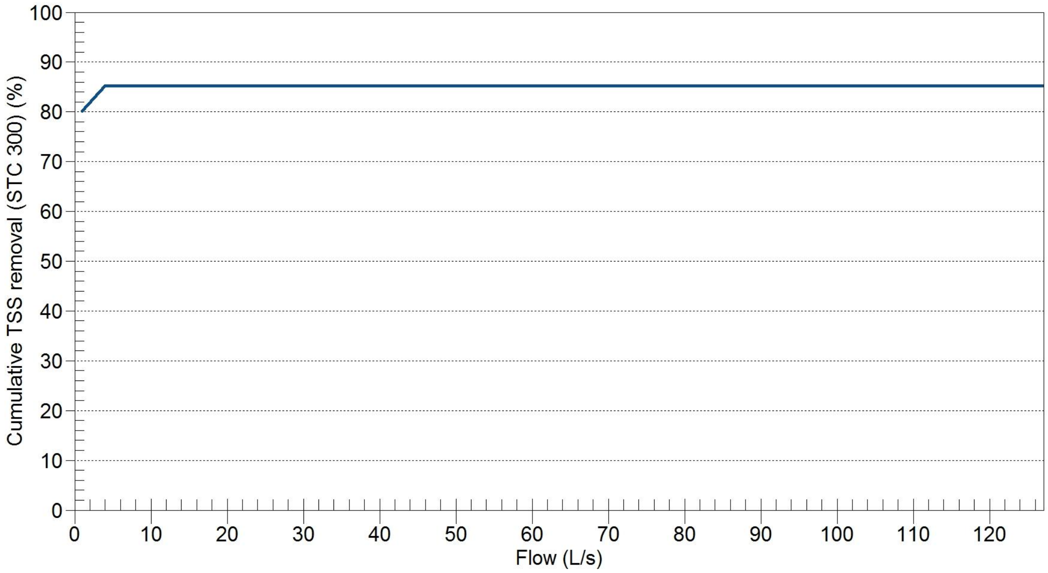


Figure 2. Long Term Pollutant Load by Flow Rate for OTTAWA MACDONALD-CARTIER INT'L A – 6000, 1967 to 2003 for 0.61 ha, 41% impervious. The majority of the annual pollutant load is transported by small frequent storm events. Conversely, large infrequent events carry an insignificant percentage of the total annual pollutant load.



Stormceptor Model	STC 300	Drainage Area (ha)	0.61
TSS Removal (%)	85	Impervious (%)	41

Figure 3. Cumulative TSS Removal by Flow Rate for OTTAWA MACDONALD-CARTIER INT'L A – 6000, 1967 to 2003. Stormceptor continuously removes TSS throughout the full range of storm events analyzed. Note that large events do not significantly impact the average annual TSS removal. Therefore no decline in cumulative TSS removal indicates scour does not occur as the flow rate increases.

Stormceptor®

Appendix 1
Stormceptor Design Summary

Project Information

Date	23/07/2015
Project Name	12 Unit Residential
Project Number	013-286
Location	Vars

Designer Information

Company	A. Dagenais
Contact	Michael

Notes

N/A

Drainage Area

Total Area (ha)	0.61
Imperviousness (%)	41

The Stormceptor System model STC 300 achieves the water quality objective removing 85% TSS for a Fine (organics, silts and sand) particle size distribution and 99% runoff volume.

Rainfall

Name	OTTAWA MACDONALD-CARTIER INT'L A
State	ON
ID	6000
Years of Records	1967 to 2003
Latitude	45°19'N
Longitude	75°40'W

Water Quality Objective

TSS Removal (%)	80
Runoff Volume (%)	95

Upstream Storage

Storage (ha-m)	Discharge (L/s)
0.000	00.000
0.013	33.070

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %	Runoff Volume %
STC 300	**85**	**99**
STC 750	89	100
STC 1000	90	100
STC 1500	90	100
STC 2000	92	100
STC 3000	93	100
STC 4000	94	100
STC 5000	94	100
STC 6000	96	100
STC 9000	97	100
STC 10000	97	100
STC 14000	98	100

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s
20	20	1.3	0.0004					
60	20	1.8	0.0016					
150	20	2.2	0.0108					
400	20	2.65	0.0647					
2000	20	2.65	0.2870					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor version 1.0
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 300 is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 750 to STC 6000 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 300	STC 750 to STC 6000	STC 9000 to STC 14000
Single inlet pipe	75 mm	25 mm	75 mm
Multiple inlet pipes	75 mm	75 mm	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Imbrium Systems Inc., 1-800-565-4801.

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Appendix 2
Summary of Design Assumptions

SITE DETAILS

Site Drainage Area

Total Area (ha)	0.61	Imperviousness (%)	41

Surface Characteristics

Width (m)	156
Slope (%)	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (mm/h)	61.98
Min. Infiltration Rate (mm/h)	10.16
Decay Rate (s^{-1})	0.00055
Regeneration Rate (s^{-1})	0.01

Evaporation

Daily Evaporation Rate (mm/day)	2.54

Maintenance Frequency

Sediment build-up reduces the storage volume for sedimentation. Frequency of maintenance is assumed for TSS removal calculations.

Maintenance Frequency (months)	12

Dry Weather Flow

Dry Weather Flow (L/s)	No

Upstream Attenuation

Stage-storage and stage-discharge relationship used to model attenuation upstream of the Stormceptor System is identified in the table below.

Storage ha-m	Discharge L/s
0.000	00.000
0.013	33.070

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PARTICLE SIZE DISTRIBUTION

Particle Size Distribution

Removing fine particles from runoff ensures the majority of pollutants, such as heavy metals, hydrocarbons, free oils and nutrients are not discharged into natural water resources. The table below identifies the particle size distribution selected to define TSS removal for the design of the Stormceptor System.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s
20	20	1.3	0.0004					
60	20	1.8	0.0016					
150	20	2.2	0.0108					
400	20	2.65	0.0647					
2000	20	2.65	0.2870					

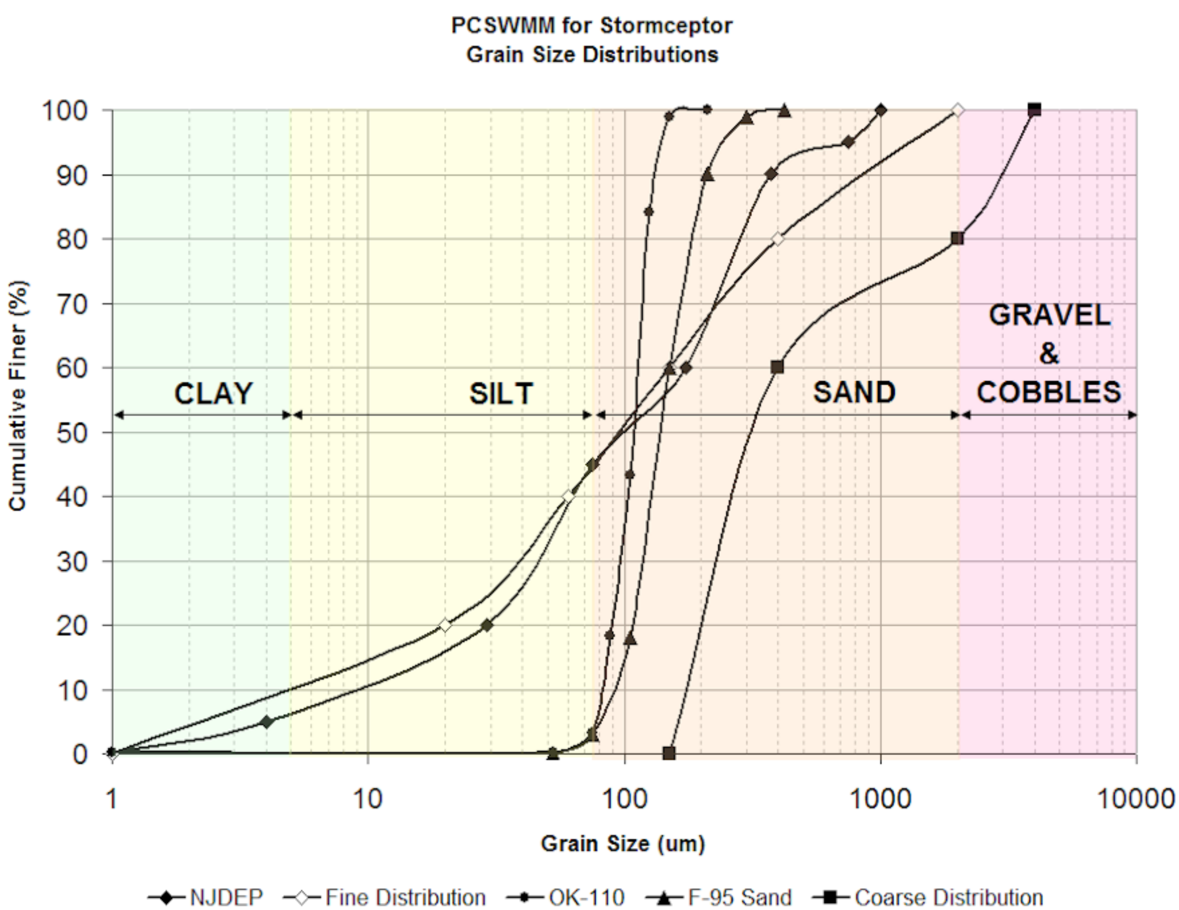


Figure 1. PCSWMM for Stormceptor standard design grain size distributions.

TSS LOADING

TSS Loading Parameters

TSS Loading Function	Buildup / Washoff

Parameters

Target Event Mean Concentration (EMC) (mg/L)	125
Exponential Buildup Power	0.4
Exponential Washoff Exponential	0.2

HYDROLOGY ANALYSIS

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of the Stormceptor System are based on the average annual removal of TSS for the selected site parameters. The Stormceptor System is engineered to capture fine particles (silts and sands) by focusing on average annual runoff volume ensuring positive removal efficiency is maintained during all rainfall events, while preventing the opportunity for negative removal efficiency (scour).

Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

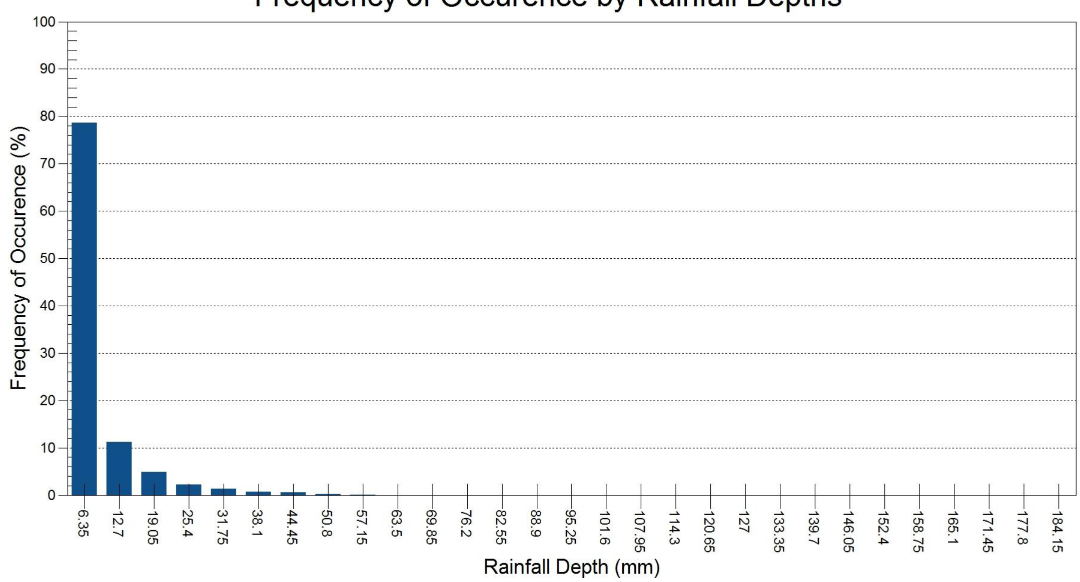
Rainfall Station

Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A		
Rainfall File Name	ON6000.NDC	Total Number of Events	4537
Latitude	45°19'N	Total Rainfall (mm)	20978.1
Longitude	75°40'W	Average Annual Rainfall (mm)	567.0
Elevation (m)		Total Evaporation (mm)	753.2
Rainfall Period of Record (y)	37	Total Infiltration (mm)	12338.5
Total Rainfall Period (y)	37	Percentage of Rainfall that is Runoff (%)	37.8

Rainfall Event Analysis

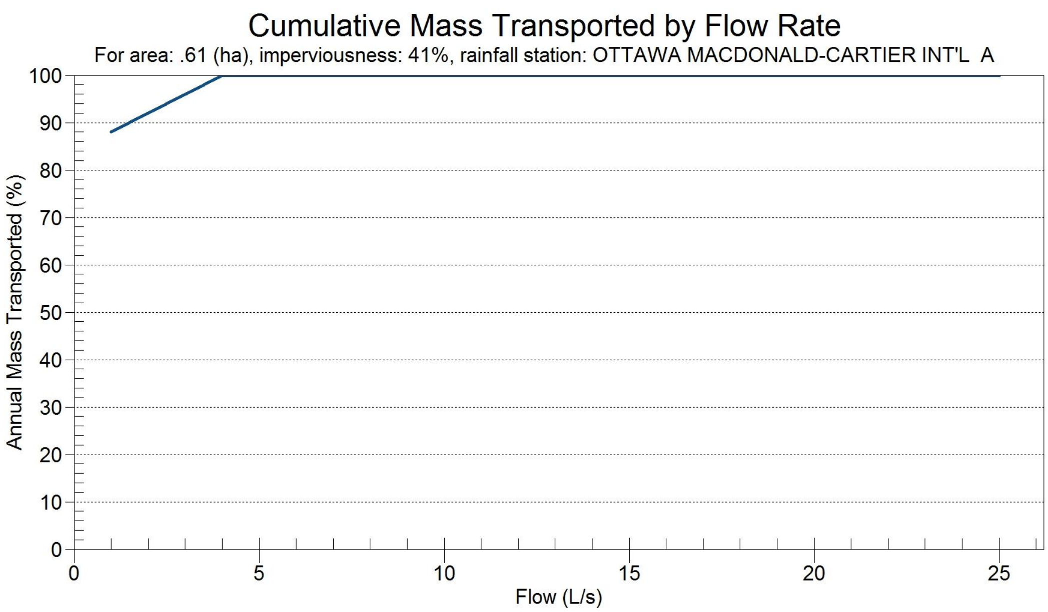
Rainfall Depth mm	No. of Events	Percentage of Total Events %	Total Volume mm	Percentage of Annual Volume %
6.35	3564	78.6	5671	27.0
12.70	508	11.2	4533	21.6
19.05	223	4.9	3434	16.4
25.40	102	2.2	2244	10.7
31.75	60	1.3	1704	8.1
38.10	33	0.7	1145	5.5
44.45	28	0.6	1165	5.6
50.80	9	0.2	416	2.0
57.15	5	0.1	272	1.3
63.50	1	0.0	63	0.3
69.85	1	0.0	64	0.3
76.20	1	0.0	76	0.4
82.55	0	0.0	0	0.0
88.90	1	0.0	84	0.4
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0
107.95	0	0.0	0	0.0
114.30	1	0.0	109	0.5
120.65	0	0.0	0	0.0
127.00	0	0.0	0	0.0
133.35	0	0.0	0	0.0
139.70	0	0.0	0	0.0
146.05	0	0.0	0	0.0
152.40	0	0.0	0	0.0
158.75	0	0.0	0	0.0
165.10	0	0.0	0	0.0
171.45	0	0.0	0	0.0
177.80	0	0.0	0	0.0
184.15	0	0.0	0	0.0
190.50	0	0.0	0	0.0
196.85	0	0.0	0	0.0
203.20	0	0.0	0	0.0
209.55	0	0.0	0	0.0
>209.55	0	0.0	0	0.0

Frequency of Occurence by Rainfall Depths



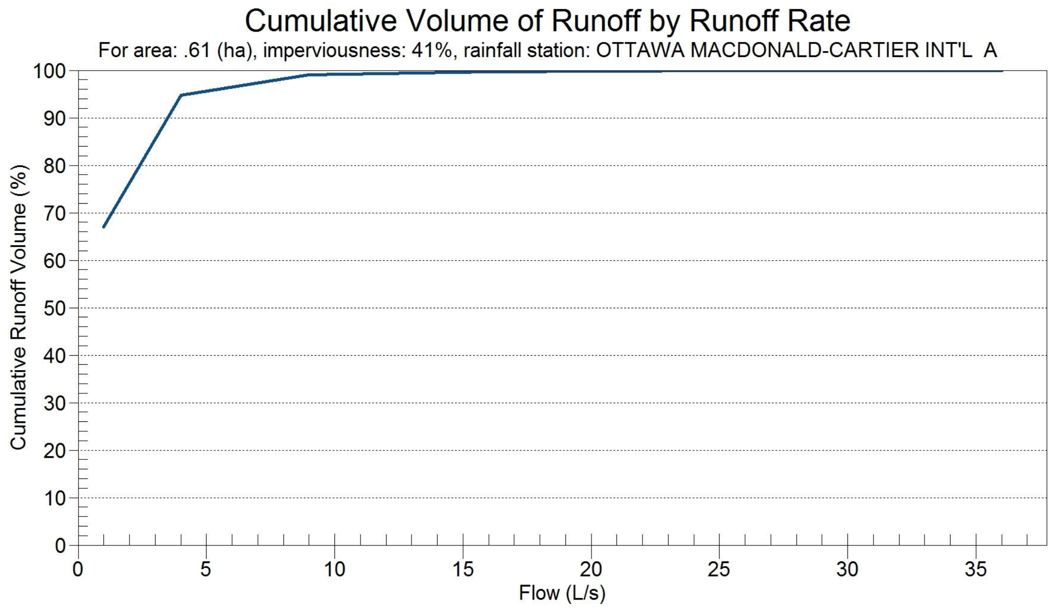
Pollutograph

Flow Rate L/s	Cumulative Mass %
1	88.0
4	99.9
9	100.0
16	100.0
25	100.0
36	100.0
49	100.0
64	100.0
81	100.0
100	100.0
121	100.0
144	100.0
169	100.0
196	100.0
225	100.0
256	100.0
289	100.0
324	100.0
361	100.0
400	100.0
441	100.0
484	100.0
529	100.0
576	100.0
625	100.0
676	100.0
729	100.0
784	100.0
841	100.0
900	100.0



Cumulative Runoff Volume by Runoff Rate

Runoff Rate L/s	Runoff Volume m³	Cumulative Runoff Volume %
1	32431	67.0
4	45913	94.8
9	47960	99.0
16	48310	99.7
25	48408	99.9
36	48433	100.0
49	48433	100.0
64	48433	100.0
81	48433	100.0
100	48433	100.0
121	48433	100.0
144	48433	100.0
169	48433	100.0
196	48433	100.0
225	48433	100.0
256	48433	100.0
289	48433	100.0
324	48433	100.0
361	48433	100.0
400	48433	100.0
441	48433	100.0
484	48433	100.0
529	48433	100.0
576	48433	100.0
625	48433	100.0
676	48433	100.0
729	48433	100.0
784	48433	100.0
841	48433	100.0
900	48433	100.0

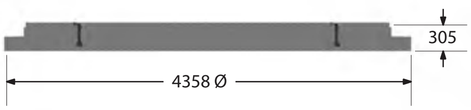


M CON Products Inc.
2150 Richardson Side Road
Carp, ON K0A 1L0
Tel: 1-800-267-5515
Email: SalesCarp@mconproducts.com

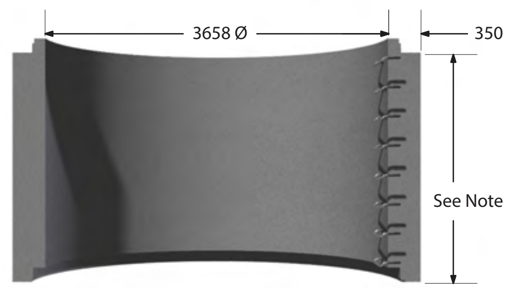
M CON Pipe & Products Inc.
2691 Greenfield Road
Ayr, ON N0B 1E0
Tel: 1-866-537-3338
Email: SalesAyr@mconproducts.com

Plan

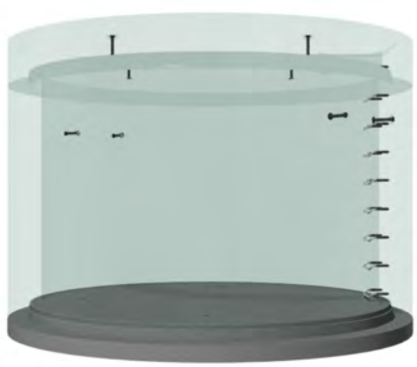
Plan



Section A-A



Section B-B



Base Slab

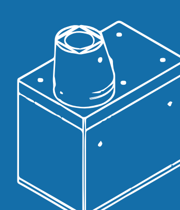
(mass - 10140 kg)

Riser

(mass - 10808 kg/m)

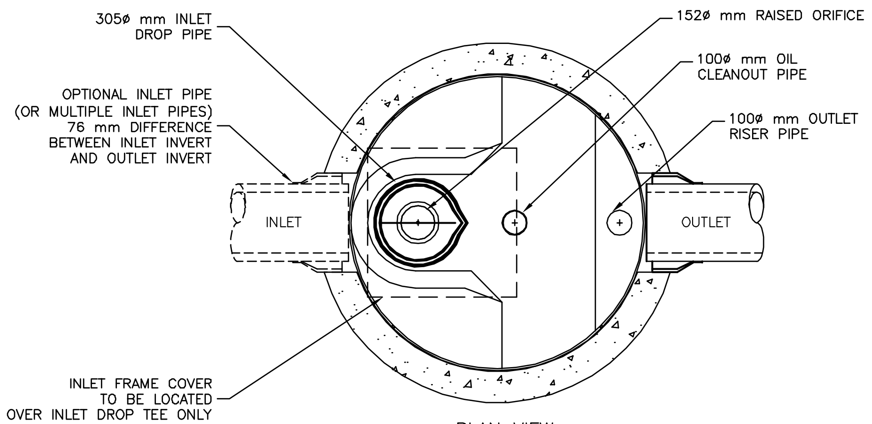
Maintenance Hole 3600mm Riser and Base Slab

Notes
1. Manufactured in accordance with OPSD 701.081.
2. See page 43 for maximum pipe size and alignment angles.
3. Available riser section heights - 305, 610, 914, 1219, 1524, 1829, and 2440.
4. Maintenance hole steps (circular hollow aluminum) as per OPSD 405.010.
5. All dimensions are in millimeters unless otherwise shown.

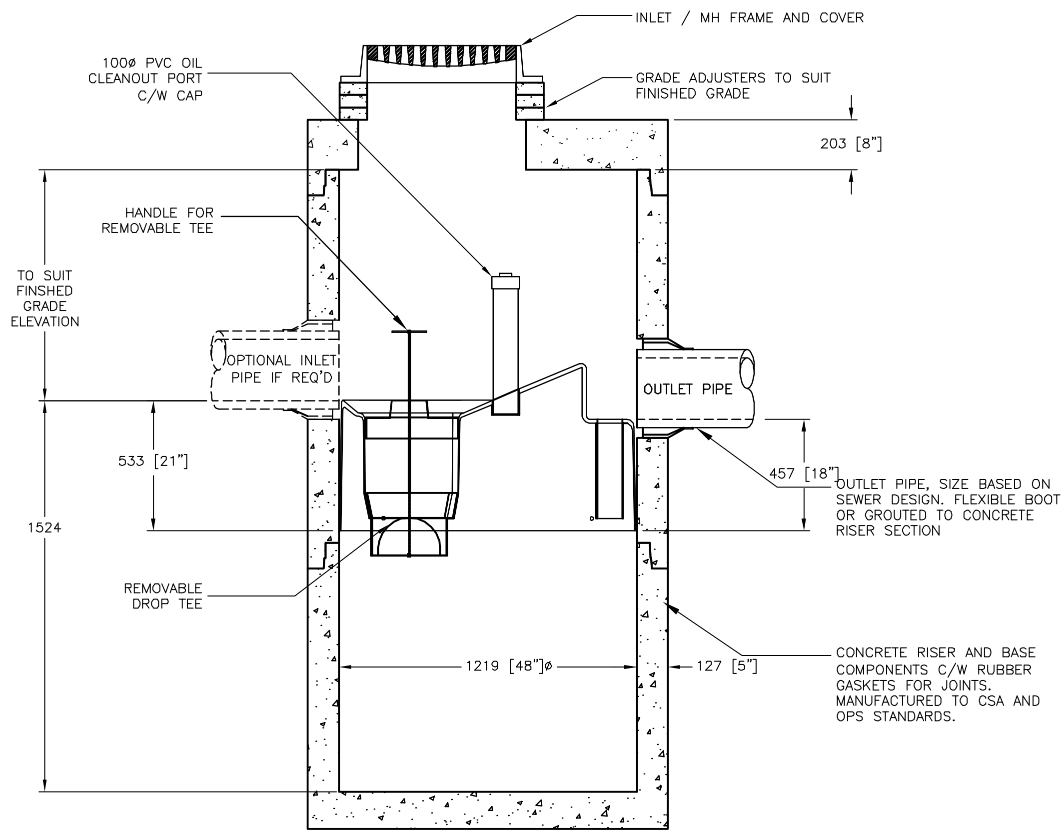


DRAWING NOT TO BE USED FOR CONSTRUCTION

THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS:
United States Patent No. 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690 • 7,582,216 • 7,666,303 | Australia Patent No. 693,164 • 707,133 • 729,096 • 779,401 • 289,647 • 2008,279,378 • 2008,288,900 | Canadian Patent No. 2,009,280 • 2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 | Indonesian Patent No. 007058 | Japan Patent No. 3581233 • 9-11476 | Korea Patent No. 10-1451593 • 0519212 | Malaysia Patent No. 118987 | New Zealand Patent No. 314,646 • 583,583 • 583,008 | South African Patent No. 2010/00683 • 2010/01796 |



PLAN VIEW



SECTION VIEW

Stormceptor®

imbrium®
WWW.IMBRIUMSYSTEMS.COM
407 FAIRVIEW DRIVE, WHITBY, ON L1N 3A9
TF 800-565-4801 CA 416-960-9900 INTL +1-416-960-9900

STC 300i
STANDARD MODEL

####

REV #	DATE	REVISION DESCRIPTION	BY

SHEET NUMBER 1 OF 1

DATE: ######## | SCALE: 30 | PROJECT No.: ##### | DRAWN: ### | CHECKED: ###

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AESTHETICS & PERFORMANCE

The look, size a durability of massive natural stone with the long-term performance of a fully engineered, structural wall

ReCon Retaining Wall Systems

ReCon Retaining Wall Systems, Inc. is an industry leader in supplying aesthetically pleasing and structurally superior retaining wall solutions. ReCon focuses on providing value to its customer, including:

- Engineering and testing for tall gravity walls and taller geogrids walls.
- Solutions that accommodate wall needs rather than dictate them.
- Durability (wet-cast, air-entrained).
- Product shape and size choices that work.

Let us bring value to your project.

Features and Benefits:

- **Large Size and Mass**
- **Tall Gravity Walls**
  - Unique tongue-and-groove lock-and-placement design, combined with massive size and weight, permits wall heights up to 20+ ft. (6m) without reinforcing geogrid. Eliminates the time and cost associated with excavation and soil replacement when reinforcing geogrid is required.
  - Significantly taller ReCon Walls can be built by incorporating geogrids, setback or tiers.
- **Durability**
  - Made of wet-cast, air-entrained concrete with a minimum psi of 4,000 (28 MPa). The durability required in environments prone to the challenges of freeze/thaw cycles, road salts or brackish water.
- **Faster Installation**
  - Walls can be constructed quickly using equipment generally available to contractors (skid steers or backhoes), maximizing productivity and minimizing manual labor. No mortar, no pins.
- **Engineered and Tested**
  - A ReCon Wall can be professionally engineered and designed (using shear and geogrid connection data unique to ReCon) for wall performance that is generally unavailable for natural stone walls. ReCon walls also meet the ASTM C1776 specification for Wet-Cast Precast Modular Retaining Wall Units.
- **Customized Design and Aesthetics**
  - The natural stone finish has several different textures, which prevents repetition in the overall wall pattern. Stains are readily available and easily applied in the field after installation to achieve a natural look that will last for years.
  - Block comes in multiple depths, to optimize design efficiency by providing the mass when required or eliminating it when not required to save material and freight cost.
  - Tapered block design allows both inside and outside 90-degree corners or curves.
  - Caps or special top units that allow greenscape within four inches of the finished wall's face are available for top-of-wall finishing options.

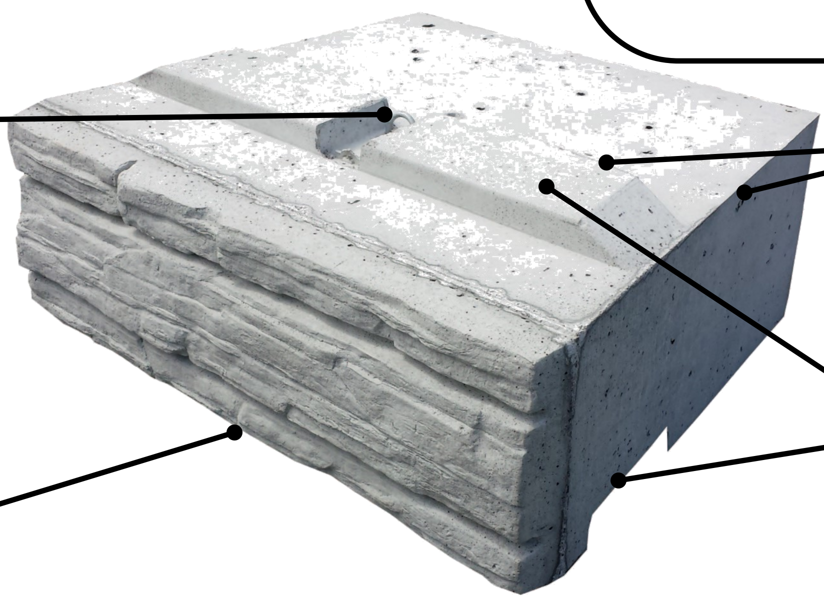
Block Specifications

- **Block Face:** 5.33 sq. ft. ($0.5m^2$), or 48 in. x 16 in. (120 cm x 40 cm)
- **Available Depths:** 24”, 39”, 45”, 60”, 66”, 72”, 78”, 84” (60, 100, 115, 150, 170, 185, 200 or 210 cm)
- **Mass:** 1,000 to 4100 pounds (450 kg to 1900 kg) per block.
- **Concrete:** Minimum of 4,000 psi (28MPa)
- **Lifting Device:** Lifting insert loop
- **Turning Radius:** Approximately 15 feet (4.5 m) (varies with wall height)
- **Retaining Wall Batter:** 3.6 degrees automatically built into the system. Can be adjusted to 7.2 degrees with the use of field-installed spacers. Can be adjusted from 9 to 26 degrees with the use of the ReCon Channel Block.

Texture & Color Options

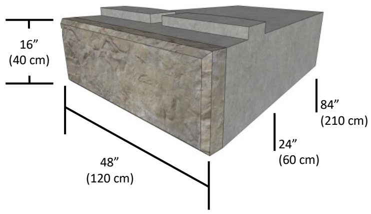
ReCon block is available in a Weathered Edge Pattern. Natural stone finishes have several different textures, which prevents repetition in the overall wall pattern. Stains are readily available and easily applied in the field to achieve a natural look that will last for years.

Full Block

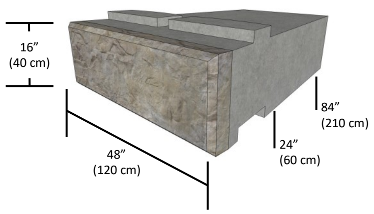


Block Shapes

FULL BASE BLOCK

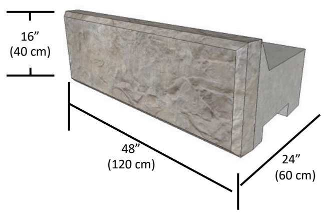


FULL MIDDLE BLOCK



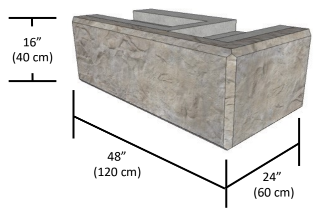
FULL TOP BLOCK

Top of block is recessed (starting behind the 4” (11 cm) texture on top of block at the face). Permits planting of sod to within 4” (11 cm) of front of the retaining wall.



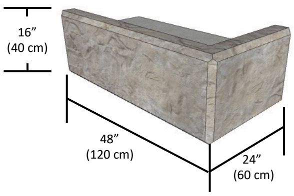
REVERSIBLE CORNER BLOCK

90° corners.

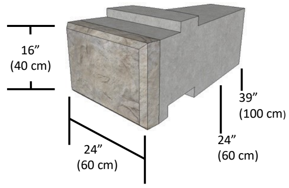


CORNER TOP BLOCK

Top of block is recessed.

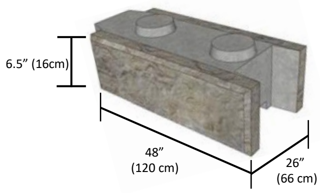


HALF BLOCK



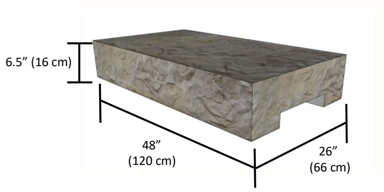
FENCE BLOCK

Double sided facing, tongue and groove on ends.



CAPSTONE

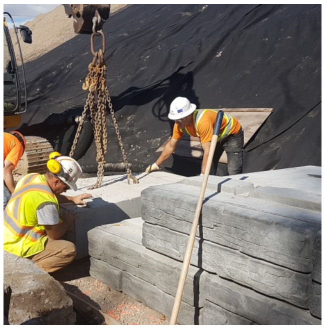
Alternate top-of-wall treatment used in lieu of full top block.



Engineering and Installation Guidelines

Design and Specification

A ReCon wall requires a site-specific design and analysis prepared by a registered professional engineer. ReCon has a comprehensive set of tools to aid architects and engineers in the specification and design of a ReCon Wall.



Blocks being set in place with a backhoe and chain.

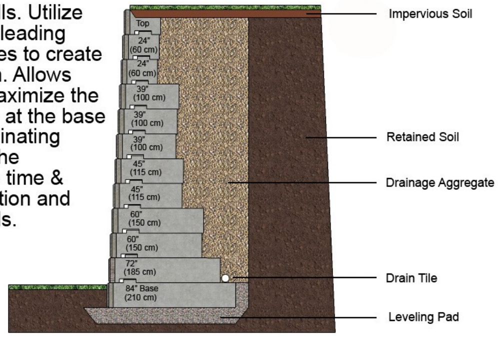
Installation Steps**

- Excavate and prepare soil foundation.
- Prepare leveling pad: A level and compacted base is essential for proper wall installation.
- Install and level base course: Individual blocks are then set in place using the lifting insert loop. The lifting insert loop is attached to a cable suspended from a backhoe or other lifting equipment.
- Drain tile
- Drainage aggregate
- Install additional courses.
- Place geogrids (if required).
- Install additional courses.
- Backfill and compact.
- Check compaction regularly.

For more product and installation information on the ReCon Wall system, please contact Boyd Bros Concrete or visit us on the web at www.reconwalls.com to find a supplier in your area.

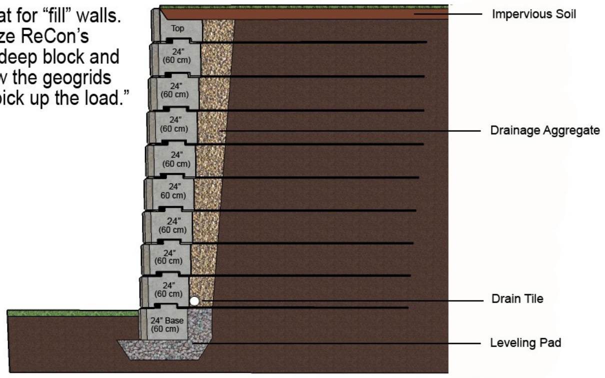
Typical Gravity Retaining Wall Section

Great for "cut" walls. Utilize ReCon's Industry leading block depth choices to create an efficient design. Allows the designer to maximize the usable real estate at the base of the wall by eliminating geogrids. Allows the contractor to save time & money on excavation and compaction of soils.



Typical Geogrid Retaining Wall Section

Great for "fill" walls. Utilize ReCon's 24" deep block and allow the geogrids to "pick up the load."



**The installation steps represent a basic outline for a ReCon Wall installation and are not meant to serve as a complete construction or installation guide. Every ReCon Wall must be designed by a registered professional engineer. Design and other industry professionals can view online or download a complete ReCon design and construction reference manual at www.reconwalls.com.

ReCon Block is produced and marketed pursuant to a license agreement with ReCon Wall Systems, Inc., 7600 West 27th St., #229, St. Louis Park, MN 55426.
Patents issued: US 6,829,867 B2 and US 7,341,685 B2.

bb boyd bros concrete products

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