Site Servicing & Stormwater Management Report

Commercial Development

3850 Cambrian Road

Ottawa, Ontario

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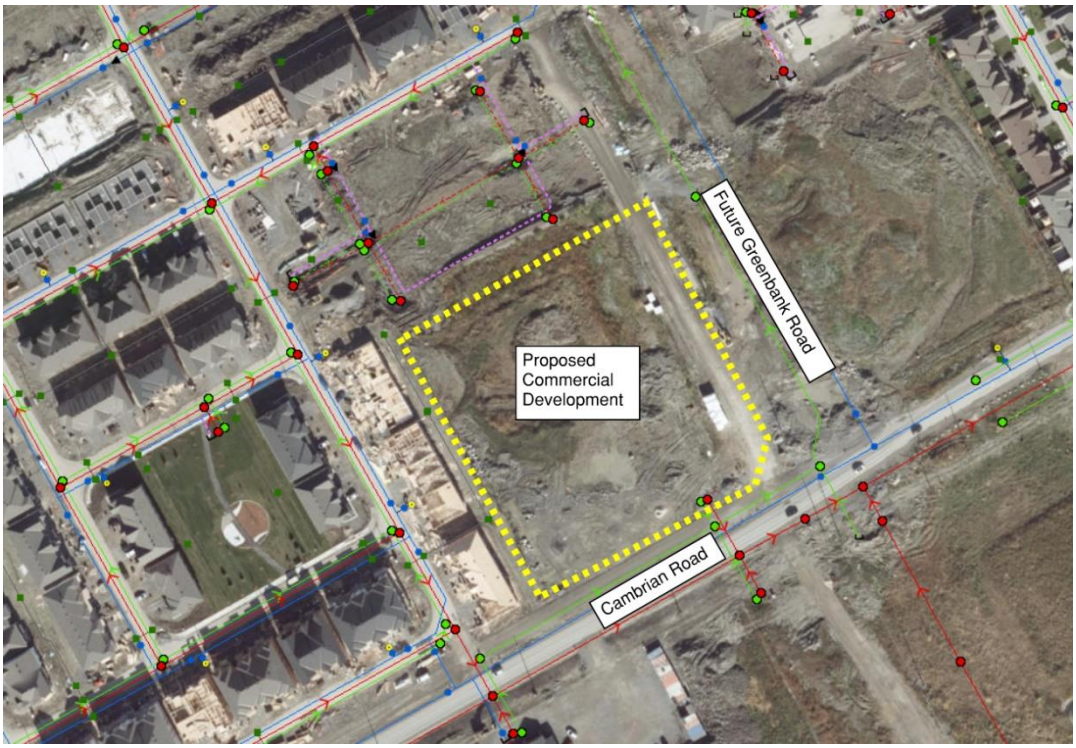
1.0 INTRODUCTION

Parsons Inc. was retained by Choice Properties Limited Partnership to provide engineering services for a new commercial development located at 3850 Cambrian Road in Ottawa, Ontario.

The site encompasses a total area of approximately 1.36 ha and is bordered by residential developments to the north and west, Cambrian Road to the south and the future re-aligned Greenbank Road to the east as shown on the following figure.

The proposed development includes the addition of a retail store and three other commercial rental units on the same lot. Servicing of the buildings will be provided by the new on-site storm sewers, sanitary services, and new water services from Cambrian Road. New fire hydrants will be added on-site to provide exterior fire protection.

Figure 1 – Site Context



2.0 PURPOSE

This report summarizes the proposed site servicing, grading and drainage design, documents the proposed method of attenuating stormwater runoff from the subject site, and deals with erosion and sediment control measures to be undertaken during construction.

Stormwater management items addressed include the following:

- establishing the allowable post-development release rate from the site;
- calculating the post-development runoff from the site;
- determining the required on-site stormwater storage volume and storage areas.

3.0 EXISTING CONDITIONS

The subject site is currently vacant. The proposed commercial development is part of the Half Moon Bay West Subdivision. As mentioned earlier, on the east site of the proposed development, will be the future re-aligned Greenbank Road. Currently, there is no access to the subject site from Greenbank Road. Cambrian Road is currently the only access to the subject site. Cambrian Road will be widened as part of the new Greenbank Road project. Addition of sidewalks and bike lanes is also proposed as part of this future project. A new 1500mm storm sewer, 500mm sanitary sewer and 400mm watermain have been installed in 2019 along Cambrian Road and will be used to provide services to the proposed commercial development. There is also a 400mm watermain and 2550mm storm sewer installed within the future Greenbank Road right-of-way. A 750mm storm service, 200mm sanitary service and a 200mm water service have also been installed in 2019 up to the property line to service this future development from Cambrian Road. Refer to **Drawing C101** for more details.

According to the geotechnical investigation report for this development, by GeoTerre Limited dated February 17, 2023, soil condition on this site consists of up to 3m of organic material fill with an underlayer of between 15m and 20m of weak silty clay “Leda Clay”. Also, the groundwater table is estimated at an elevation of 92.0m. Existing site surface elevation varies between 92.19m and 95.11m.

4.0 PROPOSED DEVELOPMENT

As shown on the Architectural Site Plan, the proposed development will consist of a new 1576 m^2 retail store (Building A) and three commercial rental units of 576 m^2 (Building B), 799 m^2 (Building C) and 418 m^2 (Building D). Building A and Building B are considered as two different units, however they do share the same foundation and finished floor elevation. The finished floor elevation of Building A and B is set at 93.92m, Building C at 94.0m and Building D at 94.20m. Each building is considerably higher than the estimated groundwater table elevation. The proposal will also include parking spaces, concrete sidewalks, concrete curbs, a new entrance from Cambrian Road and two entrances from the future Greenbank Road.

The site grading will match the existing conditions along the residential properties on the north and west side of the subject site. Grading along Cambrian Road and future Greenbank Road will be coordinated with the future project to plan a smooth transition in the future, however at this time the grading will tie-in to existing conditions.

5.0 STORMWATER MANAGEMENT PLAN

Drawing C106, appended to this report, depicts the boundaries of the post-development drainage areas, and should be read in conjunction with this report.

The design approach for the stormwater management is to ensure that the post-development peak flows do not exceed the allowable release rate to mitigate the risk of flooding and against erosion. The City of Ottawa indicated that the allowable release rate for this site was determined in the *Design Brief for the Half Moon Bay West Phase 1, prepared by DSEL, dated September 5, 2018*. Correspondence with the City can be found in **Appendix F**. The storm sewers installed as part of this new subdivision project are sized to allow a flow of **316.1 L/s** for the proposed commercial development. Parameters used to calculate the allowable release rate are from the DSEL report.

- Runoff Coefficient (C) = 0.80
- Drainage Area (A) = 1.36 ha
- Time of Concentration (Tc) = 10min

The Rational Method formula has been used to calculate stormwater runoff and rainfall data is based on the IDF curve equations from the *Ottawa Sewer Design Guidelines, Second Edition, October 2012.*

Q = 2.78 CIA, where:

Q = Flow rate (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr)
A = Area (ha)

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

Using the Rational Method formula and the above parameters, the allowable post-development release rate for this site is **316.1 L/s**.

5.1 Pre-Development Conditions

As mentioned earlier, the subject site is currently vacant. Based on the topographical survey received, the site grading is higher on the edge of the future Greenbank Road and the lowest point is located on the south-west border of the site near Cambrian Road. A drainage ditch used to flow through this site, however this ditch was abandoned as part of the construction of new infrastructure along Cambrian Rd and future Greenbank Rd. Existing roadside ditch along Cambrian Rd is currently collecting runoff from the road and is intercepted by a temporary ditch inlet connected to the existing 1500mm storm sewer. Services for this property were installed in 2019. A Storm catch basin maintenance hole (CBMH) with a 750m pipe was installed at the property line along Cambrian Rd and collects stormwater runoff from this site.

5.2 Post-Development Conditions

As mentioned earlier, proposed building A and B are considered as two different unit, thus separate services for each unit will be provided. All roof areas will be controlled with roof drain systems. Each building will have a separate roof drain outlet.

The following is a description of each drainage areas through the site, refer to **Drawing C106** attached to this report.

- Areas WS-01 to WS-04 consist of the controlled roof areas;
- Area WS-05 is the entrance from Cambrian Rd as well as the patio of building C;
- Areas WS-06 to WS-10 consist of the main parking lot area;
- Areas WS-11 and WS-12 are the grassed area and garbage disposal area between building C and D;
- Area WS-13 is the proposed swale on the corner the Cambrian and future Greenbank intersection, located behind the future Greenbank sidewalk;
- Area WS-14 consist of the proposed swale/grassed area between the building A and the future Greenbank sidewalk;
- Areas WS-15 to WS-17 consist of the area behind building A and B including the loading dock and proposed entrance from future Greenbank Rd.

Since this project will be constructed before the new re-aligned Greenbank Rd, the grading of the site must match existing surface elevations at the property line while also considering the future Greenbank Rd project proposed sidewalk and road profile. Due to the important variation in grades between existing conditions and future conditions along Cambrian Rd and Greenbank Rd, grading along the property lines of the residential homes, Cambrian Rd and future Greenbank will match existing condition with a maximum slope of 3H:1V. This means that a small portion of this site will drain uncontrolled towards the public right of way. The uncontrolled area of this site is estimated at 0.046 ha and generates a flow of 4.7 L/s and 10.0 L/s for the 5-year and 100-year storm event respectively.

All other areas on-site will be captured though a new on-site storm sewer system.

For the purpose of calculating the average runoff coefficients for the post-development areas, the following guidelines were used:

- Landscaped surfaces (grass, trees, shrubs, etc.) C = 0.20
- Impervious surfaces (asphalt, concrete, pavers, rooftops, etc.) C = 0.90
- The runoff coefficient for 100-year event is increased by 25% based on the Ottawa Sewer Design Guidelines.

Appendix A "Stormwater Management Calculations" provides a summary of the post-development areas and average runoff coefficients.

An inlet control device (ICD) is required to control the flows from the site to the allowable release rate of **316.1 L/s** for the 100-year post development storm event. The equivalent storage to attenuate the 100-year post-development flow has been calculated to be **112.2 m³** in addition to the rooftop storage provided on each building. The required storage will be provided by the storm pipes, the structures and by new proposed underground storage chambers. The calculations are shown in **Appendix A**.

Storage requirements to attenuate the 100-year post-development flow rate are given below:

5.2.1 100-year Site Storage Requirements

The 100-year post-development flow will be captured within the subsurface storage system. Below grade storage will be provided by storm structures, pipes, and mainly underground storm chambers. All roof areas will also be controlled to provide additional storage. The design will utilize **112.2 m³** of storage in the underground storage system. The proposed system is the StormTech SC-310 or equivalent, see **Appendix E** for specifications. The bottom of the proposed chambers is set above the estimated groundwater table elevation (92.0m). Perforated subdrains will be placed on the perimeter of the storm chambers, directly above the elevation 92.0m to collect infiltration from the chambers and redirect it to the storm outlet.

As the uncontrolled area of the site generates a flow of 10.0 L/s for the 100-year storm event, the allowable discharge at the proposed ICD located in the existing CMBH is limited at **306.0 L/s**. The design head was calculated as the delta in height between the centre of the orifice and the hydraulic grade line (HGL) for the 100-year event within the underground storage chambers which is equivalent to the 100-year storage elevation. The orifice outlet flow has been calculated based on the MTO Drainage Management Manual, Part 3, Chapter 8, p.127:

- Qorifice (m^3/s) = $C_dA(2gH)^{0.5}$

  where:
  C_d = coefficient of discharge (0.62)
  A = Area of orifice opening in m^2
  g = acceleration due to gravity (9.81 m/s^2)
  H = difference in height between 2y HGL and centre of the orifice in metres

See **Appendix A** for detailed pipe outlet calculations and **Drawing C104** for ICD detail.

The **Table 1** lists all the requirements for the manufacturer to design the appropriate ICD.

Table 1 - ICD Schedule

ICD ID	Location	Outlet Diameter (mm)	Flow 5y/100y (L/s)	Head 5y/100y (m)	Equivalent Diameter (mm)	Model
1	EX. CBMH	750	274.6/306.0	2.05/2.55	300	FRAME & PLATE

6.0 STORM SEWERS AND STORMWATER MANAGEMENT SYSTEM

6.1 Storm Sewers

Calculations showing the storm sewer capacities are appended to this report under **Appendix B** "Storm Sewer Computation Forms". The storm sewer design spreadsheet is based on the Rational Method and Manning formula and was used to calculate the design flow and required pipe sizes. Capacity required for proposed storm sewers is based on the 5-year rainfall intensity obtained from the Ottawa Sewer Design Guidelines, where T_c is the time of concentration:

- I_5 (mm/hr) = $998.071/(T_c+6.053)^{0.814}$

Drawing C106 shows the proposed drainage areas. Details including pipe lengths, sizes, materials, inverts elevations and structure types are shown on **Drawing C102**.

6.2 Stormwater Management System

As mentioned above, the Stormwater Management system includes an ICD in existing CBMH that will control the flow to a maximum of **306.0 L/s**. The total allowable discharge from the site is **316.1 L/s** including uncontrolled areas. Any additional flow will be store on-site using underground storage chambers and the piping system. The site stormwater runoff ultimately discharges to the Jock River. There is no on-site stormwater quality treatment required as the runoff from the site is conveyed to the Clarke Pond before discharging in the Jock River. The Clarke Pond was designed and constructed to provide a minimum of 80% TSS removal for all stormwater generated from the Half Moon Bay West Subdivision.

7.0 SANITARY SEWER

The new commercial units within the proposed development will be served with a new on-site sanitary system. Each building will have its own sanitary service. The on-site sanitary system will be connected to the existing sanitary maintenance hole previously installed for this future development located at the property line along Cambrian Road. The peak sanitary flow for the proposed commercial development is calculated to be **0.61 L/s**, including infiltration. The sanitary load calculations can be found in **Appendix C**. The additional flow from the commercial development to the municipal sanitary sewer was accounted for in the Half Moon Bay Subdivision design. Thus, the capacity of the downstream sanitary sewer is considered adequate. The Sanitary Sewer Computation Sheet is included in **Appendix B**. Details concerning the existing and proposed pipe lengths and locations are shown on the site servicing plan.

8.0 WATER SERVICING

Water servicing and fire protection for the proposed commercial development will be provided by a new on-site 200mm watermain connected to the existing 400mm watermain on Cambrian Road. Two new fire hydrants will be installed on-site to provide exterior fire protection, as a fire hydrant located within 75m of a bulding can provide a maximum fire flow of 95 L/s and the maximum fire flow required on-site is **100 L/s**. Details regarding the new and existing watermain service connection pipe size and location are shown on **Drawing C102**. Buildings A and B are exepcted to have interior sprinklers systems, thus the water services for these building will be a 200mm diameter. Buildings C and D are not expected to have sprinkler systems, only 50mm services will be provided.

The water demands for the proposed development are listed in **Table 2.** The fire flow was calculated using the Fire Underwriters Survey (FUS, 2020) method. Calculation details can be found in **Appendix C.**

Table 2 - Building Water Demands and Fire Flow

	Average Daily Demand (L/s)	Max Daily Demand (L/s)	Peak Hourly Demand (L/s)	Fire Flow Demand (L/s)	Max Daily + Fire Flow Demand (L/s)
Building A	0.05	0.08	0.14	100	100.08
Building B	0.02	0.03	0.05	50	50.03
Building C	0.03	0.04	0.07	100	100.04
Building D	0.01	0.02	0.04	83	83.02

Boundary conditions were obtained from the City on March 27, 2023, and are presented in **Appendix F**. Based on the information received, a water model was created using WaterCad to confirm that the proposed watermain and fire hydrants were able to provide domestic and fire flow demands while maintaining adequate pressure in the system. The water model shows that the proposed system has the required capacity to provide domestic and fire protection demands. However, for the average day demand, the pressure in the system is over 550 kPa (80 psi) meaning that every building water connection will require water pressure reducing valve installed directly downstream of the water meter inside the building. Water model results are shown in **Appendix D**.

9.0 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

To mitigate the impacts due to erosion and sedimentation during construction, erosion and sediment control measures shall be installed and maintained throughout the duration of construction.

Measures shall only be removed once the construction activities are complete, and the site has stabilized.

The measures will include but are not limited to:

- Siltsack® shall be installed between the frame and cover of existing and new catchbasins and maintenance holes, to minimize sediments entering the storm drainage system.
- All grassed areas must be completed prior to the removal of the Siltsack® in catch basins and maintenance holes.
- Light Duty Silt Fence Barriers placed around the perimeter of the site where necessary, installed and maintained according to OPSS 577 and OPSD 219.110.
- Construction mud mat at site entrance along Cambrian Rd to minimize the amount of mud carried out of the site.

Refer to **Drawing C101** notes for more details.

10.0 CONCLUSIONS

The 100-year storm event peak flow will be controlled to an allowable discharge of **316.1 L/s**. Stormwater storage is provided up to and including the 100-year storm in underground chambers and on building rooftops prior to discharging to the municipal storm sewer system. On-site stormwater quality treatment is not required as this site is part of the area serviced by the Clarke Pond.

The water servicing of the building addition will be provided by a new on-site 200mm watermain with two new fire hydrants. The maximum fire flow of the four proposed building was estimated at **100 L/s**. A water model was used to confirm that adequate pressure in the system could be maintained during a fire flow demand. However, pressure in the City system during average day demands is too high and will trigger the addition of pressure reducing valves inside the buildings.

The sanitary servicing of the site will be provided by an on-site sanitary sewer connected to the existing 500mm sanitary along Cambrian Rd. The peak sanitary flow for the proposed development, including infiltration, is calculated to be **0.61 L/s**.

Grading and drainage measures will ensure proper drainage of the site, while erosion and sediment control measures will minimize downstream impacts due to construction activities.

We look forward to receiving approval of this report and the appended plans from the City of Ottawa in order to proceed with construction of the site.

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Appendix A:
Stormwater Management Calculations

TABLE I - ALLOWABLE RUNOFF CALCULATIONS BASED ON EXISTING CONDITIONS

Area Description	Area (ha)	Time of Conc, Tc (min)	Minor Storm			
				I_5 (mm/hr)	C_{AVG}	Q_{ALLOW} (L/s)
EWS-01	1.36	10	Storm = 5 yr	104.19	0.80	**316.1**
TOTAL	1.36					**316.1**

Allowable Capture Rate is based the Design Brief for the Half Moon Bay West Phase 1, prepared by DSEL, Project #16-888, dated September 5, 2018

5-year Storm $C_{ASPH/ROOF/CONC}$ = 0.90 C_{GRASS} = 0.20
100-year Storm $C_{ASPH/ROOF/CONC}$ = 1.00 C_{GRASS} = 0.25

TABLE II - POST-DEVELOPMENT AVERAGE RUNOFF COEFFICIENTS

Watershed Area No.	Impervious Areas (m^2)	A * C_{ASPH}	Pervious Areas (m^2)	A * C_{GRASS}	Sum AC	Total Area (m^2)	$C_{AVG\ (5yr)}$	$C_{AVG(100yr)}$
WS-01*	1576.00	1418	0.00	0	1418	1576	0.90	1.00
WS-02*	594.00	535	0.00	0	535	594	0.90	1.00
WS-03*	800.00	720	0.00	0	720	800	0.90	1.00
WS-04*	418.00	376	0.00	0	376	418	0.90	1.00
WS-05	330.00	297	112.00	22	319	442	0.72	0.90
WS-06	1000.00	900	102.00	20	920	1102	0.84	1.00
WS-07	1809.00	1628	75.00	15	1643	1884	0.87	1.00
WS-08	868.00	781	75.00	15	796	943	0.84	1.00
WS-09	916.00	824	47.00	9	834	963	0.87	1.00
WS-10	710.00	639	32.00	6	645	742	0.87	1.00
WS-11	186.00	167	70.00	14	181	256	0.71	0.89
WS-12	17.00	15	63.00	13	28	80	0.35	0.44
WS-13	0.00	0	88.00	18	18	88	0.20	0.25
WS-14	0.00	0	346.00	69	69	346	0.20	0.25
WS-15	850.00	765	463.00	93	858	1313	0.65	0.82
WS-16	1173.00	1056	228.00	46	1101	1401	0.79	0.98
WS-17	232.00	209	0.00	0	209	232	0.90	1.00
WS-Unc**	100.00	90	359.00	72	162	459	0.35	0.44
Total	11247		1701		10463	13639		

* Roof top storage Areas
**Uncontrolled Areas

TABLE III - TOTAL RUNOFF COEFFICIENT FOR CONTROLLED AREAS (EXCLUDING ROOF TOP AREAS)

$C_{AVG(5yr)}$ = Sum AC / Total Area = **7 622 / 9 792** = **0.78** $C_{AVG(100yr)}$ = **0.97**

TABLE IV - SUMMARY OF POST-DEVELOPMENT RUNOFF

Area No	Area (ha)	Storm = 5 yr				Storm = 100 yr			
		I_5 (mm/hr)	$C_{AVG(5yr)}$	Q_{GEN} (L/s)	Q_{CONT} (L/s)	I_{100} (mm/hr)	$C_{AVG(100yr)}$	Q_{GEN} (L/s)	Q_{CONT} (L/s)
WS-01*	0.158	104.19	0.90	41.1		178.56	1.00	78.2	
WS-02*	0.059	104.19	0.90	15.5		178.56	1.00	29.5	
WS-03*	0.080	104.19	0.90	20.9		178.56	1.00	39.7	
WS-04*	0.042	104.19	0.90	10.9		178.56	1.00	20.7	
WS-05	0.044	104.19	0.72	9.3		178.56	0.90	19.8	
WS-06	0.110	104.19	0.84	26.7		178.56	1.00	54.7	
WS-07	0.188	104.19	0.87	47.6		178.56	1.00	93.5	
WS-08	0.094	104.19	0.84	23.1		178.56	1.00	46.8	
WS-09	0.096	104.19	0.87	24.2	**274.6**	178.56	1.00	47.8	**306.0**
WS-10	0.074	104.19	0.87	18.7		178.56	1.00	36.8	
WS-11	0.026	104.19	0.71	5.3		178.56	0.89	11.3	
WS-12	0.008	104.19	0.35	0.8		178.56	0.44	1.7	
WS-13	0.009	104.19	0.20	0.5		178.56	0.25	1.1	
WS-14	0.035	104.19	0.20	2.0		178.56	0.25	4.3	
WS-15	0.131	104.19	0.65	24.8		178.56	0.82	53.2	
WS-16	0.140	104.19	0.79	31.9		178.56	0.98	68.3	
WS-17	0.023	104.19	0.90	6.0		178.56	1.00	11.5	
WS-Unc**	0.046	104.19	0.35	4.7	**4.7**	178.56	0.44	10.0	**10.0**
Total	1.364			313.8	**279.3**			629.142	**316.1**

* Roof top storage Areas
$I_5 = 998.071 / (Tc+6.053)^{0.814}$
$I_{100} = 1735.688 / (Tc+6.014)^{0.820}$
Time of concentration (min), Tc = 10 mins

Table V - Storage Volumes (5-Year and 100-Year Storm Events)

Site Storage Requirement

C_{AVG} = 0.78 (5-year)
C_{AVG} = 0.97 (100-year)
Time Interval = 5 (mins)
Drainage Area = 0.979 (hectares)

	Release Rate = 274.6 (L/sec)						Release Rate = 306.0 (L/sec)					
	Return Period = 5 (years)						Return Period = 100 (years)					
	IDF Parameters, A = 998.071 , B = 0.814						IDF Parameters, A = 1735.688 , B = 0.820					
	$I = A/(T_c+6.199)^B$						$I = A/(T_c+6.014)^B$					
Duration (min)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Peak Flow from Roof (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Peak Flow from Roof (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	-	-	-	-	-	-	-	-	-	-	-	-
5	141.2	299.1	15.3	274.6	39.8	11.9	242.7	642.8	20.0	306.0	356.8	107.1
10	104.2	220.8	15.3	274.6	-38.6	-23.1	178.6	472.9	20.0	306.0	186.9	112.2
15	83.6	177.1	15.3	274.6	-82.3	-74.1	142.9	378.5	20.0	306.0	92.5	83.2
20	70.3	148.9	15.3	274.6	-110.5	-132.6	120.0	317.7	20.0	306.0	31.7	38.0
25	60.9	129.0	15.3	274.6	-130.3	-195.5	103.8	275.1	20.0	306.0	-10.9	-16.4
30	53.9	114.3	15.3	274.6	-145.1	-261.1	91.9	243.3	20.0	306.0	-42.7	-76.8
35	48.5	102.8	15.3	274.6	-156.5	-328.7	82.6	218.7	20.0	306.0	-67.3	-141.3
40	44.2	93.6	15.3	274.6	-165.7	-397.7	75.1	199.0	20.0	306.0	-87.0	-208.7
45	40.6	86.1	15.3	274.6	-173.3	-467.8	69.1	182.9	20.0	306.0	-103.1	-278.4
50	37.7	79.8	15.3	274.6	-179.6	-538.7	64.0	169.4	20.0	306.0	-116.6	-349.8
55	35.1	74.4	15.3	274.6	-184.9	-610.2	59.6	157.9	20.0	306.0	-128.1	-422.7
60	32.9	69.8	15.3	274.6	-189.5	-682.3	55.9	148.0	20.0	306.0	-138.0	-496.6
65	31.0	65.8	15.3	274.6	-193.6	-754.9	52.6	139.4	20.0	306.0	-146.6	-571.6
70	29.4	62.2	15.3	274.6	-197.1	-827.8	49.8	131.9	20.0	306.0	-154.1	-647.3
75	27.9	59.1	15.3	274.6	-200.2	-901.1	47.3	125.2	20.0	306.0	-160.8	-723.8
80	26.6	56.3	15.3	274.6	-203.1	-974.7	45.0	119.2	20.0	306.0	-166.8	-800.8
85	25.4	53.8	15.3	274.6	-205.6	-1048.5	43.0	113.8	20.0	306.0	-172.2	-878.4
90	24.3	51.5	15.3	274.6	-207.9	-1122.5	41.1	108.9	20.0	306.0	-177.1	-956.4
95	23.3	49.4	15.3	274.6	-210.0	-1196.8	39.4	104.4	20.0	306.0	-181.6	-1034.9
100	22.4	47.5	15.3	274.6	-211.9	-1271.2	37.9	100.4	20.0	306.0	-185.6	-1113.7
105	21.6	45.7	15.3	274.6	-213.6	-1345.7	36.5	96.7	20.0	306.0	-189.3	-1192.8
110	20.8	44.1	15.3	274.6	-215.2	-1420.4	35.2	93.2	20.0	306.0	-192.8	-1272.3
115	20.1	42.6	15.3	274.6	-216.7	-1495.3	34.0	90.1	20.0	306.0	-195.9	-1352.0
120	19.5	41.3	15.3	274.6	-218.1	-1570.2	32.9	87.1	20.0	306.0	-198.9	-1431.9
Max =						**11.9**						**112.2**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A
2) Rainfall Intensity, $I_5 = A/(Tc+6.053)^B$ & $I_{100} = A/(Tc+6.014)^B$
3) Release Rate = LESSER of Min (Release Rate, Peak Flow) - Minus 100 Year Flow Of Uncontroled Areas OR Pipe Outlet Capacity
4) Storage Rate = Peak Flow - Release Rate
5) Storage = Duration x Storage Rate
6) Maximium Storage = Max Storage Over Duration

Table VI - Storage Volumes (5-Year and 100-Year Storm Events)

Storage Requirement for Roof Area Building A

C_{AVG} =	0.90	(5-year)		
C_{AVG} =	1.00	(100-year)	Zurn Z105 Control-Flo Single Notch	
Time Interval =	5	(mins)	Number of Drains =	4
Drainage Area =	0.039	(hectares) per drain	Total Release Rate 5 year =	**6.28 L/s**
	394	(sqm) per drain	Total Release Rate 100 year =	**8.18 L/s**

	Release Rate = **1.57** (L/sec) per drain Return Period = 5 (years) IDF Parameters, A = 998.071 , B = 0.814 $I = A/(T_c+6.053)^B$					Release Rate = **2.04** (L/sec) per drain Return Period = 100 (years) IDF Parameters, A = 1735.688 , B = 0.820 $I = A/(T_c+6.014)^B$				
Duration (min)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	-	-	-	-	-	-	-	-	-	-
5	141.2	13.9	1.6	12.3	3.7	242.7	26.6	2.0	24.5	7.4
10	104.2	10.3	1.6	8.7	5.2	178.6	19.6	2.0	17.5	10.5
15	83.6	8.2	1.6	6.7	6.0	142.9	15.7	2.0	13.6	12.2
20	70.3	6.9	1.6	5.4	6.4	120.0	13.1	2.0	11.1	13.3
25	60.9	6.0	1.6	4.4	6.6	103.8	11.4	2.0	9.3	14.0
30	53.9	5.3	1.6	3.7	6.7	91.9	10.1	2.0	8.0	14.4
35	48.5	4.8	1.6	3.2	6.7	82.6	9.0	2.0	7.0	14.7
40	44.2	4.4	1.6	2.8	6.7	75.1	8.2	2.0	6.2	14.8
45	40.6	4.0	1.6	2.4	6.6	69.1	7.6	2.0	5.5	14.9
50	37.7	3.7	1.6	2.1	6.4	64.0	7.0	2.0	5.0	14.9
55	35.1	3.5	1.6	1.9	6.2	59.6	6.5	2.0	4.5	14.8
60	32.9	3.2	1.6	1.7	6.0	55.9	6.1	2.0	4.1	14.7
65	31.0	3.1	1.6	1.5	5.8	52.6	5.8	2.0	3.7	14.5
70	29.4	2.9	1.6	1.3	5.6	49.8	5.5	2.0	3.4	14.3
75	27.9	2.7	1.6	1.2	5.3	47.3	5.2	2.0	3.1	14.1
80	26.6	2.6	1.6	1.0	5.0	45.0	4.9	2.0	2.9	13.8
85	25.4	2.5	1.6	0.9	4.7	43.0	4.7	2.0	2.7	13.6
90	24.3	2.4	1.6	0.8	4.5	41.1	4.5	2.0	2.5	13.3
95	23.3	2.3	1.6	0.7	4.1	39.4	4.3	2.0	2.3	13.0
100	22.4	2.2	1.6	0.6	3.8	37.9	4.2	2.0	2.1	12.6
105	21.6	2.1	1.6	0.6	3.5	36.5	4.0	2.0	2.0	12.3
110	20.8	2.1	1.6	0.5	3.2	35.2	3.9	2.0	1.8	12.0
115	20.1	2.0	1.6	0.4	2.9	34.0	3.7	2.0	1.7	11.6
120	19.5	1.9	1.6	0.3	2.5	32.9	3.6	2.0	1.6	11.2
Max Storage (m^3) per drain=					**6.7**					**14.9**
Average Ponding Depth (mm)					**17.1**					**37.8**
Maximum Ponding Depth (mm)					**104.9**					**136.7**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I_5 = A/(Tc+6.053)^B$ & $I_{100} = A/(Tc+6.014)^B$

3) Release Rate = LESSER of Min (Release Rate, Peak Flow) - Minus 100 Year Flow Of Uncontroled Areas OR Pipe Outlet Capacity

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

Table VII - Storage Volumes (5-Year and 100-Year Storm Events)

Storage Requirement for Roof Area Building B

C_{AVG} = 0.90 (5-year)

C_{AVG} = 1.00 (100-year)

Time Interval = 5 (mins)

Drainage Area = 0.030 (hectares) per drain

297 (sqm) per drain

Zurn Z105 Control-Flo Single Notch

Number of Drains = 2

Total Release Rate 5 year = **3.02 L/s**

Total Release Rate 100 year = **3.96 L/s**

	5-year					100-year				
	Release Rate = **1.51** (L/sec) per drain Return Period = 5 (years) IDF Parameters, A = 998.071, B = 0.814 $I = A/(T_c+6.053)^B$					Release Rate = **1.98** (L/sec) per drain Return Period = 100 (years) IDF Parameters, A = 1735.688, B = 0.820 $I = A/(T_c+6.014)^B$				
Duration (min)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	-	-	-	-	-	-	-	-	-	-
5	141.2	10.5	1.5	9.0	2.7	242.7	20.0	2.0	18.1	5.4
10	104.2	7.7	1.5	6.2	3.7	178.6	14.7	2.0	12.8	7.7
15	83.6	6.2	1.5	4.7	4.2	142.9	11.8	2.0	9.8	8.8
20	70.3	5.2	1.5	3.7	4.5	120.0	9.9	2.0	7.9	9.5
25	60.9	4.5	1.5	3.0	4.5	103.8	8.6	2.0	6.6	9.9
30	53.9	4.0	1.5	2.5	4.5	91.9	7.6	2.0	5.6	10.1
35	48.5	3.6	1.5	2.1	4.4	82.6	6.8	2.0	4.8	10.2
40	44.2	3.3	1.5	1.8	4.3	75.1	6.2	2.0	4.2	10.1
45	40.6	3.0	1.5	1.5	4.1	69.1	5.7	2.0	3.7	10.1
50	37.7	2.8	1.5	1.3	3.9	64.0	5.3	2.0	3.3	9.9
55	35.1	2.6	1.5	1.1	3.6	59.6	4.9	2.0	2.9	9.7
60	32.9	2.4	1.5	0.9	3.4	55.9	4.6	2.0	2.6	9.5
65	31.0	2.3	1.5	0.8	3.1	52.6	4.3	2.0	2.4	9.2
70	29.4	2.2	1.5	0.7	2.8	49.8	4.1	2.0	2.1	9.0
75	27.9	2.1	1.5	0.6	2.5	47.3	3.9	2.0	1.9	8.7
80	26.6	2.0	1.5	0.5	2.2	45.0	3.7	2.0	1.7	8.3
85	25.4	1.9	1.5	0.4	1.9	43.0	3.5	2.0	1.6	8.0
90	24.3	1.8	1.5	0.3	1.6	41.1	3.4	2.0	1.4	7.6
95	23.3	1.7	1.5	0.2	1.3	39.4	3.3	2.0	1.3	7.3
100	22.4	1.7	1.5	0.2	0.9	37.9	3.1	2.0	1.2	6.9
105	21.6	1.6	1.5	0.1	0.6	36.5	3.0	2.0	1.0	6.5
110	20.8	1.5	1.5	0.0	0.2	35.2	2.9	2.0	0.9	6.1
115	20.1	1.5	1.5	0.0	0.0	34.0	2.8	2.0	0.8	5.7
120	19.5	1.4	1.4	0.0	0.0	32.9	2.7	2.0	0.7	5.3
Max Storage (m^3) per drain=					**4.5**					**10.2**
Average Ponding Depth (mm)					**15.2**					**34.2**
Maximum Ponding Depth (mm)					**100.9**					**132.2**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I_5 = A/(Tc+6.053)^B$ & $I_{100} = A/(Tc+6.014)^B$

3) Release Rate = LESSER of Min (Release Rate, Peak Flow) - Minus 100 Year Flow Of Uncontroled Areas OR Pipe Outlet Capacity

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

Table VIII - Storage Volumes (5-Year and 100-Year Storm Events)

Storage Requirement for Roof Area Building C

C_{AVG} =	0.90	(5-year)		
C_{AVG} =	1.00	(100-year)	Zurn Z105 Control-Flo Single Notch	
Time Interval =	5	(mins)	Number of Drains =	2
Drainage Area =	0.040	(hectares) per drain	Total Release Rate 5 year =	**3.15 L/s**
	400	(sqm) per drain	Total Release Rate 100 year =	**4.10 L/s**

	Release Rate = **1.57** (L/sec) per drain Return Period = 5 (years) IDF Parameters, A = 998.071 , B = 0.814 $I = A/(T_c+6.053)^B$					Release Rate = **2.05** (L/sec) per drain Return Period = 100 (years) IDF Parameters, A = 1735.688 , B = 0.820 $I = A/(T_c+6.014)^B$				
Duration (min)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	-	-	-	-	-	-	-	-	-	-
5	141.2	14.1	1.6	12.6	3.8	242.7	27.0	2.0	24.9	7.5
10	104.2	10.4	1.6	8.9	5.3	178.6	19.9	2.0	17.8	10.7
15	83.6	8.4	1.6	6.8	6.1	142.9	15.9	2.0	13.8	12.5
20	70.3	7.0	1.6	5.5	6.5	120.0	13.3	2.0	11.3	13.5
25	60.9	6.1	1.6	4.5	6.8	103.8	11.5	2.0	9.5	14.2
30	53.9	5.4	1.6	3.8	6.9	91.9	10.2	2.0	8.2	14.7
35	48.5	4.9	1.6	3.3	6.9	82.6	9.2	2.0	7.1	15.0
40	44.2	4.4	1.6	2.8	6.8	75.1	8.4	2.0	6.3	15.1
45	40.6	4.1	1.6	2.5	6.7	69.1	7.7	2.0	5.6	15.2
50	37.7	3.8	1.6	2.2	6.6	64.0	7.1	2.0	5.1	15.2
55	35.1	3.5	1.6	1.9	6.4	59.6	6.6	2.0	4.6	15.1
60	32.9	3.3	1.6	1.7	6.2	55.9	6.2	2.0	4.2	15.0
65	31.0	3.1	1.6	1.5	6.0	52.6	5.9	2.0	3.8	14.8
70	29.4	2.9	1.6	1.4	5.7	49.8	5.5	2.0	3.5	14.7
75	27.9	2.8	1.6	1.2	5.5	47.3	5.3	2.0	3.2	14.4
80	26.6	2.7	1.6	1.1	5.2	45.0	5.0	2.0	3.0	14.2
85	25.4	2.5	1.6	1.0	4.9	43.0	4.8	2.0	2.7	13.9
90	24.3	2.4	1.6	0.9	4.6	41.1	4.6	2.0	2.5	13.6
95	23.3	2.3	1.6	0.8	4.3	39.4	4.4	2.0	2.3	13.3
100	22.4	2.2	1.6	0.7	4.0	37.9	4.2	2.0	2.2	13.0
105	21.6	2.2	1.6	0.6	3.7	36.5	4.1	2.0	2.0	12.7
110	20.8	2.1	1.6	0.5	3.4	35.2	3.9	2.0	1.9	12.3
115	20.1	2.0	1.6	0.4	3.0	34.0	3.8	2.0	1.7	12.0
120	19.5	1.9	1.6	0.4	2.7	32.9	3.7	2.0	1.6	11.6
Max Storage (m^3) per drain=					**6.9**					**15.2**
Average Ponding Depth (mm)					**17.2**					**38.0**
Maximum Ponding Depth (mm)					**105.2**					**136.9**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I_5 = A/(Tc+6.053)^B$ & $I_{100} = A/(Tc+6.014)^B$

3) Release Rate = LESSER of Min (Release Rate, Peak Flow) - Minus 100 Year Flow Of Uncontroled Areas OR Pipe Outlet Capacity

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

Table IX - Storage Volumes (5-Year and 100-Year Storm Events)

Storage Requirement for Roof Area Building D

C_{AVG} = 0.90 (5-year)

C_{AVG} = 1.00 (100-year)

Time Interval = 5 (mins)

Drainage Area = 0.021 (hectares) per drain

209 (sqm) per drain

Zurn Z105 Control-Flo Single Notch

Number of Drains = 2

Total Release Rate 5 year = **2.86 L/s**

Total Release Rate 100 year = **3.78 L/s**

	5-year: Release Rate = **1.43** (L/sec) per drain; Return Period = 5 (years); IDF Parameters, A = 998.071, B = 0.814; $I = A/(T_c+6.053)^B$					100-year: Release Rate = **1.89** (L/sec) per drain; Return Period = 100 (years); IDF Parameters, A = 1735.688, B = 0.820; $I = A/(T_c+6.014)^B$				
Duration (min)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	-	-	-	-	-	-	-	-	-	-
5	141.2	7.4	1.4	6.0	1.8	242.7	14.1	1.9	12.2	3.7
10	104.2	5.4	1.4	4.0	2.4	178.6	10.4	1.9	8.5	5.1
15	83.6	4.4	1.4	2.9	2.6	142.9	8.3	1.9	6.4	5.8
20	70.3	3.7	1.4	2.2	2.7	120.0	7.0	1.9	5.1	6.1
25	60.9	3.2	1.4	1.8	2.6	103.8	6.0	1.9	4.1	6.2
30	53.9	2.8	1.4	1.4	2.5	91.9	5.3	1.9	3.5	6.2
35	48.5	2.5	1.4	1.1	2.3	82.6	4.8	1.9	2.9	6.1
40	44.2	2.3	1.4	0.9	2.1	75.1	4.4	1.9	2.5	5.9
45	40.6	2.1	1.4	0.7	1.9	69.1	4.0	1.9	2.1	5.7
50	37.7	2.0	1.4	0.5	1.6	64.0	3.7	1.9	1.8	5.5
55	35.1	1.8	1.4	0.4	1.3	59.6	3.5	1.9	1.6	5.2
60	32.9	1.7	1.4	0.3	1.1	55.9	3.2	1.9	1.4	4.9
65	31.0	1.6	1.4	0.2	0.8	52.6	3.1	1.9	1.2	4.6
70	29.4	1.5	1.4	0.1	0.5	49.8	2.9	1.9	1.0	4.2
75	27.9	1.5	1.4	0.0	0.1	47.3	2.7	1.9	0.9	3.9
80	26.6	1.4	1.4	0.0	0.0	45.0	2.6	1.9	0.7	3.5
85	25.4	1.3	1.3	0.0	0.0	43.0	2.5	1.9	0.6	3.1
90	24.3	1.3	1.3	0.0	0.0	41.1	2.4	1.9	0.5	2.7
95	23.3	1.2	1.2	0.0	0.0	39.4	2.3	1.9	0.4	2.3
100	22.4	1.2	1.2	0.0	0.0	37.9	2.2	1.9	0.3	1.9
105	21.6	1.1	1.1	0.0	0.0	36.5	2.1	1.9	0.2	1.5
110	20.8	1.1	1.1	0.0	0.0	35.2	2.0	1.9	0.2	1.0
115	20.1	1.1	1.1	0.0	0.0	34.0	2.0	1.9	0.1	0.6
120	19.5	1.0	1.0	0.0	0.0	32.9	1.9	1.9	0.0	0.2
Max Storage (m^3) per drain=					**2.7**					**6.2**
Average Ponding Depth (mm)					**12.9**					**29.8**
Maximum Ponding Depth (mm)					**95.5**					**126.2**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I_5 = A/(Tc+6.053)^B$ & $I_{100} = A/(Tc+6.014)^B$

3) Release Rate = LESSER of Min (Release Rate, Peak Flow) - Minus 100 Year Flow Of Uncontroled Areas OR Pipe Outlet Capacity

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

ICD Design Table - X

$Q = 0.62 \times A \times [2gh]^{0.5}$ where: g= 9.81

Location	Pipe Outlet Diameter (mm)	Pipe Outlet Invert (m)	HGL (m)		Outlet flow (L/s)		Trial orifice size (mm)	Orifice size (mm)	Orifice Area (sqm)	Head (m)	
			100-year event	5-year event	100-year event	5-year event				100-year event	5-year event
EX CBMH	750	90.09	92.79	92.29	306.0	274.6	**300**	298.22	0.06985	2.55	2.05

Appendix B:
Storm and Sanitary Sewer Computation Forms

STORM SEWER COMPUTATION FORM

Rational Method

Q = 2.78*A*I*R

Q = Flow (L/sec)
A = Area (ha)
I = Rainfall Intensity (mm/h)
R = Ave. Runoff Coefficient

City of Ottawa IDF Curve - 5-y

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

Minimum Time of Conc. Tc = **10 min**

Manning's n = **0.013**

Drainage Area	From	To	Area (ha)	Runoff Parameters: Runoff Coeff. R	Indiv. 2.78AR	Accum. 2.78AR	Time of Conc. (min)	Rainfall Intensity (mm/hr)	Roof Flow Q (L/sec)	Peak Flow Q (L/sec)	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	REMARKS
WS-14	RY-CB-15	MHST-14	0.035	0.20	0.02	0.02	10.00	104.19		2.00	250	254	0.50	16.2	43.87	0.87	0.40	0.31	0.05	
	MHST-14	CBMH-13				0.02	10.31	102.58		1.97	250	254	0.50	22.5	43.87	0.87	0.38	0.43	0.04	
WS-01 & WS-02	MHST-17	CBMH-13					10.00		9.30	9.30	200	203	0.95	30.4	33.35	1.03	0.73	0.49	0.28	
WS-09 & WS-10	CBMH-13	MHST-9	0.171	0.87	0.41	0.43	10.74	100.44	9.30	52.53	375	381	0.25	26.7	91.46	0.80	0.71	0.55	0.57	
WS-13	RY-CB-11	MHST-10	0.009	0.20	0.005	0.005	10.00	104.19		0.51	250	254	0.50	14.6	43.87	0.87	0.28	0.28	0.01	
	MHST-10	MHST-9				0.005	10.28	102.74		0.50	250	254	0.50	24.0	43.87	0.87	0.28	0.46	0.01	
	MHST-9	MHST-8				0.44	11.29	97.84	9.30	51.89	300	305	0.50	7.6	71.33	0.98	0.94	0.13	0.73	
WS-15	CB-19	CBMH-16	0.131	0.65	0.238	0.238	10.00	104.19		24.84	200	203	2.00	20.7	48.39	1.49	1.27	0.23	0.51	
WS-17	TD-CB-25	CBMH-16	0.023	0.90	0.058	0.058	10.00	104.19		6.05	200	203	1.50	27.6	41.91	1.29	0.76	0.36	0.14	
WS-16	CBMH-16	MHST-18	0.140	0.79	0.306	0.603	10.36	102.33		61.67	375	381	0.30	20.2	100.18	0.88	0.80	0.38	0.62	
WS-06	MHST-18	MHST-3	0.110	0.84	0.256	0.858	10.74	100.44		86.23	450	457	0.27	51.3	154.55	0.94	0.83	0.91	0.56	
WS-05	MHST-3	MHST-8	0.044	0.72	0.089	0.947	11.65	96.22		91.14	450	457	0.20	63.0	133.02	0.81	0.76	1.30	0.69	
WS-07, WS-08 & WS-11	MHST-8	MHST-6	0.308	0.85	0.729	2.111	12.95	90.82	9.30	201.05	600	610	0.23	26.3	307.20	1.05	0.97	0.42	0.65	
WS-03, WS-04 & WS-12	MHST-6	*EX. CBMH*	0.008	0.35	0.008	2.119	13.37	89.22	15.30	204.36	600	610	0.45	4.4	429.70	1.47	1.24	0.05	0.48	

Note:

Design: B. Villeneuve
Check: M. Theiner

Date: 2023-03-16

Project: 3850 Cambrian Rd
Commercial Development

Client: Choice Properties

STORM SEWER COMPUTATION FORM

Rational Method

Q = 2.78*A*I*R

Q = Flow (L/sec)
A = Area (ha)
I = Rainfall Intensity (mm/h)
R = Ave. Runoff Coefficient

City of Ottawa IDF Curve - 100-y

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

Minimum Time of Conc. Tc = **10 min**

Manning's n = **0.013**

Drainage Area	From	To	Area	Runoff Parameters					Roof Flow Q	Peak Flow Q	Pipe Dia.		Slope	Length	Capacity	Velocity		Time of Flow	Q(d) / Q(f)	REMARKS
				Runoff Coeff. R	Indiv. 2.78AR	Accum. 2.78AR	Time of Conc.	Rainfall Intensity			nom.	actual			full	full	actual			
			(ha)				(min)	(mm/hr)	(L/sec)	(L/sec)	(mm)	(mm)	(%)	(m)	(L/sec)	(m/sec)	(m/sec)	(min)		
WS-14	RY-CB-15	MHST-14	0.035	0.25	0.02	0.02	10.00	178.56		4.29	250	254	0.50	16.2	43.87	0.87	0.40	0.31	0.10	
	MHST-14	CBMH-13				0.02	10.31	175.77		4.23	250	254	0.50	22.5	43.87	0.87	0.38	0.43	0.10	
WS-01 & WS-02	MHST-17	CBMH-13					10.00		12.13	12.13	200	203	0.95	30.4	33.35	1.03	0.73	0.49	0.36	
WS-09 & WS-10	CBMH-13	MHST-9	0.171	1.00	0.47	0.50	10.74	172.07	12.13	97.83	375	381	0.25	26.7	91.46	0.80	0.71	0.55	1.07	
WS-13	RY-CB-11	MHST-10	0.009	0.25	0.006	0.006	10.00	178.56		1.09	250	254	0.50	14.6	43.87	0.87	0.28	0.28	0.02	
	MHST-10	MHST-9				0.006	10.28	176.04		1.08	250	254	0.50	24.0	43.87	0.87	0.28	0.46	0.02	
	MHST-9	MHST-8				0.50	11.29	167.57	12.13	96.61	300	305	0.50	7.6	71.33	0.98	0.94	0.13	1.35	
WS-15	CB-19	CBMH-16	0.131	0.82	0.298	0.298	10.00	178.56		53.21	200	203	2.00	20.7	48.39	1.49	1.27	0.23	1.10	
WS-17	TD-CB-25	CBMH-16	0.023	1.00	0.064	0.064	10.00	178.56		11.52	200	203	1.50	27.6	41.91	1.29	0.76	0.36	0.27	
WS-16	CBMH-16	MHST-18	0.140	0.98	0.383	0.745	10.36	175.33		130.66	375	381	0.30	20.2	100.18	0.88	0.80	0.38	1.30	
WS-06	MHST-18	MHST-3	0.110	1.00	0.306	1.052	10.74	172.07		180.94	450	457	0.27	51.3	154.55	0.94	0.83	0.91	1.17	
WS-05	MHST-3	MHST-8	0.044	0.90	0.111	1.163	11.65	164.76		191.55	450	457	0.20	63.0	133.02	0.81	0.76	1.30	1.44	
WS-07, WS-08 & WS-11	MHST-8	MHST-6	0.308	0.99	0.849	2.516	12.95	155.44	12.13	403.17	600	610	0.23	26.3	307.20	1.05	0.97	0.42	1.31	
WS-03, WS-04 & WS-12	MHST-6	*EX. CBMH*	0.008	0.44	0.010	2.525	13.37	152.68	20.01	405.57	600	610	0.45	4.4	429.70	1.47	1.24	0.05	0.94	

Note:

Design: B. Villeneuve
Check: M. Theiner

Date: 2023-03-16

Project: 3850 Cambrian Rd
Commercial Development

Client: Choice Properties

SANITARY SEWER DESIGN SHEET

Drainage Area	From	To	Peak Flow Q (L/sec)	Sewer Data										REMARKS
				Type of Pipe	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	
	MHSA-1	MHSA-2	0.56	PVC	150	152.4	1.06	22.9	16.4	0.90	0.41	0.93	0.03	Bldg A&B Connections + Infiltration
	MHSA-2	*EX MH-S-1*	0.62	PVC	150	152.4	1.50	55.3	19.5	1.07	0.49	1.88	0.03	Bldg C&D Connections
	EX MH-S-1	*EX MH-S-2*	0.62	*PVC*	*200*	*203.2*	*2.20*	*25.3*	*50.8*	*1.56*	*0.64*	*0.66*	*0.01*	
	EX MH-S-2	*EX MH-S*	97.94	*CONC*	*500*	*500*	*0.13*	*167.5*	*136.1*	*0.69*	*0.67*	*4.19*	*0.72*	*From DSEL Report

Manning's n = **0.013**

Design: BV
Check: MT
Date: March 2023

Project Name: 3850 Cambrian Road
Parsons Project #: 478356
Client: Choice Properties
Client Project #:

Appendix C:
Sanitary Load and Fire Flow

SANITARY DESIGN FLOWS

Area	COMMERCIAL/RETAIL			TOTAL	INFILTRATION			Total
	Retail Area (m^2)	Peak Factor	Peak Flow (L/s)	Peak Flow (L/s)	Site Area (ha)	Infiltration Allowance (L/s/ha)	Infilt. Flow (L/s)	Total Peak Flow (L/s)
Subject Site					1.36	0.33	0.45	0.45
Bldg A	1 576	1.5	0.08	0.08				0.08
Bldg B	576	1.5	0.03	0.03				0.03
Bldg C	798	1.5	0.04	0.04				0.04
Bldg D	418	1.5	0.02	0.02				0.02
							Total	**0.61**

Design:	BV	**Project:**	Commercial Development Choice Properties
Check :	MT	**Location:**	3850 Cambrian Road Ottawa, Ontario
Dwg reference:		**Project # :**	478356
		Date:	March 2023
		Sheet:	1 of 1

Average Daily Demands

(Based on City of Ottawa *Sewer Design Guidelines 2012* and *MOE Water Design Guidelines*)

Average Residential Daily Flow =	280	L/p/d
Institutional Flow =	28 000	L/ha/d
Commercial Flow =	28 000	L/ha/d
Light Industrial Flow =	35 000	L/ha/d
Heavy Industrial Flow =	55 000	L/ha/d
Hotel Daily Flow =	225	L/bed/d
Office/Warehouse Daily Flow =	75	L/empl/d
Shopping Centres =	2 500	L/(1000m^2/d)

Population Densities

Average suburban residential dev.	60	p/ha
Single family	3.4	p./unit
Semi-detached	2.7	p./unit
Duplex	2.3	p./unit
Townhouse	2.7	p./unit
Appartment average	1.8	p./unit
Bachelor	1.4	p./unit
1 Bedroom	1.4	p./unit
2 Bedrooms	2.1	p./unit
3 Bedrooms	3.1	p./unit
Hotel room, 18 m2	1	p./unit
Restaurant, 1 m2	1	p./unit
Office	1	p/25m^2
Warehouse	1	p/90m^2
Automotive Service Centre, per bay	1	p/bay (plus management)

Peak Factors

Commercial =	1.5	if commercial contribution > 20%, otherwise
Institutional =	1.5	if institutional contribution > 20%, otherwise
Industrial =		per Appendix 4-B.0 Graph
Residential :		Harmon Equation
		1 + (14/(4+(Capita/1000) ^ 0.5))*8
		min = 2
		max = 4

Infiltration allowance (dry weather)	0.05	L/s/ha
Infiltration allowance (wet weather)	0.28	L/s/ha
I/I (total)	0.33	L/s/ha

3850 Cambrian Road Commercial Development - Estimated Water Demands

Area	Units	Population	Gross Floor Area (m2)	Average Daily Demand (ADD) (L/s)	Maximum Daily Demand (MDD) (L/s)	Peak Hourly Demand (PHD) (L/s)	Fire Flow (FF) (L/s)	MDD + FF (L/s)
Proposed Bldg A								
Commercial Unit			1576	0.05	0.08	0.14	100	100.08
Proposed Bldg B								
Commercial Unit			576	0.02	0.03	0.05	50	50.03
Proposed Bldg C								
Commercial Unit			798	0.03	0.04	0.07	100	100.04
Proposed Bldg D								
Commercial Unit			418	0.01	0.02	0.04	83	83.02

Average Daily Demand

Based on Ottawa Design Guidelines - Water Distribution, 2010 and MOE Design Guidelines for Drinking-Water Systems, 2008

Average Residential Daily Flow =	350	L/p/d
Institutional Flow =	28 000	L/gross ha/d
Commercial Flow =	28 000	L/gross ha/d
Light Industrial Flow =	35 000	L/gross ha/d
Heavy Industrial Flow =	55 000	L/gross ha/d
Hotel Daily Flow =	225	L/bed/d
Office/Warehouse Daily Flow =	75	L/person/d
Office/Warehouse Daily Flow =	8.06	L/m2/day
Restaurant (Ordinary not 24 Hours) =	125	L/seat/d
Restaurant (24 Hours) =	200	L/seat/d
Shopping Centres =	2 500	L/(1000m^2/d)
Amenity Area =	5	L/m2/d

Maximum Daily Demand

Residential =	2.5 x Average Daily Demand
	4.9 x Average Daily Demand **
Industrial =	1.5 x Average Daily Demand
Commercial =	1.5 x Average Daily Demand
Institutional =	1.5 x Average Daily Demand

Peak Hourly Demand

Residential =	2.2 x Maximum Daily Demand
	7.4 x Maximum Daily Demand **
Industrial =	1.8 x Maximum Daily Demand
Commercial =	1.8 x Maximum Daily Demand
Institutional =	1.8 x Maximum Daily Demand

3850 Cambrian Road Commercial Development

Building	Type of Construction C	Total Floor Area (m2) A	Fire Flow (min. 2,000) (L/min) F	Adjusted (nearest 1,000) (L/min)	Occupancy Factor O	Reduction / Increase due to Occupancy	Fire Flow with Occupancy (min. 2,000) (L/min)	Sprinklers Factor S	Reduction due to Sprinklers (L/min)	Exposure Factor % E	Increase due to Exposure (L/min)	Fire Flow (L/min)	Roof Contribution (L/min) R	Required Fire Demand: Adjusted to the nearest 1000 (min. 2,000, max. 45,000) (L/min) F	Required Fire Demand: Minimum 33 (L/s)
Bldg A	0.8	1 576	6 987	7 000	0%	0	7 000	50%	3 500	40%	2 800	6 000	0	6 000	100
Bldg B	0.8	576	4 224	4 000	0%	0	4 000	50%	2 000	35%	1 400	3 000	0	3 000	50
Bldg C	0.8	798	4 972	5 000	0%	0	5 000	0%	0	15%	750	6 000	0	6 000	100
Bldg D	0.8	418	3 598	4 000	0%	0	4 000	0%	0	15%	600	5 000	0	5 000	83

Reference:

References

Water Supply for Public Fire Protection , 2020 by Fire Underwriters Survey (FUS) and
Ottawa Design Guidelines - Water Distribution, July 2010 and subsequent Technical Bulletins

C Type of Construction

Wood Frame (Type V)	1.5
Mass Timber (Type IV-A) - Encapsulated Mass Timber	0.8
Mass Timber (Type IV-B) - Rated Mass Timber	0.9
Mass Timber (Type IV-C) - Ordinary Mass Timber	1.0
Mass Timber (Type IV-D) - Unrated Mass Timber	1.5
Ordinary Construction (Type III also known as joisted masonry)	1.0
Non-Combustible Construction (Type II - minimum 1 hour fire resistance rating)	0.8
Fire resistive Construction (Type I - minimum 2 hour fire resistance rating)	0.6

A Total Effective Floor Area (m ^{2})

Buildings Classified with a Construction Coefficient from 1.0 to 1.5
100% of all Floor Areas

Buildings Classified with a Construction Coefficient below 1.0
Vertical Openings Unprotected
Two (2) Largest Adjoining Floor Areas
Additional Floors (up to eight (8)) at 50%

Vertical Openings Properly Protected
Single Largest Floor
Additional Two (2) Adjoining Floors at 25%

High One Storey Building
When a building has a large single storey space exceeding 3m in height, the number of storeys to be used in determining the total effective area depends upon the use being made of the building.

Subdividing Buildings (Vertical Firewalls)
Minimum two (2) hour fire resistance rating and meets National Building Code requirements.

- Up to 10% can be applied if there is severe risk of fire on the exposed side of the firewall due to hazard conditions.
- An exposure charge of up to 10% can be applied if there are unprotected openings in the firewall

Basement
Basement floor excluded when it is at least 50% below grade.

Open Parking Garages
Use the area of the largest floor.

O Occupancy

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

- Table 3 provides recommended Occupancy and Contents Adjustment Factors for Example Major Occupancies from the National Building Code of Canada.
- Adjustment factors should be adjusted accordingly to the specific fore loading and situation that exists in the subject building.
- Values can be interpolated from the examples given considering fire loading and expected combustibility of contents if the subject building is not listed.
- Values can be modified by up to 10% (+/-) depending on the extent to which the fire loading is unusual for the building.
- Buildings with multiple major occupancies should use the most restrictive factor or interpolate based on the percentage of each occupancy and its associated fire loading.

Table 3 Values for Subject Building
Group:
Division:
Description of Occupancy:
Occupancy and Contents:
Adjustment Factor: 0%

R Roof

Shake Roof	2,000 to 4,000 L/min	additional should be added to the fire flow
Wood Shingle	2,000 to 4,000 L/min	additional should be added to the fire flow

F Fire Flow (L/Min)
220*C*(A^0.5)

S Sprinklers

	Complete Coverage	Partial Coverage
Automatic Sprinklers NFPA Standards	30%	30% * x%
Standard Water Supply	10%	10% * x%
Full Supervision	10%	10% * x%

(x%: percentage of total protected floor area)

Additional Reductions for Community Level Automatic Sprinkler Protection of Area
Buildings located within communities or subdivisions that are completely sprinkler protected may apply up to a maximum additional 25% reduction in required fire flows beyond the normal maximum of 50% reduction for sprinkler protection of an individual building.

Adjustment of Sprinkler Reductions for Community Level Oversight of Sprinkler Maintenance, Testing, and Water Supply Requirements
The reduction in required fire flow for sprinkler protection may be reduced of eliminated if:
- The community does not have a Fire Prevention Program that provides a system of ensuring that the fire sprinkler systems are inspected, tested, and maintained in accordance with NFPA 25
- The community does not maintain the pressure and flow rate requirements for fire sprinkler installations, or otherwise allows the flow rates and pressure levels that were available during sprinkler system design to significantly degrade, increasing the probability of inadequate water supply for effective sprinkler operation.

E Exposure
The maximum exposure adjustment that can be applied to a building is 75% when summing the percentages of all sides of the building

Separation Distance (m)	Maximum Exposure Adjustment	N	E	S	W
0 to 3	25%		BldgB		BldgA
3.1 to 10	20%				
10.1 to 20	15%	BldgA	BldgC		BldgD
20.1 to 30	10%				BldgB
Greater than 30	0%				

Table 6: Exposure Adjustment Charges for Subject Building Considering Construction Type of Exposed Building Face

Distance to the Exposure (m)	Length-Height Factor of Exposing Building Face	Type V	Type III-IV[2]	Type III-IV[3]	Type I-II[2]	Type I-II[3]
0 to 3	0-20	20%	15%	5%	10%	0%
	21-40	21%	16%	6%	11%	1%
	41-60	22%	17%	7%	12%	2%
	61-80	23%	18%	8%	13%	3%
	81-100	24%	19%	9%	14%	4%
	Over 100	25%	20%	10%	15%	5%
3.1 to 10	0-20	15%	10%	3%	6%	0%
	21-40	16%	11%	4%	7%	0%
	41-60	17%	12%	5%	8%	1%
	61-80	18%	13%	6%	9%	2%
	81-100	19%	14%	7%	10%	3%
	Over 100	20%	15%	8%	11%	4%
10.1 to 20	0-20	10%	5%	0%	3%	0%
	21-40	11%	6%	1%	4%	0%
	41-60	12%	7%	2%	5%	0%
	61-80	13%	8%	3%	6%	1%
	81-100	14%	9%	4%	7%	2%
	Over 100	15%	10%	5%	8%	3%
20.1 to 30	0-20	0%	0%	0%	0%	0%
	21-40	2%	1%	0%	0%	0%
	41-60	4%	2%	0%	1%	0%
	61-80	6%	3%	1%	2%	0%
	81-100	8%	4%	2%	3%	0%
	Over 100	10%	5%	3%	4%	0%
Over 30m	All Sizes	0%	0%	0%	0%	0%

[2] with unprotected openings
[3] without unprotected openings

Automatic Sprinkler Protection in Exposed Buildings
- If the exposed building is fully protected with an automatic sprinkler system (see note Recognition of Automatic Sprinkler), the exposure adjustment charge determined from Table 6 may be reduced by up to 50% of the value determined.

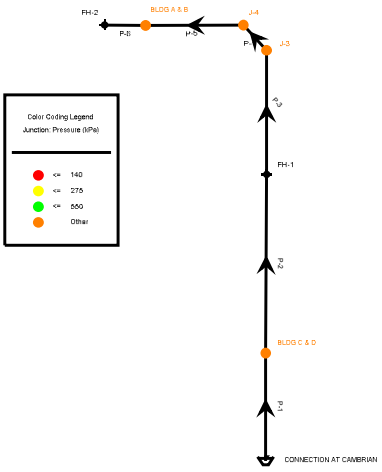
Automatic Sprinkler Protection in both Subject and Exposed Buildings
- If both the subject building and the exposed building are fully protected with automatic sprinkler systems (see note Recognition of Automatic Sprinkler), no exposure adjustment charge should be applied.

Exposure Protection of Area Between Subject and Exposed Buildings
- If the exposed building is fully protected with an automatic sprinkler system (see note Recognition of Automatic Sprinkler), and the area between the buildings is protected with an exterior automatic sprinkler system, no exposure adjustment charge should be applied.

Reduction of Exposure Charge for Type V Buildings
- If the exposed building face of a Type V building has an exterior cladding assembly with a minimum 1 hour fire resistive rating, then the exposure charge may be treated as a Type III/IV building for the purposes of looking up the appropriate exposure charge in Table 6.

Appendix D:
WaterCad Model Results

Scenario: Base



AVERAGE DAY RESULTS

PIPE TABLE

Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-Williams C	Flow (L/s)	Velocity (m/s)
19	CONNECTION AT CAMBRIAN	BLDG C & D	200.0	PVC	110.0	0.11	0.00
31	BLDG C & D	FH-1	200.0	PVC	110.0	0.07	0.00
21	FH-1	J-3	200.0	PVC	110.0	0.07	0.00
6	J-3	J-4	200.0	PVC	110.0	0.07	0.00
17	J-4	BLDG A & B	200.0	PVC	110.0	0.07	0.00
7	BLDG A & B	FH-2	200.0	PVC	110.0	0.00	0.00

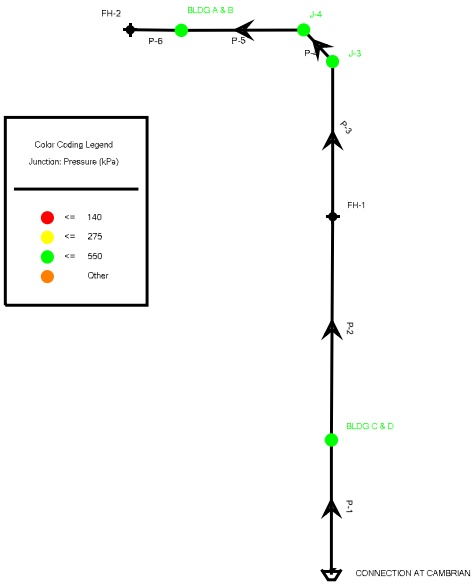
JUNCTION TABLE

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
BLDG C & D	94.10	0.04	156.50	611
J-3	93.60	0.00	156.50	616
J-4	93.60	0.00	156.50	616
BLDG A & B	93.92	0.07	156.50	612

RESERVOIR TABLE

Label	Elevation (m)	Flow (Out net) (L/s)	Hydraulic Grade (m)
CONNECTION AT CAMBRIAN	156.50	0.11	156.50

Scenario: Peak Hour



PEAK HOUR RESULTS

PIPE TABLE

Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-Williams C	Flow (L/s)	Velocity (m/s)
19	CONNECTION AT CAMBRIAN	BLDG C & D	200.0	PVC	110.0	0.31	0.01
31	BLDG C & D	FH-1	200.0	PVC	110.0	0.20	0.01
21	FH-1	J-3	200.0	PVC	110.0	0.20	0.01
6	J-3	J-4	200.0	PVC	110.0	0.20	0.01
17	J-4	BLDG A & B	200.0	PVC	110.0	0.20	0.01
7	BLDG A & B	FH-2	200.0	PVC	110.0	0.00	0.00

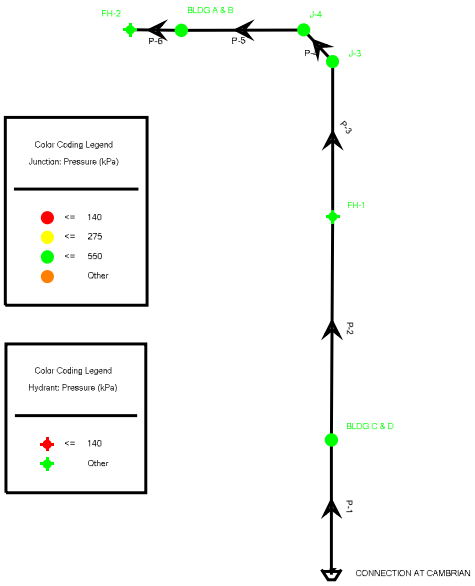
JUNCTION TABLE

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
BLDG C & D	94.10	0.11	142.60	475
J-3	93.60	0.00	142.60	480
J-4	93.60	0.00	142.60	480
BLDG A & B	93.92	0.20	142.60	476

RESERVOIR TABLE

Label	Elevation (m)	Flow (Out net) (L/s)	Hydraulic Grade (m)
CONNECTION AT CAMBRIAN	142.60	0.31	142.60

Scenario: Max Day + FF



MAX DAY + FIRE FLOW RESULTS

HYDRANT TABLE

Label	Length (Hydrant Lateral) (m)	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
FH-2	6	93.60	95.00	131.31	369
FH-1	6	93.85	5.00	135.77	410

PIPE TABLE

Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-Williams C	Flow (L/s)	Velocity (m/s)
19	CONNECTION AT CAMBRIAN	BLDG C & D	200.0	PVC	110.0	100	3.19
31	BLDG C & D	FH-1	200.0	PVC	110.0	100	3.19
21	FH-1	J-3	200.0	PVC	110.0	95	3.03
6	J-3	J-4	200.0	PVC	110.0	95	3.03
17	J-4	BLDG A & B	200.0	PVC	110.0	95	3.03
7	BLDG A & B	FH-2	200.0	PVC	110.0	95	3.02

JUNCTION TABLE

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
BLDG C & D	94.10	0.06	137.72	427
J-3	93.60	0.00	134.54	401
J-4	93.60	0.00	134.20	397
BLDG A & B	93.92	0.11	133.23	385

RESERVOIR TABLE

Label	Elevation (m)	Flow (Out net) (L/s)	Hydraulic Grade (m)
CONNECTION AT CAMBRIAN	138.90	100.17	138.90

Appendix E:
Stormwater Storage Chambers Specifications

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

Advanced Drainage Systems, Inc.

SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
VISIT OUR APP

3850 CAMBRIAN RD REV1

OTTAWA, ON, CANADA

SC-310 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-310.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE OR POLYETHYLENE COPOLYMERS.
3. CHAMBERS SHALL BE CERTIFIED TO CSA B184, "POLYMERIC SUB-SURFACE STORMWATER MANAGEMENT STRUCTURES", AND MEET THE REQUIREMENTS OF ASTM F2922 (POLETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE CSA S6 CL-625 TRUCK AND THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 50 mm (2").
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2922 SHALL BE GREATER THAN OR EQUAL TO 400 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 23° C / 73° F), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2922 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310 SYSTEM

1. STORMTECH SC-310 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 150 mm (6") SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 20-50 mm (3/4-2").
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-310 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 900 mm (36") OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

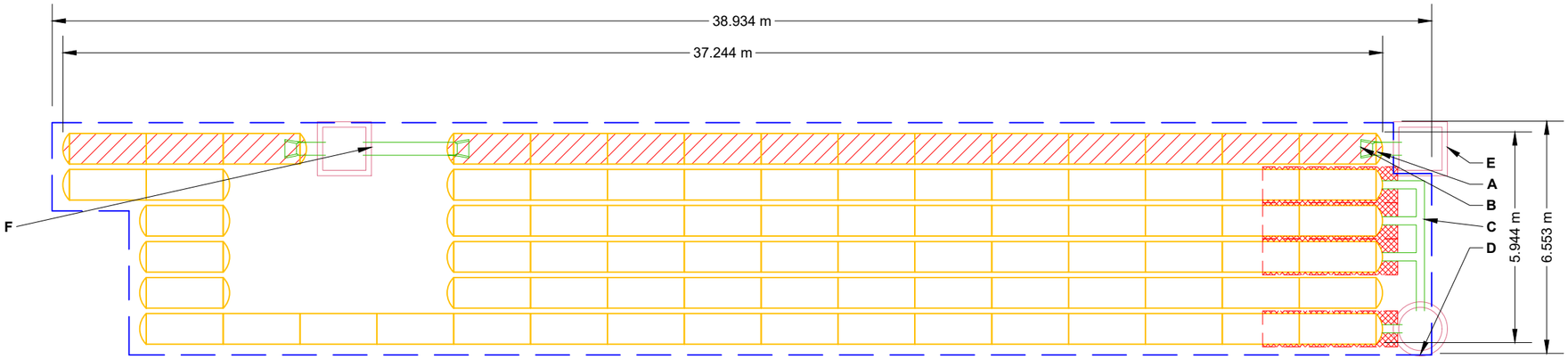
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

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

PROPOSED LAYOUT		PROPOSED ELEVATIONS	
84	STORMTECH SC-310 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	95.215
22	STORMTECH SC-310 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	93.386
152	STONE ABOVE (mm)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	93.234
370	STONE BELOW (mm)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	93.234
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	93.234
113.1	INSTALLED SYSTEM VOLUME (m^3) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	92.929
		TOP OF SC-310 CHAMBER:	92.776
		300 mm ISOLATOR ROW PLUS INVERT:	92.393
		300 mm ISOLATOR ROW PLUS INVERT:	92.393
244.8	SYSTEM AREA (m^2)	200 mm x 200 mm BOTTOM MANIFOLD INVERT:	92.385
91.0	SYSTEM PERIMETER (m)	200 mm BOTTOM CONNECTION INVERT:	92.385
		BOTTOM OF SC-310 CHAMBER:	92.370
		BOTTOM OF STONE:	92.000

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED EZ END CAP	A	300 mm BOTTOM PREFABRICATED EZ END CAP, PART#: SC310ECEZ / TYP OF ALL 300 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	23 mm	
FLAMP	B	INSTALL FLAMP ON 300 mm ACCESS PIPE / PART#: SC31012RAMP (TYP 3 PLACES)		
MANIFOLD	C	200 mm x 200 mm BOTTOM MANIFOLD, MOLDED FITTINGS	15 mm	
CONCRETE STRUCTURE	D	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		71 L/s IN
CONCRETE STRUCTURE W/WEIR	E	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		59 L/s IN
CONCRETE STRUCTURE W/WEIR	F	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		59 L/s IN



ISOLATOR ROW PLUS
(SEE DETAIL/TYP 2 PLACES)

PLACE MINIMUM 3.810 m OF ADSPLUS125 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

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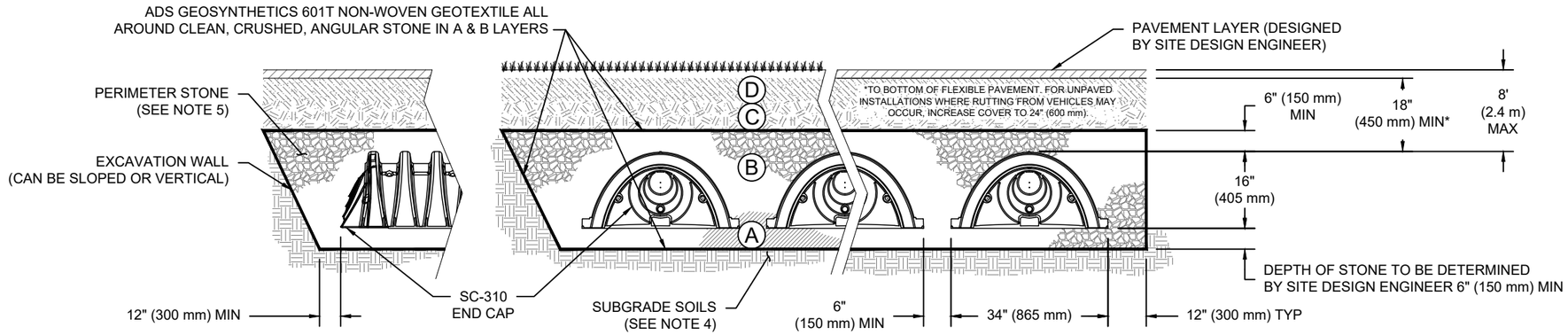
SCALE = 1 : 150

ACCEPTABLE FILL MATERIALS: STORMTECH SC-310 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2922 (POLETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-310 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 400 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

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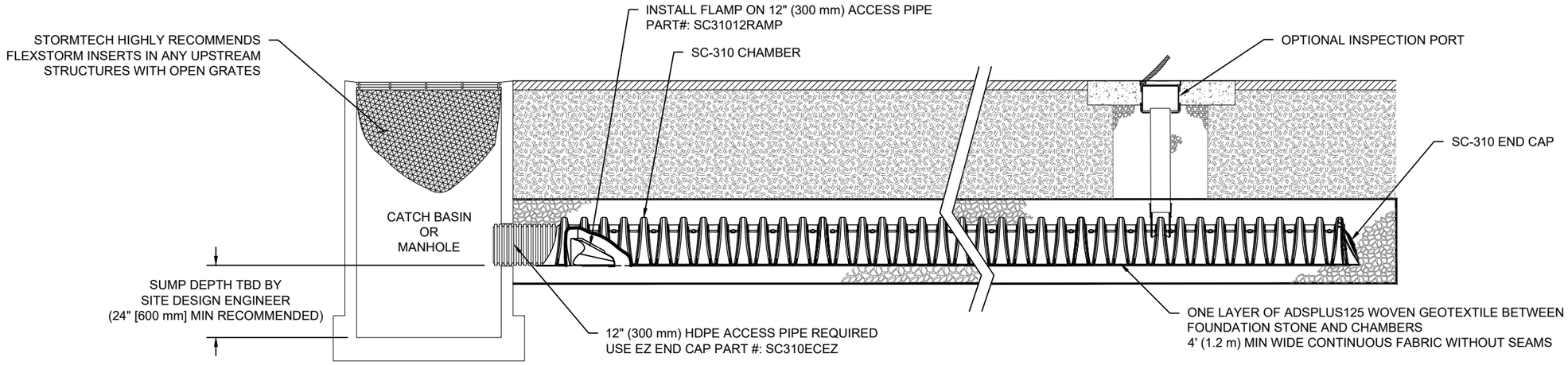

SC-310 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

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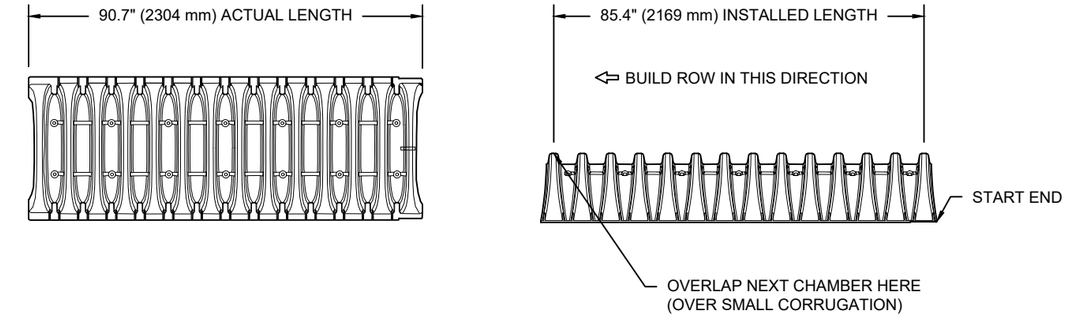
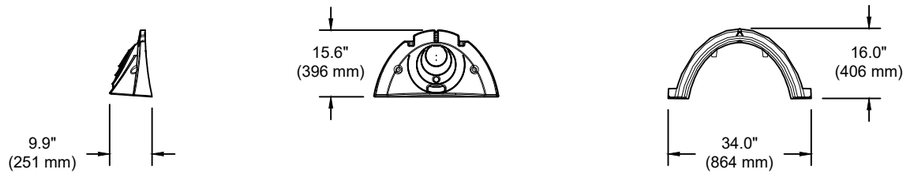
SC-310 TECHNICAL SPECIFICATION

NTS

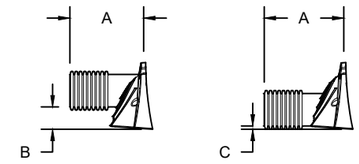




NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	34.0" X 16.0" X 85.4"	(864 mm X 406 mm X 2169 mm)
CHAMBER STORAGE	14.7 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	31.0 CUBIC FEET	(0.88 m³)
WEIGHT	35.0 lbs.	(16.8 kg)

*ASSUMES 6" (152 mm) ABOVE, BELOW, AND BETWEEN CHAMBERS



PRE-FAB STUB AT BOTTOM OF END CAP WITH FLAMP END WITH "BR"
PRE-FAB STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PRE-FAB STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
PRE CORED END CAPS END WITH "PC"

PART #	STUB	A	B	C
SC310EPE06T / SC310EPE06TPC	6" (150 mm)	9.6" (244 mm)	5.8" (147 mm)	---
SC310EPE06B / SC310EPE06BPC			---	0.5" (13 mm)
SC310EPE08T / SC310EPE08TPC	8" (200 mm)	11.9" (302 mm)	3.5" (89 mm)	---
SC310EPE08B / SC310EPE08BPC			---	0.6" (15 mm)
SC310EPE10T / SC310EPE10TPC	10" (250 mm)	12.7" (323 mm)	1.4" (36 mm)	---
SC310EPE10B / SC310EPE10BPC			---	0.7" (18 mm)
SC310ECEZ*	12" (300 mm)	13.5" (343 mm)	---	0.9" (23 mm)

ALL STUBS, EXCEPT FOR THE SC310ECEZ ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC310ECEZ THE 12" (300 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 0.25" (6 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

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LOT 11 CONCESSION 3 (CRIDEAU FRONT)

STM 28.8m - 250mmØ @ 1.28%

STM 24.2m - 150mmØ @ 2.21%

MHSA-1
T/G = 93.57
NE. INV. = 90.21

MHSA-2
T/G = 93.64
SW. INV. = 89.68
SE. INV. = 89.62

SC-CB-4
T/G = 93.33

SC-CB-5
T/G = 93.37

STM 2.6m - 300mmØ @ 1.04%

MHST-3
T/G = 93.51
NW. INV. = -4.06
NE. INV. = -3.45

STM 63.0m - 450mmØ @ 1.00%

MHST-6
T/G = 93.[illegible]
SW. INV. = -4.09

STM 3.[illegible]m - 150mmØ @ 2.10%

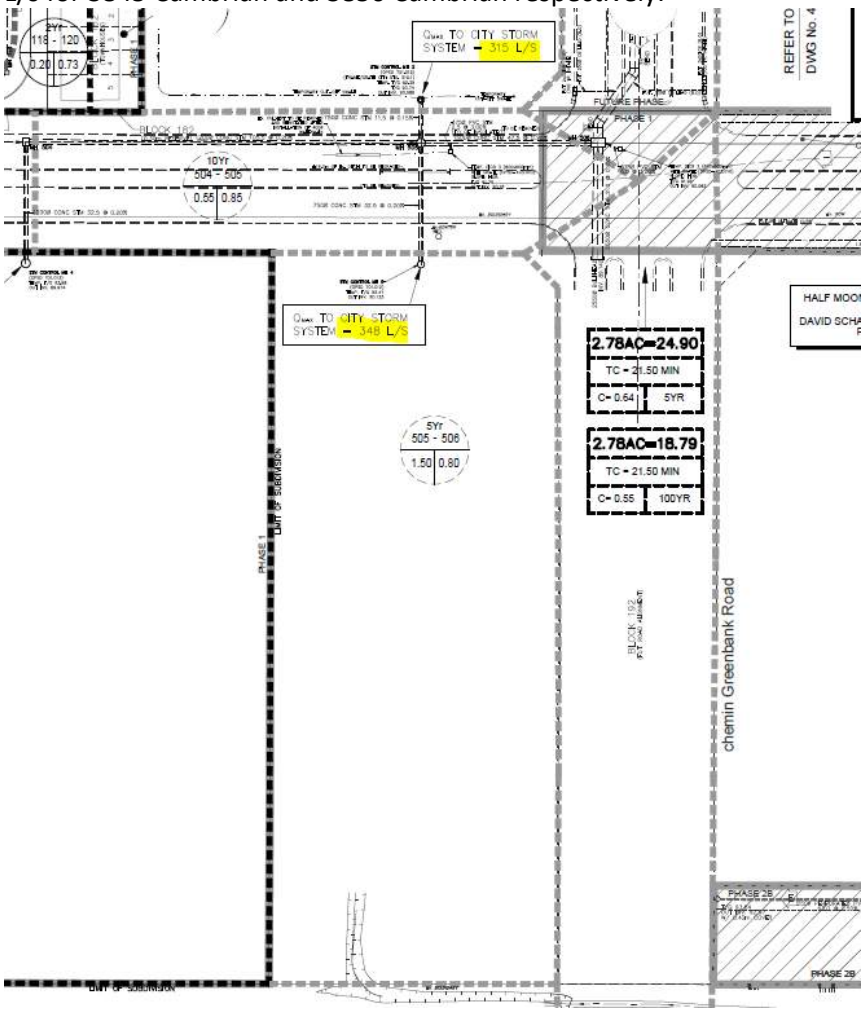
Appendix F:
City Correspondence

Villeneuve, Benoit [NN-CA]

From: Bramah, Bruce <bruce.bramah@ottawa.ca>
Sent: 20 mars 2023 15:00
To: Villeneuve, Benoit [NN-CA]
Cc: Theiner, Mathew [NN-CA]; Harrold, Eric
Subject: [EXTERNAL] RE: 3845 & 3850 Cambrian Rd Commercial Developments - Stormwater Management

Good afternoon Benoit,

Both properties shall comply with the servicing criteria from the final detailed design: Design Brief for the Half Moon Bay West Phase 1, Prepared by DSEL, Project #16-888, dated Sept 5, 2018.
The design brief notes a predevelopment C=0.8, Tc=10min. The resulting pre development flows are 348 L/s and 315 L/s for 3845 Cambrian and 3850 Cambrian respectively.



If you have any further questions, please feel free to call me or we can set up a meeting to discuss.
Thank you,

--

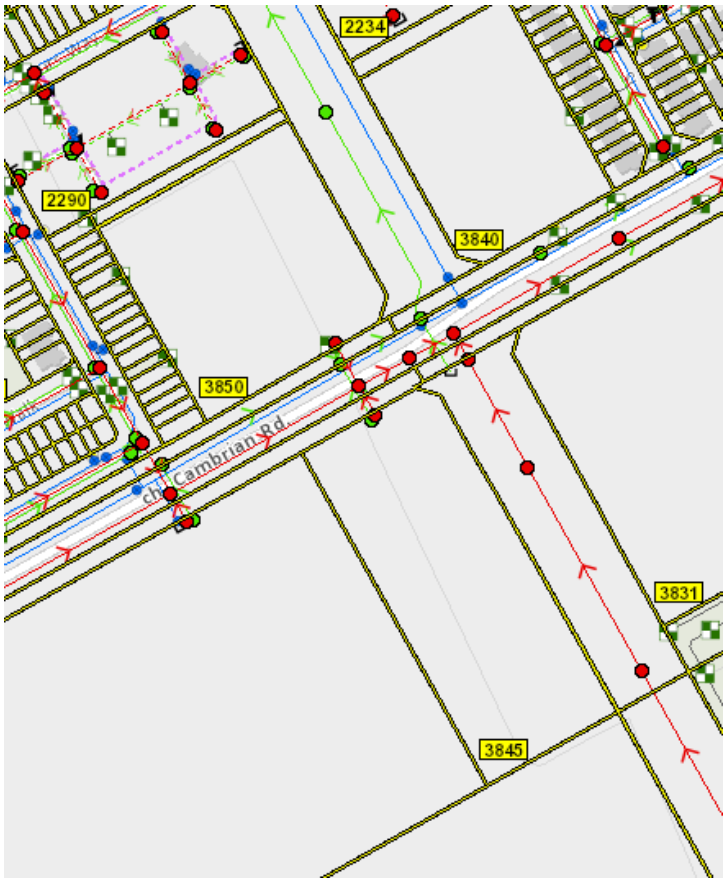
Bruce Bramah, EIT
Project Manager
Planning, Real Estate and Economic Development Department / Direction générale de la planification, des biens immobiliers et du développement économique
Development Review - South Branch

City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 29686, Bruce.Bramah@ottawa.ca

From: Benoit.Villeneuve@parsons.com <Benoit.Villeneuve@parsons.com>
Sent: March 10, 2023 1:24 PM
To: Bramah, Bruce <bruce.bramah@ottawa.ca>; Charie, Kelsey <kelsey.charie@ottawa.ca>; Harrold, Eric <eric.harrold@ottawa.ca>
Cc: Theiner, Mathew <mathew.theiner@parsons.com>; Moore, Sean <Sean.Moore@ottawa.ca>; O'Callaghan, Katie <katie.ocallaghan@ottawa.ca>
Subject: 3845 & 3850 Cambrian Rd Commercial Developments - Stormwater Management

Hi,

Parsons is currently providing municipal engineering services for both commercial development located at 3845 Cambrian Rd and 3850 Cambrian Rd. These two sites are across from each other on Cambrian Rd and are serviced by the same storm sewer previously installed in 2019 for the future re-aligned Greenbank Rd. (see image below)



According to pre-consultation meeting notes for both projects (see attached), the allowable release rate for each site is determined using two different methods.

For 3850 Cambrian Rd the allowable release rate is calculated using the following parameters:

- Allowable runoff coefficient = lesser of existing pre-development to a maximum of 0.5 (in our case C=0.2 as this is a vacant land)
- Time of concentration = pre-development, maximum 10 min
- Allowable flowrate using Tc=10min, C=0.2 and an area of 1.4 ha, Qallowable = 81.1 L/s

For 3845 Cambrian Rd the allowable release rate is calculated using the following parameters:

- Allowable runoff coefficient = 0.8
- Time of concentration = 10 min
- Site area = 1.5 ha
- Allowable flowrate = 348 L/s

Furthermore, as these two properties are part of the Half Moon Bay West Subdivision, these two sites were taken into account in the design of the new storm sewer along future Greenbank Rd and the new Clarke Pond. Based on the *Functional Servicing and Stormwater Management Report for the Half Moon Bay West Subdivision, dated March 8, 2019 by Mattamy Homes and DSEL*, the storm sewer was designed using runoff coefficient of 0.8 for both properties and a time of concentration of 29.62 min and 31.23 min for 3845 Cambrian and 3850 Cambrian respectively. Appendix D of this report showing the storm drainage plan and storm design sheets is attached for your reference.

Using the time of concentration mentioned above and runoff coefficient of 0.8, the allowable release rate for 3845 Cambrian is 181.5 L/s and 163.4 L/s for 3850 Cambrian.

We would like you to discuss and let us know which method of calculations should be used for both of these commercial developments. We could also arrange a meeting in the middle of next week to discuss.

If you have any questions please let us know.

Thank you,

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Boundary Conditions
3850 Cambrian Rd

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	7	0.11
Maximum Daily Demand	10	0.17
Peak Hour	19	0.31
Fire Flow Demand #1	6,000	100.00

Location

Results

Existing Conditions (Pressure Zone 3SW)

Connection 1 – Cambrian Rd.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	156.5	89.9
Peak Hour	142.6	70.1
Max Day plus Fire Flow	138.9	64.9

[1] Ground Elevation = 93.3 m

Future Conditions (Pressure Zone SUC)

Connection 1 – Cambrian Rd.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	146.8	76.0
Peak Hour	142.8	70.4
Max Day plus Fire Flow	143.8	71.8
[1] Ground Elevation =	93.3	m

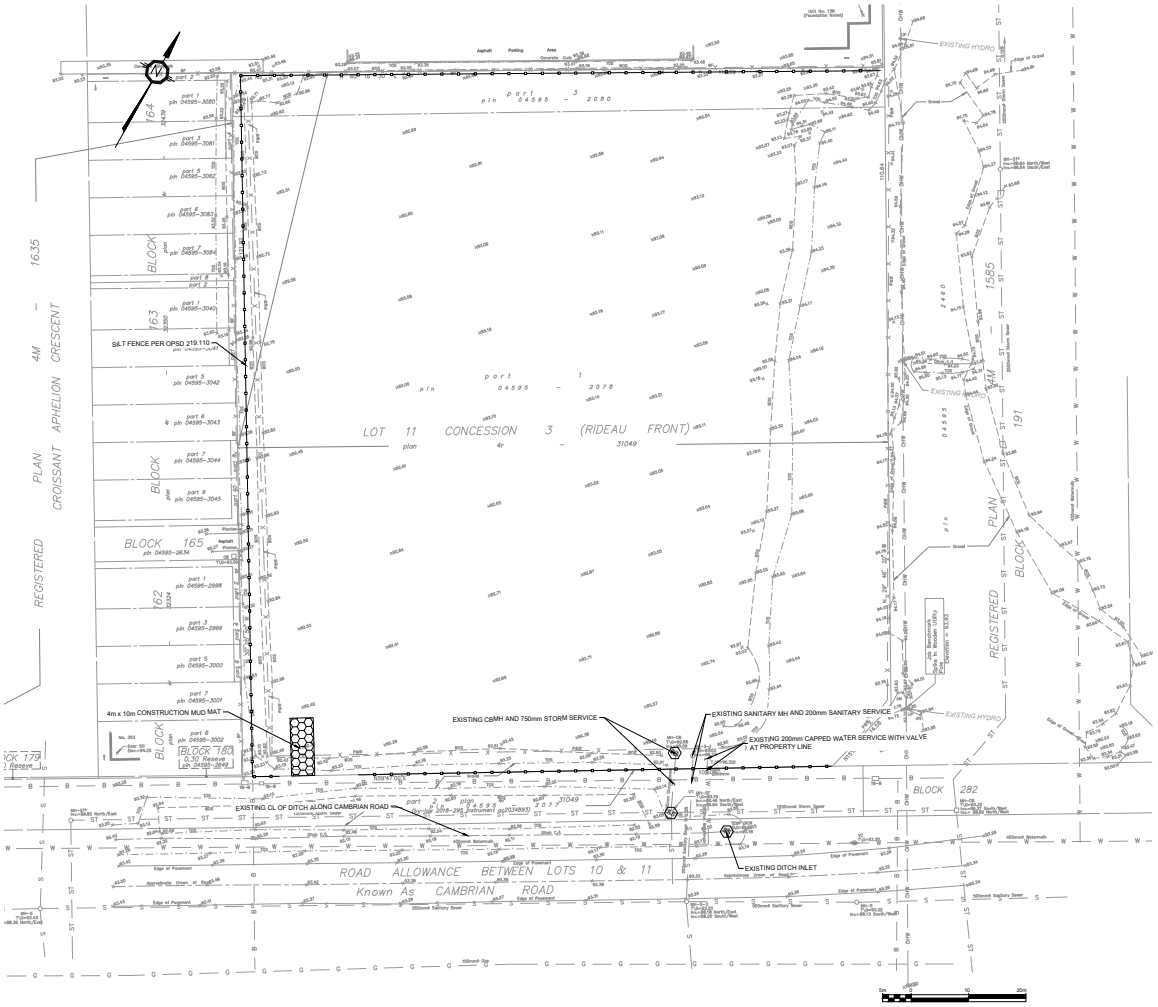
Notes

1. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    a. If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
    b. Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

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

DRAWINGS



LEGEND:

- EXISTING PROPERTY LINE
- EXISTING WATERMAIN
- EXISTING V&VB
- EXISTING VALVE CHAMBER
- EXISTING SANITARY SEWER AND MAINTENANCE HOLE
- EXISTING STORM SEWER AND MAINTENANCE HOLE
- EXISTING GRADE
- EXISTING OVERHEAD HYDRO
- EXISTING GAS
- EXISTING BELL
- 4m x 10m CONSTRUCTION MUD MAT
- PROPOSED SILT FENCE AS PER OPSD 219.110
- SILT SACK PER DETAIL D1

EROSION AND SEDIMENT CONTROL MEASURES:

- CONTRACTOR IS RESPONSIBLE FOR ALL INSTALLATION, MONITORING, REPAIR AND REMOVAL OF ALL EROSION AND SEDIMENT CONTROL FEATURES. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURE MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
- SEDIMENT AND EROSION CONTROL PLAN OBJECTIVES:
- PREVENT SOIL EROSION. THIS CAN RESULT FROM STREAMING RAIN WATER OR WIND EROSION DURING CONSTRUCTION.
- PREVENT SEDIMENT DEPOSITS IN THE SEWER PIPES AND NEARBY COLLECTING STREAMS (AS APPLICABLE).
- PREVENT AIR POLLUTION FROM PARTICULATE MATTER AND DUST.

1. PRIOR TO START OF CONSTRUCTION:

PRIOR TO THE REMOVAL OF ANY VEGETATIVE COVER, MOVING OF SOIL AND CONSTRUCTION:

- INSTALL SILT FENCE (AS PER OPSD 219.110) ALONG DITCHES IMMEDIATELY DOWNSTREAM FROM AREAS TO BE DISTURBED (SEE PLAN FOR LOCATION).
- INSTALL FILTER CLOTH ON DOWNSTREAM MANHOLE COVERS.
- INSTALL SILTSACK FILTERS IN ALL CONCRETE CATCH BASINS STRUCTURES.
- INSPECT MEASURES IMMEDIATELY AFTER INSTALLATION.
- THE CONTRACTOR MUST SET UP THE MEASURES INDICATED ON THE PLAN, INSPECT THEM FREQUENTLY AND CLEAN AND REPAIR OR REPLACE THE DETERIORATED STRUCTURES. AT THE END OF THE CONSTRUCTION PERIOD, THE CONTRACTOR IS RESPONSIBLE FOR REMOVAL OF THE TEMPORARY STRUCTURES AND RECONDITIONING THE AFFECTED AREAS

2. DURING CONSTRUCTION:

- SEDIMENT AND EROSION CONTROL MEASURES TO BE CONSTRUCTED AS PER OPSS 805.
- WHEN SEDIMENT AND EROSION CONTROL MEASURES MUST BE REMOVED TO COMPLETE A PORTION OF THE WORK, THE SAME MEASURES MUST BE REINSTATED UPON THE WORK'S COMPLETION.
- WORK TO BE DONE IN THE VICINITY OF MAJOR WATERWAYS TO BE CARRIED OUT FROM JULY AND SEPTEMBER ONLY.
- MINIMIZE THE EXTENT OF DISTURBED AREAS AND THE DURATION OF EXPOSURE.
- PROTECT DISTURBED AREAS FROM RUNOFF.
- PROVIDE TEMPORARY COVER SUCH AS SEEDING OR MULCHING IF DISTURBED AREA WILL NOT BE REHABILITATED SHORTLY.
- INSPECT STRAW BALE FLOW CHECK DAMS, SILT FENCES, SILT SACKS, AND CATCH BASIN SUMPS REGULARLY AND AFTER EACH RAIN BY MAJOR STORM EVENTS. REPAIR AND CLEAN WHEN NECESSARY.
- FLOW CHECK DEVICES AND SEDIMENT TRAPS SHALL BE CLEANED DURING CONSTRUCTION.
- EROSION CONTROL FENCING TO BE PLACED AND INSTALLED AROUND THE BASE OF ALL STOCKPILES.
- DO NOT LOCATE TOPSOIL PILES AND EXCAVATION MATERIAL CLOSER THAN 2.5m FROM ANY PAVED SURFACE, OR ONS WHICH IS TO BE PAVED BEFORE THIS PILE IS REMOVED. ALL TOPSOIL PILES ARE TO BE SEEDED IF THEY ARE TO REMAIN ON SITE LONG ENOUGH FOR SEEDS TO GROW (LONGER THAN 30 DAYS). WHEN STORING SOIL ON SITE IN PILES THE CONTRACTOR MUST COVER EACH PILE WITH TARPS, STRAW OR A GEOTEXTILE FABRIC TO AVOID FINE PARTICLE TRANSPORT BY WIND AND/OR STREAMING RAIN WATER.
- CONTROL WIND-BLOWN DUST OFF SITE TO ACCEPTABLE LEVELS BY SEEDING TOPSOIL PILES AND OTHER AREAS TEMPORARILY (PROVIDE WATERING AS REQUIRED). FOR DUST CONTROL, CONTRACTOR TO APPLY CALCIUM CHLORIDE (TYPE I – OPSS 2501 AND CANICGSB-15-1) AND WATER WITH EQUIPMENT APPROVED BY THE OWNER'S REPRESENTATIVE AT RATE IN ACCORDANCE TO OPSS 506 WHEN DIRECTED BY OWNER'S REPRESENTATIVE.
- 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. SEDIMENT CONTROL DEVICES MUST BE MAINTAINED AND CANNOT BE REMOVED UNTIL ALL LANDSCAPING AREAS ARE STABILIZED.
- NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY THIS CONSULTING ENGINEER AND THE TOWN DEPARTMENT OF PUBLIC WORKS.
- CONTRACTOR RESPONSIBLE FOR MUNICIPAL ROADWAY AND SIDEWALK TO BE CLEANED OF ALL SEDIMENT FROM VEHICULAR TRACKING ETC. AT THE END OF EACH WORK DAY.
- DURING WET CONDITIONS, TIRES OF ALL VEHICLES/EQUIPMENT LEAVING THE SITE ARE TO BE SCRAPED.
- ANY MUD/MATERIAL TRACKED ONTO THE ROAD SHALL BE REMOVED IMMEDIATELY BY HAND OR RUBBER TIRE LOADER.
- 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.
- PROVIDE GRAVEL ENTRANCE WHEREVER EQUIPMENT LEAVES THE SITE TO PROVIDE MUD TRACKING ONTO PAVED SURFACES. GRAVEL BED SHALL BE A MINIMUM OF 10m LONG, 4m WIDE, AND 0.15m DEEP AND SHALL CONSIST OF COARSE MATERIAL. MAINTAIN GRAVEL ENTRANCE IN CLEAN CONDITION.

3. AFTER CONSTRUCTION:

- PROVIDE PERMANENT COVER CONSISTING OF TOPSOIL AND SEED TO DISTURBED AREAS.
- ALL SEDIMENT AND EROSION CONTROL MEASURES TO BE REMOVED BY THE CONTRACTOR FOLLOWING THE COMPLETION OF WORK AND AFTER DISTURBED AREAS HAVE BEEN REHABILITATED AND STABILIZED. THIS INCLUDES REMOVE STRAW BALE FLOW CHECK DAMS, SILT FENCES AND FILTER CLOTHS ON CATCH BASINS AND MANHOLE COVERS.
- INSPECT AND CLEAN CATCH BASIN SUMPS AND STORM SEWERS.

TURNER FLEISCHER

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TOPOGRAPHIC INFORMATION & BENCHMARK

SURVEY COMPLETED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ON OCTOBER 21, 2022. ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM, DERIVED FROM CONTROL MONUMENT NO. 019680071 HAVING AN ELEVATION OF 99.742m.

#	DATE	DESCRIPTION	BY
1	2023-04-26	ISSUED FOR SPA	BV

Choice Properties REIT

PROJECT

3850 CAMBRIAN RD

BARRHAVEN, ONTARIO

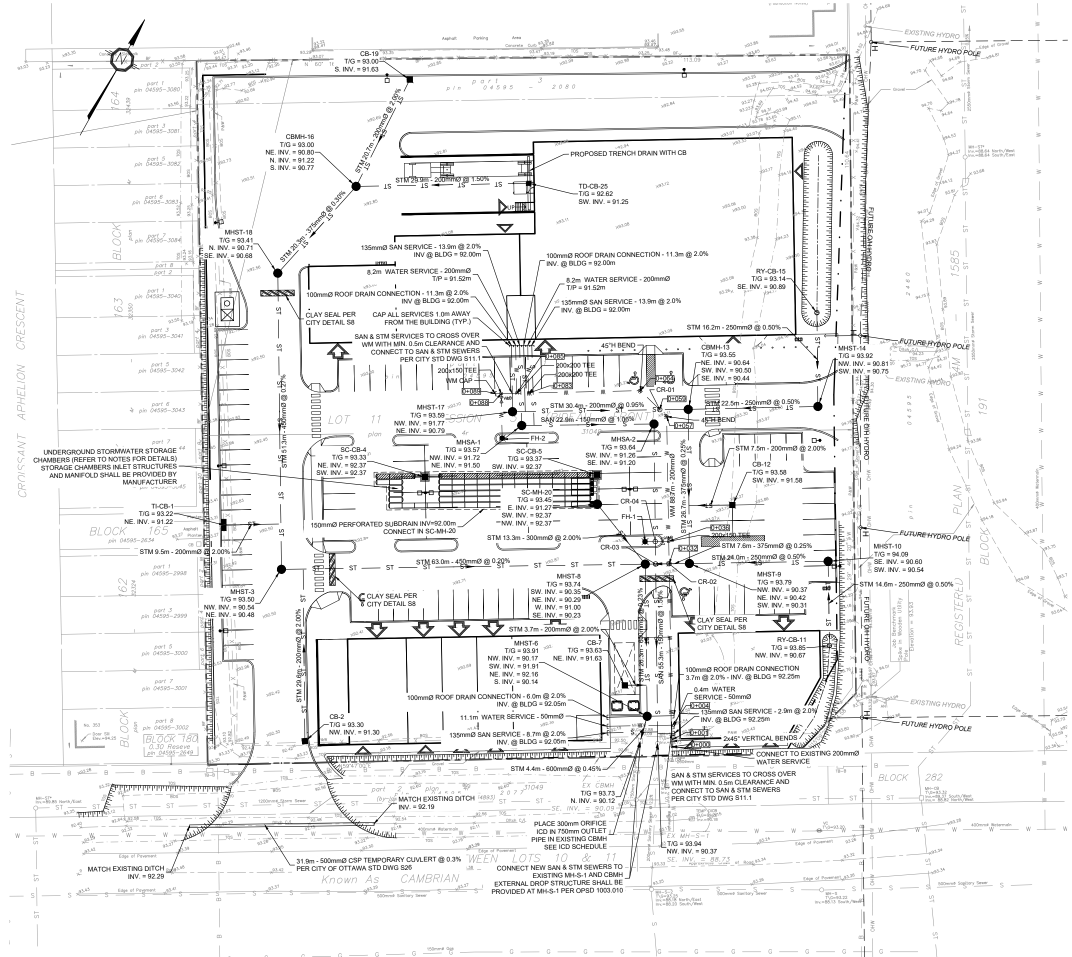
DRAWING

EROSION/SEDIMENT CONTROL & EXISTING CONDITIONS PLAN

PROJECT NO.	478356
PROJECT DATE	2022-08-19
DRAWN BY	BV
CHECKED BY	MT
SCALE	As indicated

PROFESSIONAL ENGINEER — B. VILLENEUVE — 100553967 — 2023-04-26 — PROVINCE OF ONTARIO

DRAWING NO.	REV.
C101	1



LEGEND:

- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE AS PART OF THE GREENBANK RD RE-ALIGNMENT PROJECT
- EXISTING WATERMAIN
- EXISTING V&VB
- EXISTING VALVE CHAMBER
- PROPOSED WATERMAIN
- PROPOSED FIRE HYDRANT PER CITY STD DWG W19
- PROPOSED V&VB
- EXISTING SANITARY SEWER AND MAINTENANCE HOLE
- PROPOSED SANITARY SEWER AND MAINTENANCE HOLE
- EXISTING STORM SEWER AND MAINTENANCE HOLE
- PROPOSED STORM SEWER AND MAINTENANCE HOLE
- PROPOSED REAR YARD CATCH BASIN AS PER CITY STD DWG S31
- PROPOSED CATCH BASIN
- PROPOSED TWIN INLET CATCH BASIN AS PER OPSD 705.020
- TERRACE (3:1 MAX)
- PROPOSED CENTERLINE SWALE
- PROPOSED LIGHT STANDARD
- CLAY SEAL PER CITY STD DETAIL S8

NOTES: WATERMAIN

1. ALL WATERMAIN TO BE INSTALLED AT MINIMUM COVER OF 2.4m BELOW FINISHED GRADE. WHERE THE MINIMUM COVER OF 2.4m IS NOT REACHED, THERMAL INSULATION IS REQUIRED AS PER CITY OF OTTAWA DETAIL W22.
2. WATERMAIN PIPE MATERIALS TO BE CLASS PVC DR-18, OR APPROVED EQUIVALENT, UNLESS INDICATED OTHERWISE.
3. WATERMAIN TO BE CONSTRUCTED AS PER OPSS 441 AND OPSD 802.010. WATERMAIN BEDDING AND COVER MATERIAL TO BE OPSS 1010 GRANULAR 'A' CRUSHER-RUN LIMESTONE COMPACTED TO 95% SPMDD.
4. A CONTINUOUS 12 GAUGE COPPER TRACER WIRE MUST BE INSTALLED OVER ALL WATERMAINS. TRACER WIRE SHALL BE TIED TO ALL FIRE HYDRANTS.
5. INSTALLATION OF A WATERMAIN PIPE CROSSING A SEWER PIPE SHALL BE AS PER CITY OF OTTAWA DETAILS W25 AND W25.2.
6. IF WATERMAIN PIPE MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THAT RECOMMENDED BY THE MANUFACTURER.
7. CATHODIC PROTECTION REQUIRED FOR ALL IRON FITTINGS AS PER OPSD 1109.011.
8. THRUST BLOCKS AND RESTRAINING AS PER OPSD 1103.010 AND OPSD 1103.020.
9. HYDRANT INSTALLATION AS PER OPSD 1105.010 AND OPSS 441. HYDRANT TO COMPLY WITH AWWA C502.
   a. HYDRANTS MUST HAVE THREE EXITS (TWO 65.5 mm AND ONE 100.0 mm 'STORZ' OF STAINLESS STEEL) WITHOUT DRAIN. FIRE HYDRANTS MUST BE INSTALLED SUCH THAT THE 'STORZ' EXIT POINTS TOWARDS THE BUILDING IT WILL SERVICE. THE CONTRACTOR MUST ENSURE THAT THE BREAKAWAY FLANGE IS LOCATED ABOVE THE FINISHED GROUND (APPROXIMATELY 150 mm).
   b. FIRE FLOW TESTS FOLLOWED BY COLOUR CODING OF HYDRANTS (AS PER NFPA-291) SHALL BE CARRIED OUT PRIOR TO SUBSTANTIAL COMPLETION OF THE WORK.
10. WATERMAIN AND HYDRANT CONTROL VALVES IN THE 100 – 300 mm RANGE WILL BE RESILIENT SEATING GATE VALVES (AWWA C509) WITH MECHANICAL JOINT CONNECTIONS. VALVES WILL OPERATE COUNTER-CLOCKWISE TO OPEN WITH A NON-RISING STEM. VALVES WILL BE COMPLETE WITH THE STANDARD AWWA 50 mm OPERATING NUT. VALVES TO BE INSTALLED AS PER OPSS 441.
11. PIPE FITTINGS (BENDS, TEES, CROSSES, REDUCERS, ETC.) WILL BE MECHANICAL JOINT (AWWA C-111) WITH CEMENT MORTAR LINING (AWWA C-104).
12. COUPLERS MUST BE COMPRESSION TYPE WITH MINIMUM PRESSURE RATING OF 1035 kPa. COUPLERS MUST BE MUELLER 11-12940.
13. VALVE BOXES MUST BE COMPLETE (FULLY METALLIC) 3 PIECE SLIDING TYPE WITH GUIDE PLATES.
14. WATERMAINS MUST BE THOROUGHLY FLUSHED AND CLEANED TO REMOVE ALL DIRT AND DEBRIS PRIOR TO THE DISINFECTION PROCESS.
15. ALL WATERMAINS SHALL BE HYDROSTATICALLY AND BACTERIOLOGICALLY TESTED AS PER PROVINCIAL AND MUNICIPAL REGULATIONS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL REQUIREMENTS ARE FOLLOWED.
16. THE DISINFECTION PROCEDURE WHICH FOLLOWS INITIAL FLUSHING AND CLEANING CONSISTS OF CHLORINATION, FINAL FLUSHING AND BACTERIOLOGICAL TESTING. DISINFECTION MUST BE PERFORMED BY THE CONTRACTOR USING METHODS APPROVED BY THE CITY AND IN ACCORDANCE WITH MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE GUIDELINES. DOSAGE MUST BE 100 ppm WITH A MINIMUM RESIDUAL OF 25 ppm AFTER 24 HOURS. DISINFECTANT MUST BE SUPPLIED BY THE CONTRACTOR AND MUST BE ANSI APPROVED. TESTING AND TEST RESULTS MUST BE WITNESSED BY CITY PERSONNEL.
17. ALL DISINFECTANT WATER IS TO BE REMOVED FROM THE NEW WATERMAINS AND REPLACED WITH DISTRIBUTION SYSTEM WATER PRIOR TO PRESSURE TESTING OF THE WATERMAIN.
18. PRESSURE TESTING OF ALL WATERMAINS AND APPURTENANCES INSTALLED BY THE CONTRACTOR MUST BE PERFORMED BY THE CONTRACTOR USING METHODS MEETING THE APPROVAL OF THE CITY. TESTING AND RESULTS MUST BE WITNESSED BY CITY PERSONNEL.
19. MAINS AND SERVICES MUST BE PRESSURE TESTED AT 1035 kPa (150 psi) IN ACCORDANCE WITH AWWA C-600-82 (MINIMUM REQUIREMENT).
20. LEAKAGE TESTS MUST BE CONDUCTED AS PER AWWA C-600-82 (MINIMUM REQUIREMENT).
21. ONCE THE DISINFECTION AND PRESSURE TESTING RESULTS HAVE BEEN APPROVED, THE CONTRACTOR MUST ENSURE THAT ALL WATERMAIN PIPES ARE FLUSHED UNTIL THE CHLORINE LEVEL IN THE WATER IS SIMILAR TO THE LEVEL OF CHLORINE IN THE MUNICIPAL WATERMAIN NETWORK IN THE AREA.
22. BACTERIOLOGICAL TESTING MUST CONSIST OF TWO SAMPLINGS TWENTY FOUR HOURS APART. IF BACTERIOLOGICAL SAMPLES ARE SATISFACTORY THE WATERMAIN MAY BE PLACED ON LINE.
23. ALL WATERMAIN VALVES TO BE OPERATED BY THE CITY OF OTTAWA ONLY.

NOTES: SEWER

1. CONTRACTOR TO CONFIRM ELEVATION OF EXISTING STORM AND SANITARY SEWERS AT PROPOSED CONNECTION POINTS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE COMMENCING ANY WORK.
2. ALL WORK SHALL BE PERFORMED, AS APPLICABLE IN ACCORDANCE WITH OPSS 407, 408 AND 410.
3. **ALL STORM AND SANITARY SEWERS INSTALLED BELOW THE GROUNDWATER TABLE ELEVATION (±92.0m) SHALL BE WATERTIGHT AND INFILTRATION TESTS SHALL BE CARRIED OUT ACCORDING TO OPSS.MUNI 410.**
4. **CLAY SEALS SHALL BE ACCORDING CITY OF OTTAWA STD DETAIL S8 AND EXTENDED AT LEAST 1.0m ABOVE THE GROUNDWATER TABLE ELEVATION.**
5. PIPE MATERIAL TO BE PVC SDR-35 AND CONFORMING TO OPSS 1841, UNLESS INDICATED OTHERWISE. PVC SEWERS TO BE INSTALLED PER OPSD 802.010 (MODIFIED). BEDDING AND COVER MATERIALS TO BE OPSS 1010 GRANULAR 'A' CRUSHER-RUN LIMESTONE BEDDING COMPACTED TO 95% SPMDD.
6. ALL SEWERS WITH LESS THAN 1.5 METERS OF COVER ARE SUBJECTED TO INSULATION PER CITY OF OTTAWA STD DETAIL S35
7. PIPE BACKFILL MATERIAL TO BE APPROVED NATIVE MATERIAL OR SELECT SUBGRADE MATERIAL IN CONFORMANCE WITH OPSS 212.
8. ALL MAINTENANCE HOLES AND CATCH BASIN MAINTENANCE HOLES TO BE 1200mmØ AS PER OPSD 701.010, UNLESS INDICATED OTHERWISE. MAINTENANCE HOLES AND CATCH BASIN MAINTENANCE HOLES TO BE INSTALLED PER OPSS 407.
9. ALL CATCH BASINS TO BE 600x600mm AS PER OPSD 705.010, UNLESS INDICATED OTHERWISE. CATCH BASINS TO BE INSTALLED PER OPSS 407.
10. EXCAVATING, BACKFILLING, AND COMPACTING REQUIRED FOR MAINTENANCE HOLES, CATCH BASIN MAINTENANCE HOLES, AND CATCH BASINS TO BE COMPLETED AS PER OPSS 402. THEY ARE TO BE BACKFILLED WITH OPSS GRANULAR 'B' COMPACTED TO 98% SPMDD. JOINTS BETWEEN SECTIONS TO BE WRAPPED WITH NON-WOVEN GEOTEXTILE.
11. FOR SANITARY STRUCTURES: CAST IRON MAINTENANCE HOLE COVER AS PER OPSD 401.010 TYPE 'A'.
12. FOR STORM STRUCTURES: CAST IRON CATCH BASIN MAINTENANCE HOLE COVER AS PER OPSD 401.010 TYPE 'B' AND CAST IRON CATCH BASIN COVER AS PER OPSD 400.020.
13. SANITARY MAINTENANCE HOLES REQUIRE BENCHING AS PER OPSD 701.021.
14. THE CONTRACTOR IS RESPONSIBLE FOR MAKING OR ARRANGING ALL CONNECTIONS TO THE EXISTING SEWERS AS PER MUNICIPAL REQUIREMENTS. PRIOR TO CONNECTION, THE CONTRACTOR MUST PROVIDE, TO THE CONSULTANT / ENGINEER AND THE CITY FOR APPROVAL, ALL TEST RESULTS PERFORMED ON THE INTERNAL SERVICES.
15. ADVISE THE CITY PUBLIC WORKS AT LEAST 72 HOURS IN ADVANCE BEFORE ANY CONNECTION TO THE CITY SERVICES. CO-ORDINATE WITH CITY AS REQUIRED.
16. TERMINATE AND PLUG ALL SERVICE CONNECTIONS AT 1.0 m FROM EDGE OF THE BUILDING.
17. ALL SEWERS TO BE C.C.T.V. INSPECTED BY THE CONTRACTOR AS PER OPSS 409. TWO COPIES OF THE INSPECTION REPORT MUST BE PROVIDED TO THE CONSULTANT AND THE C.C.T.V. INSPECTION IN DVD FORMAT ONLY.

ICD SCHEDULE

ICD ID	LOCATION	ORIFICE INVERT (m)	FLOW 5y/100y (L/s)	HEAD 5y/100y (m)	EQUIVALENT DIAMETER (mm)	MODEL*
1	*EX. CBMH*	90.09	274.6/306.0	2.05/2.55	300	SEE D2 ON DWG C104

* ICD SHOP DRAWINGS SHALL BE SUBMITTED TO PARSONS BEFORE COMMENCING ANY WORK

NOTES: UNDERGROUND STORMWATER STORAGE

1. UNDERGROUND STORMWATER STORAGE SYSTEM CHAMBER TYPE OR EQUIVALENT STORAGE REQUIREMENT: $112.2m^3$.
2. CHAMBER TYPE: STORMTECH SC-310 OR EQUIVALENT
3. BOTTOM GRANULAR PAD ELEVATION & PERFORATED SUBDRAIN INVERT: 92.00m.
4. BOTTOM OF CHAMBER ELEVATION: 92.37
5. TOP OF CHAMBER ELEVATION: 92.78m.
6. TOP OF SYSTEM TO BE A MINIMUM OF 450mm BELOW PARKING LOT PAVEMENT

CROSSING TABLE

CROSSING No.	PIPE ELEV. AT CROSSING	PIPE ELEV. AT CROSSING	CLEARANCE
CR-01	STM, TOP. 90.75	WM, INV. 91.00	0.25m
CR-02	STM, TOP. 90.68	WM, INV. 91.20	0.52m
CR-03	STM, TOP. 90.68	SAN, INV. 90.84	0.16m
CR-04	SAN, TOP. 91.05	FH LAT., INV. 91.30	0.25m

WATERMAIN TABLE

STATION	SURFACE ELEVATION	W/M DEPTH	TOP OF W/M ELEV.	INV. OF W/M ELEV.	NOTES
0+000	94.10	3.79m	90.31	90.11	CONNECTION TO EXISTING WATERMAIN
0+001	94.10	2.40m	91.70	91.50	2 x 45° VERTICAL BENDS
0+004	94.05	2.40m	91.65	91.45	2 x 50mm WATER SERVICE CONNECTIONS
0+032	93.80	2.40m	91.40	91.20	CR-02 REFER TO CROSSING TABLE
0+036	93.70	2.40m	91.30	91.10	200x150 TEE FOR FIRE HYDRANT LATERAL, CR-04 REFER TO CROSSING TABLE
0+057	93.60	2.40m	91.20	91.00	45° HORIZONTAL BEND
0+059	93.60	2.40m	91.20	91.00	CR-01 REFER TO CROSSING TABLE
0+064	93.60	2.40m	91.20	91.00	45° HORIZONTAL BEND
0+083	93.60	2.40m	91.20	91.00	200x200 TEE, 200mmWATER SERVICE CONNECTION
0+085	93.60	2.40m	91.20	91.00	200x200 TEE, 200mmWATER SERVICE CONNECTION
0+088	93.60	2.40m	91.20	91.00	200x150 TEE FOR FIRE HYDRANT LATERAL
0+089	93.60	2.40m	91.20	91.00	WATER CAP WITH CONCRETE THRUST BLOCK

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TOPOGRAPHIC INFORMATION & BENCHMARK

SURVEY COMPLETED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ON OCTOBER 21, 2022. ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM, DERIVED FROM CONTROL MONUMENT NO. 019680071 HAVING AN ELEVATION OF 99.742m.

#	DATE	DESCRIPTION	BY
1	2023-04-26	ISSUED FOR SPA	BV

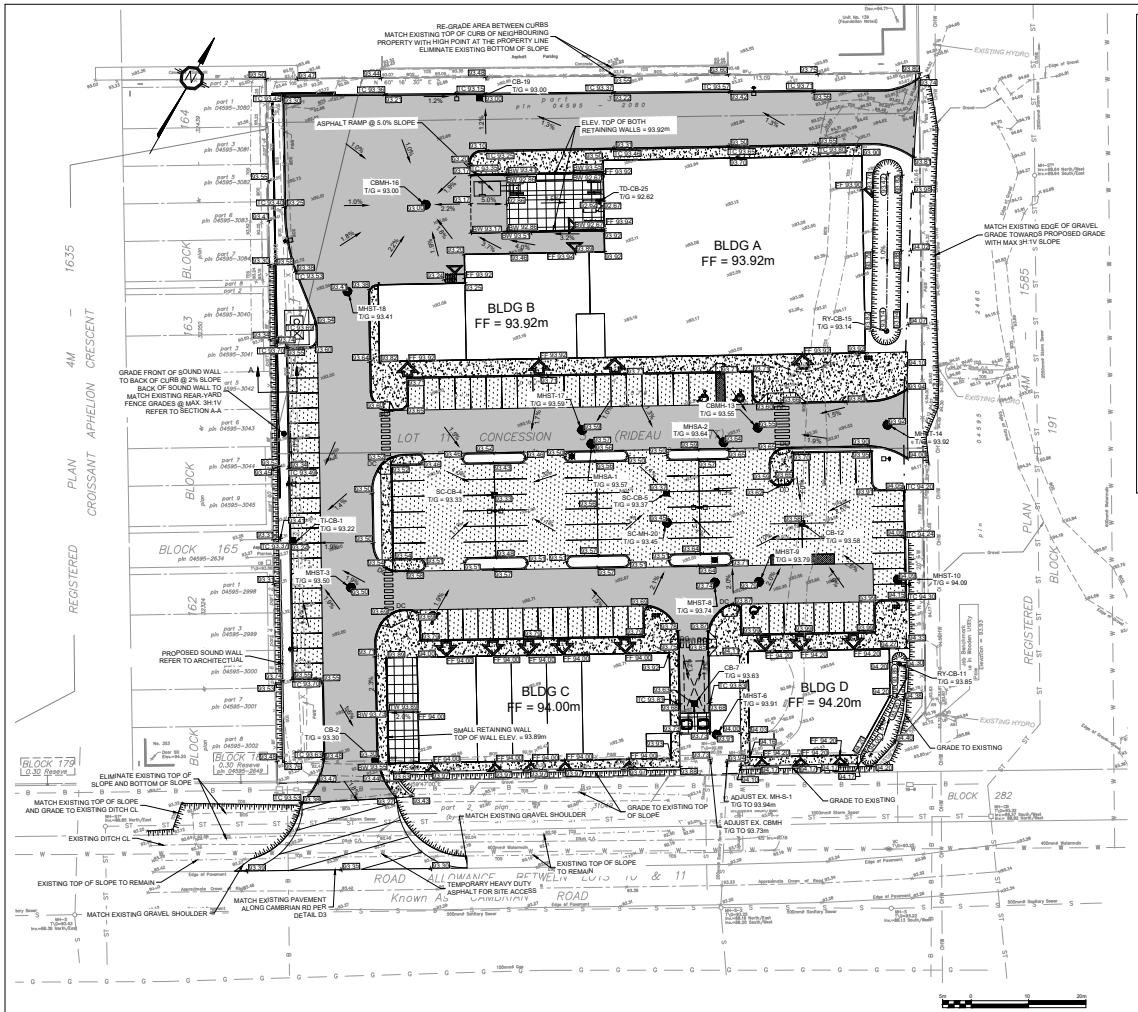
Choice Properties

PROJECT
3850 CAMBRIAN RD
BARRHAVEN, ONTARIO

DRAWING
SITE SERVICING PLAN

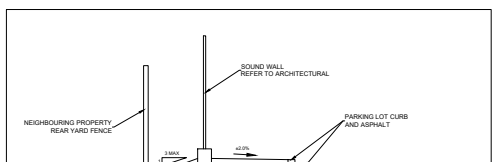
PROJECT NO.	478356
PROJECT DATE	2022-08-19
DRAWN BY	BV
CHECKED BY	MT
SCALE	As indicated
DRAWING NO.	C102
REV.	1

LICENSED PROFESSIONAL ENGINEER
B. VILLENEUVE
100553987
2023-04-26
PROVINCE OF ONTARIO



PAVEMENT STRUCTURES			
MATERIAL	LIGHT DUTY	HEAVY DUTY	COMPACTION
SURFACE LAYER : HL3	40 mm	40 mm	≥ 92%*
BASE LAYER : HL8	40 mm	60 mm	≥ 92%*
GRANULAR BASE : OPSS.MUNI 1010 GRANULAR A	200 mm	200 mm	100%**
GRANULAR SUB-BASE : EXISTING GRANULAR BASE PLACED DURING INITIAL SITE GRADING	min. 350 mm	min. 350 mm	100%**

*MINIMUM PAVEMENT COMPACTION BASED ON MAXIMUM RELATIVE DENSITY, PER OPSS.MUNI 310
**OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY
SOURCE: GEOTECHNICAL INVESTIGATION REPORT, PROPOSED COMMERCIAL DEVELOPMENT, 3850 CAMBRIAN RD, NEPEAN, OTTAWA, ONTARIO, BY GEOTERRE LIMITED, DATED APRIL 6, 2023



LEGEND:

- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE AS PART OF THE GREENBANK RD RE-ALIGNMENT PROJECT
- PROPOSED DITCH/SWALE CENTERLINE
- TERRACE (3:1 MAX)
- EXISTING GRADE
- 99.99 PROPOSED GRADE
- TW 99.99 PROPOSED TOP OF WALL GRADE
- BW 99.99 PROPOSED BOTTOM OF WALL GRADE
- FF 99.99 PROPOSED FINISHED FLOOR ELEVATION
- TC 99.99 PROPOSED TOP OF CURB ELEVATION
- CL 99.99 PROPOSED CENTRELINE OF DITCH/SWALE GRADE
- 9.9% PROPOSED SLOPE DIRECTION AND PERCENTAGE
- PROPOSED STORM MAINTENANCE HOLE
- PROPOSED SANITARY MAINTENANCE HOLE
- PROPOSED CATCH BASIN
- PROPOSED REAR YARD CATCH BASIN AS PER CITY STD DWG S31
- PROPOSED TWIN INLET CATCH BASIN AS PER OPSD 705.020
- PROPOSED LIGHT DUTY PAVEMENT
- PROPOSED HEAVY DUTY PAVEMENT
- PROPOSED TEMPORARY HEAVY DUTY PAVEMENT
- PROPOSED CONCRETE SIDEWALK
- PROPOSED CONCRETE STRUCTURAL SLAB PER STRUCTURAL
- PROPOSED CONCRETE CURB
- DC PROPOSED DEPRESSED CONCRETE CURB WITH TWSI PER CITY STD DWG SC7.3
- PROPOSED LIGHT STANDARD

NOTES: GENERAL

1. THE CONTRACTOR MUST CONFORM TO ALL LAWS, CODES, ORDINANCES, AND REGULATIONS ADOPTED BY FEDERAL, PROVINCIAL OR MUNICIPAL GOVERNMENT COUNCILS AND GOVERNMENT AGENCIES, APPLYING TO WORK TO BE CARRIED OUT. WHEREVER STANDARDS, LAWS AND/OR REGULATIONS ARE MENTIONED THEY REFER TO THEIR CURRENT VERSIONS, MODIFICATIONS INCLUDED.
2. ALL MATERIALS AND CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE ONTARIO PROVINCIAL STANDARD SPECIFICATIONS AND DRAWINGS (OPSS AND OPSD), THE ONTARIO MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE, THE ONTARIO MINISTRY OF NATURAL RESOURCES, APPLICABLE CONSERVATION AUTHORITIES, THE MUNICIPAL STANDARD SPECIFICATIONS AND DRAWINGS, AND ALL OTHER GOVERNING AUTHORITIES AS THEY APPLY, UNLESS OTHERWISE INDICATED.
3. ALL MATERIAL SUPPLIED AND PLACED FOR PARKING LOT AND ACCESS ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. CONSTRUCTION TO OPSS 206, 310 & 314. MATERIALS TO OPSS 1001, 1003 & 1010.
4. THE LOCATION OF EXISTING UNDERGROUND MUNICIPAL SERVICES AND PUBLIC UTILITIES AS SHOWN ON THE PLANS ARE APPROXIMATE. THE CONTRACTOR MUST DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES (ON-SITE AND OFF-SITE) PRIOR TO ANY EXCAVATION WORK. DAMAGE TO ANY EXISTING SERVICES AND/OR EXISTING UTILITIES DURING CONSTRUCTION, WHETHER OR NOT SHOWN ON THE DRAWINGS MUST BE REPAIRED BY THE CONTRACTOR AT HIS OWN EXPENSE.
5. THE CONTRACTOR SHALL DETERMINE THE EXACT INVERT (GEODETIC ELEVATION), DIAMETER AND CONSTRUCTION MATERIAL OF THE EXISTING CONDUITS AT THE PROPOSED CONNECTIONS. THEY SHALL ALSO CARRY OUT, IF NECESSARY, EXPLORATORY DIGS IN ORDER TO DETERMINE THE EXACT LOCATION AND INVERTS OF EXISTING DUCK BANKS. THIS INFORMATION SHALL IMMEDIATELY BE PROVIDED TO THE CONSULTANT PRIOR TO START UNDERTAKING ANY MUNICIPAL SEWER WORK AND A 48 HOUR PERIOD MUST BE ALLOCATED TO THE CONSULTANT FOR DESIGN REVIEW.
6. AT PROPOSED UTILITY CONNECTION POINTS AND CROSSINGS (I.E. STORM SEWER, SANITARY SEWER, WATER, ETC.) THE CONTRACTOR SHALL DETERMINE THE PRECISE LOCATION AND DEPTH OF EXISTING UTILITIES AND REPORT ANY DISCREPANCIES OR CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK.
7. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
8. THE CONTRACTOR IS RESPONSIBLE FOR THE COORDINATION OF ALL WORK AND ACTIVITIES WITH OTHERS TRADES AND CONTRACTORS.
9. THE CONTRACTOR IS THE ONLY PERSON IN CHARGE OF SAFETY ON THE BUILDING SITE. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ADEQUATE PROTECTION OF THE WORKERS, OTHER PERSONNEL AND THE GENERAL PUBLIC. PROTECTION OF MATERIALS, AS WELL AS MAINTAINING IN GOOD CONDITION THE COMPLETED WORKS AND WORKS TO BE COMPLETED. THE CONTRACTOR MUST PROVIDE AT ANY TIME:
   a. A SUFFICIENT NUMBER OF FENCES, BARRIERS, POSTERS, GUARDS AND OTHERS TO ENSURE SAFETY;
   b. NECESSARY CONVENIENCES FOR THE COMPLETION OF WORK SUCH AS HEATING, LIGHTING, VENTILATION ETC.
10. CONTRACTOR IS RESPONSIBLE TO OBTAIN THE VARIOUS PERMITS/APPROVALS REQUIRED TO COMPLETE ALL THE WORKS AND ACTIVITIES AND BEAR COST OF THE SAME. SUCH AS BUT NOT LIMITED TO, ROAD CUT PERMITS, SEWER PERMITS, WATER PERMIT, ETC. AND THEIR ASSOCIATED COSTS.
11. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
12. JOB BENCH MARK - CONFIRM WITH PARSONS PRIOR TO UTILIZATION. THE CONTRACTOR MUST MAINTAIN BENCHMARKS AND LANDMARK REFERENCES AS IS. OTHERWISE THESE REFERENCES WILL BE REPOSITIONED BY A CERTIFIED LAND SURVEYOR AT THE CONTRACTOR'S EXPENSE.
13. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
14. IF GROUNDWATER IS ENCOUNTERED DURING CONSTRUCTION, DEWATERING OF EXCAVATIONS COULD BE REQUIRED. IT IS ASSUMED THAT GROUNDWATER MAY BE CONTROLLED BY SUMP AND PUMPING METHODS. THE CONTRACTOR SHALL OBTAIN A PERMIT TO TAKE WATER IF SITE CONDITIONS REQUIRE TAKING MORE THAN A TOTAL OF 400 000 L/DAY.
15. STRIP AND REMOVE ALL TOPSOIL FROM IMPROVED AREAS. SITE PREPARATION INCLUDES CLEARING, GRUBBING, STRIPPING OF TOPSOIL, DEMOLITION, REMOVAL OF UNSUITABLE MATERIALS, CUT, FILL AND ROUGH GRADING OF ALL AREAS TO RECEIVE FINISHED SURFACES.
16. ABUTTING PROPERTY GRADE TO BE MATCHED.
17. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT. PAVEMENT REINSTATEMENT SHALL BE WITH STEP JOINTS OF 300mm WIDTH MINIMUM.
18. CURBS TO BE BARRIER, CONSTRUCTED AS PER OPSD 600.110, EXCEPT WHERE INDICATED OTHERWISE. ELEVATION AT TOP OF CONCRETE CURBS TO BE 150 mm ABOVE THE ASPHALT, UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
19. DEPRESSED CURBS TO BE MOUNTABLE, CONSTRUCTED AS PER OPSD 600.100.
20. LIGHT DUTY AND HEAVY DUTY ASPHALT PAVEMENTS TO BE CONSTRUCTED AS PER TABLE ON DRAWING C103.
21. TRANSITION BETWEEN EXISTING AND PROPOSED PAVEMENT SHALL BE CONSTRUCTED AS PER DETAIL D3 ON DRAWING C104.
22. RESTORE PAVEMENT, STRUCTURE AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE MUNICIPAL AUTHORITIES.
23. CLEANLINESS ON THE SITE. INCLUDES THE CONTRACTOR SHALL CLEAN ROADWAYS AT HIS OWN COST AS DIRECTED BY THE OWNER'S REPRESENTATIVE. MATERIALS AND EQUIPMENT MUST BE LAID OUT IN AN ORGANIZED AND SAFE MANNER, AND ALL MATERIAL, EQUIPMENT AND TEMPORARY STRUCTURES WHICH ARE NO LONGER NECESSARY FOR THE EXECUTION OF THE CONTRACT MUST BE REMOVED FROM THE SITE.
24. CONTRACTOR TO ENSURE MITIGATION MEASURES ARE IMPLEMENTED TO REDUCED THE RISK OF GROUND CONTAMINATION FROM PETROLEUM PRODUCTS.
25. THE CONTRACTOR MUST ENSURE THE FOLLOWING MEASURES ARE IMPLEMENTED REGARDING THE HANDLING OF CONCRETE:
   a. CONCRETE SHOULD EITHER BE MIXED AWAY FROM THE SITE OR SHOULD BE PREPARED ON PAVED SURFACES IF ONLY SMALL QUANTITIES ARE REQUIRED (I.E. MINOR REPAIRS);
   b. EXCESS CONCRETE MUST BE DISPOSED OFF-SITE AT A LOCATION THAT MEETS ALL REGULATORY REQUIREMENTS;
   c. THE WASHING OF CONCRETE TRUCKS AND OTHER EQUIPMENT USED FOR MIXING CONCRETE SHOULD NOT BE CARRIED OUT WITHIN 30 METERS OF A WATERCOURSE OR WETLAND AND SHOULD TAKE PLACE OUTSIDE OF THE WORK SITE;
   d. ALL CONCRETE TRUCKS SHOULD COLLECT THEIR WASH WATER AND RECYCLE IT BACK INTO THEIR TRUCKS FOR DISPOSAL OFF-SITE AT A LOCATION MEETING ALL REGULATORY REQUIREMENTS.
26. THE CONTRACTOR SHALL ENSURE THAT ALL EXCAVATED SURPLUS MATERIALS THAT WILL BE REQUIRED TO BE DISPOSED OFFSITE BE STOCKPILED TEMPORALLY FOR SAMPLING PRIOR BEING LOADED OFFSITE.
27. MINIMIZE DISTURBANCE TO EXISTING VEGETATION DURING THE EXECUTION OF ALL WORKS.
28. TRENCHING, BACKFILLING AND COMPACTING MUST CONFORM TO OPSS 401.
29. DEWATERING OF PIPELINE, UTILITY AND ASSOCIATED STRUCTURE EXCAVATIONS TO BE COMPLETED AS PER OPSS 517.
30. THE CONTRACTOR MUST CONTROL SURFACE RUNOFF FROM PRECIPITATION DURING CONSTRUCTION.
31. FOR ALL GEOTECHNICAL WORK, CONTRACTOR TO REFER TO "GEOTECHNICAL INVESTIGATION REPORT, PROPOSED COMMERCIAL DEVELOPMENT, 3850 CAMBRIAN RD, NEPEAN, OTTAWA, ONTARIO, BY GEOTERRE LIMITED, DATED APRIL 6, 2023."
32. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE DIRECTED FROM THE ENGINEER. EXCAVATE AND REMOVE ALL ORGANIC MATERIAL AND DEBRIS LOCATED WITHIN THE PROPOSED BUILDING, PARKING AND ROADWAY LOCATIONS.
33. THE CONTRACTOR IS RESPONSIBLE FOR ALL EXCAVATION, BACKFILL AND REINSTATEMENT OFF ALL AREAS DISTURBED DURING CONSTRUCTION TO EXISTING CONDITIONS OR BETTER AND ALL ASSOCIATED WORKS TO THE SATISFACTION OF THE CONSULTANT AND MUNICIPAL AUTHORITIES. ASPHALT REINSTATEMENT MUST BE IN ACCORDANCE WITH OPSS 310. LANDSCAPE AREAS TO BE REINSTATED WITH 150 mm OF TOPSOIL AND SOD IN ACCORDANCE WITH OPSS 802 AND OPSS 803.
34. DURING THE CONSTRUCTION PERIOD THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING AND MAINTAINING TEMPORARY TRAFFIC SIGNAGE, INCLUDING TRAFFIC SIGNS, TRAFFIC MARKINGS AND TEMPORARY TRAFFIC LIGHTS, AND FLAGMEN, AS REQUIRED BY THE OWNER, THE CONSULTANT, THE MUNICIPALITY, THE MTO, AND OTHER GOVERNING AUTHORITIES.
35. CONSTRUCT SIDEWALK EXPANSION JOINTS & CONTROL JOINTS AS PER OPSD 310.020.
36. CONSTRUCT CONCRETE SIDEWALK AS PER OPSD 310.020 AND OPSS 351. TACTILE WALKING SURFACE INDICATORS PER OPSS 351.
37. DISPOSE OF CONTAMINATED MATERIALS AT APPROPRIATE OFF-SITE FACILITY THAT MEETS ALL REGULATORY REQUIREMENTS.
38. BE PREPARED TO INTERCEPT, CLEAN UP, AND DISPOSE OF SPILLS OR RELEASES THAT MAY OCCUR WHETHER ON LAND OR WATER. MAINTAIN MATERIALS AND EQUIPMENT REQUIRED FOR CLEANUP OF SPILLS OR RELEASES READILY ACCESSIBLE ON SITE.
39. PROMPTLY REPORT SPILLS AND RELEASES POTENTIALLY CAUSING DAMAGE TO ENVIRONMENT TO: AUTHORITY HAVING JURISDICTION OR INTEREST IN SPILL OR RELEASE, INCLUDING CONSERVATION AUTHORITY, WATER SUPPLY AUTHORITIES, DRAINAGE AUTHORITY, ROAD AUTHORITY, AND FIRE DEPARTMENT.
40. DECONTAMINATE EQUIPMENT AFTER WORKING IN POTENTIALLY CONTAMINATED WORK AREAS AND PRIOR TO SUBSEQUENT WORK OR TRAVEL ON CLEAN AREAS.
41. DO NOT DISCHARGE DECONTAMINATED WATER, OR SURFACE WATER RUNOFF, OR GROUNDWATER, WHICH MAY HAVE COME IN CONTACT WITH POTENTIALLY CONTAMINATED MATERIAL, OFF SITE OR TO MUNICIPAL SEWERS.
42. CONTRACTOR IS TO SUBMIT A TRAFFIC MANAGEMENT PLAN FOR APPROVAL ONE (1) WEEK PRIOR TO ANY WORK WITHIN THE ROW LIMITS TO MEET THE REQUIREMENTS OF MTO BOOK 7. THE CONTRACTOR WILL BE REQUIRED TO IMPLEMENT ALL REQUIREMENTS OF THE MTO BOOK 7.
43. CITY PUBLIC WORKS DEPARTMENT TO BE CONTACTED MINIMUM 7 DAYS PRIOR TO PLANNED DATE FOR CONNECTION TO EXISTING STORM SEWERS, SANITARY SEWERS, AND WATERMAIN. CONNECTION TO EXISTING TO TAKE PLACE IN THE PRESENCE OF APPROPRIATE CITY OF OTTAWA STAFF.

TURNER FLEISCHER
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PARSONS
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Tel: 613-738-4160 Fax: 613-739-7105

TOPOGRAPHIC INFORMATION & BENCHMARK

SURVEY COMPLETED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ON OCTOBER 21, 2022. ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM, DERIVED FROM CONTROL MONUMENT NO. 119580071 HAVING AN ELEVATION OF 99.742m.

#	DATE	DESCRIPTION	BY
1	2023-04-26	ISSUED FOR SPA	BV

Choice Properties REIT

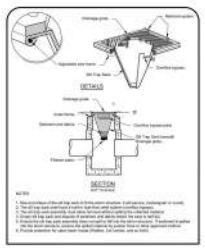
PROJECT
3850 CAMBRIAN RD
BARRHAVEN, ONTARIO

DRAWING
GRADING PLAN

PROJECT NO. 478356
PROJECT DATE 2022-08-19
DRAWN BY BV
CHECKED BY MT
SCALE As indicated

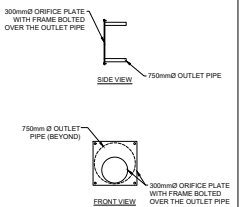
PROFESSIONAL ENGINEER — B. VILENEUVE — 100553987 — PROVINCE OF ONTARIO — 2023-04-26

DRAWING NO. C103 | REV. 1



SILT SACK DETAIL

PARSONS D1

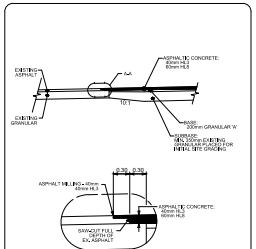


*ICD SHOP DRAWINGS SHALL BE PROVIDED TO PARSONS BEFORE COMMENCING ANY WORK

FRAME & PLATE ICD

N.T.S.

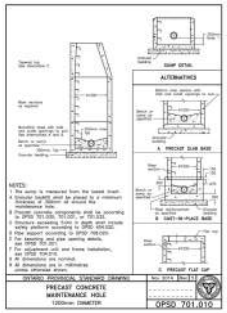
PARSONS D2

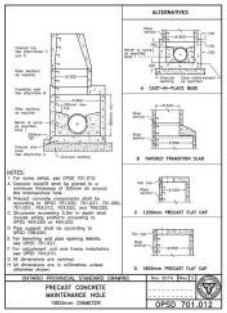


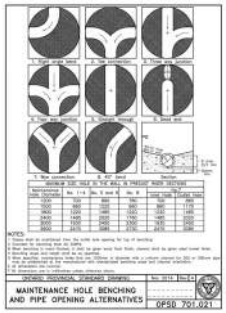
NEW TO EXISTING PAVEMENT PERPENDICULAR TRANSITION TREATMENT

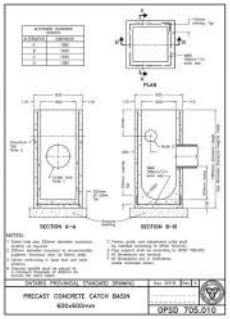
N.T.S.

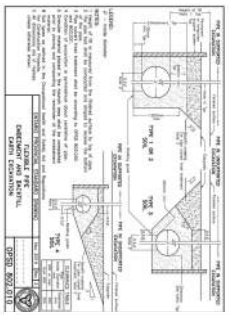
PARSONS D3

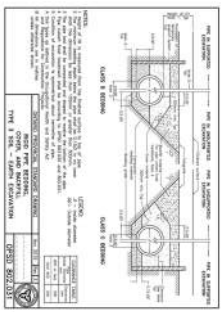


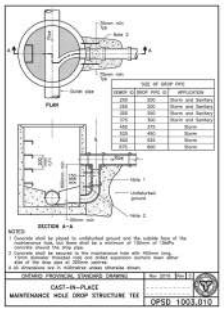


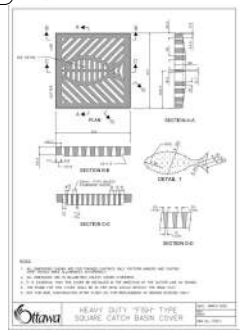


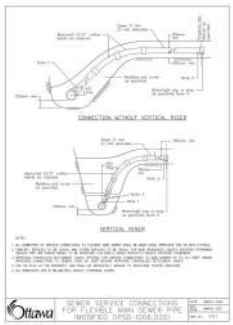


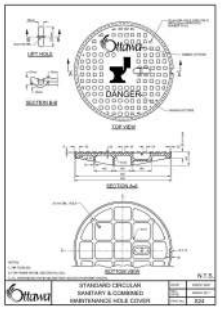


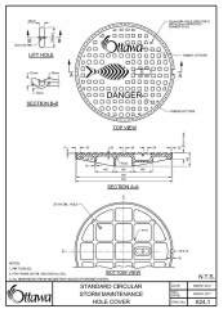


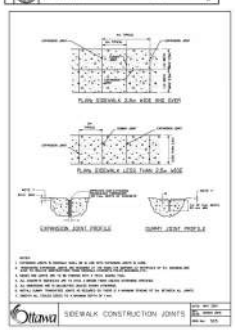


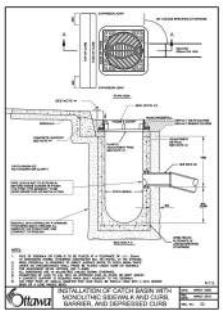


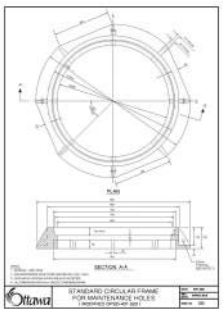


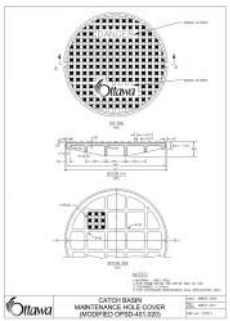


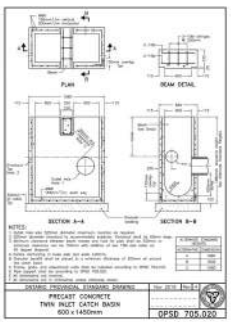


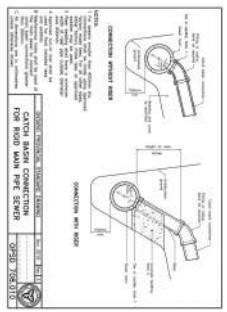


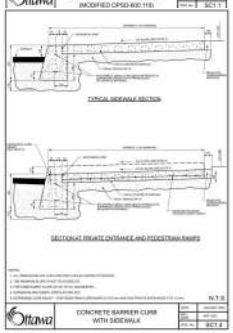


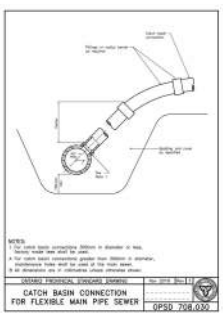


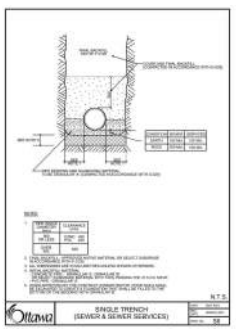


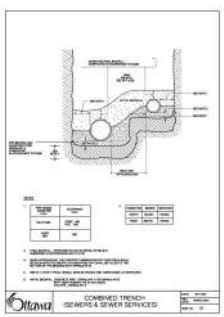


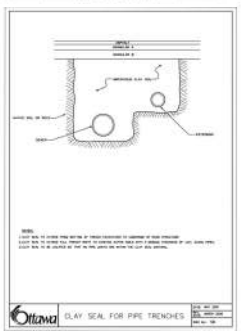


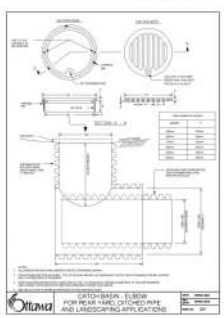


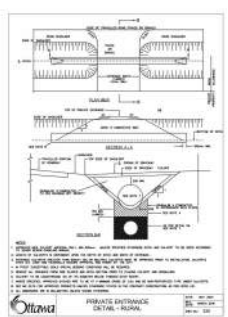












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#	DATE	DESCRIPTION	BY
1	2023-04-26	ISSUED FOR SPA	BV

Choice Properties REIT

PROJECT

3850 CAMBRIAN RD

BARRHAVEN, ONTARIO

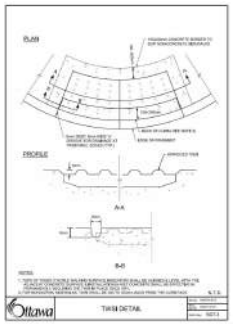
DRAWING

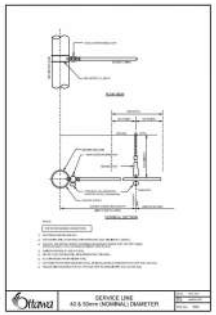
DETAIL PAGE 1

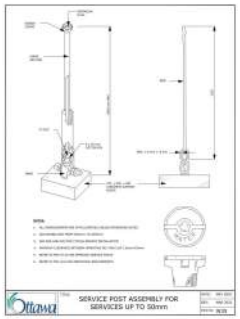
PROJECT NO.	478356
PROJECT DATE	2022-08-19
DRAWN BY	BV
CHECKED BY	MT
SCALE	NTS

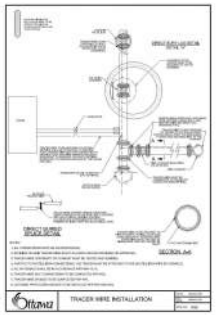
PROFESSIONAL ENGINEER — B. VILLENEUVE — 100553967 — PROVINCE OF ONTARIO — 2023-04-26

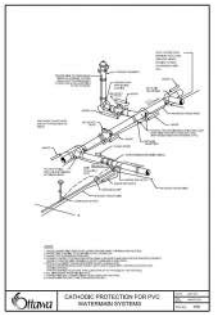
DRAWING NO. C104 | REV. 1

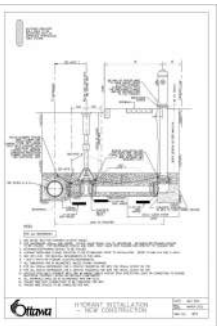


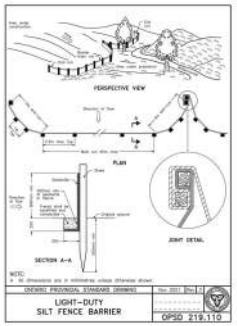


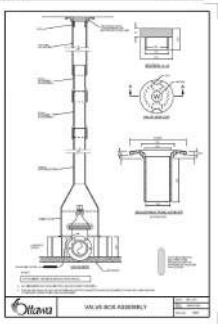


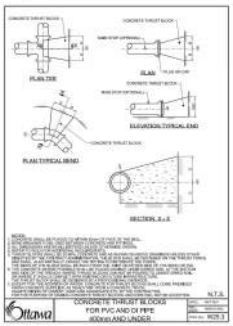


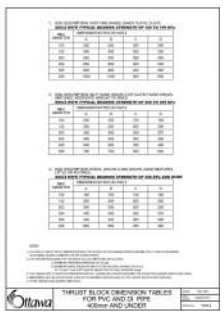


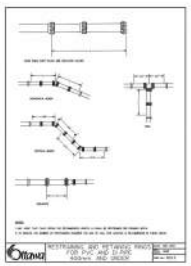


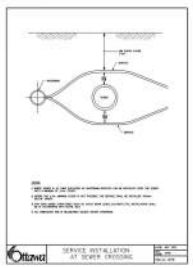












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Choice Properties REIT

PROJECT

3850 CAMBRIAN RD

BARRHAVEN, ONTARIO

DRAWING

DETAIL PAGE 2

PROJECT NO.	478356
PROJECT DATE	2022-08-19
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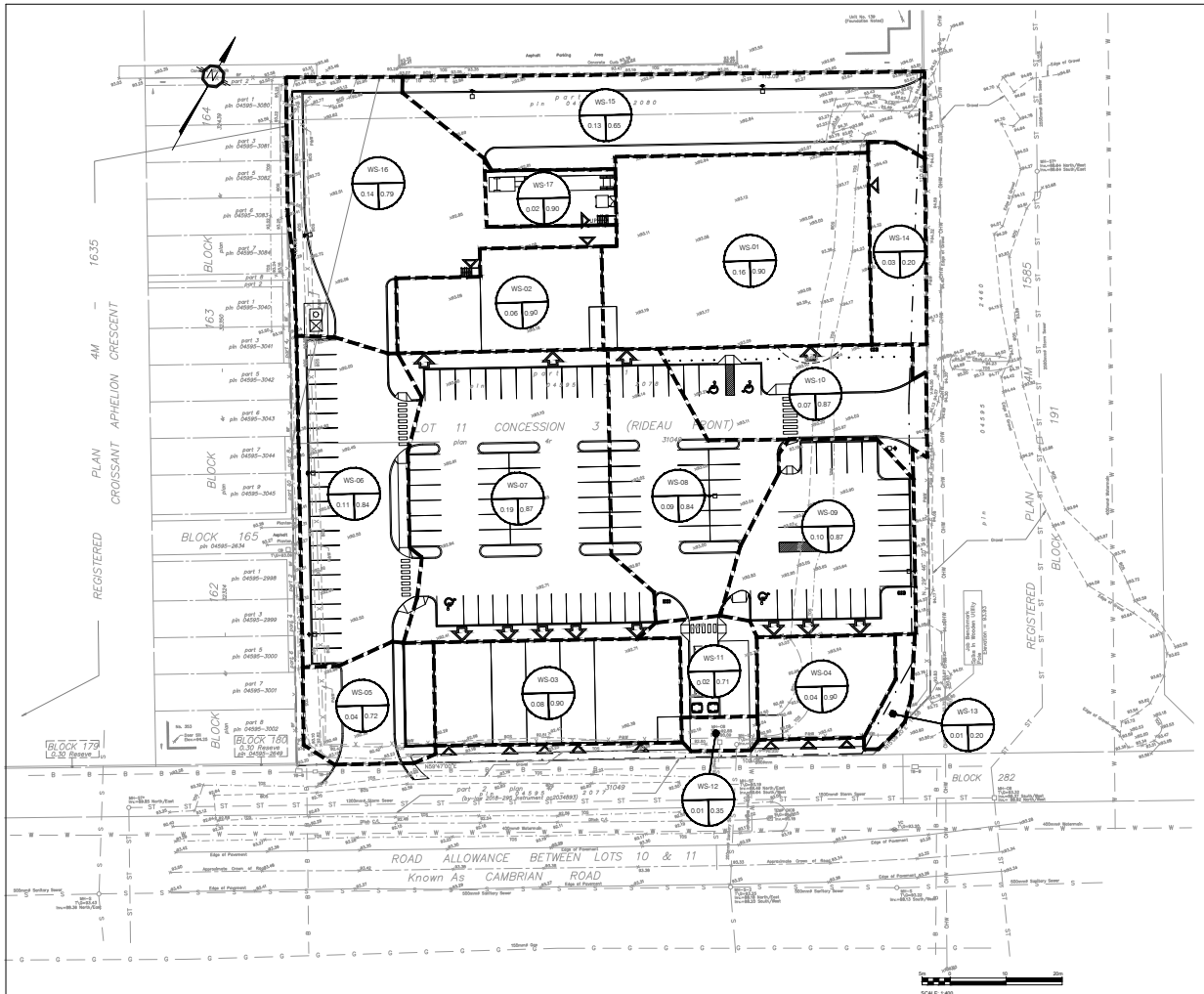
SCALE	NTS

PROFESSIONAL ENGINEER
B. VILLENEUVE
100553967
2023-04-26
PROVINCE OF ONTARIO

DRAWING NO. C105 REV. 1



LEGEND:

- WATERSHED BOUNDARY
- WATERSHED NAME
- RUNOFF COEFFICIENT
- AREA IN HECTARES

WS-XX
0.61 0.90

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Choice Properties REIT

PROJECT

3850 CAMBRIAN RD

BARRHAVEN, ONTARIO

DRAWING

POST-DEVELOPMENT DRAINAGE AREAS

PROJECT NO.	478356
PROJECT DATE	2022-08-19
DRAWN BY	BV
CHECKED BY	MT
SCALE	As indicated

PROFESSIONAL ENGINEER
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2023-04-26
PROVINCE OF ONTARIO

DRAWING NO. C106 | REV. 1