a.m. candaras associates inc.
consulting engineers

STORMWATER MANAGEMENT BRIEF
FOR
PROPOSED 1 STOREY INDUSTRAIL BUILDING
12155 COLERAIN DRIVE
TOWN OF CALEDON: BOLTON

October 16, 2024

a.m. candaras associates inc.
8551 WestonRoad, Suite 203
Woodbridge, Ontario L4L 9R4

Project No. 2417

1.0 INTRODUCTION

The site will be developed with a single industrial building. Stormwater management will consist of roof top controls and roof ponding, plus ponding in the paved areas. The site outlets to the existing ditch on Colerain Drive which then discharges to an existing watercourse.

2.0 DESIGN CRITERIA

(a) The allowable stormwater discharge for all storms up to the 100-year storm to be limited to the 2-year storm existing rate at C=.25.

(b) The 2 to 100-year storm events must be contained on site and released at the allowable discharge rate as defined above.

(c) On site detention must be provided for the 100-year storm. Storm events based on the 100yr, 24-hour Chicago storm at 10min distribution. (See Appendix)

(d) Stormwater quality controls to provide Enhanced protection (80% TSS removal).

(e) Provide onsite retention through the means of infiltration, evapotranspiration and/or irrigation/reuse for the first 28mm of all storm events.

3.0 SITE DESCRIPTION

Roof:	=	2,514.43 m^2
Paved	=	23,473.66 m^2
Landscaped	=	896.67 m^2
Total	=	26,884.76 m^2

4.0 ROOF TOP CONTROLS

The roof area will be equipped with Zurn Z-105-5-ERC control flow roof drains as follows:

Area	No. of Notches	Notch Area	Flow [1] Per Notch	Total Flow
2,514.43	4	628.6	93 l/m	6.2 l/s
			Q_R =	6.2 l/s

[1] Based on manufacturer's design tables at a 102 mm depth.

The resulting total roof top volume ponding is:

153.7 m^3

, as indicated in Table 1. The available roof top storage is 167.6 m^3, based on a maximum ponding depth of 100 mm, as indicated in the attached calculations.

5.0 UNCONTROLLED RUNOFF

The following post development areas will discharge uncontrolled see SD-1 for uncontrolled locations:

Paved area = 0.0 m^2

Landscaped area = 80.7 m^2

The 100 year storm uncontrolled runoff is:

$$Q_U = \frac{(80.7)\ (.31)]\ (196.5)\ (2.778)}{10000}$$

$$= 1.4 \text{ l/s}$$

$$I_{100year} = \frac{4688}{(Tc+17)^{0.9624}}$$

T_c = 10 minutes

$I_{100year}$ = 196.5 mm/hr

6.0 DETENTION VOLUME CALCULATIONS

The allowable site runoff is to be limited to the 2-year pre-development area that is tributary to Colerain which is 7,174.85m^2:

Q_S = CAIN

= (.25) (0.7175) (85.7) (2.778)

= 42.7 l/s

$I_{2year} = \frac{1070}{(Tc+7.85)^{0.8759}}$

T_c = 10 minutes

I_{2year} = 85.7 mm/hr

Allowable Site Runoff:

Q_S = 42.7 l/s

Uncontrolled Flow:

Q_U = 1.4 l/s

Allowable discharge from the paved and landscaped areas:

Q_{PL} = Q_S - (Q_R + Q_U)

Q_{PL} = 42.7 l/s - (6.2 l/s + 1.4 l/s)

= 35.1 l/s

Storage required = 1,607.0 m^3

Note: see Table 2 for volume calculations.

7.0 AVAILABLE DETENTION VOLUME

Based on a high-water level of 233.90 the available surface detention is:

MH#5,6,7,8,9 & CB#3,4,5,6	=	1,707.0 m^3
CB#2	=	12.7 m^3
		1,719.7 m^3

Note: Surface storage calculations on DWG G-1

8.0 OUTLET CONTROLS

The total site discharge is to be limited to:

$Q = Q_S - Q_U$

$Q = 42.7\ l/s - 1.4\ l/s$

$= 41.3\ l/s$

Sizing of the orifice is as follows:

$$Q = CA\sqrt{2gh}$$

where:

h = HWL - Inv of orifice

$h = 233.90\ m - 231.81\ m$

$h = 2.09\ m$

$$A = \frac{Q}{C\sqrt{2gh}}$$

$$A = \frac{0.0413}{.82\sqrt{2X9.81X2.09}}$$

$A = 0.0079\ m^2$

$$d = \sqrt{\frac{4X0.0079m^2}{\pi}}$$

$d = 0.100\ m$

therefore, use 100mm orifice tube on the downstream face of Manhole #2 as shown on DWG G-1.

9.0 STORMWATER QUALITY CONTROLS

Quality controls for the proposed development are provided by an oil grit separator providing enhanced protection level 1 (80% TSS Removal) based on a total site area of 2.69 ha with a total imperviousness of 97%. The Stormceptor (OGS) will be located downstream of the orifice control.

10.0 WATER BALANCE / VOLUME CONTROL

The Region of Peel requires that the 28mm storm be retained onsite. The resulting volume is:

$$\left(\frac{28mm}{1000}\right) \text{ x } 26{,}884.76 \text{ m}^2$$

$$= 752.8 \text{ m}^3$$

Since the groundwater seasonal high elevation of 230.80m, as listed by DS Consultants, with a minimum 1.0m buffer (231.80m) is above the gravity outlet of the site (231.75m) is too high to infiltrate the retained volume. Therefore, watertight StormTrap concrete chambers are proposed to provide a storage of 788.6m^3. A pump chamber (MH 1) will be provided to discharge the 788.6m^3 over a 72-hour period.

16.0 STORMWATER SUMMARY TABLE

DESCRIPTION	VALUE	UNIT
Allowable Site Release Rate (2yr Pre)	**42.7**	l/s
Uncontrolled Release Rate	1.4	l/s
Roof Release Rate	14.0	l/s
Paved & Landscape	35.1	l/s
Required Site Storage	1607.0	m^3
Provided Site Storage	1,719.7	m^3
Required Roof Storage	153.7	m^3
Provided Roof Storage	167.6	m^3
Orifice Tube Size	100	mm
Water Balance Volume Required	752.8	m^3
Water Balance Volume Provided	788.6	m^3
OGS	Stormceptor	80% TSS REMOVAL. 90% ALLUAL RUNOFF TREATED

Prepared by,
a.m. candaras associates inc.

A.M. Candaras, P. Eng.
Consulting Engineer

October 16, 2024

Table 1: 100 YR Storm Runoff Computations for Roof Area

Time Period (min)	Intensity (mm/hr)	Runoff (l/s)	Storage (m^3)
25-30	2.9	1.9	-
30-35	3.7	2.5	-
35-40	4.9	3.3	-
40-45	7.0	4.6	-
45-50	11.0	7.3	0.7
50-55	21.1	14.0	4.7
55-60	62.2	41.3	21.0
60-65	196.5	130.4	74.5
65-70	83.1	55.1	29.4
70-75	41.2	27.3	12.7
75-80	25.1	16.7	6.3
80-85	17.1	11.3	3.1
85-90	12.5	8.3	1.3
90-95	9.6	6.4	0.1
95-100	7.7	5.1	-
100-105	6.3	4.2	-
105-110	5.3	3.5	-
110-115	4.5	3.0	-
115-120	3.9	2.6	-
120-125	3.4	2.3	-
			153.7

Roof Area = 2,514.43 m^2 @ C = 0.95

CAN = $\frac{(2{,}514.43m^2)(.95)(2.778)}{10{,}000}$

= 0.6636

Roof Outflow = 6.2 l/s

Storage (m^3) = $\frac{\text{(Runoff - Roof Outflow) x 10 min x 60 sec}}{1000}$

Table 2: 100 YR Storm Runoff Computations for Paved and Landscaped Areas

Time Period (min)	Intensity (mm/hr.)	Runoff (l/s)	Storage (m^3)
25-30	2.9	18.2	-
30-35	3.7	23.2	-
35-40	4.9	30.7	-
40-45	7.0	43.9	5.2
45-50	11.0	68.9	20.3
50-55	21.1	132.2	58.2
55-60	62.2	389.7	212.7
60-65	196.5	1231.1	717.6
65-70	83.1	520.6	291.3
70-75	41.2	258.1	133.8
75-80	25.1	157.3	73.3
80-85	17.1	107.1	43.2
85-90	12.5	78.3	25.9
90-95	9.6	60.1	15.0
95-100	7.7	48.2	7.9
100-105	6.3	39.5	2.6
105-110	5.3	33.2	-
110-115	4.5	28.2	-
115-120	3.9	24.4	-
120-125	3.4	21.3	-
			1607.0

Net Paved: 23,473.66 m^2 @ C = 0.95

Net Landscaped: 815.97 m^2 @ C = 0.31

$$\text{CAN:} = \frac{[(23{,}473.66\ x\ 0.95)+(815.97\ x\ 0.31)]\ x\ 2.778}{10{,}000}$$

$$= 6.2652$$

$$\text{Storage } (m^3): = \frac{\text{(Runoff - Roof Outflow) x 10 min x 60 sec}}{1000}$$

Outflow: = 35.1 l/s

ROOF PONDING DETAILS

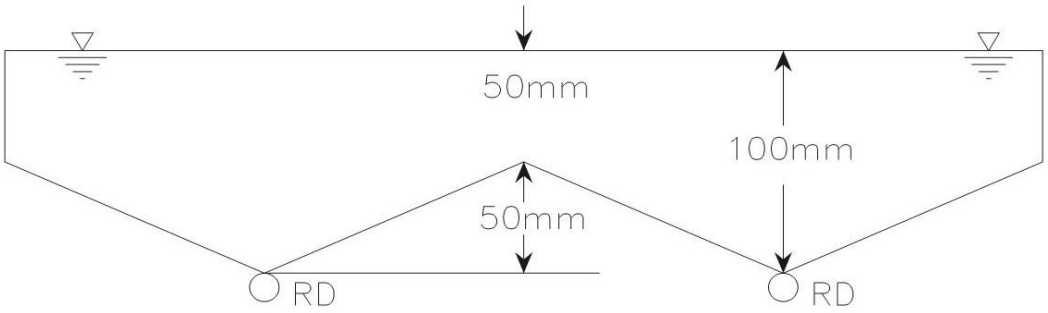
Criteria:

Roof Area = 2,514.43 m^2

Total No. of Drains = 4

100 mm Ponding Depth

50 mm Rise between Drains



Average Area per Drain: $= \frac{2{,}514.43\ m^2}{4}$

$= 628.6\ m^2$

Available Ponding Volume Per Drain: $= \frac{628.6\ m^2 \times 0.050\ m}{3} + (628.6\ m^2 \times 0.050\ m)$

$= 41.9\ m^3/\text{Drain}$

Total Volume $= 41.9\ m^3 \times 4$

$= 167.6\ m^3$

Required Volume $= 153.7\ m^3$

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ROOF DRAIN MANUFACTURERS DESIGN TABLE

LOCATION	SQUARE METRE (SQUARE FOOT) NOTCH AREA RATING	ROOF LOAD FACTOR KGS (LBS.)	TOTAL ROOF SLOPE											
			DEAD-LEVEL			51mm (2") RISE			102mm (4") RISE			152mm (6") RISE		
			L.P.M. (G.P.M.) Discharge	Draindown Time Hrs.	mm (In.) Water Depth	L.P.M. (G.P.M.) Discharge	Draindown Time Hrs.	mm (In.) Water Depth	L.P.M. (G.P.M.) Discharge	Draindown Time Hrs.	mm (In.) Water Depth	L.P.M. (G.P.M.) Discharge	Draindown Time Hrs.	mm (In.) Water Depth
St. Thomas, Ontario	232 (2,500)	5.7 (12.5)	54.5 (12)	8	61 (2.4)	68 (15)	7	76 (3.0)	86.5 (19)	5	96.5 (3.8)	104.5 (23)	4	117 (4.6)
	465 (5,000)	6.6 (14.6)	63.5 (14)	19	71 (2.8)	77.5 (17)	16	86.5 (3.4)	97.5 (21.5)	11	109 (4.3)	118 (26)	9	132 (5.2)
	697 (7,500)	7.1 (15.6)	68 (15)	29	76 (3.0)	82 (18)	26	91.5 (3.6)	102.5 (22.5)	18	114.5 (4.5)	125 (27.5)	15	139.5 (5.5)
	929 (10,000)	7.5 (16.6)	72.5 (16)	40	81.5 (3.2)	86.5 (19)	34	96.5 (3.8)	107 (23.5)	24	119.5 (4.7)	132 (29)	20	147.5 (5.8)
Timmins, Ontario	232 (2,500)	4.3 (9.4)	41 (9)	7	45.5 (1.8)	57 (12.5)	6	63.5 (2.5)	72.5 (16)	4	81.5 (3.2)	86.5 (19)	3.3	96.5 (3.8)
	465 (5,000)	5.7 (12.5)	54.5 (12)	16	61 (2.4)	63.5 (14)	14	71 (2.8)	82 (18)	9	91.5 (3.6)	97.5 (21.5)	7.5	109 (4.3)
	697 (7,500)	6.4 (14)	61.5 (13.5)	27	68.5 (2.7)	70.5 (15.5)	22	78.5 (3.1)	86.5 (19)	15	96.5 (3.8)	104.5 (23)	12	117 (4.6)
	929 (10,000)	6.6 (14.6)	63.5 (14)	36	71 (2.8)	72.5 (16)	30	81.5 (3.2)	91 (20)	21	101.5 (4.0)	109 (24)	17	122 (4.8)
Toronto, Ontario	232 (2,500)	5.7 (12.5)	54.5 (12)	8	61 (2.4)	66 (14.5)	7	73.5 (2.9)	82 (18)	4.5	91.5 (3.6)	97.5 (21.5)	3.5	109 (4.3)
	465 (5,000)	6.8 (15.1)	66 (14.5)	19	73.5 (2.9)	77.5 (17)	16	86.5 (3.4)	93 (20.5)	11	104 (4.1)	111.5 (24.5)	9	124.5 (4.9)
	697 (7,500)	8.0 (17.7)	77.5 (17)	30	86.5 (3.4)	84 (18.5)	26	94 (3.7)	100 (22)	18	112 (4.4)	120.5 (26.5)	14	134.5 (5.3)
	929 (10,000)	8.7 (19.2)	82 (18)	42	91.5 (3.6)	86.5 (19)	34	96.5 (3.8)	104.5 (23)	24	117 (4.6)	127.5 (28)	20	142 (5.6)
Windsor, Ontario	232 (2,500)	6.1 (13.5)	59 (13)	8.5	66 (2.6)	70.5 (15.5)	7.5	78.5 (3.1)	84 (18.5)	4.5	94 (3.7)	107 (23.5)	4	119.5 (4.7)
	465 (5,000)	7.1 (15.6)	68 (15)	20	76 (3.0)	79.5 (17.5)	16	89 (3.5)	97.5 (21.5)	11	109 (4.3)	118 (26)	9	132 (5.2)
	697 (7,500)	8.0 (17.7)	77.5 (17)	30	86.5 (3.4)	86.5 (19)	26	96.5 (3.8)	107 (23.5)	18	119.5 (4.7)	125 (27.5)	15	139.5 (5.5)
	929 (10,000)	8.7 (19.2)	82 (18)	42	91.5 (3.6)	91 (20)	36	101.5 (4.0)	113.5 (25)	26	127 (5.0)	129.5 (28.5)	20	145 (5.7)
Charlottetown, P.E.I.	232 (2,500)	4.9 (10.9)	47.5 (10.5)	7.5	53.5 (2.1)	57 (12.5)	6	63.5 (2.5)	68 (15)	3.8	76 (3.0)	79.5 (17.5)	3	89 (3.5)
	465 (5,000)	6.6 (14.6)	63.5 (14)	19	71 (2.8)	75 (16.5)	15.5	84 (3.3)	88.5 (19.5)	10	99 (3.9)	100 (22)	7.5	112 (4.4)
	697 (7,500)	7.8 (17.2)	75 (16.5)	31	84 (3.3)	86.5 (19)	26	96.5 (3.8)	102.5 (22.5)	18	114.5 (4.5)	113.5 (25)	13	127 (5.0)
	929 (10,000)	8.7 (19.2)	84 (18.5)	42	94 (3.7)	97.5 (21.5)	37	106.5 (4.2)	111.5 (24.5)	26	124.5 (4.9)	125 (27.5)	20	139.5 (5.5)
Montreal, Quebec	232 (2,500)	5.2 (11.4)	50 (11)	7.5	56 (2.2)	61.5 (13.5)	7	68.5 (2.7)	79.5 (17.5)	4.5	89 (3.5)	97.5 (21.5)	3.5	109 (4.3)
	465 (5,000)	5.9 (13)	57 (12.5)	17	63.5 (2.5)	70.5 (15.5)	15	78.5 (3.1)	88.5 (19.5)	10	99 (3.9)	109 (24)	8	122 (4.8)
	697 (7,500)	6.1 (13.5)	59 (13)	27	66 (2.6)	72.5 (16)	23	81.5 (3.2)	93 (20.5)	16	104 (4.1)	113.5 (25)	13	127 (5.0)
	929 (10,000)	6.4 (14)	61.5 (13.5)	36	68.5 (2.7)	77.5 (17)	31	86.5 (3.4)	95.5 (21)	22	106.5 (4.2)	120.5 (26.5)	19	134.5 (5.3)
Quebec City, Quebec	232 (2,500)	5.4 (12)	52.5 (11.5)	8	58.5 (2.3)	63.5 (14)	7	71 (2.8)	79.5 (17.5)	4.5	89 (3.5)	97.5 (21.5)	3.5	109 (4.3)
	465 (5,000)	6.4 (14)	61.5 (13.5)	18	68.5 (2.7)	70.5 (15.5)	15	78.5 (3.1)	84 (18.5)	10	94 (3.7)	104.5 (23)	8	117 (4.6)
	697 (7,500)	6.6 (14.6)	63.5 (14)	28	71 (2.8)	72.5 (16)	23	81.5 (3.2)	86.5 (19)	15	96.5 (3.8)	107 (23.5)	12	119.5 (4.7)
	929 (10,000)	7.1 (15.6)	68 (15)	37	76 (3.0)	77.5 (17)	31	86.5 (3.4)	88.5 (19.5)	20	99 (3.9)	109 (24)	17	122 (4.8)
Regina, Saskatchewan	232 (2,500)	4.5 (9.9)	43 (9.5)	7	48.5 (1.9)	54.5 (12)	6	61 (2.4)	72.5 (16)	4	81.5 (3.2)	79.5 (17.5)	3	89 (3.5)
	465 (5,000)	6.4 (14)	61.5 (13.5)	18	68.5 (2.7)	68 (15)	14	76 (3.0)	86.5 (19)	10	96.5 (3.8)	97.5 (21.5)	7.5	109 (4.3)
	697 (7,500)	7.3 (16.1)	70.5 (15.5)	29	78.5 (3.1)	77.5 (17)	24	86.5 (3.4)	100 (22)	17	112 (4.4)	109 (24)	12	122 (4.8)
	929 (10,000)	8.3 (18.2)	79.5 (17.5)	40	89 (3.5)	82 (18)	32	91.5 (3.6)	104.5 (23)	24	117 (4.6)	118 (26)	18	132 (5.2)
Saskatoon, Saskatchewan	232 (2,500)	4.0 (8.8)	38.5 (8.5)	6	43 (1.7)	57 (12.5)	6	63.5 (2.5)	66 (14.5)	3.8	73.5 (2.9)	77.5 (17)	2.8	86.5 (3.4)
	465 (5,000)	5.7 (12.5)	54.5 (12)	16	61 (2.4)	68 (15)	14.5	76 (3.0)	82 (18)	9	91.5 (3.6)	95.5 (21)	7	106.5 (4.2)
	697 (7,500)	6.6 (14.6)	63.5 (14)	28	71 (2.8)	75 (16.5)	24	84 (3.3)	91 (20)	16	101.5 (4.0)	104.5 (23)	12	117 (4.6)
	929 (10,000)	7.1 (15.6)	68 (15)	38	76 (3.0)	82 (18)	32	91.5 (3.6)	97.5 (21.5)	22	109 (4.3)	113.5 (25)	18	127 (5.0)

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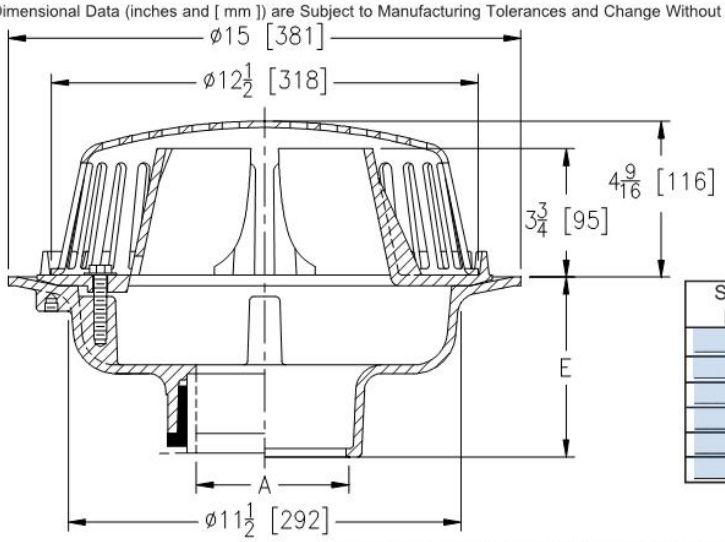
Z105

CONTROL-FLO ROOF DRAIN
W/ PARABOLIC WEIR

SPECIFICATION SHEET

TAG _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



Specify Number of Notches in Weir	
___-N1	One Notch
___-N2	Two Notches
___-N3	Three Notches
___-N4	Four Notches
___-N5	Five Notches
___-N6	Six Notches

A- Pipe Size In.[mm]	Approx. Wt. Lbs. [kg]	Dome Open Area Sq. In. [cm^2]
2,3,4 [51,76,102]	34 [15]	103 [665]

ENGINEERING SPECIFICATION: ZURN Z105
15" [381mm] Diameter Control-Flo roof drain for dead-level roof construction, Dura-Coated cast iron body, Control-Flo weir shall be linear functioning with integral membrane flashing clamp/gravel guard and Poly-Dome. All data shall be verified proportional to flow rates. Each notch will allow 10 GPM [LPM] of flow per 1" [25mm] of rain water build up above the drain.

OPTIONS (Check/specify appropriate options)

PIPE SIZE
3, 4 [76, 102]
2 , 3, 4 [51, 76, 102]
2 , 3, 4 [51, 76, 102]

(Specify size/type) **OUTLET**
_____ IC Inside Caulk
_____ NH No-Hub
_____ NL Neo-Loc

E BODY HT. DIM.
5-1/4 [133]
5-1/4 [133]
4-9/16 [116]

PREFIXES
____ Z D.C.C.I. Body with Poly-Dome*
____ ZA D.C.C.I. Body with Aluminum Dome
____ ZC D.C.C.I. Body with Cast Iron Dome

SUFFIXES
____ -C Underdeck Clamp
____ -DP Top-Set® Deck Plate (Replaces both -C & -R)
____ -E Static Extension 1 [25] thru 4 [102] (Specify Ht.)
____ -EA Adjustable Extension Assembly 2-1/8 [54] thru 3-1/2 [89]
____ -G Galvanized Cast Iron
____ -R Roof Sump Receiver
____ -TC Neo-Loc Test Cap Gasket (2,3,4 [51,76,102] NL Bottom Outlet Only)
____ -VP Vandal Proof Secured Top
____ -10 6 [152] High Parabolic Weir for Sloped Roof (ZC or ZA)

* Regularly furnished unless otherwise specified.

Zurn Industries, LLC | **Specification Drainage Operation**
1801 Pittsburgh Avenue, Erie, PA U.S.A. 16502 · Ph. 855-663-9876, Fax 814-454-7929
In Canada | **Zurn Industries Limited**
3544 Nashua Drive, Mississauga, Ontario L4V 1L2 · Ph. 905-405-8272, Fax 905-405-1292
www.zurn.com

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