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PROPOSED TOWNHOUSES 4257 MONTROSE ROAD, NIAGARA FALLS

STORMWATER MANAGEMENT REPORT May 2, 2023

INTRODUCTION

Frank Costantino Construction Ltd. is proposing to construct 10 townhouse units on a vacant lot known as 4257 Montrose Road, a Regional Road in Niagara Falls. The lot area is approximately 0.48 hectare. Presently lot is covered with grass and is not in any use. There is no storm sewer on Montrose Road. There is a 900 mm diameter storm sewer on adjacent old NS&T right-of-way. All stormwater flow from the site is draining south to NS&T right-of-way to the existing 900 mm diameter storm sewer. This storm sewer eventually outlets into Shriner's Creek Stormwater Management System.

City of Niagara Falls requires that 5 year post-development stormwater flow to be controlled to 5 year pre-development flow and 100 year flow to be directed overland to a suitable overland flow path. Niagara Region require that all stormwater flows to be contained within the site and an appropriate stormwater quality control provided in accordance with the MOE requirements. Purpose of this report is to review existing site conditions and recommend a suitable stormwater management plan that will fulfil City and Region requirements.

STORMWATER MANAGEMENT

Both Region and City requires that post-development stormwater flow from the site to be controlled to pre-development level and appropriate stormwater quality control to be provided to fulfil stormwater management control requirements. Therefore, it is necessary to determine pre and post-development flows and stormwater detention requirements when 5 year storm post-development flow is controlled to pre-development level.

Miduss stormwater management program has been used to determine the pre and post-development flow and stormwater detention requirement. Following data has been extracted from the attached computer printout:

Storm Year	Pre-dev. Flow, lps	Post dev. Flow, lps	Detention Req'd Cu.m	Detention Provided Cu.m
5	27.0	75.0	49.0	50.2

The required stormwater detention has been provided in the oversized concrete 1050 mm and Boss1000 300 mm storm sewer pipes within the site. The stormwater detention provided in pipes has been determined as follows:

Area of 1050 mm pipe = 0.865 sq.m Pipe length = 55 m Volume = 47.6 cu.m
Area of 300 mm pipe = 0.071 sq.m Pipe length = 36.5 m Volume = 2.6 cu.m

Total volume provided in pipes is 50.2 cu.m. This is greater than 49.0 cu.m required.

Stormwater Flow Control

To control the stormwater to pre-development level, a 110 mm diameter orifice will be cored to bottom of pre-manufactured cap to the 300 mm diameter outlet pipe in CBMH2.

Flow through orifice will be as follows:

$$\begin{aligned} \text{Orifice Flow} &= 0.60a(2gh)^{0.50}, \text{ where "a" is orifice area (0.0095 sq.m)} \\ &\quad \text{"g" is 9.8 and "h" is head on orifice = 1.14 m} \\ &= 0.6 \times 0.0095 (9.8 \times 2 \times 1.14)^{0.50} = 26.94 \text{ lps} \sim 27.0 \text{ lps pre-dev flow} \end{aligned}$$

The flow through orifice is approximately equal to pre-development flow of 27.00 lps

Overland Flow

The site grading has been carried out in such a way that in case of a minor storm all stormwater run-off will stay within the site and drain through proposed storm sewer system to existing storm sewer on NS&T right-of-way, without adversely impacting the adjacent properties and Montrose Road. In case of a major storm, all overland storm water flow will be directed to NS&T right-of-way and thereafter follow the existing overland flow path to the west

Stormwater Quality Control

As per Region and City requirements a stormwater quality control unit has been provided to treat the stormwater run-off from all impervious parking areas and driveways. It is recommended to use stormwater quality control unit Model HS4 manufactured by Hydroworks. This unit is expected to annually treat 98% of run-off and remove 81% of total suspended solids (TSS) with an imperviousness of 60.0% as required by the Region, City, and MOE guidelines. This unit will treat stormwater run-off to a Normal standard prior to discharge from the site. Please refer to the attached Hydroworks Sizing Summary.

Sediment Control

To prevent sediment from the site entering to the existing drainage system, all new catchbasins will be fitted with filter cloth as shown on the attached site servicing plan. Perimeter silt fence will be provided to prevent silt flow to adjacent properties.

OGS Maintenance and Inspection

The stormwater quality control unit shall be flushed and clean after completion of construction. Thereafter, the unit shall be inspected regularly and cleaned once in three years.

CONCLUSION

Since the proposed development is in a developed area of the City, therefore, the existing storm sewer system is available for the proposed development. Necessary stormwater management controls including stormwater detention and quality control unit has been provided meeting City and Region requirements. All site services will be constructed in accordance with the City requirements and construction specifications.

Report prepared by:



Zakir Ali, P.Eng.

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Units used are defined by G = 9.810

36 60 5.000 are MAXDT MAXHYD & DTMIN values

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35 COMMENT

4 line(s) of comment

STORMWATER MANAGEMENT

TOWNHOUSE DEVELOPMENT, 4257 MONTROSE ROAD, NIAGARA FALLS

5 YEAR PRE-DEVELOPMENT FLOW USING NIAGARA FALLS IDF CURVE

2 STORM

1 1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic

719.500 Coefficient a

6.340 Constant b (min)

.769 Exponent c

.400 Fraction to peak r

180.000 Duration ó 180 min

38.751 mm Total depth

3 IMPERVIOUS

1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat

.015 Manning "n"

98.000 SCS Curve No or C

.100 Ia/S Coefficient

.518 Initial Abstraction

4 CATCHMENT

1.000 ID No.ó 99999

.480 Area in hectares

5.000 Length (PERV) metres

2.000 Gradient (%)

5.000 Per cent Impervious

5.000 Length (IMPERV)

.000 %Imp. with Zero Dpth

1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat

.240 Manning "n"

80.000 SCS Curve No or C

.100 Ia/S Coefficient

6.350 Initial Abstraction

1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv

.027 .000 .000 .000 c.m/s

.280 .825 .307 C perv/imperv/total

15 ADD RUNOFF

.027 .027 .000 .000 c.m/s

20 MANUAL

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Units used are defined by G = 9.810

36 60 5.000 are MAXDT MAXHYD & DTMIN values

Licensee: NIAGARA ENGINEERING

35 COMMENT

4 line(s) of comment

STORMWATER MANAGEMENT

TOWNHOUSE DEVELOPMENT, 4257 MONTROSE ROAD, NIAGARA FALLS

5 YEAR POSTDEVELOPMENT FLOW USING NIAGARA FALLS IDF CURVE

2 STORM

1 1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic

719.500 Coefficient a

6.340 Constant b (min)

.769 Exponent c

.400 Fraction to peak r

180.000 Duration ó 180 min

38.751 mm Total depth

3 IMPERVIOUS

1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat

.015 Manning "n"

98.000 SCS Curve No or C

.100 Ia/S Coefficient

.518 Initial Abstraction

4 CATCHMENT

1.000 ID No.ó 99999

.480 Area in hectares

10.000 Length (PERV) metres

1.000 Gradient (%)

60.000 Per cent Impervious

10.000 Length (IMPERV)

.000 %Imp. with Zero Dpth

1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat

.230 Manning "n"

87.000 SCS Curve No or C

.100 Ia/S Coefficient

3.795 Initial Abstraction

1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv

.075 .000 .000 .000 c.m/s

.430 .853 .684 C perv/imperv/total

15 ADD RUNOFF

.075 .075 .000 .000 c.m/s

10 POND

3 Depth - Discharge - Volume sets

.000 .000 .0

1.000 .0270 49.2

2.000 .0699 128.0

Peak Outflow = .027 c.m/s

Maximum Depth = 1.000 metres

Maximum Storage = 49. c.m

.075 .075 .027 .000 c.m/s

20 MANUAL



Hydroworks Sizing Summary

4257 Montrose Rd Townhomes

Niagara Falls, Ontario

03-31-2023

Recommended Size: HydroStorm HS 4

A HydroStorm HS 4 is recommended to provide 80 % annual TSS removal based on a drainage area of .48 (ha) with an imperviousness of 60 % and St. Catherines A, Ontario rainfall for the 20 um to 2000 um particle size distribution.

The recommended HydroStorm HS 4 treats 98 % of the annual runoff and provides 81 % annual TSS removal for the St. Catherines A rainfall records and 20 um to 2000 um particle size distribution.

The HydroStorm has a headloss coefficient (K) of 1.04. Since a peak flow was not specified, headloss was calculated using the full pipe flow of .1 (m³/s) for the given 300 (mm) pipe diameter at 1% slope. The headloss was calculated to be 99 (mm) based on a flow depth of 300 (mm) (full pipe flow).

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroStorm .

TSS Removal Sizing Summary

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Video | Other

Site Parameters: Area (ha) Imperviousness (%)

Units: U.S. Metric

Rainfall Station: St. Catharines A Ontario
1971 To 2005 Rainfall Timestep = 60 min.

Project Title (2 lines): 4257 Montrose Rd Townhomes
Niagara Falls, Ontario

ETV Lab Testing Results Post Treatment Recharge

Outlet Pipe: Diam. (mm) Peak Design Flow (m3/s)
Slope (%)

HydroStorm Annual Sizing Results				
Model #	Qlow (m3/s)	Qtot (m3/s)	Flow Capture (%)	TSS Removal (%)
Unavailable	.019	.097	96 %	76 %
HS 4	.033	.097	98 %	81 %
HS 5	.041	.097	99 %	87 %
HS 6	.05	.097	99 %	91 %
Unavailable	.069	.097	100 %	93 %
HS 8	.089	.097	100 %	94 %
HS 10	.097	.097	100 %	97 %
HS 12	.097	.097	100 %	98 %

Particle Size Distribution		
Size (um)	%	SG
20	20	2.65
60	20	2.65
150	20	2.65
400	20	2.65
2000	20	2.65

Note: Results vary significantly based on particle size distribution

TSS Particle Size Distribution

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Video | Other

TSS Particle Size Distribution		
Size (um)	%	SG
▶ 20	20	2.65
60	20	2.65
150	20	2.65
400	20	2.65
2000	20	2.65
*		

Notes:

- To change data just click a cell and type in the new value(s)
- To add a row just go to the bottom of the table and start typing.
- To delete a row, select the row by clicking on the first pointer column, then press delete
- To sort the table click on one of the column headings

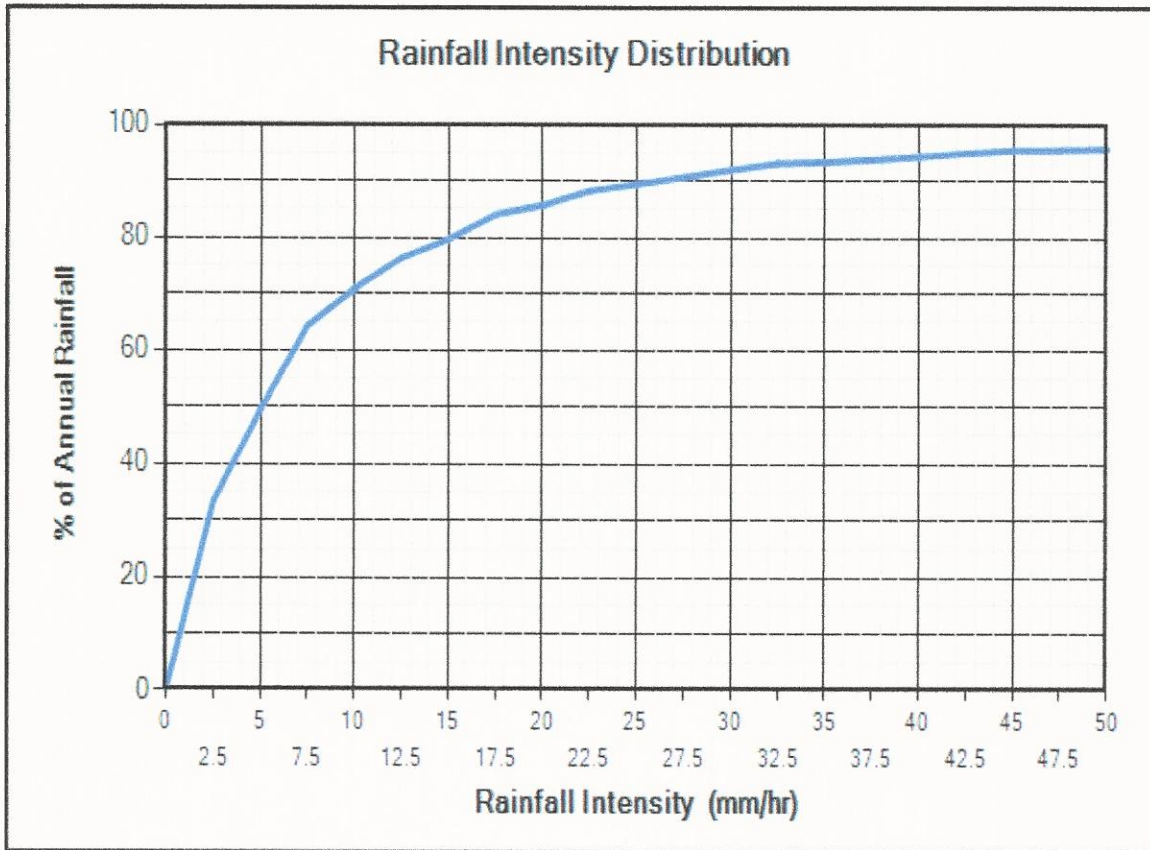
TSS Distributions:

ETV Canada / NJDEP
 Standard HDS Design
 Alden Laboratory
 OK110
 Toronto
 Ontario Fine
 Calgary Forebay
 Kitchener
 User Defined

You must select a particle size distribution for TSS to simulate TSS removal

Water Temp (C)

Rainfall Station - St. Catherines A, Ontario(1971 To 2005)



Site Physical Characteristics

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Video | Other

Catchment Parameters

Width (m) Imperv. Mannings n Maintenance Frequency (months)

Default Width Perv Mannings n

Slope (%) Imp. Depress. Storage (mm)

Perv. Depress. Storage (mm)

Daily Evaporation (mm/day)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	2.54	2.54	3.81	3.81	3.81	2.54	2.54	0	0

Infiltration

Max. Infiltration Rate (mm/hr)

Min. Infiltration Rate (mm/hr)

Infiltration Decay Rate (1/s)

Infiltration Regen. Rate (1/s)

Catch Basins

of Catch basins

Controlled Roof Runoff

Roof Runoff (m3/s)

Resets all parameters excluding input catchment width.

Dimensions And Capacities

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Dimensions and Capacities					
Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HS 3	0.91	1.07	185	0.4	0.7
HS 4	1.22	1.22	381	0.9	1.4
HS 5	1.52	1.52	642	1.8	2.8
HS 6	1.83	1.83	1041	3.2	4.8
HS 7	2.13	1.98	1575	4.6	7.1
HS 8	2.44	2.13	2354	6.3	10
HS 10	3.05	2.74	4327	13.2	20
HS 12	3.66	3.35	7164	23.8	35.2

Depth = Depth from outlet invert to inside bottom of tank

Generic HS 4 CAD Drawing

Outlet

Inlet

Inner Chamber

Ø1200

Plan

Inlet

Inner Chamber

Outlet

600

1200

1200

Profile

Maximum Pipe Size = 600 mmØ

ETV Canada Verified
NJDEP Certified
Independent Testing

CDN Patent # 3,085,711
www.hydroworks.com
888-290-7900

HydroStorm HS4 (1200 mmØ)

PROJECT:

LOCATION:

REVISION DATE:

TSS Buildup And Washoff

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Video | Other

TSS Buildup

Power Linear

Exponential

Michaelis-Menton

Street Sweeping

Efficiency (%)

Start Month

Stop Month

Frequency (days)

Available Fraction

Soil Erosion

Add Erosion to TSS

Reset to Default Values

TSS Washoff

Power-Exponential

Rating Curve (no upper limit)

Rating Curve (limited to buildup)

TSS Buildup Parameters

Limit (kg/ha)

Coeff (kg/ha)

Exponent

TSS Washoff Parameters

Coefficient

Exponent

TSS Buildup

Based on Area

Based on Curb Length

Upstream Quantity Storage

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Video | Other

Quantity Control Storage

	Storage (m3)	Discharge (m3/s)
▶	0	0
*		

Notes:

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3. To delete a row, select the row by clicking on the first pointer column, then press delete
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Other Parameters

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Video | Other

Scaling Law

- Peclet Scaling based on diameter x depth
- Peclet Scaling based on surface area (diameter x diameter)

TSS Removal Extrapolation

- Extrapolate TSS Removal for flows lower than tested
- No TSS Removal extrapolation for flows lower than tested
- No TSS Removal extrapolation for lower flows or inter-event periods

Lab Testing

- Use NJDEP Lab Testing Results
- Use ETV Canada Lab Testing Results

Oil / Sediment Storage

- Oil Spill Storage in Pretreatment Area
- Sediment Storage in Pretreatment Area
- 50% Oil Spill / 50% Sediment Storage in Pretreatment Area

TSS Removal Results

- Required TSS Removal
- Choose Model #

TSS Removal Required

TSS Removal (%) Enter required TSS Removal (%)

Flagged Issues

None

Hydroworks Sizing Program - Version 5.7

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