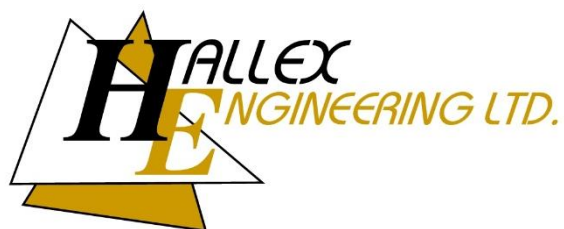

**PROPOSED NIAGARA HISTORICAL
SOCIETY MUSEUM ADDITION
43 CASTLEREAGH STREET, NIAGARA-ON-THE-LAKE**

**STORM WATER MANAGEMENT DESIGN BRIEF
NEW DEVELOPMENT DRAINAGE SYSTEM**

REV 0 – January 21, 2026

PREPARED BY:



HALLEX PROJECT #251023

HALLEX NIAGARA
4999 VICTORIA AVENUE
NIAGARA FALLS, ON L2E 4C9

HALLEX HAMILTON
745 SOUTH SERVICE ROAD, UNIT 205
STONEY CREEK, ON L8E 5Z2

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1. PRE-DEVELOPMENT CONDITIONS

1.1 LOCATION

The proposed Niagara Historical Society Museum Addition will take place in two recently merged properties: the Niagara-on-the-Lake Museum at 43 Castlereagh Street and a former residential property at 25 Castlereagh Street, known as the Museum Annex. This development is located at the northwest corner of the Davy Street and Castlereagh Street intersection in the Town of Niagara-on-the-Lake, ON.

1.2 DRAINAGE PATTERN

The current drainage path for the site consists of overland sheet flow to the existing 375mm municipal storm sewer at Davy Street and partly of overland sheet flow to Castlereagh Street and to the northerly property. The proposed stormwater management controls will ensure the storm flows are controlled to the pre-development flow rate to the existing municipal storm sewer at Davy Street.

2. PROPOSED WORK

2.1 GRADING

The objective of the design is to utilize the existing natural slope and achieve the minimum and maximum slopes in the grading of the proposed surfaces. This will ensure the surface not only drains as per the design, but is not too steep. The grading of the site also ensures that the storm water flow will mostly drain through the onsite drainage system for storm water quantity and quality controls. The proposed drainage system onsite has been designed according to the five and one-hundred-year storm event as per the Town of Niagara-on-the-Lake intensity-duration-frequency curve.

2.2 DRAINAGE

The proposed design requires 156.5 metres of storm sewer piping, ONE precast catch basin, three precast catch basin maintenance holes, three area drains, a Hydroguard HG4 oil and grit separator and a cast-in-place concrete stormwater management tank.

3. DESIGN CONSIDERATIONS

3.1 SITE DRAINAGE

3.1.1 Pre-Development

A. Peak Runoff

The total drainage area for the proposed development is 0.276 hectares with an existing runoff coefficient of 0.47 based on the existing roof, concrete, gravel and grass surfaces.

The time of concentration is determined to be 10 minutes to the start of the existing drainage system as required by the Town of Niagara-on-the-Lake municipal standards.

Using the Rational Method, the peak flow rates are $Q = \frac{CiA}{360}$

Subcatchment	Description	Draining to	Area, ha	Tc, min
Area.1	Sheet	Davy Street	0.053	10
Area.2	Sheet	Castlereagh Street	0.115	10
Area.3	Sheet	North Property	0.108	10
5-year Storm				
	A,ha	C	i,mm/h	Q, L/s
Area.1	0.053	0.50	90	6.6
Area.2	0.115	0.58	90	16.6
Area.3	0.108	0.35	90	9.5
TOTAL	0.276	0.47	90	32.7
100-year Storm				
	A,ha	C	i,mm/h	Q, L/s
Area.1	0.053	0.50	144	10.6
Area.2	0.115	0.58	144	26.6
Area.3	0.108	0.35	144	15.3
TOTAL	0.170	0.47	144	52.5

Therefore, the total pre-development flow for the subject site is 32.7L/s for the five-year storm and 52.5L/s for the one-hundred-year storm event, as outlined in Exhibit #1 and #2 at the end of this report.

B. Quantity

There is no known storm quantity control measure in place for the pre-development condition.

C. Quality

There is no known storm quality control measure in place for the pre-development condition.

3.1.2 Post-Development

A. Peak Runoff

The proposed Niagara Historical Society Museum Addition consists of the construction of an addition to the existing building along with concrete, pavers and grass surface areas. The resulting runoff coefficient in the post-development condition of the site is 0.55.

The proposed development will drain through the proposed onsite storm drainage system and shall discharge to the existing 375mm municipal storm sewer at Davy Street as per the existing site condition. Part of the site will continue to drain directly to Davy Street, and part of the site will continue to drain to the North Property similar to the pre-development condition.

The site's storm sewer pipes are designed according to the 5-year minor storm. Utilizing the minimum recommended time of concentration of 10 minutes, the time for storm water to flow from the farthest drainage area to the municipal storm sewer at Davy Street, as outlined in Exhibit #1, is calculated to be 11.81 minutes.

Using the Rational Method, the peak flow rates are as follows:

Subcatchment	Description	Draining to	Area, ha	Tc, min
Area.1	Sheet	Davy Street	0.018	10
Area.2	Sheet	North Property	0.010	10
Prop. Sewer	Sewer	Street	0.155	10
5-year Storm	A,ha	C	i,mm/h	Q, L/s
Area.1	0.018	0.60	90	2.7
Area.2	0.010	0.74	90	1.8
Prop. Sewer	0.248	0.54	90	32.3
TOTAL	0.276	0.55	90	36.9
100-year Storm	A,ha	C	i,mm/h	Q, L/s
Area.1	0.018	0.60	144	4.3
Area.2	0.010	0.74	144	3.0
Prop. Sewer	0.248	0.54	144	51.8
TOTAL	0.276	0.55	144	59.1

Therefore, the total post-development flow for the subject site is 36.9L/s for the five-year storm and 59.1L/s for the one-hundred-year storm event. The flows and other design information are contained in Exhibit #3 for the five-year storm and Exhibit #4 for the one-hundred-year storm at the end of the design brief.

B. Quantity

The post-development storm water runoff to the existing 375mm municipal storm sewer at Davy Street is higher than the pre-development runoff. As such, storm water detention is required to ensure that the existing municipal sewer does not surcharge as a result of the proposed development.

Stormwater quantity controls for the site will be achieved by utilizing a 50mm diameter orifice plate at the outlet side of CBMH.4. The orifice plate will ensure the post-development runoff is controlled to the pre-development runoff rate for the five and one-hundred-year storm event. The resulting 39m³ volume generated from the five-year storm and 64m³ from the one-hundred-year storm will be fully contained within the proposed underground stormwater management tank.

Since such a small orifice hole is required to maintain the pre-development runoff rate, a hooded outlet complete with a screen is suggested. This will prevent any large objects from clogging the orifice.

The following table summarizes the pre-development flow rates, the post-development uncontrolled flow rates and the post-development-controlled flow rates for the subject site:

	Pre- Development Flow Rate (L/s)	Post- Development Uncontrolled Flow Rate (L/s)	Post- Development Controlled Flow Rate (L/s)
5-year Storm			
Area.1	6.6	2.7	2.7
Area.2	16.6	1.8	1.8
Area.3	9.5	N/A	N/A
Prop. Sewer	N/A	32.3	3.8
TOTAL	32.7	36.9	8.3
100-year Storm			
Area.1	10.6	4.3	4.3
Area.2	26.6	3.0	3.0
Area.3	15.3	N/A	N/A
Prop. Sewer	N/A	51.8	4.8
TOTAL	52.5	59.1	12.1

The orifice plate and subsequent storage volume for the detained flow are indicated in Exhibit #5 for the five - year storm and Exhibit #6 for the one-hundred-year storm at the end of the design brief.

C. Quality

The storm water collected in the proposed development passes through a Hydroguard HG4, which achieves a total suspended solids removal of at least 98%. This value is greater than the required 'Normal' treatment of 70% as indicated in the MOE Stormwater Management Planning and Design Manual, dated March 2003 (refer to Chapter 3: Environmental Design Criteria, Section 3.3.1.1. Level of Protection). The design calculations from the manufacturer as well as the drawings for the unit are included in Appendix 'A' of this report.

D. Maintenance Recommendations

The storm sewer system includes pipes, catch basins, maintenance holes, the oil/grit separator and underground storage tank. It is important to regularly inspect the elements to ensure that storm water is flowing as originally designed. Debris and sediment commonly clog the system and reduce the overall effectiveness.

The following maintenance and inspection tasks should be done:

1. Inspect the inlet pipes and outlet pipes for structural integrity. (Annually) Check inlet/ outlet pipes for structural integrity to ensure they aren't crumbling or broken.
2. Conduct routine inspections for trash or other debris that may be blocking the inlet and outlet pipes. (Monthly and after rain events) Remove all trash and debris.

3. Inspect and clean the storm sewer system (Every 5 years or as needed). Catchbasins to be inspected annually and debris removed when the debris reaches a depth of ½ from the bottom of the sump to the bottom of the pipe.
4. Inspect for sediment accumulation at pipes (Semi-annually and after rain events). It is important to clean out sediment that might be restricting water flow.
5. Do not dump any materials in the storm sewer system.
6. Inspect the Hydroguard Oil/Grit Separator (Annually). Procedures for inspection are provided in the Hydroguard Owner's Manual. A vacuum truck is to be used for maintenance of the Hydroguard.
7. Inspect the concrete stormwater management tank (Annually).

4. CONCLUSION

The aforementioned calculations and recommendations for the storm drainage system are based on the current design for the site as of writing this report.

We trust this report meets your approval. Please contact the undersigned should you have any questions or comments.

Yours truly,

HALLEX ENGINEERING LTD

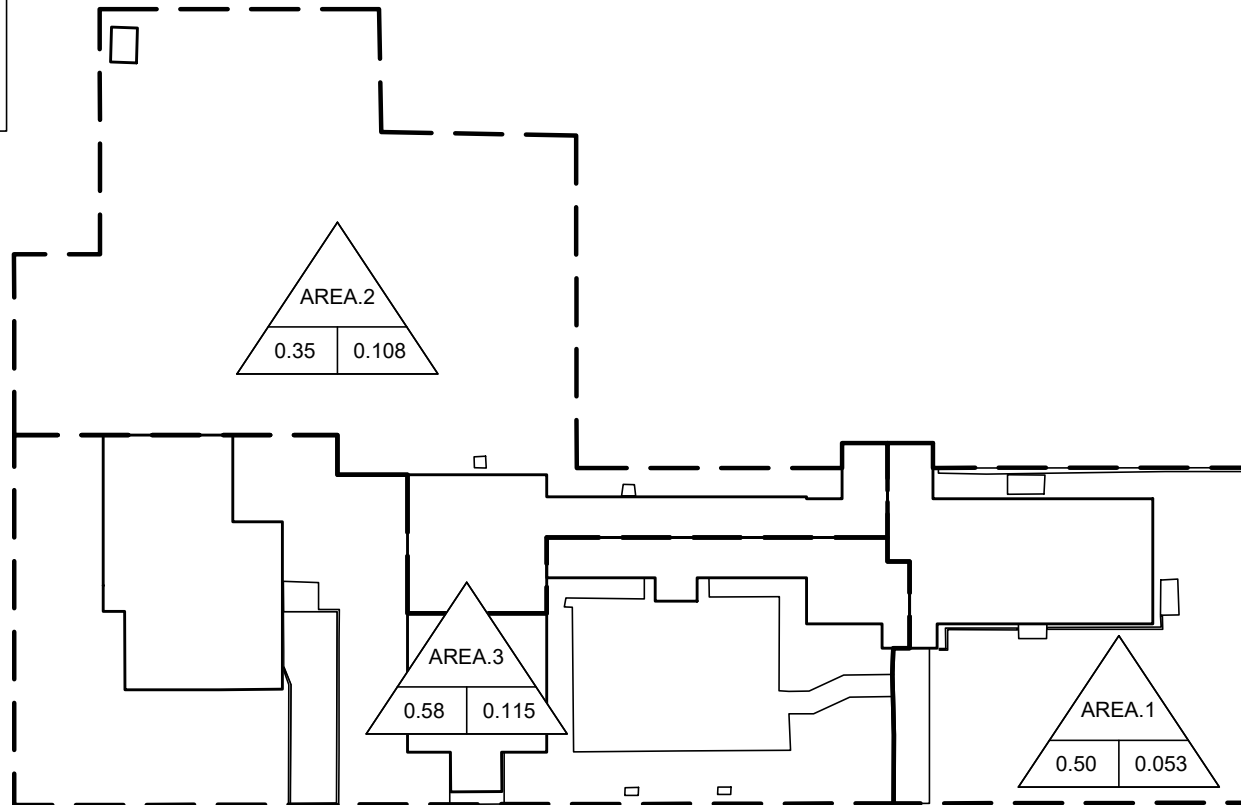
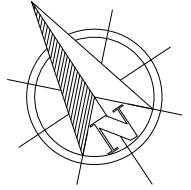
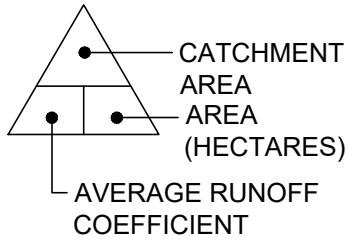


Jim Halucha, P.Eng
Civil/Structural Engineer

A handwritten signature in black ink, appearing to read "Mustafa Abdullaiev".

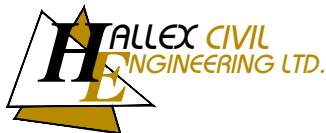
Mustafa Abdullaiev, B.Eng
Civil Designer

LEGEND



DAVY STREET

CASTLEREAGH STREET



4999 Victoria Avenue
Niagara Falls, ON L2E 4C9
Tel: 905-357-4015 Fax: 905-353-1105

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PROJECT:
NIAGARA HISTORICAL SOCIETY
MUSEUM ADDITION. NOTL, ON

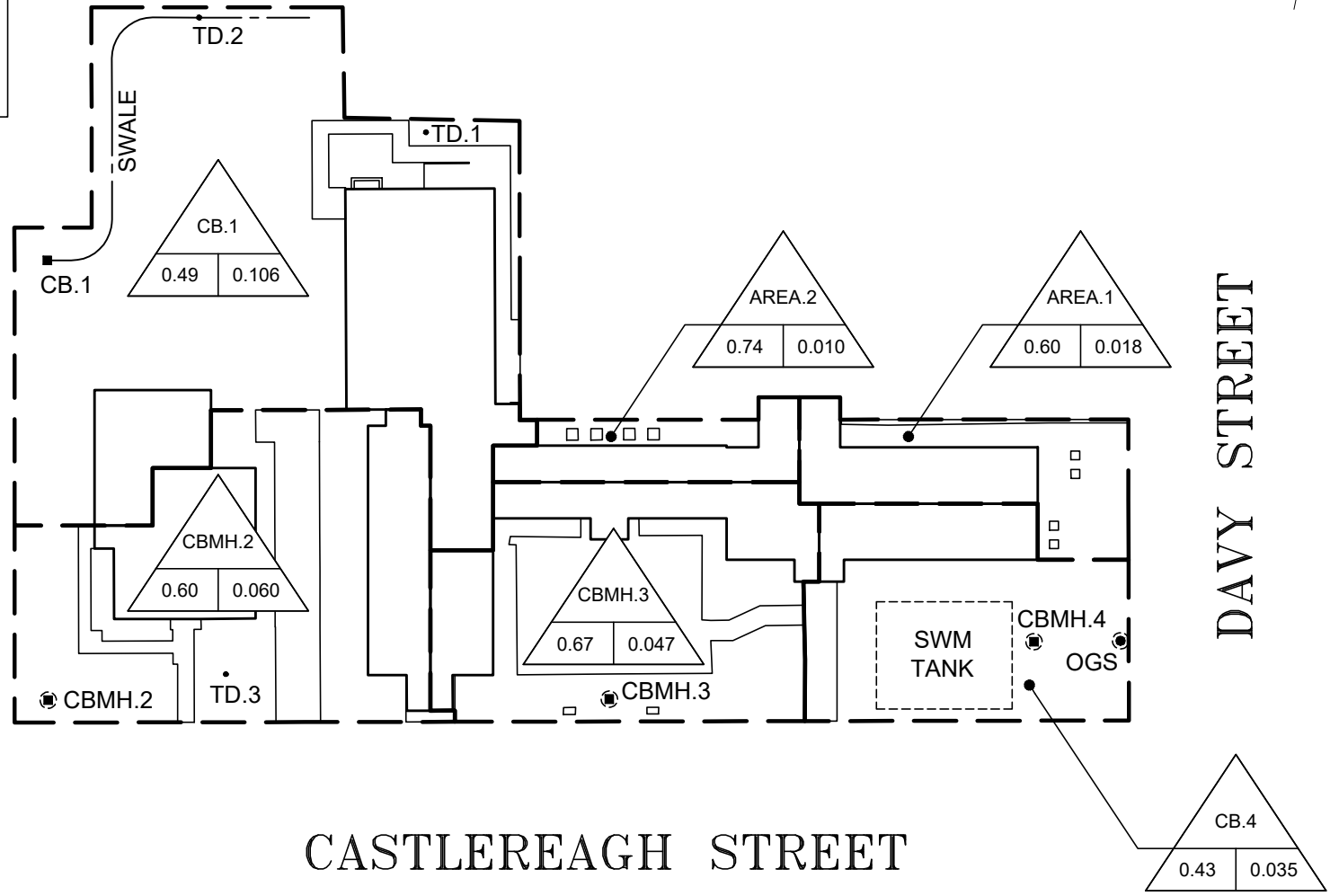
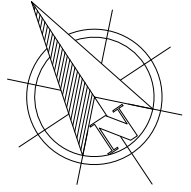
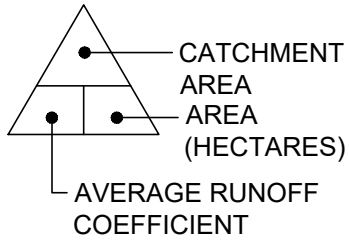
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PRE-DEVELOPMENT
CATCHMENT AREA PLAN

SCALE: 1:500
DATE: 2026/01/21
DRAWN BY: MA
DESIGNED BY: MA
CHECKED BY: AI

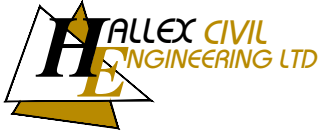
JOB NUMBER: 251023
ISSUED FOR: APPROVAL
DWG REV.

CSK1 1

LEGEND



CASTLEREAGH STREET



4999 Victoria Avenue
Niagara Falls, ON L2E 4C9
Tel: 905-357-4015 Fax: 905-353-1105

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PROJECT:
NIAGARA HISTORICAL SOCIETY
MUSEUM ADDITION. NOTL, ON

SHEET TITLE:
POST-DEVELOPMENT
CATCHMENT AREA PLAN

SCALE: 1:500

DATE: 2026/01/21

DRAWN BY: MA

DESIGNED BY: MA

CHECKED BY: AI

JOB NUMBER: 251023

ISSUED FOR: APPROVAL

DWG **REV.**

CSK2 **2**



Niagara Historical Society Museum Addition Exhibit #2 - 100 Year Pre - Development Calculations

2026-01-21
Job: 251023

MUNICIPALITY: **NOTL**

manning's n = 0.013 Conc Pipe
 0.013 PVC Pipe
 0.024 Corr. Stl Pipe

Rainfall Intensity Values = A= 980.000
 B= 3.700
 C= 0.732

Pipe	Location		Length of Pipe (m)	Area		Flow Time		Rainfall Intensity mm/hr	Unit rate of Runoff m ³ /ha*day	Design Flows	
	From Node	To Node		Incre-ment (ha)	Cum Total (ha)	To Upper (min)	In Sectio (min)			Cum Flow (m ³ /d)	Cum Flow (m ³ /s)
1	Area.1	Street.1	N/A	0.053	0.053	10.00	N/A	144	103867	912.3	0.0106
Roof	-	-	-	0.015	-	-	-	-	32891.3	493.4	-
Paved	-	-	-	0.004	-	-	-	-	31160.2	124.6	-
Grass	-	-	-	0.034	-	-	-	-	8655.6	294.3	-
2	Area.2	Prpty.1	N/A	0.108	0.108	10.00	N/A	144	103867	1322.6	0.0153
Roof	-	-	-	0.016	-	-	-	-	32891.3	526.3	-
Paved	-	-	-	0.000	-	-	-	-	31160.2	0.0	-
Gravel	-	-	-	0.000	-	-	-	-	20773.5	0.0	-
Grass	-	-	-	0.092	-	-	-	-	8655.6	796.3	-
3	Area.3	Street.2	N/A	0.115	0.115	10.00	N/A	144	103867	2298.9	0.0266
Roof	-	-	-	0.036	-	-	-	-	32891.3	1184.1	-
Grass	-	-	-	0.058	-	-	-	-	8655.6	502.0	-

Run-off Coefficients Used:

Velocity Range:

Roof Structure	C =	0.95	Minimum Velocity =	0.75 m/s
Paved Surface	C =	0.90	Maximum Velocity =	6.00 m/s
Gravel Surface	C =	0.60		
Perm. Paver	C =	0.30	<u>Time of Concentration =</u>	10 min
Grass Surface	C =	0.25		



Niagara Historical Society Museum Addition Exhibit #4 - 100 Year Post - Development Calculations

2026-01-21
Job: 251023

MUNICIPALITY: NOTL

Rainfall Intensity Values =
 A= 980.000
 B= 3.700
 C= 0.732

manning's n =
 0.013 PVC Pipe
 0.013 Conc Pipe
 0.024 Corr. Stl Pipe
 0.035 Grass Swale

Location			Length of Pipe	Area		Flow Time		Rainfall Intensity	Unit rate of Runoff	Design Flows		Flow Control	Sewer/Channel Design				Invert Elevations	
Pipe	From Node	To Node		Increment	Cum Total	To Upper	In Section			Cum Flow	Cum Flow		Slope	Capacity Full	Velocity Full	*Dia/Depth	Up-stream	Down-stream
			(m)	(ha)	(ha)	(min)	(min)	(m ³ /d)	(m ³ /s)	(m ³ /s)	(m/m)	(m ³ /s)	(m/s)	(m)	(m)	(m)		
1	Area 1	Street 1	N/A	0.018	0.018	10.00	N/A	144	72707	372.2	0.0043	0.0043	N/A	N/A	N/A	N/A	N/A	N/A
Roof	-	-	-	0.008	-	-	-	-	32891.3	263.1	-	-	-	-	-	-	-	-
Paved	-	-	-	0.001	-	-	-	-	31160.2	31.2	-	-	-	-	-	-	-	-
Grass	-	-	-	0.009	-	-	-	-	8655.6	77.9	-	-	-	-	-	-	-	-
2	Area 2	Prpty 1	N/A	0.010	0.010	10.00	N/A	144	41547	256.2	0.0030	0.0030	N/A	N/A	N/A	N/A	N/A	N/A
Roof	-	-	-	0.007	-	-	-	-	32891.3	230.2	-	-	-	-	-	-	-	-
Grass	-	-	-	0.003	-	-	-	-	8655.6	26.0	-	-	-	-	-	-	-	-
3	CB. 1	CBMH. 2	31.5	0.106	0.106	10.00	0.61	144	72707	1779.6	0.0206	0.0206	0.0070	0.0274	0.8735	0.200	86.92	86.69
Roof	-	-	-	0.030	-	-	-	-	32891.3	986.7	-	-	-	-	-	-	-	-
Paved	-	-	-	0.006	-	-	-	-	31160.2	187.0	-	-	-	-	-	-	-	-
Grass	-	-	-	0.070	-	-	-	-	8655.6	605.9	-	-	-	-	-	-	-	-
4	CBMH. 2	CBMH. 3	40.1	0.060	0.166	10.61	0.77	140	70425	2991.9	0.0346	0.0346	0.0070	0.0274	0.8735	0.200	86.63	86.34
Roof	-	-	-	0.020	-	-	-	-	31859.0	637.2	-	-	-	-	-	-	-	-
Paved	-	-	-	0.011	-	-	-	-	30182.3	332.0	-	-	-	-	-	-	-	-
Grass	-	-	-	0.029	-	-	-	-	8384.0	243.1	-	-	-	-	-	-	-	-
5	CBMH. 3	Tank. 1	19	0.047	0.213	11.38	0.31	134	67775	4002.1	0.0463	0.0463	0.0100	0.0328	1.0440	0.200	86.34	86.15
Roof	-	-	-	0.014	-	-	-	-	30659.9	429.2	-	-	-	-	-	-	-	-
Paved	-	-	-	0.015	-	-	-	-	29046.2	435.7	-	-	-	-	-	-	-	-
Grass	-	-	-	0.018	-	-	-	-	8068.4	145.2	-	-	-	-	-	-	-	-
6	Tank. 1	CBMH. 4	1	0.000	0.213	11.69	0.02	132	0	4002.1	0.0463	0.0463	0.0100	0.0328	1.0440	0.200	86.15	86.14
7	CBMH. 4	OGS 1	5.2	0.035	0.248	11.71	0.09	132	66709	4477.0	0.0518	0.0048	0.0100	0.0328	1.0440	0.200	86.14	86.08
Roof	-	-	-	0.007	-	-	-	-	30177.9	211.2	-	-	-	-	-	-	-	-
Paved	-	-	-	0.002	-	-	-	-	28589.6	57.2	-	-	-	-	-	-	-	-
Grass	-	-	-	0.026	-	-	-	-	7941.6	206.5	-	-	-	-	-	-	-	-
8	OGS 1	Street 1	12.8	0.000	0.248	11.80	0.21	132	0	4477.0	0.0518	0.0048	0.0100	0.0328	1.0440	0.200	86.08	85.95

Run-off Coefficients Used:

Roof Structure C = 0.95
 Paved Surface C = 0.90
 Gravel Surface C = 0.60
 Grass Surface C = 0.25

Velocity Range:

Minimum Velocity = 0.75 m/s
 Maximum Velocity = 6.00 m/s

Time of Concentration:

Time of Concentration = 10 min



Niagara Historical Society Museum Addition Exhibit #6 - 100 Year Orifice Plate and Storage Volume Calcs

2026-01-21
Job: 251023

Site Data

Site Discharge	Flow (m ³ /s)	Flow to Davy Street (m ³ /s)	Adj. Flow (w/o Surface Runoff) (m ³ /s)	Total Storm Volume (m ³)
Pre - Develop.	0.0525	0.0106	0.0063	64.0
Post - Develop.	0.0591	0.0561	0.0518	64.0

Control Node Data

Outlet Pipe	Storm Control Node	Outlet Pipe Size (m)	Outlet Invert Elev. (m)	Elev. @ Orifice (m)
7	CBMH. 4	0.200	86.14	86.17

* Volume calculated using SWMM 5.1 modelling software in accordance with the flow rate for actual size of the orifice.

Storm Retention Elevation
Head Height

86.96 m
0.80 m

Storm Retention Elev. Check **86.96 m**

Cast-in-Place Concrete Tank Storage

Model #	Length (m)	Width (m)	Height (m)	Storage Volume (m ³)
CIP	10.00	7.90	0.81	64.0
Total	 			64.0

Total Storage =	64.0 m³	Required Storage Achieved
------------------------	---------------------------	----------------------------------

Orifice Diameter Calculation (A=Q/(Cd*sqrt(2*g*h)))

Coefficient of Discharge	Cd = 0.62 (sharp)	0.62 Sharp Orifice coefficient of discharge
Allowable Flow Rate	Q = 0.0063 m ³ /s	0.80 Tube coefficient of discharge
Force of Gravity	g = 9.81 m/s/s	
Head Height	h = 0.80 m	
Dia of Max. Orifice	dia = 57.02 mm	Use - 50 mm

Flow Rate for Actual Size of Hole (Q=Cd*A*sqrt(2*g*h))

Area of Orifice	A = 0.0020 m ²
Flow Rate through Orifice	Q = 0.0048 m ³ /s

APPENDIX 'A'

Hydroguard HG4

Sizing Calculations and Schematic



Hydroworks Sizing Summary

Niagara Historical Society Museum Addition 43 Castlereagh St, NOTL

05-27-2021

Recommended Size: HG 4

A Hydroguard HG 4 is recommended to provide 70 % annual TSS removal based on a drainage area of .16 (ha) with an imperviousness of 70 % and St. Catherines A, Ontario rainfall for the 20 um to 2000 um particle size distribution.

The recommended Hydroguard HG 4 treats 99 % of the annual runoff and provides 98 % annual TSS removal for the St. Catherines A rainfall records and 20 um to 2000 um particle size distribution.

The Hydroguard has a headloss coefficient (K) of 1.6. Since a peak flow was not specified, headloss was calculated using the full pipe flow of .03 (m³/s) for the given 200 (mm) pipe diameter at .7% slope. The headloss was calculated to be 62 (mm) based on a flow depth of 200 (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 Hydroguard . Design liability is only valid for lawsuits brought within the United States where Hydroworks has its corporate headquarters.

TSS Removal Sizing Summary

Hydroworks Hydrodynamic Separator Sizing Program - Hydroguard

File Product Units View Help

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

Site Parameters: Area (ha) .16, Imperviousness (%) 70

Units: U.S., Metric

Rainfall Station: St. Catherines A, Ontario, 1971 to 2005, Rainfall Timestep = 60 min.

Project Title (2 lines): Niagara Historical Society Museum Addition, 43 Castlereagh St. NOTL

Inlet Pipe: Diam. (mm) 200, Slope (%) .7, Peak Design Flow (m3/s)

Stokes Cheng ETV Lab Testing Results

Annual TSS Removal Results					Particle Size Distribution		
Model #	Qlow (m3/s)	Qtot (m3/s)	Flow Capture (%)	TSS Removal (%)	Size (um)	%	SG
HG 4	.02	.03	99 %	98 %	20	20	2.65
HG 5	.02	.03	100 %	99 %	60	20	2.65
HG 6	.03	.03	100 %	99 %	150	20	2.65
Unavailable	.03	.03	100 %	99 %	400	20	2.65
HG 8	.03	.03	100 %	99 %	2000	20	2.65
Unavailable	.03	.03	100 %	99 %			
HG 10	.03	.03	100 %	99 %			
HG 12	.03	.03	100 %	99 %			

Note: Results vary significantly based on particle size distribution

Simulate

TSS Particle Size Distribution

Hydroworks Hydrodynamic Separator Sizing Program - Hydroguard

File Product Units View Help

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

OK110

Toronto

Ontario (1994)

Calgary Forebay

F95 Sand

NURP (1983)

Kitchener

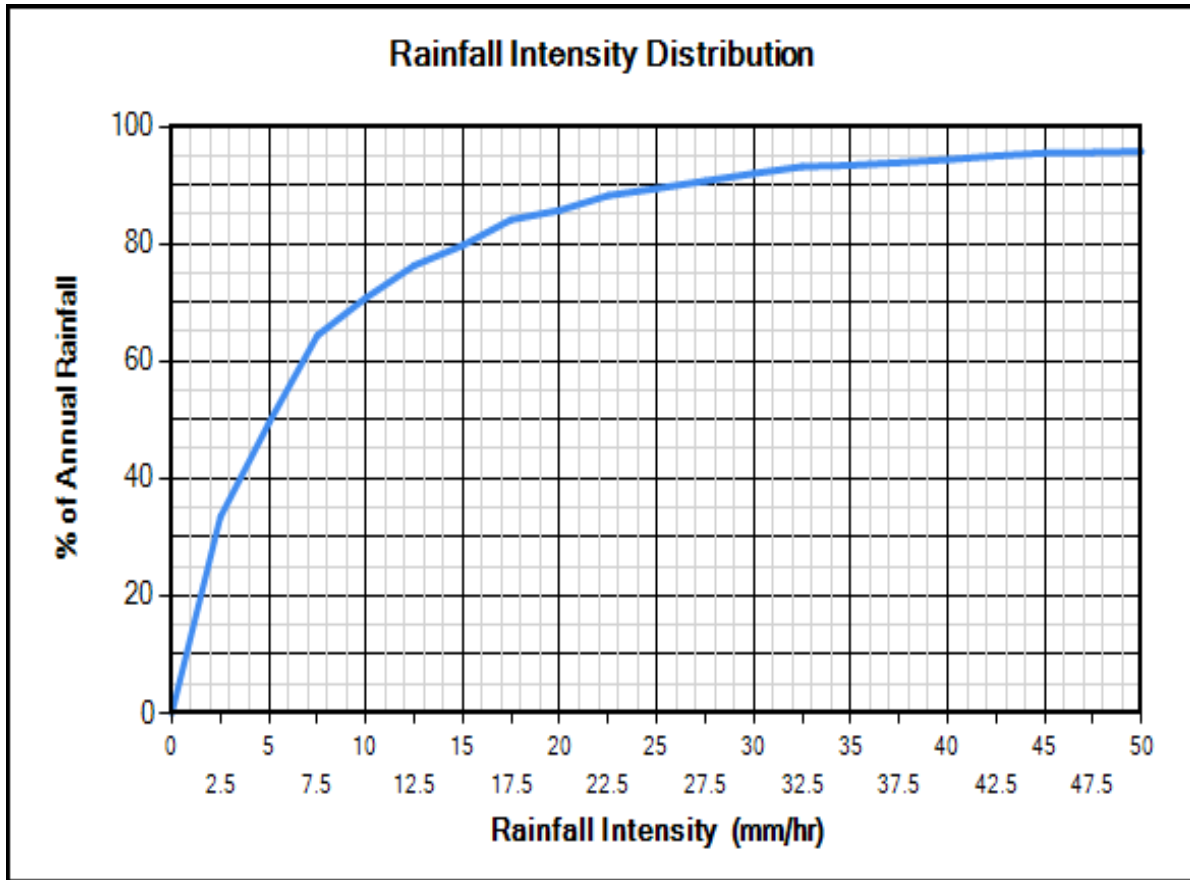
User Defined

Clear

TSS Removal Required (%) 70

Water Temp (C) 20

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



Site Physical Characteristics

Hydroworks Hydrodynamic Separator Sizing Program - Hydroguard

File Product Units View Help

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

Catchment Parameters

Width (m) Imperv. Mannings n

Perv Mannings n

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

Perv. Depress. Storage (mm)

Maintenance

Frequency (months)

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

Evaporation and 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

Baseflow (m3/s)

Resets all parameters excluding input catchment width.

Dimensions And Capacities

Hydroworks Hydrodynamic Separator Sizing Program - Hydroguard

File Product Units View Help

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

Dimensions and Capacities					
Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HG 4	1.22	1.52	278	1.2	1.8
HG 5	1.52	1.68	504	2.1	3
HG 6	1.83	1.83	833	3.3	4.8
Unavailable	2.13	1.98	1270	4.8	7.1
HG 8	2.44	2.13	1853	6.8	10
Unavailable	2.74	2.44	2686	9.9	14.4
HG 10	3.05	2.74	3619	14.1	20
HG 12	3.66	3.35	6672	24.9	35.2

Depth = Depth from outlet invert to inside bottom of tank

Generic HG 4 CAD Drawing

Canadian Patent # 2,536,300

Dimensions in millimeters
 Permanent Pool Volume = 1700 Liters
 The Hydroguard must be cleaned after the construction period if used as a sediment and erosion control measure
 The Hydroguard should be inspected once per year on stabilized sites
 Inspection will determine the maintenance frequency (annual maintenance or every 2 years typical for stabilized sites)
 Sites with unstable conditions (exposed soil or materials storage) will require more frequent inspection and maintenance

Hydroworks, LLC
 Phone: 888-290-7900 Fax: 888-783-7271
 Web: www.hydroworks.com

Hydroworks HG4 (1200mmØ)		
PROJECT:		
LOCATION:		
REVISION DATE:	9/17/2018	

TSS Buildup And Washoff

Hydroworks Hydrodynamic Separator Sizing Program - Hydroguard

File Product Units View Help

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

TSS Buildup

Power Linear
 Exponential
 Michaelis-Menton
 No Buildup Required

TSS Washoff

Power-Exponential
 Rating Curve (no upper limit)
 Rating Curve (limited to buildup)
 Event Mean Concentration

Street Sweeping

Efficiency (%)
 Start Month
 Stop Month
 Frequency (days)
 Available Fraction

Soil Erosion

Add Erosion to TSS

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 - Hydroguard

File Product Units View Help

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

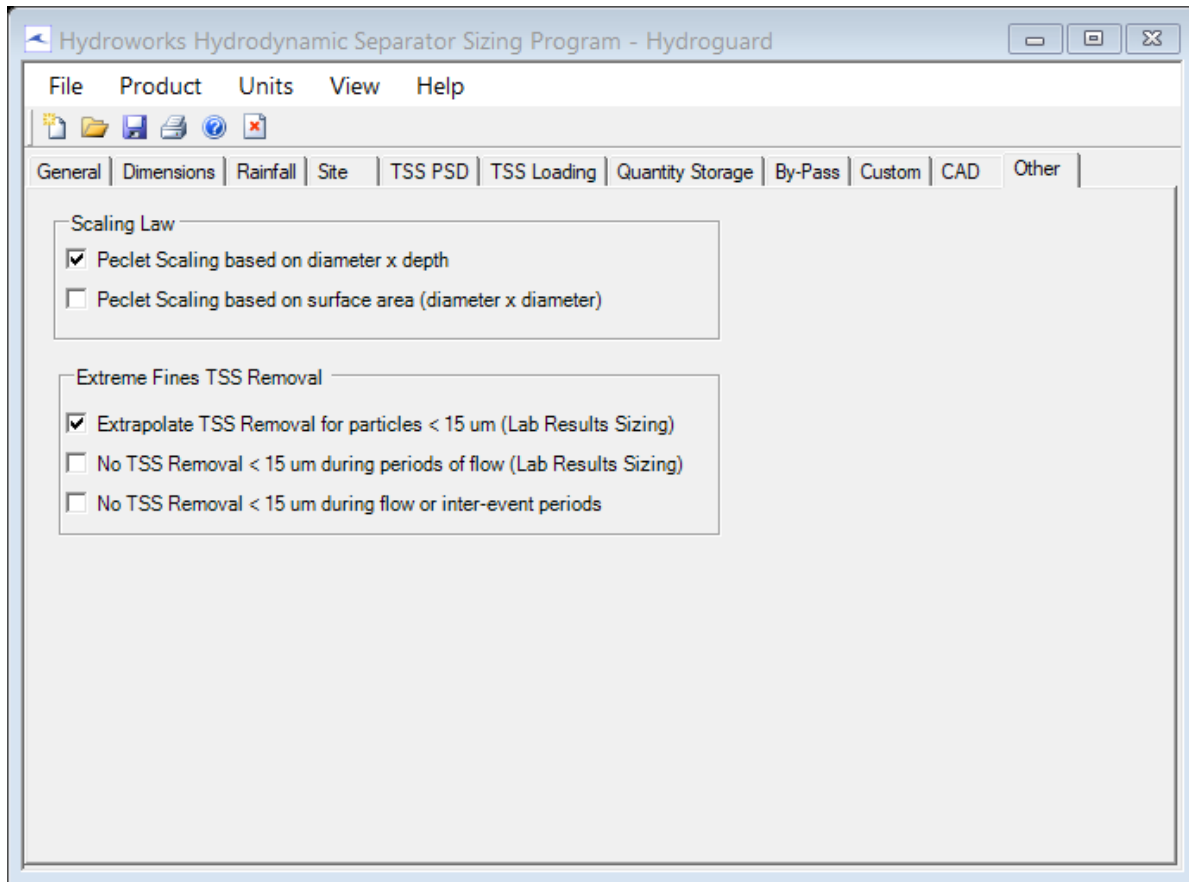
Quantity Control Storage

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

Notes:

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

Other Parameters



Hydroworks Sizing Program - Version 5.0
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APPENDIX 'B'

EPA SWMM v5.1

Output File

Historical Museum, 5yr Storm

 Element Count

Number of rain gages 1
 Number of subcatchments ... 1
 Number of nodes 2
 Number of links 1
 Number of pollutants 0
 Number of land uses 0

 Raingage Summary

Name	Data Source	Data Type	Recording Interval
1	3hrChicago5yr_R0.46	INTENSITY	5 min.

 Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
POST	0.28	60.60	54.00	1.5000	1	Storage

 Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
DavySt_POST	OUTFALL	100.00	0.00	0.0	
Storage	STORAGE	101.00	1.00	0.0	

 Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
Outlet	Storage	DavySt_POST	ORIFICE			

 Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow

 NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

 Analysis Options

Flow Units LPS
 Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method CURVE_NUMBER
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN
 Starting Date 08/08/2014 00:00:00
 Ending Date 08/08/2014 06:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:05:00
 Wet Time Step 00:05:00
 Dry Time Step 01:00:00

Routing Time Step 30.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 1
 Head Tolerance 0.001524 m

```

*****
Volume      Depth
Runoff Quantity Continuity  hectare-m    mm
*****
Total Precipitation ..... 0.011      38.537
Evaporation Loss ..... 0.000      0.000
Infiltration Loss ..... 0.005      17.433
Surface Runoff ..... 0.006      20.271
Final Storage ..... 0.000      0.904
Continuity Error (%) ..... -0.184
  
```

```

*****
Volume      Volume
Flow Routing Continuity    hectare-m    10^6 ltr
*****
Dry Weather Inflow ..... 0.000      0.000
Wet Weather Inflow ..... 0.006      0.056
Groundwater Inflow ..... 0.000      0.000
RDII Inflow ..... 0.000      0.000
External Inflow ..... 0.000      0.000
External Outflow ..... 0.004      0.041
Flooding Loss ..... 0.000      0.000
Evaporation Loss ..... 0.000      0.000
Exfiltration Loss ..... 0.000      0.000
Initial Stored Volume .... 0.000      0.000
Final Stored Volume ..... 0.002      0.015
Continuity Error (%) ..... 0.000
  
```

 Time-Step Critical Elements

 None

 Highest Flow Instability Indexes

 All links are stable.

```

*****
Routing Time Step Summary
*****
Minimum Time Step      : 29.50 sec
Average Time Step      : 29.96 sec
Maximum Time Step      : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00
Percent Not Converging : 0.00
Time Step Frequencies :
  30.000 - 13.228 sec : 100.00 %
  13.228 - 5.833 sec  : 0.00 %
  5.833 - 2.572 sec   : 0.00 %
  2.572 - 1.134 sec   : 0.00 %
  1.134 - 0.500 sec   : 0.00 %
  
```

 Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
POST	38.54	0.00	0.00	17.43	20.27	0.00	20.27	0.06	35.66	0.526

 Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
DavySt_POST	OUTFALL	0.00	0.00	100.00	0 00:00	0.00
Storage	STORAGE	0.03	0.06	101.06	0 02:02	0.06

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
DavySt_POST	OUTFALL	0.00	3.80	0 02:02	0	0.0406	0.000
Storage	STORAGE	35.66	35.66	0 01:30	0.0559	0.0559	-0.004

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
Storage	0.022	3	0	0	0.039	6	0 02:02	3.80

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
DavySt_POST	89.32	2.10	3.80	0.041
System	89.32	2.10	3.80	0.041

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
Outlet	ORIFICE	3.80	0 02:02			0.27

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Wed Jan 21 09:52:51 2026
Analysis ended on: Wed Jan 21 09:52:51 2026
Total elapsed time: < 1 sec

Historical Museum, 100yr Storm

Element Count

Number of rain gages 1
 Number of subcatchments ... 1
 Number of nodes 2
 Number of links 1
 Number of pollutants 0
 Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
1	3hrChicago100yr_R0.46	INTENSITY	5 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
POST	0.28	60.60	54.00	1.5000	1	Storage

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
DavySt_POST	OUTFALL	100.00	0.00	0.0	
Storage	STORAGE	101.00	1.00	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
Outlet	Storage	DavySt_POST	ORIFICE			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

Analysis Options

Flow Units LPS
 Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method CURVE_NUMBER
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN
 Starting Date 08/08/2014 00:00:00
 Ending Date 08/08/2014 06:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:05:00
 Wet Time Step 00:05:00
 Dry Time Step 01:00:00

Routing Time Step 30.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 1
 Head Tolerance 0.001524 m

```

*****
Volume      Depth
Runoff Quantity Continuity  hectare-m    mm
*****
Total Precipitation ..... 0.017      60.011
Evaporation Loss ..... 0.000      0.000
Infiltration Loss ..... 0.007      27.121
Surface Runoff ..... 0.009      31.882
Final Storage ..... 0.000      1.094
Continuity Error (%) ..... -0.144
  
```

```

*****
Volume      Volume
Flow Routing Continuity    hectare-m    10^6 ltr
*****
Dry Weather Inflow ..... 0.000      0.000
Wet Weather Inflow ..... 0.009      0.088
Groundwater Inflow ..... 0.000      0.000
RDII Inflow ..... 0.000      0.000
External Inflow ..... 0.000      0.000
External Outflow ..... 0.006      0.056
Flooding Loss ..... 0.000      0.000
Evaporation Loss ..... 0.000      0.000
Exfiltration Loss ..... 0.000      0.000
Initial Stored Volume .... 0.000      0.000
Final Stored Volume ..... 0.003      0.032
Continuity Error (%) ..... 0.000
  
```

 Time-Step Critical Elements

 None

 Highest Flow Instability Indexes

 All links are stable.

```

*****
Routing Time Step Summary
*****
Minimum Time Step      : 29.50 sec
Average Time Step      : 29.96 sec
Maximum Time Step      : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00
Percent Not Converging  : 0.00
Time Step Frequencies
  30.000 - 13.228 sec   : 100.00 %
  13.228 - 5.833 sec   : 0.00 %
  5.833 - 2.572 sec    : 0.00 %
  2.572 - 1.134 sec    : 0.00 %
  1.134 - 0.500 sec    : 0.00 %
  
```

 Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
POST	60.01	0.00	0.00	27.12	31.88	0.00	31.88	0.09	55.67	0.531

 Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
DavySt_POST	OUTFALL	0.00	0.00	100.00	0 00:00	0.00
Storage	STORAGE	0.06	0.09	101.09	0 02:12	0.09

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
DavySt_POST	OUTFALL	0.00	4.80	0 02:12	0	0.0562	0.000
Storage	STORAGE	55.67	55.67	0 01:30	0.088	0.088	-0.003

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
Storage	0.039	6	0	0	0.064	9	0 02:12	4.80

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
DavySt_POST	91.26	2.85	4.80	0.056
System	91.26	2.85	4.80	0.056

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
Outlet	ORIFICE	4.80	0 02:12			0.74

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Wed Jan 21 09:53:48 2026
Analysis ended on: Wed Jan 21 09:53:48 2026
Total elapsed time: < 1 sec