

Technical Memorandum

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Via Email: Darren.mackenzie@notl.com
To: Darren MacKenzie, C.Tech., rcsi, Town of Niagara-on-the-Lake
From: Sarah Primmer, P.Eng., GEI Consultants
Date: June 19, 2025
Re: Conceptual Pond Re-design Tech Memo
 Vineyard Creek Estates Stormwater Management Pond Review
 Niagara-on-the-Lake, ON
Project No. 2408081

GEI has been retained to review drainage and flooding issues within the Sandalwood Crescent area of Niagara-on-the-Lake, including at the stormwater management pond and the ditch and culvert adjacent to 1225 Queenston Road. In past memos, we have evaluated the capacity and constraints of the current Vineyard Creek Estates stormwater management pond on Sandalwood Crescent. In an effort to reduce stormwater flooding issues, this technical memo reviews the possibilities for increasing the storage capacity of the Vineyard Creek Estates stormwater management pond and reviews the resulting water quantity and quality controls.

Original Design

The following table lists the intended ponding elevations in the stormwater management pond on Sandalwood Crescent as per the Vineyard Creek Estates Stormwater Management Report (dated June 2005).

Table 1. Pond Function – Per Stormwater Management Design Report

Stage	Design Storm Event	Peak Outflow (m ³ /s)	Storage Volume (m ³)	Water Elevation (m)
Bottom of Active Storage	--	--	0	116.59
--	2	0.157	989	117.38
--	5	0.245	1,824	117.71
--	100	1.262	2,887	118.22
Top of Pond	--	--	2,960	118.25

As these peak outflows are higher than the pre-development flow rates listed in the report, we have assumed that the peak outflows represent the allowable discharge rates from the pond.

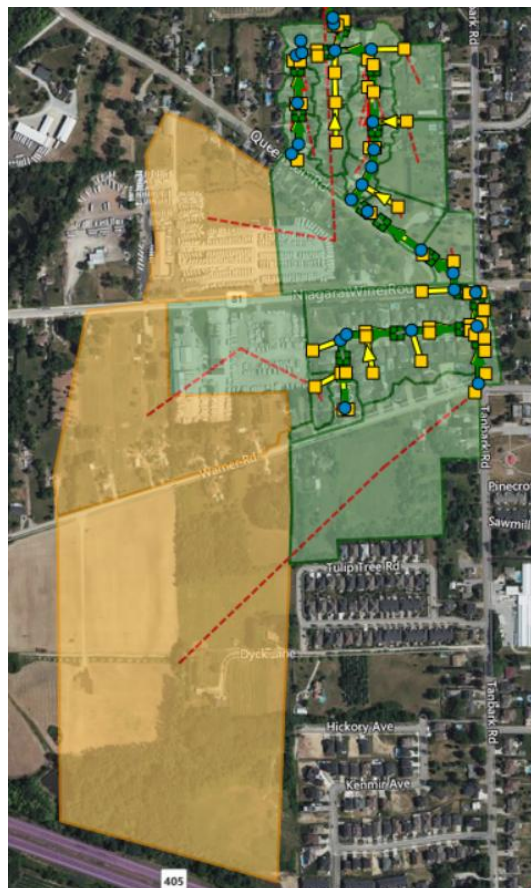
Redesign Criteria

There are three main criteria for conceptually re-designing the Vineyard Creek Estates stormwater management pond:

1. Reduce the ponding elevation to be below Sandalwood Road's current low point of 118.20 in order to eliminate flooding on the road.
2. Increase the storage volume in order to provide as much storage and quantity control as feasible within the site.
3. Continue to provide quality control.

Catchment Areas and Approximate Storage Volumes

For this review, the catchment area has been considered as the contributing area within the urban boundary, including the development south of Warner Road. The catchment areas are shown in green the figure below. The orange area was removed as it is outside of the urban boundary.



Based on the above contributing area to the pond, we've estimated the following storage volumes are required to meet the allowable release rates:

- 2-year design storm event – 3,450 m³
- 5-year design storm event – 4,575 m³

- 100-year design storm event – 7,015 m³

As indicated in Table 1, the existing pond was design with approximately 2,960 m³ of storage, which is far less than what is needed to control flows form the contributing catchment area.

Existing Pond Function

Technical Memo No. 2 explored the function of the existing pond in detail. Table 2, below, summarizes the flows through the pond and storage elevations with the contributing Catchment limited to the urban boundary.

Table 2. Ex. Pond Function – Only Areas Within Urban Boundary

Stage	Design Storm Event	Peak Outflow (m ³ /s)	Storage Volume (m ³)	Water Elevation (m)
Bottom of Active Storage	--	--	0	116.40
--	2	0.327	2,564	117.91
--	5	0.901	3,084	118.14
--	100	5.010	3,693	118.41
Top of Pond	--	--	3,834	118.47

As seen above, the 100-year storm in the existing pond analysis reaches an elevation of 118.41, which floods into the road. As such, the first possibility for re-design would be to increase the outlets from the existing pond in order to increase the flows from the pond and thus decrease the ponding elevations. The table below shows the results of the existing pond with revised outlet structures to reduce the ponding level to below 118.20.

Table 3. Ex. Pond Function – Revised Outlet Structures

Stage	Design Storm Event	Peak Outflow (m ³ /s)	Storage Volume (m ³)	Water Elevation (m)
Bottom of Active Storage	--	--	0	116.40
--	2	0.954	1,553	117.44
--	5	1.172	2,283	117.78
--	100	5.429	3,052	118.12
Top of Pond	--	--	3,225	118.20

Options for Increasing Storage Capacity

Three options that were considered at this time for increasing the storage volume are as follows:

1. Dry Pond with 4:1 Side Slopes
 - This involves the elimination of the permanent pool and maximizing the storage volume while still maintaining accessible side slopes at 4:1 grade.
2. Dry Pond with Retaining Walls
 - This involves the elimination of the permanent pool, plus the installation of retaining walls to increase the storage volume by eliminating side slopes.
3. Underground Tank with Shallow Ponding above ground
 - This involves constructing a storage tank to the largest extent feasible, with shallow stormwater ponding on top

Quality Controls

Based on a contributing area of 24.27 ha at an imperviousness of 57% (excluding areas outside of the urban boundary, including the proposed development south of Warner Road), the dry pond would need to have approximately 3,802 m³ of extended detention to provide 60% TSS removal. However, 24 hours of extended detention for this volume is not feasible with the limited storage volumes. Therefore, these systems would be dependent on an oil and grit separator to provide the majority of quality control, with runoff passing over the vegetated bottom of the dry pond providing the rest.

Isolator rows in the underground tank could provide the 70% TSS removal required as per the original design.

Pond Re-Design Peak Flow Rates

Conceptual level design was completed for the three options noted above, resulting in the following storage volumes available:

1. Dry Pond with 4:1 Side Slopes – 4,000 m³
2. Dry Pond with Retaining Walls (no side slopes) – 4,800 m³
3. Underground Tank with Shallow Ponding aboveground – 4,000 m³

The outflow controls for the possible ponds were set based on keeping the elevation of the runoff from the 100-year design storm event beneath the top of pond elevation in order to mitigate flooding.

Table 2. Option 1 - Dry Pond with 4:1 Side Slopes

Stage	Design Storm Event	Peak Outflow (m ³ /s)	Storage Volume (m ³)	Water Elevation (m)
Bottom of Active Storage	--	--	0	116.20
--	2	0.986	1,757	117.28
--	5	1.211	2,562	117.65
--	100	5.428	3,752	118.11
Top of Pond	--	--	3,999	118.20

Table 3. Option 2 - Dry Pond with Retaining Walls

Stage	Design Storm Event	Peak Outflow (m ³ /s)	Storage Volume (m ³)	Water Elevation (m)
Bottom of Active Storage	--	--	0	116.20
--	2	0.273	2,677	117.32
--	5	0.323	3,776	117.77
--	100	4.718	4,639	118.13
Top of Pond	--	--	4,800	118.20

Table 4. Option 3 - Underground Tank

Stage	Design Storm Event	Peak Outflow (m ³ /s)	Storage Volume (m ³)	Water Elevation (m)
Bottom of Tank	--	--	0	114.70
--	2	0.636	2,165	115.72
--	5	0.799	3,043	116.13
--	100	5.558	3,955	118.07
Top of Pond	--	--	4,002	118.20

The flows discharging from the Pond Re-Design options noted above are compared both to the allowable flow rates (from Table 1) and the

Comparison of Results

The following table compares the results of the various redesign options.

Storm Event	Allowable (Per Original Design Report)		Existing Pond		Redesigned Existing Pond		Dry Pond		Pond with Retaining Walls		Underground Tank	
	Elevation (m)	Flow (m ³ /s)	Elevation (m)	Flow (m ³ /s)	Elevation (m)	Flow (m ³ /s)	Elevation (m)	Flow (m ³ /s)	Elevation (m)	Flow (m ³ /s)	Elevation (m)	Flow (m ³ /s)
2-Year	117.38	0.157	117.91	0.327	117.44	0.954	117.28	0.986	117.32	0.273	115.72	0.636
5-Year	117.71	0.245	118.14	0.901	117.78	1.172	117.65	1.211	117.77	0.323	116.13	0.799
100-Year	118.22	1.262	118.41	5.010	118.12	5.429	118.11	5.428	118.13	4.718	118.07	5.558

As can be seen in this table, none of the proposed redesign options are able to meet the flow rates that were prescribed based on the original stormwater report (due to the increased drainage area and impervious levels, as described in Memo No.1). However, the option of a pond with retaining walls increases the volume significantly enough that the peak flows and elevations are reduced from the function of the existing pond today.

Next Steps

Based on the above, we recommend that a more detailed design be completed of the pond with retaining walls option in order to validate these conceptual results and move towards a constructable solution. In addition, the capacity of the downstream channel should be investigated in order to determine if the channel can accept these additional flows over the long term.

Closing

If you have any questions, please feel free to contact Sarah Primmer at 519-748-1440.

Sincerely,

GEI CONSULTANTS CANADA LTD.



Sarah Primmer, P.Eng.
Senior Project Engineer

Appendices

Appendix A Modelling Results

PW/SP

B:\Working\NIAGARA-ON-THE-LAKE, TOWN OF\2408081 Stormwater Catchment and Pond Review\Work in Progress\GEI-Technical Memo 3_2025-06-19.docx

Appendix A Modelling Results

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"          125.000 Pervious Max.infiltration"
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"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
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"          0.050  Impervious Lag constant (hours)"
"          1.500  Impervious Depression storage"

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"	Catchment 200		Pervious	Impervious	Total Area "
"	Surface Area		5.031	0.559	5.590 hectare"
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"	Time to Centroid		0.000	128.979	128.979 minutes"
"	Rainfall depth		32.777	32.777	32.777 mm"
"	Rainfall volume		1649.01	183.22	1832.23 c.m"
"	Rainfall losses		32.777	1.591	29.658 mm"
"	Runoff depth		0.000	31.186	3.119 mm"
"	Runoff volume		0.00	174.33	174.33 c.m"
"	Runoff coefficient		0.000	0.951	0.095 "
"	Maximum flow		0.000	0.096	0.096 c.m/sec"
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"	450.000	Pervious length"			
"	2.500	Pervious slope"			
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"	450.000	Impervious length"			
"	2.500	Impervious slope"			
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"	125.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			

"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		2.081	0.096	0.096	0.000 c.m/sec"
"		Catchment 100	Pervious	Impervious	Total Area "
"		Surface Area	6.538	12.142	18.680 hectare"
"		Time of concentration	---	10.559	10.559 minutes"
"		Time to Centroid	0.000	128.979	128.979 minutes"
"		Rainfall depth	32.777	32.777	32.777 mm"
"		Rainfall volume	2142.95	3979.77	6122.72 c.m"
"		Rainfall losses	32.777	1.591	12.506 mm"
"		Runoff depth	0.000	31.186	20.271 mm"
"		Runoff volume	0.00	3786.56	3786.56 c.m"
"		Runoff coefficient	0.000	0.951	0.618 "
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"		Maximum level	117.435	metre"	
"		Maximum storage	1553.199	c.m"	
"		Centroidal lag	2.654	hours"	
"		2.081	2.176	0.954	0.000 c.m/sec"

" 38	START/RE-START TOTALS 100"		
"	3 Runoff Totals on EXIT"		
"	Total Catchment area	24.270	hectare"
"	Total Impervious area	12.701	hectare"
"	Total % impervious	52.332"	
" 19	EXIT"		

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"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
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"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"
"          1.500  Impervious Depression storage"

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"	Catchment 200		Pervious	Impervious	Total Area "
"	Surface Area	5.031	0.559	5.590	hectare"
"	Time of concentration	93.692	8.907	38.241	minutes"
"	Time to Centroid	169.249	125.411	140.578	minutes"
"	Rainfall depth	42.500	42.500	42.500	mm"
"	Rainfall volume	2138.20	237.58	2375.78	c.m"
"	Rainfall losses	40.097	1.614	36.249	mm"
"	Runoff depth	2.403	40.886	6.252	mm"
"	Runoff volume	120.91	228.55	349.46	c.m"
"	Runoff coefficient	0.057	0.962	0.147	"
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"	0.250	Pervious Manning 'n'"			
"	125.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			

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"      0.000 Impervious Min.infiltration"
"      0.050 Impervious Lag constant (hours)"
"      1.500 Impervious Depression storage"
"          3.294      0.155      0.155      0.000 c.m/sec"
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"      Surface Area      6.538      12.142      18.680      hectare"
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"      17.      Number of stages"
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"      118.470      Maximum water level      metre"
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"      116.800      0.1860      482.200"
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"      117.700      1.129      2100.300"
"      117.810      1.194      2344.200"
"      117.890      1.706      2524.800"
"      118.200      6.649      3224.500"
"      Peak outflow      1.172      c.m/sec"
"      Maximum level      117.783      metre"
"      Maximum storage      2283.362      c.m"
"      Centroidal lag      2.639      hours"
"          3.294      3.449      1.172      0.000 c.m/sec"

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" 38	START/RE-START TOTALS 100"		
"	3 Runoff Totals on EXIT"		
"	Total Catchment area	24.270	hectare"
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"          1500.000 Max. Hydrograph"
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"          1  Chicago storm"
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"          3.090  Constant B"
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"          Total depth                      69.225  mm"
"          6  100hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 200"
"          1  Triangular SCS"
"          3  Specify values"
"          2  Horton equation"
"          200  Catchment 200"
"          10.000 % Impervious"
"          5.590  Total Area"
"          130.000 Flow length"
"          2.500  Overland Slope"
"          5.031  Pervious Area"
"          450.000 Pervious length"
"          2.500  Pervious slope"
"          0.559  Impervious Area"
"          450.000 Impervious length"
"          2.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          125.000 Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"
"          1.500  Impervious Depression storage"

```

"		0.469	0.000	0.000	0.000 c.m/sec"
"	Catchment 200		Pervious	Impervious	Total Area "
"	Surface Area	5.031	0.559	5.590	hectare"
"	Time of concentration	41.553	6.830	32.973	minutes"
"	Time to Centroid	148.745	120.576	141.785	minutes"
"	Rainfall depth	69.225	69.225	69.225	mm"
"	Rainfall volume	3482.72	386.97	3869.68	c.m"
"	Rainfall losses	46.597	2.385	42.176	mm"
"	Runoff depth	22.628	66.840	27.049	mm"
"	Runoff volume	1138.43	373.64	1512.06	c.m"
"	Runoff coefficient	0.327	0.966	0.391	"
"	Maximum flow	0.433	0.325	0.469	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4	Add Runoff "			
"		0.469	0.469	0.000	0.000"
" 56	DIVERSION"				
"	200	Node number"			
"	0.250	Overflow threshold"			
"	1.000	Required diverted fraction"			
"	0	Conduit type; 1=Pipe;2=Channel"			
"			0.219	c.m/sec"	
"			350.937	c.m"	
"		DIV00200.100hyd"			
"		Major flow at 200"			
"		0.469	0.469	0.250	0.000 c.m/sec"
" 40	HYDROGRAPH Next link "				
"	5	Next link "			
"		0.469	0.250	0.250	0.000"
" 33	CATCHMENT 100"				
"	1	Triangular SCS"			
"	3	Specify values"			
"	2	Horton equation"			
"	100	Catchment 100"			
"	65.000	% Impervious"			
"	18.680	Total Area"			
"	275.000	Flow length"			
"	2.500	Overland Slope"			
"	6.538	Pervious Area"			
"	450.000	Pervious length"			
"	2.500	Pervious slope"			
"	12.142	Impervious Area"			
"	450.000	Impervious length"			
"	2.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	125.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			

```

"      0.000 Impervious Min.infiltration"
"      0.050 Impervious Lag constant (hours)"
"      1.500 Impervious Depression storage"
"          7.219      0.250      0.250      0.000 c.m/sec"
"      Catchment 100      Pervious Impervious Total Area "
"      Surface Area      6.538      12.142      18.680 hectare"
"      Time of concentration 41.553      6.830      12.184 minutes"
"      Time to Centroid 148.745      120.576      124.919 minutes"
"      Rainfall depth 69.225      69.225      69.225 mm"
"      Rainfall volume 0.4526      0.8405      1.2931 ha-m"
"      Rainfall losses 46.597      2.385      17.859 mm"
"      Runoff depth 22.628      66.840      51.366 mm"
"      Runoff volume 1479.43      8115.72      9595.16 c.m"
"      Runoff coefficient 0.327      0.966      0.742 "
"      Maximum flow 0.563      7.068      7.219 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"          7.219      7.469      0.250      0.000"
" 54 POND DESIGN"
"      7.469 Current peak flow c.m/sec"
"      0.419 Target outflow c.m/sec"
" 10756.3 Hydrograph volume c.m"
"      17. Number of stages"
" 116.400 Minimum water level metre"
" 118.470 Maximum water level metre"
" 116.400 Starting water level metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge Volume"
" 116.400 0.000 0.000"
" 116.500 0.04600 108.100"
" 116.600 0.09300 223.800"
" 116.700 0.1390 348.000"
" 116.800 0.1860 482.200"
" 116.900 0.4150 627.100"
" 117.000 0.5570 781.800"
" 117.100 0.6690 944.900"
" 117.200 0.7650 1116.200"
" 117.300 0.8510 1295.900"
" 117.420 0.9430 1523.000"
" 117.500 1.000 1681.200"
" 117.600 1.066 1886.600"
" 117.700 1.129 2100.300"
" 117.810 1.194 2344.200"
" 117.890 1.706 2524.800"
" 118.200 6.649 3224.500"
"      Peak outflow 5.429 c.m/sec"
"      Maximum level 118.124 metre"
"      Maximum storage 3051.860 c.m"
"      Centroidal lag 2.543 hours"
"          7.219      7.469      5.429      0.000 c.m/sec"

```

" 38	START/RE-START TOTALS 100"		
"	3 Runoff Totals on EXIT"		
"	Total Catchment area	24.270	hectare"
"	Total Impervious area	12.701	hectare"
"	Total % impervious	52.332"	
" 19	EXIT"		

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\NIAGARA-ON-THE-LAKE, TOWN OF\
"          2408081 Stormwater Catchment and Pond Review\Work in
Progress\Calculations\PropSWMP_2025-05-26"
"          Output filename:                    DryPond_2yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              5/28/2025 at 9:57:22 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          240.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          719.650  Coefficient A"
"          5.849  Constant B"
"          0.813  Exponent C"
"          0.400  Fraction R"
"          240.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          99.424  mm/hr"
"          Total depth                32.777  mm"
"          6  002hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 200"
"          1  Triangular SCS"
"          3  Specify values"
"          2  Horton equation"
"          200  Catchment 200"
"          30.000  % Impervious"
"          5.590  Total Area"
"          80.000  Flow length"
"          2.500  Overland Slope"
"          3.913  Pervious Area"
"          450.000  Pervious length"
"          2.500  Pervious slope"
"          1.677  Impervious Area"
"          450.000  Impervious length"
"          2.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          125.000  Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.287	0.000	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	3.913	1.677	5.590	hectare"
"		Time of concentration	---	10.559	10.559	minutes"
"		Time to Centroid	0.000	128.979	128.979	minutes"
"		Rainfall depth	32.777	32.777	32.777	mm"
"		Rainfall volume	1282.56	549.67	1832.23	c.m"
"		Rainfall losses	32.777	1.591	23.421	mm"
"		Runoff depth	0.000	31.186	9.356	mm"
"		Runoff volume	0.00	522.98	522.98	c.m"
"		Runoff coefficient	0.000	0.951	0.285	"
"		Maximum flow	0.000	0.287	0.287	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.287	0.287	0.000	0.000"	
" 33		CATCHMENT 100"				
"	1	Triangular SCS"				
"	3	Specify values"				
"	2	Horton equation"				
"	100	Catchment 100"				
"	65.000	% Impervious"				
"	18.680	Total Area"				
"	275.000	Flow length"				
"	2.500	Overland Slope"				
"	6.538	Pervious Area"				
"	450.000	Pervious length"				
"	2.500	Pervious slope"				
"	12.142	Impervious Area"				
"	450.000	Impervious length"				
"	2.500	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	125.000	Pervious Max.infiltration"				
"	5.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.015	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		2.081	0.287	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	6.538	12.142	18.680	hectare"
"		Time of concentration	---	10.559	10.559	minutes"
"		Time to Centroid	0.000	128.979	128.979	minutes"
"		Rainfall depth	32.777	32.777	32.777	mm"
"		Rainfall volume	2142.95	3979.77	6122.72	c.m"
"		Rainfall losses	32.777	1.591	12.506	mm"
"		Runoff depth	0.000	31.186	20.271	mm"

"	Runoff volume	0.00	3786.56	3786.56	c.m"
"	Runoff coefficient	0.000	0.951	0.618	"
"	Maximum flow	0.000	2.081	2.081	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		2.081	2.368	0.000	0.000"
" 54	POND DESIGN"				
"	2.368	Current peak flow	c.m/sec"		
"	1.149	Target outflow	c.m/sec"		
"	4309.5	Hydrograph volume	c.m"		
"	11.	Number of stages"			
"	116.200	Minimum water level	metre"		
"	118.200	Maximum water level	metre"		
"	116.200	Starting water level	metre"		
"	0	Keep Design Data: 1 = True; 0 = False"			
"		Level Discharge	Volume"		
"	116.200	0.000	0.000"		
"	116.400	0.09300	249.500"		
"	116.600	0.1860	532.400"		
"	116.800	0.5570	848.800"		
"	117.000	0.7650	1198.600"		
"	117.200	0.9280	1581.700"		
"	117.400	1.066	1998.400"		
"	117.600	1.189	2448.400"		
"	117.800	1.300	2931.800"		
"	117.900	2.004	3186.100"		
"	118.200	6.922	3999.000"		
"	Peak outflow	0.986	c.m/sec"		
"	Maximum level	117.284	metre"		
"	Maximum storage	1756.629	c.m"		
"	Centroidal lag	2.704	hours"		
"	2.081	2.368	0.986	0.000	c.m/sec"
" 38	START/RE-START TOTALS 100"				
"	3	Runoff Totals on EXIT"			
"	Total Catchment area		24.270	hectare"	
"	Total Impervious area		13.819	hectare"	
"	Total % impervious		56.939"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\NIAGARA-ON-THE-LAKE, TOWN OF\
"          2408081 Stormwater Catchment and Pond Review\Work in
Progress\Calculations\PropSWMP_2025-05-26"
"          Output filename:                    DryPond_5yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              5/28/2025 at 9:59:36 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          996.920 Coefficient A"
"          4.233  Constant B"
"          0.826  Exponent C"
"          0.400  Fraction R"
"          240.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          152.144  mm/hr"
"          Total depth                42.500  mm"
"          6  005hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 200"
"          1  Triangular SCS"
"          3  Specify values"
"          2  Horton equation"
"          200  Catchment 200"
"          30.000 % Impervious"
"          5.590  Total Area"
"          80.000 Flow length"
"          2.500  Overland Slope"
"          3.913  Pervious Area"
"          450.000 Pervious length"
"          2.500  Pervious slope"
"          1.677  Impervious Area"
"          450.000 Impervious length"
"          2.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          125.000 Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.457	0.000	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	3.913	1.677	5.590	hectare"
"		Time of concentration	93.692	8.907	19.133	minutes"
"		Time to Centroid	169.249	125.411	130.698	minutes"
"		Rainfall depth	42.500	42.500	42.500	mm"
"		Rainfall volume	1663.04	712.73	2375.78	c.m"
"		Rainfall losses	40.097	1.614	28.552	mm"
"		Runoff depth	2.403	40.886	13.948	mm"
"		Runoff volume	94.04	685.66	779.70	c.m"
"		Runoff coefficient	0.057	0.962	0.328	"
"		Maximum flow	0.020	0.454	0.457	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.457	0.457	0.000	0.000"	
" 33		CATCHMENT 100"				
"	1	Triangular SCS"				
"	3	Specify values"				
"	2	Horton equation"				
"	100	Catchment 100"				
"	65.000	% Impervious"				
"	18.680	Total Area"				
"	275.000	Flow length"				
"	2.500	Overland Slope"				
"	6.538	Pervious Area"				
"	450.000	Pervious length"				
"	2.500	Pervious slope"				
"	12.142	Impervious Area"				
"	450.000	Impervious length"				
"	2.500	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	125.000	Pervious Max.infiltration"				
"	5.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.015	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		3.294	0.457	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	6.538	12.142	18.680	hectare"
"		Time of concentration	93.692	8.907	11.508	minutes"
"		Time to Centroid	169.249	125.411	126.756	minutes"
"		Rainfall depth	42.500	42.500	42.500	mm"
"		Rainfall volume	2778.68	5160.41	7939.09	c.m"
"		Rainfall losses	40.097	1.614	15.083	mm"
"		Runoff depth	2.403	40.886	27.417	mm"

"	Runoff volume	157.13	4964.40	5121.53	c.m"
"	Runoff coefficient	0.057	0.962	0.645	"
"	Maximum flow	0.033	3.290	3.294	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		3.294	3.751	0.000	0.000"
" 54	POND DESIGN"				
"	3.751	Current peak flow	c.m/sec"		
"	1.149	Target outflow	c.m/sec"		
"	5901.2	Hydrograph volume	c.m"		
"	11.	Number of stages"			
"	116.200	Minimum water level	metre"		
"	118.200	Maximum water level	metre"		
"	116.200	Starting water level	metre"		
"	0	Keep Design Data: 1 = True; 0 = False"			
"		Level Discharge	Volume"		
"	116.200	0.000	0.000"		
"	116.400	0.09300	249.500"		
"	116.600	0.1860	532.400"		
"	116.800	0.5570	848.800"		
"	117.000	0.7650	1198.600"		
"	117.200	0.9280	1581.700"		
"	117.400	1.066	1998.400"		
"	117.600	1.189	2448.400"		
"	117.800	1.300	2931.800"		
"	117.900	2.004	3186.100"		
"	118.200	6.922	3999.000"		
"	Peak outflow	1.211	c.m/sec"		
"	Maximum level	117.647	metre"		
"	Maximum storage	2561.795	c.m"		
"	Centroidal lag	2.684	hours"		
"	3.294	3.751	1.211	0.000	c.m/sec"
" 38	START/RE-START TOTALS 100"				
"	3	Runoff Totals on EXIT"			
"	Total Catchment area		24.270	hectare"	
"	Total Impervious area		13.819	hectare"	
"	Total % impervious		56.939"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\NIAGARA-ON-THE-LAKE, TOWN OF\
"          2408081 Stormwater Catchment and Pond Review\Work in
Progress\Calculations\PropSWMP_2025-05-26"
"          Output filename:                    DryPond_100yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              5/28/2025 at 10:01:03 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          240.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          1815.300  Coefficient A"
"          3.090  Constant B"
"          0.847  Exponent C"
"          0.400  Fraction R"
"          240.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          295.424  mm/hr"
"          Total depth                69.225  mm"
"          6  100hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 200"
"          1  Triangular SCS"
"          3  Specify values"
"          2  Horton equation"
"          200  Catchment 200"
"          30.000  % Impervious"
"          5.590  Total Area"
"          80.000  Flow length"
"          2.500  Overland Slope"
"          3.913  Pervious Area"
"          450.000  Pervious length"
"          2.500  Pervious slope"
"          1.677  Impervious Area"
"          450.000  Impervious length"
"          2.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          125.000  Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"			
"		1.067	0.000	0.000	0.000 c.m/sec"
"		Catchment 200	Pervious	Impervious	Total Area "
"		Surface Area	3.913	1.677	5.590 hectare"
"		Time of concentration	41.553	6.830	22.154 minutes"
"		Time to Centroid	148.745	120.576	133.008 minutes"
"		Rainfall depth	69.225	69.225	69.225 mm"
"		Rainfall volume	2708.78	1160.91	3869.68 c.m"
"		Rainfall losses	46.597	2.385	33.333 mm"
"		Runoff depth	22.628	66.840	35.892 mm"
"		Runoff volume	885.44	1120.91	2006.35 c.m"
"		Runoff coefficient	0.327	0.966	0.518 "
"		Maximum flow	0.337	0.976	1.067 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		1.067	1.067	0.000	0.000"
" 33		CATCHMENT 100"			
"	1	Triangular SCS"			
"	3	Specify values"			
"	2	Horton equation"			
"	100	Catchment 100"			
"	65.000	% Impervious"			
"	18.680	Total Area"			
"	275.000	Flow length"			
"	2.500	Overland Slope"			
"	6.538	Pervious Area"			
"	450.000	Pervious length"			
"	2.500	Pervious slope"			
"	12.142	Impervious Area"			
"	450.000	Impervious length"			
"	2.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	125.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		7.219	1.067	0.000	0.000 c.m/sec"
"		Catchment 100	Pervious	Impervious	Total Area "
"		Surface Area	6.538	12.142	18.680 hectare"
"		Time of concentration	41.553	6.830	12.184 minutes"
"		Time to Centroid	148.745	120.576	124.919 minutes"
"		Rainfall depth	69.225	69.225	69.225 mm"
"		Rainfall volume	0.4526	0.8405	1.2931 ha-m"
"		Rainfall losses	46.597	2.385	17.859 mm"
"		Runoff depth	22.628	66.840	51.366 mm"

"	Runoff volume	1479.43	8115.72	9595.16	c.m"
"	Runoff coefficient	0.327	0.966	0.742	"
"	Maximum flow	0.563	7.068	7.219	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	7.219	8.286	0.000	0.000"	
" 54	POND DESIGN"				
"	8.286	Current peak flow	c.m/sec"		
"	1.149	Target outflow	c.m/sec"		
"	11601.5	Hydrograph volume	c.m"		
"	11.	Number of stages"			
"	116.200	Minimum water level	metre"		
"	118.200	Maximum water level	metre"		
"	116.200	Starting water level	metre"		
"	0	Keep Design Data: 1 = True; 0 = False"			
"	Level Discharge	Volume"			
"	116.200	0.000	0.000"		
"	116.400	0.09300	249.500"		
"	116.600	0.1860	532.400"		
"	116.800	0.5570	848.800"		
"	117.000	0.7650	1198.600"		
"	117.200	0.9280	1581.700"		
"	117.400	1.066	1998.400"		
"	117.600	1.189	2448.400"		
"	117.800	1.300	2931.800"		
"	117.900	2.004	3186.100"		
"	118.200	6.922	3999.000"		
"	Peak outflow	5.428	c.m/sec"		
"	Maximum level	118.109	metre"		
"	Maximum storage	3751.982	c.m"		
"	Centroidal lag	2.582	hours"		
"	7.219	8.286	5.428	0.000 c.m/sec"	
" 38	START/RE-START TOTALS 100"				
"	3	Runoff Totals on EXIT"			
"	Total Catchment area		24.270	hectare"	
"	Total Impervious area		13.819	hectare"	
"	Total % impervious		56.939"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\NIAGARA-ON-THE-LAKE, TOWN OF\
"          2408081 Stormwater Catchment and Pond Review\Work in
Progress\Calculations\PropSWMP_2025-05-26"
"          Output filename:                    RetainingWalls_2yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              5/28/2025 at 9:49:35 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          719.650 Coefficient A"
"          5.849  Constant B"
"          0.813  Exponent C"
"          0.400  Fraction R"
"          240.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    99.424  mm/hr"
"          Total depth                        32.777  mm"
"          6  002hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 200"
"          1  Triangular SCS"
"          3  Specify values"
"          2  Horton equation"
"          200  Catchment 200"
"          30.000 % Impervious"
"          5.590  Total Area"
"          80.000 Flow length"
"          2.500  Overland Slope"
"          3.913  Pervious Area"
"          450.000 Pervious length"
"          2.500  Pervious slope"
"          1.677  Impervious Area"
"          450.000 Impervious length"
"          2.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          125.000 Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.287	0.000	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	3.913	1.677	5.590	hectare"
"		Time of concentration	---	10.559	10.559	minutes"
"		Time to Centroid	0.000	128.979	128.979	minutes"
"		Rainfall depth	32.777	32.777	32.777	mm"
"		Rainfall volume	1282.56	549.67	1832.23	c.m"
"		Rainfall losses	32.777	1.591	23.421	mm"
"		Runoff depth	0.000	31.186	9.356	mm"
"		Runoff volume	0.00	522.98	522.98	c.m"
"		Runoff coefficient	0.000	0.951	0.285	"
"		Maximum flow	0.000	0.287	0.287	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.287	0.287	0.000	0.000"	
" 33		CATCHMENT 100"				
"	1	Triangular SCS"				
"	3	Specify values"				
"	2	Horton equation"				
"	100	Catchment 100"				
"	65.000	% Impervious"				
"	18.680	Total Area"				
"	275.000	Flow length"				
"	2.500	Overland Slope"				
"	6.538	Pervious Area"				
"	450.000	Pervious length"				
"	2.500	Pervious slope"				
"	12.142	Impervious Area"				
"	450.000	Impervious length"				
"	2.500	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	125.000	Pervious Max.infiltration"				
"	5.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.015	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		2.081	0.287	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	6.538	12.142	18.680	hectare"
"		Time of concentration	---	10.559	10.559	minutes"
"		Time to Centroid	0.000	128.979	128.979	minutes"
"		Rainfall depth	32.777	32.777	32.777	mm"
"		Rainfall volume	2142.95	3979.77	6122.72	c.m"
"		Rainfall losses	32.777	1.591	12.506	mm"
"		Runoff depth	0.000	31.186	20.271	mm"

"	Runoff volume	0.00	3786.56	3786.56	c.m"
"	Runoff coefficient	0.000	0.951	0.618	"
"	Maximum flow	0.000	2.081	2.081	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		2.081	2.368	0.000	0.000"
" 54	POND DESIGN"				
"	2.368	Current peak flow	c.m/sec"		
"	0.245	Target outflow	c.m/sec"		
"	4309.5	Hydrograph volume	c.m"		
"	11.	Number of stages"			
"	116.200	Minimum water level	metre"		
"	118.200	Maximum water level	metre"		
"	116.200	Starting water level	metre"		
"	0	Keep Design Data: 1 = True; 0 = False"			
"		Level Discharge	Volume"		
"	116.200	0.000	0.000"		
"	116.400	0.1210	480.000"		
"	116.600	0.1670	960.000"		
"	116.800	0.2020	1440.000"		
"	117.000	0.2320	1920.000"		
"	117.200	0.2590	2400.000"		
"	117.400	0.2830	2880.000"		
"	117.600	0.3050	3360.000"		
"	117.800	0.3260	3840.000"		
"	117.900	0.9890	4080.000"		
"	118.200	5.789	4800.000"		
"	Peak outflow	0.273	c.m/sec"		
"	Maximum level	117.315	metre"		
"	Maximum storage	2676.582	c.m"		
"	Centroidal lag	4.231	hours"		
"	2.081	2.368	0.273	0.000	c.m/sec"
" 38	START/RE-START TOTALS 100"				
"	3	Runoff Totals on EXIT"			
"	Total Catchment area		24.270	hectare"	
"	Total Impervious area		13.819	hectare"	
"	Total % impervious		56.939"		
" 19	EXIT"				

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"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\NIAGARA-ON-THE-LAKE, TOWN OF\
"          2408081 Stormwater Catchment and Pond Review\Work in
Progress\Calculations\PropSWMP_2025-05-26"
"          Output filename:                    RetainingWalls_5yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              5/28/2025 at 9:51:26 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          996.920 Coefficient A"
"          4.233  Constant B"
"          0.826  Exponent C"
"          0.400  Fraction R"
"          240.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          152.144  mm/hr"
"          Total depth                42.500  mm"
"          6  005hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 200"
"          1  Triangular SCS"
"          3  Specify values"
"          2  Horton equation"
"          200  Catchment 200"
"          30.000 % Impervious"
"          5.590  Total Area"
"          80.000 Flow length"
"          2.500  Overland Slope"
"          3.913  Pervious Area"
"          450.000 Pervious length"
"          2.500  Pervious slope"
"          1.677  Impervious Area"
"          450.000 Impervious length"
"          2.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          125.000 Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

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"	1.500	Impervious Depression storage"				
"		0.457	0.000	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	3.913	1.677	5.590	hectare"
"		Time of concentration	93.692	8.907	19.133	minutes"
"		Time to Centroid	169.249	125.411	130.698	minutes"
"		Rainfall depth	42.500	42.500	42.500	mm"
"		Rainfall volume	1663.04	712.73	2375.78	c.m"
"		Rainfall losses	40.097	1.614	28.552	mm"
"		Runoff depth	2.403	40.886	13.948	mm"
"		Runoff volume	94.04	685.66	779.70	c.m"
"		Runoff coefficient	0.057	0.962	0.328	"
"		Maximum flow	0.020	0.454	0.457	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.457	0.457	0.000	0.000"	
" 33		CATCHMENT 100"				
"	1	Triangular SCS"				
"	3	Specify values"				
"	2	Horton equation"				
"	100	Catchment 100"				
"	65.000	% Impervious"				
"	18.680	Total Area"				
"	275.000	Flow length"				
"	2.500	Overland Slope"				
"	6.538	Pervious Area"				
"	450.000	Pervious length"				
"	2.500	Pervious slope"				
"	12.142	Impervious Area"				
"	450.000	Impervious length"				
"	2.500	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	125.000	Pervious Max.infiltration"				
"	5.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.015	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		3.294	0.457	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	6.538	12.142	18.680	hectare"
"		Time of concentration	93.692	8.907	11.508	minutes"
"		Time to Centroid	169.249	125.411	126.756	minutes"
"		Rainfall depth	42.500	42.500	42.500	mm"
"		Rainfall volume	2778.68	5160.41	7939.09	c.m"
"		Rainfall losses	40.097	1.614	15.083	mm"
"		Runoff depth	2.403	40.886	27.417	mm"

"	Runoff volume	157.13	4964.40	5121.53	c.m"
"	Runoff coefficient	0.057	0.962	0.645	"
"	Maximum flow	0.033	3.290	3.294	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		3.294	3.751	0.000	0.000"
" 54	POND DESIGN"				
"	3.751	Current peak flow	c.m/sec"		
"	0.245	Target outflow	c.m/sec"		
"	5901.2	Hydrograph volume	c.m"		
"	11.	Number of stages"			
"	116.200	Minimum water level	metre"		
"	118.200	Maximum water level	metre"		
"	116.200	Starting water level	metre"		
"	0	Keep Design Data: 1 = True; 0 = False"			
"		Level Discharge	Volume"		
"	116.200	0.000	0.000"		
"	116.400	0.1210	480.000"		
"	116.600	0.1670	960.000"		
"	116.800	0.2020	1440.000"		
"	117.000	0.2320	1920.000"		
"	117.200	0.2590	2400.000"		
"	117.400	0.2830	2880.000"		
"	117.600	0.3050	3360.000"		
"	117.800	0.3260	3840.000"		
"	117.900	0.9890	4080.000"		
"	118.200	5.789	4800.000"		
"	Peak outflow	0.323	c.m/sec"		
"	Maximum level	117.773	metre"		
"	Maximum storage	3775.537	c.m"		
"	Centroidal lag	4.591	hours"		
"	3.294	3.751	0.323	0.000	c.m/sec"
" 38	START/RE-START TOTALS 100"				
"	3	Runoff Totals on EXIT"			
"	Total Catchment area		24.270	hectare"	
"	Total Impervious area		13.819	hectare"	
"	Total % impervious		56.939"		
" 38	START/RE-START TOTALS 100"				
"	3	Runoff Totals on EXIT"			
"	Total Catchment area		24.270	hectare"	
"	Total Impervious area		13.819	hectare"	
"	Total % impervious		56.939"		
" 19	EXIT"				

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"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\NIAGARA-ON-THE-LAKE, TOWN OF\
"          2408081 Stormwater Catchment and Pond Review\Work in
Progress\Calculations\PropSWMP_2025-05-26"
"          Output filename:                    RetainingWalls_100yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              5/28/2025 at 9:53:56 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          1815.300 Coefficient A"
"          3.090  Constant B"
"          0.847  Exponent C"
"          0.400  Fraction R"
"          240.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                295.424  mm/hr"
"          Total depth                      69.225  mm"
"          6  100hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 200"
"          1  Triangular SCS"
"          3  Specify values"
"          2  Horton equation"
"          200  Catchment 200"
"          30.000 % Impervious"
"          5.590  Total Area"
"          80.000 Flow length"
"          2.500  Overland Slope"
"          3.913  Pervious Area"
"          450.000 Pervious length"
"          2.500  Pervious slope"
"          1.677  Impervious Area"
"          450.000 Impervious length"
"          2.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          125.000 Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"			
"		1.067	0.000	0.000	0.000 c.m/sec"
"		Catchment 200	Pervious	Impervious	Total Area "
"		Surface Area	3.913	1.677	5.590 hectare"
"		Time of concentration	41.553	6.830	22.154 minutes"
"		Time to Centroid	148.745	120.576	133.008 minutes"
"		Rainfall depth	69.225	69.225	69.225 mm"
"		Rainfall volume	2708.78	1160.91	3869.68 c.m"
"		Rainfall losses	46.597	2.385	33.333 mm"
"		Runoff depth	22.628	66.840	35.892 mm"
"		Runoff volume	885.44	1120.91	2006.35 c.m"
"		Runoff coefficient	0.327	0.966	0.518 "
"		Maximum flow	0.337	0.976	1.067 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		1.067	1.067	0.000	0.000"
" 33		CATCHMENT 100"			
"	1	Triangular SCS"			
"	3	Specify values"			
"	2	Horton equation"			
"	100	Catchment 100"			
"	65.000	% Impervious"			
"	18.680	Total Area"			
"	275.000	Flow length"			
"	2.500	Overland Slope"			
"	6.538	Pervious Area"			
"	450.000	Pervious length"			
"	2.500	Pervious slope"			
"	12.142	Impervious Area"			
"	450.000	Impervious length"			
"	2.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	125.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		7.219	1.067	0.000	0.000 c.m/sec"
"		Catchment 100	Pervious	Impervious	Total Area "
"		Surface Area	6.538	12.142	18.680 hectare"
"		Time of concentration	41.553	6.830	12.184 minutes"
"		Time to Centroid	148.745	120.576	124.919 minutes"
"		Rainfall depth	69.225	69.225	69.225 mm"
"		Rainfall volume	0.4526	0.8405	1.2931 ha-m"
"		Rainfall losses	46.597	2.385	17.859 mm"
"		Runoff depth	22.628	66.840	51.366 mm"

"	Runoff volume	1479.43	8115.72	9595.16	c.m"
"	Runoff coefficient	0.327	0.966	0.742	"
"	Maximum flow	0.563	7.068	7.219	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	7.219	8.286	0.000	0.000"	
" 54	POND DESIGN"				
"	8.286	Current peak flow	c.m/sec"		
"	0.245	Target outflow	c.m/sec"		
"	11601.5	Hydrograph volume	c.m"		
"	11.	Number of stages"			
"	116.200	Minimum water level	metre"		
"	118.200	Maximum water level	metre"		
"	116.200	Starting water level	metre"		
"	0	Keep Design Data: 1 = True; 0 = False"			
"	Level Discharge	Volume"			
"	116.200	0.000	0.000"		
"	116.400	0.1210	480.000"		
"	116.600	0.1670	960.000"		
"	116.800	0.2020	1440.000"		
"	117.000	0.2320	1920.000"		
"	117.200	0.2590	2400.000"		
"	117.400	0.2830	2880.000"		
"	117.600	0.3050	3360.000"		
"	117.800	0.3260	3840.000"		
"	117.900	0.9890	4080.000"		
"	118.200	5.789	4800.000"		
"	Peak outflow	4.718	c.m/sec"		
"	Maximum level	118.133	metre"		
"	Maximum storage	4639.339	c.m"		
"	Centroidal lag	3.591	hours"		
"	7.219	8.286	4.718	0.000 c.m/sec"	
" 38	START/RE-START TOTALS 100"				
"	3	Runoff Totals on EXIT"			
"	Total Catchment area		24.270	hectare"	
"	Total Impervious area		13.819	hectare"	
"	Total % impervious		56.939"		
" 19	EXIT"				

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"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"      10  Units used:                          ie METRIC"
"          Job folder:                        B:\Working\NIAGARA-ON-THE-LAKE, TOWN OF\
"          2408081 Stormwater Catchment and Pond Review\Work in
Progress\Calculations\PropSWMP_2025-05-26"
"          Output filename:                    Underground Tank_2yr.out"
"          Licensee name:                      "
"          Company                             "
"          Date & Time last used:              5/28/2025 at 9:47:26 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          719.650 Coefficient A"
"          5.849  Constant B"
"          0.813  Exponent C"
"          0.400  Fraction R"
"          240.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          99.424  mm/hr"
"          Total depth                32.777  mm"
"          6  002hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 200"
"          1  Triangular SCS"
"          3  Specify values"
"          2  Horton equation"
"          200  Catchment 200"
"          30.000 % Impervious"
"          5.590  Total Area"
"          80.000 Flow length"
"          2.500  Overland Slope"
"          3.913  Pervious Area"
"          450.000 Pervious length"
"          2.500  Pervious slope"
"          1.677  Impervious Area"
"          450.000 Impervious length"
"          2.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          125.000 Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.287	0.000	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	3.913	1.677	5.590	hectare"
"		Time of concentration	---	10.559	10.559	minutes"
"		Time to Centroid	0.000	128.979	128.979	minutes"
"		Rainfall depth	32.777	32.777	32.777	mm"
"		Rainfall volume	1282.56	549.67	1832.23	c.m"
"		Rainfall losses	32.777	1.591	23.421	mm"
"		Runoff depth	0.000	31.186	9.356	mm"
"		Runoff volume	0.00	522.98	522.98	c.m"
"		Runoff coefficient	0.000	0.951	0.285	"
"		Maximum flow	0.000	0.287	0.287	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.287	0.287	0.000	0.000"	
" 33		CATCHMENT 100"				
"	1	Triangular SCS"				
"	3	Specify values"				
"	2	Horton equation"				
"	100	Catchment 100"				
"	65.000	% Impervious"				
"	18.680	Total Area"				
"	275.000	Flow length"				
"	2.500	Overland Slope"				
"	6.538	Pervious Area"				
"	450.000	Pervious length"				
"	2.500	Pervious slope"				
"	12.142	Impervious Area"				
"	450.000	Impervious length"				
"	2.500	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	125.000	Pervious Max.infiltration"				
"	5.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.015	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		2.081	0.287	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	6.538	12.142	18.680	hectare"
"		Time of concentration	---	10.559	10.559	minutes"
"		Time to Centroid	0.000	128.979	128.979	minutes"
"		Rainfall depth	32.777	32.777	32.777	mm"
"		Rainfall volume	2142.95	3979.77	6122.72	c.m"
"		Rainfall losses	32.777	1.591	12.506	mm"
"		Runoff depth	0.000	31.186	20.271	mm"

"	Runoff volume	0.00	3786.56	3786.56	c.m"
"	Runoff coefficient	0.000	0.951	0.618	"
"	Maximum flow	0.000	2.081	2.081	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		2.081	2.368	0.000	0.000"
" 54	POND DESIGN"				
"	2.368	Current peak flow	c.m/sec"		
"	0.245	Target outflow	c.m/sec"		
"	4309.5	Hydrograph volume	c.m"		
"	18.	Number of stages"			
"	114.700	Minimum water level	metre"		
"	118.200	Maximum water level	metre"		
"	114.700	Starting water level	metre"		
"	0	Keep Design Data: 1 = True; 0 = False"			
"		Level Discharge	Volume"		
"	114.700	0.000	0.000"		
"	114.900	0.1190	425.000"		
"	115.100	0.2380	850.000"		
"	115.300	0.4120	1275.000"		
"	115.500	0.5310	1700.000"		
"	115.700	0.6290	2125.000"		
"	115.900	0.7130	2550.000"		
"	116.100	0.7880	2975.000"		
"	116.300	0.8570	3400.000"		
"	116.500	0.9200	3825.000"		
"	116.700	0.9800	3825.300"		
"	116.900	1.036	3825.600"		
"	117.100	1.089	3825.900"		
"	117.300	1.140	3826.200"		
"	117.500	1.188	3826.400"		
"	117.700	1.235	3841.000"		
"	117.800	1.906	3858.900"		
"	118.200	8.808	4001.900"		
"	Peak outflow	0.636	c.m/sec"		
"	Maximum level	115.719	metre"		
"	Maximum storage	2164.569	c.m"		
"	Centroidal lag	3.084	hours"		
"	2.081	2.368	0.636	0.000 c.m/sec"	
" 38	START/RE-START TOTALS 100"				
"	3	Runoff Totals on EXIT"			
"	Total Catchment area		24.270	hectare"	
"	Total Impervious area		13.819	hectare"	
"	Total % impervious		56.939"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\NIAGARA-ON-THE-LAKE, TOWN OF\
"          2408081 Stormwater Catchment and Pond Review\Work in
Progress\Calculations\PropSWMP_2025-05-26"
"          Output filename:                    Underground Tank_5yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              5/28/2025 at 9:43:50 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          996.920 Coefficient A"
"          4.233  Constant B"
"          0.826  Exponent C"
"          0.400  Fraction R"
"          240.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          152.144  mm/hr"
"          Total depth                42.500  mm"
"          6  005hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 200"
"          1  Triangular SCS"
"          3  Specify values"
"          2  Horton equation"
"          200  Catchment 200"
"          30.000 % Impervious"
"          5.590  Total Area"
"          80.000 Flow length"
"          2.500  Overland Slope"
"          3.913  Pervious Area"
"          450.000 Pervious length"
"          2.500  Pervious slope"
"          1.677  Impervious Area"
"          450.000 Impervious length"
"          2.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          125.000 Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

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"	1.500	Impervious Depression storage"				
"		0.457	0.000	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	3.913	1.677	5.590	hectare"
"		Time of concentration	93.692	8.907	19.133	minutes"
"		Time to Centroid	169.249	125.411	130.698	minutes"
"		Rainfall depth	42.500	42.500	42.500	mm"
"		Rainfall volume	1663.04	712.73	2375.78	c.m"
"		Rainfall losses	40.097	1.614	28.552	mm"
"		Runoff depth	2.403	40.886	13.948	mm"
"		Runoff volume	94.04	685.66	779.70	c.m"
"		Runoff coefficient	0.057	0.962	0.328	"
"		Maximum flow	0.020	0.454	0.457	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.457	0.457	0.000	0.000"	
" 33		CATCHMENT 100"				
"	1	Triangular SCS"				
"	3	Specify values"				
"	2	Horton equation"				
"	100	Catchment 100"				
"	65.000	% Impervious"				
"	18.680	Total Area"				
"	275.000	Flow length"				
"	2.500	Overland Slope"				
"	6.538	Pervious Area"				
"	450.000	Pervious length"				
"	2.500	Pervious slope"				
"	12.142	Impervious Area"				
"	450.000	Impervious length"				
"	2.500	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	125.000	Pervious Max.infiltration"				
"	5.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.015	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		3.294	0.457	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	6.538	12.142	18.680	hectare"
"		Time of concentration	93.692	8.907	11.508	minutes"
"		Time to Centroid	169.249	125.411	126.756	minutes"
"		Rainfall depth	42.500	42.500	42.500	mm"
"		Rainfall volume	2778.68	5160.41	7939.09	c.m"
"		Rainfall losses	40.097	1.614	15.083	mm"
"		Runoff depth	2.403	40.886	27.417	mm"

"	Runoff volume	157.13	4964.40	5121.53	c.m"
"	Runoff coefficient	0.057	0.962	0.645	"
"	Maximum flow	0.033	3.290	3.294	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		3.294	3.751	0.000	0.000"
" 54	POND DESIGN"				
"	3.751	Current peak flow	c.m/sec"		
"	0.245	Target outflow	c.m/sec"		
"	5901.2	Hydrograph volume	c.m"		
"	18.	Number of stages"			
"	114.700	Minimum water level	metre"		
"	118.200	Maximum water level	metre"		
"	114.700	Starting water level	metre"		
"	0	Keep Design Data: 1 = True; 0 = False"			
"		Level Discharge	Volume"		
"	114.700	0.000	0.000"		
"	114.900	0.1190	425.000"		
"	115.100	0.2380	850.000"		
"	115.300	0.4120	1275.000"		
"	115.500	0.5310	1700.000"		
"	115.700	0.6290	2125.000"		
"	115.900	0.7130	2550.000"		
"	116.100	0.7880	2975.000"		
"	116.300	0.8570	3400.000"		
"	116.500	0.9200	3825.000"		
"	116.700	0.9800	3825.300"		
"	116.900	1.036	3825.600"		
"	117.100	1.089	3825.900"		
"	117.300	1.140	3826.200"		
"	117.500	1.188	3826.400"		
"	117.700	1.235	3841.000"		
"	117.800	1.906	3858.900"		
"	118.200	8.808	4001.900"		
"	Peak outflow	0.799	c.m/sec"		
"	Maximum level	116.132	metre"		
"	Maximum storage	3042.968	c.m"		
"	Centroidal lag	3.089	hours"		
"	3.294	3.751	0.799	0.000	c.m/sec"
" 38	START/RE-START TOTALS 100"				
"	3	Runoff Totals on EXIT"			
"	Total Catchment area		24.270	hectare"	
"	Total Impervious area		13.819	hectare"	
"	Total % impervious		56.939"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\NIAGARA-ON-THE-LAKE, TOWN OF\
"          2408081 Stormwater Catchment and Pond Review\Work in
Progress\Calculations\PropSWMP_2025-05-26"
"          Output filename:                    Underground Tank_100yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              5/28/2025 at 9:37:31 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          1815.300 Coefficient A"
"          3.090  Constant B"
"          0.847  Exponent C"
"          0.400  Fraction R"
"          240.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                295.424  mm/hr"
"          Total depth                      69.225  mm"
"          6  100hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 200"
"          1  Triangular SCS"
"          3  Specify values"
"          2  Horton equation"
"          200  Catchment 200"
"          30.000 % Impervious"
"          5.590  Total Area"
"          80.000 Flow length"
"          2.500 Overland Slope"
"          3.913 Pervious Area"
"          450.000 Pervious length"
"          2.500 Pervious slope"
"          1.677 Impervious Area"
"          450.000 Impervious length"
"          2.500 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          125.000 Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.250 Pervious Lag constant (hours)"
"          5.000 Pervious Depression storage"
"          0.015 Impervious Manning 'n'"
"          0.000 Impervious Max.infiltration"
"          0.000 Impervious Min.infiltration"
"          0.050 Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"			
"		1.067	0.000	0.000	0.000 c.m/sec"
"		Catchment 200	Pervious	Impervious	Total Area "
"		Surface Area	3.913	1.677	5.590 hectare"
"		Time of concentration	41.553	6.830	22.154 minutes"
"		Time to Centroid	148.745	120.576	133.008 minutes"
"		Rainfall depth	69.225	69.225	69.225 mm"
"		Rainfall volume	2708.78	1160.91	3869.68 c.m"
"		Rainfall losses	46.597	2.385	33.333 mm"
"		Runoff depth	22.628	66.840	35.892 mm"
"		Runoff volume	885.44	1120.91	2006.35 c.m"
"		Runoff coefficient	0.327	0.966	0.518 "
"		Maximum flow	0.337	0.976	1.067 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		1.067	1.067	0.000	0.000"
" 33		CATCHMENT 100"			
"	1	Triangular SCS"			
"	3	Specify values"			
"	2	Horton equation"			
"	100	Catchment 100"			
"	65.000	% Impervious"			
"	18.680	Total Area"			
"	275.000	Flow length"			
"	2.500	Overland Slope"			
"	6.538	Pervious Area"			
"	450.000	Pervious length"			
"	2.500	Pervious slope"			
"	12.142	Impervious Area"			
"	450.000	Impervious length"			
"	2.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	125.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		7.219	1.067	0.000	0.000 c.m/sec"
"		Catchment 100	Pervious	Impervious	Total Area "
"		Surface Area	6.538	12.142	18.680 hectare"
"		Time of concentration	41.553	6.830	12.184 minutes"
"		Time to Centroid	148.745	120.576	124.919 minutes"
"		Rainfall depth	69.225	69.225	69.225 mm"
"		Rainfall volume	0.4526	0.8405	1.2931 ha-m"
"		Rainfall losses	46.597	2.385	17.859 mm"
"		Runoff depth	22.628	66.840	51.366 mm"

"	Runoff volume	1479.43	8115.72	9595.16	c.m"
"	Runoff coefficient	0.327	0.966	0.742	"
"	Maximum flow	0.563	7.068	7.219	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		7.219	8.286	0.000	0.000"
" 54	POND DESIGN"				
"	8.286	Current peak flow	c.m/sec"		
"	0.245	Target outflow	c.m/sec"		
"	11601.5	Hydrograph volume	c.m"		
"	18.	Number of stages"			
"	114.700	Minimum water level	metre"		
"	118.200	Maximum water level	metre"		
"	114.700	Starting water level	metre"		
"	0	Keep Design Data: 1 = True; 0 = False"			
"		Level Discharge	Volume"		
"	114.700	0.000	0.000"		
"	114.900	0.1190	425.000"		
"	115.100	0.2380	850.000"		
"	115.300	0.4120	1275.000"		
"	115.500	0.5310	1700.000"		
"	115.700	0.6290	2125.000"		
"	115.900	0.7130	2550.000"		
"	116.100	0.7880	2975.000"		
"	116.300	0.8570	3400.000"		
"	116.500	0.9200	3825.000"		
"	116.700	0.9800	3825.300"		
"	116.900	1.036	3825.600"		
"	117.100	1.089	3825.900"		
"	117.300	1.140	3826.200"		
"	117.500	1.188	3826.400"		
"	117.700	1.235	3841.000"		
"	117.800	1.906	3858.900"		
"	118.200	8.808	4001.900"		
"	Peak outflow	5.558	c.m/sec"		
"	Maximum level	118.069	metre"		
"	Maximum storage	3954.983	c.m"		
"	Centroidal lag	2.907	hours"		
"	7.219	8.286	5.558	0.000	c.m/sec"
" 38	START/RE-START TOTALS 100"				
"	3	Runoff Totals on EXIT"			
"	Total Catchment area		24.270	hectare"	
"	Total Impervious area		13.819	hectare"	
"	Total % impervious		56.939"		
" 38	START/RE-START TOTALS 100"				
"	3	Runoff Totals on EXIT"			
"	Total Catchment area		24.270	hectare"	
"	Total Impervious area		13.819	hectare"	
"	Total % impervious		56.939"		
" 19	EXIT"				