STORMWATER MANAGEMENT AND FUNCTIONAL SERVICING REPORT

FOR

560 WINSTON CHURCHILL BOULEVARD
BLACKWOOD PARTNERS

TOWN OF OAKVILLE

February 26, 2021
Rev. November 25, 2021

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Project No. 1870

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1.0 INTRODUCTION

This report presents the site servicing and stormwater management analysis for the Blackwood site located at 560 Winston Churchill Boulevard, north of Deer Run Ave in the Town of Oakville as shown on Figure 1. The total site area is 12.93 ha which will be developed as three Industrial Warehouses and a stormwater management pond.

Stormwater management will be provided within a quality/quantity wet pond facility (0.87 ha), that will be constructed at the southeast portion of the site as shown on Plan G-1.

A Subwatershed Study was completed by McCormick Rankin Corporation (MRC) for the Clearview Creek in May 2007 which established pre-development flow rates. In the 2007 Clearview Creek Subwatershed Study a 4.0 ha site was identified as being part of Subcatchment 5, which had a total area of 24.2 ha. The drainage limits of Subcatchment 5, as delineated in the 2007 Clearview Creek Subwatershed Study, is referenced in Figure 2, with further details of Subcatchment 5 and the related pre-development flow rates provided in Appendix A.

The whole site area will be controlled to the balance of the allowable area of 8.93 ha (12.93 ha – 4.0 ha) and will drain to the southeast and discharge to the ditch along the west side of Winston Churchill Boulevard.

SITE LOCATION PLAN
FIGURE 1

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Blackwood Partners

Date: July 11, 2019

Job No.: 1870

MODIFIED: 07/03/15 16:07:54 DRAWING NAME: K5470-EXISTING LANDUSE.DWG

MRC	EXISTING LAND USE CLEARVIEW CREEK SUBWATERSHED STUDY	EXHIBIT 2

MODIFIED BY A.M. CANDARAS & ASSOCIATES INC.
DATE: July 16, 2019

FIGURE 2

2.0 DESIGN CRITERIA

1. Maximum allowable stormwater discharge to be limited to pre-development flows.
2. On-site detention must be provided to attenuate post development peak flows to the pre-development rates for storms up to and including the 100-year storm.
3. Stormwater quality controls to be based on Type 1 Enhanced Protection as per the MOE Stormwater Management Planning and Design Manual (2003).

3.0 SITE DEVELOPMENT STATISTICS

The development site will be separated into two areas for the stormwater analysis:

- Roof area of 5.91 ha to have rooftop controls, and drain to the SWM Pond
- Building/Paved/Parking/Landscaped areas of 11.69 ha to the proposed SWM pond at southeast portion of site

The proposed site conditions consist of three industrial buildings, a stormwater management pond plus paved and landscaped areas. The site statistics are provided below:

Building A	=	16,206.0m^2
Building B	=	12,791.0m^2
Building C	=	30,082.0m^2
Paved	=	39,454.0m^2
Landscaped:	=	22,079.0m^2
SWM Pond:	=	8,700.0m^2
Site Area	=	129,312.0m^2

The stormwater analysis for the site has been completed using the SWMHYMO model. The subcatchment areas used in the model calculations are summarized in Table 1.

Table 1 - Proposed Development Land Use

Subcatchment ID	Post-Development Land Use Type	Area
1	Building, Paved and Landscaped Areas	116,912 m^2
2	Stormwater Management Pond	8,700 m^2
3	Uncontrolled Area Discharged to Winston Churchill Boulevard	1,400 m^2
4	Uncontrolled Area Discharged to the Clearview Creek Channel	2,300 m^2
TOTAL		**129,312 m^2**

4.0 PRE-DEVELOPMENT STORMWATER FLOWS

The allowable discharge rates will be limited to the pre-development values which are indicated in Table 2, based on the Chicago Storm (Bloor St. Data). The pre-development rates listed in Table 2 below are based on the stormwater flow rates provided by the 2007 Clearview Creek Subwatershed Study (see Appendix A). The pre-development rates for the site area of 12.93 ha is the pro rata flow rate of total subcatchment area (24.2 ha) discharging to the Clearview Creek realignment.

Table 2 – Calculated Pre-Development Flow Rates Based On Total Area

Storm Event	Pre-Development Pro-Rated Target Rate [m^3/s]		
	Area (24.2 ha)(1)	Area (4.0 ha)(1)	Area (8.93 ha)
2 Year	0.155	0.026	0.057
5 Year	0.300	0.050	0.111
10 Year	0.413	0.068	0.152
25 Year	0.540	0.089	0.199
100 Year	0.869	0.144	0.321

(1) Flow rates from Clearview Creek subwatershed study prepared by MRC

5.0 STORMWATER MANAGEMENT

The total drainage area to the SWM Facility is 12.56 ha, which does not include the uncontrolled areas (0.37 ha) outlined in Table 1. A 0.87 ha stormwater management wet pond will provide both quality and quantity controls, refer to Plan G-1 and G-3 for the design layout and details. Refer to Appendix C for the SWM Facility calculations.

5.1 QUANTITY CONTROLS

A proposed permanent pool elevation for this facility is 91.10m. The proposed stage storage relationship for this facility is shown in Table 3. A permanent pool volume of 3,045.1m^3 will be provided between the pond bottom of 90.00m and 91.10m elevations. An erosion control volume of 3,146.2m^3 will be provided between the 91.10m and 91.90m elevations.

For this facility, a 125mm orifice will be installed with an invert elevation of 91.10m. The erosion control volume will be released over a period of 61.1 hours at a peak release rate of 0.025m^3/s. A 175mm weir at elevation 91.90m will provide the quantity controls as detailed on Plan G-1, G-3 and C-1. Refer to Table 4 for the SWM pond performance.

Table 3 - SWM Pond Stage Storage Discharge Relationship

	AREA (m^2)		VOLUME (m^3)			DISCHARGE (m^3) AND HEAD (m)								
Elevation	Pond	Forebay	Pond	Forebay	Total	Effective	Orifice (1)	Orifice Head	Weir 1 (2)	Weir 1 Head	Weir 2 (3)	Weir 2 Head	Discharge (m^3/s)	Storage (ha*m)
90.00	1,231.00	826.0	0.0	0.0	0.0								0.0000	0.0000
90.20	1,342.00	948.00	257.3	177.4	434.7								0.0000	0.0000
90.40	1,453.00	1070.0	536.8	379.2	916.0								0.0000	0.0000
90.60	1,624.85	1,193.85	844.6	605.6	1,450.2								0.0000	0.0000
90.80	1,796.69	1,317.69	1,186.7	856.7	2,043.5								0.0000	0.0000
90.90	1,882.62	1,379.62	1,370.7	991.6	2,362.3								0.0000	0.0000
91.00	1,968.54	1,441.54	1,563.3	1132.7	2,695.9	0.0							0.0000	0.0000
91.10	2,054.46	1,520.00	1,764.4	1280.7	3,045.1	0.0	0.0000	0.00	0.0000	0.00			0.0000	0.0000
91.30	2,226.31	1,627.31	2,192.5	1595.5	3,788.0	742.8	0.0127	0.20	0.0000	0.00			0.0127	0.0743
91.50	2,398.15	1,751.15	2,654.9	1933.3	4,588.2	1,543.1	0.0199	0.40	0.0000	0.00			0.0199	0.1543
91.70	2,570.00	1,875.00	3,151.8	2295.9	5,447.7	2,402.5	0.0251	0.60	0.0000	0.00			0.0251	0.2403
91.90	4,867.00	0.0	3,895.5	2295.9	6,191.4	3,146.2	0.0294	0.80	0.0000	0.00			0.0294	0.3146
92.10	5,057.38	0.0	4,887.9	2295.9	7,183.8	4,138.7	0.0332	1.00	0.0267	0.20			0.0598	0.4139
92.30	5,247.75	0.0	5,918.4	2295.9	8,214.3	5,169.2	0.0365	1.20	0.0755	0.40			0.1120	0.5169
92.50	5,438.13	0.0	6,987.0	2295.9	9,282.9	6,237.8	0.0396	1.40	0.1387	0.60			0.1783	0.6238
92.70	5,628.50	0.0	8,093.7	2295.9	10,389.6	7,344.4	0.0425	1.60	0.2135	0.80			0.2560	0.7344
93.00	5,914.06	0.0	9,825.0	2295.9	12,121.0	9,075.8	0.0464	1.90	0.3442	1.10	0.000	0.00	0.3907	0.9076
93.20	6,104.44	0.0	11,026.9	2295.9	13,322.8	10,277.7	0.0489	2.10	0.4423	1.30	1.830	0.20	2.3211	1.0278
93.30	6,199.63	0.0	11,642.1	2295.9	13,938.0	10,892.9	0.0501	2.20	0.4943	1.40	3.362	0.30	3.9062	1.0893
93.40	6,294.81	0.0	12,266.8	2295.9	14,562.7	11,517.6	0.0512	2.30	0.5481	1.50	5.176	0.40	5.7754	1.1518
93.50	6,390.00	0.0	12,901.1	2295.9	15,197.0	12,151.8	0.0524	2.40	0.6039	1.60	7.234	0.50	7.8899	1.2152

1. Based on an 125mm orifice set at Permanent HWL = 91.10, $Q=CA\sqrt{2gh}$
2. Based on a 175mm weir at Inv. 91.90, $Q=CLH^{3/2}$
3. Based on an emergency overflow weir at Inv. 93.00, 12.00m wide, $Q=CLH^{3/2}$

Table 4 – Stormwater Management Pond Performance

Storm	Inflow (m^3/s)	Outflow (m^3/s)	Pre-Development Flow Rates (m^3/s)	Storage (m^3)	Pond HWL
2 Year	2.497	0.037	0.057	3,380	91.95
5 Year	3.472	0.074	0.111	4,413	92.15
10 Year	4.178	0.106	0.152	5,045	92.28
25 Year	4.949	0.143	0.199	5,671	92.39
100 Year	6.355	0.231	0.321	6,990	92.64
100 Year 24Hr SCS	3.680	0.269	0.321	7,510	92.73
Regional	1.834	1.814		9,962	93.15

5.2 QUALITY CONTROLS

For the proposed development, stormwater quality controls are to be provided within the SWM facility. The Clearview Creek subwatershed study prepared by MRC has stipulated design guidelines that are in agreement with the Stormwater Management Practices Planning and Design Manual (2003) (SWMP) as published by the Ontario Ministry of the Environment. The proposed facility will provide an Enhanced Protection Level.

Based on the site coverage values the imperviousness of the site directed to the pond is calculated as follows:

Table 5 – Impervious Calculations

Post-Development Land Use Type	Imperviousness	Total Area	Impervious Area
Building 1	100%	16, 206 m^2	16,206 m^2
Building 2	100%	12,791 m^2	12,791 m^2
Building 3	100%	30,082 m^2	30,082 m^2
Paved	100%	39,454 m^2	39,454 m^2
Landscaped / Seeded Area	0%	18,379 m^2 (1)	0 m^2
Stormwater Management Pond	50%	8,700 m^2	4,350 m^2
TOTAL	**83% (weighted)**	125,612 m^2 (2)	102,883 m^2

(1) The landscaped area does not include the uncontrolled areas outlined in Table 1. Landscaped Area = Total Landscaped Area – Uncontrolled Areas = 22,079m^2 – 3,700m^2 = 18,379m^2.

(2) Total Pond Tributary Area does not include the uncontrolled areas (3,700m^2). Total Area = 129,312m^2 (total site area) – 3,700m^2 (uncontrolled area) = 125,612m^2.

Based on 85% imperviousness a permanent storage volume of 250m^3/ha is required to provide Enhanced Protection.

Table 6 - SWM Facility - Stormwater Quality Requirements

Area	Imperviousness	Permanent Pool
12.56ha	85%	210m^3/ha (1)
	Required:	2,637.6m^3
	Provided:	3,045.1m^3
	Elevation:	91.10m

(1) MOE SWM Planning and Design Manual for a wet pond based on 80% imperviousness. (250m^3/ha – 40m^3/ha active storage)

5.3 SWM FACILITY OUTLET

The proposed SWM facility located at the southeast corner of the site will discharge into the existing ditch along the west side of Winston Churchill Boulevard. As shown on Plan G-1 and Figure 3, the existing ditch flows south through an existing 600mm culvert.

The runoff will continue downstream to a low point where the runoff is conveyed east under Winston Churchill Boulevard through two existing 20.8m long 900mm culvert with a 0.25% slope. The runoff continues northeast through a drainage path that leads to the Clearview Creek. Therefore, the site will discharge to the ditch along Winston Churchill Boulevard and continue through an existing drainage path into the Clearview Creek.

6.0 UNCONTROLLED RUNOFF

There are multiple landscaped areas that will discharge uncontrolled on to two different locations which include Winston Churchill Boulevard and the Clearview Creek. The combined uncontrolled discharge volumes in addition to the SWMP discharge rates are below the pre-development flow rates outlined in Table 2. Refer to Plan STM-1 for the post development storm drainage area plan.

6.1 UNCONTROLLED RUNOFF TO WINSTON CHURCHILL BOULEVARD

The uncontrolled runoff from a portion of the landscaped frontage facing Winston Churchill Boulevard and a portion of the two driveway entrances (0.14 ha) will discharge onto Winston Churchill Boulevard. The uncontrolled discharge is in addition to the controlled discharge from the SWMP on site. The runoff for a 2-year to 100-year rainfall event was modelled using SWMHYMO. The results are displayed in Table 7 below.

6.2 UNCONTROLLED RUNOFF TO CLEARVIEW CREEK

The uncontrolled runoff from the landscaped area along the north side of the site (0.23 ha) will discharge into the Clearview Creek. The uncontrolled runoff for a 2-year to 100-year rainfall event was modelled using SWMHYMO. The results are displayed in Table 7.

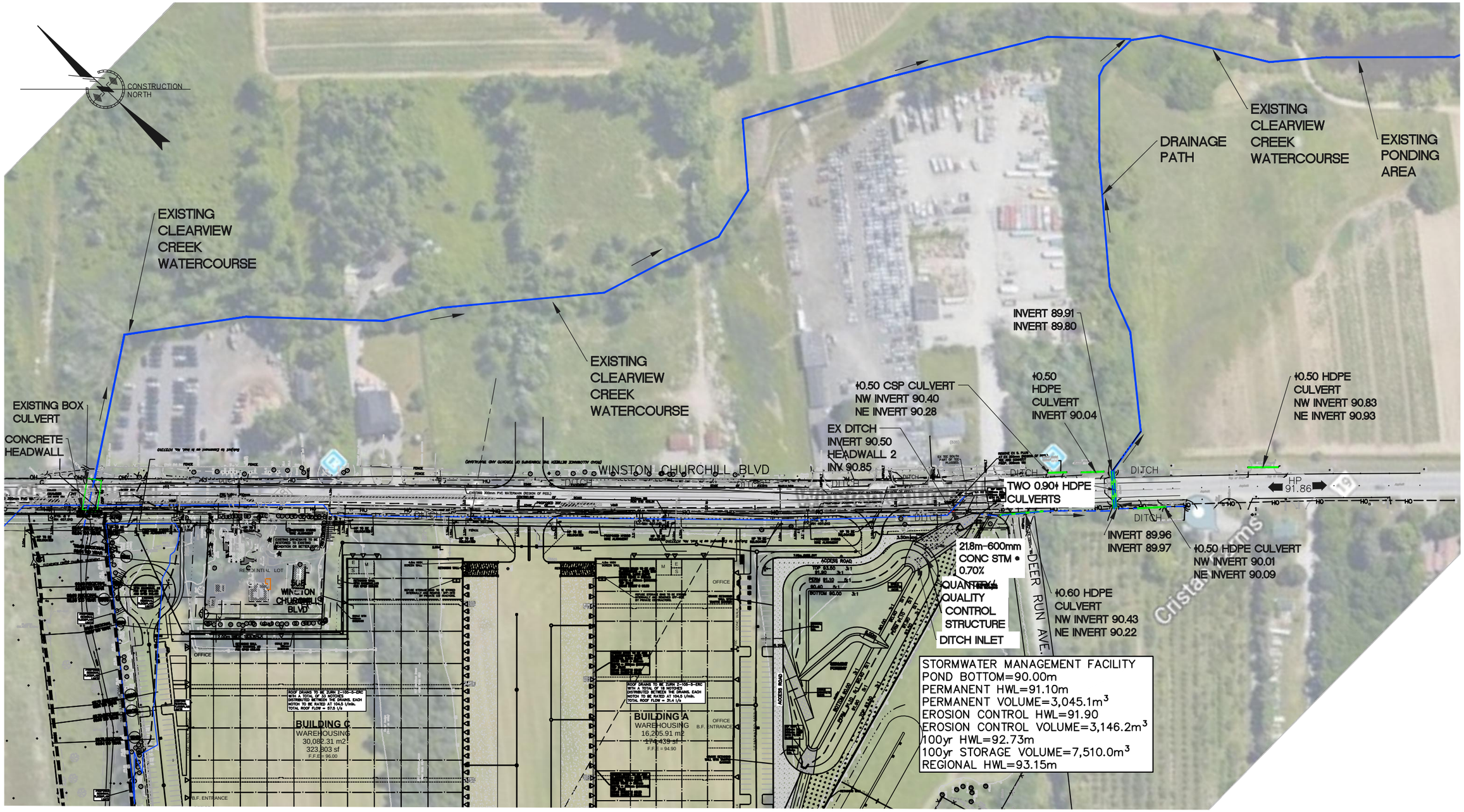

FIGURE 3 – SWMP DISCHARGE DRAINAGE PATH

LEGEND

- CATCHBASIN
- CATCHBASIN MANHOLE
- STORM MANHOLE
- HEADWALL
- STORM
- HP HIGH POINT
- CLEARVIEW CREEK
- WATERCOURSE FLOW ROUTE

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560 WINSTON CHURCHILL BLVD TOWN OF OAKVILLE	
BLACKWOOD PARTNERS	
SCALE	1: 2000
DATE:	JANUARY 2020
JOB No.	1870

Table 7 - Total Site Discharge Flows

Storm	SWMP Discharge Flows (1) (m^3/s)	Uncontrolled to Winston Churchill Boulevard (m^3/s)	Total Site Discharge Flows (2) (m^3/s)	Pre-Development Flow Rates (3) (m^3/s)
2 Year	0.037	0.009	0.037	0.057
5 Year	0.074	0.015	0.074	0.111
10 Year	0.106	0.020	0.107	0.152
25 Year	0.143	0.026	0.144	0.199
100 Year	0.231	0.038	0.233	0.321
100 Year 24Hr SCS	0.269	0.028	0.272	0.321
Regional	1.814	0.020	1.834	-

(1) Refer to Table 4 for the SWMP outflow rates for the 2-Year to 100-Year rainfall event.
(2) Refer to SWMHYMO output In Appendix B for total site discharge flows.
(3) Pre-Development Flow Rates are based on the 8.93ha pro-rated target rates from Table 2 in Section 4.0 of this report.

Table 8 - Clearview Creek Discharge Flows

Storm	Uncontrolled Discharge to Clearview Creek (1) (m^3/s)	Pre-Development Flow Rates (2) (m^3/s)
2 Year	0.005	0.026
5 Year	0.009	0.050
10 Year	0.013	0.068
25 Year	0.017	0.089
100 Year	0.027	0.144
100 Year SCS	0.030	0.144

(1) Refer to SWMHYMO output In Appendix B for discharge flows.
(2) Pre-Development Flow Rates are based on the 4.0ha pro-rated target rates from Table 2 in Section 4.0 of this report.

As demonstrated above the post-development flow rates are below the allowable pre-development pro-rated target rates from Table 2 in Section 4.0 of this report.

7.0 STORM SEWERS

All entrances to the site and a portion of the landscape frontage along Winston Churchill Boulevard will include a storm sewer network that has be sized for the 100-Year event, refer to Plan G-1, G-3 and the storm sewer design sheet in Appendix A for details. Due to the existing grades in these areas the runoff from the 100-year storm cannot be conveyed overland to the SWM pond. Instead, the runoff will be conveyed using CB's and storm sewer pipes sized to capture and convey the 100-year storm event to the SWM pond.

The storm sewer network on site, other than the network outline above, has been sized to capture and convey the 5-year storm event with an intensity based on a time of concentration (Tc) of 10 minutes. Refer to Plan G-1, G-2 and the storm sewer design sheets for details.

8.0 FLOODPLAIN MODIFICATION

Currently a portion of the property approximately 0.29ha located within the northeast corner of the site is part of the Clearview Creek Floodplain limits. As part of this development, it is being proposed that this area be built up to an elevation of 94.00m along the property line to match the north limits off the Clearview Creek channel.

Using the Clearview Creek HEC-RAS model (dated May 2020) provided by the Credit Valley Conservation (CVC) a floodplain analysis was completed. Channel elevations and sloping changes were made from Section 11915 to Section 11802. The Sections were modified to show the proposed channel grading that would match the north bank of the channel consisting of a 1% slope from the channel bank followed by a 3:1 slope to the property line. The proposed elevation along the 560 Winston Churchill property line would be 94.00m. The output model table compares the existing and modified HEC-RAS model high water elevations (Appendix D). The results indicated no changes to the existing high water elevations with the proposed channel modifications.

9.0 ROOF DRAIN

The three proposed industrial buildings, Building A, Building B and Building C, will be equipped with roof drains as outlined below:

Building A will be equipped with of Zurn (Z-105-5-ERC) control flow drains with a total of 35 notches, as follows:

Table 9 - Building A Rooftop Controls

Area	No. of Notches	Notch Area	Flow per Notch (1)	Total Flows
16,206.0m²	35	463.0 m²	1.55 l/s	54.3 l/s

Q_R = 54.3 l/s

(1) Based on manufacturer's design tables at a 102mm depth, 1 notch/drain, 465m²/notch, 93lpm.

The resulting required total roof top 100-year volume is 656.1m³, as indicated in **Appendix A**. The available roof top storage is 810.3m³, based on a maximum ponding depth of 100mm, as indicated in the Rooftop Available Storage calculations located in **Appendix A.**

Building B will be equipped with Zurn (Z-105-5-ERC) control flow drains with a total of 28 notches, as follows:

Table 10 - Building B Rooftop Controls

Area	No. of Notches	Notch Area	Flow per Notch (1)	Total Flows
12,791.0m²	28	456.8 m²	1.55 l/s	43.4 l/s

Q_R = 43.4 l/s

(1) Based on manufacturer's design tables at a 102mm depth, 1 notch/drain, 465m²/notch, 93lpm.

The resulting required total roof top 100-year volume is 515.8m³, as indicated in **Appendix A**. The available roof top storage is 639.6m³, based on a maximum ponding depth of 100mm, as indicated in the Rooftop Available Storage calculations located in **Appendix A.**

Building C will be equipped with Zurn (Z-105-5-ERC) control flow drains with a total of 65 notches, as follows:

Table 11 - Building C Rooftop Controls

Area	No. of Notches	Notch Area	Flow per Notch (1)	Total Flows
30,082.0m^2	65	462.8 m^2	1.55 l/s	100.8 l/s

Q_R = 100.8 l/s

(1) Based on manufacturer's design tables at a 102mm depth, 1 notch/drain, 465m^2/notch, 93lpm.

The resulting required total roof top 100-year volume is 1,217.7m^3, as indicated in **Appendix A**. The available roof top storage is 1520.8m^3, based on a maximum ponding depth of 100mm, as indicated in the Rooftop Available Storage calculations located in **Appendix A.**

10.0 SANITARY DESIGN

10.1 SANITARY DESIGN FLOWS

The peak sanitary flow will discharge from the southwest side of Building A, Building B and Building C and connect to a lift station at MH 105A. At MH 105A a forcemain will be installed to convey the sanitary flows to MH 100A where it will connect to a proposed 250mm sanitary sewer which will be located in an easement to the west of the site and extended downstream through Acacia Court to the 750mm trunk sewer on Deer Run Avenue. For the external sanitary works outside of this site a separate FSR for the Industrial Developments located at 772, 560, 568 and 824 Winston Churchill Boulevard dated August 31, 2020 has been completed and submitted to the Town of Oakville and Halton Region for approval.

The population for Building A, Building B and Building C is based on the anticipated maximum employee population. Sanitary sewage flows were calculated below:

Site Area = 12.93 ha

Population Density = 125 persons/ha

Total Population = 1,616 people

Sanitary Flow Rate = 34.375 m^3/ha/day

Peaking Factor M = $0.8 \cdot \left(1 + \frac{14}{4+P^{0.5}}\right)$ where P = Populations in thousands

= $0.8 \cdot \left(1 + \frac{14}{4+(1.616)^{0.5}}\right)$ = 2.93

Peak Sewage Flow Q = $\frac{A \times q \times m}{86400}$ + IA

Q = $\frac{12.93 \times 34.375\ m^3/ha/day \times 2.93}{86400}$

= 15.1 l/s + IA

Infiltration = 12.93 ha x 0.00028 m^3/sec/ha

= 0.0037 m^3/sec

Total Peak Flow = 15.1 l/s + 3.7 l/s

= 18.8 l/s

10.2 PROPOSED SANITARY SERVICING

A 200mm sanitary service connection will be provided on site and connect downstream to the proposed 250mm sanitary sewer as described in Section 7.1. The sanitary servicing for this site will be along the south portion of the site, connecting to the southwest face of Building A, Building B and Building C. The sanitary connection to the proposed 250mm sanitary sewer system will be a 100mm forcemain from MH 105A to MH 100A which will convey the combined sanitary flow of 18.8 l/s from Building A, B and C. The sanitary connection, from 568 Winston Churchill Boulevard, to the proposed 250mm sanitary sewer system will be a 150mm gravity sewer from MH 103A to MH 100A which will convey the sanitary flow from the residential property at 568 Winston Churchil Boulevard.

10.3 EXTERNAL SANITARY SERVICING

The existing single residential home at 568 Winston Churchill Boulevard will also be serviced through an 8.0m wide sanitary easement along the north and west portion of the site. A sanitary duplex grinder pump will be located on the northwest corner of the single residential lot, as shown on Plan G-1. This will convey the peak flow from this residential property through a forcemain that goes along the north and a sanitary gravity sewer along the west side of the proposed development where it connects to MH 100A. From MH 100A the sanitary sewer network connects to MH 6A on Acadia Court. This section of the sanitary network is to be completed by others. Refer to Plan G-2 for more details.

Another section of the proposed sanitary network that will be completed by others will service the property west of the proposed development with the municipal address of 772 Winston Churchill Boulevard. From MH 4A, located south of MH 100A of the proposed development, to MH 1A, located west of the property limit of 772 Winston Churchill Boulevard, will also be completed by others. There is also an existing 400mm steel sleeve, that has been plugged, that is 80m long within the 772 Winston Churchill Boulevard property limits.

Overall, the sanitary sewer system for the proposed development at 560 Winston Churchill Boulevard includes the servicing of Building 'A', Building 'B', Building 'C' and the existing residential home at 568 Winston Churchill Boulevard. The sanitary sewer system that connects the proposed network, mentioned above, to Acadia Court and services 772 Winston Churchill Boulevard will be completed by others and is further discussed in the FSR for Industrial Developments at 772, 560, 568 and 824 Winston Churchill Boulevard dated August 31, 2020 has been submitted to the Town of Oakville and Halton Region for approval.

11.0 WATERMAIN DESIGN

The proposed development will connect to a proposed 300mm watermain along Winston Churchill Boulevard. On site there will be a 150mm domestic and 200mm fire line pipe that connects to all three buildings, as shown on Plan G-1, G-1 and G-2. The watermain connection for Building A and Building C will be along the east side of the building and the connection for Building B will be along the west side of the building.

11.1 DOMESTIC AND FIREFLOW DEMAND

The domestic demands were based on the Water and Wastewater Linear Design Manual (October 2019) by Halton Region. The water demand for this site is outlined below:

Site Area	=	12.93 ha
Population Density	=	125 persons/ha (Light Industrial Area)
Total Population	=	1,616 people
Consumption	=	275 l/person/day
Max Day Factor	=	2.25
Peak Hour Factor	=	2.25

<u>Water Demands</u>

Average Daily Demand

= 275 l/capita/day x 1,616 people
= 444,000 l/day
= 5.14 l/s

Maximum Daily Demand

= 275 l/capita/day x 1,616 people x 2.25 (Max day factor)
= 999,900 l/day
= 11.57 l/s

Peak Hour Demand

= 275 l/capita/day x 1,616 people x 2.25 (Peak Hour factor)
= 999,900 l/day
= 11.57 l/s

Fire Flow Calculation

Fire Flow Calculation (Based on Fire Underwriters Survey 1999)

1. An estimate of the fire flow required for a given area is determined by the formula:

$$F = 220C\sqrt{A}$$

Where, F = the required fire flow in litres per minute l/m
C = Construction type coefficient= 0.8 (Fire resistive construction)
A = Total area (based on construction type and protected openings)

Building Area = 30,082 m^2 (1)

(1) Based on the largest building area on site, Building C.

$F = 220(0.80)\sqrt{30{,}082\ m^2}$

$F = 30{,}525\ l/m$ (509 l/s)

Therefore use: $F = 31{,}000\ l/m$ (517 l/s)

2. Occupancy Reduction

Office Area = 0% Increase based on Commercial buildings

∴ Total Reduction = 0%

F_2 = 31,000 *l/m* - (31,000 l/m × 0%)

F_2 = 31,000 *l/m (517 l/s)*

3. Sprinkler Reduction

30% Reduction for NFPA 13 System

4. Separation Charge

East Side (10.1 - 20m)	= 15%
West Side (30.1 - 45m)	= 5%
North Side (> 45m)	= 0%
South Side (> 45m)	= 0%
Total Separation Charge	= 20%

$F_{final} = F_2 - (F_2 \times 30\%) + (F_2 \times 20\%)$

F_{final} = 31,000 l/m – (9,300 l/min) + (6,200 l/min)

F_{final} = 27,900 l/min (465 l/s)

Therefore use: F_{final} = 28,000 l/min (467 l/s)

F_{final} = 7,402 US gpm

The water supply system will be designed to convey the greater of the fire flow plus maximum day demand or the peak hour demand. The greater flow results from the fire flow plus max day, as calculated below.

Fire Flow + Max Day	=	467 l/s + 11.57 l/s
	=	478.57 l/s
	=	28,714 l/min (7,596 US gpm)

A fire flow hydrant test will be undertaken once the proposed 300mm watermain is constructed on Winston Churchill Boulevard.

11.2 EXTERNAL WATERMAIN SERVICING

The existing single residential home at 568 Winston Churchill Boulevard, located north of the proposed development, will also be serviced by a 200mm watermain that will connect to the proposed 300mm watermain along Winston Churchill Boulevard.

The currently undeveloped property at 772 Winston Churchill Boulevard, adjacent to the proposed development, will also be serviced by a proposed 200mm watermain that is connected to the proposed 300mm watermain along Winston Churchill Boulevard. Since this site is currently undeveloped the proposed 200mm watermain will be split into a 200mm fire line and 100mm domestic line. Both of these lines will be plugged.

12.0 EROSION AND SEDIMENT CONTROLS

During construction, temporary erosion and sediment controls are to be provided in accordance with the "Erosion and Sediment Control Guidelines for Urban Construction" (2006), prepared by the Greater Golden Horseshoe Conservation Authorities. Erosion control measures will be provided through the use of silt fences, diversion swales, inlet protection devices, sediment traps, temporary sediment pond, and the proposed SWM pond.

12.1 EROSION CONTROL AND SEDIMENT CONTROL REQUIREMENTS

The erosion and sediment control requirements for the proposed development are as follows:

1. The Contractor will provide temporary excavated sediment traps for sediment control. The sediment traps should be located at points of discharge from the area.
2. The Contractor will monitor the quality of stormwater discharging from the SWM pond and sediment traps during the construction period.
3. The Contractor will construct temporary drainage systems, such as ditching, temporary culverts to facilitate drainage from exposed soils to the SWM pond and sediment traps.
4. Silt fences will be installed around the exposed area of the pond.
5. The exposed soils will be vegetated as soon as possible. Erosion control blankets should be placed where applicable.
6. Straw bales and/or rock protection will be placed in temporary drainage conveyance channels on steep grades.
7. Rock protection will be placed at points of concentrated discharge, which includes the outlet of the SWM pond.
8. Stockpiled excavated material, and topsoil will be protected from wind and rain erosion.
9. The SWM pond will be cleaned of sediment upon completion of construction.

12.2 MONITORING PLAN

The monitoring plan for the development site will be implemented for three stages of development: pre-development, construction, and post-construction. The monitoring plan will be as recommended by the Clearview Creek subwatershed study. Excerpts of the recommended monitoring plan is provided in Appendix A.

As described in the subwatershed study:

The development / activity driven monitoring should follow three stages: the pre-development phase, the construction phase, and the post-construction phase. During the pre-development phase, monitoring should be undertaken to generate any additional baseline data that may be required to compile a more detailed understanding of existing conditions.

In the construction phase, the purpose of monitoring will be to ensure that the environmental measures implemented during construction are performing as expected (i.e. sediment control by provision of silt fences and temporary sediment traps/basins). Monitoring during the post-construction phase will be conducted to confirm that the performance targets are being achieved and to ensure that no negative environmental changes are occurring because of development.

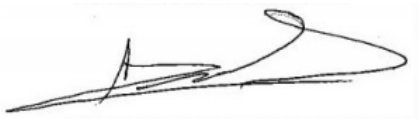
<u>During Construction Monitoring Program:</u>
During construction, the monitoring program of the SWM facilities, including the temporary sediment control facilities such as excavated sediment traps, should include the following:

- Weekly inspections of the facilities
- Inspections of the control facilities and the receiving water course (Clearview Creek), after rainfall events with at least 10mm of precipitation
- Measurement of suspended solids downstream of the control works

Weekly inspection reports should be submitted by the developer's engineer to the satisfaction of the Town of Oakville. The reports should summarize the state of the control works, their performance during rainfall events, any presence of downstream erosion or sediment accumulation, and any actions necessary to modify the works.

<u>Post-Construction Monitoring Program:</u>
A monitoring response and maintenance program (MRM Program) will be initiated upon completion of the 'During Construction Monitoring Program' and will extend for a 2-year period following substantial completion. Refer to Section 5.2 of the subwatershed study (also provided in Appendix A of this report) for details and requirements of the post-construction monitoring program.

Prepared by,
a.m. candaras associates inc.



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

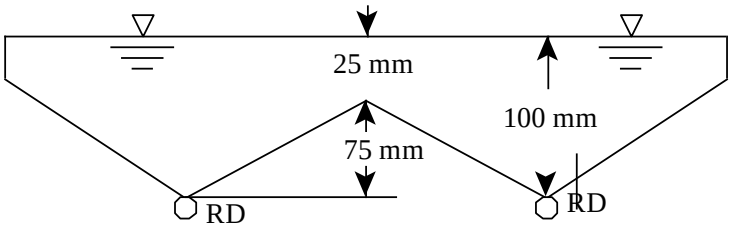
Jennifer Nobile, EIT
November 25, 2021

APPENDIX A
SUPPORTING DOCUMENTATION

ROOFTOP STORAGE AVAILABLE CALCULATIONS

Table A – Building A Roof Storage Required for 100-Year Storm Event

TIME PERIOD (min)	INTENSITY (mm/hr)	RUNOFF (l/s)	STORAGE (m^3)
20-30	4.96	20.1	0.0
30-40	5.88	23.8	0.0
40-50	7.27	29.5	0.0
50-60	9.69	39.3	0.0
60-70	15	60.8	3.9
70-80	38.04	154.1	59.9
80-90	203.31	823.8	461.7
90-100	51.04	206.8	91.5
100-110	25.59	103.7	29.7
110-120	17.24	69.9	9.4
120-130	13.11	53.1	0.0
130-140	10.64	43.1	0.0
140-150	8.99	36.4	0.0
150-160	7.81	31.6	0.0
160-170	6.92	28.0	0.0
			656.1



Building A Rooftop Ponding:

Area per Drain $= 16{,}206.0\text{m}^2 / 35 \text{ drain} = 463.0 \text{ m}^2/\text{drain}$

Available Ponding Volume per Drain $= \frac{l \cdot w \cdot h}{3} + l \cdot w \cdot h$

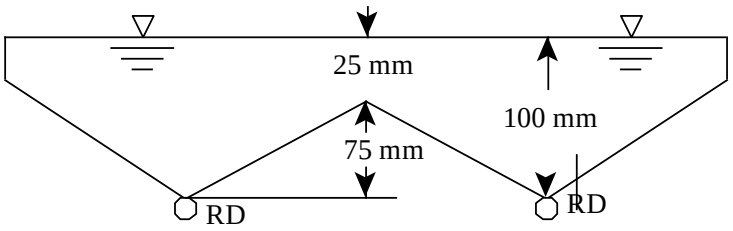
Ponding Volume Per Drain $= \frac{(463.0\text{m}^2)\cdot(0.075\text{m})}{3} + (463.0\text{m}^2) \cdot (0.025\text{m}) = 23.2\text{m}^3/\text{drain}$

Rooftop Volume Provided $= 23.2\text{m}^3 \cdot 35 \text{ drains} = 810.3\text{m}^3$

Required Rooftop Volume = 656.1m^3

Table B – Building B Roof Storage Required for 100-Year Storm Event

TIME PERIOD (min)	INTENSITY (mm/hr)	RUNOFF (l/s)	STORAGE (m^3)
30-40	5.88	18.8	0.0
40-50	7.27	23.2	0.0
50-60	9.69	31.0	0.0
60-70	15	48.0	2.7
70-80	38.04	121.7	47.0
80-90	203.31	650.2	364.1
90-100	51.04	163.2	71.9
100-110	25.59	81.8	23.1
110-120	17.24	55.1	7.0
120-130	13.11	41.9	0.0
130-140	10.64	34.0	0.0
140-150	8.99	28.8	0.0
150-160	7.81	25.0	0.0
160-170	6.92	22.1	0.0
			515.8



<u>Building B Rooftop Ponding:</u>

Area per Drain $= 12{,}792.0\text{m}^2 / 28 \text{ drain} = 456.8 \text{ m}^2/\text{drain}$

Available Ponding Volume per Drain $= \frac{\text{l}\cdot\text{w}\cdot\text{h}}{3} + \text{l}\cdot\text{w}\cdot\text{h}$

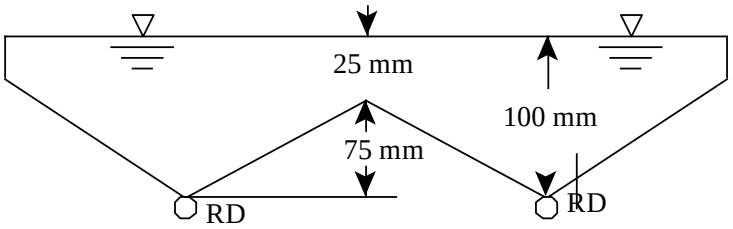
Ponding Volume Per Drain $= \frac{(456.8\text{m}^2)\cdot(0.075\text{m})}{3} + (456.8\text{m}^2)\cdot(0.025\text{m}) = 22.8\text{m}^3/\text{drain}$

Rooftop Volume Provided $= 22.8\text{m}^3 \cdot 28 \text{ drains} = 639.6\text{m}^3$

Required Rooftop Volume = 515.8m^3

Table C – Building C Roof Storage Required for 100-Year Storm Event

TIME PERIOD (min)	INTENSITY (mm/hr)	RUNOFF (l/s)	STORAGE (m^3)
40-50	7.27	54.7	0.0
50-60	9.69	72.9	0.0
60-70	15	112.8	7.2
70-80	38.04	286.1	111.2
80-90	203.31	1529.1	857.0
90-100	51.04	383.9	169.9
100-110	25.59	192.5	55.0
110-120	17.24	129.7	17.3
120-130	13.11	98.6	0.0
130-140	10.64	80.0	0.0
140-150	8.99	67.6	0.0
150-160	7.81	58.7	0.0
160-170	6.92	52.0	0.0
			1,217.7



Building C Rooftop Ponding:

Area per Drain $= 30{,}082.3\text{m}^2 / 65\text{ drain} = 462.8\ \text{m}^2/\text{drain}$

Available Ponding Volume per Drain $= \frac{\text{l}\cdot\text{w}\cdot\text{h}}{3} + \text{l}\cdot\text{w}\cdot\text{h}$

Ponding Volume Per Drain $= \frac{(462.8\text{m}^2)\cdot(0.075\text{m})}{3} + (462.8\text{m}^2)\cdot(0.025\text{m}) = 23.1\text{m}^3/\text{drain}$

Rooftop Volume Provided $= 23.1\text{m}^3 \cdot 65\text{ drains} = 1{,}504.1\text{m}^3$

Required Rooftop Volume = 1,217.7m^3

ROOF DRAIN MANUFACTURERS DESIGN TABLE

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

4.3 Stormwater Management for the Park Mount Development

4.3.1. Existing and Future Flows

Existing conditions and post-development flows, with and without a stormwater management pond were calculated for the study subcatchment containing the Park Mount Development. All flows were calculated using the 4-hour Chicago Storm distribution. The NASH Hydrograph method was used to calculate the existing conditions flows and the StandHyd method was used to calculate the future conditions flows.

Table 13 presents the pre-development and post-development flows and runoff volumes for Subcatchment 5 (total area 24.2 ha) that includes the Park Mount Property (approximately 14.5 ha development area not including the creek realignment corridor). Numbers in brackets show the flow contribution from the Park Mount Development area of 14.5 ha.

Table 13 Post-development and Pre-development Flows for Park Mount Development Subcatchment

Storm Recurrence (Years)	Pre-development Runoff		Uncontrolled Post-development Runoff		Post-development Runoff with Stormwater Management Pond in Park Mount Development	
	Flow (m^3/s)	Volume (m^3)	Flow (m^3/s)	Volume (m)	Flow (m^3/s)	Volume (m^3)
2	0.15 (0.10)	1300 (780)	1.74 (1.73)	3840 (3470)	0.08 (0.04)	3840 (3470)
5	0.30 (0.19)	2390 (1430)	2.57 (2.56)	5540 (4830)	0.24 (0.17)	5540 (4830)
10	0.42 (0.27)	3250 (1950)	3.16 (3.15)	6740 (5780)	0.40 (0.31)	6740 (5780)
25	0.58 (0.37)	4460 (2680)	3.99 (3.99)	8360 (7010)	0.55 (0.37)	8360 (7010)
50	0.71 (0.45)	5350 (3200)	4.58 (4.57)	9480 (7850)	0.56 (0.45)	9480 (7850)
100	0.84 (0.54)	6320 (3790)	5.17 (5.16)	10680 (8730)	0.74 (0.54)	10680 (8730)

4.3.2. Stormwater Management Pond

The proposed extended detention SWM wet pond for the Park Mount Development will provide an Enhanced (Level 1) level of treatment, which exceeds the specified Normal (Level 2) target for water quality treatment in the study watershed. The Enhanced level of treatment will provide an added benefit to upstream and downstream users by releasing cleaner post-development flows to the creek thus enhancing the overall water quality in the creek.

The estimated preliminary parameters for the required stormwater pond are summarized in Table 14. The volumes of the permanent pool, the extended detention, and flood attenuation zones were calculated using the criteria discussed in Section 4.2.1, with the exception for water quality, where a higher standard was used. As summarized in Table 14, 202 m^3/ha was used for water quality control, which is based on 80 % impervious area and the Enhanced level of protection, according to criteria in MOE guidelines. The extended detention volume of 210 m^3/ha was calculated based on the volume of runoff generated by 25mm of precipitation and the weighted runoff coefficient of 0.84 for the development area. The combined extended detention and flood attenuation volume is the required detention storage to reduce the 2 year to 100-year post-

6.0 IMPLEMENTATION AND MONITORING PLAN

The implementation and monitoring plan encompasses two different components, specifically, the more detailed and intensive but shorter term monitoring associated with a development proposal or specific construction activity that will change the land use or landscape in one area of the watershed, and the more general long term monitoring undertaken across the watershed as a whole. The development or activity specific monitoring would be undertaken by the developer/proponent, with reporting and review requirements to the Town and CVC. The long term overall monitoring program would be undertaken by the Town and / or CVC.

6.1 Development / Activity Monitoring

The development / activity driven monitoring should follow three stages: the pre-development phase, the construction phase, and the post-construction phase. During the pre-development phase, monitoring should be undertaken to generate any additional baseline data that may be required to compile a more detailed understanding of existing conditions. In the construction phase the purpose of monitoring will be to ensure that the environmental measures implemented during construction are performing as expected (i.e. sediment control by provision of silt fences and temporary sediment traps/basins). Monitoring during the post-construction phase will be conducted to confirm that the performance targets are being achieved and to ensure that no negative environmental changes are occurring because of development.

For the study watershed, the areas of critical importance include impacts of development on water quality and peak flows, potential point soil contamination (on-going issue) and monitoring of the proposed channel re-location and associated stream and riparian corridor habitat elements. Soil contamination is an issue due to the industrial nature of the existing and proposed developments within the subwatershed.

6.2 Stormwater Management Implementation and Monitoring Plan

The preferred option for treatment of stormwater in the study subwatershed is based on the use of 'wet detention ponds'. Where ponds cannot be provided due to existing space/land purchase negotiations the use of flat bottom grassed swales is recommended. The approximate capital cost of construction of the three SWM extended detention wet ponds is approximately $1,050,000. The cost of construction of grassed swales by modification of existing ditches and provision of sediment control BMPs would be in the order of $400,000.

During Construction Monitoring Program

During construction, the monitoring program of the SWM facilities, including the temporary sediment control facilities such as excavated sediment traps, should include the following:

- Weekly inspections of the facilities.
- Inspections of the control facilities and the receiving watercourse, i.e. Clearview Creek, after rainfall events with at least 10 m of precipitation.
- Measurement of suspended solids downstream of the control works.

Weekly inspection reports should be submitted by the developer's engineer to the satisfaction of the Town of Oakville. The reports should summarize the state of the control works, their performance during rainfall events, any presence of downstream erosion or sediment accumulation, and any actions necessary to modify the works.

Post-Construction Monitoring Program

The proponent will submit a Monitoring Response and Maintenance Program (MRM Program), which will be initiated upon completion of the 'During Construction Monitoring Program', and will extend for a 2 year period following substantial completion. A typical monitoring season should extend from mid-April to end of October, with specific monitoring during the off-construction season following major runoff events to ensure long term or over-wintering measures remain stable. The substantial completion requires that for a given development all roads and open spaces be completed and 90% of lots sodded. The program should focus on compliance with watershed targets as well as ecological health immediately downstream of the development. The program should identify the following:

- **Performance Targets.** The following specifies allowable targets for flood control, allowable sediment levels, temperature and other targets relating to water quality:
    - Flood Control Target - SWM pond outflows to be controlled to pre-development levels up to the 100 year event.
    - Sediment Control Target: Background Annual Average.
    - Temperature of SWM pond discharge to Clearview Creek: Background Maximum - Conditional on Air Temperature.
    - Dissolved Oxygen: Background Annual Average.
    - Other water quality parameters: Background Annual Average Levels
        - Total Phosphorous, Nitrate, Chlorides, E.coli, Aluminum, Copper, Ttotal ammonia (unionized NH3)

The exceedance of any of the identified target levels will represent triggers, which will immediately initiate the Response Plan.

- **Mitigation Measures.** If targets are not met mitigation measures should be implemented. Possible mitigation measures will be identified in the MRM Program, along with approximate costs and expected benefits.
- **Response Plan,** which will be implemented where the monitoring identifies that Performance Targets are not being met. The Response Plan may include more comprehensive monitoring program to determine the consequence of exceedance.
- **Maintenance Requirements.** Routine and occasional maintenance requirements will be identified for the SWM facilities.
- **Monitoring Program,** which at the minimum should include the items listed below. Recommendations for remediation should be made where required.

a. Collect water level from SWM facilities during the monitoring season.
b. Collect water quality data (suspended solids, dissolved oxygen, phosphorous) as per Section 6.2 during the same five significant rainfall events specified in Section 6.2.1.
c. During the spring and fall, inspect all SWM facilities shortly after a rainfall event to determine whether the outlet works operate as designed. Make recommendations
d. Groundwater elevation and quality monitoring
e. Twice annually inspect the health of the vegetation at existing SWM facilities
f. Inspect annually the boundary between developed areas and natural areas/buffers.
g. Cleanup litter and notify the Town of Oakville of illicit dumping.

The Monitoring Reports should be submitted twice per year to the Town of Oakville and CVC. The reports will present the results of monitoring of the SWM facilities, note trends, exceedance of performance targets, comment on the effectiveness of the SWM facilities and recommend mitigation measures where required.

- **Erosion Control.** Two or more erosion monitoring stations should be established on Clearview Creek downstream of the proposed development to monitor the amount of erosion during construction and in the post-construction period. The selected sites should contain a section where erosion is evident as well as a section which does not show erosion but is prone to erosion (i.e. creek bend). Each station should be inspected annually and any changes in bed or banks should be noted. A photographic inventory should be maintained at selected sites, which should be updated after each inspection.

6.2.1. Water Quality Testing Frequency and Locations

A total of eight water quality sampling runs per year will be conducted at two locations over a three-year period. Five of these sampling runs will be conducted during significant rain events and three sampling runs will be conducted during dry weather conditions (negligible precipitation in the previous five days). The sampling frequency should be evenly distributed throughout the open water season from April to October. The recommended water chemistry sampling locations are:

1. Downstream of Royal Windsor Road
2. Upstream of Winston Churchill Blvd at the property boundary at the downstream end of stream re-alignment

The recommended water sampling program is as follows:

Year 1 - Baseline monitoring, prior to site development. Eight samples are to be taken at the two locations and the samples will be tested for the above-identified parameters.

Years 2 and 3 - Post-construction monitoring, to be conducted after completion of site development. Eight samples are to be taken during each year at the two locations and the samples will be tested for the above-identified parameters.

STORM SEWER DESIGN SHEET

a.m. candaras associates inc.
consulting engineers

Project / Subdivision 560 WINSTON CHURCHILL BLVD., OAKVILLE

Consulting Engineer A.M. Candaras Associates Inc.

Project No.: #1870

Prepared by: J.M.N.

Checked by: A.M.C.

Last Revised: 26-Feb-21

Design Parameters

A = drainage area (ha)	5_{YR} T_{init} = 10	100_{YR} T_{init} = 10
C = runoff coefficient	A= 1170	A= 2150
T_c = time of concentration	B= 5.800	B= 5.700
	C= 0.843	C= 0.861

Design Equations

$$I = \frac{A}{(t + B)^C}$$

$$Q = 2.78 \times A \times C \times I$$

Notes/Comments: 5 year sewers

Location			Drainage Area Characteristics				Rainfall / Runoff			Sewer Data							Remarks
Street	From	To	Area	C	AC	Accum.	T_c	I	Flow	Diameter	Length	Slope	Cap.	Vel.	Sect.	Accum.	
	MH.	MH.	(ha)			AC	(min)	(mm/hr)	(m^3/s)	(mm)	(m)	(%)	(m^3/s)	(m/s)	Time	Time	
STM PIPE NETWORK TO HW 1																	
																10.00	minimum entry time
Building C - North Side	CBMH 21	MH 19	0.21	0.90	0.19	0.19	10.00	114.21	0.060	450	75.0	0.15	0.110	0.69	1.80	11.80	
Building C - North Side	CB 20	MH 19	0.15	0.90	0.14	0.14	10.00	114.21	0.043	300	1.1	1.00	0.097	1.37	0.01	10.01	
Building C - North Side	MH 19	CBMH 17	0.00	0.90	0.00	0.32	11.80	104.28	0.094	600	75.0	0.15	0.238	0.84	1.49	13.29	
Building C - North Side	CBMH 17	CBMH 16	0.17	0.90	0.15	0.48	13.29	97.39	0.129	600	65.3	0.15	0.238	0.84	1.29	14.58	
Building B - North Side	CBMH 16	CBMH 15	0.14	0.90	0.13	0.60	14.58	92.15	0.154	600	40.9	0.15	0.238	0.84	0.81	15.39	
Building B - North Side	CBMH 15	MH 13	0.16	0.85	0.14	0.74	15.39	89.17	0.183	600	61.2	0.15	0.238	0.84	1.21	15.79	
Building B - West Side	MH 13	CBMH 11	0.18	0.90	0.16	0.90	15.79	87.77	0.220	675	83.8	0.15	0.326	0.91	1.54	17.33	
Building B - West Side	ROOF 3	CBMH 11	0.04	0.90	0.04	0.04	10.00	114.21	0.012	300	10.5	1.00	0.097	1.37	0.13	10.13	*AREA EDITED TO ACHIEVE DISCHARGE (12.1 L/S)
Building B - West Side	CBMH 11	MH 9	0.36	0.90	0.32	1.26	17.33	82.83	0.291	750	102.2	0.15	0.431	0.98	1.75	19.07	
Building B - West Side	MH 9	MH 7	0.19	0.85	0.16	1.42	19.07	77.91	0.308	750	78.3	0.15	0.431	0.98	1.34	20.41	
Building B - West Side	Roof 4	MH 7	0.04	0.85	0.04	0.04	10.00	114.21	0.011	300	14.0	1.00	0.097	1.37	0.17	10.17	*AREA EDITED TO ACHIEVE DISCHARGE (12.1 L/S)
Building B - South Side	MH 7	MH 5	0.27	0.85	0.23	1.69	20.41	74.54	0.350	750	47.4	0.15	0.431	0.98	0.81	21.22	
																10.00	minimum entry time
Loading Dock	CBMH 35	CBMH 34	0.20	0.90	0.18	0.18	10.00	114.21	0.057	300	40.0	1.00	0.097	1.37	0.49	10.49	
Loading Dock	CB 33	CBMH 34	0.13	0.90	0.12	0.12	10.00	114.21	0.037	300	1.0	1.00	0.097	1.37	0.01	10.01	
Loading Dock	ROOF 1	CBMH 34	0.10	0.90	0.09	0.09	10.00	114.21	0.028	300	27.1	1.00	0.097	1.37	0.33	10.33	*AREA EDITED TO ACHIEVE DISCHARGE (28.75 L/S)
Loading Dock	CBMH 34	CBMH 32	0.20	0.90	0.18	0.57	10.49	111.33	0.175	600	84.2	0.20	0.275	0.97	1.44	11.44	
Loading Dock	ROOF 2	CBMH 32	0.10	0.90	0.09	0.09	10.00	114.21	0.028	300	27.1	1.00	0.097	1.37	0.33	10.33	*AREA EDITED TO ACHIEVE DISCHARGE (28.75 L/S)
Loading Dock	CBMH 32	CBMH 31	0.16	0.90	0.14	0.80	11.44	106.09	0.235	675	33.2	0.20	0.376	1.05	0.53	11.97	
Loading Dock	CBMH 31	MH 30	0.10	0.90	0.09	0.89	11.97	103.43	0.255	675	32.6	0.20	0.376	1.05	0.52	12.49	
BUILDING B - TRENCH DRAIN	TRENCH DRAIN	MH 30	0.93	0.90	0.84	0.84	10.00	114.21	0.266	600	32.8	0.30	0.336	1.19	0.46	10.46	
Loading Dock	MH 30	MH 5	0.00	0.90	0.00	1.72	12.49	100.96	0.484	825	63.7	0.20	0.642	1.20	0.88	13.37	

STORM SEWER DESIGN SHEET

a.m. candaras associates inc.
consulting engineers

Project / Subdivision 560 WINSTON CHURCHILL BLVD., OAKVILLE

Consulting Engineer A.M. Candaras Associates Inc.

Project No.: #1870

Prepared by: J.M.N.

Checked by: A.M.C.

Last Revised: 26-Feb-21

Design Parameters

A = drainage area (ha)	5_{YR} T_{init} = 10	100_{YR} T_{init} = 10
C = runoff coefficient	A= 1170	A= 2150
T_c = time of concentration	B= 5.800	B= 5.700
	C= 0.843	C= 0.861

Design Equations

$$I = \frac{A}{(t + B)^C}$$

$$Q = 2.78 \times A \times C \times I$$

Notes/Comments: 5 year sewers

Location			Drainage Area Characteristics				Rainfall / Runoff			Sewer Data							Remarks
Street	From	To	Area	C	AC	Accum.	T_c	I	Flow	Diameter	Length	Slope	Cap.	Vel.	Sect.	Accum.	
	MH.	MH.	(ha)			AC	(min)	(mm/hr)	(m^3/s)	(mm)	(m)	(%)	(m^3/s)	(m/s)	Time	Time	
																10.00	minimum entry time
BUILDING A - South Side	MH 5	CBMH 4	0.00	0.90	0.00	3.41	21.22	72.66	0.689	1050	43.5	0.20	1.221	1.41	0.51	21.73	
BUILDING A - South Side	CBMH 4	MH 3	0.12	0.90	0.11	3.52	21.73	71.51	0.700	1050	47.1	0.20	1.221	1.41	0.56	22.29	
BUILDING A - South Side	MH 3	CBMH 2	0.00	0.90	0.00	3.52	22.29	70.31	0.688	1050	33.7	0.20	1.221	1.41	0.40	22.69	
																10.00	minimum entry time
BUILDING A - TRENCH DRAIN	TRENCH DRAIN	CBMH 2	0.84	0.90	0.76	0.76	10.00	114.21	0.240	525	85.7	1.00	0.430	1.99	0.72	10.72	
																10.00	minimum entry time
Site	CB 53	MH 52	0.08	0.90	0.07	0.07	10.00	200.80	0.040	300	53.8	0.30	0.053	0.75	1.20	11.20	Sized for 100 YR Event
Site	MH 52	MH 51	0.00	0.25	0.00	0.07	11.20	188.50	0.038	300	83.0	0.30	0.053	0.75	1.85	13.04	Sized for 100 YR Event
Site	MH 51	CBMH 50	0.00	0.25	0.00	0.07	13.04	172.40	0.034	300	44.0	0.30	0.053	0.75	0.98	14.02	Sized for 100 YR Event
Site	CBMH 50	CB 48	0.26	0.25	0.07	0.14	14.02	165.00	0.063	375	94.9	0.30	0.096	0.87	1.82	15.84	Sized for 100 YR Event
Site	CB 48	CB 47	0.09	0.90	0.08	0.22	15.84	152.93	0.093	450	8.0	0.30	0.156	0.98	0.14	15.98	Sized for 100 YR Event
Site	CB 47	MH 46	0.00	0.25	0.00	0.22	15.98	152.11	0.092	525	84.7	0.15	0.167	0.77	1.83	17.81	Sized for 100 YR Event
Site	CB 45	MH 46	0.18	0.25	0.05	0.05	10.00	200.80	0.025	300	5.0	1.00	0.097	1.37	0.06	10.06	Sized for 100 YR Event
Site	MH 46	MH 43	0.00	0.25	0.00	0.26	17.81	141.83	0.104	525	32.2	0.15	0.167	0.77	0.70	18.51	Sized for 100 YR Event
Site	CB 44	MH 43	0.07	0.90	0.06	0.06	10.00	200.80	0.035	375	52.3	0.15	0.068	0.61	1.42	11.42	Sized for 100 YR Event
Site	CB 42	MH 43	0.12	0.90	0.11	0.11	10.00	200.80	0.060	300	0.8	1.00	0.097	1.37	0.01	10.01	Sized for 100 YR Event
Site	MH 43	MH 41	0.00	0.90	0.00	0.43	18.51	138.31	0.167	600	81.2	0.15	0.238	0.84	1.61	20.12	Sized for 100 YR Event
Site	CB 40	MH 41	0.11	0.90	0.10	0.10	10.00	200.80	0.055	300	1.3	1.00	0.097	1.37	0.02	10.02	Sized for 100 YR Event
Site	ROOF 5	MH 41	0.11	0.90	0.10	0.10	10.00	114.21	0.031	300	10.2	1.00	0.097	1.37	0.12	10.12	*AREA EDITED TO ACHIEVE DISCHARGE (31.4 L/S)
Site	MH 41	CBMH 2	0.00	0.90	0.00	0.63	20.12	130.85	0.230	675	63.1	0.15	0.326	0.91	1.16	21.27	Sized for 100 YR Event
Site	CBMH 2	MH 1	0.00	0.90	0.00	4.91	22.69	120.58	1.645	1200	11.2	0.30	2.135	1.89	0.10	22.79	Sized for 100 YR Event
Site	MH 1	HW 1	0.00	0.90	0.00	4.91	22.79	120.22	1.640	1200	32.8	0.37	2.372	2.10	0.26	23.05	Sized for 100 YR Event

APPENDIX B
SWMHYMO OUTPUT

```
2     Metric units
*#*************************************************************************
*
*#  Project Name: 560 Winston Churchill Blvd., Oakville
*#  Project Number: 1870
*#  Date        : DECEMBER 15, 2020
*#  Revised     : SEPTEMBER 22, 2020
*#  Modeller    : JMN
*#  Company     : a.m. candaras associates inc.
*#  License #   : 3813174
*#*************************************************************************
*
START               TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN= [001]
                     "CHIC25MM.STM"
*
READ STORM          STORM_FILENAME= ["storm.001"]

*
**************************
*SITE 560 WINSTON CHURCHILL*
**************************
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS
CALIB STANDHYD      ID=[1], NHYD=["002"], DT=[1](min), AREA=[11.69](ha),
                    XIMP=[0.90], TIMP=[0.90], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[70.0],
                    Pervious   surfaces: IAper=[5](mm), SLPP=[2.0](%),
                                         LGP=[40.0](m), MNP=[0.25],
                                         SCP=[0.0](min),
                    Impervious surfaces: IAimp=[2](mm), SLPI=[1.0](%),
                                         LGI=[30](m), MNI=[0.013],
                                         SCI=[0.0](min),
                    RAINFALL=[ , , , , ](mm/hr) ,  END=-1

* SWM POND AREA
CALIB STANDHYD      ID=[2], NHYD=["003"], DT=[1](min), AREA=[0.87](ha),
                    XIMP=[0.50], TIMP=[0.50], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[70.0],
                    Pervious   surfaces: IAper=[5](mm), SLPP=[2.0](%),
                                         LGP=[10.0](m), MNP=[0.25],
                                         SCP=[0.0](min),
                    Impervious surfaces: IAimp=[2](mm), SLPI=[1.0](%),
                                         LGI=[22](m), MNI=[0.013],
                                         SCI=[0.0](min),
                    RAINFALL=[ , , , , ](mm/hr) ,  END=-1

* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD
CALIB STANDHYD      ID=[3], NHYD=["004"], DT=[1](min), AREA=[0.14](ha),
                    XIMP=[0.25], TIMP=[0.25], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[70.0],
                    Pervious   surfaces: IAper=[5](mm), SLPP=[2.0](%),
                                         LGP=[10.0](m), MNP=[0.25],
                                         SCP=[0.0](min),
                    Impervious surfaces: IAimp=[2](mm), SLPI=[1.0](%),
                                         LGI=[30](m), MNI=[0.013],
                                         SCI=[0.0](min),
                    RAINFALL=[ , , , , ](mm/hr) ,  END=-1
```



```
* UNCONTROLLED AREA TO CHANNEL
CALIB NASHYD        ID=[4], NHYD=["005"], DT=[1]min, AREA=[0.23](ha),
                    DWF=[0.0](cms),  CN/C=[70.0], IA=[5](mm),
                    N=[3], TP=[0.16]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1


*****************************************************
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
*****************************************************
ADD HYD             IDsum=6 NHYD=300 IDs to add=1+2

*********************************************
*STORMWATER MANAGEMENT FACILITY
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm
*********************************************

ROUTE RESERVOIR     IDout= 7 ,   NHYD= 200 ,  IDin= 6 ,
                    RDT=[1](min),
                    TABLE of ( OUTFLOW-STORAGE ) values
                    (cms) - (ha-m)
                    0.0000  0.0000
                    0.0127  0.0743
                    0.0199  0.1543
                    0.0251  0.2403
                    0.0294  0.3146
                    0.0598  0.4139
                    0.1120  0.5169
                    0.1783  0.6238
                    0.2560  0.7344
                    0.3907  0.9076
                    2.3211  1.0278
                    3.9062  1.0893
                    5.7754  1.1518
                    7.8899  1.2152
                    IDovf=[   ], NHYDovf=[   ]

*************************************************************
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill
*************************************************************
ADD HYD             IDsum=8 NHYD=300 IDs to add=7+3

*************************************************************
START               TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN= [002]
                     "CHIC2YR.STM"
START               TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN= [003]
                     "CHIC5YR.STM"
START               TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN= [004]
                     "CHIC10YR.STM"
                     START               TZERO=[0.0], METOUT=[2], NSTORM=[1],
                     NRUN= [005]
                     "CHIC25YR.STM"
                     START               TZERO=[0.0], METOUT=[2], NSTORM=[1],
                     NRUN= [006]
                     "CH100YR.STM"
```

```
                     START               TZERO=[0.0], METOUT=[2], NSTORM=[1],
                     NRUN= [007]
                     "2Y24HS.STM"
                     START               TZERO=[0.0], METOUT=[2], NSTORM=[1],
                     NRUN= [008]
                     "5Y24HS.STM"
START                TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN= [009]
                     "10Y24HS.STM"
START                TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN= [010]
                     "25Y24HS.STM"
                     START               TZERO=[0.0], METOUT=[2], NSTORM=[1],
                     NRUN= [011]
                     "100Y24HS.STM"
                     FINISH
```

```
================================================================================

 SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999  =========
 S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
 SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9 Ver. 4.02
     S   W W   M   M  H   H    Y    M   M  O   O       9999   9999 July 1999
 SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9 =========
                                                      9   9  9   9 # 3813174
      StormWater Management HYdrologic Model           999    999  =========

 ********************************************************************************
 ************************** SWMHYMO-99 Ver/4.02 *************************
 *******  A single event and continuous hydrologic simulation model  *******
 *******     based on the principles of HYMO and its successors      *******
 *******                 OTTHYMO-83 and OTTHYMO-89.                  *******
 ********************************************************************************
 ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
 *******                  Ottawa,  Ontario: (613) 727-5199           *******
 *******                  Gatineau, Quebec: (819) 243-6858           *******
 *******                  E-Mail: swmhymo@jfsa.Com                   *******
 ********************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++ Licensed user: A.M. Candaras Associates Inc.                +++++++
 +++++++                Woodbridge            SERIAL#:3813174       +++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *******           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *******
 *******           Maximum value for ID numbers  :     10            *******
 *******           Max. number of rainfall points:  15000            *******
 *******           Max. number of flow points    :  15000            *******
 ********************************************************************************


 ******************   D E T A I L E D   O U T P U T   ******************
 ********************************************************************************
 *       DATE: 2021-09-23     TIME: 11:14:02     RUN COUNTER: 000656       *
 ********************************************************************************
 * Input   filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\1870PST.dat *
 * Output  filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\1870PST.out *
 * Summary filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\1870PST.sum *
 * User comments:                                                           *
 * 1:_______________________________________________________________________*
 * 2:_______________________________________________________________________*
 * 3:_______________________________________________________________________*
 ********************************************************************************


--------------------------------------------------------------------------------
001:0001----------------------------------------------------------------------
*#*****************************************************************************
*
*#  Project Name: 560 Winston Churchill Blvd., Oakville
*#  Project Number: 1870
*#  Date        : DECEMBER 15, 2020
*#  Revised     : SEPTEMBER 22, 2020
*#  Modeller    : JMN
*#  Company     : a.m. candaras associates inc.
```



```
*#  License #   : 3813174
*#*****************************************************************************
*
--------------------
| START            |  Project  dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
--------------------  Rainfall dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=CHIC25MM.STM
--------------------------------------------------------------------------------
001:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\187
| Ptotal=  25.00 mm|    Comments: *BLOOR ST STAT DATA 10 MIN DISCRITIZATIO
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   1.624 |   1.08  12.284 |   2.08   3.786 |   3.08   1.940
               .17   1.624 |   1.17  12.284 |   2.17   3.786 |   3.17   1.940
               .25   1.853 |   1.25  58.772 |   2.25   3.233 |   3.25   1.803
               .33   1.853 |   1.33  58.772 |   2.33   3.233 |   3.33   1.803
               .42   2.170 |   1.42  16.185 |   2.42   2.838 |   3.42   1.688
               .50   2.170 |   1.50  16.185 |   2.50   2.838 |   3.50   1.688
               .58   2.651 |   1.58   8.549 |   2.58   2.529 |   3.58   1.588
               .67   2.651 |   1.67   8.549 |   2.67   2.529 |   3.67   1.588
               .75   3.470 |   1.75   5.927 |   2.75   2.292 |   3.75   1.501
               .83   3.470 |   1.83   5.927 |   2.83   2.292 |   3.83   1.501
               .92   5.201 |   1.92   4.598 |   2.92   2.098 |   3.92   1.422
              1.00   5.201 |   2.00   4.598 |   3.00   2.098 |   4.00   1.422

--------------------------------------------------------------------------------
001:0003----------------------------------------------------------------------
*
*************************
*SITE 560 WINSTON CHURCHILL*
*************************
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS
----------------------
| CALIB STANDHYD     |   Area    (ha)=   11.69
| 01:002    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.52         1.17
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      58.77         3.13
               over (min)        2.00        30.00
     Storage Coeff.  (min)=       1.53 (ii)   29.74 (ii)
     Unit Hyd. Tpeak (min)=       2.00        30.00
     Unit Hyd. peak  (cms)=        .66          .04
                                                          *TOTALS*
```

```
     PEAK FLOW       (cms)=       1.71          .01          1.715 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.92          1.333
     RUNOFF VOLUME    (mm)=      23.00         3.10         21.010
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .92          .12           .840

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
001:0004--------------------------------------------------------------------------
* SWM POND AREA
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .87
| 02:003    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .44          .44
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.00        10.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      58.77         4.71
               over (min)        1.00        12.00
     Storage Coeff.  (min)=       1.27 (ii)   11.70 (ii)
     Unit Hyd. Tpeak (min)=       1.00        12.00
     Unit Hyd. peak  (cms)=        .92          .10
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .07          .00          .072 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.52          1.333
     RUNOFF VOLUME    (mm)=      23.00         3.10         13.052
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .92          .12           .522

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
001:0005--------------------------------------------------------------------------
* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .14
| 03:004    DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   25.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        10.00
     Mannings n            =       .013         .250
```



```
     Max.eff.Inten.(mm/hr)=      58.77         4.71
               over (min)        2.00        12.00
     Storage Coeff.  (min)=       1.53 (ii)   11.96 (ii)
     Unit Hyd. Tpeak (min)=       2.00        12.00
     Unit Hyd. peak  (cms)=        .66          .09
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .006 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.52          1.333
     RUNOFF VOLUME    (mm)=      23.00         3.10          8.078
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .92          .12           .323

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
001:0006--------------------------------------------------------------------------
* UNCONTROLLED AREA TO CHANNEL
----------------------
| CALIB NASHYD       |   Area    (ha)=     .23   Curve Number   (CN)=70.00
| 04:005    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .055

     PEAK FLOW       (cms)=     .002 (i)
     TIME TO PEAK    (hrs)=    1.517
     RUNOFF VOLUME    (mm)=    3.103
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .124

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
001:0007--------------------------------------------------------------------------
********************************************************
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
********************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.      DWF
--------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                ID1 01:002       11.69    1.715    1.33  21.01    .000
               +ID2 02:003         .87     .072    1.33  13.05    .000
                ==========================================================
                SUM 06:000300    12.56    1.787    1.33  20.46    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
001:0008--------------------------------------------------------------------------
*********************************************
*STORMWATER MANAGEMENT FACILITY
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm
```

```
*********************************************
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(000300)   |
| OUT<07:(000200)   |    =========  OUTFLOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .178  .6238E+00
                           .013  .7430E-01   |     .256  .7344E+00
                           .020  .1543E+00   |     .391  .9076E+00
                           .025  .2403E+00   |    2.321  .1028E+01
                           .029  .3146E+00   |    3.906  .1089E+01
                           .060  .4139E+00   |    5.775  .1152E+01
                           .112  .5169E+00   |    7.890  .1215E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------         (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (000300)      12.56     1.787     1.333     20.459
     OUTFLOW<07: (000200)      12.56      .025     4.033     20.459

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.380
                  TIME SHIFT OF PEAK FLOW          (min)=   162.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.2330E+00

--------------------------------------------------------------------------------
001:0009----------------------------------------------------------------------
*****************************************************************
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill
*****************************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                  ID1 07:000200    12.56     .025    4.03  20.46    .000
                 +ID2 03:004         .14     .006    1.33   8.08    .000
                  ======================================================
                  SUM 08:000300    12.70     .025    4.00  20.32    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
001:0010----------------------------------------------------------------------
*****************************************************************
  ** END OF RUN :   1

*******************************************************************************




--------------------
| START            |  Project  dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
--------------------  Rainfall dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
```



```
          #  1=CHIC2YR.STM
--------------------------------------------------------------------------------
002:0002----------------------------------------------------------------------
*#*****************************************************************************
*
*#  Project Name: 560 Winston Churchill Blvd., Oakville
*#  Project Number: 1870
*#  Date        : DECEMBER 15, 2020
*#  Revised     : SEPTEMBER 22, 2020
*#  Modeller    : JMN
*#  Company     : a.m. candaras associates inc.
*#  License #   : 3813174
*#*****************************************************************************
*
--------------------------------------------------------------------------------
002:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\187
| Ptotal=  34.80 mm|    Comments: *BLOOR ST STAT DATA 10 MIN DISCRITIZATIO
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr  |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .08   2.260  |   1.08  17.100 |   2.08   5.270 |   3.08   2.700
              .17   2.260  |   1.17  17.100 |   2.17   5.270 |   3.17   2.700
              .25   2.580  |   1.25  81.810 |   2.25   4.500 |   3.25   2.510
              .33   2.580  |   1.33  81.810 |   2.33   4.500 |   3.33   2.510
              .42   3.020  |   1.42  22.530 |   2.42   3.950 |   3.42   2.350
              .50   3.020  |   1.50  22.530 |   2.50   3.950 |   3.50   2.350
              .58   3.690  |   1.58  11.900 |   2.58   3.520 |   3.58   2.210
              .67   3.690  |   1.67  11.900 |   2.67   3.520 |   3.67   2.210
              .75   4.830  |   1.75   8.250 |   2.75   3.190 |   3.75   2.090
              .83   4.830  |   1.83   8.250 |   2.83   3.190 |   3.83   2.090
              .92   7.240  |   1.92   6.400 |   2.92   2.920 |   3.92   1.980
             1.00   7.240  |   2.00   6.400 |   3.00   2.920 |   4.00   1.980

--------------------------------------------------------------------------------
002:0003----------------------------------------------------------------------
*
*************************
*SITE 560 WINSTON CHURCHILL*
*************************
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS
----------------------
| CALIB STANDHYD     |   Area    (ha)=   11.69
| 01:002    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.52          1.17
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      30.00         40.00
     Mannings n             =     .013          .250

     Max.eff.Inten.(mm/hr)=      81.81          8.53
               over (min)        1.00         20.00
     Storage Coeff.  (min)=      1.34 (ii)    20.24 (ii)
```

```
     Unit Hyd. Tpeak (min)=       1.00        20.00
     Unit Hyd. peak  (cms)=        .89          .06
                                                    *TOTALS*
     PEAK FLOW       (cms)=       2.39          .02          2.393 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.65          1.333
     RUNOFF VOLUME    (mm)=      32.80         6.40         30.161
     TOTAL RAINFALL   (mm)=      34.80        34.80         34.800
     RUNOFF COEFFICIENT   =        .94          .18           .867

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0004----------------------------------------------------------------------
* SWM POND AREA
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .87
| 02:003    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .44          .44
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.00        10.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      81.81        13.00
               over (min)        1.00         8.00
     Storage Coeff.  (min)=       1.12 (ii)    8.06 (ii)
     Unit Hyd. Tpeak (min)=       1.00         8.00
     Unit Hyd. peak  (cms)=       1.01          .14
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .10          .01           .105 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.43          1.333
     RUNOFF VOLUME    (mm)=      32.80         6.40         19.602
     TOTAL RAINFALL   (mm)=      34.80        34.80         34.800
     RUNOFF COEFFICIENT   =        .94          .18           .563

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0005----------------------------------------------------------------------
* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .14
| 03:004    DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   25.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
```



```
     Length            (m)=      30.00        10.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      81.81        13.00
               over (min)        1.00         8.00
     Storage Coeff.  (min)=       1.34 (ii)    8.29 (ii)
     Unit Hyd. Tpeak (min)=       1.00         8.00
     Unit Hyd. peak  (cms)=        .89          .14
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .01          .00           .009 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.43          1.333
     RUNOFF VOLUME    (mm)=      32.80         6.40         13.003
     TOTAL RAINFALL   (mm)=      34.80        34.80         34.800
     RUNOFF COEFFICIENT   =        .94          .18           .374

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0006----------------------------------------------------------------------
* UNCONTROLLED AREA TO CHANNEL
----------------------
| CALIB NASHYD       |   Area    (ha)=     .23   Curve Number   (CN)=70.00
| 04:005    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .055

     PEAK FLOW       (cms)=     .005 (i)
     TIME TO PEAK    (hrs)=    1.500
     RUNOFF VOLUME    (mm)=    6.403
     TOTAL RAINFALL   (mm)=   34.800
     RUNOFF COEFFICIENT   =     .184

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0007----------------------------------------------------------------------
*********************************************************
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
*********************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
-------------------- ID1 01:002     (ha)     (cms)   (hrs)   (mm)    (cms)
                     ID1 01:002    11.69    2.393    1.33  30.16    .000
                    +ID2 02:003      .87     .105    1.33  19.60    .000
                     ==========================================================
                     SUM 06:000300  12.56    2.497    1.33  29.43    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
002:0008----------------------------------------------------------------------
*********************************************
```

```
*STORMWATER MANAGEMENT FACILITY
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm
*******************************************
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(000300)   |
| OUT<07:(000200)   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .178  .6238E+00
                           .013  .7430E-01   |     .256  .7344E+00
                           .020  .1543E+00   |     .391  .9076E+00
                           .025  .2403E+00   |    2.321  .1028E+01
                           .029  .3146E+00   |    3.906  .1089E+01
                           .060  .4139E+00   |    5.775  .1152E+01
                           .112  .5169E+00   |    7.890  .1215E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------         (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (000300)      12.56     2.497     1.333     29.429
     OUTFLOW<07: (000200)      12.56      .037     4.017     29.428

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.464
                  TIME SHIFT OF PEAK FLOW         (min)=   161.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.3380E+00

------------------------------------------------------------------------------
002:0009--------------------------------------------------------------------
*****************************************************************
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill
*****************************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                  ID1 07:000200    12.56     .037    4.02  29.43    .000
                 +ID2 03:004         .14     .009    1.33  13.00    .000
                  ===================================================
                  SUM 08:000300    12.70     .037    4.00  29.25    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
002:0010--------------------------------------------------------------------
*****************************************************************
------------------------------------------------------------------------------
002:0002--------------------------------------------------------------------
  ** END OF RUN :   2

*******************************************************************************




--------------------
| START            |  Project  dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
```



```
--------------------  Rainfall dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 003
    NSTORM=   1
           #  1=CHIC5YR.STM
------------------------------------------------------------------------------
003:0002--------------------------------------------------------------------
*#**************************************************************************
*
*#  Project Name: 560 Winston Churchill Blvd., Oakville
*#  Project Number: 1870
*#  Date        : DECEMBER 15, 2020
*#  Revised     : SEPTEMBER 22, 2020
*#  Modeller    : JMN
*#  Company     : a.m. candaras associates inc.
*#  License #   : 3813174
*#**************************************************************************
*
------------------------------------------------------------------------------
003:0002--------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\187
| Ptotal=  46.25 mm|    Comments: *BLOOR ST STAT DATA 10 MIN DISCRITIZATIO
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   2.820 |   1.08  22.680 |   2.08   6.740 |   3.08   3.400
               .17   2.820 |   1.17  22.680 |   2.17   6.740 |   3.17   3.400
               .25   3.240 |   1.25 113.160 |   2.25   5.730 |   3.25   3.150
               .33   3.240 |   1.33 113.160 |   2.33   5.730 |   3.33   3.150
               .42   3.810 |   1.42  30.090 |   2.42   5.010 |   3.42   2.950
               .50   3.810 |   1.50  30.090 |   2.50   5.010 |   3.50   2.950
               .58   4.680 |   1.58  15.580 |   2.58   4.460 |   3.58   2.770
               .67   4.680 |   1.67  15.580 |   2.67   4.460 |   3.67   2.770
               .75   6.160 |   1.75  10.690 |   2.75   4.030 |   3.75   2.610
               .83   6.160 |   1.83  10.690 |   2.83   4.030 |   3.83   2.610
               .92   9.350 |   1.92   8.230 |   2.92   3.680 |   3.92   2.480
              1.00   9.350 |   2.00   8.230 |   3.00   3.680 |   4.00   2.480

------------------------------------------------------------------------------
003:0003--------------------------------------------------------------------
*
*************************
*SITE 560 WINSTON CHURCHILL*
*************************
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS
----------------------
| CALIB STANDHYD     |   Area    (ha)=   11.69
| 01:002    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.52         1.17
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        40.00
```

```
     Mannings n          =       .013         .250

     Max.eff.Inten.(mm/hr)=    113.16        18.45
               over (min)        1.00        15.00
     Storage Coeff.  (min)=     1.18 (ii)   15.06 (ii)
     Unit Hyd. Tpeak (min)=     1.00        15.00
     Unit Hyd. peak  (cms)=      .97          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=     3.31          .04        3.317 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.57        1.333
     RUNOFF VOLUME    (mm)=    44.25        11.34       40.959
     TOTAL RAINFALL   (mm)=    46.25        46.25       46.250
     RUNOFF COEFFICIENT   =      .96          .25         .886

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
003:0004----------------------------------------------------------------------
* SWM POND AREA
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .87
| 02:003    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .44          .44
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.00        10.00
     Mannings n          =       .013         .250

     Max.eff.Inten.(mm/hr)=    113.16        28.32
               over (min)        1.00         6.00
     Storage Coeff.  (min)=      .98 (ii)    6.07 (ii)
     Unit Hyd. Tpeak (min)=     1.00         6.00
     Unit Hyd. peak  (cms)=     1.09          .19
                                                      *TOTALS*
     PEAK FLOW       (cms)=      .14          .02          .155 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.40         1.333
     RUNOFF VOLUME    (mm)=    44.25        11.34        27.793
     TOTAL RAINFALL   (mm)=    46.25        46.25        46.250
     RUNOFF COEFFICIENT   =      .96          .25          .601

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
003:0005----------------------------------------------------------------------
* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .14
| 03:004    DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   25.00
```



```
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        10.00
     Mannings n          =       .013         .250

     Max.eff.Inten.(mm/hr)=    113.16        28.32
               over (min)        1.00         6.00
     Storage Coeff.  (min)=     1.18 (ii)    6.27 (ii)
     Unit Hyd. Tpeak (min)=     1.00         6.00
     Unit Hyd. peak  (cms)=      .97          .18
                                                      *TOTALS*
     PEAK FLOW       (cms)=      .01          .01          .015 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.40         1.333
     RUNOFF VOLUME    (mm)=    44.25        11.34        19.564
     TOTAL RAINFALL   (mm)=    46.25        46.25        46.250
     RUNOFF COEFFICIENT   =      .96          .25          .423

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
003:0006----------------------------------------------------------------------
* UNCONTROLLED AREA TO CHANNEL
----------------------
| CALIB NASHYD       |   Area    (ha)=     .23   Curve Number   (CN)=70.00
| 04:005    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .055

     PEAK FLOW       (cms)=     .009 (i)
     TIME TO PEAK    (hrs)=    1.483
     RUNOFF VOLUME    (mm)=   11.334
     TOTAL RAINFALL   (mm)=   46.250
     RUNOFF COEFFICIENT   =     .245

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
003:0007----------------------------------------------------------------------
********************************************************
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
********************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------              (ha)     (cms)   (hrs)   (mm)    (cms)
                    ID1 01:002      11.69    3.317    1.33  40.96    .000
                   +ID2 02:003        .87     .155    1.33  27.79    .000
                    ==========================================================
                    SUM 06:000300   12.56    3.472    1.33  40.05    .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
------------------------------------------------------------------------------
003:0008----------------------------------------------------------------------
**********************************************
*STORMWATER MANAGEMENT FACILITY
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm
**********************************************
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(000300)   |
| OUT<07:(000200)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .178  .6238E+00
                            .013  .7430E-01   |     .256  .7344E+00
                            .020  .1543E+00   |     .391  .9076E+00
                            .025  .2403E+00   |    2.321  .1028E+01
                            .029  .3146E+00   |    3.906  .1089E+01
                            .060  .4139E+00   |    5.775  .1152E+01
                            .112  .5169E+00   |    7.890  .1215E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (000300)      12.56     3.472     1.333     40.047
     OUTFLOW<07: (000200)      12.56      .074     4.000     40.046

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    2.122
                  TIME SHIFT OF PEAK FLOW         (min)=   160.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.4413E+00

------------------------------------------------------------------------------
003:0009----------------------------------------------------------------------
**************************************************************
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill
**************************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                  ID1 07:000200    12.56     .074    4.00  40.05    .000
                 +ID2 03:004         .14     .015    1.33  19.56    .000
                  ==================================================
                  SUM 08:000300    12.70     .074    4.00  39.82    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
003:0010----------------------------------------------------------------------
**************************************************************
------------------------------------------------------------------------------
003:0002----------------------------------------------------------------------
------------------------------------------------------------------------------
003:0002----------------------------------------------------------------------
  ** END OF RUN :   3

********************************************************************************
```



```
--------------------
| START            |  Project  dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
--------------------  Rainfall dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 004
    NSTORM=   1
           #  1=CHIC10YR.STM
------------------------------------------------------------------------------
004:0002----------------------------------------------------------------------
*#**************************************************************************
*
*#  Project Name: 560 Winston Churchill Blvd., Oakville
*#  Project Number: 1870
*#  Date        : DECEMBER 15, 2020
*#  Revised     : SEPTEMBER 22, 2020
*#  Modeller    : JMN
*#  Company     : a.m. candaras associates inc.
*#  License #   : 3813174
*#**************************************************************************
*
------------------------------------------------------------------------------
004:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\187
| Ptotal=  54.14 mm|    Comments: *BLOOR ST STAT DATA 10 MIN DISCRITIZATIO
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.410 |   1.08  25.220 |   2.08   7.880 |   3.08   4.080
               .17   3.410 |   1.17  25.220 |   2.17   7.880 |   3.17   4.080
               .25   3.890 |   1.25 135.630 |   2.25   6.750 |   3.25   3.800
               .33   3.890 |   1.33 135.630 |   2.33   6.750 |   3.33   3.800
               .42   4.560 |   1.42  33.220 |   2.42   5.930 |   3.42   3.560
               .50   4.560 |   1.50  33.220 |   2.50   5.930 |   3.50   3.560
               .58   5.550 |   1.58  17.550 |   2.58   5.300 |   3.58   3.350
               .67   5.550 |   1.67  17.550 |   2.67   5.300 |   3.67   3.350
               .75   7.230 |   1.75  12.240 |   2.75   4.810 |   3.75   3.160
               .83   7.230 |   1.83  12.240 |   2.83   4.810 |   3.83   3.160
               .92  10.770 |   1.92   9.540 |   2.92   4.410 |   3.92   3.000
              1.00  10.770 |   2.00   9.540 |   3.00   4.410 |   4.00   3.000

------------------------------------------------------------------------------
004:0003----------------------------------------------------------------------
*
*************************
*SITE 560 WINSTON CHURCHILL*
*************************
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS
---------------------
| CALIB STANDHYD     |   Area    (ha)=   11.69
```

```
| 01:002    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.52         1.17
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     135.63        27.75
               over (min)        1.00        13.00
     Storage Coeff.  (min)=       1.10 (ii)   12.88 (ii)
     Unit Hyd. Tpeak (min)=       1.00        13.00
     Unit Hyd. peak  (cms)=       1.02          .09
                                                      *TOTALS*
     PEAK FLOW       (cms)=       3.96          .06         3.984 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.52         1.333
     RUNOFF VOLUME    (mm)=      52.14        15.28        48.454
     TOTAL RAINFALL   (mm)=      54.14        54.14        54.140
     RUNOFF COEFFICIENT   =        .96          .28          .895

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0004----------------------------------------------------------------------
* SWM POND AREA
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .87
| 02:003    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .44          .44
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.00        10.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     135.63        41.68
               over (min)        1.00         5.00
     Storage Coeff.  (min)=        .91 (ii)    5.27 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.13          .22
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .16          .03          .194 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.38         1.333
     RUNOFF VOLUME    (mm)=      52.14        15.28        33.712
     TOTAL RAINFALL   (mm)=      54.14        54.14        54.140
     RUNOFF COEFFICIENT   =        .96          .28          .623

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```



```
--------------------------------------------------------------------------------
004:0005----------------------------------------------------------------------
* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .14
| 03:004    DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   25.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        10.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     135.63        41.68
               over (min)        1.00         5.00
     Storage Coeff.  (min)=       1.10 (ii)    5.46 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.02          .21
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .01          .01          .020 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.38         1.333
     RUNOFF VOLUME    (mm)=      52.14        15.28        24.497
     TOTAL RAINFALL   (mm)=      54.14        54.14        54.140
     RUNOFF COEFFICIENT   =        .96          .28          .452

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0006----------------------------------------------------------------------
* UNCONTROLLED AREA TO CHANNEL
----------------------
| CALIB NASHYD       |   Area    (ha)=     .23   Curve Number   (CN)=70.00
| 04:005    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .055

     PEAK FLOW       (cms)=     .013 (i)
     TIME TO PEAK    (hrs)=    1.467
     RUNOFF VOLUME    (mm)=   15.282
     TOTAL RAINFALL   (mm)=   54.140
     RUNOFF COEFFICIENT   =     .282

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0007----------------------------------------------------------------------
************************************************************
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
************************************************************
--------------------
```

ADD HYD (000300)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:002	11.69	3.984	1.33	48.45	.000
	+ID2 02:003	.87	.194	1.33	33.71	.000
	SUM 06:000300	12.56	4.178	1.33	47.43	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

004:0008
*STORMWATER MANAGEMENT FACILITY
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm

ROUTE RESERVOIR IN>06:(000300) OUT<07:(000200)	Requested routing time step = 1.0 min.

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.000	.0000E+00	.178	.6238E+00
.013	.7430E-01	.256	.7344E+00
.020	.1543E+00	.391	.9076E+00
.025	.2403E+00	2.321	.1028E+01
.029	.3146E+00	3.906	.1089E+01
.060	.4139E+00	5.775	.1152E+01
.112	.5169E+00	7.890	.1215E+01

ROUTING RESULTS	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW >06: (000300)	12.56	4.178	1.333	47.433
OUTFLOW<07: (000200)	12.56	.106	3.700	47.432

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.530
TIME SHIFT OF PEAK FLOW (min)= 142.00
MAXIMUM STORAGE USED (ha.m.)=.5045E+00

004:0009
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill

ADD HYD (000300)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 07:000200	12.56	.106	3.70	47.43	.000
	+ID2 03:004	.14	.020	1.33	24.50	.000
	SUM 08:000300	12.70	.107	3.67	47.18	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

004:0010

004:0002
004:0002
004:0002
** END OF RUN : 4

START	Project dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
	Rainfall dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\

TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 005
NSTORM= 1
# 1=CHIC25YR.STM

005:0002
*#
*
*# Project Name: 560 Winston Churchill Blvd., Oakville
*# Project Number: 1870
*# Date : DECEMBER 15, 2020
*# Revised : SEPTEMBER 22, 2020
*# Modeller : JMN
*# Company : a.m. candaras associates inc.
*# License # : 3813174
*#
*
005:0002
*

READ STORM	Filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\187
Ptotal= 62.16 mm	Comments: *BLOOR ST STAT DATA 10 MIN DISCRITIZATIO

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	4.040	1.08	27.240	2.08	9.030	3.08	4.800
.17	4.040	1.17	27.240	2.17	9.030	3.17	4.800
.25	4.590	1.25	159.940	2.25	7.790	3.25	4.480
.33	4.590	1.33	159.940	2.33	7.790	3.33	4.480
.42	5.340	1.42	35.500	2.42	6.880	3.42	4.200
.50	5.340	1.50	35.500	2.50	6.880	3.50	4.200
.58	6.460	1.58	19.320	2.58	6.190	3.58	3.960
.67	6.460	1.67	19.320	2.67	6.190	3.67	3.960
.75	8.320	1.75	13.740	2.75	5.630	3.75	3.750
.83	8.320	1.83	13.740	2.83	5.630	3.83	3.750
.92	12.160	1.92	10.840	2.92	5.180	3.92	3.570
1.00	12.160	2.00	10.840	3.00	5.180	4.00	3.570

```
005:0003-------------------------------------------------------------------------
*
*************************
*SITE 560 WINSTON CHURCHILL*
*************************
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS
---------------------
| CALIB STANDHYD     |   Area    (ha)=   11.69
| 01:002    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
---------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.52         1.17
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        40.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.94        41.33
               over (min)        1.00        11.00
     Storage Coeff.  (min)=       1.03 (ii)   11.08 (ii)
     Unit Hyd. Tpeak (min)=       1.00        11.00
     Unit Hyd. peak  (cms)=       1.06          .10
                                                      *TOTALS*
     PEAK FLOW       (cms)=       4.67          .08         4.713 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.48         1.333
     RUNOFF VOLUME    (mm)=      60.16        19.68        56.110
     TOTAL RAINFALL   (mm)=      62.16        62.16        62.158
     RUNOFF COEFFICIENT   =        .97          .32          .903

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
005:0004-------------------------------------------------------------------------
* SWM POND AREA
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .87
| 02:003    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
---------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .44          .44
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.00        10.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.94        56.01
               over (min)        1.00         5.00
     Storage Coeff.  (min)=        .85 (ii)    4.73 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.17          .23
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .19          .05          .236 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.37         1.333
```



```
     RUNOFF VOLUME    (mm)=      60.16        19.68        39.919
     TOTAL RAINFALL   (mm)=      62.16        62.16        62.158
     RUNOFF COEFFICIENT   =        .97          .32          .642

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
005:0005-------------------------------------------------------------------------
* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .14
| 03:004    DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   25.00
---------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        10.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.94        56.01
               over (min)        1.00         5.00
     Storage Coeff.  (min)=       1.03 (ii)    4.90 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.06          .23
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .02          .01          .026 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.37         1.333
     RUNOFF VOLUME    (mm)=      60.16        19.68        29.799
     TOTAL RAINFALL   (mm)=      62.16        62.16        62.158
     RUNOFF COEFFICIENT   =        .97          .32          .479

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
005:0006-------------------------------------------------------------------------
* UNCONTROLLED AREA TO CHANNEL
---------------------
| CALIB NASHYD       |   Area    (ha)=     .23   Curve Number   (CN)=70.00
| 04:005    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .055

     PEAK FLOW       (cms)=     .017 (i)
     TIME TO PEAK    (hrs)=    1.467
     RUNOFF VOLUME    (mm)=   19.678
     TOTAL RAINFALL   (mm)=   62.158
     RUNOFF COEFFICIENT   =     .317
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
------------------------------------------------------------------------------
005:0007------------------------------------------------------------------------
*********************************************************
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
*********************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                  ID1 01:002       11.69    4.713    1.33  56.11    .000
                 +ID2 02:003         .87     .236    1.33  39.92    .000
                  ==========================================================
                  SUM 06:000300    12.56    4.949    1.33  54.99    .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
------------------------------------------------------------------------------
005:0008------------------------------------------------------------------------
*********************************************
*STORMWATER MANAGEMENT FACILITY
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm
*********************************************
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(000300)   |
| OUT<07:(000200)   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                          .000  .0000E+00   |     .178  .6238E+00
                          .013  .7430E-01   |     .256  .7344E+00
                          .020  .1543E+00   |     .391  .9076E+00
                          .025  .2403E+00   |    2.321  .1028E+01
                          .029  .3146E+00   |    3.906  .1089E+01
                          .060  .4139E+00   |    5.775  .1152E+01
                          .112  .5169E+00   |    7.890  .1215E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------         (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (000300)      12.56     4.949     1.333     54.989
     OUTFLOW<07: (000200)      12.56      .143     3.350     54.988

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    2.891
                  TIME SHIFT OF PEAK FLOW         (min)=   121.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.5671E+00

------------------------------------------------------------------------------
005:0009------------------------------------------------------------------------
*************************************************************
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill
*************************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                  ID1 07:000200    12.56     .143    3.35  54.99    .000
```



```
                 +ID2 03:004         .14     .026    1.33  29.80    .000
                  ==========================================================
                  SUM 08:000300    12.70     .144    3.33  54.71    .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
------------------------------------------------------------------------------
005:0010------------------------------------------------------------------------
*************************************************************
------------------------------------------------------------------------------
005:0002------------------------------------------------------------------------
------------------------------------------------------------------------------
005:0002------------------------------------------------------------------------
------------------------------------------------------------------------------
005:0002------------------------------------------------------------------------
------------------------------------------------------------------------------
005:0002------------------------------------------------------------------------
  ** END OF RUN :   5

********************************************************************************
```

```
--------------------
| START             |  Project  dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
--------------------  Rainfall dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 006
    NSTORM=   1
           #  1=CH100YR.STM
------------------------------------------------------------------------------
006:0002------------------------------------------------------------------------
*#**************************************************************************
*
*#  Project Name: 560 Winston Churchill Blvd., Oakville
*#  Project Number: 1870
*#  Date        : DECEMBER 15, 2020
*#  Revised     : SEPTEMBER 22, 2020
*#  Modeller    : JMN
*#  Company     : a.m. candaras associates inc.
*#  License #   : 3813174
*#**************************************************************************
*
------------------------------------------------------------------------------
006:0002------------------------------------------------------------------------
*
--------------------
| READ STORM        |    Filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\187
| Ptotal=  78.03 mm|    Comments: *BLOOR ST STAT DATA 10 MIN DISCRITIZATIO
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   4.310 |   1.08  38.040 |   2.08  10.640 |   3.08   5.210
               .17   4.310 |   1.17  38.040 |   2.17  10.640 |   3.17   5.210
               .25   4.960 |   1.25 203.310 |   2.25   8.990 |   3.25   4.830
```

```
              .33   4.960 |   1.33 203.310 |   2.33   8.990 |   3.33   4.830
              .42   5.880 |   1.42  51.040 |   2.42   7.810 |   3.42   4.500
              .50   5.880 |   1.50  51.040 |   2.50   7.810 |   3.50   4.500
              .58   7.270 |   1.58  25.590 |   2.58   6.920 |   3.58   4.220
              .67   7.270 |   1.67  25.590 |   2.67   6.920 |   3.67   4.220
              .75   9.690 |   1.75  17.240 |   2.75   6.230 |   3.75   3.970
              .83   9.690 |   1.83  17.240 |   2.83   6.230 |   3.83   3.970
              .92  15.000 |   1.92  13.110 |   2.92   5.670 |   3.92   3.760
             1.00  15.000 |   2.00  13.110 |   3.00   5.670 |   4.00   3.760

--------------------------------------------------------------------------------
006:0003----------------------------------------------------------------------
*
**************************
*SITE 560 WINSTON CHURCHILL*
**************************
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS
----------------------
| CALIB STANDHYD     |   Area    (ha)=   11.69
| 01:002    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.52         1.17
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        40.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=     203.31        72.73
               over (min)        1.00         9.00
     Storage Coeff.  (min)=        .93 (ii)    8.95 (ii)
     Unit Hyd. Tpeak (min)=       1.00         9.00
     Unit Hyd. peak  (cms)=       1.12          .13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       5.94          .15         6.032 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.45         1.333
     RUNOFF VOLUME    (mm)=      76.03        29.32        71.361
     TOTAL RAINFALL   (mm)=      78.03        78.03        78.032
     RUNOFF COEFFICIENT   =        .97          .38          .915

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
006:0004----------------------------------------------------------------------
* SWM POND AREA
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .87
| 02:003    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .44          .44
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
```



```
     Length            (m)=      22.00        10.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=     203.31        88.72
               over (min)        1.00         4.00
     Storage Coeff.  (min)=        .78 (ii)    4.00 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.23          .28
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .25          .08          .323 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.35         1.333
     RUNOFF VOLUME    (mm)=      76.03        29.32        52.678
     TOTAL RAINFALL   (mm)=      78.03        78.03        78.032
     RUNOFF COEFFICIENT   =        .97          .38          .675

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
006:0005----------------------------------------------------------------------
* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .14
| 03:004    DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   25.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        10.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=     203.31        88.72
               over (min)        1.00         4.00
     Storage Coeff.  (min)=        .93 (ii)    4.16 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.12          .28
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .02          .02          .038 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.35         1.333
     RUNOFF VOLUME    (mm)=      76.03        29.32        41.000
     TOTAL RAINFALL   (mm)=      78.03        78.03        78.032
     RUNOFF COEFFICIENT   =        .97          .38          .525

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
006:0006----------------------------------------------------------------------
* UNCONTROLLED AREA TO CHANNEL
----------------------
| CALIB NASHYD       |   Area    (ha)=     .23   Curve Number   (CN)=70.00
```

```
| 04:005    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .055

     PEAK FLOW       (cms)=     .027 (i)
     TIME TO PEAK    (hrs)=    1.467
     RUNOFF VOLUME    (mm)=   29.322
     TOTAL RAINFALL   (mm)=   78.032
     RUNOFF COEFFICIENT   =     .376

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
006:0007----------------------------------------------------------------------
**********************************************************
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
**********************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 01:002       11.69    6.032    1.33  71.36    .000
                +ID2 02:003         .87     .323    1.33  52.68    .000
                 ============================================================
                 SUM 06:000300    12.56    6.355    1.33  70.07    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
006:0008----------------------------------------------------------------------
**********************************************
*STORMWATER MANAGEMENT FACILITY
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm
**********************************************
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(000300)   |
| OUT<07:(000200)   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .178  .6238E+00
                           .013  .7430E-01   |     .256  .7344E+00
                           .020  .1543E+00   |     .391  .9076E+00
                           .025  .2403E+00   |    2.321  .1028E+01
                           .029  .3146E+00   |    3.906  .1089E+01
                           .060  .4139E+00   |    5.775  .1152E+01
                           .112  .5169E+00   |    7.890  .1215E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (000300)      12.56     6.355     1.333     70.067
     OUTFLOW<07: (000200)      12.56      .231     2.667     70.064

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    3.637
                  TIME SHIFT OF PEAK FLOW         (min)=    80.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.6990E+00
```



```
--------------------------------------------------------------------------------
006:0009----------------------------------------------------------------------
**********************************************************
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill
**********************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 07:000200    12.56     .231    2.67  70.06    .000
                +ID2 03:004         .14     .038    1.33  41.00    .000
                 ============================================================
                 SUM 08:000300    12.70     .233    2.53  69.74    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
006:0010----------------------------------------------------------------------
**********************************************************************
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
  ** END OF RUN :   6

********************************************************************************




--------------------
| START            |  Project  dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
--------------------  Rainfall dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 007
    NSTORM=   1
           #  1=2Y24HS.STM
--------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
*#*****************************************************************************
*
*#  Project Name: 560 Winston Churchill Blvd., Oakville
*#  Project Number: 1870
*#  Date        : DECEMBER 15, 2020
*#  Revised     : SEPTEMBER 22, 2020
*#  Modeller    : JMN
*#  Company     : a.m. candaras associates inc.
*#  License #   : 3813174
*#*****************************************************************************
```

```
*
------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\187
| Ptotal=  51.39 mm|    Comments: * 2YR SCS 24hr STORM, 15min TIME STEPS,M
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.25	.570	6.25	1.030	12.25	7.400	18.25	.920
.50	.570	6.50	1.030	12.50	7.400	18.50	.920
.75	.570	6.75	1.030	12.75	3.800	18.75	.920
1.00	.570	7.00	1.030	13.00	3.800	19.00	.920
1.25	.570	7.25	1.030	13.25	.720	19.25	.920
1.50	.570	7.50	1.030	13.50	.720	19.50	.920
1.75	.570	7.75	1.030	13.75	4.210	19.75	.920
2.00	.570	8.00	1.030	14.00	4.210	20.00	.920
2.25	.670	8.25	1.390	14.25	1.540	20.25	.620
2.50	.670	8.50	1.390	14.50	1.540	20.50	.620
2.75	.670	8.75	1.390	14.75	1.540	20.75	.620
3.00	.670	9.00	1.390	15.00	1.540	21.00	.620
3.25	.670	9.25	1.640	15.25	1.540	21.25	.620
3.50	.670	9.50	1.640	15.50	1.540	21.50	.620
3.75	.670	9.75	1.850	15.75	1.540	21.75	.620
4.00	.670	10.00	1.850	16.00	1.540	22.00	.620
4.25	.820	10.25	2.360	16.25	.920	22.25	.620
4.50	.820	10.50	2.360	16.50	.920	22.50	.620
4.75	.820	10.75	3.190	16.75	.920	22.75	.620
5.00	.820	11.00	3.190	17.00	.920	23.00	.620
5.25	.820	11.25	4.930	17.25	.920	23.25	.620
5.50	.820	11.50	4.930	17.50	.920	23.50	.620
5.75	.820	11.75	21.380	17.75	.920	23.75	.620
6.00	.820	12.00	56.730	18.00	.920	24.00	.620

```
------------------------------------------------------------------------------
007:0003----------------------------------------------------------------------
*
**************************
*SITE 560 WINSTON CHURCHILL*
**************************
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS
----------------------
| CALIB STANDHYD     |   Area    (ha)=   11.69
| 01:002    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.52         1.17
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        40.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      56.73        16.57
               over (min)        2.00        16.00
     Storage Coeff.  (min)=       1.56 (ii)   16.04 (ii)
     Unit Hyd. Tpeak (min)=       2.00        16.00
```



```
     Unit Hyd. peak  (cms)=        .65          .07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.66          .03          1.680 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.17         12.000
     RUNOFF VOLUME    (mm)=      49.39        13.86         45.835
     TOTAL RAINFALL   (mm)=      51.39        51.39         51.388
     RUNOFF COEFFICIENT   =        .96          .27           .892

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
007:0004----------------------------------------------------------------------
* SWM POND AREA
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .87
| 02:003    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .44          .44
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.00        10.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      56.73        19.62
               over (min)        1.00         7.00
     Storage Coeff.  (min)=       1.29 (ii)    7.19 (ii)
     Unit Hyd. Tpeak (min)=       1.00         7.00
     Unit Hyd. peak  (cms)=        .92          .16
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .07          .02           .086 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.03         12.000
     RUNOFF VOLUME    (mm)=      49.39        13.86         31.624
     TOTAL RAINFALL   (mm)=      51.39        51.39         51.388
     RUNOFF COEFFICIENT   =        .96          .27           .615

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
007:0005----------------------------------------------------------------------
* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .14
| 03:004    DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   25.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        10.00
```

```
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      56.73        19.62
               over (min)        2.00         7.00
     Storage Coeff.  (min)=       1.56 (ii)    7.45 (ii)
     Unit Hyd. Tpeak (min)=       2.00         7.00
     Unit Hyd. peak  (cms)=        .65          .16
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .010 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.03         12.000
     RUNOFF VOLUME    (mm)=      49.39        13.86         22.743
     TOTAL RAINFALL   (mm)=      51.39        51.39         51.388
     RUNOFF COEFFICIENT   =        .96          .27           .443

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
007:0006----------------------------------------------------------------------
* UNCONTROLLED AREA TO CHANNEL
----------------------
| CALIB NASHYD       |   Area    (ha)=     .23   Curve Number   (CN)=70.00
| 04:005    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .055

     PEAK FLOW       (cms)=     .009 (i)
     TIME TO PEAK    (hrs)=   12.067
     RUNOFF VOLUME    (mm)=   13.859
     TOTAL RAINFALL   (mm)=   51.388
     RUNOFF COEFFICIENT   =     .270

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
007:0007----------------------------------------------------------------------
************************************************************
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
************************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 01:002       11.69    1.680   12.00  45.83    .000
                +ID2 02:003         .87     .086   12.00  31.62    .000
                 ==========================================================
                 SUM 06:000300    12.56    1.767   12.00  44.85    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
007:0008----------------------------------------------------------------------
*********************************************
*STORMWATER MANAGEMENT FACILITY
```



```
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm
*********************************************
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(000300)   |
| OUT<07:(000200)   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .178  .6238E+00
                           .013  .7430E-01   |     .256  .7344E+00
                           .020  .1543E+00   |     .391  .9076E+00
                           .025  .2403E+00   |    2.321  .1028E+01
                           .029  .3146E+00   |    3.906  .1089E+01
                           .060  .4139E+00   |    5.775  .1152E+01
                           .112  .5169E+00   |    7.890  .1215E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (000300)      12.56     1.767    12.000     44.851
     OUTFLOW<07: (000200)      12.56      .054    14.133     44.850

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    3.072
                  TIME SHIFT OF PEAK FLOW         (min)=   128.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.3958E+00

--------------------------------------------------------------------------------
007:0009----------------------------------------------------------------------
************************************************************
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill
************************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 07:000200    12.56     .054   14.13  44.85    .000
                +ID2 03:004         .14     .010   12.00  22.74    .000
                 ==========================================================
                 SUM 08:000300    12.70     .055   14.02  44.61    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
007:0010----------------------------------------------------------------------
************************************************************
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007:0002----------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
  ** END OF RUN :   7
```

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*******************************************************************************



--------------------
| START            |  Project  dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
--------------------  Rainfall dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 008
    NSTORM=   1
           #  1=5Y24HS.STM
-------------------------------------------------------------------------------
008:0002-------------------------------------------------------------------------
*#*****************************************************************************
*
*#  Project Name: 560 Winston Churchill Blvd., Oakville
*#  Project Number: 1870
*#  Date        : DECEMBER 15, 2020
*#  Revised     : SEPTEMBER 22, 2020
*#  Modeller    : JMN
*#  Company     : a.m. candaras associates inc.
*#  License #   : 3813174
*#*****************************************************************************
*
-------------------------------------------------------------------------------
008:0002-------------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\187
| Ptotal=  63.89 mm|    Comments: * 5 YEAR SCS 24hr STORM, 15 min TIME STE
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .25    .700 |   6.25   1.280 |  12.25   9.200 |  18.25   1.150
               .50    .700 |   6.50   1.280 |  12.50   9.200 |  18.50   1.150
               .75    .700 |   6.75   1.280 |  12.75   4.730 |  18.75   1.150
              1.00    .700 |   7.00   1.280 |  13.00   4.730 |  19.00   1.150
              1.25    .700 |   7.25   1.280 |  13.25    .890 |  19.25   1.150
              1.50    .700 |   7.50   1.280 |  13.50    .890 |  19.50   1.150
              1.75    .700 |   7.75   1.280 |  13.75   5.240 |  19.75   1.150
              2.00    .700 |   8.00   1.280 |  14.00   5.240 |  20.00   1.150
              2.25    .830 |   8.25   1.720 |  14.25   1.920 |  20.25    .770
              2.50    .830 |   8.50   1.720 |  14.50   1.920 |  20.50    .770
              2.75    .830 |   8.75   1.720 |  14.75   1.920 |  20.75    .770
              3.00    .830 |   9.00   1.720 |  15.00   1.920 |  21.00    .770
              3.25    .830 |   9.25   2.040 |  15.25   1.920 |  21.25    .770
              3.50    .830 |   9.50   2.040 |  15.50   1.920 |  21.50    .770
              3.75    .830 |   9.75   2.300 |  15.75   1.920 |  21.75    .770
              4.00    .830 |  10.00   2.300 |  16.00   1.920 |  22.00    .770
              4.25   1.020 |  10.25   2.940 |  16.25   1.150 |  22.25    .770
              4.50   1.020 |  10.50   2.940 |  16.50   1.150 |  22.50    .770
              4.75   1.020 |  10.75   3.960 |  16.75   1.150 |  22.75    .770
              5.00   1.020 |  11.00   3.960 |  17.00   1.150 |  23.00    .770
              5.25   1.020 |  11.25   6.130 |  17.25   1.150 |  23.25    .770
```



```
              5.50   1.020 |  11.50   6.130 |  17.50   1.150 |  23.50    .770
              5.75   1.020 |  11.75  26.580 |  17.75   1.150 |  23.75    .770
              6.00   1.020 |  12.00  70.530 |  18.00   1.150 |  24.00    .770

-------------------------------------------------------------------------------
008:0003-------------------------------------------------------------------------
*
*************************
*SITE 560 WINSTON CHURCHILL*
*************************
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS
----------------------
| CALIB STANDHYD     |   Area    (ha)=   11.69
| 01:002    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.52         1.17
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        40.00
     Mannings n             =     .013         .250

     Max.eff.Inten.(mm/hr)=      70.53        26.86
               over (min)        1.00        13.00
     Storage Coeff.  (min)=       1.43 (ii)   13.37 (ii)
     Unit Hyd. Tpeak (min)=       1.00        13.00
     Unit Hyd. peak  (cms)=        .86          .09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.06          .05          2.105 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.12         12.000
     RUNOFF VOLUME    (mm)=      61.89        20.67         57.771
     TOTAL RAINFALL   (mm)=      63.89        63.89         63.892
     RUNOFF COEFFICIENT   =        .97          .32           .904

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
008:0004-------------------------------------------------------------------------
* SWM POND AREA
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .87
| 02:003    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .44          .44
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.00        10.00
     Mannings n             =     .013         .250

     Max.eff.Inten.(mm/hr)=      70.53        29.45
               over (min)        1.00         6.00
     Storage Coeff.  (min)=       1.18 (ii)    6.19 (ii)
```

```
     Unit Hyd. Tpeak (min)=       1.00         6.00
     Unit Hyd. peak  (cms)=        .97          .18
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .09          .03          .114 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.02        12.000
     RUNOFF VOLUME    (mm)=      61.89        20.67        41.284
     TOTAL RAINFALL   (mm)=      63.89        63.89        63.892
     RUNOFF COEFFICIENT   =        .97          .32          .646

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
008:0005----------------------------------------------------------------------
* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .14
| 03:004    DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   25.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        10.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      70.53        29.45
               over (min)        1.00         6.00
     Storage Coeff.  (min)=      1.43 (ii)    6.44 (ii)
     Unit Hyd. Tpeak (min)=      1.00         6.00
     Unit Hyd. peak  (cms)=       .86          .18
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .01          .01          .014 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.02        12.000
     RUNOFF VOLUME    (mm)=      61.89        20.67        30.979
     TOTAL RAINFALL   (mm)=      63.89        63.89        63.892
     RUNOFF COEFFICIENT   =        .97          .32          .485

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
008:0006----------------------------------------------------------------------
* UNCONTROLLED AREA TO CHANNEL
----------------------
| CALIB NASHYD       |   Area    (ha)=     .23   Curve Number   (CN)=70.00
| 04:005    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .055

     PEAK FLOW       (cms)=     .013 (i)
```



```
     TIME TO PEAK    (hrs)=   12.067
     RUNOFF VOLUME    (mm)=   20.674
     TOTAL RAINFALL   (mm)=   63.892
     RUNOFF COEFFICIENT   =     .324

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
008:0007----------------------------------------------------------------------
*********************************************************
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
*********************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.      DWF
--------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                  ID1 01:002       11.69    2.105   12.00  57.77    .000
                 +ID2 02:003         .87     .114   12.00  41.28    .000
                  ===================================================
                  SUM 06:000300    12.56    2.219   12.00  56.63    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
008:0008----------------------------------------------------------------------
*********************************************
*STORMWATER MANAGEMENT FACILITY
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm
*********************************************
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(000300)   |
| OUT<07:(000200)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .178  .6238E+00
                            .013  .7430E-01   |     .256  .7344E+00
                            .020  .1543E+00   |     .391  .9076E+00
                            .025  .2403E+00   |    2.321  .1028E+01
                            .029  .3146E+00   |    3.906  .1089E+01
                            .060  .4139E+00   |    5.775  .1152E+01
                            .112  .5169E+00   |    7.890  .1215E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (000300)      12.56     2.219    12.000     56.629
     OUTFLOW<07: (000200)      12.56      .094    14.033     56.626

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    4.228
                  TIME SHIFT OF PEAK FLOW         (min)=   122.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.4810E+00

--------------------------------------------------------------------------------
008:0009----------------------------------------------------------------------
*************************************************************
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill
```

```
************************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
                  ID1 07:000200    12.56     .094   14.03  56.63    .000
                 +ID2 03:004         .14     .014   12.00  30.98    .000
                  ========================================================
                  SUM 08:000300    12.70     .095   14.00  56.34    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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008:0010----------------------------------------------------------------------
************************************************************
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008:0002----------------------------------------------------------------------
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008:0002----------------------------------------------------------------------
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008:0002----------------------------------------------------------------------
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008:0002----------------------------------------------------------------------
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008:0002----------------------------------------------------------------------
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008:0002----------------------------------------------------------------------
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008:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
008:0002----------------------------------------------------------------------
  ** END OF RUN :   8

********************************************************************************




--------------------
| START            |  Project  dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
--------------------  Rainfall dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 009
    NSTORM=   1
           #  1=10Y24HS.STM
--------------------------------------------------------------------------------
009:0002----------------------------------------------------------------------
*#*****************************************************************************
*
*#  Project Name: 560 Winston Churchill Blvd., Oakville
*#  Project Number: 1870
*#  Date        : DECEMBER 15, 2020
*#  Revised     : SEPTEMBER 22, 2020
*#  Modeller    : JMN
*#  Company     : a.m. candaras associates inc.
*#  License #   : 3813174
*#*****************************************************************************
*
--------------------------------------------------------------------------------
```



```
009:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\187
| Ptotal=  72.94 mm|    Comments: * 10 YEAR SCS 24hr STORM, 15 min TIME ST
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.25	.800	6.25	1.460	12.25	10.500	18.25	1.310
.50	.800	6.50	1.460	12.50	10.500	18.50	1.310
.75	.800	6.75	1.460	12.75	5.400	18.75	1.310
1.00	.800	7.00	1.460	13.00	5.400	19.00	1.310
1.25	.800	7.25	1.460	13.25	1.020	19.25	1.310
1.50	.800	7.50	1.460	13.50	1.020	19.50	1.310
1.75	.800	7.75	1.460	13.75	5.980	19.75	1.310
2.00	.800	8.00	1.460	14.00	5.980	20.00	1.310
2.25	.950	8.25	1.970	14.25	2.190	20.25	.880
2.50	.950	8.50	1.970	14.50	2.190	20.50	.880
2.75	.950	8.75	1.970	14.75	2.190	20.75	.880
3.00	.950	9.00	1.970	15.00	2.190	21.00	.880
3.25	.950	9.25	2.330	15.25	2.190	21.25	.880
3.50	.950	9.50	2.330	15.50	2.190	21.50	.880
3.75	.950	9.75	2.630	15.75	2.190	21.75	.880
4.00	.950	10.00	2.630	16.00	2.190	22.00	.880
4.25	1.170	10.25	3.350	16.25	1.310	22.25	.880
4.50	1.170	10.50	3.350	16.50	1.310	22.50	.880
4.75	1.170	10.75	4.520	16.75	1.310	22.75	.880
5.00	1.170	11.00	4.520	17.00	1.310	23.00	.880
5.25	1.170	11.25	7.000	17.25	1.310	23.25	.880
5.50	1.170	11.50	7.000	17.50	1.310	23.50	.880
5.75	1.170	11.75	30.330	17.75	1.310	23.75	.880
6.00	1.170	12.00	80.500	18.00	1.310	24.00	.880

```
--------------------------------------------------------------------------------
009:0003----------------------------------------------------------------------
*
*************************
*SITE 560 WINSTON CHURCHILL*
*************************
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS
----------------------
| CALIB STANDHYD     |   Area    (ha)=   11.69
| 01:002    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.52          1.17
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      30.00         40.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=      80.50         34.46
               over (min)        1.00         12.00
     Storage Coeff.  (min)=       1.35 (ii)    12.16 (ii)
     Unit Hyd. Tpeak (min)=       1.00         12.00
     Unit Hyd. peak  (cms)=        .89           .09
                                                      *TOTALS*
```

```
     PEAK FLOW       (cms)=       2.35          .07          2.414 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.10         12.000
     RUNOFF VOLUME    (mm)=      70.94        26.10         66.459
     TOTAL RAINFALL   (mm)=      72.94        72.94         72.942
     RUNOFF COEFFICIENT   =        .97          .36           .911

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
009:0004----------------------------------------------------------------------
* SWM POND AREA
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .87
| 02:003    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .44          .44
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.00        10.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      80.50        37.03
               over (min)        1.00         6.00
     Storage Coeff.  (min)=       1.12 (ii)    5.69 (ii)
     Unit Hyd. Tpeak (min)=       1.00         6.00
     Unit Hyd. peak  (cms)=       1.00          .20
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .10          .04           .134 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.02         12.000
     RUNOFF VOLUME    (mm)=      70.94        26.11         48.526
     TOTAL RAINFALL   (mm)=      72.94        72.94         72.942
     RUNOFF COEFFICIENT   =        .97          .36           .665

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
009:0005----------------------------------------------------------------------
* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .14
| 03:004    DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   25.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        10.00
     Mannings n            =       .013         .250
```



```
     Max.eff.Inten.(mm/hr)=      80.50        37.03
               over (min)        1.00         6.00
     Storage Coeff.  (min)=       1.35 (ii)    5.92 (ii)
     Unit Hyd. Tpeak (min)=       1.00         6.00
     Unit Hyd. peak  (cms)=        .89          .19
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .01          .01           .017 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.02         12.000
     RUNOFF VOLUME    (mm)=      70.94        26.11         37.317
     TOTAL RAINFALL   (mm)=      72.94        72.94         72.942
     RUNOFF COEFFICIENT   =        .97          .36           .512

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
009:0006----------------------------------------------------------------------
* UNCONTROLLED AREA TO CHANNEL
----------------------
| CALIB NASHYD       |   Area    (ha)=     .23   Curve Number   (CN)=70.00
| 04:005    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .055

     PEAK FLOW       (cms)=     .016 (i)
     TIME TO PEAK    (hrs)=   12.067
     RUNOFF VOLUME    (mm)=   26.108
     TOTAL RAINFALL   (mm)=   72.942
     RUNOFF COEFFICIENT   =     .358

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
009:0007----------------------------------------------------------------------
*********************************************************
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
*********************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.      DWF
--------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                ID1 01:002       11.69    2.414   12.00  66.46    .000
               +ID2 02:003         .87     .134   12.00  48.53    .000
                ==========================================================
                SUM 06:000300    12.56    2.548   12.00  65.22    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
009:0008----------------------------------------------------------------------
*********************************************
*STORMWATER MANAGEMENT FACILITY
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm
```

```
*********************************************
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(000300)   |
| OUT<07:(000200)   |    =========  OUTFLOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .178  .6238E+00
                           .013  .7430E-01   |     .256  .7344E+00
                           .020  .1543E+00   |     .391  .9076E+00
                           .025  .2403E+00   |    2.321  .1028E+01
                           .029  .3146E+00   |    3.906  .1089E+01
                           .060  .4139E+00   |    5.775  .1152E+01
                           .112  .5169E+00   |    7.890  .1215E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------         (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (000300)      12.56     2.548    12.000     65.216
     OUTFLOW<07: (000200)      12.56      .127    13.017     65.214

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    4.997
                  TIME SHIFT OF PEAK FLOW         (min)=    61.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.5417E+00

------------------------------------------------------------------------------
009:0009----------------------------------------------------------------------
**************************************************************
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill
**************************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
-------------------- ------------  (ha)     (cms)   (hrs)   (mm)   (cms)
                ID1 07:000200    12.56     .127   13.02  65.21    .000
               +ID2 03:004         .14     .017   12.00  37.32    .000
                ==========================================================
                SUM 08:000300    12.70     .129   13.00  64.91    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
009:0010----------------------------------------------------------------------
**************************************************************
------------------------------------------------------------------------------
009:0002----------------------------------------------------------------------
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009:0002----------------------------------------------------------------------
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009:0002----------------------------------------------------------------------
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009:0002----------------------------------------------------------------------
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009:0002----------------------------------------------------------------------
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009:0002----------------------------------------------------------------------
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009:0002----------------------------------------------------------------------
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009:0002----------------------------------------------------------------------
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```
009:0002----------------------------------------------------------------------
  ** END OF RUN :   9

******************************************************************************




--------------------
| START            |  Project  dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
--------------------  Rainfall dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 010
    NSTORM=   1
           #  1=25Y24HS.STM
------------------------------------------------------------------------------
010:0002----------------------------------------------------------------------
*#**************************************************************************
*
*#  Project Name: 560 Winston Churchill Blvd., Oakville
*#  Project Number: 1870
*#  Date        : DECEMBER 15, 2020
*#  Revised     : SEPTEMBER 22, 2020
*#  Modeller    : JMN
*#  Company     : a.m. candaras associates inc.
*#  License #   : 3813174
*#**************************************************************************
*
------------------------------------------------------------------------------
010:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\187
| Ptotal=  85.25 mm|    Comments: * 25 YEAR SCS 24hr STORM, 15 min TIME ST
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .25    .940 |   6.25   1.710 |  12.25  12.280 |  18.25   1.530
               .50    .940 |   6.50   1.710 |  12.50  12.280 |  18.50   1.530
               .75    .940 |   6.75   1.710 |  12.75   6.310 |  18.75   1.530
              1.00    .940 |   7.00   1.710 |  13.00   6.310 |  19.00   1.530
              1.25    .940 |   7.25   1.710 |  13.25   1.190 |  19.25   1.530
              1.50    .940 |   7.50   1.710 |  13.50   1.190 |  19.50   1.530
              1.75    .940 |   7.75   1.710 |  13.75   6.990 |  19.75   1.530
              2.00    .940 |   8.00   1.710 |  14.00   6.990 |  20.00   1.530
              2.25   1.110 |   8.25   2.300 |  14.25   2.560 |  20.25   1.020
              2.50   1.110 |   8.50   2.300 |  14.50   2.560 |  20.50   1.020
              2.75   1.110 |   8.75   2.300 |  14.75   2.560 |  20.75   1.020
              3.00   1.110 |   9.00   2.300 |  15.00   2.560 |  21.00   1.020
              3.25   1.110 |   9.25   2.730 |  15.25   2.560 |  21.25   1.020
              3.50   1.110 |   9.50   2.730 |  15.50   2.560 |  21.50   1.020
              3.75   1.110 |   9.75   3.070 |  15.75   2.560 |  21.75   1.020
              4.00   1.110 |  10.00   3.070 |  16.00   2.560 |  22.00   1.020
              4.25   1.360 |  10.25   3.920 |  16.25   1.530 |  22.25   1.020
              4.50   1.360 |  10.50   3.920 |  16.50   1.530 |  22.50   1.020
              4.75   1.360 |  10.75   5.290 |  16.75   1.530 |  22.75   1.020
```

5.00	1.360	11.00	5.290	17.00	1.530	23.00	1.020
5.25	1.360	11.25	8.190	17.25	1.530	23.25	1.020
5.50	1.360	11.50	8.190	17.50	1.530	23.50	1.020
5.75	1.360	11.75	35.470	17.75	1.530	23.75	1.020
6.00	1.360	12.00	94.140	18.00	1.530	24.00	1.020

010:0003----------
*
****
SITE 560 WINSTON CHURCHILL
****
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS

CALIB STANDHYD	Area (ha)= 11.69
01:002 DT= 1.00	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	10.52	1.17	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	30.00	40.00	
Mannings n	=	.013	.250	
Max.eff.Inten.(mm/hr)=		94.14	45.55	
over (min)		1.00	11.00	
Storage Coeff. (min)=		1.27 (ii)	10.94 (ii)	
Unit Hyd. Tpeak (min)=		1.00	11.00	
Unit Hyd. peak (cms)=		.93	.10	
				TOTALS
PEAK FLOW	(cms)=	2.75	.10	2.840 (iii)
TIME TO PEAK	(hrs)=	12.00	12.08	12.000
RUNOFF VOLUME	(mm)=	83.24	34.05	78.329
TOTAL RAINFALL	(mm)=	85.25	85.25	85.248
RUNOFF COEFFICIENT	=	.98	.40	.919

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

010:0004----------
* SWM POND AREA

CALIB STANDHYD	Area (ha)= .87
02:003 DT= 1.00	Total Imp(%)= 50.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	.44	.44
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	22.00	10.00
Mannings n	=	.013	.250
Max.eff.Inten.(mm/hr)=		94.14	48.55

over (min)		1.00	5.00
Storage Coeff. (min)=		1.06 (ii)	5.16 (ii)
Unit Hyd. Tpeak (min)=		1.00	5.00
Unit Hyd. peak (cms)=		1.04	.22
			TOTALS
PEAK FLOW	(cms)=	.11	.05 .164 (iii)
TIME TO PEAK	(hrs)=	12.00	12.02 12.000
RUNOFF VOLUME	(mm)=	83.25	34.05 58.651
TOTAL RAINFALL	(mm)=	85.25	85.25 85.248
RUNOFF COEFFICIENT	=	.98	.40 .688

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

010:0005----------
* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD

CALIB STANDHYD	Area (ha)= .14
03:004 DT= 1.00	Total Imp(%)= 25.00 Dir. Conn.(%)= 25.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.04	.10	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	30.00	10.00	
Mannings n	=	.013	.250	
Max.eff.Inten.(mm/hr)=		94.14	48.55	
over (min)		1.00	5.00	
Storage Coeff. (min)=		1.27 (ii)	5.37 (ii)	
Unit Hyd. Tpeak (min)=		1.00	5.00	
Unit Hyd. peak (cms)=		.93	.22	
				TOTALS
PEAK FLOW	(cms)=	.01	.01	.021 (iii)
TIME TO PEAK	(hrs)=	11.98	12.02	12.000
RUNOFF VOLUME	(mm)=	83.25	34.05	46.352
TOTAL RAINFALL	(mm)=	85.25	85.25	85.248
RUNOFF COEFFICIENT	=	.98	.40	.544

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

010:0006----------
* UNCONTROLLED AREA TO CHANNEL

CALIB NASHYD	Area (ha)= .23 Curve Number (CN)=70.00
04:005 DT= 1.00	Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .160

Unit Hyd Qpeak (cms)= .055

```
     PEAK FLOW       (cms)=     .022 (i)
     TIME TO PEAK    (hrs)=   12.067
     RUNOFF VOLUME    (mm)=   34.052
     TOTAL RAINFALL   (mm)=   85.248
     RUNOFF COEFFICIENT   =     .399

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
010:0007-----------------------------------------------------------------------
**********************************************************
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
***********************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
                ID1 01:002       11.69     2.840   12.00  78.33    .000
               +ID2 02:003         .87      .164   12.00  58.65    .000
                ===================================================
                SUM 06:000300    12.56     3.005   12.00  76.97    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
010:0008-----------------------------------------------------------------------
************************************************
*STORMWATER MANAGEMENT FACILITY
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm
************************************************
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(000300)   |
| OUT<07:(000200)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |      .178  .6238E+00
                            .013  .7430E-01   |      .256  .7344E+00
                            .020  .1543E+00   |      .391  .9076E+00
                            .025  .2403E+00   |     2.321  .1028E+01
                            .029  .3146E+00   |     3.906  .1089E+01
                            .060  .4139E+00   |     5.775  .1152E+01
                            .112  .5169E+00   |     7.890  .1215E+01

     ROUTING RESULTS           AREA     QPEAK     TPEAK       R.V.
     --------------------      (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (000300)     12.56     3.005    12.000     76.965
     OUTFLOW<07: (000200)     12.56      .181    13.000     76.963

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    6.020
                   TIME SHIFT OF PEAK FLOW        (min)=    60.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.6275E+00

-------------------------------------------------------------------------------
010:0009-----------------------------------------------------------------------
***************************************************************
```



```
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill
***************************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
                ID1 07:000200    12.56      .181   13.00  76.96    .000
               +ID2 03:004         .14      .021   12.00  46.35    .000
                ===================================================
                SUM 08:000300    12.70      .183   13.00  76.63    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
010:0010-----------------------------------------------------------------------
***************************************************************
-------------------------------------------------------------------------------
010:0002-----------------------------------------------------------------------
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010:0002-----------------------------------------------------------------------
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010:0002-----------------------------------------------------------------------
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010:0002-----------------------------------------------------------------------
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010:0002-----------------------------------------------------------------------
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010:0002-----------------------------------------------------------------------
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010:0002-----------------------------------------------------------------------
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010:0002-----------------------------------------------------------------------
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010:0002-----------------------------------------------------------------------
  ** END OF RUN :  10

*******************************************************************************




--------------------
| START            |  Project  dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
--------------------  Rainfall dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 011
    NSTORM=   1
           #  1=100Y24HS.STM
-------------------------------------------------------------------------------
011:0002-----------------------------------------------------------------------
*#*****************************************************************************
*
*#  Project Name: 560 Winston Churchill Blvd., Oakville
*#  Project Number: 1870
*#  Date        : DECEMBER 15, 2020
*#  Revised     : SEPTEMBER 22, 2020
```

```
*#  Modeller    : JMN
*#  Company     : a.m. candaras associates inc.
*#  License #   : 3813174
*#*************************************************************************
*
--------------------------------------------------------------------------------
011:0002--------------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\187
| Ptotal= 103.37 mm|    Comments: * 100 YEAR SCS 24hr STORM, 15 min TIME S
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.25	1.140	6.25	2.070	12.25	14.890	18.25	1.860
.50	1.140	6.50	2.070	12.50	14.890	18.50	1.860
.75	1.140	6.75	2.070	12.75	7.650	18.75	1.860
1.00	1.140	7.00	2.070	13.00	7.650	19.00	1.860
1.25	1.140	7.25	2.070	13.25	1.450	19.25	1.860
1.50	1.140	7.50	2.070	13.50	1.450	19.50	1.860
1.75	1.140	7.75	2.070	13.75	8.480	19.75	1.860
2.00	1.140	8.00	2.070	14.00	8.480	20.00	1.860
2.25	1.340	8.25	2.790	14.25	3.100	20.25	1.240
2.50	1.340	8.50	2.790	14.50	3.100	20.50	1.240
2.75	1.340	8.75	2.790	14.75	3.100	20.75	1.240
3.00	1.340	9.00	2.790	15.00	3.100	21.00	1.240
3.25	1.340	9.25	3.310	15.25	3.100	21.25	1.240
3.50	1.340	9.50	3.310	15.50	3.100	21.50	1.240
3.75	1.340	9.75	3.720	15.75	3.100	21.75	1.240
4.00	1.340	10.00	3.720	16.00	3.100	22.00	1.240
4.25	1.650	10.25	4.760	16.25	1.860	22.25	1.240
4.50	1.650	10.50	4.760	16.50	1.860	22.50	1.240
4.75	1.650	10.75	6.410	16.75	1.860	22.75	1.240
5.00	1.650	11.00	6.410	17.00	1.860	23.00	1.240
5.25	1.650	11.25	9.920	17.25	1.860	23.25	1.240
5.50	1.650	11.50	9.920	17.50	1.860	23.50	1.240
5.75	1.650	11.75	43.010	17.75	1.860	23.75	1.240
6.00	1.650	12.00	114.144	18.00	1.860	24.00	1.240

```
--------------------------------------------------------------------------------
011:0003--------------------------------------------------------------------------
*
**************************
*SITE 560 WINSTON CHURCHILL*
**************************
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS
----------------------
| CALIB STANDHYD     |   Area    (ha)=   11.69
| 01:002    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.52         1.17
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        40.00
     Mannings n             =      .013         .250
```



```
     Max.eff.Inten.(mm/hr)=     114.14        62.99
               over (min)          1.00        10.00
     Storage Coeff.  (min)=       1.18 (ii)    9.67 (ii)
     Unit Hyd. Tpeak (min)=       1.00        10.00
     Unit Hyd. peak  (cms)=        .97          .12
                                                      *TOTALS*
     PEAK FLOW       (cms)=       3.34          .15         3.471 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.07        12.000
     RUNOFF VOLUME    (mm)=     101.37        46.69        95.906
     TOTAL RAINFALL   (mm)=     103.37       103.37       103.374
     RUNOFF COEFFICIENT   =        .98          .45          .928

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
011:0004--------------------------------------------------------------------------
* SWM POND AREA
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .87
| 02:003    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .44          .44
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.00        10.00
     Mannings n             =      .013         .250

     Max.eff.Inten.(mm/hr)=     114.14        65.98
               over (min)          1.00         5.00
     Storage Coeff.  (min)=        .98 (ii)    4.60 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.09          .24
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .14          .07          .209 (iii)
     TIME TO PEAK    (hrs)=      11.98        12.00        12.000
     RUNOFF VOLUME    (mm)=     101.38        46.70        74.037
     TOTAL RAINFALL   (mm)=     103.37       103.37       103.374
     RUNOFF COEFFICIENT   =        .98          .45          .716

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
011:0005--------------------------------------------------------------------------
* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .14
| 03:004    DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   25.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=        .04          .10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        10.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     114.14        65.98
               over (min)        1.00         5.00
     Storage Coeff.  (min)=       1.18 (ii)    4.80 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=        .97          .23
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .01          .02          .028 (iii)
     TIME TO PEAK    (hrs)=      11.98        12.00        12.000
     RUNOFF VOLUME    (mm)=     101.37        46.70        60.368
     TOTAL RAINFALL   (mm)=     103.37       103.37       103.374
     RUNOFF COEFFICIENT   =        .98          .45          .584

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
011:0006----------------------------------------------------------------------
* UNCONTROLLED AREA TO CHANNEL
----------------------
| CALIB NASHYD       |   Area    (ha)=     .23   Curve Number   (CN)=70.00
| 04:005    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .055

     PEAK FLOW       (cms)=     .030 (i)
     TIME TO PEAK    (hrs)=   12.067
     RUNOFF VOLUME    (mm)=   46.698
     TOTAL RAINFALL   (mm)=  103.374
     RUNOFF COEFFICIENT   =     .452

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
011:0007----------------------------------------------------------------------
**********************************************************
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
**********************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
                  ID1 01:002       11.69    3.471   12.00  95.91    .000
                 +ID2 02:003         .87     .209   12.00  74.04    .000
                  ==========================================================
                  SUM 06:000300    12.56    3.680   12.00  94.39    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```



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--------------------------------------------------------------------------------
011:0008----------------------------------------------------------------------
**********************************************
*STORMWATER MANAGEMENT FACILITY
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm
**********************************************
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(000300)   |
| OUT<07:(000200)   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .178  .6238E+00
                           .013  .7430E-01   |     .256  .7344E+00
                           .020  .1543E+00   |     .391  .9076E+00
                           .025  .2403E+00   |    2.321  .1028E+01
                           .029  .3146E+00   |    3.906  .1089E+01
                           .060  .4139E+00   |    5.775  .1152E+01
                           .112  .5169E+00   |    7.890  .1215E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (000300)      12.56     3.680    12.000     94.392
     OUTFLOW<07: (000200)      12.56      .269    12.667     94.389

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    7.309
                  TIME SHIFT OF PEAK FLOW         (min)=    40.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.7510E+00

--------------------------------------------------------------------------------
011:0009----------------------------------------------------------------------
**********************************************************************
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill
**********************************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
                  ID1 07:000200    12.56     .269   12.67  94.39    .000
                 +ID2 03:004         .14     .028   12.00  60.37    .000
                  ==========================================================
                  SUM 08:000300    12.70     .272   12.55  94.01    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
011:0010----------------------------------------------------------------------
**************************************************************
--------------------------------------------------------------------------------
011:0002----------------------------------------------------------------------
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011:0002----------------------------------------------------------------------
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011:0002----------------------------------------------------------------------
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011:0002----------------------------------------------------------------------
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011:0002----------------------------------------------------------------------
------------------------------------------------------------------------------
011:0002----------------------------------------------------------------------
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011:0002----------------------------------------------------------------------
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011:0002----------------------------------------------------------------------
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011:0002----------------------------------------------------------------------
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011:0002----------------------------------------------------------------------
------------------------------------------------------------------------------
011:0002----------------------------------------------------------------------
      FINISH
------------------------------------------------------------------------------
******************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2021-09-23     at 11:14:04
==============================================================================
```

```
2     Metric units
*#*************************************************************************
*
*#  Project Name: 560 Winston Churchill Blvd., Oakville
*#  Project Number: 1870
*#  Date        : DECEMBER 15, 2020
*#  Revised     : SEPTEMBER 23, 2021
*#  Modeller    : JMN
*#  Company     : a.m. candaras associates inc.
*#  License #   : 3813174
*#*************************************************************************
*
START               TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN= [001]
                     "HAZEL.STM"
*
READ STORM          STORM_FILENAME= ["storm.001"]

*
**************************
*SITE 560 WINSTON CHURCHILL*
**************************
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS
CALIB STANDHYD      ID=[1], NHYD=["002"], DT=[1](min), AREA=[11.69](ha),
                    XIMP=[0.90], TIMP=[0.90], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[86.0],
                    Pervious   surfaces: IAper=[5](mm), SLPP=[2.0](%),
                                         LGP=[40.0](m), MNP=[0.25],
                                         SCP=[0.0](min),
                    Impervious surfaces: IAimp=[2](mm), SLPI=[1.0](%),
                                         LGI=[196](m), MNI=[0.013],
                                         SCI=[0.0](min),
                    RAINFALL=[ , , , , ](mm/hr) ,  END=-1

* SWM POND AREA
CALIB STANDHYD      ID=[2], NHYD=["003"], DT=[1](min), AREA=[0.87](ha),
                    XIMP=[0.50], TIMP=[0.50], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[86.0],
                    Pervious   surfaces: IAper=[5](mm), SLPP=[2.0](%),
                                         LGP=[10.0](m), MNP=[0.25],
                                         SCP=[0.0](min),
                    Impervious surfaces: IAimp=[2](mm), SLPI=[1.0](%),
                                         LGI=[22.0](m), MNI=[0.013],
                                         SCI=[0.0](min),
                    RAINFALL=[ , , , , ](mm/hr) ,  END=-1

* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD
CALIB STANDHYD      ID=[3], NHYD=["005"], DT=[1](min), AREA=[0.14](ha),
                    XIMP=[0.25], TIMP=[0.25], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[86.0],
                    Pervious   surfaces: IAper=[5](mm), SLPP=[2.0](%),
                                         LGP=[10.0](m), MNP=[0.25],
                                         SCP=[0.0](min),
                    Impervious surfaces: IAimp=[2](mm), SLPI=[1.0](%),
                                         LGI=[300](m), MNI=[0.013],
                                         SCI=[0.0](min),
                    RAINFALL=[ , , , , ](mm/hr) ,  END=-1
```



```
* UNCONTROLLED AREA TO CHANNEL
CALIB NASHYD        ID=[4], NHYD=["004"], DT=[1]min, AREA=[0.23](ha),
                    DWF=[0.0](cms),  CN/C=[86], IA=[5](mm),
                    N=[3], TP=[0.16]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1

*******************************************************
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
*******************************************************
ADD HYD             IDsum=6 NHYD=300 IDs to add=1+2

***********************************************
*STORMWATER MANAGEMENT FACILITY
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm
***********************************************

ROUTE RESERVOIR     IDout= 7 ,   NHYD= 200 ,  IDin= 6 ,
                    RDT=[1](min),
                    TABLE of ( OUTFLOW-STORAGE ) values
                    (cms) - (ha-m)
                    0.0000  0.0000
                    0.0127  0.0743
                    0.0199  0.1543
                    0.0251  0.2403
                    0.0294  0.3146
                    0.0598  0.4139
                    0.1120  0.5169
                    0.1783  0.6238
                    0.2560  0.7344
                    0.3907  0.9076
                    2.3211  1.0278
                    3.9062  1.0893
                    5.7754  1.1518
                    7.8899  1.2152
                    IDovf=[   ], NHYDovf=[   ]

************************************************************
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill
************************************************************
ADD HYD             IDsum=8 NHYD=300 IDs to add=7+3

************************************************************
FINISH
```

```
================================================================================

 SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999  =========
 S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
 SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9 Ver. 4.02
     S   W W   M   M  H   H    Y    M   M  O   O       9999   9999 July 1999
 SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9 =========
                                                      9   9  9   9 # 3813174
      StormWater Management HYdrologic Model           999    999  =========

 ********************************************************************************
 ************************** SWMHYMO-99 Ver/4.02 *********************************
 *******  A single event and continuous hydrologic simulation model  *******
 *******     based on the principles of HYMO and its successors      *******
 *******                 OTTHYMO-83 and OTTHYMO-89.                  *******
 ********************************************************************************
 ******* Distributed by:  J.F. Sabourin and Associates Inc.          *******
 *******                  Ottawa,  Ontario: (613) 727-5199          *******
 *******                  Gatineau, Quebec: (819) 243-6858          *******
 *******                  E-Mail: swmhymo@jfsa.Com                  *******
 ********************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++ Licensed user: A.M. Candaras Associates Inc.                +++++++
 +++++++                Woodbridge            SERIAL#:3813174       +++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *******           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *******
 *******           Maximum value for ID numbers  :     10           *******
 *******           Max. number of rainfall points:  15000           *******
 *******           Max. number of flow points    :  15000           *******
 ********************************************************************************


 ******************   D E T A I L E D   O U T P U T   ******************
 ********************************************************************************
 *       DATE: 2021-09-23     TIME: 11:11:53     RUN COUNTER: 000655       *
 ********************************************************************************
 * Input   filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\1870Reg.dat *
 * Output  filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\1870Reg.out *
 * Summary filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\1870Reg.sum *
 * User comments:                                                           *
 * 1:_______________________________________________________________________*
 * 2:_______________________________________________________________________*
 * 3:_______________________________________________________________________*
 ********************************************************************************


--------------------------------------------------------------------------------
001:0001----------------------------------------------------------------------
*#*****************************************************************************
*
*#  Project Name: 560 Winston Churchill Blvd., Oakville
*#  Project Number: 1870
*#  Date        : DECEMBER 15, 2020
*#  Revised     : SEPTEMBER 23, 2021
*#  Modeller    : JMN
*#  Company     : a.m. candaras associates inc.
```



```
*#  License #   : 3813174
*#*****************************************************************************
*
--------------------
| START            |  Project  dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
--------------------  Rainfall dir.: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\1870\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=HAZEL.STM
--------------------------------------------------------------------------------
001:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: C:\DOCUME~1\ADMINI~1\DESKTOP\SWMHYMO\187
| Ptotal= 212.00 mm|    Comments: HURRICANE HAZEL STORM
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              1.00   6.000 |   4.00  13.000 |   7.00  23.000 |  10.00  53.000
              2.00   4.000 |   5.00  17.000 |   8.00  13.000 |  11.00  38.000
              3.00   6.000 |   6.00  13.000 |   9.00  13.000 |  12.00  13.000

--------------------------------------------------------------------------------
001:0003----------------------------------------------------------------------
*
*************************
*SITE 560 WINSTON CHURCHILL*
*************************
*
* BUILDING, PAVED AREAS AND LANDSCAPED AREAS
----------------------
| CALIB STANDHYD     |   Area    (ha)=   11.69
| 01:002    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.52         1.17
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     196.00        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        50.52
               over (min)        5.00        14.00
     Storage Coeff.  (min)=       4.93 (ii)   14.21 (ii)
     Unit Hyd. Tpeak (min)=       5.00        14.00
     Unit Hyd. peak  (cms)=        .23          .08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.55          .16          1.709 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.02         10.000
     RUNOFF VOLUME    (mm)=     209.99       172.52        206.253
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.000
     RUNOFF COEFFICIENT   =        .99          .81           .973

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  86.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0004
* SWM POND AREA

| CALIB STANDHYD | Area (ha)= .87
| 02:003 DT= 1.00 | Total Imp(%)= 50.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	.44	.44	
Dep. Storage (mm)=	2.00	5.00	
Average Slope (%)=	1.00	2.00	
Length (m)=	22.00	10.00	
Mannings n =	.013	.250	
Max.eff.Inten.(mm/hr)=	53.00	50.62	
over (min)	1.00	5.00	
Storage Coeff. (min)=	1.33 (ii)	5.36 (ii)	
Unit Hyd. Tpeak (min)=	1.00	5.00	
Unit Hyd. peak (cms)=	.90	.22	
			TOTALS
PEAK FLOW (cms)=	.06	.06	.125 (iii)
TIME TO PEAK (hrs)=	9.33	10.00	10.000
RUNOFF VOLUME (mm)=	210.00	172.53	191.267
TOTAL RAINFALL (mm)=	212.00	212.00	212.000
RUNOFF COEFFICIENT =	.99	.81	.902

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0005
* UNCONTROLLED AREA TO WINSTON CHURCHILL BLVD

| CALIB STANDHYD | Area (ha)= .14
| 03:005 DT= 1.00 | Total Imp(%)= 25.00 Dir. Conn.(%)= 25.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	.04	.10	
Dep. Storage (mm)=	2.00	5.00	
Average Slope (%)=	1.00	2.00	
Length (m)=	300.00	10.00	
Mannings n =	.013	.250	
Max.eff.Inten.(mm/hr)=	53.00	50.56	
over (min)	6.00	10.00	
Storage Coeff. (min)=	6.37 (ii)	10.40 (ii)	
Unit Hyd. Tpeak (min)=	6.00	10.00	
Unit Hyd. peak (cms)=	.18	.11	
			TOTALS
PEAK FLOW (cms)=	.01	.01	.020 (iii)
TIME TO PEAK (hrs)=	10.00	10.00	10.000
RUNOFF VOLUME (mm)=	209.99	172.53	181.901

TOTAL RAINFALL (mm)=	212.00	212.00	212.000
RUNOFF COEFFICIENT =	.99	.81	.858

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0006
* UNCONTROLLED AREA TO CHANNEL

| CALIB NASHYD | Area (ha)= .23 Curve Number (CN)=86.00
| 04:004 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= .160

Unit Hyd Qpeak (cms)= .055

PEAK FLOW	(cms)=	.032 (i)
TIME TO PEAK	(hrs)=	10.000
RUNOFF VOLUME	(mm)=	172.535
TOTAL RAINFALL	(mm)=	212.000
RUNOFF COEFFICIENT	=	.814

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0007
****
* Discharge rates from the SWMP, buildings and paved area
* Total Area = 12.56 ha
****

ADD HYD (000300)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:002	11.69	1.709	10.00	206.25	.000
	+ID2 02:003	.87	.125	10.00	191.27	.000
	SUM 06:000300	12.56	1.834	10.00	205.22	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0008
****
*STORMWATER MANAGEMENT FACILITY
*PERMANENT WL 91.10 ORIFICE 125mm
*EROS/EXT WL 91.90 WEIR 175mm
****

ROUTE RESERVOIR	IN>06:(000300)	OUT<07:(000200)

Requested routing time step = 1.0 min.

========= OUTLFOW STORAGE TABLE =========

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.000	.0000E+00	.178	.6238E+00
.013	.7430E-01	.256	.7344E+00

```
                           .020  .1543E+00   |     .391  .9076E+00
                           .025  .2403E+00   |    2.321  .1028E+01
                           .029  .3146E+00   |    3.906  .1089E+01
                           .060  .4139E+00   |    5.775  .1152E+01
                           .112  .5169E+00   |    7.890  .1215E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (000300)      12.56     1.834    10.000    205.215
     OUTFLOW<07: (000200)      12.56     1.814    10.017    205.211

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   98.931
                  TIME SHIFT OF PEAK FLOW         (min)=     1.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.9962E+00

--------------------------------------------------------------------------------
001:0009----------------------------------------------------------------------
**************************************************************
* Discharge rates from the SWMP, buildings, paved area and
* Uncontrolled discharge being released onto Winston Churchill
**************************************************************
--------------------
| ADD HYD (000300) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------              (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 07:000200    12.56    1.814   10.02 205.21    .000
                +ID2 03:005         .14     .020   10.00 181.90    .000
                 ==================================================
                 SUM 08:000300    12.70    1.834   10.02 204.95    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
001:0010----------------------------------------------------------------------
**************************************************************
      FINISH
--------------------------------------------------------------------------------
********************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2021-09-23     at 11:11:53
================================================================================
```

APPENDIX C
SWM FACILITY CALCULATIONS

SWM Facility Calculations

Drawdown Time

The drawdown time for this facility was determined using the falling head equation as per the MOE manual 2003 which is represented below.

$$t = \frac{2Ap}{(CA_o)\sqrt{2g}}\left(\sqrt{h_1} - \sqrt{h_2}\right)$$

- t = draw down time in seconds
- A_p = surface area of the pond (m^2)
- C = discharge coefficient (0.63)
- A_o = cross-sectional area of the orifice
- g = gravitational acceleration constant ($9.81 m/s^2$)
- h_1 = starting water elevation above the orifice
- h_2 = ending water elevation above the orifice

The calculation has been completed based on a 125mm orifice at an invert of 91.10m. This orifice will be a vertical orifice located within the outlet control structure as shown on Plan C-1. Since this orifice is greater than 100mm, protection of the orifice is not required in accordance to the M.O.E. SWMP manual. The proposed orifice will provide a 61 hr 6 min drain time for erosion control volume as calculated below.

$$t = \frac{2 \times 4{,}220.7}{(0.63 \times 0.0123)\sqrt{2 \times 9.81}}\left(\sqrt{0.80}\right)$$

$$t = 219{,}970.4 \text{ sec}$$

$$t = 61.1 \text{ hr}$$

- t = draw down time in seconds
- A_p = 4,220.7m^2 (average area at elevations 91.10m and 91.90m)
- C = discharge coefficient (0.63)
- A_o = (πx(0.125 m)^2) ÷ 4 = 0.0123m^2
- g = gravitational acceleration constant ($9.81 m/s^2$)
- h_1 = 91.10m
- h_2 = 91.90m

Emergency Overflow

The emergency overflow for this facility has been sized to convey the uncontrolled 100-Year (CHIC) post-development flow, which yields the largest flow rate of the storms, of $6.355 m^3/s$, refer to SWMHYMO Output. The emergency overflow will operate between the 93.00m elevation and the 93.50m elevation which is the top of the facility. The emergency overflow will be a weir configuration as calculated below:

$$Q = 1.7 \times L \times h^{3/2}$$

where:

$Q = 6.355\ m^3/s$

$h = 93.00m - 93.50m = 0.50m$

therefore:

$$L = \frac{Q}{1.7 \times h^{3/2}} = \frac{6.355}{1.7 \times (0.50)^{3/2}}.$$

$L = 10.6m$

set:

$L = 12.0m$

A 12.0m emergency overflow at elevation 93.00 will be constructed to direct the uncontrolled 100-Year post-development inflow in a safe manner if the outlet control structure becomes inoperable. The resulting depth of flow based on a 12.0m emergency overflow weir is 0.46m, as calculated below:

$$Q = 1.7 \times L \times h^{3/2}$$

$$H = (Q / 1.7 \times L)^{2/3}$$

$$= (6.355 / (1.7 \times 12.0))^{2/3}$$

$$= 0.46\ m$$

Erosion control for the emergency overflow will be provided by the Terrafix Terraweb liner, which may accommodate velocities up to 6.0m/s. Based on the peak flow, the maximum velocity is 1.18m/s, as calculated below:

$$Q = V \times A$$

$$V = 6.355 m^3/s / (12.0m \times 0.46m)$$

$$= 1.18m/s$$

Sediment Forebay Sizing

An additional requirement for this stormwater quality facility is a sediment forebay. The sediment forebay is required to provide a localized area for the majority of the sediments within the stormwater facility to settle out. This sediment forebay makes maintenance of the stormwater quality facility easier and minimizes total wetland disruption. As per the MOE Stormwater Management Planning and Design Manual (March 2003), there are two equations for the design of a sediment forebay as listed below:

Equation 4.5: Forebay Settling Length

$$Dist = \sqrt{\frac{rQ_p}{V_s}}$$

where: Dist = sediment forebay length (m)

Q_p = peak flow rate from the pond during design quality storm (0.025m^3/s @ 91.10)

V_s = settling velocity (0.0003m/s)

r = length-to-width ratio of forebay (2:1 min)

$$Dist = \sqrt{\frac{2(0.025)}{0.0003}}$$
$$= 12.9\text{m}$$

Equation 4.6: Dispersion Length

$$Dist = \frac{8Q}{dV_f}$$

where: Dist = sediment forebay length (m)

Q = inlet flow rate (4.178m^3/s, SWMHYMO output))

V_f = desired velocity in the forebay (0.5m/s)

d = depth of permanent pool in the forebay (1.10m)

$$Dist = \frac{8\times4.178}{1.10\times0.5}$$
$$= 60.8m$$

Equation 4.7: Minimum Forebay Deep Zone Bottom Width

$$Width = \frac{Dist}{8}$$
$$= \frac{60.8m}{8}$$
$$= 7.6\text{m}$$

The sediment forebay will have a length of 62m and a minimum width of 7.6. Therefore, the sediment forebay will accommodate the proposed development and will promote localized settling of particulate matter.

<u>Average Forebay Velocity:</u>

$$V = \frac{Q}{A} = \frac{4.355\ m^3/s}{62m\ x\ 1.10m} = 0.063\ m/s$$

Therefore, the average velocity through the forebay will be 0.063 m/s. This velocity is acceptable as it is less than the 0.15 m/s permissible velocity to prevent erosion.