1085 CLEARVIEW AVENUE
6 STOREY RESIDENTIAL BUILDING

Functional Servicing and Stormwater Management Report

Project Location:
1085 Clearview Avenue; 1082, 1086 & 1090 St. Matthews Avenue;
64-66 Masonry Court
Burlington, Ontario

Prepared for:
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TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Overview 1
1.2 Background Information 1
1.3 Geotechnical Investigation 3

2.0 SANITARY SERVICES 3
2.1 Existing Conditions 3
2.2 Sanitary Servicing Demands 4
2.3 Proposed Sanitary Servicing Plan 4

3.0 WATER SERVICING 5
3.1 Existing Conditions 5
3.2 Domestic Water Demands 5
3.3 Fire Flow Demands 6
3.4 Proposed Water Servicing Plan 6

4.0 STORMWATER MANAGEMENT 6
4.1 Design Criteria 6
4.2 Methodology 6
4.3 Existing Conditions 7
4.4 Proposed Conditions – Quantity Control 9
4.5 Proposed Conditions – Quality Control 12

5.0 EROSION AND SEDIMENT CONTROL 13

6.0 CONCLUSIONS AND RECOMMENDATIONS 13

FIGURES

FIGURE 1 LOCATION PLAN 2
FIGURE 2 PRE-DEVELOPMENT STORM CATCHMENT AREAS 8
FIGURE 3 POST-DEVELOPMENT STORM CATCHMENT AREAS 10

TABLES

TABLE 2.1 EXISTING & PROPOSED SANITARY SEWER DISCHARGE 4
TABLE 3.1 DOMESTIC WATER DEMANDS 5
TABLE 3.2 REQUIRED FIRE FLOW 6
TABLE 4.1 EXISTING CONDITIONS CATCHMENT AREAS 7
TABLE 4.2 IDF PARAMETERS AND CORRESPONDING PRE-DEVELOPMENT RUNOFF RATES 9
TABLE 4.3 PROPOSED CONDITIONS CATCHMENT AREAS 9
TABLE 4.4 STAGE-STORAGE-DISCHARGE RELATIONSHIP FOR ORIFICE CONTROL AT SWM TANK 11
TABLE 4.5 AREA DRAIN INLET CAPACITIES 11
TABLE 4.6 POST-DEVELOPMENT SITE DISCHARGE 12
TABLE 4.7 POST-DEVELOPMENT STORAGE RQUIREMENTS 12

APPENDICIES

APPENDIX A WASTEWATER CALCULATIONS
APPENDIX B WATER CALCULATIONS
APPENDIX C STORMWATER MANAGEMENT CALCULATIONS

1.0 INTRODUCTION

1.1 Overview

MTE Consultants Inc. was retained by LIV Communities to complete a Functional Servicing and Stormwater Management Report for the proposed development of a six (6) storey residential building located at 1085 Clearview Avenue in the City of Burlington. This report is being prepared to supplement the ZBA/OPA submission and will be updated with final design at the SPA and Building Permit stages.

The site is located on a 0.63ha parcel of land located southeast of Masonry Court and southwest of St. Matthews Avenue (see Figure 1 for Location Plan). The site is currently made up of four lots and is bounded by Masonry Court to the northwest, St. Matthews Avenue to the northeast, Clearview Avenue to the southwest and existing residential area to the southeast. There exists a single storey building with associated parking, driveways and landscaped areas as well as three dwellings with associated garages, sheds, driveways and landscaped areas.

1.2 Background Information

The following documents were referenced in the preparation of this report:

Ref.1: *Water Supply for Public Fire Protection* (Fire Underwriters Survey, 1999).

Ref.2: *Standard Drawing Manual* (City of Burlington, 1999).

Ref.3: *MOE Stormwater Management Practices Planning and Design Manual* (Ministry of the Environment, March 2003).

Ref.4: *Design Guidelines for Drinking-Water Systems* (Ministry of the Environment, 2008).

Ref.5: *Ontario Building Code* (2012).

Ref.6: *Water and Wastewater Linear Design Manual v3.0*, Region of Halton (April 2015).

Ref.7: *Preliminary Geotechnical Investigation, Proposed Residential Development* (Soil-Mat Engineering & Consultants Ltd., December 20, 2018).

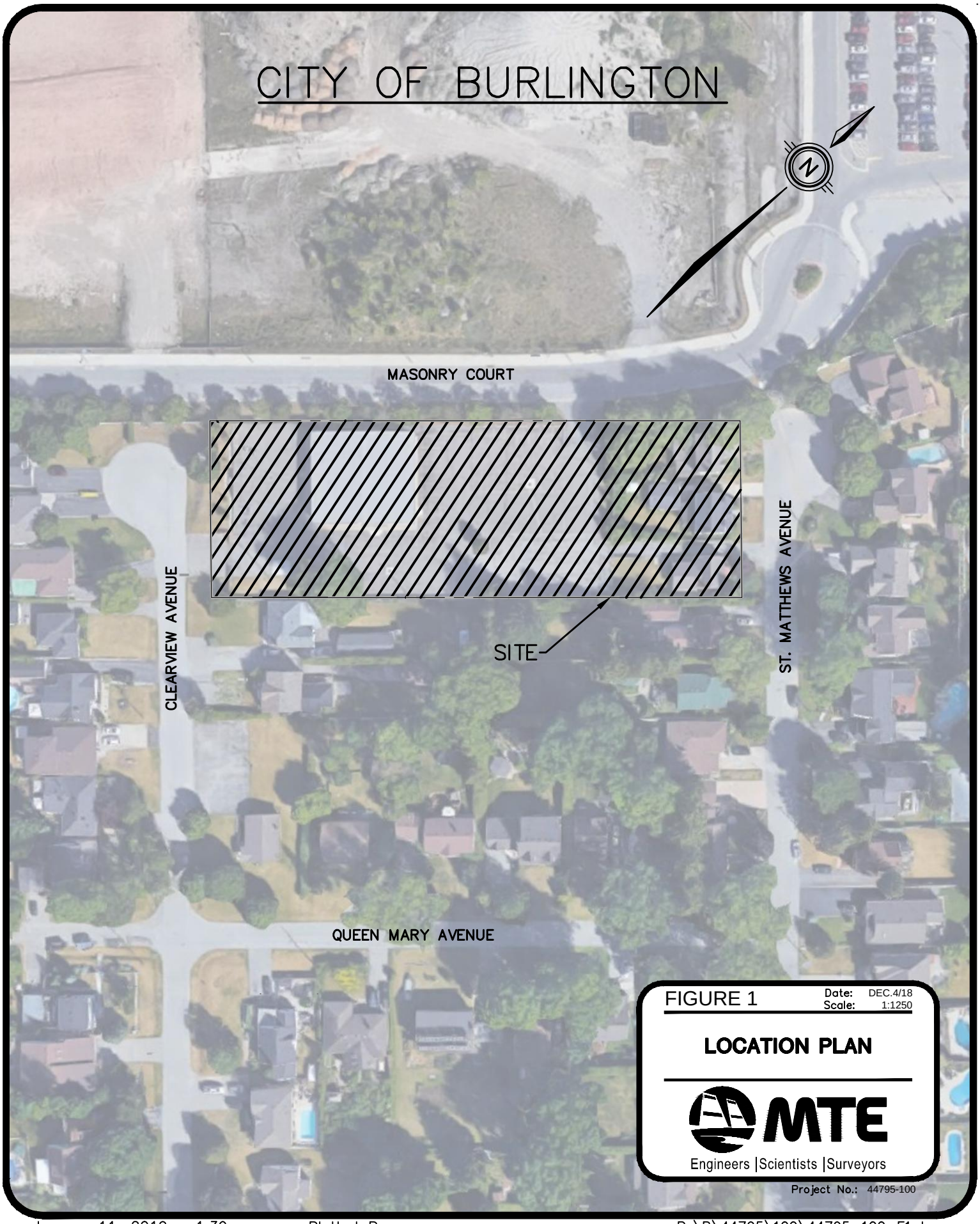


FIGURE 1

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LOCATION PLAN

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1.3 Geotechnical Investigation

A preliminary geotechnical investigation was prepared by Soil-Mat Engineers & Consultants Limited dated December 20, 2018. Sixteen (16) boreholes were advanced at varying depths from approximately 3.7 to 11.1m below the present grade. The majority of the site is overlain with a pavement structure consisting of 75 to 90mm of asphaltic concrete overlying 150 to 225mm of compact granular base. A deposit of sand fill was encountered beneath the pavement structure of seven (7) boreholes to depths of approximately 1.2 to 4.0m beneath the existing pavement surface. Native brown sand was encountered beneath the pavement structure and/or fill material to depths of approximately 4.8 to 6.4m. Below the sand, native clayey silt was encountered to the extent of the borehole depths for boreholes 1 through 4, 201, 202 and 205 and to a depth of 10.1m at borehole 5. Coarse sand and gravel was encountered in borehole 5 beneath the clayey silt up to termination at a depth of 11.1m. Based on our experience with projects in the area and the aforementioned geotechnical report, a SCS Curve Number (CN) of 74 was used where applicable.

As stated in the preliminary geotechnical investigation prepared by Soil-Mat Engineers dated December 20, 2018, the static groundwater elevation is estimated at depths between approximately 4 to 5m below existing grade (elevations between 99.98 and 100.61 m). The proposed building has a first floor elevation of 105.15m (refer to Drawing C1.1). Elevations provided on architectural drawing A4.1 show the underground parking level having a height of 3.6m, giving it an elevation of 101.55m which is well above the established high groundwater level of 100.61m. Therefore, there is not expected to be a requirement for ongoing long-term pumping of water.

Excavations for foundation installation are anticipated to extend to depths of up to approximately 3 to 4m. Excavations through soils above the static groundwater level are expected to remain dry and stable. Some minor infiltration of ground water through more permeable ‘wet’ seams encountered and from surface runoff should be anticipated. This infiltration should be readily controlled with typical construction dewatering methods (i.e. pumping from sumps in the base of excavations). Additional sumps may be required to control groundwater infiltration where excavations extend to within 0.5m of the static groundwater level. More sophisticated groundwater control methods may be required for excavations deeper than about 0.5m below the groundwater level. For further detail and information about groundwater control please refer to Ref. 1.

2.0 SANITARY SERVICES

2.1 Existing Conditions

A 200mm diameter sanitary sewer is located within the Clearview Avenue right-of-way adjacent to the site’s southwestern limits. The sewer has a slope of 1.68% flowing south with a full flow capacity of 42 L/s. There also exists a 450mm diameter sanitary sewer within the St. Matthews Avenue right-of-way adjacent to the site’s northeastern limits. This sewer has a slope of 1.27% flowing south with a full flow capacity of 321 L/s.

The existing dwellings have service connections to the 450mm diameter sanitary sewer on St. Matthews Avenue.

2.2 Sanitary Servicing Demands

The sanitary sewage from the proposed development will outlet to the existing 450mm diameter sanitary sewer on St. Matthews Avenue with a proposed connection.

The anticipated sanitary discharge rate from the proposed development was estimated using Region of Halton and Ontario Building Code design criteria. Design population densities based on the residential units proposed were used to calculate the sanitary discharge. Table 2.1 summarizes the existing and the expected sanitary discharge from the site.

TABLE 2.1 – EXISTING & PROPOSED SANITARY SEWER DISCHARGE

Description	Area (ha) [A]	Units [B]	Population Density [C]	Population	Avg. Flow (L/s) [D]	Peaking Factor [E]	Peak Flow (L/s) [F]
EXISTING							
Ex. Dwellings	0.154	---	55 per/ha	8	0.027	4.42	0.119
Ex. Commercial	0.473	---	90 per/ha	43	0.135	3.46	0.466
Ex. Infiltration Allowance	0.627	---					0.179
Total Existing Sanitary Discharge							**0.76**
PROPOSED							
1 Bed Apartment	---	121	1 per/bed	121	0.385	4.16	1.600
2 Bed Apartment	---	35	1 per/bed	70	0.223	4.16	0.927
Infiltration Allowance	0.627	---					0.179 [G]
Total Proposed Sanitary Discharge							**2.71 [H]**

[A] Area reflects site area.
[B] Unit count from Unit Type Analysis provided by the Architect.
[C] Existing population density referenced from "Table 3-1 Residential Dry Weather Flow" and "Table 3-2 Commercial, Industrial, and Community Dry Weather Flow", Halton Water and Wastewater Linear Design Manual (2015) - Single Family and Light commercial. Proposed population density referenced from OBC 3.1.17.1.1(c)(i) – more conservative than Halton Water and Wastewater Linear Design Manual (135 pph). Refer to Appendix A.
[D] Avg. Flow = (Population) x (Unit Sewage Flow) = (121) x (275L/d/cap) / (24x60x60) = 0.385 L/s
[E] Harmon Peaking Factor (PF) = 1 + 14 / (4+$P^{0.5}$) where P = population in thousands
PF = 1 + 14 / (4+$0.191^{0.5}$) = 4.16
[F] Peak Flow = (Avg. Flow) x (PF) = (0.385 L/s) x (4.16) = 1.60 L/s
[G] Infiltration Allowance (IA) based on 0.286 L/s/ha, as outlined in the Halton Water and Wastewater Linear Design Manual (2015).
IA = (0.286 L/s/ha) x (0.627 ha) = 0.179 L/s
[H] Total Sanitary Demand = Peak Flow + Infiltration Allowance = 1.60 + 0.927 + 0.179 = 2.71 L/s

2.3 Proposed Sanitary Servicing Plan

Based on the expected sanitary sewer discharge (see Table 2.1), the proposed site can be serviced with a 150mm diameter sanitary pipe at a 1% slope. The full-flow capacity of a 150mm diameter pipe at a 1% slope is 13.27 L/s; the expected sanitary demand is

well below this limit. The proposed sanitary sewer will connect to the existing 450mm diameter sanitary sewer within the St. Matthews Avenue right-of-way.

Based on plan and profile drawings received from the City of Burlington, the existing 450mm diameter sanitary sewer has a slope of 1.27%; the full-flow capacity of this sewer is 321 L/s. Although the proposed sanitary demand discharging to the existing sewer is 1.95 L/s greater than what exists (see Table 2.1), this accounts for less than 1% of the total capacity of the existing sewer. Therefore it is not expected that there will be capacity issues within the existing sanitary infrastructure due to this proposed development.

3.0 WATER SERVICING

3.1 Existing Conditions

The existing municipal water distribution system around the site consist of a 250mm diameter watermain on Clearview Avenue, a 300mm diameter watermain on Masonry Court and a 150mm diameter watermain on St. Matthews Avenue. Existing municipal hydrants are located within the Masonry Court boulevard at the northeast and southwest end of the site's northwestern limits and in the Clearview Avenue boulevard at the site's southwestern limits.

3.2 Domestic Water Demands

The expected domestic water demand for the proposed development was estimated using the Region of Halton design criteria. Table 3.1 summarizes the domestic water demand requirements for the Average Day, Maximum Day and Peak Hour demand scenarios.

TABLE 3.1 – DOMESTIC WATER DEMANDS

Proposed Apartment Building		
Population	191 people (see Table 2.1)	
Average Day Demand [A]	(275 L/cap/d) x (191 people) =	**0.61 L/s**
Max. Day Peaking Factor [B]	2.25	
Peak Hour Peaking Factor [C]	4.00	
Maximum Day Demand	(2.25) x (2.53 L/s) =	**1.37 L/s**
Peak Hour Demand	(4.00) x (2.53 L/s) =	**2.43 L/s**

[A] Average Day Demand from design factor (a) presented in Halton Water and Wastewater Linear Design Manual (2015). Refer to Appendix B.
[B] Max. Day Peaking Factor from design factor (b) presented in Halton Water and Wastewater Linear Design Manual (2015). Refer to Appendix B.
[C] Peak Hour Peaking Factor from "Table 2-2 Maximum Hourly Demand Peaking Factor", Halton Water and Wastewater Linear Design Manual (2015). Refer to Appendix B.

3.3 Fire Flow Demands

Fire flow demands for the proposed development were determined using the methodology outlined in the "Water Supply for Public Fire Protection" (Fire Underwriters Survey, 1999). The fire demands associated with the proposed building is summarized in Table 3.2 and detailed calculations can be found in the Appendix B.

TABLE 3.2 – REQUIRED FIRE FLOW

Building	Required Fire Flow [A]
Apartment Building	200 L/s
Total Required Water Demand for Site [B]	***201.37 L/s***

[A] Required Fire Flow for apartment building calculated using methodology outlined in FUS (1999).
[B] Total required water demand based on Max Day + Fire Flow.

3.4 Proposed Water Servicing Plan

Water servicing for the site will include the installation of a dual 150mm diameter fire service and 100mm diameter domestic watermain which will connect to the existing 300mm diameter watermain located on Masonry Court. The existing south fire hydrant within the Masonry Court boulevard is to be relocated to accommodate the proposed entrance and sidewalk.

The Region of Halton requires water distribution systems to maintain a minimum residual pressure of 140 kPa (20 psi) when subject to Maximum Day + Fire Flow demands. A hydrant flow test will be required to evaluate the available system pressure.

4.0 STORMWATER MANAGEMENT

4.1 Design Criteria

The stormwater management design criteria for the subject site as established by the City of Burlington are as follows:

i) Attenuation of the post-development peak flow rate for the 100-year storm event to the pre-development (existing) peak flow rate for the 5-year storm event; and
ii) Achieve "Enhanced" level water quality treatment (80% TSS removal).

4.2 Methodology

In order to successfully complete the stormwater management design for the site, the following tasks were undertaken:

i) Determined the pre-development impervious cover of the site and specific sub-catchment parameters for use in the SWMHYMO hydrologic modeling program;

ii) Calculated pre-development runoff hydrographs to establish the allowable runoff rates using the SWMHYMO hydrologic modeling program;
iii) Determined the post-development impervious cover of the site and specific sub-catchment parameters for use in the SWMHYMO hydrologic modeling program;
iv) Calculated post-development runoff hydrographs using the SWMHYMO hydrologic modeling program; and
v) Prepared the site grading and storm servicing to achieve runoff attenuation to meet the SWM criteria.

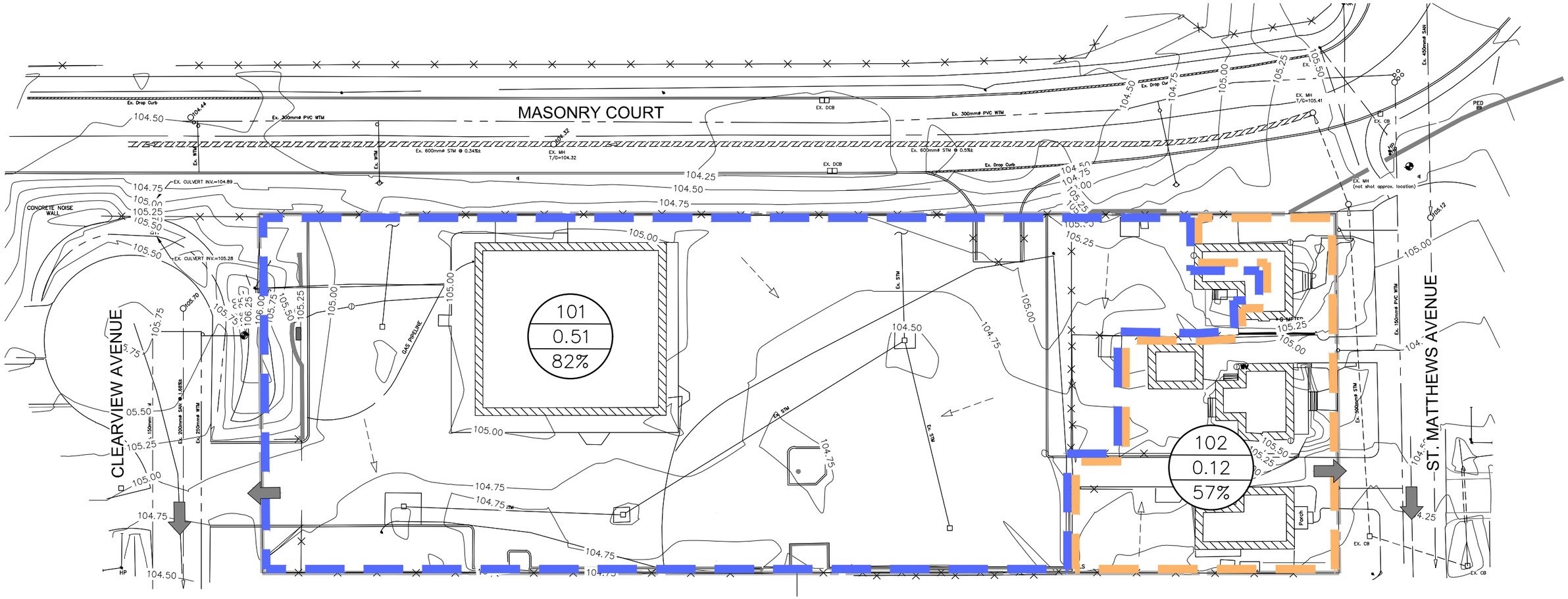
4.3 Existing Conditions

Under existing conditions, the development area is made up of four properties; a single storey commercial building and three dwellings along with associated sheds, driveways, parking and landscaped areas. The commercial portion of the site is serviced via an existing on-site storm sewer system which outlets to the existing 600mm diameter storm sewer within the Masonry Court right-of-way while the three dwellings have service connections to the existing 300mm diameter storm sewer within the St. Matthews Avenue right-of-way which ultimately outlets to the existing 600mm diameter storm sewer on Masonry Court. The overland flow route (major flows) for the commercial site does not follow the minor flows, instead flowing towards Clearview Avenue while the overland flow route for the single family dwelling properties matches their minor flows towards St. Matthews Avenue. The site is generally flat and can be delineated using two (2) catchment areas. Table 4.1 provides a brief description of the catchment areas as well as the size and impervious cover.

TABLE 4.1 – EXISTING CONDITIONS CATCHMENT AREAS

Catchment ID	Catchment Description	% Imp.	Area (ha)
101	Minor flows to Masonry Court, Major flows to Clearview Avenue	82%	0.51
102	Existing site discharging to St. Matthews Avenue	57%	0.12
Total			**0.63**

The existing conditions were assessed using the SWMHYMO hydrologic modeling program developed by J.F. Sabourin & Associates for the 2 to 100-year City of Burlington design storm (4-hour duration Chicago distribution). The existing minor flows to Masonry Court were estimated to be the 5-year flow rate calculated using the rational method as this is what the storm sewers would have been designed for (refer to Appendix C for calculations). Table 4.2 summarizes the pre-development runoff rates for each of the aforementioned design storm events.



LEGEND

- SITE BOUNDARY
- EXISTING SPOT ELEVATIONS/CONTOURS (326)
- EXISTING STORM SEWER (Ex. MH)
- CATCHMENT 101
- CATCHMENT 102
- OVERLAND FLOW ROUTE (MAJOR STORM)
- EXISTING DIRECTION OF DRAINAGE
- 101 / 0.51 / 82% — CATCHMENT ID / AREA (Ha) / % IMP

FIGURE 2

Date: DEC.20/18
Scale: 1:500

PRE-DEVELOPMENT DRAINAGE AREA PLAN

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TABLE 4.2 – IDF PARAMETERS AND CORRESPONDING PRE-DEVELOPMENT RUNOFF RATES

Constant [A]	2-Yr.	5-Yr.	10-Yr.	25-Yr.	50-Yr.	100-Yr.
A	592.60	697.40	798.50	926.90	1019.40	1114.20
B	6	5	5	5	5	5
C	0.780	0.764	0.763	0.762	0.761	0.761
Outlet	**Peak Flow Rate (m^3/s) [B]**					
101 Minor Flows to Masonry Court	0.080	**0.097**	0.097	0.097	0.097	0.097
101 Major Flows to Clearview Avenue	0.000	**0.008**	0.025	0.046	0.063	0.079
102 to St Matthews Avenue	0.013	**0.018**	0.022	0.026	0.029	0.033

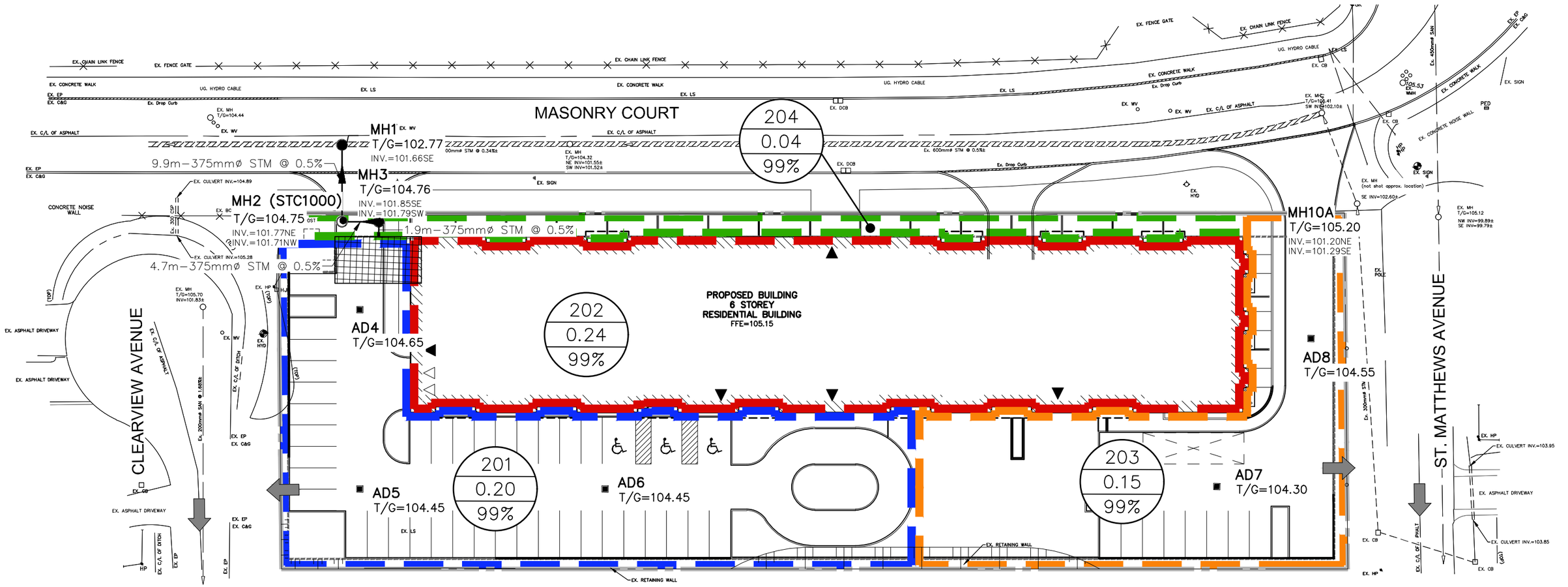
[A] IDF parameters from City of Burlington's Standard Drawing Manual (1999). Refer to Appendix C.
[B] Q taken from SWMHYMO output for pre-development hydrologic model.

4.4 Proposed Conditions – Quantity Control

The proposed conditions drainage pattern is delineated by four (4) catchment areas (see Figure 3). Table 4.3 provides a brief description of each catchment area as well as the size and impervious cover associated with each. Areas located above the proposed underground parking structure were considered to be impervious. Stormwater runoff from the site will be conveyed to the existing 600mm diameter storm sewer located within the Masonry Court right-of-way. Due to grading constraints, emergency overland flows will continue to be directed towards Clearview Avenue and St. Matthews Avenue. Based on plan and profile drawings provided by the City of Burlington, the overland flow route for any emergency flows to Clearview Avenue and St. Matthews Avenue is southeast towards Plains Road East where it eventually flows into Lake Ontario.

TABLE 4.3 – PROPOSED CONDITIONS CATCHMENT AREAS

Catchment ID	Catchment Description	% Imp.	Area (ha)
201	Minor flows to Masonry Court, major flows discharging to Clearview Avenue (controlled)	99%	0.20
202	Building Roof discharging to Masonry Court (controlled)	99%	0.24
203	Minor flows to Masonry Court, major flows discharging to St. Matthews Avenue (controlled)	99%	0.15
204	Proposed perimeter area of site discharging to Masonry Court (Uncontrolled)	99%	0.04
Total			**0.63**



LEGEND

- SITE BOUNDARY
- EXISTING SPOT ELEVATIONS/CONTOURS (326)
- EXISTING STORM SEWER (Ex. MH)
- CATCHMENT 201
- CATCHMENT 202
- CATCHMENT 203
- CATCHMENT 204
- OVERLAND FLOW ROUTE (MAJOR STORM)
- PROPOSED STORM SEWER (MH, 21.3m-300mmø STM @ 1.30%)
- 101 — CATCHMENT ID; 0.51 — AREA (Ha); 82% — % IMP

FIGURE 3

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POST-DEVELOPMENT DRAINAGE AREA PLAN

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The grading design will direct emergency overland flows onto Clearview Avenue and St. Matthews Avenue similar to existing conditions if all on-site storage has been exhausted. Storm events up to and including the 100-year design storm will be captured and controlled to the existing 5-year storm event flow rate and conveyed to the existing Masonry Court storm sewer. The water will be conveyed to a stormwater management tank located within the underground parking area. A small 100mm diameter orifice pipe will be installed at the outlet of the SWM tank. Table 4.4 summarizes the stage-storage-discharge relationship for the controlled area.

TABLE 4.4 – STAGE-STORAGE-DISCHARGE RELATIONSHIP FOR ORIFICE CONTROL AT SWM TANK

Elevation (m)	Head (m)	Cumulative Storage Volume (m^3) [A]	Discharge, Q (m^3/s) [B]	Comments
101.25	0.00	0.0	0.0000	Bottom of Tank
101.91	0.00	50.6	0.0000	C/L of 100mm Orifice Pipe
104.25	2.34	230.0	0.0436	Top of Tank

[A] Storage volume based on tank volume.
[B] From orifice equation $Q=CA(2gH)^{0.5}$ for a 100mm diameter orifice pipe.
Where: C = 0.82, A=cross-sectional area, g=9.81, H=pressure head

The proposed conditions were assessed using the SWMHYMO hydrologic modeling program developed by J.F. Sabourin & Associates for the 2 to 100-year City of Burlington design storm (4-hour duration Chicago design storm). The proposed area drain inlet capacities were calculated using the Ontario Building Code and catchment areas. Table 4.5 summarizes the inlet capacities and storage volume provided for the two (2) catchments containing area drains. Table 4.6 summarizes the proposed conditions site discharge and compares them to the associated pre-development peak discharge (i.e. allowable discharge rate).

TABLE 4.5 – AREA DRAIN INLET CAPACITIES

Catchment ID	Area (ha)	15 min Rainfall (mm) [A]	Capacity, Q (m^3/s) [B]	Storage Volume Provided (m^3) [C]
201	0.20	23	0.051	83.2
203	0.15	23	0.038	32.4

[A] 15 minute rainfall from MMAH Supplementary Standard SB-1, “Climatic and Seismic Data”. Refer to Appendix C.
[B] Capacity from Ontario Building Code (OBC), Section 7.4.10.4.(1). Refer to Appendix C.
[C] Storage volume provided in the form of parking lot ponding. Refer to Appendix C for calculations.

TABLE 4.6 – POST-DEVELOPMENT SITE DISCHARGE

Storm Event	Site Peak Discharge Rates (m^3/s)					
	Proposed Conditions [A]			5-Year Allowable Conditions [B]		
	Clearview Avenue	St Matthews Avenue	Masonry Court	Clearview Avenue	St Matthews Avenue	Masonry Court
2-yr	0.000	0.000	0.017	0.008	0.018	0.097
5-yr	0.000	0.000	0.026			
10-yr	0.000	0.000	0.031			
25-yr	0.000	0.000	0.037			
50-yr	0.000	0.000	0.042			
100-yr	**0.000**	**0.000**	**0.046**			

[A] Total site discharge with SWM controls, taken from SWMHYMO output; refer to Appendix C.
[B] From Table 4.2.

TABLE 4.7 – POST-DEVELOPMENT STORAGE RQUIREMENTS

Catchment	100-Year Storm Event		
	Storage Provided (m^3) [A]	Storage Used (m^3) [B]	Depth of Ponding (m)
201	83.2	14.0	0.15 @ AD5 & AD6 0.00 @ AD4
203	32.4	11.0	0.21 @ AD7 & AD8

[A] From Table 4.5.
[B] Total storage used from SWMHYMO output. Refer to Appendix C.

The analysis indicates the following:

- For all outlets, post development flows for all storm events are less than the pre-development peak discharge rate for the 5-year storm event as summarized in Table 4.6. This satisfies the stormwater management quantity control requirement set by the City of Burlington;
- There is sufficient storage volume provided on-site to attenuate the 100-year storm event to the 5-year pre-development level.

4.5 Proposed Conditions – Quality Control

Stormwater quality control for the site will be provided by a Stormceptor oil/grit separator (or approved equivalent) that will be installed at the downstream end of the proposed on-site storm sewer system prior to connecting to the existing 600mm diameter storm sewer located within the Masonry Court right-of-way.

The following parameters were used to size the oil/grit separator device:

- Catchment Area (201+202+203) = 0.59 ha
- % Imperviousness = 83% (calculated via weighted average)
- Particle Distribution = Fine

The analysis indicates that a Stormceptor STC-1000 will provide 80% TSS removal which meets the requirements for an “Enhanced” (Level 1, or 80% TSS removal) level of water quality protection. The Stormceptor sizing output information is included in Appendix C.

5.0 EROSION AND SEDIMENT CONTROL

During construction, erosion and sedimentation controls will be provided primarily via a sediment control fence to be erected around the perimeter of the construction area wherever runoff has the potential of leaving the site or entering into the storm sewer system. All proposed on-site catchbasin manholes and nearby off-site catchbasins will be fitted with silt sacks within the structures to mitigate sediment transport during construction. A mudmat will be constructed at the proposed accesses from Masonry Court to mitigate the transport of sediments to the surrounding roads.

All erosion and sediment controls must be inspected and maintained regularly for the full duration of construction until the Engineer or the City approves removal of the measures. The Contractor shall inspect all erosion and sediment controls weekly and after any rainfall event and rectify any deficiencies immediately.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information provided herein, it is concluded that the development can be constructed to meet the servicing requirements of the City of Burlington and the Region of Halton. Based on the foregoing analysis, it is concluded that:

- Sanitary service for the proposed development can be achieved with a 150mm diameter pipe at a 1% slope connecting to the existing 450mm diameter sanitary sewer on St. Matthews Avenue;
- Water servicing will be provided via a dual 100mm diameter domestic and 150mm diameter fire service connected to the existing 300mm diameter watermain located on Masonry Court. The existing south hydrant within the Masonry Court boulevard will need to be relocated to accommodate the proposed entrance and sidewalk;
- A hydrant flow test will need to be conducted to ensure pressures in the system are sufficient to service the site;
- The peak flow rates for the 2 to 100-year design storm events under post-development conditions match pre-development 5-year rates, therefore meeting the City of Burlington’s requirements;
- Stormwater quality control can be provided in the form of an OGS unit along with other best management practices.

It is recommended that:

- The site grading be undertaken according to the proposed elevations, details and erosion control measures shown on the enclosed engineering drawings;
- The oil/grit separator unit be installed as detailed on the enclosed engineering drawings;

- Erosion and sediment control measures are to be installed as outlined in this report and as per the engineering drawings and maintained until the site is stabilized;
- The proposed stormwater management plan presented in this report and the site servicing works illustrated on the attached engineering drawings be accepted in support of the site plan approval process.

All of which is respectfully submitted,

MTE CONSULTANTS INC.



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APPENDIX A

WASTEWATER CALCULATIONS

6 Storey Residential Development
1085 Clearview Avenue, Burlington, ON
MTE Project #: 44795-100
Date: 12/10/2018

Sanitary Demand Calculations

Location	Residential					Commercial & Restaurant		Total (Residential + Commercial + Restaurant)		
	Area [1] (ha)	Units [2]	Population Density [3] (pph)	Population (persons)	Demand (L/s)	Area (ha)	Demand (L/s)	Total Average Demand (L/s)	Total Peaked Demand (L/s)	Total Peaked Demand + Infiltration (L/s)
Existing										
Dwellings	0.154		55.0	8	0.027			0.027	0.119	
Commercial Building	0.473		90.0	43		0.47	0.135	0.135	0.466	
Sub Total	0.627			51	0.027			0.162	0.585	0.76
Proposed										
1 Bedroom Apartments	0.627	121	1	121	0.385			0.385	1.600	
2 Bedroom Apartments		35	2	70	0.223			0.223	0.927	
Total		156		191	0.608			**0.608**	**2.526**	**2.71**

Sanitary Demand		
Residential Daily Demands [4]	275	L/ca/day
	0.0032	L/ca/sec
Harmon PF [5] (Ex. Dwellings)	4.42	
Harmon PF [5] (Ex. Commercial)	3.46	
Harmon PF [5] (Prop. Residential)	4.16	
Commercial Space Daily Demands [6]	24750	L/ha/d
	0.2865	L/ha/s
Site Area	0.627	ha
Infiltration Allowance [7]	0.286	L/s/ha
	0.179	L/s

Note 1: Area based on existing topographic survey and proposed site plan
Note 2: Unit count based on unit type analysis provided by Architect
Note 3: Population Density based on Halton Region Design Standards (existing) and OBC 3.1.17.1.1ci (proposed) since more conservative than Halton Region Design Standards
Note 4: Residential Demand based on Halton Region Design Standards
Note 5: Harmon Peaking Factor = 1 + (14/(4+(P/1000)^{½})), 5.0 max (modified 0.8PF for commercial)
Note 6: Commercial Space Demand based on Halton Region Design Standards
Note 7: Infiltration allowance based on Halton Region Design Standards

3.1.16. Fabrics

3.1.16.1. Fabric Awnings, Canopies and Marquees

(1) Fabrics used as part of an awning, *canopy* or *marquee* that is located within or attached to a *building* of any type of construction shall conform to CAN/ULC-S109, "Flame Tests of Flame-Resistant Fabrics and Films".

3.1.17. Occupant Load

3.1.17.1. Occupant Load Determination

(1) The *occupant load* of a *floor area* or part of a *floor area*, or of a *building* or part of a *building* not having a *floor area*, shall be based on,
(a) the number of seats in an *assembly occupancy* having fixed seats,
(b) two persons per sleeping room or sleeping area in a *dwelling unit* or *suite*, or
(c) the number of persons,
  (i) for which the area is designed, or
  (ii) determined from Table 3.1.17.1. for *occupancies* other than those described in Clauses (a) and (b).

(2) If a *floor area* or part of it has been designed for an *occupant load* other than that determined from Table 3.1.17.1., a permanent sign indicating that *occupant load* shall be posted in a conspicuous location.

(3) For the purposes of this Article, *mezzanines*, tiers and balconies shall be regarded as part of the *floor area*.

(4) If a room or group of rooms is intended for different *occupancies* at different times, the value to be used from Table 3.1.17.1. shall be the value that gives the greatest number of persons for the *occupancies* concerned.

(5) Except as provided by Sentence (6) or (7), in dining, alcoholic beverage and cafeteria spaces the *occupant load* shall be determined from Table 3.1.17.1.

(6) The *occupant load* in Sentence (5) is permitted to be the number of persons for which the space is designed.

(7) The *occupant load* in Sentence (6) shall be not more than that determined by using an area of 0.6 m^2 per person.

Table 3-1 Residential Dry Weather Flow

Type of Development	Equivalent Population Density (persons/hectare)	Unit Sewage Flow	
		m^3pcd	m^3/person/s
Single Family	55	0.275	0.003183×10^{-3}
Semi-detached, duplex and 4-plex	100	0.275	0.003183×10^{-3}
Townhouse, Maisonette (6 storey apt. or less)	135	0.275	0.003183×10^{-3}
Apartment (over 6 stories High)	285	0.275	0.003183×10^{-3}

Notes:
1) m^3pcd = metres^3 per capita per day
2) m^3/ha/s = metres^3 per hectare per second
3) m^3/ha/day = metres^3 per hectare per day

Table 3-2 Commercial, Industrial, and Community Dry Weather Flow

Type of Development	Equivalent Population Density (persons/hectare)	Unit Sewage Flow	
		m^3/ha/day	m^3/ha/s
Light Commercial Areas	90	24.750	0.28646×10^{-3}
Community Services	40	11.000	0.12732×10^{-3}
Light Industrial Areas	125	34.375	0.003183×10^{-3}
Hospitals	4 persons per bed	1.1 m^3/bed/day	0.0127×10^{-3} m^3/bed/s

Notes:
1) m^3pcd = metres^3 per capita per day
2) m^3/ha/s = metres^3 per hectare per second
3) m^3/ha/day = metres^3 per hectare per day

3.2.3. Peak Wastewater Flow Factor

a. Residential and Community Services Land Use

The peak wastewater flow will be derived by applying the ratio established by the Harmon Formula to the average wastewater flow for residential and community services areas as follow:

$$M = 1 + \frac{14}{4 + \sqrt{P}}$$

where, M = ratio of peak flow to average flow
P = tributary population in thousands

Note: The minimum permissible peaking factor M is 2.0

The value of M for tributary population up to 13,200 can be obtained from Halton Standard RH 2002.01.

b. Commercial and Industrial Land Use

For commercial and industrial land uses, the peaking factor will be determined from a modified Harmon Formula as follows:

$$M_e = 0.80 \cdot (1 + \frac{14}{4 + \sqrt{P_e}})$$

where, M_e = ratio of peak flow to average flow
P_e = equivalent tributary population in thousands

c. Combined Land Use

When a tributary area consists of residential, industrial and commercial land uses, the peaking factor shall be calculated using the modified Harmon Formula as follow:

$$M_{av} = K_{av}\ x\ (1 + \frac{14}{4 + \sqrt{P + P_e}})$$

where,

$$K_{av} = \frac{A_R + 0.80\ x\ (A_I + A_C)}{A_R + A_I + A_C}$$

and A_R = residential area
A_I = industrial area
A_C = commercial area

3.2.4. Inflow/Infiltration Allowance

a. Except under unusual circumstances, the inflow/infiltration allowance shall be a minimum of 0.286×10^{-3} m^3s/ha for all types of land use.

3.3. Pipe Size

3.3.1. To determine the pipe size and its capacity, the Halton Standard Design Table RH 2000 or Manning's Formula shall be used. Manning's Formula is expressed as:

$$Q = \frac{1}{n} R^{2/3} \; x \; S^{1/2} \; x \; A$$

where,

Q	=	design flow (m^3/sec)
n	=	coefficient of roughness (dimensionless)
R	=	hydraulic radius (m)
S	=	slope (m/m)
A	=	section area of flow (m^2)

Table 3-3 Coefficient of Roughness Values

Type of Pipe	Coefficient of Roughness (n)
Vitrified Clay (VC)	0.013
Concrete	0.013
Polyvinyl Chloride (PVC)	0.010*
Polyethylene (PE)	0.010*

Note: *For Master Plans, Secondary Plans, Area Servicing Plans and all local municipal plans, the coefficient of Roughness Values for PVC and PE shall be 0.013.

3.3.2. For residential areas, the minimum pipe shall be 200 mm diameter.

3.3.3. For commercial and industrial areas, the minimum pipe size shall be 300 mm diameter.

3.4. Flow Velocities

3.4.1. The flow velocity shall be determined from the Halton Standard Design Table RH 2000 or from the following:

$$V = \frac{Q}{A}$$

where,

V	=	flow velocity (m/sec)
Q	=	design flow (m^3/sec)
A	=	cross section area of flow (m^2)

The minimum velocity in a pipe shall be 0.6 m/sec based on actual flows.

APPENDIX B

WATER CALCULATIONS

Drawing on experience...Building on strength.

6 Storey Residential Development

1085 Clearview Avenue, Burlington, ON
MTE Project #: 44795-100
Date: 12/10/2018

Residential Peaking Factors[1]:	
Avg. Day	1.0
Max. Day	2.25
Peak Hour	4.0

MTE More Than Engineering

Water Demand Calculations

	Residential				Final Demand		
Location	Units (ea)	Population Density (persons/unit) [2]	Population (persons)	Demand (L/s)	Avg Day Demand Qavg (L/s)	Max Day Demand Qmax.day (L/s)	Peak Hour Demand Qpeak (L/s)
Residential							
1 Bedroom Apartments	121	1.0	121	0.385	0.385	0.867	1.541
2 Bedroom Apartments	35	2.0	70	0.223	0.223	0.501	0.891
Sub Total	156		191	0.608	**0.608**	**1.368**	**2.432**
Totals					***0.608***	***1.368***	***2.432***

Water Demand [3]	
Average Residential Daily Demands	275 L/d/person
	0.0032 L/s/person

Fire Flow [4]	
Fire Flow (Hyatt Hotel)	200 L/s

Max Day + Fire Flow Demand	
Qmax.day+fire (Hyatt Hotel)	201.37 L/s

Note 1: Peaking factors based on Halton Region Design Guidelines
Note 2: Residential Population Density based on OBC 3.1.17.1.1(c)(i)
Note 3: Water Demands based on Halton Region Design Guidelines
Note 4: Fire flows calculated using FUS (1999) guidelines - See attached worksheet

d. Proposing pressure reducing valves to ensure pressures are within standard operating limits, and

e. Adjusting zone boundaries to ensure pressures are within standard operating limits.

2.2.3. Individual hydraulic and capacity studies may be required for development areas.

2.3. Equivalent Population

2.3.1. The equivalent population densities listed in Table 2-1 shall be used to estimate the design of the water service connection demand for the different types of development.

Table 2-1 Equivalent Population Density and Water service connection Demand

Type of Development	Equivalent Population Density (Person/Hectare)	Average Day Service Demands (m^3/ha/day)
Single Family	55	15.125
Semi-detached duplex and 4-plex	100	27.5
Townhouse, Maisonette (6 storey apt. or less)	135	37.125
Apartments (over 6 stories high)	285	78.375
Light Commercial Areas	90	24.75
Community Services	40	11.00
Light Industrial Areas	125	34.375
Hospitals	4 persons/bed	

2.4. Design Factors

2.4.1. The following are the design factors for water distribution systems:

a. Average Daily Demand = 0.275 m^3 per capita

b. Maximum Daily Demand Peaking Factor = 2.25

c. Maximum Hourly Demand Peaking Factor: See Table 2-2

Table 2-2 Maximum Hourly Demand Peaking Factor

Type of Development	Maximum Hourly Demand Peaking Factor
Residential	4.00
Industrial	2.25
Commercial	2.25
Community Services	2.25

6 Storey Residential Development

1085 Clearview Avenue, Burlington, ON
MTE Project #: 44795-100
Date: 12/10/2018

FIRE FLOW DEMAND REQUIREMENTS - FIRE UNDERWRITERS SURVEY (FUS GUIDELINES)

Fire flow demands for the FUS method is based on information and guidance provided in "Water Supply for Public Protection" (Fire Underwriters Survey, 1999).

An estimate of the fire flow required is given by the following formula:

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

where:

F = the required fire flow in litres per minute
C = coefficient related to the type of construction
= 1.5 for wood frame construction (structure essentially all combustible).
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls)
= 0.6 for fire-resistive construction (fully protected frame, floors, roof)
A = Total floor area in square metres

Adjustments to the calculated fire flow can be made based on occupancy, sprinkler protection and exposure to other structures. The table below summarizes the adjustments made to the basic fire flow demand.

			(1)		(2)		(3)		(4)		**Final Adjusted**		
Building	Area "A" [A] (m^2)	C [B]	Fire Flow "F"		Occupancy		Sprinkler		Exposure		**Fire Flow**		
			(l/min)	(l/s)	%	Adjusted Fire Flow (L/min)	%	Adjustment (L/min)	%	Adjustment (L/min)	**(L/min)**	**Rounded(L/min)**	**(L/s)**
Apartments	11,060	0.8	19,000	316.7	-15	16,150	-40	-6,460	15	2,423	12,113	12,000	**200**

Note [A]: Area "A" represents the Gross Floor Area as indicated on the unit matrix.
Note [B]: Construction type confirmed by the Architect

(2) Occupancy

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	No charge
Free Burning	15%
Rapid Burning	25%

(3) Sprinkler

40% credit for adequately designed system per NFPA 13. Additional 10% if water supply standard for both the system and fire department hose lines.

(4) Exposure

0 to 3m	25%	
3.1 to 10m	20%	Calculate for all
10.1 to 20m	15%	sides. Maximum
20.1 to 30m	10%	charge shall not
30.1 to 45m	5%	exceed 75%

NW	> 45m	0
NE	42.30m	5
SE	20.10m	10
SW	> 45m	0
	TOTAL	15

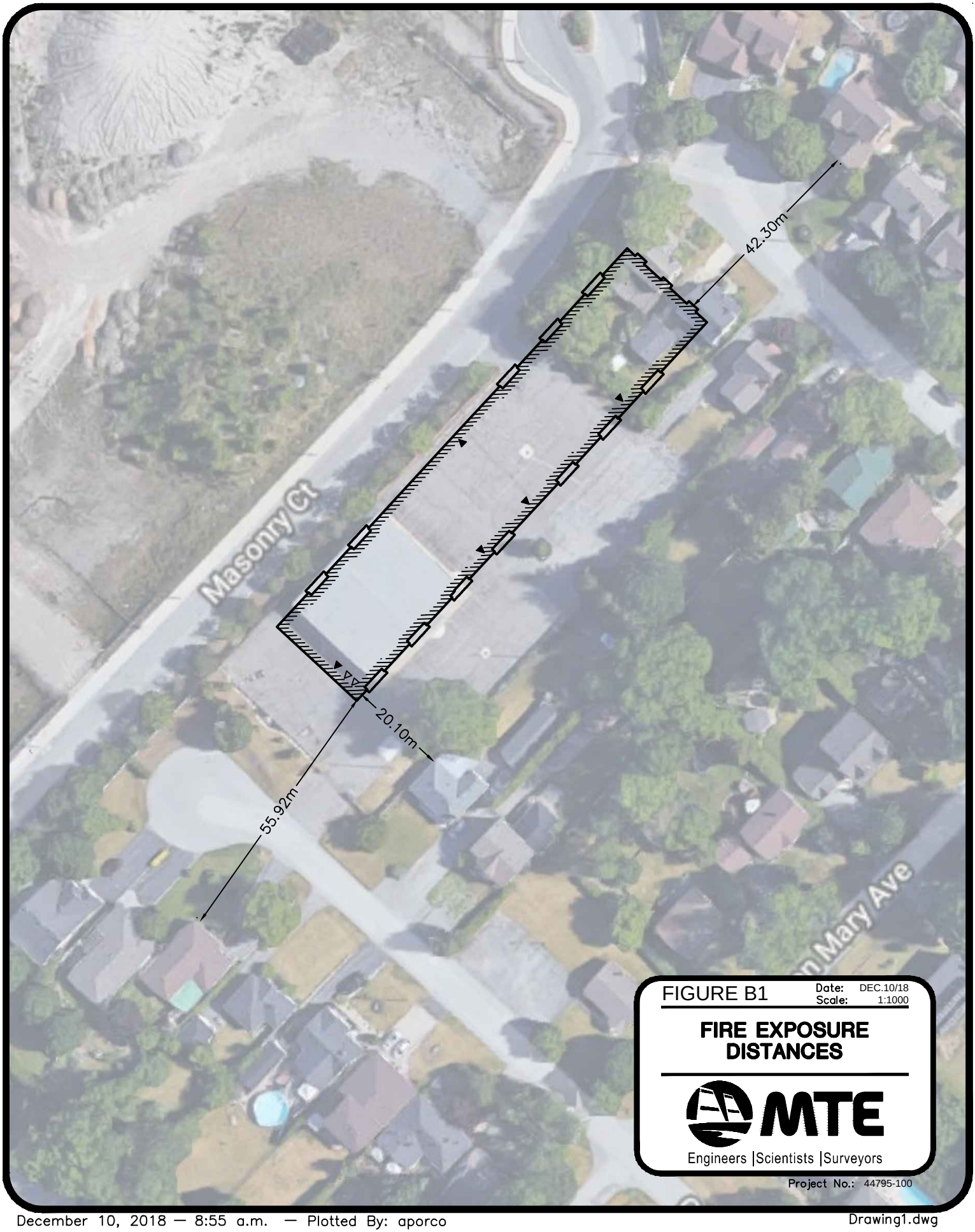


FIGURE B1

Date: DEC.10/18
Scale: 1:1000

FIRE EXPOSURE DISTANCES

MTE
Engineers | Scientists | Surveyors

Project No.: 44795-100

December 10, 2018 — 8:55 a.m. — Plotted By: aporco

Drawing1.dwg

APPENDIX C

STORMWATER MANAGEMENT CALCULATIONS

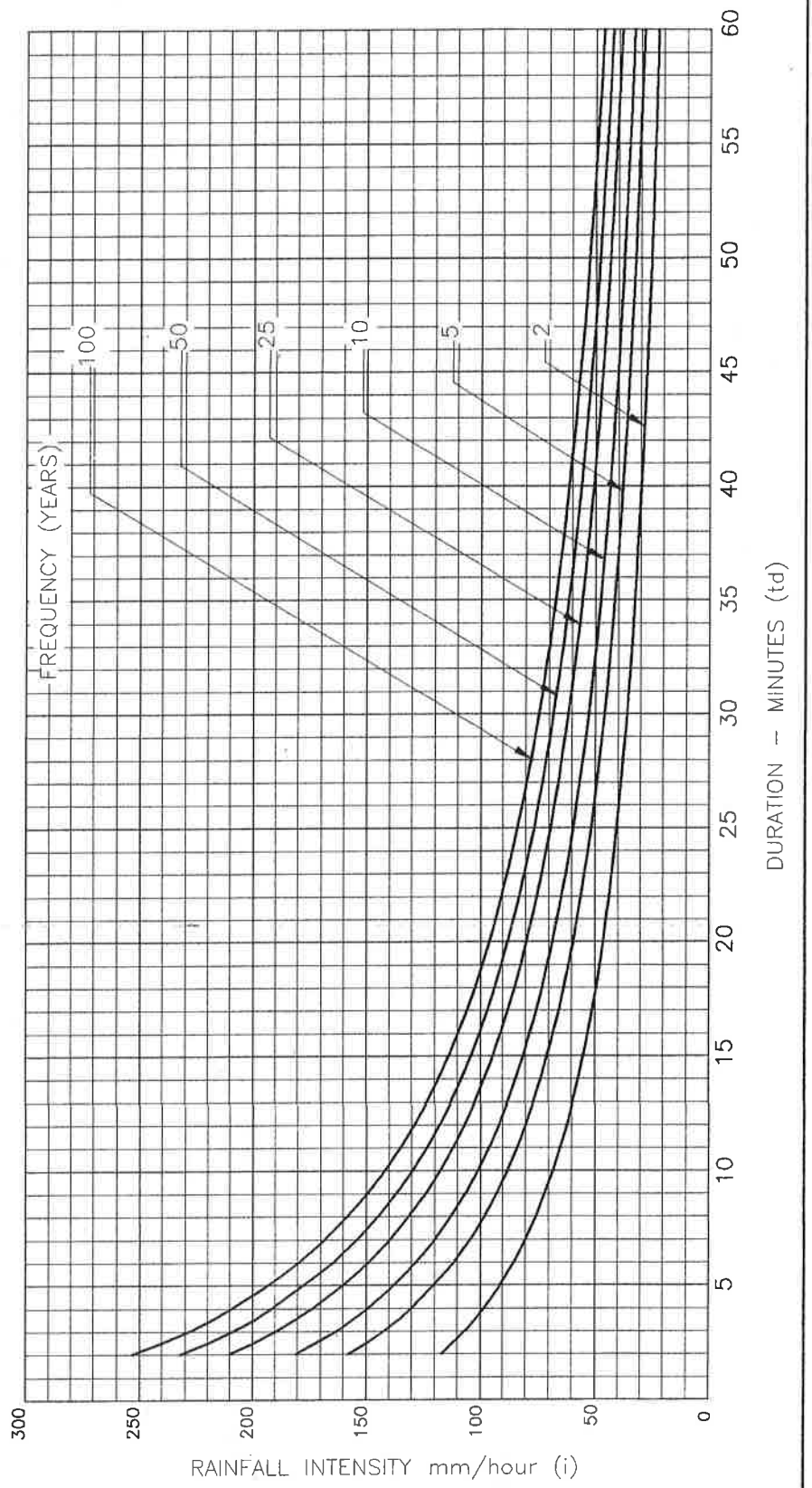
DATE: JUNE/98	REV. 2

EQUATION OF CURVE

$$i_{100} = \frac{1114.20}{(td+5)^{0.761}} \qquad i_{10} = \frac{798.50}{(td+5)^{0.763}}$$

$$i_{50} = \frac{1019.40}{(td+5)^{0.761}} \qquad i_{5} = \frac{697.40}{(td+5)^{0.764}}$$

$$i_{25} = \frac{926.90}{(td+5)^{0.762}} \qquad i_{2} = \frac{592.60}{(td+6)^{0.780}}$$



APPROVED	CITY OF BURLINGTON	METRIC
J. Eidsvaag	ENGINEERING DEPARTMENT	SCALE: N.T.S.
DIRECTOR OF ENGINEERING		
DATE: Feb. 17/99	INTENSITY, DURATION, FREQUENCY CURVES	DWG. NO. S-IDF

1085 Clearview Avenue
City of Burlington
Stormwater Management

EXISTING CONDITIONS ALLOWABLE RELEASE RATE

Catchment ID	Catchment Description	Hydrograph Method	Area (ha)	Perv. CN	Perv. Ia (mm)	Impervious (%)		Flow Length (m)		Manning "n"		Slope (%)		Time to Peak Tp (hrs)
						TIMP	XIMP	Perv.	Imperv.	Perv.	Imperv.	Perv.	Imperv.	
101	Minor flows to Masonry Court, Major Flows to Clearview Avenue	STANDHYD	0.51	74	8.92	82	82	5	10	0.250	0.013	2.0	1.0	
102	Existing site to St. Matthews Avenue	STANDHYD	0.12	74	8.92	57	57	5	15	0.250	0.013	2.0	1.0	
Total			**0.63**											

PROPOSED CONDITIONS HYDROLOGIC MODELING PARAMETERS

Catchment ID	Catchment Description	Hydrograph Method	Area (ha)	Perv. CN	Perv. Ia (mm)	Impervious (%)		Flow Length (m)		Manning "n"		Slope (%)		Time to Peak Tp (hrs)
						TIMP	XIMP	Perv.	Imperv.	Perv.	Imperv.	Perv.	Imperv.	
201	Proposed site to Clearview Avenue	STANDHYD	0.20	74	8.92	99	99	5	35	0.250	0.013	2.0	1.0	
202	Proposed roof to Masonry Court	STANDHYD	0.24	74	8.92	99	99	10	15	0.250	0.013	2.0	1.0	
203	Proposed site to St. Matthews Avenue	STANDHYD	0.15	74	8.92	99	99	10	15	0.250	0.013	2.0	1.0	
204	Proposed site to Masonry Court (uncontrolled)	STANDHYD	0.04	74	8.92	99	99	3	3	0.250	0.013	2.0	1.0	
Total			**0.63**											

- Pervious Initial Abstraction (Perv. Ia) = (0.1 x S), where S = (25400 / CN) - 254
- Depression Storage over Impervious areas (DPSI) = 1.0mm

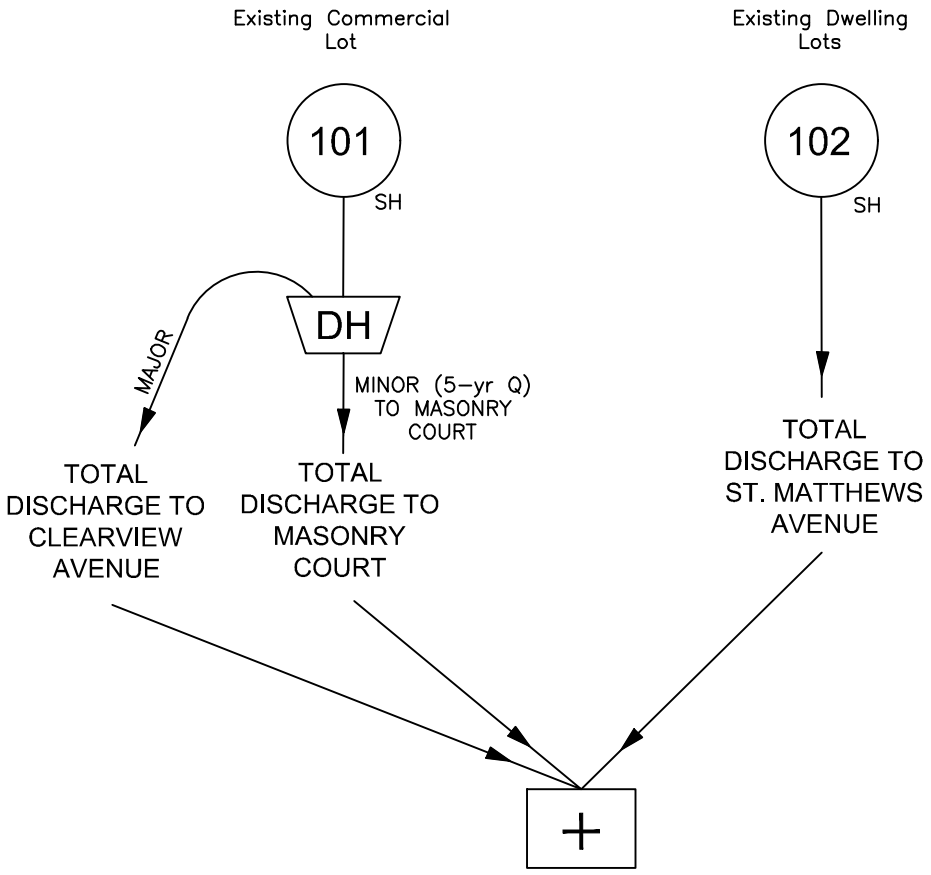
1085 Clearview Avenue
City of Burlington
STORMWATER MANAGEMENT

Project Number: 44795-100
Date: January 9, 2019
File: Q:\44795\100\SWM\44795-100 SWM Calculations.xlsx

Orifice Calculations for Catchment 201 $Q_o=C_d*A_o*(2*g*H_o)^{0.5}$		
	Orifice	**Description**
C_d	0.82	Outlet Plate
Invert (m)	101.86	
CL elevation (m)	101.91	
Diameter (mm)	100	
Type (H/V)	V	

STAGE-STORAGE-DISCHARGE RELATIONSHIP

Description	**Stage**	**Incremental Volume**	**Cumulative Volume**	**Orifice**		
				Orifice Area	**H_o**	**Flow**
	m	m^3	m^3	m^2	*m*	m^3/s
Bottom of Tank	101.25	0.0	0.0	0.008	0.00	0.0000
C/L of orifice	101.91	50.6	50.6	0.008	0.00	0.0000
Top of Tank	104.25	179.4	230.0	0.008	2.34	0.0436



TOTAL DISCHARGE FROM SITE

LEGEND

101	CATCHMENT ID	- "SH" denotes STANDHYD hydrograph command
+	ADD HYDROGRAPHS	- "DH" denotes DUALHYD hydrograph command

Date: DEC. 10/18

PRE DEVELOPMENT SWM MODEL SCHEMATIC

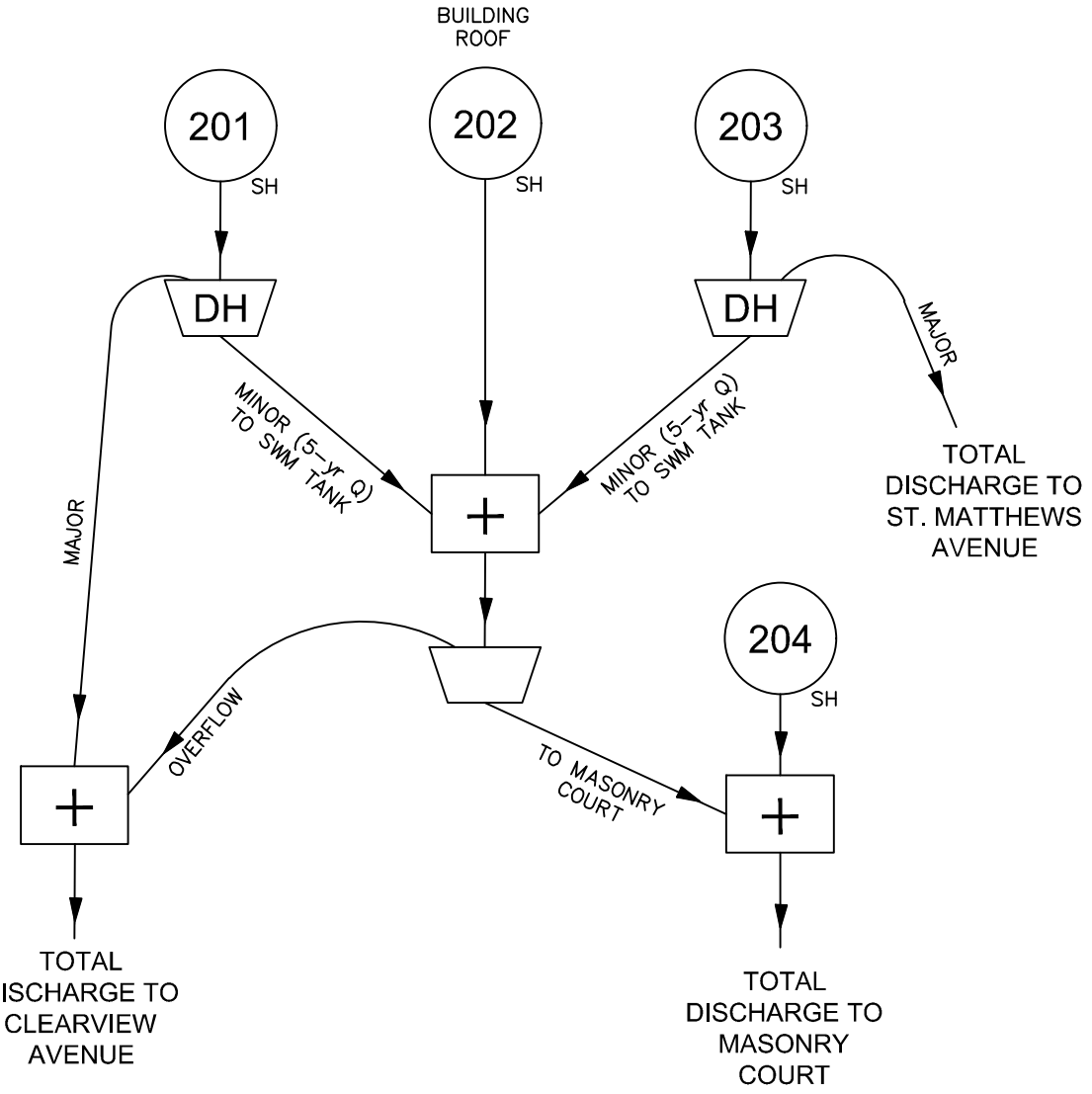
MTE

Engineers | Scientists | Surveyors

Project No.: 44795-100

January 11, 2019 — 2:10 p.m. — Plotted By: aporco

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LEGEND

201 — CATCHMENT ID

- "SH" denotes STANDHYD hydrograph command

\+ — ADD HYDROGRAPHS

- "DH" denotes DUALHYD hydrograph command

ROUTE RESERVOIR

Date: DEC. 10/18

POST DEVELOPMENT SWM MODEL SCHEMATIC

MTE

Engineers | Scientists | Surveyors

Project No.: 44795-100

January 11, 2019 — 2:12 p.m. — Plotted By: aporco

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00003> *#  Project Name: 1085 CLEARVIEW AVENUE
00004> *#                    BURLINGTON, ONTARIO
00005> *#  JOB NUMBER  : 44795-100
00006> *#       Date   : DECEMBER 2018
00007> *#  Modeller    : ALP
00008> *#    Company   : MTE CONSULTANTS INC.
00009> *#       File   : 44795.DAT
00010> *
00011> *%-----------------|---------------------------------------------------------|
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00013>                     ["BURL_002.stm"]
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00015> *
00016> *#########################################################################|
00017> *#
00018> *#                    EXISTING CONDITIONS HYDROLOGIC MODELING
00019> *#                ================================================
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00021> *#########################################################################|
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00034> *Note: Minor system for commercial lot outlets to storm sewer on Masonry Court
00035> *Major overland flows proceed to Clearview Avenue
00036> *%-----------------|---------------------------------------------------------|
00037> COMPUTE DUALHYD     IDin=[1], CINLET=[0.097](cms), NINLET=[1],
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00044> *#*************************************************************************|
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00056> *%-----------------|---------------------------------------------------------|
00057> *#########################################################################|
00058> *#
00059> *#                    PROPOSED CONDITIONS HYDROLOGIC MODELING
00060> *#                ================================================
00061> *#
00062> *#########################################################################|
00063> *#*************************************************************************|
00064> *AREA 201 - Minor Flow to Masonry Court, Major Flow to Clearview Avenue
00065> *#*************************************************************************|
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00070>                                          LGP=[5](m), MNP=[0.250], SCP=[0](min),
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00075> *Note: Minor system for 201 outlets to storm sewer on Masonry Court
00076> *Major overland flows proceed to Clearview Avenue
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00103>                    Impervious surfaces: IAimp=[1](mm), SLPI=[1.0](%),
00104>                                      LGI=[15](m), MNI=[0.013], SCI=[0](min),
00105>                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00106> *%-----------------|-------------------------------------------------------|
00107> *Note: Minor system for 203 outlets to storm sewer on Masonry Court
00108> *Major overland flows proceed to St. Matthews Avenue
00109> *%-----------------|-------------------------------------------------------|
00110> COMPUTE DUALHYD     IDin=[4], CINLET=[0.038](cms), NINLET=[1],
00111>                    MAJID=[5], MajNHYD=["ST.MATT"],
00112>                    MINID=[6], MinNHYD=["202mnr"],
00113>                    TMJSTO=[32.4](cu-m)
00114> *%-----------------|-------------------------------------------------------|
00115> *#*******************************************************************************|
00116> *AREA 204 - Site Perimeter Uncontrolled to Masonry Court
00117> *#*******************************************************************************|
00118> CALIB STANDHYD      ID=[7], NHYD=["204"], DT=[1.0](min), AREA=[0.04](ha),
00119>                    XIMP=[0.99], TIMP=[0.99], DWF=[0](cms), LOSS=[2],
00120>                    SCS curve number CN=[74],
00121>                    Pervious   surfaces: IAper=[8.92](mm), SLPP=[2.0](%),
00122>                                      LGP=[3](m), MNP=[0.250], SCP=[0](min),
00123>                    Impervious surfaces: IAimp=[1](mm), SLPI=[1.0](%),
00124>                                      LGI=[3](m), MNI=[0.013], SCI=[0](min),
00125>                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00126> *%-----------------|-------------------------------------------------------|
00127> *ADD TOTAL DRAINAGE TO TANK
00128> ADD HYD             IDsum=[8], NHYD=["TOTANK"], IDs to add=[1,3,6]
00129> *%-----------------|-------------------------------------------------------|
00130> *Control to Masonry Court via orifice plate on outlet from tank
00131> *%-----------------|-------------------------------------------------------|
00132> ROUTE RESERVOIR     IDout=[6],   NHYD=["CTL-TANK"],  IDin=[8],
00133>                    RDT=[1](min),
00134>                          TABLE of ( OUTFLOW-STORAGE ) values
00135>                                      (cms) - (ha-m)
00136>  0.0000  0.00000
00137>  0.0000  0.00506
00138>  0.0436 0.02300
00139>                                    -1       -1   (max twenty pts)
00140>                          IDovf=[1], NHYDovf=["OVF-TANK"]
00141> *%-----------------|-------------------------------------------------------|
00142> *ADD TOTAL DRAINAGE TO MASONRY
00143> ADD HYD             IDsum=[3], NHYD=["MASONRY"], IDs to add=[6,7]
00144> *%-----------------|-------------------------------------------------------|
00145> *ADD TOTAL DRAINAGE TO CLEARVIEW
00146> ADD HYD             IDsum=[4], NHYD=["CLEARVIEW"], IDs to add=[1,2]
00147> *%-----------------|-------------------------------------------------------|
00148> *ADD TOTAL DRAINAGE FROM SITE
00149> ADD HYD             IDsum=[9], NHYD=["PROP"], IDs to add=[3,4,5]
00150> *%-----------------|-------------------------------------------------------|
00151> *AREA CHECK
00152> ADD HYD             IDsum=[8], NHYD=["CHECK"], IDs to add=[9,10]
00153> *%-----------------|-------------------------------------------------------|
00154> *%-----------------|-------------------------------------------------------|
00155> * RUN REMAINING DESIGN STORMS (City of Burlington 4-hour duration 5 TO 100-YR)
00156> *
00157> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[005]
00158>                    {"BURL_005.stm"]
00159>
00160> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[010]
00161>                   ["BURL_010.stm"]
00162>
00163> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[025]
00164>                   {"BURL_025.stm"]
00165>
00166> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[050]
00167>                   ["BURL_050.stm"]
00168>
00169> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[100]
00170>                   ["BURL_100.stm"]
00171>
00172> *%-----------------|-------------------------------------------------------|
00173> FINISH
00174>
00175>
00176>
00177>
00178>
```

```
00001> ================================================================================
00002>
00003>    SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO       999    999    =========
00004>    S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9  9   9
00005>    SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>        S  W W  M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>    SSSSS  W W  M   M  H   H    Y    M   M   OOO           9      9    =========
00008>                                                        9   9  9   9   # 3053466
00009>          StormWater Management HYdrologic Model         999    999    =========
00010>
00011>  ********************************************************************************
00012>  **************************** SWMHYMO Ver/4.05  *****************************
00013>  *********  A single event and continuous hydrologic simulation model  *********
00014>  *********     based on the principles of HYMO and its successors      *********
00015>  *********                 OTTHYMO-83 and OTTHYMO-89.                  *********
00016>  ********************************************************************************
00017>  *********  Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018>  *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019>  *********                  Gatineau, Quebec: (819) 243-6858           *********
00020>  *********                  E-Mail: swmhymo@jfsa.Com                   *********
00021>  ********************************************************************************
00022>
00023>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++++ Licensed user: MTE Consultants Inc.                          +++++++++
00025>  +++++++++                 Burlington          SERIAL#:3053466        +++++++++
00026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *********          ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030>  *********          Maximum value for ID numbers  :     10            *********
00031>  *********          Max. number of rainfall points: 105408            *********
00032>  *********          Max. number of flow points    : 105408            *********
00033>  ********************************************************************************
00034>
00035>
00036>  *********************   D E T A I L E D   O U T P U T   **********************
00037>  ********************************************************************************
00038>  *         DATE: 2019-01-11     TIME: 14:01:31     RUN COUNTER: 000861          *
00039>  ********************************************************************************
00040>  * Input   filename: Q:\44795\100\SWM\SWMHYMO\44795.dat                         *
00041>  * Output  filename: Q:\44795\100\SWM\SWMHYMO\44795.out                         *
00042>  * Summary filename: Q:\44795\100\SWM\SWMHYMO\44795.sum                         *
00043>  * User comments:                                                              *
00044>  * 1:_____________________________________________________________________________*
00045>  * 2:_____________________________________________________________________________*
00046>  * 3:_____________________________________________________________________________*
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*****************************************************************************|
00052> *#  Project Name: 1085 CLEARVIEW AVENUE
00053> *#               BURLINGTON, ONTARIO
00054> *#  JOB NUMBER  : 44795-100
00055> *#       Date   : DECEMBER 2018
00056> *#  Modeller    : ALP
00057> *#    Company   : MTE CONSULTANTS INC.
00058> *#       File   : 44795.DAT
00059> *
00060>   ** END OF RUN :   1
00061>
00062> ********************************************************************************
00063>
00064>
00065>
00066>
00067>
00068> --------------------
00069> | START              |  Project  dir.: Q:\44795\100\SWM\SWMHYMO\
00070> --------------------  Rainfall dir.: Q:\44795\100\SWM\SWMHYMO\
00071>     TZERO =   .00 hrs on      0
00072>     METOUT=  2 (output = METRIC)
00073>     NRUN  = 002
00074>     NSTORM=  1
00075>               #  1=BURL_002.stm
00076> --------------------------------------------------------------------------------
00077> 002:0002--------------------------------------------------------------------------
00078> *#*****************************************************************************|
00079> *#  Project Name: 1085 CLEARVIEW AVENUE
00080> *#               BURLINGTON, ONTARIO
00081> *#  JOB NUMBER  : 44795-100
00082> *#       Date   : DECEMBER 2018
00083> *#  Modeller    : ALP
00084> *#    Company   : MTE CONSULTANTS INC.
00085> *#       File   : 44795.DAT
00086> *
00087> --------------------------------------------------------------------------------
00088> 002:0002--------------------------------------------------------------------------
00089> --------------------
00090> | READ STORM       |    Filename: 2-YR BURLINGTON CHICAGO STORM (4-HR DURA
00091> | Ptotal=  32.34 mm|    Comments: 2-YR BURLINGTON CHICAGO STORM (4-HR DURA
00092> --------------------
00093>              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00094>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00095>               .17   2.193 |   1.17  17.083 |   2.17   5.221 |   3.17   2.635
00096>               .33   2.511 |   1.33  68.163 |   2.33   4.444 |   3.33   2.448
00097>               .50   2.955 |   1.50  22.413 |   2.50   3.884 |   3.50   2.289
00098>               .67   3.627 |   1.67  11.979 |   2.67   3.459 |   3.67   2.151
00099>               .83   4.775 |   1.83   8.270 |   2.83   3.126 |   3.83   2.031
00100>              1.00   7.239 |   2.00   6.374 |   3.00   2.857 |   4.00   1.925
00101>
00102> --------------------------------------------------------------------------------
00103> 002:0003--------------------------------------------------------------------------
00104> *
00105> *###############################################################################|
00106> *#
00107> *#                    EXISTING CONDITIONS HYDROLOGIC MODELING
00108> *#                ================================================
00109> *#
00110> *###############################################################################|
00111> *#*****************************************************************************|
00112> *AREA 101 - Existing Commercial Lot
00113> *#*****************************************************************************|
00114> ----------------------
00115> | CALIB STANDHYD     |   Area    (ha)=     .51
00116> | 01:101    DT= 1.00 |   Total Imp(%)=   82.00   Dir. Conn.(%)=   82.00
00117> ----------------------
00118>                                IMPERVIOUS    PERVIOUS (i)
00119>      Surface Area     (ha)=        .42          .09
00120>      Dep. Storage     (mm)=       1.00         8.92
00121>      Average Slope     (%)=       1.00         2.00
00122>      Length            (m)=      10.00         5.00
00123>      Mannings n            =       .013         .250
00124>
00125>      Max.eff.Inten.(mm/hr)=      68.16         7.94
00126>                 over (min)        1.00         6.00
00127>      Storage Coeff.  (min)=         .75 (ii)    6.33 (ii)
00128>      Unit Hyd. Tpeak (min)=        1.00         6.00
00129>      Unit Hyd. peak  (cms)=        1.25          .18
00130>                                                          *TOTALS*
00131>      PEAK FLOW       (cms)=         .08          .00          .080 (iii)
00132>      TIME TO PEAK    (hrs)=        1.33         1.42         1.333
00133>      RUNOFF VOLUME    (mm)=       31.34         4.87        26.577
00134>      TOTAL RAINFALL   (mm)=       32.34        32.34        32.342
00135>      RUNOFF COEFFICIENT   =         .97          .15          .822
00136>
00137>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00138>            CN* =  74.0    Ia = Dep. Storage  (Above)
00139>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00140>            THAN THE STORAGE COEFFICIENT.
00141>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00142>
00143> --------------------------------------------------------------------------------
00144> 002:0004--------------------------------------------------------------------------
00145> *Note: Minor system for commercial lot outlets to storm sewer on Masonry Court
00146> *Major overland flows proceed to Clearview Avenue
00147> ----------------------
00148> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .097  (cms)
00149> | TotalHyd 01:101    |   Number of inlets in system [NINLET] =      1
00150> ----------------------   Total minor system capacity        =    .097  (cms)
00151>                          Total major system storage [TMJSTO] =      0.(cu.m.)
00152>
00153>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.       DWF
00154>                                    (ha)     (cms)     (hrs)     (mm)     (cms)
00155>      TOTAL HYD.   01:101            .51      .080     1.333   26.577     .000
00156>      ==========================================================================
00157>      MAJOR SYST   02:101MJR         .00      .000      .000     .000     .000
00158>      MINOR SYST   03:101mnr         .51      .080     1.333   26.577     .000
00159>
00160>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00161>
00162> --------------------------------------------------------------------------------
00163> 002:0005--------------------------------------------------------------------------
00164> *#*****************************************************************************|
00165> *AREA 102 - Existing Dwelling Lots to St. Matthews Avenue
00166> *#*****************************************************************************|
00167> ----------------------
00168> | CALIB STANDHYD     |   Area    (ha)=     .12
00169> | 01:102    DT= 1.00 |   Total Imp(%)=   57.00   Dir. Conn.(%)=   57.00
00170> ----------------------
00171>                                IMPERVIOUS    PERVIOUS (i)
00172>      Surface Area     (ha)=        .07          .05
00173>      Dep. Storage     (mm)=       1.00         8.92
00174>      Average Slope     (%)=       1.00         2.00
00175>      Length            (m)=      15.00         5.00
00176>      Mannings n            =       .013         .250
00177>
00178>      Max.eff.Inten.(mm/hr)=      68.16         7.39
00179>                 over (min)        1.00         7.00
00180>      Storage Coeff.  (min)=         .95 (ii)    6.70 (ii)
00181>      Unit Hyd. Tpeak (min)=        1.00         7.00
00182>      Unit Hyd. peak  (cms)=        1.10          .17
00183>                                                          *TOTALS*
00184>      PEAK FLOW       (cms)=         .01          .00          .013 (iii)
00185>      TIME TO PEAK    (hrs)=        1.33         1.43         1.333
00186>      RUNOFF VOLUME    (mm)=       31.34         4.87        19.959
00187>      TOTAL RAINFALL   (mm)=       32.34        32.34        32.342
00188>      RUNOFF COEFFICIENT   =         .97          .15          .617
00189>
00190>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00191>            CN* =  74.0    Ia = Dep. Storage  (Above)
00192>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00193>            THAN THE STORAGE COEFFICIENT.
00194>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00195>
00196> --------------------------------------------------------------------------------
00197> 002:0006--------------------------------------------------------------------------
00198> *ADD TOTAL AREA CONTRIBUTING TO SITE DISCHARGE
00199> ------------------------
00200> | ADD HYD (EX        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00201> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00202>                          ID1 01:102          .12     .013    1.33  19.96    .000
00203>                         +ID2 02:101MJR       .00     .000     .00    .00    .000
00204>                         +ID3 03:101mnr       .51     .080    1.33  26.58    .000
00205>                          ========================================================
00206>                          SUM 10:EX            .63     .093    1.33  25.32    .000
00207>
00208>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00209>
00210> --------------------------------------------------------------------------------
00211> 002:0007--------------------------------------------------------------------------
00212> *###############################################################################|
00213> *#
00214> *#                    PROPOSED CONDITIONS HYDROLOGIC MODELING
00215> *#                ================================================
00216> *#
00217> *###############################################################################|
00218> *#*****************************************************************************|
00219> *AREA 201 - Minor Flow to Masonry Court, Major Flow to Clearview Avenue
00220> *#*****************************************************************************|
00221> ----------------------
00222> | CALIB STANDHYD     |   Area    (ha)=     .20
00223> | 01:201    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
00224> ----------------------
00225>                                IMPERVIOUS    PERVIOUS (i)
00226>      Surface Area     (ha)=        .20          .00
00227>      Dep. Storage     (mm)=       1.00         8.92
00228>      Average Slope     (%)=       1.00         2.00
00229>      Length            (m)=      35.00         5.00
00230>      Mannings n            =       .013         .250
00231>
00232>      Max.eff.Inten.(mm/hr)=      68.16         7.39
00233>                 over (min)        2.00         7.00
00234>      Storage Coeff.  (min)=        1.59 (ii)    7.33 (ii)
00235>      Unit Hyd. Tpeak (min)=        2.00         7.00
00236>      Unit Hyd. peak  (cms)=         .64          .16
00237>                                                          *TOTALS*
00238>      PEAK FLOW       (cms)=         .04          .00          .037 (iii)
00239>      TIME TO PEAK    (hrs)=        1.33         1.43         1.333
00240>      RUNOFF VOLUME    (mm)=       31.34         4.87        31.078
00241>      TOTAL RAINFALL   (mm)=       32.34        32.34        32.342
00242>      RUNOFF COEFFICIENT   =         .97          .15          .961
00243>
00244>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00245>            CN* =  74.0    Ia = Dep. Storage  (Above)
00246>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00247>            THAN THE STORAGE COEFFICIENT.
00248>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00249>
00250> --------------------------------------------------------------------------------
00251> 002:0008--------------------------------------------------------------------------
00252> *Note: Minor system for 201 outlets to storm sewer on Masonry Court
00253> *Major overland flows proceed to Clearview Avenue
00254> ----------------------
00255> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .051  (cms)
00256> | TotalHyd 01:201    |   Number of inlets in system [NINLET] =      1
00257> ----------------------   Total minor system capacity        =    .051  (cms)
00258>                          Total major system storage [TMJSTO] =     83.(cu.m.)
00259>
00260>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.       DWF
00261>                                    (ha)     (cms)     (hrs)     (mm)     (cms)
00262>      TOTAL HYD.   01:201            .20      .037     1.333   31.078     .000
00263>      ==========================================================================
00264>      MAJOR SYST   02:201MJR         .00      .000      .000     .000     .000
00265>      MINOR SYST   03:201mnr         .20      .037     1.333   31.078     .000
00266>
00267>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00268>
00269>      Maximum MAJOR SYSTEM storage used =       0.(cu.m.)
00270>
00271> --------------------------------------------------------------------------------
00272> 002:0009--------------------------------------------------------------------------
00273> *#*****************************************************************************|
00274> *AREA 202 - Building Roof to Masonry Court
00275> *#*****************************************************************************|
00276> ----------------------
00277> | CALIB STANDHYD     |   Area    (ha)=     .24
00278> | 01:202    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
```

```
00279> ---------------------
00280>                              IMPERVIOUS    PERVIOUS (i)
00281>      Surface Area     (ha)=        .24          .00
00282>      Dep. Storage     (mm)=       1.00         8.92
00283>      Average Slope     (%)=       1.00         2.00
00284>      Length            (m)=      15.00        10.00
00285>      Mannings n             =      .013         .250
00286>
00287>      Max.eff.Inten.(mm/hr)=      68.16         6.50
00288>                   over (min)        1.00        10.00
00289>      Storage Coeff.  (min)=        .95 (ii)   10.12 (ii)
00290>      Unit Hyd. Tpeak (min)=       1.00        10.00
00291>      Unit Hyd. peak  (cms)=       1.10          .11
00292>                                                      *TOTALS*
00293>      PEAK FLOW       (cms)=        .04          .00          .045 (iii)
00294>      TIME TO PEAK    (hrs)=       1.33         1.57         1.333
00295>      RUNOFF VOLUME    (mm)=      31.34         4.87        31.077
00296>      TOTAL RAINFALL   (mm)=      32.34        32.34        32.342
00297>      RUNOFF COEFFICIENT   =        .97          .15          .961
00298>
00299>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00300>            CN* =  74.0    Ia = Dep. Storage  (Above)
00301>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00302>            THAN THE STORAGE COEFFICIENT.
00303>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00304>
00305> -------------------------------------------------------------------------------
00306> 002:0010-----------------------------------------------------------------------
00307> *#*****************************************************************************|
00308> *AREA 203 - Minor Flow to Masonry Court, Major Flow to St. Matthews Avenue
00309> *#*****************************************************************************|
00310> ---------------------
00311> | CALIB STANDHYD     |   Area    (ha)=     .15
00312> | 04:203    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
00313> ---------------------
00314>                              IMPERVIOUS    PERVIOUS (i)
00315>      Surface Area     (ha)=        .15          .00
00316>      Dep. Storage     (mm)=       1.00         8.92
00317>      Average Slope     (%)=       1.00         2.00
00318>      Length            (m)=      15.00        10.00
00319>      Mannings n             =      .013         .250
00320>
00321>      Max.eff.Inten.(mm/hr)=      68.16         6.50
00322>                   over (min)        1.00        10.00
00323>      Storage Coeff.  (min)=        .95 (ii)   10.12 (ii)
00324>      Unit Hyd. Tpeak (min)=       1.00        10.00
00325>      Unit Hyd. peak  (cms)=       1.10          .11
00326>                                                      *TOTALS*
00327>      PEAK FLOW       (cms)=        .03          .00          .028 (iii)
00328>      TIME TO PEAK    (hrs)=       1.33         1.57         1.333
00329>      RUNOFF VOLUME    (mm)=      31.34         4.87        31.077
00330>      TOTAL RAINFALL   (mm)=      32.34        32.34        32.342
00331>      RUNOFF COEFFICIENT   =        .97          .15          .961
00332>
00333>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00334>            CN* =  74.0    Ia = Dep. Storage  (Above)
00335>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00336>            THAN THE STORAGE COEFFICIENT.
00337>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00338>
00339> -------------------------------------------------------------------------------
00340> 002:0011-----------------------------------------------------------------------
00341> *Note: Minor system for 203 outlets to storm sewer on Masonry Court
00342> *Major overland flows proceed to St. Matthews Avenue
00343> ---------------------
00344> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .038  (cms)
00345> | TotalHyd 04:203    |   Number of inlets in system [NINLET] =      1
00346> ---------------------   Total minor system capacity          =    .038  (cms)
00347>                         Total major system storage [TMJSTO] =     32.(cu.m.)
00348>
00349>                  ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
00350>                                  (ha)     (cms)     (hrs)     (mm)    (cms)
00351>      TOTAL HYD.   04:203           .15      .028     1.333   31.077     .000
00352>      ================================================================
00353>      MAJOR SYST   05:ST.MAT        .00      .000      .000     .000     .000
00354>      MINOR SYST   06:202mnr        .15      .028     1.333   31.077     .000
00355>
00356>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00357>
00358>      Maximum MAJOR SYSTEM storage used =      0.(cu.m.)
00359>
00360> -------------------------------------------------------------------------------
00361> 002:0012-----------------------------------------------------------------------
00362> *#*****************************************************************************|
00363> *AREA 204 - Site Perimeter Uncontrolled to Masonry Court
00364> *#*****************************************************************************|
00365> ---------------------
00366> | CALIB STANDHYD     |   Area    (ha)=     .04
00367> | 07:204    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
00368> ---------------------
00369>                              IMPERVIOUS    PERVIOUS (i)
00370>      Surface Area     (ha)=        .04          .00
00371>      Dep. Storage     (mm)=       1.00         8.92
00372>      Average Slope     (%)=       1.00         2.00
00373>      Length            (m)=       3.00         3.00
00374>      Mannings n             =      .013         .250
00375>
00376>      Max.eff.Inten.(mm/hr)=      68.16         9.40
00377>                   over (min)        1.00         4.00
00378>      Storage Coeff.  (min)=        .36 (ii)    4.20 (ii)
00379>      Unit Hyd. Tpeak (min)=       1.00         4.00
00380>      Unit Hyd. peak  (cms)=       1.59          .28
00381>                                                      *TOTALS*
00382>      PEAK FLOW       (cms)=        .01          .00          .008 (iii)
00383>      TIME TO PEAK    (hrs)=       1.25         1.38         1.333
00384>      RUNOFF VOLUME    (mm)=      31.34         4.87        31.077
00385>      TOTAL RAINFALL   (mm)=      32.34        32.34        32.342
00386>      RUNOFF COEFFICIENT   =        .97          .15          .961
00387>
00388>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00389>            CN* =  74.0    Ia = Dep. Storage  (Above)
00390>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00391>            THAN THE STORAGE COEFFICIENT.
00392>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00393>
00394> -------------------------------------------------------------------------------
00395> 002:0013-----------------------------------------------------------------------
00396> *ADD TOTAL DRAINAGE TO TANK
00397> ------------------------
00398> | ADD HYD (TOTANK    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00399> ------------------------                  (ha)     (cms)   (hrs)   (mm)    (cms)
00400>                        ID1 01:202           .24     .045    1.33  31.08    .000
00401>                       +ID2 03:201mnr        .20     .037    1.33  31.08    .000
00402>                       +ID3 06:202mnr        .15     .028    1.33  31.08    .000
00403>                        ========================================================
00404>                        SUM 08:TOTANK         .59     .111    1.33  31.08    .000
00405>
00406>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00407>
00408> -------------------------------------------------------------------------------
00409> 002:0014-----------------------------------------------------------------------
00410> *Control to Masonry Court via orifice plate on outlet from tank
00411> --------------------
00412> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00413> |  IN>08:(TOTANK)   |
00414> | OUT<06:(CTL-TA)   |    =========  OUTLFOW STORAGE TABLE  =========
00415> --------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00416>                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
00417>                             .000  .0000E+00   |     .044  .2300E-01
00418>                             .000  .5060E-02   |     .000  .0000E+00
00419>
00420>      ROUTING RESULTS           AREA     QPEAK     TPEAK       R.V.
00421>      --------------------      (ha)     (cms)     (hrs)       (mm)
00422>      INFLOW >08: (TOTANK)       .59      .111     1.333     31.077
00423>      OUTFLOW<06: (CTL-TA)       .59      .015     1.700     22.501
00424>     OVERFLOW<01: (OVF-TA)       .00      .000      .000       .000
00425>
00426>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00427>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00428>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00429>
00430>
00431>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   13.897
00432>                    TIME SHIFT OF PEAK FLOW          (min)=    22.00
00433>                    MAXIMUM  STORAGE   USED       (ha.m.)=.1138E-01
00434>
00435>       *** WARNING: Outflow volume is less than inflow volume.
00436> -------------------------------------------------------------------------------
00437> 002:0015-----------------------------------------------------------------------
00438> *ADD TOTAL DRAINAGE TO MASONRY
00439> ------------------------
00440> | ADD HYD (MASONRY   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00441> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00442>                        ID1 06:CTL-TANK       .59     .015    1.70  22.50    .000
00443>                       +ID2 07:204            .04     .008    1.33  31.08    .000
00444>                        ========================================================
00445>                        SUM 03:MASONRY        .63     .017    1.50  23.05    .000
00446>
00447>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00448>
00449> -------------------------------------------------------------------------------
00450> 002:0016-----------------------------------------------------------------------
00451> *ADD TOTAL DRAINAGE TO CLEARVIEW
00452> ------------------------
00453> | ADD HYD (CLEARVIEW ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00454> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00455>                        ID1 01:OVF-TANK       .00     .000     .00    .00    .000
00456>                       +ID2 02:201MJR         .00     .000     .00    .00    .000
00457>                        ========================================================
00458>                        SUM 04:CLEARVIEW      .00     .000     .00    .00    .000
00459> -------------------------------------------------------------------------------
00460> 002:0017-----------------------------------------------------------------------
00461> *ADD TOTAL DRAINAGE FROM SITE
00462> ------------------------
00463> | ADD HYD (PROP      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00464> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00465>                        ID1 03:MASONRY        .63     .017    1.50  23.05    .000
00466>                       +ID2 04:CLEARVIEW      .00     .000     .00    .00    .000
00467>                       +ID3 05:ST.MATT        .00     .000     .00    .00    .000
00468>                        ========================================================
00469>                        SUM 09:PROP           .63     .017    1.50  23.05    .000
00470>
00471>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00472>
00473> -------------------------------------------------------------------------------
00474> 002:0018-----------------------------------------------------------------------
00475> *AREA CHECK
00476> ------------------------
00477> | ADD HYD (CHECK     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00478> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00479>                        ID1 09:PROP           .63     .017    1.50  23.05    .000
00480>                       +ID2 10:EX             .63     .093    1.33  25.32    .000
00481>                        ========================================================
00482>                        SUM 08:CHECK          1.26     .110    1.33  24.18    .000
00483>
00484>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00485>
00486> -------------------------------------------------------------------------------
00487> 002:0019-----------------------------------------------------------------------
00488> * RUN REMAINING DESIGN STORMS (City of Burlington 4-hour duration 5 TO 100-YR)
00489> *
00490>  ** END OF RUN :   4
00491>
00492> *******************************************************************************
00493>
00494>
00495>
00496>
00497>
00498> --------------------
00499> | START            |  Project  dir.: Q:\44795\100\SWM\SWMHYMO\
00500> --------------------  Rainfall dir.: Q:\44795\100\SWM\SWMHYMO\
00501>     TZERO =   .00 hrs on        0
00502>     METOUT=   2 (output = METRIC)
00503>     NRUN  = 005
00504>     NSTORM=   1
00505>              #  1=BURL_005.stm
00506> -------------------------------------------------------------------------------
00507> 005:0002-----------------------------------------------------------------------
00508> *#*****************************************************************************|
00509> *#  Project Name: 1085 CLEARVIEW AVENUE
00510> *#                BURLINGTON, ONTARIO
00511> *#  JOB NUMBER  : 44795-100
00512> *#       Date   : DECEMBER 2018
00513> *#  Modeller    : ALP
00514> *#    Company   : MTE CONSULTANTS INC.
00515> *#       File   : 44795.DAT
00516> *
00517> -------------------------------------------------------------------------------
00518> 005:0002-----------------------------------------------------------------------
00519> --------------------
00520> | READ STORM       |    Filename: 5-YR BURLINGTON CHICAGO STORM (4-HR DURA
00521> | Ptotal=  41.70 mm|    Comments: 5-YR BURLINGTON CHICAGO STORM (4-HR DURA
00522> --------------------
00523>                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00524>                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00525>                 .17   2.963 |   1.17  21.285 |   2.17   6.805 |   3.17   3.535
00526>                 .33   3.374 |   1.33  88.094 |   2.33   5.834 |   3.33   3.293
00527>                 .50   3.946 |   1.50  27.774 |   2.50   5.128 |   3.50   3.087
00528>                 .67   4.803 |   1.67  15.072 |   2.67   4.590 |   3.67   2.908
00529>                 .83   6.247 |   1.83  10.561 |   2.83   4.165 |   3.83   2.751
00530>                1.00   9.295 |   2.00   8.234 |   3.00   3.820 |   4.00   2.612
00531>
00532> -------------------------------------------------------------------------------
00533> 005:0003-----------------------------------------------------------------------
00534> *
00535> *#############################################################################|
00536> *#
00537> *#                     EXISTING CONDITIONS HYDROLOGIC MODELING
00538> *#                   ============================================
00539> *#
00540> *#############################################################################|
00541> *#*****************************************************************************|
00542> *AREA 101 - Existing Commercial Lot
00543> *#*****************************************************************************|
00544> ----------------------
00545> | CALIB STANDHYD     |   Area    (ha)=     .51
00546> | 01:101    DT= 1.00 |   Total Imp(%)=   82.00   Dir. Conn.(%)=   82.00
00547> ----------------------
00548>                              IMPERVIOUS    PERVIOUS (i)
00549>      Surface Area     (ha)=        .42          .09
00550>      Dep. Storage     (mm)=       1.00         8.92
00551>      Average Slope     (%)=       1.00         2.00
00552>      Length            (m)=      10.00         5.00
00553>      Mannings n             =      .013         .250
00554>
00555>      Max.eff.Inten.(mm/hr)=      88.09        17.82
00556>                   over (min)        1.00         5.00
```

```
00557>      Storage Coeff.  (min)=        .68 (ii)    4.72 (ii)
00558>      Unit Hyd. Tpeak (min)=       1.00         5.00
00559>      Unit Hyd. peak  (cms)=       1.31          .23
00560>                                                      *TOTALS*
00561>      PEAK FLOW       (cms)=        .10          .00          .105 (iii)
00562>      TIME TO PEAK    (hrs)=       1.33         1.38         1.333
00563>      RUNOFF VOLUME    (mm)=      40.70         8.80        34.955
00564>      TOTAL RAINFALL   (mm)=      41.70        41.70        41.696
00565>      RUNOFF COEFFICIENT   =        .98          .21          .838
00566>
00567>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00568>            CN* =  74.0    Ia = Dep. Storage  (Above)
00569>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00570>            THAN THE STORAGE COEFFICIENT.
00571>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00572>
00573> ----------------------------------------------------------------------------
00574> 005:0004------------------------------------------------------------------
00575> *Note: Minor system for commercial lot outlets to storm sewer on Masonry Court
00576> *Major overland flows proceed to Clearview Avenue
00577> ---------------------
00578> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .097  (cms)
00579> | TotalHyd 01:101    |   Number of inlets in system [NINLET] =      1
00580> ---------------------   Total minor system capacity         =    .097  (cms)
00581>                         Total major system storage [TMJSTO] =     0.(cu.m.)
00582>
00583>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
00584>                                    (ha)     (cms)     (hrs)     (mm)    (cms)
00585>      TOTAL HYD.   01:101           .51      .105     1.333   34.955     .000
00586>      ==========================================================================
00587>      MAJOR SYST   02:101MJR        .01      .008     1.333   34.955     .000
00588>      MINOR SYST   03:101mnr        .50      .097     1.200   34.955     .000
00589>
00590>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00591>
00592> ----------------------------------------------------------------------------
00593> 005:0005------------------------------------------------------------------
00594> *#*************************************************************************|
00595> *AREA 102 - Existing Dwelling Lots to St. Matthews Avenue
00596> *#*************************************************************************|
00597> ---------------------
00598> | CALIB STANDHYD     |   Area    (ha)=     .12
00599> | 01:102    DT= 1.00 |   Total Imp(%)=   57.00   Dir. Conn.(%)=   57.00
00600> ---------------------
00601>                         IMPERVIOUS    PERVIOUS (i)
00602>      Surface Area     (ha)=        .07          .05
00603>      Dep. Storage     (mm)=       1.00         8.92
00604>      Average Slope     (%)=       1.00         2.00
00605>      Length            (m)=      15.00         5.00
00606>      Mannings n            =       .013         .250
00607>
00608>      Max.eff.Inten.(mm/hr)=      88.09        17.82
00609>                   over (min)       1.00         5.00
00610>      Storage Coeff.  (min)=        .86 (ii)    4.90 (ii)
00611>      Unit Hyd. Tpeak (min)=       1.00         5.00
00612>      Unit Hyd. peak  (cms)=       1.17          .23
00613>                                                      *TOTALS*
00614>      PEAK FLOW       (cms)=        .02          .00          .018 (iii)
00615>      TIME TO PEAK    (hrs)=       1.33         1.38         1.333
00616>      RUNOFF VOLUME    (mm)=      40.70         8.80        26.982
00617>      TOTAL RAINFALL   (mm)=      41.70        41.70        41.696
00618>      RUNOFF COEFFICIENT   =        .98          .21          .647
00619>
00620>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00621>            CN* =  74.0    Ia = Dep. Storage  (Above)
00622>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00623>            THAN THE STORAGE COEFFICIENT.
00624>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00625>
00626> ----------------------------------------------------------------------------
00627> 005:0006------------------------------------------------------------------
00628> *ADD TOTAL AREA CONTRIBUTING TO SITE DISCHARGE
00629> ----------------------
00630> | ADD HYD (EX      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00631> ----------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00632>                      ID1 01:102           .12      .018    1.33  26.98    .000
00633>                     +ID2 02:101MJR        .01      .008    1.33  34.96    .000
00634>                     +ID3 03:101mnr        .50      .097    1.20  34.96    .000
00635>                      ========================================================
00636>                      SUM 10:EX             .63      .123    1.33  33.44    .000
00637>
00638>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00639>
00640> ----------------------------------------------------------------------------
00641> 005:0007------------------------------------------------------------------
00642> *#########################################################################|
00643> *#
00644> *#                     PROPOSED CONDITIONS HYDROLOGIC MODELING
00645> *#                  ================================================
00646> *#
00647> *#########################################################################|
00648> *#*************************************************************************|
00649> *AREA 201 - Minor Flow to Masonry Court, Major Flow to Clearview Avenue
00650> *#*************************************************************************|
00651> ---------------------
00652> | CALIB STANDHYD     |   Area    (ha)=     .20
00653> | 01:201    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
00654> ---------------------
00655>                         IMPERVIOUS    PERVIOUS (i)
00656>      Surface Area     (ha)=        .20          .00
00657>      Dep. Storage     (mm)=       1.00         8.92
00658>      Average Slope     (%)=       1.00         2.00
00659>      Length            (m)=      35.00         5.00
00660>      Mannings n            =       .013         .250
00661>
00662>      Max.eff.Inten.(mm/hr)=      88.09        16.73
00663>                   over (min)       1.00         6.00
00664>      Storage Coeff.  (min)=       1.43 (ii)    5.58 (ii)
00665>      Unit Hyd. Tpeak (min)=       1.00         6.00
00666>      Unit Hyd. peak  (cms)=        .85          .20
00667>                                                      *TOTALS*
00668>      PEAK FLOW       (cms)=        .05          .00          .048 (iii)
00669>      TIME TO PEAK    (hrs)=       1.33         1.40         1.333
00670>      RUNOFF VOLUME    (mm)=      40.70         8.80        40.377
00671>      TOTAL RAINFALL   (mm)=      41.70        41.70        41.696
00672>      RUNOFF COEFFICIENT   =        .98          .21          .968
00673>
00674>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00675>            CN* =  74.0    Ia = Dep. Storage  (Above)
00676>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00677>            THAN THE STORAGE COEFFICIENT.
00678>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00679>
00680> ----------------------------------------------------------------------------
00681> 005:0008------------------------------------------------------------------
00682> *Note: Minor system for 201 outlets to storm sewer on Masonry Court
00683> *Major overland flows proceed to Clearview Avenue
00684> ---------------------
00685> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .051  (cms)
00686> | TotalHyd 01:201    |   Number of inlets in system [NINLET] =      1
00687> ---------------------   Total minor system capacity         =    .051  (cms)
00688>                         Total major system storage [TMJSTO] =     83.(cu.m.)
00689>
00690>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
00691>                                    (ha)     (cms)     (hrs)     (mm)    (cms)
00692>      TOTAL HYD.   01:201           .20      .048     1.333   40.377     .000
00693>      ==========================================================================
00694>      MAJOR SYST   02:201MJR        .00      .000      .000     .000     .000
00695>      MINOR SYST   03:201mnr        .20      .048     1.333   40.377     .000
00696>
00697>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00698>
00699>      Maximum MAJOR SYSTEM storage used =       0.(cu.m.)
00700>
00701> ----------------------------------------------------------------------------
00702> 005:0009------------------------------------------------------------------
00703> *#*************************************************************************|
00704> *AREA 202 - Building Roof to Masonry Court
00705> *#*************************************************************************|
00706> ---------------------
00707> | CALIB STANDHYD     |   Area    (ha)=     .24
00708> | 01:202    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
00709> ---------------------
00710>                         IMPERVIOUS    PERVIOUS (i)
00711>      Surface Area     (ha)=        .24          .00
00712>      Dep. Storage     (mm)=       1.00         8.92
00713>      Average Slope     (%)=       1.00         2.00
00714>      Length            (m)=      15.00        10.00
00715>      Mannings n            =       .013         .250
00716>
00717>      Max.eff.Inten.(mm/hr)=      88.09        15.61
00718>                   over (min)       1.00         7.00
00719>      Storage Coeff.  (min)=        .86 (ii)    7.32 (ii)
00720>      Unit Hyd. Tpeak (min)=       1.00         7.00
00721>      Unit Hyd. peak  (cms)=       1.17          .16
00722>                                                      *TOTALS*
00723>      PEAK FLOW       (cms)=        .06          .00          .058 (iii)
00724>      TIME TO PEAK    (hrs)=       1.33         1.43         1.333
00725>      RUNOFF VOLUME    (mm)=      40.70         8.80        40.377
00726>      TOTAL RAINFALL   (mm)=      41.70        41.70        41.696
00727>      RUNOFF COEFFICIENT   =        .98          .21          .968
00728>
00729>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00730>            CN* =  74.0    Ia = Dep. Storage  (Above)
00731>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00732>            THAN THE STORAGE COEFFICIENT.
00733>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00734>
00735> ----------------------------------------------------------------------------
00736> 005:0010------------------------------------------------------------------
00737> *#*************************************************************************|
00738> *AREA 203 - Minor Flow to Masonry Court, Major Flow to St. Matthews Avenue
00739> *#*************************************************************************|
00740> ---------------------
00741> | CALIB STANDHYD     |   Area    (ha)=     .15
00742> | 04:203    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
00743> ---------------------
00744>                         IMPERVIOUS    PERVIOUS (i)
00745>      Surface Area     (ha)=        .15          .00
00746>      Dep. Storage     (mm)=       1.00         8.92
00747>      Average Slope     (%)=       1.00         2.00
00748>      Length            (m)=      15.00        10.00
00749>      Mannings n            =       .013         .250
00750>
00751>      Max.eff.Inten.(mm/hr)=      88.09        15.61
00752>                   over (min)       1.00         7.00
00753>      Storage Coeff.  (min)=        .86 (ii)    7.32 (ii)
00754>      Unit Hyd. Tpeak (min)=       1.00         7.00
00755>      Unit Hyd. peak  (cms)=       1.17          .16
00756>                                                      *TOTALS*
00757>      PEAK FLOW       (cms)=        .04          .00          .036 (iii)
00758>      TIME TO PEAK    (hrs)=       1.33         1.43         1.333
00759>      RUNOFF VOLUME    (mm)=      40.70         8.80        40.377
00760>      TOTAL RAINFALL   (mm)=      41.70        41.70        41.696
00761>      RUNOFF COEFFICIENT   =        .98          .21          .968
00762>
00763>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00764>            CN* =  74.0    Ia = Dep. Storage  (Above)
00765>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00766>            THAN THE STORAGE COEFFICIENT.
00767>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00768>
00769> ----------------------------------------------------------------------------
00770> 005:0011------------------------------------------------------------------
00771> *Note: Minor system for 203 outlets to storm sewer on Masonry Court
00772> *Major overland flows proceed to St. Matthews Avenue
00773> ---------------------
00774> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .038  (cms)
00775> | TotalHyd 04:203    |   Number of inlets in system [NINLET] =      1
00776> ---------------------   Total minor system capacity         =    .038  (cms)
00777>                         Total major system storage [TMJSTO] =     32.(cu.m.)
00778>
00779>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
00780>                                    (ha)     (cms)     (hrs)     (mm)    (cms)
00781>      TOTAL HYD.   04:203           .15      .036     1.333   40.377     .000
00782>      ==========================================================================
00783>      MAJOR SYST   05:ST.MAT        .00      .000      .000     .000     .000
00784>      MINOR SYST   06:202mnr        .15      .036     1.333   40.377     .000
00785>
00786>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00787>
00788>      Maximum MAJOR SYSTEM storage used =       0.(cu.m.)
00789>
00790> ----------------------------------------------------------------------------
00791> 005:0012------------------------------------------------------------------
00792> *#*************************************************************************|
00793> *AREA 204 - Site Perimeter Uncontrolled to Masonry Court
00794> *#*************************************************************************|
00795> ---------------------
00796> | CALIB STANDHYD     |   Area    (ha)=     .04
00797> | 07:204    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
00798> ---------------------
00799>                         IMPERVIOUS    PERVIOUS (i)
00800>      Surface Area     (ha)=        .04          .00
00801>      Dep. Storage     (mm)=       1.00         8.92
00802>      Average Slope     (%)=       1.00         2.00
00803>      Length            (m)=       3.00         3.00
00804>      Mannings n            =       .013         .250
00805>
00806>      Max.eff.Inten.(mm/hr)=      88.09        19.90
00807>                   over (min)       1.00         3.00
00808>      Storage Coeff.  (min)=        .33 (ii)    3.17 (ii)
00809>      Unit Hyd. Tpeak (min)=       1.00         3.00
00810>      Unit Hyd. peak  (cms)=       1.62          .37
00811>                                                      *TOTALS*
00812>      PEAK FLOW       (cms)=        .01          .00          .010 (iii)
00813>      TIME TO PEAK    (hrs)=       1.25         1.35         1.333
00814>      RUNOFF VOLUME    (mm)=      40.70         8.80        40.377
00815>      TOTAL RAINFALL   (mm)=      41.70        41.70        41.696
00816>      RUNOFF COEFFICIENT   =        .98          .21          .968
00817>
00818>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00819>            CN* =  74.0    Ia = Dep. Storage  (Above)
00820>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00821>            THAN THE STORAGE COEFFICIENT.
00822>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00823>
00824> ----------------------------------------------------------------------------
00825> 005:0013------------------------------------------------------------------
00826> *ADD TOTAL DRAINAGE TO TANK
00827> ----------------------
00828> | ADD HYD (TOTANK    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00829> ----------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00830>                      ID1 01:202           .24      .058    1.33  40.38    .000
00831>                     +ID2 03:201mnr        .20      .048    1.33  40.38    .000
00832>                     +ID3 06:202mnr        .15      .036    1.33  40.38    .000
00833>                      ========================================================
00834>                      SUM 08:TOTANK         .59      .143    1.33  40.38    .000
```

```
00835>
00836>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00837>
00838> ------------------------------------------------------------------------
00839> 005:0014-------------------------------------------------------------------
00840> *Control to Masonry Court via orifice plate on outlet from tank
00841> --------------------
00842> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00843> |  IN>08:(TOTANK)   |
00844> | OUT<06:(CTL-TA)   |    =========  OUTFLOW STORAGE TABLE  =========
00845> --------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00846>                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
00847>                            .000  .0000E+00   |     .044  .2300E-01
00848>                            .000  .5060E-02   |     .000  .0000E+00
00849>
00850>     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00851>     --------------------       (ha)     (cms)     (hrs)       (mm)
00852>     INFLOW >08: (TOTANK)        .59      .143     1.333     40.377
00853>     OUTFLOW<06: (CTL-TA)        .59      .022     1.683     31.801
00854>    OVERFLOW<01: (OVF-TA)        .00      .000      .000       .000
00855>
00856>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00857>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=       .00
00858>                    PERCENTAGE OF TIME OVERFLOWING    (%)=       .00
00859>
00860>
00861>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   15.503
00862>                    TIME SHIFT OF PEAK FLOW        (min)=    21.00
00863>                    MAXIMUM  STORAGE   USED       (ha.m.)=.1419E-01
00864>
00865>      *** WARNING: Outflow volume is less than inflow volume.
00866> ------------------------------------------------------------------------
00867> 005:0015-------------------------------------------------------------------
00868> *ADD TOTAL DRAINAGE TO MASONRY
00869> ------------------------
00870> | ADD HYD (MASONRY   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00871> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00872>                        ID1 06:CTL-TANK       .59     .022    1.68  31.80    .000
00873>                       +ID2 07:204            .04     .010    1.33  40.38    .000
00874>                        ========================================================
00875>                        SUM 03:MASONRY         .63     .026    1.33  32.35    .000
00876>
00877>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00878>
00879> ------------------------------------------------------------------------
00880> 005:0016-------------------------------------------------------------------
00881> *ADD TOTAL DRAINAGE TO CLEARVIEW
00882> ------------------------
00883> | ADD HYD (CLEARVIEW ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00884> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00885>                        ID1 01:OVF-TANK       .00     .000     .00    .00    .000
00886>                       +ID2 02:201MJR         .00     .000     .00    .00    .000
00887>                        ========================================================
00888>                        SUM 04:CLEARVIEW       .00     .000     .00    .00    .000
00889> ------------------------------------------------------------------------
00890> 005:0017-------------------------------------------------------------------
00891> *ADD TOTAL DRAINAGE FROM SITE
00892> ------------------------
00893> | ADD HYD (PROP      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00894> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00895>                        ID1 03:MASONRY         .63     .026    1.33  32.35    .000
00896>                       +ID2 04:CLEARVIEW       .00     .000     .00    .00    .000
00897>                       +ID3 05:ST.MATT         .00     .000     .00    .00    .000
00898>                        ========================================================
00899>                        SUM 09:PROP            .63     .026    1.33  32.35    .000
00900>
00901>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00902>
00903> ------------------------------------------------------------------------
00904> 005:0018-------------------------------------------------------------------
00905> *AREA CHECK
00906> ------------------------
00907> | ADD HYD (CHECK     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00908> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00909>                        ID1 09:PROP            .63     .026    1.33  32.35    .000
00910>                       +ID2 10:EX             .63     .123    1.33  33.44    .000
00911>                        ========================================================
00912>                        SUM 08:CHECK          1.26     .149    1.33  32.89    .000
00913>
00914>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00915>
00916> ------------------------------------------------------------------------
00917> 005:0019-------------------------------------------------------------------
00918> * RUN REMAINING DESIGN STORMS (City of Burlington 4-hour duration 5 TO 100-YR)
00919> *
00920> ------------------------------------------------------------------------
00921> 005:0002-------------------------------------------------------------------
00922>   ** END OF RUN :   9
00923>
00924> ************************************************************************
00925>
00926>
00927>
00928>
00929>
00930> --------------------
00931> | START             |  Project  dir.: Q:\44795\100\SWM\SWMHYMO\
00932> --------------------  Rainfall dir.: Q:\44795\100\SWM\SWMHYMO\
00933>     TZERO =   .00 hrs on      0
00934>     METOUT=   2 (output = METRIC)
00935>     NRUN  = 010
00936>     NSTORM=   1
00937>              #  1=BURL_010.stm
00938> ------------------------------------------------------------------------
00939> 010:0002-------------------------------------------------------------------
00940> *#*********************************************************************|
00941> *#  Project Name: 1085 CLEARVIEW AVENUE
00942> *#               BURLINGTON, ONTARIO
00943> *#  JOB NUMBER  : 44795-100
00944> *#       Date   : DECEMBER 2018
00945> *#  Modeller    : ALP
00946> *#    Company   : MTE CONSULTANTS INC.
00947> *#       File   : 44795.DAT
00948> *
00949> ------------------------------------------------------------------------
00950> 010:0002-------------------------------------------------------------------
00951> --------------------
00952> | READ STORM      |    Filename: 10-YR BURLINGTON CHICAGO STORM (4-HR DUR
00953> | Ptotal=  48.00 mm|    Comments: 10-YR BURLINGTON CHICAGO STORM (4-HR DUR
00954> --------------------
00955>              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00956>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00957>               .17   3.423 |   1.17  24.501 |   2.17   7.052 |   3.17   4.083
00958>               .33   3.898 |  1.33 101.139 |   2.33   6.733 |   3.33   3.805
00959>               .50   4.558 |   1.50  31.955 |   2.50   5.920 |   3.50   3.567
00960>               .67   5.545 |   1.67  17.363 |   2.67   5.300 |   3.67   3.360
00961>               .83   7.210 |   1.83  12.175 |   2.83   4.810 |   3.83   3.179
00962>              1.00  10.719 |   2.00   9.497 |   3.00   4.413 |   4.00   3.019
00963>
00964> ------------------------------------------------------------------------
00965> 010:0003-------------------------------------------------------------------
00966> *
00967> *#####################################################################|
00968> *#
00969> *#                     EXISTING CONDITIONS HYDROLOGIC MODELING
00970> *#               ========================================
00971> *#
00972> *#####################################################################|
00973> *#*********************************************************************|
00974> *AREA 101 - Existing Commercial Lot
00975> *#*********************************************************************|
00976> ----------------------
00977> | CALIB STANDHYD     |   Area    (ha)=     .51
00978> | 01:101    DT= 1.00 |   Total Imp(%)=   82.00   Dir. Conn.(%)=   82.00
00979> ----------------------
00980>                                IMPERVIOUS    PERVIOUS (i)
00981>      Surface Area     (ha)=        .42          .09
00982>      Dep. Storage     (mm)=       1.00         8.92
00983>      Average Slope     (%)=       1.00         2.00
00984>      Length            (m)=      10.00         5.00
00985>      Mannings n            =       .013         .250
00986>
00987>      Max.eff.Inten.(mm/hr)=    101.14        26.28
00988>                  over (min)       1.00         4.00
00989>      Storage Coeff.  (min)=        .64 (ii)    4.10 (ii)
00990>      Unit Hyd. Tpeak (min)=       1.00         4.00
00991>      Unit Hyd. peak  (cms)=       1.34          .28
00992>                                                      *TOTALS*
00993>      PEAK FLOW       (cms)=        .12          .00          .122 (iii)
00994>      TIME TO PEAK    (hrs)=       1.32         1.37         1.333
00995>      RUNOFF VOLUME    (mm)=      47.00        11.90        40.686
00996>      TOTAL RAINFALL   (mm)=      48.00        48.00        48.004
00997>      RUNOFF COEFFICIENT   =        .98          .25          .848
00998>
00999>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01000>            CN* =  74.0    Ia = Dep. Storage  (Above)
01001>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01002>            THAN THE STORAGE COEFFICIENT.
01003>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01004>
01005> ------------------------------------------------------------------------
01006> 010:0004-------------------------------------------------------------------
01007> *Note: Minor system for commercial lot outlets to storm sewer on Masonry Court
01008> *Major overland flows proceed to Clearview Avenue
01009> ----------------------
01010> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .097  (cms)
01011> | TotalHyd 01:101    |   Number of inlets in system [NINLET] =      1
01012> ----------------------   Total minor system capacity          =    .097  (cms)
01013>                          Total major system storage [TMJSTO] =      0.(cu.m.)
01014>
01015>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.       DWF
01016>                                    (ha)     (cms)     (hrs)     (mm)     (cms)
01017>      TOTAL HYD.   01:101            .51      .122     1.333   40.686     .000
01018>      ================================================================================
01019>      MAJOR SYST   02:101MJR          .03      .025     1.333   40.686     .000
01020>      MINOR SYST   03:101mnr          .48      .097     1.183   40.686     .000
01021>
01022>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01023>
01024> ------------------------------------------------------------------------
01025> 010:0005-------------------------------------------------------------------
01026> *#*********************************************************************|
01027> *AREA 102 - Existing Dwelling Lots to St. Matthews Avenue
01028> *#*********************************************************************|
01029> ----------------------
01030> | CALIB STANDHYD     |   Area    (ha)=     .12
01031> | 01:102    DT= 1.00 |   Total Imp(%)=   57.00   Dir. Conn.(%)=   57.00
01032> ----------------------
01033>                                IMPERVIOUS    PERVIOUS (i)
01034>      Surface Area     (ha)=        .07          .05
01035>      Dep. Storage     (mm)=       1.00         8.92
01036>      Average Slope     (%)=       1.00         2.00
01037>      Length            (m)=      15.00         5.00
01038>      Mannings n            =       .013         .250
01039>
01040>      Max.eff.Inten.(mm/hr)=    101.14        26.28
01041>                  over (min)       1.00         4.00
01042>      Storage Coeff.  (min)=        .81 (ii)    4.27 (ii)
01043>      Unit Hyd. Tpeak (min)=       1.00         4.00
01044>      Unit Hyd. peak  (cms)=       1.20          .27
01045>                                                      *TOTALS*
01046>      PEAK FLOW       (cms)=        .02          .00          .022 (iii)
01047>      TIME TO PEAK    (hrs)=       1.33         1.37         1.333
01048>      RUNOFF VOLUME    (mm)=      47.00        11.90        31.911
01049>      TOTAL RAINFALL   (mm)=      48.00        48.00        48.004
01050>      RUNOFF COEFFICIENT   =        .98          .25          .665
01051>
01052>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01053>            CN* =  74.0    Ia = Dep. Storage  (Above)
01054>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01055>            THAN THE STORAGE COEFFICIENT.
01056>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01057>
01058> ------------------------------------------------------------------------
01059> 010:0006-------------------------------------------------------------------
01060> *ADD TOTAL AREA CONTRIBUTING TO SITE DISCHARGE
01061> ------------------------
01062> | ADD HYD (EX        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
01063> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
01064>                        ID1 01:102             .12      .022    1.33  31.91    .000
01065>                       +ID2 02:101MJR          .03      .025    1.33  40.69    .000
01066>                       +ID3 03:101mnr          .48      .097    1.18  40.69    .000
01067>                        ========================================================
01068>                        SUM 10:EX               .63      .143    1.33  39.01    .000
01069>
01070>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01071>
01072> ------------------------------------------------------------------------
01073> 010:0007-------------------------------------------------------------------
01074> *#####################################################################|
01075> *#
01076> *#                     PROPOSED CONDITIONS HYDROLOGIC MODELING
01077> *#               ================================================
01078> *#
01079> *#####################################################################|
01080> *#*********************************************************************|
01081> *AREA 201 - Minor Flow to Masonry Court, Major Flow to Clearview Avenue
01082> *#*********************************************************************|
01083> ----------------------
01084> | CALIB STANDHYD     |   Area    (ha)=     .20
01085> | 01:201    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
01086> ----------------------
01087>                                IMPERVIOUS    PERVIOUS (i)
01088>      Surface Area     (ha)=        .20          .00
01089>      Dep. Storage     (mm)=       1.00         8.92
01090>      Average Slope     (%)=       1.00         2.00
01091>      Length            (m)=      35.00         5.00
01092>      Mannings n            =       .013         .250
01093>
01094>      Max.eff.Inten.(mm/hr)=    101.14        25.00
01095>                  over (min)       1.00         5.00
01096>      Storage Coeff.  (min)=       1.35 (ii)    4.88 (ii)
01097>      Unit Hyd. Tpeak (min)=       1.00         5.00
01098>      Unit Hyd. peak  (cms)=        .89          .23
01099>                                                      *TOTALS*
01100>      PEAK FLOW       (cms)=        .06          .00          .056 (iii)
01101>      TIME TO PEAK    (hrs)=       1.33         1.38         1.333
01102>      RUNOFF VOLUME    (mm)=      47.00        11.90        46.653
01103>      TOTAL RAINFALL   (mm)=      48.00        48.00        48.004
01104>      RUNOFF COEFFICIENT   =        .98          .25          .972
01105>
01106>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01107>            CN* =  74.0    Ia = Dep. Storage  (Above)
01108>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01109>            THAN THE STORAGE COEFFICIENT.
01110>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01111>
01112> ------------------------------------------------------------------------
```

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01113> 010:0008-----------------------------------------------------------------
01114> *Note: Minor system for 201 outlets to storm sewer on Masonry Court
01115> *Major overland flows proceed to Clearview Avenue
01116> ----------------------
01117> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .051  (cms)
01118> | TotalHyd 01:201    |   Number of inlets in system [NINLET] =       1
01119> ----------------------   Total minor system capacity        =    .051  (cms)
01120>                          Total major system storage [TMJSTO] =     83.(cu.m.)
01121>
01122>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
01123>                                    (ha)     (cms)     (hrs)     (mm)    (cms)
01124>      TOTAL HYD.   01:201           .20      .056     1.333   46.653     .000
01125>      ======================================================================
01126>      MAJOR SYST   02:201MJR        .00      .000      .000     .000     .000
01127>      MINOR SYST   03:201mnr        .20      .051     1.367   46.991     .000
01128>
01129>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01130>
01131>      Maximum MAJOR SYSTEM storage used =       2.(cu.m.)
01132>
01133> ----------------------------------------------------------------------------
01134> 010:0009-----------------------------------------------------------------
01135> *#*************************************************************************|
01136> *AREA 202 - Building Roof to Masonry Court
01137> *#*************************************************************************|
01138> ----------------------
01139> | CALIB STANDHYD     |   Area    (ha)=     .24
01140> | 01:202    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
01141> ----------------------
01142>                                IMPERVIOUS    PERVIOUS (i)
01143>      Surface Area     (ha)=         .24          .00
01144>      Dep. Storage     (mm)=        1.00         8.92
01145>      Average Slope     (%)=        1.00         2.00
01146>      Length            (m)=       15.00        10.00
01147>      Mannings n             =       .013         .250
01148>
01149>      Max.eff.Inten.(mm/hr)=     101.14        23.68
01150>                   over (min)        1.00         6.00
01151>      Storage Coeff.  (min)=         .81 (ii)    6.28 (ii)
01152>      Unit Hyd. Tpeak (min)=        1.00         6.00
01153>      Unit Hyd. peak  (cms)=        1.20          .18
01154>                                                          *TOTALS*
01155>      PEAK FLOW        (cms)=         .07          .00          .067 (iii)
01156>      TIME TO PEAK     (hrs)=        1.33         1.40         1.333
01157>      RUNOFF VOLUME     (mm)=       47.00        11.90        46.653
01158>      TOTAL RAINFALL    (mm)=       48.00        48.00        48.004
01159>      RUNOFF COEFFICIENT   =         .98          .25          .972
01160>
01161>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01162>            CN* =  74.0    Ia = Dep. Storage  (Above)
01163>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01164>            THAN THE STORAGE COEFFICIENT.
01165>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01166>
01167> ----------------------------------------------------------------------------
01168> 010:0010-----------------------------------------------------------------
01169> *#*************************************************************************|
01170> *AREA 203 - Minor Flow to Masonry Court, Major Flow to St. Matthews Avenue
01171> *#*************************************************************************|
01172> ----------------------
01173> | CALIB STANDHYD     |   Area    (ha)=     .15
01174> | 04:203    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
01175> ----------------------
01176>                                IMPERVIOUS    PERVIOUS (i)
01177>      Surface Area     (ha)=         .15          .00
01178>      Dep. Storage     (mm)=        1.00         8.92
01179>      Average Slope     (%)=        1.00         2.00
01180>      Length            (m)=       15.00        10.00
01181>      Mannings n             =       .013         .250
01182>
01183>      Max.eff.Inten.(mm/hr)=     101.14        23.68
01184>                   over (min)        1.00         6.00
01185>      Storage Coeff.  (min)=         .81 (ii)    6.28 (ii)
01186>      Unit Hyd. Tpeak (min)=        1.00         6.00
01187>      Unit Hyd. peak  (cms)=        1.20          .18
01188>                                                          *TOTALS*
01189>      PEAK FLOW        (cms)=         .04          .00          .042 (iii)
01190>      TIME TO PEAK     (hrs)=        1.33         1.40         1.333
01191>      RUNOFF VOLUME     (mm)=       47.00        11.90        46.653
01192>      TOTAL RAINFALL    (mm)=       48.00        48.00        48.004
01193>      RUNOFF COEFFICIENT   =         .98          .25          .972
01194>
01195>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01196>            CN* =  74.0    Ia = Dep. Storage  (Above)
01197>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01198>            THAN THE STORAGE COEFFICIENT.
01199>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01200>
01201> ----------------------------------------------------------------------------
01202> 010:0011-----------------------------------------------------------------
01203> *Note: Minor system for 203 outlets to storm sewer on Masonry Court
01204> *Major overland flows proceed to St. Matthews Avenue
01205> ----------------------
01206> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .038  (cms)
01207> | TotalHyd 04:203    |   Number of inlets in system [NINLET] =      1
01208> ----------------------   Total minor system capacity        =    .038  (cms)
01209>                          Total major system storage [TMJSTO] =     32.(cu.m.)
01210>
01211>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
01212>                                    (ha)     (cms)     (hrs)     (mm)    (cms)
01213>      TOTAL HYD.   04:203           .15      .042     1.333   46.653     .000
01214>      ======================================================================
01215>      MAJOR SYST   05:ST.MAT        .00      .000      .000     .000     .000
01216>      MINOR SYST   06:202mnr        .15      .038     1.200   47.009     .000
01217>
01218>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01219>
01220>      Maximum MAJOR SYSTEM storage used =       2.(cu.m.)
01221>
01222> ----------------------------------------------------------------------------
01223> 010:0012-----------------------------------------------------------------
01224> *#*************************************************************************|
01225> *AREA 204 - Site Perimeter Uncontrolled to Masonry Court
01226> *#*************************************************************************|
01227> ----------------------
01228> | CALIB STANDHYD     |   Area    (ha)=     .04
01229> | 07:204    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
01230> ----------------------
01231>                                IMPERVIOUS    PERVIOUS (i)
01232>      Surface Area     (ha)=         .04          .00
01233>      Dep. Storage     (mm)=        1.00         8.92
01234>      Average Slope     (%)=        1.00         2.00
01235>      Length            (m)=        3.00         3.00
01236>      Mannings n             =       .013         .250
01237>
01238>      Max.eff.Inten.(mm/hr)=     101.14        27.51
01239>                   over (min)        1.00         3.00
01240>      Storage Coeff.  (min)=         .31 (ii)    2.81 (ii)
01241>      Unit Hyd. Tpeak (min)=        1.00         3.00
01242>      Unit Hyd. peak  (cms)=        1.63          .39
01243>                                                          *TOTALS*
01244>      PEAK FLOW        (cms)=         .01          .00          .011 (iii)
01245>      TIME TO PEAK     (hrs)=        1.25         1.35         1.333
01246>      RUNOFF VOLUME     (mm)=       47.00        11.90        46.653
01247>      TOTAL RAINFALL    (mm)=       48.00        48.00        48.004
01248>      RUNOFF COEFFICIENT   =         .98          .25          .972
01249>
01250>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01251>            CN* =  74.0    Ia = Dep. Storage  (Above)
01252>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01253>            THAN THE STORAGE COEFFICIENT.
01254>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01255>
01256> ----------------------------------------------------------------------------
01257> 010:0013-----------------------------------------------------------------
01258> *ADD TOTAL DRAINAGE TO TANK
01259> ------------------------
01260> | ADD HYD (TOTANK    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
01261> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
01262>                         ID1 01:202          .24      .067    1.33  46.65    .000
01263>                        +ID2 03:201mnr       .20      .051    1.37  46.99    .000
01264>                        +ID3 06:202mnr       .15      .038    1.20  47.01    .000
01265>                         ========================================================
01266>                         SUM 08:TOTANK        .59      .156    1.33  46.86    .000
01267>
01268>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01269>
01270> ----------------------------------------------------------------------------
01271> 010:0014-----------------------------------------------------------------
01272> *Control to Masonry Court via orifice plate on outlet from tank
01273> ------------------------
01274> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
01275> |  IN>08:(TOTANK)    |
01276> | OUT<06:(CTL-TA)    |    =========  OUTLFOW STORAGE TABLE  =========
01277> ----------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01278>                             (cms)    (ha.m.)   |    (cms)    (ha.m.)
01279>                              .000  .0000E+00    |     .044  .2300E-01
01280>                              .000  .5060E-02    |     .000  .0000E+00
01281>
01282>      ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
01283>      -------------------         (ha)     (cms)     (hrs)       (mm)
01284>      INFLOW >08: (TOTANK)         .59      .156     1.333     46.858
01285>      OUTFLOW<06: (CTL-TA)         .59      .027     1.667     38.282
01286>     OVERFLOW<01: (OVF-TA)         .00      .000      .000       .000
01287>
01288>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
01289>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
01290>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
01291>
01292>
01293>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   17.410
01294>                    TIME SHIFT OF PEAK FLOW         (min)=    20.00
01295>                    MAXIMUM  STORAGE   USED       (ha.m.)=.1623E-01
01296>
01297>       *** WARNING: Outflow volume is less than inflow volume.
01298> ----------------------------------------------------------------------------
01299> 010:0015-----------------------------------------------------------------
01300> *ADD TOTAL DRAINAGE TO MASONRY
01301> ------------------------
01302> | ADD HYD (MASONRY   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
01303> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
01304>                         ID1 06:CTL-TANK      .59      .027    1.67  38.28    .000
01305>                        +ID2 07:204           .04      .011    1.33  46.65    .000
01306>                         ========================================================
01307>                         SUM 03:MASONRY       .63      .031    1.33  38.81    .000
01308>
01309>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01310>
01311> ----------------------------------------------------------------------------
01312> 010:0016-----------------------------------------------------------------
01313> *ADD TOTAL DRAINAGE TO CLEARVIEW
01314> ------------------------
01315> | ADD HYD (CLEARVIEW ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
01316> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
01317>                         ID1 01:OVF-TANK      .00      .000     .00    .00    .000
01318>                        +ID2 02:201MJR        .00      .000     .00    .00    .000
01319>                         ========================================================
01320>                         SUM 04:CLEARVIEW     .00      .000     .00    .00    .000
01321> ----------------------------------------------------------------------------
01322> 010:0017-----------------------------------------------------------------
01323> *ADD TOTAL DRAINAGE FROM SITE
01324> ------------------------
01325> | ADD HYD (PROP      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
01326> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
01327>                         ID1 03:MASONRY       .63      .031    1.33  38.81    .000
01328>                        +ID2 04:CLEARVIEW     .00      .000     .00    .00    .000
01329>                        +ID3 05:ST.MATT       .00      .000     .00    .00    .000
01330>                         ========================================================
01331>                         SUM 09:PROP          .63      .031    1.33  38.81    .000
01332>
01333>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01334>
01335> ----------------------------------------------------------------------------
01336> 010:0018-----------------------------------------------------------------
01337> *AREA CHECK
01338> ------------------------
01339> | ADD HYD (CHECK     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
01340> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
01341>                         ID1 09:PROP          .63      .031    1.33  38.81    .000
01342>                        +ID2 10:EX            .63      .143    1.33  39.01    .000
01343>                         ========================================================
01344>                         SUM 08:CHECK        1.26      .174    1.33  38.91    .000
01345>
01346>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01347>
01348> ----------------------------------------------------------------------------
01349> 010:0019-----------------------------------------------------------------
01350> * RUN REMAINING DESIGN STORMS (City of Burlington 4-hour duration 5 TO 100-YR)
01351> *
01352> ----------------------------------------------------------------------------
01353> 010:0002-----------------------------------------------------------------
01354> ----------------------------------------------------------------------------
01355> 010:0002-----------------------------------------------------------------
01356>   ** END OF RUN :  24
01357>
01358> ****************************************************************************
01359>
01360>
01361>
01362>
01363>
01364> --------------------
01365> | START            |  Project  dir.: Q:\44795\100\SWM\SWMHYMO\
01366> --------------------  Rainfall dir.: Q:\44795\100\SWM\SWMHYMO\
01367>     TZERO =   .00 hrs on        0
01368>     METOUT=   2 (output = METRIC)
01369>     NRUN  = 025
01370>     NSTORM=   1
01371>               #  1=BURL_025.stm
01372> ----------------------------------------------------------------------------
01373> 025:0002-----------------------------------------------------------------
01374> *#*************************************************************************|
01375> *#  Project Name: 1085 CLEARVIEW AVENUE
01376> *#               BURLINGTON, ONTARIO
01377> *#  JOB NUMBER  : 44795-100
01378> *#       Date   : DECEMBER 2018
01379> *#  Modeller    : ALP
01380> *#    Company   : MTE CONSULTANTS INC.
01381> *#       File   : 44795.DAT
01382> *
01383> ----------------------------------------------------------------------------
01384> 025:0002-----------------------------------------------------------------
01385> --------------------
01386> | READ STORM       |    Filename: 25-YR BURLINGTON CHICAGO STORM (4-HR DUR
01387> | Ptotal=  56.03 mm|    Comments: 25-YR BURLINGTON CHICAGO STORM (4-HR DUR
01388> --------------------
01389>                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
01390>                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
```

```
                .17   4.010 |   1.17  28.592 |   2.17   9.185 |   3.17   4.782
                .33   4.566 |   1.33 117.720 |   2.33   7.879 |   3.33   4.457
                .50   5.337 |   1.50  37.274 |   2.50   6.929 |   3.50   4.178
                .67   6.491 |   1.67  20.279 |   2.67   6.204 |   3.67   3.937
                .83   8.435 |   1.83  14.230 |   2.83   5.632 |   3.83   3.725
               1.00  12.531 |   2.00  11.105 |   3.00   5.167 |   4.00   3.538

 ----------------------------------------------------------------------------
 025:0003----------------------------------------------------------------------
 *
 *#############################################################################|
 *#
 *#                        EXISTING CONDITIONS HYDROLOGIC MODELING
 *#                  ==================================================
 *#
 *#############################################################################|
 *#*****************************************************************************|
 *AREA 101 - Existing Commercial Lot
 *#*****************************************************************************|
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=      .51
 | 01:101    DT= 1.00 |   Total Imp(%)=   82.00   Dir. Conn.(%)=   82.00
 ----------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .42          .09
      Dep. Storage     (mm)=       1.00         8.92
      Average Slope     (%)=       1.00         2.00
      Length            (m)=      10.00         5.00
      Mannings n           =       .013         .250

      Max.eff.Inten.(mm/hr)=     117.72        36.75
                   over (min)       1.00         4.00
      Storage Coeff.  (min)=        .60 (ii)    3.63 (ii)
      Unit Hyd. Tpeak (min)=       1.00         4.00
      Unit Hyd. peak  (cms)=       1.38          .30
                                                        *TOTALS*
      PEAK FLOW       (cms)=        .14          .01          .143 (iii)
      TIME TO PEAK    (hrs)=       1.32         1.37         1.333
      RUNOFF VOLUME    (mm)=      55.03        16.28        48.055
      TOTAL RAINFALL   (mm)=      56.03        56.03        56.030
      RUNOFF COEFFICIENT   =        .98          .29          .858

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  74.0    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.

 ----------------------------------------------------------------------------
 025:0004----------------------------------------------------------------------
 *Note: Minor system for commercial lot outlets to storm sewer on Masonry Court
 *Major overland flows proceed to Clearview Avenue
 ----------------------
 | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .097  (cms)
 | TotalHyd 01:101    |   Number of inlets in system [NINLET] =       1
 ----------------------   Total minor system capacity         =    .097  (cms)
                          Total major system storage [TMJSTO] =      0.(cu.m.)

                   ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
                                   (ha)     (cms)     (hrs)     (mm)    (cms)
      TOTAL HYD.   01:101           .51      .143     1.333   48.055     .000
      ==========================================================
      MAJOR SYST   02:101MJR        .05      .046     1.333   48.055     .000
      MINOR SYST   03:101mnr        .46      .097     1.183   48.055     .000

      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------------
 025:0005----------------------------------------------------------------------
 *#*****************************************************************************|
 *AREA 102 - Existing Dwelling Lots to St. Matthews Avenue
 *#*****************************************************************************|
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=      .12
 | 01:102    DT= 1.00 |   Total Imp(%)=   57.00   Dir. Conn.(%)=   57.00
 ----------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .07          .05
      Dep. Storage     (mm)=       1.00         8.92
      Average Slope     (%)=       1.00         2.00
      Length            (m)=      15.00         5.00
      Mannings n           =       .013         .250

      Max.eff.Inten.(mm/hr)=     117.72        36.75
                   over (min)       1.00         4.00
      Storage Coeff.  (min)=        .77 (ii)    3.79 (ii)
      Unit Hyd. Tpeak (min)=       1.00         4.00
      Unit Hyd. peak  (cms)=       1.24          .29
                                                        *TOTALS*
      PEAK FLOW       (cms)=        .02          .00          .026 (iii)
      TIME TO PEAK    (hrs)=       1.33         1.37         1.333
      RUNOFF VOLUME    (mm)=      55.03        16.28        38.366
      TOTAL RAINFALL   (mm)=      56.03        56.03        56.030
      RUNOFF COEFFICIENT   =        .98          .29          .685

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  74.0    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.

 ----------------------------------------------------------------------------
 025:0006----------------------------------------------------------------------
 *ADD TOTAL AREA CONTRIBUTING TO SITE DISCHARGE
 ----------------------
 | ADD HYD (EX        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
 ----------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:102           .12      .026    1.33  38.37    .000
                      +ID2 02:101MJR        .05      .046    1.33  48.05    .000
                      +ID3 03:101mnr        .46      .097    1.18  48.05    .000
                       ==========================================================
                       SUM 10:EX            .63      .169    1.33  46.21    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------------
 025:0007----------------------------------------------------------------------
 *#############################################################################|
 *#
 *#                    PROPOSED CONDITIONS HYDROLOGIC MODELING
 *#                  ==========================================
 *#
 *#############################################################################|
 *#*****************************************************************************|
 *AREA 201 - Minor Flow to Masonry Court, Major Flow to Clearview Avenue
 *#*****************************************************************************|
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=      .20
 | 01:201    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
 ----------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .20          .00
      Dep. Storage     (mm)=       1.00         8.92
      Average Slope     (%)=       1.00         2.00
      Length            (m)=      35.00         5.00
      Mannings n           =       .013         .250

      Max.eff.Inten.(mm/hr)=     117.72        36.75
                   over (min)       1.00         4.00
      Storage Coeff.  (min)=        .60 (ii)    3.63 (ii)
      Unit Hyd. Tpeak (min)=       1.00         4.00
      Unit Hyd. peak  (cms)=       1.38          .30
                                                        *TOTALS*
      PEAK FLOW       (cms)=        .14          .01          .143 (iii)
      TIME TO PEAK    (hrs)=       1.32         1.37         1.333
      RUNOFF VOLUME    (mm)=      55.03        16.28        48.055
      TOTAL RAINFALL   (mm)=      56.03        56.03        56.030
      RUNOFF COEFFICIENT   =        .98          .29          .858

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  74.0    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.

 ----------------------------------------------------------------------------
 025:0008----------------------------------------------------------------------
 *Note: Minor system for 201 outlets to storm sewer on Masonry Court
 *Major overland flows proceed to Clearview Avenue
 ----------------------
 | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .051  (cms)
 | TotalHyd 01:201    |   Number of inlets in system [NINLET] =       1
 ----------------------   Total minor system capacity         =    .051  (cms)
                          Total major system storage [TMJSTO] =     83.(cu.m.)

                   ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
                                   (ha)     (cms)     (hrs)     (mm)    (cms)
      TOTAL HYD.   01:201           .20      .065     1.333   54.643     .000
      ==========================================================
      MAJOR SYST   02:201MJR        .00      .000      .000     .000     .000
      MINOR SYST   03:201mnr        .20      .051     1.200   54.938     .000

      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

      Maximum MAJOR SYSTEM storage used =       6.(cu.m.)

 ----------------------------------------------------------------------------
 025:0009----------------------------------------------------------------------
 *#*****************************************************************************|
 *AREA 202 - Building Roof to Masonry Court
 *#*****************************************************************************|
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=      .24
 | 01:202    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
 ----------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .24          .00
      Dep. Storage     (mm)=       1.00         8.92
      Average Slope     (%)=       1.00         2.00
      Length            (m)=      15.00        10.00
      Mannings n           =       .013         .250

      Max.eff.Inten.(mm/hr)=     117.72        35.19
                   over (min)       1.00         5.00
      Storage Coeff.  (min)=        .77 (ii)    5.43 (ii)
      Unit Hyd. Tpeak (min)=       1.00         5.00
      Unit Hyd. peak  (cms)=       1.24          .21
                                                        *TOTALS*
      PEAK FLOW       (cms)=        .08          .00          .078 (iii)
      TIME TO PEAK    (hrs)=       1.33         1.38         1.333
      RUNOFF VOLUME    (mm)=      55.03        16.28        54.643
      TOTAL RAINFALL   (mm)=      56.03        56.03        56.030
      RUNOFF COEFFICIENT   =        .98          .29          .975

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  74.0    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.

 ----------------------------------------------------------------------------
 025:0010----------------------------------------------------------------------
 *#*****************************************************************************|
 *AREA 203 - Minor Flow to Masonry Court, Major Flow to St. Matthews Avenue
 *#*****************************************************************************|
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=      .15
 | 04:203    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
 ----------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .15          .00
      Dep. Storage     (mm)=       1.00         8.92
      Average Slope     (%)=       1.00         2.00
      Length            (m)=      15.00        10.00
      Mannings n           =       .013         .250

      Max.eff.Inten.(mm/hr)=     117.72        35.19
                   over (min)       1.00         5.00
      Storage Coeff.  (min)=        .77 (ii)    5.43 (ii)
      Unit Hyd. Tpeak (min)=       1.00         5.00
      Unit Hyd. peak  (cms)=       1.24          .21
                                                        *TOTALS*
      PEAK FLOW       (cms)=        .05          .00          .049 (iii)
      TIME TO PEAK    (hrs)=       1.33         1.38         1.333
      RUNOFF VOLUME    (mm)=      55.03        16.28        54.643
      TOTAL RAINFALL   (mm)=      56.03        56.03        56.030
      RUNOFF COEFFICIENT   =        .98          .29          .975

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  74.0    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.

 ----------------------------------------------------------------------------
 025:0011----------------------------------------------------------------------
 *Note: Minor system for 203 outlets to storm sewer on Masonry Court
 *Major overland flows proceed to St. Matthews Avenue
 ----------------------
 | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .038  (cms)
 | TotalHyd 04:203    |   Number of inlets in system [NINLET] =       1
 ----------------------   Total minor system capacity         =    .038  (cms)
                          Total major system storage [TMJSTO] =     32.(cu.m.)

                   ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
                                   (ha)     (cms)     (hrs)     (mm)    (cms)
      TOTAL HYD.   04:203           .15      .049     1.333   54.643     .000
      ==========================================================
      MAJOR SYST   05:ST.MAT        .00      .000      .000     .000     .000
      MINOR SYST   06:202mnr        .15      .038     1.183   54.964     .000

      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

      Maximum MAJOR SYSTEM storage used =       6.(cu.m.)

 ----------------------------------------------------------------------------
 025:0012----------------------------------------------------------------------
 *#*****************************************************************************|
 *AREA 204 - Site Perimeter Uncontrolled to Masonry Court
 *#*****************************************************************************|
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=      .04
 | 07:204    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
 ----------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .04          .00
      Dep. Storage     (mm)=       1.00         8.92
      Average Slope     (%)=       1.00         2.00
```

```
      Length           (m)=       3.00         3.00
      Mannings n         =        .013         .250

      Max.eff.Inten.(mm/hr)=     117.72        39.70
                over (min)        1.00         2.00
      Storage Coeff.  (min)=        .29 (ii)    2.45 (ii)
      Unit Hyd. Tpeak (min)=       1.00         2.00
      Unit Hyd. peak  (cms)=       1.64          .49
                                                        *TOTALS*
      PEAK FLOW       (cms)=        .01          .00          .013 (iii)
      TIME TO PEAK    (hrs)=       1.30         1.33         1.333
      RUNOFF VOLUME    (mm)=      55.03        16.28        54.643
      TOTAL RAINFALL   (mm)=      56.03        56.03        56.030
      RUNOFF COEFFICIENT   =        .98          .29          .975

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  74.0    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.
```

```
025:0013
*ADD TOTAL DRAINAGE TO TANK
```

ADD HYD (TOTANK)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:202	.24	.078	1.33	54.64	.000
	+ID2 03:201mnr	.20	.051	1.20	54.94	.000
	+ID3 06:202mnr	.15	.038	1.18	54.96	.000
	SUM 08:TOTANK	.59	.167	1.33	54.82	.000

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

```
025:0014
*Control to Masonry Court via orifice plate on outlet from tank
```

ROUTE RESERVOIR	Requested routing time step = 1.0 min.
IN>08:(TOTANK)	
OUT<06:(CTL-TA)	

```
                    =========  OUTLFOW STORAGE TABLE  =========
                    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                      (cms)    (ha.m.)   |    (cms)    (ha.m.)
                       .000  .0000E+00   |     .044  .2300E-01
                       .000  .5060E-02   |     .000  .0000E+00
```

ROUTING RESULTS	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW >08: (TOTANK)	.59	.167	1.333	54.825
OUTFLOW<06: (CTL-TA)	.59	.033	1.600	46.248
OVERFLOW<01: (OVF-TA)	.00	.000	.000	.000

```
                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   19.904
                    TIME SHIFT OF PEAK FLOW         (min)=    16.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.1872E-01

      *** WARNING: Outflow volume is less than inflow volume.
```

```
025:0015
*ADD TOTAL DRAINAGE TO MASONRY
```

ADD HYD (MASONRY)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 06:CTL-TANK	.59	.033	1.60	46.25	.000
	+ID2 07:204	.04	.013	1.33	54.64	.000
	SUM 03:MASONRY	.63	.037	1.50	46.78	.000

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

```
025:0016
*ADD TOTAL DRAINAGE TO CLEARVIEW
```

ADD HYD (CLEARVIEW)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:OVF-TANK	.00	.000	.00	.00	.000
	+ID2 02:201MJR	.00	.000	.00	.00	.000
	SUM 04:CLEARVIEW	.00	.000	.00	.00	.000

```
025:0017
*ADD TOTAL DRAINAGE FROM SITE
```

ADD HYD (PROP)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 03:MASONRY	.63	.037	1.50	46.78	.000
	+ID2 04:CLEARVIEW	.00	.000	.00	.00	.000
	+ID3 05:ST.MATT	.00	.000	.00	.00	.000
	SUM 09:PROP	.63	.037	1.50	46.78	.000

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

```
025:0018
*AREA CHECK
```

ADD HYD (CHECK)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 09:PROP	.63	.037	1.50	46.78	.000
	+ID2 10:EX	.63	.169	1.33	46.21	.000
	SUM 08:CHECK	1.26	.206	1.33	46.50	.000

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

```
025:0019
* RUN REMAINING DESIGN STORMS (City of Burlington 4-hour duration 5 TO 100-YR)
*
025:0002
025:0002
025:0002
   ** END OF RUN :  49
```

```
| START            |  Project  dir.: Q:\44795\100\SWM\SWMHYMO\
|                  |  Rainfall dir.: Q:\44795\100\SWM\SWMHYMO\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 050
    NSTORM=   1
           #  1=BURL_050.stm
```

```
050:0002
*#*************************************************************************|
*#  Project Name: 1085 CLEARVIEW AVENUE
*#                BURLINGTON, ONTARIO
*#  JOB NUMBER  : 44795-100
*#       Date   : DECEMBER 2018
*#  Modeller    : ALP
*#    Company   : MTE CONSULTANTS INC.
*#       File   : 44795.DAT
*
050:0002
READ STORM       |    Filename: 50-YR BURLINGTON CHICAGO STORM (4-HR DUR
Ptotal=  61.96 mm|    Comments: 50-YR BURLINGTON CHICAGO STORM (4-HR DUR
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	4.451	1.17	31.613	2.17	10.180	3.17	5.306
.33	5.067	1.33	129.819	2.33	8.734	3.33	4.946
.50	5.921	1.50	41.194	2.50	7.683	3.50	4.637
.67	7.198	1.67	22.439	2.67	6.881	3.67	4.369
.83	9.350	1.83	15.757	2.83	6.247	3.83	4.135
1.00	13.879	2.00	12.303	3.00	5.733	4.00	3.927

```
050:0003
*
*#########################################################################|
*#
*#                  EXISTING CONDITIONS HYDROLOGIC MODELING
*#               ================================================
*#
*#########################################################################|
*#*************************************************************************|
*AREA 101 - Existing Commercial Lot
*#*************************************************************************|
```

CALIB STANDHYD	Area (ha)= .51
01:101 DT= 1.00	Total Imp(%)= 82.00 Dir. Conn.(%)= 82.00

```
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .42          .09
      Dep. Storage     (mm)=       1.00         8.92
      Average Slope     (%)=       1.00         2.00
      Length            (m)=      10.00         5.00
      Mannings n          =        .013         .250

      Max.eff.Inten.(mm/hr)=     129.82        46.77
                over (min)        1.00         3.00
      Storage Coeff.  (min)=        .58 (ii)    3.32 (ii)
      Unit Hyd. Tpeak (min)=       1.00         3.00
      Unit Hyd. peak  (cms)=       1.40          .35
                                                        *TOTALS*
      PEAK FLOW       (cms)=        .15          .01          .160 (iii)
      TIME TO PEAK    (hrs)=       1.32         1.35         1.333
      RUNOFF VOLUME    (mm)=      60.96        19.77        53.548
      TOTAL RAINFALL   (mm)=      61.96        61.96        61.962
      RUNOFF COEFFICIENT   =        .98          .32          .864

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  74.0    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.
```

```
050:0004
*Note: Minor system for commercial lot outlets to storm sewer on Masonry Court
*Major overland flows proceed to Clearview Avenue
```

COMPUTE HUALHYD	Average inlet capacities [CINLET] = .097 (cms)
TotalHyd 01:101	Number of inlets in system [NINLET] = 1
	Total minor system capacity = .097 (cms)
	Total major system storage [TMJSTO] = 0.(cu.m.)

ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
TOTAL HYD. 01:101	.51	.160	1.333	53.548	.000
MAJOR SYST 02:101MJR	.06	.063	1.333	53.548	.000
MINOR SYST 03:101mnr	.45	.097	1.183	53.548	.000

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

```
050:0005
*#*************************************************************************|
*AREA 102 - Existing Dwelling Lots to St. Matthews Avenue
*#*************************************************************************|
```

CALIB STANDHYD	Area (ha)= .12
01:102 DT= 1.00	Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00

```
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .07          .05
      Dep. Storage     (mm)=       1.00         8.92
      Average Slope     (%)=       1.00         2.00
      Length            (m)=      15.00         5.00
      Mannings n          =        .013         .250

      Max.eff.Inten.(mm/hr)=     129.82        45.08
                over (min)        1.00         4.00
      Storage Coeff.  (min)=        .74 (ii)    3.52 (ii)
      Unit Hyd. Tpeak (min)=       1.00         4.00
      Unit Hyd. peak  (cms)=       1.26          .31
                                                        *TOTALS*
      PEAK FLOW       (cms)=        .02          .01          .029 (iii)
      TIME TO PEAK    (hrs)=       1.33         1.37         1.333
      RUNOFF VOLUME    (mm)=      60.96        19.77        43.251
      TOTAL RAINFALL   (mm)=      61.96        61.96        61.962
      RUNOFF COEFFICIENT   =        .98          .32          .698

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  74.0    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.
```

```
050:0006
*ADD TOTAL AREA CONTRIBUTING TO SITE DISCHARGE
```

ADD HYD (EX)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:102	.12	.029	1.33	43.25	.000
	+ID2 02:101MJR	.06	.063	1.33	53.55	.000
	+ID3 03:101mnr	.45	.097	1.18	53.55	.000
	SUM 10:EX	.63	.189	1.33	51.59	.000

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

```
050:0007
*#########################################################################|
*#
*#                   PROPOSED CONDITIONS HYDROLOGIC MODELING
```

```
01947> *#              ==========================================================
01948> *#
01949> *#########################################################################|
01950> *#************************************************************************|
01951> *AREA 201 - Minor Flow to Masonry Court, Major Flow to Clearview Avenue
01952> *#************************************************************************|
01953> ---------------------
01954> | CALIB STANDHYD     |   Area    (ha)=     .20
01955> | 01:201    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
01956> ---------------------
01957>                              IMPERVIOUS    PERVIOUS (i)
01958>      Surface Area     (ha)=        .20          .00
01959>      Dep. Storage     (mm)=       1.00         8.92
01960>      Average Slope     (%)=       1.00         2.00
01961>      Length            (m)=      35.00         5.00
01962>      Mannings n            =       .013         .250
01963>
01964>      Max.eff.Inten.(mm/hr)=     129.82        45.08
01965>                 over (min)        1.00         4.00
01966>      Storage Coeff.  (min)=       1.23 (ii)    4.01 (ii)
01967>      Unit Hyd. Tpeak (min)=       1.00         4.00
01968>      Unit Hyd. peak  (cms)=        .95          .28
01969>                                                        *TOTALS*
01970>      PEAK FLOW       (cms)=        .07          .00          .072 (iii)
01971>      TIME TO PEAK    (hrs)=       1.33         1.37         1.333
01972>      RUNOFF VOLUME    (mm)=      60.96        19.77        60.550
01973>      TOTAL RAINFALL   (mm)=      61.96        61.96        61.962
01974>      RUNOFF COEFFICIENT   =        .98          .32          .977
01975>
01976>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01977>            CN* =  74.0    Ia = Dep. Storage  (Above)
01978>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01979>            THAN THE STORAGE COEFFICIENT.
01980>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01981>
01982> -------------------------------------------------------------------------------
01983> 050:0008-----------------------------------------------------------------------
01984> *Note: Minor system for 201 outlets to storm sewer on Masonry Court
01985> *Major overland flows proceed to Clearview Avenue
01986> ---------------------
01987> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .051  (cms)
01988> | TotalHyd 01:201    |   Number of inlets in system [NINLET] =       1
01989> ---------------------   Total minor system capacity         =    .051  (cms)
01990>                         Total major system storage [TMJSTO] =     83.(cu.m.)
01991>
01992>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
01993>                                    (ha)     (cms)     (hrs)     (mm)    (cms)
01994>      TOTAL HYD.   01:201           .20      .072     1.333   60.550     .000
01995>      ================================================================
01996>      MAJOR SYST   02:201MJR        .00      .000      .000     .000     .000
01997>      MINOR SYST   03:201mnr        .20      .051     1.467   61.192     .000
01998>
01999>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02000>
02001>      Maximum MAJOR SYSTEM storage used =      10.(cu.m.)
02002>
02003> -------------------------------------------------------------------------------
02004> 050:0009-----------------------------------------------------------------------
02005> *#************************************************************************|
02006> *AREA 202 - Building Roof to Masonry Court
02007> *#************************************************************************|
02008> ---------------------
02009> | CALIB STANDHYD     |   Area    (ha)=     .24
02010> | 01:202    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
02011> ---------------------
02012>                              IMPERVIOUS    PERVIOUS (i)
02013>      Surface Area     (ha)=        .24          .00
02014>      Dep. Storage     (mm)=       1.00         8.92
02015>      Average Slope     (%)=       1.00         2.00
02016>      Length            (m)=      15.00        10.00
02017>      Mannings n            =       .013         .250
02018>
02019>      Max.eff.Inten.(mm/hr)=     129.82        43.32
02020>                 over (min)        1.00         5.00
02021>      Storage Coeff.  (min)=        .74 (ii)    5.03 (ii)
02022>      Unit Hyd. Tpeak (min)=       1.00         5.00
02023>      Unit Hyd. peak  (cms)=       1.26          .23
02024>                                                        *TOTALS*
02025>      PEAK FLOW       (cms)=        .09          .00          .086 (iii)
02026>      TIME TO PEAK    (hrs)=       1.33         1.38         1.333
02027>      RUNOFF VOLUME    (mm)=      60.96        19.77        60.550
02028>      TOTAL RAINFALL   (mm)=      61.96        61.96        61.962
02029>      RUNOFF COEFFICIENT   =        .98          .32          .977
02030>
02031>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02032>            CN* =  74.0    Ia = Dep. Storage  (Above)
02033>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02034>            THAN THE STORAGE COEFFICIENT.
02035>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02036>
02037> -------------------------------------------------------------------------------
02038> 050:0010-----------------------------------------------------------------------
02039> *#************************************************************************|
02040> *AREA 203 - Minor Flow to Masonry Court, Major Flow to St. Matthews Avenue
02041> *#************************************************************************|
02042> ---------------------
02043> | CALIB STANDHYD     |   Area    (ha)=     .15
02044> | 04:203    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
02045> ---------------------
02046>                              IMPERVIOUS    PERVIOUS (i)
02047>      Surface Area     (ha)=        .15          .00
02048>      Dep. Storage     (mm)=       1.00         8.92
02049>      Average Slope     (%)=       1.00         2.00
02050>      Length            (m)=      15.00        10.00
02051>      Mannings n            =       .013         .250
02052>
02053>      Max.eff.Inten.(mm/hr)=     129.82        43.32
02054>                 over (min)        1.00         5.00
02055>      Storage Coeff.  (min)=        .74 (ii)    5.03 (ii)
02056>      Unit Hyd. Tpeak (min)=       1.00         5.00
02057>      Unit Hyd. peak  (cms)=       1.26          .23
02058>                                                        *TOTALS*
02059>      PEAK FLOW       (cms)=        .05          .00          .054 (iii)
02060>      TIME TO PEAK    (hrs)=       1.33         1.38         1.333
02061>      RUNOFF VOLUME    (mm)=      60.96        19.77        60.550
02062>      TOTAL RAINFALL   (mm)=      61.96        61.96        61.962
02063>      RUNOFF COEFFICIENT   =        .98          .32          .977
02064>
02065>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02066>            CN* =  74.0    Ia = Dep. Storage  (Above)
02067>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02068>            THAN THE STORAGE COEFFICIENT.
02069>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02070>
02071> -------------------------------------------------------------------------------
02072> 050:0011-----------------------------------------------------------------------
02073> *Note: Minor system for 203 outlets to storm sewer on Masonry Court
02074> *Major overland flows proceed to St. Matthews Avenue
02075> ---------------------
02076> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .038  (cms)
02077> | TotalHyd 04:203    |   Number of inlets in system [NINLET] =       1
02078> ---------------------   Total minor system capacity         =    .038  (cms)
02079>                         Total major system storage [TMJSTO] =     32.(cu.m.)
02080>
02081>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
02082>                                    (ha)     (cms)     (hrs)     (mm)    (cms)
02083>      TOTAL HYD.   04:203           .15      .054     1.333   60.550     .000
02084>      ================================================================
02085>      MAJOR SYST   05:ST.MAT        .00      .000      .000     .000     .000
02086>      MINOR SYST   06:202mnr        .15      .038     1.183   61.051     .000
02087>
02088>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02089>
02090>      Maximum MAJOR SYSTEM storage used =       9.(cu.m.)
02091>
02092> -------------------------------------------------------------------------------
02093> 050:0012-----------------------------------------------------------------------
02094> *#************************************************************************|
02095> *AREA 204 - Site Perimeter Uncontrolled to Masonry Court
02096> *#************************************************************************|
02097> ---------------------
02098> | CALIB STANDHYD     |   Area    (ha)=     .04
02099> | 07:204    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
02100> ---------------------
02101>                              IMPERVIOUS    PERVIOUS (i)
02102>      Surface Area     (ha)=        .04          .00
02103>      Dep. Storage     (mm)=       1.00         8.92
02104>      Average Slope     (%)=       1.00         2.00
02105>      Length            (m)=       3.00         3.00
02106>      Mannings n            =       .013         .250
02107>
02108>      Max.eff.Inten.(mm/hr)=     129.82        48.40
02109>                 over (min)        1.00         2.00
02110>      Storage Coeff.  (min)=        .28 (ii)    2.27 (ii)
02111>      Unit Hyd. Tpeak (min)=       1.00         2.00
02112>      Unit Hyd. peak  (cms)=       1.65          .52
02113>                                                        *TOTALS*
02114>      PEAK FLOW       (cms)=        .01          .00          .014 (iii)
02115>      TIME TO PEAK    (hrs)=       1.23         1.33         1.333
02116>      RUNOFF VOLUME    (mm)=      60.96        19.77        60.550
02117>      TOTAL RAINFALL   (mm)=      61.96        61.96        61.962
02118>      RUNOFF COEFFICIENT   =        .98          .32          .977
02119>
02120>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02121>            CN* =  74.0    Ia = Dep. Storage  (Above)
02122>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02123>            THAN THE STORAGE COEFFICIENT.
02124>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02125>
02126> -------------------------------------------------------------------------------
02127> 050:0013-----------------------------------------------------------------------
02128> *ADD TOTAL DRAINAGE TO TANK
02129> ----------------------
02130> | ADD HYD (TOTANK    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02131> ----------------------                    (ha)     (cms)  (hrs)   (mm)   (cms)
02132>                         ID1 01:202          .24      .086    1.33  60.55    .000
02133>                        +ID2 03:201mnr       .20      .051    1.47  61.19    .000
02134>                        +ID3 06:202mnr       .15      .038    1.18  61.05    .000
02135>                         ================================================
02136>                         SUM 08:TOTANK        .59      .175    1.33  60.90    .000
02137>
02138>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02139>
02140> -------------------------------------------------------------------------------
02141> 050:0014-----------------------------------------------------------------------
02142> *Control to Masonry Court via orifice plate on outlet from tank
02143> ---------------------
02144> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
02145> |  IN>08:(TOTANK)    |
02146> | OUT<06:(CTL-TA)    |    =========  OUTLFOW STORAGE TABLE  =========
02147> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
02148>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
02149>                             .000  .0000E+00    |     .044  .2300E-01
02150>                             .000  .5060E-02    |     .000  .0000E+00
02151>
02152>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
02153>      ---------------            (ha)     (cms)     (hrs)       (mm)
02154>      INFLOW >08: (TOTANK)        .59      .175     1.333     60.895
02155>      OUTFLOW<06: (CTL-TA)        .59      .038     1.550     52.319
02156>     OVERFLOW<01: (OVF-TA)        .00      .000      .000       .000
02157>
02158>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =       0
02159>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
02160>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
02161>
02162>
02163>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   21.756
02164>                    TIME SHIFT OF PEAK FLOW         (min)=    13.00
02165>                    MAXIMUM  STORAGE   USED       (ha.m.)=.2071E-01
02166>
02167>       *** WARNING: Outflow volume is less than inflow volume.
02168> -------------------------------------------------------------------------------
02169> 050:0015-----------------------------------------------------------------------
02170> *ADD TOTAL DRAINAGE TO MASONRY
02171> ----------------------
02172> | ADD HYD (MASONRY   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02173> ----------------------                    (ha)     (cms)  (hrs)   (mm)   (cms)
02174>                         ID1 06:CTL-TANK     .59      .038    1.55  52.32    .000
02175>                        +ID2 07:204          .04      .014    1.33  60.55    .000
02176>                         ================================================
02177>                         SUM 03:MASONRY       .63      .042    1.50  52.84    .000
02178>
02179>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02180>
02181> -------------------------------------------------------------------------------
02182> 050:0016-----------------------------------------------------------------------
02183> *ADD TOTAL DRAINAGE TO CLEARVIEW
02184> ----------------------
02185> | ADD HYD (CLEARVIEW ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02186> ----------------------                    (ha)     (cms)  (hrs)   (mm)   (cms)
02187>                         ID1 01:OVF-TANK     .00      .000     .00    .00    .000
02188>                        +ID2 02:201MJR       .00      .000     .00    .00    .000
02189>                         ================================================
02190>                         SUM 04:CLEARVIEW     .00      .000     .00    .00    .000
02191> -------------------------------------------------------------------------------
02192> 050:0017-----------------------------------------------------------------------
02193> *ADD TOTAL DRAINAGE FROM SITE
02194> ----------------------
02195> | ADD HYD (PROP      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02196> ----------------------                    (ha)     (cms)  (hrs)   (mm)   (cms)
02197>                         ID1 03:MASONRY       .63      .042    1.50  52.84    .000
02198>                        +ID2 04:CLEARVIEW     .00      .000     .00    .00    .000
02199>                        +ID3 05:ST.MATT       .00      .000     .00    .00    .000
02200>                         ================================================
02201>                         SUM 09:PROP          .63      .042    1.50  52.84    .000
02202>
02203>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02204>
02205> -------------------------------------------------------------------------------
02206> 050:0018-----------------------------------------------------------------------
02207> *AREA CHECK
02208> ----------------------
02209> | ADD HYD (CHECK     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02210> ----------------------                    (ha)     (cms)  (hrs)   (mm)   (cms)
02211>                         ID1 09:PROP          .63      .042    1.50  52.84    .000
02212>                        +ID2 10:EX           .63      .189    1.33  51.59    .000
02213>                         ================================================
02214>                         SUM 08:CHECK        1.26      .229    1.33  52.21    .000
02215>
02216>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02217>
02218> -------------------------------------------------------------------------------
02219> 050:0019-----------------------------------------------------------------------
02220> * RUN REMAINING DESIGN STORMS (City of Burlington 4-hour duration 5 TO 100-YR)
02221> *
02222> -------------------------------------------------------------------------------
02223> 050:0002-----------------------------------------------------------------------
02224> -------------------------------------------------------------------------------
```

```
02225> 050:0002-----------------------------------------------------------------------
02226> -----------------------------------------------------------------------------
02227> 050:0002-----------------------------------------------------------------------
02228> -----------------------------------------------------------------------------
02229> 050:0002-----------------------------------------------------------------------
02230>   ** END OF RUN :  99
02231>
02232> ****************************************************************************
02233>
02234>
02235>
02236>
02237>
02238> --------------------
02239> | START            |  Project  dir.: Q:\44795\100\SWM\SWMHYMO\
02240> --------------------  Rainfall dir.: Q:\44795\100\SWM\SWMHYMO\
02241>     TZERO =   .00 hrs on        0
02242>     METOUT=   2 (output = METRIC)
02243>     NRUN  = 100
02244>     NSTORM=   1
02245>              #  1=BURL_100.stm
02246> -----------------------------------------------------------------------------
02247> 100:0002-----------------------------------------------------------------------
02248> *#*************************************************************************|
02249> *#  Project Name: 1085 CLEARVIEW AVENUE
02250> *#               BURLINGTON, ONTARIO
02251> *#  JOB NUMBER  : 44795-100
02252> *#       Date   : DECEMBER 2018
02253> *#  Modeller    : ALP
02254> *#    Company   : MTE CONSULTANTS INC.
02255> *#       File   : 44795.DAT
02256> *
02257> -----------------------------------------------------------------------------
02258> 100:0002-----------------------------------------------------------------------
02259> --------------------
02260> | READ STORM       |    Filename: 100-YR BURLINGTON CHICAGO STORM (4-HR DU
02261> | Ptotal=  67.72 mm|    Comments: 100-YR BURLINGTON CHICAGO STORM (4-HR DU
02262> --------------------
02263>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
02264>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
02265>                .17   4.865 |   1.17  34.553 |   2.17  11.126 |   3.17   5.800
02266>                .33   5.538 |   1.33 141.892 |   2.33   9.547 |   3.33   5.406
02267>                .50   6.472 |   1.50  45.024 |   2.50   8.397 |   3.50   5.068
02268>                .67   7.868 |   1.67  24.526 |   2.67   7.521 |   3.67   4.776
02269>                .83  10.219 |   1.83  17.223 |   2.83   6.828 |   3.83   4.519
02270>               1.00  15.170 |   2.00  13.447 |   3.00   6.266 |   4.00   4.292
02271>
02272> -----------------------------------------------------------------------------
02273> 100:0003-----------------------------------------------------------------------
02274> *
02275> *#########################################################################|
02276> *#
02277> *#                     EXISTING CONDITIONS HYDROLOGIC MODELING
02278> *#               ================================================
02279> *#
02280> *#########################################################################|
02281> *#*************************************************************************|
02282> *AREA 101 - Existing Commercial Lot
02283> *#*************************************************************************|
02284> ----------------------
02285> | CALIB STANDHYD     |   Area    (ha)=     .51
02286> | 01:101    DT= 1.00 |   Total Imp(%)=   82.00   Dir. Conn.(%)=   82.00
02287> ----------------------
02288>                                IMPERVIOUS    PERVIOUS (i)
02289>      Surface Area     (ha)=        .42          .09
02290>      Dep. Storage     (mm)=       1.00         8.92
02291>      Average Slope     (%)=       1.00         2.00
02292>      Length            (m)=      10.00         5.00
02293>      Mannings n            =       .013         .250
02294>
02295>      Max.eff.Inten.(mm/hr)=     141.89        55.67
02296>                   over (min)        1.00         3.00
02297>      Storage Coeff.  (min)=        .56 (ii)     3.12 (ii)
02298>      Unit Hyd. Tpeak (min)=        1.00         3.00
02299>      Unit Hyd. peak  (cms)=        1.42          .37
02300>                                                        *TOTALS*
02301>      PEAK FLOW       (cms)=         .16          .01          .176 (iii)
02302>      TIME TO PEAK    (hrs)=        1.32         1.35         1.333
02303>      RUNOFF VOLUME    (mm)=       66.72        23.36        58.918
02304>      TOTAL RAINFALL   (mm)=       67.72        67.72        67.724
02305>      RUNOFF COEFFICIENT   =         .99          .34          .870
02306>
02307>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02308>            CN* =  74.0    Ia = Dep. Storage  (Above)
02309>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02310>            THAN THE STORAGE COEFFICIENT.
02311>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02312>
02313> -----------------------------------------------------------------------------
02314> 100:0004-----------------------------------------------------------------------
02315> *Note: Minor system for commercial lot outlets to storm sewer on Masonry Court
02316> *Major overland flows proceed to Clearview Avenue
02317> ----------------------
02318> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .097  (cms)
02319> | TotalHyd 01:101    |   Number of inlets in system [NINLET] =      1
02320> ----------------------   Total minor system capacity        =    .097  (cms)
02321>                          Total major system storage [TMJSTO] =       0.(cu.m.)
02322>
02323>                   ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
02324>                                    (ha)     (cms)     (hrs)     (mm)    (cms)
02325>      TOTAL HYD.   01:101           .51      .176     1.333   58.918     .000
02326>      ==========================================================================
02327>      MAJOR SYST   02:101MJR        .07      .079     1.333   58.918     .000
02328>      MINOR SYST   03:101mnr        .44      .097     1.183   58.918     .000
02329>
02330>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02331>
02332> -----------------------------------------------------------------------------
02333> 100:0005-----------------------------------------------------------------------
02334> *#*************************************************************************|
02335> *AREA 102 - Existing Dwelling Lots to St. Matthews Avenue
02336> *#*************************************************************************|
02337> ----------------------
02338> | CALIB STANDHYD     |   Area    (ha)=     .12
02339> | 01:102    DT= 1.00 |   Total Imp(%)=   57.00   Dir. Conn.(%)=   57.00
02340> ----------------------
02341>                                IMPERVIOUS    PERVIOUS (i)
02342>      Surface Area     (ha)=        .07          .05
02343>      Dep. Storage     (mm)=       1.00         8.92
02344>      Average Slope     (%)=       1.00         2.00
02345>      Length            (m)=      15.00         5.00
02346>      Mannings n            =       .013         .250
02347>
02348>      Max.eff.Inten.(mm/hr)=     141.89        55.67
02349>                   over (min)        1.00         3.00
02350>      Storage Coeff.  (min)=        .71 (ii)     3.27 (ii)
02351>      Unit Hyd. Tpeak (min)=        1.00         3.00
02352>      Unit Hyd. peak  (cms)=        1.28          .35
02353>                                                        *TOTALS*
02354>      PEAK FLOW       (cms)=         .03          .01          .033 (iii)
02355>      TIME TO PEAK    (hrs)=        1.32         1.35         1.333
02356>      RUNOFF VOLUME    (mm)=       66.72        23.36        48.076
02357>      TOTAL RAINFALL   (mm)=       67.72        67.72        67.724
02358>      RUNOFF COEFFICIENT   =         .99          .34          .710
02359>
02360>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02361>            CN* =  74.0    Ia = Dep. Storage  (Above)
02362>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02363>            THAN THE STORAGE COEFFICIENT.
02364>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02365>
02366> -----------------------------------------------------------------------------
02367> 100:0006-----------------------------------------------------------------------
02368> *ADD TOTAL AREA CONTRIBUTING TO SITE DISCHARGE
02369> ------------------------
02370> | ADD HYD (EX        ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02371> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
02372>                          ID1 01:102          .12      .033    1.33  48.08    .000
02373>                         +ID2 02:101MJR       .07      .079    1.33  58.92    .000
02374>                         +ID3 03:101mnr       .44      .097    1.18  58.92    .000
02375>                          ============================================================
02376>                          SUM 10:EX           .63      .209    1.33  56.85    .000
02377>
02378>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02379>
02380> -----------------------------------------------------------------------------
02381> 100:0007-----------------------------------------------------------------------
02382> *#########################################################################|
02383> *#
02384> *#                  PROPOSED CONDITIONS HYDROLOGIC MODELING
02385> *#               ================================================
02386> *#
02387> *#########################################################################|
02388> *#*************************************************************************|
02389> *AREA 201 - Minor Flow to Masonry Court, Major Flow to Clearview Avenue
02390> *#*************************************************************************|
02391> ----------------------
02392> | CALIB STANDHYD     |   Area    (ha)=     .20
02393> | 01:201    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
02394> ----------------------
02395>                                IMPERVIOUS    PERVIOUS (i)
02396>      Surface Area     (ha)=        .20          .00
02397>      Dep. Storage     (mm)=       1.00         8.92
02398>      Average Slope     (%)=       1.00         2.00
02399>      Length            (m)=      35.00         5.00
02400>      Mannings n            =       .013         .250
02401>
02402>      Max.eff.Inten.(mm/hr)=     141.89        53.79
02403>                   over (min)        1.00         4.00
02404>      Storage Coeff.  (min)=       1.18 (ii)    3.78 (ii)
02405>      Unit Hyd. Tpeak (min)=       1.00         4.00
02406>      Unit Hyd. peak  (cms)=        .97          .29
02407>                                                        *TOTALS*
02408>      PEAK FLOW       (cms)=        .08          .00          .078 (iii)
02409>      TIME TO PEAK    (hrs)=       1.33         1.37         1.333
02410>      RUNOFF VOLUME    (mm)=      66.72        23.36        66.290
02411>      TOTAL RAINFALL   (mm)=      67.72        67.72        67.724
02412>      RUNOFF COEFFICIENT   =        .99          .34          .979
02413>
02414>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02415>            CN* =  74.0    Ia = Dep. Storage  (Above)
02416>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02417>            THAN THE STORAGE COEFFICIENT.
02418>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02419>
02420> -----------------------------------------------------------------------------
02421> 100:0008-----------------------------------------------------------------------
02422> *Note: Minor system for 201 outlets to storm sewer on Masonry Court
02423> *Major overland flows proceed to Clearview Avenue
02424> ----------------------
02425> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .051  (cms)
02426> | TotalHyd 01:201    |   Number of inlets in system [NINLET] =      1
02427> ----------------------   Total minor system capacity        =    .051  (cms)
02428>                          Total major system storage [TMJSTO] =      83.(cu.m.)
02429>
02430>                   ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
02431>                                    (ha)     (cms)     (hrs)     (mm)    (cms)
02432>      TOTAL HYD.   01:201           .20      .078     1.333   66.290     .000
02433>      ==========================================================================
02434>      MAJOR SYST   02:201MJR        .00      .000      .000     .000     .000
02435>      MINOR SYST   03:201mnr        .20      .051     1.183   67.070     .000
02436>
02437>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02438>
02439>      Maximum MAJOR SYSTEM storage used =      14.(cu.m.)
02440>
02441> -----------------------------------------------------------------------------
02442> 100:0009-----------------------------------------------------------------------
02443> *#*************************************************************************|
02444> *AREA 202 - Building Roof to Masonry Court
02445> *#*************************************************************************|
02446> ----------------------
02447> | CALIB STANDHYD     |   Area    (ha)=     .24
02448> | 01:202    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
02449> ----------------------
02450>                                IMPERVIOUS    PERVIOUS (i)
02451>      Surface Area     (ha)=        .24          .00
02452>      Dep. Storage     (mm)=       1.00         8.92
02453>      Average Slope     (%)=       1.00         2.00
02454>      Length            (m)=      15.00        10.00
02455>      Mannings n            =       .013         .250
02456>
02457>      Max.eff.Inten.(mm/hr)=     141.89        51.83
02458>                   over (min)        1.00         5.00
02459>      Storage Coeff.  (min)=        .71 (ii)     4.71 (ii)
02460>      Unit Hyd. Tpeak (min)=       1.00         5.00
02461>      Unit Hyd. peak  (cms)=       1.28          .24
02462>                                                        *TOTALS*
02463>      PEAK FLOW       (cms)=        .09          .00          .094 (iii)
02464>      TIME TO PEAK    (hrs)=       1.33         1.38         1.333
02465>      RUNOFF VOLUME    (mm)=      66.72        23.36        66.290
02466>      TOTAL RAINFALL   (mm)=      67.72        67.72        67.724
02467>      RUNOFF COEFFICIENT   =        .99          .34          .979
02468>
02469>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02470>            CN* =  74.0    Ia = Dep. Storage  (Above)
02471>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02472>            THAN THE STORAGE COEFFICIENT.
02473>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02474>
02475> -----------------------------------------------------------------------------
02476> 100:0010-----------------------------------------------------------------------
02477> *#*************************************************************************|
02478> *AREA 203 - Minor Flow to Masonry Court, Major Flow to St. Matthews Avenue
02479> *#*************************************************************************|
02480> ----------------------
02481> | CALIB STANDHYD     |   Area    (ha)=     .15
02482> | 04:203    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
02483> ----------------------
02484>                                IMPERVIOUS    PERVIOUS (i)
02485>      Surface Area     (ha)=        .15          .00
02486>      Dep. Storage     (mm)=       1.00         8.92
02487>      Average Slope     (%)=       1.00         2.00
02488>      Length            (m)=      15.00        10.00
02489>      Mannings n            =       .013         .250
02490>
02491>      Max.eff.Inten.(mm/hr)=     141.89        51.83
02492>                   over (min)        1.00         5.00
02493>      Storage Coeff.  (min)=        .71 (ii)     4.71 (ii)
02494>      Unit Hyd. Tpeak (min)=       1.00         5.00
02495>      Unit Hyd. peak  (cms)=       1.28          .24
02496>                                                        *TOTALS*
02497>      PEAK FLOW       (cms)=        .06          .00          .059 (iii)
02498>      TIME TO PEAK    (hrs)=       1.33         1.38         1.333
02499>      RUNOFF VOLUME    (mm)=      66.72        23.36        66.290
02500>      TOTAL RAINFALL   (mm)=      67.72        67.72        67.724
02501>      RUNOFF COEFFICIENT   =        .99          .34          .979
02502>
```

```
02503>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02504>           CN* =  74.0    Ia = Dep. Storage  (Above)
02505>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02506>           THAN THE STORAGE COEFFICIENT.
02507>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02508>
02509> ---------------------------------------------------------------------------
02510> 100:0011-----------------------------------------------------------------
02511> *Note: Minor system for 203 outlets to storm sewer on Masonry Court
02512> *Major overland flows proceed to St. Matthews Avenue
02513> ----------------------
02514> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .038  (cms)
02515> | TotalHyd 04:203    |   Number of inlets in system [NINLET] =       1
02516> ----------------------   Total minor system capacity         =    .038  (cms)
02517>                          Total major system storage [TMJSTO] =     32.(cu.m.)
02518>
02519>                  ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
02520>                                  (ha)     (cms)     (hrs)     (mm)    (cms)
02521>      TOTAL HYD.   04:203          .15      .059     1.333   66.290     .000
02522>      ==========================================================================
02523>      MAJOR SYST   05:ST.MAT        .00      .000      .000     .000     .000
02524>      MINOR SYST   06:202mnr        .15      .038     1.183   66.855     .000
02525>
02526>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02527>
02528>      Maximum MAJOR SYSTEM storage used =      11.(cu.m.)
02529>
02530> ---------------------------------------------------------------------------
02531> 100:0012-----------------------------------------------------------------
02532> *#*************************************************************************|
02533> *AREA 204 - Site Perimeter Uncontrolled to Masonry Court
02534> *#*************************************************************************|
02535> ----------------------
02536> | CALIB STANDHYD     |   Area    (ha)=     .04
02537> | 07:204    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
02538> ----------------------
02539>                              IMPERVIOUS    PERVIOUS (i)
02540>      Surface Area     (ha)=        .04          .00
02541>      Dep. Storage     (mm)=       1.00         8.92
02542>      Average Slope     (%)=       1.00         2.00
02543>      Length            (m)=       3.00         3.00
02544>      Mannings n             =      .013         .250
02545>
02546>      Max.eff.Inten.(mm/hr)=     141.89        57.47
02547>                 over (min)        1.00         2.00
02548>      Storage Coeff.  (min)=        .27 (ii)    2.13 (ii)
02549>      Unit Hyd. Tpeak (min)=       1.00         2.00
02550>      Unit Hyd. peak  (cms)=       1.66          .54
02551>                                                      *TOTALS*
02552>      PEAK FLOW       (cms)=        .02          .00          .016 (iii)
02553>      TIME TO PEAK    (hrs)=       1.23         1.33         1.333
02554>      RUNOFF VOLUME    (mm)=      66.72        23.36        66.290
02555>      TOTAL RAINFALL   (mm)=      67.72        67.72        67.724
02556>      RUNOFF COEFFICIENT   =        .99          .34          .979
02557>
02558>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02559>           CN* =  74.0    Ia = Dep. Storage  (Above)
02560>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02561>           THAN THE STORAGE COEFFICIENT.
02562>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02563>
02564> ---------------------------------------------------------------------------
02565> 100:0013-----------------------------------------------------------------
02566> *ADD TOTAL DRAINAGE TO TANK
02567> ----------------------
02568> | ADD HYD (TOTANK    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02569> ----------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
02570>                       ID1 01:202           .24      .094    1.33  66.29    .000
02571>                      +ID2 03:201mnr        .20      .051    1.18  67.07    .000
02572>                      +ID3 06:202mnr        .15      .038    1.18  66.85    .000
02573>                       ==========================================================
02574>                       SUM 08:TOTANK         .59      .183    1.33  66.70    .000
02575>
02576>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02577>
02578> ---------------------------------------------------------------------------
02579> 100:0014-----------------------------------------------------------------
02580> *Control to Masonry Court via orifice plate on outlet from tank
02581> --------------------
02582> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
02583> |  IN>08:(TOTANK)   |
02584> | OUT<06:(CTL-TA)   |    =========  OUTLFOW STORAGE TABLE  =========
02585> --------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
02586>                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
02587>                             .000  .0000E+00   |     .044  .2300E-01
02588>                             .000  .5060E-02   |     .000  .0000E+00
02589>
02590>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
02591>      --------------------       (ha)     (cms)     (hrs)       (mm)
02592>      INFLOW >08: (TOTANK)        .59      .183     1.333     66.698
02593>      OUTFLOW<06: (CTL-TA)        .59      .043     1.533     58.122
02594>     OVERFLOW<01: (OVF-TA)        .00      .000      .000       .000
02595>
02596>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
02597>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
02598>                     PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
02599>
02600>
02601>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=   23.384
02602>                     TIME SHIFT OF PEAK FLOW          (min)=   12.00
02603>                     MAXIMUM  STORAGE   USED       (ha.m.)=.2266E-01
02604>
02605>       *** WARNING: Outflow volume is less than inflow volume.
02606> ---------------------------------------------------------------------------
02607> 100:0015-----------------------------------------------------------------
02608> *ADD TOTAL DRAINAGE TO MASONRY
02609> ----------------------
02610> | ADD HYD (MASONRY   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02611> ----------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
02612>                       ID1 06:CTL-TANK        .59      .043    1.53  58.12    .000
02613>                      +ID2 07:204             .04      .016    1.33  66.29    .000
02614>                       ==========================================================
02615>                       SUM 03:MASONRY         .63      .046    1.50  58.64    .000
02616>
02617>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02618>
02619> ---------------------------------------------------------------------------
02620> 100:0016-----------------------------------------------------------------
02621> *ADD TOTAL DRAINAGE TO CLEARVIEW
02622> ----------------------
02623> | ADD HYD (CLEARVIEW ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02624> ----------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
02625>                       ID1 01:OVF-TANK        .00      .000     .00    .00    .000
02626>                      +ID2 02:201MJR          .00      .000     .00    .00    .000
02627>                       ==========================================================
02628>                       SUM 04:CLEARVIEW       .00      .000     .00    .00    .000
02629> ---------------------------------------------------------------------------
02630> 100:0017-----------------------------------------------------------------
02631> *ADD TOTAL DRAINAGE FROM SITE
02632> ----------------------
02633> | ADD HYD (PROP      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02634> ----------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
02635>                       ID1 03:MASONRY         .63      .046    1.50  58.64    .000
02636>                      +ID2 04:CLEARVIEW       .00      .000     .00    .00    .000
02637>                      +ID3 05:ST.MATT         .00      .000     .00    .00    .000
02638>                       ==========================================================
02639>                       SUM 09:PROP            .63      .046    1.50  58.64    .000
02640>
02641>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02642>
02643> ---------------------------------------------------------------------------
02644> 100:0018-----------------------------------------------------------------
02645> *AREA CHECK
02646> ----------------------
02647> | ADD HYD (CHECK     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02648> ----------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
02649>                       ID1 09:PROP            .63      .046    1.50  58.64    .000
02650>                      +ID2 10:EX              .63      .209    1.33  56.85    .000
02651>                       ==========================================================
02652>                       SUM 08:CHECK          1.26      .253    1.33  57.75    .000
02653>
02654>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02655>
02656> ---------------------------------------------------------------------------
02657> 100:0019-----------------------------------------------------------------
02658> * RUN REMAINING DESIGN STORMS (City of Burlington 4-hour duration 5 TO 100-YR)
02659> *
02660> ---------------------------------------------------------------------------
02661> 100:0002-----------------------------------------------------------------
02662> ---------------------------------------------------------------------------
02663> 100:0002-----------------------------------------------------------------
02664> ---------------------------------------------------------------------------
02665> 100:0002-----------------------------------------------------------------
02666> ---------------------------------------------------------------------------
02667> 100:0002-----------------------------------------------------------------
02668> ---------------------------------------------------------------------------
02669> 100:0002-----------------------------------------------------------------
02670>       FINISH
02671> ---------------------------------------------------------------------------
02672> ***************************************************************************
02673>      WARNINGS / ERRORS / NOTES
02674>      -------------------------
02675>  002:0014 ROUTE RESERVOIR
02676>       *** WARNING: Outflow volume is less than inflow volume.
02677>       *** WARNING: Outflow volume is less than inflow volume.
02678>       *** WARNING: Outflow volume is less than inflow volume.
02679>       *** WARNING: Outflow volume is less than inflow volume.
02680>       *** WARNING: Outflow volume is less than inflow volume.
02681>       *** WARNING: Outflow volume is less than inflow volume.
02682>    Simulation ended on 2019-01-11     at 14:01:34
02683> ===============================================================================
02684>
```

(2) The part of the *fixture outlet pipe* that is common to three compartments of a sink shall be one *size* larger than the largest *fixture outlet pipe* of the compartments that it serves.

(3) Where clothes washers do not drain to a laundry tray, the *trap* inlet shall be fitted with a vertical standpipe that is not less than 600 mm long measured from the *trap weir* and the top of the standpipe shall terminate above the *flood level rim* of the clothes washer it serves.

7.4.9.4. Minimum Size of Building Drains and Sewers

(1) Every *sanitary building drain* and every *sanitary building sewer* shall be at least 4 in. in *size*.

(2) Every *storm building drain* and every *storm building sewer* shall be at least 4 in. in *size*.

7.4.10. Hydraulic Loads

7.4.10.1. Total Load on a Pipe

(1) The hydraulic load on a pipe is the total load from,

(a) every *fixture* that is connected to the system upstream of the pipe,

(b) every *fixture* for which provision is made for future connection upstream of the pipe, and

(c) all roofs and paved surfaces that drain into the system upstream of the pipe.

7.4.10.2. Hydraulic Loads for Fixtures

(1) The hydraulic load from a *fixture* that is listed in Table 7.4.9.3. is the number of *fixture units* set forth in the Table.

(2) Except as provided in Sentence (1), the hydraulic load from a *fixture* that is not listed in Table 7.4.9.3. is the number of *fixture units* set forth in Table 7.4.10.2. for the *trap* of the *size* that serves the *fixture*.

Table 7.4.10.2.
Permitted Hydraulic Load from a Fixture Based on Size of Trap

Forming Part of Sentence 7.4.10.2.(2)

Item	*Column 1*	Column 2
	***Size* of *Trap*, in.**	**Hydraulic Load, *fixture units***
1.	1 ¼	1
2.	1 ½	2
3.	2	3
4.	2 ½	4
5.	3	5
6.	4	6

7.4.10.3. Hydraulic Loads from Fixtures with Continuous or Semi-continuous Flow

(1) Except as provided in Sentence (2), the hydraulic load from a *fixture* that produces a continuous flow, such as a pump or an air-conditioning *fixture*, is 31.7 *fixture units* for each litre per second of flow.

(2) Where a *fixture* or equipment that produces a continuous or semi-continuous flow drains to a *storm drainage system*, the hydraulic load from the *fixture* is 900 litres for each litre per second of flow.

(3) The hydraulic load from a *fixture* or equipment that produces a semi-continuous flow shall conform to Table 7.4.10.3.

Table 7.4.10.3.
Maximum Permitted Hydraulic Load from Fixtures with Semi-continuous Flows

Forming Part of Sentence 7.4.10.3.(3)

Item	*Column 1*	Column 2	Column 3
	Maximum Permitted Flows by *Trap Size*		
	***Trap Size*, in.**	**Flow, L/s**	**Hydraulic Load, *fixture units***
1.	1 ½	0.00 - 0.090	3
2.	2	0.091 - 0.190	6
3.	3	0.191 - 0.850	27
4.	4	0.851 - 5.700	180

7.4.10.4. Hydraulic Loads from Roofs or Paved Surfaces

(1) Except as provided in Sentence (2), the hydraulic load in litres from a roof or paved surface is the maximum 15 min rainfall determined in conformance with MMAH Supplementary Standard SB-1, "Climatic and Seismic Data", multiplied by the sum of,

(a) the area in square metres of the horizontal projection of the surface drained, and

(b) one-half the area in square metres of the largest adjoining vertical surface.

(2) *Flow control roof drains* may be installed provided,

(a) the maximum drain down time does not exceed 24 h,

(b) the roof structure is designed to carry the load of the stored water,

(c) one or more scuppers are installed not more than 30 m apart along the perimeter of the *building* so that,

(i) the scuppers are designed to handle at least 200% of the 15-minute rainfall intensity, and

(ii) the maximum depth of controlled water is limited to 150 mm,

(d) they are located not more than 15 m from the edge of the roof and not more than 30 m from adjacent drains, and

(e) there is at least one drain for each 900 m^2.

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Table 1.2 (Cont'd)
Design Data for Selected Locations in Ontario

Location	Elevation, m	Design Temperature				Degree Days Below 18°C	15 Min Rainfall, mm	One Day Rainfall, 1/50, mm	Annual Rainfall, mm	Annual Total Precipitation, mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa		Seismic Data				
		January		July 2.5%										1/10	1/50					
		2.5%, °C	1%, °C	Dry, °C	Wet, °C							S_s	S_r			$S_a(0.2)$	$S_a(0.5)$	$S_a(1.0)$	$S_a(2.0)$	PGA
Burlington	80	-17	-19	31	23	3740	23	103	770	850	160	0.9	0.4	0.36	0.46	0.320	0.170	0.064	0.022	0.180
Cambridge	295	-18	-20	29	23	4100	25	113	800	890	160	1.6	0.4	0.28	0.36	0.180	0.100	0.060	0.019	0.073
Campbellford	150	-23	-26	30	23	4280	25	97	730	850	160	1.7	0.4	0.32	0.41	0.230	0.150	0.085	0.027	0.084
Cannington	255	-24	-26	30	23	4310	25	108	740	950	120	2.2	0.4	0.28	0.36	0.170	0.120	0.070	0.023	0.048
Carleton Place	135	-25	-27	30	23	4600	25	97	730	850	160	2.5	0.4	0.32	0.41	0.490	0.250	0.120	0.039	0.230
Cavan	200	-23	-25	30	23	4400	25	97	740	850	140	2.0	0.4	0.34	0.44	0.190	0.130	0.076	0.024	0.061
Centralia	260	-17	-19	30	23	3800	25	103	820	1000	180	2.3	0.4	0.38	0.49	0.130	0.080	0.052	0.016	0.041
Chapleau	425	-35	-38	27	21	5900	20	97	530	850	80	4.0	0.4	0.23	0.30	0.095	0.057	0.037	0.013	0.036
Chatham	180	-16	-18	31	24	3470	28	103	800	850	180	1.0	0.4	0.33	0.43	0.160	0.092	0.050	0.015	0.088
Chesley	275	-19	-21	29	22	4320	28	103	810	1125	140	2.8	0.4	0.37	0.48	0.120	0.082	0.053	0.018	0.037
Clinton	280	-17	-19	29	23	4150	25	103	810	1000	160	2.6	0.4	0.38	0.49	0.120	0.078	0.050	0.016	0.038
Coboconk	270	-25	-27	30	23	4500	25	108	740	950	120	2.5	0.4	0.27	0.35	0.180	0.130	0.074	0.025	0.055
Cobourg	90	-21	-23	29	23	3980	23	94	760	825	160	1.2	0.4	0.38	0.49	0.220	0.140	0.079	0.025	0.096
Cochrane	245	-34	-36	29	21	6200	20	92	575	875	80	2.8	0.3	0.27	0.35	0.180	0.098	0.054	0.018	0.094
Colborne	105	-21	-23	29	23	3980	23	94	760	850	160	1.6	0.4	0.38	0.49	0.230	0.140	0.081	0.026	0.098
Collingwood	190	-21	-23	29	23	4180	28	97	720	950	160	2.7	0.4	0.30	0.39	0.130	0.097	0.060	0.020	0.040
Cornwall	35	-23	-25	30	23	4250	25	103	780	960	180	2.2	0.4	0.32	0.41	0.620	0.310	0.140	0.046	0.310
Corumna	185	-16	-18	31	24	3600	25	100	760	800	180	1.0	0.4	0.36	0.47	0.120	0.074	0.047	0.015	0.040
Deep River	145	-29	-32	30	22	4900	23	92	650	850	100	2.5	0.4	0.27	0.35	0.630	0.300	0.130	0.043	0.320
Deseronto	85	-22	-24	29	23	4070	23	92	760	900	160	1.9	0.4	0.33	0.43	0.270	0.170	0.092	0.029	0.110
Dorchester	260	-18	-20	30	24	3900	28	103	850	950	180	1.9	0.4	0.36	0.47	0.160	0.096	0.056	0.017	0.081
Dorion	200	-33	-35	28	21	5950	20	103	550	725	160	2.8	0.4	0.30	0.39	0.095	0.057	0.026	0.008	0.036
Dresden	185	-16	-18	31	24	3750	28	97	760	820	180	1.0	0.4	0.33	0.43	0.150	0.088	0.050	0.015	0.078
Dryden	370	-34	-36	28	22	5850	25	97	550	700	120	2.4	0.3	0.23	0.30	0.095	0.057	0.026	0.008	0.036
Dundalk	525	-22	-24	29	22	4700	28	108	750	1080	150	3.4	0.4	0.33	0.42	0.130	0.091	0.058	0.019	0.043
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

1085 Clearview Avenue
City of Burlington
STORMWATER MANAGEMENT

Project Number: 44795-100
Date: January 8, 2019
File: Q:\44795\100\SWM\44795-100 SWM Calculations.xlsx

Ponding Calculations		
Catchment	**Flow**	**Description**
201 203	0.051 0.038	WATTS Area Drain

STAGE-STORAGE-DISCHARGE RELATIONSHIP FOR OVERFLOW TO CLEARVIEW AVENUE

Description	Stage	Area	Incremental Volume	Cumulative Volume
	m	m^2	m^3	m^3
T/G AD5 & AD6	104.45	0.00	0.0	0.0
	104.55	91.18	4.6	4.6
T/G AD4	104.65	352.95	22.2	26.8
Max 0.3m ponding	104.75	776.17	56.5	83.2

STAGE-STORAGE-DISCHARGE RELATIONSHIP FOR OVERFLOW TO CLEARVIEW AVENUE

Description	Stage	Area	Incremental Volume	Cumulative Volume
	m	m^2	m^3	m^3
T/G AD7	104.30	0.00	0.0	0.0
	104.40	33.60	1.7	1.7
	104.50	134.47	8.4	10.1
Max 0.3m ponding	104.60	312.54	22.4	32.4

Detailed Stormceptor Sizing Report – 1085 Clearview Avenue

Project Information & Location			
Project Name	1085 Clearview Avenue	**Project Number**	44795-100
City	Burlington	**State/ Province**	Ontario
Country	Canada	**Date**	12/3/2018
Designer Information		**EOR Information (optional)**	
Name	Alexandra Porco	**Name**	
Company	MTE Consultants Inc.	**Company**	
Phone #	519-743-6500	**Phone #**	
Email	aporco@mte85.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	1085 Clearview Avenue
Recommended Stormceptor Model	STC 1000
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	80
PSD	Fine Distribution
Rainfall Station	HAMILTON A

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 300	70
STC 750	79
STC 1000	80
STC 1500	81
STC 2000	84
STC 3000	85
STC 4000	88
STC 5000	89
STC 6000	90
STC 9000	93
STC 10000	93
STC 14000	95
StormceptorMAX	Custom

Stormceptor
The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology
Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:
• Site parameters
• Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
• Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
• TSS load
• Detention time of the system

Hydrology Analysis
PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour). Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station			
State/Province	Ontario	**Total Number of Rainfall Events**	3863
Rainfall Station Name	HAMILTON A	**Total Rainfall (mm)**	20907.2
Station ID #	3194	**Average Annual Rainfall (mm)**	614.9
Coordinates	43°10'N, 79°56'W	**Total Evaporation (mm)**	1538.9
Elevation (ft)	77	**Total Infiltration (mm)**	3532.9
Years of Rainfall Data	34	**Total Rainfall that is Runoff (mm)**	15835.4

Notes
• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules. • Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed. • For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (ha)	0.59
Imperviousness %	83.0

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000
0.000	0.079
0.000	0.081
0.002	0.082
0.005	0.084

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	1085 Clearview Avenue

Site Details

Drainage Area

Total Area (ha)	0.59
Imperviousness %	83.0

Surface Characteristics

Width (m)	154.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow

Dry Weather Flow (lps)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

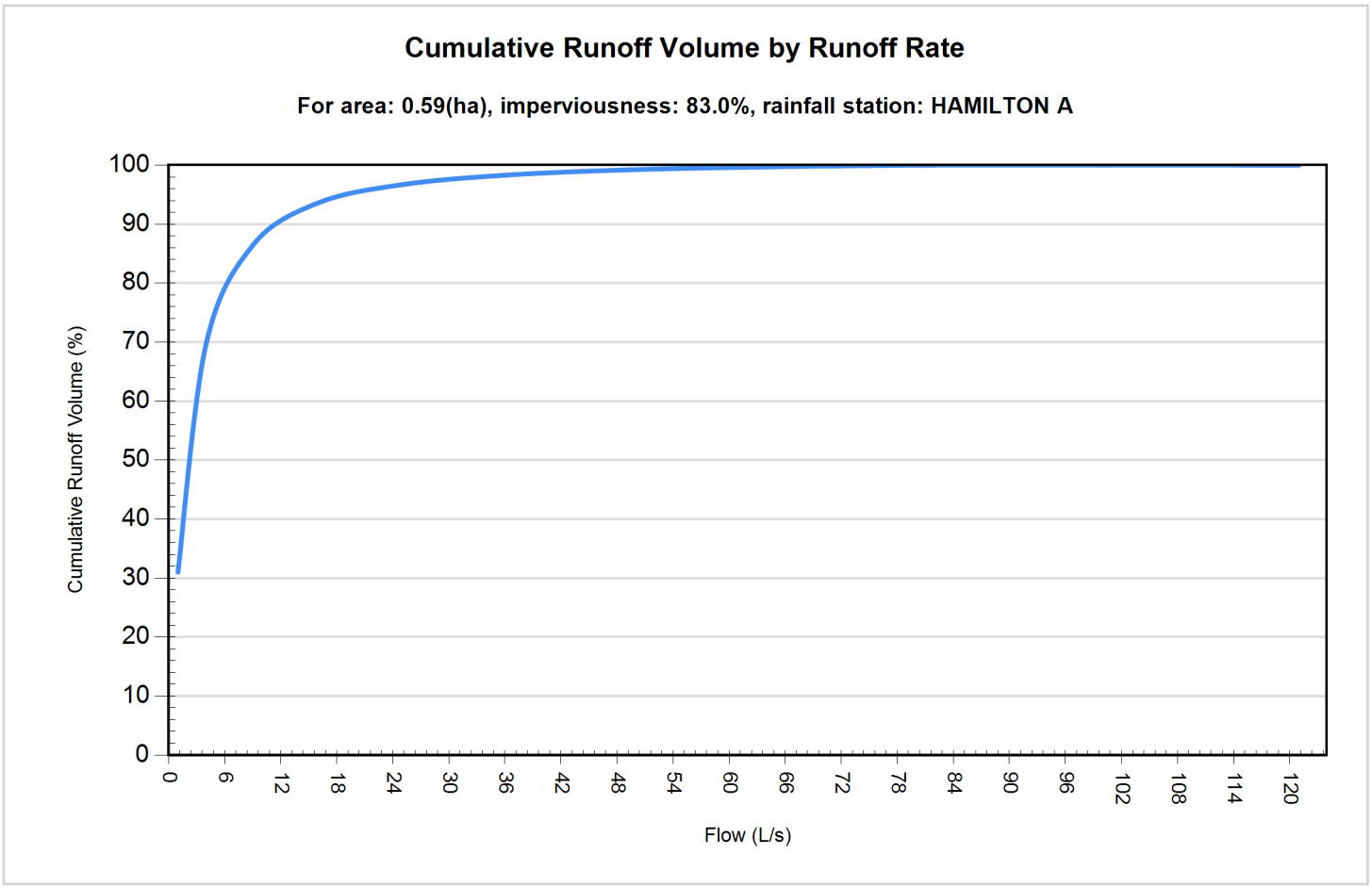
Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

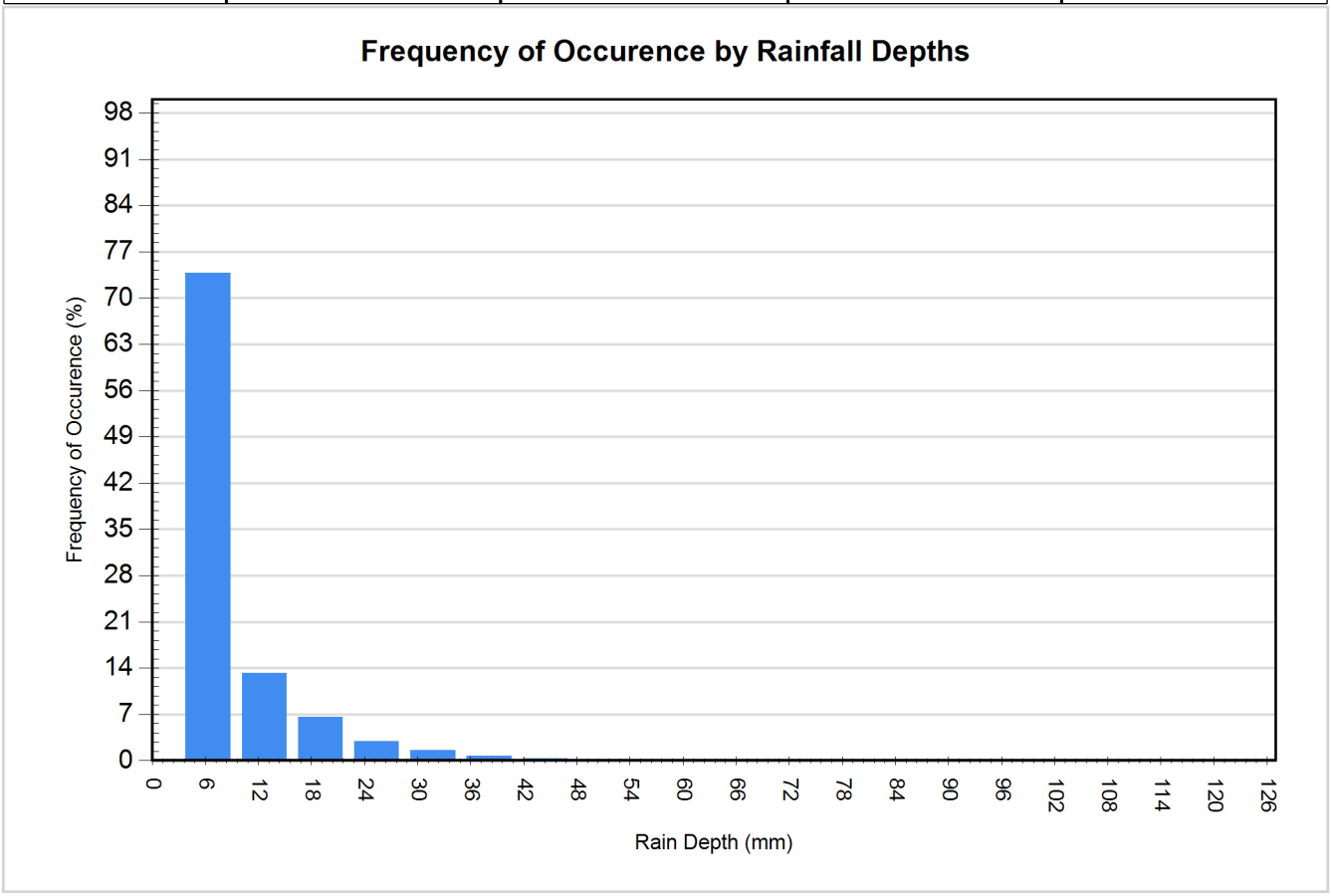
TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	Runoff Volume (m^3)	Volume Over (m^3)	Cumulative Runoff Volume (%)
1	29175	64821	31.0
4	65435	28549	69.6
9	81237	12754	86.4
16	87932	6056	93.6
25	90928	3061	96.7
36	92418	1571	98.3
49	93210	779	99.2
64	93685	304	99.7
81	93980	9	100.0
100	93989	0	100.0
121	93989	0	100.0



Rainfall Event Analysis				
Rainfall Depth (mm)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (mm)**	**Percentage of Annual Volume (%)**
6.35	2852	73.8	4781	22.9
12.70	515	13.3	4749	22.7
19.05	254	6.6	3943	18.9
25.40	112	2.9	2471	11.8
31.75	61	1.6	1736	8.3
38.10	28	0.7	985	4.7
44.45	11	0.3	461	2.2
50.80	9	0.2	417	2.0
57.15	9	0.2	493	2.4
63.50	8	0.2	489	2.3
69.85	0	0.0	0	0.0
76.20	0	0.0	0	0.0
82.55	0	0.0	0	0.0
88.90	0	0.0	0	0.0
95.25	2	0.1	181	0.9
101.60	1	0.0	97	0.5
107.95	1	0.0	106	0.5
114.30	0	0.0	0	0.0
120.65	0	0.0	0	0.0



For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications