Final

Functional Servicing Report
1107 Main Street West, Hamilton
City of Hamilton

Prepared for 1107 Main Inc.
by IBI Group

March 25, 2020

Document Control Page

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CIRCULATION LIST:	
HISTORY:	

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1 Introduction

1107 Main Inc. retained IBI Group to prepare a Functional Servicing Report for the proposed development at 1107 Main Street West, Hamilton, Ontario.

The development is located on the south side of Main Street West between Dow Avenue and Cline Avenue South with a total land area of approximately 0.517 hectares. Refer to Plate 1 below for the location of the proposed development.

PLATE 1: Site Location *(source: www.map.hamilton.ca)*

The proposed redevelopment will demolish the existing buildings and infrastructure then construct a 15-storey mixed-use building with three levels of underground parking. Refer to Appendix A for the Site Plan and Engineering Drawings.

This report will describe the proposed functional grading, servicing and stormwater management for the development in order to demonstrate the feasibility and approach for the design of the proposed development from a site municipal engineering perspective.

2 Existing Conditions

The existing subject property currently has the Grace Evangelical Lutheran Church with a stone building, landscaped areas, concrete pavements and a gravel parking lot. The Adas Israel

Synagogue and Hamilton Hebrew Academy borders the south property boundary of the subject development. Plate 2 below show the aerial photography of the site.

PLATE 1: Site Aerial Photo *(source: https://www.conservationhalton.ca/mapping-and-data)*

2.1 Roads and Pedestrian Access

The subject lands is fronted by Main Street West to the north, Cline Avenue South to the west, Dow Avenue to the east and existing development to the south. Current vehicular access to the subject lands is from Cline Avenue South. On all three roadways flanking the subject property there exist municipal 1.5m wide sidewalk running.

2.2 Sanitary

The subject site has a combined sewers on the three adjacent streets as follows:

- Dow Avenue has a 375mm diameter combined sewer draining northward at a slope of 0.56% with a calculated full pipe capacity of 131.2L/s. The combined sewer on Dow Avenue is received by the 450mm diameter combined sewer on Main Street West.
- Cline Avenue South has a 375mm diameter combined sewer draining northward at a slope of 0.75% with a calculated full pipe capacity of 151.8L/s. The combined sewer on Dow Avenue is received by the 450mm diameter combined sewer on Main Street West.
- Main Street West has a 450mm diameter combined sewer draining westward at a slope of 0.42% with a calculated full pipe capacity of 184.8L/s. Main Street West also has a 300mm diameter combined sewer draining eastward at a slope of 0.48% with a calculated full pipe capacity of 67.0L/s.

2.3 Watermains

The subject lands are flanked with existing municipal watermains: A 300mm diameter watermain exists on Main Street West, and existing 150mm diameter watermains exist on both Cline Avenue South and Dow Avenue.

A 150mm diameter watermain service connection exists to the subject property on Dow Avenue. A municipal hydrant is located to the east and west of the subject lands on Cline Avenue South and Dow Avenue respectively.

2.4 Topography and Storm Sewers

The development land is generally flat with a gentle slope away from the existing church building towards the property boundaries. There is no known existing stormwater infrastructure on the property and stormwater sheet flows from the property to the storm infrastructure on Cline Avenue South and Dow Avenue.

2.5 Utilities

Electricity, natural gas, and telecomm services are present within close proximity to the subject development on Main Street West, Cline Avenue South and Dow Avenue.

3 Proposed Development

The proposed development will demolish the existing Grace Evangelical Lutheran Church, including hardscaped areas and infrastructure features on site. A 15-storey residential building with 310 residential units and 535.1m^2 of commercial space will be constructed. The building will have three levels of underground parking and limited street parking totalling 234 parking stalls provided.

The following sections describe the functional design of the area grading and municipal servicing of the proposed development. The purpose of the functional design is to demonstrate the feasibility of the development, outlining the general strategy for the grading, and municipal servicing. The subsequent final design and approval process will establish the details of the development's design.

3.1 Roads and Pedestrian Access

The proposed development will have vehicular access to the underground parking from Cline Avenue South with surface level parallel parking provided along Cline Avenue South and Dow Avenue. The subject development will extend the asphalt surface of the existing roadway to provide the parallel parking spots.

A separate Traffic Impact Study will review the impacts and requirements of the proposed development in terms of improvements needed on existing adjacent roads and entrances. Any required improvements would be incorporated into the Final Design of the site.

3.2 Grading

The proposed development will construct a building whose face will be near to the property line with the building's footprint being at least 70% of the subject land area. The grading of the site will be such that the narrow strip of land surrounding the building will sheet drain to the adjacent roadways, matching the elevations at the property line.

A minimum of 0.5% and a maximum of 5% will be used on all hard surfaces for vehicular and pedestrian access routes to ensure accessibility, with the exception of the parking garage ramp that will have a maximum slope of 15%. A minimum of 2% and a maximum of 33.3% grade will be used for landscaped areas.

Refer to Appendix A for the functional grading of the site.

3.3 Sanitary Servicing

The proposed development is proposed to have 310 residential units and 535.1m^2 of commercial space. Using the Ontario Building Code Section 8 and the City's engineering guidelines the total design sanitary flow based on population is estimated to be 18.0 L/s. The theoretical capacity of the receiving 375mm diameter combined sanitary sewer with a 0.56% slope is 131.2 L/s.

Runoff collected in the building's underground parking will discharged to the sanitary system via sump pumps.

Refer to Appendix A for the functional servicing plans of the proposed development. The sanitary flow calculations and sewer capacity calculations are in Appendix B.

3.4 Water Supply and Distribution

The proposed water supply for the subject development will be a service connection to the existing 300mm diameter watermain on Main Street West. All watermain and appurtenances will be designed and constructed in accordance with the current municipal and American Water Works Association standards and specifications.

The maximum domestic water demand for the proposed development was determined using the fixture value procedure detailed in the American Water Works Association Manual M22 "Sizing Water Service Lines and Meters". Hydraulic loading for the fixtures was derived from the Ontario Building Code, Section 7. The estimated maximum domestic water demand for the proposed 310 residential unit and 535.1m^2 commercial space development is 80 gpm or 5.1 L/s.

As per the Fire Underwriter Survey, a minimum flow of 4,000 L/min plus a maximum day demand of 37 L/min will be required at 20 PSI (140 kPa) to service this development under fire suppression. Using the preliminary architecture drawings and based on the Fire Underwritters Survey methodology the required fire flow is 216.7 L/s for the proposed development.

The City of Hamilton in Memorandum "Formal Consultation Meeting- Application by SRM Architects Inc. for lands located at 1107 Main Street West, Hamilton (Ward 1)" dated June 3, 2019 provided hydrant flow tests of the hydrants in close proximity to the development. The results of the hydrant flow test performed on Main Street West, Cline Avenue South and Dow Avenue are shown in Table 1.

TABLE 1: Hydrant test data (*source:* City of Hamilton)

Hydrant ID	Address	Pressure Zone	Date of Most Recent HFI2	Static Pressure (psi)	Residual Pressure (psi)	Test Flow (Imp Gal/min)	DSR	DSR2	FAR20 (Imp Gal/min)
HA51H001	1070 MAIN ST W HAMILTON	2	9/27/18 5:24:34 AM	64	60	950	4	44	3468
HA50H025	DOW AVE HAMILTON	2	8/25/18 10:43:38 AM	68	40	470	28	48	629
HA50H024	CLINE AVE S HAMILTON	2	8/19/18 11:58:10 PM	68	32	304	36	48	355

Hydrant HA51H001 located close to 1070 Main Street West has a theoretical flow of 3468 Imperial gpm or 262.8 L/s at 20 psi. Accordingly, the existing water infrastructure is adequate to service the proposed development.

The existing fire hydrants on Dow Avenue and Cline Avenue South will be maintained with the proposed development.

Refer to Appendix A for a plan of the site's servicing, and Appendix B for calculation details of the domestic water demand and fire flow.

3.5 Stormwater Servicing

The SWM criteria addressing the stormwater quality and quantity for this development are based on the requirements of the City of Hamilton and are summarized as follows:

- Proposed conditions peak flows for the 2 year to 100 year storm events are to be controlled to the lesser of the 2 year pre-development flows or the available capacity in the Dow Avenue storm sewer system; and,
- Stormwater quality controls are to be provided for the site to an Enhanced Protection Level as per Ministry of Environment "Stormwater Management Planning and Design Manual", March 2003 guidelines.

The site's proposed stormwater system will collect runoff from the building's roof and larger landscaped areas via area drains. Some small areas at the boundary of the site will sheet drain to the adjacent lands as is the existing condition.

On-site stormwater storage utilizing rooftop areas and an underground stormwater storage tank are proposed to provide quantity control. The collected runoff will outlet via an orifice to the municipal 300mm diameter storm sewer located on Dow Avenue. Minor pedestrian areas and landscape buffers will sheet flow to the adjacent roadways.

Given that the site runoff is primarily from clean sources, an enhanced level of water quality for the proposed development will be achieved without the use of any stormwater quality measures.

The following sections provide more detailed description of the stormwater management controls. Calculations and modelling are provided in Appendix B.

3.5.1 Stormwater Quantity Control

The 3-hour duration Chicago style storms and 6-Hour SCS storms derived from City of Hamilton rainfall data were used for the stormwater management modelling. The total depths of rainfall for the modelled storms are as indicated in Table 2.

TABLE 2: Rainfall Depths

RETURN EVENT	STORM DURATION (hours)	RAINFALL DEPTH (mm)
3-Hour Chicago Storm		
2 Year	3	32.7
5 Year	3	46.9
10 Year	3	56.5
25 Year	3	68.7
50 Year	3	76.9
100 Year	3	86.1
6-Hour SCS Storm		
2 Year	6	39.6
5 Year	6	56.5
10 Year	6	67.6
25 Year	6	81.6
50 Year	6	91.9
100 Year	6	102.3

The existing and proposed conditions were modelled using MIDUSS, and the modelling parameters are summarized in Table 3. Figure 2 and Figure 3 depicts the existing and proposed stormwater drainage condition. The total impervious area under existing conditions is approximately 2,575 m^2.

TABLE 3: MIDUSS Modelling Variables

CATCHMENT ID	DESCRIPTION	AREA (ha)	FLOW LENGTH (m)	GRADIENT (%)	IMPERV. (%)	MANNING 'n'	PERVIOUS CN
Existing Conditions							
101	Subject Lands	0.516	40	2	50	0.250	74
Proposed Conditions							
200	SWM Rooftop	0.158	20	1	100	0.250	74
201	Non-SWM Rooftop	0.173	20	1	100	0.250	74
202	Courtyard	0.039	10	2	60	0.250	74
203	Uncontrolled Land	0.148	10	2	35	0.250	74

The 300mm diameter storm sewer on Dow Avenue is sloped at 0.50% with a calculated full pipe capacity of 68 L/s. Table 4 below shows the existing condition peak flows as determined from the MIDUSS model. Comparing the 2-year pre-development flow and the pipe capacity, the lesser 2-year pre-development flow will govern the stormwater quantity control design and represent the maximum peak flow target from the subject lands.

TABLE 4: Existing Peak Flows

RETURN EVENT	EXISTING CONDITIONS PEAK FLOW (m^3/s)
3-Hour Chicago Storm – External Lands	
2 Year	0.048
5 Year	0.072
10 Year	0.089
25 Year	0.109
50 Year	0.125
100 Year	0.141
6-Hour SCS Storm – External Lands	
2 Year	0.040
5 Year	0.062
10 Year	0.078
25 Year	0.100
50 Year	0.114
100 Year	0.132

Under proposed conditions, the total impervious area will be approximately 4,700 m^2. Based on the MIDUSS model, the 6-Hour SCS storm requires a greater stormwater storage volume as compared to the 3-Hour Chicago storm. Therefore, the 6-Hour SCS storm was used to design the proposed stormwater servicing system.

Rooftop attenuation has been included in the MIDUSS model for Catchment 200. Attenuating the proposed condition's peak flow to the 2-year pre-development flow also requires a stormwater storage tank of 272 m^3 with a 50mm diameter orifice control. The existing and proposed conditions peak flows for the 6-Hour SCS storm are summarized in Table 5.

TABLE 5: Proposed Development Peak Flows

RETURN EVENT	EXISTING CONDITIONS PEAK FLOW (m^3/s)	PROPOSED CONDITIONS PEAK FLOW (m^3/s)
6-Hour SCS Storm		
2 Year	0.040	0.011
5 Year	0.062	0.018
10 Year	0.078	0.024
25 Year	0.100	0.031
50 Year	0.114	0.037
100 Year	0.132	0.043

Note that under the 6-Hour SCS storm the peak flows from the 100-year storm is greater than the existing 2-year storm peak flow. The smallest diameter orifice of 50mm is unable to reduce the stormwater outflow within the limits of the 2-year storm. However, the 100-year storm outflow is less than the capacity of the 300mm diameter storm sewer on Dow Avenue.

The functional layout of the proposed storm system is shown in Appendix A. The preliminary SWM calculations and MIDUSS modelling are included in Appendix B. Refer to the Functional Site Grading and Servicing Plan in Appendix A for further details on stormwater servicing.

3.5.2 Stormwater Quality Control

The runoff from the proposed development is from rooftop and pedestrian areas, with no runoff from surface parking. Thus, there would be no stormwater quality impacts and thus no required stormwater quality measures for the site.

3.6 Utilities

Considering the adjacent developed areas, it is reasonable to assume there are existing hydro, gas, and telecomm services in the near vicinity which can be extended to the proposed site. Servicing of the development by the various utilities will be provided by the extension of these facilities. It is anticipated that each of these utilities will, as required, identify their specific requirements through the standard application circulation, review and design process.

4 Erosion and Sediment Control

During construction, erosion and sediment control measures will be required. Details of these controls are shown on the engineering plans in Appendix A and include:

- Silt fence erected around site perimeter before any work begins on the site to protect adjacent areas from migration of sediment in overland flow.
- A “mud mat” installed at the construction entrance(s) to the site to minimize the amount of sediment transported off site via construction vehicles; and,
- All disturbed areas will be stabilized as quickly as possible to minimize erosion.

5 Summary

The servicing report outlines the proposed site grading and municipal servicing design for the proposed development at 1107 Main Street West, Hamilton, Ontario, and demonstrates that the development is feasible and can be designed and constructed in accordance with municipal standards.

The following summarizes the components of the design:

- The site grading will achieve gentle gradients between 0.5% to 5% for all vehicular and pedestrian areas, with the exception of the parking garage ramp which will have a maximum slope of 15%;
- Stormwater management quantity control will utilize rooftop storage and a stormwater storage tank of 272 m^3 with an orifice of 50mm diameter to attenuate the 100 year peak flow to the 2 year peak flow. As the stormwater collected on the site is from rooftop or pedestrian areas, and not vehicular areas, stormwater quality control is not required.
- Existing 375mm diameter municipal combined sewer infrastructure on Dow Avenue will provide service to the site; and,
- The existing 300mm diameter watermain on Main Street West will provide potable water and fire protection for the site.
- The existing fire hydrants on Dow Avenue and Cline Avenue South will be maintained with the proposed development.

We trust the foregoing is satisfactory to support the development application. Should there be any questions or if further information is required, please do not hesitate to contact the undersigned.

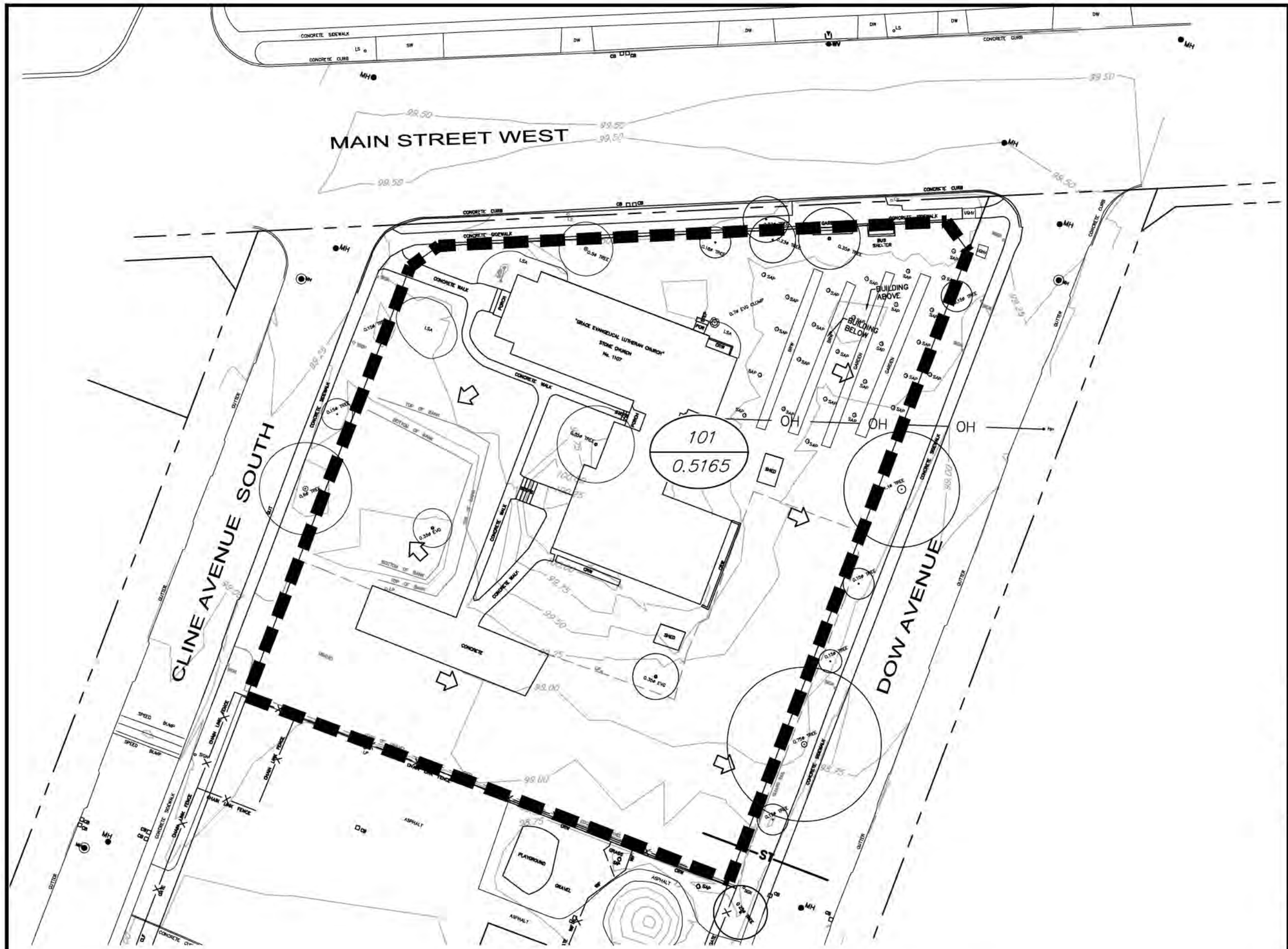
All of which is respectfully submitted.

Yours truly

IBI GROUP

John Perks, MBA, P.Eng.
Associate Director

André Hollingsworth, M.Eng.,P.Eng.
Project Engineer



LEGEND

- EXISTING CATCHMENT BOUNDARIES
- EX. CATCHMENT SYMBOL
  - CATCHMENT AREA NUMBER
  - AREA (ha)
- EXISTING OVERLAND FLOW ROUTE

SITE AREA = 5165 sq.m.

EX. IMPERVIOUS = 2575 sq.m.

N

3 1 0 2 4 8

1:200 (m)

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SCALE	1:200
DATE	JANUARY 2020
PROJECT No.	122727

1107 MAIN STREET WEST
HAMILTON, ONTARIO

EXISTING CONDITIONS SWM PLAN

FIGURE 1

FILE:\\10.120.26.4\ij\WT\122727_1107MainStW\7.0_Production\7.3_Design\04_Civil\Sheets\122727_SWM.dwg LAYOUT:SWM-EX
LAST SAVED BY:Andre.hollingsworth, Friday, January 31, 2020 2:26:27 PM PLOTTED BY:André Hollingsworth Friday, January 31, 2020 2:28:26 PM

MAIN STREET WEST

CLINE AVENUE SOUTH

DOW AVENUE

203 | 35
0.1480

200 | 100
0.158*

*ROOFTOP STORAGE AREA FROM SRM ARCHITECTS

201 | 100
0.1726

ROOFTOP WITHOUT STORAGE

202 | 60
0.039

BUILDING ABOVE

BUILDING BELOW

CONCRETE SIDEWALK

CONCRETE CURB

GUTTER

SPEED BUMP

ASPHALT

PLAYGROUND

GRAVEL

CHAIN LINK FENCE

LEGEND

PROPOSED CATCHMENT BOUNDARIES

CATCHMENT AREA NUMBER

202 | 100
0.90

PERCENT IMPERVIOUS

AREA (ha)

PROPOSED OVERLAND FLOW

N

3 1 0 2 4 8

1:200 (m)

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SCALE	1:200
DATE	JANUARY 2020
PROJECT No.	122727

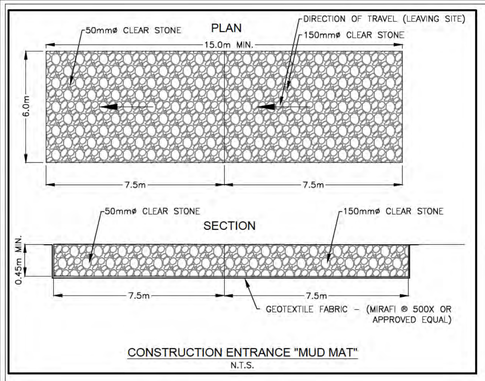
1107 MAIN STREET WEST
HAMILTON, ONTARIO

PROPOSED SWM PLAN

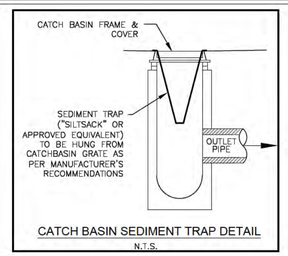
FIGURE 2

FILE:\\10.120.26.4\ji\WT\122727_1107MainStW\7.0_Production\7.3_Design\04_Civil\Sheets\122727_SWM.dwg LAYOUT:SWM-PR
LAST SAVED BY:Andre.hollingsworth, Friday, January 31, 2020 2:26:27 PM PLOTTED BY:André Hollingsworth Friday, January 31, 2020 2:28:32 PM

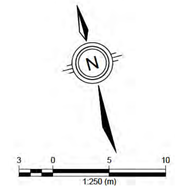
APPENDIX A:
Drawings



CONSTRUCTION ENTRANCE "MUD MAT"
N.T.S.

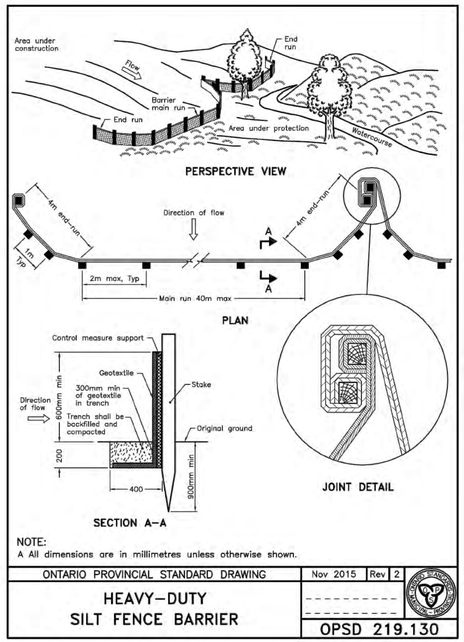


CATCH BASIN SEDIMENT TRAP DETAIL
N.T.S.



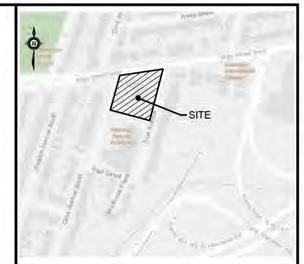
EROSION AND SEDIMENT CONTROL NOTES

1. ALL EROSION AND SEDIMENT CONTROL MEASURES (TEMPORARY SEDIMENT CONTROL FENCES, STORM SEWER BULKHEADS, ROCK CHECK DAMS, WORK LIMIT FENCES, SEDIMENT BASINS, ETC.) MUST BE INSTALLED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
2. TEMPORARY VEHICLE TRACKING CONTROLS TO BE CONSTRUCTED AS PER REQUIREMENTS IN "EROSION & SEDIMENT CONTROL GUIDELINE FOR URBAN CONSTRUCTION" DATED DECEMBER 2006, AT ALL ACCESS POINTS. CONTRACTOR SHALL MAINTAIN THESE AS REQUIRED AND AS DIRECTED BY THE CITY ENGINEER.
3. OVERLAND SHEET FLOW EROSION PROTECTION SHALL BE AS PER OPSD 219.130. IF EXCESSIVE SEDIMENT BUILDUP/BLOCKAGE OCCURS (VISUAL INSPECTION) THEN REPLACEMENT OF THE FILTER CLOTH IS REQUIRED.
4. CATCH BASIN SEDIMENT CONTROL DEVICE, I.E. "SILTSACK" BY ACF ENVIRONMENT OR APPROVED EQUIVALENT, TO BE PLACED AS PER MANUFACTURER'S RECOMMENDATIONS (SEE DETAIL "B"). REGULAR MAINTENANCE IS REQUIRED ("SILTSACK" SUMPS SHALL BE INSPECTED FOR SEDIMENT ACCUMULATION AND FILTER CLOTH BLOCKAGE ON A WEEKLY BASIS). THESE SEDIMENT TRAPS ARE NOT TO BE REMOVED UNTIL THE CURBS AND THE BOULEVARDS SODDED. SEDIMENT TRAPS SHALL ALSO BE PLACED AS PER DETAIL "A" AT ALL CATCH BASINS LOCATIONS IN AREAS TO BE VEGETATED AND MAINTAINED UNTIL GROUND COVER IS ESTABLISHED.
5. REGULAR MAINTENANCE FOR ALL CATCH BASINS (ON THE PUBLIC ROADWAY AND ON PRIVATE PROPERTY) AND INLET CHAMBERS IS REQUIRED (SEDIMENT TRAPS AND SUMPS SHALL BE INSPECTED FOR SEDIMENT ACCUMULATION, TRASH BUILDUP AND FILTER CLOTH BLOCKAGE ON A WEEKLY BASIS AND AFTER ANY MAJOR RAINFALL EVENT). ACCUMULATED SEDIMENT SHALL BE REMOVED BY MECHANICAL MEANS. FLUSHING OF SEDIMENT INTO THE STORM SEWER SYSTEM IS PROHIBITED. IF STANDING WATER REMAINS IN THE CATCH BASIN 24 HOURS (MINIMUM) AFTER A STORM THEN CLEANING OR REPLACEMENT OF THE FILTER CLOTH IS REQUIRED.
6. TOPSOIL PILES SHALL ALSO BE TEMPORARILY SEEDED TO PREVENT EROSION. PLACEMENT OF VEGETATION SHALL BE IN ACCORDANCE WITH OPSS.572. WHERE REQUIRED, EROSION CONTROL BLANKETS SHALL BE PLACED AS PER OPSS.572, AT THE DIRECTION OF THE CITY ENGINEER.
7. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE VISUALLY INSPECTED AFTER EACH WORKING DAY AND MAINTAINED WHEN REQUIRED AS DIRECTED BY THE CONSULTANT AND TO THE SATISFACTION OF THE CITY/CONSERVATION AUTHORITY. THE CONSULTANT SHALL KEEP A DAILY RECORD OF INSPECTION, MAINTENANCE, ETC. AND PRESENT THE CITY WITH A COPY OF THE REPORT ON A MONTHLY BASIS.
8. ANY DISTURBED AREAS NOT SCHEDULED FOR FURTHER CONSTRUCTION WITHIN 45 DAYS WILL BE PROVIDED WITH A SUITABLE TEMPORARY MULCH AND SEED COVER WITHIN 7 DAYS OF THE COMPLETION OF THAT PARTICULAR PHASE OF CONSTRUCTION.
9. ALL DISTURBED EXTERNAL AREAS SHALL BE REVEGETATED WITH PERMANENT COVER (AS DETAILED) WITHIN 7 DAYS OF THE COMPLETION OF THAT PARTICULAR PHASE OF CONSTRUCTION.
10. ADDITIONAL EROSION AND SEDIMENT CONTROL LOCATIONS/MEASURES MAY BE REQUIRED AS DETERMINED BY THE CITY/CONSERVATION AUTHORITY.
11. THE OWNER IS RESPONSIBLE FOR THE REMOVAL OF ALL MUD AND DEBRIS THAT ARE TRACKED ONTO THE ROADWAYS FROM VEHICLES ENTERING OR LEAVING THE CONSTRUCTION SITE. THE OWNER SHALL, UPON VERBAL AND/OR WRITTEN REQUEST BY THE CITY, IMMEDIATELY PROCEED WITH CLEAN-UP OPERATIONS AT THEIR EXPENSE. SHOULD THE OWNER FAIL TO MAINTAIN THE ROADS DIRECTED, THE CITY WILL HAVE THE CLEANING CARRIED OUT, AND DRAW ON THE OWNER'S SECURITY FOR COSTS AND/OR LAY CHARGES.



NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
HEAVY–DUTY SILT FENCE BARRIER		OPSD 219.130



KEY MAP - N.T.S.

LEGEND

- PROPERTY LINE
- LOT/EASEMENT LINE
- SAN Son — EXISTING COMBINED SEWER
- WM W — EXISTING WATERMAIN
- STM ST — EXISTING STM SEWER
- OH OH — EXISTING OVERHEAD HYDRO
- MH — EXISTING MANHOLE
- CB — EXISTING CATCH BASIN
- HYD — EXISTING HYDRANT
- WV — EXISTING WATER VALVE
- 0.2 DIA — EXISTING TREE
- BH — EXISTING BOREHOLE
- EXISTING CONTOURS
- HEAVY DUTY SILT FENCE PER OPSD 219.130
- CATCH BASIN SEDIMENT TRAP PER DETAIL THIS SHEET
- TO BE REMOVED

NOT FOR TENDER

BENCHMARK – ELEVATION
DESCRIPTION

#	DATE	BY	DESCRIPTION
2	2020.01.31	PC	REVISED SITE PLAN
1	2019.10.31	PC	ISSUED FOR ZBA

REVISIONS

APPROVALS

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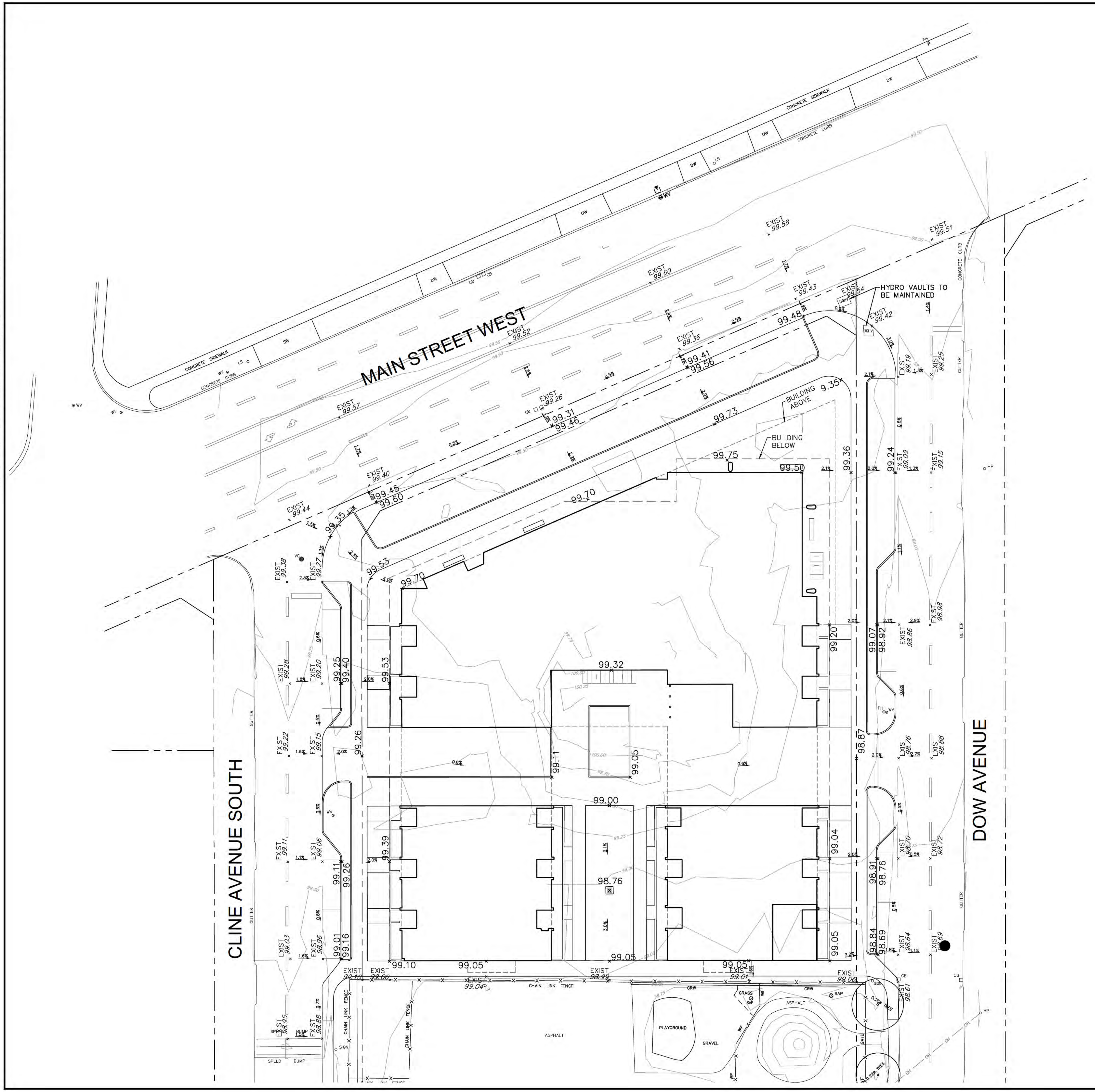
CITY OF HAMILTON

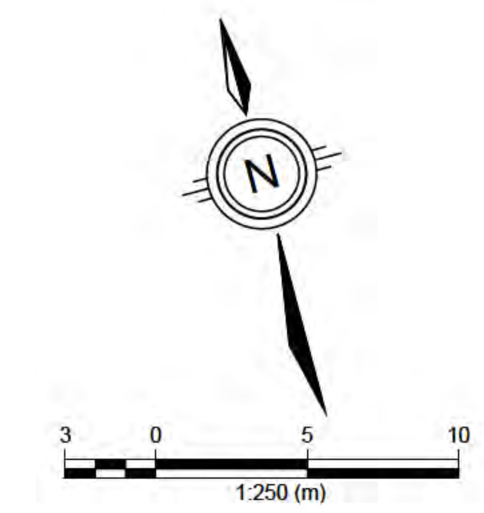
1107 MAIN STREET WEST

MIXED-USE RESIDENTIAL BUILDING

EXISTING CONDITIONS AND EROSION AND SEDIMENT CONTROL PLAN

DESIGNED BY:	P.CLOUTIER	SCALE HORIZ:	1:250
DRAWN BY:	P.CLOUTIER	SCALE VERT:	NA
CHECKED BY:	J.PEIKRS	FILE NUMBER:	122727
DATE:	2019-10-31	SHEET NUMBER:	ESC





KEY MAP - N.T.S.

GENERAL GRADING NOTES

1) ALONG ADJOINING PROPERTIES GRADE TO MEET EXISTING ELEVATIONS WITH SODDED SLOPES (MIN. 3H TO 1V) AND/OR RETAINING WALLS AS SPECIFIED.

2) ALL RETAINING WALLS, WALKWAYS, CURBS, ETC; SHALL BE PLACED A MIN. OF 0.45m OFF THE PROPERTY LINE. ALL WALLS 1.0m OR HIGHER SHALL BE DESIGNED BY A P.ENG.

3) SHOULD A RETAINING WALL BE REQUIRED, THE TOP OF WALL ELEVATIONS SHALL BE SET 150mm ABOVE THE SIDE YARDS SWALES.

4) RETAINING WALLS 0.6m IN HEIGHT OR GREATER REQUIRE CONSTRUCTION OF A FENCE OR GUARD RAIL AT THE TOP OF THE REAR OF THE WALL. GUARDS FOR RETAINING WALLS SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF EXTERIOR GUARDS AS CONTAINED IN THE ONTARIO BUILDING CODE.

5) SLOPES OF SWALES FOR BOTH "BACK TO FRONT" AND "SPLIT" DRAINAGE SHALL BE NO LESS THAN 2.0% GRADE AND NO GREATER THAN 33% GRADE (3:1 SLOPES).

6) WHEN MATCHING TO EXISTING PROPERTIES WHERE A 2.0% GRADE CANNOT BE ACHIEVED, A 1.5% GRADE IS PERMITTED PROVIDED A 150mm SUB-DRAIN IS INSTALLED BELLOW THE BOTTOM OF THE SWALE AND DRAINED TO A SUITABLE OUTLET, (WITH A MINIMUM O.3 COVER OVER THE SUB-DRAIN), OR OTHER MITIGATION MEASURES.

7) UNLESS OTHERWISE NOTED, THE GROUND BETWEEN ELEVATIONS ON SIDE LOTS SHALL BE GRADED AS A STRAIGHT LINE.

8) TOP OF FOUNDATION WALLS FOR BUILDINGS SHALL BE 150mm (MIN) ABOVE FINISHED GRADE.

9) GARAGE FLOOR ELEVATION TO BE SET MINIMUM 0.3m HIGHER THAN BACK OF WALK, UNLESS OTHERWISE SPECIFIED.

10) ALL FILL PLACED ON LOTS SHALL BE COMPACTED TO A MINIMUM 95% SPD (UNLESS OTHERWISE RECOMMENDED BY THE GEOTECHNICAL ENGINEER). ALL MATERIAL SHALL BE PLACED IN LAYERS NOT EXCEEDING 300mm LIFTS.

11) IF GRADING IS REQUIRED ON LANDS ADJACENT TO THE DEVELOPMENT WHICH ARE NOT OWNED BY THE DEVELOPER, THEN THE DEVELOPER MUST OBTAIN WRITTEN PERMISSION FROM THE ADJACENT PROPERTY OWNER TO ALLOW THE DEVELOPER TO GRADE ON THE ADJACENT LANDS, OTHERWISE RETAINING WALLS MUST BE USED.

12) THE WRITTEN PERMISSION REQUIRED FROM THE ADJACENT LANDOWNER SHALL BE OBTAINED PRIOR TO ENTERING THE LANDS. SHOULD PERMISSION NOT BE OBTAINED OR IS WITHDRAWN PRIOR TO COMMENCING THE WORK, THEN THE DEVELOPER SHALL LIMIT HIS ACTIVITIES TO THE LIMITS OF THE DEVELOPMENT SITE.

13) DRIVEWAY AND DRIVEWAY APPROACHES SHALL BE LOCATED SUCH THAT HYDRO VAULTS AND OTHER STREET FURNITURE ARE MIN. OF 1.2m FROM THE PROJECTIONS OF THE OUTSIDE GARAGE WALLS.

14) ANY CHANGES IN GRADES AND CATCH BASINS REQUIRE THE APPROVAL OF THE DIRECTOR, DEVELOPMENT DIVISION, PLANNING AND DEVELOPMENT DEPARTMENT.

15) ALL DRIVEWAYS FROM PROPERTY LINES FOR THE FIRST 7.5m SHALL BE WITHIN 5% MAXIMUM GRADE, THEREAFTER, ALL DRIVEWAYS SHALL BE WITHIN 10% MAXIMUM GRADE.

16) THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE OWNER'S BONDED CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS NORMALLY REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS, BUT NOT LIMITED TO THE FOLLOWING:
- ROAD CUT PERMITS
- APPROACH APPROVAL PERMITS
- SEWER PERMITS
- RELOCATION OF SERVICES
- ENCROACHMENT AGREEMENTS (IF REQUIRED)

LEGEND

— — — —	PROPERTY LINE
——— — — ———	LOT/EASEMENT LINE
×326.25	EXISTING SPOT ELEVATION
×326.25	PROPOSED SPOT ELEVATION
3.0%	PROPOSED DRAINAGE DIRECTION
— OH — OH —	EXISTING OVERHEAD HYDRO
MH	EXISTING MANHOLE
CB	EXISTING CATCH BASIN
HYD	EXISTING HYDRANT
WV	EXISTING WATER VALVE
0.2 DIA	EXISTING TREE
BH	EXISTING BOREHOLE
	EXISTING CONTOURS

NOT FOR TENDER

#	DATE	BY	DESCRIPTION
2	2020.01.31	PC	REVISED SITE PLAN
1	2019.11.31	PC	ISSUED FOR ZBA

REVISIONS

APPROVALS

IBI GROUP
101 - 410 Albert Street
Waterloo ON N2L 3V3 Canada
tel 519 585 2255
ibigroup.com

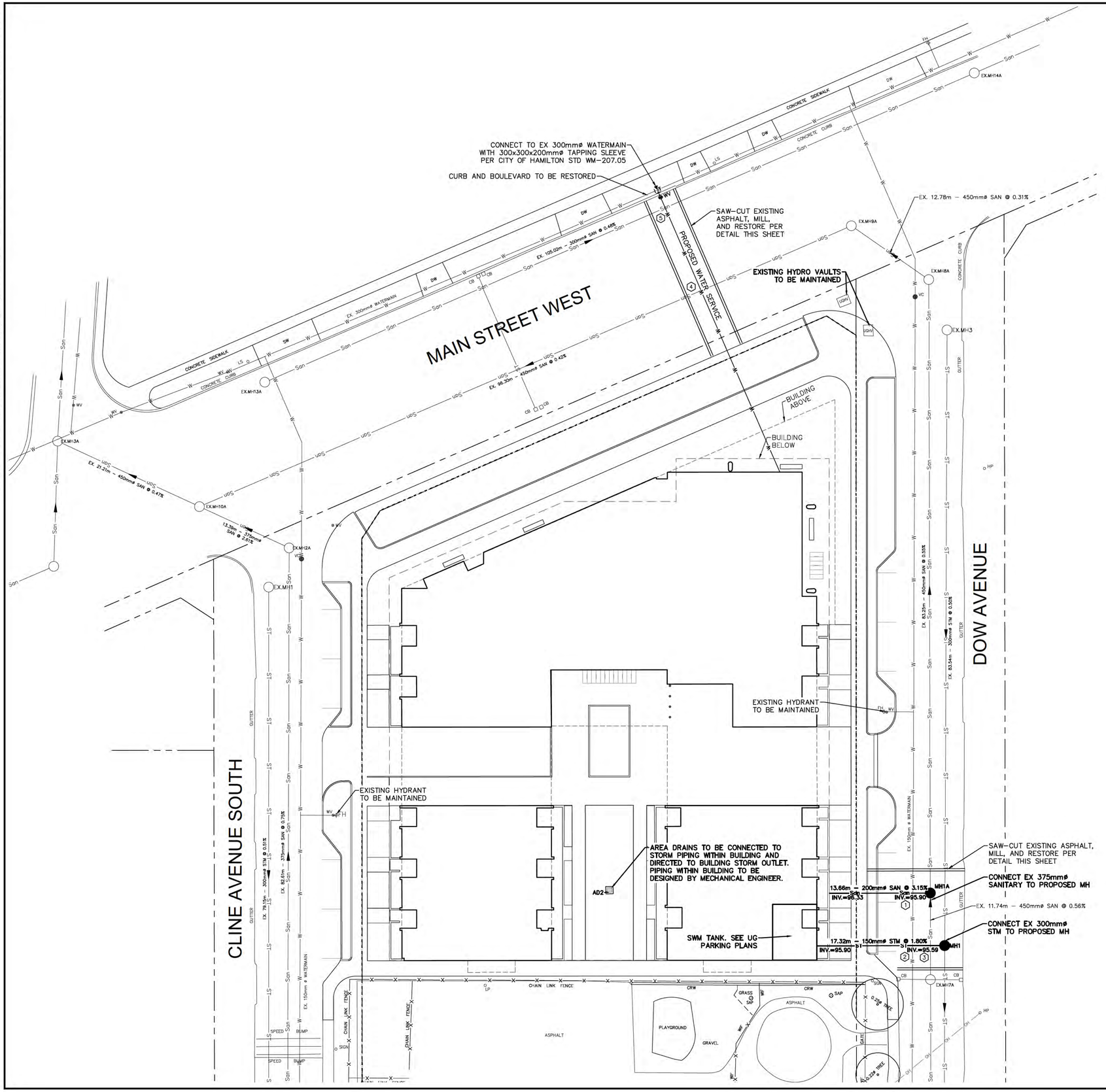
CITY OF HAMILTON

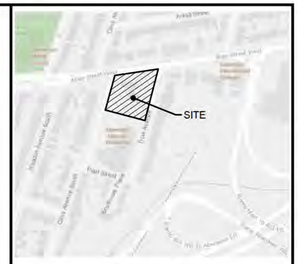
1107 MAIN STREET WEST

MIXED-USE RESIDENTIAL BUILDING

GRADING PLAN

DESIGNED BY:	P.CLOUTIER	SCALE HORIZ:	1:250
DRAWN BY:	P.CLOUTIER	SCALE VERT:	NA
CHECKED BY:	J.PERKS	FILE NUMBER:	122727
DATE:	2019-10-31	SHEET NUMBER:	GP





KEY MAP - N.T.S.

LEGEND

- PROPERTY LINE
- LOT/EASEMENT LINE
- SAN San — EXISTING COMBINED SEWER
- WM W — EXISTING WATERMAIN
- STM ST — EXISTING STM SEWER
- OH — OH — EXISTING OVERHEAD HYDRO
- MH — EXISTING MANHOLE
- CB — EXISTING CATCH BASIN
- HYD — EXISTING HYDRANT
- WV — EXISTING WATER VALVE
- 0.2 DIA — EXISTING TREE
- BH — EXISTING BOREHOLE
- SAN San — PROPOSED SANITARY
- WM W — PROPOSED WATER
- STM ST — PROPOSED STORM
- PROPOSED MH
- 1 — PIPE CROSSING
- WV — PROPOSED WATER VALVE
- PROPOSED TEE

GENERAL NOTES

1. ALL WORK INVOLVED IN THE CONSTRUCTION, RELOCATION, REPAIR OF MUNICIPAL SERVICES FOR THE PROJECT SHALL BE TO THE SATISFACTION OF THE DIRECTOR, DEVELOPMENT DIVISION, PLANNING AND DEVELOPMENT DEPARTMENT.
2. FIRE ROUTE SIGNS AND 3-WAY FIRE HYDRANTS SHALL BE ESTABLISHED TO THE SATISFACTION OF THE CITY FIRE DEPARTMENT AND AT THE EXPENSE OF THE OWNER.
3. MAIN DRIVEWAY DIMENSIONS AT THE PROPERTY LINE BOUNDARIES ARE PLUS OR MINUS 7.5m UNLESS OTHERWISE STATED.
4. ALL DRIVEWAYS FROM PROPERTY LINES FOR THE FIRST 7.5m SHALL BE WITHIN 5% MAXIMUM GRADE, THEREAFTER, ALL DRIVEWAYS SHALL BE WITHIN 10% MAXIMUM GRADE.
5. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE OWNER'S BONDED CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS NORMALLY REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS, BUT NOT LIMITED TO THE FOLLOWING:
   - ROAD CUT PERMITS
   - APPROACH APPROVAL PERMITS
   - COMMITTEE OF ADJUSTMENT
   - SEWER PERMITS
   - RELOCATION OF SERVICES
   - ENCROACHMENT AGREEMENTS (IF REQUIRED)
6. ABANDONED ACCESSES MUST BE REMOVED AND THE CURB AND BOULEVARD RESTORED WITH SOD AT THE OWNER'S EXPENSE TO THE SATISFACTION OF THE TRAFFIC ENGINEERING SECTION, TRANSPORTATION, OPERATIONS AND ENVIRONMENT DEPARTMENT.
7. 3 METRE BY 3 METRE VISIBILITY TRIANGLES IN WHICH THE MAXIMUM HEIGHT OF ANY OBJECTS OR MATURE VEGETATION IS NOT TO EXCEED A HEIGHT OF 0.60 METRES ABOVE THE CORRESPONDING PERPENDICULAR CENTRELINE ELEVATION OF THE ADJACENT STREET.
8. SILTATION CONTROL DEVICES SHALL BE INSTALLED PRIOR TO WORKS COMMENCING ON THE SITE AND SHALL BE MAINTAINED FOR THE DURATION OF CONSTRUCTION, TO THE SATISFACTION OF THE CITY.
9. THE SUB-GRADE SOILS EXPOSED AFTER EXCAVATION SHALL BE INSPECTED AND CERTIFIED BY A QUALIFIED REGISTERED PROFESSIONAL SOILS ENGINEER AND A COPY OF THE REPORT SHALL BE FORWARDED TO THE CITY OF HAMILTON BUILDING DIVISION. WHERE THE FOOTING WILL BE SITUATED ON FILL MATERIAL, THE FOOTINGS SHALL BE DESIGNED AND APPROVED BY QUALIFIED REGISTERED PROFESSIONAL ENGINEER.
10. ALL FILL PLACED ON THE SITE SHALL BE COMPACTED TO A MINIMUM OF 98% STANDARD PROCTOR DENSITY. A SUFFICIENT NUMBER OF TESTS SHALL BE TAKEN AT VARIOUS LEVELS SATISFACTORY TO THE DIRECTOR OF ENGINEERING. TEST RESULTS SHALL BE SENT TO THE CITY WITH A LETTER, SIGNED AND STAMPED BY THE SOILS ENGINEER, STATING THAT A SUFFICIENT NUMBER OF TESTS HAVE BEEN TAKEN AND THE MINIMUM DEGREE OF COMPACTION HAS BEEN REACHED.
11. APPROVAL OF THIS DRAWING IS FOR MATERIAL ACCEPTABILITY AND COMPLIANCE WITH MUNICIPAL AND PROVINCIAL SPECIFICATIONS AND STANDARDS ONLY. APPROVAL AND INSPECTION BY THE CITY OF THE WORKS DOES NOT CERTIFY THE LINE AND GRADE OF THE WORKS AND IT IS THE OWNER'S RESPONSIBILITY TO HAVE THEIR ENGINEER CERTIFY THIS ACCORDINGLY.

BEFORE STARTING WORK

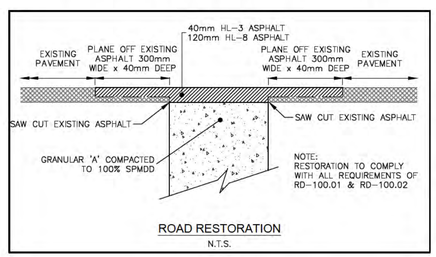
1. THE CONTRACTOR SHALL NOTIFY THE CITY OF HAMILTON AND IBI GROUP AT LEAST 48 HOURS PRIOR TO COMMENCING CONSTRUCTION.
2. THE POSITION OF THE POLE LINES, CONDUITS, WATERMAINS, SEWERS, AND OTHER UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.
3. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, ALL BENCHMARKS, ELEVATIONS, DIMENSIONS, AND GRADES MUST BE CHECKED BY THE CONTRACTOR AND ANY DISCREPANCIES REPORTED TO THE ENGINEER.
4. ALL EXISTING UNDERGROUND UTILITIES WITHIN THE LIMITS OF CONSTRUCTION SHALL BE LOCATED, MARKED AND PROTECTED. ANY UTILITIES DAMAGED OR DISTURBED DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE ENGINEER, AT THE CONTRACTOR'S EXPENSE.
5. AT LEAST TWO DIFFERENT BENCHMARKS MUST BE REFERRED TO AT ALL TIMES.
6. REPRODUCED PLANS SHALL AT NO TIMES BE SCALED AND ASSUMED ACCURATE.

PIPE CROSSING ELEVATIONS			
LOCATION	INVERT	OBVERT	ELEV. DIFFERENCE
1	±96.60 WM	96.10 SAN	0.50m
2	±96.60 WM	95.75 STM	0.85m
3	±95.86 SAN	95.70 STM	0.16m
4	97.30 WM	±95.66 SAN	1.64m
5	97.10 WM	±96.55 SAN	0.55m

NOTE: EX. (±) ELEVATIONS ARE APPROXIMATE, CONTRACTOR TO CONFIRM.

NOTE TO CONTRACTOR

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THIS CONTRACT DRAWING, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES IS NOT GUARANTEED. BEFORE STARTING WORK THE CONTRACTOR SHALL INFORM THEMSELVES OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.



ROAD RESTORATION
N.T.S.

NOT FOR TENDER

#	DATE	BY	DESCRIPTION
2	2020.01.31	PC	REVISED SITE PLAN
1	2019.11.31	PC	ISSUED FOR ZBA

REVISIONS

APPROVALS

IBI GROUP
101 - 410 Albert Street
Waterloo ON N2L 3V3 Canada
tel 519 585 2255
ibigroup.com

CITY OF HAMILTON

1107 MAIN STREET WEST

MIXED-USE RESIDENTIAL BUILDING

SERVICING PLAN

DESIGNED BY:	P.CLOUTIER	SCALE HORIZ:	1:250
DRAWN BY:	P.CLOUTIER	SCALE VERT:	NA
CHECKED BY:	J.PERKS	FILE NUMBER:	122727
DATE:	2019.10.31	SHEET NUMBER:	SP

APPENDIX B:
Calculations

City of Hamilton
Sanitary Design Flow Review

Project: 1107 Main Street West, Hamilton
File No: 122727
Date: 25-Mar-20
Design By: AH
Checked By JP

REQUIREMENT
Design Flow = Average Dry Weather Flow X Peak Flow Factor + Infiltration Allowance

Existing Devlopment Maximum Daily Flow

Land Use	Population Density	Units	Area	Equivalent Population
Church				
Institutional[2]	300 ppha	-	0.52 ha	155
			Total	155

Peaking Factor, $M^2 = 5/ P^{0.2}$
where: P = design population in thousands
Peaking Factor[2] = 5.00

Average dry weather flow[2] = 360 L/day/p
Dry Weather Flow = 55800 L/day
= 55.80 m^3/day
= 0.65 L/s

Drainage area = 0.52 ha
Infiltration Allowance[2] = 0.400 L/s/ha
= 0.21 L/s

Total Design Flow = 3.44 L/s

1- Ontario Building Code Part 8 - Table 8.2.1.3.A
2- City of Hamilton Engineering Guidelines for Servicing Land Under Development Applications Part 2.4.2.6

City of Hamilton
Sanitary Design Flow Review

Project: 1107 Main Street West, Hamilton
File No: 122727
Date: 25-Mar-20
Design By: AH
Checked By: JP
Page: 2 of 2

IBI

REQUIREMENT
Design Flow = Average Dry Weather Flow X Peak Flow Factor + Infiltration Allowance

Proposed Devlopment Maximum Daily Flow

Land Use	Population Density		Units	Area	Equivalent Population
1-Storey Family Unit					
2 Bedroom[1]	1100.0 L/day	3.06 PPU	5	-	16
3 Bedroom[1]	1600.0 L/day	4.44 PPU	5	-	23
2-Storey Townhouse					
2 Bedroom[1]	1100.0 L/day	3.06 PPU	5	-	16
3 Bedroom[1]	1600.0 L/day	4.44 PPU	2	-	9
15-Storey Building				-	
Bachelor[1]	750.0 L/day	2.08 PPU	4	-	9
1 Bedroom[1]	750.0 L/day	2.08 PPU	166	-	346
2 Bedroom[1]	1100.0 L/day	3.06 PPU	99	-	303
3 Bedroom[1]	1600.0 L/day	4.44 PPU	24	-	107
Commercial[2]	450.0 ppha		-	0.0535 ha	25
		Total	310	Total	854

Peaking Factor, $M^2 = 5/ P^{0.2}$
where: P = design population in thousands

Peaking Factor[2] =	5.00	
Average dry weather flow[2]	360	L/day/p
Dry Weather Flow =	307440	L/day
=	307.44	m^3/day
=	3.56	L/s
Drainage area	0.52	ha
Infiltration Allowance[2] =	0.400	L/s/ha
=	0.21	L/s
Total Design Flow =	**18.00**	**L/s**

1- Ontario Building Code Part 8 - Table 8.2.1.3.A
2- City of Hamilton Engineering Guidelines for Servicing Land Under Development Applications Part 2.4.2.6

City of Hamilton
Sanitary Sewer Capacity Analysis

Project: 1107 Main Street West, Hamilton
File No: 122727
Date: 25-Mar-20
Design By: AH
Checked By: JP
Page: 1 of 1

n= 0.013

Street Name	Total Proposed Flow (L/s)	Sewer Calculation					Remarks
		Diameter (mm)	Grade (%)	Capacity (L/s)	Velocity (m/s)	Full %	
Main Street W.	0.00	450	0.42%	184.77	1.16	0%	n/a
Main Street W.	0.00	300	0.48%	67.00	0.95	0%	n/a
Cline Ave. S.	0.00	375	0.75%	151.84	1.37	0%	n/a
Dow Avenue	18.00	375	0.56%	131.21	1.19	14%	Neglig ble impact

City of Hamilton
Fire Flow Review

Project: 1107 Main Street West, Hamilton
File No: 122727
Date: 25-Mar-20
Sheet By: AH
Checked By: JP
Page: 1 of 1

Required Fire Flow

Formula F = 220 * C √ A (Part II, Fire Underwriters Survey, 1999)

Assumptions	Ordinary construction	
Subject Floor Area	2794.45	m^2
25% of Floor Area Above	698.6	m^2
25% of Floor Area Below	698.6	m^2
Shared Walls	0	ea.
North Separation*	35.0	m
North Adjustment	**5%**	
East Separation*	23.0	m
East Adjustment	**10%**	
South Separation*	18.0	m
South Adjustment	**15%**	
West Separation*	26.0	m
West Adjustment	**10%**	
A =	4191.7	m^2
C =	1	
F =	14,243.49	L/min
Rounded F =	14,000	L/min
Occupancy Fire Hazard Adjustment	-15%	
Adjustmented due to Occupancy Fire Hazard F =	11,900	
Interior Firewall Adjustment	0	(10% per unpeirced party wall)
Exposure Adjustment	4,760	(see Separation Table)
Sprinkler Adjustment	-3570	(30% reduction, Sprinkler System comforming to NFPA 13 and other NFPA Standards)
Adjusted F =	13,000.0	L/min
Required Fire Flow =	**216.7**	**L/s**

MIN REQUIRED FLOW =	**216.7**	**L/s**
(@20psi theoretical)	**3434**	**gal(US)/min**
Available flow	**0.0**	**L/s**
(To be determined)	**0**	**gal(US)/min**

Exposure		
Separation		Charge
From (m)	To (m)	
0	3	25%
3.1	10	20%
10.1	20	15%
20.1	30	10%
30.1	45	5%

Notes:
1- All calculations and factors from "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 1999
2- Assumptions based on architect's preliminary floor plans, to be confirmed with architect and client at a later date.

City of Hamilton
Domestic Water Demand

Project: 1107 Main Street West, Hamilton
File No: 122727
Date: 25-Mar-20
Sheet By: AH
Checked By: JP
Page: 1 of 1

Fixture	Fixture Units per Device[1]	Number of Fixtures	Fixture Units
Bathroom group with greater than 6 LPF flush tank	6	347	2082
Sink, kitchen, domestic, greater than 8.3 L/min	1.5	310	465
Dishwasher, domestic	1.4	310	434
Clothes washer, 3.5 kg	1.4	310	434
Lavatory, greater than 8.3 L/min	1	6	6
		Total	3421

Maximum Water Demand[2] 80 gpm
5.05 L/s

1- Ontario Building Code Section 7 - Table 7.6.3.2.A
2- American Water Works Association Manual M22 “Sizing Water Service Lines and Meters"- Figure 4.2

122727 - 1107 Main Street West, City of Hamilton
Area 200 Roof Stage-Storage-Discharge Relationship

Total Rooftop Area =	1580	(m^2)
Number of Roof Drains =	12	
Roof Cell Area =	131.7	(m^2)
The Length of a Cell Side* =	11.47	(m)
Maximum Ponding Depth =	0.152	(m)
Total Number of Notches per Drain =	1	

Depth (inch)	Depth (m)	Base Area (m^2)	Cell Volume (m^3)	Total Volume (m^3)	Notch Discharge** (m^3/s)	Total Discharge (m^3/s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	3.66	0.03	0.37	0.00038	0.00456
2	0.051	14.63	0.25	2.97	0.00076	0.00912
3	0.076	32.92	0.84	10.03	0.00114	0.01368
4	0.102	58.52	1.98	23.78	0.00152	0.01824
5	0.127	91.44	3.87	46.45	0.00190	0.02280
6	0.152	131.67	6.69	83.26	0.00228	0.02736

* - assumed that the cell is square

** - notch discharge given as 0.38 l/s/notch/inch of head

(from Zurn Control-Flo Roof Drainage System Technical Catalogue)

1107 Main Street West, City of Hamilton
Underground Tank Stage-Storage-Discharge Relationship

Orifice # 1

Orifice Invert =	95.90	m
Orifice Radius =	0.0250	m
Orifice Diameter =	50	mm
Orifice Centreline =	95.925	m
Orifice Coefficient =	0.6	
Orifice Area =	0.0019634	m^2

Spill

Spill Elevation =	99.30	m
Weir Length =	6.00	m
Weir Coefficient =	1.6	

Tank # 1 Storage

Tank Invert =	95.95	m		
Tank Obvert =	96.75	m		
Length =	35.00	m	70	units
Width =	10.00	m	20	units
Height =	0.80	m	2	units
Voids =	0.97			
Storage =	339.5	m^3/m		
Total Storage =	271.6	m^3		

Hydraulic Depth (m)	Elevation (m)	Description	Orifice # 1 Flow (m^3/s)	Weir Flow (m^3/s)	Total Flow (m^3/s)	Tank Total Storage (m^3)	Surface Storage (m^3)	Total Active Storage (m^3)
0.00	95.95	Tank Invert	0.0000	0.0000	0.0000	0.0	0.0	0.0
0.05	96.00		0.0014	0.0000	0.0014	17.0	0.0	17.0
0.10	96.05		0.0018	0.0000	0.0018	33.9	0.0	33.9
0.15	96.10		0.0022	0.0000	0.0022	50.9	0.0	50.9
0.25	96.20		0.0027	0.0000	0.0027	84.9	0.0	84.9
0.35	96.30		0.0032	0.0000	0.0032	118.8	0.0	118.8
0.45	96.40		0.0036	0.0000	0.0036	152.8	0.0	152.8
0.55	96.50		0.0040	0.0000	0.0040	186.7	0.0	186.7
0.65	96.60		0.0043	0.0000	0.0043	220.7	0.0	220.7
0.75	96.70		0.0046	0.0000	0.0046	254.6	0.0	254.6
0.80	96.75	Tank Obvert	0.0047	0.0000	0.0047	271.6	0.0	271.6
3.05	99.00	Top of Grate	0.0091	0.0000	0.0091	271.6	0.2	271.8
3.10	99.05		0.0092	0.0000	0.0092	271.6	0.4	272.0
3.15	99.10		0.0093	0.0000	0.0093	271.6	0.6	272.2
3.20	99.15		0.0094	0.0000	0.0094	271.6	0.8	272.4
3.25	99.20		0.0094	0.0000	0.0094	271.6	1.0	272.6
3.30	99.25		0.0095	0.0000	0.0095	271.6	1.2	272.8
3.35	99.30		0.0096	0.0000	0.0096	271.6	1.4	273.0

Orifice equation: $Q = C_o \times A \times (2 \times g \times h)^{0.5}$

Weir equation: $Q = C_w \times L \times (H)^{3/2}$

where:

A = orifice area (m^2)

g = 9.806 m/s^2

h = head above c/l of orifice (m)

L = weir length (m)

H = head above weir (m)

```
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"             * CITY OF HAMILTON                    *"
"             * IBI GROUP                           *"
"             * JANUARY 2020                        *"
"             ************************************"
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"            1   Chicago storm"
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"        0.781   Exponent C"
"        0.400   Fraction R"
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"        1.000   Time step multiplier"
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"             ***********************"
"             * EXISTING CONDITIONS *"
"             ***********************"
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"          3  Lines of comment"
"             *********************************"
"             * AREA 101 - EXISTING SITE AREA *"
"             *********************************"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
```

```
"            1   Equal length"
"            1   SCS method"
"          101   101- Exisitng site"
"       50.000   % Impervious"
"        0.516   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.258   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.258   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.153   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.834   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.048     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.258      0.258      0.516      hectare"
"             Time of concentration  35.718     2.736      7.851      minutes"
"             Time to Centroid       147.110    92.738     101.171    minutes"
"             Rainfall depth         32.724     32.724     32.724     mm"
"             Rainfall volume        84.43      84.43      168.85     c.m"
"             Rainfall losses        27.716     5.443      16.579     mm"
"             Runoff depth           5.008      27.281     16.144     mm"
"             Runoff volume          12.92      70.38      83.31      c.m"
"             Runoff coefficient     0.153      0.834      0.493      "
"             Maximum flow           0.003      0.048      0.048      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"             ************************************"
"             * TOTAL FLOW FROM EXISTING SITE AREA *"
"             ************************************"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.048     0.048     0.000     0.000"
" 51          PIPE DESIGN"
"        0.048   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                0.134    metre"
"             Velocity                     1.355    m/sec"
"             Pipe capacity                0.175    c.m/sec"
```

```
"             Critical depth                0.159    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.048     0.048     0.048     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Runoff from existing site"
"             Maximum flow                  0.048    c.m/sec"
"             Hydrograph volume            83.305    c.m"
"                     0.048     0.048     0.048     0.048"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.048     0.000     0.048     0.048"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              **********************"
"              * PROPSOED CONDITIONS *"
"              **********************"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * AREA 200 - ROOFTOP SWM STORAGE AREA *"
"              ************************************"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          200   200- Rooftop stormwater storage"
"      100.000   % Impervious"
"        0.158   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.158   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.835   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.031     0.000     0.048     0.048 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.000      0.158      0.158      hectare"
"             Time of concentration  27.548     2.222      2.222      minutes"
"             Time to Centroid       137.677    91.965     91.965     minutes"
"             Rainfall depth         32.724     32.724     32.724     mm"
"             Rainfall volume        0.00       51.70      51.70      c.m"
"             Rainfall losses        27.324     5.403      5.403      mm"
"             Runoff depth           5.400      27.321     27.321     mm"
"             Runoff volume          0.00       43.17      43.17      c.m"
"             Runoff coefficient     0.000      0.835      0.835      "
"             Maximum flow           0.000      0.031      0.031      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.031     0.031     0.048     0.048"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ***********************************"
"              * CONTROLLED - ROOFTOP SWM STORAGE * "
"              ***********************************"
" 54          POND DESIGN"
"         0.031   Current peak flow    c.m/sec"
"         0.020   Target outflow    c.m/sec"
"          43.2   Hydrograph volume    c.m"
"             7.   Number of stages"
"         0.000   Minimum water level    metre"
"         0.152   Maximum water level    metre"
"         0.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                   0.000     0.000     0.000"
"                  0.02540   0.00456    0.3700"
"                  0.05080   0.00912     2.970"
"                  0.07620   0.01368    10.030"
"                   0.1016   0.01824    23.780"
"                   0.1270   0.02280    46.450"
"                   0.1524   0.02736    83.260"
"              Peak outflow                  0.014    c.m/sec"
"              Maximum level                 0.078    metre"
"              Maximum storage              11.195    c.m"
"              Centroidal lag                1.653   hours"
"                   0.031     0.031     0.014     0.048 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"              Maximum flow                  0.014    c.m/sec"
"              Hydrograph volume            43.176    c.m"
"                     0.031     0.031     0.014     0.014"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.031     0.000     0.014     0.014"
" 81          ADD COMMENT================================================="
```

```
"          3  Lines of comment"
"             ********************************************  "
"             * AREA 201 - ROOFTOP AREA WITHOUT SWM STORAGE *  "
"             ********************************************"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   201- Rooftop without storage"
"      100.000   % Impervious"
"        0.173   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.173   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.835   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.034     0.000     0.014     0.014 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.173      0.173      hectare"
"             Time of concentration  27.548     2.222      2.222      minutes"
"             Time to Centroid       137.677    91.965     91.965     minutes"
"             Rainfall depth         32.724     32.724     32.724     mm"
"             Rainfall volume        0.00       56.61      56.61      c.m"
"             Rainfall losses        27.324     5.403      5.403      mm"
"             Runoff depth           5.400      27.321     27.321     mm"
"             Runoff volume          0.00       47.27      47.27      c.m"
"             Runoff coefficient     0.000      0.835      0.835      "
"             Maximum flow           0.000      0.034      0.034      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.034     0.034     0.014     0.014"
" 51          PIPE DESIGN"
"        0.034   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                0.112    metre"
"             Velocity                     1.228    m/sec"
```

```
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.132    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.034     0.034     0.034     0.014 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Runoff to underground storage tank"
"             Maximum flow                  0.044    c.m/sec"
"             Hydrograph volume            90.441    c.m"
"                     0.034     0.034     0.034     0.044"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     0.034     0.000     0.034     0.044"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ****************************"
"             * AREA 202 - COURTYARD AREA * "
"             ****************************"
" 33          CATCHMENT 202"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         202   202- Courtyard"
"       60.000   % Impervious"
"        0.039   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.016   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.023   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.153   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.827   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.005     0.000     0.034     0.044 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.016      0.023      0.039      hectare"
"             Time of concentration  15.547     1.191      2.764      minutes"
"             Time to Centroid       123.752    90.290     93.957     minutes"
"             Rainfall depth         32.724     32.724     32.724     mm"
```

```
"             Rainfall volume        5.10       7.66       12.76      c.m"
"             Rainfall losses        27.727     5.656      14.484     mm"
"             Runoff depth           4.997      27.068     18.240     mm"
"             Runoff volume          0.78       6.33       7.11       c.m"
"             Runoff coefficient     0.153      0.827      0.557      "
"             Maximum flow           0.000      0.005      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.005     0.005     0.034     0.044"
" 51          PIPE DESIGN"
"        0.005   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.300   Diameter    metre"
"        0.400   Gradient   %"
"             Depth of flow                 0.058    metre"
"             Velocity                      0.523    m/sec"
"             Pipe capacity                 0.061    c.m/sec"
"             Critical depth                0.053    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                    0.005     0.005     0.005     0.044 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.049    c.m/sec"
"             Hydrograph volume            97.554    c.m"
"                    0.005     0.005     0.005     0.049"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ******************************************"
"              * CONTROLLED - UNDERGROUND SWM STORAGE TANK * "
"              ******************************************"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.049    c.m/sec"
"             Hydrograph volume            97.554    c.m"
"                    0.005     0.049     0.005     0.000"
" 54          POND DESIGN"
"        0.049   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"         97.6   Hydrograph volume    c.m"
"          18.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.550   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
```

```
"                0.05000   0.00140    17.000"
"                 0.1000   0.00180    33.900"
"                 0.1500   0.00220    50.900"
"                 0.2500   0.00270    84.900"
"                 0.3500   0.00320   118.800"
"                 0.4500   0.00360   152.800"
"                 0.5500   0.00400   186.700"
"                 0.6500   0.00430   220.700"
"                 0.7500   0.00460   254.600"
"                 0.8000   0.00470   271.600"
"                  3.050   0.00910   271.800"
"                  3.100   0.00920   272.000"
"                  3.150   0.00930   272.200"
"                  3.200   0.00940   272.400"
"                  3.250   0.00940   272.600"
"                  3.300   0.00950   272.800"
"                  3.350   0.00960   273.000"
"             Peak outflow                  0.003    c.m/sec"
"             Maximum level                 0.234    metre"
"             Maximum storage              79.553    c.m"
"             Centroidal lag                7.566   hours"
"                  0.005     0.049     0.003     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.005     0.003     0.003     0.000"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * AREA 203 - UNCONSTROLLED LAND AREA * "
"              ************************************"
" 33          CATCHMENT 203"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           203   203- Uncontrolled land"
"        35.000   % Impervious"
"         0.148   Total Area"
"        10.000   Flow length"
"         2.000   Overland Slope"
"         0.096   Pervious Area"
"        10.000   Pervious length"
"         2.000   Pervious slope"
"         0.052   Impervious Area"
"        10.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.153   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.827   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.011     0.003     0.003     0.000 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.096      0.052      0.148      hectare"
"             Time of concentration  15.547     1.191      4.856      minutes"
"             Time to Centroid       123.752    90.290     98.833     minutes"
"             Rainfall depth         32.724     32.724     32.724     mm"
"             Rainfall volume        31.48      16.95      48.43      c.m"
"             Rainfall losses        27.727     5.655      20.002     mm"
"             Runoff depth           4.997      27.068     12.722     mm"
"             Runoff volume          4.81       14.02      18.83      c.m"
"             Runoff coefficient     0.153      0.827      0.389      "
"             Maximum flow           0.002      0.011      0.011      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * TOTAL FLOW FROM PROPOSED SITE AREA *"
"              ************************************"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.011     0.013     0.003     0.000"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      1.034    hectare"
"             Total Impervious area                     0.664    hectare"
"             Total % impervious                       64.236"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:             \\10.120.26.4\j\WT\122727_1107MainStW\"
"                              7.0_Production\7.99_Submitted\FSR\Appendix B\SWM"
"                Output filename:                          122727-3hr Ch(5YR).out"
"                Licensee name:                                             install1"
"                Company                                                  IBI Group"
"                Date & Time last used:                2020-01-29 at 4:35:52 PM"
" 81           ADD COMMENT================================================="
"          6  Lines of comment"
"             ************************************"
"             * 122727 - 1107 MAIN STREET WEST      *"
"             * CITY OF HAMILTON                    *"
"             * IBI GROUP                           *"
"             * JANUARY 2020                        *"
"             ************************************"
" 31           TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 81           ADD COMMENT================================================="
"          4  Lines of comment"
"             ****************************"
"             *    5 YEAR CHICAGO STORM   *"
"             * MOUNT HOPE IDF PARAMETERS *"
"             ****************************"
" 32           STORM Chicago storm"
"             1   Chicago storm"
"     1049.500   Coefficient A"
"        8.000   Constant B"
"        0.803   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           133.809    mm/hr"
"             Total depth                  46.985    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 81           ADD COMMENT================================================="
"          3  Lines of comment"
"             ***********************"
"             * EXISTING CONDITIONS *"
"             ***********************"
" 81           ADD COMMENT================================================="
"          3  Lines of comment"
"             *********************************"
"             * AREA 101 - EXISTING SITE AREA *"
"             *********************************"
" 33           CATCHMENT 101"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   101- Exisitng site"
"       50.000   % Impervious"
"        0.516   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.258   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.258   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.242   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.875   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.072     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.258      0.258      0.516      hectare"
"             Time of concentration  23.936     2.392      7.062      minutes"
"             Time to Centroid       131.359    90.884     99.658     minutes"
"             Rainfall depth         46.985     46.985     46.985     mm"
"             Rainfall volume        121.22     121.22     242.44     c.m"
"             Rainfall losses        35.610     5.889      20.749     mm"
"             Runoff depth           11.375     41.095     26.235     mm"
"             Runoff volume          29.35      106.03     135.37     c.m"
"             Runoff coefficient     0.242      0.875      0.558      "
"             Maximum flow           0.008      0.072      0.072      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"             ************************************"
"             * TOTAL FLOW FROM EXISTING SITE AREA *"
"             ************************************"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.072     0.072     0.000     0.000"
" 51          PIPE DESIGN"
"        0.072   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.168    metre"
```

```
"             Velocity                       1.512    m/sec"
"             Pipe capacity                  0.175    c.m/sec"
"             Critical depth                 0.196    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.072     0.072     0.072     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Runoff from existing site"
"             Maximum flow                   0.072    c.m/sec"
"             Hydrograph volume            135.373    c.m"
"                     0.072     0.072     0.072     0.072"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.072     0.000     0.072     0.072"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              **********************"
"              * PROPSOED CONDITIONS *"
"              **********************"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * AREA 200 - ROOFTOP SWM STORAGE AREA *"
"              ************************************"
" 33          CATCHMENT 200"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           200   200- Rooftop stormwater storage"
"       100.000   % Impervious"
"         0.158   Total Area"
"        20.000   Flow length"
"         1.000   Overland Slope"
"         0.000   Pervious Area"
"        20.000   Pervious length"
"         1.000   Pervious slope"
"         0.158   Impervious Area"
"        20.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.877   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.045     0.000     0.072     0.072 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.158      0.158      hectare"
"             Time of concentration  18.845     1.943      1.943      minutes"
"             Time to Centroid       124.799    90.147     90.147     minutes"
"             Rainfall depth         46.985     46.985     46.985     mm"
"             Rainfall volume        0.00       74.24      74.24      c.m"
"             Rainfall losses        34.963     5.764      5.764      mm"
"             Runoff depth           12.022     41.220     41.220     mm"
"             Runoff volume          0.00       65.13      65.13      c.m"
"             Runoff coefficient     0.000      0.877      0.877      "
"             Maximum flow           0.000      0.045      0.045      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.045     0.045     0.072     0.072"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             **********************************"
"             * CONTROLLED - ROOFTOP SWM STORAGE * "
"             **********************************"
" 54          POND DESIGN"
"        0.045   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"         65.1   Hydrograph volume    c.m"
"           7.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.152   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02540   0.00456    0.3700"
"                 0.05080   0.00912     2.970"
"                 0.07620   0.01368    10.030"
"                  0.1016   0.01824    23.780"
"                  0.1270   0.02280    46.450"
"                  0.1524   0.02736    83.260"
"             Peak outflow                  0.017    c.m/sec"
"             Maximum level                 0.095    metre"
"             Maximum storage              20.065    c.m"
"             Centroidal lag                1.688   hours"
"                  0.045     0.045     0.017     0.072 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.017    c.m/sec"
"             Hydrograph volume            65.204    c.m"
"                     0.045     0.045     0.017     0.017"
```

```
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.045     0.000     0.017     0.017"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              *********************************************  "
"              * AREA 201 - ROOFTOP AREA WITHOUT SWM STORAGE *  "
"              *********************************************"
" 33          CATCHMENT 201"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           201   201- Rooftop without storage"
"       100.000   % Impervious"
"         0.173   Total Area"
"        20.000   Flow length"
"         1.000   Overland Slope"
"         0.000   Pervious Area"
"        20.000   Pervious length"
"         1.000   Pervious slope"
"         0.173   Impervious Area"
"        20.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.877   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.050     0.000     0.017     0.017 c.m/sec"
"              Catchment 201          Pervious   Impervious Total Area "
"              Surface Area           0.000      0.173      0.173      hectare"
"              Time of concentration  18.845     1.943      1.943      minutes"
"              Time to Centroid       124.799    90.147     90.147     minutes"
"              Rainfall depth         46.985     46.985     46.985     mm"
"              Rainfall volume        0.00       81.28      81.28      c.m"
"              Rainfall losses        34.963     5.764      5.765      mm"
"              Runoff depth           12.022     41.220     41.220     mm"
"              Runoff volume          0.00       71.31      71.31      c.m"
"              Runoff coefficient     0.000      0.877      0.877      "
"              Maximum flow           0.000      0.050      0.050      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.050     0.050     0.017     0.017"
" 51          PIPE DESIGN"
"         0.050   Current peak flow    c.m/sec"
```

```
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.137    metre"
"             Velocity                      1.366    m/sec"
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.161    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.050     0.050     0.050     0.017 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.063    c.m/sec"
"             Hydrograph volume           136.515    c.m"
"                     0.050     0.050     0.050     0.063"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.050     0.000     0.050     0.063"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ****************************"
"             * AREA 202 - COURTYARD AREA * "
"             ****************************"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   202- Courtyard"
"       60.000   % Impervious"
"        0.039   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.016   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.023   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.241   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.862   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.007     0.000     0.050     0.063 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.016      0.023      0.039      hectare"
"             Time of concentration  10.419     1.041      2.516      minutes"
"             Time to Centroid       114.611    88.724     92.796     minutes"
"             Rainfall depth         46.985     46.985     46.985     mm"
"             Rainfall volume        7.33       10.99      18.32      c.m"
"             Rainfall losses        35.640     6.461      18.132     mm"
"             Runoff depth           11.345     40.524     28.852     mm"
"             Runoff volume          1.77       9.48       11.25      c.m"
"             Runoff coefficient     0.241      0.862      0.614      "
"             Maximum flow           0.001      0.007      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.007     0.007     0.050     0.063"
" 51          PIPE DESIGN"
"         0.007   Current peak flow    c.m/sec"
"         0.013   Manning 'n'"
"         0.300   Diameter    metre"
"         0.400   Gradient   %"
"              Depth of flow                0.070    metre"
"              Velocity                     0.583    m/sec"
"              Pipe capacity                0.061    c.m/sec"
"              Critical depth               0.064    metre"
" 53          ROUTE Zero Route"
"          0.00   Zero Route Reach length   ( metre)"
"                    0.007     0.007     0.007     0.063 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.070    c.m/sec"
"             Hydrograph volume           147.767    c.m"
"                    0.007     0.007     0.007     0.070"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ******************************************"
"              * CONTROLLED - UNDERGROUND SWM STORAGE TANK * "
"              ******************************************"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.070    c.m/sec"
"             Hydrograph volume           147.767    c.m"
"                    0.007     0.070     0.007     0.000"
" 54          POND DESIGN"
"         0.070   Current peak flow    c.m/sec"
"         0.001   Target outflow    c.m/sec"
"         147.8   Hydrograph volume    c.m"
```

```
"          18.   Number of stages"
"       0.000   Minimum water level    metre"
"       3.550   Maximum water level    metre"
"       0.000   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"                 0.000     0.000     0.000"
"                0.05000   0.00140    17.000"
"                 0.1000   0.00180    33.900"
"                 0.1500   0.00220    50.900"
"                 0.2500   0.00270    84.900"
"                 0.3500   0.00320   118.800"
"                 0.4500   0.00360   152.800"
"                 0.5500   0.00400   186.700"
"                 0.6500   0.00430   220.700"
"                 0.7500   0.00460   254.600"
"                 0.8000   0.00470   271.600"
"                  3.050   0.00910   271.800"
"                  3.100   0.00920   272.000"
"                  3.150   0.00930   272.200"
"                  3.200   0.00940   272.400"
"                  3.250   0.00940   272.600"
"                  3.300   0.00950   272.800"
"                  3.350   0.00960   273.000"
"             Peak outflow                  0.003    c.m/sec"
"             Maximum level                 0.369    metre"
"             Maximum storage             125.186    c.m"
"             Centroidal lag                9.004   hours"
"                  0.007     0.070     0.003     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"           5   Next link "
"                    0.007     0.003     0.003     0.000"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ************************************"
"             * AREA 203 - UNCONSTROLLED LAND AREA * "
"             ************************************"
" 33          CATCHMENT 203"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         203   203- Uncontrolled land"
"      35.000   % Impervious"
"       0.148   Total Area"
"      10.000   Flow length"
"       2.000   Overland Slope"
"       0.096   Pervious Area"
"      10.000   Pervious length"
"       2.000   Pervious slope"
"       0.052   Impervious Area"
```

```
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.241   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.862   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.017     0.003     0.003     0.000 c.m/sec"
"            Catchment 203          Pervious   Impervious Total Area "
"            Surface Area           0.096      0.052      0.148      hectare"
"            Time of concentration  10.419     1.041      4.249      minutes"
"            Time to Centroid       114.611    88.724     97.579     minutes"
"            Rainfall depth         46.985     46.985     46.985     mm"
"            Rainfall volume        45.20      24.34      69.54      c.m"
"            Rainfall losses        35.640     6.461      25.427     mm"
"            Runoff depth           11.345     40.524     21.557     mm"
"            Runoff volume          10.91      20.99      31.90      c.m"
"            Runoff coefficient     0.241      0.862      0.459      "
"            Maximum flow           0.005      0.016      0.017      c.m/sec"
" 81         ADD COMMENT================================================="
"          3  Lines of comment"
"            ************************************"
"            * TOTAL FLOW FROM PROPOSED SITE AREA *"
"            ************************************"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.017     0.019     0.003     0.000"
" 38         START/RE-START TOTALS 203"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                    1.034    hectare"
"            Total Impervious area                   0.664    hectare"
"            Total % impervious                     64.236"
" 19         EXIT"
```

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                            Version 2.25  rev. 473"
"               MIDUSS created                          Sunday, February 7, 2010"
"          10   Units used:                                            ie METRIC"
"               Job folder:            \\10.120.26.4\j\WT\122727_1107MainStW\"
"                             7.0_Production\7.99_Submitted\FSR\Appendix B\SWM"
"               Output filename:                        122727-3hr Ch(10YR).out"
"               Licensee name:                                           install1"
"               Company                                                IBI Group"
"               Date & Time last used:                2020-01-29 at 4:34:18 PM"
" 81          ADD COMMENT================================================="
"          6  Lines of comment"
"             ************************************"
"             * 122727 - 1107 MAIN STREET WEST      *"
"             * CITY OF HAMILTON                    *"
"             * IBI GROUP                           *"
"             * JANUARY 2020                        *"
"             ************************************"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 81          ADD COMMENT================================================="
"          4  Lines of comment"
"             ****************************"
"             *   10 YEAR CHICAGO STORM   *"
"             * MOUNT HOPE IDF PARAMETERS *"
"             ****************************"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1343.700   Coefficient A"
"        9.000   Constant B"
"        0.814   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           156.803    mm/hr"
"             Total depth                  56.544    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ***********************"
"             * EXISTING CONDITIONS *"
"             ***********************"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             *********************************"
"             * AREA 101 - EXISTING SITE AREA *"
"             *********************************"
" 33          CATCHMENT 101"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   101- Exisitng site"
"       50.000   % Impervious"
"        0.516   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.258   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.258   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.293   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.893   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.089     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.258      0.258      0.516      hectare"
"             Time of concentration  20.286     2.234      6.691      minutes"
"             Time to Centroid       125.568    90.036     98.810     minutes"
"             Rainfall depth         56.544     56.544     56.544     mm"
"             Rainfall volume        145.88     145.88     291.77     c.m"
"             Rainfall losses        39.989     6.057      23.023     mm"
"             Runoff depth           16.554     50.487     33.520     mm"
"             Runoff volume          42.71      130.26     172.97     c.m"
"             Runoff coefficient     0.293      0.893      0.593      "
"             Maximum flow           0.013      0.087      0.089      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"             ************************************"
"             * TOTAL FLOW FROM EXISTING SITE AREA *"
"             ************************************"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.089     0.089     0.000     0.000"
" 51          PIPE DESIGN"
"        0.089   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.189    metre"
```

```
"             Velocity                      1.592    m/sec"
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.218    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.089     0.089     0.089     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Runoff from existing site"
"             Maximum flow                  0.089    c.m/sec"
"             Hydrograph volume           172.966    c.m"
"                     0.089     0.089     0.089     0.089"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.089     0.000     0.089     0.089"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              **********************"
"              * PROPSOED CONDITIONS *"
"              **********************"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * AREA 200 - ROOFTOP SWM STORAGE AREA *"
"              ************************************"
" 33          CATCHMENT 200"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           200   200- Rooftop stormwater storage"
"       100.000   % Impervious"
"         0.158   Total Area"
"        20.000   Flow length"
"         1.000   Overland Slope"
"         0.000   Pervious Area"
"        20.000   Pervious length"
"         1.000   Pervious slope"
"         0.158   Impervious Area"
"        20.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.894   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.055     0.000     0.089     0.089 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.158      0.158      hectare"
"             Time of concentration  16.056     1.814      1.814      minutes"
"             Time to Centroid       120.033    89.331     89.331     minutes"
"             Rainfall depth         56.544     56.544     56.544     mm"
"             Rainfall volume        0.00       89.34      89.34      c.m"
"             Rainfall losses        39.180     6.000      6.000      mm"
"             Runoff depth           17.364     50.544     50.544     mm"
"             Runoff volume          0.00       79.86      79.86      c.m"
"             Runoff coefficient     0.000      0.894      0.894      "
"             Maximum flow           0.000      0.055      0.055      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.055     0.055     0.089     0.089"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              **********************************"
"              * CONTROLLED - ROOFTOP SWM STORAGE * "
"              **********************************"
" 54          POND DESIGN"
"        0.055   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"         79.9   Hydrograph volume    c.m"
"           7.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.152   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02540   0.00456    0.3700"
"                 0.05080   0.00912     2.970"
"                 0.07620   0.01368    10.030"
"                  0.1016   0.01824    23.780"
"                  0.1270   0.02280    46.450"
"                  0.1524   0.02736    83.260"
"             Peak outflow                  0.019    c.m/sec"
"             Maximum level                 0.105    metre"
"             Maximum storage              26.604    c.m"
"             Centroidal lag                1.718   hours"
"                  0.055     0.055     0.019     0.089 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.019    c.m/sec"
"             Hydrograph volume            79.912    c.m"
"                     0.055     0.055     0.019     0.019"
```

```
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.055     0.000     0.019     0.019"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              *********************************************  "
"              * AREA 201 - ROOFTOP AREA WITHOUT SWM STORAGE *  "
"              *********************************************"
" 33          CATCHMENT 201"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           201   201- Rooftop without storage"
"       100.000   % Impervious"
"         0.173   Total Area"
"        20.000   Flow length"
"         1.000   Overland Slope"
"         0.000   Pervious Area"
"        20.000   Pervious length"
"         1.000   Pervious slope"
"         0.173   Impervious Area"
"        20.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.894   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.060     0.000     0.019     0.019 c.m/sec"
"              Catchment 201          Pervious   Impervious Total Area "
"              Surface Area           0.000      0.173      0.173      hectare"
"              Time of concentration  16.056     1.814      1.814      minutes"
"              Time to Centroid       120.032    89.331     89.331     minutes"
"              Rainfall depth         56.544     56.544     56.544     mm"
"              Rainfall volume        0.00       97.82      97.82      c.m"
"              Rainfall losses        39.180     6.000      6.000      mm"
"              Runoff depth           17.364     50.544     50.544     mm"
"              Runoff volume          0.00       87.44      87.44      c.m"
"              Runoff coefficient     0.000      0.894      0.894      "
"              Maximum flow           0.000      0.060      0.060      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.060     0.060     0.019     0.019"
" 51          PIPE DESIGN"
"         0.060   Current peak flow    c.m/sec"
```

```
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.151    metre"
"             Velocity                      1.437    m/sec"
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.178    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.060     0.060     0.060     0.019 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.074    c.m/sec"
"             Hydrograph volume           167.353    c.m"
"                     0.060     0.060     0.060     0.074"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.060     0.000     0.060     0.074"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ****************************"
"             * AREA 202 - COURTYARD AREA * "
"             ****************************"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   202- Courtyard"
"       60.000   % Impervious"
"        0.039   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.016   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.023   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.292   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.876   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.009     0.000     0.060     0.074 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.016      0.023      0.039      hectare"
"             Time of concentration  8.830      0.972      2.400      minutes"
"             Time to Centroid       111.155    88.058     92.256     minutes"
"             Rainfall depth         56.544     56.544     56.544     mm"
"             Rainfall volume        8.82       13.23      22.05      c.m"
"             Rainfall losses        40.047     7.028      20.236     mm"
"             Runoff depth           16.496     49.516     36.308     mm"
"             Runoff volume          2.57       11.59      14.16      c.m"
"             Runoff coefficient     0.292      0.876      0.642      "
"             Maximum flow           0.001      0.009      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.009     0.009     0.060     0.074"
" 51          PIPE DESIGN"
"         0.009   Current peak flow    c.m/sec"
"         0.013   Manning 'n'"
"         0.300   Diameter    metre"
"         0.400   Gradient   %"
"              Depth of flow                0.077    metre"
"              Velocity                     0.617    m/sec"
"              Pipe capacity                0.061    c.m/sec"
"              Critical depth               0.071    metre"
" 53          ROUTE Zero Route"
"          0.00   Zero Route Reach length   ( metre)"
"                    0.009     0.009     0.009     0.074 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.083    c.m/sec"
"             Hydrograph volume           181.513    c.m"
"                    0.009     0.009     0.009     0.083"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ******************************************"
"              * CONTROLLED - UNDERGROUND SWM STORAGE TANK * "
"              ******************************************"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.083    c.m/sec"
"             Hydrograph volume           181.513    c.m"
"                    0.009     0.083     0.009     0.000"
" 54          POND DESIGN"
"         0.083   Current peak flow    c.m/sec"
"         0.001   Target outflow    c.m/sec"
"         181.5   Hydrograph volume    c.m"
```

```
"          18.   Number of stages"
"       0.000   Minimum water level    metre"
"       3.550   Maximum water level    metre"
"       0.000   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"                 0.000     0.000     0.000"
"               0.05000   0.00140    17.000"
"                0.1000   0.00180    33.900"
"                0.1500   0.00220    50.900"
"                0.2500   0.00270    84.900"
"                0.3500   0.00320   118.800"
"                0.4500   0.00360   152.800"
"                0.5500   0.00400   186.700"
"                0.6500   0.00430   220.700"
"                0.7500   0.00460   254.600"
"                0.8000   0.00470   271.600"
"                 3.050   0.00910   271.800"
"                 3.100   0.00920   272.000"
"                 3.150   0.00930   272.200"
"                 3.200   0.00940   272.400"
"                 3.250   0.00940   272.600"
"                 3.300   0.00950   272.800"
"                 3.350   0.00960   273.000"
"            Peak outflow                  0.004    c.m/sec"
"            Maximum level                 0.461    metre"
"            Maximum storage             156.392    c.m"
"            Centroidal lag                9.845   hours"
"                 0.009     0.083     0.004     0.000 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                    0.009     0.004     0.004     0.000"
" 81         ADD COMMENT================================================="
"          3  Lines of comment"
"            ************************************"
"            * AREA 203 - UNCONSTROLLED LAND AREA * "
"            ************************************"
" 33         CATCHMENT 203"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         203   203- Uncontrolled land"
"      35.000   % Impervious"
"       0.148   Total Area"
"      10.000   Flow length"
"       2.000   Overland Slope"
"       0.096   Pervious Area"
"      10.000   Pervious length"
"       2.000   Pervious slope"
"       0.052   Impervious Area"
```

```
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.292   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.876   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.021     0.004     0.004     0.000 c.m/sec"
"            Catchment 203          Pervious   Impervious Total Area "
"            Surface Area           0.096      0.052      0.148      hectare"
"            Time of concentration  8.830      0.972      3.976      minutes"
"            Time to Centroid       111.155    88.058     96.886     minutes"
"            Rainfall depth         56.544     56.544     56.544     mm"
"            Rainfall volume        54.39      29.29      83.68      c.m"
"            Rainfall losses        40.047     7.028      28.490     mm"
"            Runoff depth           16.496     49.516     28.053     mm"
"            Runoff volume          15.87      25.65      41.52      c.m"
"            Runoff coefficient     0.292      0.876      0.496      "
"            Maximum flow           0.007      0.019      0.021      c.m/sec"
" 81         ADD COMMENT================================================="
"          3  Lines of comment"
"            ************************************"
"            * TOTAL FLOW FROM PROPOSED SITE AREA *"
"            ************************************"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.021     0.023     0.004     0.000"
" 38         START/RE-START TOTALS 203"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                    1.034    hectare"
"            Total Impervious area                   0.664    hectare"
"            Total % impervious                     64.236"
" 19         EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:             \\10.120.26.4\j\WT\122727_1107MainStW\"
"                              7.0_Production\7.99_Submitted\FSR\Appendix B\SWM"
"                Output filename:                        122727-3hr Ch(25YR).out"
"                Licensee name:                                           install1"
"                Company                                                IBI Group"
"                Date & Time last used:                2020-01-29 at 4:32:31 PM"
" 81           ADD COMMENT================================================="
"           6  Lines of comment"
"              ************************************"
"              * 122727 - 1107 MAIN STREET WEST      *"
"              * CITY OF HAMILTON                    *"
"              * IBI GROUP                           *"
"              * JANUARY 2020                        *"
"              ************************************"
" 31           TIME PARAMETERS"
"         5.000   Time Step"
"       180.000   Max. Storm length"
"      3600.000   Max. Hydrograph"
" 81           ADD COMMENT================================================="
"           4  Lines of comment"
"              ****************************"
"              *   25 YEAR CHICAGO STORM   *"
"              * MOUNT HOPE IDF PARAMETERS *"
"              ****************************"
" 32           STORM Chicago storm"
"             1   Chicago storm"
"      1719.500   Coefficient A"
"        10.000   Constant B"
"         0.823   Exponent C"
"         0.400   Fraction R"
"       180.000   Duration"
"         1.000   Time step multiplier"
"              Maximum intensity           185.131    mm/hr"
"              Total depth                  68.724    mm"
"             6   025hyd   Hydrograph extension used in this file"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
"              ***********************"
"              * EXISTING CONDITIONS *"
"              ***********************"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
"              *********************************"
"              * AREA 101 - EXISTING SITE AREA *"
"              *********************************"
" 33           CATCHMENT 101"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   101- Exisitng site"
"       50.000   % Impervious"
"        0.516   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.258   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.258   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.349   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.909   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.109     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.258      0.258      0.516      hectare"
"             Time of concentration  17.353     2.082      6.317      minutes"
"             Time to Centroid       120.707    89.276     97.993     minutes"
"             Rainfall depth         68.724     68.724     68.724     mm"
"             Rainfall volume        177.31     177.31     354.62     c.m"
"             Rainfall losses        44.748     6.242      25.495     mm"
"             Runoff depth           23.976     62.482     43.229     mm"
"             Runoff volume          61.86      161.20     223.06     c.m"
"             Runoff coefficient     0.349      0.909      0.629      "
"             Maximum flow           0.021      0.106      0.109      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"             ************************************"
"             * TOTAL FLOW FROM EXISTING SITE AREA *"
"             ************************************"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.109     0.109     0.000     0.000"
" 51          PIPE DESIGN"
"        0.109   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.214    metre"
```

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"             Velocity                       1.673    m/sec"
"             Pipe capacity                  0.175    c.m/sec"
"             Critical depth                 0.243    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.109     0.109     0.109     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Runoff from existing site"
"             Maximum flow                   0.109    c.m/sec"
"             Hydrograph volume            223.064    c.m"
"                     0.109     0.109     0.109     0.109"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.109     0.000     0.109     0.109"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              **********************"
"              * PROPSOED CONDITIONS *"
"              **********************"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * AREA 200 - ROOFTOP SWM STORAGE AREA *"
"              ************************************"
" 33          CATCHMENT 200"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           200   200- Rooftop stormwater storage"
"       100.000   % Impervious"
"         0.158   Total Area"
"        20.000   Flow length"
"         1.000   Overland Slope"
"         0.000   Pervious Area"
"        20.000   Pervious length"
"         1.000   Pervious slope"
"         0.158   Impervious Area"
"        20.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.909   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.067     0.000     0.109     0.109 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.158      0.158      hectare"
"             Time of concentration  13.791     1.691      1.691      minutes"
"             Time to Centroid       115.937    88.619     88.619     minutes"
"             Rainfall depth         68.724     68.724     68.724     mm"
"             Rainfall volume        0.00       108.58     108.58     c.m"
"             Rainfall losses        43.739     6.244      6.244      mm"
"             Runoff depth           24.985     62.480     62.480     mm"
"             Runoff volume          0.00       98.72      98.72      c.m"
"             Runoff coefficient     0.000      0.909      0.909      "
"             Maximum flow           0.000      0.067      0.067      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.067     0.067     0.109     0.109"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             **********************************"
"             * CONTROLLED - ROOFTOP SWM STORAGE * "
"             **********************************"
" 54          POND DESIGN"
"        0.067   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"         98.7   Hydrograph volume    c.m"
"           7.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.152   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02540   0.00456    0.3700"
"                 0.05080   0.00912     2.970"
"                 0.07620   0.01368    10.030"
"                  0.1016   0.01824    23.780"
"                  0.1270   0.02280    46.450"
"                  0.1524   0.02736    83.260"
"             Peak outflow                  0.021    c.m/sec"
"             Maximum level                 0.115    metre"
"             Maximum storage              35.412    c.m"
"             Centroidal lag                1.761   hours"
"                  0.067     0.067     0.021     0.109 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.021    c.m/sec"
"             Hydrograph volume            98.573    c.m"
"                     0.067     0.067     0.021     0.021"
```

```
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.067     0.000     0.021     0.021"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              *********************************************  "
"              * AREA 201 - ROOFTOP AREA WITHOUT SWM STORAGE *  "
"              *********************************************"
" 33          CATCHMENT 201"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           201   201- Rooftop without storage"
"       100.000   % Impervious"
"         0.173   Total Area"
"        20.000   Flow length"
"         1.000   Overland Slope"
"         0.000   Pervious Area"
"        20.000   Pervious length"
"         1.000   Pervious slope"
"         0.173   Impervious Area"
"        20.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.909   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.073     0.000     0.021     0.021 c.m/sec"
"              Catchment 201          Pervious   Impervious Total Area "
"              Surface Area           0.000      0.173      0.173      hectare"
"              Time of concentration  13.791     1.691      1.691      minutes"
"              Time to Centroid       115.937    88.619     88.619     minutes"
"              Rainfall depth         68.724     68.724     68.724     mm"
"              Rainfall volume        0.00       118.89     118.89     c.m"
"              Rainfall losses        43.739     6.244      6.244      mm"
"              Runoff depth           24.985     62.480     62.480     mm"
"              Runoff volume          0.00       108.09     108.09     c.m"
"              Runoff coefficient     0.000      0.909      0.909      "
"              Maximum flow           0.000      0.073      0.073      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.073     0.073     0.021     0.021"
" 51          PIPE DESIGN"
"         0.073   Current peak flow    c.m/sec"
```

```
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.169    metre"
"             Velocity                      1.514    m/sec"
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.197    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.073     0.073     0.073     0.021 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.089    c.m/sec"
"             Hydrograph volume           206.664    c.m"
"                     0.073     0.073     0.073     0.089"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.073     0.000     0.073     0.089"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ****************************"
"             * AREA 202 - COURTYARD AREA * "
"             ****************************"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   202- Courtyard"
"       60.000   % Impervious"
"        0.039   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.016   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.023   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.348   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.887   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.011     0.000     0.073     0.089 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.016      0.023      0.039      hectare"
"             Time of concentration  7.553      0.906      2.283      minutes"
"             Time to Centroid       108.279    87.524     91.824     minutes"
"             Rainfall depth         68.724     68.724     68.724     mm"
"             Rainfall volume        10.72      16.08      26.80      c.m"
"             Rainfall losses        44.836     7.781      22.603     mm"
"             Runoff depth           23.888     60.944     46.121     mm"
"             Runoff volume          3.73       14.26      17.99      c.m"
"             Runoff coefficient     0.348      0.887      0.671      "
"             Maximum flow           0.002      0.010      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.011     0.011     0.073     0.089"
" 51          PIPE DESIGN"
"        0.011   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.300   Diameter    metre"
"        0.400   Gradient   %"
"             Depth of flow                0.085    metre"
"             Velocity                     0.652    m/sec"
"             Pipe capacity                0.061    c.m/sec"
"             Critical depth               0.078    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                    0.011     0.011     0.011     0.089 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                 0.099    c.m/sec"
"             Hydrograph volume          224.651    c.m"
"                    0.011     0.011     0.011     0.099"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ******************************************"
"              * CONTROLLED - UNDERGROUND SWM STORAGE TANK * "
"              ******************************************"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                 0.099    c.m/sec"
"             Hydrograph volume          224.651    c.m"
"                    0.011     0.099     0.011     0.000"
" 54          POND DESIGN"
"        0.099   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        224.7   Hydrograph volume    c.m"
```

```
"          18.   Number of stages"
"       0.000   Minimum water level    metre"
"       3.550   Maximum water level    metre"
"       0.000   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"                 0.000     0.000     0.000"
"                0.05000   0.00140    17.000"
"                 0.1000   0.00180    33.900"
"                 0.1500   0.00220    50.900"
"                 0.2500   0.00270    84.900"
"                 0.3500   0.00320   118.800"
"                 0.4500   0.00360   152.800"
"                 0.5500   0.00400   186.700"
"                 0.6500   0.00430   220.700"
"                 0.7500   0.00460   254.600"
"                 0.8000   0.00470   271.600"
"                  3.050   0.00910   271.800"
"                  3.100   0.00920   272.000"
"                  3.150   0.00930   272.200"
"                  3.200   0.00940   272.400"
"                  3.250   0.00940   272.600"
"                  3.300   0.00950   272.800"
"                  3.350   0.00960   273.000"
"             Peak outflow                  0.004    c.m/sec"
"             Maximum level                 0.579    metre"
"             Maximum storage             196.572    c.m"
"             Centroidal lag               10.805   hours"
"                  0.011     0.099     0.004     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.011     0.004     0.004     0.000"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ************************************"
"             * AREA 203 - UNCONSTROLLED LAND AREA * "
"             ************************************"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   203- Uncontrolled land"
"       35.000   % Impervious"
"        0.148   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.096   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.052   Impervious Area"
```

```
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.348   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.887   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.026     0.004     0.004     0.000 c.m/sec"
"            Catchment 203          Pervious   Impervious Total Area "
"            Surface Area           0.096      0.052      0.148      hectare"
"            Time of concentration  7.553      0.906      3.706      minutes"
"            Time to Centroid       108.279    87.524     96.268     minutes"
"            Rainfall depth         68.724     68.724     68.724     mm"
"            Rainfall volume        66.11      35.60      101.71     c.m"
"            Rainfall losses        44.836     7.781      31.866     mm"
"            Runoff depth           23.888     60.944     36.858     mm"
"            Runoff volume          22.98      31.57      54.55      c.m"
"            Runoff coefficient     0.348      0.887      0.536      "
"            Maximum flow           0.012      0.023      0.026      c.m/sec"
" 81         ADD COMMENT================================================="
"          3  Lines of comment"
"            ************************************"
"            * TOTAL FLOW FROM PROPOSED SITE AREA *"
"            ************************************"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.026     0.028     0.004     0.000"
" 38         START/RE-START TOTALS 203"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                    1.034    hectare"
"            Total Impervious area                   0.664    hectare"
"            Total % impervious                     64.236"
" 19         EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:             \\10.120.26.4\j\WT\122727_1107MainStW\"
"                              7.0_Production\7.99_Submitted\FSR\Appendix B\SWM"
"                Output filename:                        122727-3hr Ch(50YR).out"
"                Licensee name:                                           install1"
"                Company                                                IBI Group"
"                Date & Time last used:                2020-01-29 at 4:27:44 PM"
" 81           ADD COMMENT================================================="
"           6  Lines of comment"
"              ************************************"
"              * 122727 - 1107 MAIN STREET WEST      *"
"              * CITY OF HAMILTON                    *"
"              * IBI GROUP                           *"
"              * JANUARY 2020                        *"
"              ************************************"
" 31           TIME PARAMETERS"
"         5.000   Time Step"
"       180.000   Max. Storm length"
"      3600.000   Max. Hydrograph"
" 81           ADD COMMENT================================================="
"           4  Lines of comment"
"              ****************************"
"              *   50 YEAR CHICAGO STORM   *"
"              * MOUNT HOPE IDF PARAMETERS *"
"              ****************************"
" 32           STORM Chicago storm"
"             1   Chicago storm"
"      1954.800   Coefficient A"
"        10.000   Constant B"
"         0.826   Exponent C"
"         0.400   Fraction R"
"       180.000   Duration"
"         1.000   Time step multiplier"
"              Maximum intensity           208.762    mm/hr"
"              Total depth                  76.908    mm"
"             6   050hyd   Hydrograph extension used in this file"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
"              ***********************"
"              * EXISTING CONDITIONS *"
"              ***********************"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
"              *********************************"
"              * AREA 101 - EXISTING SITE AREA *"
"              *********************************"
" 33           CATCHMENT 101"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   101- Exisitng site"
"       50.000   % Impervious"
"        0.516   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.258   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.258   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.381   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.917   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.125     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.258      0.258      0.516      hectare"
"             Time of concentration  15.802     1.980      6.041      minutes"
"             Time to Centroid       118.106    88.795     97.406     minutes"
"             Rainfall depth         76.908     76.908     76.908     mm"
"             Rainfall volume        198.42     198.42     396.85     c.m"
"             Rainfall losses        47.583     6.412      26.998     mm"
"             Runoff depth           29.325     70.496     49.911     mm"
"             Runoff volume          75.66      181.88     257.54     c.m"
"             Runoff coefficient     0.381      0.917      0.649      "
"             Maximum flow           0.028      0.120      0.125      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"             ************************************"
"             * TOTAL FLOW FROM EXISTING SITE AREA *"
"             ************************************"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.125     0.125     0.000     0.000"
" 51          PIPE DESIGN"
"        0.125   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.234    metre"
```

```
"             Velocity                       1.724    m/sec"
"             Pipe capacity                  0.175    c.m/sec"
"             Critical depth                 0.261    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.125     0.125     0.125     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Runoff from existing site"
"             Maximum flow                   0.125    c.m/sec"
"             Hydrograph volume            257.539    c.m"
"                     0.125     0.125     0.125     0.125"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.125     0.000     0.125     0.125"
" 81          ADD COMMENT=================================================="
"           3  Lines of comment"
"              **********************"
"              * PROPSOED CONDITIONS *"
"              **********************"
" 81          ADD COMMENT=================================================="
"           3  Lines of comment"
"              ************************************"
"              * AREA 200 - ROOFTOP SWM STORAGE AREA *"
"              ************************************"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          200   200- Rooftop stormwater storage"
"       100.000   % Impervious"
"         0.158   Total Area"
"        20.000   Flow length"
"         1.000   Overland Slope"
"         0.000   Pervious Area"
"        20.000   Pervious length"
"         1.000   Pervious slope"
"         0.158   Impervious Area"
"        20.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.917   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.076     0.000     0.125     0.125 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.158      0.158      hectare"
"             Time of concentration  12.582     1.609      1.609      minutes"
"             Time to Centroid       113.690    88.202     88.202     minutes"
"             Rainfall depth         76.908     76.908     76.908     mm"
"             Rainfall volume        0.00       121.51     121.52     c.m"
"             Rainfall losses        46.385     6.417      6.417      mm"
"             Runoff depth           30.524     70.491     70.491     mm"
"             Runoff volume          0.00       111.38     111.38     c.m"
"             Runoff coefficient     0.000      0.917      0.917      "
"             Maximum flow           0.000      0.076      0.076      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.076     0.076     0.125     0.125"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             **********************************"
"             * CONTROLLED - ROOFTOP SWM STORAGE * "
"             **********************************"
" 54          POND DESIGN"
"        0.076   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"        111.4   Hydrograph volume    c.m"
"           7.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.152   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02540   0.00456    0.3700"
"                 0.05080   0.00912     2.970"
"                 0.07620   0.01368    10.030"
"                  0.1016   0.01824    23.780"
"                  0.1270   0.02280    46.450"
"                  0.1524   0.02736    83.260"
"             Peak outflow                  0.022    c.m/sec"
"             Maximum level                 0.122    metre"
"             Maximum storage              41.948    c.m"
"             Centroidal lag                1.793   hours"
"                  0.076     0.076     0.022     0.125 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.022    c.m/sec"
"             Hydrograph volume           111.453    c.m"
"                     0.076     0.076     0.022     0.022"
```

```
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.076     0.000     0.022     0.022"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              *********************************************  "
"              * AREA 201 - ROOFTOP AREA WITHOUT SWM STORAGE *  "
"              *********************************************"
" 33          CATCHMENT 201"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           201   201- Rooftop without storage"
"       100.000   % Impervious"
"         0.173   Total Area"
"        20.000   Flow length"
"         1.000   Overland Slope"
"         0.000   Pervious Area"
"        20.000   Pervious length"
"         1.000   Pervious slope"
"         0.173   Impervious Area"
"        20.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.917   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.083     0.000     0.022     0.022 c.m/sec"
"              Catchment 201          Pervious   Impervious Total Area "
"              Surface Area           0.000      0.173      0.173      hectare"
"              Time of concentration  12.582     1.609      1.609      minutes"
"              Time to Centroid       113.690    88.202     88.202     minutes"
"              Rainfall depth         76.908     76.908     76.908     mm"
"              Rainfall volume        0.00       133.05     133.05     c.m"
"              Rainfall losses        46.385     6.417      6.417      mm"
"              Runoff depth           30.524     70.491     70.491     mm"
"              Runoff volume          0.00       121.95     121.95     c.m"
"              Runoff coefficient     0.000      0.917      0.917      "
"              Maximum flow           0.000      0.083      0.083      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.083     0.083     0.022     0.022"
" 51          PIPE DESIGN"
"         0.083   Current peak flow    c.m/sec"
```

```
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.182    metre"
"             Velocity                      1.566    m/sec"
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.211    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.083     0.083     0.083     0.022 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.100    c.m/sec"
"             Hydrograph volume           233.402    c.m"
"                     0.083     0.083     0.083     0.100"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.083     0.000     0.083     0.100"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ****************************"
"             * AREA 202 - COURTYARD AREA * "
"             ****************************"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   202- Courtyard"
"       60.000   % Impervious"
"        0.039   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.016   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.023   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.379   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.891   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.013     0.000     0.083     0.100 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.016      0.023      0.039      hectare"
"             Time of concentration  6.878      0.862      2.190      minutes"
"             Time to Centroid       106.727    87.204     91.514     minutes"
"             Rainfall depth         76.908     76.908     76.908     mm"
"             Rainfall volume        12.00      18.00      29.99      c.m"
"             Rainfall losses        47.780     8.361      24.128     mm"
"             Runoff depth           29.129     68.548     52.780     mm"
"             Runoff volume          4.54       16.04      20.58      c.m"
"             Runoff coefficient     0.379      0.891      0.686      "
"             Maximum flow           0.002      0.012      0.013      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.013     0.013     0.083     0.100"
" 51          PIPE DESIGN"
"        0.013   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.300   Diameter    metre"
"        0.400   Gradient   %"
"             Depth of flow                0.092    metre"
"             Velocity                     0.680    m/sec"
"             Pipe capacity                0.061    c.m/sec"
"             Critical depth               0.084    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                    0.013     0.013     0.013     0.100 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                 0.112    c.m/sec"
"             Hydrograph volume          253.987    c.m"
"                    0.013     0.013     0.013     0.112"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ******************************************"
"              * CONTROLLED - UNDERGROUND SWM STORAGE TANK * "
"              ******************************************"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                 0.112    c.m/sec"
"             Hydrograph volume          253.987    c.m"
"                    0.013     0.112     0.013     0.000"
" 54          POND DESIGN"
"        0.112   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        254.0   Hydrograph volume    c.m"
```

```
"          18.   Number of stages"
"       0.000   Minimum water level    metre"
"       3.550   Maximum water level    metre"
"       0.000   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"                 0.000     0.000     0.000"
"               0.05000   0.00140    17.000"
"                0.1000   0.00180    33.900"
"                0.1500   0.00220    50.900"
"                0.2500   0.00270    84.900"
"                0.3500   0.00320   118.800"
"                0.4500   0.00360   152.800"
"                0.5500   0.00400   186.700"
"                0.6500   0.00430   220.700"
"                0.7500   0.00460   254.600"
"                0.8000   0.00470   271.600"
"                 3.050   0.00910   271.800"
"                 3.100   0.00920   272.000"
"                 3.150   0.00930   272.200"
"                 3.200   0.00940   272.400"
"                 3.250   0.00940   272.600"
"                 3.300   0.00950   272.800"
"                 3.350   0.00960   273.000"
"             Peak outflow                  0.004    c.m/sec"
"             Maximum level                 0.660    metre"
"             Maximum storage             224.173    c.m"
"             Centroidal lag               11.423   hours"
"                  0.013     0.112     0.004     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.013     0.004     0.004     0.000"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ************************************"
"             * AREA 203 - UNCONSTROLLED LAND AREA * "
"             ************************************"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   203- Uncontrolled land"
"       35.000   % Impervious"
"        0.148   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.096   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.052   Impervious Area"
```

```
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.379   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.891   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.031     0.004     0.004     0.000 c.m/sec"
"            Catchment 203          Pervious   Impervious Total Area "
"            Surface Area           0.096      0.052      0.148      hectare"
"            Time of concentration  6.878      0.862      3.516      minutes"
"            Time to Centroid       106.727    87.204     95.815     minutes"
"            Rainfall depth         76.908     76.908     76.908     mm"
"            Rainfall volume        73.99      39.84      113.82     c.m"
"            Rainfall losses        47.780     8.361      33.983     mm"
"            Runoff depth           29.129     68.548     42.925     mm"
"            Runoff volume          28.02      35.51      63.53      c.m"
"            Runoff coefficient     0.379      0.891      0.558      "
"            Maximum flow           0.015      0.026      0.031      c.m/sec"
" 81         ADD COMMENT================================================="
"          3  Lines of comment"
"            ************************************"
"            * TOTAL FLOW FROM PROPOSED SITE AREA *"
"            ************************************"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.031     0.034     0.004     0.000"
" 38         START/RE-START TOTALS 203"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                    1.034    hectare"
"            Total Impervious area                   0.664    hectare"
"            Total % impervious                     64.236"
" 19         EXIT"
```

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                            Version 2.25  rev. 473"
"               MIDUSS created                          Sunday, February 7, 2010"
"          10   Units used:                                            ie METRIC"
"               Job folder:             \\10.120.26.4\j\WT\122727_1107MainStW\"
"                              7.0_Production\7.99_Submitted\FSR\Appendix B\SWM"
"               Output filename:                      122727-3hr Ch(100YR).out"
"               Licensee name:                                         install1"
"               Company                                               IBI Group"
"               Date & Time last used:                2020-01-29 at 4:22:32 PM"
" 81          ADD COMMENT================================================="
"          6  Lines of comment"
"             ************************************"
"             * 122727 - 1107 MAIN STREET WEST      *"
"             * CITY OF HAMILTON                    *"
"             * IBI GROUP                           *"
"             * JANUARY 2020                        *"
"             ************************************"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 81          ADD COMMENT================================================="
"          4  Lines of comment"
"             ****************************"
"             *  100 YEAR CHICAGO STORM   *"
"             * MOUNT HOPE IDF PARAMETERS *"
"             ****************************"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2317.400   Coefficient A"
"       11.000   Constant B"
"        0.836   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           228.222    mm/hr"
"             Total depth                  86.135    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ***********************"
"             * EXISTING CONDITIONS *"
"             ***********************"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             *********************************"
"             * AREA 101 - EXISTING SITE AREA *"
"             *********************************"
" 33          CATCHMENT 101"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   101- Exisitng site"
"       50.000   % Impervious"
"        0.516   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.258   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.258   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.415   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.924   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.141     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.258      0.258      0.516      hectare"
"             Time of concentration  14.629     1.908      5.855      minutes"
"             Time to Centroid       115.787    88.362     96.871     minutes"
"             Rainfall depth         86.135     86.135     86.135     mm"
"             Rainfall volume        222.23     222.23     444.46     c.m"
"             Rainfall losses        50.350     6.577      28.463     mm"
"             Runoff depth           35.785     79.557     57.671     mm"
"             Runoff volume          92.33      205.26     297.58     c.m"
"             Runoff coefficient     0.415      0.924      0.670      "
"             Maximum flow           0.036      0.133      0.141      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"             ************************************"
"             * TOTAL FLOW FROM EXISTING SITE AREA *"
"             ************************************"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.141     0.141     0.000     0.000"
" 51          PIPE DESIGN"
"        0.141   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.254    metre"
```

```
"             Velocity                      1.764    m/sec"
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.276    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.141     0.141     0.141     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Runoff from existing site"
"             Maximum flow                  0.141    c.m/sec"
"             Hydrograph volume           297.584    c.m"
"                     0.141     0.141     0.141     0.141"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.141     0.000     0.141     0.141"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              **********************"
"              * PROPSOED CONDITIONS *"
"              **********************"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * AREA 200 - ROOFTOP SWM STORAGE AREA *"
"              ************************************"
" 33          CATCHMENT 200"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           200   200- Rooftop stormwater storage"
"       100.000   % Impervious"
"         0.158   Total Area"
"        20.000   Flow length"
"         1.000   Overland Slope"
"         0.000   Pervious Area"
"        20.000   Pervious length"
"         1.000   Pervious slope"
"         0.158   Impervious Area"
"        20.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.924   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.084     0.000     0.141     0.141 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.158      0.158      hectare"
"             Time of concentration  11.669     1.550      1.550      minutes"
"             Time to Centroid       111.711    87.838     87.838     minutes"
"             Rainfall depth         86.135     86.135     86.135     mm"
"             Rainfall volume        0.00       136.09     136.09     c.m"
"             Rainfall losses        49.069     6.578      6.579      mm"
"             Runoff depth           37.065     79.556     79.556     mm"
"             Runoff volume          0.00       125.70     125.70     c.m"
"             Runoff coefficient     0.000      0.924      0.924      "
"             Maximum flow           0.000      0.084      0.084      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.084     0.084     0.141     0.141"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             **********"
"             * CONTROLLED - ROOFTOP SWM STORAGE * "
"             **********"
" 54          POND DESIGN"
"        0.084   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"        125.7   Hydrograph volume    c.m"
"           7.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.152   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02540   0.00456    0.3700"
"                 0.05080   0.00912     2.970"
"                 0.07620   0.01368    10.030"
"                  0.1016   0.01824    23.780"
"                  0.1270   0.02280    46.450"
"                  0.1524   0.02736    83.260"
"             Peak outflow                  0.023    c.m/sec"
"             Maximum level                 0.129    metre"
"             Maximum storage              49.141    c.m"
"             Centroidal lag                1.826   hours"
"                  0.084     0.084     0.023     0.141 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.023    c.m/sec"
"             Hydrograph volume           125.754    c.m"
"                     0.084     0.084     0.023     0.023"
```

```
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.084     0.000     0.023     0.023"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              *********************************************  "
"              * AREA 201 - ROOFTOP AREA WITHOUT SWM STORAGE *  "
"              *********************************************"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   201- Rooftop without storage"
"       100.000   % Impervious"
"         0.173   Total Area"
"        20.000   Flow length"
"         1.000   Overland Slope"
"         0.000   Pervious Area"
"        20.000   Pervious length"
"         1.000   Pervious slope"
"         0.173   Impervious Area"
"        20.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.924   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.092     0.000     0.023     0.023 c.m/sec"
"              Catchment 201          Pervious   Impervious Total Area "
"              Surface Area           0.000      0.173      0.173      hectare"
"              Time of concentration  11.669     1.550      1.550      minutes"
"              Time to Centroid       111.711    87.838     87.838     minutes"
"              Rainfall depth         86.135     86.135     86.135     mm"
"              Rainfall volume        0.00       149.01     149.01     c.m"
"              Rainfall losses        49.069     6.578      6.579      mm"
"              Runoff depth           37.065     79.556     79.556     mm"
"              Runoff volume          0.00       137.63     137.63     c.m"
"              Runoff coefficient     0.000      0.924      0.924      "
"              Maximum flow           0.000      0.092      0.092      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.092     0.092     0.023     0.023"
" 51          PIPE DESIGN"
"         0.092   Current peak flow    c.m/sec"
```

```
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.193    metre"
"             Velocity                      1.608    m/sec"
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.223    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.092     0.092     0.092     0.023 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.110    c.m/sec"
"             Hydrograph volume           263.386    c.m"
"                     0.092     0.092     0.092     0.110"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.092     0.000     0.092     0.110"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ****************************"
"             * AREA 202 - COURT YARD AREA * "
"             ****************************"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   202- Courtyard"
"       60.000   % Impervious"
"        0.039   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.016   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.023   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.412   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.896   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.014     0.000     0.092     0.110 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.016      0.023      0.039      hectare"
"             Time of concentration  6.368      0.831      2.131      minutes"
"             Time to Centroid       105.229    86.939     91.233     minutes"
"             Rainfall depth         86.135     86.135     86.135     mm"
"             Rainfall volume        13.44      20.16      33.59      c.m"
"             Rainfall losses        50.622     8.985      25.640     mm"
"             Runoff depth           35.513     77.149     60.495     mm"
"             Runoff volume          5.54       18.05      23.59      c.m"
"             Runoff coefficient     0.412      0.896      0.702      "
"             Maximum flow           0.003      0.013      0.014      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.014     0.014     0.092     0.110"
" 51          PIPE DESIGN"
"         0.014   Current peak flow    c.m/sec"
"         0.013   Manning 'n'"
"         0.300   Diameter    metre"
"         0.400   Gradient   %"
"              Depth of flow                0.098    metre"
"              Velocity                     0.703    m/sec"
"              Pipe capacity                0.061    c.m/sec"
"              Critical depth               0.090    metre"
" 53          ROUTE Zero Route"
"          0.00   Zero Route Reach length   ( metre)"
"                    0.014     0.014     0.014     0.110 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.124    c.m/sec"
"             Hydrograph volume           286.979    c.m"
"                    0.014     0.014     0.014     0.124"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ******************************************"
"              * CONTROLLED - UNDERGROUND SWM STORAGE TANK * "
"              ******************************************"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.124    c.m/sec"
"             Hydrograph volume           286.979    c.m"
"                    0.014     0.124     0.014     0.000"
" 54          POND DESIGN"
"         0.124   Current peak flow    c.m/sec"
"         0.001   Target outflow    c.m/sec"
"         287.0   Hydrograph volume    c.m"
```

```
"          18.   Number of stages"
"       0.000   Minimum water level    metre"
"       3.550   Maximum water level    metre"
"       0.000   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"                 0.000     0.000     0.000"
"               0.05000   0.00140    17.000"
"                0.1000   0.00180    33.900"
"                0.1500   0.00220    50.900"
"                0.2500   0.00270    84.900"
"                0.3500   0.00320   118.800"
"                0.4500   0.00360   152.800"
"                0.5500   0.00400   186.700"
"                0.6500   0.00430   220.700"
"                0.7500   0.00460   254.600"
"                0.8000   0.00470   271.600"
"                 3.050   0.00910   271.800"
"                 3.100   0.00920   272.000"
"                 3.150   0.00930   272.200"
"                 3.200   0.00940   272.400"
"                 3.250   0.00940   272.600"
"                 3.300   0.00950   272.800"
"                 3.350   0.00960   273.000"
"             Peak outflow                  0.005    c.m/sec"
"             Maximum level                 0.752    metre"
"             Maximum storage             255.307    c.m"
"             Centroidal lag               12.085   hours"
"                  0.014     0.124     0.005     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"           5   Next link "
"                    0.014     0.005     0.005     0.000"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ************************************"
"             * AREA 203 - UNCONSTROLLED LAND AREA * "
"             ************************************"
" 33          CATCHMENT 203"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         203   203- Uncontrolled land"
"      35.000   % Impervious"
"       0.148   Total Area"
"      10.000   Flow length"
"       2.000   Overland Slope"
"       0.096   Pervious Area"
"      10.000   Pervious length"
"       2.000   Pervious slope"
"       0.052   Impervious Area"
```

```
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.412   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.896   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.036     0.005     0.005     0.000 c.m/sec"
"            Catchment 203          Pervious   Impervious Total Area "
"            Surface Area           0.096      0.052      0.148      hectare"
"            Time of concentration  6.368      0.831      3.382      minutes"
"            Time to Centroid       105.229    86.939     95.368     minutes"
"            Rainfall depth         86.135     86.135     86.135     mm"
"            Rainfall volume        82.86      44.62      127.48     c.m"
"            Rainfall losses        50.622     8.985      36.049     mm"
"            Runoff depth           35.513     77.149     50.086     mm"
"            Runoff volume          34.16      39.96      74.13      c.m"
"            Runoff coefficient     0.412      0.896      0.581      "
"            Maximum flow           0.019      0.028      0.036      c.m/sec"
" 81         ADD COMMENT================================================="
"          3  Lines of comment"
"            ************************************"
"            * TOTAL FLOW FROM PROPOSED SITE AREA *"
"            ************************************"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.036     0.039     0.005     0.000"
" 38         START/RE-START TOTALS 203"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                    1.034    hectare"
"            Total Impervious area                   0.664    hectare"
"            Total % impervious                     64.236"
" 19         EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:            \\10.120.26.4\j\WT\122727_1107MainStW\"
"                              7.0_Production\7.99_Submitted\FSR\Appendix B\SWM"
"                Output filename:                          122727-6hr H(2YR).out"
"                Licensee name:                                          install1"
"                Company                                               IBI Group"
"                Date & Time last used:                2020-01-29 at 3:46:34 PM"
" 81           ADD COMMENT================================================="
"           6  Lines of comment"
"              ************************************"
"              * 122727 - 1107 MAIN STREET WEST      *"
"              * CITY OF HAMILTON                    *"
"              * IBI GROUP                           *"
"              * JANUARY 2020                        *"
"              ************************************"
" 31           TIME PARAMETERS"
"        10.000   Time Step"
"       360.000   Max. Storm length"
"      3600.000   Max. Hydrograph"
" 81           ADD COMMENT================================================="
"           4  Lines of comment"
"              ****************************"
"              *  2 YEAR 6 HOUR SCS STORM  *"
"              * MOUNT HOPE IDF PARAMETERS *"
"              ****************************"
" 32           STORM Historic"
"             5   Historic"
"       360.000   Duration"
"        36.000   Rainfall intensity values"
"                   1.590     1.590     1.590     2.380     2.380"
"                   2.380     2.380     2.380     2.380     3.970"
"                   3.970     3.970     4.760     4.760     4.760"
"                  23.820    42.880    61.930     8.730     8.730"
"                   8.730     3.970     3.970     3.970     3.180"
"                   3.180     3.180     2.380     2.380     2.380"
"                   1.590     1.590     1.590     1.590     1.590"
"                   1.590"
"              Maximum intensity            61.930    mm/hr"
"              Total depth                  39.698    mm"
"             6   002hyd   Hydrograph extension used in this file"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
"              ***********************"
"              * EXISTING CONDITIONS *"
"              ***********************"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
```

```
"             *********************************"
"             * AREA 101 - EXISTING SITE AREA *"
"             *********************************"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   101- Exisitng site"
"       50.000   % Impervious"
"        0.516   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.258   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.258   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.199   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.861   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.040     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.258      0.258      0.516      hectare"
"             Time of concentration  29.434     3.238      8.150      minutes"
"             Time to Centroid       258.018    193.655    205.724    minutes"
"             Rainfall depth         39.698     39.698     39.698     mm"
"             Rainfall volume        102.42     102.42     204.84     c.m"
"             Rainfall losses        31.814     5.535      18.675     mm"
"             Runoff depth           7.884      34.163     21.024     mm"
"             Runoff volume          20.34      88.14      108.48     c.m"
"             Runoff coefficient     0.199      0.861      0.530      "
"             Maximum flow           0.005      0.039      0.040      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"             *************************************"
"             * TOTAL FLOW FROM EXISTING SITE AREA *"
"             *************************************"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.040     0.040     0.000     0.000"
" 51          PIPE DESIGN"
"         0.040   Current peak flow    c.m/sec"
```

```
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.122    metre"
"             Velocity                      1.289    m/sec"
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.145    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.040     0.040     0.040     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Runoff from existing site"
"             Maximum flow                  0.040    c.m/sec"
"             Hydrograph volume           108.482    c.m"
"                     0.040     0.040     0.040     0.040"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.040     0.000     0.040     0.040"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             **********************"
"             * PROPSOED CONDITIONS *"
"             **********************"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ************************************"
"             * AREA 200 - ROOFTOP SWM STORAGE AREA *"
"             ************************************"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          200   200- Rooftop stormwater storage"
"      100.000   % Impervious"
"        0.158   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.158   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
```

```
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.854   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.024     0.000     0.040     0.040 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.158      0.158      hectare"
"             Time of concentration  23.294     2.630      2.630      minutes"
"             Time to Centroid       248.413    192.972    192.972    minutes"
"             Rainfall depth         39.698     39.698     39.698     mm"
"             Rainfall volume        0.00       62.72      62.72      c.m"
"             Rainfall losses        31.291     5.795      5.795      mm"
"             Runoff depth           8.407      33.903     33.903     mm"
"             Runoff volume          0.00       53.57      53.57      c.m"
"             Runoff coefficient     0.000      0.854      0.854      "
"             Maximum flow           0.000      0.024      0.024      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                     0.024     0.024     0.040     0.040"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ************************************"
"             * CONTROLLED - ROOFTOP SWM STORAGE * "
"             ************************************"
" 54          POND DESIGN"
"        0.024   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"         53.6   Hydrograph volume    c.m"
"           7.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.152   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02540   0.00456    0.3700"
"                 0.05080   0.00912     2.970"
"                 0.07620   0.01368    10.030"
"                  0.1016   0.01824    23.780"
"                  0.1270   0.02280    46.450"
"                  0.1524   0.02736    83.260"
"             Peak outflow                  0.014    c.m/sec"
"             Maximum level                 0.077    metre"
"             Maximum storage              10.490    c.m"
"             Centroidal lag                3.323   hours"
"                  0.024     0.024     0.014     0.040 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
```

```
"               Runoff to underground storage tank"
"            Maximum flow                  0.014    c.m/sec"
"            Hydrograph volume            54.070    c.m"
"                    0.024     0.024     0.014     0.014"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.024     0.000     0.014     0.014"
" 81         ADD COMMENT================================================="
"          3  Lines of comment"
"             ******************************************  "
"             * AREA 201 - ROOFTOP AREA WITHOUT SWM STORAGE *  "
"             ******************************************"
" 33         CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   201- Rooftop without storage"
"      100.000   % Impervious"
"        0.173   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.173   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.854   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.026     0.000     0.014     0.014 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.000      0.173      0.173      hectare"
"            Time of concentration  23.294     2.630      2.630      minutes"
"            Time to Centroid       248.413    192.972    192.972    minutes"
"            Rainfall depth         39.698     39.698     39.698     mm"
"            Rainfall volume        0.00       68.68      68.68      c.m"
"            Rainfall losses        31.291     5.795      5.795      mm"
"            Runoff depth           8.407      33.903     33.903     mm"
"            Runoff volume          0.00       58.65      58.65      c.m"
"            Runoff coefficient     0.000      0.854      0.854      "
"            Maximum flow           0.000      0.026      0.026      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.026     0.026     0.014     0.014"
" 51          PIPE DESIGN"
"        0.026   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        0.500   Gradient   %"
"             Depth of flow                 0.117    metre"
"             Velocity                      0.891    m/sec"
"             Pipe capacity                 0.124    c.m/sec"
"             Critical depth                0.116    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.026     0.026     0.026     0.014 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.039    c.m/sec"
"             Hydrograph volume           112.722    c.m"
"                     0.026     0.026     0.026     0.039"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.026     0.000     0.026     0.039"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ****************************"
"             * AREA 202 - COURTYARD AREA * "
"             ****************************"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   202- Courtyard"
"       60.000   % Impervious"
"        0.039   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.016   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.023   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.197   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.813   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.004     0.000     0.026     0.039 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.016      0.023      0.039      hectare"
"             Time of concentration  12.812     1.409      2.991      minutes"
"             Time to Centroid       234.635    191.495    197.479    minutes"
"             Rainfall depth         39.698     39.698     39.698     mm"
"             Rainfall volume        6.19       9.29       15.48      c.m"
"             Rainfall losses        31.897     7.407      17.203     mm"
"             Runoff depth           7.802      32.291     22.495     mm"
"             Runoff volume          1.22       7.56       8.77       c.m"
"             Runoff coefficient     0.197      0.813      0.567      "
"             Maximum flow           0.000      0.003      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.004     0.004     0.026     0.039"
" 51          PIPE DESIGN"
"        0.004   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.300   Diameter    metre"
"        0.400   Gradient   %"
"             Depth of flow                 0.050    metre"
"             Velocity                      0.475    m/sec"
"             Pipe capacity                 0.061    c.m/sec"
"             Critical depth                0.045    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.004     0.004     0.004     0.039 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.043    c.m/sec"
"             Hydrograph volume           121.495    c.m"
"                     0.004     0.004     0.004     0.043"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ******************************************"
"              * CONTROLLED - UNDERGROUND SWM STORAGE TANK * "
"              ******************************************"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.043    c.m/sec"
"             Hydrograph volume           121.495    c.m"
"                     0.004     0.043     0.004     0.000"
```

```
" 54          POND DESIGN"
"        0.043   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        121.5   Hydrograph volume    c.m"
"          18.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.550   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.05000   0.00140    17.000"
"                  0.1000   0.00180    33.900"
"                  0.1500   0.00220    50.900"
"                  0.2500   0.00270    84.900"
"                  0.3500   0.00320   118.800"
"                  0.4500   0.00360   152.800"
"                  0.5500   0.00400   186.700"
"                  0.6500   0.00430   220.700"
"                  0.7500   0.00460   254.600"
"                  0.8000   0.00470   271.600"
"                   3.050   0.00910   271.800"
"                   3.100   0.00920   272.000"
"                   3.150   0.00930   272.200"
"                   3.200   0.00940   272.400"
"                   3.250   0.00940   272.600"
"                   3.300   0.00950   272.800"
"                   3.350   0.00960   273.000"
"              Peak outflow                  0.003    c.m/sec"
"              Maximum level                 0.267    metre"
"              Maximum storage              90.724    c.m"
"              Centroidal lag                9.793   hours"
"                   0.004     0.043     0.003     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"             5   Next link "
"                      0.004     0.003     0.003     0.000"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * AREA 203 - UNCONSTROLLED LAND AREA * "
"              ************************************"
" 33          CATCHMENT 203"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           203   203- Uncontrolled land"
"        35.000   % Impervious"
"         0.148   Total Area"
"        10.000   Flow length"
"         2.000   Overland Slope"
```

```
"        0.096   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.052   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.197   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.813   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.009     0.003     0.003     0.000 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.096      0.052      0.148      hectare"
"             Time of concentration  12.812     1.409      4.941      minutes"
"             Time to Centroid       234.635    191.495    204.856    minutes"
"             Rainfall depth         39.698     39.698     39.698     mm"
"             Rainfall volume        38.19      20.56      58.75      c.m"
"             Rainfall losses        31.897     7.407      23.325     mm"
"             Runoff depth           7.802      32.291     16.373     mm"
"             Runoff volume          7.51       16.73      24.23      c.m"
"             Runoff coefficient     0.197      0.813      0.412      "
"             Maximum flow           0.003      0.008      0.009      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * TOTAL FLOW FROM PROPOSED SITE AREA *"
"              ************************************"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.009     0.011     0.003     0.000"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      1.034    hectare"
"             Total Impervious area                     0.664    hectare"
"             Total % impervious                       64.236"
" 19          EXIT"
```

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                            Version 2.25  rev. 473"
"               MIDUSS created                          Sunday, February 7, 2010"
"          10   Units used:                                            ie METRIC"
"               Job folder:            \\10.120.26.4\j\WT\122727_1107MainStW\"
"                             7.0_Production\7.99_Submitted\FSR\Appendix B\SWM"
"               Output filename:                          122727-6hr H(5YR).out"
"               Licensee name:                                          install1"
"               Company                                               IBI Group"
"               Date & Time last used:                2020-01-29 at 3:24:17 PM"
" 81          ADD COMMENT================================================="
"          6  Lines of comment"
"             ************************************"
"             * 122727 - 1107 MAIN STREET WEST      *"
"             * CITY OF HAMILTON                    *"
"             * IBI GROUP                           *"
"             * JANUARY 2020                        *"
"             ************************************"
" 31          TIME PARAMETERS"
"       10.000   Time Step"
"      360.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 81          ADD COMMENT================================================="
"          4  Lines of comment"
"             ****************************"
"             *  5 YEAR 6 HOUR SCS STORM  *"
"             * MOUNT HOPE IDF PARAMETERS *"
"             ****************************"
" 32          STORM Historic"
"            5   Historic"
"      360.000   Duration"
"       36.000   Rainfall intensity values"
"                  2.260     2.260     2.260     3.390     3.390"
"                  3.390     3.390     3.390     3.390     5.650"
"                  5.650     5.650     6.780     6.780     6.780"
"                 33.900    61.020    88.140    12.430    12.430"
"                 12.430     5.650     5.650     5.650     4.520"
"                  4.520     4.520     3.390     3.390     3.390"
"                  2.260     2.260     2.260     2.260     2.260"
"                  2.260"
"             Maximum intensity            88.140    mm/hr"
"             Total depth                  56.500    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ***********************"
"             * EXISTING CONDITIONS *"
"             ***********************"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
```

```
"            *********************************"
"            * AREA 101 - EXISTING SITE AREA *"
"            *********************************"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   101- Exisitng site"
"       50.000   % Impervious"
"        0.516   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.258   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.258   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.292   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.892   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.062     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.258      0.258      0.516      hectare"
"             Time of concentration  21.926     2.794      7.515      minutes"
"             Time to Centroid       242.383    191.167    203.805    minutes"
"             Rainfall depth         56.500     56.500     56.500     mm"
"             Rainfall volume        145.77     145.77     291.54     c.m"
"             Rainfall losses        39.995     6.116      23.056     mm"
"             Runoff depth           16.505     50.384     33.444     mm"
"             Runoff volume          42.58      129.99     172.57     c.m"
"             Runoff coefficient     0.292      0.892      0.592      "
"             Maximum flow           0.012      0.057      0.062      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"             ************************************"
"             * TOTAL FLOW FROM EXISTING SITE AREA *"
"             ************************************"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.062     0.062     0.000     0.000"
" 51          PIPE DESIGN"
"         0.062   Current peak flow    c.m/sec"
```

```
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.154    metre"
"             Velocity                      1.449    m/sec"
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.180    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.062     0.062     0.062     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Runoff from existing site"
"             Maximum flow                  0.062    c.m/sec"
"             Hydrograph volume           172.573    c.m"
"                     0.062     0.062     0.062     0.062"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.062     0.000     0.062     0.062"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             **********************"
"             * PROPSOED CONDITIONS *"
"             **********************"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ************************************"
"             * AREA 200 - ROOFTOP SWM STORAGE AREA *"
"             ************************************"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          200   200- Rooftop stormwater storage"
"      100.000   % Impervious"
"        0.158   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.158   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
```

```
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.877   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.035     0.000     0.062     0.062 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.158      0.158      hectare"
"             Time of concentration  17.471     2.269      2.269      minutes"
"             Time to Centroid       235.454    190.292    190.292    minutes"
"             Rainfall depth         56.500     56.500     56.500     mm"
"             Rainfall volume        0.00       89.27      89.27      c.m"
"             Rainfall losses        39.143     6.927      6.927      mm"
"             Runoff depth           17.357     49.573     49.573     mm"
"             Runoff volume          0.00       78.32      78.32      c.m"
"             Runoff coefficient     0.000      0.877      0.877      "
"             Maximum flow           0.000      0.035      0.035      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.035     0.035     0.062     0.062"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ***********************************"
"             * CONTROLLED - ROOFTOP SWM STORAGE * "
"             ***********************************"
" 54          POND DESIGN"
"        0.035   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"         78.3   Hydrograph volume    c.m"
"           7.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.152   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02540   0.00456    0.3700"
"                 0.05080   0.00912     2.970"
"                 0.07620   0.01368    10.030"
"                  0.1016   0.01824    23.780"
"                  0.1270   0.02280    46.450"
"                  0.1524   0.02736    83.260"
"             Peak outflow                  0.017    c.m/sec"
"             Maximum level                 0.093    metre"
"             Maximum storage              18.996    c.m"
"             Centroidal lag                3.328   hours"
"                  0.035     0.035     0.017     0.062 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
```

```
"               Runoff to underground storage tank"
"            Maximum flow                  0.017    c.m/sec"
"            Hydrograph volume            77.191    c.m"
"                    0.035     0.035     0.017     0.017"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.035     0.000     0.017     0.017"
" 81         ADD COMMENT================================================="
"          3  Lines of comment"
"             *******************************************  "
"             * AREA 201 - ROOFTOP AREA WITHOUT SWM STORAGE *  "
"             *******************************************"
" 33         CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   201- Rooftop without storage"
"      100.000   % Impervious"
"        0.173   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.173   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.877   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.038     0.000     0.017     0.017 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.000      0.173      0.173      hectare"
"            Time of concentration  17.471     2.269      2.269      minutes"
"            Time to Centroid       235.455    190.292    190.293    minutes"
"            Rainfall depth         56.500     56.500     56.500     mm"
"            Rainfall volume        0.00       97.74      97.75      c.m"
"            Rainfall losses        39.143     6.927      6.927      mm"
"            Runoff depth           17.357     49.573     49.573     mm"
"            Runoff volume          0.00       85.76      85.76      c.m"
"            Runoff coefficient     0.000      0.877      0.877      "
"            Maximum flow           0.000      0.038      0.038      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.038     0.038     0.017     0.017"
" 51          PIPE DESIGN"
"        0.038   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        0.500   Gradient   %"
"             Depth of flow                 0.142    metre"
"             Velocity                      0.986    m/sec"
"             Pipe capacity                 0.124    c.m/sec"
"             Critical depth                0.140    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.038     0.038     0.038     0.017 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.053    c.m/sec"
"             Hydrograph volume           162.952    c.m"
"                     0.038     0.038     0.038     0.053"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.038     0.000     0.038     0.053"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ****************************"
"             * AREA 202 - COURTYARD AREA * "
"             ****************************"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   202- Courtyard"
"       60.000   % Impervious"
"        0.039   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.016   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.023   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.290   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.834   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.006     0.000     0.038     0.053 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.016      0.023      0.039      hectare"
"             Time of concentration  9.544      1.216      2.785      minutes"
"             Time to Centroid       225.006    189.208    195.950    minutes"
"             Rainfall depth         56.500     56.500     56.500     mm"
"             Rainfall volume        8.81       13.22      22.04      c.m"
"             Rainfall losses        40.108     9.407      21.687     mm"
"             Runoff depth           16.392     47.093     34.813     mm"
"             Runoff volume          2.56       11.02      13.58      c.m"
"             Runoff coefficient     0.290      0.834      0.616      "
"             Maximum flow           0.001      0.005      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.006     0.006     0.038     0.053"
" 51          PIPE DESIGN"
"        0.006   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.300   Diameter    metre"
"        0.400   Gradient   %"
"             Depth of flow                 0.062    metre"
"             Velocity                      0.542    m/sec"
"             Pipe capacity                 0.061    c.m/sec"
"             Critical depth                0.056    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.006     0.006     0.006     0.053 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.059    c.m/sec"
"             Hydrograph volume           176.529    c.m"
"                     0.006     0.006     0.006     0.059"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ******************************************"
"              * CONTROLLED - UNDERGROUND SWM STORAGE TANK * "
"              ******************************************"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.059    c.m/sec"
"             Hydrograph volume           176.529    c.m"
"                     0.006     0.059     0.006     0.000"
```

```
" 54          POND DESIGN"
"         0.059   Current peak flow    c.m/sec"
"         0.001   Target outflow    c.m/sec"
"         176.5   Hydrograph volume    c.m"
"           18.   Number of stages"
"         0.000   Minimum water level    metre"
"         3.550   Maximum water level    metre"
"         0.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                   0.000     0.000     0.000"
"                  0.05000   0.00140    17.000"
"                   0.1000   0.00180    33.900"
"                   0.1500   0.00220    50.900"
"                   0.2500   0.00270    84.900"
"                   0.3500   0.00320   118.800"
"                   0.4500   0.00360   152.800"
"                   0.5500   0.00400   186.700"
"                   0.6500   0.00430   220.700"
"                   0.7500   0.00460   254.600"
"                   0.8000   0.00470   271.600"
"                    3.050   0.00910   271.800"
"                    3.100   0.00920   272.000"
"                    3.150   0.00930   272.200"
"                    3.200   0.00940   272.400"
"                    3.250   0.00940   272.600"
"                    3.300   0.00950   272.800"
"                    3.350   0.00960   273.000"
"               Peak outflow                  0.003    c.m/sec"
"               Maximum level                 0.401    metre"
"               Maximum storage             136.181    c.m"
"               Centroidal lag               11.147   hours"
"                    0.006     0.059     0.003     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"              5   Next link "
"                       0.006     0.003     0.003     0.000"
" 81          ADD COMMENT================================================="
"            3  Lines of comment"
"               ************************************"
"               * AREA 203 - UNCONSTROLLED LAND AREA * "
"               ************************************"
" 33          CATCHMENT 203"
"              1   Triangular SCS"
"              1   Equal length"
"              1   SCS method"
"            203   203- Uncontrolled land"
"         35.000   % Impervious"
"          0.148   Total Area"
"         10.000   Flow length"
"          2.000   Overland Slope"
```

```
"        0.096   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.052   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.290   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.834   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.016     0.003     0.003     0.000 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.096      0.052      0.148      hectare"
"             Time of concentration  9.544      1.216      4.486      minutes"
"             Time to Centroid       225.005    189.208    203.263    minutes"
"             Rainfall depth         56.500     56.500     56.500     mm"
"             Rainfall volume        54.35      29.27      83.62      c.m"
"             Rainfall losses        40.108     9.407      29.363     mm"
"             Runoff depth           16.392     47.093     27.137     mm"
"             Runoff volume          15.77      24.39      40.16      c.m"
"             Runoff coefficient     0.290      0.834      0.480      "
"             Maximum flow           0.006      0.011      0.016      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * TOTAL FLOW FROM PROPOSED SITE AREA *"
"              ************************************"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.016     0.018     0.003     0.000"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      1.034    hectare"
"             Total Impervious area                     0.664    hectare"
"             Total % impervious                       64.236"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:            \\10.120.26.4\j\WT\122727_1107MainStW\"
"                              7.0_Production\7.99_Submitted\FSR\Appendix B\SWM"
"                Output filename:                        122727-6hr H(10YR).out"
"                Licensee name:                                           install1"
"                Company                                                IBI Group"
"                Date & Time last used:                2020-01-29 at 3:03:03 PM"
" 81           ADD COMMENT================================================="
"           6  Lines of comment"
"              ************************************"
"              * 122727 - 1107 MAIN STREET WEST      *"
"              * CITY OF HAMILTON                    *"
"              * IBI GROUP                           *"
"              * JANUARY 2020                        *"
"              ************************************"
" 31           TIME PARAMETERS"
"        10.000   Time Step"
"       360.000   Max. Storm length"
"      3600.000   Max. Hydrograph"
" 81           ADD COMMENT================================================="
"           4  Lines of comment"
"              ****************************"
"              * 10 YEAR 6 HOUR SCS STORM  *"
"              * MOUNT HOPE IDF PARAMETERS *"
"              ****************************"
" 32           STORM Historic"
"             5   Historic"
"       360.000   Duration"
"        36.000   Rainfall intensity values"
"                   2.700     2.700     2.700     4.060     4.060"
"                   4.060     4.060     4.060     4.060     6.760"
"                   6.760     6.760     8.110     8.110     8.110"
"                  40.560    73.010   105.460    14.870    14.870"
"                  14.870     6.760     6.760     6.760     5.410"
"                   5.410     5.410     4.060     4.060     4.060"
"                   2.700     2.700     2.700     2.700     2.700"
"                   2.700"
"              Maximum intensity           105.460    mm/hr"
"              Total depth                  67.600    mm"
"             6   010hyd   Hydrograph extension used in this file"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
"              ***********************"
"              * EXISTING CONDITIONS *"
"              ***********************"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
```

```
"             *********************************"
"             * AREA 101 - EXISTING SITE AREA *"
"             *********************************"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   101- Exisitng site"
"       50.000   % Impervious"
"        0.516   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.258   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.258   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.342   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.901   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.078     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.258      0.258      0.516      hectare"
"             Time of concentration  19.178     2.595      7.157      minutes"
"             Time to Centroid       236.512    189.963    202.768    minutes"
"             Rainfall depth         67.600     67.600     67.600     mm"
"             Rainfall volume        174.41     174.41     348.82     c.m"
"             Rainfall losses        44.497     6.716      25.606     mm"
"             Runoff depth           23.103     60.884     41.994     mm"
"             Runoff volume          59.61      157.08     216.69     c.m"
"             Runoff coefficient     0.342      0.901      0.621      "
"             Maximum flow           0.019      0.068      0.078      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"             ************************************"
"             * TOTAL FLOW FROM EXISTING SITE AREA *"
"             ************************************"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.078     0.078     0.000     0.000"
" 51          PIPE DESIGN"
"          0.078   Current peak flow    c.m/sec"
```

```
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.175    metre"
"             Velocity                      1.539    m/sec"
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.204    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.078     0.078     0.078     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Runoff from existing site"
"             Maximum flow                  0.078    c.m/sec"
"             Hydrograph volume           216.688    c.m"
"                     0.078     0.078     0.078     0.078"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.078     0.000     0.078     0.078"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             **********************"
"             * PROPSOED CONDITIONS *"
"             **********************"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ************************************"
"             * AREA 200 - ROOFTOP SWM STORAGE AREA *"
"             ************************************"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          200   200- Rooftop stormwater storage"
"      100.000   % Impervious"
"        0.158   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.158   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
```

```
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.888   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.041     0.000     0.078     0.078 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.158      0.158      hectare"
"             Time of concentration  15.321     2.108      2.108      minutes"
"             Time to Centroid       230.621    189.051    189.051    minutes"
"             Rainfall depth         67.600     67.600     67.600     mm"
"             Rainfall volume        0.00       106.81     106.81     c.m"
"             Rainfall losses        43.380     7.602      7.602      mm"
"             Runoff depth           24.220     59.998     59.998     mm"
"             Runoff volume          0.00       94.80      94.80      c.m"
"             Runoff coefficient     0.000      0.888      0.888      "
"             Maximum flow           0.000      0.041      0.041      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                     0.041     0.041     0.078     0.078"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ***********************************"
"             * CONTROLLED - ROOFTOP SWM STORAGE * "
"             ***********************************"
" 54          POND DESIGN"
"        0.041   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"         94.8   Hydrograph volume    c.m"
"           7.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.152   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02540   0.00456    0.3700"
"                 0.05080   0.00912     2.970"
"                 0.07620   0.01368    10.030"
"                  0.1016   0.01824    23.780"
"                  0.1270   0.02280    46.450"
"                  0.1524   0.02736    83.260"
"             Peak outflow                  0.019    c.m/sec"
"             Maximum level                 0.103    metre"
"             Maximum storage              25.297    c.m"
"             Centroidal lag                3.339   hours"
"                  0.041     0.041     0.019     0.078 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
```

```
"               Runoff to underground storage tank"
"            Maximum flow                  0.019    c.m/sec"
"            Hydrograph volume            94.145    c.m"
"                    0.041     0.041     0.019     0.019"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.041     0.000     0.019     0.019"
" 81         ADD COMMENT================================================="
"          3  Lines of comment"
"             *******************************************  "
"             * AREA 201 - ROOFTOP AREA WITHOUT SWM STORAGE *  "
"             *******************************************"
" 33         CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   201- Rooftop without storage"
"      100.000   % Impervious"
"        0.173   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.173   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.888   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.045     0.000     0.019     0.019 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.000      0.173      0.173      hectare"
"            Time of concentration  15.321     2.108      2.108      minutes"
"            Time to Centroid       230.622    189.051    189.051    minutes"
"            Rainfall depth         67.600     67.600     67.600     mm"
"            Rainfall volume        0.00       116.95     116.95     c.m"
"            Rainfall losses        43.380     7.602      7.602      mm"
"            Runoff depth           24.220     59.998     59.998     mm"
"            Runoff volume          0.00       103.80     103.80     c.m"
"            Runoff coefficient     0.000      0.888      0.888      "
"            Maximum flow           0.000      0.045      0.045      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.045     0.045     0.019     0.019"
" 51          PIPE DESIGN"
"        0.045   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        0.500   Gradient   %"
"             Depth of flow                 0.157    metre"
"             Velocity                      1.035    m/sec"
"             Pipe capacity                 0.124    c.m/sec"
"             Critical depth                0.154    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.045     0.045     0.045     0.019 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.062    c.m/sec"
"             Hydrograph volume           197.941    c.m"
"                     0.045     0.045     0.045     0.062"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.045     0.000     0.045     0.062"
" 81          ADD COMMENT=================================================="
"          3  Lines of comment"
"             ****************************"
"             * AREA 202 - COURTYARD AREA * "
"             ****************************"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   202- Courtyard"
"       60.000   % Impervious"
"        0.039   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.016   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.023   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.341   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.839   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.007     0.000     0.045     0.062 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.016      0.023      0.039      hectare"
"             Time of concentration  8.348      1.130      2.666      minutes"
"             Time to Centroid       221.205    188.083    195.134    minutes"
"             Rainfall depth         67.600     67.600     67.600     mm"
"             Rainfall volume        10.55      15.82      26.36      c.m"
"             Rainfall losses        44.577     10.851     24.342     mm"
"             Runoff depth           23.023     56.749     43.258     mm"
"             Runoff volume          3.59       13.28      16.87      c.m"
"             Runoff coefficient     0.341      0.839      0.640      "
"             Maximum flow           0.001      0.006      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.007     0.007     0.045     0.062"
" 51          PIPE DESIGN"
"        0.007   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.300   Diameter    metre"
"        0.400   Gradient   %"
"             Depth of flow                 0.069    metre"
"             Velocity                      0.579    m/sec"
"             Pipe capacity                 0.061    c.m/sec"
"             Critical depth                0.063    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.007     0.007     0.007     0.062 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.069    c.m/sec"
"             Hydrograph volume           214.812    c.m"
"                     0.007     0.007     0.007     0.069"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ******************************************"
"             * CONTROLLED - UNDERGROUND SWM STORAGE TANK * "
"             ******************************************"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.069    c.m/sec"
"             Hydrograph volume           214.812    c.m"
"                     0.007     0.069     0.007     0.000"
```

```
" 54          POND DESIGN"
"         0.069   Current peak flow    c.m/sec"
"         0.001   Target outflow    c.m/sec"
"         214.8   Hydrograph volume    c.m"
"           18.   Number of stages"
"         0.000   Minimum water level    metre"
"         3.550   Maximum water level    metre"
"         0.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                   0.000     0.000     0.000"
"                 0.05000   0.00140    17.000"
"                  0.1000   0.00180    33.900"
"                  0.1500   0.00220    50.900"
"                  0.2500   0.00270    84.900"
"                  0.3500   0.00320   118.800"
"                  0.4500   0.00360   152.800"
"                  0.5500   0.00400   186.700"
"                  0.6500   0.00430   220.700"
"                  0.7500   0.00460   254.600"
"                  0.8000   0.00470   271.600"
"                   3.050   0.00910   271.800"
"                   3.100   0.00920   272.000"
"                   3.150   0.00930   272.200"
"                   3.200   0.00940   272.400"
"                   3.250   0.00940   272.600"
"                   3.300   0.00950   272.800"
"                   3.350   0.00960   273.000"
"              Peak outflow                  0.004    c.m/sec"
"              Maximum level                 0.497    metre"
"              Maximum storage             168.724    c.m"
"              Centroidal lag               11.987   hours"
"                   0.007     0.069     0.004     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.007     0.004     0.004     0.000"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * AREA 203 - UNCONSTROLLED LAND AREA * "
"              ************************************"
" 33          CATCHMENT 203"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           203   203- Uncontrolled land"
"        35.000   % Impervious"
"         0.148   Total Area"
"        10.000   Flow length"
"         2.000   Overland Slope"
```

```
"        0.096   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.052   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.341   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.839   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.021     0.004     0.004     0.000 c.m/sec"
"            Catchment 203          Pervious   Impervious Total Area "
"            Surface Area           0.096      0.052      0.148      hectare"
"            Time of concentration  8.348      1.130      4.231      minutes"
"            Time to Centroid       221.205    188.083    202.315    minutes"
"            Rainfall depth         67.600     67.600     67.600     mm"
"            Rainfall volume        65.03      35.02      100.05     c.m"
"            Rainfall losses        44.577     10.851     32.773     mm"
"            Runoff depth           23.023     56.749     34.827     mm"
"            Runoff volume          22.15      29.40      51.54      c.m"
"            Runoff coefficient     0.341      0.839      0.515      "
"            Maximum flow           0.009      0.013      0.021      c.m/sec"
" 81         ADD COMMENT================================================="
"          3  Lines of comment"
"            ************************************"
"            * TOTAL FLOW FROM PROPOSED SITE AREA *"
"            ************************************"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.021     0.024     0.004     0.000"
" 38         START/RE-START TOTALS 203"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                    1.034    hectare"
"            Total Impervious area                   0.664    hectare"
"            Total % impervious                     64.236"
" 19         EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:            \\10.120.26.4\j\WT\122727_1107MainStW\"
"                              7.0_Production\7.99_Submitted\FSR\Appendix B\SWM"
"                Output filename:                        122727-6hr H(25YR).out"
"                Licensee name:                                           install1"
"                Company                                                IBI Group"
"                Date & Time last used:                2020-01-29 at 2:44:12 PM"
" 81           ADD COMMENT================================================="
"           6  Lines of comment"
"              ************************************"
"              * 122727 - 1107 MAIN STREET WEST      *"
"              * CITY OF HAMILTON                    *"
"              * IBI GROUP                           *"
"              * JANUARY 2020                        *"
"              ************************************"
" 31           TIME PARAMETERS"
"       10.000   Time Step"
"      360.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 81           ADD COMMENT================================================="
"           4  Lines of comment"
"              ****************************"
"              * 25 YEAR 6 HOUR SCS STORM  *"
"              * MOUNT HOPE IDF PARAMETERS *"
"              ****************************"
" 32           STORM Historic"
"             5   Historic"
"      360.000   Duration"
"       36.000   Rainfall intensity values"
"                  3.260     3.260     3.260     4.900     4.900"
"                  4.900     4.900     4.900     4.900     8.160"
"                  8.160     8.160     9.790     9.790     9.790"
"                 48.960    88.130   127.300    17.950    17.950"
"                 17.950     8.160     8.160     8.160     6.530"
"                  6.530     6.530     4.900     4.900     4.900"
"                  3.260     3.260     3.260     3.260     3.260"
"                  3.260"
"              Maximum intensity           127.300    mm/hr"
"              Total depth                  81.600    mm"
"             6   025hyd   Hydrograph extension used in this file"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
"              ***********************"
"              * EXISTING CONDITIONS *"
"              ***********************"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
```

```
"             *********************************"
"             * AREA 101 - EXISTING SITE AREA *"
"             *********************************"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   101- Exisitng site"
"       50.000   % Impervious"
"        0.516   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.258   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.258   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.400   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.907   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.100     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.258      0.258      0.516      hectare"
"             Time of concentration  16.815     2.403      6.810      minutes"
"             Time to Centroid       231.116    188.707    201.674    minutes"
"             Rainfall depth         81.600     81.600     81.600     mm"
"             Rainfall volume        210.53     210.53     421.06     c.m"
"             Rainfall losses        49.000     7.582      28.291     mm"
"             Runoff depth           32.600     74.018     53.309     mm"
"             Runoff volume          84.11      190.97     275.08     c.m"
"             Runoff coefficient     0.400      0.907      0.653      "
"             Maximum flow           0.030      0.083      0.100      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"             ************************************"
"             * TOTAL FLOW FROM EXISTING SITE AREA *"
"             ************************************"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.100     0.100     0.000     0.000"
" 51          PIPE DESIGN"
"         0.100   Current peak flow    c.m/sec"
```

```
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.202    metre"
"             Velocity                      1.638    m/sec"
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.232    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.100     0.100     0.100     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Runoff from existing site"
"             Maximum flow                  0.100    c.m/sec"
"             Hydrograph volume           275.077    c.m"
"                     0.100     0.100     0.100     0.100"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.100     0.000     0.100     0.100"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             **********************"
"             * PROPSOED CONDITIONS *"
"             **********************"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ************************************"
"             * AREA 200 - ROOFTOP SWM STORAGE AREA *"
"             ************************************"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          200   200- Rooftop stormwater storage"
"      100.000   % Impervious"
"        0.158   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.158   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
```

```
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.895   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.050     0.000     0.100     0.100 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.158      0.158      hectare"
"             Time of concentration  13.465     1.952      1.952      minutes"
"             Time to Centroid       226.055    187.855    187.855    minutes"
"             Rainfall depth         81.600     81.600     81.600     mm"
"             Rainfall volume        0.00       128.93     128.93     c.m"
"             Rainfall losses        48.129     8.528      8.528      mm"
"             Runoff depth           33.471     73.072     73.072     mm"
"             Runoff volume          0.00       115.45     115.45     c.m"
"             Runoff coefficient     0.000      0.895      0.895      "
"             Maximum flow           0.000      0.050      0.050      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                     0.050     0.050     0.100     0.100"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ***********************************"
"             * CONTROLLED - ROOFTOP SWM STORAGE * "
"             ***********************************"
" 54          POND DESIGN"
"        0.050   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"        115.5   Hydrograph volume    c.m"
"           7.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.152   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02540   0.00456    0.3700"
"                 0.05080   0.00912     2.970"
"                 0.07620   0.01368    10.030"
"                  0.1016   0.01824    23.780"
"                  0.1270   0.02280    46.450"
"                  0.1524   0.02736    83.260"
"             Peak outflow                  0.020    c.m/sec"
"             Maximum level                 0.113    metre"
"             Maximum storage              33.594    c.m"
"             Centroidal lag                3.359   hours"
"                  0.050     0.050     0.020     0.100 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
```

```
"               Runoff to underground storage tank"
"            Maximum flow                  0.020    c.m/sec"
"            Hydrograph volume           115.493    c.m"
"                    0.050     0.050     0.020     0.020"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.050     0.000     0.020     0.020"
" 81         ADD COMMENT================================================="
"          3  Lines of comment"
"             *******************************************  "
"             * AREA 201 - ROOFTOP AREA WITHOUT SWM STORAGE *  "
"             *******************************************"
" 33         CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   201- Rooftop without storage"
"      100.000   % Impervious"
"        0.173   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.173   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.895   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.055     0.000     0.020     0.020 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.000      0.173      0.173      hectare"
"            Time of concentration  13.465     1.952      1.952      minutes"
"            Time to Centroid       226.055    187.855    187.854    minutes"
"            Rainfall depth         81.600     81.600     81.600     mm"
"            Rainfall volume        0.00       141.17     141.17     c.m"
"            Rainfall losses        48.129     8.528      8.528      mm"
"            Runoff depth           33.471     73.072     73.072     mm"
"            Runoff volume          0.00       126.41     126.41     c.m"
"            Runoff coefficient     0.000      0.895      0.895      "
"            Maximum flow           0.000      0.055      0.055      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.055     0.055     0.020     0.020"
" 51          PIPE DESIGN"
"        0.055   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        0.500   Gradient   %"
"             Depth of flow                 0.174    metre"
"             Velocity                      1.088    m/sec"
"             Pipe capacity                 0.124    c.m/sec"
"             Critical depth                0.169    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.055     0.055     0.055     0.020 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.073    c.m/sec"
"             Hydrograph volume           241.908    c.m"
"                     0.055     0.055     0.055     0.073"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.055     0.000     0.055     0.073"
" 81          ADD COMMENT=================================================="
"          3  Lines of comment"
"             ****************************"
"             * AREA 202 - COURTYARD AREA * "
"             ****************************"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   202- Courtyard"
"       60.000   % Impervious"
"        0.039   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.016   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.023   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.390   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.843   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.009     0.000     0.055     0.073 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.016      0.023      0.039      hectare"
"             Time of concentration  7.319      1.046      2.524      minutes"
"             Time to Centroid       217.963    186.981    194.282    minutes"
"             Rainfall depth         81.600     81.600     81.600     mm"
"             Rainfall volume        12.73      19.09      31.82      c.m"
"             Rainfall losses        49.785     12.814     27.603     mm"
"             Runoff depth           31.815     68.786     53.997     mm"
"             Runoff volume          4.96       16.10      21.06      c.m"
"             Runoff coefficient     0.390      0.843      0.662      "
"             Maximum flow           0.002      0.007      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.009     0.009     0.055     0.073"
" 51          PIPE DESIGN"
"        0.009   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.300   Diameter    metre"
"        0.400   Gradient   %"
"             Depth of flow                 0.078    metre"
"             Velocity                      0.620    m/sec"
"             Pipe capacity                 0.061    c.m/sec"
"             Critical depth                0.071    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.009     0.009     0.009     0.073 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.082    c.m/sec"
"             Hydrograph volume           262.967    c.m"
"                     0.009     0.009     0.009     0.082"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ******************************************"
"              * CONTROLLED - UNDERGROUND SWM STORAGE TANK * "
"              ******************************************"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.082    c.m/sec"
"             Hydrograph volume           262.967    c.m"
"                     0.009     0.082     0.009     0.000"
```

```
" 54          POND DESIGN"
"        0.082   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        263.0   Hydrograph volume    c.m"
"          18.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.550   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.05000   0.00140    17.000"
"                  0.1000   0.00180    33.900"
"                  0.1500   0.00220    50.900"
"                  0.2500   0.00270    84.900"
"                  0.3500   0.00320   118.800"
"                  0.4500   0.00360   152.800"
"                  0.5500   0.00400   186.700"
"                  0.6500   0.00430   220.700"
"                  0.7500   0.00460   254.600"
"                  0.8000   0.00470   271.600"
"                   3.050   0.00910   271.800"
"                   3.100   0.00920   272.000"
"                   3.150   0.00930   272.200"
"                   3.200   0.00940   272.400"
"                   3.250   0.00940   272.600"
"                   3.300   0.00950   272.800"
"                   3.350   0.00960   273.000"
"              Peak outflow                  0.004    c.m/sec"
"              Maximum level                 0.620    metre"
"              Maximum storage             210.475    c.m"
"              Centroidal lag               12.956   hours"
"                   0.009     0.082     0.004     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"             5   Next link "
"                      0.009     0.004     0.004     0.000"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * AREA 203 - UNCONSTROLLED LAND AREA * "
"              ************************************"
" 33          CATCHMENT 203"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           203   203- Uncontrolled land"
"        35.000   % Impervious"
"         0.148   Total Area"
"        10.000   Flow length"
"         2.000   Overland Slope"
```

```
"        0.096   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.052   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.390   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.843   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.028     0.004     0.004     0.000 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.096      0.052      0.148      hectare"
"             Time of concentration  7.319      1.046      3.945      minutes"
"             Time to Centroid       217.963    186.981    201.297    minutes"
"             Rainfall depth         81.600     81.600     81.600     mm"
"             Rainfall volume        78.50      42.27      120.77     c.m"
"             Rainfall losses        49.785     12.814     36.845     mm"
"             Runoff depth           31.815     68.786     44.755     mm"
"             Runoff volume          30.61      35.63      66.24      c.m"
"             Runoff coefficient     0.390      0.843      0.548      "
"             Maximum flow           0.013      0.015      0.028      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * TOTAL FLOW FROM PROPOSED SITE AREA *"
"              ************************************"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.028     0.031     0.004     0.000"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      1.034    hectare"
"             Total Impervious area                     0.664    hectare"
"             Total % impervious                       64.236"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:            \\10.120.26.4\j\WT\122727_1107MainStW\"
"                              7.0_Production\7.99_Submitted\FSR\Appendix B\SWM"
"                Output filename:                        122727-6hr H(50YR).out"
"                Licensee name:                                           install1"
"                Company                                                IBI Group"
"                Date & Time last used:                2020-01-29 at 2:29:47 PM"
" 81           ADD COMMENT================================================="
"           6  Lines of comment"
"              ************************************"
"              * 122727 - 1107 MAIN STREET WEST      *"
"              * CITY OF HAMILTON                    *"
"              * IBI GROUP                           *"
"              * JANUARY 2020                        *"
"              ************************************"
" 31           TIME PARAMETERS"
"       10.000   Time Step"
"      360.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 81           ADD COMMENT================================================="
"           4  Lines of comment"
"              ****************************"
"              * 50 YEAR 6 HOUR SCS STORM  *"
"              * MOUNT HOPE IDF PARAMETERS *"
"              ****************************"
" 32           STORM Historic"
"             5   Historic"
"      360.000   Duration"
"       36.000   Rainfall intensity values"
"                  3.680     3.680     3.680     5.510     5.510"
"                  5.510     5.510     5.510     5.510     9.190"
"                  9.190     9.190    11.030    11.030    11.030"
"                 55.140    99.250   143.360    20.220    20.220"
"                 20.220     9.190     9.190     9.190     7.350"
"                  7.350     7.350     5.510     5.510     5.510"
"                  3.680     3.680     3.680     3.680     3.680"
"                  3.680"
"              Maximum intensity           143.360    mm/hr"
"              Total depth                  91.900    mm"
"             6   050hyd   Hydrograph extension used in this file"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
"              ***********************"
"              * EXISTING CONDITIONS *"
"              ***********************"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
```

```
"             *********************************"
"             * AREA 101 - EXISTING SITE AREA *"
"             *********************************"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   101- Exisitng site"
"       50.000   % Impervious"
"        0.516   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.258   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.258   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.433   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.911   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.114     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.258      0.258      0.516      hectare"
"             Time of concentration  15.541     2.290      6.559      minutes"
"             Time to Centroid       228.373    187.989    200.999    minutes"
"             Rainfall depth         91.900     91.900     91.900     mm"
"             Rainfall volume        237.10     237.10     474.20     c.m"
"             Rainfall losses        52.112     8.184      30.148     mm"
"             Runoff depth           39.788     83.716     61.752     mm"
"             Runoff volume          102.65     215.99     318.64     c.m"
"             Runoff coefficient     0.433      0.911      0.672      "
"             Maximum flow           0.042      0.093      0.114      c.m/sec"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             *************************************"
"             * TOTAL FLOW FROM EXISTING SITE AREA *"
"             *************************************"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.114     0.114     0.000     0.000"
" 51          PIPE DESIGN"
"         0.114   Current peak flow    c.m/sec"
```

```
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.220    metre"
"             Velocity                      1.689    m/sec"
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.248    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.114     0.114     0.114     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Runoff from existing site"
"             Maximum flow                  0.114    c.m/sec"
"             Hydrograph volume           318.640    c.m"
"                     0.114     0.114     0.114     0.114"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.114     0.000     0.114     0.114"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             **********************"
"             * PROPSOED CONDITIONS *"
"             **********************"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ************************************"
"             * AREA 200 - ROOFTOP SWM STORAGE AREA *"
"             ************************************"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          200   200- Rooftop stormwater storage"
"      100.000   % Impervious"
"        0.158   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.158   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
```

```
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.899   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.056     0.000     0.114     0.114 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.158      0.158      hectare"
"             Time of concentration  12.461     1.860      1.860      minutes"
"             Time to Centroid       223.420    187.240    187.240    minutes"
"             Rainfall depth         91.900     91.900     91.900     mm"
"             Rainfall volume        0.00       145.20     145.20     c.m"
"             Rainfall losses        50.812     9.273      9.273      mm"
"             Runoff depth           41.088     82.627     82.627     mm"
"             Runoff volume          0.00       130.55     130.55     c.m"
"             Runoff coefficient     0.000      0.899      0.899      "
"             Maximum flow           0.000      0.056      0.056      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                     0.056     0.056     0.114     0.114"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ***********************************"
"             * CONTROLLED - ROOFTOP SWM STORAGE * "
"             ***********************************"
" 54          POND DESIGN"
"        0.056   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"        130.6   Hydrograph volume    c.m"
"           7.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.152   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02540   0.00456    0.3700"
"                 0.05080   0.00912     2.970"
"                 0.07620   0.01368    10.030"
"                  0.1016   0.01824    23.780"
"                  0.1270   0.02280    46.450"
"                  0.1524   0.02736    83.260"
"             Peak outflow                 0.021    c.m/sec"
"             Maximum level                0.120    metre"
"             Maximum storage             39.864    c.m"
"             Centroidal lag               3.377   hours"
"                  0.056     0.056     0.021     0.114 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
```

```
"               Runoff to underground storage tank"
"            Maximum flow                  0.021    c.m/sec"
"            Hydrograph volume           130.459    c.m"
"                    0.056     0.056     0.021     0.021"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.056     0.000     0.021     0.021"
" 81         ADD COMMENT================================================="
"          3  Lines of comment"
"             ******************************************  "
"             * AREA 201 - ROOFTOP AREA WITHOUT SWM STORAGE *  "
"             ******************************************"
" 33         CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   201- Rooftop without storage"
"      100.000   % Impervious"
"        0.173   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.173   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.899   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.062     0.000     0.021     0.021 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.000      0.173      0.173      hectare"
"            Time of concentration  12.461     1.860      1.860      minutes"
"            Time to Centroid       223.420    187.240    187.240    minutes"
"            Rainfall depth         91.900     91.900     91.900     mm"
"            Rainfall volume        0.00       158.99     158.99     c.m"
"            Rainfall losses        50.812     9.273      9.273      mm"
"            Runoff depth           41.088     82.627     82.627     mm"
"            Runoff volume          0.00       142.95     142.95     c.m"
"            Runoff coefficient     0.000      0.899      0.899      "
"            Maximum flow           0.000      0.062      0.062      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.062     0.062     0.021     0.021"
" 51          PIPE DESIGN"
"        0.062   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        0.500   Gradient   %"
"             Depth of flow                 0.187    metre"
"             Velocity                      1.120    m/sec"
"             Pipe capacity                 0.124    c.m/sec"
"             Critical depth                0.180    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.062     0.062     0.062     0.021 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.081    c.m/sec"
"             Hydrograph volume           273.404    c.m"
"                     0.062     0.062     0.062     0.081"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.062     0.000     0.062     0.081"
" 81          ADD COMMENT=================================================="
"          3  Lines of comment"
"             ****************************"
"             * AREA 202 - COURTYARD AREA * "
"             ****************************"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   202- Courtyard"
"       60.000   % Impervious"
"        0.039   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.016   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.023   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.424   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.847   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.010     0.000     0.062     0.081 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.016      0.023      0.039      hectare"
"             Time of concentration  6.765      0.997      2.440      minutes"
"             Time to Centroid       215.675    186.343    193.685    minutes"
"             Rainfall depth         91.900     91.900     91.900     mm"
"             Rainfall volume        14.34      21.50      35.84      c.m"
"             Rainfall losses        52.935     14.101     29.635     mm"
"             Runoff depth           38.965     77.799     62.265     mm"
"             Runoff volume          6.08       18.20      24.28      c.m"
"             Runoff coefficient     0.424      0.847      0.678      "
"             Maximum flow           0.003      0.008      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.010     0.010     0.062     0.081"
" 51          PIPE DESIGN"
"        0.010   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.300   Diameter    metre"
"        0.400   Gradient   %"
"             Depth of flow                 0.084    metre"
"             Velocity                      0.646    m/sec"
"             Pipe capacity                 0.061    c.m/sec"
"             Critical depth                0.077    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.010     0.010     0.010     0.081 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.092    c.m/sec"
"             Hydrograph volume           297.687    c.m"
"                     0.010     0.010     0.010     0.092"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ******************************************"
"              * CONTROLLED - UNDERGROUND SWM STORAGE TANK * "
"              ******************************************"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.092    c.m/sec"
"             Hydrograph volume           297.687    c.m"
"                     0.010     0.092     0.010     0.000"
```

```
" 54          POND DESIGN"
"         0.092   Current peak flow    c.m/sec"
"         0.001   Target outflow    c.m/sec"
"         297.7   Hydrograph volume    c.m"
"           18.   Number of stages"
"         0.000   Minimum water level    metre"
"         3.550   Maximum water level    metre"
"         0.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                   0.000     0.000     0.000"
"                 0.05000   0.00140    17.000"
"                  0.1000   0.00180    33.900"
"                  0.1500   0.00220    50.900"
"                  0.2500   0.00270    84.900"
"                  0.3500   0.00320   118.800"
"                  0.4500   0.00360   152.800"
"                  0.5500   0.00400   186.700"
"                  0.6500   0.00430   220.700"
"                  0.7500   0.00460   254.600"
"                  0.8000   0.00470   271.600"
"                   3.050   0.00910   271.800"
"                   3.100   0.00920   272.000"
"                   3.150   0.00930   272.200"
"                   3.200   0.00940   272.400"
"                   3.250   0.00940   272.600"
"                   3.300   0.00950   272.800"
"                   3.350   0.00960   273.000"
"              Peak outflow                  0.004    c.m/sec"
"              Maximum level                 0.710    metre"
"              Maximum storage             240.904    c.m"
"              Centroidal lag               13.624   hours"
"                   0.010     0.092     0.004     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"             5   Next link "
"                      0.010     0.004     0.004     0.000"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * AREA 203 - UNCONSTROLLED LAND AREA * "
"              ************************************"
" 33          CATCHMENT 203"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           203   203- Uncontrolled land"
"        35.000   % Impervious"
"         0.148   Total Area"
"        10.000   Flow length"
"         2.000   Overland Slope"
```

```
"        0.096   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.052   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.424   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.847   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.034     0.004     0.004     0.000 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.096      0.052      0.148      hectare"
"             Time of concentration  6.765      0.997      3.776      minutes"
"             Time to Centroid       215.675    186.343    200.478    minutes"
"             Rainfall depth         91.900     91.900     91.900     mm"
"             Rainfall volume        88.41      47.60      136.01     c.m"
"             Rainfall losses        52.935     14.101     39.343     mm"
"             Runoff depth           38.965     77.799     52.557     mm"
"             Runoff volume          37.48      40.30      77.78      c.m"
"             Runoff coefficient     0.424      0.847      0.572      "
"             Maximum flow           0.016      0.017      0.034      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"             ************************************"
"             * TOTAL FLOW FROM PROPOSED SITE AREA *"
"             ************************************"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.034     0.037     0.004     0.000"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      1.034    hectare"
"             Total Impervious area                     0.664    hectare"
"             Total % impervious                       64.236"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:            \\10.120.26.4\j\WT\122727_1107MainStW\"
"                              7.0_Production\7.99_Submitted\FSR\Appendix B\SWM"
"                Output filename:                        122727-6hr H(100YR).out"
"                Licensee name:                                           install1"
"                Company                                                IBI Group"
"                Date & Time last used:                2020-01-29 at 1:50:07 PM"
" 81           ADD COMMENT================================================="
"           6  Lines of comment"
"              ************************************"
"              * 122727 - 1107 MAIN STREET WEST      *"
"              * CITY OF HAMILTON                    *"
"              * IBI GROUP                           *"
"              * JANUARY 2020                        *"
"              ************************************"
" 31           TIME PARAMETERS"
"       10.000   Time Step"
"      360.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 81           ADD COMMENT================================================="
"           4  Lines of comment"
"              ******************************"
"              *  100 YEAR 6 HOUR SCS STORM *"
"              *  MOUNT HOPE IDF PARAMETERS *"
"              ******************************"
" 32           STORM Historic"
"             5   Historic"
"      360.000   Duration"
"       36.000   Rainfall intensity values"
"                  4.090     4.090     4.090     6.140     6.140"
"                  6.140     6.140     6.140     6.140    10.230"
"                 10.230    10.230    12.280    12.280    12.280"
"                 61.380   110.480   159.590    22.510    22.510"
"                 22.510    10.230    10.230    10.230     8.180"
"                  8.180     8.180     6.140     6.140     6.140"
"                  4.090     4.090     4.090     4.090     4.090"
"                  4.090"
"              Maximum intensity           159.590    mm/hr"
"              Total depth                 102.302    mm"
"             6   100hyd   Hydrograph extension used in this file"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
"              ***********************"
"              * EXISTING CONDITIONS *"
"              ***********************"
" 81           ADD COMMENT================================================="
"           3  Lines of comment"
```

```
"            *********************************"
"            * AREA 101 - EXISTING SITE AREA *"
"            *********************************"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   101- Exisitng site"
"       50.000   % Impervious"
"        0.516   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.258   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.258   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.463   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.914   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.132     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.258      0.258      0.516      hectare"
"             Time of concentration  14.511     2.192      6.334      minutes"
"             Time to Centroid       225.826    187.314    200.263    minutes"
"             Rainfall depth         102.302    102.302    102.302    mm"
"             Rainfall volume        263.94     263.94     527.88     c.m"
"             Rainfall losses        54.916     8.763      31.839     mm"
"             Runoff depth           47.386     93.539     70.462     mm"
"             Runoff volume          122.26     241.33     363.59     c.m"
"             Runoff coefficient     0.463      0.914      0.689      "
"             Maximum flow           0.050      0.103      0.132      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * TOTAL FLOW FROM EXISTING SITE AREA *"
"              ************************************"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.132     0.132     0.000     0.000"
" 51          PIPE DESIGN"
"          0.132   Current peak flow    c.m/sec"
```

```
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        1.000   Gradient   %"
"             Depth of flow                 0.243    metre"
"             Velocity                      1.743    m/sec"
"             Pipe capacity                 0.175    c.m/sec"
"             Critical depth                0.268    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.132     0.132     0.132     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Runoff from existing site"
"             Maximum flow                  0.132    c.m/sec"
"             Hydrograph volume           363.585    c.m"
"                     0.132     0.132     0.132     0.132"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.132     0.000     0.132     0.132"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             **********************"
"             * PROPSOED CONDITIONS *"
"             **********************"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ************************************"
"             * AREA 200 - ROOFTOP SWM STORAGE AREA *"
"             ************************************"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          200   200- Rooftop stormwater storage"
"      100.000   % Impervious"
"        0.158   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.158   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
```

```
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.901   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.062     0.000     0.132     0.132 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.158      0.158      hectare"
"             Time of concentration  11.649     1.781      1.781      minutes"
"             Time to Centroid       221.109    186.675    186.675    minutes"
"             Rainfall depth         102.302    102.302    102.302    mm"
"             Rainfall volume        0.00       161.64     161.64     c.m"
"             Rainfall losses        53.186     10.092     10.092     mm"
"             Runoff depth           49.116     92.210     92.210     mm"
"             Runoff volume          0.00       145.69     145.69     c.m"
"             Runoff coefficient     0.000      0.901      0.901      "
"             Maximum flow           0.000      0.062      0.062      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.062     0.062     0.132     0.132"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ************************************"
"             * CONTROLLED - ROOFTOP SWM STORAGE * "
"             ************************************"
" 54          POND DESIGN"
"        0.062   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"        145.7   Hydrograph volume    c.m"
"           7.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.152   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02540   0.00456    0.3700"
"                 0.05080   0.00912     2.970"
"                 0.07620   0.01368    10.030"
"                  0.1016   0.01824    23.780"
"                  0.1270   0.02280    46.450"
"                  0.1524   0.02736    83.260"
"             Peak outflow                  0.023    c.m/sec"
"             Maximum level                 0.127    metre"
"             Maximum storage              46.263    c.m"
"             Centroidal lag                3.397   hours"
"                  0.062     0.062     0.023     0.132 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
```

```
"               Runoff to underground storage tank"
"            Maximum flow                  0.023    c.m/sec"
"            Hydrograph volume           145.399    c.m"
"                    0.062     0.062     0.023     0.023"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.062     0.000     0.023     0.023"
" 81         ADD COMMENT================================================="
"          3  Lines of comment"
"             ******************************************  "
"             * AREA 201 - ROOFTOP AREA WITHOUT SWM STORAGE *  "
"             ******************************************"
" 33         CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   201- Rooftop without storage"
"      100.000   % Impervious"
"        0.173   Total Area"
"       20.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        1.000   Pervious slope"
"        0.173   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.901   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.068     0.000     0.023     0.023 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.000      0.173      0.173      hectare"
"            Time of concentration  11.649     1.781      1.781      minutes"
"            Time to Centroid       221.109    186.675    186.675    minutes"
"            Rainfall depth         102.302    102.302    102.302    mm"
"            Rainfall volume        0.00       176.98     176.98     c.m"
"            Rainfall losses        53.186     10.092     10.092     mm"
"            Runoff depth           49.116     92.210     92.210     mm"
"            Runoff volume          0.00       159.52     159.52     c.m"
"            Runoff coefficient     0.000      0.901      0.901      "
"            Maximum flow           0.000      0.068      0.068      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.068     0.068     0.023     0.023"
" 51          PIPE DESIGN"
"        0.068   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.375   Diameter    metre"
"        0.500   Gradient   %"
"             Depth of flow                 0.199    metre"
"             Velocity                      1.150    m/sec"
"             Pipe capacity                 0.124    c.m/sec"
"             Critical depth                0.190    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.068     0.068     0.068     0.023 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.089    c.m/sec"
"             Hydrograph volume           304.922    c.m"
"                     0.068     0.068     0.068     0.089"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.068     0.000     0.068     0.089"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ****************************"
"             * AREA 202 - COURTYARD AREA * "
"             ****************************"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   202- Courtyard"
"       60.000   % Impervious"
"        0.039   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.016   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.023   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.456   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.849   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.012     0.000     0.068     0.089 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.016      0.023      0.039      hectare"
"             Time of concentration  6.316      0.954      2.368      minutes"
"             Time to Centroid       213.916    185.767    193.190    minutes"
"             Rainfall depth         102.302    102.302    102.302    mm"
"             Rainfall volume        15.96      23.94      39.90      c.m"
"             Rainfall losses        55.630     15.424     31.506     mm"
"             Runoff depth           46.672     86.878     70.796     mm"
"             Runoff volume          7.28       20.33      27.61      c.m"
"             Runoff coefficient     0.456      0.849      0.692      "
"             Maximum flow           0.003      0.009      0.012      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.012     0.012     0.068     0.089"
" 51          PIPE DESIGN"
"        0.012   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.300   Diameter    metre"
"        0.400   Gradient   %"
"             Depth of flow                 0.090    metre"
"             Velocity                      0.671    m/sec"
"             Pipe capacity                 0.061    c.m/sec"
"             Critical depth                0.082    metre"
" 53          ROUTE Zero Route"
"         0.00   Zero Route Reach length   ( metre)"
"                     0.012     0.012     0.012     0.089 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.101    c.m/sec"
"             Hydrograph volume           332.533    c.m"
"                     0.012     0.012     0.012     0.101"
" 81          ADD COMMENT================================================="
"          3  Lines of comment"
"             ******************************************"
"             * CONTROLLED - UNDERGROUND SWM STORAGE TANK * "
"             ******************************************"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Runoff to underground storage tank"
"             Maximum flow                  0.101    c.m/sec"
"             Hydrograph volume           332.533    c.m"
"                     0.012     0.101     0.012     0.000"
```

```
" 54          POND DESIGN"
"         0.101   Current peak flow    c.m/sec"
"         0.001   Target outflow    c.m/sec"
"         332.5   Hydrograph volume    c.m"
"           18.   Number of stages"
"         0.000   Minimum water level    metre"
"         3.550   Maximum water level    metre"
"         0.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                   0.000     0.000     0.000"
"                 0.05000   0.00140    17.000"
"                  0.1000   0.00180    33.900"
"                  0.1500   0.00220    50.900"
"                  0.2500   0.00270    84.900"
"                  0.3500   0.00320   118.800"
"                  0.4500   0.00360   152.800"
"                  0.5500   0.00400   186.700"
"                  0.6500   0.00430   220.700"
"                  0.7500   0.00460   254.600"
"                  0.8000   0.00470   271.600"
"                   3.050   0.00910   271.800"
"                   3.100   0.00920   272.000"
"                   3.150   0.00930   272.200"
"                   3.200   0.00940   272.400"
"                   3.250   0.00940   272.600"
"                   3.300   0.00950   272.800"
"                   3.350   0.00960   273.000"
"              Peak outflow                  0.005    c.m/sec"
"              Maximum level                 1.169    metre"
"              Maximum storage             271.633    c.m"
"              Centroidal lag               14.266   hours"
"                   0.012     0.101     0.005     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.012     0.005     0.005     0.000"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"              ************************************"
"              * AREA 203 - UNCONSTROLLED LAND AREA * "
"              ************************************"
" 33          CATCHMENT 203"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           203   203- Uncontrolled land"
"        35.000   % Impervious"
"         0.148   Total Area"
"        10.000   Flow length"
"         2.000   Overland Slope"
```

```
"        0.096   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.052   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.456   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.849   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.039     0.005     0.005     0.000 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.096      0.052      0.148      hectare"
"             Time of concentration  6.316      0.954      3.632      minutes"
"             Time to Centroid       213.916    185.767    199.825    minutes"
"             Rainfall depth         102.302    102.302    102.302    mm"
"             Rainfall volume        98.41      52.99      151.41     c.m"
"             Rainfall losses        55.630     15.424     41.558     mm"
"             Runoff depth           46.672     86.878     60.744     mm"
"             Runoff volume          44.90      45.00      89.90      c.m"
"             Runoff coefficient     0.456      0.849      0.594      "
"             Maximum flow           0.020      0.019      0.039      c.m/sec"
" 81          ADD COMMENT================================================="
"           3  Lines of comment"
"             ************************************"
"             * TOTAL FLOW FROM PROPOSED SITE AREA *"
"             ************************************"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.039     0.043     0.005     0.000"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      1.034    hectare"
"             Total Impervious area                     0.664    hectare"
"             Total % impervious                       64.236"
" 19          EXIT"
```