The Odan/Detech Group Inc.
P: (905) 632-3811
F: (905) 632-3363
5230, SOUTH SERVICE ROAD, UNIT 107
BURLINGTON, ONTARIO, L7L 5K2
www.odandetech.com

PROPOSED MIXED USE REDEVELOPMENT
3355 THE COLLEGEWAY
CITY OF MISSISSAUGA

Project No. 15268

FUNCTIONAL SERVICING REPORT

Prepared For:

3355 THE COLLEGEWAY L.P.
3700 STEELES AVENUE WEST, SUITE 800
VAUGHAN, ONTARIO

Prepared By:

The Odan/Detech Group Inc.

Original: June 10, 2016
Revised:

DESCRIPTION page

1.0 BACKGROUND 1
2.0 DESIGN CONSIDERATIONS 2
A) Sanitary Waste Water Disposal 2
Existing Condition 2
Proposed Commercial Site 4
Proposed Residential Site 4
B) Water Distribution 7
Existing Condition 7
Design Considerations 7
C) Storm Water Management 14
Existing Condition 14
Post Development Flow Analysis 16
Annual Stormwater Charge (Proposed Commercial) 19
Storm Water Quality ..... **Error! Bookmark not defined.**
Post Development Flow Analysis 20
Annual Stormwater Charge (Proposed Residential) 23
Storm Water Quality 23
3.0 CONCLUSIONS 24

APPENDIX A
Aerial Photo of Existing Site
Site Plan by Guthrie Muscovitch Architects

APPENDIX B
Visual Otthymo Pre Development 2 to 100 Year Design Storms
Visual Otthymo Post Development 2 to 100 Year Design Storms
Figure 1 – Existing Storm Tributary Plan
Figure 2 – Proposed Storm Tributary Plan
Stage/Storage/Discharge Characteristics for Flow Controlled Area

1.0 BACKGROUND

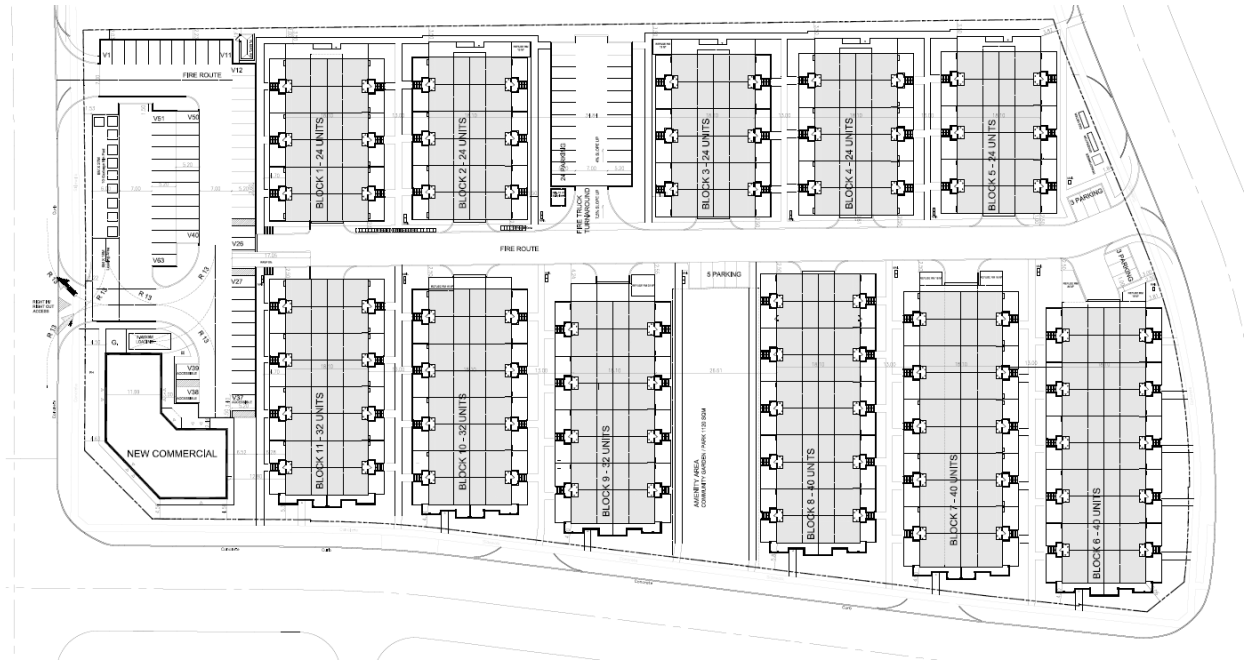
The property under study is a 2.657 ha (6.57 acre) site located on the northwest side of The Collegeway between Ridgeway Drive and Colonial Drive, in the City of Mississauga. The development is bound by Ridgeway Drive to the southwest, The Collegeway to the southeast Colonial Drive to the northeast, and existing residential to the northwest. Currently, the site is occupied by a 5560m^2 commercial plaza with related parking. The existing site consists of three public entrances and two loading entrances.

It is proposed to construct 11 blocks of residential stacked townhouses with a total of 336 units with parking under each block and additional surface visitor parking. The site will also have 540m^2 of commercial which and 540m^2 of office space with the required parking. For further information regarding the layout of the proposed development please refer to the drawings prepared by Guthrie Muscovitch Architects.

The site is currently zoned for commercial use and it is proposed to rezone part of the site to residential. The site is presently one property with plans to severe the property in the future between the commercial development (0.379ha) and residential (2.278ha). This report will refer to each part separately as the "commercial block" and the "residential block" and provide flows and servicing requirements for each block.

This report will evaluate the serviceability of the site with respect to sanitary, water, storm services and also evaluate the stormwater management (SWM) strategy that will be implemented to meet the City of Mississauga and Region of Peel requirements.

For detailed topography of the existing site conditions, as of January 2016, refer to the topographic survey prepared by Land Survey Group Inc.



2.0 DESIGN CONSIDERATIONS

A) SANITARY WASTE WATER DISPOSAL

Existing Condition

The existing sanitary sewer service for the site connects to the existing 375mm diameter sanitary sewer on The Collegeway. There is also a 250mm diameter sewer on Ridgeway Drive and a 300mm diameter sewer on Colonial Drive.

TABLE 1 - Existing flow from the Site to The Collegeway

Area (ha)	Population	Existing Commercial Flow (l/s)	Infiltration Flow (l/s)	Total Flow (l/s)
2.657	133	1.96	0.53	**2.49**

For calculating the existing and proposed population/flows for the site the following Regional of Peel standards for population densities and flow rates will be used:

- flow rate = 302.8 L/person/day per capita
- Infiltration to be 0.0002$m^{3/}$sec/ha
- for commercial areas, population of 50 persons per hectare is to be used
- for residential areas, population of 175 persons per hectare is to be used (row dwellings)
- The Harmon formula will be used for the peaking factor

EXISTING SANITARY FLOW CALCULATIONS

This program calculates the sanitary discharge from various land use As per the City of Toronto Guideline

PROJECT: 3355 THE COLLEGEWAY, Proposed Mixed-Use Development

COMMERCIAL SITE AREA (ha) = n/a

RESIDENTIAL SITE AREA (ha) = n/a

TOTAL SITE AREA (ha) = 2.657

LAND USE	NUMBER OF UNITS	SITE AREA, (ha)	GROSS FLOOR AREA, m2	TOTAL POPULATION	TOTAL DAILY FLOW (LITERS)	AVERAGE DAILY FLOW l/sec	PEAKING FACTOR, M	TOTAL FLOW FROM LAND USE, l/sec
RESIDENTIAL Density 1, using 86 person/site area				0	0	0.00	4.50	0.00
RESIDENTIAL Density 2, using 170 persons/site area				0	0	0.00	4.50	0.00
RESIDENTIAL Townhomes, using 2.70 persons/unit				0	0	0.00	4.50	0.00
RESIDENTIAL Bachelor & 1-bedroom, using 1.4 person/unit				0	0	0.00	4.50	0.00
RESIDENTIAL 2-bedroom, using 2.1 person/unit				0	0	0.00	4.50	0.00
RESIDENTIAL 3-bedroom, using 3.1 person/unit				0	0	0.00	4.50	0.00
TOTAL RESIDENTIAL								0.00
COMMERCIAL, Using 136 persons/ha				0	0	0.00	4.50	0.00
COMMERCIAL, Using 50 persons/ha		2.657		133	40227	0.47	4.21	1.96
OFFICES, Using 3.3 persons/100 m2				0	0	0.00	4.50	0.00
TOTAL COMMERCIAL								**1.96**
	0			133				

TOTAL V1= 40227

Q1= 0.00
Q2= 1.96
Qinfil 0.53
Qtot 2.49

Q = (MqP/86400) + A * I (L/sec)

Q1= total flow from Residential Land Use (L/sec)
Q2= total flow from Commercial Land Use (L/sec)
Qinfil = total flow from infiltration (L/sec)
Qtot = total flow (Land use + infiltration)

V1= Total Volume from Land Use in liters

where : P is population
q = 302.8 L/person/day for proposed residential
q = 180000 L/floor ha/day for proposed commercial and office
A = gross site area
i = 0.20 L/sec/ha (infiltration rate)
Peaking Factor M = 1 + [14 / (4 + (P/1000,1/2))]

Proposed Commercial Site

The following Table 2 summarizes the proposed flow for the commercial site.

TABLE 2 - Proposed Commercial flows from the Site to Ridgeway Drive				
Area (ha)	**Population**	**Commercial Flow (l/s)**	**Infiltration Flow (l/s)**	**Total Flow (l/s)**
0.379	19	0.29	0.08	**0.37**

The proposed commercial site will connect to the existing 250mm diameter sewer on Ridgeway Drive. The proposed connection will be a 150mm diameter PVC lateral at 2.0% having a full flow capacity of 21.5 l/s, greater than the calculated proposed total flow.

Proposed Residential Site

The following Table 3 summarizes the proposed flow for the residential site.

TABLE 3 - Proposed Residential flows from the Site to The Collegeway				
Area (ha)	**Population**	**Residential Flow (l/s)**	**Infiltration Flow (l/s)**	**Total Flow (l/s)**
2.278	399	8.35	0.46	**8.81**

The proposed commercial site will connect to the existing 375mm diameter sewer on The Collegeway. The proposed connection will be a 200mm diameter PVC lateral at 1.0% having a full flow capacity of 32.8 l/s, greater than the calculated proposed total flow.

The overall proposed site will result in a 6.69 L/s increase in sanitary peak flow to the sewer system from the existing condition. Discussions with the Region of Peel have indicated that they are not aware of any major capacity issues in the vicinity of the site.

COMMERCIAL SANITARY FLOW CALCULATIONS

This program calculates the sanitary discharge from various land use As per the City of Toronto Guideline

PROJECT: 3355 THE COLLEGEWAY, Proposed Mixed-UseDevelopment

COMMERCIAL SITE AREA (ha) = n/a

RESIDENTIAL SITE AREA (ha) = n/a

TOTAL SITE AREA (ha) = 0.379

LAND USE	NUMBER OF UNITS	SITE AREA, (ha)	GROSS FLOOR AREA, m2	TOTAL POPULATION	TOTAL DAILY FLOW (LITERS)	AVERAGE DAILY FLOW l/sec	PEAKING FACTOR, M	TOTAL FLOW FROM LAND USE, l/sec
RESIDENTIAL Density 1, using 86 person/site area				0	0	0.00	4.50	0.00
RESIDENTIAL Density 2, using 170 persons/site area				0	0	0.00	4.50	0.00
RESIDENTIAL Townhomes, using 2.70 persons/unit				0	0	0.00	4.50	0.00
RESIDENTIAL Bachelor & 1-bedroom, using 1.4 person/unit				0	0	0.00	4.50	0.00
RESIDENTIAL 2-bedroom, using 2.1 person/unit				0	0	0.00	4.50	0.00
RESIDENTIAL 3-bedroom, using 3.1 person/unit				0	0	0.00	4.50	0.00
TOTAL RESIDENTIAL								0.00
COMMERCIAL, Using 136 persons/ha				0	0	0.00	4.50	0.00
COMMERCIAL, Using 50 persons/ha		0.379		19	5738	0.07	4.38	0.29
OFFICES, Using 3.3 persons/100 m2				0	0	0.00	4.50	0.00
TOTAL COMMERCIAL								**0.29**
	0			19				

TOTAL V1= 5738

Q1= 0.00
Q2= 0.29
Qinfil 0.08
Qtot 0.37

Q = (MqP/86400) + A * I (L/sec)

Q1= total flow from Residential Land Use (L/sec)
Q2= total flow from Commercial Land Use (L/sec)
Qinfil = total flow from infiltration (L/sec)
Qtot = total flow (Land use + infiltration)

V1= Total Volume from Land Use in liters

where : P is population
q = 302.8 L/person/day for proposed residential
q = 180000 L/floor ha/day for proposed commercial and office
A = gross site area
i = 0.20 L/sec/ha (infiltration rate)
Peaking Factor M = 1 + [14 / (4 + (P/1000,1/2))]

This program calculates the sanitary discharge from various land use As per the City of Toronto Guideline

PROJECT: 3355 THE COLLEGEWAY, Proposed Mized-Use Development

COMMERCIAL SITE AREA (ha) = n/a

RESIDENTIAL SITE AREA (ha) = n/a

TOTAL SITE AREA (ha) = 2.278

LAND USE	NUMBER OF UNITS	SITE AREA, (ha)	GROSS FLOOR AREA, m2	TOTAL POPULATION	TOTAL DAILY FLOW (LITERS)	AVERAGE DAILY FLOW l/sec	PEAKING FACTOR, M	TOTAL FLOW FROM LAND USE, l/sec
RESIDENTIAL Density 1, using 86 person/site area				0	0	0.00	4.50	0.00
RESIDENTIAL Density 2, using 175 persons/site area		2.28		399	179393	2.08	4.02	8.35
RESIDENTIAL Townhomes, using 2.70 persons/unit				0	0	0.00	4.50	0.00
RESIDENTIAL Bachelor & 1-bedroom, using 1.4 person/unit				0	0	0.00	4.50	0.00
RESIDENTIAL 2-bedroom, using 2.1 person/unit				0	0	0.00	4.50	0.00
RESIDENTIAL 3-bedroom, using 3.1 person/unit				0	0	0.00	4.50	0.00
TOTAL RESIDENTIAL								8.35
COMMERCIAL, Using 136 persons/ha				0	0	0.00	4.50	0.00
COMMERCIAL, Using 50 persons/ha				0	0	0.00	4.50	0.00
OFFICES, Using 3.3 persons/100 m2				0	0	0.00	4.50	0.00
TOTAL COMMERCIAL								**0.00**
	0			0				

TOTAL V1= 179393

Q1=	8.35
Q2=	0.00
Qinfil	0.46
Qtot	8.81

Q = (MqP/86400) + A * I (L/sec)

Q1= total flow from Residential Land Use (L/sec)
Q2= total flow from Commercial Land Use (L/sec)
Qinfil = total flow from infiltration (L/sec)
Qtot = total flow (Land use + infiltration)

V1= Total Volume from Land Use in liters

where : P is population
q = 302.8 L/person/day for proposed residential
q = 180000 L/floor ha/day for proposed commercial and office
A = gross site area
i = 0.20 L/sec/ha (infiltration rate)
Peaking Factor M = 1 + [14 / (4 + (P/1000,1/2))]

B) WATER DISTRIBUTION

Existing Condition

There are existing 300mm diameter watermains on The Collegeway and Colonial Drive, and a 400mm diameter watermain on Ridgeway Drive.

Design Considerations

The unit rate and peaking factors of water consumption, minimum pipe size and allowable pressure in line were established from the Region Design Manual Standards.

The pressures and volumes must be sufficient for peak hour conditions and under fire conditions as established by the Ontario Building Code 2006. The minimal residual pressure under fire conditions is 140 kpa (or 20.3 psi).

According to the MOE criteria the allowable pressures are as follows:

Condition	**Allowable Pressures (kpa)**	
	min.	**max.**
1) Min. Hour	275	700
2) Peak Hour	275	700
3) Peak Day + Fire Flow	140	700

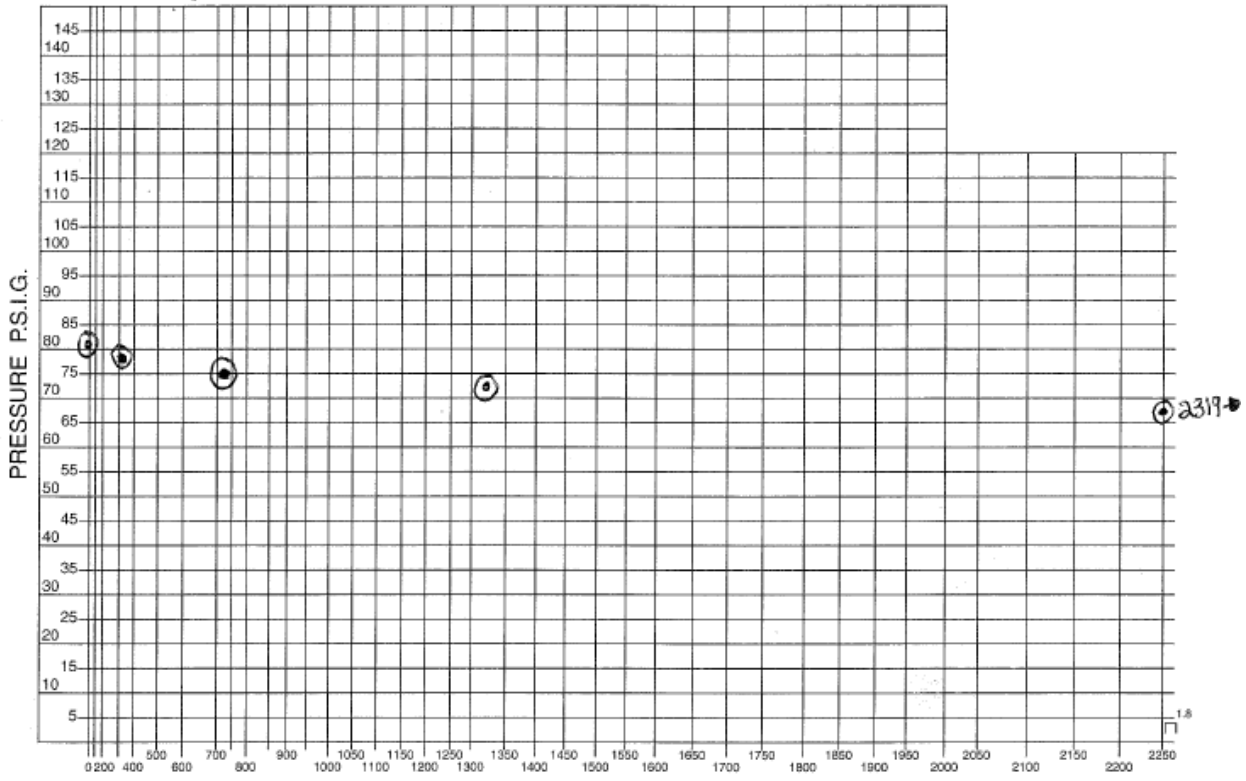
Flows test were conducted for the site on March 30, 2016. One test was performed on Ridgeway and the second was done on The Collegeway. The flow tests demonstrate that there is adequate flow within the system to provide water for domestic and fire fighting purposes for the proposed site.

corix®
Water Services

10 Estate Drive, Toronto, Ontario M1H 2Z1
Phone: 416.282.1665 Fax: 416.282.7702 Toll Free: 1.888.349.2493
www.corix.com

SITE NAME: ODAN/DETECH GROUP INC DATE: 03/30/16
LOCATION: THE COLLEGEWAY @ RIDGEWAY, MISSISSAUGA, ON
TEST DATA TIME OF TEST: 10:07 a.m
LOCATION OF TEST: (FLOW) 108 THE COLLEGEWAY McAVITY M67 (3 PORT)
(RESIDUAL) 68/70 THE COLLEGEWAY McAVITY M63 (3 PORT)
MAIN SIZE: 300 mm
STATIC PRESSURE: 81 PSI

	NUMBER OF OUTLETS & ORIFICE SIZE	PITOT PRESSURE	FLOW (U.S. G.P.M.)	RESIDUAL PRESSURE
# 1	1⅛"	76 PSI	327	78 PSI
# 2	1¾"	65 PSI	733	75 PSI
# 3	2½"	63 PSI	1329	73 PSI
# 4	2 x 2½"	48 PSI	2319	67 PSI



COMMENTS: PERFORMED ONE COMPLETE NFPA-291 FLOW TEST WITH FOUR FLOW READINGS, AS REQUESTED

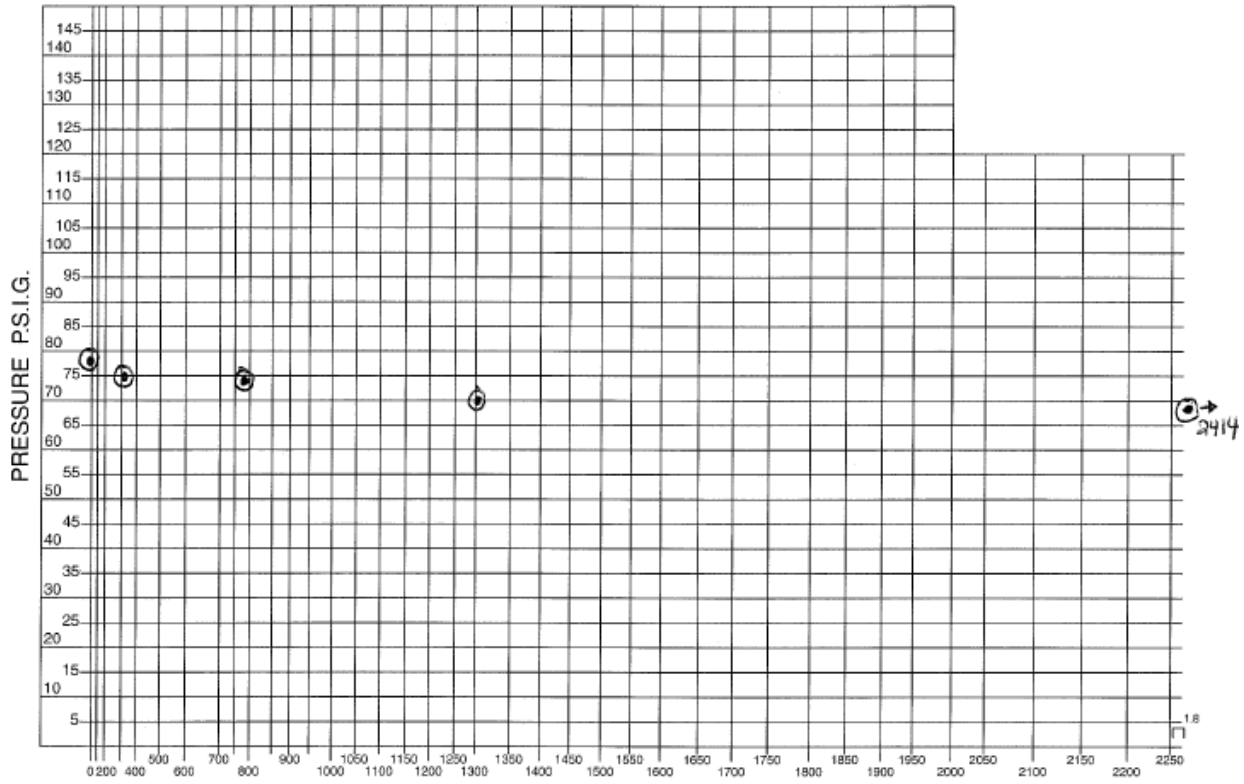
Authorized Signature _____ Corix Water Services Signature _____

CORIX®
Water Services

10 Estate Drive, Toronto, Ontario M1H 2Z1
Phone: 416.282.1665 Fax: 416.282.7702 Toll Free: 1.888.349.2493
www.corix.com

SITE NAME: ODAN / DETECH GROUP INC DATE: 03/30/16
LOCATION: THE COLLEGEWAY @ RIDGEWAY, MISSISSAUGA, ON
TEST DATA TIME OF TEST: 10:32 am
LOCATION OF TEST: (FLOW) 3450 RIDGEWAY, UNIT 17 - McAUITY M67 (3 PORT)
(RESIDUAL) 3400 RIDGEWAY - McAVITY M67 (3 PORT)
MAIN SIZE: 400mm
STATIC PRESSURE: 78 PSI

	NUMBER OF OUTLETS & ORIFICE SIZE	PITOT PRESSURE	FLOW (U.S. G.P.M.)	RESIDUAL PRESSURE
# 1	1⅛	72 PSI	318	75 PSI
# 2	1¾	65 PSI	733	74 PSI
# 3	2½	62 PSI	1318	70 PSI
# 4	2 x 2½	52 PSI	2414	68 PSI



COMMENTS: PERFORMED ONE COMPLETE NFPA-291 FLOW TEST, WITH FOUR FLOW READINGS, AS REQUESTED

Authorized Signature _____ Corix Water Services Signature _____

Proposed Commercial Site

The water demand of the site was calculated using the proposed commercial building.

a)	Average Day domestic demand -	using 300 L/cap/day (19 persons)	0.06 L/s
b)	Max day demand -	1.4 x daily demand	0.08 L/s
c)	Peak hour demand -	3.0 x daily demand	0.18 L/s
d)	Fire flow (see Appendix C for calculations)		67 L/s

TABLE 4 - Total Water Demand for Site

	L/s	USGM
Max Day Demand	0.08	1.3
Fire Flow Demand	67.00	1057
Total Water Demand	67.08	1058.3
Approx. Flow at 20 PSI Residual Pressure	394	6237

A proposed 150mm service will be connected to the existing 400mm watermain on Ridgeway Drive for the commercial site to provide water for domestic and sprinkler services. No additional hydrants will be added to the commercial site as there are existing hydrants on Ridgeway and Collegeway that provide adequate coverage.

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

$F = 220 \times C \times \sqrt{A}$
Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

LOCATION:	3355 THE COLLEGEWAY	**PROJECT:**	3355 THE COLLEGEWAY, COM & RES, MISSISSAUGA
OBC OCCUPANCY:	Commercial	**PROJECT No:**	15268
BUILDING FOOT PRINT (m2):	540		
# OF STOREYS	2		

Contents	Charge
Non-Combustible	-25%
limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

CONSTRUCTION CLASS: Non-Combustible

AUTOMATED SPRINKLER PROTECTION		Credit	Total
NFPA 13 sprinkler standard	yes	30%	
Standard Water Supply	yes	10%	50%
Fully Supervised System	yes	10%	
		50%	

CONTENTS FACTOR: Combustible CHARGE: 0%

EXPOSURE 1 (south)	Distance to Exposure Building (m)	>45	0%	
Residential	Length - Height			
EXPOSURE 2 (east)	Distance to Exposure Building (m)	13	10%	
Residential (Sprinklered)	Length - Height			
EXPOSURE 3 (west)	Distance to Exposure Building (m)	>45	0%	
Right-of-way	Length - Height			
EXPOSURE 4 (north)	Distance to Exposure Building (m)	>45	0%	
Parking	Length - Height			
		Total:	10%	no more than 75%

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%

ARE BUILDINGS CONTIGUOUS: NO

FIRE RESISTANT BUILDING Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating: NO

CALCULATIONS Non-Combustible

	C =	0.8		
	A =	1080	m2	
	F =	5784	L/min	
Round to Nearest 1000 L/min	F =	6000	L/min	must be > 2000 L/min

STOREY AREAS m2
540
540
0

CORRECTION FACTORS:

OCCUPANCY	0	L/min
FIRE FLOW ADJUSTED FOR OCCUPANCY	6000	L/min
REDUCTION FOR SPRINKLER	-3000	L/min
EXPOSURE CHARGE	600	L/min

REQUIRED FIRE FLOW					
	F =	3600	L/min		
Round to Nearest 1000 L/min	**F =**	4000	L/min	1057	usgm
	F =	67	L/sec		

Proposed Residential Site

The water demand of the site will be calculated using the proposed Block 7 as it has the largest fire demand for the site. The water demand is calculated as follows.

b)	Average Day domestic demand -	using 280 L/cap/day (399 persons)	1.29 L/s
b)	Max day demand -	2.0 x daily demand	2.58 L/s
c)	Peak hour demand -	3.0 x daily demand	3.87 L/s
e)	Fire flow for Block 7 (see Appendix C for calculations)		217 L/s

TABLE 5 - Total Water Demand for Site

	L/s	USGM
Max Day Demand	2.58	41
Fire Flow Demand	217.00	3434
Total Water Demand	219.58	3475
Approx. Flow at 20 PSI Residual Pressure	324	5134

It is proposed to loop a 200mm water services to the existing 300mm watermain on The Collegeway and to the existing 300mm watermain on Colonial Drive for the domestic and fire fighting purposes for the site. Additional hydrants will be added along the drive aisle to provide adequate coverage for the site.

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

$F = 220 \times C \times \sqrt{A}$
Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

LOCATION:	3355 THE COLLEGEWAY	**PROJECT:**	3355 THE COLLEGEWAY, COM & RES, MISSISSAUGA
OBC OCCUPANCY:	Residential	**PROJECT No:**	15268
BUILDING FOOT PRINT (m2):	1100		
# OF STOREYS	3	Block 7	

Contents	Charge
Non-Combustible	-25%
limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

CONSTRUCTION CLASS: Wood Frame

AUTOMATED SPRINKLER PROTECTION

		Credit	Total
NFPA 13 sprinkler standard	yes	30%	
Standard Water Supply	yes	10%	50%
Fully Supervised System	yes	10%	
		50%	

CONTENTS FACTOR: Limited Combustible CHARGE: -20%

EXPOSURE 1 (south)	Distance to Exposure Building (m)	36	5%
Residential	Length - Height		
EXPOSURE 2 (east)	Distance to Exposure Building (m)	13	10%
Residential (Sprinklered)	Length - Height		
EXPOSURE 3 (west)	Distance to Exposure Building (m)	13	10%
Residential (Sprinklered)	Length - Height		
EXPOSURE 4 (north)	Distance to Exposure Building (m)	13	10%
Residential (Sprinklered)	Length - Height		
		Total:	35%

no more than 75%

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%

ARE BUILDINGS CONTIGUOUS: YES

FIRE RESISTANT BUILDING Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating: NO

CALCULATIONS Wood Frame

	C =	1.5		
	A =	3300	m2	
	F =	18957	L/min	
Round to Nearest 1000 L/min	F =	19000	L/min	must be > 2000 L/min

STOREY AREAS m2
1100
1100
1100

CORRECTION FACTORS:

OCCUPANCY	-3800	L/min
FIRE FLOW ADJUSTED FOR OCCUPANCY	15200	L/min
REDUCTION FOR SPRINKLER	-7600	L/min
EXPOSURE CHARGE	5320	L/min

REQUIRED FIRE FLOW

	F =	12920	L/min	
Round to Nearest 1000 L/min	**F =**	13000	L/min	3434 usgm
	F =	217	L/sec	

C) STORM WATER MANAGEMENT

Storm water management for the proposed development will follow the storm water criteria as set out by the City of Mississauga's guidelines for quantity control. The allowable post-development peak flow for the proposed development will match the pre-development flows for each design storm. Design storm data for the City of Mississauga's 2 through 100 year storms are shown below. A comparison will be made for the entire range of storms for predevelopment versus post-development.

$$\text{2 YEAR STORM } i = \frac{610}{(TC+4.6)^{0.78}}$$

$$\text{5 YEAR STORM } i = \frac{820}{(TC+4.6)^{0.78}}$$

$$\text{10 YEAR STORM } i = \frac{1010}{(TC+4.6)^{0.78}}$$

$$\text{25 YEAR STORM } i = \frac{1160}{(TC+4.6)^{0.78}}$$

$$\text{50 YEAR STORM } i = \frac{1300}{(TC+4.7)^{0.78}}$$

$$\text{100 YEAR STORM } i = \frac{1450}{(TC+4.9)^{0.78}}$$

where: I = intensity (mm/hr)
T = time of concentration (10min)

Existing Condition

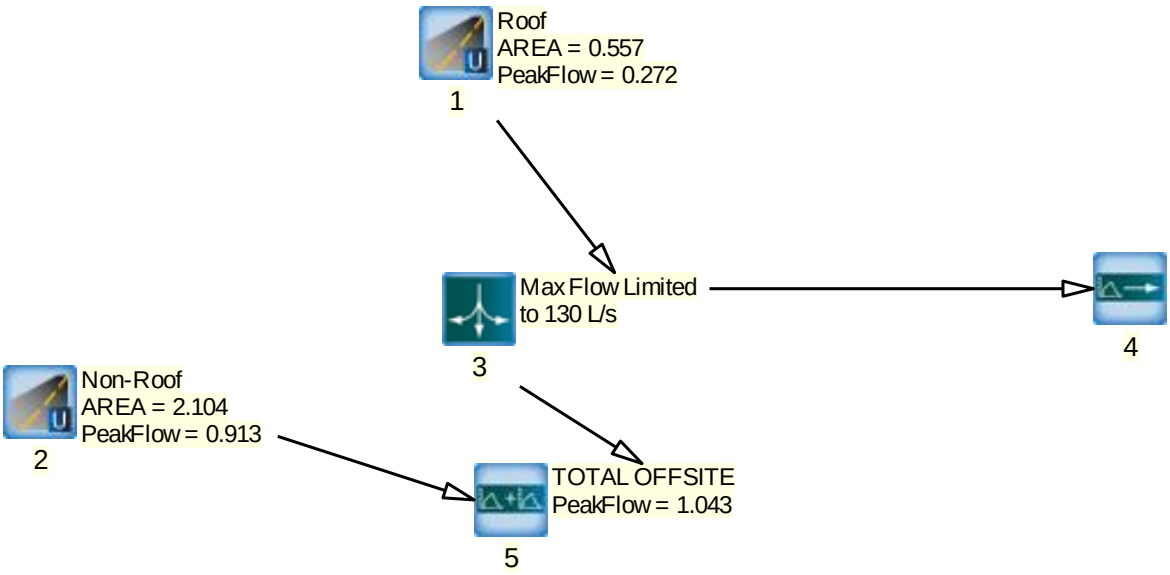
Allowable discharge from the site will be determined by modelling the existing site condition using Visual Otthymo 2.3.2. for 2-100 year design storms. The following Table summarizes the parameters used in Otthymo to characterize the predevelopment catchment areas.

TABLE 6 - Catchment Characteristics for the Pre-Developed Site

Area No.	Area (ha)	Hydrograph Method	% impervious	imperviousness directly connected %	Loss Method for Pervious Area	CN for Pervious Area	Initial Abstraction for Pervious Area (mm)	Time to peak (T_p)
Area 1 (Roof)	0.557	StandHyd	99	99	SCS	99	1	-
Area 2 (Remainder)	2.103	StandHyd	84	84	SCS	80	5	-
TOTAL	**2.660**							

The existing rooftop is drained via a 250m diameter sewer at 0.5% which has a capacity of 130 L/s. Since the controlled flow off the rooftop is unknown, the model includes a flow splitter, which limits the maximum roof flow to 130L/s, simulating roof top controls. The following Table 7 summarises the results from Otthymo.

Pre-Development Otthymo Model



For more detailed information, refer to Appendix D for the computer modelling output results. The total flow from the site was distributed based on land area to determine the allowable flow for each individual site. The commercial site being 14% of the total land area and the Residential site being 86%.

TABLE 7 - Allowable Flows

Storm Event	Existing Site (L/s)	Commercial Allowable (L/s)	Residential Allowable (L/s)
2 Year Storm	481	67	414
5 Year Storm	633	89	544
10 Year Storm	759	106	653
25 Year Storm	860	120	740
50 Year Storm	951	133	818
100 Year Storm	1043	146	897

Each site, commercial and residential, will be evaluated separately. Each will have their own service connection and control devices in order to align with the proposed severance.

Proposed Commercial Site

Post Development Flow Analysis

For the purpose of post development analysis, the post development storm tributary areas of the subject site have been identified as shown on Figure 1 in Appendix D.

In order to control the post development flows to the allowable flow rate, on-site storage will be required through surface and underground storage in the commercial parking area. As per the predevelopment conditions, Otthymo will be used to model and establish the post development flows and determine the detention volume required.

The following Table 8 summarizes the parameters used in Otthymo to characterize the post development catchment areas.

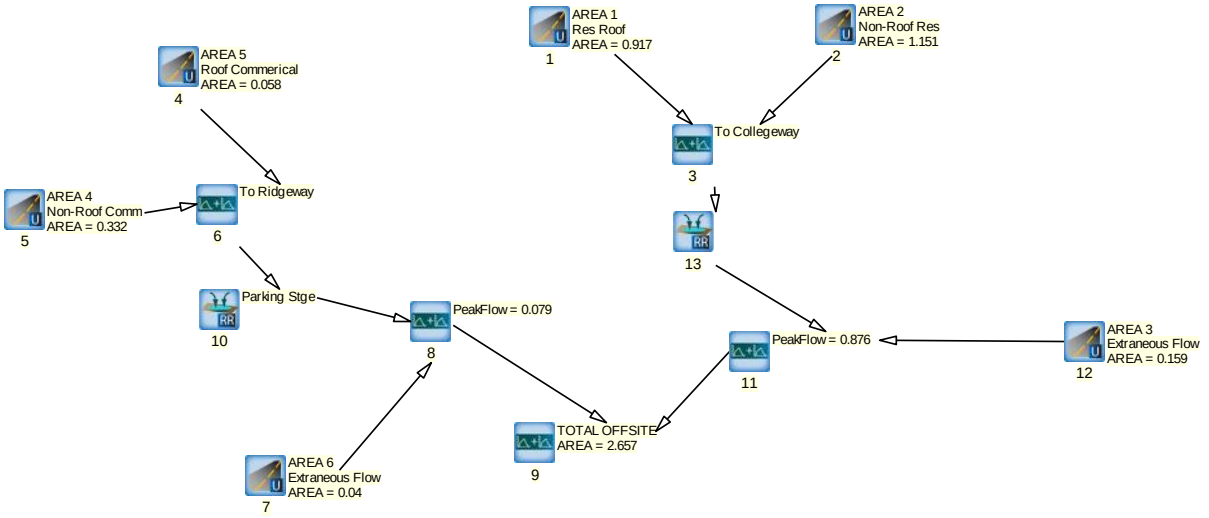
TABLE 8 - Catchment Characteristics for the Post-Developed Site

Area No.	Area (ha)	Hydrograph Method	% impervious	imperviousness directly connected %	Loss Method for Pervious Area	CN for Pervious Area	Initial Abstraction for Pervious Area (mm)	Time to peak (T_p)
Area 4 (Commercial Parking)	0.332	StandHyd	90	90	SCS	99	1	-
Area 5 (Commercial Roof Area)	0.058	StandHyd	99	99	SCS	80	5	-
Area 5 (Extraneous Flow)	0.040	StandHyd	20	20	SCS	80	5	-
TOTAL	**0.430**							

The storage details and the stage/storage/discharge properties used to model the flow controls for this site are shown in Appendix D. Area 4 and Area 5 will be controlled by a downstream orifice.

Please note that both commercial and residential were modelled together in Otthymo.

Post-Development Otthymo Model



The following Table 9 shows a summary of the total peak flows from the site. As shown, the total flow is less than the allowable flow for each storm except the 2 year design storm.

TABLE 9 - Summary of Flows from the Commercial Site

Storm Event	Allowable Flow (L/s)	Proposed Flow (L/s)
2 Year Storm	67	**70**
5 Year Storm	89	**73**
10 Year Storm	106	**74**
25 Year Storm	120	**76**
50 Year Storm	133	**78**
100 Year Storm	146	**79**

Although the 2 year storm has a minor increase in flow (4%) the remainder of the storms have a decrease in flow, up to 45% on the 100 year storm, therefore improving the downstream storm sewers during major storm events.

The following Table 10 summarizes the surface storage requirements for the 2 year and 100 year storm events.

TABLE 10 - Summary of Commercial Volumes (100 Year Volume)

Ponding Area	Surface Ponding Elevation (m)		Surface Pond Depth Calculated Above Rim Elevation (m)		Ponding Volume Req'd (m^3)		Ponding Volume Provided (m^3) Including Pipes & Structures
	2 Yr	100 Yr	2 Yr	100 Yr	2 Yr	100 Yr	
Area 4	178.75	178.95	0.00	0.20	14	73	110

As demonstrated in Table 10, there is sufficient storage capacity on site to store the 100 year storm event with no surface ponding occurring during the minor storm.

The proposed storm lateral connecting to Ridgeway Street is a 375mm dia. PVC pipe at a 1.0% slope. Using an 'n' value of 0.013 this pipe will have a capacity of 175 L/s, greater than the site allowable.

Please refer to the servicing drawings as prepared by the Odan/Detech Group for more information.

Annual Stormwater Charge (Proposed Commercial)

Effective January 2016, all properties in Mississauga will be charged for their stormwater runoff. For non-residential sites, it based on the hard surface area.

Based on the estimator on the City of Mississauga website, the overall existing site is subject to an estimated annual charge of $8,580.00.

The proposed site is expected to maintain the pervious area of the site compared to the pre-development conditions but reduce in area. Thus, the post development annual charge would be decreased.

Credits to reduce this annual charge will be awarded based on the implementation of stormwater management and best management practices. Since the proposed site will have quantity control (as discussed above) it is expected that this charge will be reduced by 40%.

The table below show the reduction amounts for various LID practises.

Stormwater Credit Schedule

Category	Evaluation Criteria	Total Credit (50% max)	
Peak Flow Reduction	Per cent reduction of the 100 year post-development flow to pre-development conditions of the site.	Up to 40%	Up to 50%
Water Quality Treatment	Per cent of site (hard surface) receiving water quality treatment consistent with Provincial criteria for enhanced treatment.	Up to 10%	
Runoff Volume Reduction	Per cent capture of first 15 mm of rainfall during a single rainfall event.	Up to 15%	
Pollution Prevention	Develop and implement a pollution prevention plan.	Up to 5%	

Due to the on-site controls the 100 year post-development peak flow for the whole site has been reduced below the pre-development flow levels.

Water Quality treatment has been maximized through landscaping and clean roof water run-off.

Run-off volume has been reduced via initial abstraction through landscaping and grassed surfaces.

Proposed Residential Site

Post Development Flow Analysis

For the purpose of post development analysis, the post development storm tributary areas of the subject site have been identified as shown on Figure 1 in Appendix D.

In order to control the post development flows to the allowable flow rate, on-site storage will be required through underground pipe storage in the residential area. As per the predevelopment conditions, Otthymo will be used to model and establish the post development flows and determine the detention volume required.

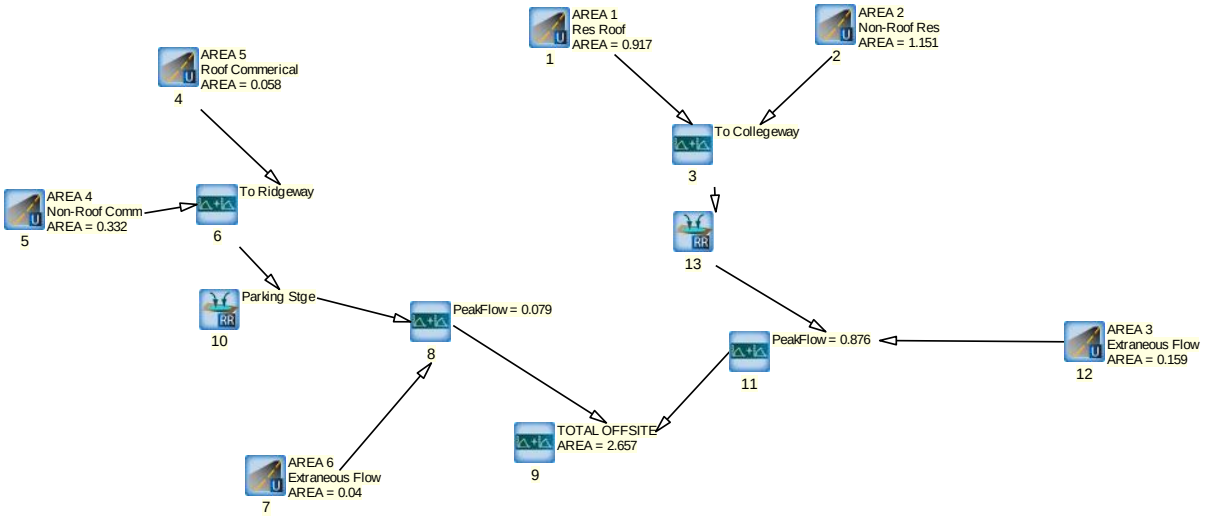
The following Table 11 summarizes the parameters used in Otthymo to characterize the post development catchment areas.

TABLE 11 - Catchment Characteristics for the Post-Developed Site

Area No.	Area (ha)	Hydrograph Method	% impervious	imperviousness directly connected %	Loss Method for Pervious Area	CN for Pervious Area	Initial Abstraction for Pervious Area (mm)	Time to peak (T_p)
Area 1 (Residential Roof)	0.917	StandHyd	99	99	SCS	99	1	-
Area 2 (Residential Non-Roof Area)	1.151	StandHyd	89	89	SCS	80	5	-
Area 3 (Extraneous Flow)	0.159	StandHyd	47	47	SCS	80	5	-
TOTAL	**2.227**							

The storage details and the stage/storage/discharge properties used to model the flow controls for this site are shown in Appendix D. Area 4 and Area 5 will be controlled be a downstream orifice.

Pre-Development Otthymo Model



The following Table 12 shows a summary of the total peak flows from the site. As shown, the total flow is less than the allowable flow for each storm.

TABLE 12 - Summary of Flows from the Residential Site

Storm Event	Total Flow (L/s)	Allowable Flow (L/s)
2 Year Storm	414	**344**
5 Year Storm	544	**471**
10 Year Storm	653	**593**
25 Year Storm	740	**682**
50 Year Storm	818	**769**
100 Year Storm	897	**876**

The following Table 13 summarizes the surface storage requirements for the 2 year and 100 year storm events.

TABLE 13 - Summary of Residential Volumes (100 Year Volume)

Ponding Area	Surface Ponding Elevation (m)		Surface Pond Depth Calculated Above Rim Elevation (m)		Ponding Volume Req'd (m^3)		Ponding Volume Provided (m^3) Including Pipes & Structures
	2 Yr	100 Yr	2 Yr	100 Yr	2 Yr	100 Yr	
Area 2	177.20	177.20	0.00	0.00	14	53	53

As demonstrated in Table 13, there is sufficient storage capacity on site to store the 100 year storm event with no surface ponding occurring during the minor storm.

The proposed storm lateral connecting to Ridgeway Street is a 675mm dia. Concrete pipe at a 1.15% slope. Using an 'n' value of 0.013 this pipe will have a capacity of 901 L/s, equal to the site allowable.

Please refer to the servicing drawings as prepared by the Odan/Detech Group for more information.

Annual Stormwater Charge (Proposed Residential)

Effective January 2016, all properties in Mississauga will be charged for their stormwater runoff. For non-residential sites, it based on the hard surface area.

Based on the estimator on the City of Mississauga website, the existing site is subject to an estimated annual charge of $8,580.00.

The proposed site is expected to decrease the pervious area of the site compared to the pre-development conditions. Thus, the post development annual charge could be decreased.

Credits to reduce this annual charge will be awarded based on the implementation of stormwater management and best management practices. Since the proposed site will have quantity control (as discussed above) it is expected that this charge will be reduced by 40%.

The table below show the reduction amounts for various LID practises.

Stormwater Credit Schedule

Category	Evaluation Criteria	Total Credit (50% max)	
Peak Flow Reduction	Per cent reduction of the 100 year post-development flow to pre-development conditions of the site.	Up to 40%	Up to 50%
Water Quality Treatment	Per cent of site (hard surface) receiving water quality treatment consistent with Provincial criteria for enhanced treatment.	Up to 10%	
Runoff Volume Reduction	Per cent capture of first 15 mm of rainfall during a single rainfall event.	Up to 15%	
Pollution Prevention	Develop and implement a pollution prevention plan.	Up to 5%	

Due to the on-site controls the 100 year post-development peak flow for the whole site has been reduced below the pre-development flow levels.

Water Quality treatment has been maximized through landscaping and clean roof water run-off.

Run-off volume has been reduced via initial abstraction through landscaping and grassed surfaces.

3.0 CONCLUSIONS

From our investigation the site is serviceable utilizing existing sanitary, storm and watermain infrastructure adjacent to the site.

Storm water management can be accommodated with on-site storage as described in this report. The post development storm design has been maintained below the allowable flow rate for the site for each storm event.

The following Table 13 summarizes the SWM components of the proposed development.

TABLE 13 - Summary Information

	Commercial	Residential
Total Sanitary Flow (L/s)	0.37	8.81
Total Fire-Domestic Flow Required (US gpm)	1058	3475
Total Fire-Domestic Flow Provided (US gpm)	6237	5134
Allowable release rate from site (L/s) (10 year)	106	653
Actual release rate from site (L/s) (10 year)	74	593
Orifice Plate Size (mm)	145	490
100 Year maximum Storage (m3)	74	593

Respectfully Submitted;
The Odan Detech Group Inc.

Kevin Osinga, C.E.T.

John Krpan, M.S.C.E., P.Eng

APPENDIX A

Aerial Photo of Existing Site
Site Plan by Guthrie Muscovitch Architects (Reduced)

Aerial Photo of Existing Site

GUTHRIE MUSCOVITCH
ARCHITECTS
Tel:(416) 252-5679 Fax: (416) 252-9637
770 Brown's Line, Toronto, Ontario M8W 3W2

Client
3355 THE COLLEGEWAY L.P.

project
3355 THE COLLEGEWAY, MISSISAUGA

ONTARIO ASSOCIATION OF ARCHITECTS
ARTHUR S. MUSCOVITCH
LICENCE 2733

DRAWING SITE PLAN

scale	N.T.S.
date	JUNE_10_2016
drawn	CW
checked	AM
project number	15013

SP1

APPENDIX D

Visual Otthymo Pre Development 2 to 100 Year Design Storms
Visual Otthymo Post Development 2 to 100 Year Design Storms
Figure 1 – Existing Storm Tributary Plan
Figure 2 – Proposed Storm Tributary Plan
Stage/Storage/Discharge Characteristics for Flow Controlled Area

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

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO

Developed and Distributed by Clarifica Inc.
Copyright 1996, 2007 Clarifica Inc.
All rights reserved.


                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.3\voin.dat
  Output  filename: P:\2015\15268\FSR\SET A\Otthymo\15238-Post Dev\PreDevelopment.out
  Summary filename: P:\2015\15268\FSR\SET A\Otthymo\15238-Post Dev\PreDevelopment.sum


DATE: 2016-03-03                          TIME: 11:26:18 AM

USER:


COMMENTS: _____________________________________________________

----------------------------------------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 610.000
| Ptotal= 33.44 mm |                          B=   4.600
--------------------                          C=    .780
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    2.24 |  1.17   16.92 |  2.17    5.18 |  3.17    2.65
                 .33    2.56 |  1.33   75.36 |  2.33    4.43 |  3.33    2.47
                 .50    3.00 |  1.50   22.14 |  2.50    3.88 |  3.50    2.31
                 .67    3.67 |  1.67   11.74 |  2.67    3.46 |  3.67    2.17
                 .83    4.80 |  1.83    8.14 |  2.83    3.14 |  3.83    2.05
                1.00    7.21 |  2.00    6.30 |  3.00    2.87 |  4.00    1.95


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .55          .01
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      60.90        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    2.24 | 1.083   16.92 | 2.083    5.18 |  3.08    2.65
                .167    2.24 | 1.167   16.92 | 2.167    5.18 |  3.17    2.65
```

```
                .250    2.56 | 1.250   75.36 | 2.250    4.43 |  3.25    2.47
                .333    2.56 | 1.333   75.36 | 2.333    4.43 |  3.33    2.47
                .417    3.00 | 1.417   22.14 | 2.417    3.88 |  3.42    2.31
                .500    3.00 | 1.500   22.14 | 2.500    3.88 |  3.50    2.31
                .583    3.67 | 1.583   11.74 | 2.583    3.46 |  3.58    2.17
                .667    3.67 | 1.667   11.74 | 2.667    3.46 |  3.67    2.17
                .750    4.80 | 1.750    8.14 | 2.750    3.14 |  3.75    2.05
                .833    4.80 | 1.833    8.14 | 2.833    3.14 |  3.83    2.05
                .917    7.21 | 1.917    6.30 | 2.917    2.87 |  3.92    1.95
               1.000    7.21 | 2.000    6.30 | 3.000    2.87 |  4.00    1.95

     Max.Eff.Inten.(mm/hr)=      75.36       677.90
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       2.12 (ii)    3.38 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .31          .26
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .11          .00          .116 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      32.44        30.06         32.41
     TOTAL RAINFALL   (mm)=      33.44        33.44         33.44
     RUNOFF COEFFICIENT   =        .97          .90           .97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (0002) |   Area    (ha)=   2.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  84.00   Dir. Conn.(%)=  84.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.77          .34
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     118.40        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=      75.36        21.18
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.17 (ii)    7.24 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .27          .14
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .36          .01          .365 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      32.44         8.80         28.65
     TOTAL RAINFALL   (mm)=      33.44        33.44         33.44
     RUNOFF COEFFICIENT   =        .97          .26           .86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DIVERT HYD (0003)|
| IN= 1   # OUT= 2 |
--------------------
     Outflow / Inflow  Relationships

      Flow 1 + Flow 2 = Total
      (cms)    (cms)    (cms)
        .00      .00      .00
        .00      .13      .13
      10.00      .13    10.13

                          AREA     QPEAK     TPEAK    R.V.
                          (ha)     (cms)     (hrs)     (mm)
     TOTAL HYD.(ID= 1):    .56       .12      1.33   32.41
     ==========================================================
```

```
     ID= 2  (   3)    :    .00       .00      1.33   32.41
     ID= 3  (   3)    :    .56       .12      1.33   32.41
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0003):       .56    .116     1.33    32.41
       + ID2= 2 (0002):     2.10    .365     1.33    28.65
         ================================================
         ID = 3 (0005):     2.66    .481     1.33    29.44

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SHIFT HYD (0004) |
| IN= 2---> OUT= 1 |
| SHIFT= 20.0 min  |      AREA     QPEAK     TPEAK      R.V.
--------------------      (ha)     (cms)     (hrs)      (mm)
         ID= 2 (0003):     .00       .00      1.33     32.41
    SHIFT ID= 1 (0004):     .00       .00      1.67     32.41

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 820.000
| Ptotal= 44.95 mm |                          B=   4.600
--------------------                          C=    .780
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .17    3.01 |  1.17   22.75 |  2.17    6.97 |  3.17    3.56
                .33    3.44 |  1.33  101.30 |  2.33    5.95 |  3.33    3.32
                .50    4.03 |  1.50   29.76 |  2.50    5.22 |  3.50    3.10
                .67    4.93 |  1.67   15.78 |  2.67    4.66 |  3.67    2.92
                .83    6.45 |  1.83   10.94 |  2.83    4.22 |  3.83    2.76
               1.00    9.69 |  2.00    8.47 |  3.00    3.86 |  4.00    2.62


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .55          .01
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      60.90        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
               .083    3.01 | 1.083   22.75 | 2.083    6.97 |  3.08    3.56
               .167    3.01 | 1.167   22.75 | 2.167    6.97 |  3.17    3.56
               .250    3.44 | 1.250  101.30 | 2.250    5.95 |  3.25    3.32
               .333    3.44 | 1.333  101.30 | 2.333    5.95 |  3.33    3.32
               .417    4.03 | 1.417   29.76 | 2.417    5.22 |  3.42    3.10
               .500    4.03 | 1.500   29.76 | 2.500    5.22 |  3.50    3.10
               .583    4.93 | 1.583   15.78 | 2.583    4.66 |  3.58    2.92
               .667    4.93 | 1.667   15.78 | 2.667    4.66 |  3.67    2.92
               .750    6.45 | 1.750   10.94 | 2.750    4.22 |  3.75    2.76
               .833    6.45 | 1.833   10.94 | 2.833    4.22 |  3.83    2.76
               .917    9.69 | 1.917    8.47 | 2.917    3.86 |  3.92    2.62
              1.000    9.69 | 2.000    8.47 | 3.000    3.86 |  4.00    2.62
```

```
     Max.Eff.Inten.(mm/hr)=     101.30       169.48
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.89 (ii)    3.00 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .32          .28
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .15          .00          .156 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      43.95        41.53         43.92
     TOTAL RAINFALL   (mm)=      44.95        44.95         44.95
     RUNOFF COEFFICIENT   =        .98          .92           .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   2.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  84.00   Dir. Conn.(%)=  84.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.77          .34
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     118.40        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     101.30        29.69
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.81 (ii)    6.43 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .28          .14
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .49          .02          .503 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      43.95        15.43         39.39
     TOTAL RAINFALL   (mm)=      44.95        44.95         44.95
     RUNOFF COEFFICIENT   =        .98          .34           .88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DIVERT HYD (0003)|
| IN= 1   # OUT= 2 |
--------------------
     Outflow / Inflow  Relationships

      Flow 1 + Flow 2 = Total
      (cms)    (cms)    (cms)
        .00      .00      .00
        .00      .13      .13
      10.00      .13    10.13

                          AREA     QPEAK     TPEAK    R.V.
                          (ha)     (cms)     (hrs)     (mm)
     TOTAL HYD.(ID= 1):    .56       .16      1.33   43.92
     ================================================
     ID= 2  (   3)    :    .03       .03      1.33   43.92
     ID= 3  (   3)    :    .53       .13      1.33   43.92
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
          ID1= 1 (0003):      .53    .130     1.33    43.92
        + ID2= 2 (0002):     2.10    .503     1.33    39.39
          ================================================
```

```
          ID = 3 (0005):     2.63    .633     1.33    40.29

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SHIFT HYD (0004) |
| IN= 2---> OUT= 1 |
| SHIFT= 20.0 min  |      AREA     QPEAK     TPEAK      R.V.
--------------------      (ha)     (cms)     (hrs)      (mm)
          ID= 2 (0003):     .03       .03      1.33     43.92
    SHIFT ID= 1 (0004):     .03       .03      1.67     43.92

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1010.000
| Ptotal= 55.37 mm |                          B=   4.600
--------------------                          C=    .780
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    3.71 |  1.17   28.02 |  2.17    8.58 |  3.17    4.39
                 .33    4.23 |  1.33  124.77 |  2.33    7.33 |  3.33    4.08
                 .50    4.97 |  1.50   36.65 |  2.50    6.42 |  3.50    3.82
                 .67    6.07 |  1.67   19.43 |  2.67    5.74 |  3.67    3.60
                 .83    7.95 |  1.83   13.47 |  2.83    5.19 |  3.83    3.40
                1.00   11.94 |  2.00   10.43 |  3.00    4.75 |  4.00    3.22


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .55          .01
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      60.90        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    3.71 | 1.083   28.02 | 2.083    8.58 |  3.08    4.39
                .167    3.71 | 1.167   28.02 | 2.167    8.58 |  3.17    4.39
                .250    4.23 | 1.250  124.77 | 2.250    7.33 |  3.25    4.08
                .333    4.23 | 1.333  124.77 | 2.333    7.33 |  3.33    4.08
                .417    4.97 | 1.417   36.65 | 2.417    6.42 |  3.42    3.82
                .500    4.97 | 1.500   36.65 | 2.500    6.42 |  3.50    3.82
                .583    6.07 | 1.583   19.43 | 2.583    5.74 |  3.58    3.60
                .667    6.07 | 1.667   19.43 | 2.667    5.74 |  3.67    3.60
                .750    7.95 | 1.750   13.47 | 2.750    5.19 |  3.75    3.40
                .833    7.95 | 1.833   13.47 | 2.833    5.19 |  3.83    3.40
                .917   11.94 | 1.917   10.43 | 2.917    4.75 |  3.92    3.22
               1.000   11.94 | 2.000   10.43 | 3.000    4.75 |  4.00    3.22

     Max.Eff.Inten.(mm/hr)=     124.77       237.49
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.74 (ii)    2.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .32          .28
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .19          .00           .192 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      54.37        51.92         54.34
     TOTAL RAINFALL   (mm)=      55.37        55.37         55.37
     RUNOFF COEFFICIENT   =        .98          .94           .98
```

```
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   2.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  84.00   Dir. Conn.(%)=  84.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.77          .34
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     118.40        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     124.77        44.90
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.59 (ii)    5.92 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .29          .15
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .60          .03          .629 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      54.37        22.28         49.23
     TOTAL RAINFALL   (mm)=      55.37        55.37         55.37
     RUNOFF COEFFICIENT   =        .98          .40           .89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DIVERT HYD (0003)|
| IN= 1   # OUT= 2 |
--------------------
     Outflow / Inflow  Relationships

      Flow 1 + Flow 2 = Total
      (cms)    (cms)    (cms)
        .00      .00      .00
        .00      .13      .13
      10.00      .13    10.13

                          AREA     QPEAK     TPEAK    R.V.
                          (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):    .56       .19      1.33   54.34
     ================================================
     ID= 2  (   3)    :    .06       .06      1.33   54.34
     ID= 3  (   3)    :    .49       .13      1.33   54.34
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):      .49    .130     1.33    54.34
        + ID2= 2 (0002):     2.10    .629     1.33    49.23
          ================================================
          ID = 3 (0005):     2.60    .759     1.33    50.20

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SHIFT HYD (0004) |
| IN= 2---> OUT= 1 |
| SHIFT= 20.0 min  |      AREA     QPEAK     TPEAK      R.V.
--------------------       (ha)     (cms)     (hrs)      (mm)
          ID= 2 (0003):     .06       .06      1.33     54.34
```

```
    SHIFT ID= 1 (0004):     .06      .06      1.67     54.34

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1160.000
| Ptotal= 63.59 mm |                          B=   4.600
--------------------                          C=    .780
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    4.26 |  1.17   32.19 |  2.17    9.86 |  3.17    5.04
                 .33    4.86 |  1.33  143.31 |  2.33    8.42 |  3.33    4.69
                 .50    5.71 |  1.50   42.10 |  2.50    7.38 |  3.50    4.39
                 .67    6.97 |  1.67   22.32 |  2.67    6.59 |  3.67    4.13
                 .83    9.13 |  1.83   15.47 |  2.83    5.96 |  3.83    3.90
                1.00   13.71 |  2.00   11.98 |  3.00    5.46 |  4.00    3.70


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .55          .01
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      60.90        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                           ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    4.26 | 1.083   32.19 | 2.083    9.86 |  3.08    5.04
                .167    4.26 | 1.167   32.19 | 2.167    9.86 |  3.17    5.04
                .250    4.86 | 1.250  143.31 | 2.250    8.42 |  3.25    4.69
                .333    4.86 | 1.333  143.31 | 2.333    8.42 |  3.33    4.69
                .417    5.71 | 1.417   42.10 | 2.417    7.38 |  3.42    4.39
                .500    5.71 | 1.500   42.10 | 2.500    7.38 |  3.50    4.39
                .583    6.97 | 1.583   22.32 | 2.583    6.59 |  3.58    4.13
                .667    6.97 | 1.667   22.32 | 2.667    6.59 |  3.67    4.13
                .750    9.13 | 1.750   15.47 | 2.750    5.96 |  3.75    3.90
                .833    9.13 | 1.833   15.47 | 2.833    5.96 |  3.83    3.90
                .917   13.71 | 1.917   11.98 | 2.917    5.46 |  3.92    3.70
               1.000   13.71 | 2.000   11.98 | 3.000    5.46 |  4.00    3.70

     Max.Eff.Inten.(mm/hr)=     143.31       359.24
                 over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.64 (ii)    2.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .32          .29
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .22          .00          .221 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33         1.33
     RUNOFF VOLUME    (mm)=      62.59        60.12        62.56
     TOTAL RAINFALL   (mm)=      63.59        63.59        63.59
     RUNOFF COEFFICIENT   =        .98          .95          .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
```

```
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   2.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  84.00   Dir. Conn.(%)=  84.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.77          .34
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     118.40        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     143.31        58.17
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       2.45 (ii)    5.60 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .30          .15
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .69          .04          .730 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      62.59        28.12         57.07
     TOTAL RAINFALL   (mm)=      63.59        63.59         63.59
     RUNOFF COEFFICIENT   =        .98          .44           .90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DIVERT HYD (0003)|
| IN= 1   # OUT= 2 |
--------------------
     Outflow / Inflow  Relationships

      Flow 1 + Flow 2 = Total
      (cms)    (cms)    (cms)
        .00      .00      .00
        .00      .13      .13
      10.00      .13    10.13

                          AREA     QPEAK     TPEAK    R.V.
                          (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):    .56       .22      1.33   62.56
     ================================================
     ID= 2  (   3)    :    .08       .09      1.33   62.56
     ID= 3  (   3)    :    .47       .13      1.33   62.56
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):      .47    .130     1.33    62.56
        + ID2= 2 (0002):     2.10    .730     1.33    57.07
          ================================================
          ID = 3 (0005):     2.58    .860     1.33    58.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SHIFT HYD (0004) |
| IN= 2---> OUT= 1 |
| SHIFT= 20.0 min  |      AREA     QPEAK     TPEAK      R.V.
--------------------      (ha)     (cms)     (hrs)      (mm)
          ID= 2 (0003):     .08       .09      1.33     62.56
    SHIFT ID= 1 (0004):     .08       .09      1.67     62.56

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1300.000
| Ptotal= 71.24 mm |                          B=   4.700
--------------------                          C=    .780
```

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	4.78	1.17	36.20	2.17	11.07	3.17	5.66
.33	5.46	1.33	159.75	2.33	9.46	3.33	5.26
.50	6.40	1.50	47.34	2.50	8.28	3.50	4.93
.67	7.83	1.67	25.10	2.67	7.40	3.67	4.63
.83	10.25	1.83	17.40	2.83	6.70	3.83	4.38
1.00	15.41	2.00	13.47	3.00	6.13	4.00	4.15

CALIB
STANDHYD (0001)
ID= 1 DT= 5.0 min

Area (ha)= .56
Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	.55	.01
Dep. Storage	(mm)=	1.00	1.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	60.90	40.00
Mannings n	=	.013	.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	4.78	1.083	36.20	2.083	11.07	3.08	5.66
.167	4.78	1.167	36.20	2.167	11.07	3.17	5.66
.250	5.46	1.250	159.75	2.250	9.46	3.25	5.26
.333	5.46	1.333	159.75	2.333	9.46	3.33	5.26
.417	6.40	1.417	47.34	2.417	8.28	3.42	4.93
.500	6.40	1.500	47.34	2.500	8.28	3.50	4.93
.583	7.83	1.583	25.10	2.583	7.40	3.58	4.63
.667	7.83	1.667	25.10	2.667	7.40	3.67	4.63
.750	10.25	1.750	17.40	2.750	6.70	3.75	4.38
.833	10.25	1.833	17.40	2.833	6.70	3.83	4.38
.917	15.41	1.917	13.47	2.917	6.13	3.92	4.15
1.000	15.41	2.000	13.47	3.000	6.13	4.00	4.15

Max.Eff.Inten.(mm/hr)=		159.75	465.35	
over (min)		5.00	5.00	
Storage Coeff. (min)=		1.57 (ii)	2.50 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		.33	.29	
				TOTALS
PEAK FLOW	(cms)=	.24	.00	.247 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33
RUNOFF VOLUME	(mm)=	70.24	67.76	70.21
TOTAL RAINFALL	(mm)=	71.24	71.24	71.24
RUNOFF COEFFICIENT	=	.99	.95	.99

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 99.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0002)
ID= 1 DT= 5.0 min

Area (ha)= 2.10
Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.77	.34
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	118.40	40.00
Mannings n	=	.013	.250

```
     Max.Eff.Inten.(mm/hr)=     159.75        70.94
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.34 (ii)    5.36 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .30          .16
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .78          .05          .821 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      70.24        33.82         64.41
     TOTAL RAINFALL   (mm)=      71.24        71.24         71.24
     RUNOFF COEFFICIENT   =        .99          .47           .90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DIVERT HYD (0003)|
| IN= 1   # OUT= 2 |
--------------------
     Outflow / Inflow  Relationships

      Flow 1 + Flow 2 = Total
      (cms)    (cms)    (cms)
        .00      .00      .00
        .00      .13      .13
      10.00      .13    10.13

                         AREA     QPEAK     TPEAK    R.V.
                         (ha)     (cms)     (hrs)     (mm)
     TOTAL HYD.(ID= 1):    .56       .25      1.33   70.21
     ==================================================
     ID= 2  (   3)    :    .10       .12      1.33   70.21
     ID= 3  (   3)    :    .46       .13      1.33   70.21
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):      .46    .130     1.33    70.21
        + ID2= 2 (0002):     2.10    .821     1.33    64.41
          ================================================
          ID = 3 (0005):     2.56    .951     1.33    65.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SHIFT HYD (0004) |
| IN= 2---> OUT= 1 |
| SHIFT= 20.0 min  |      AREA     QPEAK     TPEAK      R.V.
--------------------      (ha)     (cms)     (hrs)      (mm)
          ID= 2 (0003):     .10       .12      1.33     70.21
    SHIFT ID= 1 (0004):     .10       .12      1.67     70.21

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1450.000
| Ptotal= 79.41 mm |                          B=   4.900
--------------------                          C=    .780
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    5.34 |  1.17   40.65 |  2.17   12.41 |  3.17    6.33
                 .33    6.10 |  1.33  176.31 |  2.33   10.59 |  3.33    5.89
                 .50    7.17 |  1.50   53.15 |  2.50    9.28 |  3.50    5.51
```

```
                .67    8.77 |  1.67   28.20 |  2.67    8.28 |  3.67    5.18
                .83   11.49 |  1.83   19.53 |  2.83    7.49 |  3.83    4.89
               1.00   17.30 |  2.00   15.10 |  3.00    6.86 |  4.00    4.64


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .55          .01
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      60.90        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
               .083    5.34 | 1.083   40.65 | 2.083   12.41 |  3.08    6.33
               .167    5.34 | 1.167   40.65 | 2.167   12.41 |  3.17    6.33
               .250    6.10 | 1.250  176.31 | 2.250   10.59 |  3.25    5.89
               .333    6.10 | 1.333  176.31 | 2.333   10.59 |  3.33    5.89
               .417    7.17 | 1.417   53.15 | 2.417    9.28 |  3.42    5.51
               .500    7.17 | 1.500   53.15 | 2.500    9.28 |  3.50    5.51
               .583    8.77 | 1.583   28.20 | 2.583    8.28 |  3.58    5.18
               .667    8.77 | 1.667   28.20 | 2.667    8.28 |  3.67    5.18
               .750   11.49 | 1.750   19.53 | 2.750    7.49 |  3.75    4.89
               .833   11.49 | 1.833   19.53 | 2.833    7.49 |  3.83    4.89
               .917   17.30 | 1.917   15.10 | 2.917    6.86 |  3.92    4.64
              1.000   17.30 | 2.000   15.10 | 3.000    6.86 |  4.00    4.64

     Max.Eff.Inten.(mm/hr)=     176.31       567.53
                 over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.51 (ii)    2.41 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .30
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .27          .00          .272 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      78.41        75.92         78.38
     TOTAL RAINFALL   (mm)=      79.41        79.41         79.41
     RUNOFF COEFFICIENT   =        .99          .96           .99

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   2.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  84.00   Dir. Conn.(%)=  84.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.77          .34
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     118.40        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     176.31        84.74
                 over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.25 (ii)    5.15 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .30          .16
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .86          .06          .913 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      78.41        40.15         72.29
     TOTAL RAINFALL   (mm)=      79.41        79.41         79.41
     RUNOFF COEFFICIENT   =        .99          .51           .91
```

```
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DIVERT HYD (0003)|
| IN= 1   # OUT= 2 |
--------------------
     Outflow / Inflow  Relationships

      Flow 1 + Flow 2 = Total
      (cms)    (cms)    (cms)
        .00      .00      .00
        .00      .13      .13
      10.00      .13    10.13

                          AREA     QPEAK     TPEAK    R.V.
                          (ha)     (cms)     (hrs)     (mm)
     TOTAL HYD.(ID= 1):    .56       .27      1.33   78.38
     ======================================================
     ID= 2  (   3)    :    .11       .14      1.33   78.38
     ID= 3  (   3)    :    .45       .13      1.33   78.38
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
          ID1= 1 (0003):      .45    .130     1.33    78.38
        + ID2= 2 (0002):     2.10    .913     1.33    72.29
          ================================================
          ID = 3 (0005):     2.55   1.043     1.33    73.36

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SHIFT HYD (0004) |
| IN= 2---> OUT= 1 |
| SHIFT= 20.0 min  |      AREA     QPEAK     TPEAK      R.V.
--------------------      (ha)     (cms)     (hrs)      (mm)
          ID= 2 (0003):     .11       .14      1.33     78.38
    SHIFT ID= 1 (0004):     .11       .14      1.67     78.38

--------------------------------------------------------------------------------

 FINISH
================================================================================================================
```

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

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO

Developed and Distributed by Clarifica Inc.
Copyright 1996, 2007 Clarifica Inc.
All rights reserved.

                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.3\voin.dat
  Output  filename: P:\2015\15268\FSR\SET A\Otthymo\15238-Post Dev\Post Development.out
  Summary filename: P:\2015\15268\FSR\SET A\Otthymo\15238-Post Dev\Post Development.sum


DATE: 3/21/2016                           TIME: 1:19:51 PM

USER:


COMMENTS: _____________________________________________________________

----------------------------------------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 610.000
| Ptotal= 33.44 mm |                          B=   4.600
--------------------                          C=    .780
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    2.24 |  1.17   16.92 |  2.17    5.18 |  3.17    2.65
                 .33    2.56 |  1.33   75.36 |  2.33    4.43 |  3.33    2.47
                 .50    3.00 |  1.50   22.14 |  2.50    3.88 |  3.50    2.31
                 .67    3.67 |  1.67   11.74 |  2.67    3.46 |  3.67    2.17
                 .83    4.80 |  1.83    8.14 |  2.83    3.14 |  3.83    2.05
                1.00    7.21 |  2.00    6.30 |  3.00    2.87 |  4.00    1.95


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0005) |   Area    (ha)=    .33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .30          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.00        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                             ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
```

```
                .083    2.24 | 1.083   16.92 | 2.083    5.18 |  3.08    2.65
                .167    2.24 | 1.167   16.92 | 2.167    5.18 |  3.17    2.65
                .250    2.56 | 1.250   75.36 | 2.250    4.43 |  3.25    2.47
                .333    2.56 | 1.333   75.36 | 2.333    4.43 |  3.33    2.47
                .417    3.00 | 1.417   22.14 | 2.417    3.88 |  3.42    2.31
                .500    3.00 | 1.500   22.14 | 2.500    3.88 |  3.50    2.31
                .583    3.67 | 1.583   11.74 | 2.583    3.46 |  3.58    2.17
                .667    3.67 | 1.667   11.74 | 2.667    3.46 |  3.67    2.17
                .750    4.80 | 1.750    8.14 | 2.750    3.14 |  3.75    2.05
                .833    4.80 | 1.833    8.14 | 2.833    3.14 |  3.83    2.05
                .917    7.21 | 1.917    6.30 | 2.917    2.87 |  3.92    1.95
               1.000    7.21 | 2.000    6.30 | 3.000    2.87 |  4.00    1.95

     Max.Eff.Inten.(mm/hr)=      75.36        15.48
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.82 (ii)    5.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .32          .16
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .06          .00          .063 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      32.44         8.80         30.07
     TOTAL RAINFALL   (mm)=      33.44        33.44         33.44
     RUNOFF COEFFICIENT   =        .97          .26           .90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0004) |   Area    (ha)=    .06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      19.70        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=      75.36        77.40
                over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.08 (ii)    2.34 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .30
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .012 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      32.44        30.06         32.41
     TOTAL RAINFALL   (mm)=      33.44        33.44         33.44
     RUNOFF COEFFICIENT   =        .97          .90           .97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0007) |   Area    (ha)=    .04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      16.30        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=      75.36        11.77
                over (min)        5.00        20.00
```

```
     Storage Coeff.  (min)=        .96 (ii)   17.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .34          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .00          .00          .002 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58          1.33
     RUNOFF VOLUME    (mm)=      32.44         8.80         13.18
     TOTAL RAINFALL   (mm)=      33.44        33.44         33.44
     RUNOFF COEFFICIENT   =        .97          .26           .39

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   1.15
|ID= 1 DT= 3.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=  65.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .75          .40
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      87.60        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .050    2.24 | 1.050   16.92 | 2.050    5.18 |  3.05    2.65
                .100    2.24 | 1.100   16.92 | 2.100    5.18 |  3.10    2.65
                .150    2.24 | 1.150   16.92 | 2.150    5.18 |  3.15    2.65
                .200    2.45 | 1.200   55.88 | 2.200    4.68 |  3.20    2.53
                .250    2.56 | 1.250   75.36 | 2.250    4.43 |  3.25    2.47
                .300    2.56 | 1.300   75.36 | 2.300    4.43 |  3.30    2.47
                .350    2.70 | 1.350   57.62 | 2.350    4.24 |  3.35    2.41
                .400    3.00 | 1.400   22.14 | 2.400    3.88 |  3.40    2.31
                .450    3.00 | 1.450   22.14 | 2.450    3.88 |  3.45    2.31
                .500    3.00 | 1.500   22.14 | 2.500    3.88 |  3.50    2.31
                .550    3.67 | 1.550   11.74 | 2.550    3.46 |  3.55    2.17
                .600    3.67 | 1.600   11.74 | 2.600    3.46 |  3.60    2.17
                .650    3.67 | 1.650   11.74 | 2.650    3.46 |  3.65    2.17
                .700    4.42 | 1.700    9.34 | 2.700    3.25 |  3.70    2.09
                .750    4.80 | 1.750    8.14 | 2.750    3.14 |  3.75    2.05
                .800    4.80 | 1.800    8.14 | 2.800    3.14 |  3.80    2.05
                .850    5.60 | 1.850    7.53 | 2.850    3.05 |  3.85    2.02
                .900    7.21 | 1.900    6.30 | 2.900    2.87 |  3.90    1.95
                .950    7.21 | 1.950    6.30 | 2.950    2.87 |  3.95    1.95
               1.000    7.21 | 2.000    6.30 | 3.000    2.87 |  4.00    1.95

     Max.Eff.Inten.(mm/hr)=      75.36        14.35
               over (min)        6.00         9.00
     Storage Coeff.  (min)=       2.64 (ii)    8.81 (ii)
     Unit Hyd. Tpeak (min)=       6.00         9.00
     Unit Hyd. peak  (cms)=        .29          .13
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .14          .01          .151 (iii)
     TIME TO PEAK    (hrs)=       1.35         1.45          1.35
     RUNOFF VOLUME    (mm)=      32.44         8.80         24.16
     TOTAL RAINFALL   (mm)=      33.44        33.44         33.44
     RUNOFF COEFFICIENT   =        .97          .26           .72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

```
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .92
|ID= 1 DT= 3.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .91          .01
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      78.20        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=      75.36       125.60
               over (min)        6.00         6.00
     Storage Coeff.  (min)=       2.47 (ii)    3.73 (ii)
     Unit Hyd. Tpeak (min)=       6.00         6.00
     Unit Hyd. peak  (cms)=        .29          .25
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .17          .00          .175 (iii)
     TIME TO PEAK    (hrs)=       1.35         1.35          1.35
     RUNOFF VOLUME    (mm)=      32.44        30.06         32.41
     TOTAL RAINFALL   (mm)=      33.44        33.44         33.44
     RUNOFF COEFFICIENT   =        .97          .90           .97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0012) |   Area    (ha)=    .16
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .08          .08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      32.60        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
               .083    2.24 | 1.083   16.92 | 2.083    5.18 |  3.08    2.65
               .167    2.24 | 1.167   16.92 | 2.167    5.18 |  3.17    2.65
               .250    2.56 | 1.250   75.36 | 2.250    4.43 |  3.25    2.47
               .333    2.56 | 1.333   75.36 | 2.333    4.43 |  3.33    2.47
               .417    3.00 | 1.417   22.14 | 2.417    3.88 |  3.42    2.31
               .500    3.00 | 1.500   22.14 | 2.500    3.88 |  3.50    2.31
               .583    3.67 | 1.583   11.74 | 2.583    3.46 |  3.58    2.17
               .667    3.67 | 1.667   11.74 | 2.667    3.46 |  3.67    2.17
               .750    4.80 | 1.750    8.14 | 2.750    3.14 |  3.75    2.05
               .833    4.80 | 1.833    8.14 | 2.833    3.14 |  3.83    2.05
               .917    7.21 | 1.917    6.30 | 2.917    2.87 |  3.92    1.95
              1.000    7.21 | 2.000    6.30 | 3.000    2.87 |  4.00    1.95

     Max.Eff.Inten.(mm/hr)=      75.36        11.77
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       1.46 (ii)   18.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .33          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .02          .00          .017 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58          1.33
     RUNOFF VOLUME    (mm)=      32.44         8.80         20.56
     TOTAL RAINFALL   (mm)=      33.44        33.44         33.44
     RUNOFF COEFFICIENT   =        .97          .26           .61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

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

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0005):       .33    .063     1.33    30.07
       + ID2= 2 (0004):       .06    .012     1.33    32.41
         ================================================
         ID = 3 (0006):       .39    .075     1.33    30.42

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0002):      1.15    .151     1.35    24.16
       + ID2= 2 (0001):       .92    .175     1.35    32.41
         ================================================
         ID = 3 (0003):      2.07    .326     1.35    27.82

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0010) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .0708       .0042
                          .0683      .0012    |    .0720       .0110
                          .0695      .0015    |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0006)      .390       .075        1.33       30.42
     OUTFLOW: ID= 1 (0010)      .390       .069        1.33       30.42

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 91.04
                   TIME SHIFT OF PEAK FLOW         (min)=   .00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0014

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0013) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .7300       .0045
                          .3600      .0015    |    .8560       .0053
                          .5750      .0030    |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0003)     2.068       .326        1.35       27.82
     OUTFLOW: ID= 1 (0013)     2.068       .329        1.35       27.82

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=100.90
                   TIME SHIFT OF PEAK FLOW         (min)=   .00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0014

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                    CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0010):       .39    .069     1.33    30.42
       + ID2= 2 (0007):       .04    .002     1.33    13.18
         ================================================
         ID = 3 (0008):       .43    .070     1.33    28.81

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

```
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0013):     2.07    .329     1.35    27.82
        + ID2= 2 (0012):      .16    .017     1.33    20.56
          ================================================
          ID = 3 (0011):     2.23    .344     1.35    27.31

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0009) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0008):      .43    .070     1.33    28.81
        + ID2= 2 (0011):     2.23    .344     1.35    27.31
          ================================================
          ID = 3 (0009):     2.66    .411     1.35    27.54

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 820.000
| Ptotal= 44.95 mm |                          B=   4.600
--------------------                          C=    .780
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    3.01 |  1.17   22.75 |  2.17    6.97 |  3.17    3.56
                 .33    3.44 |  1.33  101.30 |  2.33    5.95 |  3.33    3.32
                 .50    4.03 |  1.50   29.76 |  2.50    5.22 |  3.50    3.10
                 .67    4.93 |  1.67   15.78 |  2.67    4.66 |  3.67    2.92
                 .83    6.45 |  1.83   10.94 |  2.83    4.22 |  3.83    2.76
                1.00    9.69 |  2.00    8.47 |  3.00    3.86 |  4.00    2.62


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0005) |   Area    (ha)=    .33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .30          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.00        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    3.01 | 1.083   22.75 | 2.083    6.97 |  3.08    3.56
                .167    3.01 | 1.167   22.75 | 2.167    6.97 |  3.17    3.56
                .250    3.44 | 1.250  101.30 | 2.250    5.95 |  3.25    3.32
                .333    3.44 | 1.333  101.30 | 2.333    5.95 |  3.33    3.32
                .417    4.03 | 1.417   29.76 | 2.417    5.22 |  3.42    3.10
                .500    4.03 | 1.500   29.76 | 2.500    5.22 |  3.50    3.10
                .583    4.93 | 1.583   15.78 | 2.583    4.66 |  3.58    2.92
                .667    4.93 | 1.667   15.78 | 2.667    4.66 |  3.67    2.92
                .750    6.45 | 1.750   10.94 | 2.750    4.22 |  3.75    2.76
                .833    6.45 | 1.833   10.94 | 2.833    4.22 |  3.83    2.76
```

```
                .917    9.69 | 1.917    8.47 | 2.917    3.86 |  3.92    2.62
               1.000    9.69 | 2.000    8.47 | 3.000    3.86 |  4.00    2.62

     Max.Eff.Inten.(mm/hr)=     101.30        38.70
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.62 (ii)    4.53 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .32          .23
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .08          .00           .087 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      43.95        15.43         41.10
     TOTAL RAINFALL   (mm)=      44.95        44.95         44.95
     RUNOFF COEFFICIENT   =        .98          .34           .91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=    .06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      19.70        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     101.30       193.50
               over (min)         5.00         5.00
     Storage Coeff.  (min)=        .96 (ii)    2.08 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .31
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .02          .00           .016 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      43.95        41.53         43.92
     TOTAL RAINFALL   (mm)=      44.95        44.95         44.95
     RUNOFF COEFFICIENT   =        .98          .92           .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=    .04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      16.30        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     101.30        24.26
               over (min)         5.00        15.00
     Storage Coeff.  (min)=        .86 (ii)   13.29 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .34          .08
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .00          .00           .003 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50          1.33
     RUNOFF VOLUME    (mm)=      43.95        15.43         20.94
     TOTAL RAINFALL   (mm)=      44.95        44.95         44.95
     RUNOFF COEFFICIENT   =        .98          .34           .47
```

```
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   1.15
|ID= 1 DT= 3.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=  65.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .75          .40
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      87.60        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .050    3.01 | 1.050   22.75 | 2.050    6.97 |  3.05    3.56
                .100    3.01 | 1.100   22.75 | 2.100    6.97 |  3.10    3.56
                .150    3.01 | 1.150   22.75 | 2.150    6.97 |  3.15    3.56
                .200    3.29 | 1.200   75.12 | 2.200    6.29 |  3.20    3.40
                .250    3.44 | 1.250  101.30 | 2.250    5.95 |  3.25    3.32
                .300    3.44 | 1.300  101.30 | 2.300    5.95 |  3.30    3.32
                .350    3.64 | 1.350   77.45 | 2.350    5.71 |  3.35    3.25
                .400    4.03 | 1.400   29.76 | 2.400    5.22 |  3.40    3.10
                .450    4.03 | 1.450   29.76 | 2.450    5.22 |  3.45    3.10
                .500    4.03 | 1.500   29.76 | 2.500    5.22 |  3.50    3.10
                .550    4.93 | 1.550   15.78 | 2.550    4.66 |  3.55    2.92
                .600    4.93 | 1.600   15.78 | 2.600    4.66 |  3.60    2.92
                .650    4.93 | 1.650   15.78 | 2.650    4.66 |  3.65    2.92
                .700    5.94 | 1.700   12.55 | 2.700    4.36 |  3.70    2.81
                .750    6.45 | 1.750   10.94 | 2.750    4.22 |  3.75    2.76
                .800    6.45 | 1.800   10.94 | 2.800    4.22 |  3.80    2.76
                .850    7.53 | 1.850   10.12 | 2.850    4.10 |  3.85    2.71
                .900    9.69 | 1.900    8.47 | 2.900    3.86 |  3.90    2.62
                .950    9.69 | 1.950    8.47 | 2.950    3.86 |  3.95    2.62
               1.000    9.69 | 2.000    8.47 | 3.000    3.86 |  4.00    2.62

     Max.Eff.Inten.(mm/hr)=     101.30        26.50
               over (min)         6.00         9.00
     Storage Coeff.  (min)=       2.35 (ii)    7.83 (ii)
     Unit Hyd. Tpeak (min)=       6.00         9.00
     Unit Hyd. peak  (cms)=        .30          .14
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .19          .02          .211 (iii)
     TIME TO PEAK    (hrs)=       1.30         1.45          1.35
     RUNOFF VOLUME    (mm)=      43.95        15.43         33.96
     TOTAL RAINFALL   (mm)=      44.95        44.95         44.95
     RUNOFF COEFFICIENT   =        .98          .34           .76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .92
|ID= 1 DT= 3.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .91          .01
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      78.20        40.00
```

```
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     101.30       231.89
               over (min)        6.00         6.00
     Storage Coeff.  (min)=       2.19 (ii)    3.31 (ii)
     Unit Hyd. Tpeak (min)=       6.00         6.00
     Unit Hyd. peak  (cms)=        .31          .26
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .24          .00          .239 (iii)
     TIME TO PEAK    (hrs)=       1.30         1.35          1.30
     RUNOFF VOLUME    (mm)=      43.95        41.53         43.92
     TOTAL RAINFALL   (mm)=      44.95        44.95         44.95
     RUNOFF COEFFICIENT   =        .98          .92           .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0012) |   Area    (ha)=    .16
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .08          .08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      32.60        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    3.01 | 1.083   22.75 | 2.083    6.97 |  3.08    3.56
                .167    3.01 | 1.167   22.75 | 2.167    6.97 |  3.17    3.56
                .250    3.44 | 1.250  101.30 | 2.250    5.95 |  3.25    3.32
                .333    3.44 | 1.333  101.30 | 2.333    5.95 |  3.33    3.32
                .417    4.03 | 1.417   29.76 | 2.417    5.22 |  3.42    3.10
                .500    4.03 | 1.500   29.76 | 2.500    5.22 |  3.50    3.10
                .583    4.93 | 1.583   15.78 | 2.583    4.66 |  3.58    2.92
                .667    4.93 | 1.667   15.78 | 2.667    4.66 |  3.67    2.92
                .750    6.45 | 1.750   10.94 | 2.750    4.22 |  3.75    2.76
                .833    6.45 | 1.833   10.94 | 2.833    4.22 |  3.83    2.76
                .917    9.69 | 1.917    8.47 | 2.917    3.86 |  3.92    2.62
               1.000    9.69 | 2.000    8.47 | 3.000    3.86 |  4.00    2.62

     Max.Eff.Inten.(mm/hr)=     101.30        24.26
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.30 (ii)   13.73 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .02          .00          .024 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50          1.33
     RUNOFF VOLUME    (mm)=      43.95        15.43         29.63
     TOTAL RAINFALL   (mm)=      44.95        44.95         44.95
     RUNOFF COEFFICIENT   =        .98          .34           .66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0005):       .33    .087     1.33    41.10
```

```
        + ID2= 2 (0004):      .06    .016     1.33    43.92
          ================================================
          ID = 3 (0006):      .39    .103     1.33    41.52

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0002):     1.15    .211     1.35    33.96
        + ID2= 2 (0001):      .92    .239     1.30    43.92
          ================================================
          ID = 3 (0003):     2.07    .448     1.35    38.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0010) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0708       .0042
                           .0683      .0012   |    .0720       .0110
                           .0695      .0015   |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0006)      .390       .103        1.33       41.52
     OUTFLOW: ID= 1 (0010)      .390       .070        1.33       41.51

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 67.74
                   TIME SHIFT OF PEAK FLOW         (min)=   .00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0026

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0013) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .7300       .0045
                           .3600      .0015   |    .8560       .0053
                           .5750      .0030   |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0003)     2.068       .448        1.35       38.38
     OUTFLOW: ID= 1 (0013)     2.068       .450        1.35       38.38

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=100.41
                   TIME SHIFT OF PEAK FLOW         (min)=   .00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0021

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                    CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0010):      .39    .070     1.33    41.51
        + ID2= 2 (0007):      .04    .003     1.33    20.94
          ================================================
          ID = 3 (0008):      .43    .073     1.33    39.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0013):     2.07    .450     1.35    38.38
        + ID2= 2 (0012):      .16    .024     1.33    29.63
          ================================================
```

```
          ID = 3 (0011):     2.23    .471     1.35    37.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0009) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0008):      .43    .073     1.33    39.60
        + ID2= 2 (0011):     2.23    .471     1.35    37.76
          ================================================
          ID = 3 (0009):     2.66    .543     1.35    38.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1010.000
| Ptotal= 55.37 mm |                          B=   4.600
--------------------                          C=    .780
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    3.71 |  1.17   28.02 |  2.17    8.58 |  3.17    4.39
                 .33    4.23 |  1.33  124.77 |  2.33    7.33 |  3.33    4.08
                 .50    4.97 |  1.50   36.65 |  2.50    6.42 |  3.50    3.82
                 .67    6.07 |  1.67   19.43 |  2.67    5.74 |  3.67    3.60
                 .83    7.95 |  1.83   13.47 |  2.83    5.19 |  3.83    3.40
                1.00   11.94 |  2.00   10.43 |  3.00    4.75 |  4.00    3.22


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0005) |   Area    (ha)=    .33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .30          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.00        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                            ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    3.71 | 1.083   28.02 | 2.083    8.58 |  3.08    4.39
                .167    3.71 | 1.167   28.02 | 2.167    8.58 |  3.17    4.39
                .250    4.23 | 1.250  124.77 | 2.250    7.33 |  3.25    4.08
                .333    4.23 | 1.333  124.77 | 2.333    7.33 |  3.33    4.08
                .417    4.97 | 1.417   36.65 | 2.417    6.42 |  3.42    3.82
                .500    4.97 | 1.500   36.65 | 2.500    6.42 |  3.50    3.82
                .583    6.07 | 1.583   19.43 | 2.583    5.74 |  3.58    3.60
                .667    6.07 | 1.667   19.43 | 2.667    5.74 |  3.67    3.60
                .750    7.95 | 1.750   13.47 | 2.750    5.19 |  3.75    3.40
                .833    7.95 | 1.833   13.47 | 2.833    5.19 |  3.83    3.40
                .917   11.94 | 1.917   10.43 | 2.917    4.75 |  3.92    3.22
               1.000   11.94 | 2.000   10.43 | 3.000    4.75 |  4.00    3.22

     Max.Eff.Inten.(mm/hr)=     124.77        74.21
                over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.49 (ii)    4.17 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .24
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .10          .00          .108 (iii)
```

```
     TIME TO PEAK     (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME     (mm)=      54.37        22.28         51.15
     TOTAL RAINFALL    (mm)=      55.37        55.37         55.37
     RUNOFF COEFFICIENT   =        .98          .40           .92

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=    .06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      19.70        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     124.77       371.07
               over (min)         5.00         5.00
     Storage Coeff.  (min)=        .88 (ii)    1.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .32
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .02          .00           .020 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      54.37        51.92         54.34
     TOTAL RAINFALL   (mm)=      55.37        55.37         55.37
     RUNOFF COEFFICIENT   =        .98          .94           .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=    .04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      16.30        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     124.77        44.90
               over (min)         5.00        15.00
     Storage Coeff.  (min)=        .79 (ii)   10.51 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .34          .09
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .00          .00           .004 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50          1.33
     RUNOFF VOLUME    (mm)=      54.37        22.28         28.51
     TOTAL RAINFALL   (mm)=      55.37        55.37         55.37
     RUNOFF COEFFICIENT   =        .98          .40           .52

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   1.15
|ID= 1 DT= 3.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=  65.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .75          .40
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      87.60        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .050    3.71 | 1.050   28.02 | 2.050    8.58 |  3.05    4.39
                .100    3.71 | 1.100   28.02 | 2.100    8.58 |  3.10    4.39
                .150    3.71 | 1.150   28.02 | 2.150    8.58 |  3.15    4.39
                .200    4.06 | 1.200   92.52 | 2.200    7.75 |  3.20    4.19
                .250    4.23 | 1.250  124.77 | 2.250    7.33 |  3.25    4.08
                .300    4.23 | 1.300  124.77 | 2.300    7.33 |  3.30    4.08
                .350    4.48 | 1.350   95.40 | 2.350    7.03 |  3.35    4.00
                .400    4.97 | 1.400   36.65 | 2.400    6.42 |  3.40    3.82
                .450    4.97 | 1.450   36.65 | 2.450    6.42 |  3.45    3.82
                .500    4.97 | 1.500   36.65 | 2.500    6.42 |  3.50    3.82
                .550    6.07 | 1.550   19.43 | 2.550    5.74 |  3.55    3.60
                .600    6.07 | 1.600   19.43 | 2.600    5.74 |  3.60    3.60
                .650    6.07 | 1.650   19.43 | 2.650    5.74 |  3.65    3.60
                .700    7.32 | 1.700   15.46 | 2.700    5.37 |  3.70    3.46
                .750    7.95 | 1.750   13.47 | 2.750    5.19 |  3.75    3.40
                .800    7.95 | 1.800   13.47 | 2.800    5.19 |  3.80    3.40
                .850    9.28 | 1.850   12.46 | 2.850    5.05 |  3.85    3.34
                .900   11.94 | 1.900   10.43 | 2.900    4.75 |  3.90    3.22
                .950   11.94 | 1.950   10.43 | 2.950    4.75 |  3.95    3.22
               1.000   11.94 | 2.000   10.43 | 3.000    4.75 |  4.00    3.22

     Max.Eff.Inten.(mm/hr)=     124.77        39.36
               over (min)        6.00         9.00
     Storage Coeff.  (min)=       2.16 (ii)    7.20 (ii)
     Unit Hyd. Tpeak (min)=       6.00         9.00
     Unit Hyd. peak  (cms)=        .31          .14
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .24          .04          .268 (iii)
     TIME TO PEAK    (hrs)=       1.30         1.40          1.35
     RUNOFF VOLUME    (mm)=      54.37        22.28         43.13
     TOTAL RAINFALL   (mm)=      55.37        55.37         55.37
     RUNOFF COEFFICIENT   =        .98          .40           .78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .92
|ID= 1 DT= 3.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .91          .01
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      78.20        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     124.77       344.40
               over (min)        6.00         6.00
     Storage Coeff.  (min)=       2.02 (ii)    3.05 (ii)
     Unit Hyd. Tpeak (min)=       6.00         6.00
     Unit Hyd. peak  (cms)=        .32          .27
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .30          .00          .298 (iii)
     TIME TO PEAK    (hrs)=       1.30         1.35          1.30
```

```
     RUNOFF VOLUME     (mm)=      54.37        51.92          54.34
     TOTAL RAINFALL    (mm)=      55.37        55.37          55.37
     RUNOFF COEFFICIENT   =        .98          .94            .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0012) |   Area    (ha)=    .16
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .08          .08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      32.60        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    3.71 | 1.083   28.02 | 2.083    8.58 |  3.08    4.39
                .167    3.71 | 1.167   28.02 | 2.167    8.58 |  3.17    4.39
                .250    4.23 | 1.250  124.77 | 2.250    7.33 |  3.25    4.08
                .333    4.23 | 1.333  124.77 | 2.333    7.33 |  3.33    4.08
                .417    4.97 | 1.417   36.65 | 2.417    6.42 |  3.42    3.82
                .500    4.97 | 1.500   36.65 | 2.500    6.42 |  3.50    3.82
                .583    6.07 | 1.583   19.43 | 2.583    5.74 |  3.58    3.60
                .667    6.07 | 1.667   19.43 | 2.667    5.74 |  3.67    3.60
                .750    7.95 | 1.750   13.47 | 2.750    5.19 |  3.75    3.40
                .833    7.95 | 1.833   13.47 | 2.833    5.19 |  3.83    3.40
                .917   11.94 | 1.917   10.43 | 2.917    4.75 |  3.92    3.22
               1.000   11.94 | 2.000   10.43 | 3.000    4.75 |  4.00    3.22

     Max.Eff.Inten.(mm/hr)=     124.77        44.90
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       1.19 (ii)   10.92 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .09
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .03          .01          .030 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50          1.33
     RUNOFF VOLUME    (mm)=      54.37        22.28         38.27
     TOTAL RAINFALL   (mm)=      55.37        55.37         55.37
     RUNOFF COEFFICIENT   =        .98          .40           .69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0005):      .33     .108     1.33    51.15
        + ID2= 2 (0004):      .06     .020     1.33    54.34
          ================================================
          ID = 3 (0006):      .39     .128     1.33    51.63

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0003) |
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0002):     1.15    .268     1.35    43.13
        + ID2= 2 (0001):      .92    .298     1.30    54.34
          ================================================
          ID = 3 (0003):     2.07    .561     1.35    48.10

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0010) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0708       .0042
                           .0683      .0012   |    .0720       .0110
                           .0695      .0015   |    .0000       .0000

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0006)       .390       .128        1.33       51.63
     OUTFLOW: ID= 1 (0010)       .390       .070        1.42       51.63

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 55.09
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0039

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0013) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .7300       .0045
                           .3600      .0015   |    .8560       .0053
                           .5750      .0030   |    .0000       .0000

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0003)      2.068       .561        1.35       48.10
     OUTFLOW: ID= 1 (0013)      2.068       .566        1.35       48.10

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=100.96
                   TIME SHIFT OF PEAK FLOW         (min)=   .00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0030

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                    CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0010):      .39    .070     1.42    51.63
        + ID2= 2 (0007):      .04    .004     1.33    28.51
          ================================================
          ID = 3 (0008):      .43    .074     1.33    49.48

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0013):     2.07    .566     1.35    48.10
        + ID2= 2 (0012):      .16    .030     1.33    38.27
          ================================================
          ID = 3 (0011):     2.23    .593     1.35    47.41

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0009) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
          ID1= 1 (0008):      .43    .074     1.33    49.48
        + ID2= 2 (0011):     2.23    .593     1.35    47.41
          ================================================
          ID = 3 (0009):     2.66    .667     1.35    47.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1160.000
| Ptotal= 63.59 mm |                          B=   4.600
--------------------                          C=    .780
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    4.26 |  1.17   32.19 |  2.17    9.86 |  3.17    5.04
                 .33    4.86 |  1.33  143.31 |  2.33    8.42 |  3.33    4.69
                 .50    5.71 |  1.50   42.10 |  2.50    7.38 |  3.50    4.39
                 .67    6.97 |  1.67   22.32 |  2.67    6.59 |  3.67    4.13
                 .83    9.13 |  1.83   15.47 |  2.83    5.96 |  3.83    3.90
                1.00   13.71 |  2.00   11.98 |  3.00    5.46 |  4.00    3.70


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0005) |   Area    (ha)=    .33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .30          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.00        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                             ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    4.26 | 1.083   32.19 | 2.083    9.86 |  3.08    5.04
                .167    4.26 | 1.167   32.19 | 2.167    9.86 |  3.17    5.04
                .250    4.86 | 1.250  143.31 | 2.250    8.42 |  3.25    4.69
                .333    4.86 | 1.333  143.31 | 2.333    8.42 |  3.33    4.69
                .417    5.71 | 1.417   42.10 | 2.417    7.38 |  3.42    4.39
                .500    5.71 | 1.500   42.10 | 2.500    7.38 |  3.50    4.39
                .583    6.97 | 1.583   22.32 | 2.583    6.59 |  3.58    4.13
                .667    6.97 | 1.667   22.32 | 2.667    6.59 |  3.67    4.13
                .750    9.13 | 1.750   15.47 | 2.750    5.96 |  3.75    3.90
                .833    9.13 | 1.833   15.47 | 2.833    5.96 |  3.83    3.90
                .917   13.71 | 1.917   11.98 | 2.917    5.46 |  3.92    3.70
               1.000   13.71 | 2.000   11.98 | 3.000    5.46 |  4.00    3.70

     Max.Eff.Inten.(mm/hr)=     143.31       112.26
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.41 (ii)    3.94 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .24
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .12          .01          .124 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33         1.33
     RUNOFF VOLUME    (mm)=      62.59        28.12        59.14
     TOTAL RAINFALL   (mm)=      63.59        63.59        63.59
     RUNOFF COEFFICIENT   =        .98          .44          .93

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=    .06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      19.70        40.00
     Mannings n            =       .013         .250

     Max.Eff.Inten.(mm/hr)=     143.31       561.31
               over (min)        5.00         5.00
     Storage Coeff.  (min)=        .83 (ii)    1.81 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .32
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .02          .00          .023 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      62.59        60.12         62.56
     TOTAL RAINFALL   (mm)=      63.59        63.59         63.59
     RUNOFF COEFFICIENT   =        .98          .95           .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=    .04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      16.30        40.00
     Mannings n            =       .013         .250

     Max.Eff.Inten.(mm/hr)=     143.31        58.17
               over (min)        5.00        10.00
     Storage Coeff.  (min)=        .74 (ii)    9.51 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .34          .12
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .00          .00          .006 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      62.59        28.12         34.88
     TOTAL RAINFALL   (mm)=      63.59        63.59         63.59
     RUNOFF COEFFICIENT   =        .98          .44           .55

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   1.15
|ID= 1 DT= 3.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=  65.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .75          .40
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
```

```
     Length            (m)=      87.60        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
               .050    4.26 | 1.050   32.19 | 2.050    9.86 |  3.05    5.04
               .100    4.26 | 1.100   32.19 | 2.100    9.86 |  3.10    5.04
               .150    4.26 | 1.150   32.19 | 2.150    9.86 |  3.15    5.04
               .200    4.66 | 1.200  106.27 | 2.200    8.90 |  3.20    4.81
               .250    4.86 | 1.250  143.31 | 2.250    8.42 |  3.25    4.69
               .300    4.86 | 1.300  143.31 | 2.300    8.42 |  3.30    4.69
               .350    5.14 | 1.350  109.57 | 2.350    8.07 |  3.35    4.59
               .400    5.71 | 1.400   42.10 | 2.400    7.38 |  3.40    4.39
               .450    5.71 | 1.450   42.10 | 2.450    7.38 |  3.45    4.39
               .500    5.71 | 1.500   42.10 | 2.500    7.38 |  3.50    4.39
               .550    6.97 | 1.550   22.32 | 2.550    6.59 |  3.55    4.13
               .600    6.97 | 1.600   22.32 | 2.600    6.59 |  3.60    4.13
               .650    6.97 | 1.650   22.32 | 2.650    6.59 |  3.65    4.13
               .700    8.41 | 1.700   17.75 | 2.700    6.17 |  3.70    3.98
               .750    9.13 | 1.750   15.47 | 2.750    5.96 |  3.75    3.90
               .800    9.13 | 1.800   15.47 | 2.800    5.96 |  3.80    3.90
               .850   10.66 | 1.850   14.31 | 2.850    5.80 |  3.85    3.84
               .900   13.71 | 1.900   11.98 | 2.900    5.46 |  3.90    3.70
               .950   13.71 | 1.950   11.98 | 2.950    5.46 |  3.95    3.70
              1.000   13.71 | 2.000   11.98 | 3.000    5.46 |  4.00    3.70

     Max.Eff.Inten.(mm/hr)=     143.31        50.97
                over (min)        6.00         9.00
     Storage Coeff.  (min)=       2.04 (ii)    6.81 (ii)
     Unit Hyd. Tpeak (min)=       6.00         9.00
     Unit Hyd. peak  (cms)=        .31          .15
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .28          .05          .314 (iii)
     TIME TO PEAK    (hrs)=       1.30         1.40          1.35
     RUNOFF VOLUME    (mm)=      62.59        28.12         50.52
     TOTAL RAINFALL   (mm)=      63.59        63.59         63.59
     RUNOFF COEFFICIENT   =        .98          .44           .79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .92
|ID= 1 DT= 3.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .91          .01
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      78.20        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     143.31       446.00
                over (min)        6.00         3.00
     Storage Coeff.  (min)=       1.91 (ii)    2.88 (ii)
     Unit Hyd. Tpeak (min)=       6.00         3.00
     Unit Hyd. peak  (cms)=        .32          .37
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .34          .00          .345 (iii)
     TIME TO PEAK    (hrs)=       1.30         1.30          1.30
     RUNOFF VOLUME    (mm)=      62.59        60.12         62.56
     TOTAL RAINFALL   (mm)=      63.59        63.59         63.59
     RUNOFF COEFFICIENT   =        .98          .95           .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
```

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

CALIB					
STANDHYD (0012)	Area (ha)= .16				
ID= 1 DT= 5.0 min	Total Imp(%)= 50.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	.08	.08
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	32.60	40.00
Mannings n	=	.013	.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	4.26	1.083	32.19	2.083	9.86	3.08	5.04
.167	4.26	1.167	32.19	2.167	9.86	3.17	5.04
.250	4.86	1.250	143.31	2.250	8.42	3.25	4.69
.333	4.86	1.333	143.31	2.333	8.42	3.33	4.69
.417	5.71	1.417	42.10	2.417	7.38	3.42	4.39
.500	5.71	1.500	42.10	2.500	7.38	3.50	4.39
.583	6.97	1.583	22.32	2.583	6.59	3.58	4.13
.667	6.97	1.667	22.32	2.667	6.59	3.67	4.13
.750	9.13	1.750	15.47	2.750	5.96	3.75	3.90
.833	9.13	1.833	15.47	2.833	5.96	3.83	3.90
.917	13.71	1.917	11.98	2.917	5.46	3.92	3.70
1.000	13.71	2.000	11.98	3.000	5.46	4.00	3.70

Max.Eff.Inten.(mm/hr)=		143.31	58.17	
over (min)		5.00	10.00	
Storage Coeff. (min)=		1.13 (ii)	9.89 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		.34	.11	
				TOTALS
PEAK FLOW	(cms)=	.03	.01	.038 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	62.59	28.12	45.32
TOTAL RAINFALL	(mm)=	63.59	63.59	63.59
RUNOFF COEFFICIENT	=	.98	.44	.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0006)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0005):	.33	.124	1.33	59.14
+ ID2= 2 (0004):	.06	.023	1.33	62.56
ID = 3 (0006):	.39	.148	1.33	59.65

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0003)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0002):	1.15	.314	1.35	50.52
+ ID2= 2 (0001):	.92	.345	1.30	62.56
ID = 3 (0003):	2.07	.651	1.30	55.86

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
--------------------
| RESERVOIR (0010) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .0708       .0042
                          .0683      .0012    |    .0720       .0110
                          .0695      .0015    |    .0000       .0000

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0006)       .390       .148        1.33       59.65
     OUTFLOW: ID= 1 (0010)       .390       .071        1.42       59.65

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 48.06
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0051

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0013) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .7300       .0045
                          .3600      .0015    |    .8560       .0053
                          .5750      .0030    |    .0000       .0000

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0003)      2.068       .651        1.30       55.86
     OUTFLOW: ID= 1 (0013)      2.068       .648        1.35       55.86

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 99.66
                   TIME SHIFT OF PEAK FLOW         (min)=  3.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0037

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0010):      .39    .071     1.42    59.65
        + ID2= 2 (0007):      .04    .006     1.33    34.88
          ================================================
          ID = 3 (0008):      .43    .076     1.33    57.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0013):     2.07    .648     1.35    55.86
        + ID2= 2 (0012):      .16    .038     1.33    45.32
          ================================================
          ID = 3 (0011):     2.23    .682     1.35    55.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0009) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0008):      .43    .076     1.33    57.34
        + ID2= 2 (0011):     2.23    .682     1.35    55.12
          ================================================
          ID = 3 (0009):     2.66    .759     1.35    55.48

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************
```

```
--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1300.000
| Ptotal= 71.24 mm |                          B=   4.700
--------------------                          C=    .780
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .17    4.78 |  1.17   36.20 |  2.17   11.07 |  3.17    5.66
                .33    5.46 |  1.33  159.75 |  2.33    9.46 |  3.33    5.26
                .50    6.40 |  1.50   47.34 |  2.50    8.28 |  3.50    4.93
                .67    7.83 |  1.67   25.10 |  2.67    7.40 |  3.67    4.63
                .83   10.25 |  1.83   17.40 |  2.83    6.70 |  3.83    4.38
               1.00   15.41 |  2.00   13.47 |  3.00    6.13 |  4.00    4.15


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0005) |   Area    (ha)=    .33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .30          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.00        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
               .083    4.78 | 1.083   36.20 | 2.083   11.07 |  3.08    5.66
               .167    4.78 | 1.167   36.20 | 2.167   11.07 |  3.17    5.66
               .250    5.46 | 1.250  159.75 | 2.250    9.46 |  3.25    5.26
               .333    5.46 | 1.333  159.75 | 2.333    9.46 |  3.33    5.26
               .417    6.40 | 1.417   47.34 | 2.417    8.28 |  3.42    4.93
               .500    6.40 | 1.500   47.34 | 2.500    8.28 |  3.50    4.93
               .583    7.83 | 1.583   25.10 | 2.583    7.40 |  3.58    4.63
               .667    7.83 | 1.667   25.10 | 2.667    7.40 |  3.67    4.63
               .750   10.25 | 1.750   17.40 | 2.750    6.70 |  3.75    4.38
               .833   10.25 | 1.833   17.40 | 2.833    6.70 |  3.83    4.38
               .917   15.41 | 1.917   13.47 | 2.917    6.13 |  3.92    4.15
              1.000   15.41 | 2.000   13.47 | 3.000    6.13 |  4.00    4.15

     Max.Eff.Inten.(mm/hr)=     159.75       145.42
                over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.35 (ii)    3.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .25
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .13          .01          .139 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      70.24        33.82         66.59
     TOTAL RAINFALL   (mm)=      71.24        71.24         71.24
     RUNOFF COEFFICIENT   =        .99          .47           .93

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=    .06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .00
     Dep. Storage     (mm)=       1.00         1.00
```

```
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      19.70        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     159.75       727.12
               over (min)        5.00         5.00
     Storage Coeff.  (min)=        .80 (ii)    1.73 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .32
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .03          .00          .026 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      70.24        67.76         70.21
     TOTAL RAINFALL   (mm)=      71.24        71.24         71.24
     RUNOFF COEFFICIENT   =        .99          .95           .99

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=    .04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      16.30        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     159.75        70.94
               over (min)        5.00        10.00
     Storage Coeff.  (min)=        .71 (ii)    8.81 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .34          .12
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .00          .00          .007 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      70.24        33.82         40.97
     TOTAL RAINFALL   (mm)=      71.24        71.24         71.24
     RUNOFF COEFFICIENT   =        .99          .47           .58

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   1.15
|ID= 1 DT= 3.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=  65.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .75          .40
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      87.60        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
               .050    4.78 | 1.050   36.20 | 2.050   11.07 |  3.05    5.66
               .100    4.78 | 1.100   36.20 | 2.100   11.07 |  3.10    5.66
               .150    4.78 | 1.150   36.20 | 2.150   11.07 |  3.15    5.66
```

```
                .200    5.23 | 1.200  118.56 | 2.200   10.00 |  3.20    5.40
                .250    5.46 | 1.250  159.75 | 2.250    9.46 |  3.25    5.26
                .300    5.46 | 1.300  159.75 | 2.300    9.46 |  3.30    5.26
                .350    5.77 | 1.350  122.28 | 2.350    9.07 |  3.35    5.15
                .400    6.40 | 1.400   47.34 | 2.400    8.28 |  3.40    4.93
                .450    6.40 | 1.450   47.34 | 2.450    8.28 |  3.45    4.93
                .500    6.40 | 1.500   47.34 | 2.500    8.28 |  3.50    4.93
                .550    7.83 | 1.550   25.10 | 2.550    7.40 |  3.55    4.63
                .600    7.83 | 1.600   25.10 | 2.600    7.40 |  3.60    4.63
                .650    7.83 | 1.650   25.10 | 2.650    7.40 |  3.65    4.63
                .700    9.45 | 1.700   19.97 | 2.700    6.93 |  3.70    4.46
                .750   10.25 | 1.750   17.40 | 2.750    6.70 |  3.75    4.38
                .800   10.25 | 1.800   17.40 | 2.800    6.70 |  3.80    4.38
                .850   11.97 | 1.850   16.09 | 2.850    6.51 |  3.85    4.30
                .900   15.41 | 1.900   13.47 | 2.900    6.13 |  3.90    4.15
                .950   15.41 | 1.950   13.47 | 2.950    6.13 |  3.95    4.15
               1.000   15.41 | 2.000   13.47 | 3.000    6.13 |  4.00    4.15

     Max.Eff.Inten.(mm/hr)=     159.75        62.18
                 over (min)        6.00         9.00
     Storage Coeff.  (min)=        1.96 (ii)    6.52 (ii)
     Unit Hyd. Tpeak (min)=        6.00         9.00
     Unit Hyd. peak  (cms)=         .32          .15
                                                          *TOTALS*
     PEAK FLOW       (cms)=         .31          .06          .357 (iii)
     TIME TO PEAK    (hrs)=        1.30         1.40         1.35
     RUNOFF VOLUME    (mm)=       70.24        33.82        57.49
     TOTAL RAINFALL   (mm)=       71.24        71.24        71.24
     RUNOFF COEFFICIENT   =         .99          .47          .81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .92
|ID= 1 DT= 3.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .91          .01
     Dep. Storage     (mm)=        1.00         1.00
     Average Slope     (%)=        1.00         2.00
     Length            (m)=       78.20        40.00
     Mannings n           =        .013         .250

     Max.Eff.Inten.(mm/hr)=     159.75       544.05
                 over (min)        6.00         3.00
     Storage Coeff.  (min)=        1.83 (ii)    2.76 (ii)
     Unit Hyd. Tpeak (min)=        6.00         3.00
     Unit Hyd. peak  (cms)=         .33          .38
                                                          *TOTALS*
     PEAK FLOW       (cms)=         .38          .00          .387 (iii)
     TIME TO PEAK    (hrs)=        1.30         1.30         1.30
     RUNOFF VOLUME    (mm)=       70.24        67.76        70.21
     TOTAL RAINFALL   (mm)=       71.24        71.24        71.24
     RUNOFF COEFFICIENT   =         .99          .95          .99

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0012) |   Area    (ha)=    .16
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .08          .08
     Dep. Storage     (mm)=        1.00         5.00
     Average Slope     (%)=        1.00         2.00
```

```
     Length            (m)=      32.60        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
               .083    4.78 | 1.083   36.20 | 2.083   11.07 |  3.08    5.66
               .167    4.78 | 1.167   36.20 | 2.167   11.07 |  3.17    5.66
               .250    5.46 | 1.250  159.75 | 2.250    9.46 |  3.25    5.26
               .333    5.46 | 1.333  159.75 | 2.333    9.46 |  3.33    5.26
               .417    6.40 | 1.417   47.34 | 2.417    8.28 |  3.42    4.93
               .500    6.40 | 1.500   47.34 | 2.500    8.28 |  3.50    4.93
               .583    7.83 | 1.583   25.10 | 2.583    7.40 |  3.58    4.63
               .667    7.83 | 1.667   25.10 | 2.667    7.40 |  3.67    4.63
               .750   10.25 | 1.750   17.40 | 2.750    6.70 |  3.75    4.38
               .833   10.25 | 1.833   17.40 | 2.833    6.70 |  3.83    4.38
               .917   15.41 | 1.917   13.47 | 2.917    6.13 |  3.92    4.15
              1.000   15.41 | 2.000   13.47 | 3.000    6.13 |  4.00    4.15

     Max.Eff.Inten.(mm/hr)=     159.75        70.94
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.08 (ii)    9.18 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .34          .12
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .04          .01          .043 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=      70.24        33.82        52.00
     TOTAL RAINFALL   (mm)=      71.24        71.24        71.24
     RUNOFF COEFFICIENT   =        .99          .47          .73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0005):       .33    .139     1.33    66.59
        + ID2= 2 (0004):       .06    .026     1.33    70.21
          ================================================
          ID = 3 (0006):       .39    .165     1.33    67.13

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0002):      1.15    .357     1.35    57.49
        + ID2= 2 (0001):       .92    .387     1.30    70.21
          ================================================
          ID = 3 (0003):      2.07    .734     1.30    63.13

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0010) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000    |    .0708       .0042
                           .0683      .0012    |    .0720       .0110
                           .0695      .0015    |    .0000       .0000

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0006)       .390       .165        1.33       67.13
```

```
     OUTFLOW: ID= 1 (0010)       .390       .071        1.42       67.13

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 43.07
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0062

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0013) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000    |    .7300       .0045
                           .3600      .0015    |    .8560       .0053
                           .5750      .0030    |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0003)      2.068       .734        1.30       63.13
     OUTFLOW: ID= 1 (0013)      2.068       .730        1.35       63.13

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 99.51
                   TIME SHIFT OF PEAK FLOW         (min)=  3.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0045

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0010):      .39    .071     1.42    67.13
        + ID2= 2 (0007):      .04    .007     1.33    40.97
          ================================================
          ID = 3 (0008):      .43    .078     1.33    64.70

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0013):     2.07    .730     1.35    63.13
        + ID2= 2 (0012):      .16    .043     1.33    52.00
          ================================================
          ID = 3 (0011):     2.23    .769     1.35    62.35

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0009) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0008):      .43    .078     1.33    64.70
        + ID2= 2 (0011):     2.23    .769     1.35    62.35
          ================================================
          ID = 3 (0009):     2.66    .846     1.35    62.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1450.000
| Ptotal= 79.41 mm |                          B=   4.900
--------------------                          C=    .780
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33

                  TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
```

.17	5.34	1.17	40.65	2.17	12.41	3.17	6.33
.33	6.10	1.33	176.31	2.33	10.59	3.33	5.89
.50	7.17	1.50	53.15	2.50	9.28	3.50	5.51
.67	8.77	1.67	28.20	2.67	8.28	3.67	5.18
.83	11.49	1.83	19.53	2.83	7.49	3.83	4.89
1.00	17.30	2.00	15.10	3.00	6.86	4.00	4.64

CALIB	
STANDHYD (0005)	Area (ha)= .33
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	.30	.03
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	47.00	40.00
Mannings n	=	.013	.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	5.34	1.083	40.65	2.083	12.41	3.08	6.33
.167	5.34	1.167	40.65	2.167	12.41	3.17	6.33
.250	6.10	1.250	176.31	2.250	10.59	3.25	5.89
.333	6.10	1.333	176.31	2.333	10.59	3.33	5.89
.417	7.17	1.417	53.15	2.417	9.28	3.42	5.51
.500	7.17	1.500	53.15	2.500	9.28	3.50	5.51
.583	8.77	1.583	28.20	2.583	8.28	3.58	5.18
.667	8.77	1.667	28.20	2.667	8.28	3.67	5.18
.750	11.49	1.750	19.53	2.750	7.49	3.75	4.89
.833	11.49	1.833	19.53	2.833	7.49	3.83	4.89
.917	17.30	1.917	15.10	2.917	6.86	3.92	4.64
1.000	17.30	2.000	15.10	3.000	6.86	4.00	4.64

Max.Eff.Inten.	(mm/hr)=	176.31	177.35	
over	(min)	5.00	5.00	
Storage Coeff.	(min)=	1.29 (ii)	3.63 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	.33	.25	
				TOTALS
PEAK FLOW	(cms)=	.15	.01	.154 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33
RUNOFF VOLUME	(mm)=	78.41	40.15	74.58
TOTAL RAINFALL	(mm)=	79.41	79.41	79.41
RUNOFF COEFFICIENT	=	.99	.51	.94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0004)	Area (ha)= .06
ID= 1 DT= 5.0 min	Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	.06	.00
Dep. Storage	(mm)=	1.00	1.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	19.70	40.00
Mannings n	=	.013	.250

Max.Eff.Inten.	(mm/hr)=	176.31	886.77	
over	(min)	5.00	5.00	
Storage Coeff.	(min)=	.77 (ii)	1.66 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	.34	.32	
				TOTALS
PEAK FLOW	(cms)=	.03	.00	.028 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33

```
     RUNOFF VOLUME     (mm)=      78.41        75.92          78.38
     TOTAL RAINFALL    (mm)=      79.41        79.41          79.41
     RUNOFF COEFFICIENT   =        .99          .96            .99

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=    .04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      16.30        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     176.31        84.74
               over (min)         5.00        10.00
     Storage Coeff.  (min)=        .69 (ii)    8.23 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .34          .13
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .00          .01           .008 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      78.41        40.15         47.67
     TOTAL RAINFALL   (mm)=      79.41        79.41         79.41
     RUNOFF COEFFICIENT   =        .99          .51           .60

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   1.15
|ID= 1 DT= 3.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=  65.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .75          .40
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      87.60        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 MIN. TIME STEP.


                        ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
               .050    5.34 | 1.050   40.65 | 2.050   12.41 |  3.05    6.33
               .100    5.34 | 1.100   40.65 | 2.100   12.41 |  3.10    6.33
               .150    5.34 | 1.150   40.65 | 2.150   12.41 |  3.15    6.33
               .200    5.85 | 1.200  131.09 | 2.200   11.20 |  3.20    6.03
               .250    6.10 | 1.250  176.31 | 2.250   10.59 |  3.25    5.89
               .300    6.10 | 1.300  176.31 | 2.300   10.59 |  3.30    5.89
               .350    6.46 | 1.350  135.26 | 2.350   10.15 |  3.35    5.76
               .400    7.17 | 1.400   53.15 | 2.400    9.28 |  3.40    5.51
               .450    7.17 | 1.450   53.15 | 2.450    9.28 |  3.45    5.51
               .500    7.17 | 1.500   53.15 | 2.500    9.28 |  3.50    5.51
               .550    8.77 | 1.550   28.20 | 2.550    8.28 |  3.55    5.18
               .600    8.77 | 1.600   28.20 | 2.600    8.28 |  3.60    5.18
               .650    8.77 | 1.650   28.20 | 2.650    8.28 |  3.65    5.18
               .700   10.58 | 1.700   22.42 | 2.700    7.75 |  3.70    4.99
               .750   11.49 | 1.750   19.53 | 2.750    7.49 |  3.75    4.89
```

```
                .800   11.49 | 1.800   19.53 | 2.800    7.49 |  3.80    4.89
                .850   13.42 | 1.850   18.05 | 2.850    7.28 |  3.85    4.81
                .900   17.30 | 1.900   15.10 | 2.900    6.86 |  3.90    4.64
                .950   17.30 | 1.950   15.10 | 2.950    6.86 |  3.95    4.64
               1.000   17.30 | 2.000   15.10 | 3.000    6.86 |  4.00    4.64

     Max.Eff.Inten.(mm/hr)=     176.31        74.32
               over (min)        6.00         9.00
     Storage Coeff.  (min)=       1.88 (ii)    6.27 (ii)
     Unit Hyd. Tpeak (min)=       6.00         9.00
     Unit Hyd. peak  (cms)=        .32          .16
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .35          .07          .400 (iii)
     TIME TO PEAK    (hrs)=       1.30         1.40         1.35
     RUNOFF VOLUME    (mm)=      78.41        40.15         65.01
     TOTAL RAINFALL   (mm)=      79.41        79.41         79.41
     RUNOFF COEFFICIENT   =        .99          .51           .82

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .92
|ID= 1 DT= 3.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .91          .01
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      78.20        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     176.31       650.30
               over (min)        6.00         3.00
     Storage Coeff.  (min)=       1.76 (ii)    2.65 (ii)
     Unit Hyd. Tpeak (min)=       6.00         3.00
     Unit Hyd. peak  (cms)=        .33          .38
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .42          .00          .429 (iii)
     TIME TO PEAK    (hrs)=       1.30         1.30         1.30
     RUNOFF VOLUME    (mm)=      78.41        75.92         78.38
     TOTAL RAINFALL   (mm)=      79.41        79.41         79.41
     RUNOFF COEFFICIENT   =        .99          .96           .99

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  99.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0012) |   Area    (ha)=    .16
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .08          .08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      32.60        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    5.34 | 1.083   40.65 | 2.083   12.41 |  3.08    6.33
                .167    5.34 | 1.167   40.65 | 2.167   12.41 |  3.17    6.33
                .250    6.10 | 1.250  176.31 | 2.250   10.59 |  3.25    5.89
```

```
                .333    6.10 | 1.333  176.31 | 2.333   10.59 |  3.33    5.89
                .417    7.17 | 1.417   53.15 | 2.417    9.28 |  3.42    5.51
                .500    7.17 | 1.500   53.15 | 2.500    9.28 |  3.50    5.51
                .583    8.77 | 1.583   28.20 | 2.583    8.28 |  3.58    5.18
                .667    8.77 | 1.667   28.20 | 2.667    8.28 |  3.67    5.18
                .750   11.49 | 1.750   19.53 | 2.750    7.49 |  3.75    4.89
                .833   11.49 | 1.833   19.53 | 2.833    7.49 |  3.83    4.89
                .917   17.30 | 1.917   15.10 | 2.917    6.86 |  3.92    4.64
               1.000   17.30 | 2.000   15.10 | 3.000    6.86 |  4.00    4.64

     Max.Eff.Inten.(mm/hr)=     176.31        84.74
                 over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.04 (ii)    8.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .34          .12
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .04          .01          .049 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=      78.41        40.15        59.25
     TOTAL RAINFALL   (mm)=      79.41        79.41        79.41
     RUNOFF COEFFICIENT   =        .99          .51          .75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0005):       .33     .154     1.33    74.58
        + ID2= 2 (0004):       .06     .028     1.33    78.38
          ================================================
          ID = 3 (0006):       .39     .183     1.33    75.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0002):      1.15     .400     1.35    65.01
        + ID2= 2 (0001):       .92     .429     1.30    78.38
          ================================================
          ID = 3 (0003):      2.07     .818     1.30    70.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0010) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |    (cms)     (ha.m.)
                           .0000      .0000    |    .0708       .0042
                           .0683      .0012    |    .0720       .0110
                           .0695      .0015    |    .0000       .0000

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0006)       .390       .183        1.33       75.15
     OUTFLOW: ID= 1 (0010)       .390       .071        1.42       75.15

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 39.00
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0073

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0013) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |    (cms)     (ha.m.)
```

```
                          .0000      .0000   |    .7300       .0045
                          .3600      .0015   |    .8560       .0053
                          .5750      .0030   |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0003)     2.068       .818        1.30       70.94
     OUTFLOW: ID= 1 (0013)     2.068       .831        1.35       70.94

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=101.60
                   TIME SHIFT OF PEAK FLOW         (min)=  3.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0053

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                    CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0010):      .39    .071     1.42    75.15
        + ID2= 2 (0007):      .04    .008     1.33    47.67
          ================================================
          ID = 3 (0008):      .43    .079     1.33    72.59

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0013):     2.07    .831     1.35    70.94
        + ID2= 2 (0012):      .16    .049     1.33    59.25
          ================================================
          ID = 3 (0011):     2.23    .876     1.35    70.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0009) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0008):      .43    .079     1.33    72.59
        + ID2= 2 (0011):     2.23    .876     1.35    70.12
          ================================================
          ID = 3 (0009):     2.66    .955     1.35    70.52

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------

 FINISH
===============================================================================================================
```

SWM INFORMATION FOR ORIFICE CONTROLED STORM TRIBUTARY AREAS

Tributary Area No. 4 **Tributary Area** 0.332 ha

INLET CONTROL DEVICE (ICD) INFORMATION

Location of ICD	PROP STM MH 3	
Type of ICD	Plate	
Rim Elevation	177.20	m
Orifice Invert Elevation	174.22	m
Orifice Size	490.00	mm
Orifice Coefficient	0.62	

STORM WATER STORAGE INFORMATION

Surface Ponding Area	0	m^2
Surface Pond Depth	0.00	m
Underground Pipe Storage	59.8	m^3

STAGE/DISCHARGE/VOLUME RELATIONSHIP

Stage Description	Elevation (m)	Head (m)	Discharge (m^3/s)	Volume (m^3)	Volume (ha·m)
Orifice	174.22	0.00	0.0000	0.0	0.00000
1st stage	174.95	0.48	0.3607	15.0	0.00150
2nd stage	175.70	1.23	0.5755	20.0	0.00200
3rd Stage	176.45	1.98	0.7296	25.0	0.00250
CB Rim	177.20	2.73	0.8564	59.8	0.00598

PONDING DEPTHS

Storm Event	Volume Required (m^3)	Ponding Depth (m)	Ponding Elevation (m)
2 Year	11	0.00	177.20
5 Year	18	0.45	177.65
10 Year	28	1.56	178.76
25 Year	36	1.74	178.94
50 Year	45	1.93	179.13
100 Year	54	2.12	179.32

SWM INFORMATION FOR ORIFICE CONTROLED STORM TRIBUTARY AREAS

Tributary Area No. 4 **Tributary Area** 0.332 ha

INLET CONTROL DEVICE (ICD) INFORMATION

Location of ICD	PROP STM MH 3	
Type of ICD	Plate	
Rim Elevation	178.75	m
Orifice Invert Elevation	176.41	m
Orifice Size	145.00	mm
Orifice Coefficient	0.62	

STORM WATER STORAGE INFORMATION

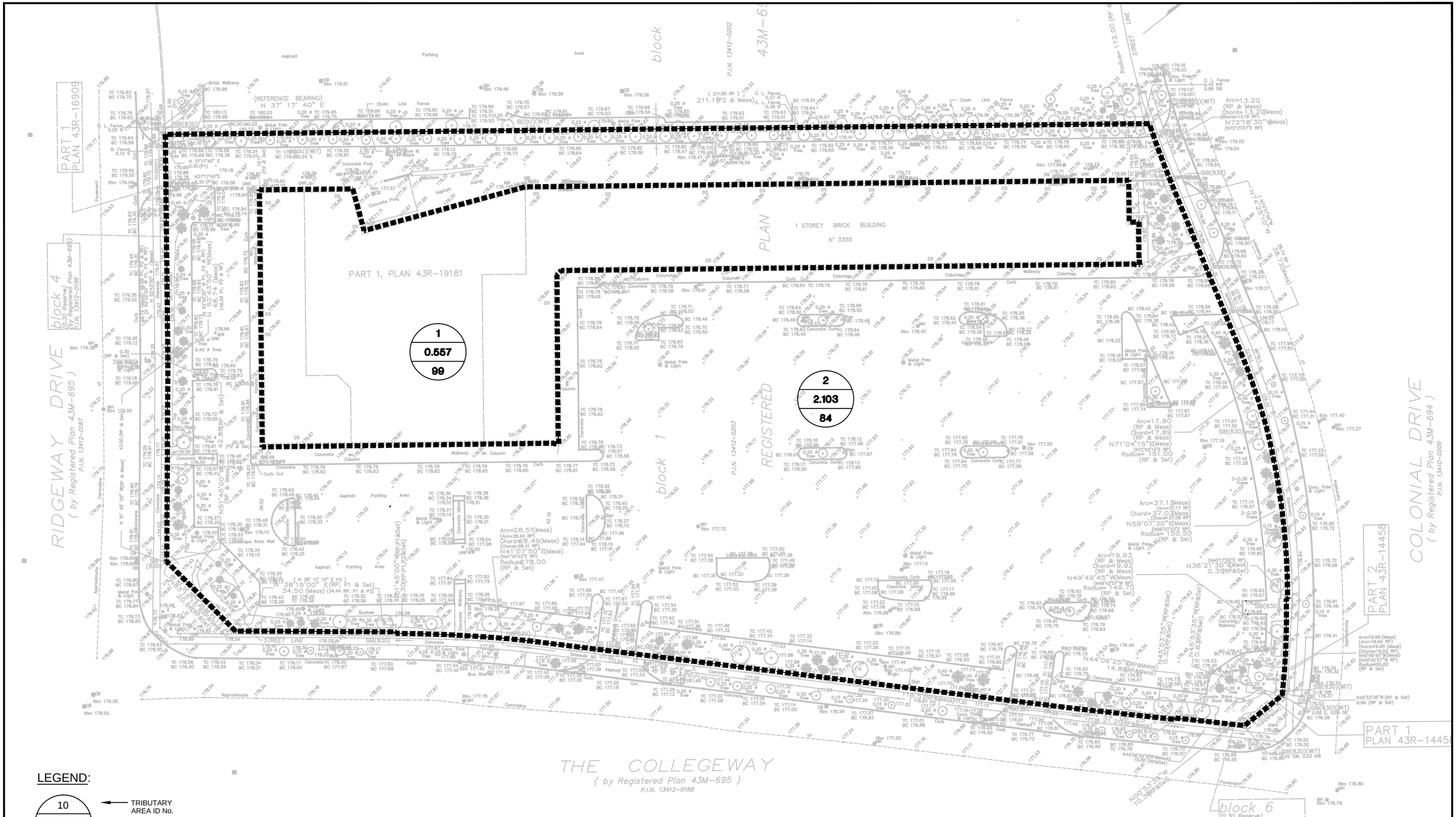
Surface Ponding Area	1091	m^2
Surface Pond Depth	0.25	m
Underground Pipe Storage	11.7	m^3

STAGE/DISCHARGE/VOLUME RELATIONSHIP

Stage Description	Elevation (m)	Head (m)	Discharge (m^3/s)	Volume (m^3)	Volume (ha·m)
Orifice	176.41	0.00	0.0000	0.0	0.00000
CB Rim	178.75	2.27	0.0683	11.7	0.00117
1st stage	178.83	2.35	0.0695	14.8	0.00148
2nd stage	178.92	2.43	0.0708	42.4	0.00424
3rd stage	179.00	2.52	0.0720	109.9	0.01099

PONDING DEPTHS

Storm Event	Volume Required (m^3)	Ponding Depth (m)	Ponding Elevation (m)
2 Year	11	0.00	178.75
5 Year	18	0.09	178.84
10 Year	28	0.12	178.87
25 Year	36	0.15	178.90
50 Year	45	0.17	178.92
100 Year	54	0.18	178.93

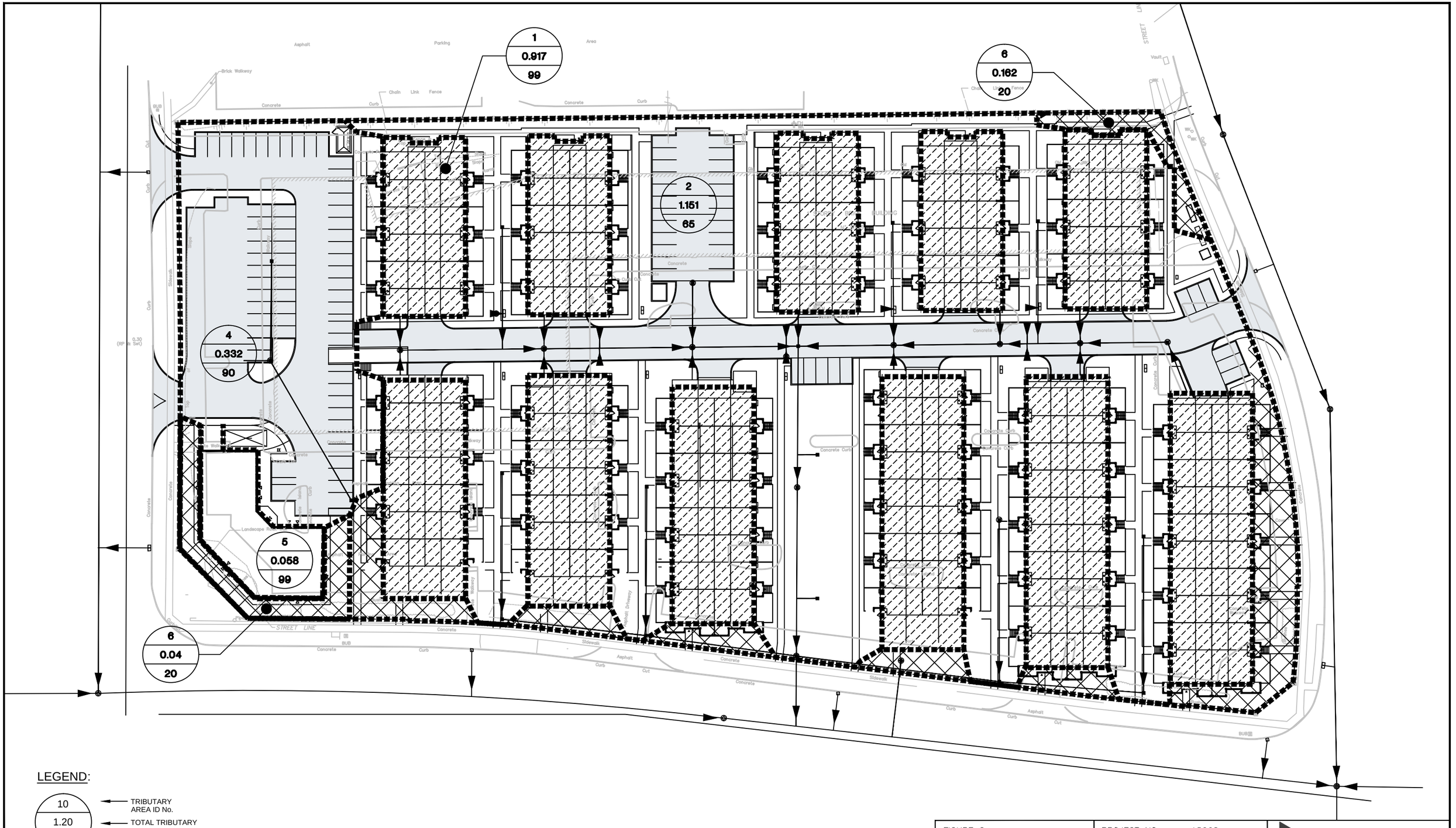


LEGEND:

10 / 1.20 / C=0.50	TRIBUTARY AREA ID No. / TOTAL TRIBUTARY AREA (ha) / PERCENT IMPERVIOUS (%)
- - - - -	STORM DRAINAGE AREA BOUNDARY

FIGURE 1	PROJECT NO : 15268
PRE STORM TRIBUTARY PLAN	3355 THE COLLEGEWAY 3700 STEELES AVE W, SUITE 800 VAUGHAN, ONTARIO
SCALE: 1:750	DATE: JUNE 2016

ODAN•DETECH CONSULTING ENGINEERS
The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2



LEGEND:

10
1.20
C=0.50

- TRIBUTARY AREA ID No.
- TOTAL TRIBUTARY AREA (ha)
- PERCENT IMPERVIOUS (%)
- STORM DRAINAGE AREA BOUNDARY

FIGURE 2	PROJECT NO : 15268
PROPOSED STORM TRIBUTARY PLAN	3355 THE COLLEGEWAY 3700 STEELES AVE W, SUITE 800 VAUGHAN, ONTARIO
SCALE: 1:750	DATE: JUNE 2016

ODAN•DETECH CONSULTING ENGINEERS
The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2