Urban Ecosystems Limited

7050 WESTON ROAD, SUITE 705

WOODBRIDGE, ONTARIO L4L 8G7

uel@urbanecosystems.com

t. (905)856-0629

f. (905)856-0698

STORMWATER MANAGEMENT REPORT

TOWN SQUARE CENTRE (BLDGS A TO K)
RIVERSIDE SOUTH

1420 EARL ARMSTRONG ROAD

CITY OF OTTAWA

File No: 12007.100

DATE: APRIL 9,2014
revised JULY 20, 2014
revised JULY 20, 2014
revised January, 2016
revised November 30, 2016

DATE: APRIL 9,2014
revised July 20,2014
revised November 30, 2016

Urban Ecosystems Limited
7050 WESTON ROAD, SUITE 705
WOODBRIDGE, ONTARIO L4L 8G7
uel@urbanecosystems.com
t. (905)856-0629
f. (905)856-0698

STORMWATER MANAGEMENT REPORT

TOWN SQUARE CENTRE (BLDGS A TO K)
RIVERSIDE SOUTH
1420 EARL ARMSTRONG ROAD
CITY OF OTTAWA
File No: 12007.100

1.0 INTRODUCTION

The purpose of this report is to provide recommended grading and drainage proposals, with the objective to control storm runoff from the above proposed commercial development. The report provides an analysis of the overall site bounded by Earl Armstrong Road to the north, Limebank Road to the west, Ceremonial Road to the east and future Town Square Blvd. to the south. The property is located within in the Riverside South Community, Phase 6, City of Ottawa. The Report also addresses Tributary No. 14, an external drainage area south of the subject property. Details are included in Appendix B to this Report.

In September 2008, Stantec prepared a report entitled, Riverside South Community Master Drainage Plan Update, Final Report. That study established the overall storm drainage strategy for the Riverside South Community and determined parameters for future developments within the community plan.

In January 2012, J.L. Richards & Associates Limited prepared a Design Report for Riverside South Community, Phase 6. That study provided further details and design parameters with respect to storm drainage of future developments within the study area.

The Stantec and the J.L. Richards studies established maximum allowable runoff from development blocks within the Riverside South Community area, inlcuding for the Subject Property. On site detention of excess runoff from the Subject Property will be required in order not to exceed the allowable site release rate.

The intent of this hydrologic evaluation is to outline the proposed stormwater management necessary to satisfy the site storage requirements produced by the occurance of the 100 year return frequency design storm.

The maximum volume of storm runoff for the site was determined using the modified rational method MRM, as outlined in the American Public Works Association Publication title Practice in Detention of Urban Stormwater Runoff.

Copies of the Proposed Site Plan, Site Grading Plan, Servicing Plan and the SWM Drainage Plan are included in the rear pockets of this Report. The rainfall intensities are derived from the City of Ottawa IDF curves.

2.0 ALLOWABLE SITE RUNOFF

The Master Drainage Study by Stantec and the Design Report by J.L. Richards established that the maximum allowable post development storm runoff from the subject property shall not exceed 203 L/s/ha for all storms up to and including the 1:100 year event.

All excess runoff shall be detained on site through surface, roof and underground storage.

ALLOWABLE RELEASE RATE

Site Area = 6.54 ha. x 203 L/s/ha = 1327 L/s

3.0 POST-DEVELOPMENT SITE CONDITION

	unit	Total	System A
Total Site Area	(m^2)	65367	65367
Pavement Area	(m^2)	48861	48861
Landscaped Area	(m^2)	0	0
Building Area	(m^2)	10136	10136
Uncontrolled Pavement Area	(m^2)	413	413
Uncontrolled Landscape Area	(m^2)	5957	5957

Urban Ecosystems Limited
7050 WESTON ROAD, SUITE 705
WOODBRIDGE, ONTARIO L4L 8G7
uel@urbanecosystems.com
t. (905)856-0629
f. (905)856-0698

4.0 EVALUATION OF SITE RUNOFF - SYSTEM A

4.1 Roof Top Storage

Proposed roofs to be equipped with control flow drains.

Model ID: Zurn Control Flo Z-105-5
Weir Rating 6 USGPM per inch head (0.15 L/s/cm head)
Quantity: One weir per hopper. Based on manufacturers table, one hopper drains a maximum roof area of 465m^2 with a maximum head of 10.16 cm

For this building 33 weirs

Total roof outflow is calculated as:

Q_{roof} 33 x 0.15 L/s/cm hd. x 10 cm head
= 49.5 L/s

From Appendix - Table 1 maximum storage volumes:

required =	404.9	m^3
available =	686.5	m^3

As shown, the available storage volume for the roof can easily contain the respective required maximum roof storage volumes.

Note: Peak rate of runoff, eg: Q = Rain (L/s)
= 0.95 x 1.0136 x mm/hr x 2.778

4.2 Parking Lot Storage and Release Rate

Note: 100 year runoff coefficients:

pavements - C_{100} = 1.00
landscaped - C_{100} = 0.25 x 0.5 + 0.5 = 0.625

4.2.1 The composite runoff coefficients for the site, excluding building, are calculated as follows:

$$C_c = \frac{48861 \times 1.0 + 0 \times 0.625}{48861 + 0}$$

C_c = 1.00

Urban Ecosystems Limited
7050 WESTON ROAD, SUITE 705
WOODBRIDGE, ONTARIO L4L 8G7
uel@urbanecosystems.com
t. (905)856-0629
f. (905)856-0698

4.2.2 Release rate calculations are based on orifice flow formula:

$Q = C \times A \times (2gH)^{1/2}$
where,
Q = discharge in m^3/s
C = shape coefficient, 0.62 for orifice plate, dimensionless
A = area of orifice in m^2
g = acceleration due to gravity in m/s^2
H = head from centre of orifice to ponding level in m

Orifice Plate at Existing Storm Manhole

max. ponding level	(m)	92.5
invert of orifice	(m)	88.15
head	(m)	4.125
diameter of orifice	(mm)	450
Q, orifice discharge	(l/s)	887.1

4.2.3 Using the Modified Rational Method, the maximum storage volume required on the parking lot was calculated. As shown in Appendix A, Table 2 and dwg 3 of 8,SWM drainage Plan, Urban Ecosystems Limited Project No. 12007.100 The required pond volume was calculated to b 993 m^3

Available site storage:

			Surface Pavement Storage=	1643.0	m^3
12.5	m -	1050	dia. stm =	10.8	m^3
81	m -	900	dia. stm =	51.5	m^3
87.5	m -	750	dia. stm =	38.7	m^3
91	m -	675	dia. stm =	32.6	m^3
135	m -	600	dia. stm =	38.2	m^3
174	m -	525	dia. stm =	37.7	m^3
137	m -	450	dia. stm =	21.8	m^3
37.5	m -	375	dia. stm =	4.1	m^3
299.5	m -	300	dia. stm =	21.2	m^3
113.5	m -	250	dia. stm =	5.6	m^3
0	m -	200	dia. stm =	0.0	m^3
2		2400 mm dia mh(@	2 m avg depth) =	18.1	m^3
2		1800 mm dia mh(@	2 m avg depth) =	10.2	m^3
8		1500 mm dia mh(@	2 m avg depth) =	28.3	m^3
19		1200 mm dia mh(@	2 m avg depth) =	43.0	m^3
			Manhole / Pipe Storage=	361.6	m^3

Total site storage = 2004.6 m^3

Required Storage	m^3	993
Available Storage	m^3	2005

Therefore, there is sufficient storage in the parking lot to self contain the drainage and control the 100 year runoff to the allowable rate within the site.

Note:Peak runoff rate, Q = R A I N + Qroof
1.00 x 4.8861 x I x 2.778 + 50

Note:
Table 3 indicates that the uncontrolled runoff will total 205.2 l/s
(Landscape = 5957 m^2 and pavement = 413 m^2)

Urban Ecosystems Limited
7050 WESTON ROAD, SUITE 705
WOODBRIDGE, ONTARIO L4L 8G7
uel@urbanecosystems.com
t. (905)856-0629
f. (905)856-0698

3.0 WATER QUALITY CONTROL

Storm runoff from the subject property will be directed to a proposed 1800 mm dia storm sewer to be constructed on Collector Road 'D'. This storm sewer connects to the existing storm sewers on Earl Armstrong Road and Limebank Road discharging to Riverside South Stormwater Management Pond No. 2, which provides for water quality controls. The Riverside South retail centre development is therefore not required to include onsite stormwater quality features.

7.0 SUMMARY

The following table summarizes the results presented in this report.

SYSTEM		100 YR STM	5 YR STM
orifice size	mm	450	450
total site release rate	L/s	1092.3	908.1
allowable site release rate	L/s	1327.0	1327.0
maximum ponding elevation	m	92.5	92.2
catchbasin elevation	m	92.2	92.2
ponding depth	m	0.3	0
required storage	m^3	993	281
available storage	m^3	2005	362

Respectfully submitted,

Urban Ecosystems Limited

Rosario Sacco, P. Eng. DATED revised November 30, 2016

Urban Ecosystems Limited
7050 WESTON ROAD, SUITE 705
WOODBRIDGE, ONTARIO L4L 8G7
uel@urbanecosystems.com
t. (905)856-0629
f. (905)856-0698

APPENDIX A

PROJECT: TOWN SQUARE CENTRE (BLDGS A TO K)
RIVERSIDE SOUTH
MUNICIPALITY: CITY OF OTTAWA
FILE NO.: 12007.100
Date: revised November 30, 2016
LOCATION: 1420 EARL ARMSTRONG ROAD

Urban Ecosystems Limited
7050 WESTON ROAD, SUITE 705
WOODBRIDGE, ONTARIO L4L 8G7
uel@urbanecosystems.com
t. (905)856-0629
f. (905)856-0698

SITE STORM WATER MANAGEMENT

SUMMARY

	Total	
Site area (sq.m) :	65367	65367
Controlled Pavement area (sq.m) :	48861	48861
Controlled Landscaped area (sq.m) :	0	0
BLDGs B,C,D,E,F,G,H,I,J,K Roof area (sq.m) :	10136	10136
Uncontrolled Pavement area (sq.m.) :	413	413
Uncontrolled Landscape area (sq.m.) :	5957	5957

Includes Building A

SYSTEM A

CONTROLLED	Orifice release rate (l/sec) :	887.1
UNCONTROLLED	Site release rate (l/sec) :	205.2
TOTAL	Site release rate (l/sec) :	1092.3
ALLOWABLE	Site release rate (l/sec) :	1327.0

PROJECT: RIVERSIDE SOUTH
MUNICIPALITY: CITY OF OTTAWA
JOB NO.: 12007.100
DATE: revised November 30, 2016
LOCATION: 1420 EARL ARMSTRONG ROAD

URBAN ECOSYSTEMS LIMITED

SYSTEM A 100 YR STORM

SITE STORM WATER MANAGEMENT

SITE PLAN CHARACTERISTICS - S Y S T E M S A

Site area (sq.m) : 65367
Controlled Pavement area (sq.m) : 48861
Controlled Landscaped area (sq.m) : 0
Proposed Roof area (sq.m) : 10136
Uncontrolled Pavement area (sq.m.) : 413
Uncontrolled Landscaped area (sq.m.) : 5957

Pavement coefficient : 1.0
Landscape coefficient : 0.625
Roof area coefficient : 0.95
Rainfall intensity (mm/hr) :
I 2yr = 732.951/(6.199+t)^.810
I 5yr = 998.071/(6.053+t)^.814
I 100yr = 1735.688/(6.014+t)^.820

ROOF DRAINAGE CHARACTERISTICS

Total roof area (sq. m) : 10136
Total number of roof hoppers : 33
Total number of weirs : 33
Max. sloped roof depth (mm) : 50.8
Max. sloped roof storage (cu.m) : 171.64
Max. parapit roof storage (cu.m) : 514.91

Weir rating (l/sec) : 0.15
Weir area rating (sq. m.) : 465
Maximum head (cm) : 10.16
Peak roof outflow rate (l/sec) : 50.3

33 hoppers @ 1 weir = 33
hoppers @ 2 weir = 0
Total 33 hoppers 33 weir

TABLE 1 - ROOF DRAINAGE SYSTEM

	1st ITERATION					2nd ITERATION						3rd ITERATION			
Time (min.)	Rainfall Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)	Peak Runoff volume (cu.m.)	Peak roof outflow volume (cu.m)	Required storage volume (cu.m)	Volume in sloped roof areas (cu.m)	Volume contained by roof parapit (cu.m)	Total head on roof hoppers (cm)	Roof outflow rate (l/sec)	Roof outflow volume (cu.m)	Required storage volume (cu.m)	Total head on roof hoppers (cm)	Roof outflow volume (cu.m)	Required storage volume (cu.m)	
5	242.70	649.23	194.77	15.09	179.68	171.64	8.05	5.16	25.54	7.66	187.11	5.23	7.77	187.00	
10	178.56	477.64	286.59	30.18	256.41	171.64	84.77	5.92	29.29	17.57	269.01	6.04	17.94	268.65	
15	142.89	382.24	344.02	45.26	298.75	171.64	127.12	6.33	31.35	28.22	315.80	6.50	28.97	315.05	
20	119.95	320.87	385.04	60.35	324.69	171.64	153.05	6.59	32.62	39.14	345.90	6.80	40.39	344.65	
25	103.85	277.79	416.69	75.44	341.25	171.64	169.61	6.75	33.43	50.14	366.54	7.00	52.00	364.69	
30	91.87	245.75	442.34	90.53	351.82	171.64	180.18	6.86	33.95	61.10	381.24	7.15	63.69	378.66	
35	82.58	220.90	463.88	105.61	358.27	171.64	186.63	6.92	34.26	71.95	391.94	7.25	75.40	388.48	
40	75.15	201.01	482.43	120.70	361.73	171.64	190.09	6.96	34.43	82.63	399.80	7.33	87.09	395.34	
45	69.05	184.71	498.72	135.79	362.93	171.64	191.29	6.97	34.49	93.12	405.60	7.39	98.74	399.97	
50	63.95	171.08	513.23	150.88	362.35	171.64	190.72	6.96	34.46	103.38	409.85	7.43	110.34	402.89	
55	59.62	159.49	526.33	165.96	360.36	171.64	188.73	6.94	34.36	113.40	412.93	7.46	121.87	404.46	
60	55.89	149.52	538.26	181.05	357.21	171.64	185.58	6.91	34.21	123.15	415.11	7.48	133.33	404.93	<<-------
65	52.65	140.83	549.23	196.14	353.09	171.64	181.46	6.87	34.01	132.63	416.60	7.50	144.73	404.51	
70	49.79	133.19	559.38	211.23	348.16	171.64	176.52	6.82	33.77	141.82	417.57	7.51	156.06	403.33	
75	47.26	126.41	568.84	226.31	342.52	171.64	170.89	6.77	33.49	150.71	418.13	7.51	167.33	401.51	
80	44.99	120.35	577.68	241.40	336.28	171.64	164.64	6.70	33.19	159.30	418.39	7.51	178.54	399.14	
85	42.95	114.90	586.00	256.49	329.51	171.64	157.87	6.64	32.86	167.56	418.43	7.51	189.71	396.28	
90	41.11	109.97	593.85	271.58	322.27	171.64	150.63	6.57	32.50	175.51	418.33	7.51	200.85	393.00	
95	39.43	105.49	601.28	286.66	314.61	171.64	142.98	6.49	32.13	183.13	418.15	7.51	211.95	389.33	
100	37.90	101.39	608.34	301.75	306.59	171.64	134.95	6.41	31.74	190.42	417.92	7.51	223.04	385.30	
105	36.50	97.63	615.07	316.84	298.23	171.64	126.59	6.33	31.33	197.37	417.70	7.51	234.13	380.94	
110	35.20	94.17	621.50	331.93	289.57	171.64	117.93	6.24	30.91	203.98	417.52	7.51	245.22	376.28	
115	34.01	90.96	627.65	347.01	280.64	171.64	109.00	6.16	30.47	210.24	417.41	7.50	256.33	371.32	
120	32.89	87.99	633.55	362.10	271.45	171.64	99.81	6.06	30.02	216.15	417.41	7.50	267.47	366.09	
125	31.86	85.23	639.23	377.19	262.04	171.64	90.40	5.97	29.56	221.71	417.52	7.51	278.65	360.57	
130	30.90	82.65	644.69	392.28	252.41	171.64	80.77	5.88	29.09	226.91	417.78	7.51	289.90	354.79	

Qroof= RAIN
= 2.675 x I (l / sec)

Peak roof outflow rate =
no. of hoppers x weir rating x max. head
= 50.3 l/sec

Peak roof outflow volume =
= 50.3 x time x 60/1000 cu. m.

Roof outflow rate =
head x weir rating x no. of hoppers
= head x 4.95 l/sec

Required max. roof storage (cu. m.) : 404.9
Available roof storage (cu. m.) : 686.5

PROJECT: RIVERSIDE SOUTH
JOB NO.: 12007.100

URBAN ECOSYSTEMS LIMITED

SYSTEM A 100 YR STORM

SITE STORM WATER MANAGEMENT

SITE CHARACTERISTICS

Controlled Pavement area (sq.m) :	48861
Controlled Landscaped area (sq.m) :	0
Total area - excl. Bldg (sq.m) :	48861
Composite runoff coefficent :	1.00

OUTLET CHARACTERISTICS

Orifice diameter (mm) :	450
Area of orifice (sq.m) :	0.15904
Orifice coefficient :	0.62
Max. ponding elev. :	92.50
Catchbasin elev. :	92.20
Ponding depth. :	0.30
Orifice invert :	88.15
Orifice center line elev. :	88.375
Head (m) :	4.125
Orifice release rate (l/sec) :	887.1

TABLE 2 - System Storage

Time (min.)	Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)	Runoff volume (cu.m)	Orifice Outflow volume (cu.m)	Required storage volume (cu.m.)	
10	178.56	2473.98	1484.39	532.25	952.13	
15	142.89	1989.88	1790.89	798.38	992.51	<-------
20	119.95	1678.45	2014.14	1064.51	949.63	
25	103.85	1459.87	2189.80	1330.64	859.17	

Required site storage (cu. m) : 993
Available site storage (cu. m) : 2005
SEE DRAWING SP-1

Qsite= R A I N + Qroof
= 13.574 x I + 50.3 l/sec

TABLE 3 - Uncontrolled Runoff

Time (min.)	Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)	
10	178.56	205.17	<-------
15	142.89	164.19	
20	119.95	137.82	

Peak runoff (L/sec) : 205.2

UNCONTROLLED SITE CHARACTERISTICS

Uncontrolled Pavement area (sq.m.) :	413
Uncontrolled Landscaped area (sq.m.) :	5957
Total area (sq.m) :	6370
Composite runoff coefficent :	0.649

SYSTEM A 100 YR STORM

SITE SUMMARY

Orifice release rate (l/sec) :	887.1
Uncontrolled release rate (l/sec) :	205.2
Total site release rate (l/sec) :	**1092.3**
Allowable site release rate (l/sec) :	**1327.0**

PROJECT: RIVERSIDE SOUTH
MUNICIPALITY: CITY OF OTTAWA
JOB NO.: 12007.100
DATE: revised November 30, 2016
LOCATION: 1420 EARL ARMSTRONG ROAD

URBAN ECOSYSTEMS LIMITED

SYSTEM A 5 YR STORM

SITE STORM WATER MANAGEMENT

SITE PLAN CHARACTERISTICS - S Y S T E M S A

Site area (sq.m) :	65367	Pavement coefficient :	0.9
Controlled Pavement area (sq.m) :	48861	Landscape coefficient :	0.25
Controlled Landscaped area (sq.m) :	0	Roof area coefficient :	0.95
Proposed Roof area (sq.m) :	10136	Rainfall intensity (mm/hr) :	
		I 2yr =	732.951/(6.199+t)^.810
Uncontrolled Pavement area (sq.m.) :	413	I 5yr =	998.071/(6.053+t)^.814
Uncontrolled Landscaped area (sq.m.) :	5957	I 100yr =	1735.688/(6.014+t)^.820

ROOF DRAINAGE CHARACTERISTICS

Total roof area (sq. m) :	10136	Weir rating (l/sec) :	0.15
Total number of roof hoppers :	33	Weir area rating (sq. m.) :	465
Total number of weirs :	33	Maximum head (cm) :	10.16
Max. sloped roof depth (mm) :	50.8	Peak roof outflow rate (l/sec) :	50.3
Max. sloped roof storage (cu.m) :	171.64		
Max. parapit roof storage (cu.m) :	514.91	33 hoppers @ 1 weir =	33
		0 hoppers @ 2 weir =	0
		Total 33 hoppers	33 weir

TABLE 1 - ROOF DRAINAGE SYSTEM

	1st ITERATION					2nd ITERATION						3rd ITERATION			
Time (min.)	Rainfall Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)	Peak Runoff volume (cu.m.)	Peak roof outflow volume (cu.m)	Required storage volume (cu.m)	Volume in sloped roof areas (cu.m)	Volume contained by roof parapit (cu.m)	Total head on roof hoppers (cm)	Roof outflow rate (l/sec)	Roof outflow volume (cu.m)	Required storage volume (cu.m)	Total head on roof hoppers (cm)	Roof outflow volume (cu.m)	Required storage volume (cu.m)	
5	141.18	377.65	113.30	15.09	98.21	98.21	-73.43	2.18	10.80	3.24	110.05	2.65	3.93	109.36	
10	104.19	278.72	167.23	30.18	137.05	137.05	-34.58	3.72	18.39	11.03	156.19	4.47	13.28	153.95	
15	83.56	223.51	201.16	45.26	155.90	155.90	-15.74	4.46	22.07	19.86	181.30	5.18	23.06	178.11	
20	70.25	187.92	225.51	60.35	165.15	165.15	-6.48	4.82	23.88	28.66	196.85	5.33	31.65	193.85	
25	60.90	162.90	244.34	75.44	168.91	168.91	-2.73	4.97	24.61	36.92	207.43	5.43	40.34	204.00	
30	53.93	144.26	259.66	90.53	169.13	169.13	-2.50	4.98	24.66	44.38	215.28	5.51	49.10	210.56	
35	48.52	129.78	272.55	105.61	166.93	166.93	-4.70	4.89	24.23	50.88	221.67	5.57	57.94	214.61	
40	44.18	118.19	283.66	120.70	162.96	162.96	-8.67	4.74	23.45	56.28	227.38	5.63	66.88	216.78	
45	40.63	108.68	293.44	135.79	157.65	157.65	-13.99	4.53	22.41	60.52	232.92	5.68	75.98	217.46	<-------
50	37.65	100.72	302.17	150.88	151.29	151.29	-20.35	4.28	21.17	63.51	238.65	5.74	85.26	216.91	
55	35.12	93.95	310.05	165.96	144.09	144.09	-27.55	3.99	19.76	65.22	244.83	5.80	94.78	215.27	
60	32.94	88.12	317.24	181.05	136.19	136.19	-35.44	3.68	18.22	65.60	251.64	5.87	104.59	212.65	
65	31.04	83.04	323.86	196.14	127.72	127.72	-43.91	3.35	16.57	64.61	259.25	5.94	114.76	209.11	
70	29.37	78.57	329.99	211.23	118.77	118.77	-52.87	2.99	14.82	62.24	267.76	6.03	125.33	204.66	
75	27.89	74.60	335.71	226.31	109.39	109.39	-62.25	2.62	12.99	58.44	277.26	6.12	136.37	199.34	
80	26.56	71.05	341.06	241.40	99.65	99.65	-71.98	2.24	11.08	53.21	287.85	6.23	147.94	193.11	
85	25.37	67.86	346.09	256.49	89.60	89.60	-82.04	1.84	9.12	46.52	299.57	6.34	160.11	185.98	
90	24.29	64.97	350.84	271.58	79.27	79.27	-92.37	1.43	7.10	38.35	312.49	6.47	172.93	177.91	
95	23.31	62.34	355.35	286.66	68.68	68.68	-102.95	1.02	5.04	28.70	326.65	6.61	186.48	168.87	
100	22.41	59.94	359.63	301.75	57.88	57.88	-113.76	0.59	2.92	17.55	342.09	6.76	200.82	158.81	
105	21.58	57.73	363.72	316.84	46.88	46.88	-124.76	0.16	0.77	4.88	358.83	6.93	216.01	147.70	
110	20.82	55.70	367.62	331.93	35.69	35.69	-135.95	-0.28	-1.41	-9.31	376.92	7.11	232.13	135.49	
115	20.12	53.82	371.36	347.01	24.34	24.34	-147.30	-0.73	-3.63	-25.03	396.38	7.30	249.24	122.12	
120	19.47	52.08	374.94	362.10	12.84	12.84	-158.80	-1.19	-5.87	-42.29	417.23	7.50	267.41	107.54	
125	18.86	50.45	378.39	377.19	1.20	1.20	-170.43	-1.65	-8.15	-61.10	439.50	7.72	286.70	91.69	
130	18.29	48.94	381.72	392.28	-10.56	-10.56	-182.20	-2.11	-10.45	-81.47	463.19	7.96	307.20	74.52	

Qroof= R A I N
= 2.675 x I (l / sec)

Peak roof outflow rate =
no. of hoppers x weir rating x max. head
= 50.3 l/sec

Peak roof outflow volume =
= 50.3 x time x 60/1000 cu. m.

Roof outflow rate =
head x weir rating x no. of hoppers
= head x 4.95 l/sec

Required max. roof storage (cu. m.) : 217.5
Available roof storage (cu. m.) : 686.5

PROJECT: RIVERSIDE SOUTH
JOB NO.: 12007.100

URBAN ECOSYSTEMS
LIMITED

SYSTEM A 5 YR STORM
SITE STORM WATER MANAGEMENT

SITE CHARACTERISTICS

Controlled Pavement area (sq.m) :	48861
Controlled Landscaped area (sq.m) :	0
Total area - excl. Bldg (sq.m) :	48861
Composite runoff coefficent :	0.90

OUTLET CHARACTERISTICS

Orifice diameter (mm) :	450
Area of orifice (sq.m) :	0.15904
Orifice coefficient :	0.62
Max. ponding elev. :	92.20
Catchbasin elev. :	92.20
Ponding depth. :	0.00
Orifice invert :	88.15
Orifice center line elev. :	88.375
Head (m) :	3.825
Orifice release rate (l/sec) :	854.2

NO SURFACE PONDING

TABLE 2 - System Storage

Time (min.)	Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)	Runoff volume (cu.m)	Orifice Outflow volume (cu.m)	Required storage volume (cu.m.)	
10	104.19	1323.14	793.88	512.53	281.35	<------
15	83.56	1071.04	963.94	768.80	195.14	
20	70.25	908.49	1090.19	1025.07	65.12	
25	60.90	794.21	1191.32	1281.34	-90.02	

Required site storage (cu. m) : 281
Available site storage (cu. m) : 362
SEE DRAWING SP-1

Qsite= R A I N + Qroof
= 12.216 x I + 50.3 l/sec

TABLE 3 - Uncontrolled Runoff

Time (min.)	Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)	
10	104.19	53.86	<------
15	83.56	43.20	
20	70.25	36.32	

Peak runoff (L/sec) : 53.9

UNCONTROLLED SITE CHARACTERISTICS

Uncontrolled Pavement area (sq.m.) :	413
Uncontrolled Landscaped area (sq.m.) :	5957
Total area (sq.m) :	6370
Composite runoff coefficent :	0.292

SYSTEM A 5 YR STORM
SITE SUMMARY

Orifice release rate (l/sec) :	854.2
Uncontrolled release rate (l/sec) :	53.9
Total site release rate (l/sec) :	**908.1**
Allowable site release rate (l/sec) :	**1327.0**

Urban Ecosystems Limited
7050 WESTON ROAD, SUITE 705
WOODBRIDGE, ONTARIO L4L 8G7
uel@urbanecosystems.com
t. (905)856-0629
f. (905)856-0698

APPENDIX B

Tributary No. 14

Approximately 68.38 ha of upstream lands to the south, are currently draining through the Subject Property via Tributary No. 14. Ultimately, the storm runoff from this area will be controlled as established through the Riverside South Community Master Drainage Area Plan. The storm drainage will be collected in local storm sewers and conveyed to the sewers on Limebank Road, ultimately discharging to Riverside South Stormwater Management Pond No. 2.

The peak flows from the upstream 68.38 ha of undeveloped lands, based on pasture lands and an estimated time to peak of 1.73 hours, were calculated to be 1.719 m^3/s. It is noted that this flow is significantly higher than what was reported in the Riverside South Community Master Drainage Plan, primarily due to a shorter time to peak. An External Storm Drainage Area Plan, Drawing 8 of 8, is included in the rear pocket.

In the interim, it is proposed that a temporary interceptor swale will be constructed (by others), immediately south of future Town Square Boulevard. The swale will convey all storm flows from the undeveloped upstream lands, discharging to the proposed storm sewers on Ceremonial Road.

The drainage from the Town Square Boulevard right of way, will be intercepted by a temporary swale located immediately south of the Subject Property. The swale will flow westerly, discharging to a temporary inlet catchbaisn to be located on the east side of Limebank Road and connected to the Limebank Road storm sewer systems.

Rideau Valley Conservation Authority has confirmed that Tributary no. 14 is approved in principle to be enclosed. Prior to commencing any construction on this Subject Property, including grading or any site alteration works, Morguard Investments Limited will file an application under Ontario Regulation 174/06 Section 28 with Rideau Valley Conservation Authority, for a Permit to enclose/alter Tributary No. 14.

```
   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O      9999   9999    Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO          9      9    =========
                                                       9   9  9   9   # 2637819
        StormWater Management HYdrologic Model          999    999    =========

**********************************************************************************
***************************** SWMHYMO Ver/4.05  ****************************
*********  A single event and continuous hydrologic simulation model  *********
*********     based on the principles of HYMO and its successors      *********
*********                OTTHYMO-83 and OTTHYMO-89.                   *********
**********************************************************************************
********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
*********                  Ottawa,  Ontario: (613) 836-3884           *********
*********                  Gatineau, Quebec: (819) 243-6858           *********
*********                  E-Mail: swmhymo@jfsa.Com                   *********
**********************************************************************************

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++++ Licensed user: The Sernas Group                            +++++++++
+++++++++                  whitby                SERIAL#:2637819     +++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

**********************************************************************************
*********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++                *********
*********           Maximum value for ID numbers  :     10               *********
*********           Max. number of rainfall points: 105408               *********
*********           Max. number of flow points    : 105408               *********
**********************************************************************************

***** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) *****
*****------------------------------------------------------------------*****
*****     ID:  Hydrograph IDentification numbers, (1-10).                *****
*****   NHYD:  Hydrograph reference numbers, (6 digits or characters).   *****
*****   AREA:  Drainage area associated with hydrograph, (ac.) or (ha.). *****
***** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).    *****
***** TpeakDate_hh:mm is the date and time of the peak flow.             *****
*****   R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).      *****
*****   R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).      *****
*****      *:  see WARNING or NOTE message printed at end of run.        *****
*****     **:  see  ERROR  message printed at end of run.                *****
**********************************************************************************
**********************************************************************************

::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

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

***********************   S U M M A R Y   O U T P U T   ***********************
**********************************************************************************
*         DATE: 2014-06-10      TIME: 15:29:25      RUN COUNTER: 000270          *
**********************************************************************************
* Input   filename: C:\DDRIVE~1\PreOtt.dat                                       *
* Output  filename: C:\DDRIVE~1\PreOtt.out                                       *
* Summary filename: C:\DDRIVE~1\PreOtt.sum                                       *
* User comments:                                                                 *
* 1:_____________________________________________________________________________*
* 2:_____________________________________________________________________________*
* 3:_____________________________________________________________________________*
```

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

#**********************************************************************************
#  Project Name: [Riverside Ottawa]    Project Number: [8811895.400]
#  Date        : 07-22-2004
#  Modeller    : [Ken Chow]
#  Company     : GHD
#  License #   : 2640114
#**********************************************************************************
  ** END OF RUN :   1

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



 RUN:COMMAND#

)02:0001-----------------------------------------------------------------------------

      START
       [TZERO =     .00 hrs on        0]
       [METOUT=   2     (1=imperial, 2=metric output)]
       [NSTORM=   2 ]
       [NRUN  =   2 ]
#**********************************************************************************
#  Project Name: [Riverside Ottawa]    Project Number: [8811895.400]
#  Date        : 07-22-2004
#  Modeller    : [Ken Chow]
#  Company     : GHD
#  License #   : 2640114
#**********************************************************************************

)02:0002-----------------------------------------------------------------------------

      MASS STORM
       Filename = C:\D DRIVE\24SCSII.mst
       Comment  = 24 hour SCS II storm mass curve
       [SDT= 2.00:SDUR=  24.00:PTOT= 103.20]

)02:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.

      DESIGN NASHYD       01:200            63.30    2.056 No_date    13:22    51.59
500
       [CN= 72.0: N= 3.00]
       [Tp= 1.37:DT= 2.00]

)02:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.

      PRINT HYD           01:200            63.30    2.056 No_date    13:22    51.59
1/a

)02:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.

      DESIGN NASHYD       01:200            63.30    1.719 No_date    13:48    51.59
500
       [CN= 72.0: N= 3.00]
       [Tp= 1.73:DT= 2.00]

)02:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
```

```
                                          PreOtt
     PRINT HYD             01:200            63.30    1.719 No_date   13:48   51.59
ı/a

)02:0007-------------------------------------------------------------------------------
-
      FINISH
---------------------------------------------------------------------------------------
--
***************************************************************************************
**
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2014-06-10     at 15:29:25
=======================================================================================
==
```

```
2     Metric units
*#**************************************************************************
*#  Project Name: [Riverside Ottawa]    Project Number: [8811895.400]
*#  Date        : 07-22-2004
*#  Modeller    : [Ken Chow]
*#  Company     : GHD
*#  License #   : 2640114
*#**************************************************************************
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[2],  NRUN=[2]
*%-----------------|-------------------------------------------------------|
* SCS 24 hours distribution
* Parameters taken from IDF curve parameters provided by City of Ottawa
* Sewer Guidelines October 2012
*%-----------------|-------------------------------------------------------|
*100 year event
*%-----------------|-------------------------------------------------------|
*
MASS STORM           PTOTAL=[103.2](mm), CSDT=[2](min),
                     CURVE_FILENAME=["C:\D DRIVE\24SCSII.mst"]
**********
* EXTERNAL AREAS  based on Row Crops and a Tp of 1.37
*
DESIGN NASHYD        ID=[1], NHYD=["200"], DT=[2]min, AREA=[63.3](ha),
                     DWF=[0](cms), CN/C=[72], TP=[1.37]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*
PRINT HYD            ID=[1],   # OF PCYCLES=[-1]
*
**********
* EXTERNAL AREAS  based on Pasture and a Tp of 1.73
*
DESIGN NASHYD        ID=[1], NHYD=["200"], DT=[2]min, AREA=[63.3](ha),
                     DWF=[0](cms), CN/C=[72], TP=[1.73]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*
PRINT HYD            ID=[1],   # OF PCYCLES=[-1]
*
FINISH
```

```
   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O      9999   9999    Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO          9      9    =========
                                                       9   9  9   9   # 2637819
        StormWater Management HYdrologic Model          999    999    =========

 ********************************************************************************
 ****************************** SWMHYMO Ver/4.05  ******************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                OTTHYMO-83 and OTTHYMO-89.                   *********
 ********************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 ********************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: The Sernas Group                            +++++++++
 +++++++++                whitby                SERIAL#:2637819      +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10           *********
 *********           Max. number of rainfall points: 105408           *********
 *********           Max. number of flow points    : 105408           *********
 ********************************************************************************


 ***********************   D E T A I L E D   O U T P U T   ***********************
 ********************************************************************************
 *         DATE: 2014-06-10     TIME: 15:29:25     RUN COUNTER: 000270          *
 ********************************************************************************
 * Input   filename: C:\DDRIVE~1\PreOtt.dat                                     *
 * Output  filename: C:\DDRIVE~1\PreOtt.out                                     *
 * Summary filename: C:\DDRIVE~1\PreOtt.sum                                     *
 * User comments:                                                               *
 * 1:_____________________________________________________________________________*
 * 2:_____________________________________________________________________________*
 * 3:_____________________________________________________________________________*
 ********************************************************************************

--------------------------------------------------------------------------------
--
)01:0001----------------------------------------------------------------------
--
'#*******************************************************************************
'#  Project Name: [Riverside Ottawa]    Project Number: [8811895.400]
'#  Date        : 07-22-2004
'#  Modeller    : [Ken Chow]
'#  Company     : GHD
'#  License #   : 2640114
'#*******************************************************************************
  ** END OF RUN :   1

'*******************************************************************************
```

```
--------------------
| START            |  Project  dir.: C:\DDRIVE~1\
--------------------  Rainfall dir.: C:\DDRIVE~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   2
           #  1=-----------------------------------------------------------|
           #  2=ibution
-------------------------------------------------------------------------------
--
)02:0002---------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [Riverside Ottawa]    Project Number: [8811895.400]
*#  Date         : 07-22-2004
*#  Modeller     : [Ken Chow]
*#  Company      : GHD
*#  License #    : 2640114
*#*****************************************************************************
-------------------------------------------------------------------------------
--
)02:0002---------------------------------------------------------------------
--
* Parameters taken from IDF curve parameters provided by City of Ottawa
* Sewer Guidelines October 2012
*100 year event
*
--------------------
| MASS STORM       |    Filename: C:\D DRIVE\24SCSII.mst
| Ptotal=103.20 mm |    Comments: 24 hour SCS II storm mass curve
--------------------
                        Duration of storm        =   24.00 hrs
                        Mass curve time step     =   12.00 min
                        Selected storm time step =    2.00 min
                        Volume of derived storm  =  103.20 mm
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.03	1.032	6.03	2.064	12.03	20.640	18.03	1.548
.07	1.032	6.07	2.064	12.07	20.640	18.07	1.548
.10	1.032	6.10	2.064	12.10	20.640	18.10	1.548
.13	1.032	6.13	2.064	12.13	20.640	18.13	1.548
.17	1.032	6.17	2.064	12.17	20.640	18.17	1.548
.20	1.032	6.20	2.064	12.20	20.640	18.20	1.548
.23	1.032	6.23	2.064	12.23	12.900	18.23	1.548
.27	1.032	6.27	2.064	12.27	12.900	18.27	1.548
.30	1.032	6.30	2.064	12.30	12.900	18.30	1.548
.33	1.032	6.33	2.064	12.33	12.900	18.33	1.548
.37	1.032	6.37	2.064	12.37	12.900	18.37	1.548
.40	1.032	6.40	2.064	12.40	12.900	18.40	1.548
.43	1.032	6.43	2.064	12.43	9.288	18.43	2.064
.47	1.032	6.47	2.064	12.47	9.288	18.47	2.064
.50	1.032	6.50	2.064	12.50	9.288	18.50	2.064
.53	1.032	6.53	2.064	12.53	9.288	18.53	2.064
.57	1.032	6.57	2.064	12.57	9.288	18.57	2.064
.60	1.032	6.60	2.064	12.60	9.288	18.60	2.064

.63	1.032	6.63	2.064	12.63	8.772	18.63	1.548
.67	1.032	6.67	2.064	12.67	8.772	18.67	1.548
.70	1.032	6.70	2.064	12.70	8.772	18.70	1.548
.73	1.032	6.73	2.064	12.73	8.772	18.73	1.548
.77	1.032	6.77	2.064	12.77	8.772	18.77	1.548
.80	1.032	6.80	2.064	12.80	8.772	18.80	1.548
.83	1.032	6.83	2.064	12.83	6.192	18.83	1.548
.87	1.032	6.87	2.064	12.87	6.192	18.87	1.548
.90	1.032	6.90	2.064	12.90	6.192	18.90	1.548
.93	1.032	6.93	2.064	12.93	6.192	18.93	1.548
.97	1.032	6.97	2.064	12.97	6.192	18.97	1.548
1.00	1.032	7.00	2.064	13.00	6.192	19.00	1.548
1.03	1.032	7.03	2.064	13.03	5.160	19.03	2.064
1.07	1.032	7.07	2.064	13.07	5.160	19.07	2.064
1.10	1.032	7.10	2.064	13.10	5.160	19.10	2.064
1.13	1.032	7.13	2.064	13.13	5.160	19.13	2.064
1.17	1.032	7.17	2.064	13.17	5.160	19.17	2.064
1.20	1.032	7.20	2.064	13.20	5.160	19.20	2.064
1.23	1.032	7.23	2.064	13.23	5.160	19.23	1.548
1.27	1.032	7.27	2.064	13.27	5.160	19.27	1.548
1.30	1.032	7.30	2.064	13.30	5.160	19.30	1.548
1.33	1.032	7.33	2.064	13.33	5.160	19.33	1.548
1.37	1.032	7.37	2.064	13.37	5.160	19.37	1.548
1.40	1.032	7.40	2.064	13.40	5.160	19.40	1.548
1.43	1.032	7.43	2.064	13.43	5.160	19.43	2.064
1.47	1.032	7.47	2.064	13.47	5.160	19.47	2.064
1.50	1.032	7.50	2.064	13.50	5.160	19.50	2.064
1.53	1.032	7.53	2.064	13.53	5.160	19.53	2.064
1.57	1.032	7.57	2.064	13.57	5.160	19.57	2.064
1.60	1.032	7.60	2.064	13.60	5.160	19.60	2.064
1.63	1.032	7.63	2.064	13.63	5.160	19.63	1.548
1.67	1.032	7.67	2.064	13.67	5.160	19.67	1.548
1.70	1.032	7.70	2.064	13.70	5.160	19.70	1.548
1.73	1.032	7.73	2.064	13.73	5.160	19.73	1.548
1.77	1.032	7.77	2.064	13.77	5.160	19.77	1.548
1.80	1.032	7.80	2.064	13.80	5.160	19.80	1.548
1.83	1.032	7.83	2.064	13.83	5.160	19.83	2.064
1.87	1.032	7.87	2.064	13.87	5.160	19.87	2.064
1.90	1.032	7.90	2.064	13.90	5.160	19.90	2.064
1.93	1.032	7.93	2.064	13.93	5.160	19.93	2.064
1.97	1.032	7.97	2.064	13.97	5.160	19.97	2.064
2.00	1.032	8.00	2.064	14.00	5.160	20.00	2.064
2.03	1.032	8.03	3.096	14.03	3.096	20.03	1.548
2.07	1.032	8.07	3.096	14.07	3.096	20.07	1.548
2.10	1.032	8.10	3.096	14.10	3.096	20.10	1.548
2.13	1.032	8.13	3.096	14.13	3.096	20.13	1.548
2.17	1.032	8.17	3.096	14.17	3.096	20.17	1.548
2.20	1.032	8.20	3.096	14.20	3.096	20.20	1.548
2.23	1.032	8.23	3.096	14.23	3.096	20.23	1.548
2.27	1.032	8.27	3.096	14.27	3.096	20.27	1.548
2.30	1.032	8.30	3.096	14.30	3.096	20.30	1.548
2.33	1.032	8.33	3.096	14.33	3.096	20.33	1.548
2.37	1.032	8.37	3.096	14.37	3.096	20.37	1.548
2.40	1.032	8.40	3.096	14.40	3.096	20.40	1.548
2.43	1.032	8.43	3.096	14.43	3.096	20.43	1.032
2.47	1.032	8.47	3.096	14.47	3.096	20.47	1.032
2.50	1.032	8.50	3.096	14.50	3.096	20.50	1.032
2.53	1.032	8.53	3.096	14.53	3.096	20.53	1.032
2.57	1.032	8.57	3.096	14.57	3.096	20.57	1.032
2.60	1.032	8.60	3.096	14.60	3.096	20.60	1.032
2.63	1.032	8.63	3.096	14.63	3.096	20.63	1.548
2.67	1.032	8.67	3.096	14.67	3.096	20.67	1.548
2.70	1.032	8.70	3.096	14.70	3.096	20.70	1.548

2.73	1.032	8.73	3.096	14.73	3.096	20.73	1.548
2.77	1.032	8.77	3.096	14.77	3.096	20.77	1.548
2.80	1.032	8.80	3.096	14.80	3.096	20.80	1.548
2.83	1.032	8.83	3.096	14.83	3.096	20.83	1.548
2.87	1.032	8.87	3.096	14.87	3.096	20.87	1.548
2.90	1.032	8.90	3.096	14.90	3.096	20.90	1.548
2.93	1.032	8.93	3.096	14.93	3.096	20.93	1.548
2.97	1.032	8.97	3.096	14.97	3.096	20.97	1.548
3.00	1.032	9.00	3.096	15.00	3.096	21.00	1.548
3.03	1.032	9.03	3.096	15.03	2.580	21.03	1.032
3.07	1.032	9.07	3.096	15.07	2.580	21.07	1.032
3.10	1.032	9.10	3.096	15.10	2.580	21.10	1.032
3.13	1.032	9.13	3.096	15.13	2.580	21.13	1.032
3.17	1.032	9.17	3.096	15.17	2.580	21.17	1.032
3.20	1.032	9.20	3.096	15.20	2.580	21.20	1.032
3.23	1.032	9.23	3.096	15.23	2.580	21.23	1.548
3.27	1.032	9.27	3.096	15.27	2.580	21.27	1.548
3.30	1.032	9.30	3.096	15.30	2.580	21.30	1.548
3.33	1.032	9.33	3.096	15.33	2.580	21.33	1.548
3.37	1.032	9.37	3.096	15.37	2.580	21.37	1.548
3.40	1.032	9.40	3.096	15.40	2.580	21.40	1.548
3.43	1.032	9.43	3.096	15.43	2.580	21.43	1.032
3.47	1.032	9.47	3.096	15.47	2.580	21.47	1.032
3.50	1.032	9.50	3.096	15.50	2.580	21.50	1.032
3.53	1.032	9.53	3.096	15.53	2.580	21.53	1.032
3.57	1.032	9.57	3.096	15.57	2.580	21.57	1.032
3.60	1.032	9.60	3.096	15.60	2.580	21.60	1.032
3.63	1.032	9.63	3.096	15.63	2.580	21.63	1.548
3.67	1.032	9.67	3.096	15.67	2.580	21.67	1.548
3.70	1.032	9.70	3.096	15.70	2.580	21.70	1.548
3.73	1.032	9.73	3.096	15.73	2.580	21.73	1.548
3.77	1.032	9.77	3.096	15.77	2.580	21.77	1.548
3.80	1.032	9.80	3.096	15.80	2.580	21.80	1.548
3.83	1.032	9.83	3.096	15.83	2.580	21.83	1.032
3.87	1.032	9.87	3.096	15.87	2.580	21.87	1.032
3.90	1.032	9.90	3.096	15.90	2.580	21.90	1.032
3.93	1.032	9.93	3.096	15.93	2.580	21.93	1.032
3.97	1.032	9.97	3.096	15.97	2.580	21.97	1.032
4.00	1.032	10.00	3.096	16.00	2.580	22.00	1.032
4.03	2.064	10.03	5.676	16.03	2.580	22.03	1.032
4.07	2.064	10.07	5.676	16.07	2.580	22.07	1.032
4.10	2.064	10.10	5.676	16.10	2.580	22.10	1.032
4.13	2.064	10.13	5.676	16.13	2.580	22.13	1.032
4.17	2.064	10.17	5.676	16.17	2.580	22.17	1.032
4.20	2.064	10.20	5.676	16.20	2.580	22.20	1.032
4.23	2.064	10.23	5.676	16.23	2.580	22.23	1.548
4.27	2.064	10.27	5.676	16.27	2.580	22.27	1.548
4.30	2.064	10.30	5.676	16.30	2.580	22.30	1.548
4.33	2.064	10.33	5.676	16.33	2.580	22.33	1.548
4.37	2.064	10.37	5.676	16.37	2.580	22.37	1.548
4.40	2.064	10.40	5.676	16.40	2.580	22.40	1.548
4.43	2.064	10.43	5.676	16.43	2.580	22.43	1.032
4.47	2.064	10.47	5.676	16.47	2.580	22.47	1.032
4.50	2.064	10.50	5.676	16.50	2.580	22.50	1.032
4.53	2.064	10.53	5.676	16.53	2.580	22.53	1.032
4.57	2.064	10.57	5.676	16.57	2.580	22.57	1.032
4.60	2.064	10.60	5.676	16.60	2.580	22.60	1.032
4.63	2.064	10.63	5.676	16.63	2.580	22.63	1.548
4.67	2.064	10.67	5.676	16.67	2.580	22.67	1.548
4.70	2.064	10.70	5.676	16.70	2.580	22.70	1.548
4.73	2.064	10.73	5.676	16.73	2.580	22.73	1.548
4.77	2.064	10.77	5.676	16.77	2.580	22.77	1.548
4.80	2.064	10.80	5.676	16.80	2.580	22.80	1.548

4.83	2.064	10.83	5.676	16.83	1.548	22.83	1.032
4.87	2.064	10.87	5.676	16.87	1.548	22.87	1.032
4.90	2.064	10.90	5.676	16.90	1.548	22.90	1.032
4.93	2.064	10.93	5.676	16.93	1.548	22.93	1.032
4.97	2.064	10.97	5.676	16.97	1.548	22.97	1.032
5.00	2.064	11.00	5.676	17.00	1.548	23.00	1.032
5.03	2.064	11.03	7.740	17.03	1.548	23.03	1.032
5.07	2.064	11.07	7.740	17.07	1.548	23.07	1.032
5.10	2.064	11.10	7.740	17.10	1.548	23.10	1.032
5.13	2.064	11.13	7.740	17.13	1.548	23.13	1.032
5.17	2.064	11.17	7.740	17.17	1.548	23.17	1.032
5.20	2.064	11.20	7.740	17.20	1.548	23.20	1.032
5.23	2.064	11.23	11.352	17.23	2.064	23.23	1.032
5.27	2.064	11.27	11.352	17.27	2.064	23.27	1.032
5.30	2.064	11.30	11.352	17.30	2.064	23.30	1.032
5.33	2.064	11.33	11.352	17.33	2.064	23.33	1.032
5.37	2.064	11.37	11.352	17.37	2.064	23.37	1.032
5.40	2.064	11.40	11.352	17.40	2.064	23.40	1.032
5.43	2.064	11.43	27.348	17.43	1.548	23.43	1.548
5.47	2.064	11.47	27.348	17.47	1.548	23.47	1.548
5.50	2.064	11.50	27.348	17.50	1.548	23.50	1.548
5.53	2.064	11.53	27.348	17.53	1.548	23.53	1.548
5.57	2.064	11.57	27.348	17.57	1.548	23.57	1.548
5.60	2.064	11.60	27.348	17.60	1.548	23.60	1.548
5.63	2.064	11.63	56.760	17.63	2.064	23.63	1.032
5.67	2.064	11.67	56.760	17.67	2.064	23.67	1.032
5.70	2.064	11.70	56.760	17.70	2.064	23.70	1.032
5.73	2.064	11.73	56.760	17.73	2.064	23.73	1.032
5.77	2.064	11.77	56.760	17.77	2.064	23.77	1.032
5.80	2.064	11.80	56.760	17.80	2.064	23.80	1.032
5.83	2.064	11.83	116.100	17.83	1.548	23.83	1.032
5.87	2.064	11.87	116.100	17.87	1.548	23.87	1.032
5.90	2.064	11.90	116.100	17.90	1.548	23.90	1.032
5.93	2.064	11.93	116.100	17.93	1.548	23.93	1.032
5.97	2.064	11.97	116.100	17.97	1.548	23.97	1.032
6.00	2.064	12.00	116.100	18.00	1.548	24.00	1.032

02:0003---

****

EXTERNAL AREAS based on Row Crops and a Tp of 1.37

DESIGN NASHYD	Area (ha)=	63.30	Curve Number (CN)=72.00
01:200 DT= 2.00	Ia (mm)=	1.500	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	1.370	

Unit Hyd Qpeak (cms)= 1.765

PEAK FLOW (cms)= 2.056 (i)
TIME TO PEAK (hrs)= 13.367
RUNOFF VOLUME (mm)= 51.591
TOTAL RAINFALL (mm)= 103.200
RUNOFF COEFFICIENT = .500

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

02:0004---

```
*
--------------------
| PRINT HYD        |   AREA       (ha)=   63.300
| ID=01 (200   )   |   QPEAK     (cms)=    2.056 (i)
| DT= 2.00 PCYC=-1 |   TPEAK     (hrs)=   13.367
--------------------   VOLUME      (mm)=   51.591

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
------------------------------------------------------------------------------
--
002:0005----------------------------------------------------------------------
--
*
******************
* EXTERNAL AREAS  based on Pasture and a Tp of 1.73
*
----------------------
| DESIGN NASHYD      |   Area    (ha)=   63.30   Curve Number    (CN)=72.00
| 01:200    DT= 2.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.730

     Unit Hyd Qpeak  (cms)=    1.398

     PEAK FLOW       (cms)=    1.719 (i)
     TIME TO PEAK    (hrs)=   13.800
     RUNOFF VOLUME    (mm)=   51.591
     TOTAL RAINFALL   (mm)=  103.200
     RUNOFF COEFFICIENT   =     .500

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

------------------------------------------------------------------------------
--
002:0006----------------------------------------------------------------------
--
*
--------------------
| PRINT HYD        |   AREA       (ha)=   63.300
| ID=01 (200   )   |   QPEAK     (cms)=    1.719 (i)
| DT= 2.00 PCYC=-1 |   TPEAK     (hrs)=   13.800
--------------------   VOLUME      (mm)=   51.591

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
------------------------------------------------------------------------------
--
002:0007----------------------------------------------------------------------
--
*
      FINISH
------------------------------------------------------------------------------
--
********************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
  Simulation ended on 2014-06-10     at 15:29:25
================================================================================
==
```