



IBI GROUP
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PRELIMINARY STORMWATER MANAGEMENT DESIGN BRIEF
653 Erb Street West, 12 Westhill Drive, City of Waterloo
October 23, 2017
Prepared For: Bel Communities Limited Partnership
IBI Group Project 102225

1. INTRODUCTION

IBI Group was retained to prepare a Preliminary Stormwater Management Design Brief in support of a Planning Application for residential development located at 653 Erb Street West and 12 Westhill Drive in the City of Waterloo. The current application includes an Official Plan Amendment and a Zoning By-Law Amendment to support the construction two 13-storey apartment buildings and three stacked townhouse blocks on the site.

This Preliminary Design Brief outlines the stormwater management requirements to accommodate the construction of a residential development. The 1.80 ha site will include on-site controls for stormwater quantity control as per City of Waterloo and Region of Waterloo requirements.

2. EXISTING CONDITIONS

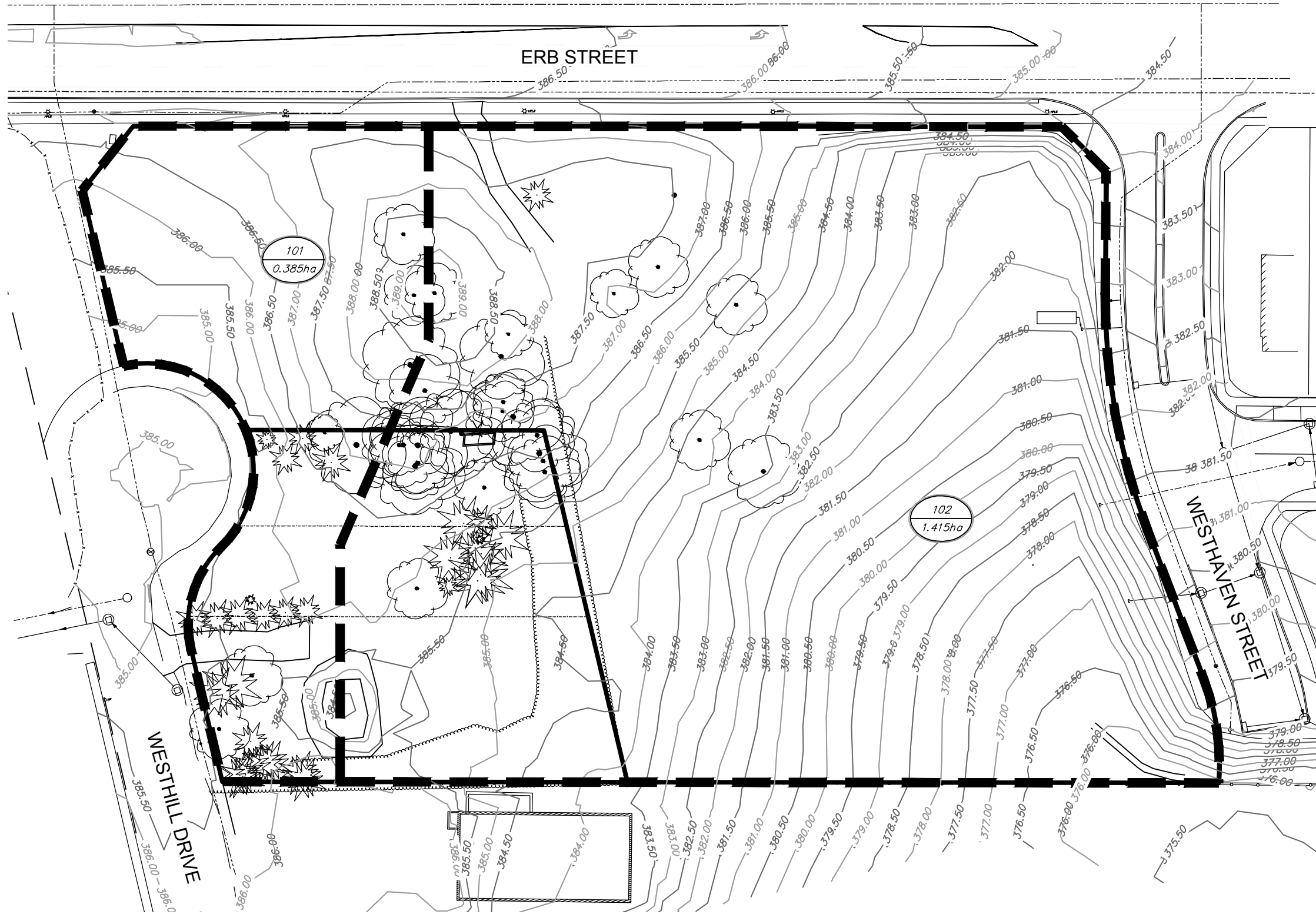
Drainage areas under existing conditions are shown on Figure 1. Runoff from Area 101 sheet drains overland toward Erbsville Street West and Westhill Drive to the north and west. Runoff from Area 102 sheet drains overland toward Westhaven Street to the east. The site is currently vacant, and contains vegetated areas and impervious concrete areas.

Based on the Revised Geotechnical Investigation Report (Proposed Residential Development, 635 Erb Street West and 12 Westhill Drive, Waterloo, Ontario, EnGlobe, June 15, 2017), site soils consist of fill overlying native deposits of sandy, silt till, and glacial till. Groundwater elevations range from 2.0m to 4.9m below existing grade. Based on these soil types, a CN value of 66 was used for the stormwater modelling of pervious areas.



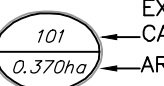
3. PROPOSED CONDITIONS

Under proposed conditions, two 13-storey apartment buildings and three stacked townhouse blocks will be constructed on the site. The site will also include parking areas and landscaped areas. A proposed on-site storm sewer will convey flows to the existing storm sewer on Westhaven Street, which will then route runoff to an the existing Gies-Westvale Subdivision stormwater management pond to the southeast of the property.

The proposed conditions drainage areas are shown on Figure 2. Stormwater attenuation will be provided on-site to control proposed conditions peak flows to the required levels. On-site infiltration of rooftop runoff will be explored at the detailed design stage.



LEGEND

-  EXISTING CATCHMENT BOUNDARIES
-  DRAINAGE ARROWS
-  EX. CATCHMENT SYMBOL
CATCHMENT AREA NUMBER
AREA (ha)

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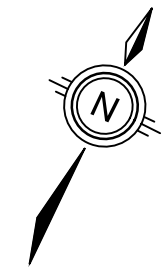
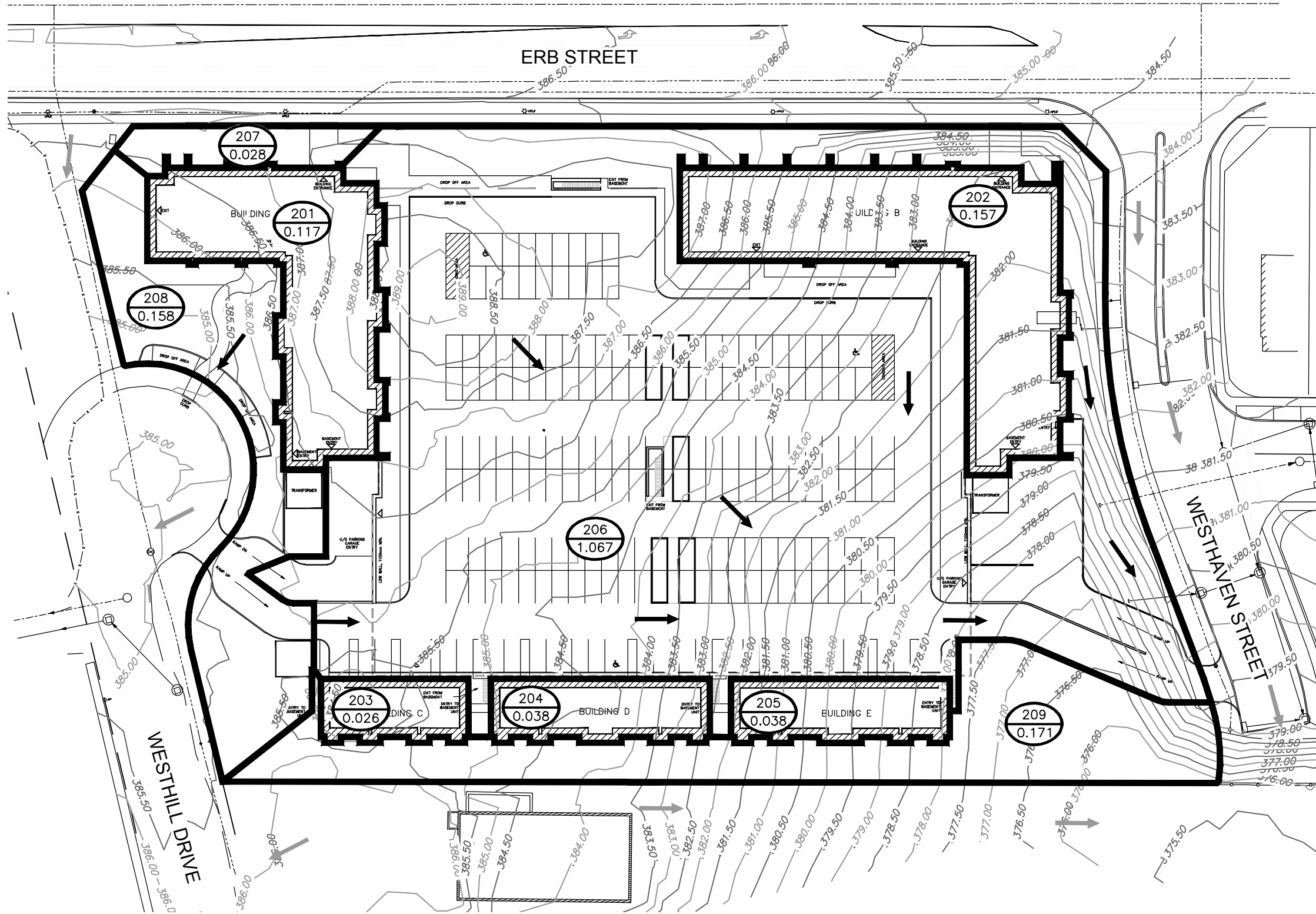
SCALE 1:750
 DATE OCT.12/2017
 PROJECT No. 102225

CITY OF WATERLOO
 REGIONAL MUNICIPALITY
 OF WATERLOO

635 ERB STREET
 WATERLOO, ON

PRE-DEVELOPMENT
 STORM AREA PLAN

FIGURE 1



LEGEND

- PROPOSED CATCHMENT BOUNDARIES
- EX DRAINAGE ARROWS
- PROP. DRAINAGE ARROWS
- PROP. CATCHMENT SYMBOL
 ← CATCHMENT AREA NUMBER
 ← AREA (ha)

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CITY OF WATERLOO
 REGIONAL MUNICIPALITY
 OF WATERLOO

635 ERB STREET
 WATERLOO, ON

POST-DEVELOPMENT
 STORM AREA PLAN

FIGURE 2

Preliminary Stormwater Management Design Brief– October 23, 2017
 653 Erb Street West, 12 Westhill Drive, City of Waterloo
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4. STORMWATER MANAGEMENT

The stormwater management criteria for this development are based on City of Waterloo and Region of Waterloo requirements as follows:

- Stormwater management for quantity control is provided for the property in the Gies-Westvale Subdivision stormwater management pond located to the southeast of the proposed development. The pond design has accounted for a drainage area of 1.26ha with a runoff coefficient value of 0.70 from the subject lands;
- The remainder of the site draining toward Erb Street West and Westhill Drive will require that proposed conditions peak flows be controlled to existing conditions levels for the 2 year, 5 year, and 100 year storm events;
- Stormwater management for quality control is required for parking lot areas to a Normal Protection Level as per MOECC standards, which is provided in the downstream Gies-Westvale Subdivision stormwater management pond;
- The stormwater management design must consider infiltration of rooftop runoff if soil and groundwater conditions permit.

The existing and proposed conditions have been modelled using MIDUSS utilizing City of Waterloo IDF curves, and modelling variables are summarized in Table 1.

Table 1: MIDUSS Modelling Variables

CATCHMENT ID	DESCRIPTION	AREA (HA)	LENGTH (M)	GRADIENT (%)	IMPERV. (%)	MANNING 'N'	PERVIOUS CN
EXISTING CONDITIONS							
101	Draining West	0.385	20	8	10	0.250	66
102	Draining East *	1.260	50	10	70	0.250	66
Total		1.645			56		
PROPOSED CONDITIONS							
201	Roof	0.117	15	1	100	0.013	98
202	Roof	0.157	15	1	100	0.013	98
203	Roof	0.026	10	1	100	0.013	98
204	Roof	0.038	10	1	100	0.013	98
205	Roof	0.038	10	1	100	0.013	98
206	Parking/Landscaping	1.067	20	2	79	0.250	66
207	Landscaping	0.028	10	5	15	0.250	66
208	Landscaping	0.158	10	5	28	0.250	66
209	Landscaping	0.171	10	5	15	0.250	66
Total		1.800			72		

* Area to East = 1.415ha, allowable Area to East = 1.26ha, with C = 0.70 (equivalent to 70% imperviousness)

As shown in Table 1, the impervious area under proposed conditions will increase from existing (allowable) conditions. Accordingly, on-site stormwater quantity control will be required in addition to that provided in the Gies-Westvale Subdivision stormwater management pond.

Preliminary Stormwater Management Design Brief– October 23, 2017
 653 Erb Street West, 12 Westhill Drive, City of Waterloo
 IBI Group Project: 102225

On-site attenuation will be provided on rooftop areas, using flow control drains for attenuation. The preliminary rooftop stage-storage-discharge calculations are attached. Approximately 70 m³ of surface and/or underground storage will be required in the parking lot to control proposed conditions peak flows to existing levels for flows discharging toward the Gies-Westvale Subdivision stormwater management pond.

The exact locations and configurations of stormwater storage areas will be provided at the detailed design stage. A single storm sewer connection for the site will be provided to the existing storm sewer on Westhaven Street.

Existing and proposed conditions peak flows are shown in Table 2. Additional peak flow attenuation measures for flows toward the west will be explored at the detailed design stage. The preliminary MIDUSS modelling is attached.

Table 2: Peak Flows

RETURN EVENT	EXISTING (ALLOWABLE) CONDITIONS	PROPOSED CONDITIONS
	PEAK FLOW (M ³ /S)	PEAK FLOW (M ³ /S)
Draining East		
2 Year	0.193	0.185
5 Year	0.272	0.243
100 Year	0.520	0.478
Draining West		
2 Year	0.009	0.011
5 Year	0.013	0.015
100 Year	0.065	0.037

The location(s) of infiltration facilities for rooftop runoff will be confirmed at the detailed design stage. Based on the Geotechnical Investigation, native soils include areas of sand which may support active infiltration of roof runoff. Any proposed infiltration facilities will be located a minimum 5.0m away from buildings.

Preliminary Stormwater Management Design Brief– October 23, 2017
653 Erb Street West, 12 Westhill Drive, City of Waterloo
IBI Group Project: 102225

5. CLOSURE

We trust the foregoing is satisfactory and will allow review and approval the Preliminary Stormwater Management Design Brief and preliminary engineering drawings for this development.

All of which is respectfully submitted.

IBI GROUP

A handwritten signature in blue ink, appearing to read 'AKroess', is positioned above the name of the signatory.

Andy Kroess, M.Eng., P.Eng.

**102225 - 653 Erb Street West, 12 Westhill Drive, City of Waterloo
Area 201 Roof Stage-Storage-Discharge Relationship**

Total Rooftop Area = 1170 (m²)
 Number of Roof Drains = 8
 Roof Cell Area = 146.3 (m²)
 The Length of a Cell Side* = 12.09 (m)
 Maximum Ponding Depth = 0.152 (m)
 Total Number of Notches per Drain = 1

Depth	Depth	Base Area	Cell Volume	Total Volume	Notch Discharge**	Total Discharge
(inch)	(m)	(m ²)	(m ³)	(m ³)	(m ³ /s)	(m ³ /s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	4.06	0.03	0.28	0.00038	0.00304
2	0.051	16.25	0.28	2.20	0.00076	0.00608
3	0.076	36.56	0.93	7.43	0.00114	0.00912
4	0.102	65.00	2.20	17.61	0.00152	0.01216
5	0.127	101.56	4.30	34.40	0.00190	0.01520
6	0.152	146.25	7.43	59.44	0.00228	0.01824

* - assumed that the cell is square

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

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

**102225 - 653 Erb Street West, 12 Westhill Drive, City of Waterloo
Area 202 Roof Stage-Storage-Discharge Relationship**

Total Rooftop Area = 1570 (m²)
 Number of Roof Drains = 8
 Roof Cell Area = 196.3 (m²)
 The Length of a Cell Side* = 14.01 (m)
 Maximum Ponding Depth = 0.152 (m)
 Total Number of Notches per Drain = 1

Depth	Depth	Base Area	Cell Volume	Total Volume	Notch Discharge**	Total Discharge
(inch)	(m)	(m ²)	(m ³)	(m ³)	(m ³ /s)	(m ³ /s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	5.45	0.05	0.37	0.00038	0.00304
2	0.051	21.81	0.37	2.95	0.00076	0.00608
3	0.076	49.06	1.25	9.97	0.00114	0.00912
4	0.102	87.22	2.95	23.63	0.00152	0.01216
5	0.127	136.28	5.77	46.16	0.00190	0.01520
6	0.152	196.25	9.97	79.76	0.00228	0.01824

* - assumed that the cell is square

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

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

**102225 - 653 Erb Street West, 12 Westhill Drive, City of Waterloo
Area 203 Roof Stage-Storage-Discharge Relationship**

Total Rooftop Area = 260 (m²)
 Number of Roof Drains = 2
 Roof Cell Area = 130.0 (m²)
 The Length of a Cell Side* = 11.40 (m)
 Maximum Ponding Depth = 0.152 (m)
 Total Number of Notches per Drain = 1

Depth	Depth	Base Area	Cell Volume	Total Volume	Notch Discharge**	Total Discharge
(inch)	(m)	(m ²)	(m ³)	(m ³)	(m ³ /s)	(m ³ /s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	3.61	0.03	0.06	0.00038	0.00076
2	0.051	14.44	0.24	0.49	0.00076	0.00152
3	0.076	32.50	0.83	1.65	0.00114	0.00228
4	0.102	57.78	1.96	3.91	0.00152	0.00304
5	0.127	90.28	3.82	7.64	0.00190	0.00380
6	0.152	130.00	6.60	13.21	0.00228	0.00456

* - assumed that the cell is square

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

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

**102225 - 653 Erb Street West, 12 Westhill Drive, City of Waterloo
Area 204 Roof Stage-Storage-Discharge Relationship**

Total Rooftop Area = 380 (m²)
 Number of Roof Drains = 2
 Roof Cell Area = 190.0 (m²)
 The Length of a Cell Side* = 13.78 (m)
 Maximum Ponding Depth = 0.152 (m)
 Total Number of Notches per Drain = 1

Depth	Depth	Base Area	Cell Volume	Total Volume	Notch Discharge**	Total Discharge
(inch)	(m)	(m ²)	(m ³)	(m ³)	(m ³ /s)	(m ³ /s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	5.28	0.04	0.09	0.00038	0.00076
2	0.051	21.11	0.36	0.71	0.00076	0.00152
3	0.076	47.50	1.21	2.41	0.00114	0.00228
4	0.102	84.44	2.86	5.72	0.00152	0.00304
5	0.127	131.94	5.59	11.17	0.00190	0.00380
6	0.152	190.00	9.65	19.30	0.00228	0.00456

* - assumed that the cell is square

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

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

**102225 - 653 Erb Street West, 12 Westhill Drive, City of Waterloo
Area 205 Roof Stage-Storage-Discharge Relationship**

Total Rooftop Area = 380 (m²)
 Number of Roof Drains = 2
 Roof Cell Area = 190.0 (m²)
 The Length of a Cell Side* = 13.78 (m)
 Maximum Ponding Depth = 0.152 (m)
 Total Number of Notches per Drain = 1

Depth	Depth	Base Area	Cell Volume	Total Volume	Notch Discharge**	Total Discharge
(inch)	(m)	(m ²)	(m ³)	(m ³)	(m ³ /s)	(m ³ /s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	5.28	0.04	0.09	0.00038	0.00076
2	0.051	21.11	0.36	0.71	0.00076	0.00152
3	0.076	47.50	1.21	2.41	0.00114	0.00228
4	0.102	84.44	2.86	5.72	0.00152	0.00304
5	0.127	131.94	5.59	11.17	0.00190	0.00380
6	0.152	190.00	9.65	19.30	0.00228	0.00456

* - assumed that the cell is square

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

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

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35 COMMENT
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* 102225 - RESIDENTIAL DEVELOPMENT *
* 635 ERB ST W & 12 WESTHILL DR, CITY OF WATERLOO *
* IBI GROUP *
* OCTOBER 2017 - PRELIMINARY *
*****
35 COMMENT
4 line(s) of comment
*****
* 2 YEAR CHICAGO STORM *
* CITY OF WATERLOO IDF PARAMETERS *
*****
2 STORM
1 1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
1101.000 Coefficient a
9.258 Constant b (min)
.882 Exponent c
.400 Fraction to peak r
180.000 Duration ó 180 min
32.400 mm Total depth
3 IMPERVIOUS
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.100 Ia/S Coefficient
.518 Initial Abstraction
35 COMMENT
3 line(s) of comment
*****
* EXISTING CONDITIONS *
*****
35 COMMENT
3 line(s) of comment
*****
* AREA 102 - ALLOWABLE AREA *
*****
4 CATCHMENT
102.000 ID No.ó 99999
1.260 Area in hectares
50.000 Length (PERV) metres
10.000 Gradient (%)
70.000 Per cent Impervious
50.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.193 .000 .000 .000 c.m/s
.077 .835 .608 C perv/imperv/total
35 COMMENT
3 line(s) of comment
*****
* TOTAL FLOW EAST TO SWM POND *
*****
15 ADD RUNOFF
.193 .193 .000 .000 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 101 *
*****
4 CATCHMENT
101.000 ID No.ó 99999

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.385 Area in hectares
20.000 Length (PERV) metres
8.000 Gradient (%)
10.000 Per cent Impervious
20.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.009 .000 .000 .000 c.m/s
.077 .822 .151 C perv/imperv/total
35 COMMENT
3 line(s) of comment
*****
* TOTAL FLOW TO WEST *
*****
15 ADD RUNOFF
.009 .009 .000 .000 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* PROPOSED CONDITIONS *
*****
35 COMMENT
3 line(s) of comment
*****
* AREA 201 *
*****
4 CATCHMENT
201.000 ID No.ó 99999
.117 Area in hectares
15.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
15.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/S Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.026 .000 .000 .000 c.m/s
.835 .835 .835 C perv/imperv/total
15 ADD RUNOFF
.026 .026 .000 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00304 .3
.051 .00608 2.2
.076 .00912 7.4
.102 .0122 17.6
.127 .0152 34.4
.152 .0182 59.4
Peak Outflow = .010 c.m/s
Maximum Depth = .083 metres
Maximum Storage = 10. c.m
.026 .026 .010 .000 c.m/s
17 COMBINE
500 Junction Node No.
.026 .026 .010 .010 c.m/s
14 START
1 1=Zero; 2=Define

```

```

35 COMMENT
3   line(s) of comment
*****
* AREA 202 *
*****
4 CATCHMENT
202.000 ID No.ó 99999
.157 Area in hectares
15.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
15.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/s Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.034 .000 .010 .010 c.m/s
.835 .835 .835 C perv/imperv/total
15 ADD RUNOFF
.034 .034 .010 .010 c.m/s
35 COMMENT
3   line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00304 .4
.051 .00608 2.9
.076 .00912 9.9
.102 .0122 23.6
.127 .0152 46.1
.152 .0182 79.7
Peak Outflow = .011 c.m/s
Maximum Depth = .088 metres
Maximum Storage = 16. c.m
.034 .034 .011 .010 c.m/s
17 COMBINE
500 Junction Node No.
.034 .034 .011 .021 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3   line(s) of comment
*****
* AREA 203 *
*****
4 CATCHMENT
203.000 ID No.ó 99999
.026 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/s Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.006 .000 .011 .021 c.m/s
.831 .831 .831 C perv/imperv/total
15 ADD RUNOFF
.006 .006 .011 .021 c.m/s
35 COMMENT
3   line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****

```

```

10  POND
    7 Depth - Discharge - Volume sets
      .000      .000      .0
      .025      .000760    .1
      .051      .00152     .5
      .076      .00228     1.6
      .102      .00304     3.9
      .127      .00380     7.6
      .152      .00456    13.2
    Peak Outflow =      .002 c.m/s
    Maximum Depth =     .081 metres
    Maximum Storage =    2. c.m
      .006      .006      .002      .021 c.m/s
17  COMBINE
    500 Junction Node No.
      .006      .006      .002      .023 c.m/s
14  START
    1      1=Zero; 2=Define
35  COMMENT
    3      line(s) of comment
    *****
    * AREA 204 *
    *****
4   CATCHMENT
    204.000 ID No.ó 99999
      .038 Area in hectares
    10.000 Length (PERV) metres
      1.000 Gradient (%)
    100.000 Per cent Impervious
    10.000 Length (IMPERV)
      .000 %Imp. with Zero Dpth
      1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .013 Manning "n"
    98.000 SCS Curve No or C
      .000 Ia/s Coefficient
      .518 Initial Abstraction
      1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .009      .000      .002      .023 c.m/s
      .831      .831      .831      C perv/imperv/total
15  ADD RUNOFF
      .009      .009      .002      .023 c.m/s
35  COMMENT
    3      line(s) of comment
    *****
    * BUILDING ROOFTOP STORAGE *
    *****
10  POND
    7 Depth - Discharge - Volume sets
      .000      .000      .0
      .025      .000760    .1
      .051      .00152     .7
      .076      .00228     2.4
      .102      .00304     5.7
      .127      .00380    11.1
      .152      .00456    19.3
    Peak Outflow =     .003 c.m/s
    Maximum Depth =     .087 metres
    Maximum Storage =    4. c.m
      .009      .009      .003      .023 c.m/s
17  COMBINE
    500 Junction Node No.
      .009      .009      .003      .026 c.m/s
14  START
    1      1=Zero; 2=Define
35  COMMENT
    3      line(s) of comment
    *****
    * AREA 205 *
    *****
4   CATCHMENT
    205.000 ID No.ó 99999
      .038 Area in hectares
    10.000 Length (PERV) metres
      1.000 Gradient (%)

```

```

100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/S Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.009 .000 .003 .026 c.m/s
.831 .831 .831 C perv/imperv/total
15 ADD RUNOFF
.009 .009 .003 .026 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .000760 .1
.051 .00152 .7
.076 .00228 2.4
.102 .00304 5.7
.127 .00380 11.1
.152 .00456 19.3
Peak Outflow = .003 c.m/s
Maximum Depth = .087 metres
Maximum Storage = 4. c.m
.009 .009 .003 .026 c.m/s
17 COMBINE
500 Junction Node No.
.009 .009 .003 .029 c.m/s
18 CONFLUENCE
500 Junction Node No.
.009 .029 .003 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****
* AREA 206 *
*****
4 CATCHMENT
206.000 ID No.ó 99999
1.067 Area in hectares
20.000 Length (PERV) metres
2.000 Gradient (%)
79.000 Per cent Impervious
20.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.186 .029 .003 .000 c.m/s
.077 .835 .675 C perv/imperv/total
15 ADD RUNOFF
.186 .207 .003 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****
* SURFACE STORAGE *
*****
10 POND
4 Depth - Discharge - Volume sets
.000 .000 .0
.100 .180 20.0
.200 .250 40.0
.300 .500 80.0
Peak Outflow = .181 c.m/s
Maximum Depth = .101 metres
Maximum Storage = 20. c.m

```



```

102225.OUT
.186 .207 .181 .000 c.m/s
17 COMBINE
600 Junction Node No.
.186 .207 .181 .181 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 209 *
*****
4 CATCHMENT
209.000 ID No.ó 99999
.171 Area in hectares
10.000 Length (PERV) metres
5.000 Gradient (%)
15.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.006 .000 .181 .181 c.m/s
.077 .803 .185 C perv/imperv/total
15 ADD RUNOFF
.006 .006 .181 .181 c.m/s
9 ROUTE
.000 Conduit Length
.000 No Conduit defined
.000 Zero lag
.000 Beta weighting factor
.000 Routing timestep
0 No. of sub-reaches
.006 .006 .006 .181 c.m/s
17 COMBINE
600 Junction Node No.
.006 .006 .006 .185 c.m/s
35 COMMENT
3 line(s) of comment
*****
* TOTAL FLOW EAST TO SWM POND *
*****
18 CONFLUENCE
600 Junction Node No.
.006 .185 .006 .000 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 207 *
*****
4 CATCHMENT
207.000 ID No.ó 99999
.028 Area in hectares
10.000 Length (PERV) metres
5.000 Gradient (%)
15.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.001 .000 .006 .000 c.m/s
.077 .803 .185 C perv/imperv/total
15 ADD RUNOFF
.001 .001 .006 .000 c.m/s
9 ROUTE

```

```

.000    Conduit Length
.000    No Conduit defined
.000    Zero lag
.000    Beta weighting factor
.000    Routing timestep
0       No. of sub-reaches
17      COMBINE
700     Junction Node No.
        .001    .001    .001    .000 c.m/s
14      START
1       1=Zero; 2=Define
35      COMMENT
3       line(s) of comment
        *****
        * AREA 208 *
        *****
4       CATCHMENT
208.000 ID No. 99999
.158    Area in hectares
10.000  Length (PERV) metres
5.000   Gradient (%)
28.000  Per cent Impervious
10.000  Length (IMPERV)
.000    %Imp. with Zero Dpth
1       Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250    Manning "n"
66.000  SCS Curve No or C
.100    Ia/S Coefficient
13.085  Initial Abstraction
1       Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
        .010    .000    .001    .001 c.m/s
        .077    .803    .280    C perv/imperv/total
15      ADD RUNOFF
9       ROUTE
        .010    .010    .001    .001 c.m/s
        .000    Conduit Length
        .000    No Conduit defined
        .000    Zero lag
        .000    Beta weighting factor
        .000    Routing timestep
        0       No. of sub-reaches
17      COMBINE
700     Junction Node No.
        .010    .010    .010    .011 c.m/s
35      COMMENT
3       line(s) of comment
        *****
        * TOTAL FLOW TO WEST *
        *****
18      CONFLUENCE
700     Junction Node No.
        .010    .011    .010    .000 c.m/s
14      START
1       1=Zero; 2=Define
35      COMMENT
4       line(s) of comment
        *****
        * 5 YEAR CHICAGO STORM *
        * CITY OF WATERLOO IDF PARAMETERS *
        *****
2       STORM
1       1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
1755.000 Coefficient a
12.347  Constant b (min)
.895    Exponent c
.400    Fraction to peak r
180.000 Duration 180 min
        47.549 mm Total depth
3       IMPERVIOUS
1       Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013    Manning "n"
98.000  SCS Curve No or C

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.100    Ia/S Coefficient
.518    Initial Abstraction
35 COMMENT
3      line(s) of comment
*****
* EXISTING CONDITIONS *
*****
35 COMMENT
3      line(s) of comment
*****
* AREA 102 - ALLOWABLE AREA *
*****
4 CATCHMENT
102.000 ID No.ó 99999
1.260   Area in hectares
50.000  Length (PERV) metres
10.000  Gradient (%)
70.000  Per cent Impervious
50.000  Length (IMPERV)
.000    %Imp. with Zero Dpth
1       Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250    Manning "n"
66.000  SCS Curve No or C
.100    Ia/S Coefficient
13.085  Initial Abstraction
1       Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.272    .000    .010    .000 c.m/s
.151    .878    .660    C perv/imperv/total
35 COMMENT
3      line(s) of comment
*****
* TOTAL FLOW EAST TO SWM POND *
*****
15 ADD RUNOFF
.272    .272    .010    .000 c.m/s
14 START
1       1=Zero; 2=Define
35 COMMENT
3      line(s) of comment
*****
* AREA 101 *
*****
4 CATCHMENT
101.000 ID No.ó 99999
.385    Area in hectares
20.000  Length (PERV) metres
8.000   Gradient (%)
10.000  Per cent Impervious
20.000  Length (IMPERV)
.000    %Imp. with Zero Dpth
1       Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250    Manning "n"
66.000  SCS Curve No or C
.100    Ia/S Coefficient
13.085  Initial Abstraction
1       Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.013    .000    .010    .000 c.m/s
.151    .858    .221    C perv/imperv/total
35 COMMENT
3      line(s) of comment
*****
* TOTAL FLOW TO WEST *
*****
15 ADD RUNOFF
.013    .013    .010    .000 c.m/s
14 START
1       1=Zero; 2=Define
35 COMMENT
3      line(s) of comment
*****
* PROPOSED CONDITIONS *
*****
35 COMMENT
3      line(s) of comment

```

```

*****
* AREA 201 *
*****
4  CATCHMENT
201.000 ID No.ó 99999
.117 Area in hectares
15.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
15.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/s Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.036 .000 .010 .000 c.m/s
.877 .877 .877 C perv/imperv/total
15 ADD RUNOFF
.036 .036 .010 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00304 .3
.051 .00608 2.2
.076 .00912 7.4
.102 .0122 17.6
.127 .0152 34.4
.152 .0182 59.4
Peak Outflow = .012 c.m/s
Maximum Depth = .102 metres
Maximum Storage = 17. c.m
.036 .036 .012 .000 c.m/s
17 COMBINE
500 Junction Node No.
.036 .036 .012 .012 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 202 *
*****
4 CATCHMENT
202.000 ID No.ó 99999
.157 Area in hectares
15.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
15.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/s Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.048 .000 .012 .012 c.m/s
.877 .877 .877 C perv/imperv/total
15 ADD RUNOFF
.048 .048 .012 .012 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets

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```

102225.OUT
.000 .000 .0
.025 .00304 .4
.051 .00608 2.9
.076 .00912 9.9
.102 .0122 23.6
.127 .0152 46.1
.152 .0182 79.7
Peak Outflow = .013 c.m/s
Maximum Depth = .107 metres
Maximum Storage = 28. c.m
.048 .048 .013 .012 c.m/s
17 COMBINE
500 Junction Node No.
.048 .048 .013 .025 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 203 *
*****
4 CATCHMENT
203.000 ID No.ó 99999
.026 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/s Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.008 .000 .013 .025 c.m/s
.870 .870 .870 C perv/imperv/total
15 ADD RUNOFF
.008 .008 .013 .025 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .000760 .1
.051 .00152 .5
.076 .00228 1.6
.102 .00304 3.9
.127 .00380 7.6
.152 .00456 13.2
Peak Outflow = .003 c.m/s
Maximum Depth = .098 metres
Maximum Storage = 4. c.m
.008 .008 .003 .025 c.m/s
17 COMBINE
500 Junction Node No.
.008 .008 .003 .028 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 204 *
*****
4 CATCHMENT
204.000 ID No.ó 99999
.038 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)

```

```

                                102225.OUT
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/s Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.012 .000 .003 .028 c.m/s
.870 .870 .870 C perv/imperv/total
15 ADD RUNOFF
.012 .012 .003 .028 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .000760 .1
.051 .00152 .7
.076 .00228 2.4
.102 .00304 5.7
.127 .00380 11.1
.152 .00456 19.3
Peak Outflow = .003 c.m/s
Maximum Depth = .106 metres
Maximum Storage = 7. c.m
.012 .012 .003 .028 c.m/s
17 COMBINE
500 Junction Node No.
.012 .012 .003 .031 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 205 *
*****
4 CATCHMENT
205.000 ID No.ó 99999
.038 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/s Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.012 .000 .003 .031 c.m/s
.870 .870 .870 C perv/imperv/total
15 ADD RUNOFF
.012 .012 .003 .031 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .000760 .1
.051 .00152 .7
.076 .00228 2.4
.102 .00304 5.7
.127 .00380 11.1
.152 .00456 19.3
Peak Outflow = .003 c.m/s
Maximum Depth = .106 metres
Maximum Storage = 7. c.m

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102225.OUT
.012 .012 .003 .031 c.m/s
17 COMBINE
500 Junction Node No.
.012 .012 .003 .034 c.m/s
18 CONFLUENCE
500 Junction Node No.
.012 .034 .003 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****
* AREA 206 *
*****
4 CATCHMENT
206.000 ID No.6 99999
1.067 Area in hectares
20.000 Length (PERV) metres
2.000 Gradient (%)
79.000 Per cent Impervious
20.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/s Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.261 .034 .003 .000 c.m/s
.151 .877 .725 C perv/imperv/total
15 ADD RUNOFF
.261 .286 .003 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****
* SURFACE STORAGE *
*****
10 POND
4 Depth - Discharge - Volume sets
.000 .000 .0
.100 .180 20.0
.200 .250 40.0
.300 .500 80.0
Peak Outflow = .236 c.m/s
Maximum Depth = .180 metres
Maximum Storage = 36. c.m
.261 .286 .236 .000 c.m/s
17 COMBINE
600 Junction Node No.
.261 .286 .236 .236 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 209 *
*****
4 CATCHMENT
209.000 ID No.6 99999
.171 Area in hectares
10.000 Length (PERV) metres
5.000 Gradient (%)
15.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/s Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.009 .000 .236 .236 c.m/s
.150 .836 .253 C perv/imperv/total
15 ADD RUNOFF
.009 .009 .236 .236 c.m/s
9 ROUTE

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```

.000 Conduit Length
.000 No Conduit defined
.000 Zero lag
.000 Beta weighting factor
.000 Routing timestep
0 No. of sub-reaches
.009 .009 .009 .236 c.m/s
17 COMBINE
600 Junction Node No.
.009 .009 .009 .243 c.m/s
35 COMMENT
3 line(s) of comment
*****
* TOTAL FLOW EAST TO SWM POND *
*****
18 CONFLUENCE
600 Junction Node No.
.009 .243 .009 .000 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 207 *
*****
4 CATCHMENT
207.000 ID No.ó 99999
.028 Area in hectares
10.000 Length (PERV) metres
5.000 Gradient (%)
15.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.001 .000 .009 .000 c.m/s
.150 .836 .253 C perv/imperv/total
15 ADD RUNOFF
.001 .001 .009 .000 c.m/s
9 ROUTE
.000 Conduit Length
.000 No Conduit defined
.000 Zero lag
.000 Beta weighting factor
.000 Routing timestep
0 No. of sub-reaches
.001 .001 .001 .000 c.m/s
17 COMBINE
700 Junction Node No.
.001 .001 .001 .001 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 208 *
*****
4 CATCHMENT
208.000 ID No.ó 99999
.158 Area in hectares
10.000 Length (PERV) metres
5.000 Gradient (%)
28.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction

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102225.OUT
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.014 .000 .001 .001 c.m/s
.150 .836 .342 C perv/imperv/total
15 ADD RUNOFF
.014 .014 .001 .001 c.m/s
9 ROUTE
.000 Conduit Length
.000 No Conduit defined
.000 Zero lag
.000 Beta weighting factor
.000 Routing timestep
0 No. of sub-reaches
.014 .014 .014 .001 c.m/s
17 COMBINE
700 Junction Node No.
.014 .014 .014 .015 c.m/s
35 COMMENT
3 line(s) of comment
*****
* TOTAL FLOW TO WEST *
*****
18 CONFLUENCE
700 Junction Node No.
.014 .015 .014 .000 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
4 line(s) of comment
*****
* 100 YEAR CHICAGO STORM *
* CITY OF WATERLOO IDF PARAMETERS *
*****
2 STORM
1 1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
4692.000 Coefficient a
17.437 Constant b (min)
.956 Exponent c
.400 Fraction to peak r
180.000 Duration ó 180 min
89.960 mm Total depth
3 IMPERVIOUS
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.100 Ia/S Coefficient
.518 Initial Abstraction
35 COMMENT
3 line(s) of comment
*****
* EXISTING CONDITIONS *
*****
35 COMMENT
3 line(s) of comment
*****
* AREA 102 - ALLOWABLE AREA *
*****
4 CATCHMENT
102.000 ID No.ó 99999
1.260 Area in hectares
50.000 Length (PERV) metres
10.000 Gradient (%)
70.000 Per cent Impervious
50.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.520 .000 .014 .000 c.m/s
.316 .920 .739 C perv/imperv/total
35 COMMENT
3 line(s) of comment

```

```

*****
* TOTAL FLOW EAST TO SWM POND *
*****
15  ADD RUNOFF
    .520      .520      .014      .000 c.m/s
14  START
1   1=Zero; 2=Define
35  COMMENT
3   line(s) of comment
    *****
    * AREA 101 *
    *****
4   CATCHMENT
101.000 ID No.6 99999
    .385 Area in hectares
20.000 Length (PERV) metres
8.000 Gradient (%)
10.000 Per cent Impervious
20.000 Length (IMPERV)
    .000 %Imp. with Zero Dpth
    1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
    .250 Manning "n"
66.000 SCS Curve No or C
    .100 Ia/S Coefficient
13.085 Initial Abstraction
    1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
    .065 .000 .014 .000 c.m/s
    .314 .884 .371 C perv/imperv/total
35  COMMENT
3   line(s) of comment
    *****
    * TOTAL FLOW TO WEST *
    *****
15  ADD RUNOFF
    .065      .065      .014      .000 c.m/s
14  START
1   1=Zero; 2=Define
35  COMMENT
3   line(s) of comment
    *****
    * PROPOSED CONDITIONS *
    *****
35  COMMENT
3   line(s) of comment
    *****
    * AREA 201 *
    *****
4   CATCHMENT
201.000 ID No.6 99999
    .117 Area in hectares
15.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
15.000 Length (IMPERV)
    .000 %Imp. with Zero Dpth
    1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
    .013 Manning "n"
98.000 SCS Curve No or C
    .000 Ia/S Coefficient
    .518 Initial Abstraction
    1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
    .068 .000 .014 .000 c.m/s
    .919 .919 .919 C perv/imperv/total
15  ADD RUNOFF
    .068      .068      .014      .000 c.m/s
35  COMMENT
3   line(s) of comment
    *****
    * BUILDING ROOFTOP STORAGE *
    *****
10  POND
7 Depth - Discharge - Volume sets
    .000 .000 .0
    .025 .00304 .3

```

```

102225.OUT
.051 .00608 2.2
.076 .00912 7.4
.102 .0122 17.6
.127 .0152 34.4
.152 .0182 59.4
Peak Outflow = .016 c.m/s
Maximum Depth = .137 metres
Maximum Storage = 44. c.m
.068 .068 .016 .000 c.m/s
17 COMBINE
500 Junction Node No.
.068 .068 .016 .016 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 202 *
*****
4 CATCHMENT
202.000 ID No.ó 99999
.157 Area in hectares
15.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
15.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/s Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.091 .000 .016 .016 c.m/s
.919 .919 .919 C perv/imperv/total
15 ADD RUNOFF
.091 .091 .016 .016 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00304 .4
.051 .00608 2.9
.076 .00912 9.9
.102 .0122 23.6
.127 .0152 46.1
.152 .0182 79.7
Peak Outflow = .017 c.m/s
Maximum Depth = .143 metres
Maximum Storage = 68. c.m
.091 .091 .017 .016 c.m/s
17 COMBINE
500 Junction Node No.
.091 .091 .017 .033 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 203 *
*****
4 CATCHMENT
203.000 ID No.ó 99999
.026 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat

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.013      Manning "n"
98.000    SCS Curve No or C
.000      Ia/s Coefficient
.518      Initial Abstraction
1         Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
          .015      .000      .017      .033 c.m/s
          .903      .903      .903      C perv/imperv/total
15  ADD RUNOFF
          .015      .015      .017      .033 c.m/s
35  COMMENT
3     1 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10  POND
7     Depth - Discharge - Volume sets
          .000      .000      .0
          .025      .000760      .1
          .051      .00152      .5
          .076      .00228      1.6
          .102      .00304      3.9
          .127      .00380      7.6
          .152      .00456      13.2
Peak Outflow = .004 c.m/s
Maximum Depth = .133 metres
Maximum Storage = 9. c.m
          .015      .015      .004      .033 c.m/s
17  COMBINE
500   Junction Node No.
          .015      .015      .004      .037 c.m/s
14  START
1     1=Zero; 2=Define
35  COMMENT
3     1 line(s) of comment
*****
* AREA 204 *
*****
4   CATCHMENT
204.000  ID No.ó 99999
.038     Area in hectares
10.000   Length (PERV) metres
1.000    Gradient (%)
100.000  Per cent Impervious
10.000   Length (IMPERV)
.000     %Imp. with Zero Dpth
1        Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013     Manning "n"
98.000   SCS Curve No or C
.000     Ia/s Coefficient
.518     Initial Abstraction
1        Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
          .022      .000      .004      .037 c.m/s
          .903      .903      .903      C perv/imperv/total
15  ADD RUNOFF
          .022      .022      .004      .037 c.m/s
35  COMMENT
3     1 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10  POND
7     Depth - Discharge - Volume sets
          .000      .000      .0
          .025      .000760      .1
          .051      .00152      .7
          .076      .00228      2.4
          .102      .00304      5.7
          .127      .00380      11.1
          .152      .00456      19.3
Peak Outflow = .004 c.m/s
Maximum Depth = .141 metres
Maximum Storage = 16. c.m
          .022      .022      .004      .037 c.m/s
17  COMBINE

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500 Junction Node No.
      .022 .022 .004 .041 c.m/s
14 START
    1 1=Zero; 2=Define
35 COMMENT
    3 line(s) of comment
      *****
      * AREA 205 *
      *****
4 CATCHMENT
205.000 ID No.ó 99999
.038 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/S Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .022 .000 .004 .041 c.m/s
      .903 .903 .903 C perv/imperv/total
15 ADD RUNOFF
      .022 .022 .004 .041 c.m/s
35 COMMENT
    3 line(s) of comment
      *****
      * BUILDING ROOFTOP STORAGE *
      *****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .000760 .1
.051 .00152 .7
.076 .00228 2.4
.102 .00304 5.7
.127 .00380 11.1
.152 .00456 19.3
Peak Outflow = .004 c.m/s
Maximum Depth = .141 metres
Maximum Storage = 16. c.m
      .022 .022 .004 .041 c.m/s
17 COMBINE
500 Junction Node No.
      .022 .022 .004 .045 c.m/s
18 CONFLUENCE
500 Junction Node No.
      .022 .045 .004 .000 c.m/s
35 COMMENT
    3 line(s) of comment
      *****
      * AREA 206 *
      *****
4 CATCHMENT
206.000 ID No.ó 99999
1.067 Area in hectares
20.000 Length (PERV) metres
2.000 Gradient (%)
79.000 Per cent Impervious
20.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .495 .045 .004 .000 c.m/s
      .316 .917 .791 C perv/imperv/total
15 ADD RUNOFF
      .495 .530 .004 .000 c.m/s

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35  COMMENT
    3  line(s) of comment
    *****
    * SURFACE STORAGE *
    *****
10  POND
    4  Depth - Discharge - Volume sets
        .000      .000      .0
        .100      .180      20.0
        .200      .250      40.0
        .300      .500      80.0
    Peak Outflow = .447 c.m/s
    Maximum Depth = .279 metres
    Maximum Storage = 71. c.m
        .495      .530      .447      .000 c.m/s
17  COMBINE
    600  Junction Node No.
        .495      .530      .447      .447 c.m/s
14  START
    1  1=Zero; 2=Define
35  COMMENT
    3  line(s) of comment
    *****
    * AREA 209 *
    *****
    4  CATCHMENT
    209.000  ID No.ó 99999
        .171  Area in hectares
    10.000  Length (PERV) metres
        5.000  Gradient (%)
    15.000  Per cent Impervious
    10.000  Length (IMPERV)
        .000  %Imp. with Zero Dpth
        1  Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .250  Manning "n"
    66.000  SCS Curve No or C
        .100  Ia/S Coefficient
    13.085  Initial Abstraction
        1  Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
        .031      .000      .447      .447 c.m/s
        .314      .854      .395      C perv/imperv/total
15  ADD RUNOFF
        .031      .031      .447      .447 c.m/s
    9  ROUTE
        .000  Conduit Length
        .000  No Conduit defined
        .000  Zero lag
        .000  Beta weighting factor
        .000  Routing timestep
        0  No. of sub-reaches
        .031      .031      .031      .447 c.m/s
17  COMBINE
    600  Junction Node No.
        .031      .031      .031      .478 c.m/s
35  COMMENT
    3  line(s) of comment
    *****
    * TOTAL FLOW EAST TO SWM POND *
    *****
18  CONFLUENCE
    600  Junction Node No.
        .031      .478      .031      .000 c.m/s
14  START
    1  1=Zero; 2=Define
35  COMMENT
    3  line(s) of comment
    *****
    * AREA 207 *
    *****
    4  CATCHMENT
    207.000  ID No.ó 99999
        .028  Area in hectares
    10.000  Length (PERV) metres
        5.000  Gradient (%)

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102225.OUT

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15.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.005 .000 .031 .000 c.m/s
.314 .854 .395 C perv/imperv/total
15 ADD RUNOFF
.005 .005 .031 .000 c.m/s
9 ROUTE
.000 Conduit Length
.000 No Conduit defined
.000 Zero lag
.000 Beta weighting factor
.000 Routing timestep
0 No. of sub-reaches
.005 .005 .005 .000 c.m/s
17 COMBINE
700 Junction Node No.
.005 .005 .005 .005 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 208 *
*****
4 CATCHMENT
208.000 ID No. 99999
.158 Area in hectares
10.000 Length (PERV) metres
5.000 Gradient (%)
28.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.033 .000 .005 .005 c.m/s
.314 .854 .465 C perv/imperv/total
15 ADD RUNOFF
.033 .033 .005 .005 c.m/s
9 ROUTE
.000 Conduit Length
.000 No Conduit defined
.000 Zero lag
.000 Beta weighting factor
.000 Routing timestep
0 No. of sub-reaches
.033 .033 .033 .005 c.m/s
17 COMBINE
700 Junction Node No.
.033 .033 .033 .037 c.m/s
35 COMMENT
3 line(s) of comment
*****
* TOTAL FLOW TO WEST *
*****
18 CONFLUENCE
700 Junction Node No.
.033 .037 .033 .000 c.m/s
20 MANUAL

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