THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

CHAPTER VI:
STANDARD FORMS & DETAILS

TABLE OF CONTENTS

J. STORM WATER CALCULATION

TABLE 1 - RUNOFF COEFFICIENTS AND ANNUAL EMCs

	Pervious & Semi-pervious						Impervious		
Land Cover	Woodland	Cleared Woodland	Planting Beds	Rough Lawns	Lawn	Grass Playfields	Buildings	Roads/ Parking	Pedestrian Pathways & Rec. Areas
Runoff Coefficient	0.1	0.15	0.25	0.3	0.35	0.35	0.95	0.95	0.95
Curve No	55.0	65.0	70.0	74.0	79.0	79.0	98	98	98
EMCs (mg/L)									
TSS	40	40	210	78	100	150	1	135	60
NO3 + NO2 (as N)	0.3	0.3	1.7	0.9	1.3	2.20	0.34	0.83	0.5
TP	0.145	0.145	1.9	1	1.5	2.3	0.08	0.43	0.19
COD	40	40	70	53	60	75	1	85	50
Lead	0.0015	0.0015	0.005	0.005	0.005	0.005	0.003	0.011	0.009
Copper	0.008	0.008	0.01	0.01	0.01	0.01	0.024	0.047	0.014
Zinc	0.015	0.015	0.02	0.02	0.02	0.02	0.290	0.167	0.04
Oil & Grease	0	0	0	0	0	0	0.6	9	0.4

(1) U.S. EPA (Results of the Nationwide Urban Runoff Program - 1983)
(2) FHWA (Pollutant Loadings and Impacts from Highway Stormwater Runoff - 1990)
(3) Characterization of Nonpoint Sources and Loadings to Corpus Christi Bay (1996)
(4) Philadelphia Water Department Technical Memorandum No. 3 (2000)
(5) Technical Note #105 from Watershed Protection Techniques (1997)

1. WORKSHEETS

Worksheet 1 - Curve Numbers and 2-Year Storm Runoff

PROJECT: _____

SUB-BASIN: _____

Existing Conditions: Land Use Types Within Drainage

Cover Type	Area (sf)	Area (ac)	CN	A * CN
Woodland		0.00	55	0.00
Cleared Woodland		0.00	65	0.00
Planting Beds		0.00	70	0.00
Meadow Lawns		0.00	74	0.00
Lawn		0.00	79	0.00
Grass Playfields		0.00	79	0.00
Buildings		0.00	98	0.00
Roads/Parking		0.00	98	0.00
Pathways & Rec		0.00	98	0.00
TOTAL:	0	0.000		0

WEIGHTED CN:	#DIV/0!	(A x CN) / A

Future Conditions: Land Use Types Within Drainage

Cover Type	Area (sf)	Area (ac)	CN	A * CN
Woodland		0.00	55	0.00
Cleared Woodland		0.00	65	0.00
Planting Beds		0.00	70	0.00
Meadow Lawns		0.00	74	0.00
Lawn		0.00	79	0.00
Grass Playfields		0.00	79	0.00
Buildings		0.00	98	0.00
Roads/Parking		0.00	98	0.00
Pathways & Rec		0.00	98	0.00
TOTAL:	0	0.000		0

WEIGHTED CN:	#DIV/0!	(A x CN) / A

Worksheet 2 – Change in Runoff Volume for 2-Year Storm Event (3.6"/ 24 hr)

PROJECT: _____

SUB-BASIN: _____

Condition	Area (ac)	CN	S	Ia	Runoff Q* (in)	Runoff Volume (cf)
Before Dev	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
After Dev	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
						#DIV/0!

NET CHANGE IN RUNOFF VOLUME (CF): #DIV/0!

(REQ'D STORAGE VOLUME)

S = 1000/CN - 10

Ia = 0.2S

*Runoff Q (in) = (P - 0.2S)2/(P + 0.8S)

Worksheet 3 - Volume Reduction Measures

PROJECT: _____

SUB-BASIN: _____

Required Storage Volume (from Worksheet 2): #DIV/0! cf

Proposed Measures			
Measure Type	Area (sf)	Storage Volume Provided per SF* (cf/sf)	Net Storage Volume (cf)
Infiltration Bed			0
Porous Pavement			0
Infiltration Swale			0
Tree Trench			0
Green Roof			0
Cistern			
TOTAL STORAGE :			0
REQ'D STORAGE (WS 2):			#DIV/0!
EXCESS STORAGE:			#DIV/0!

* Provide supporting Design Calculations for each measure proposed

Worksheet 4 - Peak Hydrograph Mitigation

Unit Peak Hydrograph Values For SCS TYPE II Rainfall Distribution

Tc = 0.1 hr

Ia/P	qu (csm/in)	qu (csf/in)
0.1	1010	3.6E-05
0.2	973	3.5E-05
0.3	936	3.4E-05
0.35	885	3.2E-05
0.4	806	2.9E-05

Tc = 0.15 hr

Ia/P	qu (csm/in)	qu (csf/in)
0.1	889	3.2E-05
0.2	841	3.0E-05
0.3	793	2.8E-05
0.35	735	2.6E-05
0.4	660	2.4E-05

Based on TR-55 Graphical Peak Discharge Tables and Formulas

Qp = qu x A x Q

Note: User should input qu based on Ia/P and provided values. For other Tc values, refer to TR-55 Chapter 4, Exhibit 4-II and convert csm/in to csf/in by dividing csm/in by 52802

Volume Abstracted by Approved Methodsa (cf): 0

1-yr Storm, P = 3.0"

Condition	Area (ac)	Iab (in)	Ia/P	qu (csf/in)	Runoff Qc (in)	Volume (cf) (Area x Q)	Qp (cfs)
Before Dev	0.00	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
After Dev	0.00	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
W/Storage	0.00	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!

2-yr Storm, P = 3.6"

Condition	Area (ac)	Iab (in)	Ia/P	qu (csf/in)	Runoff Qc (in)	Volume (cf) (Area x Q)	Qp (cfs)
Before Dev	0.00	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
After Dev	0.00	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
W/Storage	0.00	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!

10-yr Storm, P = 5.38"

Condition	Area (ac)	Iab (in)	Ia/P	qu (csf/in)	Runoff Qc (in)	Volume (cf) (Area x Q)	Qp (cfs)
Before Dev	0.00	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!

Worksheet 4 Cont. - Peak Hydrograph Mitigation

After Dev	0.00	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
W/Storage	0.00	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!

a From Worksheet 3

b From Worksheet 2

c Runoff Q (in) = (P - 0.2S)2/(P + 0.8S)

Unit Peak Hydrograph Values
For SCS TYPE II Rainfall Distribution

Tc = 0.1 hr

Ia/P	qu (csm/in)	qu (csf/in)
0.1	1010	3.6E-05
0.2	973	3.5E-05
0.3	936	3.4E-05
0.35	885	3.2E-05
0.4	806	2.9E-05

Tc = 0.15 hr

Ia/P	qu (csm/in)	qu (csf/in)
0.1	889	3.2E-05
0.2	841	3.0E-05
0.3	793	2.8E-05
0.35	735	2.6E-05
0.4	660	2.4E-05

Based on TR-55 Graphical Peak Discharge Tables and Formulas

Qp = qu x A x Q Note: User should input qu based on Ia/P and provided values.

Volume Abstracted by Approved Methodsa (cf): #DIV/0!

25-yr Storm, P = 6.41"

Condition	Area (ac)	Iab (in)	Ia/P	qu (csf/in)	Runoff Qc (in)	Volume (cf) (Area x Q)	Qp (cfs)
Before Dev	0	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
After Dev	0.00	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
W/Storage	0.00	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!

50-yr Storm, P = 7.21"

Condition	Area (ac)	Iab (in)	Ia/P	qu (csf/in)	Runoff Qc (in)	Volume (cf) (Area x Q)	Qp (cfs)
Before Dev	0	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
After Dev	0.00	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
W/Storage	0.00	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!

a From Worksheet 3

Worksheet 4 Cont. - Peak Hydrograph Mitigation

b From Worksheet 2

c Runoff Q (in) = (P - 0.2S)2/(P + 0.8S)

Worksheet 5 – Volume Reductions for Project Specific Measures

PROJECT: Carrington Hall Addition

Green Roof Stormwater Storage

Layer	Storage (gal/sf)	Storage (cf/sf)
Hydrodrain FD60	0.20	0.027
SSm45 Moisture Mat	0.12	0.016
8" Soil at 20% capacity	1.00	0.134
Total:	1.32	0.18
Roof Area:	4475	

TOTAL STORAGE: 4475 sf (Roof Area (sf)) x 0.18 (cf/sf) (Storage (cf/sf)) = 806 cf

Infiltration Bed

Rain Garden