



***Drainage Report
Prepared For
Block 6001 Lot 33, 34, 34.01, 35, 35.01 & 36
Montgomery Township
Somerset County, New Jersey
Project Number: 1805M***

***January 17, 2023
Revised May 18, 2023
Revised July 28, 2023***

***Prepared For:
Harlingen Associates, LLC
36 Brower Lane
Hillsborough, NJ 08844***

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Michael K. Ford

Michael K. Ford, NJ PE No. 3472

Appendix F2

MTD Information



State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATER QUALITY
Bureau of Stormwater Permitting

401 East State Street
P.O. Box 420 Mail Code 401-02B

Trenton, NJ 08625-0420
Tel. (609) 633-7021 • Fax (609) 777-0432
www.nj.gov/dep/dwq/bnpe_home.htm

PHILIP D. MURPHY
Governor

SHAWN M. LATOURETTE
Acting Commissioner

SHEILA Y. OLIVER
Lt. Governor

February 12, 2021

Derek M. Berg
Director – Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Lab Certification
Filtterra® HC Bioretention System
Off-line Installation Approved

TSS Removal Rate 80%

Dear Mr. Berg:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions LLC has requested a Laboratory Certification for the Filtterra® HC Bioretention System (Filtterra® HC.)

The project falls under the “Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology” dated January 25, 2013. The applicable protocol is the “New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device” dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated January 2021) for this device is published online at http://www.njcat.org/uploads/newDocs/NJCATFiltterraTechnologyVerificationReportFinal_.pdf.

The NJDEP certifies the use of the Filterra® HC stormwater treatment unit by Contech Engineered Solutions LLC at a TSS removal rate of 80% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 3.12 gpm/ft² of effective filtration treatment area.
2. The Filterra® HC stormwater treatment unit shall be installed using the same configuration reviewed by NJCAT, and sized in accordance with the criteria specified in item 7 below.
3. This device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.
4. Additional design criteria for MTDs can be found in the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.
5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Filterra® HC. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at <https://www.conteches.com/Portals/0/Documents/Maintenance%20Guides/Filterra%20HC%20OM%20Packet.pdf> for any changes to the maintenance requirements.
6. For an MTD to be considered “green infrastructure” (GI) in accordance with the March 2, 2020 amendments to the Stormwater Management rules at N.J.A.C. 7:8, the MTD must meet the GI definition noted at amended N.J.A.C. 7:8-1.2. Specifically, the MTD shall (1) treat stormwater runoff through infiltration into subsoil; and/or (2) treat stormwater runoff through filtration by vegetation or soil; or (3) store stormwater runoff for reuse.

The Filterra® HC filters stormwater runoff through an engineered biofiltration soil media and, thus, meets the definition of GI. Filterra® HC can be configured with or without a precast vault. Installations that will not include a precast vault will additionally need to comply the NJDEP Stormwater BMP Manual conditions regarding separation from the seasonal high water table and, if infiltration is proposed as an outlet, minimum vertical saturated hydraulic conductivity of the subsoil. Installations without a precast vault that do not rely on infiltration are required to maintain at least a one-foot separation from the seasonal high water table measured from the lowest point of the system. Installations without a precast vault that utilize infiltration are required to have the most hydraulically restrictive soil layer below the MTD meet the minimum tested vertical saturated hydraulic conductivity of one inch per hour and have at least two feet of separation from the seasonal high water table measured from the lowest point of the system.

7. Sizing Requirement:

The example below demonstrates the sizing procedure for the Filterra® HC:

Example: A 0.25-acre impervious site is to be treated to 80% TSS removal using the Filterra® HC. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

The selection of the appropriate model of Filterra® HC is based upon both the maximum inflow drainage area and the MTFR. It is necessary to calculate the required model using both methods and to use the largest model determined by the two methods.

Inflow Drainage Area Evaluation:

The drainage area to the Filterra® HC in this example is 0.25 acres. Included in Table 1 below, all of the Filterra® HC models are designed with a maximum allowable drainage area greater than 0.25 acres. Specifically, the Filterra® HC with a 4'x4' media bay and a maximum allowable drainage area of 0.40 acres would be the smallest model able to treat runoff without exceeding the maximum allowable drainage area.

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was based on the following:
time of concentration = 10 minutes
 $i = 3.2$ in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
 $c = 0.99$ (runoff coefficient for impervious)
 $Q = ciA = 0.99 \times 3.2 \times 0.25 = 0.79$ cfs

Given the site runoff is 0.79 cfs and based on the MTFR's listed in Table 1 below, the Filterra® HC with a 16'x8' media bay and an MTFR of 0.889 cfs would be the smallest model that could be used to treat the impervious area without exceeding the MTFR. If using more than one unit for treating runoff, the units should be configured such that the flowrate to each unit does not exceed the design MTFR for each unit and ensuring the entire 0.25 acre area is treated.

The MTFR evaluation results will be used since that method results in the highest minimum configuration determined by the two methods.

The sizing table corresponding to the available system models is noted below:

Table 1. Filtterra® HC MTFRs and Maximum Allowable Drainage Areas

	Available Filtterra® Media Bay Sizes (feet)	Effective Filtration Treatment Area (ft ²)	Treatment Flow Rate (cfs)	Maximum Allowable Drainage Area (ac)
Standard Configuration Filtterra and Filtterra Bioscape Vaults	4x4	16	0.111	0.40
	4x6 or 6x4	24	0.167	0.60
	4.5x7.83 or 7.83x4.5 (Nominal 4x8/8x4)	35.24	0.245	0.89
	6x6	36	0.250	0.91
	6x8 or 8x6	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	6x12 or 12x6	72	0.500	1.81
	7x13 or 13x7	91	0.632	2.29
	14x8	112	0.778	2.82
	16x8	128	0.889	3.22
	18x8	144	1.000	3.62
	20x8	160	1.111	4.03
	22x8	176	1.222	4.43
Peak Diversion Filtterra Vaults	4x4	16	0.111	0.40
	4.5x5.83 (Nominal 4x6)	26.24	0.182	0.66
	6x4	24	0.167	0.60
	6x6	36	0.250	0.91
	6x8	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	7x10	70	0.486	1.76
	8x10.5	84	0.583	2.11
	8x12.5	100	0.694	2.52
	Custom and/or Filtterra Bioscape	Media Area in ft ²	0.00694 * (Media Area in ft ²)	0.0252 * (Media Area in ft ²)

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact me at (609) 633-7021.

Sincerely,

A handwritten signature in blue ink that reads "Gabriel Mahon". The signature is written in a cursive, flowing style.

Gabriel Mahon, Chief
Bureau of Stormwater Permitting

Attachment: Maintenance Plan

cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP – Water & Land Management
Nancy Kempel, NJDEP– BSTP
Keith Stampfel, NJDEP – DLRP
Dennis Contois, NJDEP – DLRP

MTD Drainage Area Breakdown

Drainage Area	Area (Acres)	Impervious CN	Open Space CN (HSG D)	Woods CN (HSG D)	Pervious Weighted CN	Time of Concentration (min)
		98	80	77		
MTD 1-1	0.25	0.19	0.06	0.00	80.0	2.33
MTD 1-2	0.34	0.17	0.17	0.00	80.0	1.80
MTD 1-4	0.31	0.19	0.12	0.00	80.0	2.27
MTD 1-5	0.79	0.14	0.45	0.20	79.1	3.09
MTD 2-2	0.33	0.21	0.12	0.00	80.0	2.91
MTD 2-2A	0.35	0.25	0.10	0.00	80.0	2.46
MTD 2-3	0.34	0.21	0.13	0.00	80.0	1.93
MTD 2-5	0.08	0.06	0.02	0.00	80.0	0.70
MTD 2-6	0.29	0.18	0.11	0.00	80.0	2.27
MTD 2-7	0.53	0.12	0.38	0.03	79.8	2.32
MTD 2-8	0.34	0.05	0.03	0.26	77.3	0.81
MTD 2-9	0.16	0.14	0.02	0.00	80.0	0.75
MTD 2-10	0.12	0.11	0.01	0.00	80.0	1.49
MTD 2-11	0.16	0.13	0.03	0.00	80.0	1.19
MTD 2-13	0.03	0.03	0.00	0.00	N/A	0.83
MTD 2-14N	0.17	0.14	0.03	0.00	80.0	5.57
MTD 2-14S	0.04	0.04	0.00	0.00	N/A	1.20
MTD 2-15N	0.27	0.19	0.08	0.00	80.0	7.40
MTD 2-15S	0.05	0.04	0.01	0.00	80.0	0.88

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 1-1

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 $3 = (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t

$$\text{Max L} = (100 \cdot \sqrt{S}) / n$$

Segment ID	A-B	
	Concrete	
	0.011	
ft	89	
in	3.34	
ft/ft	0.023	
hr	0.02	=
		0.02

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	235	
ft/ft	0.023	
ft/s	3	
hr	0.02	=
		0.02

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		=
hr		0.00
min		0.04
		2.33

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 1-2

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 $3 = (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t
- Max L = (100 * √S) / n

Segment ID	A-B	
	Pavement	
	0.011	
ft	29	
in	3.34	
ft/ft	0.018	
hr	0.01	=
		0.01

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	241	
ft/ft	0.022	
ft/s	3	
hr	0.02	=
		0.02

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		=
hr		0.00
min		0.03
		1.80

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 1-4

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 3 $= (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t
- Max L = (100 * √S) / n

Segment ID	A-B	
	Asphalt	
	0.011	
ft	22	
in	3.34	
ft/ft	0.013	
hr	0.01	=
		0.01

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	266	
ft/ft	0.014	
ft/s	2.4	
hr	0.03	=
		0.03

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		=
hr		0.00
min		0.04
		2.27

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 1-5

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
- 2 Mannings Roughness Coeff., n (table 3-1)
- Flow Length, L
- 3 $= (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
- 4 Two-yr 24-hr Rainfall, P₂
- 5 land slope, s
- 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t

$$\text{Max L} = (100 \cdot \sqrt{S}) / n$$

Segment ID	A-B	
	Asphalt	
	0.011	
ft	68	
in	3.34	
ft/ft	0.014	
hr	0.02	=
		0.02

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
- 8 Flow Length, L
- 9 Watercourse Slope, s
- 10 Average Velocity, V (Figure 15-4)
- 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	263	
ft/ft	0.012	
ft/s	2.1	
hr	0.03	=
		0.03

Channel Flow

- 12 Cross sectional flow area, a
- 13 Wetted Perimeter, P_w
- 14 Hydraulic Radius, $r = a / P_w$ Compute r
- 15 Channel Slope, s
- 16 Mannings roughness Coeff., n
- 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
- 18 Flow Length, L
- 19 $T_t = L / (3600 \cdot V)$ Compute T_t
- 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		=
hr		0.00
min		0.05
		3.09

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-2

By MM
 Checked

Date 5/25/2023
 Date

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 3 $= (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t

$$\text{Max L} = (100 \cdot \sqrt{S}) / n$$

Segment ID	A-B	
	Asphalt	
	0.011	
ft	25	
in	3.34	
ft/ft	0.021	
hr	0.01	= 0.01

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	288	
ft/ft	0.008	
ft/s	1.9	
hr	0.04	= 0.04

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		= 0.00
hr		0.05
min		2.91

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-2A

By MM
 Checked

Date 5/25/2023
 Date

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 $3 = (100 \times \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P2
 5 land slope, s
 $6 \text{ } T_t = (0.007 \times (nL)^{0.8} / ((P_2^{0.5}) \times (s^{0.4})))$ Compute Tt

$$\text{Max } L = (100 \times \sqrt{S}) / n$$

Segment ID	A-B	
	Asphalt	
	0.011	
ft	27	
in	3.34	
ft/ft	0.015	
hr	0.01	= 0.01

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 $11 \text{ } T_t = L / (3600 \times V)$ Compute Tt

Segment ID	B-C	
	Pavement	
ft	167	
ft/ft	0.008	
ft/s	1.7	
hr	0.03	= 0.03

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, Pw
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 $17 \text{ } V = 1.49 (r^{2/3}) \times (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 $19 \text{ } T_t = L / (3600 \times V)$ Compute Tt
 20 Water shed or Subarea Tc or Tt (add Tt in steps 6, 11, 19)

Segment ID	C-D	
ft ²		
ft		
ft		
ft/ft		
ft/s	2	Assumed
ft	43	
hr	0.01	= 0.01
hr		0.04
min		2.46

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-3

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 3 $= (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t

$$\text{Max L} = (100 \cdot \sqrt{S}) / n$$

Segment ID	A-B	
	Asphalt	
	0.011	
ft	14	
in	3.34	
ft/ft	0.025	
hr	0.00	=
		0.00

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	287	
ft/ft	0.02	
ft/s	2.8	
hr	0.03	=
		0.03

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		=
hr		0.00
min		0.03
		1.93

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-5

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 3 $= (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t

$$\text{Max L} = (100 \cdot \sqrt{S}) / n$$

Segment ID	A-B	
	Asphalt	
	0.011	
ft	70	
in	3.34	
ft/ft	0.036	
hr	0.01	= 0.01

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID		
ft		
ft/ft		
ft/s		
hr		= 0.00

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		= 0.00
hr		0.01
min		0.70

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-6

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 3 $= (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t

$$\text{Max L} = (100 \cdot \sqrt{S}) / n$$

Segment ID	A-B	
	Asphalt	
	0.011	
ft	15	
in	3.34	
ft/ft	0.025	
hr	0.00	= 0.00

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	256	
ft/ft	0.012	
ft/s	2.1	
hr	0.03	= 0.03

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		= 0.00
hr		0.04
min		2.27

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-7

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 3 $= (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$ Max L = $(100 \cdot \sqrt{S}) / n$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t

Segment ID	A-B	
	Asphalt	
	0.011	
ft	100	
in	3.34	
ft/ft	0.015	
hr	0.02	=
		0.02

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	148	
ft/ft	0.015	
ft/s	2.5	
hr	0.02	=
		0.02

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) \cdot (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		=
hr		0.00
min		0.04
		2.32

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-8

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 3 $= (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t
- Max L = (100 * S) / n

Segment ID	A-B	
	Pavement	
	0.011	
ft	36	
in	3.34	
ft/ft	0.028	
hr	0.01	=
		0.01

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	70	
ft/ft	0.028	
ft/s	3.3	
hr	0.01	=
		0.01

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		=
hr		0.00
min		0.01
		0.81

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-9

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 3 $= (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t
- Max L = $(100 \cdot \sqrt{S}) / n$

Segment ID	A-B	
	Pavement	
	0.011	
ft	44	
in	3.34	
ft/ft	0.038	
hr	0.01	=
		0.01

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	65	
ft/ft	0.039	
ft/s	3.9	
hr	0.00	=
		0.00

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		=
hr		0.00
min		0.01
		0.75

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-10

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 $3 = (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t
- Max L = (100 * √S) / n

Segment ID	A-B	
	Pavement	
	0.011	
ft	26	
in	3.34	
ft/ft	0.016	
hr	0.01	=
		0.01

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	189	
ft/ft	0.023	
ft/s	3	
hr	0.02	=
		0.02

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		=
hr		0.00
min		0.02
		1.49

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-11

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
- 2 Mannings Roughness Coeff., n (table 3-1)
- Flow Length, L $\text{Max L} = (100 \cdot \sqrt{S})/n$
- 3 $= (100 \cdot \sqrt{0.067})/0.24 = 108 \text{ ft (100 max)}$
- 4 Two-yr 24-hr Rainfall, P₂
- 5 land slope, s
- 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t

Segment ID	A-B	
	Asphalt	
	0.011	
ft	14	
in	3.34	
ft/ft	0.03	
hr	0.00	= 0.00

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
- 8 Flow Length, L
- 9 Watercourse Slope, s
- 10 Average Velocity, V (Figure 15-4)
- 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	183	
ft/ft	0.026	
ft/s	3.1	
hr	0.02	= 0.02

Channel Flow

- 12 Cross sectional flow area, a
- 13 Wetted Perimeter, P_w
- 14 Hydraulic Radius, $r = a / P_w$ Compute r
- 15 Channel Slope, s
- 16 Mannings roughness Coeff., n
- 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
- 18 Flow Length, L
- 19 $T_t = L / (3600 \cdot V)$ Compute T_t
- 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		= 0.00
hr		0.02
min		1.19

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-13

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 $3 = (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t

$$\text{Max L} = (100 \cdot \sqrt{S}) / n$$

Segment ID	A-B	
	Asphalt	
	0.011	
ft	74	
in	3.34	
ft/ft	0.027	
hr	0.01	=
		0.01

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID		
ft		
ft/ft		
ft/s		
hr		=
		0.00

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		=
hr		0.00
min		0.01
		0.83

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-14N

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 3 $= (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t
- Max L = $(100 \cdot \sqrt{S}) / n$

Segment ID	A-B	
	Concrete	Grass
	0.011	0.24
ft	67	33
in	3.34	3.34
ft/ft	0.01	0.039
hr	0.02	0.07
	=	
		0.09

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	5	
ft/ft	0.016	
ft/s	2.6	
hr	0.00	
	=	
		0.00

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		
hr		
min		
	=	
		0.00
		0.09
		5.57

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-14S

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 $3 = (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t
- Max L = (100 * √S) / n

Segment ID	A-B	
	Pavement	
	0.011	
ft	70	
in	3.34	
ft/ft	0.016	
hr	0.02	=
		0.02

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	32	
ft/ft	0.014	
ft/s	2.4	
hr	0.00	=
		0.00

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		=
hr		0.00
min		0.02
		1.20

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-15N

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 3 $= (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t

$$\text{Max L} = (100 \cdot \sqrt{S}) / n$$

Segment ID	A-B	
	Concrete	Grass
	0.011	0.24
ft	64	36
in	3.34	3.34
ft/ft	0.018	0.02
hr	0.01	0.10
=		

0.12

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	46	
ft/ft	0.011	
ft/s	2.1	
hr	0.01	
=		

0.01

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		
hr		
min		
=		

0.00
0.12
7.40

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Project 1805M
 Location Montgomery Township
 Select One: Post-Developed
 Select One: Time of Concentration
 Area Name MTD 2-15S

By MM
 Checked _____

Date 5/25/2023
 Date _____

Notes: Space for as many as two segments per flow type can be used for each worksheet
 Include a Map, schematic, or description of flow segments

Sheet Flow (Applicable to Tc only)

- 1 Surface Description (table 3-1)
 2 Mannings Roughness Coeff., n (table 3-1)
 Flow Length, L
 3 $= (100 \cdot \sqrt{0.067}) / 0.24 = 108 \text{ ft (100 max)}$ Max L = $(100 \cdot \sqrt{S}) / n$
 4 Two-yr 24-hr Rainfall, P₂
 5 land slope, s
 6 $T_t = (0.007 \cdot (nL)^{0.8} / ((P_2^{0.5}) \cdot (s^{0.4})))$ Compute T_t

Segment ID	A-B	
	Asphalt	
	0.011	
ft	45	
in	3.34	
ft/ft	0.014	
hr	0.01	=
		0.01

Shallow Concentrated Flow

- 7 Surface Description (paved or unpaved)
 8 Flow Length, L
 9 Watercourse Slope, s
 10 Average Velocity, V (Figure 15-4)
 11 $T_t = L / (3600 \cdot V)$ Compute T_t

Segment ID	B-C	
	Pavement	
ft	19	
ft/ft	0.01	
ft/s	2	
hr	0.00	=
		0.00

Channel Flow

- 12 Cross sectional flow area, a
 13 Wetted Perimeter, P_w
 14 Hydraulic Radius, $r = a / P_w$ Compute r
 15 Channel Slope, s
 16 Mannings roughness Coeff., n
 17 $V = 1.49 (r^{2/3}) (s^{1/2}) / n$ Compute V
 18 Flow Length, L
 19 $T_t = L / (3600 \cdot V)$ Compute T_t
 20 Water shed or Subarea T_c or T_t (add T_t in steps 6, 11, 19)

Segment ID		
ft ²		
ft		
ft		
ft/ft		
ft/s		
ft		
hr		=
hr		0.00
min		0.01
		0.88

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft ³)	Time to Peak (min)	Peak Flow (ft ³ /s)
DA 1-1 Impervious	WQDS	1	720.00	63.00	0.58
DA 1-1 Pervious	WQDS	1	38.00	66.00	0.04
DA 1-2 Impervious	WQDS	1	646.00	63.00	0.52
DA 1-2 Pervious	WQDS	1	108.00	66.00	0.10
DA 1-4 Impervious	WQDS	1	721.00	63.00	0.58
DA 1-4 Pervious	WQDS	1	76.00	66.00	0.08
DA 1-5 Impervious	WQDS	1	528.00	63.00	0.42
DA 1-5 Pervious	WQDS	1	366.00	66.00	0.35
DA 2-10 Impervious	WQDS	1	417.00	63.00	0.34
DA 2-10 Pervious	WQDS	1	6.00	66.00	0.01
DA 2-11 Impervious	WQDS	1	489.00	63.00	0.40
DA 2-11 Pervious	WQDS	1	19.00	63.00	0.02
DA 2-13 Impervious	WQDS	1	112.00	63.00	0.09
DA 2-14N Impervious	WQDS	1	526.00	66.00	0.41
DA 2-14N Pervious	WQDS	1	19.00	66.00	0.01
DA 2-14S Impervious	WQDS	1	151.00	63.00	0.12
DA 2-15N Impervious	WQDS	1	713.00	66.00	0.54
DA 2-15N Pervious	WQDS	1	50.00	69.00	0.04
DA 2-15S Impervious	WQDS	1	149.00	63.00	0.12
DA 2-15S Pervious	WQDS	1	6.00	63.00	0.01
DA 2-2 Impervious	WQDS	1	793.00	63.00	0.63
DA 2-2 Pervious	WQDS	1	76.00	66.00	0.07
DA 2-2A Impervious	WQDS	1	947.00	63.00	0.76
DA 2-2A Pervious	WQDS	1	63.00	66.00	0.06
DA 2-3 Impervious	WQDS	1	798.00	63.00	0.64
DA 2-3 Pervious	WQDS	1	82.00	66.00	0.08
DA 2-5 Impervious	WQDS	1	223.00	63.00	0.18
DA 2-5 Pervious	WQDS	1	12.00	63.00	0.01
DA 2-6 Impervious	WQDS	1	683.00	63.00	0.55
DA 2-6 Pervious	WQDS	1	70.00	66.00	0.07
DA 2-7 Impervious	WQDS	1	455.00	63.00	0.36
DA 2-7 Pervious	WQDS	1	253.00	66.00	0.25
DA 2-8 Impervious	WQDS	1	186.00	63.00	0.15
DA 2-8 Pervious	WQDS	1	126.00	63.00	0.10
DA 2-9 Impervious	WQDS	1	520.00	63.00	0.43
DA 2-9 Pervious	WQDS	1	12.00	63.00	0.01

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft ³)	Time to Peak (min)	Peak Flow (ft ³ /s)
MTD 1-1	WQDS	1	758.00	63.00	0.60
MTD 1-2	WQDS	1	754.00	63.00	0.60
MTD 1-4	WQDS	1	797.00	63.00	0.63

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft ³)	Time to Peak (min)	Peak Flow (ft ³ /s)
MTD 1-5	WQDS	1	894.00	66.00	0.76
MTD 2-10	WQDS	1	423.00	63.00	0.34
MTD 2-11	WQDS	1	508.00	63.00	0.41
MTD 2-13	WQDS	1	112.00	63.00	0.09
MTD 2-14N	WQDS	1	545.00	66.00	0.42
MTD 2-14S	WQDS	1	151.00	63.00	0.12
MTD 2-15N	WQDS	1	764.00	66.00	0.56
MTD 2-15S	WQDS	1	155.00	63.00	0.13
MTD 2-2	WQDS	1	868.00	63.00	0.68
MTD 2-2A	WQDS	1	1,010.00	63.00	0.80
MTD 2-3	WQDS	1	880.00	63.00	0.70
MTD 2-5	WQDS	1	235.00	63.00	0.20
MTD 2-6	WQDS	1	753.00	63.00	0.59
MTD 2-7	WQDS	1	708.00	66.00	0.58
MTD 2-8	WQDS	1	312.00	63.00	0.25
MTD 2-9	WQDS	1	532.00	63.00	0.44

Subsection: Unit Hydrograph Summary
Label: DA 1-1 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	2.33 min
Area (User Defined)	0.19 acres
Computational Time Increment	0.31 min
Time to Peak (Computed)	64.93 min
Flow (Peak, Computed)	0.58 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.58 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.19 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	713.54 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	720.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	2.33 min
Computational Time Increment	0.31 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	5.54 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 1-1 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.55 min
Unit receding limb, Tr	6.21 min
Total unit time, Tb	7.77 min

Subsection: Unit Hydrograph Summary
Label: DA 1-1 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	2.33 min
Area (User Defined)	0.06 acres
Computational Time Increment	0.31 min
Time to Peak (Computed)	65.55 min
Flow (Peak, Computed)	0.04 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	66.00 min
Flow (Peak Interpolated Output)	0.04 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.06 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	37.70 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	38.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	2.33 min
Computational Time Increment	0.31 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.75 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 1-1 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.55 min
Unit receding limb, Tr	6.21 min
Total unit time, Tb	7.77 min

Subsection: Unit Hydrograph Summary
Label: DA 1-2 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	1.80 min
Area (User Defined)	0.17 acres
Computational Time Increment	0.24 min
Time to Peak (Computed)	64.80 min
Flow (Peak, Computed)	0.52 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.52 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.17 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	638.43 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	646.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.80 min
Computational Time Increment	0.24 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	6.42 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 1-2 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.20 min
Unit receding limb, Tr	4.80 min
Total unit time, Tb	6.00 min

Subsection: Unit Hydrograph Summary
Label: DA 1-2 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	1.80 min
Area (User Defined)	0.17 acres
Computational Time Increment	0.24 min
Time to Peak (Computed)	65.28 min
Flow (Peak, Computed)	0.12 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	66.00 min
Flow (Peak Interpolated Output)	0.10 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.17 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	106.81 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	108.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.80 min
Computational Time Increment	0.24 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	6.42 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 1-2 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.20 min
Unit receding limb, Tr	4.80 min
Total unit time, Tb	6.00 min

Subsection: Unit Hydrograph Summary
Label: DA 1-4 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	2.27 min
Area (User Defined)	0.19 acres
Computational Time Increment	0.30 min
Time to Peak (Computed)	64.77 min
Flow (Peak, Computed)	0.58 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.58 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.19 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	713.54 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	721.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	2.27 min
Computational Time Increment	0.30 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	5.69 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 1-4 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.51 min
Unit receding limb, Tr	6.05 min
Total unit time, Tb	7.57 min

Subsection: Unit Hydrograph Summary
Label: DA 1-4 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	2.27 min
Area (User Defined)	0.12 acres
Computational Time Increment	0.30 min
Time to Peak (Computed)	65.38 min
Flow (Peak, Computed)	0.08 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	66.00 min
Flow (Peak Interpolated Output)	0.08 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.12 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	75.39 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	76.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	2.27 min
Computational Time Increment	0.30 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	3.59 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 1-4 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	1.51 min
Unit receding limb, T_r	6.05 min
Total unit time, T_b	7.57 min

Subsection: Unit Hydrograph Summary
Label: DA 1-5 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	3.09 min
Area (User Defined)	0.14 acres
Computational Time Increment	0.41 min
Time to Peak (Computed)	65.10 min
Flow (Peak, Computed)	0.43 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.42 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.14 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	525.77 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	528.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	3.09 min
Computational Time Increment	0.41 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	3.08 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 1-5 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	2.06 min
Unit receding limb, Tr	8.24 min
Total unit time, Tb	10.30 min

Subsection: Unit Hydrograph Summary
Label: DA 1-5 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	3.09 min
Area (User Defined)	0.65 acres
Computational Time Increment	0.41 min
Time to Peak (Computed)	65.92 min
Flow (Peak, Computed)	0.35 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	66.00 min
Flow (Peak Interpolated Output)	0.35 ft ³ /s
Drainage Area	
SCS CN (Composite)	79.1
Area (User Defined)	0.65 acres
Maximum Retention (Pervious)	2.6 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	365.20 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	366.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	3.09 min
Computational Time Increment	0.41 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	14.30 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 1-5 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	2.06 min
Unit receding limb, Tr	8.24 min
Total unit time, Tb	10.30 min

Subsection: Unit Hydrograph Summary
Label: DA 2-10 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	1.49 min
Area (User Defined)	0.11 acres
Computational Time Increment	0.20 min
Time to Peak (Computed)	64.96 min
Flow (Peak, Computed)	0.34 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.34 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.11 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	413.10 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	417.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.49 min
Computational Time Increment	0.20 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	5.02 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-10 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.99 min
Unit receding limb, Tr	3.97 min
Total unit time, Tb	4.97 min

Subsection: Unit Hydrograph Summary
Label: DA 2-10 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	1.49 min
Area (User Defined)	0.01 acres
Computational Time Increment	0.20 min
Time to Peak (Computed)	65.16 min
Flow (Peak, Computed)	0.01 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	66.00 min
Flow (Peak Interpolated Output)	0.01 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.01 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	6.28 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	6.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.49 min
Computational Time Increment	0.20 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.46 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-10 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.99 min
Unit receding limb, Tr	3.97 min
Total unit time, Tb	4.97 min

Subsection: Unit Hydrograph Summary
Label: DA 2-11 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	1.19 min
Area (User Defined)	0.13 acres
Computational Time Increment	0.16 min
Time to Peak (Computed)	64.89 min
Flow (Peak, Computed)	0.40 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.40 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.13 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	488.21 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	489.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.19 min
Computational Time Increment	0.16 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	7.43 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-11 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.79 min
Unit receding limb, Tr	3.17 min
Total unit time, Tb	3.97 min

Subsection: Unit Hydrograph Summary
Label: DA 2-11 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	1.19 min
Area (User Defined)	0.03 acres
Computational Time Increment	0.16 min
Time to Peak (Computed)	65.21 min
Flow (Peak, Computed)	0.02 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.02 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.03 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	18.85 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	19.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.19 min
Computational Time Increment	0.16 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.71 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-11 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.79 min
Unit receding limb, Tr	3.17 min
Total unit time, Tb	3.97 min

Subsection: Unit Hydrograph Summary
Label: DA 2-13 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	0.83 min
Area (User Defined)	0.03 acres
Computational Time Increment	0.11 min
Time to Peak (Computed)	64.96 min
Flow (Peak, Computed)	0.09 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.09 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.03 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	112.66 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	112.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.83 min
Computational Time Increment	0.11 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	2.46 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-13 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.55 min
Unit receding limb, Tr	2.21 min
Total unit time, Tb	2.77 min

Subsection: Unit Hydrograph Summary
Label: DA 2-14N Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	5.57 min
Area (User Defined)	0.14 acres
Computational Time Increment	0.74 min
Time to Peak (Computed)	65.35 min
Flow (Peak, Computed)	0.41 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	66.00 min
Flow (Peak Interpolated Output)	0.41 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.14 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	525.77 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	526.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.57 min
Computational Time Increment	0.74 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.71 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-14N Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	3.71 min
Unit receding limb, Tr	14.85 min
Total unit time, Tb	18.57 min

Subsection: Unit Hydrograph Summary
Label: DA 2-14N Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	5.57 min
Area (User Defined)	0.03 acres
Computational Time Increment	0.74 min
Time to Peak (Computed)	67.58 min
Flow (Peak, Computed)	0.02 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	66.00 min
Flow (Peak Interpolated Output)	0.01 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.03 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	18.85 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	19.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.57 min
Computational Time Increment	0.74 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.37 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-14N Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	3.71 min
Unit receding limb, Tr	14.85 min
Total unit time, Tb	18.57 min

Subsection: Unit Hydrograph Summary
Label: DA 2-14S Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	1.20 min
Area (User Defined)	0.04 acres
Computational Time Increment	0.16 min
Time to Peak (Computed)	64.96 min
Flow (Peak, Computed)	0.12 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.12 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.04 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	150.22 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	151.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.20 min
Computational Time Increment	0.16 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	2.27 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-14S Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.80 min
Unit receding limb, Tr	3.20 min
Total unit time, Tb	4.00 min

Subsection: Unit Hydrograph Summary
Label: DA 2-15N Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	7.40 min
Area (User Defined)	0.19 acres
Computational Time Increment	0.99 min
Time to Peak (Computed)	66.11 min
Flow (Peak, Computed)	0.54 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	66.00 min
Flow (Peak Interpolated Output)	0.54 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.19 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	713.54 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	713.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	7.40 min
Computational Time Increment	0.99 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.75 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-15N Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	4.93 min
Unit receding limb, Tr	19.73 min
Total unit time, Tb	24.67 min

Subsection: Unit Hydrograph Summary
Label: DA 2-15N Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	7.40 min
Area (User Defined)	0.08 acres
Computational Time Increment	0.99 min
Time to Peak (Computed)	69.07 min
Flow (Peak, Computed)	0.04 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	69.00 min
Flow (Peak Interpolated Output)	0.04 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.08 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	50.26 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	50.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	7.40 min
Computational Time Increment	0.99 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.73 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-15N Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	4.93 min
Unit receding limb, Tr	19.73 min
Total unit time, Tb	24.67 min

Subsection: Unit Hydrograph Summary
Label: DA 2-15S Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	0.88 min
Area (User Defined)	0.04 acres
Computational Time Increment	0.12 min
Time to Peak (Computed)	65.00 min
Flow (Peak, Computed)	0.12 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.12 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.04 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	150.22 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	149.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.88 min
Computational Time Increment	0.12 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	3.09 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-15S Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.59 min
Unit receding limb, Tr	2.35 min
Total unit time, Tb	2.93 min

Subsection: Unit Hydrograph Summary
Label: DA 2-15S Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	0.88 min
Area (User Defined)	0.01 acres
Computational Time Increment	0.12 min
Time to Peak (Computed)	65.12 min
Flow (Peak, Computed)	0.01 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.01 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.01 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	6.28 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	6.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.88 min
Computational Time Increment	0.12 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.77 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-15S Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.59 min
Unit receding limb, Tr	2.35 min
Total unit time, Tb	2.93 min

Subsection: Unit Hydrograph Summary
Label: DA 2-2 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	2.91 min
Area (User Defined)	0.21 acres
Computational Time Increment	0.39 min
Time to Peak (Computed)	64.80 min
Flow (Peak, Computed)	0.64 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.63 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.21 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	788.65 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	793.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	2.91 min
Computational Time Increment	0.39 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	4.91 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-2 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.94 min
Unit receding limb, Tr	7.76 min
Total unit time, Tb	9.70 min

Subsection: Unit Hydrograph Summary
Label: DA 2-2 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	2.91 min
Area (User Defined)	0.12 acres
Computational Time Increment	0.39 min
Time to Peak (Computed)	65.57 min
Flow (Peak, Computed)	0.08 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	66.00 min
Flow (Peak Interpolated Output)	0.07 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.12 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	75.39 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	76.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	2.91 min
Computational Time Increment	0.39 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	2.80 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-2 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.94 min
Unit receding limb, Tr	7.76 min
Total unit time, Tb	9.70 min

Subsection: Unit Hydrograph Summary
Label: DA 2-2A Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	2.46 min
Area (User Defined)	0.25 acres
Computational Time Increment	0.33 min
Time to Peak (Computed)	64.94 min
Flow (Peak, Computed)	0.77 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.76 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.25 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	938.87 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	947.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	2.46 min
Computational Time Increment	0.33 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	6.91 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-2A Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.64 min
Unit receding limb, Tr	6.56 min
Total unit time, Tb	8.20 min

Subsection: Unit Hydrograph Summary
Label: DA 2-2A Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	2.46 min
Area (User Defined)	0.10 acres
Computational Time Increment	0.33 min
Time to Peak (Computed)	65.60 min
Flow (Peak, Computed)	0.07 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	66.00 min
Flow (Peak Interpolated Output)	0.06 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.10 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	62.83 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	63.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	2.46 min
Computational Time Increment	0.33 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	2.76 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-2A Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.64 min
Unit receding limb, Tr	6.56 min
Total unit time, Tb	8.20 min

Subsection: Unit Hydrograph Summary
Label: DA 2-3 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	1.93 min
Area (User Defined)	0.21 acres
Computational Time Increment	0.26 min
Time to Peak (Computed)	64.85 min
Flow (Peak, Computed)	0.65 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.64 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.21 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	788.65 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	798.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.93 min
Computational Time Increment	0.26 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	7.40 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-3 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.29 min
Unit receding limb, Tr	5.15 min
Total unit time, Tb	6.43 min

Subsection: Unit Hydrograph Summary
Label: DA 2-3 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	1.93 min
Area (User Defined)	0.13 acres
Computational Time Increment	0.26 min
Time to Peak (Computed)	65.36 min
Flow (Peak, Computed)	0.09 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	66.00 min
Flow (Peak Interpolated Output)	0.08 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.13 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	81.68 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	82.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.93 min
Computational Time Increment	0.26 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	4.58 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-3 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	1.29 min
Unit receding limb, T_r	5.15 min
Total unit time, T_b	6.43 min

Subsection: Unit Hydrograph Summary
Label: DA 2-5 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	0.70 min
Area (User Defined)	0.06 acres
Computational Time Increment	0.09 min
Time to Peak (Computed)	64.96 min
Flow (Peak, Computed)	0.19 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.18 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.06 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	225.33 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	223.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.70 min
Computational Time Increment	0.09 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	5.83 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-5 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.47 min
Unit receding limb, Tr	1.87 min
Total unit time, Tb	2.33 min

Subsection: Unit Hydrograph Summary
Label: DA 2-5 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	0.70 min
Area (User Defined)	0.02 acres
Computational Time Increment	0.09 min
Time to Peak (Computed)	65.05 min
Flow (Peak, Computed)	0.02 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.01 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.02 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	12.57 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	12.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.70 min
Computational Time Increment	0.09 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.94 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-5 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.47 min
Unit receding limb, Tr	1.87 min
Total unit time, Tb	2.33 min

Subsection: Unit Hydrograph Summary
Label: DA 2-6 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	2.27 min
Area (User Defined)	0.18 acres
Computational Time Increment	0.30 min
Time to Peak (Computed)	64.77 min
Flow (Peak, Computed)	0.55 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.55 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.18 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	675.99 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	683.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	2.27 min
Computational Time Increment	0.30 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	5.39 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-6 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.51 min
Unit receding limb, Tr	6.05 min
Total unit time, Tb	7.57 min

Subsection: Unit Hydrograph Summary
Label: DA 2-6 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	2.27 min
Area (User Defined)	0.11 acres
Computational Time Increment	0.30 min
Time to Peak (Computed)	65.38 min
Flow (Peak, Computed)	0.07 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	66.00 min
Flow (Peak Interpolated Output)	0.07 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.11 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	69.11 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	70.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	2.27 min
Computational Time Increment	0.30 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	3.29 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-6 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.51 min
Unit receding limb, Tr	6.05 min
Total unit time, Tb	7.57 min

Subsection: Unit Hydrograph Summary
Label: DA 2-7 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	2.32 min
Area (User Defined)	0.12 acres
Computational Time Increment	0.31 min
Time to Peak (Computed)	64.96 min
Flow (Peak, Computed)	0.37 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.36 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.12 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	450.66 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	455.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	2.32 min
Computational Time Increment	0.31 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	3.52 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-7 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.55 min
Unit receding limb, Tr	6.19 min
Total unit time, Tb	7.73 min

Subsection: Unit Hydrograph Summary
Label: DA 2-7 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	2.32 min
Area (User Defined)	0.41 acres
Computational Time Increment	0.31 min
Time to Peak (Computed)	65.58 min
Flow (Peak, Computed)	0.27 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	66.00 min
Flow (Peak Interpolated Output)	0.25 ft ³ /s
Drainage Area	
SCS CN (Composite)	79.8
Area (User Defined)	0.41 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	251.37 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	253.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	2.32 min
Computational Time Increment	0.31 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	12.01 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-7 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	1.55 min
Unit receding limb, Tr	6.19 min
Total unit time, Tb	7.73 min

Subsection: Unit Hydrograph Summary
Label: DA 2-8 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	0.81 min
Area (User Defined)	0.05 acres
Computational Time Increment	0.11 min
Time to Peak (Computed)	64.91 min
Flow (Peak, Computed)	0.15 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.15 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.05 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	187.77 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	186.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.81 min
Computational Time Increment	0.11 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	4.20 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-8 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.54 min
Unit receding limb, Tr	2.16 min
Total unit time, Tb	2.70 min

Subsection: Unit Hydrograph Summary
Label: DA 2-8 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	0.81 min
Area (User Defined)	0.29 acres
Computational Time Increment	0.11 min
Time to Peak (Computed)	65.12 min
Flow (Peak, Computed)	0.15 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.10 ft ³ /s
Drainage Area	
SCS CN (Composite)	77.3
Area (User Defined)	0.29 acres
Maximum Retention (Pervious)	2.9 in
Maximum Retention (Pervious, 20 percent)	0.6 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.1 in
Runoff Volume (Pervious)	128.44 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	126.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.81 min
Computational Time Increment	0.11 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	24.34 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-8 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.54 min
Unit receding limb, Tr	2.16 min
Total unit time, Tb	2.70 min

Subsection: Unit Hydrograph Summary
Label: DA 2-9 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	0.75 min
Area (User Defined)	0.14 acres
Computational Time Increment	0.10 min
Time to Peak (Computed)	65.00 min
Flow (Peak, Computed)	0.43 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.43 ft ³ /s
Drainage Area	
SCS CN (Composite)	98.0
Area (User Defined)	0.14 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	525.77 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	520.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.75 min
Computational Time Increment	0.10 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	12.69 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-9 Impervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.50 min
Unit receding limb, Tr	2.00 min
Total unit time, Tb	2.50 min

Subsection: Unit Hydrograph Summary
Label: DA 2-9 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

Storm Event	WQDS
Return Event	1 years
Duration	4,320.00 min
Depth	1.3 in
Time of Concentration (Composite)	0.75 min
Area (User Defined)	0.02 acres
Computational Time Increment	0.10 min
Time to Peak (Computed)	65.10 min
Flow (Peak, Computed)	0.02 ft ³ /s
Output Increment	3.00 min
Time to Flow (Peak Interpolated Output)	63.00 min
Flow (Peak Interpolated Output)	0.01 ft ³ /s
Drainage Area	
SCS CN (Composite)	80.0
Area (User Defined)	0.02 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.2 in
Runoff Volume (Pervious)	12.57 ft ³
Hydrograph Volume (Area under Hydrograph curve)	
Volume	12.00 ft ³
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.75 min
Computational Time Increment	0.10 min
Unit Hydrograph Shape Factor	483.4
K Factor	0.7
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.81 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: DA 2-9 Pervious
Scenario: WQDS

Return Event: 1 years
Storm Event: WQDS

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.50 min
Unit receding limb, Tr	2.00 min
Total unit time, Tb	2.50 min