Two River Engineering

265 Route 34
P.O. Box 155
Colts Neck, NJ 07722

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Worksheet 2: Runoff curve number and runoff

Project	By	Date
COLTS NECK COMMUNITY CHURCH	AJG	19-Feb-20
Location	**Checked**	**Date**
TOWNSHIP OF COLTS NECK, MONMOUTH COUNTY	AJG	19-Feb-20

Check one: ☐ Present ☒ Developed — P-1, PROPOSED CONDITIONS (PERVIOUS)

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	CN[1] Figure 2-3	CN[1] Figure 2-4	Area ☒ acres ☐ mi² ☐ %	Product of CN x Area
FnA 'B'	GRASS	61			0.56	34.16
ToA 'A'	GRASS	39			2.10	81.90
				Totals ➡	2.66	116.06

1. Use only one CN source per line

$$\text{CN (weighted)} = \frac{\text{tot.prod.}}{\text{tot. area}} = \frac{116.06}{2.66} = 43.6 \; ; \quad \textbf{Use CN} \Rightarrow \; \mathbf{44}$$

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.....	yr	2	10	100
Rainfall, P (24-hour).....	in	3.4	5.3	7.5
Runoff, Q.....	in			

Use P and CN with table 2-1, figure 2-1, or equation 2-3 abd 2-4

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Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project	By	Date
COLTS NECK COMMUNITY CHURCH	AJG	19-Feb-20
Location	**Checked**	**Date**
COLTS NECK, MONMOUTH COUNTY, NEW JERSEY	AJG	19-Feb-20

Check one: [ ] Present [X] Developed — P-1, PROPOSED CONDITIONS (PERVIOUS)

Check one: [X] T_c [ ] T_t through subarea

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 T_c only)

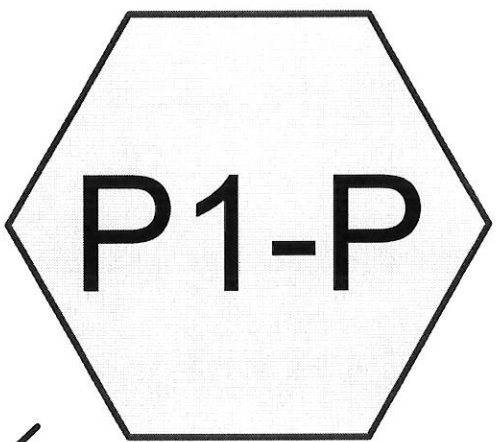
		Segment ID				
1. Surface description (table 3-1)						
2. Manning's roughness coefficient, n (table 3-1)						
3. Flow length, L (total L ≤ 300 ft.)	ft					
4. Two-year 24-hour rainfall, p_2	in					
5. Land slope, s	ft/ft					
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr		+		=	

Shallow Concentrated Flow

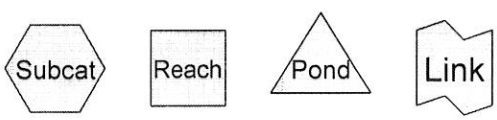
		Segment ID				
7. Surface description (paved or unpaved)						
8. Flow Length, L	ft					
9. Watercourse slope, s	ft/ft					
10. Average velocity, V (figure 3-1)	ft/s					
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr		+		=	

Channel Flow

		Segment ID				
12. Cross sectional flow area, a	ft^2					
13. Wetted perimeter, P_w	ft					
14. Hydraulic radius, $r=a/P_w$ Compute r	ft					
15. Channel slope, s	ft/ft					
16. Manning's roughness coefficient, n						
17. $V = \frac{1.49 r^{2/3} \sqrt{s}}{n}$ Compute V	ft/s					
18. Flow length, L	ft					
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr		+		=	0.00
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)	hr					0.170
	min					10.0



Proposed Drainage Area Pervious



Routing Diagram for CN COMMUNITY CHURCH Proposed 1 - 02-19-20
Prepared by {enter your company name here}, Printed 3/6/2020
HydroCAD® 10.00-24 s/n 08511 © 2018 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.660	44	(P1-P)
2.660	**44**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
2.660	Other	P1-P
2.660		**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1-P: Proposed Drainage Runoff Area=2.660 ac 0.00% Impervious Runoff Depth=0.01"
Tc=10.0 min CN=44 Runoff=0.00 cfs 0.002 af

Total Runoff Area = 2.660 ac Runoff Volume = 0.002 af Average Runoff Depth = 0.01"
100.00% Pervious = 2.660 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment P1-P: Proposed Drainage Area Pervious

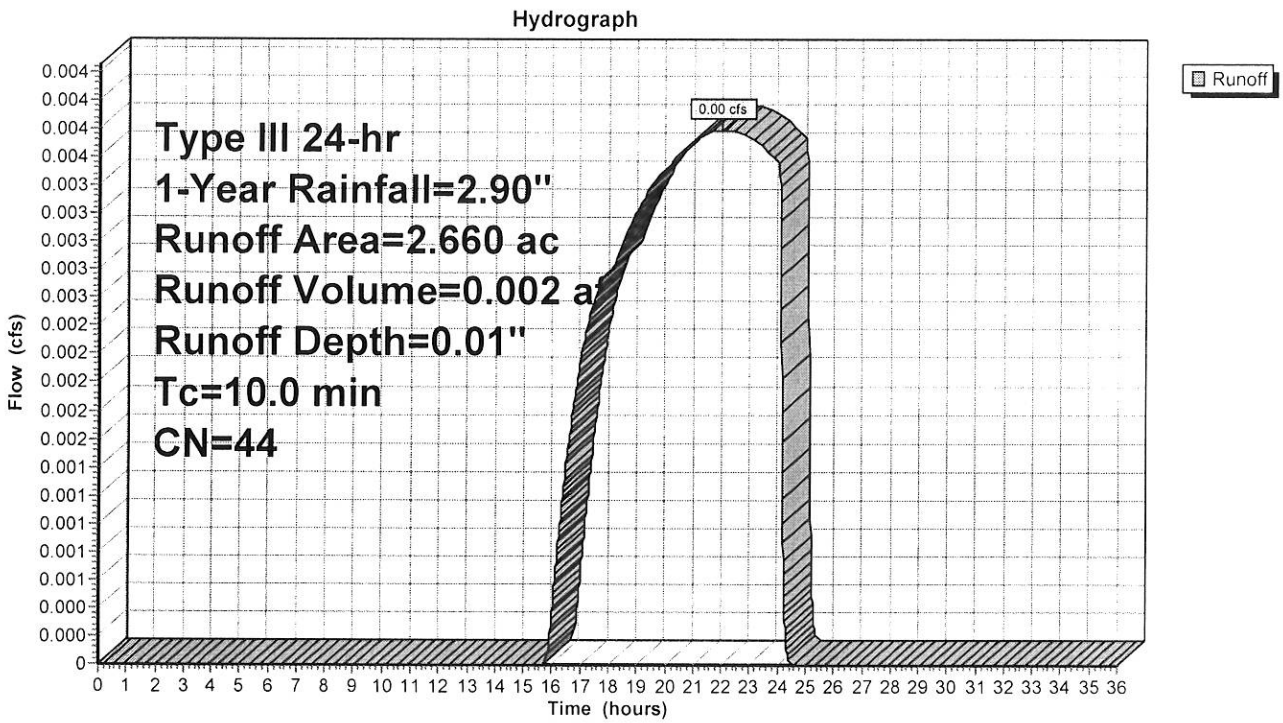
Runoff = 0.00 cfs @ 22.01 hrs, Volume= 0.002 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.90"

	Area (ac)	CN	Description
*	2.660	44	
	2.660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P1-P: Proposed Drainage Area Pervious



Hydrograph for Subcatchment P1-P: Proposed Drainage Area Pervious

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.01	0.00	0.00
1.00	0.03	0.00	0.00
1.50	0.04	0.00	0.00
2.00	0.06	0.00	0.00
2.50	0.07	0.00	0.00
3.00	0.09	0.00	0.00
3.50	0.11	0.00	0.00
4.00	0.12	0.00	0.00
4.50	0.14	0.00	0.00
5.00	0.16	0.00	0.00
5.50	0.19	0.00	0.00
6.00	0.21	0.00	0.00
6.50	0.23	0.00	0.00
7.00	0.26	0.00	0.00
7.50	0.29	0.00	0.00
8.00	0.33	0.00	0.00
8.50	0.37	0.00	0.00
9.00	0.42	0.00	0.00
9.50	0.48	0.00	0.00
10.00	0.55	0.00	0.00
10.50	0.63	0.00	0.00
11.00	0.73	0.00	0.00
11.50	0.86	0.00	0.00
12.00	1.45	0.00	0.00
12.50	2.04	0.00	0.00
13.00	2.18	0.00	0.00
13.50	2.27	0.00	0.00
14.00	2.35	0.00	0.00
14.50	2.42	0.00	0.00
15.00	2.48	0.00	0.00
15.50	2.53	0.00	0.00
16.00	2.57	0.00	0.00
16.50	2.61	0.00	0.00
17.00	2.64	0.00	0.00
17.50	2.67	0.00	0.00
18.00	2.69	0.00	0.00
18.50	2.71	0.00	0.00
19.00	2.74	0.00	0.00
19.50	2.76	0.00	0.00
20.00	2.78	0.00	0.00
20.50	2.79	0.00	0.00
21.00	2.81	0.01	0.00
21.50	2.83	0.01	0.00
22.00	2.84	0.01	**0.00**
22.50	2.86	0.01	**0.00**
23.00	2.87	0.01	0.00
23.50	2.89	0.01	0.00
24.00	**2.90**	**0.01**	0.00
24.50	2.90	0.01	0.00
25.00	2.90	0.01	0.00
25.50	2.90	0.01	0.00
26.00	2.90	0.01	0.00
26.50	2.90	0.01	0.00
27.00	2.90	0.01	0.00
27.50	2.90	0.01	0.00
28.00	2.90	0.01	0.00
28.50	2.90	0.01	0.00
29.00	2.90	0.01	0.00
29.50	2.90	0.01	0.00
30.00	2.90	0.01	0.00
30.50	2.90	0.01	0.00
31.00	2.90	0.01	0.00
31.50	2.90	0.01	0.00
32.00	2.90	0.01	0.00
32.50	2.90	0.01	0.00
33.00	2.90	0.01	0.00
33.50	2.90	0.01	0.00
34.00	2.90	0.01	0.00
34.50	2.90	0.01	0.00
35.00	2.90	0.01	0.00
35.50	2.90	0.01	0.00
36.00	2.90	0.01	0.00

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1-P: Proposed Drainage Runoff Area=2.660 ac 0.00% Impervious Runoff Depth=0.05"
Tc=10.0 min CN=44 Runoff=0.02 cfs 0.012 af

Total Runoff Area = 2.660 ac Runoff Volume = 0.012 af Average Runoff Depth = 0.05"
100.00% Pervious = 2.660 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment P1-P: Proposed Drainage Area Pervious

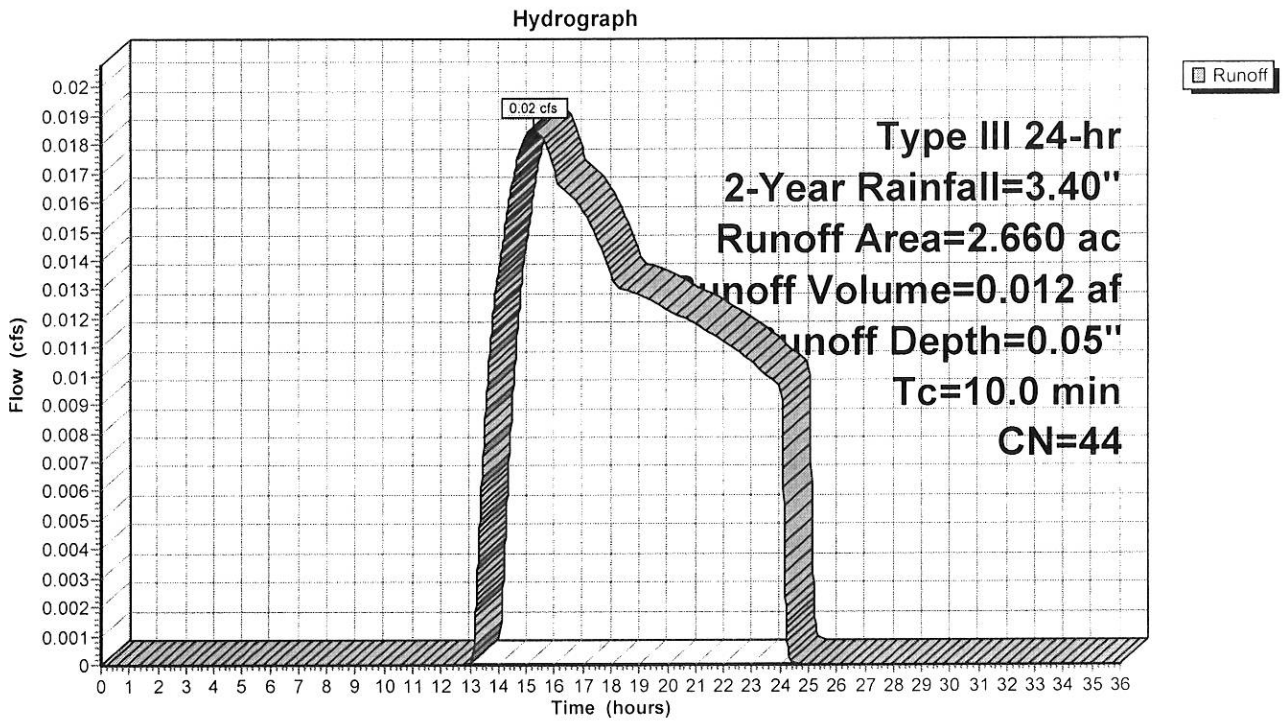
Runoff = 0.02 cfs @ 15.28 hrs, Volume= 0.012 af, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
*	2.660	44	
	2.660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P1-P: Proposed Drainage Area Pervious



Hydrograph for Subcatchment P1-P: Proposed Drainage Area Pervious

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	3.40	0.05	0.00
0.50	0.02	0.00	0.00	26.50	3.40	0.05	0.00
1.00	0.03	0.00	0.00	27.00	3.40	0.05	0.00
1.50	0.05	0.00	0.00	27.50	3.40	0.05	0.00
2.00	0.07	0.00	0.00	28.00	3.40	0.05	0.00
2.50	0.09	0.00	0.00	28.50	3.40	0.05	0.00
3.00	0.10	0.00	0.00	29.00	3.40	0.05	0.00
3.50	0.12	0.00	0.00	29.50	3.40	0.05	0.00
4.00	0.15	0.00	0.00	30.00	3.40	0.05	0.00
4.50	0.17	0.00	0.00	30.50	3.40	0.05	0.00
5.00	0.19	0.00	0.00	31.00	3.40	0.05	0.00
5.50	0.22	0.00	0.00	31.50	3.40	0.05	0.00
6.00	0.24	0.00	0.00	32.00	3.40	0.05	0.00
6.50	0.27	0.00	0.00	32.50	3.40	0.05	0.00
7.00	0.31	0.00	0.00	33.00	3.40	0.05	0.00
7.50	0.35	0.00	0.00	33.50	3.40	0.05	0.00
8.00	0.39	0.00	0.00	34.00	3.40	0.05	0.00
8.50	0.44	0.00	0.00	34.50	3.40	0.05	0.00
9.00	0.50	0.00	0.00	35.00	3.40	0.05	0.00
9.50	0.56	0.00	0.00	35.50	3.40	0.05	0.00
10.00	0.64	0.00	0.00	36.00	3.40	0.05	0.00
10.50	0.74	0.00	0.00				
11.00	0.85	0.00	0.00				
11.50	1.01	0.00	0.00				
12.00	1.70	0.00	0.00				
12.50	2.39	0.00	0.00				
13.00	2.55	0.00	0.00				
13.50	2.66	0.00	0.01				
14.00	2.76	0.00	0.01				
14.50	2.84	0.01	0.02				
15.00	2.90	0.01	**0.02**				
15.50	2.96	0.01	**0.02**				
16.00	3.01	0.02	0.02				
16.50	3.05	0.02	0.02				
17.00	3.09	0.02	0.02				
17.50	3.13	0.03	0.01				
18.00	3.16	0.03	0.01				
18.50	3.18	0.03	0.01				
19.00	3.21	0.03	0.01				
19.50	3.23	0.04	0.01				
20.00	3.25	0.04	0.01				
20.50	3.28	0.04	0.01				
21.00	3.30	0.04	0.01				
21.50	3.32	0.04	0.01				
22.00	3.33	0.05	0.01				
22.50	3.35	0.05	0.01				
23.00	3.37	0.05	0.01				
23.50	3.39	0.05	0.01				
24.00	**3.40**	**0.05**	0.01				
24.50	3.40	0.05	0.00				
25.00	3.40	0.05	0.00				
25.50	3.40	0.05	0.00				

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1-P: Proposed Drainage Runoff Area=2.660 ac 0.00% Impervious Runoff Depth=0.46"
Tc=10.0 min CN=44 Runoff=0.53 cfs 0.102 af

Total Runoff Area = 2.660 ac Runoff Volume = 0.102 af Average Runoff Depth = 0.46"
100.00% Pervious = 2.660 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment P1-P: Proposed Drainage Area Pervious

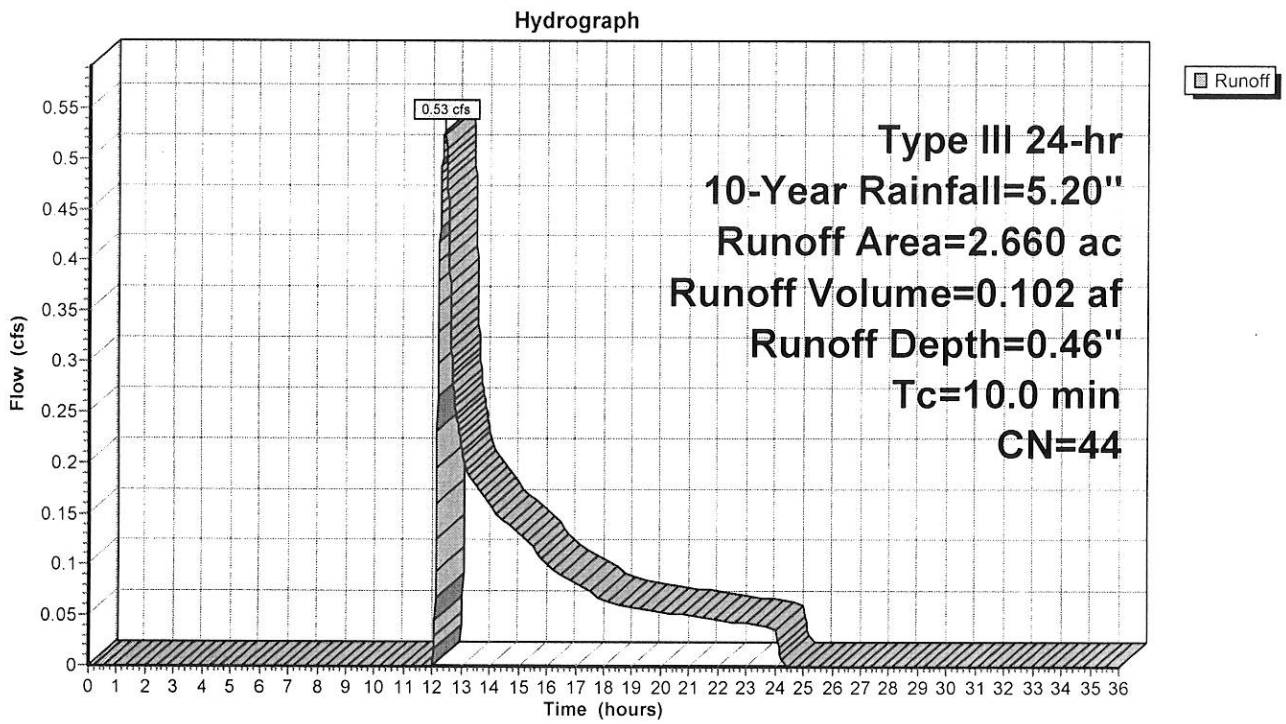
Runoff = 0.53 cfs @ 12.37 hrs, Volume= 0.102 af, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

	Area (ac)	CN	Description
*	2.660	44	
	2.660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P1-P: Proposed Drainage Area Pervious



Hydrograph for Subcatchment P1-P: Proposed Drainage Area Pervious

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	5.20	0.46	0.00
0.50	0.03	0.00	0.00	26.50	5.20	0.46	0.00
1.00	0.05	0.00	0.00	27.00	5.20	0.46	0.00
1.50	0.08	0.00	0.00	27.50	5.20	0.46	0.00
2.00	0.10	0.00	0.00	28.00	5.20	0.46	0.00
2.50	0.13	0.00	0.00	28.50	5.20	0.46	0.00
3.00	0.16	0.00	0.00	29.00	5.20	0.46	0.00
3.50	0.19	0.00	0.00	29.50	5.20	0.46	0.00
4.00	0.22	0.00	0.00	30.00	5.20	0.46	0.00
4.50	0.26	0.00	0.00	30.50	5.20	0.46	0.00
5.00	0.30	0.00	0.00	31.00	5.20	0.46	0.00
5.50	0.33	0.00	0.00	31.50	5.20	0.46	0.00
6.00	0.37	0.00	0.00	32.00	5.20	0.46	0.00
6.50	0.42	0.00	0.00	32.50	5.20	0.46	0.00
7.00	0.47	0.00	0.00	33.00	5.20	0.46	0.00
7.50	0.53	0.00	0.00	33.50	5.20	0.46	0.00
8.00	0.59	0.00	0.00	34.00	5.20	0.46	0.00
8.50	0.67	0.00	0.00	34.50	5.20	0.46	0.00
9.00	0.76	0.00	0.00	35.00	5.20	0.46	0.00
9.50	0.86	0.00	0.00	35.50	5.20	0.46	0.00
10.00	0.98	0.00	0.00	36.00	5.20	0.46	0.00
10.50	1.13	0.00	0.00				
11.00	1.30	0.00	0.00				
11.50	1.55	0.00	0.00				
12.00	2.60	0.00	**0.00**				
12.50	3.65	0.09	**0.46**				
13.00	3.90	0.13	0.21				
13.50	4.07	0.16	0.18				
14.00	4.22	0.19	0.16				
14.50	4.34	0.22	0.14				
15.00	4.44	0.25	0.13				
15.50	4.53	0.27	0.12				
16.00	4.61	0.29	0.10				
16.50	4.67	0.30	0.09				
17.00	4.73	0.32	0.08				
17.50	4.78	0.33	0.07				
18.00	4.83	0.35	0.07				
18.50	4.87	0.36	0.06				
19.00	4.90	0.37	0.06				
19.50	4.94	0.38	0.06				
20.00	4.98	0.39	0.05				
20.50	5.01	0.40	0.05				
21.00	5.04	0.41	0.05				
21.50	5.07	0.42	0.05				
22.00	5.10	0.43	0.05				
22.50	5.13	0.44	0.04				
23.00	5.15	0.44	0.04				
23.50	5.18	0.45	0.04				
24.00	**5.20**	**0.46**	0.04				
24.50	5.20	0.46	0.00				
25.00	5.20	0.46	0.00				
25.50	5.20	0.46	0.00				

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1-P: Proposed Drainage Runoff Area=2.660 ac 0.00% Impervious Runoff Depth=0.94"
Tc=10.0 min CN=44 Runoff=1.63 cfs 0.208 af

Total Runoff Area = 2.660 ac Runoff Volume = 0.208 af Average Runoff Depth = 0.94"
100.00% Pervious = 2.660 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment P1-P: Proposed Drainage Area Pervious

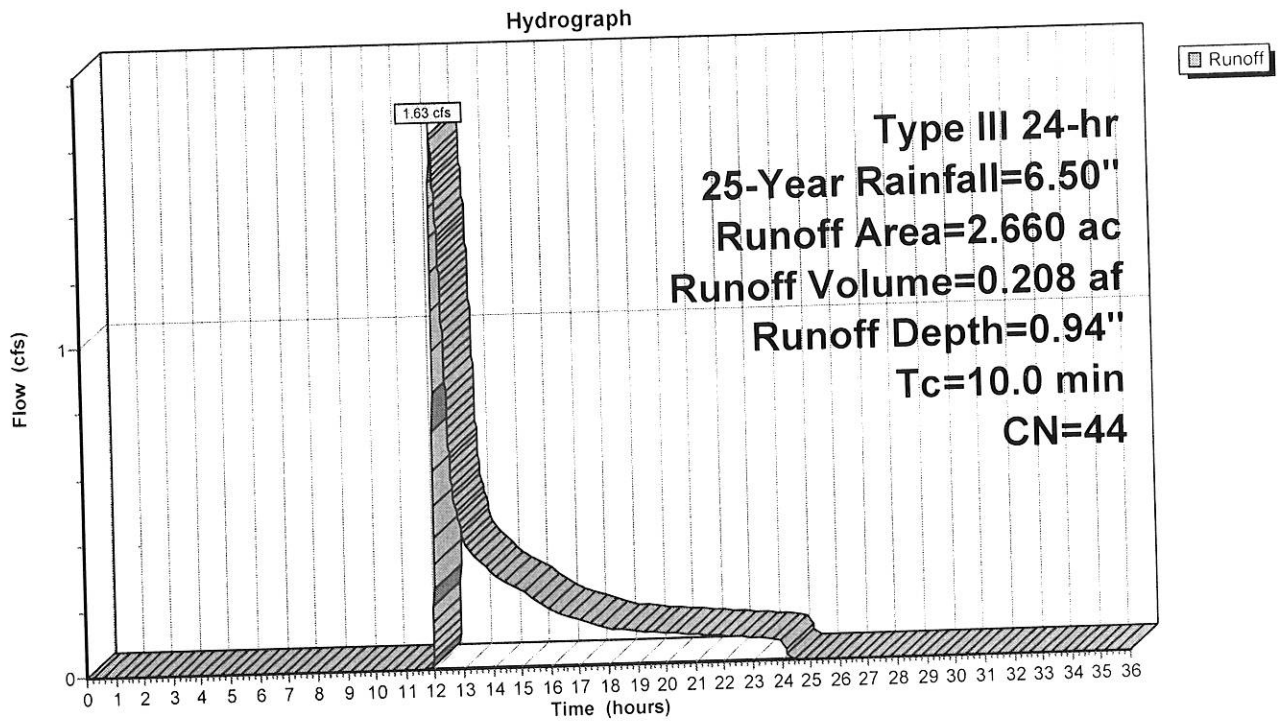
Runoff = 1.63 cfs @ 12.19 hrs, Volume= 0.208 af, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.50"

	Area (ac)	CN	Description
*	2.660	44	
	2.660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P1-P: Proposed Drainage Area Pervious



Hydrograph for Subcatchment P1-P: Proposed Drainage Area Pervious

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00
1.00	0.07	0.00	0.00
1.50	0.10	0.00	0.00
2.00	0.13	0.00	0.00
2.50	0.16	0.00	0.00
3.00	0.20	0.00	0.00
3.50	0.24	0.00	0.00
4.00	0.28	0.00	0.00
4.50	0.32	0.00	0.00
5.00	0.37	0.00	0.00
5.50	0.42	0.00	0.00
6.00	0.47	0.00	0.00
6.50	0.52	0.00	0.00
7.00	0.59	0.00	0.00
7.50	0.66	0.00	0.00
8.00	0.74	0.00	0.00
8.50	0.83	0.00	0.00
9.00	0.95	0.00	0.00
9.50	1.08	0.00	0.00
10.00	1.23	0.00	0.00
10.50	1.41	0.00	0.00
11.00	1.63	0.00	0.00
11.50	1.94	0.00	0.00
12.00	3.25	0.04	**0.14**
12.50	4.56	0.28	**1.03**
13.00	4.87	0.36	0.42
13.50	5.09	0.42	0.34
14.00	5.27	0.48	0.29
14.50	5.42	0.53	0.26
15.00	5.55	0.57	0.23
15.50	5.67	0.61	0.21
16.00	5.76	0.65	0.17
16.50	5.84	0.68	0.16
17.00	5.91	0.70	0.14
17.50	5.98	0.73	0.13
18.00	6.03	0.75	0.11
18.50	6.08	0.77	0.10
19.00	6.13	0.79	0.10
19.50	6.18	0.81	0.10
20.00	6.22	0.82	0.09
20.50	6.26	0.84	0.09
21.00	6.30	0.86	0.08
21.50	6.34	0.87	0.08
22.00	6.37	0.89	0.08
22.50	6.41	0.90	0.07
23.00	6.44	0.91	0.07
23.50	6.47	0.93	0.07
24.00	**6.50**	**0.94**	0.06
24.50	6.50	0.94	0.00
25.00	6.50	0.94	0.00
25.50	6.50	0.94	0.00
26.00	6.50	0.94	0.00
26.50	6.50	0.94	0.00
27.00	6.50	0.94	0.00
27.50	6.50	0.94	0.00
28.00	6.50	0.94	0.00
28.50	6.50	0.94	0.00
29.00	6.50	0.94	0.00
29.50	6.50	0.94	0.00
30.00	6.50	0.94	0.00
30.50	6.50	0.94	0.00
31.00	6.50	0.94	0.00
31.50	6.50	0.94	0.00
32.00	6.50	0.94	0.00
32.50	6.50	0.94	0.00
33.00	6.50	0.94	0.00
33.50	6.50	0.94	0.00
34.00	6.50	0.94	0.00
34.50	6.50	0.94	0.00
35.00	6.50	0.94	0.00
35.50	6.50	0.94	0.00
36.00	6.50	0.94	0.00

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1-P: Proposed Drainage Runoff Area=2.660 ac 0.00% Impervious Runoff Depth=2.12"
Tc=10.0 min CN=44 Runoff=4.96 cfs 0.469 af

Total Runoff Area = 2.660 ac Runoff Volume = 0.469 af Average Runoff Depth = 2.12"
100.00% Pervious = 2.660 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment P1-P: Proposed Drainage Area Pervious

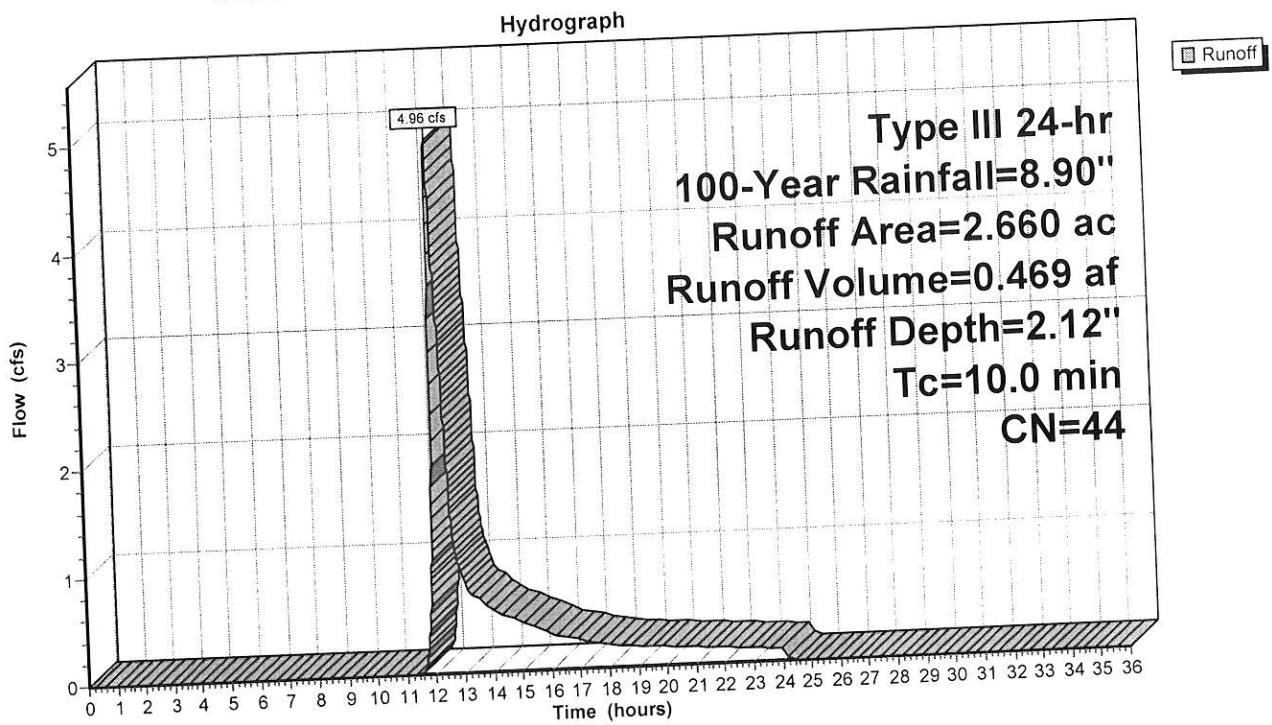
Runoff = 4.96 cfs @ 12.16 hrs, Volume= 0.469 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

	Area (ac)	CN	Description
*	2.660	44	
	2.660		100.00% Pervious Area

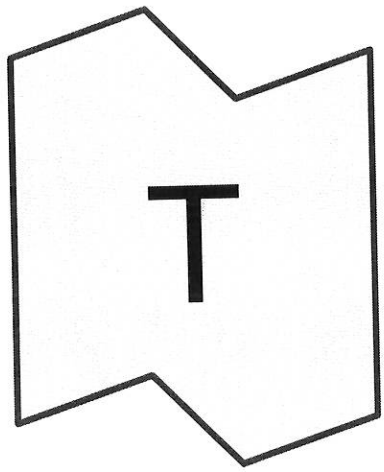
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Subcatchment P1-P: Proposed Drainage Area Pervious

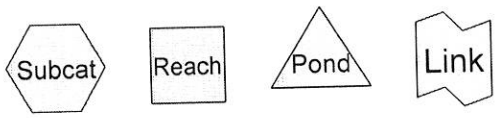


Hydrograph for Subcatchment P1-P: Proposed Drainage Area Pervious

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	8.90	2.12	0.00
0.50	0.04	0.00	0.00	26.50	8.90	2.12	0.00
1.00	0.09	0.00	0.00	27.00	8.90	2.12	0.00
1.50	0.13	0.00	0.00	27.50	8.90	2.12	0.00
2.00	0.18	0.00	0.00	28.00	8.90	2.12	0.00
2.50	0.22	0.00	0.00	28.50	8.90	2.12	0.00
3.00	0.27	0.00	0.00	29.00	8.90	2.12	0.00
3.50	0.33	0.00	0.00	29.50	8.90	2.12	0.00
4.00	0.38	0.00	0.00	30.00	8.90	2.12	0.00
4.50	0.44	0.00	0.00	30.50	8.90	2.12	0.00
5.00	0.51	0.00	0.00	31.00	8.90	2.12	0.00
5.50	0.57	0.00	0.00	31.50	8.90	2.12	0.00
6.00	0.64	0.00	0.00	32.00	8.90	2.12	0.00
6.50	0.72	0.00	0.00	32.50	8.90	2.12	0.00
7.00	0.81	0.00	0.00	33.00	8.90	2.12	0.00
7.50	0.90	0.00	0.00	33.50	8.90	2.12	0.00
8.00	1.01	0.00	0.00	34.00	8.90	2.12	0.00
8.50	1.14	0.00	0.00	34.50	8.90	2.12	0.00
9.00	1.30	0.00	0.00	35.00	8.90	2.12	0.00
9.50	1.48	0.00	0.00	35.50	8.90	2.12	0.00
10.00	1.68	0.00	0.00	36.00	8.90	2.12	0.00
10.50	1.93	0.00	0.00				
11.00	2.23	0.00	0.00				
11.50	2.65	0.00	0.00				
12.00	4.45	0.25	**1.58**				
12.50	6.25	0.83	**2.30**				
13.00	6.67	1.01	0.88				
13.50	6.97	1.14	0.69				
14.00	7.22	1.25	0.58				
14.50	7.42	1.35	0.51				
15.00	7.60	1.44	0.45				
15.50	7.76	1.51	0.40				
16.00	7.89	1.58	0.33				
16.50	8.00	1.63	0.29				
17.00	8.09	1.68	0.27				
17.50	8.18	1.73	0.24				
18.00	8.26	1.77	0.21				
18.50	8.33	1.81	0.19				
19.00	8.39	1.84	0.19				
19.50	8.46	1.88	0.18				
20.00	8.52	1.91	0.17				
20.50	8.57	1.94	0.16				
21.00	8.63	1.97	0.16				
21.50	8.68	1.99	0.15				
22.00	8.73	2.02	0.14				
22.50	8.78	2.05	0.14				
23.00	8.82	2.07	0.13				
23.50	8.86	2.09	0.12				
24.00	**8.90**	**2.12**	0.11				
24.50	8.90	2.12	0.00				
25.00	8.90	2.12	0.00				
25.50	8.90	2.12	0.00				



Combined Hydrograph



Routing Diagram for CN COMMUNITY CHURCH Proposed 1 - 02-19-20
Prepared by {enter your company name here}, Printed 4/7/2020
HydroCAD® 10.00-24 s/n 08511 © 2018 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.000	**0**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.000		**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Link T: Combined Hydrograph

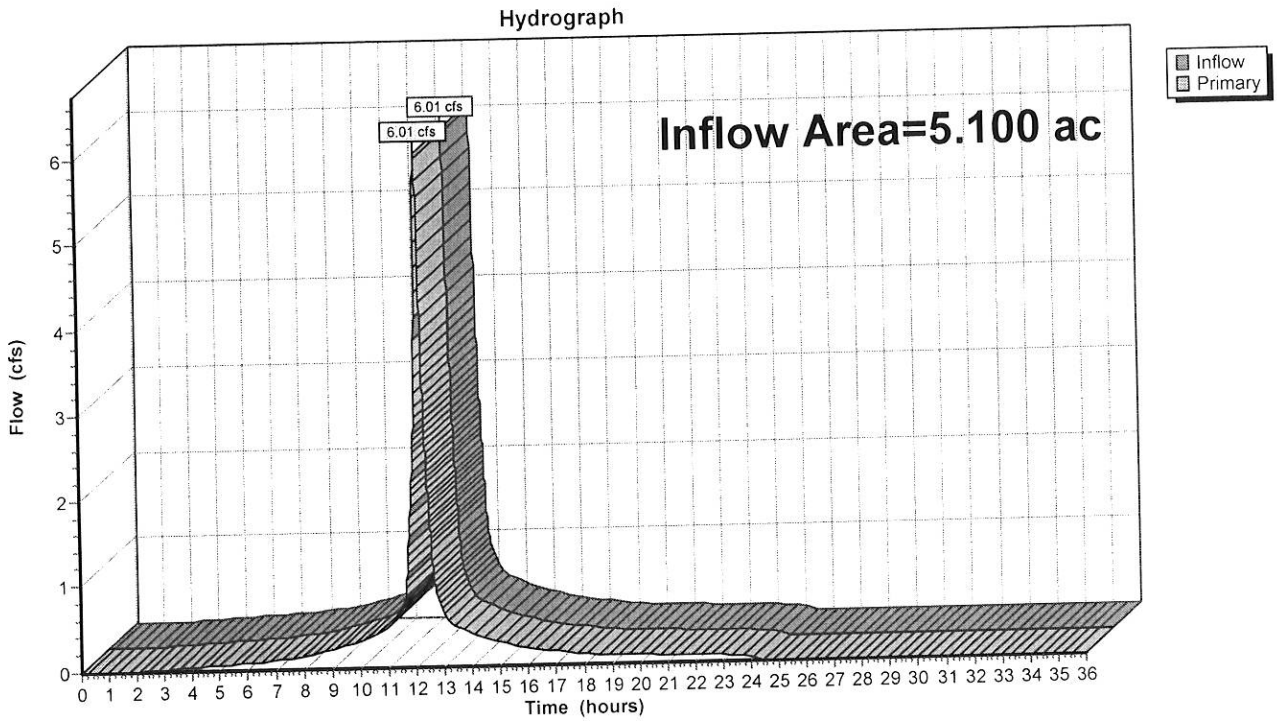
Inflow=6.01 cfs 0.545 af
Primary=6.01 cfs 0.545 af

Summary for Link T: Combined Hydrograph

Inflow Area = 5.100 ac, 47.84% Impervious, Inflow Depth = 1.28" for 1-Year event
Inflow = 6.01 cfs @ 12.13 hrs, Volume= 0.545 af
Primary = 6.01 cfs @ 12.13 hrs, Volume= 0.545 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link T: Combined Hydrograph



Hydrograph for Link T: Combined Hydrograph

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	**0.00**	0.00
0.50	0.00	0.00	0.00
1.00	0.00	0.00	0.00
1.50	0.00	0.00	0.00
2.00	0.01	0.00	0.01
2.50	0.02	0.00	0.02
3.00	0.03	0.00	0.03
3.50	0.03	0.00	0.03
4.00	0.04	0.00	0.04
4.50	0.05	0.00	0.05
5.00	0.06	0.00	0.06
5.50	0.07	0.00	0.07
6.00	0.08	0.00	0.08
6.50	0.09	0.00	0.09
7.00	0.11	0.00	0.11
7.50	0.13	0.00	0.13
8.00	0.15	0.00	0.15
8.50	0.18	0.00	0.18
9.00	0.22	0.00	0.22
9.50	0.26	0.00	0.26
10.00	0.31	0.00	0.31
10.50	0.38	0.00	0.38
11.00	0.47	0.00	0.47
11.50	0.72	0.00	0.72
12.00	**3.20**	0.00	**3.20**
12.50	**1.82**	0.00	**1.82**
13.00	0.62	0.00	0.62
13.50	0.46	0.00	0.46
14.00	0.37	0.00	0.37
14.50	0.32	0.00	0.32
15.00	0.28	0.00	0.28
15.50	0.24	0.00	0.24
16.00	0.20	0.00	0.20
16.50	0.17	0.00	0.17
17.00	0.16	0.00	0.16
17.50	0.14	0.00	0.14
18.00	0.12	0.00	0.12
18.50	0.11	0.00	0.11
19.00	0.11	0.00	0.11
19.50	0.10	0.00	0.10
20.00	0.10	0.00	0.10
20.50	0.09	0.00	0.09
21.00	0.09	0.00	0.09
21.50	0.09	0.00	0.09
22.00	0.08	0.00	0.08
22.50	0.08	0.00	0.08
23.00	0.07	0.00	0.07
23.50	0.07	0.00	0.07
24.00	0.07	0.00	0.07
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00
30.50	0.00	0.00	0.00
31.00	0.00	0.00	0.00
31.50	0.00	0.00	0.00
32.00	0.00	0.00	0.00
32.50	0.00	0.00	0.00
33.00	0.00	0.00	0.00
33.50	0.00	0.00	0.00
34.00	0.00	0.00	0.00
34.50	0.00	0.00	0.00
35.00	0.00	0.00	0.00
35.50	0.00	0.00	0.00
36.00	0.00	0.00	0.00

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Link T: Combined Hydrograph

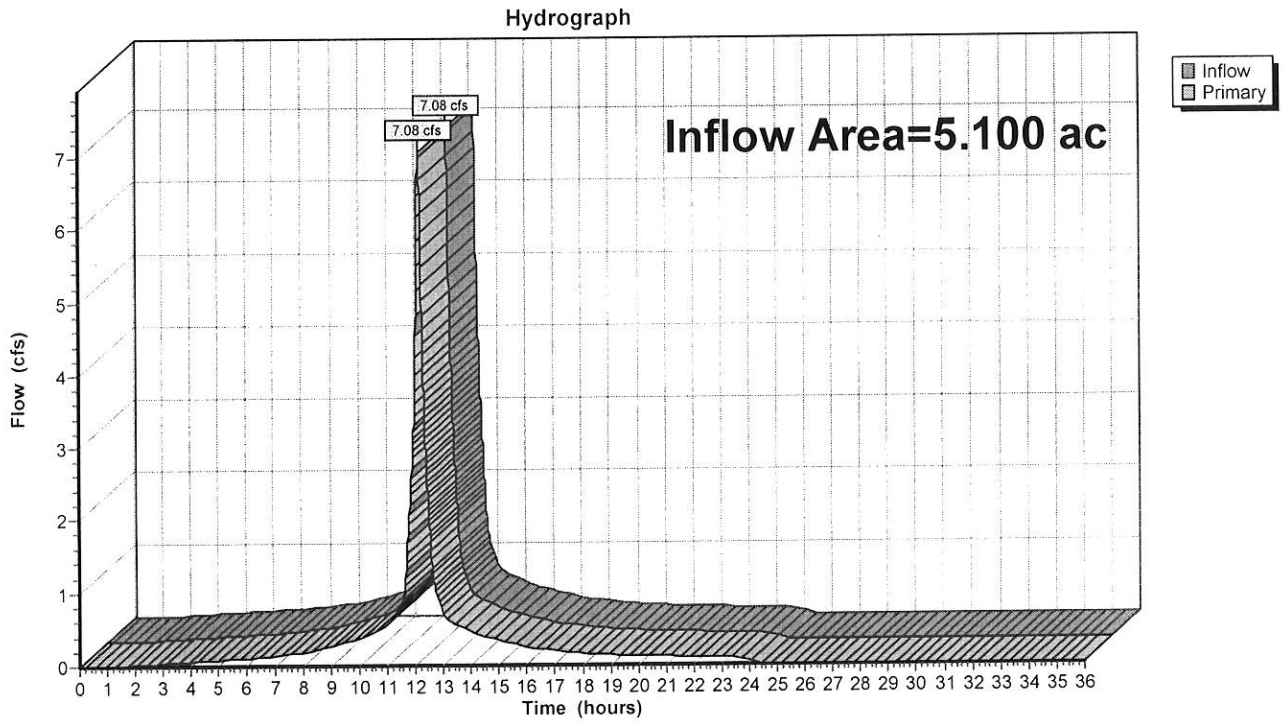
Inflow=7.08 cfs 0.656 af
Primary=7.08 cfs 0.656 af

Summary for Link T: Combined Hydrograph

Inflow Area = 5.100 ac, 47.84% Impervious, Inflow Depth = 1.54" for 2-Year event
Inflow = 7.08 cfs @ 12.13 hrs, Volume= 0.656 af
Primary = 7.08 cfs @ 12.13 hrs, Volume= 0.656 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link T: Combined Hydrograph



Hydrograph for Link T: Combined Hydrograph

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	**0.00**	0.00
0.50	0.00	0.00	0.00
1.00	0.00	0.00	0.00
1.50	0.00	0.00	0.00
2.00	0.02	0.00	0.02
2.50	0.03	0.00	0.03
3.00	0.04	0.00	0.04
3.50	0.05	0.00	0.05
4.00	0.06	0.00	0.06
4.50	0.07	0.00	0.07
5.00	0.08	0.00	0.08
5.50	0.09	0.00	0.09
6.00	0.10	0.00	0.10
6.50	0.11	0.00	0.11
7.00	0.14	0.00	0.14
7.50	0.16	0.00	0.16
8.00	0.18	0.00	0.18
8.50	0.22	0.00	0.22
9.00	0.27	0.00	0.27
9.50	0.32	0.00	0.32
10.00	0.37	0.00	0.37
10.50	0.45	0.00	0.45
11.00	0.55	0.00	0.55
11.50	0.85	0.00	0.85
12.00	**3.78**	0.00	**3.78**
12.50	**2.14**	0.00	**2.14**
13.00	0.73	0.00	0.73
13.50	0.55	0.00	0.55
14.00	0.45	0.00	0.45
14.50	0.39	0.00	0.39
15.00	0.35	0.00	0.35
15.50	0.30	0.00	0.30
16.00	0.25	0.00	0.25
16.50	0.22	0.00	0.22
17.00	0.20	0.00	0.20
17.50	0.18	0.00	0.18
18.00	0.15	0.00	0.15
18.50	0.14	0.00	0.14
19.00	0.14	0.00	0.14
19.50	0.13	0.00	0.13
20.00	0.12	0.00	0.12
20.50	0.12	0.00	0.12
21.00	0.11	0.00	0.11
21.50	0.11	0.00	0.11
22.00	0.10	0.00	0.10
22.50	0.10	0.00	0.10
23.00	0.09	0.00	0.09
23.50	0.09	0.00	0.09
24.00	0.08	0.00	0.08
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00
30.50	0.00	0.00	0.00
31.00	0.00	0.00	0.00
31.50	0.00	0.00	0.00
32.00	0.00	0.00	0.00
32.50	0.00	0.00	0.00
33.00	0.00	0.00	0.00
33.50	0.00	0.00	0.00
34.00	0.00	0.00	0.00
34.50	0.00	0.00	0.00
35.00	0.00	0.00	0.00
35.50	0.00	0.00	0.00
36.00	0.00	0.00	0.00

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Link T: Combined Hydrograph

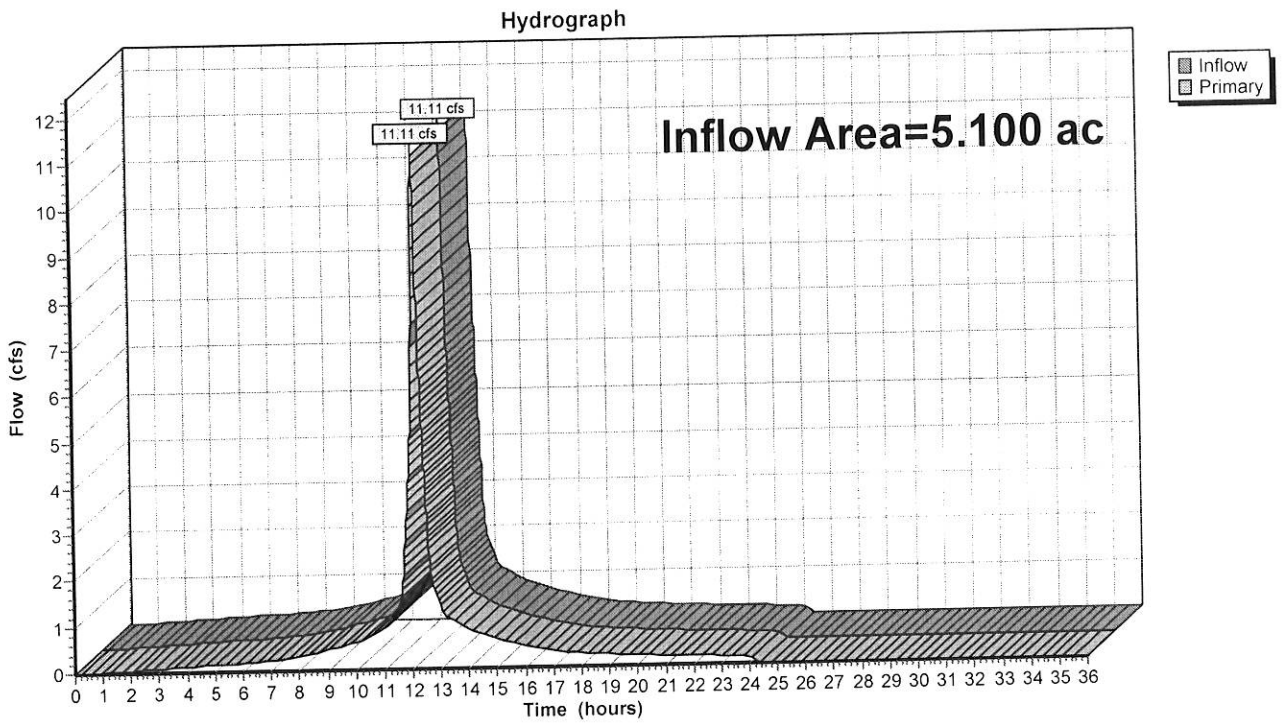
Inflow=11.11 cfs 1.111 af
Primary=11.11 cfs 1.111 af

Summary for Link T: Combined Hydrograph

Inflow Area = 5.100 ac, 47.84% Impervious, Inflow Depth = 2.61" for 10-Year event
Inflow = 11.11 cfs @ 12.14 hrs, Volume= 1.111 af
Primary = 11.11 cfs @ 12.14 hrs, Volume= 1.111 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link T: Combined Hydrograph



Hydrograph for Link T: Combined Hydrograph

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	**0.00**	0.00
0.50	0.00	0.00	0.00
1.00	0.00	0.00	0.00
1.50	0.03	0.00	0.03
2.00	0.05	0.00	0.05
2.50	0.07	0.00	0.07
3.00	0.08	0.00	0.08
3.50	0.10	0.00	0.10
4.00	0.12	0.00	0.12
4.50	0.13	0.00	0.13
5.00	0.14	0.00	0.14
5.50	0.16	0.00	0.16
6.00	0.17	0.00	0.17
6.50	0.20	0.00	0.20
7.00	0.23	0.00	0.23
7.50	0.26	0.00	0.26
8.00	0.30	0.00	0.30
8.50	0.36	0.00	0.36
9.00	0.43	0.00	0.43
9.50	0.51	0.00	0.51
10.00	0.58	0.00	0.58
10.50	0.71	0.00	0.71
11.00	0.87	0.00	0.87
11.50	1.32	0.00	1.32
12.00	**5.84**	0.00	**5.84**
12.50	**3.75**	0.00	**3.75**
13.00	1.33	0.00	1.33
13.50	1.00	0.00	1.00
14.00	0.83	0.00	0.83
14.50	0.72	0.00	0.72
15.00	0.63	0.00	0.63
15.50	0.54	0.00	0.54
16.00	0.45	0.00	0.45
16.50	0.40	0.00	0.40
17.00	0.36	0.00	0.36
17.50	0.32	0.00	0.32
18.00	0.28	0.00	0.28
18.50	0.26	0.00	0.26
19.00	0.25	0.00	0.25
19.50	0.24	0.00	0.24
20.00	0.22	0.00	0.22
20.50	0.21	0.00	0.21
21.00	0.20	0.00	0.20
21.50	0.20	0.00	0.20
22.00	0.19	0.00	0.19
22.50	0.18	0.00	0.18
23.00	0.17	0.00	0.17
23.50	0.16	0.00	0.16
24.00	0.15	0.00	0.15
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00
30.50	0.00	0.00	0.00
31.00	0.00	0.00	0.00
31.50	0.00	0.00	0.00
32.00	0.00	0.00	0.00
32.50	0.00	0.00	0.00
33.00	0.00	0.00	0.00
33.50	0.00	0.00	0.00
34.00	0.00	0.00	0.00
34.50	0.00	0.00	0.00
35.00	0.00	0.00	0.00
35.50	0.00	0.00	0.00
36.00	0.00	0.00	0.00

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Link T: Combined Hydrograph

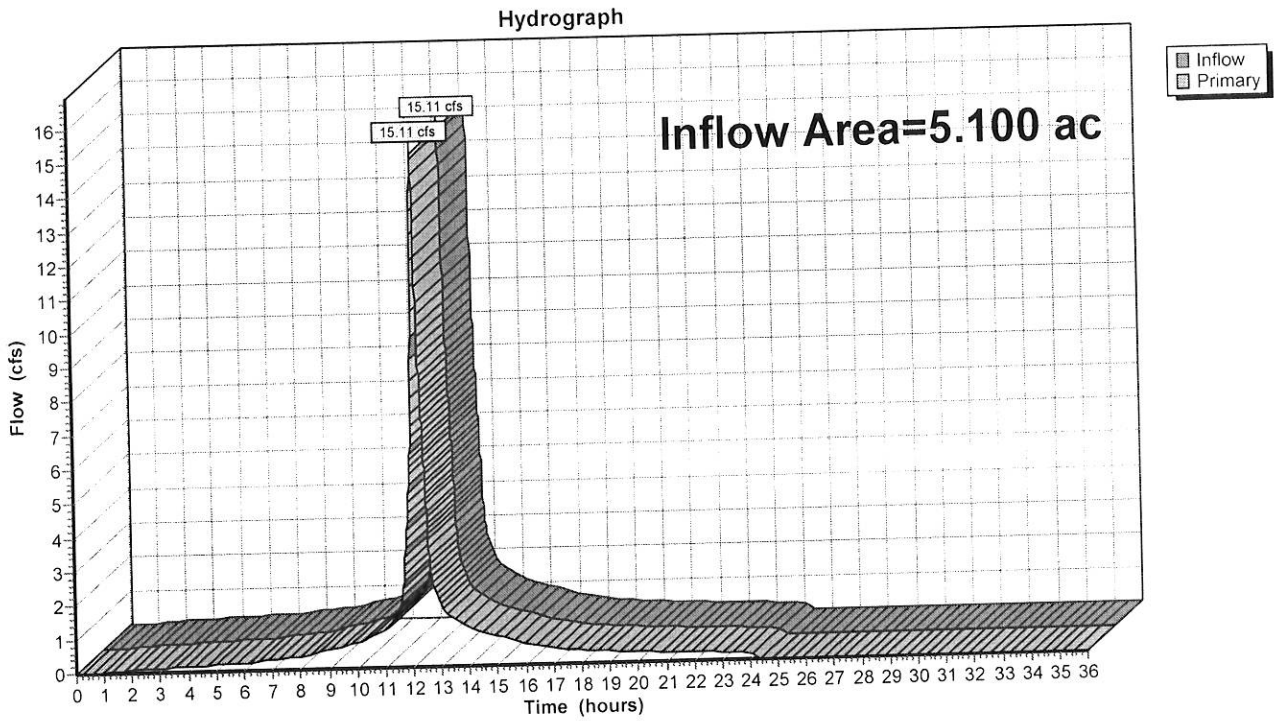
Inflow=15.11 cfs 1.481 af
Primary=15.11 cfs 1.481 af

Summary for Link T: Combined Hydrograph

Inflow Area = 5.100 ac, 47.84% Impervious, Inflow Depth = 3.48" for 25-Year event
Inflow = 15.11 cfs @ 12.14 hrs, Volume= 1.481 af
Primary = 15.11 cfs @ 12.14 hrs, Volume= 1.481 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link T: Combined Hydrograph



Hydrograph for Link T: Combined Hydrograph

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	**0.00**	0.00
0.50	0.00	0.00	0.00
1.00	0.02	0.00	0.02
1.50	0.05	0.00	0.05
2.00	0.08	0.00	0.08
2.50	0.10	0.00	0.10
3.00	0.12	0.00	0.12
3.50	0.14	0.00	0.14
4.00	0.16	0.00	0.16
4.50	0.18	0.00	0.18
5.00	0.19	0.00	0.19
5.50	0.21	0.00	0.21
6.00	0.22	0.00	0.22
6.50	0.26	0.00	0.26
7.00	0.30	0.00	0.30
7.50	0.34	0.00	0.34
8.00	0.38	0.00	0.38
8.50	0.46	0.00	0.46
9.00	0.55	0.00	0.55
9.50	0.64	0.00	0.64
10.00	0.74	0.00	0.74
10.50	0.90	0.00	0.90
11.00	1.09	0.00	1.09
11.50	1.66	0.00	1.66
12.00	**7.46**	0.00	**7.46**
12.50	**5.14**	0.00	**5.14**
13.00	1.81	0.00	1.81
13.50	1.37	0.00	1.37
14.00	1.13	0.00	1.13
14.50	0.98	0.00	0.98
15.00	0.86	0.00	0.86
15.50	0.74	0.00	0.74
16.00	0.62	0.00	0.62
16.50	0.54	0.00	0.54
17.00	0.49	0.00	0.49
17.50	0.44	0.00	0.44
18.00	0.38	0.00	0.38
18.50	0.35	0.00	0.35
19.00	0.34	0.00	0.34
19.50	0.32	0.00	0.32
20.00	0.30	0.00	0.30
20.50	0.29	0.00	0.29
21.00	0.28	0.00	0.28
21.50	0.26	0.00	0.26
22.00	0.25	0.00	0.25
22.50	0.24	0.00	0.24
23.00	0.23	0.00	0.23
23.50	0.21	0.00	0.21
24.00	0.20	0.00	0.20
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00
30.50	0.00	0.00	0.00
31.00	0.00	0.00	0.00
31.50	0.00	0.00	0.00
32.00	0.00	0.00	0.00
32.50	0.00	0.00	0.00
33.00	0.00	0.00	0.00
33.50	0.00	0.00	0.00
34.00	0.00	0.00	0.00
34.50	0.00	0.00	0.00
35.00	0.00	0.00	0.00
35.50	0.00	0.00	0.00
36.00	0.00	0.00	0.00

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Link T: Combined Hydrograph

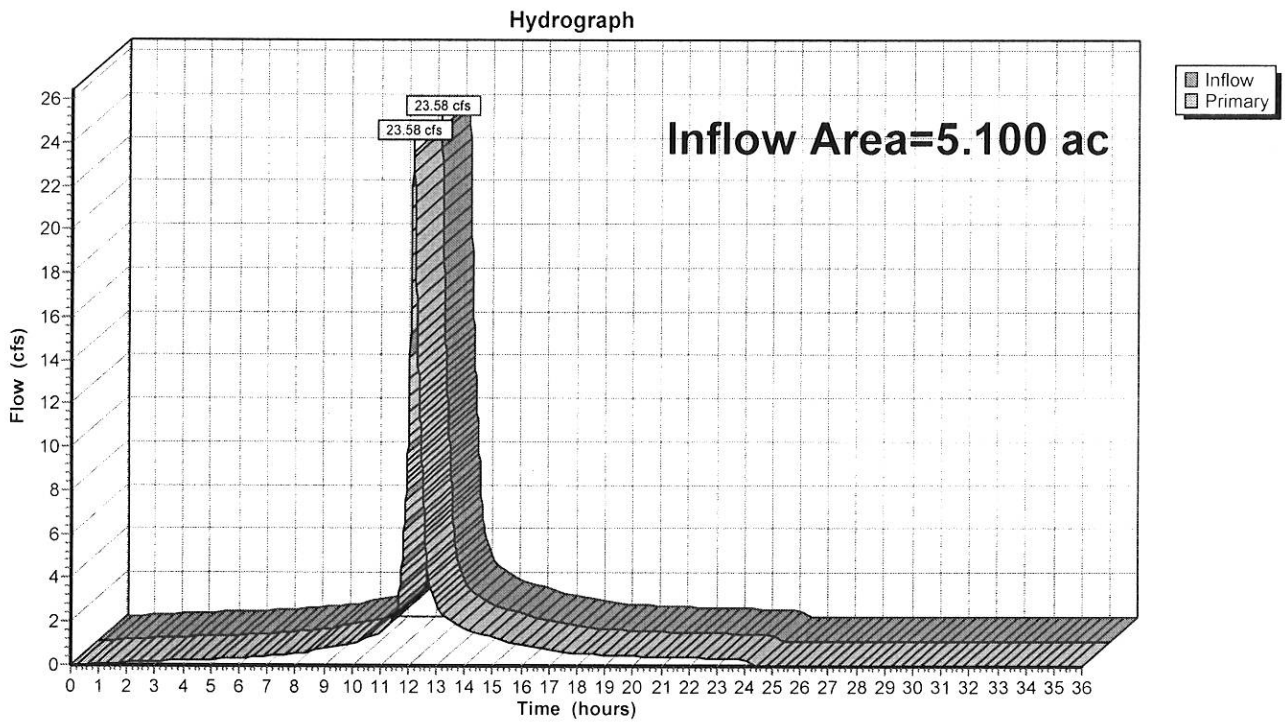
Inflow=23.58 cfs 2.230 af
Primary=23.58 cfs 2.230 af

Summary for Link T: Combined Hydrograph

Inflow Area = 5.100 ac, 47.84% Impervious, Inflow Depth = 5.25" for 100-Year event
Inflow = 23.58 cfs @ 12.14 hrs, Volume= 2.230 af
Primary = 23.58 cfs @ 12.14 hrs, Volume= 2.230 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link T: Combined Hydrograph



Hydrograph for Link T: Combined Hydrograph

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	**0.00**	0.00
0.50	0.00	0.00	0.00
1.00	0.06	0.00	0.06
1.50	0.10	0.00	0.10
2.00	0.13	0.00	0.13
2.50	0.16	0.00	0.16
3.00	0.19	0.00	0.19
3.50	0.21	0.00	0.21
4.00	0.24	0.00	0.24
4.50	0.26	0.00	0.26
5.00	0.28	0.00	0.28
5.50	0.30	0.00	0.30
6.00	0.32	0.00	0.32
6.50	0.37	0.00	0.37
7.00	0.42	0.00	0.42
7.50	0.48	0.00	0.48
8.00	0.53	0.00	0.53
8.50	0.64	0.00	0.64
9.00	0.77	0.00	0.77
9.50	0.89	0.00	0.89
10.00	1.02	0.00	1.02
10.50	1.24	0.00	1.24
11.00	1.50	0.00	1.50
11.50	2.28	0.00	2.28
12.00	**11.63**	0.00	**11.63**
12.50	**7.94**	0.00	**7.94**
13.00	2.79	0.00	2.79
13.50	2.10	0.00	2.10
14.00	1.73	0.00	1.73
14.50	1.50	0.00	1.50
15.00	1.31	0.00	1.31
15.50	1.13	0.00	1.13
16.00	0.94	0.00	0.94
16.50	0.83	0.00	0.83
17.00	0.74	0.00	0.74
17.50	0.66	0.00	0.66
18.00	0.58	0.00	0.58
18.50	0.53	0.00	0.53
19.00	0.51	0.00	0.51
19.50	0.48	0.00	0.48
20.00	0.46	0.00	0.46
20.50	0.44	0.00	0.44
21.00	0.42	0.00	0.42
21.50	0.40	0.00	0.40
22.00	0.38	0.00	0.38
22.50	0.36	0.00	0.36
23.00	0.34	0.00	0.34
23.50	0.32	0.00	0.32
24.00	0.30	0.00	0.30
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00
30.50	0.00	0.00	0.00
31.00	0.00	0.00	0.00
31.50	0.00	0.00	0.00
32.00	0.00	0.00	0.00
32.50	0.00	0.00	0.00
33.00	0.00	0.00	0.00
33.50	0.00	0.00	0.00
34.00	0.00	0.00	0.00
34.50	0.00	0.00	0.00
35.00	0.00	0.00	0.00
35.50	0.00	0.00	0.00
36.00	0.00	0.00	0.00

Two River Engineering

265 Route 34
P.O. Box 155
Colts Neck, NJ 07722

Tel: 732.866.0111
Fax: 732.866.4348

Worksheet 2: Runoff curve number and runoff

Project	By	Date
COLTS NECK COMMUNITY CHURCH	AJG	19-Feb-20
Location	**Checked**	**Date**
TOWNSHIP OF COLTS NECK, MONMOUTH COUNTY	AJG	19-Feb-20

Check one: ☐ Present ☒ Developed — P-2, PROPOSED CONDITIONS (PERVIOUS)

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	CN[1] Figure 2-3	CN[1] Figure 2-4	Area ☒ acres / ☐ mi² / ☐ %	Product of CN x Area
CtE2 'B'	GRASS	61			0.34	20.74
ToA 'A'	GRASS	39			3.95	154.05
				Totals ➡	4.29	174.79

1. Use only one CN source per line

CN (weighted) = tot.prod. / tot. area = 174.79 / 4.29 = 40.7 ; **Use CN ➡ 41**

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.....	yr	2	10	100
Rainfall, P (24-hour).....	in	3.4	5.3	7.5
Runoff, Q.....	in			

Use P and CN with table 2-1, figure 2-1, or equation 2-3 abd 2-4

Two River Engineering

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Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project	By	Date
COLTS NECK COMMUNITY CHURCH	AJG	19-Feb-20
Location	**Checked**	**Date**
COLTS NECK, MONMOUTH COUNTY, NEW JERSEY	AJG	19-Feb-20

Check one: [X] Present [X] Developed — P-2, PROPOSED CONDITIONS (PERVIOUS)

Check one: [X] T_c [ ] T_t through subarea

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 T_c only)

Segment ID						
		AB				
1. Surface description (table 3-1)		GRASS				
2. Manning's roughness coefficient, n (table 3-1)		0.240				
3. Flow length, L (total L ≤ 300 ft.)	ft	150				
4. Two-year 24-hour rainfall, p_2	in	3.4				
5. Land slope, s	ft/ft	0.025				
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ Compute T_t	hr	0.29	+		=	0.29

Shallow Concentrated Flow

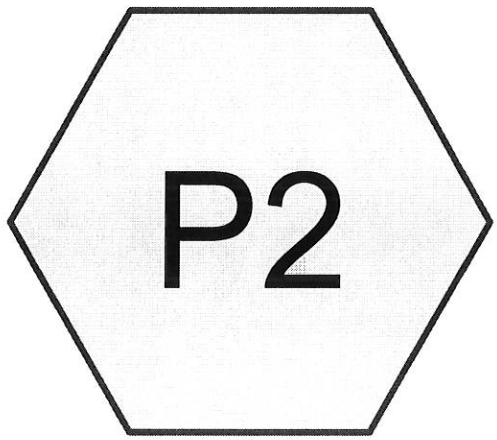
Segment ID						
		BC				
7. Surface description (paved or unpaved)		UNPAVED				
8. Flow Length, L	ft	545				
9. Watercourse slope, s	ft/ft	0.035				
10. Average velocity, V (figure 3-1)	ft/s	3.0				
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr	0.05	+		=	0.05

Channel Flow

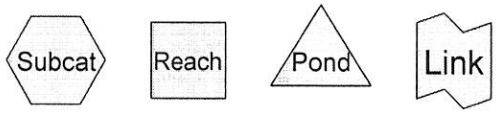
Segment ID						
12. Cross sectional flow area, a	ft^2					
13. Wetted perimeter, P_w	ft					
14. Hydraulic radius, $r=a/P_w$ Compute r	ft					
15. Channel slope, s	ft/ft					
16. Manning's roughness coefficient, n						
17. $V = \frac{1.49 r^{2/3} \sqrt{s}}{n}$ Compute V	ft/s					
18. Flow length, L	ft					
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr		+		=	0.00

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) ..... hr 0.342

min 20.5



Proposed Drainage Area Pervious



Routing Diagram for CN COMMUNITY CHURCH Proposed 2 - 02-19-20
Prepared by {enter your company name here}, Printed 4/7/2020
HydroCAD® 10.00-24 s/n 08511 © 2018 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.290	41	Impervious (P2)
4.290	**41**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
4.290	Other	P2
4.290		**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P2: Proposed Drainage Area Runoff Area=4.290 ac 0.00% Impervious Runoff Depth=0.00"
Tc=20.5 min CN=41 Runoff=0.00 cfs 0.000 af

Total Runoff Area = 4.290 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
100.00% Pervious = 4.290 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment P2: Proposed Drainage Area Pervious

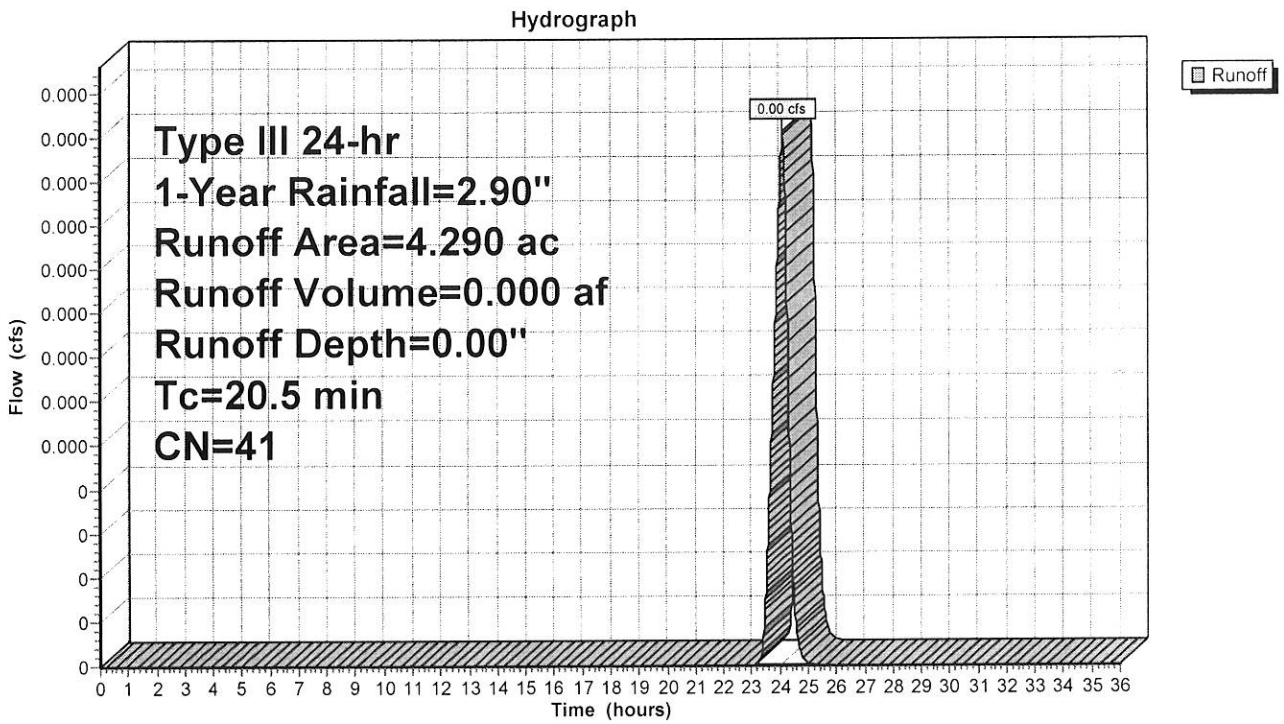
Runoff = 0.00 cfs @ 24.12 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.90"

	Area (ac)	CN	Description
*	4.290	41	Impervious
	4.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5					**Direct Entry, Proposed**

Subcatchment P2: Proposed Drainage Area Pervious



Hydrograph for Subcatchment P2: Proposed Drainage Area Pervious

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.01	0.00	0.00
1.00	0.03	0.00	0.00
1.50	0.04	0.00	0.00
2.00	0.06	0.00	0.00
2.50	0.07	0.00	0.00
3.00	0.09	0.00	0.00
3.50	0.11	0.00	0.00
4.00	0.12	0.00	0.00
4.50	0.14	0.00	0.00
5.00	0.16	0.00	0.00
5.50	0.19	0.00	0.00
6.00	0.21	0.00	0.00
6.50	0.23	0.00	0.00
7.00	0.26	0.00	0.00
7.50	0.29	0.00	0.00
8.00	0.33	0.00	0.00
8.50	0.37	0.00	0.00
9.00	0.42	0.00	0.00
9.50	0.48	0.00	0.00
10.00	0.55	0.00	0.00
10.50	0.63	0.00	0.00
11.00	0.73	0.00	0.00
11.50	0.86	0.00	0.00
12.00	1.45	0.00	0.00
12.50	2.04	0.00	0.00
13.00	2.18	0.00	0.00
13.50	2.27	0.00	0.00
14.00	2.35	0.00	0.00
14.50	2.42	0.00	0.00
15.00	2.48	0.00	0.00
15.50	2.53	0.00	0.00
16.00	2.57	0.00	0.00
16.50	2.61	0.00	0.00
17.00	2.64	0.00	0.00
17.50	2.67	0.00	0.00
18.00	2.69	0.00	0.00
18.50	2.71	0.00	0.00
19.00	2.74	0.00	0.00
19.50	2.76	0.00	0.00
20.00	2.78	0.00	0.00
20.50	2.79	0.00	0.00
21.00	2.81	0.00	0.00
21.50	2.83	0.00	0.00
22.00	2.84	0.00	0.00
22.50	2.86	0.00	0.00
23.00	2.87	0.00	0.00
23.50	2.89	0.00	0.00
24.00	**2.90**	**0.00**	**0.00**
24.50	2.90	0.00	**0.00**
25.00	2.90	0.00	0.00
25.50	2.90	0.00	0.00
26.00	2.90	0.00	0.00
26.50	2.90	0.00	0.00
27.00	2.90	0.00	0.00
27.50	2.90	0.00	0.00
28.00	2.90	0.00	0.00
28.50	2.90	0.00	0.00
29.00	2.90	0.00	0.00
29.50	2.90	0.00	0.00
30.00	2.90	0.00	0.00
30.50	2.90	0.00	0.00
31.00	2.90	0.00	0.00
31.50	2.90	0.00	0.00
32.00	2.90	0.00	0.00
32.50	2.90	0.00	0.00
33.00	2.90	0.00	0.00
33.50	2.90	0.00	0.00
34.00	2.90	0.00	0.00
34.50	2.90	0.00	0.00
35.00	2.90	0.00	0.00
35.50	2.90	0.00	0.00
36.00	2.90	0.00	0.00

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P2: Proposed Drainage Area Runoff Area=4.290 ac 0.00% Impervious Runoff Depth=0.02"
Tc=20.5 min CN=41 Runoff=0.01 cfs 0.007 af

Total Runoff Area = 4.290 ac Runoff Volume = 0.007 af Average Runoff Depth = 0.02"
100.00% Pervious = 4.290 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment P2: Proposed Drainage Area Pervious

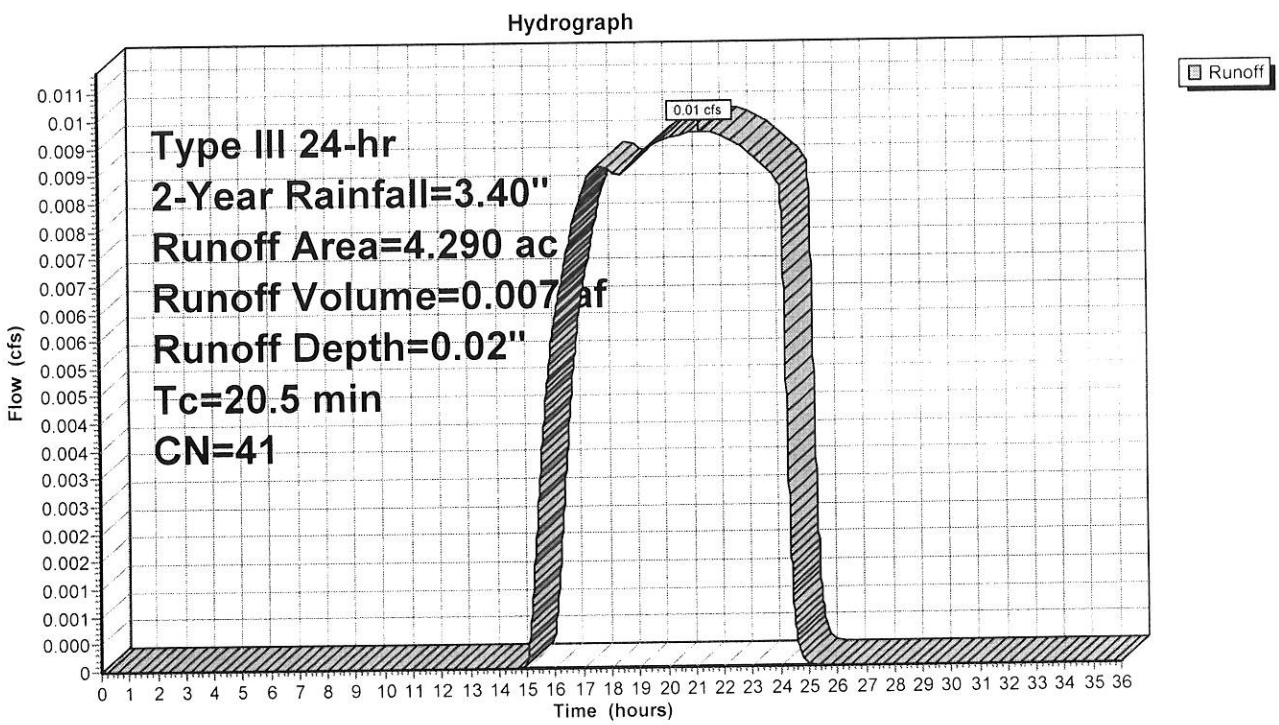
Runoff = 0.01 cfs @ 21.25 hrs, Volume= 0.007 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
*	4.290	41	Impervious
	4.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5					**Direct Entry, Proposed**

Subcatchment P2: Proposed Drainage Area Pervious



Hydrograph for Subcatchment P2: Proposed Drainage Area Pervious

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.02	0.00	0.00
1.00	0.03	0.00	0.00
1.50	0.05	0.00	0.00
2.00	0.07	0.00	0.00
2.50	0.09	0.00	0.00
3.00	0.10	0.00	0.00
3.50	0.12	0.00	0.00
4.00	0.15	0.00	0.00
4.50	0.17	0.00	0.00
5.00	0.19	0.00	0.00
5.50	0.22	0.00	0.00
6.00	0.24	0.00	0.00
6.50	0.27	0.00	0.00
7.00	0.31	0.00	0.00
7.50	0.35	0.00	0.00
8.00	0.39	0.00	0.00
8.50	0.44	0.00	0.00
9.00	0.50	0.00	0.00
9.50	0.56	0.00	0.00
10.00	0.64	0.00	0.00
10.50	0.74	0.00	0.00
11.00	0.85	0.00	0.00
11.50	1.01	0.00	0.00
12.00	1.70	0.00	0.00
12.50	2.39	0.00	0.00
13.00	2.55	0.00	0.00
13.50	2.66	0.00	0.00
14.00	2.76	0.00	0.00
14.50	2.84	0.00	0.00
15.00	2.90	0.00	0.00
15.50	2.96	0.00	0.00
16.00	3.01	0.00	0.01
16.50	3.05	0.00	0.01
17.00	3.09	0.00	0.01
17.50	3.13	0.00	0.01
18.00	3.16	0.01	0.01
18.50	3.18	0.01	0.01
19.00	3.21	0.01	0.01
19.50	3.23	0.01	0.01
20.00	3.25	0.01	0.01
20.50	3.28	0.01	0.01
21.00	3.30	0.01	**0.01**
21.50	3.32	0.01	**0.01**
22.00	3.33	0.01	0.01
22.50	3.35	0.02	0.01
23.00	3.37	0.02	0.01
23.50	3.39	0.02	0.01
24.00	**3.40**	**0.02**	0.01
24.50	3.40	0.02	0.00
25.00	3.40	0.02	0.00
25.50	3.40	0.02	0.00
26.00	3.40	0.02	0.00
26.50	3.40	0.02	0.00
27.00	3.40	0.02	0.00
27.50	3.40	0.02	0.00
28.00	3.40	0.02	0.00
28.50	3.40	0.02	0.00
29.00	3.40	0.02	0.00
29.50	3.40	0.02	0.00
30.00	3.40	0.02	0.00
30.50	3.40	0.02	0.00
31.00	3.40	0.02	0.00
31.50	3.40	0.02	0.00
32.00	3.40	0.02	0.00
32.50	3.40	0.02	0.00
33.00	3.40	0.02	0.00
33.50	3.40	0.02	0.00
34.00	3.40	0.02	0.00
34.50	3.40	0.02	0.00
35.00	3.40	0.02	0.00
35.50	3.40	0.02	0.00
36.00	3.40	0.02	0.00

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P2: Proposed Drainage Area Runoff Area=4.290 ac 0.00% Impervious Runoff Depth=0.32"
Tc=20.5 min CN=41 Runoff=0.38 cfs 0.115 af

Total Runoff Area = 4.290 ac Runoff Volume = 0.115 af Average Runoff Depth = 0.32"
100.00% Pervious = 4.290 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment P2: Proposed Drainage Area Pervious

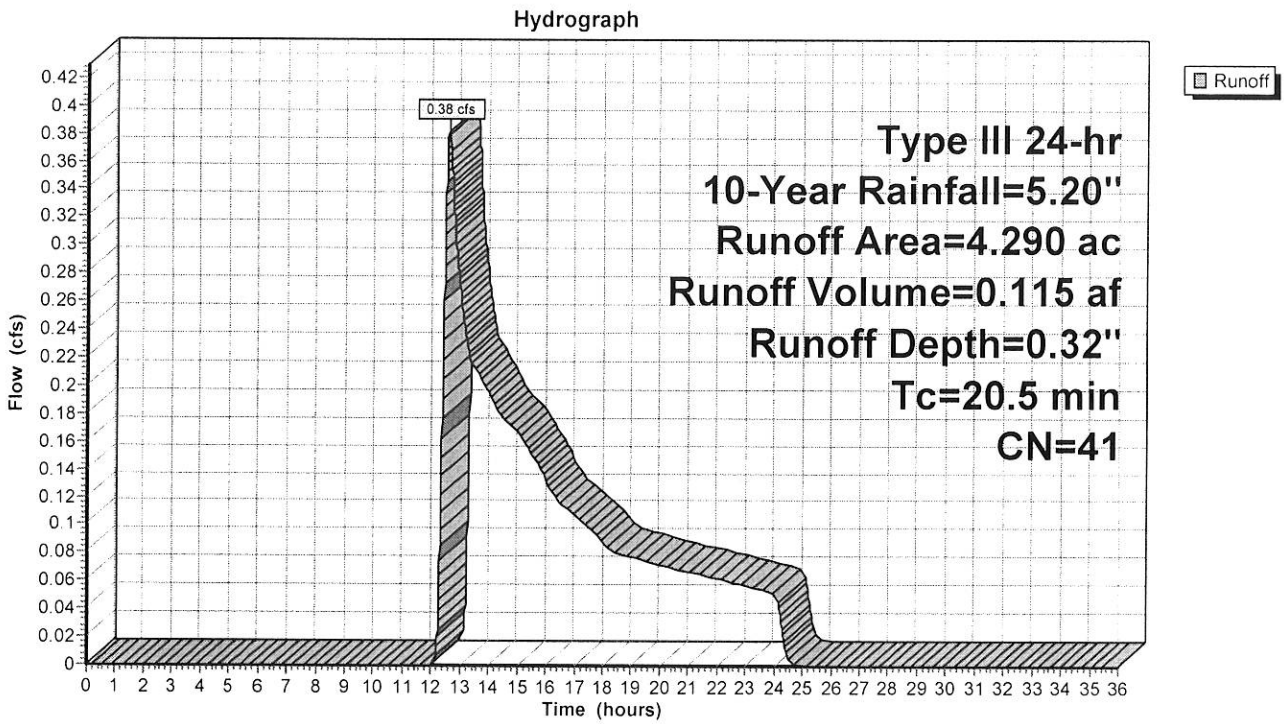
Runoff = 0.38 cfs @ 12.60 hrs, Volume= 0.115 af, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.20"

	Area (ac)	CN	Description
*	4.290	41	Impervious
	4.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5					**Direct Entry, Proposed**

Subcatchment P2: Proposed Drainage Area Pervious



Hydrograph for Subcatchment P2: Proposed Drainage Area Pervious

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00
1.00	0.05	0.00	0.00
1.50	0.08	0.00	0.00
2.00	0.10	0.00	0.00
2.50	0.13	0.00	0.00
3.00	0.16	0.00	0.00
3.50	0.19	0.00	0.00
4.00	0.22	0.00	0.00
4.50	0.26	0.00	0.00
5.00	0.30	0.00	0.00
5.50	0.33	0.00	0.00
6.00	0.37	0.00	0.00
6.50	0.42	0.00	0.00
7.00	0.47	0.00	0.00
7.50	0.53	0.00	0.00
8.00	0.59	0.00	0.00
8.50	0.67	0.00	0.00
9.00	0.76	0.00	0.00
9.50	0.86	0.00	0.00
10.00	0.98	0.00	0.00
10.50	1.13	0.00	0.00
11.00	1.30	0.00	0.00
11.50	1.55	0.00	0.00
12.00	2.60	0.00	0.00
12.50	3.65	0.04	**0.35**
13.00	3.90	0.07	**0.26**
13.50	4.07	0.09	0.21
14.00	4.22	0.11	0.20
14.50	4.34	0.13	0.18
15.00	4.44	0.15	0.17
15.50	4.53	0.17	0.15
16.00	4.61	0.19	0.13
16.50	4.67	0.20	0.12
17.00	4.73	0.21	0.11
17.50	4.78	0.22	0.10
18.00	4.83	0.23	0.09
18.50	4.87	0.24	0.08
19.00	4.90	0.25	0.08
19.50	4.94	0.26	0.07
20.00	4.98	0.27	0.07
20.50	5.01	0.27	0.07
21.00	5.04	0.28	0.07
21.50	5.07	0.29	0.06
22.00	5.10	0.30	0.06
22.50	5.13	0.30	0.06
23.00	5.15	0.31	0.06
23.50	5.18	0.32	0.05
24.00	**5.20**	**0.32**	0.05
24.50	5.20	0.32	0.01
25.00	5.20	0.32	0.00
25.50	5.20	0.32	0.00
26.00	5.20	0.32	0.00
26.50	5.20	0.32	0.00
27.00	5.20	0.32	0.00
27.50	5.20	0.32	0.00
28.00	5.20	0.32	0.00
28.50	5.20	0.32	0.00
29.00	5.20	0.32	0.00
29.50	5.20	0.32	0.00
30.00	5.20	0.32	0.00
30.50	5.20	0.32	0.00
31.00	5.20	0.32	0.00
31.50	5.20	0.32	0.00
32.00	5.20	0.32	0.00
32.50	5.20	0.32	0.00
33.00	5.20	0.32	0.00
33.50	5.20	0.32	0.00
34.00	5.20	0.32	0.00
34.50	5.20	0.32	0.00
35.00	5.20	0.32	0.00
35.50	5.20	0.32	0.00
36.00	5.20	0.32	0.00

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P2: Proposed Drainage Area Runoff Area=4.290 ac 0.00% Impervious Runoff Depth=0.73"
Tc=20.5 min CN=41 Runoff=1.40 cfs 0.260 af

Total Runoff Area = 4.290 ac Runoff Volume = 0.260 af Average Runoff Depth = 0.73"
100.00% Pervious = 4.290 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment P2: Proposed Drainage Area Pervious

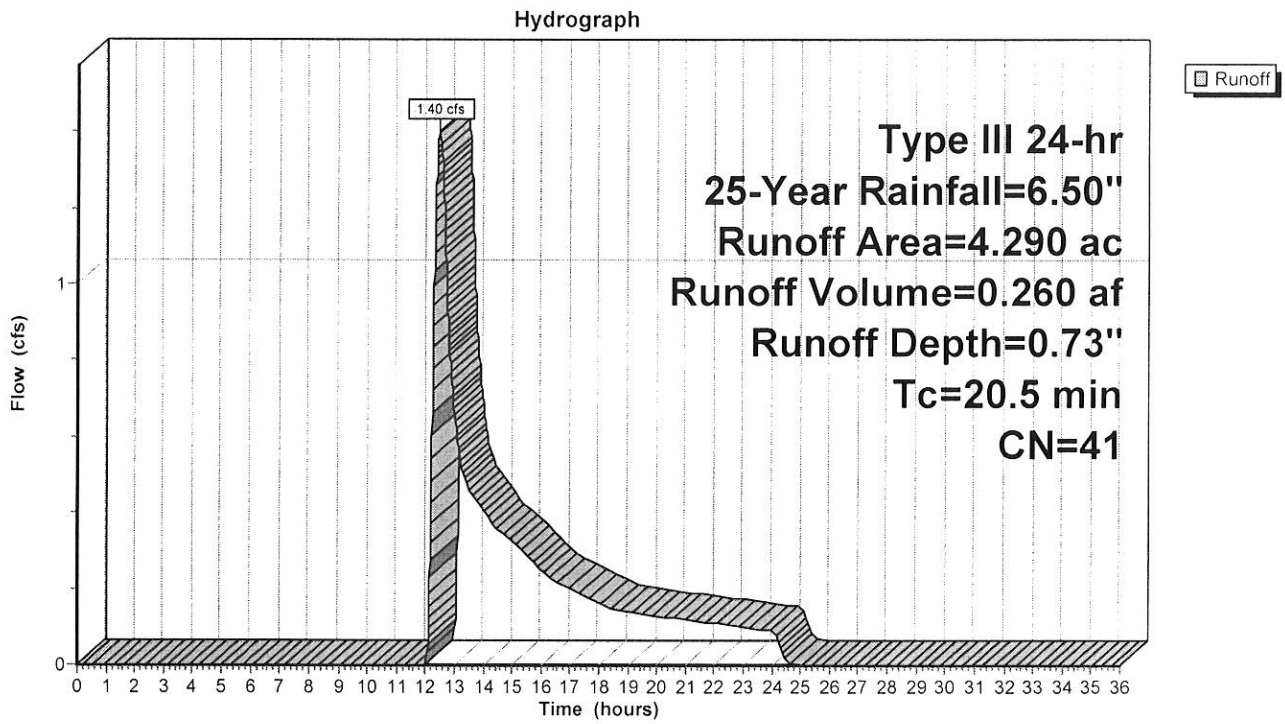
Runoff = 1.40 cfs @ 12.46 hrs, Volume= 0.260 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.50"

	Area (ac)	CN	Description
*	4.290	41	Impervious
	4.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5					**Direct Entry, Proposed**

Subcatchment P2: Proposed Drainage Area Pervious



Hydrograph for Subcatchment P2: Proposed Drainage Area Pervious

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00
1.00	0.07	0.00	0.00
1.50	0.10	0.00	0.00
2.00	0.13	0.00	0.00
2.50	0.16	0.00	0.00
3.00	0.20	0.00	0.00
3.50	0.24	0.00	0.00
4.00	0.28	0.00	0.00
4.50	0.32	0.00	0.00
5.00	0.37	0.00	0.00
5.50	0.42	0.00	0.00
6.00	0.47	0.00	0.00
6.50	0.52	0.00	0.00
7.00	0.59	0.00	0.00
7.50	0.66	0.00	0.00
8.00	0.74	0.00	0.00
8.50	0.83	0.00	0.00
9.00	0.95	0.00	0.00
9.50	1.08	0.00	0.00
10.00	1.23	0.00	0.00
10.50	1.41	0.00	0.00
11.00	1.63	0.00	0.00
11.50	1.94	0.00	0.00
12.00	3.25	0.01	**0.00**
12.50	4.56	0.18	**1.39**
13.00	4.87	0.24	0.65
13.50	5.09	0.30	0.46
14.00	5.27	0.34	0.41
14.50	5.42	0.38	0.36
15.00	5.55	0.42	0.33
15.50	5.67	0.45	0.29
16.00	5.76	0.48	0.25
16.50	5.84	0.51	0.22
17.00	5.91	0.53	0.20
17.50	5.98	0.55	0.18
18.00	6.03	0.57	0.16
18.50	6.08	0.58	0.15
19.00	6.13	0.60	0.14
19.50	6.18	0.62	0.13
20.00	6.22	0.63	0.13
20.50	6.26	0.64	0.12
21.00	6.30	0.66	0.12
21.50	6.34	0.67	0.11
22.00	6.37	0.68	0.11
22.50	6.41	0.70	0.10
23.00	6.44	0.71	0.10
23.50	6.47	0.72	0.09
24.00	**6.50**	**0.73**	0.09
24.50	6.50	0.73	0.01
25.00	6.50	0.73	0.00
25.50	6.50	0.73	0.00
26.00	6.50	0.73	0.00
26.50	6.50	0.73	0.00
27.00	6.50	0.73	0.00
27.50	6.50	0.73	0.00
28.00	6.50	0.73	0.00
28.50	6.50	0.73	0.00
29.00	6.50	0.73	0.00
29.50	6.50	0.73	0.00
30.00	6.50	0.73	0.00
30.50	6.50	0.73	0.00
31.00	6.50	0.73	0.00
31.50	6.50	0.73	0.00
32.00	6.50	0.73	0.00
32.50	6.50	0.73	0.00
33.00	6.50	0.73	0.00
33.50	6.50	0.73	0.00
34.00	6.50	0.73	0.00
34.50	6.50	0.73	0.00
35.00	6.50	0.73	0.00
35.50	6.50	0.73	0.00
36.00	6.50	0.73	0.00

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P2: Proposed Drainage Area Runoff Area=4.290 ac 0.00% Impervious Runoff Depth=1.78"
Tc=20.5 min CN=41 Runoff=4.79 cfs 0.635 af

Total Runoff Area = 4.290 ac Runoff Volume = 0.635 af Average Runoff Depth = 1.78"
100.00% Pervious = 4.290 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment P2: Proposed Drainage Area Pervious

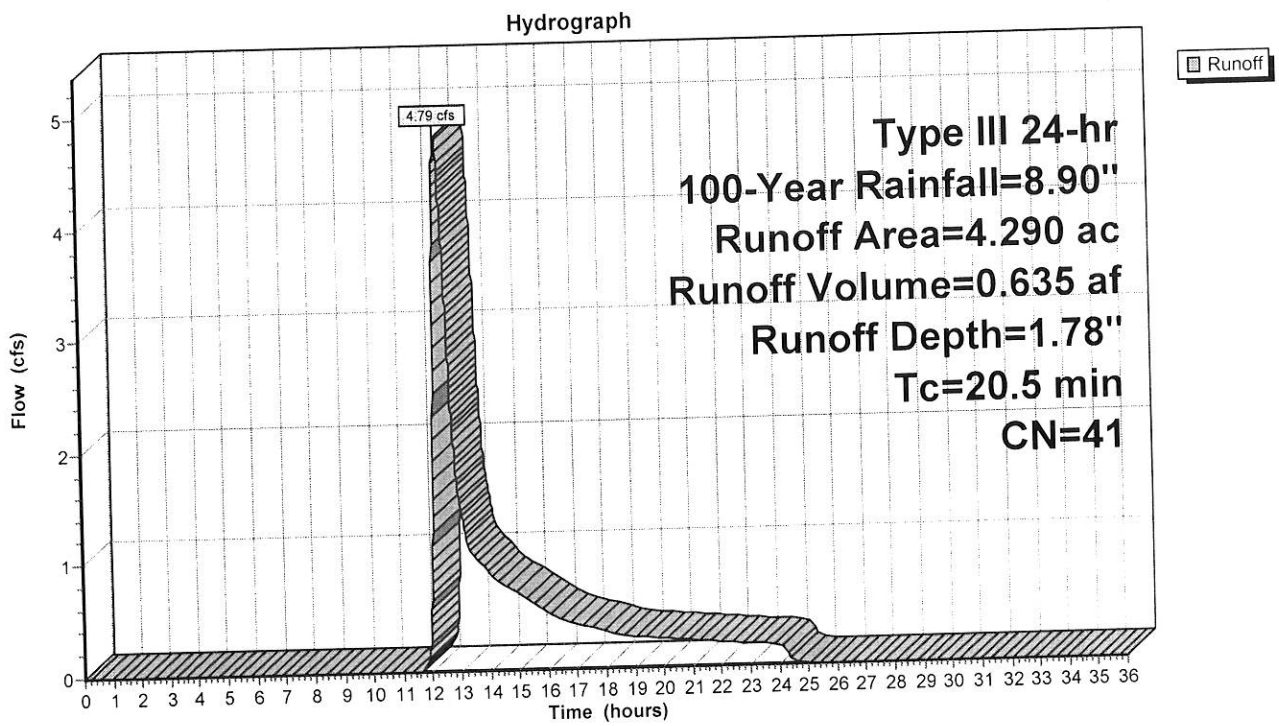
Runoff = 4.79 cfs @ 12.35 hrs, Volume= 0.635 af, Depth= 1.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.90"

	Area (ac)	CN	Description
*	4.290	41	Impervious
	4.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5					Direct Entry, Proposed

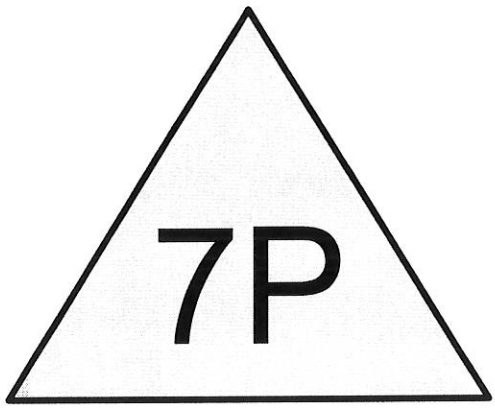
Subcatchment P2: Proposed Drainage Area Pervious



Hydrograph for Subcatchment P2: Proposed Drainage Area Pervious

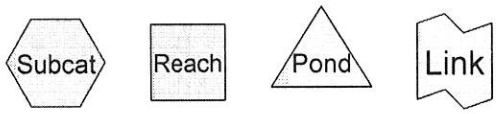
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.04	0.00	0.00
1.00	0.09	0.00	0.00
1.50	0.13	0.00	0.00
2.00	0.18	0.00	0.00
2.50	0.22	0.00	0.00
3.00	0.27	0.00	0.00
3.50	0.33	0.00	0.00
4.00	0.38	0.00	0.00
4.50	0.44	0.00	0.00
5.00	0.51	0.00	0.00
5.50	0.57	0.00	0.00
6.00	0.64	0.00	0.00
6.50	0.72	0.00	0.00
7.00	0.81	0.00	0.00
7.50	0.90	0.00	0.00
8.00	1.01	0.00	0.00
8.50	1.14	0.00	0.00
9.00	1.30	0.00	0.00
9.50	1.48	0.00	0.00
10.00	1.68	0.00	0.00
10.50	1.93	0.00	0.00
11.00	2.23	0.00	0.00
11.50	2.65	0.00	0.00
12.00	4.45	0.15	**0.49**
12.50	6.25	0.64	**4.17**
13.00	6.67	0.79	1.53
13.50	6.97	0.91	1.02
14.00	7.22	1.01	0.87
14.50	7.42	1.09	0.75
15.00	7.60	1.17	0.68
15.50	7.76	1.24	0.59
16.00	7.89	1.29	0.51
16.50	8.00	1.34	0.44
17.00	8.09	1.39	0.40
17.50	8.18	1.43	0.36
18.00	8.26	1.46	0.32
18.50	8.33	1.50	0.29
19.00	8.39	1.53	0.27
19.50	8.46	1.56	0.26
20.00	8.52	1.59	0.25
20.50	8.57	1.62	0.24
21.00	8.63	1.64	0.23
21.50	8.68	1.67	0.22
22.00	8.73	1.69	0.21
22.50	8.78	1.71	0.20
23.00	8.82	1.74	0.19
23.50	8.86	1.76	0.18
24.00	**8.90**	**1.78**	0.17
24.50	8.90	1.78	0.02
25.00	8.90	1.78	0.00
25.50	8.90	1.78	0.00
26.00	8.90	1.78	0.00
26.50	8.90	1.78	0.00
27.00	8.90	1.78	0.00
27.50	8.90	1.78	0.00
28.00	8.90	1.78	0.00
28.50	8.90	1.78	0.00
29.00	8.90	1.78	0.00
29.50	8.90	1.78	0.00
30.00	8.90	1.78	0.00
30.50	8.90	1.78	0.00
31.00	8.90	1.78	0.00
31.50	8.90	1.78	0.00
32.00	8.90	1.78	0.00
32.50	8.90	1.78	0.00
33.00	8.90	1.78	0.00
33.50	8.90	1.78	0.00
34.00	8.90	1.78	0.00
34.50	8.90	1.78	0.00
35.00	8.90	1.78	0.00
35.50	8.90	1.78	0.00
36.00	8.90	1.78	0.00

Appendix 3A
Detention Basin Routing Calculations (No Infiltration)



Detention Basin

(NO INFILTRATION)



Routing Diagram for CN Community Church Proposed DA 1 NO INFILTRATION- COUNTY
Prepared by {enter your company name here}, Printed 4/9/2020
HydroCAD® 10.00-24 s/n 08511 © 2018 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.000	**0**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.000		**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Pond 7P: Detention Basin Peak Elev=67.93' Storage=0.546 af Inflow=6.01 cfs 0.546 af
Outflow=0.00 cfs 0.000 af

Summary for Pond 7P: Detention Basin

Inflow Area =	4.880 ac, 50.00% Impervious, Inflow Depth = 1.34" for 1-Year event				
Inflow =	6.01 cfs @ 12.13 hrs, Volume=	0.546 af			
Outflow =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af, Atten= 100%, Lag= 0.0 min			
Primary =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af			

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 67.93' @ 24.57 hrs Surf.Area= 0.417 ac Storage= 0.546 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

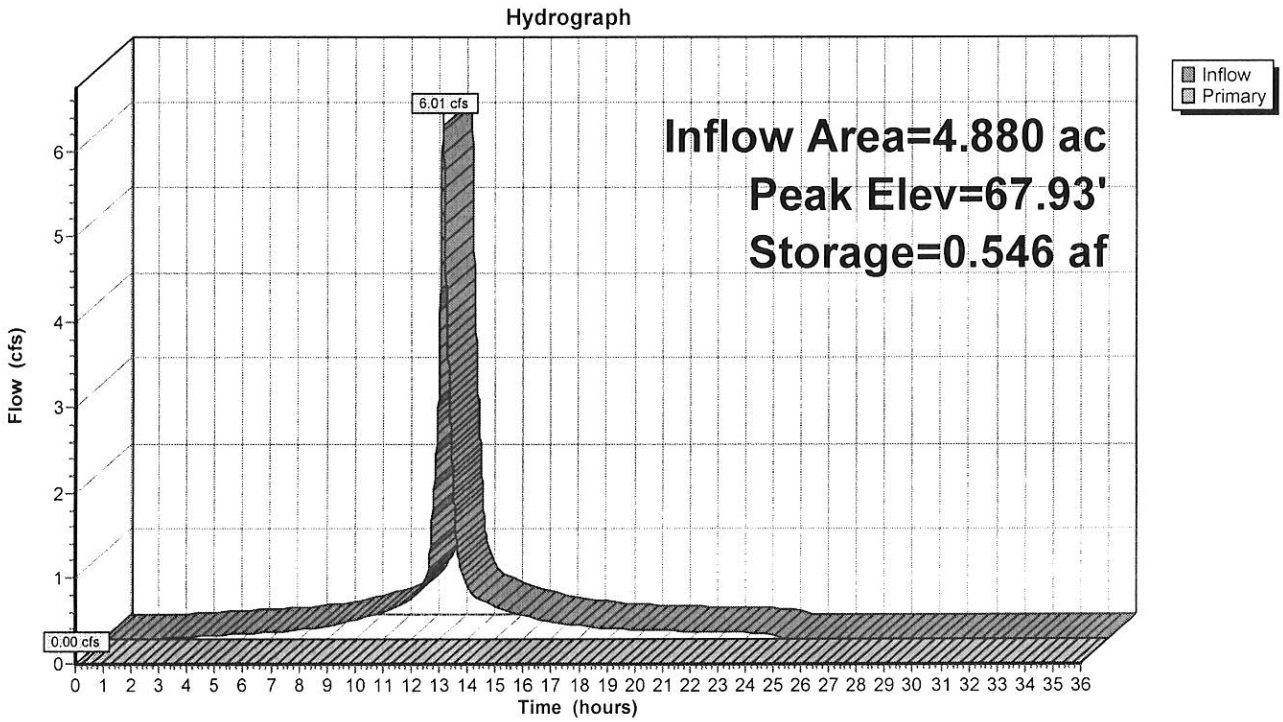
Volume	Invert	Avail.Storage	Storage Description
#1	66.50'	2.030 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
66.50	0.350	0.000	0.000
67.00	0.370	0.180	0.180
68.00	0.420	0.395	0.575
69.00	0.460	0.440	1.015
70.00	0.510	0.485	1.500
71.00	0.550	0.530	2.030

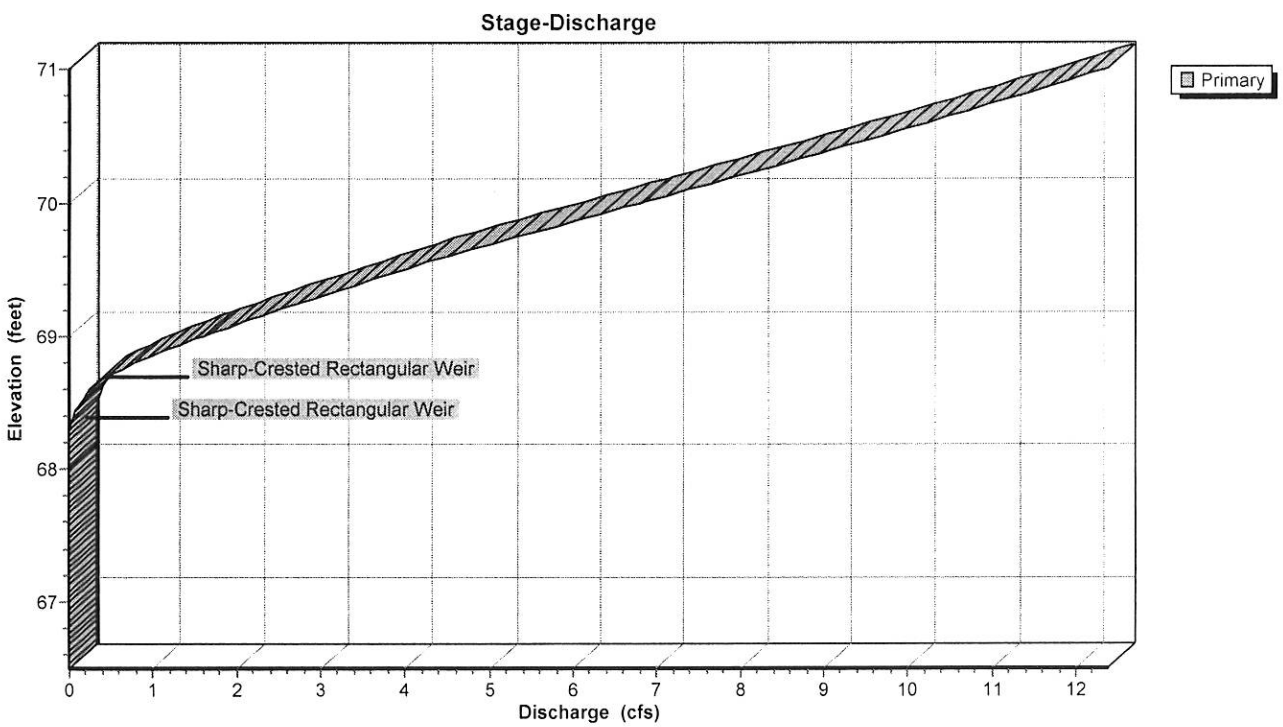
Device	Routing	Invert	Outlet Devices
#1	Primary	68.30'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Primary	68.60'	**1.2' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=66.50' (Free Discharge)
└─**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

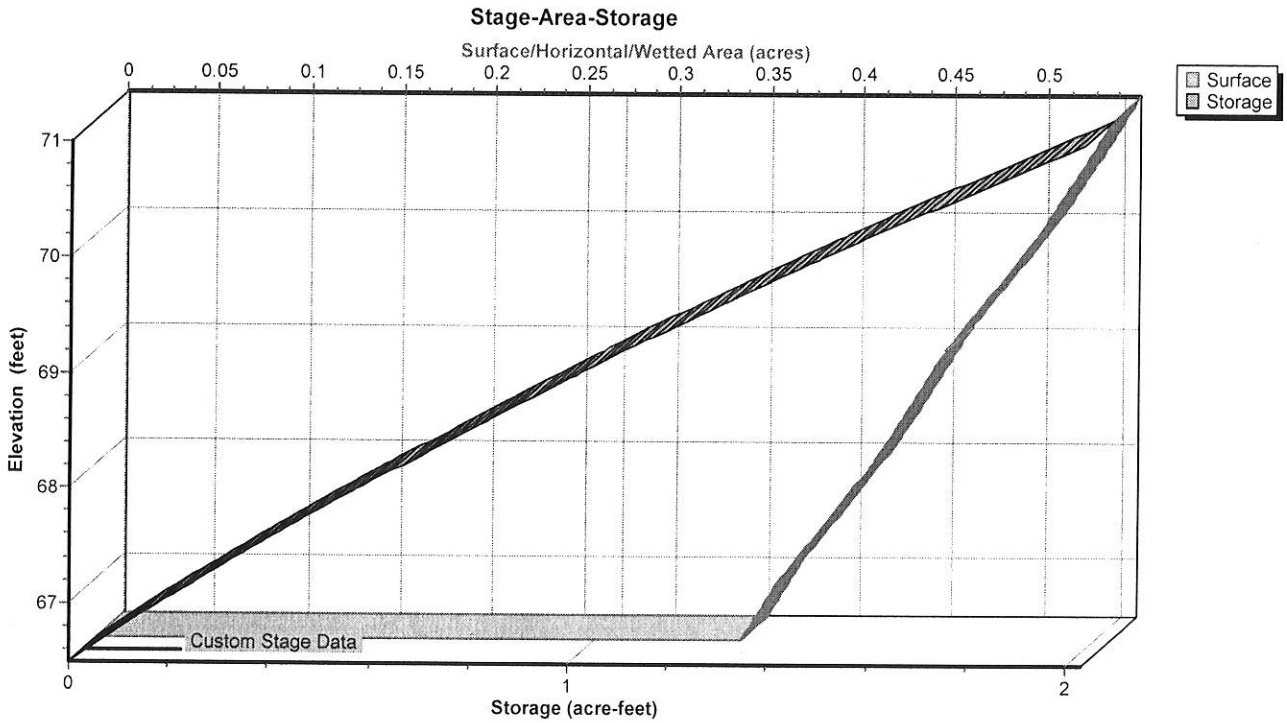
Pond 7P: Detention Basin



Pond 7P: Detention Basin



Pond 7P: Detention Basin



Hydrograph for Pond 7P: Detention Basin

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	66.50	**0.00**
1.00	0.00	0.000	66.50	0.00
2.00	0.01	0.000	66.50	0.00
3.00	0.03	0.002	66.50	0.00
4.00	0.04	0.004	66.51	0.00
5.00	0.06	0.009	66.52	0.00
6.00	0.08	0.014	66.54	0.00
7.00	0.11	0.022	66.56	0.00
8.00	0.15	0.033	66.59	0.00
9.00	0.22	0.048	66.64	0.00
10.00	0.31	0.070	66.70	0.00
11.00	0.47	0.101	66.78	0.00
12.00	**3.20**	0.189	67.03	0.00
13.00	**0.62**	0.389	67.54	0.00
14.00	0.37	0.427	67.64	0.00
15.00	0.28	0.454	67.71	0.00
16.00	0.20	0.474	67.75	0.00
17.00	0.16	0.488	67.79	0.00
18.00	0.12	0.500	67.82	0.00
19.00	0.11	0.509	67.84	0.00
20.00	0.10	0.518	67.86	0.00
21.00	0.09	0.526	67.88	0.00
22.00	0.08	0.533	67.90	0.00
23.00	0.07	0.539	67.91	0.00
24.00	0.07	**0.545**	**67.93**	0.00
25.00	0.00	**0.546**	**67.93**	0.00
26.00	0.00	0.546	67.93	0.00
27.00	0.00	0.546	67.93	0.00
28.00	0.00	0.546	67.93	0.00
29.00	0.00	0.546	67.93	0.00
30.00	0.00	0.546	67.93	0.00
31.00	0.00	0.546	67.93	0.00
32.00	0.00	0.546	67.93	0.00
33.00	0.00	0.546	67.93	0.00
34.00	0.00	0.546	67.93	0.00
35.00	0.00	0.546	67.93	0.00
36.00	0.00	0.546	67.93	0.00

Stage-Discharge for Pond 7P: Detention Basin

Elevation (feet)	Primary (cfs)
66.50	0.00
66.55	0.00
66.60	0.00
66.65	0.00
66.70	0.00
66.75	0.00
66.80	0.00
66.85	0.00
66.90	0.00
66.95	0.00
67.00	0.00
67.05	0.00
67.10	0.00
67.15	0.00
67.20	0.00
67.25	0.00
67.30	0.00
67.35	0.00
67.40	0.00
67.45	0.00
67.50	0.00
67.55	0.00
67.60	0.00
67.65	0.00
67.70	0.00
67.75	0.00
67.80	0.00
67.85	0.00
67.90	0.00
67.95	0.00
68.00	0.00
68.05	0.00
68.10	0.00
68.15	0.00
68.20	0.00
68.25	0.00
68.30	0.00
68.35	0.02
68.40	0.05
68.45	0.09
68.50	0.13
68.55	0.18
68.60	0.24
68.65	0.33
68.70	0.47
68.75	0.63
68.80	0.80
68.85	0.99
68.90	1.19
68.95	1.40
69.00	1.62
69.05	1.84
69.10	2.07
69.15	2.30
69.20	2.53
69.25	2.77
69.30	3.01
69.35	3.25
69.40	3.49
69.45	3.73
69.50	3.97
69.55	4.20
69.60	4.48
69.65	4.77
69.70	5.05
69.75	5.34
69.80	5.63
69.85	5.92
69.90	6.21
69.95	6.50
70.00	6.80
70.05	7.09
70.10	7.38
70.15	7.67
70.20	7.96
70.25	8.26
70.30	8.55
70.35	8.83
70.40	9.12
70.45	9.41
70.50	9.69
70.55	9.97
70.60	10.25
70.65	10.53
70.70	10.80
70.75	11.07
70.80	11.34
70.85	11.61
70.90	11.87
70.95	12.13
71.00	**12.38**

Stage-Area-Storage for Pond 7P: Detention Basin

Elevation (feet)	Surface (acres)	Storage (acre-feet)
66.50	0.350	0.000
66.55	0.352	0.018
66.60	0.354	0.035
66.65	0.356	0.053
66.70	0.358	0.071
66.75	0.360	0.089
66.80	0.362	0.107
66.85	0.364	0.125
66.90	0.366	0.143
66.95	0.368	0.162
67.00	0.370	0.180
67.05	0.372	0.199
67.10	0.375	0.217
67.15	0.378	0.236
67.20	0.380	0.255
67.25	0.383	0.274
67.30	0.385	0.293
67.35	0.387	0.313
67.40	0.390	0.332
67.45	0.393	0.352
67.50	0.395	0.371
67.55	0.397	0.391
67.60	0.400	0.411
67.65	0.403	0.431
67.70	0.405	0.451
67.75	0.408	0.472
67.80	0.410	0.492
67.85	0.412	0.513
67.90	0.415	0.533
67.95	0.418	0.554
68.00	0.420	0.575
68.05	0.422	0.596
68.10	0.424	0.617
68.15	0.426	0.638
68.20	0.428	0.660
68.25	0.430	0.681
68.30	0.432	0.703
68.35	0.434	0.724
68.40	0.436	0.746
68.45	0.438	0.768
68.50	0.440	0.790
68.55	0.442	0.812
68.60	0.444	0.834
68.65	0.446	0.856
68.70	0.448	0.879
68.75	0.450	0.901
68.80	0.452	0.924
68.85	0.454	0.946
68.90	0.456	0.969
68.95	0.458	0.992
69.00	0.460	1.015
69.05	0.462	1.038
69.10	0.465	1.061
69.15	0.468	1.085
69.20	0.470	1.108
69.25	0.472	1.132
69.30	0.475	1.155
69.35	0.477	1.179
69.40	0.480	1.203
69.45	0.483	1.227
69.50	0.485	1.251
69.55	0.487	1.276
69.60	0.490	1.300
69.65	0.493	1.325
69.70	0.495	1.349
69.75	0.497	1.374
69.80	0.500	1.399
69.85	0.502	1.424
69.90	0.505	1.449
69.95	0.508	1.475
70.00	0.510	1.500
70.05	0.512	1.526
70.10	0.514	1.551
70.15	0.516	1.577
70.20	0.518	1.603
70.25	0.520	1.629
70.30	0.522	1.655
70.35	0.524	1.681
70.40	0.526	1.707
70.45	0.528	1.734
70.50	0.530	1.760
70.55	0.532	1.787
70.60	0.534	1.813
70.65	0.536	1.840
70.70	0.538	1.867
70.75	0.540	1.894
70.80	0.542	1.921
70.85	0.544	1.948
70.90	0.546	1.975
70.95	0.548	2.003
71.00	**0.550**	**2.030**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Pond 7P: Detention Basin

Peak Elev=68.20' Storage=0.658 af Inflow=7.08 cfs 0.658 af
Outflow=0.00 cfs 0.000 af

Summary for Pond 7P: Detention Basin

Inflow Area =	4.880 ac,	50.00% Impervious,	Inflow Depth =	1.62"	for 2-Year event
Inflow =	7.08 cfs @	12.13 hrs,	Volume=	0.658 af	
Outflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af,	Atten= 100%, Lag= 0.0 min
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 68.20' @ 24.57 hrs Surf.Area= 0.428 ac Storage= 0.658 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

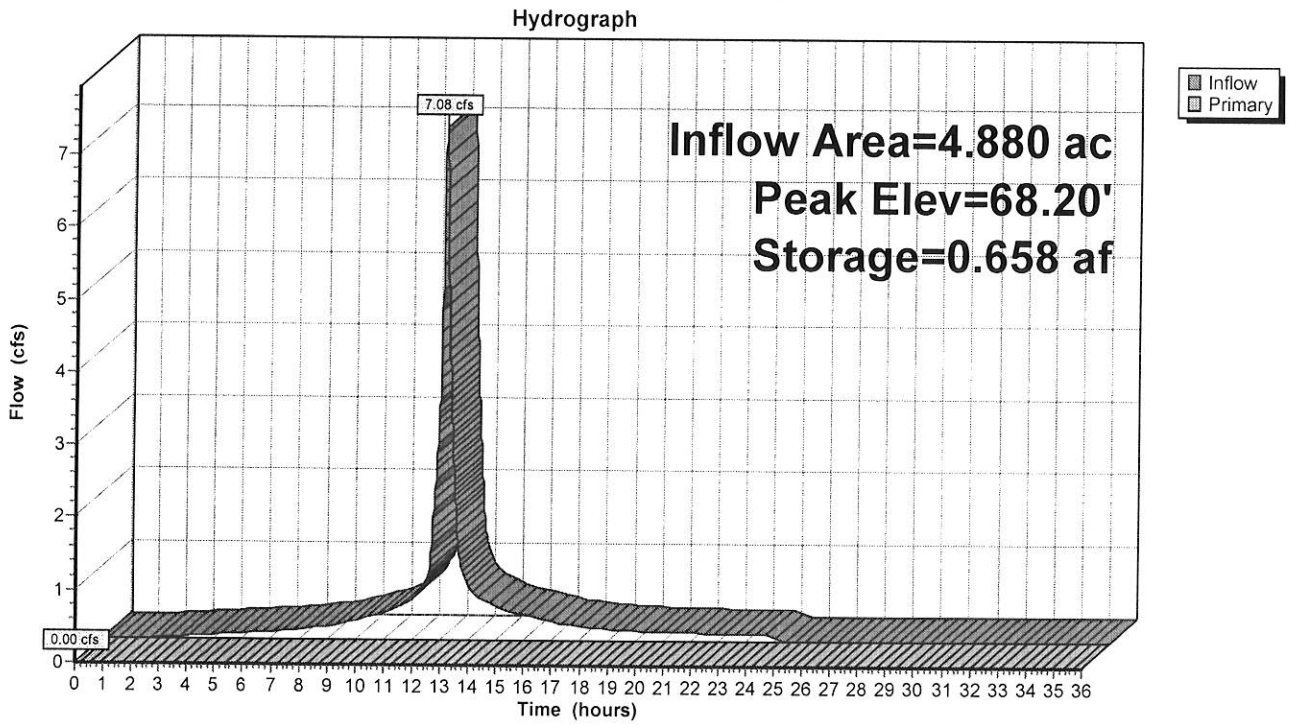
Volume	Invert	Avail.Storage	Storage Description
#1	66.50'	2.030 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
66.50	0.350	0.000	0.000
67.00	0.370	0.180	0.180
68.00	0.420	0.395	0.575
69.00	0.460	0.440	1.015
70.00	0.510	0.485	1.500
71.00	0.550	0.530	2.030

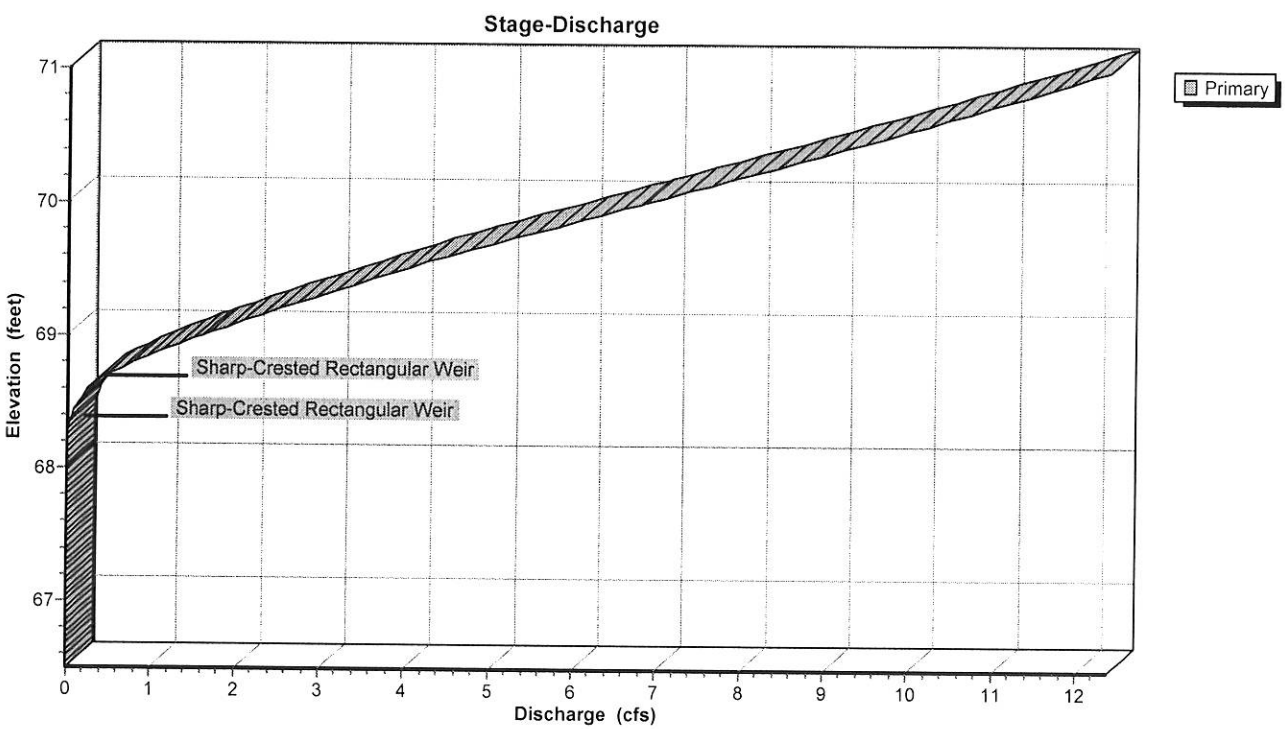
Device	Routing	Invert	Outlet Devices
#1	Primary	68.30'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Primary	68.60'	**1.2' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=66.50' (Free Discharge)
└─**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

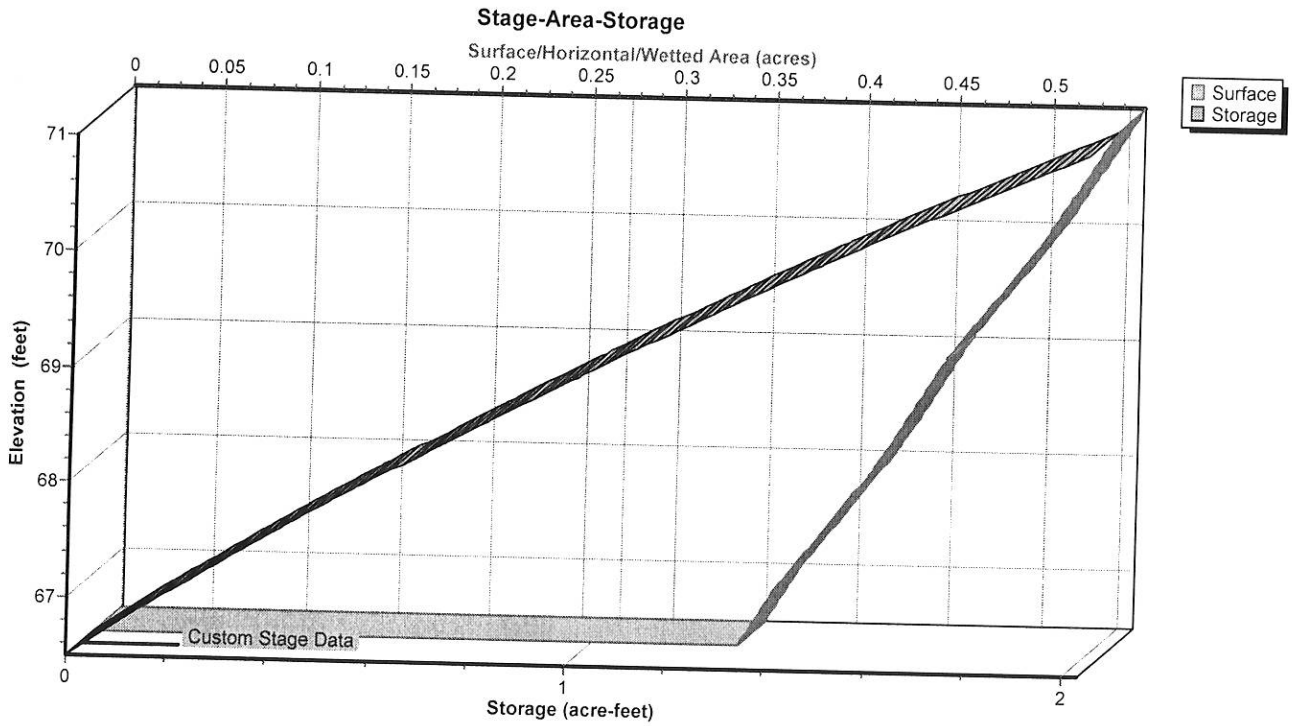
Pond 7P: Detention Basin



Pond 7P: Detention Basin



Pond 7P: Detention Basin



Hydrograph for Pond 7P: Detention Basin

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	66.50	**0.00**
1.00	0.00	0.000	66.50	0.00
2.00	0.02	0.000	66.50	0.00
3.00	0.04	0.003	66.51	0.00
4.00	0.06	0.007	66.52	0.00
5.00	0.08	0.012	66.53	0.00
6.00	0.10	0.019	66.56	0.00
7.00	0.14	0.029	66.58	0.00
8.00	0.18	0.042	66.62	0.00
9.00	0.27	0.060	66.67	0.00
10.00	0.37	0.087	66.74	0.00
11.00	0.55	0.124	66.85	0.00
12.00	**3.78**	0.229	67.13	0.00
13.00	**0.73**	0.463	67.73	0.00
14.00	0.46	0.510	67.84	0.00
15.00	0.35	0.543	67.92	0.00
16.00	0.25	0.567	67.98	0.00
17.00	0.20	0.586	68.03	0.00
18.00	0.15	0.600	68.06	0.00
19.00	0.14	0.612	68.09	0.00
20.00	0.12	0.623	68.11	0.00
21.00	0.11	0.633	68.14	0.00
22.00	0.10	0.642	68.16	0.00
23.00	0.09	0.650	68.18	0.00
24.00	0.08	**0.657**	**68.19**	0.00
25.00	0.00	**0.658**	**68.20**	0.00
26.00	0.00	0.658	68.20	0.00
27.00	0.00	0.658	68.20	0.00
28.00	0.00	0.658	68.20	0.00
29.00	0.00	0.658	68.20	0.00
30.00	0.00	0.658	68.20	0.00
31.00	0.00	0.658	68.20	0.00
32.00	0.00	0.658	68.20	0.00
33.00	0.00	0.658	68.20	0.00
34.00	0.00	0.658	68.20	0.00
35.00	0.00	0.658	68.20	0.00
36.00	0.00	0.658	68.20	0.00

Stage-Discharge for Pond 7P: Detention Basin

Elevation (feet)	Primary (cfs)
66.50	0.00
66.55	0.00
66.60	0.00
66.65	0.00
66.70	0.00
66.75	0.00
66.80	0.00
66.85	0.00
66.90	0.00
66.95	0.00
67.00	0.00
67.05	0.00
67.10	0.00
67.15	0.00
67.20	0.00
67.25	0.00
67.30	0.00
67.35	0.00
67.40	0.00
67.45	0.00
67.50	0.00
67.55	0.00
67.60	0.00
67.65	0.00
67.70	0.00
67.75	0.00
67.80	0.00
67.85	0.00
67.90	0.00
67.95	0.00
68.00	0.00
68.05	0.00
68.10	0.00
68.15	0.00
68.20	0.00
68.25	0.00
68.30	0.00
68.35	0.02
68.40	0.05
68.45	0.09
68.50	0.13
68.55	0.18
68.60	0.24
68.65	0.33
68.70	0.47
68.75	0.63
68.80	0.80
68.85	0.99
68.90	1.19
68.95	1.40
69.00	1.62
69.05	1.84
69.10	2.07
69.15	2.30
69.20	2.53
69.25	2.77
69.30	3.01
69.35	3.25
69.40	3.49
69.45	3.73
69.50	3.97
69.55	4.20
69.60	4.48
69.65	4.77
69.70	5.05
69.75	5.34
69.80	5.63
69.85	5.92
69.90	6.21
69.95	6.50
70.00	6.80
70.05	7.09
70.10	7.38
70.15	7.67
70.20	7.96
70.25	8.26
70.30	8.55
70.35	8.83
70.40	9.12
70.45	9.41
70.50	9.69
70.55	9.97
70.60	10.25
70.65	10.53
70.70	10.80
70.75	11.07
70.80	11.34
70.85	11.61
70.90	11.87
70.95	12.13
71.00	**12.38**

Stage-Area-Storage for Pond 7P: Detention Basin

Elevation (feet)	Surface (acres)	Storage (acre-feet)
66.50	0.350	0.000
66.55	0.352	0.018
66.60	0.354	0.035
66.65	0.356	0.053
66.70	0.358	0.071
66.75	0.360	0.089
66.80	0.362	0.107
66.85	0.364	0.125
66.90	0.366	0.143
66.95	0.368	0.162
67.00	0.370	0.180
67.05	0.372	0.199
67.10	0.375	0.217
67.15	0.378	0.236
67.20	0.380	0.255
67.25	0.383	0.274
67.30	0.385	0.293
67.35	0.387	0.313
67.40	0.390	0.332
67.45	0.393	0.352
67.50	0.395	0.371
67.55	0.397	0.391
67.60	0.400	0.411
67.65	0.403	0.431
67.70	0.405	0.451
67.75	0.408	0.472
67.80	0.410	0.492
67.85	0.412	0.513
67.90	0.415	0.533
67.95	0.418	0.554
68.00	0.420	0.575
68.05	0.422	0.596
68.10	0.424	0.617
68.15	0.426	0.638
68.20	0.428	0.660
68.25	0.430	0.681
68.30	0.432	0.703
68.35	0.434	0.724
68.40	0.436	0.746
68.45	0.438	0.768
68.50	0.440	0.790
68.55	0.442	0.812
68.60	0.444	0.834
68.65	0.446	0.856
68.70	0.448	0.879
68.75	0.450	0.901
68.80	0.452	0.924
68.85	0.454	0.946
68.90	0.456	0.969
68.95	0.458	0.992
69.00	0.460	1.015
69.05	0.462	1.038
69.10	0.465	1.061
69.15	0.468	1.085
69.20	0.470	1.108
69.25	0.472	1.132
69.30	0.475	1.155
69.35	0.477	1.179
69.40	0.480	1.203
69.45	0.483	1.227
69.50	0.485	1.251
69.55	0.487	1.276
69.60	0.490	1.300
69.65	0.493	1.325
69.70	0.495	1.349
69.75	0.497	1.374
69.80	0.500	1.399
69.85	0.502	1.424
69.90	0.505	1.449
69.95	0.508	1.475
70.00	0.510	1.500
70.05	0.512	1.526
70.10	0.514	1.551
70.15	0.516	1.577
70.20	0.518	1.603
70.25	0.520	1.629
70.30	0.522	1.655
70.35	0.524	1.681
70.40	0.526	1.707
70.45	0.528	1.734
70.50	0.530	1.760
70.55	0.532	1.787
70.60	0.534	1.813
70.65	0.536	1.840
70.70	0.538	1.867
70.75	0.540	1.894
70.80	0.542	1.921
70.85	0.544	1.948
70.90	0.546	1.975
70.95	0.548	2.003
71.00	**0.550**	**2.030**