STORMWATER MANAGEMENT REPORT

FOR

FIRST BAPTIST CHURCH OF ELMER
BLOCK 12, LOTS 2.10 & 2.12
BOROUGH OF ELMER
SALEM COUNTY
NEW JERSEY

Prepared By:

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Executive Summary

Description of Existing Site Characteristics

Site Civil Engineering (SCE) has prepared this Stormwater Management Report for the proposed First Baptist Church of Elmer located within the Borough of Elmer, Salem County, New Jersey. The project consists of constructing a a 5,400 sf Pavilion, access road, parking and a future 8,700 sf Youth Center Building, auto parking lot and stormwater management basins. The project area (Site) is known as Block 12, Lots 2.10 & 2.12 on the Borough of Elmer Tax Map and consists of approximately 33.49 acres. 21.63 acres are located within the Borough of Elmer and 11.86 acres are located within the Township of Upper Pittsgrove. All construction activities are proposed within the Borough of Elmer. The project is considered a major development per Borough of Elmer and per NJDEP Division of Land Use Regulations.

This report has been prepared to describe the existing stormwater conditions of the Site and to assess the effects of the proposed improvements in conjunction with the Project drawings.

The Site is located at 329 Front Street, Elmer, New Jersey. The Site contains a barn and is currently an agriculture use. Wetland areas are present on the Site.

The soil types for the Site taken from the NJDEP Geoweb Soils Survey Map. Multiple soil borings were performed on the Site. The borings were used to determine the seasonal high groundwater table and percolation rates. They are included in the appendixes of this report.

Description of Existing Drainage Watersheds

The subject property has been analyzed as one drainage watershed, which consists of the disturbed areas. A general description of the watershed and its approximate route of flow are described below.

- Watershed XA: Watershed XA consists of the proposed developed areas on-site. Watershed XA consists of an existing barn building and agricultural fields. Undeveloped portions of the site will remain as agricultural fields. The watershed flows overland in an easterly direction the wetlands located along the eastern property line.

The stormwater drainage conditions for the subject property were analyzed using the method described in Technical Release No. 20 (TR-20), published by the U.S. Soil Conservation Service. Soils information utilized in the calculations were based upon the the NJDEP Geoweb Soils Survey Map and from soil borings taken on-site. Peak rates of runoff were determined for the 2-year, 10-year, and 100-year storm events to facilitate assessment of impacts on downstream properties pursuant to applicable regulations. Time

of concentration calculations were not assumed and were calculated based on land cover & topography. Separate time of concentration paths were used for pervious and impervious surfaces.

Peak Runoff Rates from Various Storm Events.

Watershed	Q_2 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
XA	3.39	9.11	22.91

The peak runoff rates for each watershed may be verified by review of the detailed calculations included herein.

Description of Proposed Site Characteristics

Stormwater runoff under developed conditions will be directed to green infrastructure small infiltration basins by swales that will infiltrate a portion of the runoff into the groundwater table and attenuate the remaining runoff.

The stormwater drainage patterns under post-development conditions will remain similar to those under existing conditions. Accordingly, the post-development drainage watershed generally correspond to those described above for existing conditions. A brief description of the post-development drainage watershed is provided below.

- Watershed A: Watershed A corresponds to the developed northwesterly portion of the Site. Watershed A1 incorporates drainage areas from the proposed Pavilion, Future Youth Center Building, onsite driveway, parking lot and lawn areas. Watershed A is directed to Green Infrastructure Infiltration Basin A.

- Watershed B: Watershed B corresponds to the developed westerly portion of the Site. Watershed B incorporates drainage areas from the Future Youth Center Building, onsite driveway, parking lot and lawn areas. Watershed B is directed to Green Infrastructure Infiltration Basin B.

- Watershed C: Watershed C corresponds to the developed southeasterly portion of the Site. Watershed C incorporates drainage areas from the onsite driveway, and lawn areas. Watershed C is directed to Green Infrastructure Infiltration Basin C.

- Watershed UC: Watershed UC corresponds to uncaptured portions of the Site. Watershed UC incorporates drainage areas from the grass area that will be uncaptured and drain overland to the wetlands.

Summary of Methodology

The Site is designed to comply with N.J.A.C. 7:8-5.4 (Stormwater Management regulations promulgated by the NDJEP effective March 2, 2021) and Borough of Elmer

stormwater regulations. The calculations utilized the NRCS Methodology, DelMarva Dimensionless Unit Hydrograph with NOAA C rainfall distribution. Time of concentration calculations were not assumed and were calculated based on land cover & topography. Separate time of concentration paths were used for pervious and impervious surfaces. Maximum sheet flow length was limited per Chapter 5 of the NJ Stormwater BMP Manual.

Peak rates of runoff were determined for the 2-year, 10-year, and 100-year storm events so as to facilitate assessment of impacts on downstream properties pursuant to applicable regulations.

This Site is designed so that the stormwater shall be attenuated so that post construction runoff rates are reduced to 50% or less of the peak flow rate for the 2-year storm, 75% or less of the peak flow rate for the 10-year storm and 80% or less of the peak flow rate for the 100-year storm. The site was also designed to recharge 100% of the Site's annual pre-developed groundwater recharge volume. Finally, the site is designed to provide 80% Total Suspended Solids (TSS) from the discharged stormwater. See table below containing flows for the 2-year, 10-yr and 100-yr storm events.

Watershed A & AUC

A summary of the maximum allowable discharge from the Watershed XA reduced per standards and XO (bypass flow) is tabulated below:

Storm Event	Existing Flow From XA (cfs)	Reduction Required	Allowable Flow From XA (cfs)	Total Allowable Flow (cfs)
2-year	3.39	50%	1.69	1.69
10-year	9.11	75%	6.83	6.83
100-year	22.91	80%	18.32	18.32

The flow from Watershed A, B, C, AUC and O offsite is as follows:

Storm Event	Allowable Flow Offsite (cfs)	Proposed Flow Basin A (cfs)	Proposed Flow Basin B (cfs)	Proposed Flow Basin C (cfs)	Proposed Flow AUC (cfs)	Total Combined Flow (cfs)
2 year	1.69	0.02	0.03	0.01	0.02	0.09
10 year	6.83	0.48	0.25	0.17	0.34	1.18
100 year	18.32	2.44	1.11	0.94	2.07	6.16

The 2, 10 and 100-year storm events have been reduced below the required reduction rates. Given the reduction of flow and the current stability of the watershed area, the proposed watershed runoff will not increase flood damage at or downstream of the site. The proposed watershed meets or exceed the requirements pursuant to the NJDEP. The following tables provides the physical parameters for Basins:

Basin A Physical Parameters

Inflow Drainage Area	1.78 acres
Inflow Drainage Area Including Basin	3.03 acres
Max. Water Depth 100-Yr Storm	0.48 feet
Max. Water Depth Infiltrated	0.10 feet
Depth of Sand Bottom	6 inches
Emergency Spillway Elevation	121.00
Depth of flow over E-Spillway	0.16 feet
Depth of freeboard	1.03 ft
Velocity over E-Spillway	1.04 ft/s
Tested Permeability Rate	11.66 in/hr*
Initial Design Permeability Rate	5.83 in/hr
Final Design Permeability Rate	0.5 in/hr
Bottom of basin Elevation	120.00
Top of basin Elevation	122.20
SHWT Elevation	114.70

*Boring # 2, See Appendix H for Soil Boring Logs.
Note. Over excavation of sandy clay loam at Test Pit # 3 to SHWT proposed.

Proposed drainage routing calculations for the site are included in Appendix C.

Basin A Characteristics

Design Storm	Peak Inflow (cfs)	Peak Outflow (cfs)	Water Surface Elevation
WQ Storm	2.41	0.00	120.06
2-Year Storm	2.92	0.02	120.12
10-Year Storm	5.20	0.48	120.23
100-Year Storm	11.14	2.44	120.48

WQ denotes NJDEP Water Quality (WQ) Storm

Basin B Physical Parameters

Inflow Drainage Area	0.85 acres
Inflow Drainage Area Including Basin	1.27 acres
Max. Water Depth 100-Yr Storm	0.63 feet
Max. Water Depth Infiltrated	0.15 feet
Depth of Sand Bottom	6 inches
Emergency Spillway Elevation	121.10
Depth of flow over E-Spillway	0.11 ft
Depth of freeboard	1.09 ft
Velocity over E-Spillway	0.87 ft/s
Tested Permeability Rate	13.2 in/hr
Initial Design Permeability Rate	6.6 in/hr
Final Design Permeability Rate	0.5 in/hr
Bottom of Basin Elevation	120.00
Top of Basin Elevation	122.30
SHWT Elevation	113.30

*Boring # 16D, See Appendix H for Soil Boring Logs

Proposed drainage routing calculations for the site are included in Appendix C.

Basin B Characteristics

Design Storm	Peak Inflow (cfs)	Peak Outflow (cfs)	Water Surface Elevation
WQ Storm	1.45	0.00	120.12
2-Year Storm	1.78	0.03	120.20
10-Year Storm	2.78	0.25	120.33
100-Year Storm	5.74	1.11	120.63

WQ denotes NJDEP Water Quality (WQ) Storm

Basin C Physical Parameters

Inflow Drainage Area	0.74 acres
Inflow Drainage Area Including Basin	1.25 acres
Max. Water Depth 100-Yr Storm	0.63 feet
Max. Water Depth Infiltrated	0.10 ft
Depth of Sand Bottom	6 inches
Emergency Spillway Elevation	120.10
Depth of flow over E-Spillway	0.08 ft
Depth of freeboard	1.02 ft
Velocity over E-Spillway	0.76 ft/s
Tested Permeability Rate	4.65 in/hr*
Initial Design Permeability Rate	2.32 in/hr
Final Design Permeability Rate	0.5 in/hr
Bottom of Basin Elevation	119.00
Top of Basin Elevation	121.20
SHWT Elevation	113.30

*Boring # 5, See Appendix H for Soil Boring Logs

Proposed drainage routing calculations for the site are included in Appendix C.

Basin C Characteristics

Design Storm	Peak Inflow (cfs)	Peak Outflow (cfs)	Water Surface Elevation
WQ Storm	0.75	0.00	119.13
2-Year Storm	0.90	0.01	119.22
10-Year Storm	1.39	0.17	119.34
100-Year Storm	3.52	0.94	119.63

WQ denotes NJDEP Water Quality (WQ) Storm

Green Infrastructure Forebay Design

Basin A

The water quality storm event produces a volume of 4,181 cf (0.096 af) at 2.41 cfs. The forebay is required to be 10% of the water quality volume, 418 cf.

The forebay volume is 3,200 cf. This volume exceeds the 10% requirement of 418 cf, therefore, the forebay is sized in accordance with Chapter 9.8 of the NJDEP BMP Manual.

The forebay are constructed of rip rap.

Basin B

The water quality storm event produces a volume of 1,786 cf (0.041 af) at 1.45 cfs. The forebay is required to be 10% of the water quality volume, 179 cf.

The forebay volume is 1,400 cf. This volume exceeds the 10% requirement of 179 cf, therefore, the forebay is sized in accordance with Chapter 9.8 of the NJDEP BMP Manual.

The forebay are constructed of rip rap.

Basin C

The water quality storm event produces a volume of 1,306 cf (0.030 af) at 0.75 cfs. The forebay is required to be 10% of the water quality volume, 131 cf.

The forebay volume is 500 cf. This volume exceeds the 10% requirement of 131 cf, therefore, the forebay is sized in accordance with Chapter 9.8 of the NJDEP BMP Manual.

The forebay are constructed of rip rap.

Recharge

A summary of the calculations provided to meet NJDEP recharge requirements are presented below, and the detailed calculations are provided in Appendix C.

As per NJAC 7:8-5.4(a)2.i.(2), the site was designed to recharge 100% of the Site's annual pre-developed groundwater recharge volume. The calculations were based on the infiltrating the increase in volume from the pre-developed to post-developed 2-year storm.

The following table summarizes the findings of the calculations:

Basin ID	Pre-Developed 2-year Storm Volume (af)	Post-Developed 2-year Storm Volume (af)	Increase in 2-year Storm Volume (af)	Volume Infiltrated (af)
A	-	0.318	-	0.686
B	-	0.125	-	0.231
C	-	0.088	-	0.169
AUC	-	0.015	-	-
Total	**0.510**	**0.546**	**0.036**	**1.086**

Water Quality

The site is designed with infiltration/detention basins that infiltrates runoff into the groundwater table. In order to provide the TSS removal rate for the basin as required by the NJDEP BMP Manual Chapter 9.5, the entire Water Quality Storm must be retained and infiltrated into the groundwater table. The following table summarizes the water quality calculations for the basin and porous paving areas.

Basin ID	Water Quality Storm Runoff Volume (acre-feet)	Volume Infiltrated (acre-feet)
A	0.096	0.686
B	0.041	0.231
C	0.030	0.169

The provided volume meets the required volume for the basin and therefore the basins meet the BMP Water Quality requirements.

Normal Drain Time

The NJDEP Best Management Practices Manual requires the GI facilities drain in less than 72 hours. The normal drain times have been calculated utilizing the groundwater mounding analysis outlined in the NJ Stormwater Management BMP Manual, Chapter 5. A summary of the normal drain time is as follows:

Normal Drain Time

| GI Facility	Normal Drain Time (min.)
A	17.97
B	22.48
C	25.19

The design drain time is less than the required 72 hours; therefore, the basin and porous paving systems meets the requirements.

D.   Conclusions

As detailed above, the watershed meets, or exceeds the requirements for the 2-, 10- and 100- year storms in the developed conditions. In comparison of the pre-developed to the post-developed, there is no increase in flow. The Watershed also meets or exceeds the appropriate groundwater recharge requirements. Finally, the watershed also meets or exceeds requirements for water quality. Therefore, the stormwater management system, as designed, is in compliance with the appropriate regulations.

A. Drainage Area Map (Pre and Post)

B. Existing Drainage Conditions Storm Hydrographs
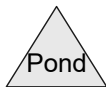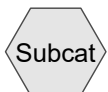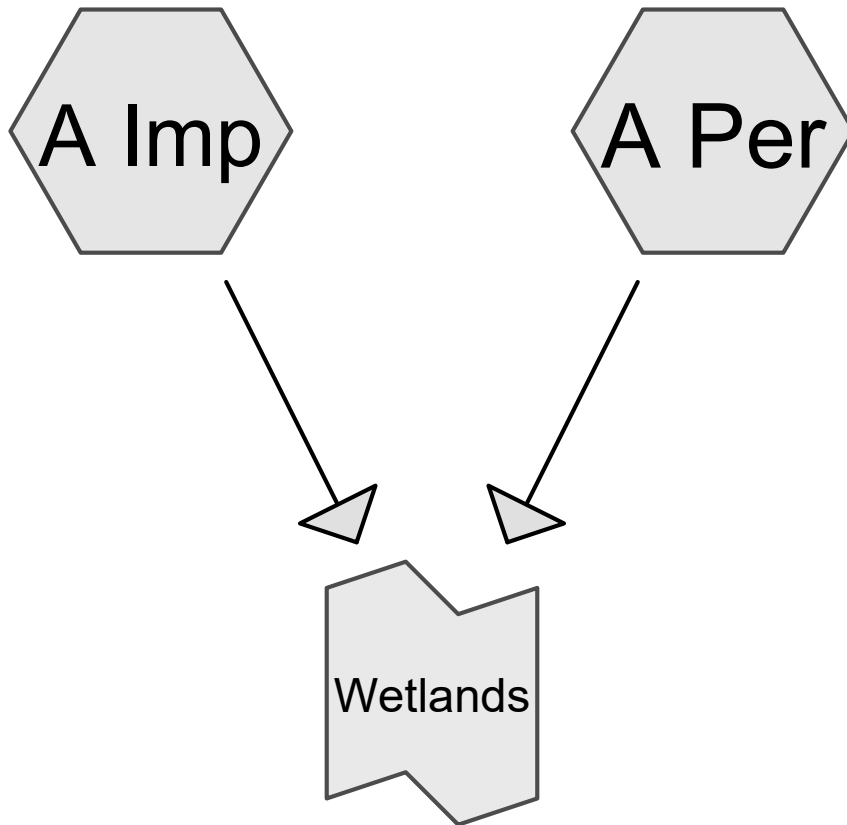
A Imp

A Per

Wetlands

Subcat Reach Pond Link

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.080	98	Roofs, HSG A (A Imp)
3.910	64	Row crops, SR + CR, Good, HSG A (A Per)
3.140	75	Row crops, SR + CR, Good, HSG B (A Per)
0.180	82	Row crops, SR + CR, Good, HSG C (A Per)
7.310	**70**	**TOTAL AREA**

Summary for Subcatchment A Imp:

Runoff   =   0.27 cfs @   12.10 hrs, Volume=   0.020 af, Depth= 3.03"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Rainfall=3.26"

Area (ac)	CN	Description
0.080	98	Roofs, HSG A
0.080	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	20	0.3300	3.09		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
2.8	240	0.0250	1.42		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
2.9	260				Total

Subcatchment A Imp:

Hydrograph

NOAA 24-hr C
2-Year Rainfall=3.26"
Runoff Area=0.080 ac
Runoff Volume=0.020 af
Runoff Depth=3.03"
Flow Length=260'
Tc=2.9 min
CN=0/98

Summary for Subcatchment A Per:

Runoff   =   3.30 cfs @ 12.31 hrs, Volume=   0.490 af, Depth= 0.81"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
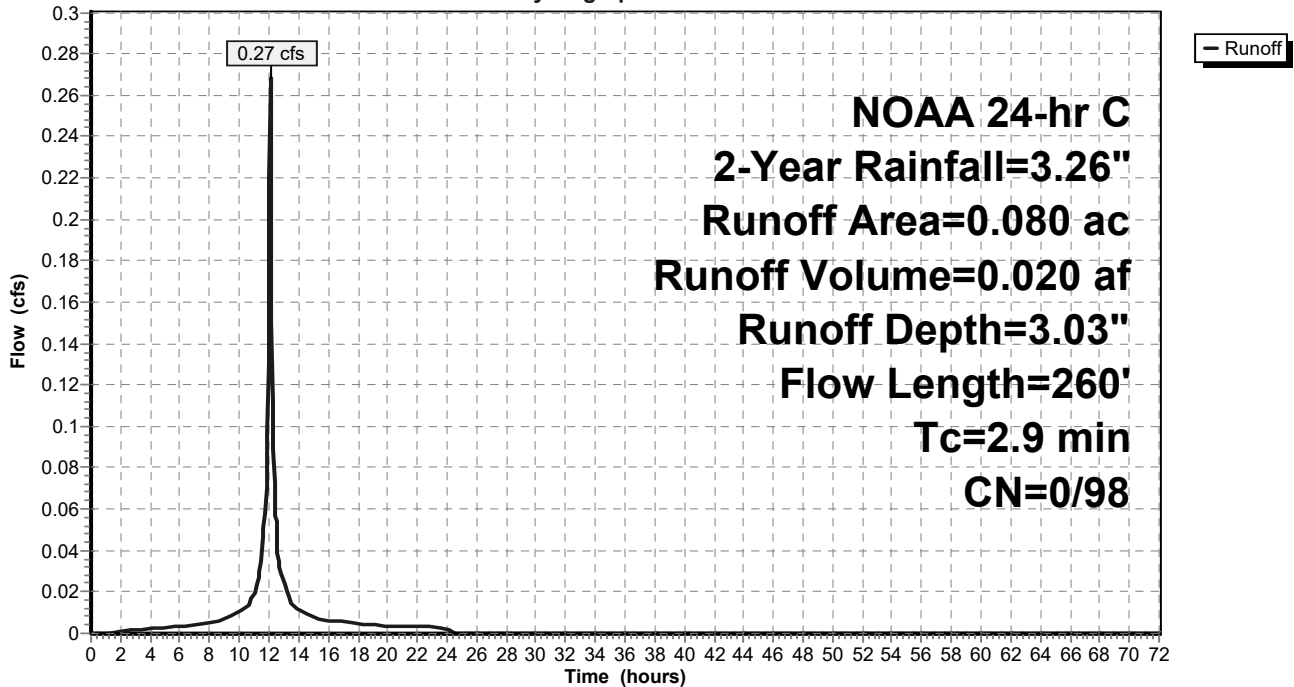NOAA 24-hr C 2-Year Rainfall=3.26"

Area (ac)	CN	Description
3.910	64	Row crops, SR + CR, Good, HSG A
3.140	75	Row crops, SR + CR, Good, HSG B
0.180	82	Row crops, SR + CR, Good, HSG C
7.230	69	Weighted Average
7.230	69	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0200	0.16		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 3.26"
5.1	370	0.0180	1.21		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
15.8	470	Total			

Subcatchment A Per:

Hydrograph

NOAA 24-hr C
2-Year Rainfall=3.26"
Runoff Area=7.230 ac
Runoff Volume=0.490 af
Runoff Depth=0.81"
Flow Length=470'
Tc=15.8 min
CN=69/0

Summary for Link Wetlands:

Inflow Area =   7.310 ac,   1.09% Impervious, Inflow Depth =   0.84"   for 2-Year event
Inflow   =   3.39 cfs @   12.31 hrs, Volume=   0.510 af
Primary   =   3.39 cfs @   12.31 hrs, Volume=   0.510 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link Wetlands:

Hydrograph

Summary for Subcatchment A Imp:

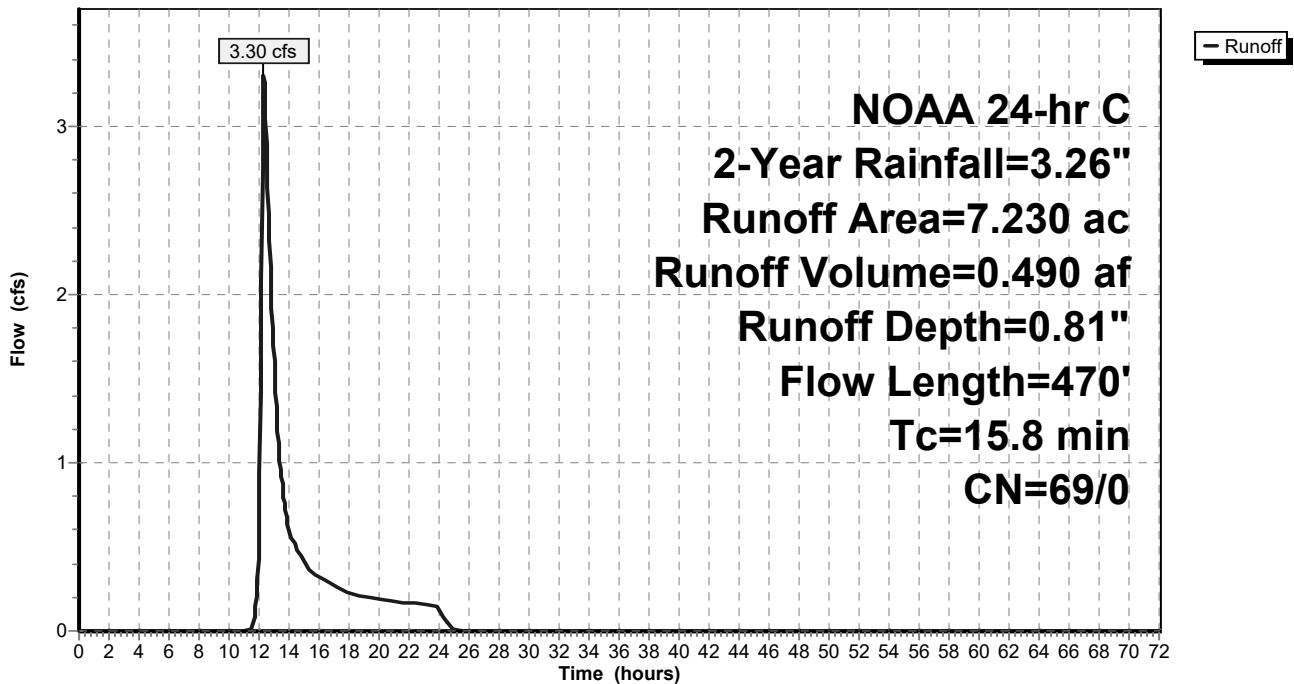Runoff = 0.41 cfs @ 12.10 hrs, Volume= 0.032 af, Depth= 4.76"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Rainfall=5.00"

Area (ac)	CN	Description
0.080	98	Roofs, HSG A
0.080	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	20	0.3300	3.09		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
2.8	240	0.0250	1.42		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
2.9	260	Total			

Subcatchment A Imp:

NOAA 24-hr C
10-Year Rainfall=5.00"
Runoff Area=0.080 ac
Runoff Volume=0.032 af
Runoff Depth=4.76"
Flow Length=260'
Tc=2.9 min
CN=0/98

Summary for Subcatchment A Per:

Runoff   =   8.97 cfs @ 12.29 hrs, Volume=   1.179 af, Depth= 1.96"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Rainfall=5.00"

Area (ac)	CN	Description
3.910	64	Row crops, SR + CR, Good, HSG A
3.140	75	Row crops, SR + CR, Good, HSG B
0.180	82	Row crops, SR + CR, Good, HSG C
7.230	69	Weighted Average
7.230	69	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0200	0.16		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 3.26"
5.1	370	0.0180	1.21		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
15.8	470	Total			

Subcatchment A Per:

Hydrograph

NOAA 24-hr C
10-Year Rainfall=5.00"
Runoff Area=7.230 ac
Runoff Volume=1.179 af
Runoff Depth=1.96"
Flow Length=470'
Tc=15.8 min
CN=69/0

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Prepared by {enter your company name here}
HydroCAD® 10.00-25 s/n 06137 © 2019 HydroCAD Software Solutions LLC

NOAA 24-hr C 10-Year Rainfall=5.00"
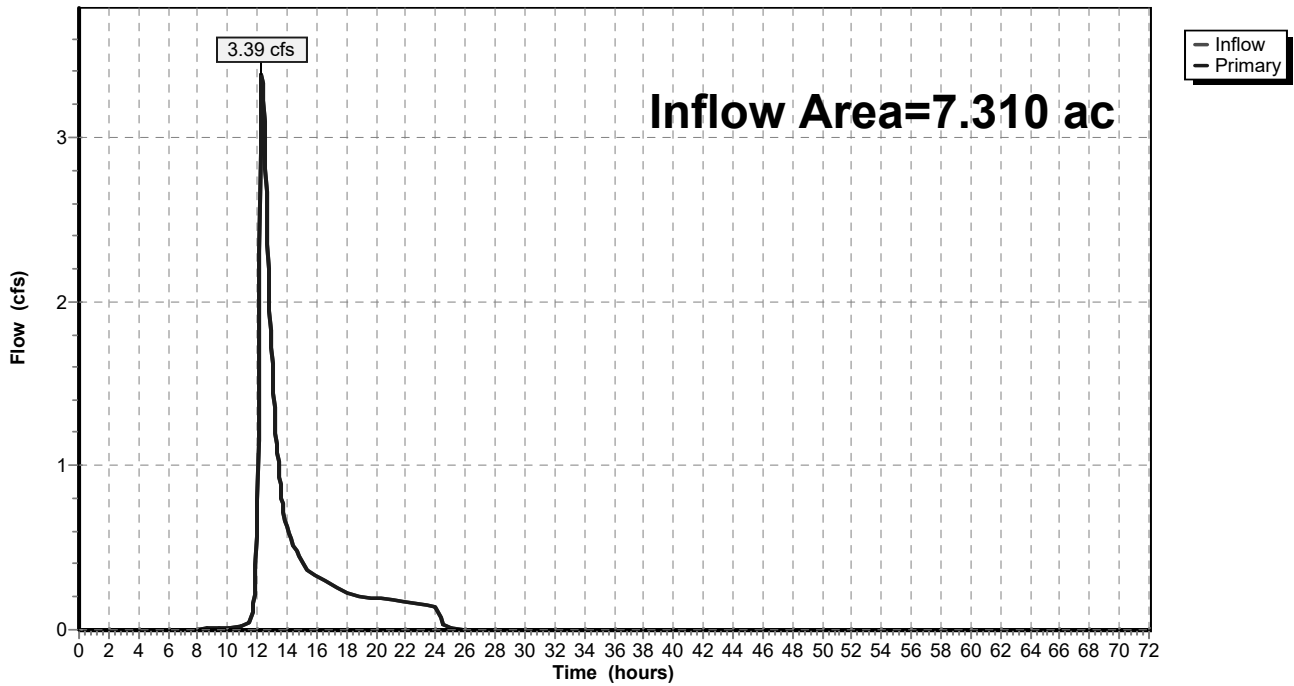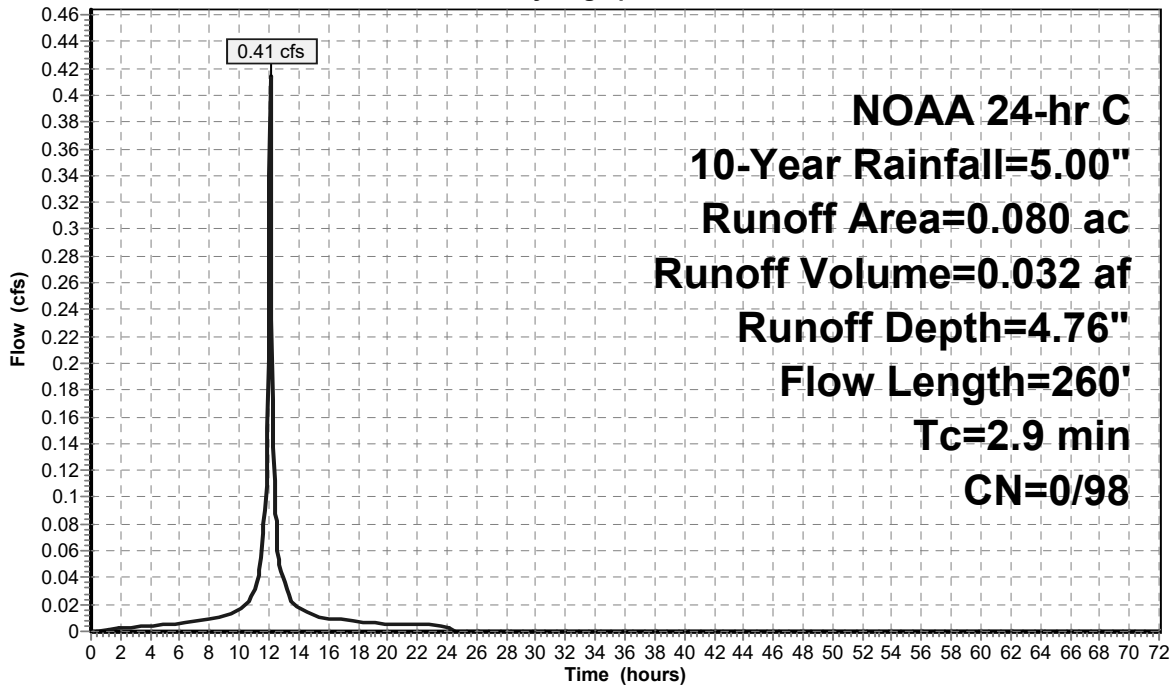Printed 11/9/2022
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Summary for Link Wetlands:

Inflow Area =   7.310 ac,   1.09% Impervious, Inflow Depth =   1.99"   for 10-Year event
Inflow   =   9.11 cfs @   12.28 hrs, Volume=   1.211 af
Primary   =   9.11 cfs @   12.28 hrs, Volume=   1.211 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link Wetlands:

Hydrograph
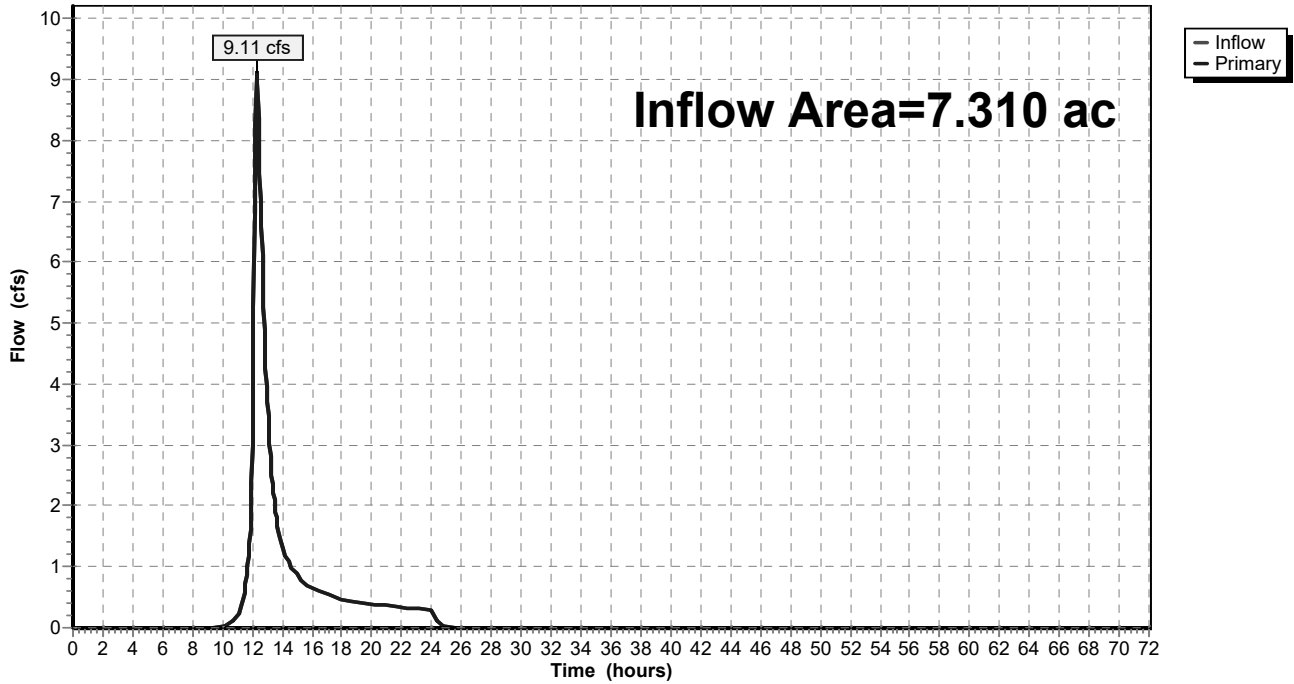
Summary for Subcatchment A Imp:

Runoff   =   0.52 cfs @   12.10 hrs, Volume=   0.040 af, Depth= 6.05"
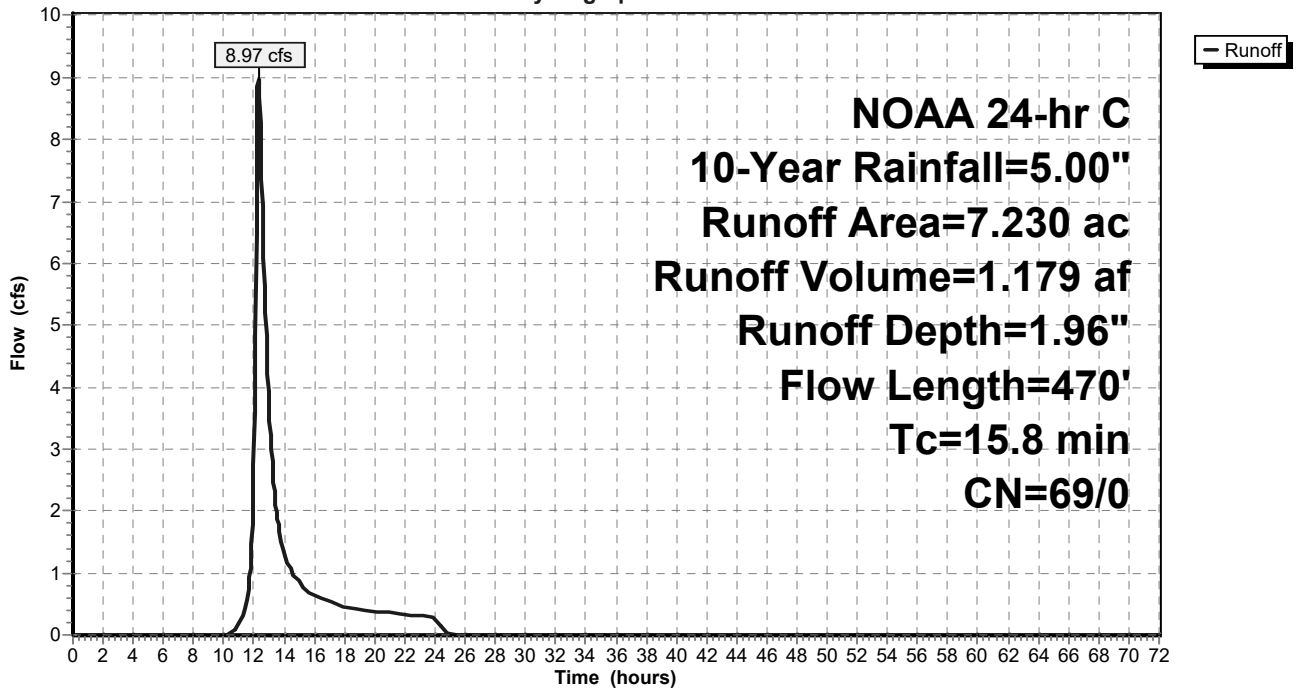
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Rainfall=6.29"

Area (ac)	CN	Description
0.080	98	Roofs, HSG A
0.080	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	20	0.3300	3.09		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
2.8	240	0.0250	1.42		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
2.9	260				Total

Subcatchment A Imp:

Hydrograph

NOAA 24-hr C
25-Year Rainfall=6.29"
Runoff Area=0.080 ac
Runoff Volume=0.040 af
Runoff Depth=6.05"
Flow Length=260'
Tc=2.9 min
CN=0/98

Summary for Subcatchment A Per:

Runoff   =   13.81 cfs @   12.28 hrs, Volume=   1.772 af, Depth= 2.94"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Rainfall=6.29"

Area (ac)	CN	Description
3.910	64	Row crops, SR + CR, Good, HSG A
3.140	75	Row crops, SR + CR, Good, HSG B
0.180	82	Row crops, SR + CR, Good, HSG C
7.230	69	Weighted Average
7.230	69	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0200	0.16		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 3.26"
5.1	370	0.0180	1.21		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
15.8	470	Total			

Subcatchment A Per:

Hydrograph

NOAA 24-hr C
25-Year Rainfall=6.29"
Runoff Area=7.230 ac
Runoff Volume=1.772 af
Runoff Depth=2.94"
Flow Length=470'
Tc=15.8 min
CN=69/0

Summary for Link Wetlands:

Inflow Area =   7.310 ac,   1.09% Impervious, Inflow Depth =   2.97"   for 25-Year event
Inflow   =   14.07 cfs @   12.27 hrs, Volume=   1.812 af
Primary   =   14.07 cfs @   12.27 hrs, Volume=   1.812 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link Wetlands:

Hydrograph
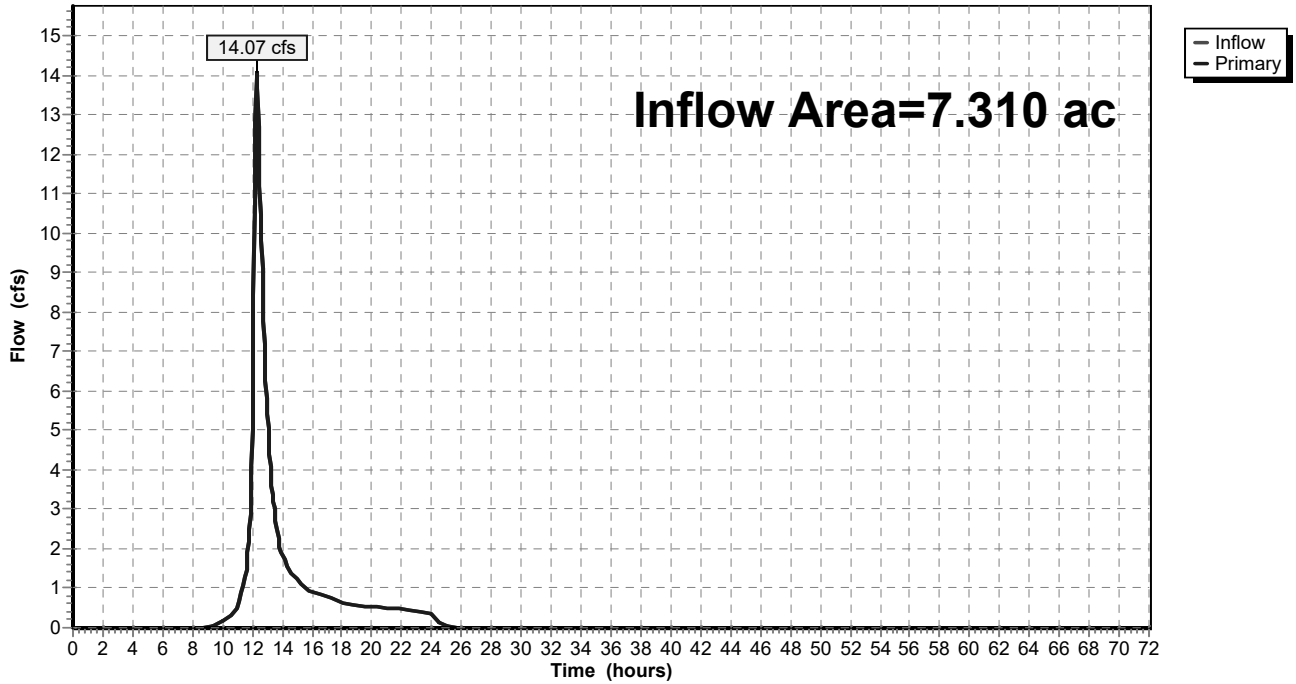
Summary for Subcatchment A Imp:

Runoff   =   0.70 cfs @   12.10 hrs, Volume=   0.055 af, Depth= 8.21"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
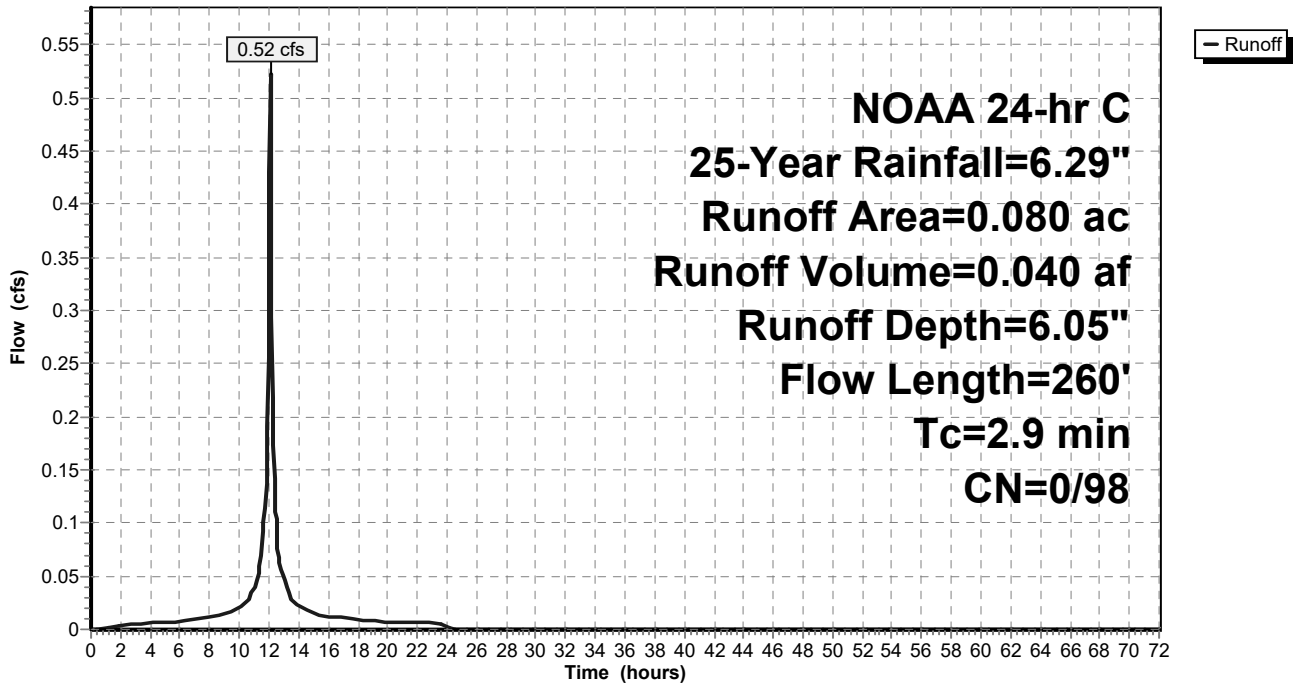NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
0.080	98	Roofs, HSG A
0.080	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	20	0.3300	3.09		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
2.8	240	0.0250	1.42		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
2.9	260				Total

Subcatchment A Imp:

Hydrograph

NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=0.080 ac
Runoff Volume=0.055 af
Runoff Depth=8.21"
Flow Length=260'
Tc=2.9 min
CN=0/98

Summary for Subcatchment A Per:

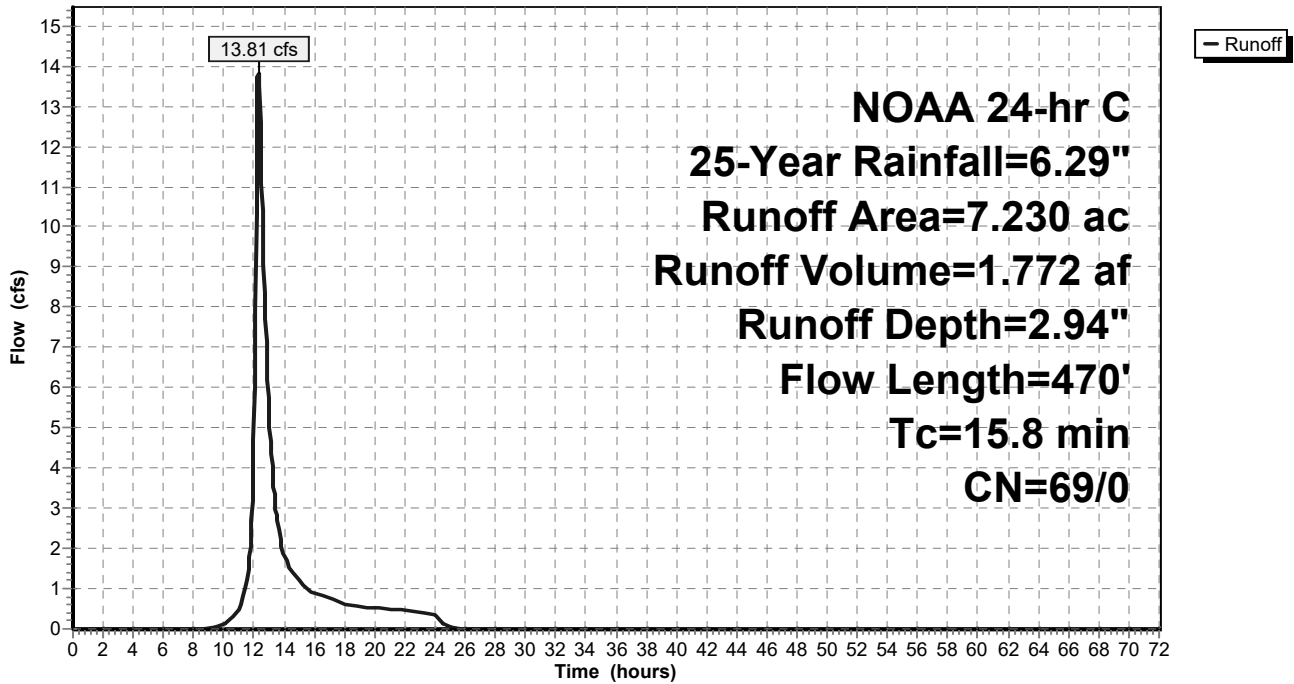Runoff   =   22.65 cfs @ 12.27 hrs, Volume=   2.853 af, Depth= 4.73"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
3.910	64	Row crops, SR + CR, Good, HSG A
3.140	75	Row crops, SR + CR, Good, HSG B
0.180	82	Row crops, SR + CR, Good, HSG C
7.230	69	Weighted Average
7.230	69	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0200	0.16		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 3.26"
5.1	370	0.0180	1.21		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
15.8	470	Total			

Subcatchment A Per:

Hydrograph

**NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=7.230 ac
Runoff Volume=2.853 af
Runoff Depth=4.73"
Flow Length=470'
Tc=15.8 min
CN=69/0**

## Summary for Link Wetlands:

Inflow Area =   7.310 ac,   1.09% Impervious, Inflow Depth =   4.77"   for 100-Year event
Inflow   =   22.91 cfs @   12.27 hrs, Volume=   2.907 af
Primary   =   22.91 cfs @   12.27 hrs, Volume=   2.907 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link Wetlands:

Hydrograph

C. Post-development Conditions Storm Hydrographs

A Imp   A Per   B Imp   B Per   C Imp   C Per

Basin A   Basin B   Basin C

Total   UC

Subcat   Reach   Pond   Link
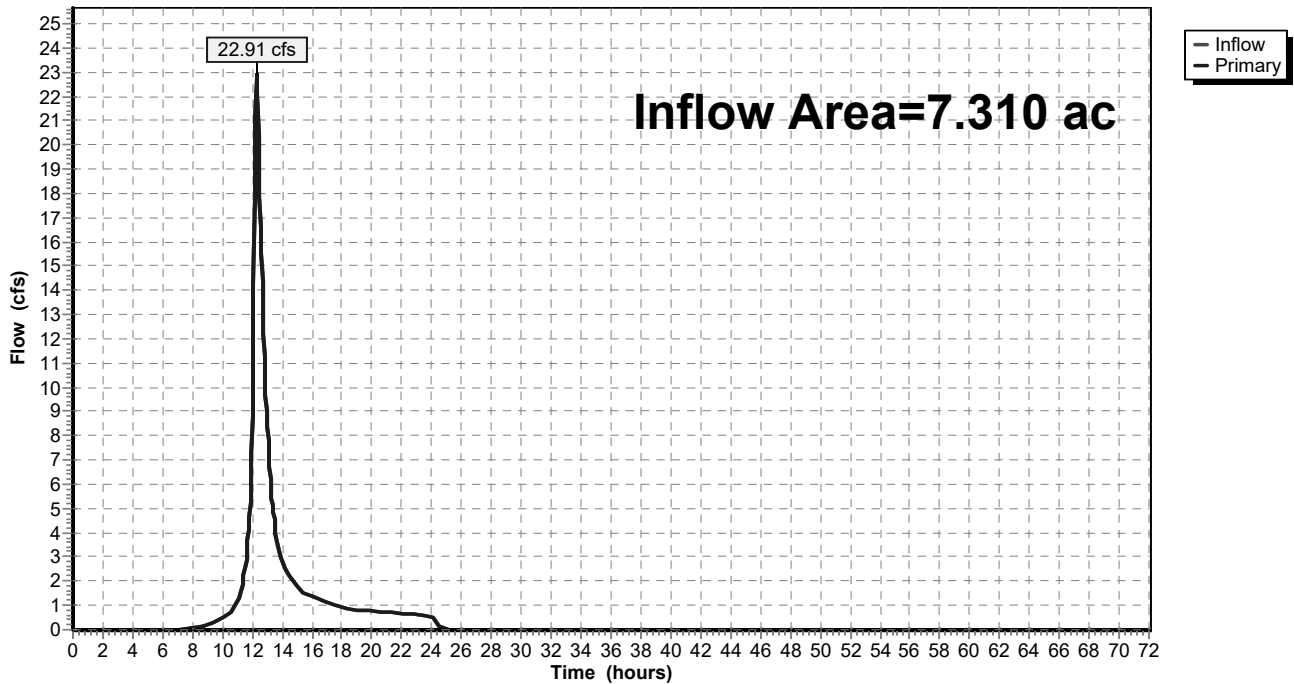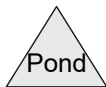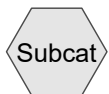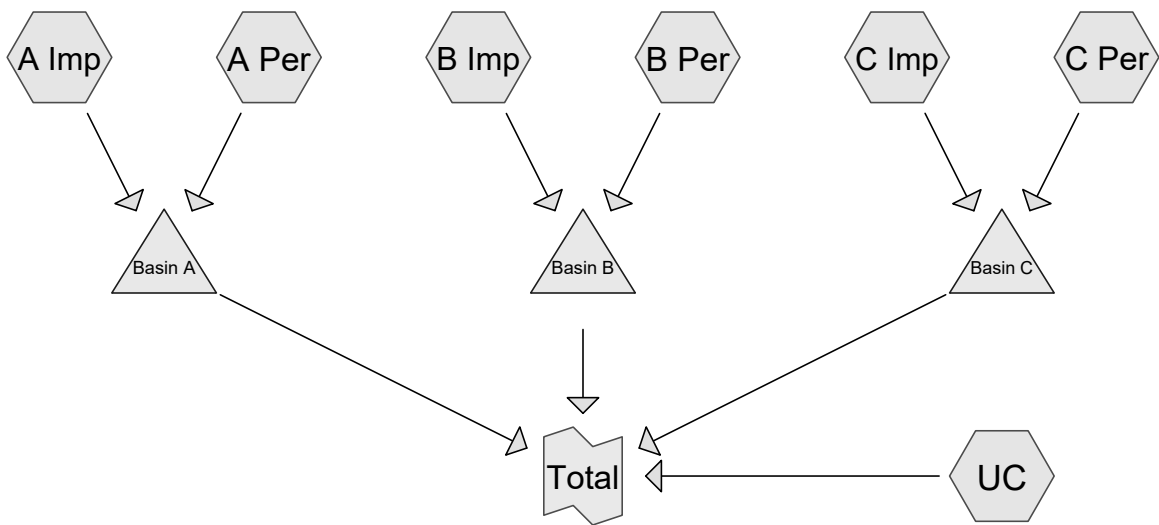
Routing Diagram for Post Developed
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.120	39	>75% Grass cover, Good, HSG A (A Per, B Per, C Per, UC)
2.080	61	>75% Grass cover, Good, HSG B (A Per, B Per, UC)
0.170	74	>75% Grass cover, Good, HSG C (UC)
0.930	98	Paved parking, HSG A (A Imp, B Imp, C Imp)
1.010	98	Paved parking, HSG B (A Imp, B Imp)
7.310	**62**	**TOTAL AREA**

Summary for Subcatchment A Imp:

Runoff   =   2.90 cfs @   12.15 hrs, Volume=   0.280 af, Depth= 3.03"
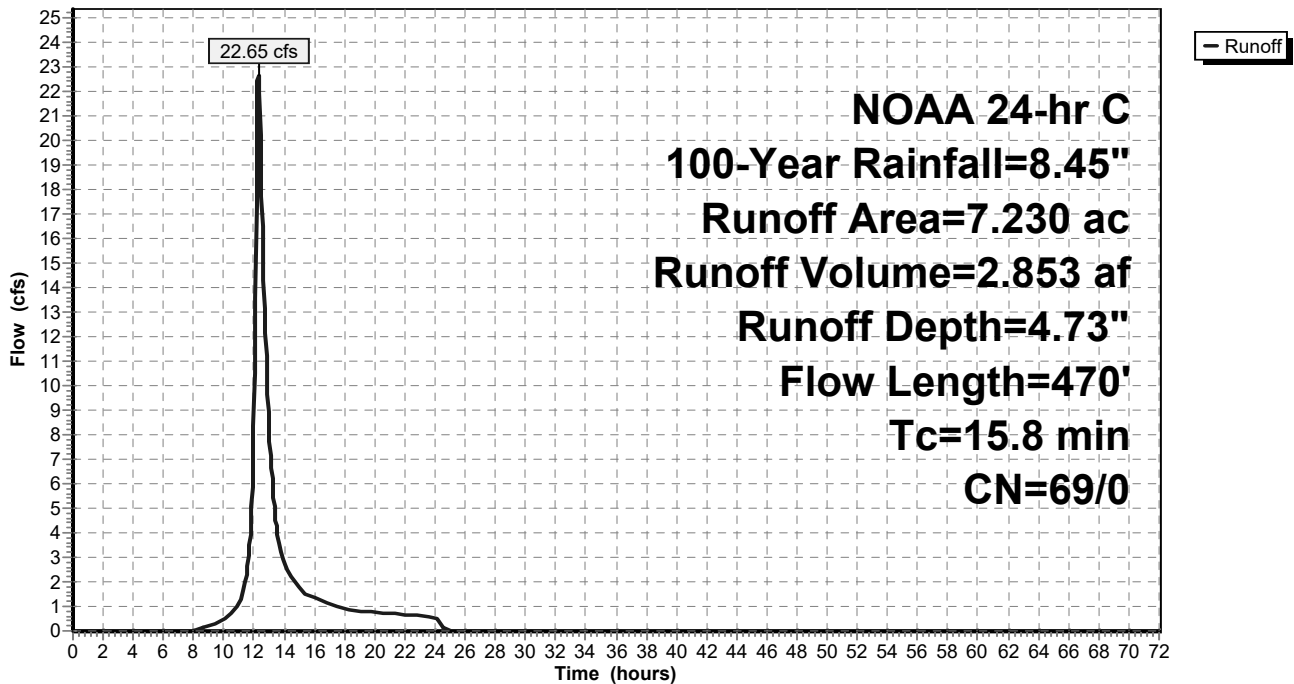
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Rainfall=3.26"

Area (ac)	CN	Description
0.450	98	Paved parking, HSG A
0.660	98	Paved parking, HSG B
1.110	98	Weighted Average
1.110	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.6	42	0.0200	1.17		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
1.3	115	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.1	222	Total			

Subcatchment A Imp:

Hydrograph

NOAA 24-hr C
2-Year Rainfall=3.26"
Runoff Area=1.110 ac
Runoff Volume=0.280 af
Runoff Depth=3.03"
Flow Length=222'
Tc=7.1 min
CN=0/98

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NOAA 24-hr C 2-Year Rainfall=3.26"
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Summary for Subcatchment A Per:

Runoff   =   0.13 cfs @ 12.59 hrs, Volume=   0.038 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Rainfall=3.26"

Area (ac)	CN	Description
0.570	39	>75% Grass cover, Good, HSG A
1.350	61	>75% Grass cover, Good, HSG B
1.920	54	Weighted Average
1.920	54	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	73	0.0120	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
3.1	142	0.0120	0.77		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.4	215	Total			

Subcatchment A Per:

Hydrograph

NOAA 24-hr C
2-Year Rainfall=3.26"
Runoff Area=1.920 ac
Runoff Volume=0.038 af
Runoff Depth=0.24"
Flow Length=215'
Slope=0.0120 '/'
Tc=12.4 min
CN=54/0

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NOAA 24-hr C 2-Year Rainfall=3.26"
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Summary for Subcatchment B Imp:

Runoff   =   1.78 cfs @   12.08 hrs, Volume=   0.121 af, Depth= 3.03"
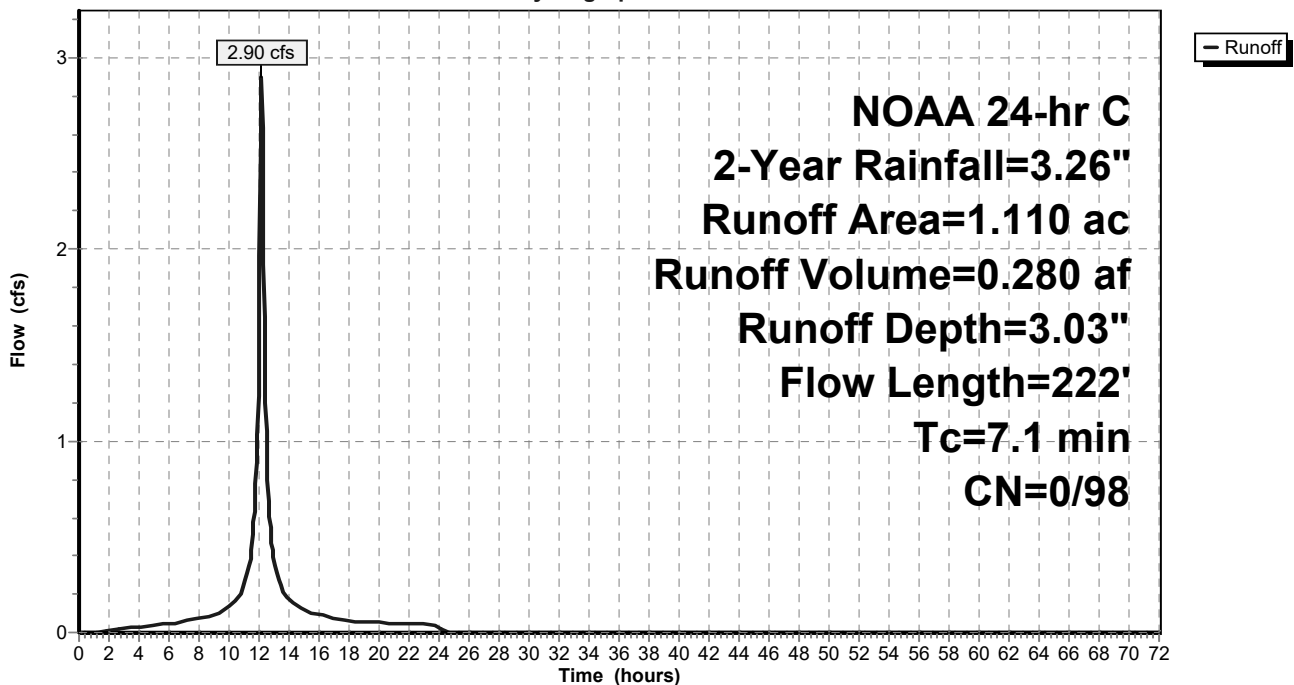
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Rainfall=3.26"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG A
0.350	98	Paved parking, HSG B
0.480	98	Weighted Average
0.480	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.39		**Sheet Flow,**
					Smooth surfaces n= 0.011 P2= 3.26"
0.3	15	0.0200	0.95		**Sheet Flow,**
					Smooth surfaces n= 0.011 P2= 3.26"
1.5	115				Total

Subcatchment B Imp:

Hydrograph

NOAA 24-hr C
2-Year Rainfall=3.26"
Runoff Area=0.480 ac
Runoff Volume=0.121 af
Runoff Depth=3.03"
Flow Length=115'
Slope=0.0200 '/'
Tc=1.5 min
CN=0/98

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NOAA 24-hr C 2-Year Rainfall=3.26"
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Summary for Subcatchment B Per:

Runoff   =   0.01 cfs @   14.35 hrs, Volume=   0.004 af, Depth= 0.07"
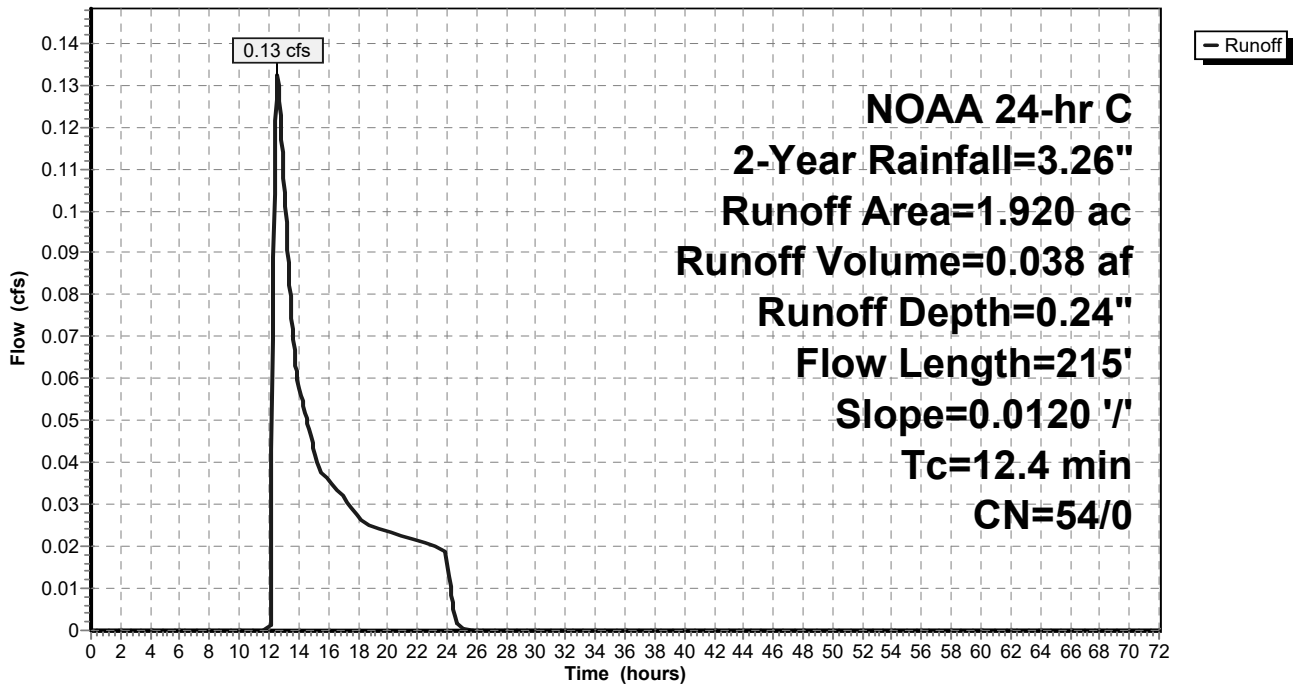
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Rainfall=3.26"

Area (ac)	CN	Description
0.540	39	>75% Grass cover, Good, HSG A
0.250	61	>75% Grass cover, Good, HSG B
0.790	46	Weighted Average
0.790	46	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.7	49	0.0200	1.20		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
0.4	66	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.2	160	Total			

Subcatchment B Per:

Hydrograph

NOAA 24-hr C
2-Year Rainfall=3.26"
Runoff Area=0.790 ac
Runoff Volume=0.004 af
Runoff Depth=0.07"
Flow Length=160'
Slope=0.0200 '/'
Tc=6.2 min
CN=46/0

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Summary for Subcatchment C Imp:

Runoff   =   0.90 cfs @   12.16 hrs, Volume=   0.088 af, Depth= 3.03"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Rainfall=3.26"

Area (ac)	CN	Description
0.350	98	Paved parking, HSG A
0.350	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	65	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.5	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
7.4	100				Total

Subcatchment C Imp:

Hydrograph

**NOAA 24-hr C
2-Year Rainfall=3.26"
Runoff Area=0.350 ac
Runoff Volume=0.088 af
Runoff Depth=3.03"
Flow Length=100'
Slope=0.0200 '/'
Tc=7.4 min
CN=0/98**

Summary for Subcatchment C Per:

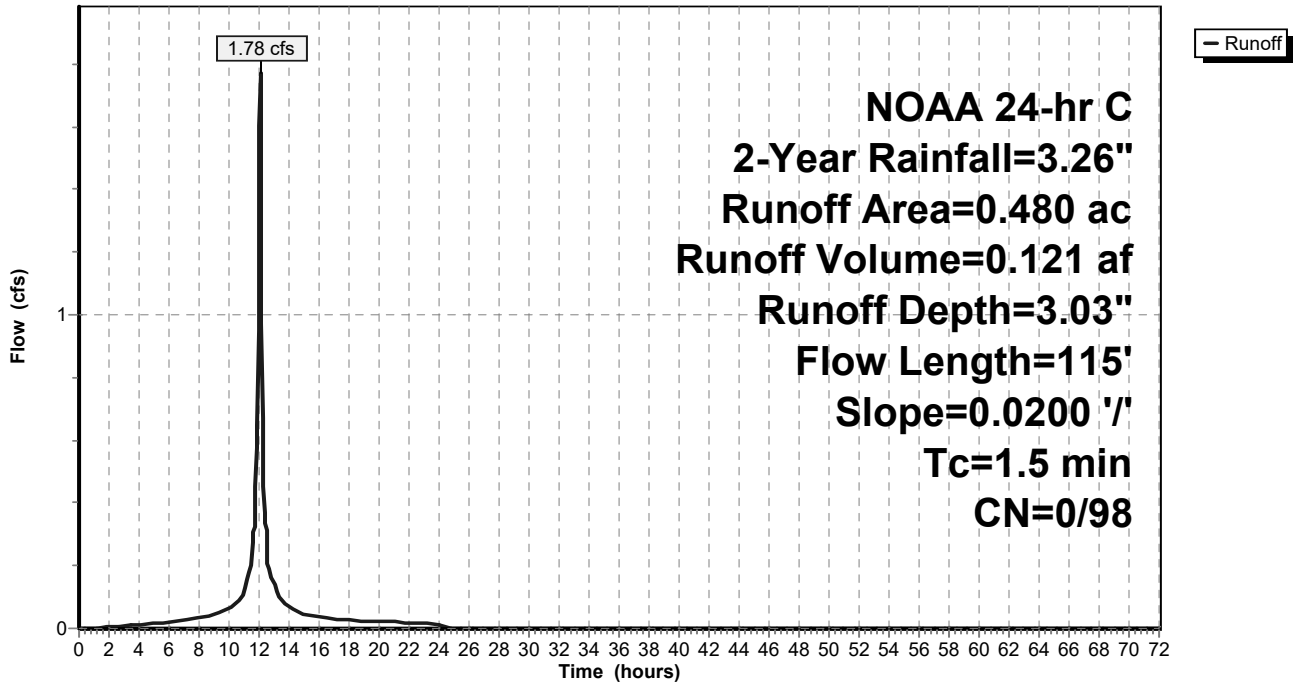Runoff   =   0.00 cfs @ 23.95 hrs, Volume=   0.000 af, Depth= 0.00"
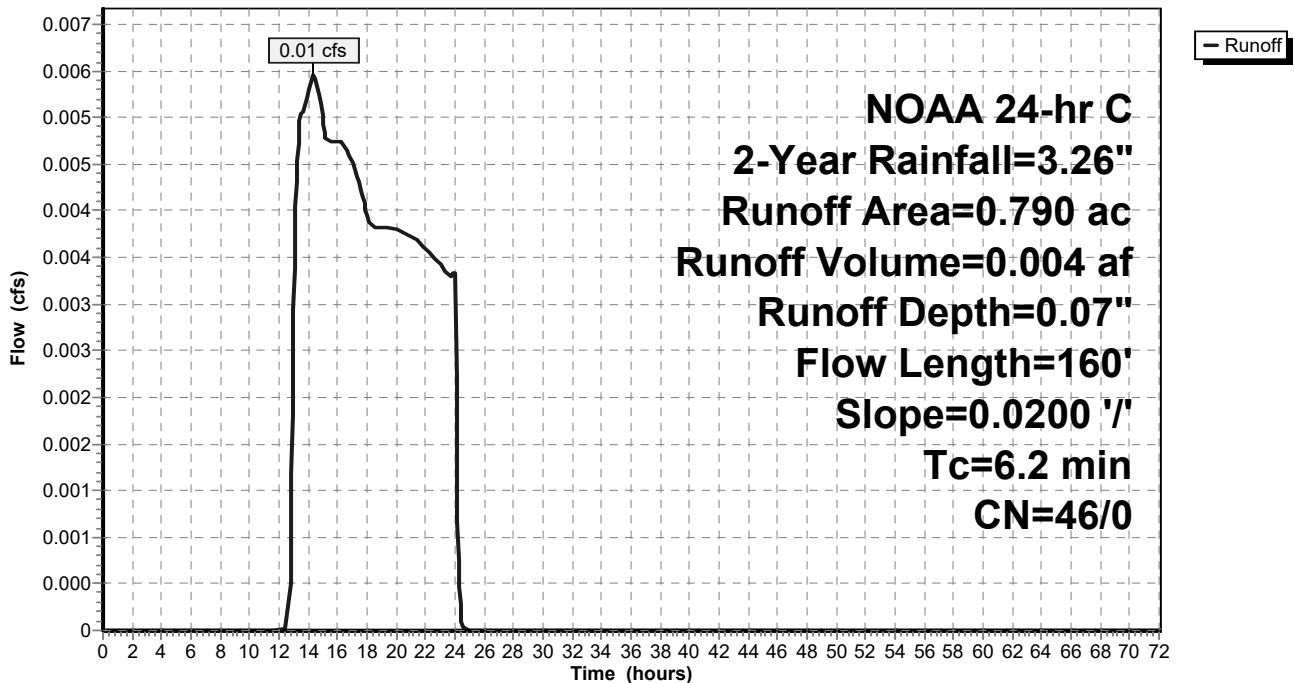
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Rainfall=3.26"

Area (ac)	CN	Description
0.900	39	>75% Grass cover, Good, HSG A
0.900	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
0.4	250	0.0150	11.76	635.20	**Channel Flow,** Area= 54.0 sf Perim= 20.0' r= 2.70' n= 0.030 Earth, grassed & winding
0.9	285				Total

Subcatchment C Per:

Hydrograph

**NOAA 24-hr C
2-Year Rainfall=3.26"
Runoff Area=0.900 ac
Runoff Volume=0.000 af
Runoff Depth=0.00"
Flow Length=285'
Tc=0.9 min
CN=39/0**

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NOAA 24-hr C 2-Year Rainfall=3.26"
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Summary for Subcatchment UC:

Runoff   =   0.02 cfs @ 13.58 hrs, Volume=   0.015 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
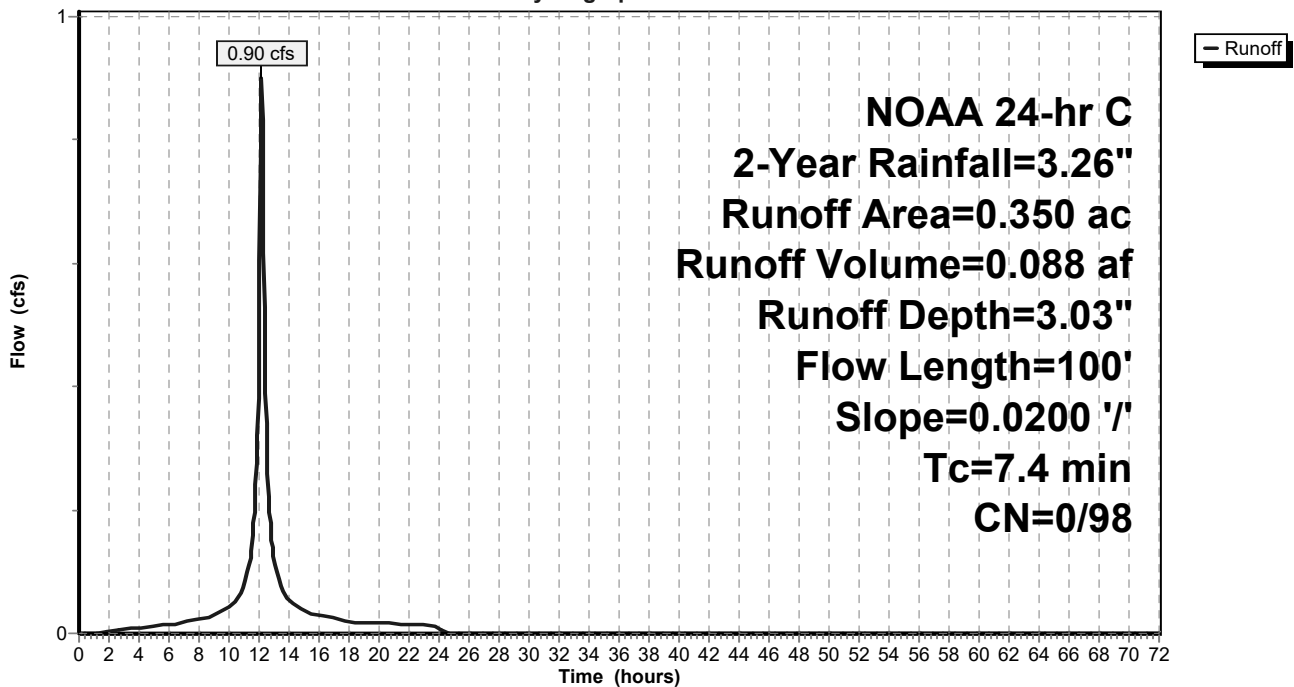NOAA 24-hr C 2-Year Rainfall=3.26"

Area (ac)	CN	Description
1.110	39	>75% Grass cover, Good, HSG A
0.480	61	>75% Grass cover, Good, HSG B
0.170	74	>75% Grass cover, Good, HSG C
1.760	48	Weighted Average
1.760	48	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	66	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
10.6	850	0.0080	1.34		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.8	916				Total

Subcatchment UC:

Hydrograph

NOAA 24-hr C
2-Year Rainfall=3.26"
Runoff Area=1.760 ac
Runoff Volume=0.015 af
Runoff Depth=0.10"
Flow Length=916'
Tc=19.8 min
CN=48/0

Summary for Pond Basin A:

Inflow Area =   3.030 ac, 36.63% Impervious, Inflow Depth = 1.26"   for 2-Year event
Inflow   =   2.92 cfs @   12.16 hrs, Volume=   0.318 af
Outflow   =   0.49 cfs @   13.00 hrs, Volume=   0.318 af, Atten= 83%, Lag= 50.7 min
Discarded =   0.47 cfs @   13.00 hrs, Volume=   0.316 af
Primary   =   0.02 cfs @   13.00 hrs, Volume=   0.002 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 120.12' @ 13.00 hrs   Surf.Area= 40,449 sf   Storage= 4,695 cf

Plug-Flow detention time= 85.5 min calculated for 0.318 af (100% of inflow)
Center-of-Mass det. time= 85.5 min (874.3 - 788.8)

Volume	Invert	Avail.Storage	Storage Description
#1	120.00'	140,905 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.00	39,908	0	0
121.00	44,542	42,225	42,225
122.00	49,296	46,919	89,144
123.00	54,226	51,761	140,905

Device	Routing	Invert	Outlet Devices
#1	Primary	118.56'	**18.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.56' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	120.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	120.10'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.90'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.47 cfs @ 13.00 hrs HW=120.12'   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.47 cfs)

Primary OutFlow Max=0.02 cfs @ 13.00 hrs HW=120.12'   (Free Discharge)
└─**1=Culvert** (Passes 0.02 cfs of 6.14 cfs potential flow)
  ├─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.43 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)
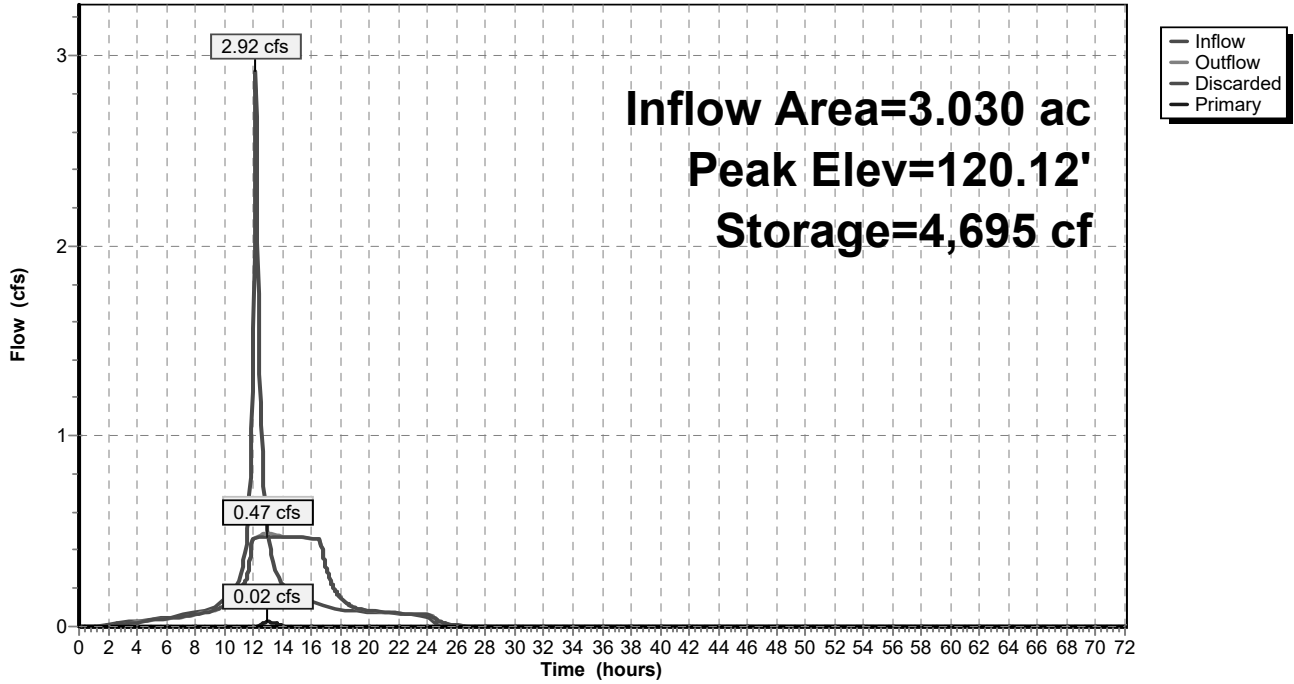
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NOAA 24-hr C 2-Year Rainfall=3.26"
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Pond Basin A:

Hydrograph

Inflow Area=3.030 ac
Peak Elev=120.12'
Storage=4,695 cf

Legend:
- Inflow
- Outflow
- Discarded
- Primary

2.92 cfs

0.47 cfs

0.02 cfs

Flow (cfs)

Time (hours)

Summary for Pond Basin B:

Inflow Area =   1.270 ac, 37.80% Impervious, Inflow Depth = 1.19"   for 2-Year event
Inflow   =   1.78 cfs @ 12.08 hrs, Volume=   0.125 af
Outflow   =   0.16 cfs @ 12.86 hrs, Volume=   0.125 af, Atten= 91%, Lag= 46.9 min
Discarded   =   0.13 cfs @ 12.86 hrs, Volume=   0.121 af
Primary   =   0.03 cfs @ 12.86 hrs, Volume=   0.005 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 120.20' @ 12.86 hrs   Surf.Area= 11,195 sf   Storage= 2,161 cf

Plug-Flow detention time= 128.2 min calculated for 0.125 af (100% of inflow)
Center-of-Mass det. time= 128.2 min (893.6 - 765.4)

Volume	Invert	Avail.Storage	Storage Description
#1	120.00'	43,672 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.00	10,742	0	0
121.00	13,042	11,892	11,892
122.00	16,315	14,679	26,571
123.00	17,888	17,102	43,672

Device	Routing	Invert	Outlet Devices
#1	Primary	118.87'	**18.0" Round Culvert** L= 74.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.87' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	120.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	120.15'	**1.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.90'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.13 cfs @ 12.86 hrs HW=120.20' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.03 cfs @ 12.86 hrs HW=120.20' (Free Discharge)
└─**1=Culvert** (Passes 0.03 cfs of 5.18 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.03 cfs @ 0.72 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond Basin B:

Hydrograph

Inflow Area=1.270 ac
Peak Elev=120.20'
Storage=2,161 cf

Legend: Inflow, Outflow, Discarded, Primary

1.78 cfs

0.13 cfs

0.03 cfs

Flow (cfs)

Time (hours)

Summary for Pond Basin C:

Inflow Area =   1.250 ac, 28.00% Impervious, Inflow Depth = 0.85"   for 2-Year event
Inflow   =   0.90 cfs @   12.16 hrs, Volume=   0.088 af
Outflow   =   0.10 cfs @   13.20 hrs, Volume=   0.088 af, Atten= 89%, Lag= 62.7 min
Discarded   =   0.09 cfs @   13.20 hrs, Volume=   0.087 af
Primary   =   0.01 cfs @   13.20 hrs, Volume=   0.001 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 119.22' @ 13.20 hrs   Surf.Area= 7,564 sf   Storage= 1,607 cf

Plug-Flow detention time= 144.4 min calculated for 0.088 af (100% of inflow)
Center-of-Mass det. time= 144.3 min (907.8 - 763.5)

Volume	Invert	Avail.Storage	Storage Description
#1	119.00'	19,534 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
119.00	7,015	0	0
120.00	9,503	8,259	8,259
121.00	13,047	11,275	19,534

Device	Routing	Invert	Outlet Devices
#1	Primary	118.56'	**18.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.56' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	119.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	119.20'	**1.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 13.20 hrs HW=119.22'   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.01 cfs @ 13.20 hrs HW=119.22'   (Free Discharge)
└─**1=Culvert** (Passes 0.01 cfs of 1.43 cfs potential flow)
   └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.47 fps)
   └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond Basin C:

Hydrograph

Inflow Area=1.250 ac
Peak Elev=119.22'
Storage=1,607 cf

0.90 cfs

0.09 cfs

0.01 cfs

Legend: Inflow, Outflow, Discarded, Primary

Flow (cfs)

Time (hours)

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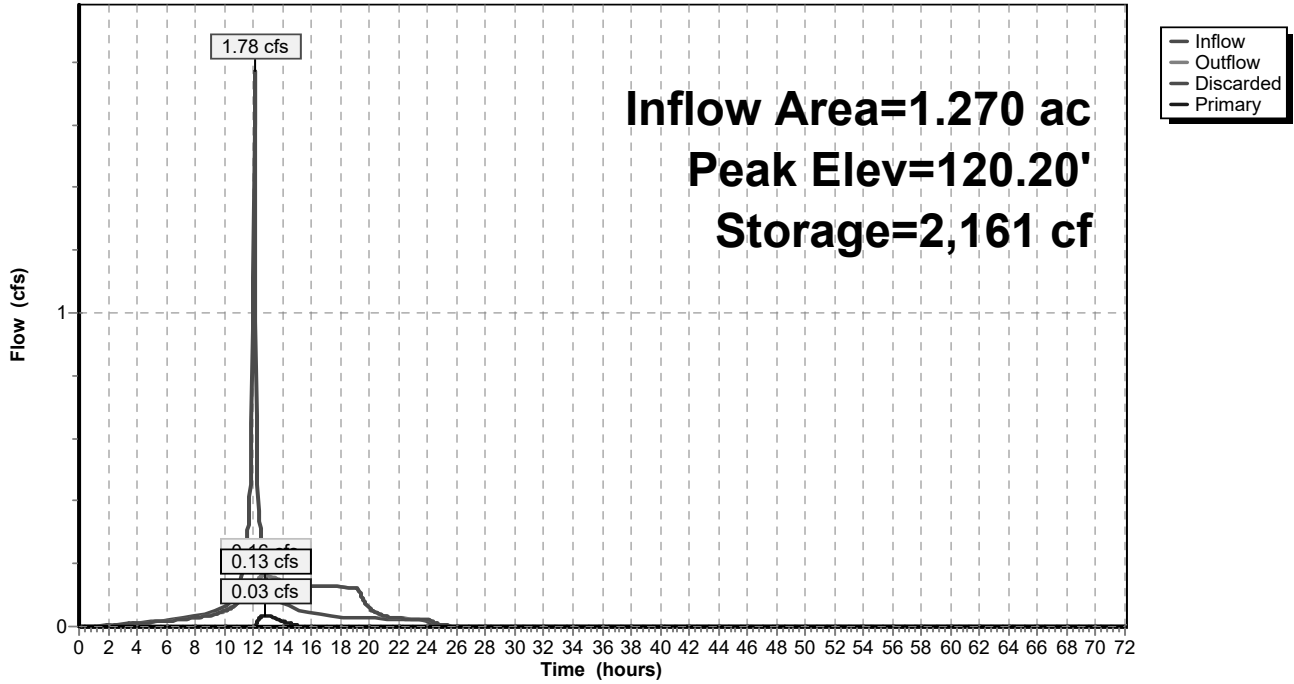*NOAA 24-hr C 2-Year Rainfall=3.26"*
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Page 16
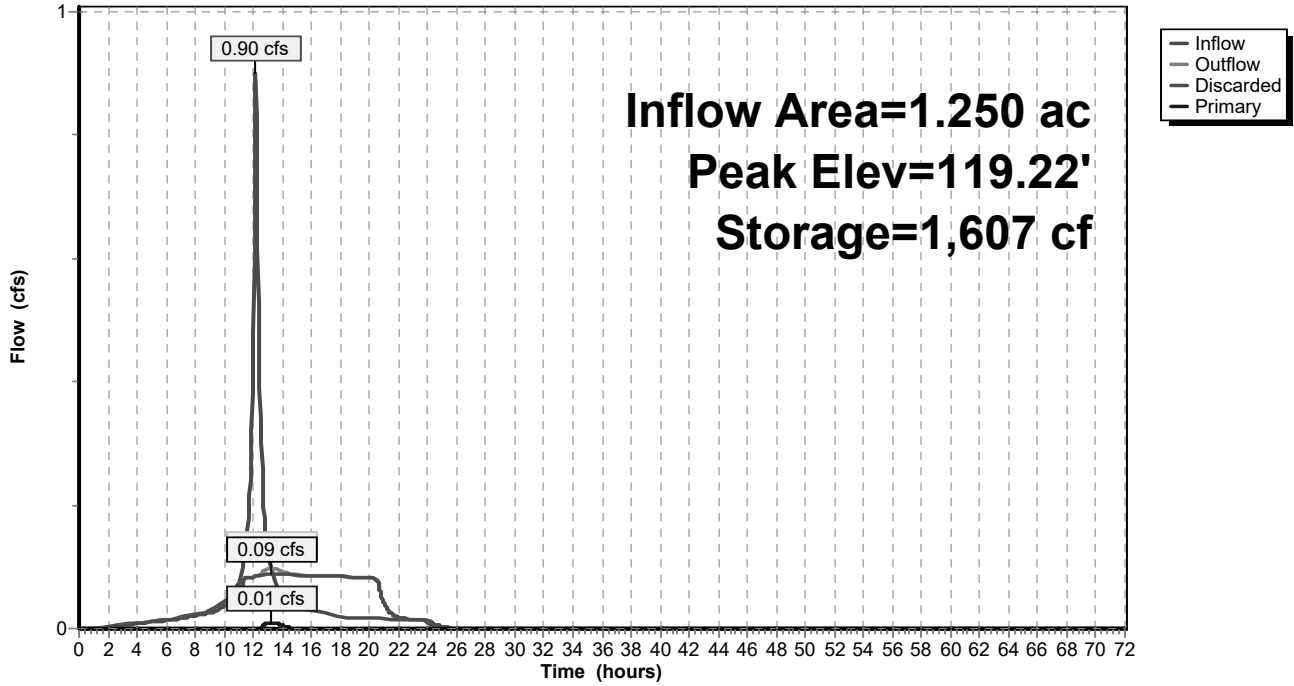
Summary for Link Total:

Inflow Area =   7.310 ac, 26.54% Impervious, Inflow Depth =   0.04"   for 2-Year event
Inflow   =   0.09 cfs @   13.13 hrs, Volume=   0.023 af
Primary   =   0.09 cfs @   13.13 hrs, Volume=   0.023 af, Atten= 0%, Lag= 0.0 min
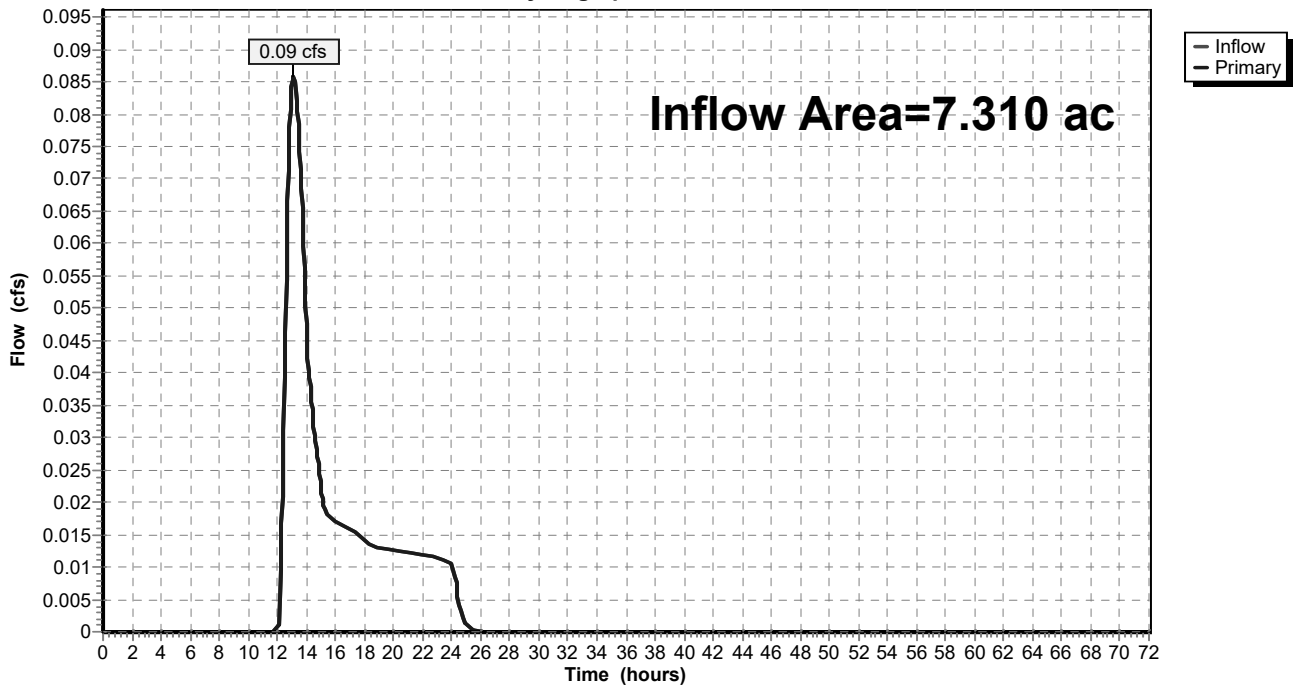
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link Total:

Summary for Subcatchment A Imp:

Runoff   =   4.48 cfs @   12.15 hrs, Volume=   0.441 af, Depth= 4.76"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Rainfall=5.00"

Area (ac)	CN	Description
0.450	98	Paved parking, HSG A
0.660	98	Paved parking, HSG B
1.110	98	Weighted Average
1.110	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.6	42	0.0200	1.17		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
1.3	115	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.1	222	Total			

Subcatchment A Imp:

Hydrograph

4.48 cfs

NOAA 24-hr C
10-Year Rainfall=5.00"
Runoff Area=1.110 ac
Runoff Volume=0.441 af
Runoff Depth=4.76"
Flow Length=222'
Tc=7.1 min
CN=0/98

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NOAA 24-hr C 10-Year Rainfall=5.00"
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Summary for Subcatchment A Per:

Runoff   =   0.97 cfs @ 12.28 hrs, Volume=   0.147 af, Depth= 0.92"
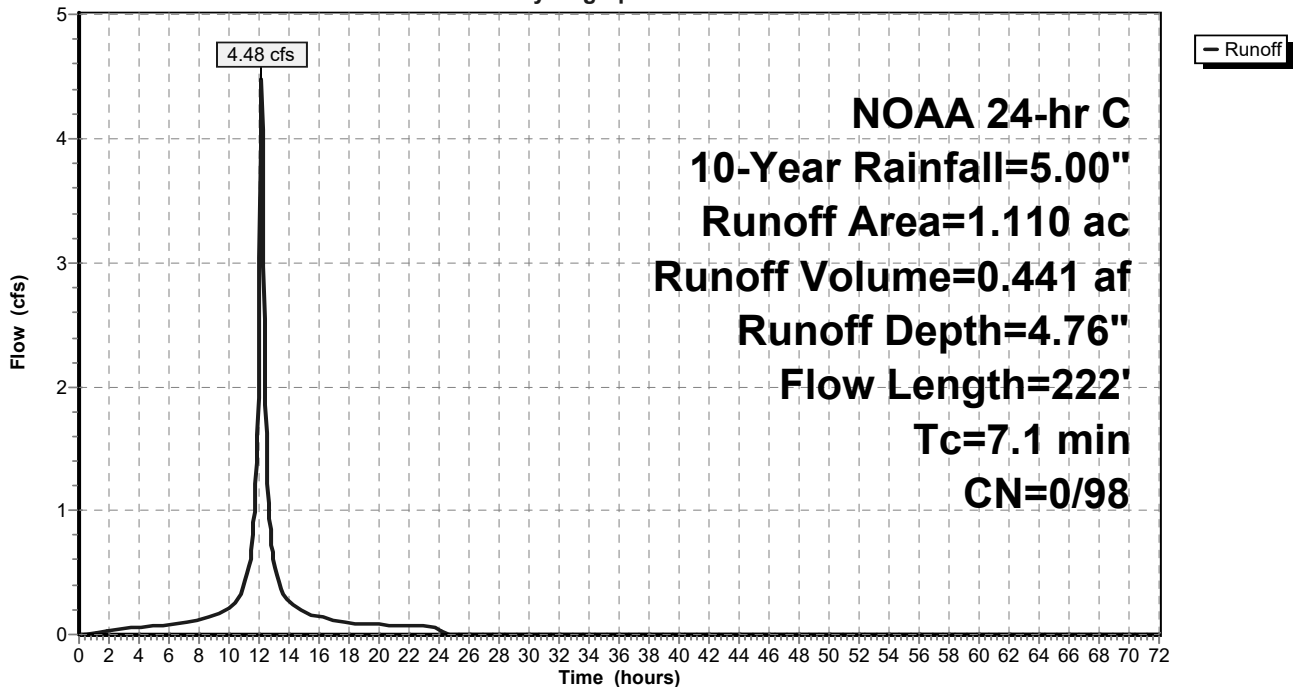
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Rainfall=5.00"

Area (ac)	CN	Description
0.570	39	>75% Grass cover, Good, HSG A
1.350	61	>75% Grass cover, Good, HSG B
1.920	54	Weighted Average
1.920	54	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	73	0.0120	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
3.1	142	0.0120	0.77		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.4	215	Total			

Subcatchment A Per:

Hydrograph

NOAA 24-hr C
10-Year Rainfall=5.00"
Runoff Area=1.920 ac
Runoff Volume=0.147 af
Runoff Depth=0.92"
Flow Length=215'
Slope=0.0120 '/'
Tc=12.4 min
CN=54/0

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Summary for Subcatchment B Imp:

Runoff   =   2.74 cfs @ 12.08 hrs, Volume=   0.191 af, Depth= 4.76"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Rainfall=5.00"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG A
0.350	98	Paved parking, HSG B
0.480	98	Weighted Average
0.480	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.39		**Sheet Flow,**
					Smooth surfaces n= 0.011 P2= 3.26"
0.3	15	0.0200	0.95		**Sheet Flow,**
					Smooth surfaces n= 0.011 P2= 3.26"
1.5	115	Total			

Subcatchment B Imp:

Hydrograph

Summary for Subcatchment B Per:

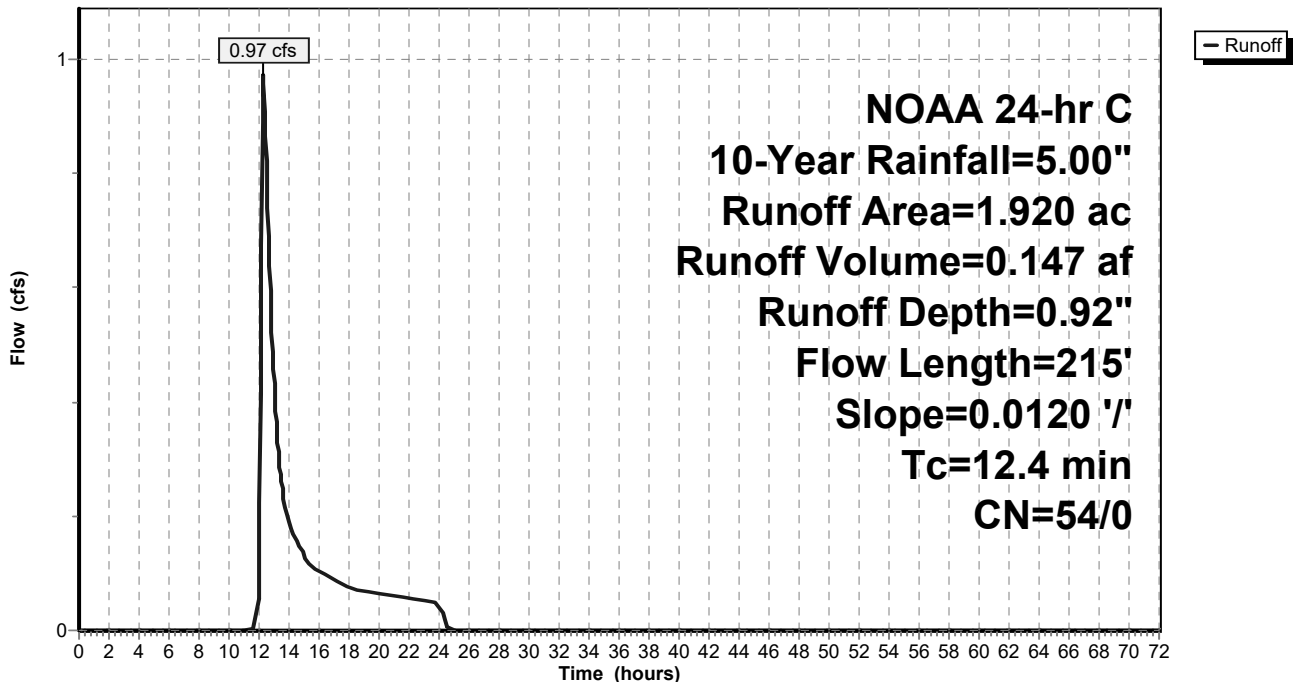Runoff   =   0.17 cfs @ 12.26 hrs, Volume=   0.032 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Rainfall=5.00"

Area (ac)	CN	Description
0.540	39	>75% Grass cover, Good, HSG A
0.250	61	>75% Grass cover, Good, HSG B
0.790	46	Weighted Average
0.790	46	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.7	49	0.0200	1.20		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
0.4	66	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.2	160	Total			

Subcatchment B Per:

Hydrograph

NOAA 24-hr C
10-Year Rainfall=5.00"
Runoff Area=0.790 ac
Runoff Volume=0.032 af
Runoff Depth=0.49"
Flow Length=160'
Slope=0.0200 '/'
Tc=6.2 min
CN=46/0

Summary for Subcatchment C Imp:

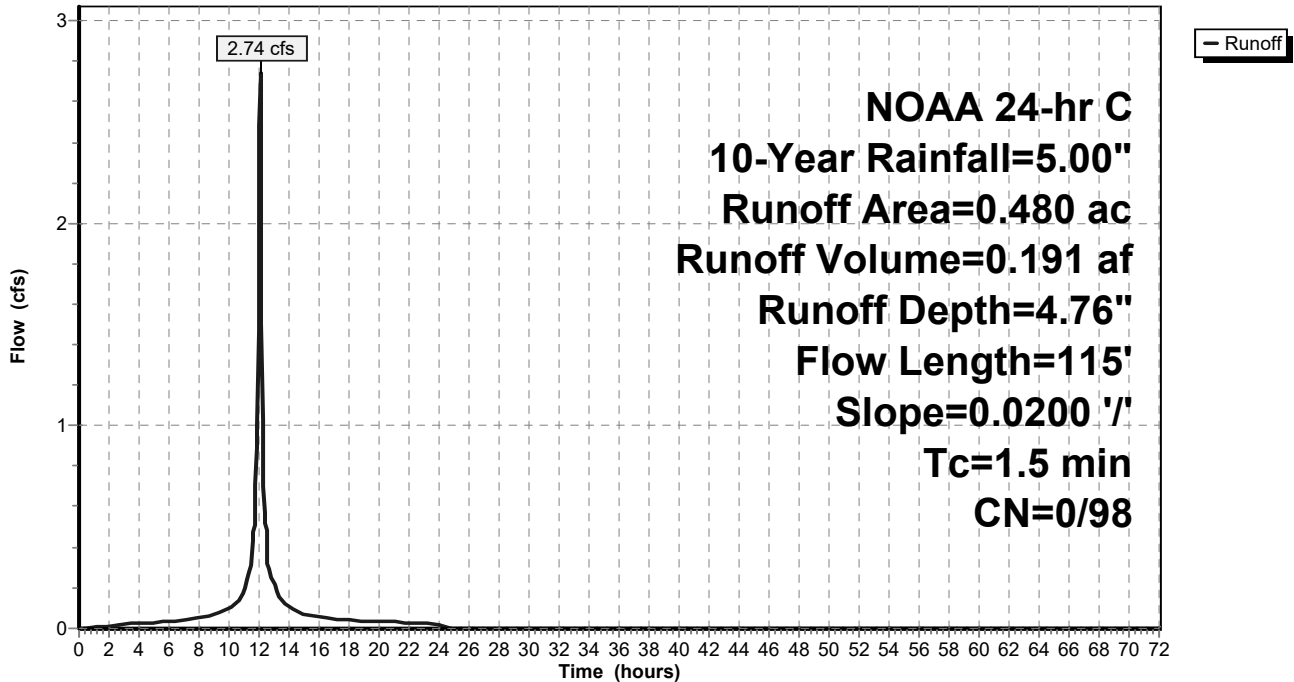Runoff   =   1.39 cfs @   12.16 hrs, Volume=   0.139 af, Depth= 4.76"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Rainfall=5.00"

Area (ac)	CN	Description
0.350	98	Paved parking, HSG A
0.350	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	65	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.5	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
7.4	100				Total

Subcatchment C Imp:

Hydrograph

Summary for Subcatchment C Per:

Runoff   =   0.04 cfs @   12.49 hrs, Volume=   0.015 af, Depth= 0.20"
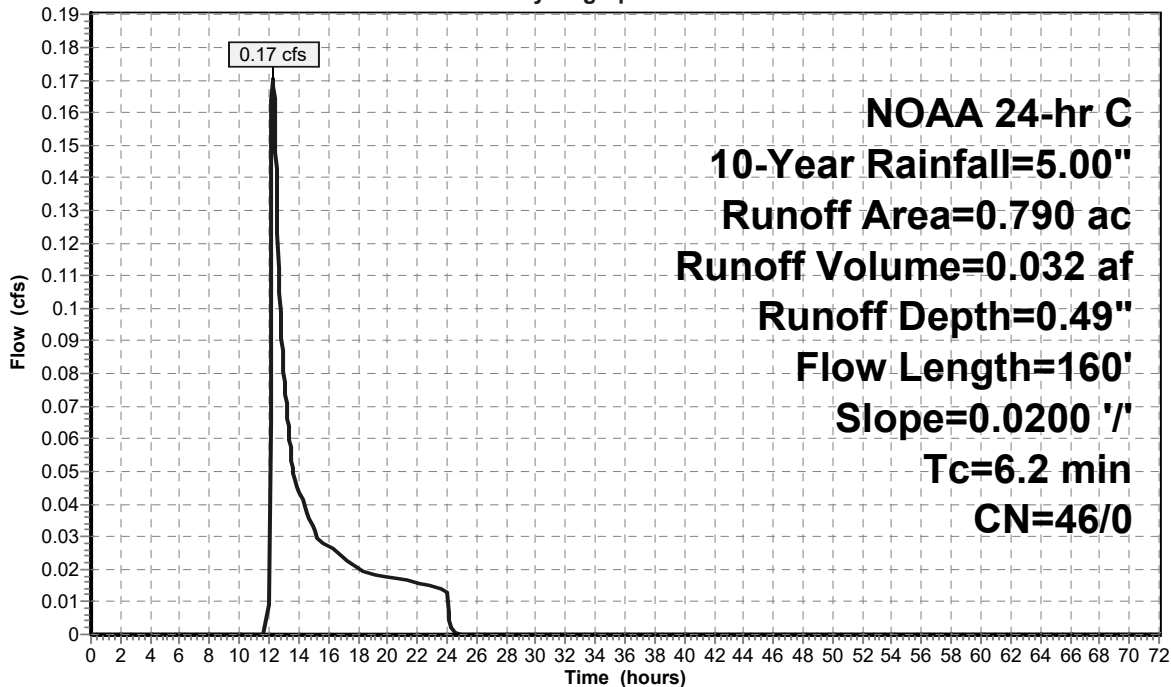
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Rainfall=5.00"

Area (ac)	CN	Description
0.900	39	>75% Grass cover, Good, HSG A
0.900	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	35	0.0200	1.13		**Sheet Flow,**
					Smooth surfaces n= 0.011 P2= 3.26"
0.4	250	0.0150	11.76	635.20	**Channel Flow,**
					Area= 54.0 sf Perim= 20.0' r= 2.70'
					n= 0.030 Earth, grassed & winding
0.9	285	Total			

Subcatchment C Per:

Hydrograph

NOAA 24-hr C
10-Year Rainfall=5.00"
Runoff Area=0.900 ac
Runoff Volume=0.015 af
Runoff Depth=0.20"
Flow Length=285'
Tc=0.9 min
CN=39/0

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Summary for Subcatchment UC:

Runoff = 0.34 cfs @ 12.59 hrs, Volume= 0.086 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
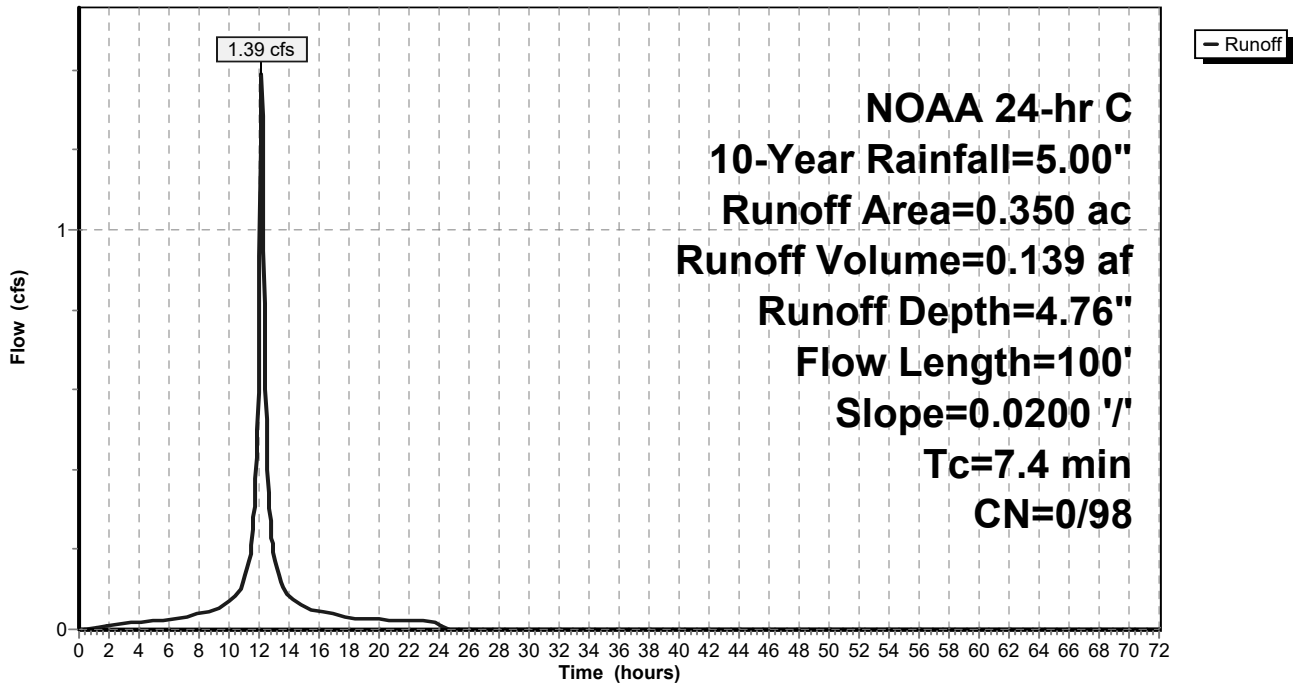NOAA 24-hr C 10-Year Rainfall=5.00"

Area (ac)	CN	Description
1.110	39	>75% Grass cover, Good, HSG A
0.480	61	>75% Grass cover, Good, HSG B
0.170	74	>75% Grass cover, Good, HSG C
1.760	48	Weighted Average
1.760	48	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	66	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
10.6	850	0.0080	1.34		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.8	916				Total

Subcatchment UC:

Hydrograph

NOAA 24-hr C
10-Year Rainfall=5.00"
Runoff Area=1.760 ac
Runoff Volume=0.086 af
Runoff Depth=0.59"
Flow Length=916'
Tc=19.8 min
CN=48/0

Summary for Pond Basin A:

Inflow Area =   3.030 ac, 36.63% Impervious, Inflow Depth = 2.33"   for 10-Year event
Inflow   =   5.20 cfs @ 12.17 hrs, Volume=   0.588 af
Outflow   =   0.95 cfs @ 13.06 hrs, Volume=   0.588 af, Atten= 82%, Lag= 53.7 min
Discarded =   0.47 cfs @ 13.06 hrs, Volume=   0.489 af
Primary   =   0.48 cfs @ 13.06 hrs, Volume=   0.099 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 120.23' @ 13.06 hrs   Surf.Area= 40,979 sf   Storage= 9,344 cf

Plug-Flow detention time= 119.0 min calculated for 0.587 af (100% of inflow)
Center-of-Mass det. time= 119.0 min (913.4 - 794.4)

Volume	Invert	Avail.Storage	Storage Description
#1	120.00'	140,905 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.00	39,908	0	0
121.00	44,542	42,225	42,225
122.00	49,296	46,919	89,144
123.00	54,226	51,761	140,905

Device	Routing	Invert	Outlet Devices
#1	Primary	118.56'	**18.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.56' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	120.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	120.10'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.90'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.47 cfs @ 13.06 hrs HW=120.23'   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.47 cfs)

Primary OutFlow Max=0.48 cfs @ 13.06 hrs HW=120.23'   (Free Discharge)
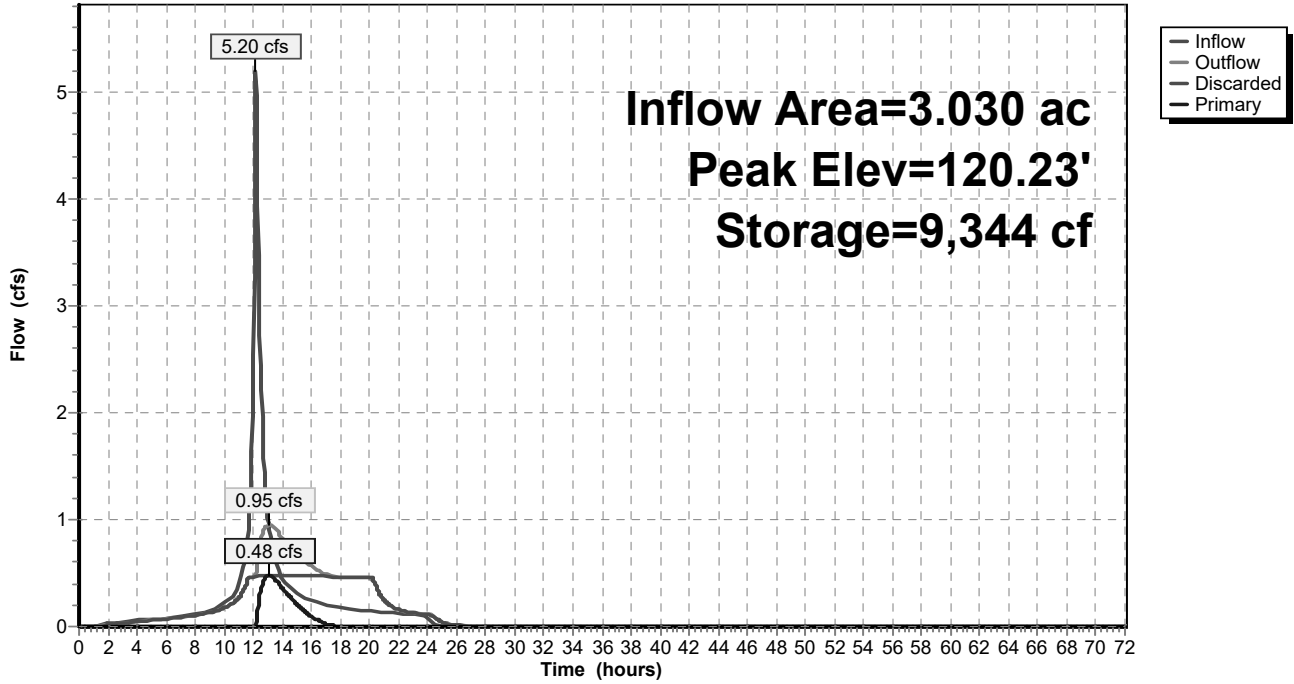└─**1=Culvert** (Passes 0.48 cfs of 6.77 cfs potential flow)
    ├─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.48 cfs @ 1.22 fps)
    └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond Basin A:

Hydrograph

Inflow Area=3.030 ac
Peak Elev=120.23'
Storage=9,344 cf

Summary for Pond Basin B:

Inflow Area =   1.270 ac, 37.80% Impervious, Inflow Depth = 2.10"   for 10-Year event
Inflow   =   2.78 cfs @   12.08 hrs, Volume=   0.223 af
Outflow   =   0.38 cfs @   12.75 hrs, Volume=   0.223 af, Atten= 86%, Lag= 40.0 min
Discarded =   0.13 cfs @   12.75 hrs, Volume=   0.171 af
Primary   =   0.25 cfs @   12.75 hrs, Volume=   0.052 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 120.33' @ 12.75 hrs   Surf.Area= 11,494 sf   Storage= 3,635 cf

Plug-Flow detention time= 144.6 min calculated for 0.223 af (100% of inflow)
Center-of-Mass det. time= 144.3 min (919.3 - 775.0)

Volume	Invert	Avail.Storage	Storage Description
#1	120.00'	43,672 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.00	10,742	0	0
121.00	13,042	11,892	11,892
122.00	16,315	14,679	26,571
123.00	17,888	17,102	43,672

Device	Routing	Invert	Outlet Devices
#1	Primary	118.87'	**18.0" Round Culvert** L= 74.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.87' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	120.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	120.15'	**1.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.90'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.13 cfs @ 12.75 hrs HW=120.33'   (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.24 cfs @ 12.75 hrs HW=120.33'   (Free Discharge)
└**1=Culvert** (Passes 0.24 cfs of 5.92 cfs potential flow)
  └**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.24 cfs @ 1.43 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

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Pond Basin B:

Hydrograph

Inflow Area=1.270 ac
Peak Elev=120.33'
Storage=3,635 cf

Legend:
- Inflow
- Outflow
- Discarded
- Primary

Flow (cfs)

2.78 cfs

0.38 cfs
0.25 cfs
0.11 cfs

Time (hours)

Summary for Pond Basin C:

Inflow Area =   1.250 ac, 28.00% Impervious, Inflow Depth = 1.48"   for 10-Year event
Inflow   =   1.39 cfs @ 12.16 hrs, Volume=   0.154 af
Outflow   =   0.26 cfs @ 12.86 hrs, Volume=   0.154 af, Atten= 81%, Lag= 42.4 min
Discarded =   0.09 cfs @ 12.86 hrs, Volume=   0.124 af
Primary   =   0.17 cfs @ 12.86 hrs, Volume=   0.030 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 119.34' @ 12.86 hrs   Surf.Area= 7,856 sf   Storage= 2,513 cf

Plug-Flow detention time= 159.4 min calculated for 0.154 af (100% of inflow)
Center-of-Mass det. time= 159.4 min (939.4 - 780.0)

Volume	Invert	Avail.Storage	Storage Description
#1	119.00'	19,534 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
119.00	7,015	0	0
120.00	9,503	8,259	8,259
121.00	13,047	11,275	19,534

Device	Routing	Invert	Outlet Devices
#1	Primary	118.56'	**18.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.56' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	119.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	119.20'	**1.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 12.86 hrs HW=119.34'   (Free Discharge)
└—**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.17 cfs @ 12.86 hrs HW=119.34'   (Free Discharge)
└—**1=Culvert** (Passes 0.17 cfs of 1.93 cfs potential flow)
　└—**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.17 cfs @ 1.26 fps)
　└—**4=Orifice/Grate** (Controls 0.00 cfs)
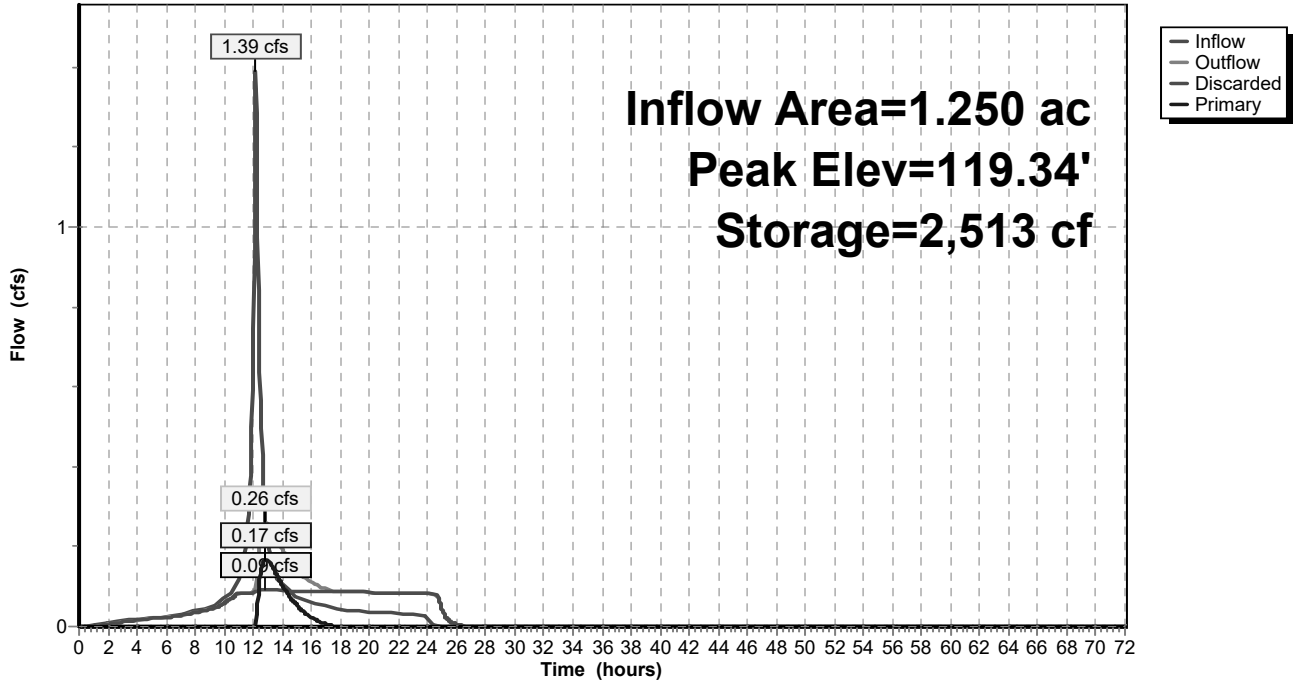
Post Developed
Prepared by {enter your company name here}
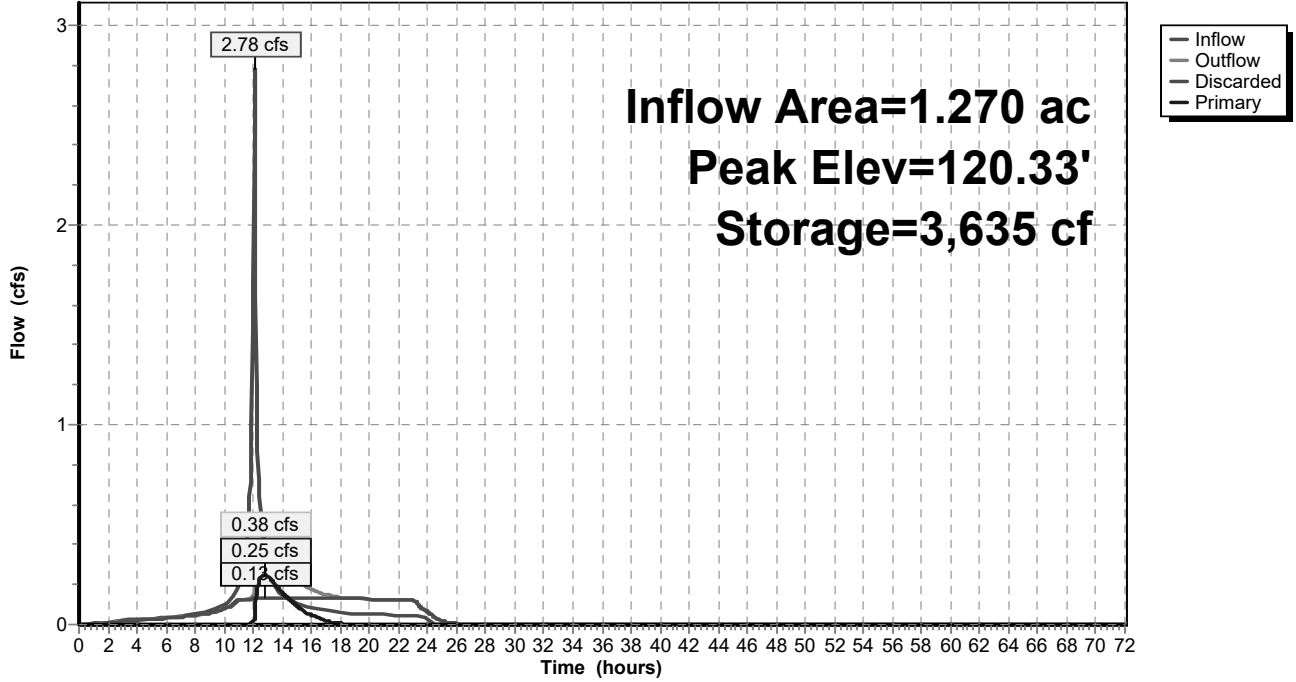HydroCAD® 10.00-25 s/n 06137 © 2019 HydroCAD Software Solutions LLC

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Pond Basin C:

Hydrograph

**Inflow Area=1.250 ac
Peak Elev=119.34'
Storage=2,513 cf**

1.39 cfs

0.26 cfs

0.17 cfs

0.00 cfs

Legend:
— Inflow
— Outflow
— Discarded
— Primary

Flow (cfs)

Time (hours)

Summary for Link Total:

Inflow Area = 7.310 ac, 26.54% Impervious, Inflow Depth = 0.44" for 10-Year event
Inflow = 1.18 cfs @ 12.81 hrs, Volume= 0.268 af
Primary = 1.18 cfs @ 12.81 hrs, Volume= 0.268 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link Total:

Hydrograph
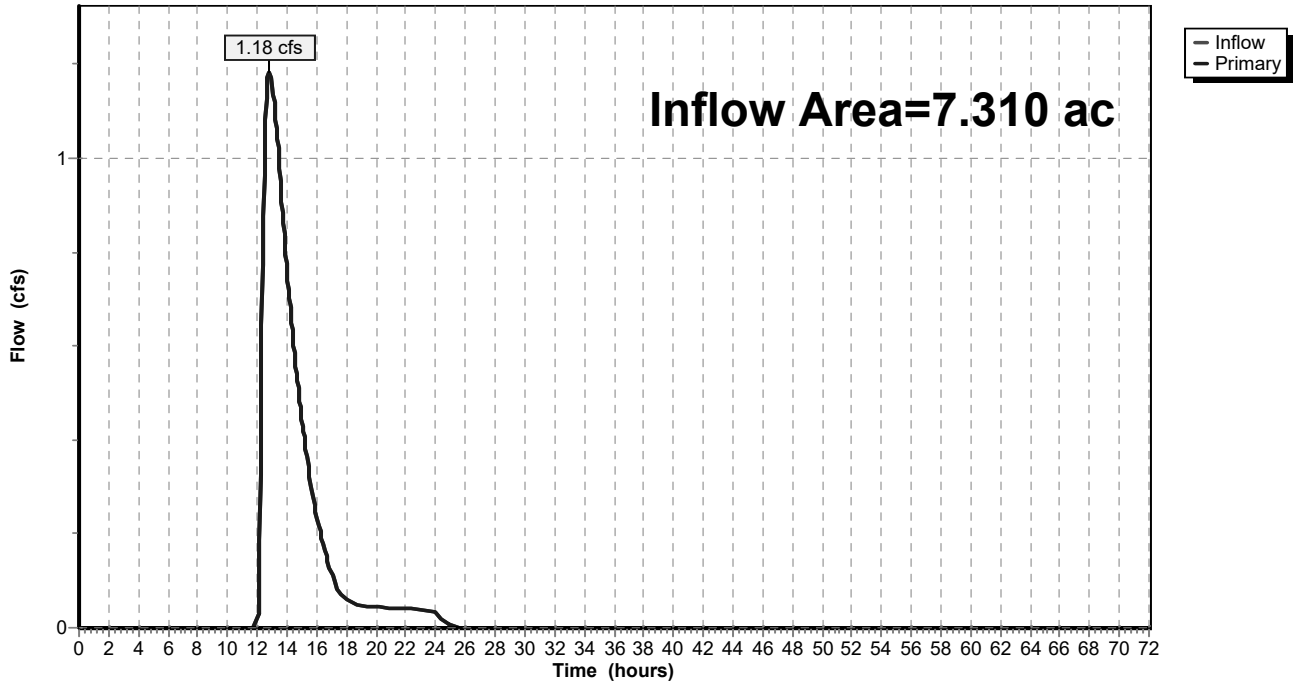
Summary for Subcatchment A Imp:

Runoff   =   5.65 cfs @ 12.15 hrs, Volume=   0.560 af, Depth= 6.05"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Rainfall=6.29"

Area (ac)	CN	Description
0.450	98	Paved parking, HSG A
0.660	98	Paved parking, HSG B
1.110	98	Weighted Average
1.110	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.6	42	0.0200	1.17		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
1.3	115	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.1	222	Total			

Subcatchment A Imp:

Hydrograph

NOAA 24-hr C
25-Year Rainfall=6.29"
Runoff Area=1.110 ac
Runoff Volume=0.560 af
Runoff Depth=6.05"
Flow Length=222'
Tc=7.1 min
CN=0/98

Summary for Subcatchment A Per:

Runoff   =   1.99 cfs @ 12.26 hrs, Volume=   0.257 af, Depth= 1.61"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Rainfall=6.29"

Area (ac)	CN	Description
0.570	39	>75% Grass cover, Good, HSG A
1.350	61	>75% Grass cover, Good, HSG B
1.920	54	Weighted Average
1.920	54	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	73	0.0120	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
3.1	142	0.0120	0.77		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.4	215	Total			

Subcatchment A Per:

Hydrograph

NOAA 24-hr C
25-Year Rainfall=6.29"
Runoff Area=1.920 ac
Runoff Volume=0.257 af
Runoff Depth=1.61"
Flow Length=215'
Slope=0.0120 '/'
Tc=12.4 min
CN=54/0

Summary for Subcatchment B Imp:

Runoff   =   3.45 cfs @ 12.08 hrs, Volume=   0.242 af, Depth= 6.05"
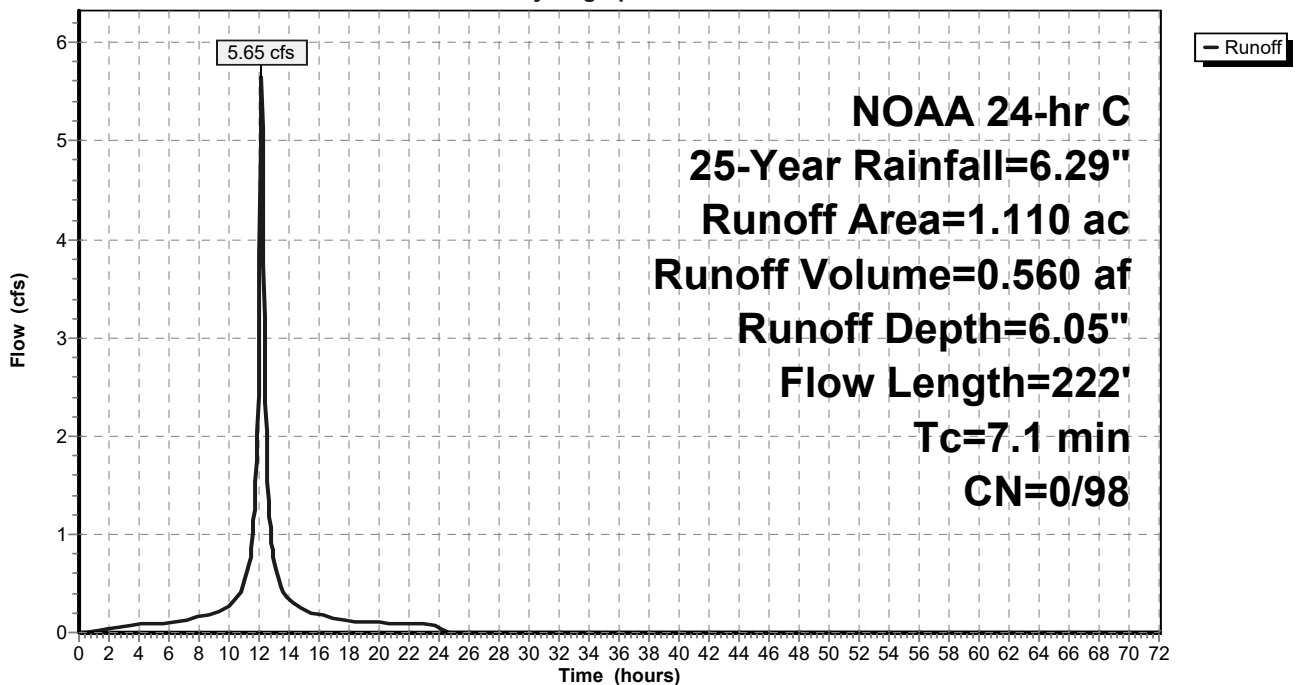
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Rainfall=6.29"

Area (ac)	CN	Description		
0.130	98	Paved parking, HSG A		
0.350	98	Paved parking, HSG B		
0.480	98	Weighted Average		
0.480	98	100.00% Impervious Area		

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.39		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
0.3	15	0.0200	0.95		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
1.5	115	Total			

Subcatchment B Imp:

Hydrograph

NOAA 24-hr C
25-Year Rainfall=6.29"
Runoff Area=0.480 ac
Runoff Volume=0.242 af
Runoff Depth=6.05"
Flow Length=115'
Slope=0.0200 '/'
Tc=1.5 min
CN=0/98

Summary for Subcatchment B Per:

Runoff   =   0.57 cfs @ 12.17 hrs, Volume=   0.065 af, Depth= 0.99"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Rainfall=6.29"

Area (ac)	CN	Description
0.540	39	>75% Grass cover, Good, HSG A
0.250	61	>75% Grass cover, Good, HSG B
0.790	46	Weighted Average
0.790	46	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.7	49	0.0200	1.20		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
0.4	66	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.2	160	Total			

Subcatchment B Per:

Hydrograph

NOAA 24-hr C
25-Year Rainfall=6.29"
Runoff Area=0.790 ac
Runoff Volume=0.065 af
Runoff Depth=0.99"
Flow Length=160'
Slope=0.0200 '/'
Tc=6.2 min
CN=46/0

Summary for Subcatchment C Imp:

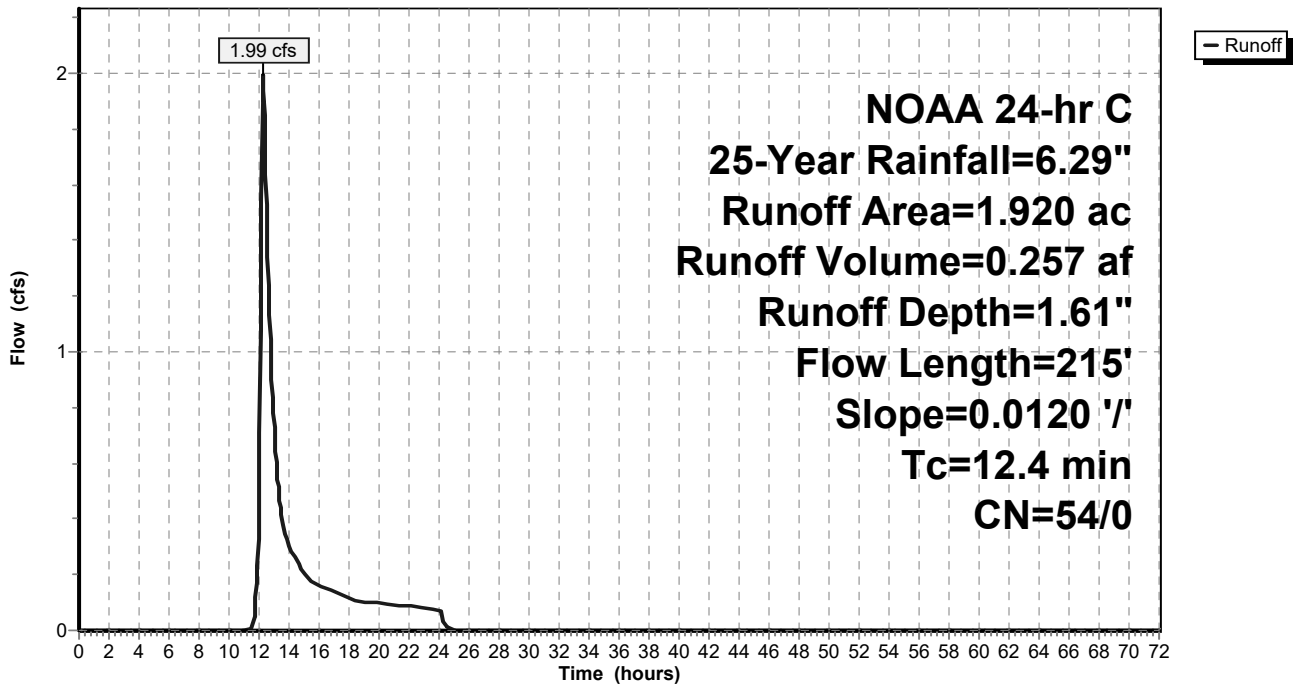Runoff   =   1.75 cfs @   12.16 hrs, Volume=   0.177 af, Depth= 6.05"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Rainfall=6.29"

Area (ac)	CN	Description
0.350	98	Paved parking, HSG A
0.350	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	65	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.5	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
7.4	100				Total

Subcatchment C Imp:

Hydrograph

NOAA 24-hr C
25-Year Rainfall=6.29"
Runoff Area=0.350 ac
Runoff Volume=0.177 af
Runoff Depth=6.05"
Flow Length=100'
Slope=0.0200 '/'
Tc=7.4 min
CN=0/98

Summary for Subcatchment C Per:

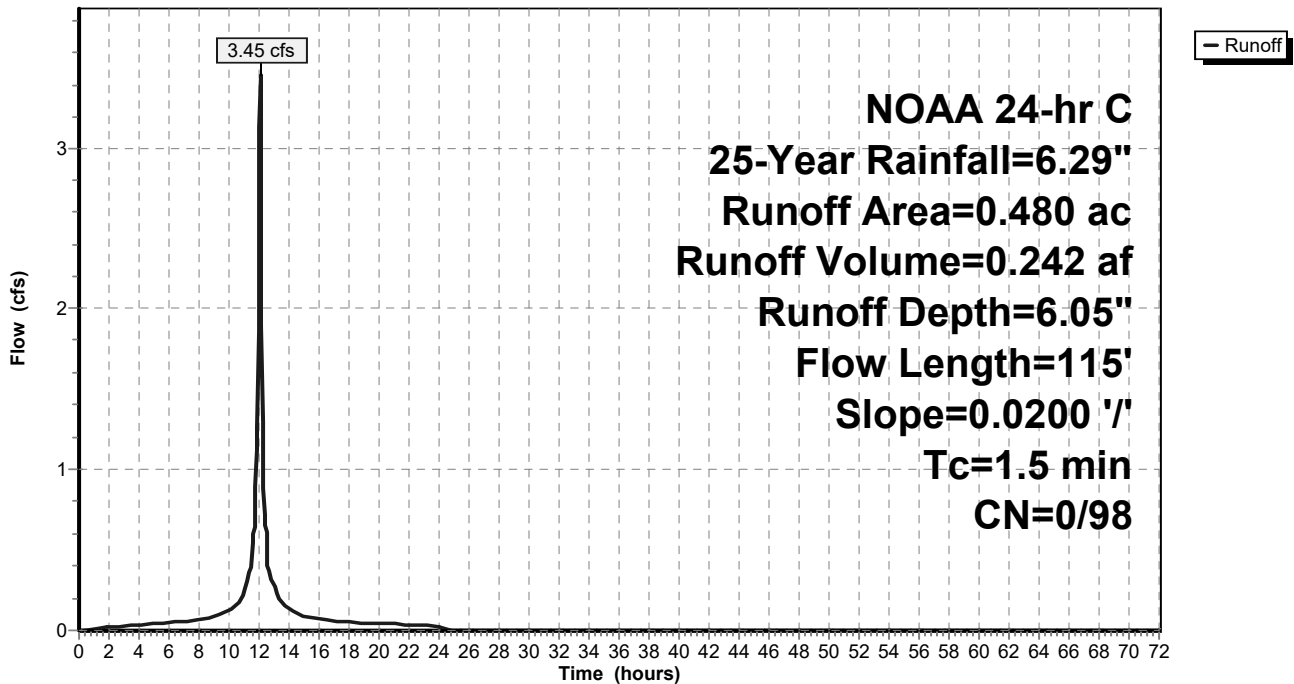Runoff   =   0.31 cfs @ 12.11 hrs, Volume=   0.040 af, Depth= 0.53"
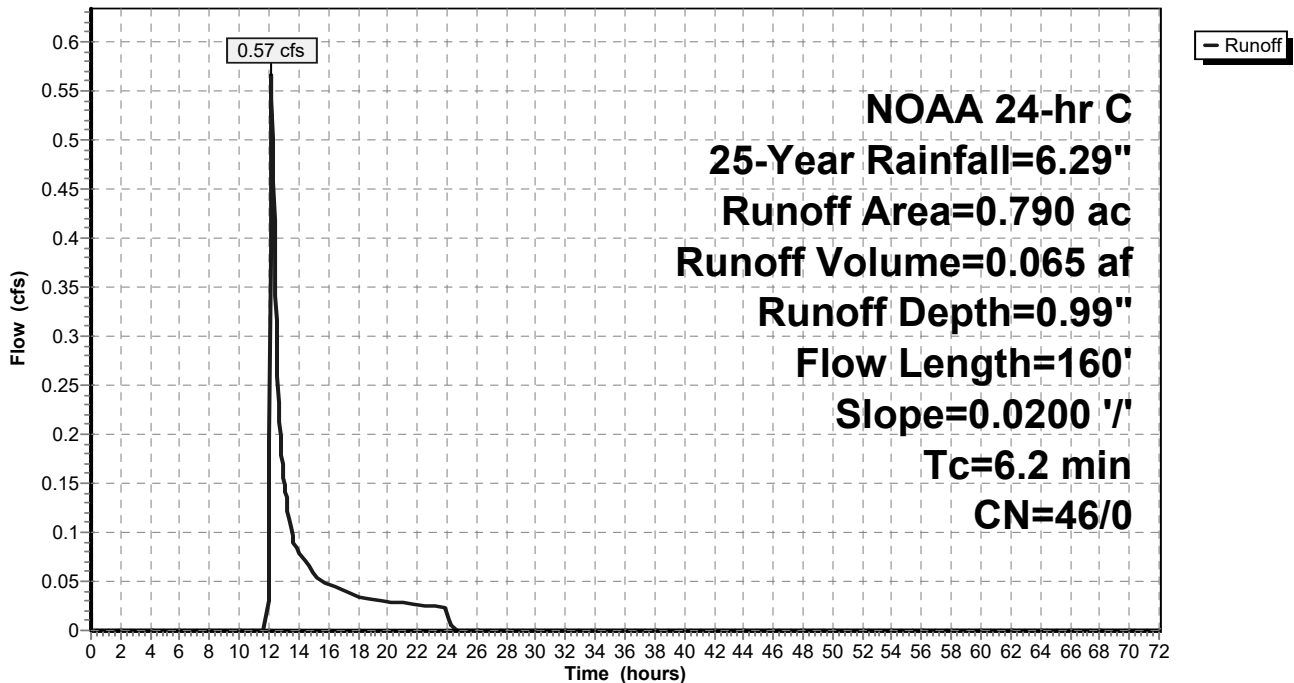
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Rainfall=6.29"

Area (ac)	CN	Description
0.900	39	>75% Grass cover, Good, HSG A
0.900	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
0.4	250	0.0150	11.76	635.20	**Channel Flow,** Area= 54.0 sf Perim= 20.0' r= 2.70' n= 0.030 Earth, grassed & winding
0.9	285				Total

Subcatchment C Per:

Hydrograph

NOAA 24-hr C
25-Year Rainfall=6.29"
Runoff Area=0.900 ac
Runoff Volume=0.040 af
Runoff Depth=0.53"
Flow Length=285'
Tc=0.9 min
CN=39/0

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NOAA 24-hr C 25-Year Rainfall=6.29"
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Summary for Subcatchment UC:

Runoff   =   0.85 cfs @ 12.43 hrs, Volume=   0.167 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Rainfall=6.29"

Area (ac)	CN	Description
1.110	39	>75% Grass cover, Good, HSG A
0.480	61	>75% Grass cover, Good, HSG B
0.170	74	>75% Grass cover, Good, HSG C
1.760	48	Weighted Average
1.760	48	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	66	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
10.6	850	0.0080	1.34		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.8	916				Total

Subcatchment UC:

Hydrograph

NOAA 24-hr C
25-Year Rainfall=6.29"
Runoff Area=1.760 ac
Runoff Volume=0.167 af
Runoff Depth=1.14"
Flow Length=916'
Tc=19.8 min
CN=48/0

Summary for Pond Basin A:

Inflow Area =   3.030 ac, 36.63% Impervious, Inflow Depth = 3.23"   for 25-Year event
Inflow   =   7.29 cfs @   12.17 hrs, Volume=   0.817 af
Outflow   =   1.55 cfs @   12.96 hrs, Volume=   0.817 af, Atten= 79%, Lag= 47.6 min
Discarded   =   0.48 cfs @   12.96 hrs, Volume=   0.576 af
Primary   =   1.07 cfs @   12.96 hrs, Volume=   0.241 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 120.32' @ 12.96 hrs   Surf.Area= 41,400 sf   Storage= 13,087 cf

Plug-Flow detention time= 124.0 min calculated for 0.816 af (100% of inflow)
Center-of-Mass det. time= 124.0 min (919.7 - 795.6)

Volume	Invert	Avail.Storage	Storage Description
#1	120.00'	140,905 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.00	39,908	0	0
121.00	44,542	42,225	42,225
122.00	49,296	46,919	89,144
123.00	54,226	51,761	140,905

Device	Routing	Invert	Outlet Devices
#1	Primary	118.56'	**18.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.56' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	120.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	120.10'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.90'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.48 cfs @ 12.96 hrs HW=120.32' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.48 cfs)

Primary OutFlow Max=1.06 cfs @ 12.96 hrs HW=120.32' (Free Discharge)
└─**1=Culvert** (Passes 1.06 cfs of 7.24 cfs potential flow)
  ├─**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.06 cfs @ 1.62 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)
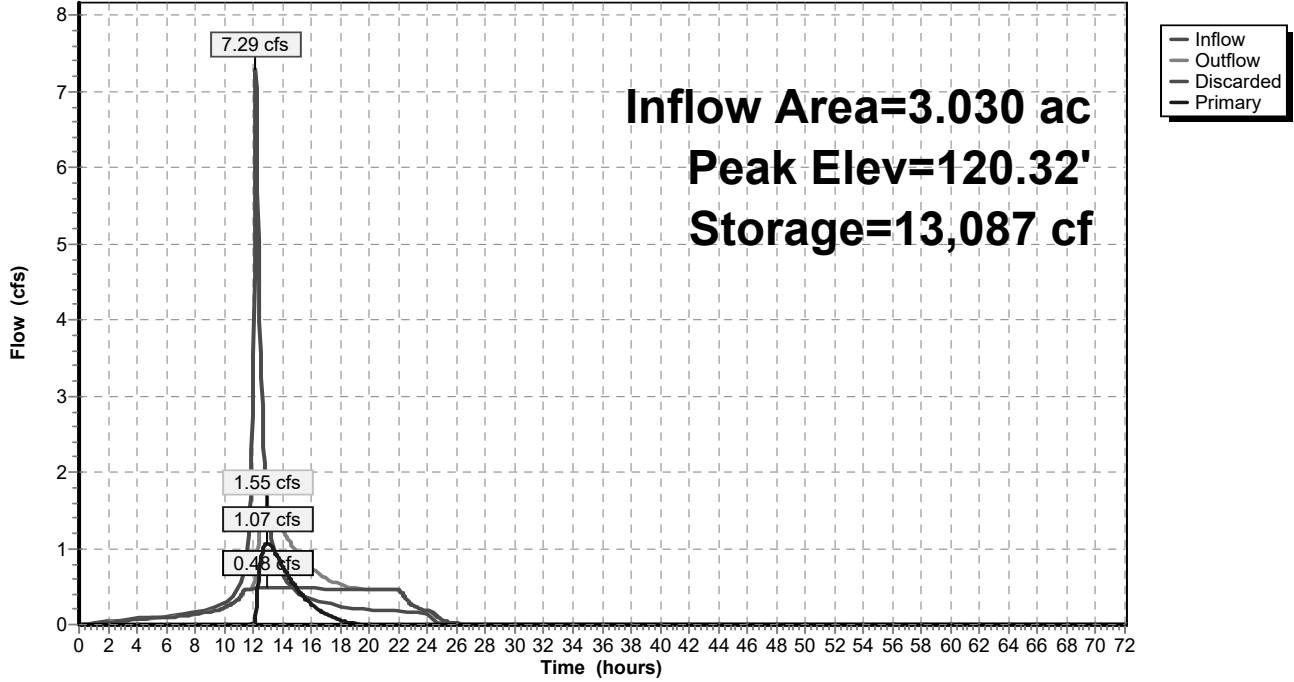
Post Developed
NOAA 24-hr C 25-Year Rainfall=6.29"
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Pond Basin A:

Hydrograph

Inflow Area=3.030 ac
Peak Elev=120.32'
Storage=13,087 cf

Legend:
— Inflow
— Outflow
— Discarded
— Primary

7.29 cfs
1.55 cfs
1.07 cfs
0.48 cfs

Summary for Pond Basin B:

Inflow Area =   1.270 ac, 37.80% Impervious, Inflow Depth = 2.90"   for 25-Year event
Inflow   =   3.78 cfs @ 12.09 hrs, Volume=   0.307 af
Outflow   =   0.64 cfs @ 12.62 hrs, Volume=   0.307 af, Atten= 83%, Lag= 32.1 min
Discarded =   0.14 cfs @ 12.62 hrs, Volume=   0.198 af
Primary   =   0.51 cfs @ 12.62 hrs, Volume=   0.110 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 120.44' @ 12.62 hrs   Surf.Area= 11,746 sf   Storage= 4,908 cf

Plug-Flow detention time= 142.4 min calculated for 0.307 af (100% of inflow)
Center-of-Mass det. time= 142.5 min (921.2 - 778.7)

Volume	Invert	Avail.Storage	Storage Description
#1	120.00'	43,672 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.00	10,742	0	0
121.00	13,042	11,892	11,892
122.00	16,315	14,679	26,571
123.00	17,888	17,102	43,672

Device	Routing	Invert	Outlet Devices
#1	Primary	118.87'	**18.0" Round Culvert** L= 74.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.87' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	120.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	120.15'	**1.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.90'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.14 cfs @ 12.62 hrs HW=120.44'   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.51 cfs @ 12.62 hrs HW=120.44'   (Free Discharge)
└─**1=Culvert** (Passes 0.51 cfs of 6.52 cfs potential flow)
  ├─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.51 cfs @ 1.87 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond Basin B:

Hydrograph

Inflow Area=1.270 ac
Peak Elev=120.44'
Storage=4,908 cf

Legend: Inflow, Outflow, Discarded, Primary

Peak labels: 3.78 cfs, 0.64 cfs, 0.51 cfs, 0.14 cfs

Flow (cfs) vs Time (hours)

Summary for Pond Basin C:

Inflow Area =   1.250 ac, 28.00% Impervious, Inflow Depth = 2.08"   for 25-Year event
Inflow   =   1.96 cfs @   12.15 hrs, Volume=   0.216 af
Outflow   =   0.48 cfs @   12.72 hrs, Volume=   0.216 af, Atten= 76%, Lag= 34.1 min
Discarded =   0.09 cfs @   12.72 hrs, Volume=   0.144 af
Primary   =   0.39 cfs @   12.72 hrs, Volume=   0.072 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 119.44' @ 12.72 hrs   Surf.Area= 8,108 sf   Storage= 3,320 cf

Plug-Flow detention time= 153.6 min calculated for 0.216 af (100% of inflow)
Center-of-Mass det. time= 153.6 min (941.6 - 788.0)

Volume	Invert	Avail.Storage	Storage Description
#1	119.00'	19,534 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
119.00	7,015	0	0
120.00	9,503	8,259	8,259
121.00	13,047	11,275	19,534

Device	Routing	Invert	Outlet Devices
#1	Primary	118.56'	**18.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.56' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	119.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	119.20'	**1.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 12.72 hrs HW=119.44' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.39 cfs @ 12.72 hrs HW=119.44' (Free Discharge)
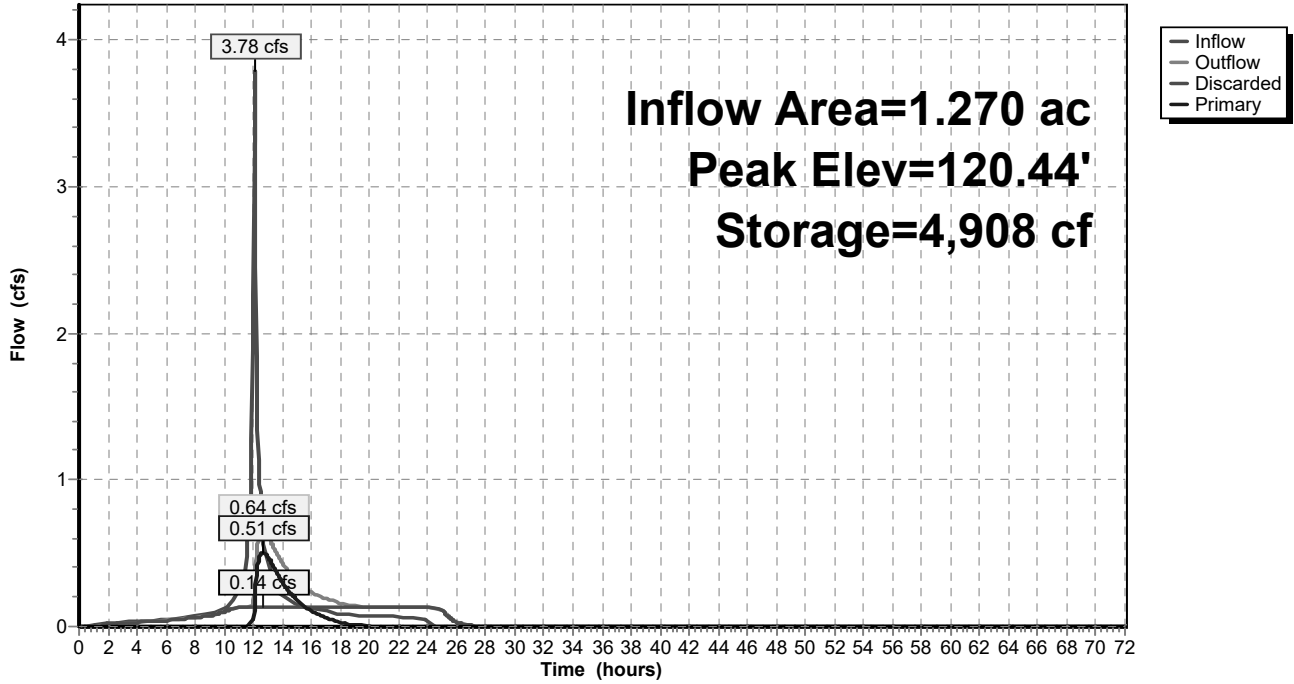└─**1=Culvert** (Passes 0.39 cfs of 2.40 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.39 cfs @ 1.69 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)
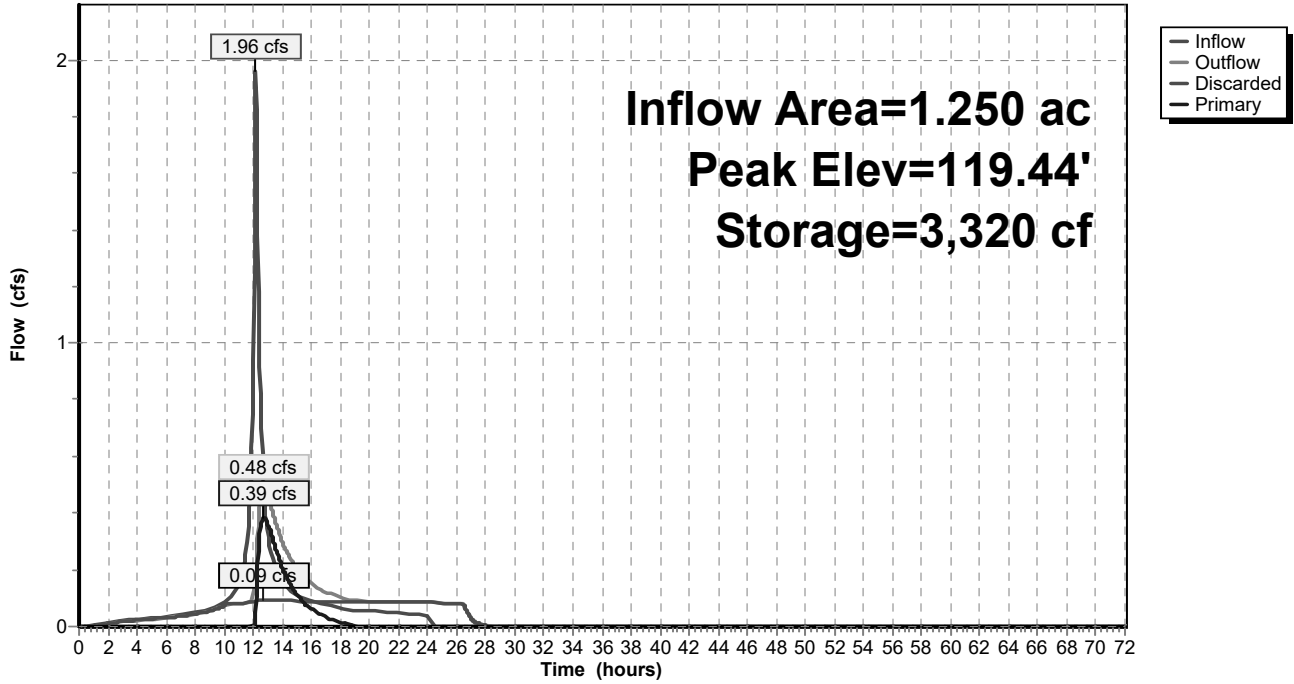
Pond Basin C:

Hydrograph

Inflow Area=1.250 ac
Peak Elev=119.44'
Storage=3,320 cf

Legend:
- Inflow
- Outflow
- Discarded
- Primary

1.96 cfs
0.48 cfs
0.39 cfs
0.09 cfs

Flow (cfs)

Time (hours)

Summary for Link Total:

Inflow Area = 7.310 ac, 26.54% Impervious, Inflow Depth = 0.97" for 25-Year event
Inflow = 2.65 cfs @ 12.68 hrs, Volume= 0.589 af
Primary = 2.65 cfs @ 12.68 hrs, Volume= 0.589 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link Total:

Hydrograph

Summary for Subcatchment A Imp:

Runoff   =   7.60 cfs @   12.15 hrs, Volume=   0.759 af, Depth= 8.21"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
0.450	98	Paved parking, HSG A
0.660	98	Paved parking, HSG B
1.110	98	Weighted Average
1.110	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.6	42	0.0200	1.17		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
1.3	115	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.1	222	Total			

Subcatchment A Imp:

Hydrograph

NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=1.110 ac
Runoff Volume=0.759 af
Runoff Depth=8.21"
Flow Length=222'
Tc=7.1 min
CN=0/98

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NOAA 24-hr C 100-Year Rainfall=8.45"
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Summary for Subcatchment A Per:

Runoff   =   4.04 cfs @ 12.24 hrs, Volume=   0.477 af, Depth= 2.98"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
0.570	39	>75% Grass cover, Good, HSG A
1.350	61	>75% Grass cover, Good, HSG B
1.920	54	Weighted Average
1.920	54	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	73	0.0120	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
3.1	142	0.0120	0.77		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.4	215				Total

Subcatchment A Per:

Hydrograph

NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=1.920 ac
Runoff Volume=0.477 af
Runoff Depth=2.98"
Flow Length=215'
Slope=0.0120 '/'
Tc=12.4 min
CN=54/0

Summary for Subcatchment B Imp:

Runoff   =   4.65 cfs @ 12.08 hrs, Volume=   0.328 af, Depth= 8.21"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG A
0.350	98	Paved parking, HSG B
0.480	98	Weighted Average
0.480	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.39		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
0.3	15	0.0200	0.95		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
1.5	115				Total

Subcatchment B Imp:

Hydrograph

NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=0.480 ac
Runoff Volume=0.328 af
Runoff Depth=8.21"
Flow Length=115'
Slope=0.0200 '/'
Tc=1.5 min
CN=0/98

Summary for Subcatchment B Per:

Runoff   =   1.50 cfs @ 12.16 hrs, Volume=   0.137 af, Depth= 2.09"
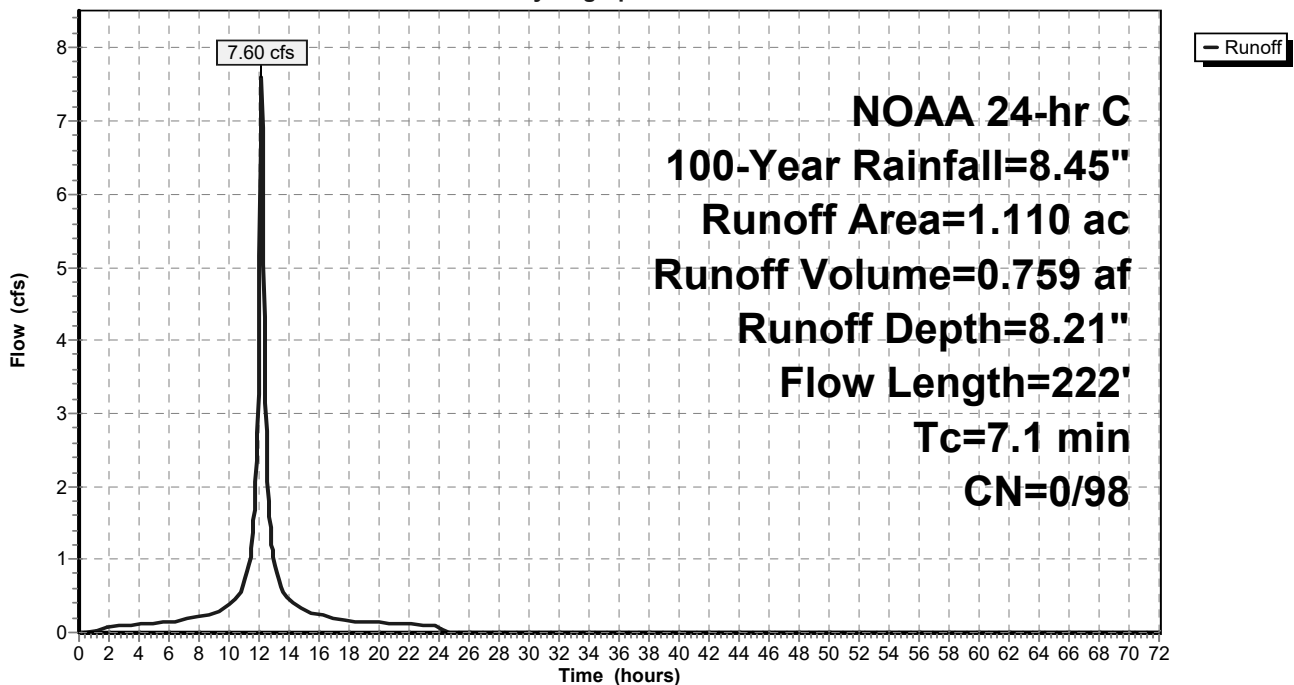
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
0.540	39	>75% Grass cover, Good, HSG A
0.250	61	>75% Grass cover, Good, HSG B
0.790	46	Weighted Average
0.790	46	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,**
					Grass: Short n= 0.150 P2= 3.26"
0.7	49	0.0200	1.20		**Sheet Flow,**
					Smooth surfaces n= 0.011 P2= 3.26"
0.4	66	0.0200	2.87		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
6.2	160	Total			

Subcatchment B Per:

Hydrograph

NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=0.790 ac
Runoff Volume=0.137 af
Runoff Depth=2.09"
Flow Length=160'
Slope=0.0200 '/'
Tc=6.2 min
CN=46/0

Summary for Subcatchment C Imp:

Runoff   =   2.36 cfs @ 12.16 hrs, Volume=   0.239 af, Depth= 8.21"
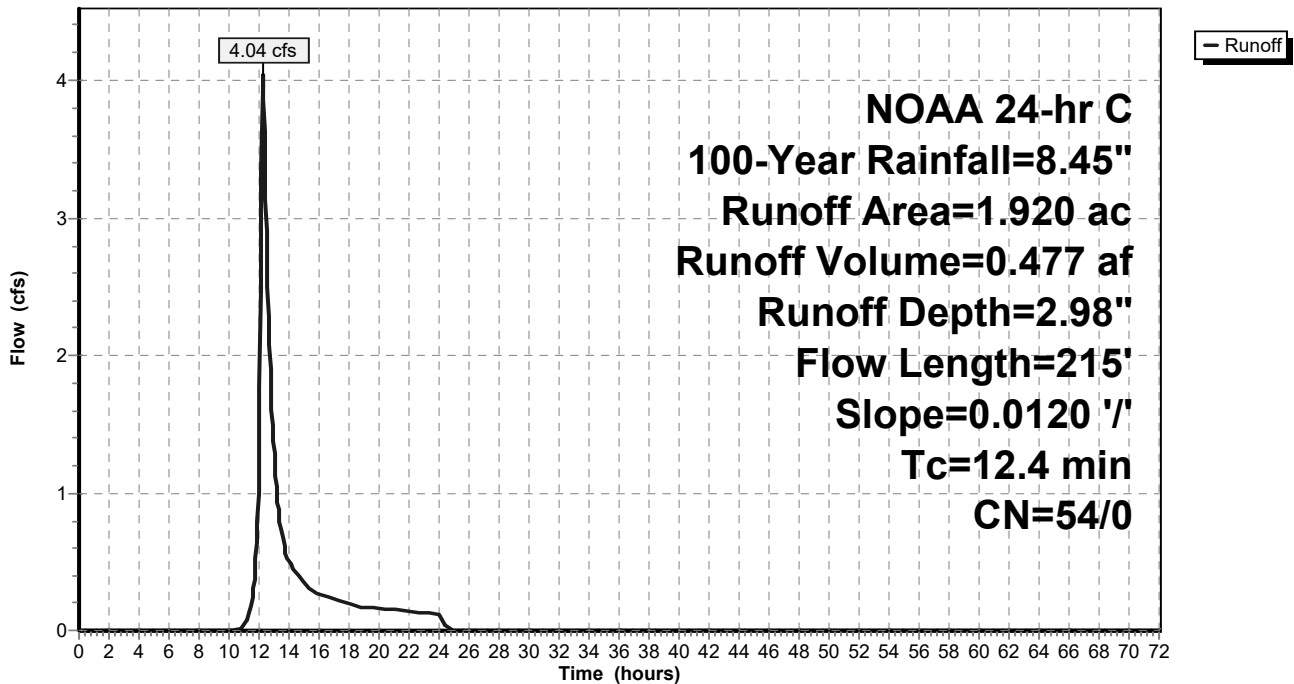
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
0.350	98	Paved parking, HSG A
0.350	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	65	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.5	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
7.4	100				Total

Subcatchment C Imp:

Hydrograph

NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=0.350 ac
Runoff Volume=0.239 af
Runoff Depth=8.21"
Flow Length=100'
Slope=0.0200 '/'
Tc=7.4 min
CN=0/98

Summary for Subcatchment C Per:

Runoff   =   1.47 cfs @ 12.09 hrs, Volume=   0.101 af, Depth= 1.35"
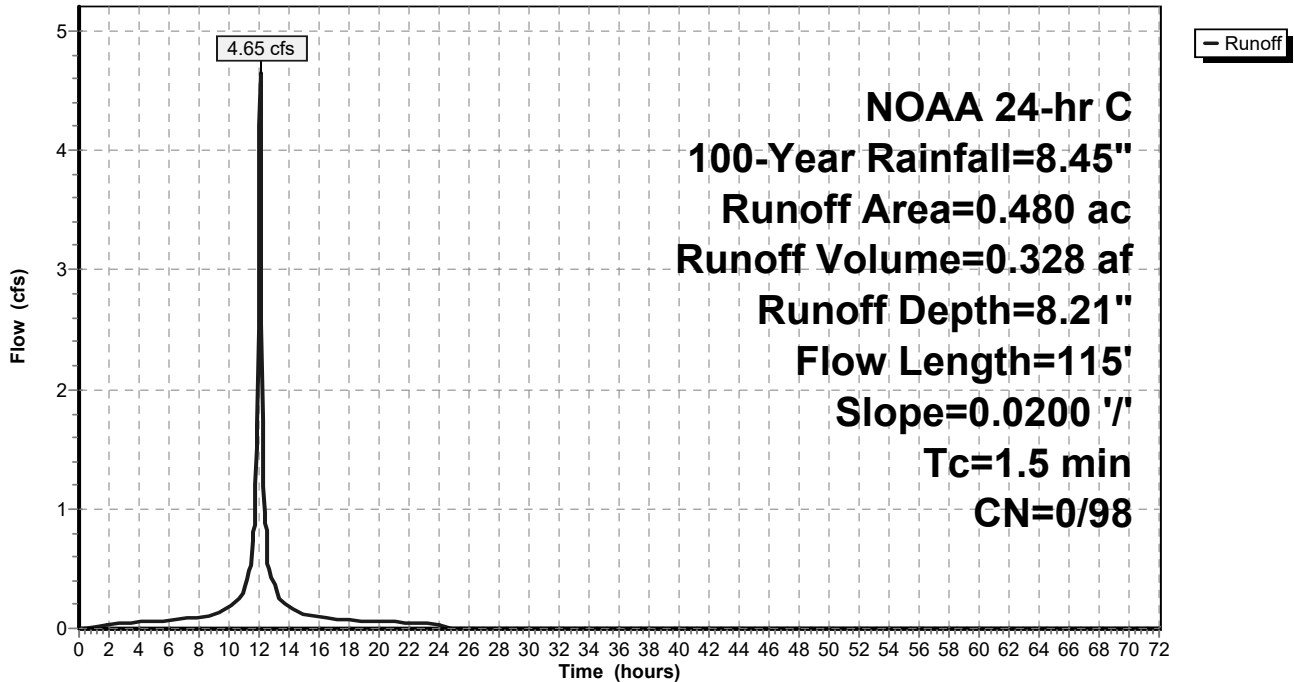
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
0.900	39	>75% Grass cover, Good, HSG A
0.900	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
0.4	250	0.0150	11.76	635.20	**Channel Flow,** Area= 54.0 sf Perim= 20.0' r= 2.70' n= 0.030 Earth, grassed & winding
0.9	285				Total

Subcatchment C Per:

Hydrograph

NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=0.900 ac
Runoff Volume=0.101 af
Runoff Depth=1.35"
Flow Length=285'
Tc=0.9 min
CN=39/0

Summary for Subcatchment UC:

Runoff   =   2.07 cfs @   12.37 hrs, Volume=   0.338 af, Depth= 2.31"
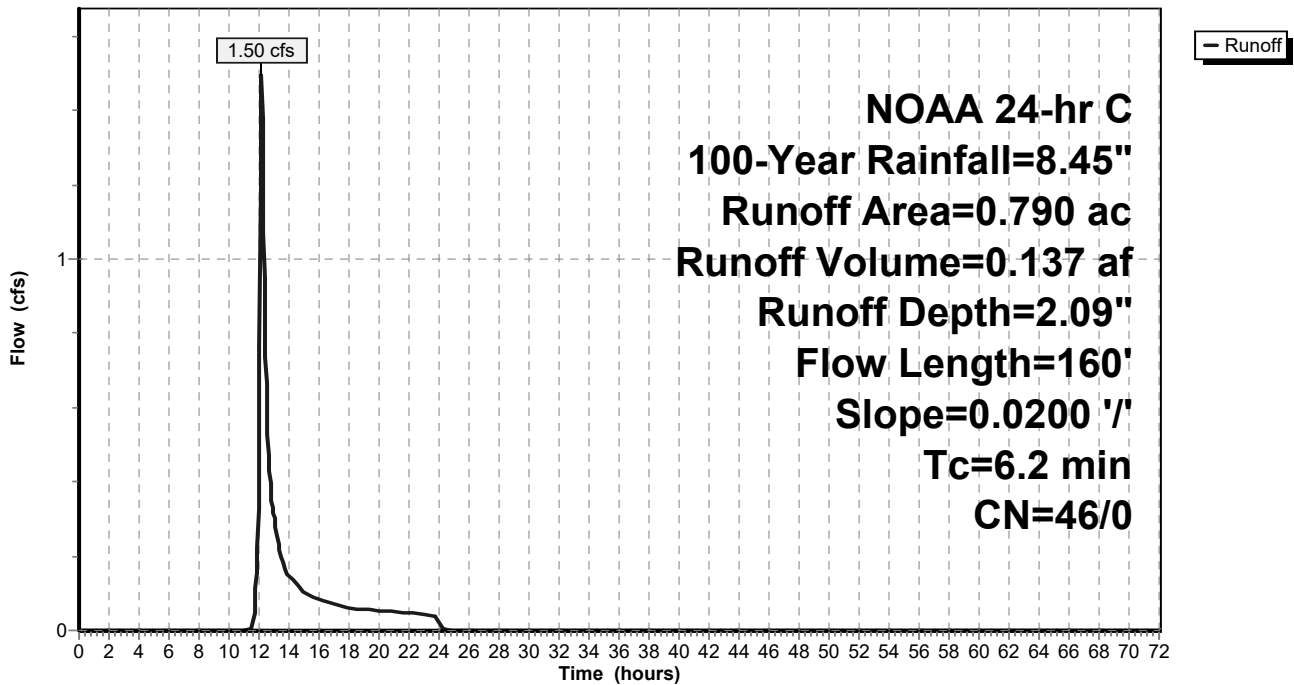
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
1.110	39	>75% Grass cover, Good, HSG A
0.480	61	>75% Grass cover, Good, HSG B
0.170	74	>75% Grass cover, Good, HSG C
1.760	48	Weighted Average
1.760	48	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	66	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
10.6	850	0.0080	1.34		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.8	916	Total			

Subcatchment UC:

Hydrograph

Summary for Pond Basin A:

Inflow Area =   3.030 ac, 36.63% Impervious, Inflow Depth = 4.90"   for 100-Year event
Inflow   =   11.14 cfs @ 12.17 hrs, Volume=   1.236 af
Outflow   =   2.93 cfs @ 12.83 hrs, Volume=   1.236 af, Atten= 74%, Lag= 39.3 min
Discarded =   0.49 cfs @ 12.83 hrs, Volume=   0.686 af
Primary   =   2.44 cfs @ 12.83 hrs, Volume=   0.550 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 120.48' @ 12.83 hrs   Surf.Area= 42,130 sf   Storage= 19,668 cf

Plug-Flow detention time= 123.1 min calculated for 1.236 af (100% of inflow)
Center-of-Mass det. time= 122.8 min (918.4 - 795.6)

Volume	Invert	Avail.Storage	Storage Description
#1	120.00'	140,905 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.00	39,908	0	0
121.00	44,542	42,225	42,225
122.00	49,296	46,919	89,144
123.00	54,226	51,761	140,905

Device	Routing	Invert	Outlet Devices
#1	Primary	118.56'	**18.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.56' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	120.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	120.10'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.90'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.49 cfs @ 12.83 hrs HW=120.48'   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.49 cfs)

Primary OutFlow Max=2.44 cfs @ 12.83 hrs HW=120.48'   (Free Discharge)
└─**1=Culvert** (Passes 2.44 cfs of 7.92 cfs potential flow)
  ├─**3=Sharp-Crested Rectangular Weir** (Weir Controls 2.44 cfs @ 2.20 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond Basin A:

Hydrograph

Inflow Area=3.030 ac
Peak Elev=120.48'
Storage=19,668 cf

Legend:
— Inflow
— Outflow
— Discarded
— Primary

Labeled values: 11.14 cfs, 2.93 cfs, 2.44 cfs, 0.49 cfs

Summary for Pond Basin B:

Inflow Area =   1.270 ac, 37.80% Impervious, Inflow Depth = 4.40"   for 100-Year event
Inflow   =   5.74 cfs @ 12.09 hrs, Volume=   0.466 af
Outflow   =   1.26 cfs @ 12.55 hrs, Volume=   0.466 af, Atten= 78%, Lag= 27.6 min
Discarded   =   0.14 cfs @ 12.55 hrs, Volume=   0.231 af
Primary   =   1.11 cfs @ 12.55 hrs, Volume=   0.235 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 120.63' @ 12.55 hrs   Surf.Area= 12,201 sf   Storage= 7,279 cf

Plug-Flow detention time= 132.5 min calculated for 0.465 af (100% of inflow)
Center-of-Mass det. time= 132.6 min (914.3 - 781.7)

Volume	Invert	Avail.Storage	Storage Description
#1	120.00'	43,672 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.00	10,742	0	0
121.00	13,042	11,892	11,892
122.00	16,315	14,679	26,571
123.00	17,888	17,102	43,672

Device	Routing	Invert	Outlet Devices
#1	Primary	118.87'	**18.0" Round Culvert** L= 74.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.87' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	120.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	120.15'	**1.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.90'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.14 cfs @ 12.55 hrs HW=120.63' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=1.11 cfs @ 12.55 hrs HW=120.63' (Free Discharge)
└─**1=Culvert** (Passes 1.11 cfs of 7.46 cfs potential flow)
  ├─**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.11 cfs @ 2.55 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)
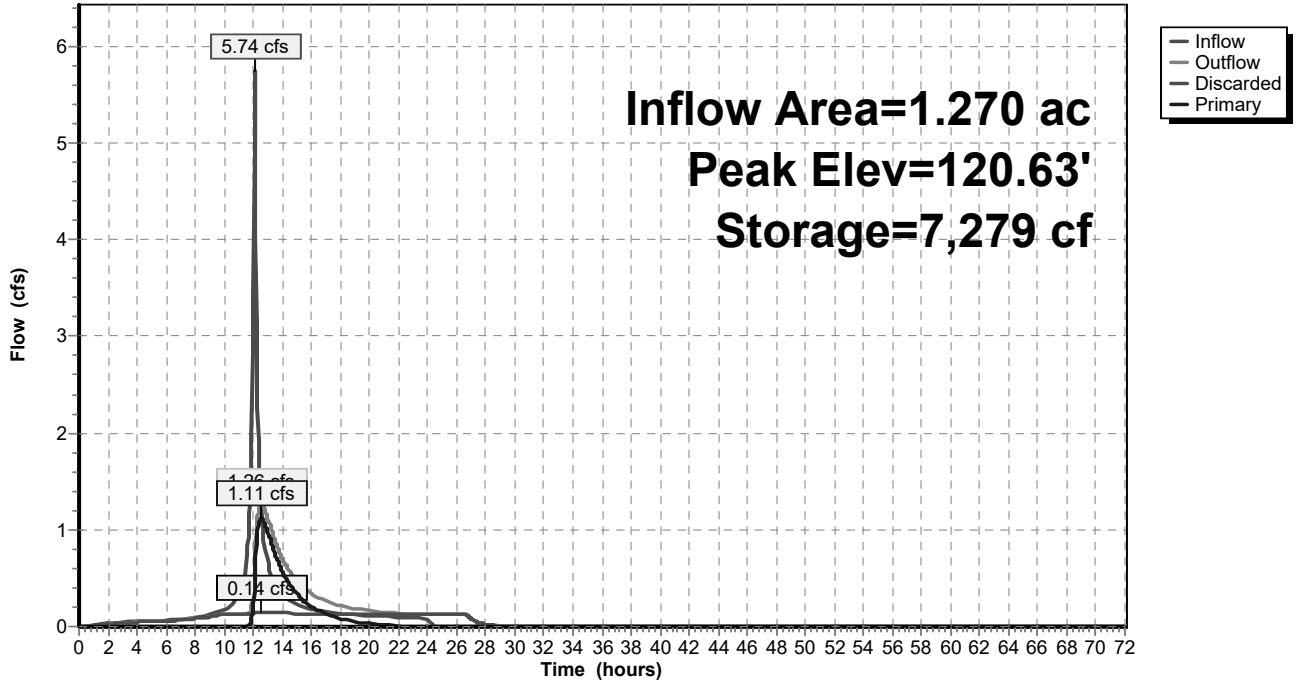
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Pond Basin B:

Hydrograph

**Inflow Area=1.270 ac
Peak Elev=120.63'
Storage=7,279 cf**

Summary for Pond Basin C:

Inflow Area =   1.250 ac, 28.00% Impervious, Inflow Depth = 3.27"   for 100-Year event
Inflow   =   3.52 cfs @ 12.11 hrs, Volume=   0.341 af
Outflow   =   1.04 cfs @ 12.57 hrs, Volume=   0.341 af, Atten= 71%, Lag= 27.8 min
Discarded =   0.10 cfs @ 12.57 hrs, Volume=   0.169 af
Primary   =   0.94 cfs @ 12.57 hrs, Volume=   0.171 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 119.63' @ 12.57 hrs   Surf.Area= 8,586 sf   Storage= 4,925 cf

Plug-Flow detention time= 135.3 min calculated for 0.341 af (100% of inflow)
Center-of-Mass det. time= 135.5 min (929.7 - 794.3)

Volume	Invert	Avail.Storage	Storage Description
#1	119.00'	19,534 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
119.00	7,015	0	0
120.00	9,503	8,259	8,259
121.00	13,047	11,275	19,534

Device	Routing	Invert	Outlet Devices
#1	Primary	118.56'	**18.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.56' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	119.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	119.20'	**1.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.10 cfs @ 12.57 hrs HW=119.63'   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.10 cfs)

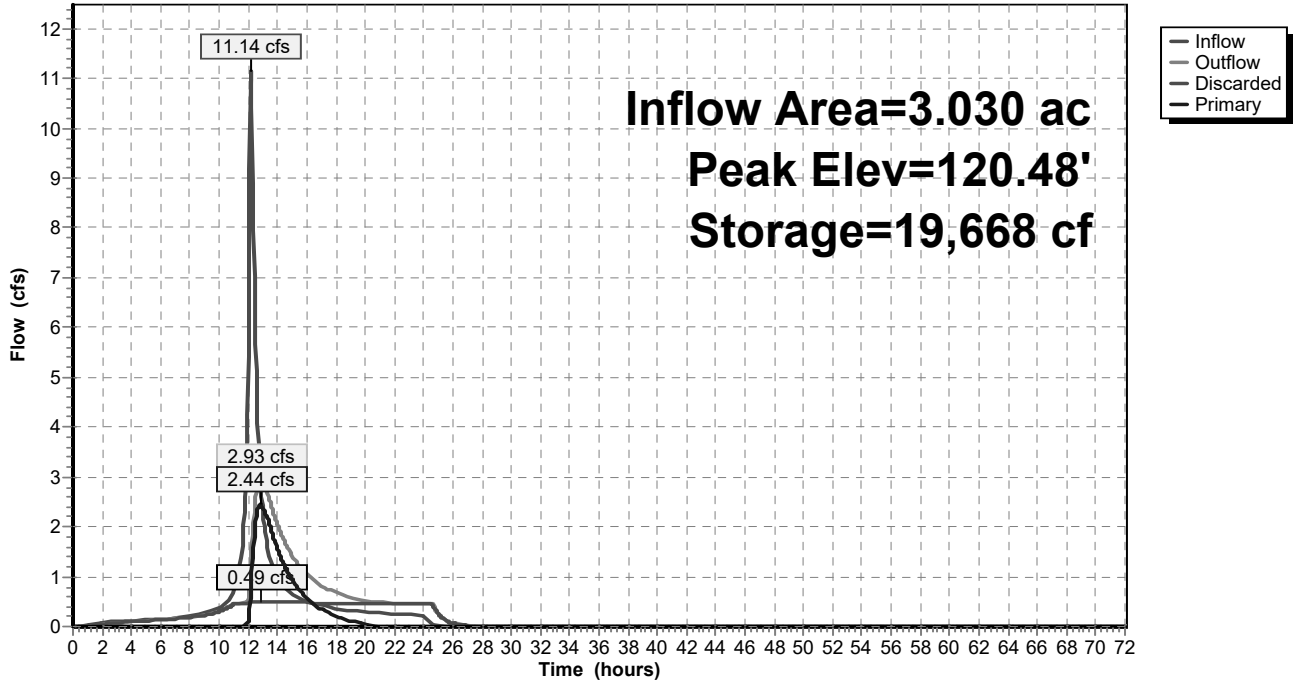**Primary OutFlow** Max=0.93 cfs @ 12.57 hrs HW=119.63'   (Free Discharge)
└─**1=Culvert** (Passes 0.93 cfs of 3.39 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.93 cfs @ 2.37 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)
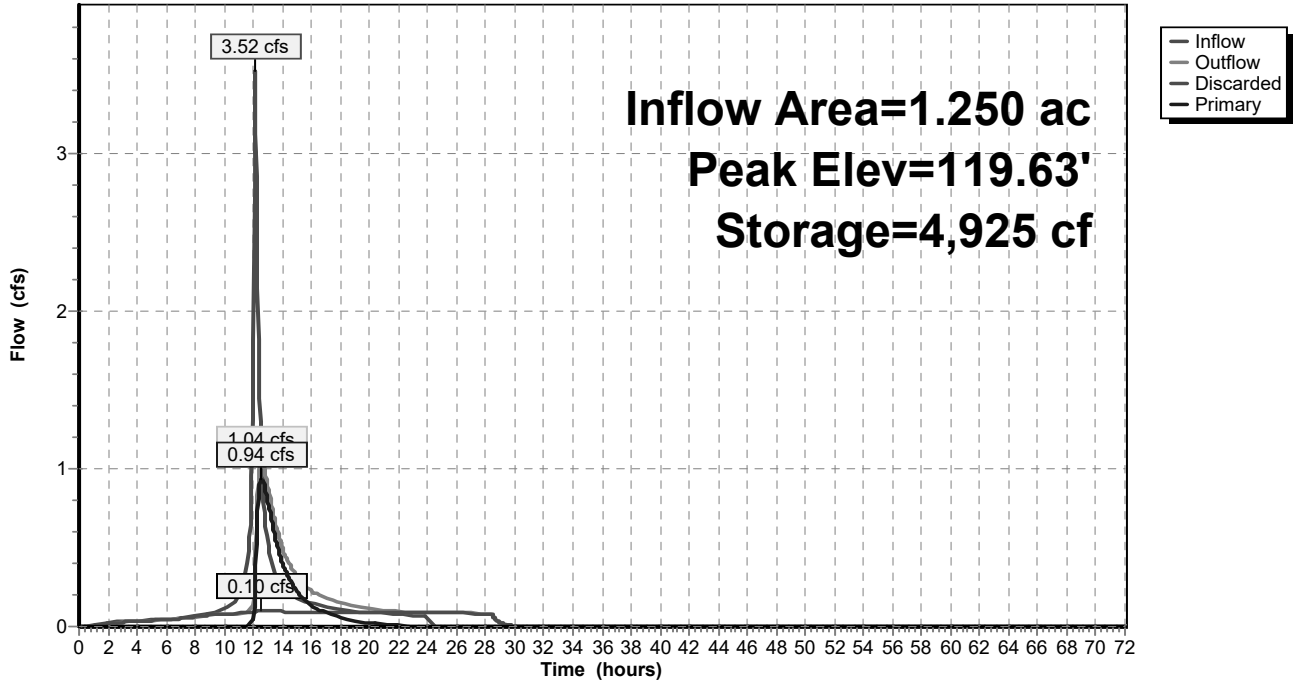
Pond Basin C:

Hydrograph

Inflow Area=1.250 ac
Peak Elev=119.63'
Storage=4,925 cf

Legend:
— Inflow
— Outflow
— Discarded
— Primary

3.52 cfs

1.04 cfs
0.94 cfs

0.10 cfs

Flow (cfs)

Time (hours)

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Summary for Link Total:

Inflow Area =   7.310 ac, 26.54% Impervious, Inflow Depth =   2.12"   for 100-Year event
Inflow   =   6.16 cfs @   12.59 hrs, Volume=   1.294 af
Primary   =   6.16 cfs @   12.59 hrs, Volume=   1.294 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link Total:

Summary for Subcatchment A Imp:

Runoff   =   2.41 cfs @   1.14 hrs, Volume=   0.096 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.450	98	Paved parking, HSG A
0.660	98	Paved parking, HSG B
1.110	98	Weighted Average
1.110	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,**
					Grass: Short n= 0.150 P2= 3.26"
0.6	42	0.0200	1.17		**Sheet Flow,**
					Smooth surfaces n= 0.011 P2= 3.26"
1.3	115	0.0050	1.44		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
7.1	222				Total

Subcatchment A Imp:

Hydrograph

NJ DEP 2-hr
WQ Rainfall=1.25"
Runoff Area=1.110 ac
Runoff Volume=0.096 af
Runoff Depth=1.03"
Flow Length=222'
Tc=7.1 min
CN=0/98

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Summary for Subcatchment A Per:

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

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.570	39	>75% Grass cover, Good, HSG A
1.350	61	>75% Grass cover, Good, HSG B
1.920	54	Weighted Average
1.920	54	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	73	0.0120	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
3.1	142	0.0120	0.77		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.4	215	Total			

Subcatchment A Per:

Hydrograph

**NJ DEP 2-hr
WQ Rainfall=1.25"
Runoff Area=1.920 ac
Runoff Volume=0.000 af
Runoff Depth=0.00"
Flow Length=215'
Slope=0.0120 '/'
Tc=12.4 min
CN=54/0**

0.00 cfs

Flow (cfs)

Time (hours)

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Summary for Subcatchment B Imp:

Runoff   =   1.45 cfs @   1.04 hrs, Volume=   0.041 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG A
0.350	98	Paved parking, HSG B
0.480	98	Weighted Average
0.480	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.39		**Sheet Flow,**
					Smooth surfaces n= 0.011 P2= 3.26"
0.3	15	0.0200	0.95		**Sheet Flow,**
					Smooth surfaces n= 0.011 P2= 3.26"
1.5	115	Total			

Subcatchment B Imp:

Hydrograph

NJ DEP 2-hr
WQ Rainfall=1.25"
Runoff Area=0.480 ac
Runoff Volume=0.041 af
Runoff Depth=1.03"
Flow Length=115'
Slope=0.0200 '/'
Tc=1.5 min
CN=0/98

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NJ DEP 2-hr WQ Rainfall=1.25"
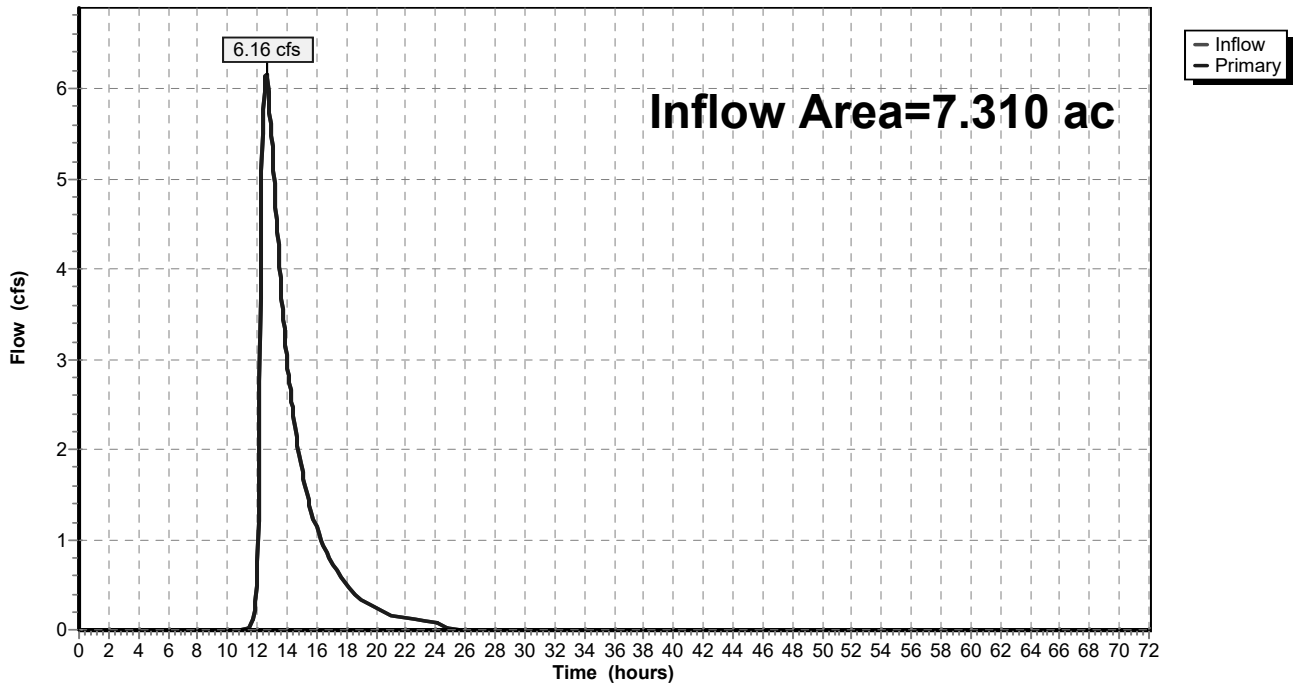Printed 11/9/2022
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Summary for Subcatchment B Per:

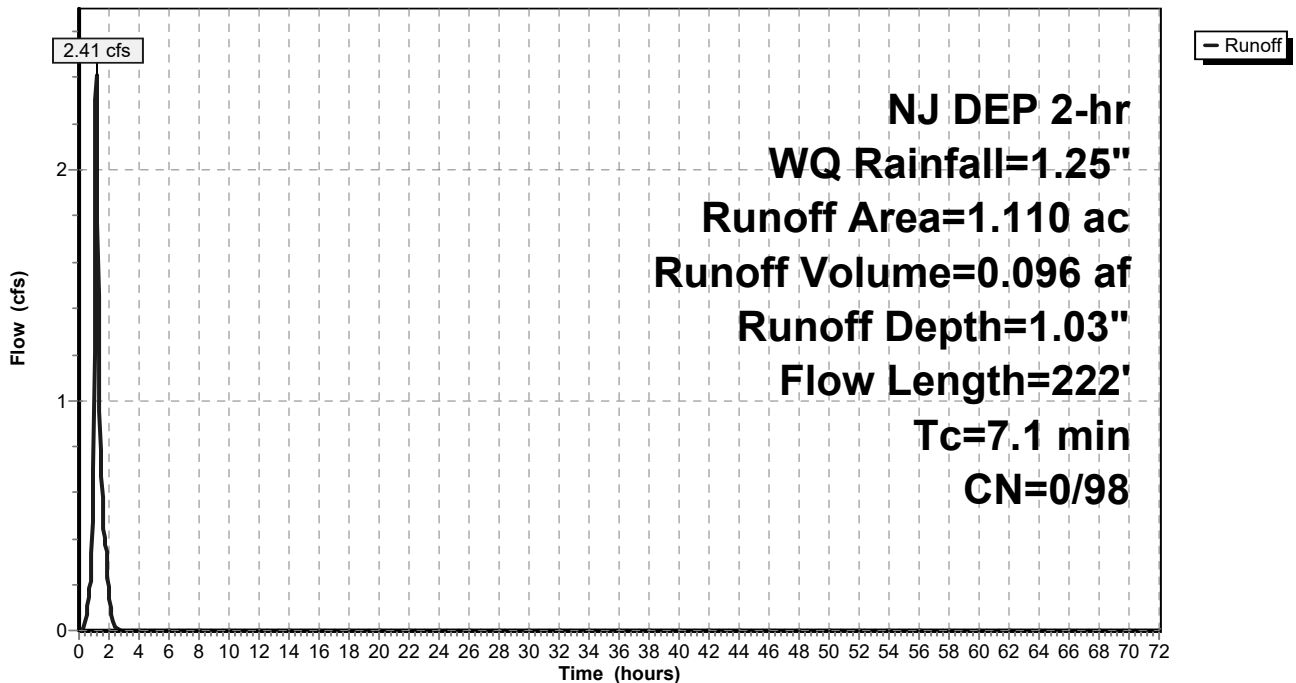Runoff   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.540	39	>75% Grass cover, Good, HSG A
0.250	61	>75% Grass cover, Good, HSG B
0.790	46	Weighted Average
0.790	46	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.7	49	0.0200	1.20		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
0.4	66	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.2	160	Total			

Subcatchment B Per:

Hydrograph

NJ DEP 2-hr
WQ Rainfall=1.25"
Runoff Area=0.790 ac
Runoff Volume=0.000 af
Runoff Depth=0.00"
Flow Length=160'
Slope=0.0200 '/'
Tc=6.2 min
CN=46/0

Summary for Subcatchment C Imp:

Runoff   =   0.75 cfs @   1.14 hrs, Volume=   0.030 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.350	98	Paved parking, HSG A
0.350	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	65	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.5	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
7.4	100				Total

Subcatchment C Imp:

Hydrograph

**NJ DEP 2-hr
WQ Rainfall=1.25"
Runoff Area=0.350 ac
Runoff Volume=0.030 af
Runoff Depth=1.03"
Flow Length=100'
Slope=0.0200 '/'
Tc=7.4 min
CN=0/98**

Summary for Subcatchment C Per:

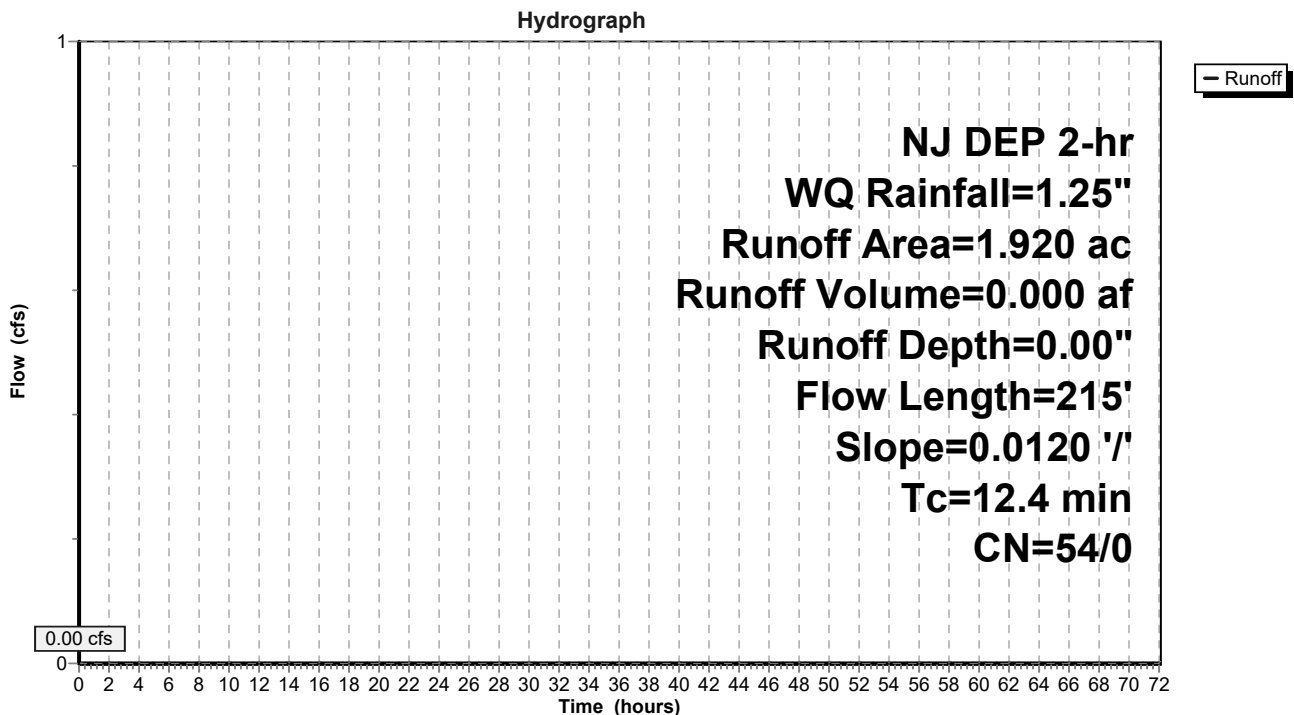Runoff   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af, Depth= 0.00"
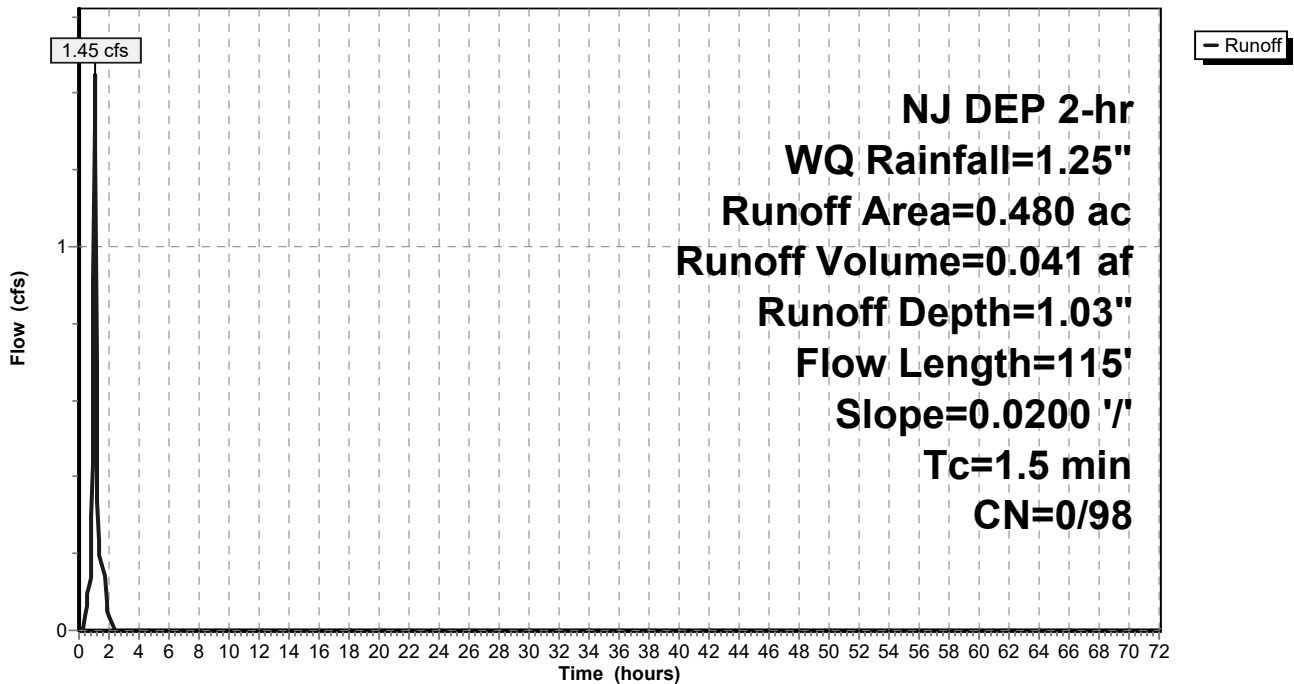
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.900	39	>75% Grass cover, Good, HSG A
0.900	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
0.4	250	0.0150	11.76	635.20	**Channel Flow,** Area= 54.0 sf Perim= 20.0' r= 2.70' n= 0.030 Earth, grassed & winding
0.9	285				Total

Subcatchment C Per:

Hydrograph

NJ DEP 2-hr
WQ Rainfall=1.25"
Runoff Area=0.900 ac
Runoff Volume=0.000 af
Runoff Depth=0.00"
Flow Length=285'
Tc=0.9 min
CN=39/0

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NJ DEP 2-hr WQ Rainfall=1.25"
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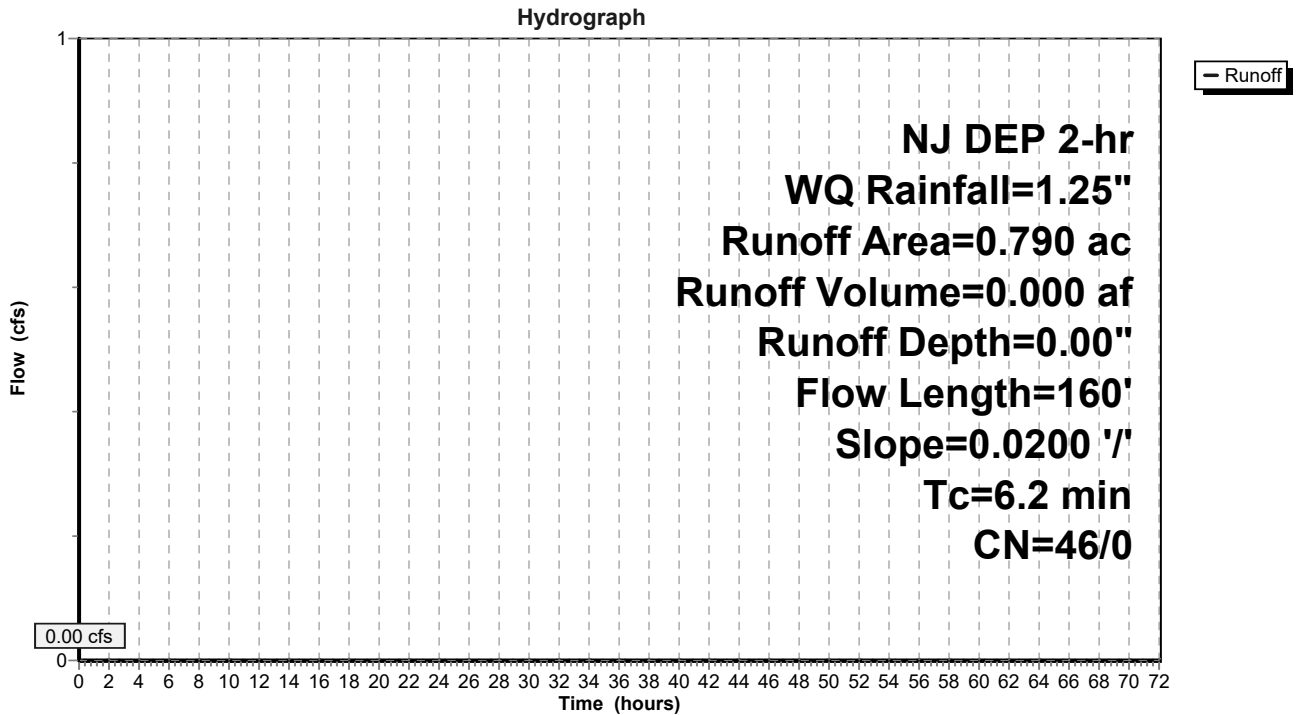## Summary for Subcatchment UC:

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

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
1.110	39	>75% Grass cover, Good, HSG A
0.480	61	>75% Grass cover, Good, HSG B
0.170	74	>75% Grass cover, Good, HSG C
1.760	48	Weighted Average
1.760	48	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	66	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
10.6	850	0.0080	1.34		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.8	916				Total

Subcatchment UC:

Hydrograph

NJ DEP 2-hr
WQ Rainfall=1.25"
Runoff Area=1.760 ac
Runoff Volume=0.000 af
Runoff Depth=0.00"
Flow Length=916'
Tc=19.8 min
CN=48/0

Summary for Pond Basin A:

Inflow Area =   3.030 ac, 36.63% Impervious, Inflow Depth =   0.38"   for WQ event
Inflow   =   2.41 cfs @   1.14 hrs, Volume=   0.096 af
Outflow   =   0.47 cfs @   1.63 hrs, Volume=   0.096 af, Atten= 81%, Lag= 29.5 min
Discarded =   0.47 cfs @   1.63 hrs, Volume=   0.096 af
Primary   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 120.06' @ 1.63 hrs   Surf.Area= 40,206 sf   Storage= 2,580 cf

Plug-Flow detention time= 64.0 min calculated for 0.096 af (100% of inflow)
Center-of-Mass det. time= 64.2 min (139.8 - 75.6)

Volume	Invert	Avail.Storage	Storage Description
#1	120.00'	140,905 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.00	39,908	0	0
121.00	44,542	42,225	42,225
122.00	49,296	46,919	89,144
123.00	54,226	51,761	140,905

Device	Routing	Invert	Outlet Devices
#1	Primary	118.56'	**18.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.56' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	120.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	120.10'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.90'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.47 cfs @ 1.63 hrs HW=120.06'   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.47 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=120.00'   (Free Discharge)
└─**1=Culvert** (Passes 0.00 cfs of 5.48 cfs potential flow)
  ├─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

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NJ DEP 2-hr WQ Rainfall=1.25"
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Pond Basin A:

Hydrograph

Inflow Area=3.030 ac
Peak Elev=120.06'
Storage=2,580 cf

Legend:
— Inflow
— Outflow
— Discarded
— Primary

2.41 cfs
0.47 cfs
0.00 cfs

Flow (cfs)

Time (hours)

Summary for Pond Basin B:

Inflow Area =   1.270 ac, 37.80% Impervious, Inflow Depth = 0.39"   for WQ event
Inflow   =   1.45 cfs @   1.04 hrs, Volume=   0.041 af
Outflow   =   0.13 cfs @   1.74 hrs, Volume=   0.041 af, Atten= 91%, Lag= 41.9 min
Discarded   =   0.13 cfs @   1.74 hrs, Volume=   0.041 af
Primary   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 120.12' @ 1.74 hrs   Surf.Area= 11,019 sf   Storage= 1,311 cf

Plug-Flow detention time= 103.8 min calculated for 0.041 af (100% of inflow)
Center-of-Mass det. time= 104.0 min (171.0 - 67.0)

Volume	Invert	Avail.Storage	Storage Description
#1	120.00'	43,672 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.00	10,742	0	0
121.00	13,042	11,892	11,892
122.00	16,315	14,679	26,571
123.00	17,888	17,102	43,672

Device	Routing	Invert	Outlet Devices
#1	Primary	118.87'	**18.0" Round Culvert** L= 74.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.87' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	120.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	120.15'	**1.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.90'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.13 cfs @ 1.74 hrs HW=120.12' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=120.00' (Free Discharge)
└─**1=Culvert** (Passes 0.00 cfs of 4.04 cfs potential flow)
    ├─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
    └─**4=Orifice/Grate** (Controls 0.00 cfs)

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NJ DEP 2-hr WQ Rainfall=1.25"
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Pond Basin B:

Hydrograph

Inflow Area=1.270 ac
Peak Elev=120.12'
Storage=1,311 cf

- Inflow
- Outflow
- Discarded
- Primary

1.45 cfs

0.13 cfs

0.00 cfs

Flow (cfs)

Time (hours)

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NJ DEP 2-hr WQ Rainfall=1.25"
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Summary for Pond Basin C:

Inflow Area = 1.250 ac, 28.00% Impervious, Inflow Depth = 0.29" for WQ event
Inflow = 0.75 cfs @ 1.14 hrs, Volume= 0.030 af
Outflow = 0.08 cfs @ 1.87 hrs, Volume= 0.030 af, Atten= 89%, Lag= 43.6 min
Discarded = 0.08 cfs @ 1.87 hrs, Volume= 0.030 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 119.13' @ 1.87 hrs Surf.Area= 7,343 sf Storage= 947 cf

Plug-Flow detention time= 107.5 min calculated for 0.030 af (100% of inflow)
Center-of-Mass det. time= 107.6 min (183.7 - 76.1)

Volume	Invert	Avail.Storage	Storage Description
#1	119.00'	19,534 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
119.00	7,015	0	0
120.00	9,503	8,259	8,259
121.00	13,047	11,275	19,534

Device	Routing	Invert	Outlet Devices
#1	Primary	118.56'	**18.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.56' / 118.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	119.00'	**0.500 in/hr Exfiltration over Surface area**
#3	Device 1	119.20'	**1.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Device 1	120.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.08 cfs @ 1.87 hrs HW=119.13' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=119.00' (Free Discharge)
└─**1=Culvert** (Passes 0.00 cfs of 0.67 cfs potential flow)
　　└─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
　　└─**4=Orifice/Grate** (Controls 0.00 cfs)

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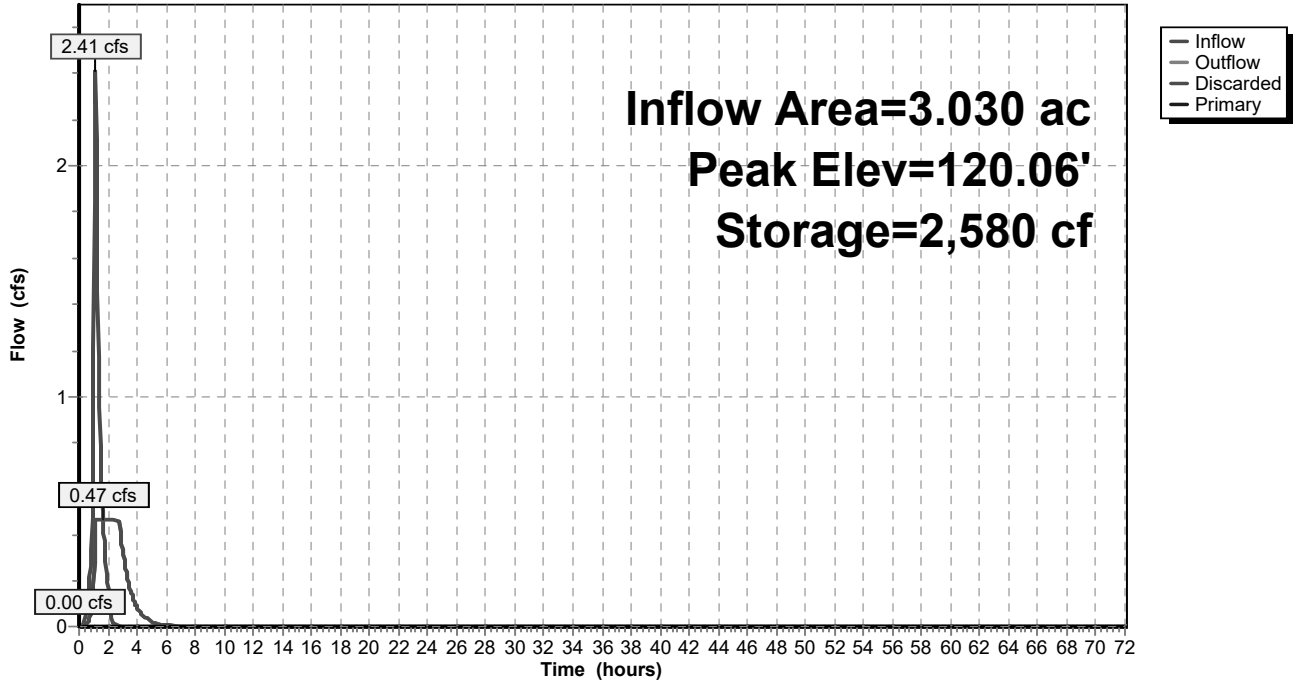
NJ DEP 2-hr WQ Rainfall=1.25"
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Pond Basin C:

Hydrograph

**Inflow Area=1.250 ac
Peak Elev=119.13'
Storage=947 cf**

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NJ DEP 2-hr WQ Rainfall=1.25"
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Summary for Link Total:

Inflow Area =   7.310 ac, 26.54% Impervious, Inflow Depth =   0.00"   for WQ event
Inflow   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af
Primary   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af, Atten= 0%, Lag= 0.0 min
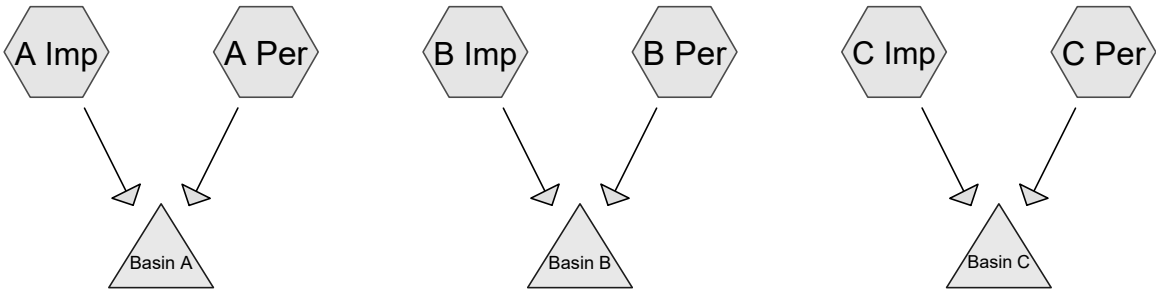
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link Total:

A Imp   A Per   B Imp   B Per   C Imp   C Per

Basin A   Basin B   Basin C

Subcat   Reach   Pond   Link

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.010	39	>75% Grass cover, Good, HSG A (A Per, B Per, C Per)
1.600	61	>75% Grass cover, Good, HSG B (A Per, B Per)
0.930	98	Paved parking, HSG A (A Imp, B Imp, C Imp)
1.010	98	Paved parking, HSG B (A Imp, B Imp)
5.550	**66**	**TOTAL AREA**

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NOAA 24-hr C 100-Year Rainfall=8.45"
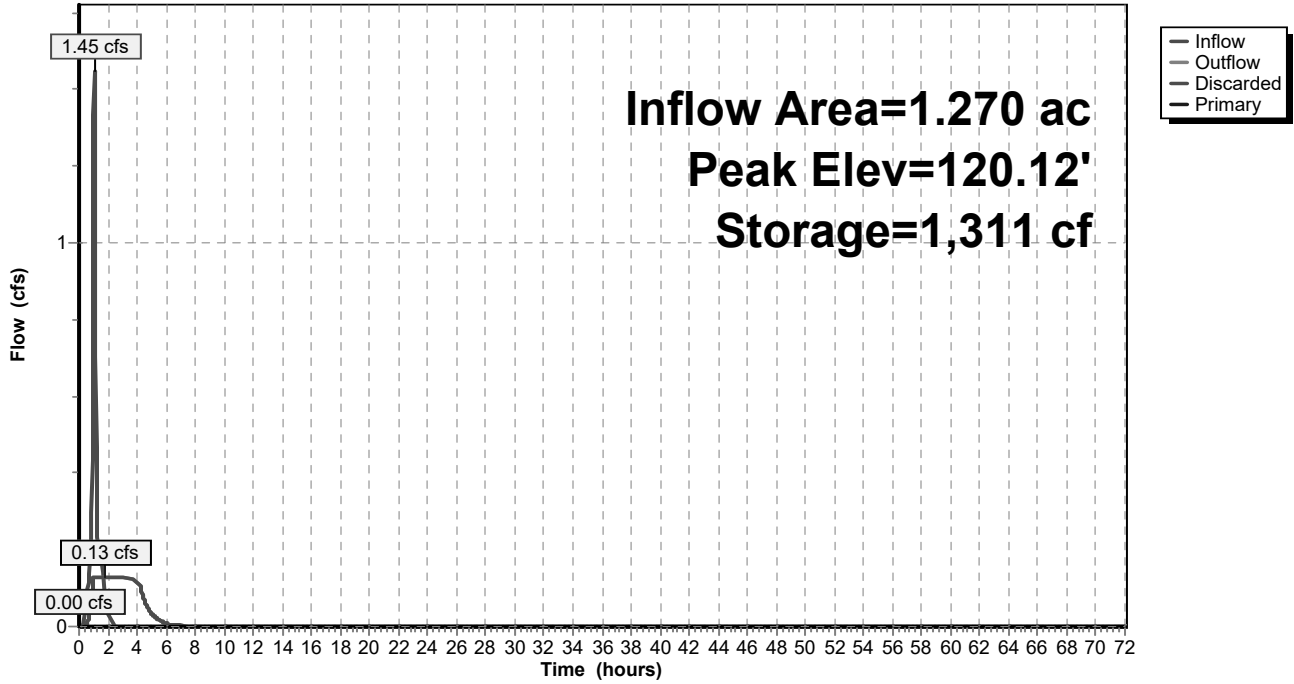Printed 11/9/2022
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Summary for Subcatchment A Imp:

Runoff   =   7.60 cfs @ 12.15 hrs, Volume=   0.759 af, Depth= 8.21"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
0.450	98	Paved parking, HSG A
0.660	98	Paved parking, HSG B
1.110	98	Weighted Average
1.110	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.6	42	0.0200	1.17		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
1.3	115	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.1	222	Total			

Subcatchment A Imp:

Hydrograph

NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=1.110 ac
Runoff Volume=0.759 af
Runoff Depth=8.21"
Flow Length=222'
Tc=7.1 min
CN=0/98

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NOAA 24-hr C 100-Year Rainfall=8.45"
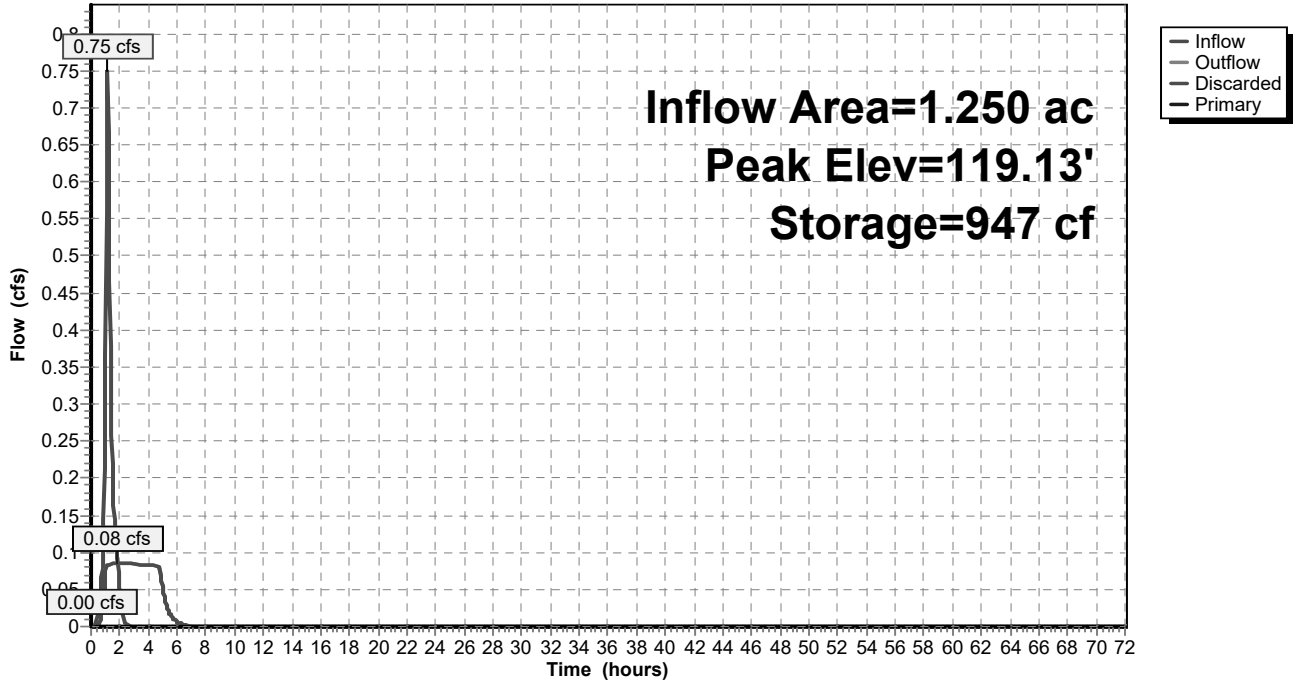Printed 11/9/2022
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Summary for Subcatchment A Per:

Runoff   =   4.04 cfs @ 12.24 hrs, Volume=   0.477 af, Depth= 2.98"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
0.570	39	>75% Grass cover, Good, HSG A
1.350	61	>75% Grass cover, Good, HSG B
1.920	54	Weighted Average
1.920	54	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	73	0.0120	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
3.1	142	0.0120	0.77		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.4	215	Total			

Subcatchment A Per:

Hydrograph

NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=1.920 ac
Runoff Volume=0.477 af
Runoff Depth=2.98"
Flow Length=215'
Slope=0.0120 '/'
Tc=12.4 min
CN=54/0

Summary for Subcatchment B Imp:

Runoff   =   4.65 cfs @ 12.08 hrs, Volume=   0.328 af, Depth= 8.21"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG A
0.350	98	Paved parking, HSG B
0.480	98	Weighted Average
0.480	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.39		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
0.3	15	0.0200	0.95		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
1.5	115	Total			

Subcatchment B Imp:

Hydrograph

**NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=0.480 ac
Runoff Volume=0.328 af
Runoff Depth=8.21"
Flow Length=115'
Slope=0.0200 '/'
Tc=1.5 min
CN=0/98**

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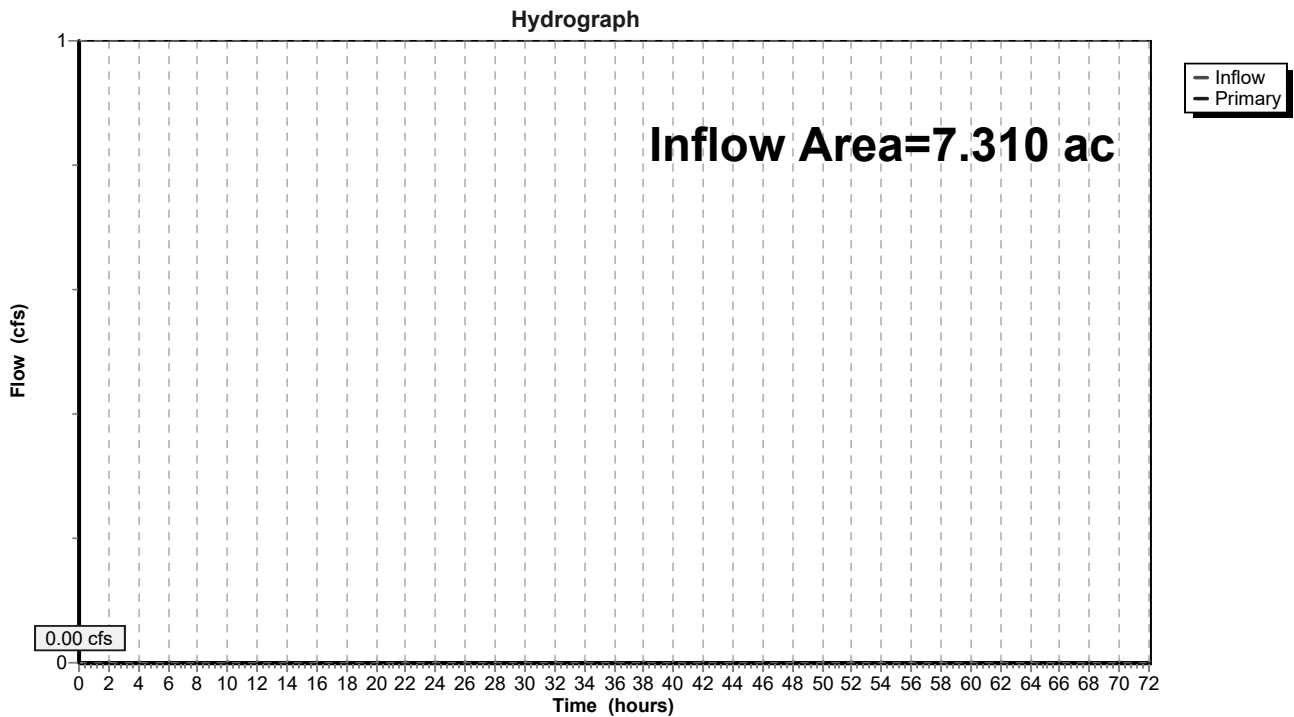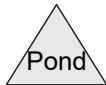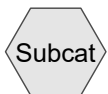*NOAA 24-hr C 100-Year Rainfall=8.45"*
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Summary for Subcatchment B Per:

Runoff   =   1.50 cfs @ 12.16 hrs, Volume=   0.137 af, Depth= 2.09"
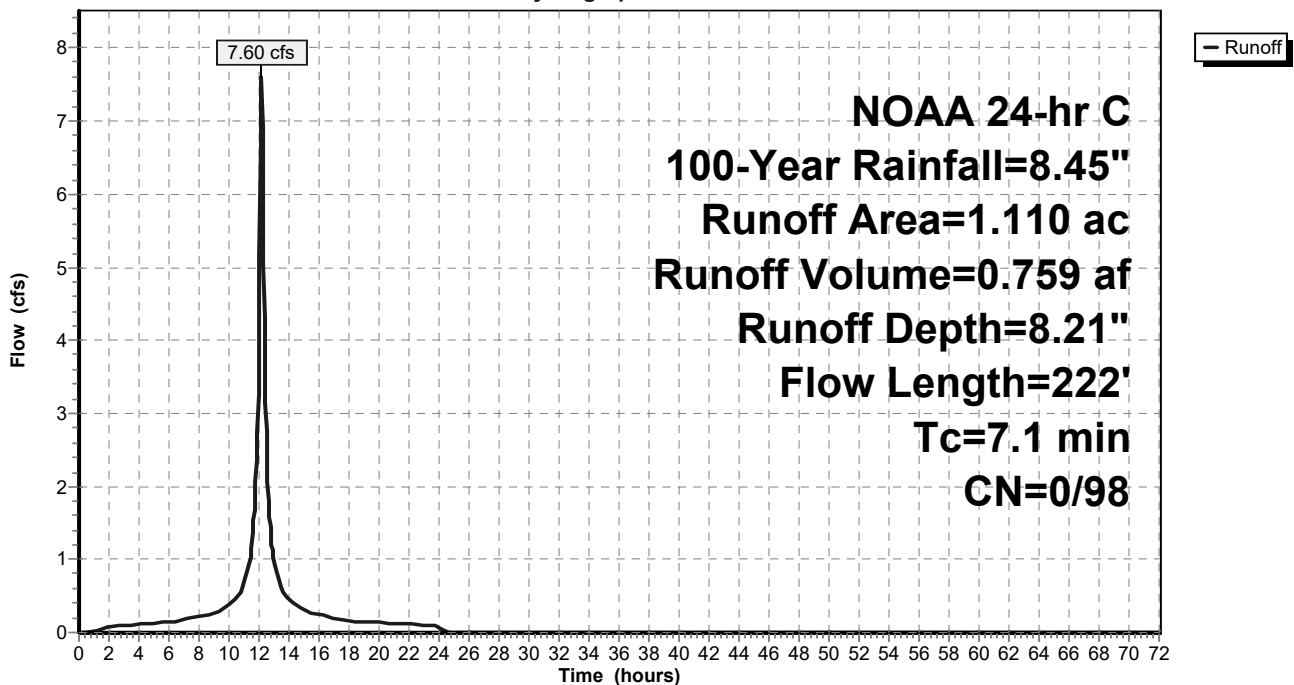
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
0.540	39	>75% Grass cover, Good, HSG A
0.250	61	>75% Grass cover, Good, HSG B
0.790	46	Weighted Average
0.790	46	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.7	49	0.0200	1.20		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
0.4	66	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.2	160	Total			

Subcatchment B Per:

Hydrograph

NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=0.790 ac
Runoff Volume=0.137 af
Runoff Depth=2.09"
Flow Length=160'
Slope=0.0200 '/'
Tc=6.2 min
CN=46/0

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Summary for Subcatchment C Imp:

Runoff   =   2.36 cfs @ 12.16 hrs, Volume=   0.239 af, Depth= 8.21"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
0.350	98	Paved parking, HSG A
0.350	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	65	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.26"
0.5	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.26"
7.4	100				Total

Subcatchment C Imp:

Hydrograph

NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=0.350 ac
Runoff Volume=0.239 af
Runoff Depth=8.21"
Flow Length=100'
Slope=0.0200 '/'
Tc=7.4 min
CN=0/98

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NOAA 24-hr C 100-Year Rainfall=8.45"
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Summary for Subcatchment C Per:

Runoff   =   1.47 cfs @   12.09 hrs, Volume=   0.101 af, Depth= 1.35"
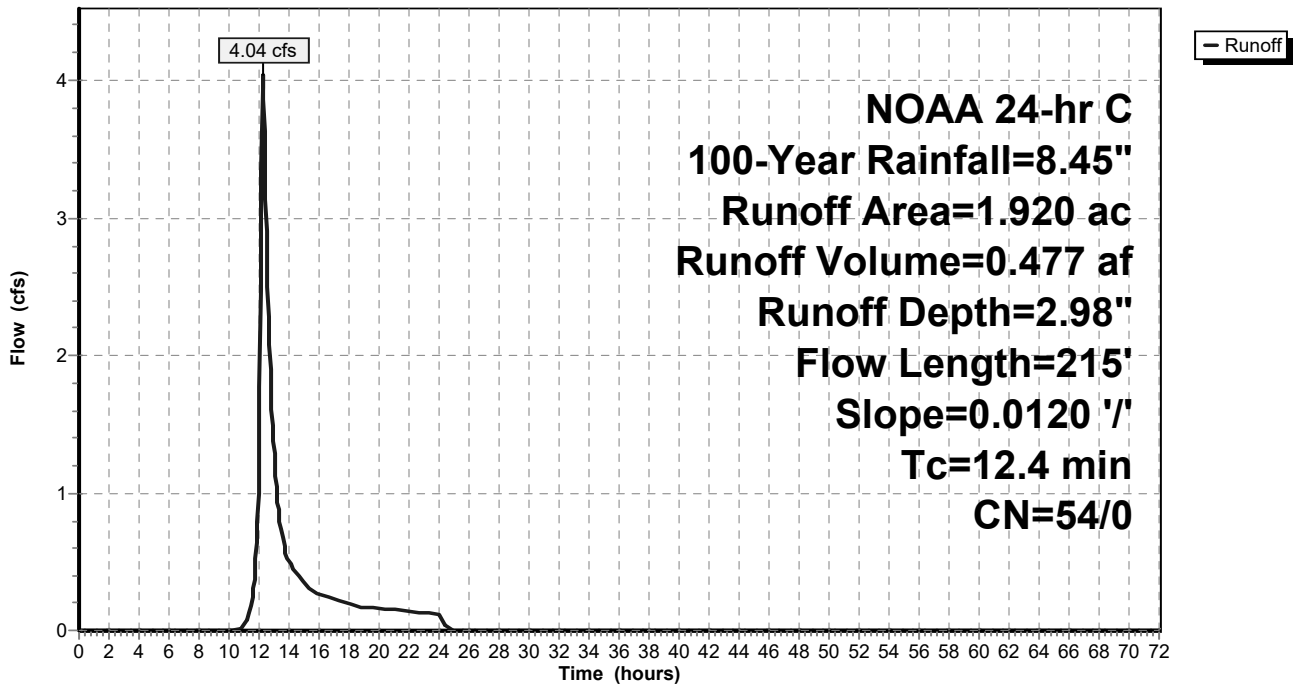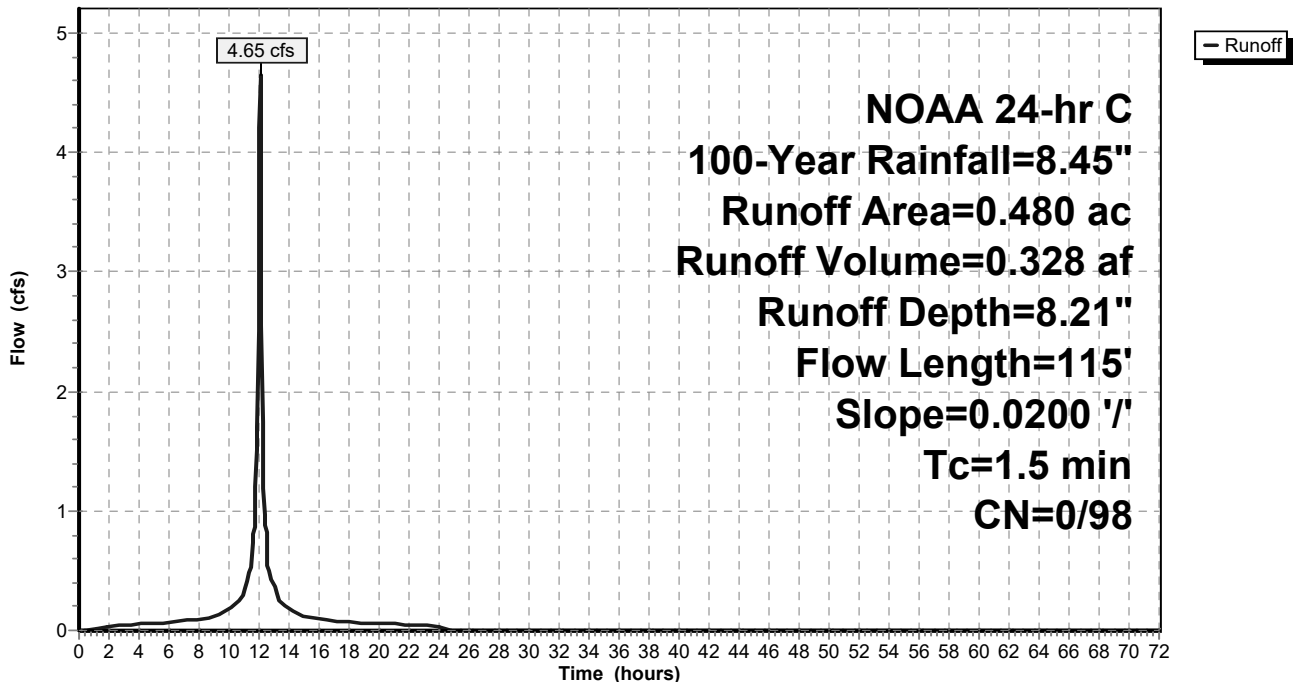
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.45"

Area (ac)	CN	Description
0.900	39	>75% Grass cover, Good, HSG A
0.900	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	35	0.0200	1.13		**Sheet Flow,**
					Smooth surfaces n= 0.011 P2= 3.26"
0.4	250	0.0150	11.76	635.20	**Channel Flow,**
					Area= 54.0 sf Perim= 20.0' r= 2.70'
					n= 0.030 Earth, grassed & winding
0.9	285				Total

Subcatchment C Per:

Hydrograph

NOAA 24-hr C
100-Year Rainfall=8.45"
Runoff Area=0.900 ac
Runoff Volume=0.101 af
Runoff Depth=1.35"
Flow Length=285'
Tc=0.9 min
CN=39/0

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Summary for Pond Basin A:

Inflow Area =   3.030 ac, 36.63% Impervious, Inflow Depth = 4.90"   for 100-Year event
Inflow   =   11.14 cfs @   12.17 hrs, Volume=   1.236 af
Outflow   =   8.36 cfs @   12.33 hrs, Volume=   1.236 af, Atten= 25%, Lag= 9.5 min
Primary   =   8.36 cfs @   12.33 hrs, Volume=   1.236 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Starting Elev= 121.00'   Surf.Area= 44,542 sf   Storage= 42,225 cf
Peak Elev= 121.16' @ 12.33 hrs   Surf.Area= 45,310 sf   Storage= 49,481 cf   (7,256 cf above start)

Plug-Flow detention time= 605.6 min calculated for 0.267 af (22% of inflow)
Center-of-Mass det. time= 26.3 min (822.0 - 795.6)

Volume	Invert	Avail.Storage	Storage Description
#1	120.00'	140,905 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.00	39,908	0	0
121.00	44,542	42,225	42,225
122.00	49,296	46,919	89,144
123.00	54,226	51,761	140,905

Device	Routing	Invert	Outlet Devices
#1	Primary	121.00'	**50.0' long x 12.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=8.31 cfs @ 12.33 hrs HW=121.16'   (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 8.31 cfs @ 1.03 fps)

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Pond Basin A:

Hydrograph

Inflow Area=3.030 ac
Peak Elev=121.16'
Storage=49,481 cf

11.14 cfs
8.36 cfs

— Inflow
— Primary

Flow (cfs)

Time (hours)

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Summary for Pond Basin B:

Inflow Area =   1.270 ac, 37.80% Impervious, Inflow Depth = 4.40"   for 100-Year event
Inflow   =   5.74 cfs @ 12.09 hrs, Volume=   0.466 af
Outflow   =   4.76 cfs @ 12.14 hrs, Volume=   0.466 af, Atten= 17%, Lag= 2.8 min
Primary   =   4.76 cfs @ 12.14 hrs, Volume=   0.466 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Starting Elev= 121.10'   Surf.Area= 13,369 sf   Storage= 13,213 cf
Peak Elev= 121.21' @ 12.14 hrs   Surf.Area= 13,722 sf   Storage= 14,673 cf   (1,460 cf above start)

Plug-Flow detention time= 416.3 min calculated for 0.162 af (35% of inflow)
Center-of-Mass det. time= 10.5 min (792.2 - 781.7)

Volume	Invert	Avail.Storage	Storage Description
#1	120.00'	43,672 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.00	10,742	0	0
121.00	13,042	11,892	11,892
122.00	16,315	14,679	26,571
123.00	17,888	17,102	43,672

Device	Routing	Invert	Outlet Devices
#1	Primary	121.10'	**50.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=4.65 cfs @ 12.14 hrs HW=121.21'   (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 4.65 cfs @ 0.87 fps)

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Pond Basin B:

Hydrograph

Inflow Area=1.270 ac
Peak Elev=121.21'
Storage=14,673 cf

Summary for Pond Basin C:

Inflow Area =   1.250 ac, 28.00% Impervious, Inflow Depth = 3.27"   for 100-Year event
Inflow   =   3.52 cfs @ 12.11 hrs, Volume=   0.341 af
Outflow   =   3.12 cfs @ 12.17 hrs, Volume=   0.341 af, Atten= 11%, Lag= 3.6 min
Primary   =   3.12 cfs @ 12.17 hrs, Volume=   0.341 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Starting Elev= 120.10'   Surf.Area= 9,857 sf   Storage= 9,227 cf
Peak Elev= 120.18' @ 12.17 hrs   Surf.Area= 10,146 sf   Storage= 10,042 cf   (815 cf above start)

Plug-Flow detention time= 395.4 min calculated for 0.129 af (38% of inflow)
Center-of-Mass det. time= 7.2 min (801.5 - 794.3)

Volume	Invert	Avail.Storage	Storage Description
#1	119.00'	19,534 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
119.00	7,015	0	0
120.00	9,503	8,259	8,259
121.00	13,047	11,275	19,534

Device	Routing	Invert	Outlet Devices
#1	Primary	120.10'	**50.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=3.06 cfs @ 12.17 hrs HW=120.18' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 3.06 cfs @ 0.76 fps)

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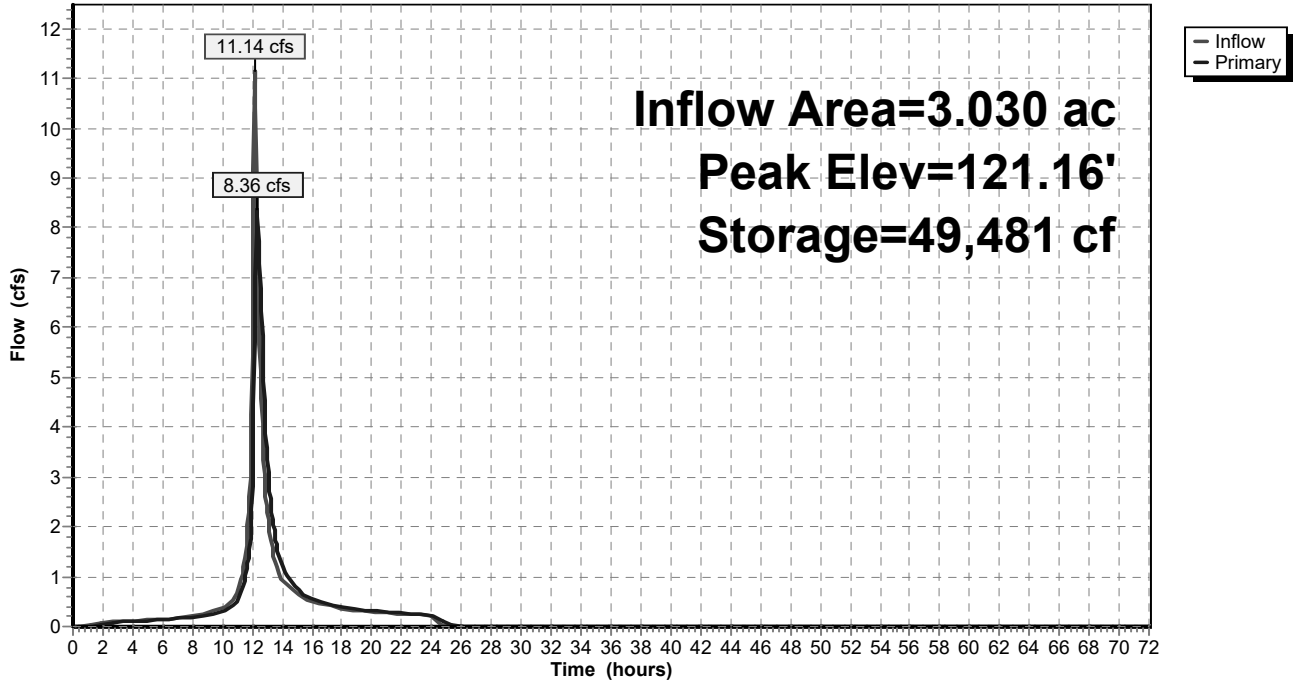HydroCAD® 10.00-25 s/n 06137 © 2019 HydroCAD Software Solutions LLC

NOAA 24-hr C 100-Year Rainfall=8.45"
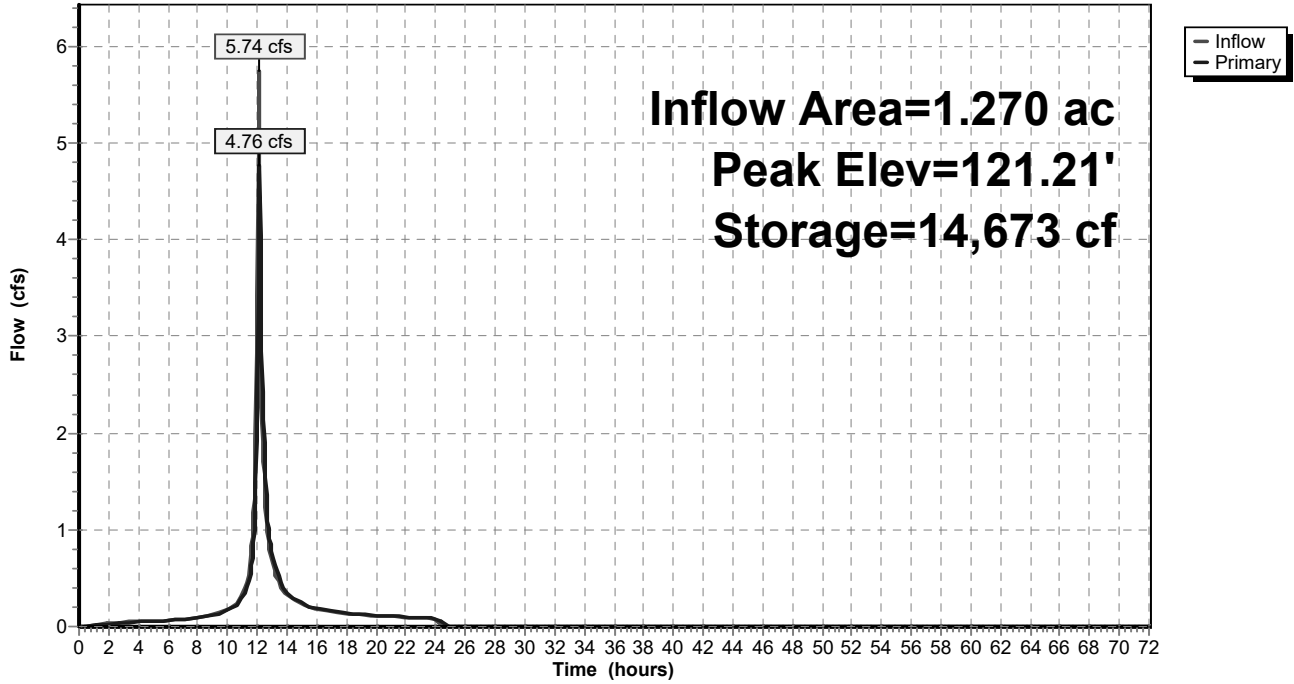Printed 11/9/2022
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Pond Basin C:

Hydrograph

Inflow Area=1.250 ac
Peak Elev=120.18'
Storage=10,042 cf

3.52 cfs

3.12 cfs

— Inflow
— Primary

Flow (cfs)

Time (hours)
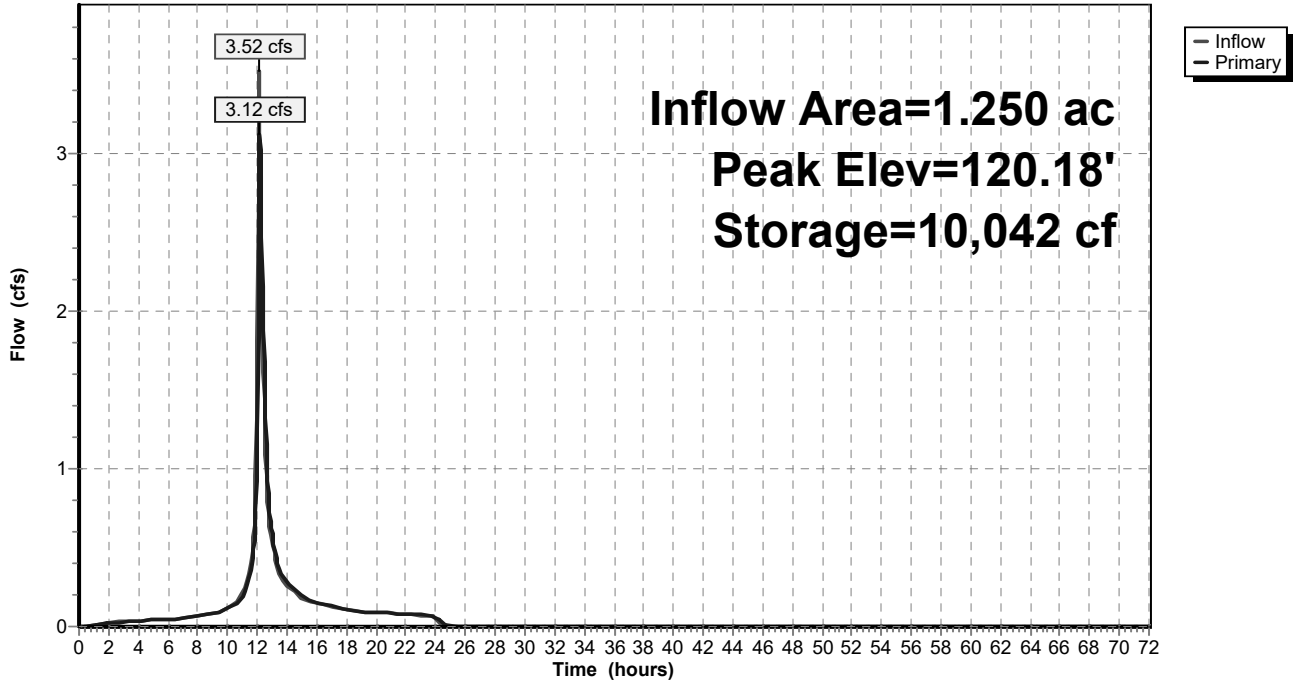
D. Groundwater Mounding Calculations

Groundwater Mounding Assessment Basin A

Initial Parameters

Volume of runnoff to be infiltrated =	53665.92 cf	1.232	af
Infiltration area =	39908 sf
Equivelent rectangular area =	160 ft	249 ft
Recharge Rate (R) =	5.83 in/hr
Specific Yield (Sy) =	0.15
Recharge Rate (Kh) =	29.15
x =	80 ft
y =	124.7 ft
t =	53665.92 x 12 / 39908 x 5.83 = 2.77	hrs.
Hi(o) =	10.00'

Initial mound in feet = **8.92**

Adjusted Parameters per methodolgy described in Chapter 13 of the NJDEP BMP manual:

Volume of runnoff to be infiltrated =	29882.16 cf	0.686	af
Infiltration area =	39908 cf
Equivelent rectangular area =	160 ft	249 ft
Recharge Rate (R) =	0.5 in/hr
Specific Yield (Sy) =	0.15
Recharge Rate (Kh) =	29.15
x =	80.0 ft
y =	124.7 ft
t =	29882.16 x 12 / 39908 x 0.5 = 17.97	hrs.
Hi(o) =	10.00'

Mound in feet =	4
SHWT elevation =	114.7
Mound Elevation =	118.7
Basin bottom under sand elevation =	119.5

The temporarily elevated groundwater table, located at 4.0 ft above the SHWT elevation, will not reach the bottom of the basin. Therefore, the assessment shows no adverse hydraulic impact to the groundwater table from the proposed infiltration BMP. As calculated above, the infiltration basin now needs 17.97 hours to drain. Since the drain time is still within 72 hours, the design of the proposed infiltration basin still meets the design criteria set forth in the BMP manual.

Value	Symbol	Description
5.83	*R*	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
29.15	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
80.000	x	1/2 length of basin (x direction, in feet)
124.700	y	1/2 width of basin (y direction, in feet)
2.77	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

Value	Symbol	Description
18.918	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
8.918	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
8.918	0
8.900	10
8.836	20
8.702	30
8.455	40
8.029	50
7.330	60
6.221	70
4.487	80
2.648	90

Re-Calculate Now

Groundwater Mounding, in feet

Disclaimer

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Input Values

0.50	R	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
29.15	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
80.000	x	1/2 length of basin (x direction, in feet)
124.700	y	1/2 width of basin (y direction, in feet)
17.97	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

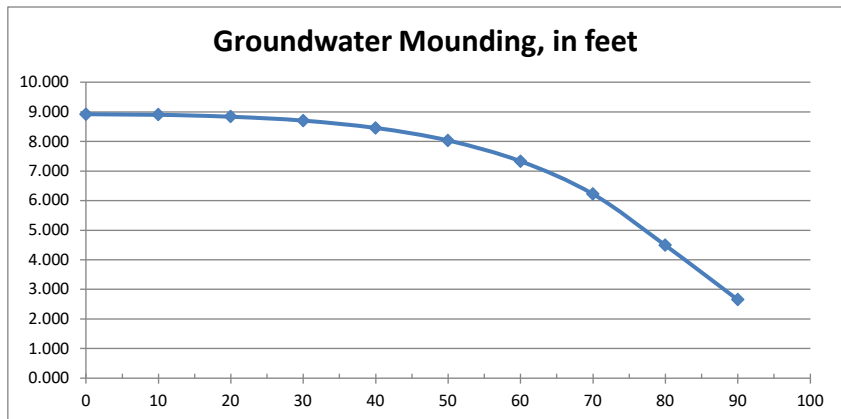|		
13.995	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
3.995	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
3.995	0
3.973	10
3.906	20
3.793	30
3.629	40
3.412	50
3.135	60
2.790	70
2.368	80
1.933	90

Re-Calculate Now

Groundwater Mounding, in feet

Disclaimer

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Groundwater Mounding Assessment Basin B

Initial Parameters

Volume of runnoff to be infiltrated =	20037.6	cf	0.46	af
Infiltration area =	10742	sf		
Equivelent rectangular area =	170	ft	63	ft
Recharge Rate (R) =	6.6	in/hr		
Specific Yield (Sy) =	0.15			
Recharge Rate (Kh) =	33			
x =	85	ft		
y =	31.6	ft		
t =	20037.6 x 12 / 10742 x 6.6 = 3.39			hrs.
Hi(o) =	10.00'			

Initial mound in feet =   **9.1**

Adjusted Parameters per methodolgy described in Chapter 13 of the NJDEP BMP manual:

Volume of runnoff to be infiltrated =	10062.36	cf	0.231	af
Infiltration area =	10742	cf		
Equivelent rectangular area =	170	ft	63	ft
Recharge Rate (R) =	0.5	in/hr		
Specific Yield (Sy) =	0.15			
Recharge Rate (Kh) =	33			
x =	85.0	ft		
y =	31.6	ft		
t =	10062.36 x 12 / 10742 x 0.5 = 22.48			hrs.
Hi(o) =	10.00'			

Mound in feet =	**2.27**
SHWT elevation =	114.7
Mound Elevation =	116.97
Basin bottom under sand elevation =	119.5

The temporarily elevated groundwater table, located at 2.27 ft above the SHWT elevation, will not reach the bottom of the basin. Therefore, the assessment shows no adverse hydraulic impact to the groundwater table from the proposed infiltration BMP. As calculated above, the infiltration basin now needs 22.48 hours to drain. Since the drain time is still within 72 hours, the design of the proposed infiltration basin still meets the design criteria set forth in the BMP manual.

Input Values

6.60	R	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
33.00	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
85.000	x	1/2 length of basin (x direction, in feet)
31.600	y	1/2 width of basin (y direction, in feet)
3.39	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

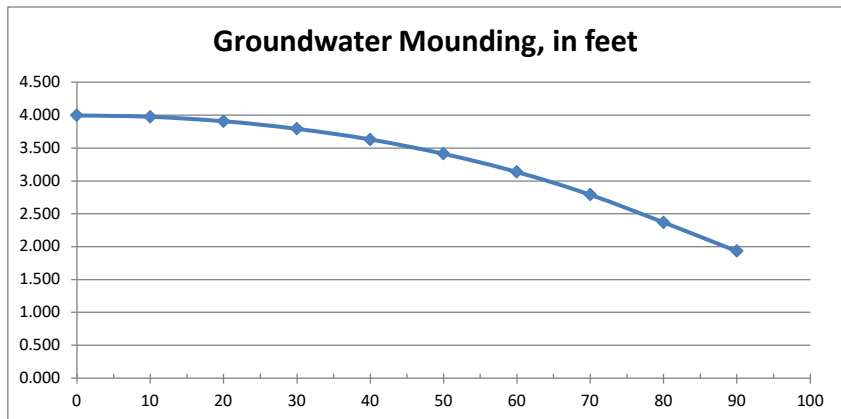|		
19.110	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
9.110	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
9.110	0
9.091	10
9.032	20
8.915	30
8.712	40
8.378	50
7.846	60
7.012	70
5.706	80
3.838	90

Re-Calculate Now

Groundwater Mounding, in feet

Disclaimer

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Input Values

0.50	R	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
33.00	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
85.000	x	1/2 length of basin (x direction, in feet)
31.600	y	1/2 width of basin (y direction, in feet)
22.48	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

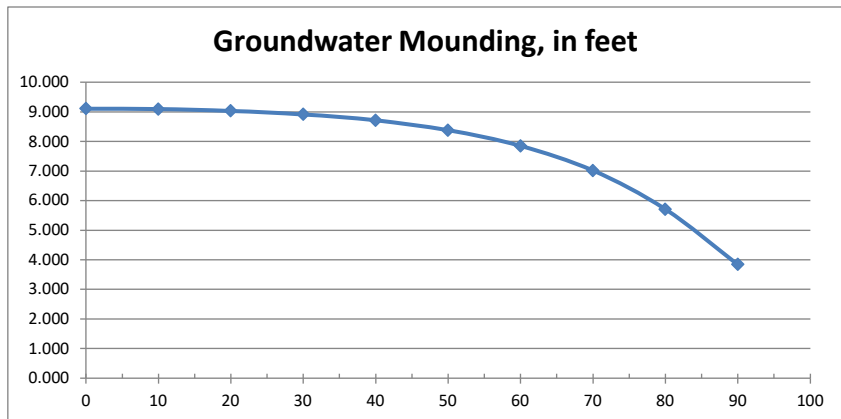|		
12.277	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
2.277	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
2.277	0
2.267	10
2.238	20
2.187	30
2.113	40
2.011	50
1.877	60
1.703	70
1.475	80
1.200	90

Re-Calculate Now

Groundwater Mounding, in feet

Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Groundwater Mounding Assessment Basin C

Initial Parameters

Volume of runoff to be infiltrated =	12458.16 cf	0.286	af	
Infiltration area =	7015 sf			
Equivelent rectangular area =	50 ft	140 ft		
Recharge Rate (R) =	2.32 in/hr			
Specific Yield (Sy) =	0.15			
Recharge Rate (Kh) =	11.6			
x =	25 ft			
y =	70.2 ft			
t =	12458.16 x 12 /	7015 x 2.32 = 9.19	hrs.	
Hi(o) =	10.00'			

Initial mound in feet = **7.73**

Adjusted Parameters per methodolgy described in Chapter 13 of the NJDEP BMP manual:

Volume of runoff to be infiltrated =	7361.64 cf	0.169	af	
Infiltration area =	7015 cf			
Equivelent rectangular area =	50 ft	140 ft		
Recharge Rate (R) =	0.5 in/hr			
Specific Yield (Sy) =	0.15			
Recharge Rate (Kh) =	11.6			
x =	25.0 ft			
y =	70.2 ft			
t =	7361.64 x 12 /	7015 x 0.5 = 25.19	hrs.	
Hi(o) =	10.00'			

Mound in feet = **3.22**
SHWT elevation = 113.3
Mound Elevation = 116.52
Basin bottom under sand elevation = 118.5

The temporarily elevated groundwater table, located at 3.22 ft above the SHWT elevation, will not reach the bottom of the basin. Therefore, the assessment shows no adverse hydraulic impact to the groundwater table from the proposed infiltration BMP. As calculated above, the infiltration basin now needs 25.19 hours to drain. Since the drain time is still within 72 hours, the design of the proposed infiltration basin still meets the design criteria set forth in the BMP manual.

Input Values

2.32	R	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
11.60	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
25.000	x	1/2 length of basin (x direction, in feet)
70.200	y	1/2 width of basin (y direction, in feet)
9.19	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

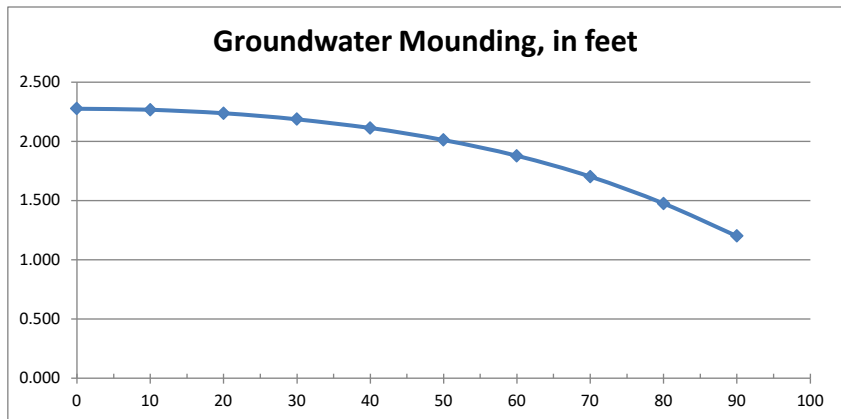|		
17.727	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
7.727	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
7.727	0
7.375	10
6.262	20
4.390	30
2.763	40
1.607	50
0.869	60
0.441	70
0.211	80
0.097	90

Re-Calculate Now

Groundwater Mounding, in feet

Disclaimer

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Input Values

0.50	*R*	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
11.60	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
25.000	x	1/2 length of basin (x direction, in feet)
70.200	y	1/2 width of basin (y direction, in feet)
25.19	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

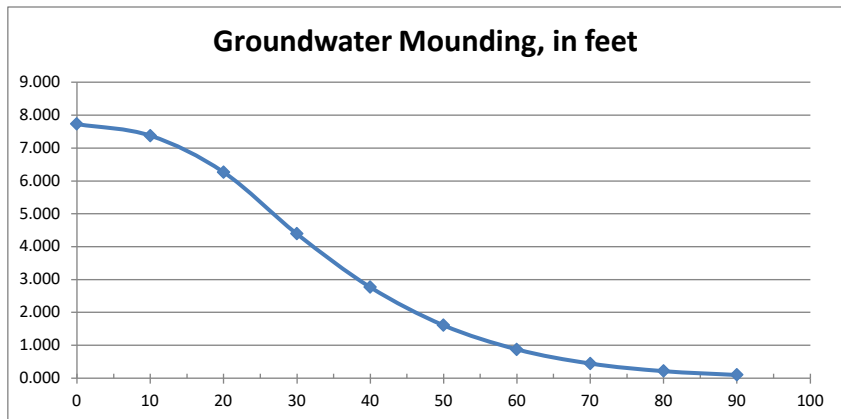|		
13.222	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
3.222	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
3.222	0
3.108	10
2.757	20
2.195	30
1.676	40
1.249	50
0.908	60
0.644	70
0.447	80
0.303	90

Re-Calculate Now

Groundwater Mounding, in feet

Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

E. Drainage design Data

Note: Design based on 25-year storm event

	AVERAGE "C" COEFFICIENT						TIME OF CONCENTRATION							
WATER SHED I.D. NO.	TOTAL AREA AC.	PERMEABLE AREA AC.	"C"	IMPERVIOUS AREA AC.	"C"	AVG. "C"	GRASS SLOPE %	LENGTH	TC	IMPERVIOUS SLOPE %	LENGTH	TC	TOTAL TC	
8	33.10	33.10	0.25	0.00	0.99	0.22	1.00	1370	56.6	0.00	0		56.63	

NOTE: Average "C" based upon Standards for Soil Erosion and Sediment Control, Appendix A-9, pg A9-1.

NOTE: Min Tc = 10.0 min. perN.J.A.C 5:21-7.(c)3.

BY: _____   DATE: _____

REV. BY: _____   DATE: _____   JOB NO.: _____

Note: Design based on 25-year storm event

N =   0.010 FOR HDPE   0.013 FOR RCP

PIPE SECTION			AREA				RUNOFF			PIPE DESIGN DATA									RIM / GRATE		INVERT	
WATER SHED ID NO.	FROM	TO	INCRE. ACRES	AVG "C"	EQUIV. AREA C*A	TOTAL AREA C*A	TC MIN.	I IN./HR.	TOTAL RUNOFF CFS	SLOPE OF PIPE %	DIA. OF PIPE IN.	LENGTH FT.	N	FLOW TIME MIN.	FULL CAPACITY CFS	FULL VELOCITY FPS	DESIGN VELOCITY FPS	UPPER END	LOWER END	UPPER END	LOWER END
8	8	7	33.10	0.22	7.28	7.28	56.6	2.4	17.49	0.80	24	76	0.013	0.20	20.23	6.44	7.25	122.00	121.00	119.11	118.50

NEW JERSEY SOIL EROSION & SEDIMENT CONTROL STANDARDS
FOR
CONDUIT OUTLET PROTECTION

Structure: HW 1   Date:
                                                   Page:

DESIGN CRITERIA: APRON DIMENSIONS:
           Design Storm   25 yr   Length (La)   10.1 Ft
          Flow Rate, Q=   1.07 CFS   Width @ Culvert (3D)   3.8 Ft
       Pipe Horiz Dim.=   15 In   Width @ End (W)   13.9 Ft
        Pipe Vert Dim.=   15 In   D(50) calc.   1 in
      Tailwater Depth=   0.25 Ft   D(50) to be used   4 in
      Filter Fabric Used? Y (Y/N)   Thickness (t)   8 in
           D(50) min.   4 in   Volume   2.38 cy.

SCOUR HOLE DIMENSIONS: SCOUR HOLE DIMENSIONS:
        Depth of Hole (E)   0.6 Ft   Depth of Hole (E)   1.3 Ft
     Length of Bottom (A)   3.8 Ft   Length of Bottom (A)   3.8 Ft
       Width of Bottom (C)   2.5 Ft   Width of Bottom (C)   2.5 Ft
  Length of Scour Hole (B)   7.5 Ft   Length of Scour Hole (B)   11.3 Ft
   Width of Scour Hole (D)   6.3 Ft   Width of Scour Hole (D)   10.0 Ft
              D(50) calc.   0 in   D(50) calc.   0 in
          D(50) to be used   4 in   D(50) to be used   4 in
            Thickness (F)   8 in   Thickness   8 in
                 Volume   1.16 cy.   Volume   2.78 cy.

Structure: HW 3

DESIGN CRITERIA: APRON DIMENSIONS:
           Design Storm   25 yr   Length (La)   9.4 Ft
          Flow Rate, Q=   0.51 CFS   Width @ Culvert (3D)   3.8 Ft
       Pipe Horiz Dim.=   15 In   Width @ End (W)   13.2 Ft
        Pipe Vert Dim.=   15 In   D(50) calc.   0 in
      Tailwater Depth=   0.25 Ft   D(50) to be used   4 in
      Filter Fabric Used? y (Y/N)   Thickness (t)   8 in
           D(50) min.   4 in   Volume   2.14 cy.

SCOUR HOLE DIMENSIONS: SCOUR HOLE DIMENSIONS:
        Depth of Hole (E)   0.6 Ft   Depth of Hole (E)   1.3 Ft
     Length of Bottom (A)   3.8 Ft   Length of Bottom (A)   3.8 Ft
       Width of Bottom (C)   2.5 Ft   Width of Bottom (C)   2.5 Ft
  Length of Scour Hole (B)   7.5 Ft   Length of Scour Hole (B)   11.3 Ft
   Width of Scour Hole (D)   6.3 Ft   Width of Scour Hole (D)   10.0 Ft
              D(50) calc.   0 in   D(50) calc.   0 in
          D(50) to be used   4 in   D(50) to be used   4 in
            Thickness (F)   8 in   Thickness   8 in
                 Volume   1.16 cy.   Volume   2.78 cy.

NOTE: Use Boxed Dimensions

NEW JERSEY SOIL EROSION & SEDIMENT CONTROL STANDARDS
FOR
CONDUIT OUTLET PROTECTION

Structure: HW 5   Date:
                                                          Page:

DESIGN CRITERIA:			APRON DIMENSIONS:		
Design Storm	25	yr	Length (La)	9.3	Ft
Flow Rate, Q=	0.41	CFS	Width @ Culvert (3D)	3.8	Ft
Pipe Horiz Dim.=	15	In	Width @ End (W)	13.0	Ft
Pipe Vert Dim.=	15	In	D(50) calc.	0	in
Tailwater Depth=	0.25	Ft	D(50) to be used	4	in
Filter Fabric Used?	Y	(Y/N)	Thickness (t)	8	in
D(50) min.	4	in	Volume	2.10	cy.

SCOUR HOLE DIMENSIONS:			SCOUR HOLE DIMENSIONS:		
Depth of Hole (E)	0.6	Ft	Depth of Hole (E)	1.3	Ft
Length of Bottom (A)	3.8	Ft	Length of Bottom (A)	3.8	Ft
Width of Bottom (C)	2.5	Ft	Width of Bottom (C)	2.5	Ft
Length of Scour Hole (B)	7.5	Ft	Length of Scour Hole (B)	11.3	Ft
Width of Scour Hole (D)	6.3	Ft	Width of Scour Hole (D)	10.0	Ft
D(50) calc.	0	in	D(50) calc.	0	in
D(50) to be used	4	in	D(50) to be used	4	in
Thickness (F)	8	in	Thickness	8	in
Volume	1.16	cy.	Volume	2.78	cy.

Structure: HW 7

DESIGN CRITERIA:			APRON DIMENSIONS:		
Design Storm	25	yr	Length (La)	25.1	Ft
Flow Rate, Q=	17.49	CFS	Width @ Culvert (3D)	6.0	Ft
Pipe Horiz Dim.=	24	In	Width @ End (W)	31.1	Ft
Pipe Vert Dim.=	24	In	D(50) calc.	9	in
Tailwater Depth=	0.40	Ft	D(50) to be used	9	in
Filter Fabric Used?	y	(Y/N)	Thickness (t)	17	in
D(50) min.	4	in	Volume	25.87	cy.

SCOUR HOLE DIMENSIONS:			SCOUR HOLE DIMENSIONS:		
Depth of Hole (E)	1.0	Ft	Depth of Hole (E)	2.0	Ft
Length of Bottom (A)	6.0	Ft	Length of Bottom (A)	6.0	Ft
Width of Bottom (C)	4.0	Ft	Width of Bottom (C)	4.0	Ft
Length of Scour Hole (B)	12.0	Ft	Length of Scour Hole (B)	18.0	Ft
Width of Scour Hole (D)	10.0	Ft	Width of Scour Hole (D)	16.0	Ft
D(50) calc.	7	in	D(50) calc.	4	in
D(50) to be used	7	in	D(50) to be used	4	in
Thickness (F)	14	in	Thickness	9	in
Volume	5.01	cy.	Volume	7.88	cy.

NOTE: Use Boxed Dimensions

F. Soil Boring Logs

SOUTH JERSEY ENGINEERS, L.L.C.

Septic System Design & Engineering

P.O. Box 1406 · Voorhees, N.J. 08043 · 1-856-651-9050 · 1-856-651-9051 (fax) · engineer@septics.com

Sandford Mersky, P.E.
Vincent Gioffre, NJDEP Licensed Operator (Wastewater)
Nicholas Bielecki, P.E., NJDEP Licensed Operator (Wastewater)

September 6, 2022

CLIENT:	Site Civil Engineering
	213 Cherry Tree Court
	Franklinville, NJ 08322
PROJECT:	329 Front Street
	Block 12 / Lot 2.10 & 2.12
	Elmer Borough, Salem County, NJ
REQUIREMENT:	Geo-Technical Investigation-Subsurface Explorations
ATTENTION:	William P. Gilmore, P.E.
	wgilmore@sitecivilengineering.com

PURPOSE

The purpose of this report is to present the findings pertaining to the subsurface explorations (test pits) performed at the above project.

INVESTIGATION

A representative from South Jersey Engineers LLC was present on August 29th of 2022 to witness the excavation of eight (8) un-surveyed test pits for the proposed storm water management basins. The objective was to ascertain the following: estimate the seasonal high water-table, record ground water levels if encountered and establish soil profile logs. The test pit locations were provided by Site Civil Engineering. In addition, soil samples were obtained and returned to our office for analytical testing.

FINDINGS

The in situ-soils encountered during the subsurface explorations consisted primarily of Sandy Loams. Refer to the attached soil profile logs for more detailed descriptions

QUALIFICATIONS

If any conditions other than what was revealed through the subsurface explorations are encountered, we should be informed immediately of such conditions so that we may modify our findings. This report is based on the subsurface conditions as revealed by the test pit. This investigation as performed by South Jersey Engineers, L.L.C. in no way releases the contractor or subcontractor of full responsibility of meeting contract documents, plans, specifications and standards in the industry. No other warranty is express or implied. No conclusions should be drawn from this report other than those specifically stated. The report does not reflect any variations, which may be encountered during construction. We should be informed immediately of such conditions so that we may modify our findings and conclusions, if necessary.

South Jersey Engineers, LLC will not be responsible for variations in subsurface soils encountered in areas other than those tested.

Respectfully,

South Jersey Engineers, L.L.C.

Test Pit #6   **Proposed Basin Area**

0"-20"	Topsoil
20"-70"	gray fine Sand / Loamy Sand
70"-100"	yellowish red medium to fine Sand / Loamy Sand
	mottles: yellow common distinct @ 70"
100"-144"	strong brown Sandy Clay Loam

Groundwater Encountered @ 92"

Estimated Seasonal High Water-table - 70"

Test Pit #5   **Proposed Basin Area**

0"-18"	Topsoil
18"-50"	gray fine Sand / Loamy Sand
50"-84"	strong brown fine Sandy Loam
84"-108"	strong brown medium to fine Loamy Sand
	mottles: yellow common distinct @ 76"
108"-144"	yellowish red Sandy Clay Loam
	Silt inclusions throughout

Groundwater Encountered @ 108"

Estimated Seasonal High Water-table- 76"

Test Pit #7   **Proposed Basin Area**

0"-23"	Topsoil
23"-52"	yellowish brown Sandy Loam
52"-125"	strong brown Loamy Sand
	mottles: yellow common distinct @ 92"
125"-144"	pale brown Silt Loam with Sand bands

Groundwater Encountered @ 108"

Estimated Seasonal High Water-table - 92"

Test Pit #8   **Proposed Basin Area**

0"-17"   Topsoil
17"-53"   strong brown Sandy Loam
53"-100"   yellowish red Loamy Sand

                    mottles: yellow common distinct @ 84"

100"-144"   strong brown Sandy Loam

                            Groundwater not Encountered
                            Estimated Seasonal High Water-table -84"

Test Pit #4   **Proposed Basin Area**

0"-22"   Topsoil
22"-46"   strong brown Sandy Clay Loam
46"-76"   yellowish brown medium to fine Loamy Sand- Gravel 30%
76"-115"   yellow medium to fine Sand- Silt inclusions throughout

                    mottles: yellowish red common distinct @ 88"

115"-144"   strong brown Loamy Sand- Gravel 50%

                            Groundwater Encountered @ 115"
                            Estimated Seasonal High Water-table -88"

Test Pit #3   **Proposed Basin Area**

0"-18"   Topsoil
18"-74"   yellowish red Loamy Sand
74"-144"   strong brown Sandy Clay Loam

                    mottles: yellowish red common distinct @ 91"
                    Silt inclusions throughout

                            Groundwater not Encountered
                            Estimated Seasonal High Water-table –91"

Test Pit #1   **Proposed Basin Area**

0"-20"   Topsoil

20"-52"   strong brown Sandy Loam

52"-96"   strong brown medium to fine Loamy Sand- Gravel 30%

96"-144"   yellowish brown Sandy Loam- Silt inclusions throughout

mottles: yellowish red common distinct @ 96"

Groundwater Encountered @ 126"

Estimated Seasonal High Water-table –96"

Test Pit #2   **Proposed Basin Area**

0"-20"   Topsoil

20"-42"   strong brown Sandy Loam

42"-90"   pale brown fine Loamy Sand

90"-144"   yellowish brown Sandy Clay Loam- Silt inclusions throughout

mottles: yellowish red common distinct @ 90"

Groundwater not Encountered

Estimated Seasonal High Water-table –90"

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   1   Replicate Letter   A   Date Collected   8/29/2022

2. Material Tested _____ Fill   X   Test in Native Soil - Indicate Depth   45"

3. Type of Sample _____ Undisturbed   x   Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   1.905
   Length of Sample, in inches   3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   151.83
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc   1.75

6. Standpipe Used: _____ x _____ No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   3.0
   At the End of Each Test Interval, H2   2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	4.37	4.62
0.00	4.45	4.75
0.00	4.54	4.90

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr x ---------/--------- x 3/	4.90	x ln(3/2)
k= 14.88		

10. Defects in the Sample (Check appropriate items):
____x____ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   `1`   Replicate Letter `B`   Date Collected `8/29/2022`

2. Material Tested `_____` Fill   `X` Test in Native Soil - Indicate Depth `45"`

3. Type of Sample `_____` Undisturbed   `x` Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   `1.905`
                     Length of Sample, in inches   `3`

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   `149.84`
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   `86.83`
   Bulk Density (Sample Wt./Sample Volume), grams/cc   `1.73`

6. Standpipe Used: ___x___ No _____ Yes
   Indicate internal Radius, cm   _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   `3.0`
   At the End of Each Test Interval, H2   `2.0`

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	4.37	4.62
0.00	4.39	4.66
0.00	4.50	4.83

9. Calculation of Permeability:

$K, (in/hr) = 60\ min/hr \times r^2/R^2 \times L(in)/T(min) \times \ln(H1/H2)$

k= 60 min/hr	x ---------/--------- x 3/	4.83	x ln(3/2)
k=	15.10		

10. Defects in the Sample (Check appropriate items):
___x___ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____

MUNICIPALITY Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number 1   Replicate Letter A   Date Collected 8/29/2022

2. Material Tested _____ Fill   X Test in Native Soil - Indicate Depth 68"

3. Type of Sample _____ Undisturbed   x Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   1.905
   Length of Sample, in inches   3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   147.77
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc   1.70

6. Standpipe Used: ____x____ No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   3.0
   At the End of Each Test Interval, H2   2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	15.18	15.30
0.00	15.31	15.51
0.00	15.42	15.70

9. Calculation of Permeability:

$$K, (in/hr) = 60 \text{ min/hr} \times r^2/R^2 \times L(in)/T(min) \times \ln(H1/H2)$$

k= 60 min/hr x --------/--------- x 3/	15.70	x ln(3/2)
k= 4.65		

10. Defects in the Sample (Check appropriate items):
___x___ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smearing _____Compactation
_____ Other---Specify_____

MUNICIPALITY   [Elmer Borough]

Form 3b. Tube Permeameter Test Data

1. Test Number   [1]   Replicate Letter [B]   Date Collected [8/29/2022]

2. Material Tested   [   ] Fill   [X] Test in Native Soil - Indicate Depth [68"]

3. Type of Sample   [   ] Undisturbed   [x] Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   [1.905]
                        Length of Sample, in inches   [3]

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   [147.35]
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   [86.83]
   Bulk Density (Sample Wt./Sample Volume), grams/cc   [1.70]

6. Standpipe Used: ____x____ No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   [3.0]
   At the End of Each Test Interval, H2   [2.0]

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	14.47	14.78
0.00	15.05	15.08
0.00	15.34	15.57

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr x ---------/--------- x 3/	15.57	x ln(3/2)
k= 4.69		

10. Defects in the Sample (Check appropriate items):
____x____ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smearing _____Compactation
_____ Other---Specify_____

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   1   Replicate Letter   A   Date Collected   8/29/2022

2. Material Tested | | Fill | X | Test in Native Soil - Indicate Depth   84"

3. Type of Sample | | Undisturbed | x | Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   1.905
                     Length of Sample, in inches   3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   151.29
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc   1.74

6. Standpipe Used: x   No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   3.0
   At the End of Each Test Interval, H2   2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	5.10	5.17
0.00	5.31	5.52
0.00	5.32	5.53

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr x ---------/--------- x 3/	5.53	x ln(3/2)
k= 13.21		

10. Defects in the Sample (Check appropriate items):
____x____ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compaction
_____ Other---Specify_____

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   1   Replicate Letter   B   Date Collected   8/29/2022

2. Material Tested   Fill   X   Test in Native Soil - Indicate Depth   84"

3. Type of Sample   Undisturbed   x   Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   1.905
                            Length of Sample, in inches   3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   150.33
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc   1.73

6. Standpipe Used: x   No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   3.0
   At the End of Each Test Interval, H2   2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	4.52	4.87
0.00	5.01	5.02
0.00	5.26	5.43

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr $\times r^2/R^2 \times L(in)/T(min) \times \ln(H1/H2)$

k= 60 min/hr $\times$ ---------/--------- x 3/   5.43   x $\ln(3/2)$
k=   13.45

10. Defects in the Sample (Check appropriate items):
____x____ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   1   Replicate Letter   A   Date Collected   8/29/2022

2. Material Tested [   ] Fill   [X] Test in Native Soil - Indicate Depth   72"

3. Type of Sample [   ] Undisturbed   [x] Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   1.905
                     Length of Sample, in inches   3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   145.45
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc   1.68

6. Standpipe Used: _____x_____ No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   3.0
   At the End of Each Test Interval, H2   2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	4.50	4.84
0.00	4.50	4.84
0.00	5.20	5.33

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr x ---------/--------- x 3/	5.33	x ln(3/2)
k= 13.70		

10. Defects in the Sample (Check appropriate items):
____x____ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   1   Replicate Letter   B   Date Collected   8/29/2022

2. Material Tested | Fill   X | Test in Native Soil - Indicate Depth   72"

3. Type of Sample | Undisturbed   x | Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   1.905
   Length of Sample, in inches   3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   148.56
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc   1.71

6. Standpipe Used: x   No   Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   3.0
   At the End of Each Test Interval, H2   2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	4.50	4.84
0.00	4.52	4.86
0.00	5.14	5.24

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr x ---------/--------- x 3/	5.24	x ln(3/2)
k= 13.93		

10. Defects in the Sample (Check appropriate items):
___x___ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smearing _____Compactation
_____ Other---Specify_____

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   [1]   Replicate Letter [A]   Date Collected [8/29/2022]

2. Material Tested   [ ] Fill   [X] Test in Native Soil - Indicate Depth [60"]

3. Type of Sample   [ ] Undisturbed   [x] Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   [1.905]
                     Length of Sample, in inches   [3]

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   [149.26]
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   [86.83]
   Bulk Density (Sample Wt./Sample Volume), grams/cc   [1.72]

6. Standpipe Used: ___x___ No _____ Yes
   Indicate internal Radius, cm   _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   [3.0]
   At the End of Each Test Interval, H2   [2.0]

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	5.11	5.18
0.00	5.31	5.52
0.00	5.45	5.74

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr x ---------/--------- x 3/	5.74	x ln(3/2)
k= 12.71		

10. Defects in the Sample (Check appropriate items):
   ___x___ None _____Cracks _____Worm Channels _____Root Channels
   _____ Soil/Tube Contact _____Large Gravel _____Large Roots
   _____ Dry Soil _____Smeering _____Compactation
   _____ Other---Specify_____

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   1   Replicate Letter   B   Date Collected   8/29/2022

2. Material Tested   Fill   X   Test in Native Soil - Indicate Depth   60"

3. Type of Sample   Undisturbed   x   Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   1.905
   Length of Sample, in inches   3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   146.54
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc   1.69

6. Standpipe Used: ___x___ No _____ Yes
   Indicate internal Radius, cm   _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   3.0
   At the End of Each Test Interval, H2   2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	5.14	5.24
0.00	5.31	5.51
0.00	5.53	5.88

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr x ---------/--------- x 3/	5.88	x ln(3/2)
k= 12.42		

10. Defects in the Sample (Check appropriate items):
___x___ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   1   Replicate Letter   A   Date Collected   8/29/2022

2. Material Tested   Fill   X   Test in Native Soil - Indicate Depth   108"

3. Type of Sample   Undisturbed   x   Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   1.905
   Length of Sample, in inches   3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   146.86
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc   1.69

6. Standpipe Used: ____x____ No _____ Yes
   Indicate internal Radius, cm   _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   3.0
   At the End of Each Test Interval, H2   2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	39.34	39.57
0.00	39.52	39.86
0.00	40.02	40.03

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr   x ---------/--------- x 3/   40.03   x ln(3/2)
k=   1.82

10. Defects in the Sample (Check appropriate items):
____x____ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   1   Replicate Letter   B   Date Collected   8/29/2022

2. Material Tested   [   ] Fill   X   Test in Native Soil - Indicate Depth   108"

3. Type of Sample   [   ] Undisturbed   x   Disturbed

4. Sample Dimensions   Inside Radius of Sample Tube, R, in cm   1.905
                        Length of Sample, in inches   3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   151.01
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc   1.74

6. Standpipe Used: _____x_____ No _____ Yes
   Indicate internal Radius, cm   _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   3.0
   At the End of Each Test Interval, H2   2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	36.56	36.93
0.00	37.13	37.21
0.00	37.27	37.45

9. Calculation of Permeability:

$K, (in/hr) = 60\ min/hr \times r^2/R^2 \times L(in)/T(min) \times \ln(H1/H2)$

k= 60 min/hr x ---------/--------- x 3/	37.45	x ln(3/2)
k= 1.95		

10. Defects in the Sample (Check appropriate items):
___x___ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   1   Replicate Letter   A   Date Collected   8/29/2022

2. Material Tested   Fill   X   Test in Native Soil - Indicate Depth   72"

3. Type of Sample   Undistubed   x   Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   1.905
                     Length of Sample, in inches   3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   148.39
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc   1.71

6. Standpipe Used: x   No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   3.0
   At the End of Each Test Interval, H2   2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	5.20	5.34
0.00	5.40	5.66
0.00	5.42	5.70

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr x ---------/--------- x 3/	5.70	x ln(3/2)
k= 12.80		

10. Defects in the Sample (Check appropriate items):
___x___ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   1   Replicate Letter   B   Date Collected   8/29/2022

2. Material Tested   _____ Fill   X   Test in Native Soil - Indicate Depth   72"

3. Type of Sample   _____ Undisturbed   x   Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   1.905
                     Length of Sample, in inches   3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   147.34
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc   1.70

6. Standpipe Used: ___x___ No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   3.0
   At the End of Each Test Interval, H2   2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	5.06	5.09
0.00	5.10	5.17
0.00	5.39	5.65

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr   x ---------/--------- x 3/   5.65   x ln(3/2)
k=   12.91

10. Defects in the Sample (Check appropriate items):
___x___ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   1   Replicate Letter   A   Date Collected   8/29/2022

2. Material Tested   Fill   X   Test in Native Soil - Indicate Depth   60"

3. Type of Sample   Undisturbed   x   Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   1.905
   Length of Sample, in inches   3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   152.11
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc   1.75

6. Standpipe Used: x   No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   3.0
   At the End of Each Test Interval, H2   2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	5.27	5.46
0.00	5.47	5.79
0.00	6.15	6.26

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr x ---------/--------- x 3/	6.26	x ln(3/2)
k= 11.66		

10. Defects in the Sample (Check appropriate items):
___x___ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____

MUNICIPALITY   Elmer Borough

Form 3b. Tube Permeameter Test Data

1. Test Number   1   Replicate Letter   B   Date Collected   8/29/2022

2. Material Tested   [   ] Fill   [X] Test in Native Soil - Indicate Depth   60"

3. Type of Sample   [   ] Undisturbed   [x] Disturbed

4. Sample Dimensions Inside Radius of Sample Tube, R, in cm   1.905
                      Length of Sample, in inches   3

5. Bulk Density Determination (Disturbed Samples Only):
   Sample Weight (Wt. Tube Containing Sample - Wt. Empty Tube   150.67
   Sample Volume (L x 2.54 cm/inch x 3.14R²), cc   86.83
   Bulk Density (Sample Wt./Sample Volume), grams/cc   1.74

6. Standpipe Used: ___x___ No _____ Yes
   Indicate internal Radius, cm _____

7. Height of water Level above Rim of Test Basin in inches:
   At the Beginning of Each Test Interval, H1   3.0
   At the End of Each Test Interval, H2   2.0

8. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1 (min.sec)	Time, Start of Test Interval, T1 (min.sec)	Length of Test Interval, T, (min)
0.00	5.42	5.70
0.00	5.57	5.95
0.00	6.08	6.13

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r²/R² x L(in)/T(min) x ln (H1/H2)

k= 60 min/hr   x ---------/--------- x 3/   6.13   x ln(3/2)
k=   11.91

10. Defects in the Sample (Check appropriate items):
___x___ None _____Cracks _____Worm Channels _____Root Channels
_____ Soil/Tube Contact _____Large Gravel _____Large Roots
_____ Dry Soil _____Smeering _____Compactation
_____ Other---Specify_____