# **Stormwater Management Report**

for

The Fairways – Phase 2B Major Site Plan Townhomes

# **Block 335.01 – Lot 5.04**

Township of Middle Cape May County, New Jersey

Prepared By:



March 30, 2020

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#### **Introduction**

The proposed major site plan will be located on Block 335.01, Lot 5.04 in the Township of Middle, Cape May County, New Jersey. The scope of the project is to construct thirteen (13) townhomes on Lot 5.04 where presently twelve (12) townhomes were previously approved on the site.

The proposed project is located off of Bay Breeze Boulevard approximately 1,500 feet east of the intersection of Bayberry Drive and Bay Breeze Boulevard.

The proposed project will utilize a stormwater management system, which has been designed in accordance with the Township of Middle (218-73) and the New Jersey Residential Site Improvement Standards (N.J.A.C. 5:21-7.1). All stormwater management calculations contained within this report are in accordance with the U.S.D.A. Soil Conservation Service Technical Release No. 55 (TR-55). Stormwater management facilities are designed to attenuate the 2, 5, 10 and 50 year, 24-hour Type III storm events and the 2, 10 and 100 year, 24-hour Type III storm events at 50%, 75% and 80% of pre-development levels respectively.

#### I. <u>Pre-Development Conditions</u>

The existing stormwater management area consists of five (5) drainage areas flowing into the existing five (5) lakes which control stormwater measures which were part of a larger development approved as Fairways Phase 2A. There are eight (8) units along Bay Berry Drive with paved drive aisle to service the units, there are five (5) units located off of Bay Breeze Boulevard and the remaining twelve (12) units are located off of Mallard Pond Lane, a cul-de-sac off of Bay Breeze Boulevard with an extension of the cul-de-sac traveling southerly towards Lake #3. Each townhome unit is 72' long by 28' wide. A total impervious coverage for the townhomes is approximately 82,656 s.f. The proposed roadway system will consist of an asphalt drive ranging from 20 feet in width to 28 feet in length. The proposed drainage areas for the site drain into various storm sewer inlets or grass swales which direct stormwater runoff to the existing lakes. There is porous asphalt parking spaces and underground roof drain collection systems to provide water quality BMP measures.

Each lake discharges into one another until the most eastern lake system, Lake #4 and #5, which act as one lake but are separated by Lake #3. The existing lakes are connected by a series of weirs which they overflow into one another and then eventually overflows into to Slab Creek which discharges into Jenkins Sound. Jenkins Sound finally discharges into the Atlantic Ocean.

The existing land-use for the site is divided by each of the drainage areas. The charts below show the individual drainage areas and their drainage information:

Γ	Pre-Development			
Drainage Areas	D.A. "1" D.A "1"		' Totals	
0	Pervious	Imp.		
Area	5.38 Ac.	2.48 Ac.	7.86 Ac.	
CN	62	98		
Time of	15 min	10 min		
Concentration				
	]	Pre-Developmer	nt	
Drainage Areas	D.A. "2"	D.A "2"	Totals	
C	Pervious	Imp.		
Area	3.11 Ac.	1.67 Ac.	4.78 Ac.	
CN	55	98		
Time of	12.7 min	10 min		
Concentration				
	Pre-Development			
Drainage Areas	<b>D.A. "3"</b>	D.A "3"	Totals	
0	Pervious	Imp.		
Area	1.56 Ac.	1.97 Ac.	3.53 Ac.	
CN	66	98		
Time of	18.5 min	10 min		
Concentration				
	]	Pre-Developmer	nt	
Drainage Areas	<b>D.A. "4"</b>	<b>D.A "4"</b>	Totals	
U	Pervious	Imp.		
Area	3.95 Ac.	1.58 Ac.	5.53 Ac.	
CN	67	98		
Time of	18.5 min	10 min		
Concentration				
	Pre-Development Off-Site			
Drainage Areas	<b>D.A. "5"</b>	D.A "5"	Totals	
-	Pervious	Imp.		
Area	3.27 Ac.	0 Ac.	3.27 Ac.	
CN	74	n/a		
Time of	12.5 min	n/a		
Concentration				

Total Drainage Area = 24.97 Ac. Total Impervious Area = 7.70 Ac. (30.84%)

Storm Event (Year)	Post-Dev. Peak Discharge Q (cfs)	Peak Storage Elevation (Lake 4 & 5)	ugh all lakes) Peak Runoff Discharge Volume from Lakes (C.F.)	
2	0	7.74	0	
5	0	8.47	0	
10	0.89	9.21	8,712	
50	9.02	9.30	153,331	
100	14.99	9.34	237,838	

 Table #2

 Pre-Development Runoff Calculations (DA #1-#4 Routed through all lakes)

Lakes 4 & 5 Weir elevations: 9.20 Broadcrested Weir at 100 ft width (discharges over cart path) 8.60 Orifice Weir, 6" diameter (discharges to the north towards a ditch on Lot 5.01)

The final discharge for pre-development is released over a 100 foot long earthen broad crested weir structure at the rear of Lake #5, the most southeastern lake. This discharges across an existing cart path and then flows into the meadows.

The NJDEP stormwater regulation rules (NJAC 7:8) are designed to regulate the stormwater groundwater recharge by using various Best Management Practices (BMP's). The rules state in NJAC 7:8-5.4(a)2(i)2 that the stormwater facility should be designed to infiltrate the increase of stormwater runoff volume from the pre-construction to post-construction two (2)- year design storm event. The facility is designed to complied with storing the difference of the Pre-Development DA and the Post-Development DA in the proposed infiltration basin and infiltrating that storm within 72 hours.

In section NJAC 7:8-5.4(a)3 the stormwater facility shall meet one of the following criteria:

*i.* Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the two, 10, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events;

ii. Demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the two, 10, and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts of existing land uses and projected land uses assuming full development under existing zoning and land use ordinances in the drainage area;

*iii. Design stormwater management measures so that the post-construction peak runoff rates for the two, 10 and 100-year storm events are 50, 75 and 80 percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the* 

postconstruction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed; or

iv. In tidal flood hazard areas, stormwater runoff quantity analysis in accordance with i, ii, and iii above shall only be applied if the increased volume of stormwater runoff could increase flood damages below the point of discharge. Due to the project discharging into a tidal water body, the project does not need to meet the runoff quantity analysis.

As per the RSIS standards in sections 5:21-7.5, 7.6 and 7.7 Stormwater Management: quantity control, water quality and recharge respectively the requirements are to meet NJAC 7:8-5 and 6. As listed above due to this project discharging into a tidal water body water quantity is not required to be met, water quality is to be met and recharge is exempt due to the project being in the regional center urban development zone.

#### II. <u>Post-Development Conditions</u>

The proposed development consists of thirteen (13) townhome units for phase 2B which are located within 3 different buildings. The buildings are located off of the existing culde-sac of Bay Breeze Boulevard with an extension of the cul-de-sac traveling easterly and then southerly towards Lake #5. Each townhome unit is 72' long by 28' wide. A total impervious coverage for the townhomes is approximately 26,076 s.f. The proposed roadway system will consist of an asphalt drive with a width of 28 feet. The proposed drainage areas for the site drain into various storm sewer inlets or grass swales which direct stormwater runoff to the existing lakes. We have proposed porous asphalt parking spaces and underground roof drain collection systems to provide water quality BMP measures.

#### III. <u>Site Coverage for Drainage Area Calculations</u>

The following provides a breakdown of the site impervious coverage:

	Post-Development			
Drainage Areas	<b>D.A. "1"</b>	D.A "1"	Totals	
_	Pervious	Imp.		
Area	5.38 Ac.	2.48 Ac.	7.86 Ac.	
CN	62	98		
Time of	15 min	10 min		
Concentration				
	Post-Development			
Drainage Areas	D.A. "2"	D.A "2"	Totals	
_	Pervious	Imp.		
Area	3.11 Ac.	1.67 Ac.	4.78 Ac.	
CN	55	98		

Time of	12.7 min	10 min		
Concentration				
	Post-Development			
Drainage Areas	D.A. "3"	D.A "3"	Totals	
0	Pervious	Imp.		
Area	1.56 Ac.	1.97 Ac.	3.53 Ac.	
CN	66	98		
Time of	18.5 min	10 min		
Concentration				
	I	Post-Developme	nt	
Drainage Areas	D.A. "4"	D.A "4"	Totals	
_	Pervious	Imp.		
Area	3.24 Ac.	2.85 Ac.	6.09 Ac.	
CN	68	98		
Time of	18.5 min	10 min		
Concentration				
	Post-	Development O	off-Site	
Drainage Areas	D.A. "5"	D.A "5"	Totals	
	Pervious	Imp.		
Area	2.81 Ac.	0.09 Ac.	2.90 Ac.	
CN	74	98		
Time of	12.5 min	10 min		
Concentration				

#### Total Drainage Area = 24.97 Ac. Total Impervious Area = 8.87 Ac. (36%)

#### IV. Drainage Design/Basin Characteristic

The proposed stormwater management system will attenuate the post-development stormwater runoff for the 2, 10 and 100-Yr. Storm events to 50%, 75% and 80% of pre-development levels respectively. Also the 2, 5, 10 and 50 year storms will be reduced to pre-development discharge rates.

Tables #3 and #4 show a break down of the post-development stormwater runoff rates and volumes for both D.A. #1-4 routed through the basin and D.A. #5 Off-Site runoff respectively:

 Table #3

 Post Development DA #1-#4 Routed through all lakes

Storm Event (Year)	Post-Dev. Peak Discharge Q (cfs)	Peak Storage Elevation (Lake 4 & 5)	Peak Runoff Discharge Volume from Lakes (C.F.)
2	0	8.49	0
5	0.49	9.11	1,309

10	2.17	9.22	38,768
50	8.90	9.29	179,903
100	15.77	9.33	265,063

Lakes 4 & 5 Weir elevations:

Discharge #1 = 9.00 Sharp crested Weir, 4 ft wide (discharges to the east by Road A cul-de-sac) Discharge #2 = 9.20 Broadcrested Weir at 100 ft width (discharges over cart path)

#### V. <u>NJDEP Stormwater Regulations Rules</u>

The NJDEP stormwater regulation rules (NJAC 7:8) are designed to regulate the stormwater groundwater recharge by using various Best Management Practices (BMP's). The rules state in NJAC 7:8-5.4(a)2(i)2 that the stormwater facility should be designed to infiltrate the increase of stormwater runoff volume from the pre-construction to post-construction two (2)- year design storm event. The facility designed has complied with design by storing the difference of the Pre-Development DA and the Post-Development DA in the proposed infiltration basin and infiltrating that storm within 72 hours.

iv. In tidal flood hazard areas, stormwater runoff quantity analysis in accordance with i, ii, and iii above shall only be applied if the increased volume of stormwater runoff could increase flood damages below the point of discharge. Due to the project discharging into a tidal water body, the project does not need to meet the runoff quantity analysis but as a safety factor, the designed lake system does in fact meet runoff quantities.

In section NJAC 7:8-5.5 stormwater management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff generated from the water quality design storm by 80 percent of the anticipated load from the developed site, expressed as an annual average. The water quality design storm is 1.25 inches of rainfall in two hours. The adopted TSS removal rate for wet ponds depends on the detention period for the water quality design storm event but 80 percent as stated in the NJBMP Manual 2004 edition, Chapter 9.5 shall be met if the permanent pool volumes are three (3) times the stormwater quality design storm runoff volume. Therefore, the wet ponds as designed meets the 80% TSS removal rate.

Lake Number	Permanent Pool Volume (CF)
1 (Elev: 6.20 to 10.70)	181,815
2 (Elev: 5.67 to 9.00)	193,825
3 (Elev: 4.60 to 8.00)	86,450
4 & 5 (Elev: 3.50 to 7.00)	78,170

The chart below shows each ponds permanent pool volumes:

The water quality design storm will generate an average of 0.38 inches of excess runoff, which in turn will produce approximately 34,412 CF of runoff volume. Due to the project being in the regional center urban development zone, ground water recharge is exempt.

In addition to meeting this TSS removal rate, the project site has over 15,000 square feet of porous paving to be installed along with roof drain collections systems with underground perforated piping with a stone trench for the townhomes.

The following calculations show the infiltration time frame of the net increase of the two year design storm from pre-development to post-development:

Pre-Development Combined DA, 2-year storm volume = 127,718 CF Post-Development Combined DA, 2-year storm volume = 135,907 CF The difference is 10,585 CF.

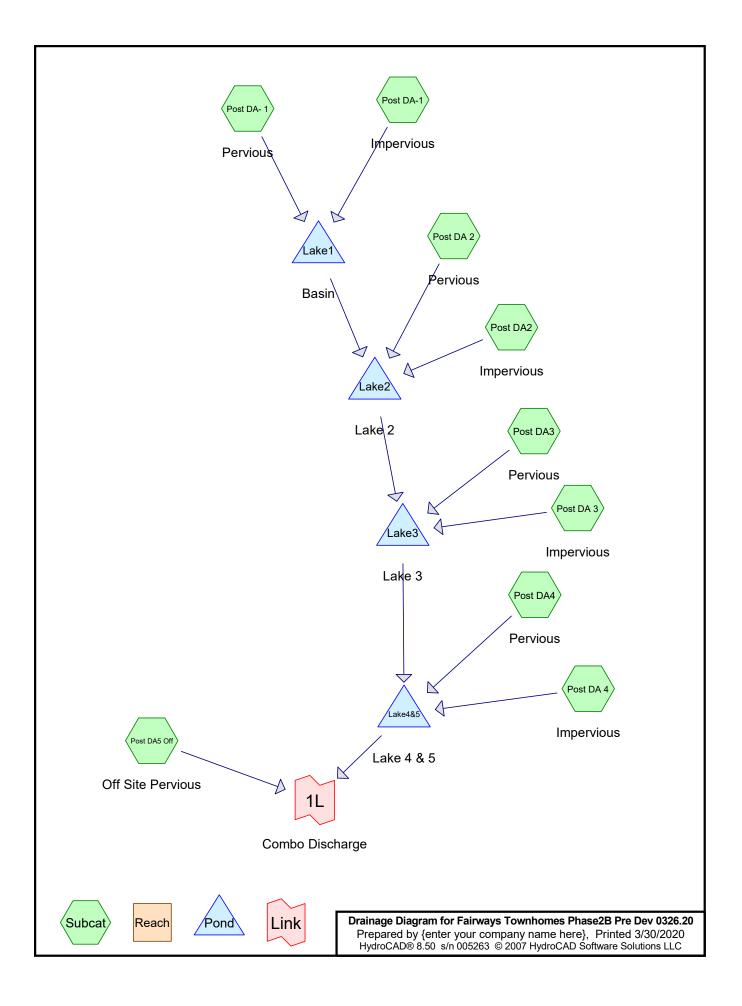
Lakes 4 & 5 act as one pond and they provide 97,507 CF @ elevation 9.00 which the post-development 2-year storm event peaks at. This is 1.32 feet higher than the permanent water elevation of 7.00 in Lakes 4 and 5. Therefore the lake system holds the difference of runoff volume for the pre and post development conditions and is less than the two (2) feet the NJBMP manual suggests. (Chapter 9.5). This also satisfies the ground water recharge requirement by infiltrating the 2-year storm event for post development as no discharge of the storm event is released. The estimated seasonal high water table was found to be at elevation 5.00 which is 2 feet above the water surface elevation of Lakes 4 and 5, which is the lowest water elevation within the lake system.

#### VI. <u>Conclusion</u>

Inspection of the above data shows the proposed stormwater management system meets the design requirements set forth by the Township of Middle, New Jersey R.S.I.S. and NJDEP NJAC 7:8 standards water quality design storm of having less than 2 feet of water at Lakes 4 & 5 where the permanent water elevation is 7.00 and the elevation of the WQ storm event is 7.51.

This drainage design meets and exceeds standards enforced by NJDEP and Middle Township with water quality and quantity due to the volume of storage the ponds provided for stormwater runoff.

# **Pre-Development Calculations**



## Fairways Townhomes Phase2B Pre Dev 0326.20

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### Area Listing (all nodes)

Area	CN	Description	
(acres)		(subcatchment-numbers)	
0.080	30	Woods, Good, HSG A (Post DA 2)	
1.010	39	>75% Grass cover, Good, HSG A (Post DA 2,Post DA- 1)	
0.650	55	Woods, Good, HSG B (Post DA 2,Post DA4)	
0.370	58	Woods/grass comb., Good, HSG B (Post DA- 1)	
7.320	61	>75% Grass cover, Good, HSG B(Post DA 2,Post DA- 1,Post DA3,Post DA4)	
0.220	70	Woods, Good, HSG C (Post DA4)	
0.100	72	Woods/grass comb., Good, HSG C (Post DA5 Off)	
7.520	74	>75% Grass cover, Good, HSG C (Post DA 2,Post DA- 1,Post DA3,Post DA4,Post DA5 Off)	
0.350	98	Cart Paths (Post DA 4,Post DA2)	
2.840	98	Paved parking & roofs (Post DA 3,Post DA 4,Post DA-1)	
0.090	98	Townhouse (Post DA2)	
4.420	98	Water Surface (Post DA 3,Post DA 4,Post DA-1,Post DA2)	
24.970		TOTAL AREA	

#### Soil Listing (all nodes)

Ar	ea Soil	Subcatchment
(acre	es) Goup	Numbers
1.0	90 HSG A	Post DA 2, Post DA- 1
8.3	40 HSG B	Post DA 2, Post DA- 1, Post DA3, Post DA4
7.8	40 HSG C	Post DA 2, Post DA- 1, Post DA3, Post DA4, Post DA5 Off
0.0	00 HSG D	
7.7	00 Other	Post DA 3, Post DA 4, Post DA-1, Post DA2
24.9	70	TOTAL AREA

Fairways Townhomes Phase2B Pre Dev 0326.20

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#### Time span=0.00-24.00 hrs, dt=0.07 hrs, 344 points Runoff by SCS TR-20 method, UH=Delmarva Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Post DA 2: Pervious Flow Length=100'	Runoff Area=3.110 ac 0.00% Impervious Runoff Depth=0.00" Slope=0.0100 '/' Tc=12.7 min CN=55 Runoff=0.00 cfs 0.000 af
Subcatchment Post DA 3: Impervious	Runoff Area=1.970 ac 100.00% Impervious Runoff Depth=1.03" Tc=10.0 min CN=98 Runoff=3.61 cfs 0.170 af
Subcatchment Post DA 4: Impervious	Runoff Area=1.580 ac 100.00% Impervious Runoff Depth=1.03" Tc=10.0 min CN=98 Runoff=2.90 cfs 0.136 af
Subcatchment Post DA- 1: Pervious	Runoff Area=5.380 ac 0.00% Impervious Runoff Depth=0.00" Tc=15.0 min CN=62 Runoff=0.00 cfs 0.000 af
Subcatchment Post DA-1: Impervious	Runoff Area=2.480 ac 100.00% Impervious Runoff Depth=1.03" Tc=10.0 min CN=98 Runoff=4.55 cfs 0.214 af
Subcatchment Post DA2: Impervious	Runoff Area=1.670 ac 100.00% Impervious Runoff Depth=1.03" Tc=10.0 min CN=98 Runoff=3.06 cfs 0.144 af
Subcatchment Post DA3: Pervious Flow Length=100'	Runoff Area=1.560 ac 0.00% Impervious Runoff Depth=0.01" Slope=0.0100 '/' Tc=18.5 min CN=66 Runoff=0.02 cfs 0.001 af
Subcatchment Post DA4: Pervious Flow Length=100'	Runoff Area=3.950 ac 0.00% Impervious Runoff Depth=0.03" Slope=0.0100 '/' Tc=12.7 min CN=69 Runoff=0.13 cfs 0.008 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=3.270 ac 0.00% Impervious Runoff Depth=0.07" Slope=0.0150 '/' Tc=12.5 min CN=74 Runoff=0.27 cfs 0.020 af
Pond Lake1: Basin	Peak Elev=10.87' Storage=8,887 cf Inflow=4.55 cfs 0.214 af Outflow=0.11 cfs 0.123 af
Pond Lake2: Lake 2	Peak Elev=9.79' Storage=7,281 cf Inflow=3.09 cfs 0.267 af Outflow=0.06 cfs 0.114 af
Pond Lake3: Lake 3	Peak Elev=8.83' Storage=6,523 cf Inflow=3.62 cfs 0.285 af Outflow=0.32 cfs 0.235 af
Pond Lake4&5: Lake 4 & 5	Peak Elev=7.43' Storage=16,541 cf Inflow=2.98 cfs 0.380 af Outflow=0.00 cfs 0.000 af
Link 1L: Combo Discharge	Inflow=0.27 cfs 0.020 af Primary=0.27 cfs 0.020 af
Total Runoff Area = 24.970	ac Runoff Volume = 0.694 af Average Runoff Depth = 0.33"

acRunoff Volume = 0.694 afAverage Runoff Depth = 0.33"69.16% Pervious = 17.270 ac30.84% Impervious = 7.700 ac

#### **Summary for Subcatchment Post DA 2: Pervious**

[45] Hint: Runoff=Zero

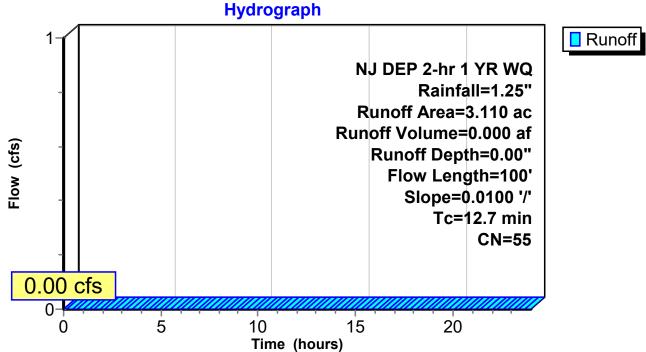
Runoff 0.00 hrs, Volume= 0.000 af, Depth= 0.00" = 0.00 cfs @

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

Area (ac	) C	N Dese	cription		
1.000	) 3	9 >75°	75% Grass cover, Good, HSG A		
1.340	) 6	51 >75 <sup>c</sup>	% Grass co	over, Good,	, HSG B
0.590	) 7	′4 >75°	% Grass co	over, Good,	, HSG C
0.080	) 3	80 Woo	ds, Good,	HSG A	
0.100	) 5	5 Woo	ds, Good,	HSG B	
3.110	) 5	5 Wei	ghted Aver	age	
3.110	)	Perv	vious Area	0	
Tc Le	ngth	Slope	Velocity	Capacity	Description
(min) (	feet)	(ft/ft)	(ft/sec)	(cfs)	
12.7	100	0.0100	0.13		Sheet Flow, Unpaved

Sheet Flow, Unpaved Grass: Short n= 0.150 P2= 3.30"

#### Subcatchment Post DA 2: Pervious

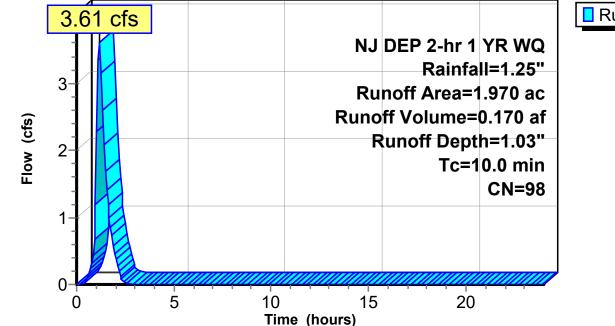


#### **Summary for Subcatchment Post DA 3: Impervious**

Runoff = 3.61 cfs @ 1.18 hrs, Volume= 0.170 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

Area (ac)	CN	Desc	cription					
0.630	98	Wate	er Surface					
1.340	98	Pave	ed parking	& roofs				
1.970	98	Weig	ghted Aver	rage				
1.970		Impe	ervious Are	ea				
Tc Leng (min) (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Descriptior	1		
10.0	10.0 Direct Entry, Paved							
			Subc	atchment	Post DA 3	3: Impervious	S	
				Hydrogr	aph			
3.61 cfs								Runoff
-					NJ	DEP 2-hr 1 Rainfa	YR WQ	



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#### **Summary for Subcatchment Post DA 4: Impervious**

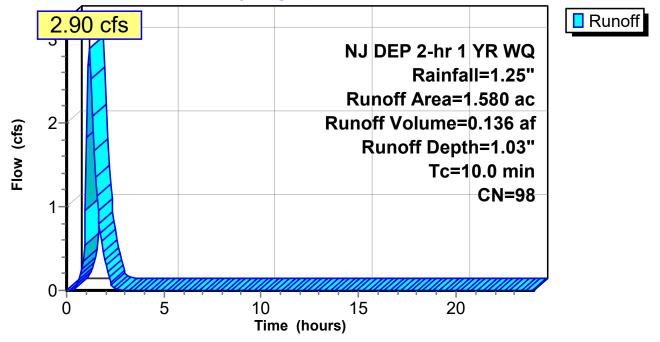
Runoff = 2.90 cfs @ 1.18 hrs, Volume= 0.136 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

	Area	(ac)	CN	Desc	cription				
*	0.	100	98	Cart	Cart Paths				
	0.	180	98	Pave	ed parking	& roofs			
	1.	300	98	Wate	er Surface				
	1.580 98 Weighted Average								
	1.	580		Impe	ervious Are	a			
					<b>o</b>				
	Tc	Leng		Slope	Velocity	Capacity	Description		
	(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)			
	10.0						Direct Entry, Paved		

#### Subcatchment Post DA 4: Impervious

#### Hydrograph



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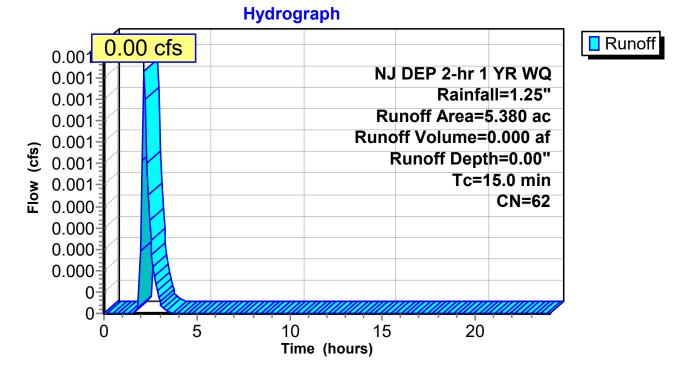
#### Summary for Subcatchment Post DA- 1: Pervious

0.00 cfs @ 2.14 hrs, Volume= 0.000 af, Depth= 0.00" Runoff =

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

Area	(ac)	CN	Desc	Description				
0.	.010	39	>75%	% Grass co	over, Good	d, HSG A		
4.	.320	61	>75%	% Grass co	over, Good	d, HSG B		
0.680 74 >75% Grass cover, Good, HSG C						d, HSG C		
0.370 58 Woods/grass comb., Good, HSG B						od, HSG B		
5.380 62 Weighted Average								
5.	.380		Perv	ious Area				
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	1		
15.0						Direct Entry, Grass		

#### Subcatchment Post DA-1: Pervious



#### Summary for Subcatchment Post DA-1: Impervious

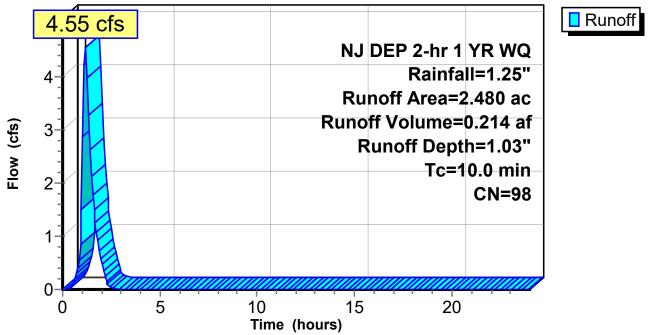
Runoff = 4.55 cfs @ 1.18 hrs, Volume= 0.214 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

 Area	(ac)	CN	Desc	cription			_
1.	160	98	Wate	er Surface			
1.	1.320 98 Paved parking & roofs						
 2.480 98 Weighted Average							_
2.480 Impervious Area							
·							
Тс	Leng	th	Slope	Velocity	Capacity	Description	
 (min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)		
 10.0						Direct Entry, Paved	

#### Subcatchment Post DA-1: Impervious

#### Hydrograph



#### **Summary for Subcatchment Post DA2: Impervious**

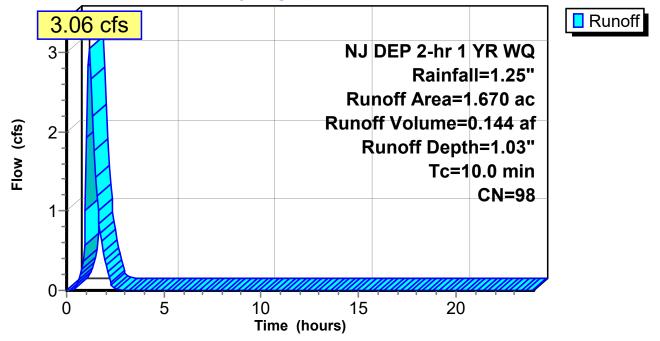
Runoff = 3.06 cfs @ 1.18 hrs, Volume= 0.144 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

	Area	(ac)	CN	Desc	cription		
*	0.	250	98	Cart	Paths		
	1.	330	98	Wate	er Surface		
*	0.	090	98	Tow	nhouse		
	1.670 98 Weighted Average						
	1.670 Impervious Area				ervious Are	a	
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	10.0						Direct Entry, Paved

#### Subcatchment Post DA2: Impervious

Hydrograph



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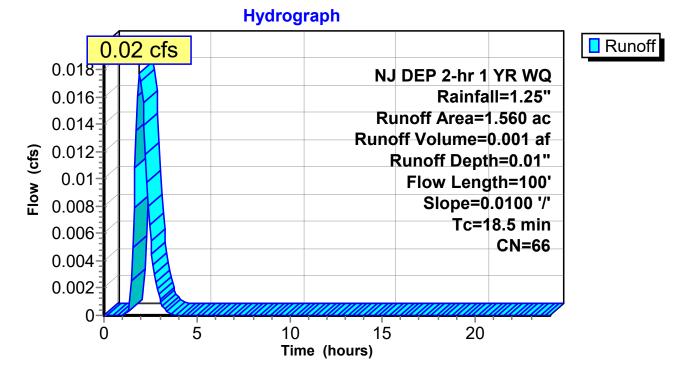
#### **Summary for Subcatchment Post DA3: Pervious**

Runoff = 0.02 cfs @ 1.92 hrs, Volume= 0.001 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

	Area	(ac) (	CN De	Description					
	1.000 61 >75% Grass cover, Good, HSG B								
_	0.	560	74 >75	5% Grass c	over, Good	, HSG C			
	1.560 66 Weighted Average								
	1.	560	Pei	vious Area					
	Tc (min)	Length (feet)	Slope (ft/ft)	,	Capacity (cfs)	Description			
	18.5	100	0.0100	0.09		Sheet Flow, Unpaved			
						Grass: Dense n= 0.240 P2= 3.30"			

#### Subcatchment Post DA3: Pervious



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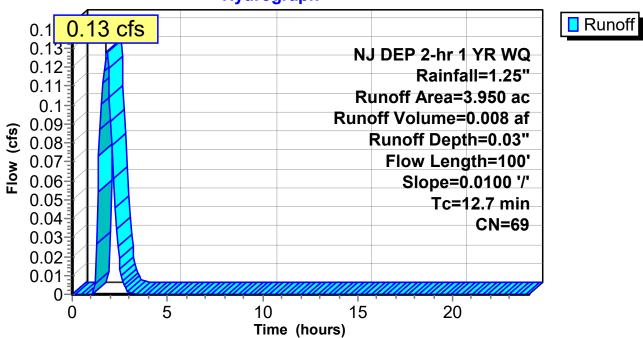
#### **Summary for Subcatchment Post DA4: Pervious**

Runoff = 0.13 cfs @ 1.81 hrs, Volume= 0.008 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

_	Area	(ac)	CN	l Desc	Description					
0.660 61 >75% Grass cover, Good, HSG B							, HSG B			
2.520 74 >75% Grass cover, Good, HSG C					, HSG C					
0.550 55 Woods, Good, HSG B										
	0.220 70 Woods, Good, HSG C									
	3.950 69 Weighted Average									
	3.950 Pervious Area					0				
	Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description			
	12.7	10	0	0.0100	0.13		Sheet Flow, Unpaved			
							Grass: Short n= 0.150	P2= 3.30"		

#### Subcatchment Post DA4: Pervious



#### Hydrograph

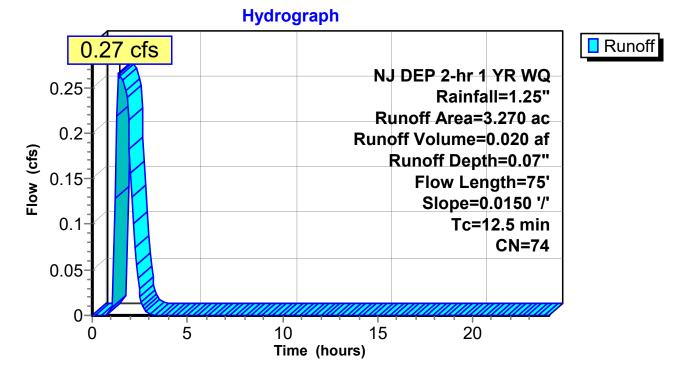
#### Summary for Subcatchment Post DA5 Off: Off Site Pervious

Runoff = 0.27 cfs @ 1.41 hrs, Volume= 0.020 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

 Area	(ac)	CN	Desc	Description						
3.	170	74	>75%	75% Grass cover, Good, HSG C						
 0.	0.100 72 Woods/grass comb., Good, HSG C									
3.270 74 Weighted Average										
3.270 Pervious Area										
Тс	Lengtl	า :	Slope	Velocity	Capacity	Description				
 (min)	(feet	)	(ft/ft)	(ft/sec)	(cfs)					
 12.5	7	5 0	.0150	0.10		Sheet Flow, Unpaved				
						Grass: Dense n= 0.240 P2= 3.30"				

#### Subcatchment Post DA5 Off: Off Site Pervious



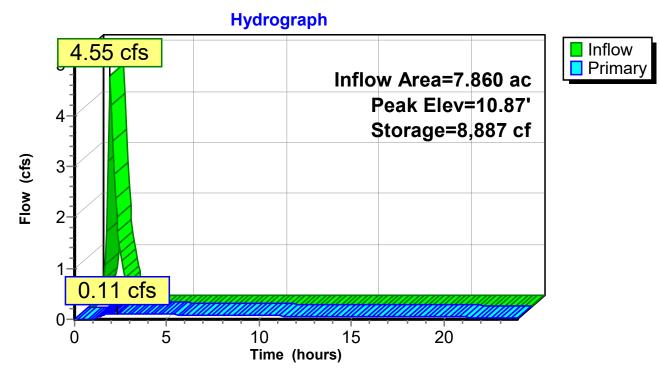
#### Summary for Pond Lake1: Basin

Inflow Area =	7.860 ac, 31.55% Impervious, Inflow	Depth = 0.33" for 1 YR WQ event
Inflow =	4.55 cfs @ 1.18 hrs, Volume=	0.214 af
Outflow =	0.11 cfs @ 2.31 hrs, Volume=	0.123 af, Atten= 98%, Lag= 68.0 min
Primary =	0.11 cfs @ 2.31 hrs, Volume=	0.123 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 10.87' @ 2.31 hrs Surf.Area= 0 sf Storage= 8,887 cf

Plug-Flow detention time= 559.5 min calculated for 0.123 af (57% of inflow) Center-of-Mass det. time= 546.5 min ( 626.6 - 80.1 )

Volume	Invert	t Avail.Stora	age Storage Description	_
#1	10.70	' 137,87	8 cf Custom Stage Data Listed below	
Elevatio (fee 10.7 11.0 12.0 13.0 13.7	et) (cu 70 00 00 00	m.Store bic-feet) 0 15,300 65,780 118,459 137,878		
Device	Routing	Invert	Outlet Devices	
#1 #2	Primary Primary	11.35' 10.70'	2.0' long Sharp-Crested Rectangular Weir2 End Contraction(s)0.5' long Sharp-Crested Rectangular Weir2 End Contraction(s)	
1=Sh	arp-Creste	2.31 hrs HW=10.87' (Free Discharge) <b>Weir</b> (Controls 0.00 cfs) <b>Weir</b> (Weir Controls 0.11 cfs @ 1.37 fps)		



#### Pond Lake1: Basin

#### Summary for Pond Lake2: Lake 2

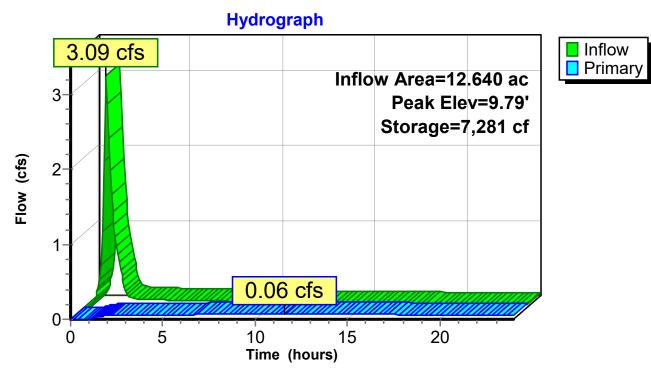
Inflow Area =	12.640 ac, 32.83% Impervious, Inflow D	Depth > 0.25" for 1 YR WQ event
Inflow =	3.09 cfs @ 1.18 hrs, Volume=	0.267 af
Outflow =	0.06 cfs @ 11.62 hrs, Volume=	0.114 af, Atten= 98%, Lag= 626.1 min
Primary =	0.06 cfs $\overline{@}$ 11.62 hrs, Volume=	0.114 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.79' @ 11.62 hrs Surf.Area= 0 sf Storage= 7,281 cf

Plug-Flow detention time= 694.5 min calculated for 0.114 af (43% of inflow) Center-of-Mass det. time= 434.9 min (766.6 - 331.7)

Volume	Inve	ert Avail.	Storage	Storage Description	
#1	9.6	67' 87	7,360 cf	Custom Stage Data Listed below	
Elevatio (fee		Cum.Store cubic-feet)			
9.6	67	0			
10.0	00	20,120			
11.0	00	87,360			
Device	Routing	Inve	ert Outle	et Devices	
#1	Primary	10.0	00' <b>4.0'</b>	long Sharp-Crested Rectangular Weir	2 End Contraction(s)
#2	Primary	9.6		long Sharp-Crested Rectangular Weir	( )
·			<u> </u>	62 hrs HW=9.79' (Free Discharge) (Controls 0.00 cfs)	

-2=Sharp-Crested Rectangular Weir (Weir Controls 0.06 cfs @ 1.13 fps)



Pond Lake2: Lake 2

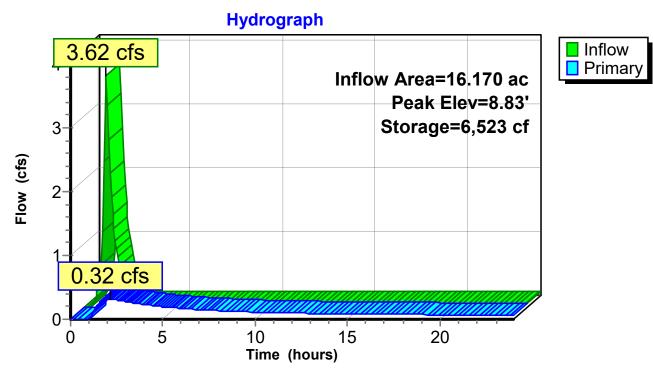
#### Summary for Pond Lake3: Lake 3

Inflow Area =	16.170 ac, 37.85% Impervious, Inflow I	Depth > 0.21" for 1 YR WQ event
Inflow =	3.62 cfs @ 1.18 hrs, Volume=	0.285 af
Outflow =	0.32 cfs @ 2.12 hrs, Volume=	0.235 af, Atten= 91%, Lag= 56.6 min
Primary =	0.32 cfs @  2.12 hrs,  Volume=	0.235 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 8.83' @ 2.12 hrs Surf.Area= 0 sf Storage= 6,523 cf

Plug-Flow detention time= 378.5 min calculated for 0.235 af (83% of inflow) Center-of-Mass det. time= 213.0 min ( 567.8 - 354.8 )

Volume	Inv	ert Avail.	Storage	Storage Description
#1	8.6	69 69	9,310 cf	Custom Stage Data Listed below
Elevatio (fee 8.6	et) (d 60	Cum.Store <u>cubic-feet)</u> 0		
9.0		11,585		
10.0		42,767		
10.8	30	69,310		
Device	Routing	Inve	ert Outl	let Devices
#1	Primary	9.6	60' <b>12.0</b>	V long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#2	Primary	9.6	60' <b>4.0'</b>	Iong Sharp-Crested Rectangular Weir 2 End Contraction(s)
#3	Primary	8.6	60' <b>0.5'</b>	Iong Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	8.6	60' <b>0.5'</b>	Iong Sharp-Crested Rectangular Weir 2 End Contraction(s)
-1=Sh -2=Sh -3=Sh	arp-Cres arp-Cres arp-Cres	ted Rectangu ted Rectangu ted Rectangu	ular Weir ular Weir ular Weir	2 hrs HW=8.83' (Free Discharge) • ( Controls 0.00 cfs) • ( Controls 0.00 cfs) • (Weir Controls 0.16 cfs @ 1.55 fps) • (Weir Controls 0.16 cfs @ 1.55 fps)



Pond Lake3: Lake 3

#### Summary for Pond Lake4&5: Lake 4 & 5

Inflow Area =	21.700 ac, 35.48% Impervious, Inflow	Depth > 0.21" for 1 YR WQ event
Inflow =	2.98 cfs @ 1.19 hrs, Volume=	0.380 af
Outflow =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af, Atten= 100%, Lag= 0.0 min
Primary =	0.00 cfs $\overline{@}$ 0.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 7.43' @ 24.01 hrs Surf.Area= 46,803 sf Storage= 16,541 cf

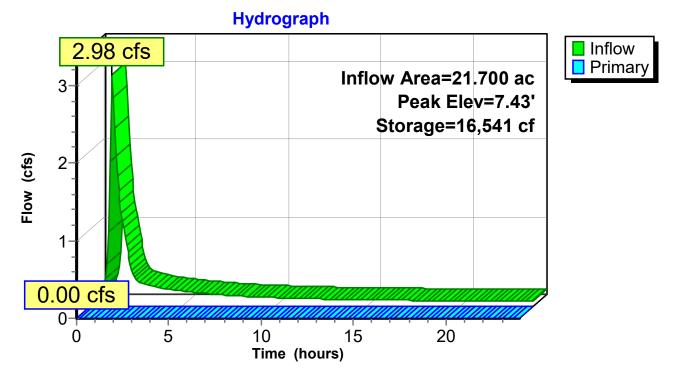
Plug-Flow detention time= (not calculated: initial storage excedes outflow) Center-of-Mass det. time= (not calculated: no outflow)

Volume	In	vert Ava	ail.Storage	Storage	Description		
#1	7	'.00'	126,192 ct	Custom	n Stage Data (Pri	i <b>smatic)</b> Listed below	
Elevatio (fee		Surf.Area (sq-ft)		nc.Store bic-feet)	Cum.Store (cubic-feet)		
7.0	00	27,767		0	0		
7.4	40	46,551		14,864	14,864		
8.0	00	50,946		29,249	44,113		
9.0	00	55,842		53,394	97,507		
9.5	50	58,900		28,686	126,192		
Device	Routing	g l	nvert Ou	tlet Device	es		
#1	Primar	У	9.20' <b>10</b>	0.0' long >	k 20.0' breadth E	Broad-Crested Rectangular Weir	
		-	He	ad (feet) (	0.20 0.40 0.60	0.80 1.00 1.20 1.40 1.60	
			Co	ef. (Englis	h) 2.68 2.70 2.	70 2.64 2.63 2.64 2.64 2.63	
#2	Primar	у	8.60' <b>12</b>	0" Vert. O	rifice/Grate C=	0.600	
Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=7.00' (Free Discharge)							

-1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-2=Orifice/Grate (Controls 0.00 cfs)

Pond Lake4&5: Lake 4 & 5

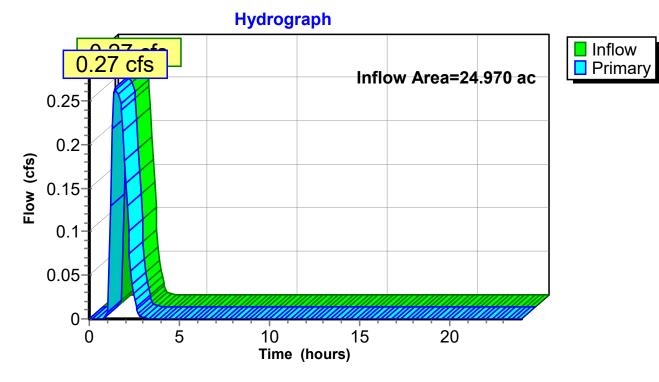


#### Summary for Link 1L: Combo Discharge

Inflow Area =	24.970 ac, 30.	84% Impervious, Inflow	/ Depth = 0.01"	for 1 YR WQ event
Inflow =	0.27 cfs @	1.41 hrs, Volume=	0.020 af	
Primary =	0.27 cfs @	1.41 hrs, Volume=	0.020 af, Atte	en= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs

#### Link 1L: Combo Discharge



Fairways Townhomes Phase2B Pre Dev 0326.20

Type III 24-hr 2 YR CM Rainfall=3.30" Printed 3/30/2020 LLC Page 23

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#### Time span=0.00-24.00 hrs, dt=0.07 hrs, 344 points Runoff by SCS TR-20 method, UH=Delmarva Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Post DA 2: Pervious Flow Length=100'	Runoff Area=3.110 ac 0.00% Impervious Runoff Depth>0.28" Slope=0.0100 '/' Tc=12.7 min CN=55 Runoff=0.28 cfs 0.072 af
Subcatchment Post DA 3: Impervious	Runoff Area=1.970 ac 100.00% Impervious Runoff Depth>3.06" Tc=10.0 min CN=98 Runoff=4.15 cfs 0.503 af
Subcatchment Post DA 4: Impervious	Runoff Area=1.580 ac 100.00% Impervious Runoff Depth>3.06" Tc=10.0 min CN=98 Runoff=3.33 cfs 0.403 af
Subcatchment Post DA- 1: Pervious	Runoff Area=5.380 ac 0.00% Impervious Runoff Depth>0.52" Tc=15.0 min CN=62 Runoff=1.26 cfs 0.233 af
Subcatchment Post DA-1: Impervious	Runoff Area=2.480 ac 100.00% Impervious Runoff Depth>3.06" Tc=10.0 min CN=98 Runoff=5.23 cfs 0.633 af
Subcatchment Post DA2: Impervious	Runoff Area=1.670 ac 100.00% Impervious Runoff Depth>3.06" Tc=10.0 min CN=98 Runoff=3.52 cfs 0.426 af
Subcatchment Post DA3: Pervious Flow Length=100'	Runoff Area=1.560 ac 0.00% Impervious Runoff Depth>0.69" Slope=0.0100 '/' Tc=18.5 min CN=66 Runoff=0.50 cfs 0.089 af
Subcatchment Post DA4: Pervious Flow Length=100'	Runoff Area=3.950 ac 0.00% Impervious Runoff Depth>0.83" Slope=0.0100 '/' Tc=12.7 min CN=69 Runoff=1.93 cfs 0.274 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=3.270 ac 0.00% Impervious Runoff Depth>1.10" Slope=0.0150 '/' Tc=12.5 min CN=74 Runoff=2.30 cfs 0.299 af
Pond Lake1: Basin	Peak Elev=11.19' Storage=24,838 cf Inflow=6.09 cfs 0.866 af Outflow=0.45 cfs 0.407 af
Pond Lake2: Lake 2	Peak Elev=10.05' Storage=23,609 cf Inflow=3.77 cfs 0.905 af Outflow=0.48 cfs 0.369 af
Pond Lake3: Lake 3	Peak Elev=9.07' Storage=13,892 cf Inflow=4.56 cfs 0.961 af Outflow=0.86 cfs 0.724 af
Pond Lake4&5: Lake 4 & 5	Peak Elev=8.32' Storage=60,950 cf Inflow=5.61 cfs 1.401 af Outflow=0.00 cfs 0.000 af
Link 1L: Combo Discharge	Inflow=2.30 cfs 0.299 af Primary=2.30 cfs 0.299 af
Total Runoff Area = 24.970	ac Runoff Volume = 2.932 af Average Runoff Depth = 1.41"

Total Runoff Area = 24.970 ac Runoff Volume = 2.932 af Average Runoff Depth = 1.41" 69.16% Pervious = 17.270 ac 30.84% Impervious = 7.700 ac

#### **Summary for Subcatchment Post DA 2: Pervious**

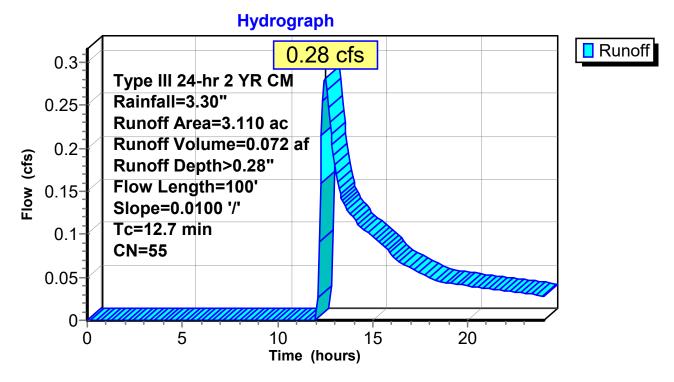
Runoff = 0.28 cfs @ 12.51 hrs, Volume= 0.072 af, Depth> 0.28"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

 Area	(ac) (	CN	Desc	ription			
1.	000	39	>75%	6 Grass co	over, Good	, HSG A	
1.	340	61	>75%	6 Grass co	over, Good	, HSG B	
0.	590	74	>75%	6 Grass co	over, Good	, HSG C	
0.	080	30	Woo	ds, Good,	HSG A		
 0.	100	55	Woo	ds, Good,	HSG B		
3.	110	55	Weig	hted Aver	age		
3.	110		Perv	ious Area	·		
Tc	Length		Slope	Velocity	Capacity	Description	
 (min)	(feet)		(ft/ft)	(ft/sec)	(cfs)		
12.7	100	0.	.0100	0.13		Sheet Flow, Unpaved	
						Grass Short n= 0.150	D2- 3 30"

Grass: Short n= 0.150 P2= 3.30"

#### **Subcatchment Post DA 2: Pervious**



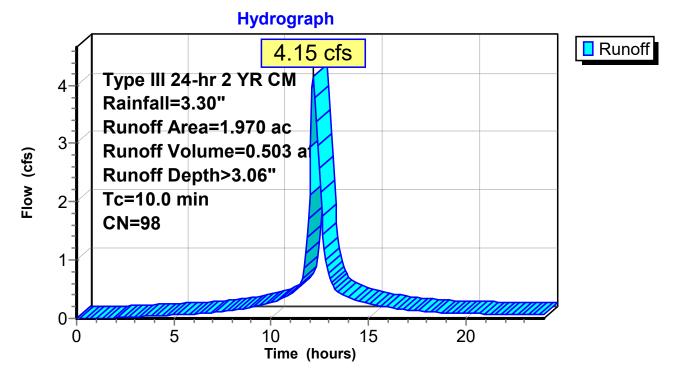
#### Summary for Subcatchment Post DA 3: Impervious

Runoff = 4.15 cfs @ 12.17 hrs, Volume= 0.503 af, Depth> 3.06"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

Are	ea (ac)	CN	Desc	cription		
	0.630	98	Wate	er Surface		
	1.340	98	Pave	ed parking	& roofs	
	1.970	98	Weig	ghted Aver	age	
	1.970		Impe	ervious Are	a	
٦	c Leng	gth	Slope	Velocity	Capacity	Description
(mi	ר) (fe	et)	(ft/ft)	(ft/sec)	(cfs)	
10	0					Direct Entry, Paved

#### Subcatchment Post DA 3: Impervious



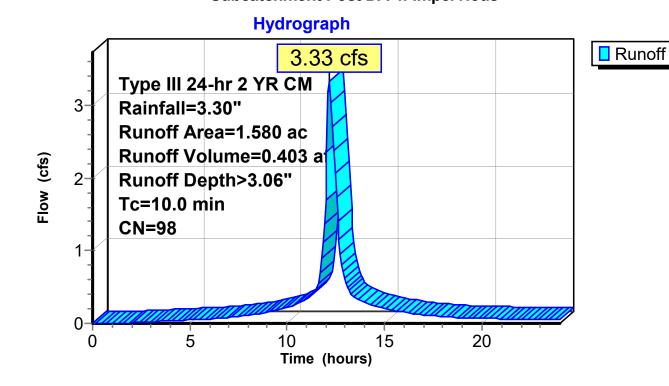
#### Summary for Subcatchment Post DA 4: Impervious

Runoff = 3.33 cfs @ 12.17 hrs, Volume= 0.403 af, Depth> 3.06"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

	Area	(ac)	CN	Desc	cription		
*	0.	100	98	Cart	Paths		
	0.	180	98	Pave	ed parking	& roofs	
	1.	300	98	Wate	er Surface		
		1.58098Weighted Average1.580Impervious Area					
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	10.0						Direct Entry, Paved

#### Subcatchment Post DA 4: Impervious



 Type III 24-hr 2 YR CM Rainfall=3.30"

 Printed 3/30/2020

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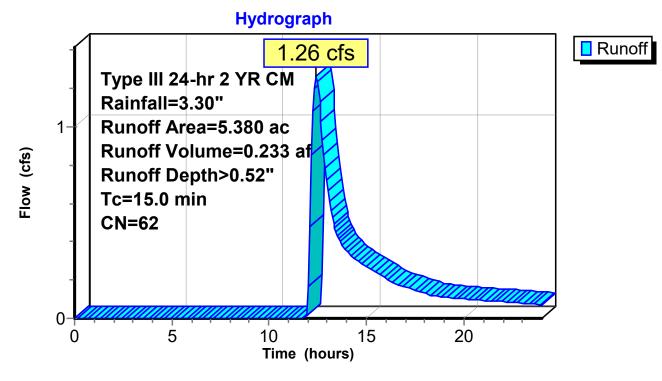
#### Summary for Subcatchment Post DA- 1: Pervious

Runoff = 1.26 cfs @ 12.43 hrs, Volume= 0.233 af, Depth> 0.52"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

Area	(ac)	CN	Desc	cription			
0.	.010	39	>75%	% Grass co	over, Good	, HSG A	
4.	320	61	>75%	% Grass co	over, Good	, HSG B	
0.	.680	74	>75%	% Grass co	over, Good	, HSG C	
0.	.370	58	Woo	ds/grass o	omb., Goo	d, HSG B	
5.	.380	62	Weig	ghted Aver	age		
5.	.380		Perv	ious Area	-		
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
15.0						Direct Entry, Grass	

#### Subcatchment Post DA- 1: Pervious



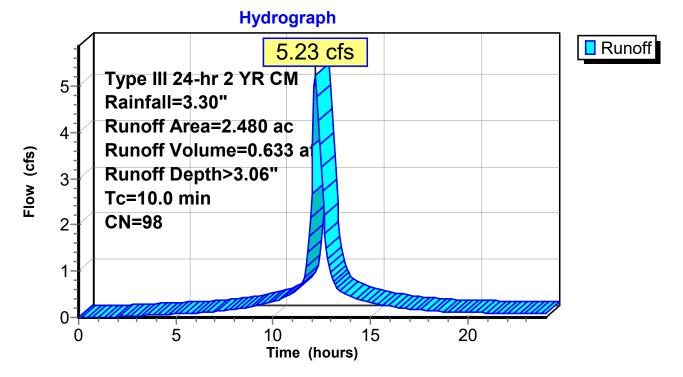
## Summary for Subcatchment Post DA-1: Impervious

Runoff = 5.23 cfs @ 12.17 hrs, Volume= 0.633 af, Depth> 3.06"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

Area	(ac)	CN	Desc	cription		
1	.160	98	Wate	er Surface		
1	.320	98	Pave	ed parking	& roofs	
2	.480	98	Weig	ghted Aver	age	
2	.480		Impe	ervious Are	a	
Tc	Leng	th	Slope	Velocity	Capacity	Description
(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
10.0						Direct Entry, Paved

# Subcatchment Post DA-1: Impervious



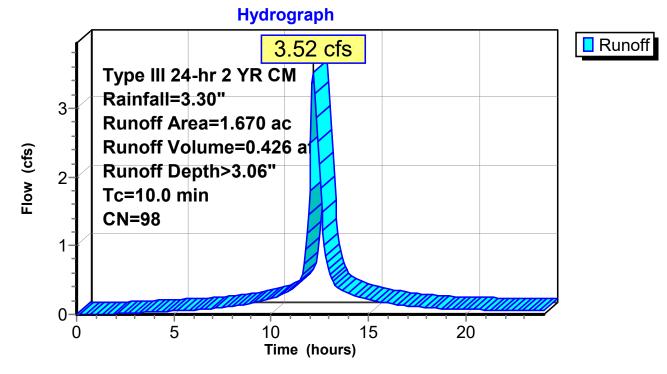
## **Summary for Subcatchment Post DA2: Impervious**

Runoff = 3.52 cfs @ 12.17 hrs, Volume= 0.426 af, Depth> 3.06"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

	Area (	(ac)	CN	Desc	cription		
*	0.2	250	98	Cart	Paths		
	1.3	330	98	Wate	er Surface		
*	0.0	090	98	Tow	nhouse		
	1.670 98 Weighted Average 1.670 Impervious Area						
	1.	010		mpe			
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	10.0						Direct Entry, Paved

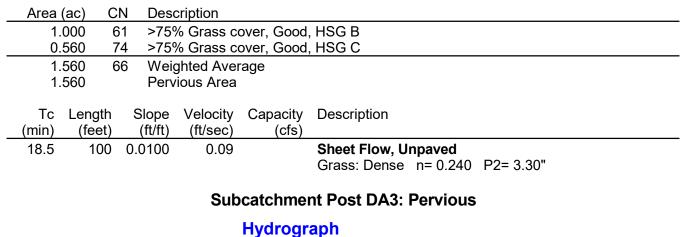
#### Subcatchment Post DA2: Impervious

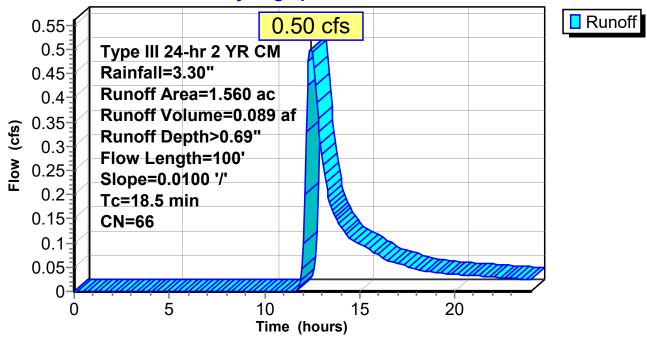


## Summary for Subcatchment Post DA3: Pervious

Runoff	=	0.50 cfs @	12.44 hrs,	Volume=	0.089 af, Depth> 0.69"
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Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"





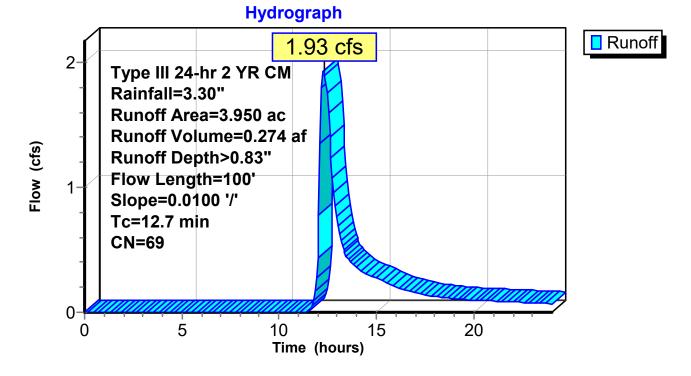
#### **Summary for Subcatchment Post DA4: Pervious**

Runoff = 1.93 cfs @ 12.28 hrs, Volume= 0.274 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

_	Area	(ac)	CN	l Desc	cription			
	0.	660	61	>75%	% Grass co	over, Good	, HSG B	
	2.	520	74	- >75%	% Grass co	over, Good	, HSG C	
	0.	550	55	i Woo	ds, Good,	HSG B		
	0.	220	70	) Woo	ds, Good,	HSG C		
	3.	950	69	) Weig	ghted Aver	age		
	3.	950		Perv	ious Area	•		
	Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
	12.7	10	0	0.0100	0.13		<b>Sheet Flow, Unpaved</b> Grass: Short n= 0.150	P2= 3 30"

#### **Subcatchment Post DA4: Pervious**



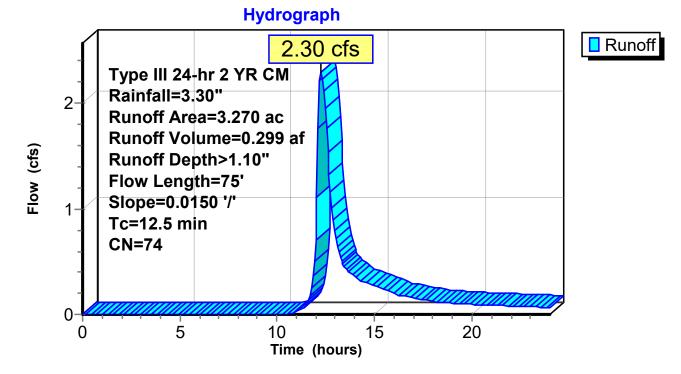
# Summary for Subcatchment Post DA5 Off: Off Site Pervious

Runoff = 2.30 cfs @ 12.25 hrs, Volume= 0.299 af, Depth> 1.10"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

 Area	(ac)	CN	Desc	cription		
3.	170	74	>75%	6 Grass co	over, Good,	, HSG C
 0.	100	72	Woo	ds/grass o	omb., Goo	d, HSG C
3.	270	74	Weig	ghted Aver	age	
3.	270		Perv	ious Area		
 Tc (min)	Length (feet)		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	75	5 0.	0150	0.10		Sheet Flow, Unpaved Grass: Dense n= 0.240 P2= 3.30"

## Subcatchment Post DA5 Off: Off Site Pervious



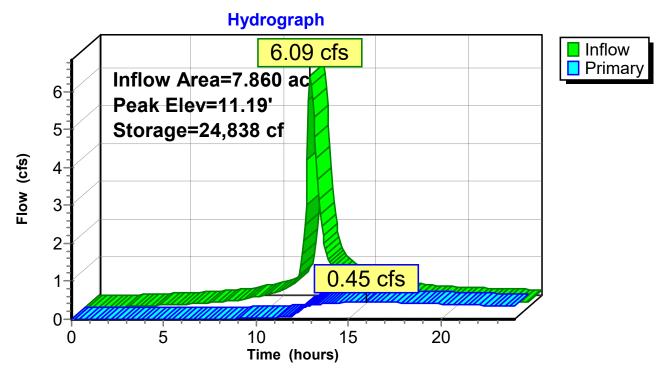
## Summary for Pond Lake1: Basin

Inflow Area =	7.860 ac, 31.55% Impervious, Inflow D	epth > 1.32" for 2 YR CM event
Inflow =	6.09 cfs @ 12.20 hrs, Volume=	0.866 af
Outflow =	0.45 cfs @ 15.97 hrs, Volume=	0.407 af, Atten= 93%, Lag= 226.5 min
Primary =	0.45 cfs @ 15.97 hrs, Volume=	0.407 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 11.19' @ 15.97 hrs Surf.Area= 0 sf Storage= 24,838 cf

Plug-Flow detention time= 404.2 min calculated for 0.407 af (47% of inflow) Center-of-Mass det. time= 260.1 min (1,066.0 - 805.9)

Volume	Invert	Avail.Stora	age Storage Description					
#1	10.70'	137,878	8 cf Custom Stage Data Listed below					
Elevatio (fee 10.7 11.0 12.0 13.0 13.7	et) (cubi 70 00 7 00 6 00 1	.Store <u>c-feet)</u> 0 15,300 55,780 18,459 37,878	J					
Device	Routing	Invert	Outlet Devices					
#1	Primary	11.35'	2.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)					
#2	Primary	10.70'	0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)					
1=Sh	Primary OutFlow Max=0.45 cfs @ 15.97 hrs HW=11.19' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs) -2=Sharp-Crested Rectangular Weir (Weir Controls 0.45 cfs @ 2.29 fps)							



Pond Lake1: Basin

## Summary for Pond Lake2: Lake 2

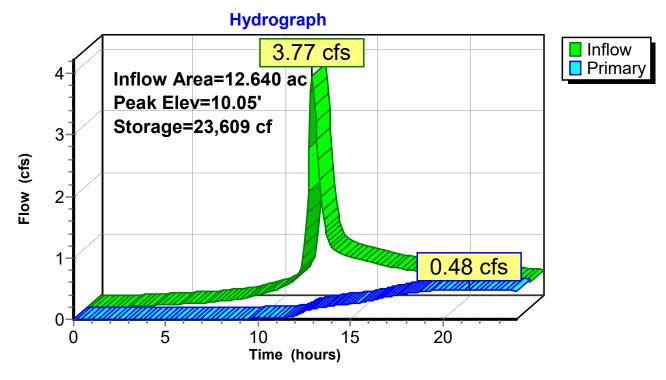
Inflow Area =	12.640 ac, 32.83% Impervious, Inflow D	epth > 0.86" for 2 YR CM event
Inflow =	3.77 cfs @ 12.18 hrs, Volume=	0.905 af
Outflow =	0.48 cfs @ 21.42 hrs, Volume=	0.369 af, Atten= 87%, Lag= 554.3 min
Primary =	0.48 cfs $\overline{@}$ 21.42 hrs, Volume=	0.369 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 10.05' @ 21.42 hrs Surf.Area= 0 sf Storage= 23,609 cf

Plug-Flow detention time= 453.5 min calculated for 0.368 af (41% of inflow) Center-of-Mass det. time= 222.9 min (1,138.3 - 915.4)

Volume	In	vert Ava	ail.Storage	e Storage Description			
#1	9	.67'	87,360 c	f Custom Stage Data Listed below			
Elevatio (fee		Cum.Store (cubic-feet)					
9.6	67	0					
10.0	00	20,120					
11.0	00	87,360					
Device	Routing	g li	nvert Ou	utlet Devices			
#1	Primary	/ 1	0.00' 4.0	)' long Sharp-Crested Rectangular Weir	2 End Contraction(s)		
#2	Primary			5' long Sharp-Crested Rectangular Weir			
Primary OutFlow Max=0.48 cfs @ 21.42 hrs HW=10.05' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Weir Controls 0.15 cfs @ 0.74 fps)							

**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.33 cfs @ 2.02 fps)



Pond Lake2: Lake 2

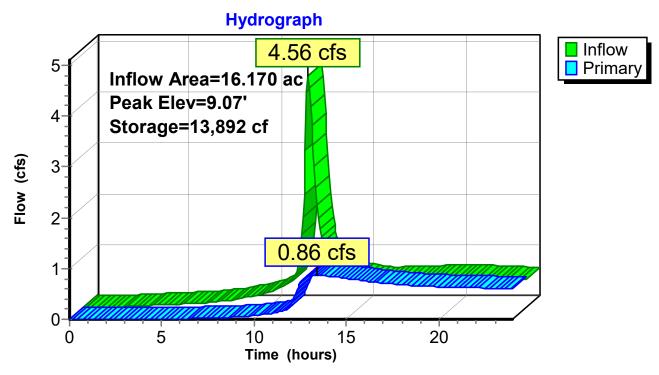
## Summary for Pond Lake3: Lake 3

Inflow Area =	16.170 ac, 37.85% Impervious, Inflow De	pth > 0.71" for 2 YR CM event
Inflow =	4.56 cfs @ 12.18 hrs, Volume=	0.961 af
Outflow =	0.86 cfs @ 13.37 hrs, Volume=	0.724 af, Atten= 81%, Lag= 71.2 min
Primary =	0.86 cfs @ 13.37 hrs, Volume=	0.724 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.07' @ 13.37 hrs Surf.Area= 0 sf Storage= 13,892 cf

Plug-Flow detention time= 241.4 min calculated for 0.724 af (75% of inflow) Center-of-Mass det. time= 120.3 min (1,041.3 - 921.0)

Volume	In	vert Av	ail.Stor	rage	Storage Description		
#1	8	.60'	69,31	0 cf	Custom Stage Data Listed below		
Elevatio	าท	Cum.Store	2				
(fee		(cubic-feet					
8.6	_/	(	<u>_</u>				
9.0		11,585	5				
10.0	00	42,767	7				
10.8	80	69,310	)				
Device	Routing	9	Invert	Out	let Devices		
#1	Primar	y	9.60'	12.0	V long Sharp-Crested Rectangular Weir 2 End Contraction(s)		
#2	Primar	y	9.60'		long Sharp-Crested Rectangular Weir 2 End Contraction(s)		
#3	Primar	•	8.60'		Iong Sharp-Crested Rectangular Weir 2 End Contraction(s)		
#4	Primar	у	8.60'	0.5'	long Sharp-Crested Rectangular Weir 2 End Contraction(s)		
Primary OutFlow Max=0.86 cfs @ 13.37 hrs HW=9.07' (Free Discharge) 1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs) 2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs) 3=Sharp-Crested Rectangular Weir (Weir Controls 0.43 cfs @ 2.25 fps) 4=Sharp-Crested Rectangular Weir (Weir Controls 0.43 cfs @ 2.25 fps)							



Pond Lake3: Lake 3

## Summary for Pond Lake4&5: Lake 4 & 5

Inflow Area =	21.700 ac, 35.48% Impervious, Inflow E	Depth > 0.77" for 2 YR CM event
Inflow =	5.61 cfs @ 12.21 hrs, Volume=	1.401 af
Outflow =	0.00 cfs @  0.00 hrs,  Volume=	0.000 af, Atten= 100%, Lag= 0.0 min
Primary =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 8.32' @ 24.01 hrs Surf.Area= 52,490 sf Storage= 60,950 cf

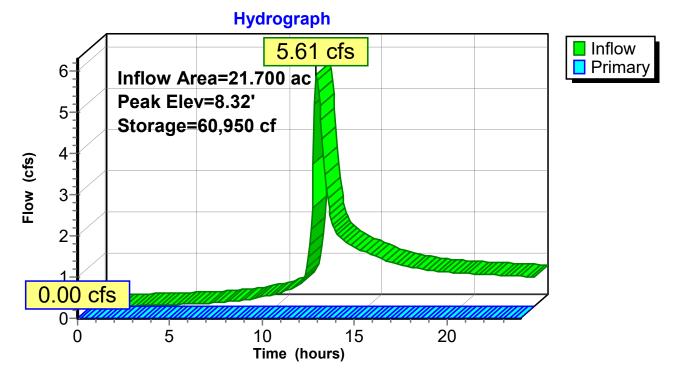
Plug-Flow detention time= (not calculated: initial storage excedes outflow) Center-of-Mass det. time= (not calculated: no outflow)

Volume	In	vert Ava	ail.Storage	Storage	Description		
#1	7	.00'	126,192 cf	Custom	n Stage Data (Pri	smatic) Listed below	
Elevatio (fee	-	Surf.Area (sq-ft)		c.Store ic-feet)	Cum.Store (cubic-feet)		
7.0	00	27,767		0	0		
7.4	40	46,551		14,864	14,864		
8.0	00	50,946		29,249	44,113		
9.0	00	55,842		53,394	97,507		
9.5	50	58,900		28,686	126,192		
Device	Routing	g li	nvert Out	let Device	es		
#1	Primar	у	9.20' <b>100</b>	.0' long >	k 20.0' breadth B	road-Crested Rectangular Weir	
		-	Hea	ad (feet) (	0.20 0.40 0.60 0	0.80 1.00 1.20 1.40 1.60	
			Coe	ef. (Englis	h) 2.68 2.70 2.7	70 2.64 2.63 2.64 2.64 2.63	
#2	Primar	У	8.60' <b>12.</b>	)" Vert. O	rifice/Grate C=	0.600	
Primary	<b>Primary OutFlow</b> Max=0.00 cfs @ 0.00 hrs HW=7.00' (Free Discharge)						

-1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-2=Orifice/Grate (Controls 0.00 cfs)

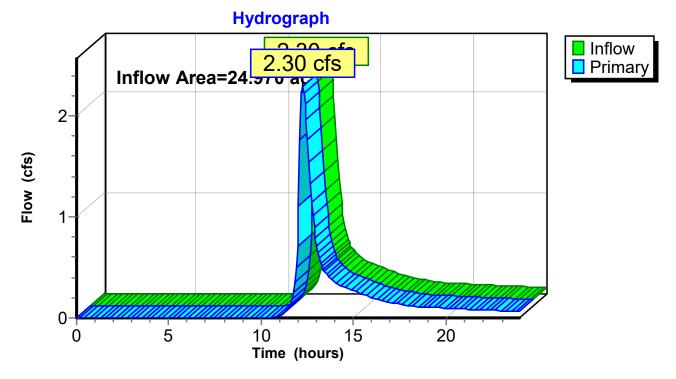
Pond Lake4&5: Lake 4 & 5



## Summary for Link 1L: Combo Discharge

Inflow Area =	24.970 ac, 30.84% Impervious, Inflow I	Depth > 0.14"	for 2 YR CM event
Inflow =	2.30 cfs @ 12.25 hrs, Volume=	0.299 af	
Primary =	2.30 cfs @ 12.25 hrs, Volume=	0.299 af, Atte	en= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs



# Link 1L: Combo Discharge

Fairways Townhomes Phase2B Pre Dev 0326.20

Type III 24-hr 5 YR CM Rainfall=4.20" Printed 3/30/2020 LLC Page 42

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#### Time span=0.00-24.00 hrs, dt=0.07 hrs, 344 points Runoff by SCS TR-20 method, UH=Delmarva Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Post DA 2: Pervious Flow Length=100'	Runoff Area=3.110 ac 0.00% Impervious Runoff Depth>0.61" Slope=0.0100 '/' Tc=12.7 min CN=55 Runoff=0.87 cfs 0.157 af
Subcatchment Post DA 3: Impervious	Runoff Area=1.970 ac 100.00% Impervious Runoff Depth>3.96" Tc=10.0 min CN=98 Runoff=5.31 cfs 0.650 af
Subcatchment Post DA 4: Impervious	Runoff Area=1.580 ac 100.00% Impervious Runoff Depth>3.96" Tc=10.0 min CN=98 Runoff=4.26 cfs 0.521 af
Subcatchment Post DA- 1: Pervious	Runoff Area=5.380 ac 0.00% Impervious Runoff Depth>0.96" Tc=15.0 min CN=62 Runoff=2.75 cfs 0.433 af
Subcatchment Post DA-1: Impervious	Runoff Area=2.480 ac 100.00% Impervious Runoff Depth>3.96" Tc=10.0 min CN=98 Runoff=6.69 cfs 0.818 af
Subcatchment Post DA2: Impervious	Runoff Area=1.670 ac 100.00% Impervious Runoff Depth>3.96" Tc=10.0 min CN=98 Runoff=4.50 cfs 0.551 af
Subcatchment Post DA3: Pervious Flow Length=100'	Runoff Area=1.560 ac 0.00% Impervious Runoff Depth>1.20" Slope=0.0100 '/' Tc=18.5 min CN=66 Runoff=0.97 cfs 0.156 af
Subcatchment Post DA4: Pervious Flow Length=100'	Runoff Area=3.950 ac 0.00% Impervious Runoff Depth>1.39" Slope=0.0100 '/' Tc=12.7 min CN=69 Runoff=3.49 cfs 0.458 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=3.270 ac 0.00% Impervious Runoff Depth>1.74" Slope=0.0150 '/' Tc=12.5 min CN=74 Runoff=3.78 cfs 0.473 af
Pond Lake1: Basin	Peak Elev=11.39' Storage=35,077 cf Inflow=9.02 cfs 1.250 af Outflow=0.74 cfs 0.628 af
Pond Lake2: Lake 2	Peak Elev=10.12' Storage=28,000 cf Inflow=5.39 cfs 1.336 af Outflow=0.92 cfs 0.738 af
Pond Lake3: Lake 3	Peak Elev=9.23' Storage=18,793 cf Inflow=6.16 cfs 1.543 af Outflow=1.23 cfs 1.186 af
Pond Lake4&5: Lake 4 & 5	Peak Elev=8.90' Storage=92,120 cf Inflow=8.32 cfs 2.166 af Outflow=0.37 cfs 0.048 af
Link 1L: Combo Discharge	Inflow=3.78 cfs 0.522 af Primary=3.78 cfs 0.522 af
Total Runoff Area = 24.970	ac Runoff Volume = 4.216 af Average Runoff Depth = 2.03"

Total Runoff Area = 24.970 ac Runoff Volume = 4.216 af Average Runoff Depth = 2.03" 69.16% Pervious = 17.270 ac 30.84% Impervious = 7.700 ac

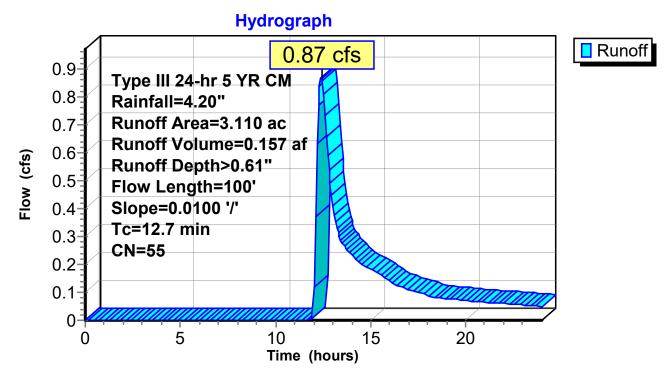
## **Summary for Subcatchment Post DA 2: Pervious**

Runoff = 0.87 cfs @ 12.41 hrs, Volume= 0.157 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

_	Area	(ac)	CN	Desc	ription			
	1.	000	39	>75%	6 Grass co	over, Good	, HSG A	
	1.	340	61	>75%	6 Grass co	over, Good	, HSG B	
	0.	590	74	>75%	6 Grass co	over, Good	, HSG C	
	0.	080	30	Woo	ds, Good,	HSG A		
	0.	100	55	Woo	ds, Good,	HSG B		
	3.	110	55	Weig	ghted Aver	age		
	3.	110		Perv	ious Area	·		
	Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
	12.7	10	0 0	.0100	0.13		<b>Sheet Flow, Unpaved</b> Grass: Short n= 0.150	P2= 3.30"

#### **Subcatchment Post DA 2: Pervious**



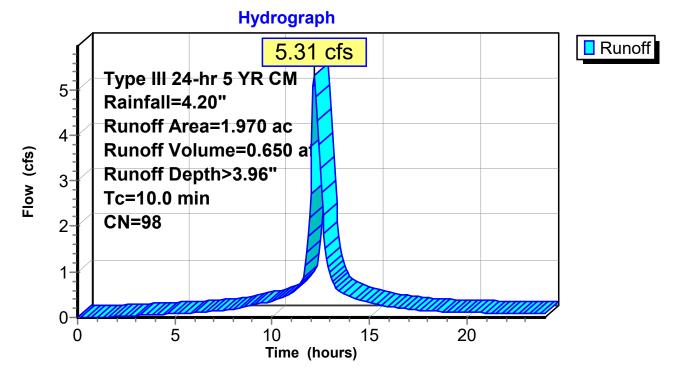
## Summary for Subcatchment Post DA 3: Impervious

Runoff = 5.31 cfs @ 12.17 hrs, Volume= 0.650 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

 Area	(ac)	CN	Desc	cription		
0.	630	98	Wate	er Surface		
 1.	340	98	Pave	ed parking	& roofs	
 1.	970	98	Weig	ghted Aver	age	
1.	970		Impe	rvious Are	a	
Тс	Leng	th	Slope	Velocity	Capacity	Description
 (min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
 10.0						Direct Entry, Paved

# Subcatchment Post DA 3: Impervious



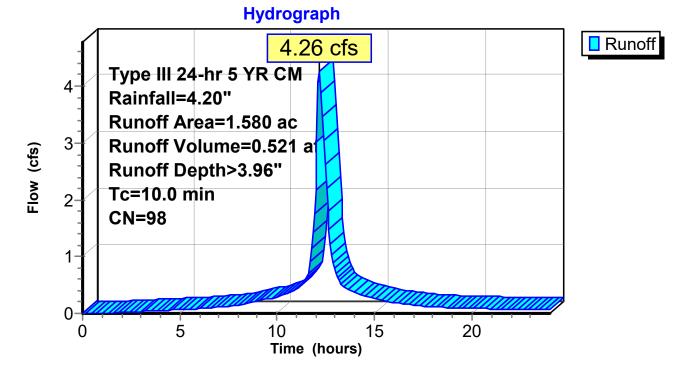
#### Summary for Subcatchment Post DA 4: Impervious

Runoff = 4.26 cfs @ 12.17 hrs, Volume= 0.521 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

	Area	(ac)	CN	Desc	cription		
*	0.	100	98	Cart	Paths		
	0.	180	98	Pave	ed parking	& roofs	
_	1.	300	98	Wate	er Surface		
	1.580 98 Weighted Average			ghted Aver	age		
	1.	580		Impe	ervious Are	a	
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	10.0						Direct Entry, Paved

#### Subcatchment Post DA 4: Impervious



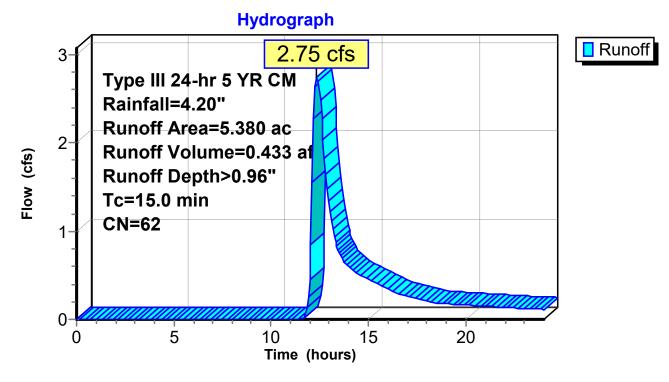
## Summary for Subcatchment Post DA- 1: Pervious

Runoff = 2.75 cfs @ 12.36 hrs, Volume= 0.433 af, Depth> 0.96"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

Area	(ac)	CN	Desc	cription		
0.	010	39	>75%	% Grass co	over, Good	I, HSG A
4.	320	61	>75%	% Grass co	over, Good	I, HSG B
0.	680	74	>75%	% Grass co	over, Good	I, HSG C
0.	370	58	Woo	ds/grass o	omb., Goo	od, HSG B
5.	380	62	Weig	ghted Aver	age	
5.	380		Perv	ious Area	-	
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0						Direct Entry, Grass

#### **Subcatchment Post DA- 1: Pervious**



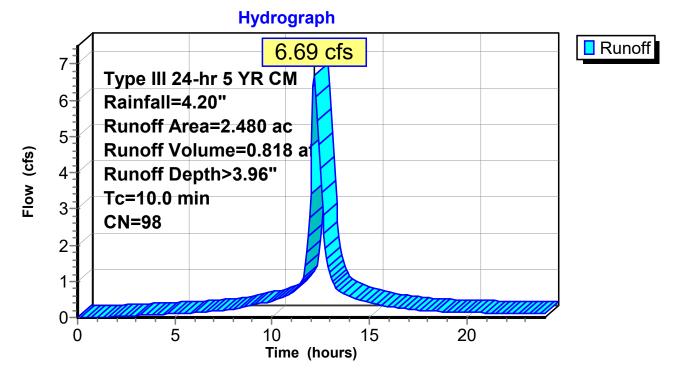
## Summary for Subcatchment Post DA-1: Impervious

Runoff = 6.69 cfs @ 12.17 hrs, Volume= 0.818 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

Area	(ac)	CN	Desc	cription		
1	160	98	Wate	er Surface		
1	.320	98	Pave	ed parking	& roofs	
2	480	98	Weig	ghted Aver	age	
2	.480		Impe	rvious Are	a	
Tc	Leng	th	Slope	Velocity	Capacity	Description
(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
10.0						Direct Entry, Paved

# Subcatchment Post DA-1: Impervious



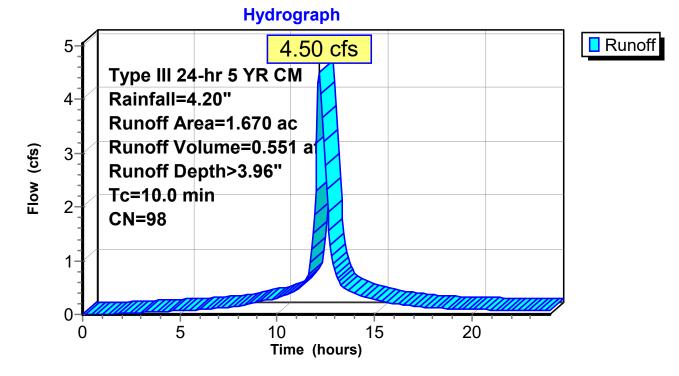
## **Summary for Subcatchment Post DA2: Impervious**

Runoff = 4.50 cfs @ 12.17 hrs, Volume= 0.551 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

Area	(ac)	CN	Desc	cription		
0.	250	98	Cart	Paths		
1.	330	98	Wate	er Surface		
0.	090	98	Tow	nhouse		
1.	670	98	Weig	ghted Aver	age	
1.	670		Impe	ervious Are	ea	
-			~		<b>•</b> ••	
				,		Description
(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
10.0						Direct Entry, Paved
	0. 1. 0. 1. 1. Tc (min)	(min) (fee	0.250 98 1.330 98 0.090 98 1.670 98 1.670 Tc Length (min) (feet)	0.250 98 Cart 1.330 98 Wate 0.090 98 Tow 1.670 98 Weig 1.670 Impe Tc Length Slope (min) (feet) (ft/ft)	0.250 98 Cart Paths 1.330 98 Water Surface 0.090 98 Townhouse 1.670 98 Weighted Aver 1.670 Impervious Are Tc Length Slope Velocity (min) (feet) (ft/ft) (ft/sec)	0.25098Cart Paths1.33098Water Surface0.09098Townhouse1.67098Weighted Average1.67098Impervious AreaTcLengthSlopeVelocityTcLengthSlopeVelocity(min)(feet)(ft/ft)(ft/sec)

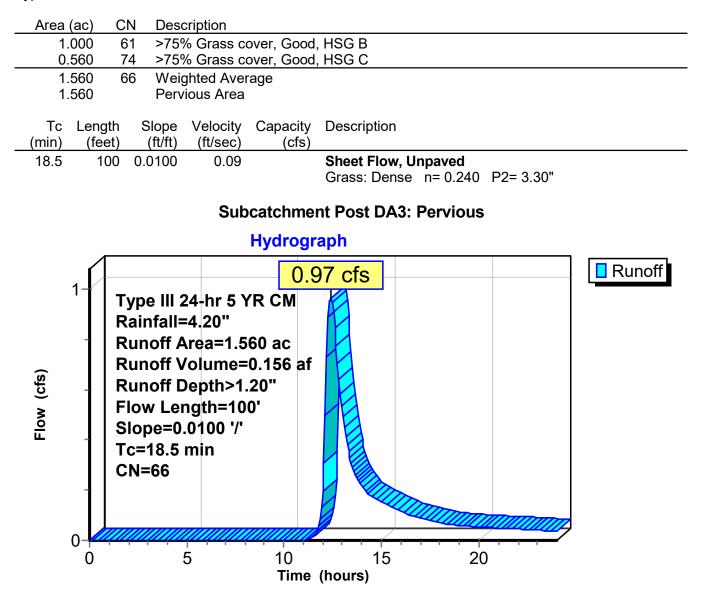
#### Subcatchment Post DA2: Impervious



#### Summary for Subcatchment Post DA3: Pervious

Runoff = 0.97 cfs @ 12.39 hrs, Volume= 0.156 af, Depth> 1.20"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"



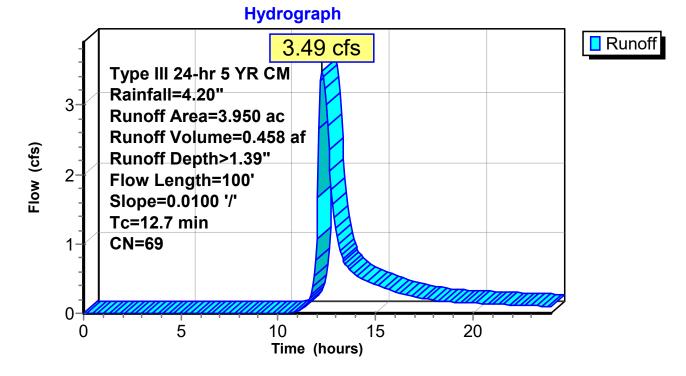
#### Summary for Subcatchment Post DA4: Pervious

Runoff = 3.49 cfs @ 12.26 hrs, Volume= 0.458 af, Depth> 1.39"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

_	Area	(ac)	CN	Desc	cription			
	0.	660	61	>75%	% Grass co	over, Good	, HSG B	
	2.	520	74	>75%	% Grass co	over, Good	, HSG C	
	0.	550	55	Woo	ds, Good,	HSG B		
	0.	220	70	Woo	ds, Good,	HSG C		
	3.	950	69	Weig	ghted Aver	age		
	3.	950		Perv	ious Area	•		
	Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
	12.7	10	0 0	0.0100	0.13		<b>Sheet Flow, Unpaved</b> Grass: Short n= 0.150	P2= 3.30"

#### Subcatchment Post DA4: Pervious



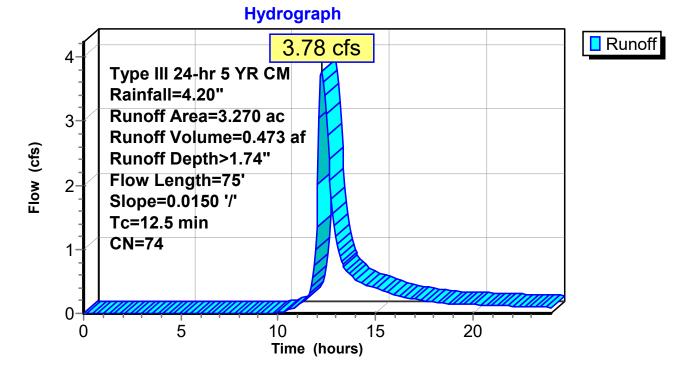
# Summary for Subcatchment Post DA5 Off: Off Site Pervious

Runoff = 3.78 cfs @ 12.23 hrs, Volume= 0.473 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

Area	(ac)	CN	Desc	cription			
3.	170	74	>75%	6 Grass co	over, Good,	, HSG C	
0.	100	72	Woo	ds/grass c	omb., Goo	d, HSG C	
3.	270	74	Weig	ghted Aver	age		
3.	270		Perv	ious Area			
Tc (min)	Length (feet		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
12.5	75	/	0150	0.10	(010)	Sheet Flow, Unpaved Grass: Dense n= 0.240 P2= 3.30"	-

#### Subcatchment Post DA5 Off: Off Site Pervious



## Summary for Pond Lake1: Basin

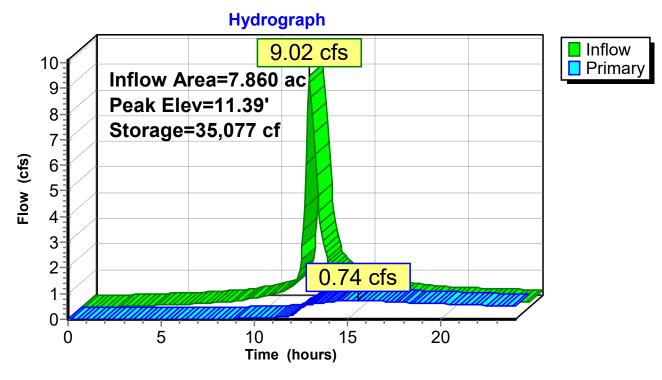
Inflow Area =	7.860 ac, 31.55% Impervious, Inflow D	Depth > 1.91" for 5 YR CM event
Inflow =	9.02 cfs @ 12.20 hrs, Volume=	1.250 af
Outflow =	0.74 cfs @ 15.60 hrs, Volume=	0.628 af, Atten= 92%, Lag= 203.8 min
Primary =	0.74 cfs @ 15.60 hrs, Volume=	0.628 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 11.39' @ 15.60 hrs Surf.Area= 0 sf Storage= 35,077 cf

Plug-Flow detention time= 389.8 min calculated for 0.628 af (50% of inflow) Center-of-Mass det. time= 253.2 min (1,059.9 - 806.7)

Volume	Inve	rt Avail.Stor	age	Storage Description			
#1	10.7	0' 137,87	'8 cf	Custom Stage Data Listed below			
Elevatio (fee	-	um.Store ubic-feet)					
10.7	70	0					
11.0	00	15,300					
12.0	00	65,780					
13.0	00	118,459					
13.7	70	137,878					
Device	Routing	Invert	Outl	et Devices			
#1	Primary	11.35'	2.0'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)		
#2	Primary	10.70'	0.5'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)		
Primary OutFlow Max=0.74 cfs @ 15.60 hrs HW=11.39' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Weir Controls 0.06 cfs @ 0.67 fps) -2=Sharp Created Rectangular Weir (Wair Controls 0.68 cfs @ 2.73 fps)							

**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.68 cfs @ 2.72 fps)



Pond Lake1: Basin

# Summary for Pond Lake2: Lake 2

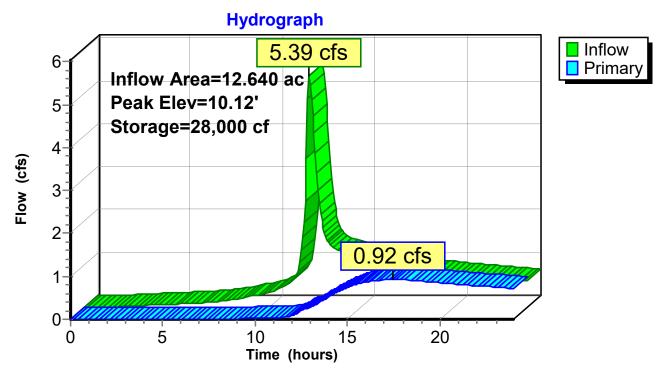
Inflow Area =	12.640 ac, 32.83% Impervious, Inflow D	Depth > 1.27" for 5 YR CM event
Inflow =	5.39 cfs @ 12.19 hrs, Volume=	1.336 af
Outflow =	0.92 cfs @ 17.47 hrs, Volume=	0.738 af, Atten= 83%, Lag= 316.6 min
Primary =	0.92 cfs @ 17.47 hrs, Volume=	0.738 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 10.12' @ 17.47 hrs Surf.Area= 0 sf Storage= 28,000 cf

Plug-Flow detention time= 376.5 min calculated for 0.738 af (55% of inflow) Center-of-Mass det. time= 190.1 min (1,109.9 - 919.8)

Volume	Inv	ert Avail.	.Storage	Storage Description			
#1	9.	67' 8	37,360 cf	Custom Stage Data Listed below			
Elevatic (fee 9.6 10.0 11.0	et) ( 67 00	Cum.Store <u>cubic-feet)</u> 0 20,120 87,360					
Device	Routing	Inv	vert Outl	et Devices			
#1	Primary	10.	00' <b>4.0'</b>	long Sharp-Crested Rectangular Weir	2 End Contraction(s)		
#2	Primary	9.	67' <b>0.5'</b>	long Sharp-Crested Rectangular Weir	2 End Contraction(s)		
<b>Primary OutFlow</b> Max=0.92 cfs @ 17.47 hrs HW=10.12' (Free Discharge) 							

**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.52 cfs @ 1.12 fps) **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.40 cfs @ 2.19 fps)



Pond Lake2: Lake 2

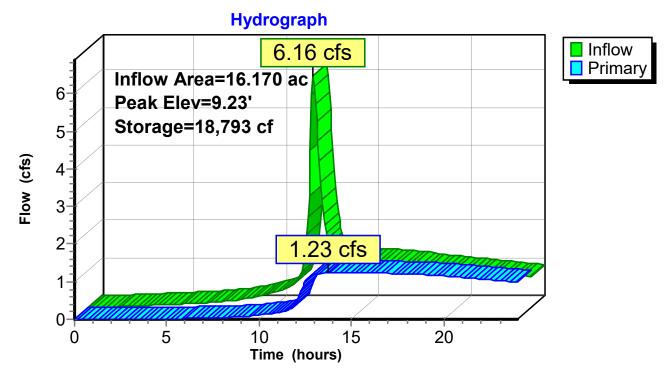
## Summary for Pond Lake3: Lake 3

Inflow Area =	16.170 ac, 37.85% Impervious, Inflow Depth > 1.15" for 5 YR CM event	
Inflow =	6.16 cfs @ 12.19 hrs, Volume= 1.543 af	
Outflow =	1.23 cfs @ 13.73 hrs, Volume= 1.186 af, Atten= 80%, Lag= 92.3 min	
Primary =	1.23 cfs @ 13.73 hrs, Volume= 1.186 af	

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.23' @ 13.73 hrs Surf.Area= 0 sf Storage= 18,793 cf

Plug-Flow detention time= 223.4 min calculated for 1.183 af (77% of inflow) Center-of-Mass det. time= 116.1 min (1,056.1 - 940.0)

Volume	Inve	ert Avai	I.Storage	Storage Description
#1	8.6	60' (	69,310 cf	Custom Stage Data Listed below
Elevatio	<b>n</b> (	Cum.Store		
(fee		ubic-feet)		
	1			
8.6	50	0		
9.0	00	11,585		
10.0	00	42,767		
10.8	30	69,310		
		,		
Device	Routing	In	vert Out	tlet Devices
#1	Primary	9	.60' <b>12.</b>	0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#2	Primary	9	.60' <b>4.0</b> '	' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#3	Primary	8	.60' <b>0.5</b> '	' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	8	6.60' <b>0.5</b> '	' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
Primarv	OutFlow	Max=1 23	cfs @ 13	.73 hrs HW=9.23' (Free Discharge)
				r (Controls 0.00 cfs)
				r (Controls 0.00 cfs)
		•	0	r (Weir Controls 0.61 cfs @ 2.60 fps)
			0	$\mathbf{r}$ (Weir Controls 0.61 cfs @ 2.60 fps)
4-31	ai p-01851	eu necian	gulai vvei	



Pond Lake3: Lake 3

#### Summary for Pond Lake4&5: Lake 4 & 5

[79] Warning: Submerged Pond Lake3 Primary device # 3 by 0.30' [79] Warning: Submerged Pond Lake3 Primary device # 4 by 0.30'

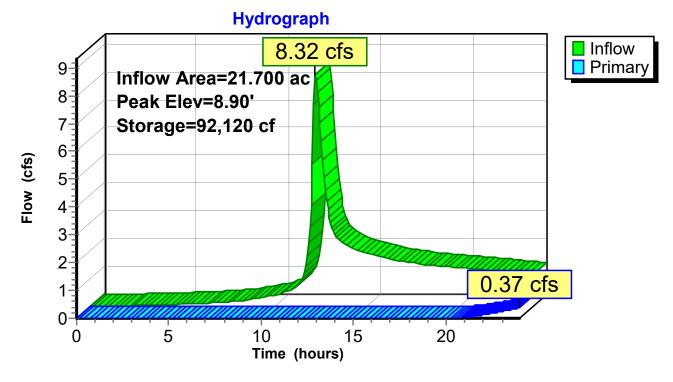
Inflow Area =	21.700 ac, 35.48% Impervious, Inflow	Depth > 1.20" for 5 YR CM event	
Inflow =	8.32 cfs @ 12.21 hrs, Volume=	2.166 af	
Outflow =	0.37 cfs @ 24.01 hrs, Volume=	0.048 af, Atten= 96%, Lag= 708.2 mi	n
Primary =	0.37 cfs $\overline{@}$ 24.01 hrs, Volume=	0.048 af	

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 8.90' @ 24.01 hrs Surf.Area= 55,348 sf Storage= 92,120 cf

Plug-Flow detention time= 1,008.7 min calculated for 0.048 af (2% of inflow) Center-of-Mass det. time= 431.4 min (1,377.1 - 945.7)

Volume			.Storage	0	Description	
#1	7.	.00' 12	26,192 cf	Custon	n Stage Data (Pr	ismatic) Listed below
Elevatio	on	Surf.Area	In	c.Store	Cum.Store	
(fee	et)	(sq-ft)	(cub	ic-feet)	(cubic-feet)	
7.0	00	27,767		0	0	
7.4	40	46,551		14,864	14,864	
8.0	8.00 50,946			29,249	44,113	
9.0		55,842		53,394	97,507	
9.5	50	58,900		28,686	126,192	
Device	Routing	ı Inv	vert Out	let Device	es	
#1	Primary	<i>י</i> 9.	20' <b>100</b>	.0' long >	x 20.0' breadth E	Broad-Crested Rectangular Weir
						0.80 1.00 1.20 1.40 1.60
				· •	,	70 2.64 2.63 2.64 2.64 2.63
#2	Primary	/ 8.	60' <b>12.0</b>	)" Vert. O	rifice/Grate C=	0.600

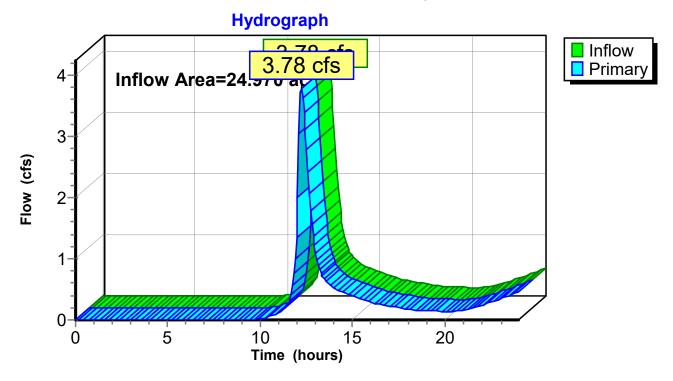
Primary OutFlow Max=0.37 cfs @ 24.01 hrs HW=8.90' (Free Discharge) -1=Broad-Crested Rectangular Weir (Controls 0.00 cfs) -2=Orifice/Grate (Orifice Controls 0.37 cfs @ 1.86 fps) Pond Lake4&5: Lake 4 & 5



## Summary for Link 1L: Combo Discharge

Inflow Area =	24.970 ac, 30.84% Impervious, Inflow I	Depth > 0.25"	for 5 YR CM event
Inflow =	3.78 cfs @ 12.23 hrs, Volume=	0.522 af	
Primary =	3.78 cfs @ 12.23 hrs, Volume=	0.522 af, Atte	en= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs



## Link 1L: Combo Discharge

Fairways Townhomes Phase2B Pre Dev 0326.20Type III 24-hiPrepared by {enter your company name here}HydroCAD® 8.50s/n 0052632007 HydroCAD Software Solutions LLC

#### Time span=0.00-24.00 hrs, dt=0.07 hrs, 344 points Runoff by SCS TR-20 method, UH=Delmarva Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Post DA 2: Pervious Flow Length=100'	Runoff Area=3.110 ac 0.00% Impervious Runoff Depth>1.02" Slope=0.0100 '/' Tc=12.7 min CN=55 Runoff=1.71 cfs 0.265 af
Subcatchment Post DA 3: Impervious	Runoff Area=1.970 ac 100.00% Impervious Runoff Depth>4.85" Tc=10.0 min CN=98 Runoff=6.47 cfs 0.797 af
Subcatchment Post DA 4: Impervious	Runoff Area=1.580 ac 100.00% Impervious Runoff Depth>4.85" Tc=10.0 min CN=98 Runoff=5.19 cfs 0.639 af
Subcatchment Post DA- 1: Pervious	Runoff Area=5.380 ac 0.00% Impervious Runoff Depth>1.49" Tc=15.0 min CN=62 Runoff=4.58 cfs 0.668 af
Subcatchment Post DA-1: Impervious	Runoff Area=2.480 ac 100.00% Impervious Runoff Depth>4.85" Tc=10.0 min CN=98 Runoff=8.15 cfs 1.003 af
Subcatchment Post DA2: Impervious	Runoff Area=1.670 ac 100.00% Impervious Runoff Depth>4.85" Tc=10.0 min CN=98 Runoff=5.49 cfs 0.675 af
Subcatchment Post DA3: Pervious Flow Length=100'	Runoff Area=1.560 ac 0.00% Impervious Runoff Depth>1.78" Slope=0.0100 '/' Tc=18.5 min CN=66 Runoff=1.51 cfs 0.232 af
Subcatchment Post DA4: Pervious Flow Length=100'	Runoff Area=3.950 ac 0.00% Impervious Runoff Depth>2.02" Slope=0.0100 '/' Tc=12.7 min CN=69 Runoff=5.25 cfs 0.665 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=3.270 ac 0.00% Impervious Runoff Depth>2.43" Slope=0.0150 '/' Tc=12.5 min CN=74 Runoff=5.39 cfs 0.663 af
Pond Lake1: Basin	Peak Elev=11.55' Storage=43,244 cf Inflow=12.29 cfs 1.672 af Outflow=1.44 cfs 0.966 af
Pond Lake2: Lake 2	Peak Elev=10.21' Storage=34,342 cf Inflow=7.36 cfs 1.907 af Outflow=1.77 cfs 1.273 af
Pond Lake3: Lake 3	Peak Elev=9.60' Storage=30,230 cf Inflow=7.85 cfs 2.302 af Outflow=1.96 cfs 1.801 af
Pond Lake4&5: Lake 4 & 5	Peak Elev=9.21' Storage=109,725 cf Inflow=11.23 cfs 3.105 af Outflow=1.79 cfs 0.589 af
Link 1L: Combo Discharge	Inflow=5.39 cfs 1.252 af Primary=5.39 cfs 1.252 af
Total Runoff Area = 24.970	ac Runoff Volume = 5.609 af Average Runoff Depth = 2.70"

Total Runoff Area = 24.970 ac Runoff Volume = 5.609 af Average Runoff Depth = 2.70" 69.16% Pervious = 17.270 ac 30.84% Impervious = 7.700 ac

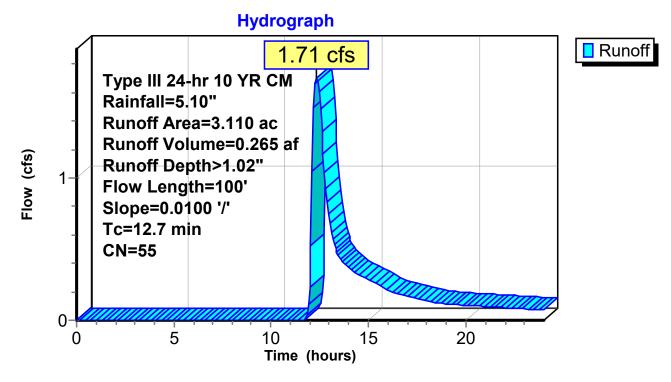
## **Summary for Subcatchment Post DA 2: Pervious**

Runoff = 1.71 cfs @ 12.33 hrs, Volume= 0.265 af, Depth> 1.02"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

	Area (	(ac)	CN	Desc	cription			
	1.0	000	39	>75%	6 Grass co	over, Good	, HSG A	
	1.3	340	61	>75%	6 Grass co	over, Good	, HSG B	
	0.5	590	74	>75%	6 Grass co	over, Good	, HSG C	
	0.0	080	30	Woo	ds, Good,	HSG A		
	0.1	100	55	Woo	ds, Good,	HSG B		
	3.1	110	55	Weig	ghted Aver	age		
	3.1	110		Perv	ious Area	·		
(	Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
	12.7	10	0 0	.0100	0.13		<b>Sheet Flow, Unpaved</b> Grass: Short n= 0.150	P2= 3.30"

#### **Subcatchment Post DA 2: Pervious**



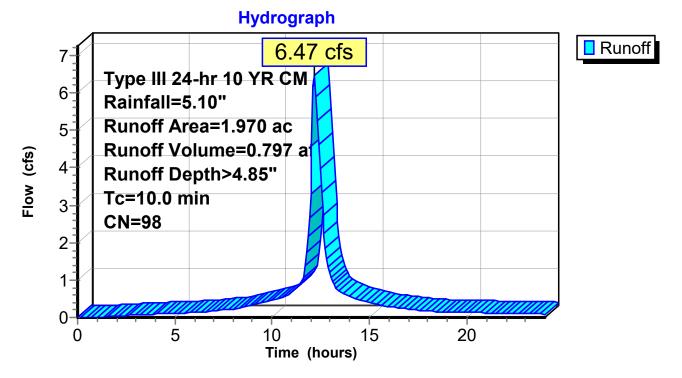
#### **Summary for Subcatchment Post DA 3: Impervious**

Runoff = 6.47 cfs @ 12.17 hrs, Volume= 0.797 af, Depth> 4.85"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

 Area	(ac)	CN	Desc	cription					
0.	630	98	Wate	Water Surface					
 1.	340	98	Pave	Paved parking & roofs					
 1.	1.970 98 Weighted Average								
1.	1.970 Impervious Area								
Tc	Leng	th	Slope	Velocity	Capacity	Description			
 (min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)				
10.0						Direct Entry, Paved			

# Subcatchment Post DA 3: Impervious



### Summary for Subcatchment Post DA 4: Impervious

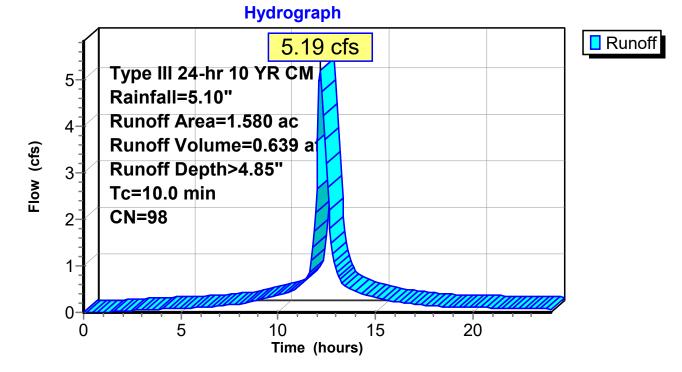
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Runoff 5.19 cfs @ 12.17 hrs, Volume= 0.639 af, Depth> 4.85" =

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

	Area	(ac)	CN	Dese	cription		
*	0.	100	98	Cart	Paths		
	0.	180	98	Pave	ed parking	& roofs	
	1.	300	98	Wate	er Surface		
					ghted Aver ervious Are		
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	10.0						Direct Entry, Paved

### **Subcatchment Post DA 4: Impervious**



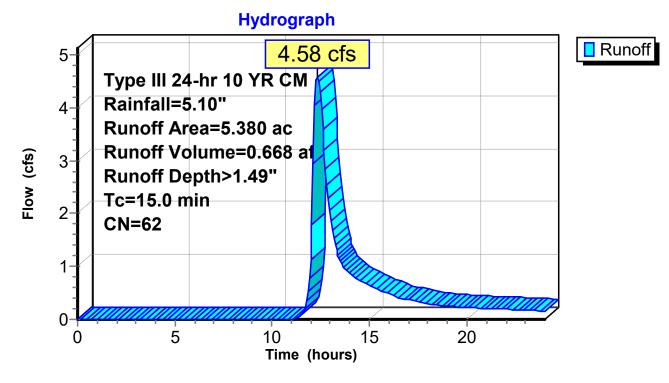
## Summary for Subcatchment Post DA- 1: Pervious

Runoff = 4.58 cfs @ 12.31 hrs, Volume= 0.668 af, Depth> 1.49"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

Area	(ac)	CN	Desc	cription		
0.	010	39	>75%	% Grass co	over, Good	I, HSG A
4.	320	61	>75%	% Grass co	over, Good	I, HSG B
0.	680	74	>75%	% Grass co	over, Good	I, HSG C
0.	370	58	Woo	ds/grass o	omb., Goo	od, HSG B
5.	380	62	Weig	ghted Aver	age	
5.	5.380 Pervi				-	
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0						Direct Entry, Grass

### **Subcatchment Post DA- 1: Pervious**



## Summary for Subcatchment Post DA-1: Impervious

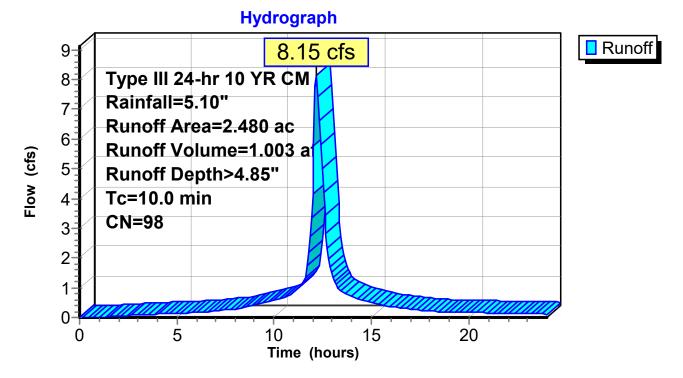
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Runoff 8.15 cfs @ 12.17 hrs, Volume= 1.003 af, Depth> 4.85" =

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

	Area (	ac)	CN	Desc	cription		
	1.1	160	98	Wate	er Surface		
	1.3	320	98	Pave	ed parking	& roofs	
	2.480 98 Weighted Average						
	2.480 Impervious Area					a	
	Тс	Lengt	th	Slope	Velocity	Capacity	Description
(	min)	(fee	t)	(ft/ft)	(ft/sec)	(cfs)	
	10.0						Direct Entry, Paved

### Subcatchment Post DA-1: Impervious



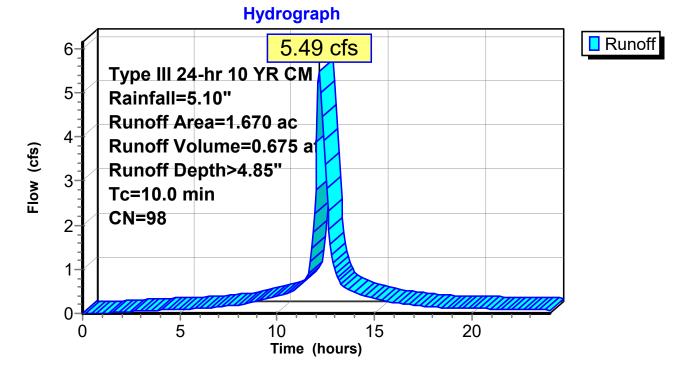
### **Summary for Subcatchment Post DA2: Impervious**

Runoff = 5.49 cfs @ 12.17 hrs, Volume= 0.675 af, Depth> 4.85"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

	10.0						Direct Entry, Paved
_	(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
	Тс	Leng	th	Slope	Velocity	Capacity	Description
					ervious Are	0	
	1.	670	98	Weid	ghted Aver	ade	
*	0.	090	98	Tow	nhouse		
	1.	330	98	Wate	er Surface		
*	0.	250	98	Cart	Paths		
_	Area	(ac)	CN	Desc	cription		

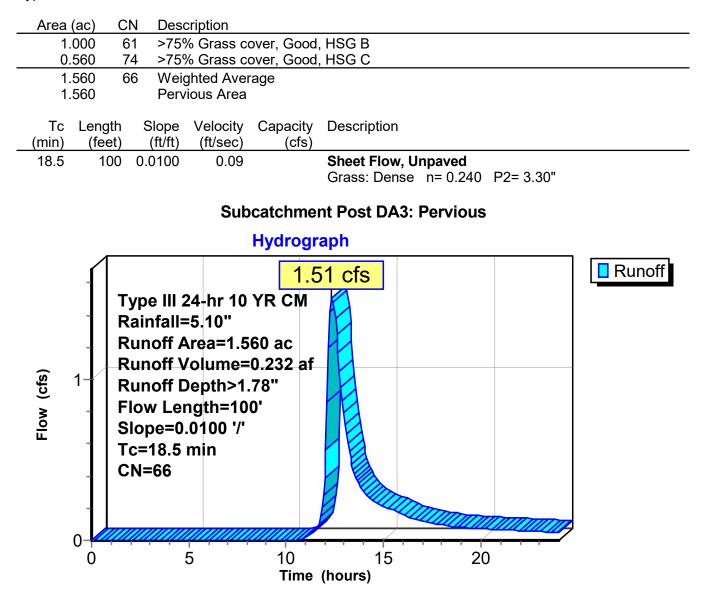
### Subcatchment Post DA2: Impervious



#### Summary for Subcatchment Post DA3: Pervious

Runoff = 1.51 cfs @ 12.35 hrs, Volume= 0.232 af, Depth> 1.78"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"



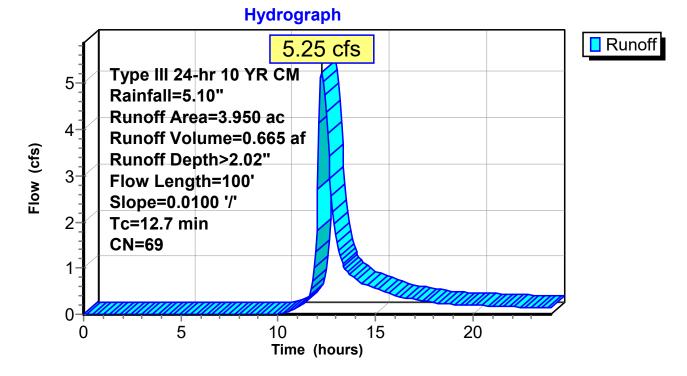
## **Summary for Subcatchment Post DA4: Pervious**

Runoff = 5.25 cfs @ 12.24 hrs, Volume= 0.665 af, Depth> 2.02"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

	Area	(ac)	CN	Desc	cription			
	0.	660	61	>75%	6 Grass co	over, Good	, HSG B	
	2.	520	74	>75%	% Grass co	over, Good	, HSG C	
0.550 55 Woods, Good, HSG B						HSG B		
0.220 70 Woods, Good, HSG C								
	3.	950	69	Weig	ghted Aver	age		
	3.	950		Perv	ious Area	•		
	Tc (min)	Lengt (feet		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
	12.7	10	0 0	.0100	0.13		Sheet Flow, Unpaved	
							Grass: Short n= 0.150	P2= 3.30"

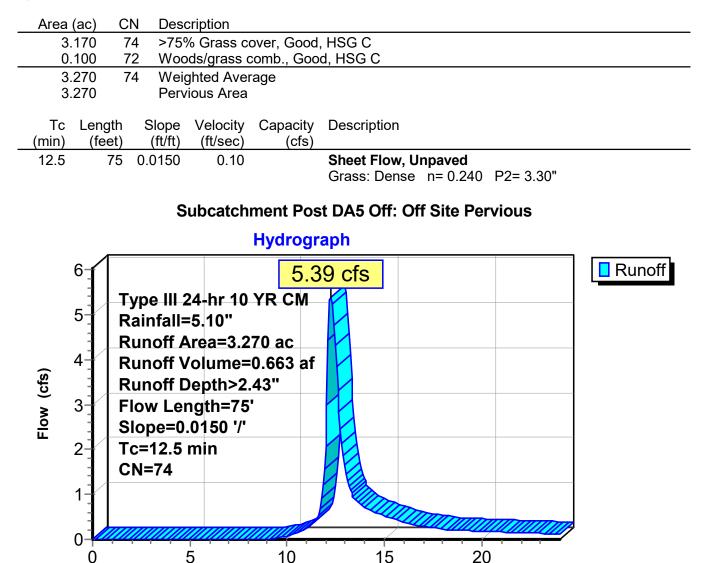
#### Subcatchment Post DA4: Pervious



### Summary for Subcatchment Post DA5 Off: Off Site Pervious

Runoff 5.39 cfs @ 12.22 hrs, Volume= 0.663 af, Depth> 2.43" =

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"



Time (hours)

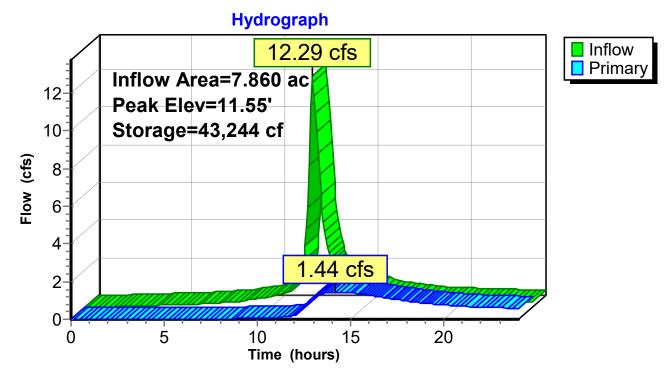
## Summary for Pond Lake1: Basin

Inflow Area	a =	7.860 ac, 31.55% Impervious, Inflow Depth > 2.55" for 10 YR CM event
Inflow	=	12.29 cfs @ 12.21 hrs, Volume= 1.672 af
Outflow	=	1.44 cfs @ 14.21 hrs, Volume= 0.966 af, Atten= 88%, Lag= 120.0 min
Primary	=	1.44 cfs @ 14.21 hrs, Volume= 0.966 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 11.55' @ 14.21 hrs Surf.Area= 0 sf Storage= 43,244 cf

Plug-Flow detention time= 338.5 min calculated for 0.963 af (58% of inflow) Center-of-Mass det. time= 217.0 min (1,023.4 - 806.4)

Volume	Invert	Avail.Stora	ge Storage Description				
#1	10.70'	137,878	cf Custom Stage Data Listed below				
Elevatio (fee 10.7 11.0 12.0 13.0 13.7	et) (cubic 70 00 1 00 6 00 11	Store <u>-feet)</u> 0 5,300 5,780 8,459 7,878					
Device	Routing	Invert (	Outlet Devices				
#1 #2	Primary Primary		2.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)				
	5						
Primary OutFlow Max=1.44 cfs @ 14.21 hrs HW=11.55' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Weir Controls 0.59 cfs @ 1.48 fps) -2=Sharp-Crested Rectangular Weir (Weir Controls 0.85 cfs @ 3.02 fps)							



Pond Lake1: Basin

# Summary for Pond Lake2: Lake 2

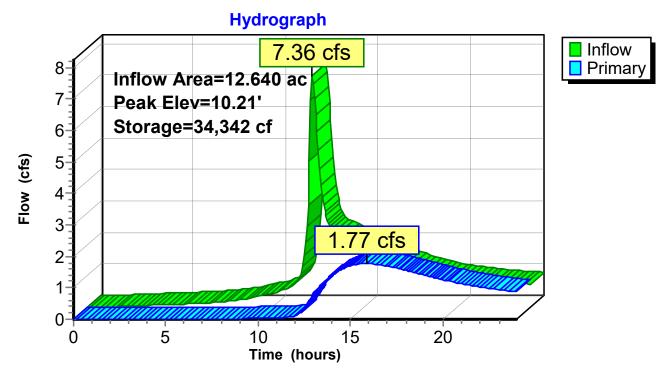
Inflow Area =	12.640 ac, 32.83% Impervious, Inflow	Depth > 1.81" for 10 YR CM event
Inflow =	7.36 cfs @ 12.20 hrs, Volume=	1.907 af
Outflow =	1.77 cfs @ 15.90 hrs, Volume=	1.273 af, Atten= 76%, Lag= 222.2 min
Primary =	1.77 cfs @ 15.90 hrs, Volume=	1.273 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 10.21' @ 15.90 hrs Surf.Area= 0 sf Storage= 34,342 cf

Plug-Flow detention time= 294.2 min calculated for 1.269 af (67% of inflow) Center-of-Mass det. time= 158.0 min (1,069.8 - 911.8)

Volume	Inve	ert Avail.Sto	rage	Storage Description			
#1	9.6	87,3	60 cf	Custom Stage Data Listed below			
Elevatic (fee 9.6 10.0 11.0	et) (c 67 00	Cum.Store cubic-feet) 0 20,120 87,360					
Device	Routing	Invert	Out	et Devices			
#1	Primary	10.00'	4.0'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)		
#2	Primary	9.67'	0.5'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)		
Primary OutFlow Max=1.77 cfs @ 15.90 hrs HW=10.21' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Weir Controls 1.26 cfs @ 1.50 fps)							

**1=Sharp-Crested Rectangular Weir** (Weir Controls 1.26 cfs @ 1.50 fps) **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.51 cfs @ 2.41 fps)



Pond Lake2: Lake 2

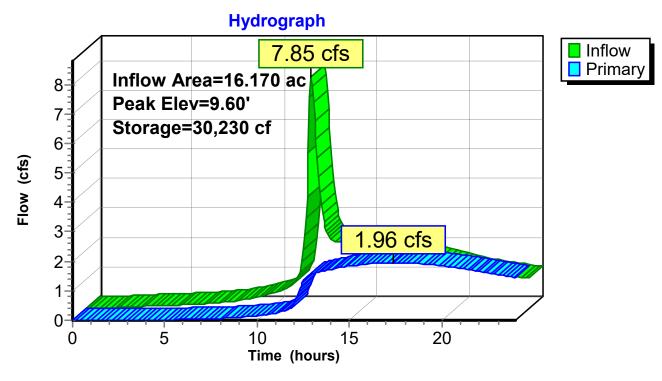
## Summary for Pond Lake3: Lake 3

Inflow Area =	16.170 ac, 37.85% Impervious, Inflow I	Depth > 1.71" for 10 YR CM event
Inflow =	7.85 cfs @ 12.19 hrs, Volume=	2.302 af
Outflow =	1.96 cfs @ 17.41 hrs, Volume=	1.801 af, Atten= 75%, Lag= 313.2 min
Primary =	1.96 cfs @ 17.41 hrs, Volume=	1.801 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.60' @ 17.41 hrs Surf.Area= 0 sf Storage= 30,230 cf

Plug-Flow detention time= 218.7 min calculated for 1.801 af (78% of inflow) Center-of-Mass det. time= 122.5 min (1,064.2 - 941.6)

Volume	Inv	ert Ava	il.Stora	rage Storage Description				
#1	8.0	50'	69,310	10 cf Custom Stage Data Listed below				
Elevetia		Dum Ctara						
Elevatio		Cum.Store						
(fee	1 1	cubic-feet)						
8.6	50	0						
9.0	00	11,585						
10.0	00	42,767						
10.8	30	69,310						
		,						
Device	Routing	Ir	nvert	Outlet Devices				
#1	Primary	9	9.60'	12.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)				
#2	Primary	9	9.60'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)				
#3	Primary	1	8.60'	0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)				
#4	Primary			0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)				
Drimany	Primary OutFlow Max=1.96 cfs @ 17.41 hrs HW=9.60' (Free Discharge)							
				Weir (Controls 0.00 cfs)				
				Weir (Controls 0.00 cfs)				
				Weir (Weir Controls 0.98 cfs @ 3.27 fps)				
-4=Sn	arp-Cres	ted Rectar	iguiar v	Weir Controls 0.98 cfs @ 3.27 fps)				



Pond Lake3: Lake 3

#### Summary for Pond Lake4&5: Lake 4 & 5

[79] Warning: Submerged Pond Lake3 Primary device # 3 by 0.61' [79] Warning: Submerged Pond Lake3 Primary device # 4 by 0.61'

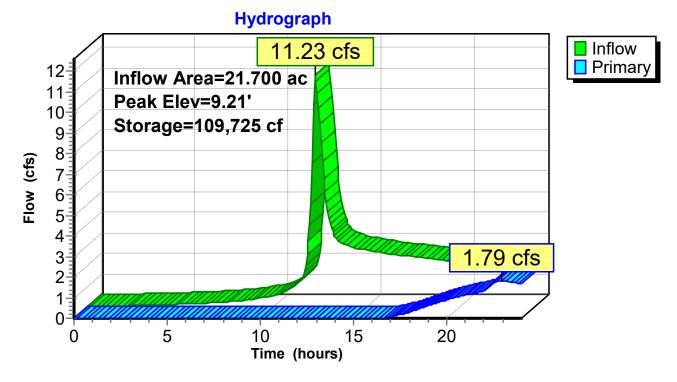
Inflow Area =	21.700 ac, 35.48% Impervious, Inflow [	Depth > 1.72" for 10 YR CM event
Inflow =	11.23 cfs @ 12.21 hrs, Volume=	3.105 af
Outflow =	1.79 cfs @ 22.91 hrs, Volume=	0.589 af, Atten= 84%, Lag= 642.3 min
Primary =	1.79 cfs @_22.91 hrs, Volume=	0.589 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.21' @ 22.91 hrs Surf.Area= 57,145 sf Storage= 109,725 cf

Plug-Flow detention time= 639.7 min calculated for 0.587 af (19% of inflow) Center-of-Mass det. time= 339.2 min (1,296.3 - 957.1)

Volume	In	vert A	vail.Sto	rage S	Storage	Description	
#1	7	.00'	126,1	92 cf <b>C</b>	Sustom	Stage Data (P	rismatic) Listed below
Elevatio (fee		Surf.Area (sq-ft)		Inc.Store (cubic-feet)		Cum.Store (cubic-feet)	
			27,767 46,551		0 ,864	0 14,864	
8.0 9.0	00	55,8	50,946 55,842		,249 ,394	44,113 97,507	
9.5	50	58,9	00	28,	,686	126,192	
Device	Routing	9	Invert	Outlet	Device	S	
#1	Primary	/	9.20'	Head (	(feet) 0	.20 0.40 0.60	<b>Broad-Crested Rectangular Weir</b> 0.80 1.00 1.20 1.40 1.60 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	/	8.60'	12.0"	Vert. O	rifice/Grate C	= 0.600

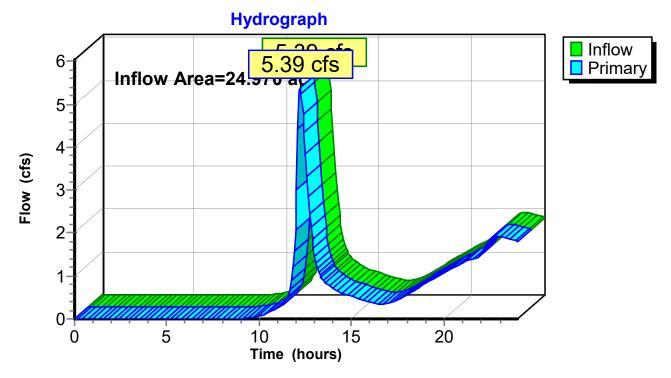
Primary OutFlow Max=1.74 cfs @ 22.91 hrs HW=9.21' (Free Discharge) -1=Broad-Crested Rectangular Weir (Weir Controls 0.40 cfs @ 0.31 fps) -2=Orifice/Grate (Orifice Controls 1.35 cfs @ 2.67 fps) Pond Lake4&5: Lake 4 & 5



## Summary for Link 1L: Combo Discharge

Inflow Area =	24.970 ac	, 30.84% Impervious,	Inflow Depth > 0.6	60" for 10 YR CM event
Inflow =	5.39 cfs (	<u></u> <u></u>	e= 1.252 af	
Primary =	5.39 cfs (	Description 12.22 hrs, Volume     Description 12.22 hrs, Volume	e= 1.252 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs



## Link 1L: Combo Discharge

Fairways Townhomes Phase2B Pre Dev 0326.20Type III 24-hPrepared by {enter your company name here}HydroCAD® 8.50s/n 005263© 2007 HydroCAD Software Solutions LLC

 Type III 24-hr 50 YR CM Rainfall=7.50"

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 LLC
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#### Time span=0.00-24.00 hrs, dt=0.07 hrs, 344 points Runoff by SCS TR-20 method, UH=Delmarva Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Post DA 2: Pervious Flow Length=100	Runoff Area=3.110 ac 0.00% Impervious Runoff Depth>2.44" Slope=0.0100 '/' Tc=12.7 min CN=55 Runoff=4.79 cfs 0.631 af					
Subcatchment Post DA 3: Impervious	Runoff Area=1.970 ac 100.00% Impervious Runoff Depth>7.25" Tc=10.0 min CN=98 Runoff=9.55 cfs 1.190 af					
Subcatchment Post DA 4: Impervious	Runoff Area=1.580 ac 100.00% Impervious Runoff Depth>7.25" Tc=10.0 min CN=98 Runoff=7.66 cfs 0.954 af					
Subcatchment Post DA- 1: Pervious	Runoff Area=5.380 ac 0.00% Impervious Runoff Depth>3.16" Tc=15.0 min CN=62 Runoff=10.52 cfs 1.415 af					
Subcatchment Post DA-1: Impervious	Runoff Area=2.480 ac 100.00% Impervious Runoff Depth>7.25" Tc=10.0 min CN=98 Runoff=12.02 cfs 1.498 af					
Subcatchment Post DA2: Impervious	Runoff Area=1.670 ac 100.00% Impervious Runoff Depth>7.25" Tc=10.0 min CN=98 Runoff=8.09 cfs 1.009 af					
Subcatchment Post DA3: Pervious Flow Length=100	Runoff Area=1.560 ac 0.00% Impervious Runoff Depth>3.58" Slope=0.0100 '/' Tc=18.5 min CN=66 Runoff=3.18 cfs 0.465 af					
Subcatchment Post DA4: Pervious Flow Length=100'	Runoff Area=3.950 ac 0.00% Impervious Runoff Depth>3.91" Slope=0.0100 '/' Tc=12.7 min CN=69 Runoff=10.48 cfs 1.288 af					
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=3.270 ac 0.00% Impervious Runoff Depth>4.47" Slope=0.0150 '/' Tc=12.5 min CN=74 Runoff=10.16 cfs 1.217 af					
Pond Lake1: Basin	Peak Elev=12.02' Storage=66,669 cf Inflow=21.96 cfs 2.913 af Outflow=4.56 cfs 2.104 af					
Pond Lake2: Lake 2	Peak Elev=10.49' Storage=53,223 cf Inflow=13.61 cfs 3.744 af Outflow=5.23 cfs 3.034 af					
Pond Lake3: Lake 3	Peak Elev=9.81' Storage=36,755 cf Inflow=12.89 cfs 4.689 af Outflow=7.15 cfs 4.028 af					
Pond Lake4&5: Lake 4 & 5	Peak Elev=9.28' Storage=113,787 cf Inflow=19.57 cfs 6.270 af Outflow=8.14 cfs 3.742 af					
Link 1L: Combo Discharge	Inflow=10.16 cfs 4.958 af Primary=10.16 cfs 4.958 af					
Total Runoff Area = 24.970 ac Runoff Volume = 9.667 af Average Runoff Depth = 4.65"						

Total Runoff Area = 24.970 ac Runoff Volume = 9.667 af Average Runoff Depth = 4.65" 69.16% Pervious = 17.270 ac 30.84% Impervious = 7.700 ac

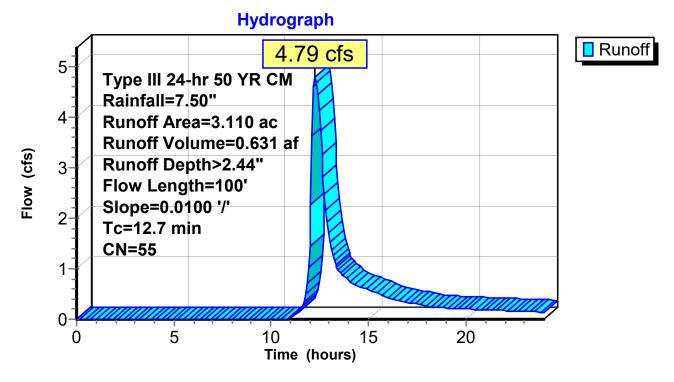
## **Summary for Subcatchment Post DA 2: Pervious**

Runoff = 4.79 cfs @ 12.26 hrs, Volume= 0.631 af, Depth> 2.44"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

_	Area	(ac)	CN	Desc	ription			
	1.000 39 >75% Grass cover, Good, HSG A							
	1.	340	61	>75%	6 Grass co	over, Good	, HSG B	
	0.	590	74	>75%	6 Grass co	over, Good	, HSG C	
	0.	080	30	Woo	ds, Good,	HSG A		
	0.	100	55	Woo	ds, Good,	HSG B		
	3.	110	55	Weig	ghted Aver	age		
	3.	110		Perv	ious Area	·		
	Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
	12.7	10	0 0	.0100	0.13		<b>Sheet Flow, Unpaved</b> Grass: Short n= 0.150	P2= 3.30"

#### **Subcatchment Post DA 2: Pervious**



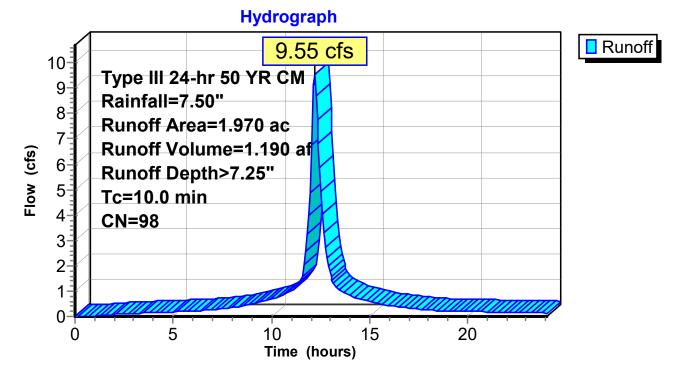
### **Summary for Subcatchment Post DA 3: Impervious**

9.55 cfs @ 12.17 hrs, Volume= 1.190 af, Depth> 7.25" Runoff =

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

 Area	(ac)	CN	Desc	cription				
0.	630	98	Wate	Water Surface				
 1.	340	98	Pave	ed parking	& roofs			
 1.970 98 Weighted Average								
1.970 Impervious Area								
Tc	Leng	th	Slope	Velocity	Capacity	Description		
 (min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)			
10.0						Direct Entry, Paved		

## **Subcatchment Post DA 3: Impervious**



## Summary for Subcatchment Post DA 4: Impervious

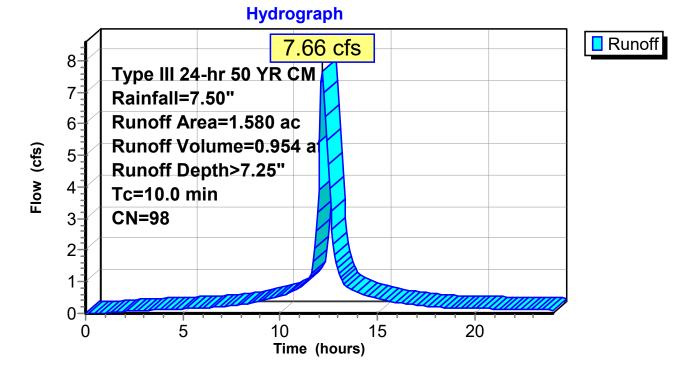
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Runoff 7.66 cfs @ 12.17 hrs, Volume= 0.954 af, Depth> 7.25" =

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

	Area	(ac)	CN	Desc	cription					
*	0.	100	98	Cart	Cart Paths					
	0.	180	98	Pave	ed parking	& roofs				
	1.	300	98	Wate	er Surface					
	1.580 98 Weighted Average									
	1.580			Impe	Impervious Area					
	<b>-</b>		а.		\/.l!t	0	Description			
	Tc	Leng		Slope	Velocity	Capacity	Description			
	(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)				
	10.0						Direct Entry, Paved			

#### **Subcatchment Post DA 4: Impervious**



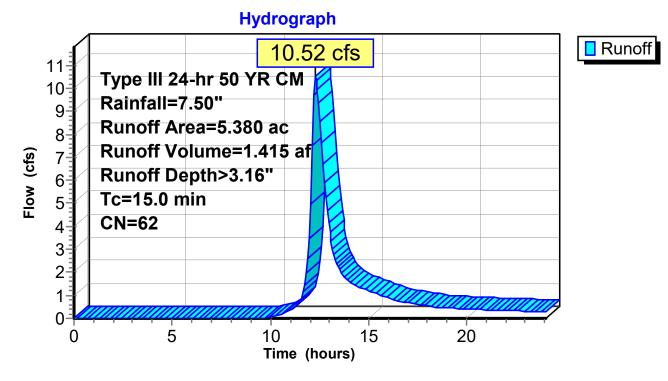
## Summary for Subcatchment Post DA- 1: Pervious

Runoff = 10.52 cfs @ 12.28 hrs, Volume= 1.415 af, Depth> 3.16"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

Area	(ac)	CN	Desc	cription			
0.	010	39	>75%	% Grass co	over, Good	I, HSG A	
4.	320	61	>75%	% Grass co	over, Good	I, HSG B	
0.	680	74	>75%	% Grass co	over, Good	I, HSG C	
0.	370	58	Woo	ds/grass o	omb., Goo	od, HSG B	
5.	5.380 62 Weighted Average						
5.	380		Perv	ious Area	-		
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
15.0						Direct Entry, Grass	

## Subcatchment Post DA- 1: Pervious



### Summary for Subcatchment Post DA-1: Impervious

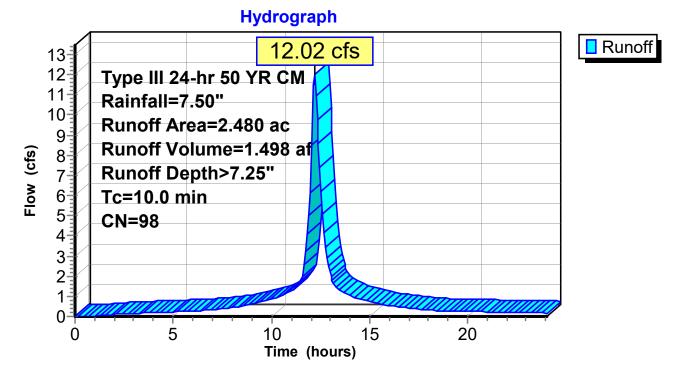
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12.02 cfs @ 12.17 hrs, Volume= 1.498 af, Depth> 7.25" Runoff =

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

A	rea (ac)	CN	Desc	cription		
	1.160	98	Wate	er Surface		
	1.320	98	Pave	ed parking	& roofs	
	2.480	98	Weig	ghted Aver	age	
	2.480		Impe	rvious Are	ea	
	Tc Len	gth	Slope	Velocity	Capacity	Description
(m	nin) (fe	et)	(ft/ft)	(ft/sec)	(cfs)	
1	0.0					Direct Entry, Paved

### Subcatchment Post DA-1: Impervious



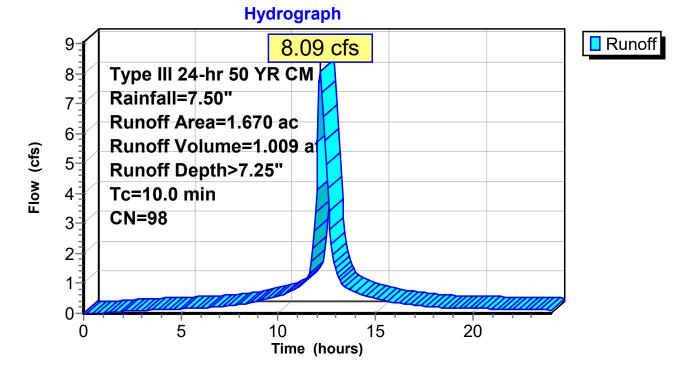
## **Summary for Subcatchment Post DA2: Impervious**

Runoff = 8.09 cfs @ 12.17 hrs, Volume= 1.009 af, Depth> 7.25"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

	Area	(ac)	CN	Desc	cription		
*	0.	250	98	Cart	Paths		
	1.	330	98	Wate	er Surface		
*	0.	090	98	Tow	nhouse		
	1.	670	98	Weig	ghted Aver	age	
	1.	670		Impe	ervious Are	a	
	_			<u>.</u> .		•	
	Tc	Leng		Slope	Velocity	Capacity	Description
	(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
	10.0						Direct Entry, Paved

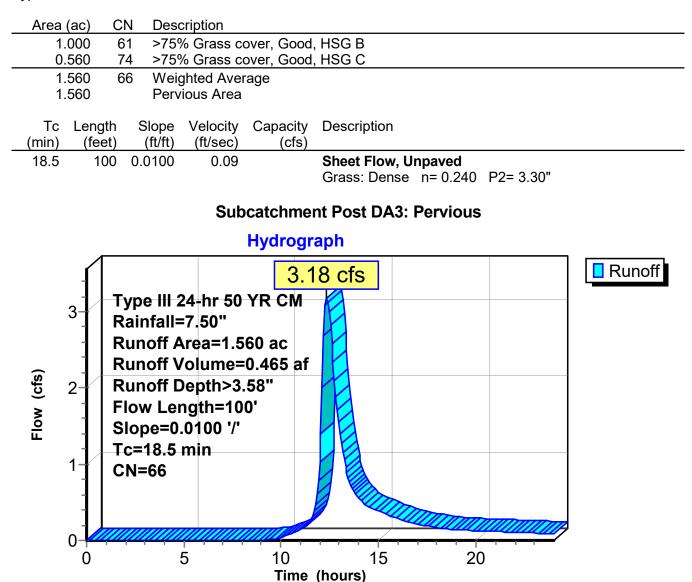
### Subcatchment Post DA2: Impervious



#### Summary for Subcatchment Post DA3: Pervious

Runoff = 3.18 cfs @ 12.33 hrs, Volume= 0.465 af, Depth> 3.58"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"



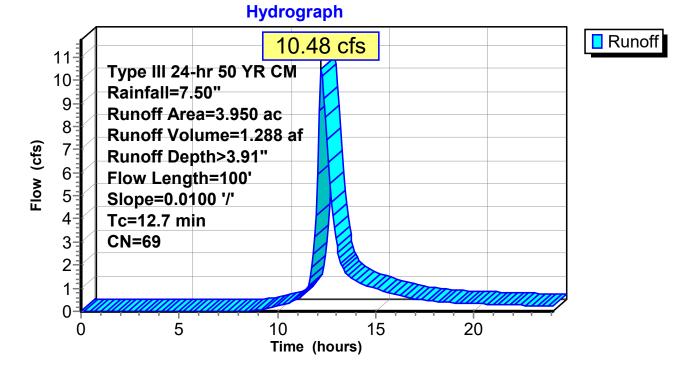
## **Summary for Subcatchment Post DA4: Pervious**

Runoff = 10.48 cfs @ 12.22 hrs, Volume= 1.288 af, Depth> 3.91"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

Are	a (ac)	CN	Desc	cription				
	0.660 61 >75% Grass cover, Good, HSG B							
	2.520	74	4 >75%	% Grass co	over, Good	, HSG C		
	0.550	55	5 Woo	ds, Good,	HSG B			
	0.220	70	) Woo	ds, Good,	HSG C			
	3.950	69	) Weig	ghted Aver	age			
	3.950		Perv	ious Area	-			
T (min			Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description		
12.	7 1	00	0.0100	0.13		<b>Sheet Flow, Unpaved</b> Grass: Short n= 0.150	P2= 3.30"	

#### Subcatchment Post DA4: Pervious



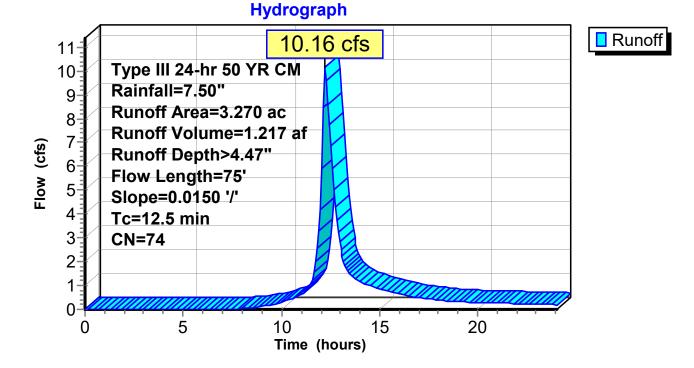
## Summary for Subcatchment Post DA5 Off: Off Site Pervious

Runoff = 10.16 cfs @ 12.21 hrs, Volume= 1.217 af, Depth> 4.47"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

 Area	(ac)	CN	Desc	ription					
3.	170	74	>75%	>75% Grass cover, Good, HSG C					
 0.	100	72	Woo	Woods/grass comb., Good, HSG C					
3.	270	74	Weig	phted Aver	age				
3.270 Pervious Area									
 Tc (min)	Length (feet		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description			
 12.5	75	5 0.	0150	0.10		Sheet Flow, Unpaved Grass: Dense n= 0.240 P2= 3.30"			

#### Subcatchment Post DA5 Off: Off Site Pervious



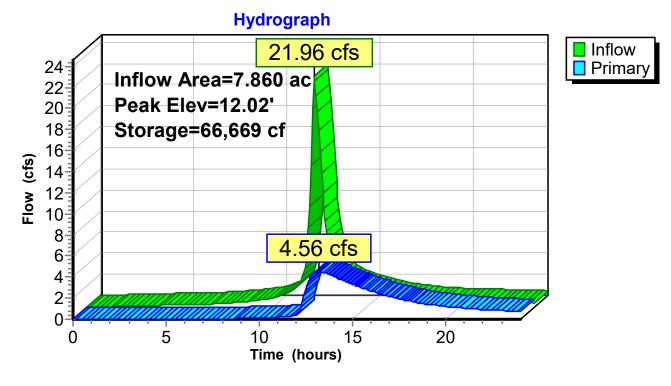
## Summary for Pond Lake1: Basin

Inflow Area =	7.860 ac, 31.55% Impervious, Inflow I	Depth > 4.45" for 50 YR CM event
Inflow =	21.96 cfs @ 12.21 hrs, Volume=	2.913 af
Outflow =	4.56 cfs @ 13.18 hrs, Volume=	2.104 af, Atten= 79%, Lag= 58.3 min
Primary =	4.56 cfs @ 13.18 hrs, Volume=	2.104 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 12.02' @ 13.18 hrs Surf.Area= 0 sf Storage= 66,669 cf

Plug-Flow detention time= 260.0 min calculated for 2.098 af (72% of inflow) Center-of-Mass det. time= 165.3 min ( 968.7 - 803.4 )

Volume	Invert	Avail.Stora	age Storage Description			
#1	10.70'	137,878	B cf Custom Stage Data Listed below			
Elevatio (fee 10.7 11.0 12.0 13.0 13.7	et) (cubi 70 00 7 00 6 00 17	.Store <u>c-feet)</u> 0 15,300 65,780 18,459 87,878				
Device	Routing	Invert	Outlet Devices			
#1	Primary		2.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)			
#2	Primary	10.70'	<b>0.5' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)			
Primary OutFlow Max=4.56 cfs @ 13.18 hrs HW=12.02' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Weir Controls 3.32 cfs @ 2.67 fps) -2=Sharp-Crested Rectangular Weir (Weir Controls 1.24 cfs @ 3.75 fps)						



Pond Lake1: Basin

# Summary for Pond Lake2: Lake 2

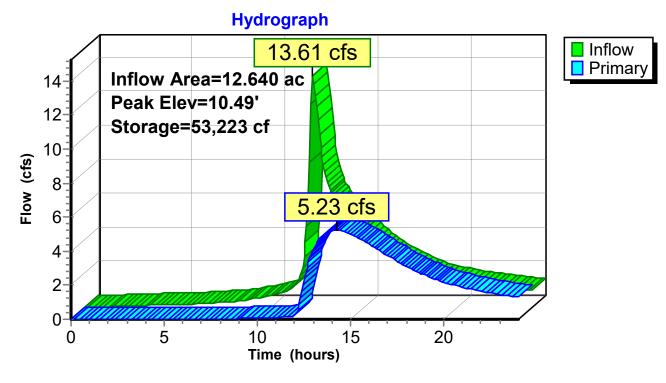
Inflow Area =	12.640 ac, 32.83% Impervious, Inflow	Depth > 3.55" for 50 YR CM event
Inflow =	13.61 cfs @ 12.21 hrs, Volume=	3.744 af
Outflow =	5.23 cfs @ 14.23 hrs, Volume=	3.034 af, Atten= 62%, Lag= 121.1 min
Primary =	5.23 cfs @ 14.23 hrs, Volume=	3.034 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 10.49' @ 14.23 hrs Surf.Area= 0 sf Storage= 53,223 cf

Plug-Flow detention time= 197.0 min calculated for 3.034 af (81% of inflow) Center-of-Mass det. time= 116.1 min (1,009.9 - 893.8)

Volume	Ir	vert Av	ail.Stor	age	Storage Description	
#1	ę	9.67'	87,36	0 cf	Custom Stage Data Listed below	
Elevatio (fee 9.6	et)	Cum.Store (cubic-feet	-			
10.0	00	20,120	)			
11.0	00	87,360	)			
Device	Routin	g	Invert	Outl	et Devices	
#1	Primar	Ϋ́Υ	10.00'	4.0'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)
#2	Primar	ÿ	9.67'	0.5'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)
					23 hrs HW=10.49' (Free Discharge) (Weir Controls 4.41 cfs @ 2.29 fps)	

**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.82 cfs @ 2.97 fps)



Pond Lake2: Lake 2

## Summary for Pond Lake3: Lake 3

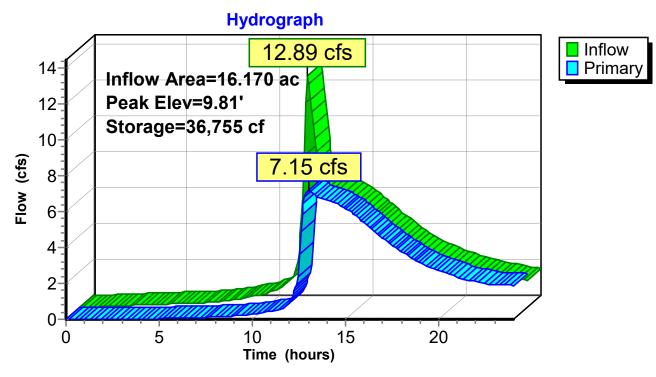
[79] Warning: Submerged Pond Lake2 Primary device # 2 by 0.14'

Inflow Area =	16.170 ac, 37.85% Impervious, Inflow Depth >	3.48" for 50 YR CM event
Inflow =	12.89 cfs @ 12.21 hrs, Volume= 4.68	9 af
Outflow =	7.15 cfs @ 13.01 hrs, Volume= 4.02	8 af, Atten= 45%, Lag= 48.3 min
Primary =	7.15 cfs @ 13.01 hrs, Volume= 4.02	8 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.81' @ 13.01 hrs Surf.Area= 0 sf Storage= 36,755 cf

Plug-Flow detention time= 125.2 min calculated for 4.016 af (86% of inflow) Center-of-Mass det. time= 63.3 min ( 992.1 - 928.8 )

Volume	Inve	ert Avail.S	torage Storage Description
#1	8.6	69,	,310 cf Custom Stage Data Listed below
Elevatio (fee 8.6 9.0	et) (c 60	Cum.Store <u>subic-feet)</u> 0 11,585	
10.0		42,767	
10.0		69,310	
		,	
Device	Routing	Inver	rt Outlet Devices
#1	Primary	9.60	0' <b>12.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)
#2	Primary	9.60	
#3	Primary	8.60	0' 0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	8.60	0' 0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
-1=Sh -2=Sh -3=Sh	arp-Crest arp-Crest arp-Crest	ed Rectangul ed Rectangul ed Rectangul	s @ 13.01 hrs HW=9.81' (Free Discharge) lar Weir (Weir Controls 3.69 cfs @ 1.49 fps) lar Weir (Weir Controls 1.22 cfs @ 1.49 fps) lar Weir (Weir Controls 1.12 cfs @ 3.59 fps) lar Weir (Weir Controls 1.12 cfs @ 3.59 fps)



Pond Lake3: Lake 3

### Summary for Pond Lake4&5: Lake 4 & 5

[79] Warning: Submerged Pond Lake3 Primary device # 3 by 0.68' [79] Warning: Submerged Pond Lake3 Primary device # 4 by 0.68'

Inflow Area =	21.700 ac, 35.48% Impervious, Inflow	Depth > 3.47" for 50 YR CM event	
Inflow =	19.57 cfs @ 12.20 hrs, Volume=	6.270 af	
Outflow =	8.14 cfs @ 14.47 hrs, Volume=	3.742 af, Atten= 58%, Lag= 136.1 mir	n
Primary =	8.14 cfs $\overline{@}$ 14.47 hrs, Volume=	3.742 af	

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.28' @ 14.47 hrs Surf.Area= 57,578 sf Storage= 113,787 cf

Plug-Flow detention time= 284.8 min calculated for 3.731 af (60% of inflow) Center-of-Mass det. time= 139.3 min (1,063.7 - 924.4)

Volume			il.Storage	0	Description	
#1	7	.00' 1	26,192 cf	Custom	n Stage Data (Pri	ismatic) Listed below
	Elevation Surf.Area			c.Store	Cum.Store	
(fee	et)	(sq-ft)	(cub	ic-feet)	(cubic-feet)	
7.0	00	27,767		0	0	
7.4	40	46,551		14,864	14,864	
8.0	00	50,946		29,249	44,113	
9.0	00	55,842		53,394	97,507	
9.5	50	58,900		28,686	126,192	
Device	Routing	ı In	vert Out	let Device	es	
#1	Primary	، S				Broad-Crested Rectangular Weir
						0.80 1.00 1.20 1.40 1.60
			Coe	ef. (Englis	h) 2.68 2.70 2.	70 2.64 2.63 2.64 2.64 2.63
#2	Primary	۲ E	8.60' <b>12.</b> 0	)" Vert. O	rifice/Grate C=	0.600

Primary OutFlow Max=8.11 cfs @ 14.47 hrs HW=9.28' (Free Discharge) 1=Broad-Crested Rectangular Weir (Weir Controls 6.50 cfs @ 0.78 fps) 2=Orifice/Grate (Orifice Controls 1.61 cfs @ 2.82 fps)

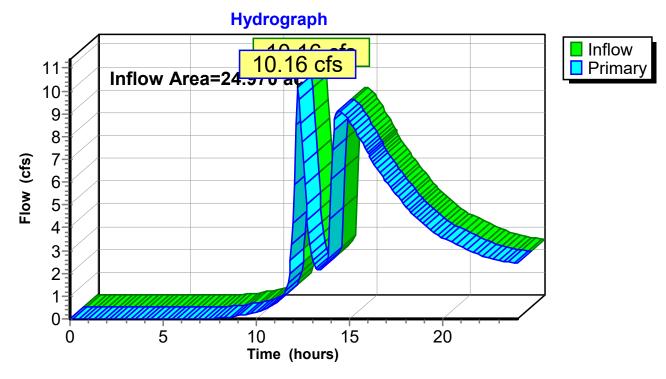
Hydrograph 19.57 cfs Inflow Primary Inflow Area=21.700 ac 20-Peak Elev=9.28' 18-Storage=113,787 cf 16-14 Flow (cfs) 12 8.14 cfs 10 8 6-4 2 0-5 10 20 0 15 Time (hours)

Pond Lake4&5: Lake 4 & 5

## Summary for Link 1L: Combo Discharge

Inflow Area =	24.970 ac, 🗧	30.84% Impervious,	Inflow Depth > 2	.38" for 50 YR CM event
Inflow =	10.16 cfs @	12.21 hrs, Volume	= 4.958 at	
Primary =	10.16 cfs @	12.21 hrs, Volume	= 4.958 at	, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs



## Link 1L: Combo Discharge

Fairways Townhomes Phase2B Pre Dev 0326.20	Type III 24-hr 100 YR CM Rainfall=8.80"
Prepared by {enter your company name here}	Printed 3/30/2020
HydroCAD® 8.50 s/n 005263 © 2007 HydroCAD Software Soluti	ons LLC Page 99

## Time span=0.00-24.00 hrs, dt=0.07 hrs, 344 points Runoff by SCS TR-20 method, UH=Delmarva Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Post DA 2: Pervious Flow Length=100	Runoff Area=3.110 ac 0.00% Impervious Runoff Depth>3.33" Slope=0.0100 '/' Tc=12.7 min CN=55 Runoff=6.75 cfs 0.863 af
Subcatchment Post DA 3: Impervious	Runoff Area=1.970 ac 100.00% Impervious Runoff Depth>8.54" Tc=10.0 min CN=98 Runoff=11.21 cfs 1.403 af
Subcatchment Post DA 4: Impervious	Runoff Area=1.580 ac 100.00% Impervious Runoff Depth>8.54" Tc=10.0 min CN=98 Runoff=8.99 cfs 1.125 af
Subcatchment Post DA- 1: Pervious	Runoff Area=5.380 ac 0.00% Impervious Runoff Depth>4.17" Tc=15.0 min CN=62 Runoff=14.08 cfs 1.868 af
Subcatchment Post DA-1: Impervious	Runoff Area=2.480 ac 100.00% Impervious Runoff Depth>8.54" Tc=10.0 min CN=98 Runoff=14.11 cfs 1.766 af
Subcatchment Post DA2: Impervious	Runoff Area=1.670 ac 100.00% Impervious Runoff Depth>8.54" Tc=10.0 min CN=98 Runoff=9.50 cfs 1.189 af
Subcatchment Post DA3: Pervious Flow Length=100	Runoff Area=1.560 ac 0.00% Impervious Runoff Depth>4.64" Slope=0.0100 '/' Tc=18.5 min CN=66 Runoff=4.15 cfs 0.604 af
Subcatchment Post DA4: Pervious Flow Length=100'	Runoff Area=3.950 ac 0.00% Impervious Runoff Depth>5.02" Slope=0.0100 '/' Tc=12.7 min CN=69 Runoff=13.68 cfs 1.652 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=3.270 ac 0.00% Impervious Runoff Depth>5.63" Slope=0.0150 '/' Tc=12.5 min CN=74 Runoff=12.79 cfs 1.534 af
Pond Lake1: Basin	Peak Elev=12.27' Storage=79,822 cf Inflow=27.56 cfs 3.633 af Outflow=6.82 cfs 2.787 af
Pond Lake2: Lake 2	Peak Elev=10.66' Storage=64,532 cf Inflow=17.76 cfs 4.838 af Outflow=7.76 cfs 4.092 af
Pond Lake3: Lake 3	Peak Elev=9.91' Storage=39,981 cf Inflow=16.12 cfs 6.098 af Outflow=11.45 cfs 5.403 af
Pond Lake4&5: Lake 4 & 5	Peak Elev=9.32' Storage=116,032 cf Inflow=24.26 cfs 8.180 af Outflow=13.35 cfs 5.648 af
Link 1L: Combo Discharge	Inflow=15.31 cfs 7.182 af Primary=15.31 cfs 7.182 af
Total Runoff Area = 24.970	ac Runoff Volume = 12.002 af Average Runoff Depth = 5.77" 69.16% Pervious = 17.270 ac 30.84% Impervious = 7.700 ac

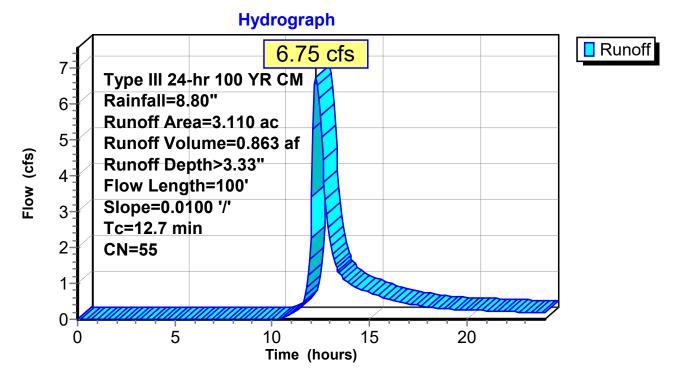
### **Summary for Subcatchment Post DA 2: Pervious**

Runoff = 6.75 cfs @ 12.25 hrs, Volume= 0.863 af, Depth> 3.33"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

 Area	(ac)	CN	Desc	cription				
1.	000	39	>75%	% Grass co	over, Good	, HSG A		
1.	340	61	>75%	75% Grass cover, Good, HSG B				
0.	590	74	>75%	% Grass co	over, Good	, HSG C		
0.	080	30	Woo	ds, Good,	HSG A			
 0.	100	55	Woo	ds, Good,	HSG B			
3.110 55 Weighted Average								
3.	110		Perv	ious Area	•			
 Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description		
12.7	10	00 (	0.0100	0.13		<b>Sheet Flow, Unpaved</b> Grass: Short n= 0.150	P2= 3.30"	

#### **Subcatchment Post DA 2: Pervious**



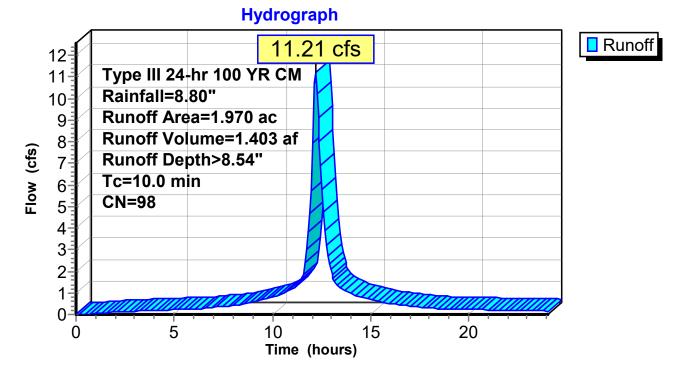
#### **Summary for Subcatchment Post DA 3: Impervious**

Runoff = 11.21 cfs @ 12.17 hrs, Volume= 1.403 af, Depth> 8.54"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

_	Area	(ac)	CN	Desc	cription		
	0.630 98 Water Surface						
_	1.340 98 Paved parking & roofs					& roofs	
	1.	970	98	Weig	ghted Aver	age	
	1.970 Impervious Area					ea	
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
_	10.0						Direct Entry, Paved

#### Subcatchment Post DA 3: Impervious



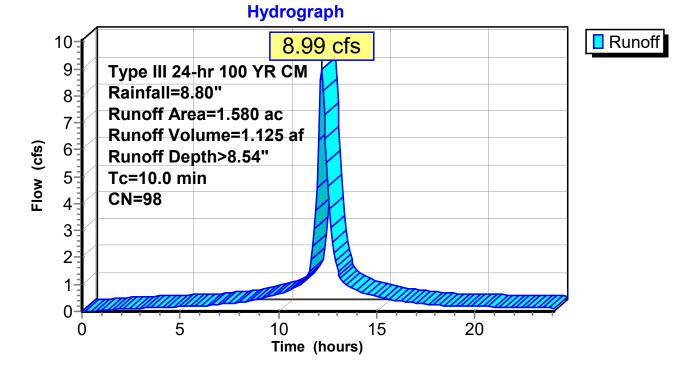
#### Summary for Subcatchment Post DA 4: Impervious

Runoff = 8.99 cfs @ 12.17 hrs, Volume= 1.125 af, Depth> 8.54"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

	Area	(ac)	CN	Desc	cription			
*	0.	100	98	Cart	Paths			
	0.	180	98	Pave	ed parking	& roofs		
	1.	300	98	Wate	er Surface			
	1.	1.580 98 Weighted Average						
	1.	1.580 Impervious Area			ervious Are	ea		
	Тс	Leng		Slope	Velocity	Capacity	Description	
_	(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)		
	10.0						Direct Entry, Paved	

#### Subcatchment Post DA 4: Impervious



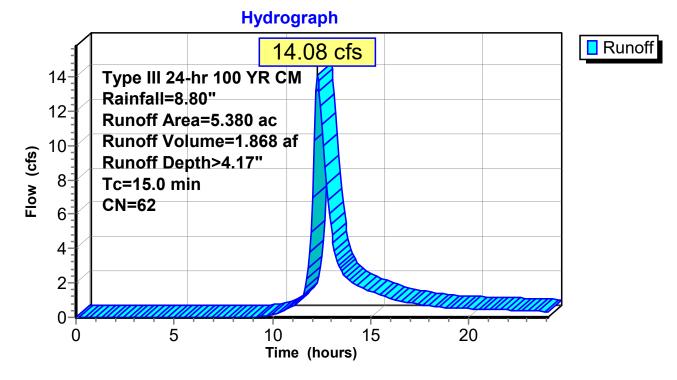
#### Summary for Subcatchment Post DA- 1: Pervious

Runoff = 14.08 cfs @ 12.27 hrs, Volume= 1.868 af, Depth> 4.17"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

Area	(ac)	CN	Desc	Description							
0.	.010	39	>75%	% Grass co	over, Good	d, HSG A					
4.	320	61	>75%	% Grass co	over, Good	d, HSG B					
0.	.680	74	>75%	% Grass co	over, Good	d, HSG C					
0.	0.370 58 Woods/grass comb., Good, HSG B										
5.	5.380 62 Weighted Average										
5.	5.380 Pervious Area				-						
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description					
15.0						Direct Entry, Grass					

#### Subcatchment Post DA- 1: Pervious



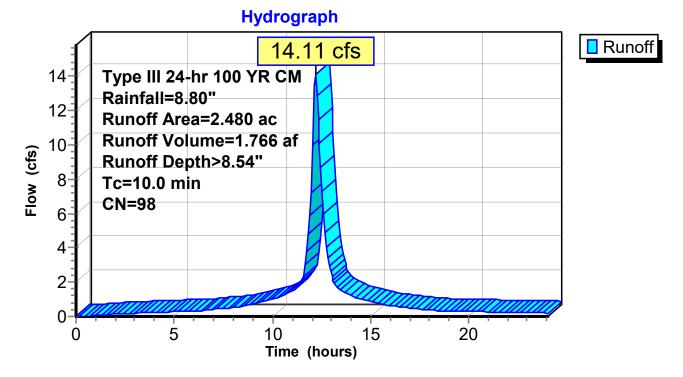
#### Summary for Subcatchment Post DA-1: Impervious

Runoff = 14.11 cfs @ 12.17 hrs, Volume= 1.766 af, Depth> 8.54"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

	Area	(ac)	CN	Desc	cription		
	1.	160	98	Wate	er Surface		
	1.320 98 Paved parking & roofs						
2.480 98 Weighted Average							
	2.480 Impervious Area						
	Тс	Leng	th	Slope	Velocity	Capacity	Description
_	(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
	10.0						Direct Entry, Paved

#### Subcatchment Post DA-1: Impervious



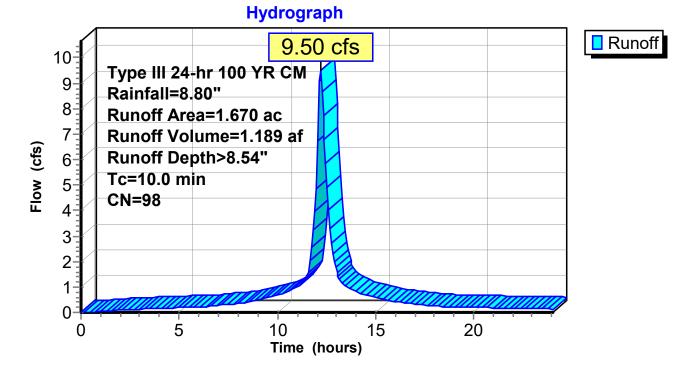
#### **Summary for Subcatchment Post DA2: Impervious**

Runoff = 9.50 cfs @ 12.17 hrs, Volume= 1.189 af, Depth> 8.54"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

_	Area	(ac)	CN	Desc	cription			_
*	0.	250	98	Cart	Paths			
	1.	330	98	Wate	er Surface			
*	0.	090	98	Tow	nhouse			
	1.670 98 Weighted Average					age		
	1.670			Impervious Area				
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
_		(100	51)	(1011)	(10360)	(013)	Direct Future Deved	—
	10.0						Direct Entry, Paved	

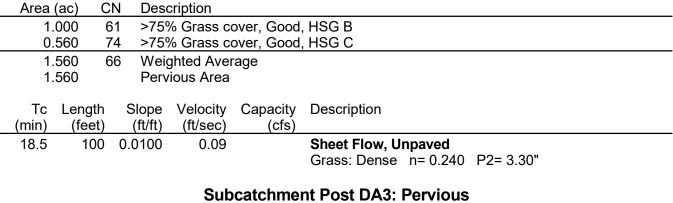
#### Subcatchment Post DA2: Impervious

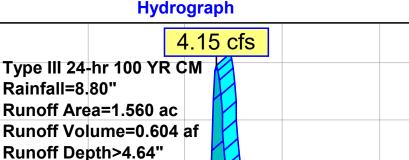


#### Summary for Subcatchment Post DA3: Pervious

Runoff 4.15 cfs @ 12.32 hrs, Volume= 0.604 af, Depth> 4.64" =

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"





10

Time (hours)

20

15

4

3

2

1

0

0

Flow Length=100'

5

Slope=0.0100 '/' Tc=18.5 min

CN=66

<sup>=</sup>low (cfs)



Runoff

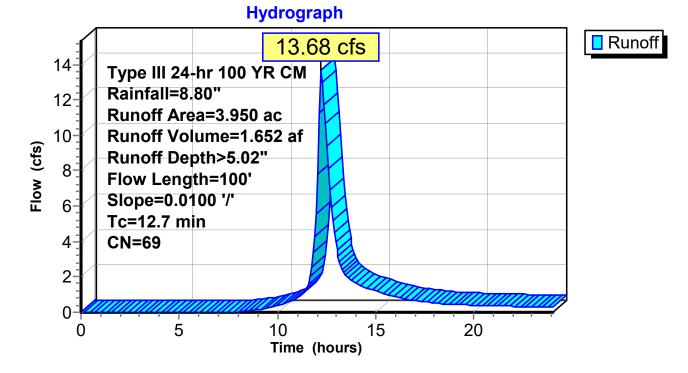
#### **Summary for Subcatchment Post DA4: Pervious**

Runoff = 13.68 cfs @ 12.21 hrs, Volume= 1.652 af, Depth> 5.02"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

Area	(ac)	CN	l Desc	cription			
C	.660	61	>759	% Grass co	over, Good	, HSG B	
2	2.520	74	>75	% Grass co	over, Good	, HSG C	
0.550 55 Woods, Good, HSG B							
C	0.220 70 Woods, Good, HSG C						
3	3.950 69 Weighted Average						
3	950		Perv	ious Area	•		
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
12.7	10	00	0.0100	0.13		<b>Sheet Flow, Unpaved</b> Grass: Short n= 0.150	P2= 3 30"

#### Subcatchment Post DA4: Pervious



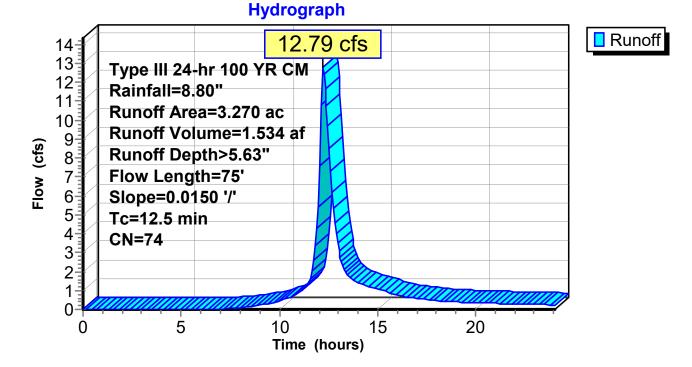
## Summary for Subcatchment Post DA5 Off: Off Site Pervious

Runoff = 12.79 cfs @ 12.21 hrs, Volume= 1.534 af, Depth> 5.63"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

	Area	(ac)	CN	Desc	Description							
	3.	170	74	>75% Grass cover, Good, HSG C								
0.100 72 Woods/grass comb., Good, HSG C												
	3.270 74 Weighted Average											
	3.	270		Perv	ious Area							
	Tc (min)	Lengtł (feet		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description					
	12.5	7	5 0.	.0150	0.10		Sheet Flow, Unpaved Grass: Dense n= 0.240 P2= 3.30"					

### Subcatchment Post DA5 Off: Off Site Pervious



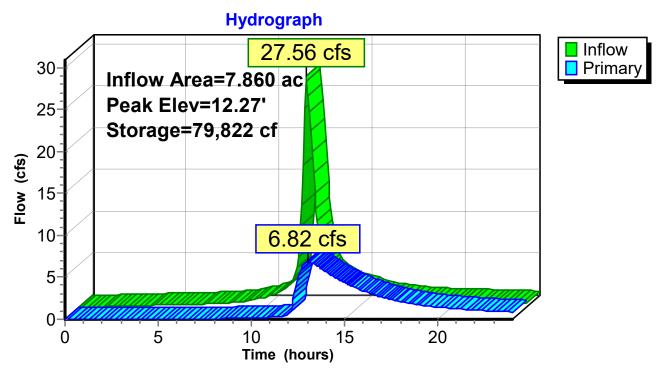
# Summary for Pond Lake1: Basin

Inflow Area =		7.860 ac, 31.55% Impervious, Inflow Depth > 5.55" for 100 YR CM event	
Inflow =		27.56 cfs @ 12.21 hrs, Volume= 3.633 af	
Outflow =		6.82 cfs @ 13.05 hrs, Volume= 2.787 af, Atten= 75%, Lag= 50.6 min	
Primary =	=	6.82 cfs @ 13.05 hrs, Volume= 2.787 af	

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 12.27' @ 13.05 hrs Surf.Area= 0 sf Storage= 79,822 cf

Plug-Flow detention time= 235.9 min calculated for 2.778 af (76% of inflow) Center-of-Mass det. time= 151.0 min (952.4 - 801.4)

Volume	Inve	ert Avail.Sto	rage	Storage Description							
#1	10.7	10.70' 137,878 cf		Custom Stage Data Listed below							
Elevatio (fee 10.7 11.0 12.0 13.0 13.7	9 <u>t) (0</u> 70 00 00 00	Cum.Store cubic-feet) 0 15,300 65,780 118,459 137,878									
Device	Routing	Invert	Outl	et Devices							
#1	Primary	11.35'	2.0'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)						
#2	Primary	10.70'	0.5'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)						
1=Sh	Primary OutFlow Max=6.81 cfs @ 13.05 hrs HW=12.27' (Free Discharge) —1=Sharp-Crested Rectangular Weir (Weir Controls 5.21 cfs @ 3.13 fps) —2=Sharp-Crested Rectangular Weir (Weir Controls 1.60 cfs @ 4.09 fps)										



Pond Lake1: Basin

# Summary for Pond Lake2: Lake 2

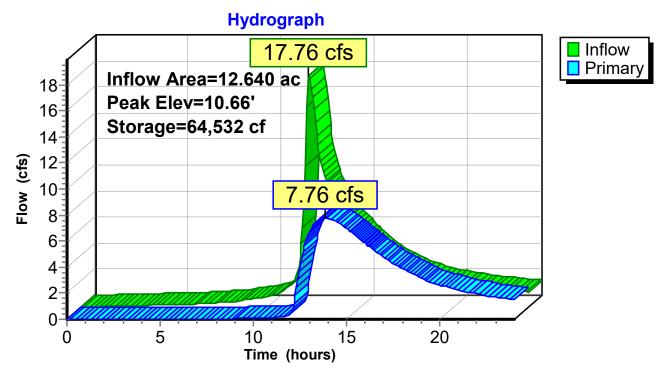
Inflow Area =	12.640 ac, 32.83% Impervious, Inflow Depth > 4.59" for 100 YR CM event	
Inflow =	17.76 cfs @ 12.23 hrs, Volume=	
Outflow =	7.76 cfs @ 13.87 hrs, Volume= 4.092 af, Atten= 56%, Lag= 98.6 min	
Primary =	7.76 cfs @ 13.87 hrs, Volume= 4.092 af	

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 10.66' @ 13.87 hrs Surf.Area= 0 sf Storage= 64,532 cf

Plug-Flow detention time= 171.9 min calculated for 4.080 af (84% of inflow) Center-of-Mass det. time= 104.8 min (991.3 - 886.4)

Volume	Inve	rt Avail.Stor	age Storage	Description							
#1	9.6	7' 87,36	0 cf Custom	Stage Data Listed below							
Elevatio	et) (ci	um.Store ubic-feet)									
9.6		0									
10.0	00	20,120									
11.0	00	87,360									
Device	Routing	Invert	Outlet Device:	5							
#1	Primary	10.00'	4.0' Iong Sha	p-Crested Rectangular Weir	2 End Contraction(s)						
#2	Primary	9.67'	•	p-Crested Rectangular Weir							
	<b>Primary OutFlow</b> Max=7.76 cfs @ 13.87 hrs HW=10.66' (Free Discharge) <b>1=Sharp-Crested Rectangular Weir</b> (Weir Controls 6.79 cfs @ 2.66 fps)										

**1=Sharp-Crested Rectangular Weir** (Weir Controls 6.79 cfs @ 2.66 fps) **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.97 cfs @ 3.25 fps)



Pond Lake2: Lake 2

#### Summary for Pond Lake3: Lake 3

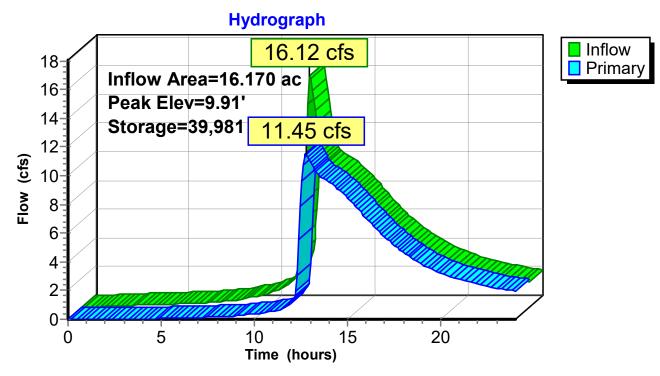
[79] Warning: Submerged Pond Lake2 Primary device # 2 by 0.24'

Inflow Area =	16.170 ac, 37.85% Impervious, Inflow D	epth > 4.53" for 100 YR CM event
Inflow =	16.12 cfs @ 12.23 hrs, Volume=	6.098 af
Outflow =	11.45 cfs @   12.76 hrs,  Volume=	5.403 af, Atten= 29%, Lag= 32.0 min
Primary =	11.45 cfs @   12.76 hrs,  Volume=	5.403 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.91' @ 12.76 hrs Surf.Area= 0 sf Storage= 39,981 cf

Plug-Flow detention time= 100.6 min calculated for 5.387 af (88% of inflow) Center-of-Mass det. time= 49.7 min ( 971.0 - 921.2 )

Volume	Inve	ert Avail.Sto	orage Storage Description
#1	8.6	0' 69,3	310 cf Custom Stage Data Listed below
Elevatio (fee 8.6 9.0 10.0 10.8	et) (c 60 00 00	Cum.Store <u>ubic-feet)</u> 0 11,585 42,767 69,310	
Device	Routing	Invert	Outlet Devices
#1	Primary	9.60'	
#2	Primary	9.60'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#3	Primary	8.60'	0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	8.60'	0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
-1=Sh -2=Sh -3=Sh	arp-Crest arp-Crest arp-Crest	ed Rectangula ed Rectangula ed Rectangula	s @ 12.76 hrs HW=9.91' (Free Discharge) ar Weir (Weir Controls 6.74 cfs @ 1.82 fps) ar Weir (Weir Controls 2.22 cfs @ 1.82 fps) ar Weir (Weir Controls 1.23 cfs @ 3.74 fps) ar Weir (Weir Controls 1.23 cfs @ 3.74 fps)



Pond Lake3: Lake 3

#### Summary for Pond Lake4&5: Lake 4 & 5

[79] Warning: Submerged Pond Lake3 Primary device # 3 by 0.72' [79] Warning: Submerged Pond Lake3 Primary device # 4 by 0.72'

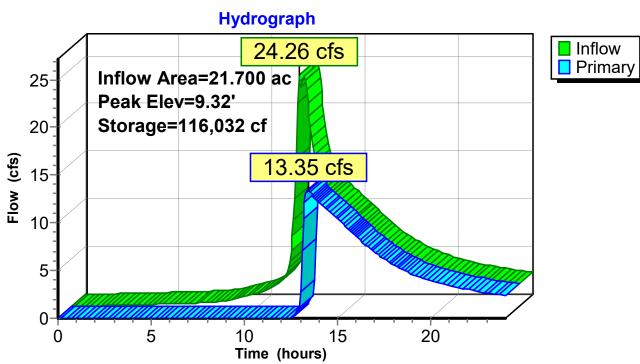
Inflow Area =	21.700 ac, 35.48% Impervious, Inflow E	Depth > 4.52" for 100 YR CM event
Inflow =	24.26 cfs @ 12.20 hrs, Volume=	8.180 af
Outflow =	13.35 cfs @ 13.40 hrs, Volume=	5.648 af, Atten= 45%, Lag= 72.1 min
Primary =	13.35 cfs @ 13.40 hrs, Volume=	5.648 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.32' @ 13.40 hrs Surf.Area= 57,817 sf Storage= 116,032 cf

Plug-Flow detention time= 215.2 min calculated for 5.632 af (69% of inflow) Center-of-Mass det. time= 100.6 min (1,013.4 - 912.8)

Volume	Inv	vert Avail.S	torage Stor	age Description	
#1	7	.00' 126,	192 cf Cus	cf Custom Stage Data (Prismatic) Listed below	
Elevatio (fee		Surf.Area (sq-ft)	Inc.Store (cubic-feet	••••••••	
7.0	40	27,767 46,551	) 14,864 29,249	,	
8.0 9.0 9.5	00	55,842		944,113497,5076126,192	
Device	Routing	l Inve	t Outlet De	vices	
#1	Primary	9.20	Head (fee	et) 0.20 0.40 0.60	Broad-Crested Rectangular Weir 0.80 1.00 1.20 1.40 1.60 .70 2.64 2.63 2.64 2.64 2.63
#2	Primary	v 8.60	· ·	t. Orifice/Grate C=	

Primary OutFlow Max=13.27 cfs @ 13.40 hrs HW=9.32' (Free Discharge) 1=Broad-Crested Rectangular Weir (Weir Controls 11.52 cfs @ 0.94 fps) 2=Orifice/Grate (Orifice Controls 1.76 cfs @ 2.89 fps)

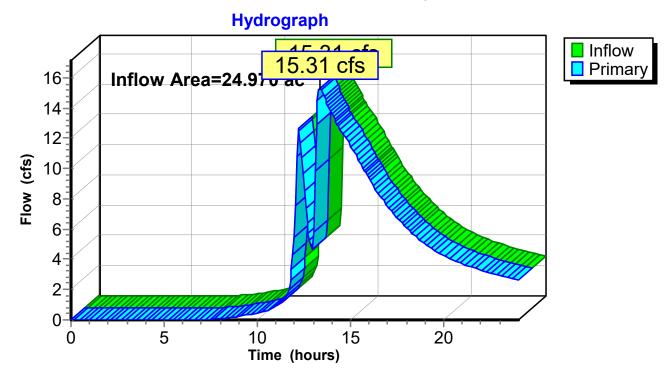


Pond Lake4&5: Lake 4 & 5

## Summary for Link 1L: Combo Discharge

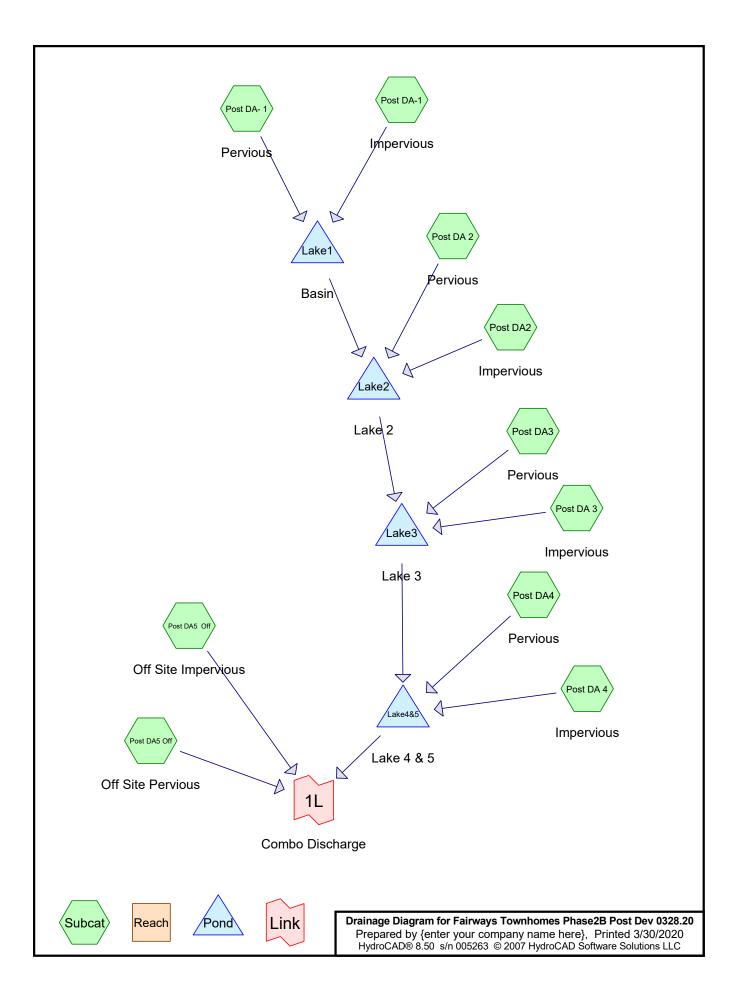
Inflow Area	a =	24.970 ac, 30.84% Impervious, Inflow Depth > 3.45" for 100 YR CM event
Inflow	=	15.31 cfs @ 13.37 hrs, Volume= 7.182 af
Primary	=	15.31 cfs @ 13.37 hrs, Volume= 7.182 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs



## Link 1L: Combo Discharge

**Post-Development Calculations** 



# Fairways Townhomes Phase2B Post Dev 0328.20

Prepared by {enter your company name here}	
HydroCAD® 8.50 s/n 005263 © 2007 HydroCAD Software Solutions LLC	

# Area Listing (all nodes)

Area	CN	Description			
(acres)		(subcatchment-numbers)			
0.080	30	Woods, Good, HSG A (Post DA 2)			
1.010	39	>75% Grass cover, Good, HSG A (Post DA 2,Post DA- 1)			
0.650	55	Woods, Good, HSG B (Post DA 2,Post DA4)			
0.370	58	Woods/grass comb., Good, HSG B (Post DA- 1)			
7.320	61	>75% Grass cover, Good, HSG B (Post DA 2,Post DA- 1,Post DA3,Post DA4)			
0.220	70	Woods, Good, HSG C (Post DA4)			
0.100	72	Woods/grass comb., Good, HSG C (Post DA5 Off)			
6.350	74	>75% Grass cover, Good, HSG C (Post DA 2,Post DA- 1,Post DA3,Post DA4,Post DA5 Off)			
0.350	98	Cart Paths (Post DA 4,Post DA2)			
0.090	98	Impervious (Post DA5 Off)			
3.920	98	Paved parking & roofs (Post DA 3,Post DA 4,Post DA-1)			
0.090	98	Townhouse (Post DA2)			
4.420	98	Water Surface (Post DA 3,Post DA 4,Post DA-1,Post DA2)			
24.970		TOTAL AREA			

## Soil Listing (all nodes)

Area	Soil	Subcatchment
 (acres)	Goup	Numbers
1.090	HSG A	Post DA 2, Post DA- 1
8.340	HSG B	Post DA 2, Post DA- 1, Post DA3, Post DA4
6.670	HSG C	Post DA 2, Post DA- 1, Post DA3, Post DA4, Post DA5 Off
0.000	HSG D	
8.870	Other	Post DA 3, Post DA 4, Post DA-1, Post DA2, Post DA5 Off
24.970		TOTAL AREA

Fairways Townhomes Phase2B Post Dev 0328.20 Prepared by {enter your company name here}

NJ DEP 2-hr 1 YR WQ Rainfall=1.25" Printed 3/30/2020 HydroCAD® 8.50 s/n 005263 © 2007 HydroCAD Software Solutions LLC Page 4

#### Time span=0.00-24.00 hrs, dt=0.07 hrs, 344 points Runoff by SCS TR-20 method, UH=Delmarva Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Post DA 2: Pervious Runoff Area=3.110 ac 0.00% Impervious Runoff Depth=0.00" Flow Length=100' Slope=0.0100 '/' Tc=12.7 min CN=55 Runoff=0.00 cfs 0.000 af Subcatchment Post DA 3: Impervious Runoff Area=1.970 ac 100.00% Impervious Runoff Depth=1.03" Tc=10.0 min CN=98 Runoff=3.61 cfs 0.170 af Runoff Area=2.660 ac 100.00% Impervious Runoff Depth=1.03" **Subcatchment Post DA 4: Impervious** Tc=10.0 min CN=98 Runoff=4.88 cfs 0.229 af Runoff Area=5.380 ac 0.00% Impervious Runoff Depth=0.00" Subcatchment Post DA-1: Pervious Tc=15.0 min CN=62 Runoff=0.00 cfs 0.000 af Runoff Area=2.480 ac 100.00% Impervious Runoff Depth=1.03" Subcatchment Post DA-1: Impervious Tc=10.0 min CN=98 Runoff=4.55 cfs 0.214 af Runoff Area=1.670 ac 100.00% Impervious Runoff Depth=1.03" Subcatchment Post DA2: Impervious Tc=10.0 min CN=98 Runoff=3.06 cfs 0.144 af Runoff Area=1.560 ac 0.00% Impervious Runoff Depth=0.01" Subcatchment Post DA3: Pervious Flow Length=100' Slope=0.0100 '/' Tc=18.5 min CN=66 Runoff=0.02 cfs 0.001 af Subcatchment Post DA4: Pervious Runoff Area=3.240 ac 0.00% Impervious Runoff Depth=0.02" Flow Length=100' Slope=0.0100 '/' Tc=12.7 min CN=68 Runoff=0.08 cfs 0.005 af Subcatchment Post DA5 Off: Off Site Runoff Area=0.090 ac 100.00% Impervious Runoff Depth=1.03" Flow Length=75' Slope=0.0150 '/' Tc=12.5 min CN=98 Runoff=0.15 cfs 0.008 af Subcatchment Post DA5 Off: Off Site Runoff Area=2.810 ac 0.00% Impervious Runoff Depth=0.07" Flow Length=75' Slope=0.0150 '/' Tc=12.5 min CN=74 Runoff=0.23 cfs 0.017 af Peak Elev=10.87' Storage=8,887 cf Inflow=4.55 cfs 0.214 af Pond Lake1: Basin Outflow=0.11 cfs 0.123 af Pond Lake2: Lake 2 Peak Elev=9.79' Storage=7,281 cf Inflow=3.09 cfs 0.267 af Outflow=0.06 cfs 0.114 af Pond Lake3: Lake 3 Peak Elev=8.83' Storage=6,523 cf Inflow=3.62 cfs 0.285 af Outflow=0.32 cfs 0.235 af Pond Lake4&5: Lake 4 & 5 Peak Elev=7.51' Storage=20,455 cf Inflow=4.96 cfs 0.470 af Outflow=0.00 cfs 0.000 af Inflow=0.34 cfs 0.025 af Link 1L: Combo Discharge Primary=0.34 cfs 0.025 af

> Total Runoff Area = 24.970 ac Runoff Volume = 0.788 af Average Runoff Depth = 0.38" 64.48% Pervious = 16.100 ac 35.52% Impervious = 8.870 ac

#### Summary for Subcatchment Post DA 2: Pervious

[45] Hint: Runoff=Zero

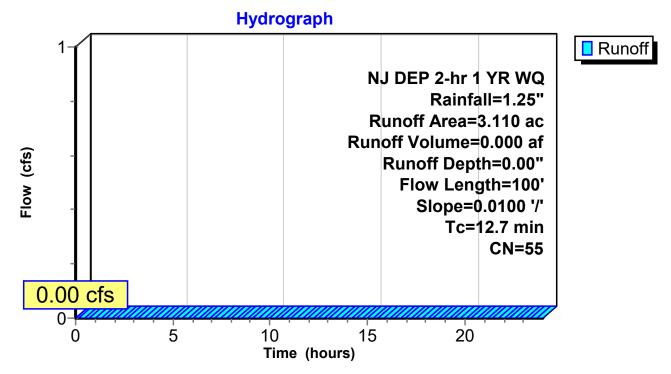
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

Area (ac)	С	N Dese	Description				
1.000	3	9 >759	>75% Grass cover, Good, HSG A				
1.340	6	51 >75 <sup>9</sup>	% Grass co	over, Good	, HSG B		
0.590	7	′4 >75°	% Grass co	over, Good	, HSG C		
0.080	3	0 Woo	ods, Good,	HSG A			
0.100	5	5 Woo	ds, Good,	HSG B			
3.110	5	5 Weig	ghted Aver	age			
3.110		Perv	vious Area	-			
Tc Lei	ngth	Slope	Velocity	Capacity	Description		
<u>(min)</u> (f	eet)	(ft/ft)	(ft/sec)	(cfs)			
12.7	100	0.0100	0.13		Sheet Flow, Unpaved		

Sheet Flow, Unpaved Grass: Short n= 0.150 P2= 3.30"

#### **Subcatchment Post DA 2: Pervious**



Flow (cfs)

2

1

0

0

5

10

Time (hours)

15

#### **Summary for Subcatchment Post DA 3: Impervious**

Runoff = 3.61 cfs @ 1.18 hrs, Volume= 0.170 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

Area (ac)	CN Des	cription					
0.630		ter Surface					
1.340	98 Pav	ed parking	& roofs				
1.970		ighted Ave					
1.970	Imp	ervious Are	ea				
Tc Leng (min) (fe		Velocity (ft/sec)	Capacity (cfs)	Descriptior	ı		
10.0		(1.000)	(010)	Direct Ent	ry, Paved		
		Subc	atchment	Post DA	3: Impervious	S	
		Subc	atchment Hydrogr		3: Imperviou	S	
3.6	1 cfs	Subc			3: Imperviou	S	Runoff
<mark>3.6</mark>	1 cfs	Subc		aph	3: Impervious DEP 2-hr 1		Runoff
<b>3.6</b>	1 cfs	Subc		aph	DEP 2-hr 1	YR WQ	Runoff
<mark>3.6</mark> 3-	1 cfs	Subc		aph NJ	DEP 2-hr 1	YR WQ II=1.25"	Runoff

Runoff Volume=0.170 af

Runoff Depth=1.03"

20

Tc=10.0 min

**CN=98** 

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### **Summary for Subcatchment Post DA 4: Impervious**

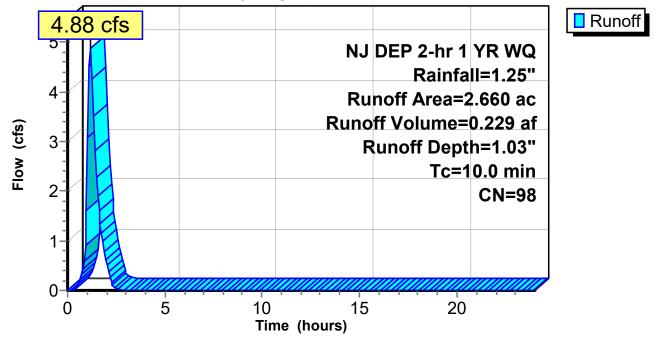
Runoff = 4.88 cfs @ 1.18 hrs, Volume= 0.229 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

	Area	(ac)	CN	Desc	cription		
*	0.	100	98	Cart	Paths		
	1.	260	98	Pave	ed parking	& roofs	
	1.	300	98	Wate	er Surface		
		660 660	98		ghted Aver ervious Are	0	
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	10.0						Direct Entry, Paved

#### Subcatchment Post DA 4: Impervious

### Hydrograph



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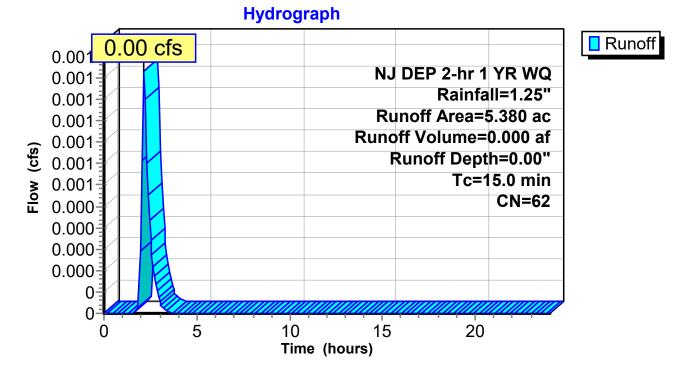
#### Summary for Subcatchment Post DA- 1: Pervious

Runoff = 0.00 cfs @ 2.14 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

Area	(ac)	CN	Desc	Description				
0.	010	39	>759	>75% Grass cover, Good, HSG A				
4.	320	61	>759	% Grass co	over, Goo	od, HSG B		
0.	680	74	>759	% Grass co	over, Goo	od, HSG C		
0.	370	58	Woo	ds/grass o	omb., Go	ood, HSG B		
5.	380	62	Weig	Weighted Average				
5.	380		Perv	ious Area				
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)			
15.0						Direct Entry, Grass		

### **Subcatchment Post DA-1: Pervious**



#### Summary for Subcatchment Post DA-1: Impervious

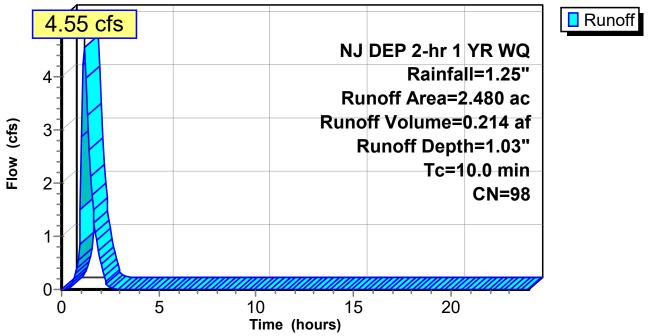
Runoff = 4.55 cfs @ 1.18 hrs, Volume= 0.214 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

Are	ea (ac)	CN	Desc	cription			
	1.160	98	Wate	er Surface			
	1.320	98	Pave	ed parking	& roofs		
	2.480	98	Weig	ghted Aver	age		
	2.480 I			ervious Are	ea		
	Tc Leng		Slope	Velocity	Capacity	Description	
(mi	n) (fee	et)	(ft/ft)	(ft/sec)	(cfs)		
10	.0					Direct Entry, Paved	

#### Subcatchment Post DA-1: Impervious

## Hydrograph



#### **Summary for Subcatchment Post DA2: Impervious**

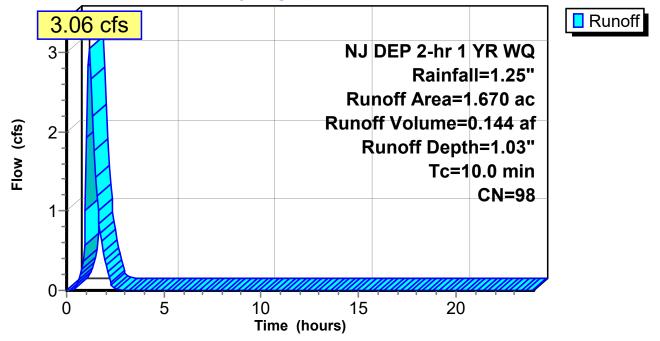
Runoff = 3.06 cfs @ 1.18 hrs, Volume= 0.144 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

	Area	(ac)	CN	Desc	cription		
*	0.	250	98	Cart	Paths		
	1.	330	98	Wate	er Surface		
*	0.	090	98	Tow	nhouse		
	1.	670	98	Weig	ghted Aver	age	
	1.670 Impervious Ar			ervious Are	a		
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	10.0						Direct Entry, Paved

#### Subcatchment Post DA2: Impervious

Hydrograph



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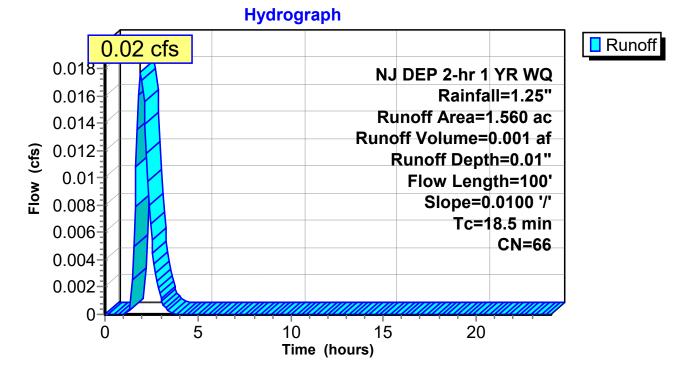
#### **Summary for Subcatchment Post DA3: Pervious**

Runoff = 0.02 cfs @ 1.92 hrs, Volume= 0.001 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

	Area	(ac) (	CN I	Desc	cription		
1.000 61 >75% Grass co					% Grass co	over, Good	, HSG B
_	0.	560	74 ።	>75%	% Grass co	over, Good	, HSG C
	1.	560	66 V	Weig	ghted Aver	age	
	1.	560	I	Perv	ious Area		
	Tc (min)	Length (feet)		ope t/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	18.5	100	0.01	100	0.09		Sheet Flow, Unpaved
							Grass: Dense n= 0.240 P2= 3.30"

#### Subcatchment Post DA3: Pervious



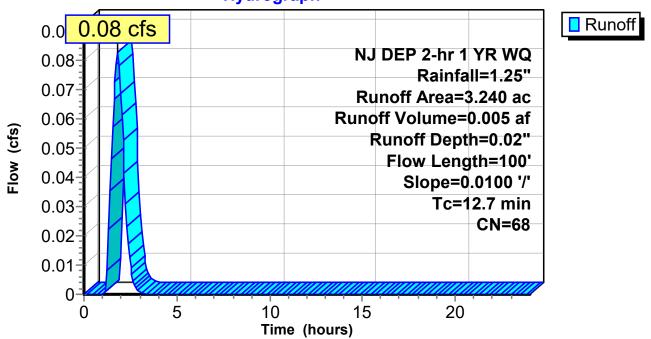
#### **Summary for Subcatchment Post DA4: Pervious**

1.82 hrs, Volume= 0.005 af, Depth= 0.02" Runoff 0.08 cfs @ =

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

	Area (ac) CN Description							
	0.0	660	61	>75%	% Grass co	over, Good	, HSG B	
	1.8	810	74	>75%	% Grass co	over, Good	, HSG C	
	0.	550	55	Woo	ds, Good,	HSG B		
	0.2	220	70	Woo	ds, Good,	HSG C		
3.240 68 Weighted Average								
	3.240 Pervious Area					•		
	Тс	Longth		Slope	Velocity	Capacity	Description	
(	(min)	Length (feet		(ft/ft)	(ft/sec)	(cfs)	Description	
	12.7	100	/	0100	0.13	(010)	Sheet Flow, Unpaved	
	/	100	, 0.	0.00	0.10		Grass: Short n= 0.150	P2= 3.30"

#### **Subcatchment Post DA4: Pervious**

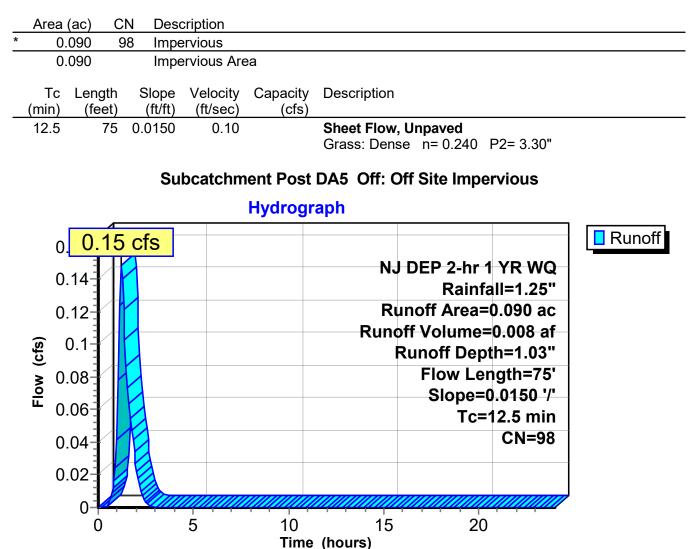


# Hydrograph

#### Summary for Subcatchment Post DA5 Off: Off Site Impervious

Runoff = 0.15 cfs @ 1.21 hrs, Volume= 0.008 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"



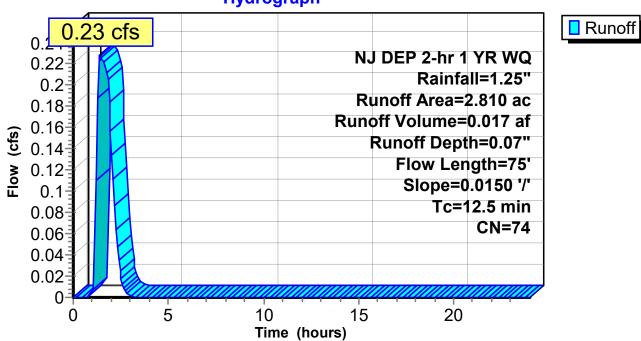
#### Summary for Subcatchment Post DA5 Off: Off Site Pervious

Runoff = 0.23 cfs @ 1.41 hrs, Volume= 0.017 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs NJ DEP 2-hr 1 YR WQ Rainfall=1.25"

_	Area (ac) CN Description						
2.710 74 >75% Grass cover, Good, HSG C						, HSG C	
0.100 72 Woods/grass comb., Good, HSG C						d, HSG C	
	2.	810	74	Weig	ghted Aver	age	
	2.810 Per				ious Area		
	Tc (min)	Length (feet		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	12.5	75	5 0.	0150	0.10		Sheet Flow, Unpaved Grass: Dense n= 0.240 P2= 3.30"

#### Subcatchment Post DA5 Off: Off Site Pervious



Hydrograph

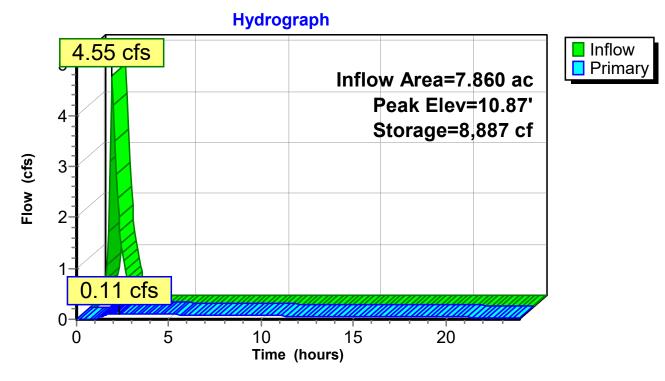
### Summary for Pond Lake1: Basin

Inflow Area =	7.860 ac, 31.55% Impervious, Inflow	Depth = 0.33" for 1 YR WQ event
Inflow =	4.55 cfs @ 1.18 hrs, Volume=	0.214 af
Outflow =	0.11 cfs @ 2.31 hrs, Volume=	0.123 af, Atten= 98%, Lag= 68.0 min
Primary =	0.11 cfs @ 2.31 hrs, Volume=	0.123 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 10.87' @ 2.31 hrs Surf.Area= 0 sf Storage= 8,887 cf

Plug-Flow detention time= 559.5 min calculated for 0.123 af (57% of inflow) Center-of-Mass det. time= 546.5 min ( 626.6 - 80.1 )

Volume	Invert	Avail.Stora	ge Storage Description							
#1	10.70'	137,878	cf Custom Stage Data Listed below							
Elevatic (fee 10.7 11.0 12.0	t) (cubic 70 00 1 00 6	0 5,300 5,780								
13.0 13.7		8,459 7,878								
Device	Routing	,	Dutlet Devices							
#1 #2	Primary Primary		2.0' Iong Sharp-Crested Rectangular Weir 2 End Contraction(s) 2.5' Iong Sharp-Crested Rectangular Weir 2 End Contraction(s)							
1=Sh	Primary OutFlow Max=0.11 cfs @ 2.31 hrs HW=10.87' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs) -2=Sharp-Crested Rectangular Weir (Weir Controls 0.11 cfs @ 1.37 fps)									



## Pond Lake1: Basin

# Summary for Pond Lake2: Lake 2

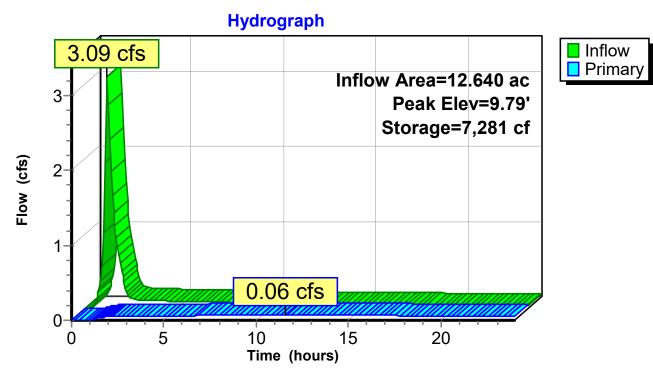
Inflow Area =	12.640 ac, 32.83% Impervious, Inflow I	Depth > 0.25" for 1 YR WQ event
Inflow =	3.09 cfs @ 1.18 hrs, Volume=	0.267 af
Outflow =	0.06 cfs @ 11.62 hrs, Volume=	0.114 af, Atten= 98%, Lag= 626.1 min
Primary =	0.06 cfs @ 11.62 hrs, Volume=	0.114 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.79' @ 11.62 hrs Surf.Area= 0 sf Storage= 7,281 cf

Plug-Flow detention time= 694.5 min calculated for 0.114 af (43% of inflow) Center-of-Mass det. time= 434.9 min (766.6 - 331.7)

Volume	Inve	ert Avail.St	orage	Storage Description				
#1	9.6	9.67' 87,36		Custom Stage Data Listed below				
Elevatio (fee		Cum.Store cubic-feet)						
9.6	67	0						
10.0	00	20,120						
11.0	00	87,360						
Device	Routing	Inver	Out	let Devices				
#1	Primary	10.00	4.0'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)			
#2	Primary	9.67		long Sharp-Crested Rectangular Weir	( )			
·	Primary OutFlow Max=0.06 cfs @ 11.62 hrs HW=9.79' (Free Discharge) 1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)							

-2=Sharp-Crested Rectangular Weir (Weir Controls 0.06 cfs @ 1.13 fps)



Pond Lake2: Lake 2

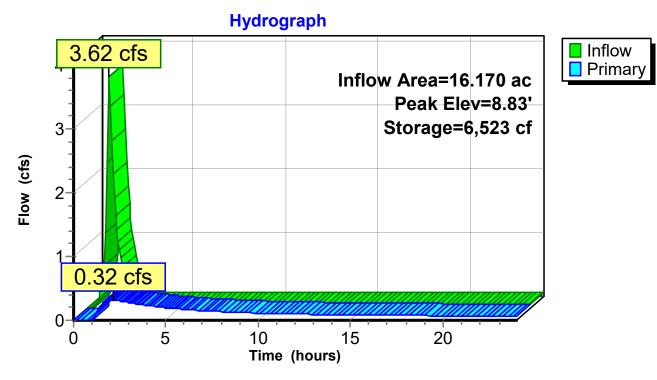
# Summary for Pond Lake3: Lake 3

Inflow Area =	16.170 ac, 37.85% Impervious, Inflow I	Depth > 0.21" for 1 YR WQ event
Inflow =	3.62 cfs @ 1.18 hrs, Volume=	0.285 af
Outflow =	0.32 cfs @ 2.12 hrs, Volume=	0.235 af, Atten= 91%, Lag= 56.6 min
Primary =	0.32 cfs @  2.12 hrs,  Volume=	0.235 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 8.83' @ 2.12 hrs Surf.Area= 0 sf Storage= 6,523 cf

Plug-Flow detention time= 378.5 min calculated for 0.235 af (83% of inflow) Center-of-Mass det. time= 213.0 min ( 567.8 - 354.8 )

Volume	Inve	ert Ava	il.Storag	ge Storage Description
#1	8.6	60'	69,310	cf Custom Stage Data Listed below
Elevatio (fee 8.6	et) (d	Cum.Store cubic-feet) 0		
9.0		11,585		
10.0		42,767		
10.8	30	69,310		
Device #1 #2 #3 #4	Routing Primary Primary Primary Primary	( ( (	9.60' <b>1</b> 9.60' <b>4</b> 3.60' <b>0</b>	Outlet Devices2.0' long Sharp-Crested Rectangular Weir2 End Contraction(s)2.0' long Sharp-Crested Rectangular Weir2 End Contraction(s)2.5' long Sharp-Crested Rectangular Weir2 End Contraction(s)2.5' long Sharp-Crested Rectangular Weir2 End Contraction(s)2.5' long Sharp-Crested Rectangular Weir2 End Contraction(s)
-1=Sh -2=Sh -3=Sh	arp-Crest arp-Crest arp-Crest	ed Rectan ed Rectan ed Rectan	igular W igular W igular W	2.12 hrs HW=8.83' (Free Discharge) /eir (Controls 0.00 cfs) /eir (Controls 0.00 cfs) /eir (Weir Controls 0.16 cfs @ 1.55 fps) /eir (Weir Controls 0.16 cfs @ 1.55 fps)



Pond Lake3: Lake 3

# Summary for Pond Lake4&5: Lake 4 & 5

Inflow Area =	22.070 ac, 39.78% Impervious, Inflow I	Depth > 0.26" for 1 YR WQ event
Inflow =	4.96 cfs @ 1.18 hrs, Volume=	0.470 af
Outflow =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af, Atten= 100%, Lag= 0.0 min
Primary =	0.00 cfs @  0.00 hrs,  Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 7.51' @ 24.01 hrs Surf.Area= 47,391 sf Storage= 20,455 cf

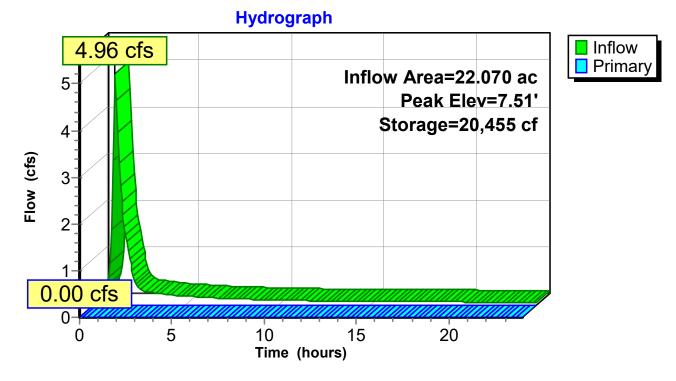
Plug-Flow detention time= (not calculated: initial storage excedes outflow) Center-of-Mass det. time= (not calculated: no outflow)

Volume	Inve	ert Avail.Sto	rage Storage	e Description
#1	7.0	0' 126,19	92 cf Custom	n Stage Data (Prismatic) Listed below
Elevatio (fee		Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
7.0	00	27,767	0	0
7.4	40	46,551	14,864	14,864
8.0	00	50,946	29,249	44,113
9.0	00	55,842	53,394	97,507
9.5	50	58,900	28,686	126,192
Device	Routing	Invert	Outlet Device	es
#1	Primary	9.20'	Head (feet)	<b>x 20.0' breadth Broad-Crested Rectangular Weir</b> 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
#2	Drimony	0.00'	, ο	sh) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	9.00'	4.0 10119 5118	arp-Crested Rectangular Weir 2 End Contraction(s)
Primary	OutFlow	Max=0.00 cfs (	@ 0.00 hrs HV	N=7.00' (Free Discharge)

-1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond Lake4&5: Lake 4 & 5

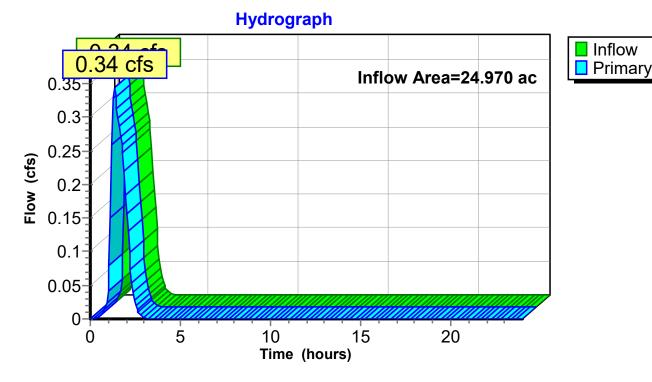


# Summary for Link 1L: Combo Discharge

Inflow Area	=	24.970 ac, 35	5.52% Impervious,	Inflow Depth =	0.01"	for 1 YR WQ event
Inflow =	=	0.34 cfs @	1.33 hrs, Volume	e 0.025 a	af	
Primary =	=	0.34 cfs @	1.33 hrs, Volume	e= 0.025 a	af, Atte	en= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs

# Link 1L: Combo Discharge



**Fairways Townhomes Phase2B Post Dev 0328.20** Prepared by {enter your company name here} Type III 24-hr 2 YR CM Rainfall=3.30" Printed 3/30/2020 LC Page 24

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Time span=0.00-24.00 hrs, dt=0.07 hrs, 344 points Runoff by SCS TR-20 method, UH=Delmarva Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Post DA 2: Pervious Flow Length=100'	Runoff Area=3.110 ac 0.00% Impervious Runoff Depth>0.28" Slope=0.0100 '/' Tc=12.7 min CN=55 Runoff=0.28 cfs 0.072 af
Subcatchment Post DA 3: Impervious	Runoff Area=1.970 ac 100.00% Impervious Runoff Depth>3.06" Tc=10.0 min CN=98 Runoff=4.15 cfs 0.503 af
Subcatchment Post DA 4: Impervious	Runoff Area=2.660 ac 100.00% Impervious Runoff Depth>3.06" Tc=10.0 min CN=98 Runoff=5.61 cfs 0.679 af
Subcatchment Post DA- 1: Pervious	Runoff Area=5.380 ac 0.00% Impervious Runoff Depth>0.52" Tc=15.0 min CN=62 Runoff=1.26 cfs 0.233 af
Subcatchment Post DA-1: Impervious	Runoff Area=2.480 ac 100.00% Impervious Runoff Depth>3.06" Tc=10.0 min CN=98 Runoff=5.23 cfs 0.633 af
Subcatchment Post DA2: Impervious	Runoff Area=1.670 ac 100.00% Impervious Runoff Depth>3.06" Tc=10.0 min CN=98 Runoff=3.52 cfs 0.426 af
Subcatchment Post DA3: Pervious Flow Length=100'	Runoff Area=1.560 ac 0.00% Impervious Runoff Depth>0.69" Slope=0.0100 '/' Tc=18.5 min CN=66 Runoff=0.50 cfs 0.089 af
Subcatchment Post DA4: Pervious Flow Length=100'	Runoff Area=3.240 ac 0.00% Impervious Runoff Depth>0.78" Slope=0.0100 '/' Tc=12.7 min CN=68 Runoff=1.45 cfs 0.211 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=0.090 ac 100.00% Impervious Runoff Depth>3.06" Slope=0.0150 '/' Tc=12.5 min CN=98 Runoff=0.17 cfs 0.023 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=2.810 ac 0.00% Impervious Runoff Depth>1.10" Slope=0.0150 '/' Tc=12.5 min CN=74 Runoff=1.97 cfs 0.257 af
Pond Lake1: Basin	Peak Elev=11.19' Storage=24,838 cf Inflow=6.09 cfs 0.866 af Outflow=0.45 cfs 0.407 af
Pond Lake2: Lake 2	Peak Elev=10.05' Storage=23,609 cf Inflow=3.77 cfs 0.905 af Outflow=0.48 cfs 0.369 af
Pond Lake3: Lake 3	Peak Elev=9.07' Storage=13,892 cf Inflow=4.56 cfs 0.961 af Outflow=0.86 cfs 0.724 af
Pond Lake4&5: Lake 4 & 5	Peak Elev=8.49' Storage=70,231 cf Inflow=7.39 cfs 1.614 af Outflow=0.00 cfs 0.000 af
Link 1L: Combo Discharge	Inflow=2.14 cfs 0.280 af Primary=2.14 cfs 0.280 af
<b>-</b> / · <b>- -</b> · · · · · · · · ·	

Total Runoff Area = 24.970 ac Runoff Volume = 3.126 af Average Runoff Depth = 1.50" 64.48% Pervious = 16.100 ac 35.52% Impervious = 8.870 ac

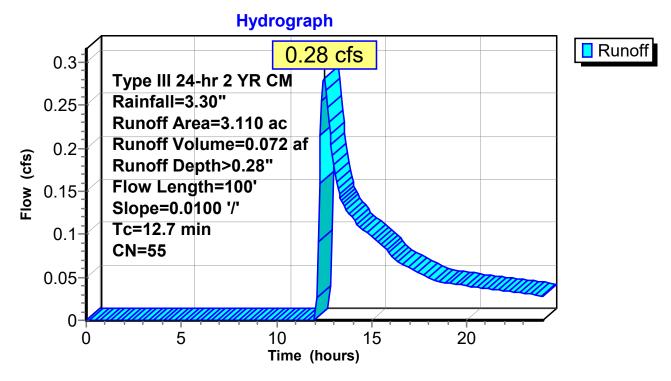
# **Summary for Subcatchment Post DA 2: Pervious**

Runoff = 0.28 cfs @ 12.51 hrs, Volume= 0.072 af, Depth> 0.28"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

_	Area	(ac)	CN	Desc	cription			
	1.	000	39	) >75%	% Grass co	over, Good	, HSG A	
	1.	340	61	l >75%	% Grass co	over, Good	, HSG B	
	0.	590	74	4 >75%	% Grass co	over, Good	, HSG C	
	0.	080	30	) Woo	ds, Good,	HSG A		
	0.	100	55	5 Woo	ds, Good,	HSG B		
	3.	110	55	5 Weig	ghted Aver	age		
	3.	110		Perv	ious Area			
	-			0		0		
	ŢĊ	Leng		Slope	Velocity	Capacity	Description	
	(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)		
	12.7	10	00	0.0100	0.13		Sheet Flow, Unpaved	
							Grass: Short n= 0.150	P2= 3.30"

#### **Subcatchment Post DA 2: Pervious**



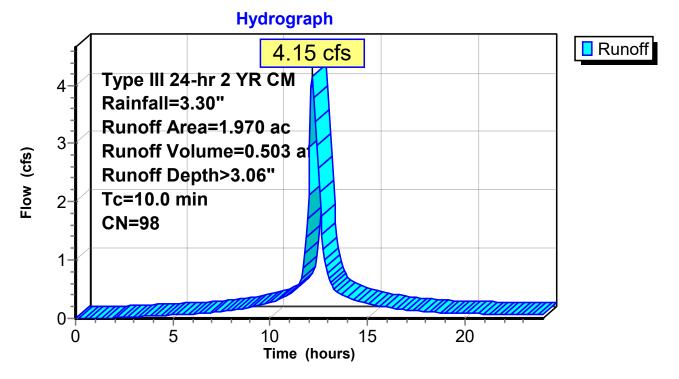
# Summary for Subcatchment Post DA 3: Impervious

Runoff = 4.15 cfs @ 12.17 hrs, Volume= 0.503 af, Depth> 3.06"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

 Area	(ac)	CN	Desc	cription		
0.	630	98	Wate	er Surface		
 1.	340	98	Pave	ed parking	& roofs	
 1.	970	98	Weig	ghted Aver	age	
1.	970		Impe	rvious Are	a	
Тс	Leng	th	Slope	Velocity	Capacity	Description
 (min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
 10.0						Direct Entry, Paved

# Subcatchment Post DA 3: Impervious



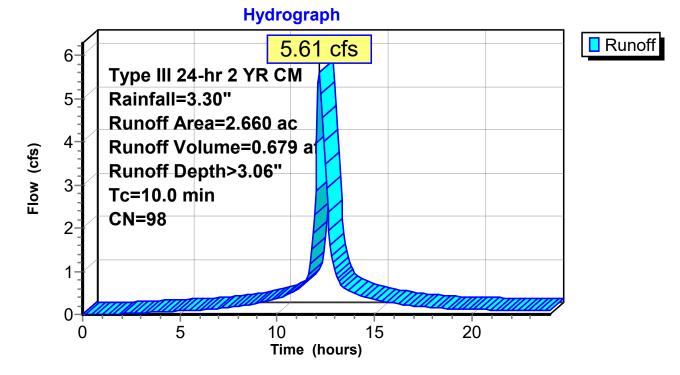
# Summary for Subcatchment Post DA 4: Impervious

Runoff = 5.61 cfs @ 12.17 hrs, Volume= 0.679 af, Depth> 3.06"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

	Area	(ac)	CN	Desc	cription		
*	0.	100	98	Cart	Paths		
	1.	260	98	Pave	ed parking	& roofs	
_	1.	300	98	Wate	er Surface		
	2.	2.660 98 Weighted Average					
	2.	660		Impe	ervious Are	ea	
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	10.0						Direct Entry, Paved

#### Subcatchment Post DA 4: Impervious



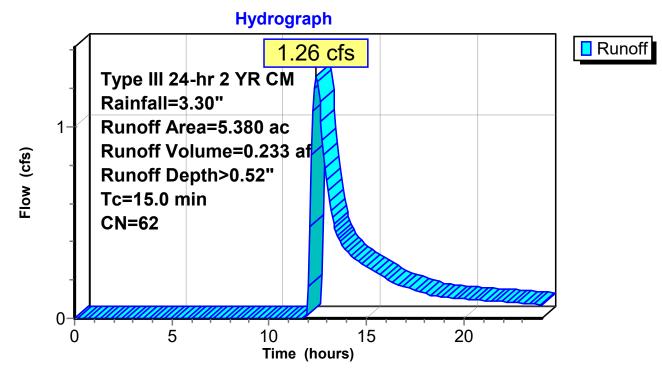
# Summary for Subcatchment Post DA- 1: Pervious

Runoff = 1.26 cfs @ 12.43 hrs, Volume= 0.233 af, Depth> 0.52"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

Area	(ac)	CN	Desc	Description						
0.	.010	39	>75%	% Grass co	over, Good	d, HSG A				
4.	320	61	>75%	% Grass co	over, Good	d, HSG B				
0.	.680	74	>75%	% Grass co	over, Good	d, HSG C				
0.	.370	58	Woo	ds/grass o	omb., Goo	od, HSG B				
5.	5.380 62 Weighted Average									
5.	.380		Perv	ious Area	-					
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description				
15.0						Direct Entry, Grass				

# Subcatchment Post DA- 1: Pervious



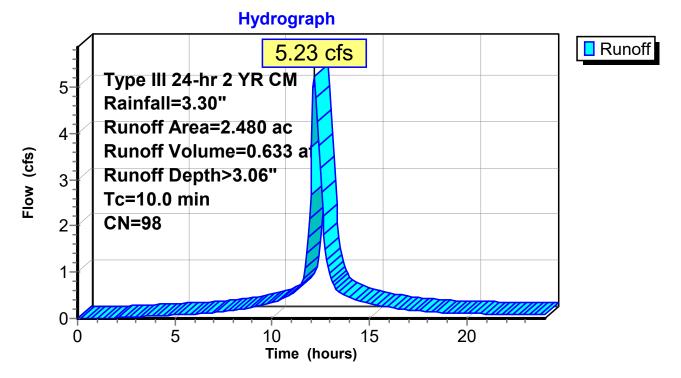
# Summary for Subcatchment Post DA-1: Impervious

Runoff = 5.23 cfs @ 12.17 hrs, Volume= 0.633 af, Depth> 3.06"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

	Area (	ac)	CN	Desc	cription		
	1.1	160	98	Wate	er Surface		
	1.3	320	98	Pave	ed parking	& roofs	
	2.4	180	98	Weig	ghted Aver	age	
	2.4	180		Impe	ervious Are	a	
	Тс	Lengt	th	Slope	Velocity	Capacity	Description
(	min)	(fee	t)	(ft/ft)	(ft/sec)	(cfs)	
	10.0						Direct Entry, Paved

#### Subcatchment Post DA-1: Impervious



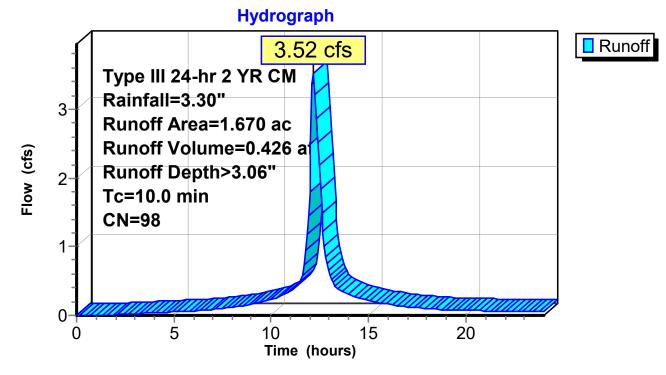
# **Summary for Subcatchment Post DA2: Impervious**

Runoff = 3.52 cfs @ 12.17 hrs, Volume= 0.426 af, Depth> 3.06"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

	Area (	(ac)	CN	Desc	cription		
*	0.2	250	98	Cart	Paths		
	1.3	330	98	Wate	er Surface		
*	0.0	090	98	Tow	nhouse		
		670 670	98		ghted Aver ervious Are		
	1.	010		mpe			
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	10.0						Direct Entry, Paved

#### Subcatchment Post DA2: Impervious



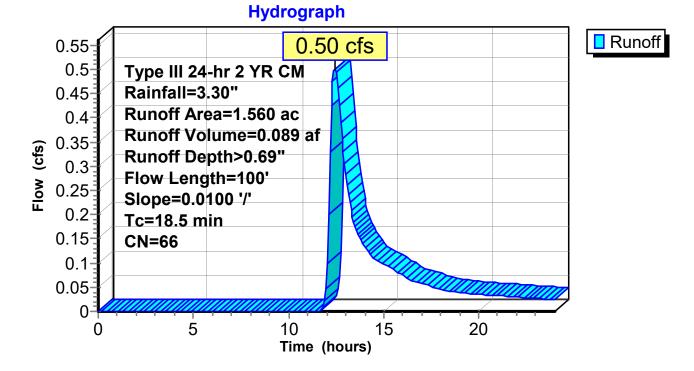
# **Summary for Subcatchment Post DA3: Pervious**

Runoff = 0.50 cfs @ 12.44 hrs, Volume= 0.089 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

Area	(ac)	CN	Desc	ription			
1	.000	61	>75%	6 Grass co	over, Good,	HSG B	
C	.560	74	>75%	6 Grass co	over, Good,	HSG C	
1	.560	66	Weig	hted Aver	age		
1	.560		Perv	ious Area	•		
Tc	5		Slope	Velocity	Capacity	Description	
(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)		
18.5	10	0 0	.0100	0.09		Sheet Flow, Unpaved	
						Grass: Dense n= 0.240	P2= 3.30"

#### Subcatchment Post DA3: Pervious



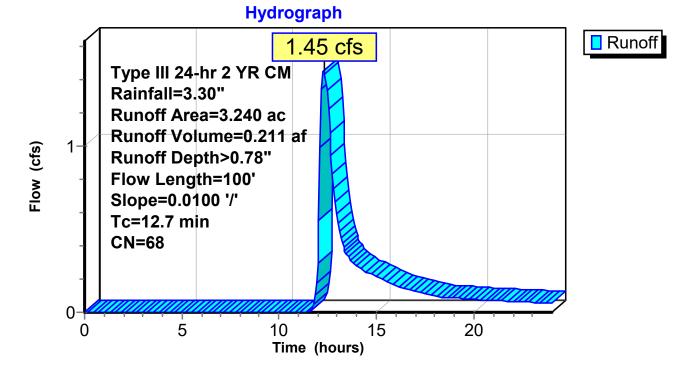
#### Summary for Subcatchment Post DA4: Pervious

Runoff = 1.45 cfs @ 12.29 hrs, Volume= 0.211 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"

 Area (	(ac)	CN	Desc	cription			
0.0	660	61	>75%	% Grass co	over, Good	, HSG B	
1.	810	74	>75%	% Grass co	over, Good	, HSG C	
0.	550	55	Woo	ds, Good,	HSG B		
 0.220 70 Woods, Good, HSG C							
3.	240	68	Weig	ghted Aver	age		
3.240 Pervious Area							
Tc (min)	Lengtł (feet		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
 12.7	100	) 0.	.0100	0.13		<b>Sheet Flow, Unpaved</b> Grass: Short n= 0.150	P2= 3.30"

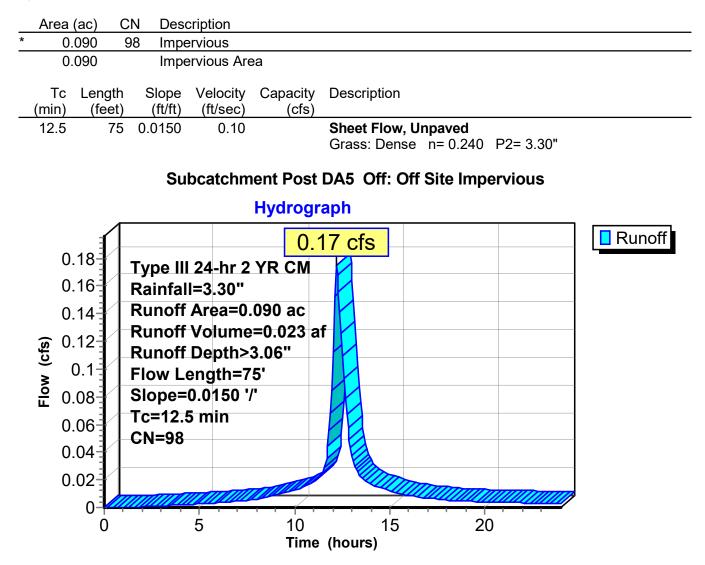
#### Subcatchment Post DA4: Pervious



#### Summary for Subcatchment Post DA5 Off: Off Site Impervious

Runoff = 0.17 cfs @ 12.20 hrs, Volume= 0.023 af, Depth> 3.06"

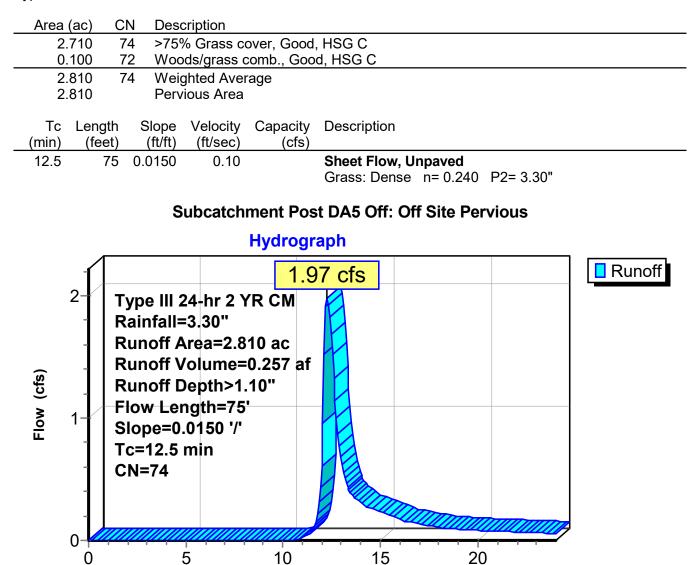
Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"



#### Summary for Subcatchment Post DA5 Off: Off Site Pervious

Runoff = 1.97 cfs @ 12.25 hrs, Volume= 0.257 af, Depth> 1.10"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 2 YR CM Rainfall=3.30"



Time (hours)

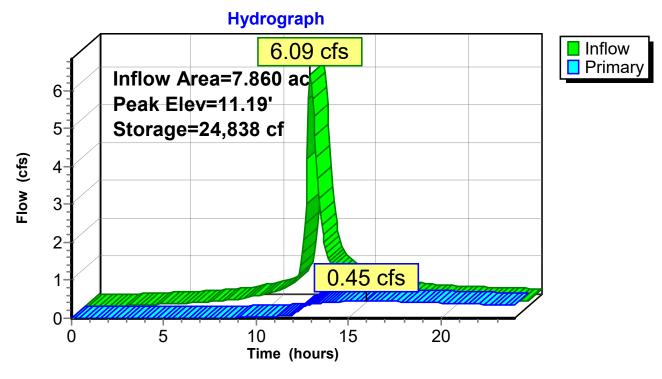
# Summary for Pond Lake1: Basin

Inflow Area =	7.860 ac, 31.55% Impervious, Inflow D	epth > 1.32" for 2 YR CM event
Inflow =	6.09 cfs @ 12.20 hrs, Volume=	0.866 af
Outflow =	0.45 cfs @ 15.97 hrs, Volume=	0.407 af, Atten= 93%, Lag= 226.5 min
Primary =	0.45 cfs @ 15.97 hrs, Volume=	0.407 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 11.19' @ 15.97 hrs Surf.Area= 0 sf Storage= 24,838 cf

Plug-Flow detention time= 404.2 min calculated for 0.407 af (47% of inflow) Center-of-Mass det. time= 260.1 min (1,066.0 - 805.9)

Volume	Inve	rt Avail.Stor	rage Storage	e Description		
#1	10.7	D' 137,87	78 cf Custon	n Stage Data Listed below		
Elevatio (fee 10.7 11.0 12.0 13.0	200 (cr 70 20 20	um.Store ubic-feet) 0 15,300 65,780 118,459		J		
13.7		137,878				
Device	Routing	Invert	Outlet Devic	es		
#1 #2	Primary Primary	11.35' 10.70'	•	arp-Crested Rectangular Weir arp-Crested Rectangular Weir		
Primary OutFlow Max=0.45 cfs @ 15.97 hrs HW=11.19' (Free Discharge) 1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs) 2=Sharp-Crested Rectangular Weir (Weir Controls 0.45 cfs @ 2.29 fps)						



Pond Lake1: Basin

# Summary for Pond Lake2: Lake 2

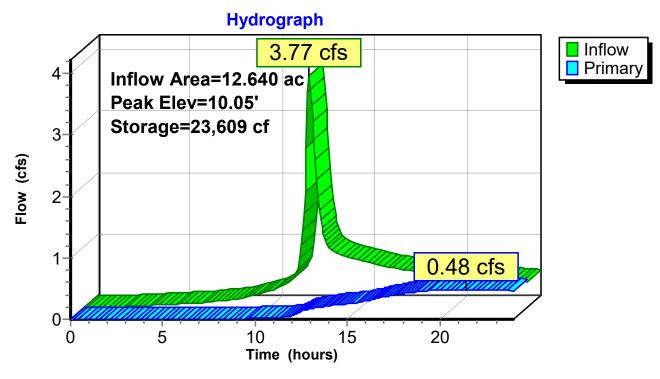
Inflow Area =	12.640 ac, 32.83% Impervious, Inflow D	epth > 0.86" for 2 YR CM event
Inflow =	3.77 cfs @ 12.18 hrs, Volume=	0.905 af
Outflow =	0.48 cfs @ 21.42 hrs, Volume=	0.369 af, Atten= 87%, Lag= 554.3 min
Primary =	0.48 cfs $\overline{@}$ 21.42 hrs, Volume=	0.369 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 10.05' @ 21.42 hrs Surf.Area= 0 sf Storage= 23,609 cf

Plug-Flow detention time= 453.5 min calculated for 0.368 af (41% of inflow) Center-of-Mass det. time= 222.9 min (1,138.3 - 915.4)

Volume	In	vert Ava	ail.Storag	e Storage Description		
#1	ç	9.67'	87,360 c	of Custom Stage Data Listed below		
Elevatio (fee		Cum.Store (cubic-feet)				
9.6	67	0				
10.0	00	20,120				
11.0	00	87,360				
Device	Routin	g l	nvert O	utlet Devices		
#1	Primar	v 1	0.00' 4.	0' long Sharp-Crested Rectangular Weir	2 End Contraction(s)	
#2	Primar			5' long Sharp-Crested Rectangular Weir		
Primary OutFlow Max=0.48 cfs @ 21.42 hrs HW=10.05' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Weir Controls 0.15 cfs @ 0.74 fps)						

**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.33 cfs @ 2.02 fps)



Pond Lake2: Lake 2

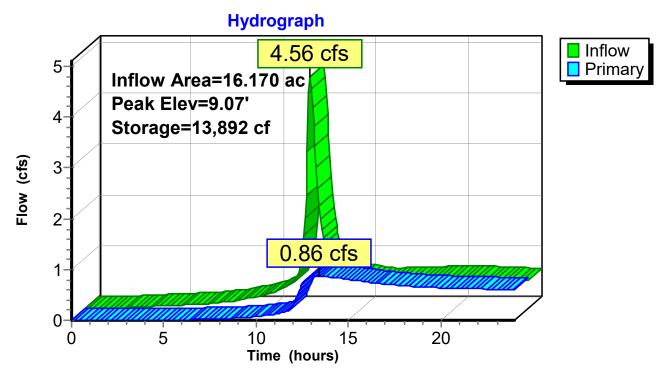
# Summary for Pond Lake3: Lake 3

Inflow Area =	16.170 ac, 37.85% Impervious, Inflow Depth > 0.71" for 2 YR CM even	ent
Inflow =	4.56 cfs @ 12.18 hrs, Volume= 0.961 af	
Outflow =	0.86 cfs @ 13.37 hrs, Volume= 0.724 af, Atten= 81%, Lag= 7	1.2 min
Primary =	0.86 cfs @ 13.37 hrs, Volume= 0.724 af	

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.07' @ 13.37 hrs Surf.Area= 0 sf Storage= 13,892 cf

Plug-Flow detention time= 241.4 min calculated for 0.724 af (75% of inflow) Center-of-Mass det. time= 120.3 min (1,041.3 - 921.0)

Volume	In	vert Ava	ail.Stora	rage Storage Description	
#1	8	.60'	69,310	10 cf Custom Stage Data Listed below	
Elevatio (fee		Cum.Store (cubic-feet)			
8.6		(0001-000) 0			
9.0	00	11,585			
10.0 10.8		42,767 69,310			
Device	Routing	j l	nvert	Outlet Devices	
#1	Primary	/	9.60'	12.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#2	Primary	/	9.60'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#3	Primary	/	8.60'	0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#4	Primary	/	8.60'	0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
Primary OutFlow Max=0.86 cfs @ 13.37 hrs HW=9.07' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs) -2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs) -3=Sharp-Crested Rectangular Weir (Weir Controls 0.43 cfs @ 2.25 fps) -4=Sharp-Crested Rectangular Weir (Weir Controls 0.43 cfs @ 2.25 fps)					



Pond Lake3: Lake 3

# Summary for Pond Lake4&5: Lake 4 & 5

Inflow Area =	22.070 ac, 39.78% Impervious, Inflow I	Depth > 0.88" for 2 YR CM event
Inflow =	7.39 cfs @ 12.19 hrs, Volume=	1.614 af
Outflow =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af, Atten= 100%, Lag= 0.0 min
Primary =	0.00 cfs $@$ 0.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 8.49' @ 24.01 hrs Surf.Area= 53,341 sf Storage= 70,231 cf

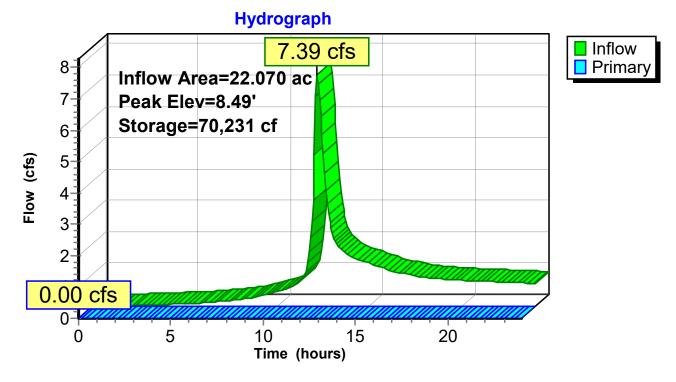
Plug-Flow detention time= (not calculated: initial storage excedes outflow) Center-of-Mass det. time= (not calculated: no outflow)

Volume	In	vert Avail.S	torage S	torage De	scription	
#1	7	.00' 126,	192 cf <b>C</b>	ustom Sta	age Data (Prisn	natic) Listed below
Elevatio (fee		Surf.Area (sq-ft)	Inc.St (cubic-fe		Cum.Store (cubic-feet)	
7.0	00	27,767		0	0	
7.4	40	46,551	14,	864	14,864	
8.0	00	50,946	29,	249	44,113	
9.0	00	55,842	53,	394	97,507	
9.5	50	58,900	28,	686	126,192	
Device	Routing	j Inve	t Outlet	Devices		
#1	Primary	/ 9.20	)' <b>100.0'</b>	long x 20	.0' breadth Bro	ad-Crested Rectangular Weir
	-		Head (	feet) 0.20	0.40 0.60 0.8	30 1.00 1.20 1.40 1.60
			Coef. (	English) 2	2.68 2.70 2.70	2.64 2.63 2.64 2.64 2.63
#2	Primary	/ 9.00	)' <b>4.0' lo</b> r	ng Sharp-	Crested Rectar	<b>igular Weir</b> 2 End Contraction(s)
Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=7.00' (Free Discharge)						

-1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

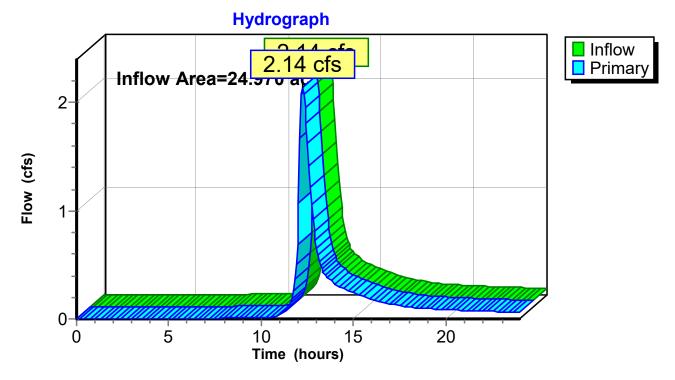
Pond Lake4&5: Lake 4 & 5



# Summary for Link 1L: Combo Discharge

Inflow Area	a =	24.970 ac, 35.52% Impervious, Infl	ow Depth > 0.13"	for 2 YR CM event
Inflow	=	2.14 cfs @ 12.25 hrs, Volume=	0.280 af	
Primary	=	2.14 cfs @ 12.25 hrs, Volume=	0.280 af, Atte	en= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs



# Link 1L: Combo Discharge

Fairways Townhomes Phase2B Post Dev 0328.20

 Type III 24-hr 5 YR CM Rainfall=4.20"

 Printed 3/30/2020

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#### Time span=0.00-24.00 hrs, dt=0.07 hrs, 344 points Runoff by SCS TR-20 method, UH=Delmarva Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Post DA 2: Pervious Flow Length=100'	Runoff Area=3.110 ac 0.00% Impervious Runoff Depth>0.61" Slope=0.0100 '/' Tc=12.7 min CN=55 Runoff=0.87 cfs 0.157 af
Subcatchment Post DA 3: Impervious	Runoff Area=1.970 ac 100.00% Impervious Runoff Depth>3.96" Tc=10.0 min CN=98 Runoff=5.31 cfs 0.650 af
Subcatchment Post DA 4: Impervious	Runoff Area=2.660 ac 100.00% Impervious Runoff Depth>3.96" Tc=10.0 min CN=98 Runoff=7.18 cfs 0.877 af
Subcatchment Post DA-1: Pervious	Runoff Area=5.380 ac 0.00% Impervious Runoff Depth>0.96" Tc=15.0 min CN=62 Runoff=2.75 cfs 0.433 af
Subcatchment Post DA-1: Impervious	Runoff Area=2.480 ac 100.00% Impervious Runoff Depth>3.96" Tc=10.0 min CN=98 Runoff=6.69 cfs 0.818 af
Subcatchment Post DA2: Impervious	Runoff Area=1.670 ac 100.00% Impervious Runoff Depth>3.96" Tc=10.0 min CN=98 Runoff=4.50 cfs 0.551 af
Subcatchment Post DA3: Pervious Flow Length=100'	Runoff Area=1.560 ac 0.00% Impervious Runoff Depth>1.20" Slope=0.0100 '/' Tc=18.5 min CN=66 Runoff=0.97 cfs 0.156 af
Subcatchment Post DA4: Pervious Flow Length=100'	Runoff Area=3.240 ac 0.00% Impervious Runoff Depth>1.33" Slope=0.0100 '/' Tc=12.7 min CN=68 Runoff=2.70 cfs 0.358 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=0.090 ac 100.00% Impervious Runoff Depth>3.95" Slope=0.0150 '/' Tc=12.5 min CN=98 Runoff=0.22 cfs 0.030 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=2.810 ac 0.00% Impervious Runoff Depth>1.74" Slope=0.0150 '/' Tc=12.5 min CN=74 Runoff=3.25 cfs 0.407 af
Pond Lake1: Basin	Peak Elev=11.39' Storage=35,077 cf Inflow=9.02 cfs 1.250 af Outflow=0.74 cfs 0.628 af
Pond Lake2: Lake 2	Peak Elev=10.12' Storage=28,000 cf Inflow=5.39 cfs 1.336 af Outflow=0.92 cfs 0.738 af
Pond Lake3: Lake 3	Peak Elev=9.23' Storage=18,793 cf Inflow=6.16 cfs 1.543 af Outflow=1.23 cfs 1.186 af
Pond Lake4&5: Lake 4 & 5	Peak Elev=9.11' Storage=103,910 cf Inflow=10.40 cfs 2.422 af Outflow=0.49 cfs 0.034 af
Link 1L: Combo Discharge	Inflow=3.47 cfs 0.471 af Primary=3.47 cfs 0.471 af
Total Dunoff Arca - 04.070	as Dunoff Volume = 4.425 of Average Dunoff Donth = 2.42"

Total Runoff Area = 24.970 ac Runoff Volume = 4.435 af Average Runoff Depth = 2.13" 64.48% Pervious = 16.100 ac 35.52% Impervious = 8.870 ac

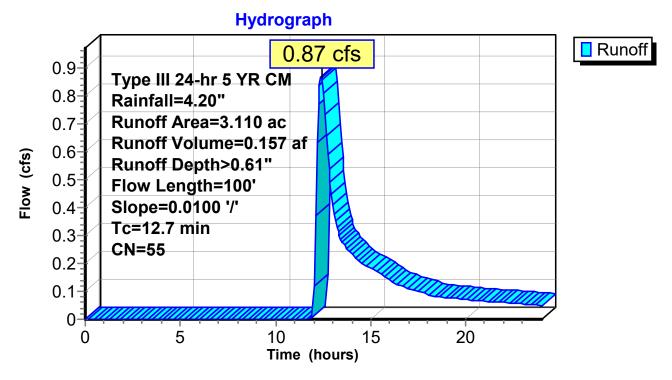
# **Summary for Subcatchment Post DA 2: Pervious**

Runoff = 0.87 cfs @ 12.41 hrs, Volume= 0.157 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

_	Area	(ac)	CN	Desc	ription					
1.000 39 >75% Grass cover, Good, HSG A										
1.340 61 >75% Grass cover, Good, HSG B										
	0.	590	74	>75%	6 Grass co	over, Good,	, HSG C			
	0.	080	30	Woo	ds, Good,	HSG A				
	0.	100	55	Woo	ds, Good,	HSG B				
	3.110 55 Weighted Average									
	3.	110		Perv	ious Area	•				
	Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description			
	12.7	10	0 0	.0100	0.13		<b>Sheet Flow, Unpaved</b> Grass: Short n= 0.150	P2= 3.30"		

#### **Subcatchment Post DA 2: Pervious**



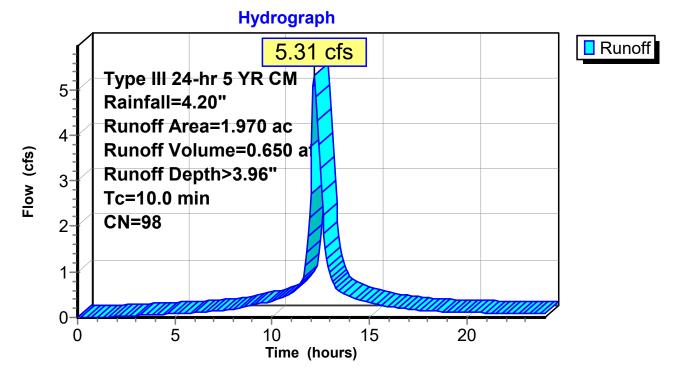
# Summary for Subcatchment Post DA 3: Impervious

Runoff = 5.31 cfs @ 12.17 hrs, Volume= 0.650 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

Area	a (ac)	CN	Desc	cription		
	0.630	98	Wate	er Surface		
	1.340	98	Pave	ed parking	& roofs	
	1.970	98	Weig	ghted Aver	age	
	1.970		Impe	ervious Are	ea	
Тс	: Leng	jth	Slope	Velocity	Capacity	Description
(min)	) (fee	et)	(ft/ft)	(ft/sec)	(cfs)	
10.0	)					Direct Entry, Paved

# Subcatchment Post DA 3: Impervious



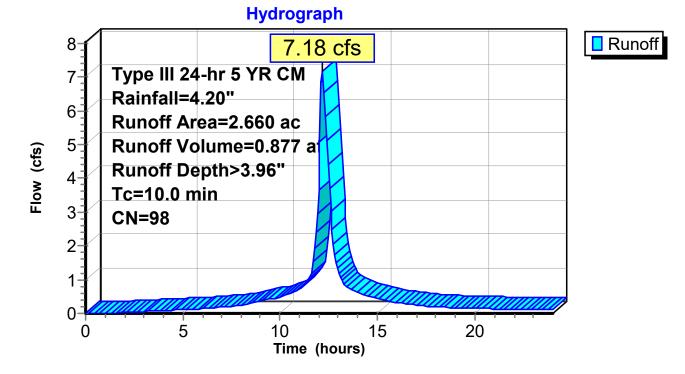
# Summary for Subcatchment Post DA 4: Impervious

Runoff = 7.18 cfs @ 12.17 hrs, Volume= 0.877 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

	Area	(ac)	CN	Desc	cription		
*	0.	100	98	Cart	Paths		
	1.	260	98		ed parking		
	1.	300	98	Wate	er Surface		
	2.660 98 Weighted Average						
	2.660		Impervious Area				
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	10.0						Direct Entry, Paved

#### Subcatchment Post DA 4: Impervious



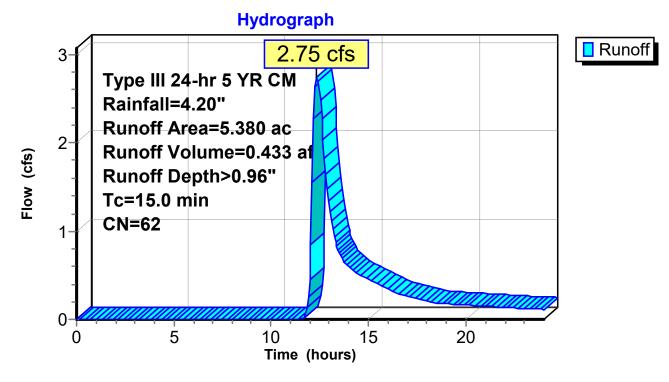
# Summary for Subcatchment Post DA- 1: Pervious

Runoff = 2.75 cfs @ 12.36 hrs, Volume= 0.433 af, Depth> 0.96"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

Area	(ac)	CN	Desc	Description							
0.	010	39	>75%	% Grass co	over, Good	I, HSG A					
4.	320	61	>75%	% Grass co	over, Good	I, HSG B					
0.	680	74	>75%	% Grass co	over, Good	I, HSG C					
0.	370	58	Woo	ds/grass o	omb., Goo	od, HSG B					
5.	380	62									
5.	380		Perv	ious Area	-						
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description					
15.0						Direct Entry, Grass					

#### **Subcatchment Post DA- 1: Pervious**



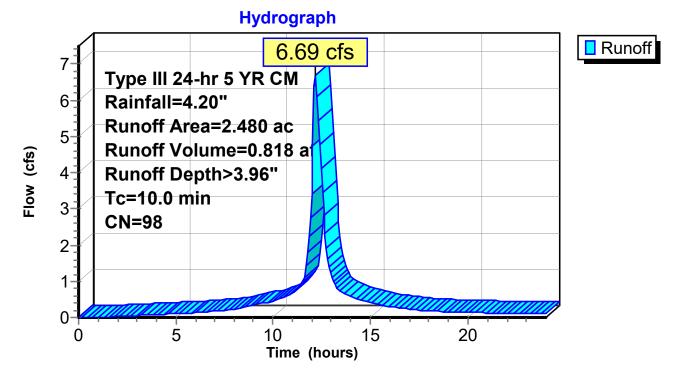
# Summary for Subcatchment Post DA-1: Impervious

Runoff = 6.69 cfs @ 12.17 hrs, Volume= 0.818 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

Area	ı (ac)	CN	Desc	cription		
	1.160	98	Wate	er Surface		
	.320	98	Pave	ed parking	& roofs	
2	2.480	98	Weig	ghted Aver	age	
	2.480		Impe	ervious Are	a	
Tc	Leng	th	Slope	Velocity	Capacity	Description
(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
10.0						Direct Entry, Paved

#### Subcatchment Post DA-1: Impervious



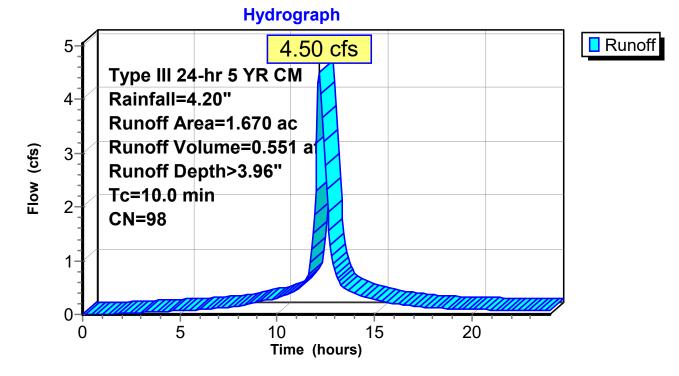
# **Summary for Subcatchment Post DA2: Impervious**

Runoff = 4.50 cfs @ 12.17 hrs, Volume= 0.551 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

	Area	(ac)	CN	Desc	cription		
*	0.	250	98	Cart	Paths		
	1.	330	98	Wate	er Surface		
*	0.	090	98	Tow	nhouse		
		670	98		ghted Aver	0	
	1.	670		Impe	ervious Are	ea	
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	10.0						Direct Entry, Paved

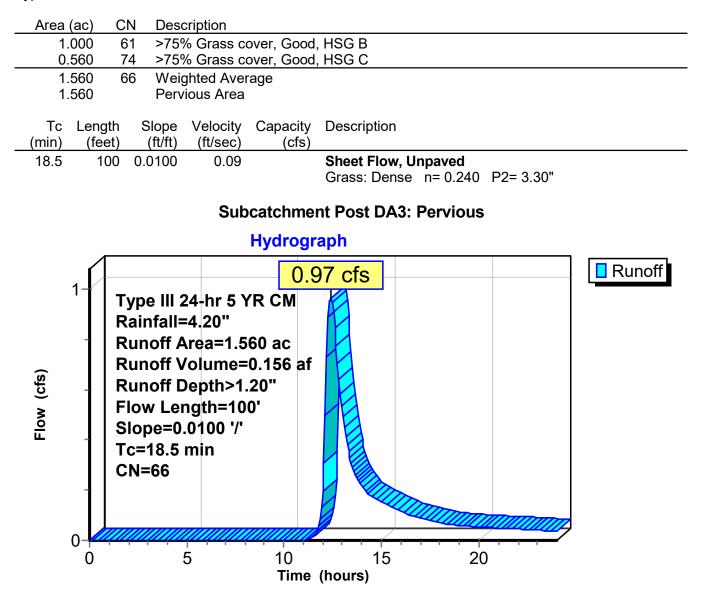
#### Subcatchment Post DA2: Impervious



#### Summary for Subcatchment Post DA3: Pervious

Runoff = 0.97 cfs @ 12.39 hrs, Volume= 0.156 af, Depth> 1.20"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"



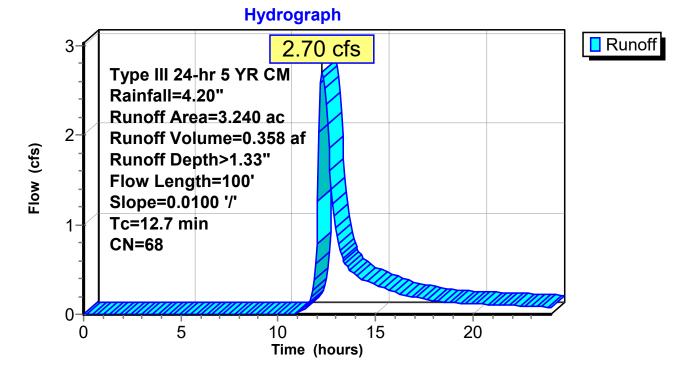
#### Summary for Subcatchment Post DA4: Pervious

Runoff = 2.70 cfs @ 12.26 hrs, Volume= 0.358 af, Depth> 1.33"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

	Area	(ac)	CN	Desc	Description								
0.660 61 >75% Grass cover, Good, HSG B													
1.810 74 >75% Grass cover, Good, HSG C													
	0.550 55 Woods, Good, HSG B												
	0.	220	70	Woo	ds, Good,	HSG C							
	3.240 68 Weighted Average												
	3.	240		Perv	ious Area	•							
	Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description						
	12.7	10	0 0	0.0100	0.13		Sheet Flow, Unpaved						
							Grass: Short n= 0.150	P2= 3.30"					

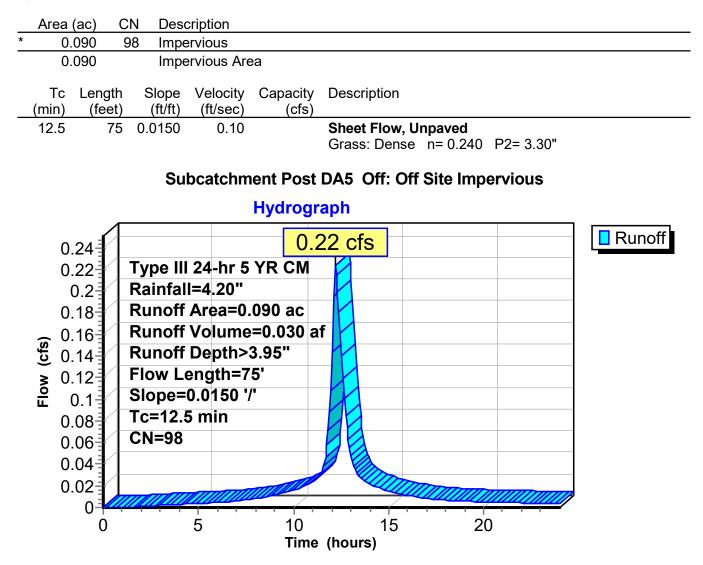
#### Subcatchment Post DA4: Pervious



#### Summary for Subcatchment Post DA5 Off: Off Site Impervious

Runoff = 0.22 cfs @ 12.20 hrs, Volume= 0.030 af, Depth> 3.95"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"



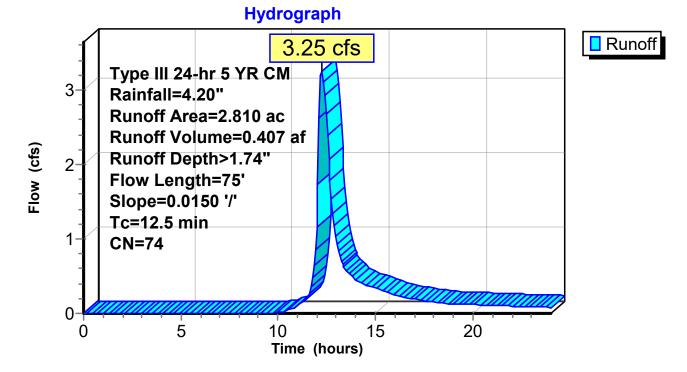
# Summary for Subcatchment Post DA5 Off: Off Site Pervious

Runoff = 3.25 cfs @ 12.23 hrs, Volume= 0.407 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 5 YR CM Rainfall=4.20"

Area (	(ac) C	CN [	Desc	ription			
2.	710	74 >	>75%	6 Grass co	over, Good,	, HSG C	
0.	100	72 \	Noo	ds/grass c	omb., Goo	d, HSG C	
2.	810	74 \	Veig	hted Aver	age		
2.	810	F	Pervi	ious Area			
Tc (min)	Length (feet)		pe /ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
12.5	75	0.01	50	0.10		<b>Sheet Flow, Unpaved</b> Grass: Dense n= 0.240	P2= 3.30"

# Subcatchment Post DA5 Off: Off Site Pervious



# Summary for Pond Lake1: Basin

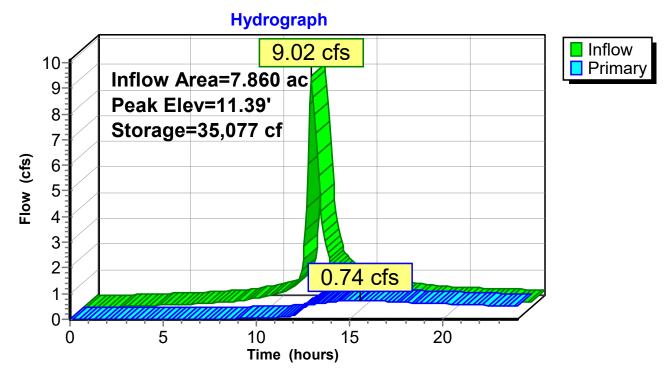
Inflow Area =	7.860 ac, 31.55% Impervious, Inflow D	Depth > 1.91" for 5 YR CM event
Inflow =	9.02 cfs @ 12.20 hrs, Volume=	1.250 af
Outflow =	0.74 cfs @ 15.60 hrs, Volume=	0.628 af, Atten= 92%, Lag= 203.8 min
Primary =	0.74 cfs @ 15.60 hrs, Volume=	0.628 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 11.39' @ 15.60 hrs Surf.Area= 0 sf Storage= 35,077 cf

Plug-Flow detention time= 389.8 min calculated for 0.628 af (50% of inflow) Center-of-Mass det. time= 253.2 min (1,059.9 - 806.7)

Volume	Inv	ert Avail.Sto	rage	Storage Description				
#1	10.7	70' 137,8	78 cf	Custom Stage Data Listed below				
Elevatio (fee		Cum.Store cubic-feet)						
10.7	70	0						
11.0	00	15,300						
12.0	00	65,780						
13.0	00	118,459						
13.7	70	137,878						
Device	Routing	Invert	Out	let Devices				
#1	Primary	11.35'	2.0'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)			
#2	Primary	10.70'	0.5'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)			
1=Sh	Primary OutFlow Max=0.74 cfs @ 15.60 hrs HW=11.39' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Weir Controls 0.06 cfs @ 0.67 fps) -2=Sharp Crested Rectangular Weir (Weir Controls 0.68 cfs @ 2.72 fps)							

**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.68 cfs @ 2.72 fps)



Pond Lake1: Basin

# Summary for Pond Lake2: Lake 2

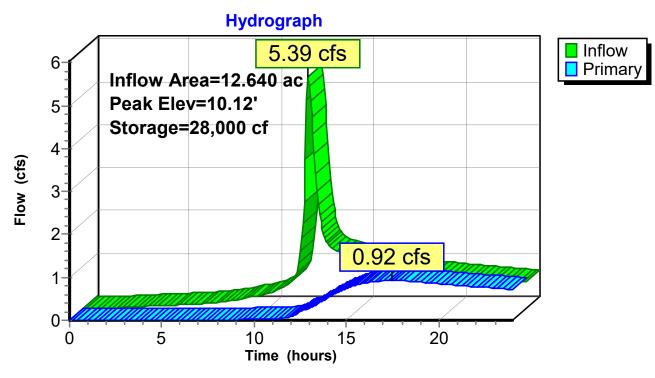
Inflow Area =	12.640 ac, 32.83% Impervious, Inflow D	Depth > 1.27" for 5 YR CM event
Inflow =	5.39 cfs @ 12.19 hrs, Volume=	1.336 af
Outflow =	0.92 cfs @ 17.47 hrs, Volume=	0.738 af, Atten= 83%, Lag= 316.6 min
Primary =	0.92 cfs @ 17.47 hrs, Volume=	0.738 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 10.12' @ 17.47 hrs Surf.Area= 0 sf Storage= 28,000 cf

Plug-Flow detention time= 376.5 min calculated for 0.738 af (55% of inflow) Center-of-Mass det. time= 190.1 min (1,109.9 - 919.8)

Volume	Inv	ert Ava	il.Storag	ge Storage Description			
#1	9.	67'	87,360	cf Custom Stage Data Listed below			
Elevatio (fee 9.6	et) (	Cum.Store <u>cubic-feet)</u> 0					
10.0	-	20,120					
11.0	)0	87,360					
Device	Routing	Ir	nvert C	Dutlet Devices			
#1	Primary	1	0.00' 4	I.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)			
#2	Primary	ļ	9.67' <b>0</b>	0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)			
	<b>Primary OutFlow</b> Max=0.92 cfs @ 17.47 hrs HW=10.12' (Free Discharge) <b>1=Sharp-Crested Rectangular Weir</b> (Weir Controls 0.52 cfs @ 1.12 fps)						

**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.52 cfs @ 1.12 fps) **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.40 cfs @ 2.19 fps)



Pond Lake2: Lake 2

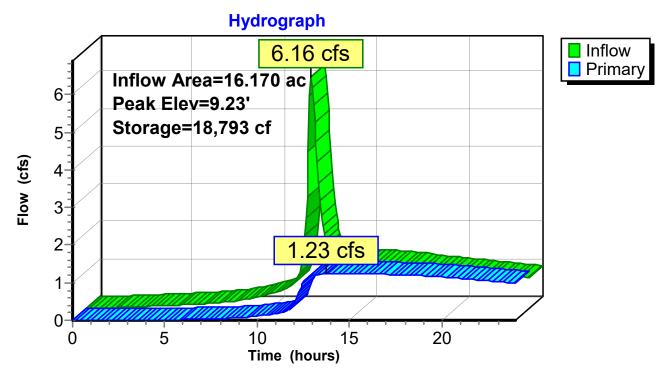
# Summary for Pond Lake3: Lake 3

Inflow Area =	16.170 ac, 37.85% Impervious, Ir	nflow Depth > 1.15" for 5 YR CM event
Inflow =	6.16 cfs @ 12.19 hrs, Volume=	1.543 af
Outflow =	1.23 cfs @ 13.73 hrs, Volume=	1.186 af, Atten= 80%, Lag= 92.3 min
Primary =	1.23 cfs @ 13.73 hrs, Volume=	1.186 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.23' @ 13.73 hrs Surf.Area= 0 sf Storage= 18,793 cf

Plug-Flow detention time= 223.4 min calculated for 1.183 af (77% of inflow) Center-of-Mass det. time= 116.1 min (1,056.1 - 940.0)

Volume	Inve	ert Ava	il.Storag	ge Storage Description
#1	8.6	60'	69,310	cf Custom Stage Data Listed below
Elevatio (fee 8.6	et) (d	Cum.Store cubic-feet) 0		
9.0		11,585		
10.0		42,767		
10.8		69,310		
		,		
Device	Routing	lr	nvert C	Dutlet Devices
#1	Primary	Ç	9.60' <b>1</b>	2.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#2	Primary	ç	9.60' <b>4</b>	.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#3	Primary	8	3.60' <b>0</b>	.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	8	3.60' <b>0</b>	.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
-1=Sh -2=Sh -3=Sh	arp-Crest arp-Crest arp-Crest	ted Rectan ted Rectan ted Rectan	igular W igular W igular W	13.73 hrs HW=9.23' (Free Discharge) /eir (Controls 0.00 cfs) /eir (Controls 0.00 cfs) /eir (Weir Controls 0.61 cfs @ 2.60 fps) /eir (Weir Controls 0.61 cfs @ 2.60 fps)



Pond Lake3: Lake 3

## Summary for Pond Lake4&5: Lake 4 & 5

[79] Warning: Submerged Pond Lake3 Primary device # 3 by 0.51' [79] Warning: Submerged Pond Lake3 Primary device # 4 by 0.51'

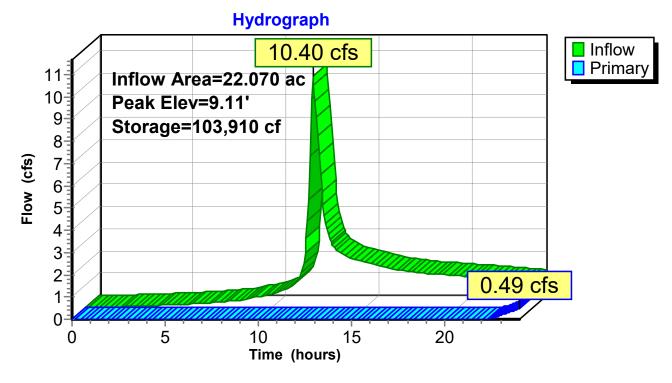
Inflow Area =	22.070 ac, 39.78% Impervious, Inflow [	Depth > 1.32" for 5 YR CM event
Inflow =	10.40 cfs @ 12.19 hrs, Volume=	2.422 af
Outflow =	0.49 cfs @ 24.01 hrs, Volume=	0.034 af, Atten= 95%, Lag= 708.9 min
Primary =	0.49 cfs @ 24.01 hrs, Volume=	0.034 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.11' @ 24.01 hrs Surf.Area= 56,525 sf Storage= 103,910 cf

Plug-Flow detention time= 1,137.4 min calculated for 0.034 af (1% of inflow) Center-of-Mass det. time= 487.2 min (1,409.0 - 921.8)

Volume	Inv	vert Avail.Sto	orage Storage	Description	
#1	7.	00' 126,1	92 cf Custon	n Stage Data (Pri	ismatic) Listed below
Elevatio (fee		Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
7.0	/	27,767	0	0	
7.4	-	46,551	14,864	14,864	
8.0	00	50,946	29,249	44,113	
9.0	9.00 5		53,394	97,507	
9.50		58,900	28,686	126,192	
Device	Routing	Invert	Outlet Device	es	
#1	Primary	9.20'			Broad-Crested Rectangular Weir
			( )		0.80 1.00 1.20 1.40 1.60
#2	Primary	9.00'			70 2.64 2.63 2.64 2.64 2.63 tangular Weir 2 End Contraction(s)

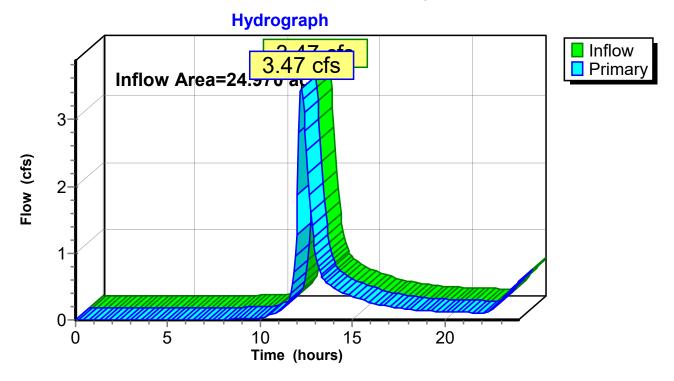
Primary OutFlow Max=0.49 cfs @ 24.01 hrs HW=9.11' (Free Discharge) 1=Broad-Crested Rectangular Weir (Controls 0.00 cfs) 2=Sharp-Crested Rectangular Weir (Weir Controls 0.49 cfs @ 1.09 fps) Pond Lake4&5: Lake 4 & 5



# Summary for Link 1L: Combo Discharge

Inflow Area =	24.970 ac,	35.52% Impervious,	Inflow Depth > 0	.23" for 5 YR CM event
Inflow =	3.47 cfs @	) 12.23 hrs, Volume	e 0.471 af	
Primary =	3.47 cfs @	) 12.23 hrs, Volume	e= 0.471 af	, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs



# Link 1L: Combo Discharge

Fairways Townhomes Phase2B Post Dev 0328.20	Type III 24-hr 10 YR CM Rainfall=5.10"
Prepared by {enter your company name here}	Printed 3/30/2020
HydroCAD® 8.50 s/n 005263 © 2007 HydroCAD Software Solution	ns LLC Page 64

#### Time span=0.00-24.00 hrs, dt=0.07 hrs, 344 points Runoff by SCS TR-20 method, UH=Delmarva Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Post DA 2: Pervious Flow Length=100'	Runoff Area=3.110 ac 0.00% Impervious Runoff Depth>1.02" Slope=0.0100 '/' Tc=12.7 min CN=55 Runoff=1.71 cfs 0.265 af
Subcatchment Post DA 3: Impervious	Runoff Area=1.970 ac 100.00% Impervious Runoff Depth>4.85" Tc=10.0 min CN=98 Runoff=6.47 cfs 0.797 af
Subcatchment Post DA 4: Impervious	Runoff Area=2.660 ac 100.00% Impervious Runoff Depth>4.85" Tc=10.0 min CN=98 Runoff=8.74 cfs 1.076 af
Subcatchment Post DA- 1: Pervious	Runoff Area=5.380 ac 0.00% Impervious Runoff Depth>1.49" Tc=15.0 min CN=62 Runoff=4.58 cfs 0.668 af
Subcatchment Post DA-1: Impervious	Runoff Area=2.480 ac 100.00% Impervious Runoff Depth>4.85" Tc=10.0 min CN=98 Runoff=8.15 cfs 1.003 af
Subcatchment Post DA2: Impervious	Runoff Area=1.670 ac 100.00% Impervious Runoff Depth>4.85" Tc=10.0 min CN=98 Runoff=5.49 cfs 0.675 af
Subcatchment Post DA3: Pervious Flow Length=100'	Runoff Area=1.560 ac 0.00% Impervious Runoff Depth>1.78" Slope=0.0100 '/' Tc=18.5 min CN=66 Runoff=1.51 cfs 0.232 af
Subcatchment Post DA4: Pervious Flow Length=100'	Runoff Area=3.240 ac 0.00% Impervious Runoff Depth>1.94" Slope=0.0100 '/' Tc=12.7 min CN=68 Runoff=4.11 cfs 0.524 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=0.090 ac 100.00% Impervious Runoff Depth>4.85" Slope=0.0150 '/' Tc=12.5 min CN=98 Runoff=0.27 cfs 0.036 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=2.810 ac 0.00% Impervious Runoff Depth>2.43" Slope=0.0150 '/' Tc=12.5 min CN=74 Runoff=4.63 cfs 0.570 af
Pond Lake1: Basin	Peak Elev=11.55' Storage=43,244 cf Inflow=12.29 cfs 1.672 af Outflow=1.44 cfs 0.966 af
Pond Lake2: Lake 2	Peak Elev=10.21' Storage=34,342 cf Inflow=7.36 cfs 1.907 af Outflow=1.77 cfs 1.273 af
Pond Lake3: Lake 3	Peak Elev=9.60' Storage=30,230 cf Inflow=7.85 cfs 2.302 af Outflow=1.96 cfs 1.801 af
Pond Lake4&5: Lake 4 & 5	Peak Elev=9.22' Storage=110,111 cf Inflow=13.59 cfs 3.401 af Outflow=2.17 cfs 0.885 af
Link 1L: Combo Discharge	Inflow=4.90 cfs 1.492 af Primary=4.90 cfs 1.492 af
Total Runoff Area = 24 970	ac Runoff Volume = 5.848 af Average Runoff Depth = 2.81"

Total Runoff Area = 24.970 ac Runoff Volume = 5.848 af Average Runoff Depth = 2.81" 64.48% Pervious = 16.100 ac 35.52% Impervious = 8.870 ac

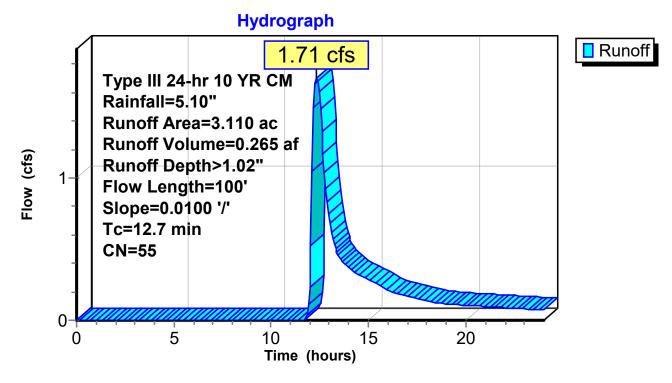
# **Summary for Subcatchment Post DA 2: Pervious**

Runoff = 1.71 cfs @ 12.33 hrs, Volume= 0.265 af, Depth> 1.02"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

A	rea (a	c) C	N Des	cription			
	1.00	00 3	89 >75	% Grass c	over, Good	, HSG A	
	1.34	40 6	61 >75	% Grass c	over, Good	, HSG B	
	0.59	90 7	′4     >75′	% Grass c	over, Good	, HSG C	
	0.08	30 3	80 Woo	ods, Good,	HSG A		
	0.10	00 5	5 Woo	ods, Good,	HSG B		
	3.11	10 5	5 Wei	ghted Avei	rage		
	3.11	10	Per	ious Area	-		
					<b>•</b> •		
,		ength	Slope	Velocity	Capacity	Description	
(m	nin)	(feet)	(ft/ft)	(ft/sec)	(cfs)		
1	2.7	100	0.0100	0.13		Sheet Flow, Unpaved	
						Grass: Short n= 0.150	P2= 3.30"

#### **Subcatchment Post DA 2: Pervious**



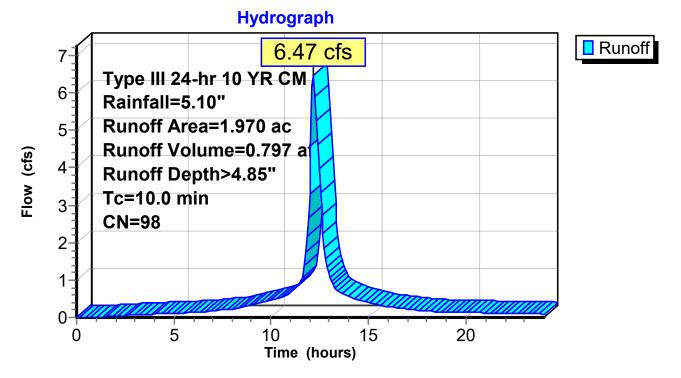
# **Summary for Subcatchment Post DA 3: Impervious**

Runoff = 6.47 cfs @ 12.17 hrs, Volume= 0.797 af, Depth> 4.85"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

Area	(ac)	CN	Desc	cription		
C	.630	98	Wate	er Surface		
1	.340	98	Pave	ed parking	& roofs	
1	.970	98	Weig	ghted Aver	age	
1	.970		Impe	rvious Are	a	
Tc	Leng	th	Slope	Velocity	Capacity	Description
(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
10.0						Direct Entry, Paved

# Subcatchment Post DA 3: Impervious



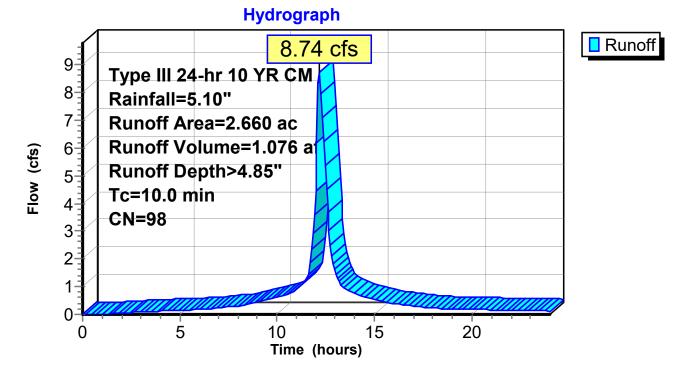
# Summary for Subcatchment Post DA 4: Impervious

Runoff = 8.74 cfs @ 12.17 hrs, Volume= 1.076 af, Depth> 4.85"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

	Area	(ac)	CN	Desc	cription		
*	0.	100	98	Cart	Paths		
	1.	260	98	Pave	ed parking	& roofs	
	1.	300	98	Wate	er Surface		
	2.	660	98	Weig	ghted Aver	age	
	2.	660		Impe	ervious Are	a	
	_						
	Tc	Leng		Slope	Velocity	Capacity	Description
	<u>(min)</u>	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
	10.0						Direct Entry, Paved

## Subcatchment Post DA 4: Impervious



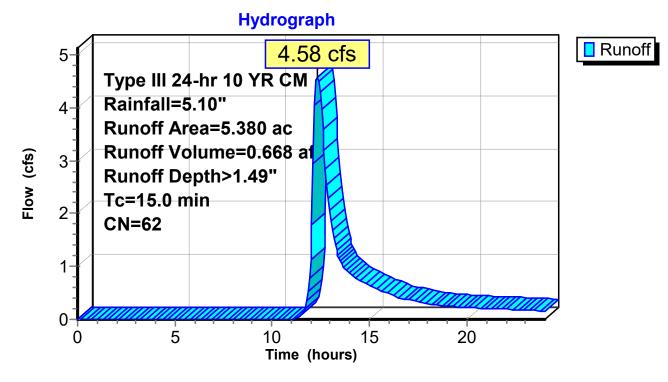
# Summary for Subcatchment Post DA- 1: Pervious

Runoff = 4.58 cfs @ 12.31 hrs, Volume= 0.668 af, Depth> 1.49"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

Area	(ac)	CN	Desc	cription		
0.	010	39	>75%	6 Grass co	over, Good	, HSG A
4.	320	61	>75%	6 Grass co	over, Good	I, HSG B
0.	680	74	>75%	6 Grass co	over, Good	I, HSG C
0.	370	58	Woo	ds/grass c	omb., Goo	od, HSG B
5.	380	62	Weig	ghted Aver	age	
5.	380		Perv	ious Area	-	
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0						Direct Entry, Grass

## **Subcatchment Post DA- 1: Pervious**



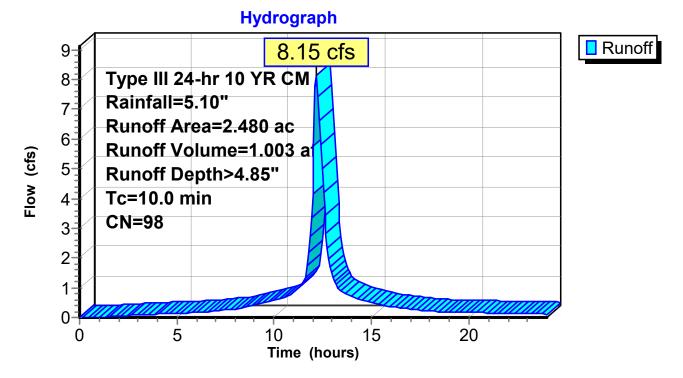
# Summary for Subcatchment Post DA-1: Impervious

Runoff = 8.15 cfs @ 12.17 hrs, Volume= 1.003 af, Depth> 4.85"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

A	rea (ac)	CN	Desc	cription		
	1.160	98	Wate	er Surface		
	1.320	98	Pave	ed parking	& roofs	
	2.480	98	Weig	ghted Aver	age	
	2.480		Impe	rvious Are	ea	
	Tc Len	gth	Slope	Velocity	Capacity	Description
(m	nin) (fe	et)	(ft/ft)	(ft/sec)	(cfs)	
1	0.0					Direct Entry, Paved

## Subcatchment Post DA-1: Impervious



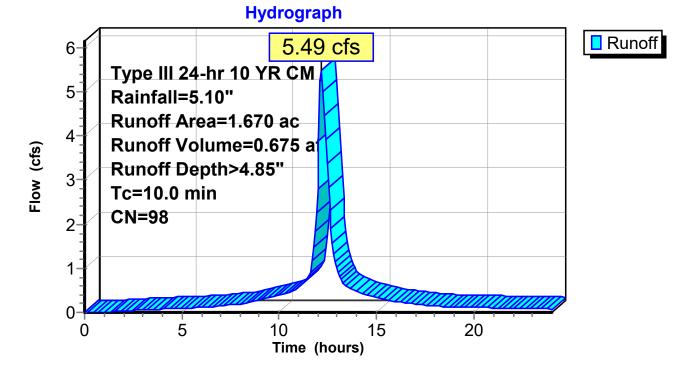
# **Summary for Subcatchment Post DA2: Impervious**

Runoff = 5.49 cfs @ 12.17 hrs, Volume= 0.675 af, Depth> 4.85"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

_	Area	(ac)	CN	Desc	cription		
*	0.	250	98	Cart	Paths		
	1.	330	98	Wate	er Surface		
*	0.	090	98	Tow	nhouse		
	1.	670	98	Weig	ghted Aver	age	
	1.	670		Impe	ervious Are	a	
	-					0	
	Tc	Leng		Slope	Velocity	Capacity	Description
	(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
	10.0						Direct Entry, Paved

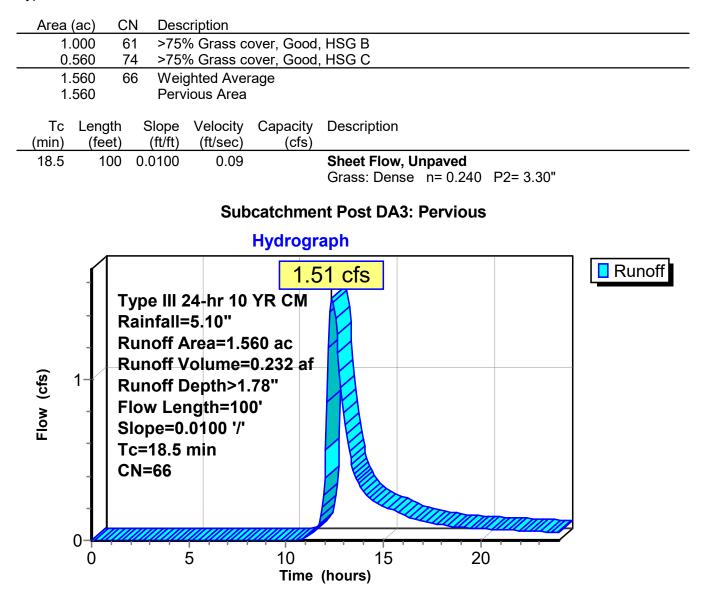
## Subcatchment Post DA2: Impervious



## Summary for Subcatchment Post DA3: Pervious

Runoff = 1.51 cfs @ 12.35 hrs, Volume= 0.232 af, Depth> 1.78"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"



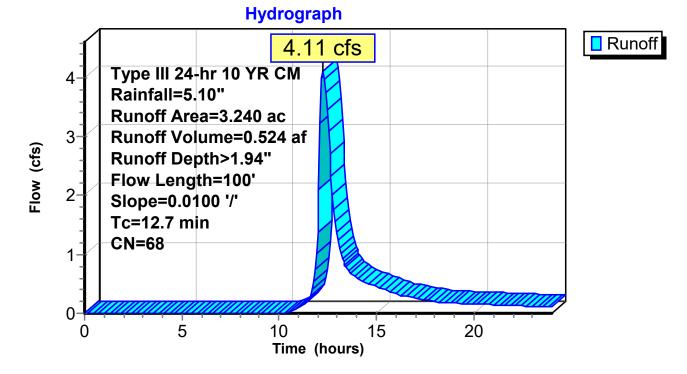
# **Summary for Subcatchment Post DA4: Pervious**

Runoff = 4.11 cfs @ 12.25 hrs, Volume= 0.524 af, Depth> 1.94"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

 Area	(ac)	CN	Desc	cription			
0.	660	61	>75%	% Grass co	over, Good	, HSG B	
1.	810	74	>75%	% Grass co	over, Good	, HSG C	
0.	550	55	Woo	ds, Good,	HSG B		
 0.	220	70	Woo	ds, Good,	HSG C		
 3.	240	68	Weig	ghted Aver	age		
3.	240		Perv	ious Area	•		
 Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
12.7	10	0 0	0.0100	0.13		Sheet Flow, Unpaved	
						Grass: Short n= 0.150	P2= 3.30"

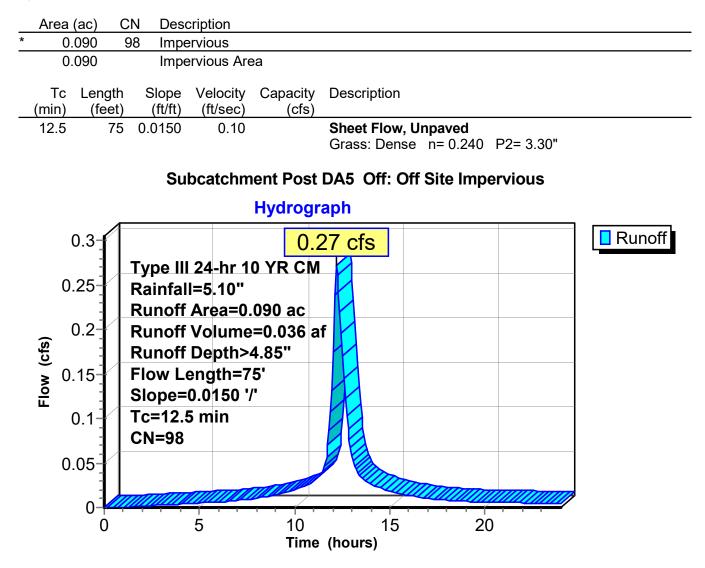
#### Subcatchment Post DA4: Pervious



## Summary for Subcatchment Post DA5 Off: Off Site Impervious

Runoff = 0.27 cfs @ 12.20 hrs, Volume= 0.036 af, Depth> 4.85"

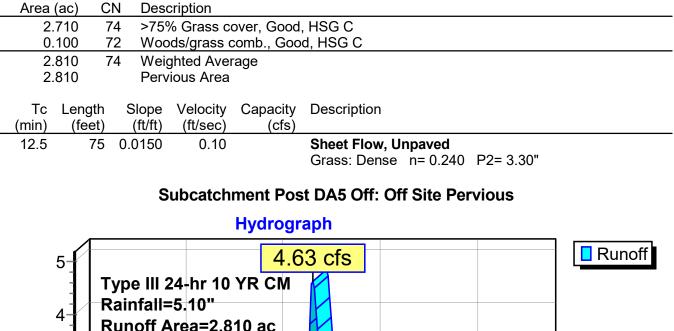
Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"

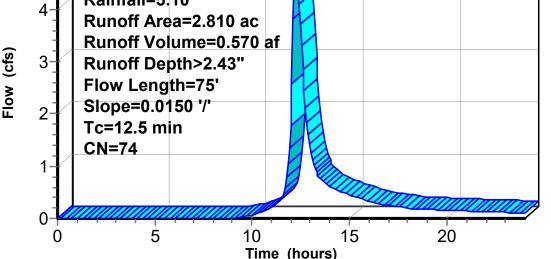


## Summary for Subcatchment Post DA5 Off: Off Site Pervious

Runoff = 4.63 cfs @ 12.22 hrs, Volume= 0.570 af, Depth> 2.43"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 10 YR CM Rainfall=5.10"





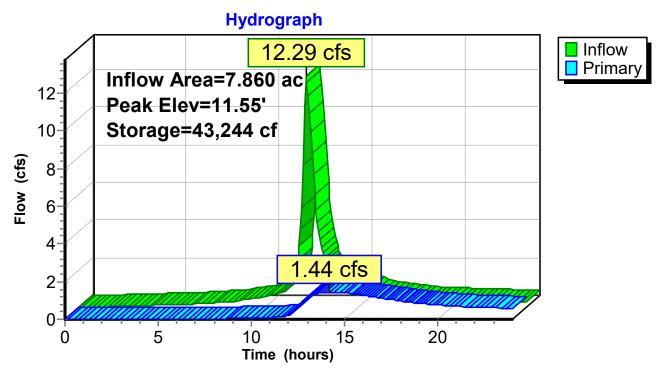
# Summary for Pond Lake1: Basin

Inflow Area	a =	7.860 ac, 31.55% Impervious, Inflow Dept	h > 2.55" for 10 YR CM event
Inflow	=	12.29 cfs @ 12.21 hrs, Volume= 1.	672 af
Outflow	=	1.44 cfs @ 14.21 hrs, Volume= 0.	966 af, Atten= 88%, Lag= 120.0 min
Primary	=	1.44 cfs @ 14.21 hrs, Volume= 0.	966 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 11.55' @ 14.21 hrs Surf.Area= 0 sf Storage= 43,244 cf

Plug-Flow detention time= 338.5 min calculated for 0.963 af (58% of inflow) Center-of-Mass det. time= 217.0 min (1,023.4 - 806.4)

Volume	Inver	t Avail.Stor	age	Storage Description	
#1	10.70	' 137,87	'8 cf	Custom Stage Data Listed below	
Elevatio (fee 10.7 11.0 12.0 13.0 13.7	et) (cu 70 00 00 00	um.Store bic-feet) 0 15,300 65,780 118,459 137,878			
Device	Routing	Invert	Outl	et Devices	
#1	Primary	11.35'		long Sharp-Crested Rectangular Weir	
#2	Primary	10.70'	0.5'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)
1=Sh	arp-Creste	d Rectangular	Weir	21 hrs HW=11.55' (Free Discharge) (Weir Controls 0.59 cfs @ 1.48 fps) (Weir Controls 0.85 cfs @ 3.02 fps)	



Pond Lake1: Basin

# Summary for Pond Lake2: Lake 2

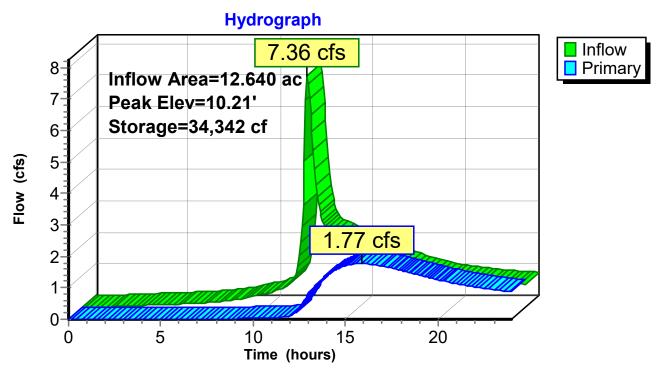
Inflow Area =	12.640 ac, 32.83% Impervious, Inflow I	Depth > 1.81" for 10 YR CM event
Inflow =	7.36 cfs @ 12.20 hrs, Volume=	1.907 af
Outflow =	1.77 cfs @ 15.90 hrs, Volume=	1.273 af, Atten= 76%, Lag= 222.2 min
Primary =	1.77 cfs @ 15.90 hrs, Volume=	1.273 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 10.21' @ 15.90 hrs Surf.Area= 0 sf Storage= 34,342 cf

Plug-Flow detention time= 294.2 min calculated for 1.269 af (67% of inflow) Center-of-Mass det. time= 158.0 min (1,069.8 - 911.8)

Volume	Inv	ert Avail	.Storage	Storage Description	
#1	9.	67' 8	37,360 cf	Custom Stage Data Listed below	
Elevatic (fee 9.6 10.0 11.0	et) ( 67 00	Cum.Store <u>cubic-feet)</u> 0 20,120 87,360			
Device	Routing	١n	vert Outl	et Devices	
#1	Primary	10.	.00' <b>4.0'</b>	long Sharp-Crested Rectangular Weir	2 End Contraction(s)
#2	Primary	9.	.67' <b>0.5'</b>	long Sharp-Crested Rectangular Weir	2 End Contraction(s)
·			<u> </u>	90 hrs HW=10.21' (Free Discharge) ' (Weir Controls 1.26 cfs @ 1.50 fps)	

**1=Sharp-Crested Rectangular Weir** (Weir Controls 1.26 cfs @ 1.50 fps) **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.51 cfs @ 2.41 fps)



Pond Lake2: Lake 2

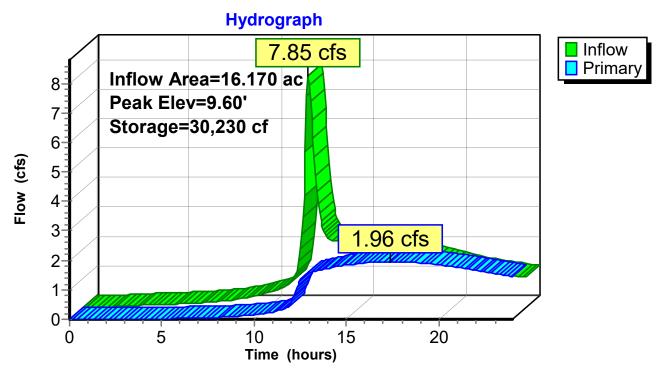
# Summary for Pond Lake3: Lake 3

Inflow Area =	16.170 ac, 37.85% Impervious, Inflow D	epth > 1.71" for 10 YR CM event
Inflow =	7.85 cfs @ 12.19 hrs, Volume=	2.302 af
Outflow =	1.96 cfs @ 17.41 hrs, Volume=	1.801 af, Atten= 75%, Lag= 313.2 min
Primary =	1.96 cfs @ 17.41 hrs, Volume=	1.801 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.60' @ 17.41 hrs Surf.Area= 0 sf Storage= 30,230 cf

Plug-Flow detention time= 218.7 min calculated for 1.801 af (78% of inflow) Center-of-Mass det. time= 122.5 min (1,064.2 - 941.6)

Volume	Inv	ert Ava	ail.Stora	ge Storage Description				
#1	8.	60'	69,310	ocf Custom Stage Data Listed below				
Elevatio	מט	Cum.Store						
(fee		cubic-feet)						
· · · ·	/							
8.6		0						
9.0		11,585						
10.0		42,767						
10.8	30	69,310						
Device	Routing	h	nvert (	Outlet Devices				
#1	Primary		9.60' ′	12.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)				
#2	Primary			4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)				
#3	Primary			0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)				
#4	Primary		8.60' (	0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)				
Primary OutFlow Max=1.96 cfs @ 17.41 hrs HW=9.60' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs) -2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs) -3=Sharp-Crested Rectangular Weir (Weir Controls 0.98 cfs @ 3.27 fps) -4=Sharp-Crested Rectangular Weir (Weir Controls 0.98 cfs @ 3.27 fps)								



Pond Lake3: Lake 3

## Summary for Pond Lake4&5: Lake 4 & 5

[79] Warning: Submerged Pond Lake3 Primary device # 3 by 0.62' [79] Warning: Submerged Pond Lake3 Primary device # 4 by 0.62'

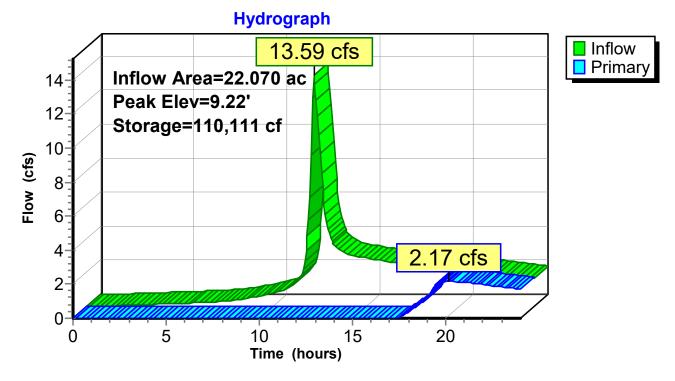
Inflow Area =	22.070 ac, 39.78% Impervious, Inflow E	Depth > 1.85" for 10 YR CM event
Inflow =	13.59 cfs @ 12.19 hrs, Volume=	3.401 af
Outflow =	2.17 cfs @ 20.15 hrs, Volume=	0.885 af, Atten= 84%, Lag= 477.2 min
Primary =	2.17 cfs @ 20.15 hrs, Volume=	0.885 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.22' @ 20.15 hrs Surf.Area= 57,186 sf Storage= 110,111 cf

Plug-Flow detention time= 615.9 min calculated for 0.885 af (26% of inflow) Center-of-Mass det. time= 338.3 min (1,274.0 - 935.7)

Volume	١nv	vert Avail.Sto	orage Storage	e Description	
#1	7.	.00' 126,1	92 cf Custon	n Stage Data (Pr	ismatic) Listed below
Elevatio (fee		Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
7.0 7.4 8.0 9.0	40 00	27,767 46,551 50,946 55.842	0 14,864 29,249 53,394	0 14,864 44,113 97,507	
9.5		58,900	28,686	126,192	
Device	Routing	Invert	Outlet Device	es	
#1	Primary	9.20'	Head (feet)	0.20 0.40 0.60	<b>Broad-Crested Rectangular Weir</b> 0.80 1.00 1.20 1.40 1.60 70 2.64 2.63 2.64 2.64 2.63
				tangular Weir 2 End Contraction(s)	

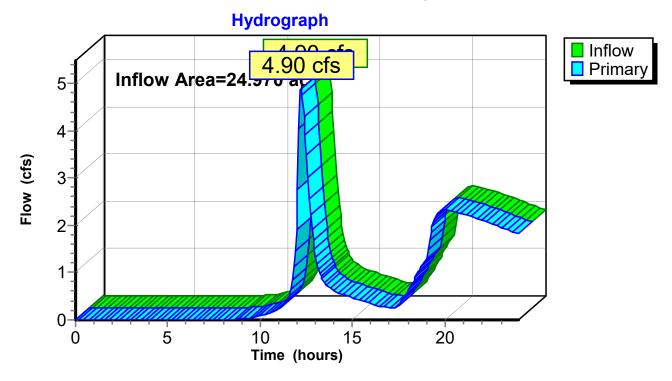
Primary OutFlow Max=2.07 cfs @ 20.15 hrs HW=9.22' (Free Discharge) 1=Broad-Crested Rectangular Weir (Weir Controls 0.74 cfs @ 0.38 fps) 2=Sharp-Crested Rectangular Weir (Weir Controls 1.33 cfs @ 1.53 fps) Pond Lake4&5: Lake 4 & 5



# Summary for Link 1L: Combo Discharge

Inflow Area =	24.970 ac, 35.52% Impervious, Inf	flow Depth > 0.72" for 10 YR CM event
Inflow =	4.90 cfs @ 12.22 hrs, Volume=	1.492 af
Primary =	4.90 cfs @ 12.22 hrs, Volume=	1.492 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs



# Link 1L: Combo Discharge

Fairways Townhomes Phase2B Post Dev 0328.20	Type III 24-hr 50 YR CM Rainfall=7.50"
Prepared by {enter your company name here}	Printed 3/30/2020
HydroCAD® 8.50 s/n 005263 © 2007 HydroCAD Software Solution	ns LLC Page 84

#### Time span=0.00-24.00 hrs, dt=0.07 hrs, 344 points Runoff by SCS TR-20 method, UH=Delmarva Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Post DA 2: Pervious Flow Length=100'	Runoff Area=3.110 ac 0.00% Impervious Runoff Depth>2.44" Slope=0.0100 '/' Tc=12.7 min CN=55 Runoff=4.79 cfs 0.631 af
Subcatchment Post DA 3: Impervious	Runoff Area=1.970 ac 100.00% Impervious Runoff Depth>7.25" Tc=10.0 min CN=98 Runoff=9.55 cfs 1.190 af
Subcatchment Post DA 4: Impervious	Runoff Area=2.660 ac 100.00% Impervious Runoff Depth>7.25" Tc=10.0 min CN=98 Runoff=12.89 cfs 1.606 af
Subcatchment Post DA- 1: Pervious	Runoff Area=5.380 ac 0.00% Impervious Runoff Depth>3.16" Tc=15.0 min CN=62 Runoff=10.52 cfs 1.415 af
Subcatchment Post DA-1: Impervious	Runoff Area=2.480 ac 100.00% Impervious Runoff Depth>7.25" Tc=10.0 min CN=98 Runoff=12.02 cfs 1.498 af
Subcatchment Post DA2: Impervious	Runoff Area=1.670 ac 100.00% Impervious Runoff Depth>7.25" Tc=10.0 min CN=98 Runoff=8.09 cfs 1.009 af
Subcatchment Post DA3: Pervious Flow Length=100'	Runoff Area=1.560 ac 0.00% Impervious Runoff Depth>3.58" Slope=0.0100 '/' Tc=18.5 min CN=66 Runoff=3.18 cfs 0.465 af
Subcatchment Post DA4: Pervious Flow Length=100'	Runoff Area=3.240 ac 0.00% Impervious Runoff Depth>3.80" Slope=0.0100 '/' Tc=12.7 min CN=68 Runoff=8.34 cfs 1.027 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=0.090 ac 100.00% Impervious Runoff Depth>7.24" Slope=0.0150 '/' Tc=12.5 min CN=98 Runoff=0.40 cfs 0.054 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=2.810 ac 0.00% Impervious Runoff Depth>4.47" Slope=0.0150 '/' Tc=12.5 min CN=74 Runoff=8.73 cfs 1.046 af
Pond Lake1: Basin	Peak Elev=12.02' Storage=66,669 cf Inflow=21.96 cfs 2.913 af Outflow=4.56 cfs 2.104 af
Pond Lake2: Lake 2	Peak Elev=10.49' Storage=53,223 cf Inflow=13.61 cfs 3.744 af Outflow=5.23 cfs 3.034 af
Pond Lake3: Lake 3	Peak Elev=9.81' Storage=36,755 cf Inflow=12.89 cfs 4.689 af Outflow=7.15 cfs 4.028 af
Pond Lake4&5: Lake 4 & 5	Peak Elev=9.29' Storage=113,968 cf Inflow=22.57 cfs 6.661 af Outflow=8.90 cfs 4.130 af
Link 1L: Combo Discharge	Inflow=9.99 cfs 5.230 af Primary=9.99 cfs 5.230 af
Total Runoff Area = 24 970	ac Runoff Volume = 9 941 af Average Runoff Depth = 4 78"

Total Runoff Area = 24.970 ac Runoff Volume = 9.941 af Average Runoff Depth = 4.78" 64.48% Pervious = 16.100 ac 35.52% Impervious = 8.870 ac

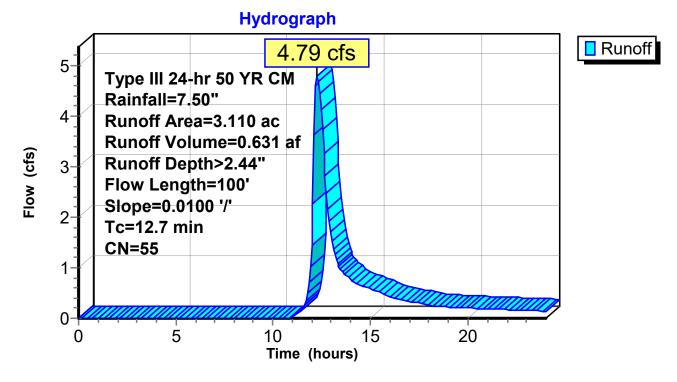
# **Summary for Subcatchment Post DA 2: Pervious**

Runoff = 4.79 cfs @ 12.26 hrs, Volume= 0.631 af, Depth> 2.44"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

 Area	(ac)	CN	Desc	Description					
1.	000	39	>75%	6 Grass co	over, Good	, HSG A			
1.	340	61	>75%	6 Grass co	over, Good	, HSG B			
0.	590	74	>75%	6 Grass co	over, Good	, HSG C			
0.	080	30	Woo	ds, Good,	HSG A				
 0.	100	55	Woo	ds, Good,	HSG B				
3.	110	55	Weig	ghted Aver	age				
3.	110		Perv	ious Area					
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description			
12.7	10	)0 (	0.0100	0.13		<b>Sheet Flow, Unpaved</b> Grass: Short n= 0.150	P2= 3.30"		

#### **Subcatchment Post DA 2: Pervious**



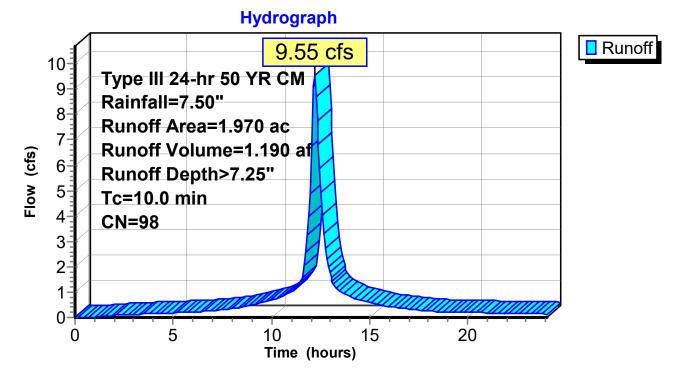
# **Summary for Subcatchment Post DA 3: Impervious**

Runoff = 9.55 cfs @ 12.17 hrs, Volume= 1.190 af, Depth> 7.25"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

 Area	(ac)	CN	Desc	cription		
0.	630	98	Wate	er Surface		
 1.	340	98	Pave	ed parking	& roofs	
 1.	1.970 98 Weighted Average					
1.	1.970 Impervious Area					
Тс	Leng	th	Slope	Velocity	Capacity	Description
 (min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
10.0						Direct Entry, Paved

# Subcatchment Post DA 3: Impervious



# Summary for Subcatchment Post DA 4: Impervious

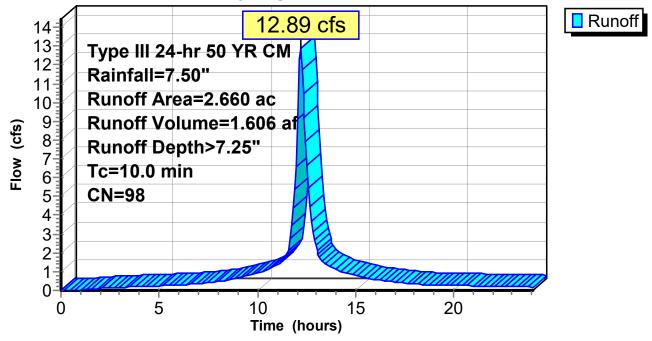
Runoff = 12.89 cfs @ 12.17 hrs, Volume= 1.606 af, Depth> 7.25"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

	Area	(ac)	CN	Desc	cription		
*	0.	100	98	Cart	Paths		
	1.	260	98	Pave	ed parking	& roofs	
	1.	300	98	Wate	er Surface		
	2.	2.660 98 Weighted Average				age	
	2.	2.660 Impervious Area			ervious Are	a	
	_			~		•	<b>—</b> • • •
	Tc	Leng		Slope	Velocity	Capacity	Description
	(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
	10.0						Direct Entry, Paved

## Subcatchment Post DA 4: Impervious





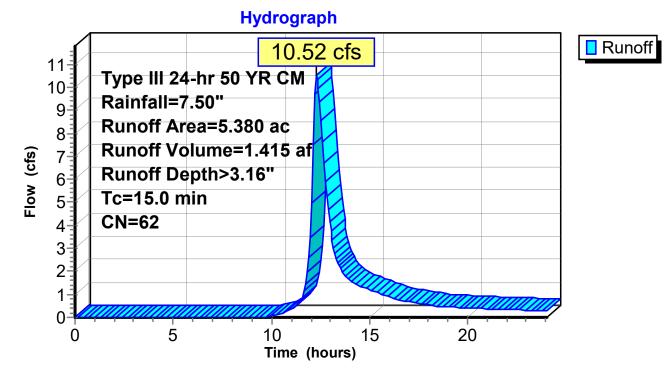
# Summary for Subcatchment Post DA- 1: Pervious

Runoff = 10.52 cfs @ 12.28 hrs, Volume= 1.415 af, Depth> 3.16"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

Area	(ac)	CN	Description						
0.	010	39	>75%	% Grass co	over, Good	d, HSG A			
4.	320	61	>75%	% Grass co	over, Good	d, HSG B			
0.	680	74	>75%	% Grass co	over, Good	d, HSG C			
0.	370	58	Woo	ds/grass o	omb., Goo	od, HSG B			
5.	5.380 62 Weighted Average								
5.	5.380 Pervious Area								
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description			
15.0						Direct Entry, Grass			

# Subcatchment Post DA- 1: Pervious



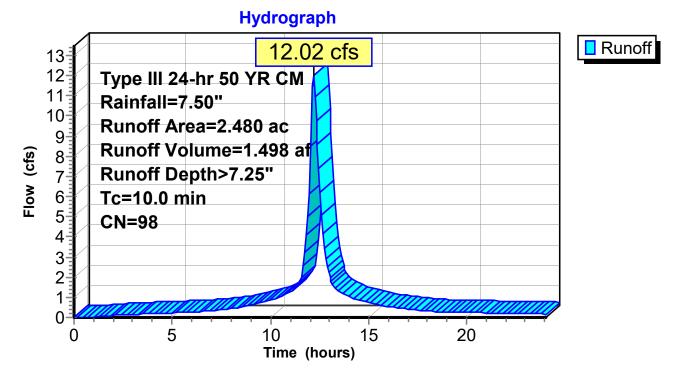
## Summary for Subcatchment Post DA-1: Impervious

Runoff = 12.02 cfs @ 12.17 hrs, Volume= 1.498 af, Depth> 7.25"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

	Area (a	ac)	CN	Desc	cription		
	1.1	60	98	Wate	er Surface		
	1.3	320	98	Pave	ed parking	& roofs	
	2.480 98 Weighted Average					age	
	2.4	2.480 Impervious Area					
	Tc	Lengt	:h	Slope	Velocity	Capacity	Description
(	(min)	(fee	t)	(ft/ft)	(ft/sec)	(cfs)	
	10.0						Direct Entry, Paved

# Subcatchment Post DA-1: Impervious



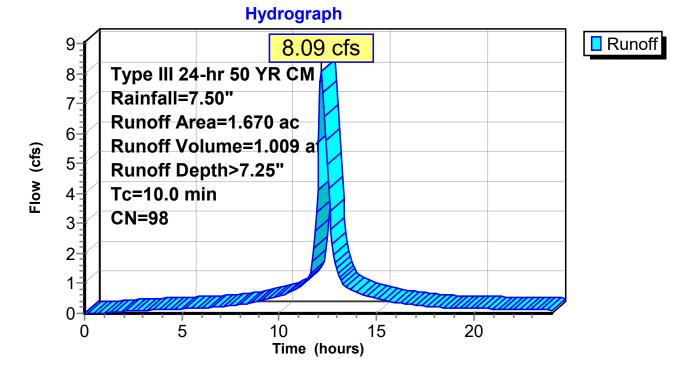
## **Summary for Subcatchment Post DA2: Impervious**

Runoff = 8.09 cfs @ 12.17 hrs, Volume= 1.009 af, Depth> 7.25"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

	Area	(ac)	CN	Desc	cription		
*	0.	250	98	Cart	Paths		
	1.	330	98	Wate	er Surface		
*	0.	090	98	Tow	nhouse		
	1.	1.670 98 Weighted Average					
	1.	1.670 Impervious Area					
	То	Long	th	Slong	Velocity	Capacity	Description
	Tc (min)	Leng		Slope	,	Capacity	Description
	(min)	(fee	-1)	(ft/ft)	(ft/sec)	(cfs)	
	10.0						Direct Entry, Paved

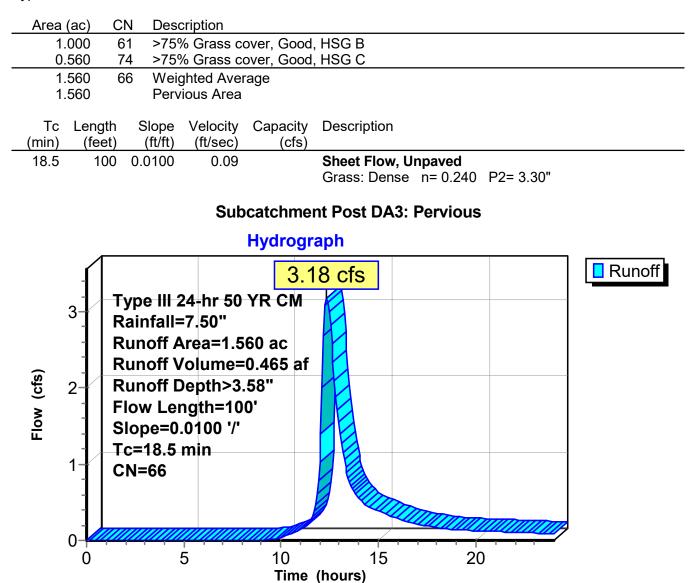
#### Subcatchment Post DA2: Impervious



#### Summary for Subcatchment Post DA3: Pervious

Runoff = 3.18 cfs @ 12.33 hrs, Volume= 0.465 af, Depth> 3.58"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"



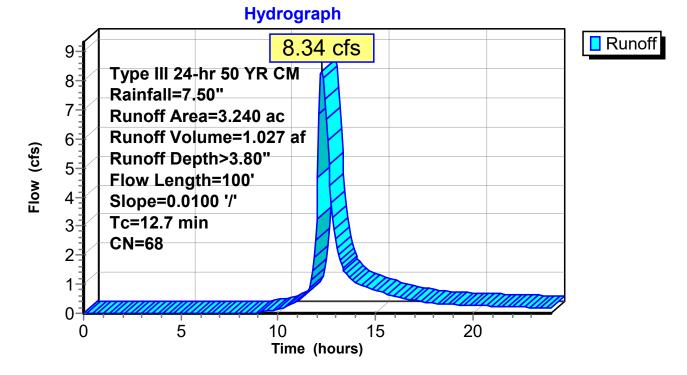
## **Summary for Subcatchment Post DA4: Pervious**

Runoff = 8.34 cfs @ 12.22 hrs, Volume= 1.027 af, Depth> 3.80"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

_	Area	(ac)	CN	Desc	cription			
	0.	660	61	>75%	% Grass co	over, Good	, HSG B	
	1.	810	74	>75%	% Grass co	over, Good	, HSG C	
	0.	550	55	Woo	ds, Good,	HSG B		
	0.	220	70	Woo	ds, Good,	HSG C		
	3.	240	68	Weig	ghted Aver	age		
	3.240 Pervious Area							
	Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
	12.7	10	0 0	0.0100	0.13		Sheet Flow, Unpaved	
							Grass: Short n= 0.150	P2= 3.30"

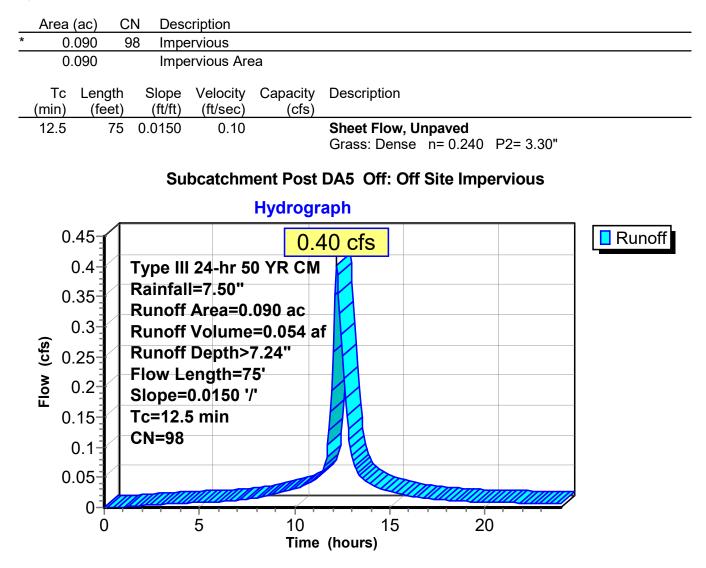
#### Subcatchment Post DA4: Pervious



#### Summary for Subcatchment Post DA5 Off: Off Site Impervious

Runoff = 0.40 cfs @ 12.20 hrs, Volume= 0.054 af, Depth> 7.24"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"



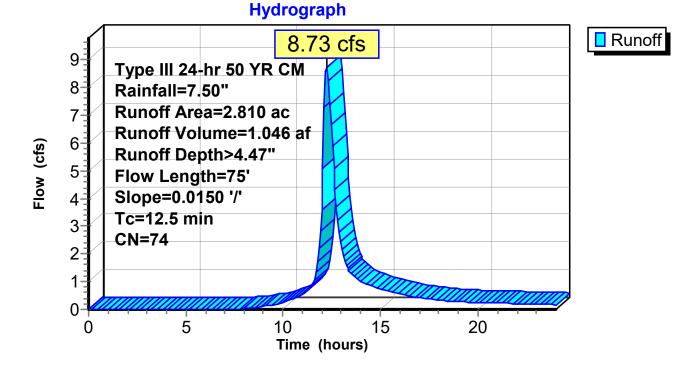
# Summary for Subcatchment Post DA5 Off: Off Site Pervious

Runoff = 8.73 cfs @ 12.21 hrs, Volume= 1.046 af, Depth> 4.47"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 50 YR CM Rainfall=7.50"

Area	(ac)	CN	Desc	cription			
2.	710	74	>75%	% Grass co	over, Good,	, HSG C	
0.	.100	72	Woo	ds/grass o	omb., Goo	d, HSG C	
2.	.810	74	Weig	ghted Aver	age		
2.	.810		Perv	ious Area			
Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
12.5	7	5 (	0.0150	0.10		Sheet Flow, Unpaved	
						Grass: Dense n= 0.240	PZ= 3.30°

#### Subcatchment Post DA5 Off: Off Site Pervious



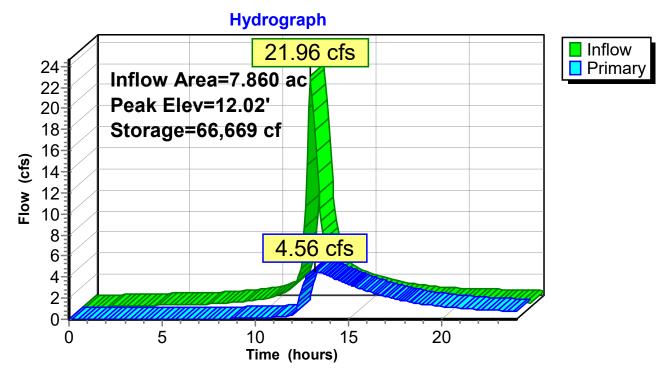
## Summary for Pond Lake1: Basin

Inflow Area =	7.860 ac, 31.55% Impervious, Inflow I	Depth > 4.45" for 50 YR CM event
Inflow =	21.96 cfs @ 12.21 hrs, Volume=	2.913 af
Outflow =	4.56 cfs @ 13.18 hrs, Volume=	2.104 af, Atten= 79%, Lag= 58.3 min
Primary =	4.56 cfs @ 13.18 hrs, Volume=	2.104 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 12.02' @ 13.18 hrs Surf.Area= 0 sf Storage= 66,669 cf

Plug-Flow detention time= 260.0 min calculated for 2.098 af (72% of inflow) Center-of-Mass det. time= 165.3 min ( 968.7 - 803.4 )

Volume	Invert	Avail.Stor	ge Storage Description				
#1	10.70'	137,87	cf Custom Stage Data Listed below				
Elevatio (fee 10.7 11.0 12.0 13.0 13.7	et) (cub 70 00 00 00	m.Store <u>bic-feet)</u> 0 15,300 65,780 118,459 137,878					
Device	Routing	Invert	Outlet Devices				
#1	Primary	11.35'	2.0' Iong Sharp-Crested Rectangular Weir 2 End Co	( )			
#2	Primary	10.70'	0.5' long Sharp-Crested Rectangular Weir 2 End Co	ntraction(s)			
1=Sh	Primary OutFlow Max=4.56 cfs @ 13.18 hrs HW=12.02' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Weir Controls 3.32 cfs @ 2.67 fps) -2=Sharp-Crested Rectangular Weir (Weir Controls 1.24 cfs @ 3.75 fps)						



Pond Lake1: Basin

# Summary for Pond Lake2: Lake 2

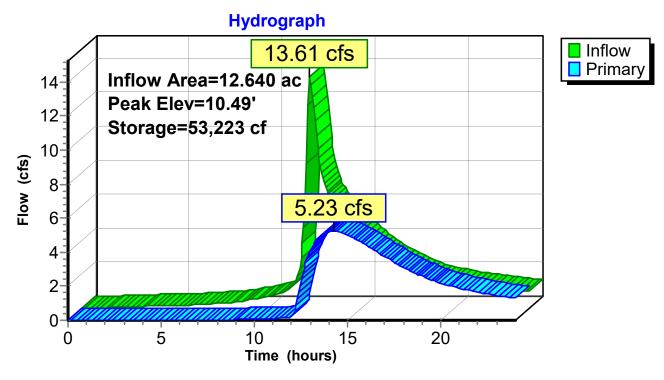
Inflow Area =	12.640 ac, 32.83% Impervious, I	nflow Depth > 3.55" for 50 YR CM event
Inflow =	13.61 cfs @ 12.21 hrs, Volume=	3.744 af
Outflow =	5.23 cfs @ 14.23 hrs, Volume=	3.034 af, Atten= 62%, Lag= 121.1 min
Primary =	5.23 cfs $\overline{@}$ 14.23 hrs, Volume=	3.034 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 10.49' @ 14.23 hrs Surf.Area= 0 sf Storage= 53,223 cf

Plug-Flow detention time= 197.0 min calculated for 3.034 af (81% of inflow) Center-of-Mass det. time= 116.1 min (1,009.9 - 893.8)

Volume	Ir	nvert A	vail.Sto	rage	Storage Description		
#1	9	9.67'	87,36	60 cf	Custom Stage Data Listed below		
Elevatio (fee 9.6	et)	Cum.Sto (cubic-fee					
10.0		20,12	20				
11.0	00	87,30	60				
Device	Routin	ıg	Invert	Outl	let Devices		
#1	Prima	ry	10.00'	4.0'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)	
#2	Prima	ry	9.67'	0.5'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)	
Primary OutFlow Max=5.22 cfs @ 14.23 hrs HW=10.49' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Weir Controls 4.41 cfs @ 2.29 fps)							

**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.82 cfs @ 2.97 fps)



Pond Lake2: Lake 2

## Summary for Pond Lake3: Lake 3

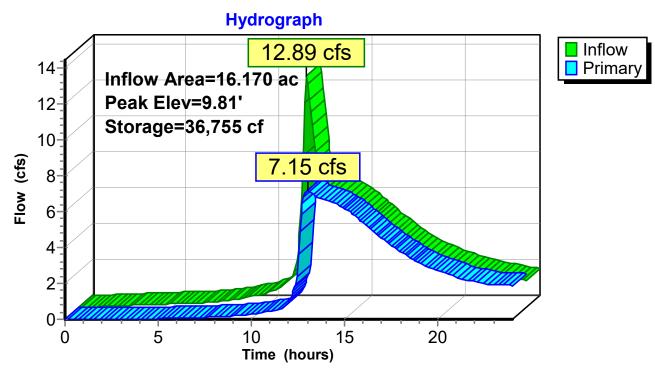
[79] Warning: Submerged Pond Lake2 Primary device # 2 by 0.14'

Inflow Area =	16.170 ac, 37.85% Impervious, Inflow D	Depth > 3.48" for 50 YR CM event
Inflow =	12.89 cfs @ 12.21 hrs, Volume=	4.689 af
Outflow =	7.15 cfs @ 13.01 hrs, Volume=	4.028 af, Atten= 45%, Lag= 48.3 min
Primary =	7.15 cfs @ 13.01 hrs, Volume=	4.028 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.81' @ 13.01 hrs Surf.Area= 0 sf Storage= 36,755 cf

Plug-Flow detention time= 125.2 min calculated for 4.016 af (86% of inflow) Center-of-Mass det. time= 63.3 min ( 992.1 - 928.8 )

Volume	Inv	ert Ava	il.Stora	age Storage Description				
#1	8.	60'	69,310	0 cf Custom Stage Data Listed below				
Elevatic (fee 8.6 9.0 10.0 10.8	et) ( 60 00 00	Cum.Store cubic-feet) 0 11,585 42,767 69,310						
Device	Routing	Ir	nvert	Outlet Devices				
#1	Primary			12.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)				
#2	Primary	9	9.60'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)				
#3	Primary	8	8.60'	0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)				
#4	Primary	8	8.60'	0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)				
-1=Sh -2=Sh -3=Sh	Primary OutFlow Max=7.15 cfs @ 13.01 hrs HW=9.81' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Weir Controls 3.69 cfs @ 1.49 fps) -2=Sharp-Crested Rectangular Weir (Weir Controls 1.22 cfs @ 1.49 fps) -3=Sharp-Crested Rectangular Weir (Weir Controls 1.12 cfs @ 3.59 fps) -4=Sharp-Crested Rectangular Weir (Weir Controls 1.12 cfs @ 3.59 fps)							



Pond Lake3: Lake 3

#### Summary for Pond Lake4&5: Lake 4 & 5

[79] Warning: Submerged Pond Lake3 Primary device # 3 by 0.69' [79] Warning: Submerged Pond Lake3 Primary device # 4 by 0.69'

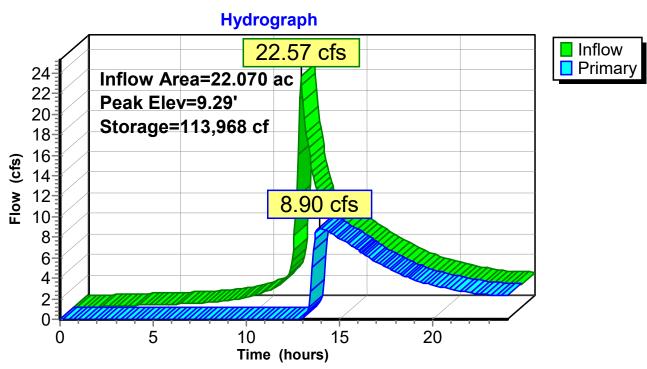
Inflow Area =	22.070 ac, 39.78% Impervious, Inflow	v Depth > 3.62" for 50 YR CM event	
Inflow =	22.57 cfs @ 12.19 hrs, Volume=	6.661 af	
Outflow =	8.90 cfs @ 13.94 hrs, Volume=	4.130 af, Atten= 61%, Lag= 104.8	min
Primary =	8.90 cfs @ 13.94 hrs, Volume=	4.130 af	

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.29' @ 13.94 hrs Surf.Area= 57,597 sf Storage= 113,968 cf

Plug-Flow detention time= 275.4 min calculated for 4.130 af (62% of inflow) Center-of-Mass det. time= 133.1 min (1,044.0 - 910.9)

Volume	Inv	vert Avail.Sto	orage Storage	e Description	
#1	7.	00' 126,1	92 cf Custor	n Stage Data (Pr	ismatic) Listed below
Elevatio (fee		Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
7.0 7.4 8.0	10	27,767 46,551 50,946	0 14,864 29,249	0 14,864 44,113	
9.0 9.5	00	55,842 58,900	53,394 28,686	97,507 126,192	
Device	Routing	Invert	Outlet Devic	es	
#1	Primary	9.20'	Head (feet)	0.20 0.40 0.60	Broad-Crested Rectangular Weir           0.80         1.00         1.20         1.40         1.60           70         2.64         2.63         2.64         2.63
#2	Primary	9.00'			tangular Weir 2 End Contraction(s)

Primary OutFlow Max=8.85 cfs @ 13.94 hrs HW=9.29' (Free Discharge) 1=Broad-Crested Rectangular Weir (Weir Controls 6.87 cfs @ 0.79 fps) 2=Sharp-Crested Rectangular Weir (Weir Controls 1.98 cfs @ 1.75 fps)

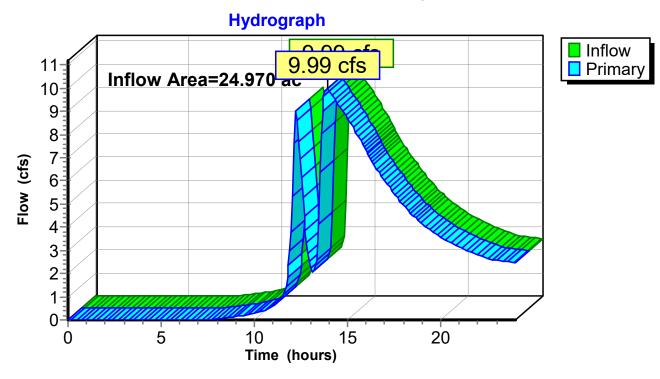


Pond Lake4&5: Lake 4 & 5

## Summary for Link 1L: Combo Discharge

Inflow Area =	=	24.970 ac,  35.52% Impervious,  Inflow Depth >   2.51"    for   50 YR CM ev	/ent
Inflow =		9.99 cfs @ 13.90 hrs, Volume= 5.230 af	
Primary =		9.99 cfs @ 13.90 hrs, Volume= 5.230 af, Atten= 0%, Lag= 0.0	min

Primary outflow = Inflow, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs



## Link 1L: Combo Discharge

Fairways Townhomes Phase2B Post Dev 0328.20	Type III 24-hr 100 YR CM Rainfall=8.80"
Prepared by {enter your company name here}	Printed 3/30/2020
HydroCAD® 8.50 s/n 005263 © 2007 HydroCAD Software Solution	ons LLC Page 104

#### Time span=0.00-24.00 hrs, dt=0.07 hrs, 344 points Runoff by SCS TR-20 method, UH=Delmarva Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Post DA 2: Pervious Flow Length=100'	Runoff Area=3.110 ac 0.00% Impervious Runoff Depth>3.33" Slope=0.0100 '/' Tc=12.7 min CN=55 Runoff=6.75 cfs 0.863 af
Subcatchment Post DA 3: Impervious	Runoff Area=1.970 ac 100.00% Impervious Runoff Depth>8.54" Tc=10.0 min CN=98 Runoff=11.21 cfs 1.403 af
Subcatchment Post DA 4: Impervious	Runoff Area=2.660 ac 100.00% Impervious Runoff Depth>8.54" Tc=10.0 min CN=98 Runoff=15.14 cfs 1.894 af
Subcatchment Post DA- 1: Pervious	Runoff Area=5.380 ac 0.00% Impervious Runoff Depth>4.17" Tc=15.0 min CN=62 Runoff=14.08 cfs 1.868 af
Subcatchment Post DA-1: Impervious	Runoff Area=2.480 ac 100.00% Impervious Runoff Depth>8.54" Tc=10.0 min CN=98 Runoff=14.11 cfs 1.766 af
Subcatchment Post DA2: Impervious	Runoff Area=1.670 ac 100.00% Impervious Runoff Depth>8.54" Tc=10.0 min CN=98 Runoff=9.50 cfs 1.189 af
Subcatchment Post DA3: Pervious Flow Length=100'	Runoff Area=1.560 ac 0.00% Impervious Runoff Depth>4.64" Slope=0.0100 '/' Tc=18.5 min CN=66 Runoff=4.15 cfs 0.604 af
Subcatchment Post DA4: Pervious Flow Length=100'	Runoff Area=3.240 ac 0.00% Impervious Runoff Depth>4.90" Slope=0.0100 '/' Tc=12.7 min CN=68 Runoff=10.94 cfs 1.322 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=0.090 ac 100.00% Impervious Runoff Depth>8.54" Slope=0.0150 '/' Tc=12.5 min CN=98 Runoff=0.47 cfs 0.064 af
Subcatchment Post DA5 Off: Off Site Flow Length=75'	Runoff Area=2.810 ac 0.00% Impervious Runoff Depth>5.63" Slope=0.0150 '/' Tc=12.5 min CN=74 Runoff=10.99 cfs 1.318 af
Pond Lake1: Basin	Peak Elev=12.27' Storage=79,822 cf Inflow=27.56 cfs 3.633 af Outflow=6.82 cfs 2.787 af
Pond Lake2: Lake 2	Peak Elev=10.66' Storage=64,532 cf Inflow=17.76 cfs 4.838 af Outflow=7.76 cfs 4.092 af
Pond Lake3: Lake 3	Peak Elev=9.91' Storage=39,981 cf Inflow=16.12 cfs 6.098 af Outflow=11.45 cfs 5.403 af
Pond Lake4&5: Lake 4 & 5	Peak Elev=9.33' Storage=116,706 cf Inflow=27.60 cfs 8.619 af Outflow=15.77 cfs 6.085 af
Link 1L: Combo Discharge	Inflow=18.45 cfs 7.467 af Primary=18.45 cfs 7.467 af
Total Runoff Area = 24.970 a	ac Runoff Volume = 12.289 af Average Runoff Depth = 5.91"

64.48% Pervious = 16.100 ac 35.52% Impervious = 8.870 ac

Fairways Townhomes Phase2B Post Dev 0328.20Type III 24-hr 100 YR CM Rainfall=8.80"Prepared by {enter your company name here}Printed 3/30/2020HydroCAD® 8.50s/n 005263 © 2007 HydroCAD Software Solutions LLCPage 105

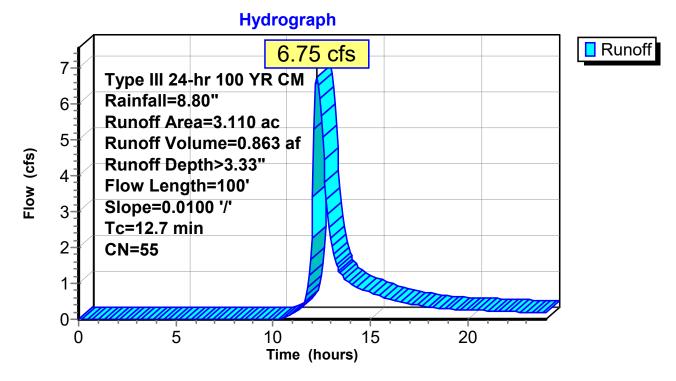
#### **Summary for Subcatchment Post DA 2: Pervious**

Runoff = 6.75 cfs @ 12.25 hrs, Volume= 0.863 af, Depth> 3.33"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

_	Area (	(ac)	CN	Desc	ription			
	1.	000	39	>75%	6 Grass co	over, Good,	, HSG A	
	1.3	340	61	>75%	6 Grass co	over, Good,	, HSG B	
	0.	590	74	>75%	6 Grass co	over, Good,	, HSG C	
	0.	080	30	Woo	ds, Good,	HSG A		
	0.	100	55	Woo	ds, Good,	HSG B		
	3.	110	55	Weig	phted Aver	age		
	3.	110		Perv	ious Area			
	Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
	12.7	10	0 0	.0100	0.13		<b>Sheet Flow, Unpaved</b> Grass: Short n= 0.150	P2= 3.30"

#### **Subcatchment Post DA 2: Pervious**



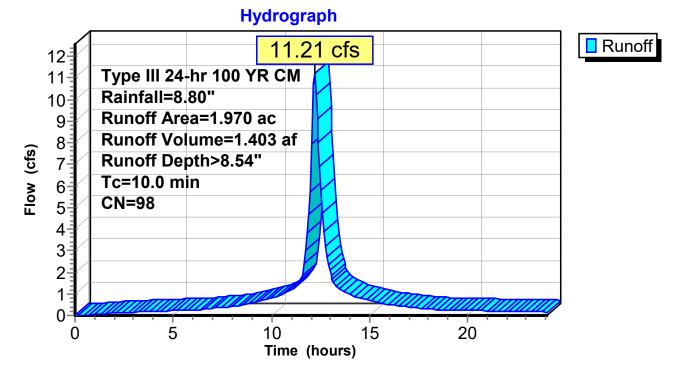
#### Summary for Subcatchment Post DA 3: Impervious

Runoff = 11.21 cfs @ 12.17 hrs, Volume= 1.403 af, Depth> 8.54"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

	Area	(ac)	CN	Desc	cription		
	0.	630	98	Wate	er Surface		
	1.	340	98	Pave	ed parking	& roofs	
	1.	970	98	Weig	ghted Aver	age	
	1.	970		Impe	rvious Are	ea	
	Тс	Leng	th	Slope	Velocity	Capacity	Description
_	(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
	10.0						Direct Entry, Paved

# Subcatchment Post DA 3: Impervious



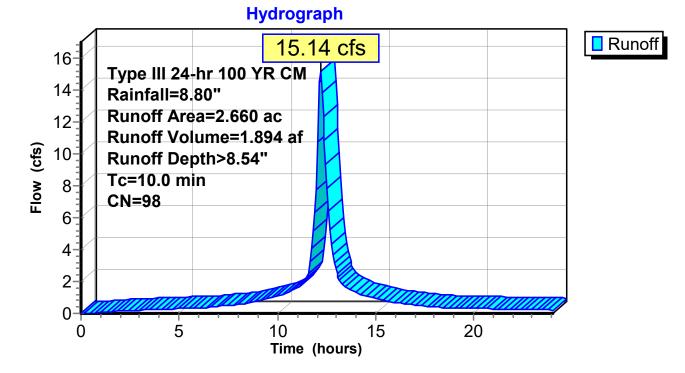
#### Summary for Subcatchment Post DA 4: Impervious

Runoff = 15.14 cfs @ 12.17 hrs, Volume= 1.894 af, Depth> 8.54"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

	Area	(ac)	CN	Desc	cription		
*	0.	100	98	Cart	Paths		
	1.	260	98	Pave	ed parking	& roofs	
	1.	300	98	Wate	er Surface		
	2.660 98 Weighted Average					age	
	2.	660		Impe	ervious Are	ea	
	Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
_	10.0		,	/	· · · /	/	Direct Entry, Paved

#### Subcatchment Post DA 4: Impervious



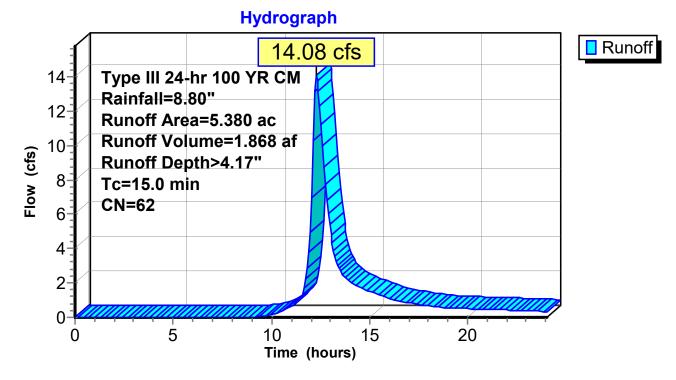
## Summary for Subcatchment Post DA- 1: Pervious

Runoff = 14.08 cfs @ 12.27 hrs, Volume= 1.868 af, Depth> 4.17"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

Area	(ac)	CN	Desc	cription			
0.	.010	39	>75%	% Grass co	over, Good	d, HSG A	
4.	320	61	>75%	% Grass co	over, Good	d, HSG B	
0.	.680	74	>75%	% Grass co	over, Good	d, HSG C	
0.	.370	58	Woo	ds/grass o	omb., Goo	od, HSG B	
5.	.380	62	Weig	ghted Aver	age		
5.	.380		Perv	ious Area	-		
Tc (min)	Leng (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
15.0						Direct Entry, Grass	

## Subcatchment Post DA- 1: Pervious



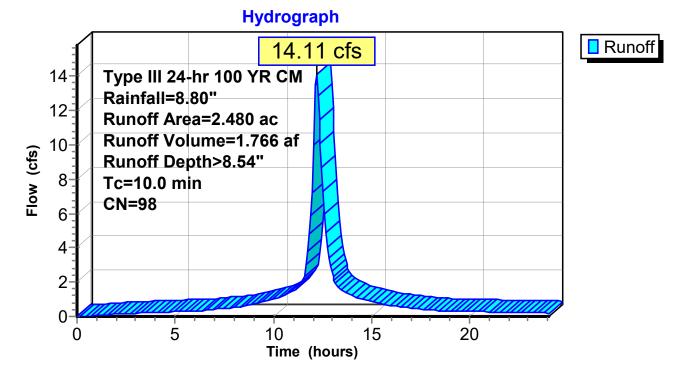
#### Summary for Subcatchment Post DA-1: Impervious

Runoff = 14.11 cfs @ 12.17 hrs, Volume= 1.766 af, Depth> 8.54"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

Area	(ac)	CN	Desc	ription		
1.	160	98	Wate	er Surface		
1.	320	98	Pave	ed parking	& roofs	
2.	480	98	Weig	ghted Aver	age	
2.	480		Impe	rvious Are	a	
Та	اممع	1h (	Clana	Volocity	Consoitu	Description
Tc (min)	Leng		Slope	Velocity	Capacity (cfs)	Description
(min)	(fee	;i)	(ft/ft)	(ft/sec)	(CIS)	
10.0						Direct Entry, Paved

# Subcatchment Post DA-1: Impervious



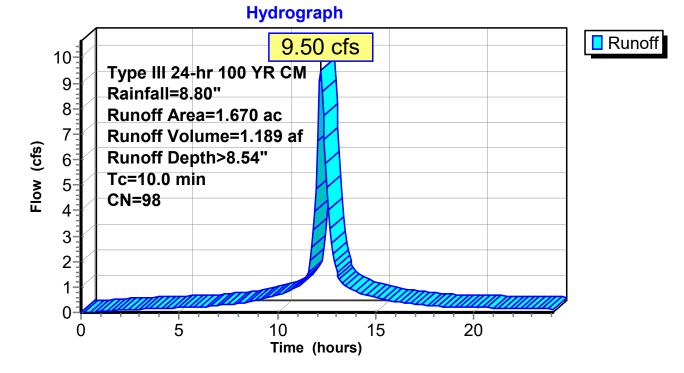
#### **Summary for Subcatchment Post DA2: Impervious**

Runoff = 9.50 cfs @ 12.17 hrs, Volume= 1.189 af, Depth> 8.54"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

	Area	(ac)	CN	Desc	cription			
*	0.	250	98	Cart	Paths			
	1.	330	98	Wate	er Surface			
*	0.	090	98	Tow	nhouse			
	1.	1.670 98 Weighted Average						
	1.	670		Impe	ervious Are	ea		
	Tc	Leng		Slope	Velocity	Capacity	Description	
	(min)	(fee	el)	(ft/ft)	(ft/sec)	(cfs)		
	10.0						Direct Entry, Paved	

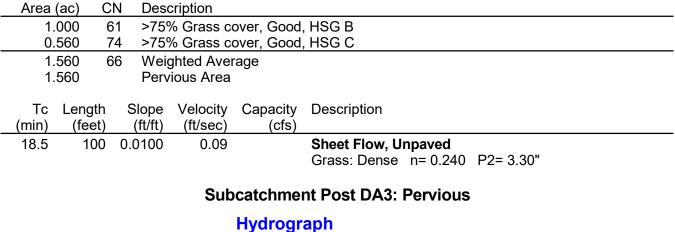
#### Subcatchment Post DA2: Impervious

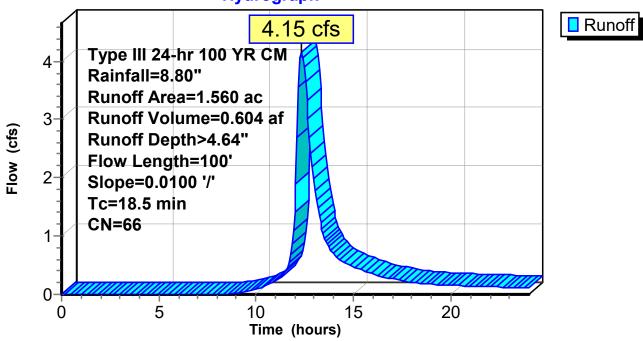


#### Summary for Subcatchment Post DA3: Pervious

Runoff = 4.15 cfs @ 12.32 hrs, Volume= 0.604 af, Depth> 4.64"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"





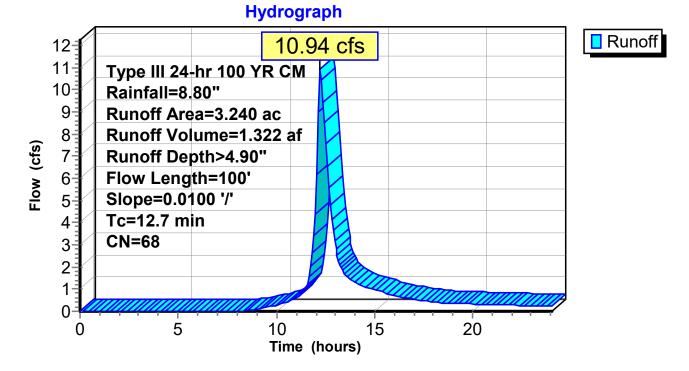
## Summary for Subcatchment Post DA4: Pervious

Runoff = 10.94 cfs @ 12.21 hrs, Volume= 1.322 af, Depth> 4.90"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

 Area	(ac)	CN	Desc	cription			
0.660 61 >75% Grass cover, Good, HSG B							
1.	810	74	>75%	% Grass co	over, Good	, HSG C	
0.	550	55	Woo	ds, Good,	HSG B		
 0.	220	70	Woo	ds, Good,	HSG C		
3.	240	68	Weig	ghted Aver	age		
3.	240		Perv	ious Area	•		
 Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
12.7	10	0	0.0100	0.13		Sheet Flow, Unpaved Grass: Short n= 0.150	P2= 3 30"

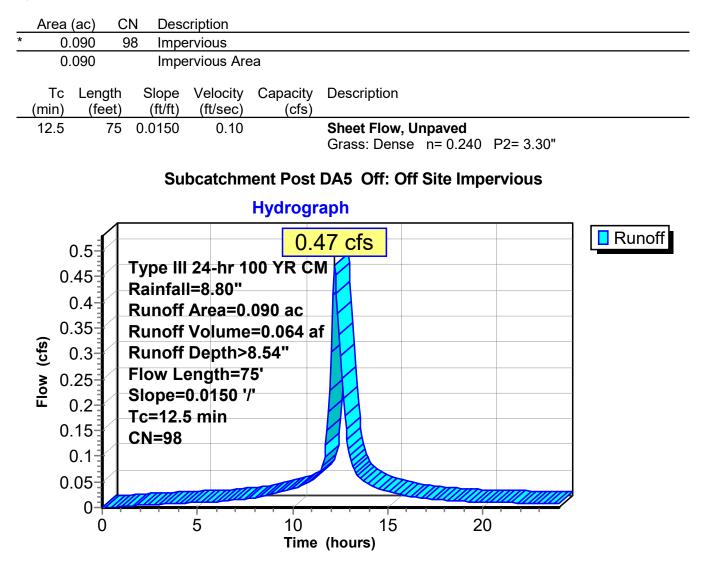
#### Subcatchment Post DA4: Pervious



#### Summary for Subcatchment Post DA5 Off: Off Site Impervious

Runoff = 0.47 cfs @ 12.20 hrs, Volume= 0.064 af, Depth> 8.54"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"



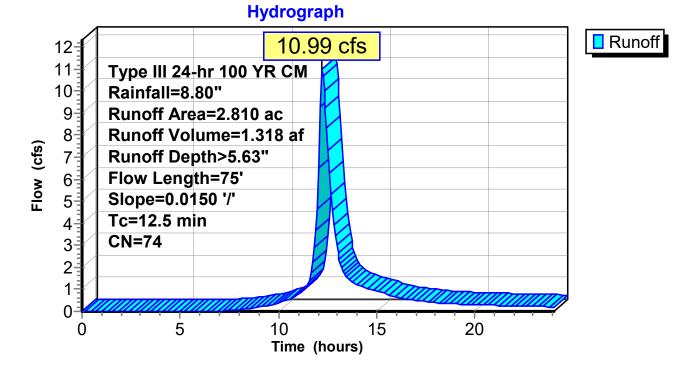
## Summary for Subcatchment Post DA5 Off: Off Site Pervious

Runoff = 10.99 cfs @ 12.21 hrs, Volume= 1.318 af, Depth> 5.63"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Type III 24-hr 100 YR CM Rainfall=8.80"

Are	ea (ac)	С	N Des	cription				
	2.710	2.710 74 >75% Grass cover, Good, HSG C						
	0.100	7	2 Woo	ods/grass o	comb., Goo	d, HSG C		
	2.810	7	4 Wei	ghted Avei	rage			
	2.810		Per	vious Area				
٦ miı)	īc Leng n) (fe	gth et)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description		
12	.5	75	0.0150	0.10		Sheet Flow, Unpaved Grass: Dense n= 0.240 P2= 3.30"		

#### Subcatchment Post DA5 Off: Off Site Pervious



## Summary for Pond Lake1: Basin

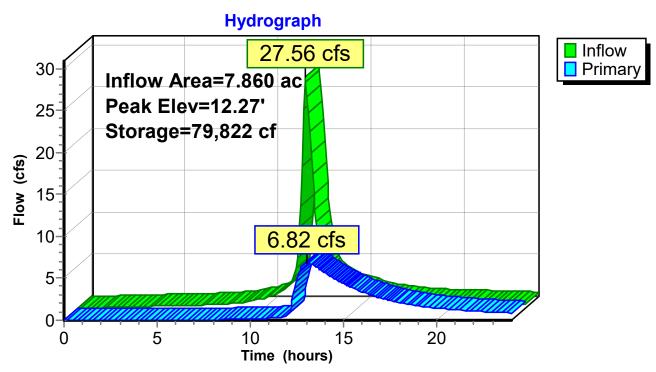
Inflow Area =	7.860 ac, 31.55% Impervious, Inflow I	Depth > 5.55" for 100 YR CM event
Inflow =	27.56 cfs @ 12.21 hrs, Volume=	3.633 af
Outflow =	6.82 cfs @ 13.05 hrs, Volume=	2.787 af, Atten= 75%, Lag= 50.6 min
Primary =	6.82 cfs @ 13.05 hrs, Volume=	2.787 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 12.27' @ 13.05 hrs Surf.Area= 0 sf Storage= 79,822 cf

Plug-Flow detention time= 235.9 min calculated for 2.778 af (76% of inflow) Center-of-Mass det. time= 151.0 min (952.4 - 801.4)

Volume	Inv	ert Avail.Sto	rage	Storage Description	
#1 10.70'		70' 137,8	78 cf	Custom Stage Data Listed below	
Elevatio (fee		Cum.Store cubic-feet)			
10.7	70	0			
11.0	00	15,300			
12.0	00	65,780			
13.0	00	118,459			
13.7	70	137,878			
Device	Routing	Invert	Out	et Devices	
#1	Primary	11.35'	2.0'	long Sharp-Crested Rectangular Weir	2 End Contraction(s)
#2	Primary	10.70'		long Sharp-Crested Rectangular Weir	( )
1=Sh	arp-Cres	ted Rectangula	r Weir	05 hrs HW=12.27' (Free Discharge) · (Weir Controls 5.21 cfs @ 3.13 fps) · (Weir Controls 1.60 cfs @ 4.09 fps)	

2=Sharp-Crested Rectangular Weir (Weir Controls 1.60 cfs @ 4.09 fps)



Pond Lake1: Basin

# Summary for Pond Lake2: Lake 2

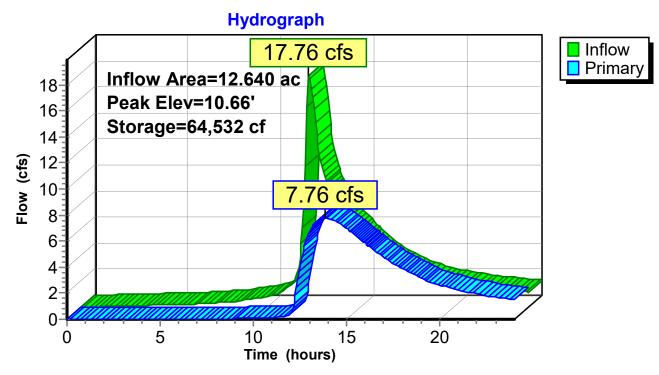
Inflow Area =	12.640 ac, 32.83% Impervious, Inflow Dep	oth > 4.59" for 100 YR CM event
Inflow =	17.76 cfs @ 12.23 hrs, Volume=	4.838 af
Outflow =	7.76 cfs @ 13.87 hrs, Volume= 4	4.092 af, Atten= 56%, Lag= 98.6 min
Primary =	7.76 cfs @ 13.87 hrs, Volume= 4	4.092 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 10.66' @ 13.87 hrs Surf.Area= 0 sf Storage= 64,532 cf

Plug-Flow detention time= 171.9 min calculated for 4.080 af (84% of inflow) Center-of-Mass det. time= 104.8 min (991.3 - 886.4)

Volume	Inver	t Avail.Stor	age Storage Desci	iption								
#1	9.67	" 87,36	0 cf Custom Stage	<b>Data</b> Listed below								
Elevatio	et) (cu	um.Store lbic-feet)										
9.6		0										
10.0	-	20,120										
11.0	00	87,360										
Device	Routing	Invert	Outlet Devices									
#1	Primary	10.00'	4.0' long Sharp-Cre	ested Rectangular Weir	2 End Contraction(s)							
#2	Primary	9.67'	• •	ested Rectangular Weir	( )							
Primary OutFlow Max=7.76 cfs @ 13.87 hrs HW=10.66' (Free Discharge) -1=Sharp-Crested Rectangular Weir (Weir Controls 6.79 cfs @ 2.66 fps)												

**1=Sharp-Crested Rectangular Weir** (Weir Controls 6.79 cfs @ 2.66 fps) **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.97 cfs @ 3.25 fps)



Pond Lake2: Lake 2

## Summary for Pond Lake3: Lake 3

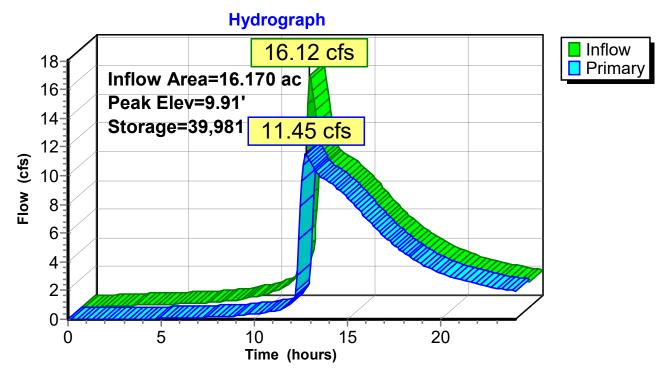
[79] Warning: Submerged Pond Lake2 Primary device # 2 by 0.24'

Inflow Area =	16.170 ac, 37.85% Impervious, Inflow D	Depth > 4.53" for 100 YR CM event
Inflow =	16.12 cfs @ 12.23 hrs, Volume=	6.098 af
Outflow =	11.45 cfs @ 12.76 hrs, Volume=	5.403 af, Atten= 29%, Lag= 32.0 min
Primary =	11.45 cfs @ 12.76 hrs, Volume=	5.403 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.91' @ 12.76 hrs Surf.Area= 0 sf Storage= 39,981 cf

Plug-Flow detention time= 100.6 min calculated for 5.387 af (88% of inflow) Center-of-Mass det. time= 49.7 min ( 971.0 - 921.2 )

Volume	Inve	ert Avail.St	torage Storage Description
#1	8.6	0' 69,	310 cf Custom Stage Data Listed below
Elevatio (fee 8.6 9.0 10.0 10.8	et) (c 60 00 00	Cum.Store oubic-feet) 0 11,585 42,767 69,310	
Device	Routing	Inver	t Outlet Devices
#1	Primary	9.60	
#2	Primary	9.60	" <b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)
#3	Primary	8.60	0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	8.60	0' 0.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
-1=Sh -2=Sh -3=Sh	arp-Crest arp-Crest arp-Crest	ed Rectangul ed Rectangul ed Rectangul	fs @ 12.76 hrs HW=9.91' (Free Discharge) ar Weir (Weir Controls 6.74 cfs @ 1.82 fps) ar Weir (Weir Controls 2.22 cfs @ 1.82 fps) ar Weir (Weir Controls 1.23 cfs @ 3.74 fps) ar Weir (Weir Controls 1.23 cfs @ 3.74 fps)



Pond Lake3: Lake 3

#### Summary for Pond Lake4&5: Lake 4 & 5

[79] Warning: Submerged Pond Lake3 Primary device # 3 by 0.73' [79] Warning: Submerged Pond Lake3 Primary device # 4 by 0.73'

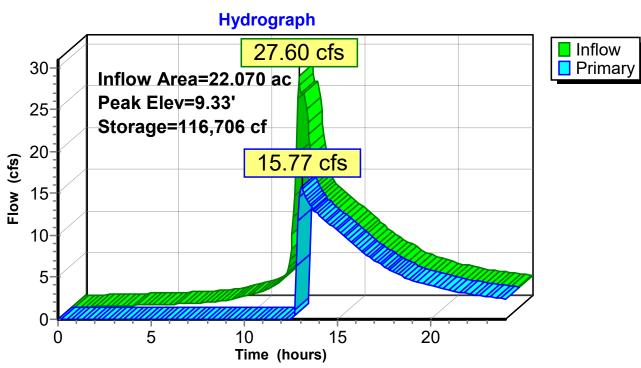
Inflow Area =	22.070 ac, 39.78% Impervious, Inflow	Depth > 4.69" for 100 YR CM event
Inflow =	27.60 cfs @ 12.19 hrs, Volume=	8.619 af
Outflow =	15.77 cfs @13.07 hrs, Volume=	6.085 af, Atten= 43%, Lag= 52.7 min
Primary =	15.77 cfs $\overline{@}$ 13.07 hrs, Volume=	6.085 af

Routing by Stor-Ind method, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs Peak Elev= 9.33' @ 13.07 hrs Surf.Area= 57,889 sf Storage= 116,706 cf

Plug-Flow detention time= 210.4 min calculated for 6.085 af (71% of inflow) Center-of-Mass det. time= 97.7 min ( 999.1 - 901.4 )

Volume	Inv	ert Avail.Sto	orage Storage	e Description	
#1	7.	00' 126,1	92 cf Custon	n Stage Data (Pris	smatic) Listed below
Elevatio (fee		Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
7.0	00	27,767	0	0	
7.4	40	46,551	14,864	14,864	
8.0	00	50,946	29,249	44,113	
9.0	00	55,842	53,394	97,507	
9.5	50	58,900	28,686	126,192	
Device	Routing	Invert	Outlet Device	es	
#1	Primary	9.20'	Head (feet)	0.20 0.40 0.60 0	<b>Toad-Crested Rectangular Weir</b> .80 1.00 1.20 1.40 1.60 0 2.64 2.63 2.64 2.64 2.63
#2	Primary	9.00'	( U	,	angular Weir 2 End Contraction(s)

Primary OutFlow Max=15.70 cfs @ 13.07 hrs HW=9.33' (Free Discharge) 1=Broad-Crested Rectangular Weir (Weir Controls 13.21 cfs @ 0.98 fps) 2=Sharp-Crested Rectangular Weir (Weir Controls 2.49 cfs @ 1.89 fps)

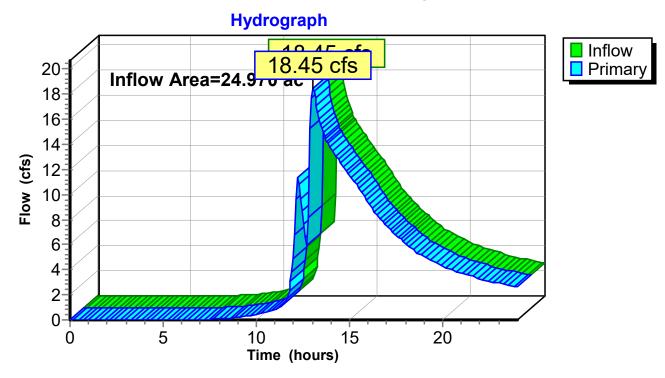


Pond Lake4&5: Lake 4 & 5

## Summary for Link 1L: Combo Discharge

Inflow Area =	=	24.970 ac, 35.52% Impervious, Inflow Depth > 3.59" for 100 YR CM event
Inflow =	:	18.45 cfs @ 13.04 hrs, Volume= 7.467 af
Primary =	:	18.45 cfs @ 13.04 hrs, Volume= 7.467 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.01 hrs, dt= 0.07 hrs



## Link 1L: Combo Discharge

**Stormwater Pipe Calculations** 

Project Name:The Fairways Major Site Plan - Phase 2 Townhomes Location: Middle Township, Cape May County, NJ Design Storm: 25 yr

	ations			A			Time																			
LUCA			ainage	Alea	_		Time							<u> </u>												
Inlet Up	Inlet Down	Area (Ac)	С	A*C	Totl. A*C	Tc (min)	Pipe Flow (min.)	Tc Total (min.)	l (in/hr.)	Q des. (c.f.s.)	n coeff.	Length (ft)	Diam. Pipe (FT)	Slope Want. FT/F	Slope Des. FT/FT	Drop want. (ft.)	Drop des.(ft.)	Q full (c.f.s.)	Vel. Full (f.p.s.)	Upper End Invert	Lower End Invert	Upper Grate	Lower Grate	Uppe Grate Cover	Lower Grate Cover	Class Pipe
I-1	I-2	0.23	0.85	0.20	0.20	10	0.1	10.0	6.6	1.32	0.01	24	1.25	0.0002	0.0042	0.006	0.100	5.4	4.4	8.10	8.00	10.58	10.58	1.23	1.33	HDPE
I-2	FES-3	0.37	0.8	0.30	0.50	10	0.6	10.2	6.6	3.28	0.01	138	1.25	0.0015	0.0030	0.210	0.420	4.6	3.8	8.00	7.58	10.58	9.00	1.33	0.17	HDPE
1-4	I-5	0.33	0.8	0.27	0.27	10	0.4	15.4	5.6	1.52	0.01	86	1.25	0.0003	0.0029	0.028	0.250	4.5	3.7	8.00	7.75	10.50	11.00	1.25	2.00	HDPE
I-5	FES-6	0.31	0.8	0.25	0.52	10	0.6	10.2	6.6	3.41	0.01	138	1.25	0.0016	0.0034	0.228	0.470	4.9	4.0	7.75	7.28	10.58	9.00	1.58	0.47	HDPE

Date: 3/30/20 Calculated by: RAW

# Low Impact Development Checklist

## New Jersey Stormwater Best Management Practices Manual

February 2004

### APPENDIX A

# Low Impact Development Checklist

# A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

According to the NJDEP Stormwater Management Rules at N.J.A.C. 7:8, the groundwater recharge, stormwater quality, and stormwater quantity standards established by the Rules for major land development projects must be met by incorporating nine specific nonstructural stormwater management strategies into the project's design to the maximum extent practicable.

To accomplish this, the Rules require an applicant seeking land development approval from a regulatory board or agency to identify those nonstructural strategies that have been incorporated into the project's design. In addition, if an applicant contends that it is not feasible to incorporate any of the specific strategies into the project's design, particularly for engineering, environmental, or safety reasons, the Rules further require that the applicant provide a basis for that contention.

This checklist has been prepared to assist applicants, site designers, and regulatory boards and agencies in ensuring that the nonstructural stormwater management requirements of the Rules are met. It provides an applicant with a means to identify both the nonstructural strategies incorporated into the development's design and the specific low impact development BMPs (LID-BMPs) that have been used to do so. It can also help an applicant explain the engineering, environmental, and/or safety reasons that a specific nonstructural strategy could not be incorporated into the development's design.

The checklist can also assist municipalities and other land development review agencies in the development of specific requirements for both nonstructural strategies and LID-BMPs in zoning and/or land use ordinances and regulations. As such, where requirements consistent with the Rules have been adopted, they may supersede this checklist.

Finally, the checklist can be used during a pre-design meeting between an applicant and pertinent review personnel to discuss local nonstructural strategies and LID-BMPs requirements in order to optimize the development's nonstructural stormwater management design.

Since this checklist is intended to promote the use of nonstructural stormwater management strategies and provide guidance in their incorporation in land development projects, municipalities are permitted to revise it as necessary to meet the goals and objectives of their specific stormwater management program and plan within the limits of N.J.A.C. 7:8.

## Low Impact Development Checklist

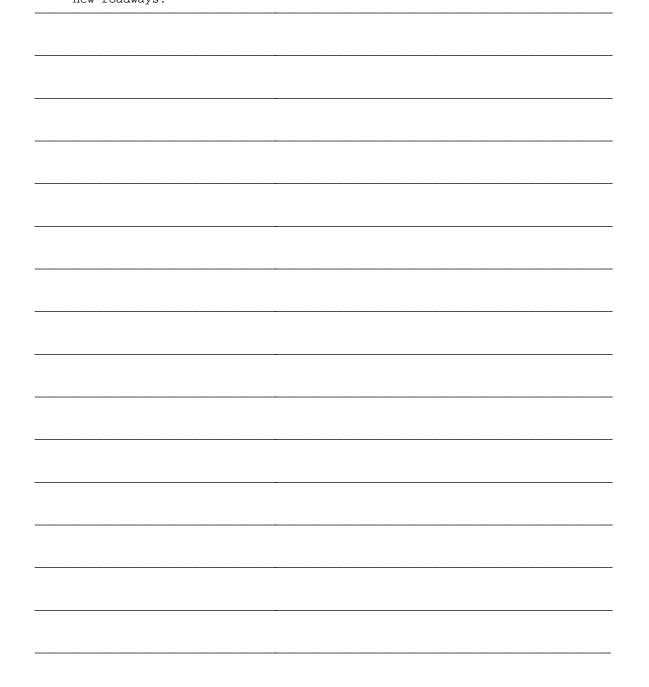
# A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

Municipality:	
County: <u>Cape May County</u> Date	3/30/20
2000 - 2000	
Review board or agency:CAFRA	
Teview bound of agency	
Esimuous Phase 20	Major Site Dian Townhomoo
Proposed land development name:	
5.04	
Lot(s): Bloc	k(s):
Project or application number:	
Annie Fred Langford	
Applicant's name:Fred Langford	
Applicant's address:212 Crest Road	
Applicant's address:	
Cape May Court House, NJ 0	8210
T 1, 1,	(609) 465-4937
Telephone: (609) 465-8000 Fax:	(00), 105 1957
Email address:	
Mott Watkins Associates, LLC	!
Designer's address:	
Egg Harbor Township, NJ 08	3234
Telephone:(609) 569-1551 Fax:	(609) 569-1521
Tux.	
Email address:bob@mottwatkins.com	

## Part 1: Description of Nonstructural Approach to Site Design

In narrative form, provide an overall description of the nonstructural stormwater management approach and strategies incorporated into the proposed site's design. Attach additional pages as necessary. Details of each nonstructural strategy are provided in Part 3 below.

The proposed stormwater basin/lake will promote infiltration above the water surface elevation and then evaporation will occur as well. We have also incorporated perforated pipe and stone trenches to collect the roof runoff as well as proposing porous asphalt paving in the 18 parking stalls along the new roadways.



## Part 2: Review of Local Stormwater Management Regulations

Title and date of stormwater management regulations used in development design:
State stormwater regulations adopted in February, 2004
Do regulations include nonstructural requirements? Yes: <u>X</u> No:
If yes, briefly describe:Nonstructural elements of design incorporated are those as
described in the Low Impact Development Checklist as found in the
February 2004 BMP
List LID-BMPs prohibited by local regulations:None are specifically prohibited.
Development Checklist as found in the February 2004 BMP
Pre-design meeting held? Yes: <u>x</u> Date: No:
Meeting held with: Reviewing Engineer
Pre-design site walk held? Yes: X Date: No:
Site walk held with:Mott Watkins Assiciates, LLC - design engineer
Other agencies with stormwater review jurisdiction:
Name:
Required approval:
Name:
Required approval:
Name:
Required approval:

## Part 3: Nonstructural Strategies and LID-BMPs in Design

### 3.1 Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharges and runoff quality and quantity. This section of the checklist helps identify the vegetation and landscaping strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to help maintain existing recharge rates and/or minimize or prevent increases in runoff quantity and pollutant loading.

А.	Has an inventory of existing si	te vegetation bee	n perfor	med? Ye	s:	X	No:	
	If yes, was this inventory a fact	or in the site's la	yout and	l design?	Yes:	X	No:	
B.	Does the site design utilize any	v of the following	g nonstru	ictural LI	D-BMPs?			
	Preservation of natural areas?	Yes:	No:	X	If yes, s	pecify %	of site:	
	Native ground cover?	Yes:	No:	Х	If yes, s	pecify %	of site:	
	Vegetated buffers?	Yes:	No:	X	If yes, s	pecify %	of site:	
C.	Do the land development regu	lations require th	nese non	structura	l LID-BM	IPs?		
	Preservation of natural areas?	Yes:	No:	X	If yes, s	pecify %	of site:	
	Native ground cover?	Yes:	No:	X	If yes, s	pecify %	of site:	
	Vegetated buffers?	Yes:	No:	X	If yes, s	pecify %	of site:	
D.	If vegetated filter strips or buff	ers are utilized, s	specify th	neir funct	ions:			
	Reduce runoff volume increase	es through lower	runoff c	coefficient	:: Yes:		No:	Х
	Reduce runoff pollutant loads	through runoff t	reatment	•	Yes:	Х	No:	

Maintain groundwater recharge by preserving netural errors	Yes:	Х	No <sup>.</sup>	
Maintain groundwater recharge by preserving natural areas:	res:		NO:	

#### 3.2 Minimize Land Disturbance

Minimizing land disturbance is a nonstructural LID-BMP that can be applied during both the development's construction and post-construction phases. This section of the checklist helps identify those land disturbance strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to minimize land disturbance and the resultant change in the site's hydrologic character.

А.	Have inventories of existing site soils and slopes been performed?	Yes:	X	No:	
	If yes, were these inventories factors in the site's layout and design?	Yes:	Х	No:	
В.	Does the development's design utilize any of the following nonstruct	tural	LID-BMPs	2	
	Restrict permanent site disturbance by land owners?	Yes:	X	No:	
	If yes, how: Deed restricting tree removal				
	Restrict temporary site disturbance during construction?	Yes:	X	No:	
	If yes, how: Construction Entrance at one entrance				
	Consider soils and slopes in selecting disturbance limits?				
	If yes, how: Reduced cut and fill in areas for limit	ed d	isturban	ce.	
C.	Specify percentage of site to be cleared: Majority of site	e_ Reg	raded:	85%	
	is cleared or d	evelo	oped		
D.	Specify percentage of cleared areas done so for buildings:10%				
	For driveways and parking:5% For roadw	vays: _	5%		

					andards require them.	
Specify site's hy	drologic soil gro	up (HSG) p	ercentages:			
HSG A:	HSG B:	78.4%	HSG C: _	21.6%	HSG D:	
Specify percent	age of each HSG	that will be	permanently	disturbed:		
HSG A:	HSG B:	100%	HSG C: _	100%	HSG D:	
disturbance with recharge rates a what other pract	hin areas with g nd reduce runof ical measures if a	reater perm f volume ir any can be t	neable soils ( ncreases. In li aken to achie	HSG A and ight of the l we this?	(HSG C and D) and mir B) can help maintain grou HSG percentages in F and C to retain enough wate	indwa G abo
disturbance with recharge rates a what other pract Oversize that coup	hin areas with g nd reduce runof ical measures if a e the storm wa	reater perm f volume ir any can be t ater basin r measures	neable soils ( ncreases. In li taken to achie n to cause s, and the	HSG A and ight of the l eve this? the basin storm wat	B) can help maintain grou HSG percentages in F and C	indwa G abo : <u>r</u>
disturbance with recharge rates a what other pract Oversize that coup reduced c	hin areas with g nd reduce runof ical measures if a e the storm wa led with other ompared to pr	reater perm f volume ir any can be t ater basin r measure re-develop	neable soils ( ncreases. In li taken to achie n to cause s, and the	HSG A and ight of the l eve this? the basin storm wat ons.	B) can help maintain grou HSG percentages in F and C to retain enough wate er discharge volume is	indwa G abo <u>:</u> r
disturbance with recharge rates a what other pract Oversize that coup reduced c	hin areas with g nd reduce runof ical measures if a e the storm wa led with other ompared to pr clude Karst topog	reater perm f volume ir any can be t ater basin r measure: re-develop graphy?	neable soils ( ncreases. In li taken to achie n to cause s, and the ped conditi	HSG A and ight of the l eve this? the basin storm wat ons.	B) can help maintain grou HSG percentages in F and C to retain enough wate ter discharge volume is	indwa G abo <u>:</u> r
disturbance with recharge rates a what other pract Oversize that coup reduced c	hin areas with g nd reduce runof ical measures if a e the storm wa led with other ompared to pr	reater perm f volume ir any can be t ater basin r measure: re-develop graphy?	neable soils ( ncreases. In li taken to achie n to cause s, and the ped conditi	HSG A and ight of the l eve this? the basin storm wat ons.	B) can help maintain grou HSG percentages in F and C to retain enough wate er discharge volume is	indwa G abo <u>:</u> r
disturbance with recharge rates a what other pract <u>Oversize</u> <u>that coup</u> <u>reduced c</u> Does the site in If yes, discuss n	hin areas with g nd reduce runof ical measures if a e the storm wa led with other ompared to pr clude Karst topog	reater perm f volume ir any can be t ater basin r measure: re-develop graphy?	neable soils ( ncreases. In li taken to achie n to cause s, and the ped conditi	HSG A and ight of the l eve this? the basin storm wat ons.	B) can help maintain grou HSG percentages in F and C to retain enough wate er discharge volume is	indwa G abo : <u>r</u>
disturbance with recharge rates a what other pract <u>Oversize</u> <u>that coup</u> <u>reduced c</u> Does the site in If yes, discuss n	hin areas with g nd reduce runof ical measures if a e the storm wa led with other ompared to pr clude Karst topog	reater perm f volume ir any can be t ater basin r measure: re-develop graphy?	neable soils ( ncreases. In li taken to achie n to cause s, and the ped conditi	HSG A and ight of the l eve this? the basin storm wat ons.	B) can help maintain grou HSG percentages in F and C to retain enough wate er discharge volume is	indwa G abo : <u>r</u>

#### 3.3 Impervious Area Management

New impervious surfaces at a development site can have the greatest adverse effect on groundwater recharge and stormwater quality and quantity. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into a proposed development's design to comprehensively manage the extent and impacts of new impervious surfaces.

A. Specify impervious cover at site: Existing: \_\_\_\_\_ Proposed: \_\_\_\_\_

B. Specify maximum site impervious coverage allowed by regulations:

C. Compare proposed street cartway widths with those required by regulations:

Type of Street	Proposed Cartway Width (feet)	Required Cartway Width (feet)
Residential access – low intensity		28 '
Residential access – medium intensity		28 '
Residential access – high intensity with parking 30	' WIDE (15' both directions	) 28'
Residential access – high intensity without parking		20 '
Neighborhood		30'
Minor collector – low intensity without parking		20'
Minor collector – with one parking lane		28'
Minor collector – with two parking lanes		36'
Minor collector – without parking		22 '
Major collector		24 '

D. Compare proposed parking space dimensions with those required by regulations:

 Proposed:
 9' x 18'
 Regulations:
 9' x 18'

E. Compare proposed number of parking spaces with those required by regulations:

 Proposed:
 2.5
 Regulations:
 2.5

F.	F. Specify percentage of total site impervious cover created by buildings: Clubhouse: 2% Houses: 1						
	By driveways and parking:	Driveways: 5%	By roadways: _	9%	-		
		Parking Lot: 2%					
G. What design criteria and/or site changes would be required to reduce the percentages in F above?							
	Reduce allowable coverage in ordinance						
					-		

H. Specify percentage of total impervious area that will be unconnected:

Total site: _1	L00	Buildings:	_ Driveways and parking:	Roads:
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I. Specify percentage of total impervious area that will be porous:

Total site:0	Buildings:	Driveways	and parking:	Roads	
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J. Specify percentage of total building roof area that will be vegetated: \_\_\_\_\_0

K. Specify percentage of total parking area located beneath buildings: \_\_\_\_\_0

L. Specify percentage of total parking located within multi-level parking deck: \_\_\_\_\_0

#### 3.4 Time of Concentration Modifications

Decreasing a site's time of concentration (Tc) can lead directly to increased site runoff rates which, in turn, can create new and/or aggravate existing erosion and flooding problems downstream. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to effectively minimize such Tc decreases.

When reviewing Tc modification strategies, it is important to remember that a drainage area's Tc should reflect the general conditions throughout the area. As a result, Tc modifications must generally be applied throughout a drainage area, not just along a specific Tc route.

A. Specify percentage of site's total stormwater conveyance system length that will be:

 Storm sewer:
 75%
 Vegetated swale:
 25%
 Natural channel:
 0%

 Stormwater management facility:
 0%
 Other:
 0%

Note: the total length of the stormwater conveyance system should be measured from the site's downstream property line to the downstream limit of sheet flow at the system's headwaters.

B. What design criteria and/or site changes would be required to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages in A above?

Modify the ordinance to permit parking lots without curbing.

C. In conveyance system subareas that have overland or sheet flow over impervious surfaces or turf grass, what practical and effective site changes can be made to:

Decrease overland flow slope: \_\_\_\_\_ Decrease slope by regrading. However, this comes at

the expense and impact of regrading away from natural or existing topography.

Increase overland flow roughness: \_\_\_\_\_Include the use of biofilters, low height dams

and rerouting of a flow path to not be straight.

#### **3.5 Preventative Source Controls**

The most effective way to address water quality concerns is by pollution prevention. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to reduce the exposure of pollutants to prevent their release into the stormwater runoff.

A. Trash Receptacles

	Specify the number of trash receptacles provided: <u>N/A</u>	
	Specify the spacing between the trash receptacles:N/A	
	Compare trash receptacles proposed with those required by regulations:	
	Proposed: Regulations: 0	
В.	Pet Waste Stations	
	Specify the number of pet waste stations provided:0	
	Specify the spacing between the pet waste stations:N/A	
	Compare pet waste stations proposed with those required by regulations	:
	Proposed: Regulations: 0	
C.	Inlets, Trash Racks, and Other Devices that Prevent Discharge of Large T Specify percentage of total inlets that comply with the NJPDES storm dra	
D.	Maintenance	
	Specify the frequency of the following maintenance activities:	
	Street sweeping: Proposed: Regulations:	0
	Litter collection: Proposed: Regulations: _	0
	Identify other stormwater management measures on the site that prev debris:	ent discharge of large trash and
	there will be a trash rack on the flared end sections go	ing into the wet pond.

### E. Prevention and Containment of Spills

Identify locations where pollutants are located on t from being exposed to stormwater runoff:	he site, and the features that prevent these pollutants
Pollutant:Oil in parking lot	Location:Runoff directed to grass
Feature utilized to prevent pollutant exposure, harm	nful accumulation, or contain spills:
Pollutant:	Location:
Feature utilized to prevent pollutant exposure, harm	nful accumulation, or contain spills:
Pollutant:	Location:
Feature utilized to prevent pollutant exposure, harm	nful accumulation, or contain spills:
Pollutant:	Location:
Feature utilized to prevent pollutant exposure, harm	nful accumulation, or contain spills:
Pollutant:	_ Location:

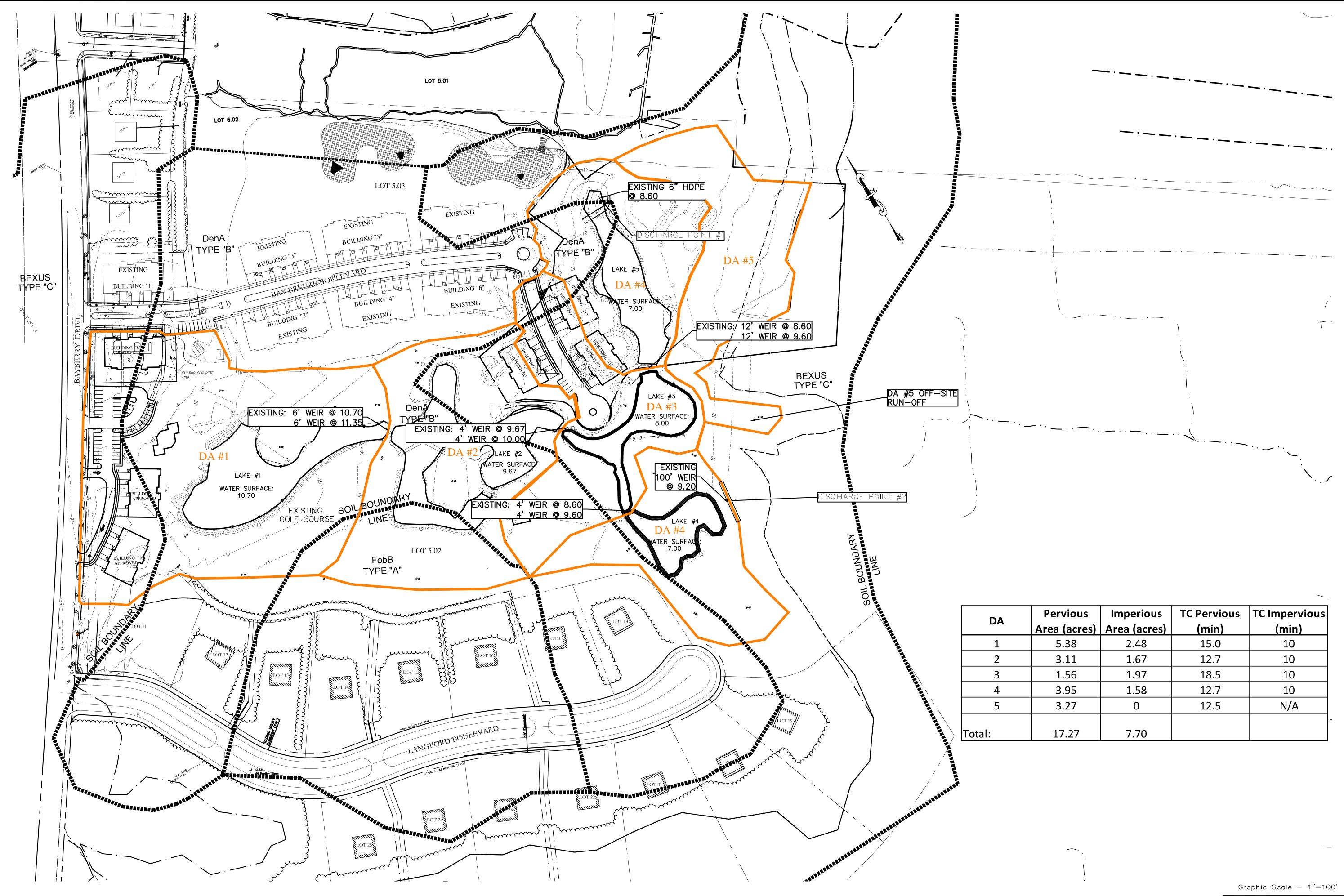
## Part 4: Compliance with Nonstructural Requirements of NJDEP Stormwater Management Rules

1. Based upon the checklist responses above, indicate which nonstructural strategies have been incorporated into the proposed development's design in accordance with N.J.A.C. 7:8-5.3(b):

No.	Nonstructural Strategy	Yes	No
1.	Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.	х	
2.	Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.	x	
3.	Maximize the protection of natural drainage features and vegetation.	х	
4.	Minimize the decrease in the pre-construction time of concentration.	Х	
5.	Minimize land disturbance including clearing and grading.	х	
6.	Minimize soil compaction.	х	
7.	Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.	x	
8.	Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.	Х	
9.	Provide preventative source controls.	Х	

2. For those strategies that have not been incorporated into the proposed development's design, provide engineering, environmental, and/or safety reasons. Attached additional pages as necessary.

## Drainage Area Map



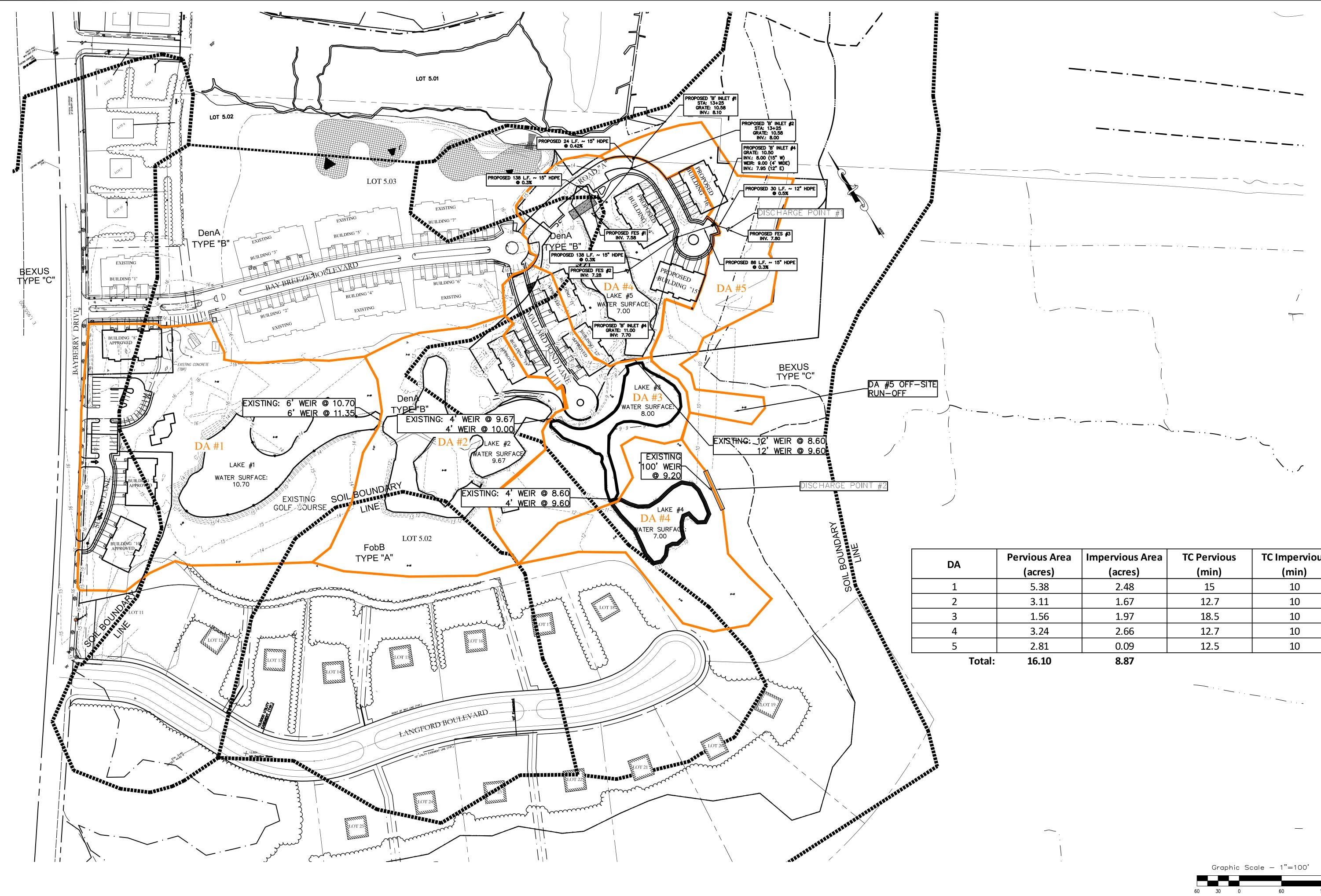
			-	
Pervious	Imperious	<b>TC Pervious</b>	TC Impervious	
Area (acres)	Area (acres)	(min)	(min)	
5.38	2.48	15.0	10	
3.11	1.67	12.7	10	
1.56	1.97	18.5	10	
3.95	1.58	12.7	10	
3.27	0	12.5	N/A	
17.27	7.70			

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-		Middle Township	Cape May County	- -	Jev. Ur		Fairways Phase ZB - Major Site Plan	Block 335.01; Lot 5.04



Pervious Area	Impervious Area	<b>TC Pervious</b>	TC Impervious
(acres)	(acres)	(min)	(min)
5.38	2.48	15	10
3.11	1.67	12.7	10
1.56	1.97	18.5	10
3.24	2.66	12.7	10
2.81	0.09	12.5	10
16 10	8 87		

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