

MANAGED RELEASE CONCEPT (MRC) DESIGN SUMMARY

Complete One Design Summary Sheet for Each BMP Designed for MRC

GENERAL INFORMATION

Applicant Name: **AAMPA Holdings, LLC** Project Name: **AAMPA Holdings – Ritner Hwy**
Applicant Address: **1514 Commerce Ave, Suite 203** Municipality: **West Pennsboro Township**
City, State, Zip: **Carlisle PA 17013** County: **Cumberland**
Permit Type: ☐ NPDES PAG-02 ☒ NPDES IP ☐ ESCGP ☐ ESP

	Pre-Development	Post-Development	Change
Impervious Area (acres):	0.00	1.18	1.18

MRC BMP INFORMATION

MRC BMP Type: **P-5 – MRC Bioretention Pond 5** Stormwater BMP Manual Section: **6.4.5**

Will the BMP Include Vegetation? ☒ Yes ☐ No

If Yes, Identify Proposed Vegetation: **Mixed grasses, Shrubs, Trees, Plugs (Details of species' on Plan Sheet C-706)**

For Non-Vegetated BMPs Will There Be Pre- or Post-Treatment? ☐ Yes (Pre-) ☐ Yes (Post-) ☒ No

If Yes, Identify Proposed Pre- or Post-Treatment: _____

Name of Surface Water to Receive MRC BMP Discharges: **Big Spring Creek**

Designated Use of Surface Water: **HQ - CWF** Existing Use of Surface Water (if different): _____

Is the Surface Water Impaired? ☒ Yes ☐ No

If Yes, Identify Cause(s): **Organic Enrichment / Oxygen Depletion**

Will the BMP have an impermeable liner? ☐ Yes ☒ No

If Yes, explain why a liner is proposed: _____

BMP Media Description: **See PCSM Plan**

Are Any Deviations from MRC Design Standards Proposed? ☐ Yes ☒ No

If Yes, Identify Deviations: _____

MRC BMP DESIGN VALUES AND STANDARDS

Parameter	Design Value	Design Standard
Actual Contributing Impervious Area to BMP (acres)	1.18	
Equivalent Contributing Impervious Area to BMP (acres)	1.17	
Total Drainage Area to BMP (acres)	3.17	
MRC BMP Release Rate (cfs)	0.01	No greater than 0.01 cfs / acre of equivalent contributing impervious
Underdrain Outflow Rate During 1.2-Inch/2-Hour Storm (cfs)	0.00	<= MRC BMP Release Rate (cfs)
Maximum Storm Event Routed to MRC BMP	100-yr/24-hr	

MRC BMP Design Summary
Revised, August 25, 2020

Parameter	Design Value	Design Standard
BMP Footprint Area (ft ²)	24,574	
Bottom BMP Elevation (Native Soils) (ft)	585.00	
2-Yr/24-Hr Storm Ponding Depth (ft)	0.00	1 ft (recommended) (2 ft max)
Maximum Ponding Depth (ft)	0.74	4 ft (max)
Overflow Bypass Elevation (ft)	588.00	
Media Depth (ft)	2.0	2 ft (min) – 4 ft (max)
Media Void Space (%)	15	
Internal Water Storage (IWS) Depth (ft)	2.0	1 ft recommended
Top of IWS Elevation (ft)	587.00	
Underdrain Pipe Diameter (in)	4.0	
Underdrain Orifice Diameter (in)	3.0	
Underdrain Outlet Elevation (ft)	587.00	
IWS Available for Routing (%)	50 – in stone	50% max
Separation Distance (Groundwater) (ft)	>1.0	1 ft (min) (2 ft recommended)
Infiltration Rate (in/hr)	0.22	
Volume of Overflow During 1.2-Inch/2-Hour Storm (cf)	0	0 (No overflow allowed)
1-Yr/24-Hr Pre -Development Peak Rate (cfs)	0.06	
2-Yr/24-Hr Post -Development Peak Rate (cfs)	0.00	1-Yr/24-Hr Pre-Development Peak Rate (or per approved Act 167 Plan)
10-Yr/24-Hr Post -Development Peak Rate (cfs)	0.02	10-Yr/24-Hr Pre-Development Peak Rate
50-Yr/24-Hr Post -Development Peak Rate (cfs)	0.14	50-Yr/24-Hr Pre-Development Peak Rate
100-Yr/24-Hr Post -Development Peak Rate (cfs)	0.19	100-Yr/24-Hr Pre-Development Peak Rate
Total 2-Yr/24-Hr Runoff Volume Managed by BMP (cf)	32,931	
Ponding Time @ 2-Yr/24-Hr Storm (hrs)	0.0	72 hrs (surface), 7 days (underground)
Ponding Time @ 10-Yr/24-Hr Storm (hrs)	61.7	72 hrs (surface), 7 days (underground)
Ponding Time @ 50-Yr/24-Hr Storm (hrs)	52.5	72 hrs (surface), 7 days (underground)
Ponding Time @ 100-Yr/24-Hr Storm (hrs)	63.6	72 hrs (surface), 7 days (underground)

Justin T. Doty

Licensed P.E. Name

Licensed P.E. Signature

PE080613

License No.

03-05-25

Date



Summary for Subcatchment WS-11: WS-11

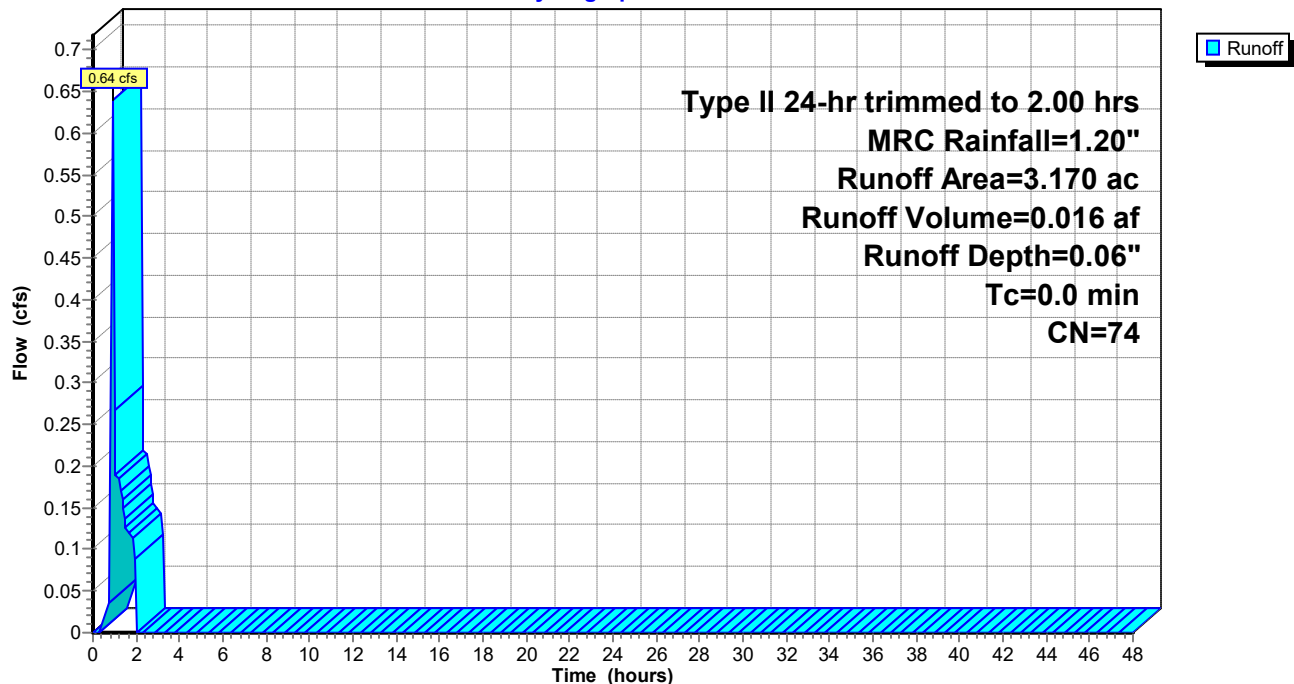
Runoff = 0.64 cfs @ 0.95 hrs, Volume= 0.016 af, Depth= 0.06"
Routed to Pond P-5 : P-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr trimmed to 2.00 hrs MRC Rainfall=1.20"

Area (ac)	CN	Description
0.560	58	Meadow, non-grazed, HSG B
1.180	98	Paved parking, HSG B
1.430	61	>75% Grass cover, Good, HSG B
3.170	74	Weighted Average
1.990		62.78% Pervious Area
1.180		37.22% Impervious Area

Subcatchment WS-11: WS-11

Hydrograph



Summary for Pond P-5: P-5

Inflow Area = 3.170 ac, 37.22% Impervious, Inflow Depth = 0.06" for MRC event
 Inflow = 0.64 cfs @ 0.95 hrs, Volume= 0.016 af
 Outflow = 0.13 cfs @ 1.47 hrs, Volume= 0.016 af, Atten= 79%, Lag= 31.2 min
 Discarded = 0.13 cfs @ 1.47 hrs, Volume= 0.016 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Reach F-O : Final Outflow

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 585.07' @ 1.47 hrs Surf.Area= 0.560 ac Storage= 0.006 af

Plug-Flow detention time= 29.5 min calculated for 0.016 af (100% of inflow)
 Center-of-Mass det. time= 29.1 min (107.2 - 78.1)

Volume	Invert	Avail.Storage	Storage Description	
#1	585.00'	4.544 af	Custom Stage Data (Prismatic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Voids (%)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
585.00	0.560	0.0	0.000	0.000
587.00	0.560	15.0	0.168	0.168
590.20	0.740	100.0	2.080	2.248
591.00	5.000	100.0	2.296	4.544

Device	Routing	Invert	Outlet Devices
#1	Discarded	585.00'	0.220 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 584.00'
#2	Primary	587.00'	3.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	588.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	588.50'	15.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.13 cfs @ 1.47 hrs HW=585.07' (Free Discharge)

↑ **1=Exfiltration** (Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=585.00' (Free Discharge)

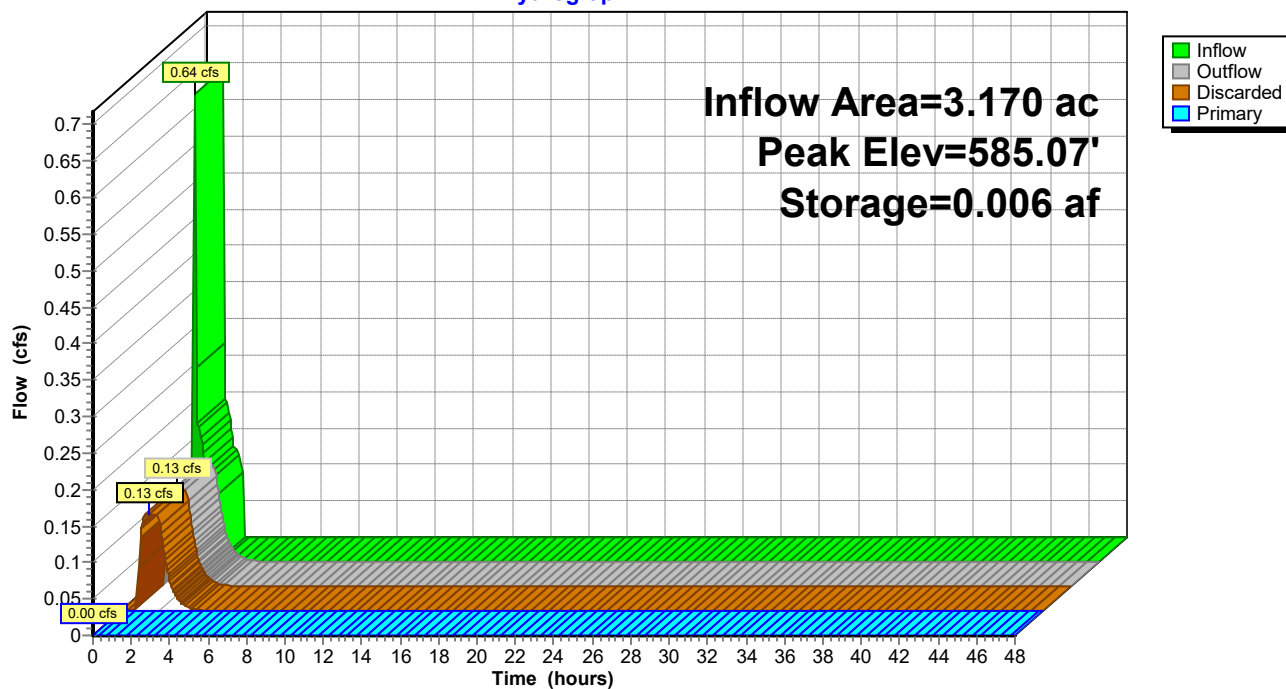
↑ **2=Orifice/Grate** (Controls 0.00 cfs)

↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P-5: P-5

Hydrograph



Stage-Discharge for Pond P-5: P-5

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
585.00	0.00	0.00	0.00	590.20	145.48	0.83	144.66
585.10	0.14	0.14	0.00	590.30	157.37	0.96	156.41
585.20	0.15	0.15	0.00	590.40	169.52	1.09	168.43
585.30	0.16	0.16	0.00	590.50	181.94	1.23	180.71
585.40	0.17	0.17	0.00	590.60	194.60	1.36	193.24
585.50	0.19	0.19	0.00	590.70	207.51	1.50	206.00
585.60	0.20	0.20	0.00	590.80	220.65	1.64	219.00
585.70	0.21	0.21	0.00	590.90	234.01	1.79	232.22
585.80	0.22	0.22	0.00	591.00	247.59	1.93	245.66
585.90	0.24	0.24	0.00				
586.00	0.25	0.25	0.00				
586.10	0.26	0.26	0.00				
586.20	0.27	0.27	0.00				
586.30	0.29	0.29	0.00				
586.40	0.30	0.30	0.00				
586.50	0.31	0.31	0.00				
586.60	0.32	0.32	0.00				
586.70	0.34	0.34	0.00				
586.80	0.35	0.35	0.00				
586.90	0.36	0.36	0.00				
587.00	0.37	0.37	0.00				
587.10	0.41	0.39	0.02				
587.20	0.46	0.40	0.06				
587.30	0.51	0.41	0.10				
587.40	0.55	0.43	0.12				
587.50	0.59	0.44	0.14				
587.60	0.62	0.46	0.16				
587.70	0.65	0.47	0.18				
587.80	0.68	0.48	0.19				
587.90	0.71	0.50	0.21				
588.00	0.73	0.51	0.22				
588.10	1.17	0.53	0.64				
588.20	1.94	0.54	1.40				
588.30	2.93	0.55	2.37				
588.40	4.08	0.57	3.51				
588.50	5.37	0.58	4.79				
588.60	8.33	0.60	7.73				
588.70	12.67	0.61	12.06				
588.80	17.94	0.62	17.32				
588.90	23.96	0.64	23.32				
589.00	30.63	0.65	29.98				
589.10	37.87	0.67	37.21				
589.20	45.64	0.68	44.96				
589.30	53.89	0.70	53.20				
589.40	62.59	0.71	61.88				
589.50	71.71	0.72	70.99				
589.60	81.22	0.74	80.48				
589.70	91.11	0.75	90.35				
589.80	101.34	0.77	100.57				
589.90	111.91	0.78	111.13				
590.00	122.80	0.80	122.01				
590.10	134.00	0.81	133.19				

Stage-Area-Storage for Pond P-5: P-5

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
585.00	0.560	0.000	590.20	0.740	2.248
585.10	0.560	0.008	590.30	1.272	2.349
585.20	0.560	0.017	590.40	1.805	2.502
585.30	0.560	0.025	590.50	2.337	2.710
585.40	0.560	0.034	590.60	2.870	2.970
585.50	0.560	0.042	590.70	3.403	3.284
585.60	0.560	0.050	590.80	3.935	3.650
585.70	0.560	0.059	590.90	4.467	4.071
585.80	0.560	0.067	591.00	5.000	4.544
585.90	0.560	0.076			
586.00	0.560	0.084			
586.10	0.560	0.092			
586.20	0.560	0.101			
586.30	0.560	0.109			
586.40	0.560	0.118			
586.50	0.560	0.126			
586.60	0.560	0.134			
586.70	0.560	0.143			
586.80	0.560	0.151			
586.90	0.560	0.160			
587.00	0.560	0.168			
587.10	0.566	0.224			
587.20	0.571	0.281			
587.30	0.577	0.339			
587.40	0.582	0.396			
587.50	0.588	0.455			
587.60	0.594	0.514			
587.70	0.599	0.574			
587.80	0.605	0.634			
587.90	0.611	0.695			
588.00	0.616	0.756			
588.10	0.622	0.818			
588.20	0.628	0.881			
588.30	0.633	0.944			
588.40	0.639	1.007			
588.50	0.644	1.071			
588.60	0.650	1.136			
588.70	0.656	1.201			
588.80	0.661	1.267			
588.90	0.667	1.334			
589.00	0.672	1.400			
589.10	0.678	1.468			
589.20	0.684	1.536			
589.30	0.689	1.605			
589.40	0.695	1.674			
589.50	0.701	1.744			
589.60	0.706	1.814			
589.70	0.712	1.885			
589.80	0.717	1.956			
589.90	0.723	2.029			
590.00	0.729	2.101			
590.10	0.734	2.174			

**MRC BMP 2-YR/24-HR RUNOFF VOLUME MANAGED BY BMP
CALCULATIONS:**

P-5:

BMP Invert: 585.00

Overflow Discharge Invert: 588.00

Total Volume Depth Below Overflow: **3.00'**

Volume at Elevation 588.00 (from HydroCAD): **0.756 ac-ft**

$$\mathbf{0.756\ ac\text{-}ft * 43,560\ cu\text{-}ft = \underline{\underline{32,931\ ft^3}}}$$

WORKSHEET 4 - EQUIVALENT IMPERVIOUS AREA CALCULATIONS

PROJECT AAMPA Holdings - Ritner Hwy
 Drainage Area: WS-11 MRC
 1.2in-2hr Rainfall 1.20 in

Managed Area 3.17 acres

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (Ac)	CN	S	Ia (0.2*S)	Q Runoff (In)	Runoff Volume (ft3)
Meadow	B	24394	0.56	58	7.24	1.45	0.01	18
Impervious	B	51401	1.18	98	0.20	0.04	0.99	4222
Open Space	B	62291	1.43	61	6.39	1.28	0.00	5
Total			3.17					4245

Equivalent Impervious Area:

4,245 / (0.0833 ft. * 43,560 sq. ft. / acre)

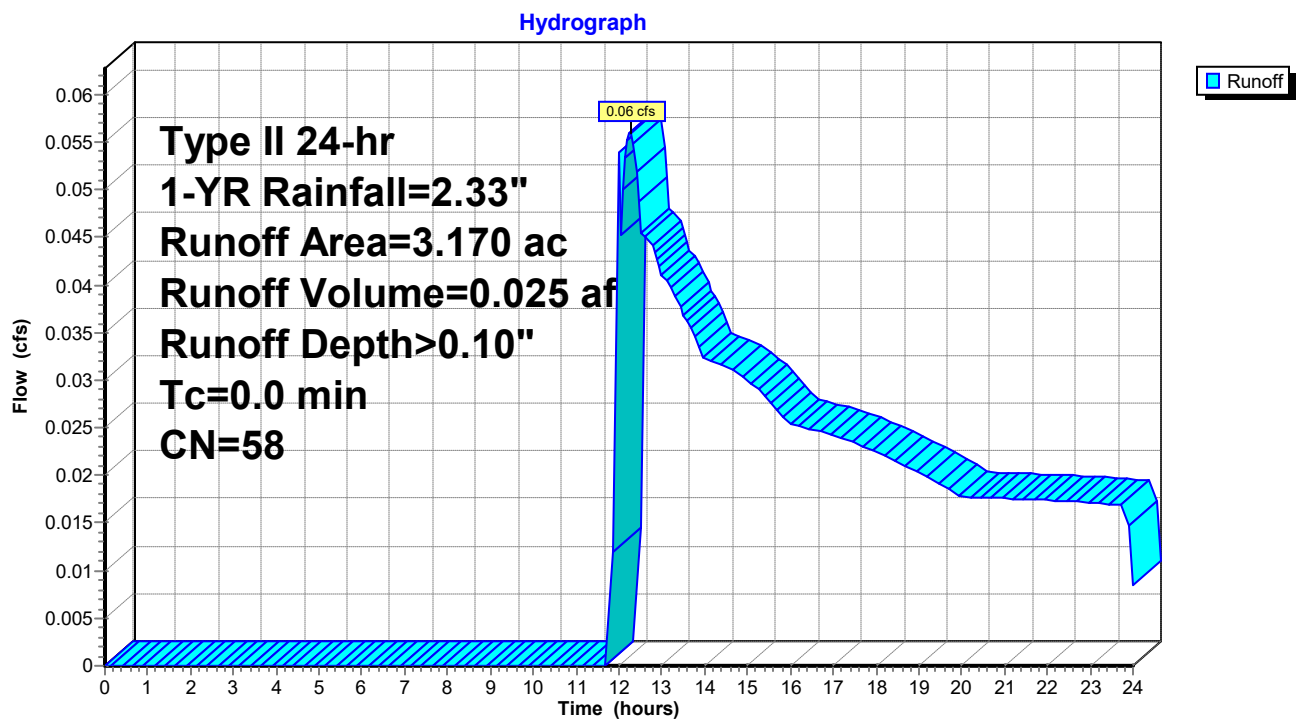
1.17 acres

Summary for Subcatchment WS-11: WS-11 P-5

Runoff = 0.06 cfs @ 12.26 hrs, Volume= 0.025 af, Depth> 0.10"
Routed to nonexistent node P-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-YR Rainfall=2.33"

Area (ac)	CN	Description
3.170	58	Meadow, non-grazed, HSG B
3.170		100.00% Pervious Area

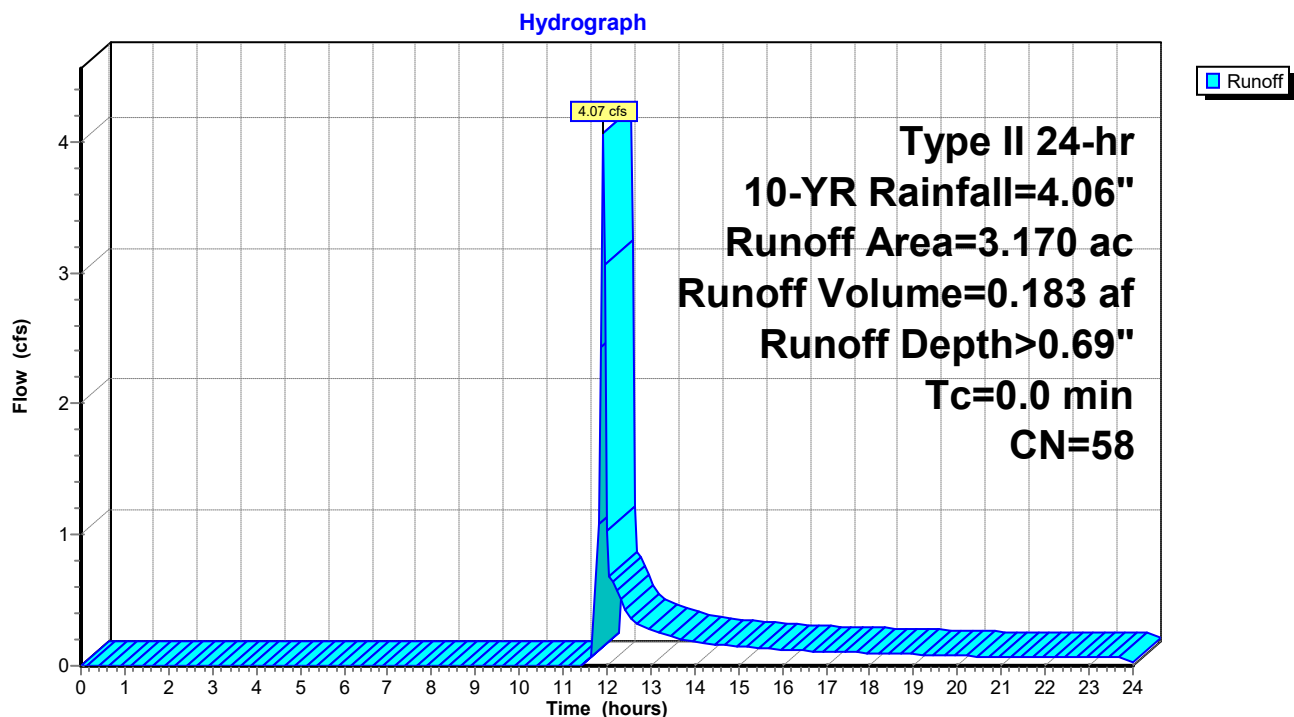
Subcatchment WS-11: WS-11 P-5

Summary for Subcatchment WS-11: WS-11 P-5

Runoff = 4.07 cfs @ 11.91 hrs, Volume= 0.183 af, Depth> 0.69"
 Routed to nonexistent node P-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-YR Rainfall=4.06"

Area (ac)	CN	Description
3.170	58	Meadow, non-grazed, HSG B
3.170		100.00% Pervious Area

Subcatchment WS-11: WS-11 P-5

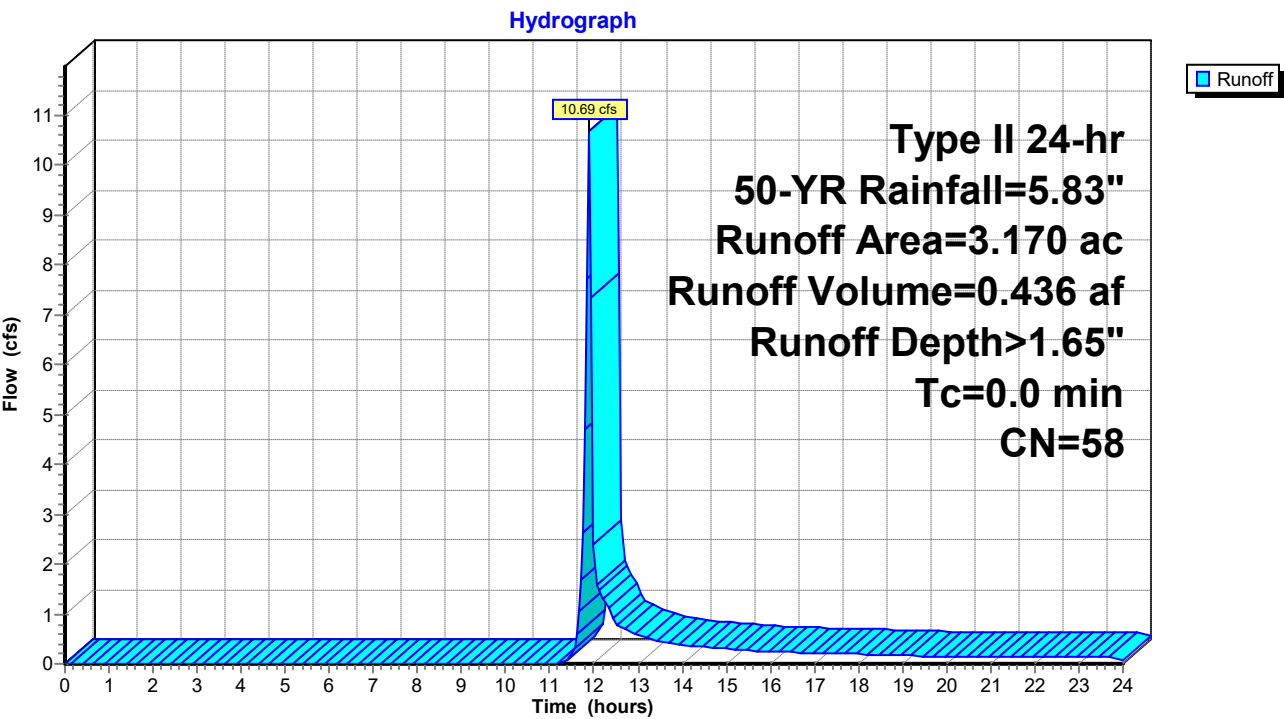
Summary for Subcatchment WS-11: WS-11 P-5

Runoff = 10.69 cfs @ 11.90 hrs, Volume= 0.436 af, Depth> 1.65"
Routed to nonexistent node P-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-YR Rainfall=5.83"

Area (ac)	CN	Description
3.170	58	Meadow, non-grazed, HSG B
3.170		100.00% Pervious Area

Subcatchment WS-11: WS-11 P-5



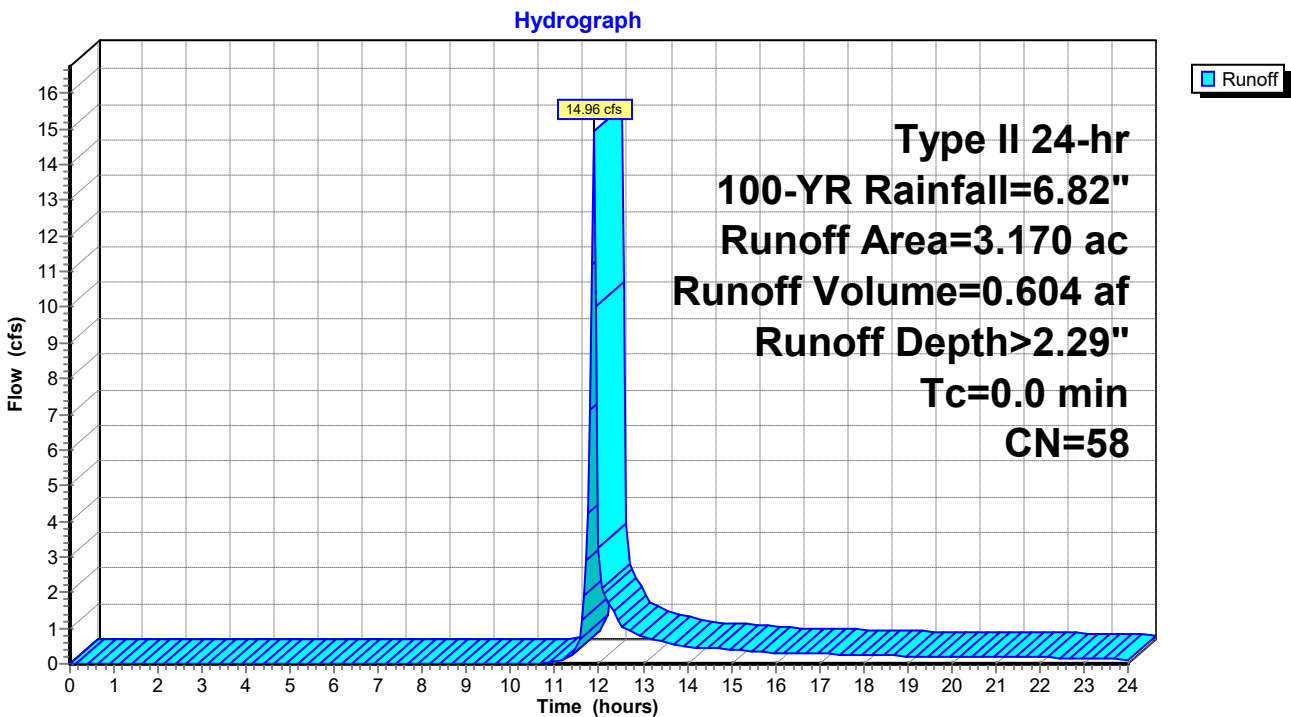
Summary for Subcatchment WS-11: WS-11 P-5

Runoff = 14.96 cfs @ 11.90 hrs, Volume= 0.604 af, Depth> 2.29"
Routed to nonexistent node P-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YR Rainfall=6.82"

Area (ac)	CN	Description
3.170	58	Meadow, non-grazed, HSG B
3.170		100.00% Pervious Area

Subcatchment WS-11: WS-11 P-5



AAMPA Holdings - Ritner Hwy

P-5 MRC Dewatering Time 2 Year Storm Event

*WATER SURFACE ELEVATION	STORAGE VOLUME (Ac. FT.)	STORAGE VOLUME (CU. FT.)	INCREMENTAL STORAGE VOLUME (CF)	** DISCHARGE (CFS)	AVERAGE DISCHARGE (CFS)	TIME (HRS.)	ACCUMULATED TIME (HRS.)
587.00		7318.1		0.00			0.0

AAMPA Holdings - Ritner Hwy

P-5 MRC Dewatering Time 10 Year Storm Event

*WATER SURFACE ELEVATION	STORAGE VOLUME (Ac. FT.)	STORAGE VOLUME (CU. FT.)	INCREMENTAL STORAGE VOLUME (CF)	** DISCHARGE (CFS)	AVERAGE DISCHARGE (CFS)	TIME (HRS.)	ACCUMULATED TIME (HRS.)
587.00		7318.1		0.00			0.0
			2221.5		0.01	61.71	
587.09		9539.6		0.02			61.7

AAMPA Holdings - Ritner Hwy

P-5 MRC Dewatering Time 50 Year Storm Event

*WATER SURFACE ELEVATION	STORAGE VOLUME (Ac. FT.)	STORAGE VOLUME (CU. FT.)	INCREMENTAL STORAGE VOLUME (CF)	** DISCHARGE (CFS)	AVERAGE DISCHARGE (CFS)	TIME (HRS.)	ACCUMULATED TIME (HRS.)
587.00		7318.1		0.00			0.0
			7448.7		0.05	41.38	
587.30		14766.8		0.10			41.4
			4791.6		0.12	11.09	
587.49		19558.4		0.14			52.5

AAMPA Holdings - Ritner Hwy

P-5 MRC Dewatering Time 100 Year Storm Event

*WATER SURFACE ELEVATION	STORAGE VOLUME (Ac. FT.)	STORAGE VOLUME (CU. FT.)	INCREMENTAL STORAGE VOLUME (CF)	** DISCHARGE (CFS)	AVERAGE DISCHARGE (CFS)	TIME (HRS.)	ACCUMULATED TIME (HRS.)
587.00		7318.1		0.00			0.0
			7448.7		0.05	41.38	
587.30		14766.8		0.10			41.4
			5053.0		0.12	11.70	
587.50		19819.8		0.14			53.1
			5183.6		0.16	9.00	
587.70		25003.4		0.18			62.1
			1045.4		0.19	1.6	
587.74		26048.8		0.19			63.6