

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	7.45	7.45

MRC BMP INFORMATION

MRC BMP Type: **P-3 – MRC Bioretention Pond 3** 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)	7.45	
Equivalent Contributing Impervious Area to BMP (acres)	7.36	
Total Drainage Area to BMP (acres)	10.85	
MRC BMP Release Rate (cfs)	0.07	<i>No greater than 0.01 cfs / acre of equivalent contributing impervious</i>
Underdrain Outflow Rate During 1.2-Inch/2-Hour Storm (cfs)	0.00	<i><= MRC BMP Release Rate (cfs)</i>
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)	72,758	
Bottom BMP Elevation (Native Soils) (ft)	585.00	
2-Yr/24-Hr Storm Ponding Depth (ft)	0.06	<i>1 ft (recommended) (2 ft max)</i>
Maximum Ponding Depth (ft)	1.02	<i>4 ft (max)</i>
Overflow Bypass Elevation (ft)	587.25	
Media Depth (ft)	2.0	<i>2 ft (min) – 4 ft (max)</i>
Media Void Space (%)	15/30	
Internal Water Storage (IWS) Depth (ft)	1.75	<i>1 ft recommended</i>
Top of IWS Elevation (ft)	586.75	
Underdrain Pipe Diameter (in)	4.0	
Underdrain Orifice Diameter (in)	4.0	
Underdrain Outlet Elevation (ft)	586.75	
IWS Available for Routing (%)	50 – in stone	<i>50% max</i>
Separation Distance (Groundwater) (ft)	>1.0	<i>1 ft (min) (2 ft recommended)</i>
Infiltration Rate (in/hr)	0.34	
Volume of Overflow During 1.2-Inch/2-Hour Storm (cf)	0	<i>0 (No overflow allowed)</i>
1-Yr/24-Hr Pre -Development Peak Rate (cfs)	0.19	
2-Yr/24-Hr Post -Development Peak Rate (cfs)	0.16	<i>1-Yr/24-Hr Pre-Development Peak Rate (or per approved Act 167 Plan)</i>
10-Yr/24-Hr Post -Development Peak Rate (cfs)	1.07	<i>10-Yr/24-Hr Pre-Development Peak Rate</i>
50-Yr/24-Hr Post -Development Peak Rate (cfs)	5.57	<i>50-Yr/24-Hr Pre-Development Peak Rate</i>
100-Yr/24-Hr Post -Development Peak Rate (cfs)	8.98	<i>100-Yr/24-Hr Pre-Development Peak Rate</i>
Total 2-Yr/24-Hr Runoff Volume Managed by BMP (cf)	42,907	
Ponding Time @ 2-Yr/24-Hr Storm (hrs)	35.5	<i>72 hrs (surface), 7 days (underground)</i>
Ponding Time @ 10-Yr/24-Hr Storm (hrs)	60.8	<i>72 hrs (surface), 7 days (underground)</i>
Ponding Time @ 50-Yr/24-Hr Storm (hrs)	63.2	<i>72 hrs (surface), 7 days (underground)</i>
Ponding Time @ 100-Yr/24-Hr Storm (hrs)	63.9	<i>72 hrs (surface), 7 days (underground)</i>

Justin T. Doty

Licensed P.E. Name

Licensed P.E. Signature

PE080613

License No.

03-05-25

Date

*Licensed
Professional's
Seal*

Summary for Subcatchment WS-5: WS-5

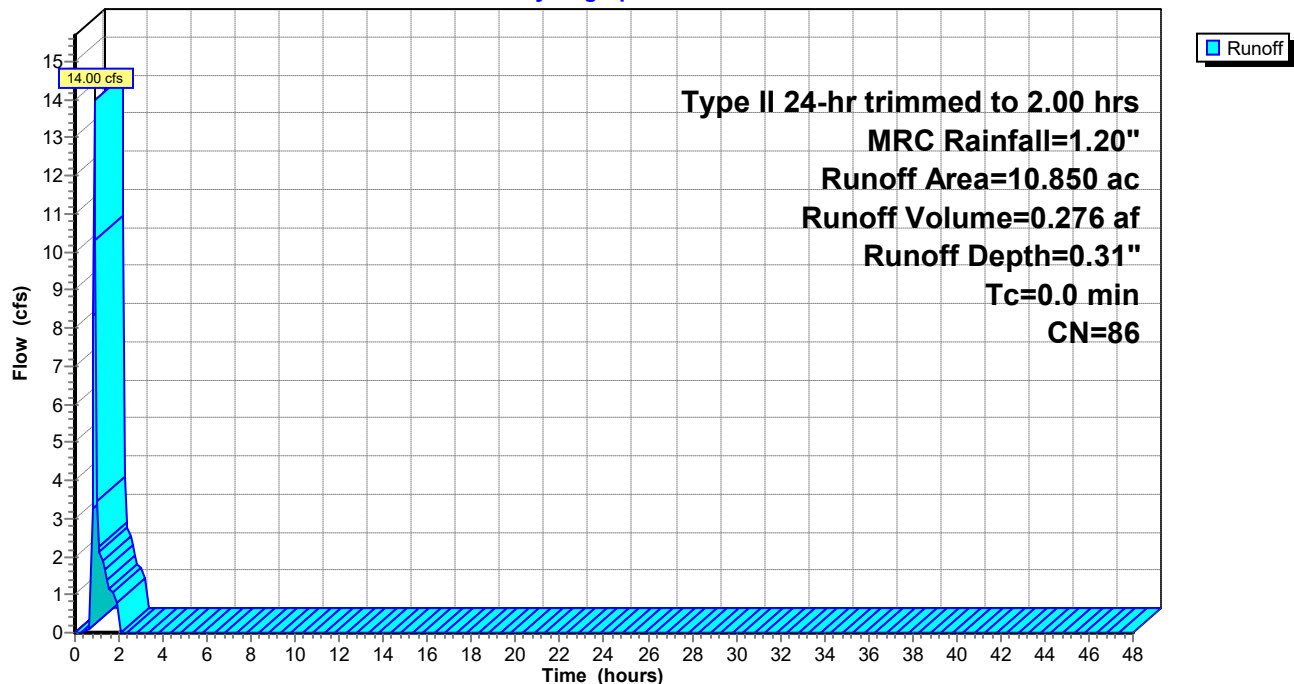
Runoff = 14.00 cfs @ 0.91 hrs, Volume= 0.276 af, Depth= 0.31"
Routed to Pond P-3 : P-3

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
1.670	58	Meadow, non-grazed, HSG B
7.450	98	Paved parking, HSG B
1.730	61	>75% Grass cover, Good, HSG B
10.850	86	Weighted Average
3.400		31.34% Pervious Area
7.450		68.66% Impervious Area

Subcatchment WS-5: WS-5

Hydrograph



Summary for Pond P-3: P-3

Inflow Area = 10.850 ac, 68.66% Impervious, Inflow Depth = 0.31" for MRC event
 Inflow = 14.00 cfs @ 0.91 hrs, Volume= 0.276 af
 Outflow = 0.80 cfs @ 1.95 hrs, Volume= 0.276 af, Atten= 94%, Lag= 62.5 min
 Discarded = 0.80 cfs @ 1.95 hrs, Volume= 0.276 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= 585.80' @ 1.95 hrs Surf.Area= 1.670 ac Storage= 0.200 af

Plug-Flow detention time= 117.1 min calculated for 0.276 af (100% of inflow)
 Center-of-Mass det. time= 117.2 min (184.1 - 66.8)

Volume	Invert	Avail.Storage	Storage Description	
#1	585.00'	10.796 af	Custom Stage Data (Prismatic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Voids (%)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
585.00	1.670	0.0	0.000	0.000
586.75	1.670	15.0	0.438	0.438
587.00	1.670	30.0	0.125	0.564
590.20	2.080	100.0	6.000	6.564
591.00	8.500	100.0	4.232	10.796

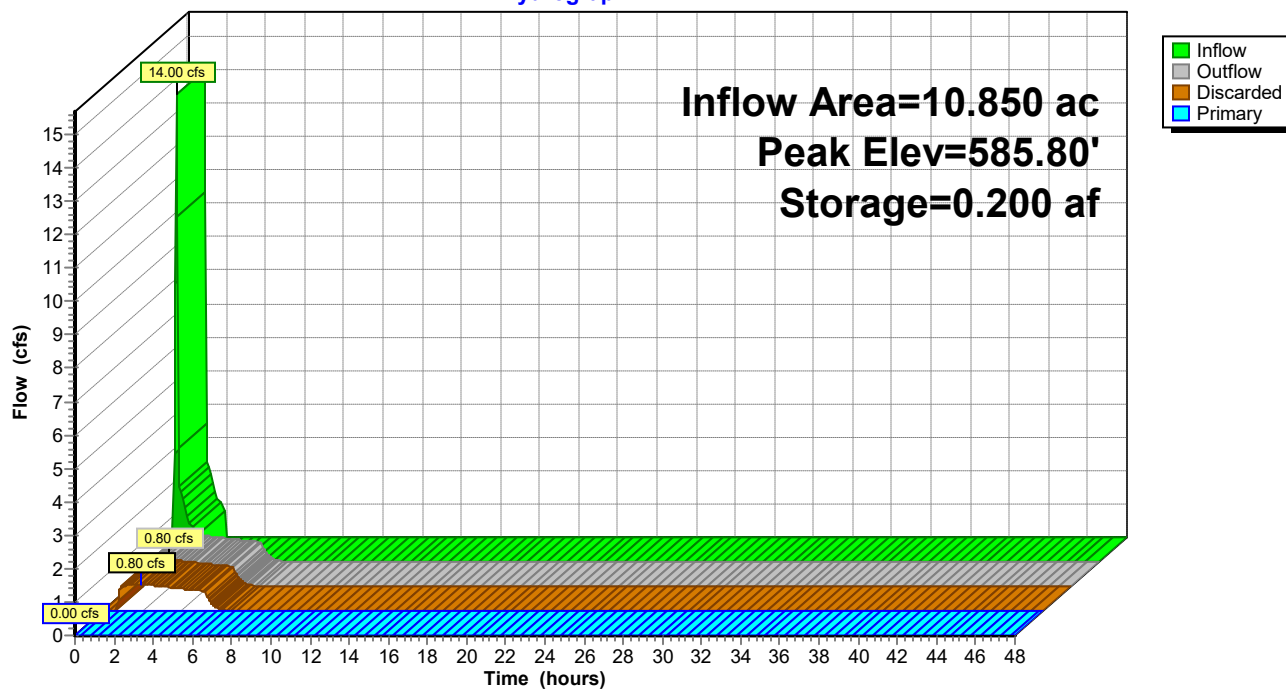
Device	Routing	Invert	Outlet Devices
#1	Discarded	585.00'	0.340 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 583.00'
#2	Primary	586.75'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	587.25'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	588.40'	15.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.80 cfs @ 1.95 hrs HW=585.80' (Free Discharge)
 ↑ **1=Exfiltration** (Controls 0.80 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-3: P-3

Hydrograph



Stage-Discharge for Pond P-3: P-3

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	175.12	2.25	172.87
585.10	0.60	0.60	0.00	590.30	187.58	2.55	185.03
585.20	0.63	0.63	0.00	590.40	200.29	2.86	197.43
585.30	0.66	0.66	0.00	590.50	213.25	3.18	210.07
585.40	0.69	0.69	0.00	590.60	226.43	3.50	222.93
585.50	0.72	0.72	0.00	590.70	239.84	3.82	236.02
585.60	0.74	0.74	0.00	590.80	253.47	4.14	249.32
585.70	0.77	0.77	0.00	590.90	267.30	4.47	262.83
585.80	0.80	0.80	0.00	591.00	281.34	4.81	276.53
585.90	0.83	0.83	0.00				
586.00	0.86	0.86	0.00				
586.10	0.89	0.89	0.00				
586.20	0.92	0.92	0.00				
586.30	0.94	0.94	0.00				
586.40	0.97	0.97	0.00				
586.50	1.00	1.00	0.00				
586.60	1.03	1.03	0.00				
586.70	1.06	1.06	0.00				
586.80	1.09	1.09	0.01				
586.90	1.17	1.12	0.05				
587.00	1.26	1.15	0.12				
587.10	1.36	1.18	0.18				
587.20	1.43	1.21	0.22				
587.30	1.65	1.24	0.41				
587.40	2.32	1.28	1.05				
587.50	3.25	1.31	1.94				
587.60	4.35	1.34	3.01				
587.70	5.61	1.38	4.23				
587.80	7.00	1.41	5.58				
587.90	8.49	1.45	7.05				
588.00	10.09	1.48	8.61				
588.10	11.79	1.51	10.27				
588.20	13.56	1.55	12.01				
588.30	15.41	1.58	13.83				
588.40	17.33	1.62	15.71				
588.50	20.87	1.65	19.22				
588.60	25.74	1.69	24.05				
588.70	31.49	1.72	29.77				
588.80	37.96	1.75	36.20				
588.90	45.04	1.79	43.25				
589.00	52.68	1.82	50.85				
589.10	60.81	1.86	58.95				
589.20	69.40	1.89	67.50				
589.30	78.41	1.93	76.48				
589.40	87.82	1.96	85.86				
589.50	97.61	2.00	95.61				
589.60	107.75	2.03	105.72				
589.70	118.23	2.07	116.16				
589.80	129.02	2.10	126.92				
589.90	140.12	2.14	137.98				
590.00	151.51	2.17	149.34				
590.10	163.18	2.21	160.97				

Stage-Area-Storage for Pond P-3: P-3

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
585.00	1.670	0.000	590.20	2.080	6.564
585.10	1.670	0.025	590.30	2.882	6.812
585.20	1.670	0.050	590.40	3.685	7.140
585.30	1.670	0.075	590.50	4.487	7.549
585.40	1.670	0.100	590.60	5.290	8.038
585.50	1.670	0.125	590.70	6.093	8.607
585.60	1.670	0.150	590.80	6.895	9.256
585.70	1.670	0.175	590.90	7.697	9.986
585.80	1.670	0.200	591.00	8.500	10.796
585.90	1.670	0.225			
586.00	1.670	0.250			
586.10	1.670	0.276			
586.20	1.670	0.301			
586.30	1.670	0.326			
586.40	1.670	0.351			
586.50	1.670	0.376			
586.60	1.670	0.401			
586.70	1.670	0.426			
586.80	1.670	0.463			
586.90	1.670	0.514			
587.00	1.670	0.564			
587.10	1.683	0.731			
587.20	1.696	0.900			
587.30	1.708	1.070			
587.40	1.721	1.242			
587.50	1.734	1.415			
587.60	1.747	1.589			
587.70	1.760	1.764			
587.80	1.772	1.941			
587.90	1.785	2.119			
588.00	1.798	2.298			
588.10	1.811	2.478			
588.20	1.824	2.660			
588.30	1.837	2.843			
588.40	1.849	3.027			
588.50	1.862	3.213			
588.60	1.875	3.400			
588.70	1.888	3.588			
588.80	1.901	3.777			
588.90	1.913	3.968			
589.00	1.926	4.160			
589.10	1.939	4.353			
589.20	1.952	4.548			
589.30	1.965	4.744			
589.40	1.977	4.941			
589.50	1.990	5.139			
589.60	2.003	5.339			
589.70	2.016	5.540			
589.80	2.029	5.742			
589.90	2.042	5.945			
590.00	2.054	6.150			
590.10	2.067	6.356			

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

P-3:

BMP Invert: 585.00

Overflow Discharge Invert: 587.25

Total Volume Depth Below Overflow: **2.25'**

Volume at Elevation 587.25 (from HydroCAD): **0.985 ac-ft**

$$\mathbf{0.985\ ac\text{-}ft * 43,560\ cu\text{-}ft = \underline{42,907\ ft^3}}$$

WORKSHEET 4 - EQUIVALENT IMPERVIOUS AREA CALCULATIONS

PROJECT AAMPA Holdings - Ritner Hwy
 Drainage Area: WS-5 MRC
 1.2in-2hr Rainfall 1.20 in

Managed Area 10.85 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	72745	1.67	58	7.24	1.45	0.01	53
Impervious	B	324522	7.45	98	0.20	0.04	0.99	26656
Open Space	B	75359	1.73	61	6.39	1.28	0.00	6
Total			10.85					26715

Equivalent Impervious Area: 23,498 / (0.0833 ft. * 43,560 sq. ft. / acre)

7.36 acres

Summary for Subcatchment WS-5: WS-5 P-3

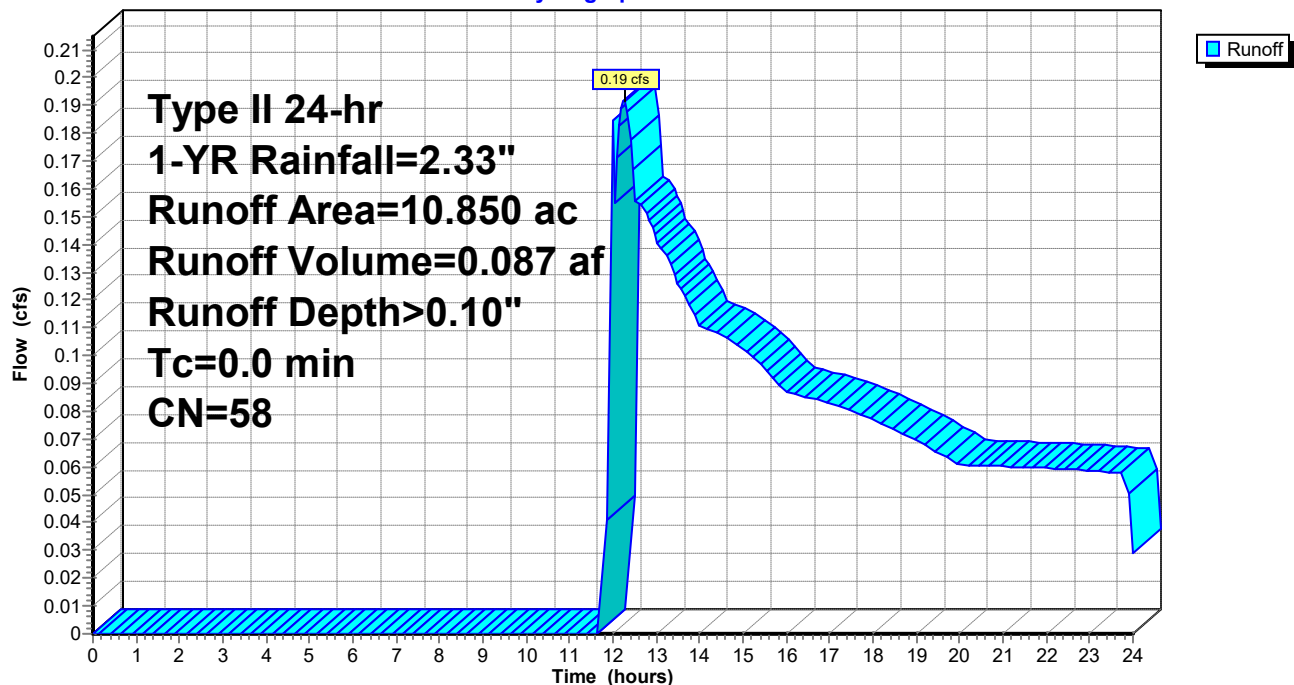
Runoff = 0.19 cfs @ 12.26 hrs, Volume= 0.087 af, Depth> 0.10"
Routed to nonexistent node P-3

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
10.850	58	Meadow, non-grazed, HSG B
10.850		100.00% Pervious Area

Subcatchment WS-5: WS-5 P-3

Hydrograph

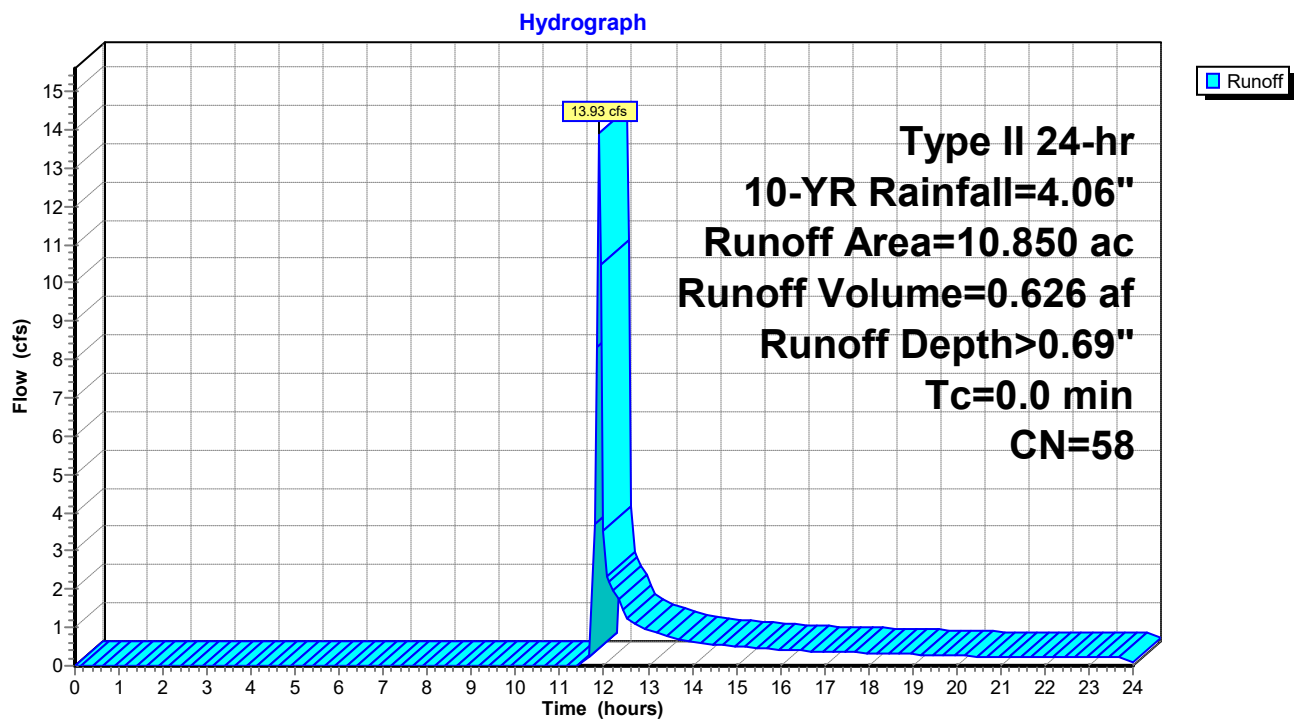


Summary for Subcatchment WS-5: WS-5 P-3

Runoff = 13.93 cfs @ 11.91 hrs, Volume= 0.626 af, Depth> 0.69"
Routed to nonexistent node P-3

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
10.850	58	Meadow, non-grazed, HSG B
10.850		100.00% Pervious Area

Subcatchment WS-5: WS-5 P-3

Summary for Subcatchment WS-5: WS-5 P-3

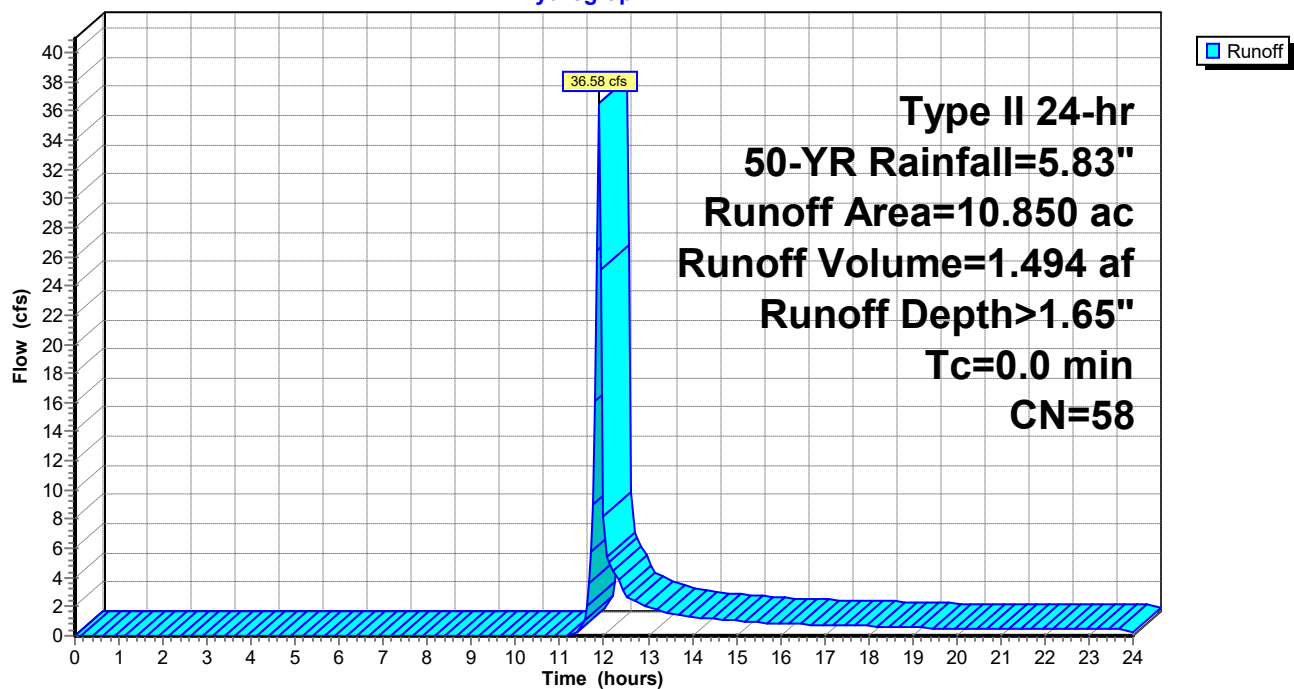
Runoff = 36.58 cfs @ 11.90 hrs, Volume= 1.494 af, Depth> 1.65"
Routed to nonexistent node P-3

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
10.850	58	Meadow, non-grazed, HSG B
10.850		100.00% Pervious Area

Subcatchment WS-5: WS-5 P-3

Hydrograph

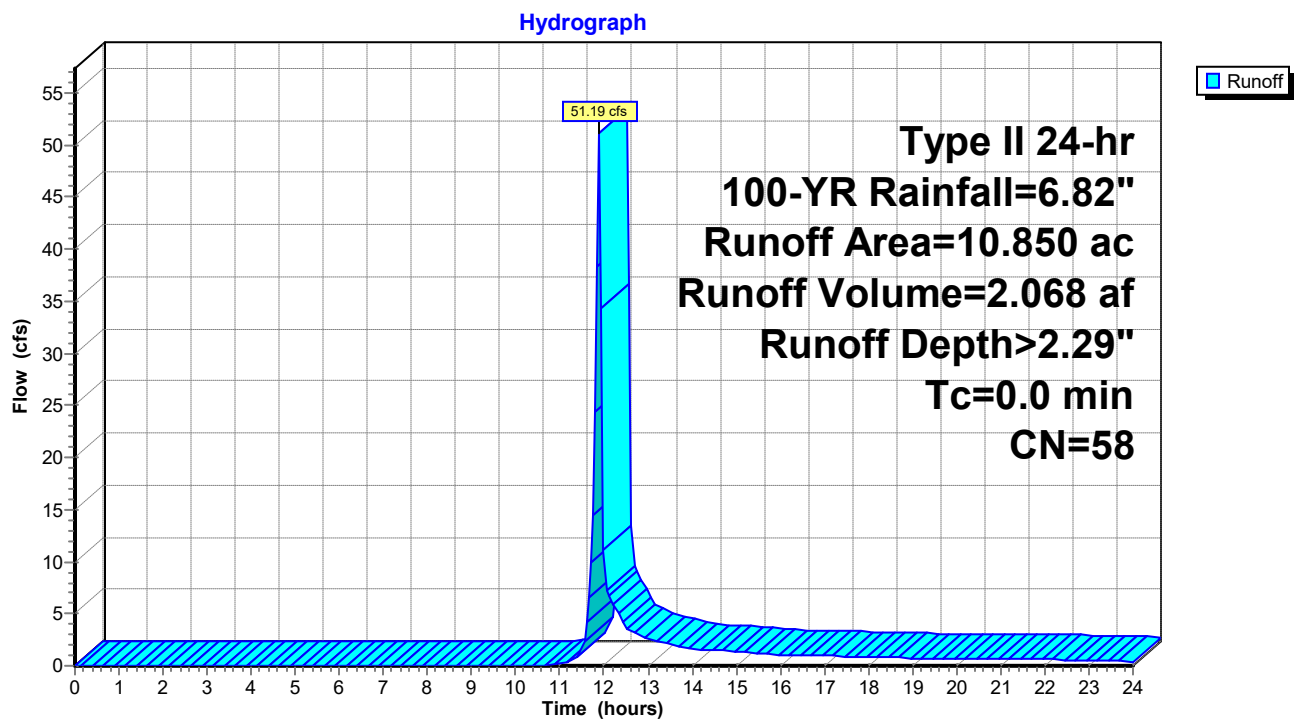


Summary for Subcatchment WS-5: WS-5 P-3

Runoff = 51.19 cfs @ 11.90 hrs, Volume= 2.068 af, Depth> 2.29"
Routed to nonexistent node P-3

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
10.850	58	Meadow, non-grazed, HSG B
10.850		100.00% Pervious Area

Subcatchment WS-5: WS-5 P-3

AAMPA Holdings - Ritner Hwy

P-3 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.)
586.75		19079.3		0.00			0.0
			5488.5		0.06	25.41	
587.00		24567.8		0.12			25.4
			5096.5		0.14	10.11	
587.06		29664.3		0.16			35.5

AAMPA Holdings - Ritner Hwy

P-3 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.)
586.75		19079.3		0.00			0.0
			5488.5		0.06	25.41	
587.00		24567.8		0.12			25.4
			22041.3		0.19	32.22	
587.30		46609.1		0.26			57.6
			7492.3		0.655	3.18	
587.40		54101.4		1.05			60.8

AAMPA Holdings - Ritner Hwy

P-3 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.)
586.75		19079.3		0.00			0.0
			5488.5		0.06	25.41	
587.00		24567.8		0.12			25.4
			22041.3		0.19	32.22	
587.30		46609.1		0.26			57.6
			15028.2		1.1	3.80	
587.50		61637.3		1.94			61.4
			15202.4		3.09	1.4	
587.70		76839.7		4.23			62.8
			7710.1		4.91	0.4	
587.80		84549.8		5.58			63.2

AAMPA Holdings - Ritner Hwy

P-3 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.)
586.75		19079.3		0.00			0.0
			5488.5		0.06	25.41	
587.00		24567.8		0.12			25.4
			22041.3		0.19	32.22	
587.30		46609.1		0.26			57.6
			15028.2		1.1	3.80	
587.50		61637.3		1.94			61.4
			15202.4		3.09	1.4	
587.70		76839.7		4.23			62.8
			23261		6.42	1.0	
588.00		100100.7		8.61			63.8
			1568.2		8.78	0.0	
588.02		101668.9		8.94			63.9