STORMWATER REPORT

"Grand Legacy" Definitive Subdivision
Cobblestone Drive (77 Elm Street)
North Reading, Massachusetts

January 17, 2019
Revised March 25, 2019

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W&S Project Data
NREA-0056
Delm77-R2.dwg
WSDelm77_R.dwg
Existing(cornell study).hcp
Proposed(cornell study).hcp
p:\NREA-0056(77 elm street)\drainage\stormwater_report_r.docx

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1 | Mitigative Drainage Analysis

1.1 Purpose

Although there has been no change in the purpose, this analysis is meant to supersede the originally submitted report due to the replacement of the TP-40 the rainfall amounts with the Cornell Study numbers a.k.a. Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada. This analysis compares the pre-development watershed condition to the post development watershed condition for the project located at 77 Elm Street, North Reading, MA and is accomplished by analyzing the surface runoff rates to the limit of watershed analysis as shown on the accompanying watershed maps. The results of this analysis are presented below in the Peak Rate of Runoff tables.

It should be noted that the Cornell Study numbers are a local requirement as they have not been officially adopted by the Massachusetts Department of Environmental Protection (DEP) to the best of our knowledge.

1.2 Introduction

The subject properties are two separate parcels located on the northerly side of Elm Street across from the entrance to Childs road in the easterly portion of the Town of North Reading. The properties are bounded to the east by residences located off of Lisa Lane and Elm Street, to the north by the Thompson Country Club, to the west by residences located off of Fairview Street and to the south by residences located off of Elm Street.

The properties are located within the Residence A zoning district according to the Town’s current zoning map. The two properties lie outside of the FEMA flood hazard area, (Zone AE) as shown on flood insurance rate map number 25017C0308E effective date June 4, 2010.

The properties are currently occupied by a single-family home and a barn with associated accessory structures, driveways and a pool. The properties are largely vegetated with deciduous and coniferous tree cover and lawn areas. There are Bordering Vegetated Wetlands (BVW) located in the northwest and southwest corners of the property as well as BVW located on the land of the Thompson Club in the northeast section.

The site topography varies in elevation from approximately 137 in the middle of the site, to elevation 90 in the northwest corner of the property adjacent to the BVW, to elevation 105 in the northeast corner of the property adjacent to the BVW, to elevation 92 in front of the existing house on Elm Street and to elevation 70 at the southwest corner of the property at the BVW. It should be noted that the elevations on the plans have been converted to NAVD 88.

The proposal is to further develop the site by razing all existing structures with appurtenances and their associated driveways and construct seven (7) single family homes. Each lot will have a subsurface sanitary disposal system, paved driveway, landscaping and associated utilities. Subsurface roof recharge chambers will be installed for the roof areas shown on the accompanying watershed map. The main drainage system consists of deep sump catch basins with hoods, sediment and oil separators, underground piping network and a subsurface infiltration structure and four (4) surface infiltration basins for mitigating and treatment of stormwater runoff.

The name of the subdivision will be “Grand Legacy” and the road will be called Cobblestone Drive.

1.3 Existing Condition Soils Analysis

In order to model the excess runoff for both the existing and proposed watershed condition, the parent soils on site were mapped using the Web Soil Survey (WSS) made available on the United States Department of Agriculture (USDA) National Resources Conservation Service (NRCS) website. The WSS provides vital soil data and information such as Hydrologic Soil Group (HSG), which is then input into a mathematical model to generate runoff curve numbers.

The user inputs soil cover type as well as the hydrologic soil group to generate a weighted curve number (CN) and also uses the topography of the land to generate a time of concentration (Tc) from which the stormwater runoff rate and volume can be calculated for a given watershed for comparison.

The soils present on site are comprised of Canton fine sandy loam with hydrologic soil group (HSG) "B "and Charlton-Hollis Rock Outcrop Complex with HSG "A".

Williams & Sparages have performed test pits on the site, see attached soil logs.

1.4 Stormwater Modeling Methodology

The mathematical model used in this analysis is computed using the stormwater modeling software HydroCAD, v10.00, developed by HydroCAD Software Solutions LLC. HydroCAD is a program used to model the hydrology and hydraulics of stormwater runoff and is based largely on programs and techniques developed by the NRCS, specifically TR-20 and TR-55 as well as other hydraulic calculation methods. As mentioned above, we have used the Cornell Study rainfall amounts in this revised report.

HydroCAD allows the user, for a given rainfall event, to generate runoff hydrographs for single or multiple watersheds and is used to determine if a given drainage system is adequate under the desired conditions and to predict flooding or other hydraulic impacts at specified locations such as erosion.

Six (6) design storm events are analyzed and the results presented in Table 1.0 below for the 2-year, 5-year, 10-year, 25-year, 50-year and 100-year storm events for comparison.

1.5 Pre-Development Watershed

The total pre-development watershed areas area as a result of analyzing the existing topography for comparison with the post-development condition.

Comparison edge 2L represents surficial flow tributary towards the north property line and onto the land owned now or formerly by the Thompson Country Club and comparison edge 5L represents the total flow from the project development tributary to the existing 24-inch diameter reinforced concrete pipe (RCP) which discharges to a manhole on the north-side of Elm Street. The 24" RCP then increases in size to a 30" drain and discharges on the south-side of Elm Street towards the Ipswich River, see plan. Link 6L represents the entire flow generated from within the limit of watershed analysis for comparison with the proposed condition development.

The total watershed area within the limit of watershed analysis is 7.88 acres.

Using the methods described in the stormwater modeling methodology above, runoff curve numbers and times of concentration are generated for each watershed for the pre-development condition to be used for comparison with the post-development condition described below. A schematic of the mathematical model and the results of the calculations for the 2 year, 10 year, 25 year and 100 year Type III, 24-hour storm events are included in this analysis.

1.6 Post-Development Watershed

Similar to the pre-development condition, the post-development watershed is separated into seventeen subcatchments.

Similar to the existing condition, comparison edge 2L represents surficial flow tributary towards the north property line and onto the land owned now or formerly by the Thompson Country Club and comparison edge 5L represents the total flow from the project development tributary to the existing 30-inch diameter reinforced concrete pipe (RCP) discharging under Elm Street and towards the Ipswich River. Link 6L represents the entire flow generated from within the limit of watershed analysis for comparison with the proposed condition development.

Post-development provides for the construction of one (1) subsurface infiltration basin, five (5) surface infiltration basins, subsurface roof recharge systems, and infiltration trenches for driveways where shown which will provide peak rate of runoff mitigation, water quality, groundwater recharge and phosphorus removal in the volume provided below the outlet devices.

Stormwater runoff from on-site paved areas will generally be collected by a deep sump catch basin with hood/trap and piped to an infiltration basin. The only exception is the basin to be installed at the center of the cul-de-sac which will discharge directly to a stone infiltration trench for pretreatment before entering the basin. Overflow from the basin will be directed to an additional basin located upgradient of the BVW located at the southwestern corner of the property.

Using the methods described in the stormwater modeling methodology above, runoff curve numbers and times of concentration were generated for each watershed for the proposed condition to be used for comparison with the existing condition. A schematic of the mathematical model and the results of the calculations for the 2-year, 5-year, 10-year, 25-year, 50-year and 100-year, Type III, 24-hour storm events are included in this analysis.

1.7 Compliance with DEP Stormwater Management Standards

Standard 1

No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

New stormwater runoff requiring treatment will be treated prior to being discharged towards the selected edges of comparison. New stormwater outfalls will discharge across rip-rap aprons or spillways providing protection from scour/erosion.

Standard 2

Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

See Table 1 below which demonstrates the post-development peak discharge rates are less than or equal to the pre-development peak discharge rates.

Standard 3

Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

The project site is analyzed using Hydrologic Soil Groups A & B for surficial stormwater runoff. Groundwater recharge is provided by five (5) surface infiltration basins, one (1) sub-surface infiltration structure and specific portions of driveway areas discharge into infiltration trenches and all of the roof areas discharge to subsurface recharge chambers.

Standard 4

Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;
b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and
c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook

The project will utilize deep-sump catch basins with a hood/trap, oil/water separator unit, stone-filled trench and a sediment forebay to collect and pre-treat stormwater runoff prior to discharging to the infiltration basins.

It should be noted that runoff from certain types of roof areas are considered “clean” by DEP and therefore do not require treatment. We have assumed that the roof types to be installed for this project will satisfy DEP’s criteria. Every roof in the subdivision will discharge directly to a separate roof recharge area as shown on the accompanying watershed map.

The project site does not lie within a Zone II or Interim Wellhead Protection Area. The project site/infiltration basin does discharge to a bordering vegetated wetland which then discharges upgradient of the Ipswich River. The Ipswich River in this section is a Class B water but is not entitled to additional treatment before being discharged from the proposed stormwater management system. The required water quality volume is based on a runoff of one-half inch (1/2”).

Standard 5

For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow melt, and stormwater runoff, the proponent shall use specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated there under at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

This project is not considered a LUHPPL.

Standard 6
Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A “storm water discharge” as defined in 314 CMR 3.04(2) (a) (1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of public water supply.

The project site does not lie within a Zone II or Interim Wellhead Protection Area.

Standard 7
A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

This project is not considered a redevelopment.

Standard 8
A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

Refer to Section 6 Stormwater Pollution Prevention Plan (SWPPP) and Construction Period Erosion, Sedimentation and Pollution Prevention Plan.

Standard 9
A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

Refer to Section 4 Long Term Operation and Maintenance Plan (O&M).

Standard 10
All illicit discharges to the stormwater management system are prohibited.

Illicit Discharge Compliance Statement
No connection between the stormwater and wastewater management systems is proposed. Per requirements of Standard 10 it is herein stated that there are no proposed illicit discharges into the Stormwater Management System to be constructed as shown on the site plan.

1.8 Conclusion

Examining the following Peak Rate of Runoff and Basin Performance table the proposed stormwater management system is effective for mitigating the peak flow rates from the limit of the watershed analysis for the 2, 5, 10, 25, 50- and 100-year storm events.

Table 1.0: Total Peak Rate of Runoff from within limit of watershed analysis | Comparison Location 6L

Description	**2 Year**	**5 Year**	**10 Year**	**25 Year**	**50 Year**	**100 Year**
Existing Peak Rate of Runoff (cfs)	0.3	0.8	2.1	5.3	8.5	14.0
Proposed Peak Rate of Runoff (cfs)	0.2	0.5	1.2	3.1	6.3	12.6
Difference	**-0.1**	**-0.3**	**-0.9**	**-2.2**	**-2.2**	**-1.4**

Table 2.0: Peak Rate of Runoff to the North | Comparison Location 2L

Description	**2 Year**	**5 Year**	**10 Year**	**25 Year**	**50 Year**	**100 Year**
Existing Peak Rate of Runoff (cfs)	0.0	0.0	0.0	0.0	0.1	0.6
Proposed Peak Rate of Runoff (cfs)	0.0	0.0	0.0	0.0	0.0	0.6
Difference	**0.0**	**0.0**	**0.0**	**0.0**	**-0.1**	**0.0**

Table 3.0: Peak Rate of Runoff to existing 24" culvert | Comparison Location 5L

Description	**2 Year**	**5 Year**	**10 Year**	**25 Year**	**50 Year**	**100 Year**
Existing Peak Rate of Runoff (cfs)	0.3	0.8	2.1	5.3	8.5	14.0
Proposed Peak Rate of Runoff (cfs)	0.2	0.5	1.2	3.1	6.2	12.5
Difference	**-0.1**	**-0.3**	**-0.9**	**-2.2**	**-2.3**	**-1.5**

Table 4.0: Peak Rate of Runoff to wetlands | Comparison Location 1L

Description	**2 Year**	**5 Year**	**10 Year**	**25 Year**	**50 Year**	**100 Year**
Existing Peak Rate of Runoff (cfs)	0.04	0.31	0.93	2.99	5.40	9.49
Proposed Peak Rate of Runoff (cfs)	0.09	0.31	0.70	2.39	4.64	9.22
Difference	**+0.05 Deminimis increase**	**0.0**	**-0.17**	**-0.60**	**-0.76**	**-0.27**

Table 4.0: Stormwater Management Area 1P | Infiltration Basin Performance Table

24 Hour Type III Storm event	Peak Rate of Inflow (cfs)	Peak Rates of Outflow (cfs) Total (cfs)	Exfiltration (cfs)	6″ Culvert (cfs)		Peak Water Level (ft)
2 year	0.56	0.23	0.04	0.19		119.07
5 year	0.82	0.45	0.04	0.40		119.23
10 year	1.10	0.63	0.05	0.58		119.43
25 year	1.52	0.84	0.05	0.78		119.74
50 year	1.94	0.99	0.06	0.93		120.02
100 year	2.65	1.20	0.08	1.13		120.47

Table 5.0: Stormwater Management Area 2P | Infiltration Basin Performance Table

24 Hour Type III Storm event	Peak Rate of Inflow (cfs)	Peak Rates of Outflow (cfs) Total (cfs)	Exfiltration (cfs)	6′L Spillway (cfs)		Peak Water Level (ft)
2 year	0.33	0.04	0.04	0.0		73.13
5 year	0.80	0.05	0.05	0.0		73.75
10 year	1.37	0.10	0.06	0.04		74.32
25 year	2.19	0.85	0.06	0.79		74.44
50 year	2.90	1.66	0.06	1.60		74.53
100 year	4.00	2.85	0.06	2.78		74.62

Table 6.0: Stormwater Management Area 3P | Subsurface Infiltration Basin Performance Table

24 Hour Type III Storm event	Peak Rate of Inflow (cfs)	Peak Rates of Outflow (cfs) Total (cfs)	Exfiltration (cfs)	8″ Culvert (cfs)		Peak Water Level (ft)
2 year	0.32	0.05	0.05	0.0		97.28
5 year	0.74	0.05	0.05	0.0		97.78
10 year	1.26	0.13	0.05	0.08		98.15
25 year	2.15	0.59	0.05	0.54		98.43
50 year	2.97	1.10	0.05	1.05		98.72
100 year	4.29	1.78	0.05	1.73		99.40

Table 7.0: Stormwater Management Area 4P | Infiltration Basin Performance Table

24 Hour Type III Storm event	Peak Rate of Inflow (cfs)	Peak Rates of Outflow (cfs) Total (cfs)	Exfiltration (cfs)	6′L Spillway (cfs)		Peak Water Level (ft)
2 year	0.00	0.00	0.00	0.00		106.80
5 year	0.00	0.00	0.00	0.00		106.80
10 year	0.01	0.01	0.01	0.00		106.95
25 year	0.11	0.03	0.03	0.00		107.58
50 year	0.27	0.05	0.05	0.00		108.08
100 year	1.03	0.67	0.08	0.59		108.62

Table 8.0: Stormwater Management Area 5P | Infiltration Basin Performance Table

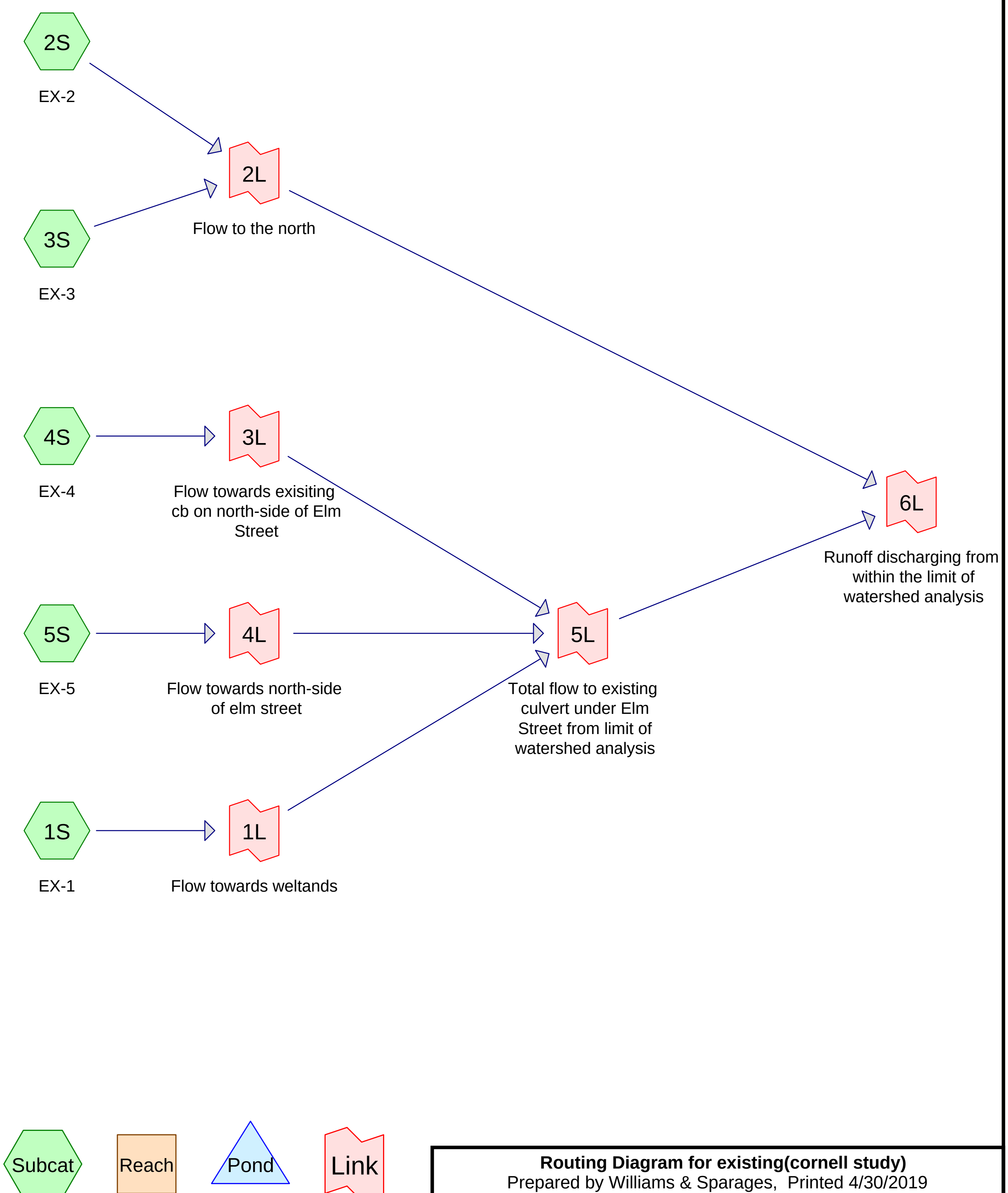
24 Hour Type III Storm event	Peak Rate of Inflow (cfs)	Peak Rates of Outflow (cfs)				Peak Water Level (ft)
		Total (cfs)	Exfiltration (cfs)	6′L Spillway (cfs)		
2 year	0.15	0.03	0.03	0.00		109.04
5 year	0.24	0.04	0.04	0.00		109.22
10 year	0.35	0.05	0.05	0.00		109.43
25 year	0.54	0.07	0.07	0.00		109.89
50 year	0.87	0.09	0.09	0.00		110.30
100 year	1.52	0.65	0.09	0.56		110.41

Table 9.0: Stormwater Management Area 6P | Infiltration Basin Performance Table

24 Hour Type III Storm event	Peak Rate of Inflow (cfs)	Peak Rates of Outflow (cfs)				Peak Water Level (ft)
		Total (cfs)	Exfiltration (cfs)	6′L Spillway (cfs)		
2 year	0.05	0.01	0.01	0.00		78.26
5 year	0.24	0.06	0.02	0.04		79.02
10 year	0.64	0.26	0.02	0.24		79.06
25 year	1.51	1.25	0.02	1.23		79.19
50 year	2.38	2.52	0.02	2.49		79.30
100 year	3.85	3.83	0.02	3.81		79.40

1.9 HydroCAD Data

Existing Condition



Routing Diagram for existing(cornell study)

Prepared by Williams & Sparages, Printed 4/30/2019

HydroCAD® 10.00-20 s/n 06611 © 2017 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.092	61	>75% Grass cover, Good, HSG B (5S)
0.039	76	Gravel roads, HSG A (3S, 5S)
0.166	85	Gravel roads, HSG B (4S, 5S)
0.021	98	Paved parking, HSG B (5S)
0.044	98	Roofs, HSG B (5S)
0.002	98	Unconnected pavement, HSG B (4S)
4.107	30	Woods, Good, HSG A (1S, 2S, 3S, 4S, 5S)
3.417	55	Woods, Good, HSG B (1S, 4S, 5S)
7.888	**43**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
4.146	HSG A	1S, 2S, 3S, 4S, 5S
3.743	HSG B	1S, 4S, 5S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
7.888		**TOTAL AREA**

Summary for Subcatchment 1S: EX-1

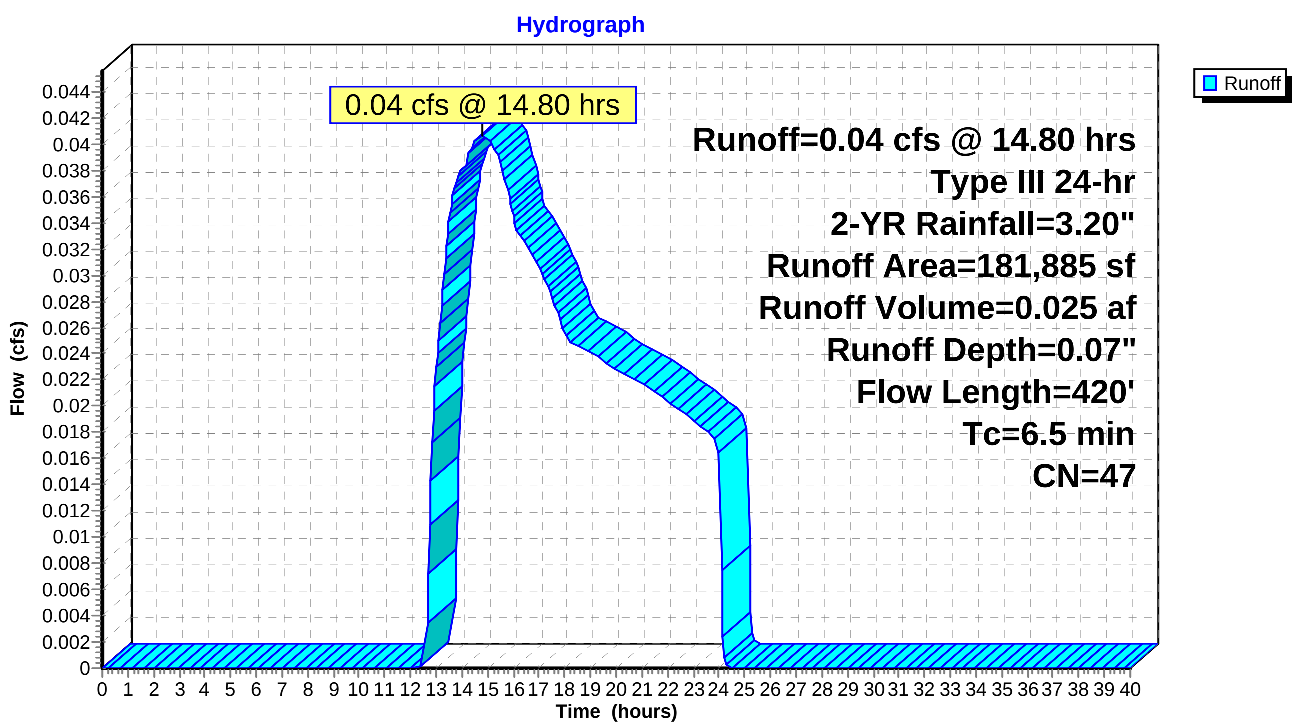
Runoff = 0.04 cfs @ 14.80 hrs, Volume= 0.025 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
60,022	30	Woods, Good, HSG A
121,863	55	Woods, Good, HSG B
181,885	47	Weighted Average
181,885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1820	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	125	0.1040	5.19		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	245	0.0650	4.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.5	420	Total			

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

[45] Hint: Runoff=Zero

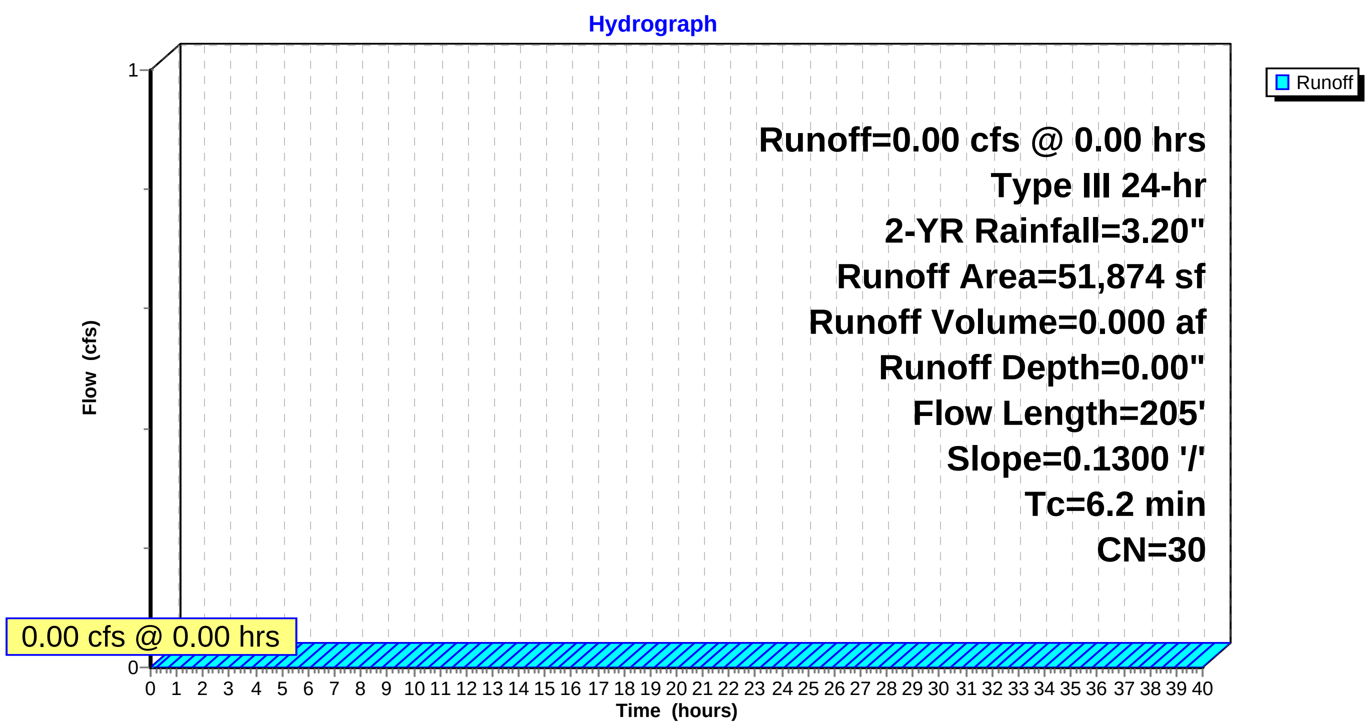
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
51,874	30	Woods, Good, HSG A
51,874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.1300	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	155	0.1300	5.80		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.2	205	Total			

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

[45] Hint: Runoff=Zero

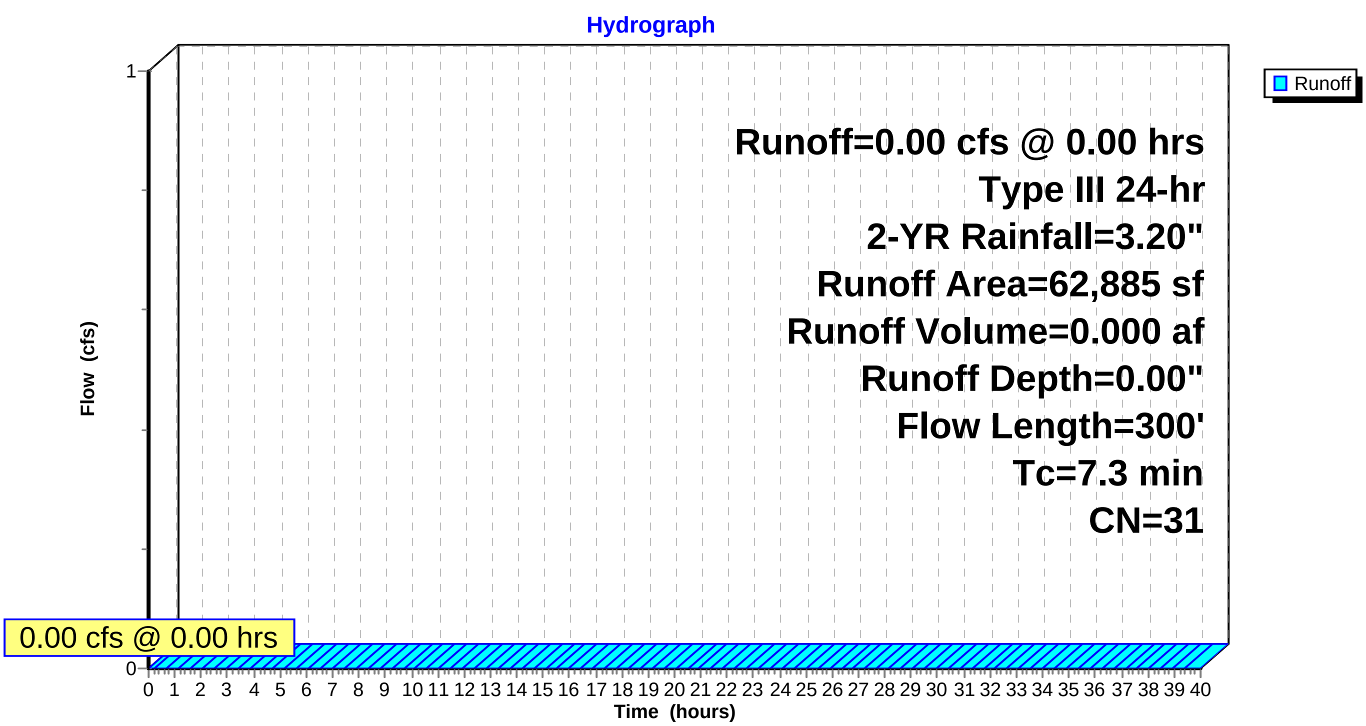
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
61,744	30	Woods, Good, HSG A
1,141	76	Gravel roads, HSG A
62,885	31	Weighted Average
62,885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1020	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	250	0.0840	4.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.3	300	Total			

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: EX-4

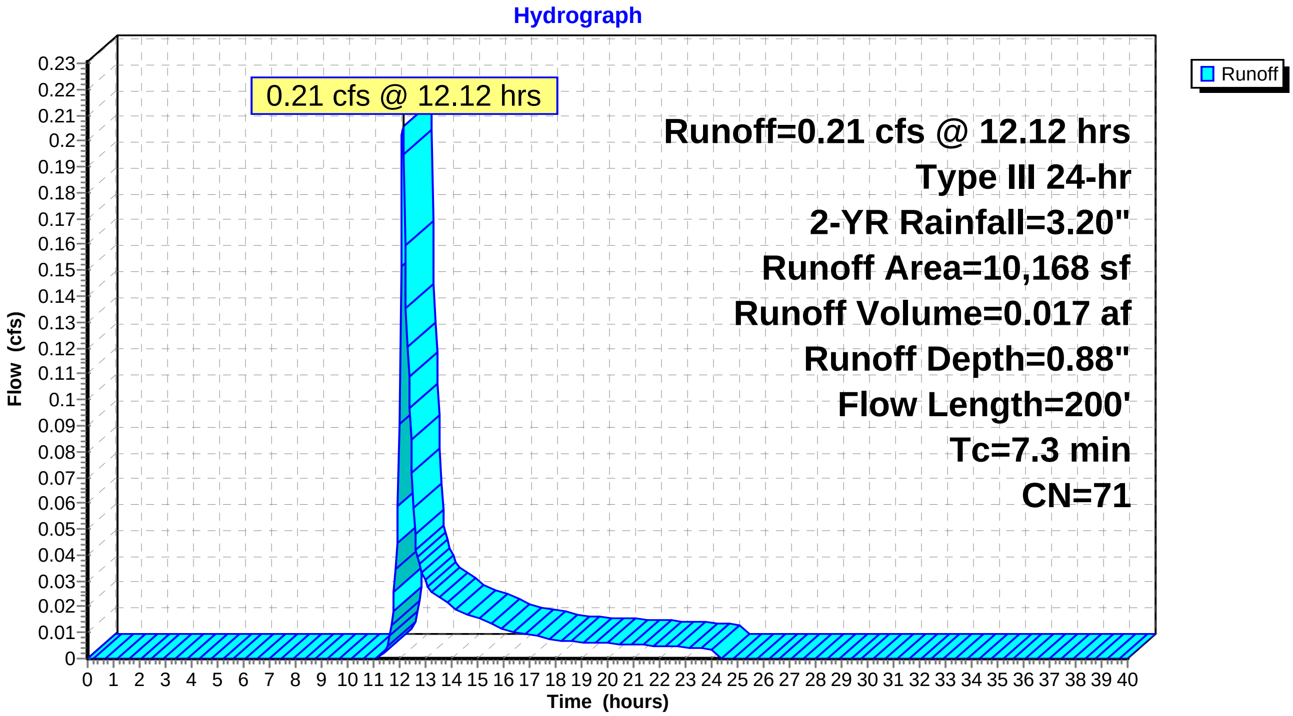
Runoff = 0.21 cfs @ 12.12 hrs, Volume= 0.017 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
1,573	30	Woods, Good, HSG A
1,846	55	Woods, Good, HSG B
6,682	85	Gravel roads, HSG B
67	98	Unconnected pavement, HSG B
10,168	71	Weighted Average
10,101		99.34% Pervious Area
67		0.66% Impervious Area
67		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0860	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	140	0.1520	6.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.1100	6.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	200	Total			

Subcatchment 4S: EX-4



Summary for Subcatchment 5S: EX-5

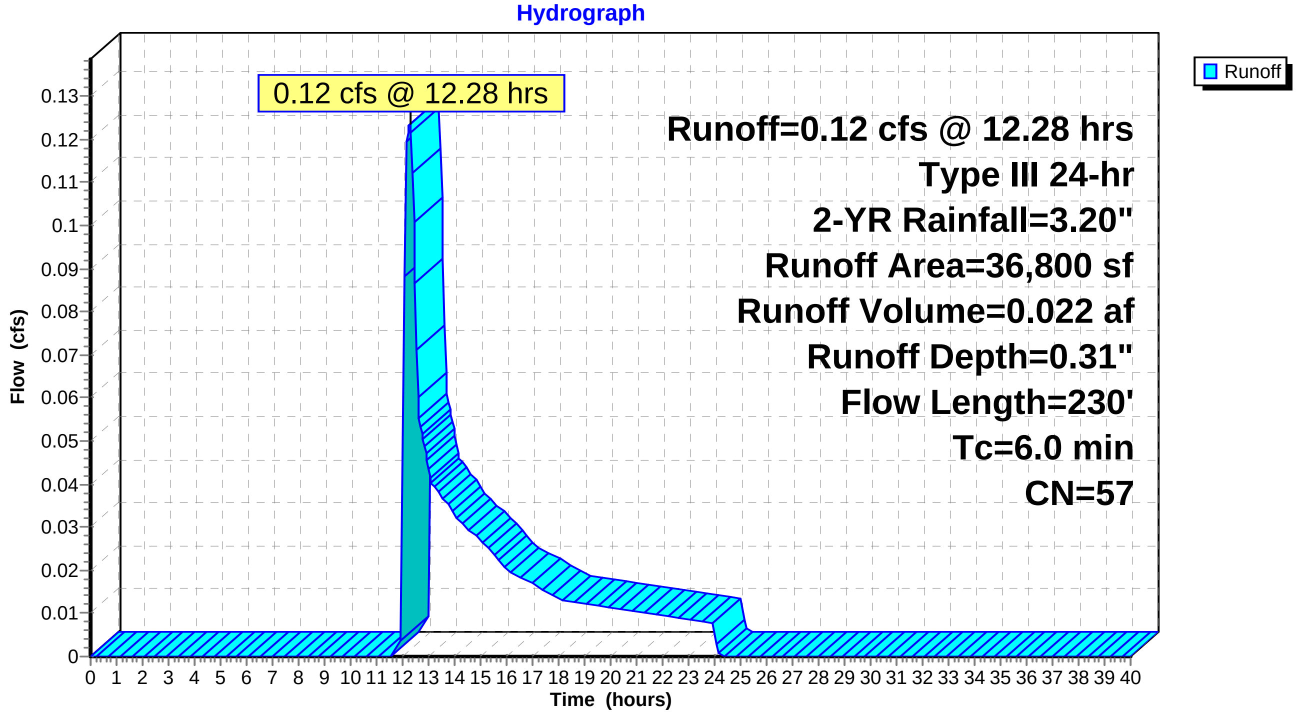
Runoff = 0.12 cfs @ 12.28 hrs, Volume= 0.022 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
3,689	30	Woods, Good, HSG A
25,151	55	Woods, Good, HSG B
540	76	Gravel roads, HSG A
569	85	Gravel roads, HSG B
928	98	Paved parking, HSG B
4,000	61	>75% Grass cover, Good, HSG B
1,923	98	Roofs, HSG B
36,800	57	Weighted Average
33,949		92.25% Pervious Area
2,851		7.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.1920	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	150	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	30	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.5	230	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: EX-5

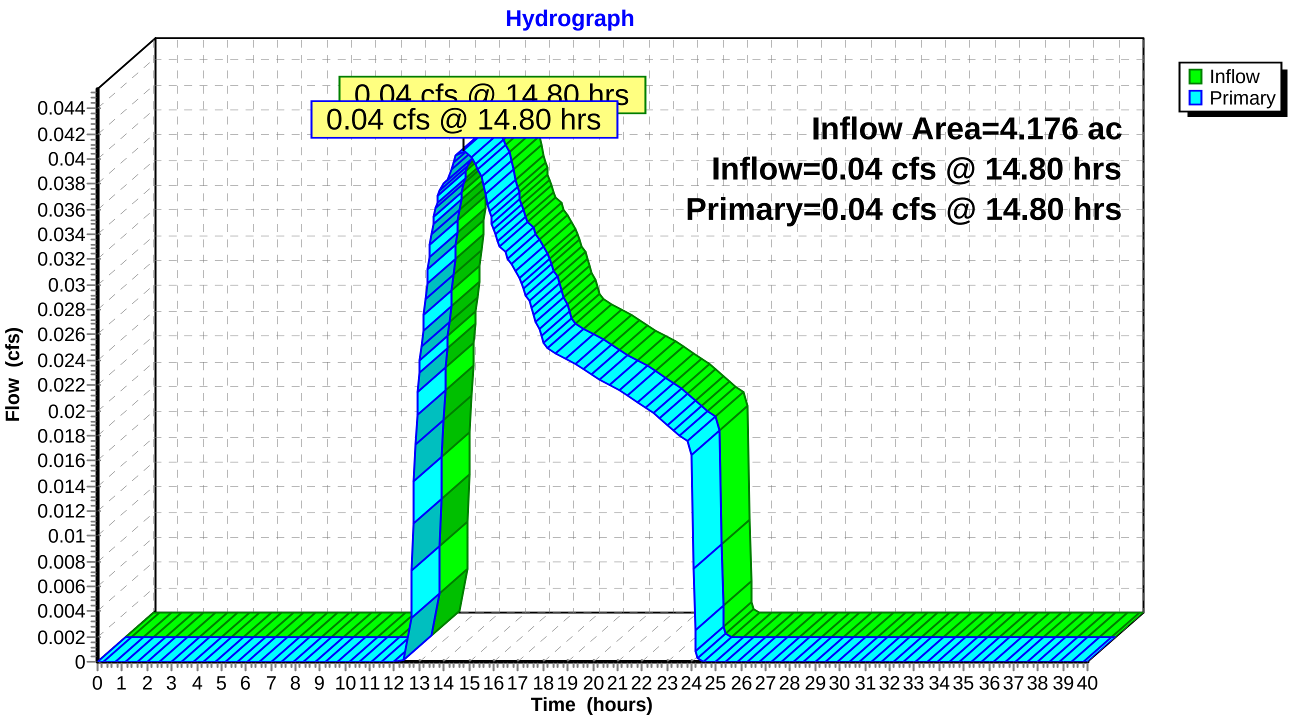


Summary for Link 1L: Flow towards weltands

Inflow Area = 4.176 ac, 0.00% Impervious, Inflow Depth = 0.07" for 2-YR event
Inflow = 0.04 cfs @ 14.80 hrs, Volume= 0.025 af
Primary = 0.04 cfs @ 14.80 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L: Flow towards weltands

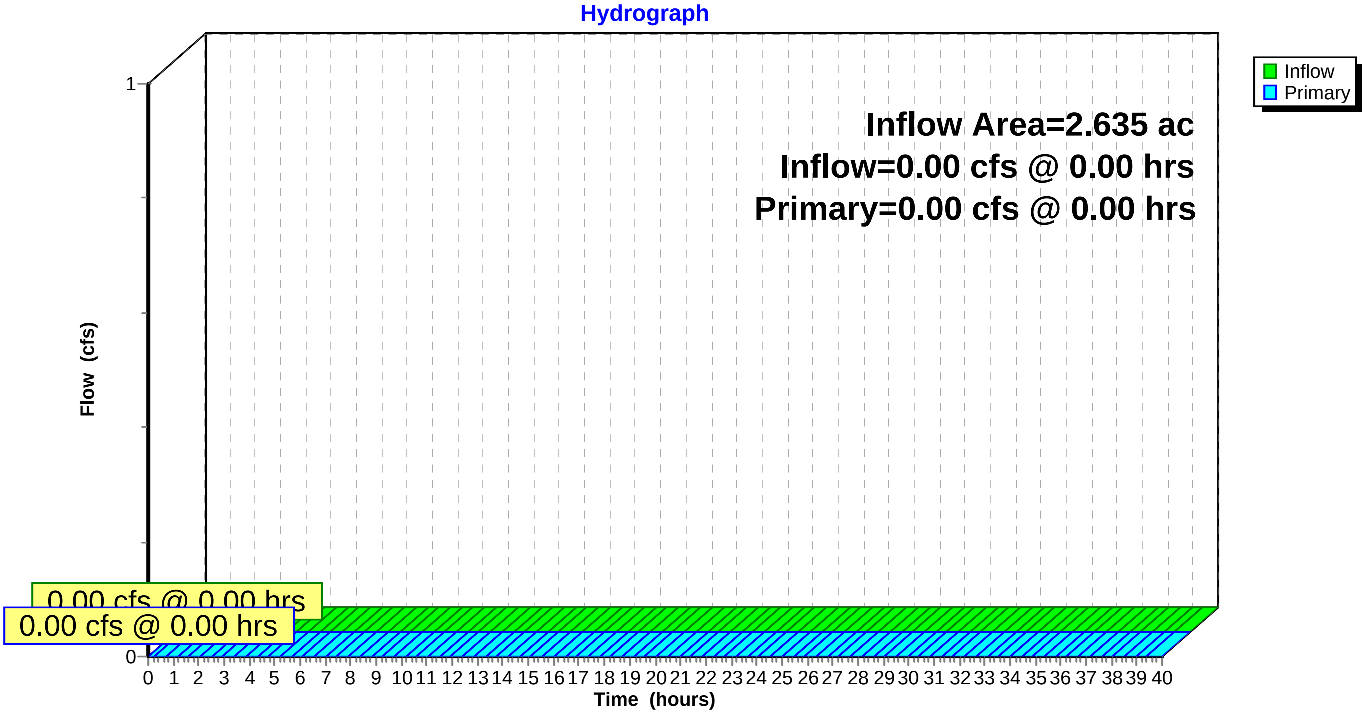


Summary for Link 2L: Flow to the north

Inflow Area =	2.635 ac,	0.00% Impervious,	Inflow Depth = 0.00"	for 2-YR event		
Inflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af		
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L: Flow to the north

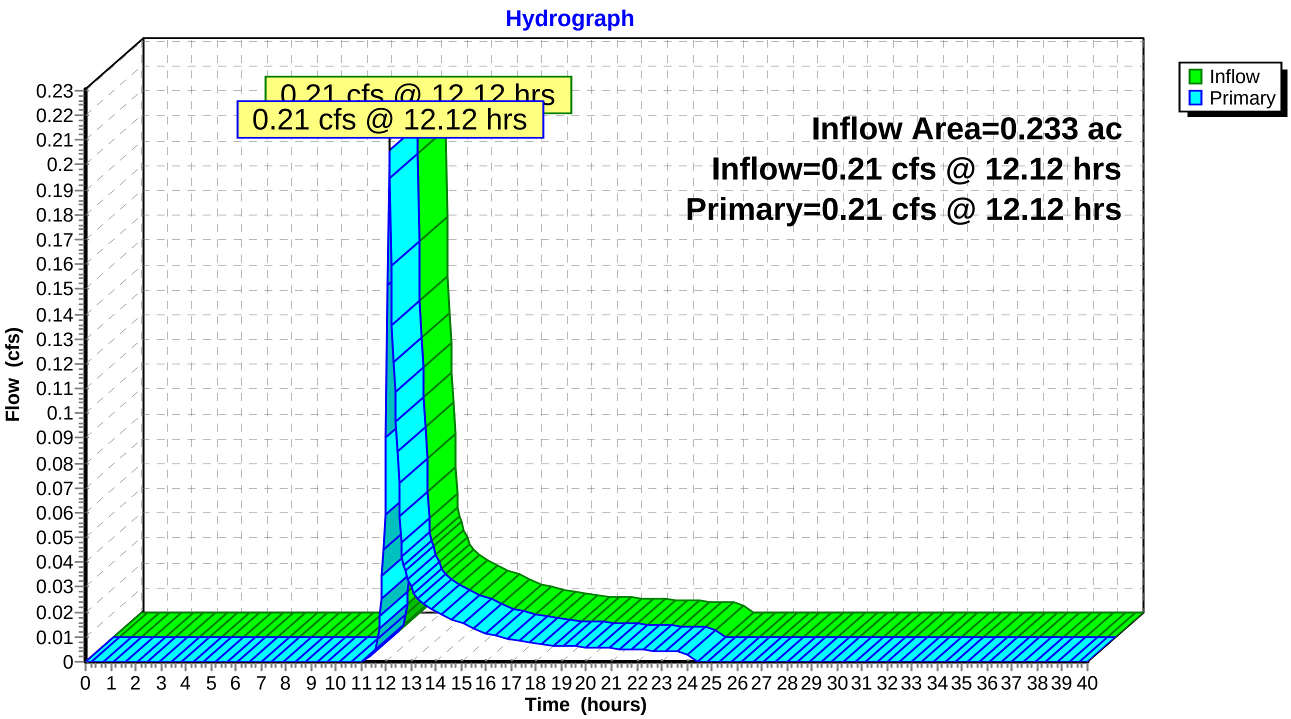


Summary for Link 3L: Flow towards exisiting cb on north-side of Elm Street

Inflow Area = 0.233 ac, 0.66% Impervious, Inflow Depth = 0.88" for 2-YR event
Inflow = 0.21 cfs @ 12.12 hrs, Volume= 0.017 af
Primary = 0.21 cfs @ 12.12 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L: Flow towards exisiting cb on north-side of Elm Street

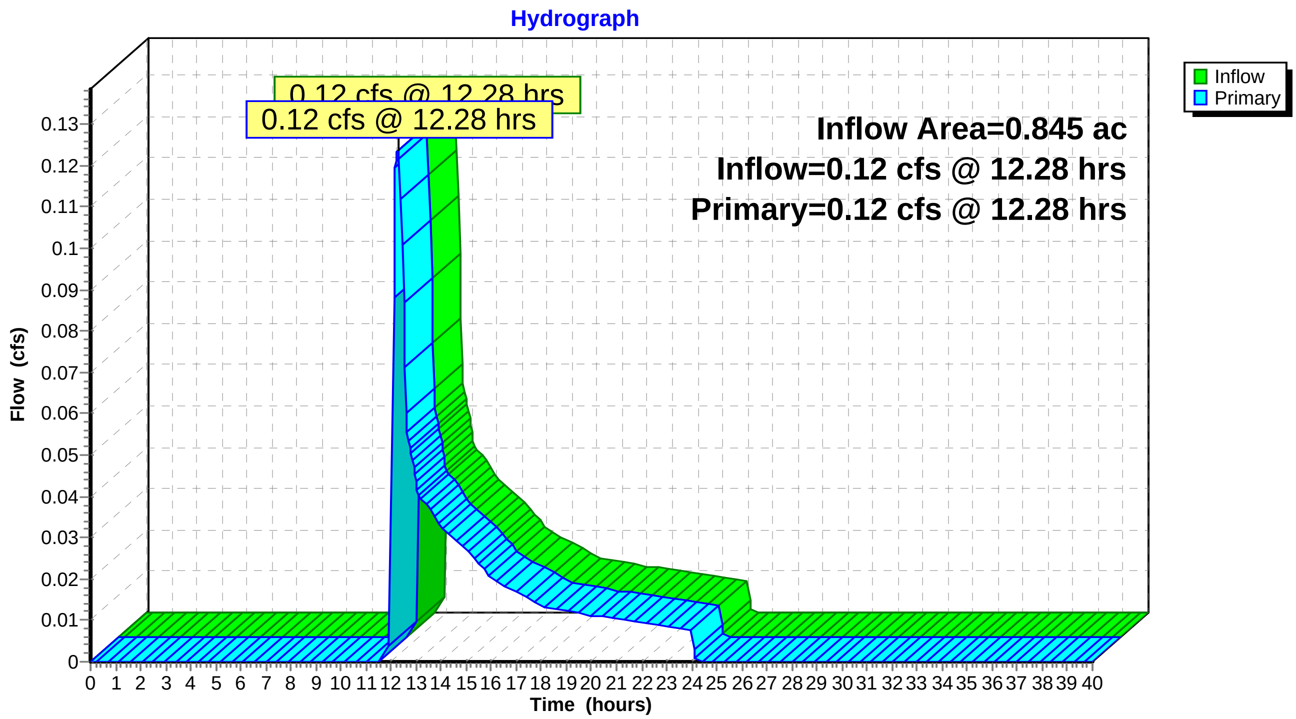


Summary for Link 4L: Flow towards north-side of elm street

Inflow Area = 0.845 ac, 7.75% Impervious, Inflow Depth = 0.31" for 2-YR event
Inflow = 0.12 cfs @ 12.28 hrs, Volume= 0.022 af
Primary = 0.12 cfs @ 12.28 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L: Flow towards north-side of elm street

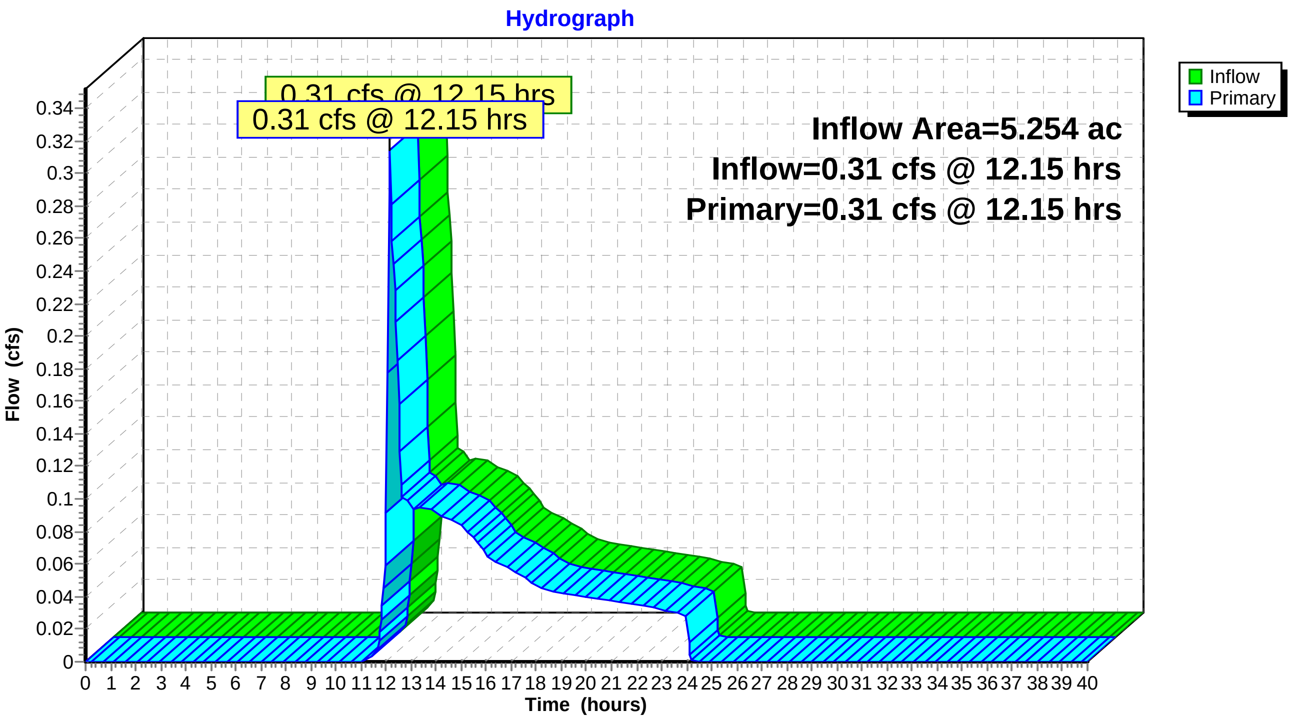


Summary for Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

Inflow Area =	5.254 ac, 1.28% Impervious, Inflow Depth = 0.15" for 2-YR event	
Inflow =	0.31 cfs @ 12.15 hrs, Volume=	0.064 af
Primary =	0.31 cfs @ 12.15 hrs, Volume=	0.064 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

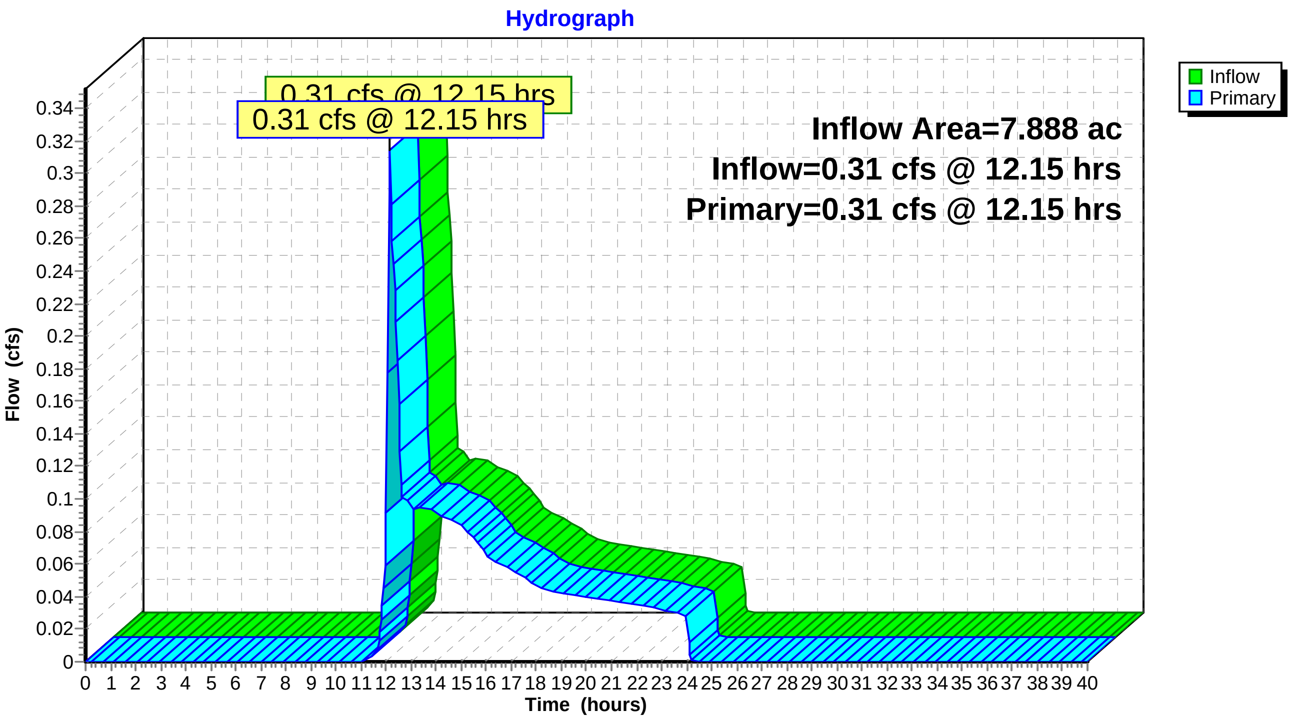


Summary for Link 6L: Runoff discharging from within the limit of watershed analysis

Inflow Area = 7.888 ac, 0.85% Impervious, Inflow Depth = 0.10" for 2-YR event
Inflow = 0.31 cfs @ 12.15 hrs, Volume= 0.064 af
Primary = 0.31 cfs @ 12.15 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 6L: Runoff discharging from within the limit of watershed analysis



Summary for Subcatchment 1S: EX-1

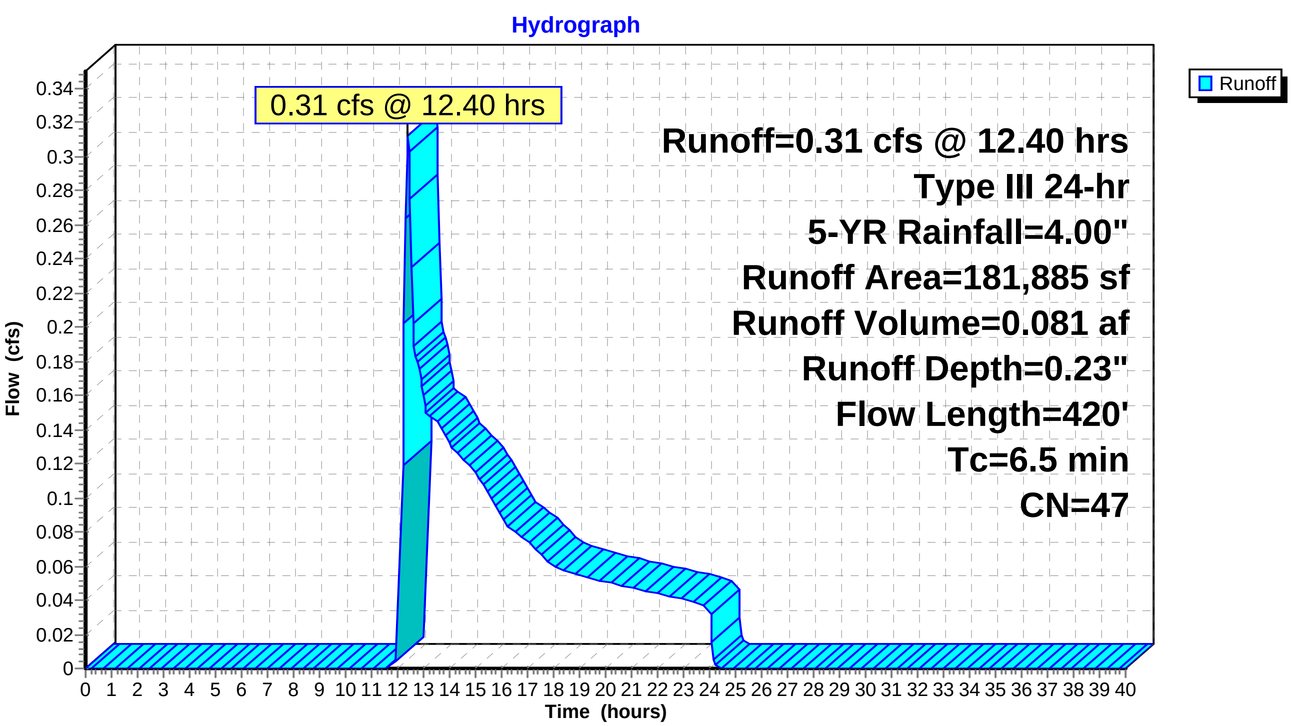
Runoff = 0.31 cfs @ 12.40 hrs, Volume= 0.081 af, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
60,022	30	Woods, Good, HSG A
121,863	55	Woods, Good, HSG B
181,885	47	Weighted Average
181,885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1820	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	125	0.1040	5.19		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	245	0.0650	4.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.5	420	Total			

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

[45] Hint: Runoff=Zero

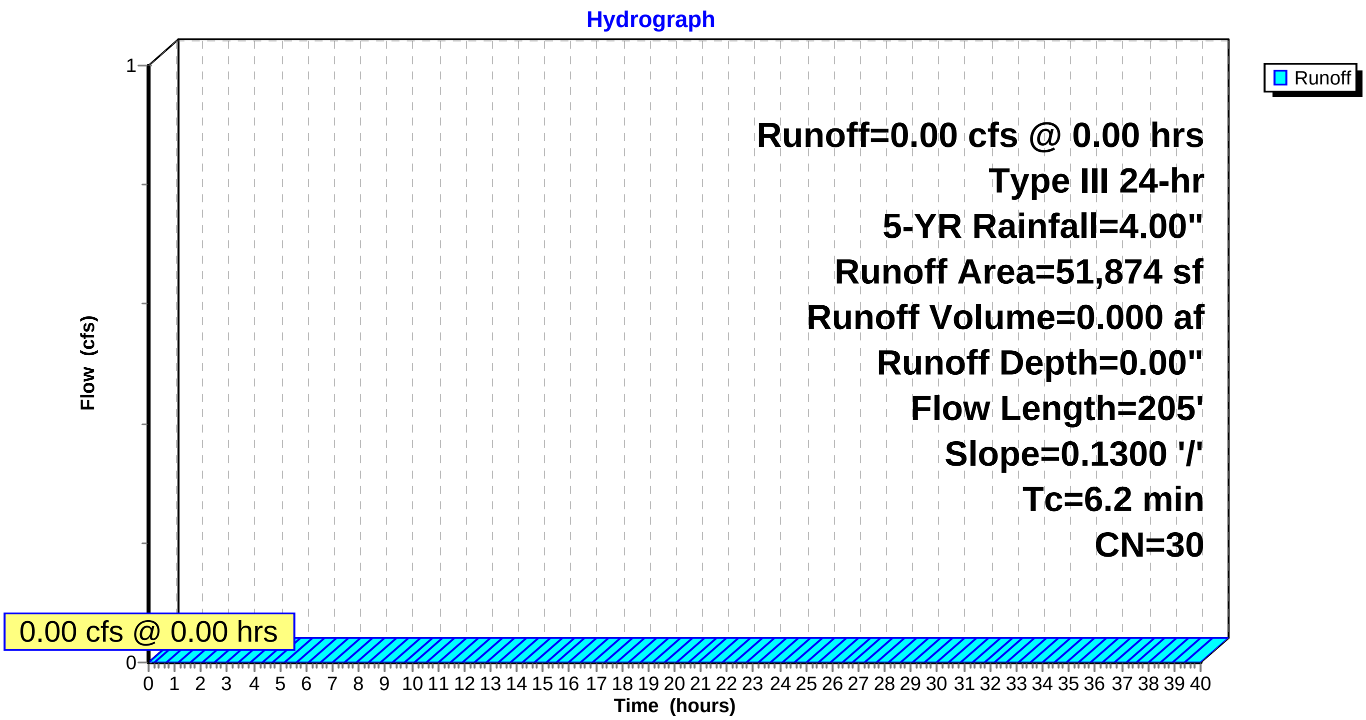
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
51,874	30	Woods, Good, HSG A
51,874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.1300	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	155	0.1300	5.80		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.2	205	Total			

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

[45] Hint: Runoff=Zero

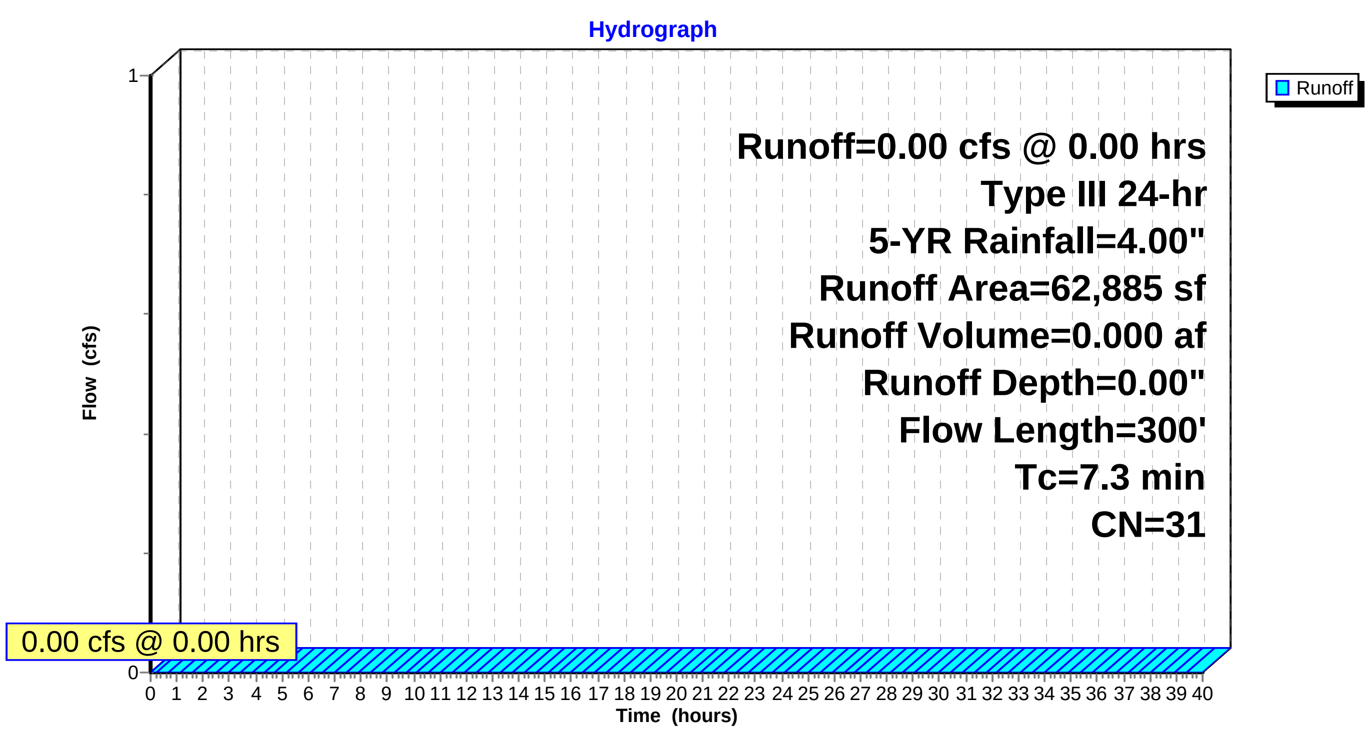
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
61,744	30	Woods, Good, HSG A
1,141	76	Gravel roads, HSG A
62,885	31	Weighted Average
62,885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1020	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	250	0.0840	4.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.3	300	Total			

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: EX-4

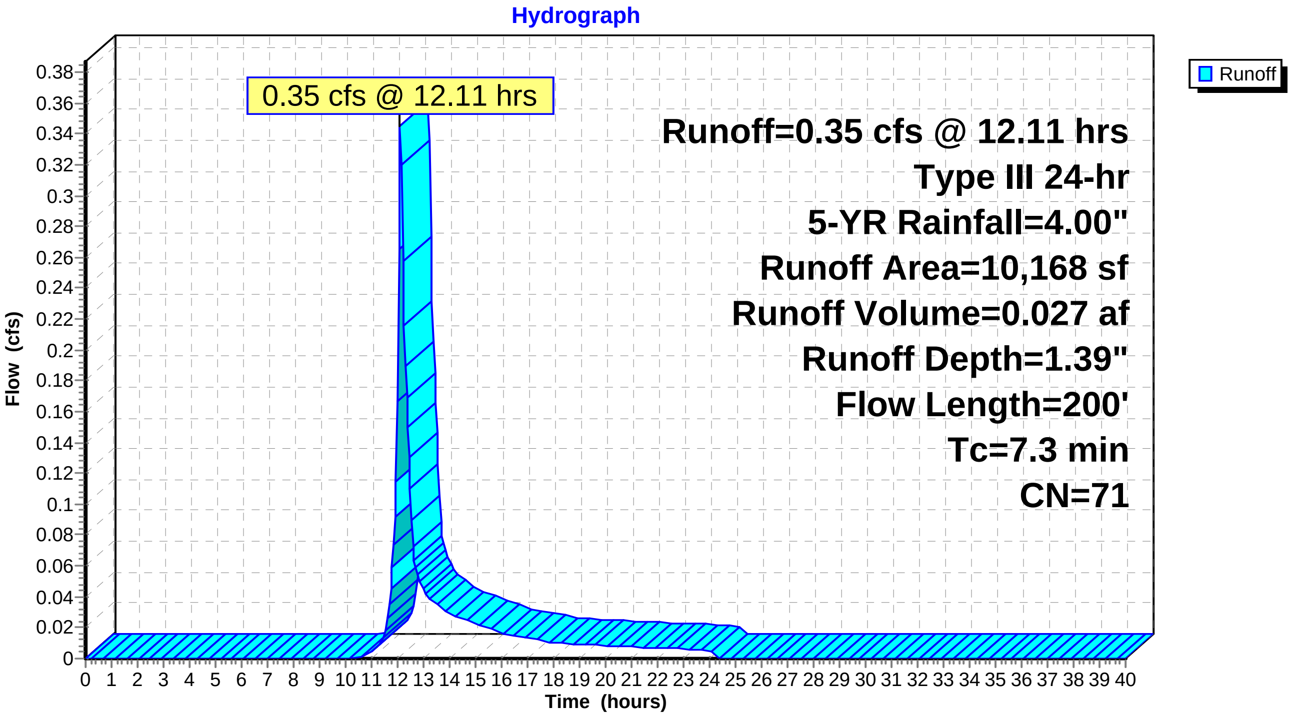
Runoff = 0.35 cfs @ 12.11 hrs, Volume= 0.027 af, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
1,573	30	Woods, Good, HSG A
1,846	55	Woods, Good, HSG B
6,682	85	Gravel roads, HSG B
67	98	Unconnected pavement, HSG B
10,168	71	Weighted Average
10,101		99.34% Pervious Area
67		0.66% Impervious Area
67		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0860	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	140	0.1520	6.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.1100	6.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	200	Total			

Subcatchment 4S: EX-4



Summary for Subcatchment 5S: EX-5

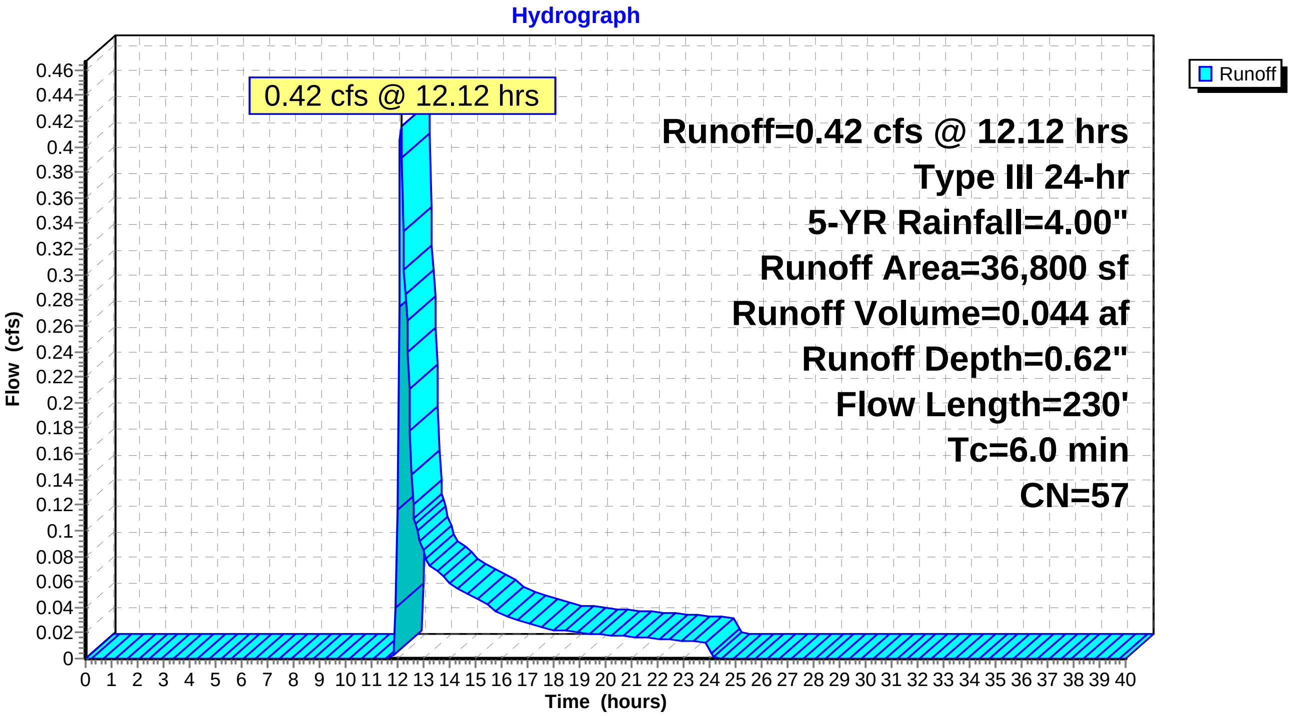
Runoff = 0.42 cfs @ 12.12 hrs, Volume= 0.044 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
3,689	30	Woods, Good, HSG A
25,151	55	Woods, Good, HSG B
540	76	Gravel roads, HSG A
569	85	Gravel roads, HSG B
928	98	Paved parking, HSG B
4,000	61	>75% Grass cover, Good, HSG B
1,923	98	Roofs, HSG B
36,800	57	Weighted Average
33,949		92.25% Pervious Area
2,851		7.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.1920	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	150	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	30	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.5	230	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: EX-5

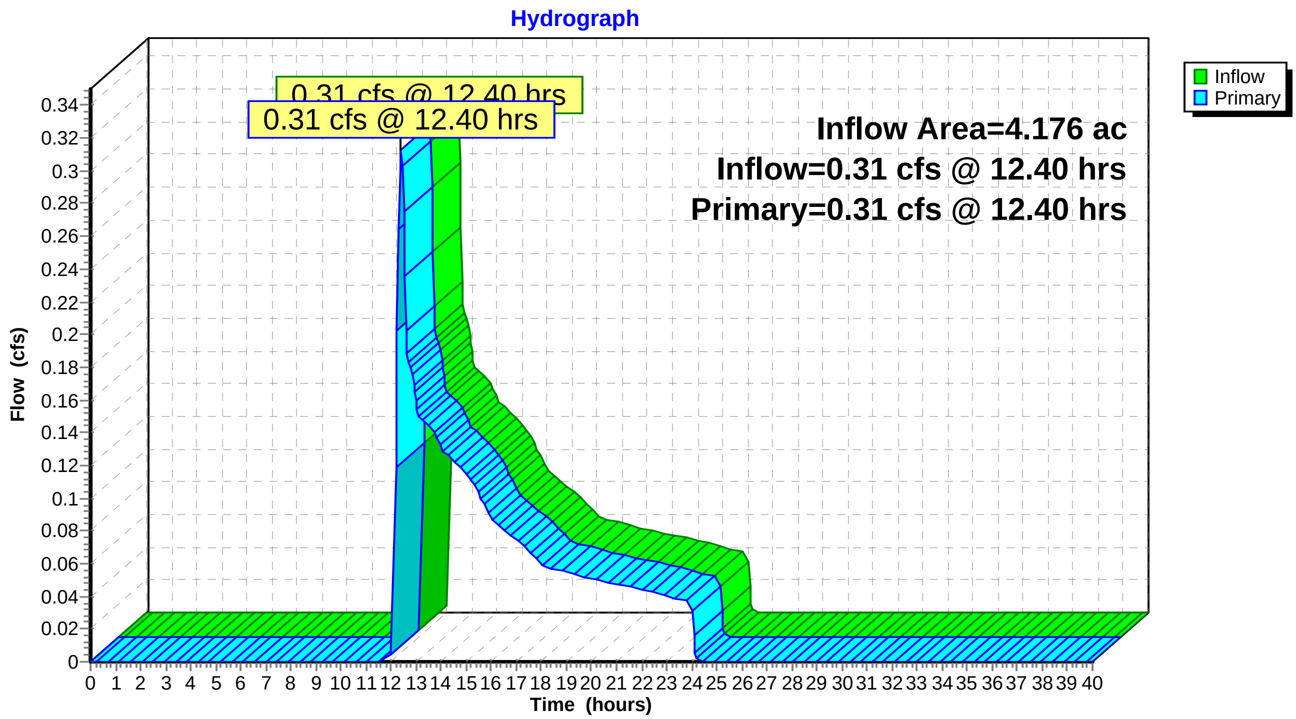


Summary for Link 1L: Flow towards weltands

Inflow Area =	4.176 ac,	0.00% Impervious,	Inflow Depth = 0.23"	for 5-YR event
Inflow =	0.31 cfs @	12.40 hrs, Volume=	0.081 af	
Primary =	0.31 cfs @	12.40 hrs, Volume=	0.081 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L: Flow towards weltands

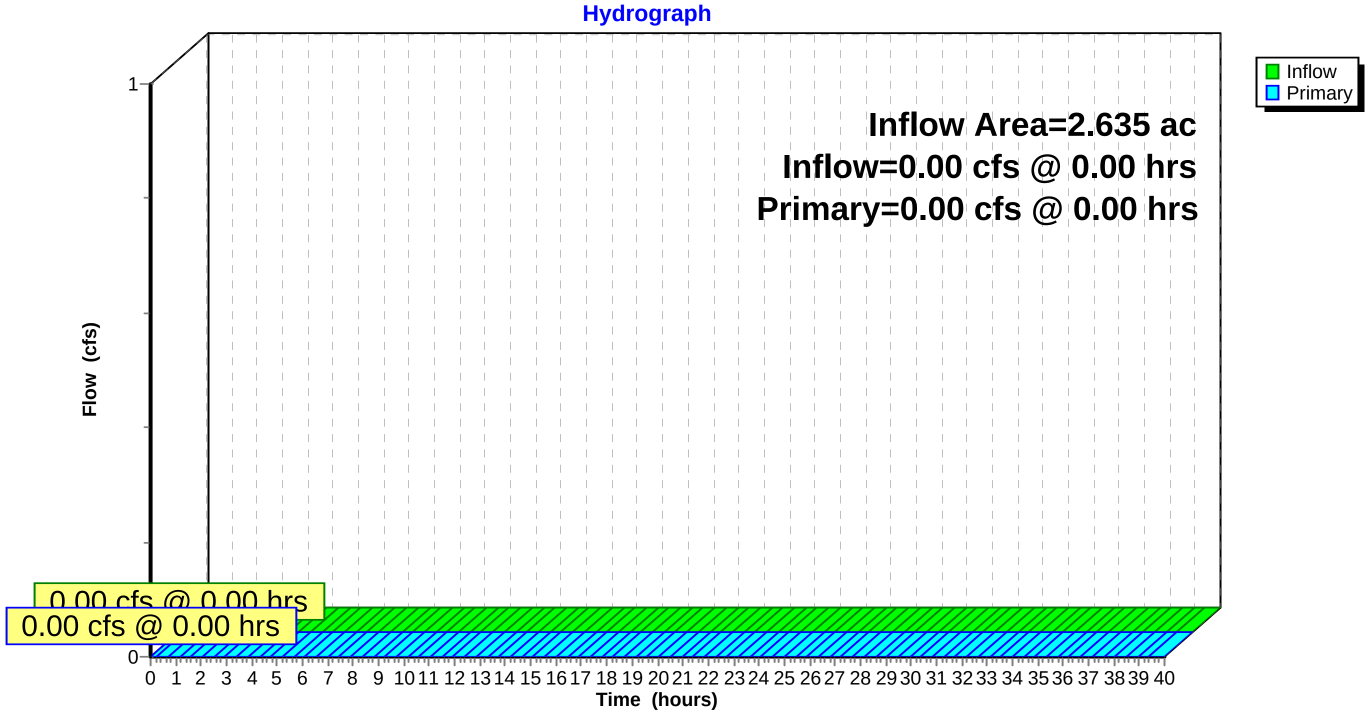


Summary for Link 2L: Flow to the north

Inflow Area = 2.635 ac, 0.00% Impervious, Inflow Depth = 0.00" for 5-YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L: Flow to the north

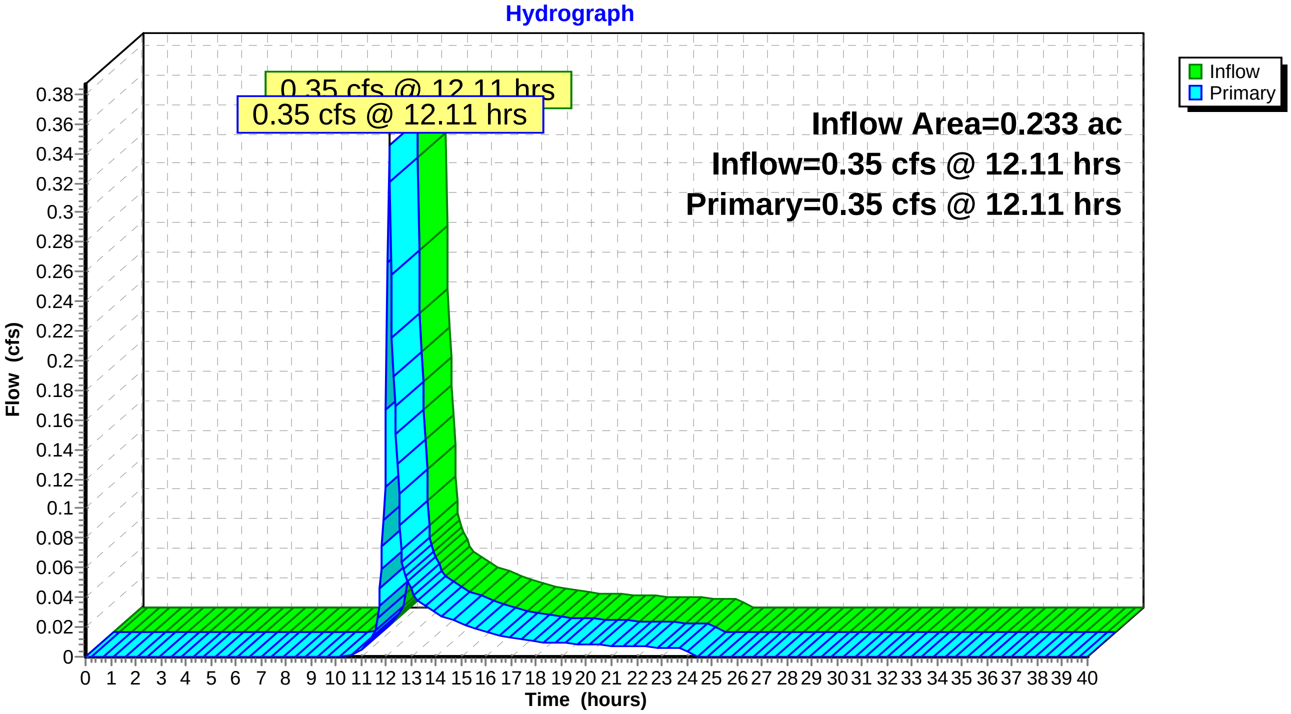


Summary for Link 3L: Flow towards exisiting cb on north-side of Elm Street

Inflow Area = 0.233 ac, 0.66% Impervious, Inflow Depth = 1.39" for 5-YR event
Inflow = 0.35 cfs @ 12.11 hrs, Volume= 0.027 af
Primary = 0.35 cfs @ 12.11 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L: Flow towards exisiting cb on north-side of Elm Street

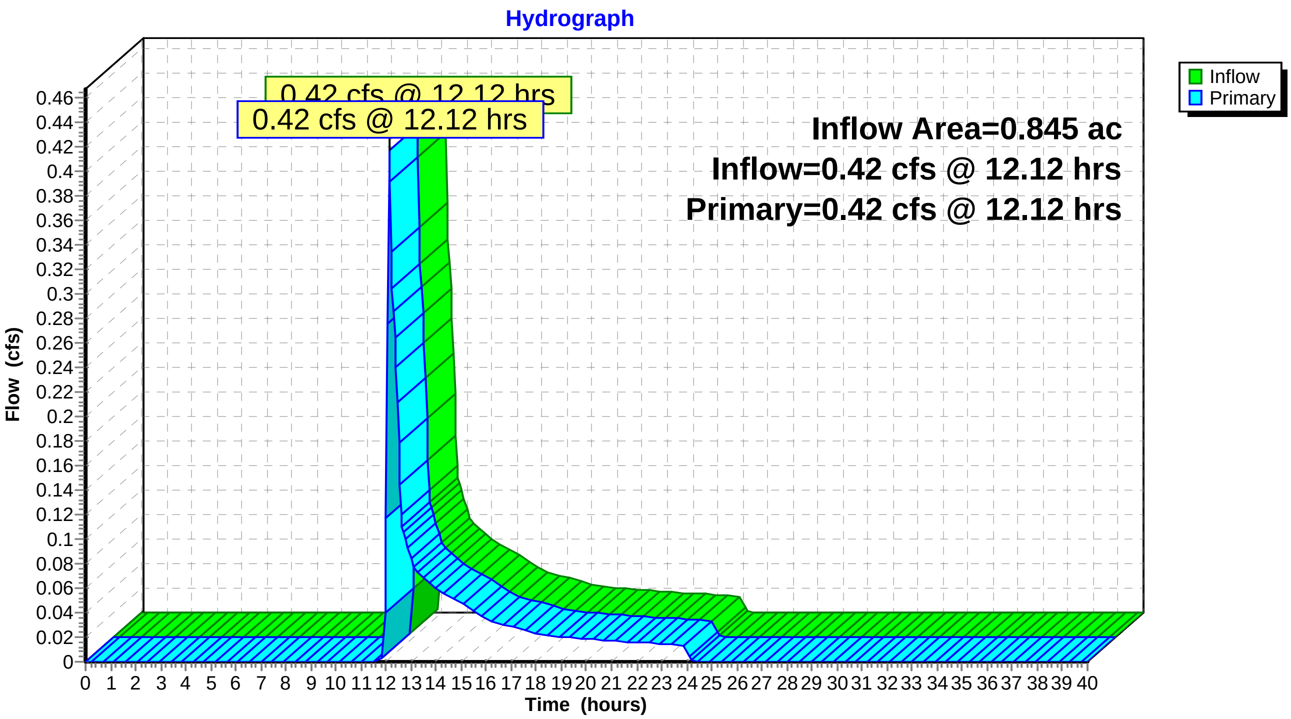


Summary for Link 4L: Flow towards north-side of elm street

Inflow Area =	0.845 ac,	7.75% Impervious, Inflow Depth = 0.62"	for 5-YR event	
Inflow =	0.42 cfs @	12.12 hrs, Volume=	0.044 af	
Primary =	0.42 cfs @	12.12 hrs, Volume=	0.044 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L: Flow towards north-side of elm street

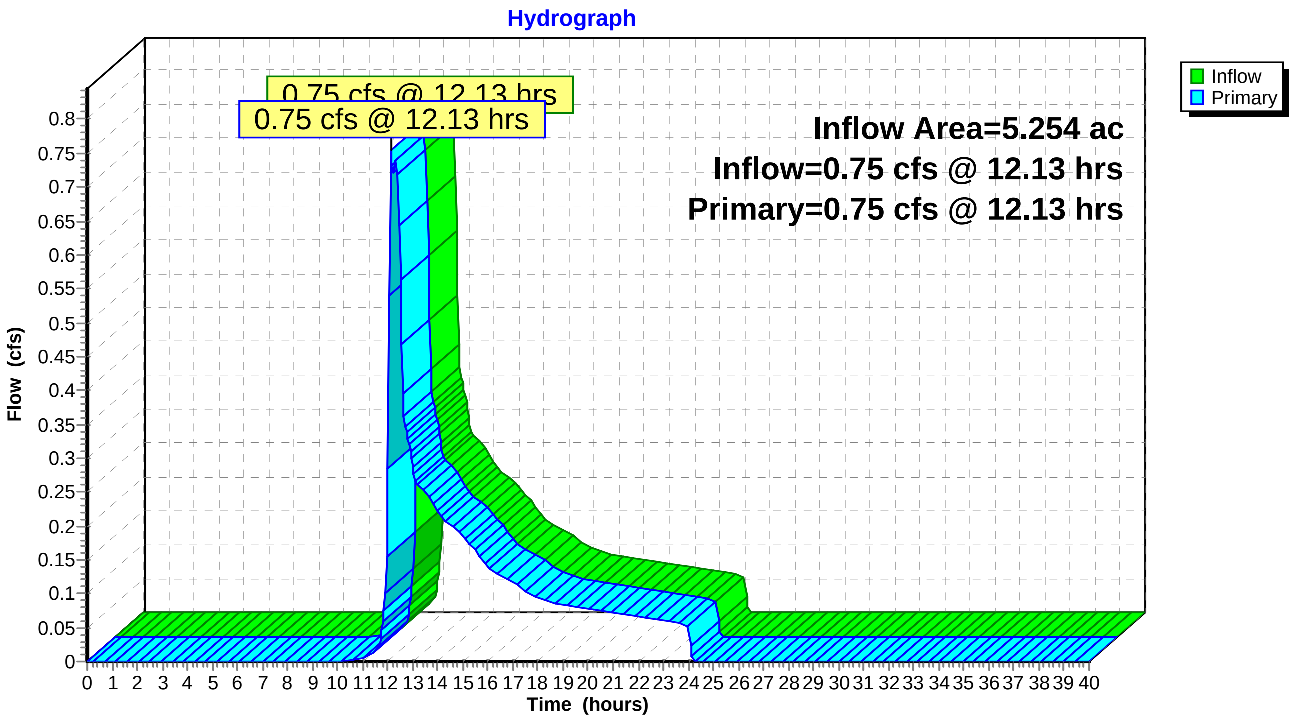


Summary for Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

Inflow Area =	5.254 ac,	1.28% Impervious, Inflow Depth = 0.35"		for 5-YR event
Inflow =	0.75 cfs @	12.13 hrs, Volume=	0.152 af	
Primary =	0.75 cfs @	12.13 hrs, Volume=	0.152 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

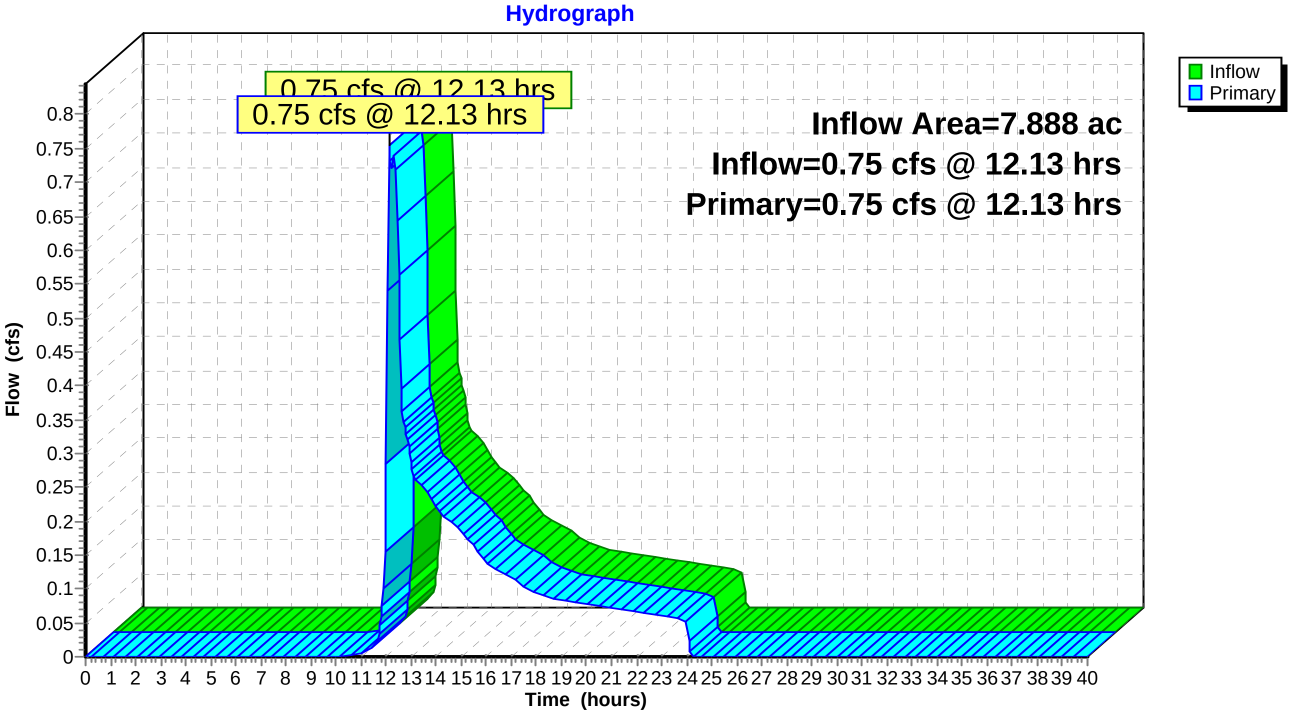


Summary for Link 6L: Runoff discharging from within the limit of watershed analysis

Inflow Area =	7.888 ac, 0.85% Impervious, Inflow Depth = 0.23" for 5-YR event		
Inflow =	0.75 cfs @ 12.13 hrs, Volume=	0.152 af	
Primary =	0.75 cfs @ 12.13 hrs, Volume=	0.152 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 6L: Runoff discharging from within the limit of watershed analysis



Summary for Subcatchment 1S: EX-1

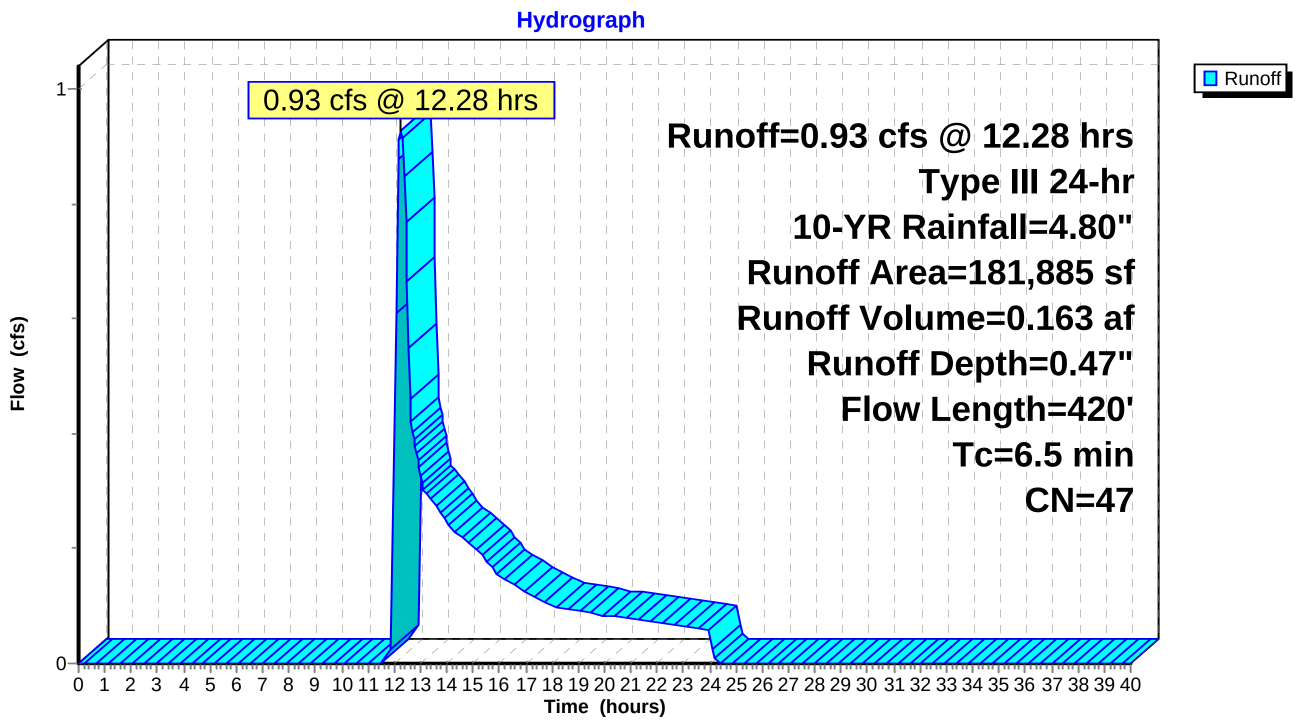
Runoff = 0.93 cfs @ 12.28 hrs, Volume= 0.163 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
60,022	30	Woods, Good, HSG A
121,863	55	Woods, Good, HSG B
181,885	47	Weighted Average
181,885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1820	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	125	0.1040	5.19		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	245	0.0650	4.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.5	420	Total			

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

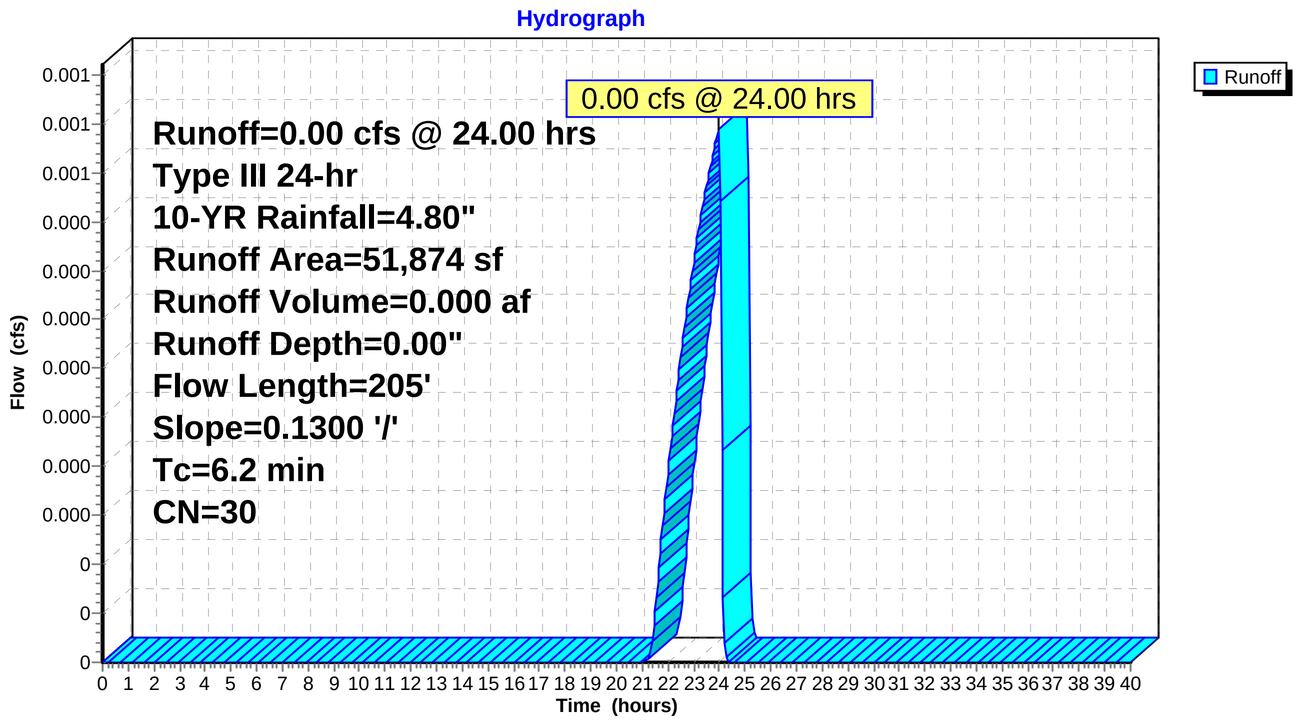
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
51,874	30	Woods, Good, HSG A
51,874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.1300	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	155	0.1300	5.80		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.2	205	Total			

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

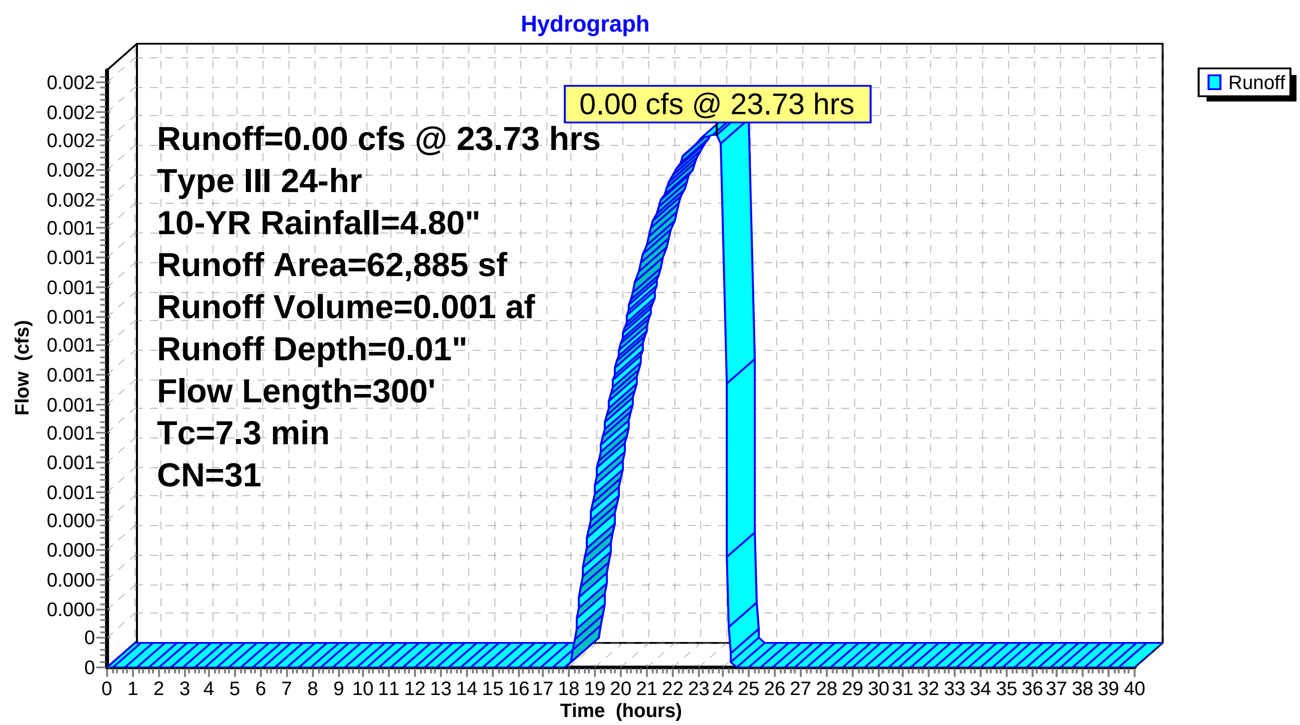
Runoff = 0.00 cfs @ 23.73 hrs, Volume= 0.001 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
61,744	30	Woods, Good, HSG A
1,141	76	Gravel roads, HSG A
62,885	31	Weighted Average
62,885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1020	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	250	0.0840	4.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.3	300	Total			

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: EX-4

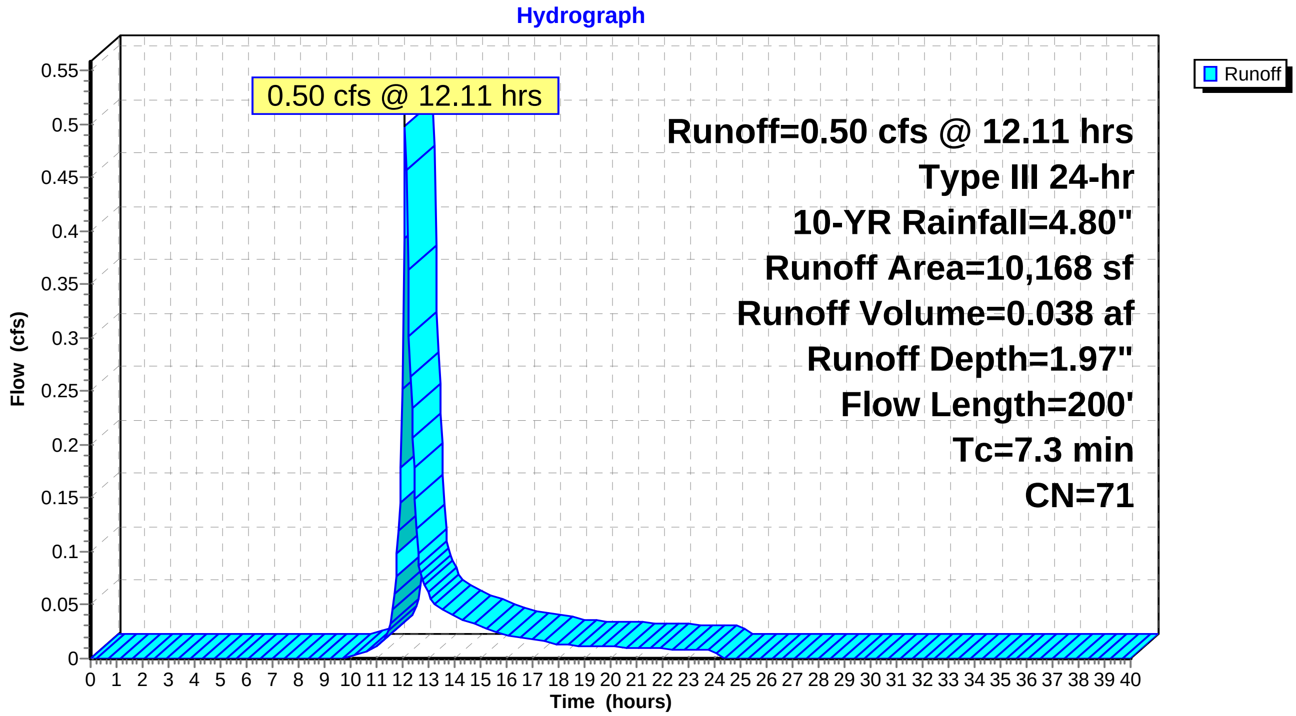
Runoff = 0.50 cfs @ 12.11 hrs, Volume= 0.038 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
1,573	30	Woods, Good, HSG A
1,846	55	Woods, Good, HSG B
6,682	85	Gravel roads, HSG B
67	98	Unconnected pavement, HSG B
10,168	71	Weighted Average
10,101		99.34% Pervious Area
67		0.66% Impervious Area
67		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0860	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	140	0.1520	6.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.1100	6.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	200	Total			

Subcatchment 4S: EX-4



Summary for Subcatchment 5S: EX-5

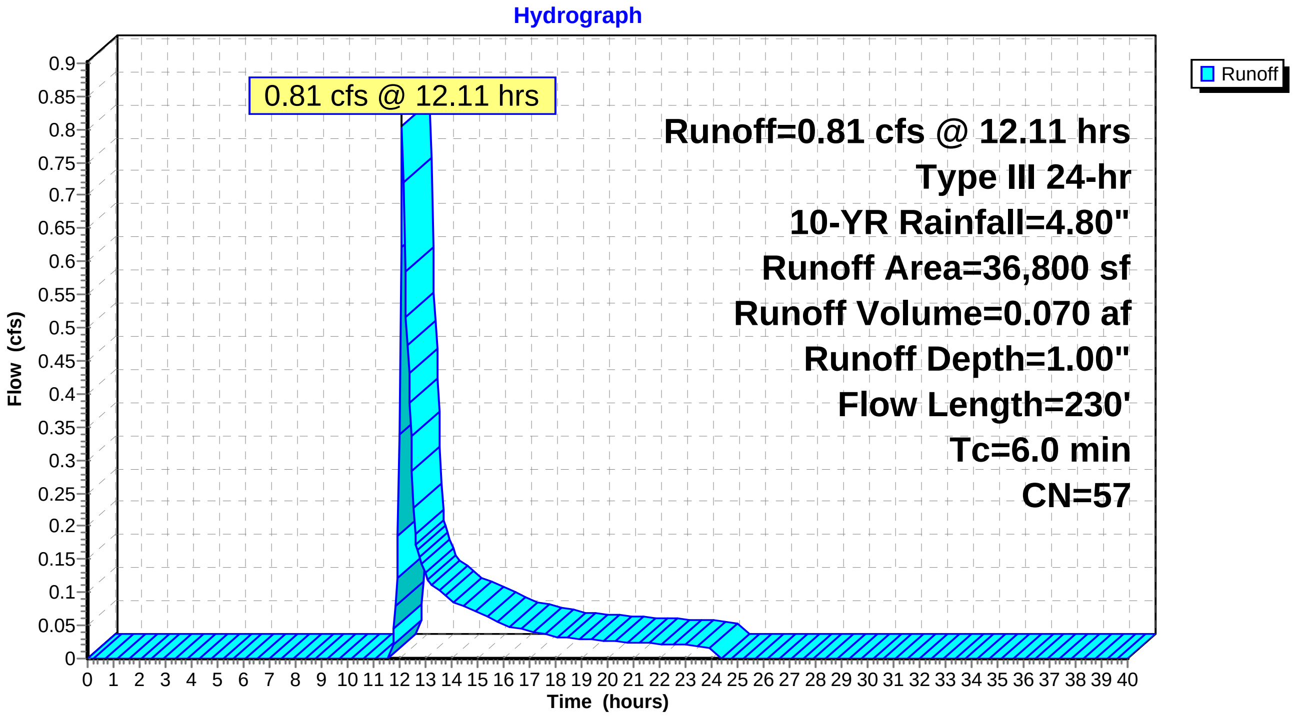
Runoff = 0.81 cfs @ 12.11 hrs, Volume= 0.070 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
3,689	30	Woods, Good, HSG A
25,151	55	Woods, Good, HSG B
540	76	Gravel roads, HSG A
569	85	Gravel roads, HSG B
928	98	Paved parking, HSG B
4,000	61	>75% Grass cover, Good, HSG B
1,923	98	Roofs, HSG B
36,800	57	Weighted Average
33,949		92.25% Pervious Area
2,851		7.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.1920	0.17		**Sheet Flow,**
					Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	150	0.1270	5.74		**Shallow Concentrated Flow,**
					Unpaved Kv= 16.1 fps
0.1	30	0.0900	6.09		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
5.5	230	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: EX-5

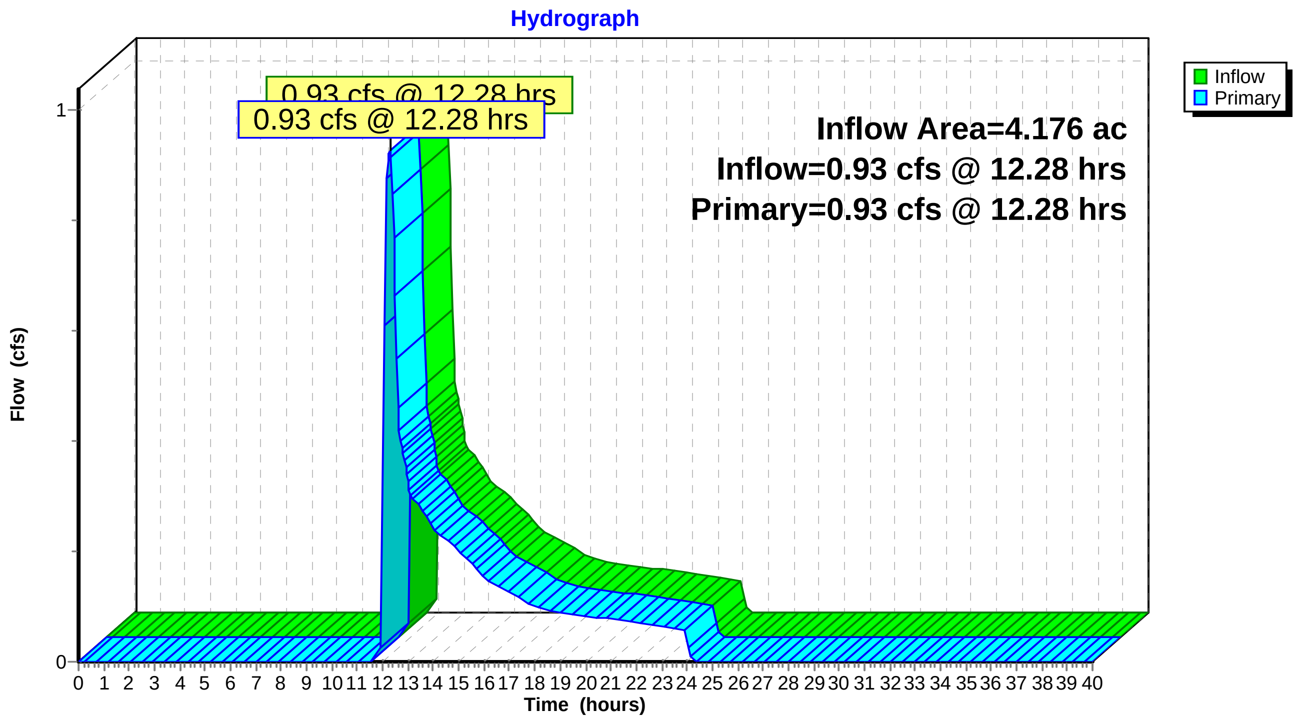


Summary for Link 1L: Flow towards weltands

Inflow Area = 4.176 ac, 0.00% Impervious, Inflow Depth = 0.47" for 10-YR event
Inflow = 0.93 cfs @ 12.28 hrs, Volume= 0.163 af
Primary = 0.93 cfs @ 12.28 hrs, Volume= 0.163 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L: Flow towards weltands

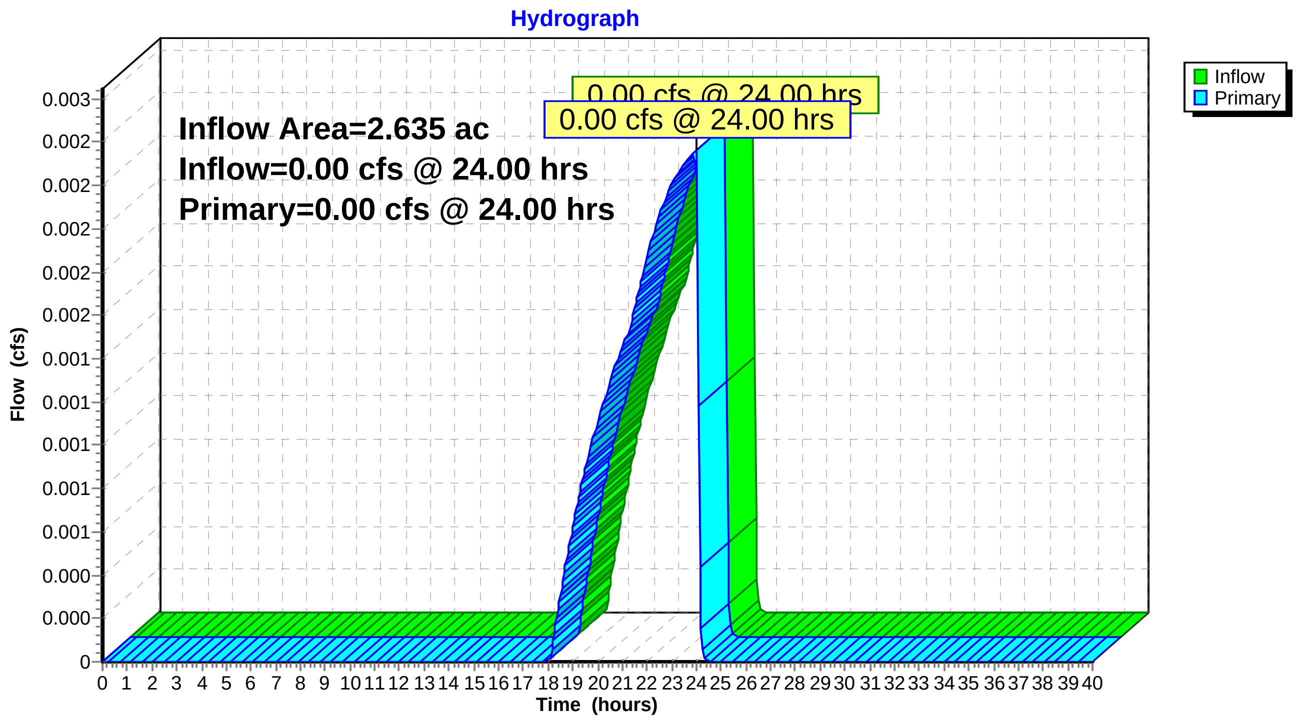


Summary for Link 2L: Flow to the north

Inflow Area = 2.635 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-YR event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L: Flow to the north

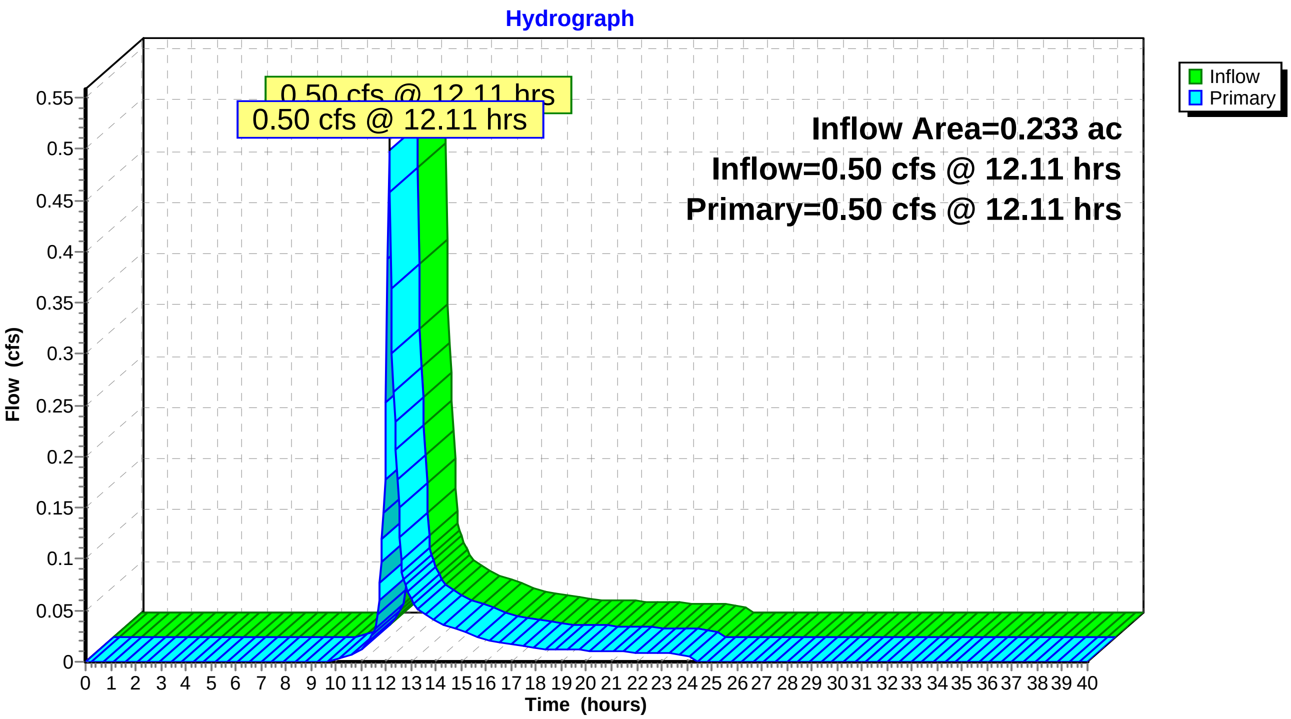


Summary for Link 3L: Flow towards exisiting cb on north-side of Elm Street

Inflow Area =	0.233 ac,	0.66% Impervious, Inflow Depth = 1.97"	for 10-YR event
Inflow =	0.50 cfs @	12.11 hrs, Volume=	0.038 af
Primary =	0.50 cfs @	12.11 hrs, Volume=	0.038 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L: Flow towards exisiting cb on north-side of Elm Street

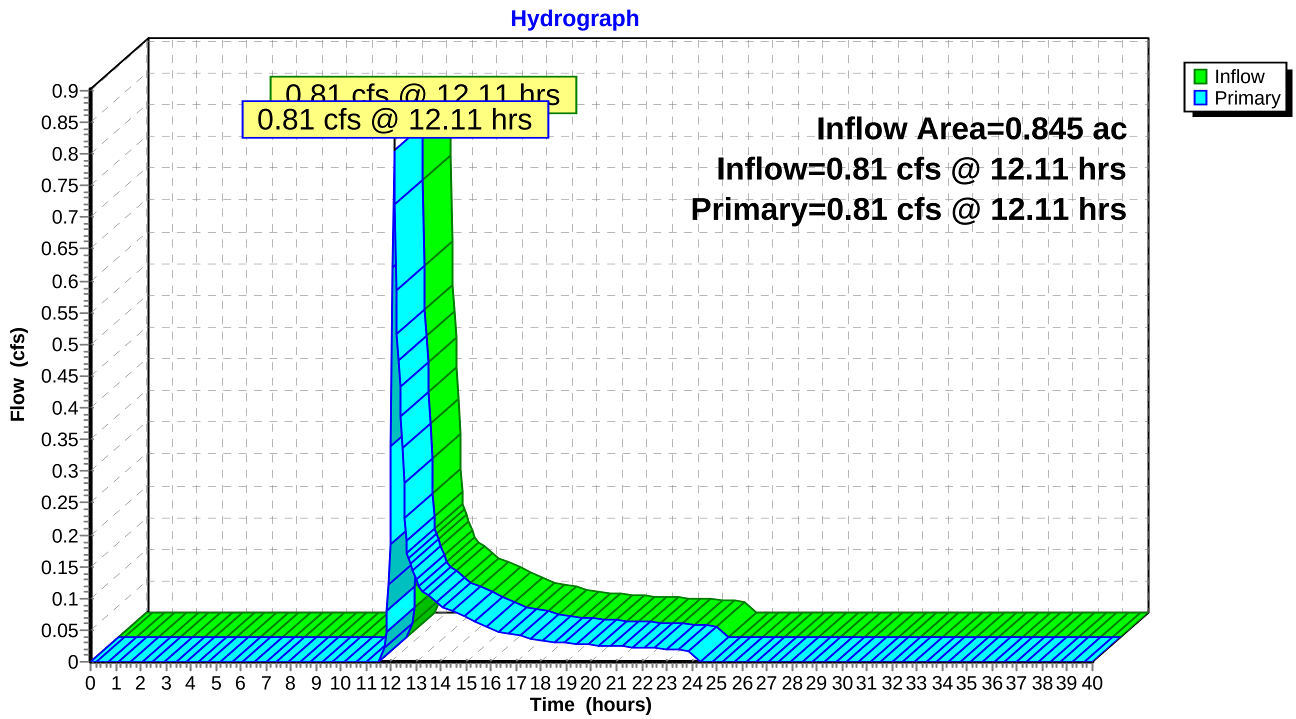


Summary for Link 4L: Flow towards north-side of elm street

Inflow Area =	0.845 ac, 7.75% Impervious, Inflow Depth = 1.00"	for 10-YR event	
Inflow =	0.81 cfs @ 12.11 hrs, Volume=	0.070 af	
Primary =	0.81 cfs @ 12.11 hrs, Volume=	0.070 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L: Flow towards north-side of elm street

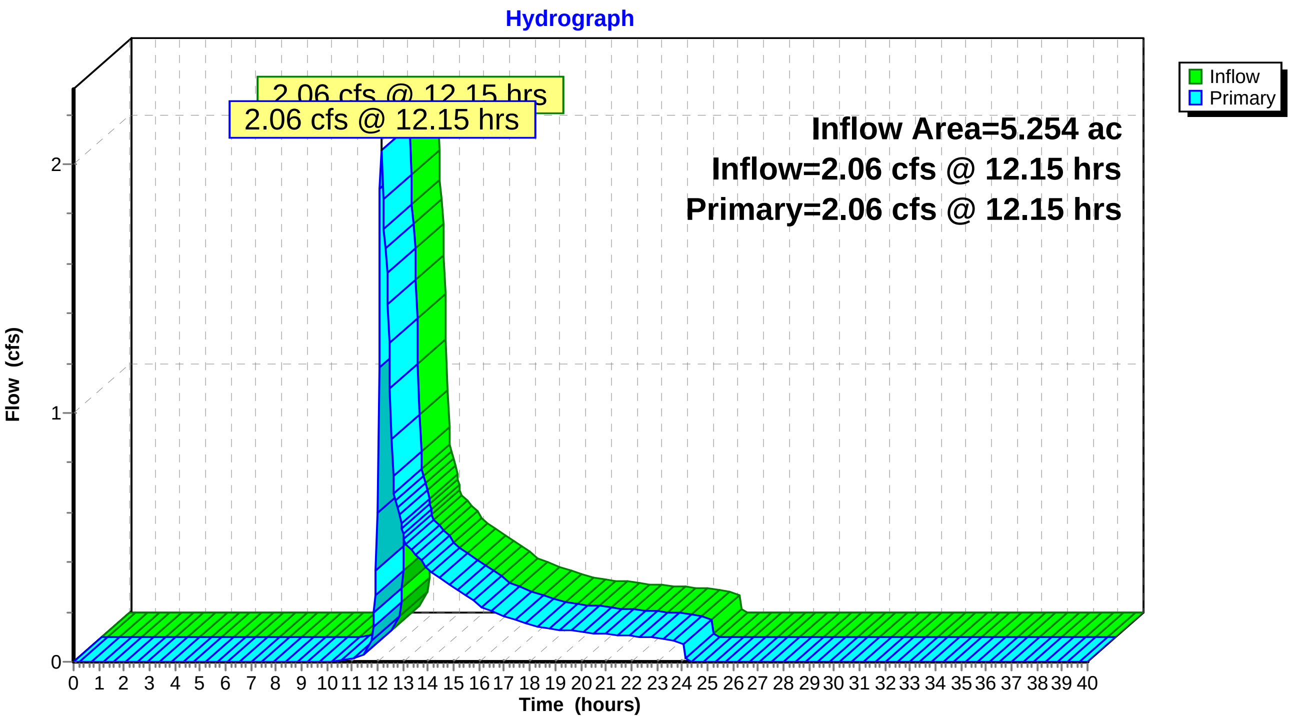


Summary for Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

Inflow Area = 5.254 ac, 1.28% Impervious, Inflow Depth = 0.62" for 10-YR event
Inflow = 2.06 cfs @ 12.15 hrs, Volume= 0.272 af
Primary = 2.06 cfs @ 12.15 hrs, Volume= 0.272 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

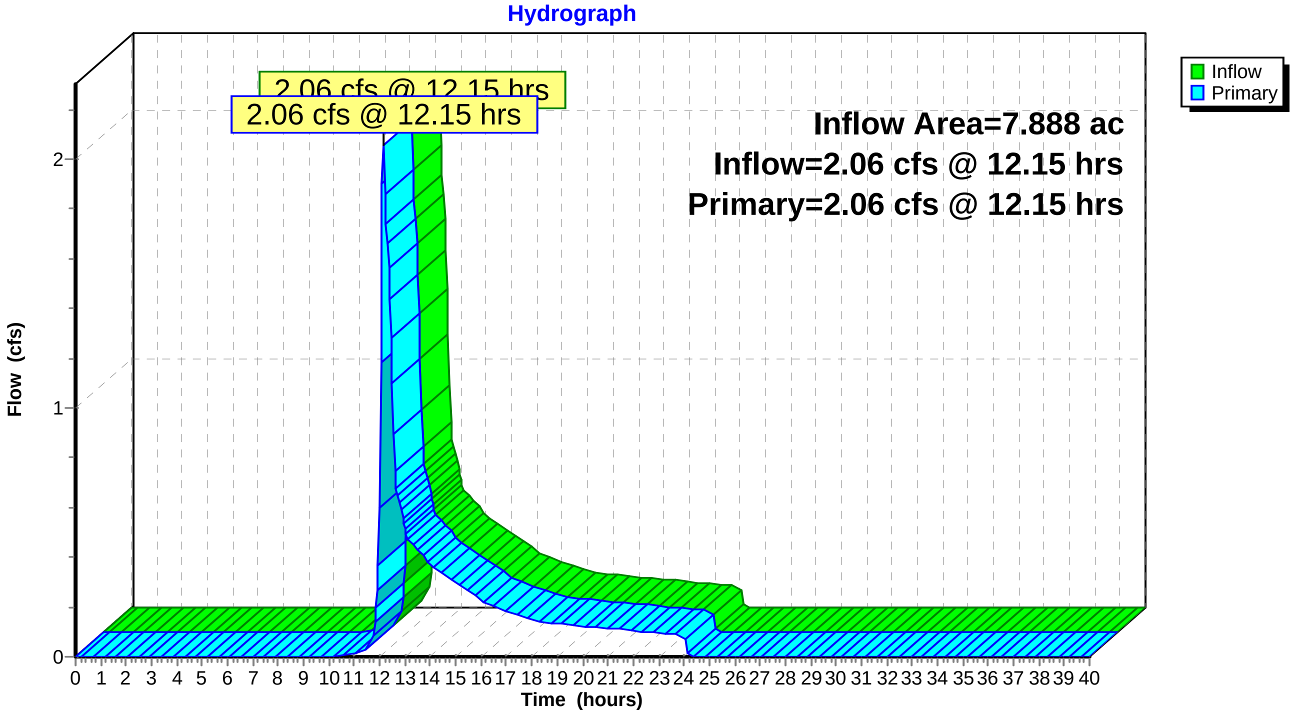


Summary for Link 6L: Runoff discharging from within the limit of watershed analysis

Inflow Area = 7.888 ac, 0.85% Impervious, Inflow Depth = 0.41" for 10-YR event
Inflow = 2.06 cfs @ 12.15 hrs, Volume= 0.272 af
Primary = 2.06 cfs @ 12.15 hrs, Volume= 0.272 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 6L: Runoff discharging from within the limit of watershed analysis



Summary for Subcatchment 1S: EX-1

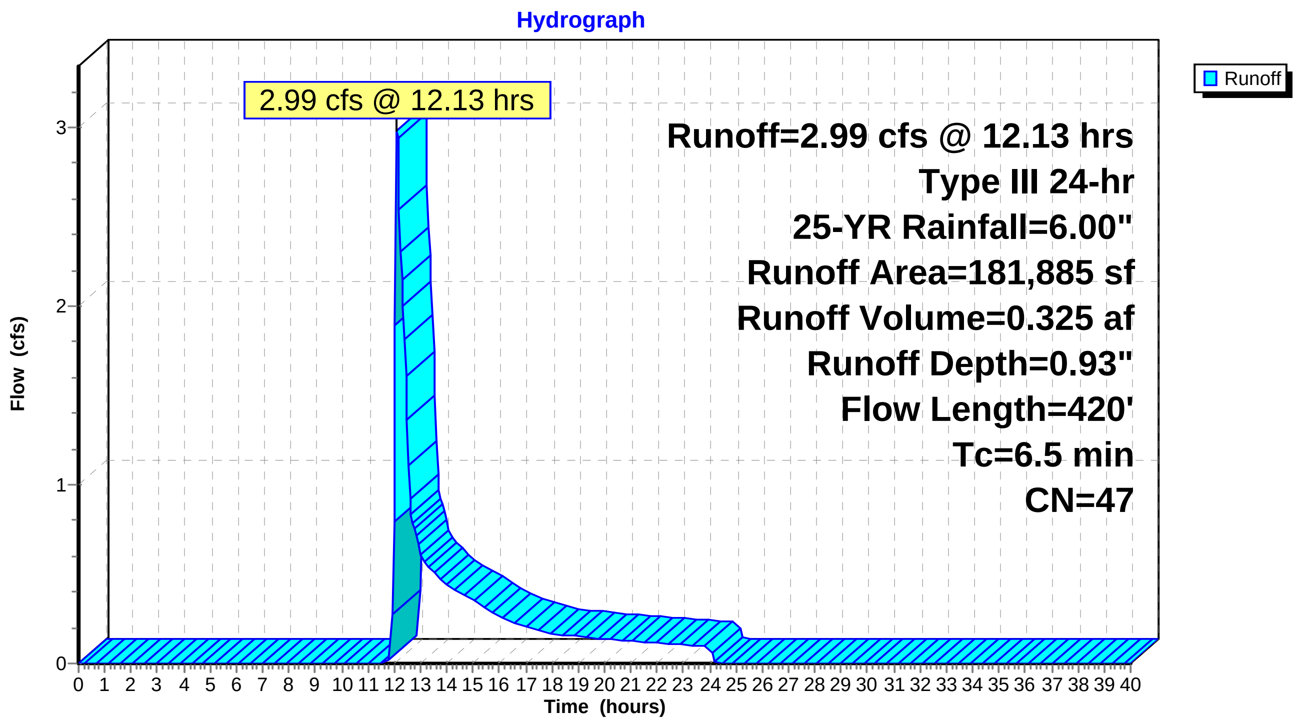
Runoff = 2.99 cfs @ 12.13 hrs, Volume= 0.325 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
60,022	30	Woods, Good, HSG A
121,863	55	Woods, Good, HSG B
181,885	47	Weighted Average
181,885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1820	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	125	0.1040	5.19		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	245	0.0650	4.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.5	420	Total			

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

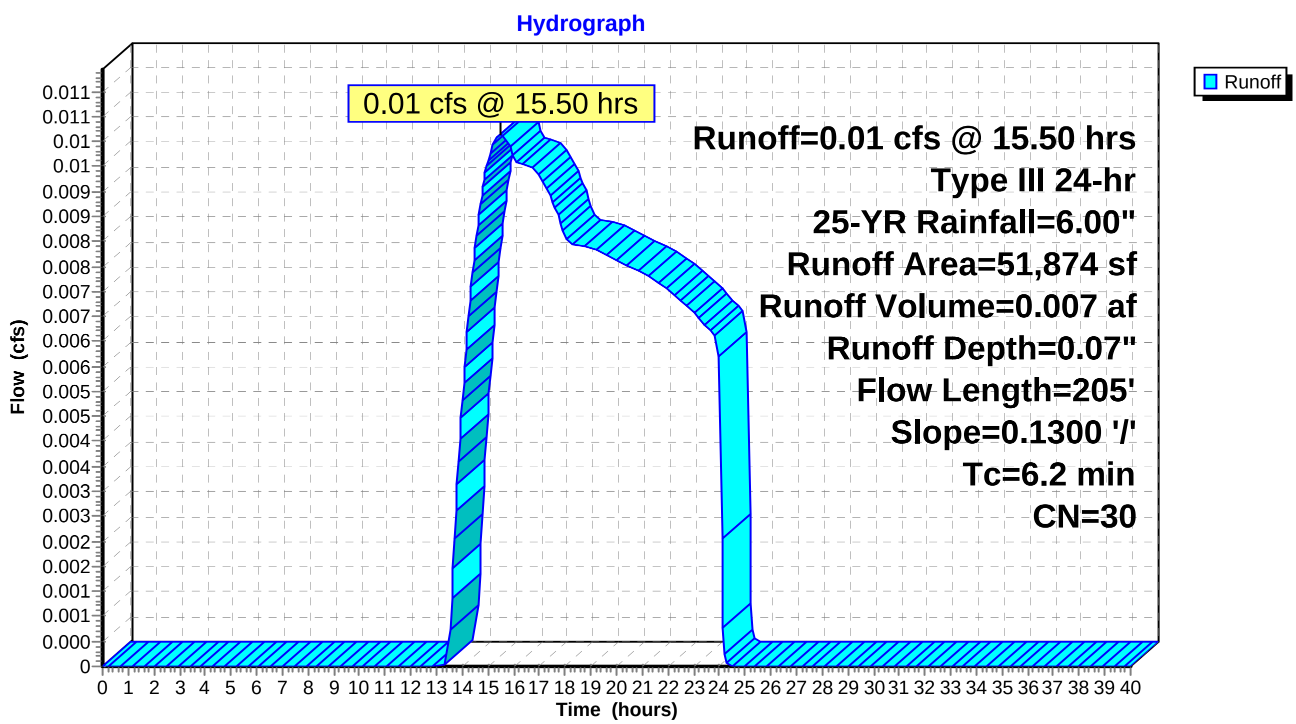
Runoff = 0.01 cfs @ 15.50 hrs, Volume= 0.007 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
51,874	30	Woods, Good, HSG A
51,874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.1300	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	155	0.1300	5.80		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.2	205	Total			

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

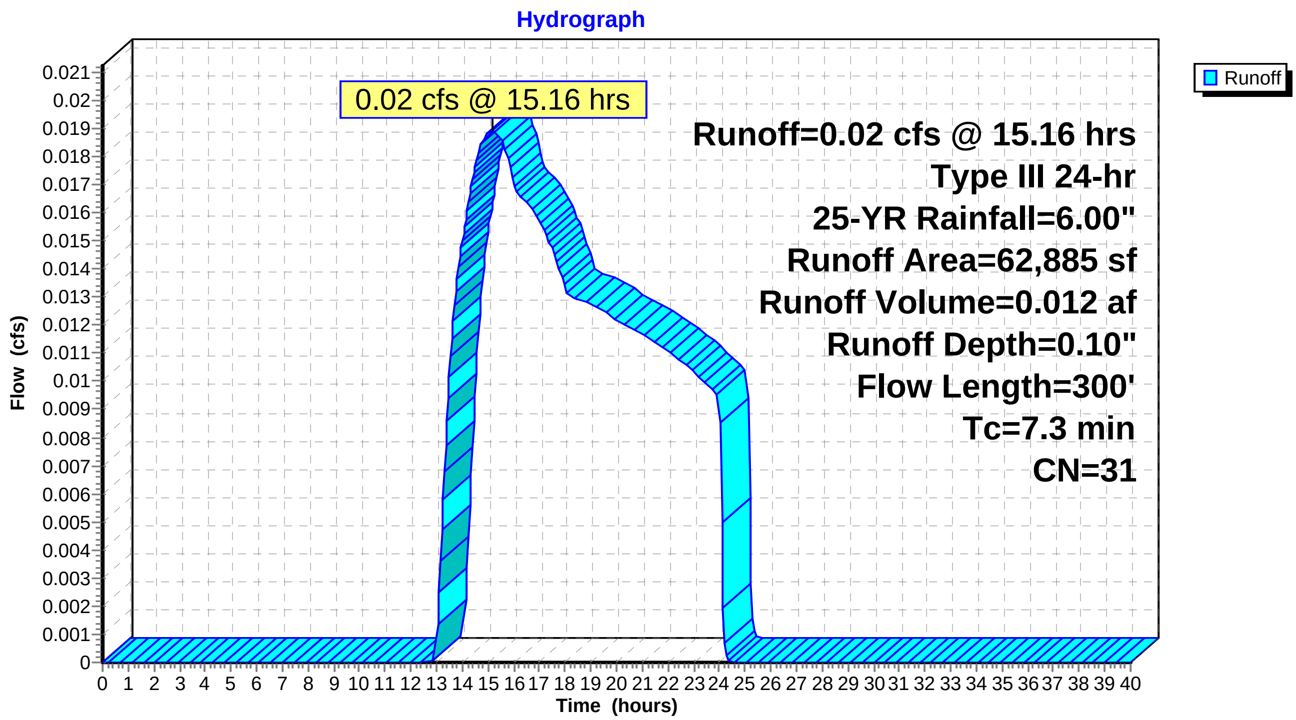
Runoff = 0.02 cfs @ 15.16 hrs, Volume= 0.012 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
61,744	30	Woods, Good, HSG A
1,141	76	Gravel roads, HSG A
62,885	31	Weighted Average
62,885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1020	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	250	0.0840	4.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.3	300	Total			

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: EX-4

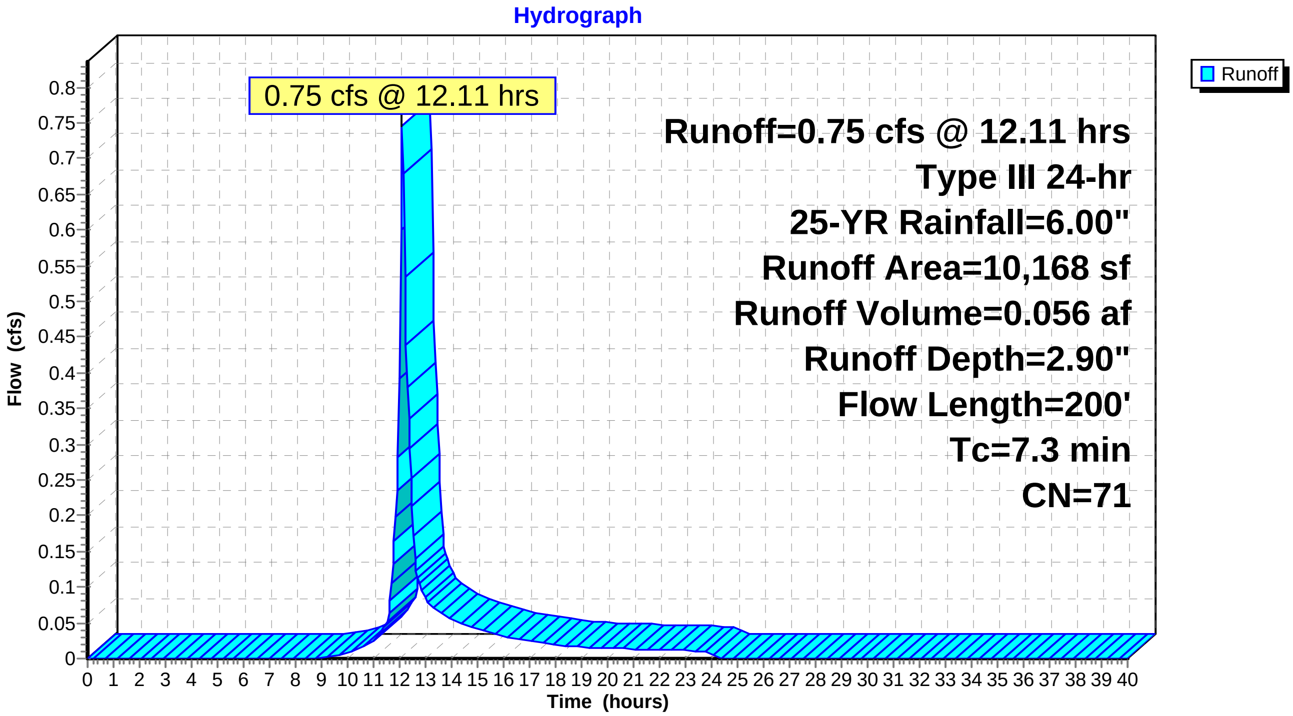
Runoff = 0.75 cfs @ 12.11 hrs, Volume= 0.056 af, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
1,573	30	Woods, Good, HSG A
1,846	55	Woods, Good, HSG B
6,682	85	Gravel roads, HSG B
67	98	Unconnected pavement, HSG B
10,168	71	Weighted Average
10,101		99.34% Pervious Area
67		0.66% Impervious Area
67		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0860	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	140	0.1520	6.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.1100	6.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	200	Total			

Subcatchment 4S: EX-4



Summary for Subcatchment 5S: EX-5

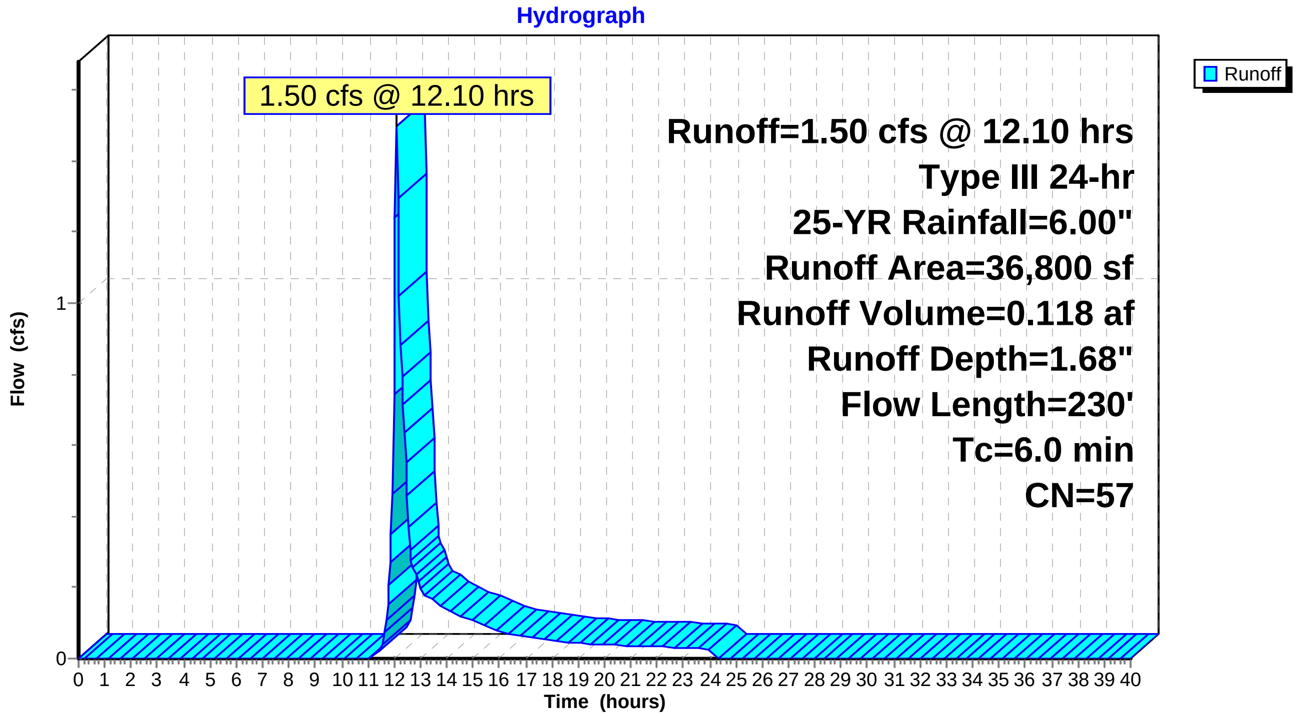
Runoff = 1.50 cfs @ 12.10 hrs, Volume= 0.118 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
3,689	30	Woods, Good, HSG A
25,151	55	Woods, Good, HSG B
540	76	Gravel roads, HSG A
569	85	Gravel roads, HSG B
928	98	Paved parking, HSG B
4,000	61	>75% Grass cover, Good, HSG B
1,923	98	Roofs, HSG B
36,800	57	Weighted Average
33,949		92.25% Pervious Area
2,851		7.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.1920	0.17		**Sheet Flow,**
					Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	150	0.1270	5.74		**Shallow Concentrated Flow,**
					Unpaved Kv= 16.1 fps
0.1	30	0.0900	6.09		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
5.5	230	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: EX-5

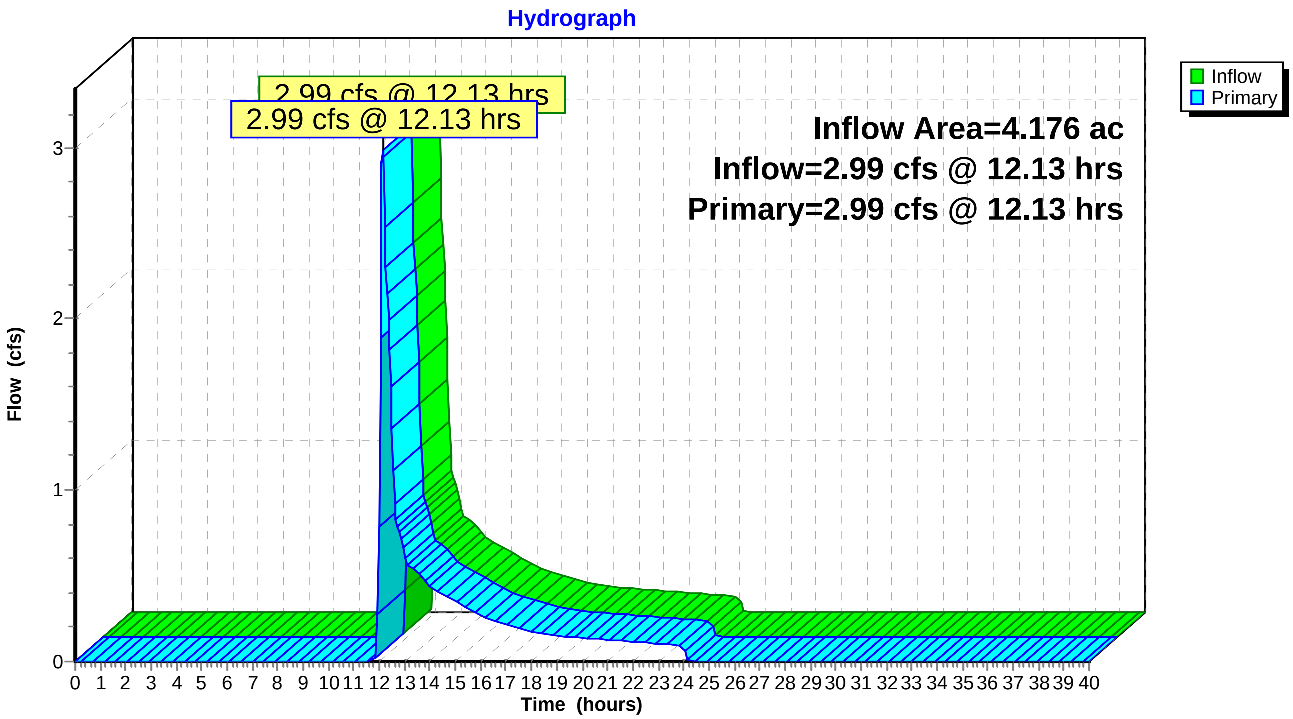


Summary for Link 1L: Flow towards weltands

Inflow Area =	4.176 ac,	0.00% Impervious, Inflow Depth = 0.93"	for 25-YR event	
Inflow =	2.99 cfs @	12.13 hrs, Volume=	0.325 af	
Primary =	2.99 cfs @	12.13 hrs, Volume=	0.325 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L: Flow towards weltands

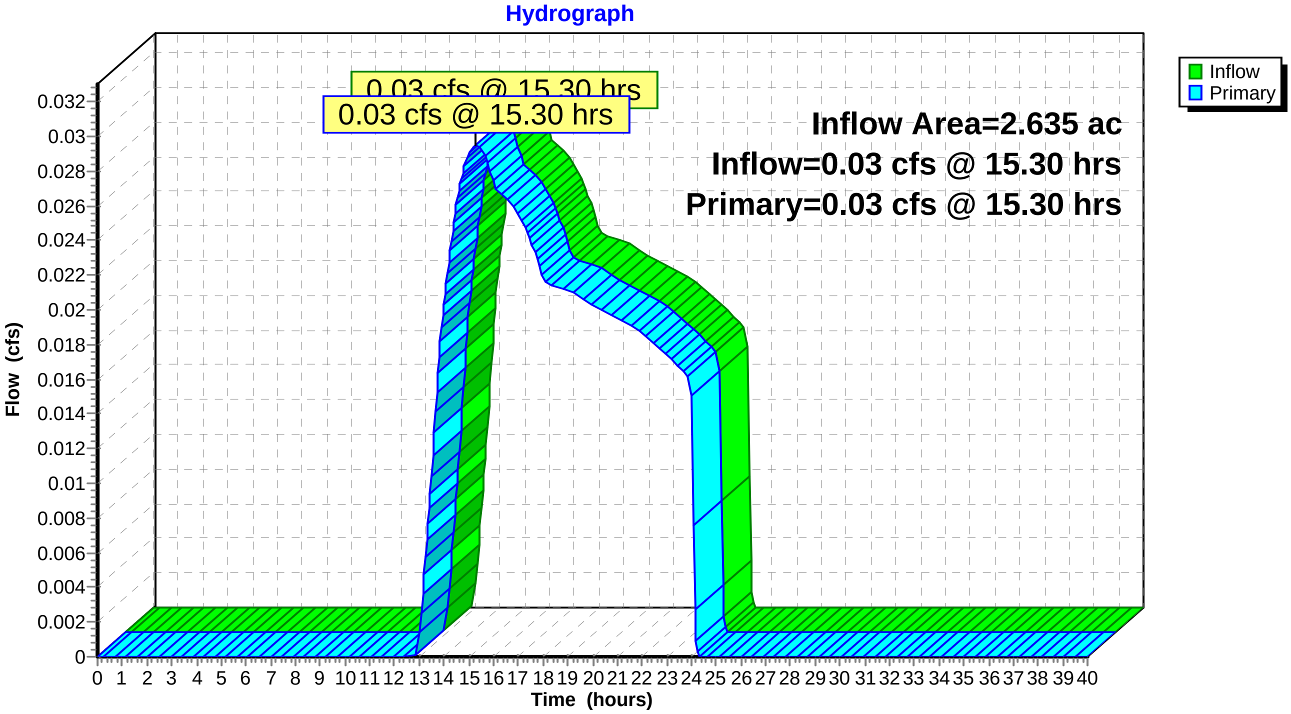


Summary for Link 2L: Flow to the north

Inflow Area =	2.635 ac,	0.00% Impervious,	Inflow Depth = 0.09"	for 25-YR event	
Inflow =	0.03 cfs @	15.30 hrs,	Volume=	0.019 af	
Primary =	0.03 cfs @	15.30 hrs,	Volume=	0.019 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L: Flow to the north

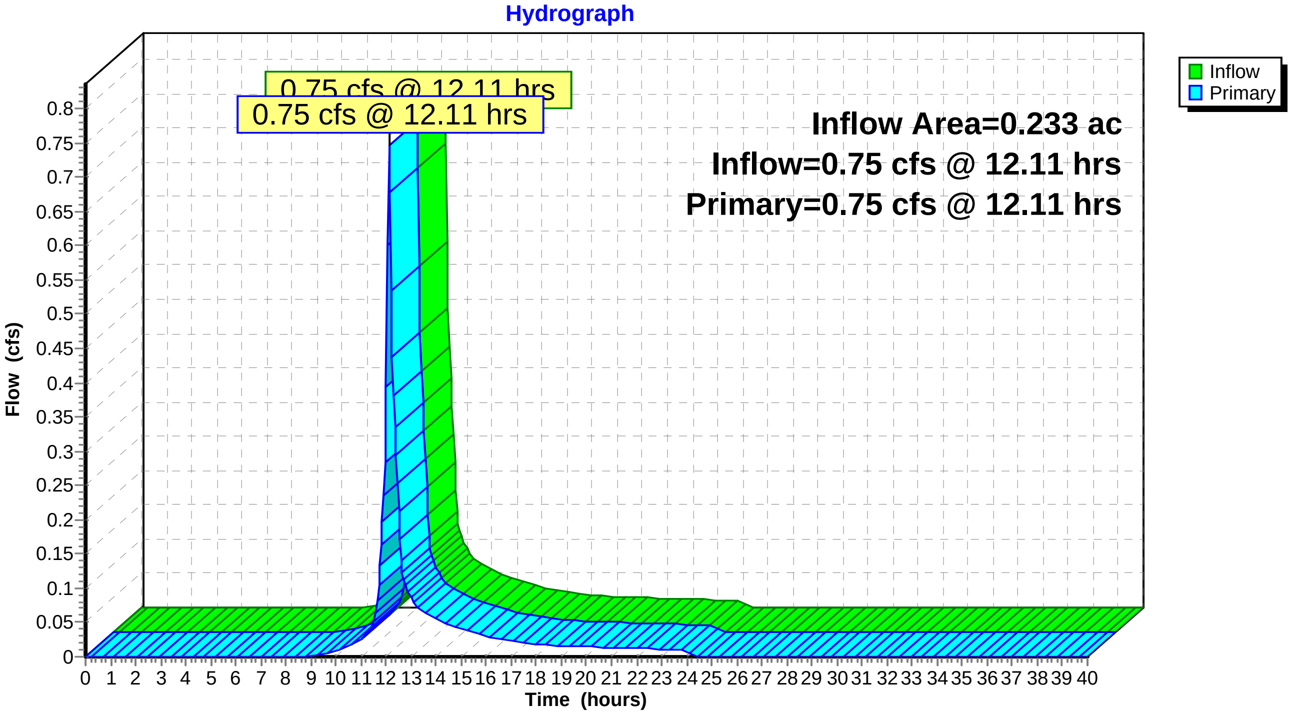


Summary for Link 3L: Flow towards exisiting cb on north-side of Elm Street

Inflow Area =	0.233 ac,	0.66% Impervious,	Inflow Depth = 2.90"	for 25-YR event
Inflow =	0.75 cfs @	12.11 hrs, Volume=	0.056 af	
Primary =	0.75 cfs @	12.11 hrs, Volume=	0.056 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L: Flow towards exisiting cb on north-side of Elm Street

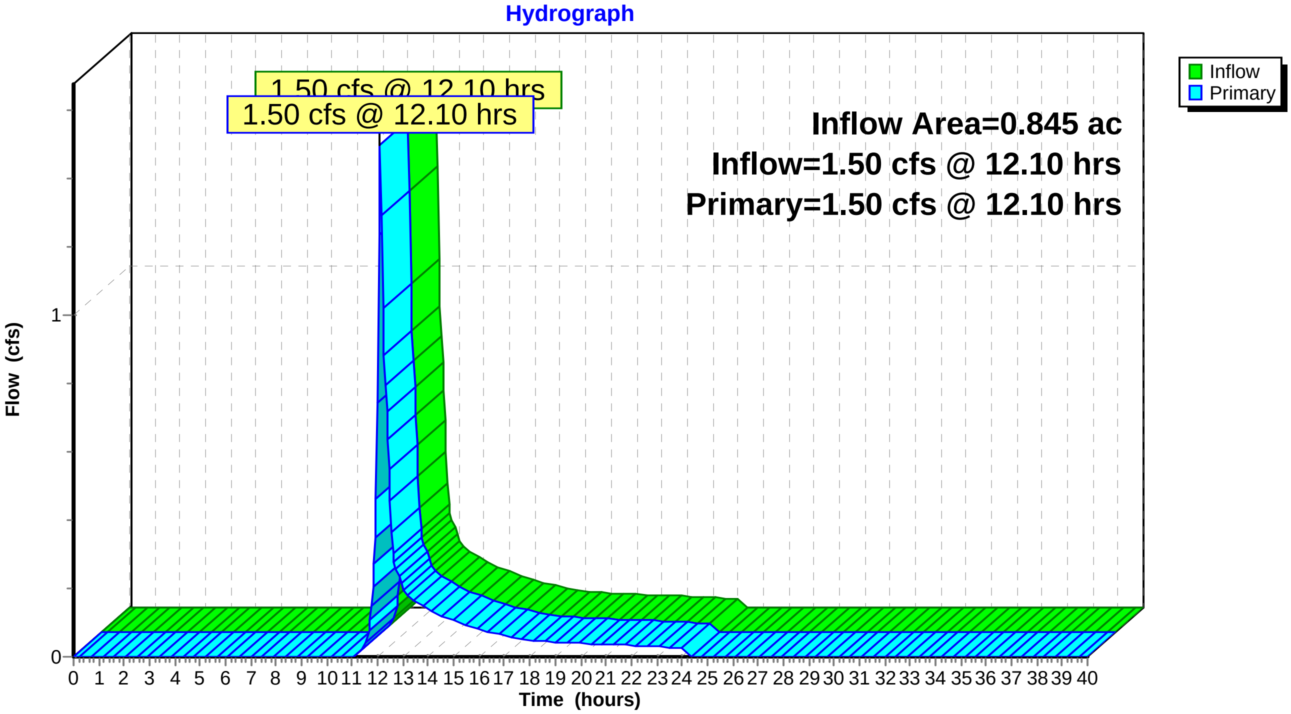


Summary for Link 4L: Flow towards north-side of elm street

Inflow Area = 0.845 ac, 7.75% Impervious, Inflow Depth = 1.68" for 25-YR event
Inflow = 1.50 cfs @ 12.10 hrs, Volume= 0.118 af
Primary = 1.50 cfs @ 12.10 hrs, Volume= 0.118 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L: Flow towards north-side of elm street

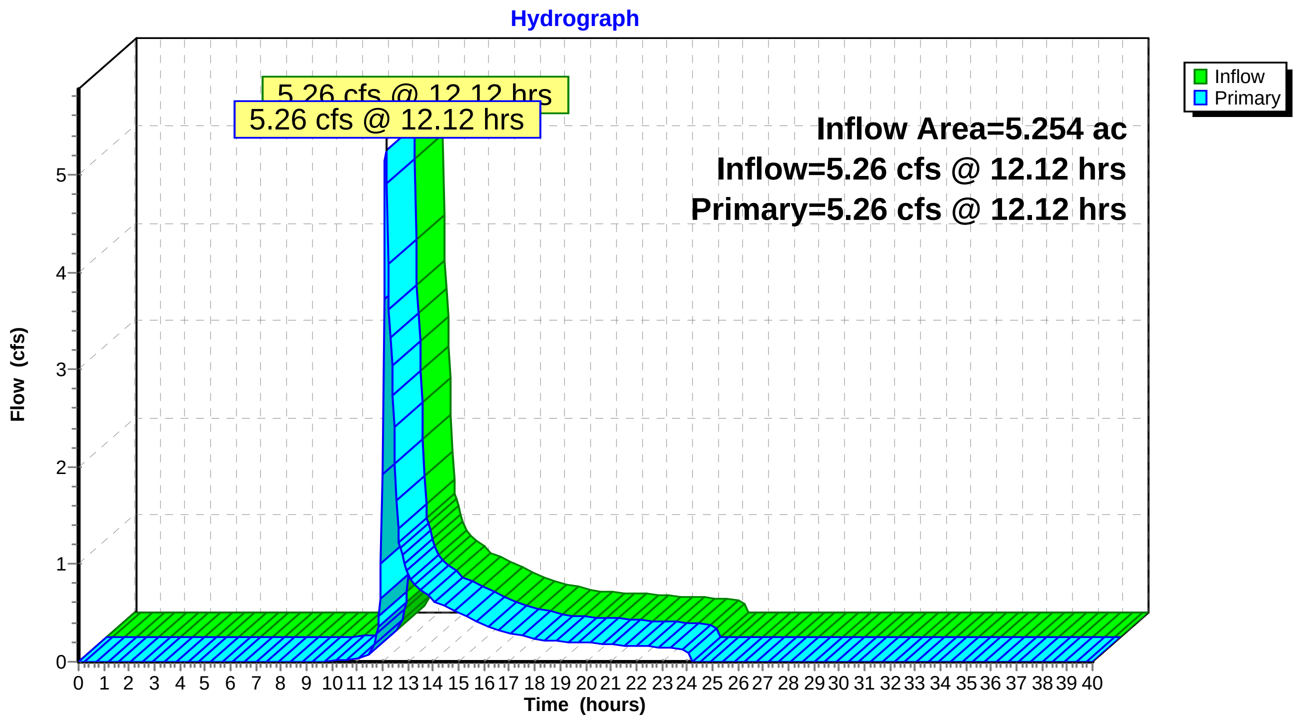


Summary for Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

Inflow Area =	5.254 ac,	1.28% Impervious, Inflow Depth = 1.14"	for 25-YR event
Inflow =	5.26 cfs @	12.12 hrs, Volume=	0.499 af
Primary =	5.26 cfs @	12.12 hrs, Volume=	0.499 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

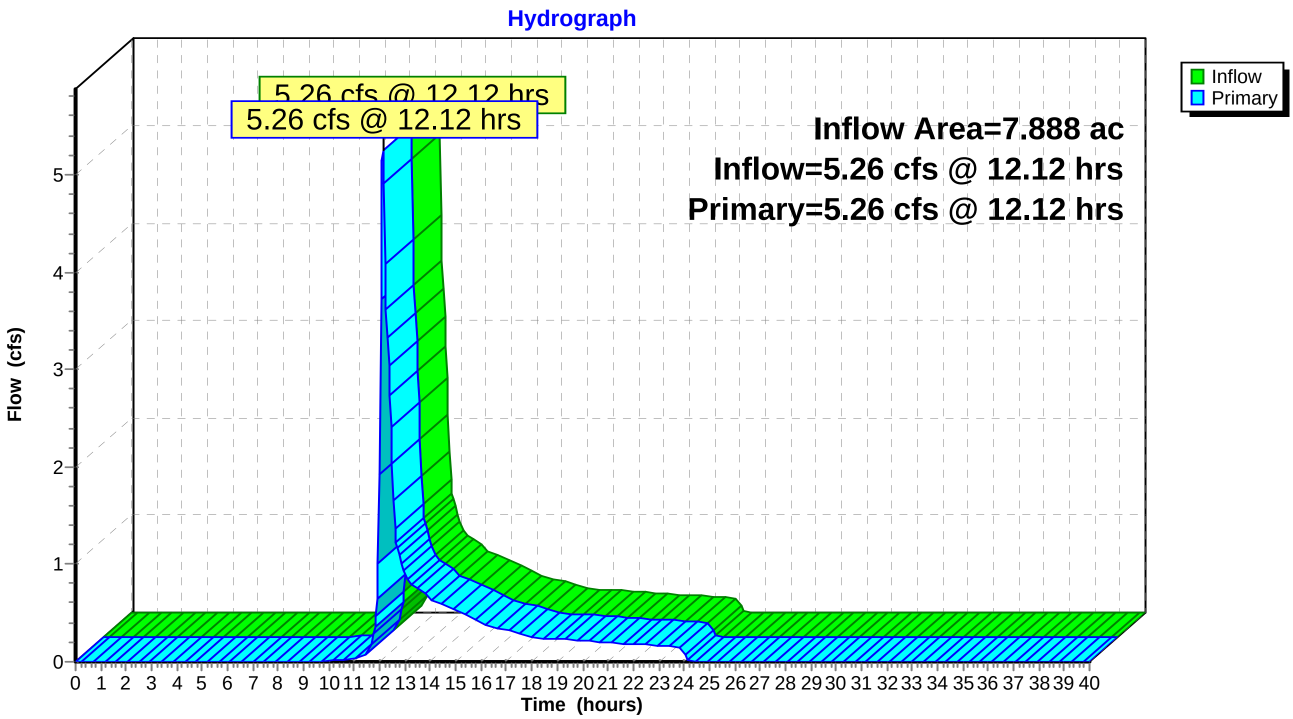


Summary for Link 6L: Runoff discharging from within the limit of watershed analysis

Inflow Area = 7.888 ac, 0.85% Impervious, Inflow Depth = 0.79" for 25-YR event
Inflow = 5.26 cfs @ 12.12 hrs, Volume= 0.518 af
Primary = 5.26 cfs @ 12.12 hrs, Volume= 0.518 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 6L: Runoff discharging from within the limit of watershed analysis



Summary for Subcatchment 1S: EX-1

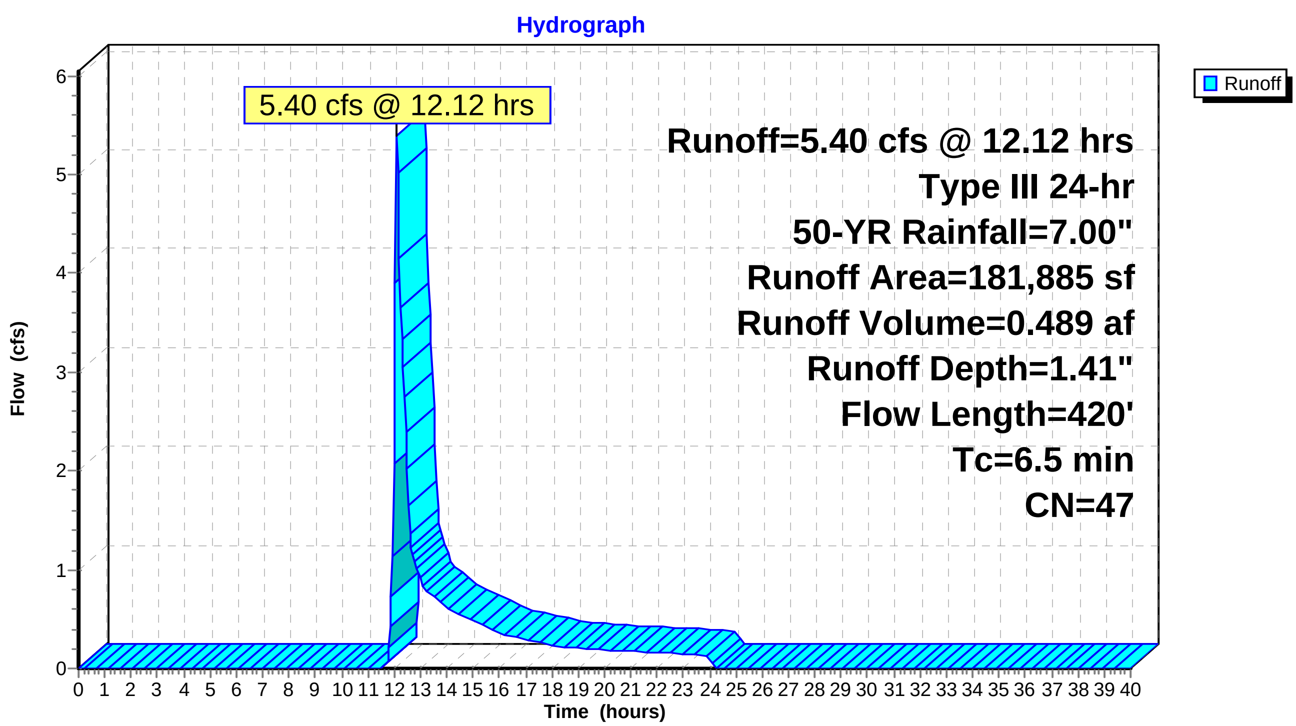
Runoff = 5.40 cfs @ 12.12 hrs, Volume= 0.489 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
60,022	30	Woods, Good, HSG A
121,863	55	Woods, Good, HSG B
181,885	47	Weighted Average
181,885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1820	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	125	0.1040	5.19		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	245	0.0650	4.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.5	420	Total			

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

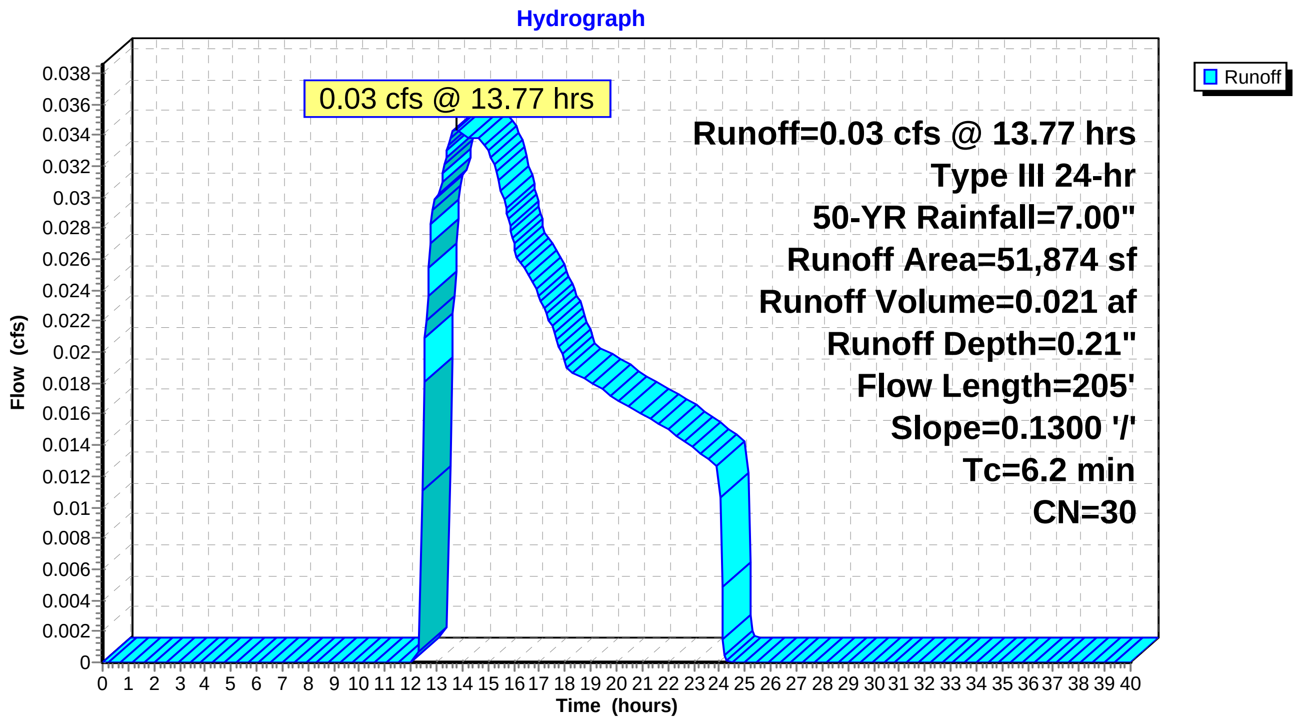
Runoff = 0.03 cfs @ 13.77 hrs, Volume= 0.021 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
51,874	30	Woods, Good, HSG A
51,874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.1300	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	155	0.1300	5.80		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.2	205	Total			

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

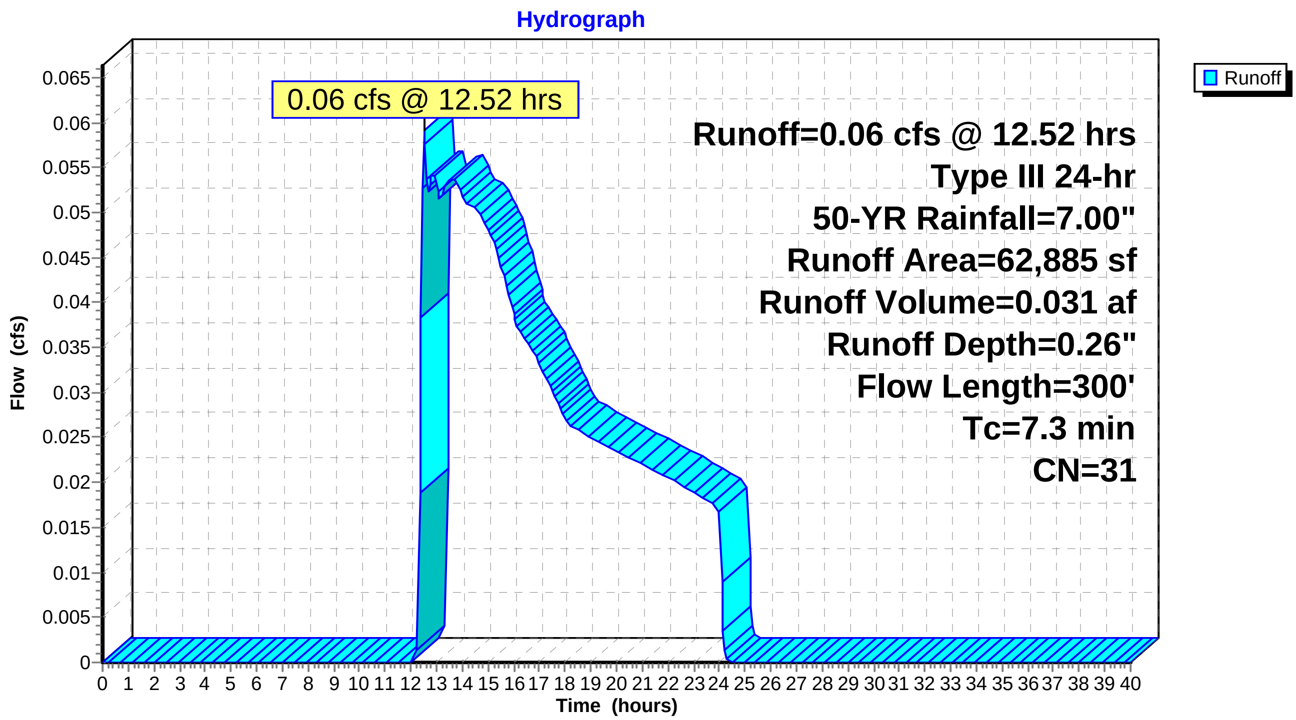
Runoff = 0.06 cfs @ 12.52 hrs, Volume= 0.031 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
61,744	30	Woods, Good, HSG A
1,141	76	Gravel roads, HSG A
62,885	31	Weighted Average
62,885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1020	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	250	0.0840	4.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.3	300	Total			

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: EX-4

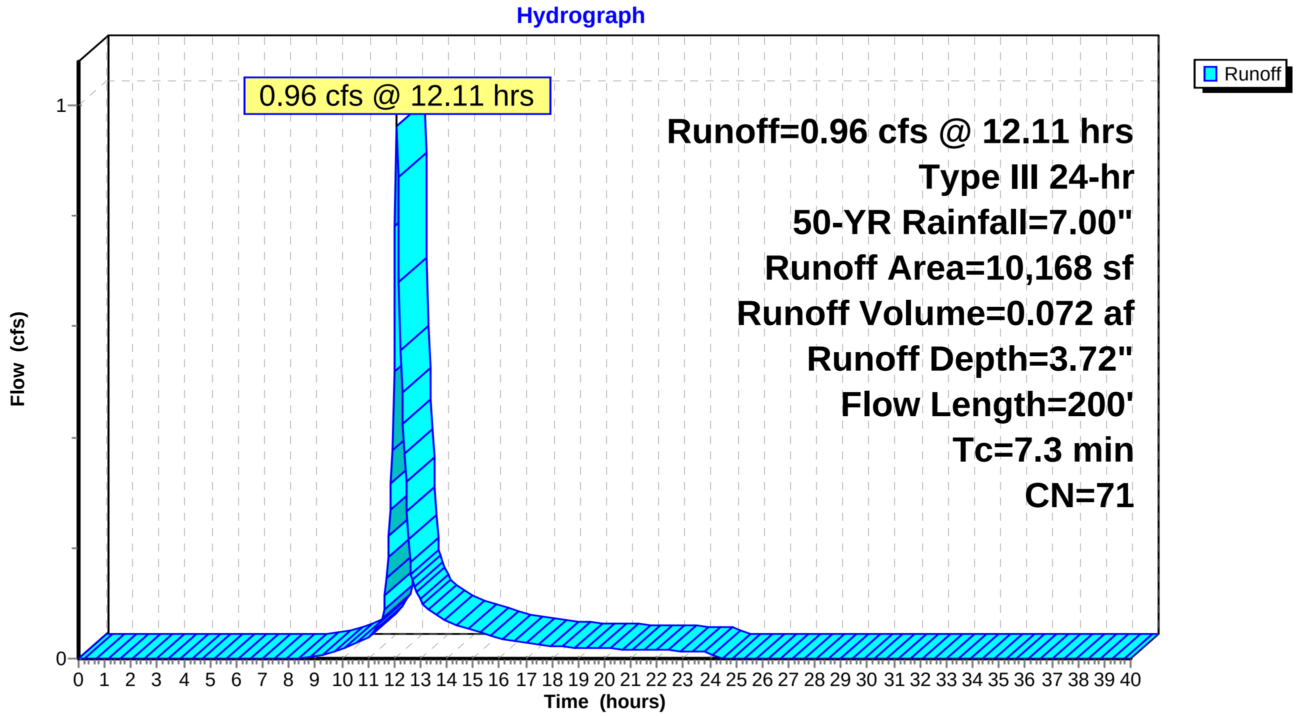
Runoff = 0.96 cfs @ 12.11 hrs, Volume= 0.072 af, Depth= 3.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
1,573	30	Woods, Good, HSG A
1,846	55	Woods, Good, HSG B
6,682	85	Gravel roads, HSG B
67	98	Unconnected pavement, HSG B
10,168	71	Weighted Average
10,101		99.34% Pervious Area
67		0.66% Impervious Area
67		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0860	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	140	0.1520	6.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.1100	6.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	200	Total			

Subcatchment 4S: EX-4



Summary for Subcatchment 5S: EX-5

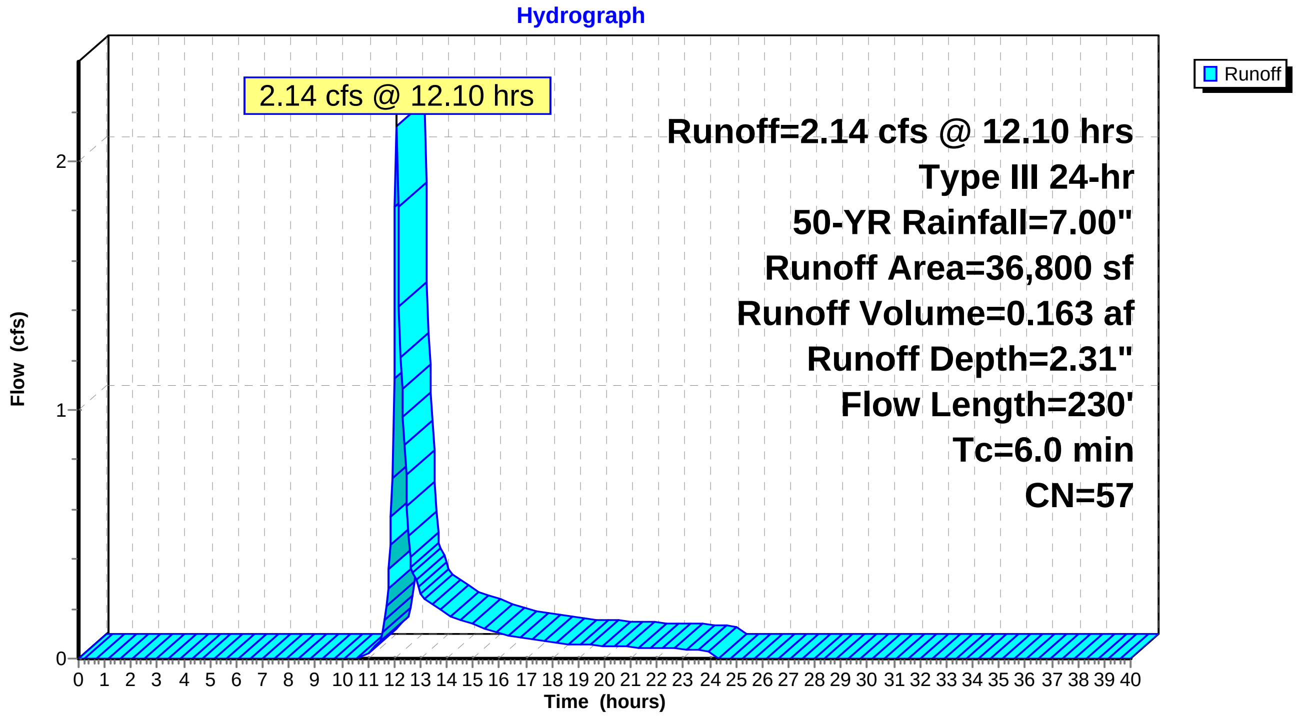
Runoff = 2.14 cfs @ 12.10 hrs, Volume= 0.163 af, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
3,689	30	Woods, Good, HSG A
25,151	55	Woods, Good, HSG B
540	76	Gravel roads, HSG A
569	85	Gravel roads, HSG B
928	98	Paved parking, HSG B
4,000	61	>75% Grass cover, Good, HSG B
1,923	98	Roofs, HSG B
36,800	57	Weighted Average
33,949		92.25% Pervious Area
2,851		7.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.1920	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	150	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	30	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.5	230	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: EX-5

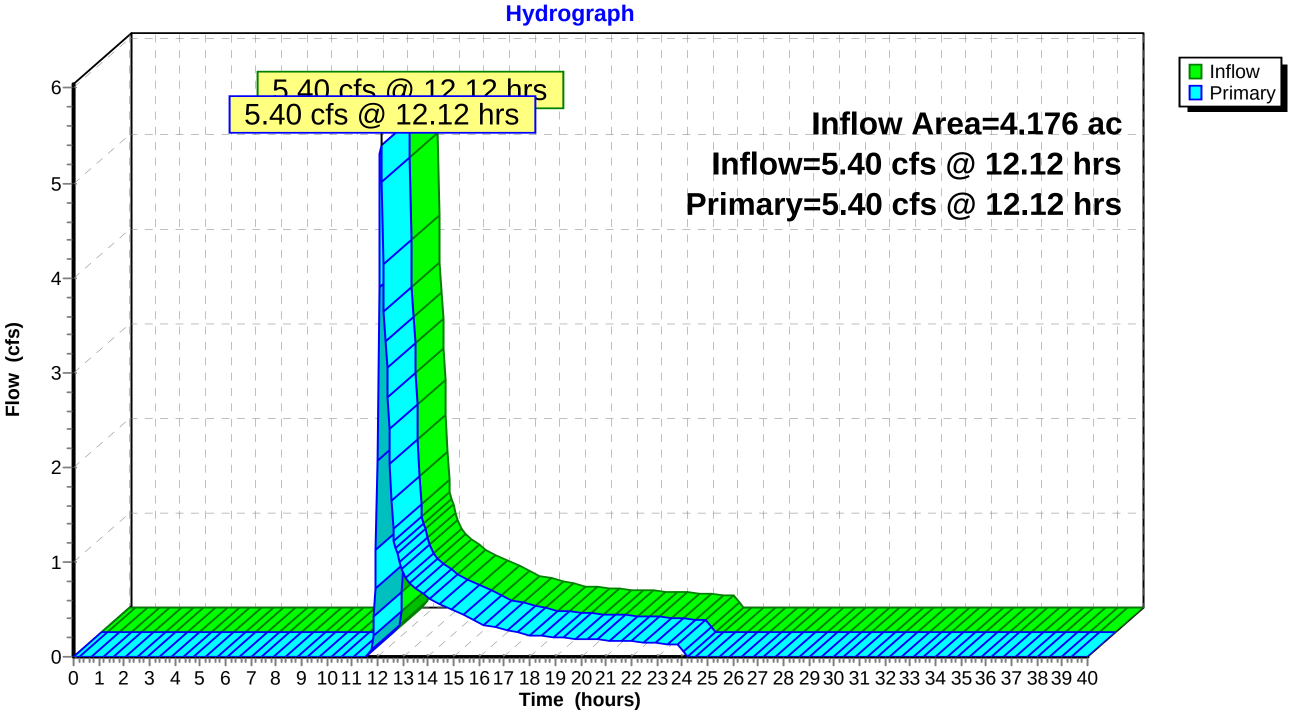


Summary for Link 1L: Flow towards weltands

Inflow Area = 4.176 ac, 0.00% Impervious, Inflow Depth = 1.41" for 50-YR event
Inflow = 5.40 cfs @ 12.12 hrs, Volume= 0.489 af
Primary = 5.40 cfs @ 12.12 hrs, Volume= 0.489 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L: Flow towards weltands

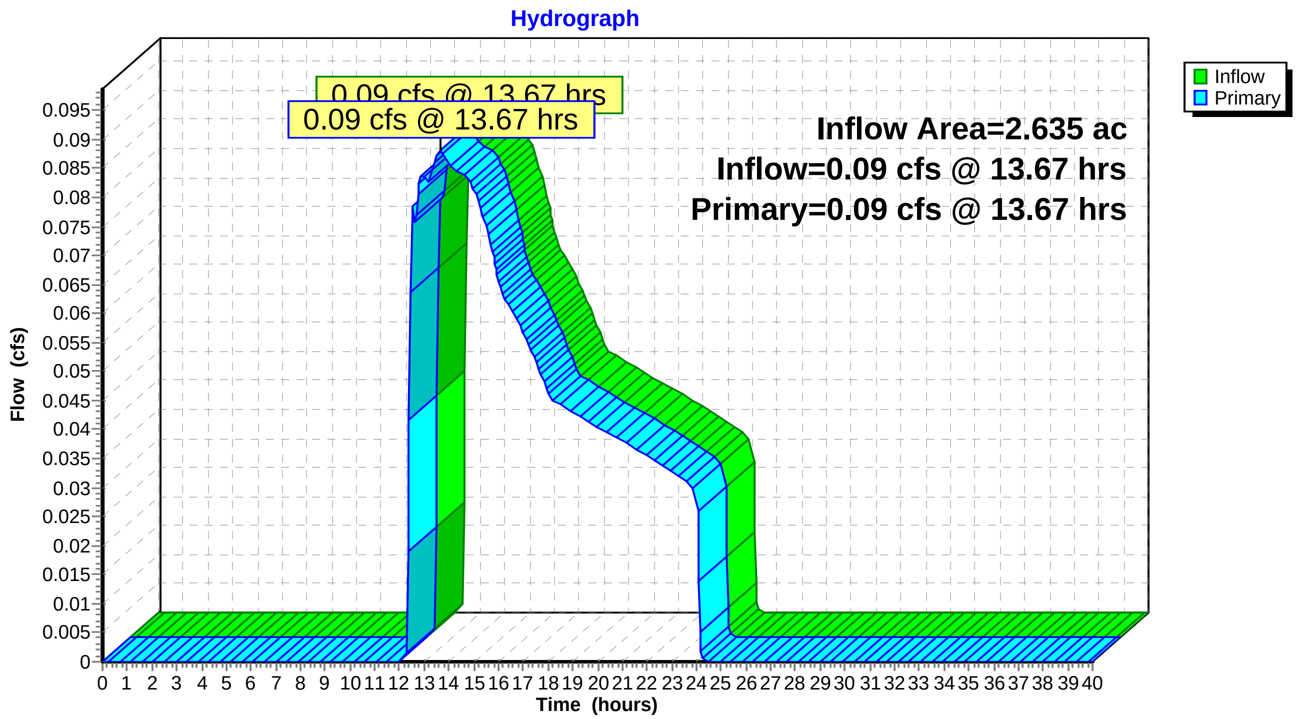


Summary for Link 2L: Flow to the north

Inflow Area = 2.635 ac, 0.00% Impervious, Inflow Depth = 0.24" for 50-YR event
Inflow = 0.09 cfs @ 13.67 hrs, Volume= 0.053 af
Primary = 0.09 cfs @ 13.67 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L: Flow to the north

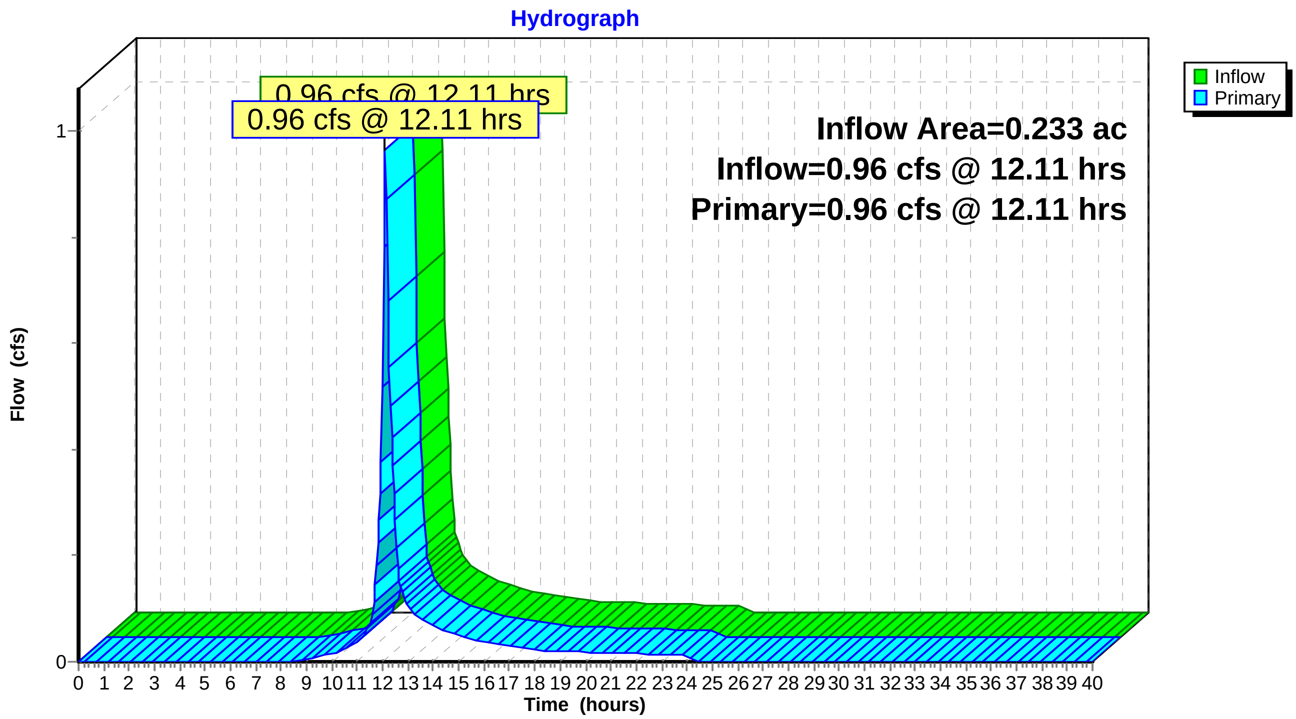


Summary for Link 3L: Flow towards exisiting cb on north-side of Elm Street

Inflow Area =	0.233 ac,	0.66% Impervious, Inflow Depth = 3.72"	for 50-YR event	
Inflow =	0.96 cfs @	12.11 hrs, Volume=	0.072 af	
Primary =	0.96 cfs @	12.11 hrs, Volume=	0.072 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L: Flow towards exisiting cb on north-side of Elm Street

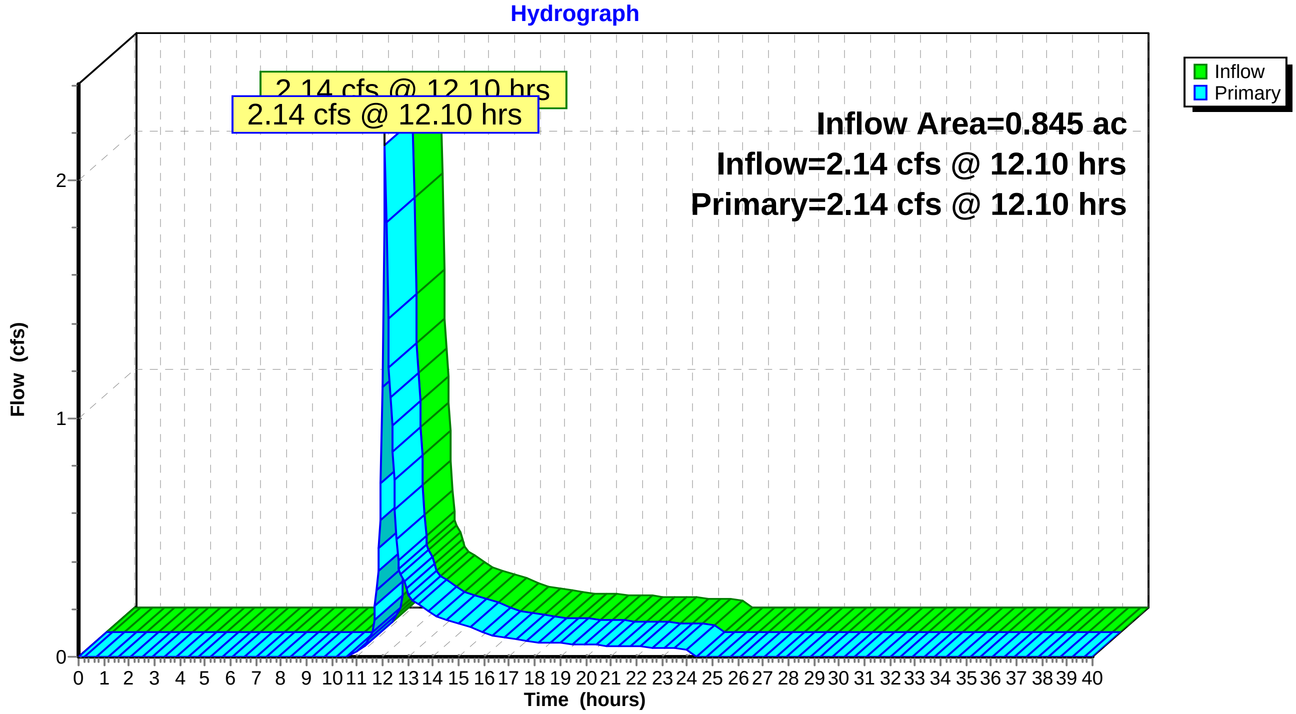


Summary for Link 4L: Flow towards north-side of elm street

Inflow Area = 0.845 ac, 7.75% Impervious, Inflow Depth = 2.31" for 50-YR event
Inflow = 2.14 cfs @ 12.10 hrs, Volume= 0.163 af
Primary = 2.14 cfs @ 12.10 hrs, Volume= 0.163 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L: Flow towards north-side of elm street

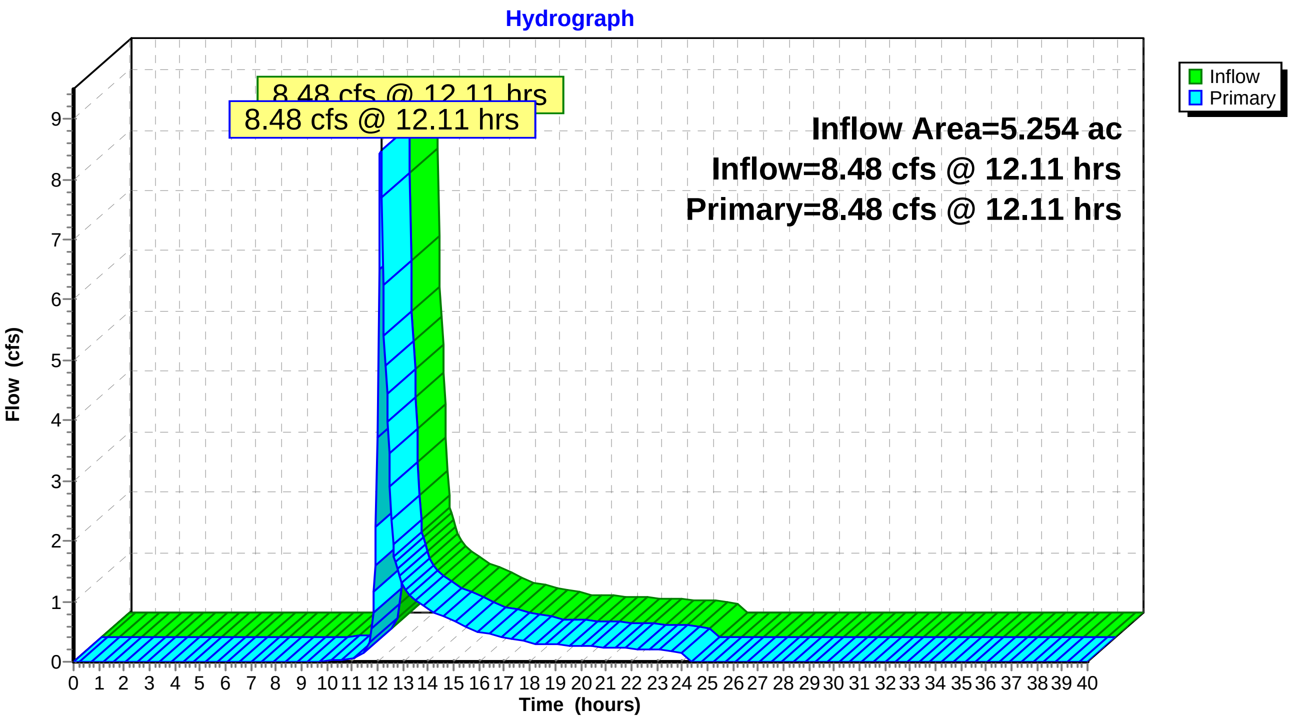


Summary for Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

Inflow Area =	5.254 ac,	1.28% Impervious, Inflow Depth = 1.65"	for 50-YR event
Inflow =	8.48 cfs @	12.11 hrs, Volume=	0.724 af
Primary =	8.48 cfs @	12.11 hrs, Volume=	0.724 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

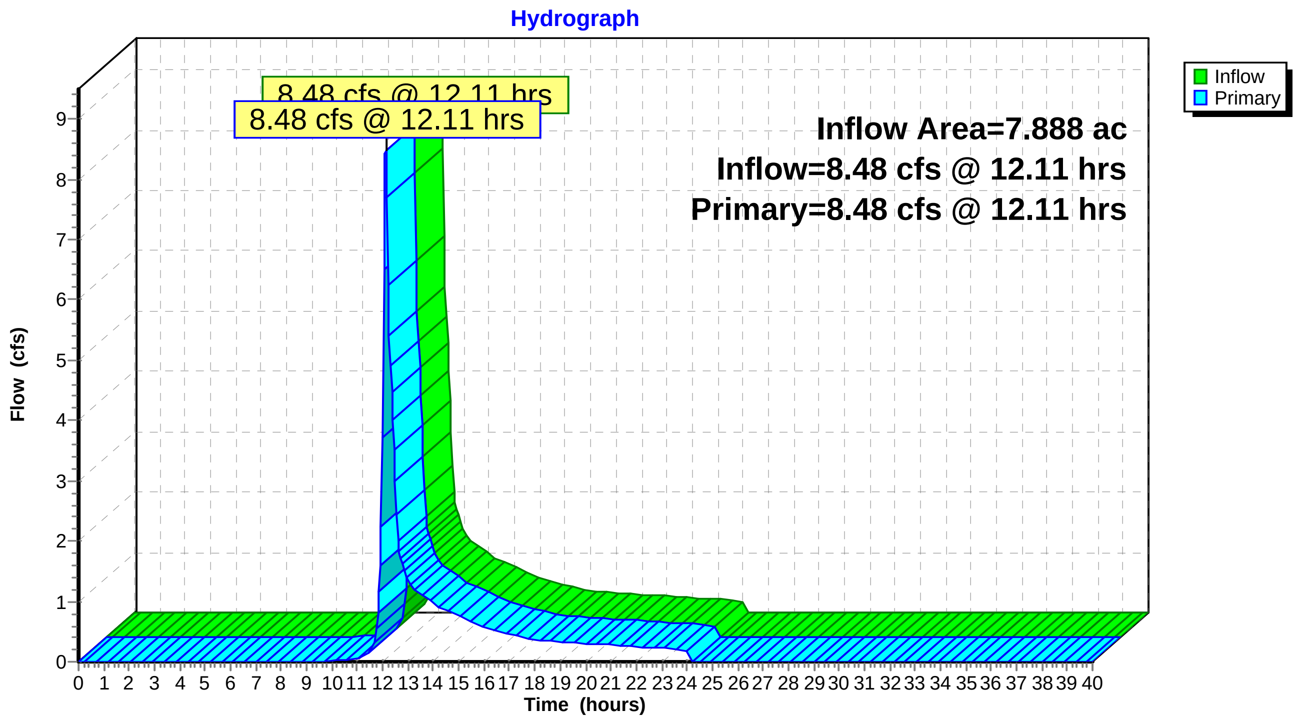


Summary for Link 6L: Runoff discharging from within the limit of watershed analysis

Inflow Area = 7.888 ac, 0.85% Impervious, Inflow Depth = 1.18" for 50-YR event
Inflow = 8.48 cfs @ 12.11 hrs, Volume= 0.777 af
Primary = 8.48 cfs @ 12.11 hrs, Volume= 0.777 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 6L: Runoff discharging from within the limit of watershed analysis



Summary for Subcatchment 1S: EX-1

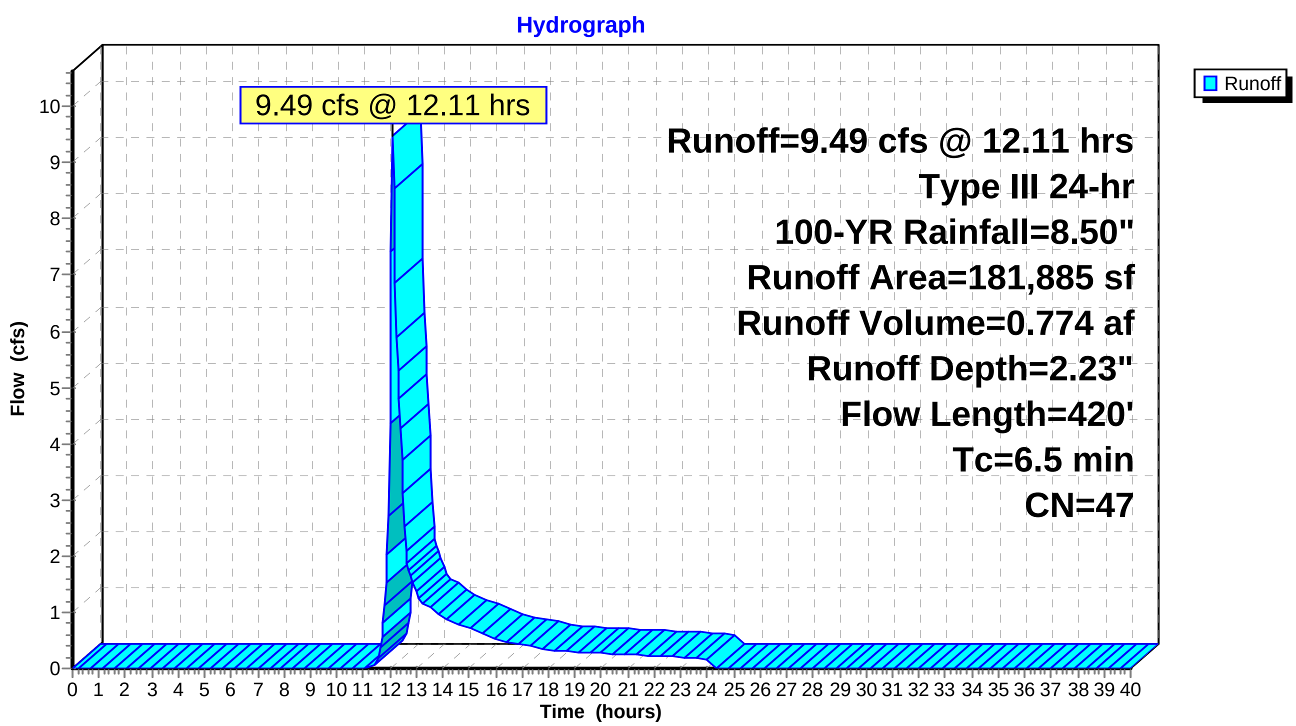
Runoff = 9.49 cfs @ 12.11 hrs, Volume= 0.774 af, Depth= 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
60,022	30	Woods, Good, HSG A
121,863	55	Woods, Good, HSG B
181,885	47	Weighted Average
181,885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1820	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	125	0.1040	5.19		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	245	0.0650	4.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.5	420	Total			

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

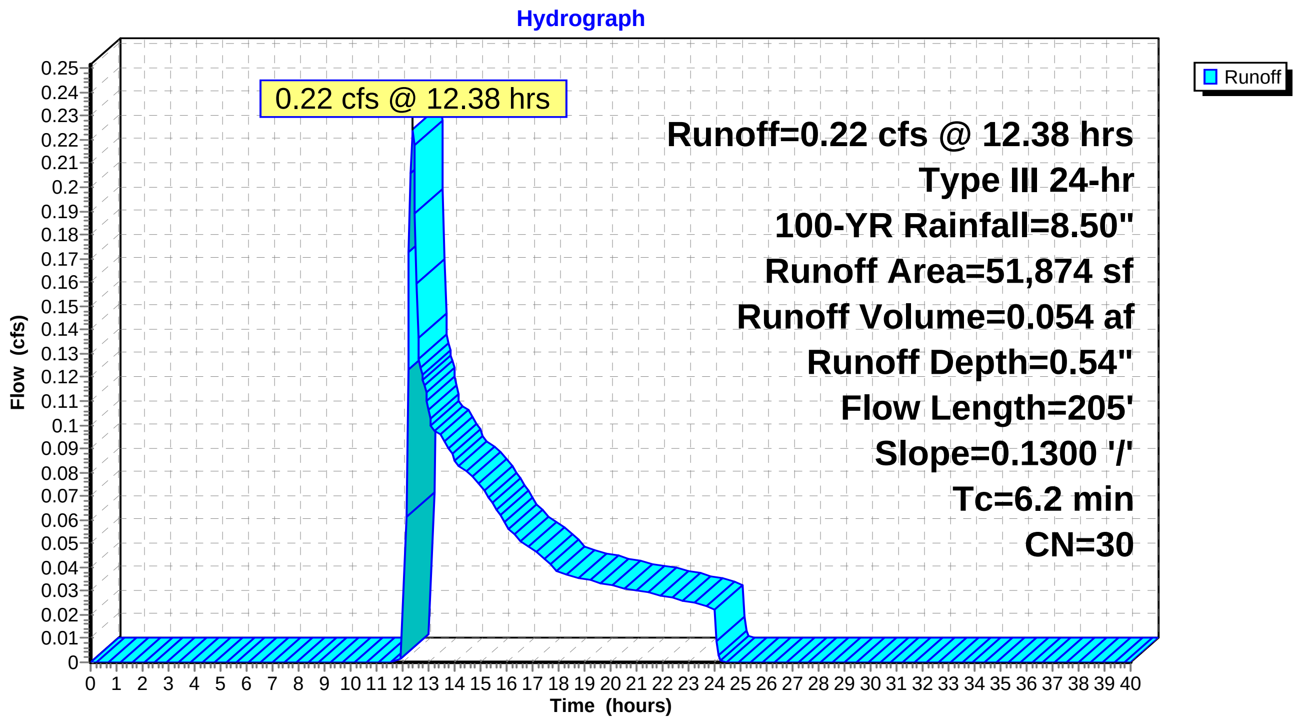
Runoff = 0.22 cfs @ 12.38 hrs, Volume= 0.054 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
51,874	30	Woods, Good, HSG A
51,874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.1300	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	155	0.1300	5.80		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.2	205	Total			

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

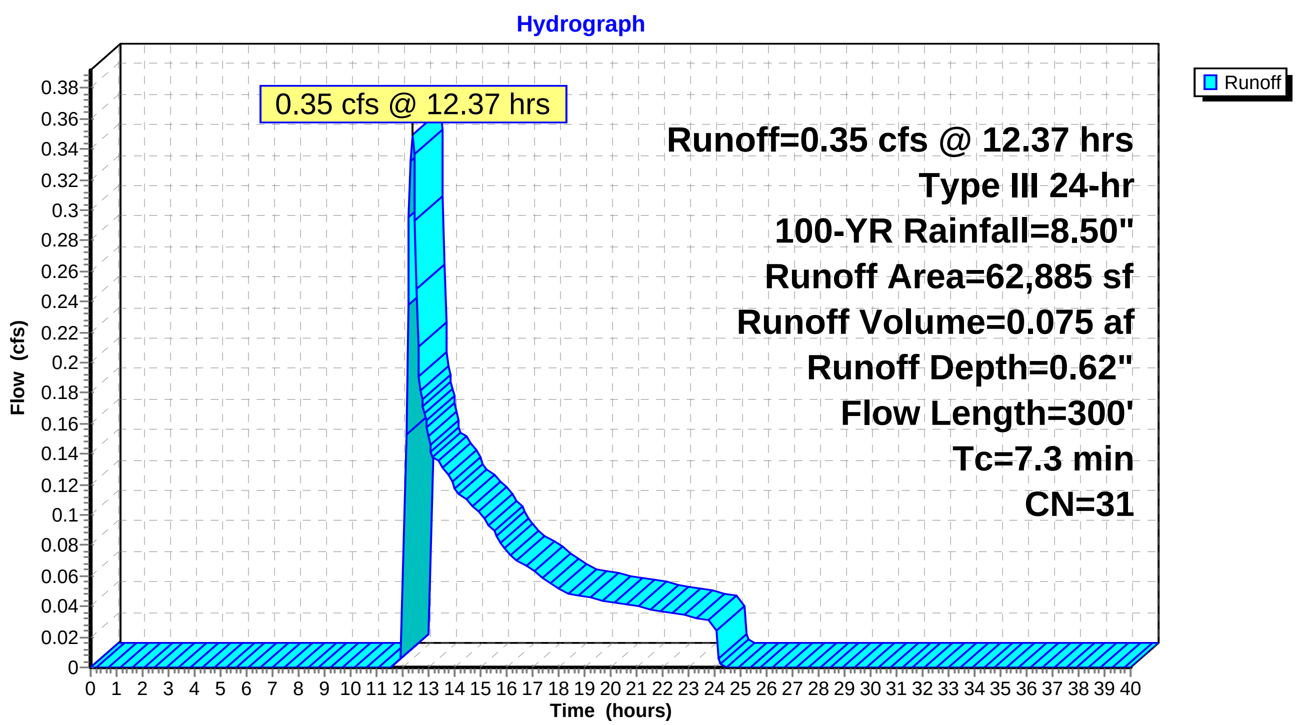
Runoff = 0.35 cfs @ 12.37 hrs, Volume= 0.075 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
61,744	30	Woods, Good, HSG A
1,141	76	Gravel roads, HSG A
62,885	31	Weighted Average
62,885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1020	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	250	0.0840	4.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.3	300	Total			

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: EX-4

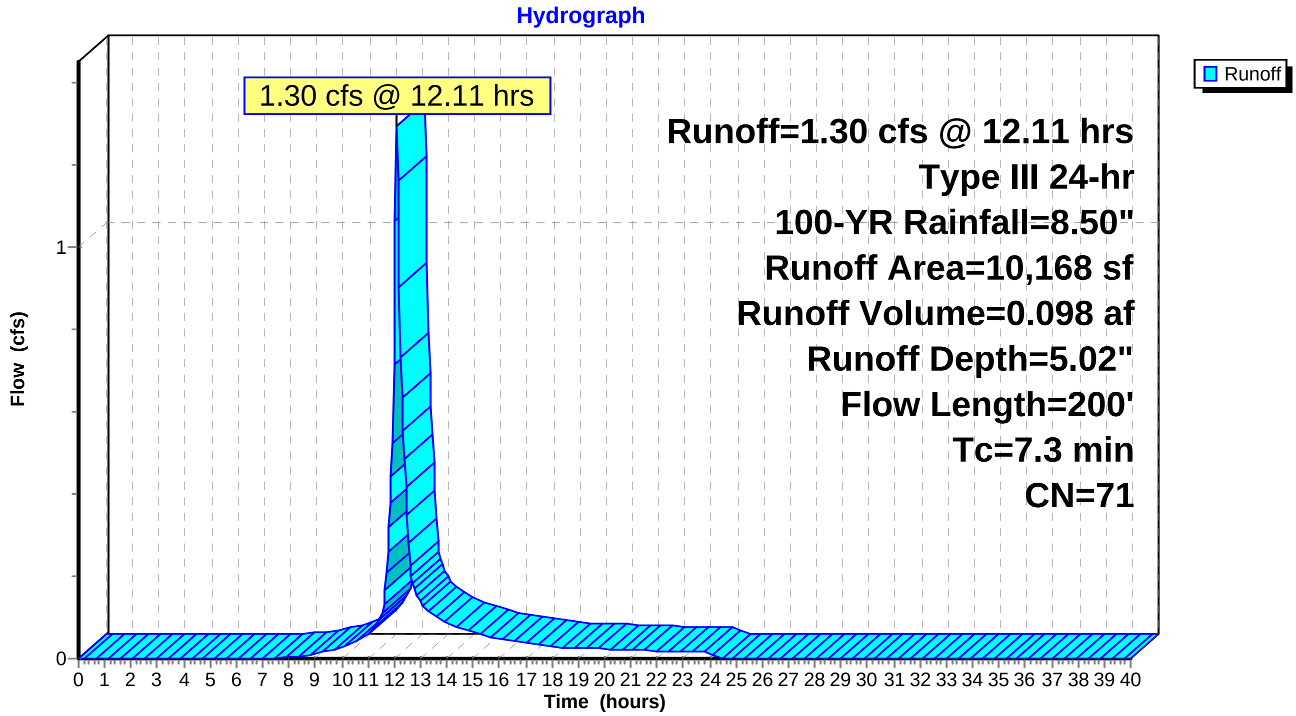
Runoff = 1.30 cfs @ 12.11 hrs, Volume= 0.098 af, Depth= 5.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
1,573	30	Woods, Good, HSG A
1,846	55	Woods, Good, HSG B
6,682	85	Gravel roads, HSG B
67	98	Unconnected pavement, HSG B
10,168	71	Weighted Average
10,101		99.34% Pervious Area
67		0.66% Impervious Area
67		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0860	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	140	0.1520	6.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.1100	6.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	200	Total			

Subcatchment 4S: EX-4



Summary for Subcatchment 5S: EX-5

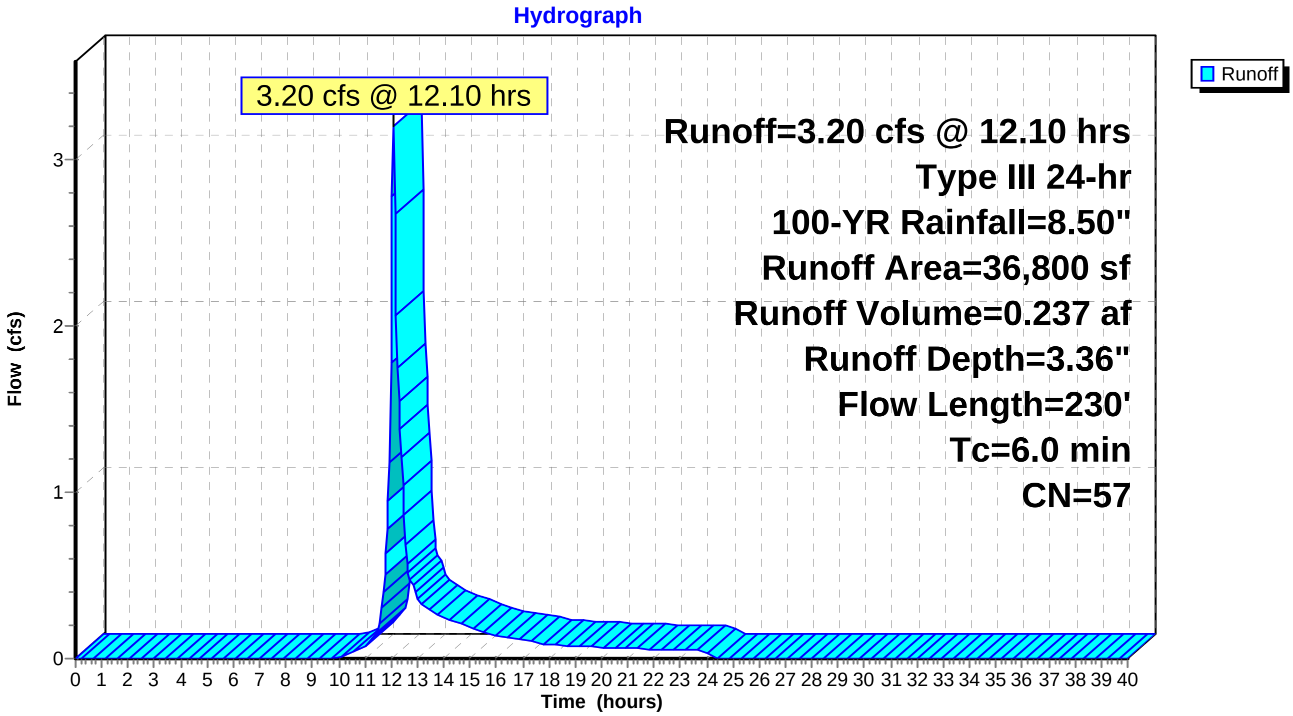
Runoff = 3.20 cfs @ 12.10 hrs, Volume= 0.237 af, Depth= 3.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
3,689	30	Woods, Good, HSG A
25,151	55	Woods, Good, HSG B
540	76	Gravel roads, HSG A
569	85	Gravel roads, HSG B
928	98	Paved parking, HSG B
4,000	61	>75% Grass cover, Good, HSG B
1,923	98	Roofs, HSG B
36,800	57	Weighted Average
33,949		92.25% Pervious Area
2,851		7.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.1920	0.17		**Sheet Flow,**
					Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	150	0.1270	5.74		**Shallow Concentrated Flow,**
					Unpaved Kv= 16.1 fps
0.1	30	0.0900	6.09		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
5.5	230	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: EX-5

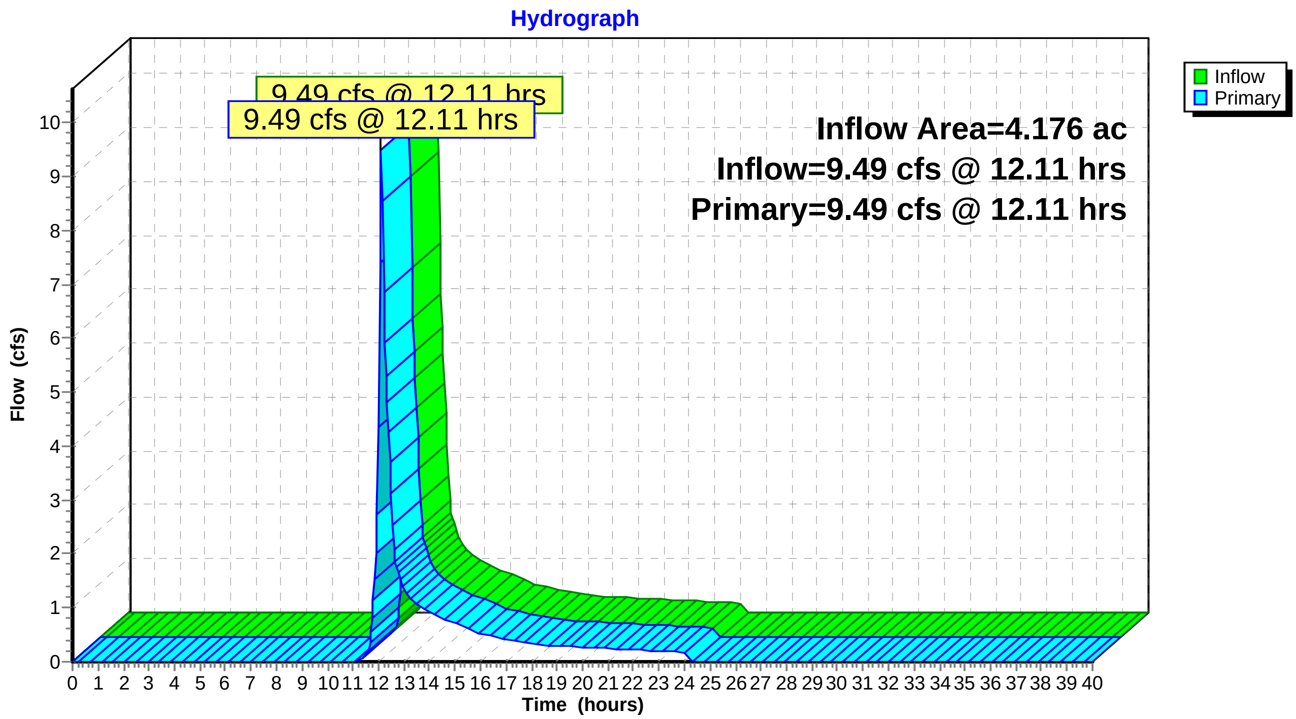


Summary for Link 1L: Flow towards weltands

Inflow Area = 4.176 ac, 0.00% Impervious, Inflow Depth = 2.23" for 100-YR event
Inflow = 9.49 cfs @ 12.11 hrs, Volume= 0.774 af
Primary = 9.49 cfs @ 12.11 hrs, Volume= 0.774 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L: Flow towards weltands

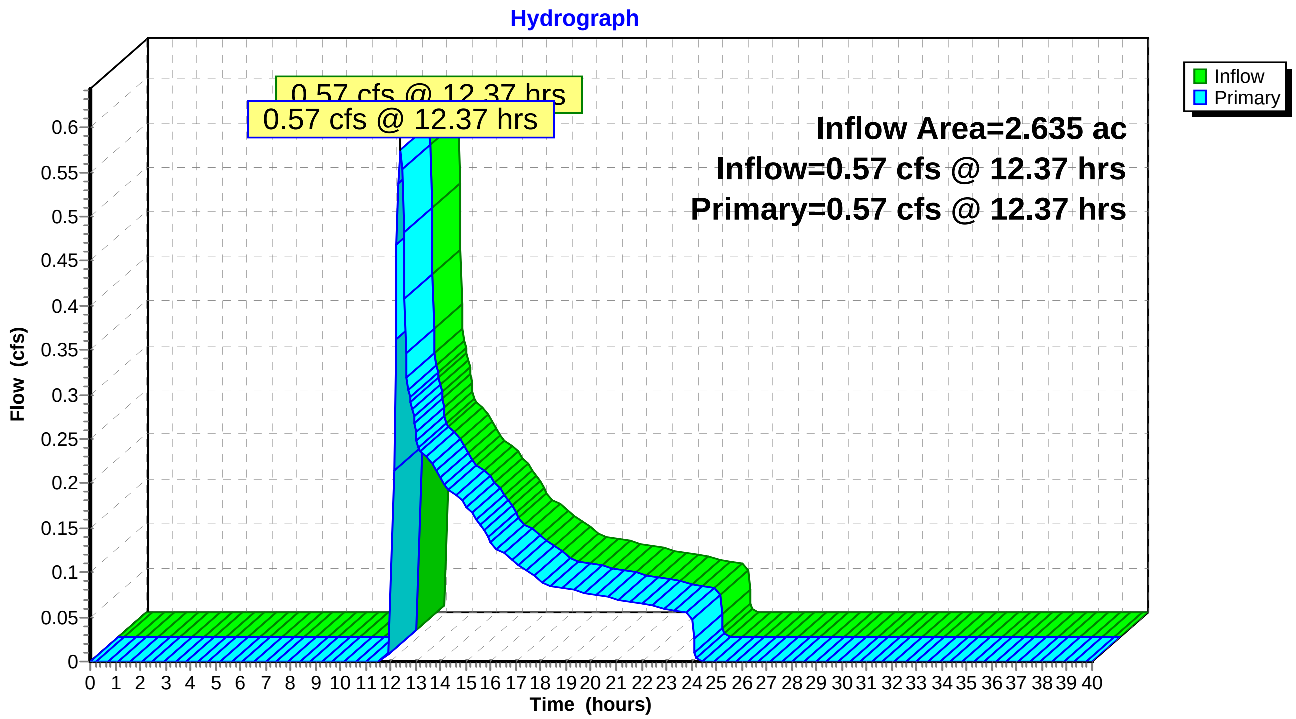


Summary for Link 2L: Flow to the north

Inflow Area =	2.635 ac,	0.00% Impervious,	Inflow Depth = 0.59"	for 100-YR event
Inflow =	0.57 cfs @	12.37 hrs, Volume=	0.129 af	
Primary =	0.57 cfs @	12.37 hrs, Volume=	0.129 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L: Flow to the north

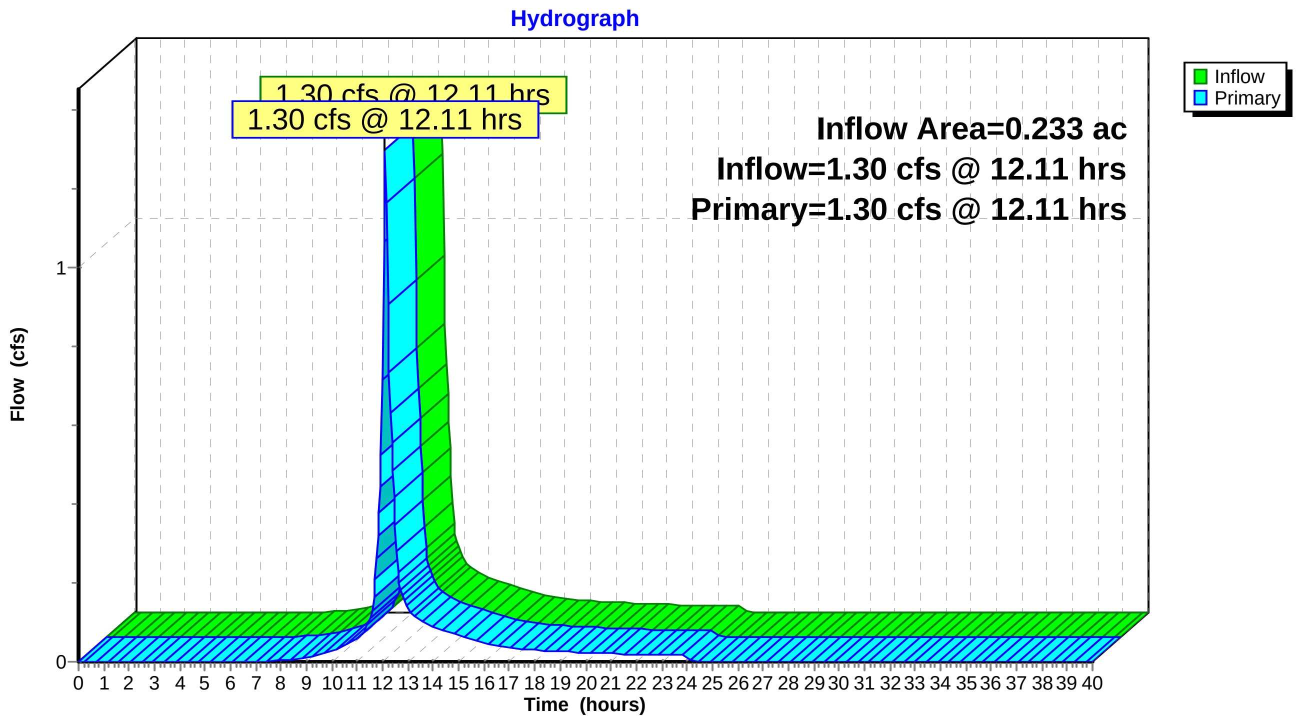


Summary for Link 3L: Flow towards exisiting cb on north-side of Elm Street

Inflow Area = 0.233 ac, 0.66% Impervious, Inflow Depth = 5.02" for 100-YR event
Inflow = 1.30 cfs @ 12.11 hrs, Volume= 0.098 af
Primary = 1.30 cfs @ 12.11 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L: Flow towards exisiting cb on north-side of Elm Street

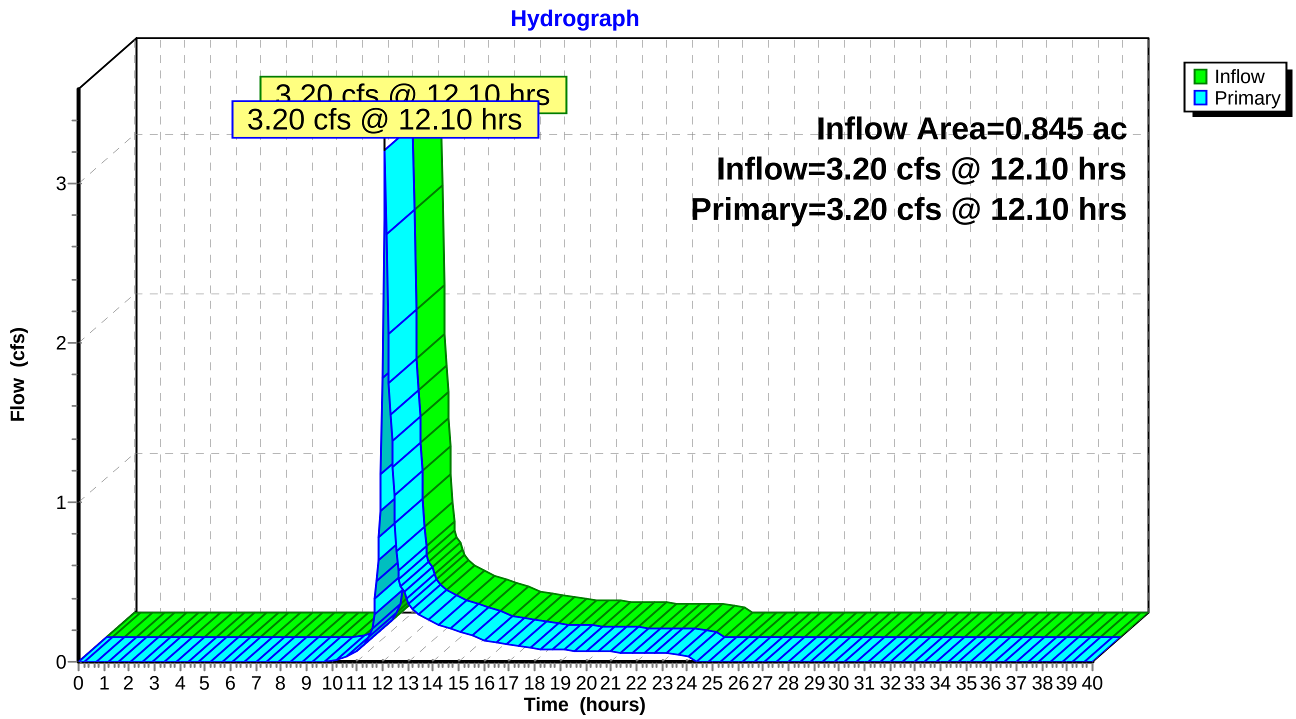


Summary for Link 4L: Flow towards north-side of elm street

Inflow Area = 0.845 ac, 7.75% Impervious, Inflow Depth = 3.36" for 100-YR event
Inflow = 3.20 cfs @ 12.10 hrs, Volume= 0.237 af
Primary = 3.20 cfs @ 12.10 hrs, Volume= 0.237 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L: Flow towards north-side of elm street

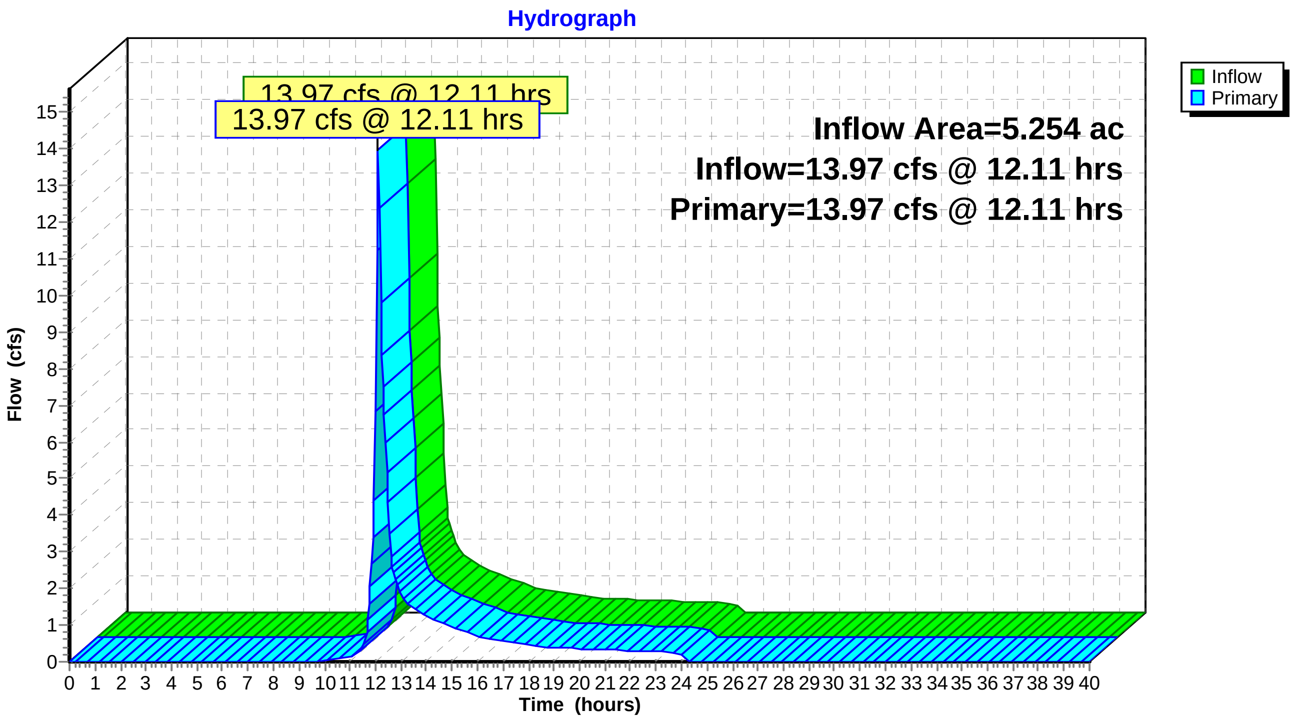


Summary for Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

Inflow Area = 5.254 ac, 1.28% Impervious, Inflow Depth = 2.53" for 100-YR event
Inflow = 13.97 cfs @ 12.11 hrs, Volume= 1.109 af
Primary = 13.97 cfs @ 12.11 hrs, Volume= 1.109 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

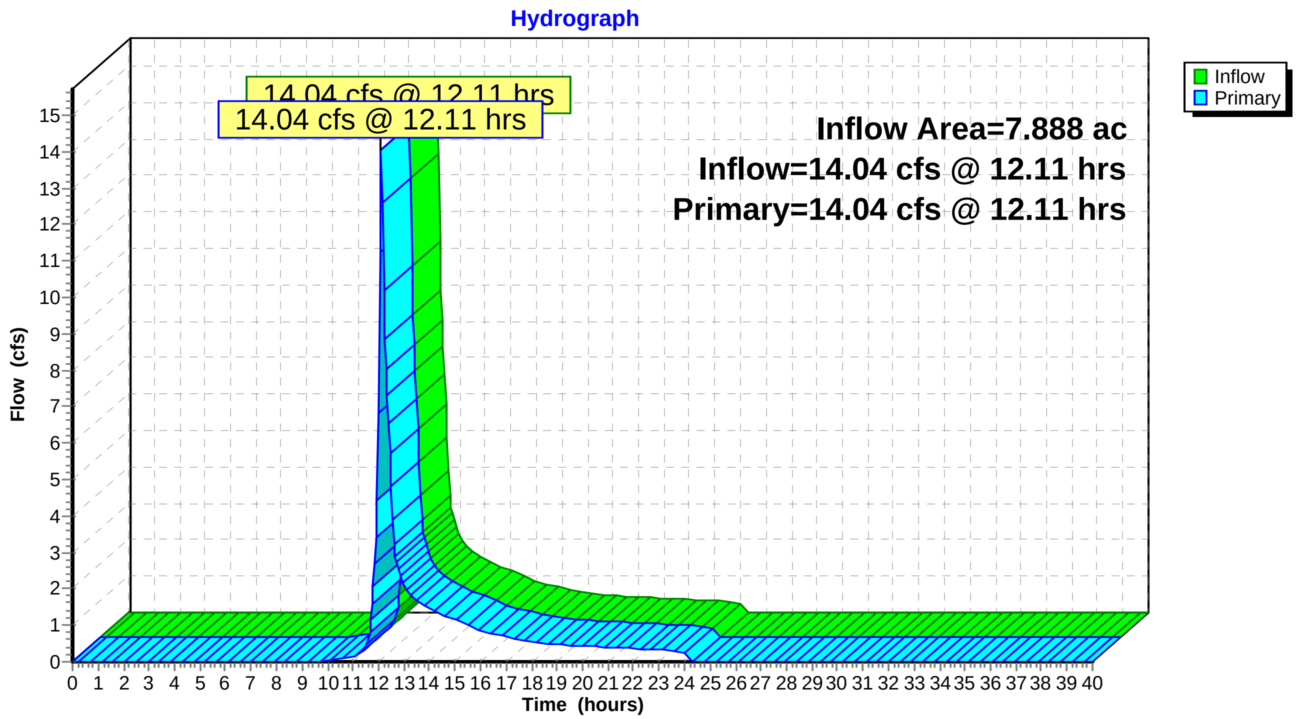


Summary for Link 6L: Runoff discharging from within the limit of watershed analysis

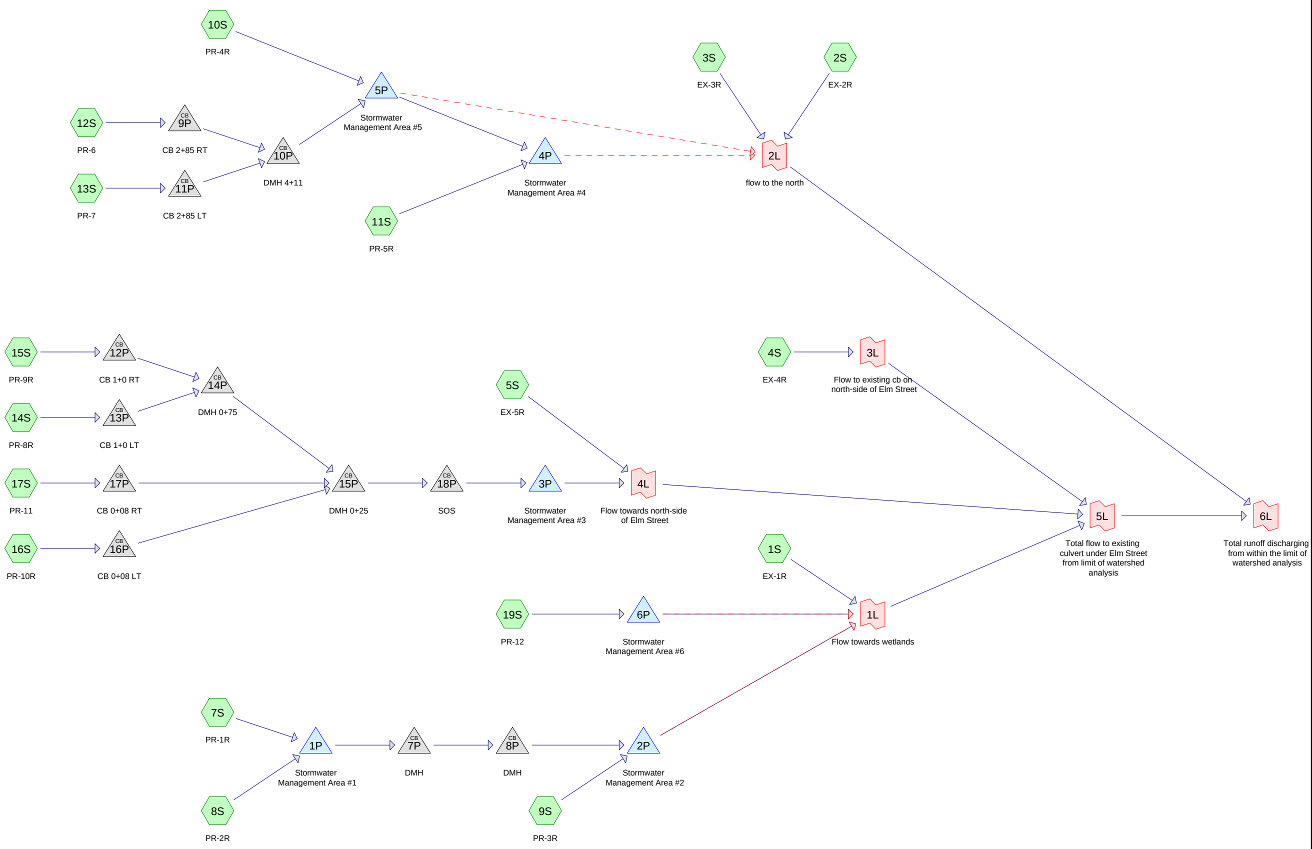
Inflow Area =	7.888 ac,	0.85% Impervious, Inflow Depth = 1.88"	for 100-YR event
Inflow =	14.04 cfs @	12.11 hrs, Volume=	1.237 af
Primary =	14.04 cfs @	12.11 hrs, Volume=	1.237 af, Atten= 0%, Lag= 0.0 min

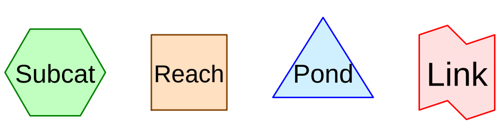
Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 6L: Runoff discharging from within the limit of watershed analysis



Proposed Condition





Routing Diagram for proposed(cornell study)
Prepared by Williams & Sparages, Printed 4/30/2019
HydroCAD® 10.00-20 s/n 06611 © 2017 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.785	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 19S)
1.639	61	>75% Grass cover, Good, HSG B (1S, 5S, 8S, 9S, 14S, 15S, 16S, 17S, 19S)
0.469	98	Paved parking, HSG A (7S, 9S, 12S, 13S, 14S, 15S)
0.207	98	Paved parking, HSG B (5S, 9S, 14S, 15S, 16S, 17S)
0.390	30	Woods, Good, HSG A (1S, 2S, 3S, 4S, 5S, 11S, 16S, 19S)
1.685	55	Woods, Good, HSG B (1S, 4S, 5S, 19S)
7.175	**53**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
3.644	HSG A	1S, 2S, 3S, 4S, 5S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 19S
3.531	HSG B	1S, 4S, 5S, 8S, 9S, 14S, 15S, 16S, 17S, 19S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
7.175		**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	117.00	116.59	41.0	0.0100	0.010	12.0	0.0	0.0
2	3P	98.00	95.92	45.0	0.0462	0.010	8.0	0.0	0.0
3	7P	109.30	97.27	150.0	0.0802	0.010	12.0	0.0	0.0
4	8P	88.47	87.80	6.0	0.1117	0.010	12.0	0.0	0.0
5	9P	115.17	114.54	120.0	0.0052	0.010	12.0	0.0	0.0
6	10P	114.34	112.00	173.0	0.0135	0.010	12.0	0.0	0.0
7	11P	115.17	114.54	120.0	0.0052	0.010	12.0	0.0	0.0
8	12P	101.27	100.48	22.5	0.0351	0.010	12.0	0.0	0.0
9	13P	101.27	100.48	22.5	0.0351	0.010	12.0	0.0	0.0
10	14P	100.38	98.02	45.0	0.0524	0.010	12.0	0.0	0.0
11	15P	97.92	97.92	16.0	0.0000	0.010	12.0	0.0	0.0
12	16P	98.22	98.02	16.0	0.0125	0.010	12.0	0.0	0.0
13	17P	98.22	98.02	16.0	0.0125	0.010	12.0	0.0	0.0
14	18P	97.68	97.52	9.5	0.0168	0.010	12.0	0.0	0.0

HY-8 Analysis Results

Culvert Summary Table - 24" RCP

Culvert Crossing: 24" RCP at Elm Street

	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth(ft)	Outlet Control Depth(ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 YR Storm	0.17	0.17	60.85	0.19	0.0*	1-S2n	0.08	0.14	0.09	56.02	18.20	0.00
	1.40	1.40	61.21	0.55	0.14	1-S2n	0.23	0.41	0.28	56.02	5.17	0.00
	2.64	2.64	61.42	0.76	0.31	1-S2n	0.32	0.56	0.40	56.02	5.80	0.00
25 YR Storm	3.09	3.09	61.48	0.82	0.36	1-S2n	0.34	0.61	0.43	56.02	5.95	0.00
	5.11	5.11	61.75	1.09	0.59	1-S2n	0.44	0.79	0.58	56.02	6.53	0.00
	6.34	6.34	61.92	1.26	0.72	1-S2n	0.49	0.89	0.66	56.02	6.83	0.00
	7.58	7.58	62.06	1.40	0.85	1-S2n	0.54	0.98	0.73	56.02	7.07	0.00
	8.81	8.81	62.20	1.54	0.98	1-S2n	0.58	1.06	0.80	56.02	7.31	0.00
	10.05	10.05	62.34	1.68	1.11	1-S2n	0.62	1.13	0.86	56.02	7.52	0.00
	11.28	11.28	62.47	1.81	1.25	1-S2n	0.66	1.20	0.92	56.02	7.73	0.00
100 YR Storm	12.52	12.52	62.60	1.94	1.39	1-S2n	0.70	1.27	0.98	56.02	7.93	0.00

As can be seen above, the 24" pipe has the capacity to discharge runoff up to the 100 year storm with an inlet control depth of 1.94 feet so there will not be any overtopping of the roadway. The 24" pipe increases in size to a 30" pipe in the first manhole and It is assumed the pipe will act under inlet control for normal flow conditions. It is also important to note that the downstream end of the 30" pipe may be submerged during a 100 year storm for the Ipswich River but we are assuming that the 100 year storm event for the subdivision is not coincident with the 100 year storm for the river which has an elevation of approximately 60.5.

TECHNICAL NOTE

Minimum and Maximum Burial Depth for Corrugated HDPE Pipe (per AASHTO)

TN 2.01
October 2016

Introduction

The information in this document is designed to provide answers to general cover height questions; the data provided is not intended to be used for project design. The design procedure described in the *Structures* section (Section 2) of the Drainage Handbook provides detailed information for analyzing most common installation conditions. This procedure should be utilized for project specific designs.

The two common cover height concerns are minimum cover in areas exposed to vehicular traffic and maximum cover heights. Either may be considered "worst case" scenario from a loading perspective, depending on the project conditions.

Minimum Cover in Traffic Applications

Pipe diameters from 4- through 48-inch (100-1200 mm) installed in traffic areas (AASHTO H-20, H-25, or HL-93 loads) must have at least one foot (0.3m) of cover over the pipe crown, while 54- and 60-inch (1350 and 1500 mm) pipes must have at least 24 inches (0.6m) of cover. The backfill envelope must be constructed in accordance with the *Installation* section (Section 5) of the Drainage Handbook and the requirements of ASTM D2321. The backfill envelope must be of the type and compaction listed in Appendix A-5, Table A-5-2 of the Drainage Handbook. In Table 1 below, this condition is represented by a Class III material compacted to 95% standard Proctor density or a Class II material compacted to 90% standard proctor density, although other material can provide similar strength at slightly lower levels of compaction. Structural backfill material should extend six inches (0.15m) over the crown of the pipe; the remaining cover should be appropriate for the installation and as specified by the design engineer. If settlement or rutting is a concern, it may be appropriate to extend the structural backfill to grade. Where pavement is involved, sub-base material can be considered in the minimum burial depth. While rigid pavements can be included in the minimum cover, the thickness of flexible pavements should not be included in the minimum cover.

Additional information that may affect the cover requirements is included in the *Installation* section (Section 5) of the Drainage Handbook. Some examples of what may need to be considered are temporary heavy equipment, construction loading , paving equipment and similar loads that are less than the design load, the potential of pipe flotation, and the type of surfacetreatment which will be installed over the pipe zone.

Table 1
Minimum Cover Requirements for ADS N-12®, N-12 ST, and N-12 WT (per AASHTO) with AASHTO H-20, H-25, or HL-93 Load

Inside Diameter, ID, in.(mm)	Minimum Cover ft. (m)	Inside Diameter, ID, in.(mm)	Minimum Cover ft. (m)
4 (100)	1 (0.3)	24 (600)	1 (0.3)
6 (150)	1 (0.3)	30 (750)	1 (0.3)
8 (200)	1 (0.3)	36 (900)	1 (0.3)
10 (250)	1 (0.3)	42 (1050)	1 (0.3)
12 (300)	1 (0.3)	48 (1200)	1 (0.3)
15 (375)	1 (0.3)	54 (1350)	2 (0.6)
18 (450)	1 (0.3)	60 (1500)	2 (0.6)

Notes:

1. *Minimum covers presented here were calculated assuming Class III backfill material to 95% standard Proctor density or Class II backfill material to 90% standard Proctor density around the pipe and a minimum of 6-inches (0.15m) structural backfill over the pipe crown, as recommended in Section 5 of the Drainage Handbook, with an additional layer of compacted traffic lane sub-base for a total cover as required. In shallow traffic installations, especially where pavement is involved, a good quality compacted material to grade is required to prevent surface rutting.*

2. *The minimum covers specified do not include pavement thickness. A pavement section of 0.4' is typical.*
3. *Backfill materials and compaction levels not shown in the table may also be acceptable. Contact ADS for further detail.*
4. *Calculations assume no hydrostatic pressure and native soils that are as strong as the specified minimum backfill recommendations.*

Maximum Cover

Wall thrust generally governs the maximum cover a pipe can withstand and conservative maximum cover heights will result when using the information presented in the *Structures* section (Section 2) of the Drainage Handbook.

The maximum burial depth is highly influenced by the type of backfill and level of compaction around the pipe. General maximum cover limits for ADS N-12, N-12 ST, N-12 WT pipe, (ASTM F2306 and AASTHO M252/M294 Type S pipes) are shown in Table 3 for a variety of backfill conditions.

Table 3 was developed assuming pipe is installed in accordance with ASTM D2321 and the *Installation* section (Section 5) of the Drainage Handbook. Additionally, the calculations assume zero hydrostatic load, incorporate the maximum safety factors represented in Structures section of the Drainage Handbook, use material properties consistent with the expected performance characteristics for N-12 (per ASTM F2306) materials as shown in Table 2 below, and assume the native soil is of adequate strength and is suitable for installation. For applications requiring fill heights greater than those shown in Table 3 or where hydrostatic pressure due to groundwater is present, contact an ADS engineering representative.

Figure 1
ADS N-12®, N-12 ST, and N-12 WT (per AASHTO) Trench Detail Under Pavement

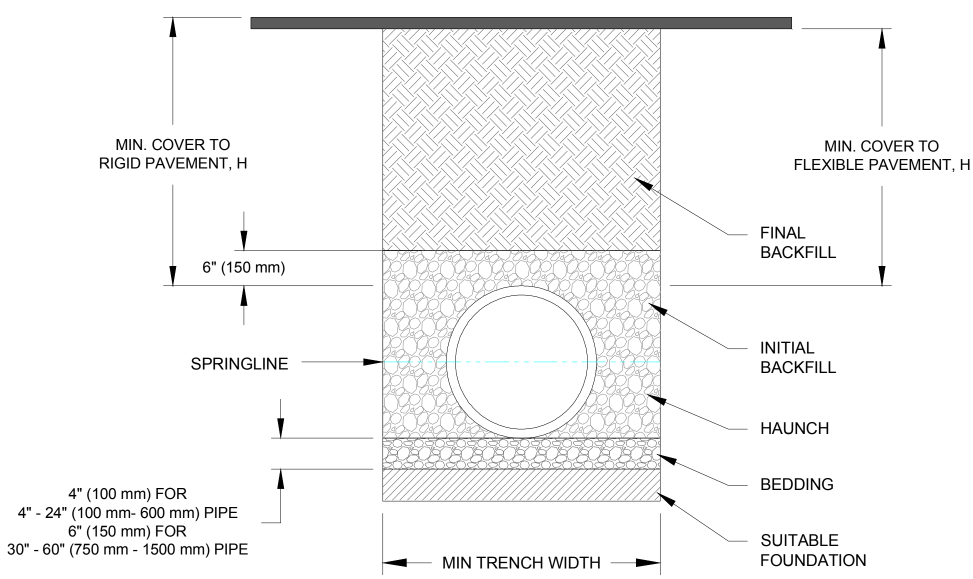


Table 2
ADS N-12 (per AASHTO) Mechanical Properties

Cell Class	Factored Compressive Strain (%)	Tension Strain (%)	Initial		75-Year	
			Fu (psi)	E (psi)	Fu (psi)	E (psi)
ASTM D3350 435400C	4.1	5.0	3,000	110,000	900	21,000

Table 3
Maximum Cover for ADS N-12, N-12 ST, and N-12 WT Pipe (per AASHTO), ft (m)

Diameter in. (mm)	Class 1		Class 2			Class 3	
	Compacted	Dumped	95%	90%	85% [3]	95%	90% [3]
4 (100)	37 (11.3)	18 (5.5)	25 (7.6)	18 (5.5)	12 (3.7)	18 (5.5)	13 (4.0)
6 (150)	44 (13.4)	20 (6.1)	29 (8.8)	20 (6.1)	14 (4.3)	21 (6.4)	15 (4.6)
8 (200)	32 (9.8)	15 (4.6)	22 (6.7)	15 (4.6)	10 (3.0)	16 (4.9)	11 (3.4)
10 (250)	38 (11.6)	18 (5.5)	26 (7.9)	18 (5.5)	12 (3.7)	18 (5.5)	13 (4.0)
12 (300)	35 (10.7)	17 (5.2)	24 (7.3)	17 (5.2)	8 (2.4)	17 (5.2)	11 (3.4)
15 (375)	38 (11.6)	17 (5.2)	25 (7.6)	17 (5.2)	8 (2.4)	18 (5.5)	11 (3.4)
18 (450)	36 (11.0)	17 (5.2)	24 (7.3)	17 (5.2)	8 (2.4)	17 (5.2)	11 (3.4)
24 (600)	28 (8.5)	13 (4.0)	20 (6.1)	13 (4.0)	7 (2.1)	14 (4.3)	10 (3.0)
30 (750)	28 (8.5)	13 (4.0)	20 (6.1)	13 (4.0)	7 (2.1)	14 (4.3)	9 (2.7)
36 (900)	26 (7.9)	12 (3.7)	18 (5.5)	12 (3.7)	7 (2.1)	13 (4.0)	9 (2.7)
42 (1050)	23 (7.0)	11 (3.4)	16 (4.9)	11 (3.4)	7 (2.1)	11 (3.4)	7 (2.1)
48 (1200)	25 (7.6)	11 (3.4)	17 (5.2)	11 (3.4)	7 (2.1)	12 (3.7)	7 (2.1)
54 (1350)	22 (6.7)	10 (3.0)	16 (4.9)	10 (3.0)	6 (1.8)	11 (3.4)	7 (2.1)
60 (1500)	25 (7.6)	11 (3.4)	17 (5.2)	11 (3.4)	6 (1.8)	12 (3.7)	7 (2.1)

Notes:
1. *Results based on calculations shown in the Structures section of the ADS Drainage Handbook (v20.7). Calculations assume no hydrostatic pressure and a density of 120 pcf (1926 kg/m^3) for overburden material.*
2. *Installation assumed to be in accordance with ASTM D2321 and the Installation section of the Drainage Handbook.*
3. *For installations using lower quality backfill materials or lower compaction efforts, pipe deflection may exceed the 5% design limit; however controlled deflection may not be a structurally limiting factor for the pipe. For installations where deflection is critical, pipe placement techniques or periodic deflection measurements may be required to ensure satisfactory pipe installation.*
4. *Backfill materials and compaction levels not shown in the table may also be acceptable. Contact ADS for further detail.*
5. *Material must be adequately "knifed" into haunch and in between corrugations. Compaction and backfill material is assumed uniform throughout entire backfill zone.*
6. *Compaction levels shown are for standard Proctor density.*
7. *For projects where cover exceeds the maximum values listed above, contact ADS for specific design considerations.*
8. *Calculations assume no hydrostatic pressure. Hydrostatic pressure will result in a reduction in allowable fill height. Reduction in allowable fill height must be assessed by the design engineer for the specific field conditions.*
9. *Fill height for dumped Class I material incorporate an additional degree of conservatism that is difficult to assess due to the large degree of variation in the consolidation of this material as it is dumped. There is limited analytical data on its performance. For this reason, values as shown are estimated to be conservatively equivalent to Class 2, 90% SPD.*

ATN2.01

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Summary for Subcatchment 1S: EX-1R

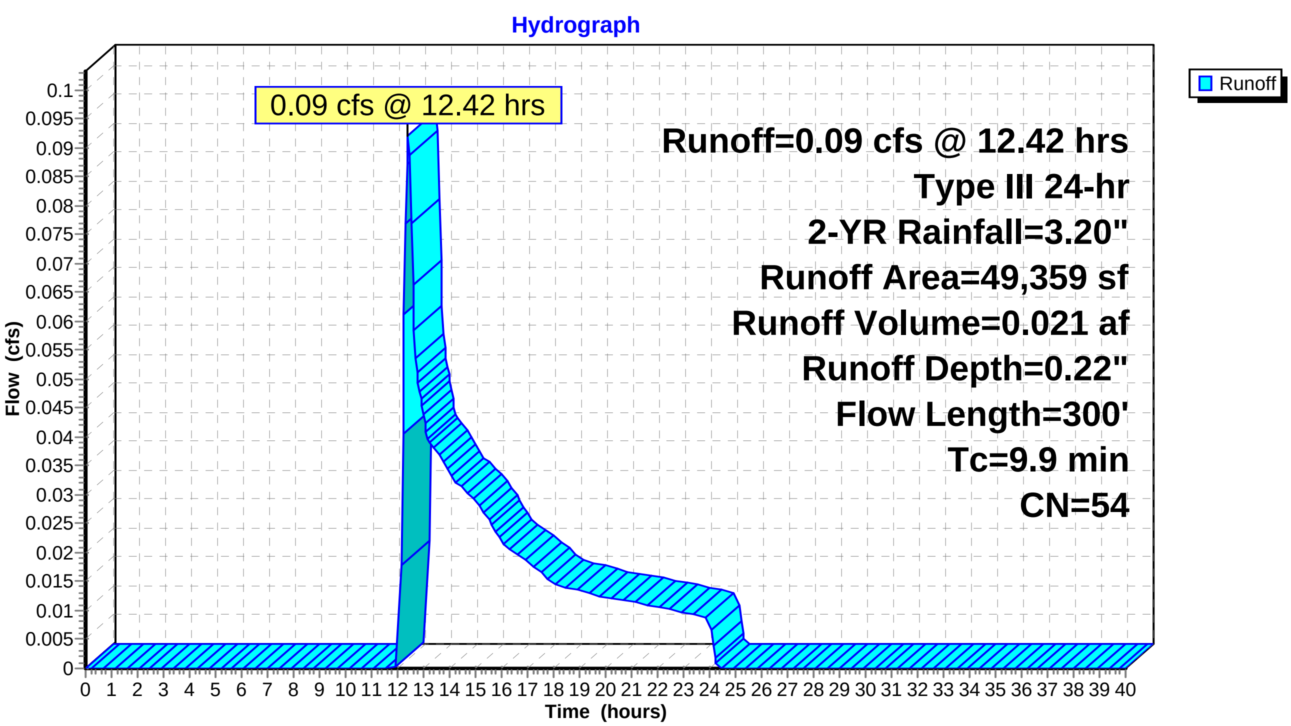
Runoff = 0.09 cfs @ 12.42 hrs, Volume= 0.021 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
1,009	30	Woods, Good, HSG A
33,181	55	Woods, Good, HSG B
5,769	39	>75% Grass cover, Good, HSG A
9,400	61	>75% Grass cover, Good, HSG B
49,359	54	Weighted Average
49,359		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0450	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	250	0.0630	4.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.9	300	Total			

Subcatchment 1S: EX-1R



Summary for Subcatchment 2S: EX-2R

[45] Hint: Runoff=Zero

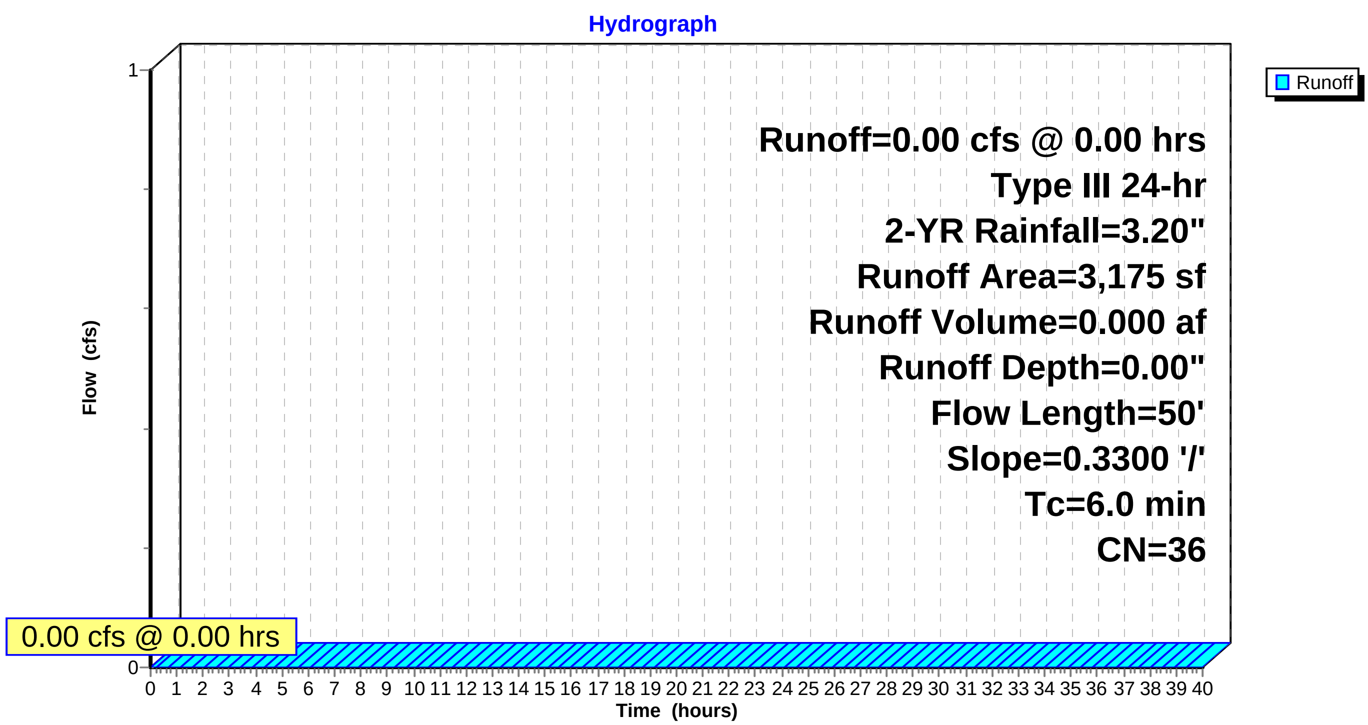
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
1,000	30	Woods, Good, HSG A
2,175	39	>75% Grass cover, Good, HSG A
3,175	36	Weighted Average
3,175		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	50	0.3300	0.45		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.8	50	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: EX-2R



Summary for Subcatchment 3S: EX-3R

[45] Hint: Runoff=Zero

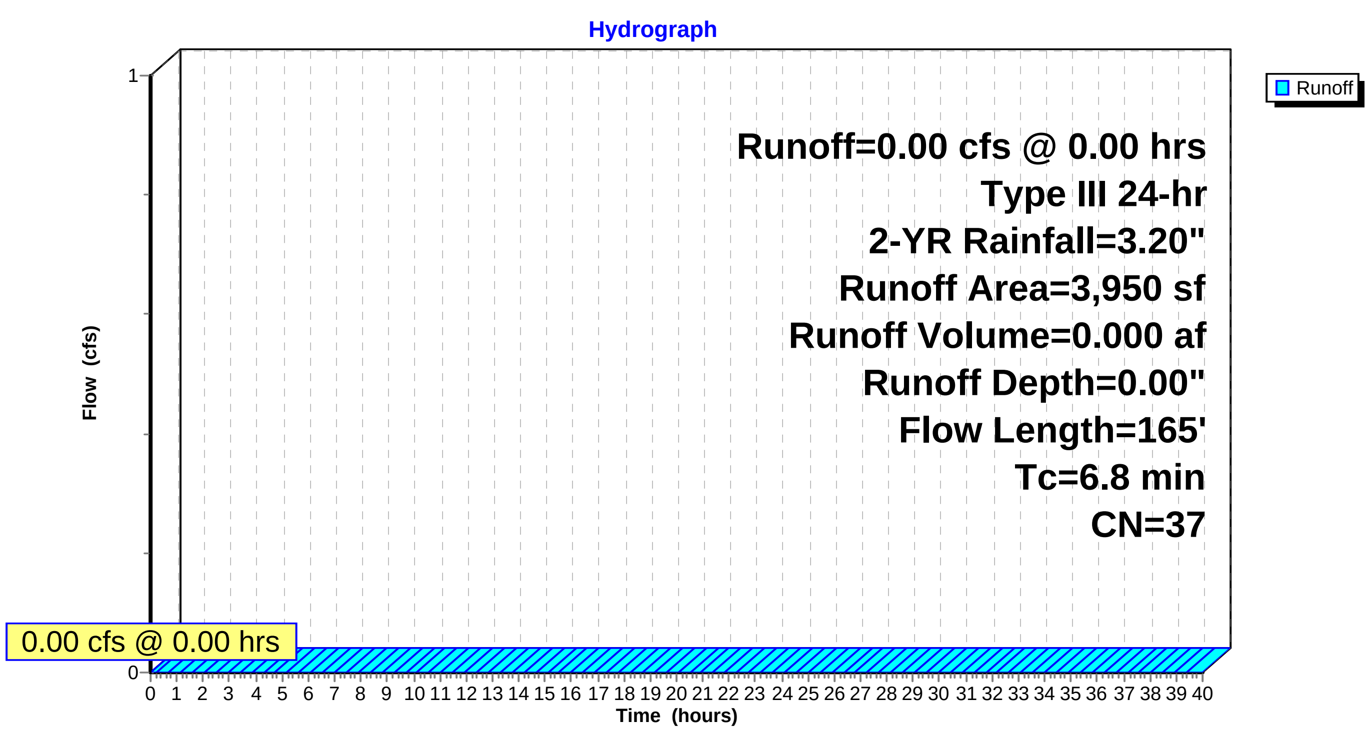
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
1,000	30	Woods, Good, HSG A
2,950	39	>75% Grass cover, Good, HSG A
3,950	37	Weighted Average
3,950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	115	0.1400	6.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	165	Total			

Subcatchment 3S: EX-3R



Summary for Subcatchment 4S: EX-4R

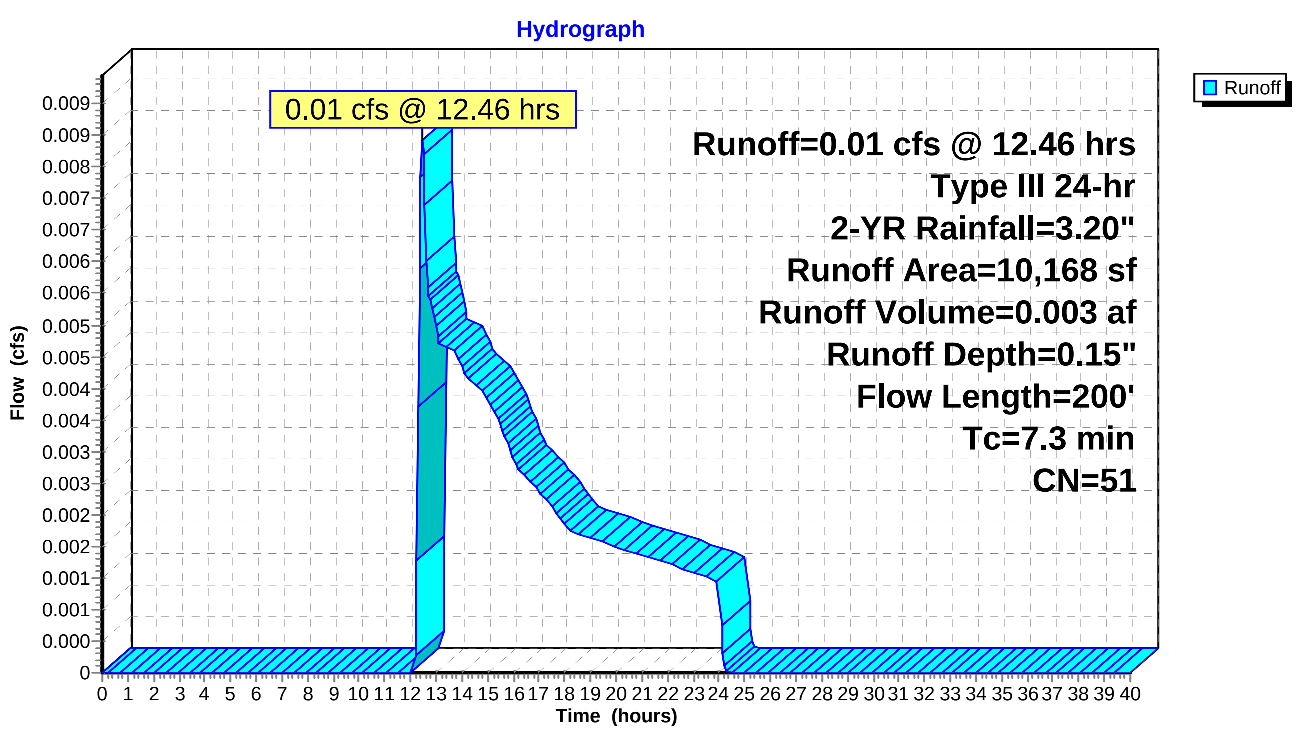
Runoff = 0.01 cfs @ 12.46 hrs, Volume= 0.003 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
1,573	30	Woods, Good, HSG A
8,595	55	Woods, Good, HSG B
10,168	51	Weighted Average
10,168		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0860	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	140	0.1520	6.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.1100	6.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	200	Total			

Subcatchment 4S: EX-4R



Summary for Subcatchment 5S: EX-5R

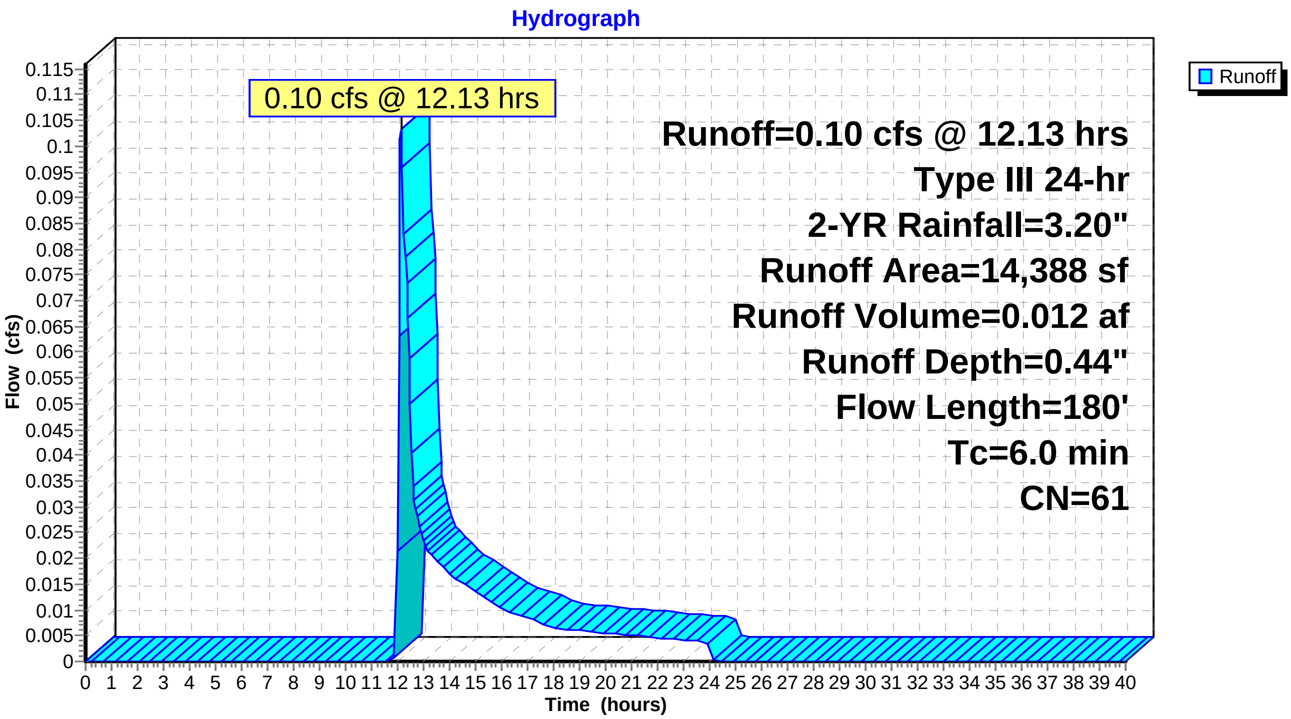
Runoff = 0.10 cfs @ 12.13 hrs, Volume= 0.012 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
278	30	Woods, Good, HSG A
2,500	55	Woods, Good, HSG B
500	98	Paved parking, HSG B
11,110	61	>75% Grass cover, Good, HSG B
14,388	61	Weighted Average
13,888		96.52% Pervious Area
500		3.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	50	0.1900	0.36		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.4	130	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	180	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: EX-5R



Summary for Subcatchment 7S: PR-1R

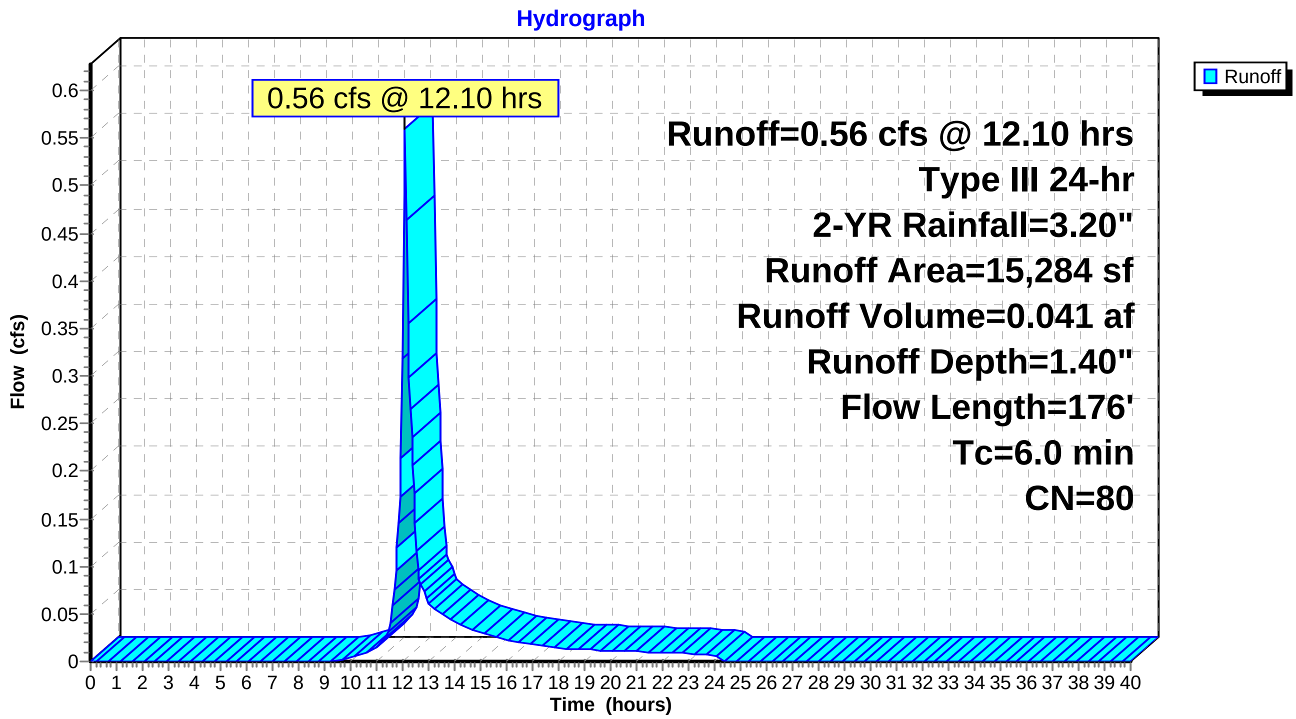
Runoff = 0.56 cfs @ 12.10 hrs, Volume= 0.041 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
4,718	39	>75% Grass cover, Good, HSG A
10,566	98	Paved parking, HSG A
15,284	80	Weighted Average
4,718		30.87% Pervious Area
10,566		69.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0310	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.5	125	0.0430	4.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	26	0.0120	2.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	176	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7S: PR-1R



Summary for Subcatchment 8S: PR-2R

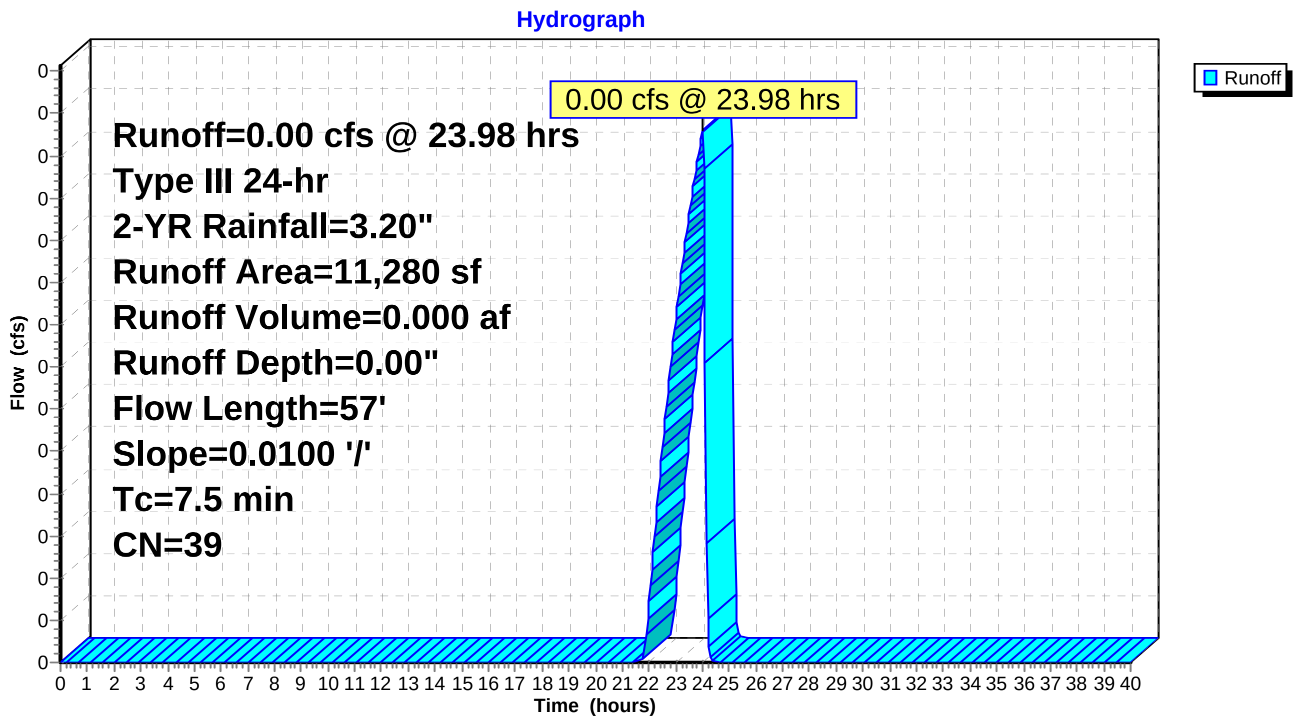
Runoff = 0.00 cfs @ 23.98 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
11,193	39	>75% Grass cover, Good, HSG A
87	61	>75% Grass cover, Good, HSG B
11,280	39	Weighted Average
11,280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	7	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	57	Total			

Subcatchment 8S: PR-2R



Summary for Subcatchment 9S: PR-3R

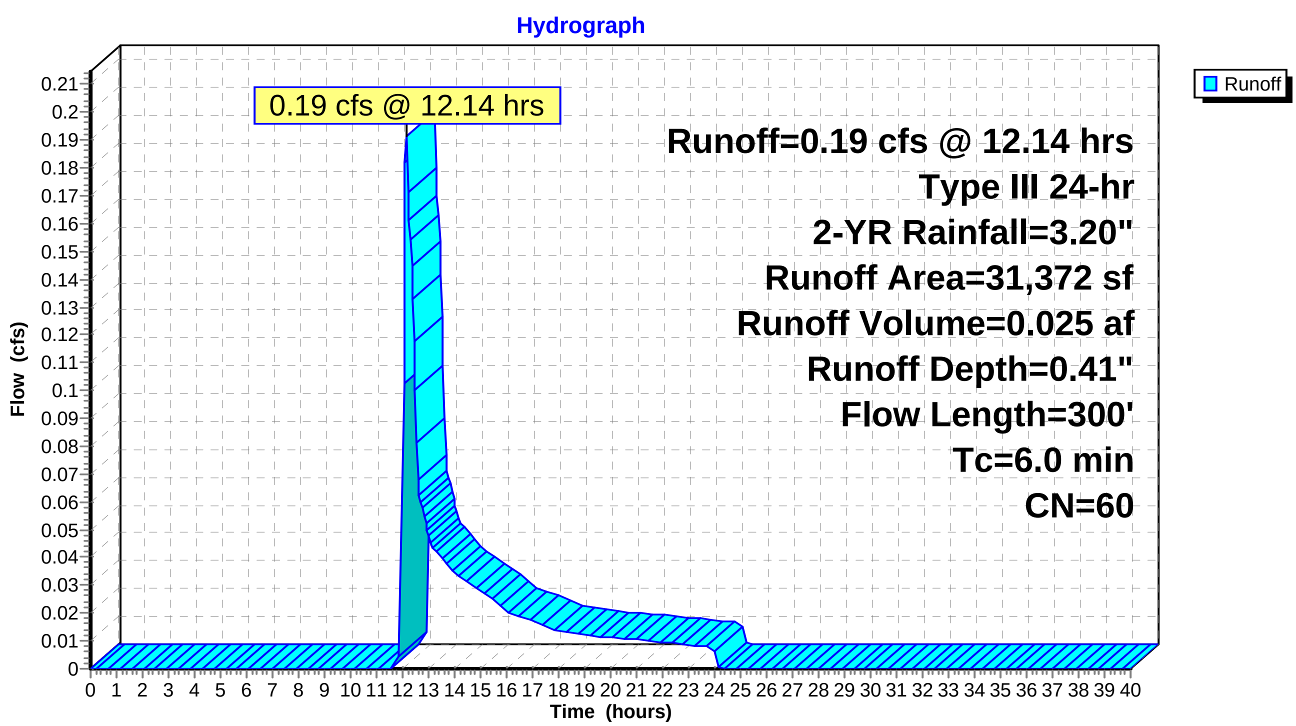
Runoff = 0.19 cfs @ 12.14 hrs, Volume= 0.025 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
6,795	39	>75% Grass cover, Good, HSG A
21,016	61	>75% Grass cover, Good, HSG B
1,143	98	Paved parking, HSG A
2,418	98	Paved parking, HSG B
31,372	60	Weighted Average
27,811		88.65% Pervious Area
3,561		11.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0700	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.5	150	0.1060	5.24		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	100	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.2	300	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 9S: PR-3R



Summary for Subcatchment 10S: PR-4R

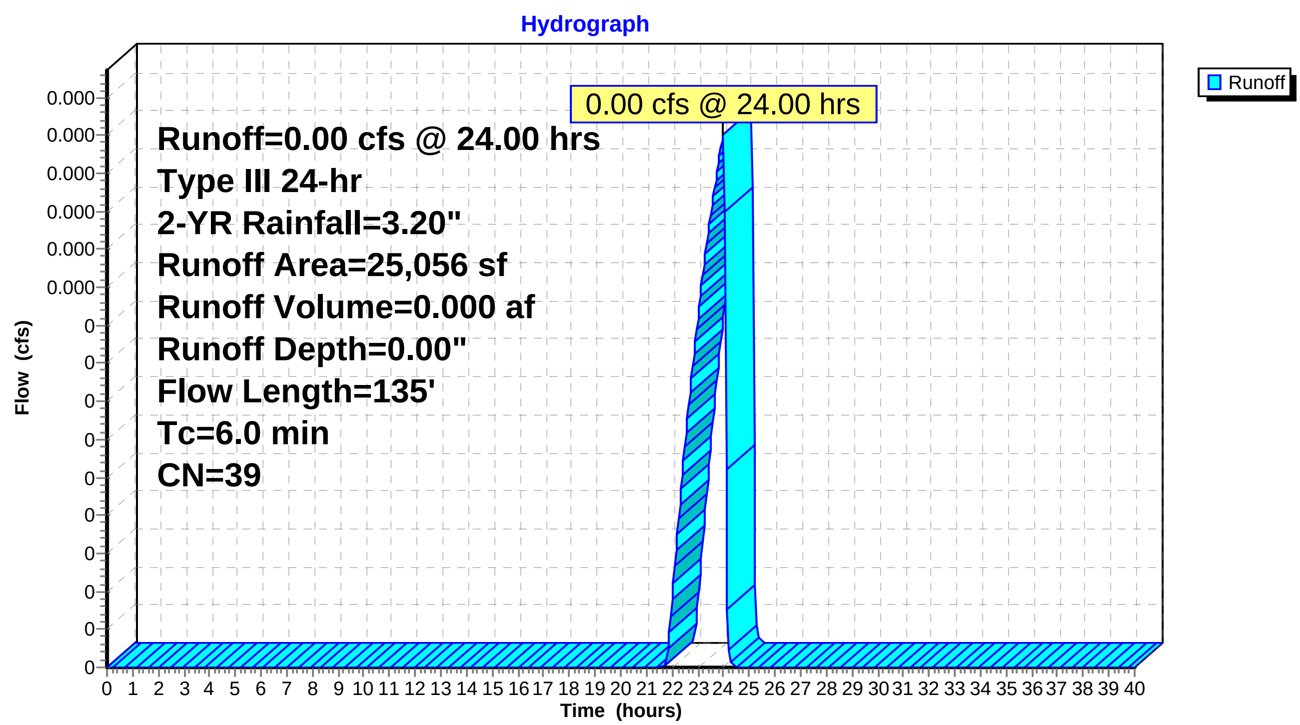
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
25,056	39	>75% Grass cover, Good, HSG A
25,056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.2	80	0.1560	6.36		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	5	0.3300	9.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.5	135	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 10S: PR-4R



Summary for Subcatchment 11S: PR-5R

[45] Hint: Runoff=Zero

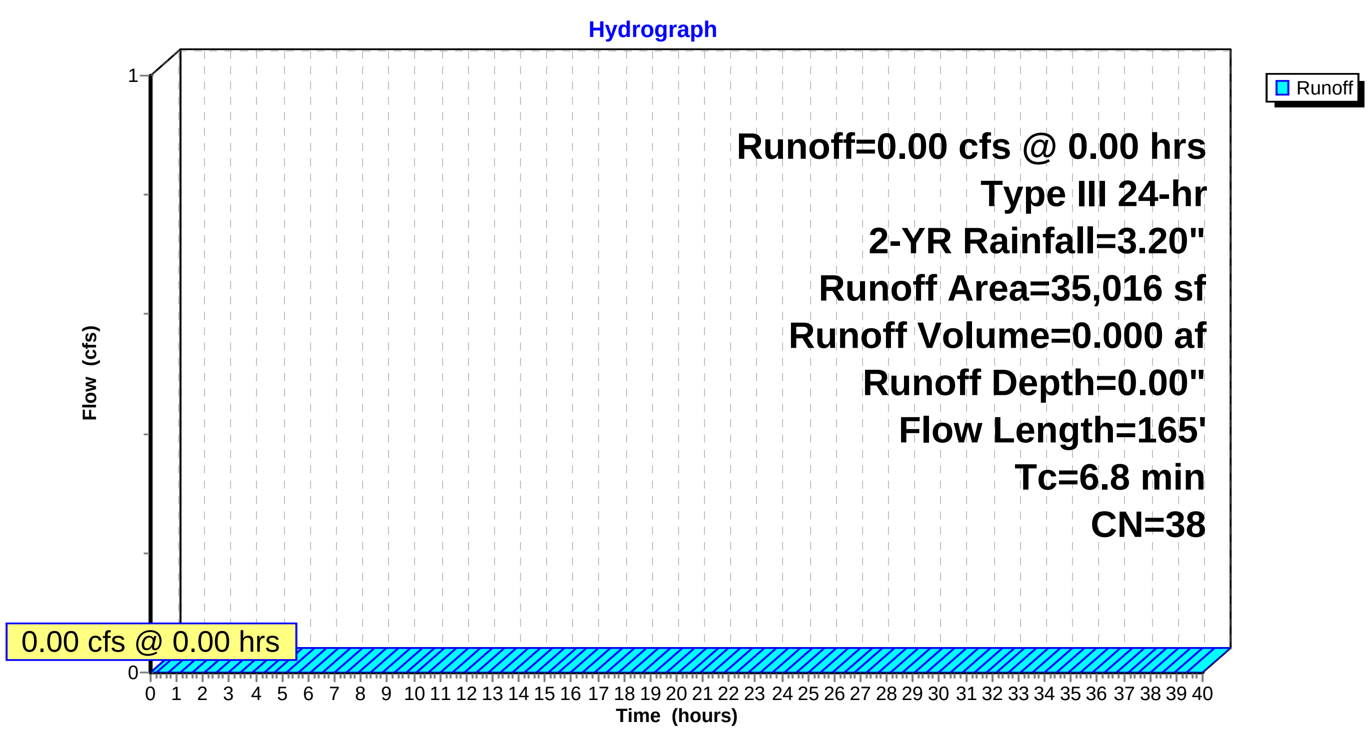
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
31,016	39	>75% Grass cover, Good, HSG A
4,000	30	Woods, Good, HSG A
35,016	38	Weighted Average
35,016		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	115	0.1400	6.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	165	Total			

Subcatchment 11S: PR-5R



Summary for Subcatchment 12S: PR-6

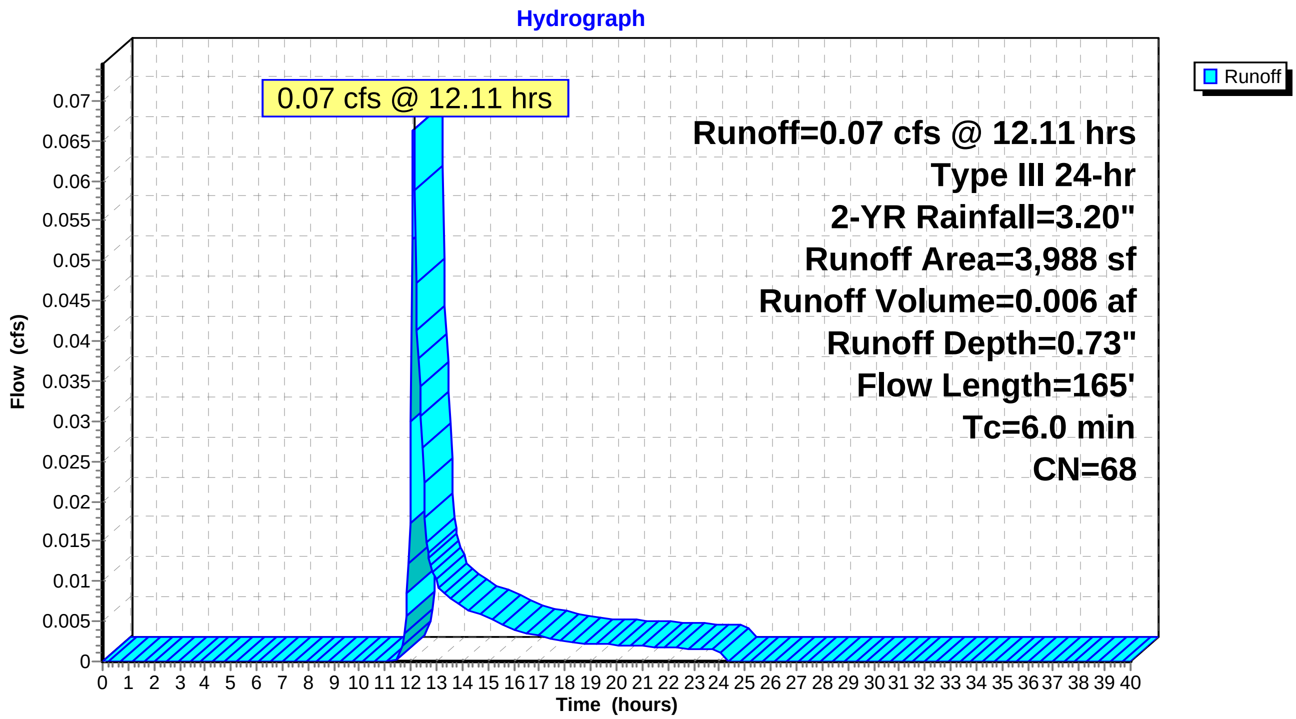
Runoff = 0.07 cfs @ 12.11 hrs, Volume= 0.006 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
2,011	39	>75% Grass cover, Good, HSG A
1,977	98	Paved parking, HSG A
3,988	68	Weighted Average
2,011		50.43% Pervious Area
1,977		49.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	35	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	11	0.0310	3.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	119	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.0	165	Total			

Subcatchment 12S: PR-6



Summary for Subcatchment 13S: PR-7

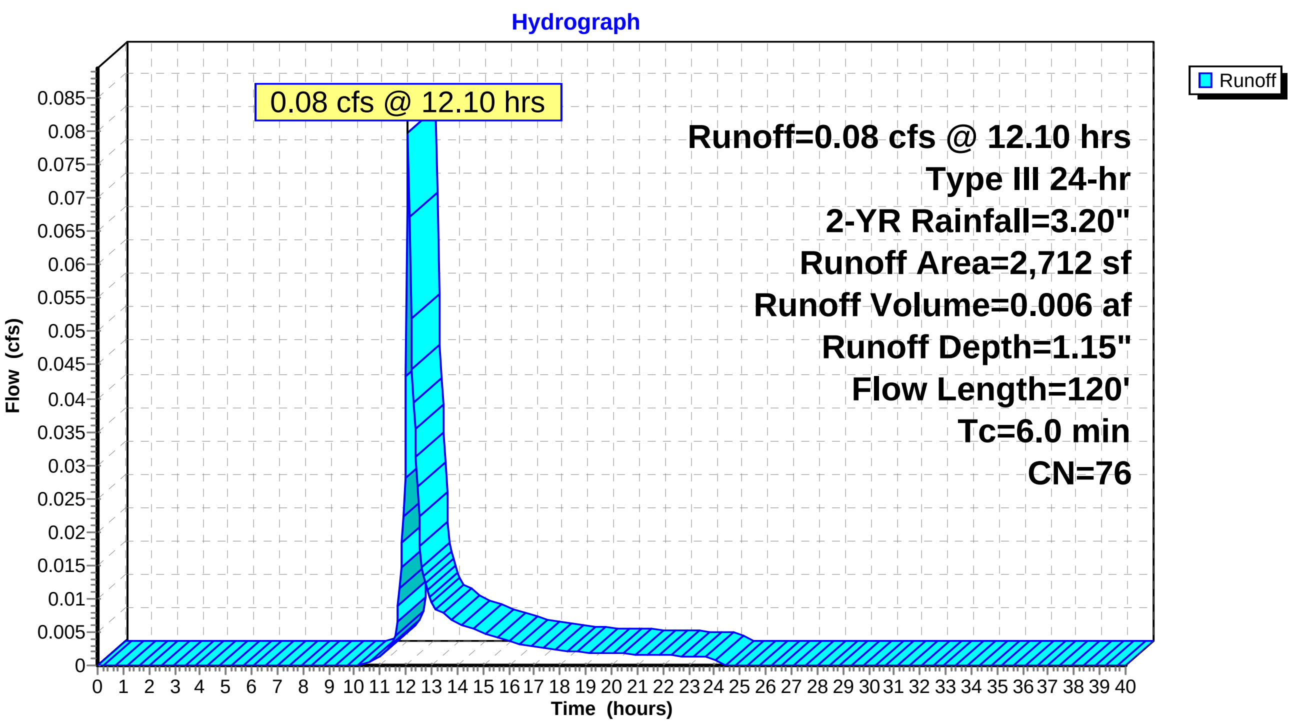
Runoff = 0.08 cfs @ 12.10 hrs, Volume= 0.006 af, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
1,021	39	>75% Grass cover, Good, HSG A
1,691	98	Paved parking, HSG A
2,712	76	Weighted Average
1,021		37.65% Pervious Area
1,691		62.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0310	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.3	95	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	120	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13S: PR-7



Summary for Subcatchment 14S: PR-8R

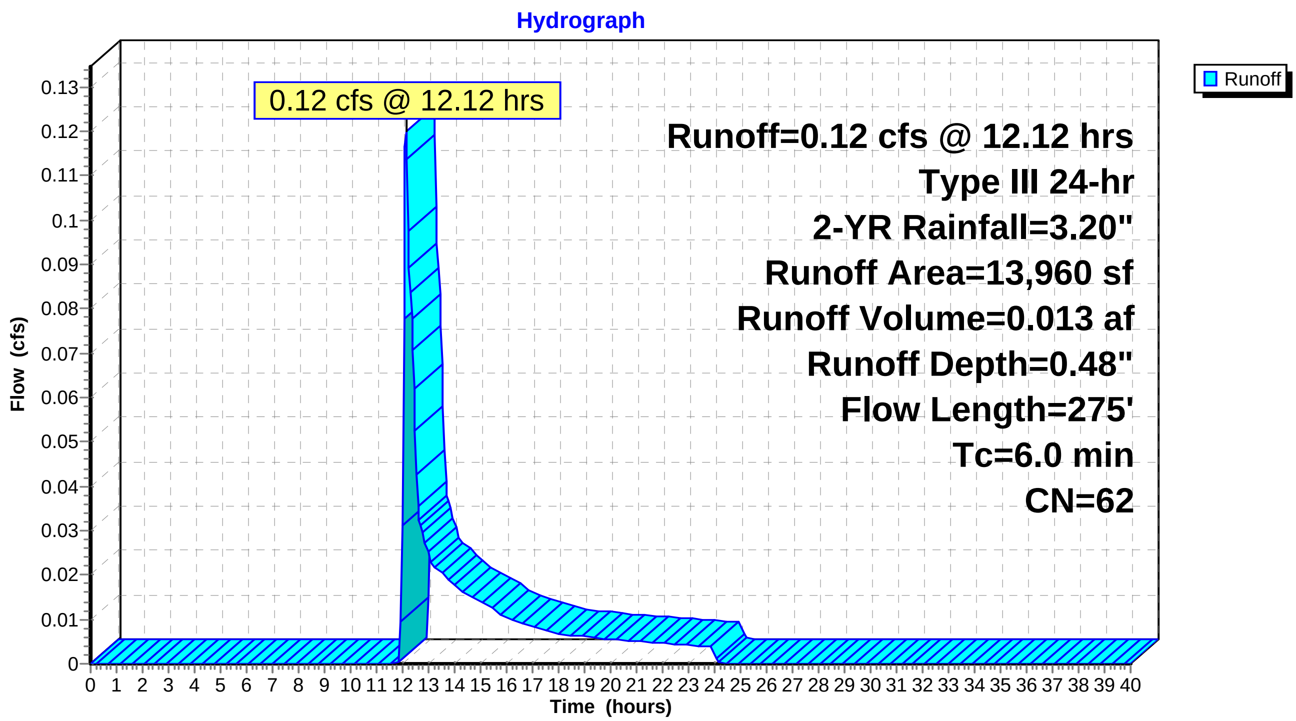
Runoff = 0.12 cfs @ 12.12 hrs, Volume= 0.013 af, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
6,684	39	>75% Grass cover, Good, HSG A
2,706	98	Paved parking, HSG A
1,525	98	Paved parking, HSG B
3,045	61	>75% Grass cover, Good, HSG B
13,960	62	Weighted Average
9,729		69.69% Pervious Area
4,231		30.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.4	100	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	125	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.9	275	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 14S: PR-8R



Summary for Subcatchment 15S: PR-9R

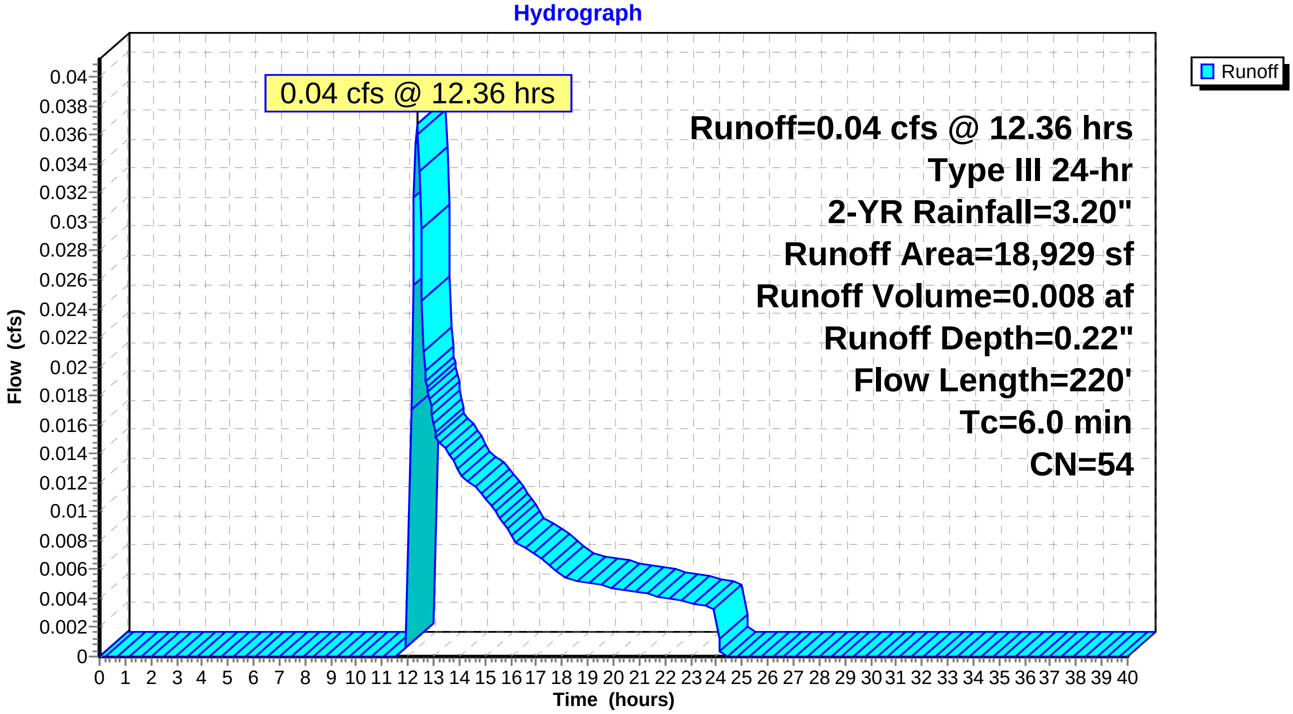
Runoff = 0.04 cfs @ 12.36 hrs, Volume= 0.008 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
11,941	39	>75% Grass cover, Good, HSG A
2,358	98	Paved parking, HSG A
1,358	98	Paved parking, HSG B
3,272	61	>75% Grass cover, Good, HSG B
18,929	54	Weighted Average
15,213		80.37% Pervious Area
3,716		19.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.0	10	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	150	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	220	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15S: PR-9R



Summary for Subcatchment 16S: PR-10R

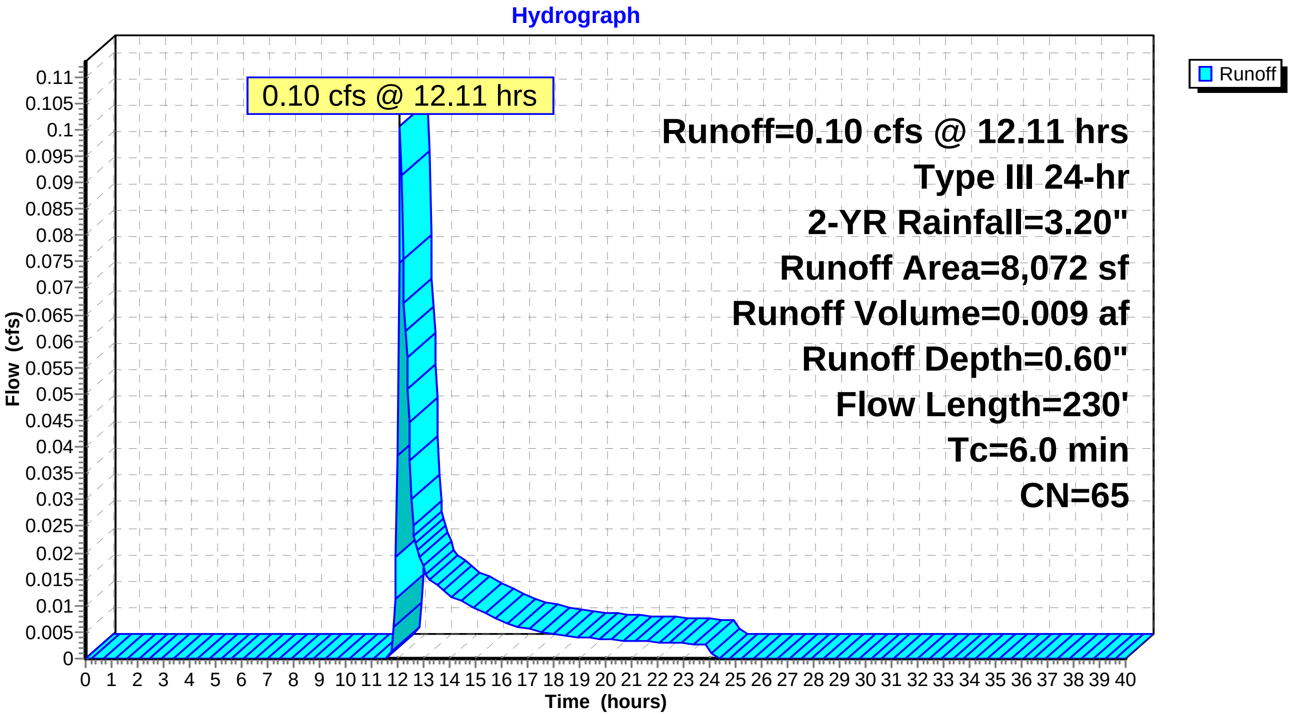
Runoff = 0.10 cfs @ 12.11 hrs, Volume= 0.009 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
670	39	>75% Grass cover, Good, HSG A
723	30	Woods, Good, HSG A
1,898	98	Paved parking, HSG B
4,781	61	>75% Grass cover, Good, HSG B
8,072	65	Weighted Average
6,174		76.49% Pervious Area
1,898		23.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	30	0.1430	0.13		**Sheet Flow,**
					Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	130	0.1770	6.77		**Shallow Concentrated Flow,**
					Unpaved Kv= 16.1 fps
0.1	20	0.0310	3.57		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
0.2	50	0.0500	4.54		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
4.3	230	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 16S: PR-10R



Summary for Subcatchment 17S: PR-11

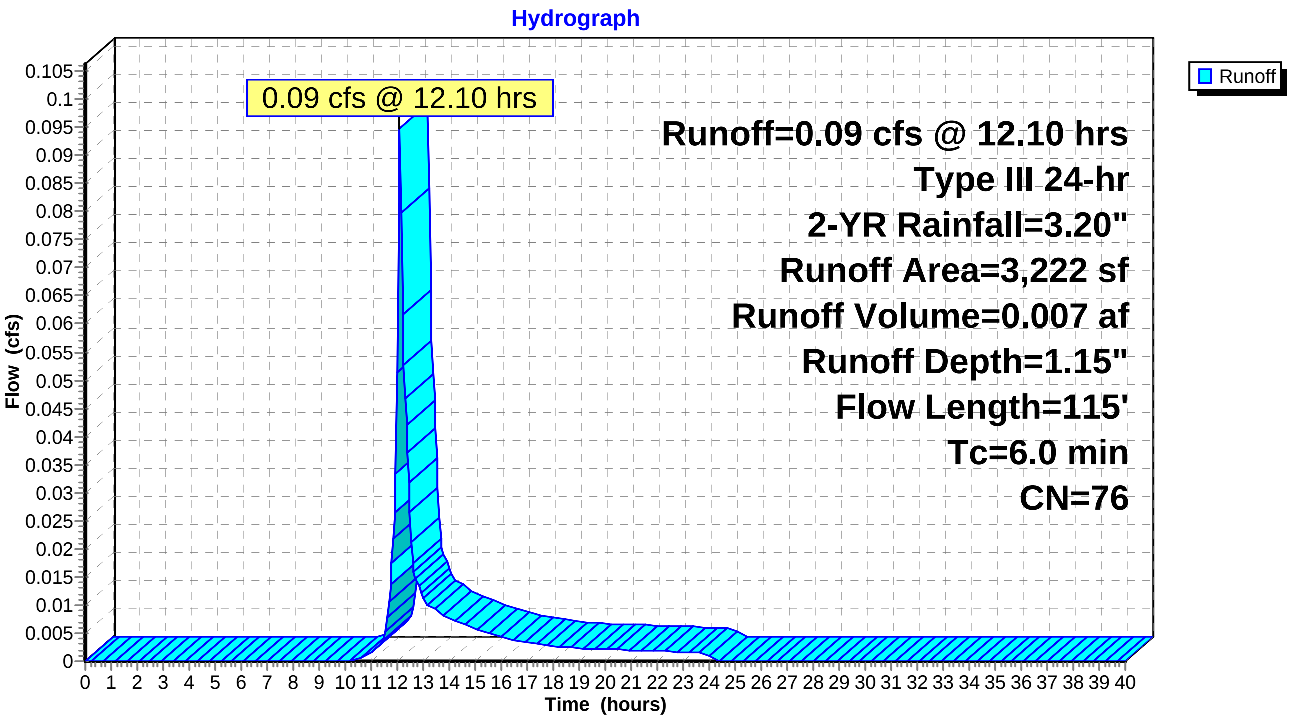
Runoff = 0.09 cfs @ 12.10 hrs, Volume= 0.007 af, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
1,329	98	Paved parking, HSG B
1,893	61	>75% Grass cover, Good, HSG B
3,222	76	Weighted Average
1,893		58.75% Pervious Area
1,329		41.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	40	0.1550	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	20	0.0310	2.83		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	55	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	115	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 17S: PR-11



Summary for Subcatchment 19S: PR-12

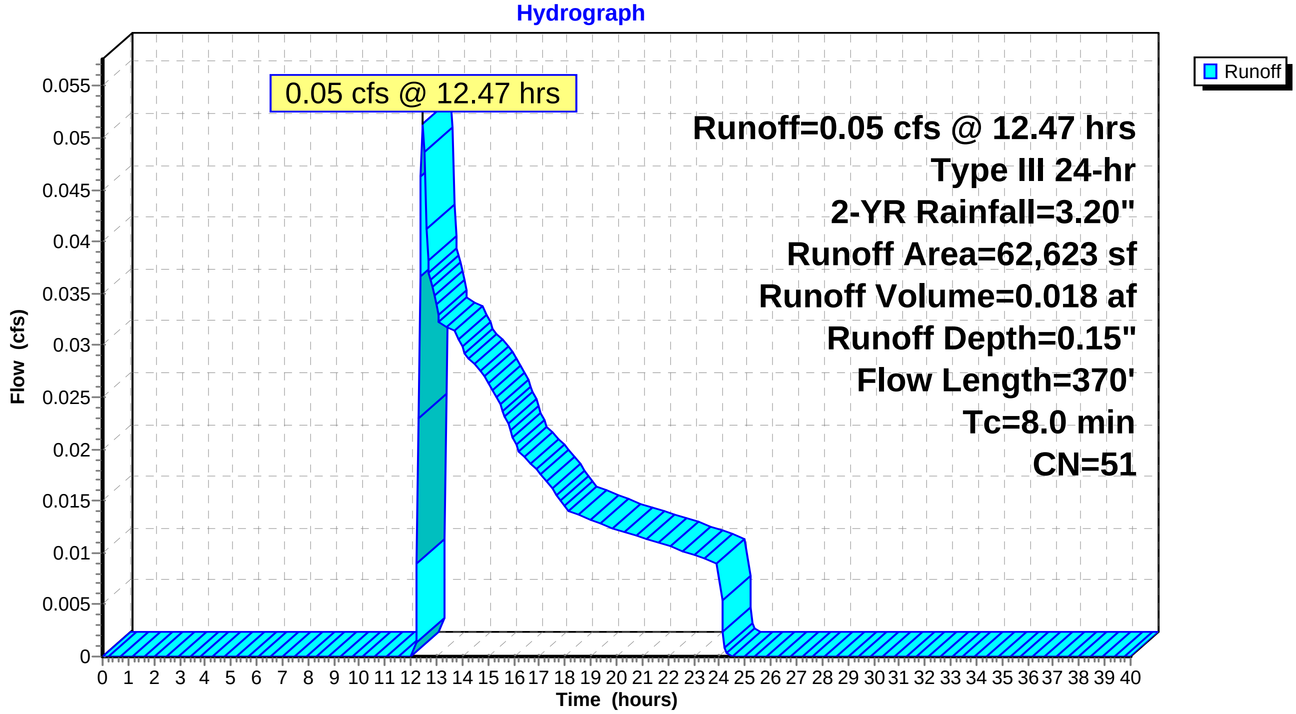
Runoff = 0.05 cfs @ 12.47 hrs, Volume= 0.018 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
9,300	39	>75% Grass cover, Good, HSG A
16,800	61	>75% Grass cover, Good, HSG B
7,412	30	Woods, Good, HSG A
29,111	55	Woods, Good, HSG B
62,623	51	Weighted Average
62,623		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	100	0.1330	5.87		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	205	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	15	0.3300	9.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.0	370	Total			

Subcatchment 19S: PR-12



Summary for Pond 1P: Stormwater Management Area #1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=37)

Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 0.81" for 2-YR event
Inflow = 0.56 cfs @ 12.10 hrs, Volume= 0.041 af
Outflow = 0.23 cfs @ 12.37 hrs, Volume= 0.041 af, Atten= 59%, Lag= 16.2 min
Discarded = 0.04 cfs @ 12.37 hrs, Volume= 0.030 af
Primary = 0.19 cfs @ 12.37 hrs, Volume= 0.011 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 119.07' @ 12.37 hrs Surf.Area= 734 sf Storage= 483 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 67.8 min (910.7 - 842.9)

Volume	Invert	Avail.Storage	Storage Description
#1	118.30'	4,746 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

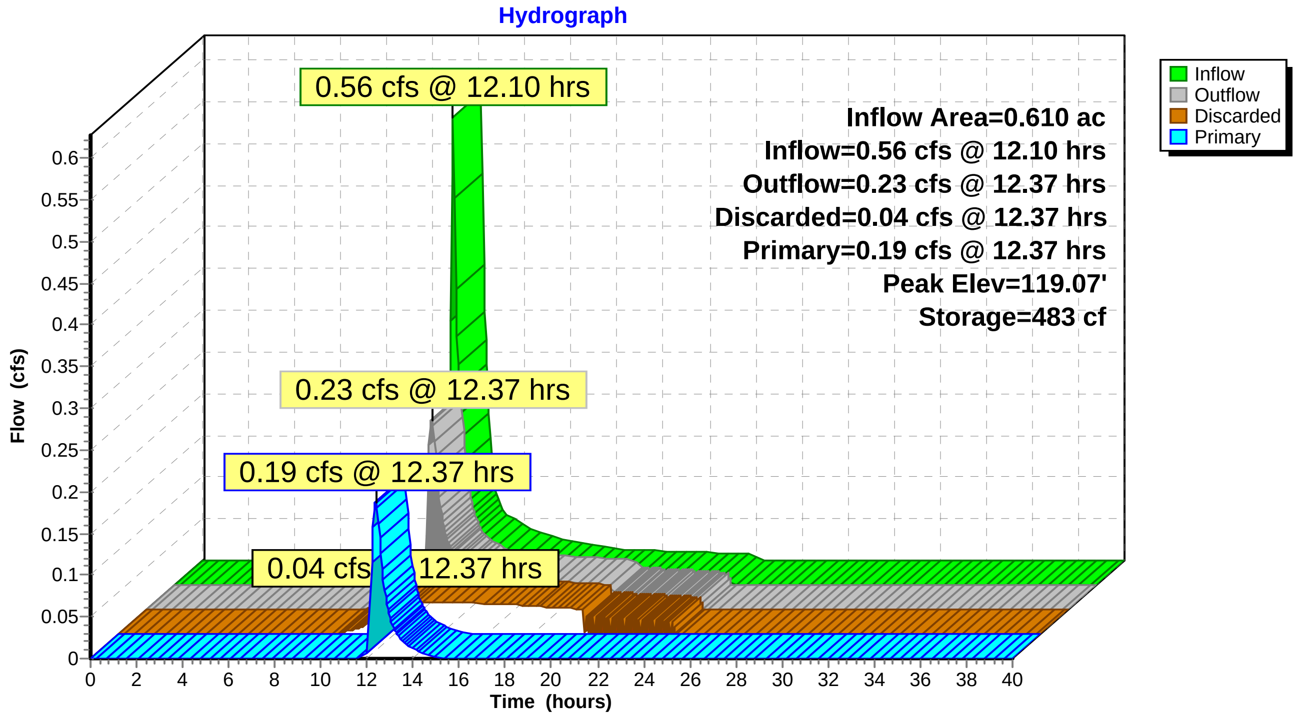
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.30	530	0	0
118.80	660	298	298
119.30	800	365	663
119.80	960	440	1,103
120.30	1,130	523	1,625
120.70	1,800	586	2,211
121.00	4,800	990	3,201
121.30	5,500	1,545	4,746

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**12.0" Round Culvert** L= 41.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 117.00' / 116.59' S= 0.0100 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Device 1	118.80'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Discarded	118.30'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.04 cfs @ 12.37 hrs HW=119.07' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.19 cfs @ 12.37 hrs HW=119.07' TW=109.51' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.19 cfs of 4.73 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.19 cfs @ 1.75 fps)

Pond 1P: Stormwater Management Area #1



Summary for Pond 2P: Stormwater Management Area #2

Inflow Area = 1.330 ac, 24.38% Impervious, Inflow Depth = 0.32" for 2-YR event
Inflow = 0.33 cfs @ 12.32 hrs, Volume= 0.035 af
Outflow = 0.04 cfs @ 14.46 hrs, Volume= 0.035 af, Atten= 89%, Lag= 128.6 min
Discarded = 0.04 cfs @ 14.46 hrs, Volume= 0.035 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 73.13' @ 14.46 hrs Surf.Area= 1,563 sf Storage= 725 cf

Plug-Flow detention time= 217.1 min calculated for 0.035 af (100% of inflow)
Center-of-Mass det. time= 217.5 min (1,089.9 - 872.4)

Volume	Invert	Avail.Storage	Storage Description
#1	72.60'	7,534 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

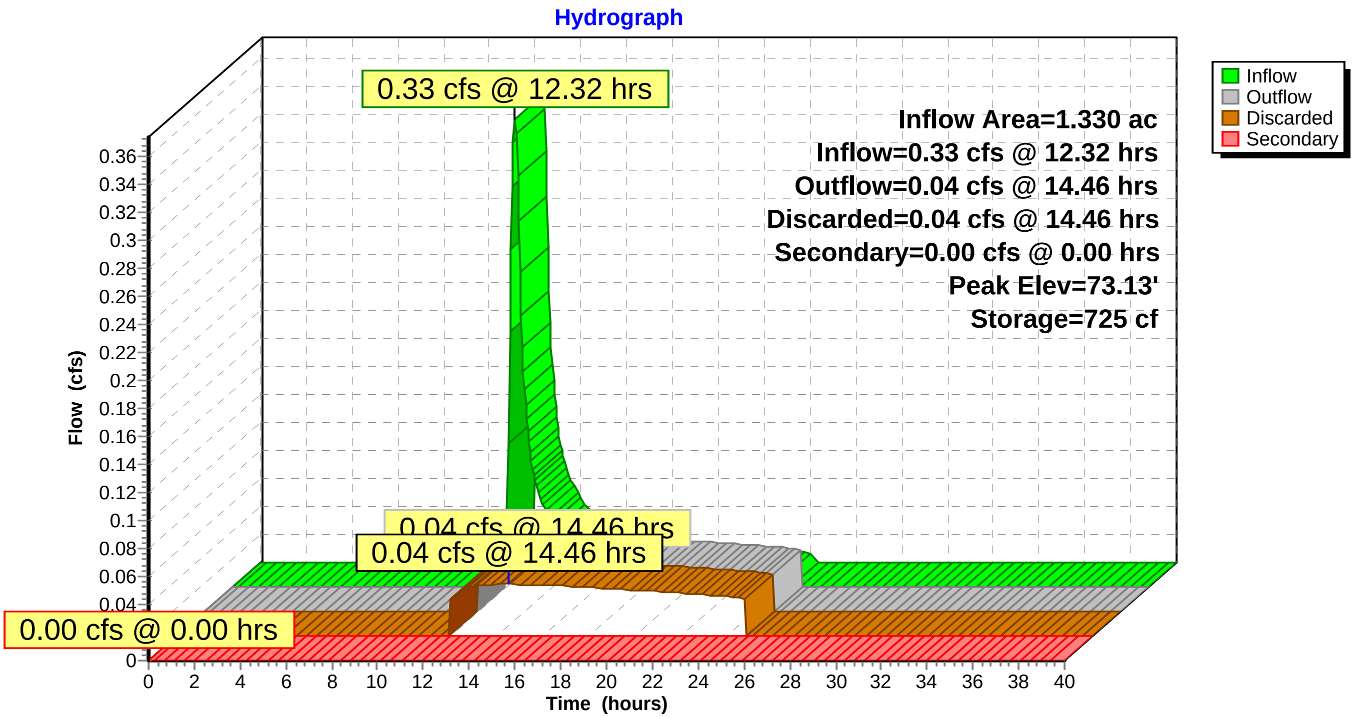
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.60	1,150	0	0
73.00	1,470	524	524
74.00	2,170	1,820	2,344
75.00	2,950	2,560	4,904
75.80	3,625	2,630	7,534

Device	Routing	Invert	Outlet Devices
#1	Discarded	72.60'	**1.020 in/hr Exfiltration over Surface area**
#2	Secondary	74.30'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.04 cfs @ 14.46 hrs HW=73.13' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.04 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=72.60' TW=0.00' (Dynamic Tailwater)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: Stormwater Management Area #2



Summary for Pond 3P: Stormwater Management Area #3

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=44)

Inflow Area = 1.014 ac, 25.29% Impervious, Inflow Depth = 0.44" for 2-YR event
Inflow = 0.32 cfs @ 12.12 hrs, Volume= 0.037 af
Outflow = 0.05 cfs @ 12.05 hrs, Volume= 0.037 af, Atten= 85%, Lag= 0.0 min
Discarded = 0.05 cfs @ 12.05 hrs, Volume= 0.037 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 97.28' @ 14.00 hrs Surf.Area= 2,102 sf Storage= 433 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 83.0 min (990.6 - 907.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	96.77'	1,779 cf	**35.33'W x 59.50'L x 3.54'H Field A**
			7,446 cf Overall - 2,999 cf Embedded = 4,447 cf x 40.0% Voids
#2A	97.27'	2,999 cf	**Cultec R-330XLHD** x 56 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		4,778 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	96.77'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	98.00'	**8.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 98.00' / 95.92' S= 0.0462 '/' Cc= 0.900
			n= 0.010, Flow Area= 0.35 sf

Discarded OutFlow Max=0.05 cfs @ 12.05 hrs HW=96.81' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=96.77' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)

Pond 3P: Stormwater Management Area #3 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 7 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

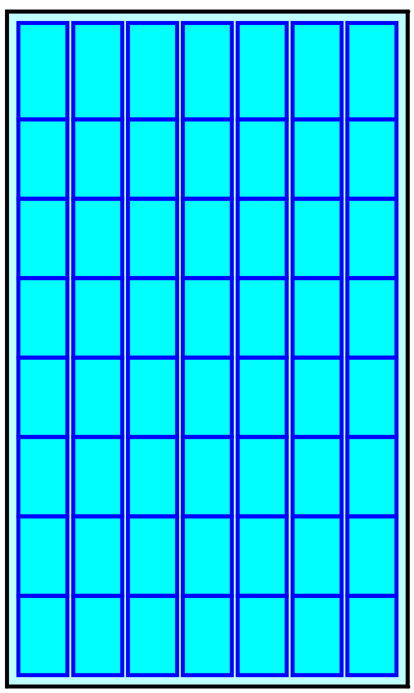
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
7 Rows x 52.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 35.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

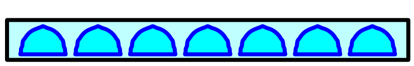
56 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 7 Rows = 2,999.0 cf Chamber Storage

7,445.8 cf Field - 2,999.0 cf Chambers = 4,446.7 cf Stone x 40.0% Voids = 1,778.7 cf Stone Storage

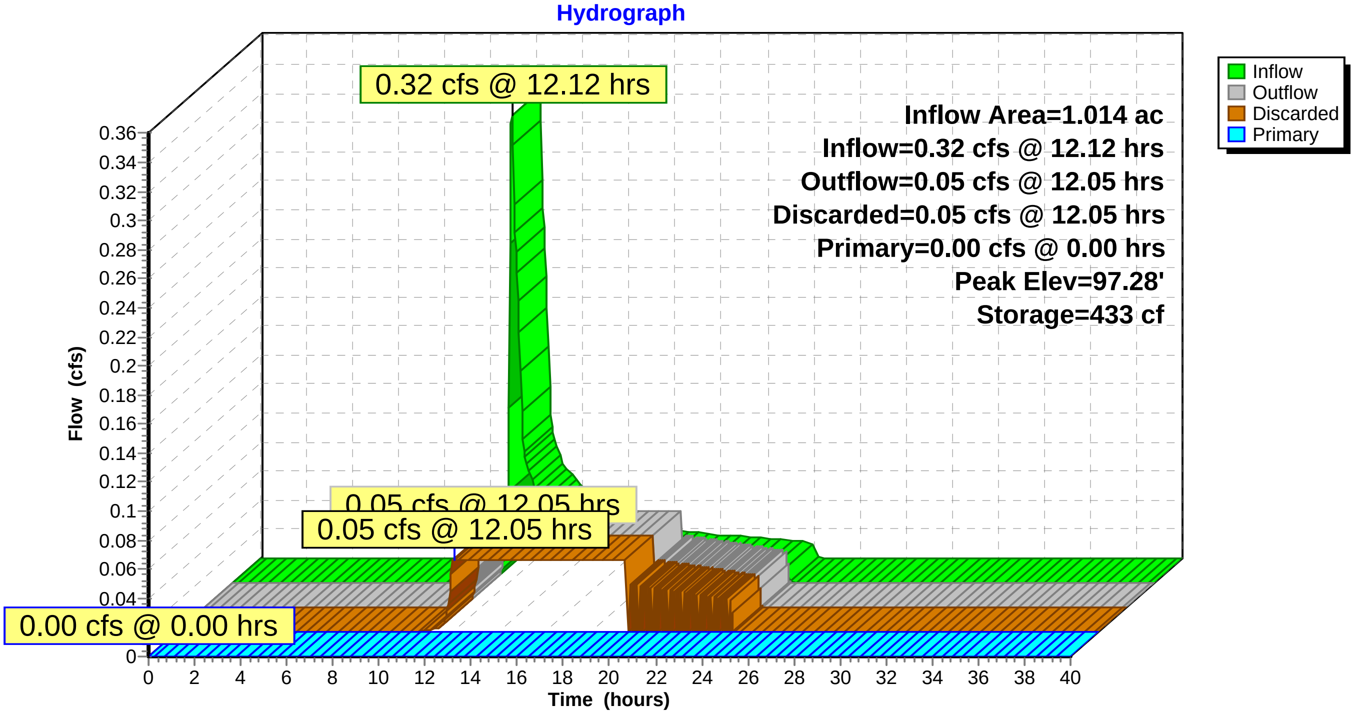
Chamber Storage + Stone Storage = 4,777.7 cf = 0.110 af
Overall Storage Efficiency = 64.2%
Overall System Size = 59.50' x 35.33' x 3.54'

56 Chambers
275.8 cy Field
164.7 cy Stone





Pond 3P: Stormwater Management Area #3



Summary for Pond 4P: Stormwater Management Area #4

Inflow Area = 1.533 ac, 5.49% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 106.80' @ 0.00 hrs Surf.Area= 150 sf Storage= 0 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	106.80'	3,728 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

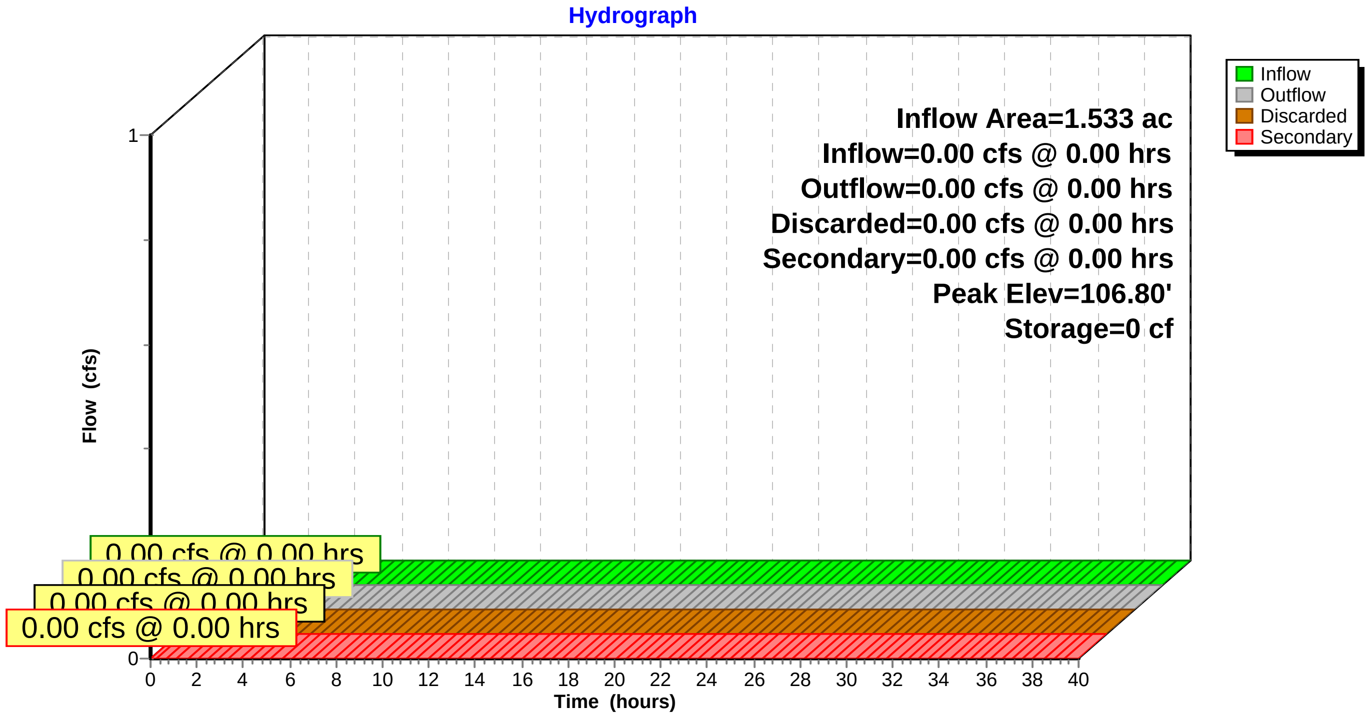
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
106.80	150	0	0
107.00	240	39	39
107.80	690	372	411
108.00	880	157	568
109.00	1,800	1,340	1,908
109.80	2,750	1,820	3,728

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	108.50'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=106.80' (Free Discharge)
└─**1=Exfiltration** (Passes 0.00 cfs of 0.01 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=106.80' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Stormwater Management Area #4



Summary for Pond 5P: Stormwater Management Area #5

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=89)

Inflow Area = 0.729 ac, 11.55% Impervious, Inflow Depth = 0.19" for 2-YR event
Inflow = 0.15 cfs @ 12.10 hrs, Volume= 0.012 af
Outflow = 0.03 cfs @ 12.57 hrs, Volume= 0.012 af, Atten= 78%, Lag= 28.2 min
Discarded = 0.03 cfs @ 12.57 hrs, Volume= 0.012 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 109.04' @ 12.57 hrs Surf.Area= 589 sf Storage= 120 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 25.5 min (895.1 - 869.6)

Volume	Invert	Avail.Storage	Storage Description
#1	108.80'	4,689 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

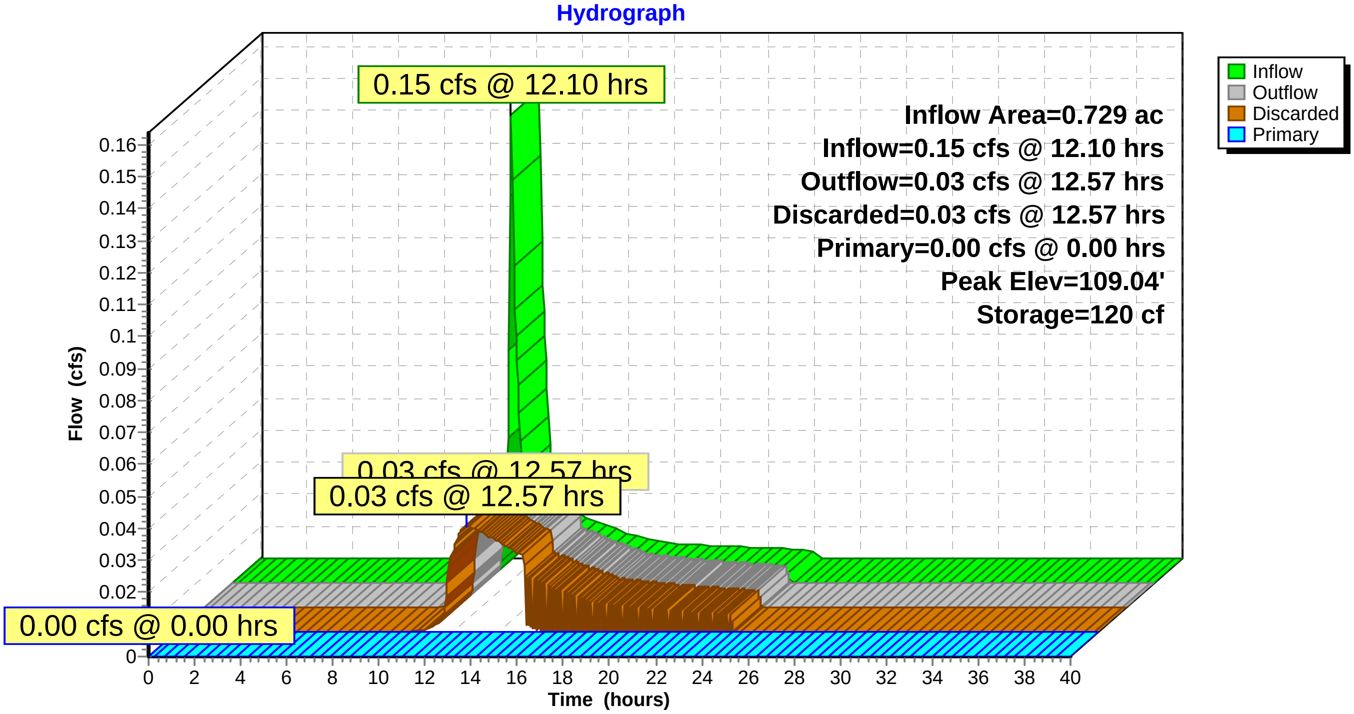
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
108.80	420	0	0
109.00	560	98	98
110.00	1,300	930	1,028
111.00	2,110	1,705	2,733
111.80	2,780	1,956	4,689

Device	Routing	Invert	Outlet Devices
#1	Discarded	108.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	110.30'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.03 cfs @ 12.57 hrs HW=109.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=108.80' TW=106.80' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: Stormwater Management Area #5



Summary for Pond 6P: Stormwater Management Area #6

Inflow Area = 1.438 ac, 0.00% Impervious, Inflow Depth = 0.15" for 2-YR event
Inflow = 0.05 cfs @ 12.47 hrs, Volume= 0.018 af
Outflow = 0.01 cfs @ 21.05 hrs, Volume= 0.018 af, Atten= 78%, Lag= 514.8 min
Discarded = 0.01 cfs @ 21.05 hrs, Volume= 0.018 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 78.26' @ 21.05 hrs Surf.Area= 485 sf Storage= 365 cf

Plug-Flow detention time= 424.7 min calculated for 0.018 af (100% of inflow)
Center-of-Mass det. time= 425.3 min (1,423.8 - 998.5)

Volume	Invert	Avail.Storage	Storage Description
#1	77.00'	2,540 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

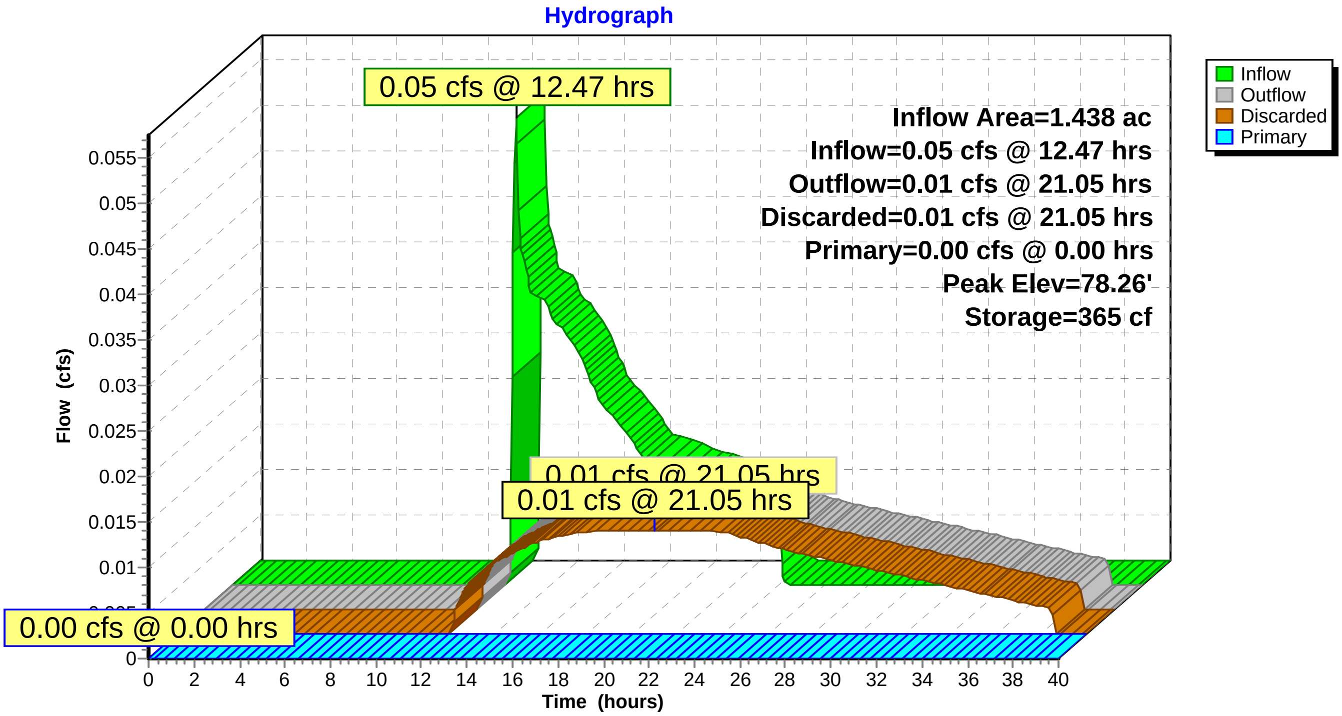
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.00	115	0	0
78.00	390	253	253
79.00	760	575	828
80.00	1,210	985	1,813
80.50	1,700	728	2,540

Device	Routing	Invert	Outlet Devices
#1	Discarded	77.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	79.00'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.01 cfs @ 21.05 hrs HW=78.26' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=77.00' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Stormwater Management Area #6



Summary for Pond 7P: DMH

[57] Hint: Peaked at 109.51' (Flood elevation advised)

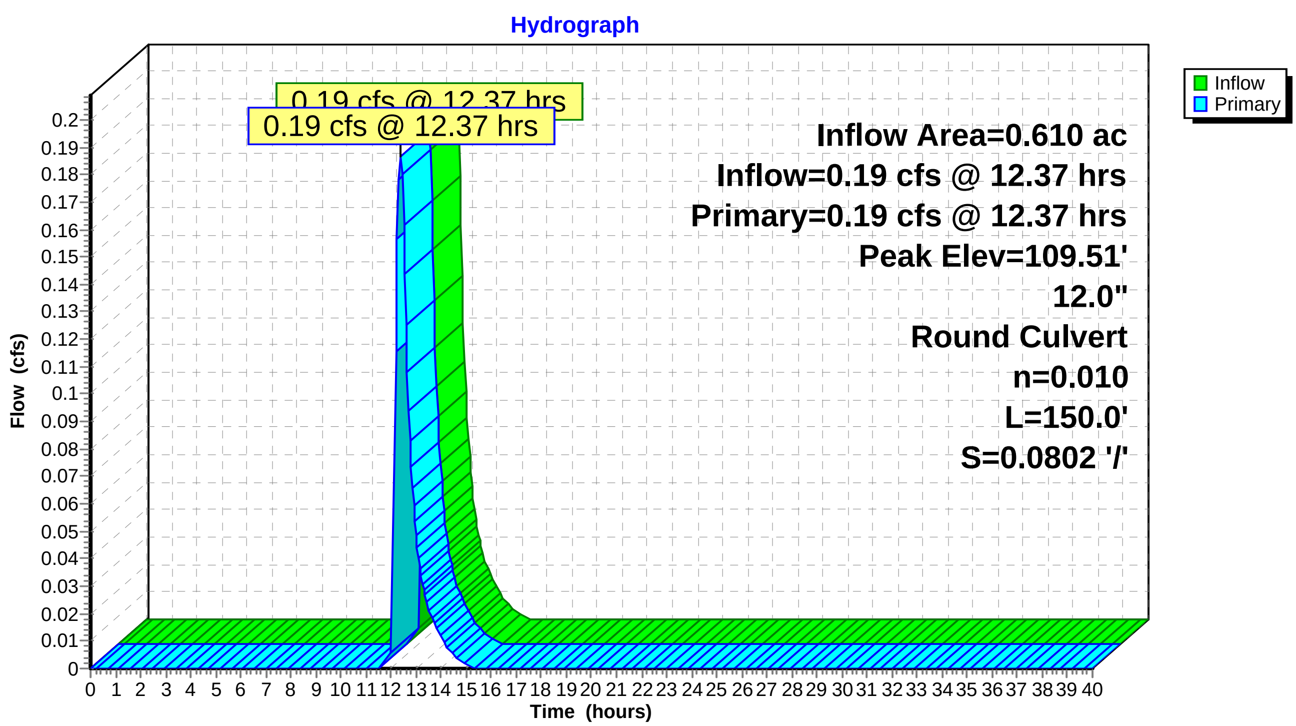
Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 0.21" for 2-YR event
Inflow = 0.19 cfs @ 12.37 hrs, Volume= 0.011 af
Outflow = 0.19 cfs @ 12.37 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min
Primary = 0.19 cfs @ 12.37 hrs, Volume= 0.011 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 109.51' @ 12.37 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	109.30'	**12.0" Round Culvert** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.30' / 97.27' S= 0.0802 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.19 cfs @ 12.37 hrs HW=109.51' TW=88.68' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.19 cfs @ 1.56 fps)

Pond 7P: DMH



Summary for Pond 8P: DMH

[57] Hint: Peaked at 88.68' (Flood elevation advised)

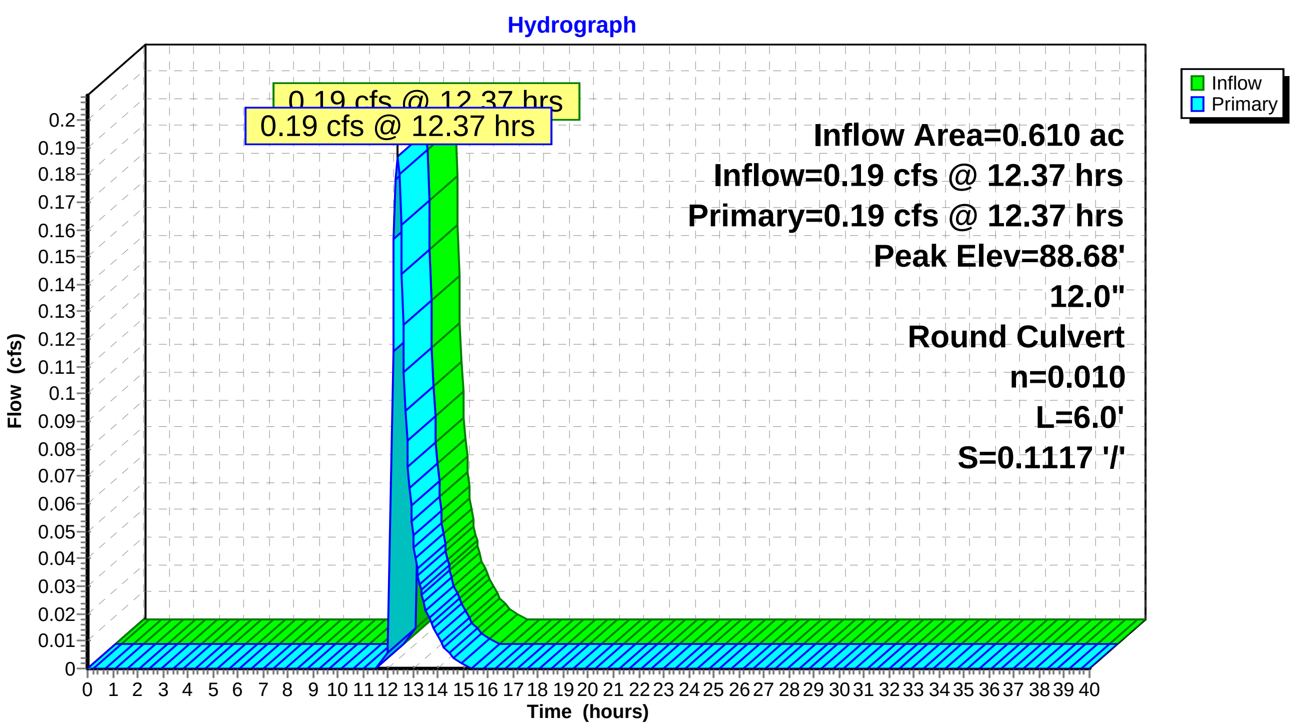
Inflow Area =	0.610 ac,	39.78% Impervious,	Inflow Depth =	0.21"	for 2-YR event
Inflow =	0.19 cfs @	12.37 hrs,	Volume=	0.011 af	
Outflow =	0.19 cfs @	12.37 hrs,	Volume=	0.011 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.19 cfs @	12.37 hrs,	Volume=	0.011 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 88.68' @ 12.37 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	88.47'	**12.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 88.47' / 87.80' S= 0.1117 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.19 cfs @ 12.37 hrs HW=88.68' TW=72.82' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.19 cfs @ 1.56 fps)

Pond 8P: DMH



Summary for Pond 9P: CB 2+85 RT

[57] Hint: Peaked at 115.30' (Flood elevation advised)

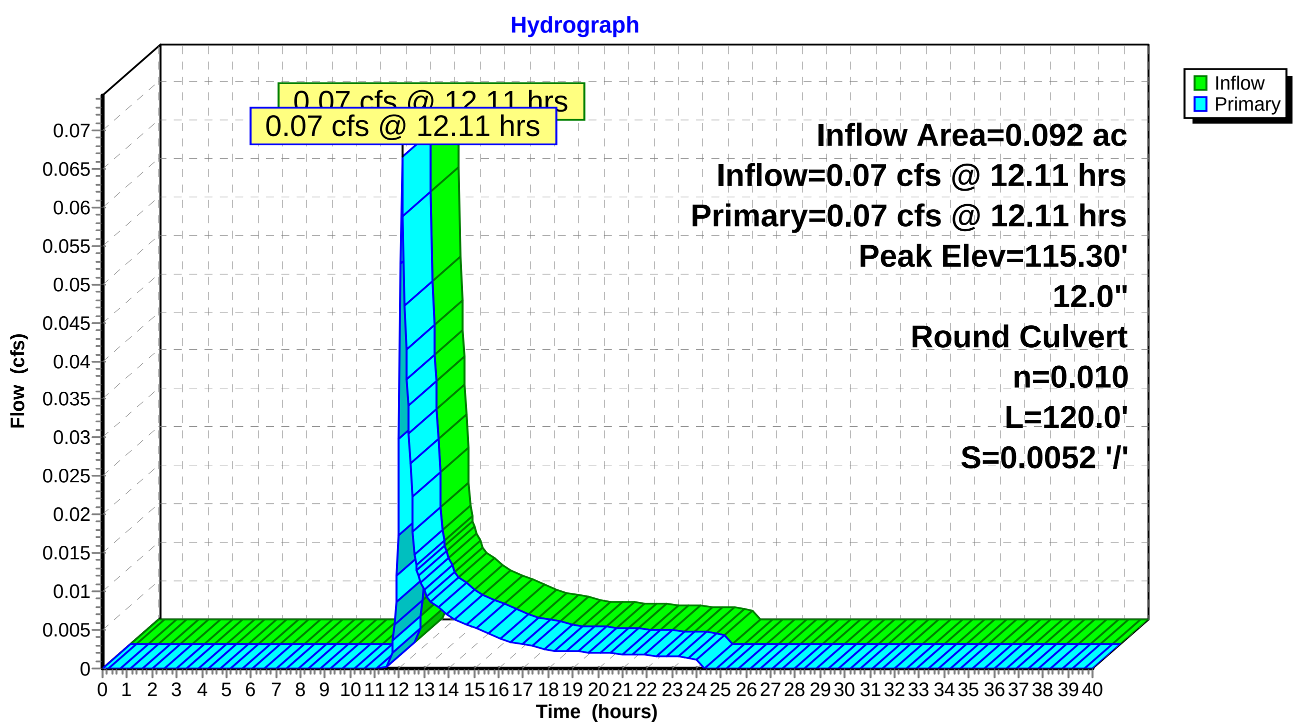
Inflow Area = 0.092 ac, 49.57% Impervious, Inflow Depth = 0.73" for 2-YR event
Inflow = 0.07 cfs @ 12.11 hrs, Volume= 0.006 af
Outflow = 0.07 cfs @ 12.11 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
Primary = 0.07 cfs @ 12.11 hrs, Volume= 0.006 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 115.30' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.17'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.17' / 114.54' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.07 cfs @ 12.11 hrs HW=115.30' TW=114.52' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.07 cfs @ 1.65 fps)

Pond 9P: CB 2+85 RT



Summary for Pond 10P: DMH 4+11

[57] Hint: Peaked at 114.52' (Flood elevation advised)

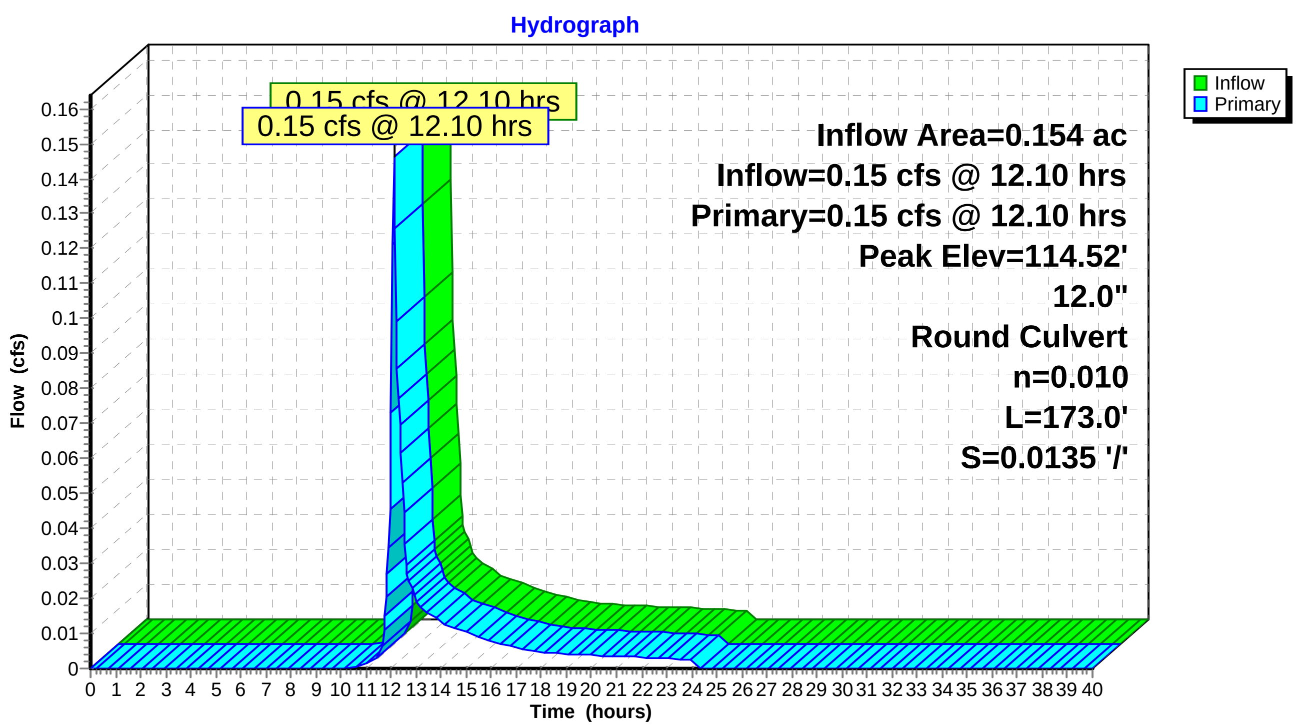
Inflow Area = 0.154 ac, 54.75% Impervious, Inflow Depth = 0.90" for 2-YR event
Inflow = 0.15 cfs @ 12.10 hrs, Volume= 0.012 af
Outflow = 0.15 cfs @ 12.10 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min
Primary = 0.15 cfs @ 12.10 hrs, Volume= 0.012 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 114.52' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	114.34'	**12.0" Round Culvert** L= 173.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 114.34' / 112.00' S= 0.0135 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.15 cfs @ 12.10 hrs HW=114.52' TW=108.90' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.15 cfs @ 1.46 fps)

Pond 10P: DMH 4+11



Summary for Pond 11P: CB 2+85 LT

[57] Hint: Peaked at 115.31' (Flood elevation advised)

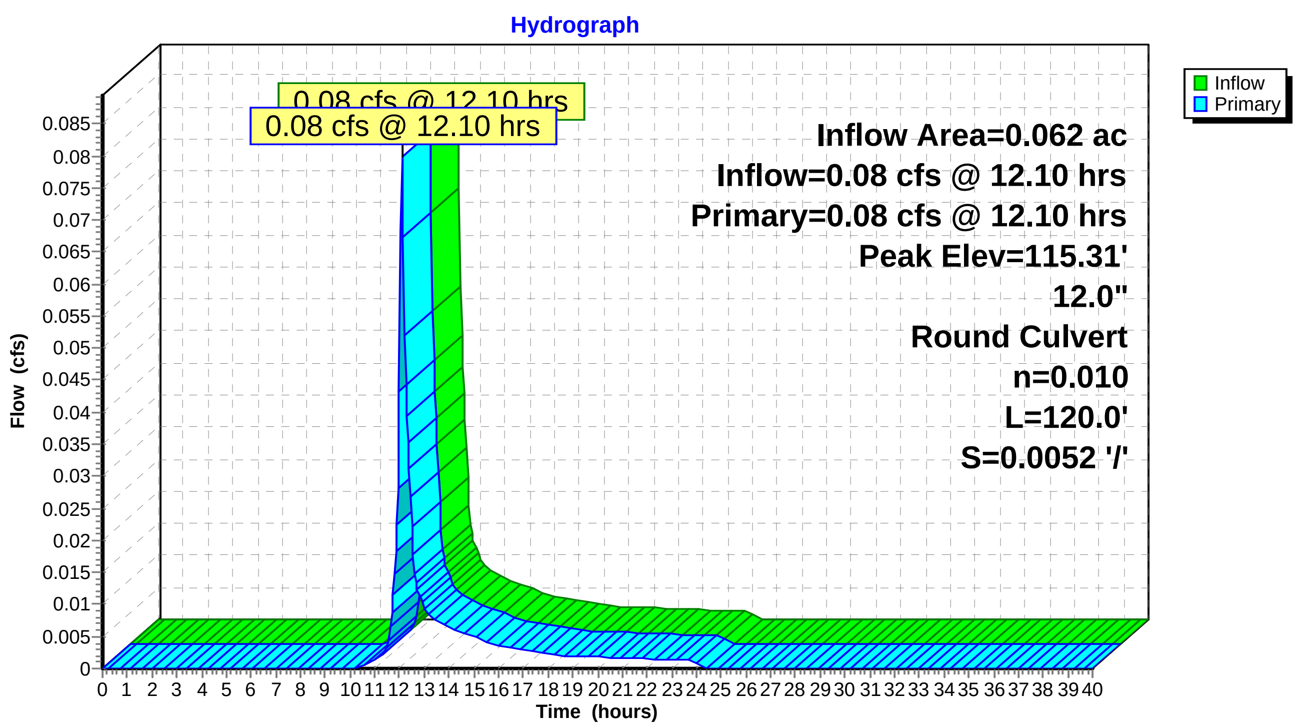
Inflow Area = 0.062 ac, 62.35% Impervious, Inflow Depth = 1.15" for 2-YR event
Inflow = 0.08 cfs @ 12.10 hrs, Volume= 0.006 af
Outflow = 0.08 cfs @ 12.10 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
Primary = 0.08 cfs @ 12.10 hrs, Volume= 0.006 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 115.31' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.17'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.17' / 114.54' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.08 cfs @ 12.10 hrs HW=115.31' TW=114.52' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.08 cfs @ 1.74 fps)

Pond 11P: CB 2+85 LT



Summary for Pond 12P: CB 1+0 RT

[57] Hint: Peaked at 101.36' (Flood elevation advised)

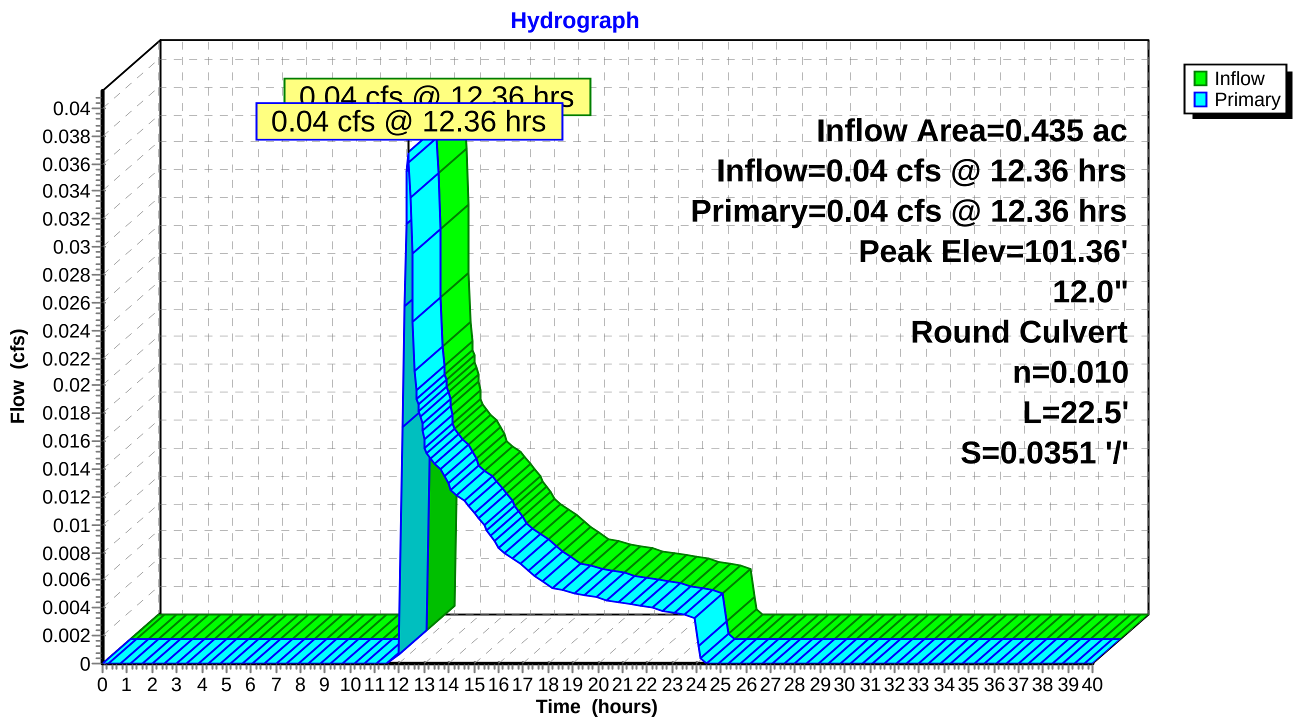
Inflow Area = 0.435 ac, 19.63% Impervious, Inflow Depth = 0.22" for 2-YR event
Inflow = 0.04 cfs @ 12.36 hrs, Volume= 0.008 af
Outflow = 0.04 cfs @ 12.36 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min
Primary = 0.04 cfs @ 12.36 hrs, Volume= 0.008 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.36' @ 12.36 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.27'	**12.0" Round Culvert** L= 22.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.27' / 100.48' S= 0.0351 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.04 cfs @ 12.36 hrs HW=101.36' TW=100.54' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.04 cfs @ 1.03 fps)

Pond 12P: CB 1+0 RT



Summary for Pond 13P: CB 1+0 LT

[57] Hint: Peaked at 101.44' (Flood elevation advised)

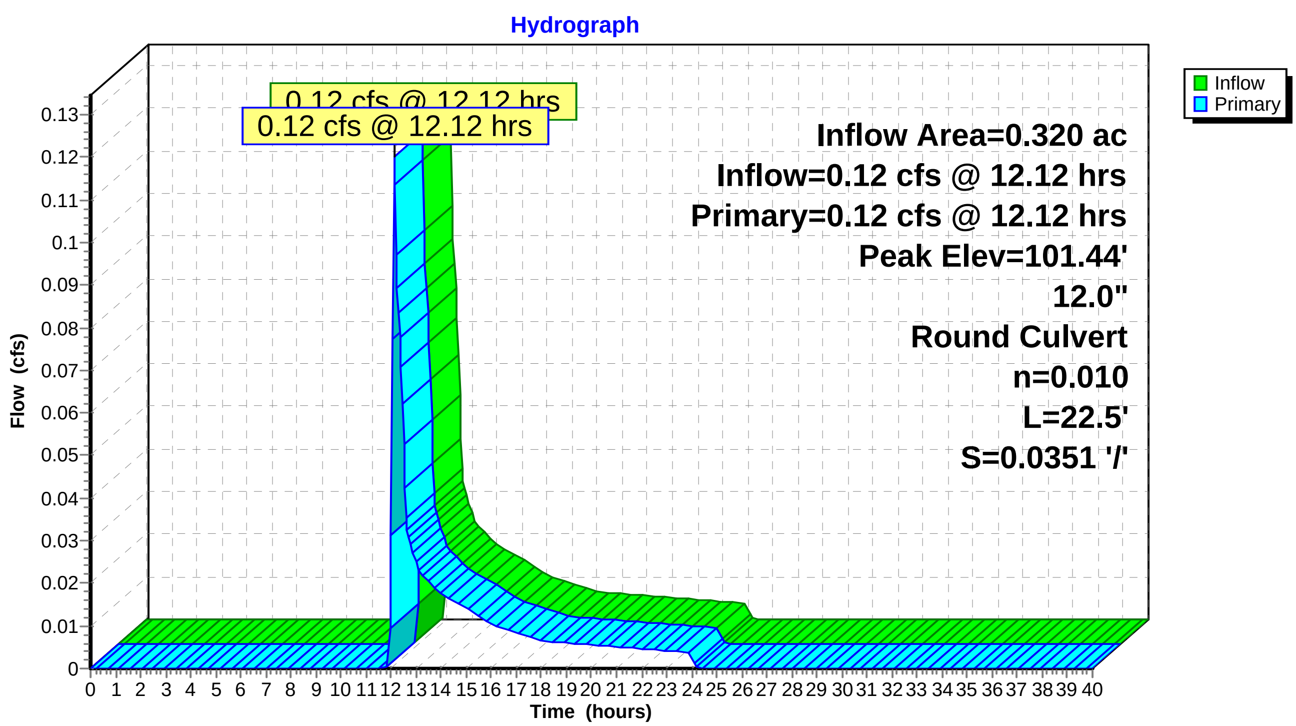
Inflow Area =	0.320 ac, 30.31% Impervious, Inflow Depth = 0.48" for 2-YR event		
Inflow =	0.12 cfs @ 12.12 hrs, Volume=	0.013 af	
Outflow =	0.12 cfs @ 12.12 hrs, Volume=	0.013 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.12 cfs @ 12.12 hrs, Volume=	0.013 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.44' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.27'	**12.0" Round Culvert** L= 22.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.27' / 100.48' S= 0.0351 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.12 cfs @ 12.12 hrs HW=101.43' TW=100.55' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.12 cfs @ 1.38 fps)

Pond 13P: CB 1+0 LT



Summary for Pond 14P: DMH 0+75

[57] Hint: Peaked at 100.55' (Flood elevation advised)

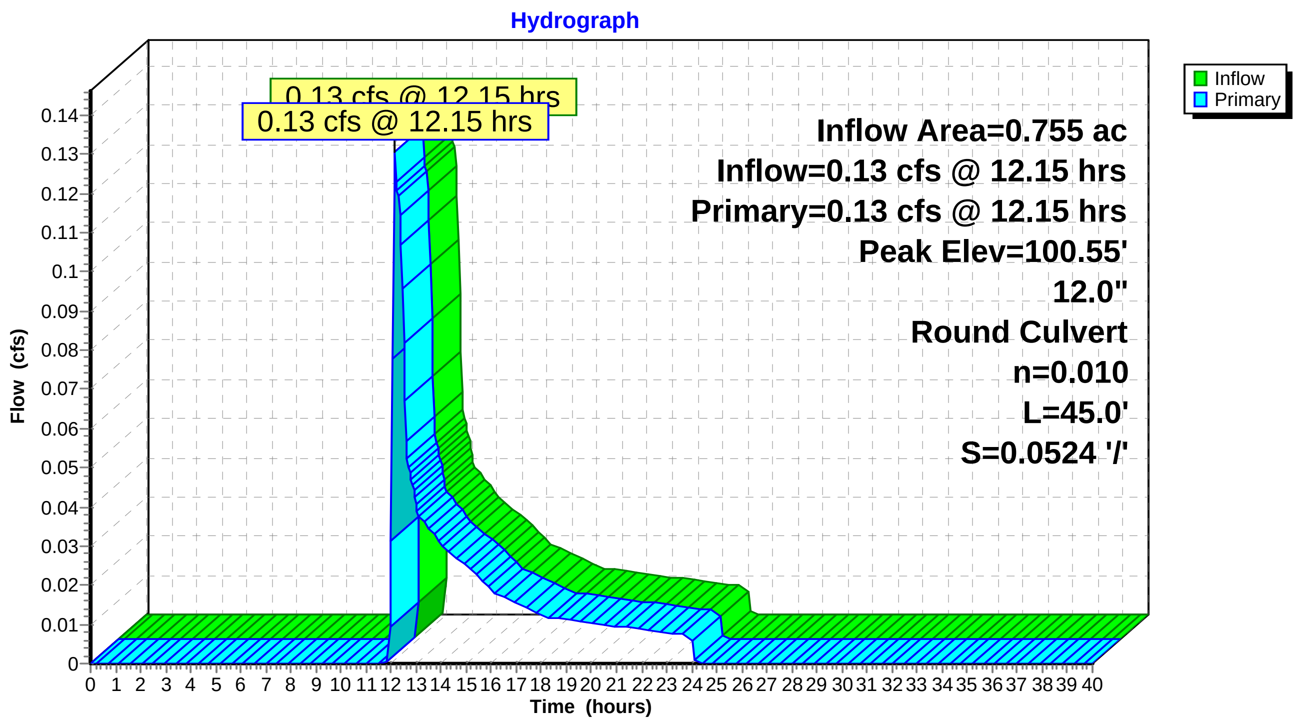
Inflow Area =	0.755 ac, 24.16% Impervious, Inflow Depth = 0.33"	for 2-YR event	
Inflow =	0.13 cfs @ 12.15 hrs, Volume=	0.021 af	
Outflow =	0.13 cfs @ 12.15 hrs, Volume=	0.021 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.13 cfs @ 12.15 hrs, Volume=	0.021 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 100.55' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	100.38'	**12.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 100.38' / 98.02' S= 0.0524 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 12.15 hrs HW=100.55' TW=98.29' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.13 cfs @ 1.42 fps)

Pond 14P: DMH 0+75



Summary for Pond 15P: DMH 0+25

[57] Hint: Peaked at 98.30' (Flood elevation advised)

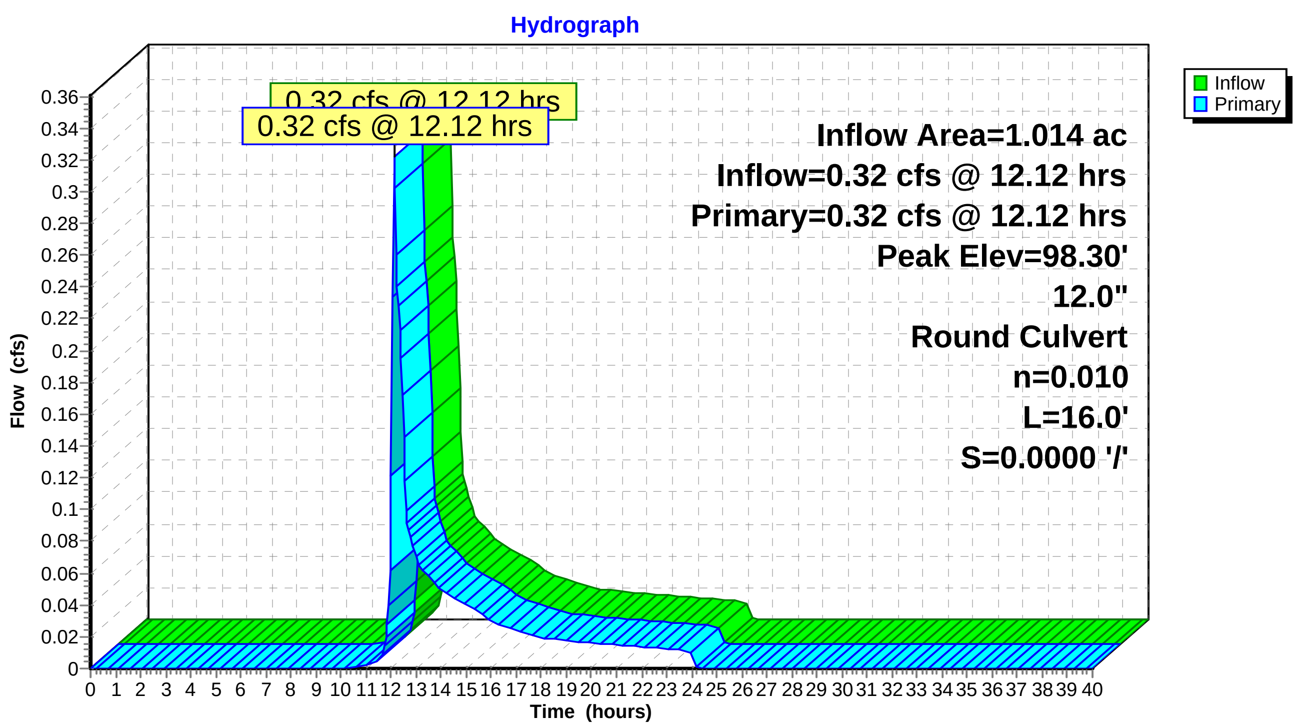
Inflow Area = 1.014 ac, 25.29% Impervious, Inflow Depth = 0.44" for 2-YR event
Inflow = 0.32 cfs @ 12.12 hrs, Volume= 0.037 af
Outflow = 0.32 cfs @ 12.12 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Primary = 0.32 cfs @ 12.12 hrs, Volume= 0.037 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.30' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.92'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.92' / 97.92' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.31 cfs @ 12.12 hrs HW=98.29' TW=97.95' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.31 cfs @ 1.72 fps)

Pond 15P: DMH 0+25



Summary for Pond 16P: CB 0+08 LT

[57] Hint: Peaked at 98.40' (Flood elevation advised)

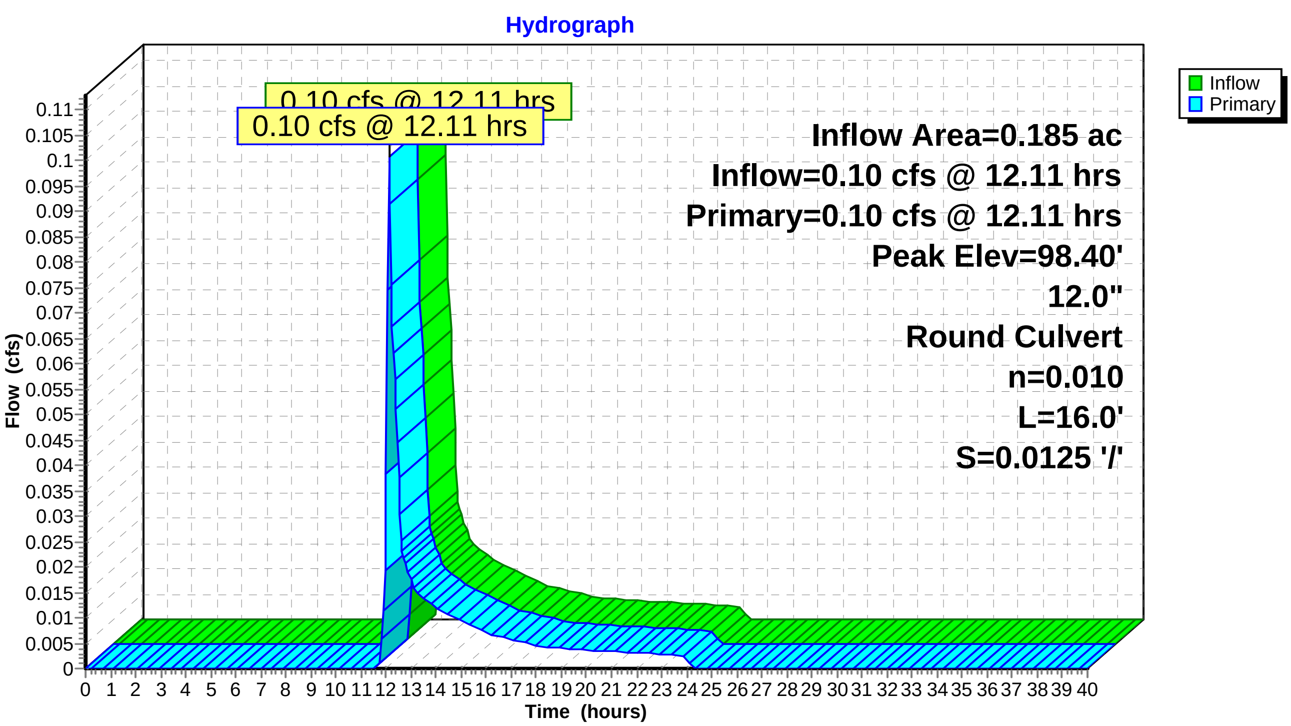
Inflow Area = 0.185 ac, 23.51% Impervious, Inflow Depth = 0.60" for 2-YR event
Inflow = 0.10 cfs @ 12.11 hrs, Volume= 0.009 af
Outflow = 0.10 cfs @ 12.11 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min
Primary = 0.10 cfs @ 12.11 hrs, Volume= 0.009 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.40' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.22'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.22' / 98.02' S= 0.0125 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.10 cfs @ 12.11 hrs HW=98.40' TW=98.29' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.10 cfs @ 1.55 fps)

Pond 16P: CB 0+08 LT



Summary for Pond 17P: CB 0+08 RT

[57] Hint: Peaked at 98.40' (Flood elevation advised)

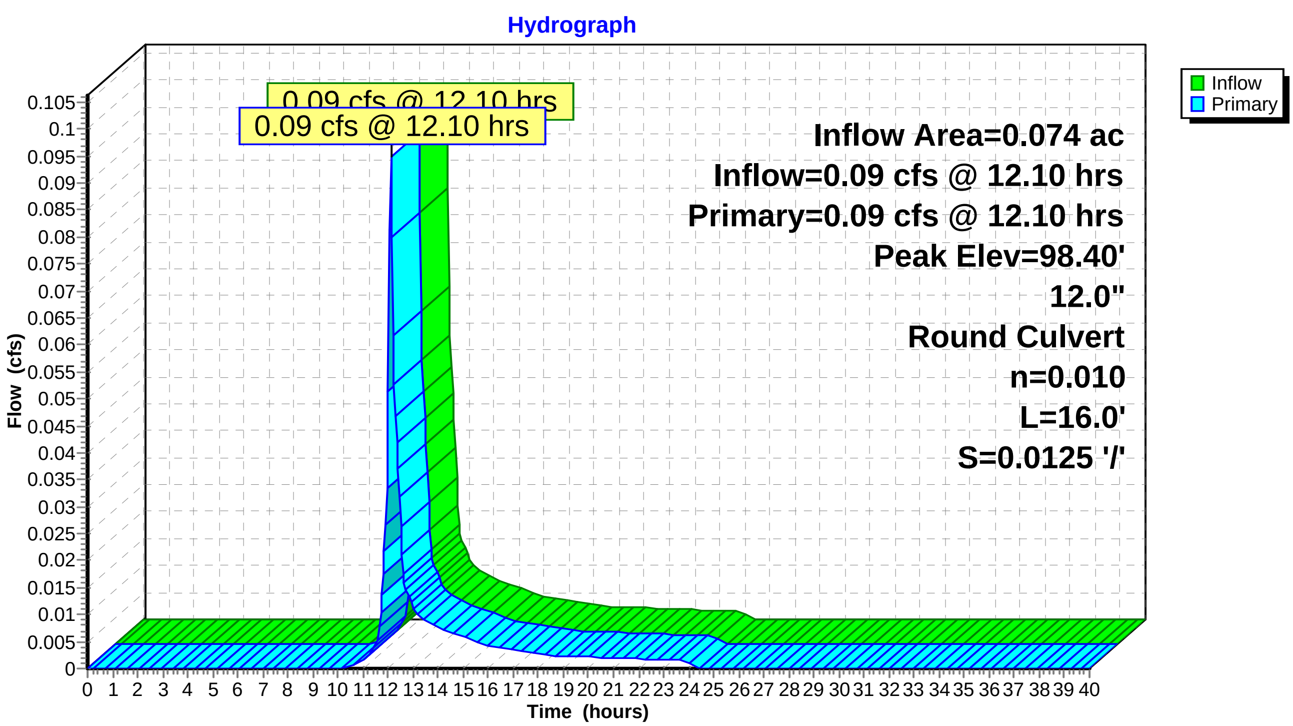
Inflow Area =	0.074 ac, 41.25% Impervious, Inflow Depth = 1.15"	for 2-YR event	
Inflow =	0.09 cfs @ 12.10 hrs, Volume=	0.007 af	
Outflow =	0.09 cfs @ 12.10 hrs, Volume=	0.007 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.09 cfs @ 12.10 hrs, Volume=	0.007 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.40' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.22'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.22' / 98.02' S= 0.0125 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.09 cfs @ 12.10 hrs HW=98.40' TW=98.30' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.09 cfs @ 1.53 fps)

Pond 17P: CB 0+08 RT



Summary for Pond 18P: SOS

[57] Hint: Peaked at 97.96' (Flood elevation advised)

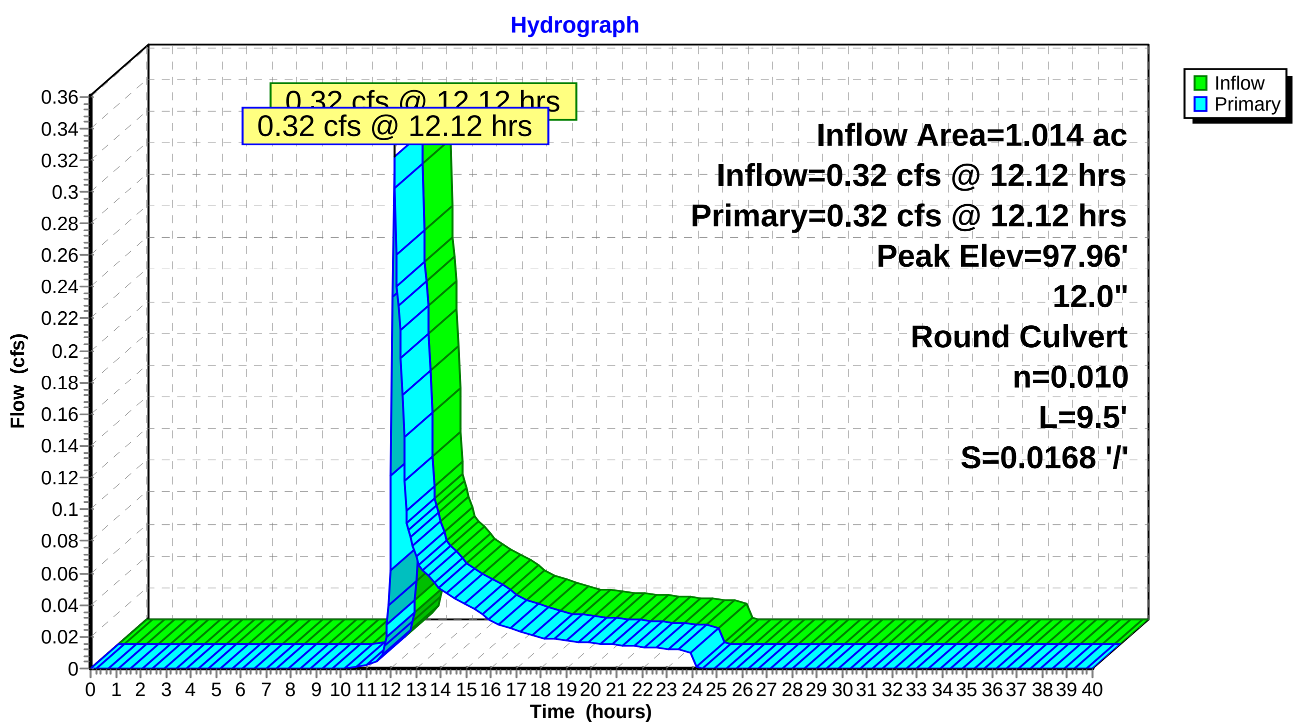
Inflow Area = 1.014 ac, 25.29% Impervious, Inflow Depth = 0.44" for 2-YR event
Inflow = 0.32 cfs @ 12.12 hrs, Volume= 0.037 af
Outflow = 0.32 cfs @ 12.12 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Primary = 0.32 cfs @ 12.12 hrs, Volume= 0.037 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 97.96' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.68'	**12.0" Round Culvert** L= 9.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.68' / 97.52' S= 0.0168 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.31 cfs @ 12.12 hrs HW=97.95' TW=96.88' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.31 cfs @ 1.78 fps)

Pond 18P: SOS

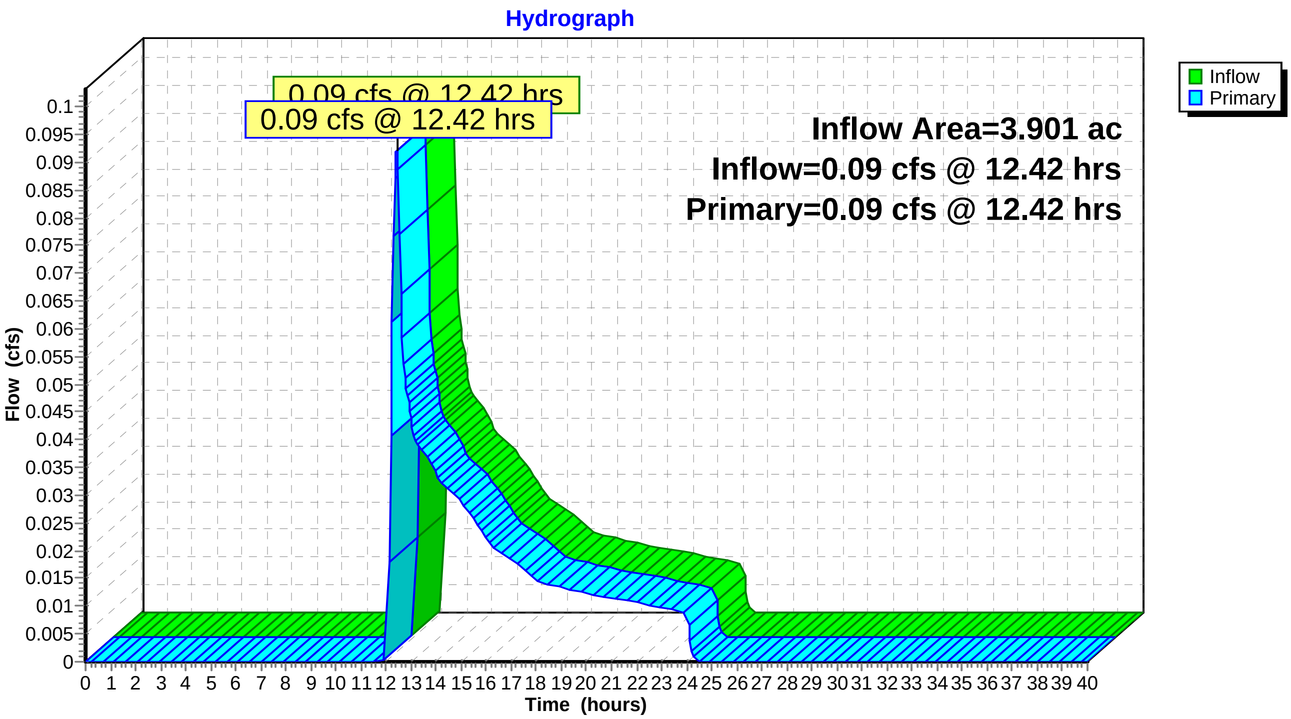


Summary for Link 1L: Flow towards wetlands

Inflow Area = 3.901 ac, 8.31% Impervious, Inflow Depth = 0.06" for 2-YR event
Inflow = 0.09 cfs @ 12.42 hrs, Volume= 0.021 af
Primary = 0.09 cfs @ 12.42 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L: Flow towards wetlands

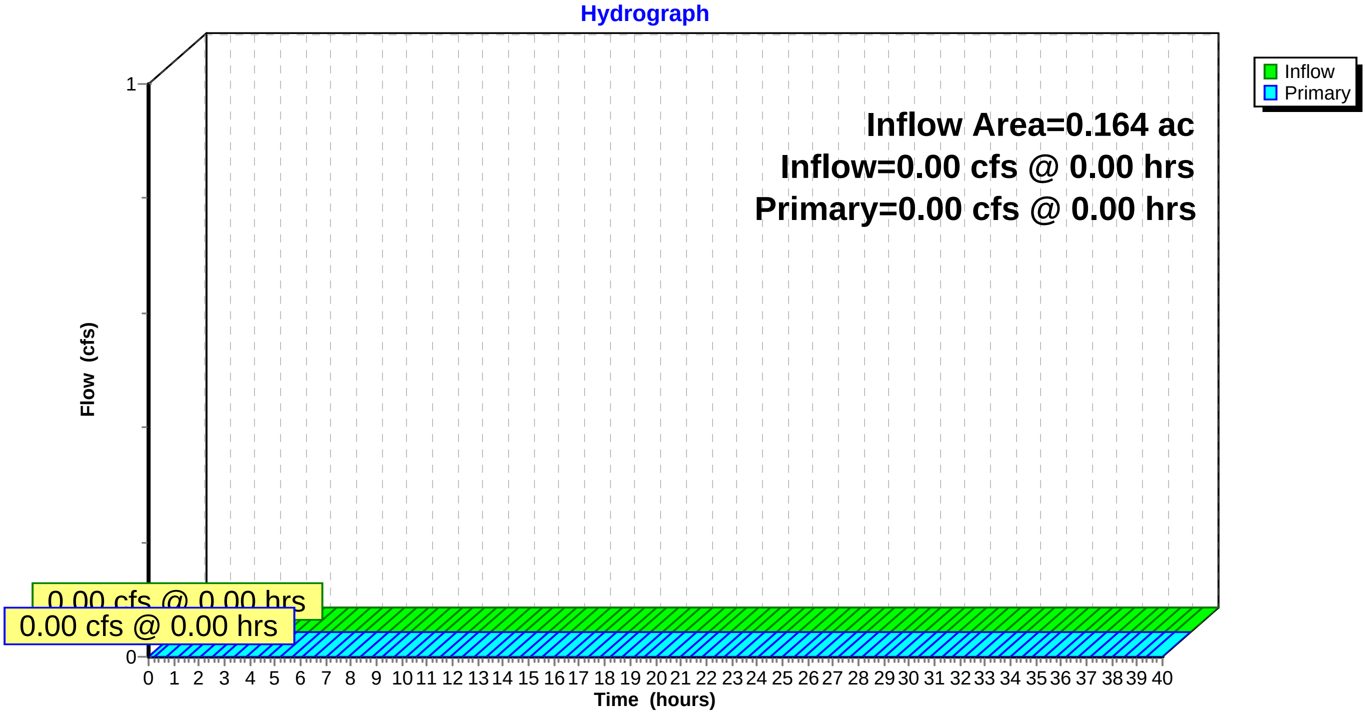


Summary for Link 2L: flow to the north

Inflow Area =	0.164 ac,	0.00% Impervious,	Inflow Depth = 0.00"	for 2-YR event
Inflow =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L: flow to the north

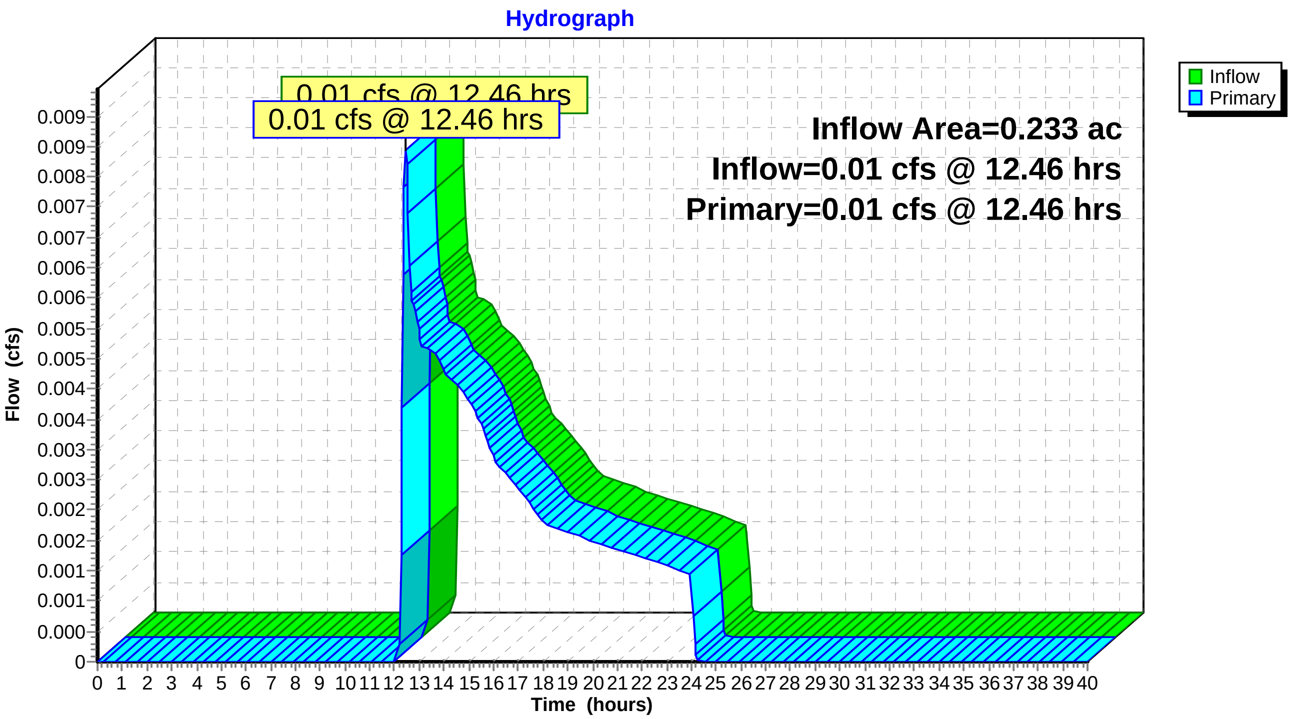


Summary for Link 3L: Flow to existing cb on north-side of Elm Street

Inflow Area = 0.233 ac, 0.00% Impervious, Inflow Depth = 0.15" for 2-YR event
Inflow = 0.01 cfs @ 12.46 hrs, Volume= 0.003 af
Primary = 0.01 cfs @ 12.46 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L: Flow to existing cb on north-side of Elm Street

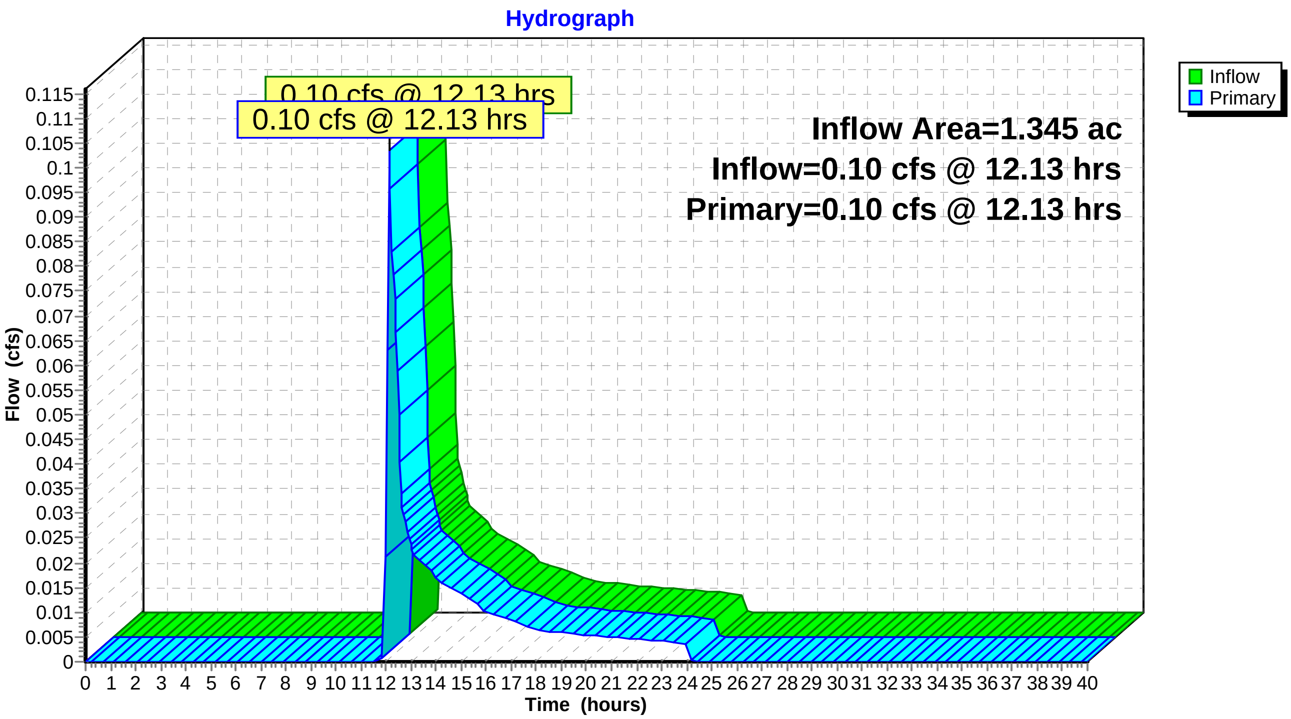


Summary for Link 4L: Flow towards north-side of Elm Street

Inflow Area = 1.345 ac, 19.93% Impervious, Inflow Depth = 0.11" for 2-YR event
Inflow = 0.10 cfs @ 12.13 hrs, Volume= 0.012 af
Primary = 0.10 cfs @ 12.13 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L: Flow towards north-side of Elm Street

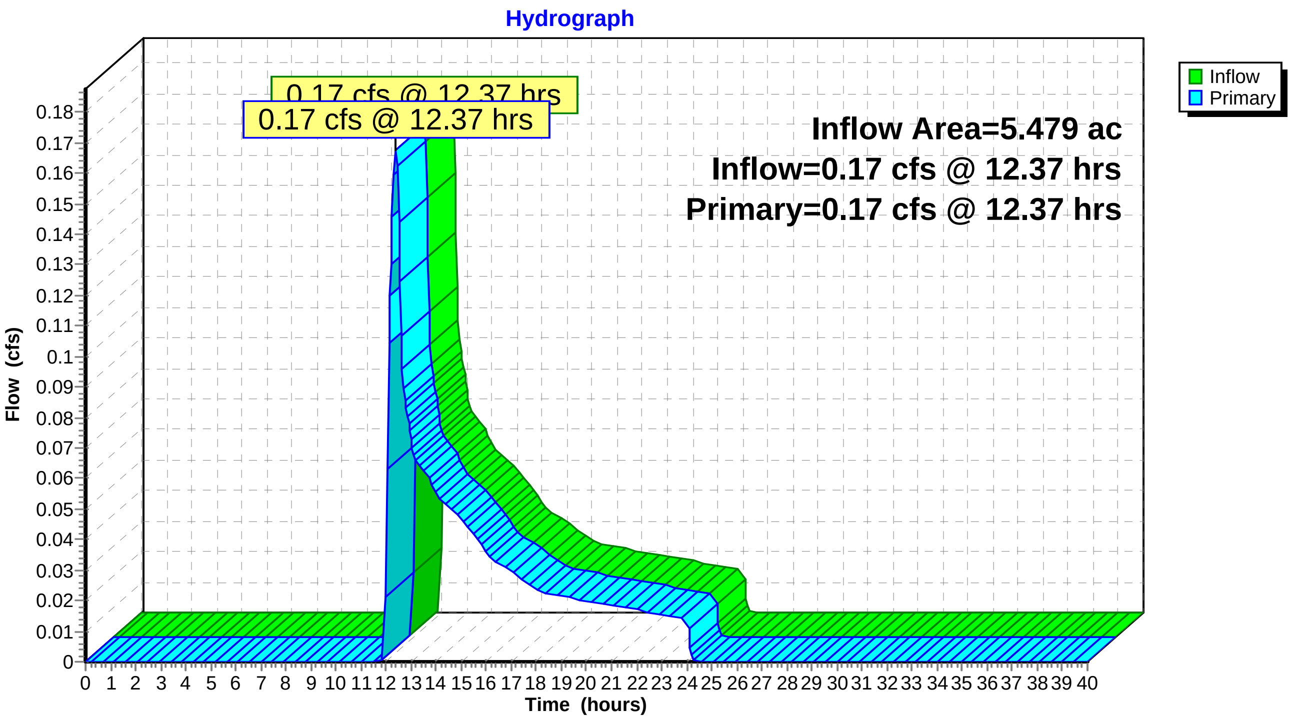


Summary for Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

Inflow Area = 5.479 ac, 10.81% Impervious, Inflow Depth = 0.08" for 2-YR event
Inflow = 0.17 cfs @ 12.37 hrs, Volume= 0.036 af
Primary = 0.17 cfs @ 12.37 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

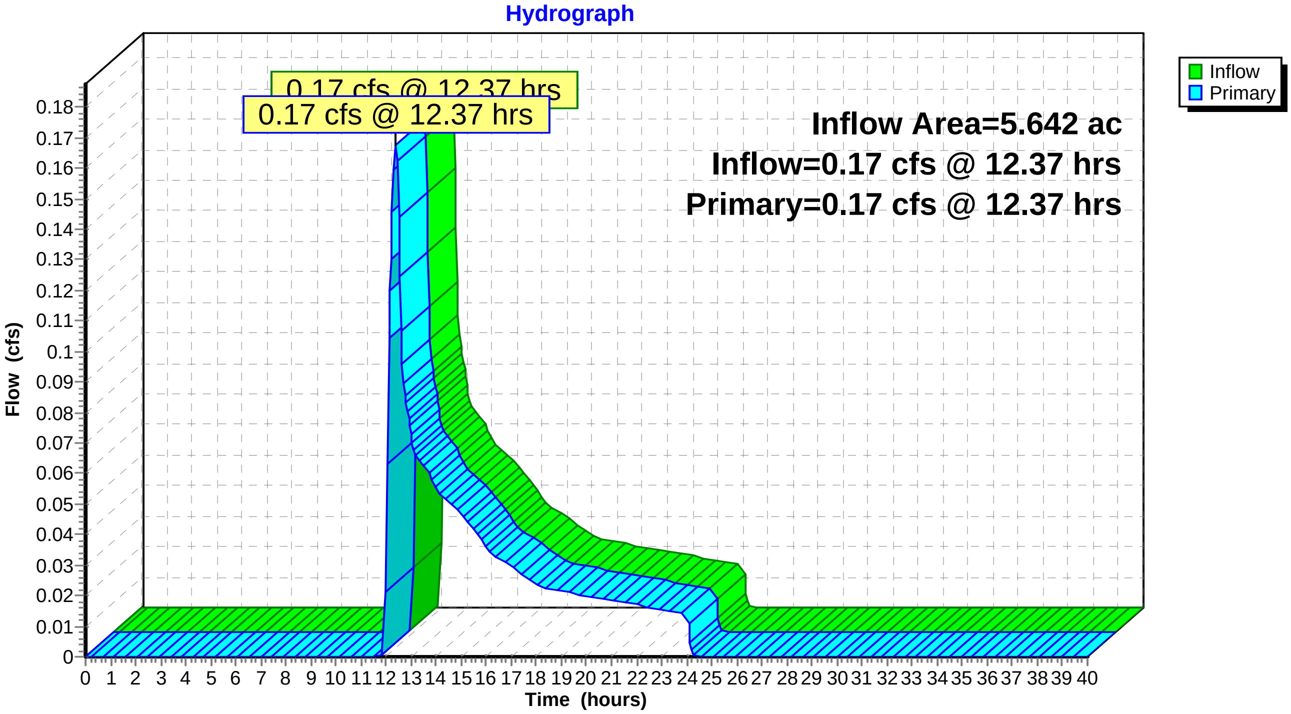


Summary for Link 6L: Total runoff discharging from within the limit of watershed analysis

Inflow Area = 5.642 ac, 10.50% Impervious, Inflow Depth = 0.08" for 2-YR event
Inflow = 0.17 cfs @ 12.37 hrs, Volume= 0.036 af
Primary = 0.17 cfs @ 12.37 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 6L: Total runoff discharging from within the limit of watershed analysis



Summary for Subcatchment 1S: EX-1R

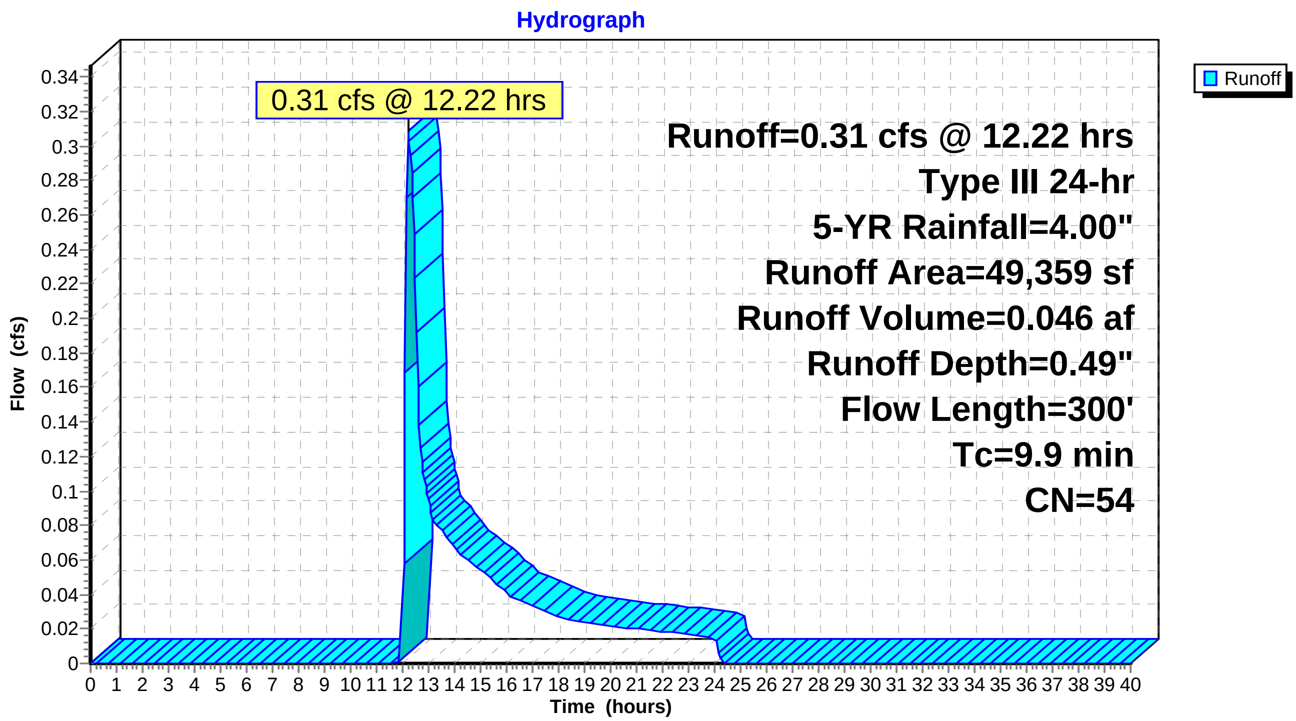
Runoff = 0.31 cfs @ 12.22 hrs, Volume= 0.046 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
1,009	30	Woods, Good, HSG A
33,181	55	Woods, Good, HSG B
5,769	39	>75% Grass cover, Good, HSG A
9,400	61	>75% Grass cover, Good, HSG B
49,359	54	Weighted Average
49,359		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0450	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	250	0.0630	4.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.9	300	Total			

Subcatchment 1S: EX-1R



Summary for Subcatchment 2S: EX-2R

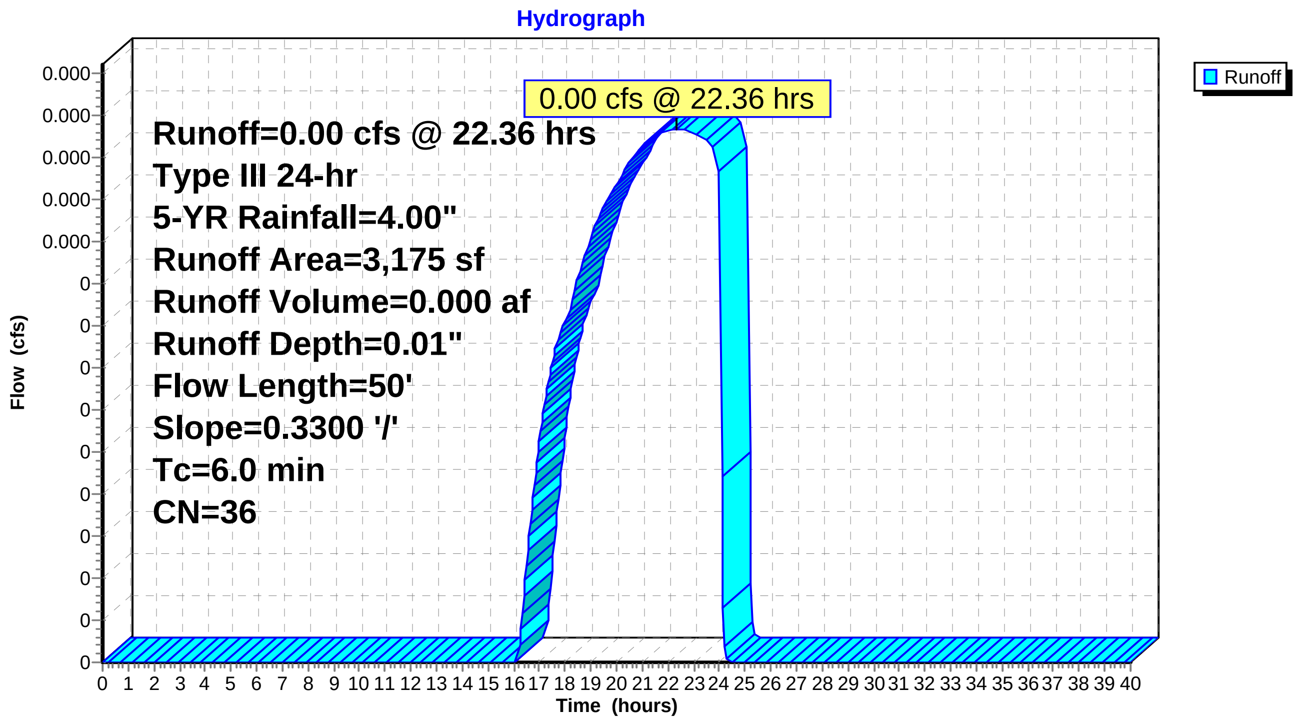
Runoff = 0.00 cfs @ 22.36 hrs, Volume= 0.000 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
1,000	30	Woods, Good, HSG A
2,175	39	>75% Grass cover, Good, HSG A
3,175	36	Weighted Average
3,175		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	50	0.3300	0.45		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.8	50	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: EX-2R



Summary for Subcatchment 3S: EX-3R

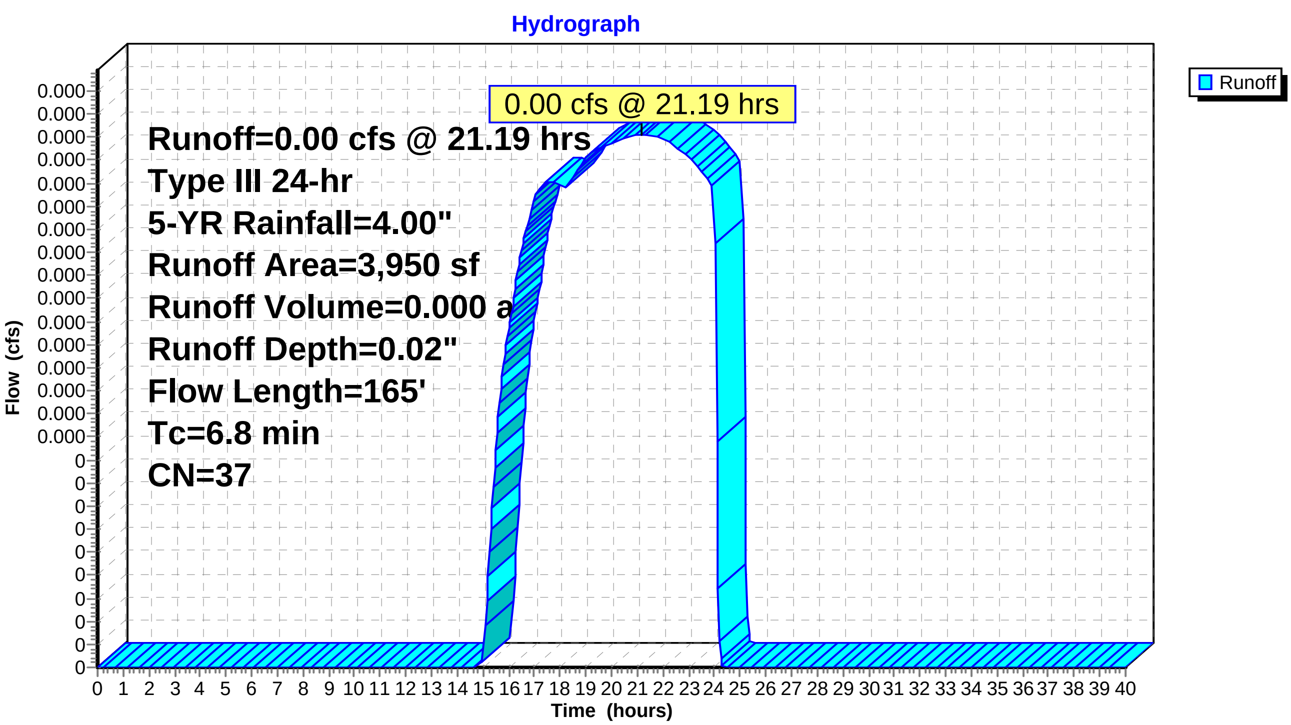
Runoff = 0.00 cfs @ 21.19 hrs, Volume= 0.000 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
1,000	30	Woods, Good, HSG A
2,950	39	>75% Grass cover, Good, HSG A
3,950	37	Weighted Average
3,950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	115	0.1400	6.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	165	Total			

Subcatchment 3S: EX-3R



Summary for Subcatchment 4S: EX-4R

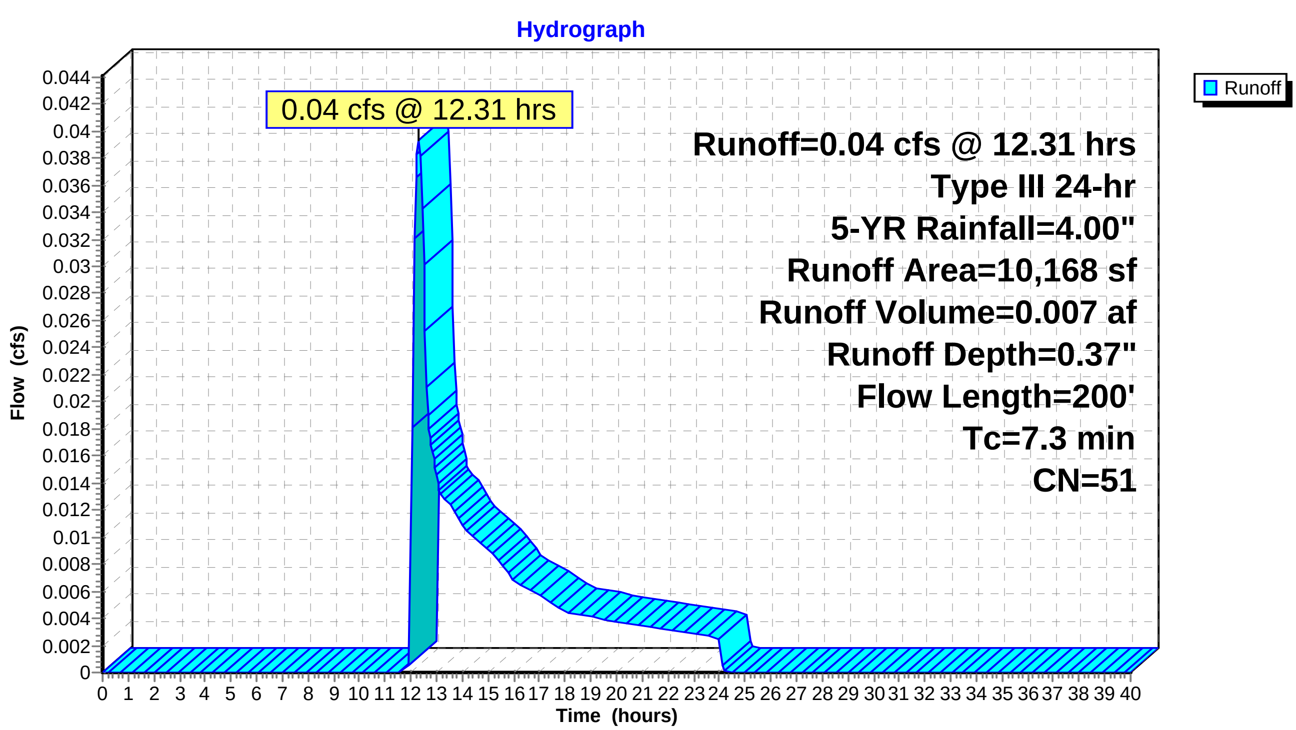
Runoff = 0.04 cfs @ 12.31 hrs, Volume= 0.007 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
1,573	30	Woods, Good, HSG A
8,595	55	Woods, Good, HSG B
10,168	51	Weighted Average
10,168		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0860	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	140	0.1520	6.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.1100	6.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	200	Total			

Subcatchment 4S: EX-4R



Summary for Subcatchment 5S: EX-5R

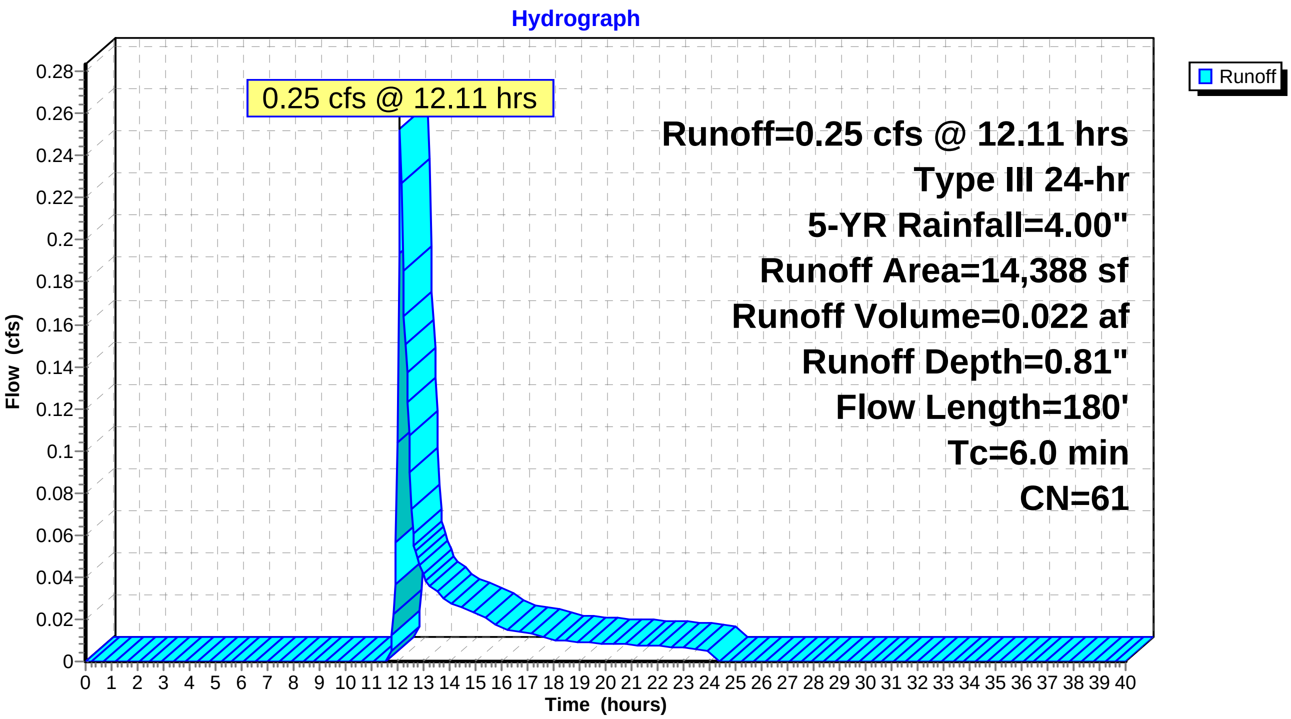
Runoff = 0.25 cfs @ 12.11 hrs, Volume= 0.022 af, Depth= 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
278	30	Woods, Good, HSG A
2,500	55	Woods, Good, HSG B
500	98	Paved parking, HSG B
11,110	61	>75% Grass cover, Good, HSG B
14,388	61	Weighted Average
13,888		96.52% Pervious Area
500		3.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	50	0.1900	0.36		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.4	130	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	180	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: EX-5R



Summary for Subcatchment 7S: PR-1R

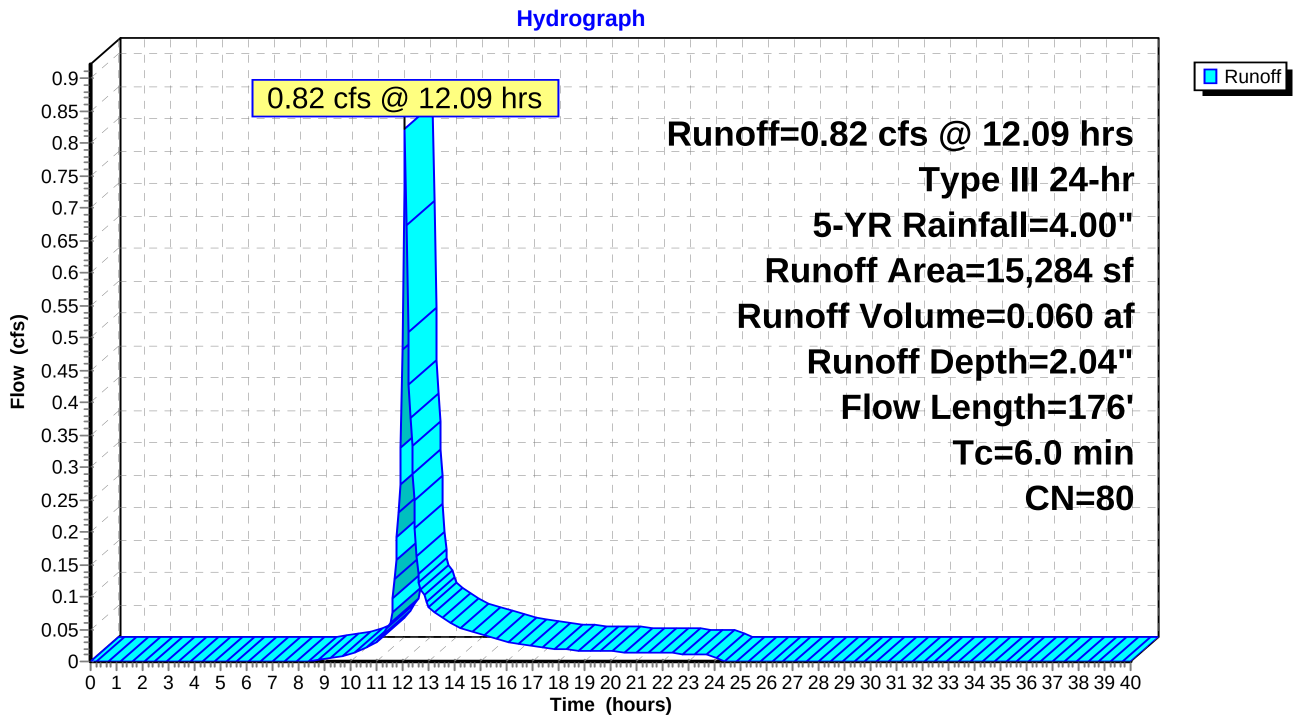
Runoff = 0.82 cfs @ 12.09 hrs, Volume= 0.060 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
4,718	39	>75% Grass cover, Good, HSG A
10,566	98	Paved parking, HSG A
15,284	80	Weighted Average
4,718		30.87% Pervious Area
10,566		69.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0310	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.5	125	0.0430	4.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	26	0.0120	2.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	176	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7S: PR-1R



Summary for Subcatchment 8S: PR-2R

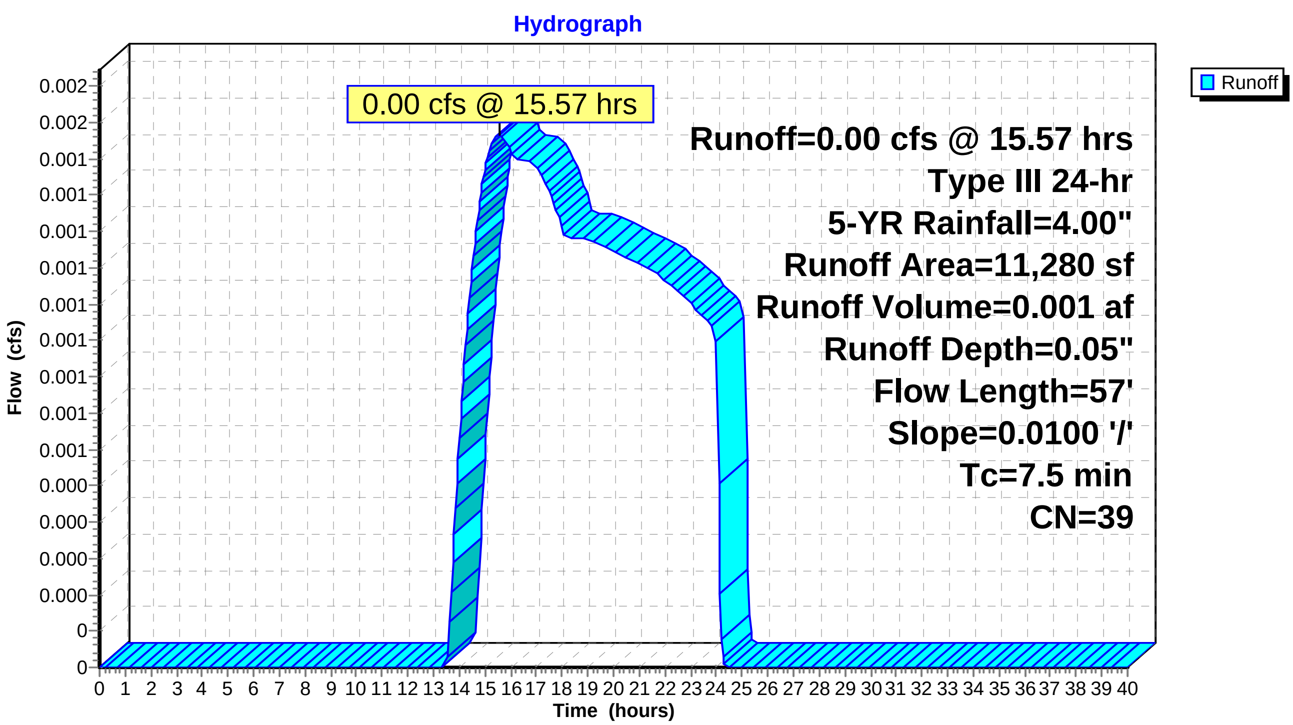
Runoff = 0.00 cfs @ 15.57 hrs, Volume= 0.001 af, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
11,193	39	>75% Grass cover, Good, HSG A
87	61	>75% Grass cover, Good, HSG B
11,280	39	Weighted Average
11,280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	7	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	57	Total			

Subcatchment 8S: PR-2R



Summary for Subcatchment 9S: PR-3R

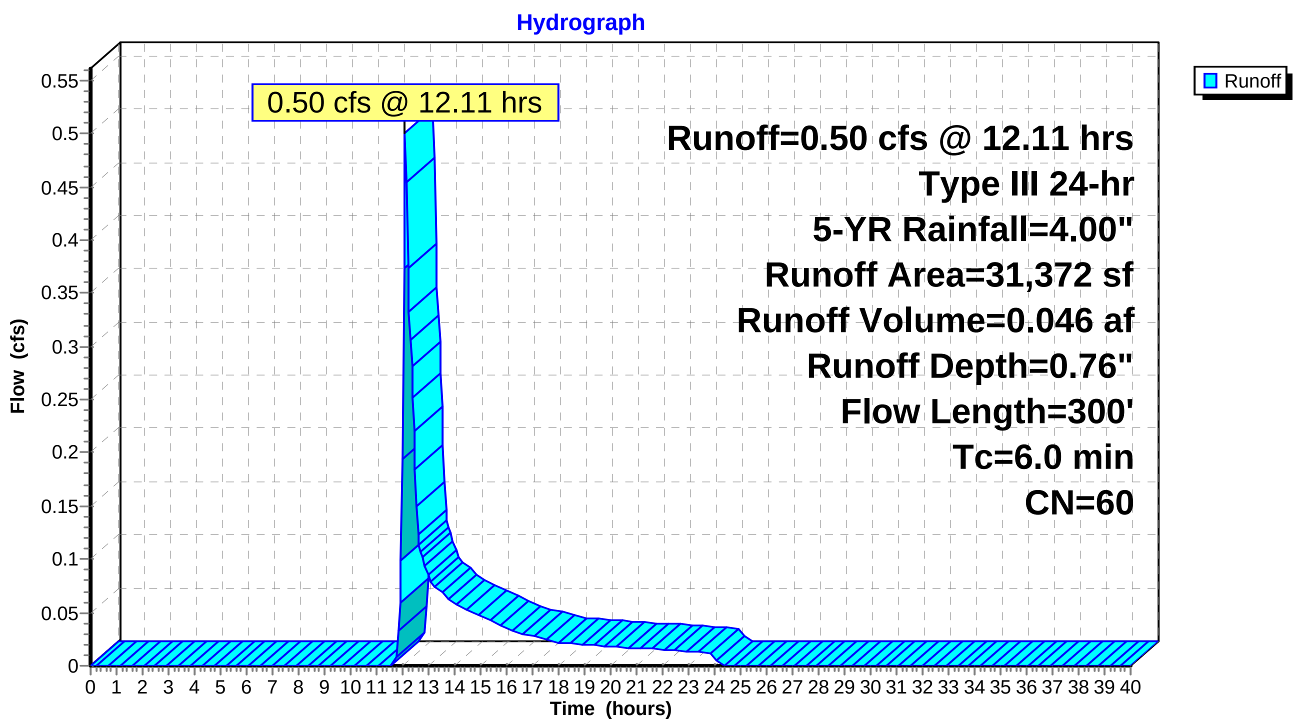
Runoff = 0.50 cfs @ 12.11 hrs, Volume= 0.046 af, Depth= 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
6,795	39	>75% Grass cover, Good, HSG A
21,016	61	>75% Grass cover, Good, HSG B
1,143	98	Paved parking, HSG A
2,418	98	Paved parking, HSG B
31,372	60	Weighted Average
27,811		88.65% Pervious Area
3,561		11.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0700	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.5	150	0.1060	5.24		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	100	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.2	300	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 9S: PR-3R



Summary for Subcatchment 10S: PR-4R

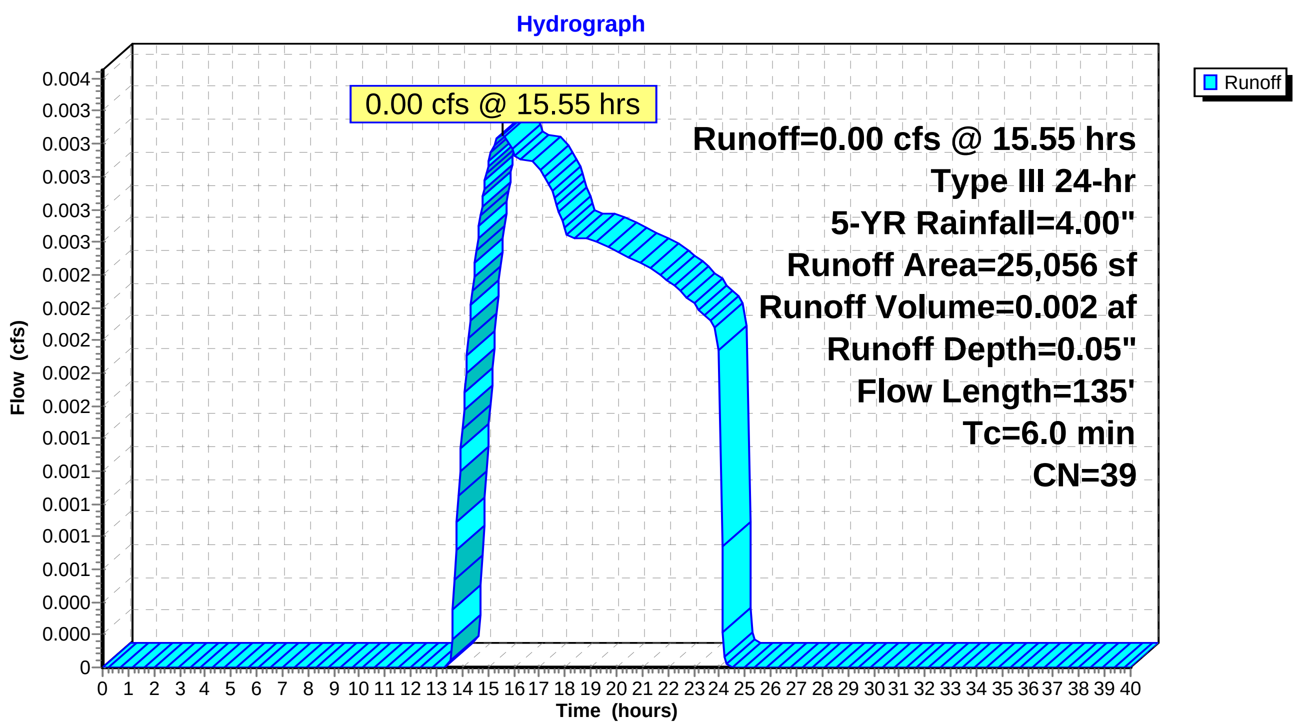
Runoff = 0.00 cfs @ 15.55 hrs, Volume= 0.002 af, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
25,056	39	>75% Grass cover, Good, HSG A
25,056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.2	80	0.1560	6.36		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	5	0.3300	9.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.5	135	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 10S: PR-4R



Summary for Subcatchment 11S: PR-5R

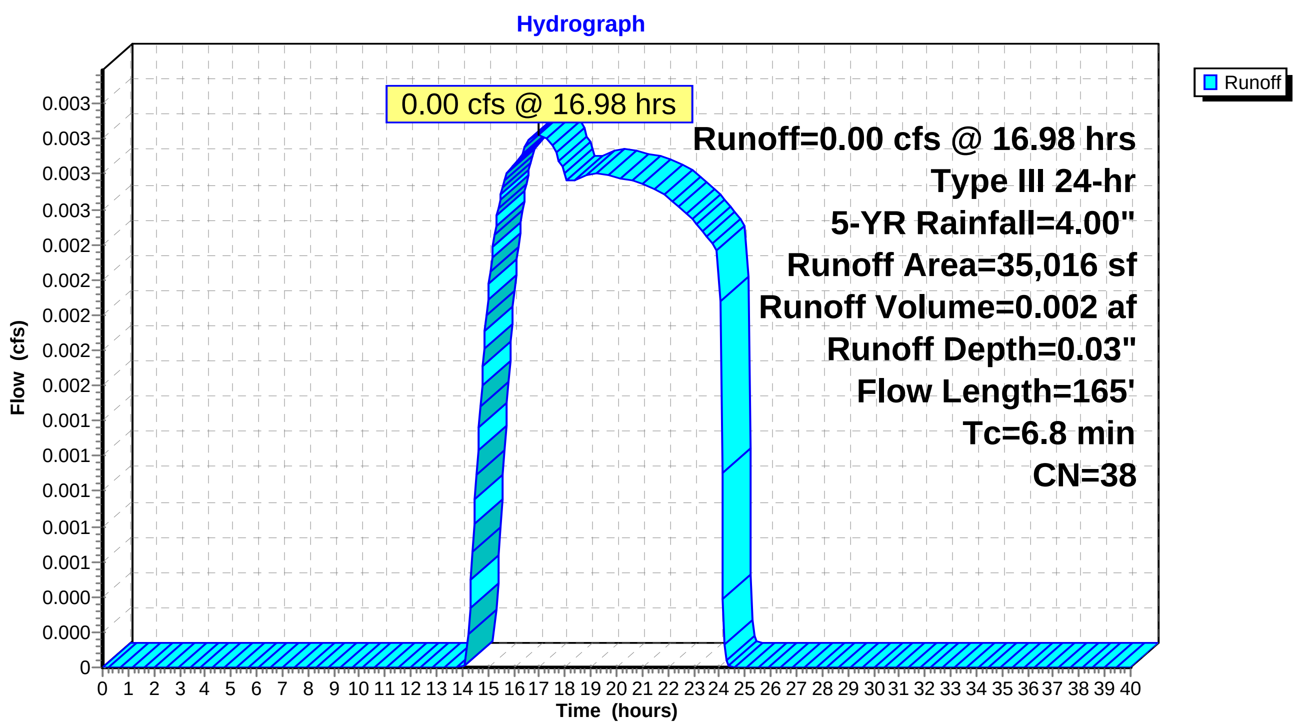
Runoff = 0.00 cfs @ 16.98 hrs, Volume= 0.002 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
31,016	39	>75% Grass cover, Good, HSG A
4,000	30	Woods, Good, HSG A
35,016	38	Weighted Average
35,016		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	115	0.1400	6.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	165	Total			

Subcatchment 11S: PR-5R



Summary for Subcatchment 12S: PR-6

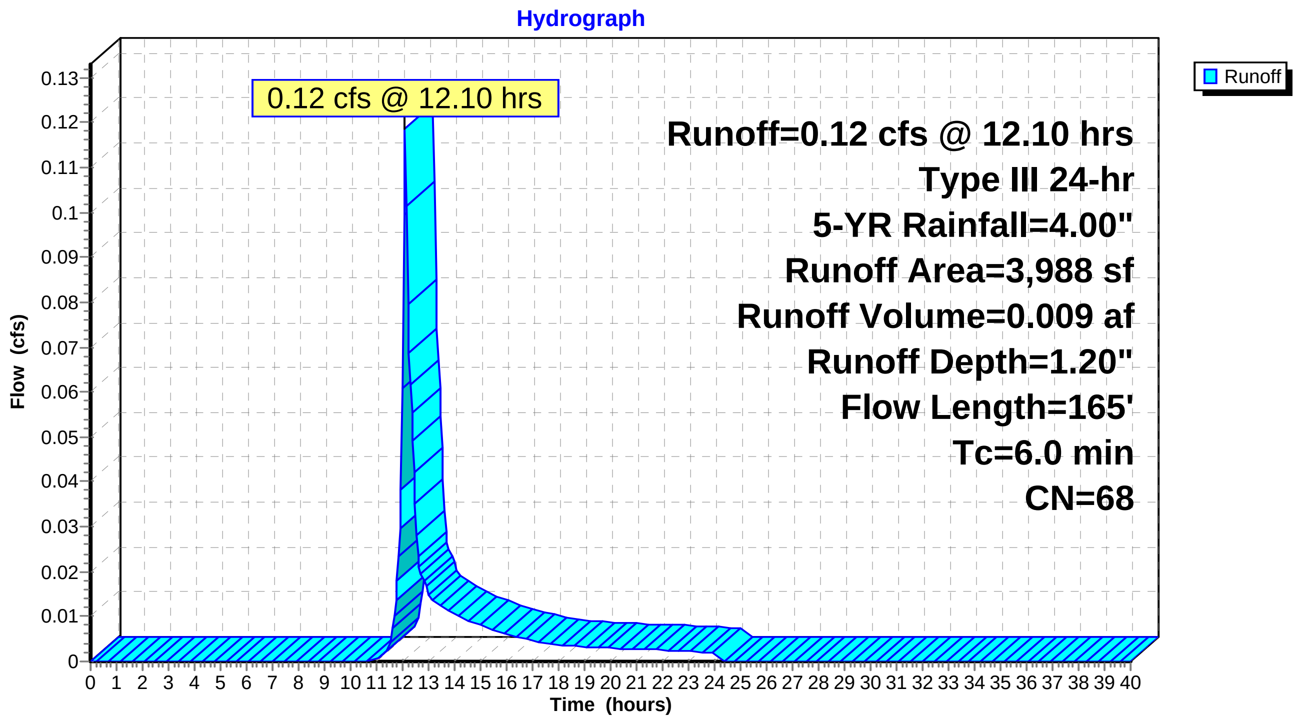
Runoff = 0.12 cfs @ 12.10 hrs, Volume= 0.009 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
2,011	39	>75% Grass cover, Good, HSG A
1,977	98	Paved parking, HSG A
3,988	68	Weighted Average
2,011		50.43% Pervious Area
1,977		49.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	35	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	11	0.0310	3.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	119	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.0	165	Total			

Subcatchment 12S: PR-6



Summary for Subcatchment 13S: PR-7

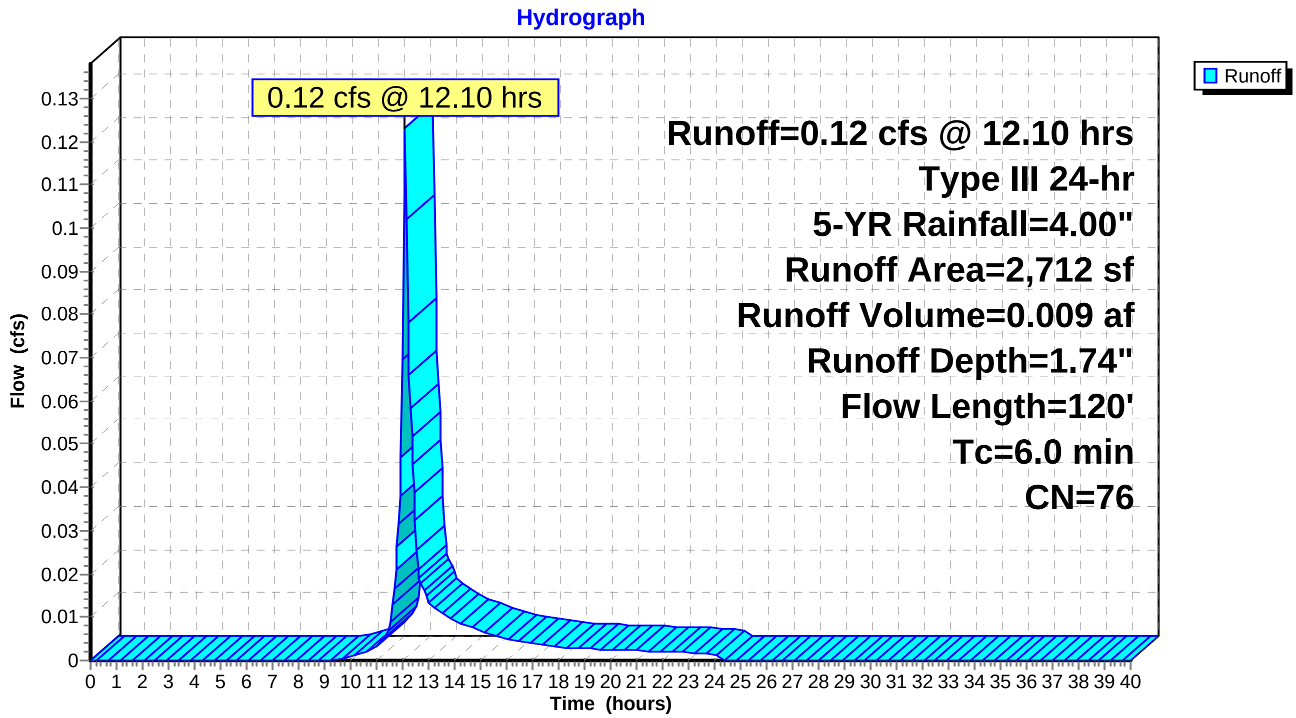
Runoff = 0.12 cfs @ 12.10 hrs, Volume= 0.009 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
1,021	39	>75% Grass cover, Good, HSG A
1,691	98	Paved parking, HSG A
2,712	76	Weighted Average
1,021		37.65% Pervious Area
1,691		62.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0310	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.3	95	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	120	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13S: PR-7



Summary for Subcatchment 14S: PR-8R

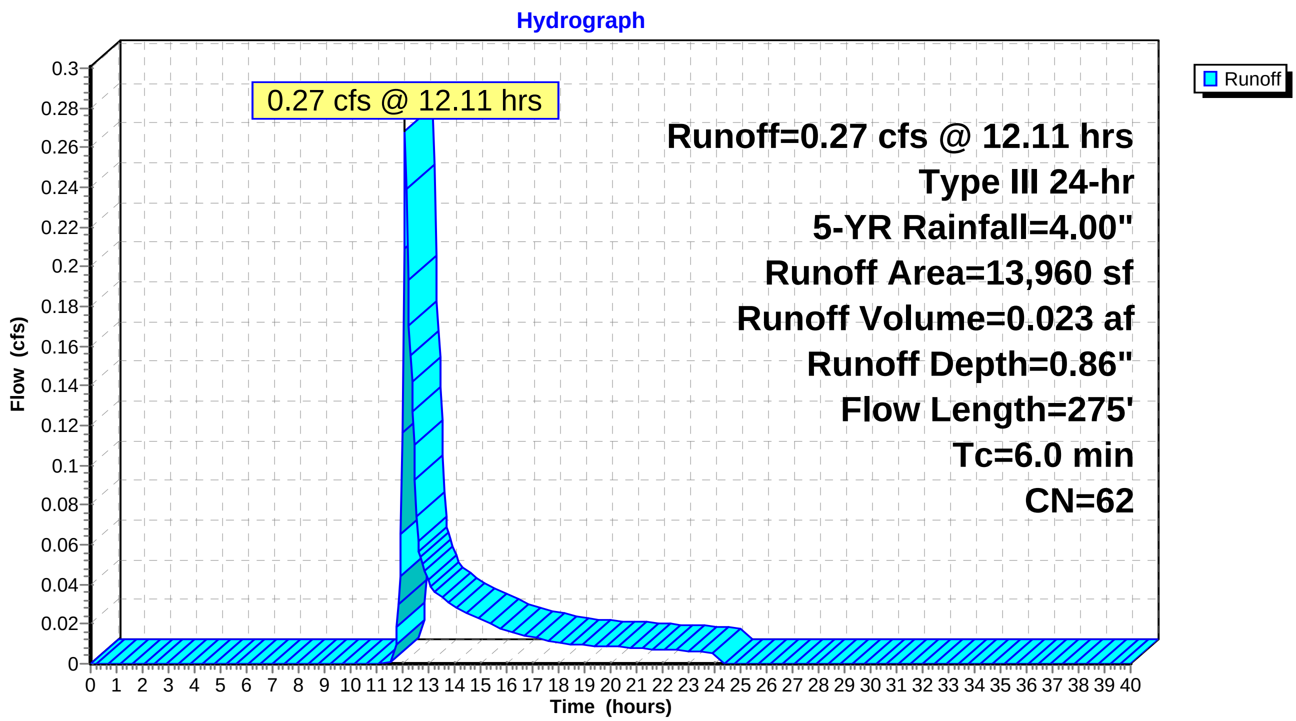
Runoff = 0.27 cfs @ 12.11 hrs, Volume= 0.023 af, Depth= 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
6,684	39	>75% Grass cover, Good, HSG A
2,706	98	Paved parking, HSG A
1,525	98	Paved parking, HSG B
3,045	61	>75% Grass cover, Good, HSG B
13,960	62	Weighted Average
9,729		69.69% Pervious Area
4,231		30.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.4	100	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	125	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.9	275	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 14S: PR-8R



Summary for Subcatchment 15S: PR-9R

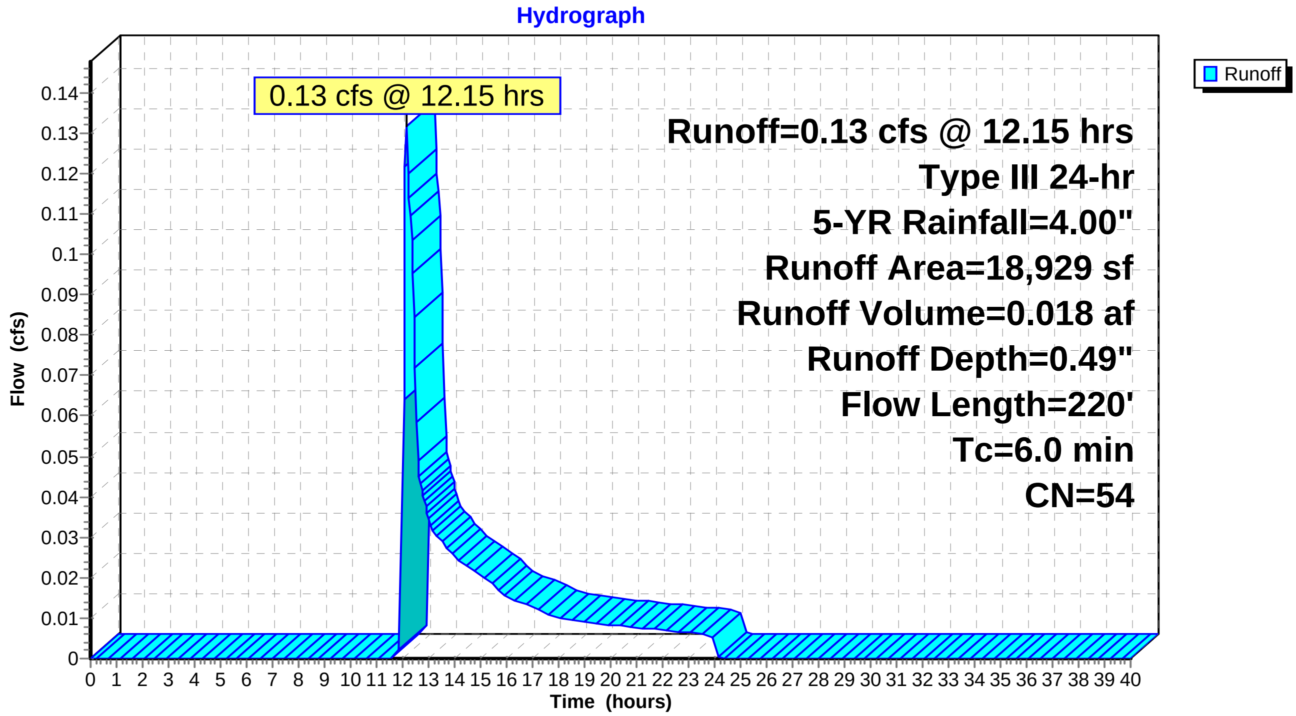
Runoff = 0.13 cfs @ 12.15 hrs, Volume= 0.018 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
11,941	39	>75% Grass cover, Good, HSG A
2,358	98	Paved parking, HSG A
1,358	98	Paved parking, HSG B
3,272	61	>75% Grass cover, Good, HSG B
18,929	54	Weighted Average
15,213		80.37% Pervious Area
3,716		19.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.0	10	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	150	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	220	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15S: PR-9R



Summary for Subcatchment 16S: PR-10R

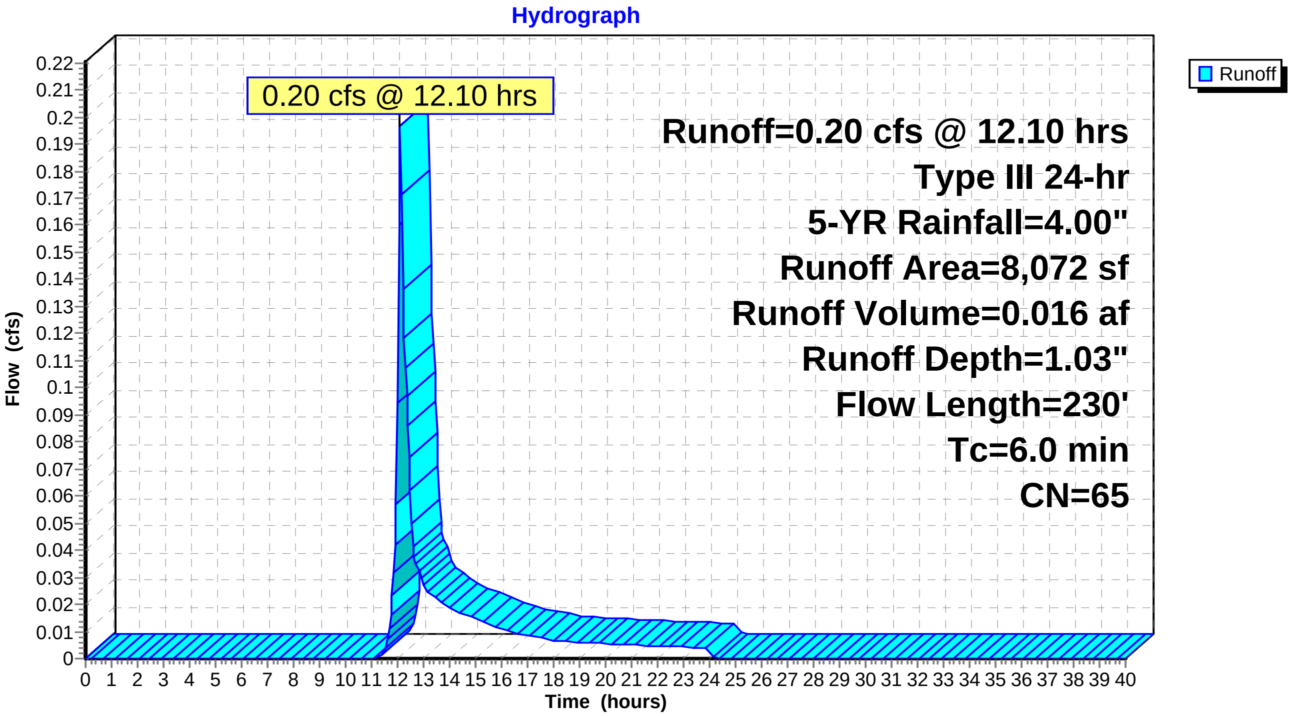
Runoff = 0.20 cfs @ 12.10 hrs, Volume= 0.016 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
670	39	>75% Grass cover, Good, HSG A
723	30	Woods, Good, HSG A
1,898	98	Paved parking, HSG B
4,781	61	>75% Grass cover, Good, HSG B
8,072	65	Weighted Average
6,174		76.49% Pervious Area
1,898		23.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	30	0.1430	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	130	0.1770	6.77		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	20	0.0310	3.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	50	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	230	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 16S: PR-10R



Summary for Subcatchment 17S: PR-11

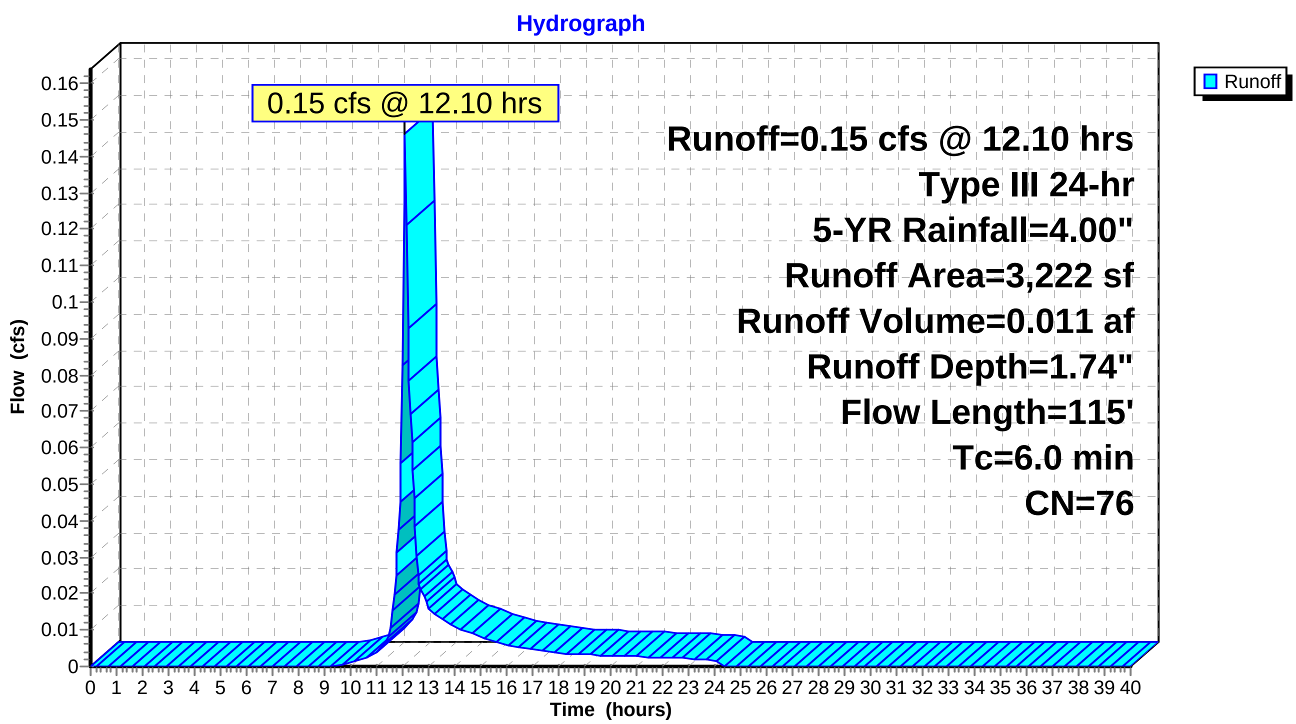
Runoff = 0.15 cfs @ 12.10 hrs, Volume= 0.011 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
1,329	98	Paved parking, HSG B
1,893	61	>75% Grass cover, Good, HSG B
3,222	76	Weighted Average
1,893		58.75% Pervious Area
1,329		41.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	40	0.1550	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	20	0.0310	2.83		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	55	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	115	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 17S: PR-11



Summary for Subcatchment 19S: PR-12

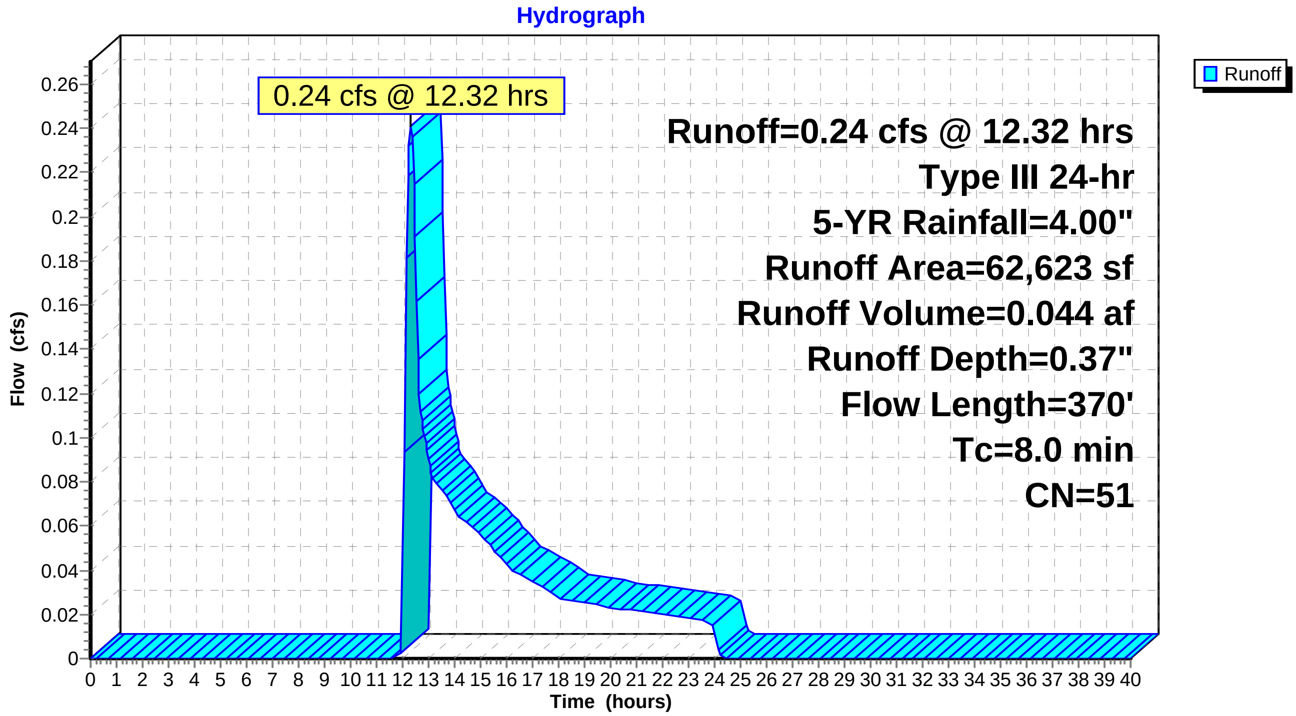
Runoff = 0.24 cfs @ 12.32 hrs, Volume= 0.044 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-YR Rainfall=4.00"

Area (sf)	CN	Description
9,300	39	>75% Grass cover, Good, HSG A
16,800	61	>75% Grass cover, Good, HSG B
7,412	30	Woods, Good, HSG A
29,111	55	Woods, Good, HSG B
62,623	51	Weighted Average
62,623		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	100	0.1330	5.87		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	205	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	15	0.3300	9.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.0	370	Total			

Subcatchment 19S: PR-12



Summary for Pond 1P: Stormwater Management Area #1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=17)

Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 1.19" for 5-YR event
Inflow = 0.82 cfs @ 12.09 hrs, Volume= 0.061 af
Outflow = 0.45 cfs @ 12.24 hrs, Volume= 0.061 af, Atten= 46%, Lag= 8.9 min
Discarded = 0.04 cfs @ 12.24 hrs, Volume= 0.037 af
Primary = 0.40 cfs @ 12.24 hrs, Volume= 0.024 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 119.23' @ 12.24 hrs Surf.Area= 781 sf Storage= 610 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 60.3 min (896.9 - 836.6)

Volume	Invert	Avail.Storage	Storage Description
#1	118.30'	4,746 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

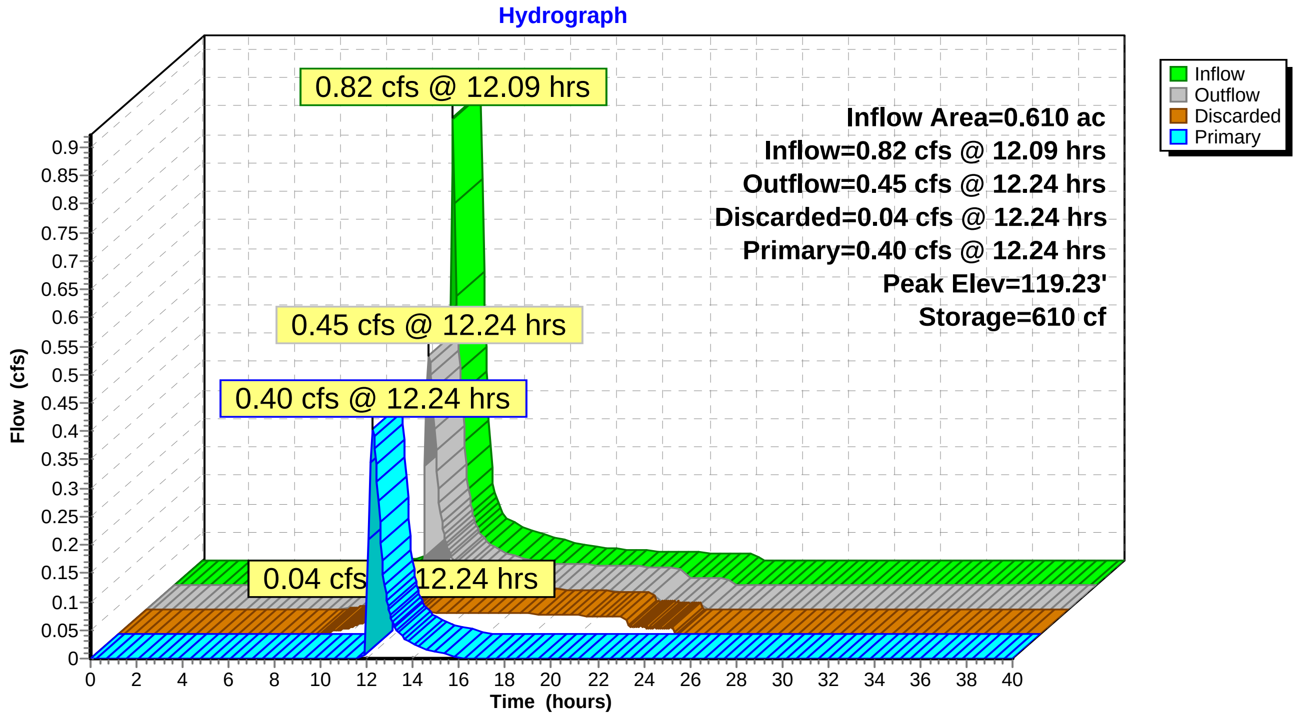
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.30	530	0	0
118.80	660	298	298
119.30	800	365	663
119.80	960	440	1,103
120.30	1,130	523	1,625
120.70	1,800	586	2,211
121.00	4,800	990	3,201
121.30	5,500	1,545	4,746

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**12.0" Round Culvert** L= 41.0' CPP, end-section conforming to fill, Ke= 0.500
			Inlet / Outlet Invert= 117.00' / 116.59' S= 0.0100 '/' Cc= 0.900
			n= 0.010, Flow Area= 0.79 sf
#2	Device 1	118.80'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Discarded	118.30'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.04 cfs @ 12.24 hrs HW=119.23' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.40 cfs @ 12.24 hrs HW=119.23' TW=109.61' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.40 cfs of 4.98 cfs potential flow)
  └**2=Orifice/Grate** (Orifice Controls 0.40 cfs @ 2.24 fps)

Pond 1P: Stormwater Management Area #1



Summary for Pond 2P: Stormwater Management Area #2

Inflow Area = 1.330 ac, 24.38% Impervious, Inflow Depth = 0.63" for 5-YR event
Inflow = 0.80 cfs @ 12.16 hrs, Volume= 0.070 af
Outflow = 0.05 cfs @ 15.52 hrs, Volume= 0.070 af, Atten= 94%, Lag= 201.3 min
Discarded = 0.05 cfs @ 15.52 hrs, Volume= 0.070 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 73.75' @ 15.52 hrs Surf.Area= 1,994 sf Storage= 1,821 cf

Plug-Flow detention time= 448.1 min calculated for 0.070 af (100% of inflow)
Center-of-Mass det. time= 448.5 min (1,298.7 - 850.3)

Volume	Invert	Avail.Storage	Storage Description
#1	72.60'	7,534 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

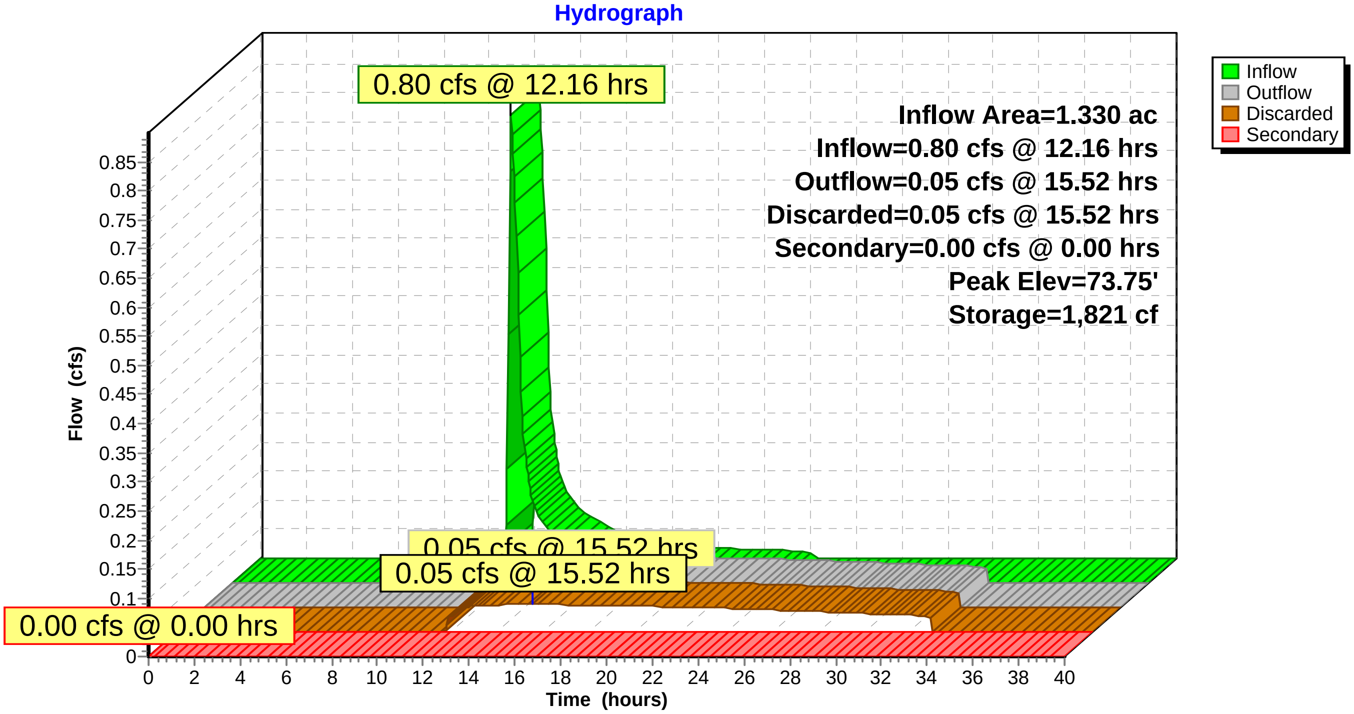
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.60	1,150	0	0
73.00	1,470	524	524
74.00	2,170	1,820	2,344
75.00	2,950	2,560	4,904
75.80	3,625	2,630	7,534

Device	Routing	Invert	Outlet Devices
#1	Discarded	72.60'	**1.020 in/hr Exfiltration over Surface area**
#2	Secondary	74.30'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.05 cfs @ 15.52 hrs HW=73.75' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=72.60' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Stormwater Management Area #2



Summary for Pond 3P: Stormwater Management Area #3

Inflow Area = 1.014 ac, 25.29% Impervious, Inflow Depth = 0.80" for 5-YR event
Inflow = 0.74 cfs @ 12.11 hrs, Volume= 0.067 af
Outflow = 0.05 cfs @ 11.95 hrs, Volume= 0.067 af, Atten= 93%, Lag= 0.0 min
Discarded = 0.05 cfs @ 11.95 hrs, Volume= 0.067 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 97.78' @ 15.93 hrs Surf.Area= 2,102 sf Storage= 1,336 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 296.6 min (1,183.5 - 886.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	96.77'	1,779 cf	**35.33'W x 59.50'L x 3.54'H Field A** 7,446 cf Overall - 2,999 cf Embedded = 4,447 cf x 40.0% Voids
#2A	97.27'	2,999 cf	**Cultec R-330XLHD** x 56 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		4,778 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	96.77'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	98.00'	**8.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.00' / 95.92' S= 0.0462 '/' Cc= 0.900 n= 0.010, Flow Area= 0.35 sf

Discarded OutFlow Max=0.05 cfs @ 11.95 hrs HW=96.82' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=96.77' TW=0.00' (Dynamic Tailwater)
└—**2=Culvert** (Controls 0.00 cfs)

Pond 3P: Stormwater Management Area #3 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 7 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

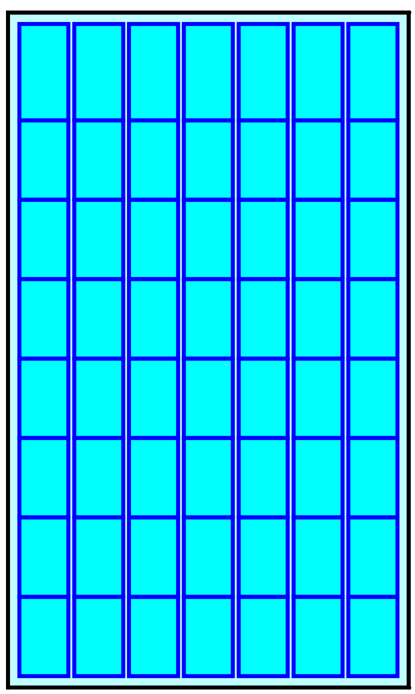
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
7 Rows x 52.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 35.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

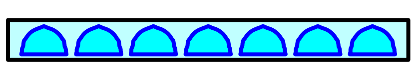
56 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 7 Rows = 2,999.0 cf Chamber Storage

7,445.8 cf Field - 2,999.0 cf Chambers = 4,446.7 cf Stone x 40.0% Voids = 1,778.7 cf Stone Storage

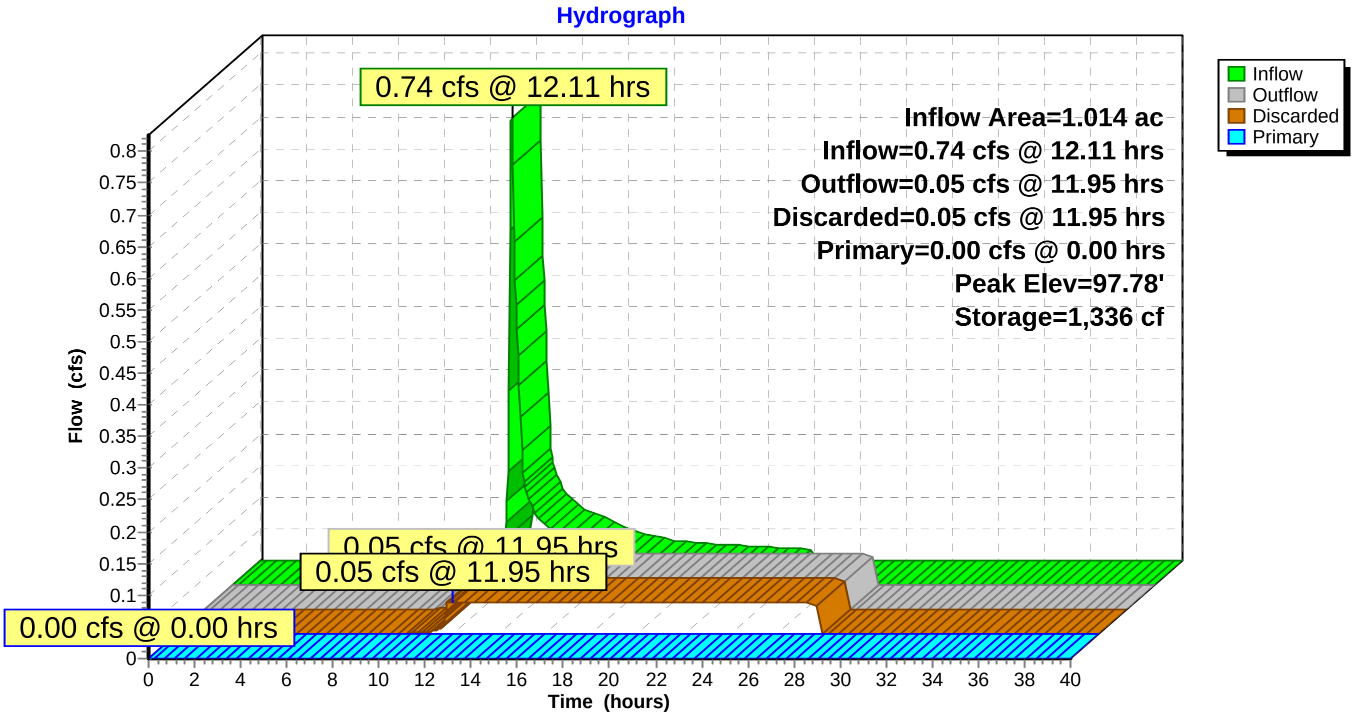
Chamber Storage + Stone Storage = 4,777.7 cf = 0.110 af
Overall Storage Efficiency = 64.2%
Overall System Size = 59.50' x 35.33' x 3.54'

56 Chambers
275.8 cy Field
164.7 cy Stone





Pond 3P: Stormwater Management Area #3



Summary for Pond 4P: Stormwater Management Area #4

Inflow Area = 1.533 ac, 5.49% Impervious, Inflow Depth = 0.02" for 5-YR event
Inflow = 0.00 cfs @ 16.98 hrs, Volume= 0.002 af
Outflow = 0.00 cfs @ 16.98 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 16.98 hrs, Volume= 0.002 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 106.80' @ 0.00 hrs Surf.Area= 150 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,157.2 - 1,157.2)

Volume	Invert	Avail.Storage	Storage Description
#1	106.80'	3,728 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

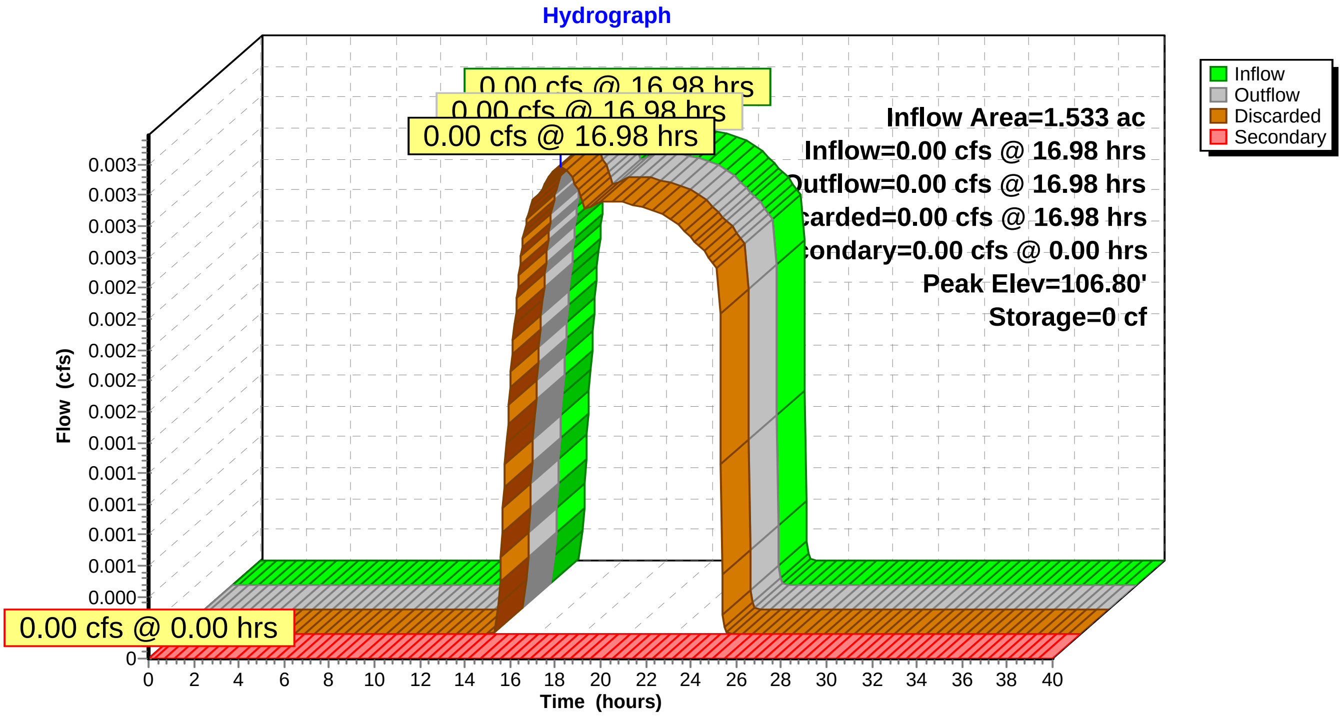
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
106.80	150	0	0
107.00	240	39	39
107.80	690	372	411
108.00	880	157	568
109.00	1,800	1,340	1,908
109.80	2,750	1,820	3,728

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	108.50'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.00 cfs @ 16.98 hrs HW=106.80' (Free Discharge)
└─**1=Exfiltration** (Passes 0.00 cfs of 0.01 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=106.80' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Stormwater Management Area #4



Summary for Pond 5P: Stormwater Management Area #5

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=66)

Inflow Area = 0.729 ac, 11.55% Impervious, Inflow Depth = 0.34" for 5-YR event
Inflow = 0.24 cfs @ 12.10 hrs, Volume= 0.020 af
Outflow = 0.04 cfs @ 12.66 hrs, Volume= 0.020 af, Atten= 83%, Lag= 33.5 min
Discarded = 0.04 cfs @ 12.66 hrs, Volume= 0.020 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 109.22' @ 12.66 hrs Surf.Area= 725 sf Storage= 242 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 48.4 min (932.4 - 884.0)

Volume	Invert	Avail.Storage	Storage Description
#1	108.80'	4,689 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

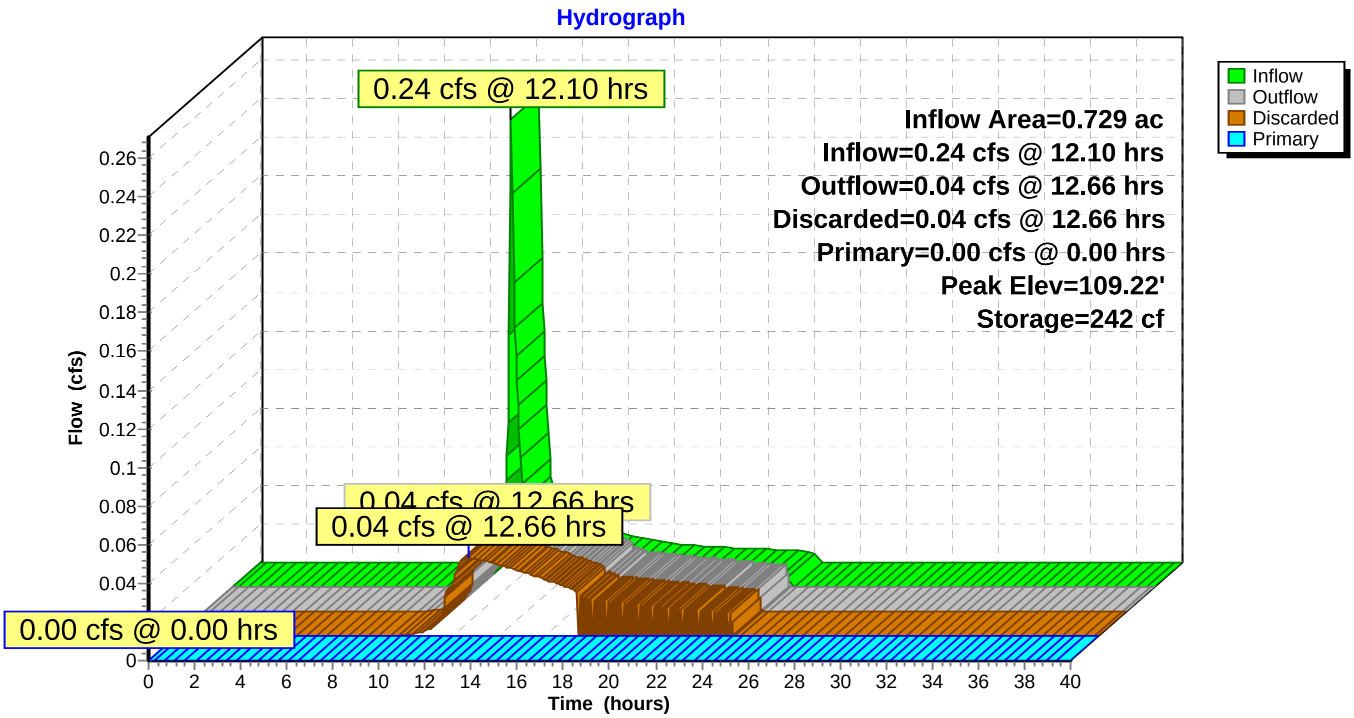
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
108.80	420	0	0
109.00	560	98	98
110.00	1,300	930	1,028
111.00	2,110	1,705	2,733
111.80	2,780	1,956	4,689

Device	Routing	Invert	Outlet Devices
#1	Discarded	108.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	110.30'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.04 cfs @ 12.66 hrs HW=109.22' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=108.80' TW=106.80' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: Stormwater Management Area #5



Summary for Pond 6P: Stormwater Management Area #6

Inflow Area = 1.438 ac, 0.00% Impervious, Inflow Depth = 0.37" for 5-YR event
Inflow = 0.24 cfs @ 12.32 hrs, Volume= 0.044 af
Outflow = 0.06 cfs @ 14.99 hrs, Volume= 0.041 af, Atten= 77%, Lag= 160.0 min
Discarded = 0.02 cfs @ 14.99 hrs, Volume= 0.033 af
Primary = 0.04 cfs @ 14.99 hrs, Volume= 0.008 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 79.02' @ 14.99 hrs Surf.Area= 768 sf Storage= 842 cf

Plug-Flow detention time= 460.2 min calculated for 0.041 af (93% of inflow)
Center-of-Mass det. time= 428.1 min (1,373.1 - 945.0)

Volume	Invert	Avail.Storage	Storage Description
#1	77.00'	2,540 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

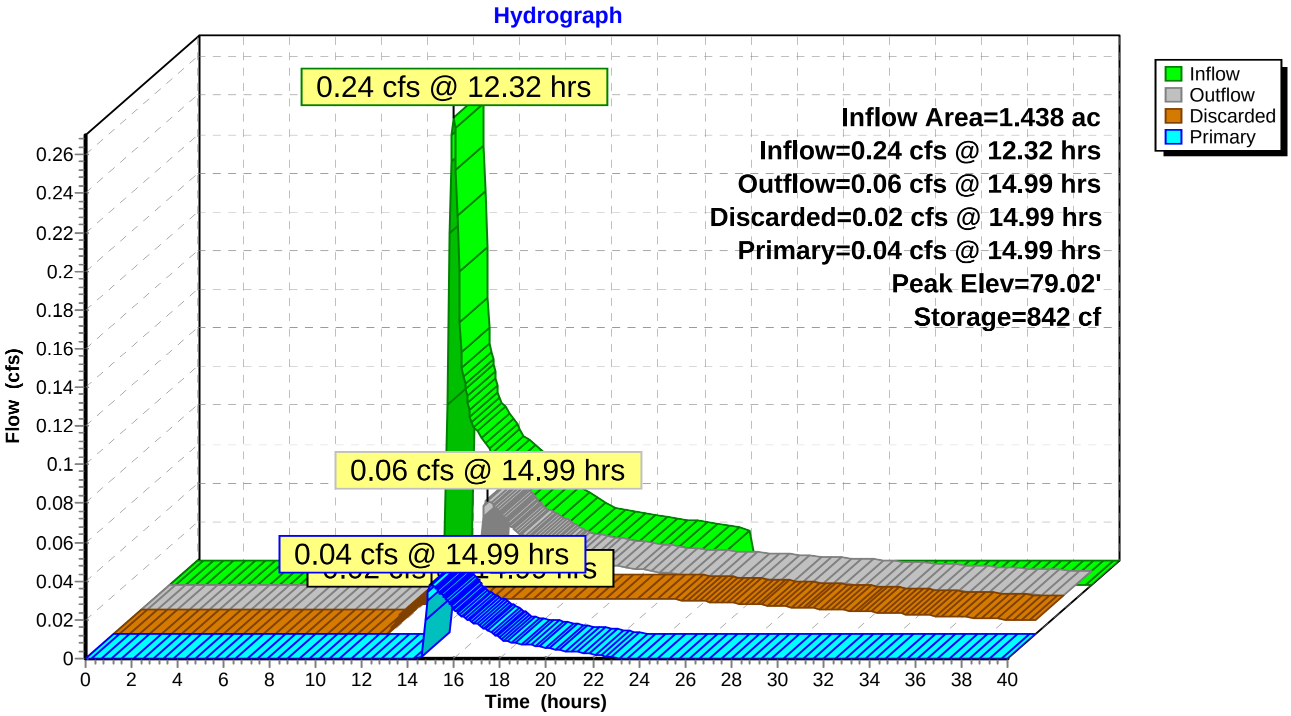
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.00	115	0	0
78.00	390	253	253
79.00	760	575	828
80.00	1,210	985	1,813
80.50	1,700	728	2,540

Device	Routing	Invert	Outlet Devices
#1	Discarded	77.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	79.00'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.02 cfs @ 14.99 hrs HW=79.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.04 cfs @ 14.99 hrs HW=79.02' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.04 cfs @ 0.34 fps)

Pond 6P: Stormwater Management Area #6



Summary for Pond 7P: DMH

[57] Hint: Peaked at 109.61' (Flood elevation advised)

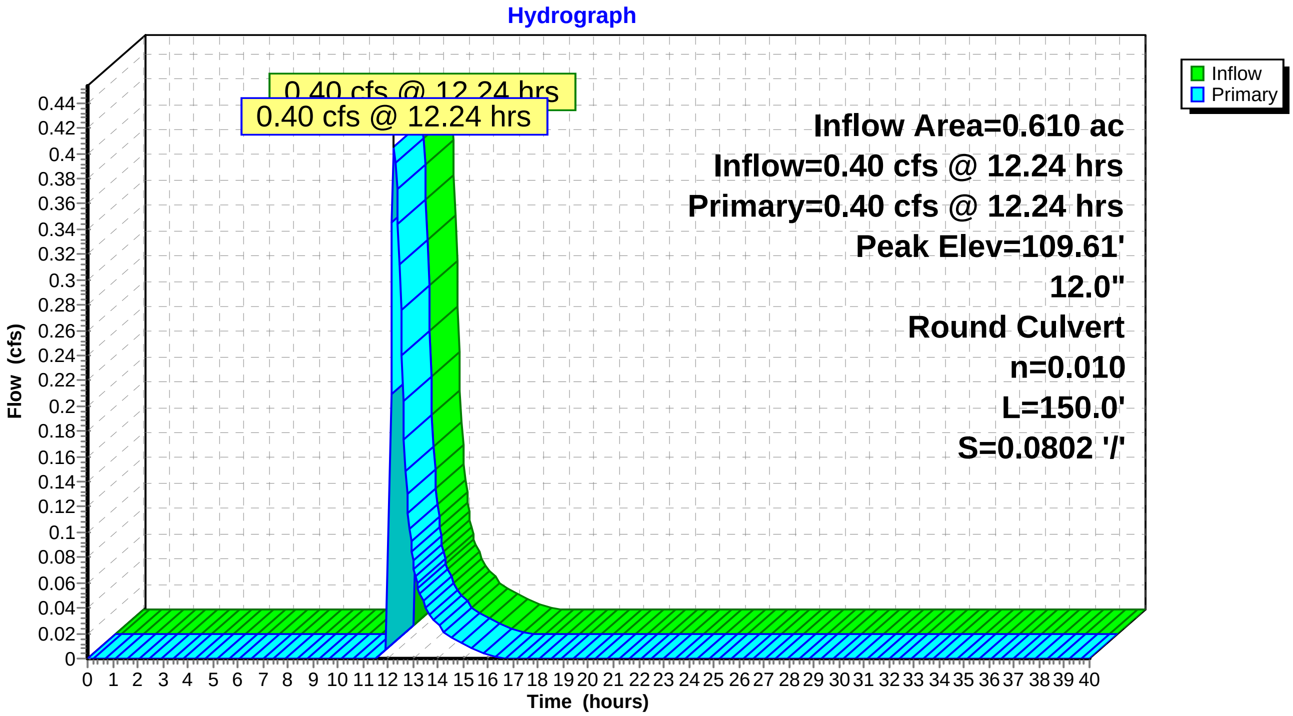
Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 0.47" for 5-YR event
Inflow = 0.40 cfs @ 12.24 hrs, Volume= 0.024 af
Outflow = 0.40 cfs @ 12.24 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min
Primary = 0.40 cfs @ 12.24 hrs, Volume= 0.024 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 109.61' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	109.30'	**12.0" Round Culvert** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.30' / 97.27' S= 0.0802 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.40 cfs @ 12.24 hrs HW=109.61' TW=88.78' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.40 cfs @ 1.91 fps)

Pond 7P: DMH



Summary for Pond 8P: DMH

[57] Hint: Peaked at 88.78' (Flood elevation advised)

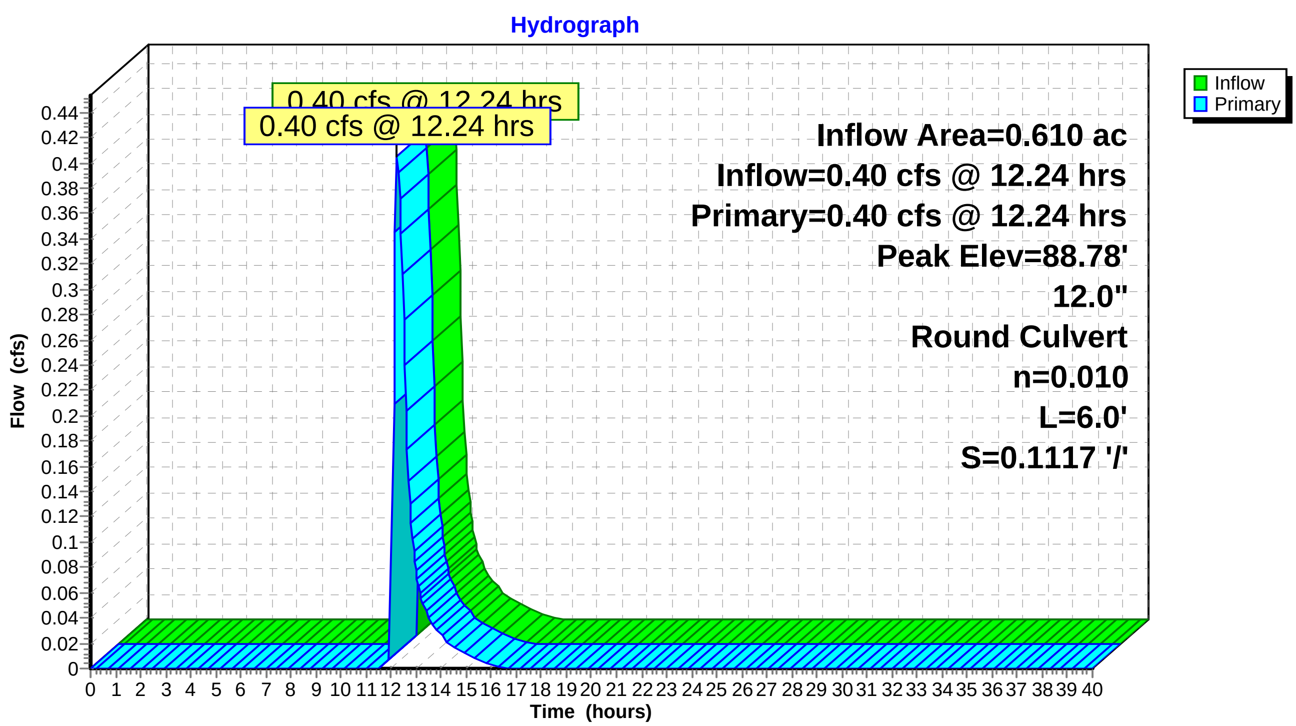
Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 0.47" for 5-YR event
Inflow = 0.40 cfs @ 12.24 hrs, Volume= 0.024 af
Outflow = 0.40 cfs @ 12.24 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min
Primary = 0.40 cfs @ 12.24 hrs, Volume= 0.024 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 88.78' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	88.47'	**12.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 88.47' / 87.80' S= 0.1117 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.40 cfs @ 12.24 hrs HW=88.78' TW=73.02' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.40 cfs @ 1.91 fps)

Pond 8P: DMH



Summary for Pond 9P: CB 2+85 RT

[57] Hint: Peaked at 115.34' (Flood elevation advised)

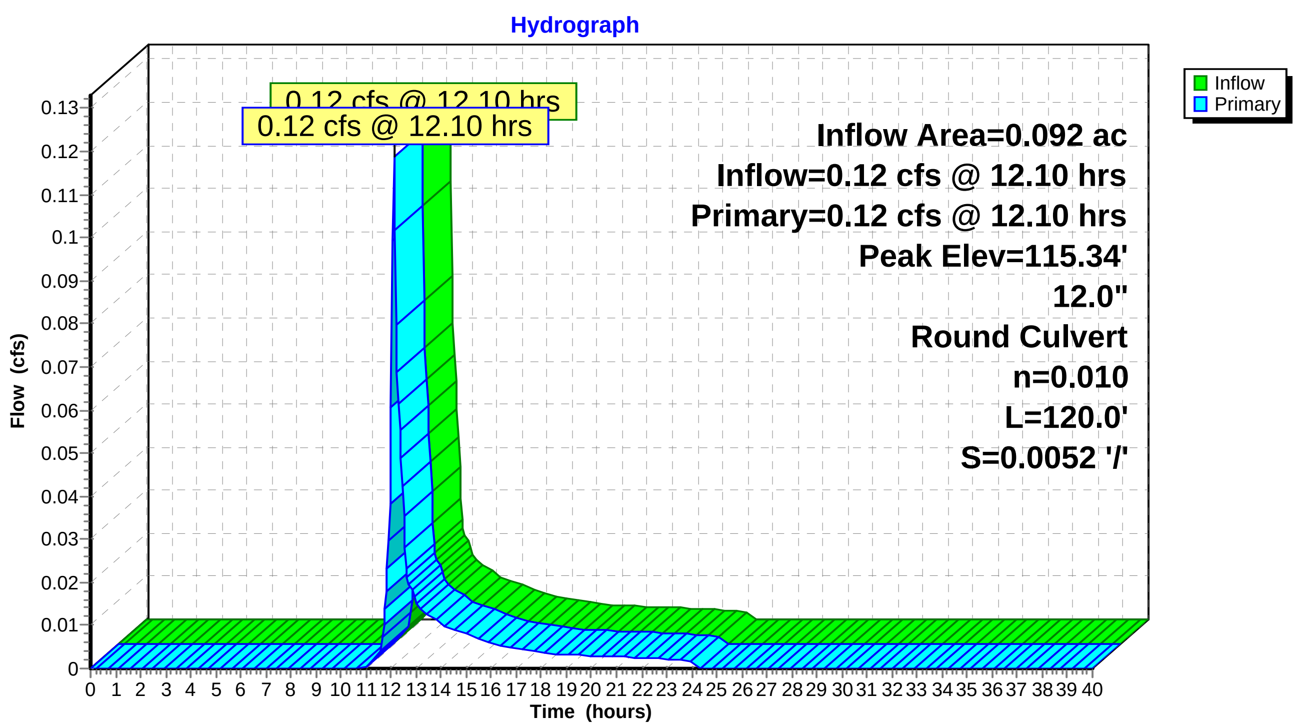
Inflow Area = 0.092 ac, 49.57% Impervious, Inflow Depth = 1.20" for 5-YR event
Inflow = 0.12 cfs @ 12.10 hrs, Volume= 0.009 af
Outflow = 0.12 cfs @ 12.10 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min
Primary = 0.12 cfs @ 12.10 hrs, Volume= 0.009 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 115.34' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.17'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.17' / 114.54' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.12 cfs @ 12.10 hrs HW=115.34' TW=114.58' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.12 cfs @ 1.95 fps)

Pond 9P: CB 2+85 RT



Summary for Pond 10P: DMH 4+11

[57] Hint: Peaked at 114.58' (Flood elevation advised)

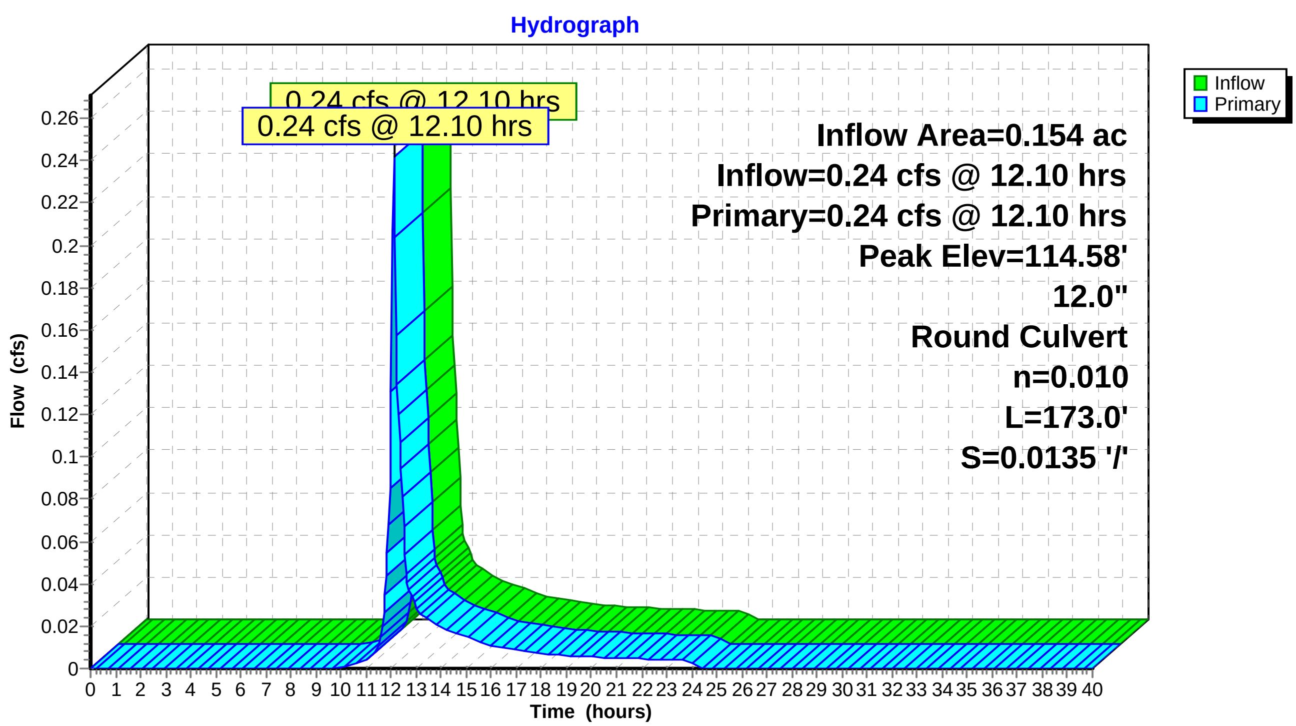
Inflow Area = 0.154 ac, 54.75% Impervious, Inflow Depth = 1.42" for 5-YR event
Inflow = 0.24 cfs @ 12.10 hrs, Volume= 0.018 af
Outflow = 0.24 cfs @ 12.10 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 12.10 hrs, Volume= 0.018 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 114.58' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	114.34'	**12.0" Round Culvert** L= 173.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 114.34' / 112.00' S= 0.0135 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.24 cfs @ 12.10 hrs HW=114.58' TW=109.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.24 cfs @ 1.67 fps)

Pond 10P: DMH 4+11



Summary for Pond 11P: CB 2+85 LT

[57] Hint: Peaked at 115.35' (Flood elevation advised)

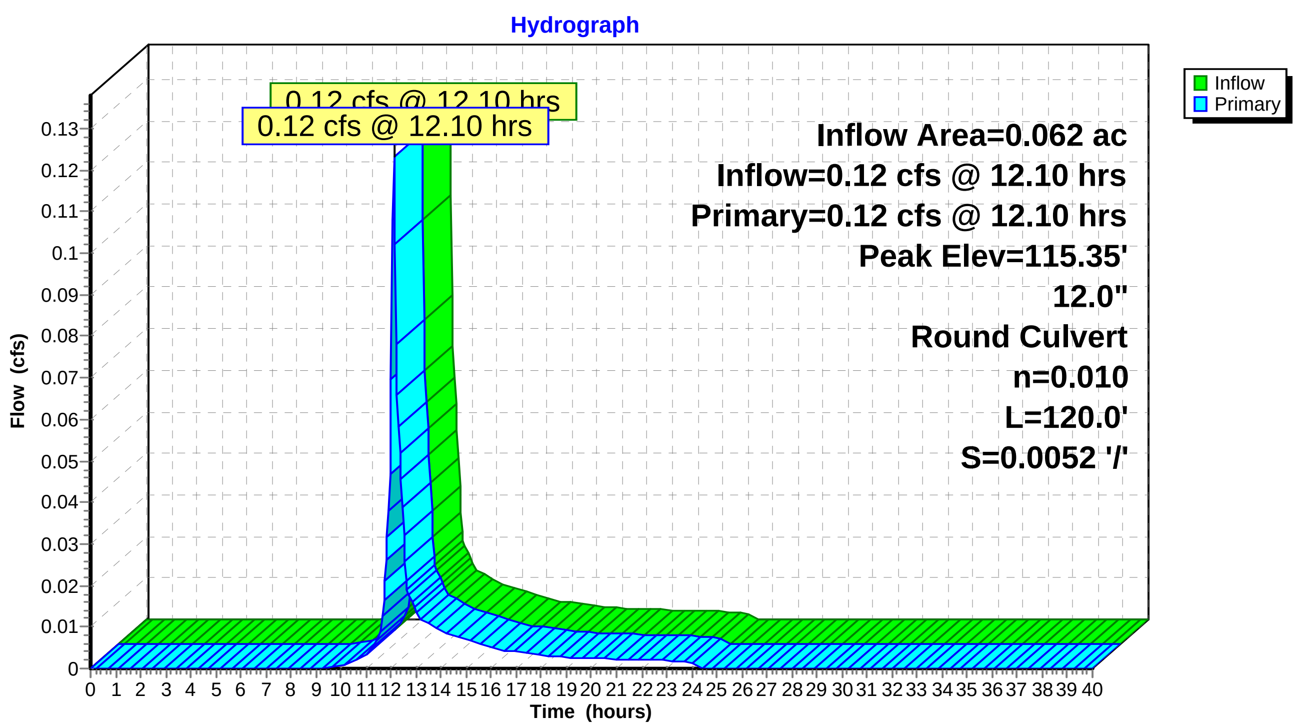
Inflow Area =	0.062 ac,	62.35% Impervious,	Inflow Depth = 1.74"	for 5-YR event
Inflow =	0.12 cfs @	12.10 hrs, Volume=	0.009 af	
Outflow =	0.12 cfs @	12.10 hrs, Volume=	0.009 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.12 cfs @	12.10 hrs, Volume=	0.009 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 115.35' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.17'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.17' / 114.54' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.12 cfs @ 12.10 hrs HW=115.35' TW=114.58' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.12 cfs @ 1.97 fps)

Pond 11P: CB 2+85 LT



Summary for Pond 12P: CB 1+0 RT

[57] Hint: Peaked at 101.45' (Flood elevation advised)

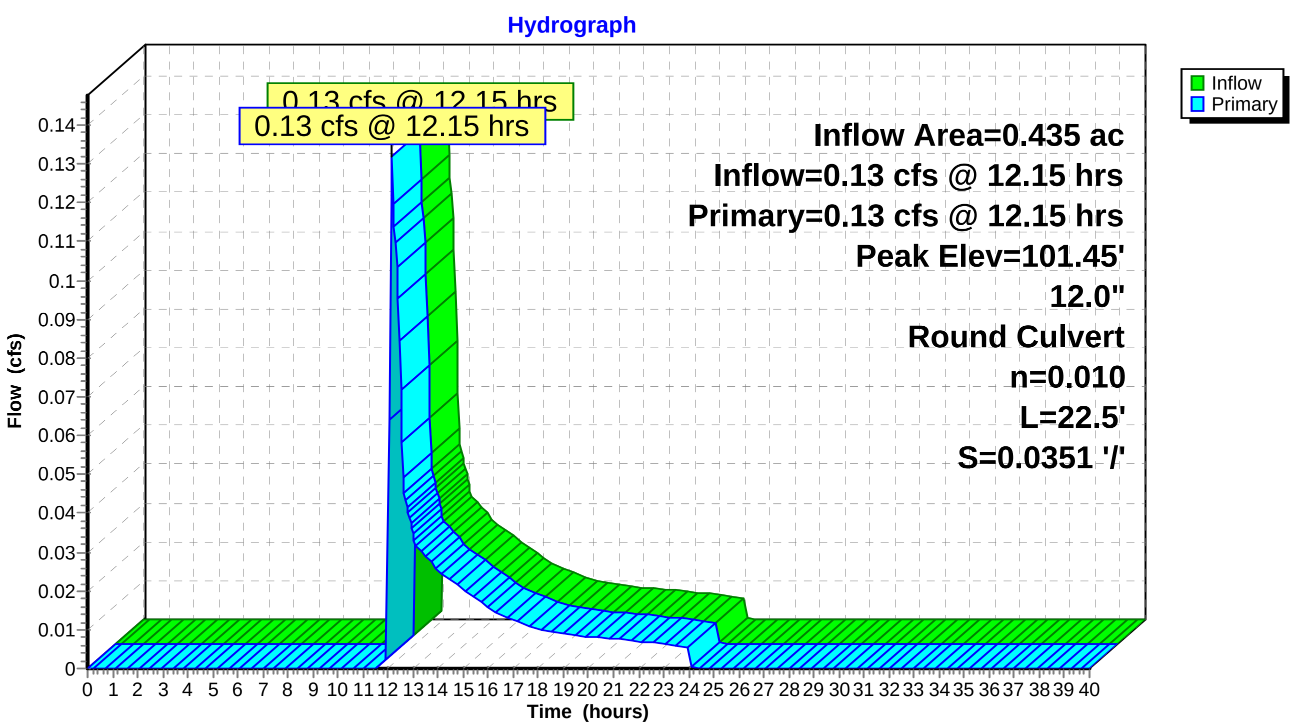
Inflow Area = 0.435 ac, 19.63% Impervious, Inflow Depth = 0.49" for 5-YR event
Inflow = 0.13 cfs @ 12.15 hrs, Volume= 0.018 af
Outflow = 0.13 cfs @ 12.15 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min
Primary = 0.13 cfs @ 12.15 hrs, Volume= 0.018 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.45' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.27'	**12.0" Round Culvert** L= 22.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.27' / 100.48' S= 0.0351 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 12.15 hrs HW=101.44' TW=100.68' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.13 cfs @ 1.42 fps)

Pond 12P: CB 1+0 RT



Summary for Pond 13P: CB 1+0 LT

[57] Hint: Peaked at 101.52' (Flood elevation advised)

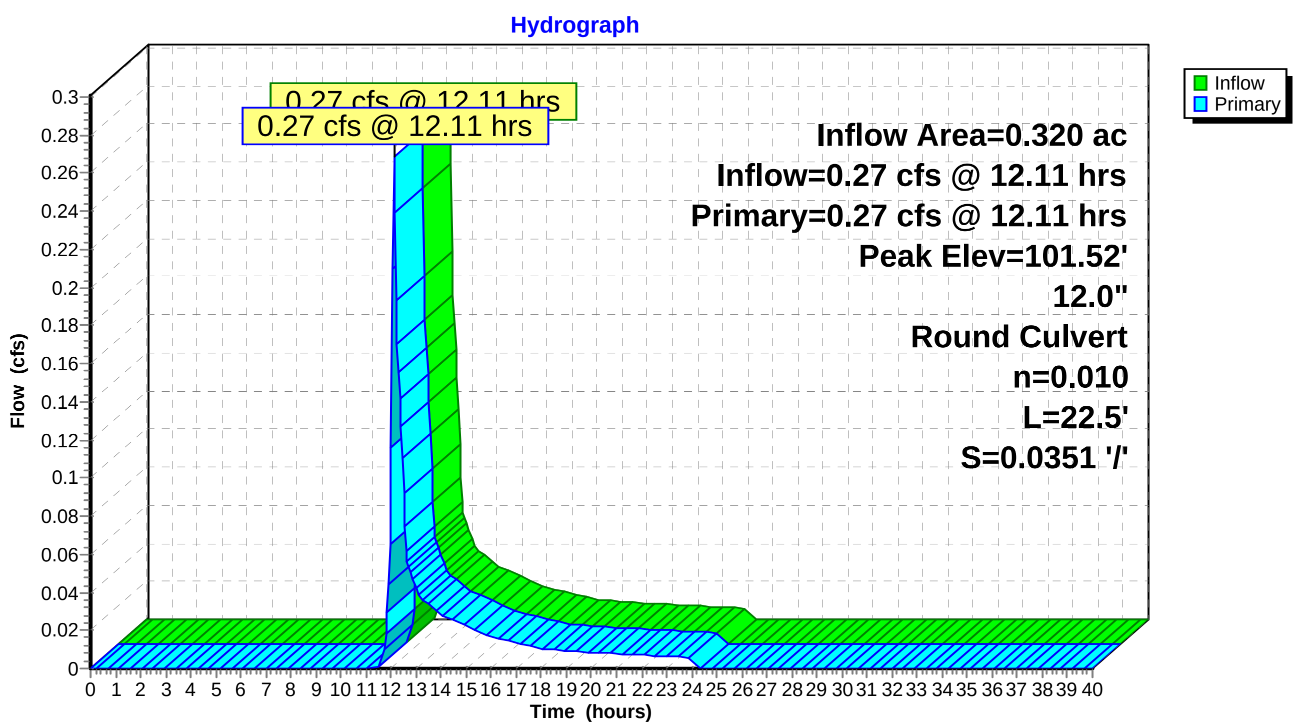
Inflow Area = 0.320 ac, 30.31% Impervious, Inflow Depth = 0.86" for 5-YR event
Inflow = 0.27 cfs @ 12.11 hrs, Volume= 0.023 af
Outflow = 0.27 cfs @ 12.11 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.11 hrs, Volume= 0.023 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.52' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.27'	**12.0" Round Culvert** L= 22.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.27' / 100.48' S= 0.0351 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.26 cfs @ 12.11 hrs HW=101.52' TW=100.69' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.26 cfs @ 1.70 fps)

Pond 13P: CB 1+0 LT



Summary for Pond 14P: DMH 0+75

[57] Hint: Peaked at 100.69' (Flood elevation advised)

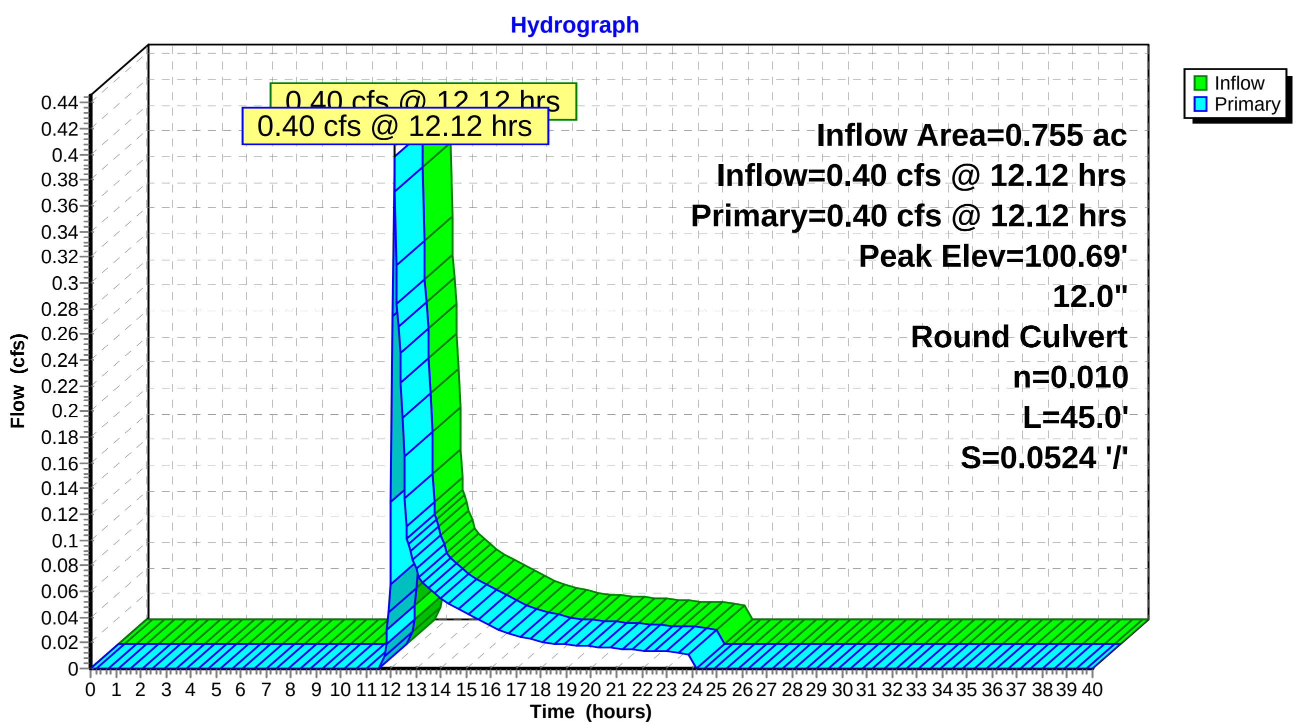
Inflow Area =	0.755 ac,	24.16% Impervious,	Inflow Depth = 0.65"	for 5-YR event
Inflow =	0.40 cfs @	12.12 hrs, Volume=	0.041 af	
Outflow =	0.40 cfs @	12.12 hrs, Volume=	0.041 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.40 cfs @	12.12 hrs, Volume=	0.041 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 100.69' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	100.38'	**12.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 100.38' / 98.02' S= 0.0524 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.38 cfs @ 12.12 hrs HW=100.69' TW=98.49' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.38 cfs @ 1.88 fps)

Pond 14P: DMH 0+75



Summary for Pond 15P: DMH 0+25

[57] Hint: Peaked at 98.50' (Flood elevation advised)

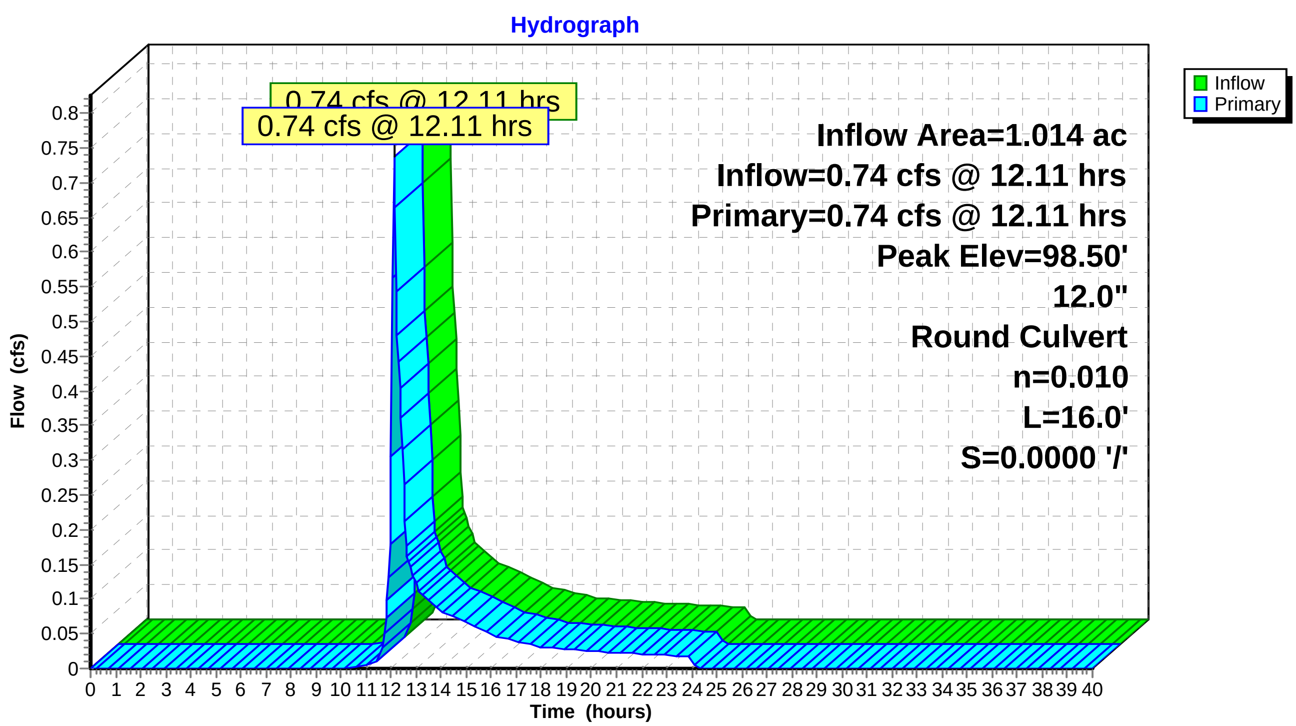
Inflow Area = 1.014 ac, 25.29% Impervious, Inflow Depth = 0.80" for 5-YR event
Inflow = 0.74 cfs @ 12.11 hrs, Volume= 0.067 af
Outflow = 0.74 cfs @ 12.11 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min
Primary = 0.74 cfs @ 12.11 hrs, Volume= 0.067 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.50' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.92'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.92' / 97.92' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.72 cfs @ 12.11 hrs HW=98.49' TW=98.12' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 0.72 cfs @ 2.23 fps)

Pond 15P: DMH 0+25



Summary for Pond 16P: CB 0+08 LT

[57] Hint: Peaked at 98.55' (Flood elevation advised)

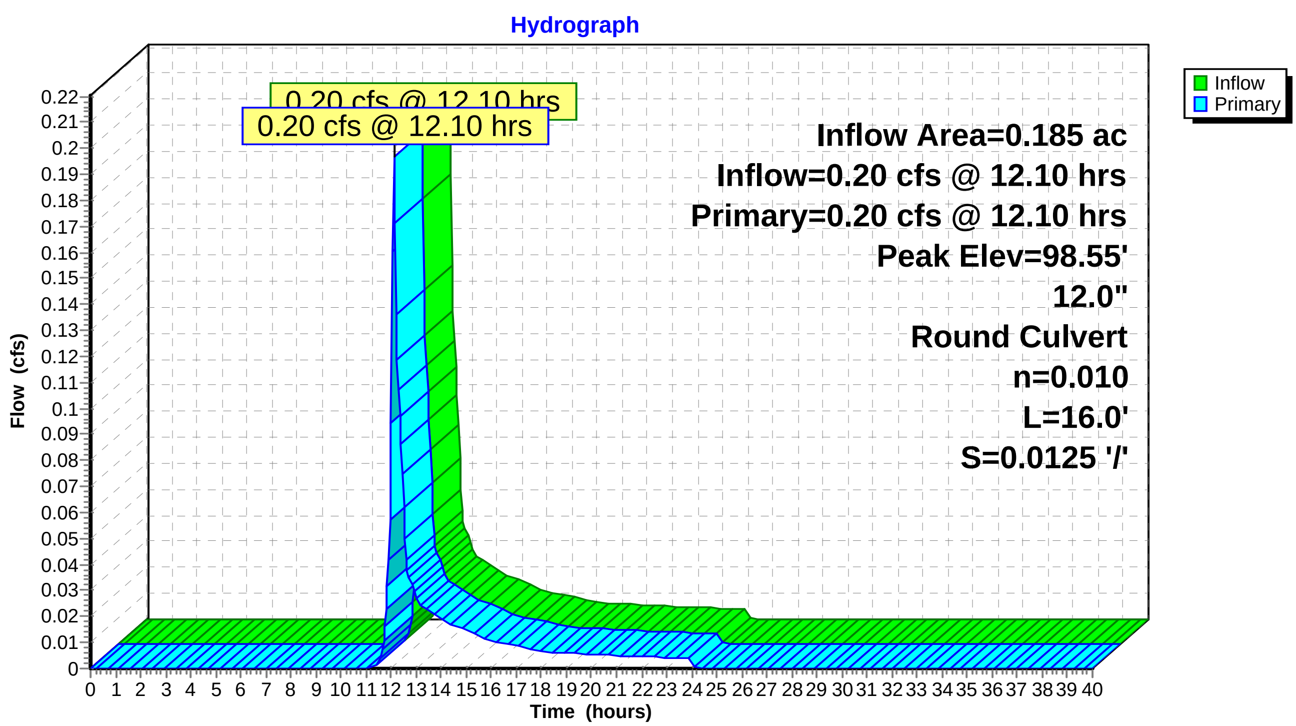
Inflow Area = 0.185 ac, 23.51% Impervious, Inflow Depth = 1.03" for 5-YR event
Inflow = 0.20 cfs @ 12.10 hrs, Volume= 0.016 af
Outflow = 0.20 cfs @ 12.10 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min
Primary = 0.20 cfs @ 12.10 hrs, Volume= 0.016 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.55' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.22'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.22' / 98.02' S= 0.0125 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.19 cfs @ 12.10 hrs HW=98.55' TW=98.49' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.19 cfs @ 1.29 fps)

Pond 16P: CB 0+08 LT



Summary for Pond 17P: CB 0+08 RT

[57] Hint: Peaked at 98.53' (Flood elevation advised)

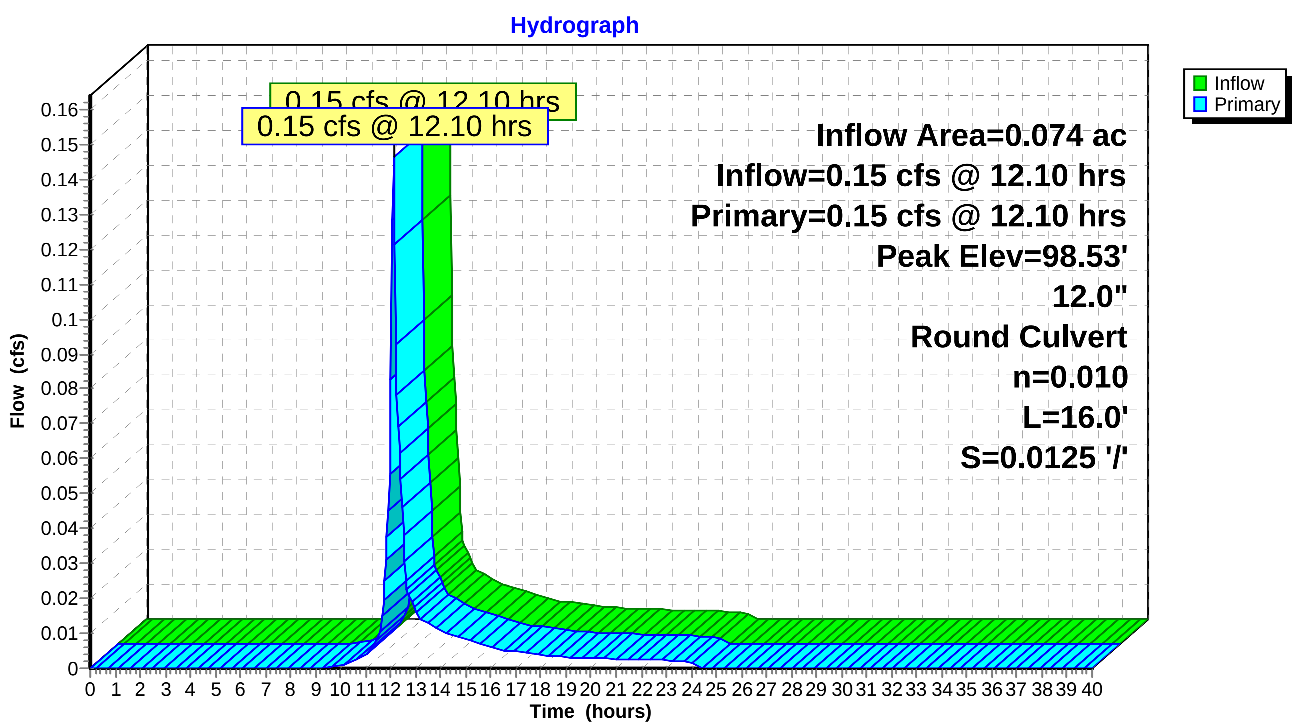
Inflow Area = 0.074 ac, 41.25% Impervious, Inflow Depth = 1.74" for 5-YR event
Inflow = 0.15 cfs @ 12.10 hrs, Volume= 0.011 af
Outflow = 0.15 cfs @ 12.10 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min
Primary = 0.15 cfs @ 12.10 hrs, Volume= 0.011 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.53' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.22'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.22' / 98.02' S= 0.0125 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.15 cfs @ 12.10 hrs HW=98.53' TW=98.49' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.15 cfs @ 1.06 fps)

Pond 17P: CB 0+08 RT



Summary for Pond 18P: SOS

[57] Hint: Peaked at 98.13' (Flood elevation advised)

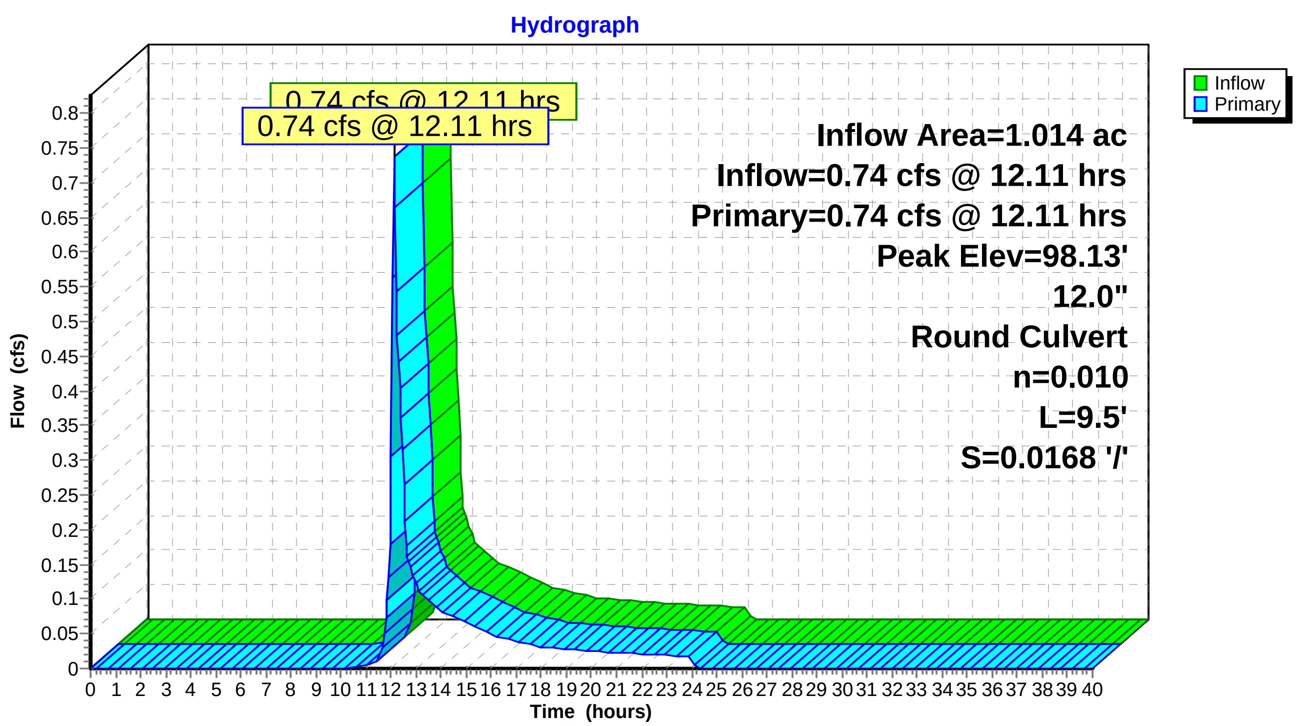
Inflow Area =	1.014 ac, 25.29% Impervious,	Inflow Depth = 0.80"	for 5-YR event
Inflow =	0.74 cfs @ 12.11 hrs,	Volume= 0.067 af	
Outflow =	0.74 cfs @ 12.11 hrs,	Volume= 0.067 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.74 cfs @ 12.11 hrs,	Volume= 0.067 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.13' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.68'	**12.0" Round Culvert** L= 9.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.68' / 97.52' S= 0.0168 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.72 cfs @ 12.11 hrs HW=98.12' TW=97.10' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.72 cfs @ 3.15 fps)

Pond 18P: SOS

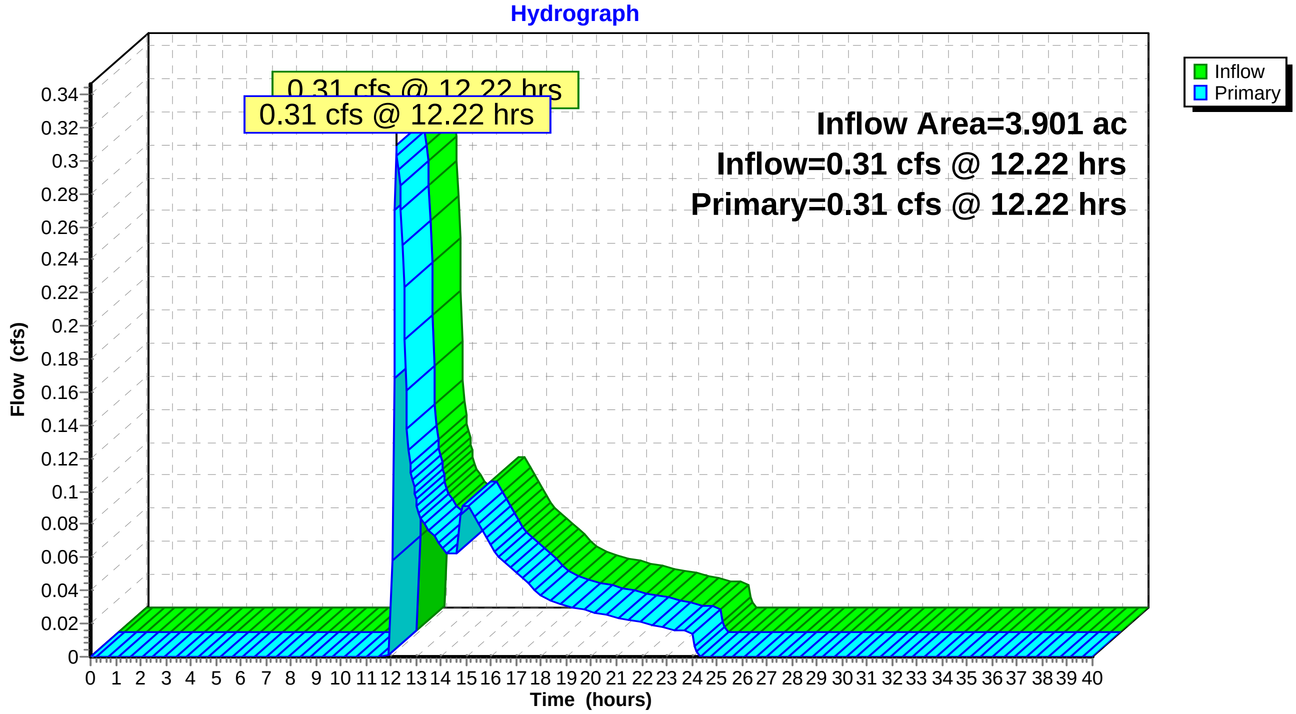


Summary for Link 1L: Flow towards wetlands

Inflow Area = 3.901 ac, 8.31% Impervious, Inflow Depth = 0.17" for 5-YR event
Inflow = 0.31 cfs @ 12.22 hrs, Volume= 0.054 af
Primary = 0.31 cfs @ 12.22 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L: Flow towards wetlands

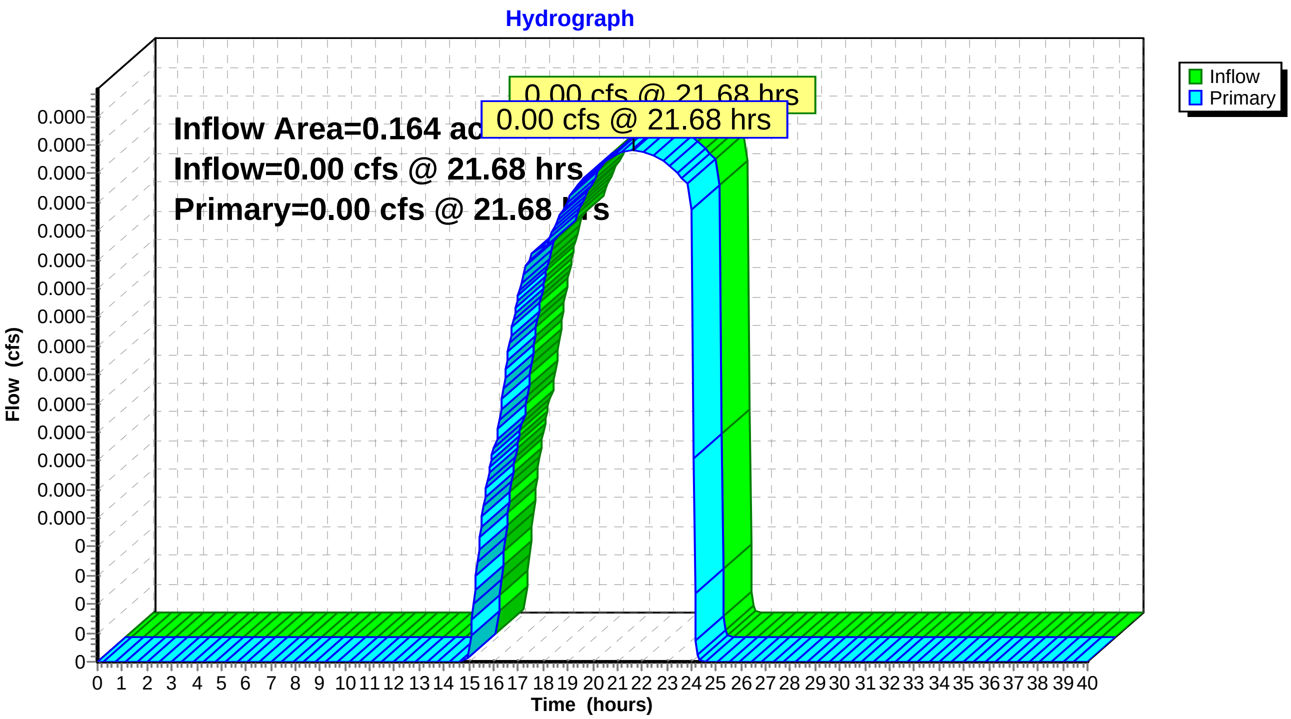


Summary for Link 2L: flow to the north

Inflow Area =	0.164 ac,	0.00% Impervious, Inflow Depth = 0.02"	for 5-YR event
Inflow =	0.00 cfs @	21.68 hrs, Volume=	0.000 af
Primary =	0.00 cfs @	21.68 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L: flow to the north

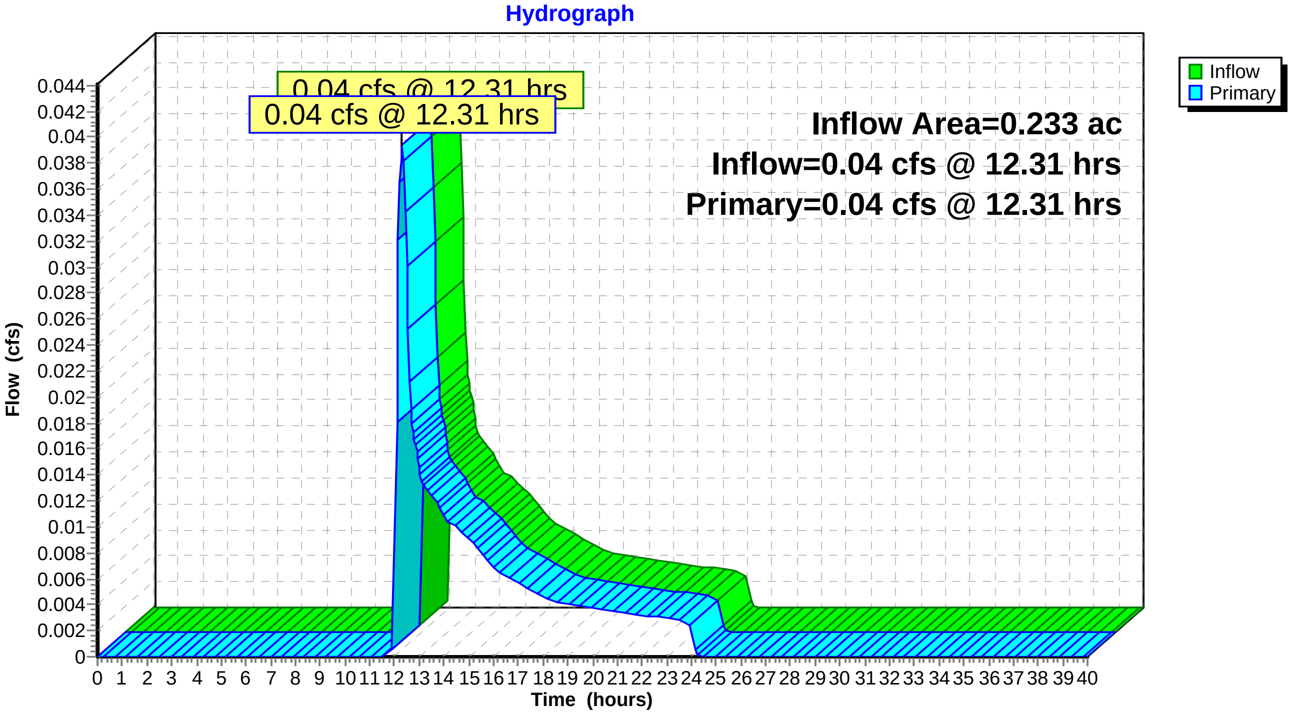


Summary for Link 3L: Flow to existing cb on north-side of Elm Street

Inflow Area = 0.233 ac, 0.00% Impervious, Inflow Depth = 0.37" for 5-YR event
Inflow = 0.04 cfs @ 12.31 hrs, Volume= 0.007 af
Primary = 0.04 cfs @ 12.31 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L: Flow to existing cb on north-side of Elm Street

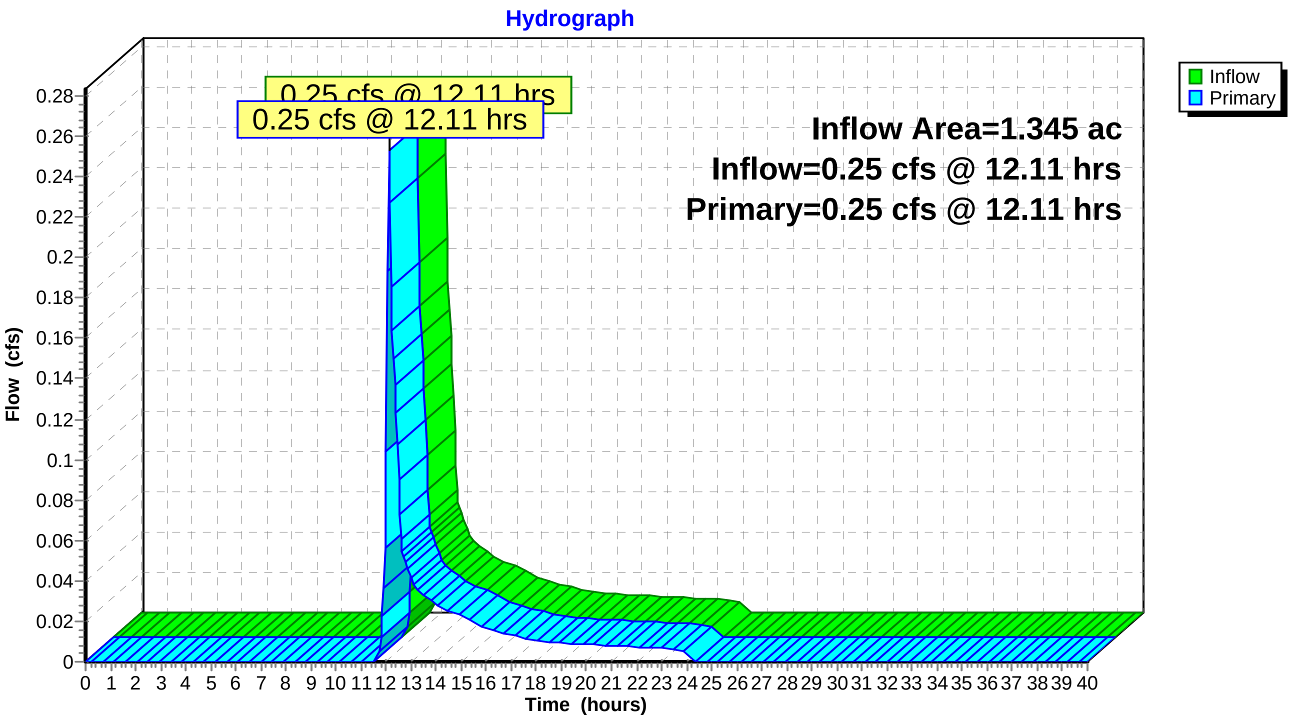


Summary for Link 4L: Flow towards north-side of Elm Street

Inflow Area = 1.345 ac, 19.93% Impervious, Inflow Depth = 0.20" for 5-YR event
Inflow = 0.25 cfs @ 12.11 hrs, Volume= 0.022 af
Primary = 0.25 cfs @ 12.11 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L: Flow towards north-side of Elm Street

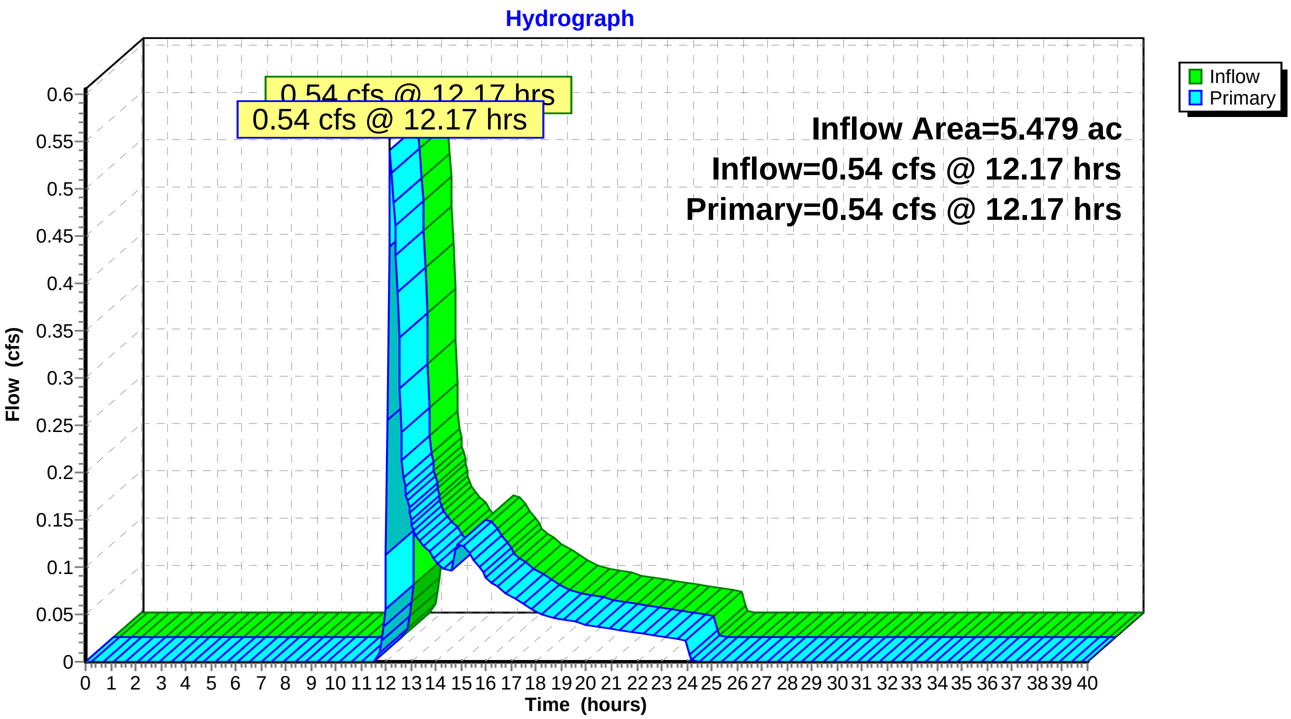


Summary for Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

Inflow Area = 5.479 ac, 10.81% Impervious, Inflow Depth = 0.18" for 5-YR event
Inflow = 0.54 cfs @ 12.17 hrs, Volume= 0.084 af
Primary = 0.54 cfs @ 12.17 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

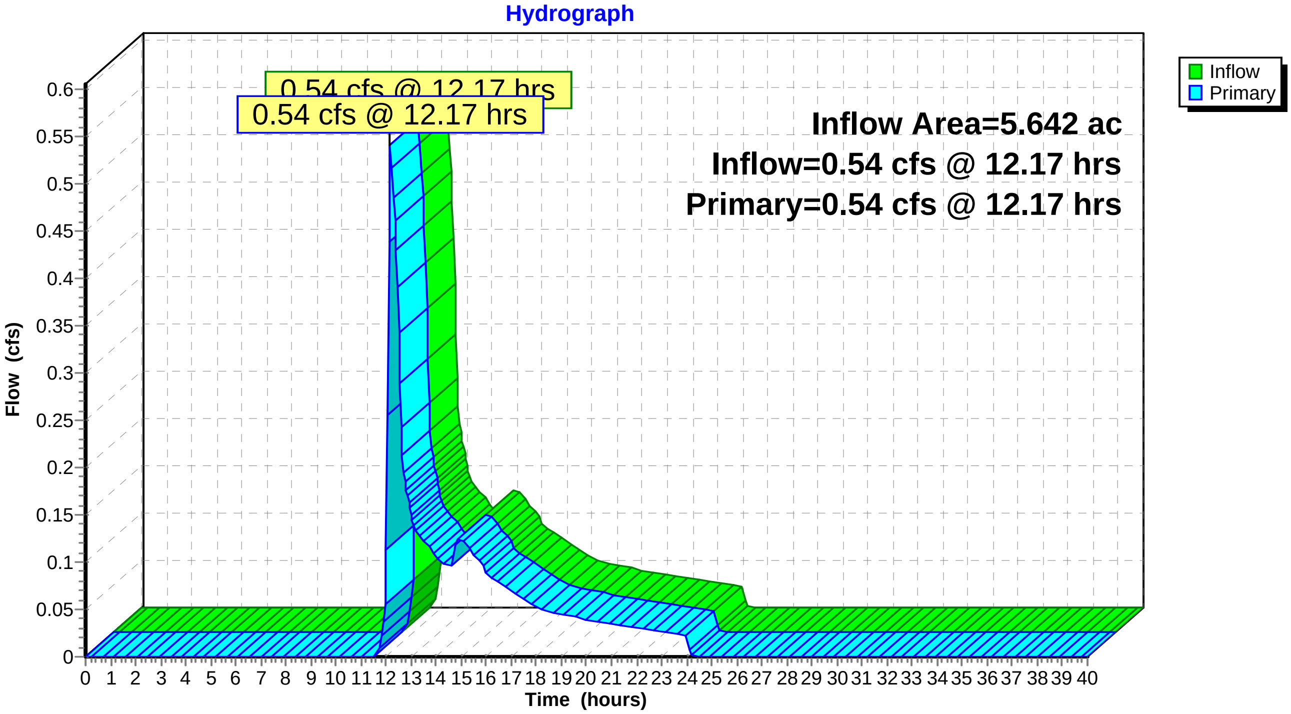


Summary for Link 6L: Total runoff discharging from within the limit of watershed analysis

Inflow Area =	5.642 ac, 10.50% Impervious, Inflow Depth = 0.18" for 5-YR event		
Inflow =	0.54 cfs @ 12.17 hrs, Volume=	0.084 af	
Primary =	0.54 cfs @ 12.17 hrs, Volume=	0.084 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 6L: Total runoff discharging from within the limit of watershed analysis



Summary for Subcatchment 1S: EX-1R

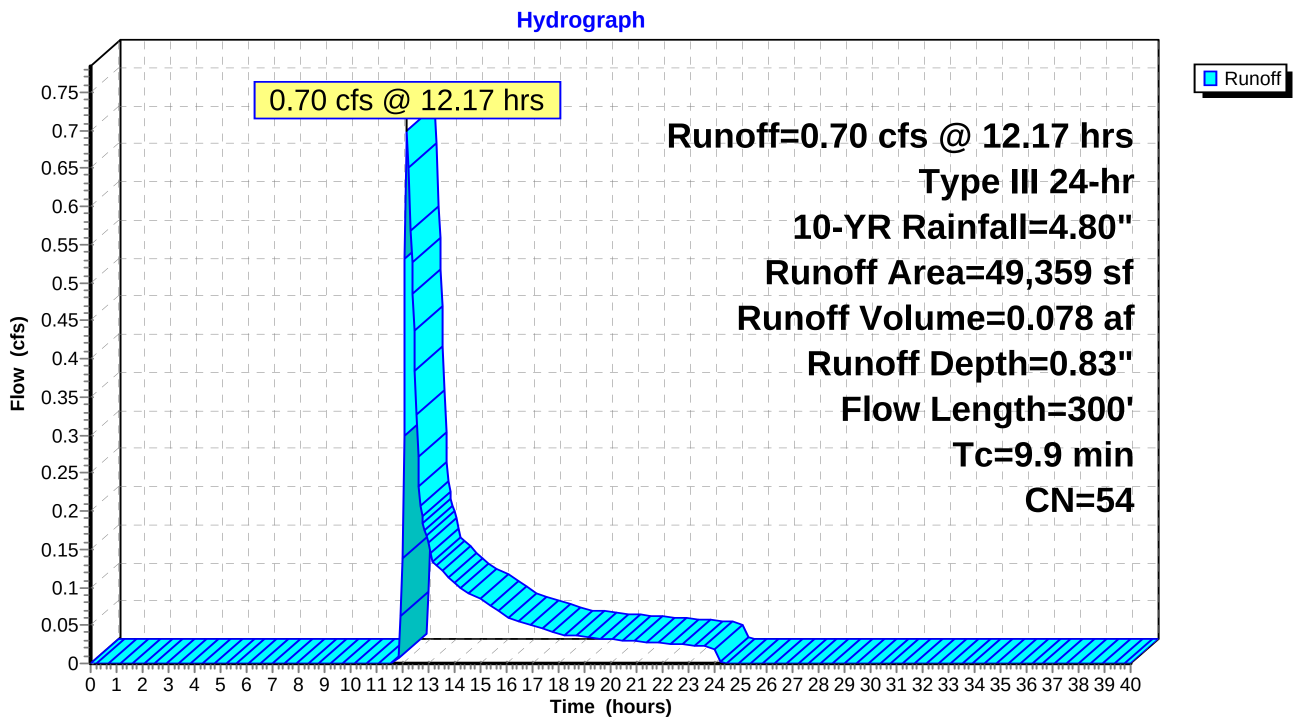
Runoff = 0.70 cfs @ 12.17 hrs, Volume= 0.078 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
1,009	30	Woods, Good, HSG A
33,181	55	Woods, Good, HSG B
5,769	39	>75% Grass cover, Good, HSG A
9,400	61	>75% Grass cover, Good, HSG B
49,359	54	Weighted Average
49,359		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0450	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	250	0.0630	4.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.9	300	Total			

Subcatchment 1S: EX-1R



Summary for Subcatchment 2S: EX-2R

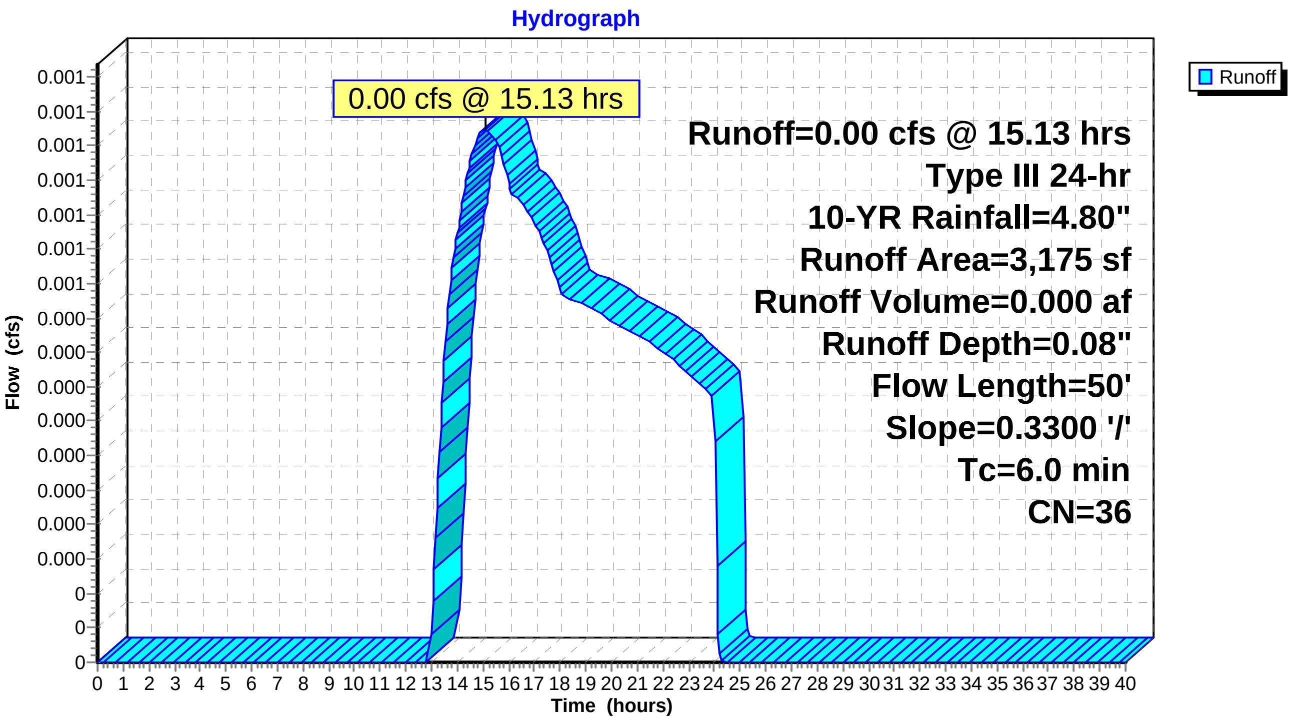
Runoff = 0.00 cfs @ 15.13 hrs, Volume= 0.000 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
1,000	30	Woods, Good, HSG A
2,175	39	>75% Grass cover, Good, HSG A
3,175	36	Weighted Average
3,175		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	50	0.3300	0.45		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.8	50	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: EX-2R



Summary for Subcatchment 3S: EX-3R

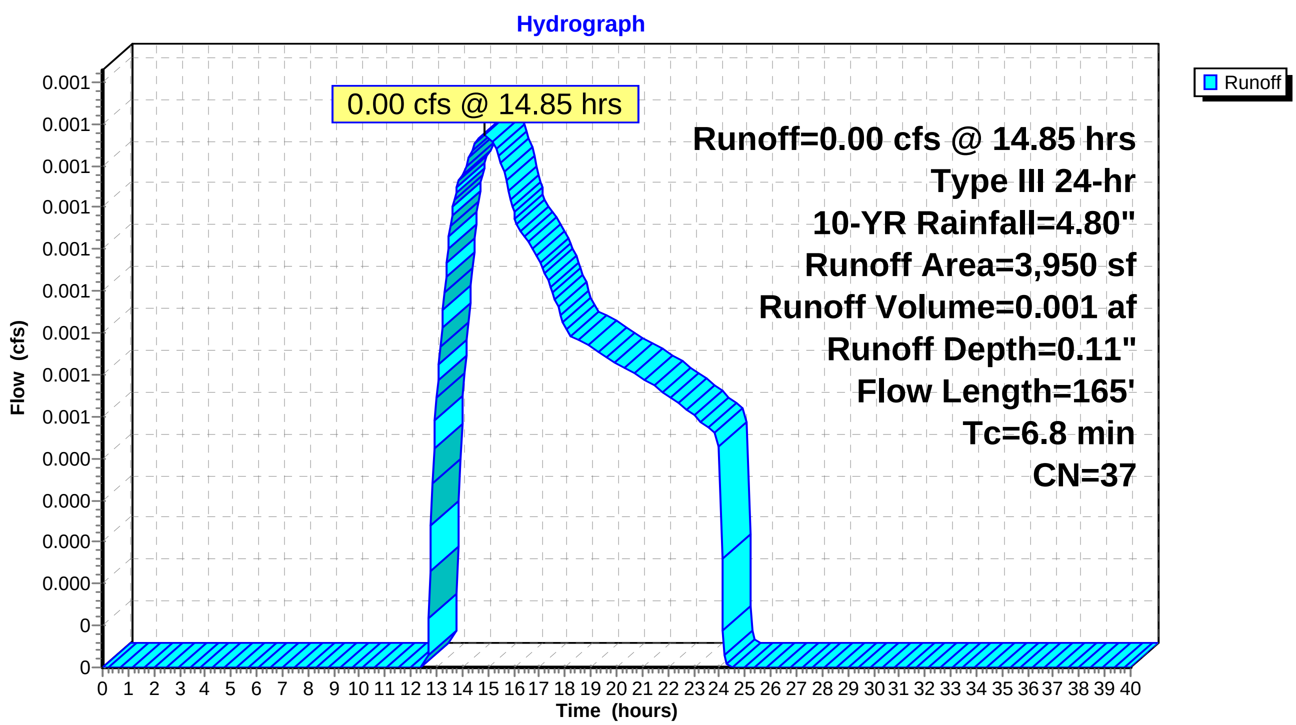
Runoff = 0.00 cfs @ 14.85 hrs, Volume= 0.001 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
1,000	30	Woods, Good, HSG A
2,950	39	>75% Grass cover, Good, HSG A
3,950	37	Weighted Average
3,950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	115	0.1400	6.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	165	Total			

Subcatchment 3S: EX-3R



Summary for Subcatchment 4S: EX-4R

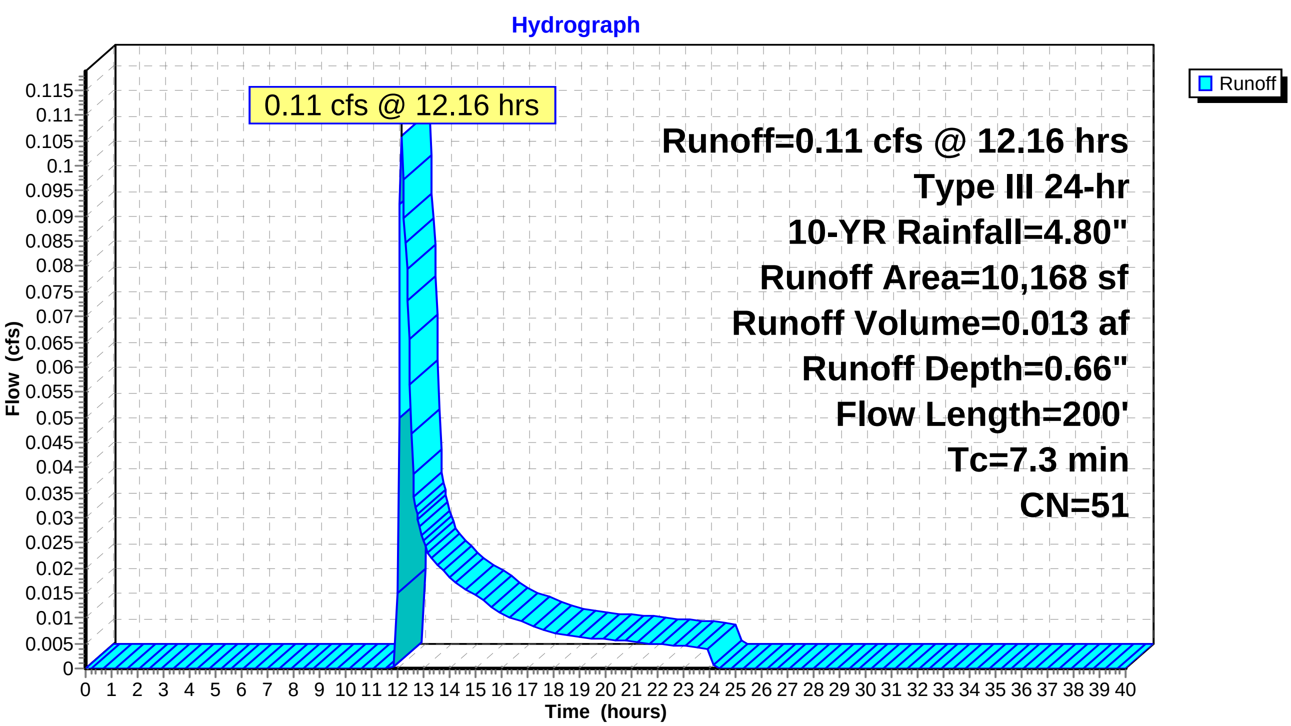
Runoff = 0.11 cfs @ 12.16 hrs, Volume= 0.013 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
1,573	30	Woods, Good, HSG A
8,595	55	Woods, Good, HSG B
10,168	51	Weighted Average
10,168		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0860	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	140	0.1520	6.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.1100	6.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	200	Total			

Subcatchment 4S: EX-4R



Summary for Subcatchment 5S: EX-5R

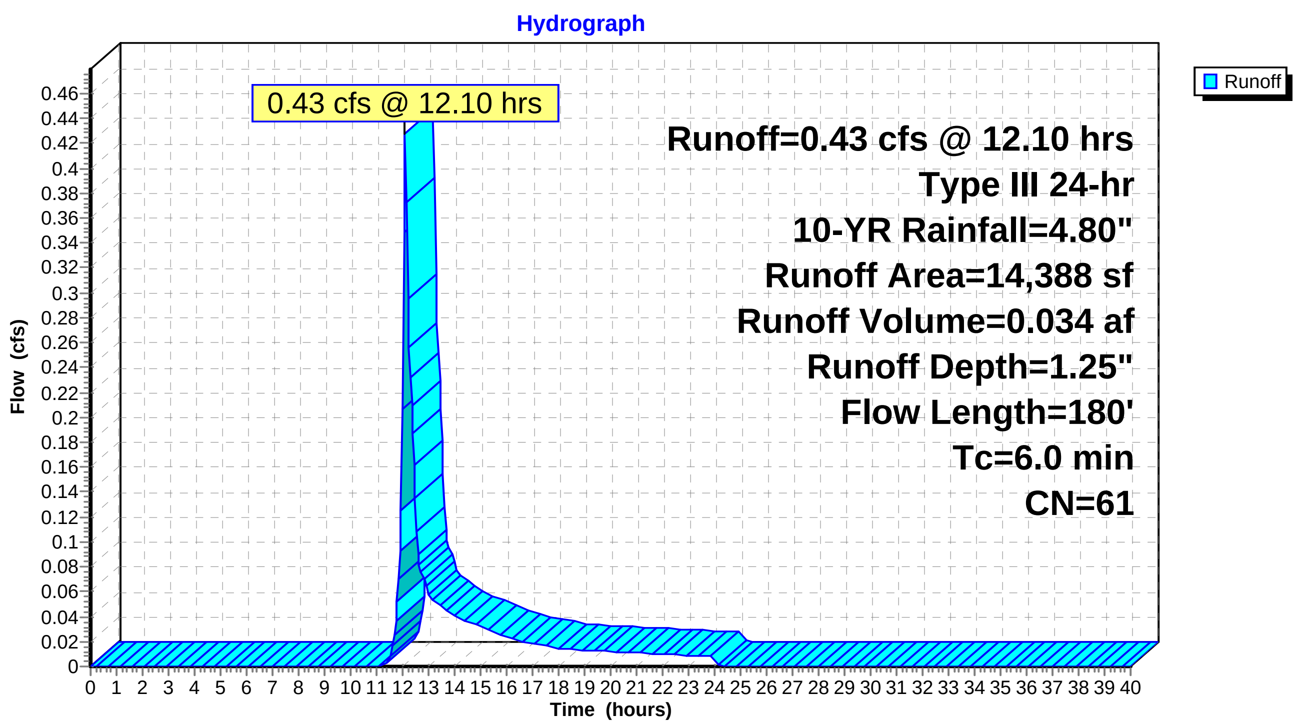
Runoff = 0.43 cfs @ 12.10 hrs, Volume= 0.034 af, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
278	30	Woods, Good, HSG A
2,500	55	Woods, Good, HSG B
500	98	Paved parking, HSG B
11,110	61	>75% Grass cover, Good, HSG B
14,388	61	Weighted Average
13,888		96.52% Pervious Area
500		3.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	50	0.1900	0.36		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.4	130	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	180	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: EX-5R



Summary for Subcatchment 7S: PR-1R

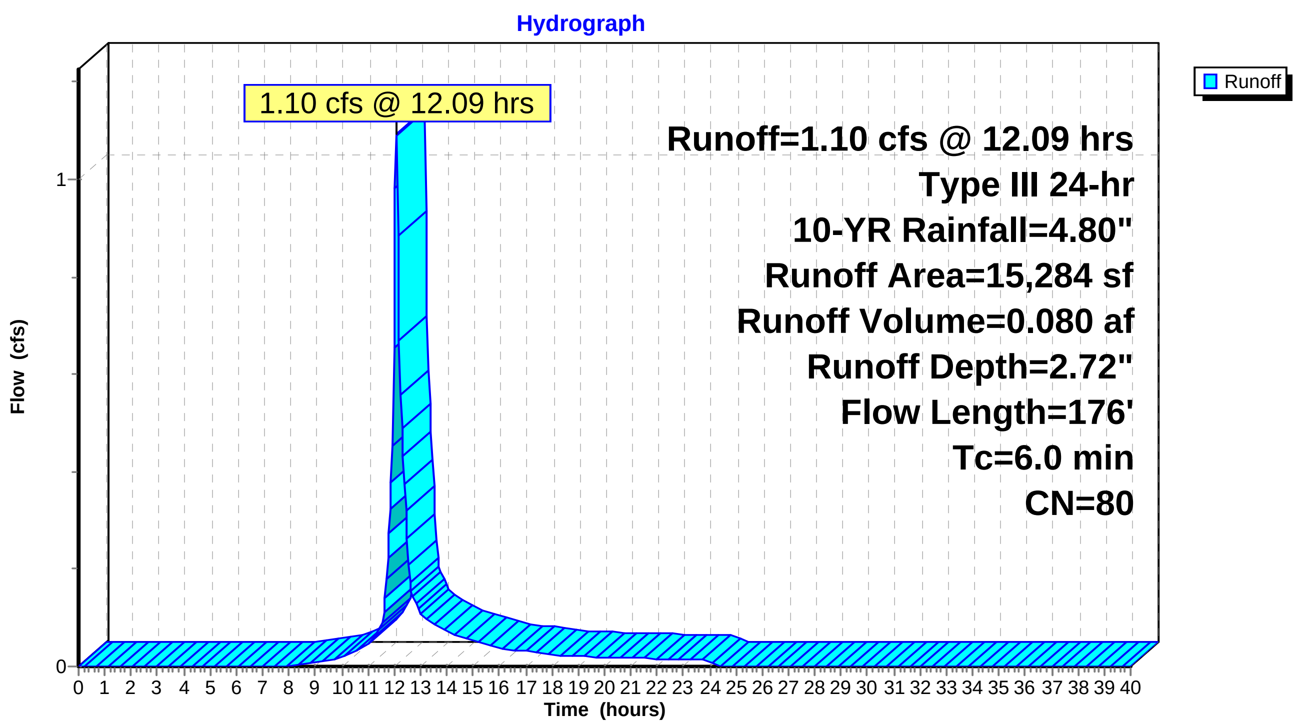
Runoff = 1.10 cfs @ 12.09 hrs, Volume= 0.080 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
4,718	39	>75% Grass cover, Good, HSG A
10,566	98	Paved parking, HSG A
15,284	80	Weighted Average
4,718		30.87% Pervious Area
10,566		69.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0310	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.5	125	0.0430	4.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	26	0.0120	2.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	176	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7S: PR-1R



Summary for Subcatchment 8S: PR-2R

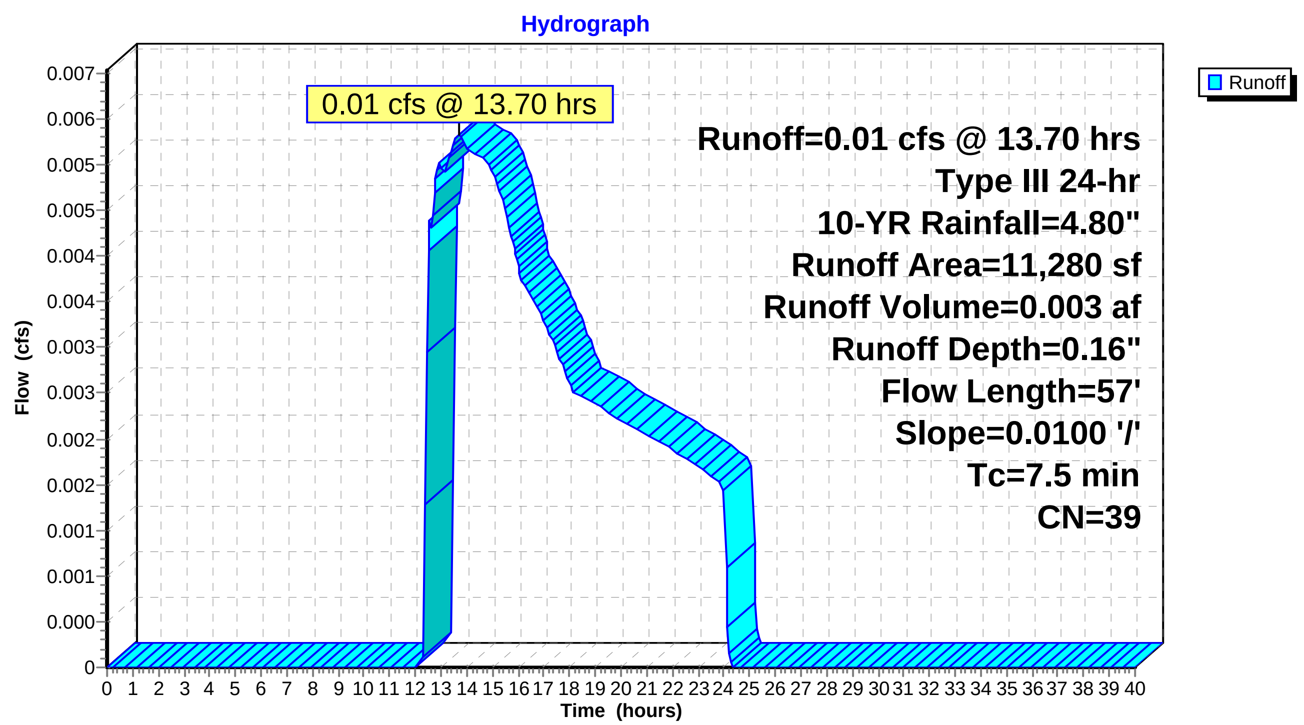
Runoff = 0.01 cfs @ 13.70 hrs, Volume= 0.003 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
11,193	39	>75% Grass cover, Good, HSG A
87	61	>75% Grass cover, Good, HSG B
11,280	39	Weighted Average
11,280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	7	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	57	Total			

Subcatchment 8S: PR-2R



Summary for Subcatchment 9S: PR-3R

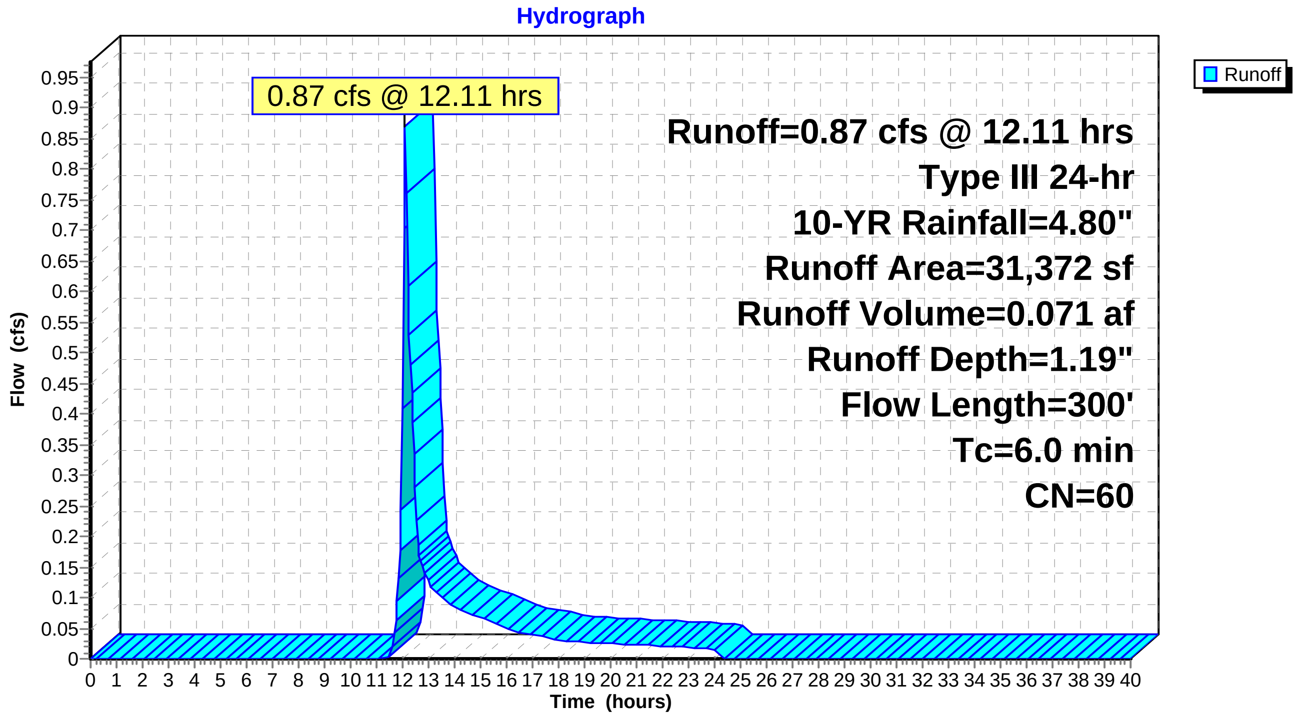
Runoff = 0.87 cfs @ 12.11 hrs, Volume= 0.071 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
6,795	39	>75% Grass cover, Good, HSG A
21,016	61	>75% Grass cover, Good, HSG B
1,143	98	Paved parking, HSG A
2,418	98	Paved parking, HSG B
31,372	60	Weighted Average
27,811		88.65% Pervious Area
3,561		11.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0700	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.5	150	0.1060	5.24		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	100	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.2	300	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 9S: PR-3R



Summary for Subcatchment 10S: PR-4R

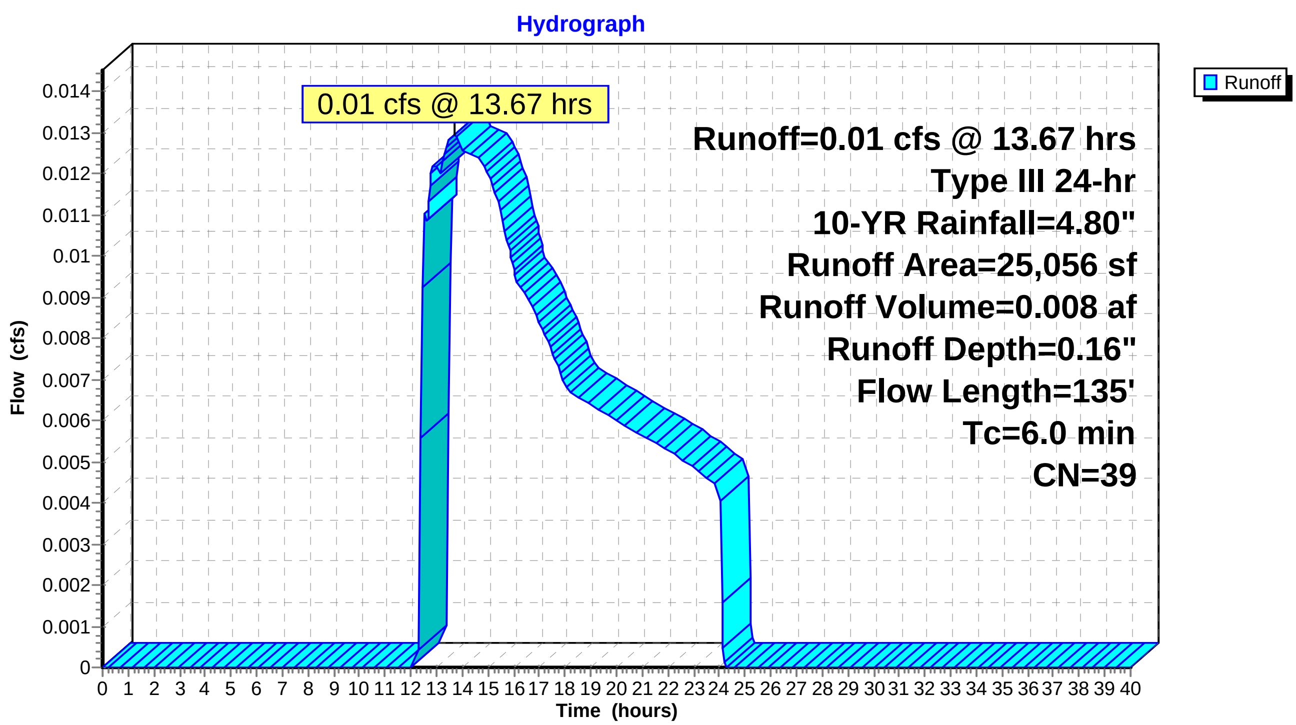
Runoff = 0.01 cfs @ 13.67 hrs, Volume= 0.008 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
25,056	39	>75% Grass cover, Good, HSG A
25,056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.2	80	0.1560	6.36		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	5	0.3300	9.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.5	135	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 10S: PR-4R



Summary for Subcatchment 11S: PR-5R

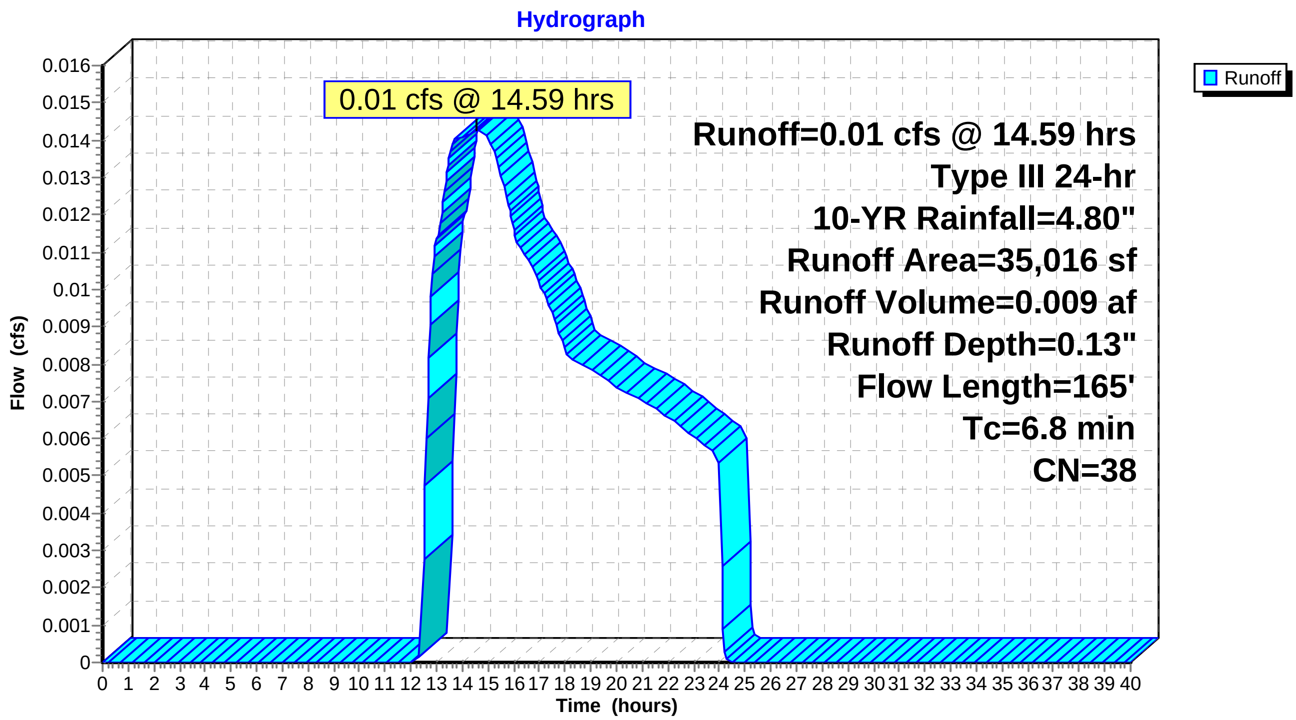
Runoff = 0.01 cfs @ 14.59 hrs, Volume= 0.009 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
31,016	39	>75% Grass cover, Good, HSG A
4,000	30	Woods, Good, HSG A
35,016	38	Weighted Average
35,016		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	115	0.1400	6.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	165	Total			

Subcatchment 11S: PR-5R



Summary for Subcatchment 12S: PR-6

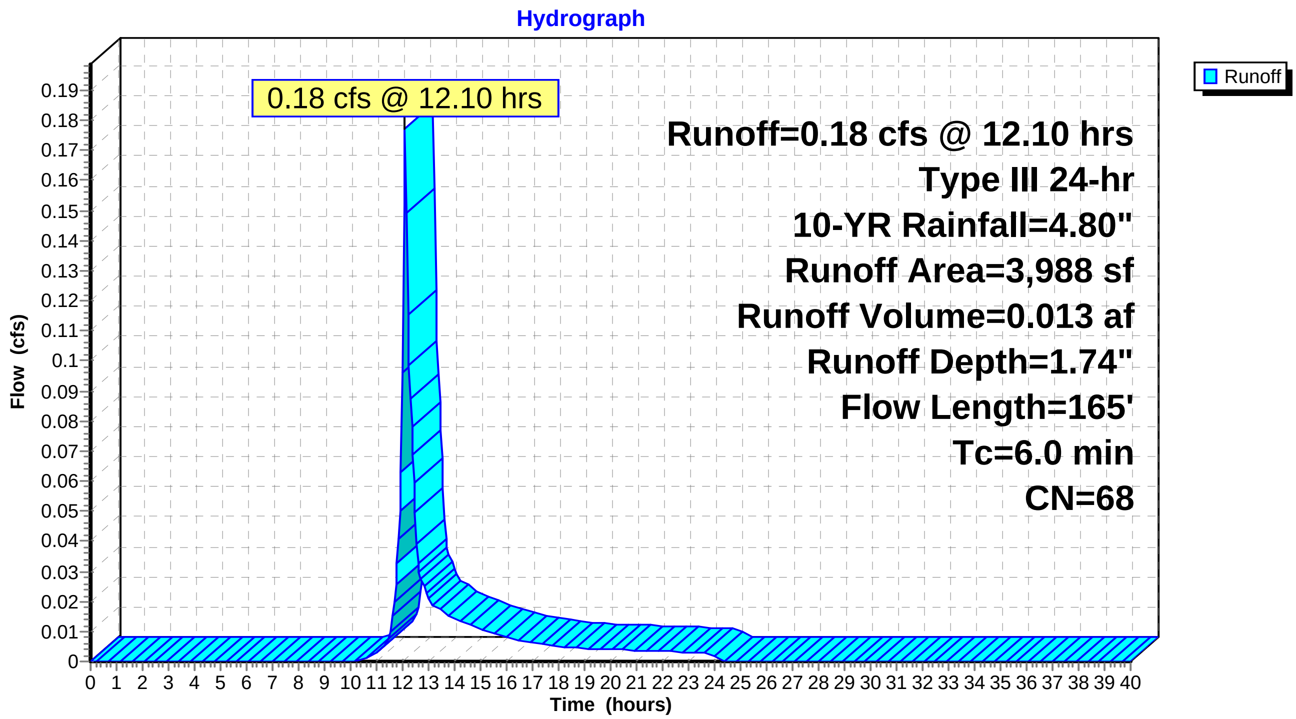
Runoff = 0.18 cfs @ 12.10 hrs, Volume= 0.013 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
2,011	39	>75% Grass cover, Good, HSG A
1,977	98	Paved parking, HSG A
3,988	68	Weighted Average
2,011		50.43% Pervious Area
1,977		49.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	35	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	11	0.0310	3.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	119	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.0	165	Total			

Subcatchment 12S: PR-6



Summary for Subcatchment 13S: PR-7

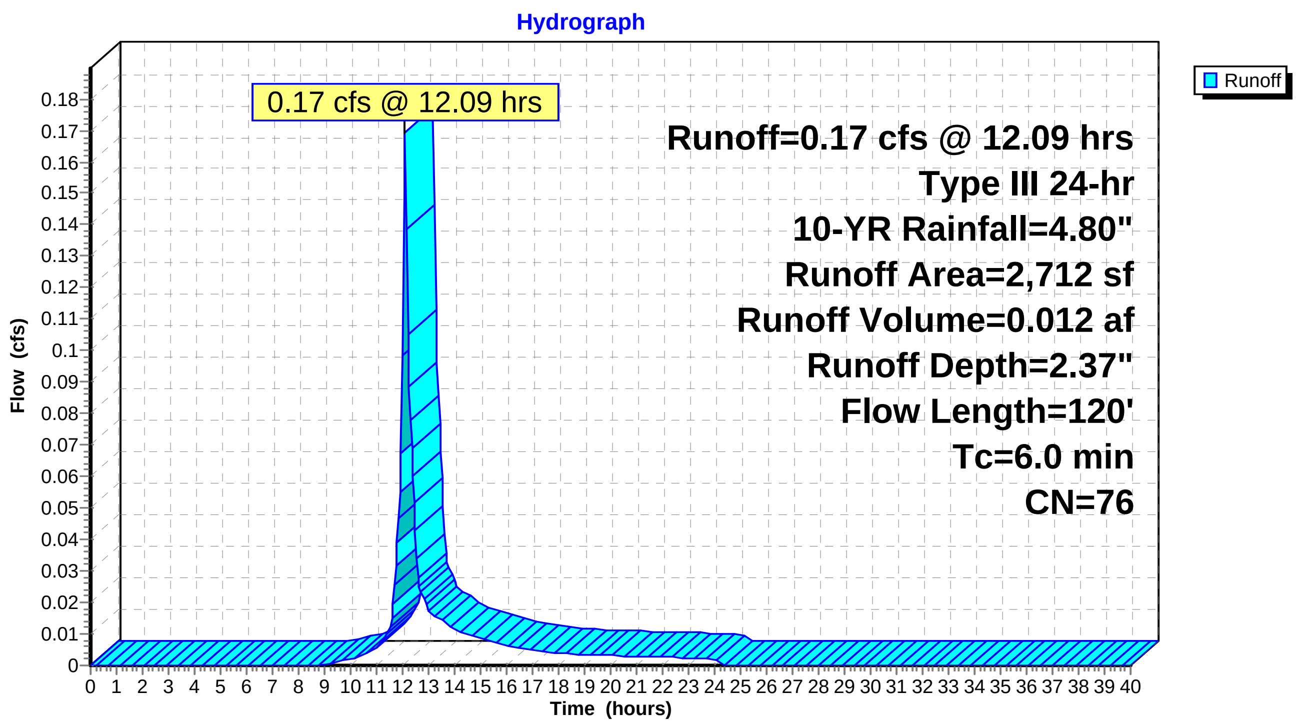
Runoff = 0.17 cfs @ 12.09 hrs, Volume= 0.012 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
1,021	39	>75% Grass cover, Good, HSG A
1,691	98	Paved parking, HSG A
2,712	76	Weighted Average
1,021		37.65% Pervious Area
1,691		62.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0310	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.3	95	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	120	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13S: PR-7



Summary for Subcatchment 14S: PR-8R

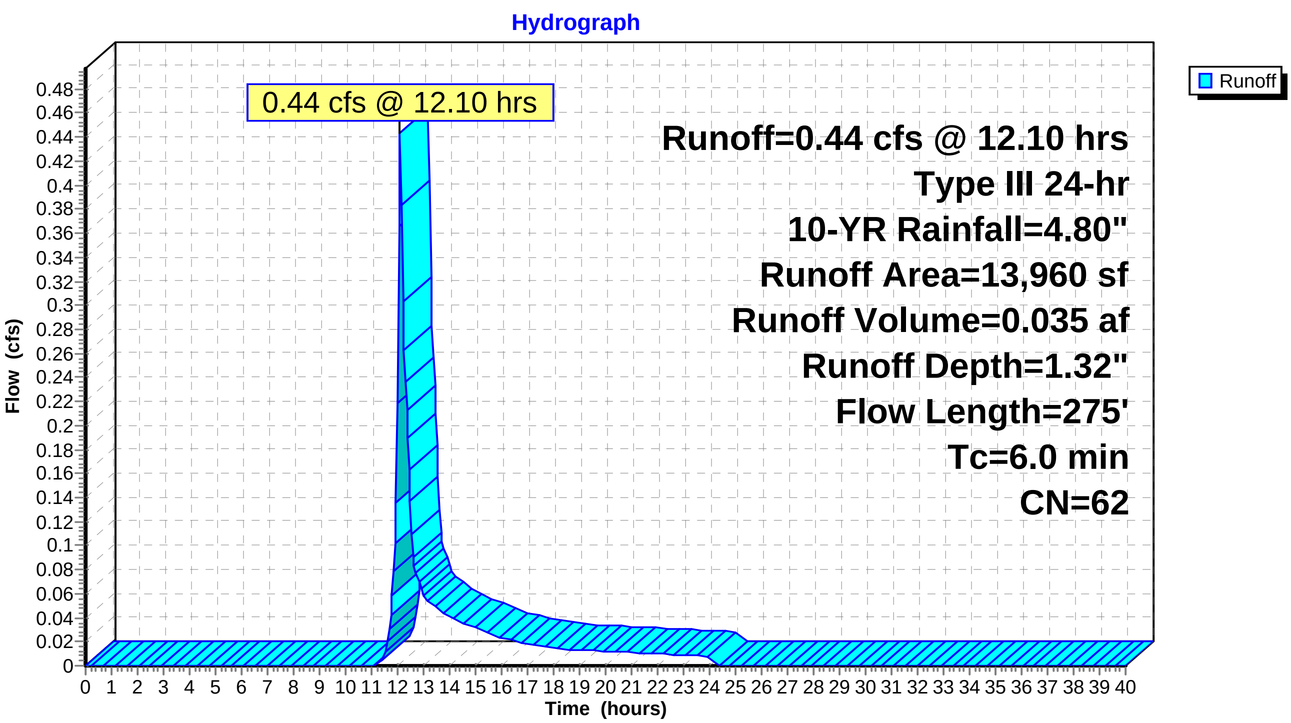
Runoff = 0.44 cfs @ 12.10 hrs, Volume= 0.035 af, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
6,684	39	>75% Grass cover, Good, HSG A
2,706	98	Paved parking, HSG A
1,525	98	Paved parking, HSG B
3,045	61	>75% Grass cover, Good, HSG B
13,960	62	Weighted Average
9,729		69.69% Pervious Area
4,231		30.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.4	100	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	125	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.9	275	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 14S: PR-8R



Summary for Subcatchment 15S: PR-9R

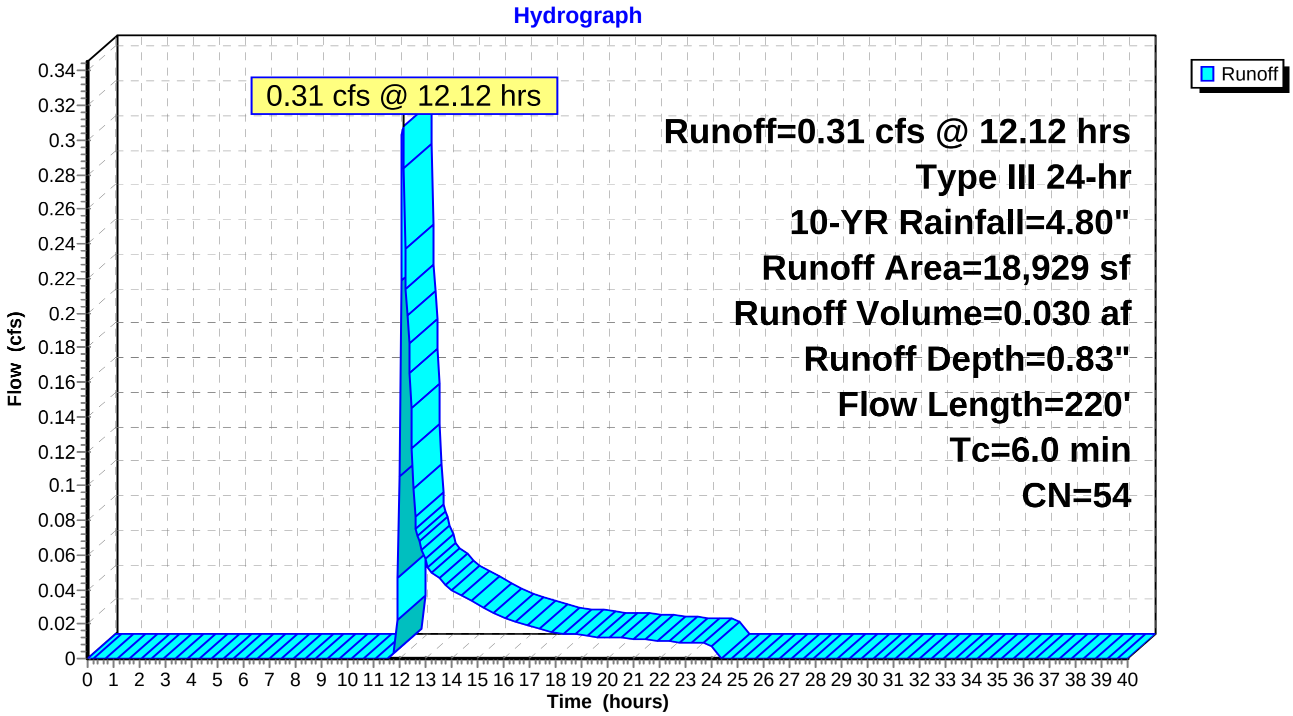
Runoff = 0.31 cfs @ 12.12 hrs, Volume= 0.030 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
11,941	39	>75% Grass cover, Good, HSG A
2,358	98	Paved parking, HSG A
1,358	98	Paved parking, HSG B
3,272	61	>75% Grass cover, Good, HSG B
18,929	54	Weighted Average
15,213		80.37% Pervious Area
3,716		19.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.0	10	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	150	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	220	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15S: PR-9R



Summary for Subcatchment 16S: PR-10R

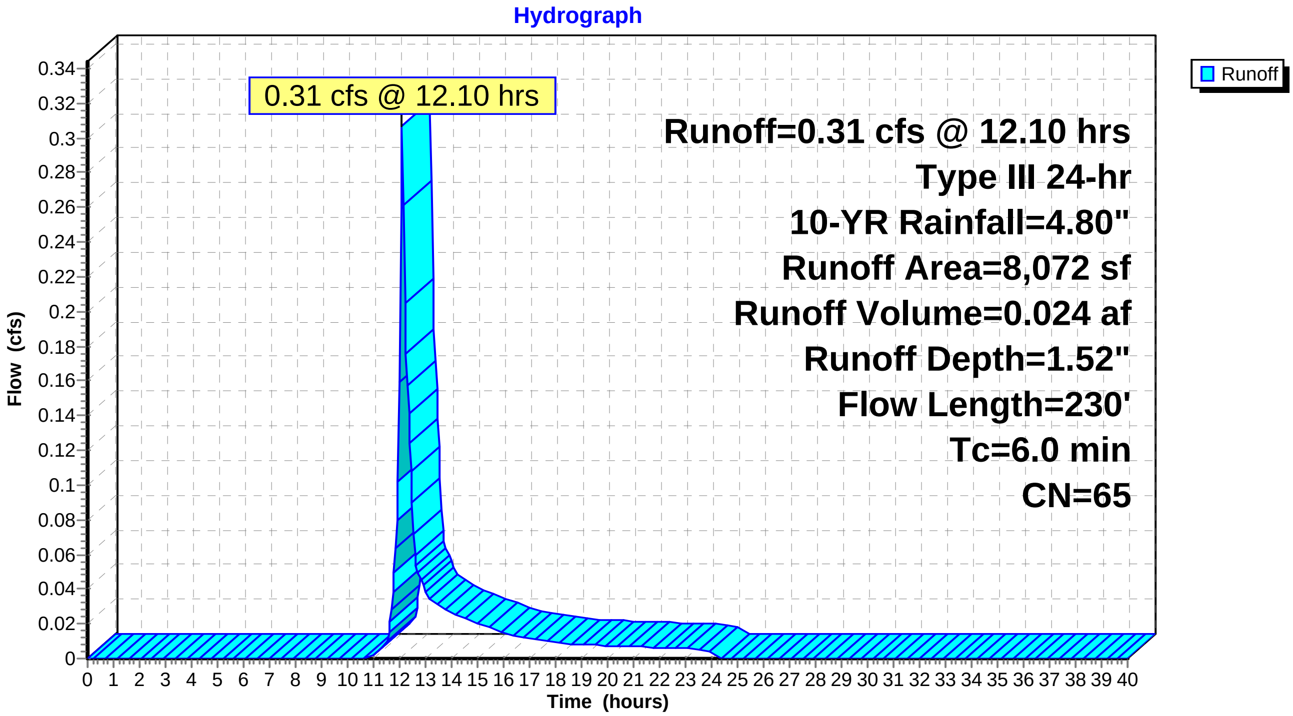
Runoff = 0.31 cfs @ 12.10 hrs, Volume= 0.024 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
670	39	>75% Grass cover, Good, HSG A
723	30	Woods, Good, HSG A
1,898	98	Paved parking, HSG B
4,781	61	>75% Grass cover, Good, HSG B
8,072	65	Weighted Average
6,174		76.49% Pervious Area
1,898		23.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	30	0.1430	0.13		**Sheet Flow,**
					Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	130	0.1770	6.77		**Shallow Concentrated Flow,**
					Unpaved Kv= 16.1 fps
0.1	20	0.0310	3.57		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
0.2	50	0.0500	4.54		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
4.3	230	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 16S: PR-10R



Summary for Subcatchment 17S: PR-11

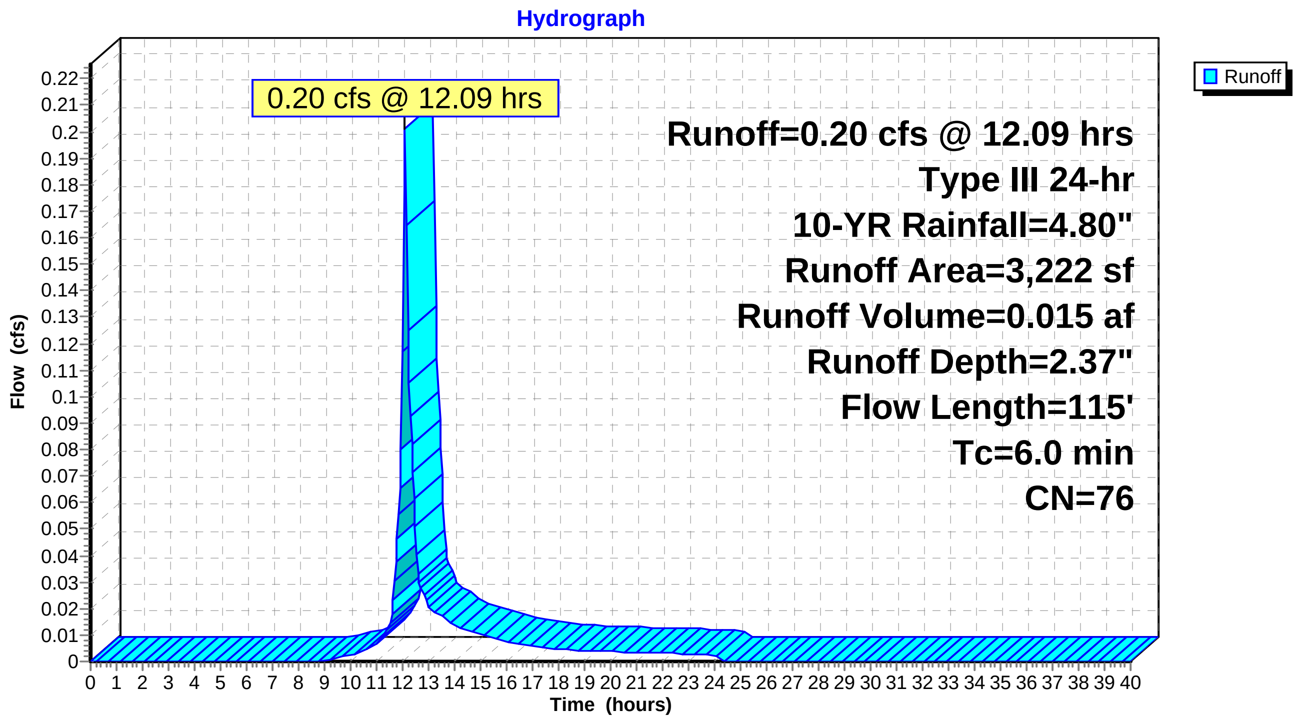
Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.015 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
1,329	98	Paved parking, HSG B
1,893	61	>75% Grass cover, Good, HSG B
3,222	76	Weighted Average
1,893		58.75% Pervious Area
1,329		41.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	40	0.1550	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	20	0.0310	2.83		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	55	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	115	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 17S: PR-11



Summary for Subcatchment 19S: PR-12

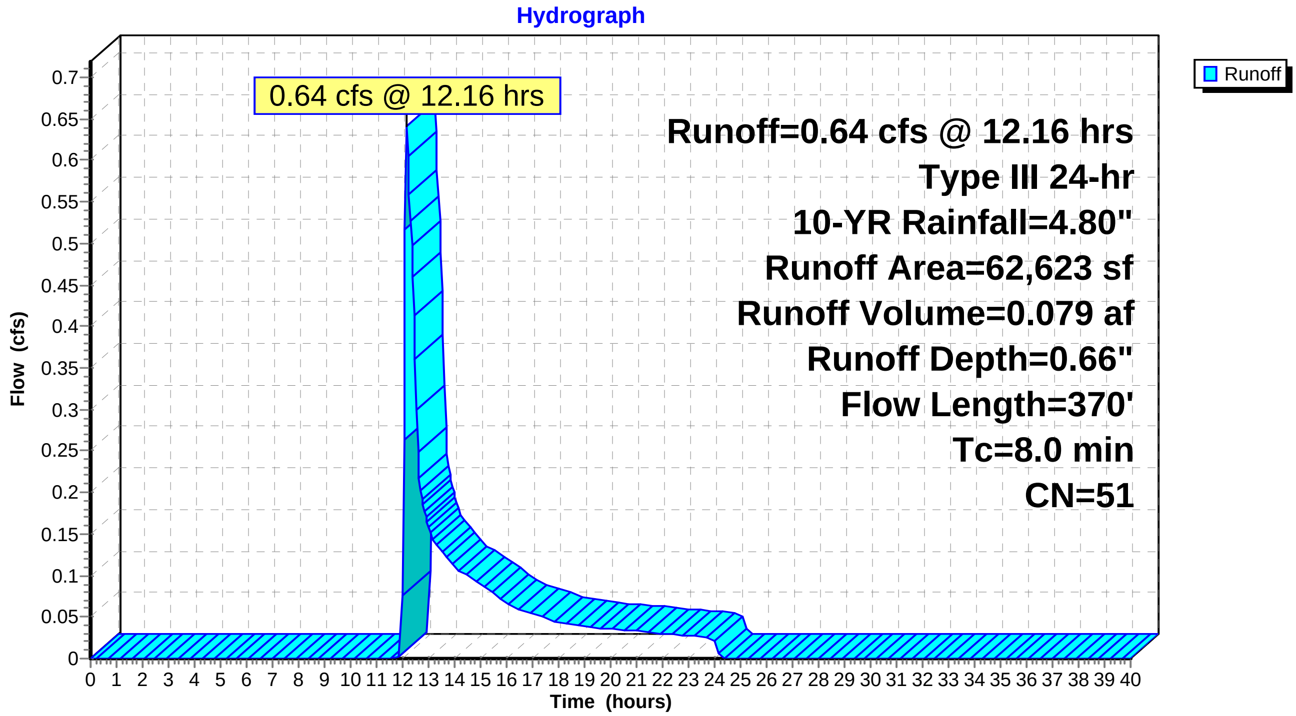
Runoff = 0.64 cfs @ 12.16 hrs, Volume= 0.079 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
9,300	39	>75% Grass cover, Good, HSG A
16,800	61	>75% Grass cover, Good, HSG B
7,412	30	Woods, Good, HSG A
29,111	55	Woods, Good, HSG B
62,623	51	Weighted Average
62,623		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,**
					Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	100	0.1330	5.87		**Shallow Concentrated Flow,**
					Unpaved Kv= 16.1 fps
1.2	205	0.0300	2.79		**Shallow Concentrated Flow,**
					Unpaved Kv= 16.1 fps
0.0	15	0.3300	9.25		**Shallow Concentrated Flow,**
					Unpaved Kv= 16.1 fps
8.0	370	Total			

Subcatchment 19S: PR-12



Summary for Pond 1P: Stormwater Management Area #1

Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 1.63" for 10-YR event
Inflow = 1.10 cfs @ 12.09 hrs, Volume= 0.083 af
Outflow = 0.63 cfs @ 12.22 hrs, Volume= 0.083 af, Atten= 42%, Lag= 7.7 min
Discarded = 0.05 cfs @ 12.22 hrs, Volume= 0.043 af
Primary = 0.58 cfs @ 12.22 hrs, Volume= 0.040 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 119.43' @ 12.22 hrs Surf.Area= 842 sf Storage= 770 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 56.6 min (888.7 - 832.1)

Volume	Invert	Avail.Storage	Storage Description
#1	118.30'	4,746 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

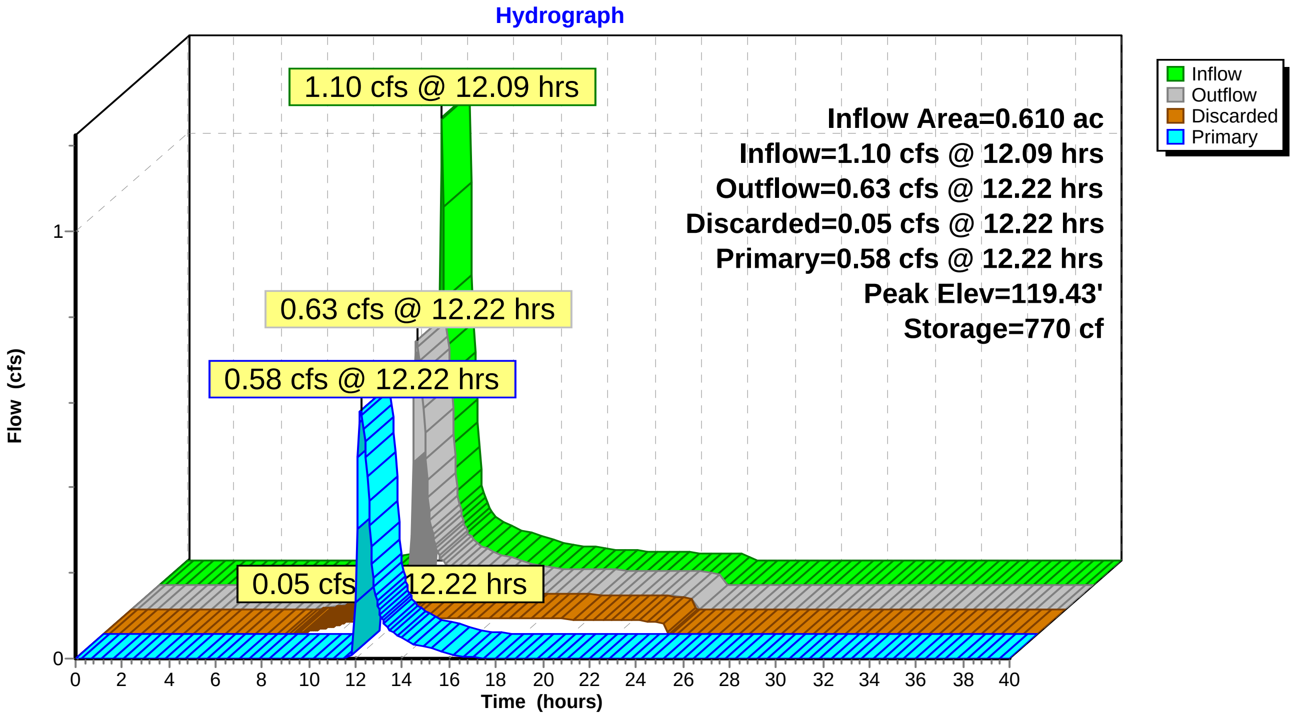
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.30	530	0	0
118.80	660	298	298
119.30	800	365	663
119.80	960	440	1,103
120.30	1,130	523	1,625
120.70	1,800	586	2,211
121.00	4,800	990	3,201
121.30	5,500	1,545	4,746

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**12.0" Round Culvert** L= 41.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 117.00' / 116.59' S= 0.0100 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Device 1	118.80'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Discarded	118.30'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 12.22 hrs HW=119.43' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.58 cfs @ 12.22 hrs HW=119.43' TW=109.68' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.58 cfs of 5.25 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.58 cfs @ 2.95 fps)

Pond 1P: Stormwater Management Area #1



Summary for Pond 2P: Stormwater Management Area #2

Inflow Area = 1.330 ac, 24.38% Impervious, Inflow Depth = 1.01" for 10-YR event
Inflow = 1.37 cfs @ 12.12 hrs, Volume= 0.112 af
Outflow = 0.10 cfs @ 14.86 hrs, Volume= 0.111 af, Atten= 93%, Lag= 164.6 min
Discarded = 0.06 cfs @ 14.86 hrs, Volume= 0.107 af
Secondary = 0.04 cfs @ 14.86 hrs, Volume= 0.004 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 74.32' @ 14.86 hrs Surf.Area= 2,419 sf Storage= 3,078 cf

Plug-Flow detention time= 605.0 min calculated for 0.111 af (100% of inflow)
Center-of-Mass det. time= 603.3 min (1,443.4 - 840.1)

Volume	Invert	Avail.Storage	Storage Description
#1	72.60'	7,534 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

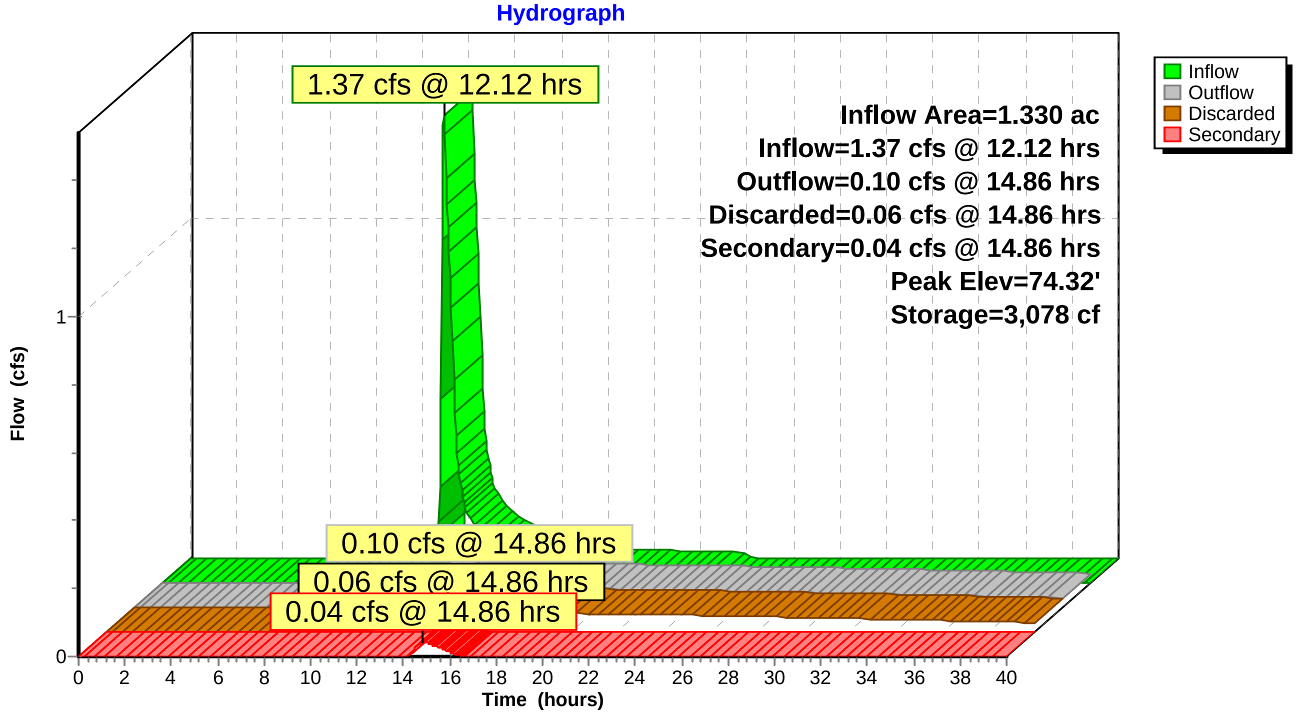
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.60	1,150	0	0
73.00	1,470	524	524
74.00	2,170	1,820	2,344
75.00	2,950	2,560	4,904
75.80	3,625	2,630	7,534

Device	Routing	Invert	Outlet Devices
#1	Discarded	72.60'	**1.020 in/hr Exfiltration over Surface area**
#2	Secondary	74.30'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.06 cfs @ 14.86 hrs HW=74.32' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Secondary OutFlow Max=0.04 cfs @ 14.86 hrs HW=74.32' TW=0.00' (Dynamic Tailwater)
└—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.04 cfs @ 0.35 fps)

Pond 2P: Stormwater Management Area #2



Summary for Pond 3P: Stormwater Management Area #3

[80] Warning: Exceeded Pond 18P by 0.11' @ 24.40 hrs (0.05 cfs 0.001 af)

Inflow Area = 1.014 ac, 25.29% Impervious, Inflow Depth = 1.22" for 10-YR event
Inflow = 1.26 cfs @ 12.10 hrs, Volume= 0.103 af
Outflow = 0.13 cfs @ 13.86 hrs, Volume= 0.103 af, Atten= 90%, Lag= 105.4 min
Discarded = 0.05 cfs @ 11.80 hrs, Volume= 0.085 af
Primary = 0.08 cfs @ 13.86 hrs, Volume= 0.018 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.15' @ 13.86 hrs Surf.Area= 2,102 sf Storage= 1,973 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 351.5 min (1,224.7 - 873.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	96.77'	1,779 cf	**35.33'W x 59.50'L x 3.54'H Field A**
			7,446 cf Overall - 2,999 cf Embedded = 4,447 cf x 40.0% Voids
#2A	97.27'	2,999 cf	**Cultec R-330XLHD** x 56 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		4,778 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	96.77'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	98.00'	**8.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 98.00' / 95.92' S= 0.0462 '/' Cc= 0.900
			n= 0.010, Flow Area= 0.35 sf

Discarded OutFlow Max=0.05 cfs @ 11.80 hrs HW=96.81' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.08 cfs @ 13.86 hrs HW=98.15' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 0.08 cfs @ 1.32 fps)

Pond 3P: Stormwater Management Area #3 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 7 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

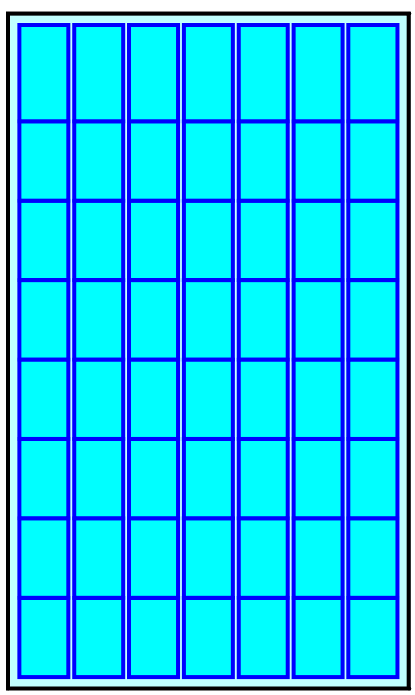
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
7 Rows x 52.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 35.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

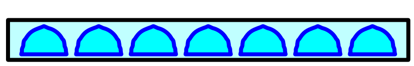
56 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 7 Rows = 2,999.0 cf Chamber Storage

7,445.8 cf Field - 2,999.0 cf Chambers = 4,446.7 cf Stone x 40.0% Voids = 1,778.7 cf Stone Storage

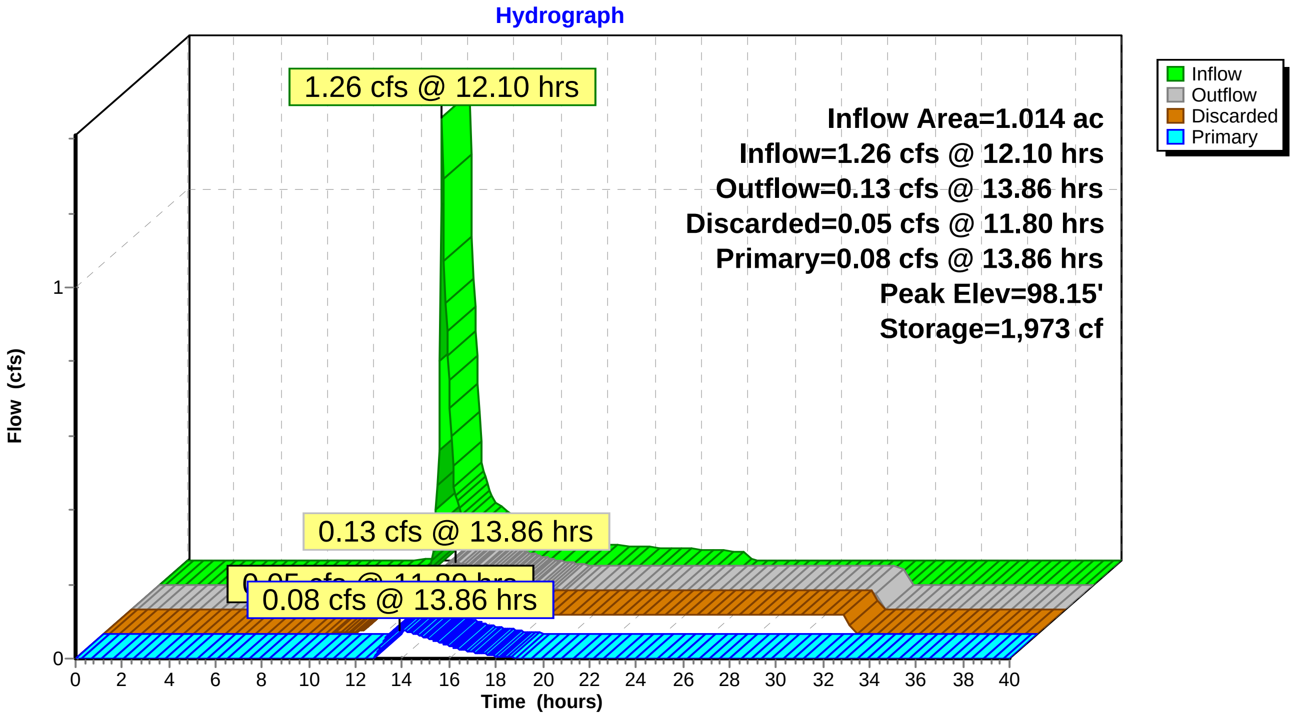
Chamber Storage + Stone Storage = 4,777.7 cf = 0.110 af
Overall Storage Efficiency = 64.2%
Overall System Size = 59.50' x 35.33' x 3.54'

56 Chambers
275.8 cy Field
164.7 cy Stone





Pond 3P: Stormwater Management Area #3



Summary for Pond 4P: Stormwater Management Area #4

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=6)

Inflow Area = 1.533 ac, 5.49% Impervious, Inflow Depth = 0.07" for 10-YR event
Inflow = 0.01 cfs @ 14.59 hrs, Volume= 0.009 af
Outflow = 0.01 cfs @ 15.81 hrs, Volume= 0.009 af, Atten= 14%, Lag= 73.2 min
Discarded = 0.01 cfs @ 15.81 hrs, Volume= 0.009 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 106.95' @ 15.81 hrs Surf.Area= 220 sf Storage= 29 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 19.1 min (1,063.3 - 1,044.2)

Volume	Invert	Avail.Storage	Storage Description
#1	106.80'	3,728 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

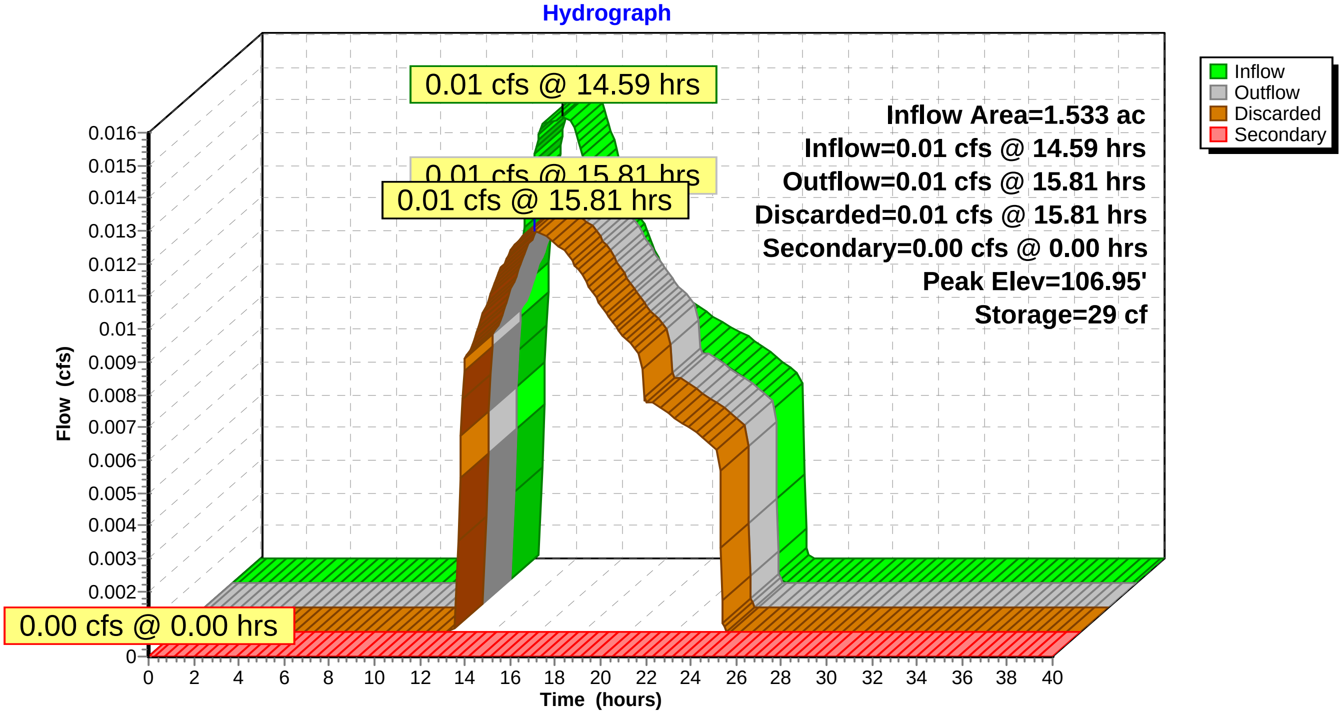
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
106.80	150	0	0
107.00	240	39	39
107.80	690	372	411
108.00	880	157	568
109.00	1,800	1,340	1,908
109.80	2,750	1,820	3,728

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	108.50'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.01 cfs @ 15.81 hrs HW=106.95' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=106.80' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Stormwater Management Area #4



Summary for Pond 5P: Stormwater Management Area #5

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=33)

Inflow Area = 0.729 ac, 11.55% Impervious, Inflow Depth = 0.55" for 10-YR event
Inflow = 0.35 cfs @ 12.10 hrs, Volume= 0.033 af
Outflow = 0.05 cfs @ 13.06 hrs, Volume= 0.033 af, Atten= 86%, Lag= 57.9 min
Discarded = 0.05 cfs @ 13.06 hrs, Volume= 0.033 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 109.43' @ 13.06 hrs Surf.Area= 877 sf Storage= 405 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 84.5 min (971.5 - 887.0)

Volume	Invert	Avail.Storage	Storage Description
#1	108.80'	4,689 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

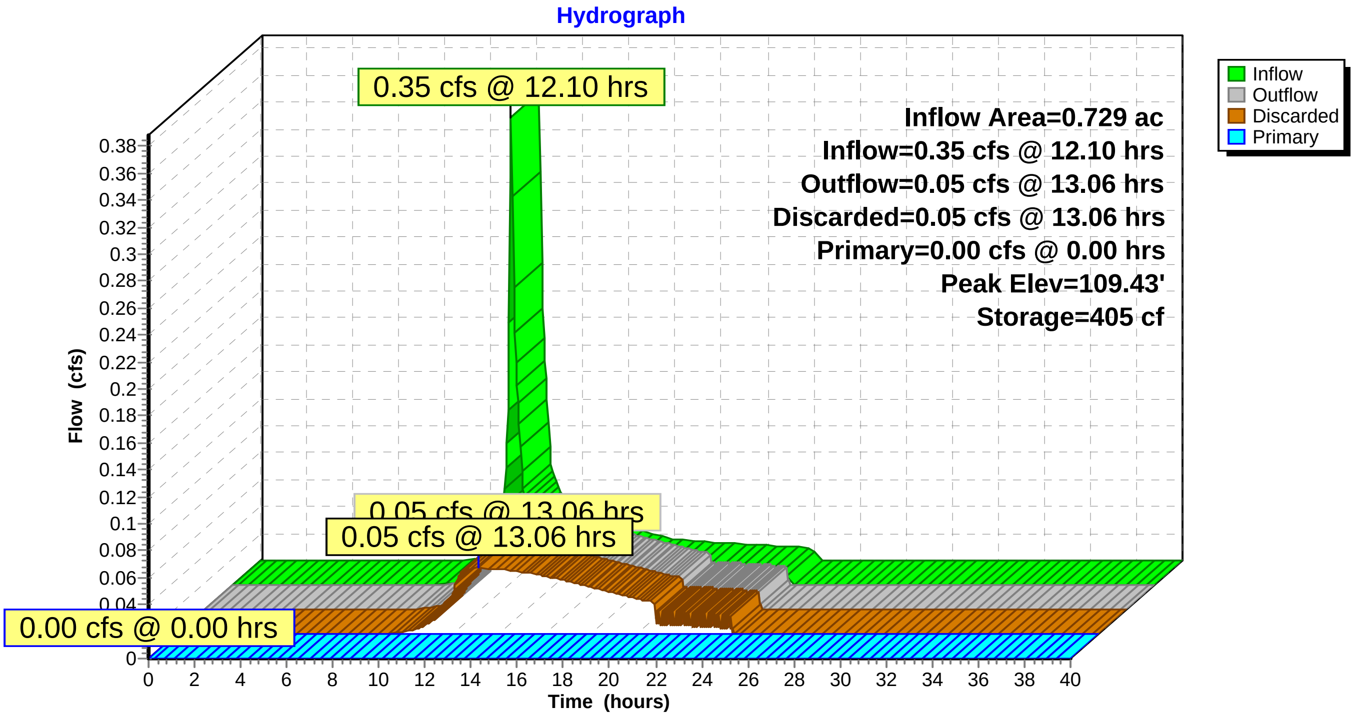
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
108.80	420	0	0
109.00	560	98	98
110.00	1,300	930	1,028
111.00	2,110	1,705	2,733
111.80	2,780	1,956	4,689

Device	Routing	Invert	Outlet Devices
#1	Discarded	108.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	110.30'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.05 cfs @ 13.06 hrs HW=109.43' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=108.80' TW=106.80' (Dynamic Tailwater)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: Stormwater Management Area #5



Summary for Pond 6P: Stormwater Management Area #6

Inflow Area = 1.438 ac, 0.00% Impervious, Inflow Depth = 0.66" for 10-YR event
Inflow = 0.64 cfs @ 12.16 hrs, Volume= 0.079 af
Outflow = 0.26 cfs @ 12.61 hrs, Volume= 0.076 af, Atten= 59%, Lag= 26.8 min
Discarded = 0.02 cfs @ 12.61 hrs, Volume= 0.034 af
Primary = 0.24 cfs @ 12.61 hrs, Volume= 0.042 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 79.06' @ 12.61 hrs Surf.Area= 789 sf Storage= 878 cf

Plug-Flow detention time= 262.9 min calculated for 0.076 af (96% of inflow)
Center-of-Mass det. time= 243.3 min (1,160.1 - 916.9)

Volume	Invert	Avail.Storage	Storage Description
#1	77.00'	2,540 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

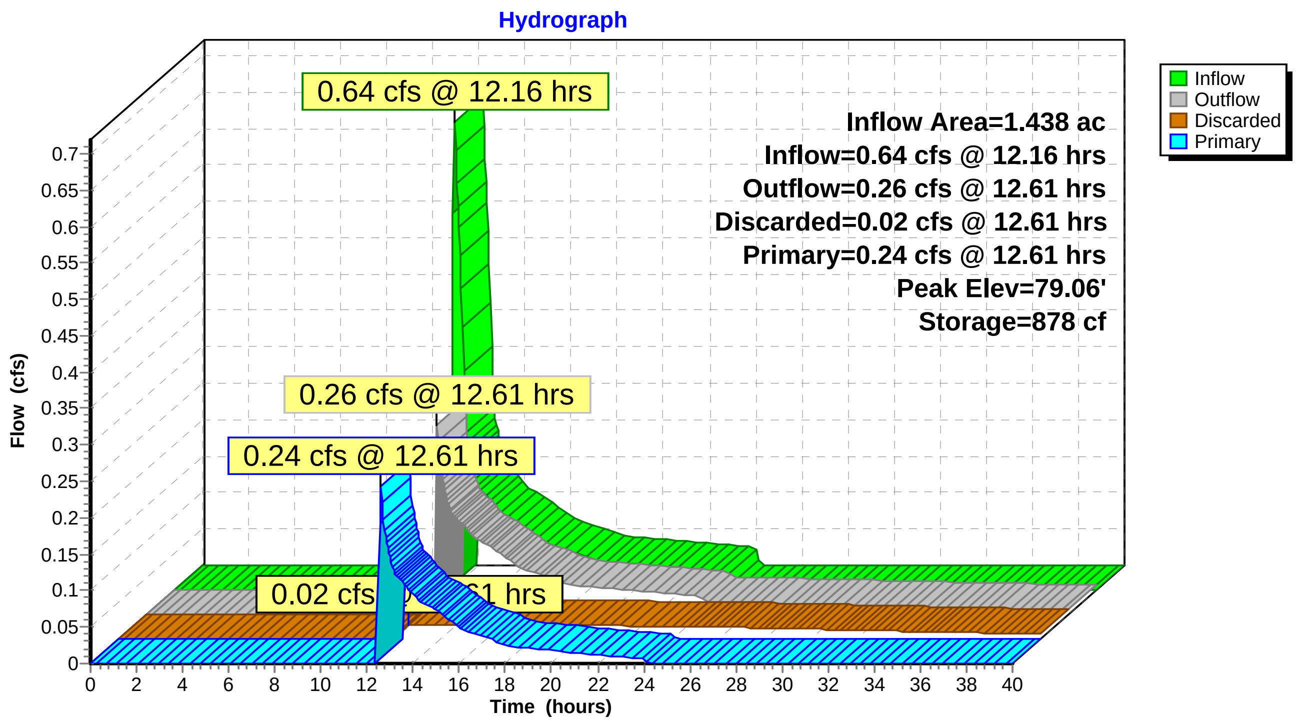
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.00	115	0	0
78.00	390	253	253
79.00	760	575	828
80.00	1,210	985	1,813
80.50	1,700	728	2,540

Device	Routing	Invert	Outlet Devices
#1	Discarded	77.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	79.00'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.02 cfs @ 12.61 hrs HW=79.06' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.24 cfs @ 12.61 hrs HW=79.06' TW=0.00' (Dynamic Tailwater)
2=Broad-Crested Rectangular Weir (Weir Controls 0.24 cfs @ 0.62 fps)

Pond 6P: Stormwater Management Area #6



Summary for Pond 7P: DMH

[57] Hint: Peaked at 109.68' (Flood elevation advised)

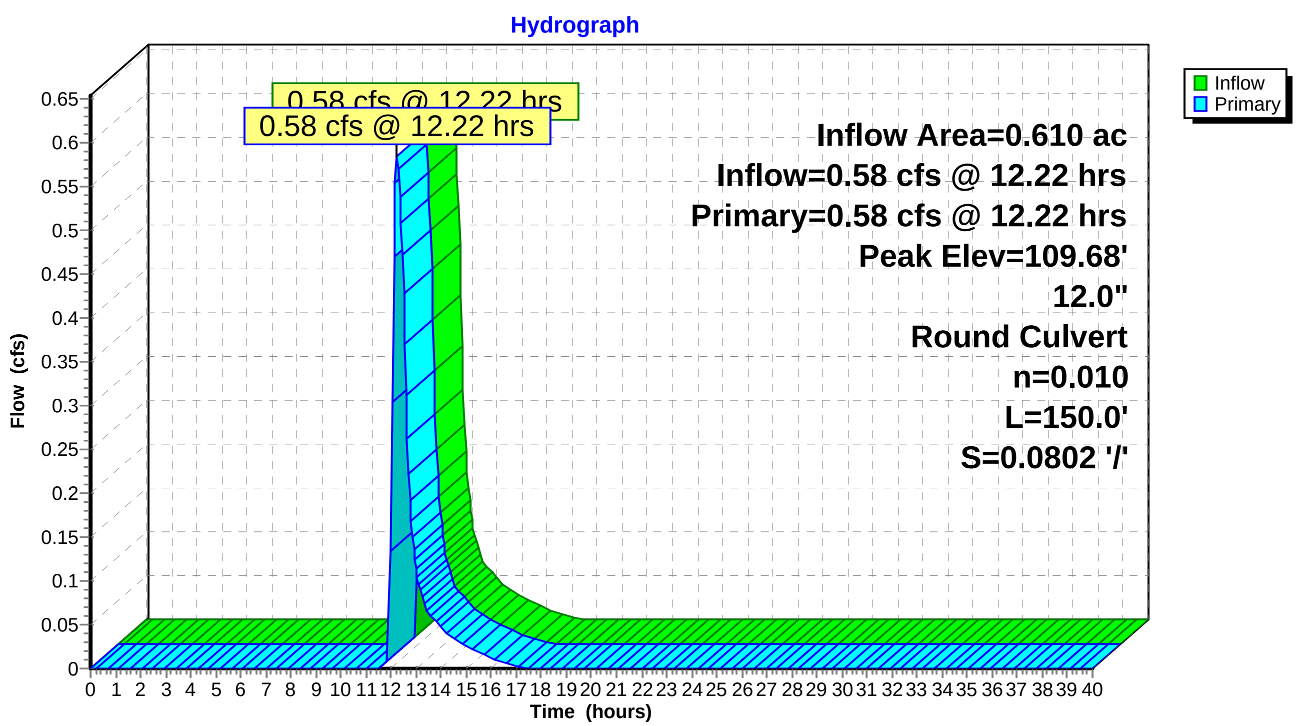
Inflow Area =	0.610 ac,	39.78% Impervious,	Inflow Depth = 0.79"	for 10-YR event
Inflow =	0.58 cfs @	12.22 hrs, Volume=	0.040 af	
Outflow =	0.58 cfs @	12.22 hrs, Volume=	0.040 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.58 cfs @	12.22 hrs, Volume=	0.040 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 109.68' @ 12.22 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	109.30'	**12.0" Round Culvert** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.30' / 97.27' S= 0.0802 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.58 cfs @ 12.22 hrs HW=109.68' TW=88.85' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.58 cfs @ 2.10 fps)

Pond 7P: DMH



Summary for Pond 8P: DMH

[57] Hint: Peaked at 88.85' (Flood elevation advised)

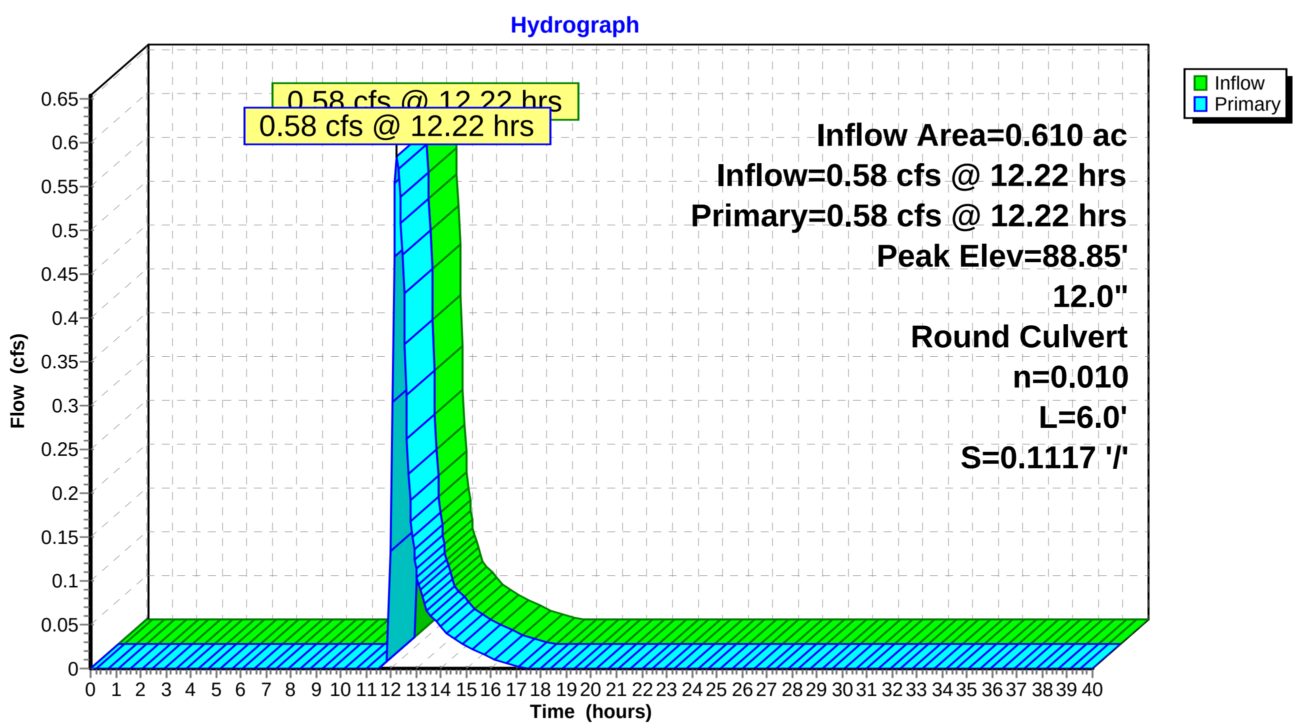
Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 0.79" for 10-YR event
Inflow = 0.58 cfs @ 12.22 hrs, Volume= 0.040 af
Outflow = 0.58 cfs @ 12.22 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min
Primary = 0.58 cfs @ 12.22 hrs, Volume= 0.040 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 88.85' @ 12.22 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	88.47'	**12.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 88.47' / 87.80' S= 0.1117 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.58 cfs @ 12.22 hrs HW=88.85' TW=73.32' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.58 cfs @ 2.10 fps)

Pond 8P: DMH



Summary for Pond 9P: CB 2+85 RT

[57] Hint: Peaked at 115.38' (Flood elevation advised)

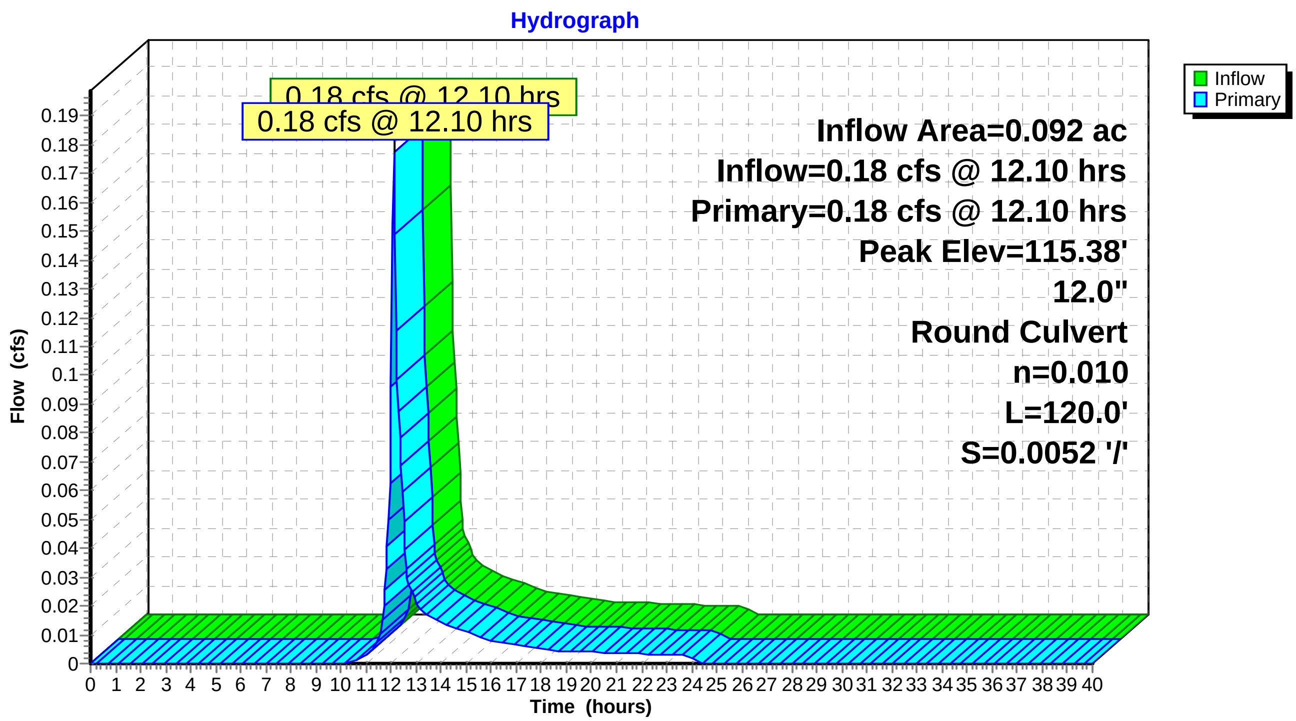
Inflow Area =	0.092 ac,	49.57% Impervious,	Inflow Depth = 1.74"	for 10-YR event
Inflow =	0.18 cfs @	12.10 hrs, Volume=	0.013 af	
Outflow =	0.18 cfs @	12.10 hrs, Volume=	0.013 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.18 cfs @	12.10 hrs, Volume=	0.013 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 115.38' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.17'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.17' / 114.54' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.18 cfs @ 12.10 hrs HW=115.38' TW=114.63' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.18 cfs @ 2.18 fps)

Pond 9P: CB 2+85 RT



Summary for Pond 10P: DMH 4+11

[57] Hint: Peaked at 114.63' (Flood elevation advised)

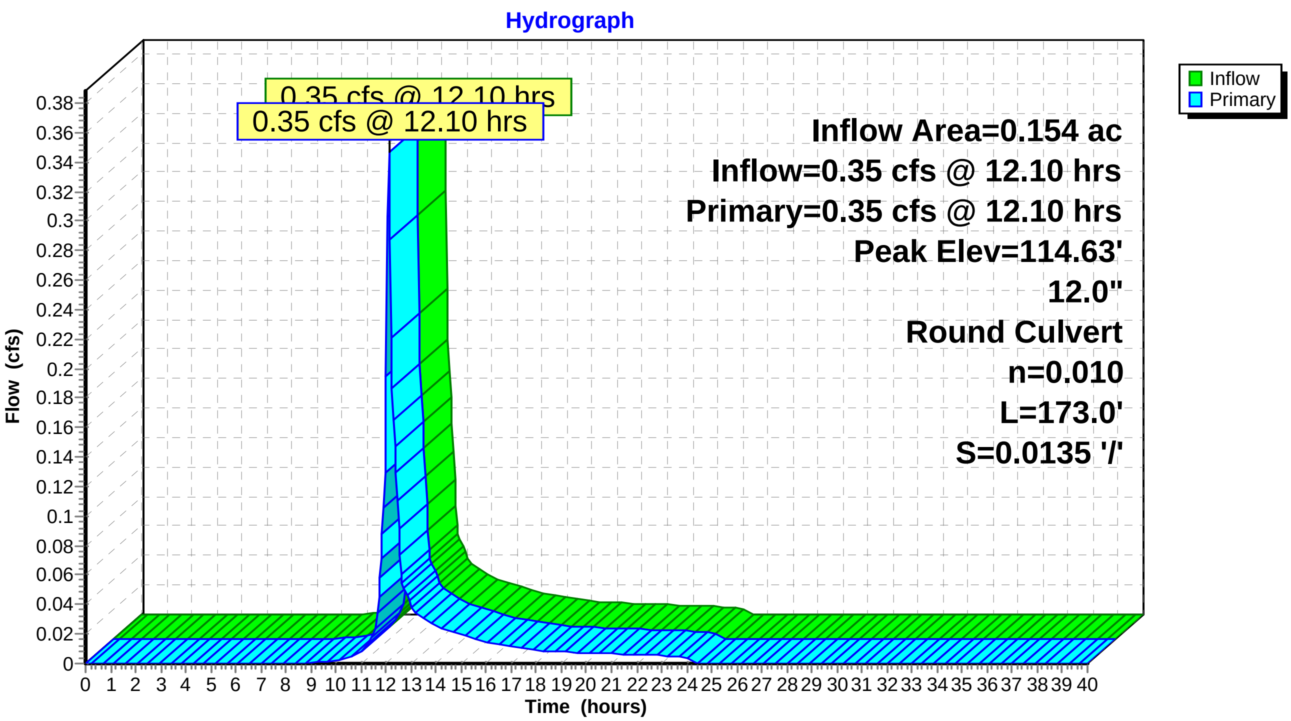
Inflow Area =	0.154 ac, 54.75% Impervious,	Inflow Depth = 1.99"	for 10-YR event
Inflow =	0.35 cfs @ 12.10 hrs,	Volume= 0.026 af	
Outflow =	0.35 cfs @ 12.10 hrs,	Volume= 0.026 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.35 cfs @ 12.10 hrs,	Volume= 0.026 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 114.63' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	114.34'	**12.0" Round Culvert** L= 173.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 114.34' / 112.00' S= 0.0135 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.34 cfs @ 12.10 hrs HW=114.63' TW=109.11' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.34 cfs @ 1.83 fps)

Pond 10P: DMH 4+11



Summary for Pond 11P: CB 2+85 LT

[57] Hint: Peaked at 115.38' (Flood elevation advised)

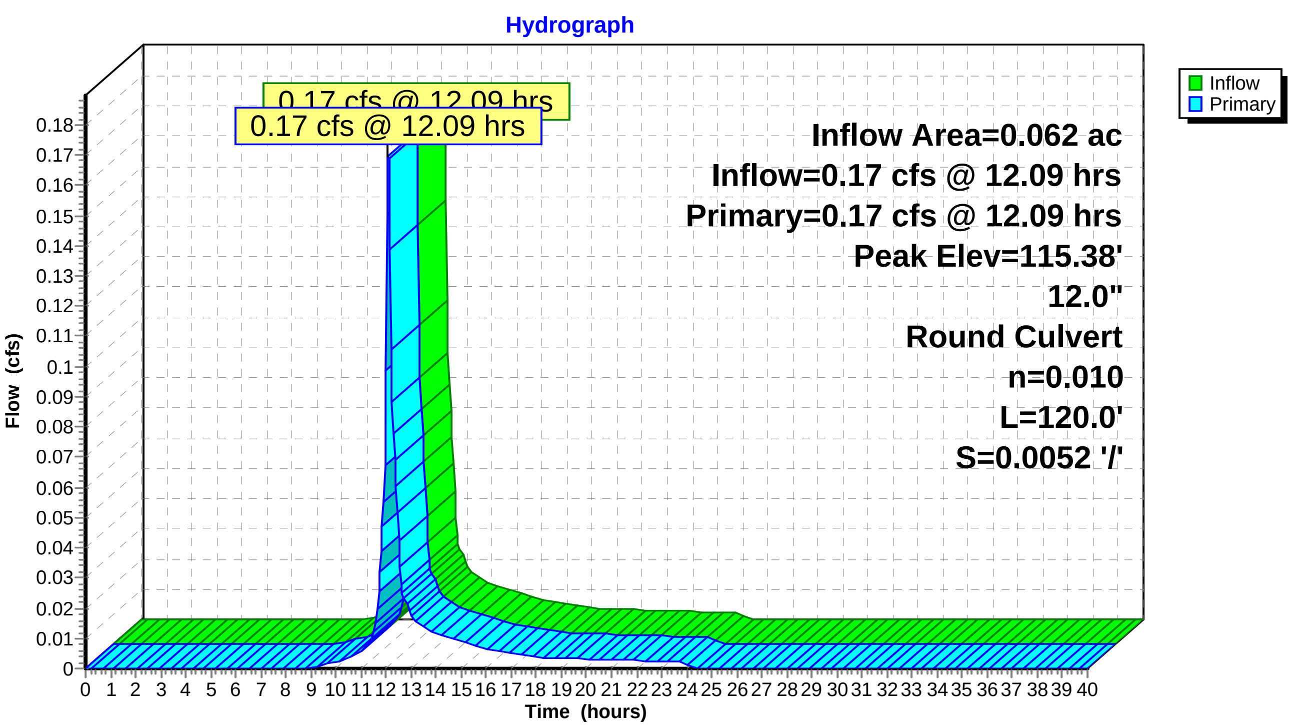
Inflow Area =	0.062 ac,	62.35% Impervious,	Inflow Depth = 2.37"	for 10-YR event
Inflow =	0.17 cfs @	12.09 hrs, Volume=	0.012 af	
Outflow =	0.17 cfs @	12.09 hrs, Volume=	0.012 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.17 cfs @	12.09 hrs, Volume=	0.012 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 115.38' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.17'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.17' / 114.54' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.17 cfs @ 12.09 hrs HW=115.38' TW=114.63' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.17 cfs @ 2.15 fps)

Pond 11P: CB 2+85 LT



Summary for Pond 12P: CB 1+0 RT

[57] Hint: Peaked at 101.54' (Flood elevation advised)

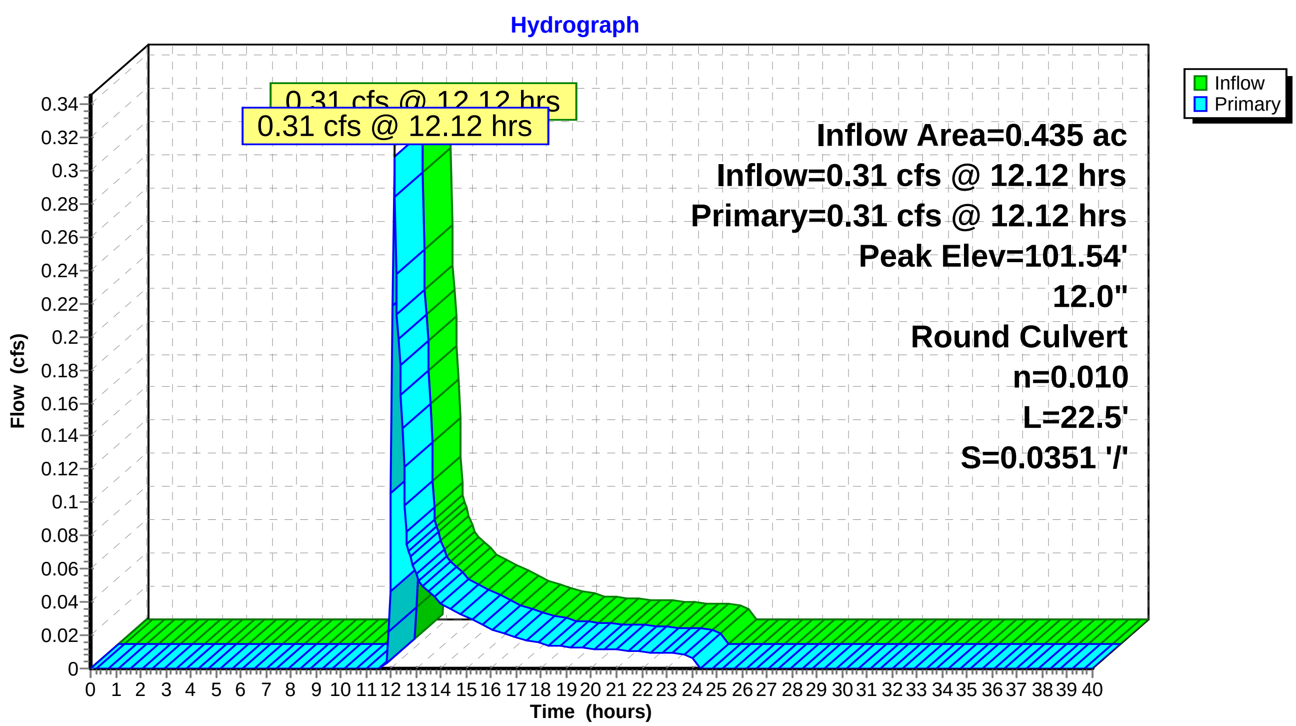
Inflow Area = 0.435 ac, 19.63% Impervious, Inflow Depth = 0.83" for 10-YR event
Inflow = 0.31 cfs @ 12.12 hrs, Volume= 0.030 af
Outflow = 0.31 cfs @ 12.12 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min
Primary = 0.31 cfs @ 12.12 hrs, Volume= 0.030 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.54' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.27'	**12.0" Round Culvert** L= 22.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.27' / 100.48' S= 0.0351 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.30 cfs @ 12.12 hrs HW=101.54' TW=100.81' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.30 cfs @ 1.76 fps)

Pond 12P: CB 1+0 RT



Summary for Pond 13P: CB 1+0 LT

[57] Hint: Peaked at 101.60' (Flood elevation advised)

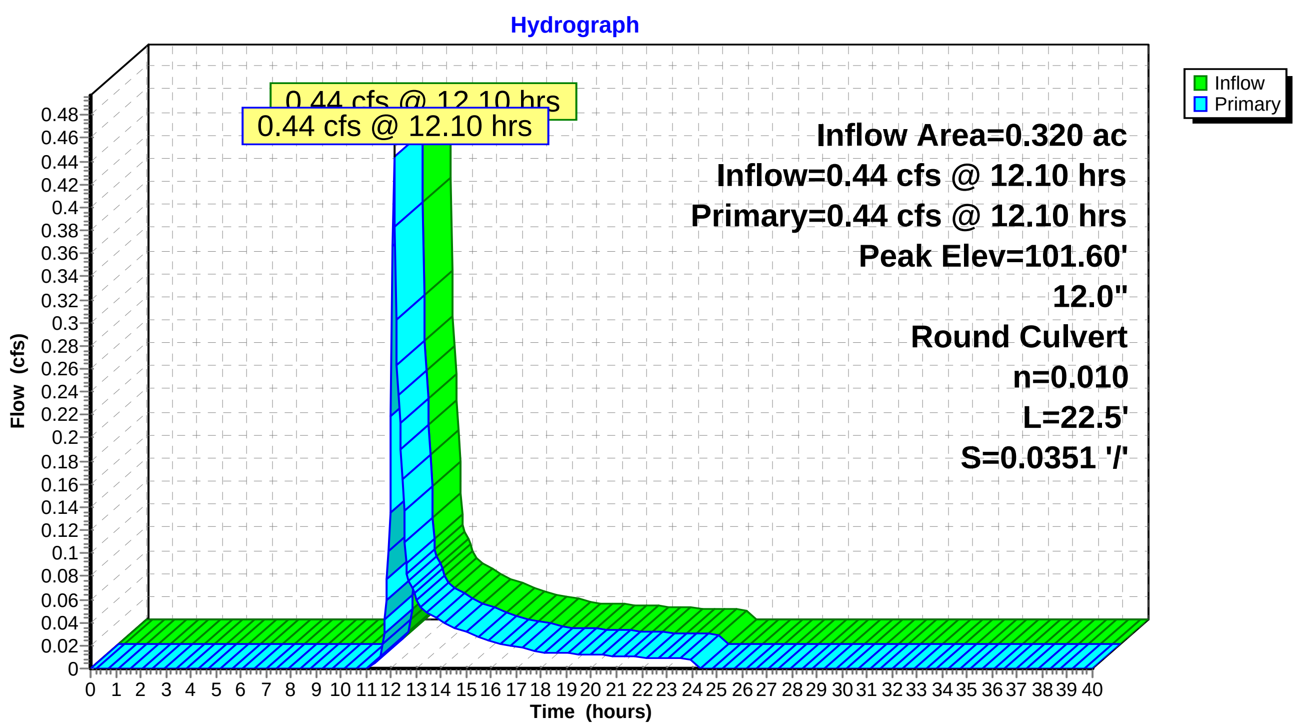
Inflow Area = 0.320 ac, 30.31% Impervious, Inflow Depth = 1.32" for 10-YR event
Inflow = 0.44 cfs @ 12.10 hrs, Volume= 0.035 af
Outflow = 0.44 cfs @ 12.10 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min
Primary = 0.44 cfs @ 12.10 hrs, Volume= 0.035 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.60' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.27'	**12.0" Round Culvert** L= 22.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.27' / 100.48' S= 0.0351 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.44 cfs @ 12.10 hrs HW=101.60' TW=100.82' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.44 cfs @ 1.95 fps)

Pond 13P: CB 1+0 LT



Summary for Pond 14P: DMH 0+75

[57] Hint: Peaked at 100.82' (Flood elevation advised)

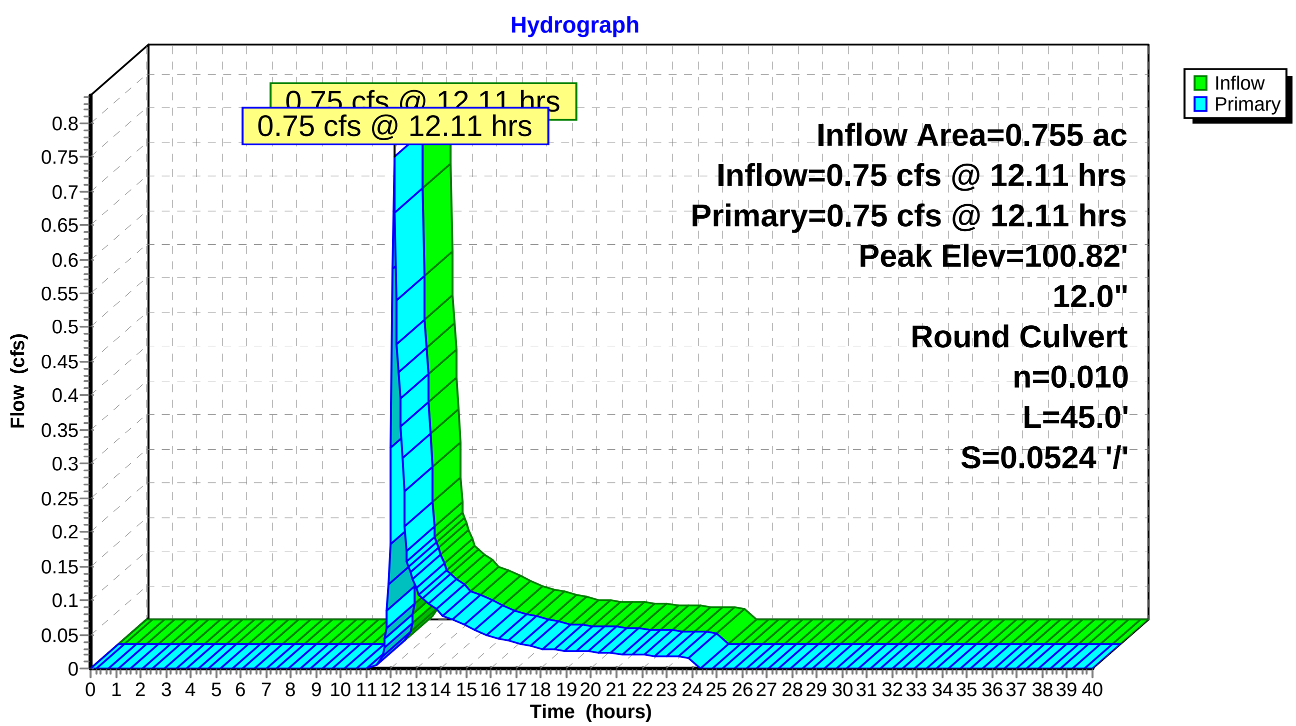
Inflow Area =	0.755 ac, 24.16% Impervious,	Inflow Depth = 1.03"	for 10-YR event
Inflow =	0.75 cfs @ 12.11 hrs,	Volume=	0.065 af
Outflow =	0.75 cfs @ 12.11 hrs,	Volume=	0.065 af, Atten= 0%, Lag= 0.0 min
Primary =	0.75 cfs @ 12.11 hrs,	Volume=	0.065 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 100.82' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	100.38'	**12.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 100.38' / 98.02' S= 0.0524 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.73 cfs @ 12.11 hrs HW=100.81' TW=98.68' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.73 cfs @ 2.24 fps)

Pond 14P: DMH 0+75



Summary for Pond 15P: DMH 0+25

[57] Hint: Peaked at 98.69' (Flood elevation advised)

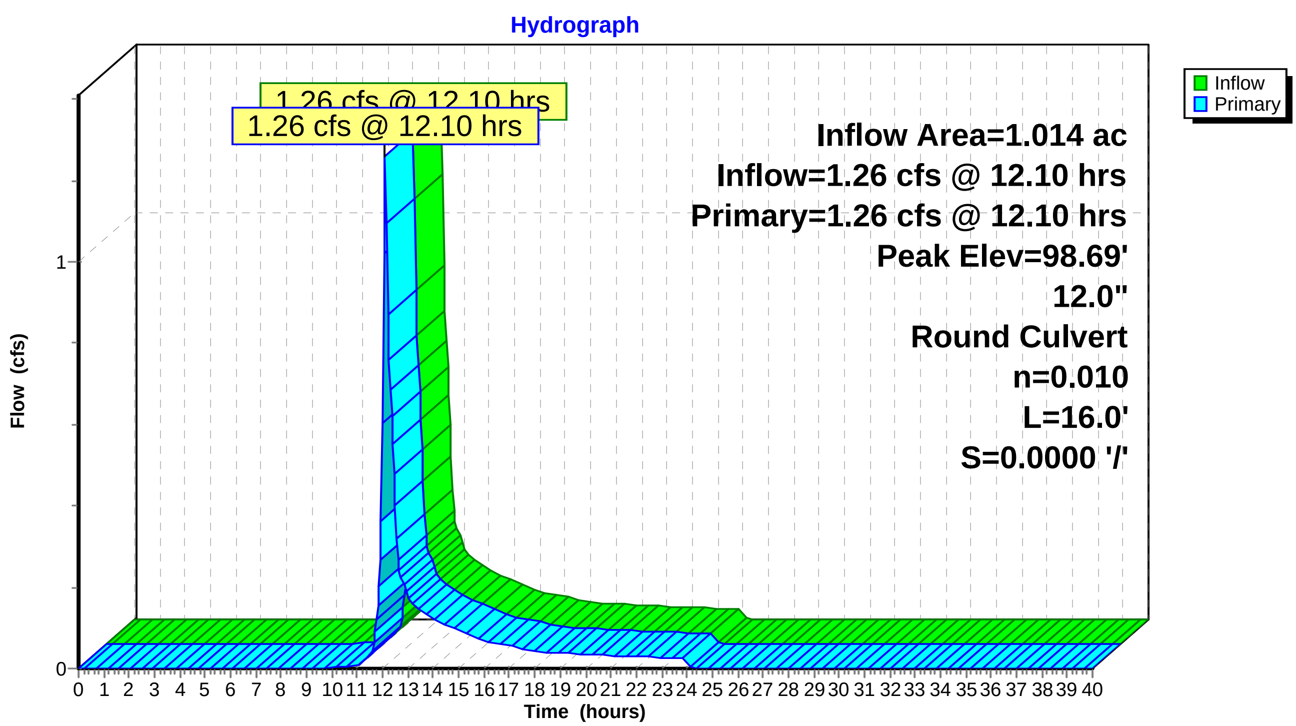
Inflow Area =	1.014 ac, 25.29% Impervious,	Inflow Depth = 1.22"	for 10-YR event
Inflow =	1.26 cfs @ 12.10 hrs,	Volume=	0.103 af
Outflow =	1.26 cfs @ 12.10 hrs,	Volume=	0.103 af, Atten= 0%, Lag= 0.0 min
Primary =	1.26 cfs @ 12.10 hrs,	Volume=	0.103 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.69' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.92'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.92' / 97.92' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.24 cfs @ 12.10 hrs HW=98.69' TW=98.30' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 1.24 cfs @ 2.65 fps)

Pond 15P: DMH 0+25



Summary for Pond 16P: CB 0+08 LT

[57] Hint: Peaked at 98.73' (Flood elevation advised)

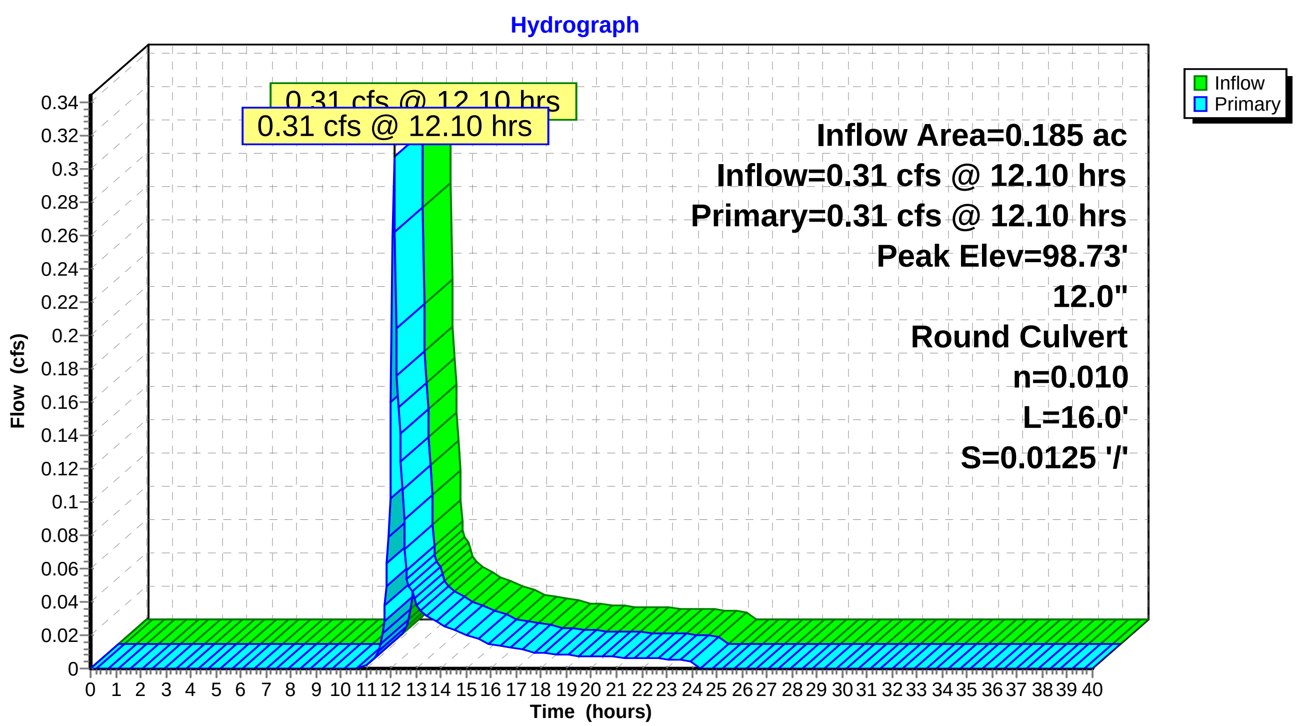
Inflow Area =	0.185 ac, 23.51% Impervious, Inflow Depth = 1.52"	for 10-YR event	
Inflow =	0.31 cfs @ 12.10 hrs, Volume=	0.024 af	
Outflow =	0.31 cfs @ 12.10 hrs, Volume=	0.024 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.31 cfs @ 12.10 hrs, Volume=	0.024 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.73' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.22'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.22' / 98.02' S= 0.0125 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.31 cfs @ 12.10 hrs HW=98.73' TW=98.69' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 0.31 cfs @ 1.11 fps)

Pond 16P: CB 0+08 LT



Summary for Pond 17P: CB 0+08 RT

[57] Hint: Peaked at 98.71' (Flood elevation advised)

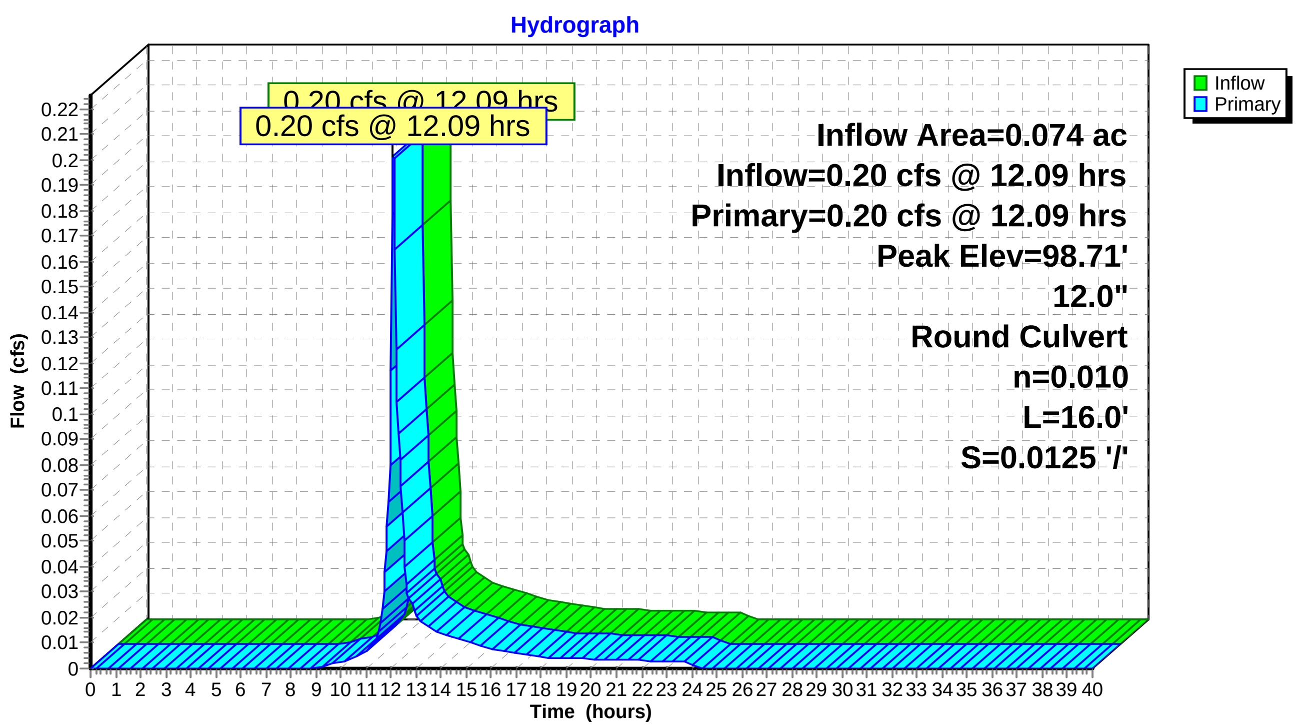
Inflow Area =	0.074 ac,	41.25% Impervious,	Inflow Depth = 2.37"	for 10-YR event
Inflow =	0.20 cfs @	12.09 hrs, Volume=	0.015 af	
Outflow =	0.20 cfs @	12.09 hrs, Volume=	0.015 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.20 cfs @	12.09 hrs, Volume=	0.015 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.71' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.22'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.22' / 98.02' S= 0.0125 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.20 cfs @ 12.09 hrs HW=98.70' TW=98.68' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.20 cfs @ 0.78 fps)

Pond 17P: CB 0+08 RT



Summary for Pond 18P: SOS

[57] Hint: Peaked at 98.31' (Flood elevation advised)

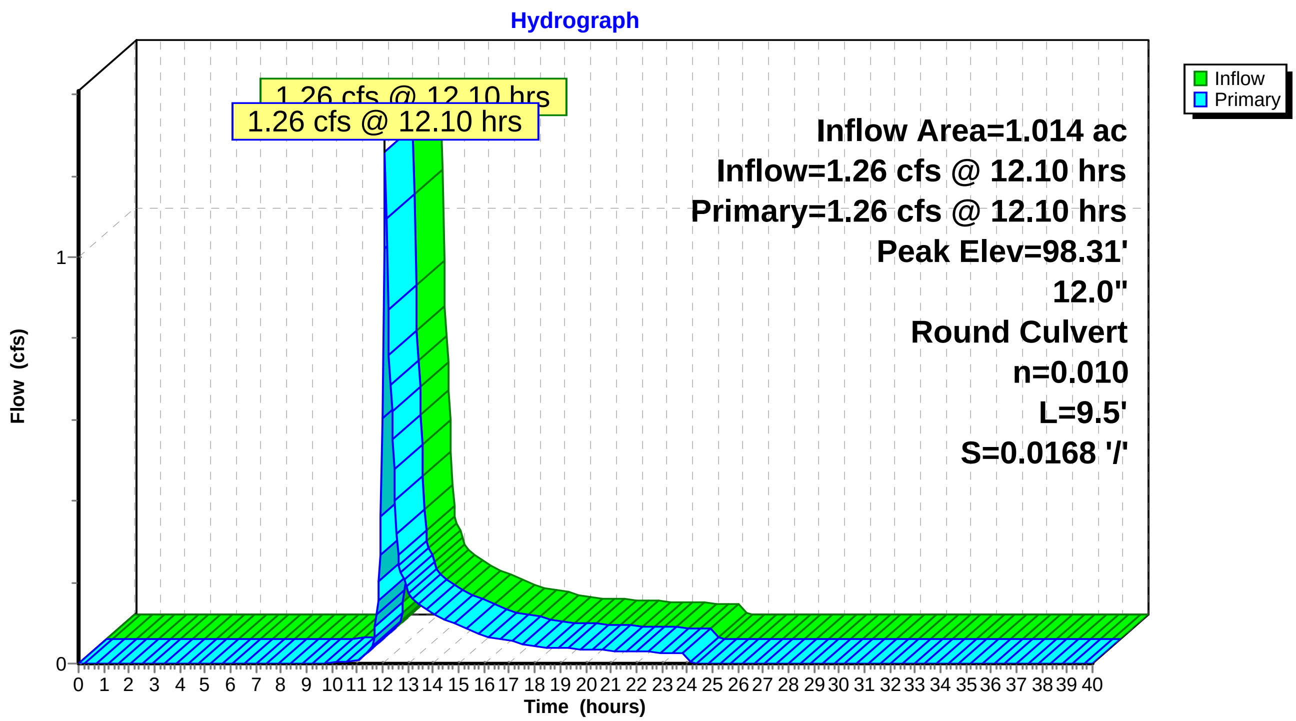
Inflow Area =	1.014 ac,	25.29% Impervious,	Inflow Depth =	1.22"	for 10-YR event
Inflow =	1.26 cfs @	12.10 hrs,	Volume=	0.103 af	
Outflow =	1.26 cfs @	12.10 hrs,	Volume=	0.103 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.26 cfs @	12.10 hrs,	Volume=	0.103 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.31' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.68'	**12.0" Round Culvert** L= 9.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.68' / 97.52' S= 0.0168 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.24 cfs @ 12.10 hrs HW=98.30' TW=97.35' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 1.24 cfs @ 3.47 fps)

Pond 18P: SOS

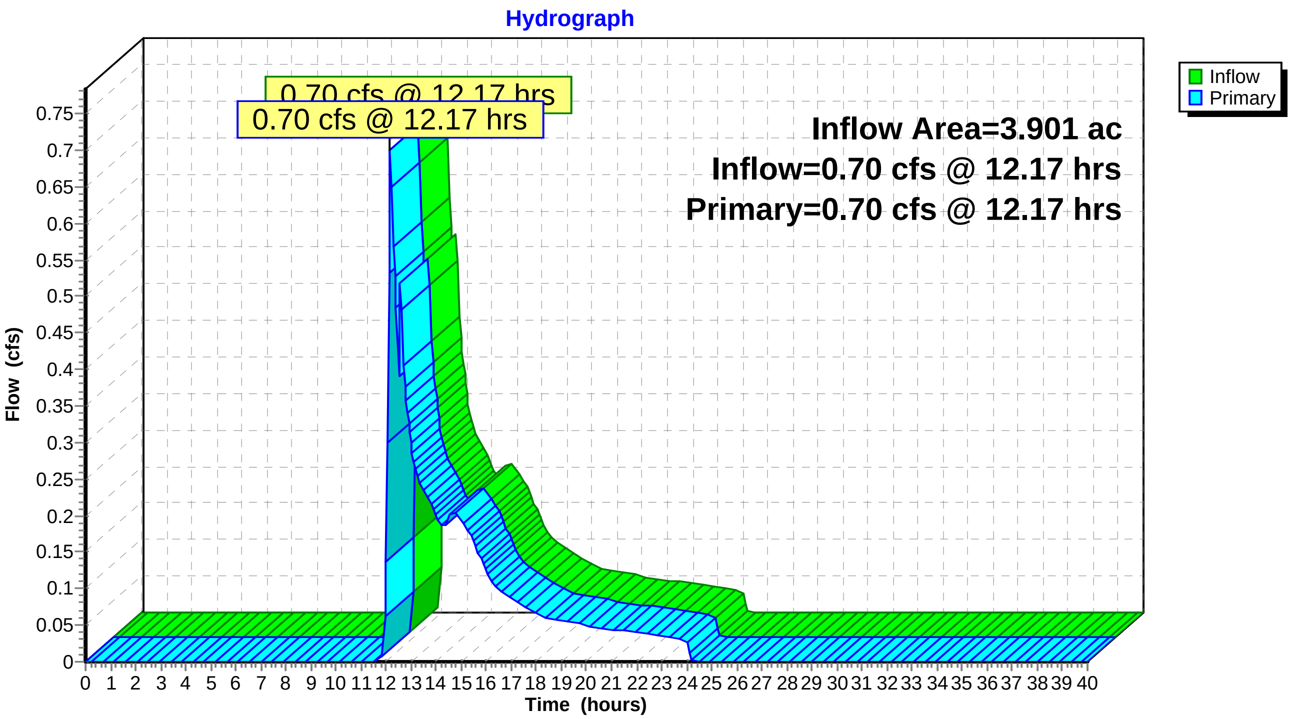


Summary for Link 1L: Flow towards wetlands

Inflow Area = 3.901 ac, 8.31% Impervious, Inflow Depth = 0.38" for 10-YR event
Inflow = 0.70 cfs @ 12.17 hrs, Volume= 0.125 af
Primary = 0.70 cfs @ 12.17 hrs, Volume= 0.125 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L: Flow towards wetlands

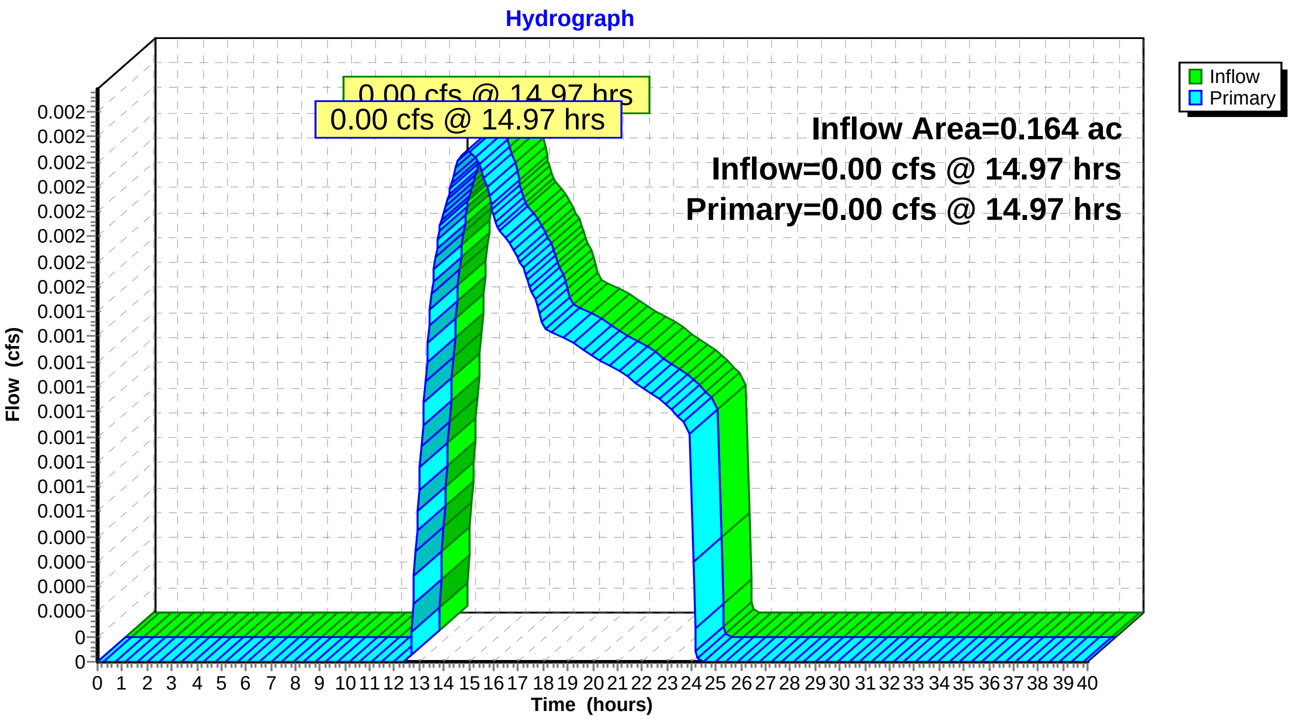


Summary for Link 2L: flow to the north

Inflow Area = 0.164 ac, 0.00% Impervious, Inflow Depth = 0.09" for 10-YR event
Inflow = 0.00 cfs @ 14.97 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 14.97 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L: flow to the north

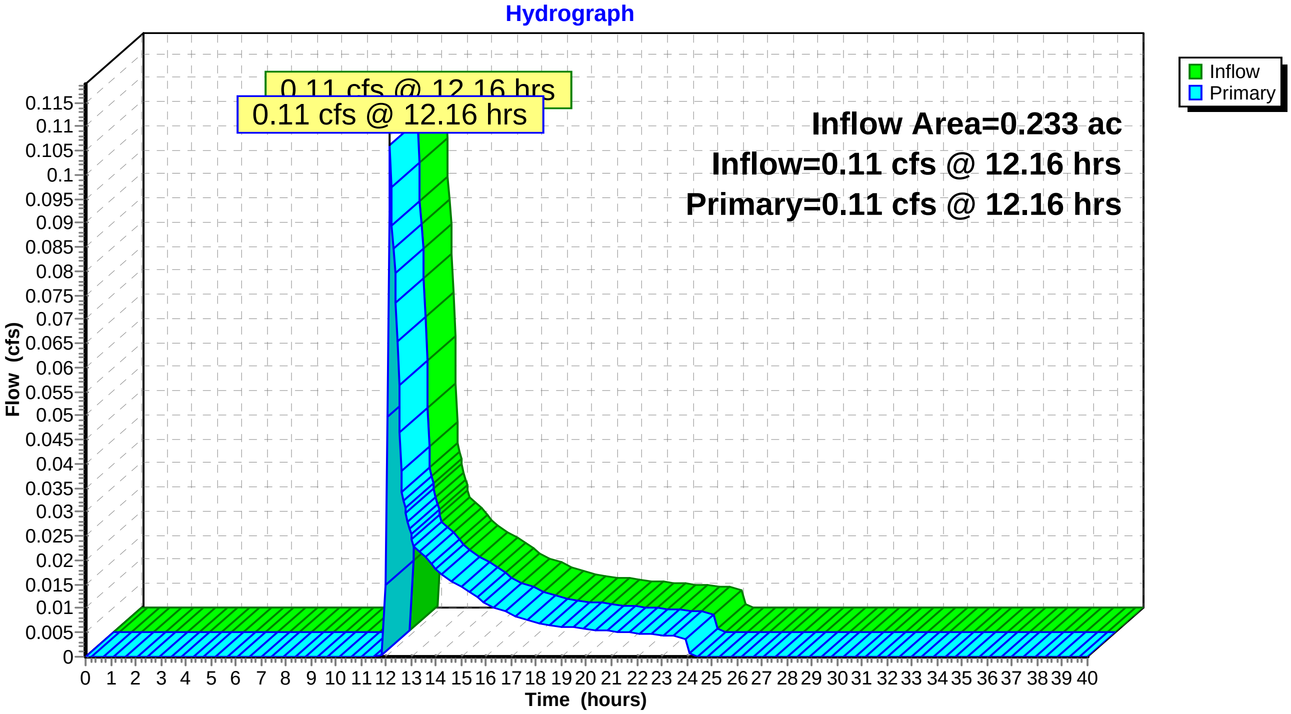


Summary for Link 3L: Flow to existing cb on north-side of Elm Street

Inflow Area = 0.233 ac, 0.00% Impervious, Inflow Depth = 0.66" for 10-YR event
Inflow = 0.11 cfs @ 12.16 hrs, Volume= 0.013 af
Primary = 0.11 cfs @ 12.16 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L: Flow to existing cb on north-side of Elm Street

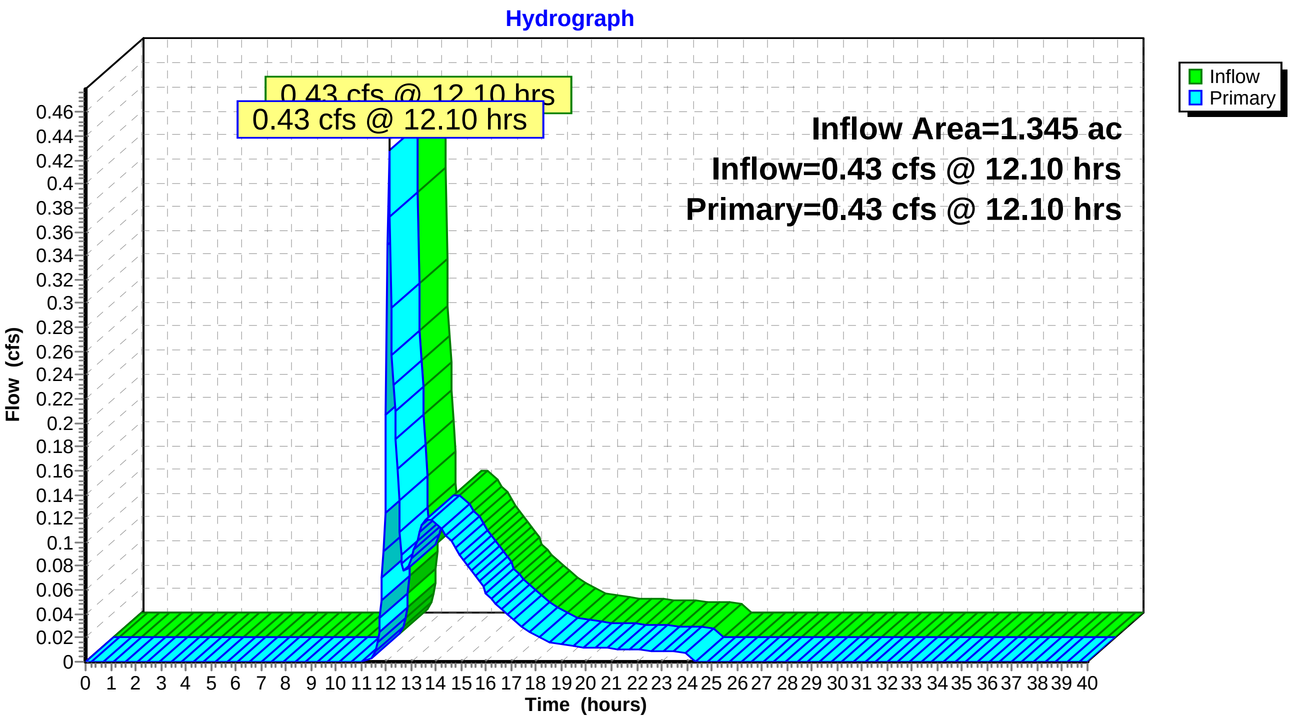


Summary for Link 4L: Flow towards north-side of Elm Street

Inflow Area =	1.345 ac,	19.93% Impervious,	Inflow Depth = 0.47"	for 10-YR event
Inflow =	0.43 cfs @	12.10 hrs, Volume=	0.053 af	
Primary =	0.43 cfs @	12.10 hrs, Volume=	0.053 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L: Flow towards north-side of Elm Street

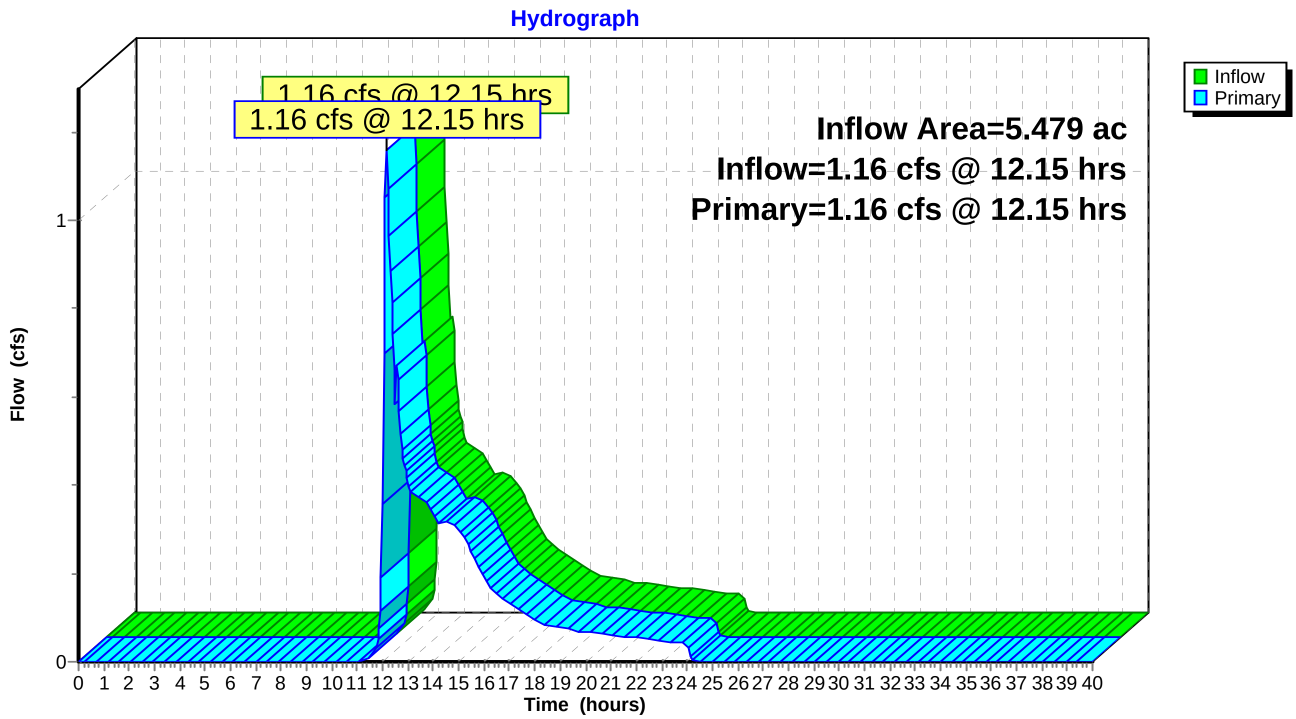


Summary for Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

Inflow Area = 5.479 ac, 10.81% Impervious, Inflow Depth = 0.42" for 10-YR event
Inflow = 1.16 cfs @ 12.15 hrs, Volume= 0.190 af
Primary = 1.16 cfs @ 12.15 hrs, Volume= 0.190 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

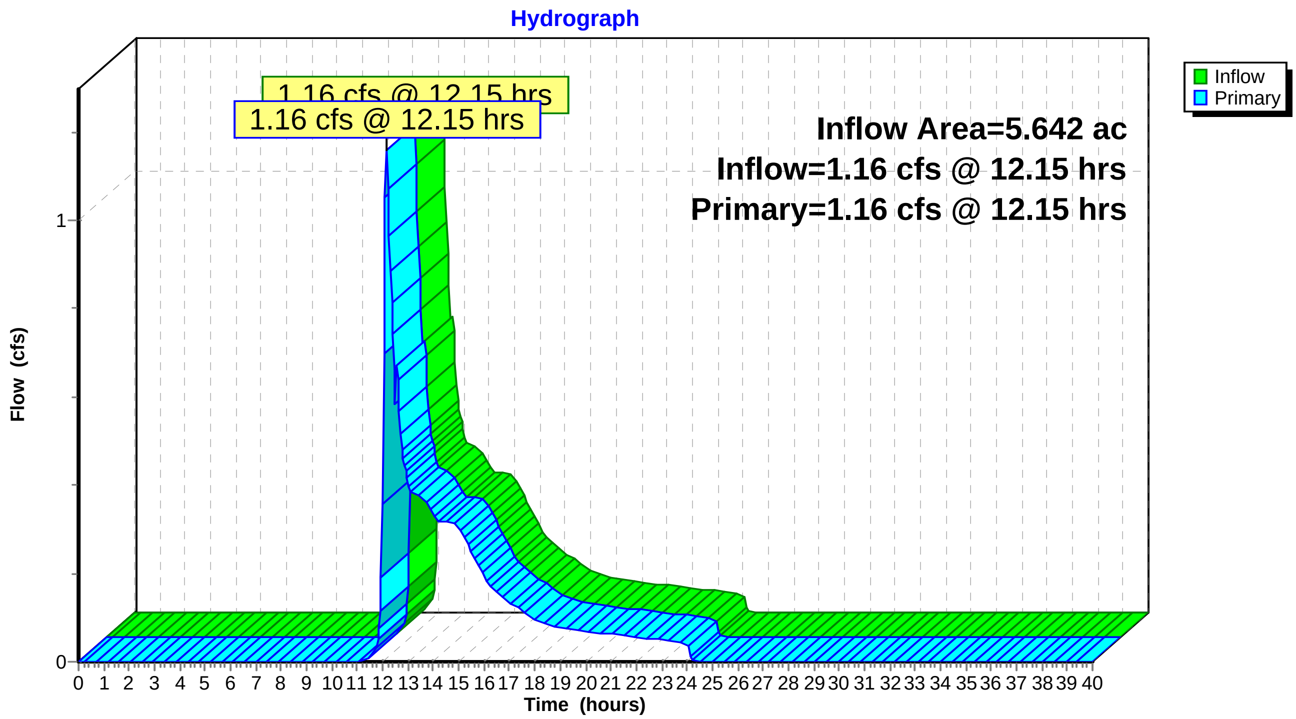


Summary for Link 6L: Total runoff discharging from within the limit of watershed analysis

Inflow Area = 5.642 ac, 10.50% Impervious, Inflow Depth = 0.41" for 10-YR event
Inflow = 1.16 cfs @ 12.15 hrs, Volume= 0.191 af
Primary = 1.16 cfs @ 12.15 hrs, Volume= 0.191 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 6L: Total runoff discharging from within the limit of watershed analysis



Summary for Subcatchment 1S: EX-1R

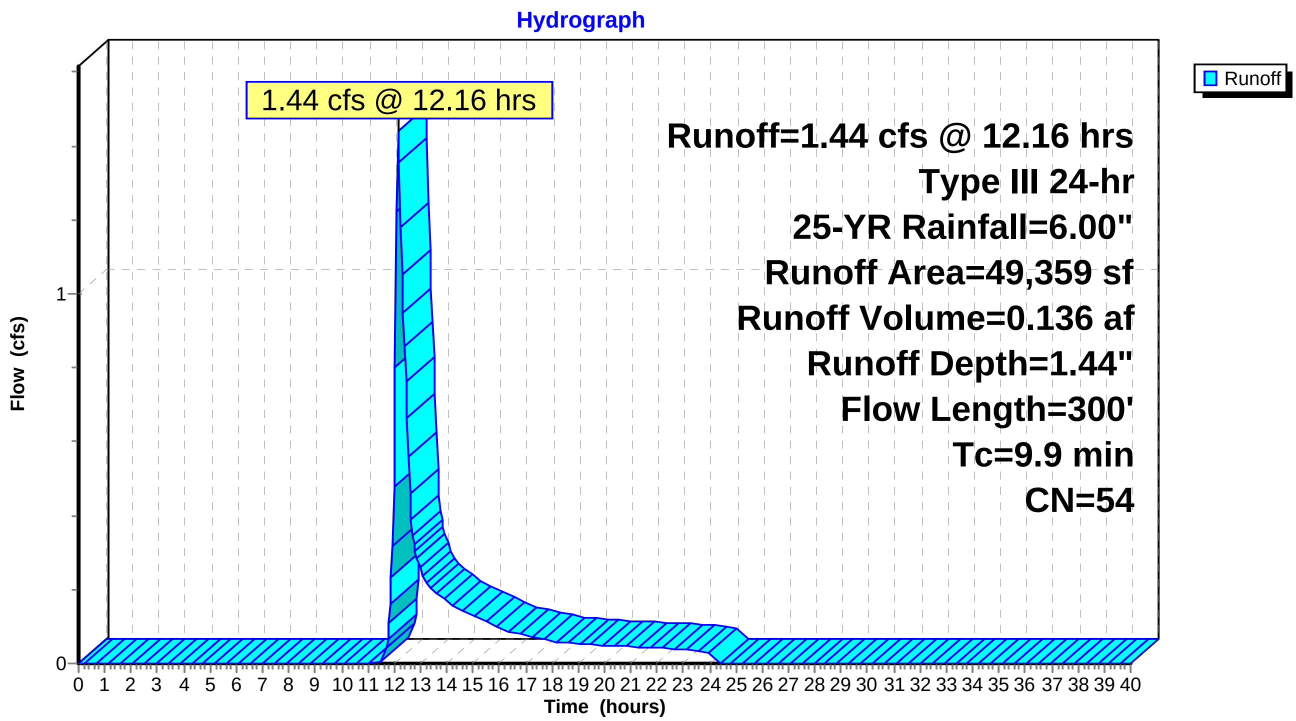
Runoff = 1.44 cfs @ 12.16 hrs, Volume= 0.136 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
1,009	30	Woods, Good, HSG A
33,181	55	Woods, Good, HSG B
5,769	39	>75% Grass cover, Good, HSG A
9,400	61	>75% Grass cover, Good, HSG B
49,359	54	Weighted Average
49,359		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0450	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	250	0.0630	4.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.9	300	Total			

Subcatchment 1S: EX-1R



Summary for Subcatchment 2S: EX-2R

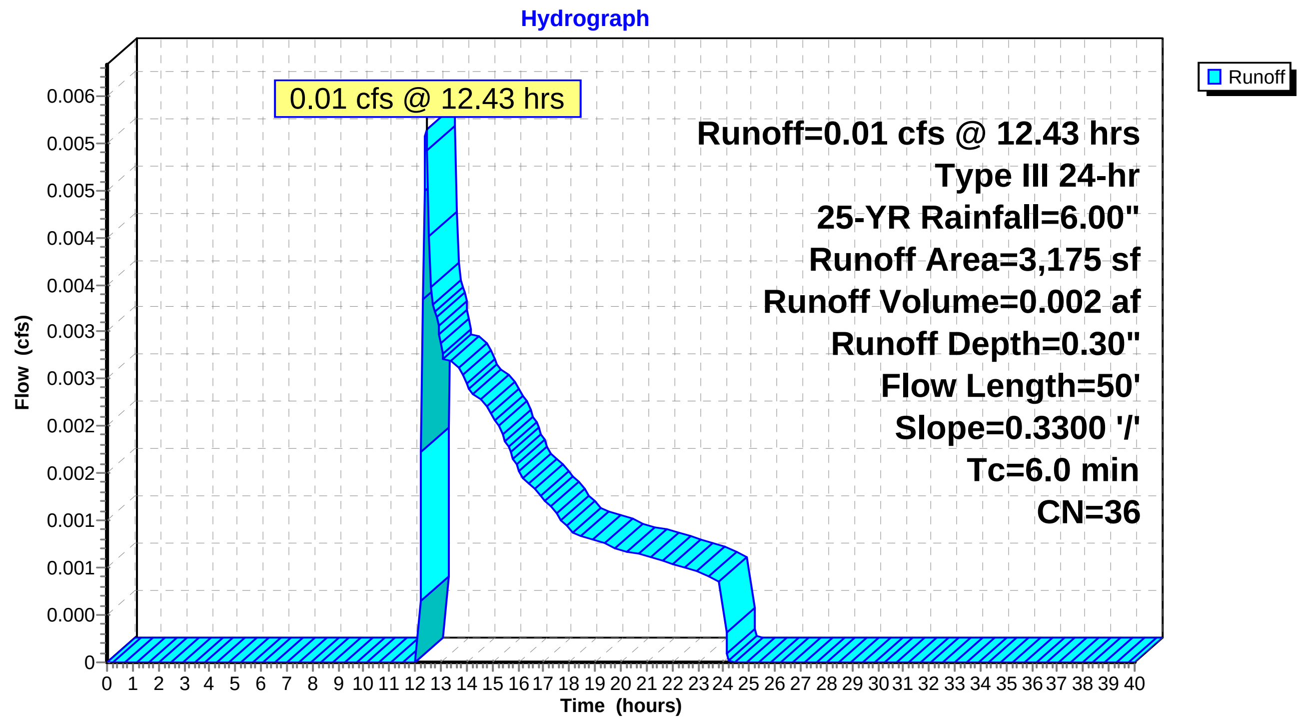
Runoff = 0.01 cfs @ 12.43 hrs, Volume= 0.002 af, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
1,000	30	Woods, Good, HSG A
2,175	39	>75% Grass cover, Good, HSG A
3,175	36	Weighted Average
3,175		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	50	0.3300	0.45		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.8	50	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: EX-2R



Summary for Subcatchment 3S: EX-3R

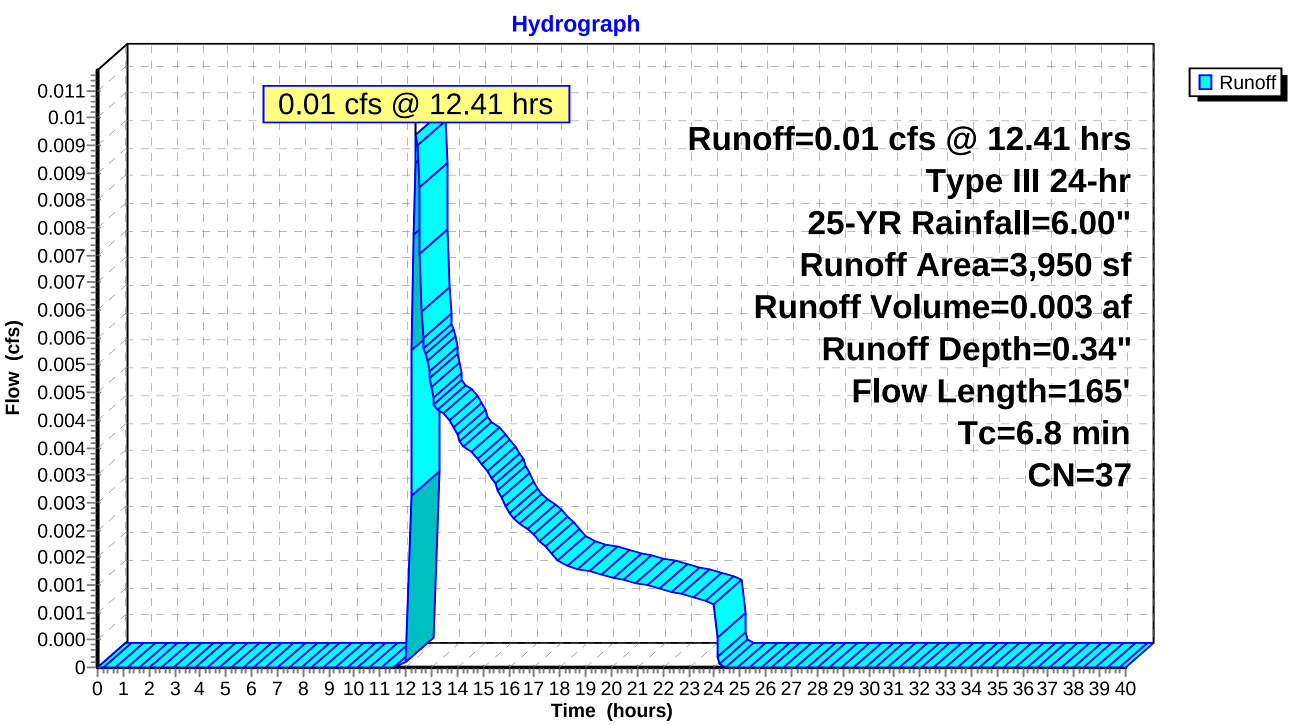
Runoff = 0.01 cfs @ 12.41 hrs, Volume= 0.003 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
1,000	30	Woods, Good, HSG A
2,950	39	>75% Grass cover, Good, HSG A
3,950	37	Weighted Average
3,950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	115	0.1400	6.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	165	Total			

Subcatchment 3S: EX-3R



Summary for Subcatchment 4S: EX-4R

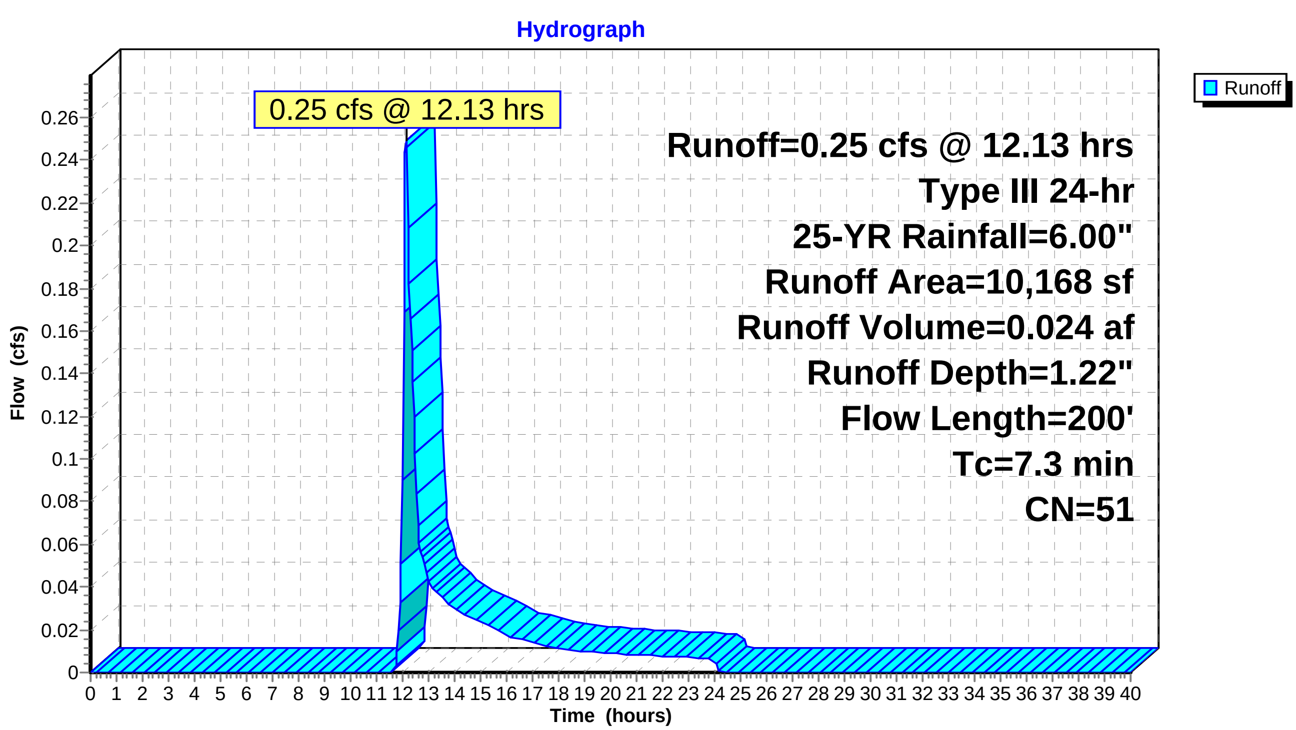
Runoff = 0.25 cfs @ 12.13 hrs, Volume= 0.024 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
1,573	30	Woods, Good, HSG A
8,595	55	Woods, Good, HSG B
10,168	51	Weighted Average
10,168		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0860	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	140	0.1520	6.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.1100	6.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	200	Total			

Subcatchment 4S: EX-4R



Summary for Subcatchment 5S: EX-5R

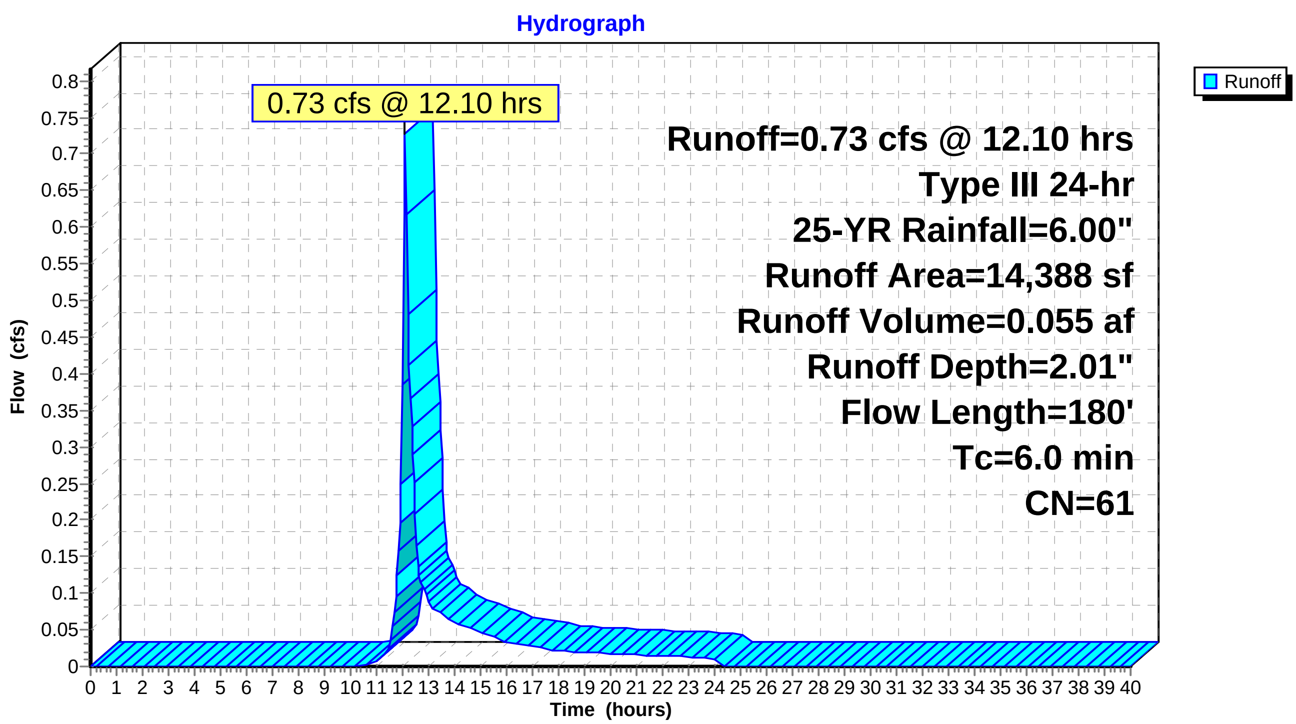
Runoff = 0.73 cfs @ 12.10 hrs, Volume= 0.055 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
278	30	Woods, Good, HSG A
2,500	55	Woods, Good, HSG B
500	98	Paved parking, HSG B
11,110	61	>75% Grass cover, Good, HSG B
14,388	61	Weighted Average
13,888		96.52% Pervious Area
500		3.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	50	0.1900	0.36		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.4	130	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	180	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: EX-5R



Summary for Subcatchment 7S: PR-1R

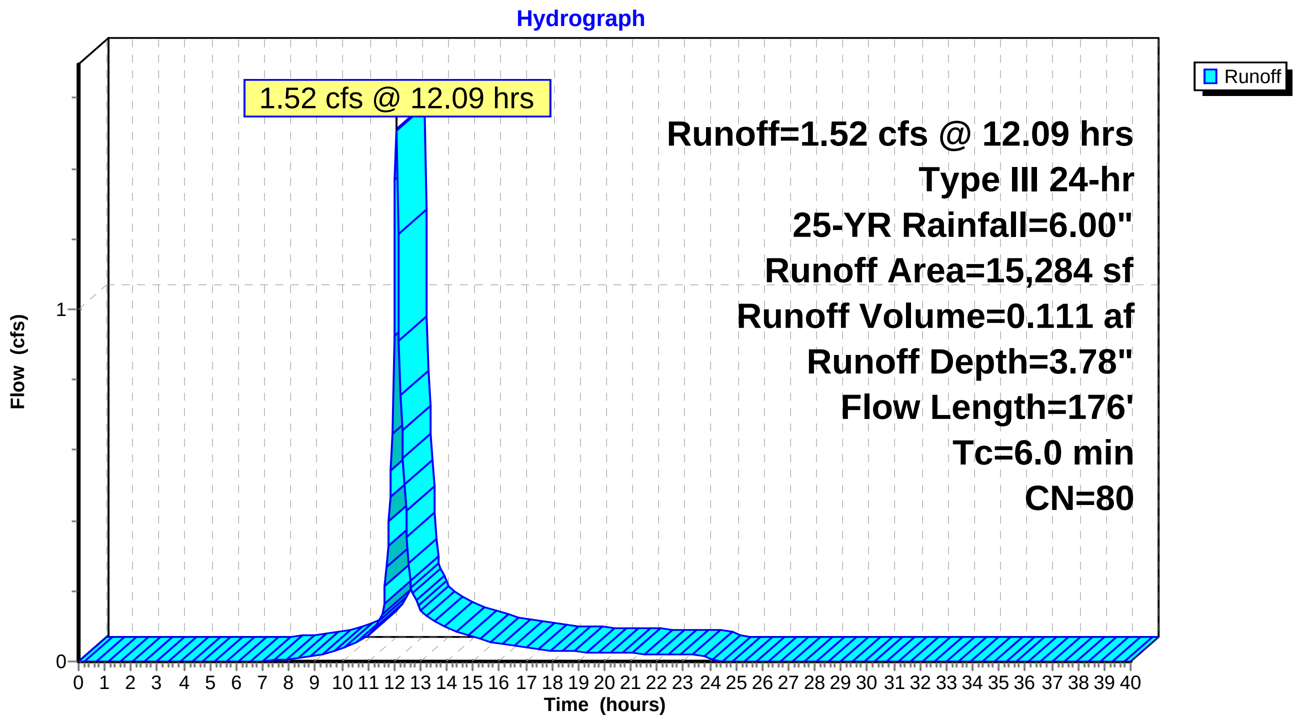
Runoff = 1.52 cfs @ 12.09 hrs, Volume= 0.111 af, Depth= 3.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
4,718	39	>75% Grass cover, Good, HSG A
10,566	98	Paved parking, HSG A
15,284	80	Weighted Average
4,718		30.87% Pervious Area
10,566		69.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0310	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.5	125	0.0430	4.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	26	0.0120	2.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	176	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7S: PR-1R



Summary for Subcatchment 8S: PR-2R

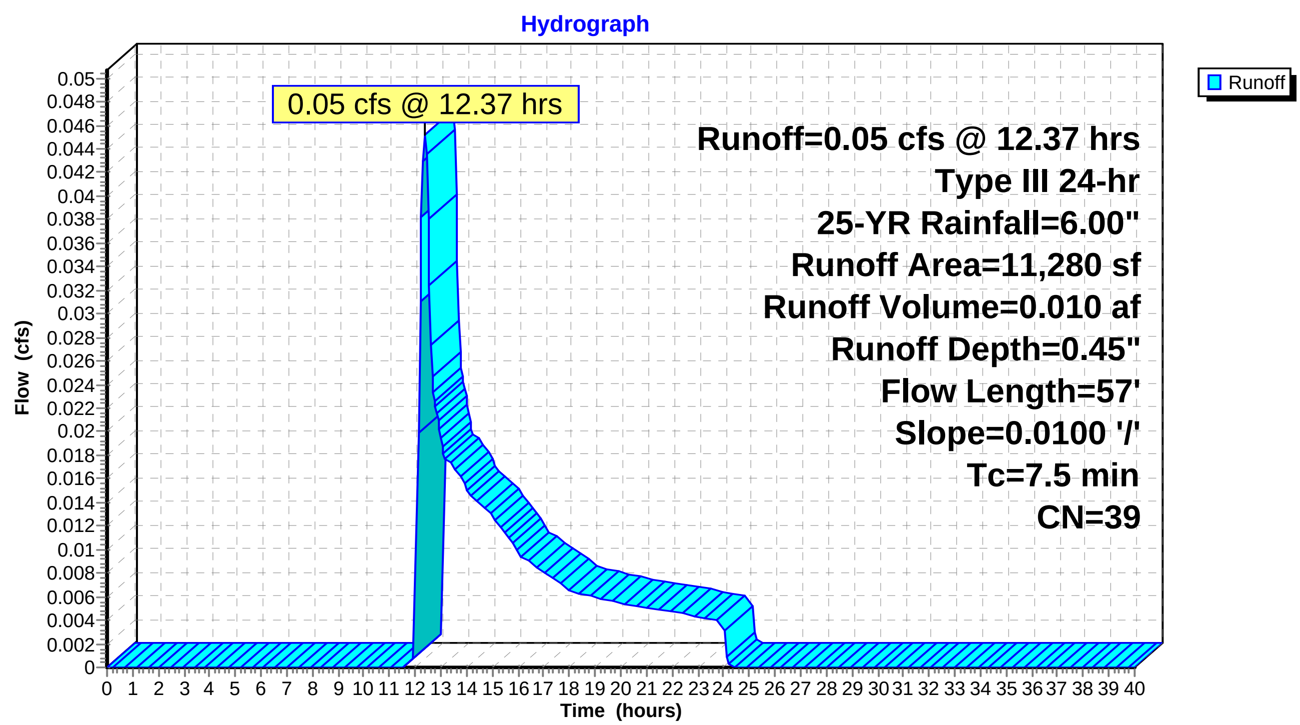
Runoff = 0.05 cfs @ 12.37 hrs, Volume= 0.010 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
11,193	39	>75% Grass cover, Good, HSG A
87	61	>75% Grass cover, Good, HSG B
11,280	39	Weighted Average
11,280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	7	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	57	Total			

Subcatchment 8S: PR-2R



Summary for Subcatchment 9S: PR-3R

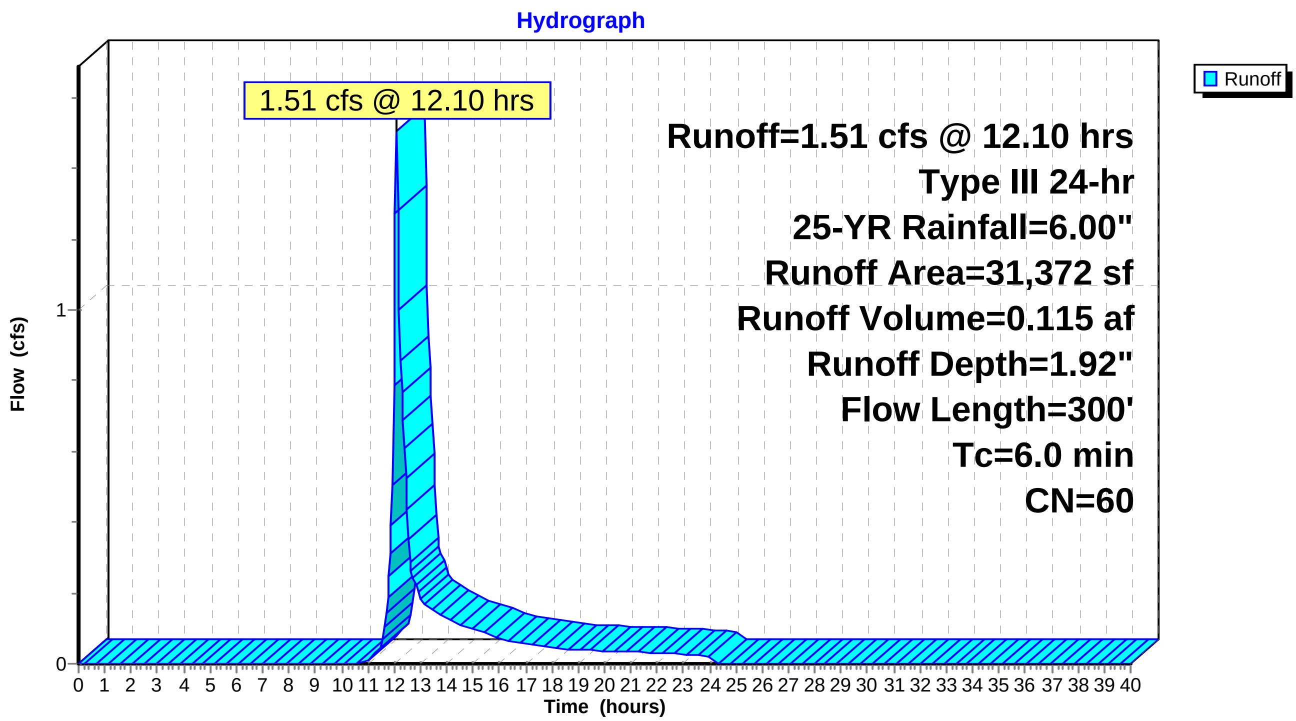
Runoff = 1.51 cfs @ 12.10 hrs, Volume= 0.115 af, Depth= 1.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
6,795	39	>75% Grass cover, Good, HSG A
21,016	61	>75% Grass cover, Good, HSG B
1,143	98	Paved parking, HSG A
2,418	98	Paved parking, HSG B
31,372	60	Weighted Average
27,811		88.65% Pervious Area
3,561		11.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0700	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.5	150	0.1060	5.24		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	100	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.2	300	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 9S: PR-3R



Summary for Subcatchment 10S: PR-4R

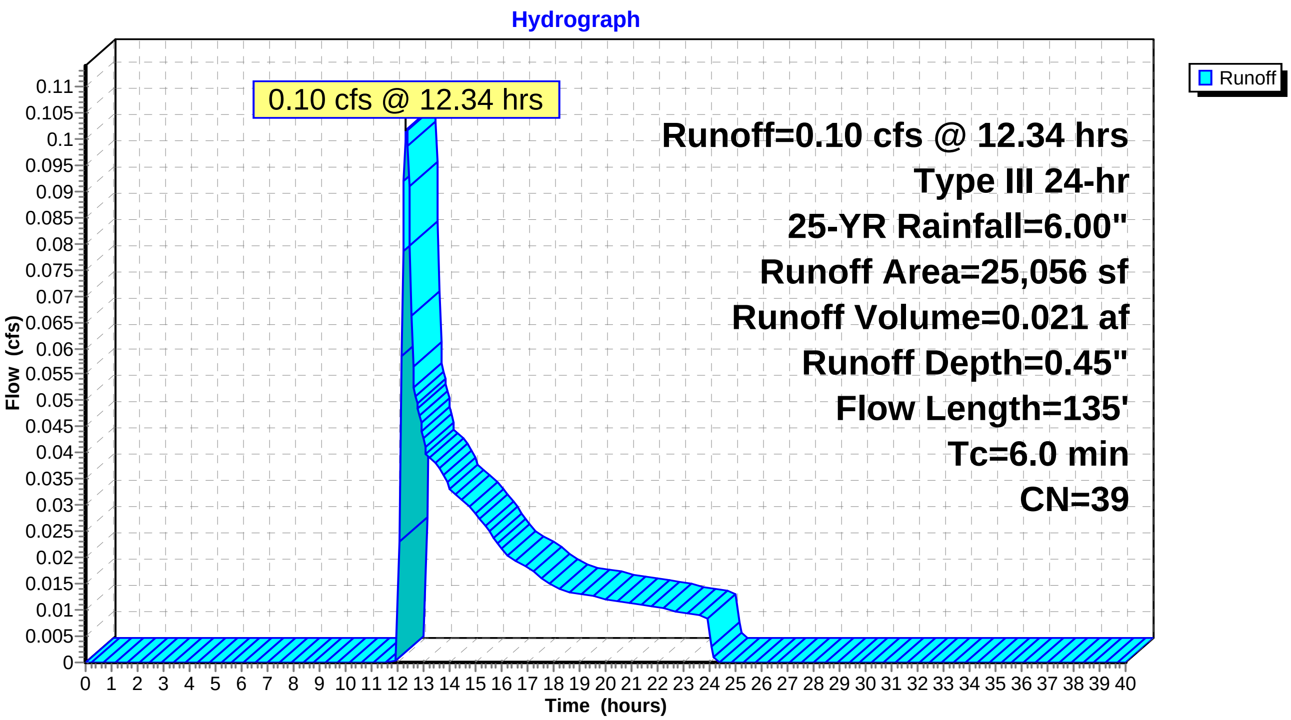
Runoff = 0.10 cfs @ 12.34 hrs, Volume= 0.021 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
25,056	39	>75% Grass cover, Good, HSG A
25,056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.2	80	0.1560	6.36		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	5	0.3300	9.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.5	135	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 10S: PR-4R



Summary for Subcatchment 11S: PR-5R

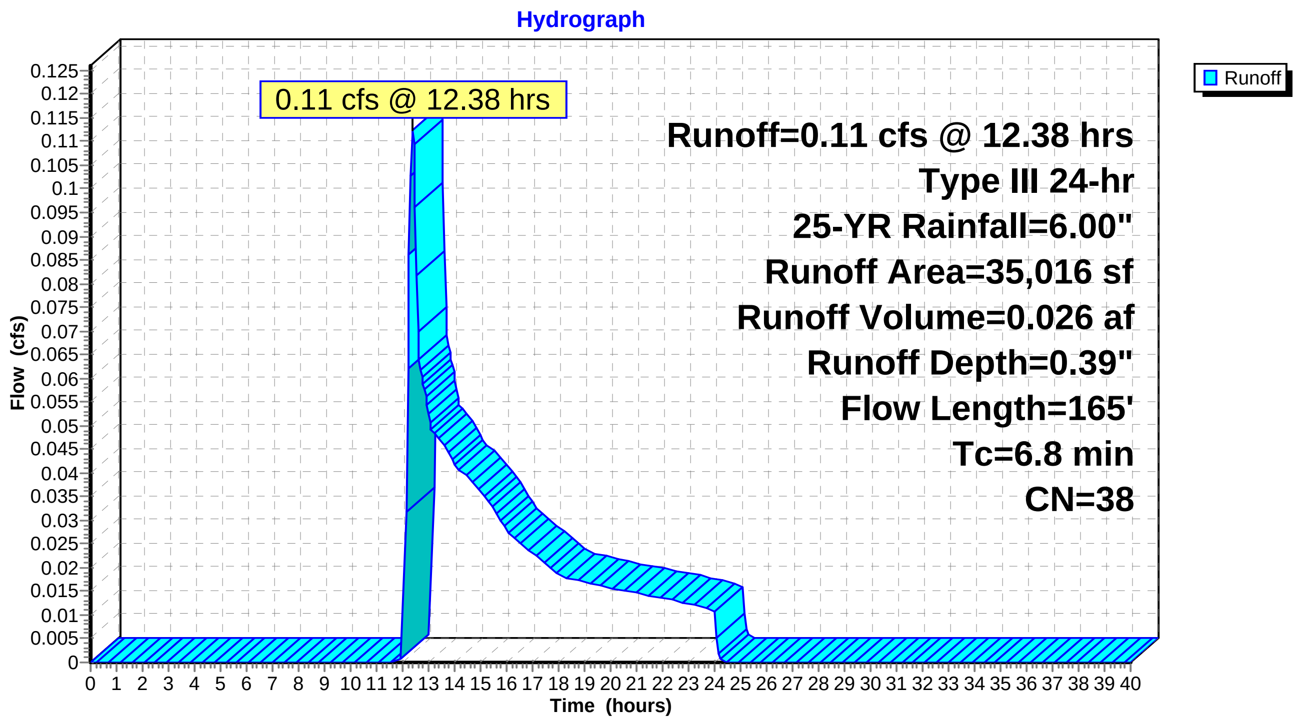
Runoff = 0.11 cfs @ 12.38 hrs, Volume= 0.026 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
31,016	39	>75% Grass cover, Good, HSG A
4,000	30	Woods, Good, HSG A
35,016	38	Weighted Average
35,016		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	115	0.1400	6.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	165	Total			

Subcatchment 11S: PR-5R



Summary for Subcatchment 12S: PR-6

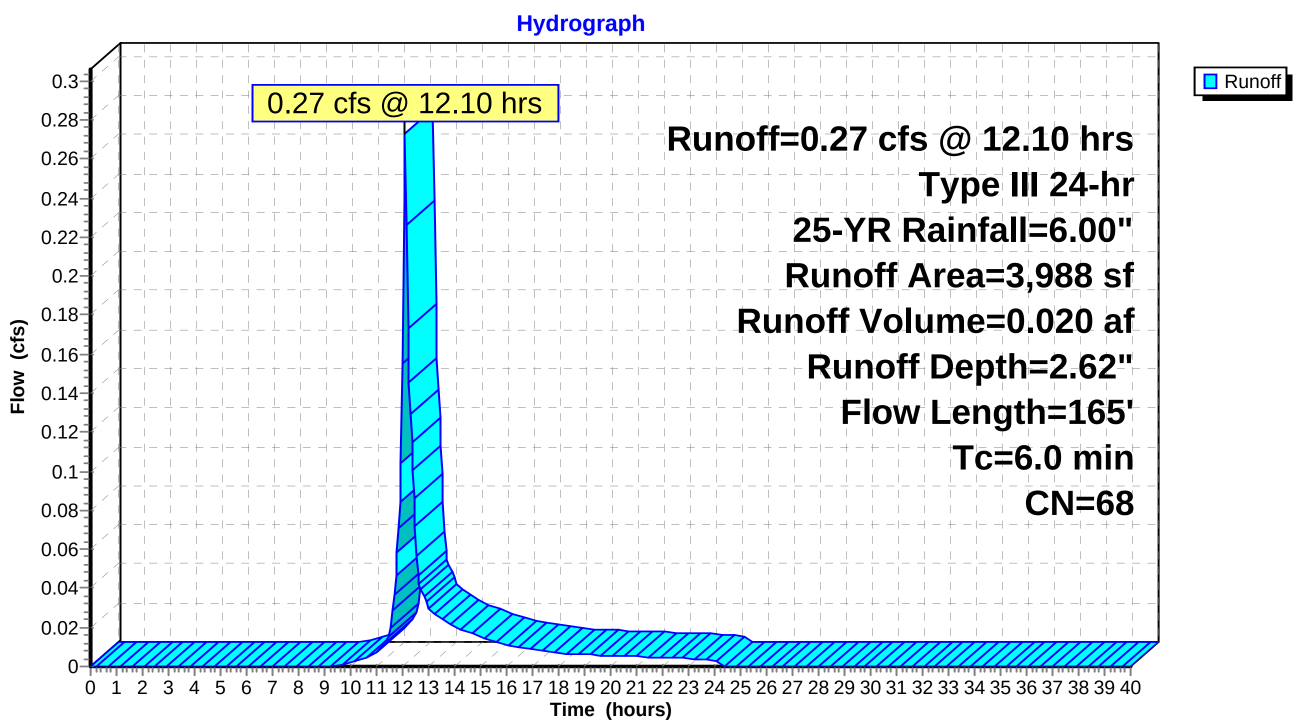
Runoff = 0.27 cfs @ 12.10 hrs, Volume= 0.020 af, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
2,011	39	>75% Grass cover, Good, HSG A
1,977	98	Paved parking, HSG A
3,988	68	Weighted Average
2,011		50.43% Pervious Area
1,977		49.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	35	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	11	0.0310	3.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	119	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.0	165	Total			

Subcatchment 12S: PR-6



Summary for Subcatchment 13S: PR-7

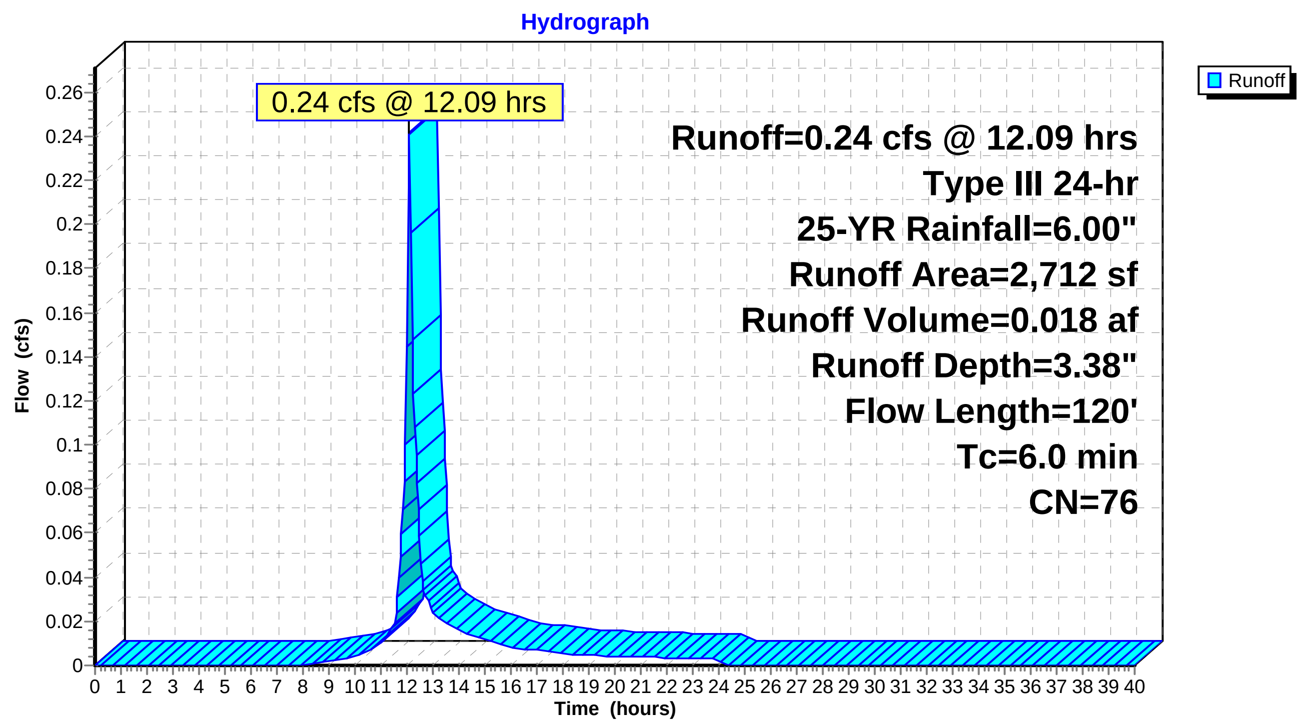
Runoff = 0.24 cfs @ 12.09 hrs, Volume= 0.018 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
1,021	39	>75% Grass cover, Good, HSG A
1,691	98	Paved parking, HSG A
2,712	76	Weighted Average
1,021		37.65% Pervious Area
1,691		62.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0310	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.3	95	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	120	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13S: PR-7



Summary for Subcatchment 14S: PR-8R

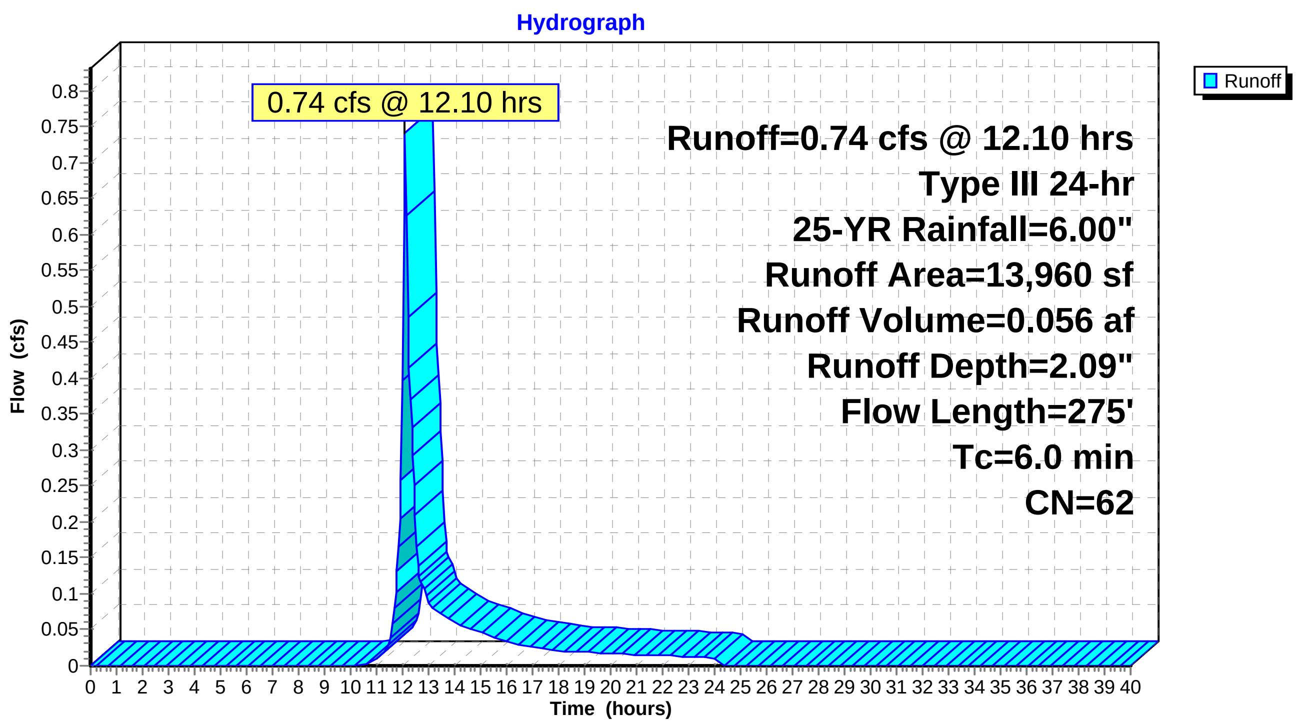
Runoff = 0.74 cfs @ 12.10 hrs, Volume= 0.056 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
6,684	39	>75% Grass cover, Good, HSG A
2,706	98	Paved parking, HSG A
1,525	98	Paved parking, HSG B
3,045	61	>75% Grass cover, Good, HSG B
13,960	62	Weighted Average
9,729		69.69% Pervious Area
4,231		30.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.4	100	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	125	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.9	275	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 14S: PR-8R



Summary for Subcatchment 15S: PR-9R

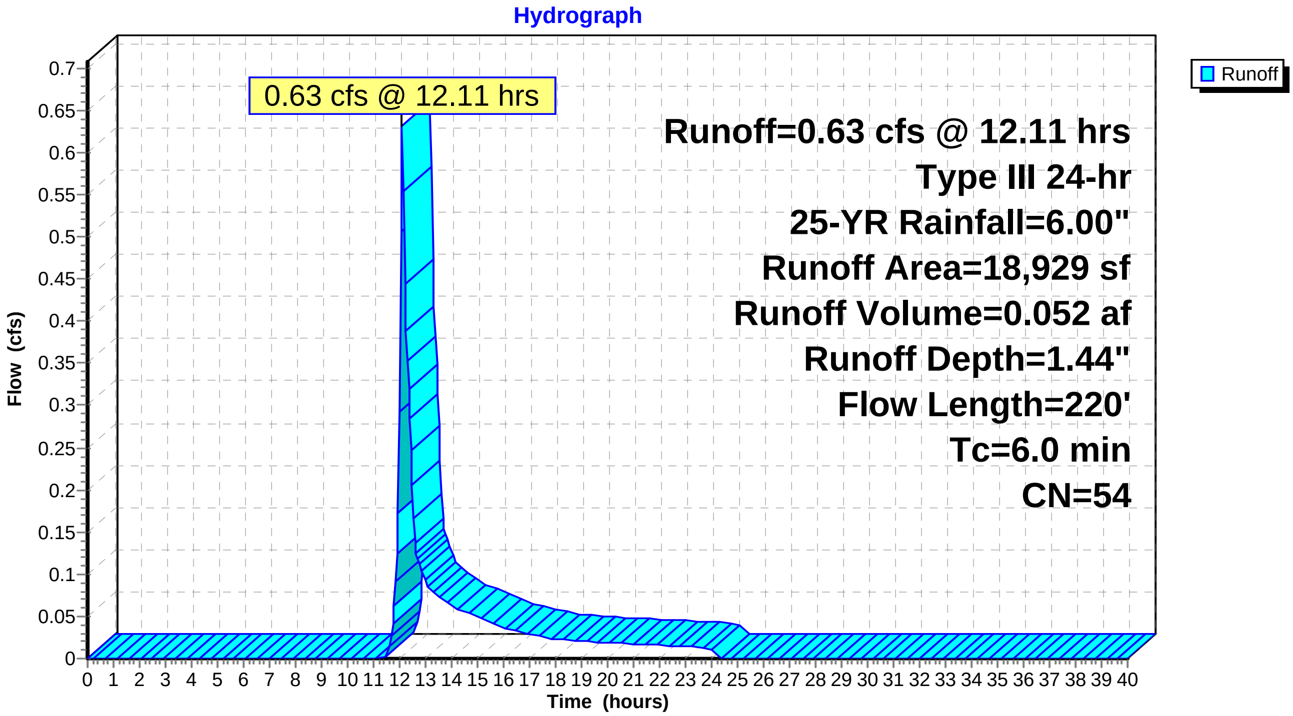
Runoff = 0.63 cfs @ 12.11 hrs, Volume= 0.052 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
11,941	39	>75% Grass cover, Good, HSG A
2,358	98	Paved parking, HSG A
1,358	98	Paved parking, HSG B
3,272	61	>75% Grass cover, Good, HSG B
18,929	54	Weighted Average
15,213		80.37% Pervious Area
3,716		19.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.0	10	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	150	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	220	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15S: PR-9R



Summary for Subcatchment 16S: PR-10R

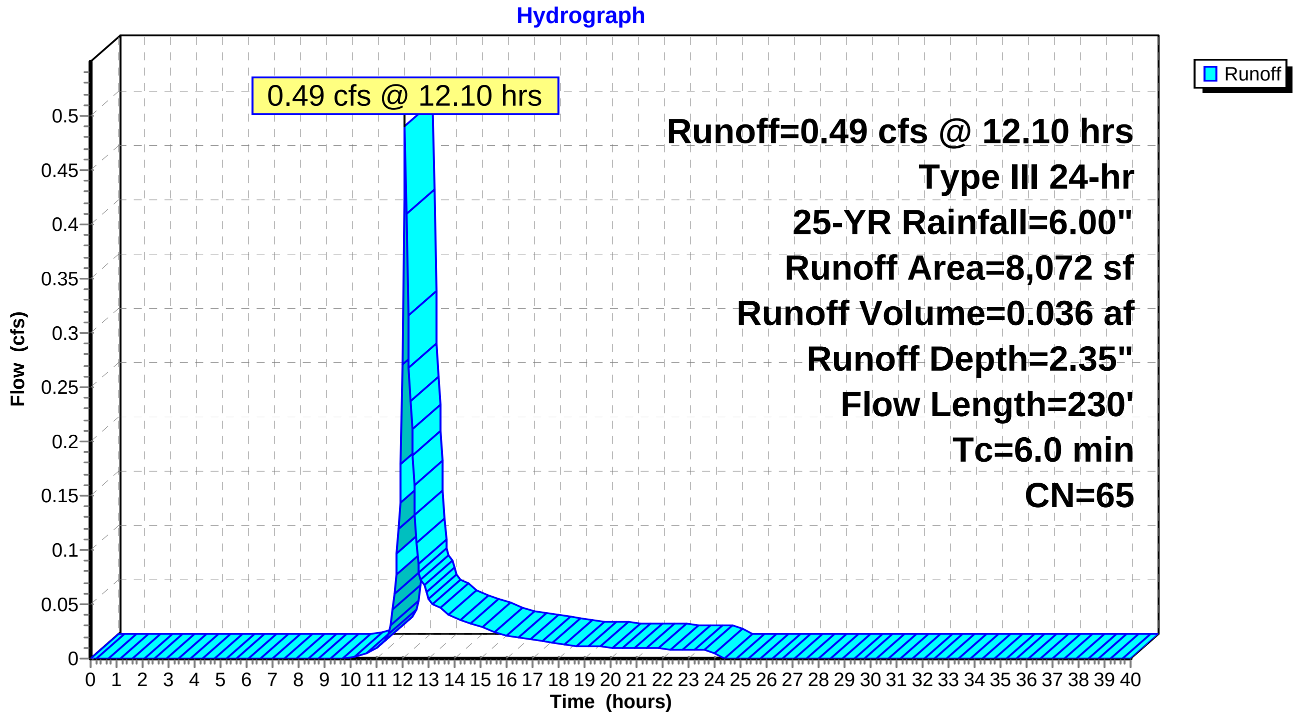
Runoff = 0.49 cfs @ 12.10 hrs, Volume= 0.036 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
670	39	>75% Grass cover, Good, HSG A
723	30	Woods, Good, HSG A
1,898	98	Paved parking, HSG B
4,781	61	>75% Grass cover, Good, HSG B
8,072	65	Weighted Average
6,174		76.49% Pervious Area
1,898		23.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	30	0.1430	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	130	0.1770	6.77		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	20	0.0310	3.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	50	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	230	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 16S: PR-10R



Summary for Subcatchment 17S: PR-11

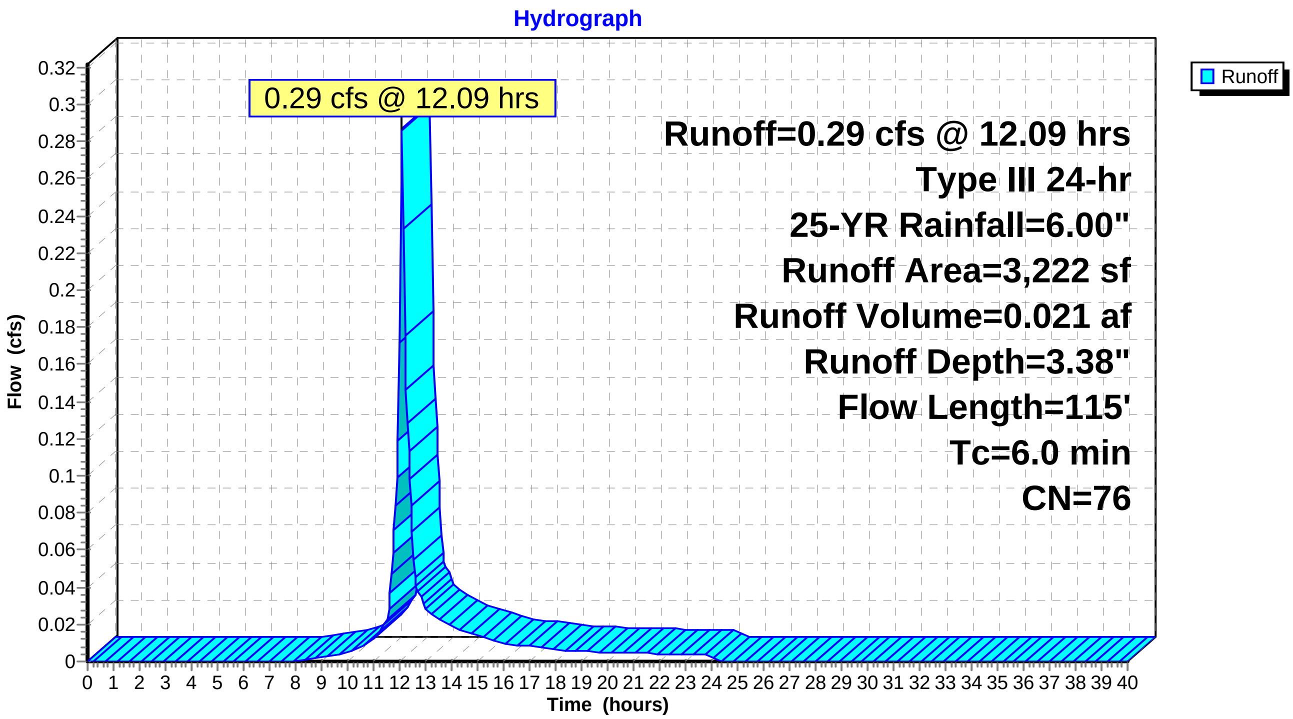
Runoff = 0.29 cfs @ 12.09 hrs, Volume= 0.021 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
1,329	98	Paved parking, HSG B
1,893	61	>75% Grass cover, Good, HSG B
3,222	76	Weighted Average
1,893		58.75% Pervious Area
1,329		41.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	40	0.1550	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	20	0.0310	2.83		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	55	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	115	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 17S: PR-11



Summary for Subcatchment 19S: PR-12

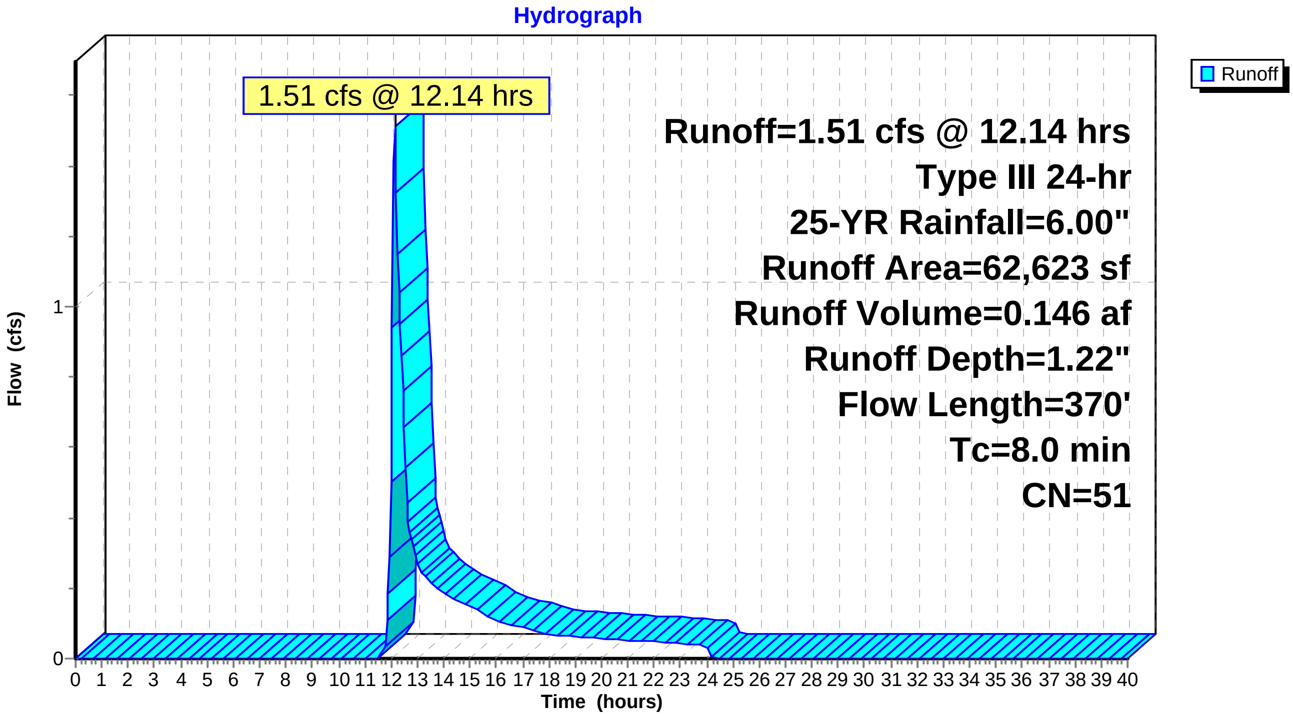
Runoff = 1.51 cfs @ 12.14 hrs, Volume= 0.146 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.00"

Area (sf)	CN	Description
9,300	39	>75% Grass cover, Good, HSG A
16,800	61	>75% Grass cover, Good, HSG B
7,412	30	Woods, Good, HSG A
29,111	55	Woods, Good, HSG B
62,623	51	Weighted Average
62,623		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	100	0.1330	5.87		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	205	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	15	0.3300	9.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.0	370	Total			

Subcatchment 19S: PR-12



Summary for Pond 1P: Stormwater Management Area #1

Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 2.36" for 25-YR event
Inflow = 1.52 cfs @ 12.09 hrs, Volume= 0.120 af
Outflow = 0.84 cfs @ 12.24 hrs, Volume= 0.120 af, Atten= 45%, Lag= 8.9 min
Discarded = 0.05 cfs @ 12.24 hrs, Volume= 0.050 af
Primary = 0.78 cfs @ 12.24 hrs, Volume= 0.070 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 119.74' @ 12.24 hrs Surf.Area= 940 sf Storage= 1,042 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 52.6 min (878.5 - 825.9)

Volume	Invert	Avail.Storage	Storage Description
#1	118.30'	4,746 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

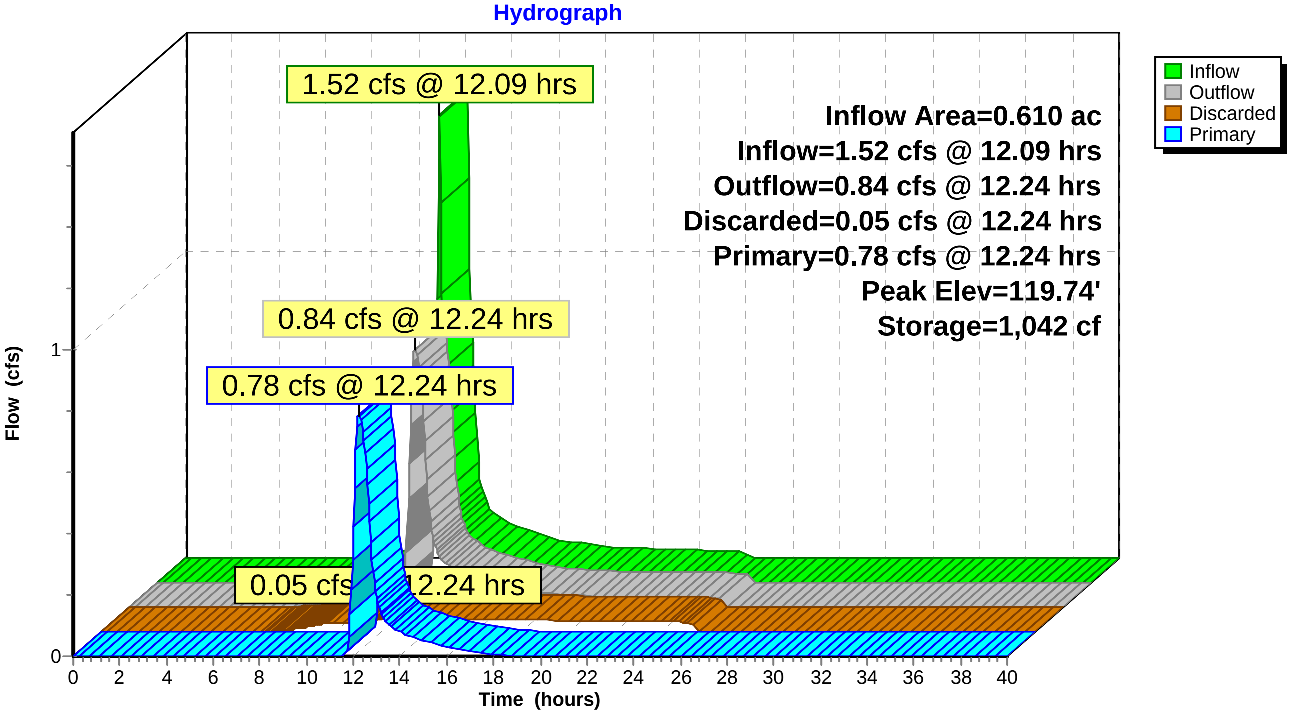
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.30	530	0	0
118.80	660	298	298
119.30	800	365	663
119.80	960	440	1,103
120.30	1,130	523	1,625
120.70	1,800	586	2,211
121.00	4,800	990	3,201
121.30	5,500	1,545	4,746

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**12.0" Round Culvert** L= 41.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 117.00' / 116.59' S= 0.0100 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Device 1	118.80'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Discarded	118.30'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 12.24 hrs HW=119.73' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.78 cfs @ 12.24 hrs HW=119.73' TW=109.75' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.78 cfs of 5.65 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.78 cfs @ 3.98 fps)

Pond 1P: Stormwater Management Area #1



Summary for Pond 2P: Stormwater Management Area #2

Inflow Area = 1.330 ac, 24.38% Impervious, Inflow Depth = 1.67" for 25-YR event
Inflow = 2.19 cfs @ 12.11 hrs, Volume= 0.185 af
Outflow = 0.85 cfs @ 12.61 hrs, Volume= 0.181 af, Atten= 61%, Lag= 30.0 min
Discarded = 0.06 cfs @ 12.61 hrs, Volume= 0.113 af
Secondary = 0.79 cfs @ 12.61 hrs, Volume= 0.068 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 74.44' @ 12.61 hrs Surf.Area= 2,515 sf Storage= 3,379 cf

Plug-Flow detention time= 400.3 min calculated for 0.181 af (98% of inflow)
Center-of-Mass det. time= 388.3 min (1,220.0 - 831.7)

Volume	Invert	Avail.Storage	Storage Description
#1	72.60'	7,534 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

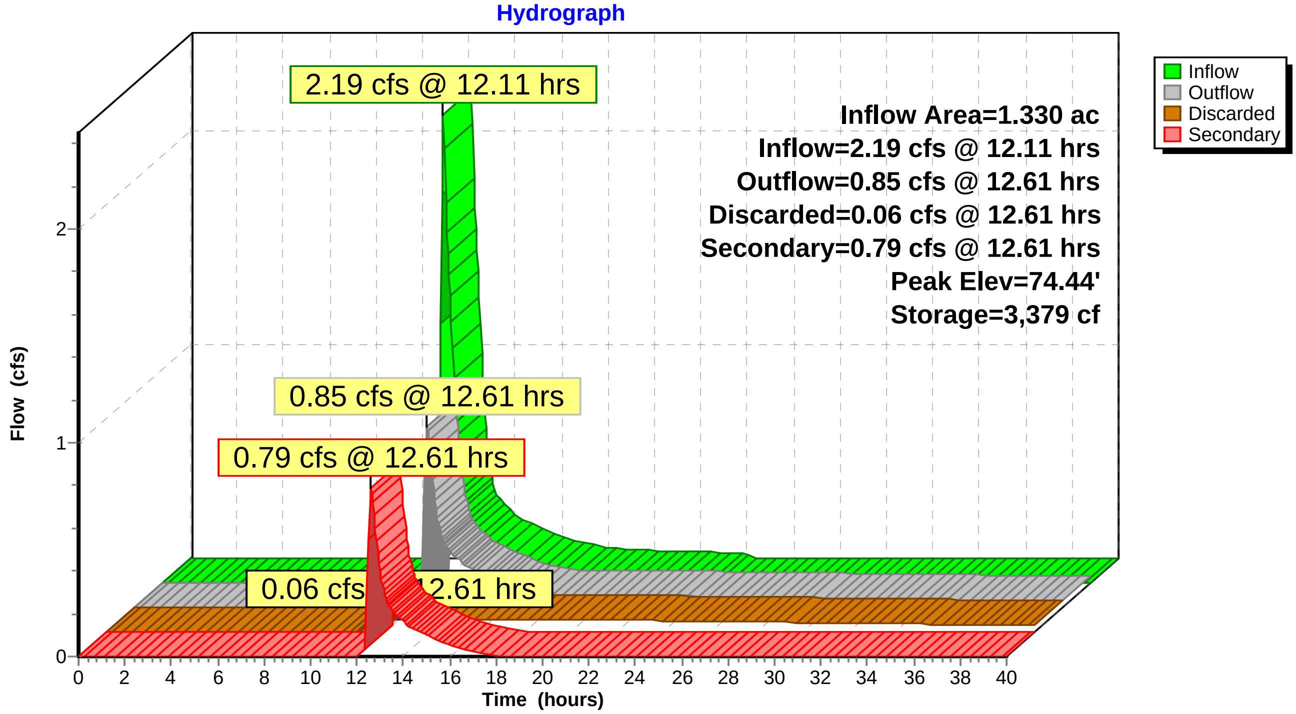
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.60	1,150	0	0
73.00	1,470	524	524
74.00	2,170	1,820	2,344
75.00	2,950	2,560	4,904
75.80	3,625	2,630	7,534

Device	Routing	Invert	Outlet Devices
#1	Discarded	72.60'	**1.020 in/hr Exfiltration over Surface area**
#2	Secondary	74.30'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.06 cfs @ 12.61 hrs HW=74.44' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Secondary OutFlow Max=0.78 cfs @ 12.61 hrs HW=74.44' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.78 cfs @ 0.92 fps)

Pond 2P: Stormwater Management Area #2



Summary for Pond 3P: Stormwater Management Area #3

[80] Warning: Exceeded Pond 18P by 0.25' @ 24.45 hrs (0.27 cfs 0.008 af)

Inflow Area = 1.014 ac, 25.29% Impervious, Inflow Depth = 1.95" for 25-YR event
Inflow = 2.15 cfs @ 12.10 hrs, Volume= 0.165 af
Outflow = 0.59 cfs @ 12.51 hrs, Volume= 0.165 af, Atten= 73%, Lag= 24.8 min
Discarded = 0.05 cfs @ 11.65 hrs, Volume= 0.093 af
Primary = 0.54 cfs @ 12.51 hrs, Volume= 0.072 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.43' @ 12.51 hrs Surf.Area= 2,102 sf Storage= 2,459 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 256.4 min (1,115.3 - 858.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	96.77'	1,779 cf	**35.33'W x 59.50'L x 3.54'H Field A**
			7,446 cf Overall - 2,999 cf Embedded = 4,447 cf x 40.0% Voids
#2A	97.27'	2,999 cf	**Cultec R-330XLHD** x 56 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		4,778 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	96.77'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	98.00'	**8.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 98.00' / 95.92' S= 0.0462 '/' Cc= 0.900
			n= 0.010, Flow Area= 0.35 sf

Discarded OutFlow Max=0.05 cfs @ 11.65 hrs HW=96.82' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.54 cfs @ 12.51 hrs HW=98.43' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 0.54 cfs @ 2.24 fps)

Pond 3P: Stormwater Management Area #3 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 7 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

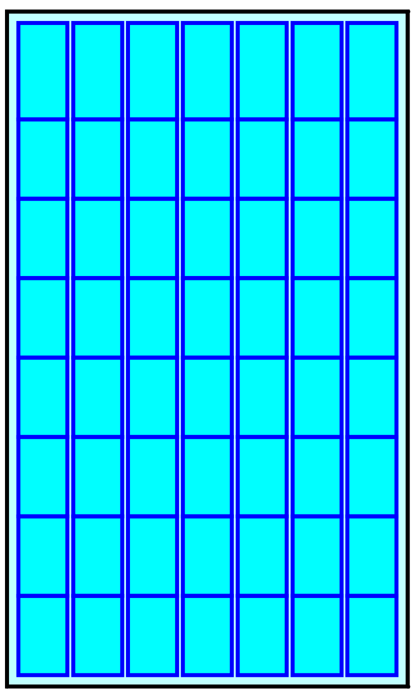
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
7 Rows x 52.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 35.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

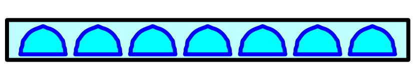
56 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 7 Rows = 2,999.0 cf Chamber Storage

7,445.8 cf Field - 2,999.0 cf Chambers = 4,446.7 cf Stone x 40.0% Voids = 1,778.7 cf Stone Storage

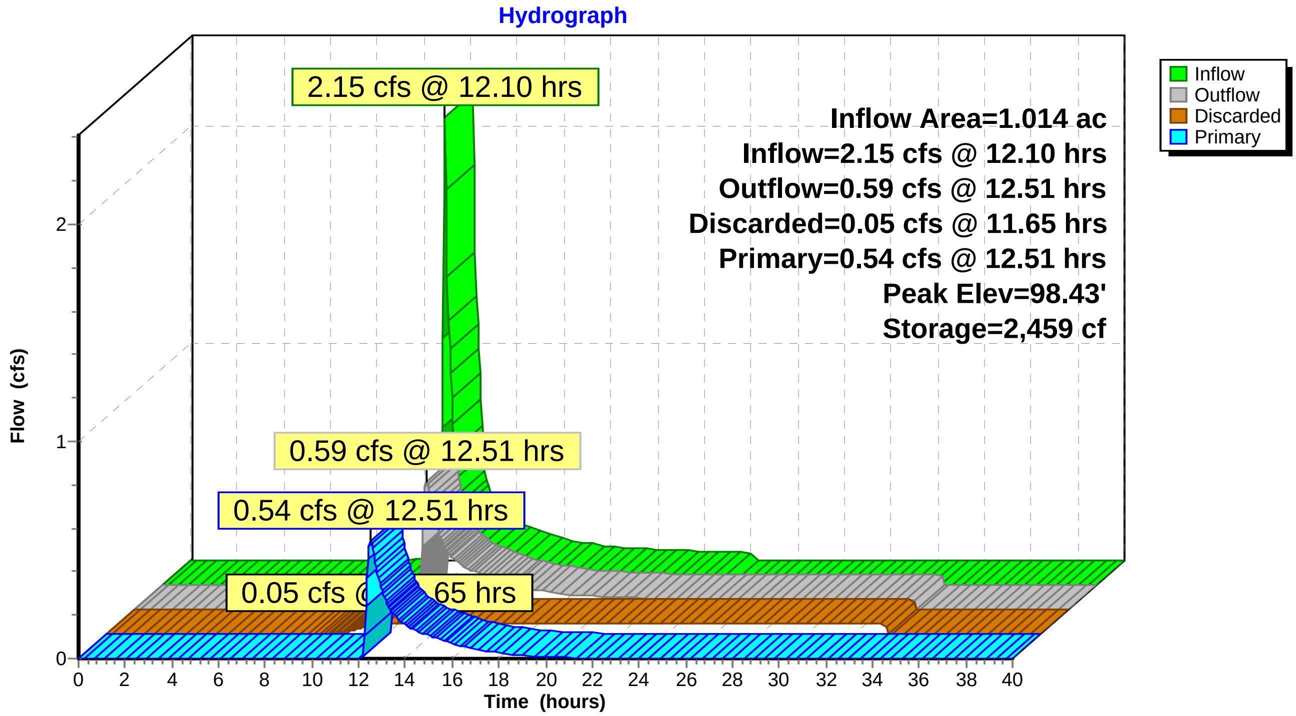
Chamber Storage + Stone Storage = 4,777.7 cf = 0.110 af
Overall Storage Efficiency = 64.2%
Overall System Size = 59.50' x 35.33' x 3.54'

56 Chambers
275.8 cy Field
164.7 cy Stone





Pond 3P: Stormwater Management Area #3



Summary for Pond 4P: Stormwater Management Area #4

Inflow Area = 1.533 ac, 5.49% Impervious, Inflow Depth = 0.21" for 25-YR event
Inflow = 0.11 cfs @ 12.38 hrs, Volume= 0.026 af
Outflow = 0.03 cfs @ 15.57 hrs, Volume= 0.026 af, Atten= 72%, Lag= 191.1 min
Discarded = 0.03 cfs @ 15.57 hrs, Volume= 0.026 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 107.58' @ 15.57 hrs Surf.Area= 569 sf Storage= 276 cf

Plug-Flow detention time= 113.0 min calculated for 0.026 af (100% of inflow)
Center-of-Mass det. time= 113.1 min (1,083.1 - 970.1)

Volume	Invert	Avail.Storage	Storage Description
#1	106.80'	3,728 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

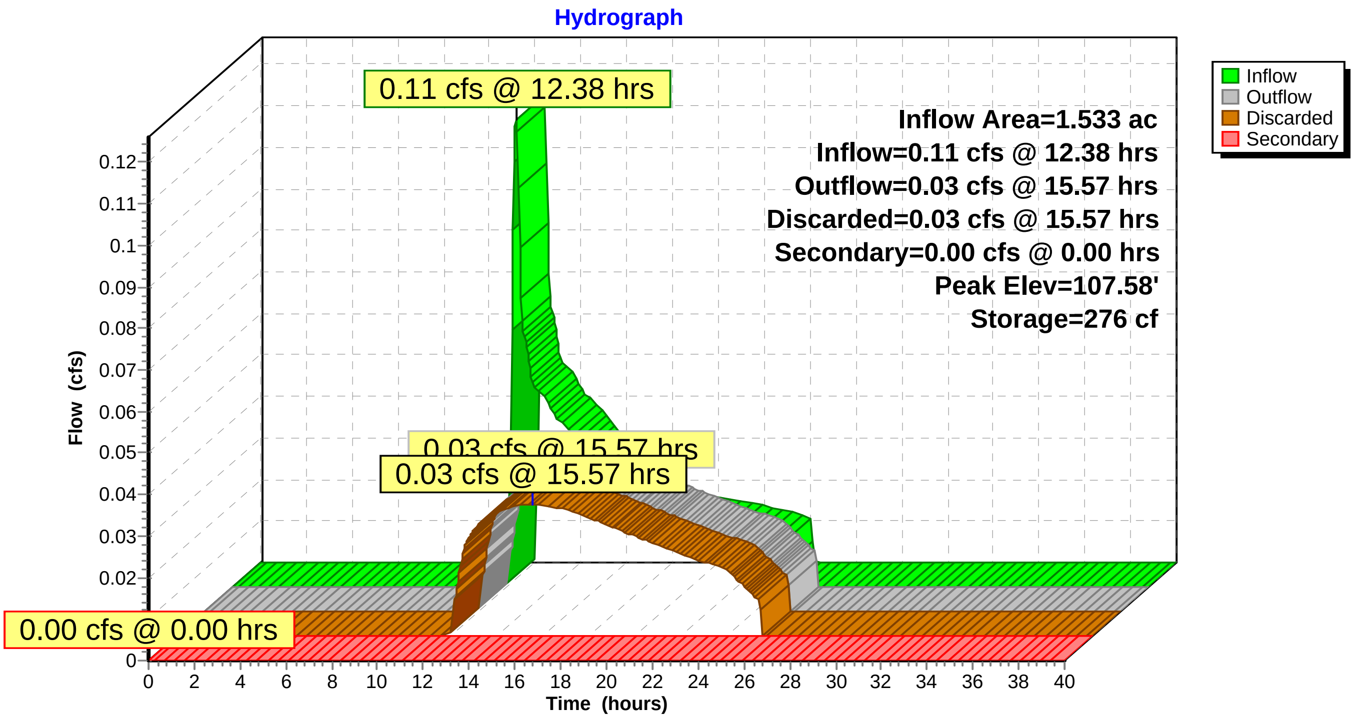
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
106.80	150	0	0
107.00	240	39	39
107.80	690	372	411
108.00	880	157	568
109.00	1,800	1,340	1,908
109.80	2,750	1,820	3,728

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	108.50'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.03 cfs @ 15.57 hrs HW=107.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=106.80' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Stormwater Management Area #4



Summary for Pond 5P: Stormwater Management Area #5

Inflow Area = 0.729 ac, 11.55% Impervious, Inflow Depth = 0.97" for 25-YR event
Inflow = 0.54 cfs @ 12.10 hrs, Volume= 0.059 af
Outflow = 0.07 cfs @ 14.05 hrs, Volume= 0.059 af, Atten= 87%, Lag= 116.7 min
Discarded = 0.07 cfs @ 14.05 hrs, Volume= 0.059 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 109.89' @ 14.05 hrs Surf.Area= 1,216 sf Storage= 885 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 154.7 min (1,034.3 - 879.6)

Volume	Invert	Avail.Storage	Storage Description
#1	108.80'	4,689 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

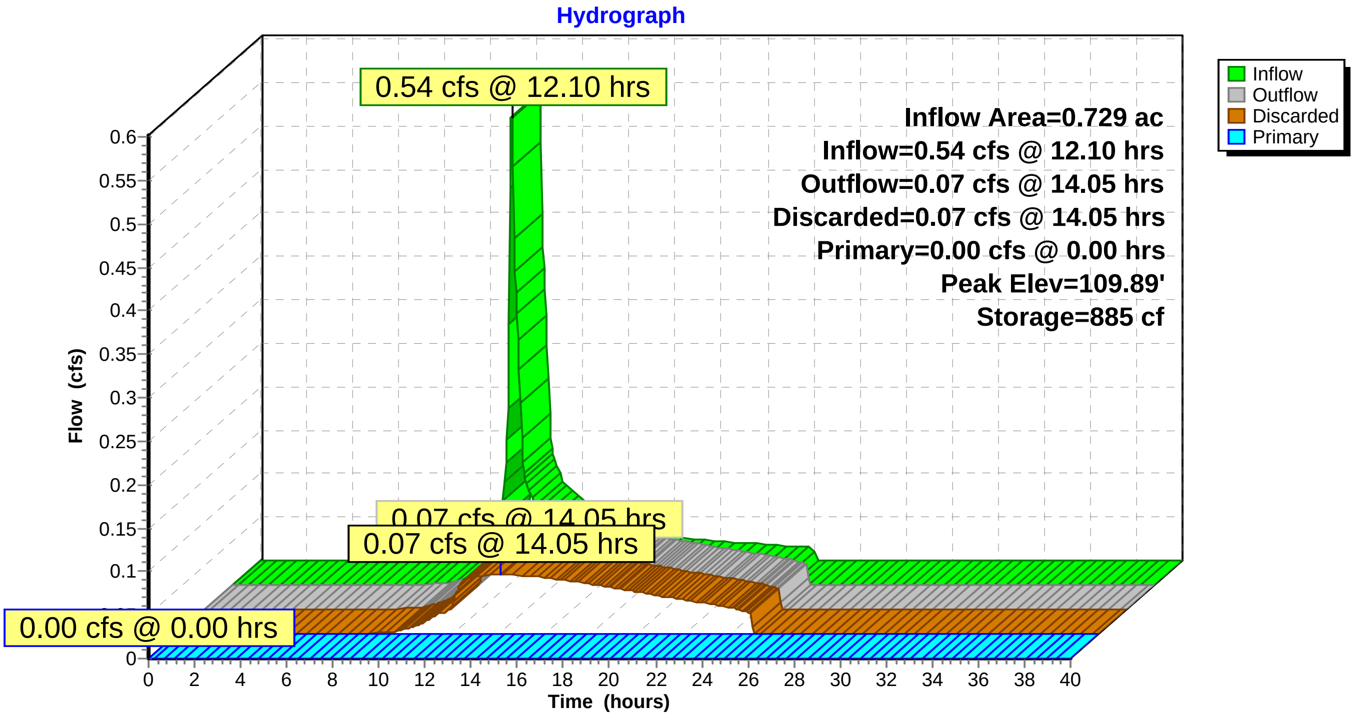
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
108.80	420	0	0
109.00	560	98	98
110.00	1,300	930	1,028
111.00	2,110	1,705	2,733
111.80	2,780	1,956	4,689

Device	Routing	Invert	Outlet Devices
#1	Discarded	108.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	110.30'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.07 cfs @ 14.05 hrs HW=109.89' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=108.80' TW=106.80' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: Stormwater Management Area #5



Summary for Pond 6P: Stormwater Management Area #6

Inflow Area = 1.438 ac, 0.00% Impervious, Inflow Depth = 1.22" for 25-YR event
Inflow = 1.51 cfs @ 12.14 hrs, Volume= 0.146 af
Outflow = 1.25 cfs @ 12.26 hrs, Volume= 0.142 af, Atten= 18%, Lag= 7.3 min
Discarded = 0.02 cfs @ 12.26 hrs, Volume= 0.034 af
Primary = 1.23 cfs @ 12.26 hrs, Volume= 0.108 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 79.19' @ 12.26 hrs Surf.Area= 846 sf Storage= 981 cf

Plug-Flow detention time= 143.2 min calculated for 0.142 af (98% of inflow)
Center-of-Mass det. time= 132.8 min (1,025.3 - 892.5)

Volume	Invert	Avail.Storage	Storage Description
#1	77.00'	2,540 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

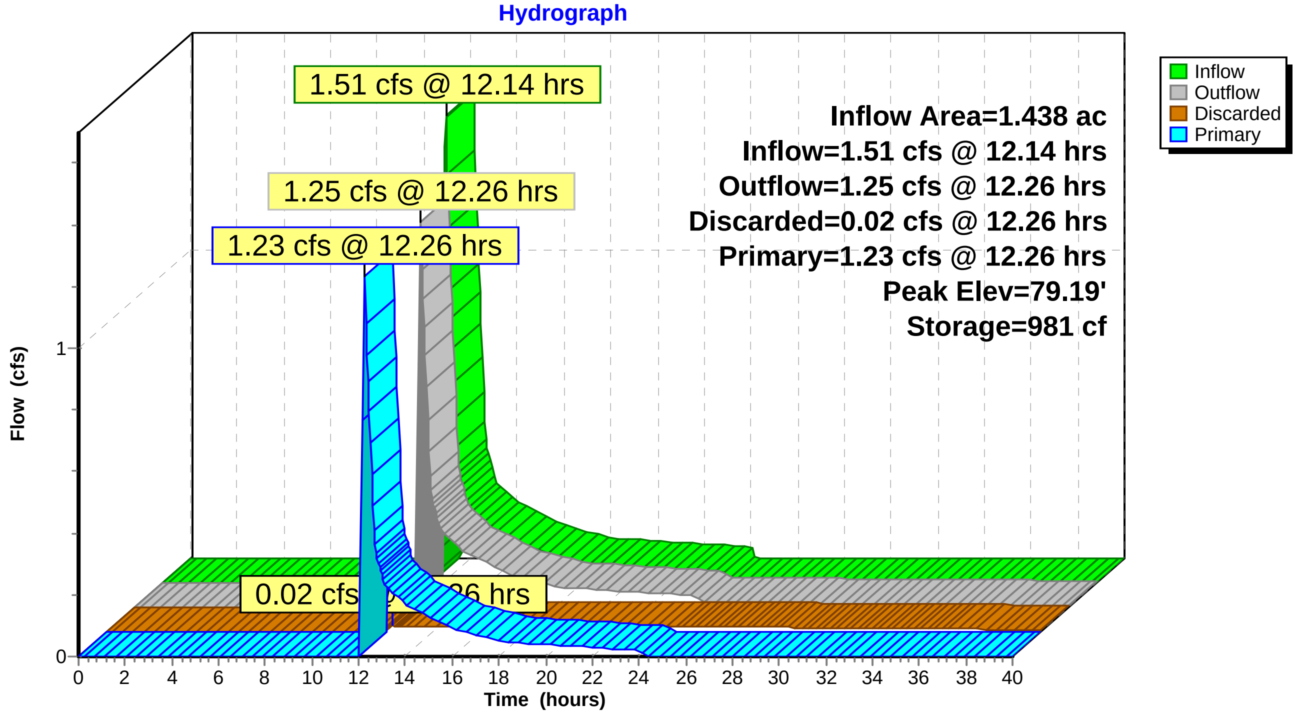
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.00	115	0	0
78.00	390	253	253
79.00	760	575	828
80.00	1,210	985	1,813
80.50	1,700	728	2,540

Device	Routing	Invert	Outlet Devices
#1	Discarded	77.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	79.00'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.02 cfs @ 12.26 hrs HW=79.18' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.17 cfs @ 12.26 hrs HW=79.18' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 1.17 cfs @ 1.06 fps)

Pond 6P: Stormwater Management Area #6



Summary for Pond 7P: DMH

[57] Hint: Peaked at 109.75' (Flood elevation advised)

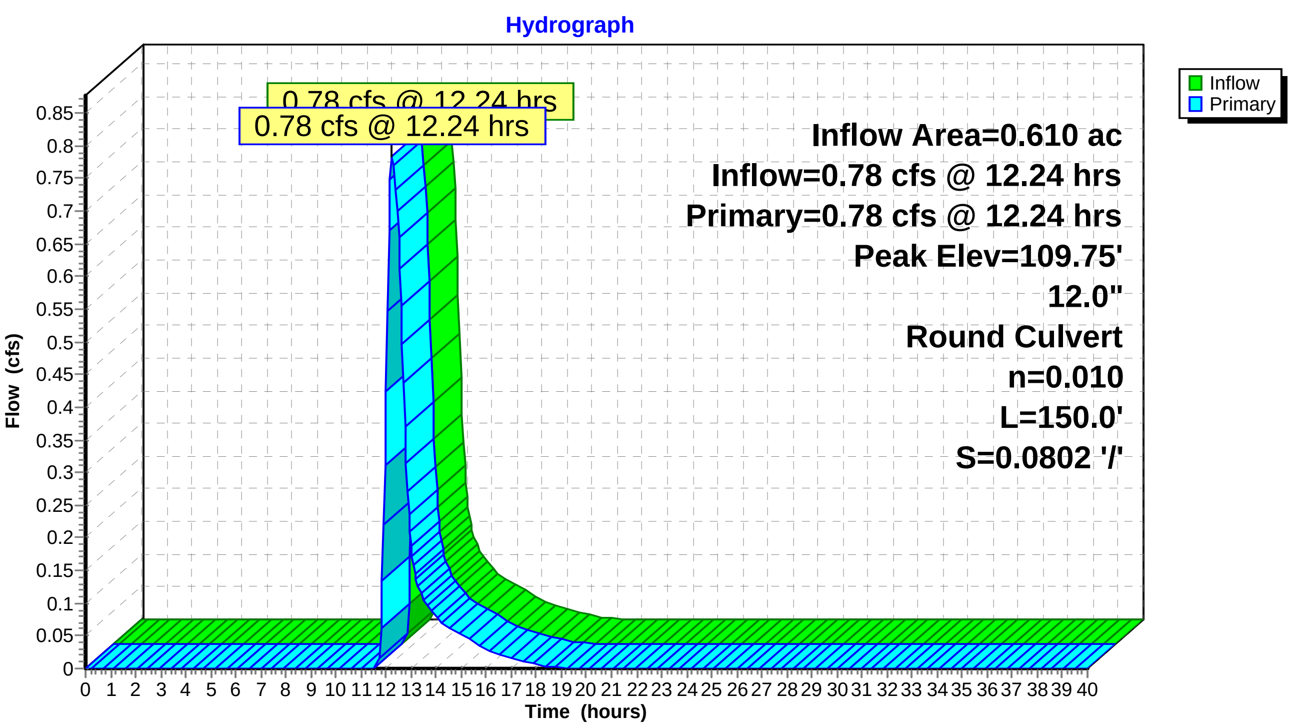
Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 1.38" for 25-YR event
Inflow = 0.78 cfs @ 12.24 hrs, Volume= 0.070 af
Outflow = 0.78 cfs @ 12.24 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min
Primary = 0.78 cfs @ 12.24 hrs, Volume= 0.070 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 109.75' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	109.30'	**12.0" Round Culvert** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.30' / 97.27' S= 0.0802 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.78 cfs @ 12.24 hrs HW=109.75' TW=88.92' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.78 cfs @ 2.28 fps)

Pond 7P: DMH



Summary for Pond 8P: DMH

[57] Hint: Peaked at 88.92' (Flood elevation advised)

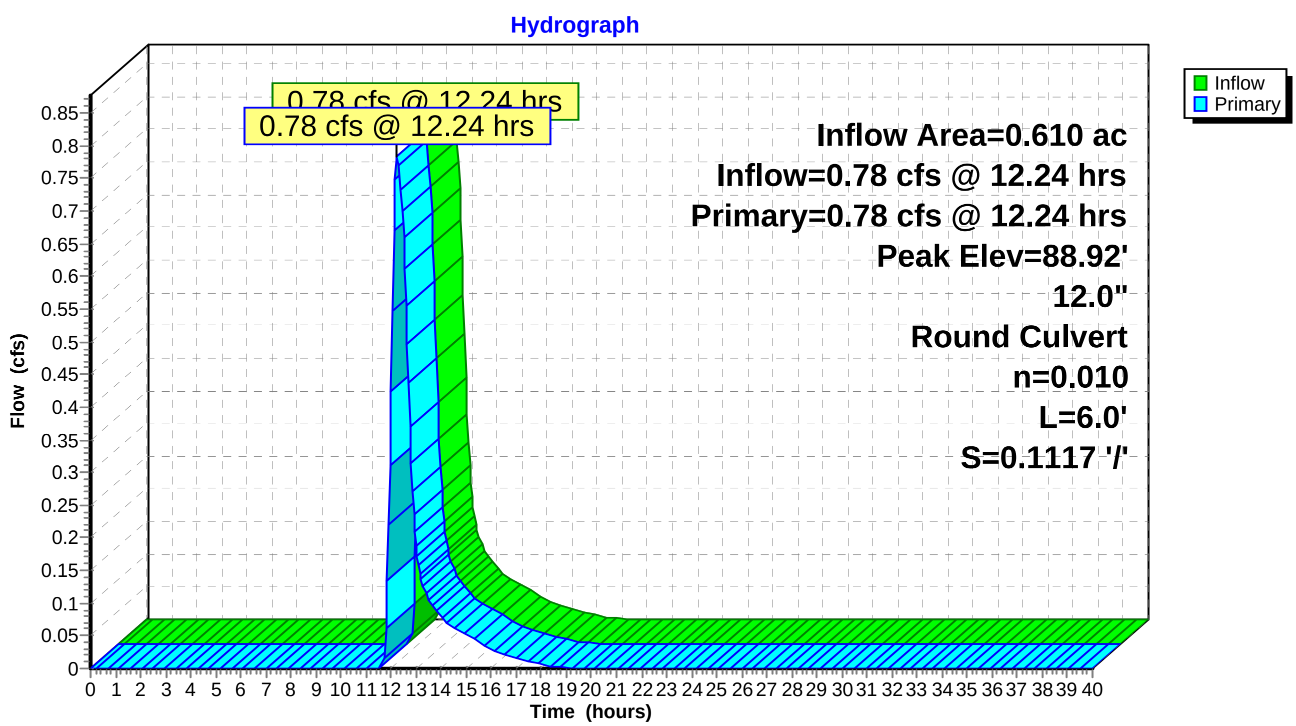
Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 1.38" for 25-YR event
Inflow = 0.78 cfs @ 12.24 hrs, Volume= 0.070 af
Outflow = 0.78 cfs @ 12.24 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min
Primary = 0.78 cfs @ 12.24 hrs, Volume= 0.070 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 88.92' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	88.47'	**12.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 88.47' / 87.80' S= 0.1117 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.78 cfs @ 12.24 hrs HW=88.92' TW=73.90' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.78 cfs @ 2.28 fps)

Pond 8P: DMH



Summary for Pond 9P: CB 2+85 RT

[57] Hint: Peaked at 115.44' (Flood elevation advised)

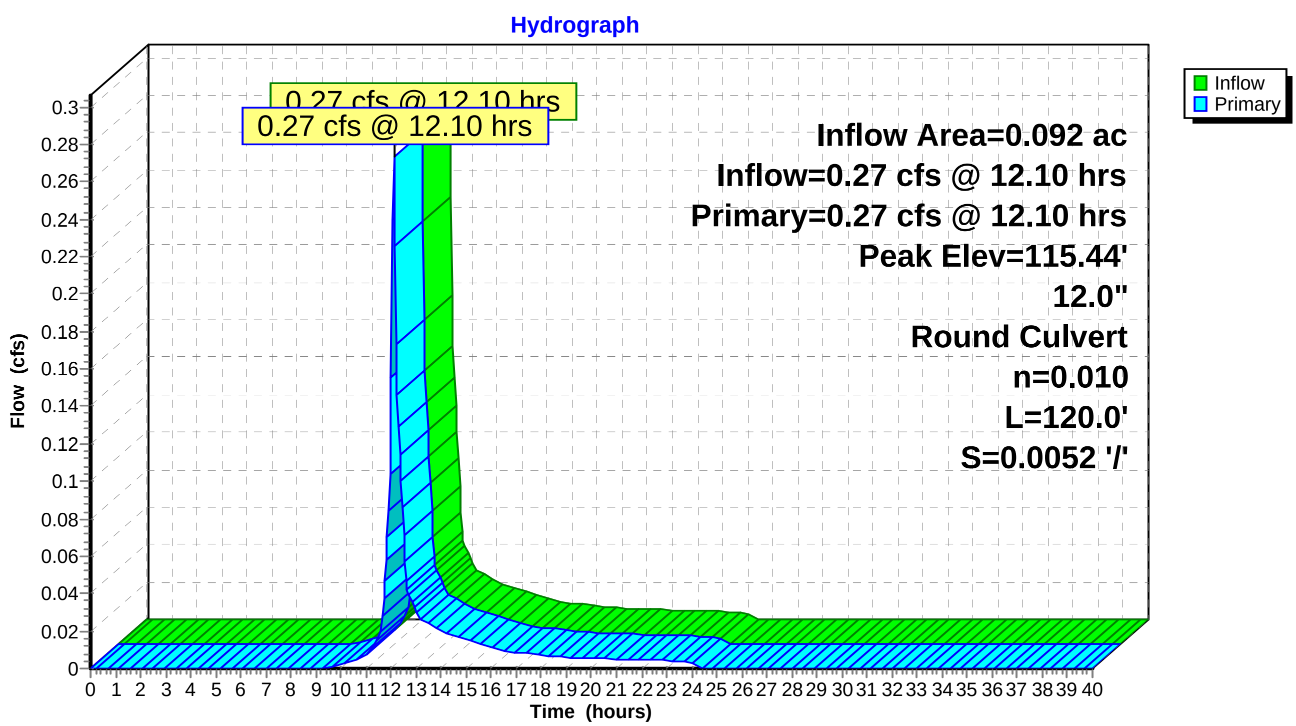
Inflow Area = 0.092 ac, 49.57% Impervious, Inflow Depth = 2.62" for 25-YR event
Inflow = 0.27 cfs @ 12.10 hrs, Volume= 0.020 af
Outflow = 0.27 cfs @ 12.10 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.10 hrs, Volume= 0.020 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 115.44' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.17'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.17' / 114.54' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.27 cfs @ 12.10 hrs HW=115.43' TW=114.70' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.27 cfs @ 2.45 fps)

Pond 9P: CB 2+85 RT



Summary for Pond 10P: DMH 4+11

[57] Hint: Peaked at 114.70' (Flood elevation advised)

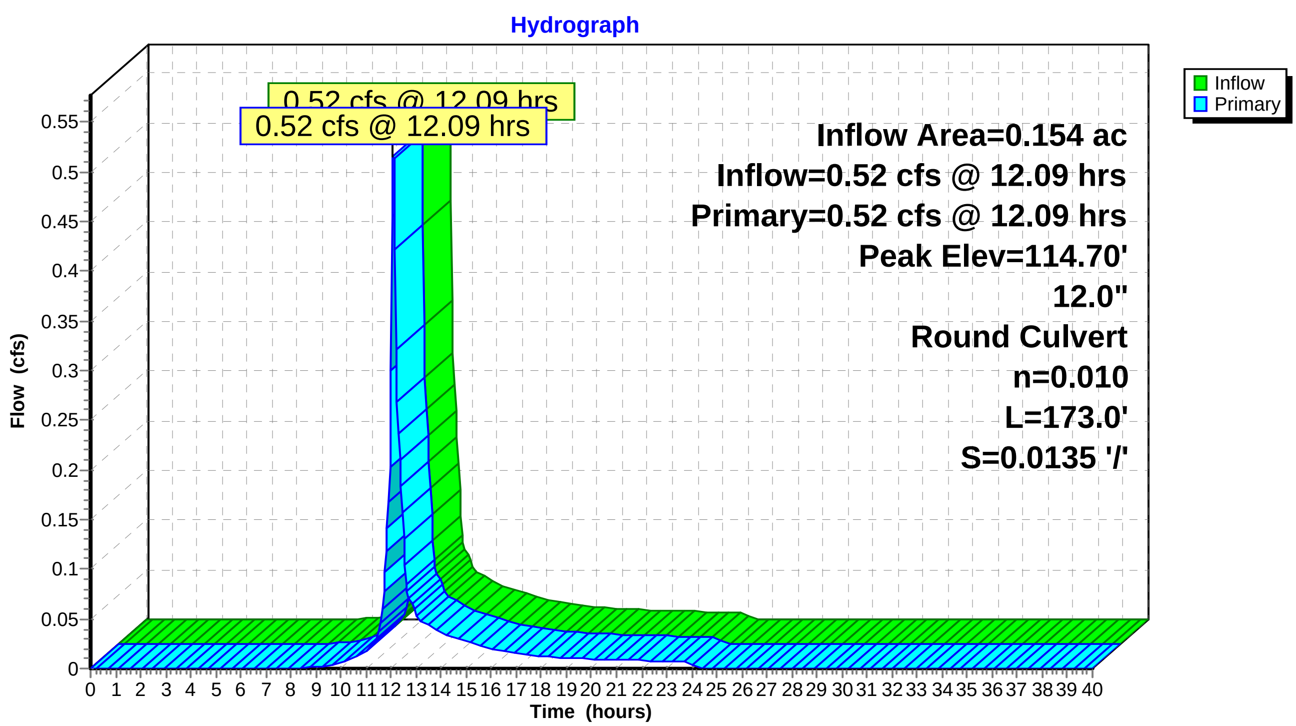
Inflow Area =	0.154 ac,	54.75% Impervious,	Inflow Depth = 2.93"	for 25-YR event	
Inflow =	0.52 cfs @	12.09 hrs,	Volume=	0.038 af	
Outflow =	0.52 cfs @	12.09 hrs,	Volume=	0.038 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.52 cfs @	12.09 hrs,	Volume=	0.038 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 114.70' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	114.34'	**12.0" Round Culvert** L= 173.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 114.34' / 112.00' S= 0.0135 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.51 cfs @ 12.09 hrs HW=114.70' TW=109.29' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.51 cfs @ 2.03 fps)

Pond 10P: DMH 4+11



Summary for Pond 11P: CB 2+85 LT

[57] Hint: Peaked at 115.42' (Flood elevation advised)

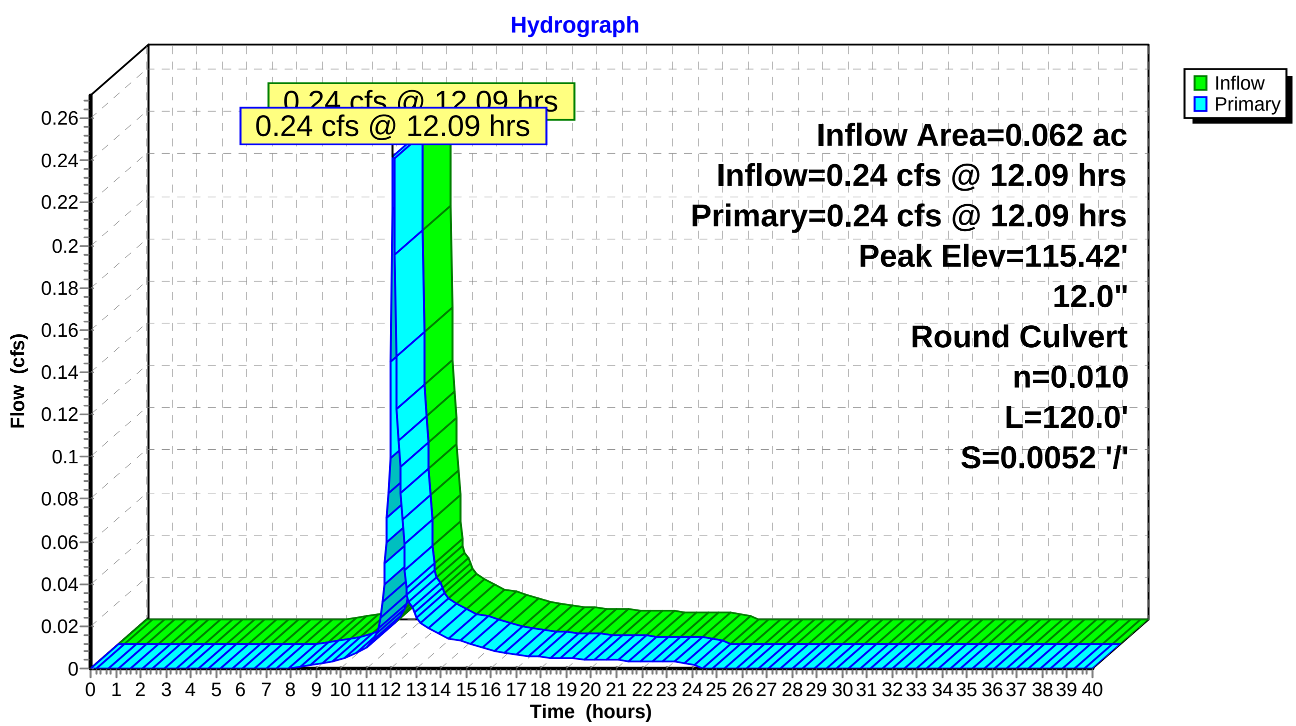
Inflow Area =	0.062 ac, 62.35% Impervious, Inflow Depth = 3.38"	for 25-YR event	
Inflow =	0.24 cfs @ 12.09 hrs, Volume=	0.018 af	
Outflow =	0.24 cfs @ 12.09 hrs, Volume=	0.018 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.24 cfs @ 12.09 hrs, Volume=	0.018 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 115.42' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.17'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.17' / 114.54' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.24 cfs @ 12.09 hrs HW=115.42' TW=114.69' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.24 cfs @ 2.37 fps)

Pond 11P: CB 2+85 LT



Summary for Pond 12P: CB 1+0 RT

[57] Hint: Peaked at 101.67' (Flood elevation advised)

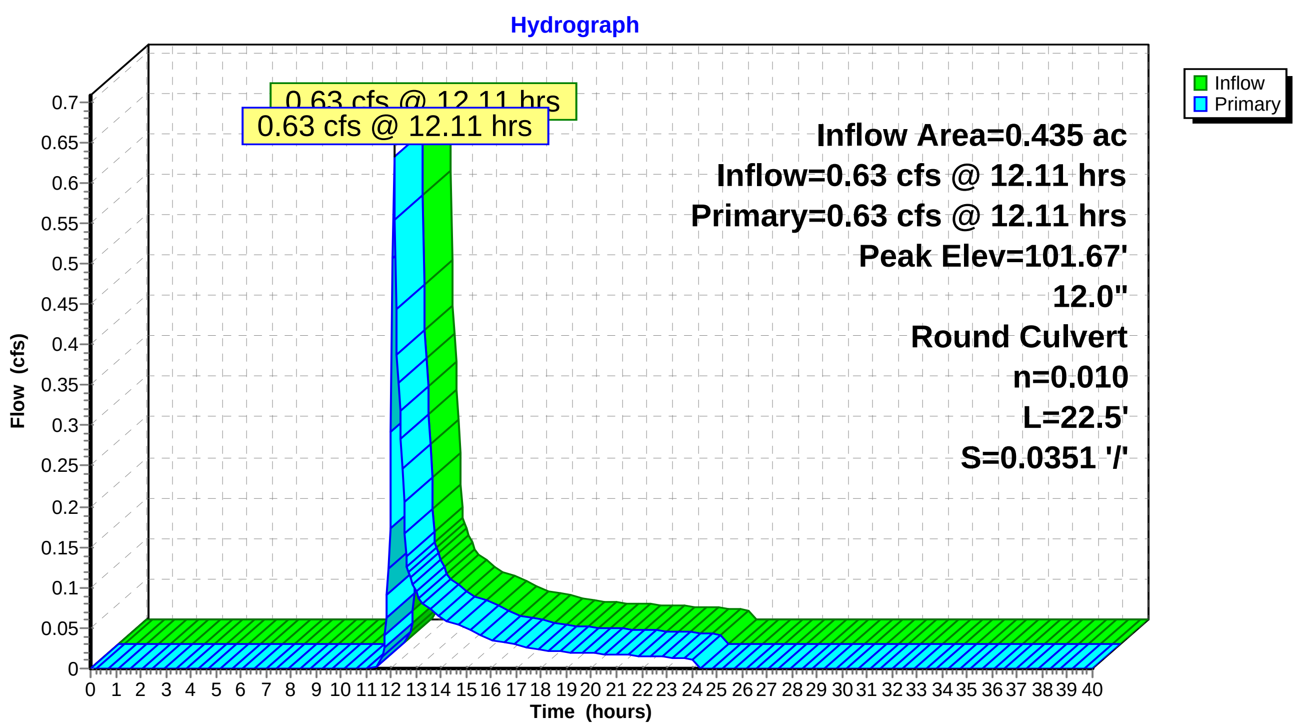
Inflow Area =	0.435 ac,	19.63% Impervious,	Inflow Depth = 1.44"	for 25-YR event
Inflow =	0.63 cfs @	12.11 hrs, Volume=	0.052 af	
Outflow =	0.63 cfs @	12.11 hrs, Volume=	0.052 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.63 cfs @	12.11 hrs, Volume=	0.052 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.67' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.27'	**12.0" Round Culvert** L= 22.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.27' / 100.48' S= 0.0351 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.62 cfs @ 12.11 hrs HW=101.67' TW=100.99' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.62 cfs @ 2.14 fps)

Pond 12P: CB 1+0 RT



Summary for Pond 13P: CB 1+0 LT

[57] Hint: Peaked at 101.71' (Flood elevation advised)

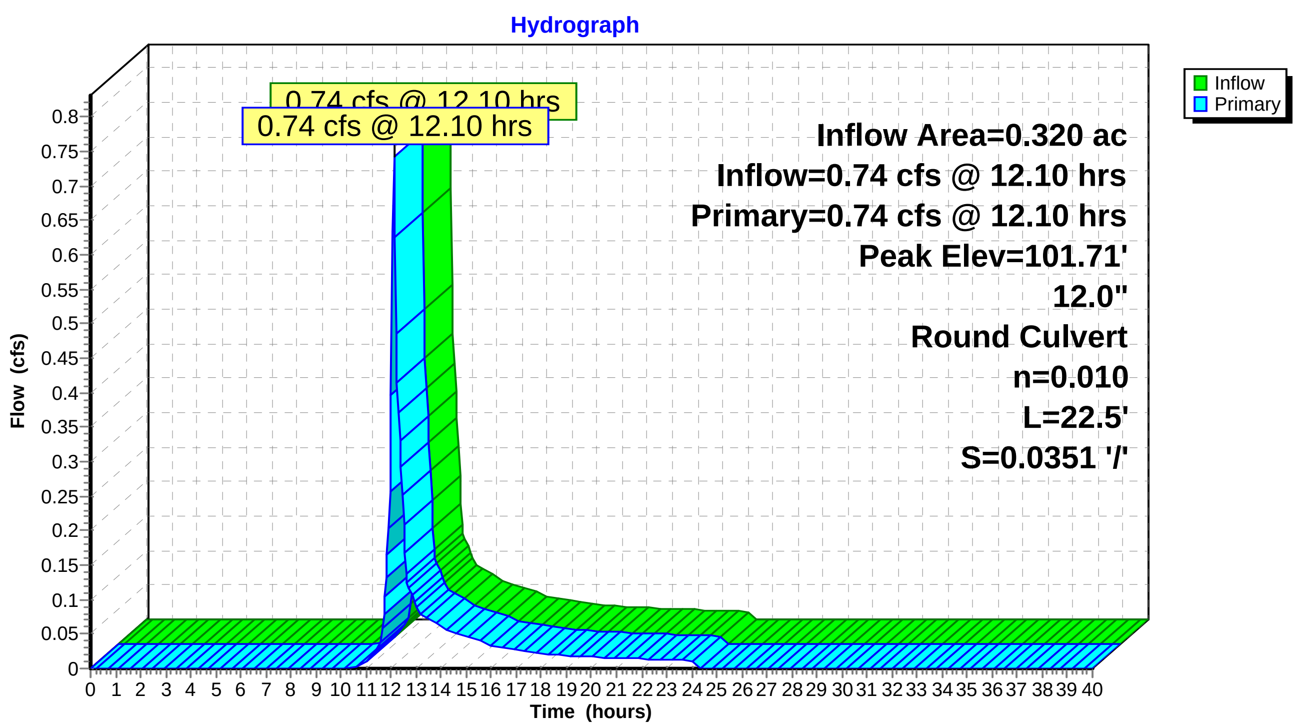
Inflow Area =	0.320 ac, 30.31% Impervious,	Inflow Depth = 2.09"	for 25-YR event
Inflow =	0.74 cfs @ 12.10 hrs,	Volume=	0.056 af
Outflow =	0.74 cfs @ 12.10 hrs,	Volume=	0.056 af, Atten= 0%, Lag= 0.0 min
Primary =	0.74 cfs @ 12.10 hrs,	Volume=	0.056 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.71' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.27'	**12.0" Round Culvert** L= 22.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.27' / 100.48' S= 0.0351 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.74 cfs @ 12.10 hrs HW=101.71' TW=101.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.74 cfs @ 2.25 fps)

Pond 13P: CB 1+0 LT



Summary for Pond 14P: DMH 0+75

[57] Hint: Peaked at 101.00' (Flood elevation advised)

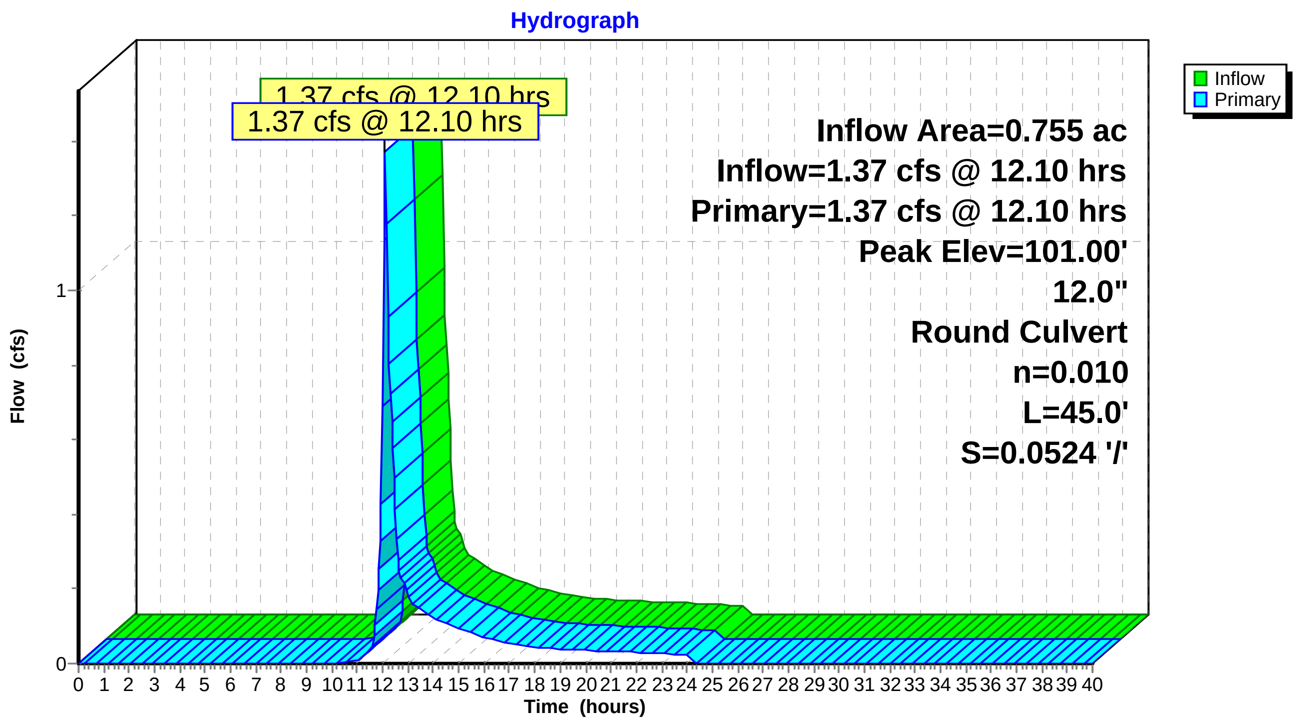
Inflow Area = 0.755 ac, 24.16% Impervious, Inflow Depth = 1.72" for 25-YR event
Inflow = 1.37 cfs @ 12.10 hrs, Volume= 0.108 af
Outflow = 1.37 cfs @ 12.10 hrs, Volume= 0.108 af, Atten= 0%, Lag= 0.0 min
Primary = 1.37 cfs @ 12.10 hrs, Volume= 0.108 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.00' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	100.38'	**12.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 100.38' / 98.02' S= 0.0524 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.36 cfs @ 12.10 hrs HW=101.00' TW=98.99' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.36 cfs @ 2.68 fps)

Pond 14P: DMH 0+75



Summary for Pond 15P: DMH 0+25

[57] Hint: Peaked at 99.00' (Flood elevation advised)
[80] Warning: Exceeded Pond 17P by 0.01' @ 12.40 hrs (0.13 cfs 0.001 af)

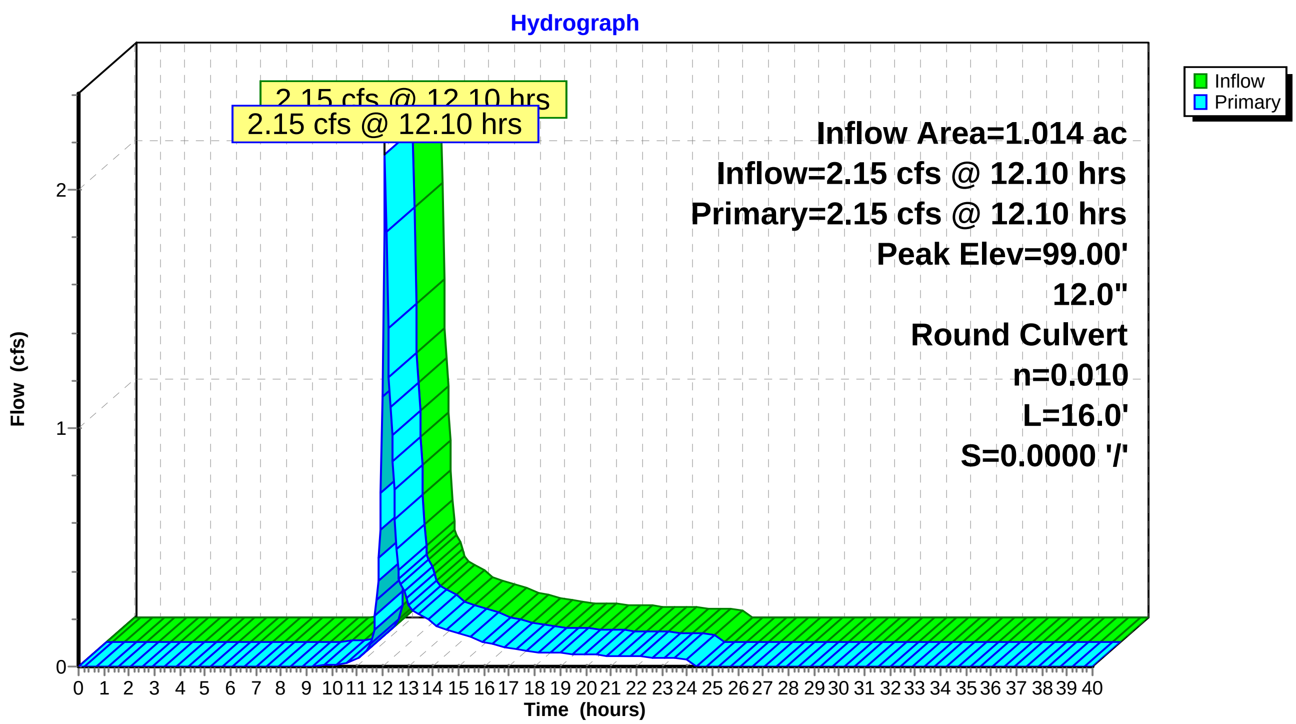
Inflow Area = 1.014 ac, 25.29% Impervious, Inflow Depth = 1.95" for 25-YR event
Inflow = 2.15 cfs @ 12.10 hrs, Volume= 0.165 af
Outflow = 2.15 cfs @ 12.10 hrs, Volume= 0.165 af, Atten= 0%, Lag= 0.0 min
Primary = 2.15 cfs @ 12.10 hrs, Volume= 0.165 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 99.00' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.92'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.92' / 97.92' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.15 cfs @ 12.10 hrs HW=99.00' TW=98.57' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 2.15 cfs @ 3.17 fps)

Pond 15P: DMH 0+25



Summary for Pond 16P: CB 0+08 LT

[57] Hint: Peaked at 99.02' (Flood elevation advised)

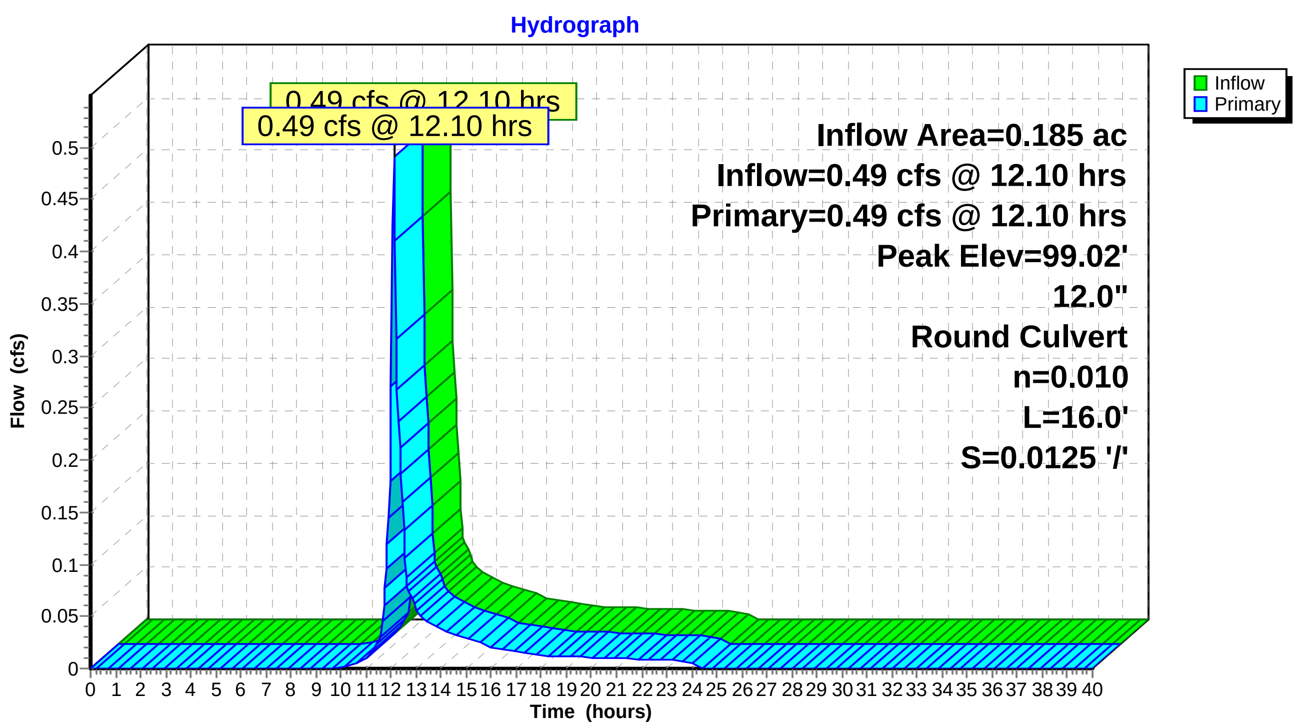
Inflow Area = 0.185 ac, 23.51% Impervious, Inflow Depth = 2.35" for 25-YR event
Inflow = 0.49 cfs @ 12.10 hrs, Volume= 0.036 af
Outflow = 0.49 cfs @ 12.10 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min
Primary = 0.49 cfs @ 12.10 hrs, Volume= 0.036 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 99.02' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.22'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.22' / 98.02' S= 0.0125 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.49 cfs @ 12.10 hrs HW=99.02' TW=98.99' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.49 cfs @ 0.99 fps)

Pond 16P: CB 0+08 LT



Summary for Pond 17P: CB 0+08 RT

[57] Hint: Peaked at 99.01' (Flood elevation advised)

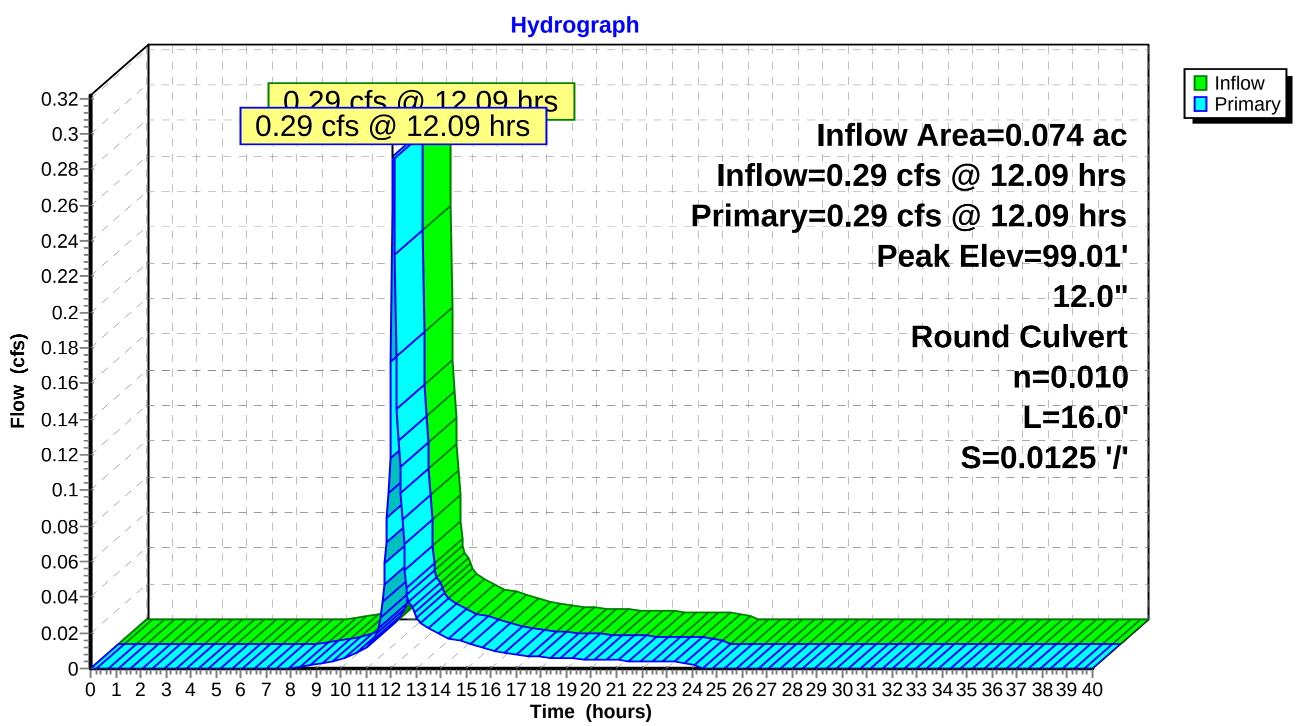
Inflow Area = 0.074 ac, 41.25% Impervious, Inflow Depth = 3.38" for 25-YR event
Inflow = 0.29 cfs @ 12.09 hrs, Volume= 0.021 af
Outflow = 0.29 cfs @ 12.09 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.09 hrs, Volume= 0.021 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 99.01' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.22'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.22' / 98.02' S= 0.0125 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.28 cfs @ 12.09 hrs HW=98.99' TW=98.98' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.28 cfs @ 0.60 fps)

Pond 17P: CB 0+08 RT



Summary for Pond 18P: SOS

[57] Hint: Peaked at 98.57' (Flood elevation advised)

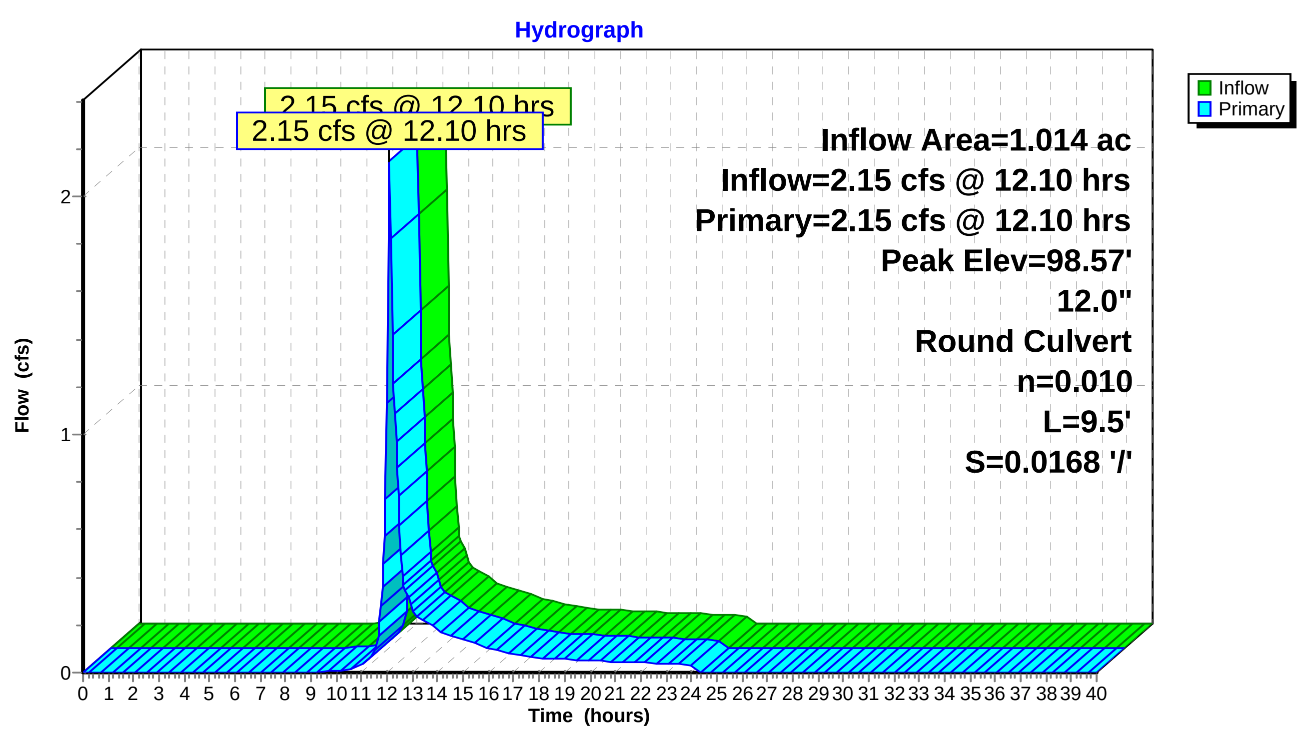
Inflow Area =	1.014 ac, 25.29% Impervious,	Inflow Depth = 1.95"	for 25-YR event
Inflow =	2.15 cfs @ 12.10 hrs,	Volume=	0.165 af
Outflow =	2.15 cfs @ 12.10 hrs,	Volume=	0.165 af, Atten= 0%, Lag= 0.0 min
Primary =	2.15 cfs @ 12.10 hrs,	Volume=	0.165 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.57' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.68'	**12.0" Round Culvert** L= 9.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.68' / 97.52' S= 0.0168 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.15 cfs @ 12.10 hrs HW=98.57' TW=97.69' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 2.15 cfs @ 3.87 fps)

Pond 18P: SOS

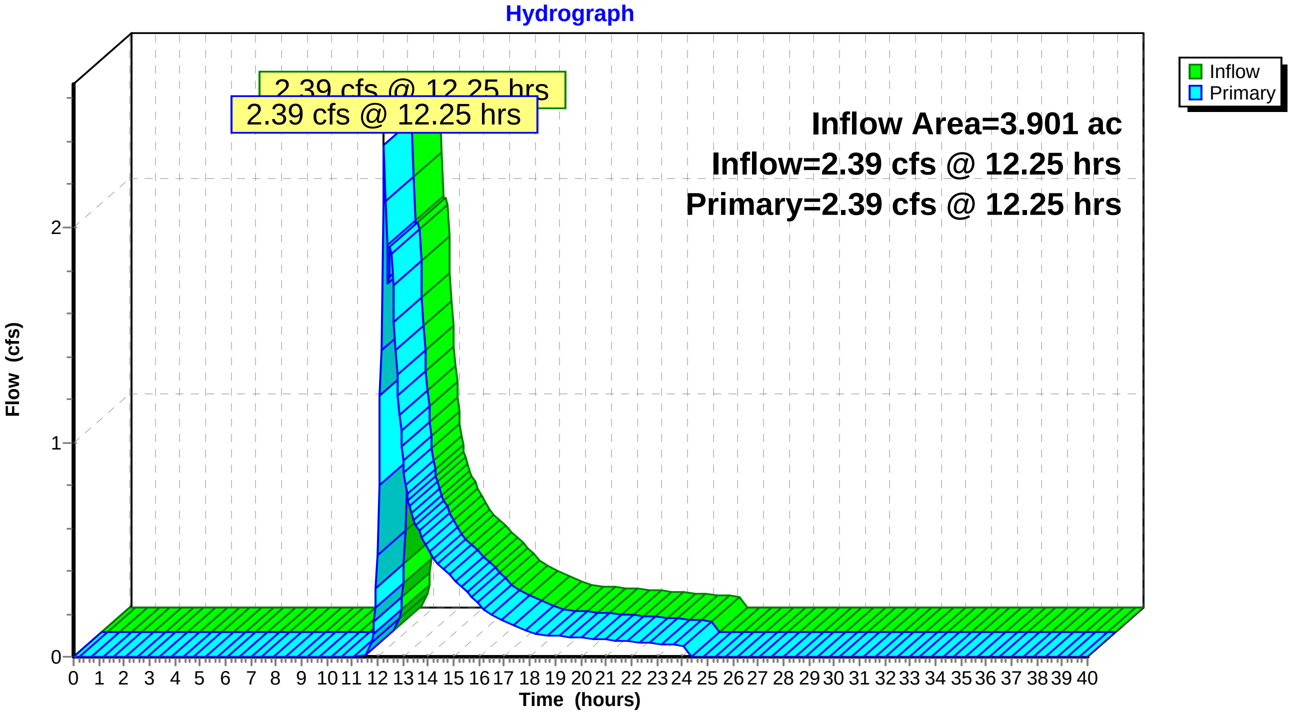


Summary for Link 1L: Flow towards wetlands

Inflow Area =	3.901 ac,	8.31% Impervious, Inflow Depth = 0.96"	for 25-YR event	
Inflow =	2.39 cfs @	12.25 hrs, Volume=	0.312 af	
Primary =	2.39 cfs @	12.25 hrs, Volume=	0.312 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L: Flow towards wetlands

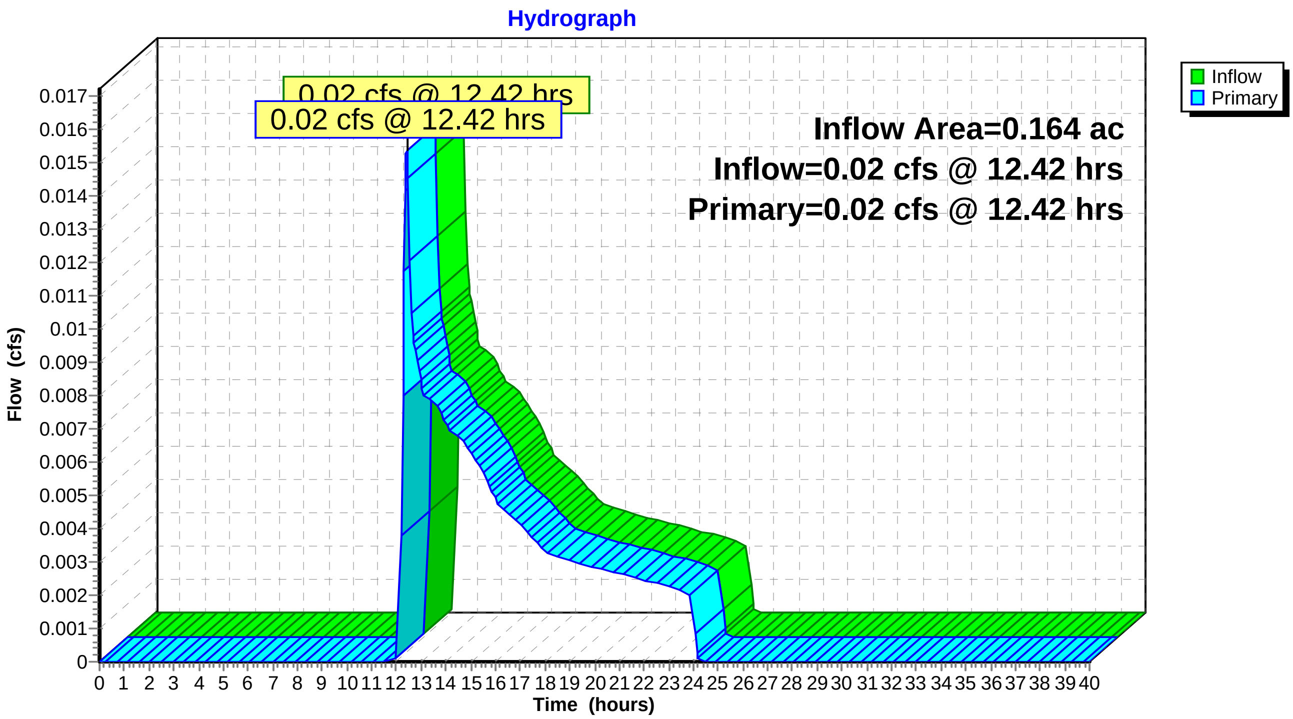


Summary for Link 2L: flow to the north

Inflow Area = 0.164 ac, 0.00% Impervious, Inflow Depth = 0.32" for 25-YR event
Inflow = 0.02 cfs @ 12.42 hrs, Volume= 0.004 af
Primary = 0.02 cfs @ 12.42 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L: flow to the north

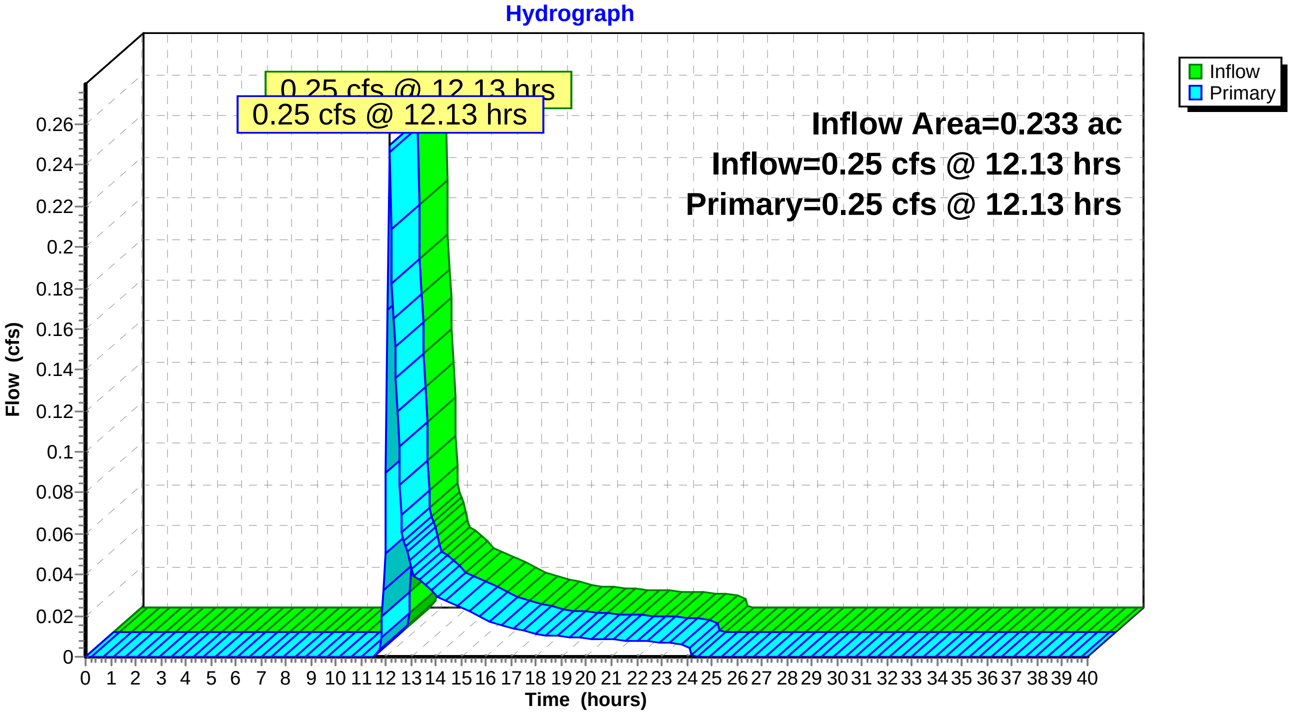


Summary for Link 3L: Flow to existing cb on north-side of Elm Street

Inflow Area = 0.233 ac, 0.00% Impervious, Inflow Depth = 1.22" for 25-YR event
Inflow = 0.25 cfs @ 12.13 hrs, Volume= 0.024 af
Primary = 0.25 cfs @ 12.13 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L: Flow to existing cb on north-side of Elm Street

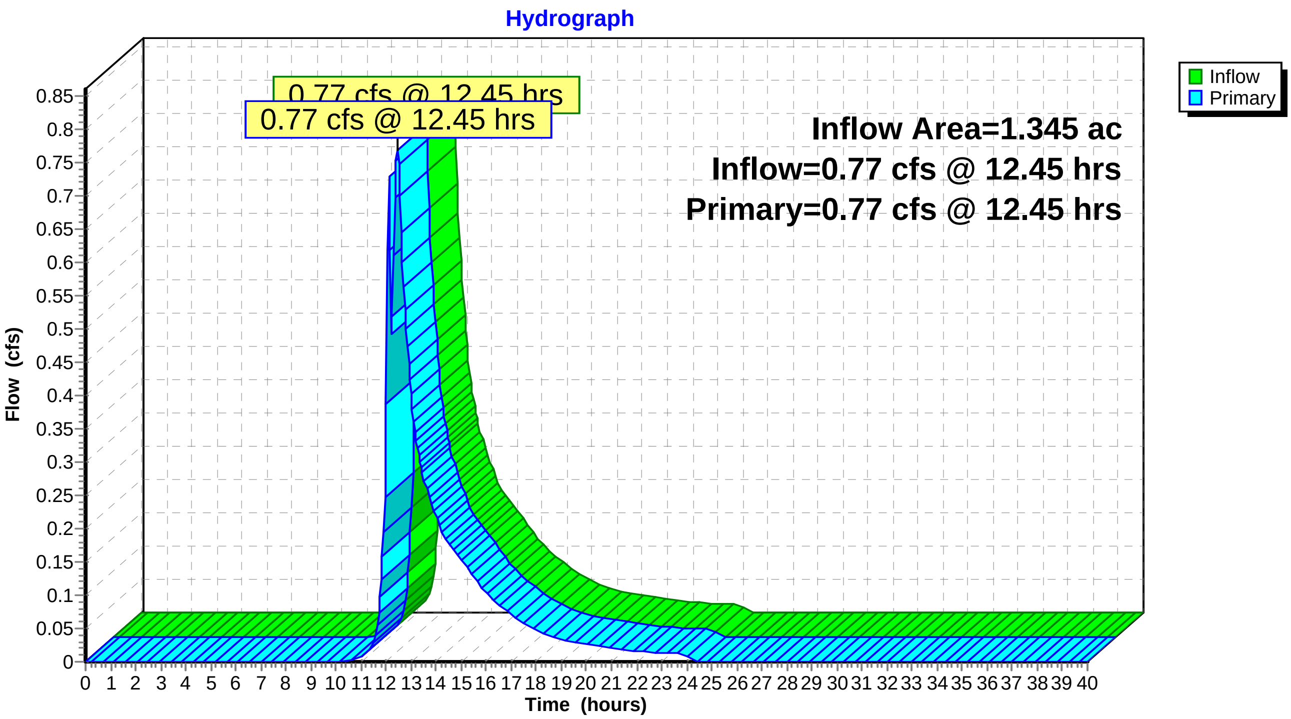


Summary for Link 4L: Flow towards north-side of Elm Street

Inflow Area = 1.345 ac, 19.93% Impervious, Inflow Depth = 1.13" for 25-YR event
Inflow = 0.77 cfs @ 12.45 hrs, Volume= 0.127 af
Primary = 0.77 cfs @ 12.45 hrs, Volume= 0.127 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L: Flow towards north-side of Elm Street

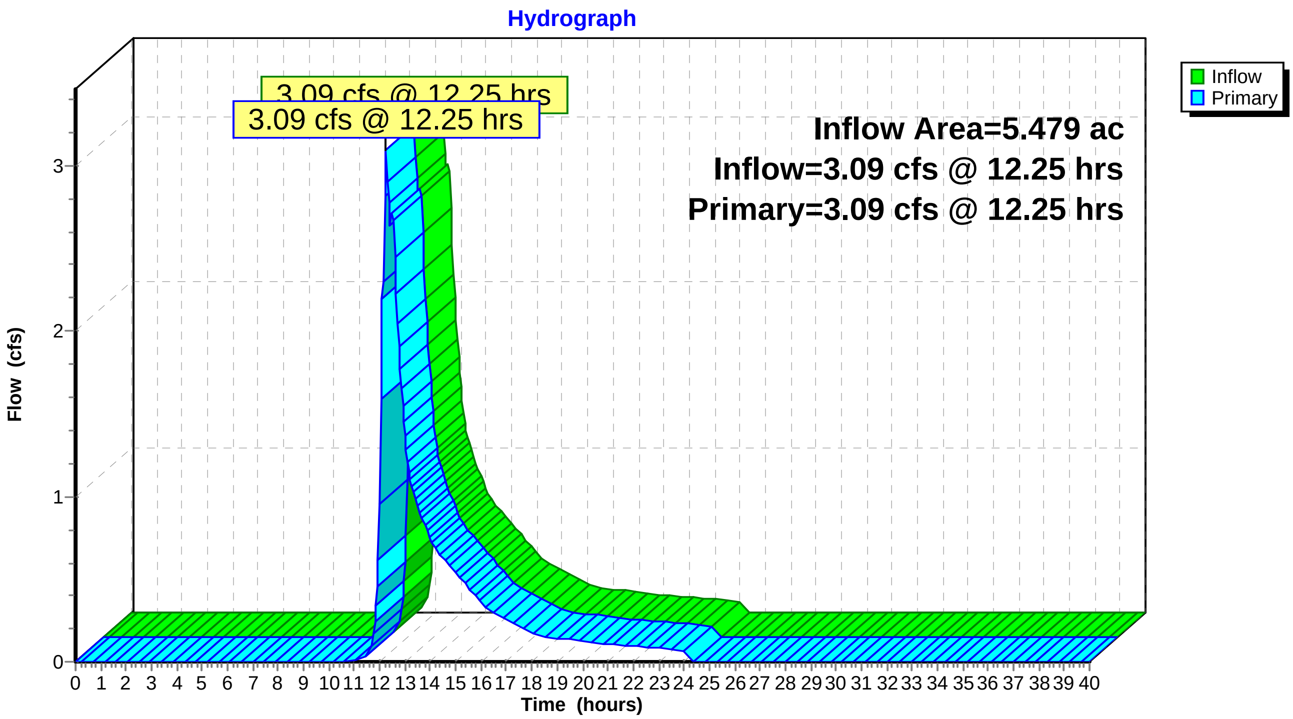


Summary for Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

Inflow Area = 5.479 ac, 10.81% Impervious, Inflow Depth = 1.01" for 25-YR event
Inflow = 3.09 cfs @ 12.25 hrs, Volume= 0.463 af
Primary = 3.09 cfs @ 12.25 hrs, Volume= 0.463 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

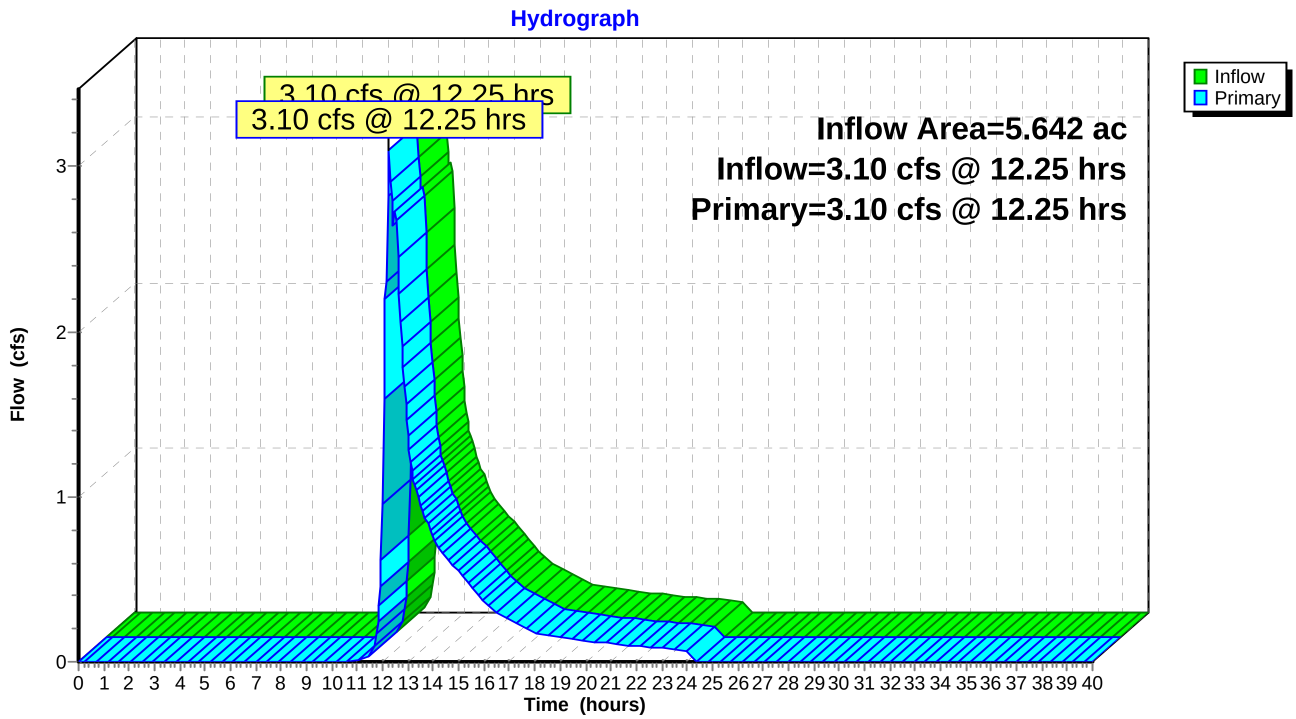


Summary for Link 6L: Total runoff discharging from within the limit of watershed analysis

Inflow Area = 5.642 ac, 10.50% Impervious, Inflow Depth = 0.99" for 25-YR event
Inflow = 3.10 cfs @ 12.25 hrs, Volume= 0.467 af
Primary = 3.10 cfs @ 12.25 hrs, Volume= 0.467 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 6L: Total runoff discharging from within the limit of watershed analysis



Summary for Subcatchment 1S: EX-1R

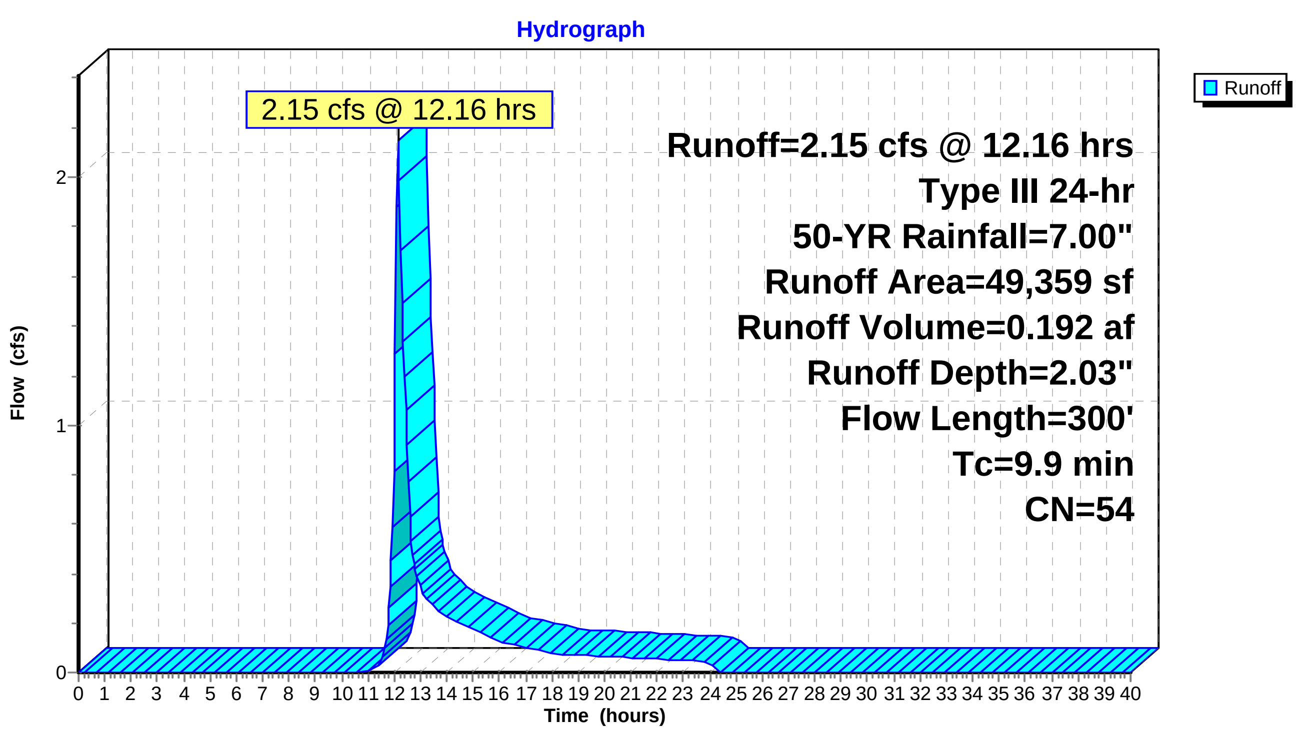
Runoff = 2.15 cfs @ 12.16 hrs, Volume= 0.192 af, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
1,009	30	Woods, Good, HSG A
33,181	55	Woods, Good, HSG B
5,769	39	>75% Grass cover, Good, HSG A
9,400	61	>75% Grass cover, Good, HSG B
49,359	54	Weighted Average
49,359		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0450	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	250	0.0630	4.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.9	300	Total			

Subcatchment 1S: EX-1R



Summary for Subcatchment 2S: EX-2R

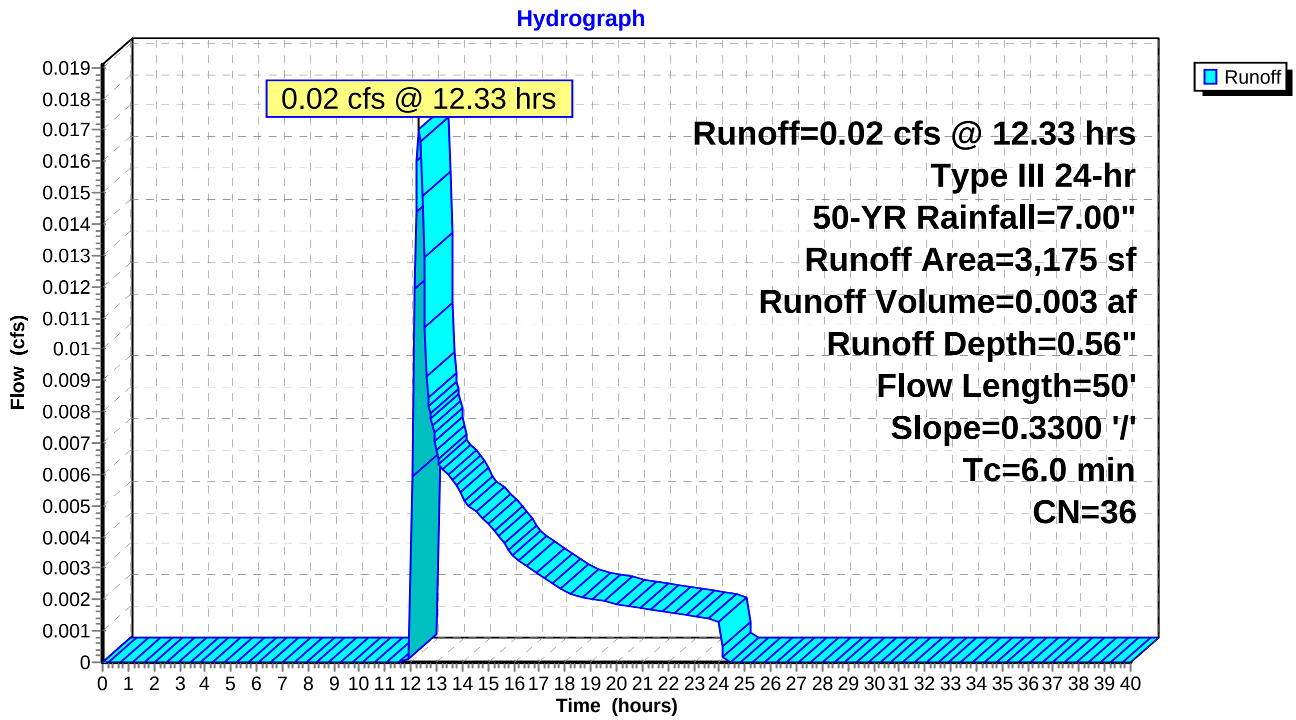
Runoff = 0.02 cfs @ 12.33 hrs, Volume= 0.003 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
1,000	30	Woods, Good, HSG A
2,175	39	>75% Grass cover, Good, HSG A
3,175	36	Weighted Average
3,175		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	50	0.3300	0.45		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.8	50	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: EX-2R



Summary for Subcatchment 3S: EX-3R

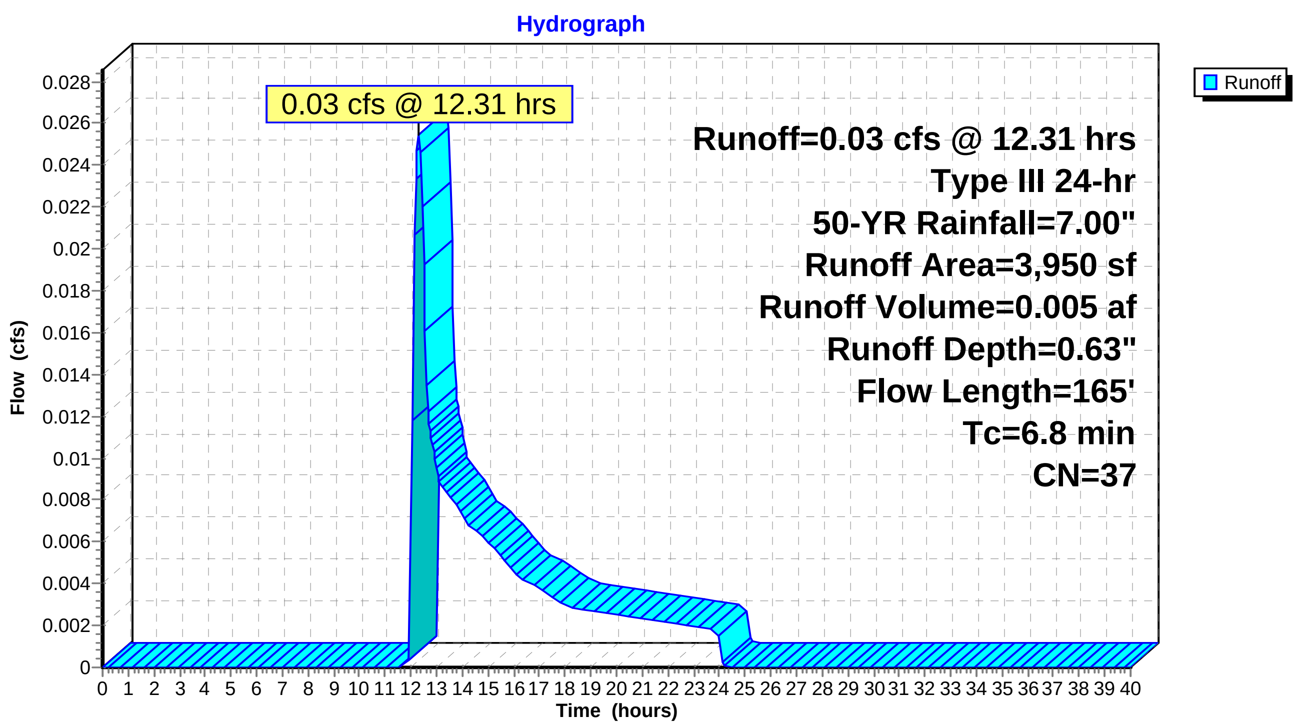
Runoff = 0.03 cfs @ 12.31 hrs, Volume= 0.005 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
1,000	30	Woods, Good, HSG A
2,950	39	>75% Grass cover, Good, HSG A
3,950	37	Weighted Average
3,950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	115	0.1400	6.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	165	Total			

Subcatchment 3S: EX-3R



Summary for Subcatchment 4S: EX-4R

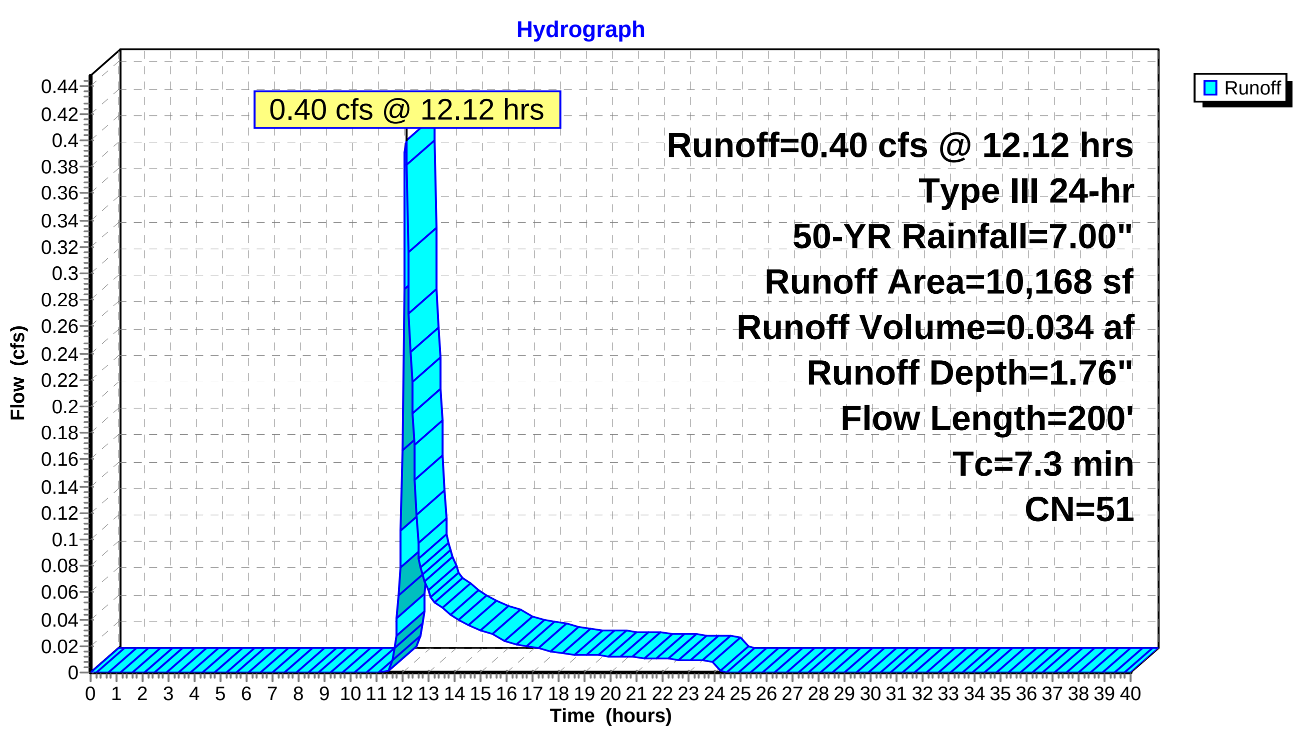
Runoff = 0.40 cfs @ 12.12 hrs, Volume= 0.034 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
1,573	30	Woods, Good, HSG A
8,595	55	Woods, Good, HSG B
10,168	51	Weighted Average
10,168		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0860	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	140	0.1520	6.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.1100	6.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	200	Total			

Subcatchment 4S: EX-4R



Summary for Subcatchment 5S: EX-5R

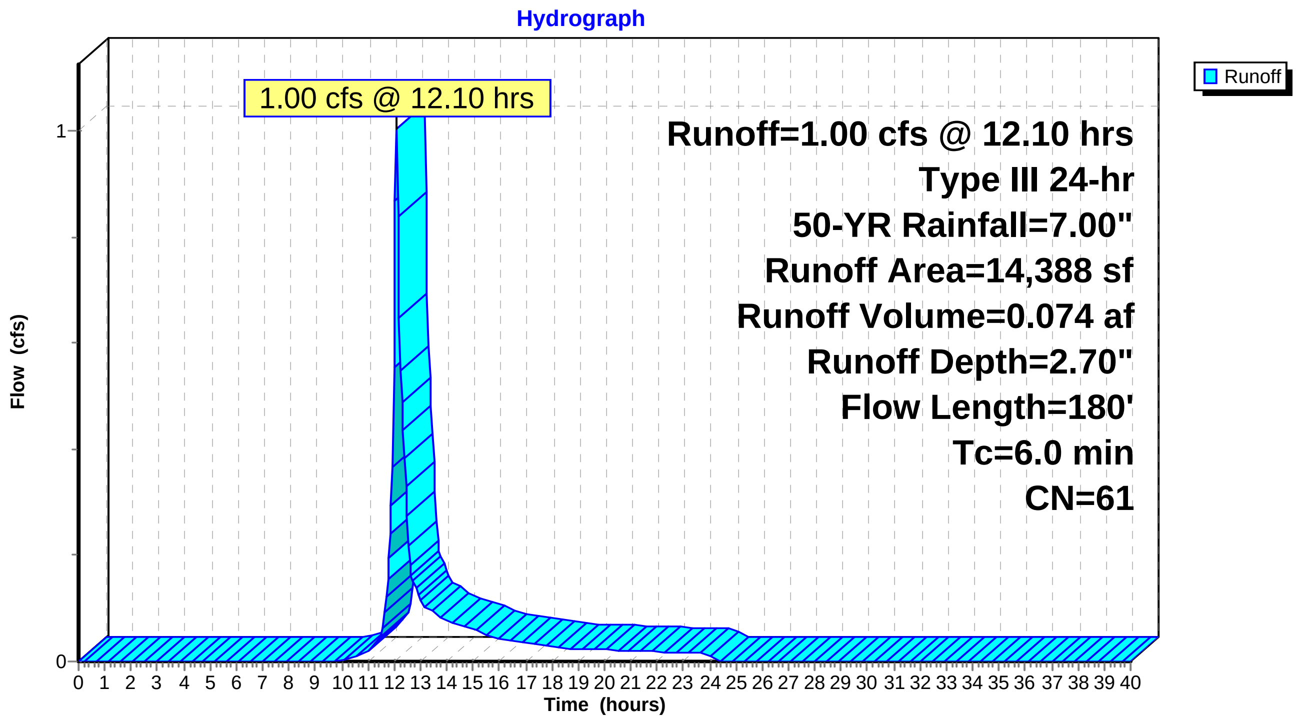
Runoff = 1.00 cfs @ 12.10 hrs, Volume= 0.074 af, Depth= 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
278	30	Woods, Good, HSG A
2,500	55	Woods, Good, HSG B
500	98	Paved parking, HSG B
11,110	61	>75% Grass cover, Good, HSG B
14,388	61	Weighted Average
13,888		96.52% Pervious Area
500		3.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	50	0.1900	0.36		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.4	130	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	180	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: EX-5R



Summary for Subcatchment 7S: PR-1R

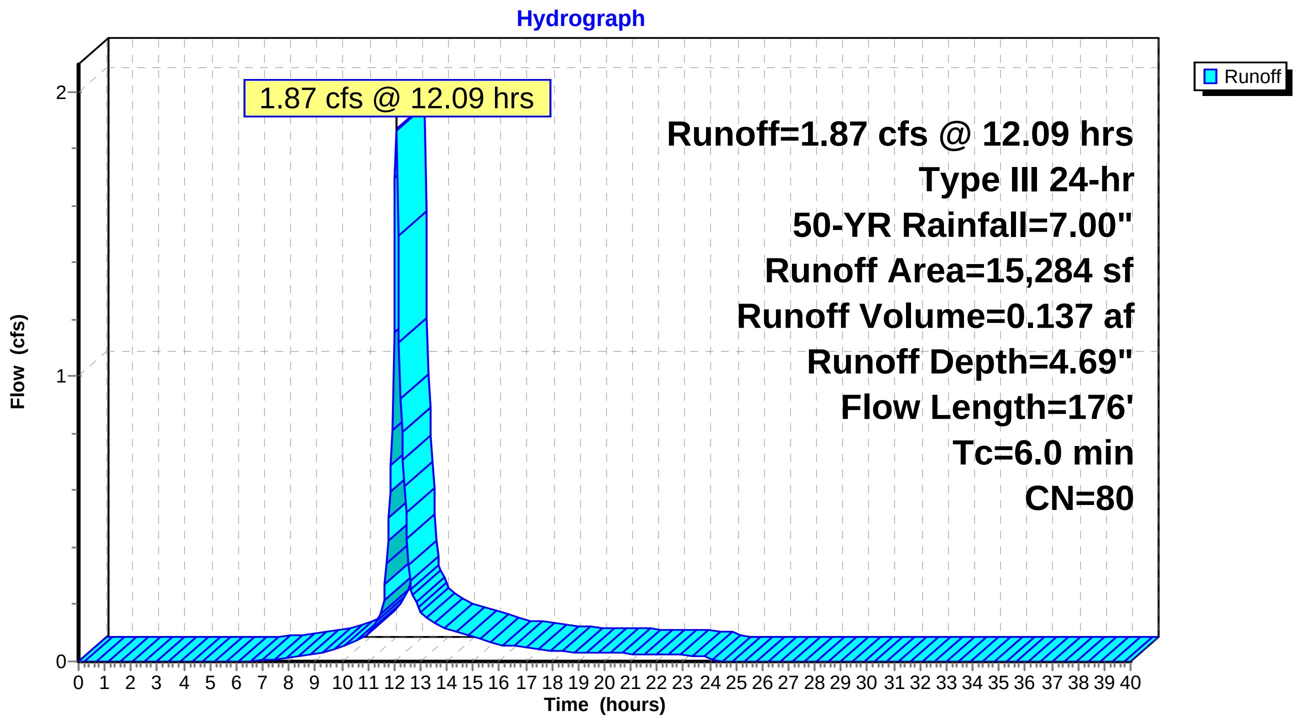
Runoff = 1.87 cfs @ 12.09 hrs, Volume= 0.137 af, Depth= 4.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
4,718	39	>75% Grass cover, Good, HSG A
10,566	98	Paved parking, HSG A
15,284	80	Weighted Average
4,718		30.87% Pervious Area
10,566		69.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0310	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.5	125	0.0430	4.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	26	0.0120	2.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	176	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7S: PR-1R



Summary for Subcatchment 8S: PR-2R

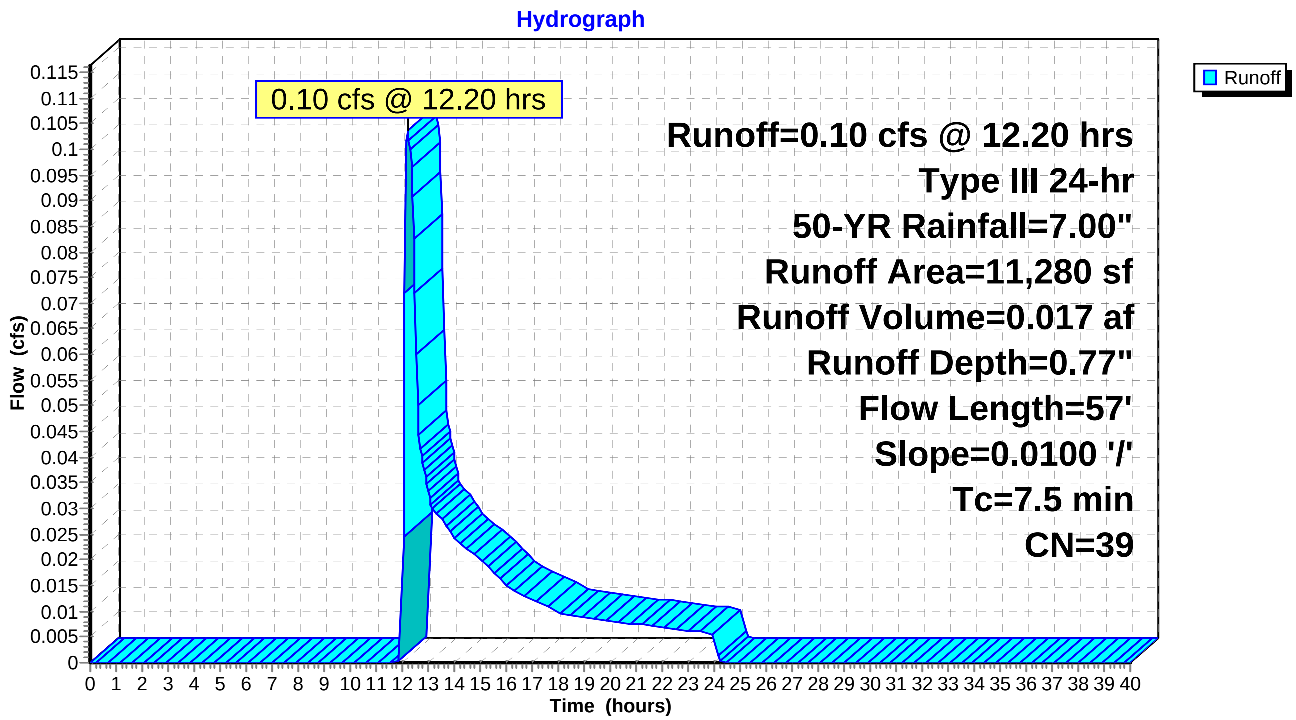
Runoff = 0.10 cfs @ 12.20 hrs, Volume= 0.017 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
11,193	39	>75% Grass cover, Good, HSG A
87	61	>75% Grass cover, Good, HSG B
11,280	39	Weighted Average
11,280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	7	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	57	Total			

Subcatchment 8S: PR-2R



Summary for Subcatchment 9S: PR-3R

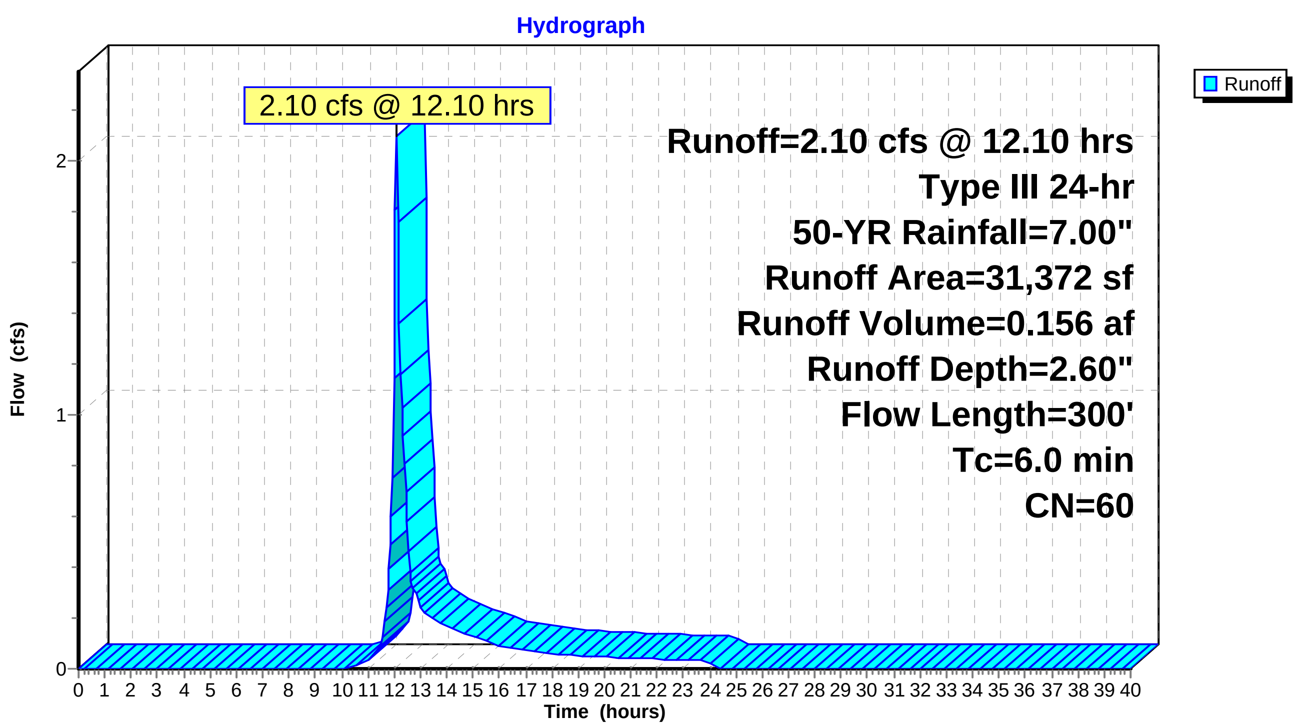
Runoff = 2.10 cfs @ 12.10 hrs, Volume= 0.156 af, Depth= 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
6,795	39	>75% Grass cover, Good, HSG A
21,016	61	>75% Grass cover, Good, HSG B
1,143	98	Paved parking, HSG A
2,418	98	Paved parking, HSG B
31,372	60	Weighted Average
27,811		88.65% Pervious Area
3,561		11.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0700	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.5	150	0.1060	5.24		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	100	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.2	300	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 9S: PR-3R



Summary for Subcatchment 10S: PR-4R

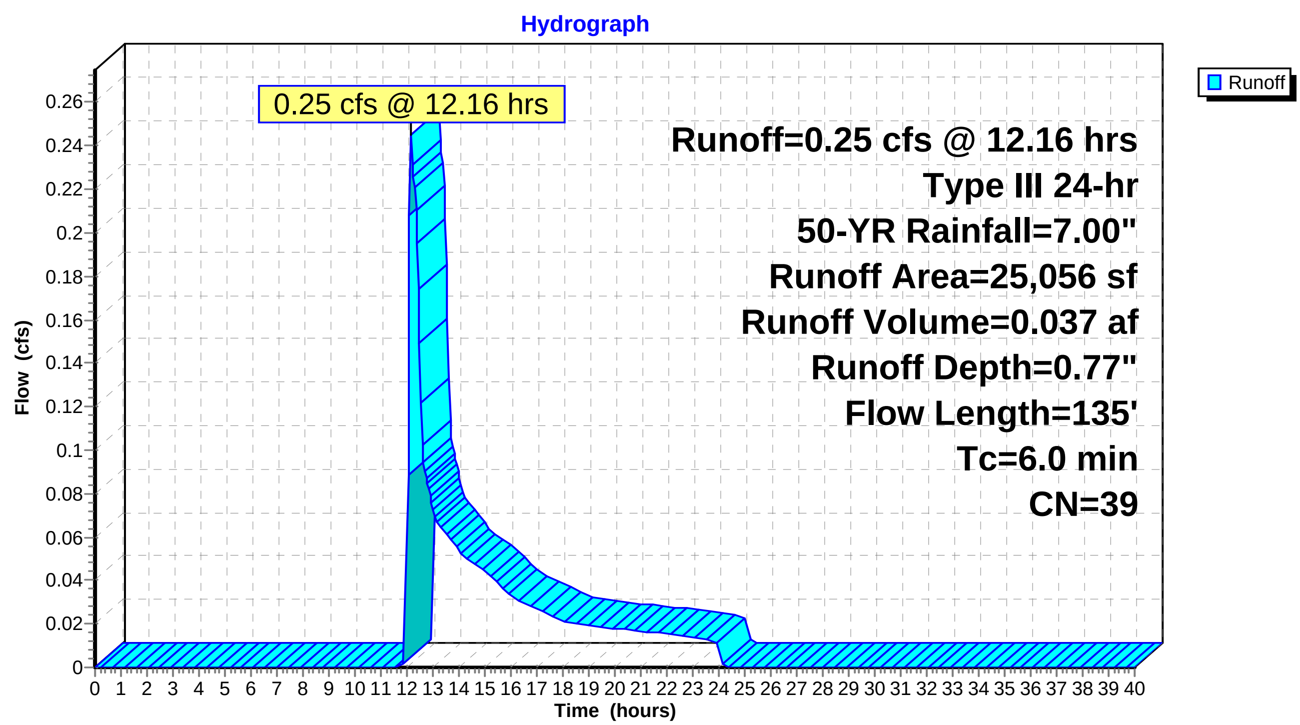
Runoff = 0.25 cfs @ 12.16 hrs, Volume= 0.037 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
25,056	39	>75% Grass cover, Good, HSG A
25,056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.2	80	0.1560	6.36		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	5	0.3300	9.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.5	135	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 10S: PR-4R



Summary for Subcatchment 11S: PR-5R

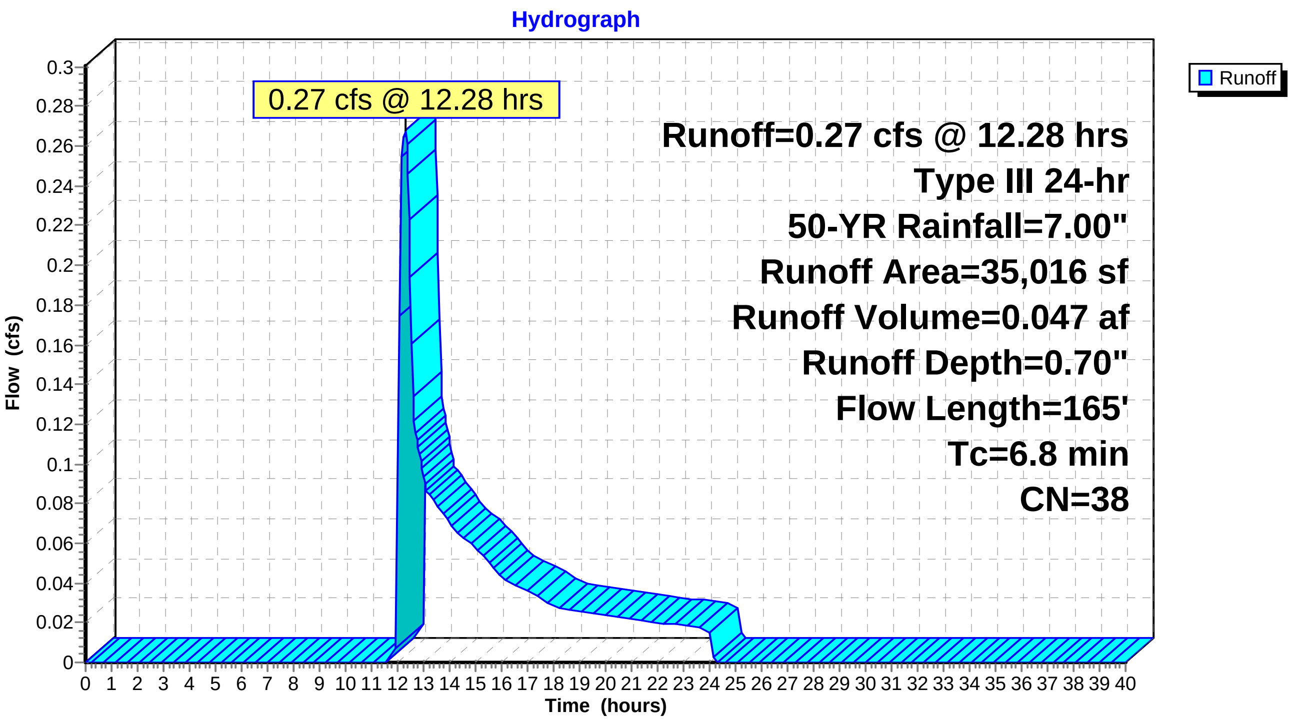
Runoff = 0.27 cfs @ 12.28 hrs, Volume= 0.047 af, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
31,016	39	>75% Grass cover, Good, HSG A
4,000	30	Woods, Good, HSG A
35,016	38	Weighted Average
35,016		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	115	0.1400	6.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	165	Total			

Subcatchment 11S: PR-5R



Summary for Subcatchment 12S: PR-6

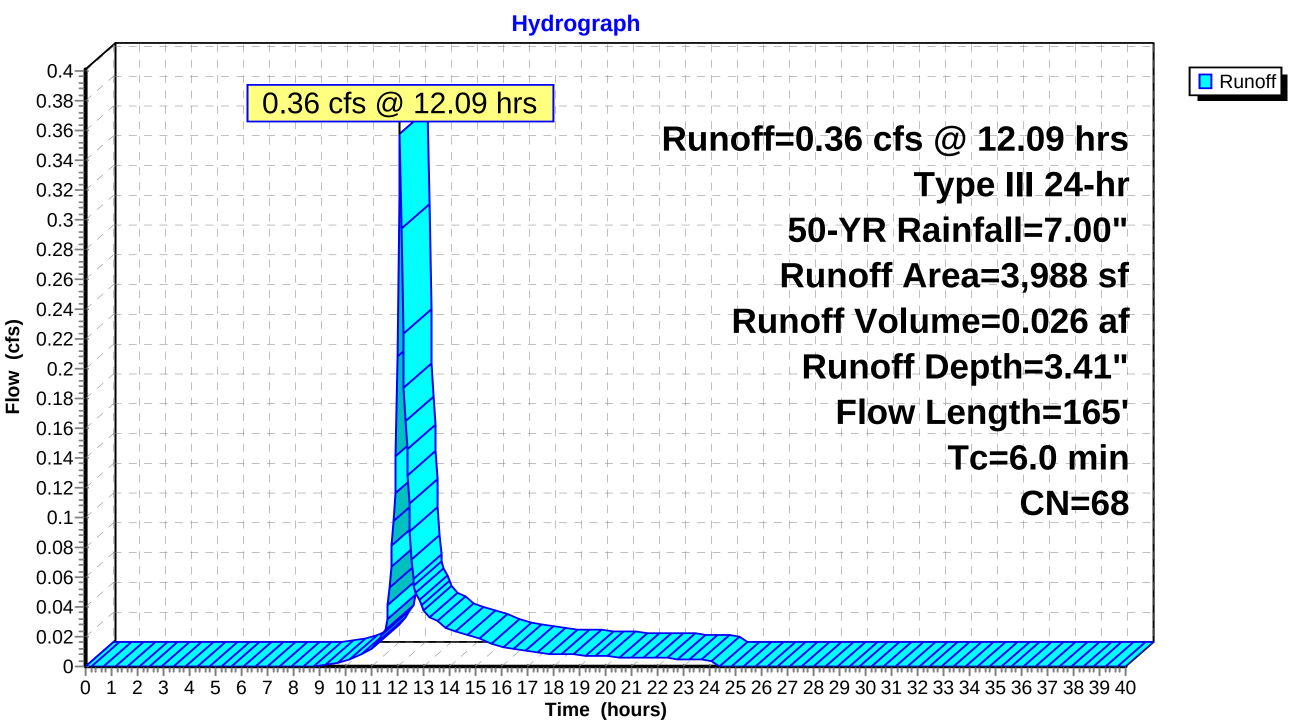
Runoff = 0.36 cfs @ 12.09 hrs, Volume= 0.026 af, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
2,011	39	>75% Grass cover, Good, HSG A
1,977	98	Paved parking, HSG A
3,988	68	Weighted Average
2,011		50.43% Pervious Area
1,977		49.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	35	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	11	0.0310	3.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	119	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.0	165	Total			

Subcatchment 12S: PR-6



Summary for Subcatchment 13S: PR-7

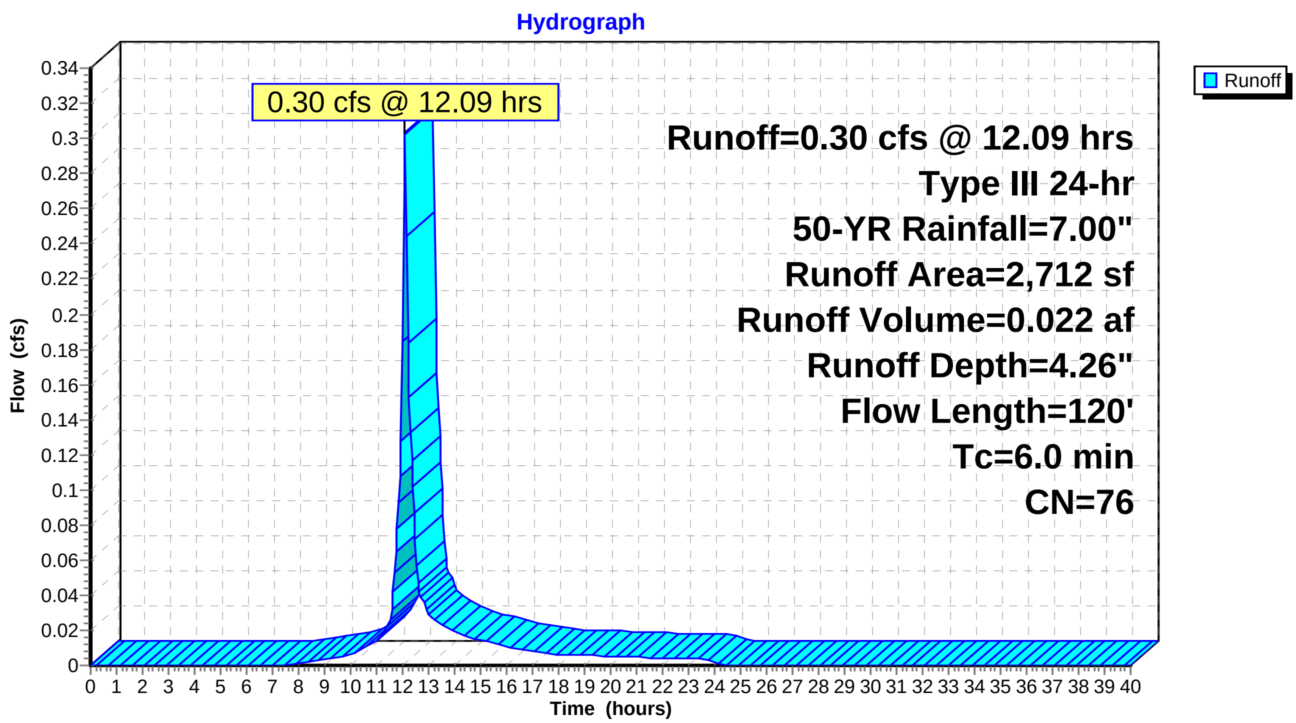
Runoff = 0.30 cfs @ 12.09 hrs, Volume= 0.022 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
1,021	39	>75% Grass cover, Good, HSG A
1,691	98	Paved parking, HSG A
2,712	76	Weighted Average
1,021		37.65% Pervious Area
1,691		62.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0310	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.3	95	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	120	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13S: PR-7



Summary for Subcatchment 14S: PR-8R

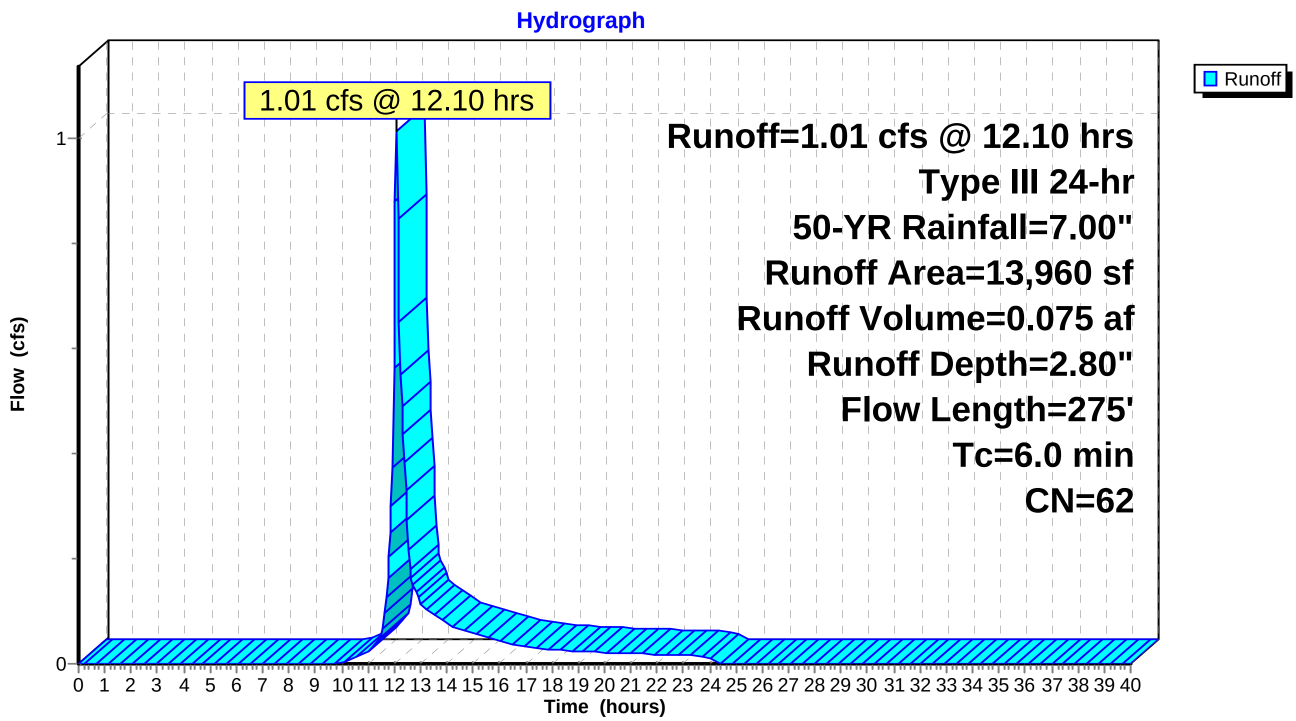
Runoff = 1.01 cfs @ 12.10 hrs, Volume= 0.075 af, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
6,684	39	>75% Grass cover, Good, HSG A
2,706	98	Paved parking, HSG A
1,525	98	Paved parking, HSG B
3,045	61	>75% Grass cover, Good, HSG B
13,960	62	Weighted Average
9,729		69.69% Pervious Area
4,231		30.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.4	100	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	125	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.9	275	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 14S: PR-8R



Summary for Subcatchment 15S: PR-9R

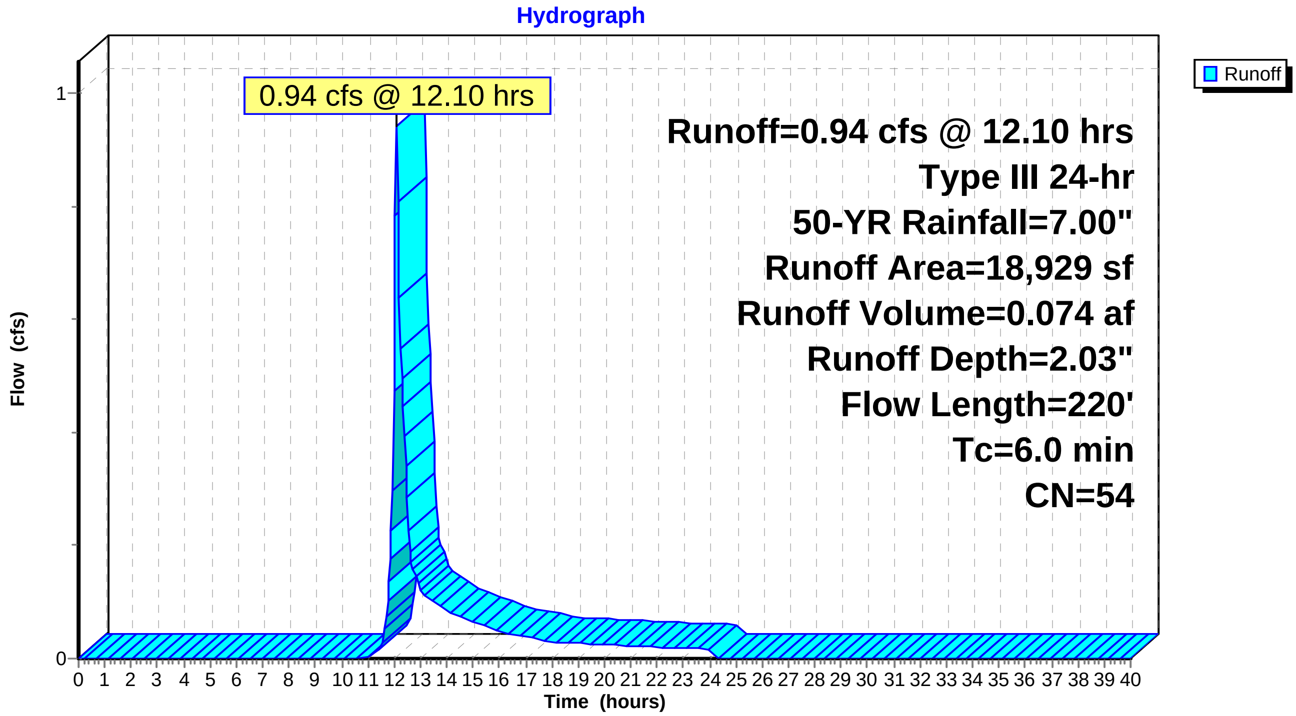
Runoff = 0.94 cfs @ 12.10 hrs, Volume= 0.074 af, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
11,941	39	>75% Grass cover, Good, HSG A
2,358	98	Paved parking, HSG A
1,358	98	Paved parking, HSG B
3,272	61	>75% Grass cover, Good, HSG B
18,929	54	Weighted Average
15,213		80.37% Pervious Area
3,716		19.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.0	10	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	150	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	220	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15S: PR-9R



Summary for Subcatchment 16S: PR-10R

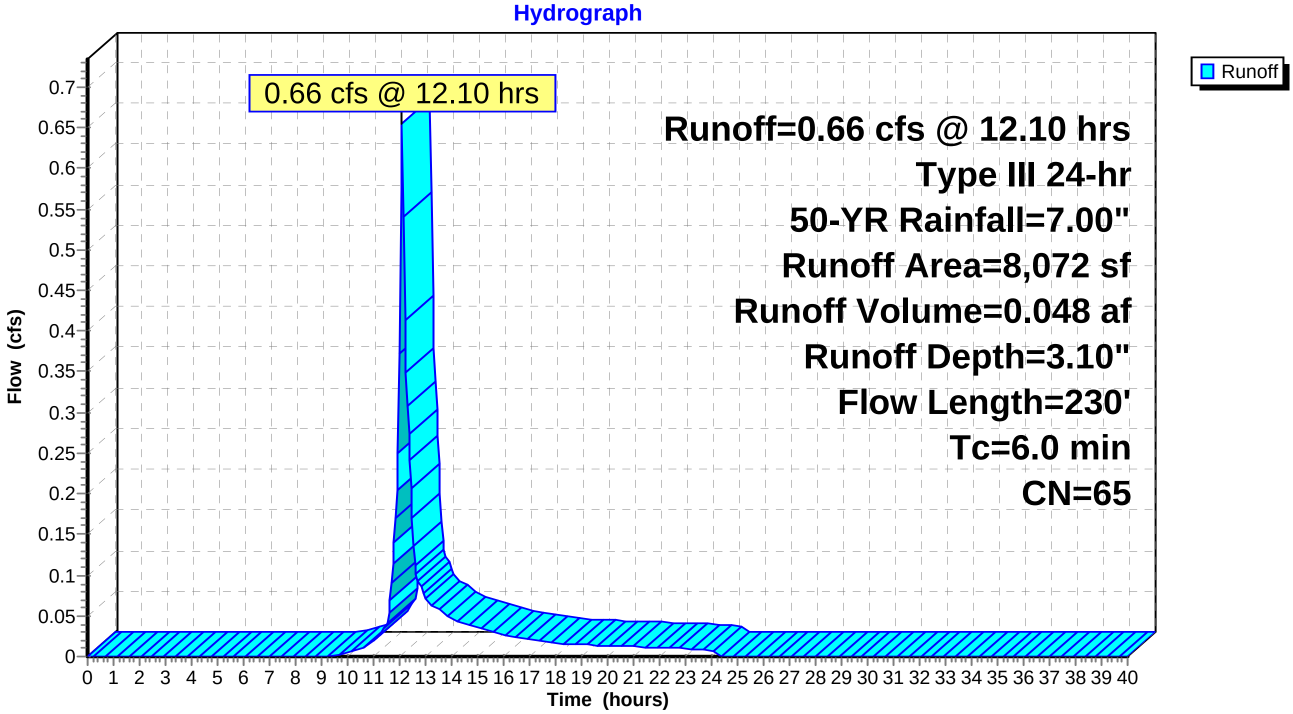
Runoff = 0.66 cfs @ 12.10 hrs, Volume= 0.048 af, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
670	39	>75% Grass cover, Good, HSG A
723	30	Woods, Good, HSG A
1,898	98	Paved parking, HSG B
4,781	61	>75% Grass cover, Good, HSG B
8,072	65	Weighted Average
6,174		76.49% Pervious Area
1,898		23.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	30	0.1430	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	130	0.1770	6.77		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	20	0.0310	3.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	50	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	230	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 16S: PR-10R



Summary for Subcatchment 17S: PR-11

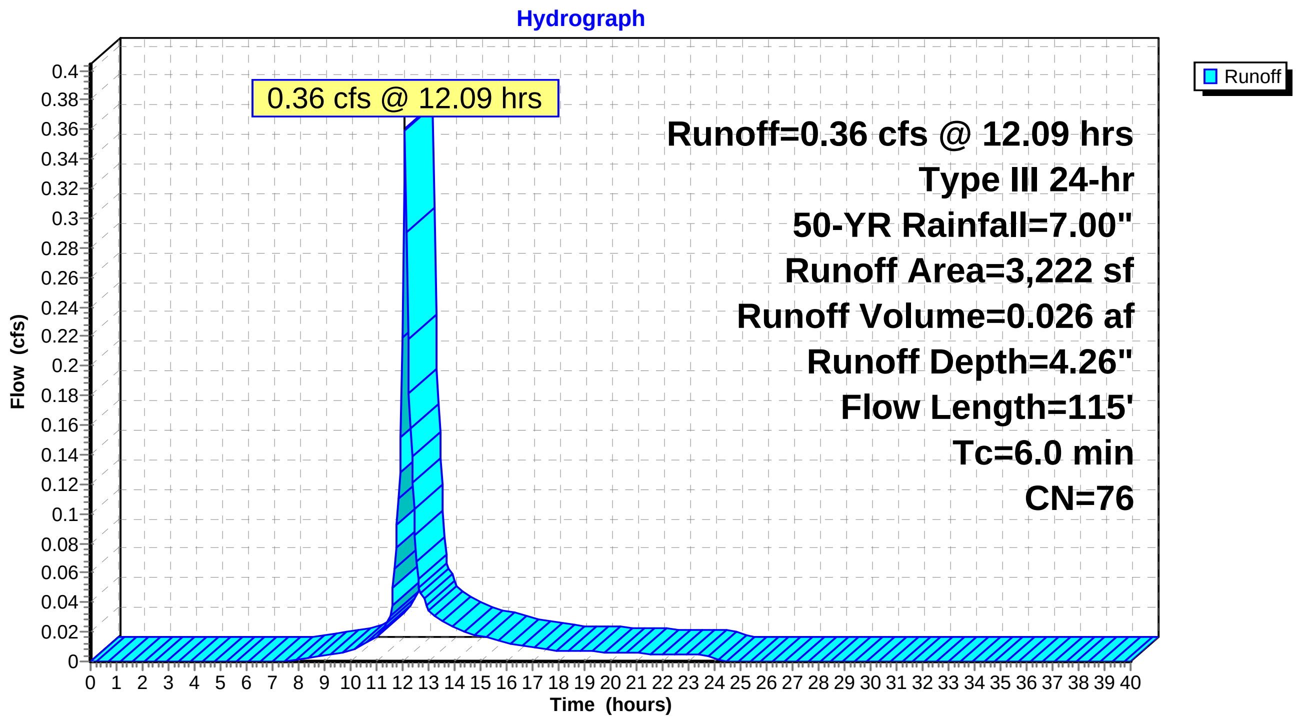
Runoff = 0.36 cfs @ 12.09 hrs, Volume= 0.026 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
1,329	98	Paved parking, HSG B
1,893	61	>75% Grass cover, Good, HSG B
3,222	76	Weighted Average
1,893		58.75% Pervious Area
1,329		41.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	40	0.1550	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	20	0.0310	2.83		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	55	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	115	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 17S: PR-11



Summary for Subcatchment 19S: PR-12

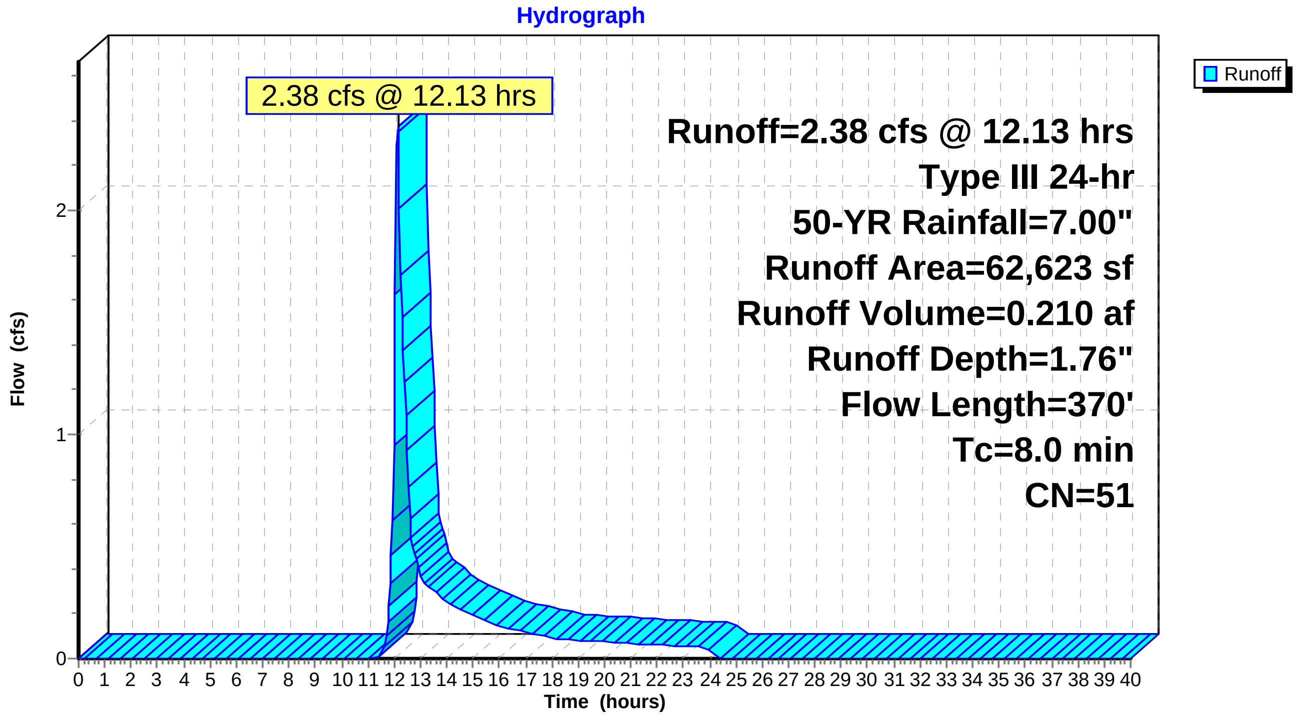
Runoff = 2.38 cfs @ 12.13 hrs, Volume= 0.210 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.00"

Area (sf)	CN	Description
9,300	39	>75% Grass cover, Good, HSG A
16,800	61	>75% Grass cover, Good, HSG B
7,412	30	Woods, Good, HSG A
29,111	55	Woods, Good, HSG B
62,623	51	Weighted Average
62,623		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	100	0.1330	5.87		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	205	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	15	0.3300	9.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.0	370	Total			

Subcatchment 19S: PR-12



Summary for Pond 1P: Stormwater Management Area #1

Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 3.03" for 50-YR event
Inflow = 1.94 cfs @ 12.09 hrs, Volume= 0.154 af
Outflow = 0.99 cfs @ 12.27 hrs, Volume= 0.154 af, Atten= 49%, Lag= 10.4 min
Discarded = 0.06 cfs @ 12.27 hrs, Volume= 0.055 af
Primary = 0.93 cfs @ 12.27 hrs, Volume= 0.099 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 120.02' @ 12.27 hrs Surf.Area= 1,035 sf Storage= 1,324 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 49.6 min (870.9 - 821.4)

Volume	Invert	Avail.Storage	Storage Description
#1	118.30'	4,746 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

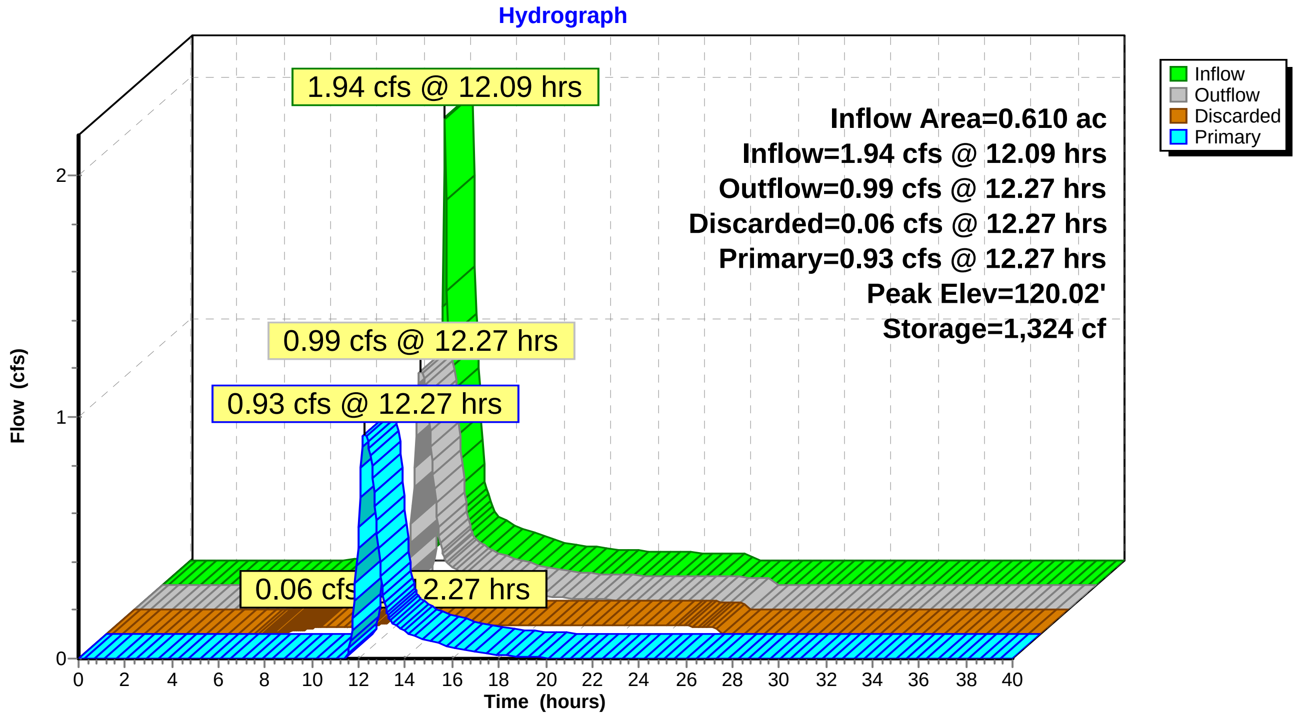
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.30	530	0	0
118.80	660	298	298
119.30	800	365	663
119.80	960	440	1,103
120.30	1,130	523	1,625
120.70	1,800	586	2,211
121.00	4,800	990	3,201
121.30	5,500	1,545	4,746

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**12.0" Round Culvert** L= 41.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 117.00' / 116.59' S= 0.0100 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Device 1	118.80'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Discarded	118.30'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.06 cfs @ 12.27 hrs HW=120.02' (Free Discharge)
↑**3=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.93 cfs @ 12.27 hrs HW=120.02' TW=109.80' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.93 cfs of 6.00 cfs potential flow)
  ↑**2=Orifice/Grate** (Orifice Controls 0.93 cfs @ 4.74 fps)

Pond 1P: Stormwater Management Area #1



Summary for Pond 2P: Stormwater Management Area #2

Inflow Area = 1.330 ac, 24.38% Impervious, Inflow Depth = 2.30" for 50-YR event
Inflow = 2.90 cfs @ 12.11 hrs, Volume= 0.255 af
Outflow = 1.66 cfs @ 12.42 hrs, Volume= 0.248 af, Atten= 43%, Lag= 19.1 min
Discarded = 0.06 cfs @ 12.42 hrs, Volume= 0.117 af
Secondary = 1.60 cfs @ 12.42 hrs, Volume= 0.131 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 74.53' @ 12.42 hrs Surf.Area= 2,581 sf Storage= 3,595 cf

Plug-Flow detention time= 303.7 min calculated for 0.248 af (97% of inflow)
Center-of-Mass det. time= 288.7 min (1,116.6 - 827.9)

Volume	Invert	Avail.Storage	Storage Description
#1	72.60'	7,534 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

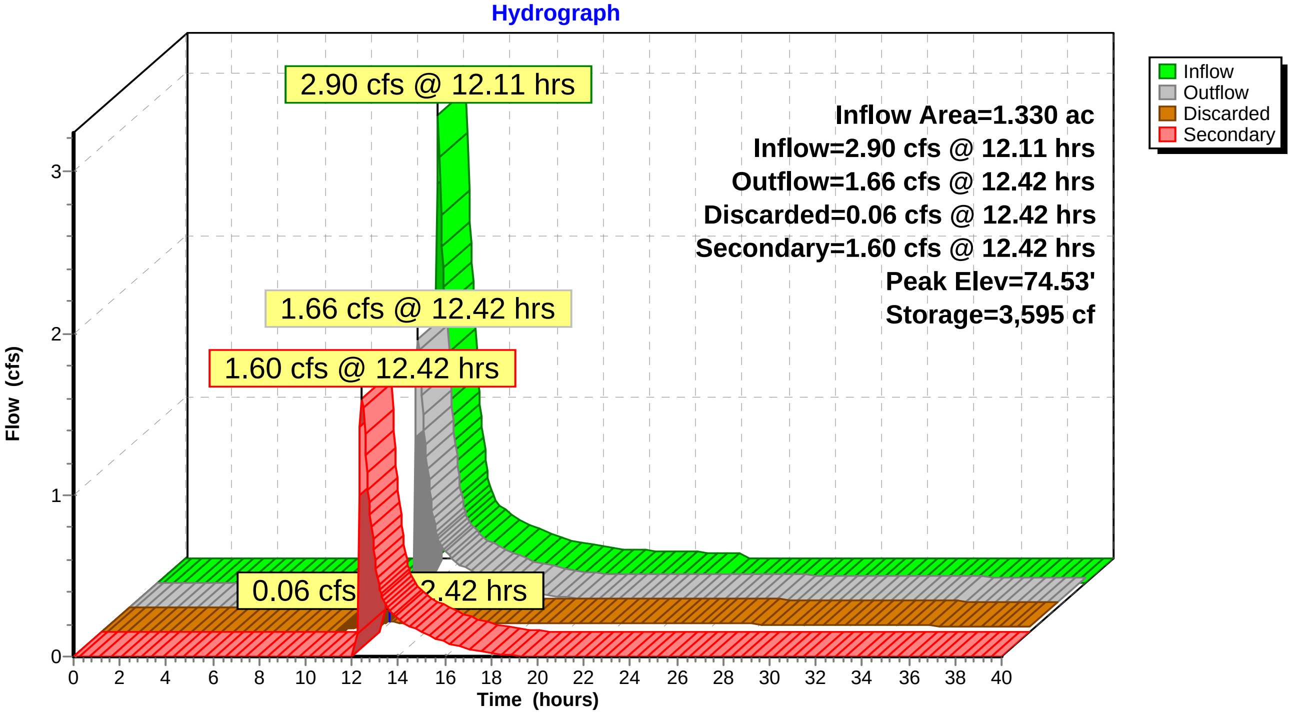
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.60	1,150	0	0
73.00	1,470	524	524
74.00	2,170	1,820	2,344
75.00	2,950	2,560	4,904
75.80	3,625	2,630	7,534

Device	Routing	Invert	Outlet Devices
#1	Discarded	72.60'	**1.020 in/hr Exfiltration over Surface area**
#2	Secondary	74.30'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.06 cfs @ 12.42 hrs HW=74.52' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Secondary OutFlow Max=1.58 cfs @ 12.42 hrs HW=74.52' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 1.58 cfs @ 1.17 fps)

Pond 2P: Stormwater Management Area #2



Summary for Pond 3P: Stormwater Management Area #3

[80] Warning: Exceeded Pond 18P by 0.31' @ 24.40 hrs (0.40 cfs 0.015 af)

Inflow Area =	1.014 ac, 25.29% Impervious, Inflow Depth =	2.63"	for 50-YR event
Inflow =	2.97 cfs @ 12.10 hrs, Volume=	0.222 af	
Outflow =	1.10 cfs @ 12.41 hrs, Volume=	0.223 af,	Atten= 63%, Lag= 19.0 min
Discarded =	0.05 cfs @ 11.30 hrs, Volume=	0.098 af	
Primary =	1.05 cfs @ 12.41 hrs, Volume=	0.125 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.72' @ 12.41 hrs Surf.Area= 2,102 sf Storage= 2,936 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 203.1 min (1,053.3 - 850.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	96.77'	1,779 cf	**35.33'W x 59.50'L x 3.54'H Field A**
			7,446 cf Overall - 2,999 cf Embedded = 4,447 cf x 40.0% Voids
#2A	97.27'	2,999 cf	**Cultec R-330XLHD** x 56 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		4,778 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	96.77'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	98.00'	**8.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 98.00' / 95.92' S= 0.0462 '/' Cc= 0.900
			n= 0.010, Flow Area= 0.35 sf

Discarded OutFlow Max=0.05 cfs @ 11.30 hrs HW=96.81' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=1.05 cfs @ 12.41 hrs HW=98.72' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 1.05 cfs @ 3.00 fps)

Pond 3P: Stormwater Management Area #3 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 7 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

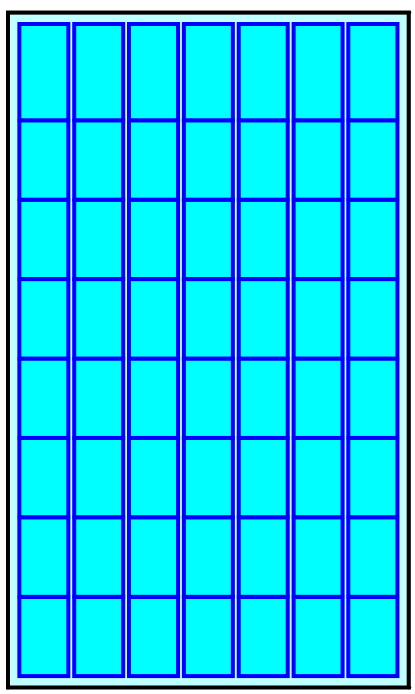
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
7 Rows x 52.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 35.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

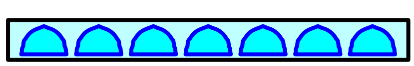
56 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 7 Rows = 2,999.0 cf Chamber Storage

7,445.8 cf Field - 2,999.0 cf Chambers = 4,446.7 cf Stone x 40.0% Voids = 1,778.7 cf Stone Storage

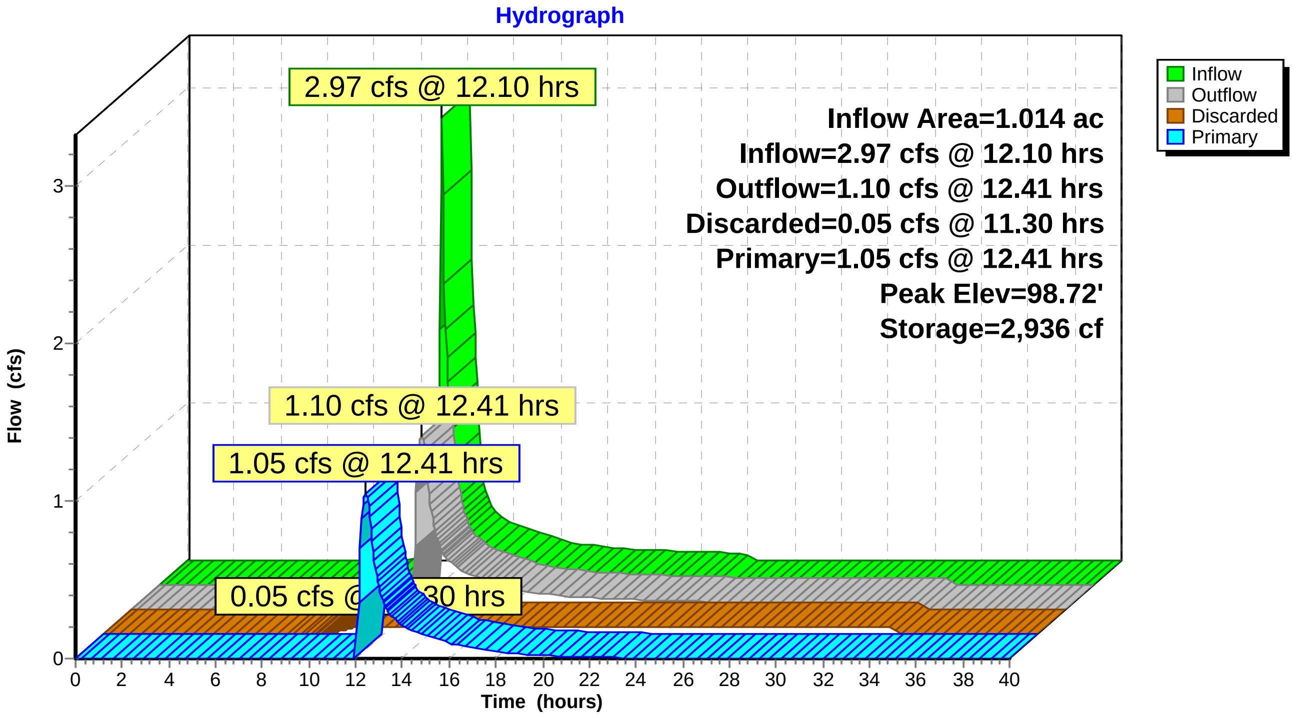
Chamber Storage + Stone Storage = 4,777.7 cf = 0.110 af
Overall Storage Efficiency = 64.2%
Overall System Size = 59.50' x 35.33' x 3.54'

56 Chambers
275.8 cy Field
164.7 cy Stone





Pond 3P: Stormwater Management Area #3



Summary for Pond 4P: Stormwater Management Area #4

Inflow Area = 1.533 ac, 5.49% Impervious, Inflow Depth = 0.37" for 50-YR event
Inflow = 0.27 cfs @ 12.28 hrs, Volume= 0.047 af
Outflow = 0.05 cfs @ 15.34 hrs, Volume= 0.047 af, Atten= 80%, Lag= 183.5 min
Discarded = 0.05 cfs @ 15.34 hrs, Volume= 0.047 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 108.08' @ 15.34 hrs Surf.Area= 955 sf Storage= 643 cf

Plug-Flow detention time= 169.6 min calculated for 0.047 af (100% of inflow)
Center-of-Mass det. time= 169.7 min (1,108.1 - 938.4)

Volume	Invert	Avail.Storage	Storage Description
#1	106.80'	3,728 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

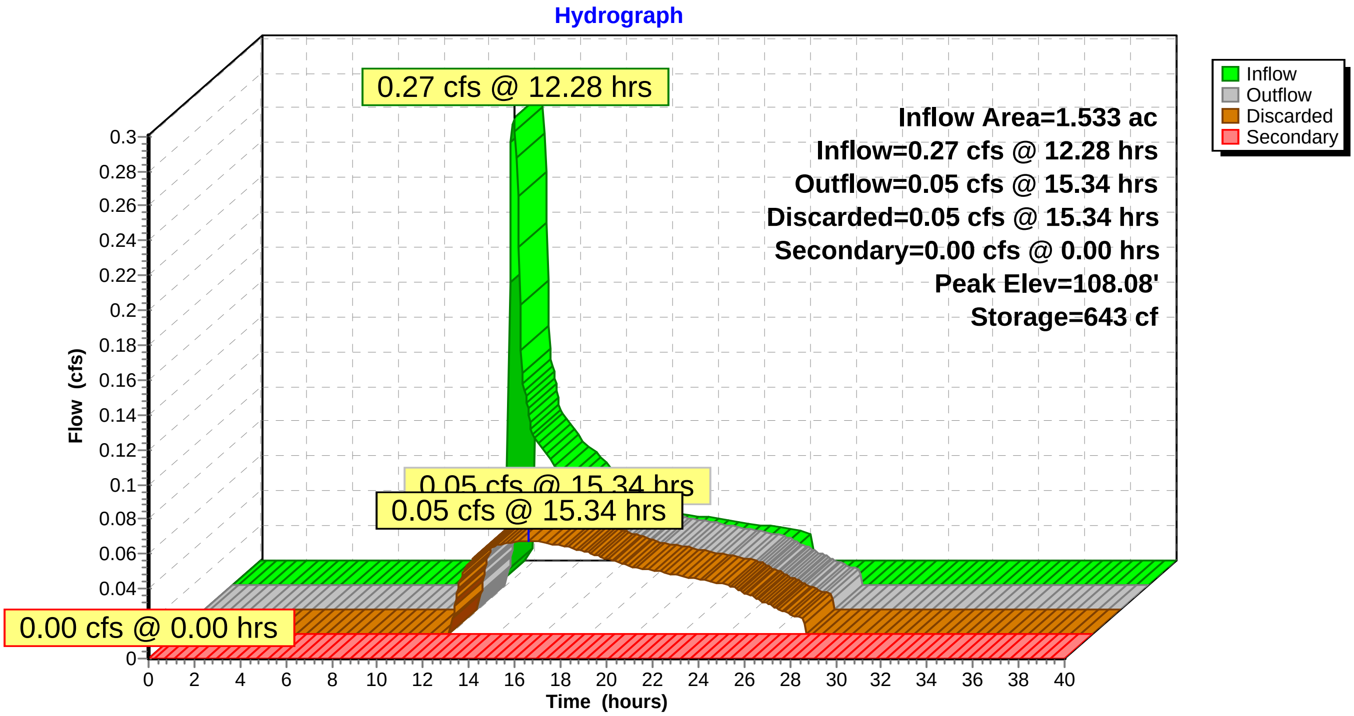
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
106.80	150	0	0
107.00	240	39	39
107.80	690	372	411
108.00	880	157	568
109.00	1,800	1,340	1,908
109.80	2,750	1,820	3,728

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	108.50'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.05 cfs @ 15.34 hrs HW=108.08' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=106.80' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Stormwater Management Area #4



Summary for Pond 5P: Stormwater Management Area #5

Inflow Area = 0.729 ac, 11.55% Impervious, Inflow Depth = 1.40" for 50-YR event
Inflow = 0.87 cfs @ 12.11 hrs, Volume= 0.085 af
Outflow = 0.09 cfs @ 14.48 hrs, Volume= 0.085 af, Atten= 90%, Lag= 142.3 min
Discarded = 0.09 cfs @ 14.48 hrs, Volume= 0.085 af
Primary = 0.00 cfs @ 14.48 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 110.30' @ 14.48 hrs Surf.Area= 1,545 sf Storage= 1,458 cf

Plug-Flow detention time= 209.1 min calculated for 0.085 af (100% of inflow)
Center-of-Mass det. time= 209.2 min (1,081.3 - 872.0)

Volume	Invert	Avail.Storage	Storage Description
#1	108.80'	4,689 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

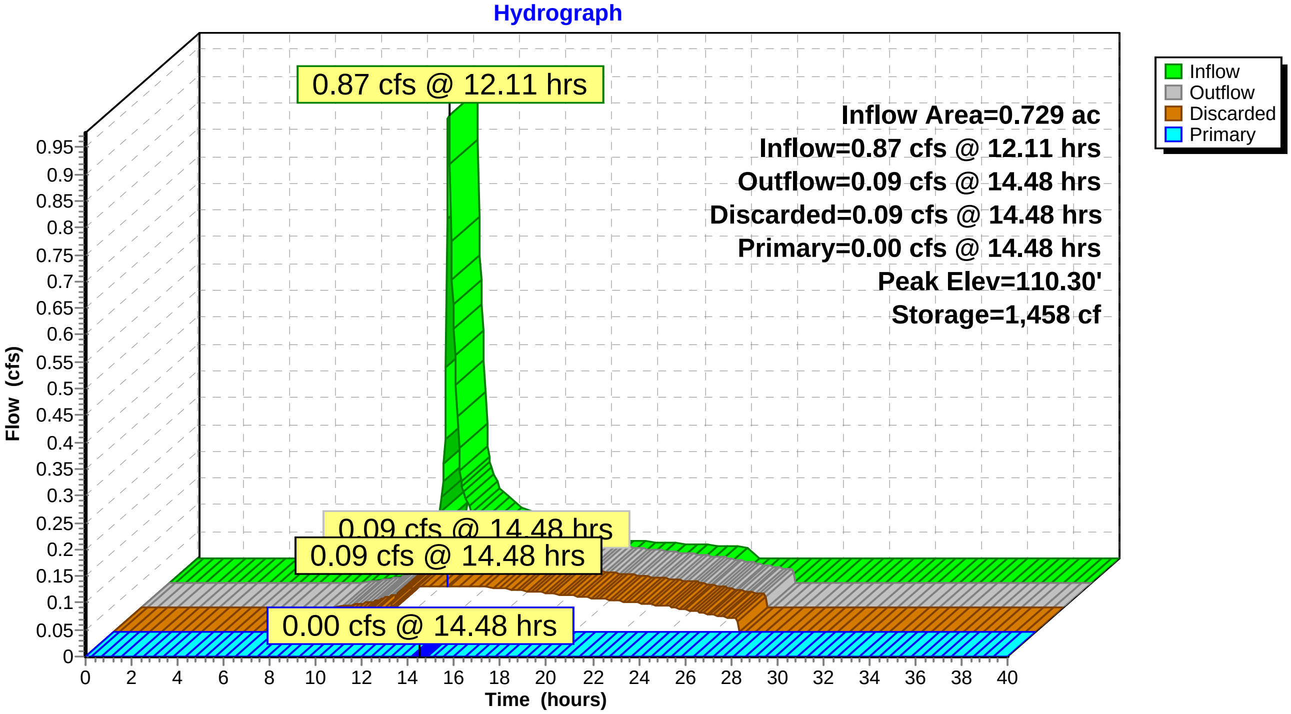
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
108.80	420	0	0
109.00	560	98	98
110.00	1,300	930	1,028
111.00	2,110	1,705	2,733
111.80	2,780	1,956	4,689

Device	Routing	Invert	Outlet Devices
#1	Discarded	108.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	110.30'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.09 cfs @ 14.48 hrs HW=110.30' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 14.48 hrs HW=110.30' TW=108.06' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.00 cfs @ 0.11 fps)

Pond 5P: Stormwater Management Area #5



Summary for Pond 6P: Stormwater Management Area #6

[90] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 1.438 ac, 0.00% Impervious, Inflow Depth = 1.76" for 50-YR event
Inflow = 2.38 cfs @ 12.13 hrs, Volume= 0.210 af
Outflow = 2.52 cfs @ 12.17 hrs, Volume= 0.207 af, Atten= 0%, Lag= 2.1 min
Discarded = 0.02 cfs @ 12.17 hrs, Volume= 0.035 af
Primary = 2.49 cfs @ 12.17 hrs, Volume= 0.172 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 79.30' @ 12.17 hrs Surf.Area= 897 sf Storage= 1,080 cf

Plug-Flow detention time= 99.6 min calculated for 0.207 af (98% of inflow)
Center-of-Mass det. time= 92.5 min (971.9 - 879.5)

Volume	Invert	Avail.Storage	Storage Description
#1	77.00'	2,540 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

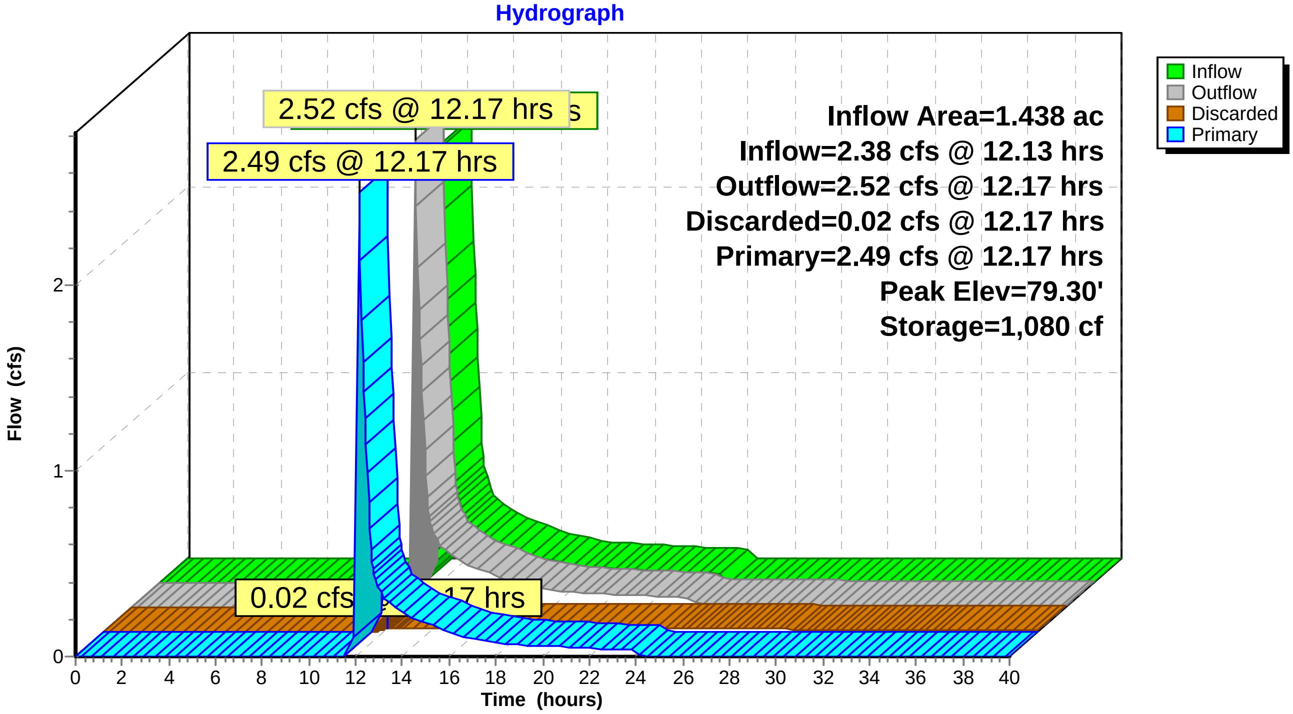
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.00	115	0	0
78.00	390	253	253
79.00	760	575	828
80.00	1,210	985	1,813
80.50	1,700	728	2,540

Device	Routing	Invert	Outlet Devices
#1	Discarded	77.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	79.00'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.02 cfs @ 12.17 hrs HW=79.29' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.29 cfs @ 12.17 hrs HW=79.29' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 2.29 cfs @ 1.34 fps)

Pond 6P: Stormwater Management Area #6



Summary for Pond 7P: DMH

[57] Hint: Peaked at 109.80' (Flood elevation advised)

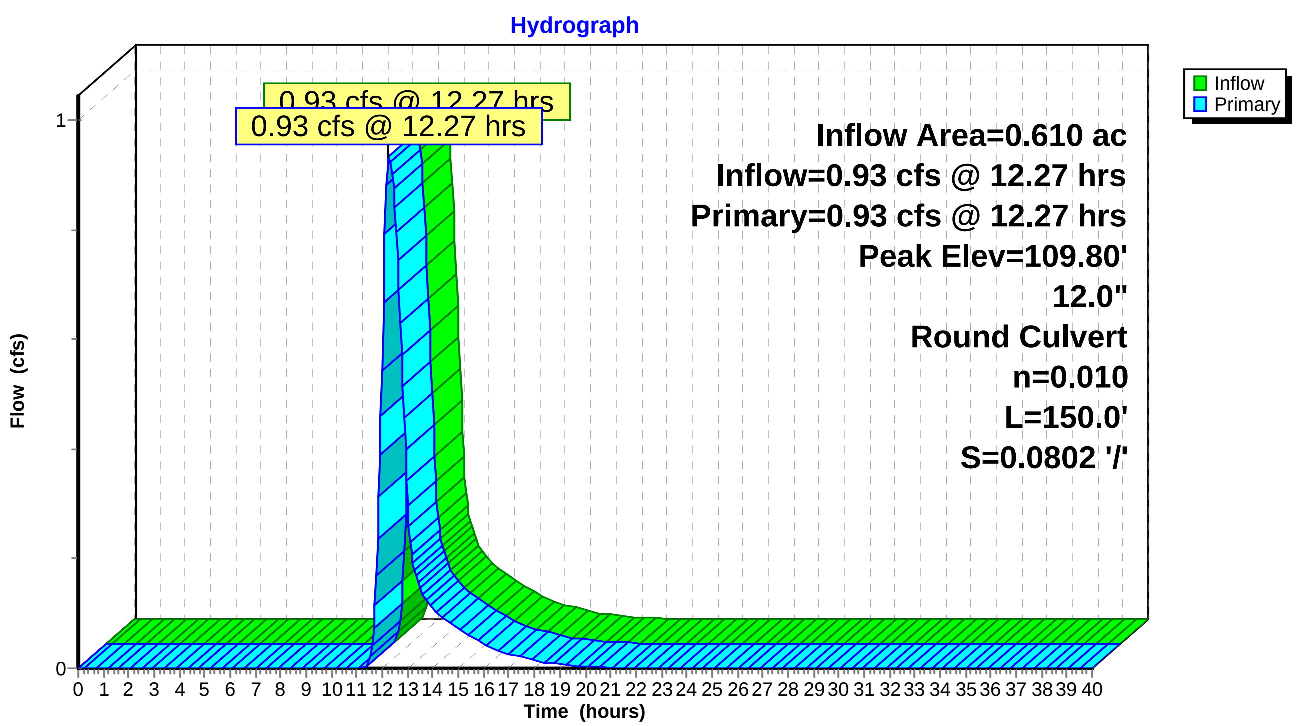
Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 1.94" for 50-YR event
Inflow = 0.93 cfs @ 12.27 hrs, Volume= 0.099 af
Outflow = 0.93 cfs @ 12.27 hrs, Volume= 0.099 af, Atten= 0%, Lag= 0.0 min
Primary = 0.93 cfs @ 12.27 hrs, Volume= 0.099 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 109.80' @ 12.27 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	109.30'	**12.0" Round Culvert** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.30' / 97.27' S= 0.0802 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.93 cfs @ 12.27 hrs HW=109.80' TW=88.97' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.93 cfs @ 2.40 fps)

Pond 7P: DMH



Summary for Pond 8P: DMH

[57] Hint: Peaked at 88.97' (Flood elevation advised)

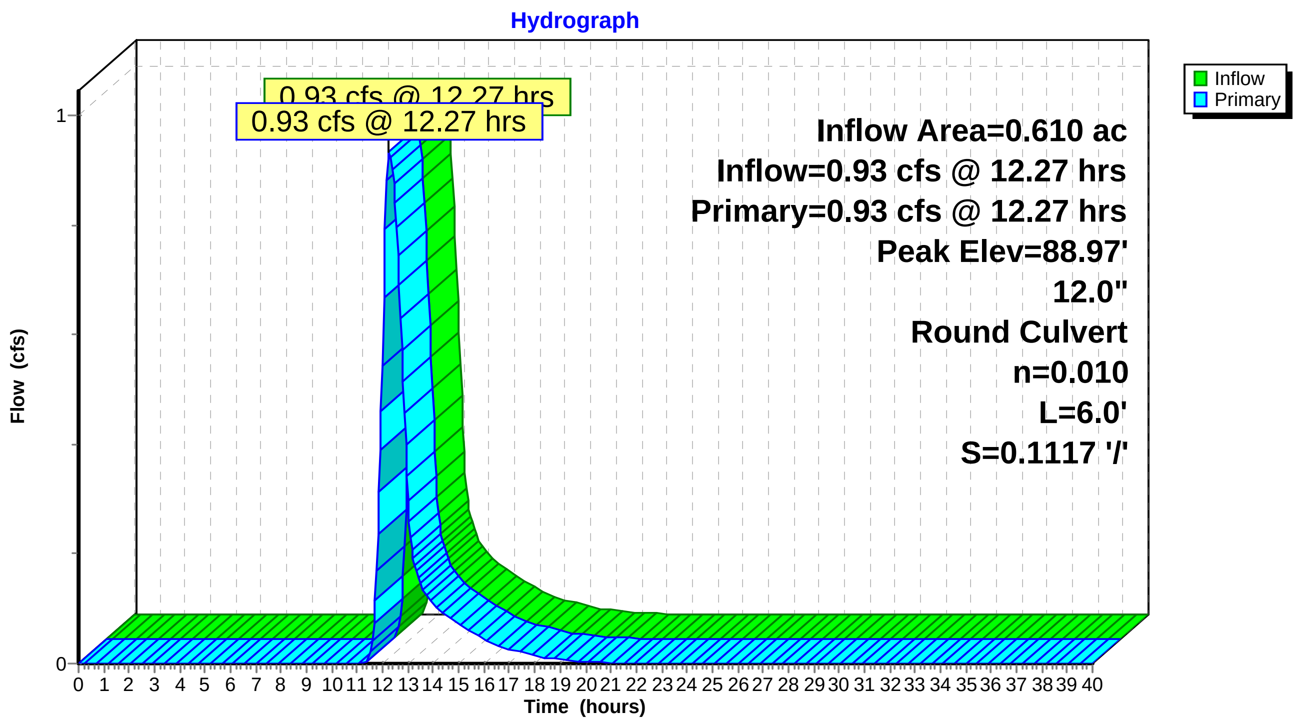
Inflow Area =	0.610 ac,	39.78% Impervious,	Inflow Depth = 1.94"	for 50-YR event
Inflow =	0.93 cfs @	12.27 hrs, Volume=	0.099 af	
Outflow =	0.93 cfs @	12.27 hrs, Volume=	0.099 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.93 cfs @	12.27 hrs, Volume=	0.099 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 88.97' @ 12.27 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	88.47'	**12.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 88.47' / 87.80' S= 0.1117 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.93 cfs @ 12.27 hrs HW=88.97' TW=74.40' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.93 cfs @ 2.40 fps)

Pond 8P: DMH



Summary for Pond 9P: CB 2+85 RT

[57] Hint: Peaked at 115.48' (Flood elevation advised)

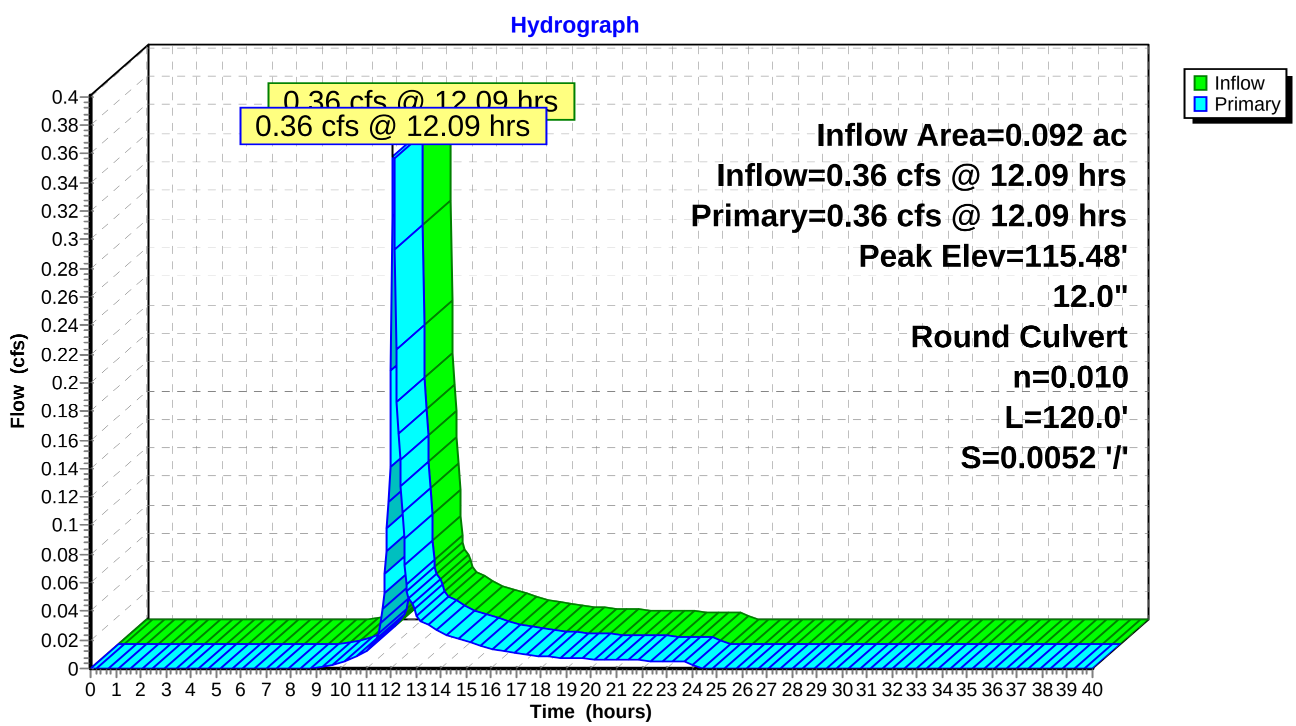
Inflow Area = 0.092 ac, 49.57% Impervious, Inflow Depth = 3.41" for 50-YR event
Inflow = 0.36 cfs @ 12.09 hrs, Volume= 0.026 af
Outflow = 0.36 cfs @ 12.09 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min
Primary = 0.36 cfs @ 12.09 hrs, Volume= 0.026 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 115.48' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.17'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.17' / 114.54' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.35 cfs @ 12.09 hrs HW=115.47' TW=114.75' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.35 cfs @ 2.63 fps)

Pond 9P: CB 2+85 RT



Summary for Pond 10P: DMH 4+11

[57] Hint: Peaked at 114.75' (Flood elevation advised)

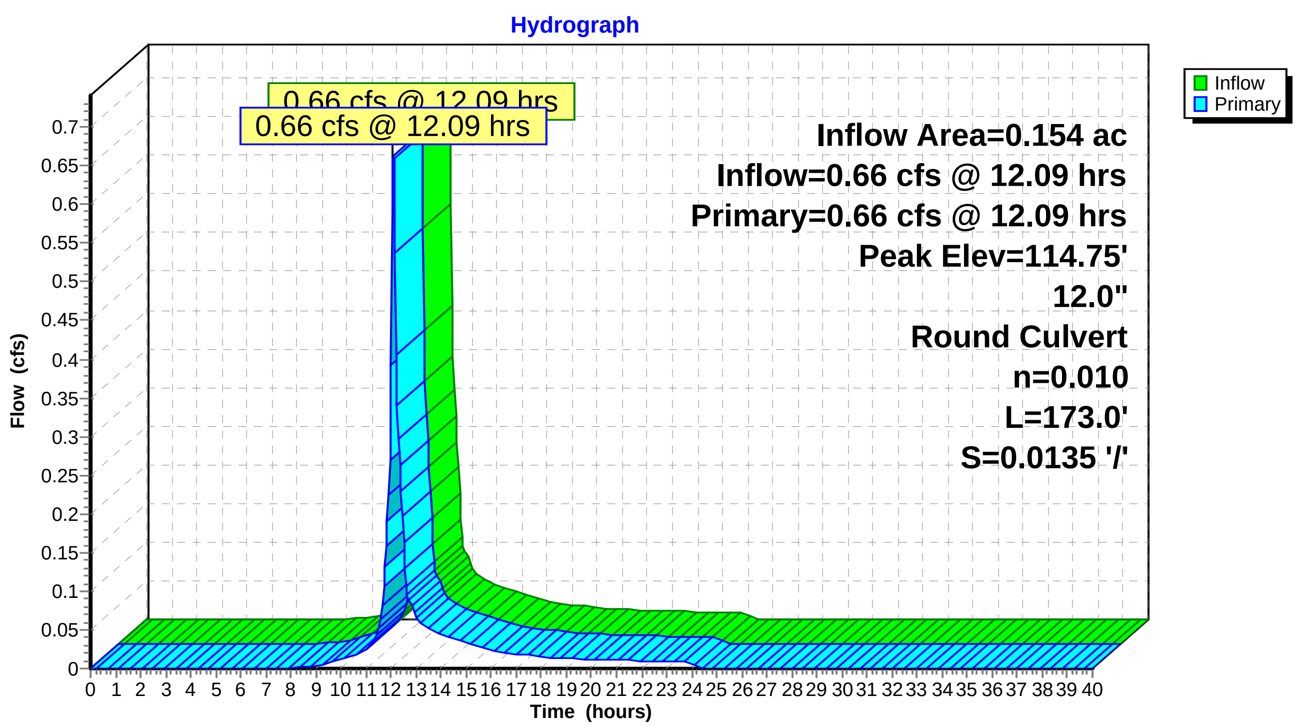
Inflow Area = 0.154 ac, 54.75% Impervious, Inflow Depth = 3.75" for 50-YR event
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 0.048 af
Outflow = 0.66 cfs @ 12.09 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min
Primary = 0.66 cfs @ 12.09 hrs, Volume= 0.048 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 114.75' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	114.34'	**12.0" Round Culvert** L= 173.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 114.34' / 112.00' S= 0.0135 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.65 cfs @ 12.09 hrs HW=114.75' TW=109.47' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.65 cfs @ 2.17 fps)

Pond 10P: DMH 4+11



Summary for Pond 11P: CB 2+85 LT

[57] Hint: Peaked at 115.45' (Flood elevation advised)

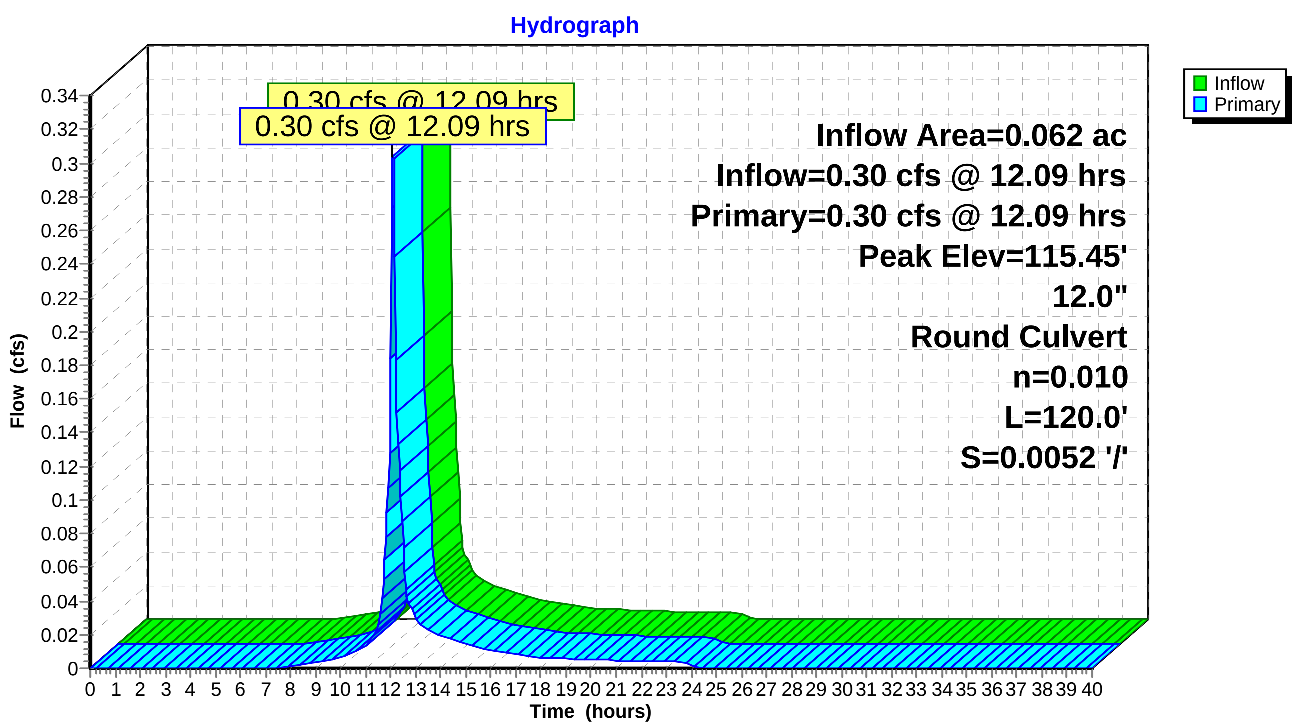
Inflow Area = 0.062 ac, 62.35% Impervious, Inflow Depth = 4.26" for 50-YR event
Inflow = 0.30 cfs @ 12.09 hrs, Volume= 0.022 af
Outflow = 0.30 cfs @ 12.09 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min
Primary = 0.30 cfs @ 12.09 hrs, Volume= 0.022 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 115.45' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.17'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.17' / 114.54' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.30 cfs @ 12.09 hrs HW=115.45' TW=114.75' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.30 cfs @ 2.51 fps)

Pond 11P: CB 2+85 LT



Summary for Pond 12P: CB 1+0 RT

[57] Hint: Peaked at 101.77' (Flood elevation advised)

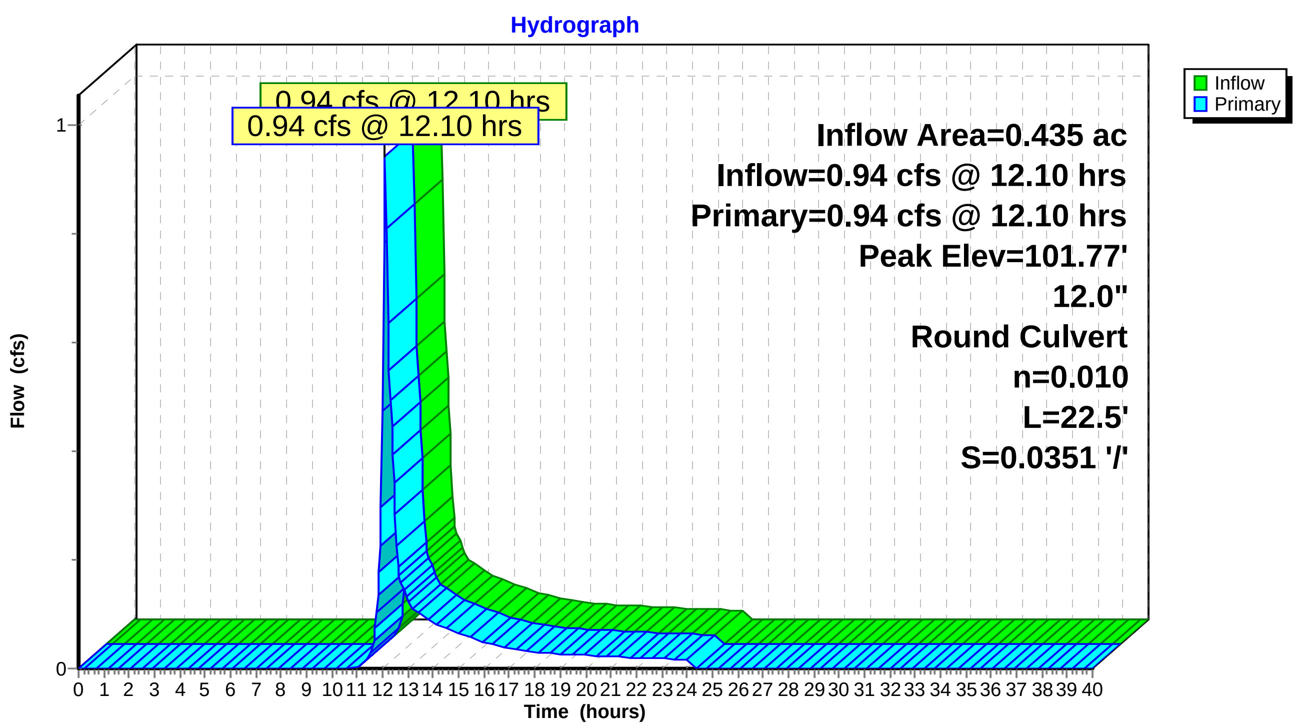
Inflow Area =	0.435 ac, 19.63% Impervious,	Inflow Depth = 2.03"	for 50-YR event
Inflow =	0.94 cfs @ 12.10 hrs,	Volume=	0.074 af
Outflow =	0.94 cfs @ 12.10 hrs,	Volume=	0.074 af, Atten= 0%, Lag= 0.0 min
Primary =	0.94 cfs @ 12.10 hrs,	Volume=	0.074 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.77' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.27'	**12.0" Round Culvert** L= 22.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.27' / 100.48' S= 0.0351 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.94 cfs @ 12.10 hrs HW=101.77' TW=101.15' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.94 cfs @ 2.40 fps)

Pond 12P: CB 1+0 RT



Summary for Pond 13P: CB 1+0 LT

[57] Hint: Peaked at 101.79' (Flood elevation advised)

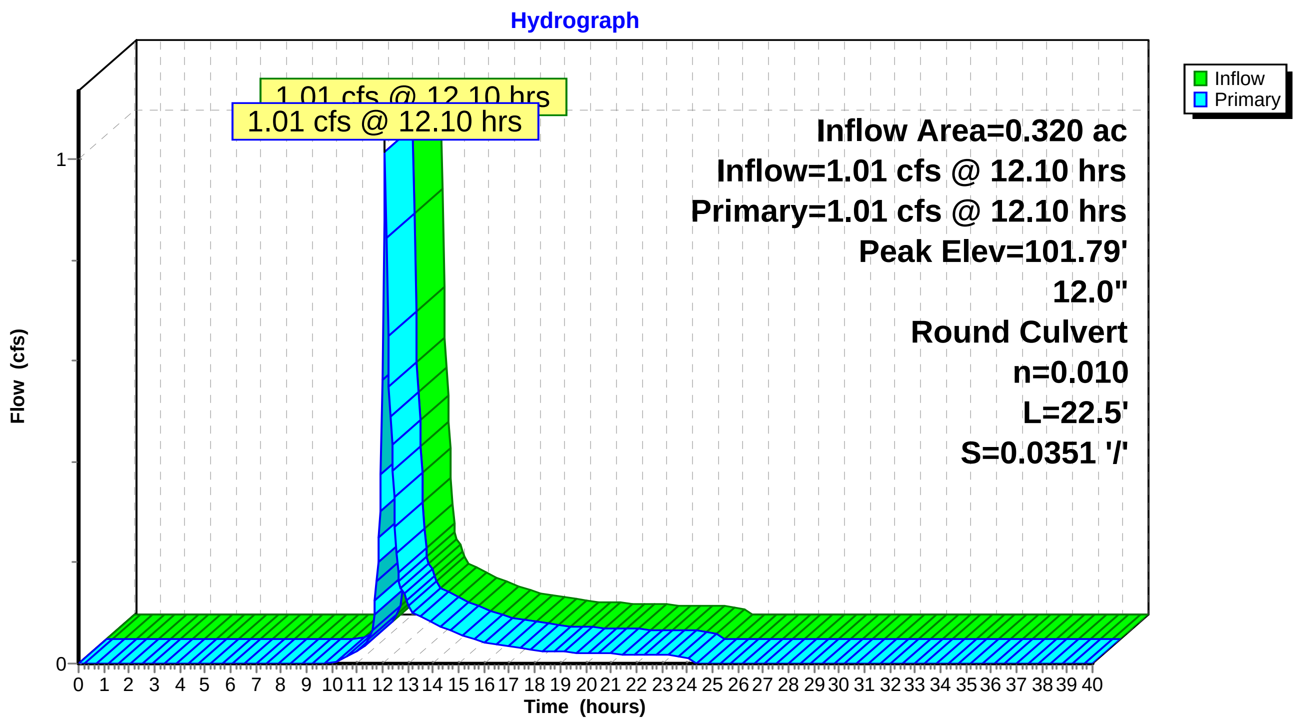
Inflow Area = 0.320 ac, 30.31% Impervious, Inflow Depth = 2.80" for 50-YR event
Inflow = 1.01 cfs @ 12.10 hrs, Volume= 0.075 af
Outflow = 1.01 cfs @ 12.10 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min
Primary = 1.01 cfs @ 12.10 hrs, Volume= 0.075 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.79' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.27'	**12.0" Round Culvert** L= 22.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.27' / 100.48' S= 0.0351 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.01 cfs @ 12.10 hrs HW=101.79' TW=101.15' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.01 cfs @ 2.45 fps)

Pond 13P: CB 1+0 LT



Summary for Pond 14P: DMH 0+75

[57] Hint: Peaked at 101.15' (Flood elevation advised)

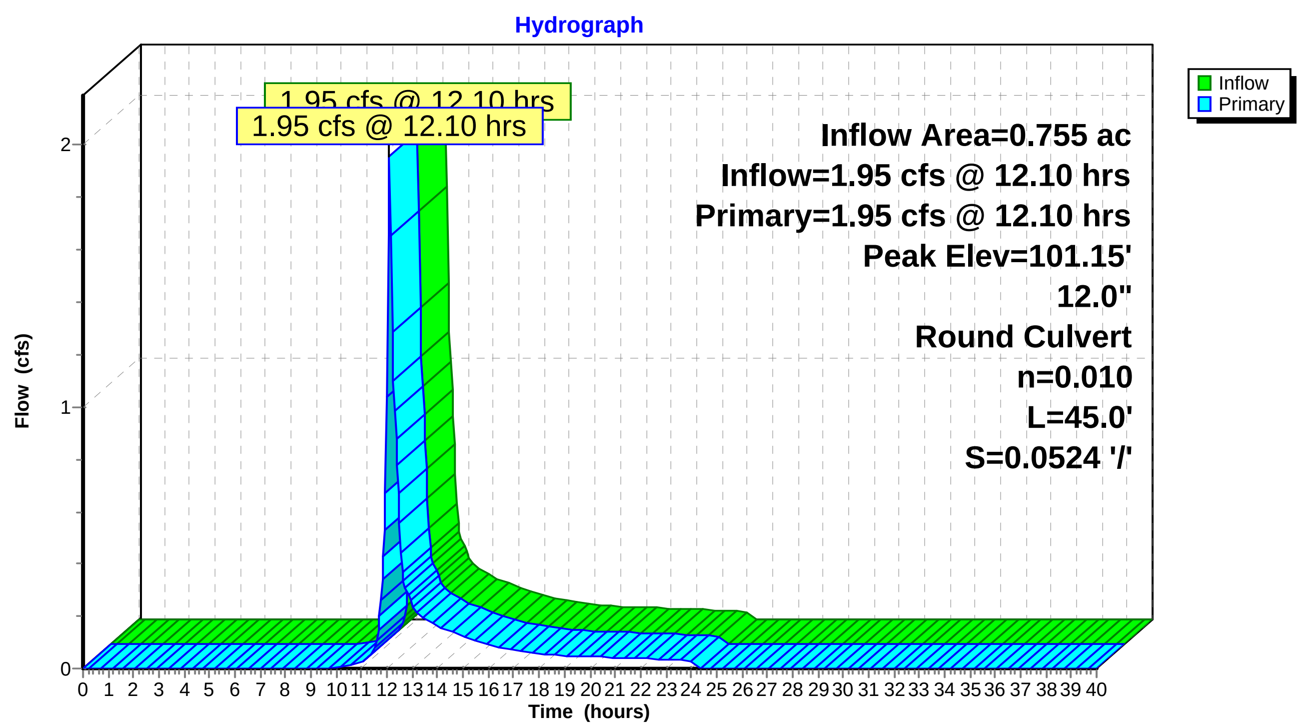
Inflow Area =	0.755 ac, 24.16% Impervious,	Inflow Depth = 2.36"	for 50-YR event
Inflow =	1.95 cfs @ 12.10 hrs,	Volume=	0.148 af
Outflow =	1.95 cfs @ 12.10 hrs,	Volume=	0.148 af, Atten= 0%, Lag= 0.0 min
Primary =	1.95 cfs @ 12.10 hrs,	Volume=	0.148 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.15' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	100.38'	**12.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 100.38' / 98.02' S= 0.0524 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.95 cfs @ 12.10 hrs HW=101.15' TW=99.43' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.95 cfs @ 2.99 fps)

Pond 14P: DMH 0+75



Summary for Pond 15P: DMH 0+25

[57] Hint: Peaked at 99.43' (Flood elevation advised)
[80] Warning: Exceeded Pond 16P by 0.08' @ 12.20 hrs (0.86 cfs 0.015 af)
[80] Warning: Exceeded Pond 17P by 0.10' @ 12.20 hrs (0.95 cfs 0.017 af)

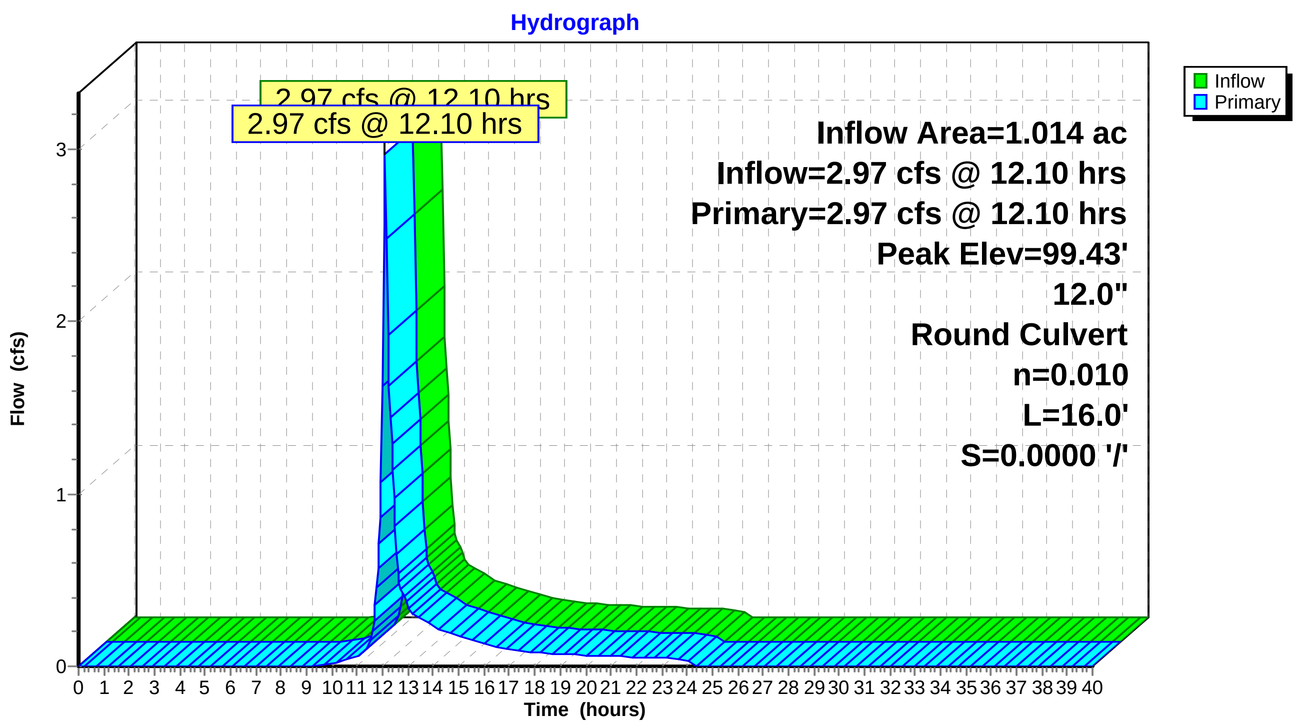
Inflow Area = 1.014 ac, 25.29% Impervious, Inflow Depth = 2.63" for 50-YR event
Inflow = 2.97 cfs @ 12.10 hrs, Volume= 0.222 af
Outflow = 2.97 cfs @ 12.10 hrs, Volume= 0.222 af, Atten= 0%, Lag= 0.0 min
Primary = 2.97 cfs @ 12.10 hrs, Volume= 0.222 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 99.43' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.92'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.92' / 97.92' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.95 cfs @ 12.10 hrs HW=99.42' TW=98.81' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.95 cfs @ 3.76 fps)

Pond 15P: DMH 0+25



Summary for Pond 16P: CB 0+08 LT

[57] Hint: Peaked at 99.46' (Flood elevation advised)

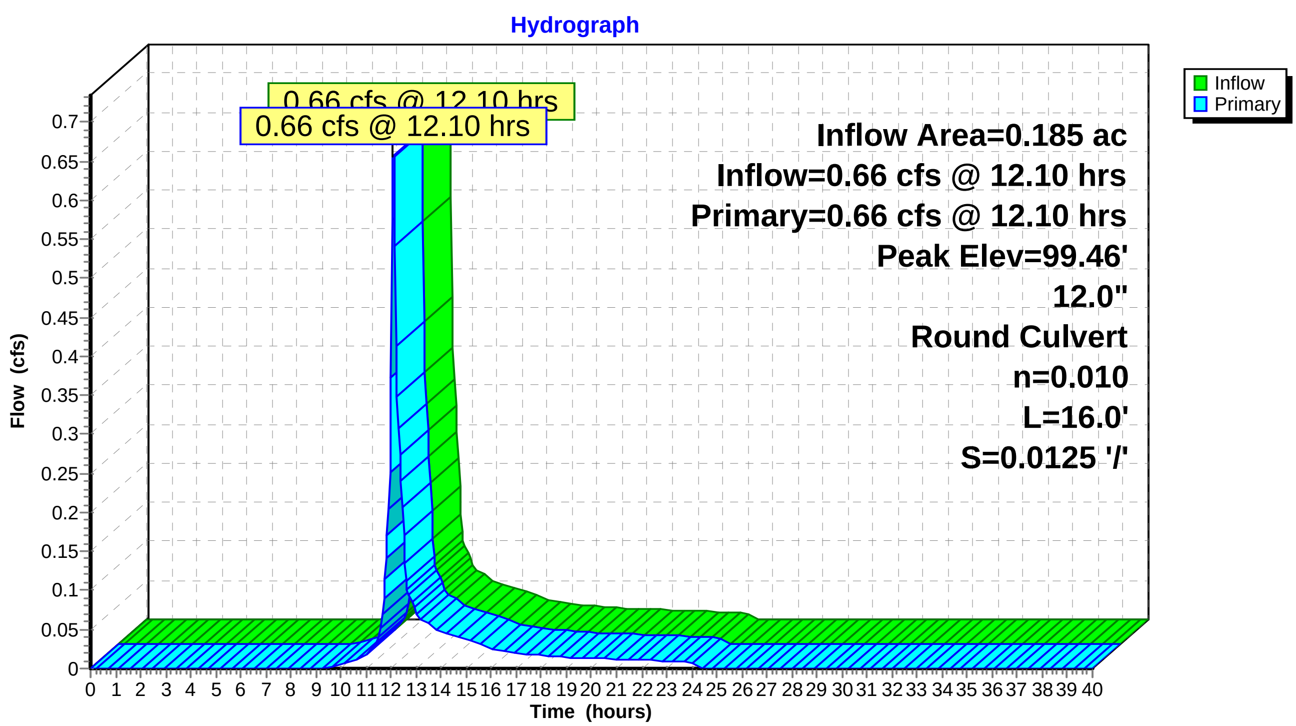
Inflow Area = 0.185 ac, 23.51% Impervious, Inflow Depth = 3.10" for 50-YR event
Inflow = 0.66 cfs @ 12.10 hrs, Volume= 0.048 af
Outflow = 0.66 cfs @ 12.10 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min
Primary = 0.66 cfs @ 12.10 hrs, Volume= 0.048 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 99.46' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.22'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.22' / 98.02' S= 0.0125 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.65 cfs @ 12.10 hrs HW=99.43' TW=99.40' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.65 cfs @ 0.83 fps)

Pond 16P: CB 0+08 LT



Summary for Pond 17P: CB 0+08 RT

[57] Hint: Peaked at 99.44' (Flood elevation advised)

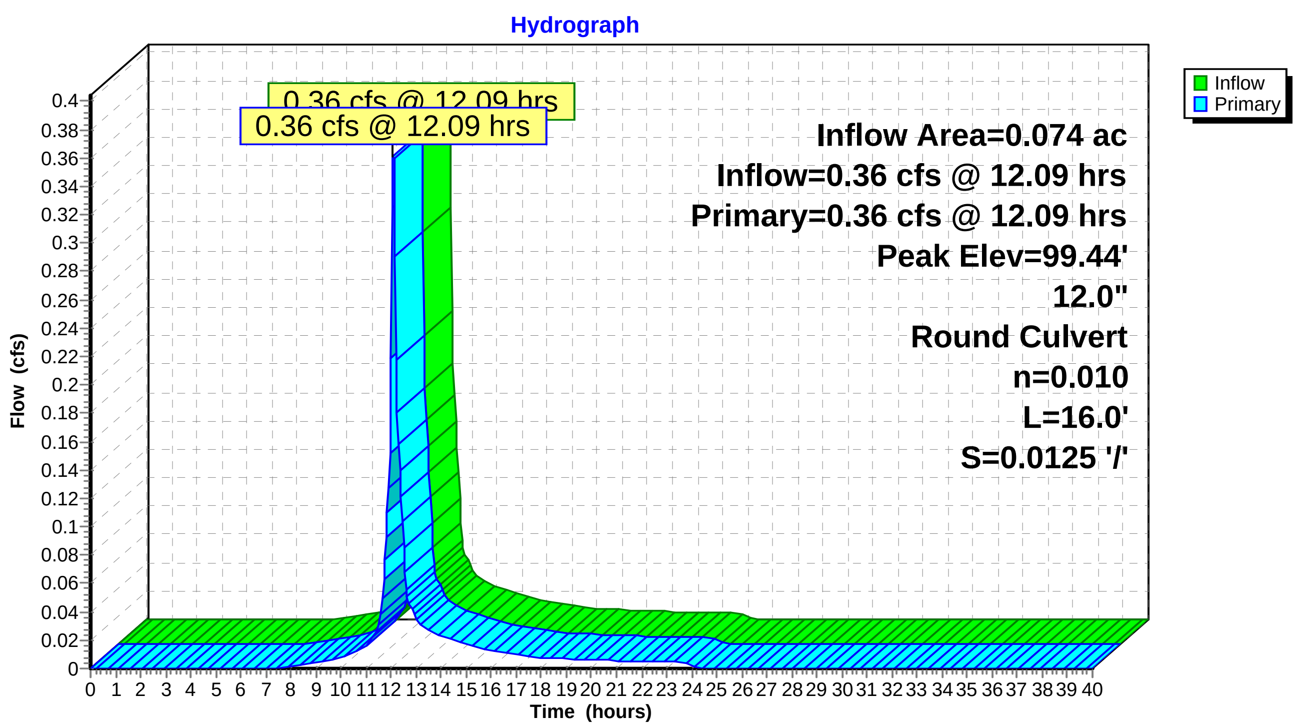
Inflow Area = 0.074 ac, 41.25% Impervious, Inflow Depth = 4.26" for 50-YR event
Inflow = 0.36 cfs @ 12.09 hrs, Volume= 0.026 af
Outflow = 0.36 cfs @ 12.09 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min
Primary = 0.36 cfs @ 12.09 hrs, Volume= 0.026 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 99.44' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.22'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.22' / 98.02' S= 0.0125 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.36 cfs @ 12.09 hrs HW=99.39' TW=99.38' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.36 cfs @ 0.45 fps)

Pond 17P: CB 0+08 RT



Summary for Pond 18P: SOS

[57] Hint: Peaked at 98.82' (Flood elevation advised)
[80] Warning: Exceeded Pond 15P by 0.06' @ 24.45 hrs (0.00 cfs 0.000 af)

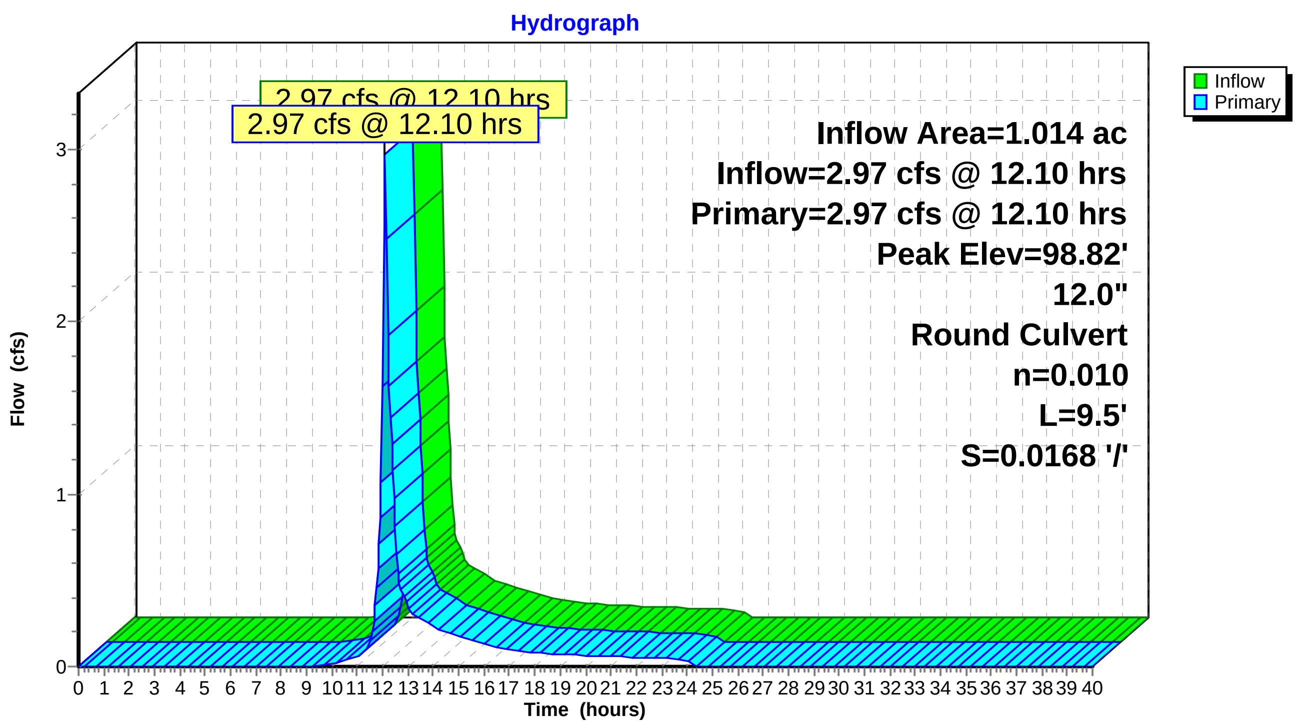
Inflow Area =	1.014 ac, 25.29% Impervious, Inflow Depth = 2.63"	for 50-YR event	
Inflow =	2.97 cfs @ 12.10 hrs, Volume=	0.222 af	
Outflow =	2.97 cfs @ 12.10 hrs, Volume=	0.222 af,	Atten= 0%, Lag= 0.0 min
Primary =	2.97 cfs @ 12.10 hrs, Volume=	0.222 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 98.82' @ 12.34 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.68'	**12.0" Round Culvert** L= 9.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.68' / 97.52' S= 0.0168 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.95 cfs @ 12.10 hrs HW=98.81' TW=98.06' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 2.95 cfs @ 4.17 fps)

Pond 18P: SOS

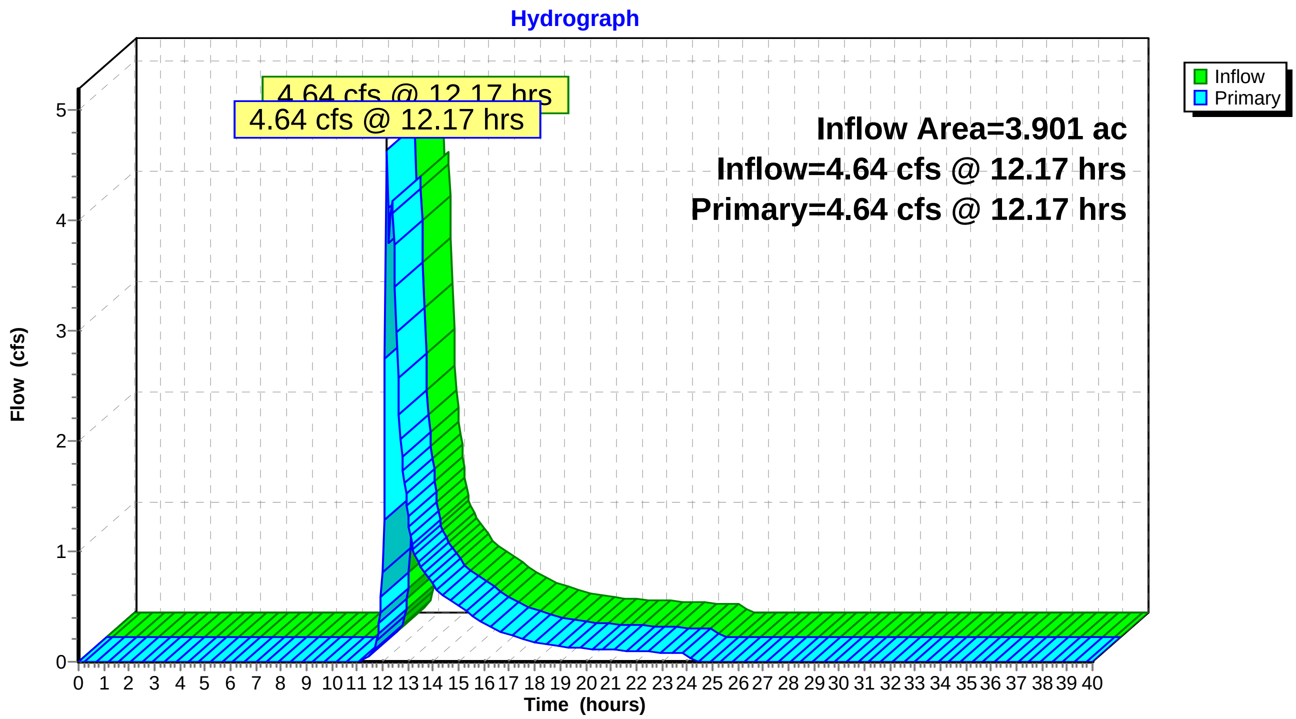


Summary for Link 1L: Flow towards wetlands

Inflow Area = 3.901 ac, 8.31% Impervious, Inflow Depth = 1.52" for 50-YR event
Inflow = 4.64 cfs @ 12.17 hrs, Volume= 0.495 af
Primary = 4.64 cfs @ 12.17 hrs, Volume= 0.495 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L: Flow towards wetlands

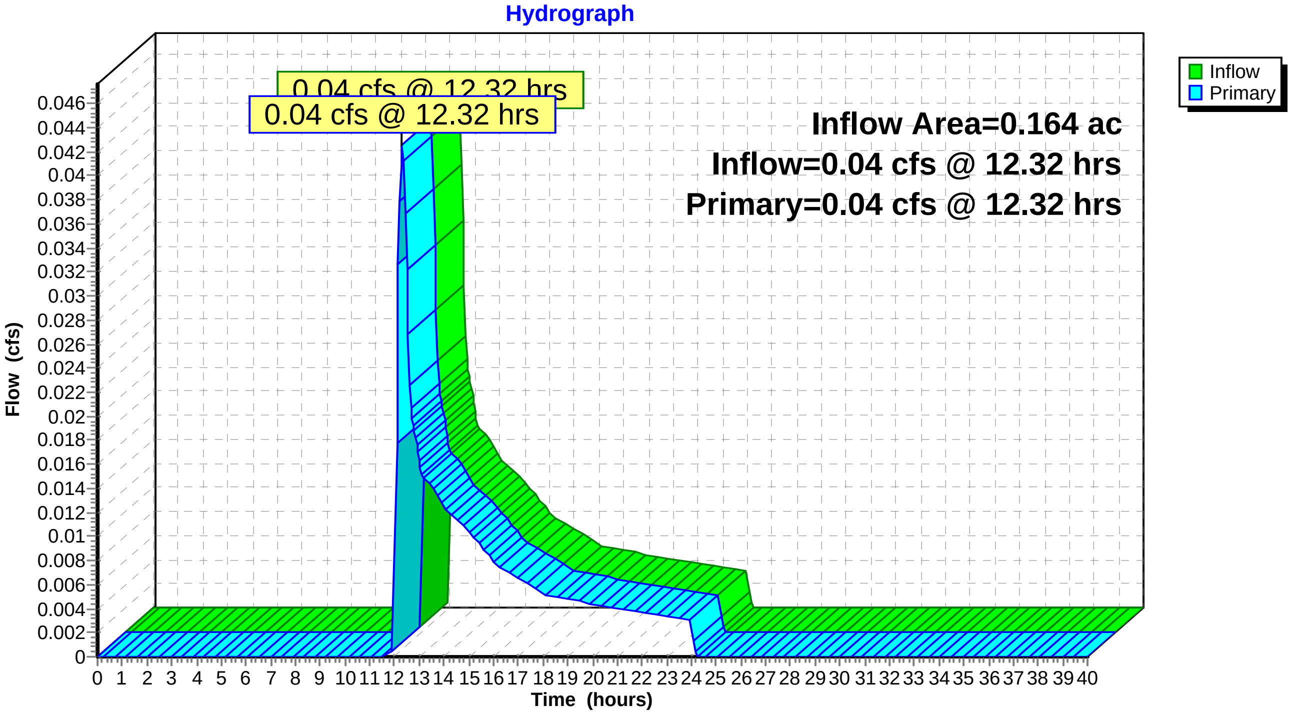


Summary for Link 2L: flow to the north

Inflow Area = 0.164 ac, 0.00% Impervious, Inflow Depth = 0.60" for 50-YR event
Inflow = 0.04 cfs @ 12.32 hrs, Volume= 0.008 af
Primary = 0.04 cfs @ 12.32 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L: flow to the north

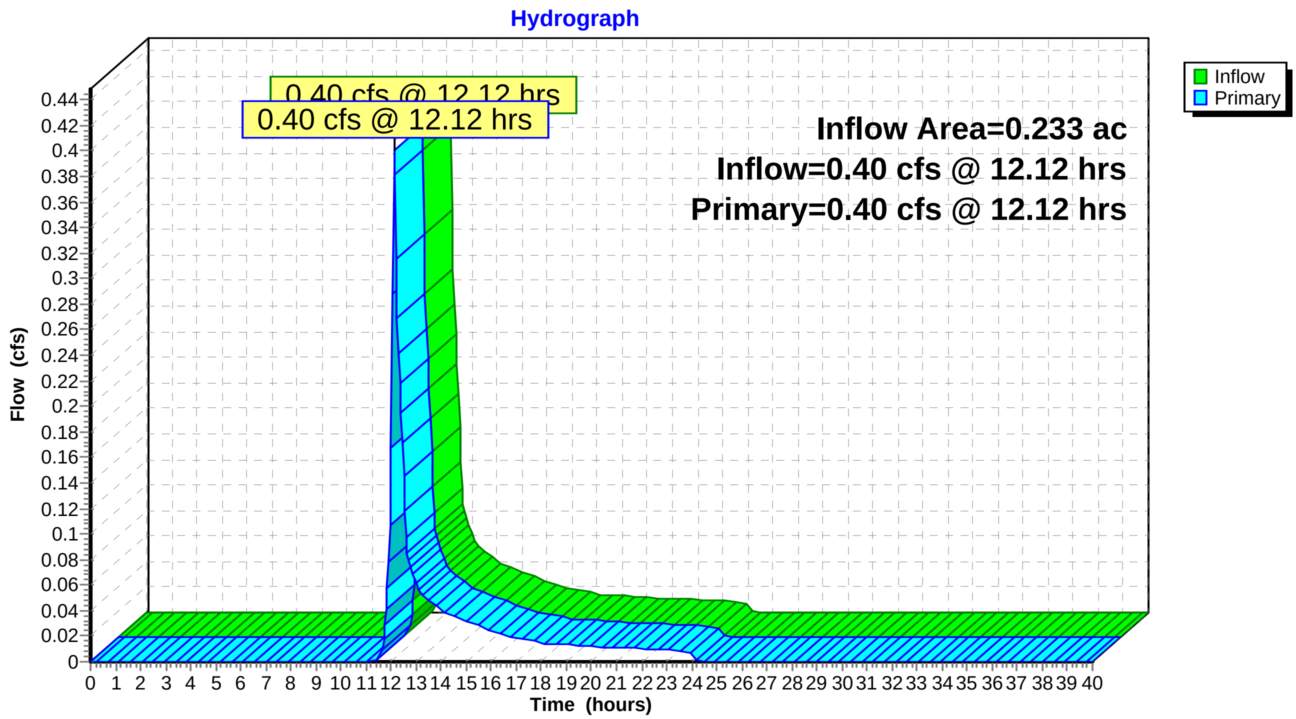


Summary for Link 3L: Flow to existing cb on north-side of Elm Street

Inflow Area = 0.233 ac, 0.00% Impervious, Inflow Depth = 1.76" for 50-YR event
Inflow = 0.40 cfs @ 12.12 hrs, Volume= 0.034 af
Primary = 0.40 cfs @ 12.12 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L: Flow to existing cb on north-side of Elm Street

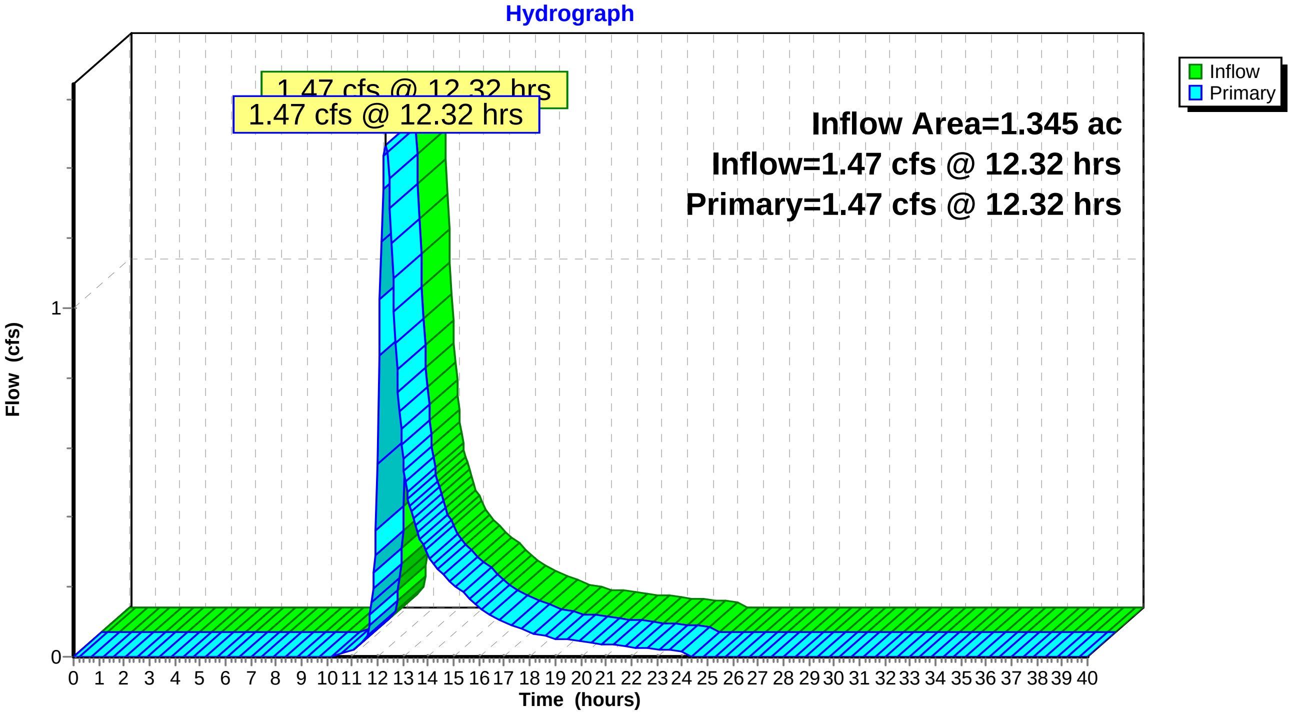


Summary for Link 4L: Flow towards north-side of Elm Street

Inflow Area = 1.345 ac, 19.93% Impervious, Inflow Depth = 1.78" for 50-YR event
Inflow = 1.47 cfs @ 12.32 hrs, Volume= 0.199 af
Primary = 1.47 cfs @ 12.32 hrs, Volume= 0.199 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L: Flow towards north-side of Elm Street

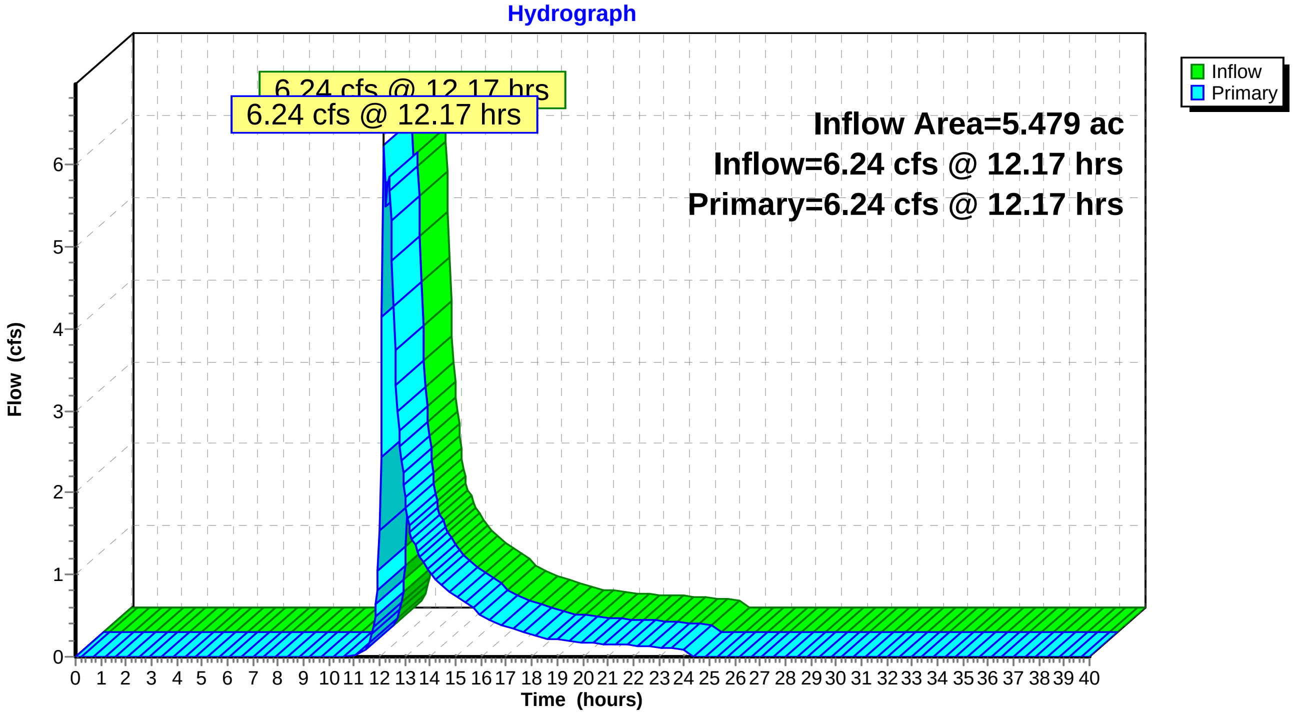


Summary for Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

Inflow Area = 5.479 ac, 10.81% Impervious, Inflow Depth = 1.60" for 50-YR event
Inflow = 6.24 cfs @ 12.17 hrs, Volume= 0.729 af
Primary = 6.24 cfs @ 12.17 hrs, Volume= 0.729 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

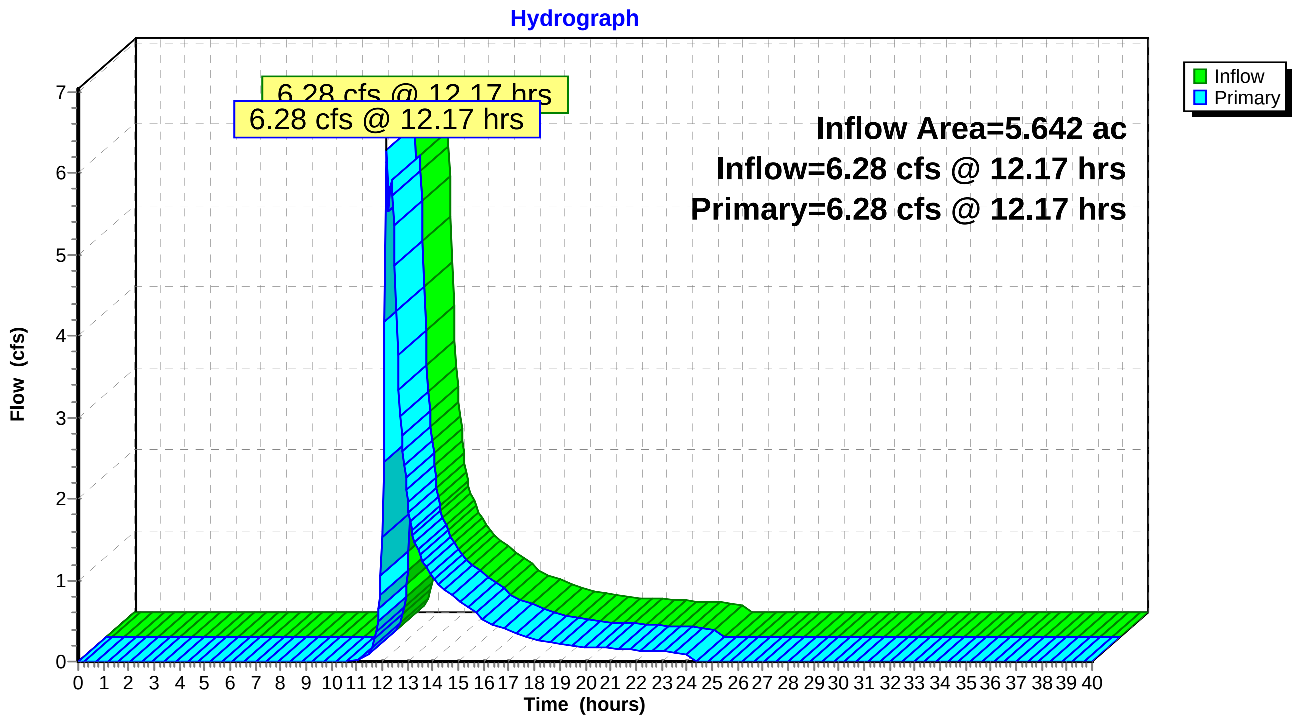


Summary for Link 6L: Total runoff discharging from within the limit of watershed analysis

Inflow Area = 5.642 ac, 10.50% Impervious, Inflow Depth = 1.57" for 50-YR event
Inflow = 6.28 cfs @ 12.17 hrs, Volume= 0.737 af
Primary = 6.28 cfs @ 12.17 hrs, Volume= 0.737 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 6L: Total runoff discharging from within the limit of watershed analysis



Summary for Subcatchment 1S: EX-1R

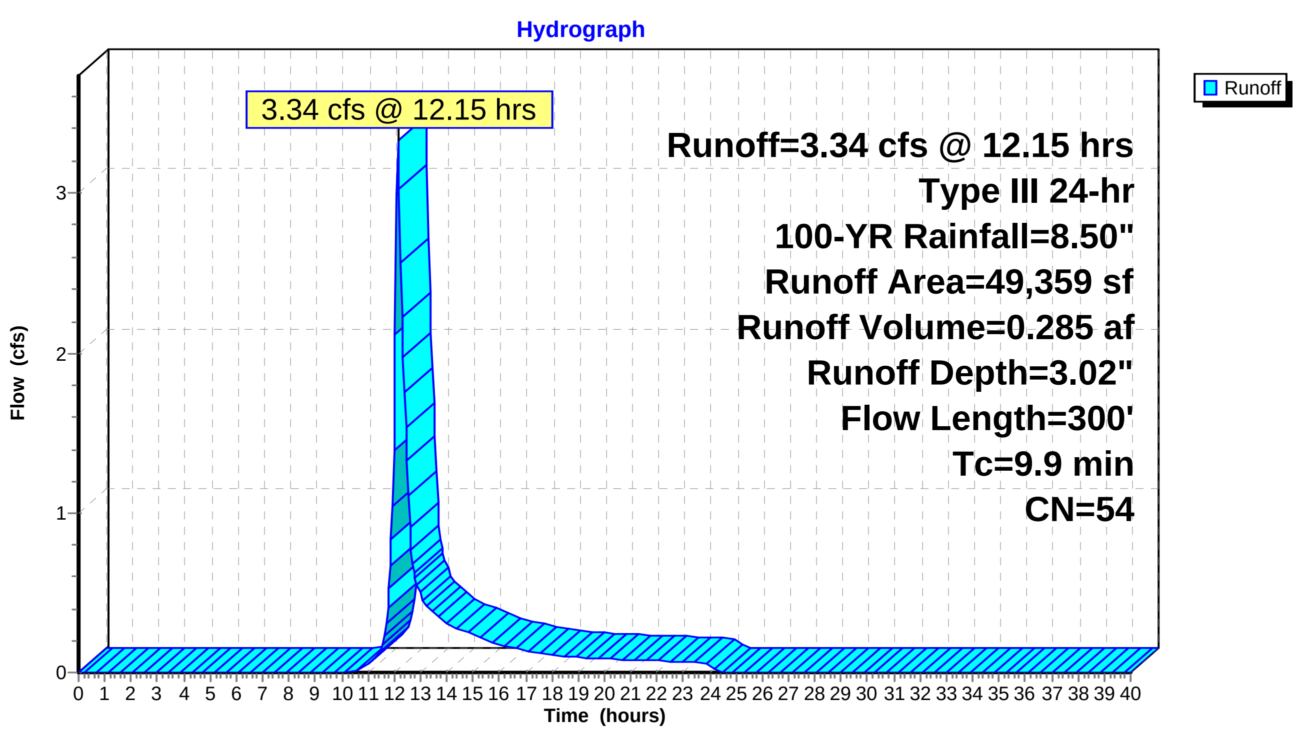
Runoff = 3.34 cfs @ 12.15 hrs, Volume= 0.285 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
1,009	30	Woods, Good, HSG A
33,181	55	Woods, Good, HSG B
5,769	39	>75% Grass cover, Good, HSG A
9,400	61	>75% Grass cover, Good, HSG B
49,359	54	Weighted Average
49,359		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0450	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	250	0.0630	4.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.9	300	Total			

Subcatchment 1S: EX-1R



Summary for Subcatchment 2S: EX-2R

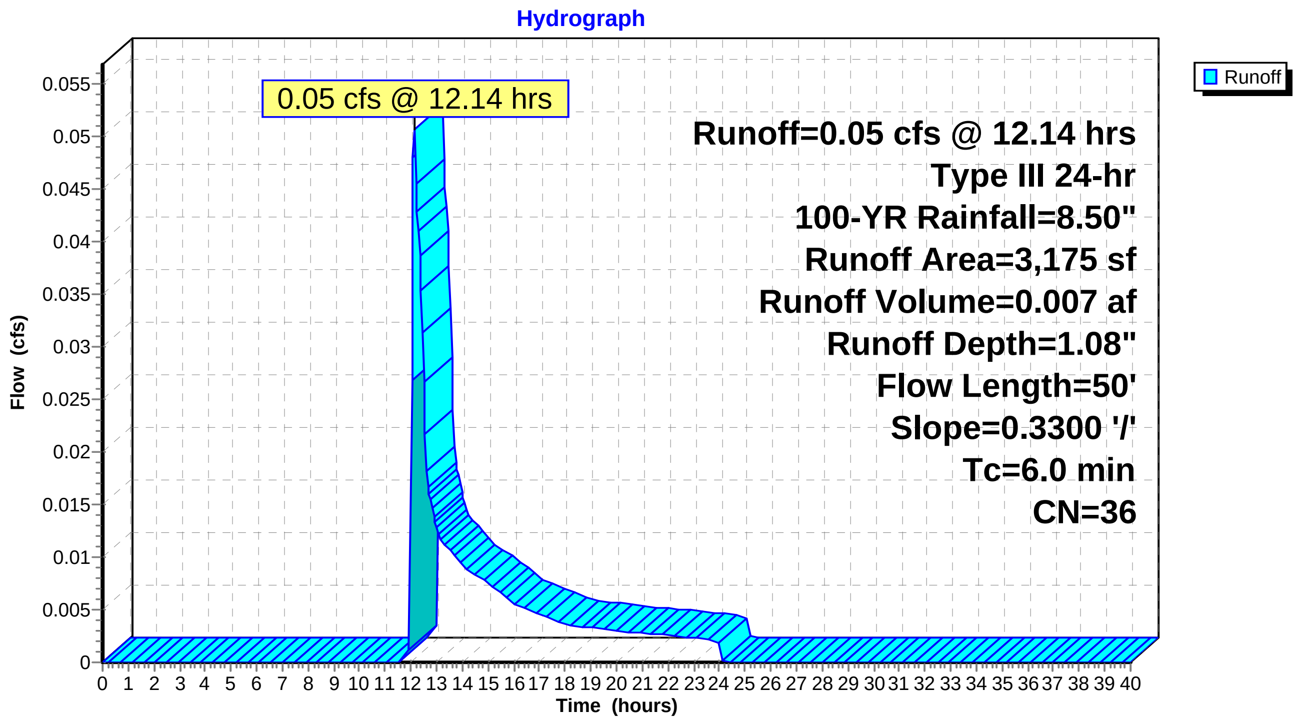
Runoff = 0.05 cfs @ 12.14 hrs, Volume= 0.007 af, Depth= 1.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
1,000	30	Woods, Good, HSG A
2,175	39	>75% Grass cover, Good, HSG A
3,175	36	Weighted Average
3,175		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	50	0.3300	0.45		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.8	50	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: EX-2R



Summary for Subcatchment 3S: EX-3R

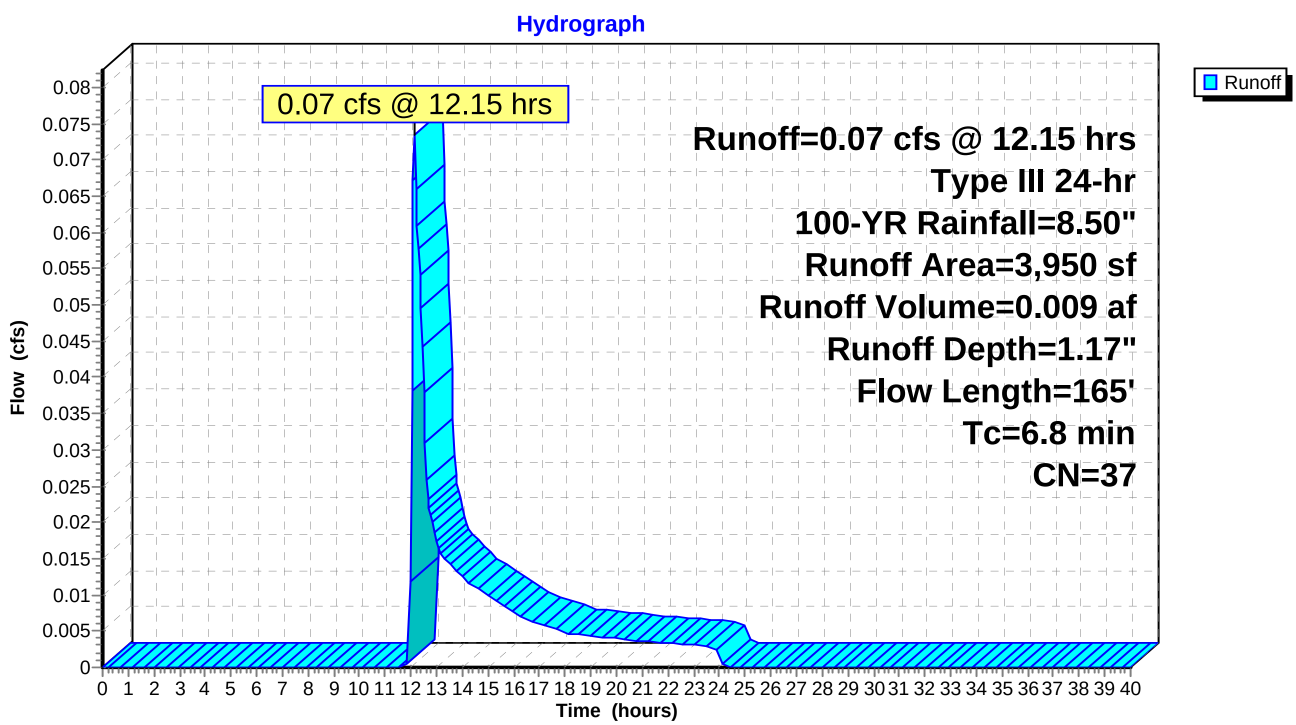
Runoff = 0.07 cfs @ 12.15 hrs, Volume= 0.009 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
1,000	30	Woods, Good, HSG A
2,950	39	>75% Grass cover, Good, HSG A
3,950	37	Weighted Average
3,950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	115	0.1400	6.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	165	Total			

Subcatchment 3S: EX-3R



Summary for Subcatchment 4S: EX-4R

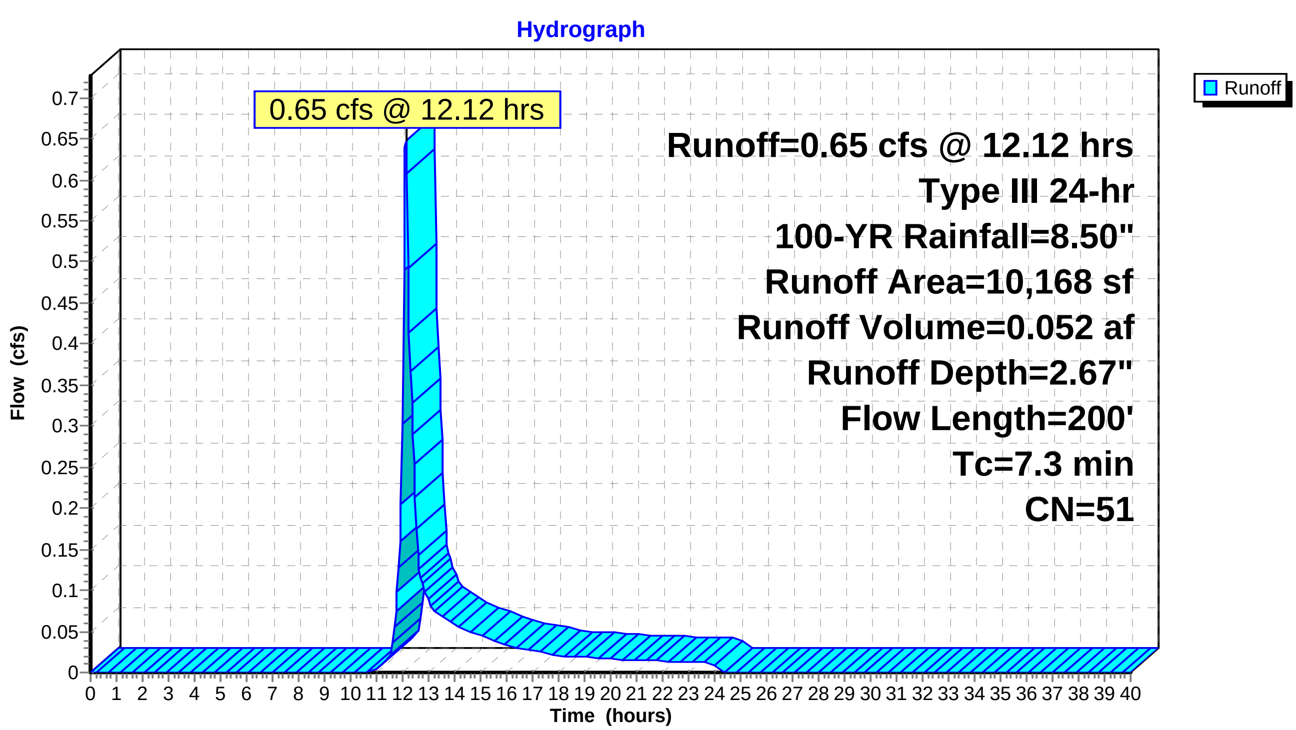
Runoff = 0.65 cfs @ 12.12 hrs, Volume= 0.052 af, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
1,573	30	Woods, Good, HSG A
8,595	55	Woods, Good, HSG B
10,168	51	Weighted Average
10,168		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0860	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	140	0.1520	6.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.1100	6.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	200	Total			

Subcatchment 4S: EX-4R



Summary for Subcatchment 5S: EX-5R

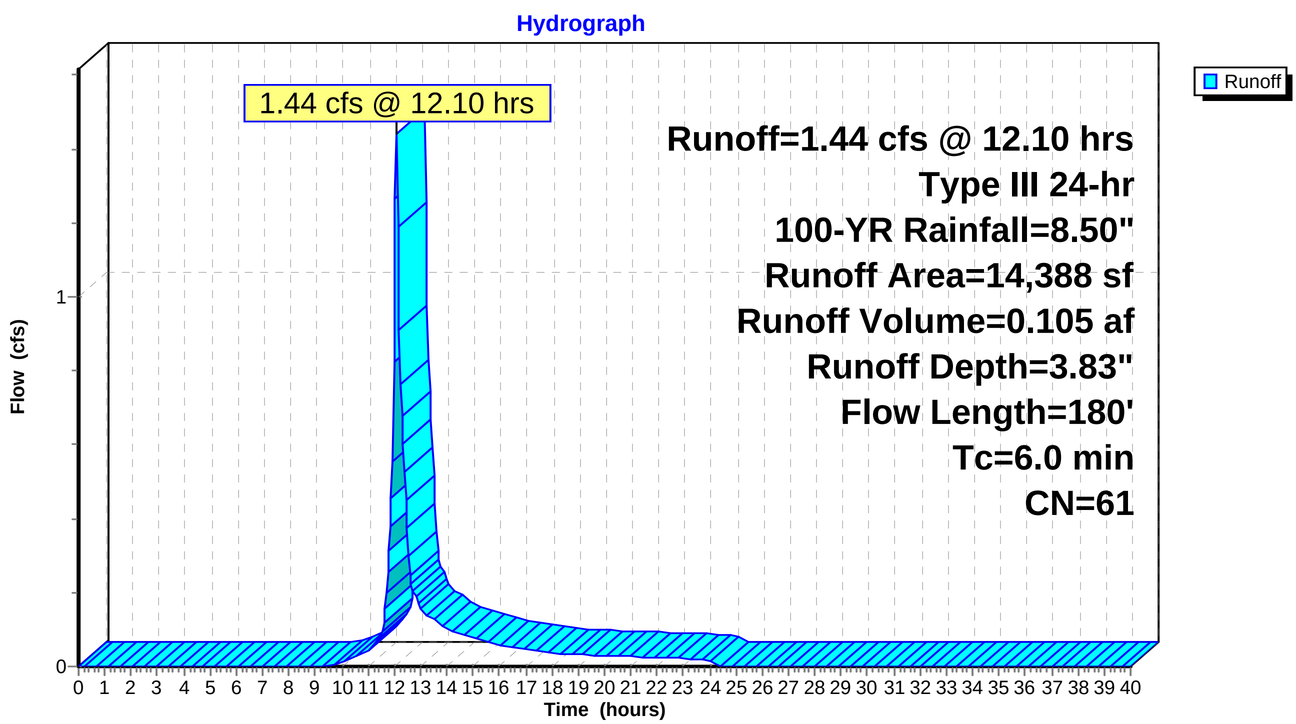
Runoff = 1.44 cfs @ 12.10 hrs, Volume= 0.105 af, Depth= 3.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
278	30	Woods, Good, HSG A
2,500	55	Woods, Good, HSG B
500	98	Paved parking, HSG B
11,110	61	>75% Grass cover, Good, HSG B
14,388	61	Weighted Average
13,888		96.52% Pervious Area
500		3.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	50	0.1900	0.36		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.4	130	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	180	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: EX-5R



Summary for Subcatchment 7S: PR-1R

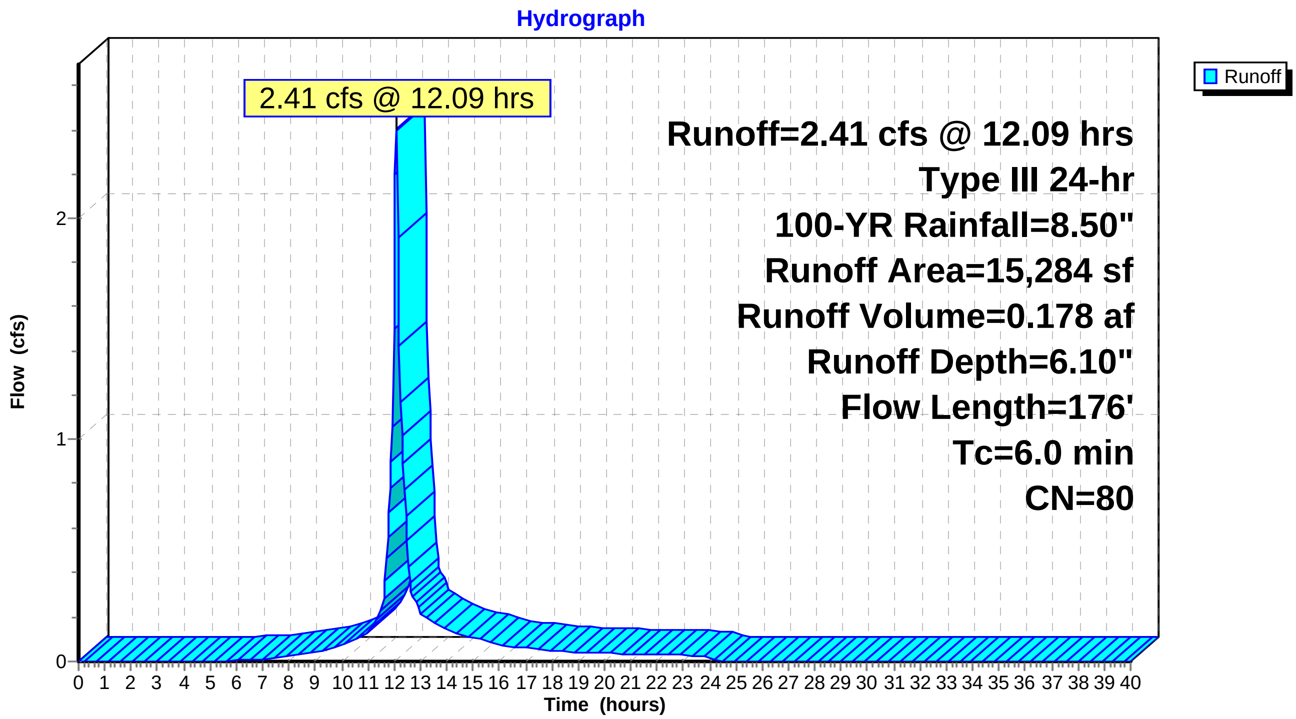
Runoff = 2.41 cfs @ 12.09 hrs, Volume= 0.178 af, Depth= 6.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
4,718	39	>75% Grass cover, Good, HSG A
10,566	98	Paved parking, HSG A
15,284	80	Weighted Average
4,718		30.87% Pervious Area
10,566		69.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0310	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.5	125	0.0430	4.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	26	0.0120	2.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	176	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7S: PR-1R



Summary for Subcatchment 8S: PR-2R

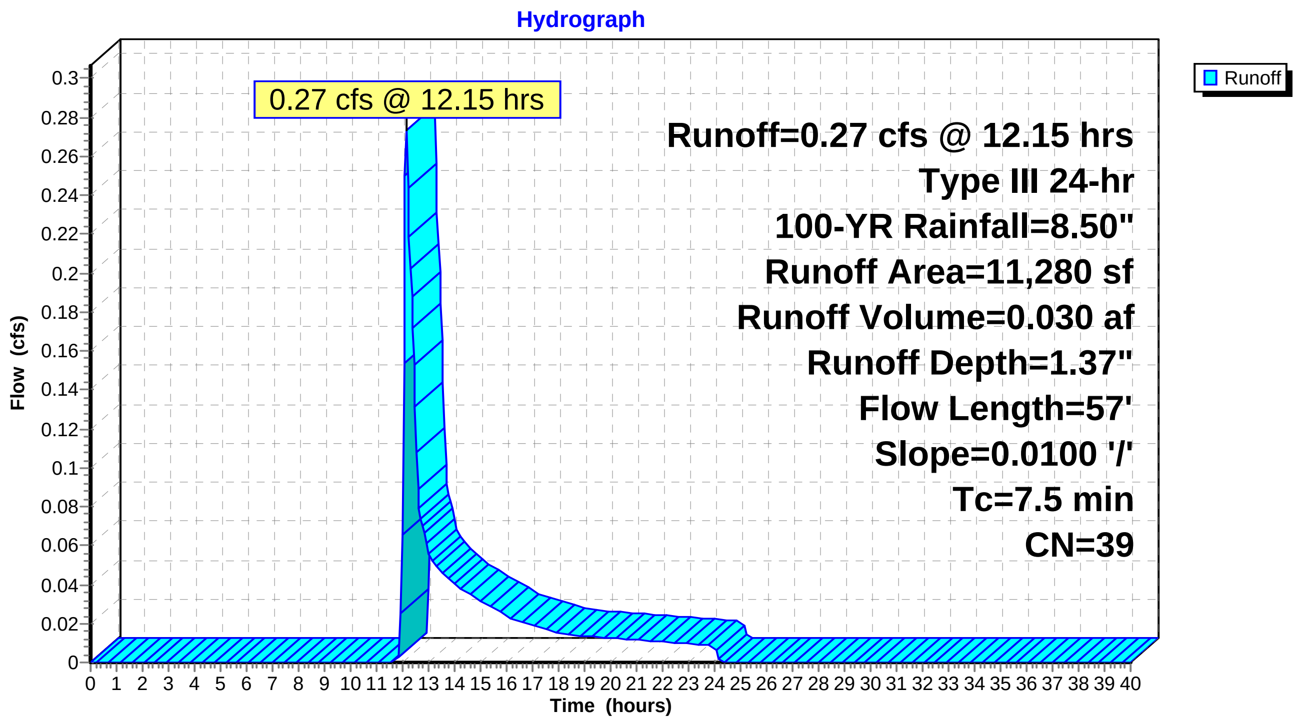
Runoff = 0.27 cfs @ 12.15 hrs, Volume= 0.030 af, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
11,193	39	>75% Grass cover, Good, HSG A
87	61	>75% Grass cover, Good, HSG B
11,280	39	Weighted Average
11,280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	7	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	57	Total			

Subcatchment 8S: PR-2R



Summary for Subcatchment 9S: PR-3R

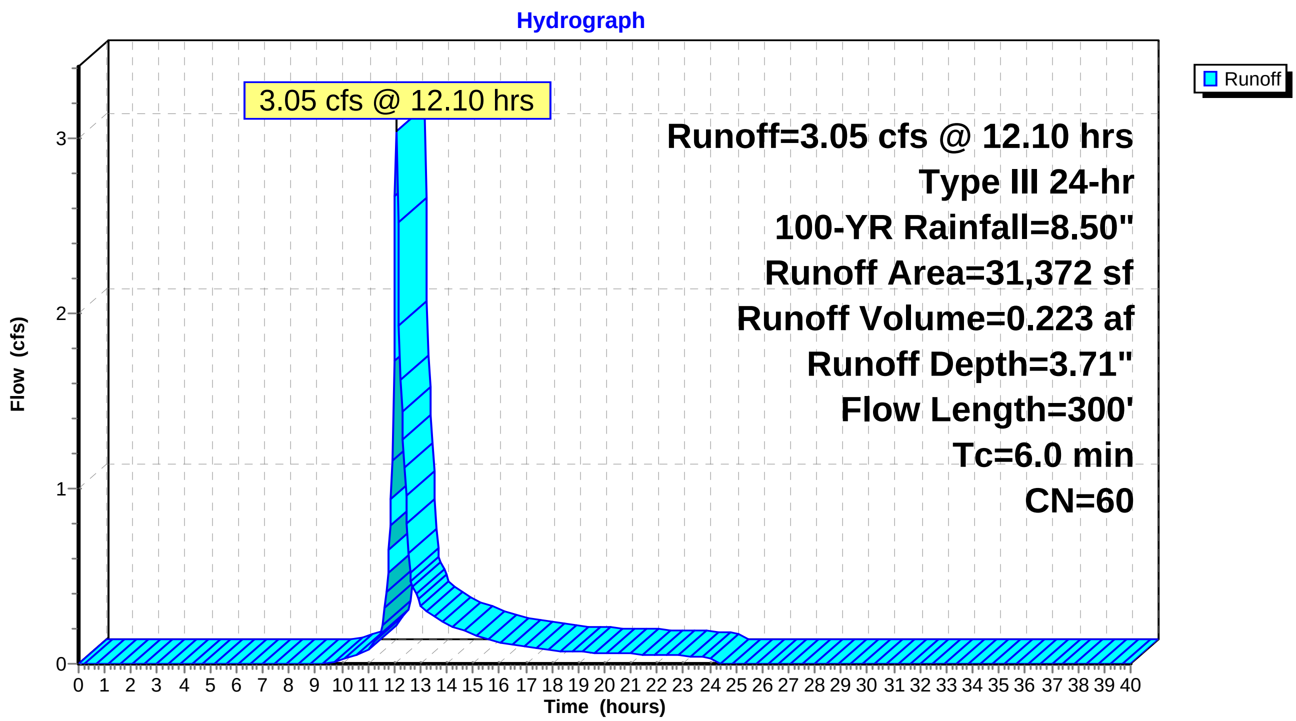
Runoff = 3.05 cfs @ 12.10 hrs, Volume= 0.223 af, Depth= 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
6,795	39	>75% Grass cover, Good, HSG A
21,016	61	>75% Grass cover, Good, HSG B
1,143	98	Paved parking, HSG A
2,418	98	Paved parking, HSG B
31,372	60	Weighted Average
27,811		88.65% Pervious Area
3,561		11.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0700	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.5	150	0.1060	5.24		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	100	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.2	300	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 9S: PR-3R



Summary for Subcatchment 10S: PR-4R

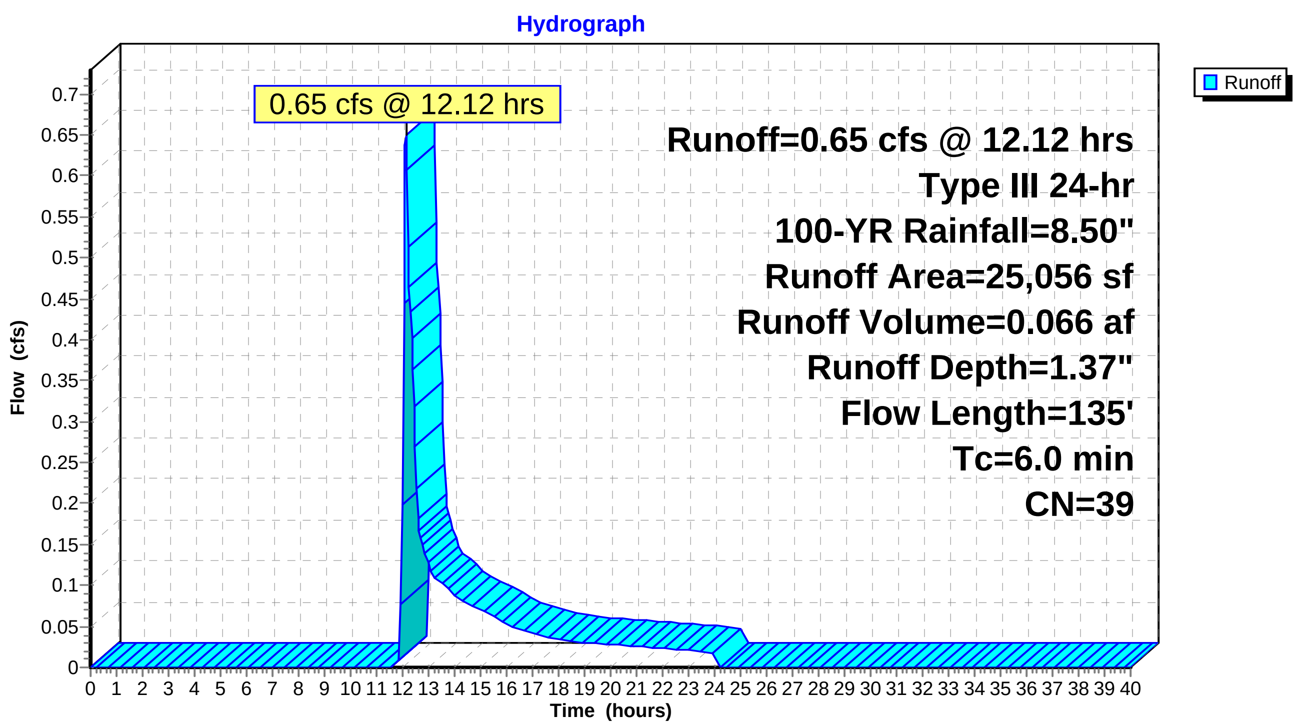
Runoff = 0.65 cfs @ 12.12 hrs, Volume= 0.066 af, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
25,056	39	>75% Grass cover, Good, HSG A
25,056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.2	80	0.1560	6.36		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	5	0.3300	9.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.5	135	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 10S: PR-4R



Summary for Subcatchment 11S: PR-5R

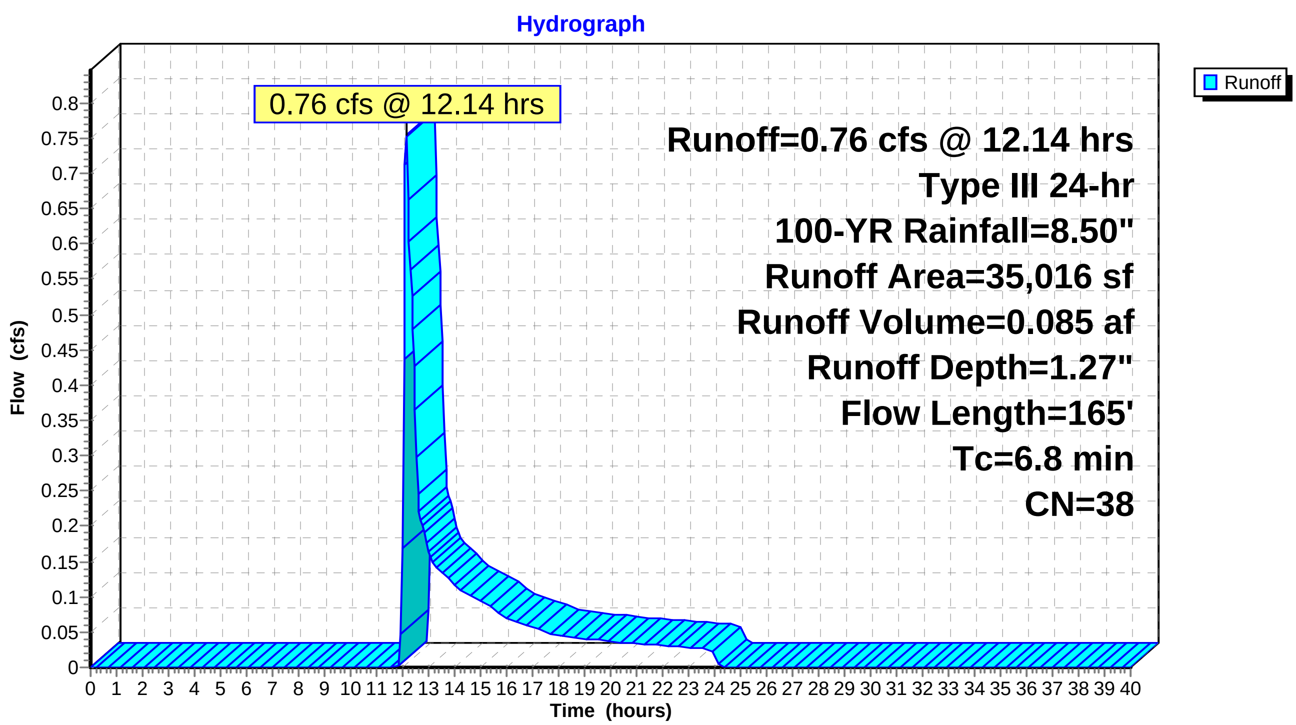
Runoff = 0.76 cfs @ 12.14 hrs, Volume= 0.085 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
31,016	39	>75% Grass cover, Good, HSG A
4,000	30	Woods, Good, HSG A
35,016	38	Weighted Average
35,016		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	115	0.1400	6.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	165	Total			

Subcatchment 11S: PR-5R



Summary for Subcatchment 12S: PR-6

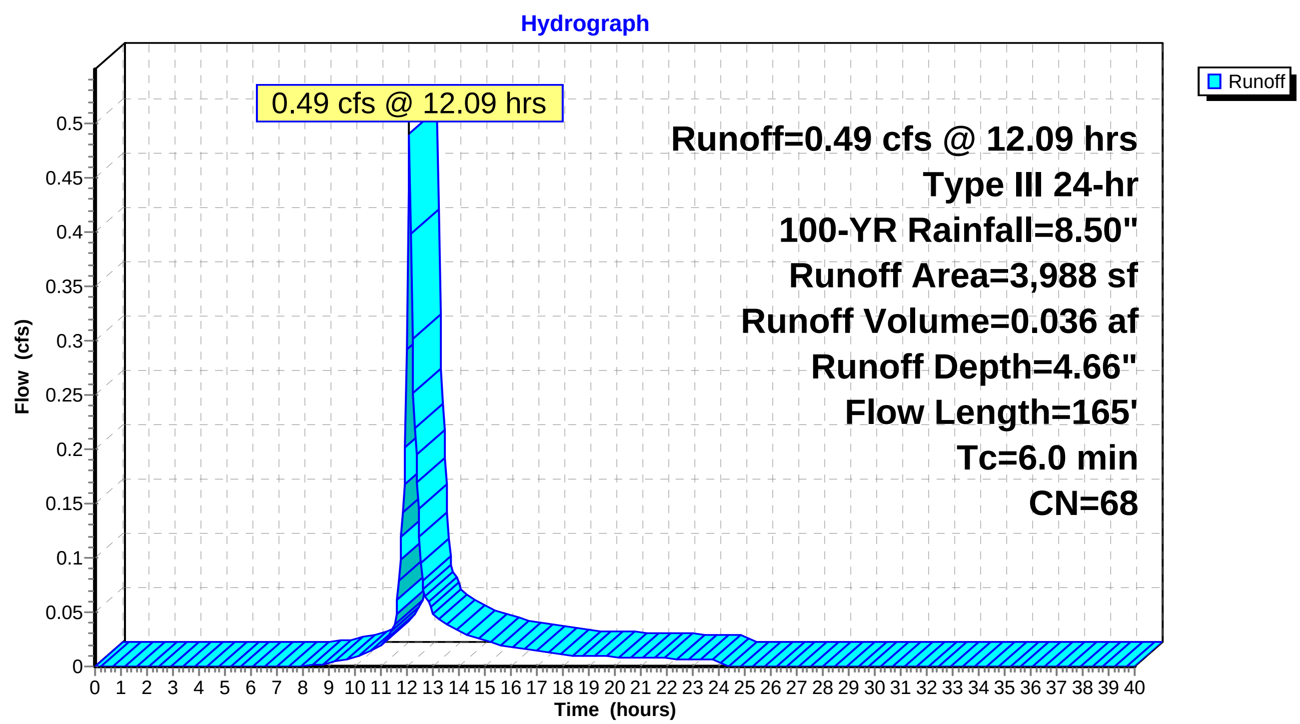
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 0.036 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
2,011	39	>75% Grass cover, Good, HSG A
1,977	98	Paved parking, HSG A
3,988	68	Weighted Average
2,011		50.43% Pervious Area
1,977		49.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	35	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	11	0.0310	3.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	119	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.0	165	Total			

Subcatchment 12S: PR-6



Summary for Subcatchment 13S: PR-7

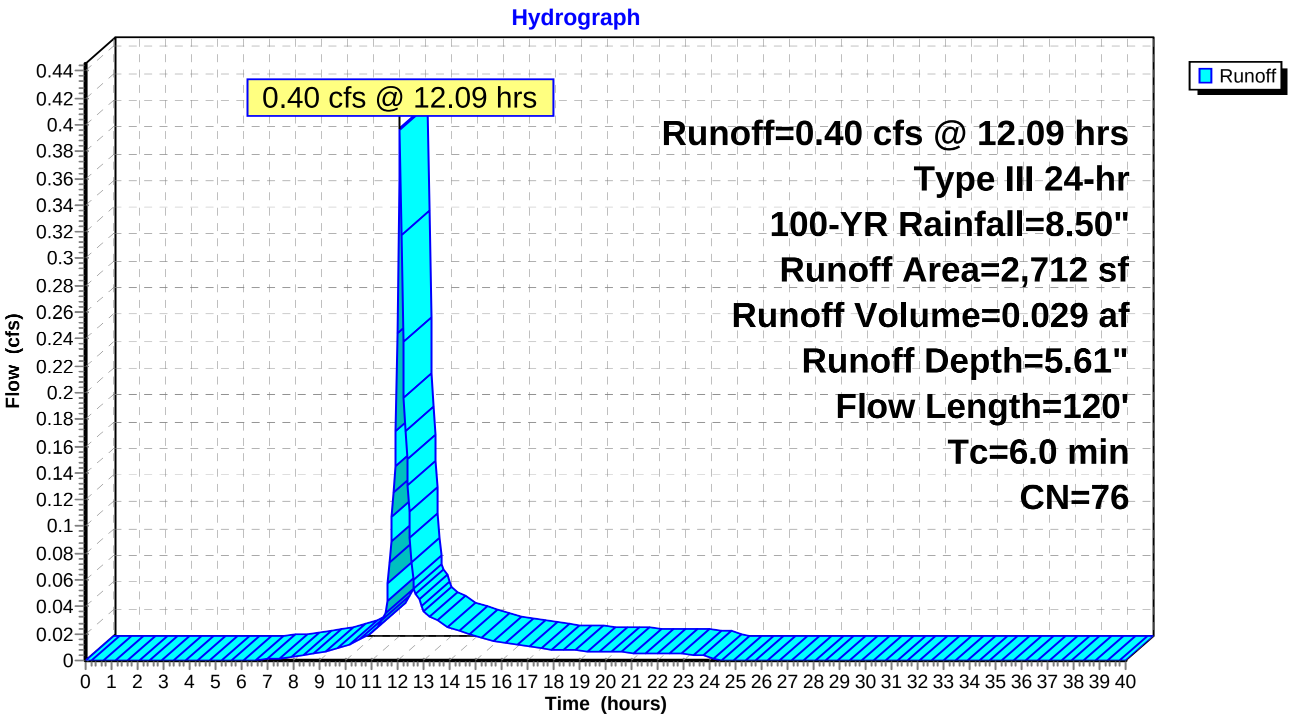
Runoff = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af, Depth= 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
1,021	39	>75% Grass cover, Good, HSG A
1,691	98	Paved parking, HSG A
2,712	76	Weighted Average
1,021		37.65% Pervious Area
1,691		62.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0310	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.3	95	0.0900	6.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	120	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13S: PR-7



Summary for Subcatchment 14S: PR-8R

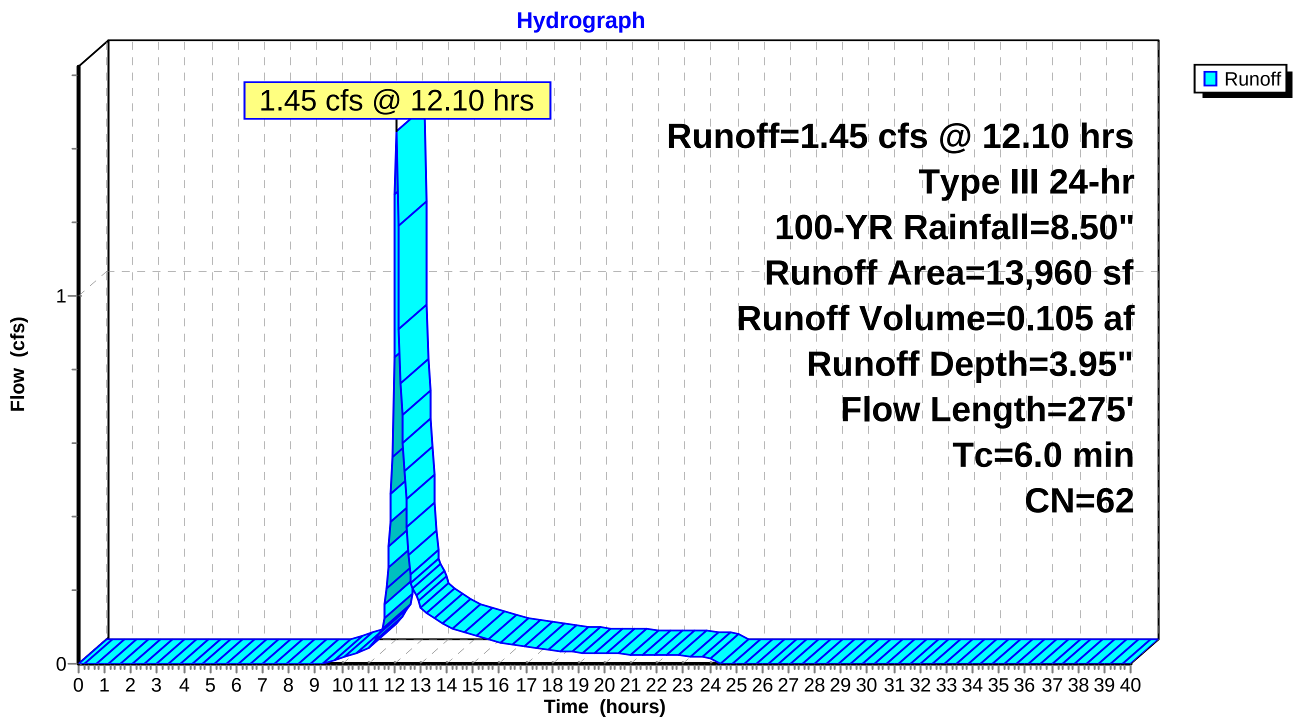
Runoff = 1.45 cfs @ 12.10 hrs, Volume= 0.105 af, Depth= 3.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
6,684	39	>75% Grass cover, Good, HSG A
2,706	98	Paved parking, HSG A
1,525	98	Paved parking, HSG B
3,045	61	>75% Grass cover, Good, HSG B
13,960	62	Weighted Average
9,729		69.69% Pervious Area
4,231		30.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.4	100	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	125	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.9	275	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 14S: PR-8R



Summary for Subcatchment 15S: PR-9R

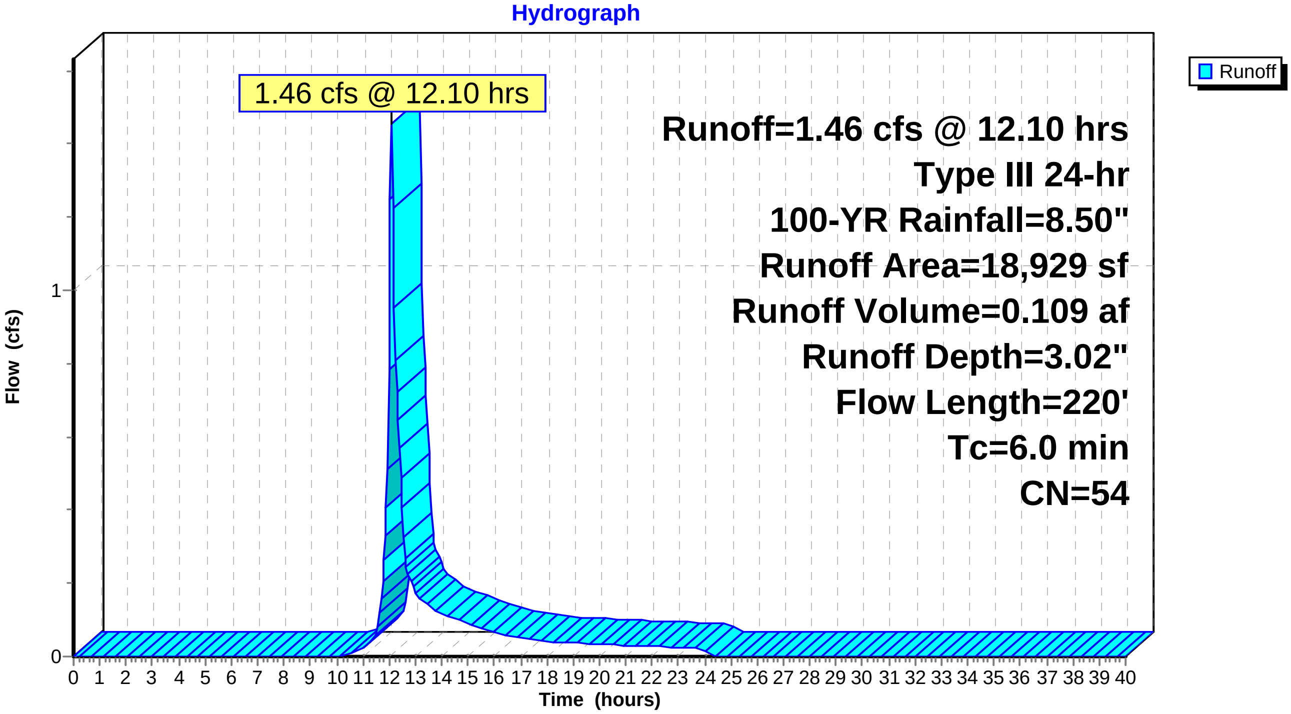
Runoff = 1.46 cfs @ 12.10 hrs, Volume= 0.109 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
11,941	39	>75% Grass cover, Good, HSG A
2,358	98	Paved parking, HSG A
1,358	98	Paved parking, HSG B
3,272	61	>75% Grass cover, Good, HSG B
18,929	54	Weighted Average
15,213		80.37% Pervious Area
3,716		19.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.0	10	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	10	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	150	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	220	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15S: PR-9R



Summary for Subcatchment 16S: PR-10R

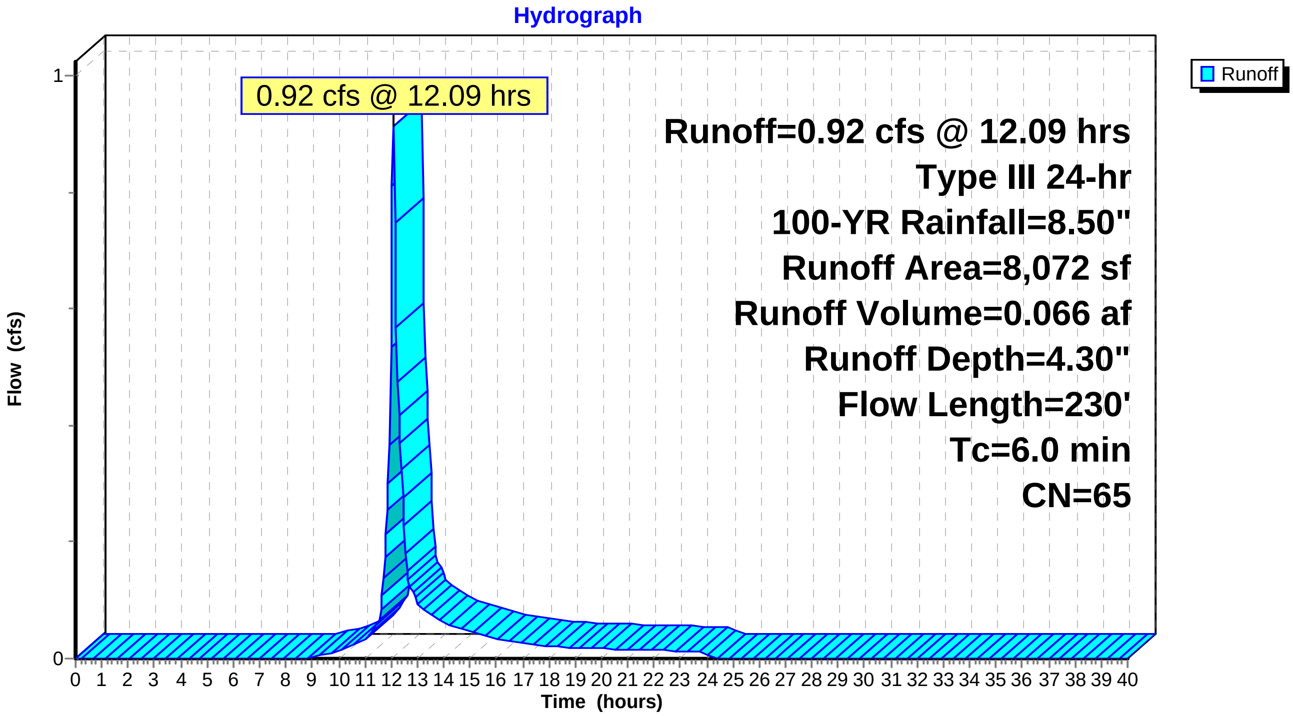
Runoff = 0.92 cfs @ 12.09 hrs, Volume= 0.066 af, Depth= 4.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
670	39	>75% Grass cover, Good, HSG A
723	30	Woods, Good, HSG A
1,898	98	Paved parking, HSG B
4,781	61	>75% Grass cover, Good, HSG B
8,072	65	Weighted Average
6,174		76.49% Pervious Area
1,898		23.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	30	0.1430	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	130	0.1770	6.77		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	20	0.0310	3.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	50	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	230	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 16S: PR-10R



Summary for Subcatchment 17S: PR-11

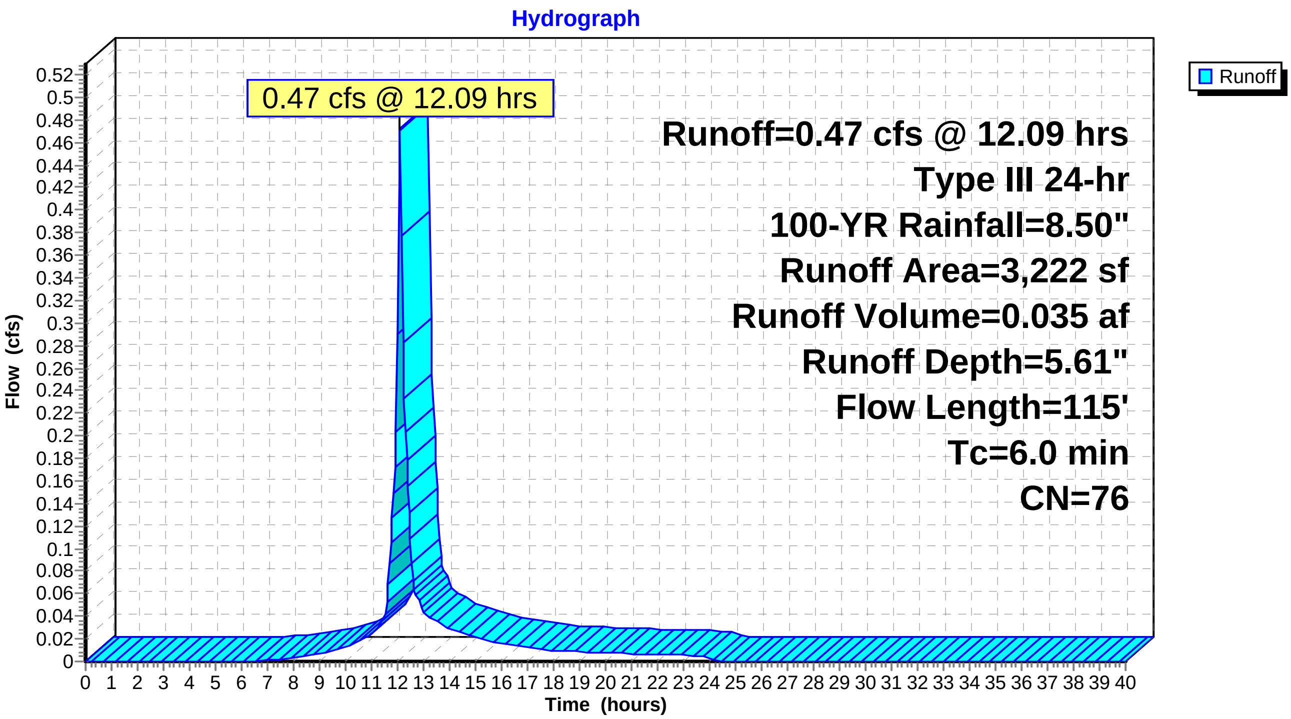
Runoff = 0.47 cfs @ 12.09 hrs, Volume= 0.035 af, Depth= 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
1,329	98	Paved parking, HSG B
1,893	61	>75% Grass cover, Good, HSG B
3,222	76	Weighted Average
1,893		58.75% Pervious Area
1,329		41.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	40	0.1550	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	20	0.0310	2.83		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	55	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	115	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 17S: PR-11



Summary for Subcatchment 19S: PR-12

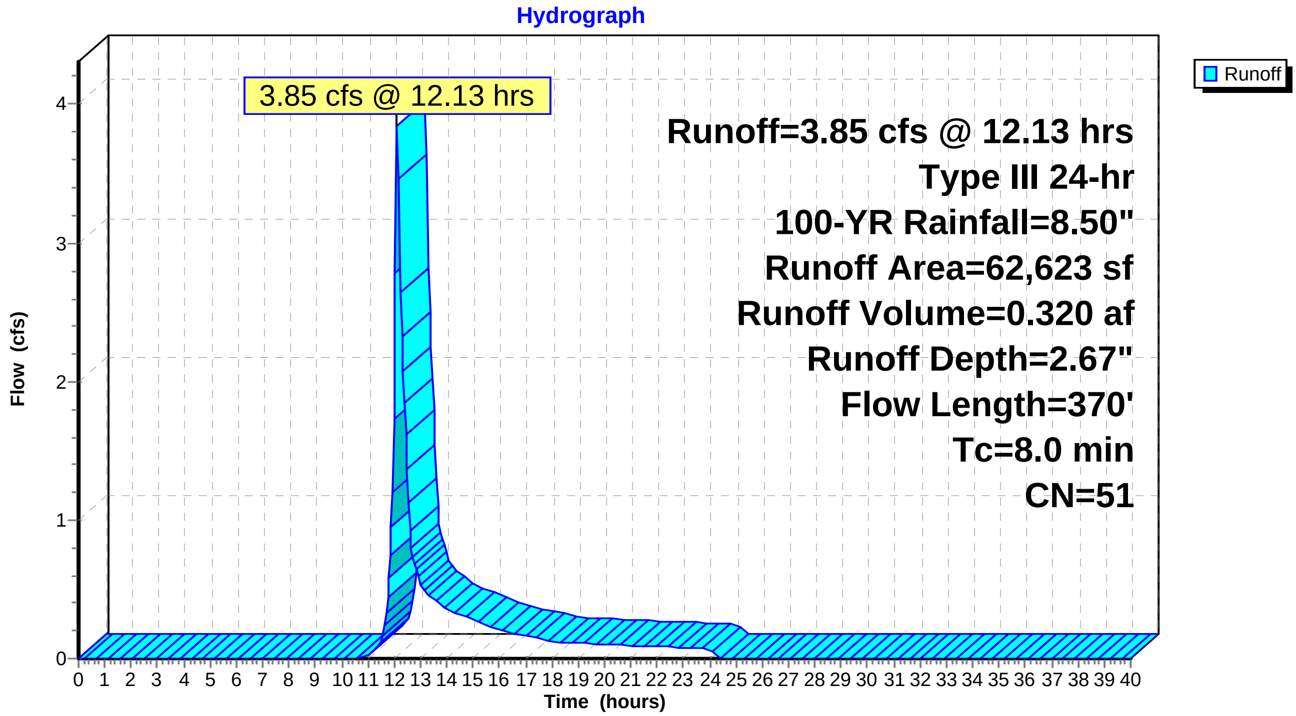
Runoff = 3.85 cfs @ 12.13 hrs, Volume= 0.320 af, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.50"

Area (sf)	CN	Description
9,300	39	>75% Grass cover, Good, HSG A
16,800	61	>75% Grass cover, Good, HSG B
7,412	30	Woods, Good, HSG A
29,111	55	Woods, Good, HSG B
62,623	51	Weighted Average
62,623		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	100	0.1330	5.87		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	205	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	15	0.3300	9.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.0	370	Total			

Subcatchment 19S: PR-12



Summary for Pond 1P: Stormwater Management Area #1

Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 4.09" for 100-YR event
Inflow = 2.65 cfs @ 12.09 hrs, Volume= 0.208 af
Outflow = 1.20 cfs @ 12.31 hrs, Volume= 0.208 af, Atten= 54%, Lag= 12.8 min
Discarded = 0.08 cfs @ 12.31 hrs, Volume= 0.061 af
Primary = 1.13 cfs @ 12.31 hrs, Volume= 0.147 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 120.47' @ 12.31 hrs Surf.Area= 1,413 sf Storage= 1,840 cf

Plug-Flow detention time= 44.4 min calculated for 0.208 af (100% of inflow)
Center-of-Mass det. time= 44.6 min (860.3 - 815.7)

Volume	Invert	Avail.Storage	Storage Description
#1	118.30'	4,746 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

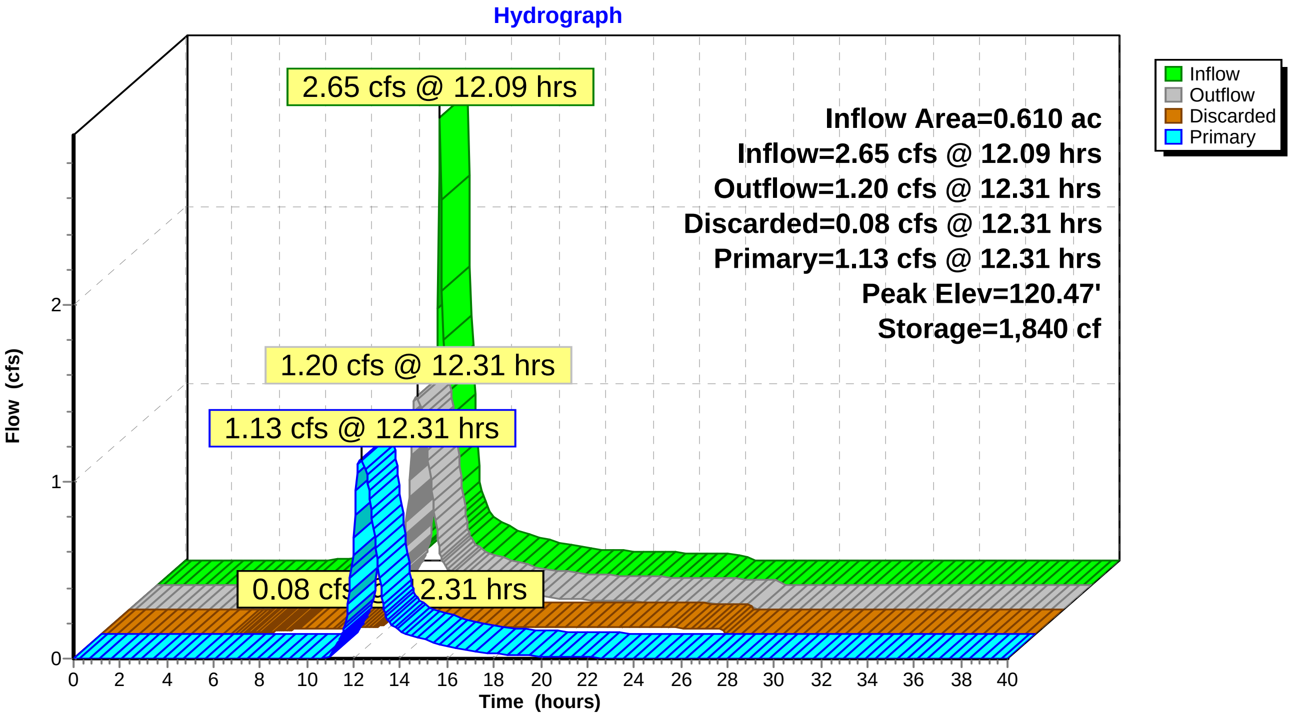
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.30	530	0	0
118.80	660	298	298
119.30	800	365	663
119.80	960	440	1,103
120.30	1,130	523	1,625
120.70	1,800	586	2,211
121.00	4,800	990	3,201
121.30	5,500	1,545	4,746

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**12.0" Round Culvert** L= 41.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 117.00' / 116.59' S= 0.0100 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Device 1	118.80'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Discarded	118.30'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.08 cfs @ 12.31 hrs HW=120.47' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=1.13 cfs @ 12.31 hrs HW=120.47' TW=109.85' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.13 cfs of 6.51 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 1.13 cfs @ 5.73 fps)

Pond 1P: Stormwater Management Area #1



Summary for Pond 2P: Stormwater Management Area #2

Inflow Area = 1.330 ac, 24.38% Impervious, Inflow Depth = 3.34" for 100-YR event
Inflow = 4.00 cfs @ 12.10 hrs, Volume= 0.370 af
Outflow = 2.85 cfs @ 12.24 hrs, Volume= 0.361 af, Atten= 29%, Lag= 8.4 min
Discarded = 0.06 cfs @ 12.24 hrs, Volume= 0.122 af
Secondary = 2.78 cfs @ 12.24 hrs, Volume= 0.239 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 74.62' @ 12.24 hrs Surf.Area= 2,657 sf Storage= 3,850 cf

Plug-Flow detention time= 216.7 min calculated for 0.361 af (97% of inflow)
Center-of-Mass det. time= 202.3 min (1,027.5 - 825.2)

Volume	Invert	Avail.Storage	Storage Description
#1	72.60'	7,534 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

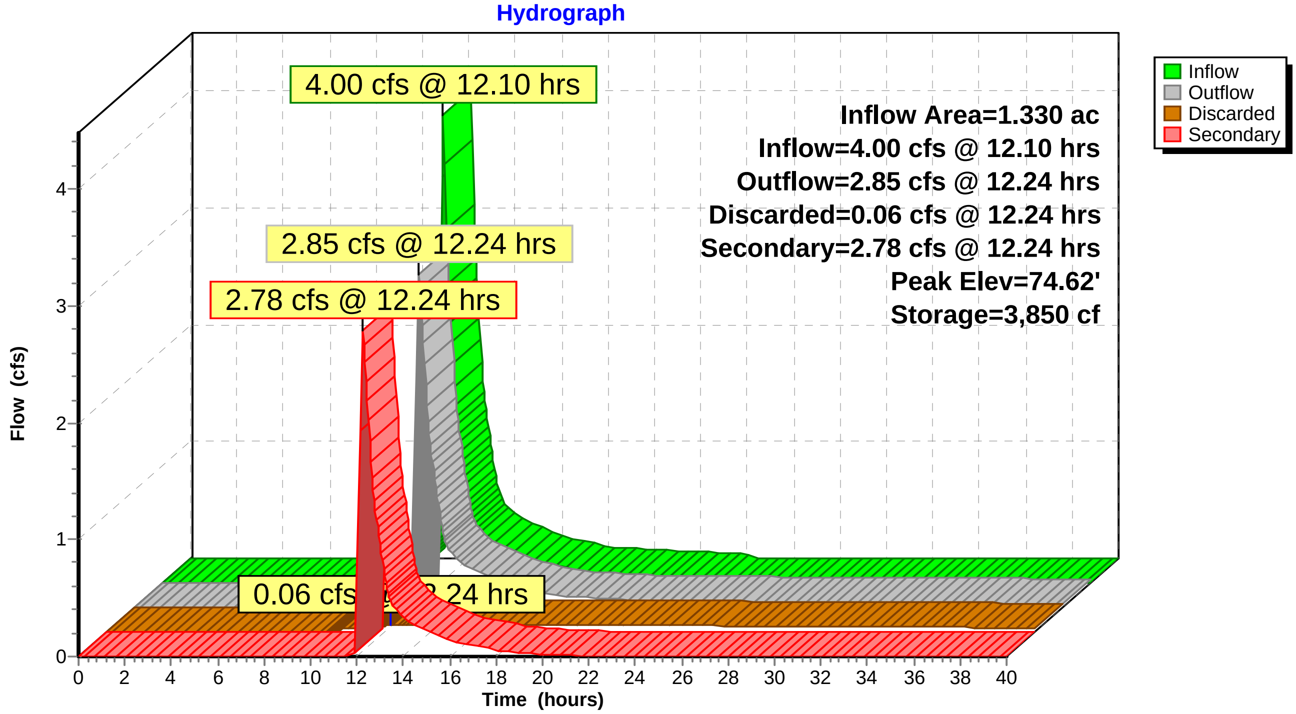
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.60	1,150	0	0
73.00	1,470	524	524
74.00	2,170	1,820	2,344
75.00	2,950	2,560	4,904
75.80	3,625	2,630	7,534

Device	Routing	Invert	Outlet Devices
#1	Discarded	72.60'	**1.020 in/hr Exfiltration over Surface area**
#2	Secondary	74.30'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.06 cfs @ 12.24 hrs HW=74.62' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Secondary OutFlow Max=2.77 cfs @ 12.24 hrs HW=74.62' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 2.77 cfs @ 1.43 fps)

Pond 2P: Stormwater Management Area #2



Summary for Pond 3P: Stormwater Management Area #3

[80] Warning: Exceeded Pond 18P by 0.34' @ 24.45 hrs (0.46 cfs 0.018 af)

Inflow Area =	1.014 ac, 25.29% Impervious,	Inflow Depth = 3.73"	for 100-YR event
Inflow =	4.29 cfs @ 12.10 hrs,	Volume=	0.316 af
Outflow =	1.78 cfs @ 12.35 hrs,	Volume=	0.316 af, Atten= 58%, Lag= 15.5 min
Discarded =	0.05 cfs @ 10.75 hrs,	Volume=	0.102 af
Primary =	1.73 cfs @ 12.35 hrs,	Volume=	0.214 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 99.40' @ 12.35 hrs Surf.Area= 2,102 sf Storage= 3,926 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 153.8 min (994.1 - 840.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	96.77'	1,779 cf	**35.33'W x 59.50'L x 3.54'H Field A** 7,446 cf Overall - 2,999 cf Embedded = 4,447 cf x 40.0% Voids
#2A	97.27'	2,999 cf	**Cultec R-330XLHD** x 56 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		4,778 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	96.77'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	98.00'	**8.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.00' / 95.92' S= 0.0462 '/' Cc= 0.900 n= 0.010, Flow Area= 0.35 sf

Discarded OutFlow Max=0.05 cfs @ 10.75 hrs HW=96.81' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=1.73 cfs @ 12.35 hrs HW=99.40' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 1.73 cfs @ 4.96 fps)

Pond 3P: Stormwater Management Area #3 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 7 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

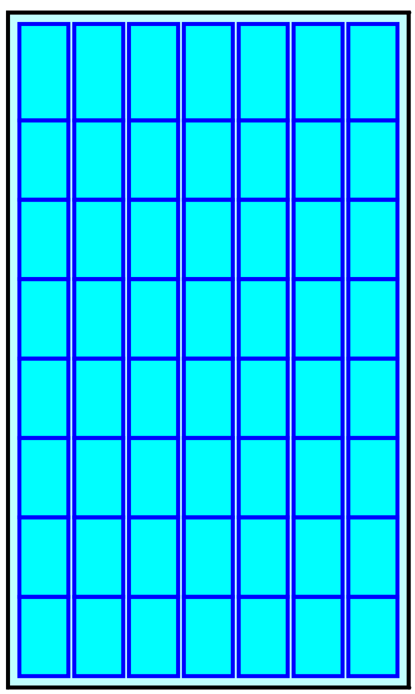
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
7 Rows x 52.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 35.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

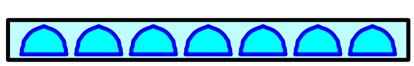
56 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 7 Rows = 2,999.0 cf Chamber Storage

7,445.8 cf Field - 2,999.0 cf Chambers = 4,446.7 cf Stone x 40.0% Voids = 1,778.7 cf Stone Storage

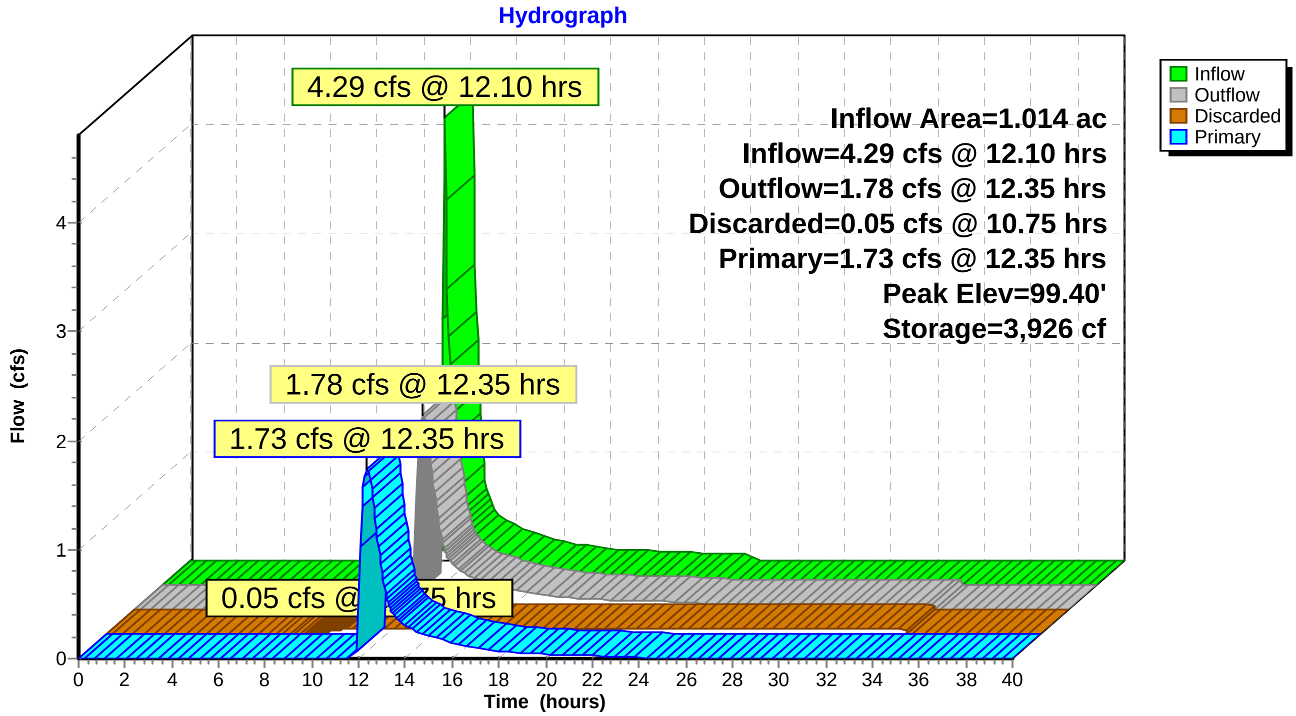
Chamber Storage + Stone Storage = 4,777.7 cf = 0.110 af
Overall Storage Efficiency = 64.2%
Overall System Size = 59.50' x 35.33' x 3.54'

56 Chambers
275.8 cy Field
164.7 cy Stone





Pond 3P: Stormwater Management Area #3



Summary for Pond 4P: Stormwater Management Area #4

Inflow Area = 1.533 ac, 5.49% Impervious, Inflow Depth = 0.91" for 100-YR event
Inflow = 1.03 cfs @ 12.39 hrs, Volume= 0.117 af
Outflow = 0.67 cfs @ 12.57 hrs, Volume= 0.117 af, Atten= 35%, Lag= 10.8 min
Discarded = 0.08 cfs @ 12.57 hrs, Volume= 0.077 af
Secondary = 0.59 cfs @ 12.57 hrs, Volume= 0.040 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 108.62' @ 12.57 hrs Surf.Area= 1,448 sf Storage= 1,287 cf

Plug-Flow detention time= 142.8 min calculated for 0.117 af (100% of inflow)
Center-of-Mass det. time= 143.1 min (1,020.6 - 877.5)

Volume	Invert	Avail.Storage	Storage Description
#1	106.80'	3,728 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

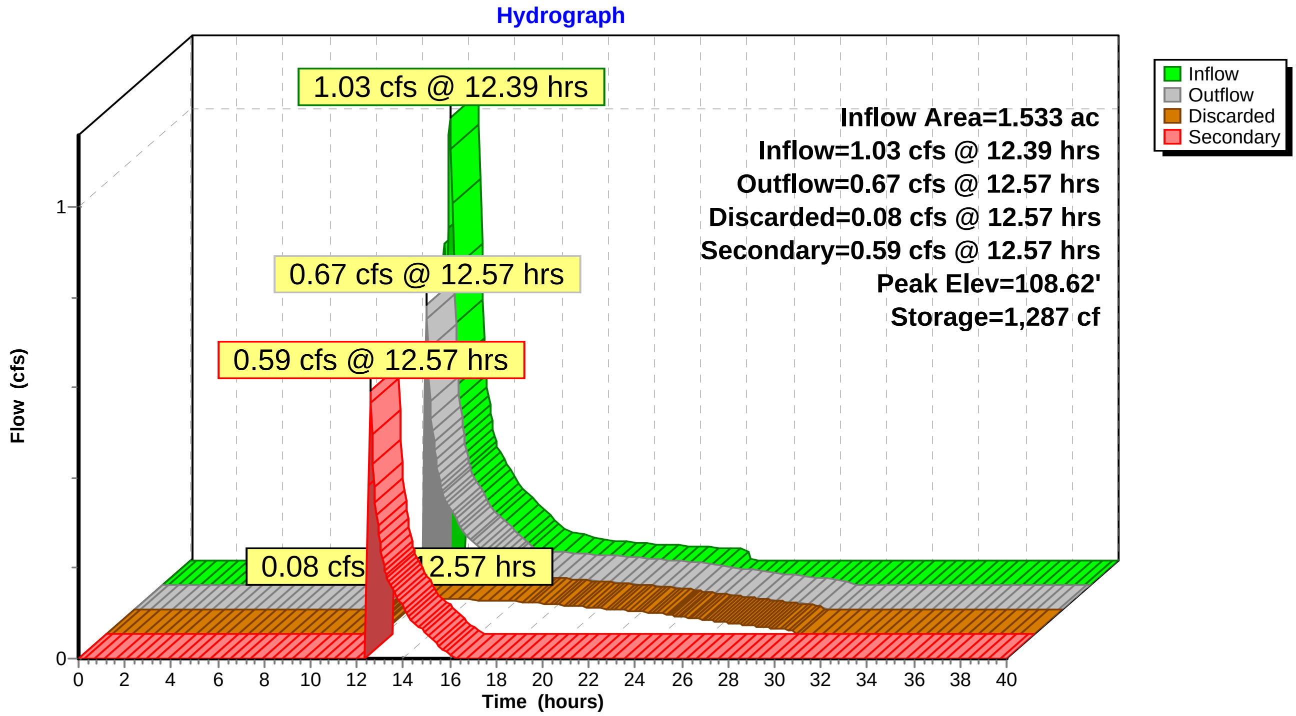
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
106.80	150	0	0
107.00	240	39	39
107.80	690	372	411
108.00	880	157	568
109.00	1,800	1,340	1,908
109.80	2,750	1,820	3,728

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	108.50'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.08 cfs @ 12.57 hrs HW=108.61' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Secondary OutFlow Max=0.57 cfs @ 12.57 hrs HW=108.61' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.57 cfs @ 0.83 fps)

Pond 4P: Stormwater Management Area #4



Summary for Pond 5P: Stormwater Management Area #5

Inflow Area = 0.729 ac, 11.55% Impervious, Inflow Depth = 2.15" for 100-YR event
Inflow = 1.52 cfs @ 12.10 hrs, Volume= 0.130 af
Outflow = 0.65 cfs @ 12.42 hrs, Volume= 0.131 af, Atten= 57%, Lag= 18.8 min
Discarded = 0.09 cfs @ 12.42 hrs, Volume= 0.099 af
Primary = 0.56 cfs @ 12.42 hrs, Volume= 0.031 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 110.41' @ 12.42 hrs Surf.Area= 1,634 sf Storage= 1,633 cf

Plug-Flow detention time= 168.4 min calculated for 0.130 af (100% of inflow)
Center-of-Mass det. time= 168.6 min (1,030.8 - 862.2)

Volume	Invert	Avail.Storage	Storage Description
#1	108.80'	4,689 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

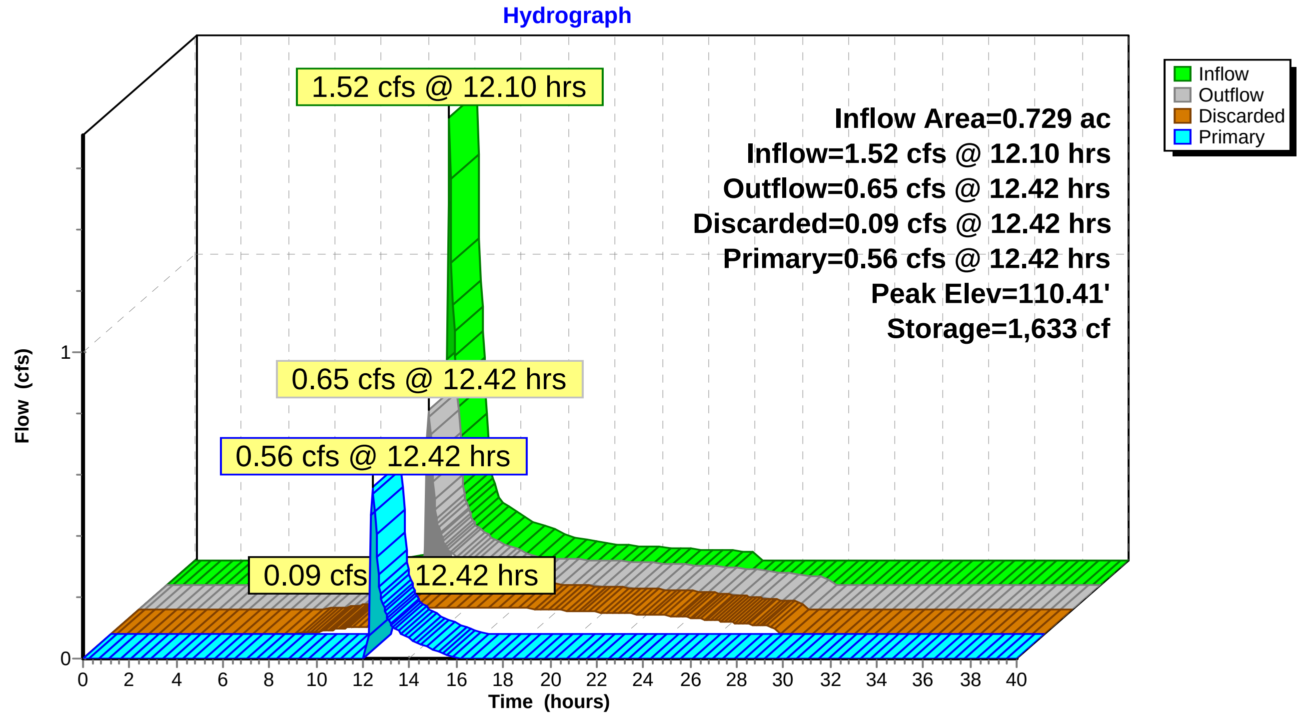
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
108.80	420	0	0
109.00	560	98	98
110.00	1,300	930	1,028
111.00	2,110	1,705	2,733
111.80	2,780	1,956	4,689

Device	Routing	Invert	Outlet Devices
#1	Discarded	108.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	110.30'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.09 cfs @ 12.42 hrs HW=110.41' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.55 cfs @ 12.42 hrs HW=110.41' TW=108.42' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.55 cfs @ 0.82 fps)

Pond 5P: Stormwater Management Area #5



Summary for Pond 6P: Stormwater Management Area #6

Inflow Area = 1.438 ac, 0.00% Impervious, Inflow Depth = 2.67" for 100-YR event
Inflow = 3.85 cfs @ 12.13 hrs, Volume= 0.320 af
Outflow = 3.83 cfs @ 12.15 hrs, Volume= 0.317 af, Atten= 0%, Lag= 1.5 min
Discarded = 0.02 cfs @ 12.15 hrs, Volume= 0.035 af
Primary = 3.81 cfs @ 12.15 hrs, Volume= 0.282 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 79.40' @ 12.15 hrs Surf.Area= 938 sf Storage= 1,164 cf

Plug-Flow detention time= 66.3 min calculated for 0.317 af (99% of inflow)
Center-of-Mass det. time= 61.8 min (927.6 - 865.8)

Volume	Invert	Avail.Storage	Storage Description
#1	77.00'	2,540 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

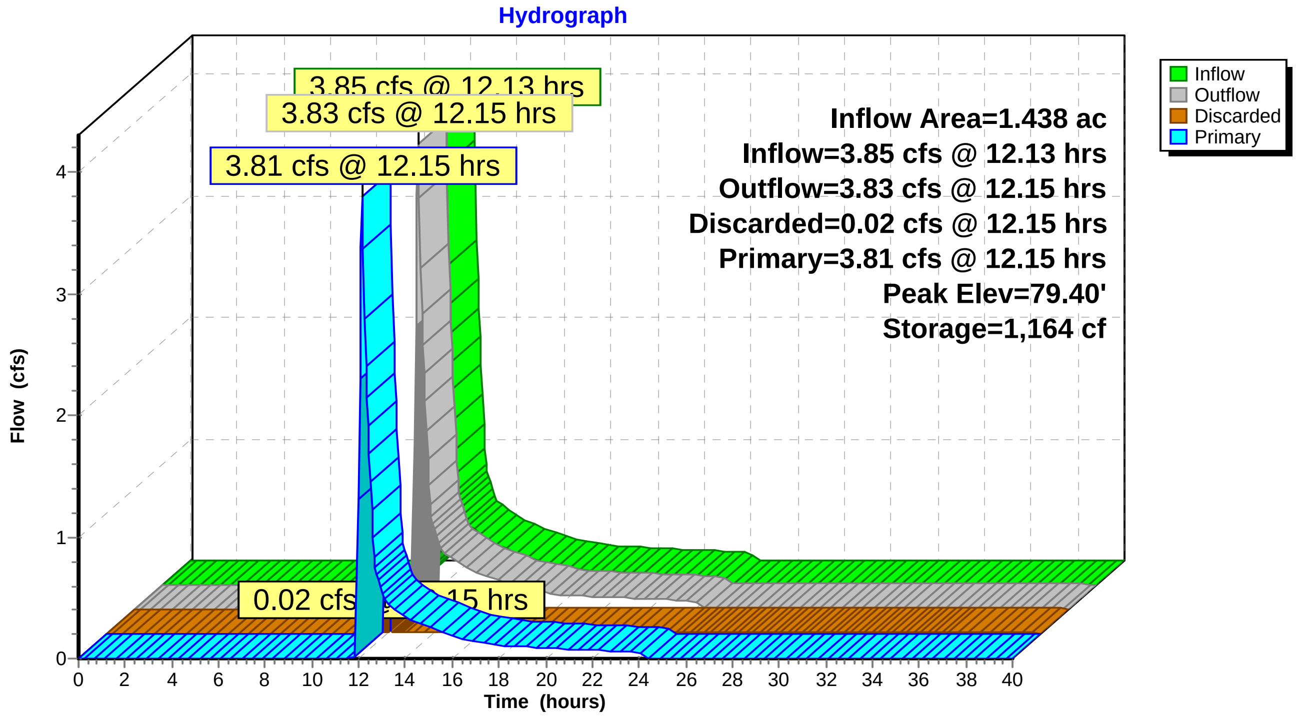
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.00	115	0	0
78.00	390	253	253
79.00	760	575	828
80.00	1,210	985	1,813
80.50	1,700	728	2,540

Device	Routing	Invert	Outlet Devices
#1	Discarded	77.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	79.00'	**6.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Discarded OutFlow Max=0.02 cfs @ 12.15 hrs HW=79.40' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=3.80 cfs @ 12.15 hrs HW=79.40' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 3.80 cfs @ 1.60 fps)

Pond 6P: Stormwater Management Area #6



Summary for Pond 7P: DMH

[57] Hint: Peaked at 109.85' (Flood elevation advised)

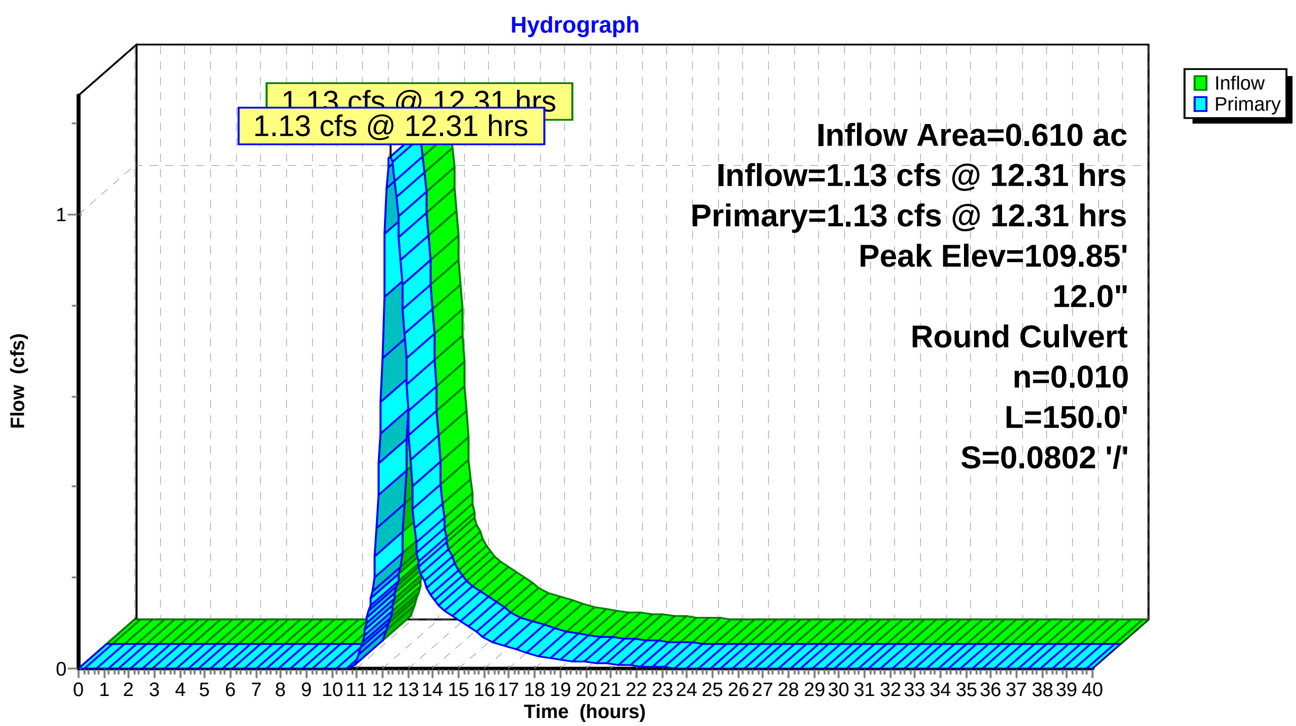
Inflow Area =	0.610 ac, 39.78% Impervious, Inflow Depth = 2.90"	for 100-YR event	
Inflow =	1.13 cfs @ 12.31 hrs, Volume=	0.147 af	
Outflow =	1.13 cfs @ 12.31 hrs, Volume=	0.147 af, Atten= 0%, Lag= 0.0 min	
Primary =	1.13 cfs @ 12.31 hrs, Volume=	0.147 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 109.85' @ 12.31 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	109.30'	**12.0" Round Culvert** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.30' / 97.27' S= 0.0802 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.13 cfs @ 12.31 hrs HW=109.85' TW=89.02' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.13 cfs @ 2.53 fps)

Pond 7P: DMH



Summary for Pond 8P: DMH

[57] Hint: Peaked at 89.02' (Flood elevation advised)

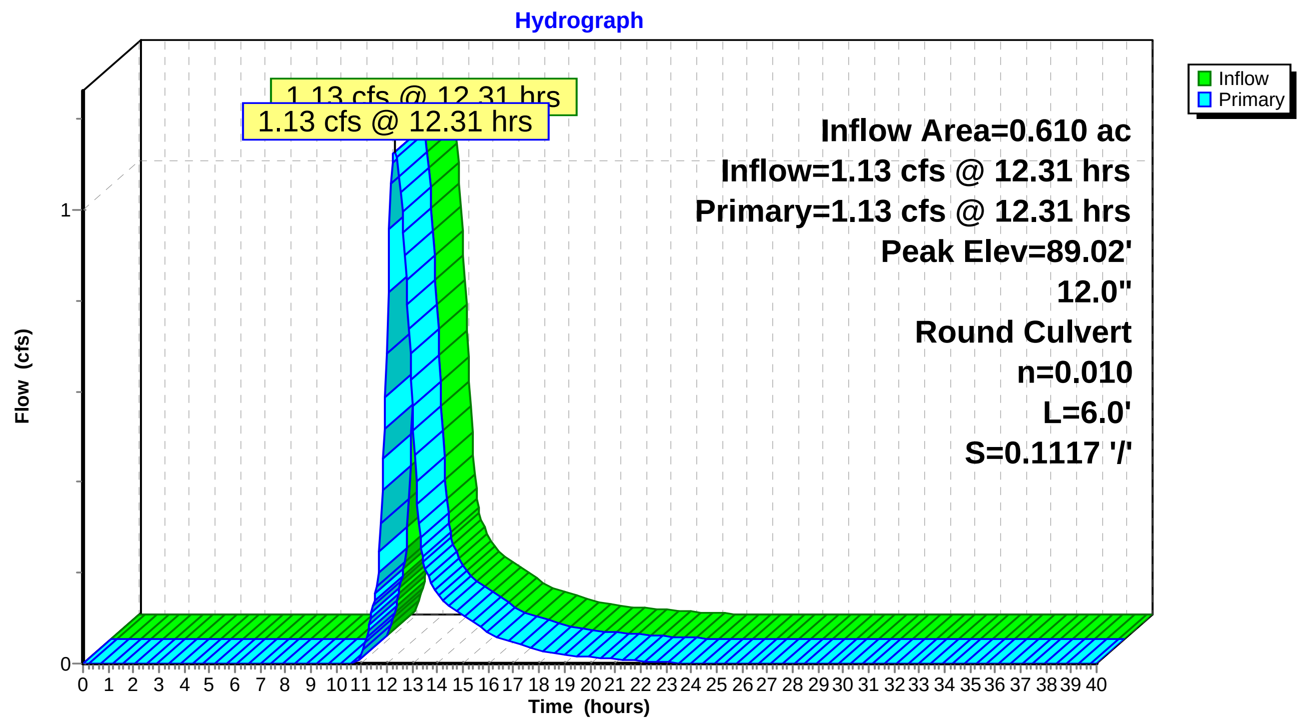
Inflow Area = 0.610 ac, 39.78% Impervious, Inflow Depth = 2.90" for 100-YR event
Inflow = 1.13 cfs @ 12.31 hrs, Volume= 0.147 af
Outflow = 1.13 cfs @ 12.31 hrs, Volume= 0.147 af, Atten= 0%, Lag= 0.0 min
Primary = 1.13 cfs @ 12.31 hrs, Volume= 0.147 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 89.02' @ 12.31 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	88.47'	**12.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 88.47' / 87.80' S= 0.1117 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.13 cfs @ 12.31 hrs HW=89.02' TW=74.61' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 1.13 cfs @ 2.53 fps)

Pond 8P: DMH



Summary for Pond 9P: CB 2+85 RT

[57] Hint: Peaked at 115.53' (Flood elevation advised)

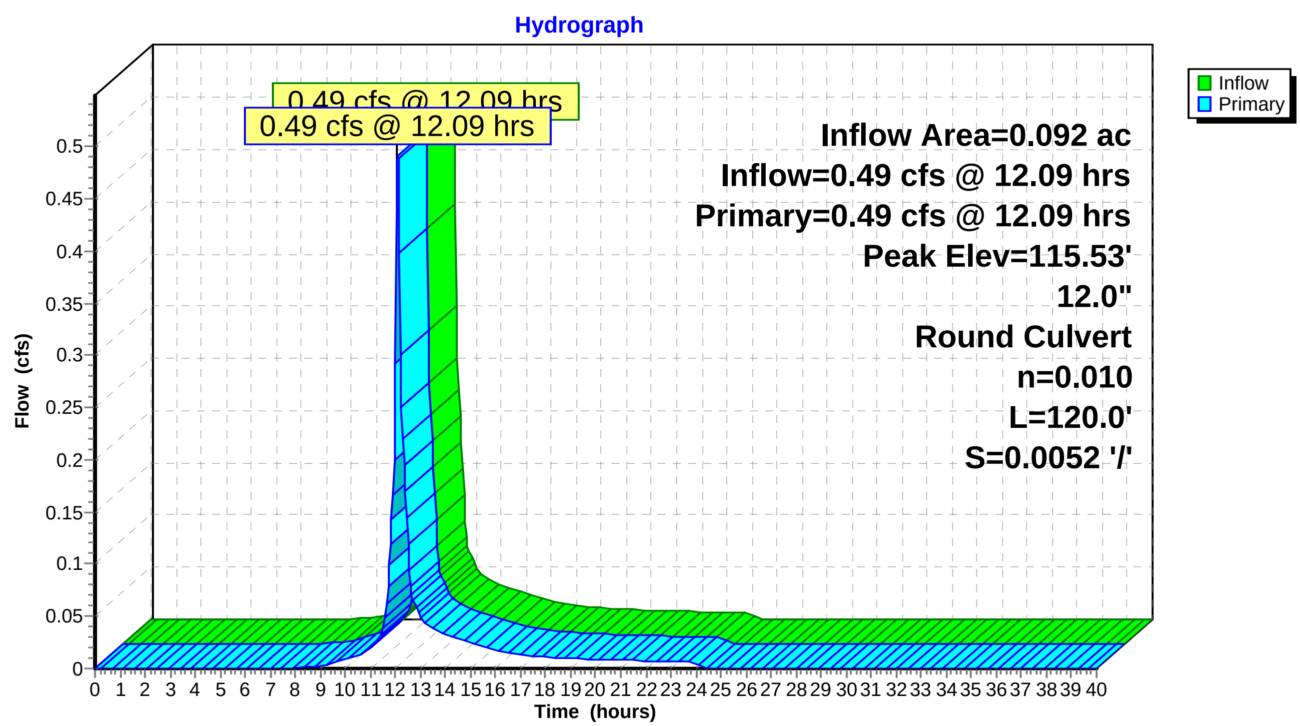
Inflow Area = 0.092 ac, 49.57% Impervious, Inflow Depth = 4.66" for 100-YR event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 0.036 af
Outflow = 0.49 cfs @ 12.09 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min
Primary = 0.49 cfs @ 12.09 hrs, Volume= 0.036 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 115.53' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.17'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.17' / 114.54' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.48 cfs @ 12.09 hrs HW=115.53' TW=114.82' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.48 cfs @ 2.84 fps)

Pond 9P: CB 2+85 RT



Summary for Pond 10P: DMH 4+11

[57] Hint: Peaked at 114.82' (Flood elevation advised)

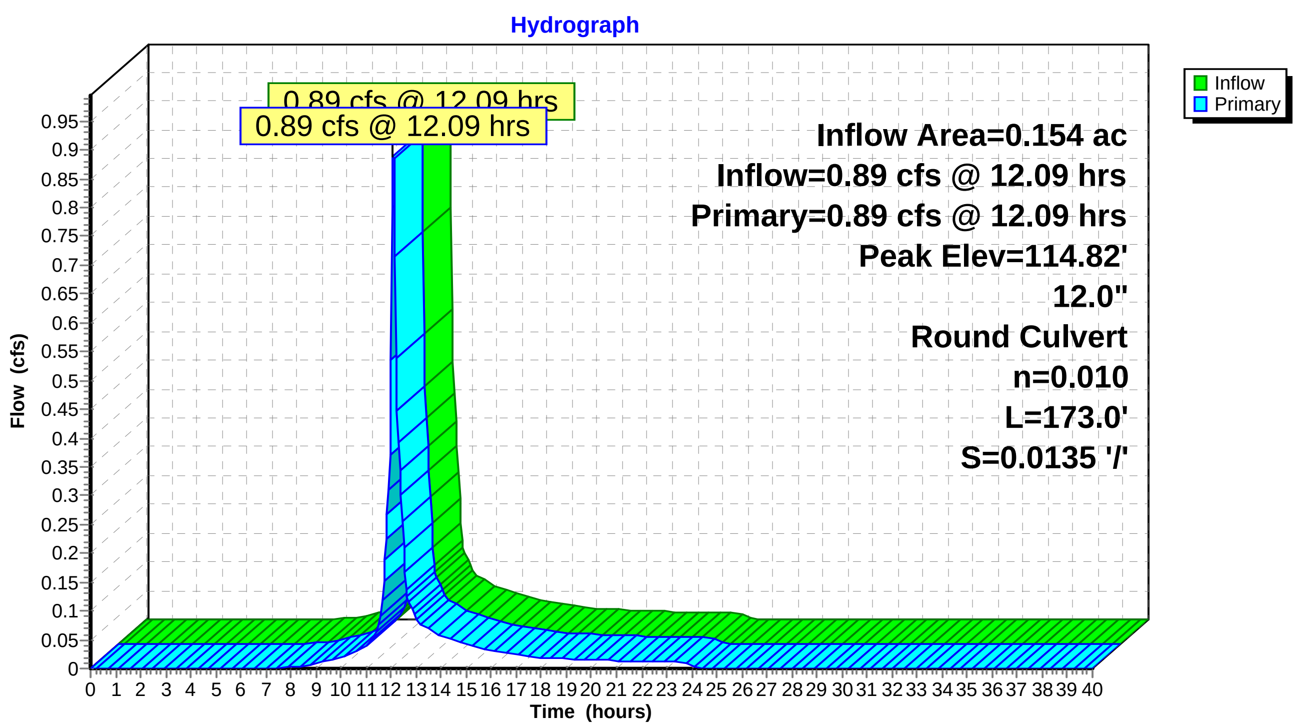
Inflow Area =	0.154 ac, 54.75% Impervious,	Inflow Depth = 5.05"	for 100-YR event
Inflow =	0.89 cfs @ 12.09 hrs,	Volume=	0.065 af
Outflow =	0.89 cfs @ 12.09 hrs,	Volume=	0.065 af, Atten= 0%, Lag= 0.0 min
Primary =	0.89 cfs @ 12.09 hrs,	Volume=	0.065 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 114.82' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	114.34'	**12.0" Round Culvert** L= 173.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 114.34' / 112.00' S= 0.0135 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.87 cfs @ 12.09 hrs HW=114.82' TW=109.80' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.87 cfs @ 2.35 fps)

Pond 10P: DMH 4+11



Summary for Pond 11P: CB 2+85 LT

[57] Hint: Peaked at 115.50' (Flood elevation advised)

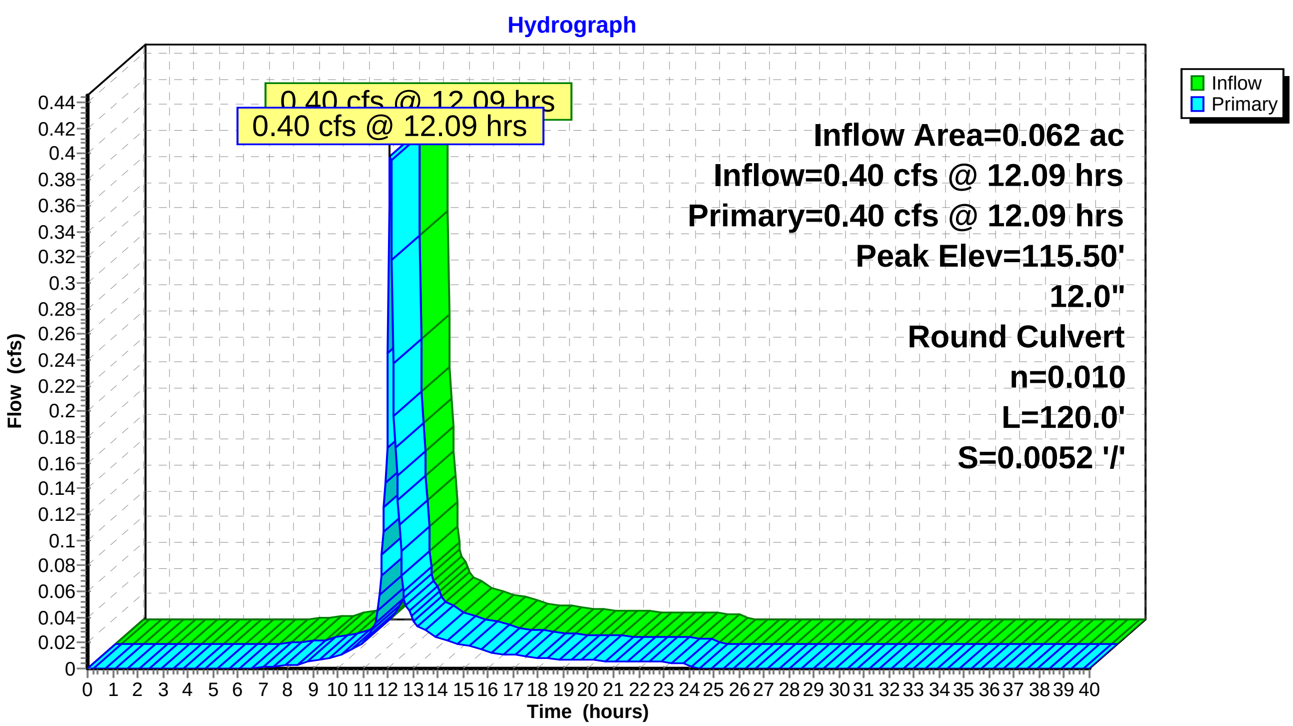
Inflow Area = 0.062 ac, 62.35% Impervious, Inflow Depth = 5.61" for 100-YR event
Inflow = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af
Outflow = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min
Primary = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 115.50' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.17'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.17' / 114.54' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 12.09 hrs HW=115.49' TW=114.82' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 0.39 cfs @ 2.65 fps)

Pond 11P: CB 2+85 LT



Summary for Pond 12P: CB 1+0 RT

[57] Hint: Peaked at 101.92' (Flood elevation advised)

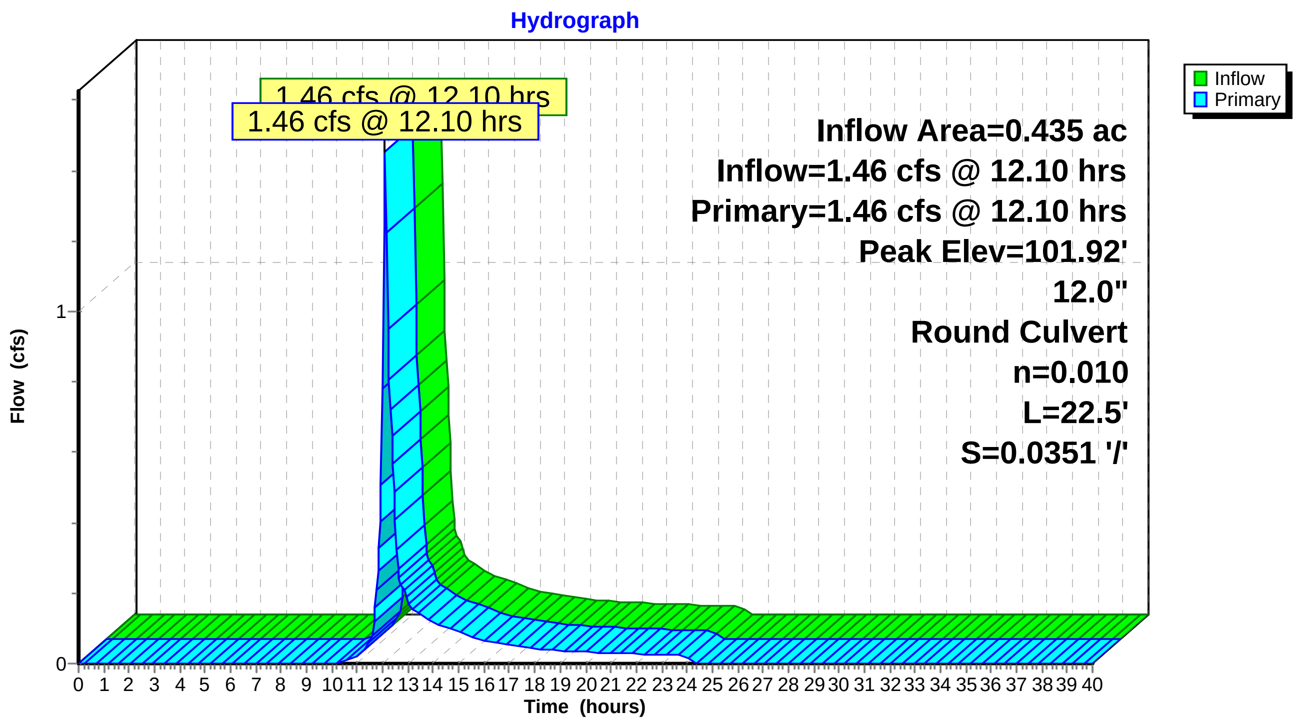
Inflow Area = 0.435 ac, 19.63% Impervious, Inflow Depth = 3.02" for 100-YR event
Inflow = 1.46 cfs @ 12.10 hrs, Volume= 0.109 af
Outflow = 1.46 cfs @ 12.10 hrs, Volume= 0.109 af, Atten= 0%, Lag= 0.0 min
Primary = 1.46 cfs @ 12.10 hrs, Volume= 0.109 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.92' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.27'	**12.0" Round Culvert** L= 22.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.27' / 100.48' S= 0.0351 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.38 cfs @ 12.10 hrs HW=101.91' TW=101.51' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.38 cfs @ 3.67 fps)

Pond 12P: CB 1+0 RT



Summary for Pond 13P: CB 1+0 LT

[57] Hint: Peaked at 101.91' (Flood elevation advised)

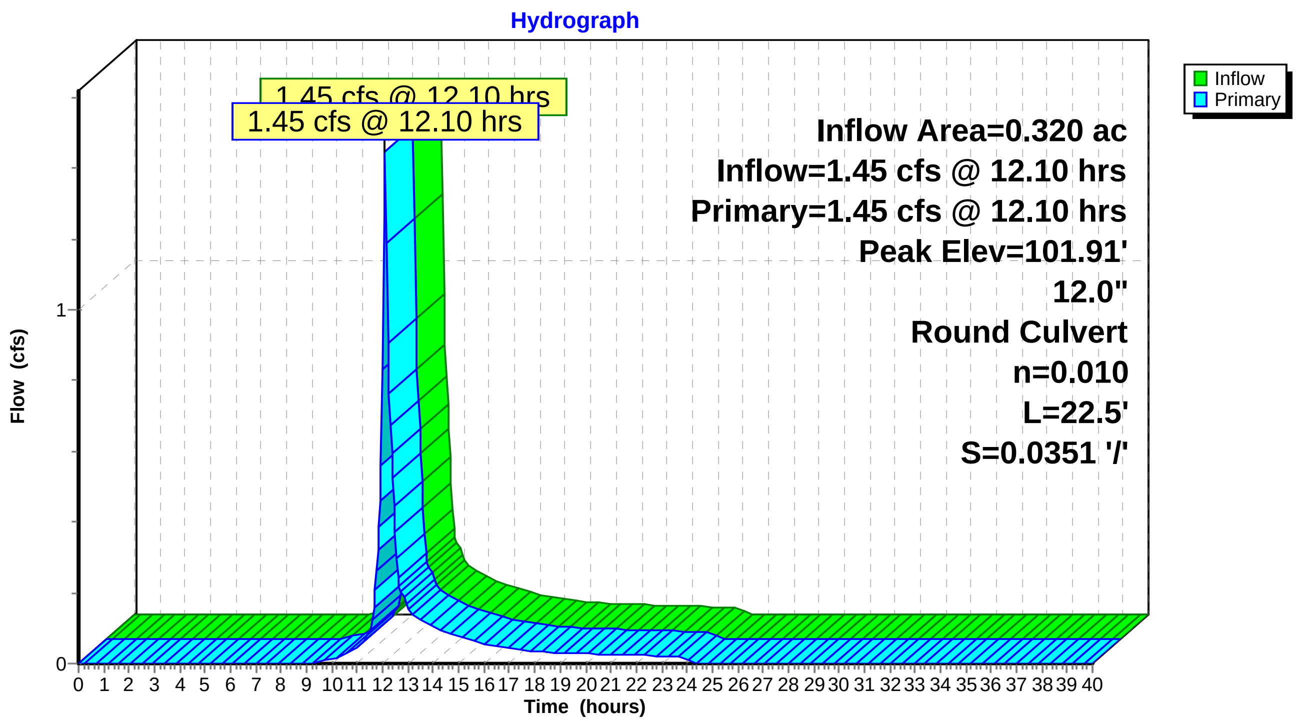
Inflow Area =	0.320 ac, 30.31% Impervious,	Inflow Depth = 3.95"	for 100-YR event
Inflow =	1.45 cfs @ 12.10 hrs,	Volume=	0.105 af
Outflow =	1.45 cfs @ 12.10 hrs,	Volume=	0.105 af, Atten= 0%, Lag= 0.0 min
Primary =	1.45 cfs @ 12.10 hrs,	Volume=	0.105 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.91' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.27'	**12.0" Round Culvert** L= 22.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.27' / 100.48' S= 0.0351 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.38 cfs @ 12.10 hrs HW=101.91' TW=101.50' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.38 cfs @ 3.70 fps)

Pond 13P: CB 1+0 LT



Summary for Pond 14P: DMH 0+75

[57] Hint: Peaked at 101.52' (Flood elevation advised)

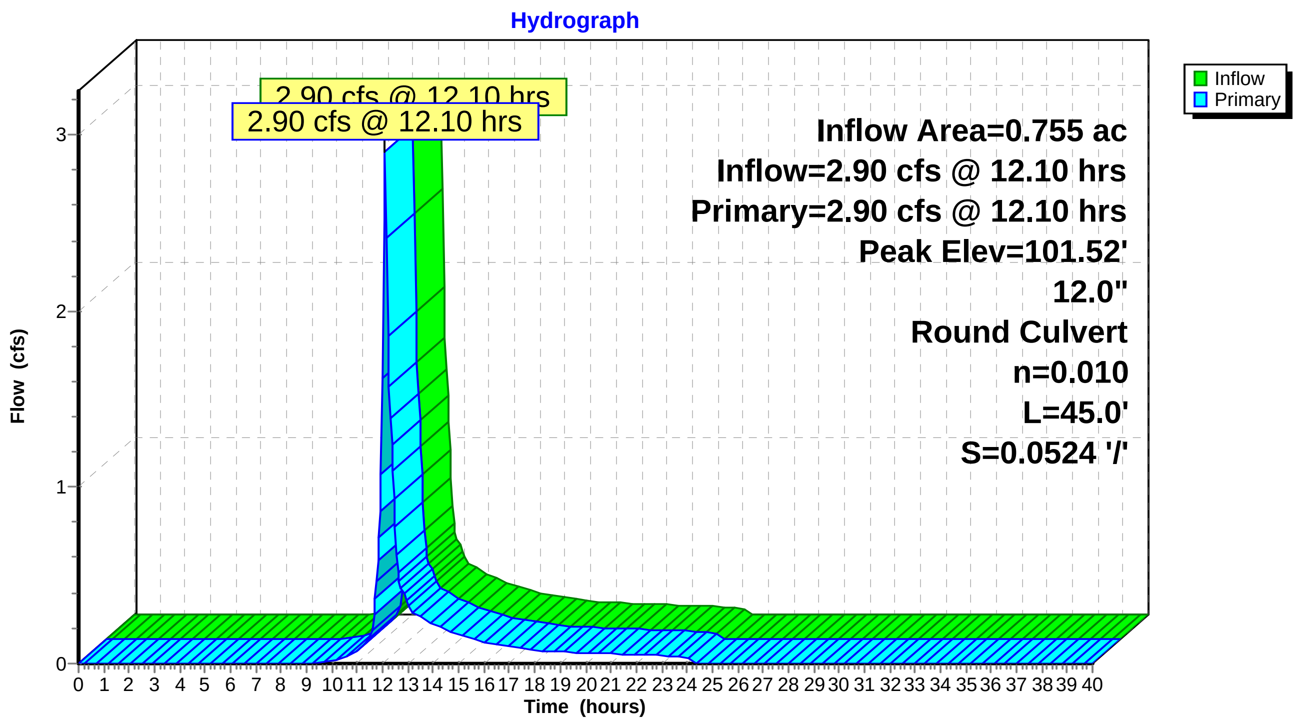
Inflow Area = 0.755 ac, 24.16% Impervious, Inflow Depth = 3.41" for 100-YR event
Inflow = 2.90 cfs @ 12.10 hrs, Volume= 0.215 af
Outflow = 2.90 cfs @ 12.10 hrs, Volume= 0.215 af, Atten= 0%, Lag= 0.0 min
Primary = 2.90 cfs @ 12.10 hrs, Volume= 0.215 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.52' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	100.38'	**12.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 100.38' / 98.02' S= 0.0524 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.00 cfs @ 12.10 hrs HW=101.50' TW=101.22' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.00 cfs @ 2.55 fps)

Pond 14P: DMH 0+75



Summary for Pond 15P: DMH 0+25

[57] Hint: Peaked at 101.30' (Flood elevation advised)
[80] Warning: Exceeded Pond 16P by 0.29' @ 12.10 hrs (2.05 cfs 0.038 af)
[80] Warning: Exceeded Pond 17P by 0.34' @ 12.10 hrs (2.20 cfs 0.041 af)

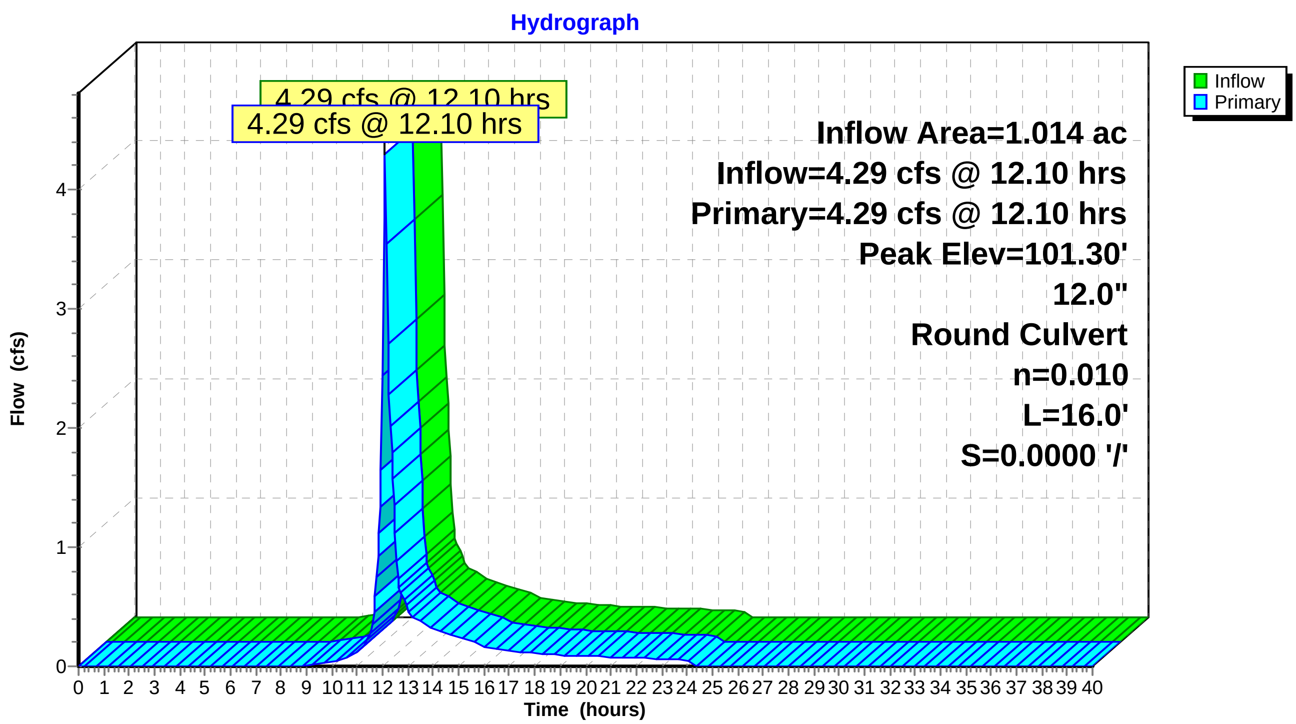
Inflow Area = 1.014 ac, 25.29% Impervious, Inflow Depth = 3.73" for 100-YR event
Inflow = 4.29 cfs @ 12.10 hrs, Volume= 0.316 af
Outflow = 4.29 cfs @ 12.10 hrs, Volume= 0.316 af, Atten= 0%, Lag= 0.0 min
Primary = 4.29 cfs @ 12.10 hrs, Volume= 0.316 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.30' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.92'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.92' / 97.92' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=4.24 cfs @ 12.10 hrs HW=101.20' TW=99.94' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 4.24 cfs @ 5.40 fps)

Pond 15P: DMH 0+25



Summary for Pond 16P: CB 0+08 LT

[57] Hint: Peaked at 100.99' (Flood elevation advised)

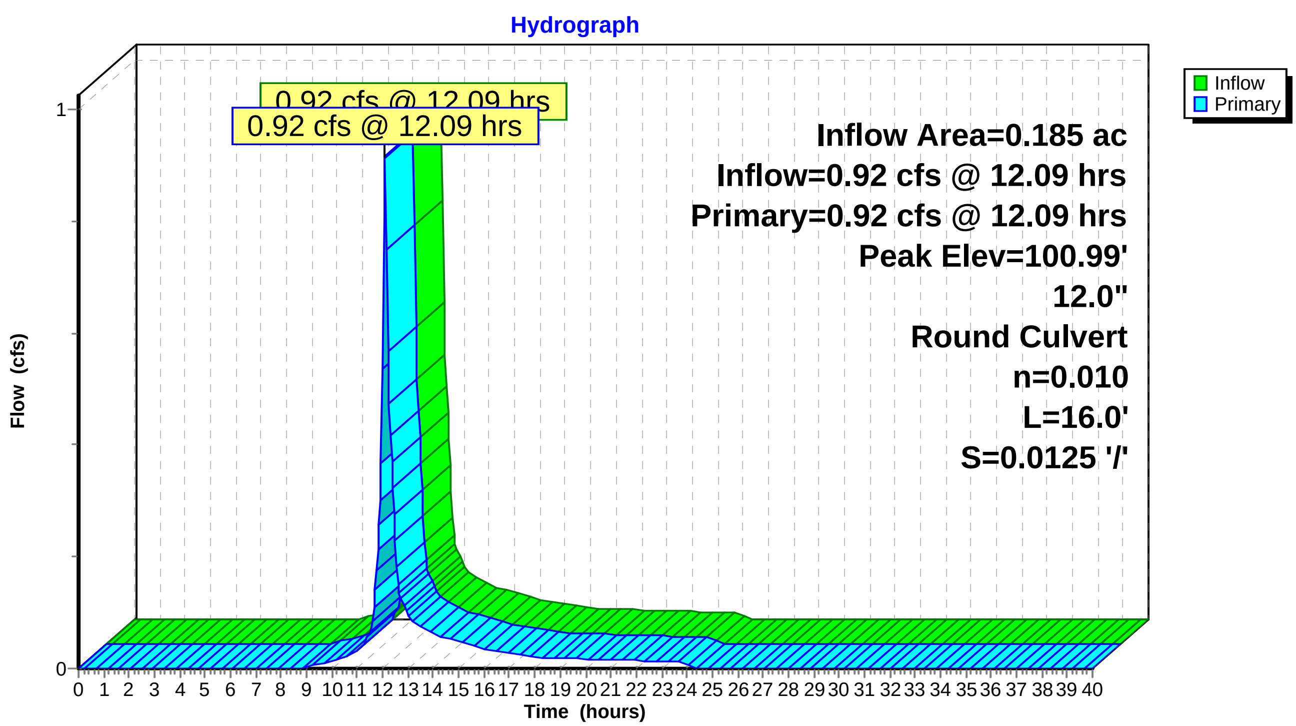
Inflow Area = 0.185 ac, 23.51% Impervious, Inflow Depth = 4.30" for 100-YR event
Inflow = 0.92 cfs @ 12.09 hrs, Volume= 0.066 af
Outflow = 0.92 cfs @ 12.09 hrs, Volume= 0.066 af, Atten= 0%, Lag= 0.0 min
Primary = 0.92 cfs @ 12.09 hrs, Volume= 0.066 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 100.99' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.22'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.22' / 98.02' S= 0.0125 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=100.89' TW=101.17' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)

Pond 16P: CB 0+08 LT



Summary for Pond 17P: CB 0+08 RT

[57] Hint: Peaked at 100.95' (Flood elevation advised)

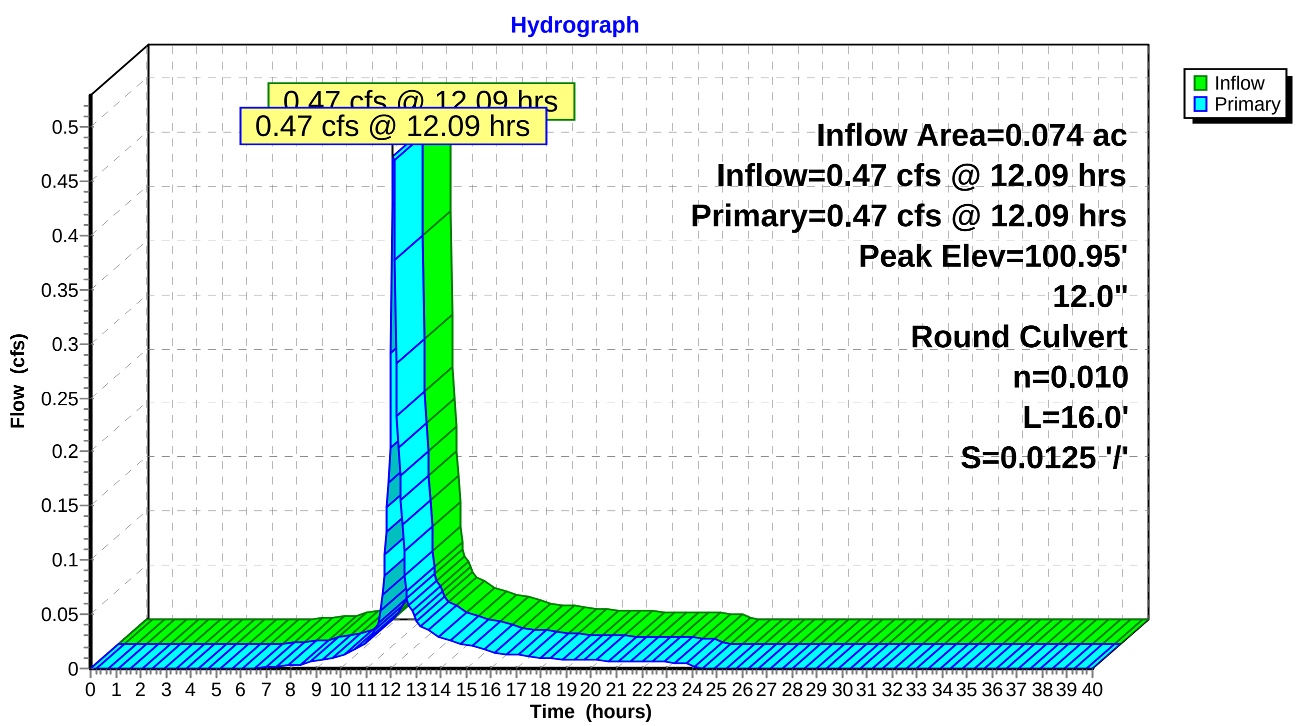
Inflow Area = 0.074 ac, 41.25% Impervious, Inflow Depth = 5.61" for 100-YR event
Inflow = 0.47 cfs @ 12.09 hrs, Volume= 0.035 af
Outflow = 0.47 cfs @ 12.09 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min
Primary = 0.47 cfs @ 12.09 hrs, Volume= 0.035 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 100.95' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.22'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.22' / 98.02' S= 0.0125 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=100.80' TW=101.10' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond 17P: CB 0+08 RT



Summary for Pond 18P: SOS

[57] Hint: Peaked at 100.05' (Flood elevation advised)
[80] Warning: Exceeded Pond 15P by 0.08' @ 24.50 hrs (0.01 cfs 0.000 af)

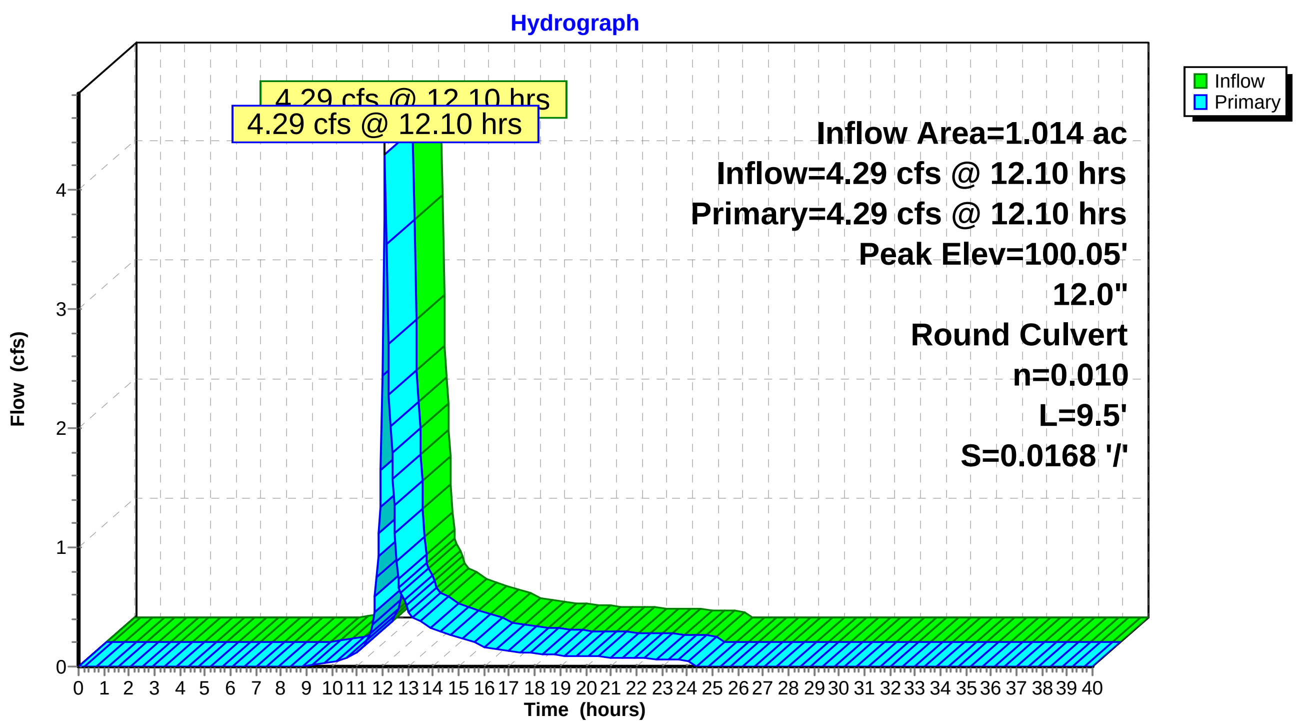
Inflow Area = 1.014 ac, 25.29% Impervious, Inflow Depth = 3.73" for 100-YR event
Inflow = 4.29 cfs @ 12.10 hrs, Volume= 0.316 af
Outflow = 4.29 cfs @ 12.10 hrs, Volume= 0.316 af, Atten= 0%, Lag= 0.0 min
Primary = 4.29 cfs @ 12.10 hrs, Volume= 0.316 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 100.05' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.68'	**12.0" Round Culvert** L= 9.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.68' / 97.52' S= 0.0168 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=4.24 cfs @ 12.10 hrs HW=99.94' TW=98.68' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 4.24 cfs @ 5.40 fps)

Pond 18P: SOS

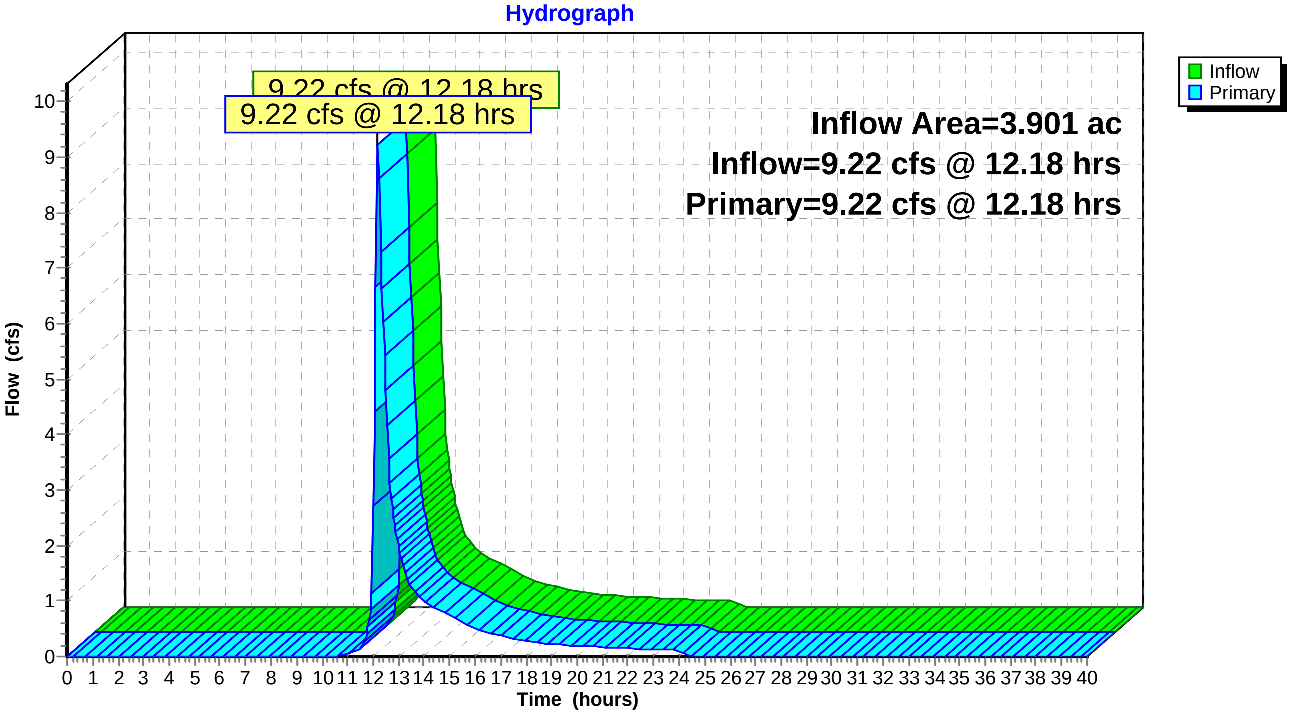


Summary for Link 1L: Flow towards wetlands

Inflow Area = 3.901 ac, 8.31% Impervious, Inflow Depth = 2.48" for 100-YR event
Inflow = 9.22 cfs @ 12.18 hrs, Volume= 0.805 af
Primary = 9.22 cfs @ 12.18 hrs, Volume= 0.805 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L: Flow towards wetlands

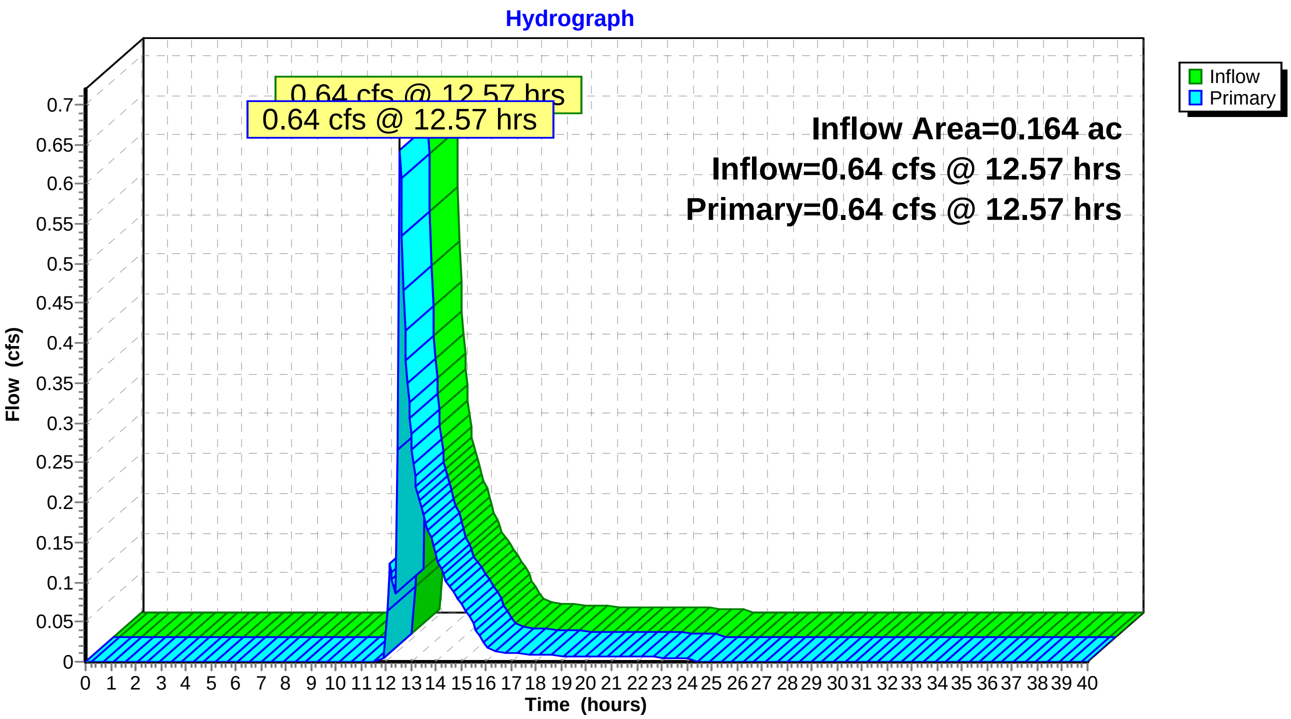


Summary for Link 2L: flow to the north

Inflow Area = 0.164 ac, 0.00% Impervious, Inflow Depth = 4.06" for 100-YR event
Inflow = 0.64 cfs @ 12.57 hrs, Volume= 0.055 af
Primary = 0.64 cfs @ 12.57 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L: flow to the north

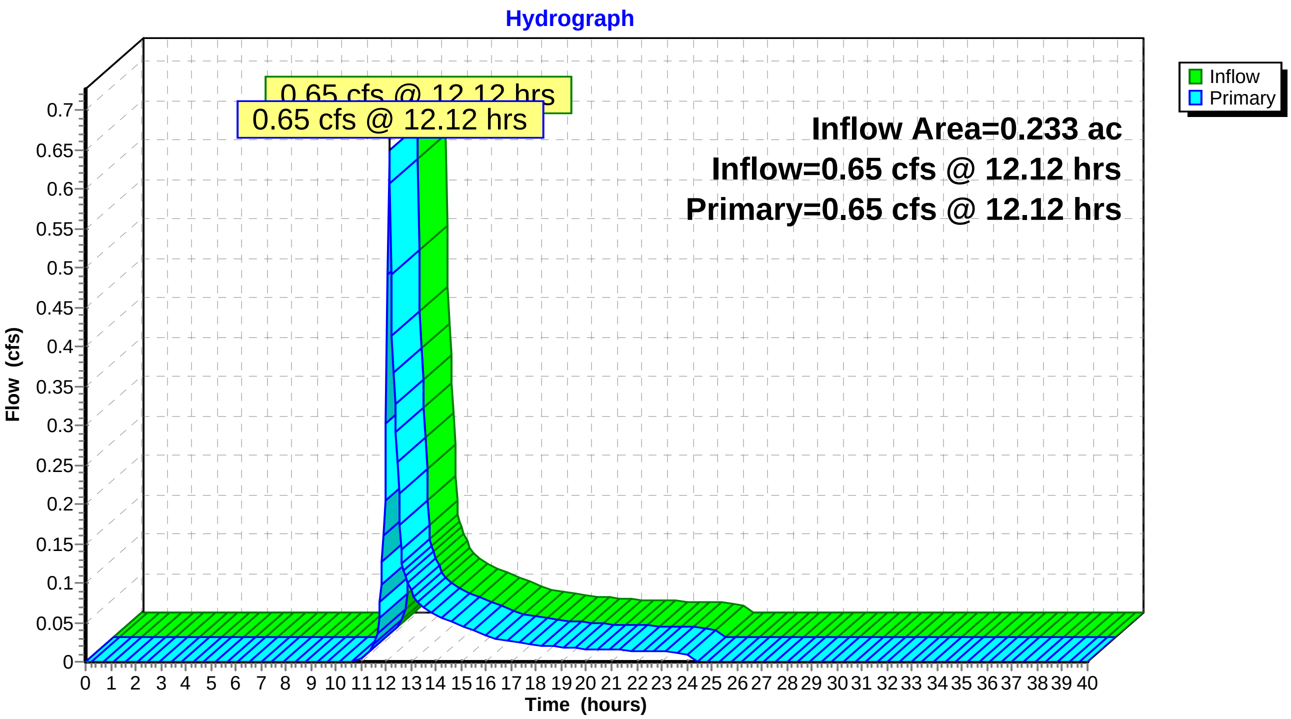


Summary for Link 3L: Flow to existing cb on north-side of Elm Street

Inflow Area = 0.233 ac, 0.00% Impervious, Inflow Depth = 2.67" for 100-YR event
Inflow = 0.65 cfs @ 12.12 hrs, Volume= 0.052 af
Primary = 0.65 cfs @ 12.12 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L: Flow to existing cb on north-side of Elm Street

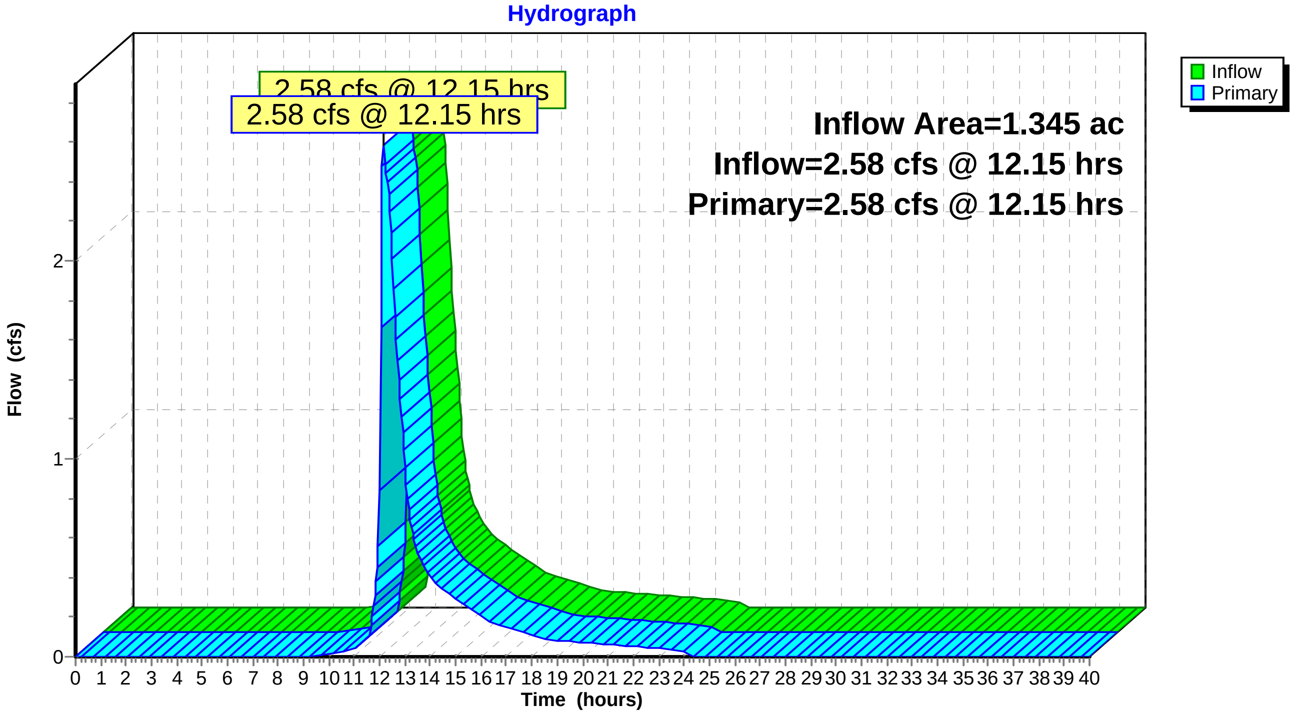


Summary for Link 4L: Flow towards north-side of Elm Street

Inflow Area = 1.345 ac, 19.93% Impervious, Inflow Depth = 2.85" for 100-YR event
Inflow = 2.58 cfs @ 12.15 hrs, Volume= 0.319 af
Primary = 2.58 cfs @ 12.15 hrs, Volume= 0.319 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L: Flow towards north-side of Elm Street

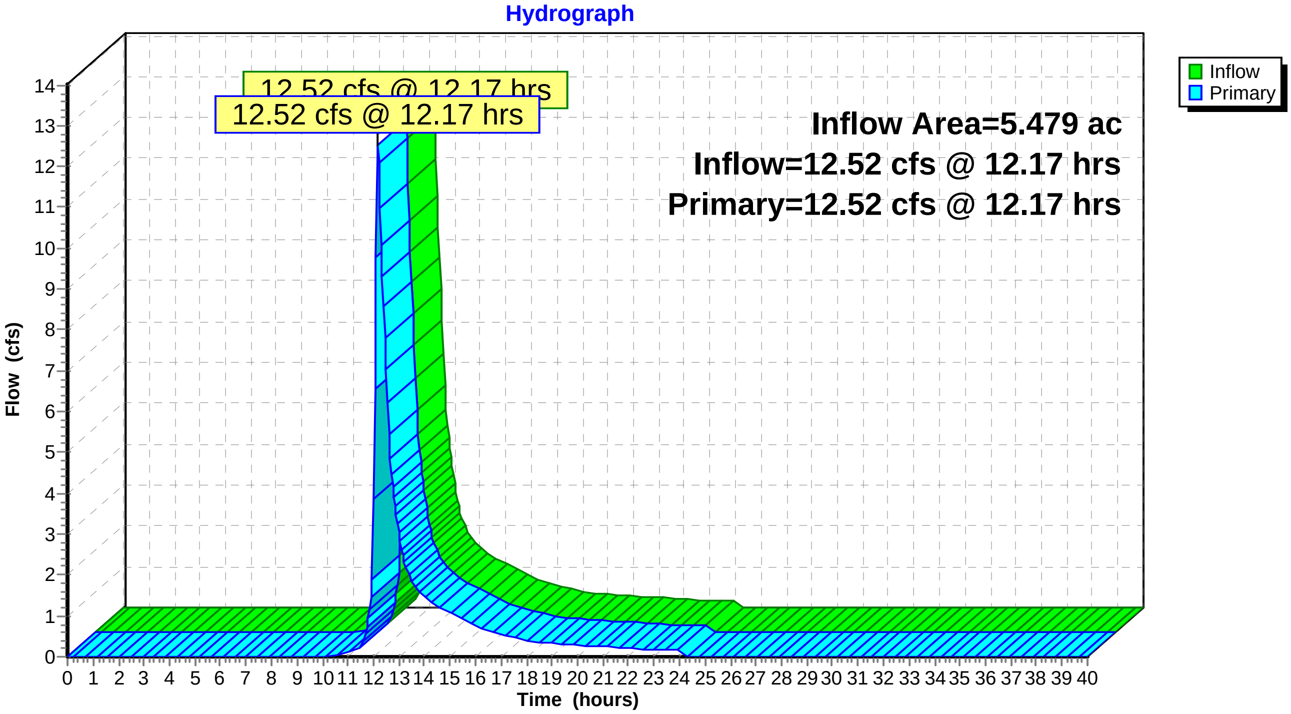


Summary for Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

Inflow Area =	5.479 ac,	10.81% Impervious,	Inflow Depth = 2.58"	for 100-YR event
Inflow =	12.52 cfs @	12.17 hrs, Volume=	1.177 af	
Primary =	12.52 cfs @	12.17 hrs, Volume=	1.177 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 5L: Total flow to existing culvert under Elm Street from limit of watershed analysis

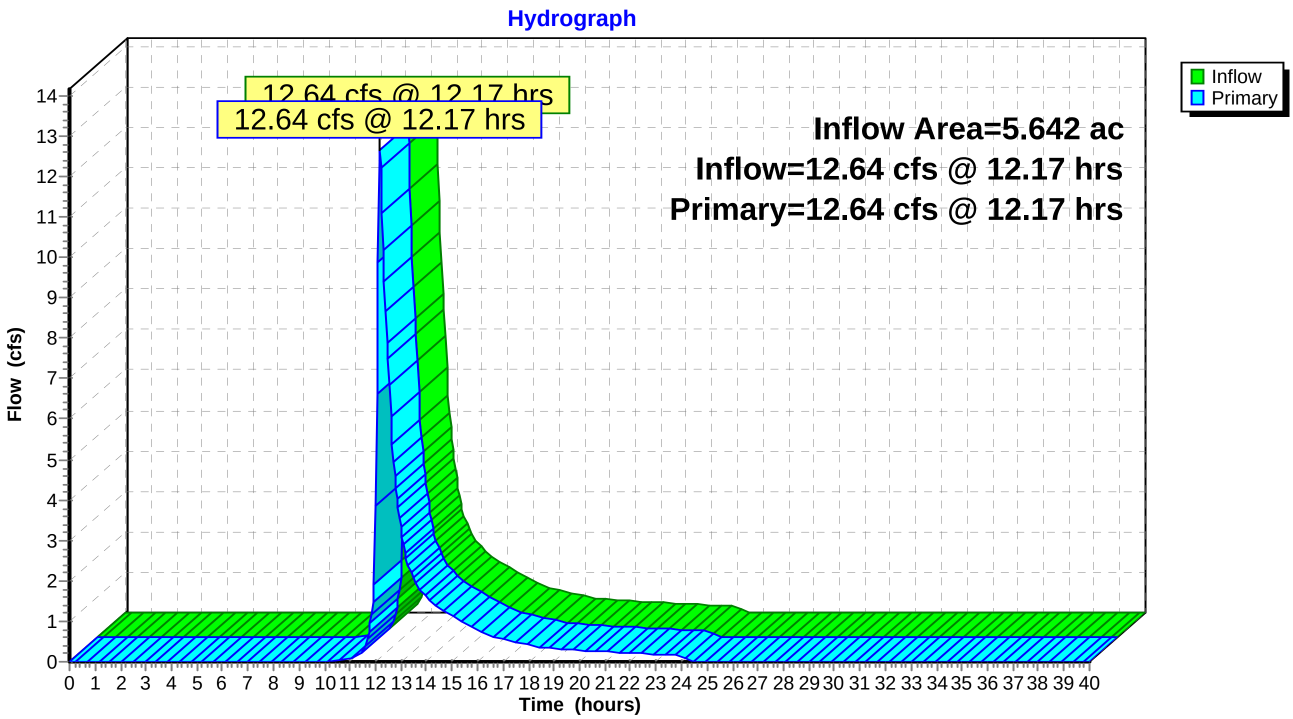


Summary for Link 6L: Total runoff discharging from within the limit of watershed analysis

Inflow Area = 5.642 ac, 10.50% Impervious, Inflow Depth = 2.62" for 100-YR event
Inflow = 12.64 cfs @ 12.17 hrs, Volume= 1.232 af
Primary = 12.64 cfs @ 12.17 hrs, Volume= 1.232 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 6L: Total runoff discharging from within the limit of watershed analysis



2 | *Stormwater Report Compliance Calculations*

2.1 Standard 1 | No Untreated Discharges Or Erosion To Wetlands

Untreated Discharges

To document compliance that new discharges are adequately treated refer to calculations for Standards 4 through 6.

Erosion to Wetlands

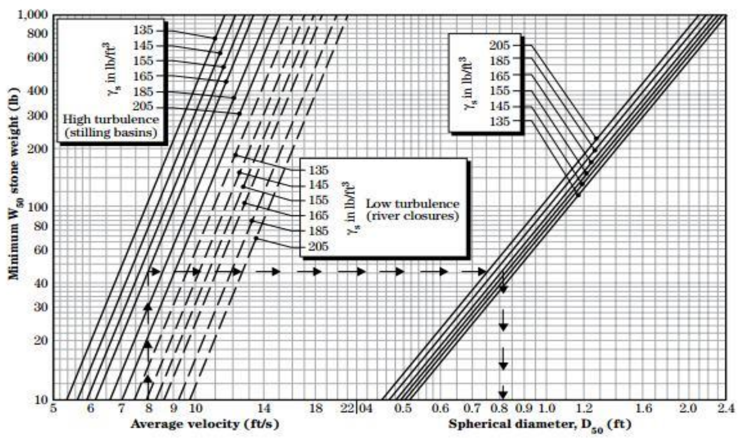
Flow exiting the stormwater management area discharges to a level spreader. For minimum stone size based on a maximum of Q_{100} = 1.13 cfs, V_{max}= 6.51 ft/s, (Pond 1P) see the following graphical solution to the Isbash Curve.

Given the velocity of 6.51 ft/s a D_{50} of 6 inches is recommended for a γ_s of 165 lb/ft^3.

Technical Supplement 14C | **Stone Sizing Criteria** | **Part 654 National Engineering Handbook**

Figure TS14C–6 Graphical solution for Isbash technique

(a)



Basic equations :

$$V_c = C\left[2g\left(\frac{\gamma_s-\gamma_w}{\gamma_w}\right)\right]^{\frac{1}{2}}(D_{50})^{\frac{1}{2}}$$

$$D_{50} = \left(\frac{8W_{50}}{\pi\gamma_s}\right)^{\frac{1}{3}}$$

where:
- V = Velocity, ft/s
- γ_s = Specific stone weight, lb/ft^3
- γ_w = Specific weight of water, 62.5 lb/ft^3
- W_{50} = Weight of stone, subscript denotes Percent of total weight of material containing stone of less weight
- D_{50} = Spherical diameter of stone having the same weight as W_{50}
- C = Isbash constant (0.86 for high turbulence level flow and 1.20 for low turbulence level flow)
- g = Acceleration of gravity, ft/s^2

Stone stability velocity vs. stone diameter

Hydraulic design chart 712–1 (Sheet 1 of 2)

TS14C–4 (210–VI–NEH, August 2007)

2.2 Standard 2 | Peak Rate Attenuation

Refer to Peak Rate of Runoff table below (see Mitigative Drainage Analysis)

Table 1.0: Total Peak Rate of Runoff from within limit of watershed analysis | Comparison Location 6L

Description	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Existing Peak Rate of Runoff (cfs)	0.3	0.8	2.1	5.3	8.5	14.0
Proposed Peak Rate of Runoff (cfs)	0.2	0.5	1.2	3.1	6.3	12.6
Difference	**-0.1**	**-0.3**	**-0.9**	**-2.2**	**-2.2**	**-1.4**

2.3 Standard 3 | Stormwater Recharge

Recharge Volume:

$R_{v\ required}$ = (Impervious Area) (F)

Site consists of Hydrologic Soils Group A: F_C = 0.60 in.
Group B: Fc = 0.35 in.

***Site Impervious Area Draining to Recharge Facilities*:**

Stormwater Management Area 1P

$A_{imp\ A\ soils}$ = 10,566 ft^2
$R_{v\ required}$ = [(10,566) (0.60)/12] = 528.3 ft^3

$R_{v\ provided}$ = 298 ft^3 (volume below 6″ outlet – Note: There is excess volume in Pond 2P; see below)

Stormwater Management Area 2P

$A_{imp\ A\ soils}$ = 1,143 ft^2
$R_{v\ required}$ = [(1,143) (0.60)/12] = 57.2 ft^3

$A_{imp\ B\ soils}$ = 2418 ft^2
$R_{v\ required}$ = [(2418) (0.35)/12] = 70.5 ft^3

Total $R_{v\ required}$ = 57.2 + 70.5 = 127.7 ft^3 + (528.3 ft^3 - 298 ft^3 from Pond 1P) = 425.7 ft^3
$R_{v\ provided}$ = 3,030 ft^3 (volume below spillway); Therefore Okay

Stormwater Management Area 3P

$A_{imp\ A\ soils}$ = 5,064 ft^2
$R_{v\ required}$ = [(5,064) (0.60)/12] = 253.2 ft^3

$A_{imp\ B\ soils}$ = 6,110 ft^2
$R_{v\ required}$ = [(6110) (0.35)/12] = 178.2 ft^3

Total $R_{v\ required}$ = 253.2 + 178.2 = 431.4 ft^3
$R_{v\ provided}$ = 1,715 ft^3 (volume below 8″ outlet); Therefore Okay

Stormwater Management Area 4P
$A_{imp\ A\ soils}$ = 0.0 ft^2
$R_{v\ required}$ = 0.0 ft^3

$R_{v\ provided}$ = 1,123 ft^3 (volume below spillway); Therefore Okay

Stormwater Management Area 5P
$A_{imp\ A\ soils}$ = 3,668 ft^2
$R_{v\ required}$ = [(3,668) (0.60)/12] = 183.4 ft^3

$R_{v\ provided}$ = 736 ft^3 (volume below 6” outlet); Therefore Okay

Stormwater Management Area 6P
$A_{imp\ A\ soils}$ = 0.0 ft^2
$R_{v\ required}$ = 0.0 ft^3

$R_{v\ provided}$ = 828 ft^3 (volume below spillway); Therefore Okay

Roof Recharge Areas
(To be designed after house designed and prior to the issuance of a building permit)

Total Area of Roof to be directly infiltrated = 16,676 ft^2 (As shown on Watershed Map)
$A_{imp\ A\ soils}$ = 9,469 ft^2 (roof area)
$R_{v\ required}$ = [(9,469) (0.60)/12] = 473.5 ft^3

$A_{imp\ B\ soils}$ = 7,207 ft^2 (roof area)
$R_{v\ required}$ = [(7207) (0.35)/12] = 210.2 ft^3

Total $R_{v\ required}$ = 473.5 + 210.2 = 341.7 ft^3

$R_{v\ provided}$ = >341.7 ft^3 (total chamber storage volume to be provided)

Driveway Recharge Areas
(Pavement pitches to separate stone-filled infiltration trenches where shown on plans)

Total Area of driveways to be directly infiltrated = 7,055 ft^2 (As shown on Watershed Map)
$A_{imp\ A\ soils}$ = 5,943 ft^2
$R_{v\ required}$ = [(5943) (0.60)/12] = 297.2 ft^3

$A_{imp\ B\ soils}$ = 1,112 ft^2 (roof area)
$R_{v\ required}$ = [(1112) (0.35)/12] = 32.4 ft^3

Total $R_{v\ required}$ = 297.2 + 32.4 = 329.6 ft^3

Total $R_{v\ provided}$ = 1,425 s.f. (surface area) x 2 ft. (depth) x 0.40 (void ratio) = 1,140 ft^3 (In trenches)

Capture Area Adjustment
Total impervious area: 43704 ft^2
Site impervious areas draining to recharge facilities: 43,308 ft^2 (There is 396 s.f. of proposed pavement not being captured by the two catch basins at the entrance to the road)
Ratio of total impervious area to site impervious areas draining to recharge facilities:
(43704/43308) = 1.01

Note: In the existing condition there is 995 s.f. of existing pavement; 1,922 s.f. of roof area from the existing dwelling and 792 s.f. of roof area from the existing barn on the property. Therefore, there is an overall reduction in the amount of impervious area from the property directly tributary to the Elm Street drainage system in the amount of (995+1922+792) – 396 = 3,313 ft^2

Total Recharge Volume Required
$A_{imp\ total}$ = 43,704 ft^2

$R_{v\ required}$ = 1P + 2P + 3P + 4P + 5P +6P = 1,591 ft^3 (See above calculations)
Adjusted minimum required recharge volume = [(1591) (1.01)] = 1,607 ft^3

Total Recharge Volume Provided
$R_{v\ provided}$ = 1P + 2P + 3P + 4P + 5P+6P = 7,730 ft^3 (See above calculations – does not include roof recharge)

Capture Area Percentage:
Site impervious areas draining to recharge facilities: 43,308 ft^2
Total impervious area: 43704 ft^2
Percent Captured: [(43308/43704)] (100) = 99.1 > 65%; Therefore Okay

Drawdown Within 72 Hours:
$T_{drawdown}$ = [$R_{v\ total}$ / (K)(Bottom Area)]

Stormwater Management Area 1P
$R_{v\ 1P}$ = 298 ft^3 (Assume water level up to 6″ outlet to be conservative)
K = 2.41 in/hr (Rawls Rate for HSG A soils)
Bottom Area = 530 ft^2 (see Mitigative Drainage Analysis)
$T_{drawdown}$ = 298 / [(2.41) (530)/12] = 2.8 hours < 72 hours

Stormwater Management Area 2P
$R_{v\ 1P}$ = 3,030 ft^3 (Assume water level up to spillway to be conservative)
K = 1.02 in/hr (Rawls Rate for HSG B soils)
Bottom Area = 1,150 ft^2 (see Mitigative Drainage Analysis)
$T_{drawdown}$ = 3,030 / [(1.02) (1150)/12] = 31.0 hours < 72 hours

Stormwater Management Area 3P
$R_{v\ 1P}$ = 1,715 ft^3 (Assume water level up to 8″ outlet to be conservative)
K = 1.02 in/hr (Rawls Rate for HSG B soils)
Bottom Area = 2,102 ft^2 (see Mitigative Drainage Analysis)
$T_{drawdown}$ = 1715 / [(1.02) (2102)/12] = 9.6 hours < 72 hours

Stormwater Management Area 4P
$R_{v\ 1P}$ = 1,123 ft^3 (Assume water level up to spillway to be conservative)
K = 2.41 in/hr (Rawls Rate for HSG A soils)
Bottom Area = 150 ft^2 (see Mitigative Drainage Analysis)
$T_{drawdown}$ = 1,123 / [(2.41) (150)/12] = 37.3 hours < 72 hours

Stormwater Management Area 5P
$R_{v\ 1P}$ = 1,454 ft^3 (Assume water level up to spillway to be conservative)
K = 2.41 in/hr (Rawls Rate for HSG A soils)
Bottom Area = 420 ft^2 (see Mitigative Drainage Analysis)
$T_{drawdown}$ = 1454 / [(2.41) (420)/12] = 17.2 hours < 72 hours

Stormwater Management Area 6P
$R_{v\ 1P}$ = 828 ft^3 (Assume water level up to spillway to be conservative)
K = 1.02 in/hr (Rawls Rate for HSG B soils)
Bottom Area = 115 ft^2 (see Mitigative Drainage Analysis)
$T_{drawdown}$ = 828 / [(1.02) (115)/12] = 84.7 hours < 72 hours

(Note: There is no required recharge volume for this pond as there is no tributary impervious area; it is our opinion that the pond will drain faster than is calculated above as the underlying soils in this area were observed to be loamy sands (HSG A) rather than hydrologic soil group “B” as shown on the NRCS map, see test pit SW8)

2.4 Standard 4 | Water Quality

Water Quality:
Water quality is provided through three structural stormwater best management practices.

1) Deep Sump Catch Basins with Hood/Trap
2) Sediment & Oil Separators
3) Stone infiltration trenches
4) Lawn (vegetated) buffer strips
5) Surface Infiltration Basins
6) Subsurface Infiltration Structure & separate roof recharge systems (to be designed later)

Water Quality Volume:
$V_{wq\ required} = (A_{imp})(D_{wq})$
D_{WQ} = 0.5 in

Stormwater Management Area 1P
$V_{wq\ required}$ = [(10566) (0.5)/12] = 440 ft^3
$V_{wq\ provided}$ = 298 ft^3 (volume below 6” outlet – Note: There is additional volume in Pond 2P; see below)

Infiltration Trench for Pretreatment of 1P:
$V_{wq\ required}$ = (0.1 in.) (A_{imp}) = (0.1) (10566)/12 = 88.1 ft^3
$V_{wq\ provided}$ = (290 ft^2) (2 ft) (0.4) = 232 ft^3; Therefore, okay for pretreatment

Stormwater Management Area 2P
$V_{wq\ required}$ = [(3561) (0.5)/12] = 148.3 ft^3
$R_{v\ provided}$ = 3,030 ft^3 (volume below spillway); Therefore Okay

Note: No proposed roadway tributary to Pond 2P, only driveway from Lot 6 which will be discharged over lawn area for pretreatment before reaching the basin

Stormwater Management Area 3P
$V_{wq\ required}$ = [(11174) (0.5)/12] = 465.6 ft^3
$R_{v\ provided}$ = 1,715 ft^3 (volume below 8″ outlet); Therefore Okay

Sediment & Oil Separator sizing calculation for Pretreatment of 3P (SOS1):
Limit pavement to 1 acre or less
Tributary pavement = 0.38 acre < 1 acre; Okay
(400 ft^3/acre) (0.38 acre) = 152 ft^3 or 1,137 gallons required in first chamber

Use 2,500-gallon Tank with Dimensions of First Chamber = 4.5′x6′x6.75′ = 182.3 ft^3

Stormwater Management Area 4P
$V_{wq\ required}$ = 0 ft^3
$R_{v\ provided}$ = 1,123 ft^3 (volume below spillway); Therefore Okay

Note: No proposed tributary impervious area, only lawn; therefore, no TSS removal required

Stormwater Management Area 5P
$V_{wq\ required}$ = [(3668) (0.5)/12] = 152.8 ft^3

$R_{v\ provided}$ = 736 ft^3 (volume below spillway); Therefore Okay

Sediment forebay for Pretreatment of 5P:
$V_{wq\ required}$ = (0.1 in.) (A_{imp}) = (0.1) (3668)/12 = 30.6 ft^3
$V_{wq\ provided}$ = 120 ft^3; Therefore, okay for pretreatment

Stormwater Management Area 6P
$V_{wq\ required}$ = 0 ft^3
$R_{v\ provided}$ = 828 ft^3 (volume below spillway); Therefore Okay

Note: No proposed tributary impervious area, only lawn & woods; therefore no TSS removal required

TSS Removal: Pond 1P

Pretreatment Chain 1 (SWMA1P) = 25%
- Infiltration Trench = 25%

Treatment Chain 1 (SWMA1P) = 80%
- Surface Infiltration Basin = 80%

TSS Removal Calculation Worksheet

Location: Pretreatment Chain 1 SWMA1P

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Trench	0.25	1.00	0.25	0.75
	0.00	0.75	0.00	0.75
	0.00	0.75	0.00	0.75
	0.00	0.75	0.00	0.75
	0.00	0.75	0.00	0.75

Total TSS Removal = 25%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: NREA-0056
Prepared By: PMB
Date: 1/17/2019

*Equals remaining load from previous BMP (E) which enters the BMP

TSS Removal Calculation Worksheet

Location: Treatment Chain 1 SWMA1P

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Basin	0.80	1.00	0.80	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20

Total TSS Removal = 80%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: NREA-0056
Prepared By: PMB
Date: 1/17/2019

*Equals remaining load from previous BMP (E) which enters the BMP

Pretreatment Chain 2 (SWMA2P) = 45%

- Vegetated Filter Strip > 50 feet = 45%

Treatment Chain 2 (SWMA2P) = 80%

- Surface Infiltration Basin = 80%

TSS Removal Calculation Worksheet

Location: Pretreatment Chain 2 SWMA2P

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Vegetated Filter Strip >50 feet	0.45	1.00	0.45	0.55
	0.00	0.55	0.00	0.55
	0.00	0.55	0.00	0.55
	0.00	0.55	0.00	0.55
	0.00	0.55	0.00	0.55

Total TSS Removal = 45%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: NREA-0056
Prepared By: PMB
Date: 1/17/2019

*Equals remaining load from previous BMP (E) which enters the BMP

Location: Treatment Chain 2 SWMA2P

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Basin	0.80	1.00	0.80	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20

Total TSS Removal = 80%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: NREA-0056
Prepared By: PMB
Date: 1/17/2019

*Equals remaining load from previous BMP (E) which enters the BMP

Pretreatment Chain 3 (SWMA3P) = 44%

- Deep Sump Catch Basin with Hood = 25%
- Oil/Sediment Separator = 25%

Treatment Chain 3 (SWMA3P) = 80%

- Subsurface Infiltration Basin = 80%

TSS Removal Calculation Worksheet

Location: Pretreatment Chain 3 SWMA3P

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Oil Grit Separator	0.25	0.75	0.19	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56

Total TSS Removal = 44%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **NREA-0056**
Prepared By: **PMB**
Date: **1/17/2019**

*Equals remaining load from previous BMP (E) which enters the BMP

Location: Treatment Chain 3 SWMA3P

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Subsurface Infiltration Structure	0.80	1.00	0.80	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20

Total TSS Removal = 80%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: NREA-0056
Prepared By: PMB
Date: 1/17/2019

*Equals remaining load from previous BMP (E) which enters the BMP

Pretreatment Chain 5 (SWMA5P) = 44%

- Deep sump catch basins w/hoots = 25%
- Sediment forebay = 25%

Treatment Chain 5 (SWMA5P) = 80%

- Surface Infiltration Basin = 80%

TSS Removal Calculation Worksheet

Location: Pretreatment Chain 5 SWMA5P

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56

Total TSS Removal = 44%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: NREA-0056
Prepared By: PMB
Date: March 25 2019

*Equals remaining load from previous BMP (E) which enters the BMP

Location: Treatment Chain 5 SWMA5P

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Basin	0.80	1.00	0.80	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20

Total TSS Removal = 80%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: NREA-0056
Prepared By: PMB
Date: 1/17/2019

*Equals remaining load from previous BMP (E) which enters the BMP

Phosphorus Load Reduction:

The Phosphorous Load Reduction calculation is limited to watershed boundaries tributary to stormwater management areas.

Stormwater Management Area 1P			
IA - Impervious Area Characteristics			
Subcatchment	Land Use	Area ft^2	HSG
7S	HDR	10566	A
Total		10566	

Stormwater Management Area 1P			
PA - Pervious Area Characteristics			
Subcatchment	Land Use	Area ft^2	HSG
7S	HDR	4718	A
8S	HDR	11193	A
8S	HDR	87	B
Total		15998	

BMP Volume = 298 ft^3 (provided below lowest hydraulic outlet device)
BMP Volume$_{(IA\text{-}in)1}$ = [(298 ft^3)(12 in/ft)]/(10566 ft^2) = 0.34 in
Interpolated runoff depth for A Soils & B Soils for 0.34 inches of rain = 0.0 in (Table 3-3)
BMP Volume$_{(PA\text{-}ft^3)}$ = (15998 ft^2)(0.0 in)/(12 in/ft) = 0.0 ft^3
BMP Volume$_{(IA\text{-}ft^3)1}$ = (298 ft^3 – 0.0 ft^3) = 298 ft^3
BMP Volume$_{(IA\text{-}in)2}$ = (298 ft^3)(12 in/ft)/(10566 ft^2) = 0.34 in
% Difference **=** (0.34 in – 0.34 in)/(0.34 in) = 0% < 5% ∴ OK
BMP Reduction$_{(\%\text{-}P)}$ = 66% (from Table 3-14, Appendix F of the MA MS4 General Permit)
BMP Load = [(10566 ft^2)/(43560 ft^2/acre)](2.32 lbs/acre/year) +
[(15998 ft^2)/(43560 ft^2/acre)](0.03 lbs/acre/year) = 0.57 lbs/year
BMP Reduction$_{(lbs\text{-}P)}$ = (0.57 lbs/year)(0.66) = 0.38 lbs/year

Stormwater Management Area 2P			
IA - Impervious Area Characteristics			
Subcatchment	Land Use	Area ft^2	HSG
9S	HDR	1143	A
9S	HDR	2418	B
Total		3561	

Stormwater Management Area 2P			
PA - Pervious Area Characteristics			
Subcatchment	Land Use	Area ft^2	HSG
9S	HDR	6795	A
9S	HDR	21016	B
Total		27811	

BMP Volume = 3,030 ft^3 (provided below lowest hydraulic outlet device)
BMP Volume $_{(IA\text{-}in)1}$ = [(3030 ft^3) (12 in/ft)]/ (3561 ft^2) = 10.2 in (See Table 3-3)
Given the calculated inches of runoff from the contributing impervious area is great than 2” it is assumed 100% phosphorus reduction is achieved.

Stormwater Management Area 3P			
IA - Impervious Area Characteristics			
Subcatchment	Land Use	Area ft^2	HSG
14S	HDR	2706	A
14S	HDR	1525	B
15S	HDR	2358	A
15S	HDR	1358	B
16S	HDR	1898	B
17S	HDR	1329	B
Total		11174	

Stormwater Management Area 3P			
PA - Pervious Area Characteristics			
Subcatchment	Land Use	Area ft^2	HSG
14S	HDR	6684	A
14S	HDR	3045	B
15S	HDR	11941	A
15S	HDR	3272	B
16S	HDR	1393	A
16S	HDR	4781	B
17S	HDR	1893	B
Total		33009	

BMP Volume = 1,715 ft^3 (provided below lowest hydraulic outlet device)
BMP Volume$_{(IA\text{-}in)1}$ = [(1,715 ft^3)(12 in/ft)]/(11174 ft^2) = 1.84 in
Interpolated runoff depth for A Soils & B Soils for 1.84 inches of rain = 0.14 in (Table 3-3)
BMP Volume$_{(PA\text{-}ft^3)}$ = (33009 ft^2)(0.14 in)/(12 in/ft) = 385 ft^3
BMP Volume$_{(IA\text{-}ft^3)1}$ = (1715 ft^3 – 385 ft^3) = 1330 ft^3
BMP Volume$_{(IA\text{-}in)2}$ = (1330 ft^3)(12 in/ft)/(11174 ft^2) = 1.43 in
% Difference = (1.84 in – 1.43 in)/(1.84 in) x 100 = 22.2% > 5% ∴ Repeat steps 4-6 using 1.43 inches

Interpolated runoff depth for A Soils & B Soils for 1.43 inches of rain = 0.07 in (Table 3-3)
BMP Volume$_{(PA\text{-}ft^3)}$ = (33009 ft^2)(0.07 in)/(12 in/ft) = 193 ft^3
BMP Volume$_{(IA\text{-}ft^3)1}$ = (1715 ft^3 – 193 ft^3) = 1,522 ft^3
BMP Volume$_{(IA\text{-}in)2}$ = (1522 ft^3)(12 in/ft)/(11174 ft^2) = 1.63 in
% Difference = (1.63 in – 1.43 in)/(1.63 in) x 100 = 12.2% > 5% ∴ Repeat steps 4-6 using 1.63 inches

Interpolated runoff depth for A Soils & B Soils for 1.63 inches of rain = 0.12 in (Table 3-3)
BMP Volume$_{(PA\text{-}ft^3)}$ = (33009 ft^2)(0.12 in)/(12 in/ft) = 330 ft^3
BMP Volume$_{(IA\text{-}ft^3)1}$ = (1715 ft^3 – 330 ft^3) = 1,385 ft^3
BMP Volume$_{(IA\text{-}in)2}$ = (1385 ft^3)(12 in/ft)/(11174 ft^2) = 1.49 in
% Difference = (1.63 in – 1.49 in)/(1.63 in) x 100 = 8.6% > 5% ∴ Repeat steps 4-6 using 1.49 inches

Interpolated runoff depth for A Soils & B Soils for 1.49 inches of rain = 0.09 in (Table 3-3)
BMP Volume$_{(PA\text{-}ft^3)}$ = (33009 ft^2)(0.09 in)/(12 in/ft) = 248 ft^3
BMP Volume$_{(IA\text{-}ft^3)1}$ = (1715 ft^3 – 248 ft^3) = 1,467 ft^3
BMP Volume$_{(IA\text{-}in)2}$ = (1467 ft^3)(12 in/ft)/(11174 ft^2) = 1.58 in
% Difference = (1.58 in – 1.49 in)/(1.58 in) x 100 = 5.7% > 5% ∴ Repeat steps 4-6 using 1.58 inches

Interpolated runoff depth for A Soils & B Soils for 1.58 inches of rain = 0.11 in (Table 3-3)
BMP Volume$_{(PA\text{-}ft^3)}$ = (33009 ft^2)(0.11 in)/(12 in/ft) = 303 ft^3
BMP Volume$_{(IA\text{-}ft^3)1}$ = (1715 ft^3 – 303 ft^3) = 1,412 ft^3
BMP Volume$_{(IA\text{-}in)2}$ = (1412 ft^3)(12 in/ft)/(11174 ft^2) = 1.52 in
% Difference = (1.58 in – 1.52 in)/(1.58 in) x 100 = 3.8% < 5% ∴ OKAY

BMP Reduction$_{(\%\text{-}P)}$ = 99% (from Table 3-13, Appendix F of the MA MS4 General Permit)
BMP Load = [(11174 ft^2)/(43560 ft^2/acre)](2.32 lbs/acre/year) +
[(33009 ft^2)/(43560 ft^2/acre)](0.03 lbs/acre/year) = 0.62 lbs/year
BMP Reduction$_{(lbs\text{-}P)}$ = (0.62 lbs/year)(0.99) = 0.61 lbs/year

Stormwater Management Area 4P			
IA - Impervious Area Characteristics			
Subcatchment	Land Use	Area ft^2	HSG
11S	HDR	0	A
Total		0	

Stormwater Management Area 4P			
PA - Pervious Area Characteristics			
Subcatchment	Land Use	Area ft^2	HSG
11S	HDR	35016	A
Total		35016	

Note: There is no impervious area tributary to this basin
$R_{v\ provided}$ = 1,123 ft^3 (volume below spillway)
BMP Volume$_{(IA\text{-}in)1}$ = [(1,123 ft^3)(12 in/ft)]/(0.0 ft^2) = N.A.

Stormwater Management Area 5P			
IA - Impervious Area Characteristics			
Subcatchment	Land Use	Area ft^2	HSG
10S	HDR	0	A
12S	HDR	1977	A
13S	HDR	1691	A
Total		3668	

Stormwater Management Area 5P			
PA - Pervious Area Characteristics			
Subcatchment	Land Use	Area ft^2	HSG
10S	HDR	25056	A
12S	HDR	2011	A
13S	HDR	1021	A
Total		28088	

BMP Volume = 1454 ft^3 (provided below lowest hydraulic outlet device)
BMP Volume$_{(IA\text{-}in)1}$ = [(1,454 ft^3)(12 in/ft)]/(3668 ft^2) = 4.76 in (See Table 3-3)
Given the calculated inches of runoff from the contributing impervious area is great than 2" it is assumed 100% phosphorus reduction is achieved.

Stormwater Management Area 6P			
IA - Impervious Area Characteristics			
Subcatchment	Land Use	Area ft^2	HSG
19S	HDR	0	A
19S	HDR	0	B
Total		0	

Stormwater Management Area 2P			
PA - Pervious Area Characteristics			
Subcatchment	Land Use	Area ft^2	HSG
19S	HDR	16712	A
19S	HDR	45911	B
Total		62623	

Note: There is no impervious area tributary to this basin
$R_{v\ provided}$ = 828 ft^3 (volume below spillway)
BMP $Volume_{(IA\text{-}in)1}$ = [(828 ft^3)(12 in/ft)]/(0.0 ft^2) = N.A.

2.5 Standard 5 | Land Uses with Higher Potential Pollutant Loading

This project is not considered a LUHPPL.

2.6 Standard 6 | Critical Areas

The project site is not a LUHPPL or within a Zone II or Interim Wellhead Protection Area. Infiltration basins and a subsurface infiltration structure are the specific structural stormwater best management practices selected to manage discharge.

2.7 Standard 7 |Redevelopment

This project is not considered a redevelopment.

2.8 Standard 8 | Construction Period Controls

Refer to Section 6 Construction Period Pollution Prevention Plan and Erosion & Sedimentation Control.

2.9 Standard 9 | Long Term Operation And Maintenance Plan

Refer to Section 4 Long Term Operation and Maintenance Plan.

2.10 Standard 10 |Illicit Discharges To Drainage System

There are no proposed illicit discharges into the Stormwater Management Systems to be constructed as shown on the site plan.

3 | MassDEP Stormwater Checklist

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
PETER M. BLAISDELL, JR.
CIVIL
No. 41613
REGISTERED
PROFESSIONAL ENGINEER

Peter M Blaisdell Jr PE 4/30/19
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☒ Use of “country drainage” versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☒ Other (describe): Separate roof recharge systems from roadway drainage system & select driveway areas as shown on watershed map

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½” or 1” Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas (See Subdivision Plan);
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached; (See section 7.0 of the Mitigative Drainage Analysis)

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

4 | *Long Term Operation & Maintenance Plan*

This Operation & Maintenance Plan is prepared to comply with provisions set forth in the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards.

Structural Best Management Practices (BMPs) require periodic maintenance to ensure proper function and efficiency in pollutant removal from stormwater discharges that would otherwise reach wetland resource areas untreated. Maintenance schedules found below are as recommended in MassDEP's Massachusetts Stormwater Handbook and as recommended in the manufacturer's specifications.

The stormwater management system owner and the party responsible for maintenance of the stormwater management system shall be 77 Elm Street LLC and its designated employees.

4.1 The following BMPs provide pollutant removal and groundwater recharge

Deep Sump Catch Basin with Hood/Trap;
Oil & Sediment Separator;
Vegetated Filter Strip (lawn areas between pavement and infiltration basins)
Stone Infiltration Trenches;
Surface Infiltration Basins;
Subsurface Infiltration Basin

Deep-Sump Catch Basin with Hood/Trap & Sediment/Oil Separator
Inspect and/or clean at least four times per year with special consideration given to the end of foliage and snow removal seasons.

Sediments must also be removed once per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the sump or one half the depth of the invert of the outlet pipe.

Clamshell buckets and/or vacuum trucks are typically used to remove sediment in Massachusetts.

Cleanings may be taken to a landfill or other facility permitted by MassDEP to accept solid waste without any prior approval by MassDEP. However, some landfills require catch basin cleanings to be tested before they are accepted. For information on all of the MassDEP requirements pertaining to the disposal of catch basin cleanings go to
http://www.mass.gov/eea/agencies/massdep/recycle/regulations/management-of-catch-basin-cleanings.html

Vegetated Filter Strip (lawn areas between pavement and infiltration basins)
Inspect for sediment buildup and the vegetation for signs of erosion, bare spots and overall health every six (6) months during the first year and annually thereafter.

Regularly mow the grass as needed.

Remove sediment from the toe of slope and reseed bare spots as needed.

Stone Infiltration Trench
Inspect and clean every six months and afar every major storm event (2-year return frequency)

Remove accumulated sediment, trash, debris, leaves and grass clippings.

Remove tree seedlings before they become firmly established.

Inspect the trench 24 hours or several days after a rain event to look for ponded water. If there is ponded water at the surface of the trench, it is likely that the trench surface is clogged.

To address surface clogging, remove and replace the first layer of stone aggregate and filter fabric. If the water is ponded inside the trench, it may indicate that the bottom of the trench has failed.

To rehabilitate a failed trench, all accumulated sediment must be stripped from the bottom, the bottom of the trench must be scarified and tilled to induce infiltration, and all of the stone aggregate and filter fabric or media must be removed and replaced.

Surface Infiltration Basin
Infiltration basins are prone to clogging and failure so it is imperative to develop and implement aggressive maintenance plans and schedules. If required, installing the required pretreatment BMPs, e.g. deep-sump catch basins and sediment forebays, will significantly reduce the maintenance requirements for the basin.

Inspections and preventative maintenance shall be performed at least twice a year, and after every time drainage discharges through the high outlet orifice or a major storm event which is defined as a storm that is equal to or greater than the 2-year, 24-hour storm (3.1 inches in a 24 hour storm).

After the basin is on line, inspect it after every major storm for the first few months to ensure that it is stabilized and functioning properly. Take corrective action if necessary.

Note the time that water remains standing in the basin after a storm event. Standing water within the basin 48 to 72 hours after a storm indicates that the infiltration capacity of the basin may have been overestimated or the bottom has been clogged.

If the reason is clogging, determine the cause, e.g. erosion, excessive compaction, or low spots and take the necessary corrective action. Thereafter, inspect the infiltration basin at least twice per year.

Important items to check during the inspections include:

1. Signs of differential settlement,
2. Cracking,
3. Erosion,
4. Leakage in the embankments,
5. Tree growth on the embankments,
6. Condition of riprap,
7. Sediment accumulation and,
8. Health of the turf.

At least twice a year the buffer area, side slopes, and basin bottom shall be mowed. Remove the grass clippings and accumulated organic matter to prevent an impervious organic mat from forming. Remove trash and debris at this time as well as using deep tilling to break up any clogged surfaces, revegetate immediately.

Remove sediment from the basin as necessary only when the floor of the basin is completely dry. Use light equipment to remove the top layer to prevent compacting the underlying soil. Deep till the remaining soil and revegetate as soon as possible.

Subsurface Infiltration Structure (Cultec 330XLHD Chambers or approved equal)
Chamber maintenance is not generally required. However, recharge systems are prone to failure due to clogging. Regulating the sediment and petroleum product input into the proposed recharge system is the priority maintenance activity. Sediments and any oil spillage should be trapped and removed before they reach the chambers. Any upstream devices connected to the infiltration system (catch basins, deep sump manholes, proprietary devices) shall be inspected and cleaned at least twice per year to prevent sediments and debris from entering and clogging the recharge system.

Sediments must also be removed whenever the depth of deposits is greater than or equal to 3”.

The contractor shall verify that the required washed crushed stone and geotechnical fabric materials are clean and free of sediments and petroleum residue prior to, during and after chamber system installation.

Inspections of the chamber system shall be made by after every major storm for the first few months after construction to verify that proper functioning has been achieved. During the initial inspection the water level should be measured and recorded in a permanent log over several days to check the drainage duration and verify that sediments are not accumulating. If ponded water is present after 24 hours or an accumulation of sediment or debris is noted within the chambers the owner or designated property manager and engineer shall determine the cause for this condition and devise an action plan to improve system functionality.

Once the chamber system has been verified to perform as designed, interior chamber conditions shall be inspected at least twice per year. Post construction inspections (to be conducted through inspection ports) shall consist of documenting interior and stone bed conditions, measured water depth and presence of sediment. Should inspection indicate that the system is clogged (ponding water present after 24 hours and/or sediment accumulations) replacement or major repair actions may be required. Should the system require replacement or major repair actions the owner or designated property manager and engineer shall determine the cause for this condition and devise an action plan

The inspection and maintenance of the subsurface infiltration system shall belong to the owner or designated property manager.

4.2 The following BMPs are utilized to minimize impacts to wetland resource areas

Street Sweeping
Street sweeping shall be conducted four times annually. Special attention shall be given to the spring (March or April) and late fall (November or December).

Snow Removal
Snow disposal/removal shall be in compliance with MassDEP’s Bureau of Water Resources guidelines, effective December 21, 2015 or in a manner consistent with other public ways in the Town of North Reading. See Section 8 Snow Disposal Guidelines.

Rip Rap Apron/Emergency Spillway
The rip rap aprons/emergency spillways shall be inspected during and after several storms (e.g. 0.5-inch or greater) and maintenance performed if necessary, during the first year of operation. Thereafter, inspections and preventative maintenance shall be performed at least twice a year and when drainage discharges through the emergency spillway or a major storm event which is defined as a storm that is equal to or greater than the 2-year, 24-hour storm (3.1 inches in a 24 hour storm).

Any detrimental sediment accumulation shall be removed.

If rilling is present downgradient or adjacent to the emergency spillway or level spreader the cause shall be identified and corrected and damage shall be repaired.

Leaf litter shall be removed from the emergency spillway or level spreader area.

Vegetation in the vicinity of the emergency spillway and level spreader shall be inspected periodically and if needed, fertilized to maintain healthy, dense growth.

4.3 Permanent Seeding

Permanent Seeding & Plantings
Once final grades have been established and the weather permits, every effort shall be made to establish permanent vegetation on disturbed and exposed areas no later than September of that year, otherwise temporary seeding practices shall be used until permanent seeding practices can resume the following spring, April 1st through May 31st.

In addition to grass seed, tree and shrub plantings shall be an integral part of the permanent stabilization plan. Care shall be taken by the owner, builder, and/or site contractor to select trees, shrubs, and seed mixes that are best suited to the soil conditions on the site. Soil moisture, depth to seasonal groundwater, and exposure to sunlight shall be carefully considered when selecting species. In recent years, the emphasis on using plant species native to Massachusetts has grown. Information on the use of non-native and native species can be found on the web and in many local nursery catalogs.

Permanent seeding shall be performed in accordance with the guidelines set forth in the "Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, May 2003, prepared by Franklin, Hampden, and Hampshire Conservation Districts."

Inspection and Maintenance Form

Refer to Sections above for frequency of inspection

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Deep Sump Catch Basins / Grates & Sediment/Oil Separators

Structure Identification	Location	Catch basin at grade	Hood/trap installed	Sediment buildup (in.)	Overall condition
DSCB's	Sta 0+08 R&L	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
DSCB's	Sta 1+00 R&L	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
DSCB's	Sta 2+75 R&L	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
SOS1	Sta 0+25 LT	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
		Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
		Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

Refer to Sections above for frequency of inspection

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Surface Infiltration Basins

Structure Identification	Location	Condition of side slope % vegetated	Sediment buildup in basin % accumulation	Rilling or gullying
SWMA1P	Center of cul-de-sac			Minor☐ Moderate☐ Major☐
SWMA2P	Rear of Lots 6 & 7			Minor☐ Moderate☐ Major☐
SWMA4P	Rear of Lot 2			Minor☐ Moderate☐ Major☐
SWMA5P	Rear of Lot 3			Minor☐ Moderate☐ Major☐
SWMA6P	Rear of Lot 5 & 6			Minor☐ Moderate☐ Major☐
				Minor☐ Moderate☐ Major☐

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

Refer to Sections above for frequency of inspection

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Subsurface Infiltration Structure

Structure Identification	Location	Condition Stone Bed	Settlement over system	Sediment Buildup in Basin
SWMA3P	Left of proposed road entrance	Poor Fair Good	Yes No	Minor☐ Moderate☐ Major☐
				Minor☐ Moderate☐ Major☐
				Minor☐ Moderate☐ Major☐
				Minor☐ Moderate☐ Major☐
				Minor☐ Moderate☐ Major☐
				Minor☐ Moderate☐ Major☐

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

Refer to Sections above for frequency of inspection

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Rip-Rap Outlet/Spillway

Structure Identification	Location	Installed at grade	Maintenance required	Corrective action taken
SWMA1P	Center of cul-de-sac	Yes☐No☐	Yes☐No☐	
SWMA2P	Rear of Lots 6 & 7	Yes☐No☐	Yes☐No☐	
SWMA4P	Rear of Lot 2	Yes☐No☐	Yes☐No☐	
SWMA5P	Rear of Lot 3	Yes☐No☐	Yes☐No☐	
SWMA6P	Rear of Lot 5 & 6	Yes☐No☐	Yes☐No☐	
		Yes☐No☐	Yes☐No☐	

Maintenance required

To be performed by: On or before:

5 | *Long Term Pollution Prevention Plan*

This Long Term Pollution Prevention Plan is prepared to comply with the provisions set forth in the Massachusetts Department of Environmental Protection (DEP) Stormwater Management Standards. Structural Best Management Practices (BMPs) require periodic maintenance to ensure proper function and efficiency in pollutant removal from stormwater discharges that would otherwise reach wetland resource areas untreated.

Maintenance schedules found below are as recommended in Department of Environmental Protection's Massachusetts Stormwater Handbook and as recommended in manufacturer's specifications.

5.1 Street Sweeping

Street shall be swept twice a year during the spring (March/April) and late fall (November/December).

5.2 Ownership and Maintenance Responsibilities

After project completion, 77 Elm Street LLC shall assume full responsibility of continuing the operation and maintenance of the stormwater management systems as well as the long-term pollution prevention plan outlined below until the road is accepted as a public way.

5.3 DEP Standard 4 Water Quality

The Long Term Pollution Prevention Plan includes the following:

Good housekeeping practices
Prevent or reduce pollutant runoff from reaching the wetland resource areas through street sweeping, stabilizing all disturbed areas with vegetative cover and catch basin cleaning.

Provisions for storing materials and waste products inside or under cover
All materials on site are to be stored in a neat and orderly fashion in their appropriate containers and, if possible, under a roof or other secure enclosure. All waste products are to be placed in secure receptacles until they are emptied by a solid waste management company licensed in the Commonwealth of Massachusetts.

Vehicle washing controls
Home owners shall wash their vehicles on lawn or gravel areas so the ground can filter the water naturally. This will prevent soap, dirt and oil from reaching the storm drains and ultimately wetlands, streams, rivers or marine waters. Encourage home owners to wash their vehicles at commercial car washes which recycle water and use approximately 60% on average of the amount of water used in a home wash.

Requirements for routine inspections and maintenance of Stormwater BMP's
Follow the procedures outlined in Section 4 Long Term Operation and Maintenance Plan and the provided Inspection and Maintenance Forms.

Spill prevention and response plans
Spill Prevention: As mentioned previously, all materials on site are to be stored in a neat and orderly fashion in their appropriate containers and, if possible, under a roof or other secure enclosure. Products shall be kept in their original containers with the original manufacturer’s label. Products should not be mixed unless recommended by the manufacturer. The manufacturer’s recommendations for proper use, storage and disposal shall be followed at all times and, if possible, all of the product should be used up before proper disposal.

Response: The manufacturer’s recommended methods for cleanup must be followed and spills cleaned up immediately after discovery. Spills shall be kept well ventilated and personnel must wear appropriate protective gear to prevent injury from contact with hazardous substances. Spills of toxic or hazardous material must be reported to the appropriate local and/or State agencies in accordance with the local and/or Commonwealth of Massachusetts regulations.

Requirements for storage and use of fertilizers, herbicides and pesticides
Consult the Town of North Reading Conservation Commission for any questions regarding these materials.

Fertilizers: Fertilizers are to be applied at the minimum amounts recommended by the manufacturer and once applied shall be worked into the soil to limit the possibility of entering the storm drains. Storage procedures are to be followed as previously stated and the contents of any partially used bags should be transferred to a sealable container, either bag or bin to avoid spilling.

Herbicides and Pesticides: Storage of these materials are to be as outlined previously and especially out of the reach of pets and children, away from damp areas where their containers may succumb to moisture or rust and should not be stored near food. These materials must not be placed in the trash or washed down the drain. Handle using rubber gloves and use an appropriate mask when using these products for extensive periods of time.

Provisions for maintenance of lawns, gardens, and other landscaped areas
These activities are left to the individual home owners to schedule and perform.

Pet waste management provisions
These activities are left to the individual home owners to schedule and perform.

Provisions for operation and maintenance of septic systems
These activities are left to the individual home owners to schedule and perform.

Provisions for solid waste management
All waste products are to be placed in secure receptacles until they are emptied by a solid waste management company licensed in the Commonwealth of Massachusetts.

Snow disposal and plowing plans relative to Wetland Resource Areas
Snow disposal/removal shall be in compliance with MassDEP’s Bureau of Water Resources guidelines, effective December 21, 2015 or in a manner consistent with other public ways in the Town of North Reading. See Section 8 Snow Disposal Guidelines.

Winter Road Salt and/or Sand Use and Storage restrictions
Road Salt use must be in compliance with the Guidelines on Deicing Chemical (Road Salt) Storage effective date December 19, 1997, Guideline No. DWSG97-1 found in the BRP’s Drinking Water Program.

Sand Use: Encourage the use of environmentally friendly alternatives such as calcium chloride and/or sand instead of road salt for melting ice whenever possible.

Street Sweeping schedules
As mentioned previously, street sweeping should be performed twice a year in the spring and fall in order to minimize the amount of Total Suspended Solids load on the deep-sump catch basins and other Best Management Practices tributary thereto.

Provisions for prevention of illicit discharges to the stormwater management systems
According to Standard 10 in the Massachusetts Stormwater Handbook, Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents.

Documentation that Stormwater BMP's are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from land uses with higher potential pollutant loads (LUHPPL)
Not applicable as this project does not meet the criteria for a LUHPPL.

Training for staff or personnel involved with implementing LTPPP
This responsibility lies with 77 Elm Street LLC until the road is accepted as a public way.

List of Emergency contacts for implementing Long-Term Pollution Prevention Plan
This responsibility lies with the 77 Elm Street LLC until the road is accepted as a public way.

6 | *Construction Period Pollution Prevention Plan & Erosion and Sedimentation Control*

This Construction Period Pollution Prevention Plan and Erosion and Sediment Control Plan has been prepared to comply with the provisions set forth in the Massachusetts Department of Environmental Protection (DEP) Stormwater Management Standards.

6.1 Site Description

Project name and location:
Grand Legacy Subdivision
Cobblestone Drive (#77 Elm Street)
North Reading, Massachusetts

Applicant Name and Address:
77 Elm Street LLC
PO Box 548
North Reading, MA 01864

Description (Purpose and Types of Soil Disturbing Activities):

Project involves razing an existing residential structure, barn with deck, pool, removal of a paved driveway, removal of a gravel roadway and path; the construction of seven (7) single family residential dwellings with associated access/egress drive, parking, landscaping, utilities and stormwater management systems.

Soil disturbing activities include: Demolition; clearing and grubbing; installation of erosion and sediment control device, pavement installation, utility installation, building construction, stormwater management systems and preparation for final loaming and seeding.

Site Runoff Coefficient:
The final composite runoff coefficient for the site is approximately 0.4.

Site Area:
The site is 7.88 acres of which 6.4± acres will be disturbed by construction activities.

Sequence of Major Activities:

1. Install construction entrances
2. Install erosion control devices
3. Demolition
4. Clearing, cutting and grubbing
5. Rough grading
6. Utility Installation
7. Gravel and pavement base course installation
8. Building site preparation
9. Finished grading and slope stabilization
10. Finished Paving
11. Loam and seed all disturbed areas
12. Final cleanup including inspection and cleanout of stormwater system

Name of Receiving Waters:
An un-named isolated vegetated wetland located at the northwesterly end of the property, an un-named bordering vegetated wetland in the northeasterly corner of the property and an un-named bordering vegetated wetland located at he southwesterly corner of the property which ultimately reaches the Ipswich River via 24” to 30” diameter reinforced concrete pipe located under Elm Street.

6.2 Erosion and Sediment Controls

In order to limit the amount of erosion and sedimentation that takes place during and after construction, it is important to implement a management plan, which will protect and limit the amount of land area that is devoid of vegetation at any given time.

Prior to Construction:
Prior to start of construction activities, the owner, builder, and site contractor shall clearly identify areas that may be affected by the proposed clearing and earth moving activities by reviewing the approved grading plan as part of an initial site visit. During the site visit, the limit of work line shall be reviewed to confirm the type of erosion control measure to be used to protect downstream wetland resources and abutting property. Limits of tree clearing shall be verified during the initial site visit with emphasis on identifying “Save Areas” for existing trees and vegetation where practicable.

Erosion and Sediment Control Device:
Siltfence is proposed as the primary erosion control device for this project (see detail provided on the site plan set). It is important for the owner, builder, and/or site contractor to have access to a supply of compost BMPs should the need arise for additional erosion and sediment control measures. Filtrexx Silt Soxx or approved equal may be used along a slope and/or together with siltfence to protect against concentrated stormwater runoff over exposed surfaces. The erosion and sediment control devices shall be inspected every 7 days or within 24-hours of a 1/2-inch (or greater) rainfall event to ensure that they are operating properly. If sediment levels begin to build up on the erosion control devices, it may be necessary to remove the accumulated sediment to ensure that the erosion control devices continue to operate as designed. Sediment shall be removed when it reaches one third the height of the fence.

Earth-moving Activities:
After trees and other vegetation are cleared, earth-moving (or grading) activities can begin. The approved grading plan shall be used to help guide the site contractor during regrading activities. Often times it is helpful to have a land surveyor establish benchmark elevations and/or lines of grade to aid the site contractor during regrading activities. This is the time during which the site is most vulnerable to erosion. Therefore, it is important for the site contractor to finalize grading activities as soon as practicable following land clearing. Areas than remain exposed longer than 30 working days in an interim condition shall be stabilized in a temporary fashion. Once final grades have been established, permanent vegetation can be established.

Temporary Seeding:
During construction it may be necessary to temporarily stabilize areas that will not be brought to final grade for a period longer than 30 working days. Temporary seeding is accomplished using fast-growing grass seed species such as ryegrass. Seeding shall be performed in accordance with

the guidelines set forth in the attached **Temporary Seeding Guidance**, which is an excerpt from a publication entitled, "Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, May 2003, prepared by Franklin, Hampden, and Hampshire Conservation Districts."

Permanent Seeding & Plantings:
Once final grades have been established and the weather permits, every effort shall be made to establish permanent vegetation on disturbed and exposed areas. In addition to grass seed, tree and shrub plantings shall be an integral part of the permanent stabilization plan. Care shall be taken by the owner, builder, and/or site contractor to select trees, shrubs, and seed mixes that are best suited to the soil conditions on the site. Soil moisture, depth to seasonal groundwater, and exposure to sunlight shall be carefully considered when selecting species. In recent years, the emphasis on using plant species native to Massachusetts has grown. Information on the use of non-native and native species can be found on the web and in many local nursery catalogs.

Permanent seeding shall be performed in accordance with the guidelines set forth in the attached **Permanent Seeding Guidance**, which is an excerpt from a publication entitled, "Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, May 2003, prepared by Franklin, Hampden, and Hampshire Conservation Districts."

Seeding, Permanent

The establishment of perennial vegetative cover on disturbed areas.

Purpose

Permanent seeding of grass and planting trees and shrubs provides stabilization to the soil by holding soil particles in place.

Vegetation reduces sediments and runoff to downstream areas by slowing the velocity of runoff and permitting greater infiltration of the runoff.

Vegetation also filters sediments, helps the soil absorb water, improves wildlife habitats, and enhances the aesthetics of a site.

Where Practice Applies

- Permanent seeding and planting is appropriate for any graded or cleared area where long-lived plant cover is needed to stabilize the soil.
- Areas which will not be brought to final grade for a year or more.
- Some areas where permanent seeding is especially important are filter strips, buffer areas, vegetated swales, steep slopes, and stream banks.
- This practice is effective on areas where soils are unstable because of their texture or structure, high water table, winds, or steep slope.

Advantages

Advantages of seeding over other means of establishing plants include the small initial establishment cost, the wide variety of grasses and legumes available, low labor requirement, and ease of establishment in difficult areas.

Seeding is usually the most economical way to stabilize large areas.

Well established grass and ground covers can give an aesthetically pleasing, finished look to a development.

Once established, the vegetation will serve to prevent erosion and retard the velocity of runoff.

Disadvantages/Problems

Disadvantages which must be dealt with are the potential for erosion during the establishment stage, a need to reseed areas that fail to establish, limited periods during the year suitable for seeding, and a need for water and appropriate climatic conditions during germination. Vegetation and mulch cannot prevent soil slippage and erosion if soil is not inherently stable.

Coarse, high grasses that are not mowed can create a fire hazard in some locales. Very short mowed grass, however, provides less stability and sediment filtering capacity.

Grass planted to the edge of a watercourse may encourage fertilizing and mowing near the water's edge and increase nutrient and pesticide contamination.

Depends initially on climate and weather for success.

May require regular irrigation to establish and maintain.

Planning considerations

Selection of the right plant materials for the site, good seedbed preparation, timing, and conscientious maintenance are important. Whenever possible, native species of plants should be used for landscaping. These plants are already adapted to the locale and survivability should be higher than with "introduced" species.

Native species are also less likely to require irrigation, which can be a large maintenance burden and is neither cost-effective nor ecologically sound.

If non-native plant species are used, they should be tolerant of a large range of growing conditions, as low-maintenance as possible, and not invasive.

Consider the microclimate within the development area. Low areas may be frost pockets and require hardier vegetation since cold air tends to sink and flow towards low spots. South-facing slopes may be more difficult to re-vegetate because they tend to be sunnier and drier.

Divert as much surface water as possible from the area to be planted.

Remove seepage water that would continue to have adverse effects on soil stability or the protecting vegetation. Subsurface drainage or other engineering practices may be needed. In this situation, a permit may be needed from the local Conservation Commission: check ahead of time to avoid construction delays.

Provide protection from equipment, trampling and other destructive agents.

Vegetation cannot be expected to supply an erosion control cover and prevent slippage on a soil that is not stable due to its texture, structure, water movement, or excessive slope.

Seeding Grasses and Legumes

Install needed surface runoff control measures such as gradient terraces, berms, dikes, level spreaders, waterways, and sediment basins prior to seeding or planting.

Seedbed Preparation

If infertile or coarse-textured subsoil will be exposed during land shaping, it is best to stockpile topsoil and respread it over the finished slope at a minimum 2- to 6-inch depth and roll it to provide a firm seedbed. If construction fill operations have left soil exposed with a loose, rough, or irregular surface, smooth with blade and roll.
Loosen the soil to a depth of 3-5 inches with suitable agricultural or construction equipment.
Areas not to receive top soil shall be treated to firm the seedbed after incorporation of the lime and fertilizer so that it is depressed no more than ½ - 1 inch when stepped on with a shoe. Areas to receive topsoil shall not be firmed until after topsoiling and lime and fertilizer is applied and incorporated, at which time it shall be treated to firm the seedbed as described above. This can be done by rolling or cultipacking.

Cool Season Grasses

Cool Season Grasses grow rapidly in the cool weather of spring and fall, and set seed in June and July. Cool season grasses become dormant when summer temperatures persist above 85 degrees and moisture is scarce.

Lime and Fertilizer

Apply lime and fertilizer according to soil test and current Extension Service recommendations. In absence of a soil test, apply lime (a pH of 5.5 - 6.0 is desired) at a rate of 2.5 tons per acre and 10-20-20 analysis fertilizer at a rate of 500 pounds per acre (40 % of N to be in an organic or slow release form). Incorporate lime and fertilizer into the top 2-3 inches of soil.

Seeding Dates

Seeding operations should be performed within one of the following periods:

- April 1 - May 31,
- August 1 - September 10,
- November 1 - December 15 as a dormant seeding (seeding rates shall be increased by 50% for dormant seedings).

Seeding Methods

Seeding should be performed by one of the following methods. Seed should be planted to a depth of ¼ to ½ inches.

- Drill seedings,
- Broadcast and rolled, cultipacked or tracked with a small track piece of construction equipment,
- Hydroseeding, with subsequent tracking.

Mulch

Mulch the seedings with straw applied at the rate of ½ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas.

Warm Season Grasses

Warm Season Grasses begin growth slowly in the spring, grow rapidly in the hot summer months and set seed in the fall. Many warm season grasses are sensitive to frost in the fall, and the top growth may die back. Growth begins from the plant base the following spring.

Lime and Fertilizer

Lime to attain a pH of at least 5.5. Apply a 0-10-10 analysis fertilizer at the rate of 600 lbs./acre.

Incorporate both into the top 2-3 inches of soil. (30 lbs. of slow release nitrogen should be applied after emergence of grass in the late spring.)

Seeding Dates

Seeding operations should be performed as an early spring seeding (April 1-May 15) with the use of cold treated seed. A late fall early winter dormant seeding (November 1 - December 15) can also be made, however the seeding rate will need to be increased by 50%.

Seeding Methods

Seeding should be performed by one of the following methods:

- Drill seedings (de-awned or de-bearded seed should be used unless the drill is equipped with special features to accept awned seed).
- Broadcast seeding with subsequent rolling, cultipacking or tracking the seeding with small track construction equipment. Tracking should be oriented up and down the slope.
- Hydroseeding with subsequent tracking. If wood fiber mulch is used, it should be applied as a separate operation after seeding and tracking to assure good seed to soil contact.

Mulch

Mulch the seedings with straw applied at the rate of ½ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas.

Seed Mixtures for Permanent Cover

Recommended mixtures for permanent seeding are provided on the following pages. Select plant species which are suited to the site conditions and planned use. Soil moisture conditions, often the major limiting site factor, are usually classified as follows:

Dry - Sands and gravels to sandy loams. No effective moisture supply from seepage or a high water table.

Moist - Well drained to moderately well drained sandy loams, loams, and finer; or coarser textured material with moderate influence on root zone from seepage or a high water table.

Wet - All textures with a water table at or very near the soil surface, or with enduring seepage.

When other factors strongly influence site conditions, the plants selected must also be tolerant of these conditions.

Permanent Seeding Mixtures

Mix	Site	Seed Mixture	Seed, Pounds per: Acre	Seed, Pounds per: 1,000 sf	Remarks
1	Dry	Little Bluestem			* Use Warm Season planting procedure.
		or Broomsedge	10	0.25	* Roadsides
		Tumble Lovegrass*	1	0.10	* Sand and Gravel Stabilization
		Switchgrass	10	0.25	* Clover requires inoculation with nitrogen-fixing bacteria
		Bush Clover*	2	0.10	
		Red Top	1	0.10	* Rates for this mix are for PLS.
2	Dry	Deertongue	15	0.35	* Use Warm Season planting procedures.
		Broomsedge	10	0.25	* Acid sites/Mine spoil
		Bush Clover*	2	0.10	* Clover requires inoculation with nitrogen-fixing bacteria.
		Red Top	1	0.10	*Rates for this mix are for PLS.
3	Dry	Big Bluestem	10	0.25	* Use Warm Season planting procedures.
		Indian Grass	10	0.25	* Eastern Prairie appearance
		Switchgrass	10	0.25	* Sand and Gravel pits.
		Little Bluestem	10	0.25	* Golf Course Wild Areas
		Red Top or	1	0.10	* Sanitary Landfill Cover seeding
		Perennial Ryegrass	10	0.25	* Wildlife Areas *OK to substitute Poverty Dropseed in place of Red Top/Ryegrass. *Rates for this mix are for PLS.
4	Dry	Flat Pea	25	0.60	* Use Cool Season planting procedures
		Red Top or	2	0.10	* Utility Rights-of-Ways (tends to suppress woody growth)
		Perennial Ryegrass	15	0.35	
5	Dry	Little Bluestem	5	0.10	* Use Warm Season planting procedures.
		Switchgrass	10	0.25	* Coastal sites
		Beach Pea*	20	0.45	* Rates for Bluestein and Switchgrass are for PLS.
		Perennial Ryegrass	10	0.25	
6	Dry - Moist	Red Fescue	10	0.25	* Use Cool Season planting procedure.
		Canada Bluegrass	10	0.25	* Provides quick cover but is non-aggressive; will tend to allow indigenous plant colonization.
		Perennial Ryegrass	10	0.25	
		Red Top	1	0.10	* General erosion control on variety of sites, including forest roads, skid trails and landings.
7	Moist-Wet	Switchgrass	10	0.25	* Use Warm Season planting procedure.
		Virginia Wild Rye	5	0.10	* Coastal plain/flood plain
		Big Bluestem	15	0.35	* Rates for Bluestem and Switchgrass are for PLS.
		Red Top	1	0.10	

Permanent Seeding Mixtures

Mix	Site	Seed Mixture	Seed, Pounds per: Acre	1,000 sf	Remarks
8	Moist Wet	Creeping Bentgrass	5	0.10	* Use Cool Season planting procedures.
		Fringed Bromegrass	5	0.10	* Pond Banks
		Fowl Meadowgrass	5	0.10	* Waterways/ditch banks
		Bluejoint Reedgrass or Rice Cutgrass	2	0.10	
		Perennial Ryegrass	10	0.25	
9	Moist Wet	Red Fescue	5	0.10	*Salt Tolerant
		Creeping Bentgrass	2	0.10	* Fescue and Bentgrass provide low growing appearance, while Switchgrass provides tall cover for wildlife.
		Switchgrass	8	0.20	
		Perennial Ryegrass	10	0.25	
10	Moist Wet	Red Fescue	5	0.10	* Use Cool Season planting procedure.
		Creeping Bentgrass	5	0.10	* Trefoil requires inoculation with nitrogen fixing bacteria.
		Virginia Wild Rye	8	0.20	
		Wood Reed Grass*	1	0.10	* Suitable for forest access roads, skid trails and other partial shade situations.
		Showy Tick Trefoil*	1	0.10	
11	Moist Wet	Creeping Bentgrass	5	0.10	* Use Cool Season planting procedure.
		Bluejoint Reed Grass	1	0.10	* Suitable for waterways, pond or ditch banks.
		Virginia Wild Rye	3	0.10	* Trefoil requires inoculation with nitrogen fixing bacteria.
		Fowl Meadow Grass	10	0.25	
		Showy Tick Trefoil*	1	0.10	
		Red Top	1	0.10	
12	Wet	Blue Joint Reed Grass	1	0.10	* Use Cool Season planting procedure.
		Canada Manna Grass	1	0.10	* OK to seed in saturated soil conditions, but not in standing water.
		Rice Cut Grass	1	0.10	
		Creeping Bent Grass	5	0.10	* Suitable as stabilization seeding for created wetland.
		Fowl Meadow Grass	5	0.10	* All species in this mix are native to Massachusetts.
13	Dry-Moist	American Beachgrass	18" centers	18' centers	*Vegetative planting with dormant culms, 3-5 culms per planting
14	Inter-Tidal	Smooth Cordgrass Saltmeadow Cordgrass	12-18" centers	12-18" centers	* Vegetative planting with transplants.

Notes:
* Species such as Tumble Lovegrass, Fringed Bromegrass, Wood Reedgrass, Bush Clover and Beach Pea, while known to be commercially available from specific seed suppliers, may not always be available from your particular seed suppliers. The local Natural Resources Conservation Service office may be able to help with a source of supply. In the event a particular species listed in a mix can not be obtained, however, it may be possible to substitute another species.
Seed mixtures by courtesy of Natural Resources Conservation Service, Amherst, MA.

(PLS) Pure Live Seed
Warm Season grass seed is sold and planted on the basis of pure live seed. An adjustment is made to the bulk rate of the seed to compensate for inert material and non-viable seed. Percent of pure live seed is calculated by multiplying the percent purity by the percent germination; **(% purity) x (% germination) = percent PLS.**
For example, if the seeding rate calls for 10 lbs./acre PLS and the seed lot has a purity of 70% and germination of 75%, the PLS factor is:

(.70 x .75) =.53

10 lbs. divided by .53 = approx. 19 lbs.

Therefore, 19 lbs of seed from the particular lot will need to be applied to obtain 10 lbs. of pure live seed.

Special Note
Tall Fescue, Reed Canary Grass, Crownvetch and Birdsfoot Trefoil are no longer recommended for general erosion control use in Massachusetts due to the invasive characteristics of each. If these species are used, it is recommended that the ecosystem of the site be analyzed for the effects species invasiveness may impose. The mixes listed in the above mixtures include either species native to Massachusetts or non-native species that are not perceived to be invasive, as per the Massachusetts Native Plant Advisory Committee.

Wetlands Seed Mixtures

For newly created wetlands, a wetlands specialist should design plantings to provide the best chance of success. Do not use introduced, invasive plants like reed canarygrass (Phalaris arundinacea) or purple loosestrife (Lythrum salicaria). Using plants such as these will cause many more problems than they will solve.

The following grasses all thrive in wetland situations:

- Fresh Water Cordgrass (*Spartina pectinata*)
- Marsh/Creeping Bentgrass (*Agrostis stolonifera, var. Palustric*)
- Broomsedge (*Andropogon virginicus*)
- Fringed Bromegrass (*Bromus ciliatus*)
- Blue Joint Reed Grass (*Calamagrostis cavedensis*)
- Fowl Meadow Grass (*Glyceria striata*)
- Riverbank Wild Rye (*Elymus riparius*)
- Rice Cutgrass (*Leersia oryzoides*)
- Stout Wood Reed (*Cinna arundinacea*)
- Canada Manna Grass (*Glyceria canadensis*)

A sample wetlands seed mix developed by The New England Environmental Wetland Plant Nursery is shown on the following page.

Wetland Seed Mixture

The New England Environmental Wetland Plant Nursery has developed a seed mixture which is specifically designed to be used in wetland replication projects and stormwater detention basins. It is composed of seeds from a variety of indigenous wetland species. Establishing a native wetland plant understory in these areas provides quick erosion control, wildlife food and cover, and helps to reduce the establishment of undesirable invasive species such as Phragmites and purple loosestrife (Lythrum salicaria). The species have been selected to represent varying degrees of drought tolerance, and will establish themselves based upon microtopography and the resulting variation in soil moisture.

Common Name (*Scientific Name*)	**% in Mix**	**Comments**
Lurid Sedge (*Carex lurida*)	30	A low ground cover that tolerates mesic sites in addition to saturated areas; prolific seeder in second growing season.
Fowl Meadow Grass (*Glyceria Canadensis*)	25	Prolific seed producer that is a valuable wildlife food source.
Fringed Sedge (*Carex crinita*)	10	A medium to large sedge that tolerates saturated areas; good seed producer.
Joe-Pye Weed (*Eupatoriadelphus maculatus*)	10	Flowering plant that is valuable for wildlife cover. Grows to 4 feet.
Brook Sedge (*Carex spp., Ovales group*)	10	Tolerates a wide range of hydrologic conditions.
Woolgrass (*Scirpus cyperinus*)	5	Tolerates fluctuating hydrology.
Boneset (*Eupatorium perfoliatum*)	5	Flowering Plant that is valuable for wildlife cover. Grows to 3 feet.
Tussock Sedge (*Carex stricta*)	<5	Grows in elevated hummocks on wet sites, may grow rhizomonously on drier sites.
Blue Vervain (*Verbena hastata*)	<5	A native plant that bears attractive, blue flowers.

The recommended application rate is one pound per 5,000 square feet when used as an understory cover. This rate should be increased to one pound per 2,500 square feet for detention basins and other sites which require a very dense cover. For best results, a late fall application is recommended. This mix is not recommended for standing water.

Maintenance

Inspect seeded areas for failure and make necessary repairs and reseed immediately. Conduct or follow-up survey after one year and replace failed plants where necessary.

If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in accordance with soil test results.

If a stand has less than 40% cover, reevaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand following seedbed preparation and seeding recommendations, omitting lime and fertilizer in the absence of soil test results. If the season prevents resowing, mulch or jute netting is an effective temporary cover.

Seeded areas should be fertilized during the second growing season. Lime and fertilize thereafter at periodic intervals, as needed.

References

North Carolina Department of Environment, Health, and Natural Resources, ***Erosion and Sediment Control Field Manual***, Raleigh, NC, February 1991.

Personal communication, Richard J. DeVergilio, USDA, Natural Resources Conservation Service, Amherst, MA.

U.S. Environmental Protection Agency, ***Storm Water Management For Construction Activities***, EPA-832-R- 92-005, Washington, DC, September, 1992.

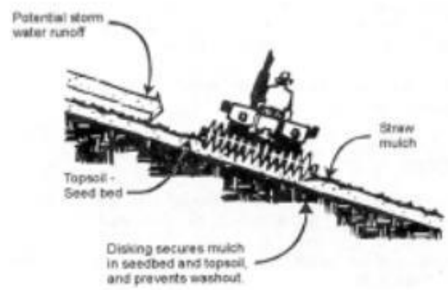
Washington State Department of Ecology, ***Stormwater Management Manual for the Puget Sound Basin***, Olympia, WA, February, 1992.

HYDRO-SEEDING

Seeding, Temporary

Planting rapid-growing annual grasses, small grains, or legumes to provide initial, temporary cover for erosion control on disturbed areas.

Purpose



To temporarily stabilize areas that will not be brought to final grade for a period of more than 30 working days.
To stabilize disturbed areas before final grading or in a season not suitable for permanent seeding.
Temporary seeding controls runoff and erosion until permanent vegetation or other erosion control measures can be established.
Root systems hold down the soils so that they are less apt to be carried offsite by storm water runoff or wind.
Temporary seeding also reduces the problems associated with mud and dust from bare soil surfaces during construction.

Where Practice Applies

On any cleared, unvegetated, or sparsely vegetated soil surface where vegetative cover is needed for less than one year. Applications of this practice include diversions, dams, temporary sediment basins, temporary road banks, and topsoil stockpiles.

Where permanent structures are to be installed or extensive re-grading of the area will occur prior to the establishment of permanent vegetation.

Areas which will not be subjected to heavy wear by construction traffic.

Areas sloping up to 10% for 100 feet or less, where temporary seeding is the only practice used.

Advantages

This is a relatively inexpensive form of erosion control but should only be used on sites awaiting permanent planting or grading. Those sites should have permanent measures used.

Vegetation will not only prevent erosion from occurring, but will also trap sediment in runoff from other parts of the site.

Temporary seeding offers fairly rapid protection to exposed areas.

Disadvantages/Problems

Temporary seeding is only viable when there is a sufficient window in time for plants to grow and establish cover. It depends heavily on the season and rainfall rate for success.

If sown on subsoil, growth will be poor unless heavily fertilized and limed. Because overfertilization can cause pollution of stormwater runoff, other practices such as mulching alone may be more appropriate. The potential for over-fertilization is an even worse problem in or near aquatic systems.

Once seeded, areas should not be travelled over.

Irrigation may be needed for successful growth. Regular irrigation is not encouraged because of the expense and the potential for erosion in areas that are not regularly inspected.

Planning Considerations

Temporary seedings provide protective cover for less than one year. Areas must be reseeded annual or planted with perennial vegetation.

Temporary seeding is used to protect earthen sediment control practices and to stabilize denuded areas that will not be brought into final grade for several weeks or months. Temporary seeding can provide a nurse crop for permanent vegetation, provide residue for soil protection and seedbed preparation, and help prevent dust production during construction.

Use low-maintenance native species wherever possible.

Planting should be timed to minimize the need for irrigation.

Sheet erosion, caused by the impact of rain on bare soil, is the source of most fine particles in sediment. To reduce this sediment load in runoff, the soil surface itself should be protected. The most efficient and economical means of controlling sheet and rill erosion is to establish vegetative cover. Annual plants which sprout rapidly and survive for only one growing season are suitable for establishing temporary vegetative cover. Temporary seeding is effective when combined with construction phasing so bare areas of the site are minimized at all times.

Temporary seeding may prevent costly maintenance operations on other erosion control systems. For example, sediment basin clean-outs will be reduced if the drainage area of the basin is seeded where grading and construction are not taking place. Perimeter dikes will be more effective if not choked with sediment.

Proper seedbed preparation and the use of quality seed are important in this practice just as in permanent seeding. Failure to carefully follow sound agronomic recommendations will often result in an inadequate stand of vegetation that provides little or no erosion control.

Soil that has been compacted by heavy traffic or machinery may need to be loosened. Successful growth usually requires that the soil be tilled before the seed is applied. Topsoiling is not necessary for temporary seeding; however, it may improve the chances of establishing temporary vegetation in an area.

Planting Procedures

Time of Planting

Planting should preferably be done between April 1 and June 30, and September 1 through September 30. If planting is done in the months of July and August, irrigation may be required. If planting is done between October 1 and March 31, mulching should be applied immediately after planting. If seeding is done during the summer months, irrigation of some sort will probably be necessary.

Site Preparation

Before seeding, install needed surface runoff control measures such as gradient terraces, interceptor dike/swales, level spreaders, and sediment basins.

Seedbed Preparation

The seedbed should be firm with a fairly fine surface.

Perform all cultural operations across or at right angles to the slope. See **Topsoiling** and **Surface Roughening** for more information on seedbed preparation. A minimum of 2 to 4 inches of tilled topsoil is required.

Liming and Fertilization

Apply uniformly 2 tons of ground limestone per acre (100 lbs. per 1,000 Sq. Ft.) or according to soil test.

Apply uniformly 10-10-10 analysis fertilizer at the rate of 400 lbs. per acre (14 lbs. per 1,000 Sq. Ft.) or as indicated by soil test. Forty percent of the nitrogen should be in organic form.

Work in lime and fertilizer to a depth of 4 inches using any suitable equipment.

Seedings for Temporary Cover

Species	**Seeding Rates lbs/sq.ft.** 1,000 Sq.Ft.	Acre	**Recommended Seeding Dates**
Annual Ryegrass	1	40	April 1 to June 1 Aug. 15 to Sept. 15
Foxtail Millet	0.7	30	May 1 to June 30
Oats	2	80	April 1 to July 1 August 15 to Sept. 15
Winter Rye	3	120	Aug. 15 to Oct. 15

"Hydro-seeding" applications with appropriate seed-mulch-fertilizer mixtures may also be used.

Seeding

Select adapted species from the accompanying table.
Apply seed uniformly according to the rate indicated in the table by broadcasting, drilling or hydraulic application.
Cover seeds with suitable equipment as follows:

Rye grass	¼ inch
Millet	½ to ¾ inch
Oats	1 to 1-1/2 inches
Winter rye	1 to 1-1/2 inches.

Mulch

Use an effective mulch, such as clean grain straw; tacked and/or tied down with netting to protect seedbed and encourage plant growth.

Common Trouble Points

Lime and fertilizer not incorporated to at least 4 inches
May be lost to runoff or remain concentrated near the surface where they may inhibit germination.

Mulch rate inadequate or straw mulch not tacked down
Results in poor germination or failure, and erosion damage. Repair damaged areas, reseed and mulch.

Annual ryegrass used for temporary seeding
Ryegrass reseeds itself and makes it difficult to establish a good cover of permanent vegetation.

Seed not broadcast evenly or rate too low
Results in patchy growth and erosion.

Maintenance

Inspect within 6 weeks of planting to see if stands are adequate. Check for damage after heavy rains. Stands should be uniform and dense. Fertilize, reseed, and mulch damaged and sparse areas immediately. Tack or tie down mulch as necessary.

Seeds should be supplied with adequate moisture. Furnish water as needed, especially in abnormally hot or dry weather or on adverse sites. Water application rates should be controlled to prevent runoff.

Structural Practices:
Silt fence with Filtrexx Silt Soxx, or approved equal, shall be installed as shown on the approved Definitive Plan/NOI Plan to help prevent erosion and sedimentation of the downstream wetland resources identified on the project.

Stormwater Management:
The stormwater runoff shall be managed through the use of several best management practices:

Deep Sump Catch Basins with Traps/Hoods
Sediment/Oil Separators
Vegetated filter strips;
Infiltration Trenches;
Surface Infiltration Ponds;
Rip-rap aprons;
Subsurface Infiltration Structure

6.3 Other Controls

Waste Materials:
All waste materials shall be collected and stored in secure metal dumpsters rented from a licensed solid waste management company in Massachusetts. The dumpsters shall meet all local and state solid waste management regulations as outlined in 310 CMR 19.00. All trash and construction debris generated on site shall be disposed of in the dumpsters. The dumpsters shall be emptied as often as necessary during construction and transferred to an approved solid waste facility licensed to accept municipal solid waste and/or construction and demolition debris. No construction waste shall be buried on site. All personnel shall be instructed regarding the correct procedure for waste disposal.

Hazardous Waste:
All hazardous waste materials shall be disposed of in a manner specified by local or State regulation or by the manufacturer. Site personnel shall be instructed in these practices.

Sanitary Waste:
All sanitary shall be collected from portable units, as needed, by a licensed septage hauler in Massachusetts, in accordance with the requirements of the local Board of Health.

Offsite Vehicle Tracking:
Construction entrances and exits shall be via Elm Street.

6.4 Timing of Controls/Measures

As indicated in the Sequence of Major Activities, the installation of erosion and sediment control devices shall be in place prior to earth excavating activities.

6.5 Certification of Compliance with Federal, State, and Local Regulations

The Construction Period Pollution Prevention Plan reflects the requirements of the Massachusetts Wetlands Protection Act (310 CMR 10.00). There is no wetland filling associated with this project, it is strictly a buffer zone project. Note that there are no other applicable State or Federal requirements for sediment and erosion control plans (or permits), or stormwater management plans (or permits) required for this project to the best of our knowledge.

6.6 Maintenance and Inspection Procedures

Erosion and Sediment Control Inspection and Maintenance Practices:
The following items represent the inspection and maintenance practices that will be used to maintain sediment and erosion control.

1. All control measures shall be inspected at least once every fourteen (14) days and following any storm event of 0.5 inches or greater.
2. All measures shall be maintained in good working order; if a repair is necessary, it shall be initiated within 24 hours of the report.
3. Built up sediment shall be removed from silt fencing when it has reached one-third the height of the fence.
4. Silt fence shall be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly set in the ground.
5. The catch basin grates shall be inspected for grate elevation relative to current surface condition; condition of silt sack, and degree to which sediment has accumulated on the grate and in the sump of the catch basin.
6. Temporary and permanent seeding and any plantings shall be inspected for bare spots, washouts, and healthy growth.
7. A maintenance inspection report shall be prepared following each inspection. A copy of the report forms to be completed by the inspector is attached to this document.
8. 77 Elm Street LLC shall select three individuals who will be responsible for inspections, maintenance and repair activities as well as who shall be responsible for filling out the inspection and maintenance report.
9. Personnel selected for inspection and maintenance responsibilities shall receive training from 77 Elm Street LLC or their designated representative. They will be trained in all the inspection and maintenance practices necessary for keeping the erosion and sediment control devices used on site in good working order.

6.7 Non-Stormwater Discharges

It is expected that the following non-stormwater discharges will occur from the site during the construction period:

1. Water from water line flushing.
2. Pavement wash waters.
   All non-stormwater discharges shall be directed to the proposed site BMPs prior to discharge.

6.8 Inventory for Pollution Prevention Plan

The materials or substances listed below are expected to be present on-site during construction:

1. Concrete
2. Wood
3. Structural Steel
4. Masonry Block
5. Office Building Materials

6. Fiber Glass Insulation
7. Fertilizers
8. Petroleum Based Products
9. Cleaning Solvents
10. Paints (enamel and latex)
11. Tar
12. Waterproofing Materials

6.9 Spill Prevention

Material Management Practices:

The following are the material management practices that shall be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

Good Housekeeping:

The following good housekeeping practices will be followed on site during the construction project.

1. A concerted effort shall be made to store only enough product required to complete a particular task.
2. All materials stored on site shall be stored in a neat and orderly fashion in their appropriate containers and, if possible, under a roof or other secure enclosure.
3. Products shall be kept in their original containers with the original manufacturer's label.
4. Substances shall not be mixed with one another unless recommended by the manufacturer.
5. Whenever possible, all of a product shall be used up before disposing of the container.
6. Manufacturer's recommendations for proper use and disposal shall be followed.
7. The site superintendent shall perform a daily site inspection to ensure proper use and disposal of materials on site.

Hazardous Products:

The following practices are intended to reduce the risks associated with hazardous materials.

1. Products shall be kept in original containers unless they are not resealable.
2. Where feasible, the original labels and material safety data shall be retained, whereas they contain important product information.
3. If surplus product must be disposed, follow manufacturer's or local and state recommended methods for proper disposal.

Product Specific Practices:

The following product specific practices shall be followed on site:

Petroleum Products:

All on site vehicles shall be monitored for leaks and receive regular preventative maintenance to reduce the risk of leakage. Petroleum products shall be stored in tightly sealed containers which are clearly labeled. Any bituminous concrete or asphalt substances used on site shall be applied according to the manufacturer's recommendations.

Fertilizers:

Fertilizers shall be applied in the minimum amounts recommended by the manufacturer. Once applied, fertilizers shall be worked into the soil to limit exposure to stormwater.

Storage shall be in a covered shed or trailer. The contents of any partially used bags of fertilizers shall be transferred to a sealable plastic bag or bin to avoid spills. Fertilizers shall be applied in the minimum amounts recommended by the manufacturer. Once applied, fertilizers shall be worked into the soil to limit exposure to stormwater. Storage shall be in a covered shed or trailer. The contents of any partially used bags of fertilizers shall be transferred to a sealable plastic bag or bin to avoid spills.

Paints:
All containers shall be tightly sealed and stored when not required for use. Excess paint shall not be discharged into any catch basin, drain manhole, or any portion of the stormwater management system. Excess paint shall be properly disposed of according to manufacturer's recommendations or State and local regulations.

Concrete Trucks:
Concrete trucks shall not be allowed to wash out or discharge surplus concrete or drum wash water on site.

Spill Control Practices:

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices shall be followed for spill prevention and cleanup:

1. Manufacturer's recommended methods for cleanup shall be readily available at the onsite trailer and site personnel shall be made aware of the procedures and the location of the information.
2. Materials and equipment necessary for spill cleanup shall be kept in the material storage area on site. Equipment and materials shall include, but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
3. All spills shall be cleaned up immediately after discovery.
4. The spill area shall be kept well ventilated and personnel shall wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
5. Spills of toxic or hazardous material shall be reported to the appropriate State and/or local authority in accordance with local and/or State regulations.
6. The spill prevention plan shall be adjusted to include measures to prevent a particular type of spill from reoccurring and how to clean up the spill if there is another occurrence. A description of the spill, what caused it, and the cleanup measures shall also be included.
7. 77 Elm Street LLC or their assigned designee shall be the spill prevention and cleanup coordinator. 77 Elm Street LLC shall designate at least three other site personnel who will be trained in the spill control practices identified above.

6.10 Pollution Prevention Plan Certificate

I certify under penalty of law that this document and all its attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed: ____
77 Elm Street LLC

Date: ____

Inspection and Maintenance Form

To be completed every 14 days and within 24 hours of a rainfall event of 0.5 inches or greater

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Silt Fence/Silt Sock					
From	**To**	**Average depth of sediment (in.)**	**Tear**	**Posts secure**	**Overall condition**
			Yes/No	Yes/No	Poor Fair Good
			Yes/No	Yes/No	Poor Fair Good
			Yes/No	Yes/No	Poor Fair Good
			Yes/No	Yes/No	Poor Fair Good
			Yes/No	Yes/No	Poor Fair Good
			Yes/No	Yes/No	Poor Fair Good

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

To be completed every 14 days and within 24 hours of a rainfall event of 0.5 inches or greater

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Rip-Rap Aprons/Emergency Spillways

Structure Identification	Location	Installed at proposed grade	Stones firmly in place	Sediment buildup (in.)	Overall condition
SWMA 1P	Center of Cul-de-Sac	Yes/No	Yes/No		Poor Fair Good
SWMA 2P	Rear of Lots 6 & 7	Yes/No	Yes/No		Poor Fair Good
SWMA 4P	Rear of Lots 1 & 2	Yes/No	Yes/No		Poor Fair Good
SWMA 5P	Rear of Lot 3	Yes/No	Yes/No		Poor Fair Good
SWMA 6P	Rear of Lot 5 & 6	Yes/No	Yes/No		Poor Fair Good

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

To be completed every 14 days and within 24 hours of a rainfall event of 0.5 inches or greater

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Surface Infiltration Basins					
Structure Identification	**Location**	**Condition of vegetation**	**Stone Spillway in place**	**Sediment buildup in basin (in.)**	**Sediment buildup at outlet (in.)**
SWMA 1P	Center of Cul-de-Sac	Poor Fair Good	Yes/No		
SWMA 2P	Rear of Lots 6 & 7	Poor Fair Good	Yes/No		
SWMA 4P	Rear of Lots 1 & 2	Poor Fair Good	Yes/No		
SWMA 5P	Rear of Lot 3	Poor Fair Good	Yes/No		
SWMA 6P	Rear of Lot 5 & 6	Poor Fair Good	Yes/No		

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

To be completed every 14 days and within 24 hours of a rainfall event of 0.5 inches or greater

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Sediment and Oil Separator		
Location	**Sediment Buildup at Inlet**	**Sediment Buildup at Outlet**
SOS1 Sta. 0+25 Left	Minor Moderate Major	Minor Moderate Major

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

To be completed every 14 days and within 24 hours of a rainfall event of 0.5 inches or greater

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Subsurface Infiltration Structure				
Location	**Condition of Stone Bed**	**Filter Fabric in Place**	**Sediment Buildup at Inlet**	**Sediment Buildup in Basin**
SWMA3P	Poor Fair Good	Yes No	Minor Moderate Major	Minor Moderate Major
	Poor Fair Good	Yes No	Minor Moderate Major	Minor Moderate Major
	Poor Fair Good	Yes No	Minor Moderate Major	Minor Moderate Major
	Poor Fair Good	Yes No	Minor Moderate Major	Minor Moderate Major

Maintenance required

To be performed by: On or before:

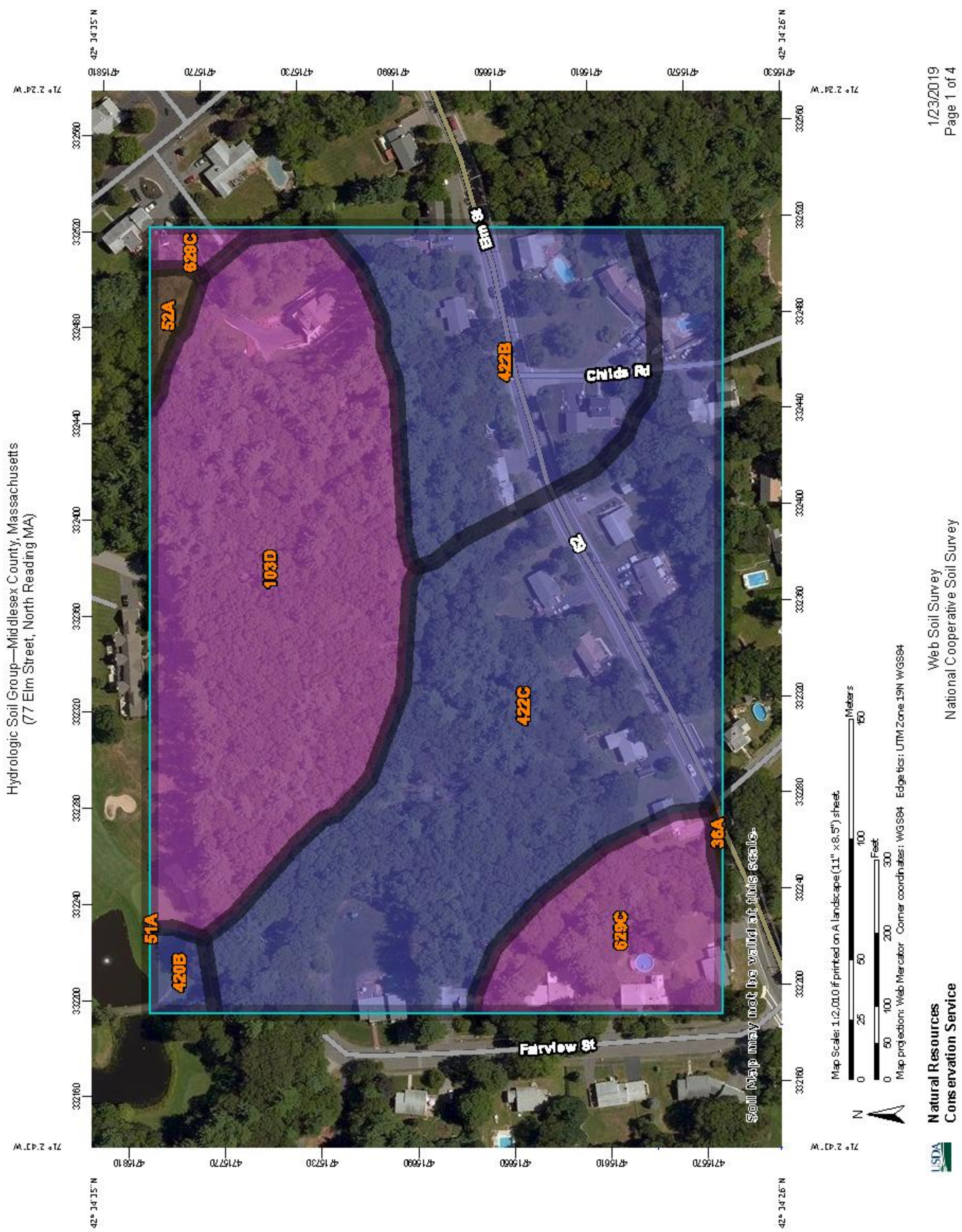
Changes required to the construction period pollution prevention plan:

Reasons for changes:

I certify under penalty of law that the above changes to the document and all its attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: Date:

7 | NRCS Web Soil Survey



Hydrologic Soil Group—Middlesex County, Massachusetts
(77 Elm Street, North Reading MA)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 18, Sep 7, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 29, 2014—Sep 19, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
36A	Saco mucky silt loam, 0 to 1 percent slopes	B/D	0.0	0.2%
51A	Swansea muck, 0 to 1 percent slopes	B/D	0.0	0.0%
52A	Freetown muck, 0 to 1 percent slopes	B/D	0.2	0.9%
103D	Charlton-Hollis-Rock outcrop complex, 15 to 25 percent slopes	A	6.3	32.6%
420B	Canton fine sandy loam, 3 to 8 percent slopes	B	0.2	1.1%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B	3.1	16.2%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	B	7.7	40.1%
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	A	1.7	8.9%
Totals for Area of Interest			**19.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

8 | Snow Disposal Guidelines

The following Snow Disposal Guidance is reproduced from the Mass.gov website:
https://www.mass.gov/guides/snow-disposal-guidance

The Massachusetts Department of Environmental Protection's Snow Disposal Guidance offers information on the proper steps to take when locating sites for the disposal of snow. Finding a place to dispose of collected snow poses a challenge to municipalities and businesses as they clear roads, parking lots, bridges, and sidewalks. Public safety is of the utmost importance. However, care must be taken to ensure that collected snow, which may be contaminated with road salt, sand, litter, and automotive pollutants such as oil, is disposed of in a manner that will minimize threats to nearby sensitive resource areas.

In order to avoid potential contamination to wetlands, water supplies, and waterbodies, MassDEP recommends that municipalities and businesses identify and map appropriate upland snow disposal locations. To assist municipalities and businesses in this planning effort, and to avoid use of snow disposal at sites which compromise wetlands resources or public water supplies, MassDEP has developed this snow disposal mapping tool:

https://maps.env.state.ma.us/dep/arcgis/js/templates/PSF/

If a community or business demonstrates that there is no remaining capacity at upland snow disposal locations, local conservation commissions are authorized to issue Emergency Certifications under the Massachusetts Wetlands Protection Act for snow disposal in certain wetland resource areas. In such cases, Emergency Certifications can only be issued at the request of a public agency or by order of a public agency for the protection of the health or safety of citizens, and are limited to those activities necessary to abate the emergency.

In the event of a regional or statewide severe weather event, MassDEP may also issue a broader Emergency Declaration under the Wetlands Protect Act which allows greater flexibility in snow disposal practices. Details of this approval process are found below.

Snow Disposal Guidance

Effective Date: December 21, 2015

Applicability: Applies to all federal, state, regional and local agencies, as well as to private businesses.

Supersedes: BRP Snow Disposal Guideline No. BRPG01-01 issued March 8, 2001, and all previous snow disposal guidance.

Approved by: Douglas Fine, Assistant Commissioner for Water

PURPOSE: To provide guidelines to all government agencies and private businesses regarding snow disposal site selection, site preparation and maintenance, and emergency snow disposal options that are protective of wetlands, drinking water, and water bodies, and are acceptable to the Massachusetts Department of Environmental Protection (MassDEP), Bureau of Water Resources.

APPLICABILITY: These Guidelines are issued by MassDEP's Bureau of Water Resources on behalf of all Bureau Programs (including Drinking Water Supply, Wetlands and Waterways, Wastewater Management, and Watershed Planning and Permitting). They apply to public agencies and private businesses disposing of snow in the Commonwealth of Massachusetts.

INTRODUCTION

Finding a place to dispose of collected snow poses a challenge to municipalities and businesses as they clear roads, parking lots, bridges, and sidewalks. While we are all aware of the threats to public safety caused by snow, collected snow that is contaminated with road salt, sand, litter, and automotive pollutants such as oil also threatens public health and the environment.

As snow melts, road salt, sand, litter, and other pollutants are transported into surface water or through the soil where they may eventually reach the groundwater. Road salt and other pollutants can contaminate water supplies and are toxic to aquatic life at certain levels. Sand washed into waterbodies can create sand bars or fill in wetlands and ponds, impacting aquatic life, causing flooding, and affecting our use of these resources.

There are several steps that communities can take to minimize the impacts of snow disposal on public health and the environment. These steps will help communities avoid the costs of a contaminated water supply, degraded waterbodies, and flooding. Everything we do on the land has the potential to impact our water resources. Given the authority of local government over the use of the land, municipal officials and staff have a critically important role to play in protecting our water resources.

The purpose of these guidelines is to help municipalities and businesses select, prepare, and maintain appropriate snow disposal sites before the snow begins to accumulate through the winter. Following these guidelines and obtaining the necessary approvals may also help municipalities in cases when seeking reimbursement for snow disposal costs from the Federal Emergency Management Agency is possible.

RECOMMENDED GUIDELINES

These snow disposal guidelines address: (1) site selection; (2) site preparation and maintenance; and (3) emergency snow disposal.

1. SITE SELECTION

The key to selecting effective snow disposal sites is to locate them adjacent to or on pervious surfaces in upland areas or upland locations on impervious surfaces that have functioning and maintained storm water management systems away from water resources and drinking water wells. At these locations, the snow meltwater can filter in to the soil, leaving behind sand and debris which can be removed in the springtime. The following areas should be avoided:

- Avoid importing snow from outside a Zone II or Interim Wellhead Protection Area (IWPA) of a public water supply well or within 75 feet of a private well, where road salt may contaminate water supplies. Only snow from within the Zone II or IWPA should be disposed of within this resource area so as not to increase the potential for pollution of water supplies.

- Avoid dumping of snow into any waterbody, including rivers, the ocean, reservoirs, ponds, or wetlands. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes into ice blocks.
- Avoid dumping snow on MassDEP-designated high and medium-yield aquifers where it may contaminate groundwater.
- Avoid dumping snow in sanitary landfills and gravel pits. Snow meltwater will create more contaminated leachate in landfills posing a greater risk to groundwater, and in gravel pits, there is little opportunity for pollutants to be filtered out of the meltwater because groundwater is close to the land surface.
- Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage swales or ditches. Snow combined with sand and debris may block a storm drainage system, causing localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water.

Recommended Site Selection Procedures

It is important that the municipal Department of Public Works or Highway Department, Conservation Commission, and Board of Health work together to select appropriate snow disposal sites. The following steps should be taken:

1. Estimate how much snow disposal capacity may be needed for the season so that an adequate number of disposal sites can be selected and prepared.
2. Identify sites that could potentially be used for snow disposal, such as municipal open space (e.g., parking lots or parks).
3. Sites located in upland locations that are not likely to impact sensitive environmental resources should be selected first.
4. If more storage space is still needed, prioritize the sites with the least environmental impact (using the site selection criteria, and local or MassGIS maps as a guide).

Snow Disposal Mapping Assistance

MassDEP has an online mapping tool to assist municipalities and businesses in identifying possible locations to potentially dispose of snow, should the need arise. The disposal locations depicted on these maps will also aid MassDEP and the Massachusetts Emergency Management Agency assist communities with snow disposal in the event of severe winter storm emergencies. The tool identifies wetland resource areas, public drinking water supplies and other sensitive locations where snow should not be disposed. The tool may be accessed through the Internet at the following web address:
https://maps.env.state.ma.us/dep/arcgis/js/templates/PSF/.

By clicking on the link for the OLIVER Online Data Viewer, communities can select your town and overlay different resource areas. The MassGIS site includes MassDEP orthophoto maps depicting local wetland resources, hard copies of which were mailed to each Conservation Commission in the past.

2. SITE PREPARATION AND MAINTENANCE

In addition to carefully selecting disposal sites before the winter begins, it is important to prepare and maintain these sites to maximize their effectiveness. The following maintenance measures should be undertaken for all snow disposal sites:

- A silt fence or equivalent barrier should be placed securely on the downgradient side of the snow disposal site.
- To filter pollutants out of the meltwater, wherever possible a 50-foot vegetative buffer strip should be maintained during the growth season between the disposal site and adjacent waterbodies.
- Debris should be cleared from the site prior to using the site for snow disposal.

Debris should be cleared from the site and properly disposed of at the end of the snow season and no later than May 15.

3. SNOW DISPOSAL APPROVALS
Proper snow disposal may be undertaken through one of the following approval procedures:

1. Routine snow disposal – Minimal, if any, administrative review is required in these cases when upland and pervious snow disposal locations or upland locations on impervious surfaces that have functioning and maintained storm water management systems have been identified, mapped, and used for snow disposal following ordinary snowfalls. Use of upland and pervious snow disposal sites avoids wetland resource areas and allows snow meltwater to recharge groundwater and will help filter pollutants, sand, and other debris. This process will address the majority of snow removal efforts until a community exhausts all available upland snow disposal sites. The location and mapping of snow disposal sites will help facilitate each municipality’s routine snow management efforts.
2. Emergency Certifications – If a community or business demonstrates that there is no remaining capacity at upland snow disposal locations, local conservation commissions are authorized to issue Emergency Certifications under the Massachusetts Wetlands Protection Act for snow disposal in buffer zones to wetlands, certain open water areas, and certain wetland resource areas, i.e. within flood plains. In such cases, Emergency Certifications can only be issued at the request of a public agency for the protection of the health or safety of citizens or by order of a public agency, and limited to those activities necessary to abate the emergency. Use the following guidelines in these emergency situations:
    a. Dispose of snow in open water with adequate flow and mixing to prevent ice dams from forming.
    b. Do not dispose of snow in salt marshes, vegetated wetlands, certified vernal pools, shellfish beds, mudflats, drinking water reservoirs and their tributaries, Zone IIs or IWPAs of public water supply wells, Outstanding Resource Waters, or Areas of Critical Environmental Concern.
    c. Do not dispose of snow where trucks may cause shoreline damage or erosion.
    d. Consult with the municipal Conservation Commission to ensure that snow disposal in open water complies with local ordinances and bylaws.

3. Emergency Declarations – In the event of a large-scale severe weather event, MassDEP may issue a broader Emergency Declaration under the Wetlands Protection Act which allows municipalities greater flexibility in snow disposal practices. Emergency Declarations typically authorize greater snow disposal options while protecting especially sensitive resources such as public drinking water supplies, vernal pools, land containing shellfish, FEMA designated floodways, coastal dunes, and salt marsh. In the event of severe winter storm emergencies, the snow disposal site maps created by municipalities will assist MassDEP and the Massachusetts Emergency

Management Agency in helping communities identify appropriate snow disposal locations.

If upland disposal sites have been exhausted, the Emergency Declaration issued by MassDEP allows for snow disposal near water bodies. A buffer of at least 50 feet, preferably vegetated, should still be maintained between the site and the waterbody in these situations. Furthermore, it is essential that the other guidelines for preparing and maintaining snow disposal sites be followed to minimize the threat to adjacent waterbodies.

Under extraordinary conditions, when all land-based snow disposal options are exhausted, the Emergency Declaration issued by MassDEP may allow disposal of snow in certain waterbodies under certain conditions. ***A municipality seeking to dispose of snow in a waterbody should take the following steps***:

a. Call the emergency contact phone number - 1-888-304-1133 - and notify the MEMA bunker personnel of the municipality’s intent.
b. The MEMA bunker personnel will ask for some information about where the requested disposal will take place.
c. The MEMA bunker personnel will confirm that the disposal is consistent with MassDEP’s Emergency Declaration and these guidelines and is therefore approved.

During declared statewide snow emergency events, MassDEP’s website will also highlight the emergency contact phone number (1-888-304-1133) for authorizations and inquiries. For further non-emergency information about this Guidance you may contact your MassDEP Regional Office Service Center:

Northeast Regional Office, Wilmington, 978-694-3249
Southeast Regional Office, Lakeville, 508-946-2714
Central Regional Office, Worcester, 508-767-2722
Western Regional Office, Springfield, 413-784-1100

9 | Deicing Chemical (Road Salt) Storage

The following Snow Disposal Guidance is reproduced from the Mass.gov website:
https://www.mass.gov/guides/guidelines-on-road-salt-storage

Effective Date: December 19, 1997
Guideline No. DWSG97-1

Applicability: Applies to all parties storing road salt or other chemical deicing agents.

Supersedes: Fact Sheet: DEICING CHEMICAL (ROAD SALT) STORAGE (January 1996)

Approved by: Arleen O'Donnell, Asst. Commissioner for Resource Protection

PURPOSE: To summarize salt storage prohibition standards around drinking water supplies and current salt storage practices.

APPLICABILITY: These guidelines are issued on behalf of the Bureau of Resource Protection's Drinking Water Program. They apply to all parties storing road salt or other chemical deicing agents.

The Road Salt Problem

Historically, there have been incidents in Massachusetts where improperly stored road salt has polluted public and private drinking water supplies. Recognizing the problem, state and local governments have taken steps in recent years to remediate impacted water supplies and to protect water supplies from future contamination. As a result of properly designing storage sheds, new incidents are uncommon. These guidelines summarize salt storage prohibition standards around drinking water supplies and current salt storage practices.

Salt Pile Restrictions in Water Supply Protection Areas

Uncovered storage of salt is forbidden by Massachusetts General Law Chapter 85, section 7A in areas that would threaten water supplies. The Drinking Water Regulations, 310 CMR 22.21(2)(b), also restrict deicing chemical storage within wellhead protection areas (Zone I and Zone II) for public water supply wells, as follows: "storage of sodium chloride, chemically treated abrasives or other chemicals used for the removal of ice and snow on roads [are prohibited], unless such storage is within a structure designed to prevent the generation and escape of contaminated runoff or leachate." For drinking water reservoirs, 310 CMR 22.20C prohibits, through local bylaw, uncovered or uncontained storage of road or parking lot de-icing and sanding materials within Zone A at new reservoirs and at those reservoirs increasing their withdrawals under MGL Chapter 21G, the Water Management Act.

For people on a low-sodium diet, 20 mg/L of sodium in drinking water is consistent with the bottled water regulations' meaning of "sodium free." At 20 mg/L, sodium contributes 10% or less to the sodium level in people on a sodium-restricted diet.

Salt Storage Best Management Practices

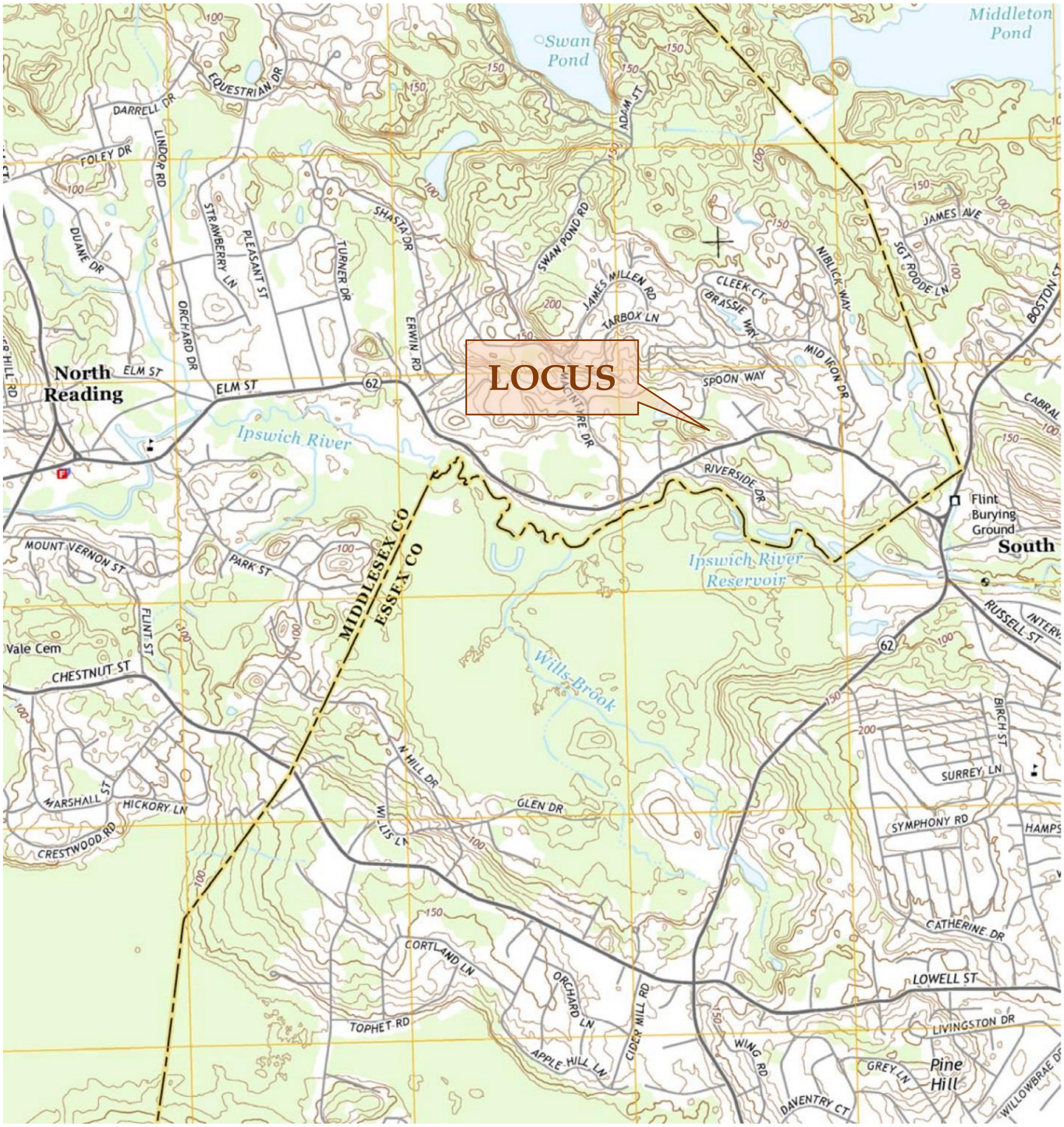
Components of an "environment-friendly" roadway deicing salt storage facility include:
the right site = a flat site;
adequate space for salt piles;

storage on a pad (impervious/paved area);
storage under a roof; and
runoff collection/containment.
For more information, see The Salt Storage Handbook, 6th ed. Virginia: Salt Institute, 2006.

Salt Storage Practices of the Massachusetts Highway Department

The Massachusetts Highway Department (MHD) has 216 permanent salt storage sheds at 109 locations in the state. On leased land and state land under arteries and ramps, where the MHD cannot build sheds, salt piles are stored under impermeable material. This accounts for an additional 15 sites. The MHD also administers a program to assist municipalities with the construction of salt storage sheds. Of 351 communities, 201 municipalities have used state funds for salt storage facilities.

Appendix A – Locus Map/Soil Logs



USGS Locus Map
Grand Legacy Subdivision
Cobblestone Drive (77 Elm Street)
North Reading, MA
Reading Quadrangle - 2015
10′ contour interval NAVD88

Address: 77 ELM STREET Date: 1/19/19

FOR STORMWATER MANAGEMENT AREAS ONLY

Soil Evaluator: T.A.
Excavation Operator: BOH Witness:
Land Use: Woods, Lawn, Pavement, Meadow / Residential, Commercial, Industrial
Slope: None, Slight, Moderate, Steep
Vegetation: Grass, Coniferous/Deciduous Trees, Wetland
Landform: Drumlin, Till Ridge, Ground Moraine, Moraine, Esker, Kame, Lake, Outwash Plain, Kettle, Flood Plain
Position on Landscape: Top, Middle, Bottom

	Depth	Horizon	Texture	Color				Mottles	Fragments	Structure	Consist.
TP: SM1		O a e i M Fill (htm) u	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam								
	0 - 8	Ap E B w g h s C 1 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F, V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
	8 - 22	A p E B w g h s C 1 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F, V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Weep Y/N	22 - 110	A p E B w g h s C 1 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW: 75"	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
____ Stand H20		A p E B w g h s C 1 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Y/N		A p E B w g h s C 1 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm

Gravel: 2mm to 3 inches Stones: 10 inches to 2 feet
Cobbles: 3 inches to 10 inches Boulders: > 2 feet

Perc Test

Hole# ____	Hole# ____
Shelf	Shelf
Bottom	Bottom
Start 15 Minute Presoak	Start 15 Minute Presoak
End 15 Minute Presoak (12")	End 15 Minute Presoak (12")
Time at 9" ____	Time at 9" ____
Time at 6" ____	Time at 6" ____
Time 9"-6" ____	Time 9"-6" ____
Rate:	Rate:

Sketch

SEE LOCATIONS ON PLAN

Other notes:

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	Depth	Horizon	Texture	Color				Mottles	Fragments	Structure	Consist.
TP: SM2		O a e i M Fill (htm) u	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam								
	0 – 10	A p E B w g h s C 1 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:___ Class IV:___	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
	10 – 23	A p E B w g h s C 1,2 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:___ Class IV:___	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Weep Y/N	23 – 110	A p E B w g h s C 1,2 ,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:___ Class IV:___	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW: 90"	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Stand H20 Y/N		A p E B w g h s C 1 ,2,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:___ Class IV:___	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
		A p E B w g h s C 1 ,2,3 d g r R	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:___ Class IV:___	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6,7,8	1 2 3 4 5 6,7,8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky	Loose V.Friable Friable Firm V.Firm Ext.Firm

	Depth	Horizon	Texture	Color				Mottles	Fragments	Structure	Consist.
TP: SM3		O a e i M Fill (htm) u	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam								
	0 – 8	A p E B w g h s C 1 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:___ Class IV:___	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
	8 – 21	A p E B w g h s C 1,2 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:___ Class IV:___	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Weep Y/N	21 – 92	A p E B w g h s C 1,2 ,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:___ Class IV:___	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW: 55"	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Stand H20 Y/N		A p E B w g h s C 1 ,2,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:___ Class IV:___	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
		A p E B w g h s C 1 ,2,3 d g r R	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:___ Class IV:___	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6,7,8	1 2 3 4 5 6,7,8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky	Loose V.Friable Friable Firm V.Firm Ext.Firm

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	Depth	Horizon	Texture	Color				Mottles	Fragments	Structure	Consist.
TP: SM4		O a e i M Fill (htm) u	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam								
	0 - 9	A p E B w g h s C 1 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth:____ Conc:____ Depl:____ ESHGW:____	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
	9 - 22	A p E B w g h s C 1,2 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth:____ Conc:____ Depl:____ ESHGW:____	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Weep Y/N	22 - 90	A p E B w g h s C 1,2 ,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth:____ Conc:____ Depl:____ ESHGW: 60"	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Stand H20 Y/N		A p E B w g h s C 1 ,2,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth:____ Conc:____ Depl:____ ESHGW:____	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
		A p E B w g h s C 1 ,2,3 d g r R	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6,7,8	1 2 3 4 5 6,7,8	Depth:____ Conc: Depl: ESHGW:____	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky	Loose V.Friable Friable Firm V.Firm Ext.Firm

	Depth	Horizon	Texture	Color				Mottles	Fragments	Structure	Consist.
TP: SM5		O a e i M Fill (htm) u	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam								
	0 - 10	A p E B w g h s C 1 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth:____ Conc:____ Depl:____ ESHGW:____	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
	10 - 24	A p E B w g h s C 1,2 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth:____ Conc:____ Depl:____ ESHGW:____	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Weep Y/N	24 - 93	A p E B w g h s C 1,2 ,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth:____ Conc:____ Depl:____ ESHGW: 75"	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Stand H20 Y/N		A p E B w g h s C 1 ,2,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth:____ Conc:____ Depl:____ ESHGW:____	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
		A p E B w g h s C 1 ,2,3 d g r R	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:____ Class IV:____	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6,7,8	1 2 3 4 5 6,7,8	Depth: Conc: Depl: ESHGW:____	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky	Loose V.Friable Friable Firm V.Firm Ext.Firm

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	Depth	Horizon	Texture	Color				Mottles	Fragments	Structure	Consist.
TP: SM6		O a e i M Fill (htm) u	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam								
	0 - 8	Ap E B w g h s C 1 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:_______ Class IV:_______	2.5 5 7.5 10 GL	 Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
	8 - 21	A p E B w g h s C 1,2 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:_______ Class IV:_______	2.5 5 7.5 10 GL	 Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Weep Y/N	21 - 86	A p E B w g h s C 1,2 ,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:_______ Class IV:_______	2.5 5 7.5 10 GL	 Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW: 70"	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Stand H20		A p E B w g h s C 1 ,2,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:_______ Class IV:_______	2.5 5 7.5 10 GL	 Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Y/N		A p E B w g h s C 1 ,2,3 d g r R	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:_______ Class IV:_______	2.5 5 7.5 10 GL	 Y YR	1 2 3 4 5 6,7,8	1 2 3 4 5 6,7,8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky	Loose V.Friable Friable Firm V.Firm Ext.Firm

	Depth	Horizon	Texture	Color				Mottles	Fragments	Structure	Consist.
TP: SM7		O a e i M Fill (htm) u	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam								
	0 - 4	Ap E B w g h s C 1 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:_______ Class IV:_______	2.5 5 7.5 10 GL	 Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
	4 - 88	A p E B w g h s C 1,2 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:_______ Class IV:_______	2.5 5 7.5 10 GL	 Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW: N.A.	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Weep Y/N		A p E B w g h s C 1,2 ,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:_______ Class IV:_______	2.5 5 7.5 10 GL	 Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Stand H20		A p E B w g h s C 1 ,2,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:_______ Class IV:_______	2.5 5 7.5 10 GL	 Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Y/N		A p E B w g h s C 1,2,3 d g r R	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:_______ Class IV:_______	2.5 5 7.5 10 GL	 Y YR	1 2 3 4 5 6,7,8	1 2 3 4 5 6,7,8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky	Loose V.Friable Friable Firm V.Firm Ext.Firm

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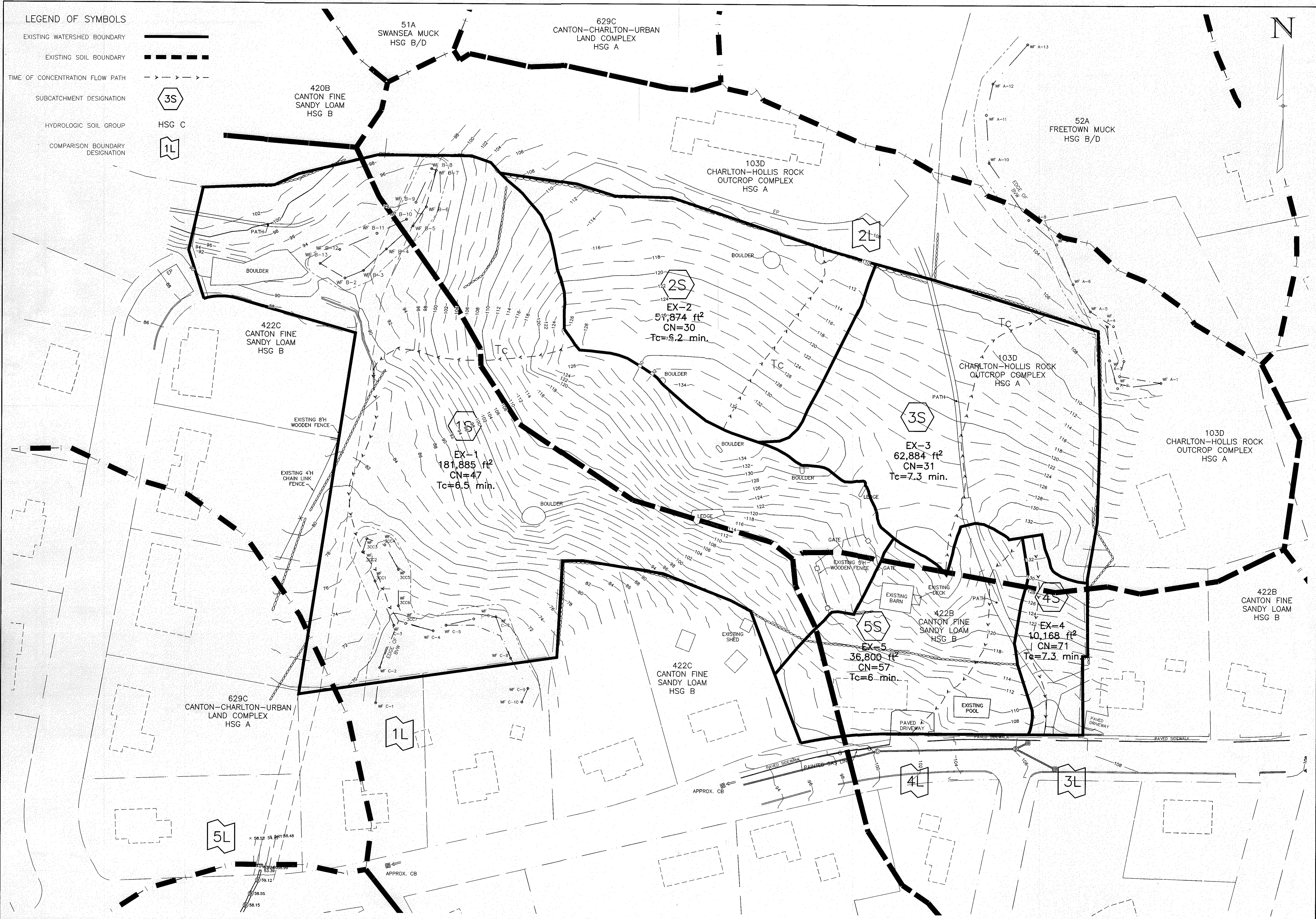
	Depth	Horizon	Texture	Color				Mottles	Fragments	Structure	Consist.
TP: SM8		O a e i M Fill (htm) u	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam								
	0 - 10	A p E B w g h s C 1 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:______ Class IV:______	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
	10 - 22	A p E B w g h s C 1,2 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:______ Class IV:______	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Weep Y/N	22 - 86	A p E B w g h s C 1,2 ,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:______ Class IV:______	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW: 80"	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Stand H20		A p E B w g h s C 1 ,2,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:______ Class IV:______	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Y/N		A p E B w g h s C 1 ,2,3 d g r R	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:______ Class IV:______	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6,7,8	1 2 3 4 5 6,7,8	Depth: Conc: Depl: ESHGW: ______	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky	Loose V.Friable Friable Firm V.Firm Ext.Firm

	Depth	Horizon	Texture	Color				Mottles	Fragments	Structure	Consist.
TP: SM9		O a e i M Fill (htm) u	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam								
	0 - 8	A p E B w g h s C 1 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:______ Class IV:______	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
	8 - 22	A p E B w g h s C 1,2 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:______ Class IV:______	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Weep Y/N	22 - 90	A p E B w g h s C 1,2 ,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:______ Class IV:______	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Stand H20		A p E B w g h s C 1 ,2,3 d g r R Fill (htm)	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:______ Class IV:______	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	Depth: Conc: Depl: ESHGW:	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky Columnar Sat/Damp	Loose V.Friable Friable Firm V.Firm Ext.Firm
Y/N		A p E B w g h s C 1 ,2,3 d g r R	Sand-F,M,C,V.C. L. Sand S. Loam- F., V.F. Loam Class III:______ Class IV:______	2.5 5 7.5 10 GL	Y YR	1 2 3 4 5 6,7,8	1 2 3 4 5 6,7,8	Depth: Conc: Depl: ESHGW: ______	% Grav: Cobb: Stone: Bdlr:	Str.less,W,M,S Granular Blocky Platey Prismatic S.Ang.blocky	Loose V.Friable Friable Firm V.Firm Ext.Firm

5/5



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North Reading, MA 01864

Designed By: PMB
Drawn By: PMB
Reviewed By: CPS
Project Manager: CPS
Job File Number: NREA-0056
Drawing File Folder: NREA56

☐ Drawing Issued for Review Only
☒ Drawing Issued for Permit
☐ Drawing Issued for Construction

SEAL
COMMONWEALTH OF MASSACHUSETTS
PETER M. BLAISDELL, JR.
CIVIL
No. 41613
(9/30/19)

6		
5		
4		
3		
2		
1	PEER REVIEW COMMENTS	3/25/2019

EXISTING CONDITION WATERSHED MAP ROAD A

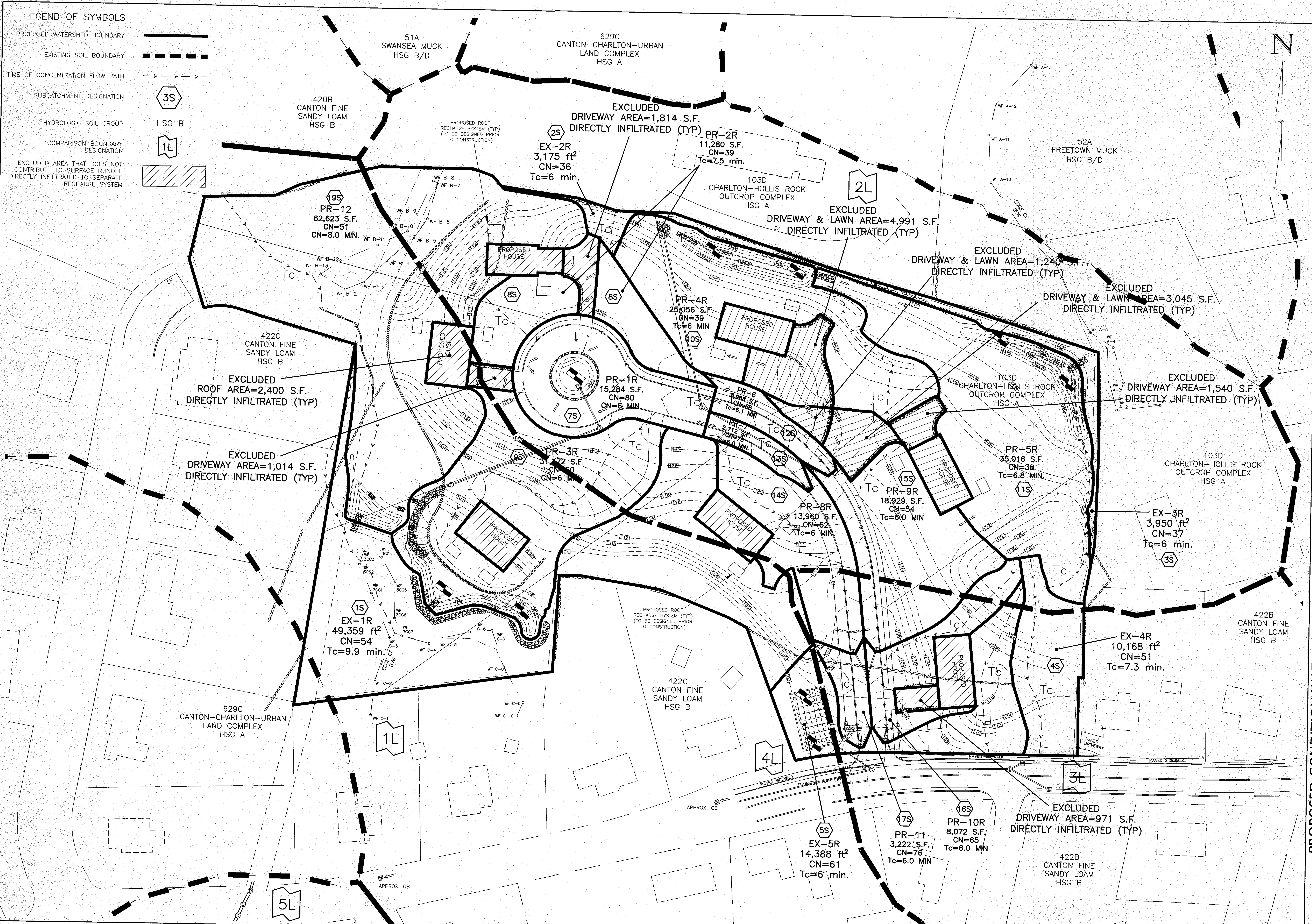
#77 ELM STREET, NORTH READING, MA

0' 20' 40' 80'
SCALE: 1"=40'

JANUARY 17, 2019

DRAWING: W1

SHEET 1 OF 2



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SEAL
COMMONWEALTH OF MASSACHUSETTS
PETER M. BLAISDELL, JR.
CIVIL
No. 41613
REGISTERED PROFESSIONAL ENGINEER
(4/30/19)

6		
5		
4		
3		
2		
1	PEER REVIEW COMMENTS	3/25/2019

PROPOSED CONDITION WATERSHED MAP
ROAD A
#77 ELM STREET, NORTH READING, MA

0' 20' 40' 80'
SCALE: 1"=40'
JANUARY 17, 2019

DRAWING: W2
SHEET 2 OF 2