STORMWATER MANAGEMENT CALCULATIONS

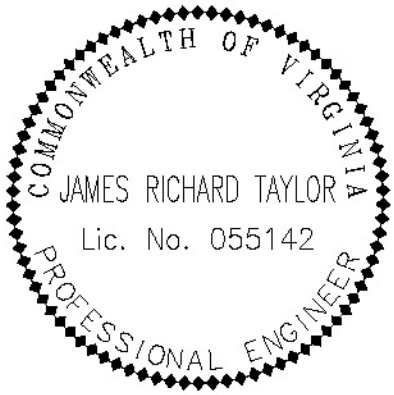
FOR

NORTHSIDE PARK
REVISED SECTION XII

MOUNT TABOR MAGISTERIAL DISTRICT
TOWN OF BLACKSBURG, VA

B&A Job #24220049.00

January 3, 2023



APPROVAL BLOCK	
BLACKSBURG TOWN ENGINEER	DATE

PREPARED BY:

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SECTION I: PROJECT NARRATIVE

Project Description

The purpose of this project is the subdivision of 36.00 acres of land for SAS Construction. The project is subdivided into 51 lots in Section XII, Phase II and 51 lots in the proposed new section (Section XII, Tract B). The parcels are zoned as R-4 (Low Density Residential) with open space design overlay. Single family homes will be constructed on the subdivided lots.

Existing Site Conditions

The site[1] consists of mixed grassed and wooded area with an area of farm land. The site is surrounded by the existing Northside Park subdivision off of Northside Drive and a parcel (Tax Map # 166-A 4C) dedicated to the Town of Blacksburg for open/recreational space.

The site has an impervious coverage of 1.28 acres (3.6%) at the conditions prior to development. Existing soil conditions onsite include the types listed below with slopes of 2%-30%. There are currently no known environmental issues on site, however, prior to construction, the site will be fully investigated to determine if there are any jurisdictional waters on the property or within any of the areas of disturbance. If evidence is found, the property will be delineated, confirmed by the US Army Corps of Engineers, and all necessary permits will be filed. A tributary of Tom's Creek is located on the property outside of the limits of disturbance. The approximate 100-year flood plain and wetland boundaries are delineated and shown on sheet SWM1.

Existing soil conditions on-site include the following types:

8D – Caneyville-Opequon-Rock outcrop complex, 7 to 25 percent
K-Factor: 0.37
pH: 5.9
HSG: C
Texture: silt loam

11B—Duffield-Ernest complex, 2 to 7 percent slopes
K-Factor: 0.28
pH: 6.0
HSG: B
Texture: silt loam

12C—Frederick and Vertrees silt loams, 7 to 15 percent slopes
K-Factor: 0.37
pH: 5.3
HSG: B
Texture: silt loam

[1] For the purposes of the Soil & Erosion Control Narrative, "site" shall be defined as the area within the proposed subject property boundary, 36.00 acres, Tax Map #s 166-10A, 166-10-B, 166-17A, 166-17B.

13C—Frederick and Vertrees gravelly silt loams, 7 to 15 percent slopes
K-Factor: 0.37
pH: 5.3
HSG: B
Texture: gravelly silt loam

13D—Frederick and Vertrees gravelly silt loams, 15 to 25 percent
K-Factor: 0.37
pH: 5.3
HSG: B
Texture: gravelly silt loam

16B—Groseclose and Poplimento soils, 2 to 7 percent slopes
K-Factor: 0.32
pH: 4.6
HSG: C
Texture: loam

16C—Groseclose and Poplimento soils, 7 to 15 percent slopes
K-Factor: 0.32
pH: 4.6
HSG: C
Texture: loam

16D—Groseclose and Poplimento soils, 15 to 25 percent slopes
K-Factor: 0.32
pH: 4.6
HSG: C
Texture: loam

25—McGary and Purdy soils
K-Factor: 0.43
pH: 7.5
HSG: D
Texture: silt loam

Development Plans

The proposed development will consist of 51 new single family homes with 3-5 bedrooms each. The homes will each be two (2) stories either over crawlspace or with walk-out basements. Each home will include a covered front porch and either an elevated deck or patio on grade in the rear and a two-car garage. Water main and sanitary sewer main extensions are proposed to serve the development. Stormwater quantity management will be handled by a standard detention system and bioretention facilities. Water quality requirements will be met by the bioretention facilities and the purchase nutrient credits up to 25%.

During Construction

Neighboring areas on the south side of the development are primarily developed urban land consisting of single-family residential properties. Properties on the north side of the development are primarily rural residential. Any runoff from the site shall be controlled with temporary measures such as a construction entrance, silt fence, inlet protection, construction road stabilization, seeding and other measures per Virginia Erosion and Sediment Control Handbook standards.

SECTION II: STORMWATER MANAGEMENT SUMMARY

PRE-DEVELOPMENT SUMMARY

Please see sheet SW3 for the pre-development drainage area map.

In the pre-development condition, the site is primarily a wooded and grassed mix cover. The site is contained in one drainage area that drains directly to tributary of Tom's Creek located on a Northside Park open space parcel adjacent to the site. Multiple large drainage areas drain through the site through natural waterways and swales. The flows converge into the tributary and discharges into a culvert that crosses US 460. The upper invert of the culvert is used as the point of analysis.

A portion of the pre-development drainage area was modeled using the Northside Park Section XII, Phase II stormwater calculations. This drainage area, denoted as DA #1 on this plan, is directed into an existing stormwater management facility that discharges to the Tom's Creek tributary.

See the following pages and the enclosed HydroCAD report for the peak flow rates and runoff volumes in the pre-development condition. All flows in the HydroCAD model have been analyzed using the SCS/TR-55, weighted Q method. See the included drainage map and HydroCAD report for time of concentration calculations. Where a subwatershed is predominantly impervious, a minimum time of concentration of 6 minutes has been assumed.

PRE-DEVELOPMENT LAND COVER

Area (acres)	CN	Description (subcatchment-numbers)
0.24	98	Paved parking, HSG B
0.17	98	Paved parking, HSG C
0.78	70	1/2 acre lots, 25% imp, HSG B
0.13	80	1/2 acre lots, 25% imp, HSG C
5.10	55	Woods, Good, HSG B
5.77	70	Woods, Good, HSG C
0.07	39	>75% Grass cover, Good, HSG A
4.59	61	>75% Grass cover, Good, HSG B
0.07	74	>75% Grass cover, Good, HSG C
8.23	58	Woods/grass comb., Good, HSG B
1.81	72	Woods/grass comb., Good, HSG C
0.41	82	Fallow, bare soil, HSG B
0.22	98	Trail, HSG B
0.01	98	Trail, HSG C
27.60	**63**	**TOTAL AREA**

POINT OF ANALYSIS

Total Drainage Area = 247.74 acres

	Peak Flow	Runoff Volume
1-year	61.83 cfs	7.55 af
2-year	92.14 cfs	10.93 af
10-year	185.51 cfs	28.51 af
100-year	247.74 cfs	68.06 af

POST-DEVELOPMENT SUMMARY

Please see sheet SW4 for the post-development drainage area map.

In accordance with the Virginia Stormwater Management Regulations (9VAC25-870), this project is subject to and has been designed in accordance with Part IIB technical criteria.

In the post-development condition, the proposed site will be graded to capture runoff via sheet flow, roof drains, curb inlets, and stormwater piping. Runoff will be collected in a standard detention basin and multiple bioretention facilities. Outflow from this system will be managed by multiple flow control devices and an emergency spillway and is routed through existing channels to the point of analysis. No negative impacts are expected to the existing wetlands or 100-year floodplain. As shown in the enclosed HydroCAD calculations, the standard detention facility has been designed to manage peak flows and meet water quantity requirements. Appendix D includes runoff reduction volumes and adjusted curve numbers for proposed bioretention drainage areas.

The following pages and the HydroCAD report demonstrate that the site will be contributing less flow to the point of analysis than in the pre-development condition.

See the following pages and the enclosed HydroCAD report for the peak flow rates and runoff volumes in the post-development condition. All flows in this model have been analyzed using the SCS/TR-55, weighted Q method. See the included drainage map and HydroCAD report for time of concentration calculations.

POST-DEVELOPMENT SITE LAND COVER

Area (acres)	CN	Description (subcatchment-numbers)
0.03	98	Parked pavement, HSG A
2.19	98	Parked pavement, HSG B
0.45	98	Parked pavement, HSG C
6.56	75	1/4 acre lots, 38% imp, HSG B
0.57	83	1/4 acre lots, 38% imp, HSG C
2.12	72	1/3 acre lots, 30% imp, HSG B
0.50	81	1/3 acre lots, 30% imp, HSG C
3.37	70	1/2 acre lots, 25% imp, HSG B
2.25	80	1/2 acre lots, 25% imp, HSG C
2.07	68	1 acre lots, 20% imp, HSG B
3.00	79	1 acre lots, 20% imp, HSG C
0.04	39	>75% Grass cover, Good, HSG A
3.26	61	>75% Grass cover, Good, HSG B
1.19	74	>75% Grass cover, Good, HSG C
27.60	**75**	**TOTAL AREA**

POINT OF ANALYSIS

Total Drainage Area = 247.74 acres

	Peak Flow	Runoff Volume
1-year	59.98 cfs	7.89 af
2-year	88.91 cfs	11.53 af
10-year	185.22 cfs	29.77 af
100-year	451.71 cfs	70.69 af

Channel Protection

In accordance with 9VAC25-870-66 (B), concentrated stormwater flows have been discharged directly to a stormwater conveyance system on Roanoke Street. In accordance with Town Code §16-58(a)(1), stormwater runoff from the development shall be released at a post-development peak flow rate for the two-year 24-hour storm event that is less than the pre- development peak flow rate from the two-year 24-hour storm event and released at a post-development peak flow rate for the ten-year 24-hour storm event that is less than the predevelopment peak flow rate from the ten-year 24-hour storm event. As documented in the attached HydroCAD calculations and the table below, the design meets this requirement.

R_v Calculation

Pre-developed = 0.537 af – See HydroCAD "RV Calculation" Report
Developed = 1.429 af – See HydroCAD "RV Calculation" Report

$$Q_{Developed} \leq I.F. \times (Q_{Pre\text{-}developed} \times RV_{Pre\text{-}developed}) / RV_{Developed}$$
$$Q_{Developed} \leq 0.8 \times (Q_{Pre\text{-}developed} \text{ x } 0.537) / 1.429$$
$$Q_{Developed} \leq 0.30 \text{ x } Q_{Pre\text{-}developed}$$

The resulting maximum allowable peak flow rate for the one-year 24-hour storm at the Point of Analysis is 60.03 cfs. The actual post-development peak flow rate achieved is 59.98 cfs.

Flood Protection

In accordance with 9VAC25-870-66 (C), concentrated stormwater flows have been discharged to a stormwater conveyance system. The downstream conveyance systems are made up of a series of natural and manmade conveyance systems. As shown on the attached HydroCAD calculations, the point of discharge releases a post-development peak flow rate for the 10-year 24-hour storm event that is less than the pre-development peak flow rate from the 10-year 24- hour storm event, satisfying subdivision 2(b). Per subdivision (3) of these regulations, no further analysis of the downstream stormwater conveyance system is required.

Predevleopment Q_{10} = 185.51 cfs
Post Development Q_{10} = 185.22 cfs

SECTION III: STORMWATER QUALITY SUMMARY

Water Quality:

Water quality compliance has been achieved through use of the Virginia Runoff Reduction Method in accordance with the design criteria set forth in 9VAC25-870-65 and through the purchase of nutrient credits in accordance with the criteria set forth in the Code of Virginia. Per §62.1-44.15:35 (C)(2), the VSMP shall allow the use of nutrient credits when it is demonstrated that onsite control of at least 75 percent of the required phosphorous water quality reduction will be achieved. The following calculations demonstrate that the minimum onsite water quality reduction requirements are met with onsite BMPs and the required nutrient credits to be purchased is below the 25% maximum.

Criteria	*Value*
Applicable Area	27.60 ac.
Existing Impervious	1.28 ac.
Existing Managed Turf	26.29 ac.
Proposed Impervious	8.59 ac.
Proposed Managed Turf	19.01 ac.
Load Reduction Required	16.24 lb/yr

The existing site[2] has a pre-development impervious land cover of 1.28 acres (3.6%). The proposed development site has an impervious land cover of 8.59 acres (31.1%) resulting in a composite runoff coefficient (R_v) of 0.30. The prescribed phosphorus pollutant reduction requirement is 16.24 lb/yr, of which 12.18 lb/yr (75%) must be achieved on site. The proposed on-site BMPs remove 12.39 lb/yr (76%) and the remaining 3.84 lbs/yr (24%) will be satisfied through a nutrient credit purchase. The phosphorus pollutant reduction achieved by the on-site BMPs is summarized in the table below.

BMP ID	*Phosphorus Load Reduction*
BIO-1	2.14 lb/yr
BIO-2	3.64 lb/yr
BIO-3	2.27 lb/yr
BIO-4	2.67 lb/yr
BIO-5	1.66 lb/yr
TOTAL	**12.39 lb/yr**

Please see the VRRM calculation sheets located in Appendix D for summary tables identifying pollutant load and load reduction requirements and calculations.

[2] In the context of water quality compliance, "site" shall be defined as the land or water area where the land-disturbing activity is physically conducted, including the limits of any off-site land disturbance. See sheets SW3-SW4.

SECTION IV: DOWNSTREAM ANALYSIS

Runoff from the proposed development is discharged directly into to a series of natural and manmade conveyance systems. The post-development peak runoff has been mitigated with bioretention facilities and a standard detention facility to prevent adverse impacts from this site to downstream properties in the form of channel erosion and flooding.

Per 9VAC25-870-66 subsection A, compliance with Minimum Standard 19 of the Virginia Erosion and Sediment Control Regulations has been satisfied by meeting the requirements of the for channel protection and flood protection as shown in the Post Development Summary. No adverse impacts to downstream properties are expected as a result of this development.

SECTION IV: STORMWATER MANAGEMENT MAINTENANCE/INSPECTION PLAN

Generally

1. The owner is responsible for providing or coordinating all facility inspections and any required maintenance that may result from such inspections.

2. Requirements listed here are to be taken as a minimum and do not represent the limit of responsibility.

3. Any standing water pumped during the maintenance operation must be disposed of per the VESCH, 1992 edition and any local requirements.

Required Action

Bioretention Filters:

1. Every (12) twelve months the responsible party shall complete the "Bioretention practices O&M Checklist" provided in Appendix 9C of the Virginia Stormwater Management Handbook (VSMH) and make any repairs necessary to areas of failure/concern discovered during inspection. typical maintenance tasks include:
    a. check to see if 75% to 90% cover (mulch plus vegetative cover) has been achieved in the bed, and measure the depth of the remaining mulch.
    b. check for sediment buildup at curb cuts, gravel diaphragms or pavement edges that prevents flow from getting into the bed, and check for other signs of bypassing.
    c. check for any winter- or salt-killed vegetation, and replace it with hardier species.
    d. note presence of accumulated sand, sediment and trash in the pre-treatment cell or filter beds, and remove it.
    e. inspect bioretention side slopes and grass filter strips for evidence of any rill or gully erosion, and repair it.
    f. check the bioretention bed for evidence of mulch flotation, excessive ponding, dead plants or concentrated flows, and take appropriate remedial action.
    g. check inflow points for clogging, and remove any sediment.
    h. look for any bare soil or sediment sources in the contributing drainage area, and stabilize them immediately.
    i. check for clogged or slow-draining soil media, a crust formed on the top layer, inappropriate soil media, or other causes of insufficient filtering time, and restore proper filtration characteristics.
2. Every (6) months and after each major runoff producing storm event, the following maintenance tasks shall be performed:
    a. inspect condition of grate inlet riser for evidence of clogging, leakage, debris accumulation, etc. that may compromise the performance of the structure. such debris or sediments shall be removed immediately.

3. Grassed areas shall be maintained so as to promote soil stabilization of basin side slopes and proper functioning of outfall structures. the basin side slopes shall be mowed a minimum of twice a year to discourage woody growth.

Standard (Dry) Detention Ponds:

1. Every (12) twelve months the responsible party shall complete and document a visual inspection of the access road, detention pond facility, and it's outlet structure and make any repairs necessary to areas of failure/concern discovered during inspection. Typical maintenance tasks include:
    a. Inspect pond outfall channel for erosion, undercutting, rip-rap displacement, woody growth, etc.
    b. Inspect condition of principal spillway and riser for evidence of spalling, joint failure, leakage, corrosion, etc.
    c. Inspect internal and external side slopes of the pond for evidence of sparse vegetative cover, erosion, or slumping, and make needed repairs immediately.
    d. Grassed areas shall be maintained so as to promote soil stabilization of pond banks and proper functioning of outfall structures. The pond banks shall be mowed a minimum of twice a year to discourage woody growth.
    e. Erosion repair and trash removal around the inlet and outlet structures and pond banks shall be performed twice during the growing season (April-October).
2. Every (6) months and after each major runoff producing storm event, the following maintenance tasks shall be performed:
    a. Inspect the condition of the access road for any issues including standing water or erosion of the surface course. A surface course of 2 to 3 inches of compacted crusher run shall be maintained at all times. Rutting, potholes, or deterioration of the surface course shall be repaired immediately.
    b. Inspect condition of all openings and trash racks for evidence of clogging, leakage, debris accumulation, etc that may compromise the performance of the structure. Such debris or sediments shall be removed immediately.

APPENDIX A:
SOIL MAPS & SOIL DESCRIPTIONS

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Montgomery County, Virginia

July 22, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:6,160 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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 1:15,800.

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: Montgomery County, Virginia
Survey Area Data: Version 14, Sep 14, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 29, 2019—Oct 4, 2019

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8D	Caneyville-Opequon-Rock outcrop complex, 7 to 25 percent slopes	4.0	6.4%
11B	Duffield-Ernest complex, 2 to 7 percent slopes	3.9	6.2%
12C	Frederick and Vertrees silt loams, 7 to 15 percent slopes	29.6	46.8%
13C	Frederick and Vertrees gravelly silt loams, 7 to 15 percent slopes	2.2	3.4%
13D	Frederick and Vertrees gravelly silt loams, 15 to 25 percent slopes	1.9	3.1%
16B	Groseclose and Poplimento soils, 2 to 7 percent slopes	0.2	0.3%
16C	Groseclose and Poplimento soils, 7 to 15 percent slopes	12.7	20.0%
16D	Groseclose and Poplimento soils, 15 to 25 percent slopes	3.7	5.8%
25	McGary and Purdy soils	5.1	8.1%
Totals for Area of Interest		**63.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different

management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Montgomery County, Virginia

8D—Caneyville-Opequon-Rock outcrop complex, 7 to 25 percent slopes

Map Unit Setting

National map unit symbol: kc3b
Elevation: 1,500 to 2,700 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 117 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Caneyville and similar soils: 30 percent
Opequon and similar soils: 25 percent
Rock outcrop: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Caneyville

Setting

Landform: Hills
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Limestone residuum

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 32 inches: clay
H3 - 32 to 79 inches: bedrock

Properties and qualities

Slope: 7 to 25 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Opequon

Setting

Landform: Hills
Landform position (two-dimensional): Summit, backslope

Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Limestone residuum

Typical profile

H1 - 0 to 4 inches: silty clay loam
H2 - 4 to 15 inches: clay
H3 - 15 to 79 inches: bedrock

Properties and qualities

Slope: 7 to 25 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Escarpments
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope, free face
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Limestone

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

11B—Duffield-Ernest complex, 2 to 7 percent slopes

Map Unit Setting

National map unit symbol: kc1q
Elevation: 1,300 to 3,000 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 50 to 57 degrees F

Frost-free period: 117 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Duffield and similar soils: 45 percent
Ernest and similar soils: 35 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Duffield

Setting

Landform: Drainageways
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Loamy colluvial, alluvial, eolian sediments underlain by loamy and clayey residuum of limestone and shale

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 37 inches: silty clay loam
H3 - 37 to 79 inches: clay

Properties and qualities

Slope: 2 to 7 percent
Depth to restrictive feature: 48 to 99 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Ernest

Setting

Landform: Drainageways
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Interbedded limestone and shale residuum

Typical profile

H1 - 0 to 6 inches: silt loam
H2 - 6 to 26 inches: silty clay loam
H3 - 26 to 50 inches: silty clay loam

H4 - 50 to 79 inches: silty clay loam

Properties and qualities

Slope: 2 to 7 percent
Depth to restrictive feature: 20 to 35 inches to fragipan
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Purdy

Percent of map unit: 3 percent
Landform: Stream terraces, depressions
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

12C—Frederick and Vertrees silt loams, 7 to 15 percent slopes

Map Unit Setting

National map unit symbol: kc1t
Elevation: 1,700 to 3,000 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 117 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Frederick and similar soils: 40 percent
Vertrees and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Frederick

Setting

Landform: Hills
Landform position (two-dimensional): Summit, backslope

Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Limestone interbedded with siltstone and shale residuum

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 22 inches: clay
H3 - 22 to 79 inches: clay

Properties and qualities

Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Forage suitability group: Moist, Fertile Soils (G128XB001VA)
Other vegetative classification: Moist, Fertile Soils (G128XB001VA)
Hydric soil rating: No

Description of Vertrees

Setting

Landform: Hills
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Limestone, siltstone, and shale residuum

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 25 inches: silty clay
H3 - 25 to 50 inches: clay
H4 - 50 to 79 inches: clay

Properties and qualities

Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Forage suitability group: Moist, Fertile Soils (G128XB001VA)
Other vegetative classification: Moist, Fertile Soils (G128XB001VA)
Hydric soil rating: No

13C—Frederick and Vertrees gravelly silt loams, 7 to 15 percent slopes

Map Unit Setting

National map unit symbol: kc1w
Elevation: 1,700 to 3,000 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 117 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Frederick and similar soils: 40 percent
Vertrees and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Frederick

Setting

Landform: Hills
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Limestone interbedded with siltstone and shale residuum

Typical profile

H1 - 0 to 10 inches: gravelly silt loam
H2 - 10 to 22 inches: clay
H3 - 22 to 79 inches: clay

Properties and qualities

Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Forage suitability group: Moist, Fertile Soils (G128XB001VA)
Other vegetative classification: Moist, Fertile Soils (G128XB001VA)
Hydric soil rating: No

Description of Vertrees

Setting

Landform: Hills
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Limestone, siltstone, and shale residuum

Typical profile

H1 - 0 to 10 inches: gravelly silt loam
H2 - 10 to 25 inches: silty clay
H3 - 25 to 50 inches: clay
H4 - 50 to 79 inches: clay

Properties and qualities

Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Forage suitability group: Moist, Fertile Soils (G128XB001VA)
Other vegetative classification: Moist, Fertile Soils (G128XB001VA)
Hydric soil rating: No

13D—Frederick and Vertrees gravelly silt loams, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: kc1x
Elevation: 1,700 to 3,000 feet
Mean annual precipitation: 30 to 45 inches

Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 117 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Frederick and similar soils: 40 percent
Vertrees and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Frederick

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Limestone interbedded with siltstone and shale residuum

Typical profile

H1 - 0 to 10 inches: gravelly silt loam
H2 - 10 to 22 inches: clay
H3 - 22 to 79 inches: clay

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Forage suitability group: Moist, Fertile Soils (G128XB001VA)
Other vegetative classification: Moist, Fertile Soils (G128XB001VA)
Hydric soil rating: No

Description of Vertrees

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Limestone, siltstone, and shale residuum

Typical profile

H1 - 0 to 10 inches: gravelly silt loam
H2 - 10 to 25 inches: silty clay

H3 - 25 to 50 inches: clay
H4 - 50 to 79 inches: clay

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Forage suitability group: Moist, Fertile Soils (G128XB001VA)
Other vegetative classification: Moist, Fertile Soils (G128XB001VA)
Hydric soil rating: No

16B—Groseclose and Poplimento soils, 2 to 7 percent slopes

Map Unit Setting

National map unit symbol: kc22
Elevation: 1,700 to 3,000 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 117 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Groseclose and similar soils: 45 percent
Poplimento and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Groseclose

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Limestone, shale, siltstone, and sandstone residuum

Typical profile

H1 - 0 to 10 inches: loam
H2 - 10 to 28 inches: clay

H3 - 28 to 39 inches: clay
H4 - 39 to 51 inches: clay
H5 - 51 to 79 inches: clay loam

Properties and qualities

Slope: 2 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Poplimento

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Limestone, shale, siltstone, and sandstone residuum

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 35 inches: clay
H3 - 35 to 55 inches: clay
H4 - 55 to 79 inches: channery silty clay loam

Properties and qualities

Slope: 2 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

16C—Groseclose and Poplimento soils, 7 to 15 percent slopes

Map Unit Setting

National map unit symbol: kc23
Elevation: 1,700 to 3,000 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 117 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Groseclose and similar soils: 45 percent
Poplimento and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Groseclose

Setting

Landform: Hills
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Limestone, shale, siltstone, and sandstone residuum

Typical profile

H1 - 0 to 10 inches: loam
H2 - 10 to 28 inches: clay
H3 - 28 to 39 inches: clay
H4 - 39 to 51 inches: clay
H5 - 51 to 79 inches: clay loam

Properties and qualities

Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Poplimento

Setting

Landform: Hills
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Limestone, shale, siltstone, and sandstone residuum

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 35 inches: clay
H3 - 35 to 55 inches: clay
H4 - 55 to 79 inches: channery silty clay loam

Properties and qualities

Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

16D—Groseclose and Poplimento soils, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: kc24
Elevation: 1,700 to 3,000 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 117 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Groseclose and similar soils: 45 percent
Poplimento and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Groseclose

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Limestone, shale, siltstone, and sandstone residuum

Typical profile

H1 - 0 to 10 inches: loam
H2 - 10 to 28 inches: clay
H3 - 28 to 39 inches: clay
H4 - 39 to 51 inches: clay
H5 - 51 to 79 inches: clay loam

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Poplimento

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Limestone, shale, siltstone, and sandstone residuum

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 35 inches: clay
H3 - 35 to 55 inches: clay
H4 - 55 to 79 inches: channery silty clay loam

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

25—McGary and Purdy soils

Map Unit Setting

National map unit symbol: kc2k
Elevation: 1,300 to 2,200 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 117 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Mcgary and similar soils: 40 percent
Purdy and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mcgary

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Limestone, shale, and sandstone alluvium

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 37 inches: silty clay
H3 - 37 to 79 inches: clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: OccasionalNone

Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Purdy

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Limestone, shale, and sandstone alluvium

Typical profile

H1 - 0 to 11 inches: loam
H2 - 11 to 34 inches: clay
H3 - 34 to 79 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Erosion Factors

Soil Erosion Factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

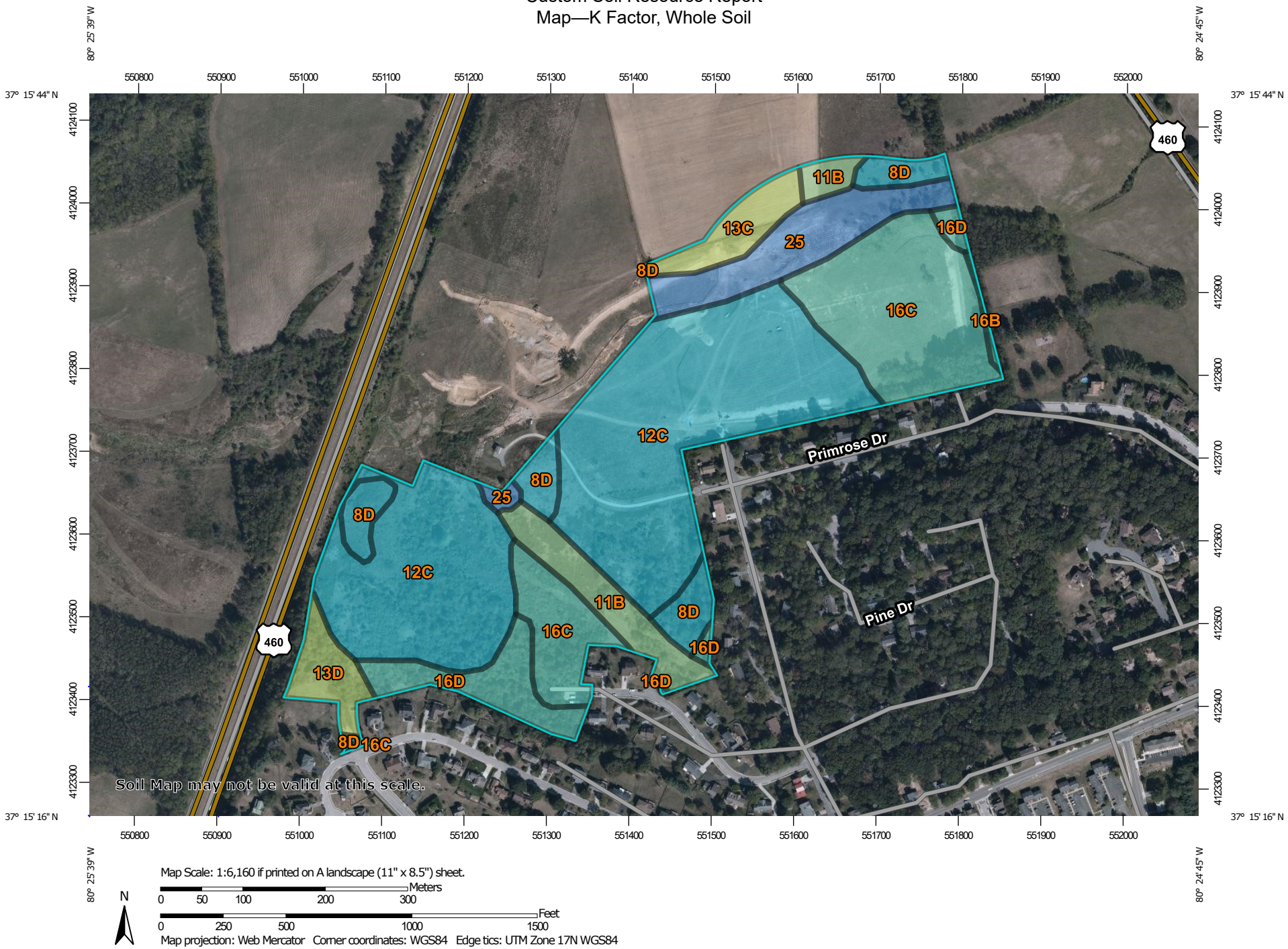
K Factor, Whole Soil

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Factor K does not apply to organic horizons and is not reported for those layers.

Map—K Factor, Whole Soil



Map Scale: 1:6,160 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Soil Rating Lines

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Soil Rating Points

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
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 1:15,800.

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: Montgomery County, Virginia
Survey Area Data: Version 14, Sep 14, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 29, 2019—Oct 4, 2019

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.

Table—K Factor, Whole Soil

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8D	Caneyville-Opequon-Rock outcrop complex, 7 to 25 percent slopes	.37	4.0	6.4%
11B	Duffield-Ernest complex, 2 to 7 percent slopes	.28	3.9	6.2%
12C	Frederick and Vertrees silt loams, 7 to 15 percent slopes	.37	29.6	46.8%
13C	Frederick and Vertrees gravelly silt loams, 7 to 15 percent slopes	.24	2.2	3.4%
13D	Frederick and Vertrees gravelly silt loams, 15 to 25 percent slopes	.24	1.9	3.1%
16B	Groseclose and Poplimento soils, 2 to 7 percent slopes	.32	0.2	0.3%
16C	Groseclose and Poplimento soils, 7 to 15 percent slopes	.32	12.7	20.0%
16D	Groseclose and Poplimento soils, 15 to 25 percent slopes	.32	3.7	5.8%
25	McGary and Purdy soils	.43	5.1	8.1%
Totals for Area of Interest			**63.2**	**100.0%**

Rating Options—K Factor, Whole Soil

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

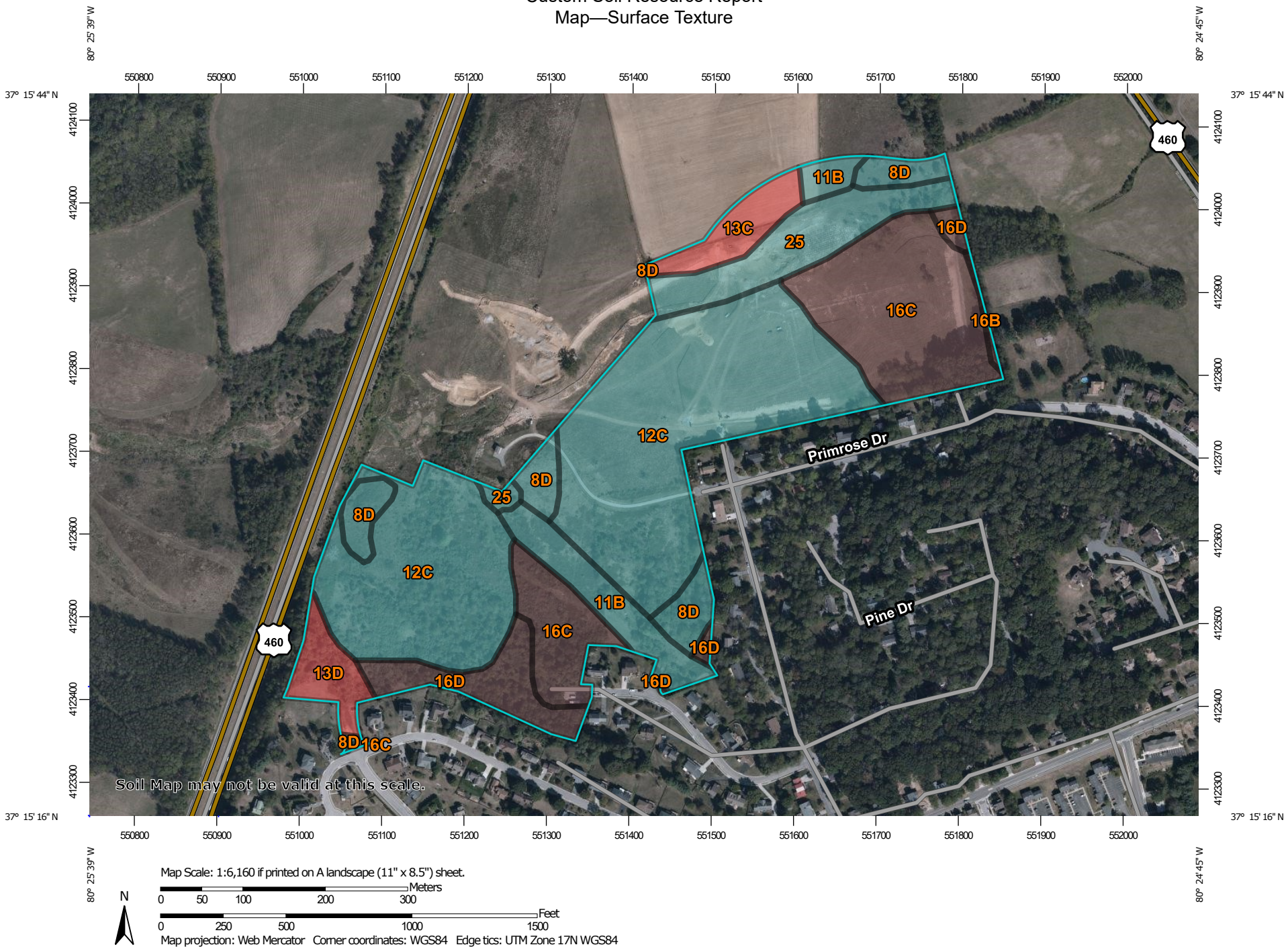
Soil Physical Properties

Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Surface Texture

This displays the representative texture class and modifier of the surface horizon.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."


80° 25' 39" W
80° 24' 45" W
37° 15' 44" N
37° 15' 16" N
550800
550900
551000
551100
551200
551300
551400
551500
551600
551700
551800
551900
552000
4124100
4124000
4123900
4123800
4123700
4123600
4123500
4123400
4123300
460
Primrose Dr
Pine Dr
11B
8D
13C
25
16D
8D
16C
16B
12C
8D
25
8D
12C
11B
8D
16C
16D
460
13D
16D
16D
8D
16C
Soil Map may not be valid at this scale.
Map Scale: 1:6,160 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 50 100 200 300
Feet
0 250 500 1000 1500
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Gravelly silt loam
- Loam
- Silt loam
- Not rated or not available

Soil Rating Lines

- Gravelly silt loam
- Loam
- Silt loam
- Not rated or not available

Soil Rating Points

- Gravelly silt loam
- Loam
- Silt loam
- 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 1:15,800.

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 14, Sep 14, 2021

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Date(s) aerial images were photographed: Sep 29, 2019—Oct 4, 2019

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.

Table—Surface Texture

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8D	Caneyville-Opequon-Rock outcrop complex, 7 to 25 percent slopes	Silt loam	4.0	6.4%
11B	Duffield-Ernest complex, 2 to 7 percent slopes	Silt loam	3.9	6.2%
12C	Frederick and Vertrees silt loams, 7 to 15 percent slopes	Silt loam	29.6	46.8%
13C	Frederick and Vertrees gravelly silt loams, 7 to 15 percent slopes	Gravelly silt loam	2.2	3.4%
13D	Frederick and Vertrees gravelly silt loams, 15 to 25 percent slopes	Gravelly silt loam	1.9	3.1%
16B	Groseclose and Poplimento soils, 2 to 7 percent slopes	Loam	0.2	0.3%
16C	Groseclose and Poplimento soils, 7 to 15 percent slopes	Loam	12.7	20.0%
16D	Groseclose and Poplimento soils, 15 to 25 percent slopes	Loam	3.7	5.8%
25	McGary and Purdy soils	Silt loam	5.1	8.1%
Totals for Area of Interest			**63.2**	**100.0%**

Rating Options—Surface Texture

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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.

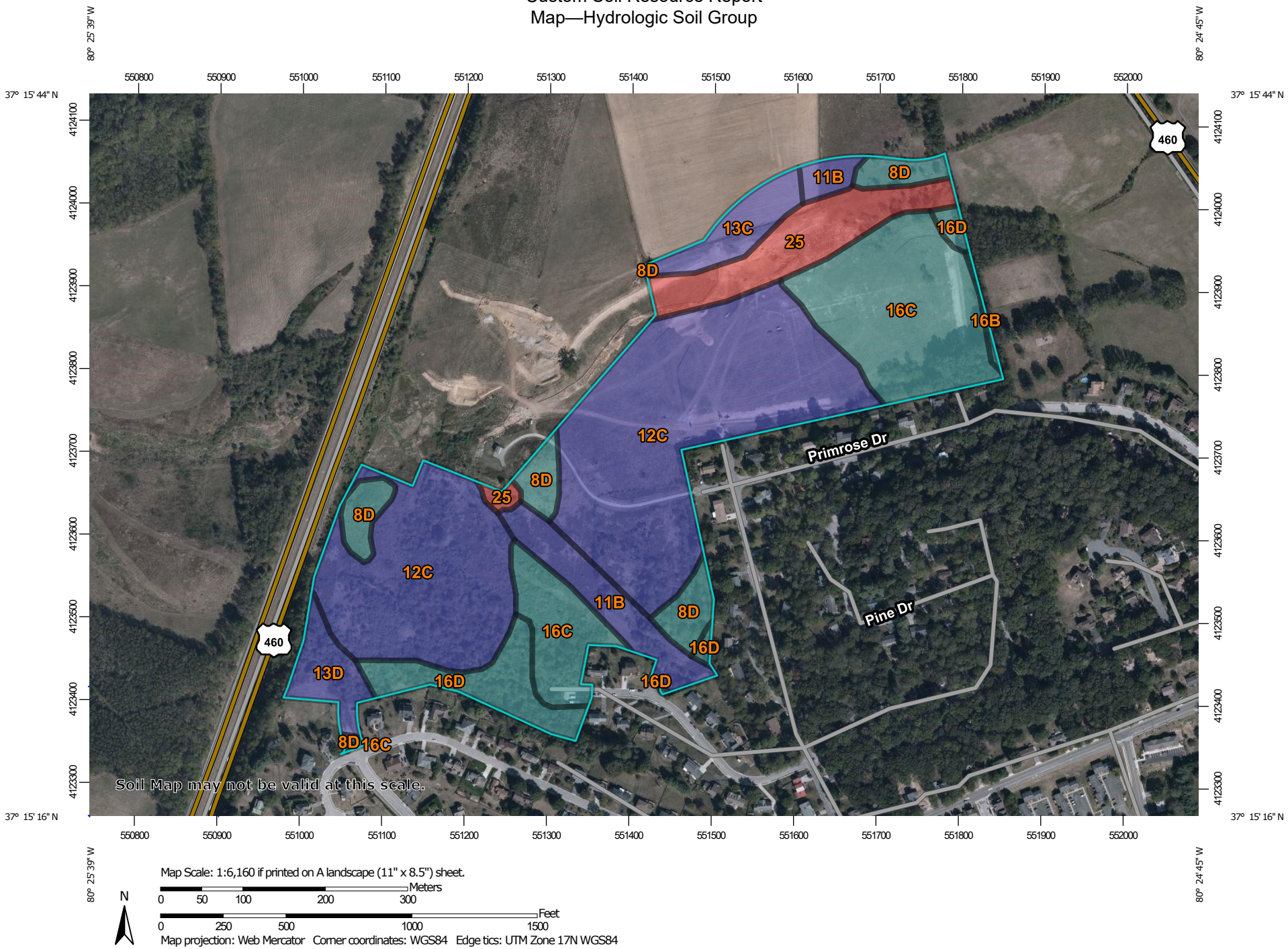
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Map—Hydrologic Soil Group



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

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8D	Caneyville-Opequon-Rock outcrop complex, 7 to 25 percent slopes	C	4.0	6.4%
11B	Duffield-Ernest complex, 2 to 7 percent slopes	B	3.9	6.2%
12C	Frederick and Vertrees silt loams, 7 to 15 percent slopes	B	29.6	46.8%
13C	Frederick and Vertrees gravelly silt loams, 7 to 15 percent slopes	B	2.2	3.4%
13D	Frederick and Vertrees gravelly silt loams, 15 to 25 percent slopes	B	1.9	3.1%
16B	Groseclose and Poplimento soils, 2 to 7 percent slopes	C	0.2	0.3%
16C	Groseclose and Poplimento soils, 7 to 15 percent slopes	C	12.7	20.0%
16D	Groseclose and Poplimento soils, 15 to 25 percent slopes	C	3.7	5.8%
25	McGary and Purdy soils	D	5.1	8.1%
Totals for Area of Interest			**63.2**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

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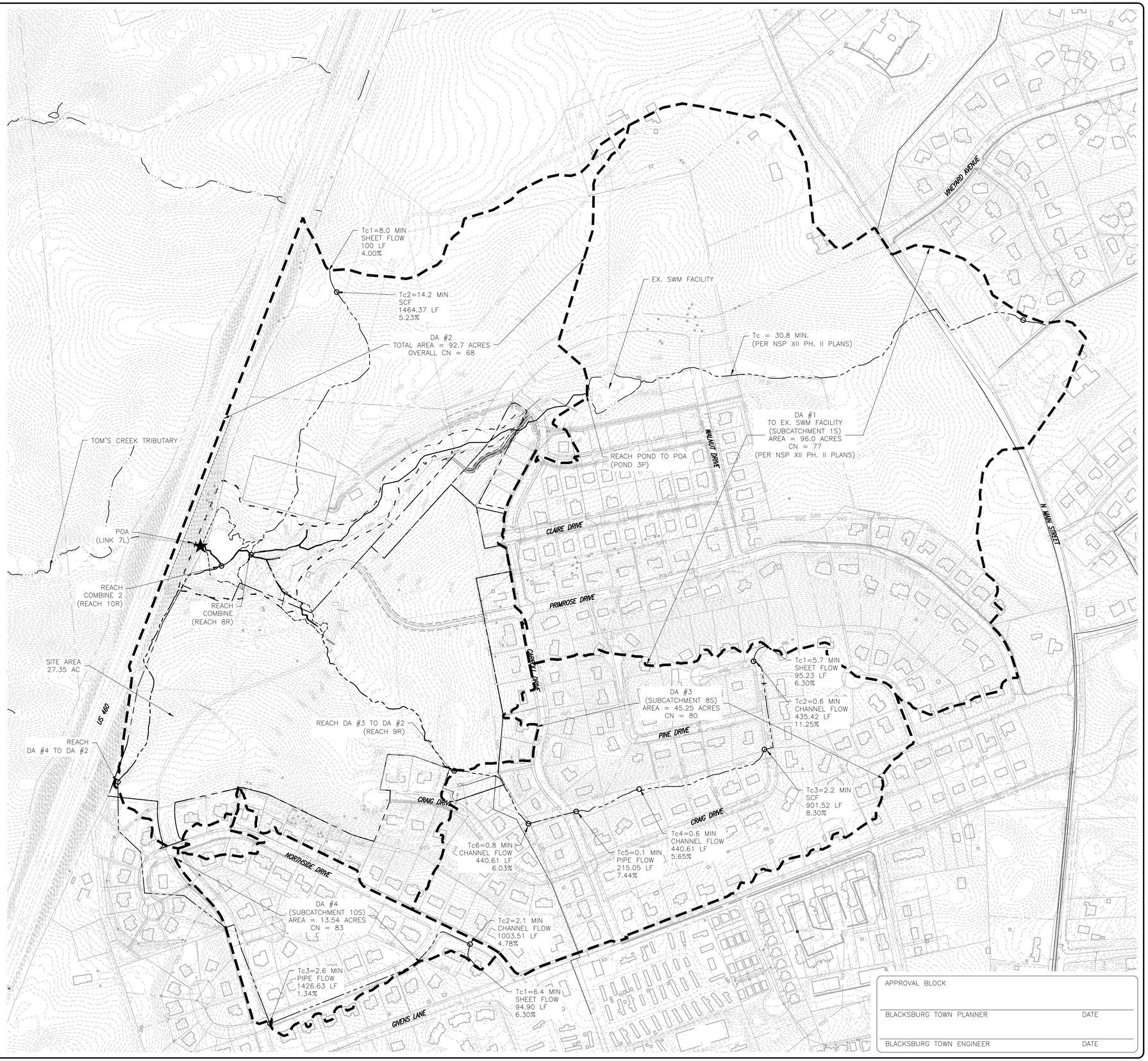
APPENDIX B:
DRAINAGE MAPS



200 0 200 400 600

1" = 200'

APPROVAL BLOCK

BLACKSBURG TOWN PLANNER DATE

BLACKSBURG TOWN ENGINEER DATE

BALZER & ASSOCIATES
PLANNERS / ARCHITECTS
ENGINEERS / SURVEYORS

Roanoke / Richmond
New River Valley
Shenandoah Valley

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COMMONWEALTH OF VIRGINIA
JAMES RICHARD TAYLOR
Lic. No. 55142
08-01-2022
PROFESSIONAL ENGINEER

NORTHSIDE PARK - REVISED SECTION XII

STORMWATER MANAGEMENT CONCEPT

PRE-DEVELOPMENT DRAINAGE MAP

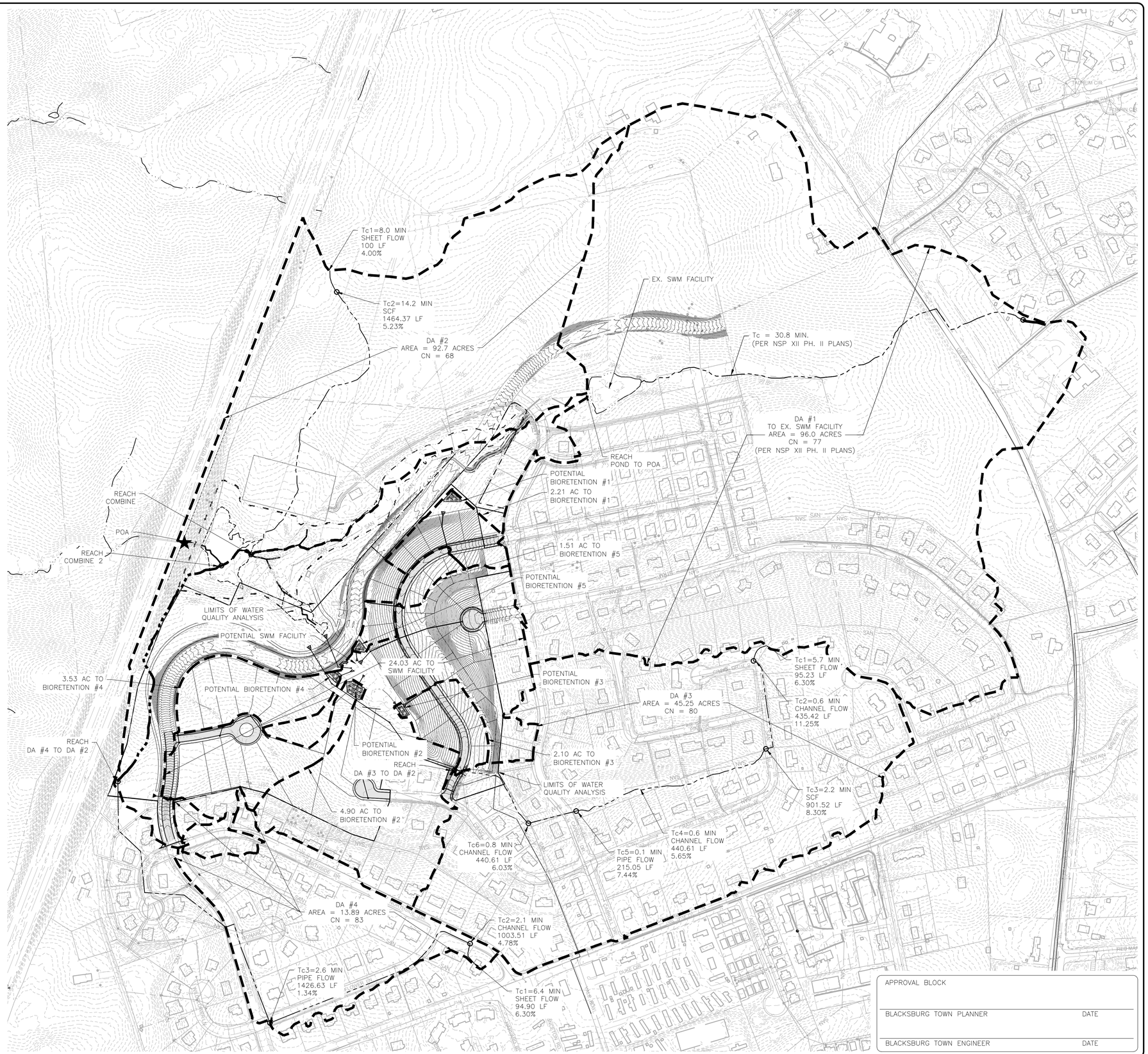
MOUNT TABOR MAGISTERIAL DISTRICT
TOWN OF BLACKSBURG, VIRGINIA

DRAWN BY	SJW
DESIGNED BY	SJW
CHECKED BY	JRT
DATE	8/1/2022
SCALE	1" = 200'
REVISIONS	

SW3

PROJECT NO. 24220049.00

J:\2023\24242200\49.00 NORTHSIDE PARK-SECTION XII\CIVIL\dwg\NORTHSIDE CONSTRUCTION PLANS.dwg PLOTTED: 8/1/2022 12:59:13 PM



80 0 80 160 240

1" = 80'

APPROVAL BLOCK

BLACKSBURG TOWN PLANNER DATE

BLACKSBURG TOWN ENGINEER DATE

BALZER & ASSOCIATES
PLANNERS / ARCHITECTS
ENGINEERS / SURVEYORS

Roanoke / Richmond
New River Valley
Shenandoah Valley

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COMMONWEALTH OF VIRGINIA
JAMES RICHARD TAYLOR
Lic. No. 55142
08-01-2022
PROFESSIONAL ENGINEER

NORTHSIDE PARK - REVISED SECTION XII

STORMWATER MANAGEMENT CONCEPT

POST-DEVELOPMENT DRAINAGE MAP

MOUNT TABOR MAGISTERIAL DISTRICT
TOWN OF BLACKSBURG, VIRGINIA

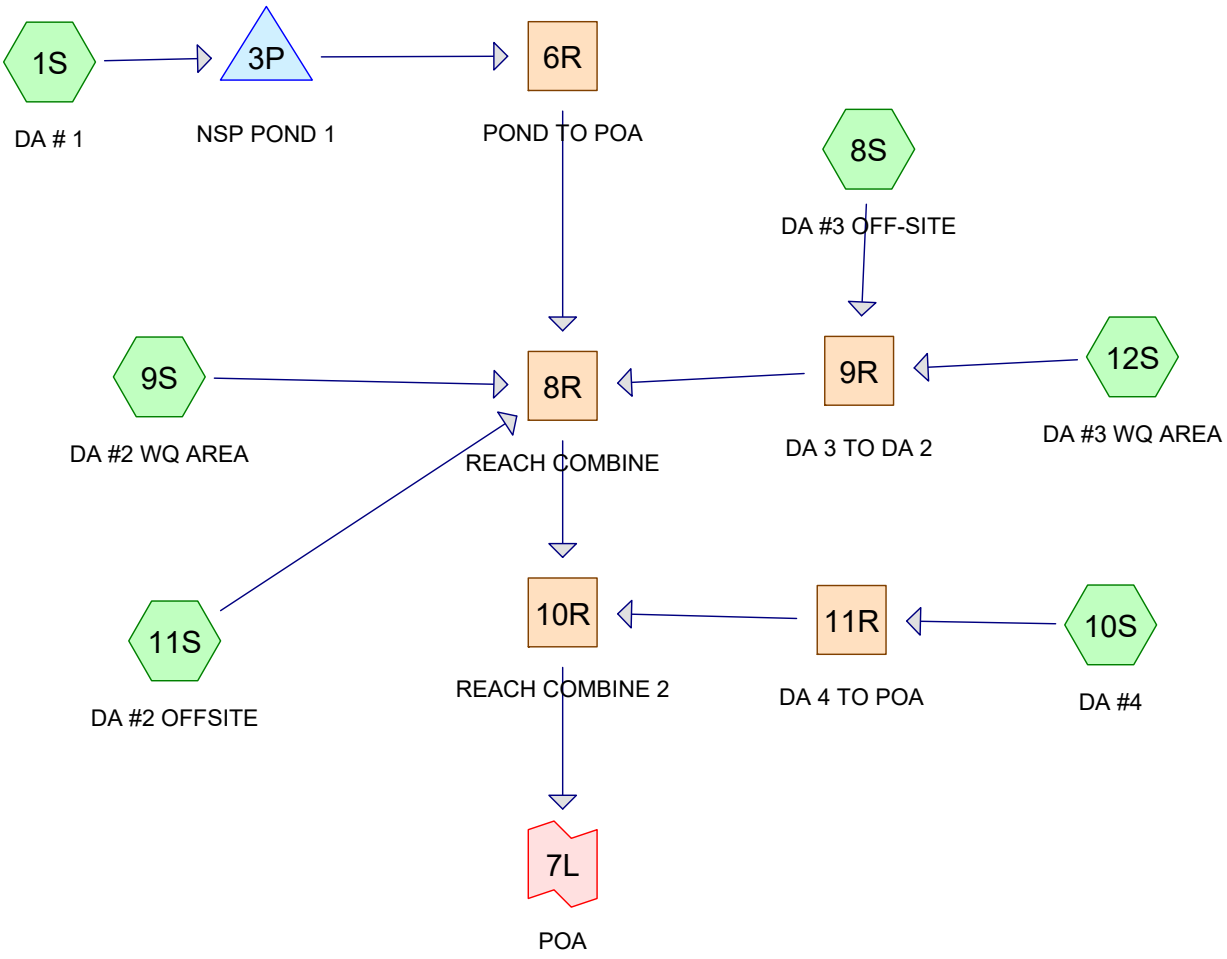
DRAWN BY	SJW
DESIGNED BY	SJW
CHECKED BY	JRT
DATE	08/01/2022
SCALE	1" = 20'
REVISIONS	

SW4

PROJECT NO. 24220049.00

J:\2022\24220049.00 NORTHSIDE PARK-SECTION XII\CIVIL\dwg\NORTHSIDE CONSTRUCTION PLANS.dwg PLOTTED: 8/1/2022 12:50:45 PM

APPENDIX C:
STORMWATER QUANTITY CALCULATIONS



Subcat Reach Pond Link

Routing Diagram for Pre-Development
Prepared by Balzer & Associates, Printed 7/29/2022

Summary for Subcatchment 1S: DA # 1

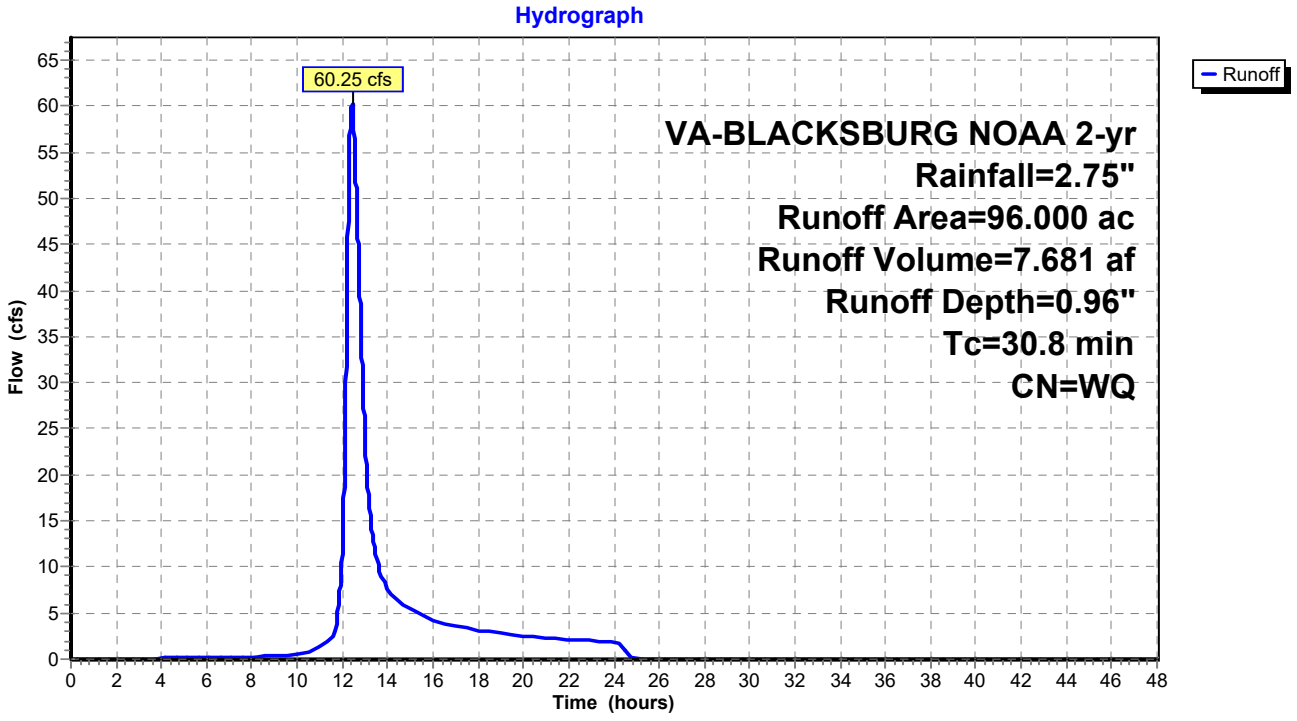
Runoff = 60.25 cfs @ 12.42 hrs, Volume= 7.681 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 2-yr Rainfall=2.75"

Area (ac)	CN	Description
5.080	98	Roofs, HSG C
3.100	84	50-75% Grass cover, Fair, HSG D
22.720	79	50-75% Grass cover, Fair, HSG C
28.800	69	50-75% Grass cover, Fair, HSG B
1.000	86	1/3 acre lots, 30% imp, HSG D
10.400	81	1/3 acre lots, 30% imp, HSG C
6.400	72	1/3 acre lots, 30% imp, HSG B
10.300	83	1/4 acre lots, 38% imp, HSG C
8.200	75	1/4 acre lots, 38% imp, HSG B
96.000		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8					**Direct Entry, FROM NSP CALCS**

Subcatchment 1S: DA # 1



Summary for Subcatchment 8S: DA #3 OFF-SITE

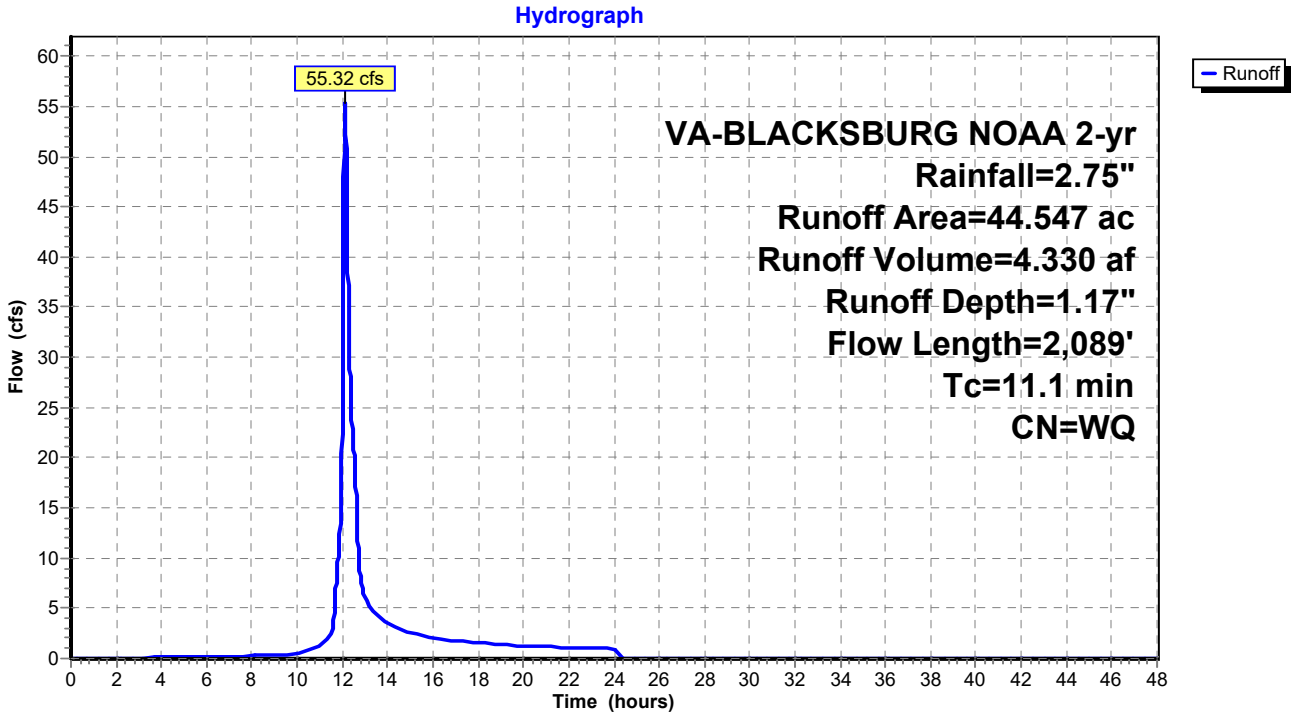
Runoff = 55.32 cfs @ 12.11 hrs, Volume= 4.330 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 2-yr Rainfall=2.75"

Area (ac)	CN	Description
0.358	98	Paved roads w/curbs & sewers, HSG B
4.733	98	Paved roads w/curbs & sewers, HSG C
5.726	70	1/2 acre lots, 25% imp, HSG B
28.476	80	1/2 acre lots, 25% imp, HSG C
0.877	72	1/3 acre lots, 30% imp, HSG B
3.986	81	1/3 acre lots, 30% imp, HSG C
0.391	79	1 acre lots, 20% imp, HSG C
44.547		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 8S: DA #3 OFF-SITE



Summary for Subcatchment 9S: DA #2 WQ AREA

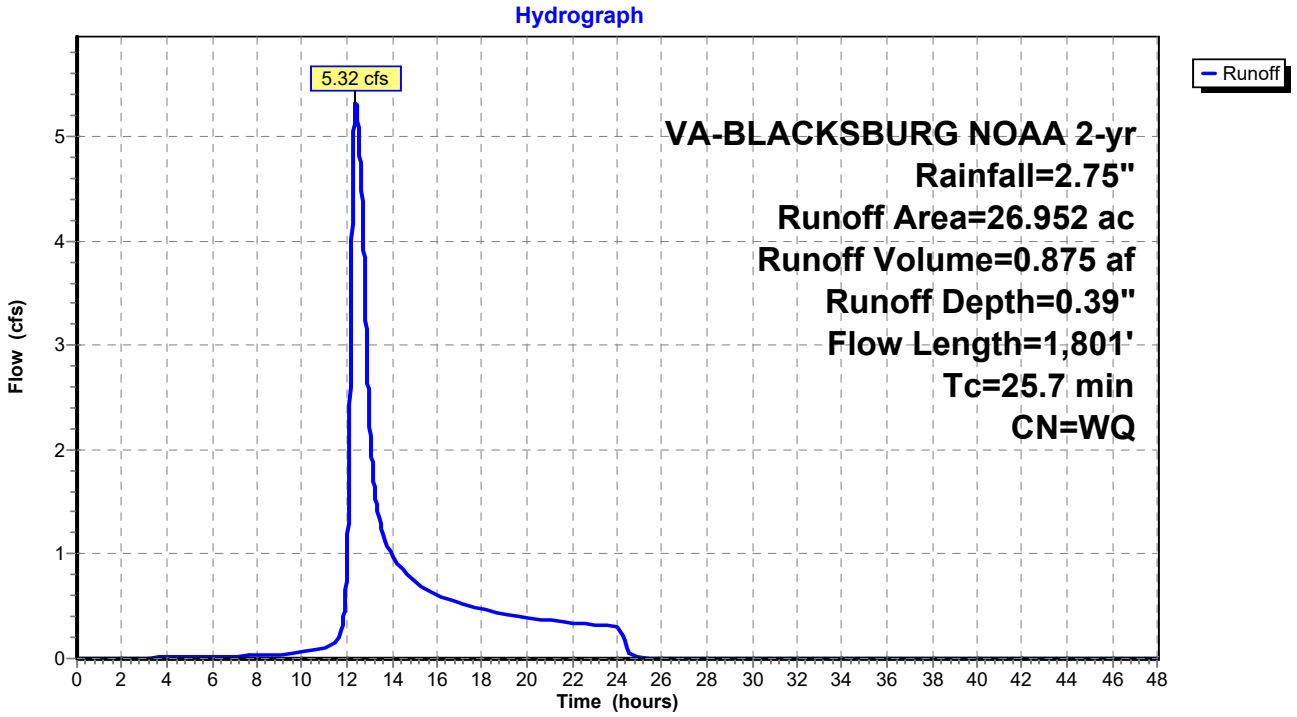
Runoff = 5.32 cfs @ 12.39 hrs, Volume= 0.875 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 2-yr Rainfall=2.75"

	Area (ac)	CN	Description
	5.097	55	Woods, Good, HSG B
	5.711	70	Woods, Good, HSG C
	8.232	58	Woods/grass comb., Good, HSG B
	1.810	72	Woods/grass comb., Good, HSG C
	0.270	70	1/2 acre lots, 25% imp, HSG B
	0.098	80	1/2 acre lots, 25% imp, HSG C
	0.070	39	>75% Grass cover, Good, HSG A
	4.590	61	>75% Grass cover, Good, HSG B
	0.070	74	>75% Grass cover, Good, HSG C
	0.240	98	Paved parking, HSG B
	0.124	98	Paved parking, HSG C
	0.410	86	Fallow, bare soil, HSG B
*	0.218	98	TRAIL, HSG B
*	0.012	98	TRAIL, HSG C
	26.952		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 9S: DA #2 WQ AREA



Summary for Subcatchment 10S: DA #4

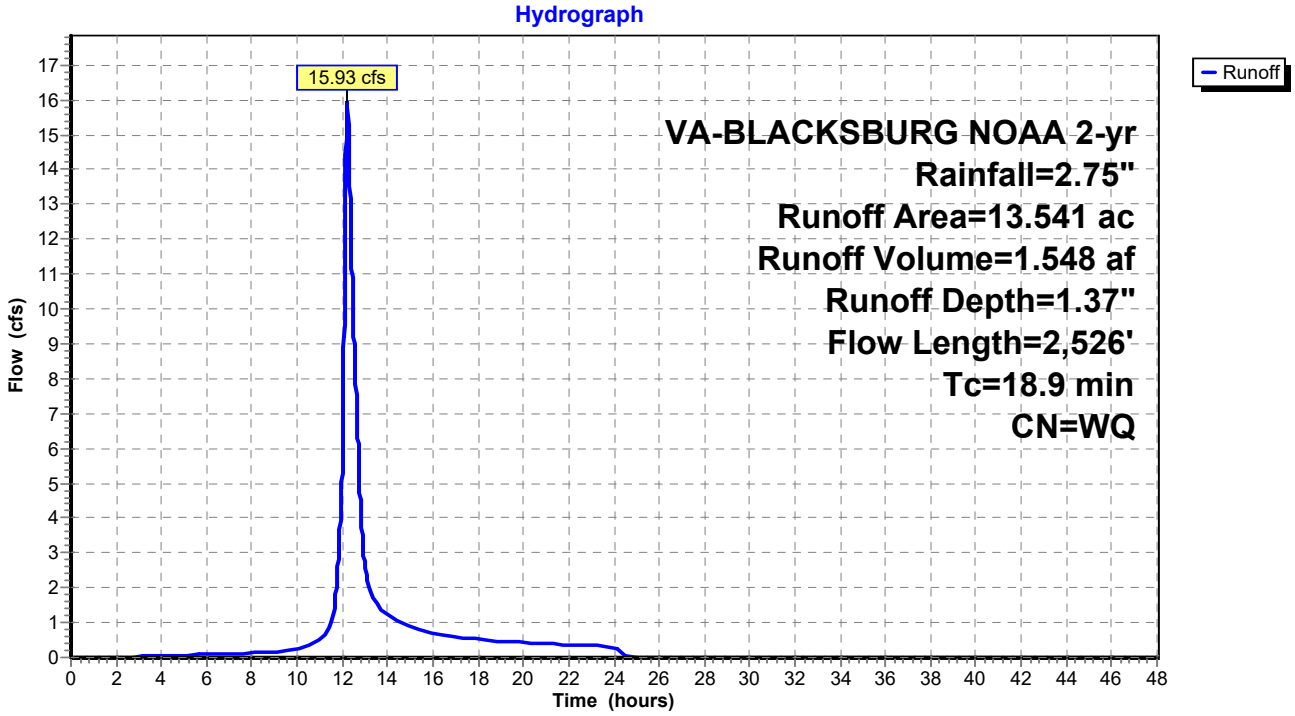
Runoff = 15.93 cfs @ 12.22 hrs, Volume= 1.548 af, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 2-yr Rainfall=2.75"

Area (ac)	CN	Description
2.555	98	Paved roads w/curbs & sewers, HSG C
7.333	81	1/3 acre lots, 30% imp, HSG C
3.653	80	1/2 acre lots, 25% imp, HSG C
13.541		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	95	0.0630	0.25		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
9.9	1,004	0.0478	1.70	5.26	**Channel Flow, Tc2** Area= 3.1 sf Perim= 50.0' r= 0.06' n= 0.030 Earth, grassed & winding
2.6	1,427	0.0134	9.03	28.37	**Pipe Channel, CMP_Round 24"** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
18.9	2,526	Total			

Subcatchment 10S: DA #4



Summary for Subcatchment 11S: DA #2 OFFSITE

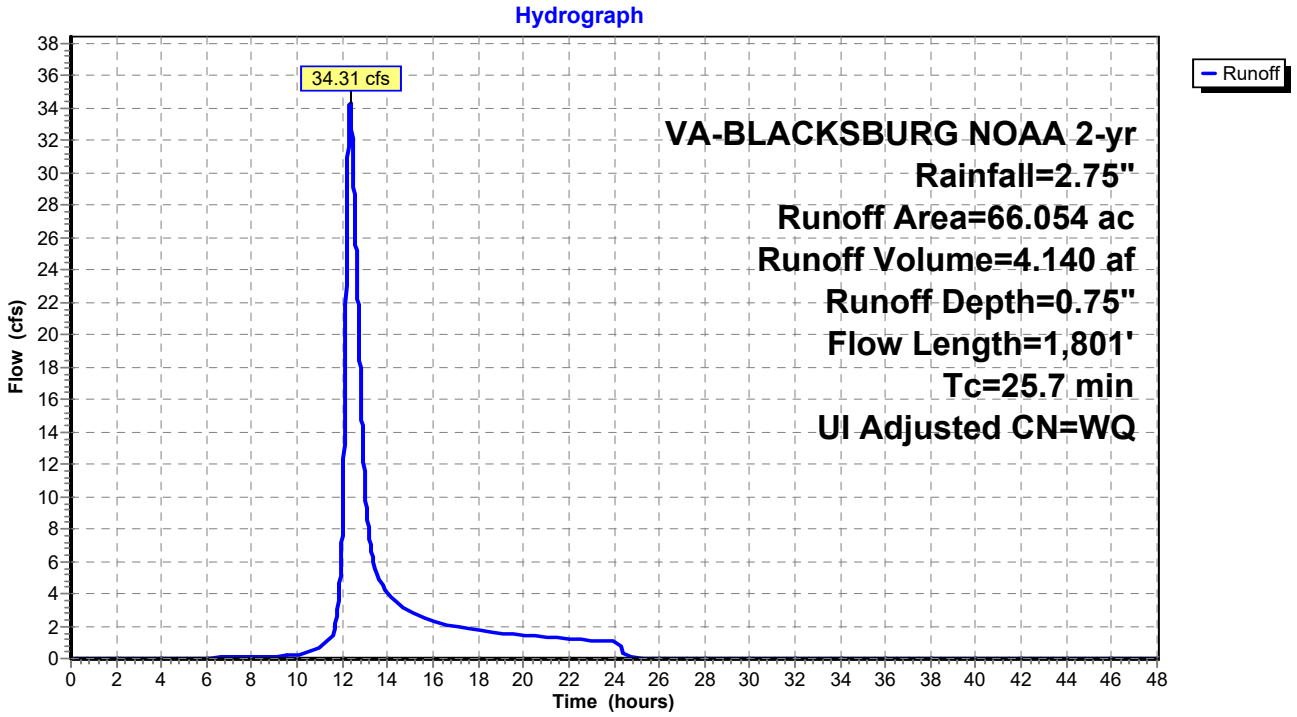
Runoff = 34.31 cfs @ 12.34 hrs, Volume= 4.140 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 2-yr Rainfall=2.75"

	Area (ac)	CN	Adj	Description
	10.040	83	83	Fallow, crop residue, Good, HSG B
	1.105	88	88	Fallow, crop residue, Good, HSG C
	1.250	98	98	Unconnected pavement, HSG C
	0.160	98	98	Unconnected pavement, HSG B
	1.555	70	70	1/2 acre lots, 25% imp, HSG B
	6.153	80	80	1/2 acre lots, 25% imp, HSG C
	1.370	81	81	1/3 acre lots, 30% imp, HSG C
	0.180	68	68	1 acre lots, 20% imp, HSG B
	0.038	79	79	1 acre lots, 20% imp, HSG C
	0.110	70	70	Woods, Good, HSG C
	1.267	55	55	Woods, Good, HSG B
	5.290	39	39	>75% Grass cover, Good, HSG A
	8.350	61	61	>75% Grass cover, Good, HSG B
	11.646	74	74	>75% Grass cover, Good, HSG C
	6.107	58	58	Woods/grass comb., Good, HSG B
	5.107	72	72	Woods/grass comb., Good, HSG C
	2.852	72	72	Dirt roads, HSG A
	1.750	82	82	Dirt roads, HSG B
	1.521	87	87	Dirt roads, HSG C
*	0.170	98	98	TRAIL, HSG B
*	0.033	98	98	TRAIL, HSG C
	66.054			Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow, Tc2** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 11S: DA #2 OFFSITE



Summary for Subcatchment 12S: DA #3 WQ AREA

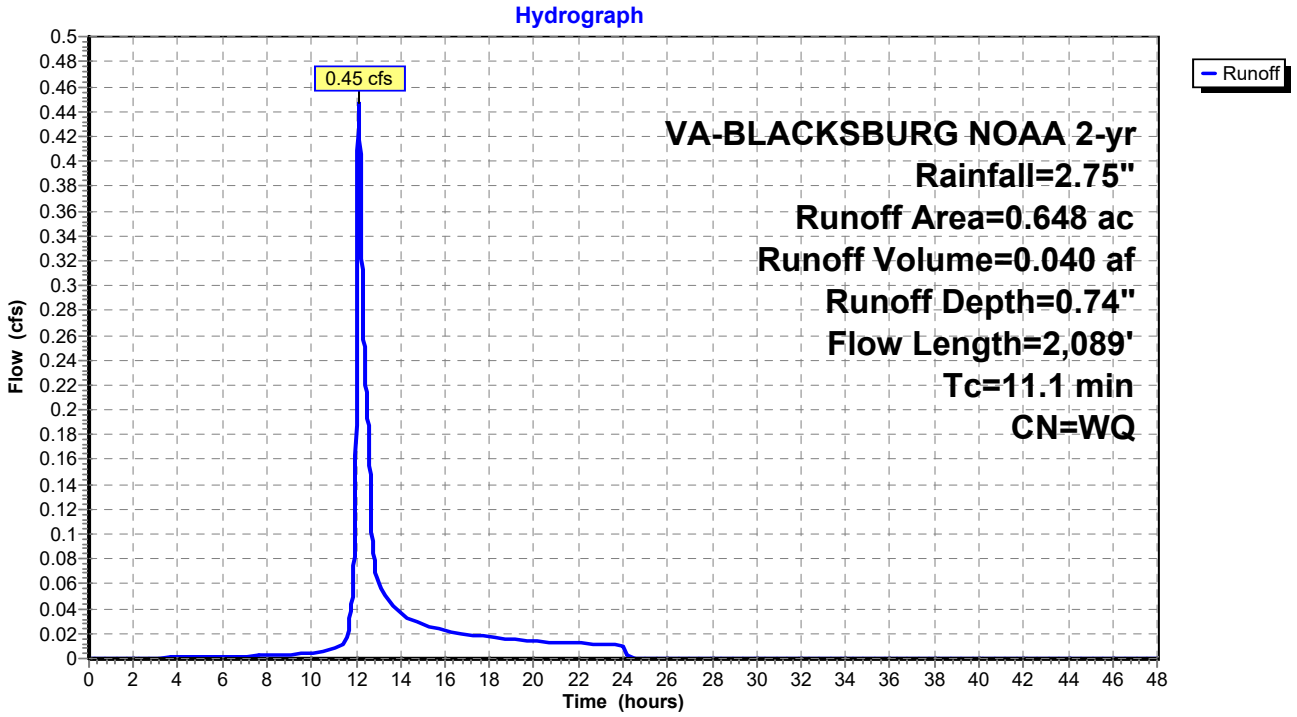
Runoff = 0.45 cfs @ 12.12 hrs, Volume= 0.040 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 2-yr Rainfall=2.75"

Area (ac)	CN	Description
0.046	98	Paved roads w/curbs & sewers, HSG C
0.513	70	1/2 acre lots, 25% imp, HSG B
0.030	80	1/2 acre lots, 25% imp, HSG C
0.059	70	Woods, Good, HSG C
0.648		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 12S: DA #3 WQ AREA



Summary for Reach 6R: POND TO POA

Inflow Area = 96.000 ac, 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

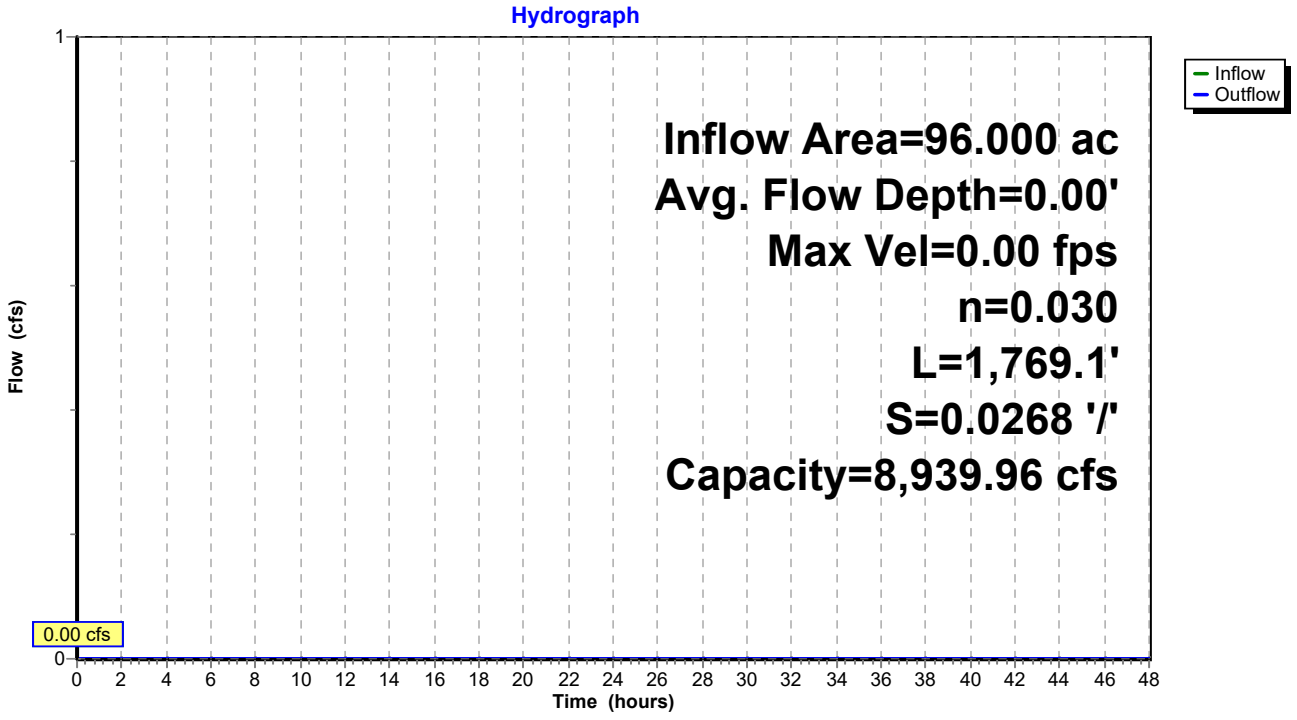
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.00' Flow Area= 425.0 sf, Capacity= 8,939.96 cfs

70.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 100.00'
Length= 1,769.1' Slope= 0.0268 '/'
Inlet Invert= 2,087.00', Outlet Invert= 2,039.65'

‡

Reach 6R: POND TO POA



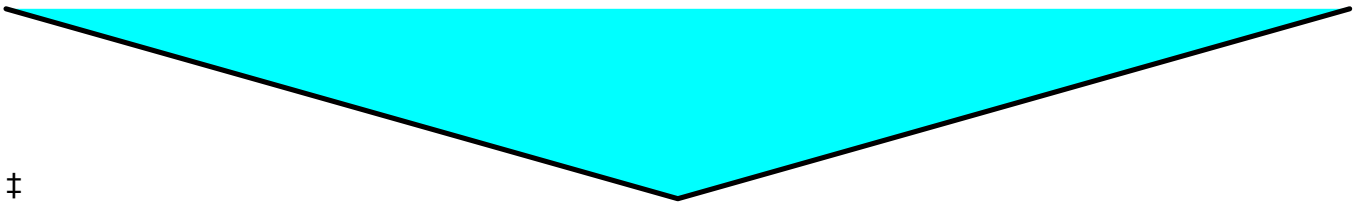
Summary for Reach 8R: REACH COMBINE

Inflow Area = 234.201 ac, Inflow Depth = 0.48" for 2-yr event
Inflow = 79.69 cfs @ 12.25 hrs, Volume= 9.384 af
Outflow = 77.46 cfs @ 12.32 hrs, Volume= 9.384 af, Atten= 3%, Lag= 3.9 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.90 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 6.7 min

Peak Storage= 14,595 cf @ 12.32 hrs
Average Depth at Peak Storage= 8.05' , Surface Width= 268.80'
Bank-Full Depth= 0.33' Flow Area= 1.8 sf, Capacity= 1.23 cfs

0.00' x 0.33' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 16.7 '/' Top Width= 11.02'
Length= 168.8' Slope= 0.0021 '/'
Inlet Invert= 2,036.90', Outlet Invert= 2,036.55'



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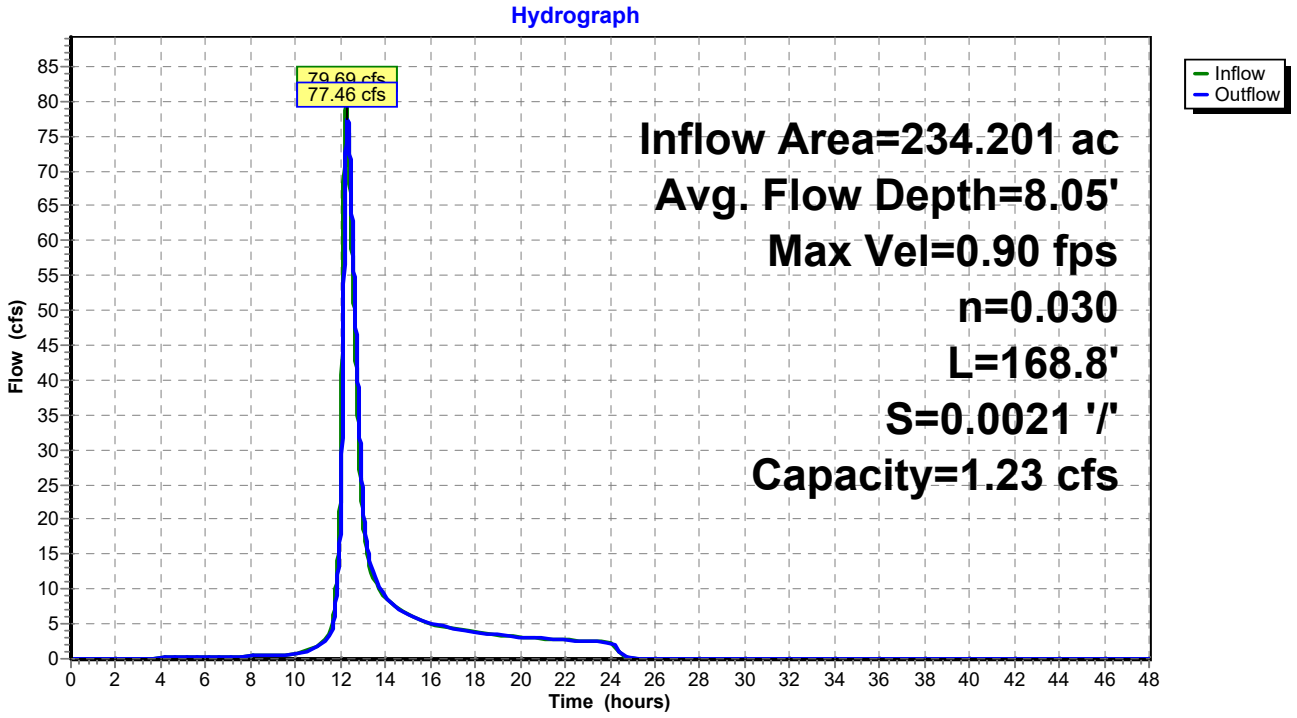
Reach 8R: REACH COMBINE



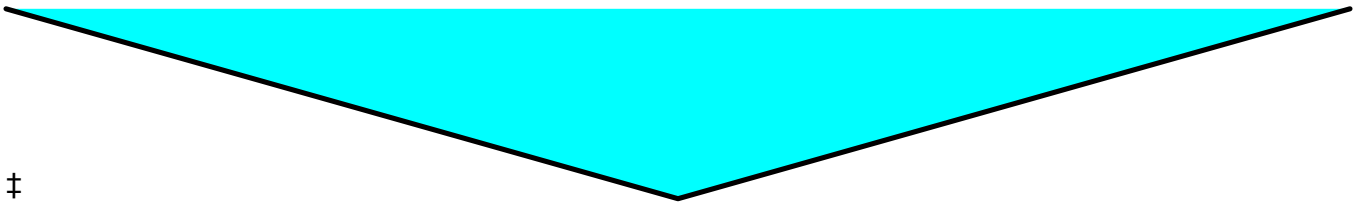
Summary for Reach 9R: DA 3 TO DA 2

Inflow Area = 45.195 ac, Inflow Depth = 1.16" for 2-yr event
Inflow = 55.76 cfs @ 12.11 hrs, Volume= 4.370 af
Outflow = 45.67 cfs @ 12.19 hrs, Volume= 4.370 af, Atten= 18%, Lag= 5.1 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.85 fps, Min. Travel Time= 6.3 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 21.0 min

Peak Storage= 17,318 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.60' , Surface Width= 47.94'
Bank-Full Depth= 0.35' Flow Area= 4.9 sf, Capacity= 15.84 cfs

0.00' x 0.35' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 40.0 '/' Top Width= 28.00'
Length= 1,462.0' Slope= 0.0435 '/'
Inlet Invert= 2,103.26', Outlet Invert= 2,039.65'



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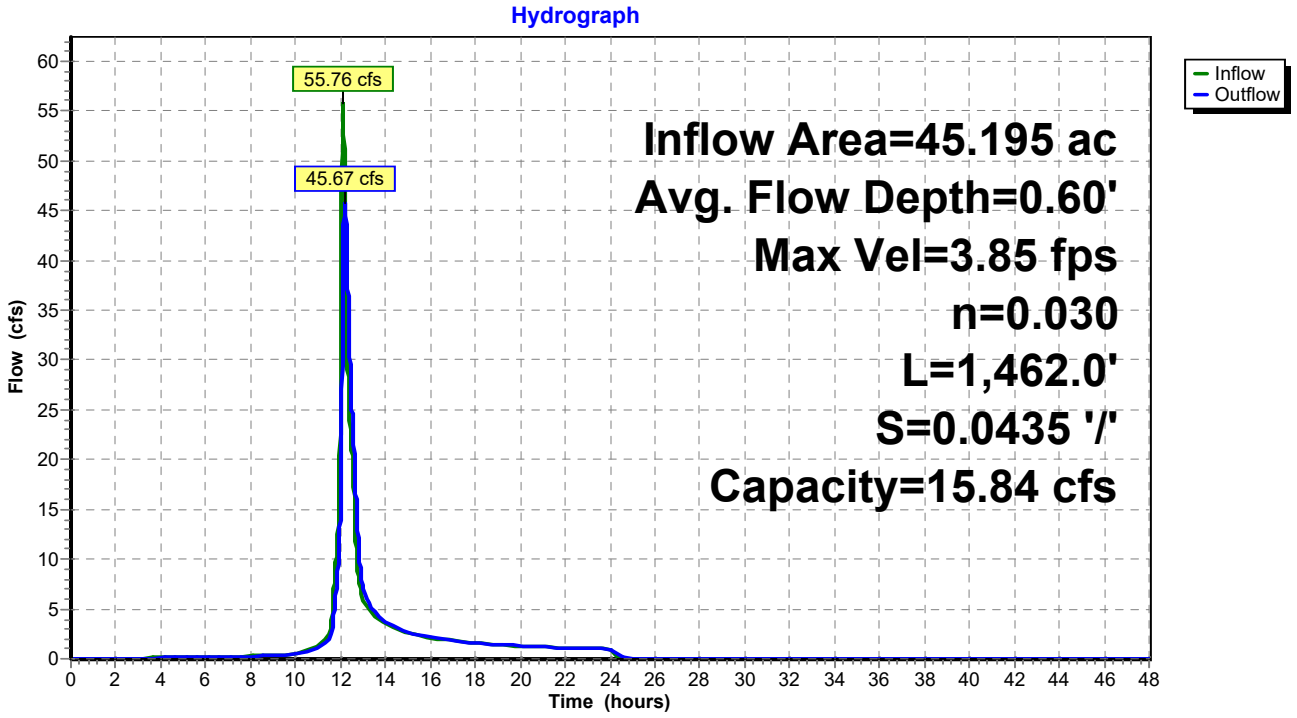
Reach 9R: DA 3 TO DA 2



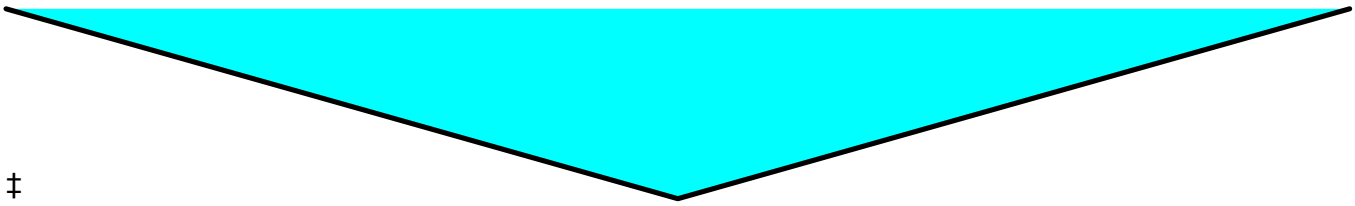
Summary for Reach 10R: REACH COMBINE 2

Inflow Area = 247.742 ac, Inflow Depth = 0.53" for 2-yr event
Inflow = 92.38 cfs @ 12.30 hrs, Volume= 10.932 af
Outflow = 92.14 cfs @ 12.32 hrs, Volume= 10.932 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.95 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 4.2 min

Peak Storage= 6,428 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.75' , Surface Width= 132.29'
Bank-Full Depth= 0.59' Flow Area= 30.8 sf, Capacity= 54.02 cfs

0.00' x 0.59' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 88.5 '/' Top Width= 104.43'
Length= 136.3' Slope= 0.0064 '/'
Inlet Invert= 2,036.75', Outlet Invert= 2,035.88'



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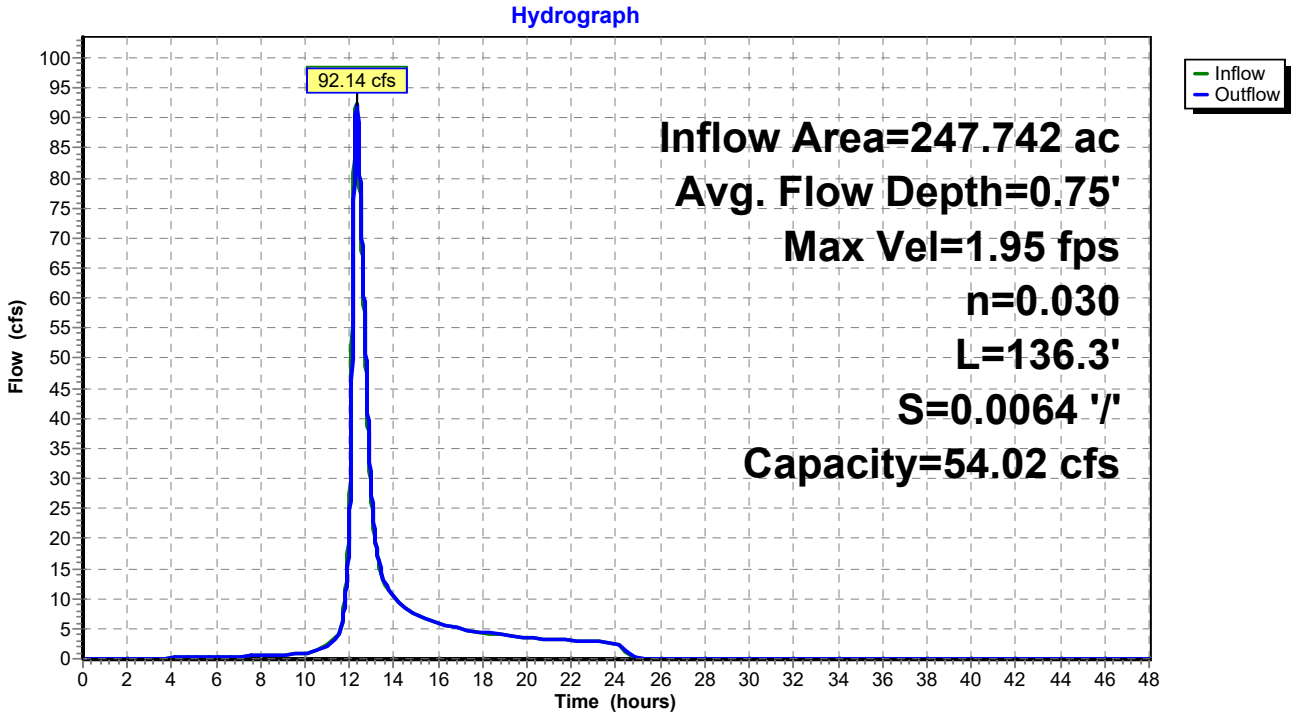
Reach 10R: REACH COMBINE 2



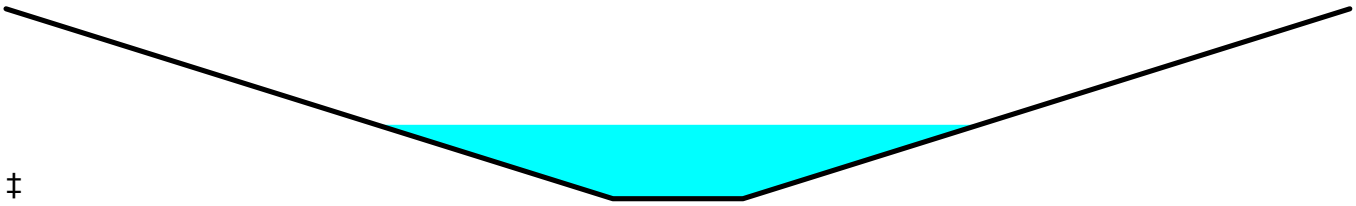
Summary for Reach 11R: DA 4 TO POA

Inflow Area = 13.541 ac, Inflow Depth = 1.37" for 2-yr event
Inflow = 15.93 cfs @ 12.22 hrs, Volume= 1.548 af
Outflow = 15.55 cfs @ 12.26 hrs, Volume= 1.548 af, Atten= 2%, Lag= 2.3 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.74 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 2.20 fps, Avg. Travel Time= 8.9 min

Peak Storage= 2,712 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.55' , Surface Width= 6.95'
Bank-Full Depth= 1.40' Flow Area= 11.9 sf, Capacity= 140.25 cfs

1.50' x 1.40' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 5.0 '/' Top Width= 15.50'
Length= 1,176.1' Slope= 0.0825 '/'
Inlet Invert= 2,133.71', Outlet Invert= 2,036.73'



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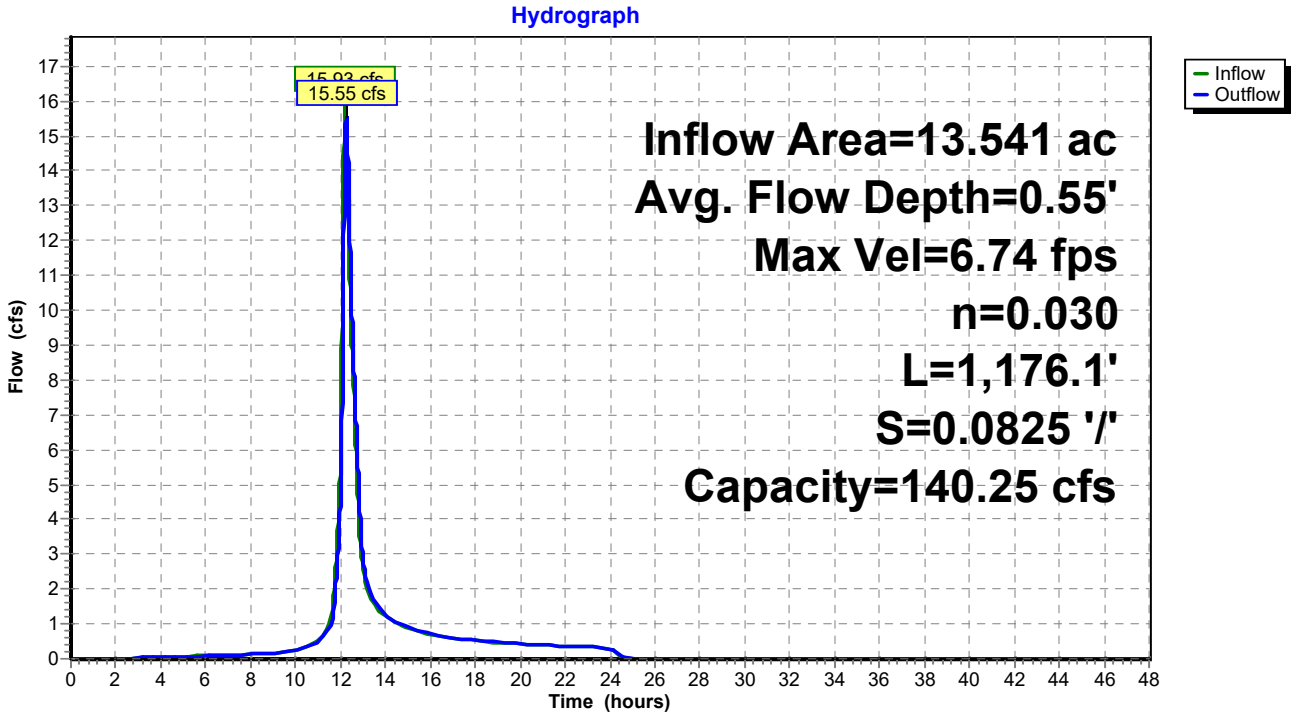
Reach 11R: DA 4 TO POA



Summary for Pond 3P: NSP POND 1

Inflow Area = 96.000 ac, Inflow Depth = 0.96" for 2-yr event
Inflow = 60.25 cfs @ 12.42 hrs, Volume= 7.681 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 8.61' @ 25.75 hrs Storage= 334,598 cf

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

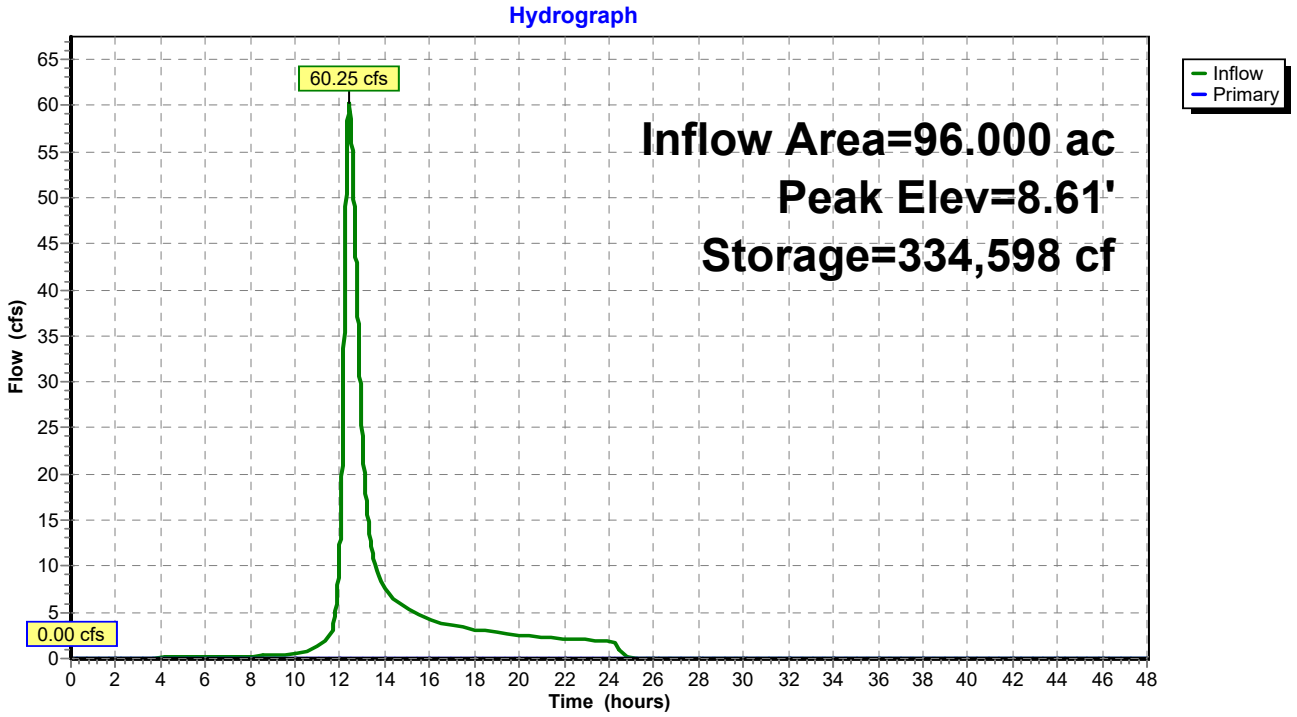
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	392,320 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	0	0
1.25	2,002	2,002
3.25	24,089	26,091
5.25	67,305	93,396
7.25	119,692	213,088
9.25	179,232	392,320

Device	Routing	Invert	Outlet Devices
#1	Primary	2,073.87'	**48.0" Round Culvert** L= 110.4' Ke= 0.600 Inlet / Outlet Invert= 2,073.87' / 2,071.85' S= 0.0183 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	2,174.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	2,080.27'	**72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	2,082.20'	**30.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: NSP POND 1

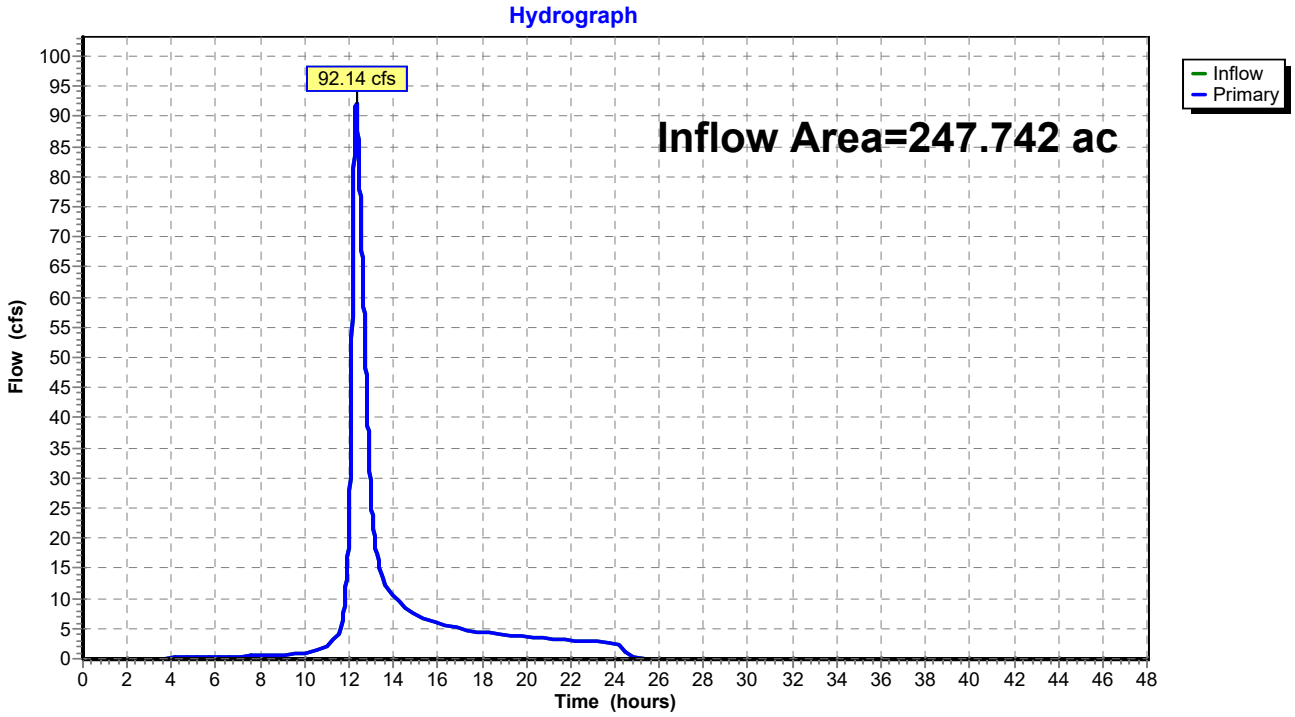


Summary for Link 7L: POA

Inflow Area = 247.742 ac, Inflow Depth = 0.53" for 2-yr event
Inflow = 92.14 cfs @ 12.32 hrs, Volume= 10.932 af
Primary = 92.14 cfs @ 12.32 hrs, Volume= 10.932 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 7L: POA



Summary for Subcatchment 1S: DA # 1

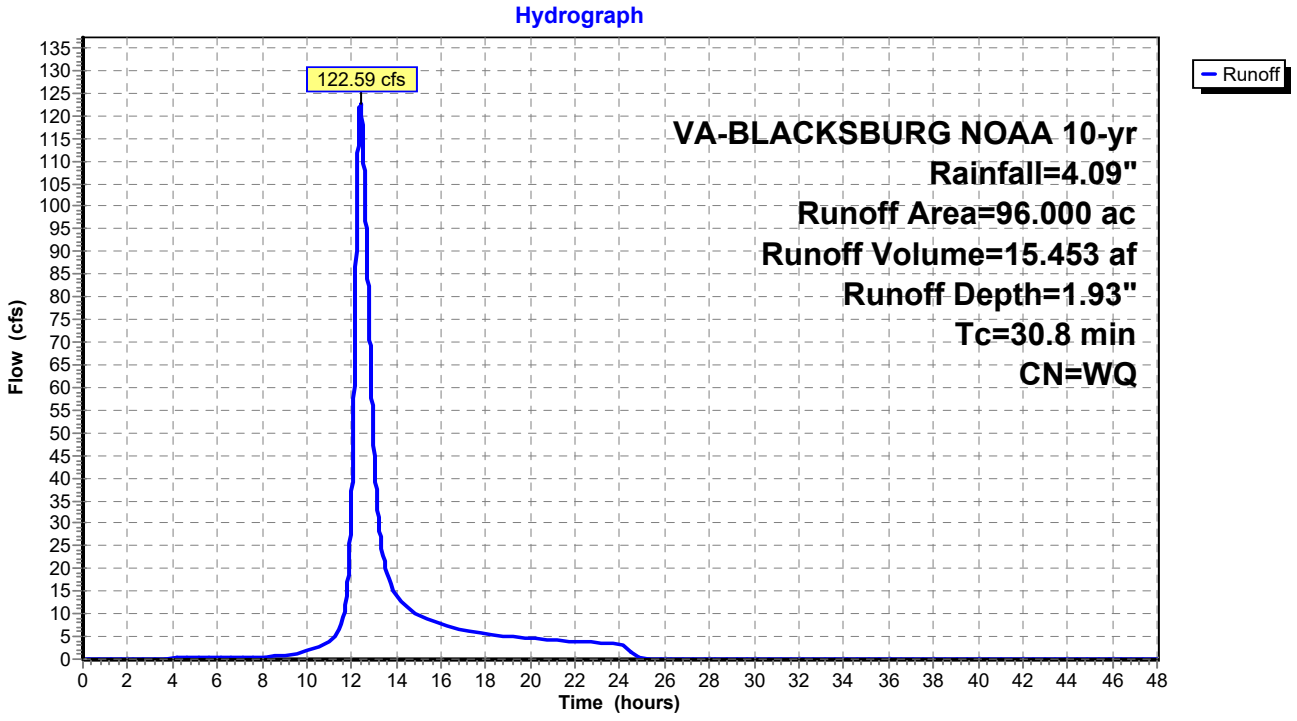
Runoff = 122.59 cfs @ 12.42 hrs, Volume= 15.453 af, Depth= 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 10-yr Rainfall=4.09"

Area (ac)	CN	Description
5.080	98	Roofs, HSG C
3.100	84	50-75% Grass cover, Fair, HSG D
22.720	79	50-75% Grass cover, Fair, HSG C
28.800	69	50-75% Grass cover, Fair, HSG B
1.000	86	1/3 acre lots, 30% imp, HSG D
10.400	81	1/3 acre lots, 30% imp, HSG C
6.400	72	1/3 acre lots, 30% imp, HSG B
10.300	83	1/4 acre lots, 38% imp, HSG C
8.200	75	1/4 acre lots, 38% imp, HSG B
96.000		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8					**Direct Entry, FROM NSP CALCS**

Subcatchment 1S: DA # 1



Summary for Subcatchment 8S: DA #3 OFF-SITE

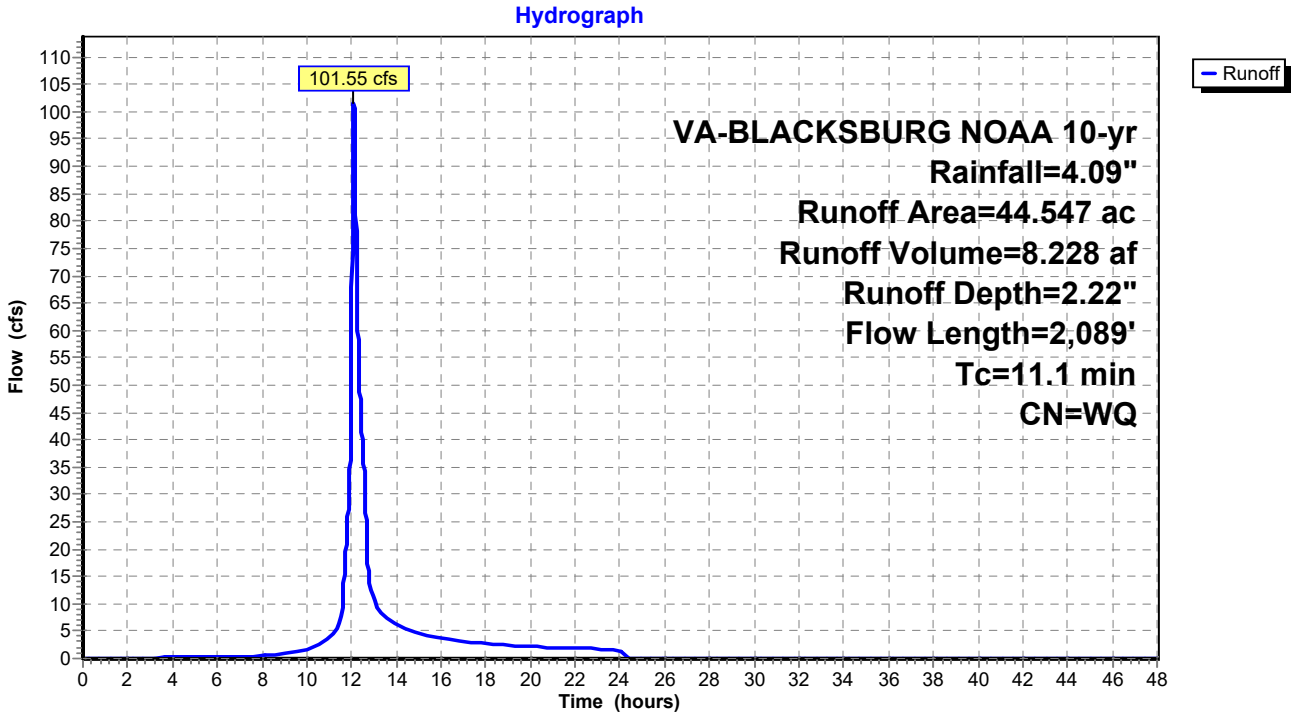
Runoff = 101.55 cfs @ 12.11 hrs, Volume= 8.228 af, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 10-yr Rainfall=4.09"

Area (ac)	CN	Description
0.358	98	Paved roads w/curbs & sewers, HSG B
4.733	98	Paved roads w/curbs & sewers, HSG C
5.726	70	1/2 acre lots, 25% imp, HSG B
28.476	80	1/2 acre lots, 25% imp, HSG C
0.877	72	1/3 acre lots, 30% imp, HSG B
3.986	81	1/3 acre lots, 30% imp, HSG C
0.391	79	1 acre lots, 20% imp, HSG C
44.547		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 8S: DA #3 OFF-SITE



Summary for Subcatchment 9S: DA #2 WQ AREA

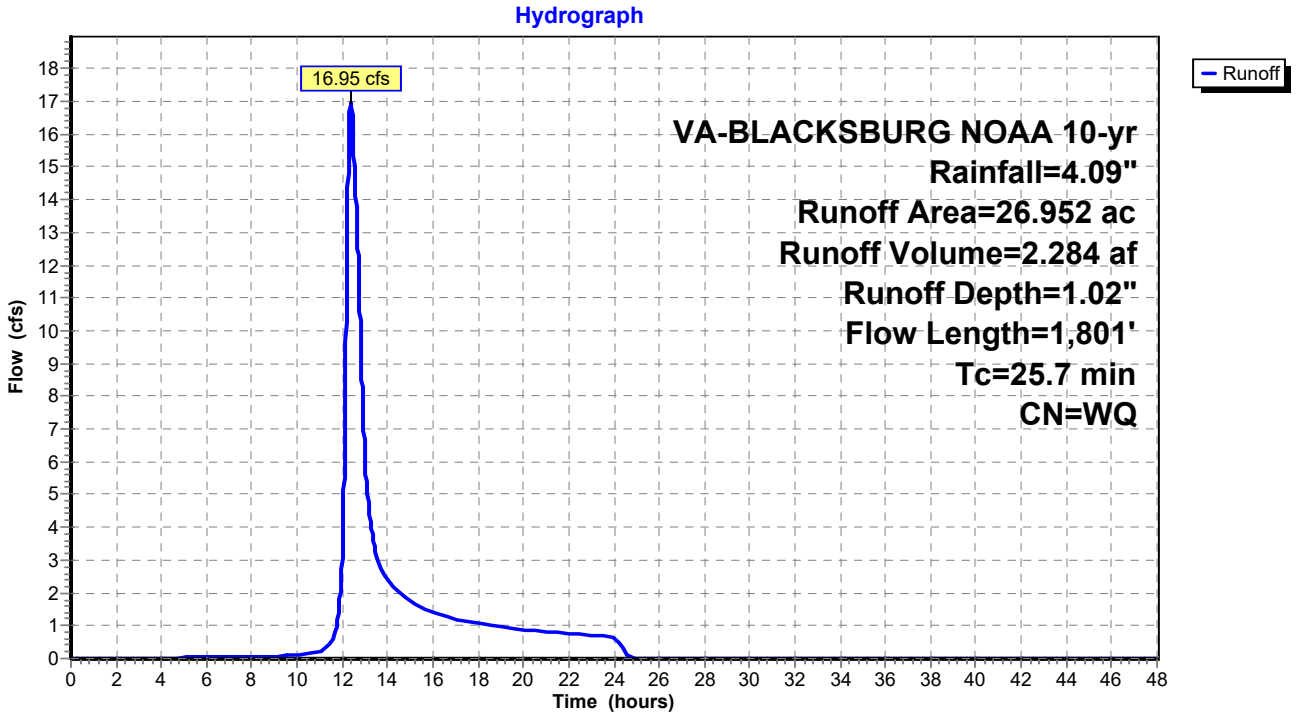
Runoff = 16.95 cfs @ 12.37 hrs, Volume= 2.284 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 10-yr Rainfall=4.09"

	Area (ac)	CN	Description
	5.097	55	Woods, Good, HSG B
	5.711	70	Woods, Good, HSG C
	8.232	58	Woods/grass comb., Good, HSG B
	1.810	72	Woods/grass comb., Good, HSG C
	0.270	70	1/2 acre lots, 25% imp, HSG B
	0.098	80	1/2 acre lots, 25% imp, HSG C
	0.070	39	>75% Grass cover, Good, HSG A
	4.590	61	>75% Grass cover, Good, HSG B
	0.070	74	>75% Grass cover, Good, HSG C
	0.240	98	Paved parking, HSG B
	0.124	98	Paved parking, HSG C
	0.410	86	Fallow, bare soil, HSG B
*	0.218	98	TRAIL, HSG B
*	0.012	98	TRAIL, HSG C
	26.952		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 9S: DA #2 WQ AREA



Summary for Subcatchment 10S: DA #4

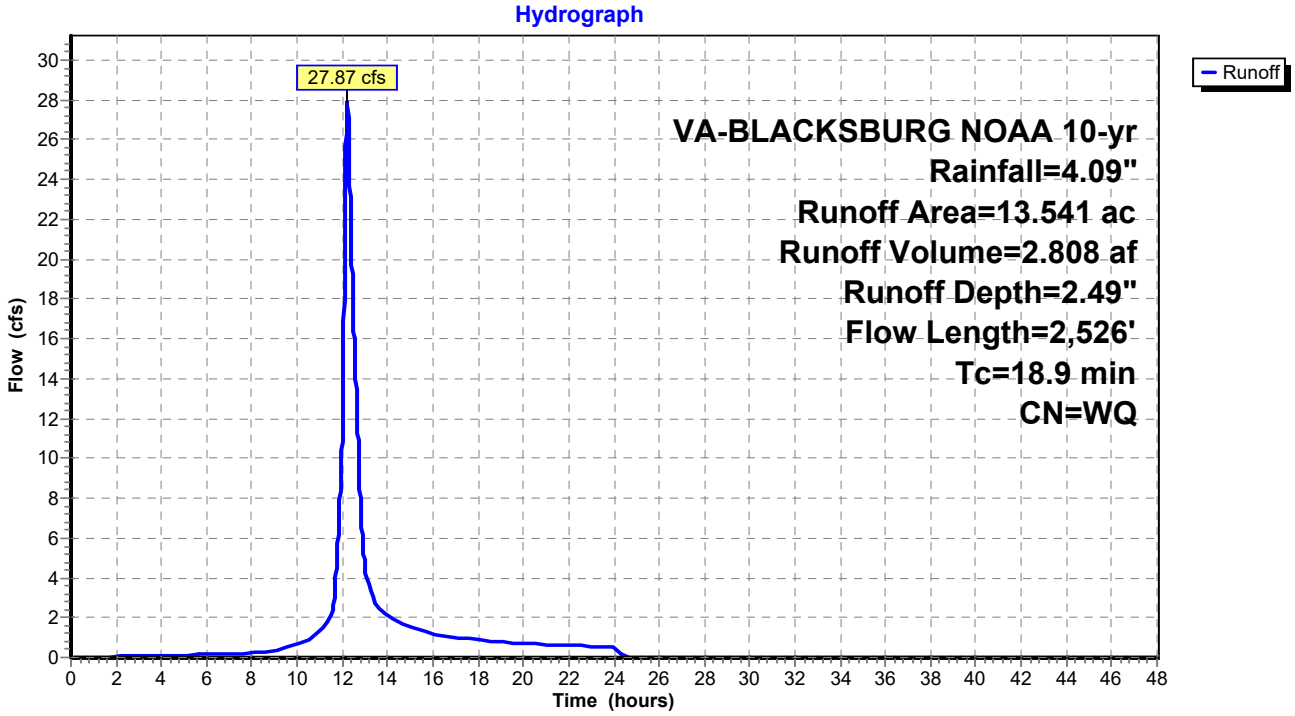
Runoff = 27.87 cfs @ 12.22 hrs, Volume= 2.808 af, Depth= 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 10-yr Rainfall=4.09"

Area (ac)	CN	Description
2.555	98	Paved roads w/curbs & sewers, HSG C
7.333	81	1/3 acre lots, 30% imp, HSG C
3.653	80	1/2 acre lots, 25% imp, HSG C
13.541		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	95	0.0630	0.25		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
9.9	1,004	0.0478	1.70	5.26	**Channel Flow, Tc2** Area= 3.1 sf Perim= 50.0' r= 0.06' n= 0.030 Earth, grassed & winding
2.6	1,427	0.0134	9.03	28.37	**Pipe Channel, CMP_Round 24"** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
18.9	2,526	Total			

Subcatchment 10S: DA #4



Summary for Subcatchment 11S: DA #2 OFFSITE

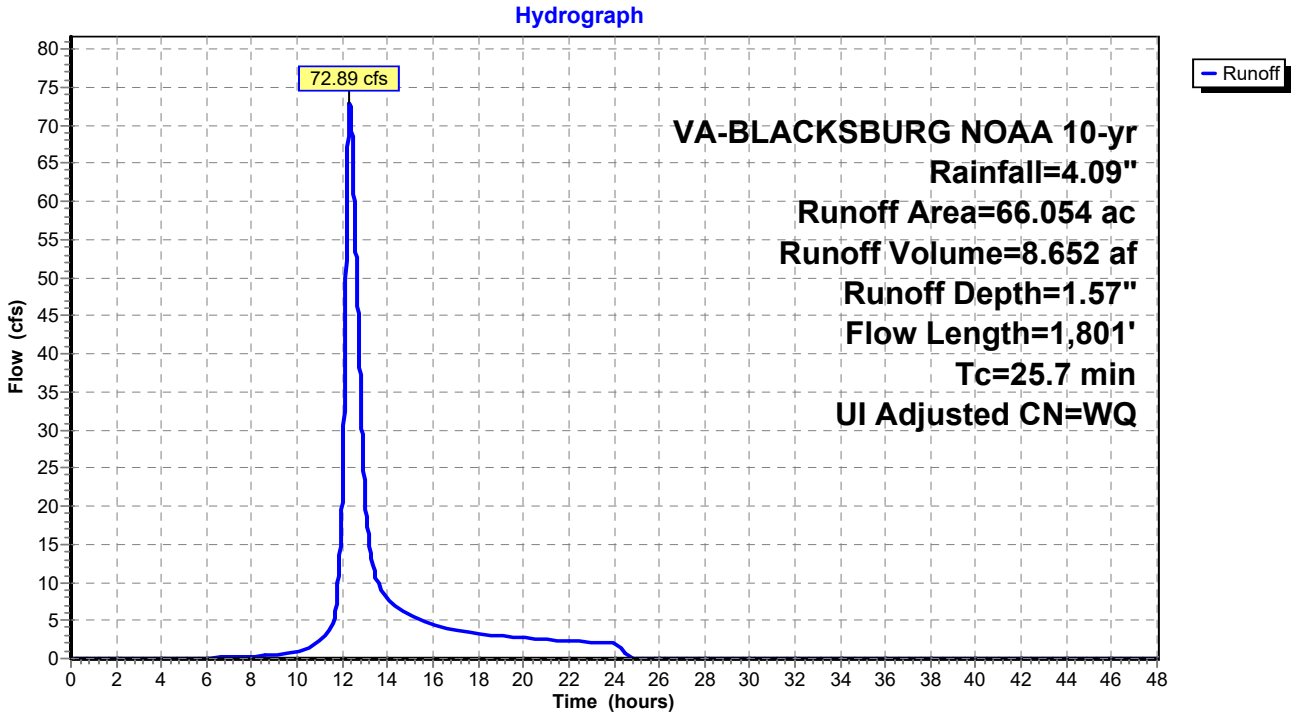
Runoff = 72.89 cfs @ 12.33 hrs, Volume= 8.652 af, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 10-yr Rainfall=4.09"

	Area (ac)	CN	Adj	Description
	10.040	83	83	Fallow, crop residue, Good, HSG B
	1.105	88	88	Fallow, crop residue, Good, HSG C
	1.250	98	98	Unconnected pavement, HSG C
	0.160	98	98	Unconnected pavement, HSG B
	1.555	70	70	1/2 acre lots, 25% imp, HSG B
	6.153	80	80	1/2 acre lots, 25% imp, HSG C
	1.370	81	81	1/3 acre lots, 30% imp, HSG C
	0.180	68	68	1 acre lots, 20% imp, HSG B
	0.038	79	79	1 acre lots, 20% imp, HSG C
	0.110	70	70	Woods, Good, HSG C
	1.267	55	55	Woods, Good, HSG B
	5.290	39	39	>75% Grass cover, Good, HSG A
	8.350	61	61	>75% Grass cover, Good, HSG B
	11.646	74	74	>75% Grass cover, Good, HSG C
	6.107	58	58	Woods/grass comb., Good, HSG B
	5.107	72	72	Woods/grass comb., Good, HSG C
	2.852	72	72	Dirt roads, HSG A
	1.750	82	82	Dirt roads, HSG B
	1.521	87	87	Dirt roads, HSG C
*	0.170	98	98	TRAIL, HSG B
*	0.033	98	98	TRAIL, HSG C
	66.054			Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow, Tc2** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 11S: DA #2 OFFSITE



Summary for Subcatchment 12S: DA #3 WQ AREA

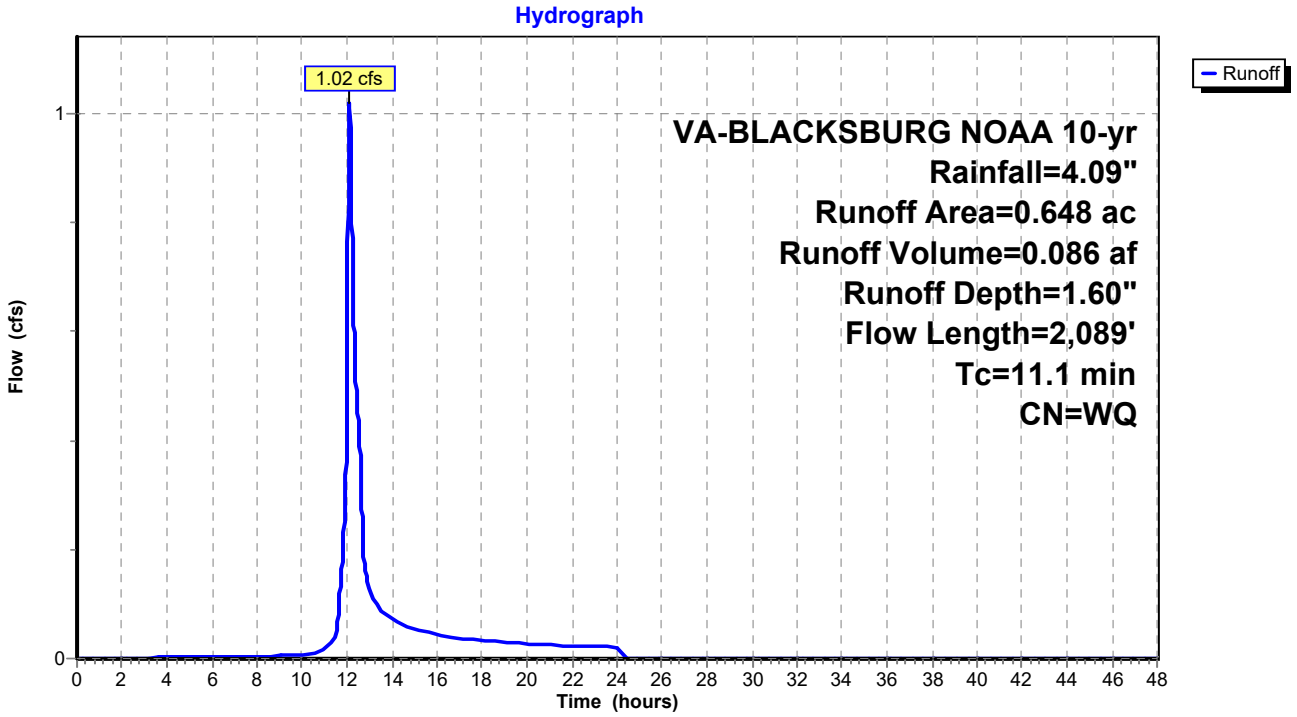
Runoff = 1.02 cfs @ 12.11 hrs, Volume= 0.086 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 10-yr Rainfall=4.09"

Area (ac)	CN	Description
0.046	98	Paved roads w/curbs & sewers, HSG C
0.513	70	1/2 acre lots, 25% imp, HSG B
0.030	80	1/2 acre lots, 25% imp, HSG C
0.059	70	Woods, Good, HSG C
0.648		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 12S: DA #3 WQ AREA



Summary for Reach 6R: POND TO POA

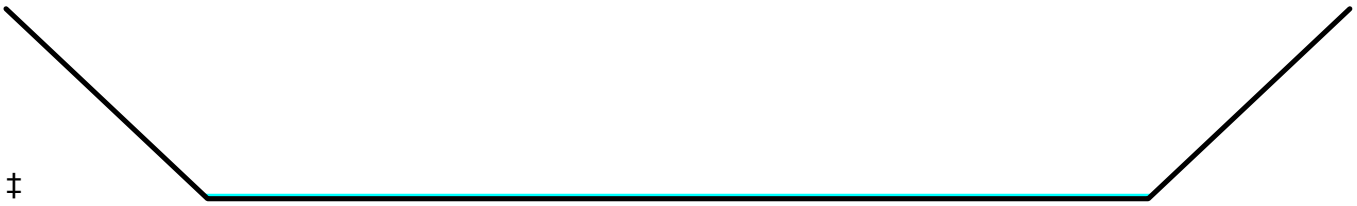
Inflow Area = 96.000 ac, Inflow Depth = 0.81" for 10-yr event
Inflow = 35.24 cfs @ 13.18 hrs, Volume= 6.448 af
Outflow = 19.60 cfs @ 13.54 hrs, Volume= 6.448 af, Atten= 44%, Lag= 21.9 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.12 fps, Min. Travel Time= 13.9 min
Avg. Velocity = 1.29 fps, Avg. Travel Time= 22.9 min

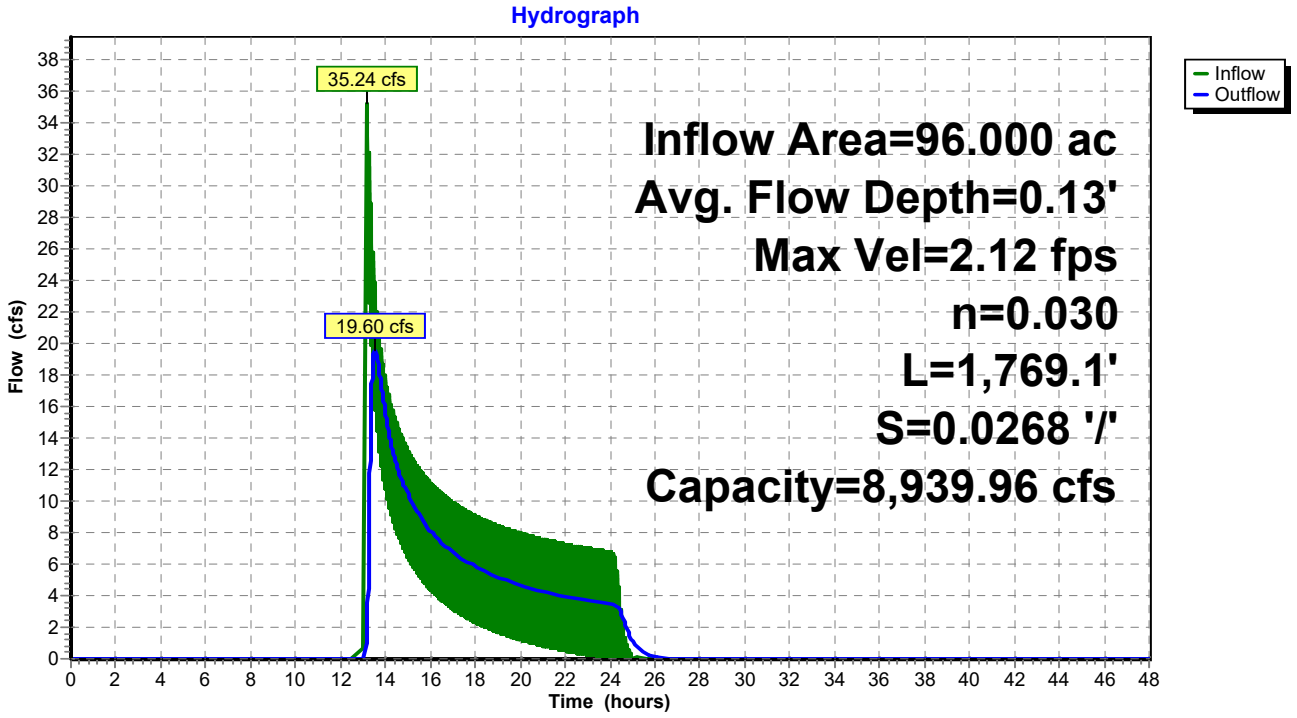
Peak Storage= 16,333 cf @ 13.54 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 70.79'
Bank-Full Depth= 5.00' Flow Area= 425.0 sf, Capacity= 8,939.96 cfs

70.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 100.00'
Length= 1,769.1' Slope= 0.0268 '/'
Inlet Invert= 2,087.00', Outlet Invert= 2,039.65'

‡



Reach 6R: POND TO POA



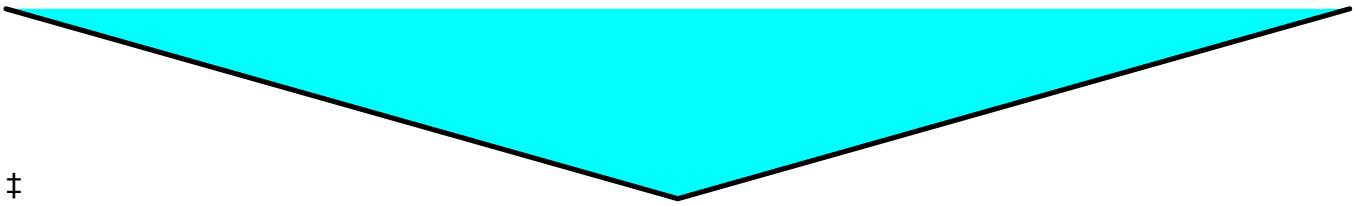
Summary for Reach 8R: REACH COMBINE

Inflow Area = 234.201 ac, Inflow Depth = 1.32" for 10-yr event
Inflow = 164.24 cfs @ 12.25 hrs, Volume= 25.699 af
Outflow = 160.01 cfs @ 12.32 hrs, Volume= 25.699 af, Atten= 3%, Lag= 3.9 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.90 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 5.9 min

Peak Storage= 30,067 cf @ 12.32 hrs
Average Depth at Peak Storage= 16.41' , Surface Width= 547.96'
Bank-Full Depth= 0.33' Flow Area= 1.8 sf, Capacity= 1.23 cfs

0.00' x 0.33' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 16.7 '/' Top Width= 11.02'
Length= 168.8' Slope= 0.0021 '/'
Inlet Invert= 2,036.90', Outlet Invert= 2,036.55'



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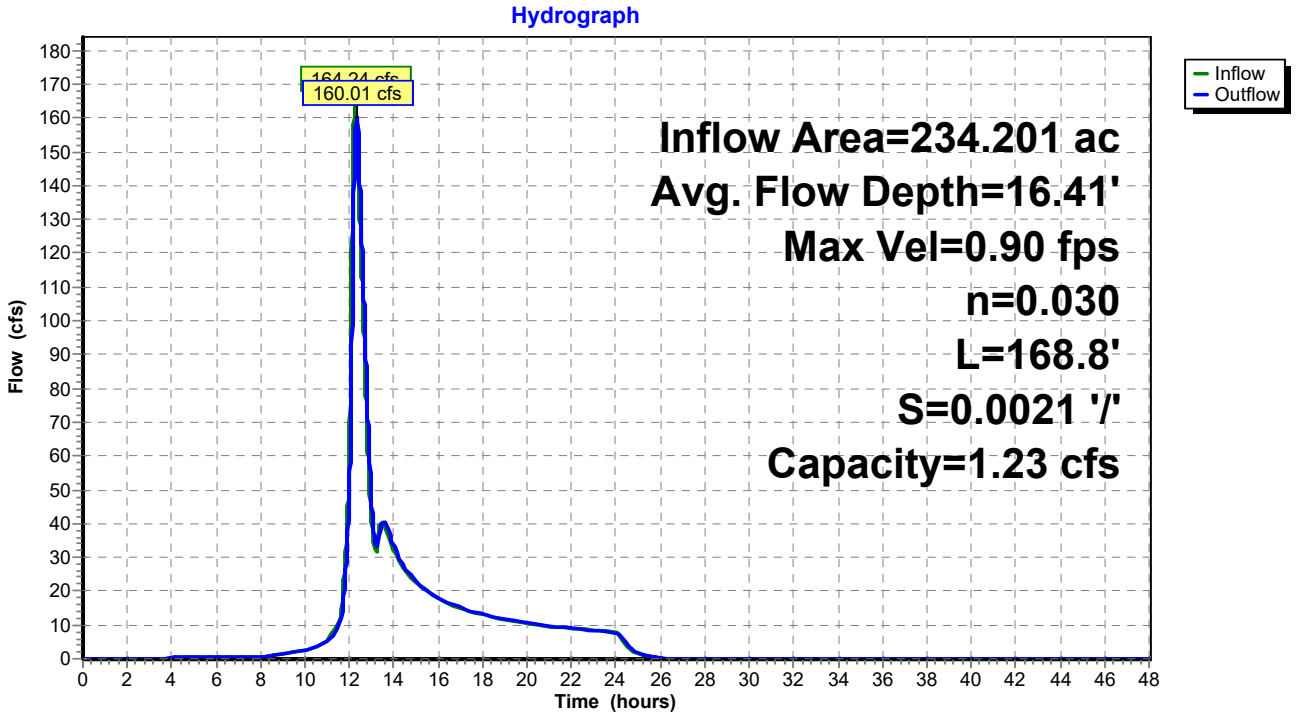
Reach 8R: REACH COMBINE



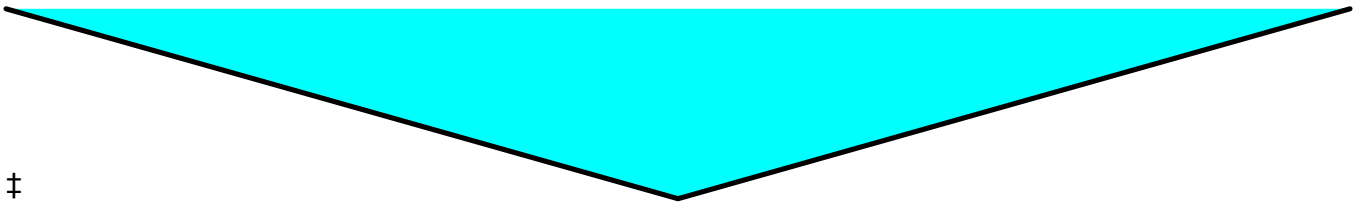
Summary for Reach 9R: DA 3 TO DA 2

Inflow Area = 45.195 ac, Inflow Depth = 2.21" for 10-yr event
Inflow = 102.56 cfs @ 12.11 hrs, Volume= 8.315 af
Outflow = 85.21 cfs @ 12.19 hrs, Volume= 8.315 af, Atten= 17%, Lag= 5.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.05 fps, Min. Travel Time= 6.0 min
Avg. Velocity = 1.34 fps, Avg. Travel Time= 18.2 min

Peak Storage= 30,780 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.93' , Surface Width= 74.38'
Bank-Full Depth= 0.35' Flow Area= 4.9 sf, Capacity= 15.84 cfs

0.00' x 0.35' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 40.0 '/' Top Width= 28.00'
Length= 1,462.0' Slope= 0.0435 '/'
Inlet Invert= 2,103.26', Outlet Invert= 2,039.65'



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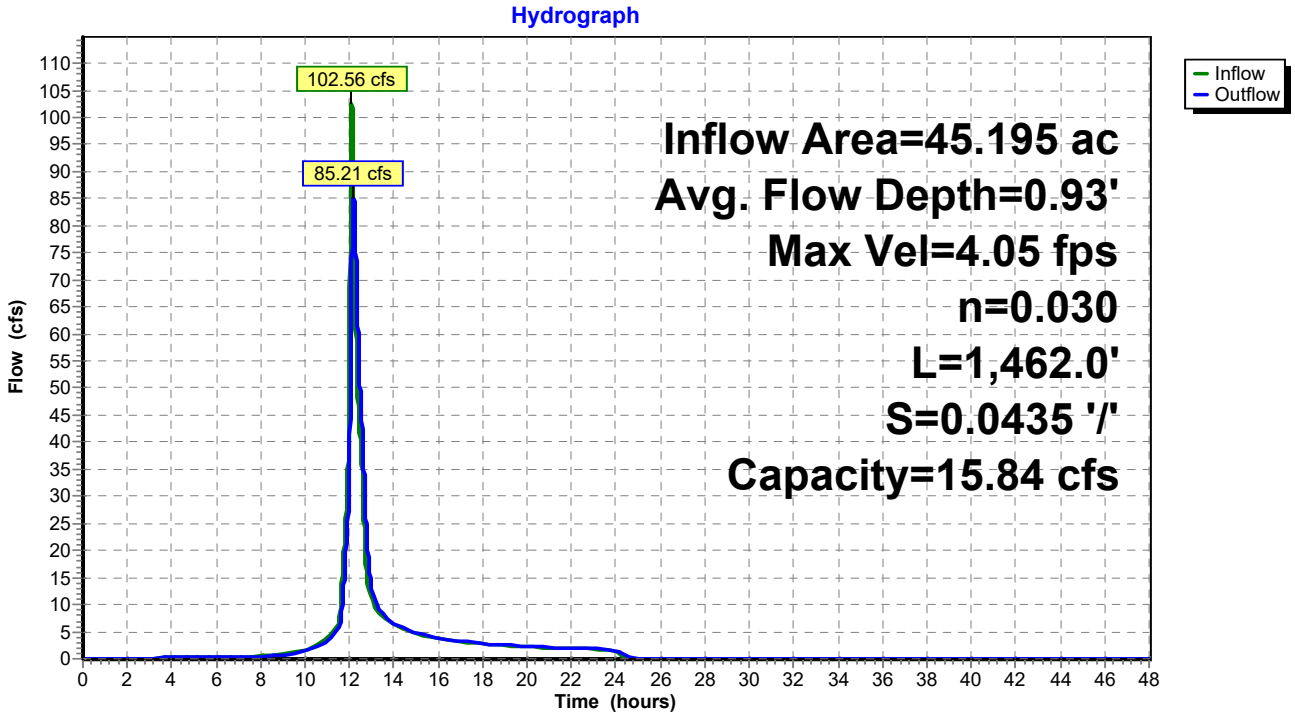
Reach 9R: DA 3 TO DA 2



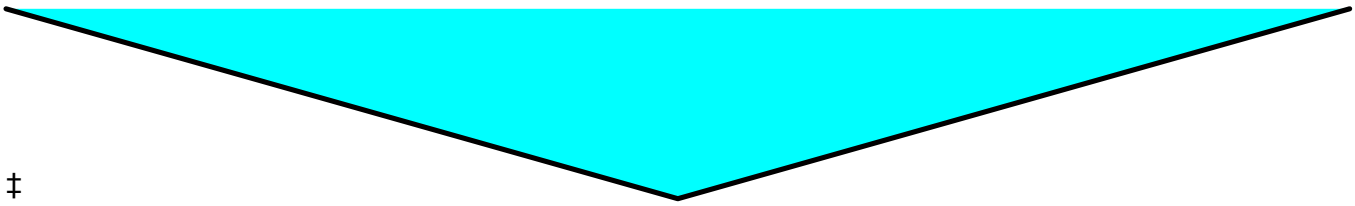
Summary for Reach 10R: REACH COMBINE 2

Inflow Area = 247.742 ac, Inflow Depth = 1.38" for 10-yr event
Inflow = 185.95 cfs @ 12.31 hrs, Volume= 28.506 af
Outflow = 185.51 cfs @ 12.32 hrs, Volume= 28.506 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.13 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 3.3 min

Peak Storage= 11,889 cf @ 12.32 hrs
Average Depth at Peak Storage= 1.13' , Surface Width= 200.54'
Bank-Full Depth= 0.59' Flow Area= 30.8 sf, Capacity= 54.02 cfs

0.00' x 0.59' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 88.5 '/' Top Width= 104.43'
Length= 136.3' Slope= 0.0064 '/'
Inlet Invert= 2,036.75', Outlet Invert= 2,035.88'



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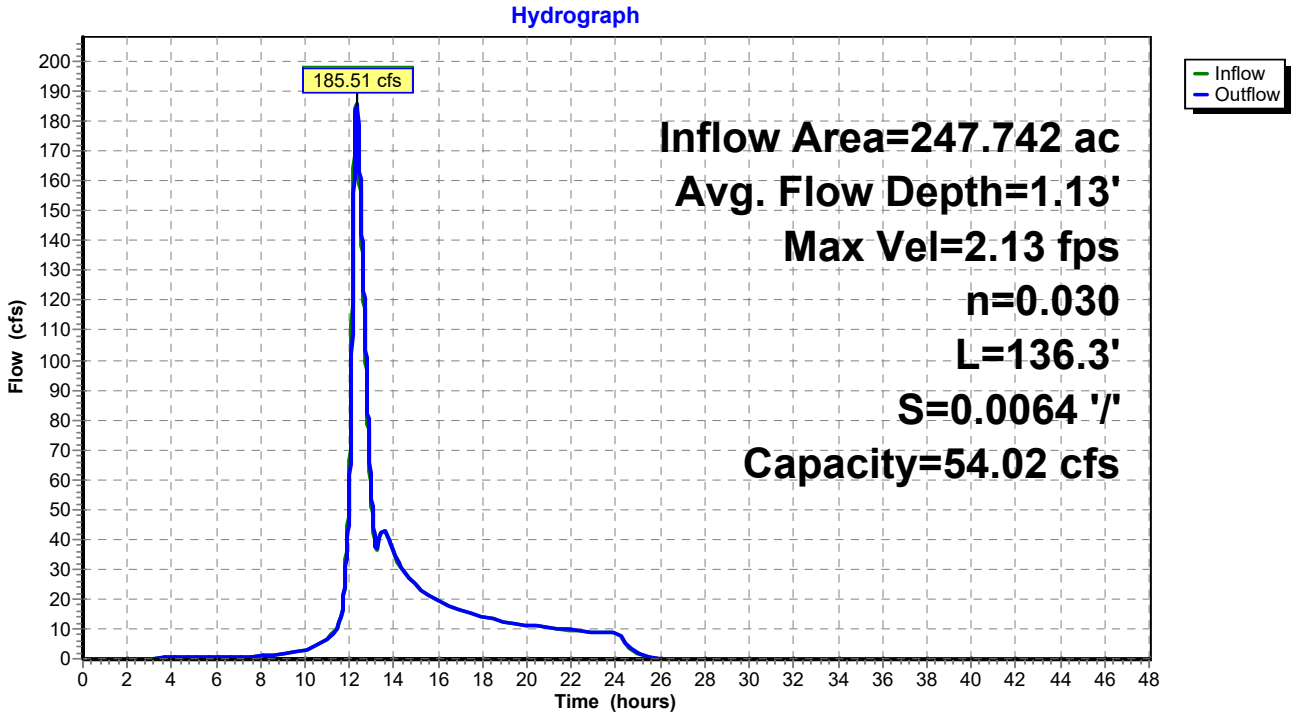
Reach 10R: REACH COMBINE 2



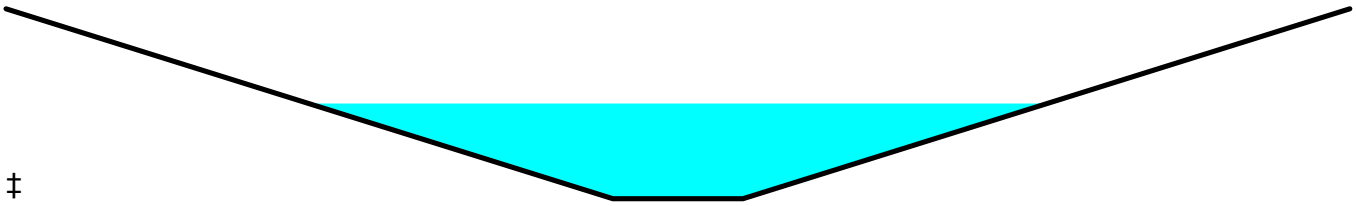
Summary for Reach 11R: DA 4 TO POA

Inflow Area = 13.541 ac, Inflow Depth = 2.49" for 10-yr event
Inflow = 27.87 cfs @ 12.22 hrs, Volume= 2.808 af
Outflow = 27.41 cfs @ 12.25 hrs, Volume= 2.808 af, Atten= 2%, Lag= 2.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.80 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 2.59 fps, Avg. Travel Time= 7.6 min

Peak Storage= 4,134 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.70' , Surface Width= 8.52'
Bank-Full Depth= 1.40' Flow Area= 11.9 sf, Capacity= 140.25 cfs

1.50' x 1.40' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 5.0 '/' Top Width= 15.50'
Length= 1,176.1' Slope= 0.0825 '/'
Inlet Invert= 2,133.71', Outlet Invert= 2,036.73'



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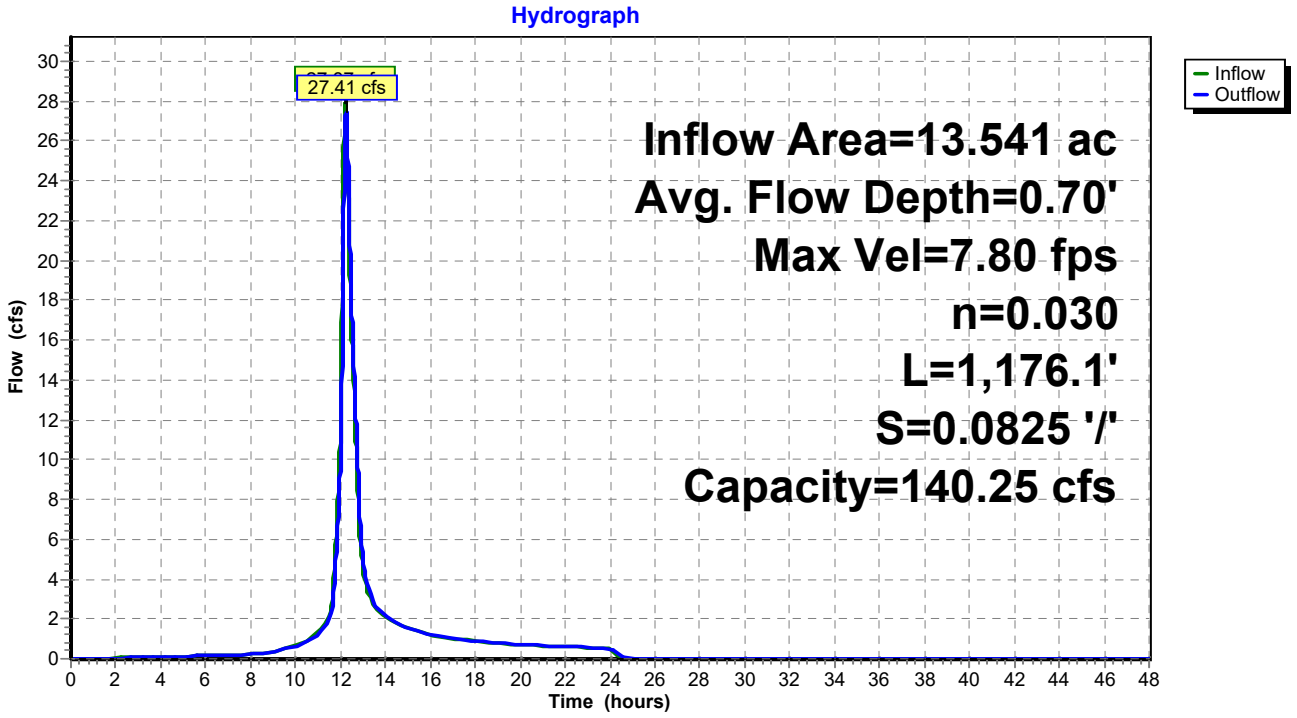
Reach 11R: DA 4 TO POA



Summary for Pond 3P: NSP POND 1

Inflow Area = 96.000 ac, Inflow Depth = 1.93" for 10-yr event
Inflow = 122.59 cfs @ 12.42 hrs, Volume= 15.453 af
Outflow = 35.24 cfs @ 13.18 hrs, Volume= 6.448 af, Atten= 71%, Lag= 45.6 min
Primary = 35.24 cfs @ 13.18 hrs, Volume= 6.448 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 2,080.75' @ 13.18 hrs Storage= 392,320 cf

Plug-Flow detention time= 304.7 min calculated for 6.448 af (42% of inflow)
Center-of-Mass det. time= 169.1 min (1,025.0 - 855.9)

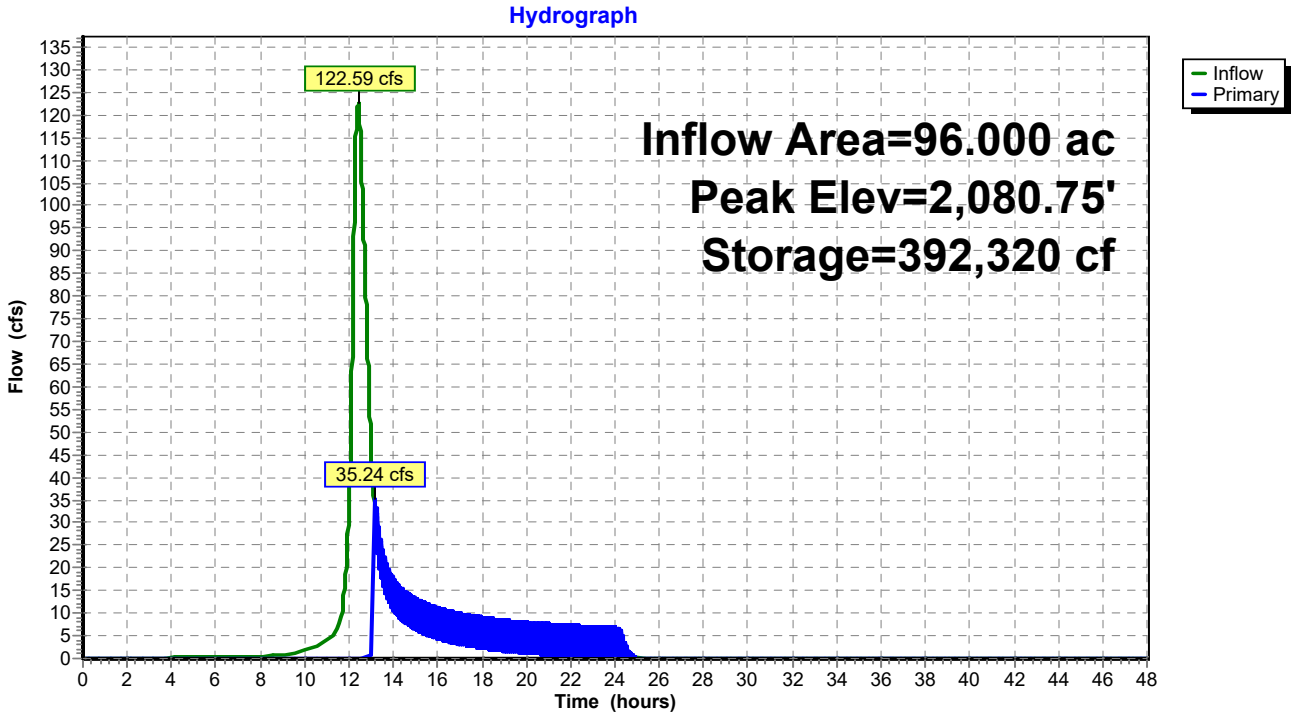
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	392,320 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	0	0
1.25	2,002	2,002
3.25	24,089	26,091
5.25	67,305	93,396
7.25	119,692	213,088
9.25	179,232	392,320

Device	Routing	Invert	Outlet Devices
#1	Primary	2,073.87'	**48.0" Round Culvert** L= 110.4' Ke= 0.600 Inlet / Outlet Invert= 2,073.87' / 2,071.85' S= 0.0183 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	2,174.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	2,080.27'	**72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	2,082.20'	**30.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=20.27 cfs @ 13.18 hrs HW=2,080.75' (Free Discharge)
└**1=Culvert** (Passes 20.27 cfs of 125.26 cfs potential flow)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Weir Controls 20.27 cfs @ 2.26 fps)
  └**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: NSP POND 1

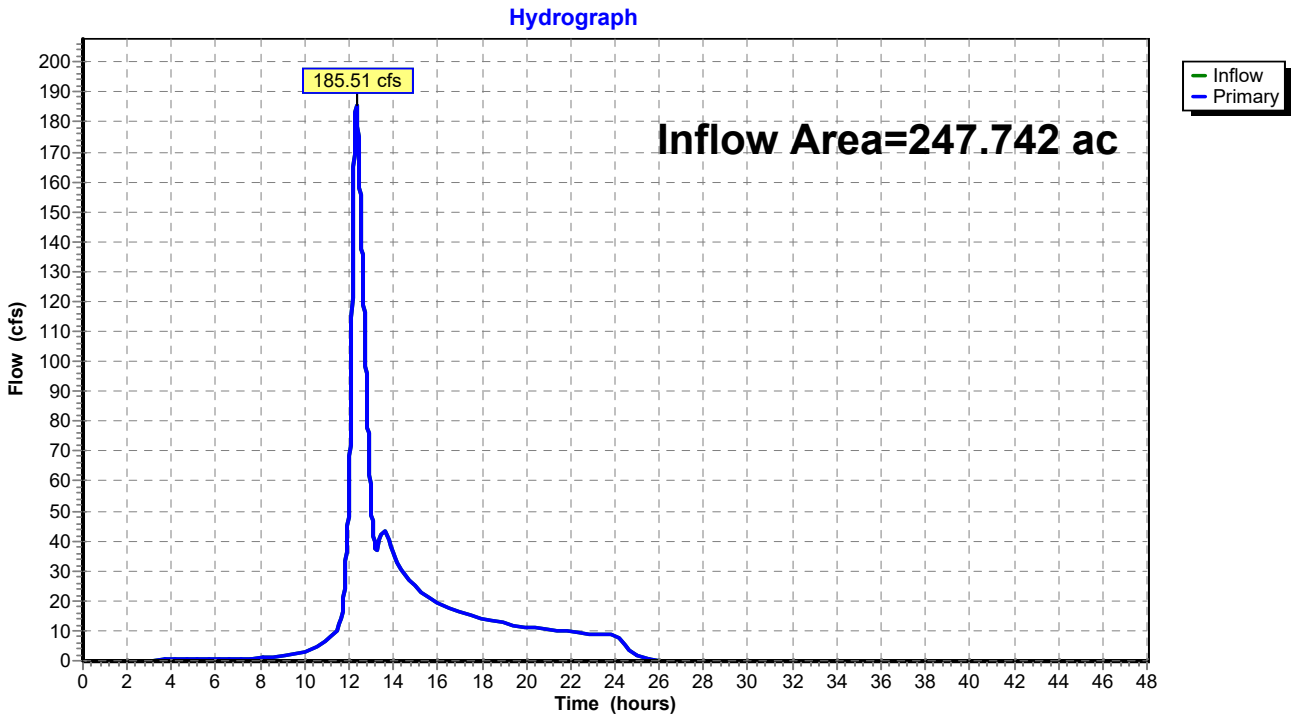


Summary for Link 7L: POA

Inflow Area = 247.742 ac, Inflow Depth = 1.38" for 10-yr event
Inflow = 185.51 cfs @ 12.32 hrs, Volume= 28.506 af
Primary = 185.51 cfs @ 12.32 hrs, Volume= 28.506 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 7L: POA



Summary for Subcatchment 1S: DA # 1

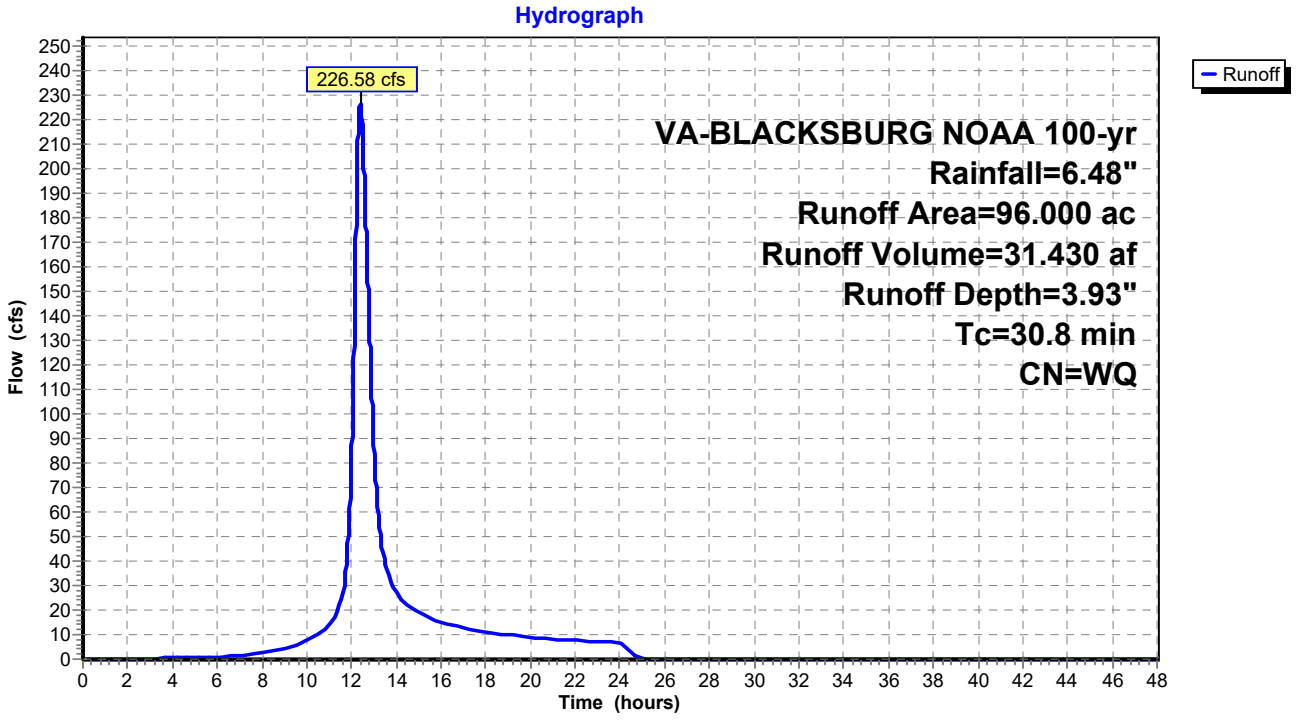
Runoff = 226.58 cfs @ 12.39 hrs, Volume= 31.430 af, Depth= 3.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 100-yr Rainfall=6.48"

Area (ac)	CN	Description
5.080	98	Roofs, HSG C
3.100	84	50-75% Grass cover, Fair, HSG D
22.720	79	50-75% Grass cover, Fair, HSG C
28.800	69	50-75% Grass cover, Fair, HSG B
1.000	86	1/3 acre lots, 30% imp, HSG D
10.400	81	1/3 acre lots, 30% imp, HSG C
6.400	72	1/3 acre lots, 30% imp, HSG B
10.300	83	1/4 acre lots, 38% imp, HSG C
8.200	75	1/4 acre lots, 38% imp, HSG B
96.000		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8					**Direct Entry, FROM NSP CALCS**

Subcatchment 1S: DA # 1



Summary for Subcatchment 8S: DA #3 OFF-SITE

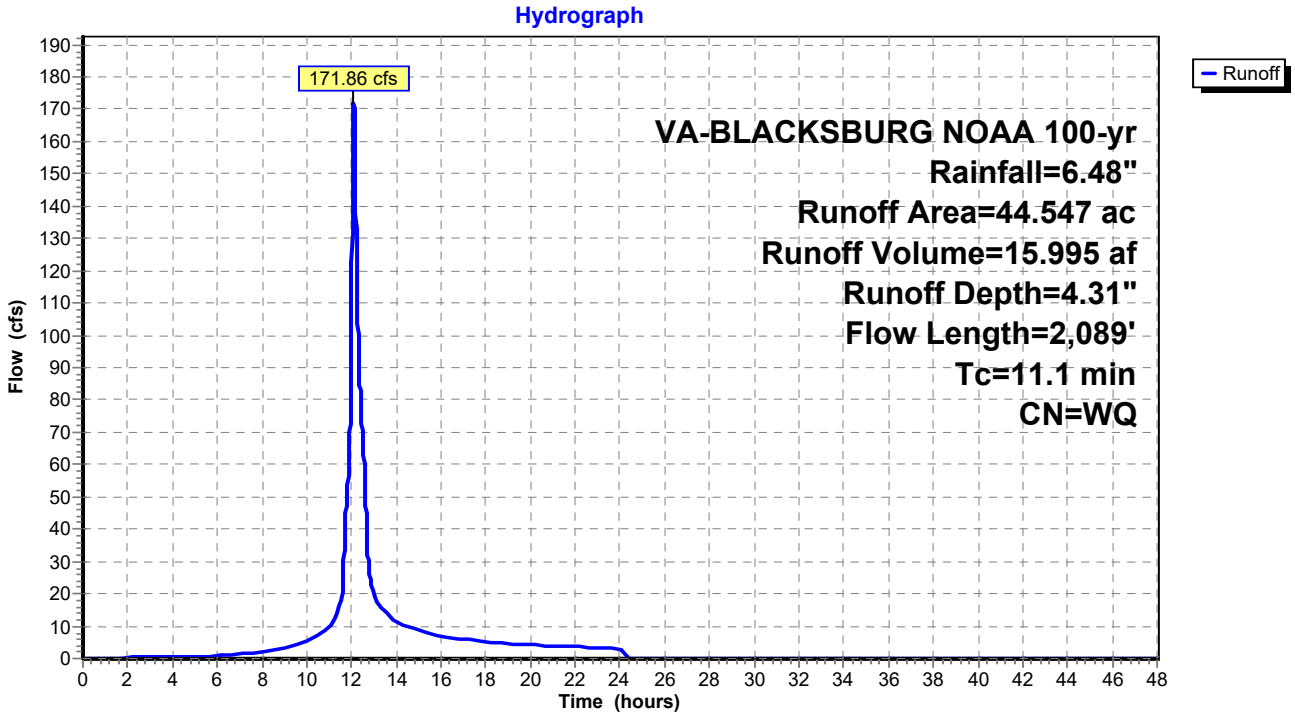
Runoff = 171.86 cfs @ 12.10 hrs, Volume= 15.995 af, Depth= 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 100-yr Rainfall=6.48"

Area (ac)	CN	Description
0.358	98	Paved roads w/curbs & sewers, HSG B
4.733	98	Paved roads w/curbs & sewers, HSG C
5.726	70	1/2 acre lots, 25% imp, HSG B
28.476	80	1/2 acre lots, 25% imp, HSG C
0.877	72	1/3 acre lots, 30% imp, HSG B
3.986	81	1/3 acre lots, 30% imp, HSG C
0.391	79	1 acre lots, 20% imp, HSG C
44.547		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 8S: DA #3 OFF-SITE



Summary for Subcatchment 9S: DA #2 WQ AREA

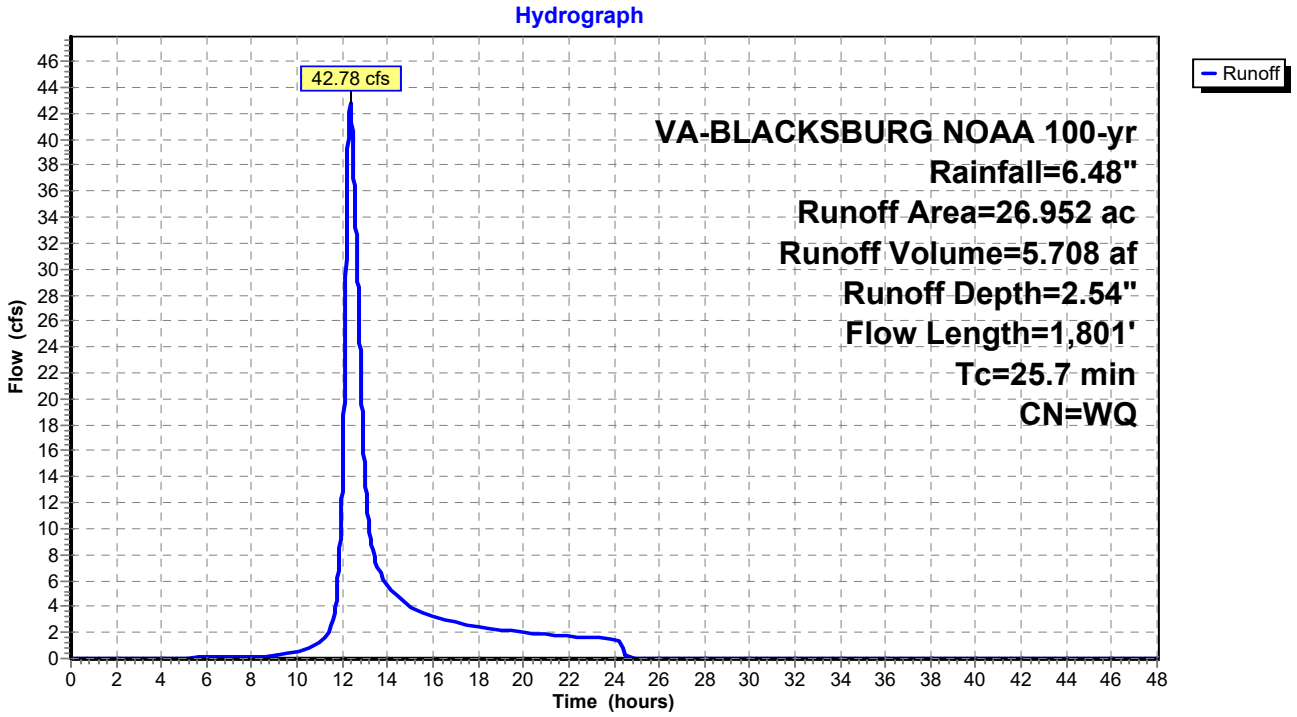
Runoff = 42.78 cfs @ 12.34 hrs, Volume= 5.708 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 100-yr Rainfall=6.48"

	Area (ac)	CN	Description
	5.097	55	Woods, Good, HSG B
	5.711	70	Woods, Good, HSG C
	8.232	58	Woods/grass comb., Good, HSG B
	1.810	72	Woods/grass comb., Good, HSG C
	0.270	70	1/2 acre lots, 25% imp, HSG B
	0.098	80	1/2 acre lots, 25% imp, HSG C
	0.070	39	>75% Grass cover, Good, HSG A
	4.590	61	>75% Grass cover, Good, HSG B
	0.070	74	>75% Grass cover, Good, HSG C
	0.240	98	Paved parking, HSG B
	0.124	98	Paved parking, HSG C
	0.410	86	Fallow, bare soil, HSG B
*	0.218	98	TRAIL, HSG B
*	0.012	98	TRAIL, HSG C
	26.952		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 9S: DA #2 WQ AREA



Summary for Subcatchment 10S: DA #4

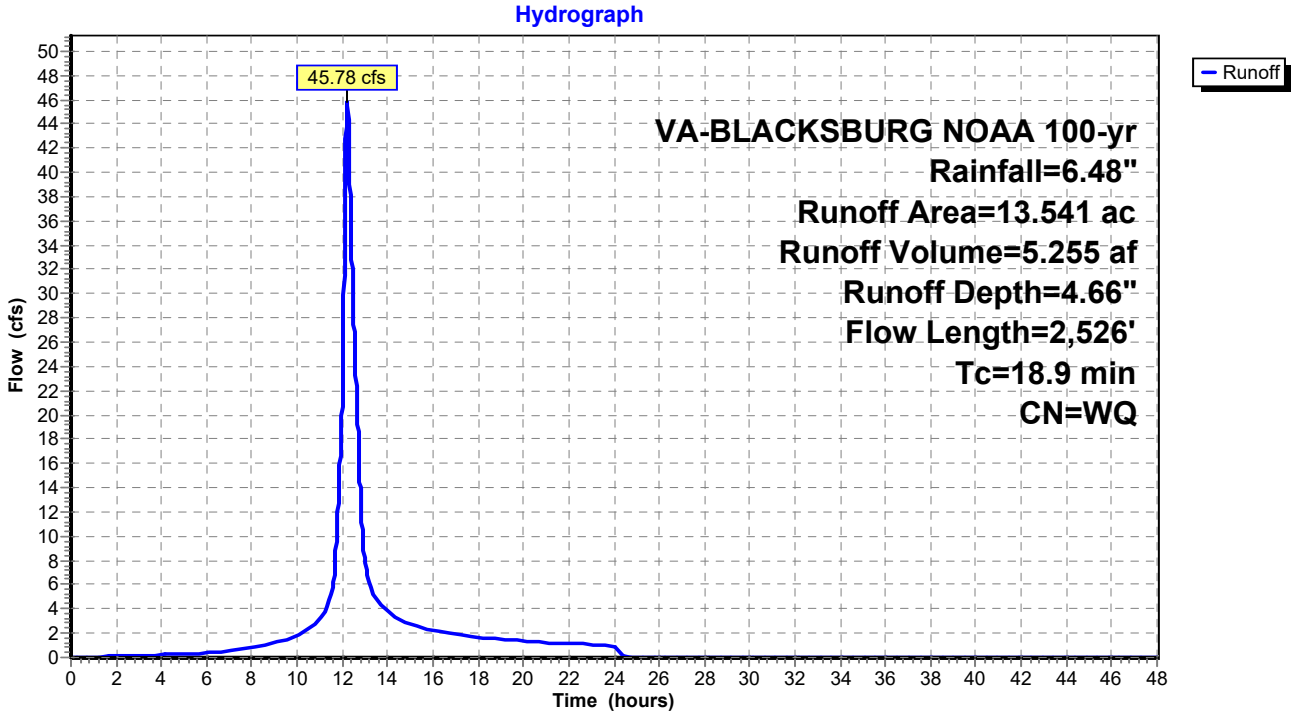
Runoff = 45.78 cfs @ 12.21 hrs, Volume= 5.255 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 100-yr Rainfall=6.48"

Area (ac)	CN	Description
2.555	98	Paved roads w/curbs & sewers, HSG C
7.333	81	1/3 acre lots, 30% imp, HSG C
3.653	80	1/2 acre lots, 25% imp, HSG C
13.541		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	95	0.0630	0.25		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
9.9	1,004	0.0478	1.70	5.26	**Channel Flow, Tc2** Area= 3.1 sf Perim= 50.0' r= 0.06' n= 0.030 Earth, grassed & winding
2.6	1,427	0.0134	9.03	28.37	**Pipe Channel, CMP_Round 24"** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
18.9	2,526	Total			

Subcatchment 10S: DA #4



Summary for Subcatchment 11S: DA #2 OFFSITE

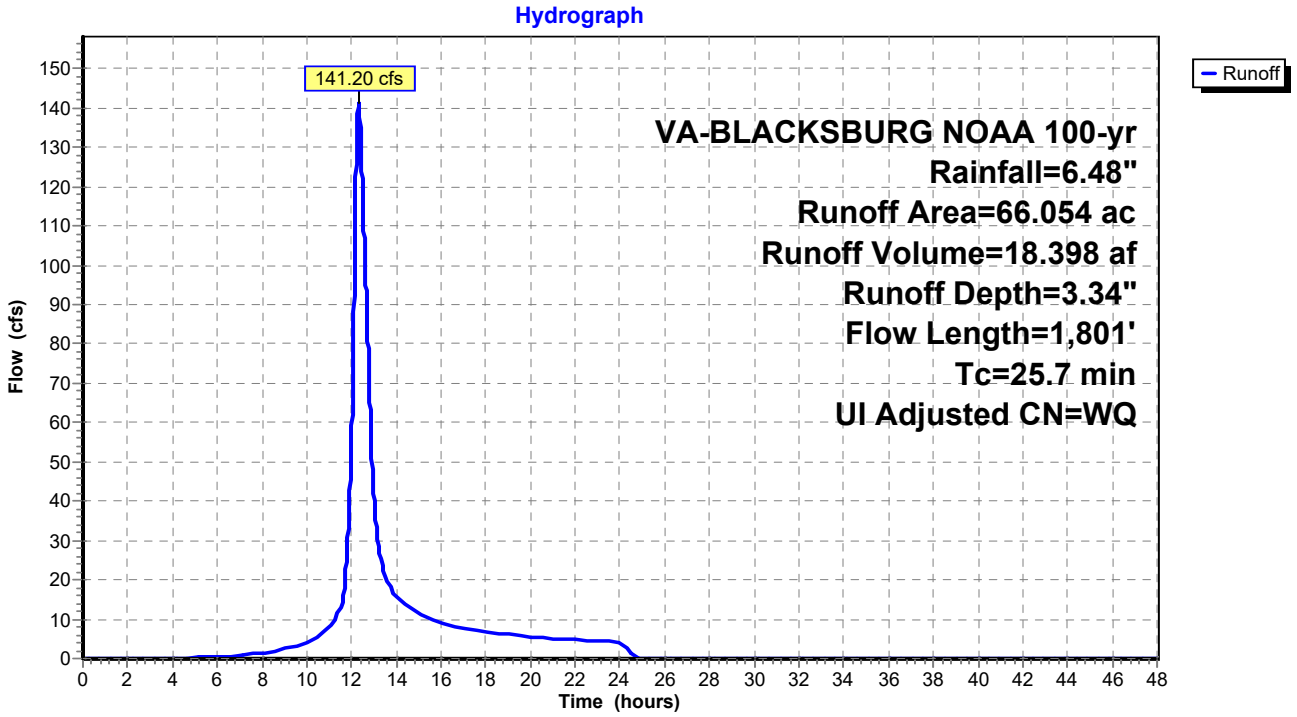
Runoff = 141.20 cfs @ 12.31 hrs, Volume= 18.398 af, Depth= 3.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 100-yr Rainfall=6.48"

	Area (ac)	CN	Adj	Description
	10.040	83	83	Fallow, crop residue, Good, HSG B
	1.105	88	88	Fallow, crop residue, Good, HSG C
	1.250	98	98	Unconnected pavement, HSG C
	0.160	98	98	Unconnected pavement, HSG B
	1.555	70	70	1/2 acre lots, 25% imp, HSG B
	6.153	80	80	1/2 acre lots, 25% imp, HSG C
	1.370	81	81	1/3 acre lots, 30% imp, HSG C
	0.180	68	68	1 acre lots, 20% imp, HSG B
	0.038	79	79	1 acre lots, 20% imp, HSG C
	0.110	70	70	Woods, Good, HSG C
	1.267	55	55	Woods, Good, HSG B
	5.290	39	39	>75% Grass cover, Good, HSG A
	8.350	61	61	>75% Grass cover, Good, HSG B
	11.646	74	74	>75% Grass cover, Good, HSG C
	6.107	58	58	Woods/grass comb., Good, HSG B
	5.107	72	72	Woods/grass comb., Good, HSG C
	2.852	72	72	Dirt roads, HSG A
	1.750	82	82	Dirt roads, HSG B
	1.521	87	87	Dirt roads, HSG C
*	0.170	98	98	TRAIL, HSG B
*	0.033	98	98	TRAIL, HSG C
	66.054			Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow, Tc2** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 11S: DA #2 OFFSITE



Summary for Subcatchment 12S: DA #3 WQ AREA

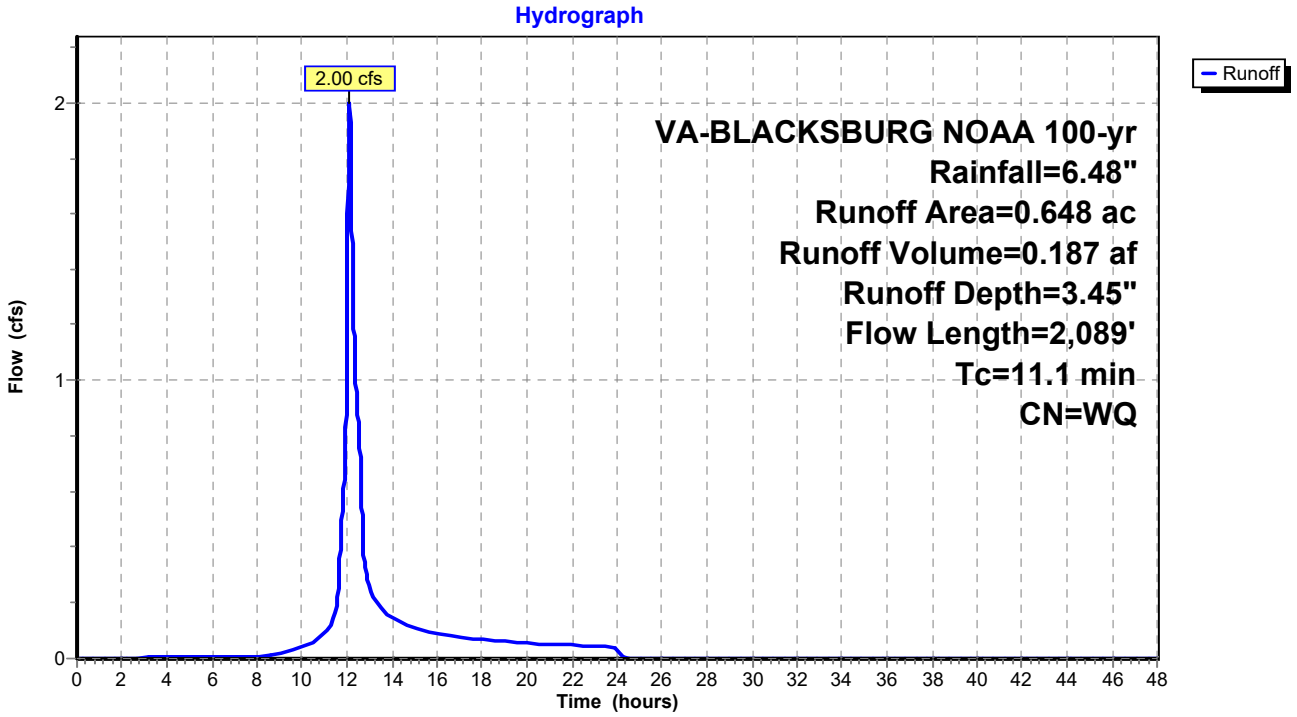
Runoff = 2.00 cfs @ 12.11 hrs, Volume= 0.187 af, Depth= 3.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 100-yr Rainfall=6.48"

Area (ac)	CN	Description
0.046	98	Paved roads w/curbs & sewers, HSG C
0.513	70	1/2 acre lots, 25% imp, HSG B
0.030	80	1/2 acre lots, 25% imp, HSG C
0.059	70	Woods, Good, HSG C
0.648		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 12S: DA #3 WQ AREA



Summary for Reach 6R: POND TO POA

Inflow Area = 96.000 ac, Inflow Depth = 2.81" for 100-yr event
Inflow = 447.33 cfs @ 12.38 hrs, Volume= 22.514 af
Outflow = 198.71 cfs @ 12.57 hrs, Volume= 22.514 af, Atten= 56%, Lag= 11.1 min

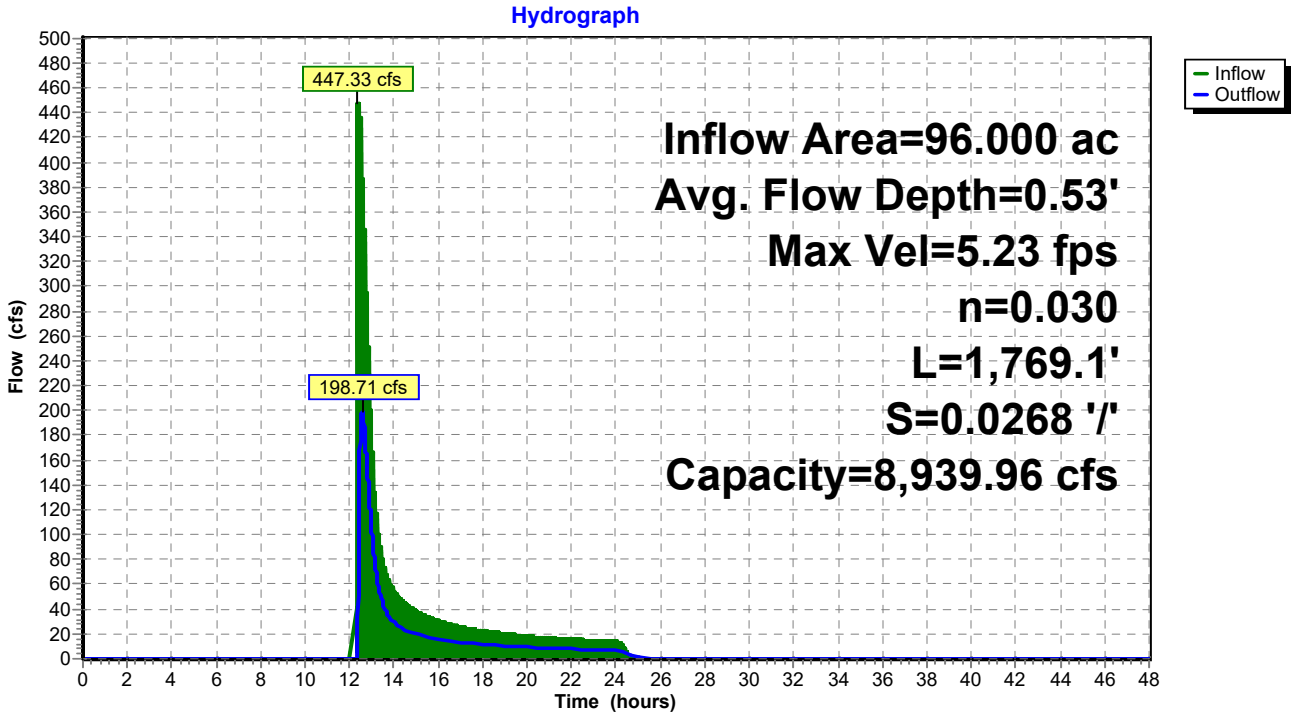
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.23 fps, Min. Travel Time= 5.6 min
Avg. Velocity = 1.72 fps, Avg. Travel Time= 17.1 min

Peak Storage= 67,198 cf @ 12.57 hrs
Average Depth at Peak Storage= 0.53' , Surface Width= 73.18'
Bank-Full Depth= 5.00' Flow Area= 425.0 sf, Capacity= 8,939.96 cfs

70.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 100.00'
Length= 1,769.1' Slope= 0.0268 '/'
Inlet Invert= 2,087.00', Outlet Invert= 2,039.65'

‡

Reach 6R: POND TO POA



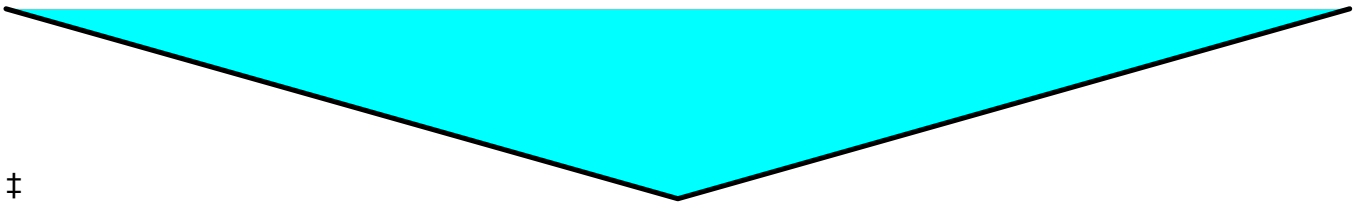
Summary for Reach 8R: REACH COMBINE

Inflow Area = 234.201 ac, Inflow Depth = 3.22" for 100-yr event
Inflow = 424.05 cfs @ 12.51 hrs, Volume= 62.803 af
Outflow = 412.29 cfs @ 12.57 hrs, Volume= 62.803 af, Atten= 3%, Lag= 3.4 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.90 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 5.5 min

Peak Storage= 77,351 cf @ 12.57 hrs
Average Depth at Peak Storage= 41.95' , Surface Width= 1,401.07'
Bank-Full Depth= 0.33' Flow Area= 1.8 sf, Capacity= 1.23 cfs

0.00' x 0.33' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 16.7 '/' Top Width= 11.02'
Length= 168.8' Slope= 0.0021 '/'
Inlet Invert= 2,036.90', Outlet Invert= 2,036.55'



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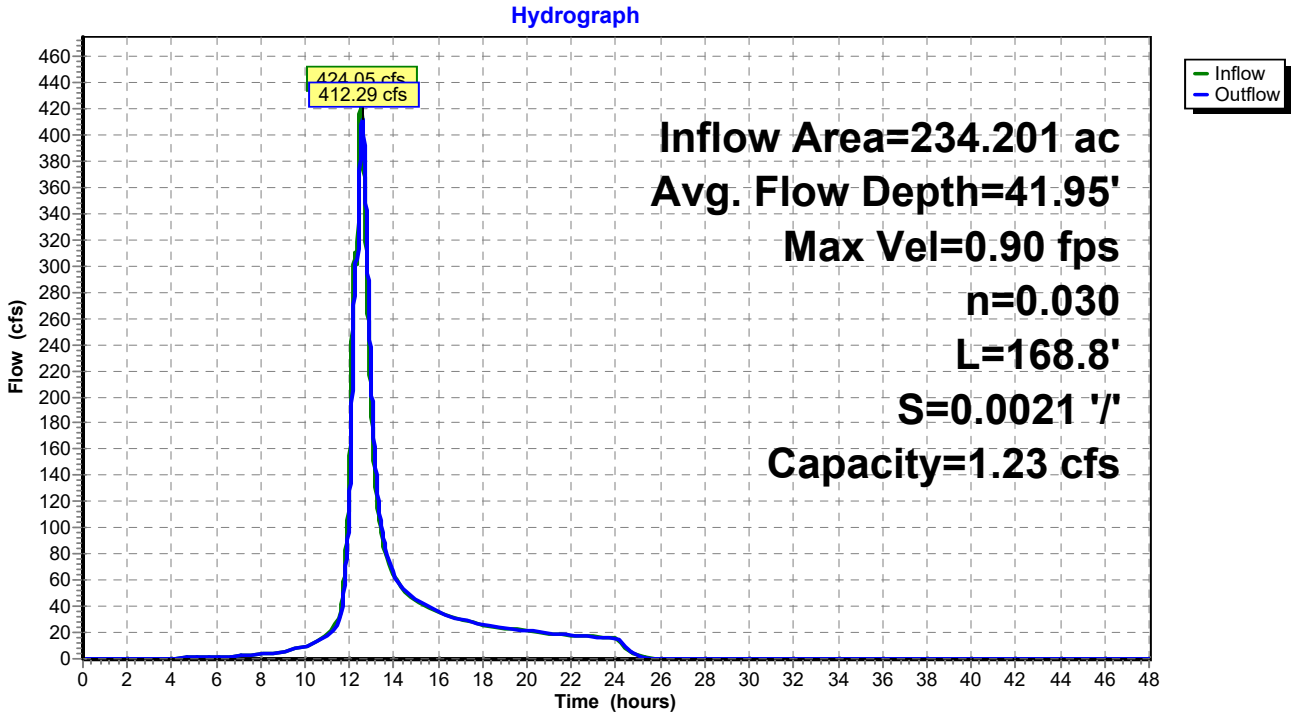
Reach 8R: REACH COMBINE



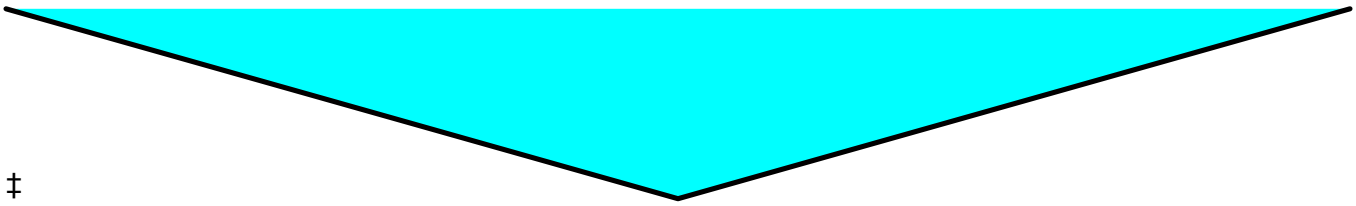
Summary for Reach 9R: DA 3 TO DA 2

Inflow Area = 45.195 ac, Inflow Depth = 4.30" for 100-yr event
Inflow = 173.86 cfs @ 12.10 hrs, Volume= 16.182 af
Outflow = 146.61 cfs @ 12.18 hrs, Volume= 16.182 af, Atten= 16%, Lag= 4.9 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.15 fps, Min. Travel Time= 5.9 min
Avg. Velocity = 1.59 fps, Avg. Travel Time= 15.3 min

Peak Storage= 51,682 cf @ 12.18 hrs
Average Depth at Peak Storage= 1.44' , Surface Width= 115.44'
Bank-Full Depth= 0.35' Flow Area= 4.9 sf, Capacity= 15.84 cfs

0.00' x 0.35' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 40.0 '/' Top Width= 28.00'
Length= 1,462.0' Slope= 0.0435 '/'
Inlet Invert= 2,103.26', Outlet Invert= 2,039.65'



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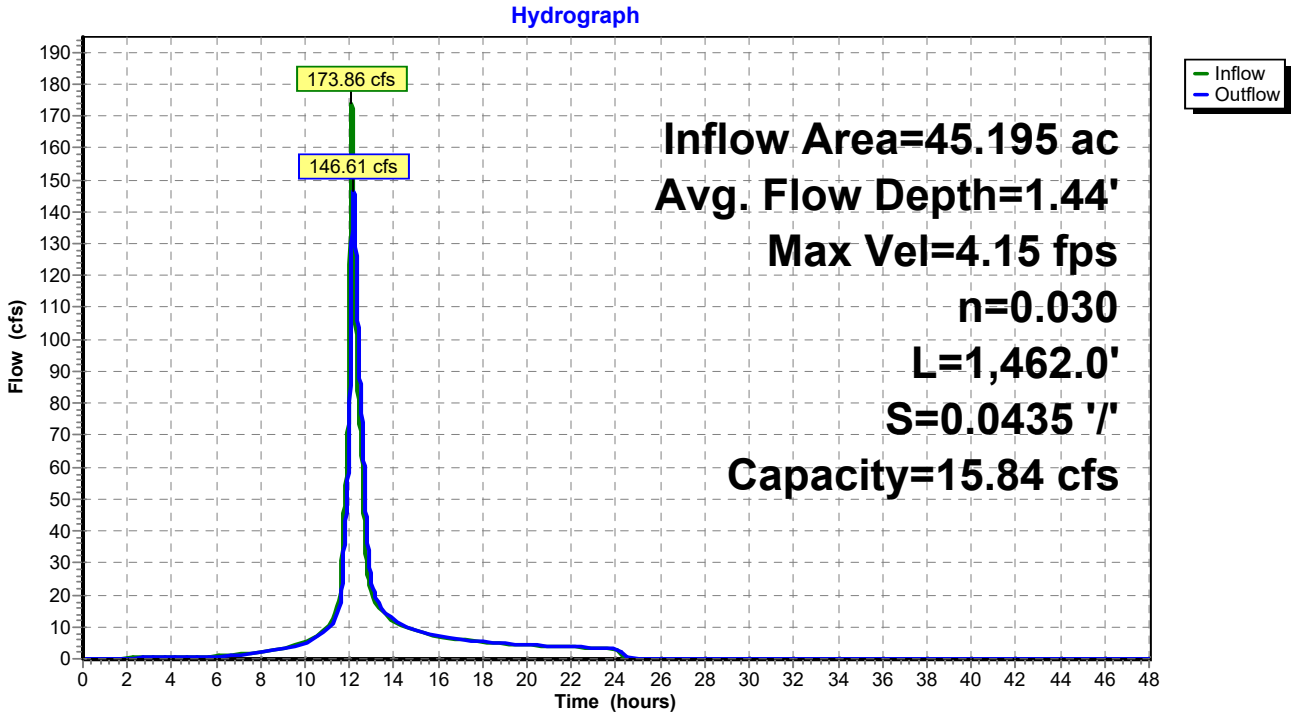
Reach 9R: DA 3 TO DA 2



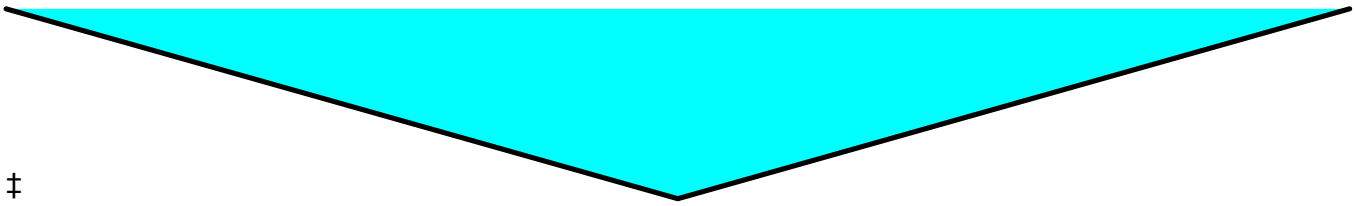
Summary for Reach 10R: REACH COMBINE 2

Inflow Area = 247.742 ac, Inflow Depth = 3.30" for 100-yr event
Inflow = 438.24 cfs @ 12.56 hrs, Volume= 68.058 af
Outflow = 437.25 cfs @ 12.58 hrs, Volume= 68.058 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.24 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 2.7 min

Peak Storage= 26,613 cf @ 12.58 hrs
Average Depth at Peak Storage= 2.17' , Surface Width= 384.55'
Bank-Full Depth= 0.59' Flow Area= 30.8 sf, Capacity= 54.02 cfs

0.00' x 0.59' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 88.5 '/' Top Width= 104.43'
Length= 136.3' Slope= 0.0064 '/'
Inlet Invert= 2,036.75', Outlet Invert= 2,035.88'



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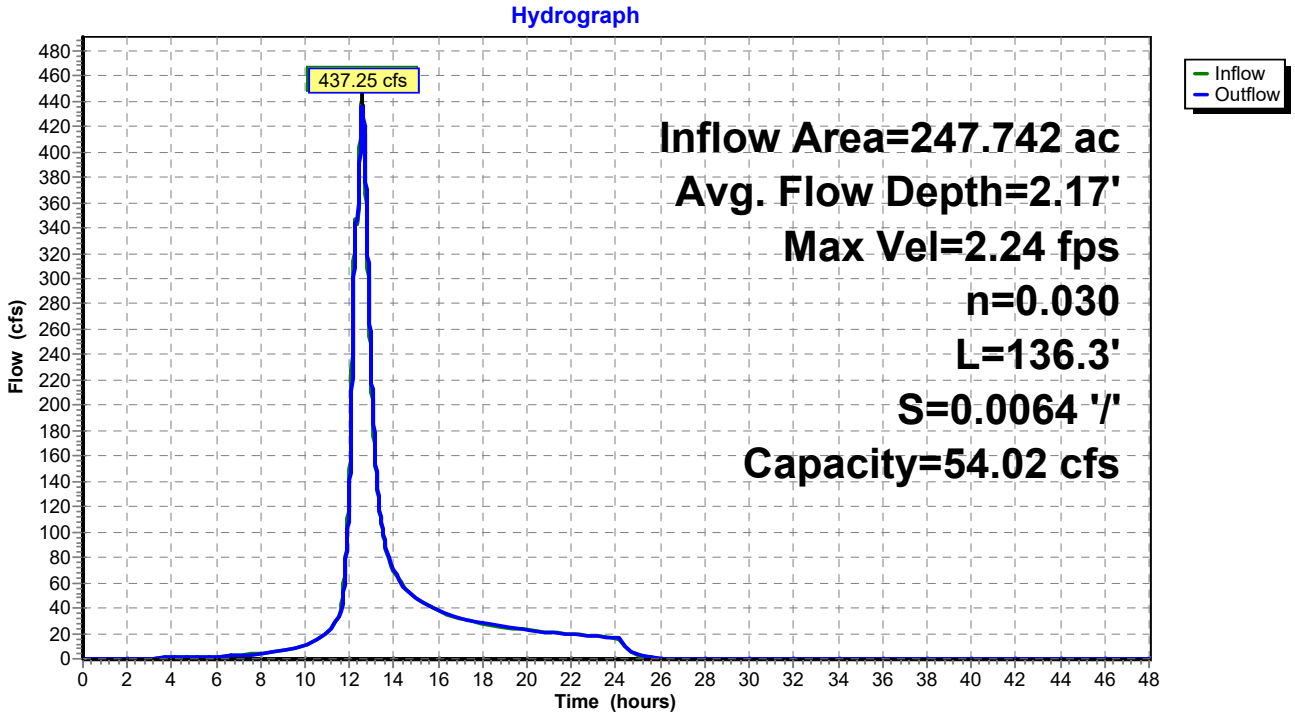
Reach 10R: REACH COMBINE 2



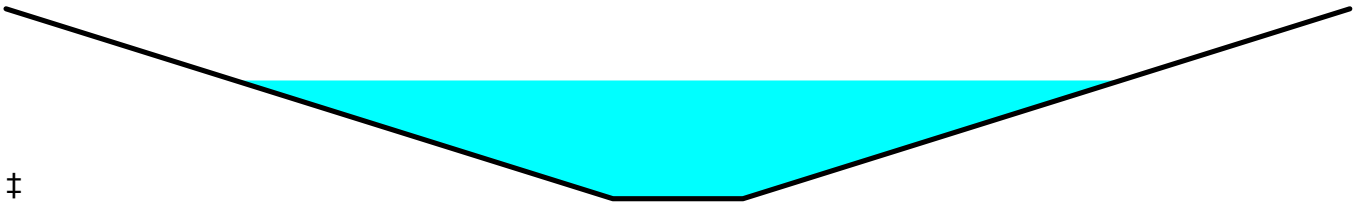
Summary for Reach 11R: DA 4 TO POA

Inflow Area = 13.541 ac, Inflow Depth = 4.66" for 100-yr event
Inflow = 45.78 cfs @ 12.21 hrs, Volume= 5.255 af
Outflow = 45.25 cfs @ 12.24 hrs, Volume= 5.255 af, Atten= 1%, Lag= 1.9 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.86 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 3.17 fps, Avg. Travel Time= 6.2 min

Peak Storage= 6,006 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.87' , Surface Width= 10.22'
Bank-Full Depth= 1.40' Flow Area= 11.9 sf, Capacity= 140.25 cfs

1.50' x 1.40' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 5.0 '/' Top Width= 15.50'
Length= 1,176.1' Slope= 0.0825 '/'
Inlet Invert= 2,133.71', Outlet Invert= 2,036.73'



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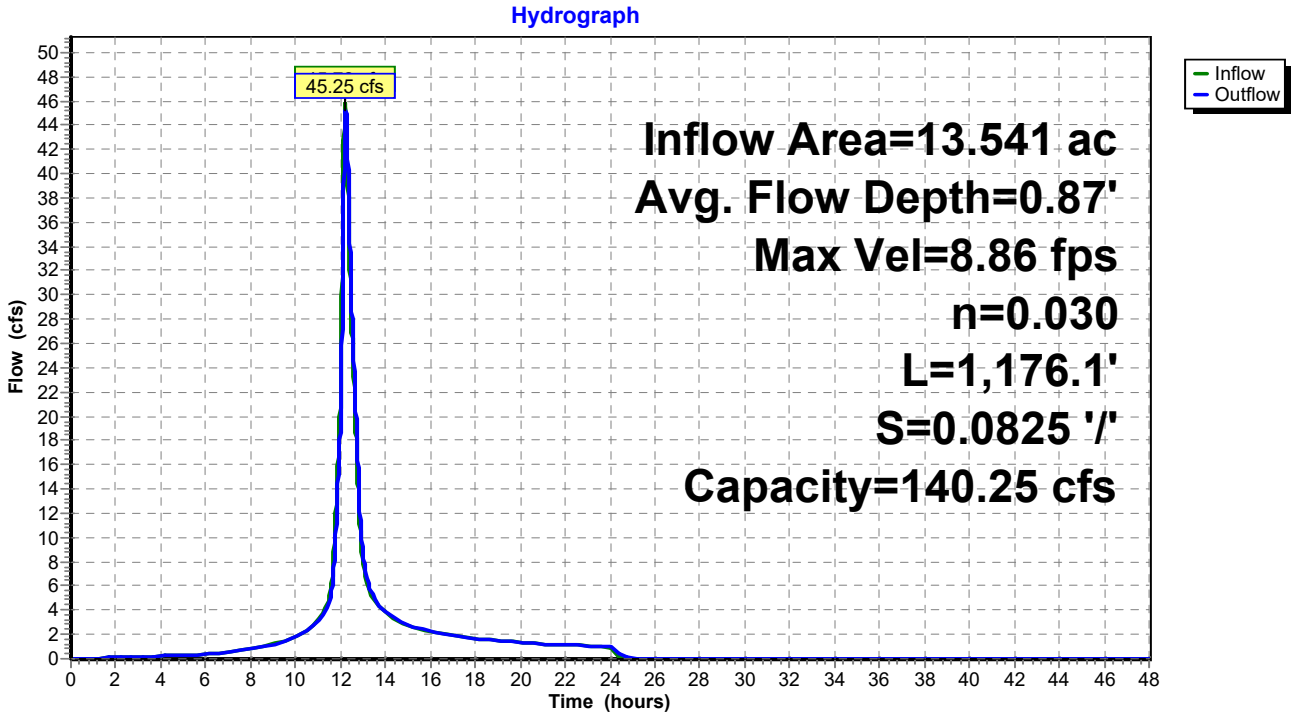
Reach 11R: DA 4 TO POA



Summary for Pond 3P: NSP POND 1

Inflow Area = 96.000 ac, Inflow Depth = 3.93" for 100-yr event
Inflow = 226.58 cfs @ 12.39 hrs, Volume= 31.430 af
Outflow = 447.33 cfs @ 12.38 hrs, Volume= 22.514 af, Atten= 0%, Lag= 0.0 min
Primary = 447.33 cfs @ 12.38 hrs, Volume= 22.514 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 2,138.45' @ 12.38 hrs Storage= 392,320 cf

Plug-Flow detention time= 170.4 min calculated for 22.514 af (72% of inflow)
Center-of-Mass det. time= 65.0 min (909.1 - 844.1)

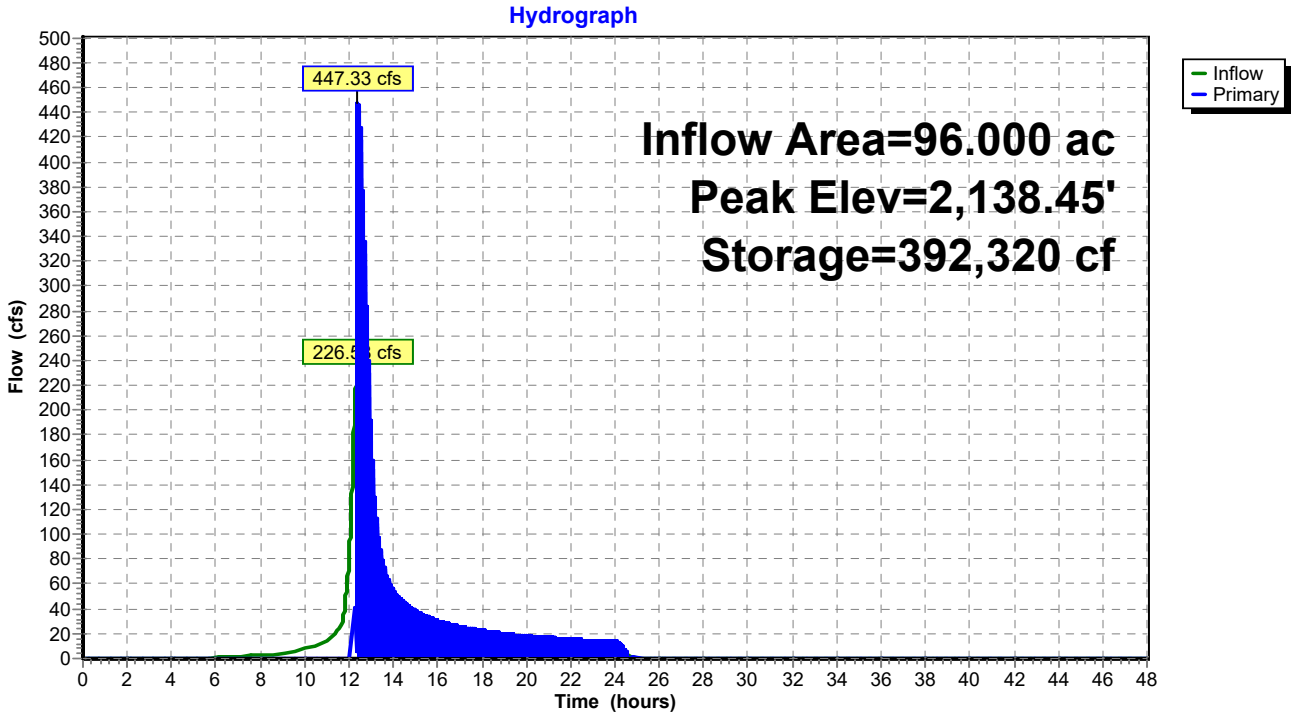
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	392,320 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	0	0
1.25	2,002	2,002
3.25	24,089	26,091
5.25	67,305	93,396
7.25	119,692	213,088
9.25	179,232	392,320

Device	Routing	Invert	Outlet Devices
#1	Primary	2,073.87'	**48.0" Round Culvert** L= 110.4' Ke= 0.600 Inlet / Outlet Invert= 2,073.87' / 2,071.85' S= 0.0183 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	2,174.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	2,080.27'	**72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	2,082.20'	**30.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=448.67 cfs @ 12.38 hrs HW=2,138.43' (Free Discharge)
└**1=Culvert** (Inlet Controls 448.67 cfs @ 35.70 fps)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Passes < 1,038.26 cfs potential flow)
  └**4=Broad-Crested Rectangular Weir** (Passes < 33,270.17 cfs potential flow)

Pond 3P: NSP POND 1

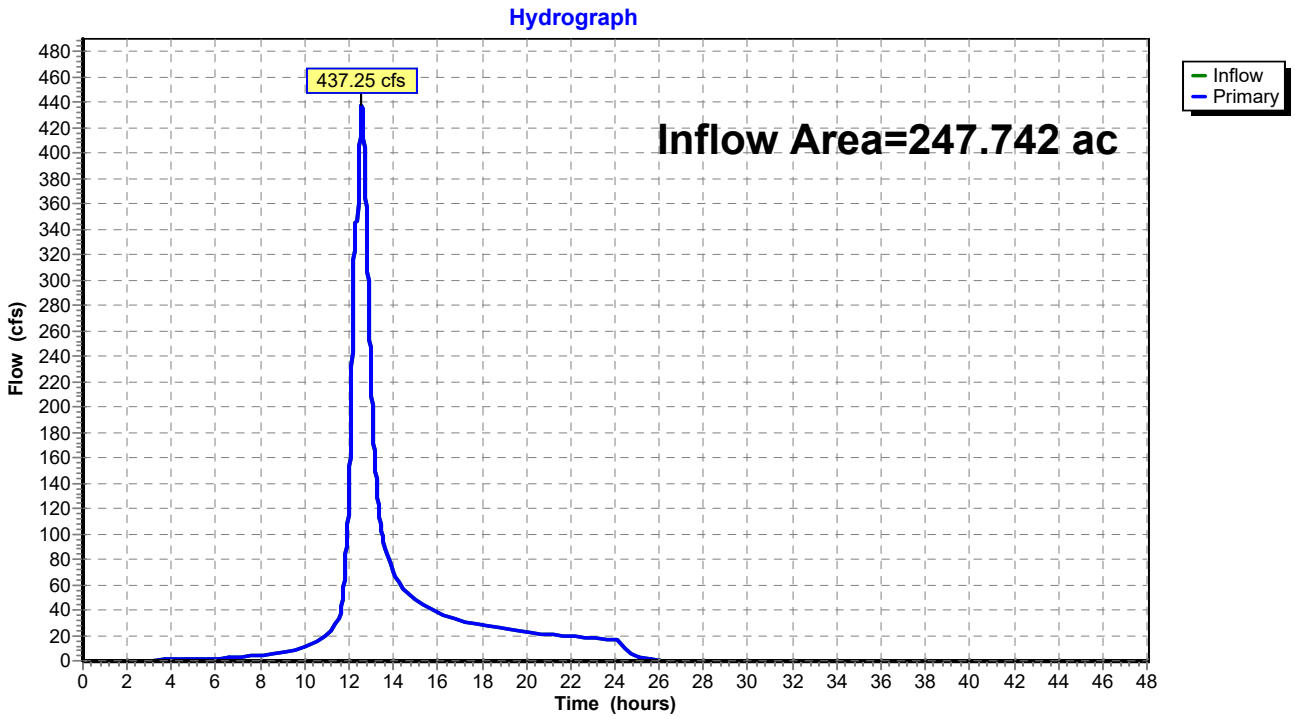


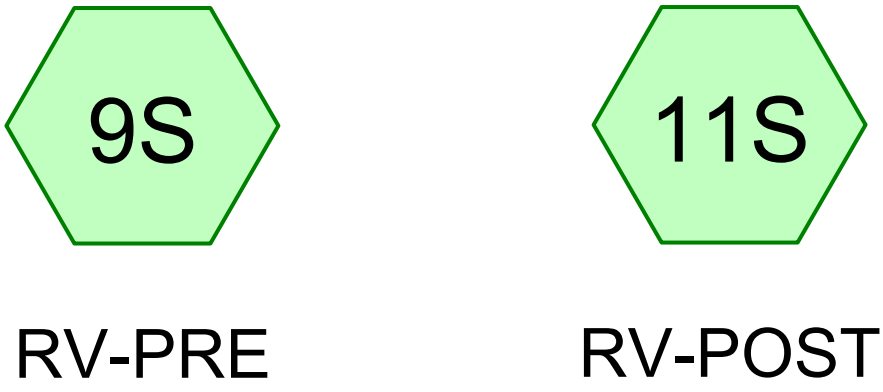
Summary for Link 7L: POA

Inflow Area = 247.742 ac, Inflow Depth = 3.30" for 100-yr event
Inflow = 437.25 cfs @ 12.58 hrs, Volume= 68.058 af
Primary = 437.25 cfs @ 12.58 hrs, Volume= 68.058 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 7L: POA

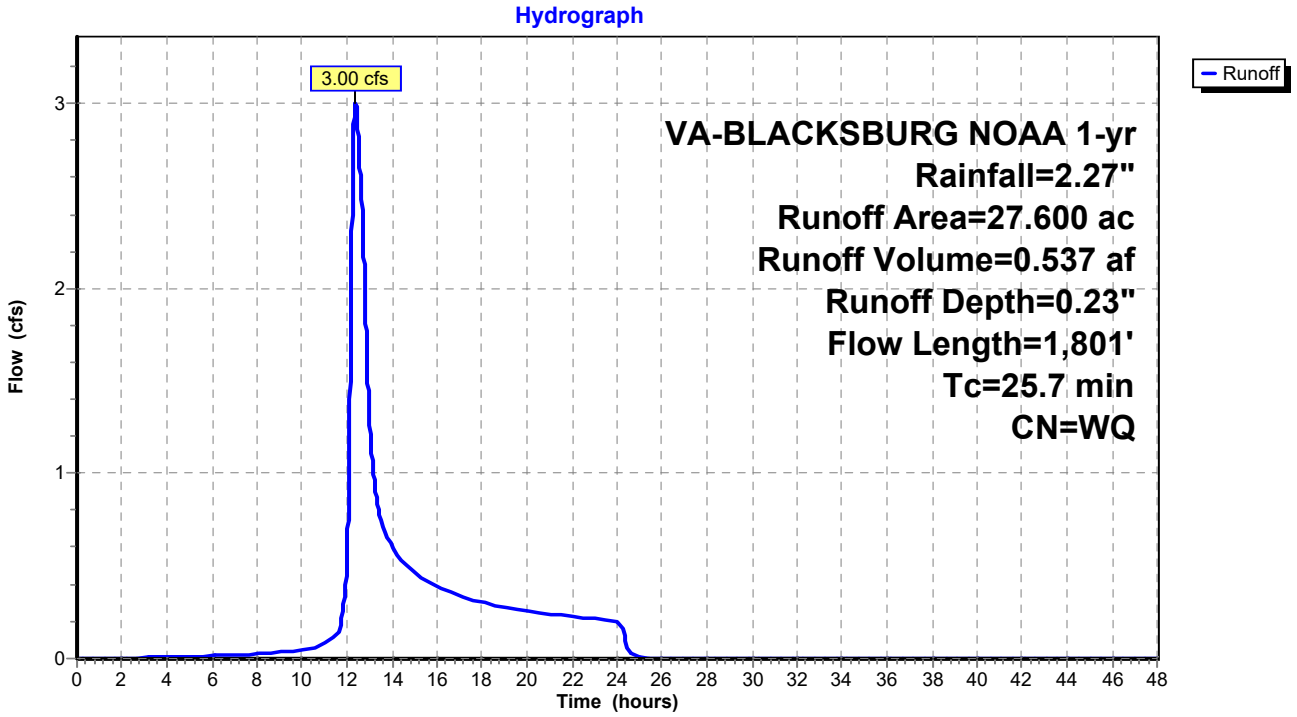




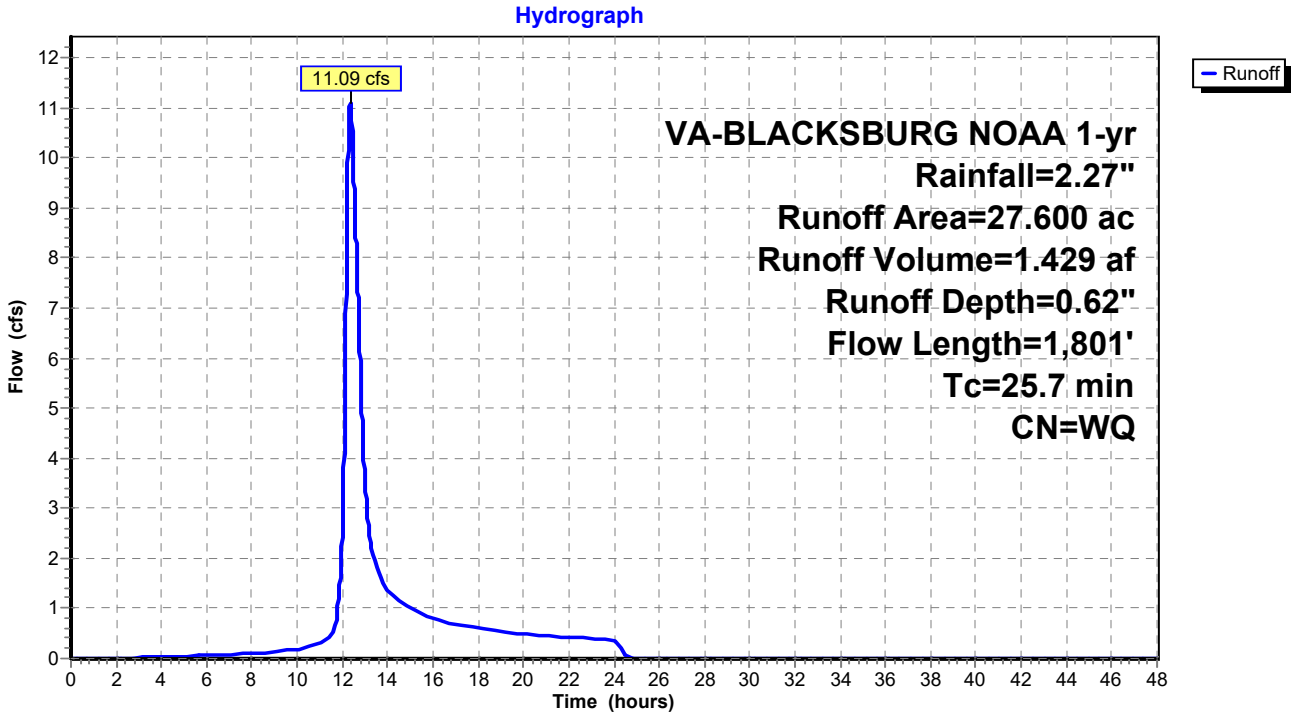
Subcat Reach Pond Link

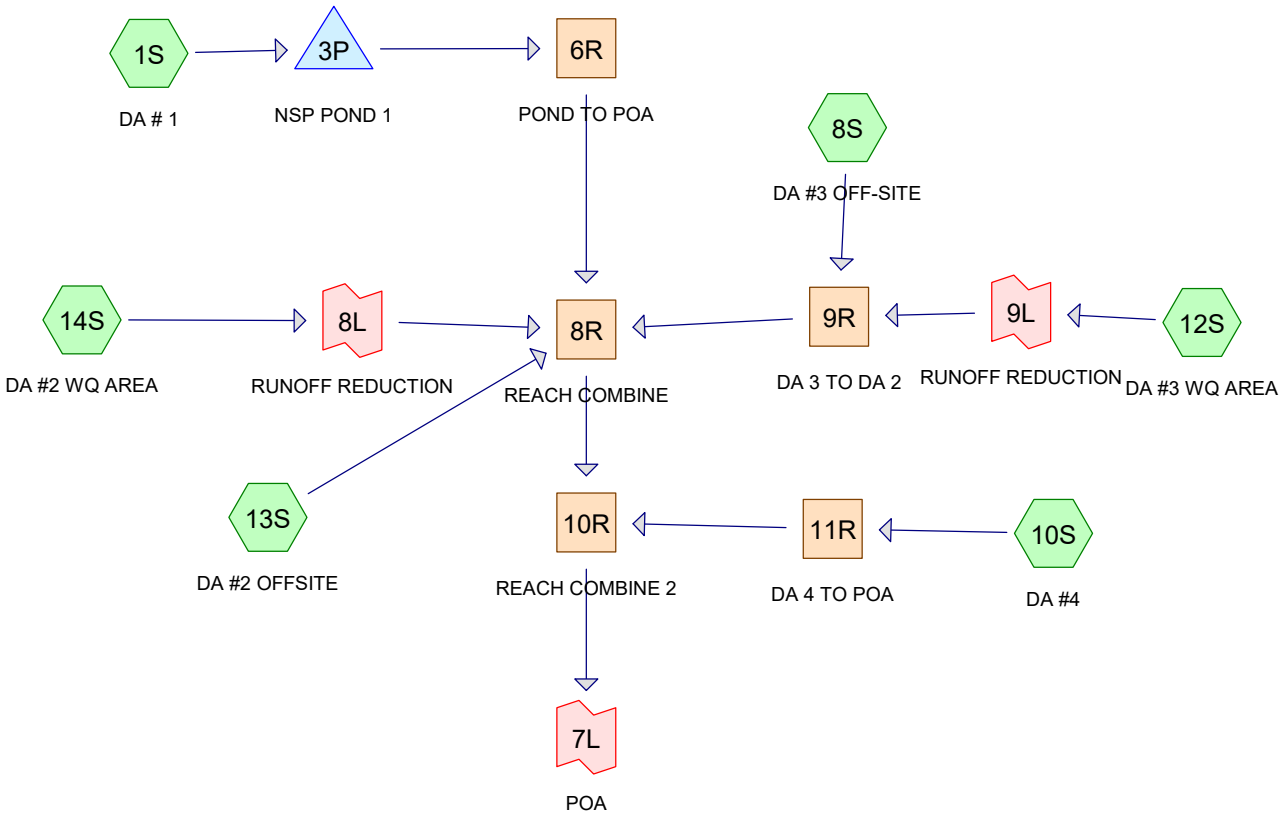
Routing Diagram for RV Calculation
Prepared by Balzer & Associates, Printed 8/1/2022

Subcatchment 9S: RV-PRE



Subcatchment 11S: RV-POST





Subcat Reach Pond Link

Routing Diagram for Channel Protection
Prepared by Balzer & Associates, Printed 7/29/2022

Summary for Subcatchment 1S: DA # 1

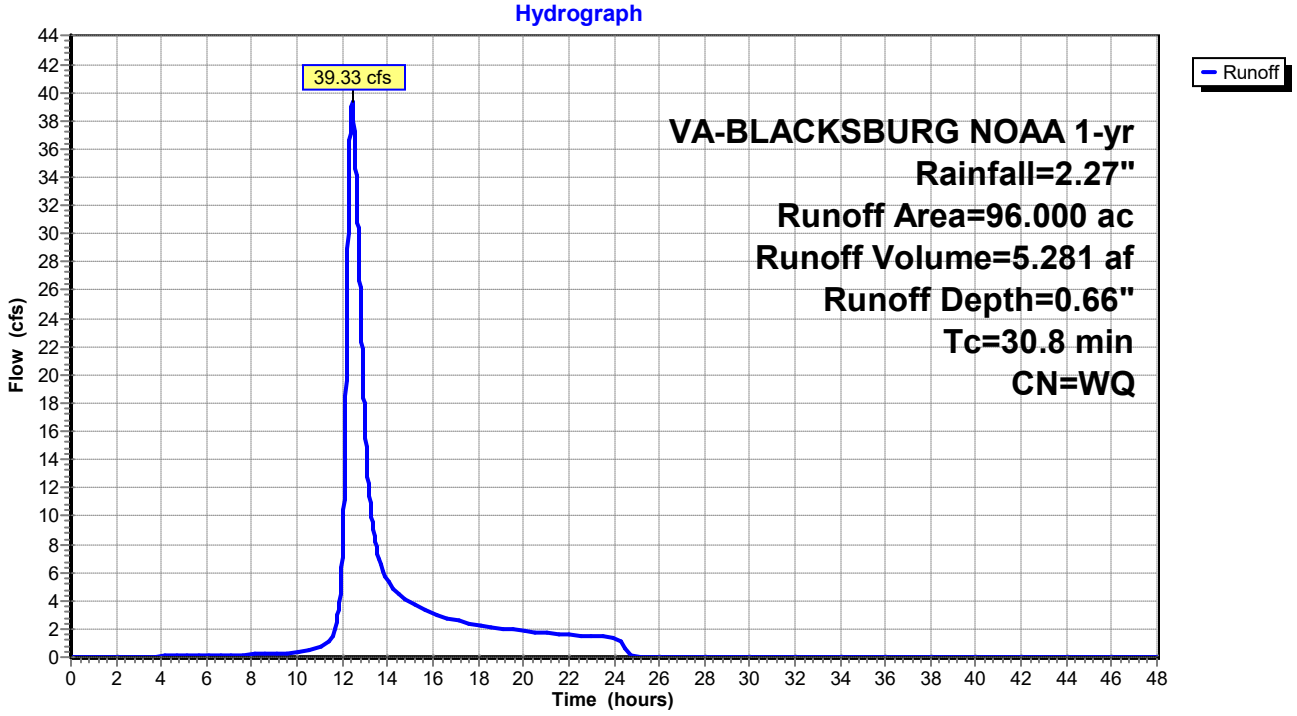
Runoff = 39.33 cfs @ 12.42 hrs, Volume= 5.281 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 1-yr Rainfall=2.27"

Area (ac)	CN	Description
5.080	98	Roofs, HSG C
3.100	84	50-75% Grass cover, Fair, HSG D
22.720	79	50-75% Grass cover, Fair, HSG C
28.800	69	50-75% Grass cover, Fair, HSG B
1.000	86	1/3 acre lots, 30% imp, HSG D
10.400	81	1/3 acre lots, 30% imp, HSG C
6.400	72	1/3 acre lots, 30% imp, HSG B
10.300	83	1/4 acre lots, 38% imp, HSG C
8.200	75	1/4 acre lots, 38% imp, HSG B
96.000		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8					**Direct Entry, FROM NSP CALCS**

Subcatchment 1S: DA # 1



Summary for Subcatchment 8S: DA #3 OFF-SITE

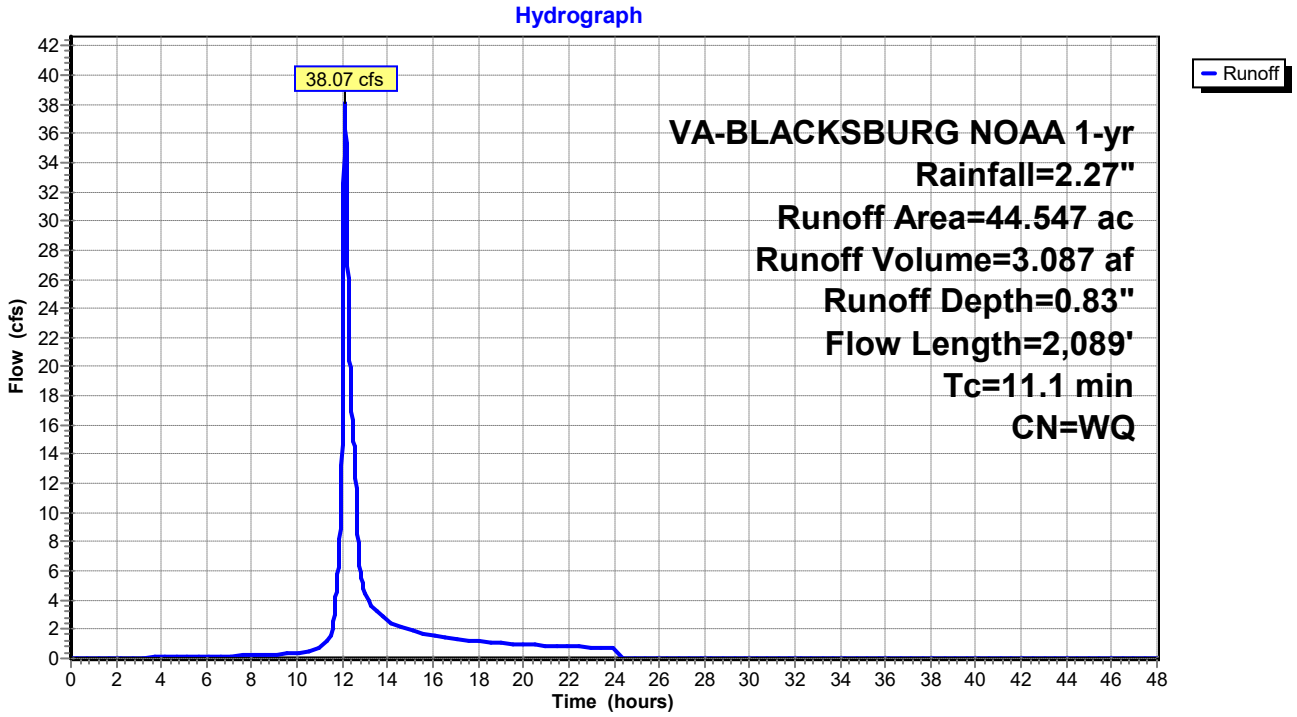
Runoff = 38.07 cfs @ 12.11 hrs, Volume= 3.087 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 1-yr Rainfall=2.27"

Area (ac)	CN	Description
0.358	98	Paved roads w/curbs & sewers, HSG B
4.733	98	Paved roads w/curbs & sewers, HSG C
5.726	70	1/2 acre lots, 25% imp, HSG B
28.476	80	1/2 acre lots, 25% imp, HSG C
0.877	72	1/3 acre lots, 30% imp, HSG B
3.986	81	1/3 acre lots, 30% imp, HSG C
0.391	79	1 acre lots, 20% imp, HSG C
44.547		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 8S: DA #3 OFF-SITE



Summary for Subcatchment 10S: DA #4

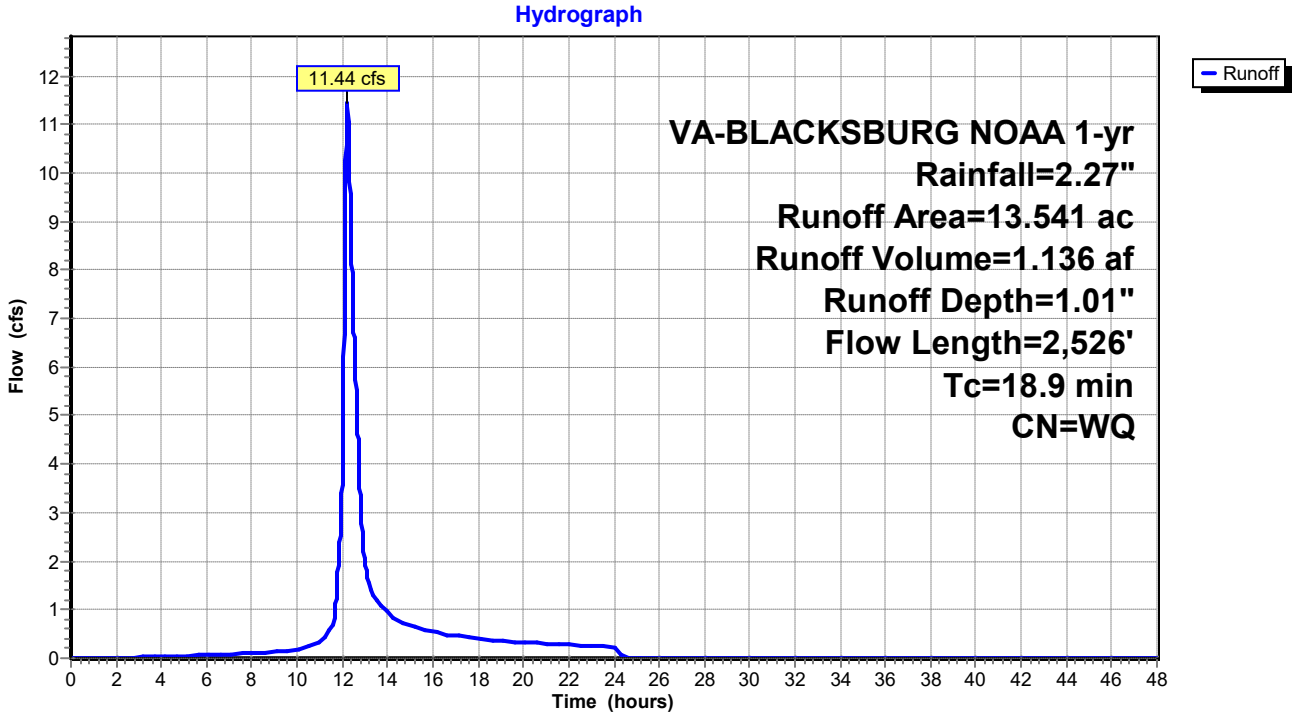
Runoff = 11.44 cfs @ 12.22 hrs, Volume= 1.136 af, Depth= 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 1-yr Rainfall=2.27"

Area (ac)	CN	Description
2.555	98	Paved roads w/curbs & sewers, HSG C
7.333	81	1/3 acre lots, 30% imp, HSG C
3.653	80	1/2 acre lots, 25% imp, HSG C
13.541		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	95	0.0630	0.25		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
9.9	1,004	0.0478	1.70	5.26	**Channel Flow, Tc2** Area= 3.1 sf Perim= 50.0' r= 0.06' n= 0.030 Earth, grassed & winding
2.6	1,427	0.0134	9.03	28.37	**Pipe Channel, CMP_Round 24"** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
18.9	2,526	Total			

Subcatchment 10S: DA #4



Summary for Subcatchment 12S: DA #3 WQ AREA

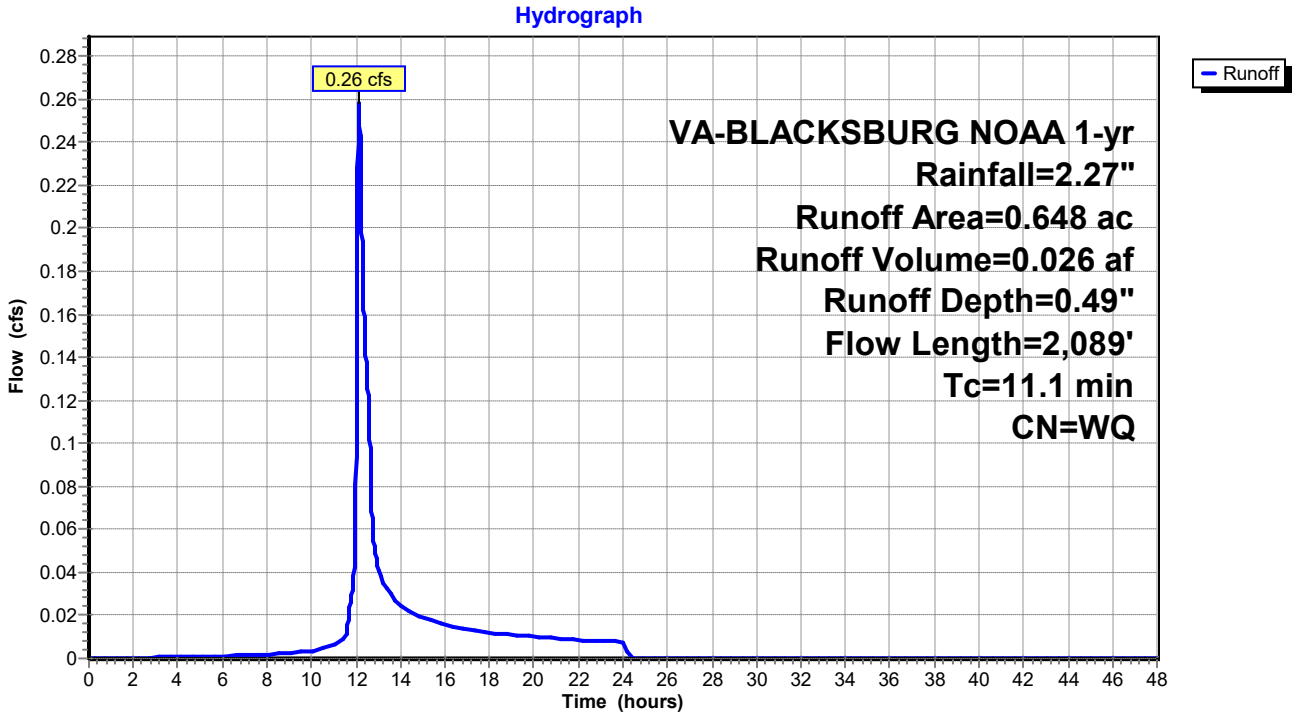
Runoff = 0.26 cfs @ 12.13 hrs, Volume= 0.026 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 1-yr Rainfall=2.27"

Area (ac)	CN	Description
0.046	98	Paved roads w/curbs & sewers, HSG C
0.513	70	1/2 acre lots, 25% imp, HSG B
0.030	80	1/2 acre lots, 25% imp, HSG C
0.059	70	Woods, Good, HSG C
0.648		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 12S: DA #3 WQ AREA



Summary for Subcatchment 13S: DA #2 OFFSITE

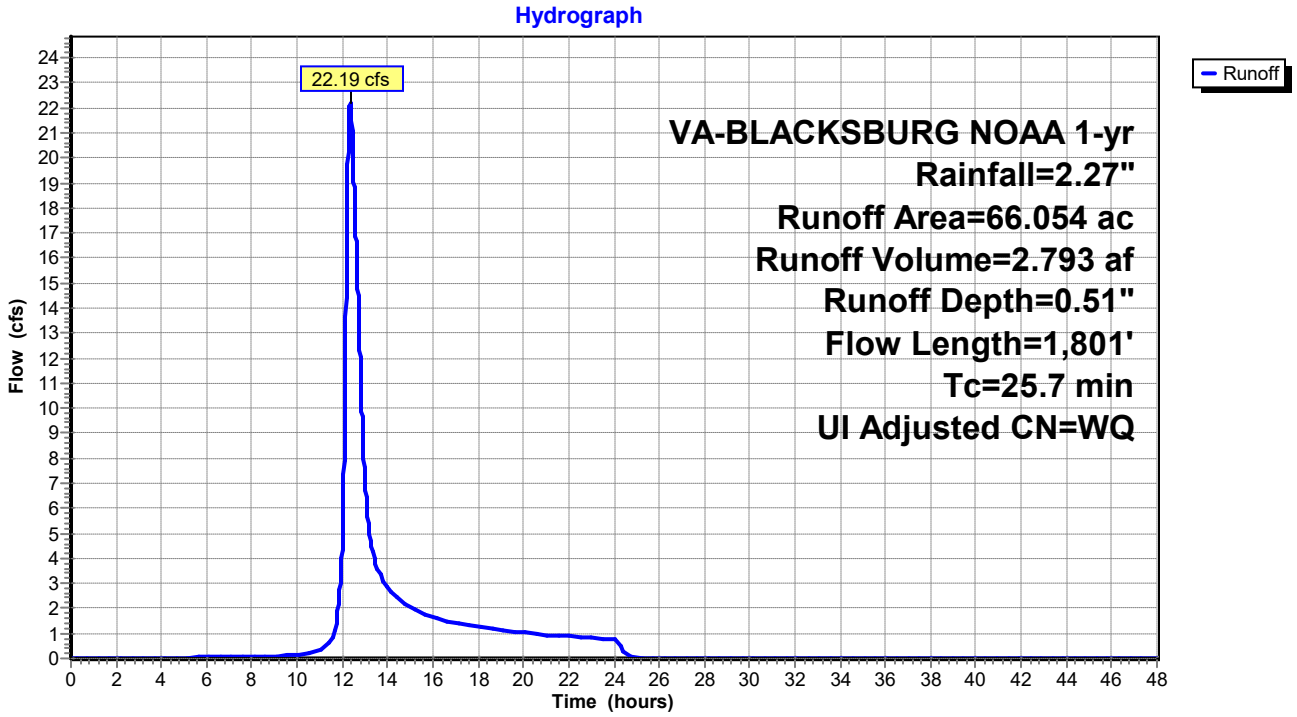
Runoff = 22.19 cfs @ 12.34 hrs, Volume= 2.793 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 1-yr Rainfall=2.27"

	Area (ac)	CN	Adj	Description
	10.040	83	83	Fallow, crop residue, Good, HSG B
	1.105	88	88	Fallow, crop residue, Good, HSG C
	1.250	98	98	Unconnected pavement, HSG C
	0.160	98	98	Unconnected pavement, HSG B
	1.555	70	70	1/2 acre lots, 25% imp, HSG B
	6.153	80	80	1/2 acre lots, 25% imp, HSG C
	1.370	81	81	1/3 acre lots, 30% imp, HSG C
	0.180	68	68	1 acre lots, 20% imp, HSG B
	0.038	79	79	1 acre lots, 20% imp, HSG C
	0.110	70	70	Woods, Good, HSG C
	1.267	55	55	Woods, Good, HSG B
	5.290	39	39	>75% Grass cover, Good, HSG A
	8.350	61	61	>75% Grass cover, Good, HSG B
	11.646	74	74	>75% Grass cover, Good, HSG C
	6.107	58	58	Woods/grass comb., Good, HSG B
	5.107	72	72	Woods/grass comb., Good, HSG C
	2.852	72	72	Dirt roads, HSG A
	1.750	82	82	Dirt roads, HSG B
	1.521	87	87	Dirt roads, HSG C
*	0.170	98	98	TRAIL, HSG B
*	0.033	98	98	TRAIL, HSG C
	66.054			Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow, Tc2** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 13S: DA #2 OFFSITE



Summary for Subcatchment 14S: DA #2 WQ AREA

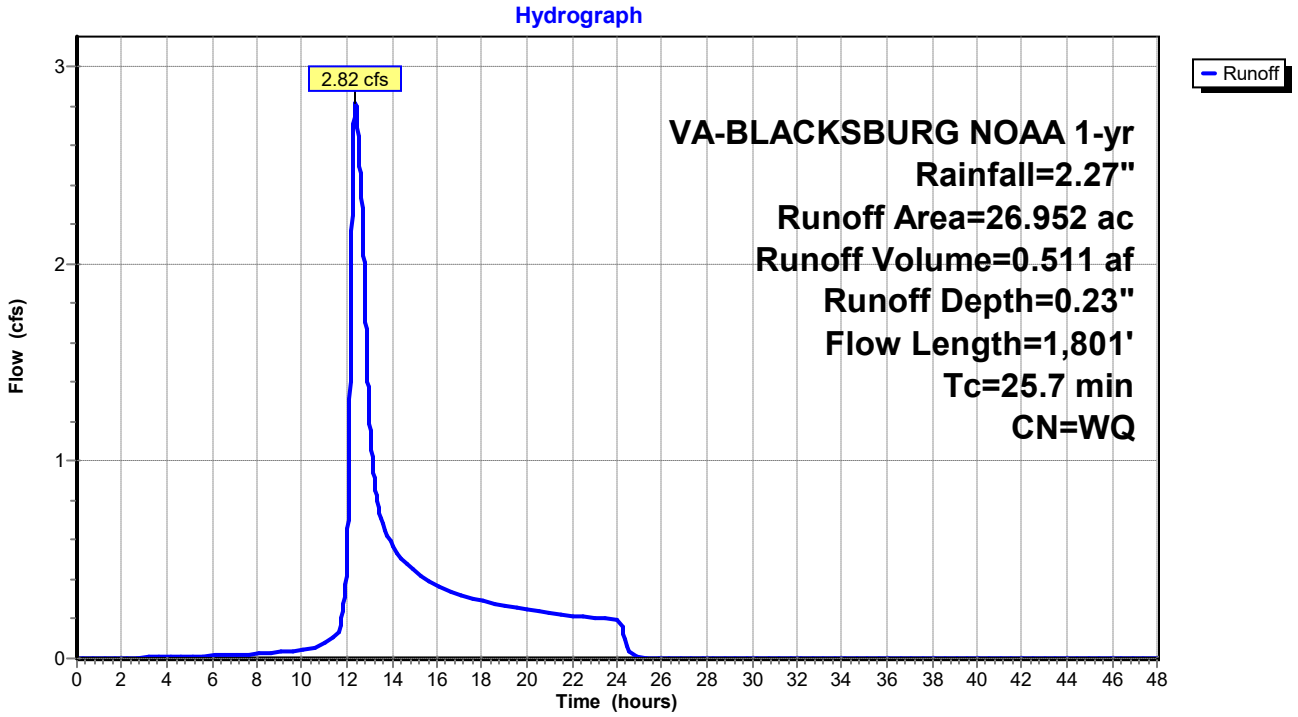
Runoff = 2.82 cfs @ 12.37 hrs, Volume= 0.511 af, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 1-yr Rainfall=2.27"

	Area (ac)	CN	Description
	5.097	55	Woods, Good, HSG B
	5.711	70	Woods, Good, HSG C
	8.232	58	Woods/grass comb., Good, HSG B
	1.810	72	Woods/grass comb., Good, HSG C
	0.270	70	1/2 acre lots, 25% imp, HSG B
	0.098	80	1/2 acre lots, 25% imp, HSG C
	0.070	39	>75% Grass cover, Good, HSG A
	4.590	61	>75% Grass cover, Good, HSG B
	0.070	74	>75% Grass cover, Good, HSG C
	0.240	98	Paved parking, HSG B
	0.124	98	Paved parking, HSG C
	0.410	86	Fallow, bare soil, HSG B
*	0.218	98	TRAIL, HSG B
*	0.012	98	TRAIL, HSG C
	26.952		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 14S: DA #2 WQ AREA



Summary for Reach 6R: POND TO POA

Inflow Area = 96.000 ac, Inflow Depth = 0.00" for 1-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

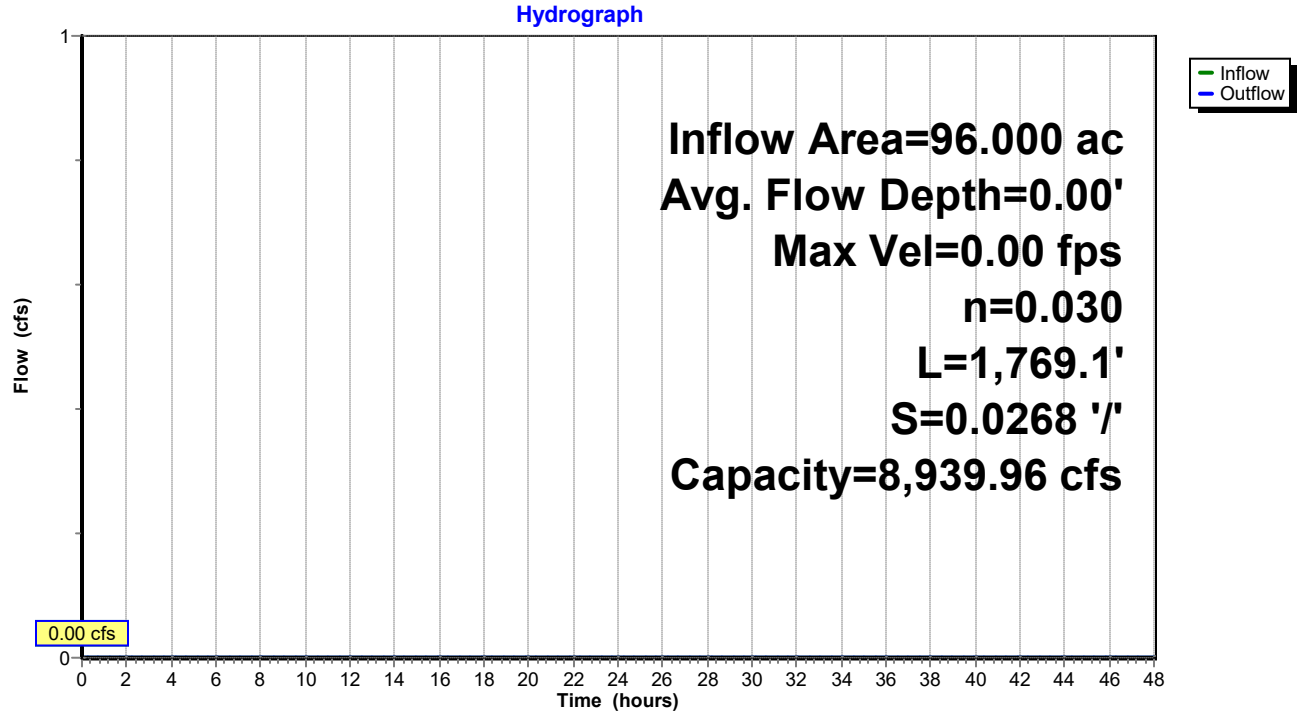
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.00' Flow Area= 425.0 sf, Capacity= 8,939.96 cfs

70.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 100.00'
Length= 1,769.1' Slope= 0.0268 '/'
Inlet Invert= 2,087.00', Outlet Invert= 2,039.65'

‡

Reach 6R: POND TO POA



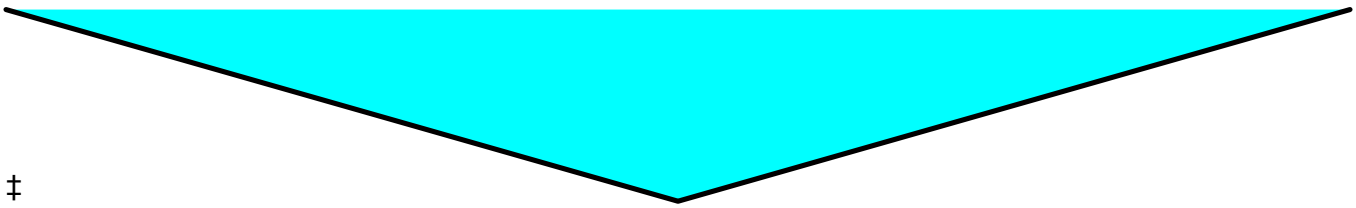
Summary for Reach 8R: REACH COMBINE

Inflow Area = 234.201 ac, Inflow Depth = 0.31" for 1-yr event
Inflow = 50.91 cfs @ 12.25 hrs, Volume= 6.041 af
Outflow = 49.41 cfs @ 12.32 hrs, Volume= 6.041 af, Atten= 3%, Lag= 3.9 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.89 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.40 fps, Avg. Travel Time= 7.1 min

Peak Storage= 9,336 cf @ 12.32 hrs
Average Depth at Peak Storage= 5.21' , Surface Width= 173.93'
Bank-Full Depth= 0.33' Flow Area= 1.8 sf, Capacity= 1.23 cfs

0.00' x 0.33' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 16.7 '/' Top Width= 11.02'
Length= 168.8' Slope= 0.0021 '/'
Inlet Invert= 2,036.90', Outlet Invert= 2,036.55'



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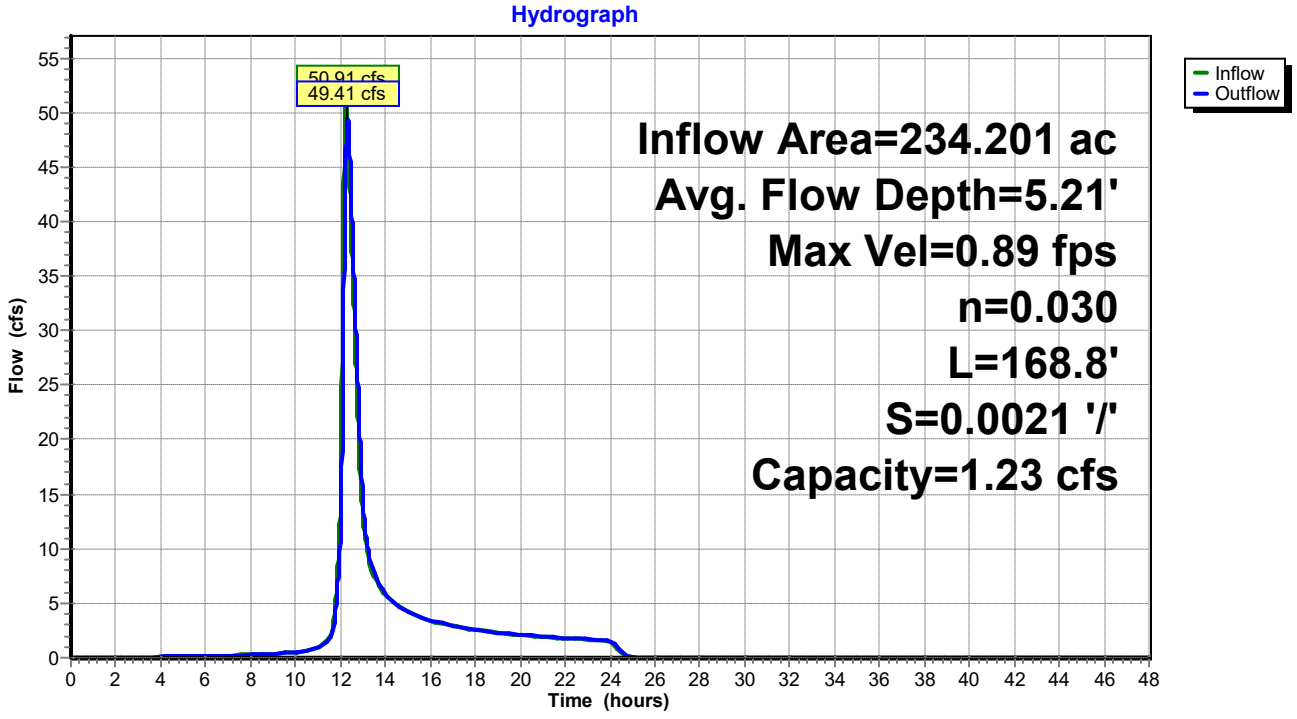
Reach 8R: REACH COMBINE



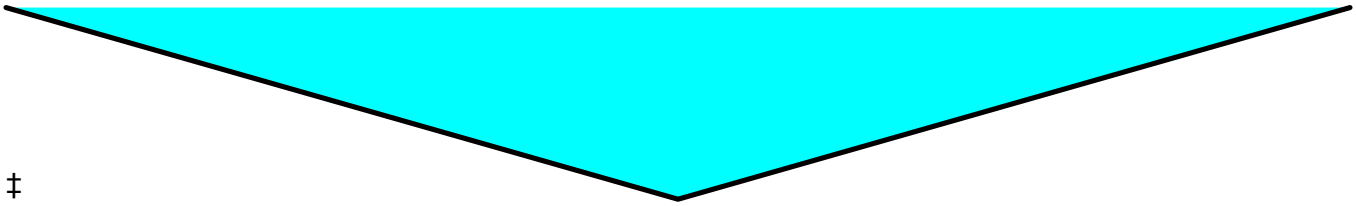
Summary for Reach 9R: DA 3 TO DA 2

Inflow Area = 45.195 ac, Inflow Depth = 0.82" for 1-yr event
Inflow = 38.14 cfs @ 12.11 hrs, Volume= 3.095 af
Outflow = 31.12 cfs @ 12.20 hrs, Volume= 3.095 af, Atten= 18%, Lag= 5.2 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.68 fps, Min. Travel Time= 6.6 min
Avg. Velocity = 1.08 fps, Avg. Travel Time= 22.5 min

Peak Storage= 12,365 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.48' , Surface Width= 38.22'
Bank-Full Depth= 0.35' Flow Area= 4.9 sf, Capacity= 15.84 cfs

0.00' x 0.35' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 40.0 '/' Top Width= 28.00'
Length= 1,462.0' Slope= 0.0435 '/'
Inlet Invert= 2,103.26', Outlet Invert= 2,039.65'



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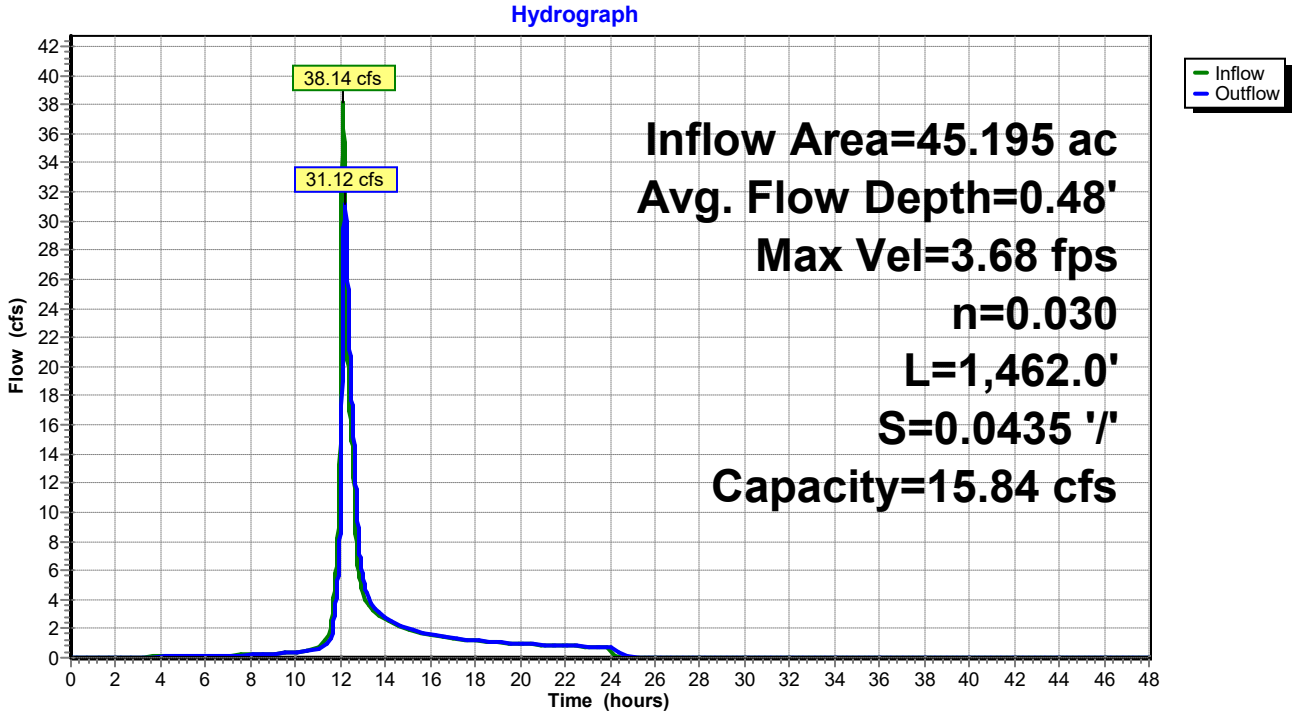
Reach 9R: DA 3 TO DA 2



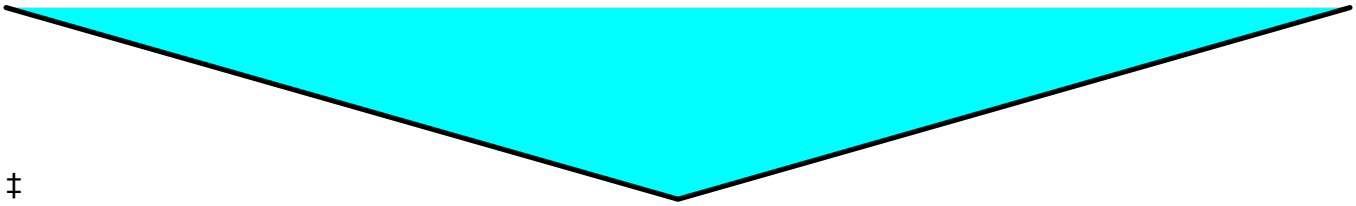
Summary for Reach 10R: REACH COMBINE 2

Inflow Area = 247.742 ac, Inflow Depth = 0.35" for 1-yr event
Inflow = 60.19 cfs @ 12.30 hrs, Volume= 7.177 af
Outflow = 60.03 cfs @ 12.32 hrs, Volume= 7.177 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.80 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 4.6 min

Peak Storage= 4,550 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.61' , Surface Width= 108.82'
Bank-Full Depth= 0.59' Flow Area= 30.8 sf, Capacity= 54.02 cfs

0.00' x 0.59' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 88.5 '/' Top Width= 104.43'
Length= 136.3' Slope= 0.0064 '/'
Inlet Invert= 2,036.75', Outlet Invert= 2,035.88'



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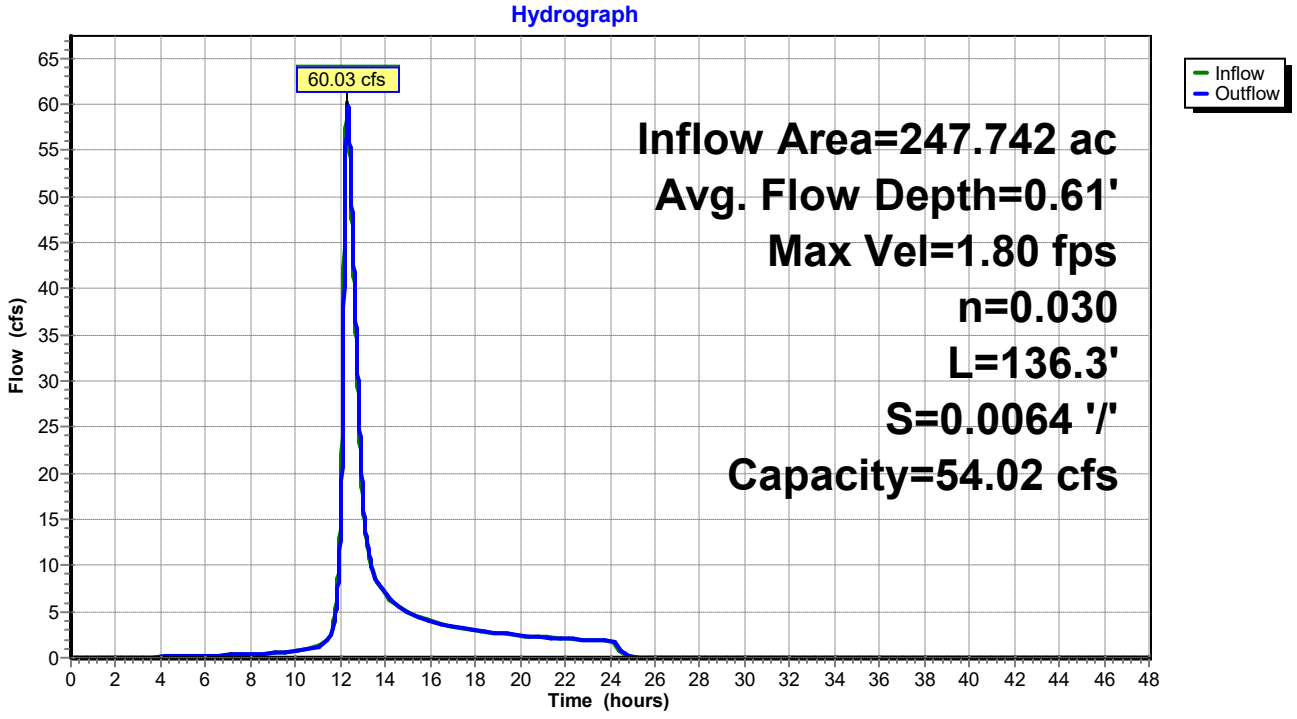
Reach 10R: REACH COMBINE 2



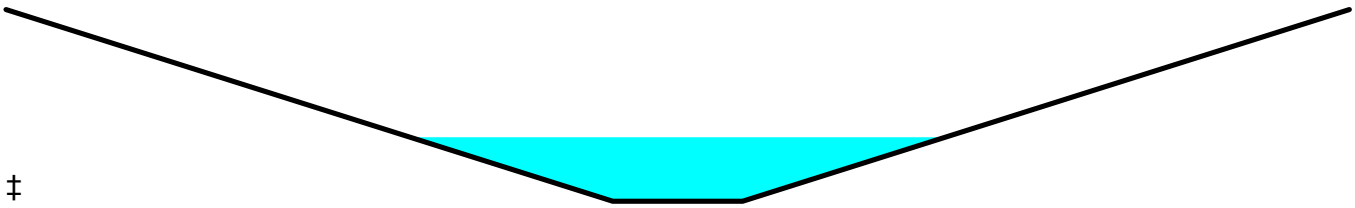
Summary for Reach 11R: DA 4 TO POA

Inflow Area = 13.541 ac, Inflow Depth = 1.01" for 1-yr event
Inflow = 11.44 cfs @ 12.22 hrs, Volume= 1.136 af
Outflow = 11.12 cfs @ 12.26 hrs, Volume= 1.136 af, Atten= 3%, Lag= 2.5 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.18 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 2.03 fps, Avg. Travel Time= 9.7 min

Peak Storage= 2,115 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.47' , Surface Width= 6.18'
Bank-Full Depth= 1.40' Flow Area= 11.9 sf, Capacity= 140.25 cfs

1.50' x 1.40' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 5.0 '/' Top Width= 15.50'
Length= 1,176.1' Slope= 0.0825 '/'
Inlet Invert= 2,133.71', Outlet Invert= 2,036.73'



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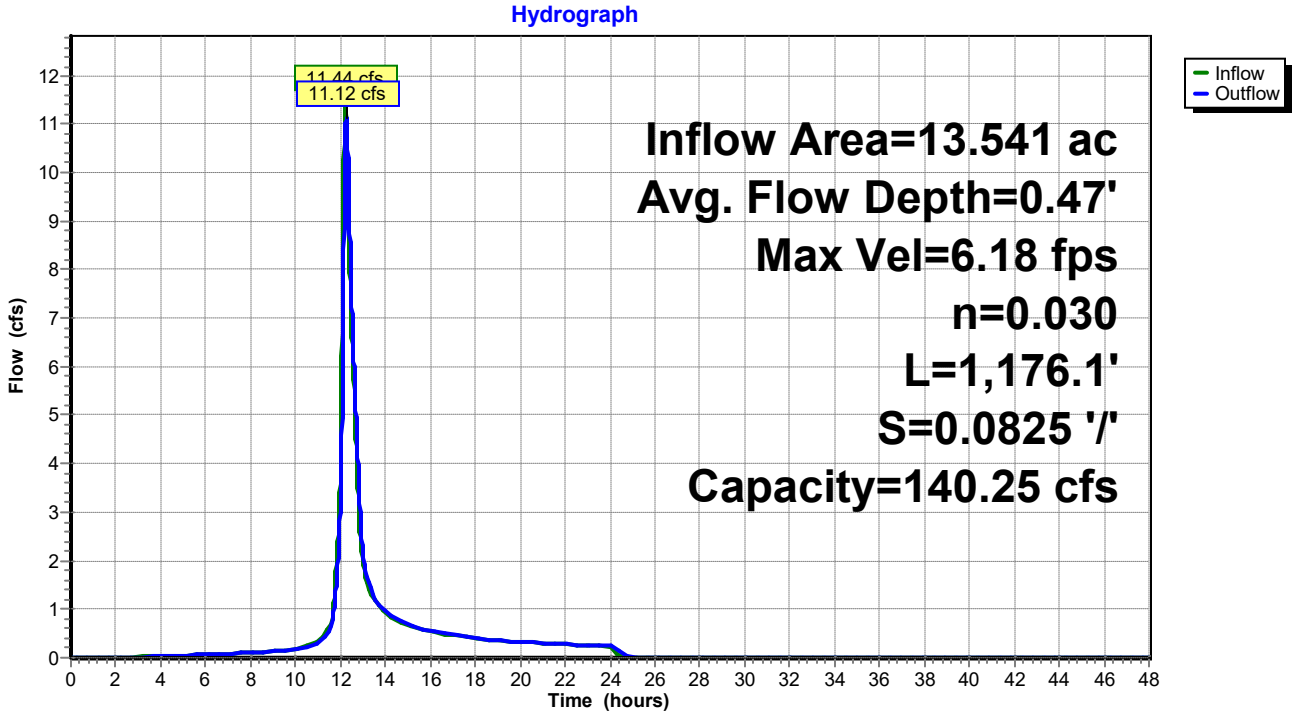
Reach 11R: DA 4 TO POA



Summary for Pond 3P: NSP POND 1

Inflow Area = 96.000 ac, Inflow Depth = 0.66" for 1-yr event
Inflow = 39.33 cfs @ 12.42 hrs, Volume= 5.281 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 7.44' @ 25.75 hrs Storage= 230,051 cf

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

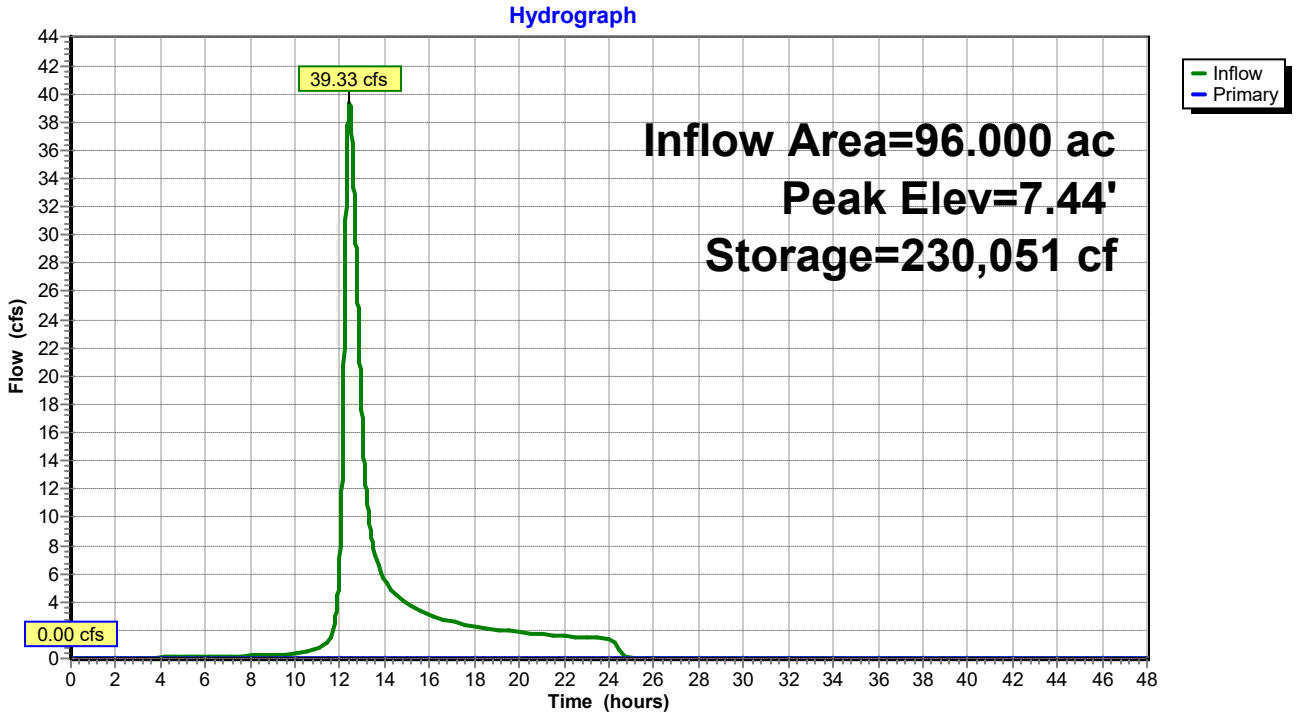
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	392,320 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	0	0
1.25	2,002	2,002
3.25	24,089	26,091
5.25	67,305	93,396
7.25	119,692	213,088
9.25	179,232	392,320

Device	Routing	Invert	Outlet Devices
#1	Primary	2,073.87'	**48.0" Round Culvert** L= 110.4' Ke= 0.600 Inlet / Outlet Invert= 2,073.87' / 2,071.85' S= 0.0183 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	2,174.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	2,080.27'	**72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	2,082.20'	**30.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: NSP POND 1

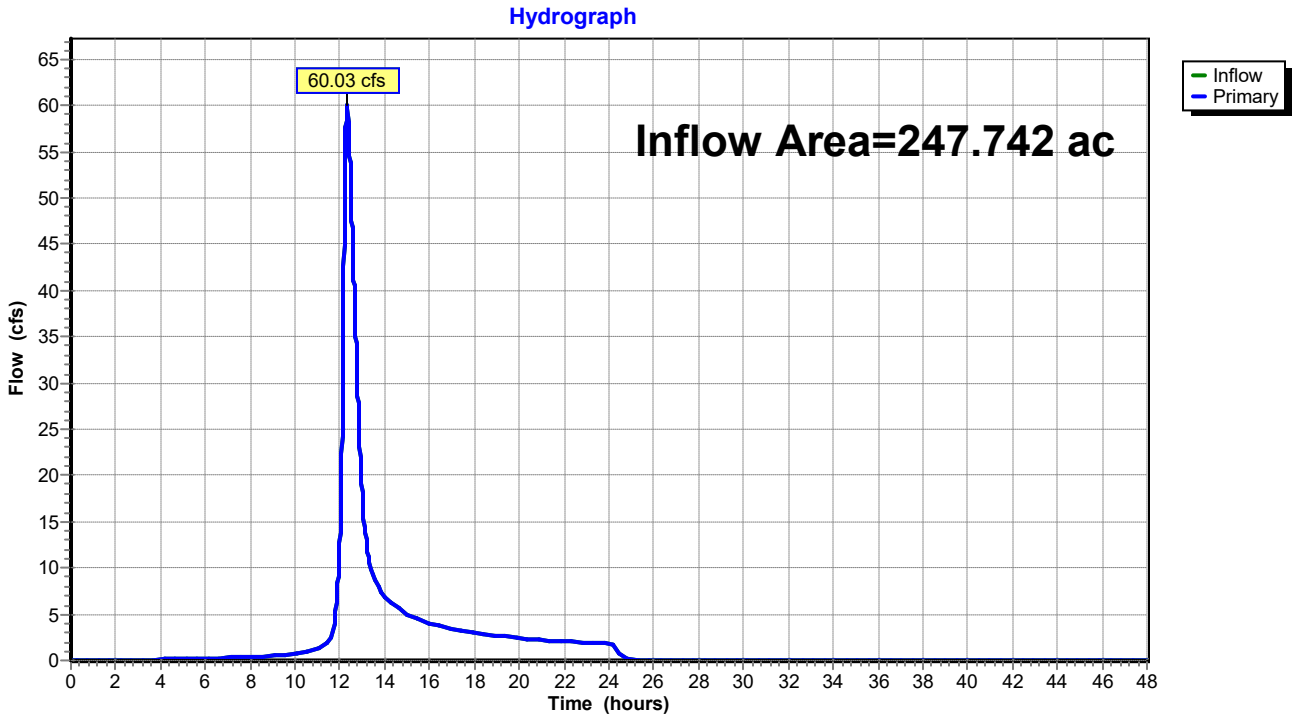


Summary for Link 7L: POA

Inflow Area = 247.742 ac, Inflow Depth = 0.35" for 1-yr event
Inflow = 60.03 cfs @ 12.32 hrs, Volume= 7.177 af
Primary = 60.03 cfs @ 12.32 hrs, Volume= 7.177 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 7L: POA

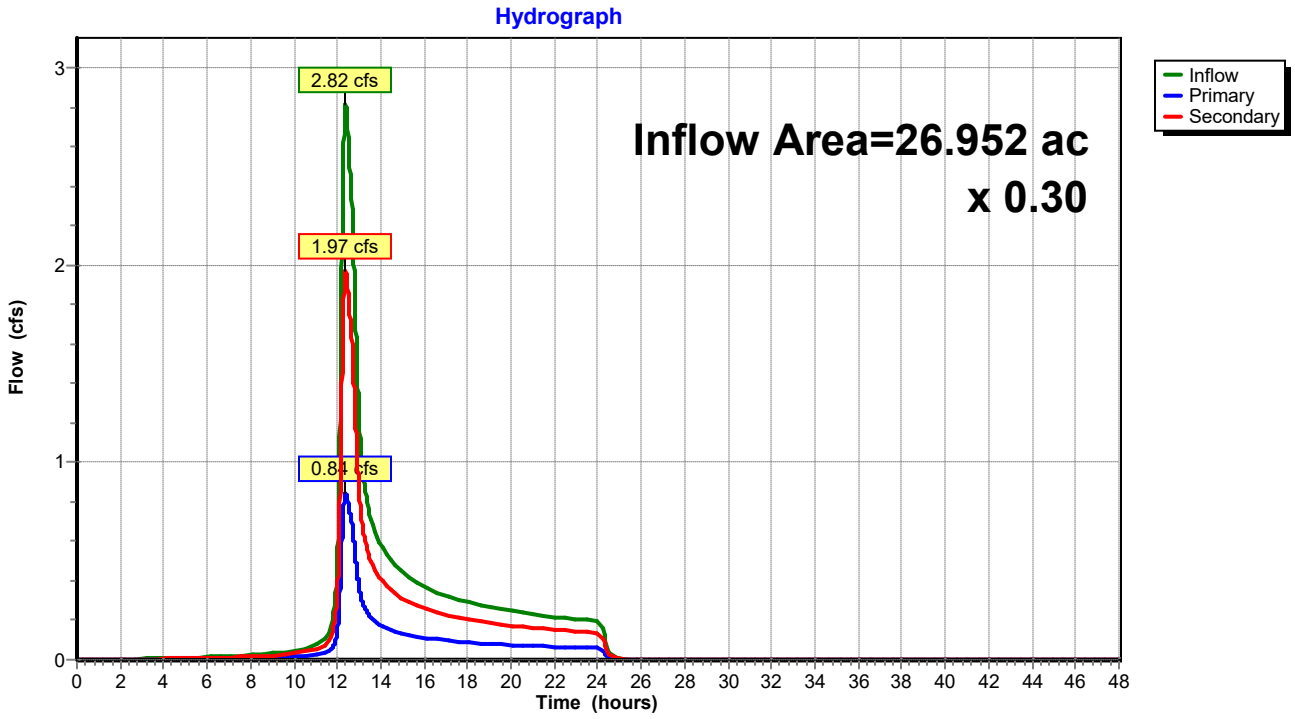


Summary for Link 8L: RUNOFF REDUCTION

Inflow Area = 26.952 ac, Inflow Depth = 0.23" for 1-yr event
Inflow = 2.82 cfs @ 12.37 hrs, Volume= 0.511 af
Primary = 0.84 cfs @ 12.37 hrs, Volume= 0.153 af, Atten= 70%, Lag= 0.0 min
Secondary = 1.97 cfs @ 12.37 hrs, Volume= 0.358 af

Primary outflow = Inflow x 0.30, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 8L: RUNOFF REDUCTION

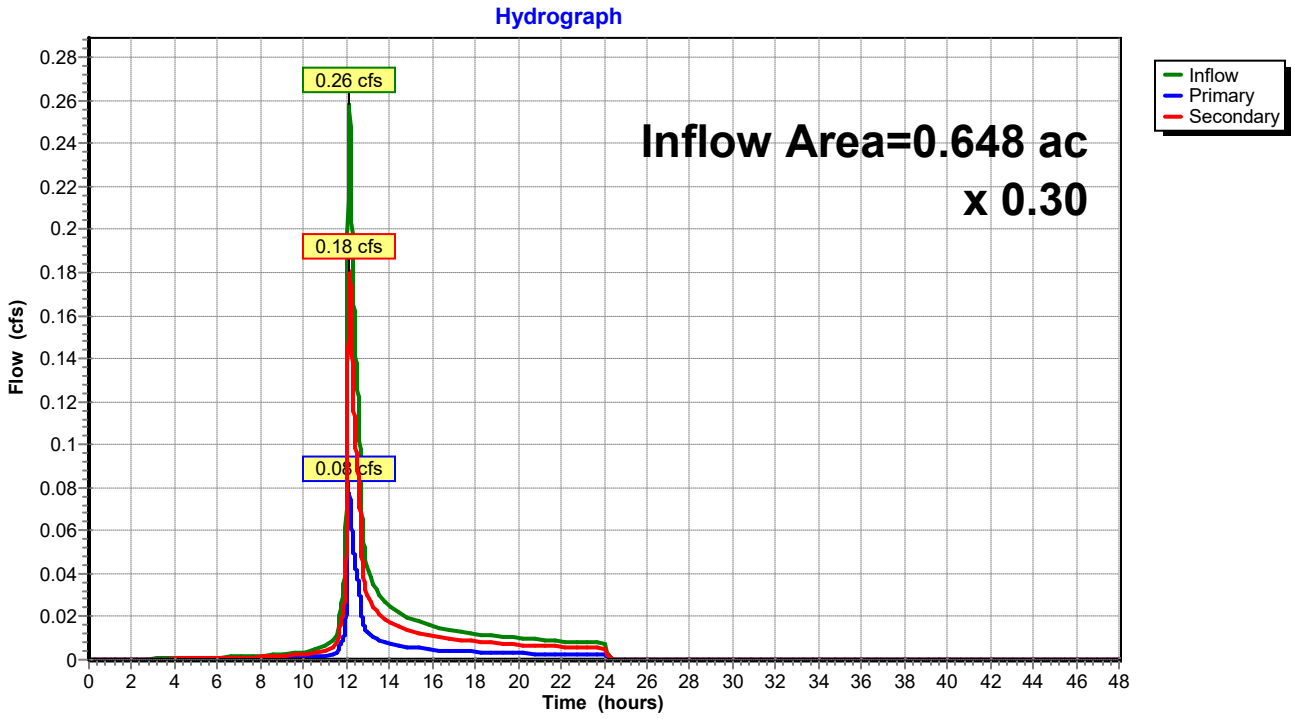


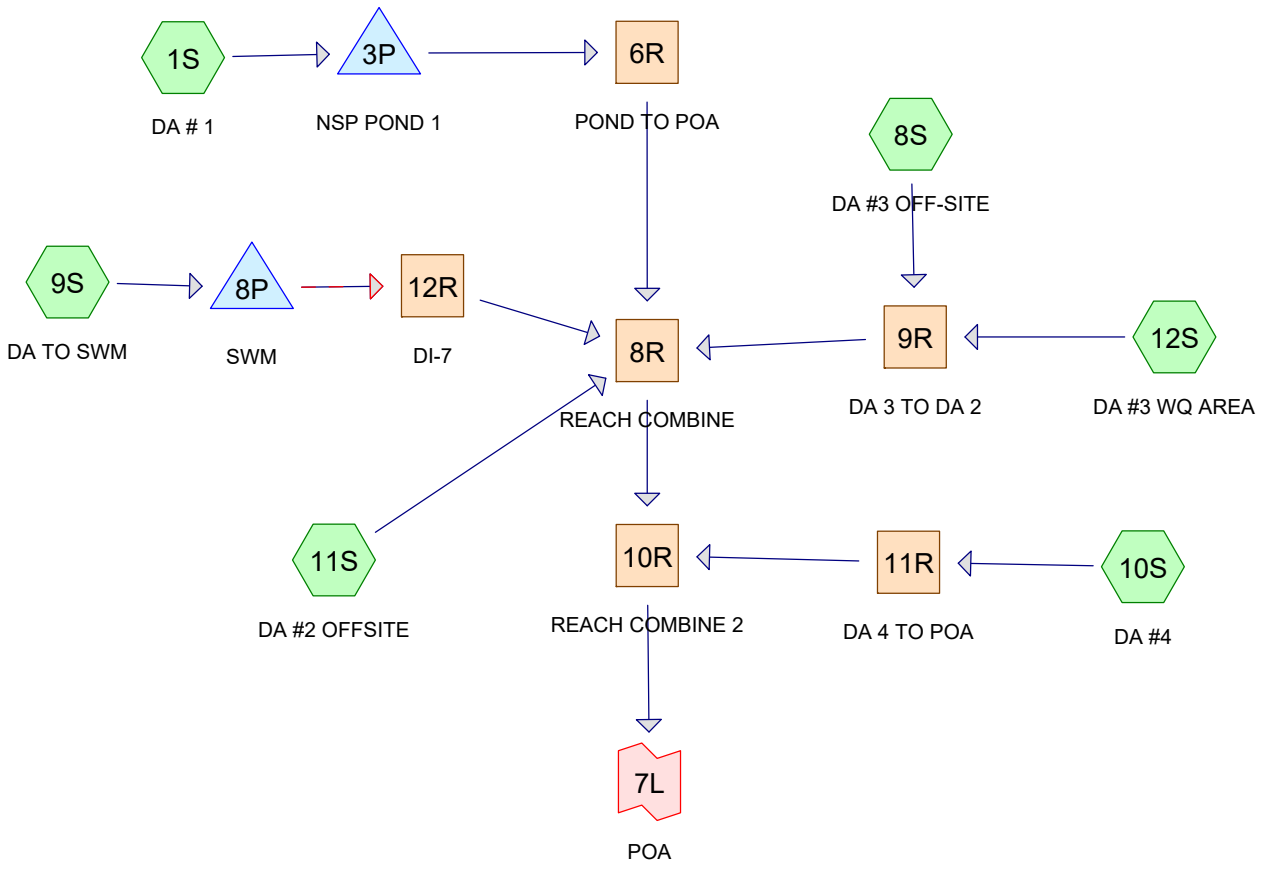
Summary for Link 9L: RUNOFF REDUCTION

Inflow Area = 0.648 ac, Inflow Depth = 0.49" for 1-yr event
Inflow = 0.26 cfs @ 12.13 hrs, Volume= 0.026 af
Primary = 0.08 cfs @ 12.13 hrs, Volume= 0.008 af, Atten= 70%, Lag= 0.0 min
Secondary = 0.18 cfs @ 12.13 hrs, Volume= 0.018 af

Primary outflow = Inflow x 0.30, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 9L: RUNOFF REDUCTION





Subcat Reach Pond Link

Routing Diagram for Post-1
Prepared by Balzer & Associates, Printed 7/29/2022

Summary for Subcatchment 1S: DA # 1

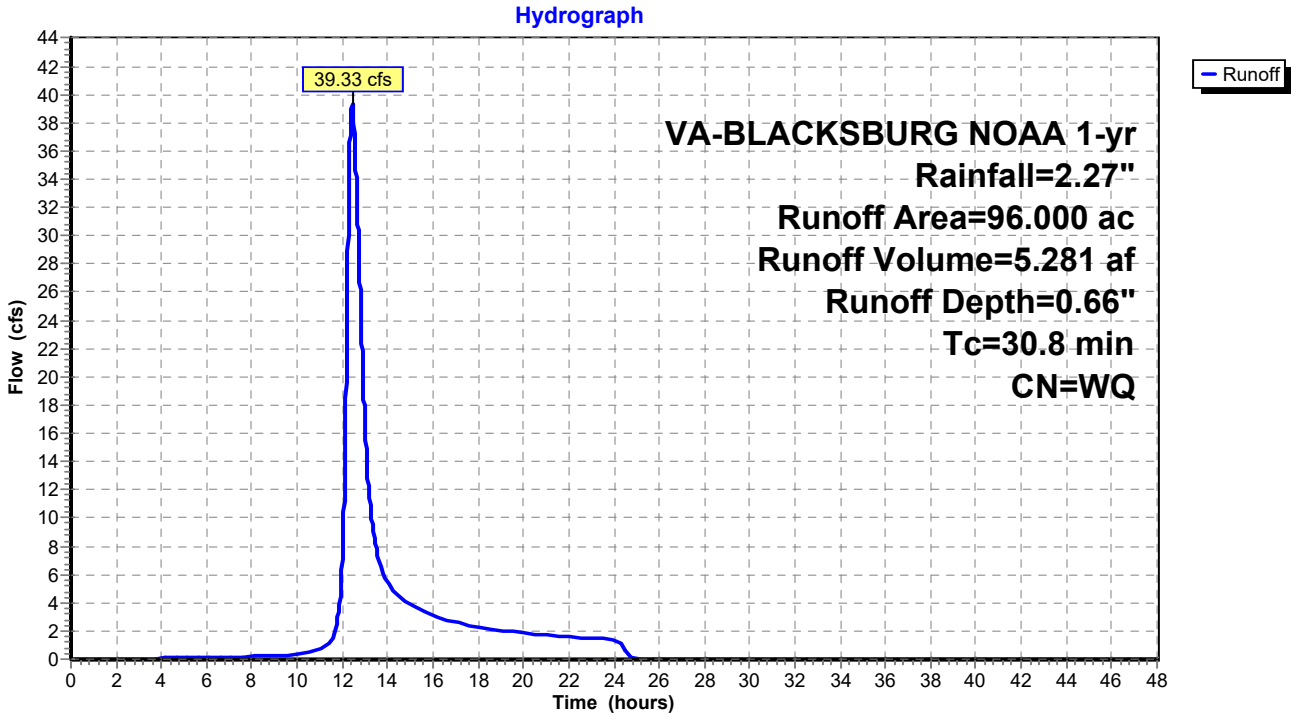
Runoff = 39.33 cfs @ 12.42 hrs, Volume= 5.281 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 1-yr Rainfall=2.27"

Area (ac)	CN	Description
5.080	98	Roofs, HSG C
3.100	84	50-75% Grass cover, Fair, HSG D
22.720	79	50-75% Grass cover, Fair, HSG C
28.800	69	50-75% Grass cover, Fair, HSG B
1.000	86	1/3 acre lots, 30% imp, HSG D
10.400	81	1/3 acre lots, 30% imp, HSG C
6.400	72	1/3 acre lots, 30% imp, HSG B
10.300	83	1/4 acre lots, 38% imp, HSG C
8.200	75	1/4 acre lots, 38% imp, HSG B
96.000		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8					**Direct Entry, FROM NSP CALCS**

Subcatchment 1S: DA # 1



Summary for Subcatchment 8S: DA #3 OFF-SITE

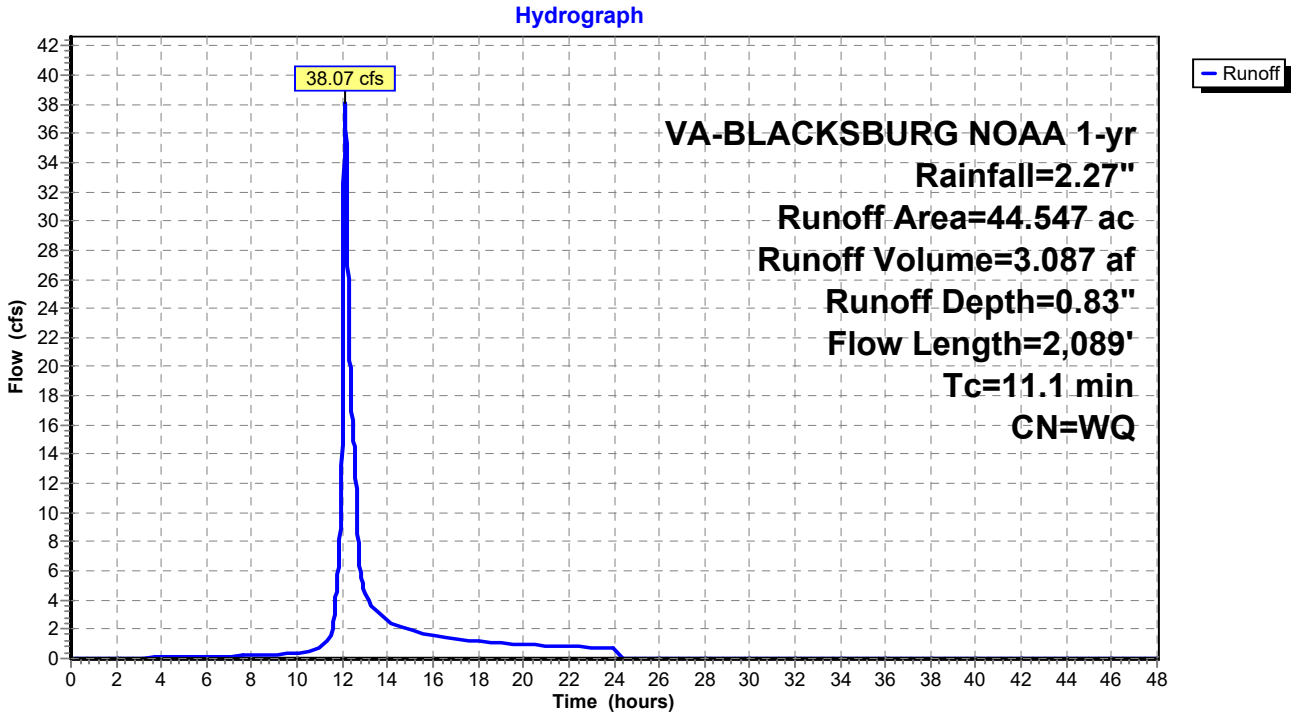
Runoff = 38.07 cfs @ 12.11 hrs, Volume= 3.087 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 1-yr Rainfall=2.27"

Area (ac)	CN	Description
0.358	98	Paved roads w/curbs & sewers, HSG B
4.733	98	Paved roads w/curbs & sewers, HSG C
5.726	70	1/2 acre lots, 25% imp, HSG B
28.476	80	1/2 acre lots, 25% imp, HSG C
0.877	72	1/3 acre lots, 30% imp, HSG B
3.986	81	1/3 acre lots, 30% imp, HSG C
0.391	79	1 acre lots, 20% imp, HSG C
44.547		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 8S: DA #3 OFF-SITE



Summary for Subcatchment 9S: DA TO SWM

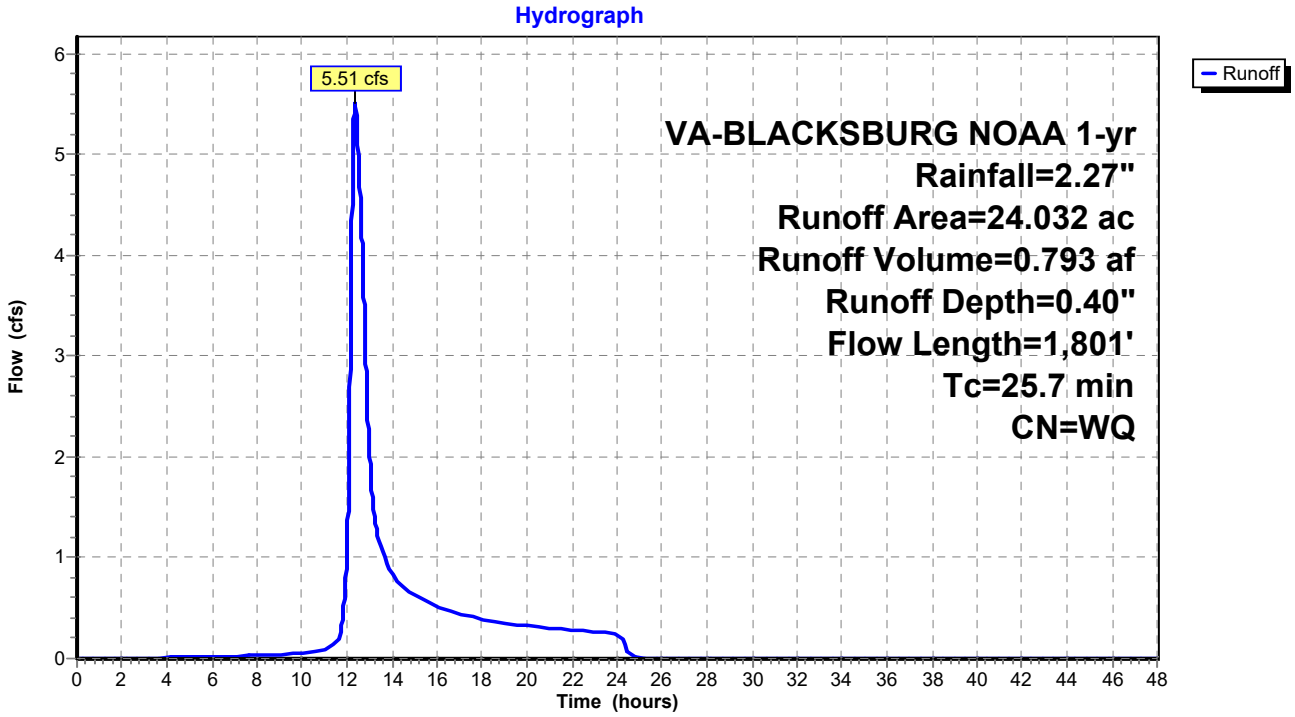
Runoff = 5.51 cfs @ 12.37 hrs, Volume= 0.793 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 1-yr Rainfall=2.27"

	Area (ac)	CN	Description
	0.000	98	Paved parking, HSG A
	0.569	98	Paved parking, HSG B
	0.228	98	Paved parking, HSG C
	0.000	39	>75% Grass cover, Good, HSG A
	1.577	61	>75% Grass cover, Good, HSG B
	0.713	74	>75% Grass cover, Good, HSG C
	2.480	75	1/4 acre lots, 38% imp, HSG B
	0.015	83	1/4 acre lots, 38% imp, HSG C
	1.630	72	1/3 acre lots, 30% imp, HSG B
	0.330	81	1/3 acre lots, 30% imp, HSG C
	0.000	70	1/2 acre lots, 25% imp, HSG B
	1.440	80	1/2 acre lots, 25% imp, HSG C
	0.650	68	1 acre lots, 20% imp, HSG B
	2.360	79	1 acre lots, 20% imp, HSG C
*	4.900	66	DA B (SEE VRRM)
*	2.100	67	DA C (SEE VRRM)
*	3.530	55	DA D (SEE VRRM)
*	1.510	65	DA E (SEE VRRM)
	24.032		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 9S: DA TO SWM



Summary for Subcatchment 10S: DA #4

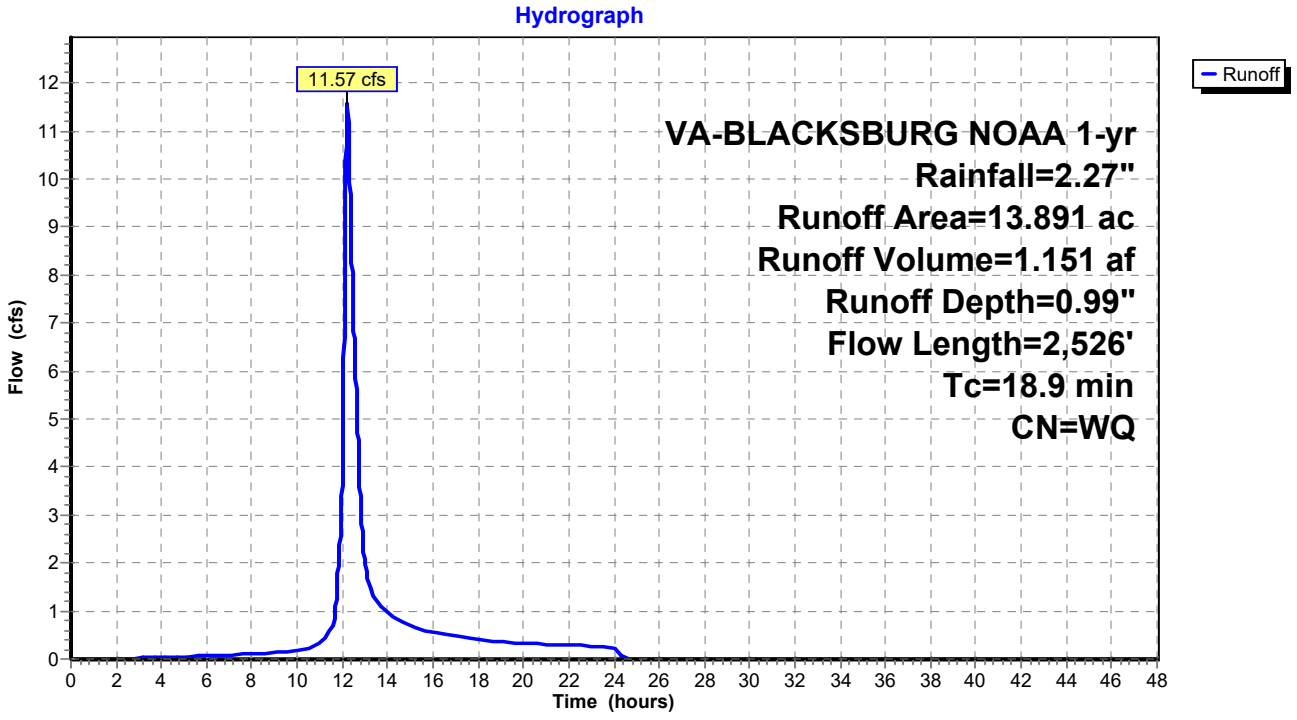
Runoff = 11.57 cfs @ 12.22 hrs, Volume= 1.151 af, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 1-yr Rainfall=2.27"

Area (ac)	CN	Description
2.555	98	Paved roads w/curbs & sewers, HSG C
7.333	81	1/3 acre lots, 30% imp, HSG C
3.803	80	1/2 acre lots, 25% imp, HSG C
0.200	70	1/2 acre lots, 25% imp, HSG B
13.891		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	95	0.0630	0.25		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
9.9	1,004	0.0478	1.70	5.26	**Channel Flow, Tc2** Area= 3.1 sf Perim= 50.0' r= 0.06' n= 0.030 Earth, grassed & winding
2.6	1,427	0.0134	9.03	28.37	**Pipe Channel, CMP_Round 24"** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
18.9	2,526	Total			

Subcatchment 10S: DA #4



Summary for Subcatchment 11S: DA #2 OFFSITE

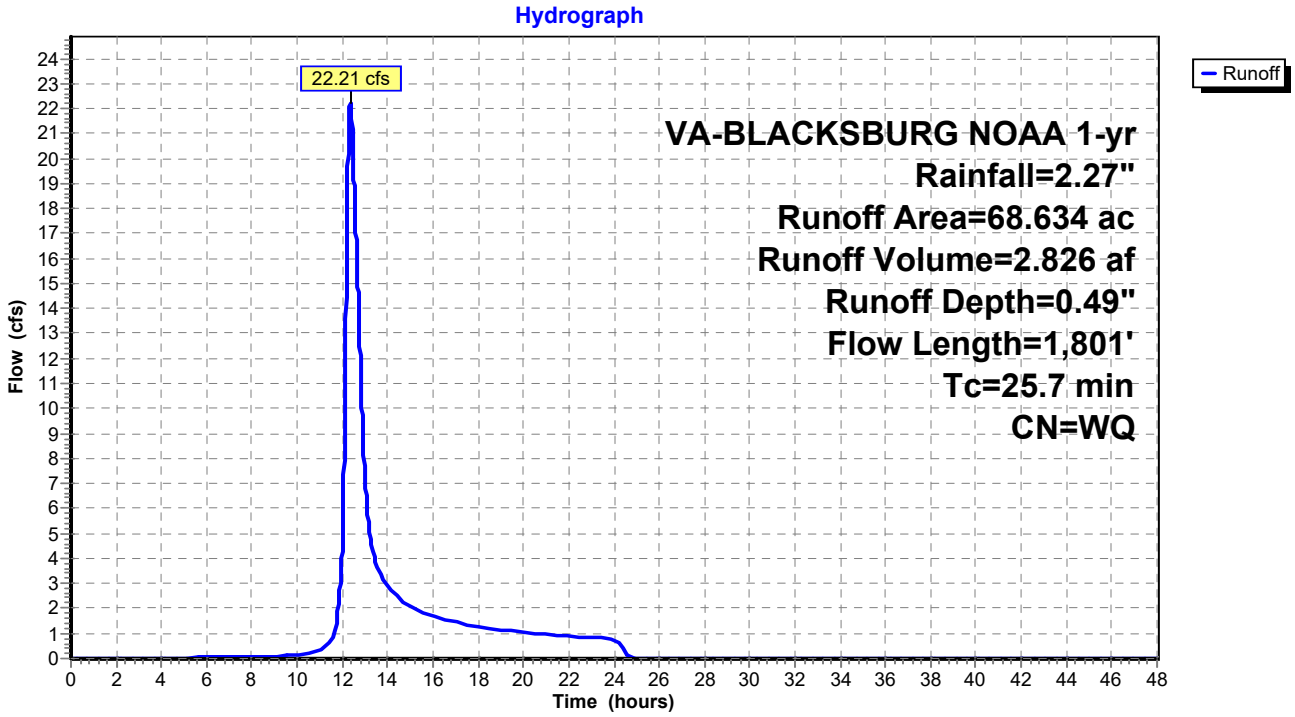
Runoff = 22.21 cfs @ 12.34 hrs, Volume= 2.826 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 1-yr Rainfall=2.27"

	Area (ac)	CN	Description
	10.040	83	Fallow, crop residue, Good, HSG B
	1.105	88	Fallow, crop residue, Good, HSG C
*	0.030	98	Unconnected pavement, HSG A
	1.290	98	Unconnected pavement, HSG C
	0.380	98	Unconnected pavement, HSG B
	1.415	70	1/2 acre lots, 25% imp, HSG B
	5.343	80	1/2 acre lots, 25% imp, HSG C
	0.010	72	1/3 acre lots, 30% imp, HSG B
	1.370	81	1/3 acre lots, 30% imp, HSG C
	0.180	68	1 acre lots, 20% imp, HSG B
	0.038	79	1 acre lots, 20% imp, HSG C
	0.110	70	Woods, Good, HSG C
	1.300	55	Woods, Good, HSG B
	5.330	39	>75% Grass cover, Good, HSG A
	8.660	61	>75% Grass cover, Good, HSG B
	11.790	74	>75% Grass cover, Good, HSG C
	6.180	58	Woods/grass comb., Good, HSG B
	5.140	72	Woods/grass comb., Good, HSG C
	2.852	72	Dirt roads, HSG A
	1.750	82	Dirt roads, HSG B
	1.521	87	Dirt roads, HSG C
*	2.210	64	DA A (SEE VRRM)
	0.590	75	1/4 acre lots, 38% imp, HSG B
	68.634		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow, Tc2** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 11S: DA #2 OFFSITE



Summary for Subcatchment 12S: DA #3 WQ AREA

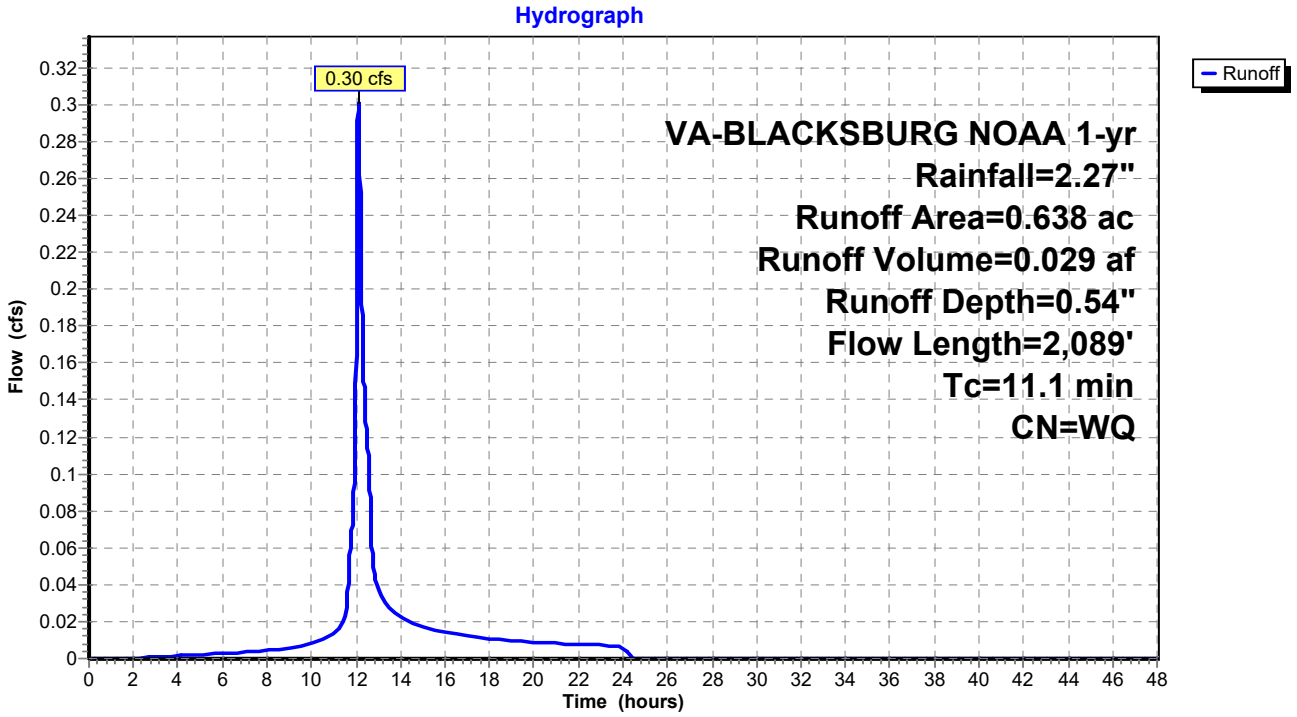
Runoff = 0.30 cfs @ 12.10 hrs, Volume= 0.029 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 1-yr Rainfall=2.27"

Area (ac)	CN	Description
0.061	98	Paved roads w/curbs & sewers, HSG B
0.042	98	Paved roads w/curbs & sewers, HSG C
0.055	83	1/4 acre lots, 38% imp, HSG C
0.057	74	>75% Grass cover, Good, HSG C
0.423	61	>75% Grass cover, Good, HSG B
0.638		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 12S: DA #3 WQ AREA



Summary for Reach 6R: POND TO POA

Inflow Area = 96.000 ac, Inflow Depth = 0.00" for 1-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

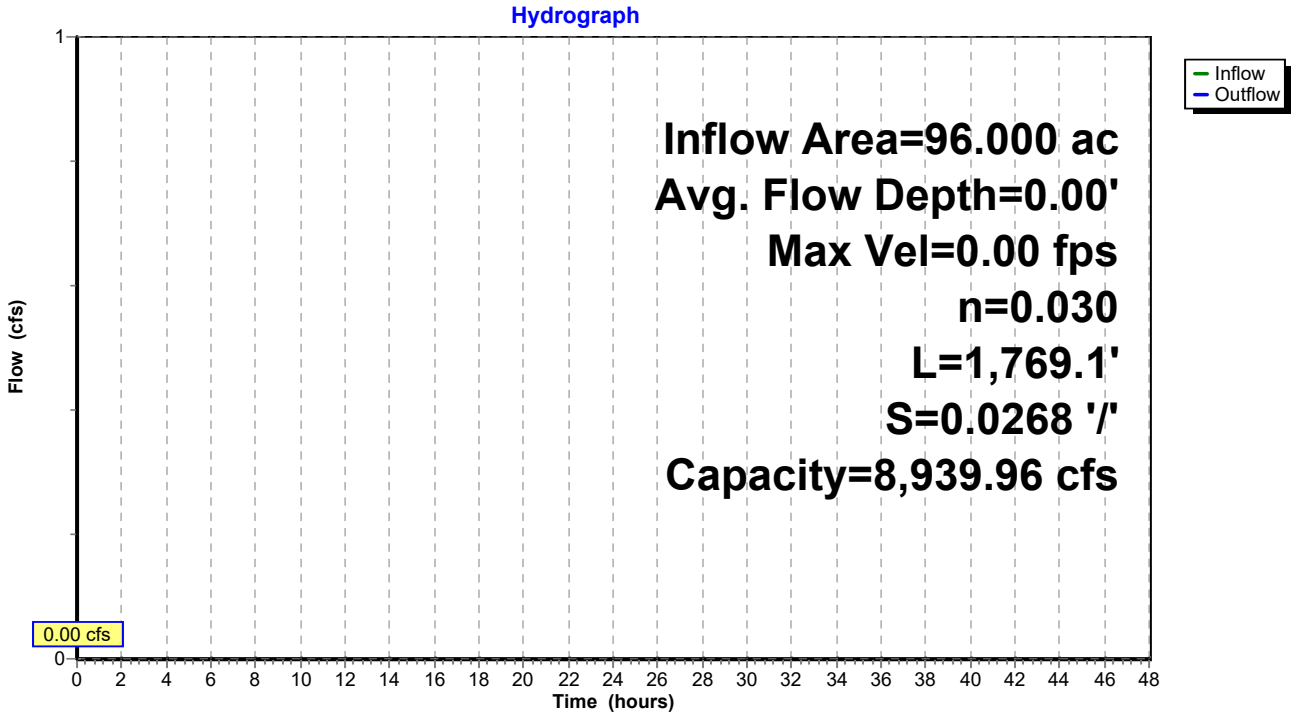
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.00' Flow Area= 425.0 sf, Capacity= 8,939.96 cfs

70.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 100.00'
Length= 1,769.1' Slope= 0.0268 '/'
Inlet Invert= 2,087.00', Outlet Invert= 2,039.65'

‡

Reach 6R: POND TO POA



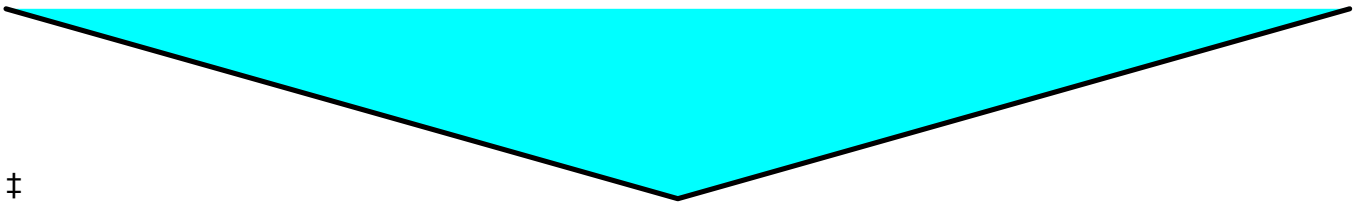
Summary for Reach 8R: REACH COMBINE

Inflow Area = 233.851 ac, Inflow Depth = 0.35" for 1-yr event
Inflow = 50.72 cfs @ 12.25 hrs, Volume= 6.735 af
Outflow = 49.22 cfs @ 12.32 hrs, Volume= 6.735 af, Atten= 3%, Lag= 3.8 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.89 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 6.8 min

Peak Storage= 9,302 cf @ 12.32 hrs
Average Depth at Peak Storage= 5.19' , Surface Width= 173.31'
Bank-Full Depth= 0.33' Flow Area= 1.8 sf, Capacity= 1.23 cfs

0.00' x 0.33' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 16.7 '/' Top Width= 11.02'
Length= 168.8' Slope= 0.0021 '/'
Inlet Invert= 2,036.90', Outlet Invert= 2,036.55'



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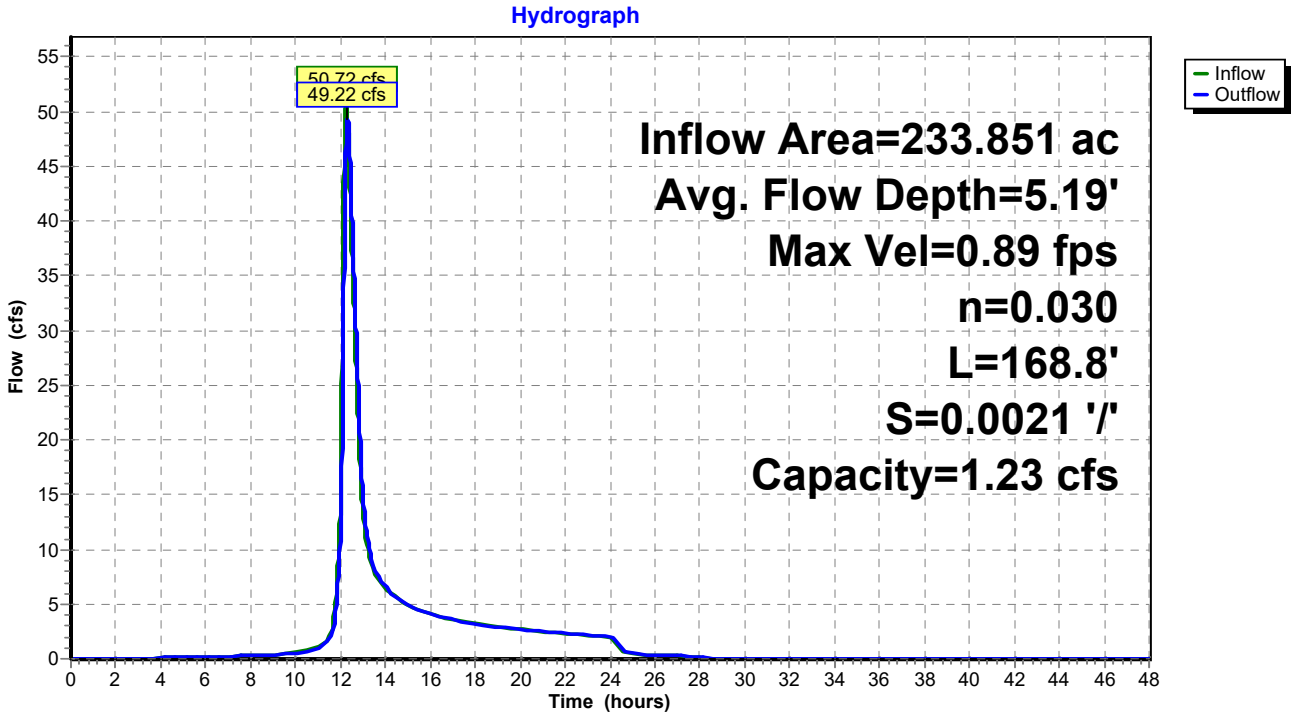
Reach 8R: REACH COMBINE



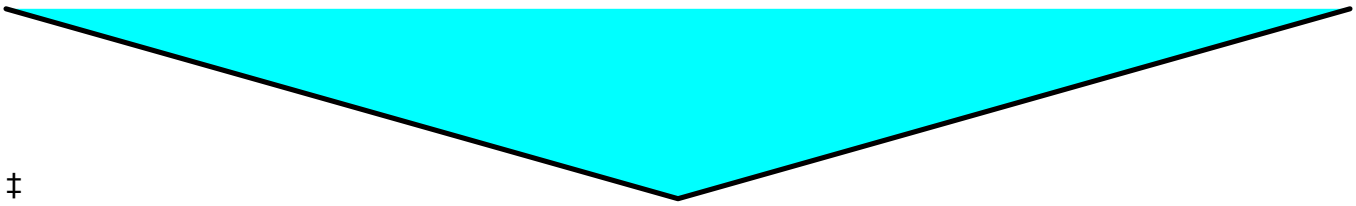
Summary for Reach 9R: DA 3 TO DA 2

Inflow Area = 45.185 ac, Inflow Depth = 0.83" for 1-yr event
Inflow = 38.37 cfs @ 12.11 hrs, Volume= 3.116 af
Outflow = 31.30 cfs @ 12.20 hrs, Volume= 3.116 af, Atten= 18%, Lag= 5.2 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.68 fps, Min. Travel Time= 6.6 min
Avg. Velocity = 1.09 fps, Avg. Travel Time= 22.4 min

Peak Storage= 12,429 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.48' , Surface Width= 38.34'
Bank-Full Depth= 0.35' Flow Area= 4.9 sf, Capacity= 15.84 cfs

0.00' x 0.35' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 40.0 '/' Top Width= 28.00'
Length= 1,462.0' Slope= 0.0435 '/'
Inlet Invert= 2,103.26', Outlet Invert= 2,039.65'



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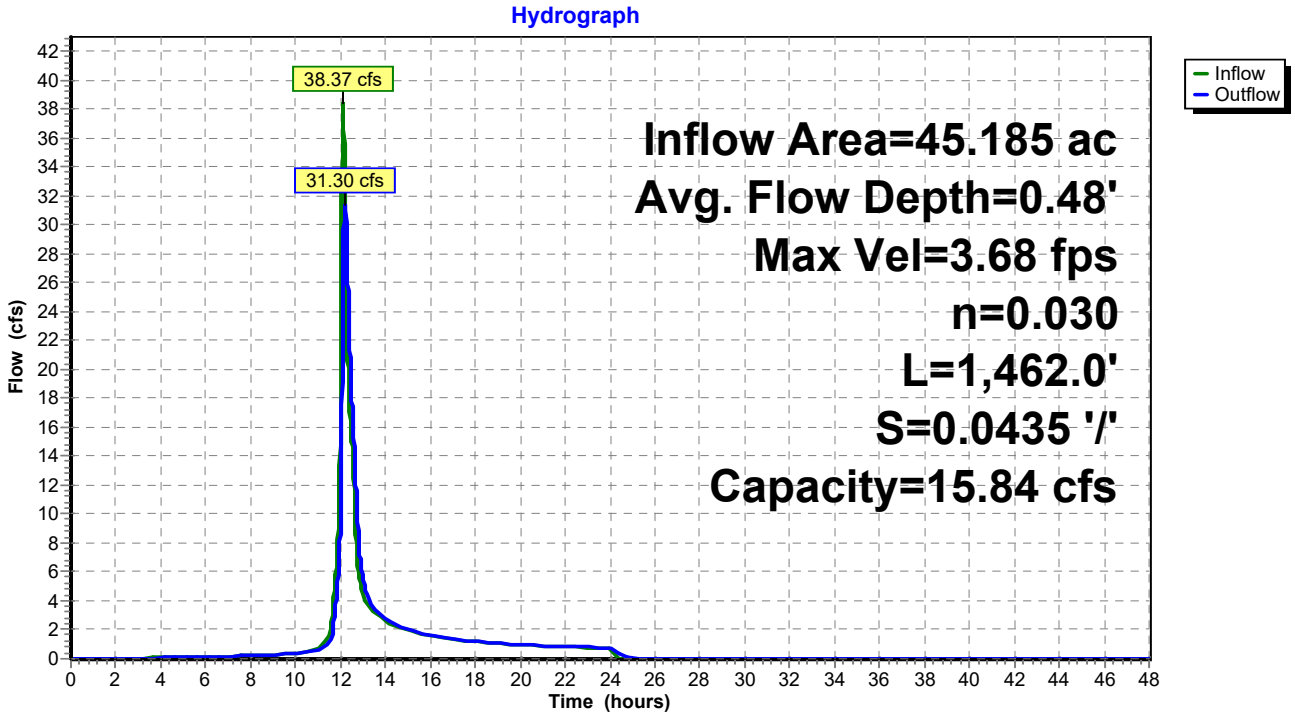
Reach 9R: DA 3 TO DA 2



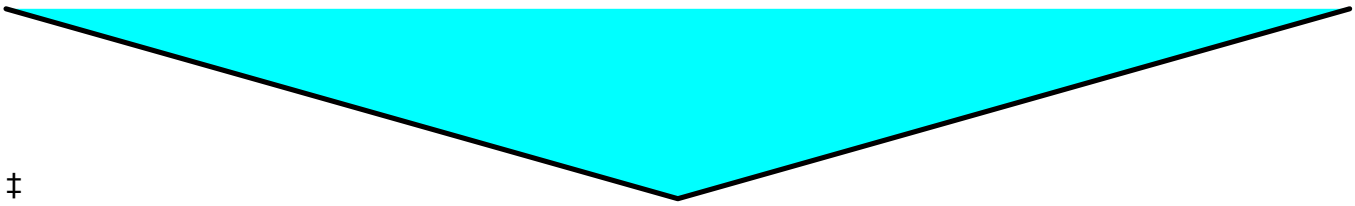
Summary for Reach 10R: REACH COMBINE 2

Inflow Area = 247.742 ac, Inflow Depth = 0.38" for 1-yr event
Inflow = 60.15 cfs @ 12.30 hrs, Volume= 7.886 af
Outflow = 59.98 cfs @ 12.32 hrs, Volume= 7.886 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.80 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.47 fps, Avg. Travel Time= 4.9 min

Peak Storage= 4,548 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.61' , Surface Width= 108.79'
Bank-Full Depth= 0.59' Flow Area= 30.8 sf, Capacity= 54.02 cfs

0.00' x 0.59' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 88.5 '/' Top Width= 104.43'
Length= 136.3' Slope= 0.0064 '/'
Inlet Invert= 2,036.75', Outlet Invert= 2,035.88'



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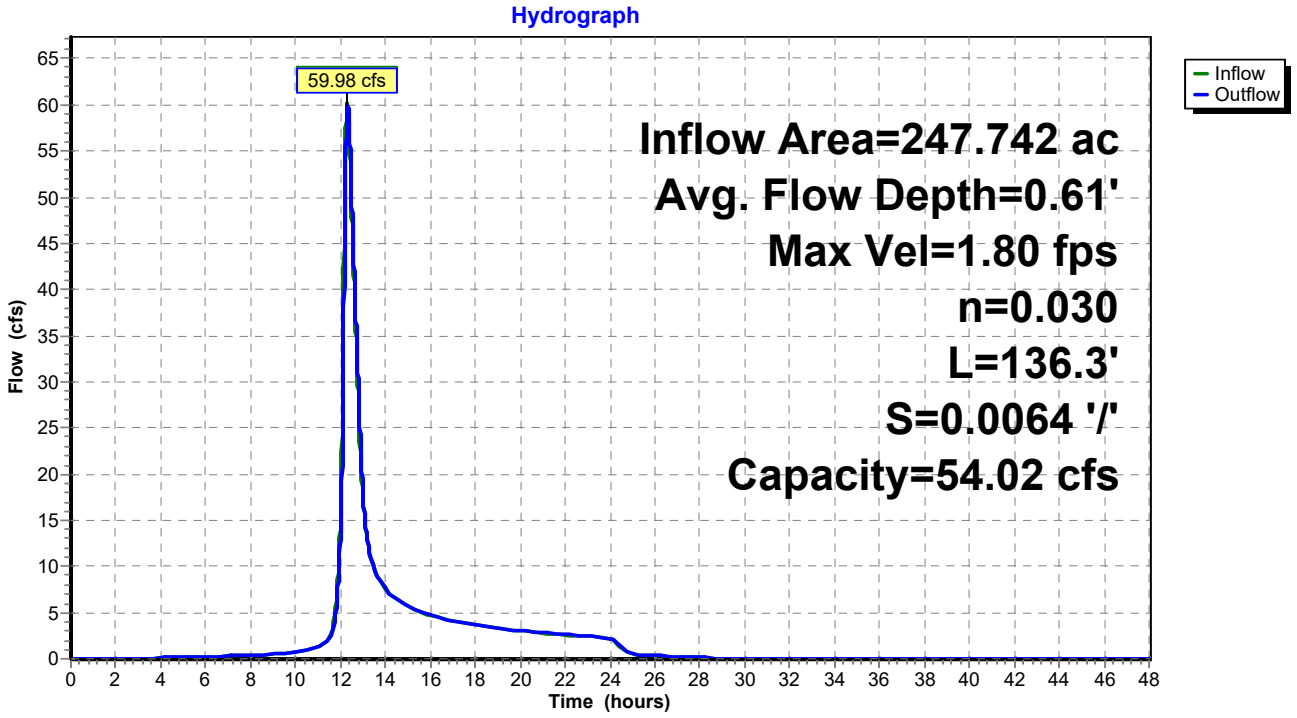
Reach 10R: REACH COMBINE 2



Summary for Reach 11R: DA 4 TO POA

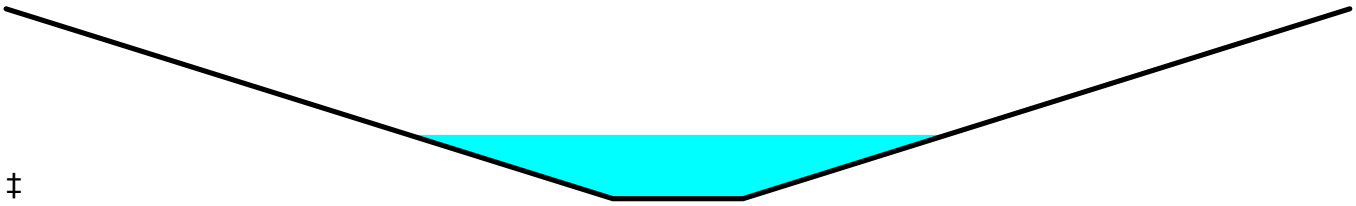
Inflow Area = 13.891 ac, Inflow Depth = 0.99" for 1-yr event
Inflow = 11.57 cfs @ 12.22 hrs, Volume= 1.151 af
Outflow = 11.25 cfs @ 12.27 hrs, Volume= 1.151 af, Atten= 3%, Lag= 2.5 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.20 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 2.04 fps, Avg. Travel Time= 9.6 min

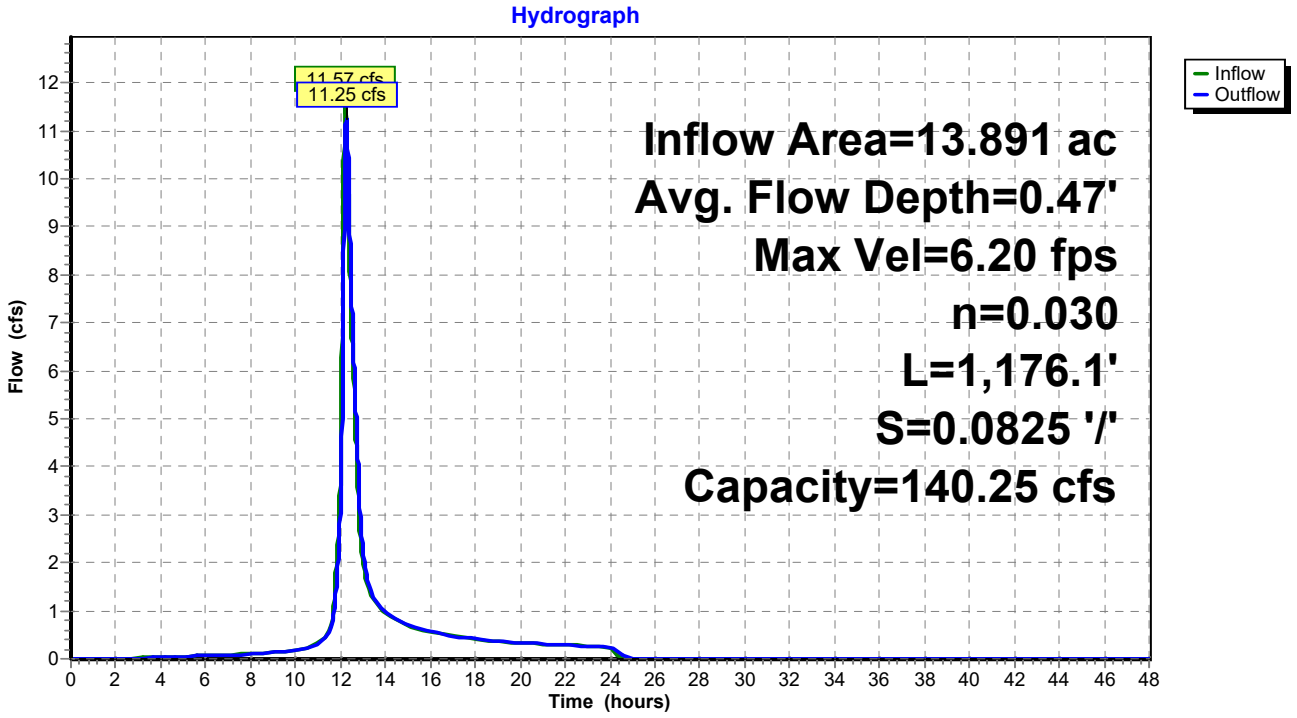
Peak Storage= 2,133 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.47' , Surface Width= 6.21'
Bank-Full Depth= 1.40' Flow Area= 11.9 sf, Capacity= 140.25 cfs

1.50' x 1.40' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 5.0 '/' Top Width= 15.50'
Length= 1,176.1' Slope= 0.0825 '/'
Inlet Invert= 2,133.71', Outlet Invert= 2,036.73'

‡



Reach 11R: DA 4 TO POA



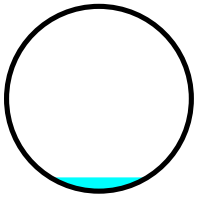
Summary for Reach 12R: DI-7

Inflow Area = 24.032 ac, Inflow Depth = 0.40" for 1-yr event
Inflow = 0.80 cfs @ 14.16 hrs, Volume= 0.793 af
Outflow = 0.80 cfs @ 14.16 hrs, Volume= 0.793 af, Atten= 0%, Lag= 0.5 min

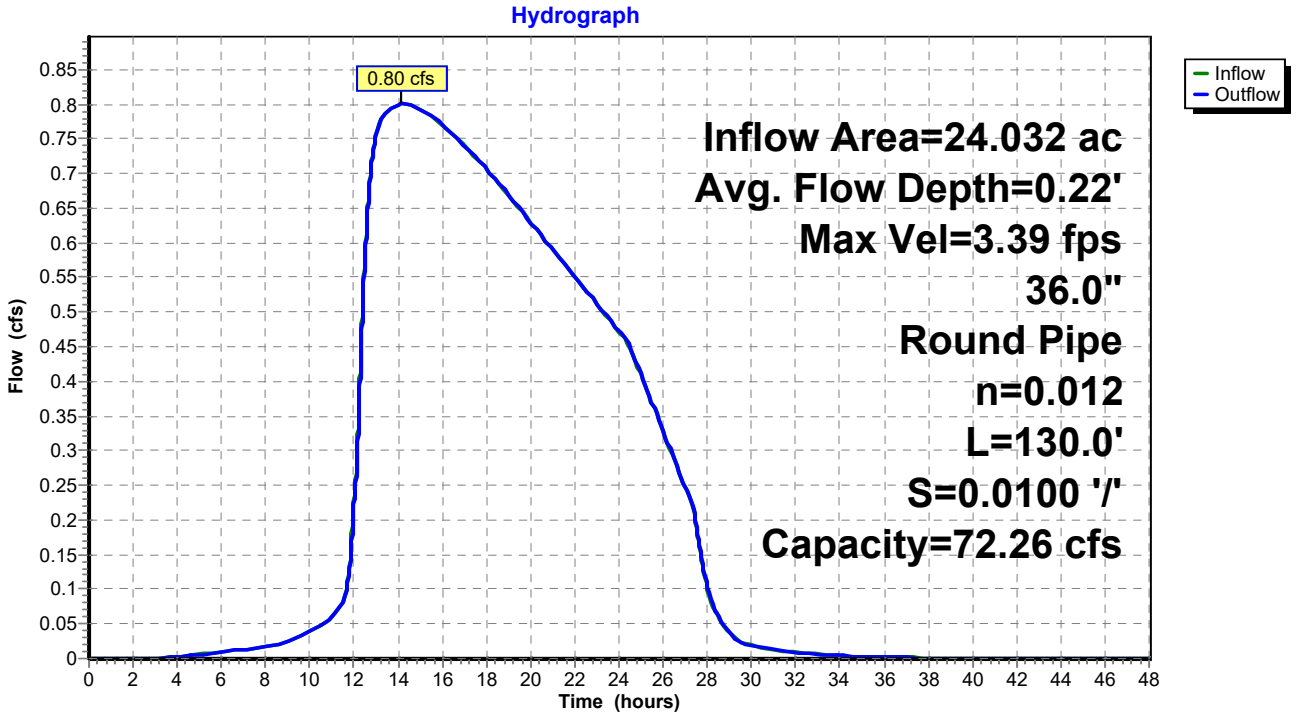
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.39 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.79 fps, Avg. Travel Time= 1.2 min

Peak Storage= 31 cf @ 14.16 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 1.57'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 72.26 cfs

36.0" Round Pipe
n= 0.012
Length= 130.0' Slope= 0.0100 '/'
Inlet Invert= 2,061.30', Outlet Invert= 2,060.00'



Reach 12R: DI-7



Summary for Pond 3P: NSP POND 1

Inflow Area = 96.000 ac, Inflow Depth = 0.66" for 1-yr event
Inflow = 39.33 cfs @ 12.42 hrs, Volume= 5.281 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 7.44' @ 25.75 hrs Storage= 230,051 cf

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

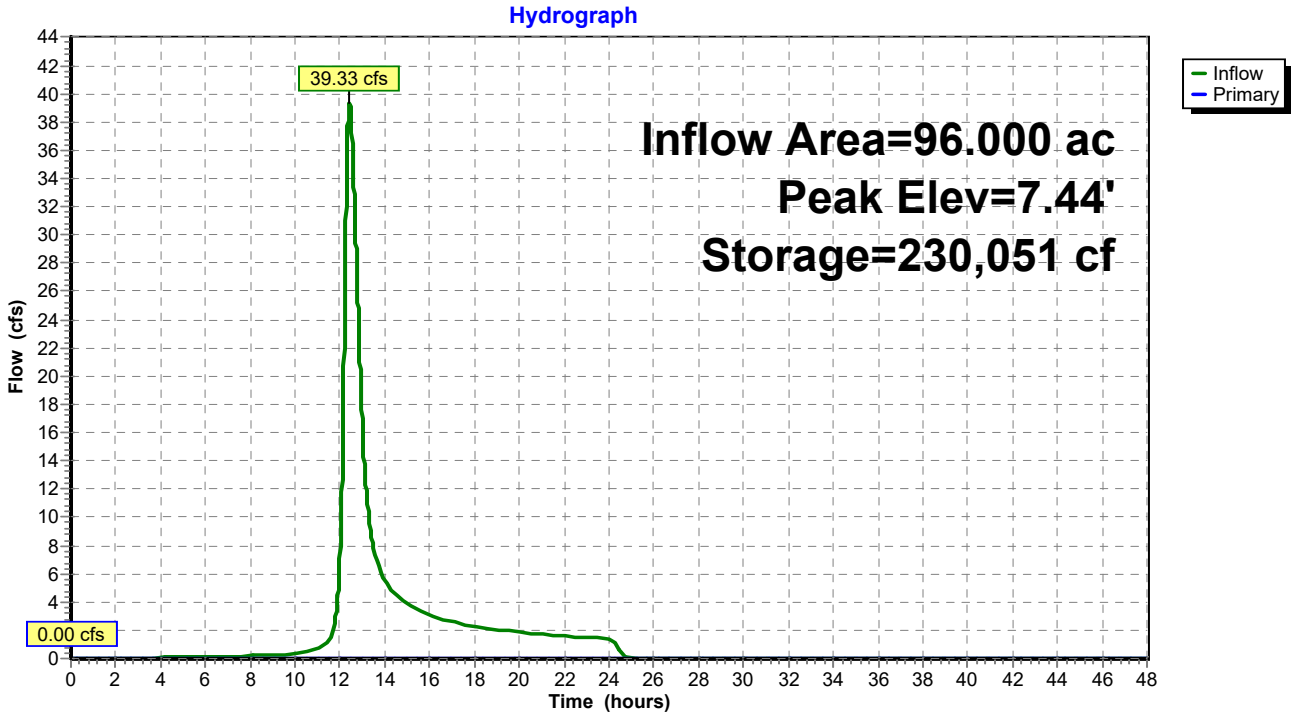
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	392,320 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	0	0
1.25	2,002	2,002
3.25	24,089	26,091
5.25	67,305	93,396
7.25	119,692	213,088
9.25	179,232	392,320

Device	Routing	Invert	Outlet Devices
#1	Primary	2,073.87'	**48.0" Round Culvert** L= 110.4' Ke= 0.600 Inlet / Outlet Invert= 2,073.87' / 2,071.85' S= 0.0183 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	2,174.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	2,080.27'	**72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	2,082.20'	**30.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: NSP POND 1



Summary for Pond 8P: SWM

Inflow Area = 24.032 ac, Inflow Depth = 0.40" for 1-yr event
Inflow = 5.51 cfs @ 12.37 hrs, Volume= 0.793 af
Outflow = 0.80 cfs @ 14.16 hrs, Volume= 0.793 af, Atten= 85%, Lag= 107.3 min
Primary = 0.80 cfs @ 14.16 hrs, Volume= 0.793 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 2,064.10' @ 14.16 hrs Surf.Area= 6,928 sf Storage= 14,033 cf

Plug-Flow detention time= 225.8 min calculated for 0.793 af (100% of inflow)
Center-of-Mass det. time= 225.7 min (1,122.1 - 896.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,061.65'	93,017 cf	**Custom Stage Data (Prismatic)**Listed below

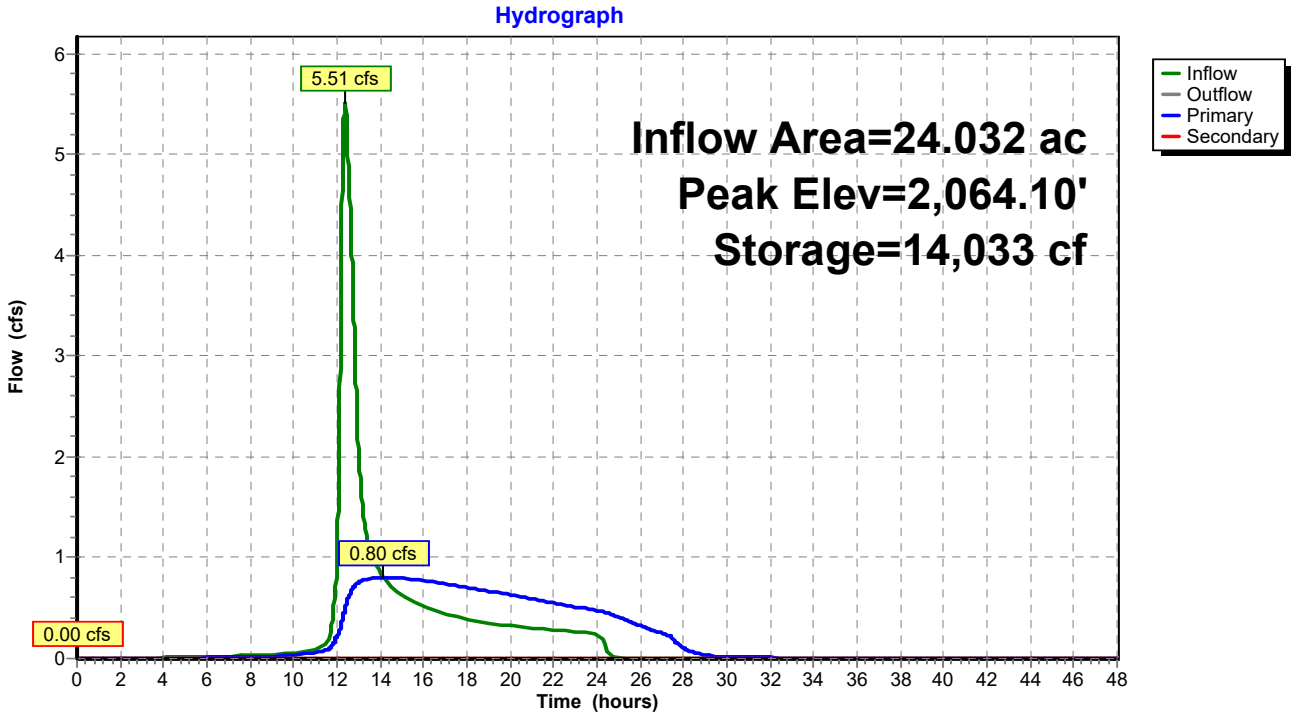
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,061.65	0	0	0
2,062.00	4,695	822	822
2,065.00	7,885	18,870	19,692
2,070.00	15,094	57,448	77,139
2,071.00	16,661	15,878	93,017

Device	Routing	Invert	Outlet Devices
#1	Primary	2,061.65'	**18.0" Round RCP_Round 18"** L= 55.0' Ke= 0.200 Inlet / Outlet Invert= 2,061.65' / 2,061.30' S= 0.0064 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	2,061.65'	**4.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	2,064.10'	**24.0" W x 6.0" H Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	2,064.67'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	2,068.25'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 2.75 Width (feet) 15.00 31.50

Primary OutFlow Max=0.80 cfs @ 14.16 hrs HW=2,064.10' (Free Discharge)
└**1=RCP_Round 18"** (Passes 0.80 cfs of 11.28 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.80 cfs @ 7.24 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.06 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,061.65' (Free Discharge)
└**5=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 8P: SWM

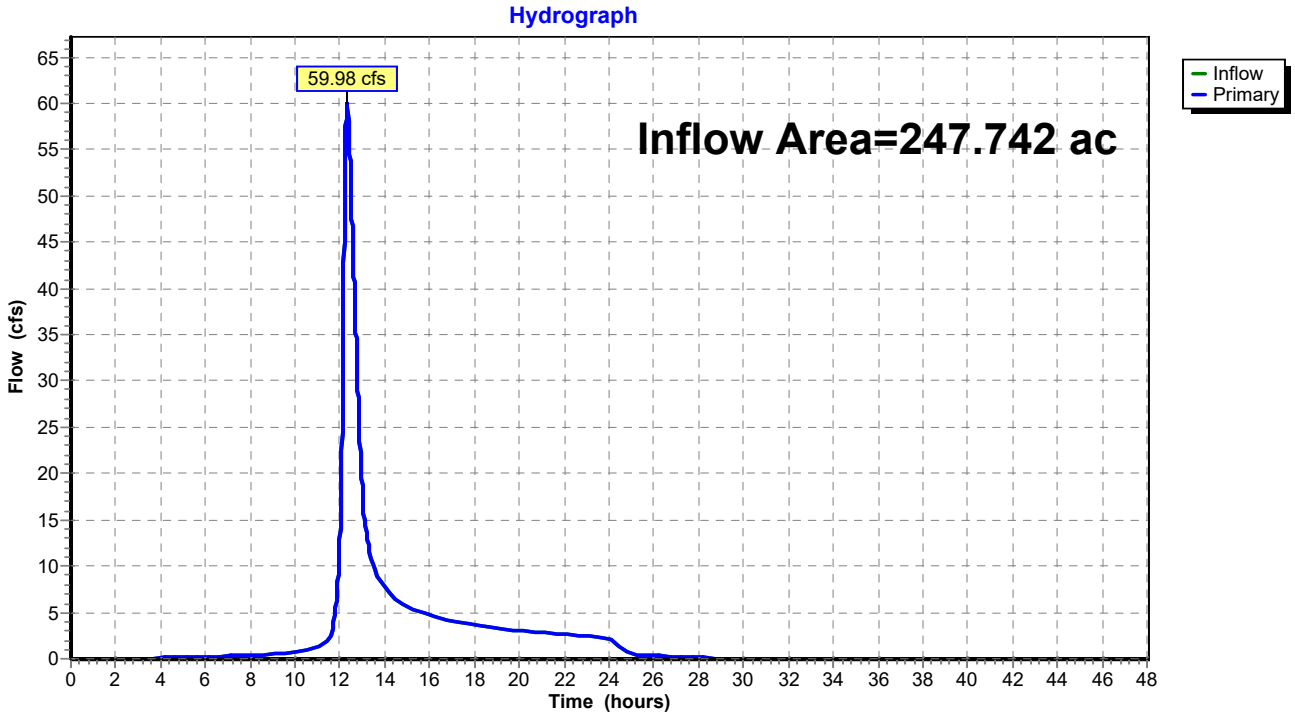

Hydrograph
Inflow Area=24.032 ac
Peak Elev=2,064.10'
Storage=14,033 cf
5.51 cfs
0.80 cfs
0.00 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

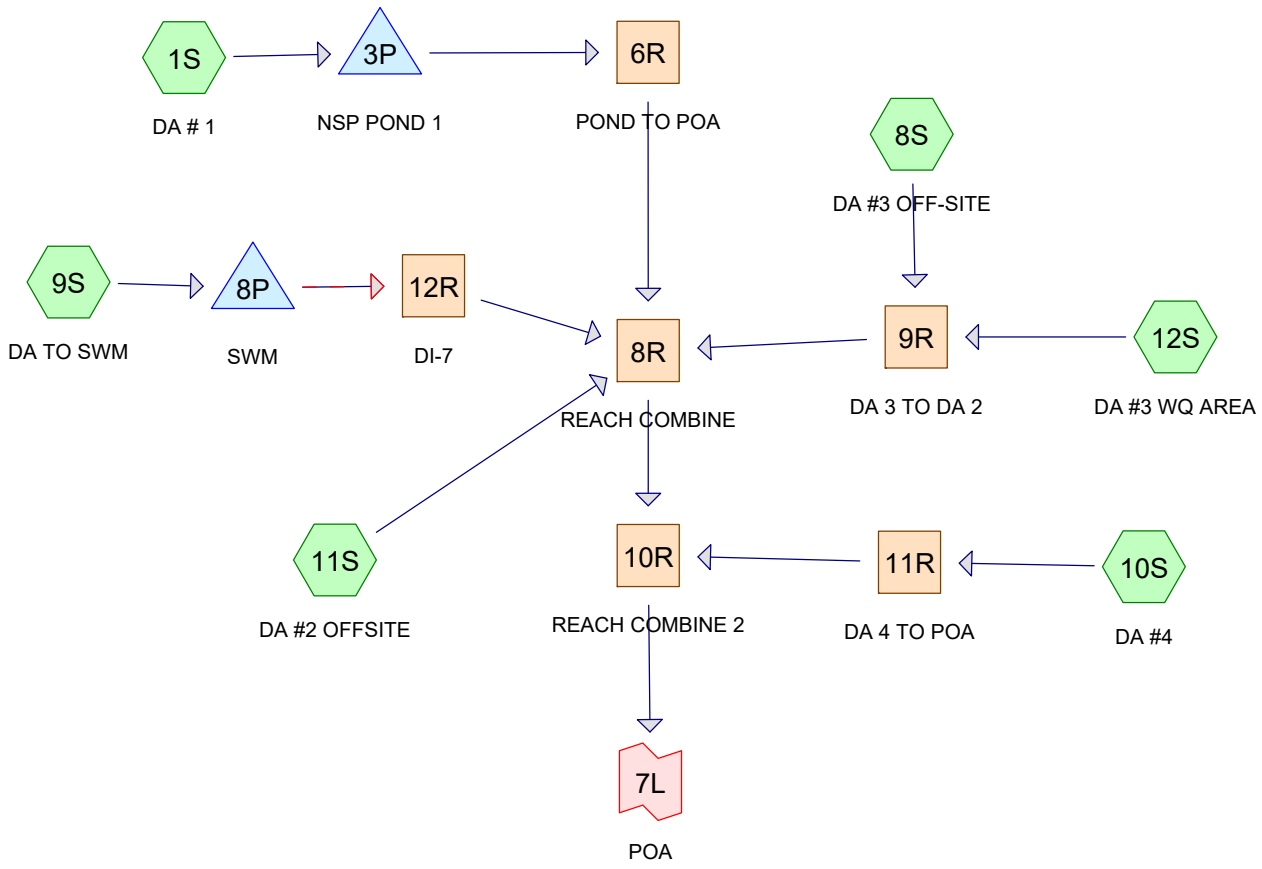
Summary for Link 7L: POA

Inflow Area = 247.742 ac, Inflow Depth = 0.38" for 1-yr event
Inflow = 59.98 cfs @ 12.32 hrs, Volume= 7.886 af
Primary = 59.98 cfs @ 12.32 hrs, Volume= 7.886 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 7L: POA





Subcat Reach Pond Link

Routing Diagram for Post-2
Prepared by Balzer & Associates, Printed 7/29/2022

Summary for Subcatchment 1S: DA # 1

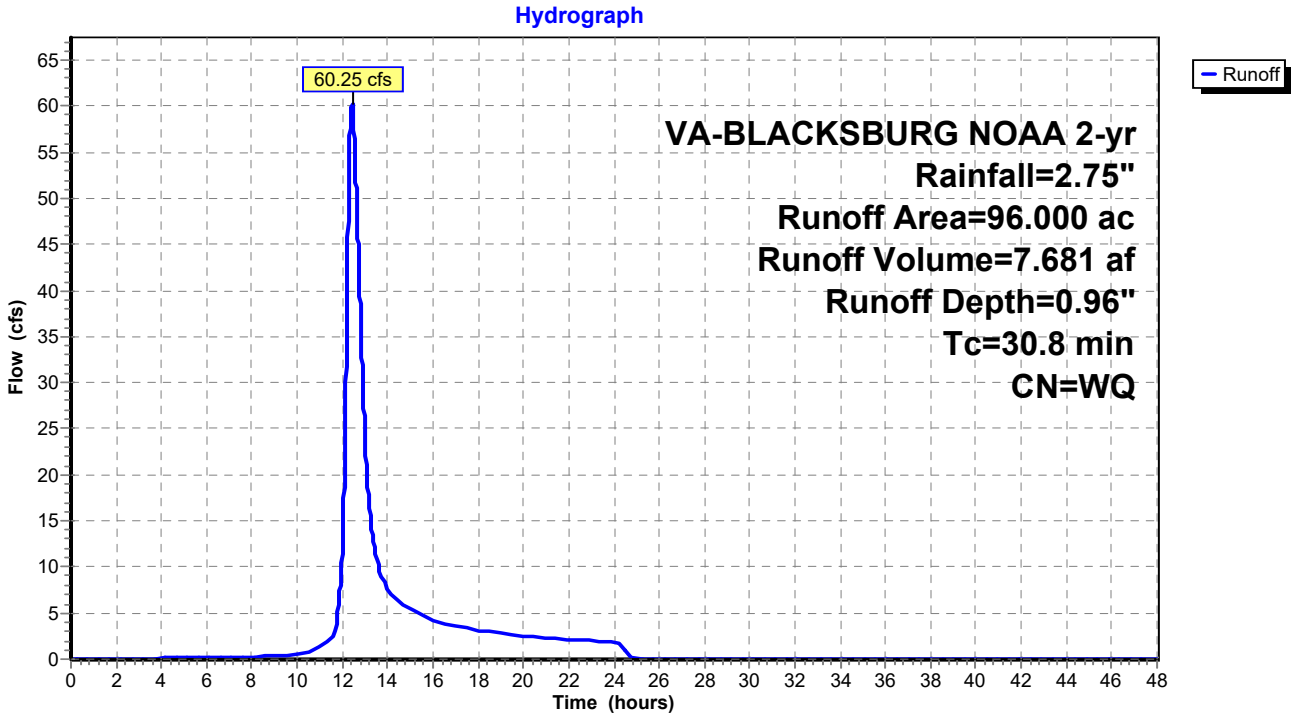
Runoff = 60.25 cfs @ 12.42 hrs, Volume= 7.681 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 2-yr Rainfall=2.75"

Area (ac)	CN	Description
5.080	98	Roofs, HSG C
3.100	84	50-75% Grass cover, Fair, HSG D
22.720	79	50-75% Grass cover, Fair, HSG C
28.800	69	50-75% Grass cover, Fair, HSG B
1.000	86	1/3 acre lots, 30% imp, HSG D
10.400	81	1/3 acre lots, 30% imp, HSG C
6.400	72	1/3 acre lots, 30% imp, HSG B
10.300	83	1/4 acre lots, 38% imp, HSG C
8.200	75	1/4 acre lots, 38% imp, HSG B
96.000		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8					**Direct Entry, FROM NSP CALCS**

Subcatchment 1S: DA # 1



Summary for Subcatchment 8S: DA #3 OFF-SITE

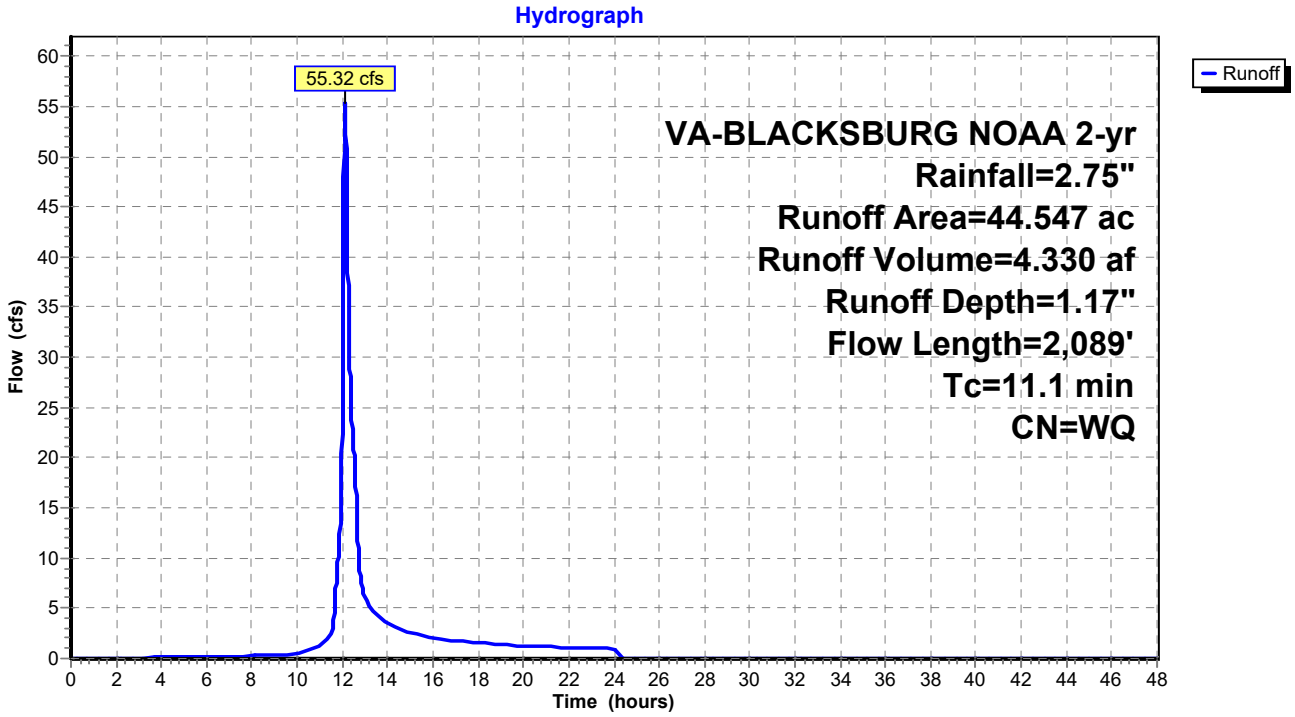
Runoff = 55.32 cfs @ 12.11 hrs, Volume= 4.330 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 2-yr Rainfall=2.75"

Area (ac)	CN	Description
0.358	98	Paved roads w/curbs & sewers, HSG B
4.733	98	Paved roads w/curbs & sewers, HSG C
5.726	70	1/2 acre lots, 25% imp, HSG B
28.476	80	1/2 acre lots, 25% imp, HSG C
0.877	72	1/3 acre lots, 30% imp, HSG B
3.986	81	1/3 acre lots, 30% imp, HSG C
0.391	79	1 acre lots, 20% imp, HSG C
44.547		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 8S: DA #3 OFF-SITE



Summary for Subcatchment 9S: DA TO SWM

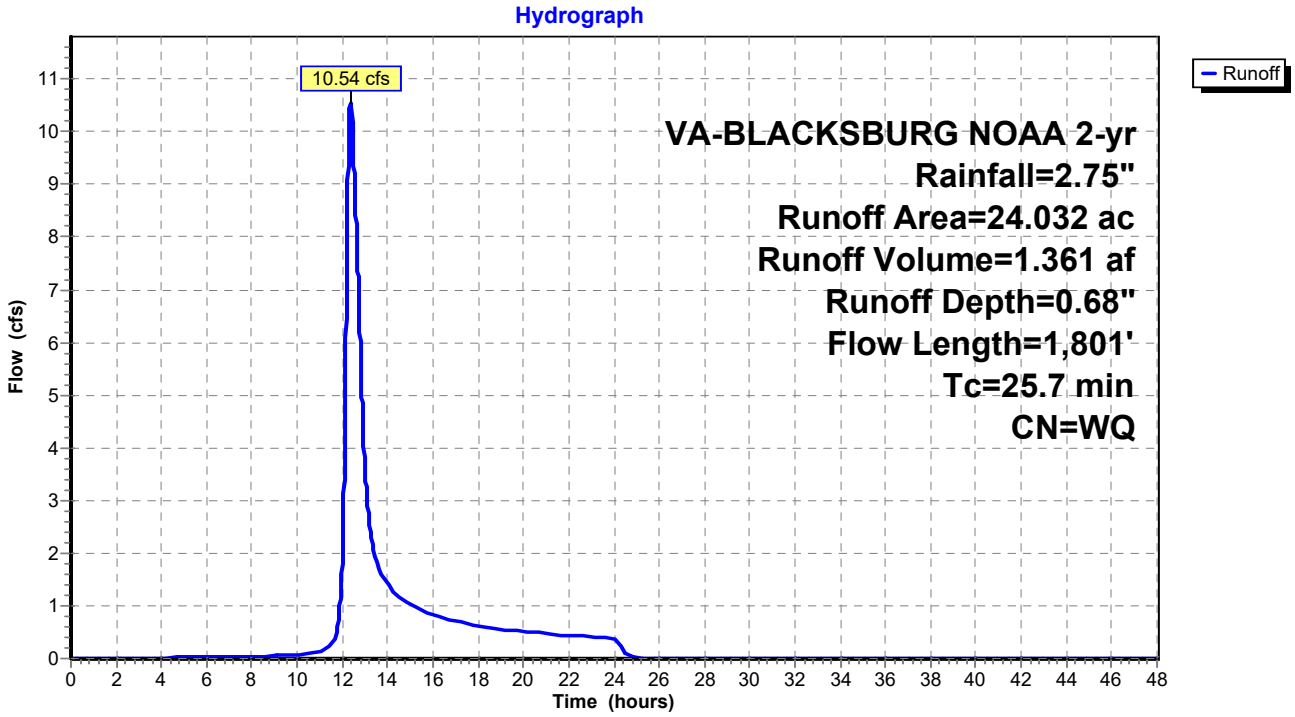
Runoff = 10.54 cfs @ 12.36 hrs, Volume= 1.361 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 2-yr Rainfall=2.75"

	Area (ac)	CN	Description
	0.000	98	Paved parking, HSG A
	0.569	98	Paved parking, HSG B
	0.228	98	Paved parking, HSG C
	0.000	39	>75% Grass cover, Good, HSG A
	1.577	61	>75% Grass cover, Good, HSG B
	0.713	74	>75% Grass cover, Good, HSG C
	2.480	75	1/4 acre lots, 38% imp, HSG B
	0.015	83	1/4 acre lots, 38% imp, HSG C
	1.630	72	1/3 acre lots, 30% imp, HSG B
	0.330	81	1/3 acre lots, 30% imp, HSG C
	0.000	70	1/2 acre lots, 25% imp, HSG B
	1.440	80	1/2 acre lots, 25% imp, HSG C
	0.650	68	1 acre lots, 20% imp, HSG B
	2.360	79	1 acre lots, 20% imp, HSG C
*	4.900	69	DA B (SEE VRRM)
*	2.100	70	DA C (SEE VRRM)
*	3.530	61	DA D (SEE VRRM)
*	1.510	69	DA E (SEE VRRM)
	24.032		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 9S: DA TO SWM



Summary for Subcatchment 10S: DA #4

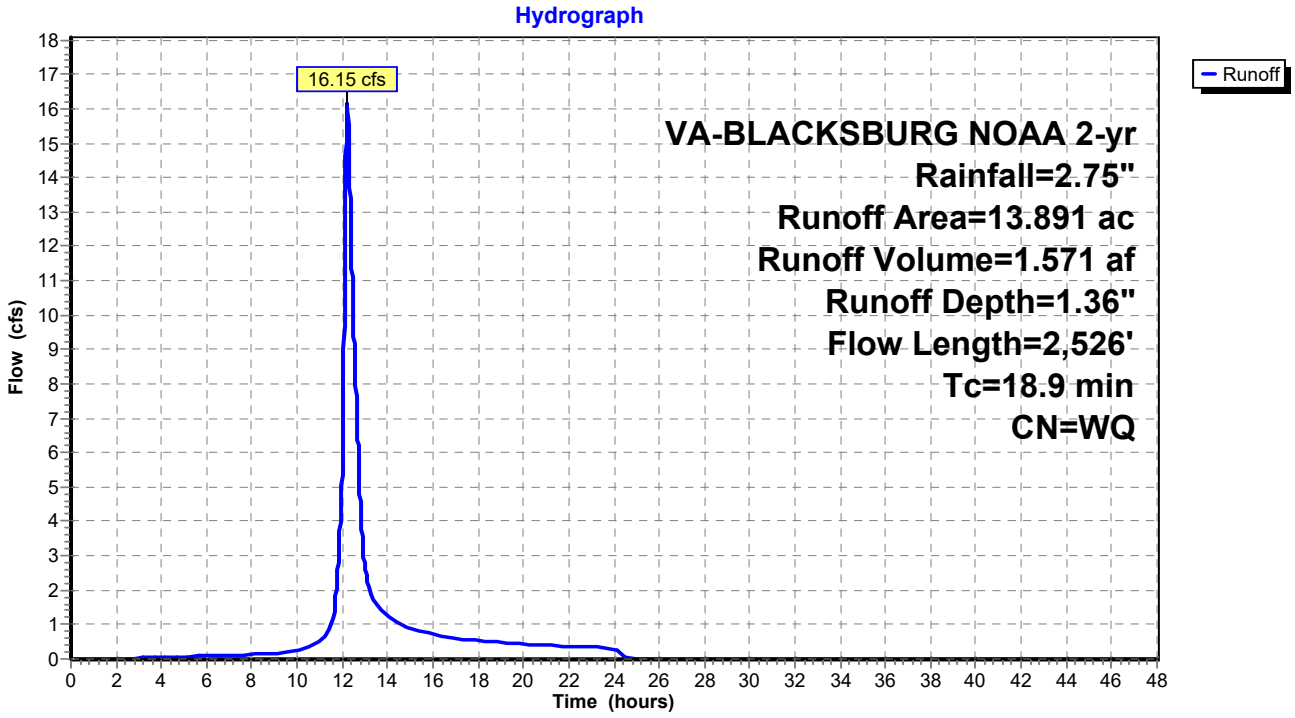
Runoff = 16.15 cfs @ 12.22 hrs, Volume= 1.571 af, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 2-yr Rainfall=2.75"

Area (ac)	CN	Description
2.555	98	Paved roads w/curbs & sewers, HSG C
7.333	81	1/3 acre lots, 30% imp, HSG C
3.803	80	1/2 acre lots, 25% imp, HSG C
0.200	70	1/2 acre lots, 25% imp, HSG B
13.891		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	95	0.0630	0.25		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
9.9	1,004	0.0478	1.70	5.26	**Channel Flow, Tc2** Area= 3.1 sf Perim= 50.0' r= 0.06' n= 0.030 Earth, grassed & winding
2.6	1,427	0.0134	9.03	28.37	**Pipe Channel, CMP_Round 24"** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
18.9	2,526	Total			

Subcatchment 10S: DA #4



Summary for Subcatchment 11S: DA #2 OFFSITE

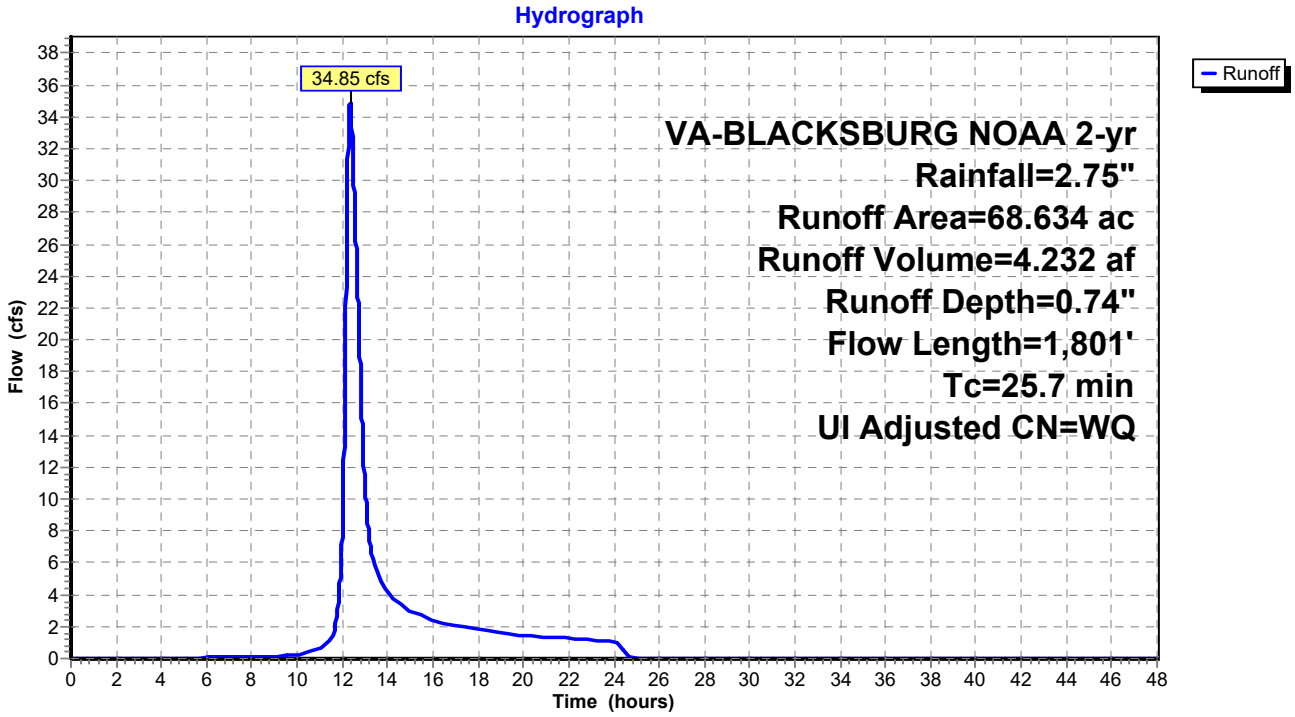
Runoff = 34.85 cfs @ 12.34 hrs, Volume= 4.232 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 2-yr Rainfall=2.75"

	Area (ac)	CN	Adj	Description
	10.040	83	83	Fallow, crop residue, Good, HSG B
	1.105	88	88	Fallow, crop residue, Good, HSG C
*	0.030	98	98	Unconnected pavement, HSG A
	1.290	98	98	Unconnected pavement, HSG C
	0.380	98	98	Unconnected pavement, HSG B
	1.415	70	70	1/2 acre lots, 25% imp, HSG B
	5.343	80	80	1/2 acre lots, 25% imp, HSG C
	0.010	72	72	1/3 acre lots, 30% imp, HSG B
	1.370	81	81	1/3 acre lots, 30% imp, HSG C
	0.180	68	68	1 acre lots, 20% imp, HSG B
	0.038	79	79	1 acre lots, 20% imp, HSG C
	0.110	70	70	Woods, Good, HSG C
	1.300	55	55	Woods, Good, HSG B
	5.330	39	39	>75% Grass cover, Good, HSG A
	8.660	61	61	>75% Grass cover, Good, HSG B
	11.790	74	74	>75% Grass cover, Good, HSG C
	6.180	58	58	Woods/grass comb., Good, HSG B
	5.140	72	72	Woods/grass comb., Good, HSG C
	2.852	72	72	Dirt roads, HSG A
	1.750	82	82	Dirt roads, HSG B
	1.521	87	87	Dirt roads, HSG C
*	2.210	68	68	DA A (SEE VRRM)
	0.590	75	75	1/4 acre lots, 38% imp, HSG B
	68.634			Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow, Tc2** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 11S: DA #2 OFFSITE



Summary for Subcatchment 12S: DA #3 WQ AREA

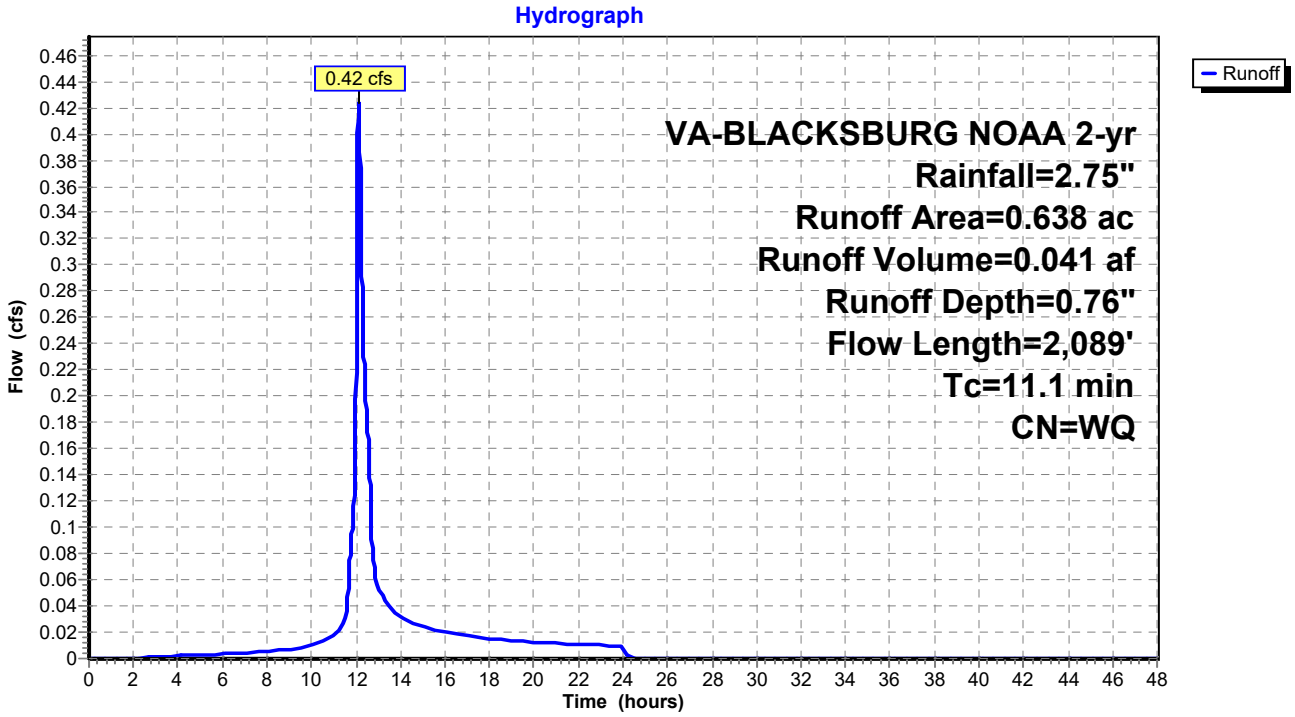
Runoff = 0.42 cfs @ 12.11 hrs, Volume= 0.041 af, Depth= 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 2-yr Rainfall=2.75"

Area (ac)	CN	Description
0.061	98	Paved roads w/curbs & sewers, HSG B
0.042	98	Paved roads w/curbs & sewers, HSG C
0.055	83	1/4 acre lots, 38% imp, HSG C
0.057	74	>75% Grass cover, Good, HSG C
0.423	61	>75% Grass cover, Good, HSG B
0.638		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 12S: DA #3 WQ AREA



Summary for Reach 6R: POND TO POA

Inflow Area = 96.000 ac, 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

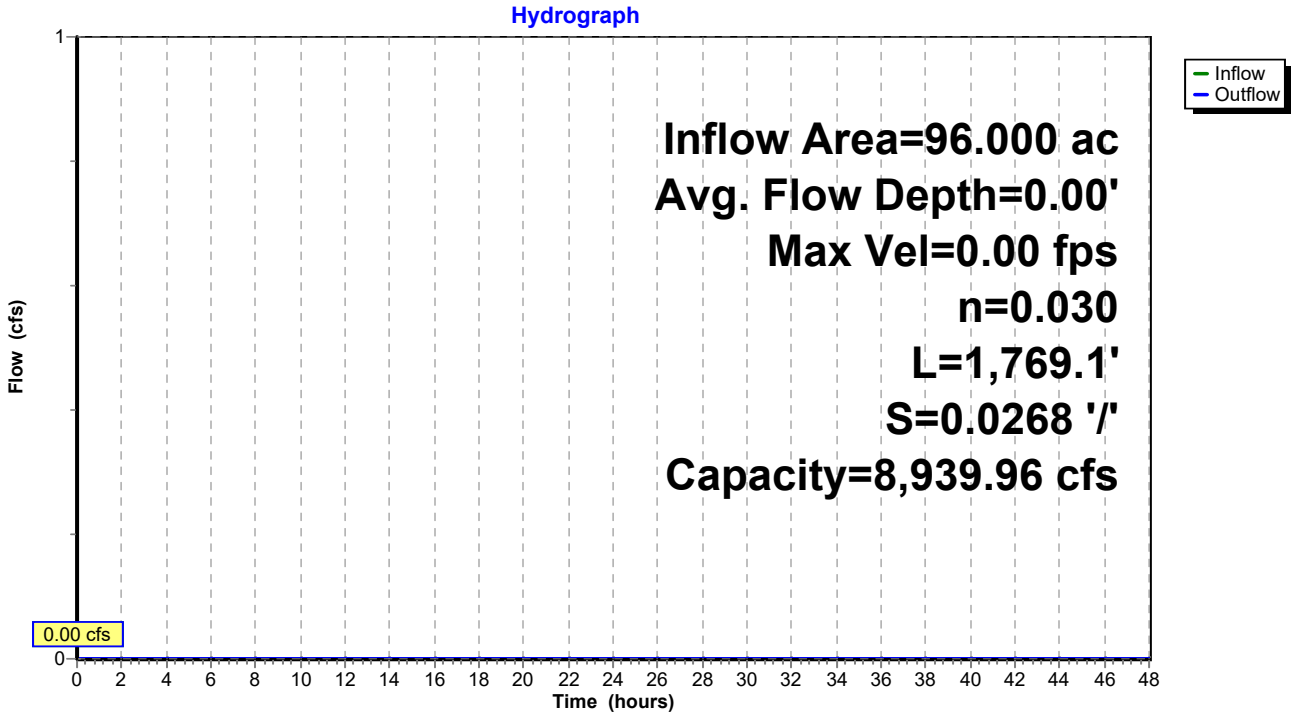
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.00' Flow Area= 425.0 sf, Capacity= 8,939.96 cfs

70.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 100.00'
Length= 1,769.1' Slope= 0.0268 '/'
Inlet Invert= 2,087.00', Outlet Invert= 2,039.65'

‡

Reach 6R: POND TO POA



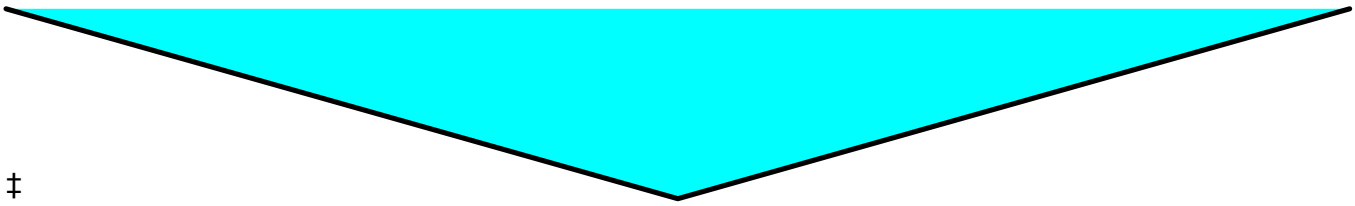
Summary for Reach 8R: REACH COMBINE

Inflow Area = 233.851 ac, Inflow Depth = 0.51" for 2-yr event
Inflow = 76.14 cfs @ 12.25 hrs, Volume= 9.963 af
Outflow = 73.90 cfs @ 12.31 hrs, Volume= 9.963 af, Atten= 3%, Lag= 3.7 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.90 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.45 fps, Avg. Travel Time= 6.3 min

Peak Storage= 13,926 cf @ 12.31 hrs
Average Depth at Peak Storage= 7.69' , Surface Width= 256.74'
Bank-Full Depth= 0.33' Flow Area= 1.8 sf, Capacity= 1.23 cfs

0.00' x 0.33' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 16.7 '/' Top Width= 11.02'
Length= 168.8' Slope= 0.0021 '/'
Inlet Invert= 2,036.90', Outlet Invert= 2,036.55'



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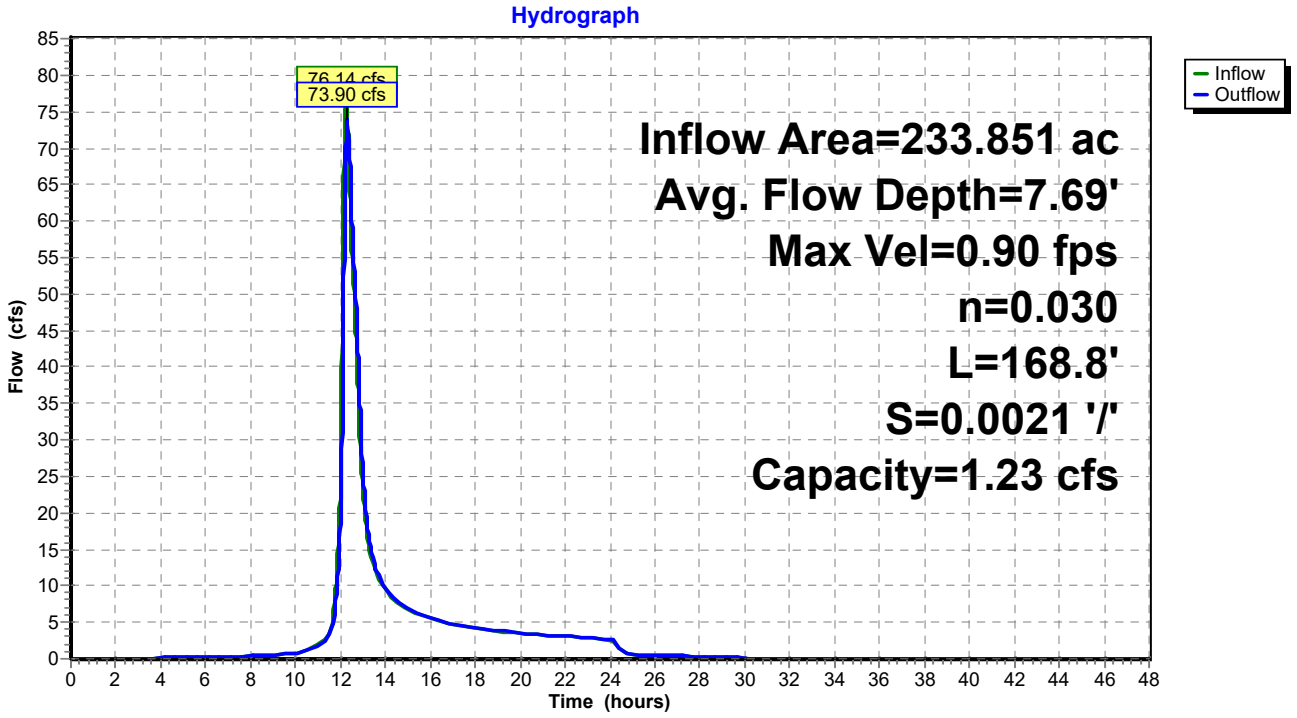
Reach 8R: REACH COMBINE



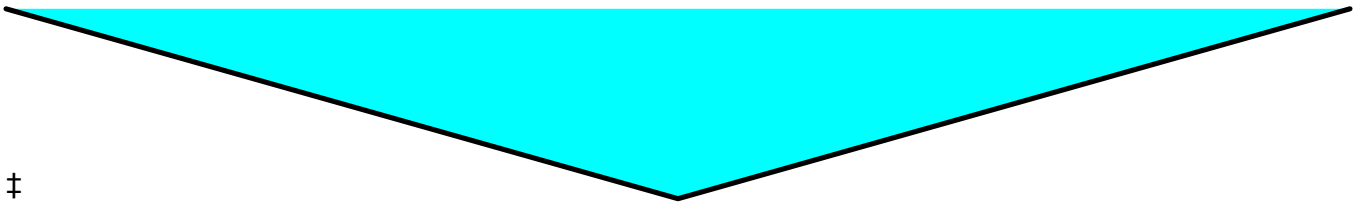
Summary for Reach 9R: DA 3 TO DA 2

Inflow Area = 45.185 ac, Inflow Depth = 1.16" for 2-yr event
Inflow = 55.74 cfs @ 12.11 hrs, Volume= 4.370 af
Outflow = 45.65 cfs @ 12.19 hrs, Volume= 4.370 af, Atten= 18%, Lag= 5.1 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.85 fps, Min. Travel Time= 6.3 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 21.0 min

Peak Storage= 17,314 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.60' , Surface Width= 47.94'
Bank-Full Depth= 0.35' Flow Area= 4.9 sf, Capacity= 15.84 cfs

0.00' x 0.35' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 40.0 '/' Top Width= 28.00'
Length= 1,462.0' Slope= 0.0435 '/'
Inlet Invert= 2,103.26', Outlet Invert= 2,039.65'



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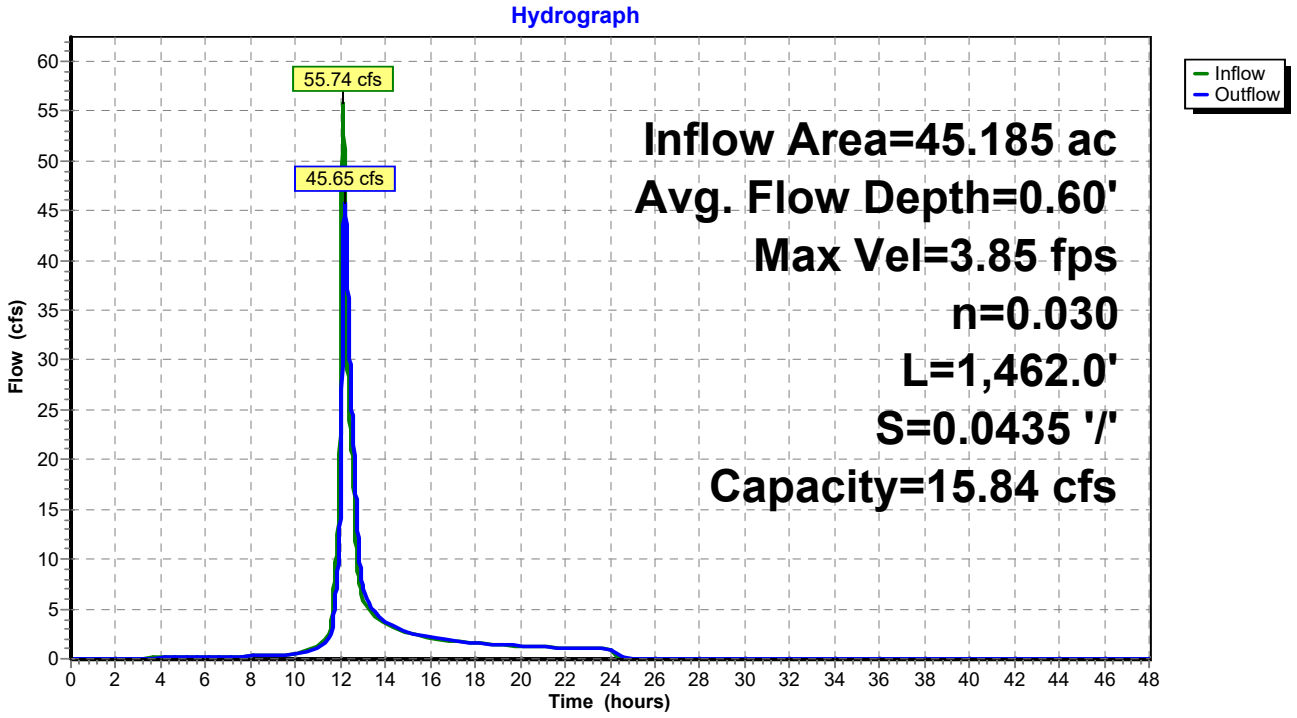
Reach 9R: DA 3 TO DA 2



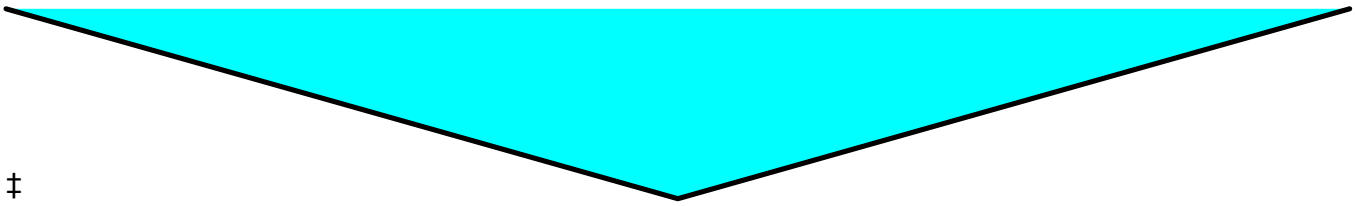
Summary for Reach 10R: REACH COMBINE 2

Inflow Area = 247.742 ac, Inflow Depth = 0.56" for 2-yr event
Inflow = 89.15 cfs @ 12.30 hrs, Volume= 11.534 af
Outflow = 88.91 cfs @ 12.32 hrs, Volume= 11.534 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.94 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 4.4 min

Peak Storage= 6,239 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.73' , Surface Width= 129.93'
Bank-Full Depth= 0.59' Flow Area= 30.8 sf, Capacity= 54.02 cfs

0.00' x 0.59' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 88.5 '/' Top Width= 104.43'
Length= 136.3' Slope= 0.0064 '/'
Inlet Invert= 2,036.75', Outlet Invert= 2,035.88'



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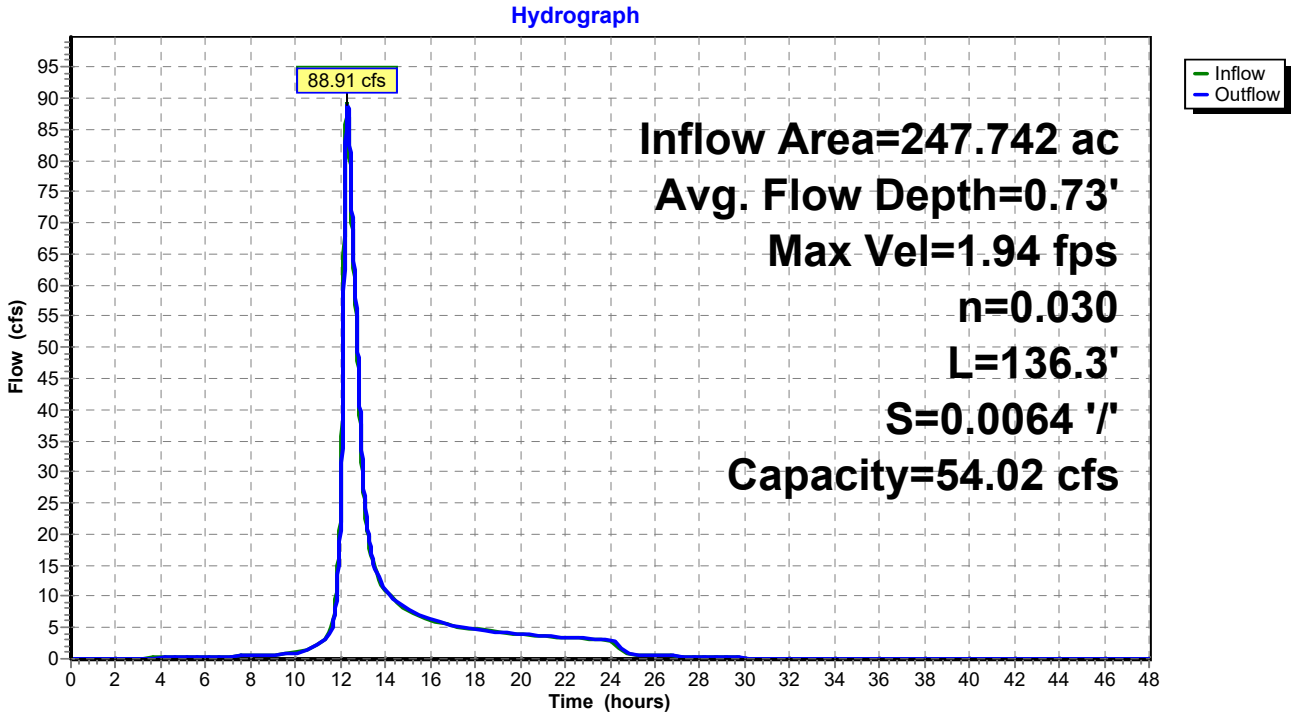
Reach 10R: REACH COMBINE 2



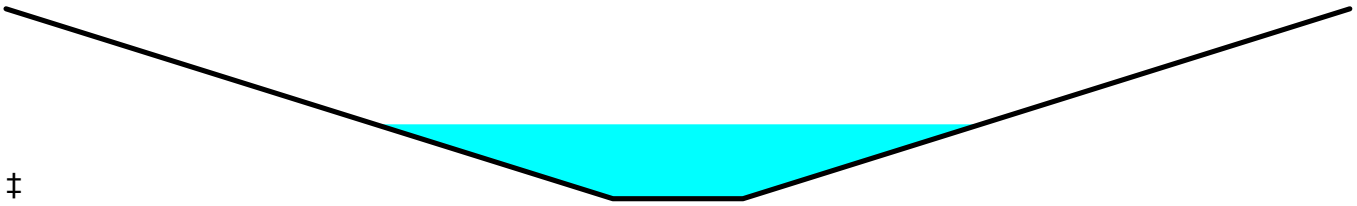
Summary for Reach 11R: DA 4 TO POA

Inflow Area = 13.891 ac, Inflow Depth = 1.36" for 2-yr event
Inflow = 16.15 cfs @ 12.22 hrs, Volume= 1.571 af
Outflow = 15.77 cfs @ 12.26 hrs, Volume= 1.571 af, Atten= 2%, Lag= 2.3 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.77 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 2.20 fps, Avg. Travel Time= 8.9 min

Peak Storage= 2,740 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.55' , Surface Width= 6.99'
Bank-Full Depth= 1.40' Flow Area= 11.9 sf, Capacity= 140.25 cfs

1.50' x 1.40' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 5.0 '/' Top Width= 15.50'
Length= 1,176.1' Slope= 0.0825 '/'
Inlet Invert= 2,133.71', Outlet Invert= 2,036.73'



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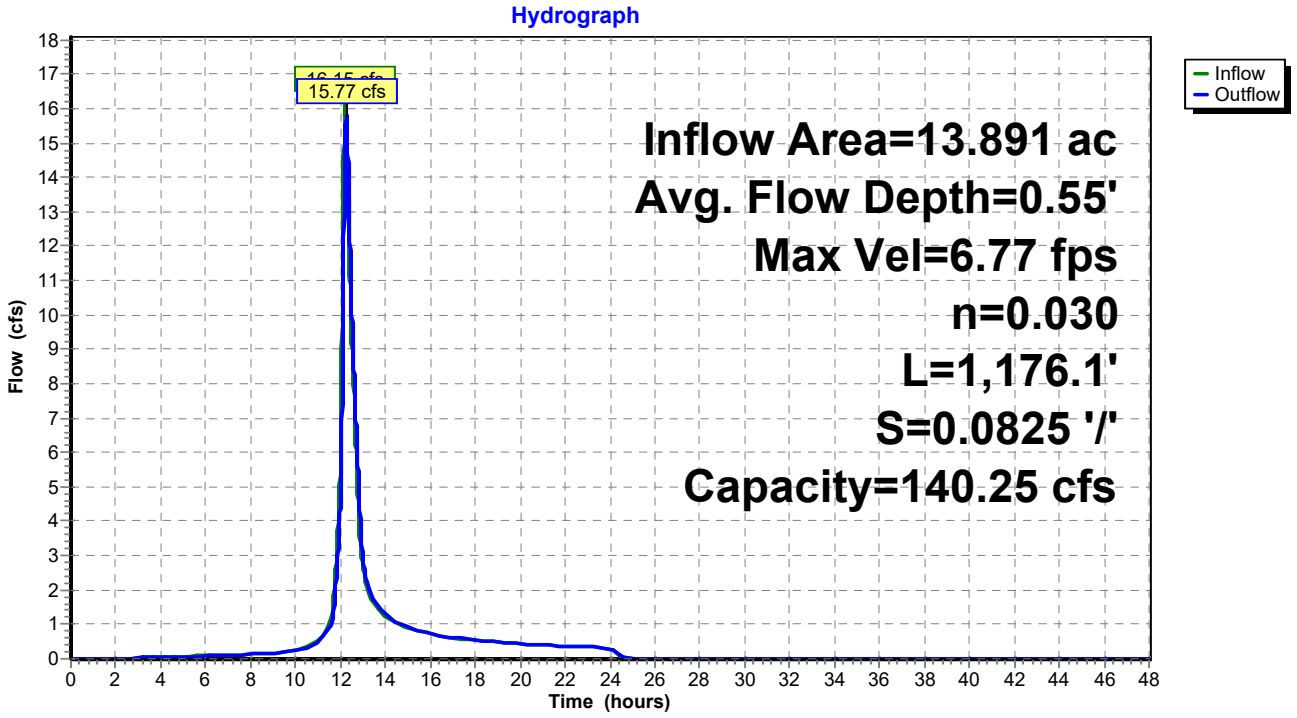
Reach 11R: DA 4 TO POA



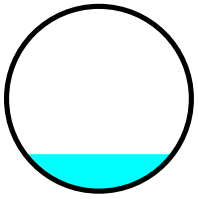
Summary for Reach 12R: DI-7

Inflow Area = 24.032 ac, Inflow Depth = 0.68" for 2-yr event
Inflow = 6.24 cfs @ 12.77 hrs, Volume= 1.361 af
Outflow = 6.24 cfs @ 12.77 hrs, Volume= 1.361 af, Atten= 0%, Lag= 0.3 min

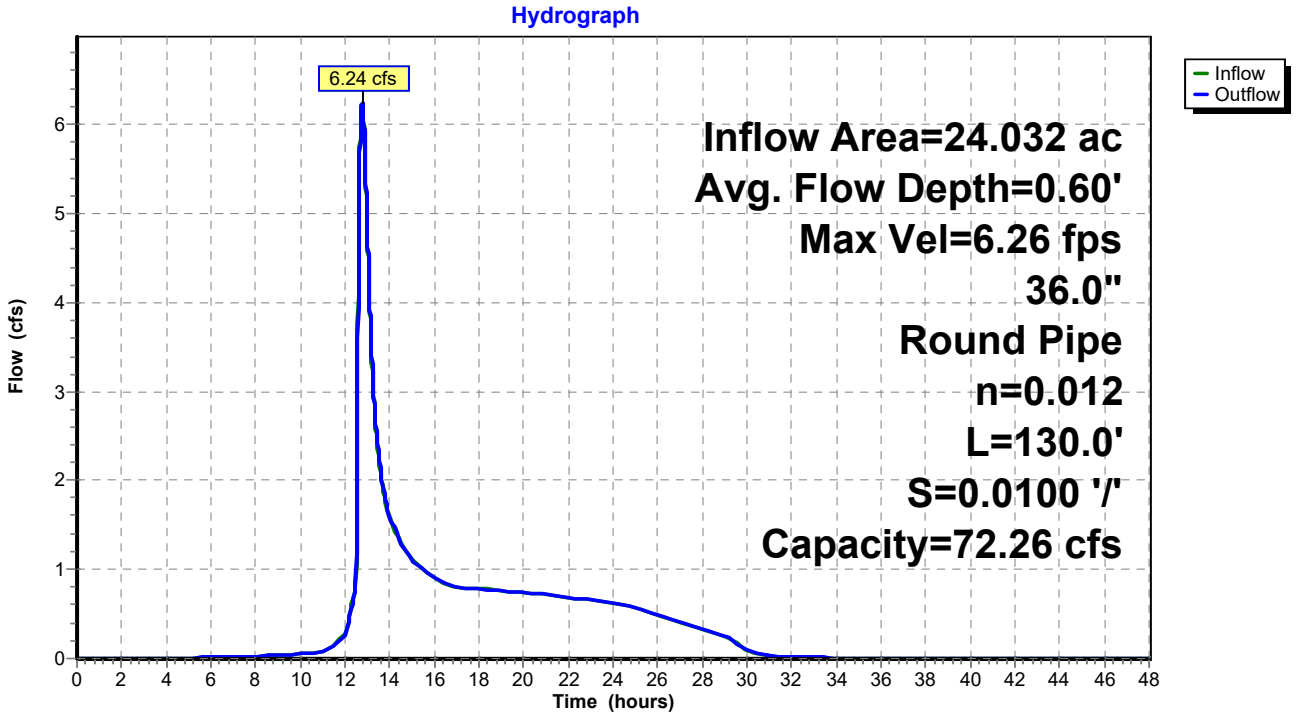
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.26 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.97 fps, Avg. Travel Time= 1.1 min

Peak Storage= 130 cf @ 12.77 hrs
Average Depth at Peak Storage= 0.60' , Surface Width= 2.39'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 72.26 cfs

36.0" Round Pipe
n= 0.012
Length= 130.0' Slope= 0.0100 '/'
Inlet Invert= 2,061.30', Outlet Invert= 2,060.00'



Reach 12R: DI-7



Summary for Pond 3P: NSP POND 1

Inflow Area = 96.000 ac, Inflow Depth = 0.96" for 2-yr event
Inflow = 60.25 cfs @ 12.42 hrs, Volume= 7.681 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 8.61' @ 25.75 hrs Storage= 334,598 cf

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

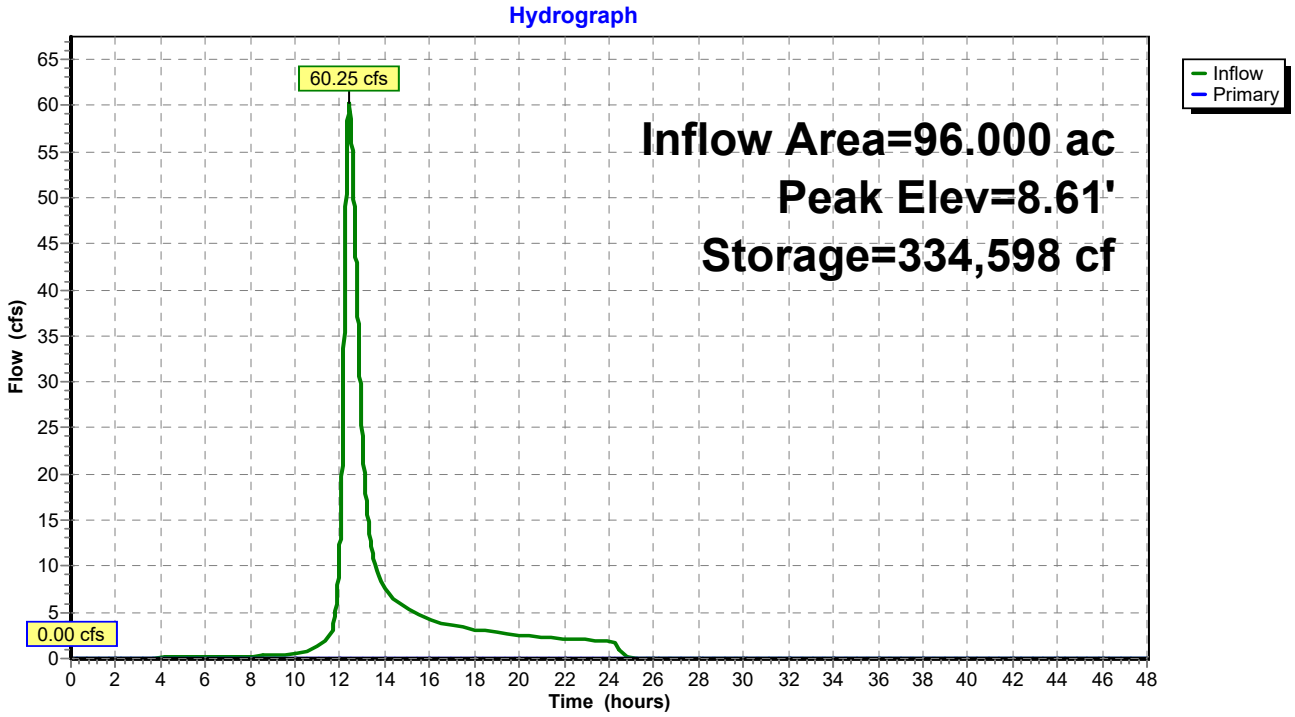
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	392,320 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	0	0
1.25	2,002	2,002
3.25	24,089	26,091
5.25	67,305	93,396
7.25	119,692	213,088
9.25	179,232	392,320

Device	Routing	Invert	Outlet Devices
#1	Primary	2,073.87'	**48.0" Round Culvert** L= 110.4' Ke= 0.600 Inlet / Outlet Invert= 2,073.87' / 2,071.85' S= 0.0183 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	2,174.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	2,080.27'	**72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	2,082.20'	**30.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: NSP POND 1



Summary for Pond 8P: SWM

Inflow Area = 24.032 ac, Inflow Depth = 0.68" for 2-yr event
Inflow = 10.54 cfs @ 12.36 hrs, Volume= 1.361 af
Outflow = 6.24 cfs @ 12.77 hrs, Volume= 1.361 af, Atten= 41%, Lag= 24.3 min
Primary = 6.24 cfs @ 12.77 hrs, Volume= 1.361 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 2,064.67' @ 12.77 hrs Surf.Area= 7,537 sf Storage= 17,634 cf

Plug-Flow detention time= 179.5 min calculated for 1.361 af (100% of inflow)
Center-of-Mass det. time= 179.5 min (1,064.8 - 885.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,061.65'	93,017 cf	**Custom Stage Data (Prismatic)**Listed below

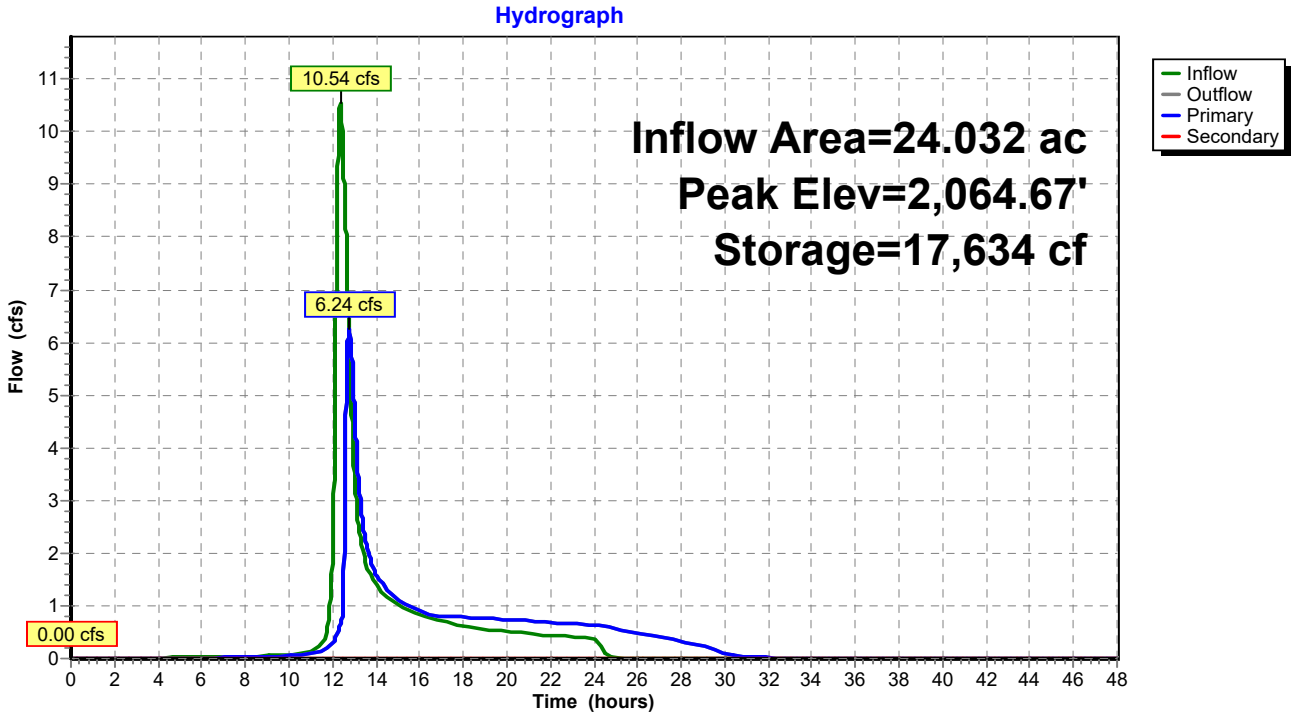
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,061.65	0	0	0
2,062.00	4,695	822	822
2,065.00	7,885	18,870	19,692
2,070.00	15,094	57,448	77,139
2,071.00	16,661	15,878	93,017

Device	Routing	Invert	Outlet Devices
#1	Primary	2,061.65'	**18.0" Round RCP_Round 18"** L= 55.0' Ke= 0.200 Inlet / Outlet Invert= 2,061.65' / 2,061.30' S= 0.0064 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	2,061.65'	**4.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	2,064.10'	**24.0" W x 6.0" H Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	2,064.67'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	2,068.25'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 2.75 Width (feet) 15.00 31.50

Primary OutFlow Max=6.22 cfs @ 12.77 hrs HW=2,064.67' (Free Discharge)
└**1=RCP_Round 18"** (Passes 6.22 cfs of 13.53 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.90 cfs @ 8.11 fps)
  ├**3=Orifice/Grate** (Orifice Controls 5.31 cfs @ 2.66 fps)
  └**4=Orifice/Grate** (Weir Controls 0.01 cfs @ 0.17 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,061.65' (Free Discharge)
└**5=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 8P: SWM

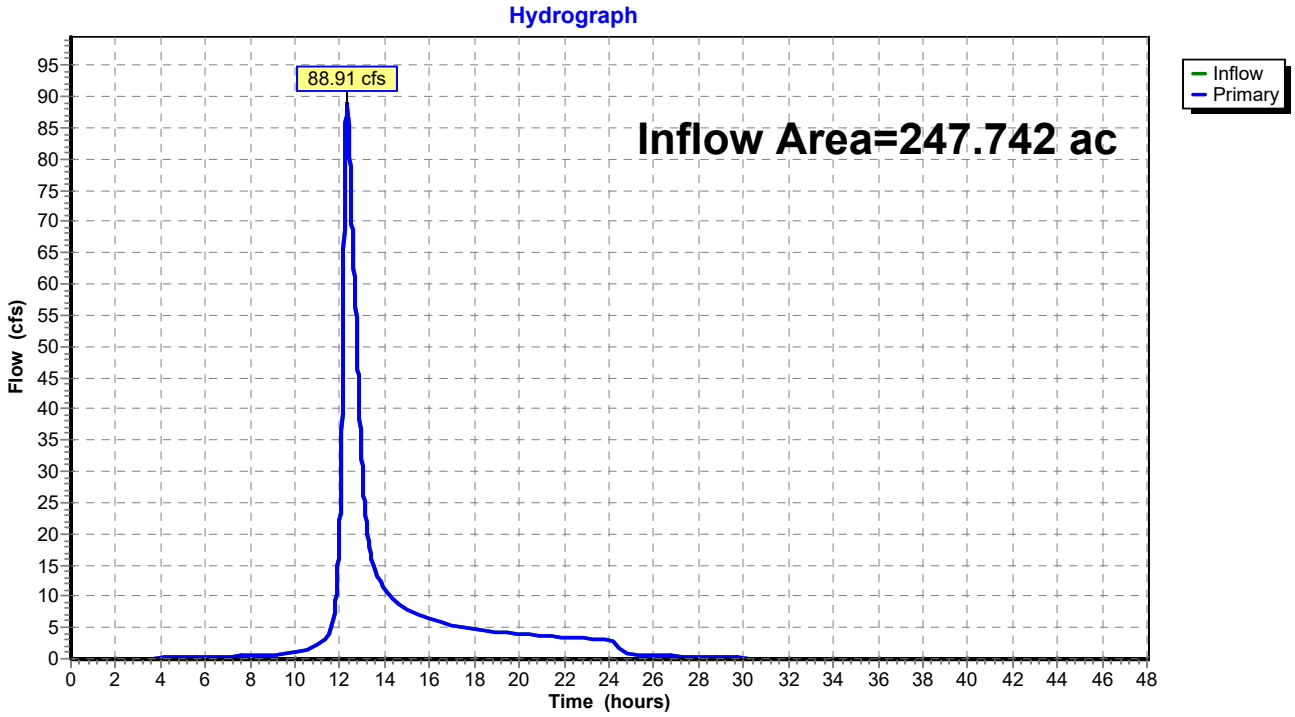

Hydrograph
Inflow Area=24.032 ac
Peak Elev=2,064.67'
Storage=17,634 cf
10.54 cfs
6.24 cfs
0.00 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 1 2 3 4 5 6 7 8 9 10 11

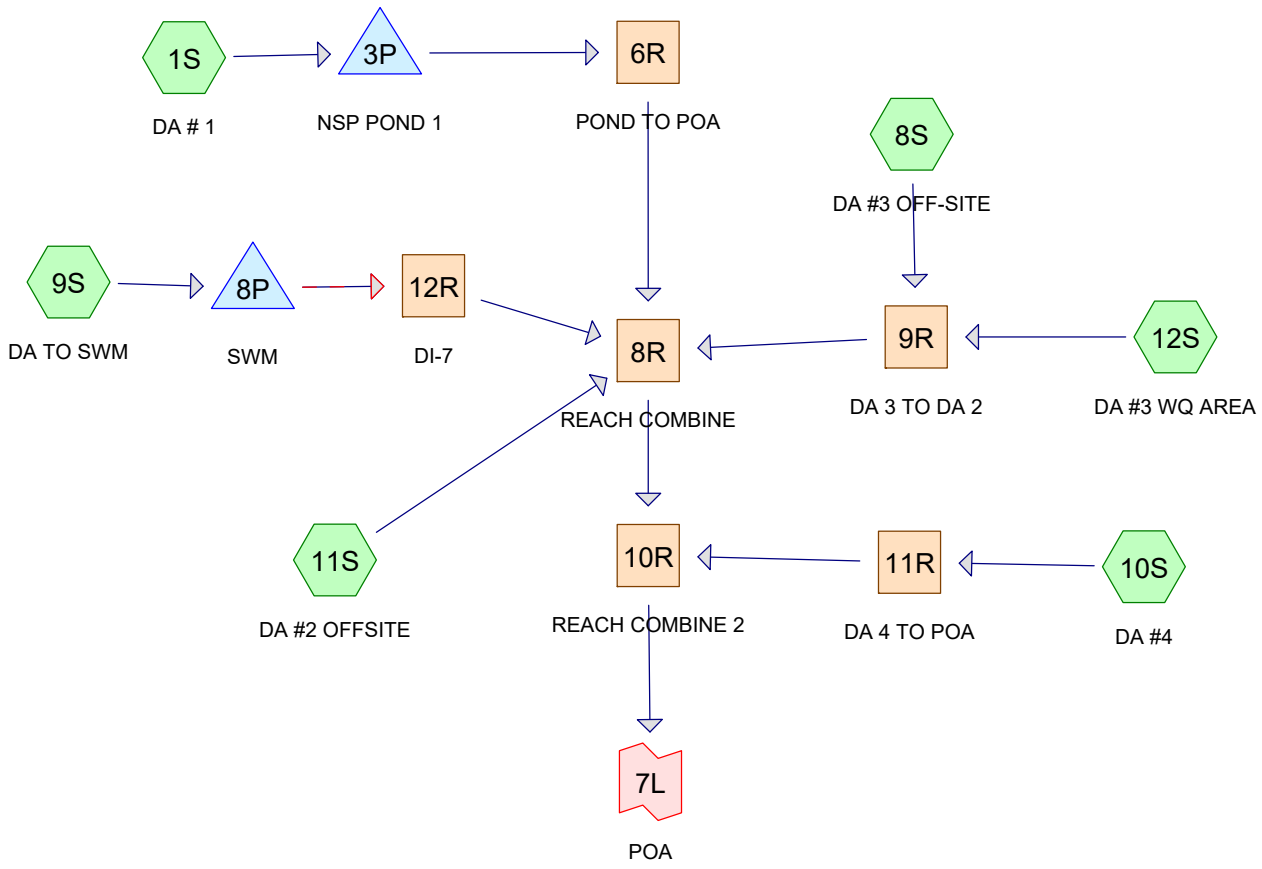
Summary for Link 7L: POA

Inflow Area = 247.742 ac, Inflow Depth = 0.56" for 2-yr event
Inflow = 88.91 cfs @ 12.32 hrs, Volume= 11.534 af
Primary = 88.91 cfs @ 12.32 hrs, Volume= 11.534 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 7L: POA





Subcat Reach Pond Link

Routing Diagram for Post-10

Prepared by Balzer & Associates, Printed 7/29/2022

Summary for Subcatchment 1S: DA # 1

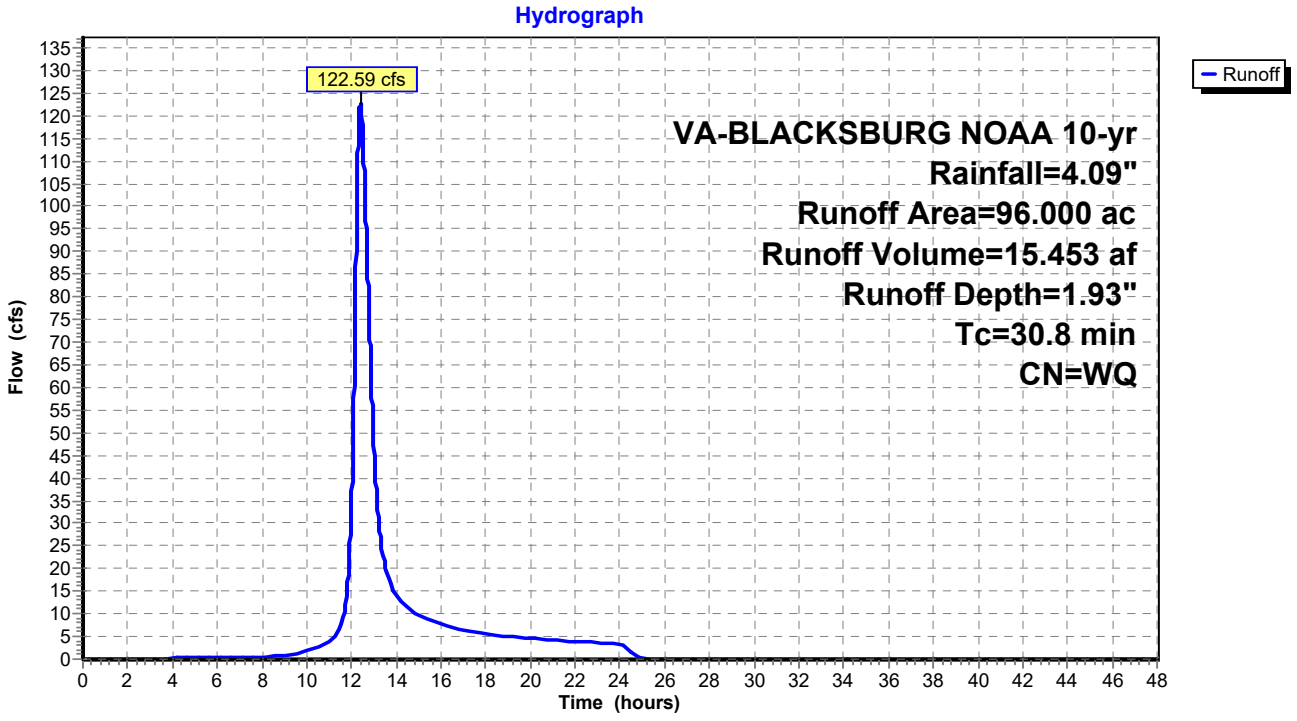
Runoff = 122.59 cfs @ 12.42 hrs, Volume= 15.453 af, Depth= 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 10-yr Rainfall=4.09"

Area (ac)	CN	Description
5.080	98	Roofs, HSG C
3.100	84	50-75% Grass cover, Fair, HSG D
22.720	79	50-75% Grass cover, Fair, HSG C
28.800	69	50-75% Grass cover, Fair, HSG B
1.000	86	1/3 acre lots, 30% imp, HSG D
10.400	81	1/3 acre lots, 30% imp, HSG C
6.400	72	1/3 acre lots, 30% imp, HSG B
10.300	83	1/4 acre lots, 38% imp, HSG C
8.200	75	1/4 acre lots, 38% imp, HSG B
96.000		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8					**Direct Entry, FROM NSP CALCS**

Subcatchment 1S: DA # 1



Summary for Subcatchment 8S: DA #3 OFF-SITE

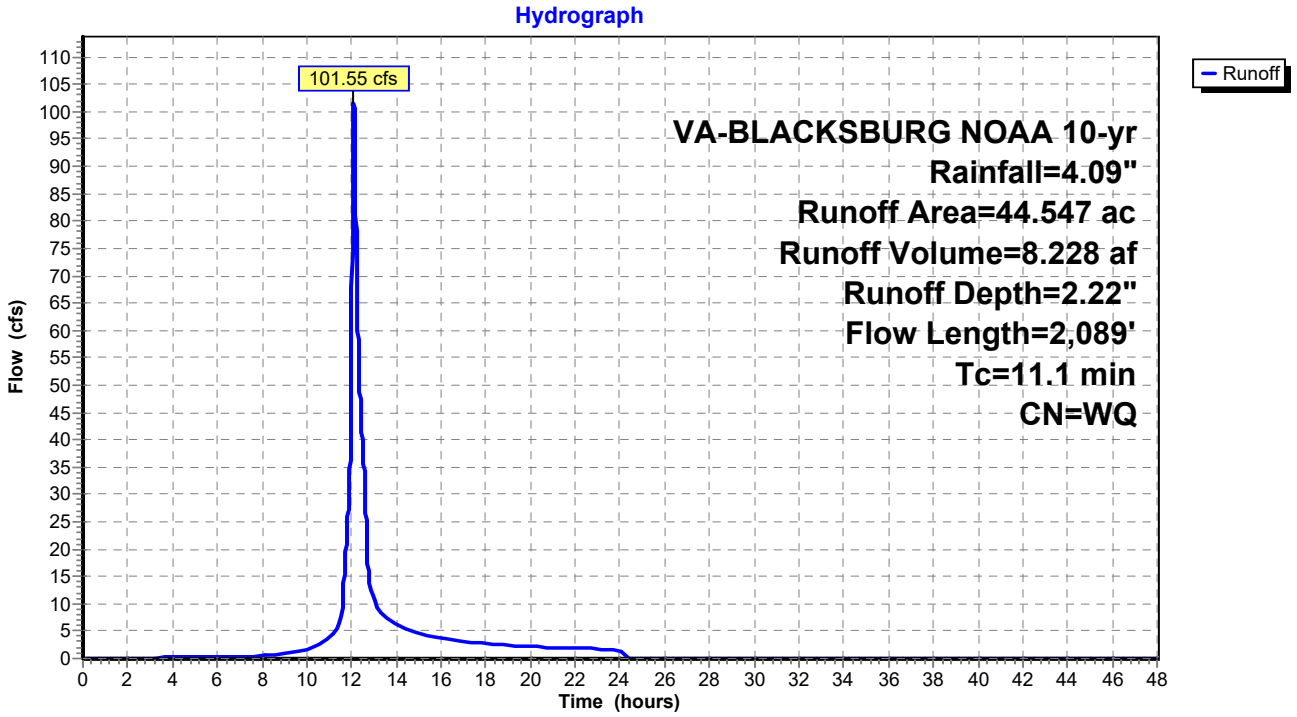
Runoff = 101.55 cfs @ 12.11 hrs, Volume= 8.228 af, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 10-yr Rainfall=4.09"

Area (ac)	CN	Description
0.358	98	Paved roads w/curbs & sewers, HSG B
4.733	98	Paved roads w/curbs & sewers, HSG C
5.726	70	1/2 acre lots, 25% imp, HSG B
28.476	80	1/2 acre lots, 25% imp, HSG C
0.877	72	1/3 acre lots, 30% imp, HSG B
3.986	81	1/3 acre lots, 30% imp, HSG C
0.391	79	1 acre lots, 20% imp, HSG C
44.547		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 8S: DA #3 OFF-SITE



Summary for Subcatchment 9S: DA TO SWM

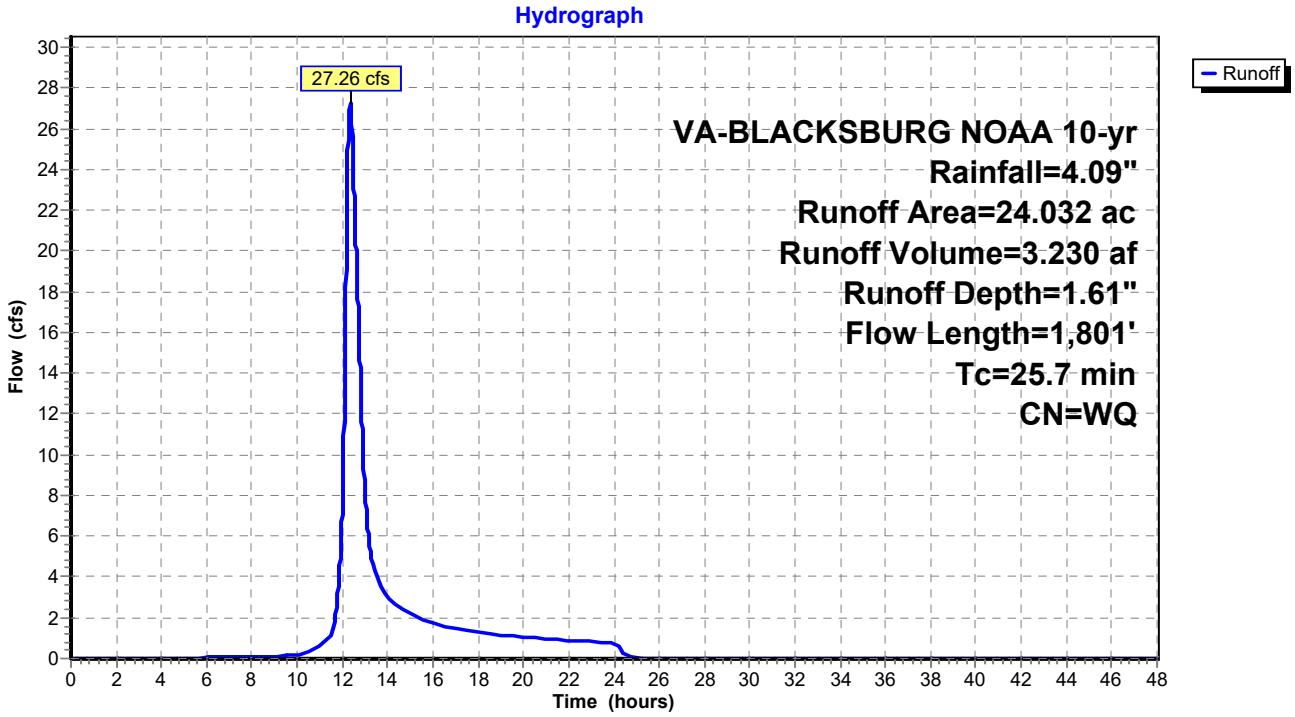
Runoff = 27.26 cfs @ 12.33 hrs, Volume= 3.230 af, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 10-yr Rainfall=4.09"

	Area (ac)	CN	Description
	0.000	98	Paved parking, HSG A
	0.569	98	Paved parking, HSG B
	0.228	98	Paved parking, HSG C
	0.000	39	>75% Grass cover, Good, HSG A
	1.577	61	>75% Grass cover, Good, HSG B
	0.713	74	>75% Grass cover, Good, HSG C
	2.480	75	1/4 acre lots, 38% imp, HSG B
	0.015	83	1/4 acre lots, 38% imp, HSG C
	1.630	72	1/3 acre lots, 30% imp, HSG B
	0.330	81	1/3 acre lots, 30% imp, HSG C
	0.000	70	1/2 acre lots, 25% imp, HSG B
	1.440	80	1/2 acre lots, 25% imp, HSG C
	0.650	68	1 acre lots, 20% imp, HSG B
	2.360	79	1 acre lots, 20% imp, HSG C
*	4.900	72	DA B (SEE VRRM)
*	2.100	73	DA C (SEE VRRM)
*	3.530	65	DA D (SEE VRRM)
*	1.510	72	DA E (SEE VRRM)
	24.032		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 9S: DA TO SWM



Summary for Subcatchment 10S: DA #4

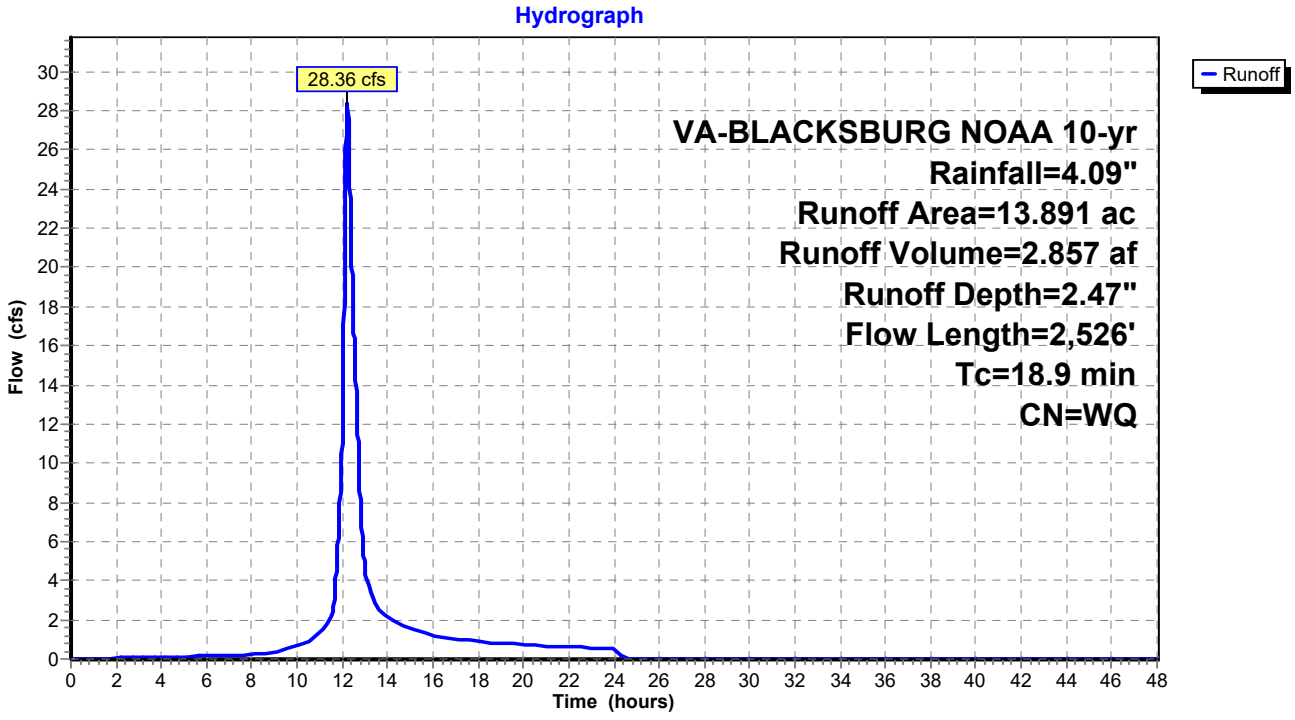
Runoff = 28.36 cfs @ 12.22 hrs, Volume= 2.857 af, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 10-yr Rainfall=4.09"

Area (ac)	CN	Description
2.555	98	Paved roads w/curbs & sewers, HSG C
7.333	81	1/3 acre lots, 30% imp, HSG C
3.803	80	1/2 acre lots, 25% imp, HSG C
0.200	70	1/2 acre lots, 25% imp, HSG B
13.891		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	95	0.0630	0.25		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
9.9	1,004	0.0478	1.70	5.26	**Channel Flow, Tc2** Area= 3.1 sf Perim= 50.0' r= 0.06' n= 0.030 Earth, grassed & winding
2.6	1,427	0.0134	9.03	28.37	**Pipe Channel, CMP_Round 24"** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
18.9	2,526	Total			

Subcatchment 10S: DA #4



Summary for Subcatchment 11S: DA #2 OFFSITE

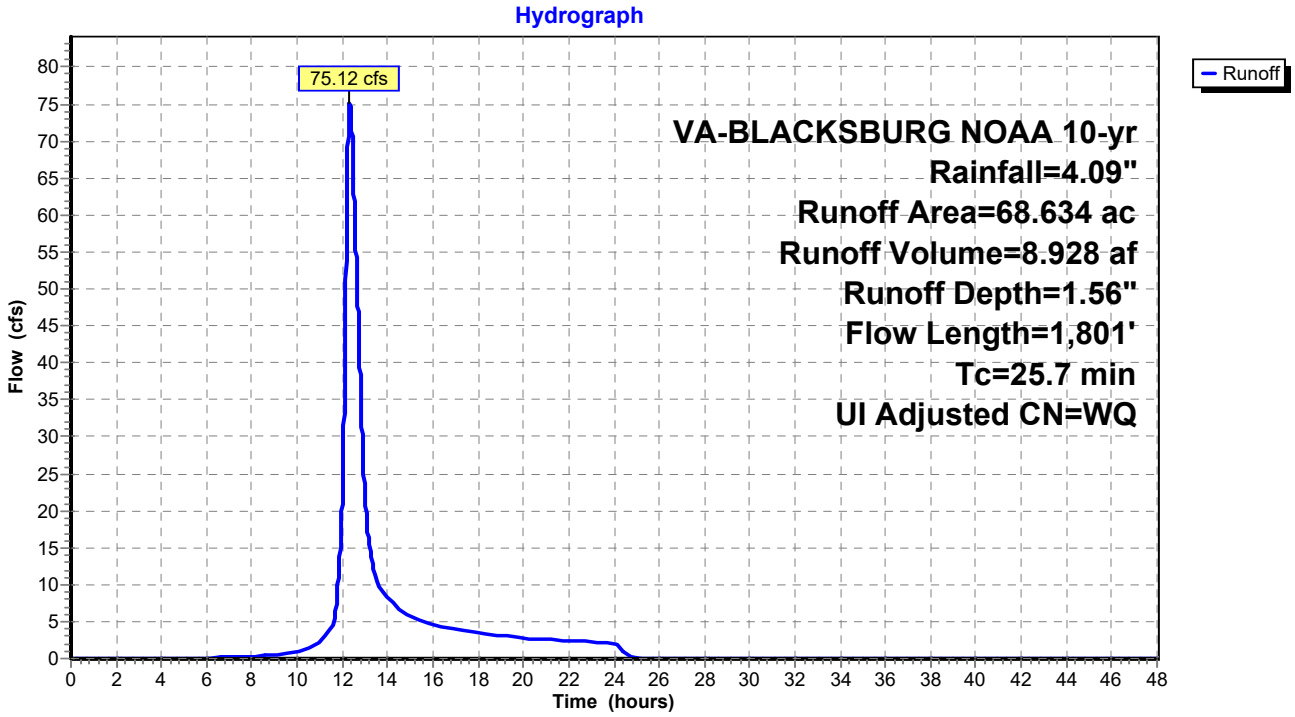
Runoff = 75.12 cfs @ 12.33 hrs, Volume= 8.928 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 10-yr Rainfall=4.09"

	Area (ac)	CN	Adj	Description
	10.040	83	83	Fallow, crop residue, Good, HSG B
	1.105	88	88	Fallow, crop residue, Good, HSG C
*	0.030	98	98	Unconnected pavement, HSG A
	1.290	98	98	Unconnected pavement, HSG C
	0.380	98	98	Unconnected pavement, HSG B
	1.415	70	70	1/2 acre lots, 25% imp, HSG B
	5.343	80	80	1/2 acre lots, 25% imp, HSG C
	0.010	72	72	1/3 acre lots, 30% imp, HSG B
	1.370	81	81	1/3 acre lots, 30% imp, HSG C
	0.180	68	68	1 acre lots, 20% imp, HSG B
	0.038	79	79	1 acre lots, 20% imp, HSG C
	0.110	70	70	Woods, Good, HSG C
	1.300	55	55	Woods, Good, HSG B
	5.330	39	39	>75% Grass cover, Good, HSG A
	8.660	61	61	>75% Grass cover, Good, HSG B
	11.790	74	74	>75% Grass cover, Good, HSG C
	6.180	58	58	Woods/grass comb., Good, HSG B
	5.140	72	72	Woods/grass comb., Good, HSG C
	2.852	72	72	Dirt roads, HSG A
	1.750	82	82	Dirt roads, HSG B
	1.521	87	87	Dirt roads, HSG C
*	2.210	71	71	DA A (SEE VRRM)
	0.590	75	75	1/4 acre lots, 38% imp, HSG B
	68.634			Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow, Tc2** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 11S: DA #2 OFFSITE



Summary for Subcatchment 12S: DA #3 WQ AREA

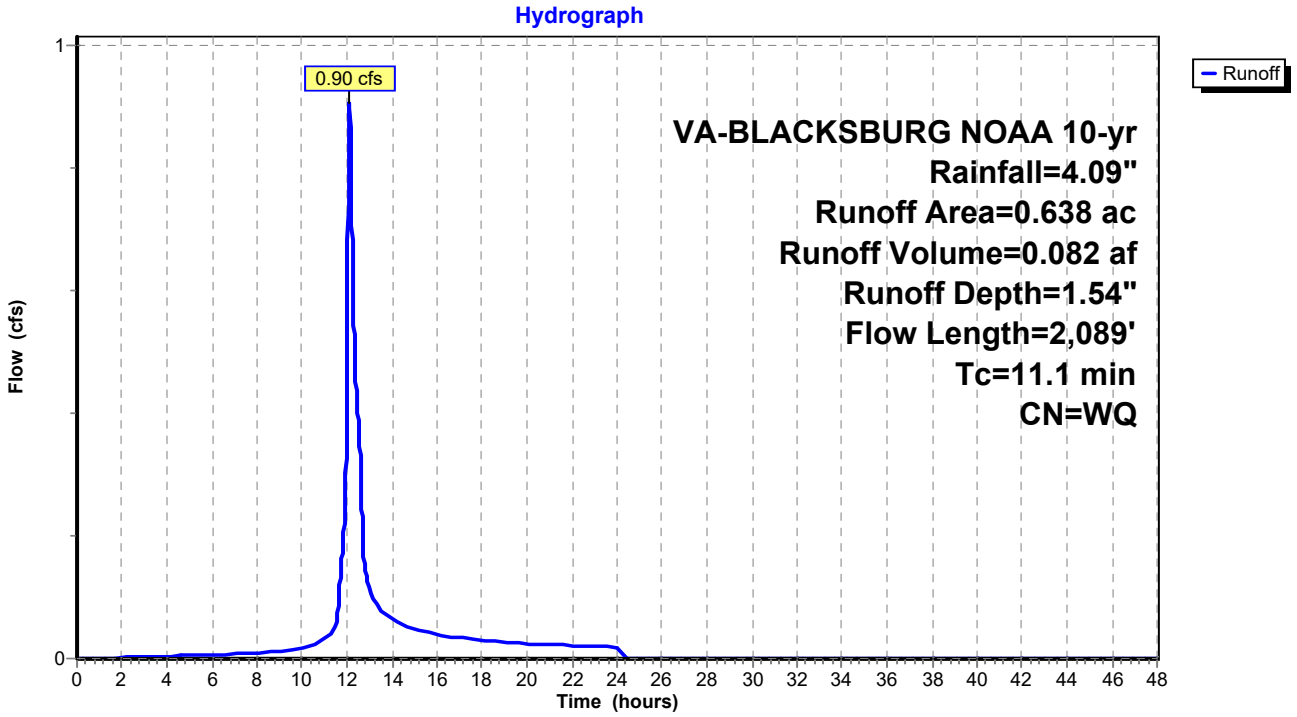
Runoff = 0.90 cfs @ 12.11 hrs, Volume= 0.082 af, Depth= 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 10-yr Rainfall=4.09"

Area (ac)	CN	Description
0.061	98	Paved roads w/curbs & sewers, HSG B
0.042	98	Paved roads w/curbs & sewers, HSG C
0.055	83	1/4 acre lots, 38% imp, HSG C
0.057	74	>75% Grass cover, Good, HSG C
0.423	61	>75% Grass cover, Good, HSG B
0.638		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 12S: DA #3 WQ AREA



Summary for Reach 6R: POND TO POA

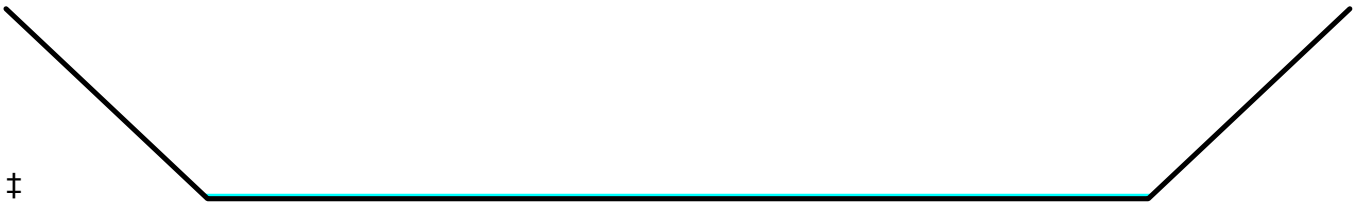
Inflow Area = 96.000 ac, Inflow Depth = 0.81" for 10-yr event
Inflow = 35.24 cfs @ 13.18 hrs, Volume= 6.448 af
Outflow = 19.60 cfs @ 13.54 hrs, Volume= 6.448 af, Atten= 44%, Lag= 21.9 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.12 fps, Min. Travel Time= 13.9 min
Avg. Velocity = 1.29 fps, Avg. Travel Time= 22.9 min

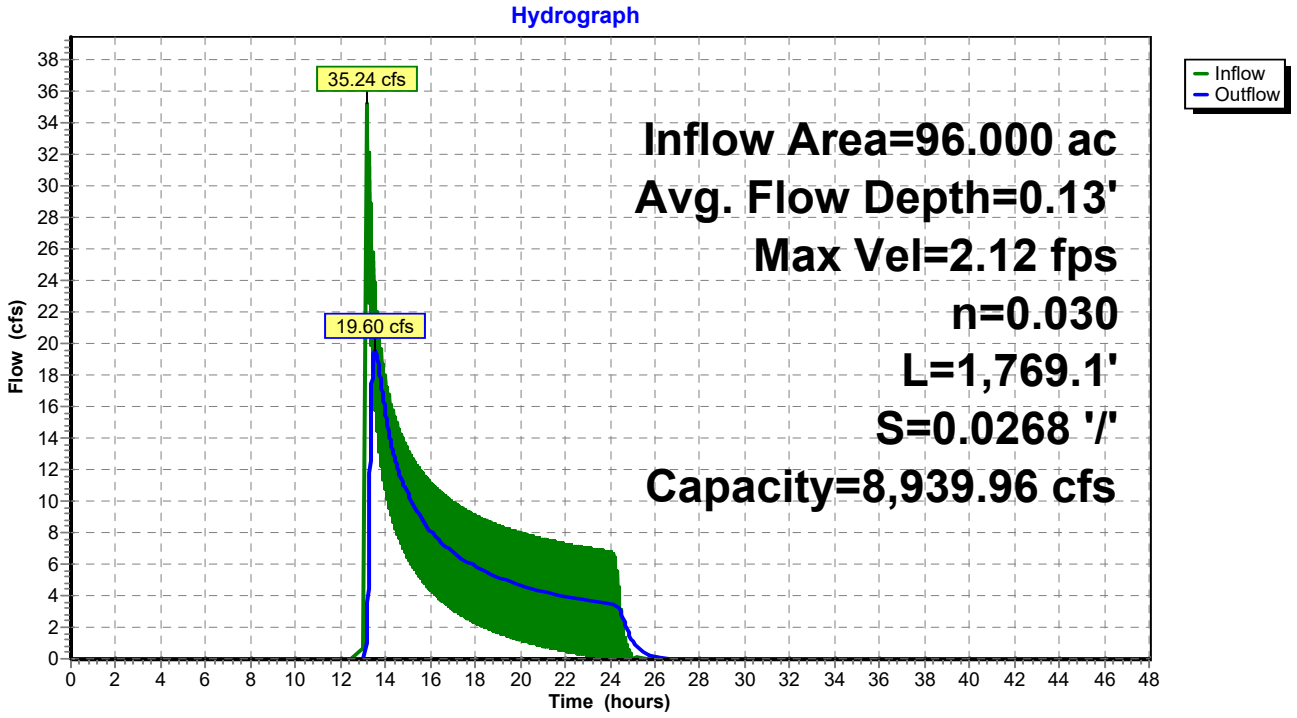
Peak Storage= 16,333 cf @ 13.54 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 70.79'
Bank-Full Depth= 5.00' Flow Area= 425.0 sf, Capacity= 8,939.96 cfs

70.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 100.00'
Length= 1,769.1' Slope= 0.0268 '/'
Inlet Invert= 2,087.00', Outlet Invert= 2,039.65'

‡



Reach 6R: POND TO POA



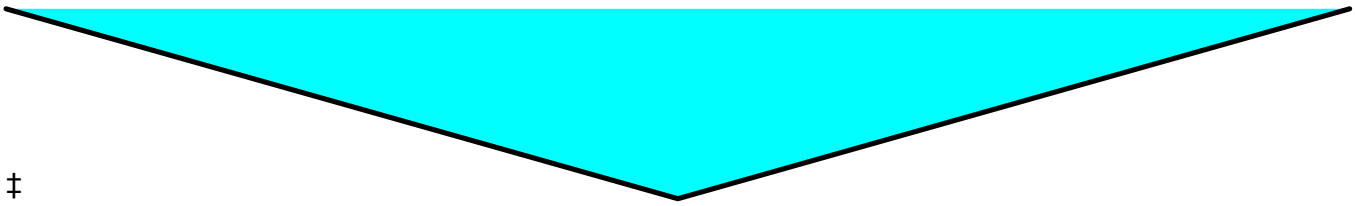
Summary for Reach 8R: REACH COMBINE

Inflow Area = 233.851 ac, Inflow Depth = 1.38" for 10-yr event
Inflow = 165.57 cfs @ 12.26 hrs, Volume= 26.916 af
Outflow = 159.71 cfs @ 12.33 hrs, Volume= 26.916 af, Atten= 4%, Lag= 3.9 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.90 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.51 fps, Avg. Travel Time= 5.5 min

Peak Storage= 30,010 cf @ 12.33 hrs
Average Depth at Peak Storage= 16.38' , Surface Width= 546.93'
Bank-Full Depth= 0.33' Flow Area= 1.8 sf, Capacity= 1.23 cfs

0.00' x 0.33' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 16.7 '/' Top Width= 11.02'
Length= 168.8' Slope= 0.0021 '/'
Inlet Invert= 2,036.90', Outlet Invert= 2,036.55'



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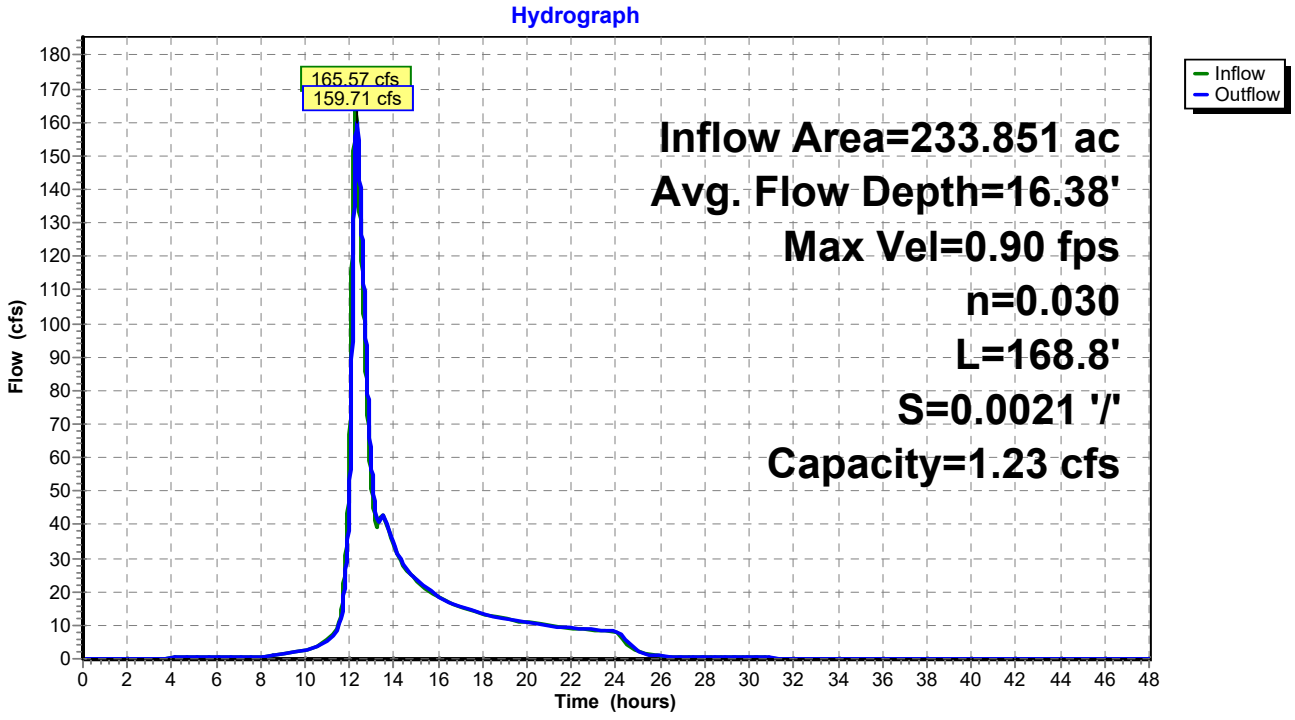
Reach 8R: REACH COMBINE



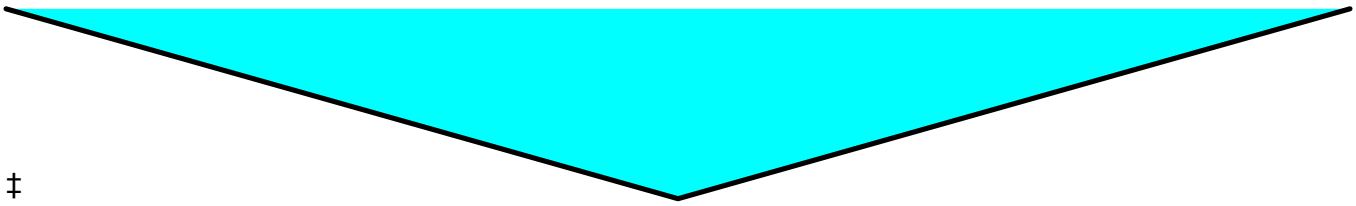
Summary for Reach 9R: DA 3 TO DA 2

Inflow Area = 45.185 ac, Inflow Depth = 2.21" for 10-yr event
Inflow = 102.45 cfs @ 12.11 hrs, Volume= 8.310 af
Outflow = 85.12 cfs @ 12.19 hrs, Volume= 8.310 af, Atten= 17%, Lag= 5.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.05 fps, Min. Travel Time= 6.0 min
Avg. Velocity = 1.34 fps, Avg. Travel Time= 18.2 min

Peak Storage= 30,748 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.93' , Surface Width= 74.32'
Bank-Full Depth= 0.35' Flow Area= 4.9 sf, Capacity= 15.84 cfs

0.00' x 0.35' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 40.0 '/' Top Width= 28.00'
Length= 1,462.0' Slope= 0.0435 '/'
Inlet Invert= 2,103.26', Outlet Invert= 2,039.65'



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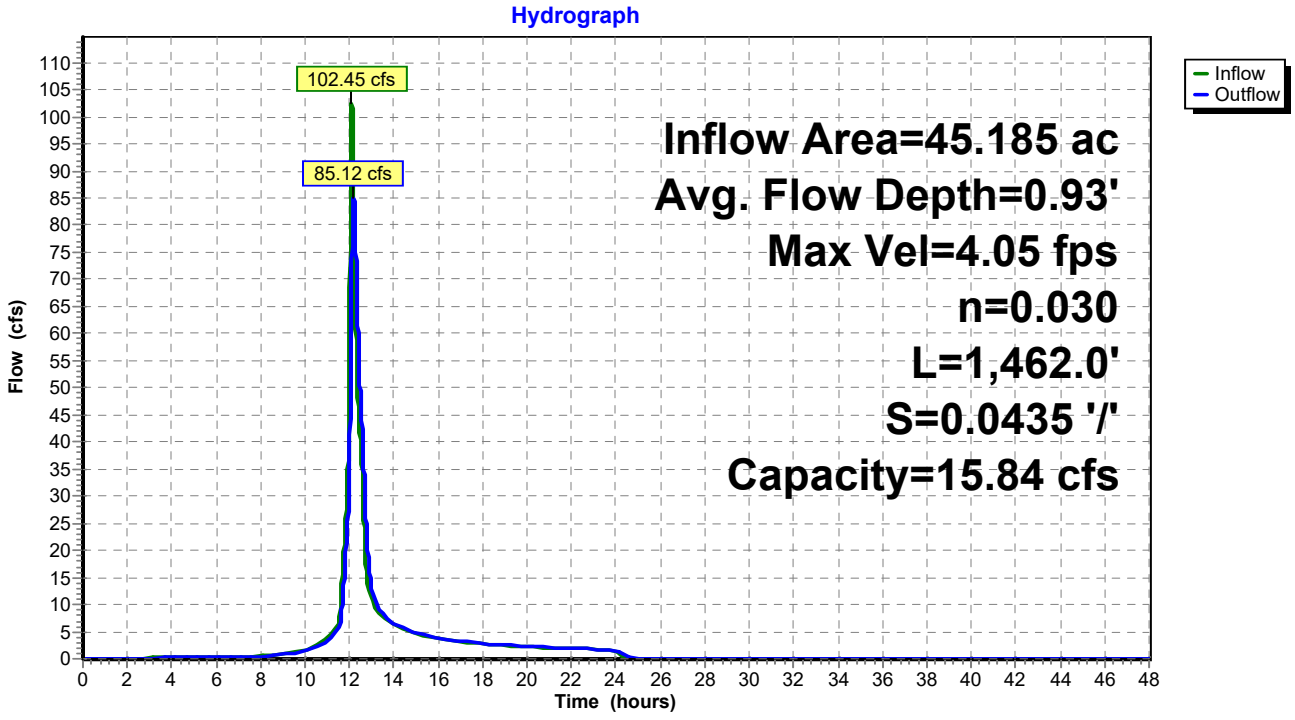
Reach 9R: DA 3 TO DA 2



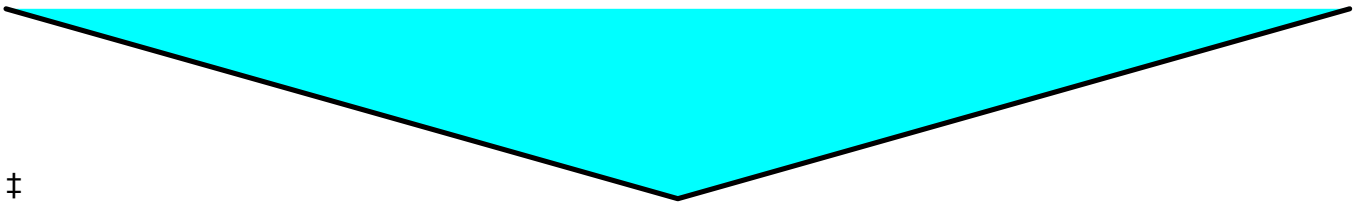
Summary for Reach 10R: REACH COMBINE 2

Inflow Area = 247.742 ac, Inflow Depth = 1.44" for 10-yr event
Inflow = 185.75 cfs @ 12.31 hrs, Volume= 29.774 af
Outflow = 185.22 cfs @ 12.33 hrs, Volume= 29.774 af, Atten= 0%, Lag= 1.1 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.13 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 3.5 min

Peak Storage= 11,872 cf @ 12.33 hrs
Average Depth at Peak Storage= 1.13' , Surface Width= 200.33'
Bank-Full Depth= 0.59' Flow Area= 30.8 sf, Capacity= 54.02 cfs

0.00' x 0.59' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 88.5 '/' Top Width= 104.43'
Length= 136.3' Slope= 0.0064 '/'
Inlet Invert= 2,036.75', Outlet Invert= 2,035.88'



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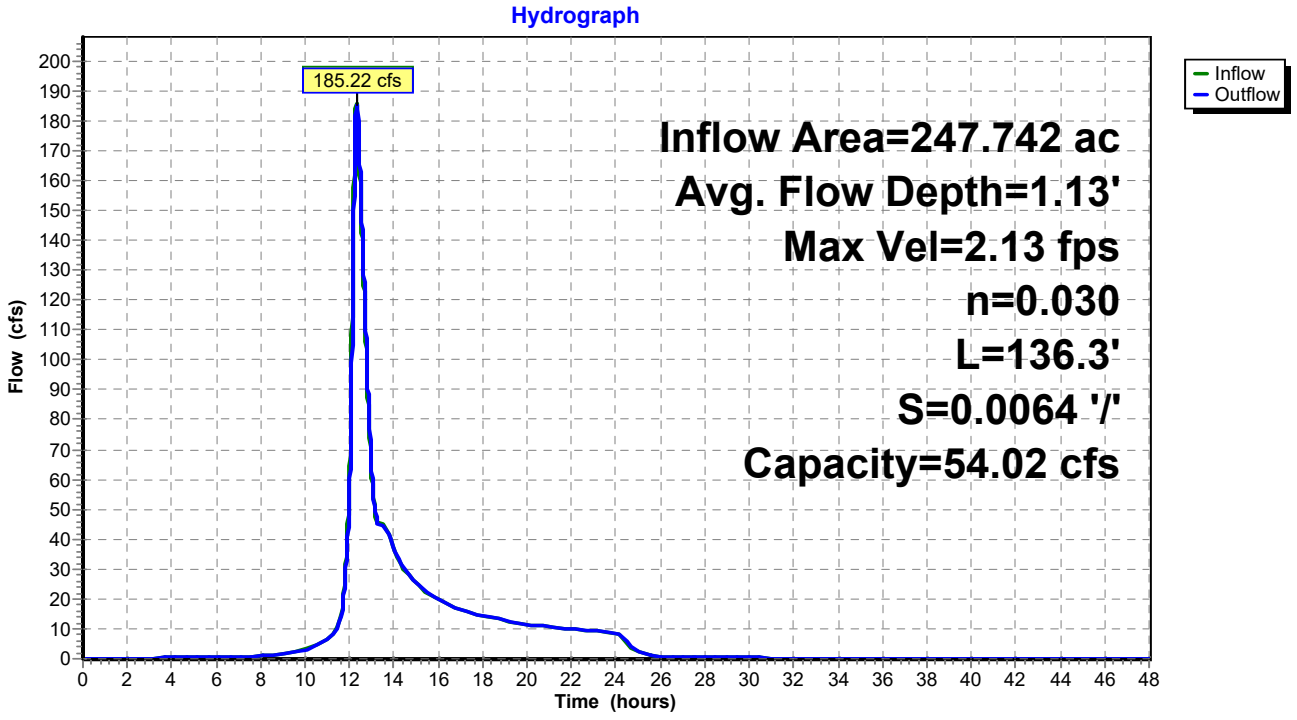
Reach 10R: REACH COMBINE 2



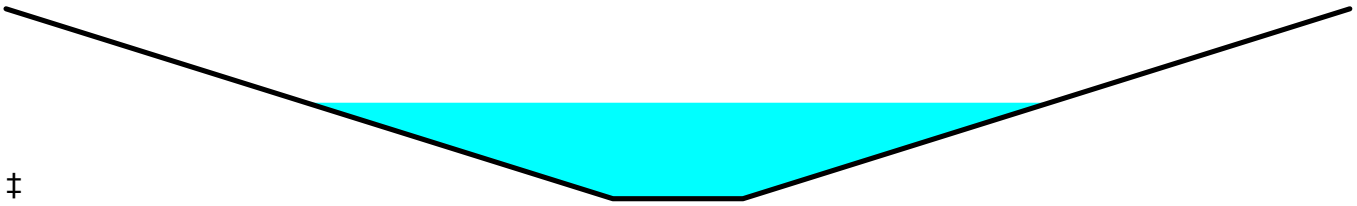
Summary for Reach 11R: DA 4 TO POA

Inflow Area = 13.891 ac, Inflow Depth = 2.47" for 10-yr event
Inflow = 28.36 cfs @ 12.22 hrs, Volume= 2.857 af
Outflow = 27.90 cfs @ 12.25 hrs, Volume= 2.857 af, Atten= 2%, Lag= 2.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.83 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 2.60 fps, Avg. Travel Time= 7.5 min

Peak Storage= 4,188 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.71' , Surface Width= 8.57'
Bank-Full Depth= 1.40' Flow Area= 11.9 sf, Capacity= 140.25 cfs

1.50' x 1.40' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 5.0 '/' Top Width= 15.50'
Length= 1,176.1' Slope= 0.0825 '/'
Inlet Invert= 2,133.71', Outlet Invert= 2,036.73'



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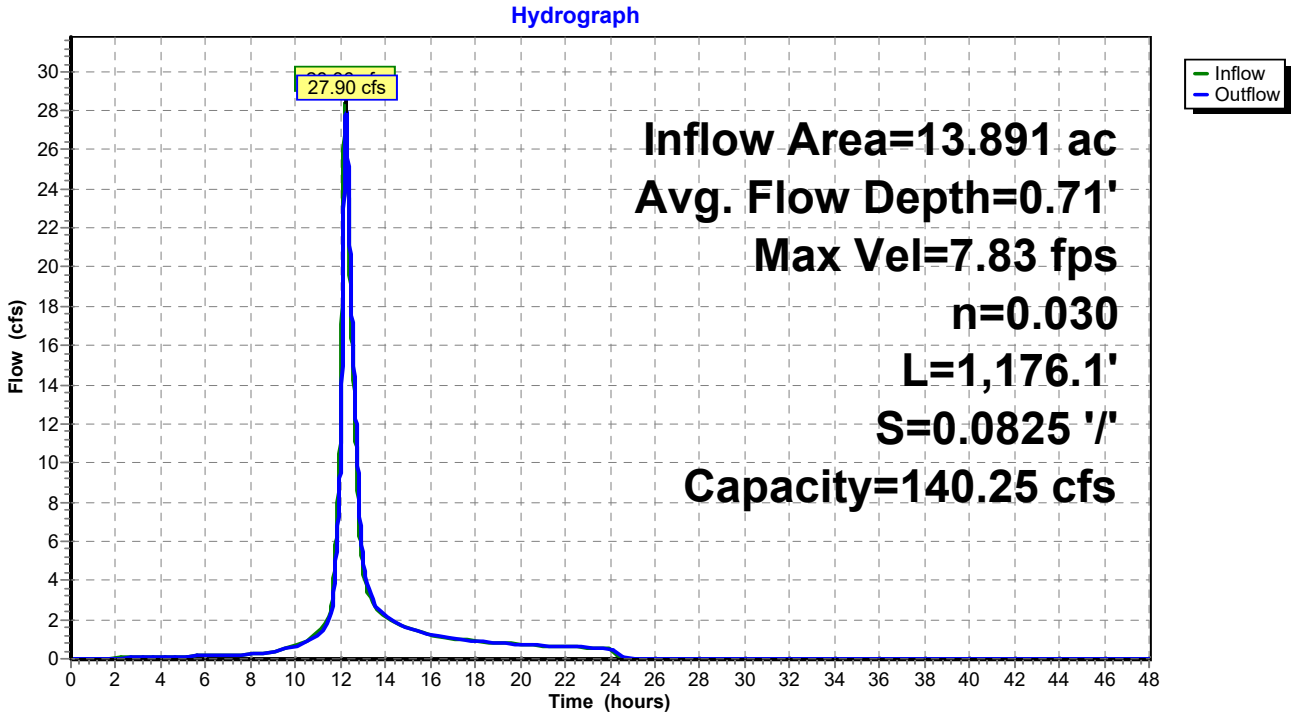
Reach 11R: DA 4 TO POA



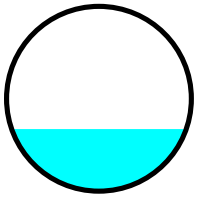
Summary for Reach 12R: DI-7

Inflow Area = 24.032 ac, Inflow Depth = 1.61" for 10-yr event
Inflow = 17.50 cfs @ 12.68 hrs, Volume= 3.230 af
Outflow = 17.50 cfs @ 12.69 hrs, Volume= 3.230 af, Atten= 0%, Lag= 0.2 min

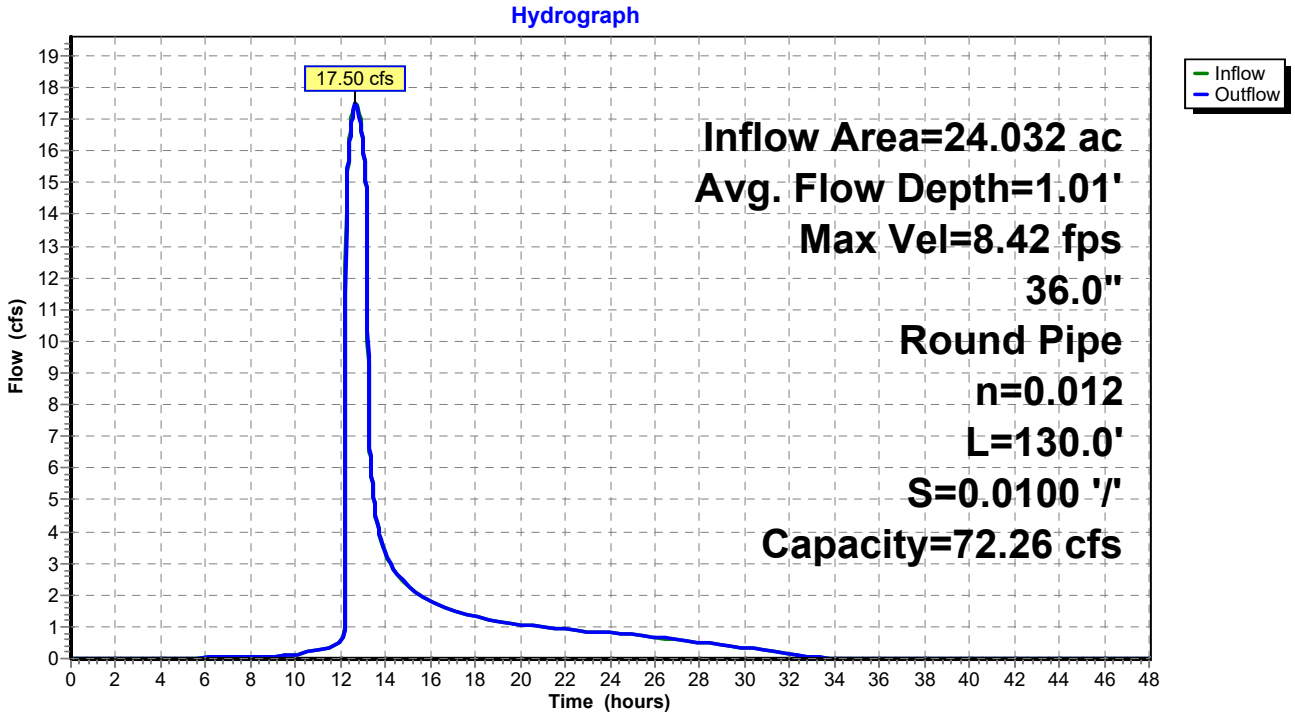
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.42 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.31 fps, Avg. Travel Time= 0.9 min

Peak Storage= 270 cf @ 12.69 hrs
Average Depth at Peak Storage= 1.01' , Surface Width= 2.83'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 72.26 cfs

36.0" Round Pipe
n= 0.012
Length= 130.0' Slope= 0.0100 '/'
Inlet Invert= 2,061.30', Outlet Invert= 2,060.00'



Reach 12R: DI-7



Summary for Pond 3P: NSP POND 1

Inflow Area = 96.000 ac, Inflow Depth = 1.93" for 10-yr event
Inflow = 122.59 cfs @ 12.42 hrs, Volume= 15.453 af
Outflow = 35.24 cfs @ 13.18 hrs, Volume= 6.448 af, Atten= 71%, Lag= 45.6 min
Primary = 35.24 cfs @ 13.18 hrs, Volume= 6.448 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 2,080.75' @ 13.18 hrs Storage= 392,320 cf

Plug-Flow detention time= 304.7 min calculated for 6.448 af (42% of inflow)
Center-of-Mass det. time= 169.1 min (1,025.0 - 855.9)

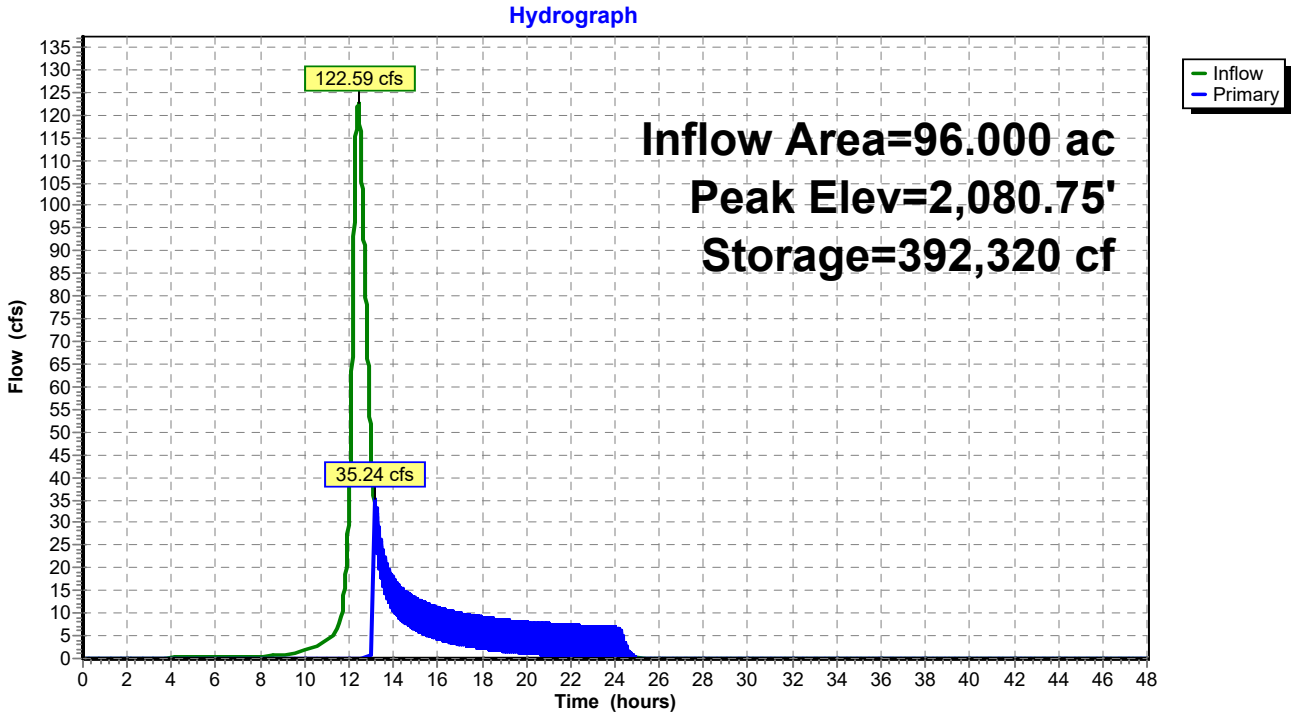
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	392,320 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	0	0
1.25	2,002	2,002
3.25	24,089	26,091
5.25	67,305	93,396
7.25	119,692	213,088
9.25	179,232	392,320

Device	Routing	Invert	Outlet Devices
#1	Primary	2,073.87'	**48.0" Round Culvert** L= 110.4' Ke= 0.600 Inlet / Outlet Invert= 2,073.87' / 2,071.85' S= 0.0183 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	2,174.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	2,080.27'	**72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	2,082.20'	**30.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=20.27 cfs @ 13.18 hrs HW=2,080.75' (Free Discharge)
└**1=Culvert** (Passes 20.27 cfs of 125.26 cfs potential flow)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Weir Controls 20.27 cfs @ 2.26 fps)
  └**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: NSP POND 1



Summary for Pond 8P: SWM

Inflow Area = 24.032 ac, Inflow Depth = 1.61" for 10-yr event
Inflow = 27.26 cfs @ 12.33 hrs, Volume= 3.230 af
Outflow = 17.50 cfs @ 12.68 hrs, Volume= 3.230 af, Atten= 36%, Lag= 21.0 min
Primary = 17.50 cfs @ 12.68 hrs, Volume= 3.230 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 2,065.93' @ 12.68 hrs Surf.Area= 9,230 sf Storage= 30,412 cf

Plug-Flow detention time= 104.7 min calculated for 3.230 af (100% of inflow)
Center-of-Mass det. time= 104.7 min (969.4 - 864.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2,061.65'	93,017 cf	**Custom Stage Data (Prismatic)**Listed below

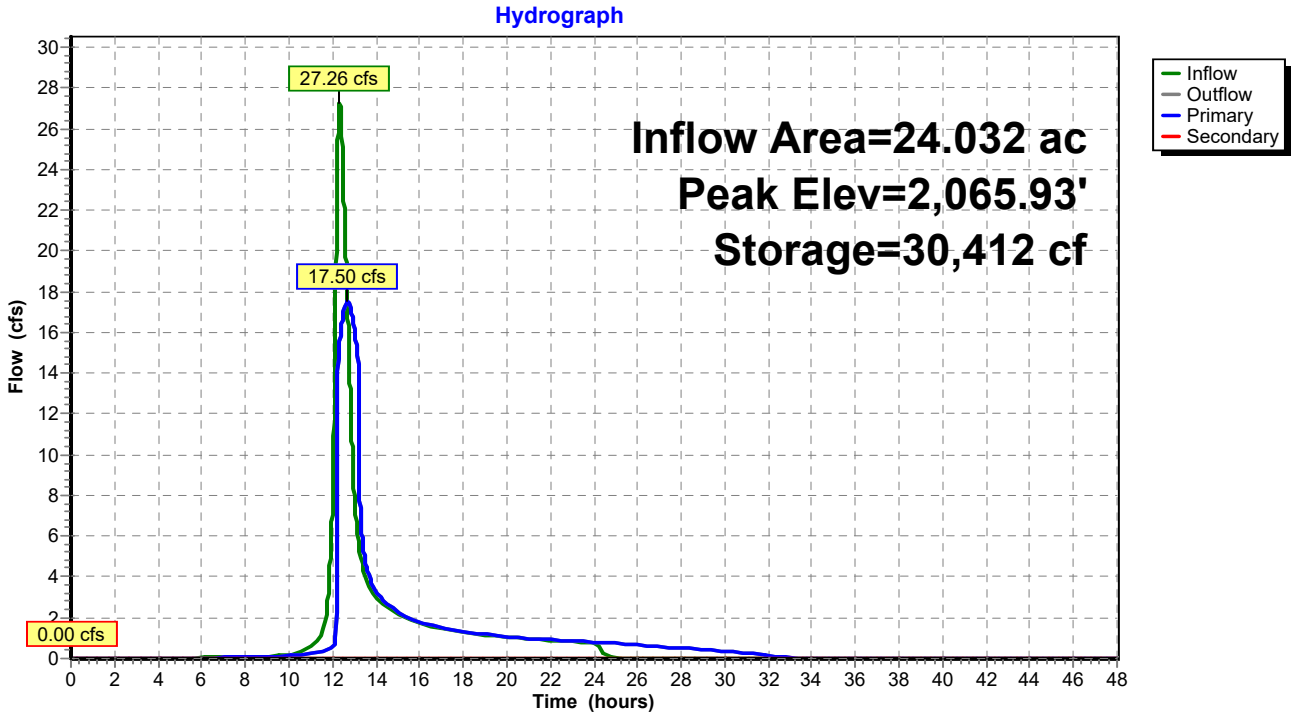
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,061.65	0	0	0
2,062.00	4,695	822	822
2,065.00	7,885	18,870	19,692
2,070.00	15,094	57,448	77,139
2,071.00	16,661	15,878	93,017

Device	Routing	Invert	Outlet Devices
#1	Primary	2,061.65'	**18.0" Round RCP_Round 18"** L= 55.0' Ke= 0.200 Inlet / Outlet Invert= 2,061.65' / 2,061.30' S= 0.0064 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	2,061.65'	**4.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	2,064.10'	**24.0" W x 6.0" H Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	2,064.67'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	2,068.25'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 2.75 Width (feet) 15.00 31.50

Primary OutFlow Max=17.50 cfs @ 12.68 hrs HW=2,065.93' (Free Discharge)
└**1=RCP_Round 18"** (Barrel Controls 17.50 cfs @ 9.90 fps)
  ├**2=Orifice/Grate** (Passes < 1.08 cfs potential flow)
  ├**3=Orifice/Grate** (Passes < 12.10 cfs potential flow)
  └**4=Orifice/Grate** (Passes < 58.32 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,061.65' (Free Discharge)
└**5=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 8P: SWM

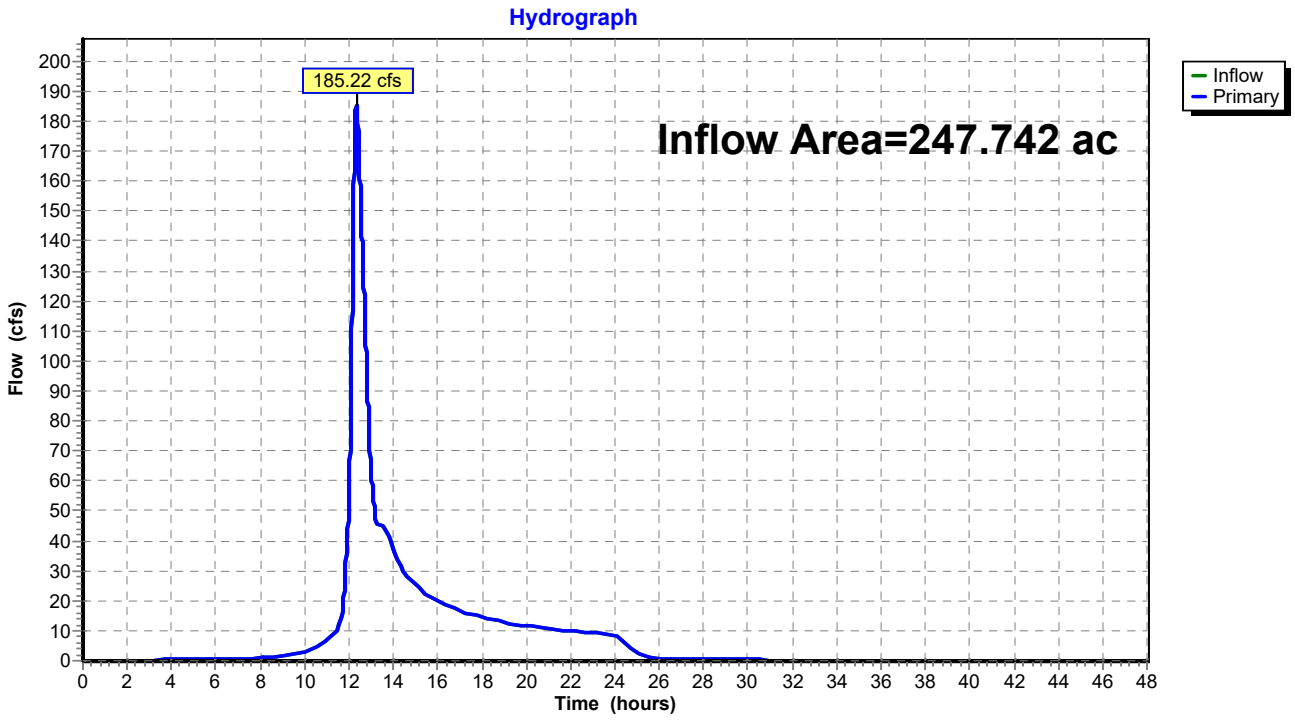

Hydrograph
Inflow Area=24.032 ac
Peak Elev=2,065.93'
Storage=30,412 cf
27.26 cfs
17.50 cfs
0.00 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

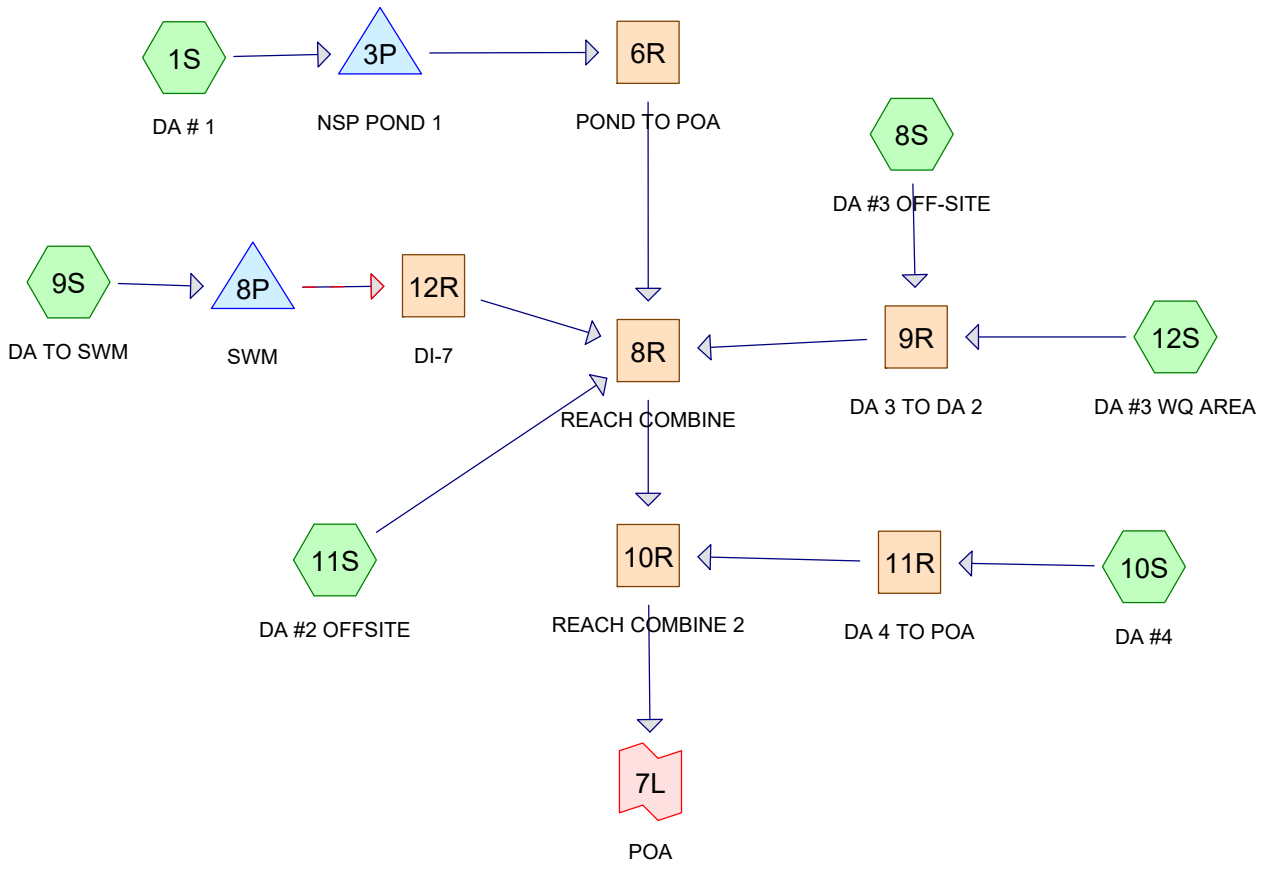
Summary for Link 7L: POA

Inflow Area = 247.742 ac, Inflow Depth = 1.44" for 10-yr event
Inflow = 185.22 cfs @ 12.33 hrs, Volume= 29.774 af
Primary = 185.22 cfs @ 12.33 hrs, Volume= 29.774 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 7L: POA





Subcat Reach Pond Link

Routing Diagram for Post-100
Prepared by Balzer & Associates, Printed 7/29/2022

Summary for Subcatchment 1S: DA # 1

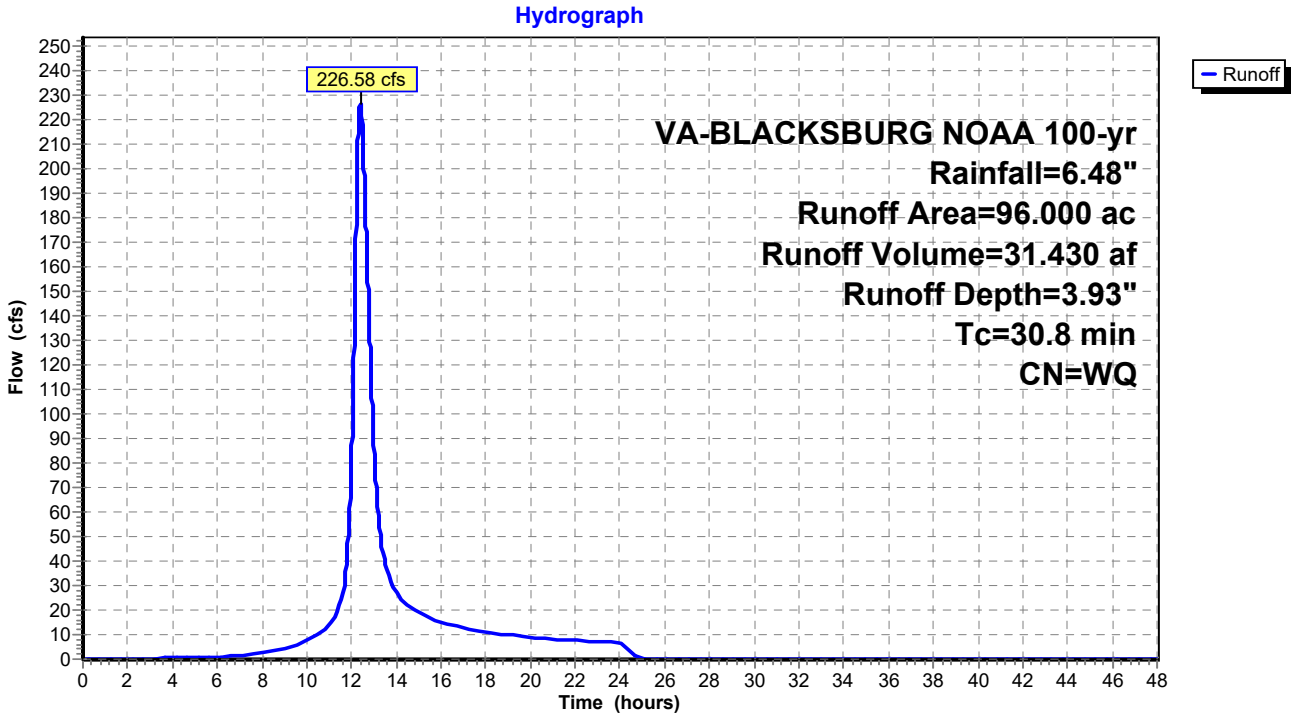
Runoff = 226.58 cfs @ 12.39 hrs, Volume= 31.430 af, Depth= 3.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 100-yr Rainfall=6.48"

Area (ac)	CN	Description
5.080	98	Roofs, HSG C
3.100	84	50-75% Grass cover, Fair, HSG D
22.720	79	50-75% Grass cover, Fair, HSG C
28.800	69	50-75% Grass cover, Fair, HSG B
1.000	86	1/3 acre lots, 30% imp, HSG D
10.400	81	1/3 acre lots, 30% imp, HSG C
6.400	72	1/3 acre lots, 30% imp, HSG B
10.300	83	1/4 acre lots, 38% imp, HSG C
8.200	75	1/4 acre lots, 38% imp, HSG B
96.000		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8					**Direct Entry, FROM NSP CALCS**

Subcatchment 1S: DA # 1



Summary for Subcatchment 8S: DA #3 OFF-SITE

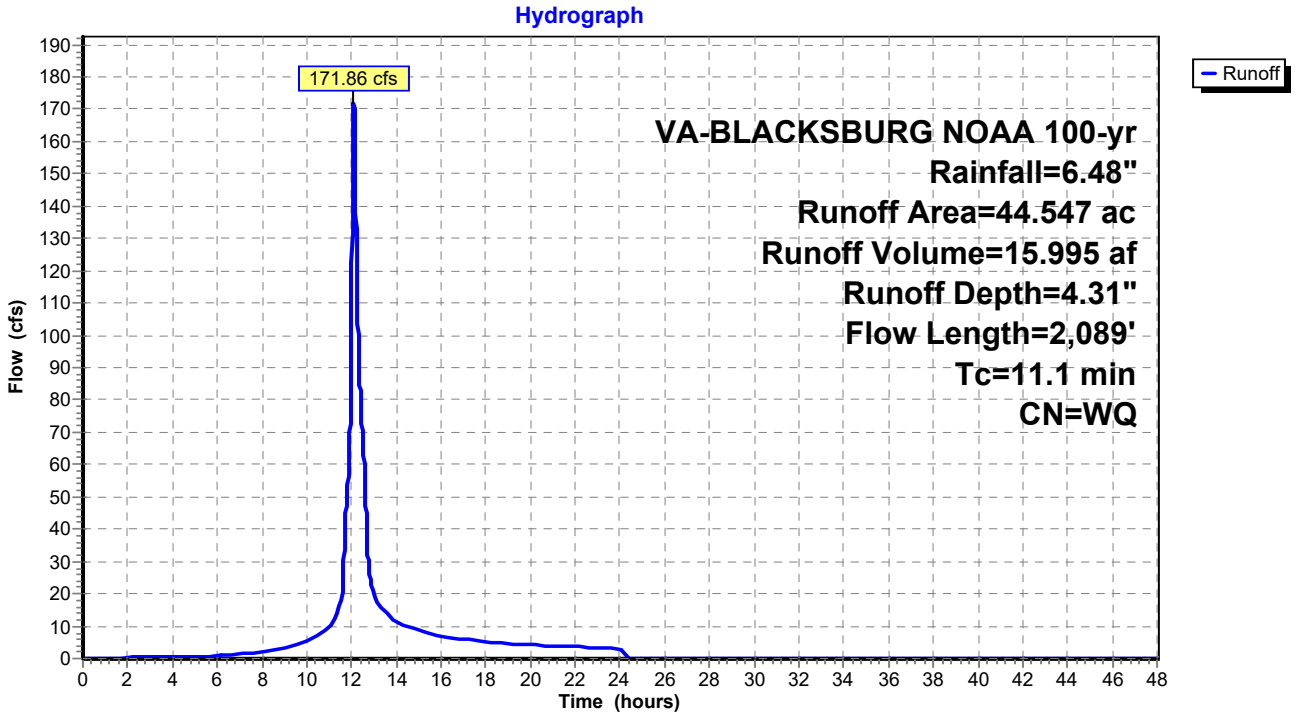
Runoff = 171.86 cfs @ 12.10 hrs, Volume= 15.995 af, Depth= 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 100-yr Rainfall=6.48"

Area (ac)	CN	Description
0.358	98	Paved roads w/curbs & sewers, HSG B
4.733	98	Paved roads w/curbs & sewers, HSG C
5.726	70	1/2 acre lots, 25% imp, HSG B
28.476	80	1/2 acre lots, 25% imp, HSG C
0.877	72	1/3 acre lots, 30% imp, HSG B
3.986	81	1/3 acre lots, 30% imp, HSG C
0.391	79	1 acre lots, 20% imp, HSG C
44.547		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 8S: DA #3 OFF-SITE



Summary for Subcatchment 9S: DA TO SWM

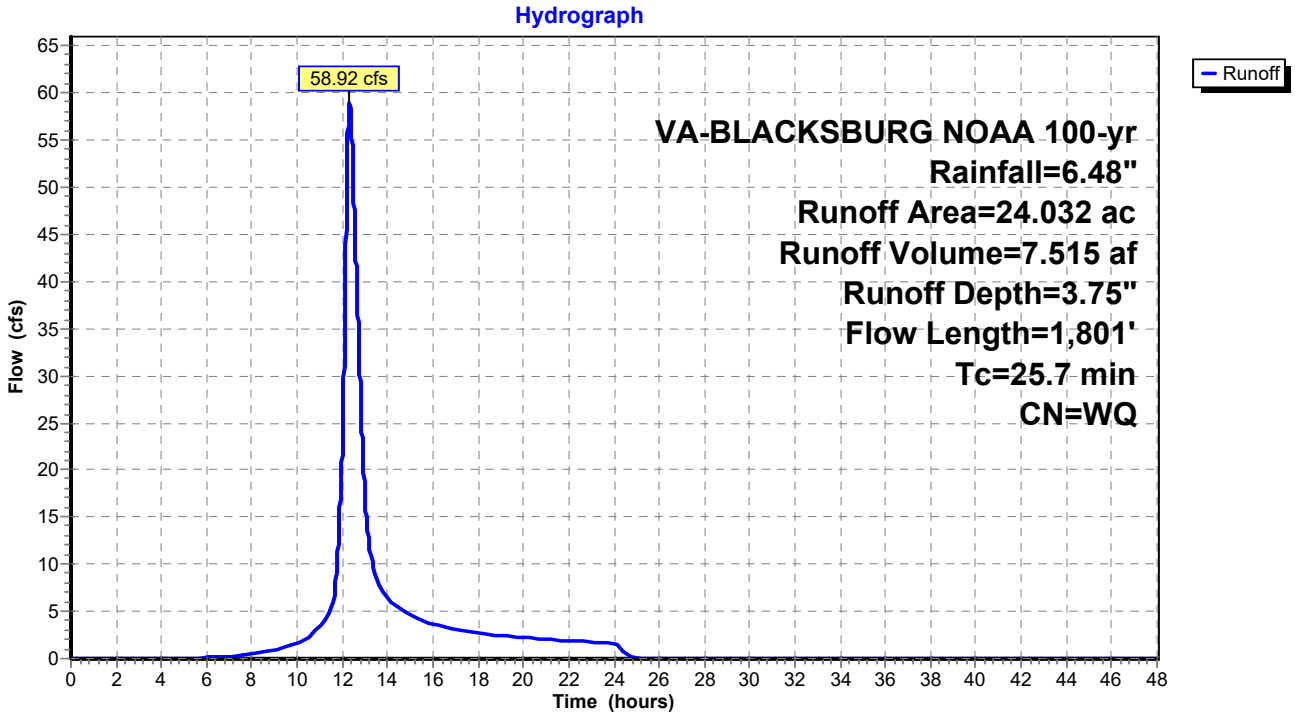
Runoff = 58.92 cfs @ 12.31 hrs, Volume= 7.515 af, Depth= 3.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 100-yr Rainfall=6.48"

	Area (ac)	CN	Description
	0.000	98	Paved parking, HSG A
	0.569	98	Paved parking, HSG B
	0.228	98	Paved parking, HSG C
	0.000	39	>75% Grass cover, Good, HSG A
	1.577	61	>75% Grass cover, Good, HSG B
	0.713	74	>75% Grass cover, Good, HSG C
	2.480	75	1/4 acre lots, 38% imp, HSG B
	0.015	83	1/4 acre lots, 38% imp, HSG C
	1.630	72	1/3 acre lots, 30% imp, HSG B
	0.330	81	1/3 acre lots, 30% imp, HSG C
	0.000	70	1/2 acre lots, 25% imp, HSG B
	1.440	80	1/2 acre lots, 25% imp, HSG C
	0.650	68	1 acre lots, 20% imp, HSG B
	2.360	79	1 acre lots, 20% imp, HSG C
*	4.900	77	DA B (SEE VRRM)
*	2.100	79	DA C (SEE VRRM)
*	3.530	70	DA D (SEE VRRM)
*	1.510	78	DA E (SEE VRRM)
	24.032		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 9S: DA TO SWM



Summary for Subcatchment 10S: DA #4

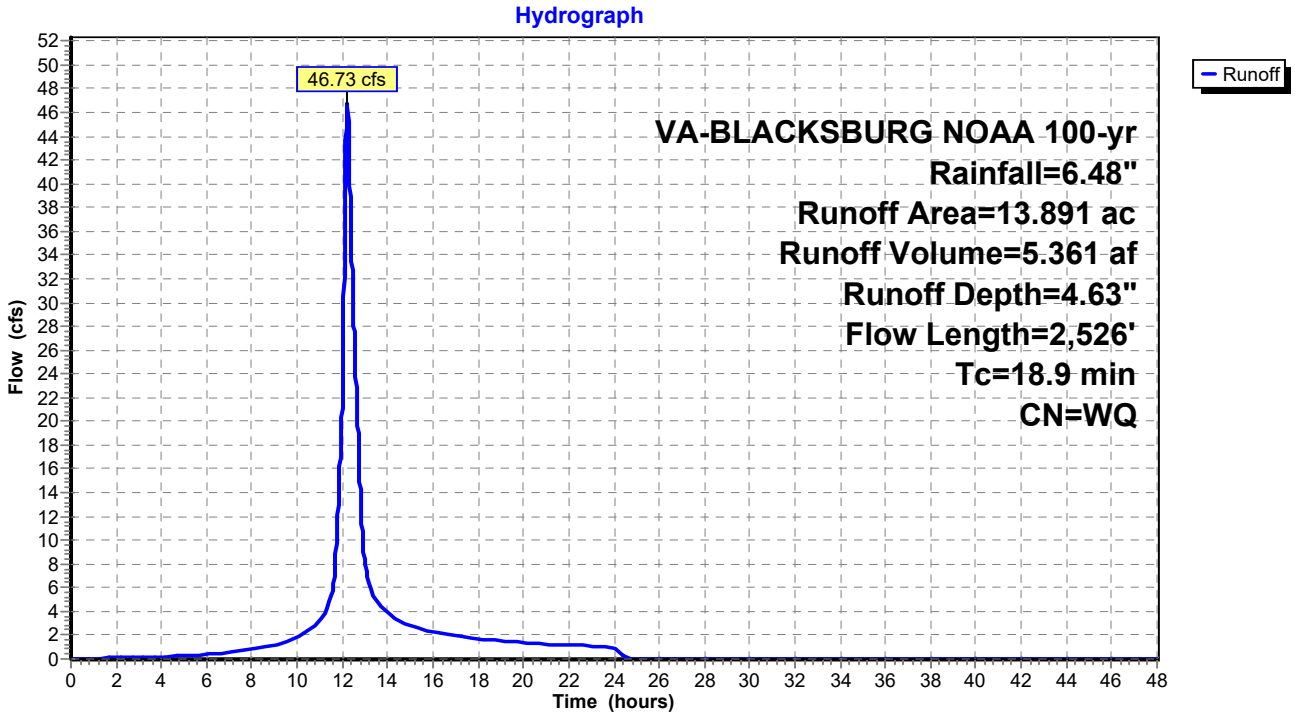
Runoff = 46.73 cfs @ 12.21 hrs, Volume= 5.361 af, Depth= 4.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 100-yr Rainfall=6.48"

Area (ac)	CN	Description
2.555	98	Paved roads w/curbs & sewers, HSG C
7.333	81	1/3 acre lots, 30% imp, HSG C
3.803	80	1/2 acre lots, 25% imp, HSG C
0.200	70	1/2 acre lots, 25% imp, HSG B
13.891		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	95	0.0630	0.25		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
9.9	1,004	0.0478	1.70	5.26	**Channel Flow, Tc2** Area= 3.1 sf Perim= 50.0' r= 0.06' n= 0.030 Earth, grassed & winding
2.6	1,427	0.0134	9.03	28.37	**Pipe Channel, CMP_Round 24"** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
18.9	2,526	Total			

Subcatchment 10S: DA #4



Summary for Subcatchment 11S: DA #2 OFFSITE

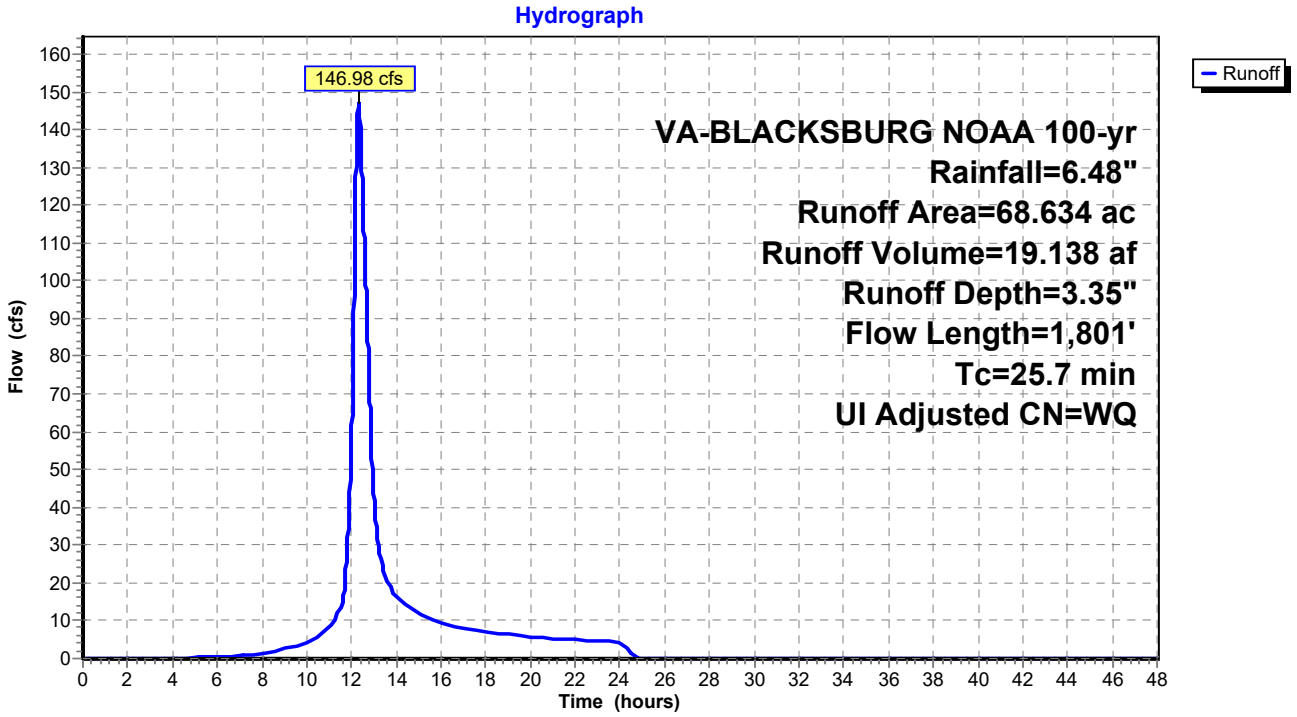
Runoff = 146.98 cfs @ 12.31 hrs, Volume= 19.138 af, Depth= 3.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 100-yr Rainfall=6.48"

	Area (ac)	CN	Adj	Description
	10.040	83	83	Fallow, crop residue, Good, HSG B
	1.105	88	88	Fallow, crop residue, Good, HSG C
*	0.030	98	98	Unconnected pavement, HSG A
	1.290	98	98	Unconnected pavement, HSG C
	0.380	98	98	Unconnected pavement, HSG B
	1.415	70	70	1/2 acre lots, 25% imp, HSG B
	5.343	80	80	1/2 acre lots, 25% imp, HSG C
	0.010	72	72	1/3 acre lots, 30% imp, HSG B
	1.370	81	81	1/3 acre lots, 30% imp, HSG C
	0.180	68	68	1 acre lots, 20% imp, HSG B
	0.038	79	79	1 acre lots, 20% imp, HSG C
	0.110	70	70	Woods, Good, HSG C
	1.300	55	55	Woods, Good, HSG B
	5.330	39	39	>75% Grass cover, Good, HSG A
	8.660	61	61	>75% Grass cover, Good, HSG B
	11.790	74	74	>75% Grass cover, Good, HSG C
	6.180	58	58	Woods/grass comb., Good, HSG B
	5.140	72	72	Woods/grass comb., Good, HSG C
	2.852	72	72	Dirt roads, HSG A
	1.750	82	82	Dirt roads, HSG B
	1.521	87	87	Dirt roads, HSG C
*	2.210	76	76	DA A (SEE VRRM)
	0.590	75	75	1/4 acre lots, 38% imp, HSG B
	68.634			Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0400	0.21		**Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76"
17.7	1,701	0.0523	1.60		**Shallow Concentrated Flow, Tc2** Short Grass Pasture Kv= 7.0 fps
25.7	1,801	Total			

Subcatchment 11S: DA #2 OFFSITE



Summary for Subcatchment 12S: DA #3 WQ AREA

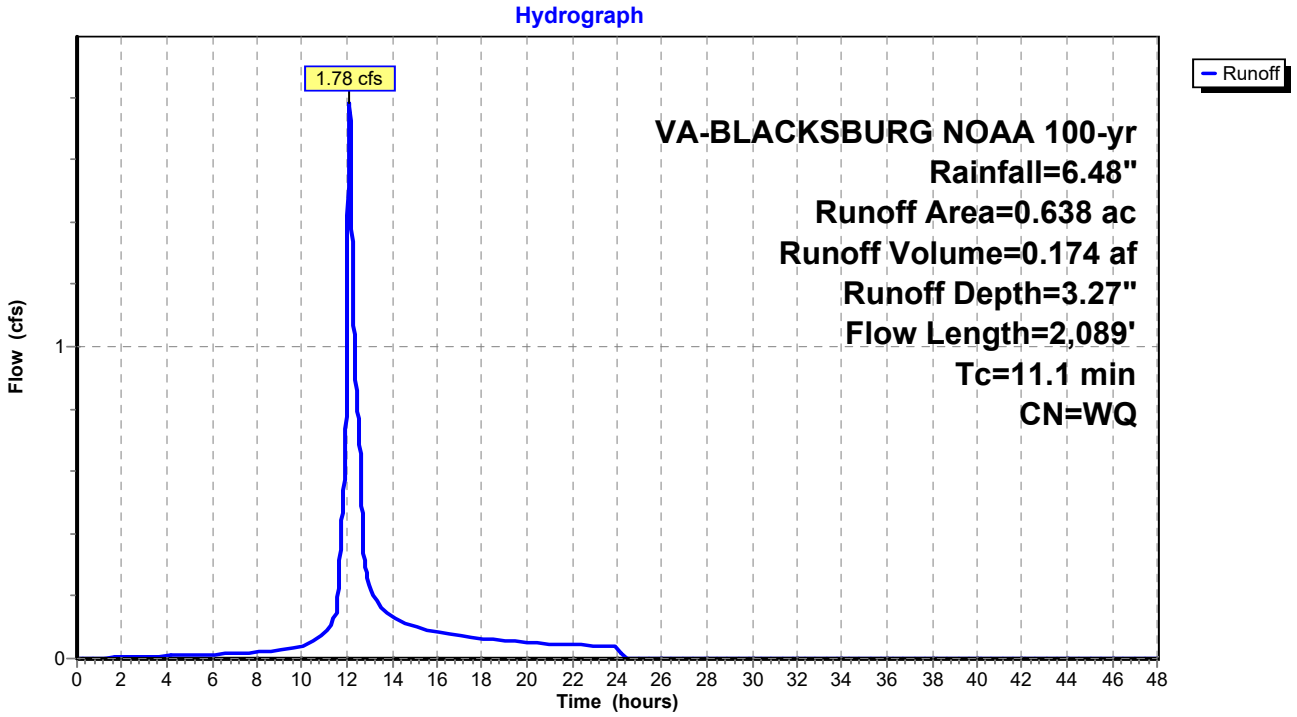
Runoff = 1.78 cfs @ 12.11 hrs, Volume= 0.174 af, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 100-yr Rainfall=6.48"

Area (ac)	CN	Description
0.061	98	Paved roads w/curbs & sewers, HSG B
0.042	98	Paved roads w/curbs & sewers, HSG C
0.055	83	1/4 acre lots, 38% imp, HSG C
0.057	74	>75% Grass cover, Good, HSG C
0.423	61	>75% Grass cover, Good, HSG B
0.638		Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.0630	0.28		**Sheet Flow, Tc1** Range n= 0.130 P2= 2.76"
1.3	435	0.1125	5.44	40.82	**Channel Flow, Tc2** Area= 7.5 sf Perim= 40.0' r= 0.19' n= 0.030 Earth, grassed & winding
2.2	602	0.0830	4.64		**Shallow Concentrated Flow, Tc3** Unpaved Kv= 16.1 fps
0.6	301	0.0565	8.57	342.85	**Channel Flow, Tc4** Area= 40.0 sf Perim= 64.4' r= 0.62' n= 0.030 Earth, grassed & winding
0.1	215	0.0744	27.88	197.09	**Pipe Channel, Tc5** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
1.2	441	0.0603	6.33	189.76	**Channel Flow, Tc6** Area= 30.0 sf Perim= 80.0' r= 0.38' n= 0.030 Earth, grassed & winding
11.1	2,089	Total			

Subcatchment 12S: DA #3 WQ AREA



Summary for Reach 6R: POND TO POA

Inflow Area = 96.000 ac, Inflow Depth = 2.81" for 100-yr event
Inflow = 447.33 cfs @ 12.38 hrs, Volume= 22.514 af
Outflow = 198.71 cfs @ 12.57 hrs, Volume= 22.514 af, Atten= 56%, Lag= 11.1 min

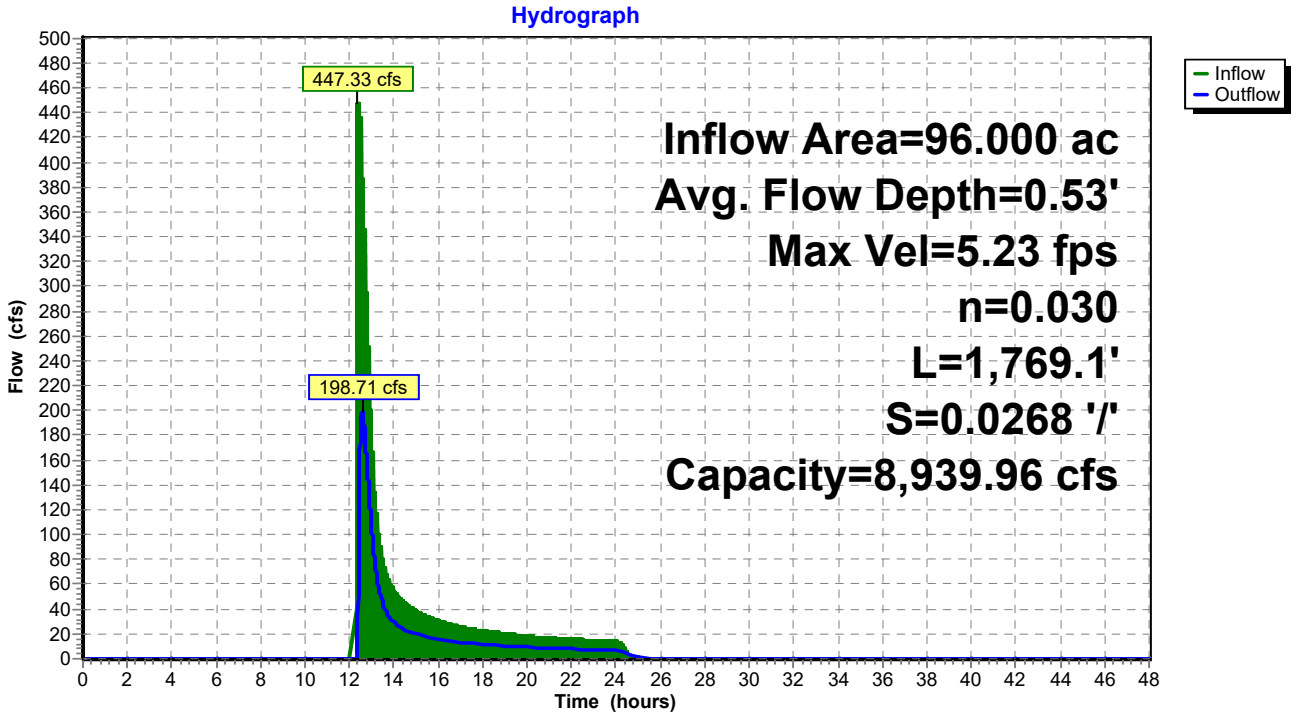
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.23 fps, Min. Travel Time= 5.6 min
Avg. Velocity = 1.72 fps, Avg. Travel Time= 17.1 min

Peak Storage= 67,198 cf @ 12.57 hrs
Average Depth at Peak Storage= 0.53' , Surface Width= 73.18'
Bank-Full Depth= 5.00' Flow Area= 425.0 sf, Capacity= 8,939.96 cfs

70.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 100.00'
Length= 1,769.1' Slope= 0.0268 '/'
Inlet Invert= 2,087.00', Outlet Invert= 2,039.65'

‡

Reach 6R: POND TO POA



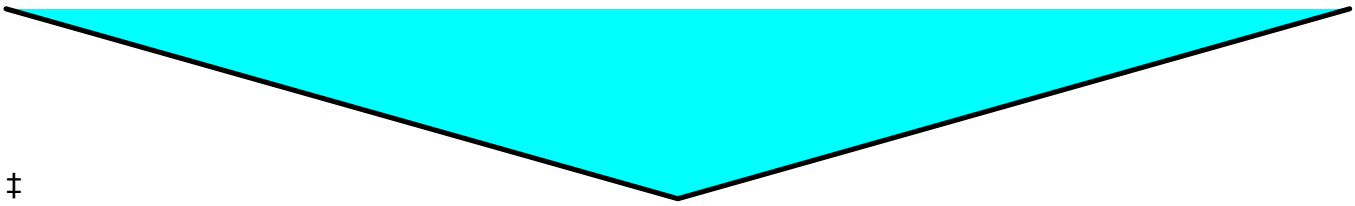
Summary for Reach 8R: REACH COMBINE

Inflow Area = 233.851 ac, Inflow Depth = 3.35" for 100-yr event
Inflow = 440.25 cfs @ 12.51 hrs, Volume= 65.336 af
Outflow = 426.59 cfs @ 12.57 hrs, Volume= 65.336 af, Atten= 3%, Lag= 3.7 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.90 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 5.2 min

Peak Storage= 80,031 cf @ 12.57 hrs
Average Depth at Peak Storage= 43.40' , Surface Width= 1,449.43'
Bank-Full Depth= 0.33' Flow Area= 1.8 sf, Capacity= 1.23 cfs

0.00' x 0.33' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 16.7 '/' Top Width= 11.02'
Length= 168.8' Slope= 0.0021 '/'
Inlet Invert= 2,036.90', Outlet Invert= 2,036.55'



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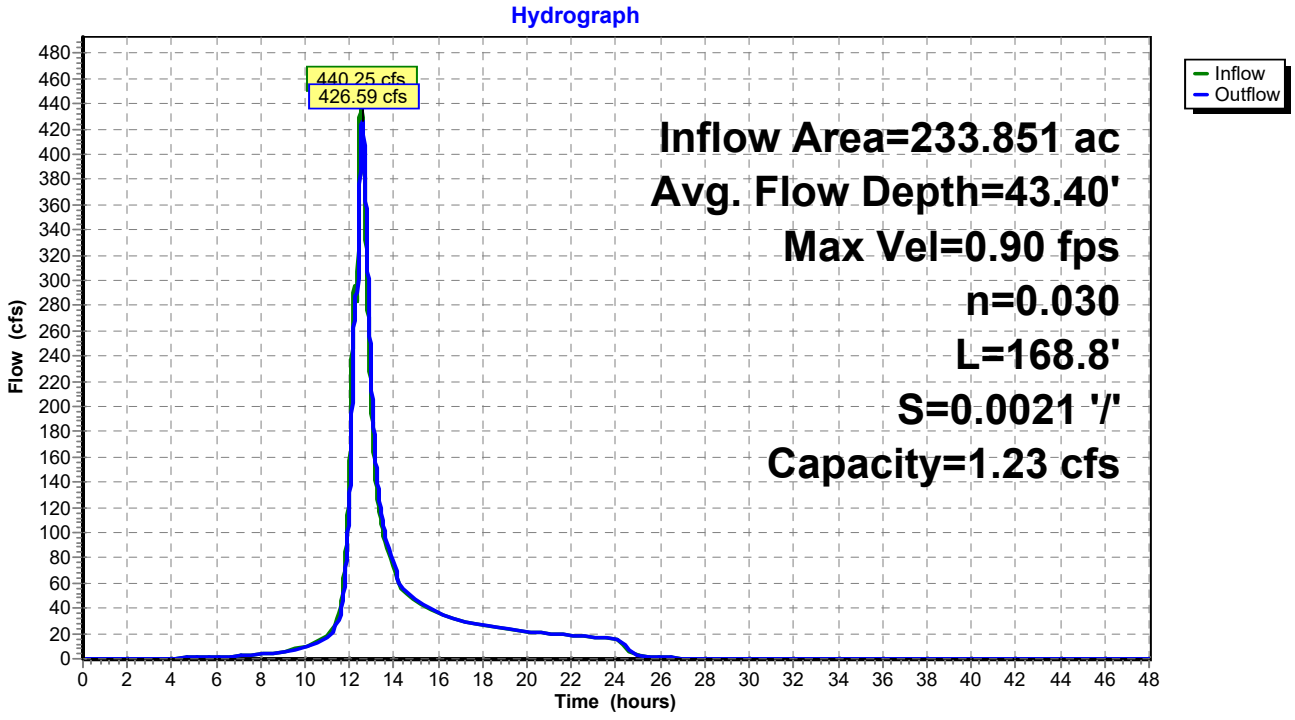
Reach 8R: REACH COMBINE



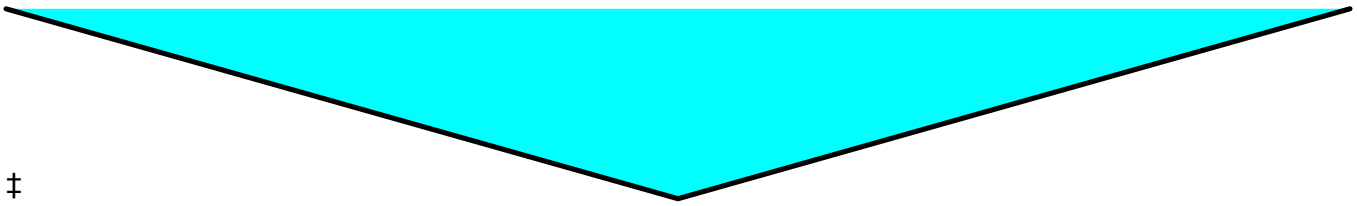
Summary for Reach 9R: DA 3 TO DA 2

Inflow Area = 45.185 ac, Inflow Depth = 4.29" for 100-yr event
Inflow = 173.64 cfs @ 12.10 hrs, Volume= 16.169 af
Outflow = 146.43 cfs @ 12.18 hrs, Volume= 16.169 af, Atten= 16%, Lag= 4.9 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.15 fps, Min. Travel Time= 5.9 min
Avg. Velocity = 1.59 fps, Avg. Travel Time= 15.3 min

Peak Storage= 51,620 cf @ 12.18 hrs
Average Depth at Peak Storage= 1.44' , Surface Width= 115.32'
Bank-Full Depth= 0.35' Flow Area= 4.9 sf, Capacity= 15.84 cfs

0.00' x 0.35' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 40.0 '/' Top Width= 28.00'
Length= 1,462.0' Slope= 0.0435 '/'
Inlet Invert= 2,103.26', Outlet Invert= 2,039.65'



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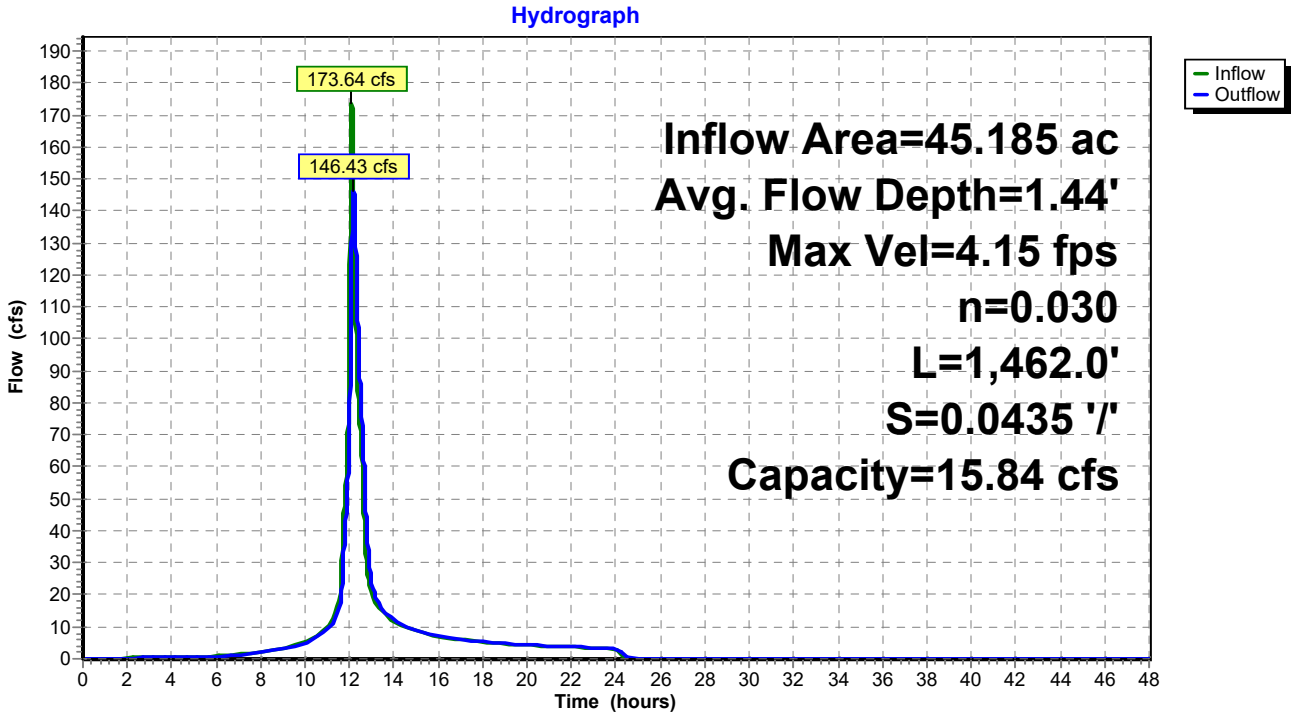
Reach 9R: DA 3 TO DA 2



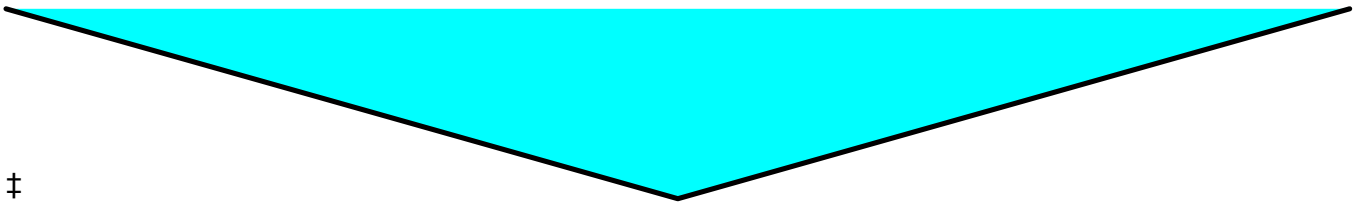
Summary for Reach 10R: REACH COMBINE 2

Inflow Area = 247.742 ac, Inflow Depth = 3.42" for 100-yr event
Inflow = 452.81 cfs @ 12.57 hrs, Volume= 70.697 af
Outflow = 451.71 cfs @ 12.59 hrs, Volume= 70.697 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.24 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 2.9 min

Peak Storage= 27,459 cf @ 12.59 hrs
Average Depth at Peak Storage= 2.23' , Surface Width= 395.12'
Bank-Full Depth= 0.59' Flow Area= 30.8 sf, Capacity= 54.02 cfs

0.00' x 0.59' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 88.5 '/' Top Width= 104.43'
Length= 136.3' Slope= 0.0064 '/'
Inlet Invert= 2,036.75', Outlet Invert= 2,035.88'



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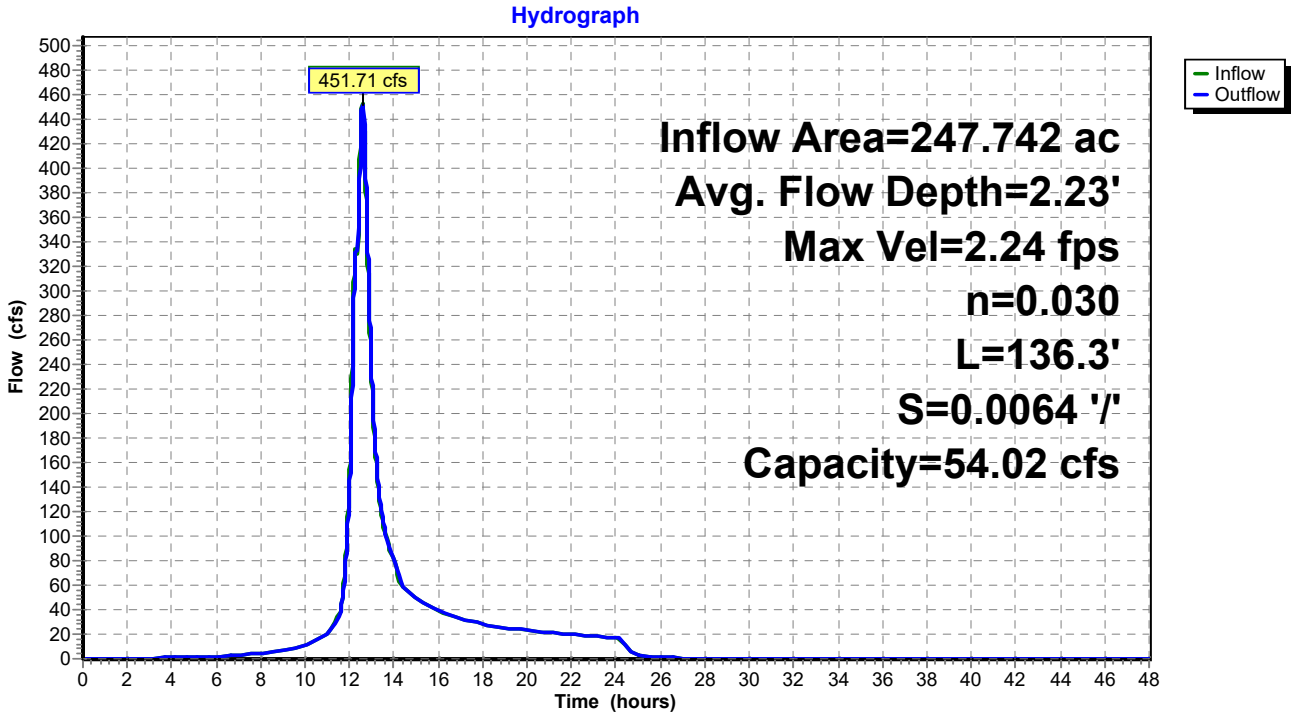
Reach 10R: REACH COMBINE 2



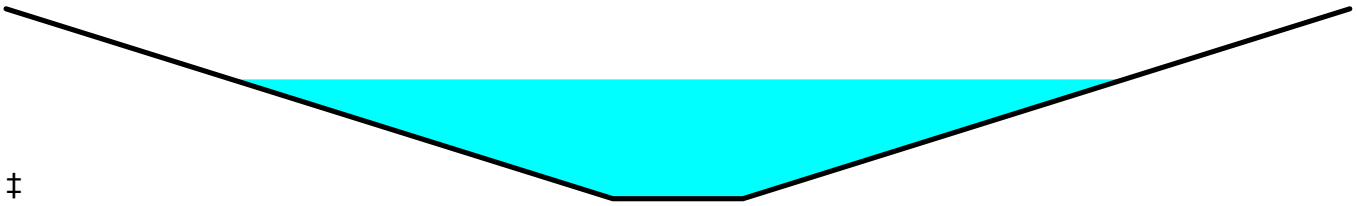
Summary for Reach 11R: DA 4 TO POA

Inflow Area = 13.891 ac, Inflow Depth = 4.63" for 100-yr event
Inflow = 46.73 cfs @ 12.21 hrs, Volume= 5.361 af
Outflow = 46.19 cfs @ 12.24 hrs, Volume= 5.361 af, Atten= 1%, Lag= 1.9 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.91 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 3.18 fps, Avg. Travel Time= 6.2 min

Peak Storage= 6,099 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.88' , Surface Width= 10.29'
Bank-Full Depth= 1.40' Flow Area= 11.9 sf, Capacity= 140.25 cfs

1.50' x 1.40' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 5.0 '/' Top Width= 15.50'
Length= 1,176.1' Slope= 0.0825 '/'
Inlet Invert= 2,133.71', Outlet Invert= 2,036.73'



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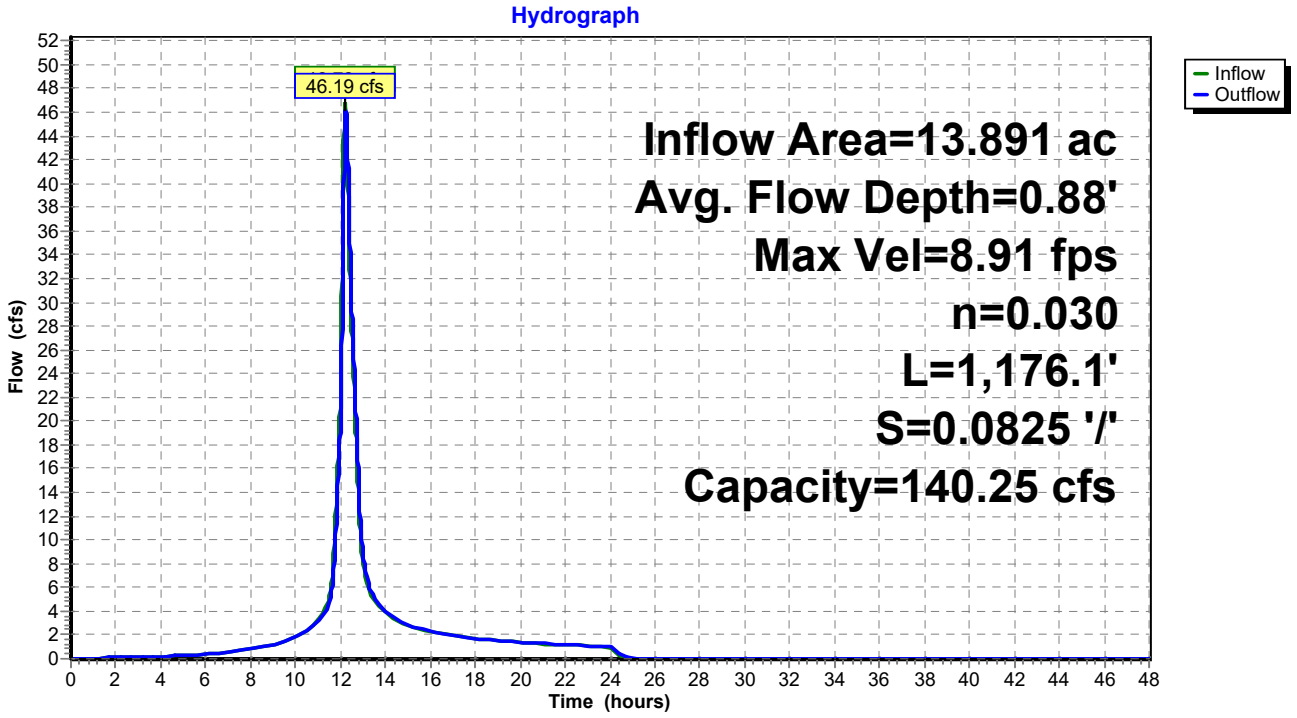
Reach 11R: DA 4 TO POA



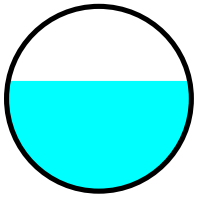
Summary for Reach 12R: DI-7

Inflow Area = 24.032 ac, Inflow Depth = 3.75" for 100-yr event
Inflow = 48.08 cfs @ 12.50 hrs, Volume= 7.515 af
Outflow = 48.07 cfs @ 12.51 hrs, Volume= 7.515 af, Atten= 0%, Lag= 0.1 min

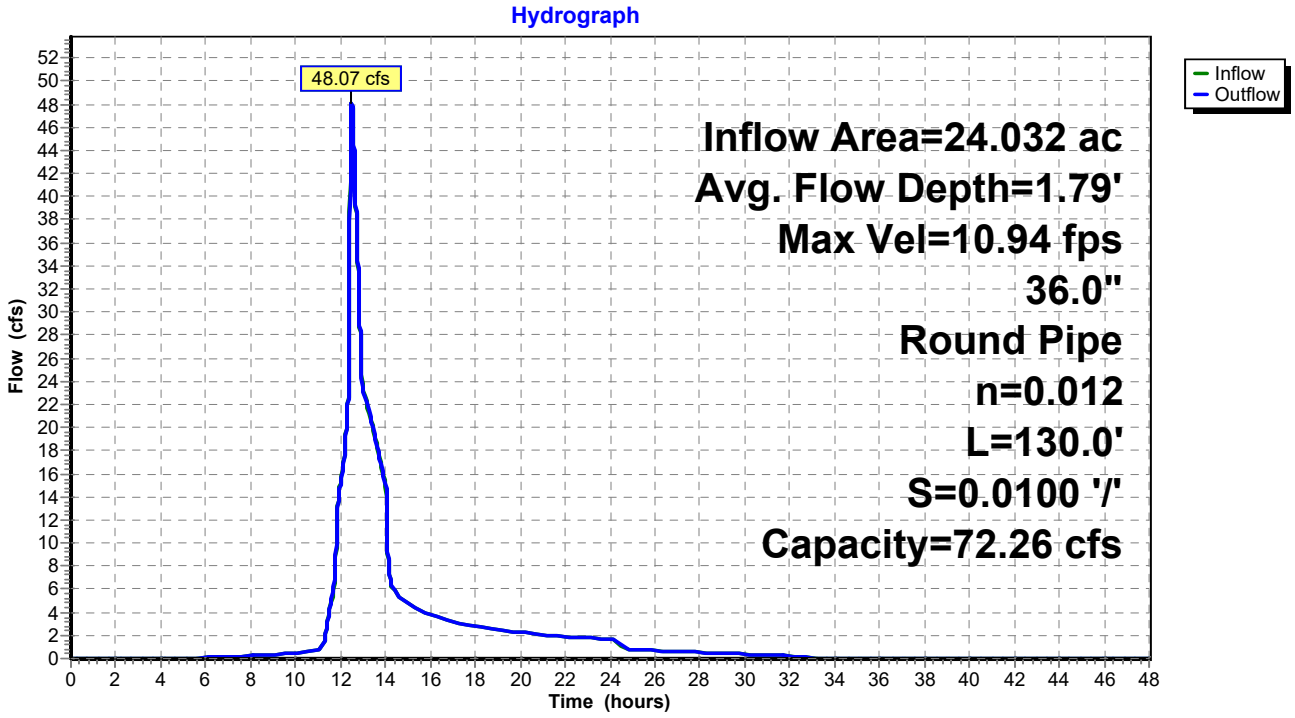
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.94 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.81 fps, Avg. Travel Time= 0.8 min

Peak Storage= 571 cf @ 12.51 hrs
Average Depth at Peak Storage= 1.79' , Surface Width= 2.94'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 72.26 cfs

36.0" Round Pipe
n= 0.012
Length= 130.0' Slope= 0.0100 '/'
Inlet Invert= 2,061.30', Outlet Invert= 2,060.00'



Reach 12R: DI-7



Summary for Pond 3P: NSP POND 1

Inflow Area = 96.000 ac, Inflow Depth = 3.93" for 100-yr event
Inflow = 226.58 cfs @ 12.39 hrs, Volume= 31.430 af
Outflow = 447.33 cfs @ 12.38 hrs, Volume= 22.514 af, Atten= 0%, Lag= 0.0 min
Primary = 447.33 cfs @ 12.38 hrs, Volume= 22.514 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 2,138.45' @ 12.38 hrs Storage= 392,320 cf

Plug-Flow detention time= 170.4 min calculated for 22.514 af (72% of inflow)
Center-of-Mass det. time= 65.0 min (909.1 - 844.1)

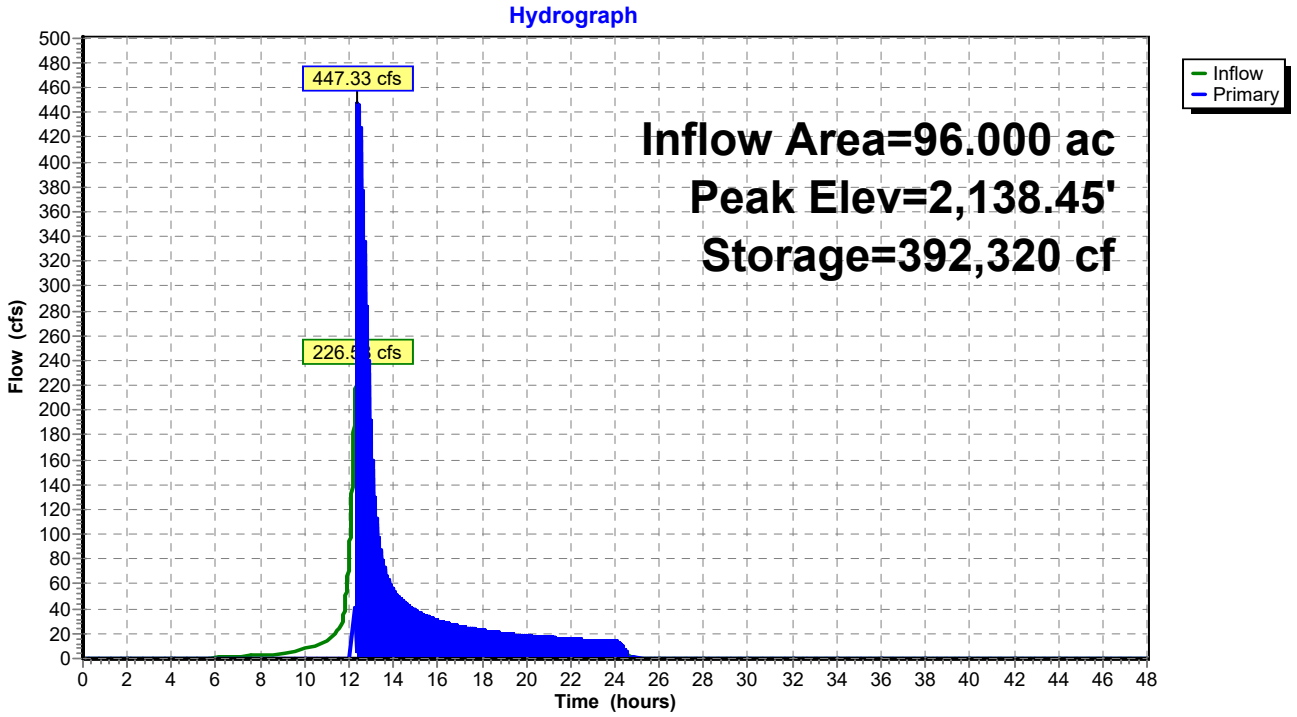
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	392,320 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	0	0
1.25	2,002	2,002
3.25	24,089	26,091
5.25	67,305	93,396
7.25	119,692	213,088
9.25	179,232	392,320

Device	Routing	Invert	Outlet Devices
#1	Primary	2,073.87'	**48.0" Round Culvert** L= 110.4' Ke= 0.600 Inlet / Outlet Invert= 2,073.87' / 2,071.85' S= 0.0183 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	2,174.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	2,080.27'	**72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	2,082.20'	**30.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=448.67 cfs @ 12.38 hrs HW=2,138.43' (Free Discharge)
- **1=Culvert** (Inlet Controls 448.67 cfs @ 35.70 fps)
  - **2=Orifice/Grate** (Controls 0.00 cfs)
  - **3=Orifice/Grate** (Passes < 1,038.26 cfs potential flow)
  - **4=Broad-Crested Rectangular Weir** (Passes < 33,270.17 cfs potential flow)

Pond 3P: NSP POND 1



Summary for Pond 8P: SWM

Inflow Area = 24.032 ac, Inflow Depth = 3.75" for 100-yr event
Inflow = 58.92 cfs @ 12.31 hrs, Volume= 7.515 af
Outflow = 48.08 cfs @ 12.50 hrs, Volume= 7.515 af, Atten= 18%, Lag= 11.5 min
Primary = 24.28 cfs @ 12.50 hrs, Volume= 6.863 af
Secondary = 23.80 cfs @ 12.50 hrs, Volume= 0.653 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 2,068.83' @ 12.50 hrs Surf.Area= 13,408 sf Storage= 63,702 cf

Plug-Flow detention time= 61.9 min calculated for 7.514 af (100% of inflow)
Center-of-Mass det. time= 62.1 min (907.7 - 845.6)

Volume	Invert	Avail.Storage	Storage Description
#1	2,061.65'	93,017 cf	**Custom Stage Data (Prismatic)**Listed below

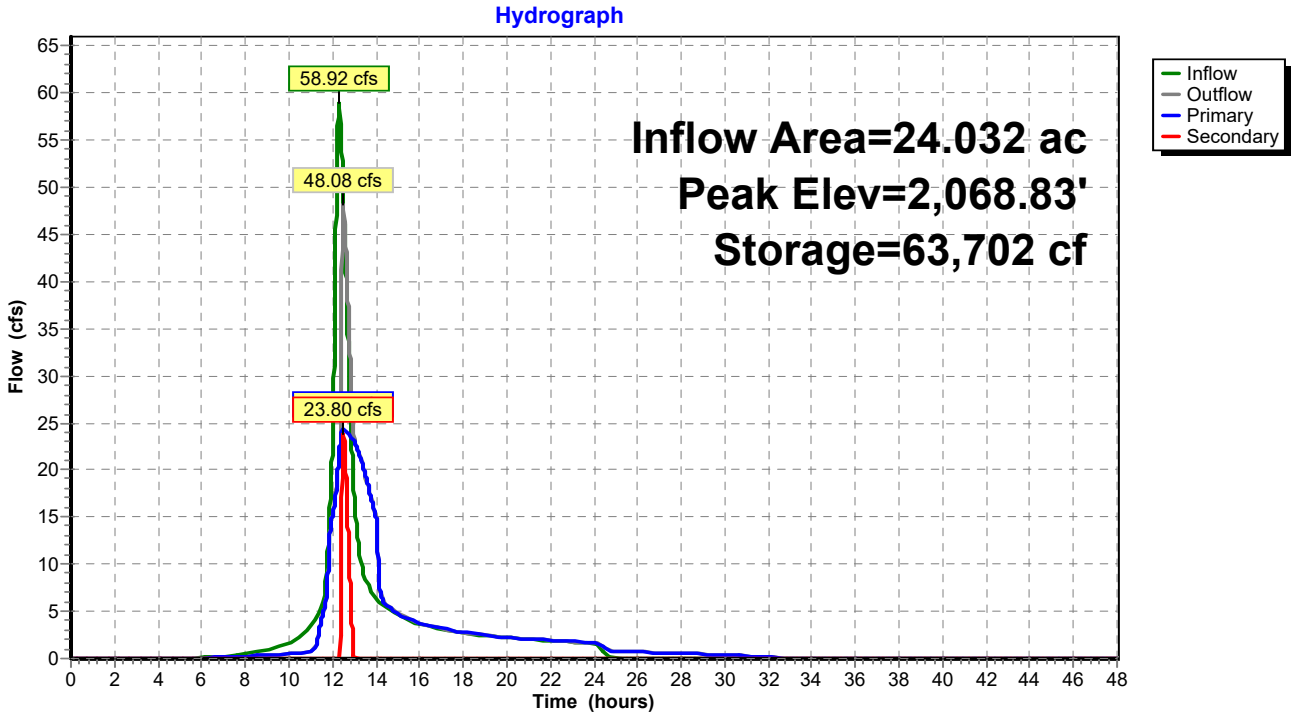
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,061.65	0	0	0
2,062.00	4,695	822	822
2,065.00	7,885	18,870	19,692
2,070.00	15,094	57,448	77,139
2,071.00	16,661	15,878	93,017

Device	Routing	Invert	Outlet Devices
#1	Primary	2,061.65'	**18.0" Round RCP_Round 18"** L= 55.0' Ke= 0.200 Inlet / Outlet Invert= 2,061.65' / 2,061.30' S= 0.0064 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	2,061.65'	**4.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	2,064.10'	**24.0" W x 6.0" H Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	2,064.67'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	2,068.25'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 2.75 Width (feet) 15.00 31.50

Primary OutFlow Max=24.28 cfs @ 12.50 hrs HW=2,068.83' (Free Discharge)
└**1=RCP_Round 18"** (Barrel Controls 24.28 cfs @ 13.74 fps)
  ├**2=Orifice/Grate** (Passes < 1.41 cfs potential flow)
  ├**3=Orifice/Grate** (Passes < 20.38 cfs potential flow)
  └**4=Orifice/Grate** (Passes < 123.41 cfs potential flow)

Secondary OutFlow Max=23.73 cfs @ 12.50 hrs HW=2,068.83' (Free Discharge)
└**5=Custom Weir/Orifice** (Weir Controls 23.73 cfs @ 2.44 fps)

Pond 8P: SWM

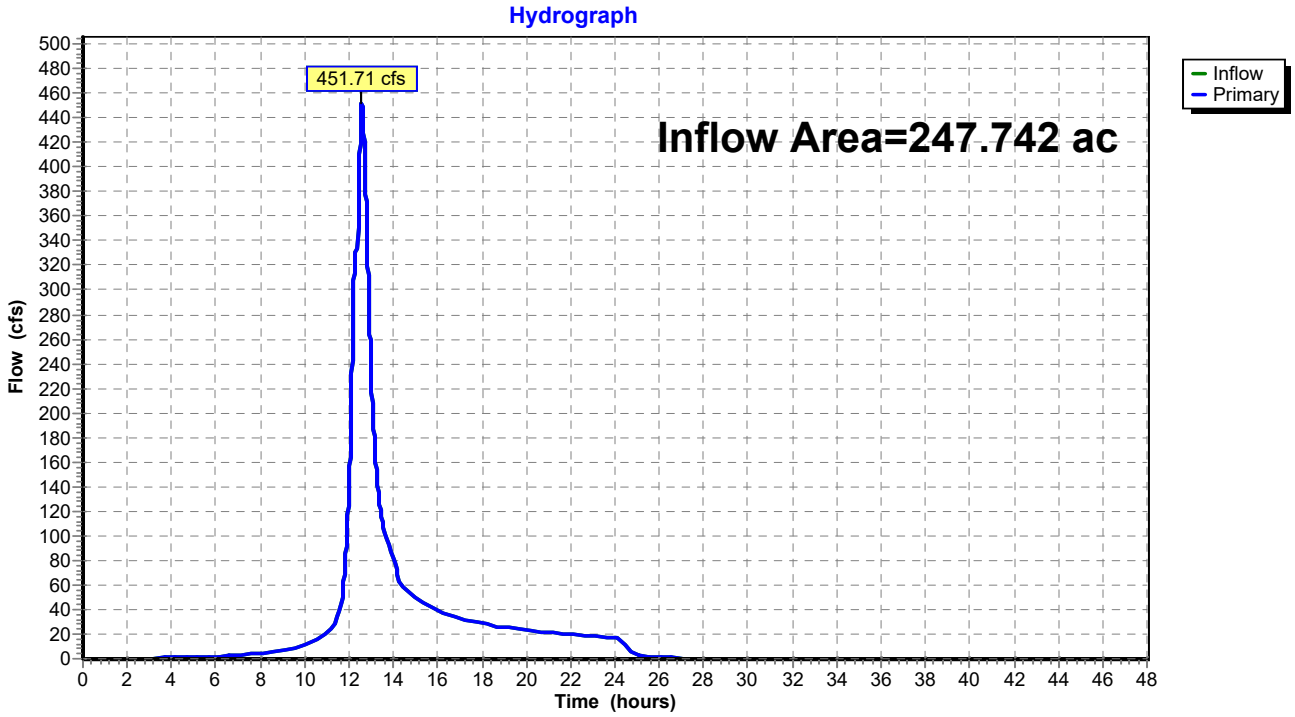

Hydrograph
Inflow Area=24.032 ac
Peak Elev=2,068.83'
Storage=63,702 cf
58.92 cfs
48.08 cfs
23.80 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 5 10 15 20 25 30 35 40 45 50 55 60 65

Summary for Link 7L: POA

Inflow Area = 247.742 ac, Inflow Depth = 3.42" for 100-yr event
Inflow = 451.71 cfs @ 12.59 hrs, Volume= 70.697 af
Primary = 451.71 cfs @ 12.59 hrs, Volume= 70.697 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 7L: POA



APPENDIX D:
STORMWATER QUALITY CALCULATIONS

DEQ Virginia Runoff Reduction Method New Development Compliance Spreadsheet - Version 3.0

☑ 2011 BMP Standards and Specifications ☐ 2013 Draft BMP Standards and Specifications

Project Name: Northside Park - Section XII
Date: 7/25/2022
BMP Design Specifications List: 2011 Stds & Specs

CLEAR ALL

data input cells
constant values
calculation cells
final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed	0.04	12.99	5.98	0.00	19.01
Impervious Cover (acres)	0.03	6.58	1.98	0.00	8.59
					27.60

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	**16.24**

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary

Forest/Open Space Cover (acres)	0.00
Weighted Rv (forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	19.01
Weighted Rv (turf)	0.21
% Managed Turf	69%
Impervious Cover (acres)	8.59
Rv (impervious)	0.95
% Impervious	31%
Site Area (acres)	**27.60**
Site Rv	**0.44**

Treatment Volume and Nutrient Loads

Treatment Volume (acre-ft)	1.0067
Treatment Volume (cubic feet)	43,851
TP Load (lb/yr)	27.55
TN Load (lb/yr) (Informational Purposes Only)	197.10

D.A. A
Bioretention #1

Drainage Area A

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)		1.34			1.34	0.20
Impervious Cover (acres)		0.87			0.87	0.95
				Total	2.21	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. A (lb/yr)	2.50
Post Development Treatment Volume in D.A. A (ft^3)	3,973

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	30			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80	1.27	0.83	0	3,027	757	3,784	50	0.00	2.37	2.14	0.24	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

Practice	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
1. Vegetated Roof (RR)					
1.a. Vegetated Roof #1 (Spec #5)	0		0.00	0.00	0.00
1.b. Vegetated Roof #2 (Spec #5)	0		0.00	0.00	0.00
2. Rooftop Disconnection (RR)					
2.a. Simple Disconnection to A/B Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.b. Simple Disconnection to C/D Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	0	0.00	0.00	0.00	0.00
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40	0.00	0.00	0.00	0.00
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	60	0.00	0.00	0.00	0.00
2.h. To Rainwater Harvesting (Spec #6)	0	0.00	0.00	0.00	0.00
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40	0.00	0.00	0.00	0.00
3. Permeable Pavement (RR)					
3.a. Permeable Pavement #1 (Spec #7)	25	0.00	0.00	0.00	0.00
3.b. Permeable Pavement #2 (Spec #7)	25		0.00	0.00	0.00
4. Grass Channel (RR)					
4.a. Grass Channel A/B Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.b. Grass Channel C/D Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20	0.00	0.00	0.00	0.00
5. Dry Swale (RR)					
5.a. Dry Swale #1 (Spec #10)	25	0.00	0.00	0.00	0.00
5.b. Dry Swale #2 (Spec #10)	35	0.00	0.00	0.00	0.00
6. Bioretention (RR)					
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	0.00	0.00	0.00	0.00
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	60	0.00	16.99	15.63	1.36
7. Infiltration (RR)					
7.a. Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
7.b. Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
8. Extended Detention Pond (RR)					
8.a. ED #1 (Spec #15)	10	0.00	0.00	0.00	0.00
8.b. ED #2 (Spec #15)	10	0.00	0.00	0.00	0.00
9. Sheetflow to Filter/Open Space (RR)					
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	0	0.00	0.00	0.00	0.00
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	0	0.00	0.00	0.00	0.00
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	0.83	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	1.27	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	3,027	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	2.50	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	2.14	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.36	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	3,027
NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	15.63

SEE WATER QUALITY COMPLIANCE TAB FOR SITE CALCULATIONS (Information Only)

D.A. A
Bioretention #1

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													
13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0			0	0	0	0	45	0.00	0.00	0.00	0.00	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

10. Wet Swale (Coastal Plain) (no RR)				
25	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00
11. Filtering Practices (no RR)				
30	0.00	0.00	0.00	0.00
45	0.00	0.00	0.00	0.00
12. Constructed Wetland (no RR)				
25	0.00	0.00	0.00	0.00
55	0.00	0.00	0.00	0.00
13. Wet Ponds (no RR)				
30	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00
14. Manufactured BMP (no RR)				
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	0.83	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	1.27	AREA CHECK: OK.
TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	16.24	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	2.50	
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	2.14	
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr)	2.14	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr)	0.36	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	15.63
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL NITROGEN REMOVED IN D.A. A (lb/yr)	15.63

D.A. B
Bioretention #2

Drainage Area B

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)		0.00	0.00		0.00	0.00
Managed Turf (acres)		1.58	1.76		3.34	0.21
Impervious Cover (acres)		1.06	0.50		1.56	0.95
				Total	4.90	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. B (lb/yr)	4.98
Post Development Treatment Volume in D.A. B (ft^3)	7,932

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	30			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80	3.16	1.17	0	5,160	1,290	6,450	50	0.00	4.05	3.64	0.40	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

Practice	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
1. Vegetated Roof (RR)					
1.a. Vegetated Roof #1 (Spec #5)	0		0.00	0.00	0.00
1.b. Vegetated Roof #2 (Spec #5)	0		0.00	0.00	0.00
2. Rooftop Disconnection (RR)					
2.a. Simple Disconnection to A/B Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.b. Simple Disconnection to C/D Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	0	0.00	0.00	0.00	0.00
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40	0.00	0.00	0.00	0.00
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	60	0.00	0.00	0.00	0.00
2.h. To Rainwater Harvesting (Spec #6)	0	0.00	0.00	0.00	0.00
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40	0.00	0.00	0.00	0.00
3. Permeable Pavement (RR)					
3.a. Permeable Pavement #1 (Spec #7)	25	0.00	0.00	0.00	0.00
3.b. Permeable Pavement #2 (Spec #7)	25		0.00	0.00	0.00
4. Grass Channel (RR)					
4.a. Grass Channel A/B Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.b. Grass Channel C/D Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20	0.00	0.00	0.00	0.00
5. Dry Swale (RR)					
5.a. Dry Swale #1 (Spec #10)	25	0.00	0.00	0.00	0.00
5.b. Dry Swale #2 (Spec #10)	35	0.00	0.00	0.00	0.00
6. Bioretention (RR)					
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	0.00	0.00	0.00	0.00
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	60	0.00	28.96	26.64	2.32
7. Infiltration (RR)					
7.a. Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
7.b. Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
8. Extended Detention Pond (RR)					
8.a. ED #1 (Spec #15)	10	0.00	0.00	0.00	0.00
8.b. ED #2 (Spec #15)	10	0.00	0.00	0.00	0.00
9. Sheetflow to Filter/Open Space (RR)					
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	0	0.00	0.00	0.00	0.00
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	0	0.00	0.00	0.00	0.00
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	1.17	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	3.16	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. B (ft^3)	5,160	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. B (lb/yr)	4.98	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	3.64	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	1.34	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

TOTAL RUNOFF REDUCTION IN D.A. B (ft^3)	5,160
NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	26.64

SEE WATER QUALITY COMPLIANCE TAB FOR SITE CALCULATIONS (Information Only)

D.A. B
Bioretention #2

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													
13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0			0	0	0	0	45	0.00	0.00	0.00	0.00	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

10. Wet Swale (Coastal Plain) (no RR)				
25	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00
11. Filtering Practices (no RR)				
30	0.00	0.00	0.00	0.00
45	0.00	0.00	0.00	0.00
12. Constructed Wetland (no RR)				
25	0.00	0.00	0.00	0.00
55	0.00	0.00	0.00	0.00
13. Wet Ponds (no RR)				
30	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00
14. Manufactured BMP (no RR)				
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	1.17	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	3.16	AREA CHECK: OK.
TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	16.24	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. B (lb/yr)	4.98	
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	3.64	
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. B (lb/yr)	3.64	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. B (lb/yr)	1.34	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	26.64
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00
TOTAL NITROGEN REMOVED IN D.A. B (lb/yr)	26.64

D.A. C
Bioretention #3

Drainage Area C

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)		0.00	0.00		0.00	0.00
Managed Turf (acres)		0.84	0.35		1.19	0.21
Impervious Cover (acres)		0.61	0.30		0.91	0.95
				Total	2.10	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. C (lb/yr)	2.53
Post Development Treatment Volume in D.A. C (ft^3)	4,027

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	30			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80	1.19	0.91	0	3,222	805	4,027	50	0.00	2.53	2.27	0.25	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

Practice	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
1. Vegetated Roof (RR)					
1.a. Vegetated Roof #1 (Spec #5)	0		0.00	0.00	0.00
1.b. Vegetated Roof #2 (Spec #5)	0		0.00	0.00	0.00
2. Rooftop Disconnection (RR)					
2.a. Simple Disconnection to A/B Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.b. Simple Disconnection to C/D Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	0	0.00	0.00	0.00	0.00
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40	0.00	0.00	0.00	0.00
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	60	0.00	0.00	0.00	0.00
2.h. To Rainwater Harvesting (Spec #6)	0	0.00	0.00	0.00	0.00
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40	0.00	0.00	0.00	0.00
3. Permeable Pavement (RR)					
3.a. Permeable Pavement #1 (Spec #7)	25	0.00	0.00	0.00	0.00
3.b. Permeable Pavement #2 (Spec #7)	25		0.00	0.00	0.00
4. Grass Channel (RR)					
4.a. Grass Channel A/B Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.b. Grass Channel C/D Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20	0.00	0.00	0.00	0.00
5. Dry Swale (RR)					
5.a. Dry Swale #1 (Spec #10)	25	0.00	0.00	0.00	0.00
5.b. Dry Swale #2 (Spec #10)	35	0.00	0.00	0.00	0.00
6. Bioretention (RR)					
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	0.00	0.00	0.00	0.00
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	60	0.00	18.08	16.64	1.45
7. Infiltration (RR)					
7.a. Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
7.b. Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
8. Extended Detention Pond (RR)					
8.a. ED #1 (Spec #15)	10	0.00	0.00	0.00	0.00
8.b. ED #2 (Spec #15)	10	0.00	0.00	0.00	0.00
9. Sheetflow to Filter/Open Space (RR)					
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	0	0.00	0.00	0.00	0.00
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	0	0.00	0.00	0.00	0.00
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	0.91	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	1.19	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. C (ft^3)	3,222	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. C (lb/yr)	2.53	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	2.27	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	0.26	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

TOTAL RUNOFF REDUCTION IN D.A. C (ft^3)	3,222
NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	16.64

SEE WATER QUALITY COMPLIANCE TAB FOR SITE CALCULATIONS (Information Only)

D.A. C
Bioretention #3

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													
13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0			0	0	0	0	45	0.00	0.00	0.00	0.00	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

10. Wet Swale (Coastal Plain) (no RR)				
25	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00
11. Filtering Practices (no RR)				
30	0.00	0.00	0.00	0.00
45	0.00	0.00	0.00	0.00
12. Constructed Wetland (no RR)				
25	0.00	0.00	0.00	0.00
55	0.00	0.00	0.00	0.00
13. Wet Ponds (no RR)				
30	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00
14. Manufactured BMP (no RR)				
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	0.91	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	1.19	AREA CHECK: OK.
TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	16.24	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. C (lb/yr)	2.53	
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	0.00	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	2.27	
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. C (lb/yr)	2.27	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. C (lb/yr)	0.26	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	16.64
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	0.00
TOTAL NITROGEN REMOVED IN D.A. C (lb/yr)	16.64

D.A. D
Bioretention #4

Drainage Area D

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)		2.52	0.22		2.74	0.20
Impervious Cover (acres)		0.78	0.01		0.79	0.95
				Total	3.53	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. D (lb/yr): 2.97

Post Development Treatment Volume in D.A. D (ft^3): 4,730

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	6.b. Bioretention #2
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	30			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80	2.74	0.79	0	3,784	946	4,730	50	0.00	2.97	2.67	0.30	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

Practice	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
1. Vegetated Roof (RR)					
1.a. Vegetated Roof #1 (Spec #5)	0		0.00	0.00	0.00
1.b. Vegetated Roof #2 (Spec #5)	0		0.00	0.00	0.00
2. Rooftop Disconnection (RR)					
2.a. Simple Disconnection to A/B Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.b. Simple Disconnection to C/D Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	0	0.00	0.00	0.00	0.00
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40	0.00	0.00	0.00	0.00
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	60	0.00	0.00	0.00	0.00
2.h. To Rainwater Harvesting (Spec #6)	0	0.00	0.00	0.00	0.00
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40	0.00	0.00	0.00	0.00
3. Permeable Pavement (RR)					
3.a. Permeable Pavement #1 (Spec #7)	25	0.00	0.00	0.00	0.00
3.b. Permeable Pavement #2 (Spec #7)	25		0.00	0.00	0.00
4. Grass Channel (RR)					
4.a. Grass Channel A/B Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.b. Grass Channel C/D Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20	0.00	0.00	0.00	0.00
5. Dry Swale (RR)					
5.a. Dry Swale #1 (Spec #10)	25	0.00	0.00	0.00	0.00
5.b. Dry Swale #2 (Spec #10)	35	0.00	0.00	0.00	0.00
6. Bioretention (RR)					
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	0.00	0.00	0.00	0.00
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	60	0.00	21.23	19.54	1.70
7. Infiltration (RR)					
7.a. Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
7.b. Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
8. Extended Detention Pond (RR)					
8.a. ED #1 (Spec #15)	10	0.00	0.00	0.00	0.00
8.b. ED #2 (Spec #15)	10	0.00	0.00	0.00	0.00
9. Sheetflow to Filter/Open Space (RR)					
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	0	0.00	0.00	0.00	0.00
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	0	0.00	0.00	0.00	0.00
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac): 0.79 AREA CHECK: OK.

TOTAL MANAGED TURF AREA TREATED (ac): 2.74 AREA CHECK: OK.

TOTAL RUNOFF REDUCTION IN D.A. D (ft^3): 3,784

TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. D (lb/yr): 2.97

TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr): 2.67

TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr): 0.30

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

TOTAL RUNOFF REDUCTION IN D.A. D (ft^3): 3,784

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr): 19.54

SEE WATER QUALITY COMPLIANCE TAB FOR SITE CALCULATIONS (Information Only)

D.A. D
Bioretention #4

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													
13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0			0	0	0	0	45	0.00	0.00	0.00	0.00	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

10. Wet Swale (Coastal Plain) (no RR)				
25	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00
11. Filtering Practices (no RR)				
30	0.00	0.00	0.00	0.00
45	0.00	0.00	0.00	0.00
12. Constructed Wetland (no RR)				
25	0.00	0.00	0.00	0.00
55	0.00	0.00	0.00	0.00
13. Wet Ponds (no RR)				
30	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00
14. Manufactured BMP (no RR)				
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	0.79	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	2.74	AREA CHECK: OK.
TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	16.24	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. D (lb/yr)	2.97	
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	0.00	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	2.67	
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. D (lb/yr)	2.67	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. D (lb/yr)	0.30	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	19.54
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	0.00
TOTAL NITROGEN REMOVED IN D.A. D (lb/yr)	19.54

D.A. E
Bioretention #5

Drainage Area E

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)		0.83			0.83	0.20
Impervious Cover (acres)		0.68			0.68	0.95
				Total	1.51	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. E (lb/yr)	1.85
Post Development Treatment Volume in D.A. E (ft^3)	2,948

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	30			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80	0.83	0.68	0	2,358	590	2,948	50	0.00	1.85	1.66	0.18	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

Practice	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
1. Vegetated Roof (RR)					
1.a. Vegetated Roof #1 (Spec #5)	0		0.00	0.00	0.00
1.b. Vegetated Roof #2 (Spec #5)	0		0.00	0.00	0.00
2. Rooftop Disconnection (RR)					
2.a. Simple Disconnection to A/B Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.b. Simple Disconnection to C/D Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	0	0.00	0.00	0.00	0.00
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40	0.00	0.00	0.00	0.00
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	60	0.00	0.00	0.00	0.00
2.h. To Rainwater Harvesting (Spec #6)	0	0.00	0.00	0.00	0.00
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40	0.00	0.00	0.00	0.00
3. Permeable Pavement (RR)					
3.a. Permeable Pavement #1 (Spec #7)	25	0.00	0.00	0.00	0.00
3.b. Permeable Pavement #2 (Spec #7)	25		0.00	0.00	0.00
4. Grass Channel (RR)					
4.a. Grass Channel A/B Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.b. Grass Channel C/D Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20	0.00	0.00	0.00	0.00
5. Dry Swale (RR)					
5.a. Dry Swale #1 (Spec #10)	25	0.00	0.00	0.00	0.00
5.b. Dry Swale #2 (Spec #10)	35	0.00	0.00	0.00	0.00
6. Bioretention (RR)					
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	0.00	0.00	0.00	0.00
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	60	0.00	13.23	12.17	1.06
7. Infiltration (RR)					
7.a. Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
7.b. Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
8. Extended Detention Pond (RR)					
8.a. ED #1 (Spec #15)	10	0.00	0.00	0.00	0.00
8.b. ED #2 (Spec #15)	10	0.00	0.00	0.00	0.00
9. Sheetflow to Filter/Open Space (RR)					
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	0	0.00	0.00	0.00	0.00
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	0	0.00	0.00	0.00	0.00
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	0.68	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.83	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. E (ft^3)	2,358	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. E (lb/yr)	1.85	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. E (lb/yr)	1.66	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. E (lb/yr)	0.19	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

TOTAL RUNOFF REDUCTION IN D.A. E (ft^3)	2,358
NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. E (lb/yr)	12.17

SEE WATER QUALITY COMPLIANCE TAB FOR SITE CALCULATIONS (Information Only)

D.A. E
Bioretention #5

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													
13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0			0	0	0	0	45	0.00	0.00	0.00	0.00	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

10. Wet Swale (Coastal Plain) (no RR)				
25	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00
11. Filtering Practices (no RR)				
30	0.00	0.00	0.00	0.00
45	0.00	0.00	0.00	0.00
12. Constructed Wetland (no RR)				
25	0.00	0.00	0.00	0.00
55	0.00	0.00	0.00	0.00
13. Wet Ponds (no RR)				
30	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00
14. Manufactured BMP (no RR)				
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	0.68	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.83	AREA CHECK: OK.
TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	16.24	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. E (lb/yr)	1.85	
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. E (lb/yr)	0.00	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. E (lb/yr)	1.66	
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. E (lb/yr)	1.66	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. E (lb/yr)	0.19	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. E (lb/yr)	12.17
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. E (lb/yr)	0.00
TOTAL NITROGEN REMOVED IN D.A. E (lb/yr)	12.17

Runoff Volume and Curve Number Calculations

Enter design storm rainfall depths (in):

1-year storm	2-year storm	10-year storm
2.27	2.75	4.09

Use NOAA Atlas 14 (http://hdsc.nws.noaa.gov/hdsc/pfds/)

***Notes (see below):**

[1] The curve numbers and runoff volumes computed in this spreadsheet for each drainage area are limited in their applicability for determining and demonstrating compliance with water quantity requirements. See VRRM User's Guide and Documentation for additional information.

[2] Runoff Volume (RV) for pre- and post-development drainage areas must be in volumetric units (e.g., acre-feet or cubic feet) when using the Energy Balance Equation. Runoff measured in watershed-inches and shown in the spreadsheet as RV(watershed-inch) can only be used in the Energy Balance Equation when the pre- and post-development drainage areas are equal. Otherwise RV(watershed-inch) must be multiplied by the drainage area.

[3] Adjusted CNs are based on runoff reduction volumes as calculated in D.A. tabs. An alternative CN adjustment calculation for Vegetated Roofs is included in BMP specification No. 5.

Drainage Area Curve Numbers and Runoff Depths*

Curve numbers (CN, CNadj) and runoff depths ($RV_{Developed}$) are computed with and without reduction practices.

Drainage Area A		**A Soils**	**B Soils**	**C Soils**	**D Soils**	**Total Area (acres):**	2.21
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	**Runoff Reduction Volume (ft^3):**	3,027
	CN	30	55	70	77		
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	1.34	0.00	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	0.87	0.00	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ A)}$		
					76		
		1-year storm	**2-year storm**	**10-year storm**			
$RV_{Developed}$ *(watershed-inch)* **with no Runoff Reduction***		0.56	0.85	1.81			
$RV_{Developed}$ *(watershed-inch)* **with Runoff Reduction***		0.18	0.47	1.43			
Adjusted CN*		**63**	**67**	**71**			

**See Notes above*

Drainage Area B		**A Soils**	**B Soils**	**C Soils**	**D Soils**	**Total Area (acres):**	4.90
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	**Runoff Reduction Volume (ft^3):**	5,160
	CN	30	55	70	77		
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	1.58	1.76	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	1.06	0.50	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ B)}$		
					77		
		1-year storm	**2-year storm**	**10-year storm**			
$RV_{Developed}$ *(watershed-inch)* **with no Runoff Reduction***		0.60	0.90	1.88			
$RV_{Developed}$ *(watershed-inch)* **with Runoff Reduction***		0.31	0.61	1.59			
Adjusted CN*		**69**	**71**	**73**			

**See Notes above*

Drainage Area C		**A Soils**	**B Soils**	**C Soils**	**D Soils**	**Total Area (acres):**	2.10
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	**Runoff Reduction Volume (ft^3):**	3,222
	CN	30	55	70	77		
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.84	0.35	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	0.61	0.30	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ C)}$		
					79		
		1-year storm	**2-year storm**	**10-year storm**			
$RV_{Developed}$ *(watershed-inch)* **with no Runoff Reduction***		0.69	1.01	2.04			
$RV_{Developed}$ *(watershed-inch)* **with Runoff Reduction***		0.26	0.59	1.61			
Adjusted CN*		**67**	**70**	**73**			

**See Notes above*

Drainage Area D		A Soils	B Soils	C Soils	D Soils	Total Area (acres):	3.53
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	Runoff Reduction Volume (ft^3):	3,784
	CN	30	55	70	77		
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	2.52	0.22	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	0.78	0.01	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ D)}$		
					70		
		1-year storm	2-year storm	10-year storm			
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*		0.35	0.58	1.39			
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*		0.06	0.28	1.09			
	Adjusted CN*	56	61	65			
	See Notes above						

Drainage Area E		A Soils	B Soils	C Soils	D Soils	Total Area (acres):	1.51
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	Runoff Reduction Volume (ft^3):	2,358
	CN	30	55	70	77		
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.83	0.00	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	0.68	0.00	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ E)}$		
					78		
		1-year storm	2-year storm	10-year storm			
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*		0.64	0.95	1.96			
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*		0.21	0.52	1.53			
	Adjusted CN*	65	69	72			
	*See Notes above						

DEQ Virginia Runoff Reduction Method New Development Compliance Spreadsheet - Version 3.0

BMP Design Specifications List: **2011 Stds & Specs**

Site Summary

Project Title: Northside Park - Section XII

Date: 44767

Total Rainfall = 43 inches

Site Land Cover Summary

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.04	12.99	5.98	0.00	19.01	69
Impervious Cover (acres)	0.03	6.58	1.98	0.00	8.59	31
					27.60	100

Site Tv and Land Cover Nutrient Loads

Site Rv	0.44
Treatment Volume (ft^3)	43,851
TP Load (lb/yr)	27.55
TN Load (lb/yr)	197.10

Total TP Load Reduction Required (lb/yr)	16.24

Site Compliance Summary

Total Runoff Volume Reduction (ft^3)	17,551
Total TP Load Reduction Achieved (lb/yr)	12.39
Total TN Load Reduction Achieved (lb/yr)	90.62
Remaining Post Development TP Load (lb/yr)	15.16
Remaining TP Load Reduction (lb/yr) Required	**3.84**

Drainage Area Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	1.34	3.34	1.19	2.74	0.83	9.44
Impervious Cover (acres)	0.87	1.56	0.91	0.79	0.68	4.81
Total Area (acres)	**2.21**	**4.90**	**2.10**	**3.53**	**1.51**	**14.25**

Drainage Area Compliance Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
TP Load Reduced (lb/yr)	2.14	3.64	2.27	2.67	1.66	12.39
TN Load Reduced (lb/yr)	15.63	26.64	16.64	19.54	12.17	90.62

Drainage Area A Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	1.34	0.00	0.00	1.34	61
Impervious Cover (acres)	0.00	0.87	0.00	0.00	0.87	39
					2.21	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	0.83
Total Turf Area Treated (acres)	1.27
Total TP Load Reduction Achieved in D.A. (lb/yr)	2.14
Total TN Load Reduction Achieved in D.A. (lb/yr)	15.63

Drainage Area B Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	1.58	1.76	0.00	3.34	68
Impervious Cover (acres)	0.00	1.06	0.50	0.00	1.56	32
					4.90	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	1.17
Total Turf Area Treated (acres)	3.16
Total TP Load Reduction Achieved in D.A. (lb/yr)	3.64
Total TN Load Reduction Achieved in D.A. (lb/yr)	26.64

Drainage Area C Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.84	0.35	0.00	1.19	57
Impervious Cover (acres)	0.00	0.61	0.30	0.00	0.91	43
					2.10	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	0.91
Total Turf Area Treated (acres)	1.19
Total TP Load Reduction Achieved in D.A. (lb/yr)	2.27
Total TN Load Reduction Achieved in D.A. (lb/yr)	16.64

Drainage Area D Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	2.52	0.22	0.00	2.74	78
Impervious Cover (acres)	0.00	0.78	0.01	0.00	0.79	22
					3.53	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	0.79
Total Turf Area Treated (acres)	2.74
Total TP Load Reduction Achieved in D.A. (lb/yr)	2.67
Total TN Load Reduction Achieved in D.A. (lb/yr)	19.54

Drainage Area E Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.83	0.00	0.00	0.83	55
Impervious Cover (acres)	0.00	0.68	0.00	0.00	0.68	45
					1.51	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	0.68
Total Turf Area Treated (acres)	0.83
Total TP Load Reduction Achieved in D.A. (lb/yr)	1.66
Total TN Load Reduction Achieved in D.A. (lb/yr)	12.17

Runoff Volume and CN Calculations

	1-year storm	2-year storm	10-year storm
Target Rainfall Event (in)	2.27	2.75	4.09

Drainage Areas	RV & CN	Drainage Area A	Drainage Area B	Drainage Area C	Drainage Area D	Drainage Area E
CN		76	77	79	70	78
RR (ft^3)		3,027	5,160	3,222	3,784	2,358
1-year return period	RV wo RR (ws-in)	0.56	0.60	0.69	0.35	0.64
	RV w RR (ws-in)	0.18	0.31	0.26	0.06	0.21
	CN adjusted	63	69	67	56	65
2-year return period	RV wo RR (ws-in)	0.85	0.90	1.01	0.58	0.95
	RV w RR (ws-in)	0.47	0.61	0.59	0.28	0.52
	CN adjusted	67	71	70	61	69
10-year return period	RV wo RR (ws-in)	1.81	1.88	2.04	1.39	1.96
	RV w RR (ws-in)	1.43	1.59	1.61	1.09	1.53
	CN adjusted	71	73	73	65	72