**STORMWATER MANAGEMENT CALCULATIONS**

**FOR**

# SEVEN BREW COFFEE

## CONDITIONAL USE PERMIT APPLICATION

**MOUNT TABOR MAGISTERIAL DISTRICT**
**TOWN OF BLACKSBURG, VIRGINIA**

**April 1, 2024**


**PREPARED BY:**

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**P-540-381-4290**
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# SECTION I: PROJECT NARRATIVE

**Project Description**

The purpose of this project is the approval of a conditional use permit for 1.02 acres of land for Seven Brew, a national coffee stand chain. The project area is currently made up of multiple connected parcels which will be combined into one. The portion of the site fronting Ardmore Street is vacant and the remainder contains an existing dwelling. The site will have access to both South Main Street and Ardmore Street and will also connect to the existing Blacksburg Square Shopping Center parking lot. The applicant proposes the conditional use of Restaurant, Drive-In for the property.

**Existing Site Conditions**

The project site[1] is located at the corner of South Main Street and Ardmore Street. The site is bound by Blacksburg Square LLC on North and East, South Main Street on the West, and Ardmore Street, A. and Gladys Smith, and MRE Outlook LLC on the South. Surrounding properties consist of single-family residential and commercial uses. The site has an existing dwelling with a driveway that will be demolished. Other areas of the site consist of grassed and wooded areas with gentle to steep slopes.

Existing soil conditions on-site include the types listed below with slopes ranging from 2%-15%. 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.

**Existing soil conditions on-site include the following types:**
(See attached soils map for specific locations.)

18B - Groseclose-Urban Land Complex, 2 to 7 percent slopes
- K-Factor: 0.32
- Texture: Loam
- HSG: C

18C - Groseclose-Urban Land Complex, 7 to 15 percent slopes
- K-Factor: 0.32
- Texture: Loam
- HSG: C

[1] For the purposes of the Project Narrative, "site" shall be defined as the area within the subject property boundary, 1.02 acres, Tax Map #'s 287-22 1-5 & 287-22 102-105.

**Development Plans**

The proposed development will consist of two structures, a coffee stand with a drive-thru window and a standalone freezer. A parking lot and a dumpster will be provided, and the site will have two access points through the Blacksburg Square parking lot and one access point on Ardmore Street. The site is currently serviced by Town of Blacksburg water and sewer and will continue to use those services through existing or replacement service connections. Stormwater quantity requirements will be handled by an underground detention system. Water quality requirements will be met by purchasing nutrient credits.

**During Construction**

Neighboring areas are primarily developed urban land consisting of single-family residential and commercial uses. 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 drainage area map.

In the pre-development condition, the site consists of an existing dwelling with a driveway and grassed and wooded areas. The site and the adjacent properties drain to several existing inlets that are located in the Blacksburg Square parking lot, Ardmore Street, and South Main Street. These inlets are all part of an existing storm sewer network that runs down South Main Street. The furthest downstream inlet that collects drainage from the site has been chosen as the point of analysis. The total drainage area to the point of analysis has been broken down into sub-drainage areas that drain to each upstream inlet.

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) |
|---|---|---|
| 0.966 | 80 | 1/2 acre lots, 25% imp, HSG C (2S) |
| 0.059 | 81 | 1/3 acre lots, 30% imp, HSG C (2S) |
| 0.179 | 83 | 1/4 acre lots, 38% imp, HSG C (1S, 2S) |
| 0.896 | 74 | >75% Grass cover, Good, HSG C (1S, 2S, 3S) |
| 0.129 | 98 | Impervious Cover, HSG (1S) |
| 0.972 | 98 | Paved roads w/curbs & sewers, HSG C (1S, 2S, 3S) |
| 2.239 | 94 | Urban commercial. 85% imp, HSG (1S, 2S, 3S, 4S) |
| **5.440** | **89** | **TOTAL AREA** |

**Point of Analysis 1**

Total Drainage Area= 5.44 acres

| | Peak Flow | Runoff Volume |
|---|---|---|
| **1-year** | 8.44 cfs | 0.608 af |
| **2-year** | 10.96 cfs | 0.791 af |
| **10-year** | 16.94 cfs | 1.331 af |

## POST-DEVELOPMENT SUMMARY

Please see Sheet SW5 for drainage area map.

In the post-development condition, site runoff will be captured via sheet flow, gutter, curb inlets, and stormwater piping. Most of the site runoff will be collected in an underground detention facility and outflow from this system will be managed by multiple flow devices. As shown in the enclosed HydroCAD calculations, the underground system has been designed to manage peak flows to meet water quantity requirements. The underground facility will outflow into the existing storm sewer in South Main Street. Other predominantly pervious areas from the site that will not be collected into the proposed detention facility will drain to existing inlets in a substantially similar manner as the pre-development condition.

All runoff from the site will be collected into the existing storm sewer and drain to the point of analysis, which is the most downstream inlet collecting runoff from the site. 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. Where a subwatershed is predominantly impervious, a minimum time of concentration of 6 minutes has been assumed.

**Post-Development Land Cover**

| Area (acres) | CN | Description (subcatchment numbers) |
|---|---|---|
| 0.966 | 80 | 1/2 acre lots, 25% imp, HSG C (2S) |
| 0.059 | 81 | 1/3 acre lots, 30% imp, HSG C (2S) |
| 0.179 | 83 | 1/4 acre lots, 38% imp, HSG C (1S, 2S) |
| 0.388 | 74 | >75% Grass cover, Good, HSG C (1S, 2S, 3S, 4S) |
| 0.637 | 98 | Impervious Cover, HSG (2S, 4S) |
| 0.972 | 98 | Paved roads w/curbs & sewers, HSG C (1S, 2S, 3S) |
| 2.239 | 94 | Urban commercial. 85% imp, HSG (1S, 2S, 3S, 4S, 5S) |
| **5.440** | **91** | **TOTAL AREA** |

**Point of Analysis 1**

Total Drainage Area= 5.44 acres

The following table summarizes the pre- and post-development peak flow rates for the point of analysis and the percent change for each storm (see HydroCAD report).

| | Pre-Dev Peak Flow Rate | Post-Dev Peak Flow Rate |
|---|---|---|
| **1-year** | 8.44 cfs | 8.19 cfs |
| **2-year** | 10.96 cfs | 10.70 cfs |
| **10-year** | 16.94 cfs | 16.27 cfs |

As shown above, the post-development peak flow rates are less than the pre-development peak flow rates for the 1-year, 2-year, and 10-year, thus meeting Town of Blacksburg requirements for stormwater quantity.

**Channel Protection**

Runoff from site[2] will be discharged directly into existing storm inlets on North Main Street and Ardmore Street. From there, runoff is conveyed by a manmade conveyance system (storm sewer) down North Main Street before discharging out of a 60" outfall pipe at the corner of North Main Street and King Street. As shown on Sheet SW4, a watershed containing approximately 192 acres forms at the beginning of the 60" outfall pipe. In accordance with Town Code §18-613(b)(4)(i), this point forms the Limits of Analysis for channel protection since the site's contributing drainage area (1.27 acres) is less than 1% of the total watershed area. The entire conveyance system from the site to this point is a manmade conveyance system made up of storm sewer and manhole structures. Because the flow at the point of analysis will be reduced in the post-development condition, no erosion of the manmade system should be expected as a result of this development.

**Flood Protection**

In accordance with Town Code §18-613(c), concentrated stormwater flows have been discharged to a stormwater conveyance system. The downstream conveyance system is a manmade storm sewer. 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 subsection 2(ii) of the Code. Per subsection (3) of the Code, when subdivision 2(ii) is utilized, the discharge point constitutes the Limits of Analysis and no further analysis of the downstream stormwater conveyance system is required.

**100-YR Storm Passage**

As shown on the attached HydroCAD calculations, the 100-year storm will fill the detention system to near capacity. Should overflow from the system occur, flows would exit the top of the system and spill directly into the curb & gutter along South Main Street, where they would combine with runoff from other adjacent areas before ultimately reaching Cedar Run. No structures are at risk in the path of the overflow from the site before it combines with the runoff of existing adjacent areas.

[2] In the context of channel and flood protection, "site" shall be defined as the area where work is being performed, including any offsite disturbance (approximately 1.27 acres). See Sheets SW3-SW5.

# SECTION III: STORMWATER QUALITY SUMMARY

Water quality compliance will be achieved 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 the area of disturbance is less than 5 acres or the water quality reduction requirement is less than 10 pounds per year. This site qualifies for nutrient credit purchase with a total disturbed area of approximately 1.27 acres and a reduction requirement of 1.09 pounds per year.

The existing site[3] has an impervious land cover of 0.35 acres (28%). The post-development site will have an impervious land cover of 0.86 acres (68%) resulting in a runoff coefficient ($R_v$) of 0.71. The required pollutant removal rate is 1.09 lb/year, all of which will be handled with nutrient credits.

[3] In the context of channel and flood protection, "site" shall be defined as the area where work is being performed, including any offsite disturbance (approximately 1.27 acres). See Sheets SW3-SW5.

# SECTION IV: DOWNSTREAM ANALYSIS

Runoff from the proposed development is discharged directly into to a manmade conveyance system. This conveyance system carries flows from the site downstream to the 1% analysis point (127 acres). The post-development peak runoff has been mitigated via underground detention facilities to prevent adverse impacts from this site to downstream properties in the form of channel erosion and flooding.

Per Town Code §18-613 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 should be expected as a result of this development.

# SECTION V: 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

Underground Detention Facilities:

1. Every (12) months the responsible party shall complete and document a visual inspection of the underground facility and its components and make any repairs necessary to areas of failure or concern discovered during inspection. Typical maintenance tasks include:
    a. Cleanout of any debris or sediment accumulated in the structure that reduces the storage volume or otherwise hinders the performance of the facility.
    b. Visual inspection for structural deterioration, spalling, or cracking of the structural components.
2. The flow control manholes shall be inspected after each runoff producing storm event to check for debris and/or sediment accumulation that may compromise the performance of the structure. Such debris and sediments shall be removed immediately.

Per the Town of Blacksburg stormwater ordinance, a formal maintenance agreement shall be provided to the Town for review and ultimately recorded at the Montgomery County Courthouse legally binding the identified party to the maintenance/inspection responsibilities listed above.

# APPENDIX A:
# SOIL MAPS & SOIL DESCRIPTIONS

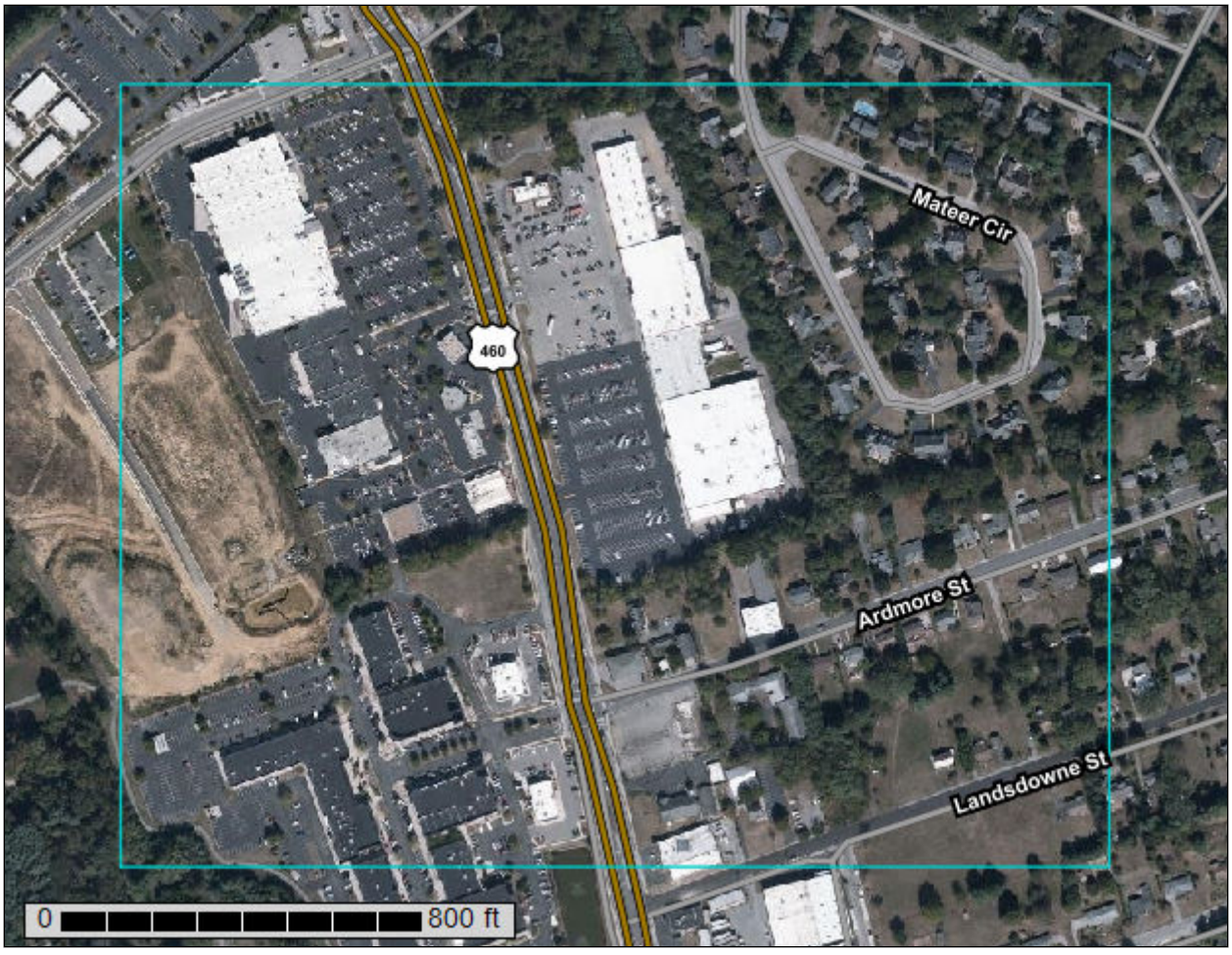
United States Department of Agriculture

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




November 15, 2023

# 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.

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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: 1:4,470 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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 16, Sep 5, 2023

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 |
|---|---|---|---|
| 18B | Groseclose-Urban land complex, 2 to 7 percent slopes | 38.4 | 43.9% |
| 18C | Groseclose-Urban land complex, 7 to 15 percent slopes | 35.5 | 40.6% |
| 18D | Groseclose-Urban land complex, 15 to 25 percent slopes | 12.4 | 14.2% |
| 29 | Udorthents and Urban land | 1.0 | 1.2% |
| W | Water | 0.2 | 0.2% |
| **Totals for Area of Interest** | | **87.5** | **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

## 18B—Groseclose-Urban land complex, 2 to 7 percent slopes

### Map Unit Setting

*National map unit symbol:* kc27
*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:* Not prime farmland

### Map Unit Composition

*Groseclose and similar soils:* 40 percent
*Urban land:* 30 percent
*Minor components:* 3 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
*Ecological site:* F128XY516WV - Mesic Limestone With Interbedded Sedimentary Uplands
*Hydric soil rating:* No

**Description of Urban Land**

**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

**Minor Components**

**Purdy**

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

## 18C—Groseclose-Urban land complex, 7 to 15 percent slopes

**Map Unit Setting**

*National map unit symbol:* kc28
*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:* Not prime farmland

**Map Unit Composition**

*Groseclose and similar soils:* 40 percent
*Urban land:* 30 percent
*Minor components:* 3 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
*Ecological site:* F128XY516WV - Mesic Limestone With Interbedded Sedimentary Uplands
*Hydric soil rating:* No

**Description of Urban Land**

**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

**Minor Components**

**Purdy**

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

## 18D—Groseclose-Urban land complex, 15 to 25 percent slopes

**Map Unit Setting**

*National map unit symbol:* kc29
*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:* Not prime farmland

**Map Unit Composition**

*Groseclose and similar soils:* 40 percent
*Urban land:* 30 percent
*Minor components:* 3 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
*Ecological site:* F128XY516WV - Mesic Limestone With Interbedded Sedimentary Uplands
*Hydric soil rating:* No

**Description of Urban Land**

**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

**Minor Components**

**Purdy**

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

## 29—Udorthents and Urban land

**Map Unit Setting**

*National map unit symbol:* kc2r
*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:* Not prime farmland

**Map Unit Composition**

*Udorthents and similar soils:* 45 percent
*Urban land:* 30 percent
*Minor components:* 3 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Udorthents**

**Setting**

*Landform:* Hills
*Landform position (two-dimensional):* Summit, backslope
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Limestone, shale, sandstone, or granite residuum

**Properties and qualities**

*Slope:* 0 to 25 percent
*Depth to restrictive feature:* More than 80 inches
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None

**Description of Urban Land**

**Setting**

*Landform:* Hills
*Landform position (two-dimensional):* Summit, backslope
*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Limestone, shale, sandstone, or granite residuum

**Minor Components**

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

## W—Water

**Map Unit Setting**
*National map unit symbol:* kc3g
*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**
*Water:* 100 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Water**

**Setting**
*Landform:* Perenial streams, lakes

# 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

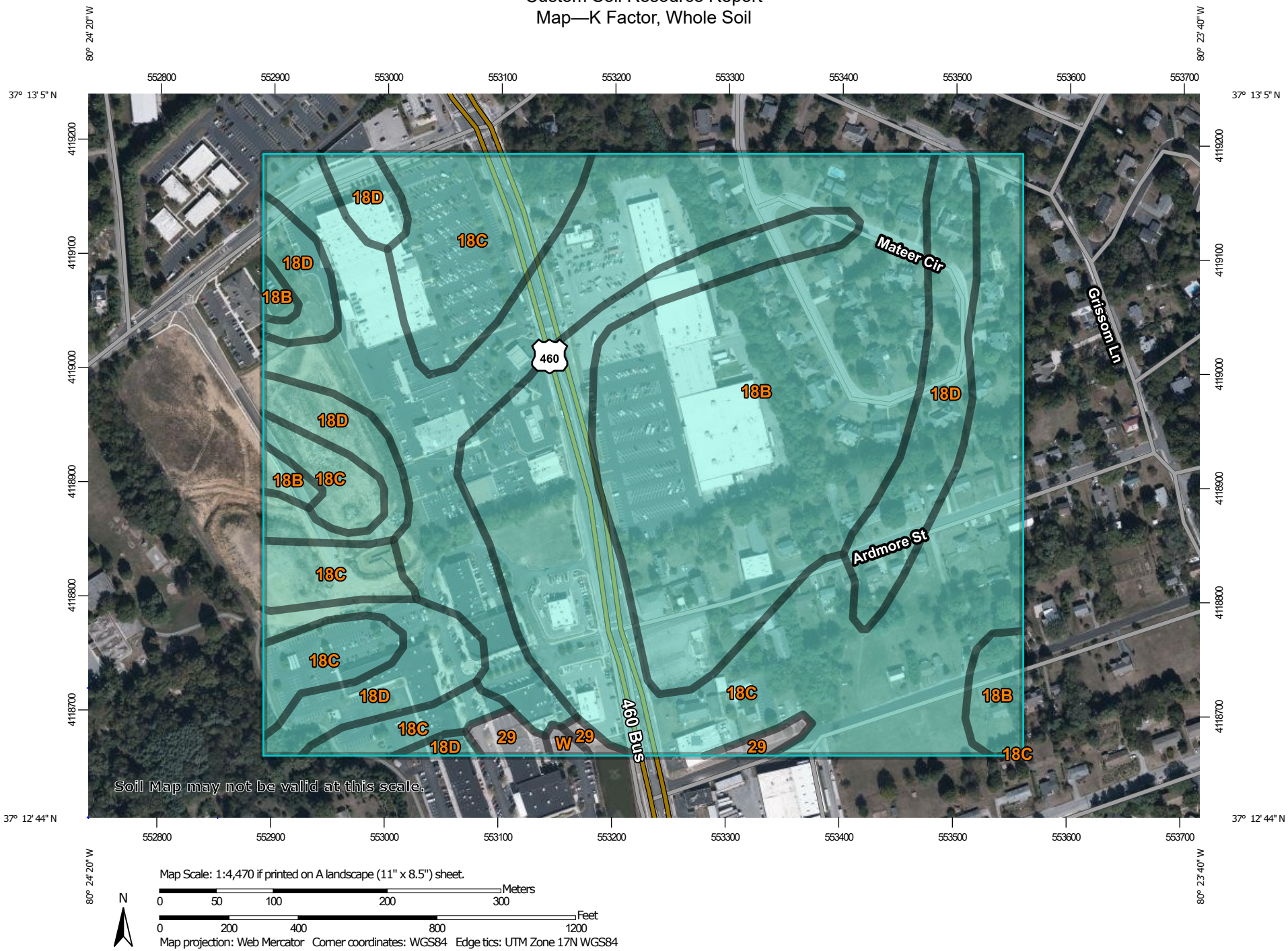
Soil Erosion Factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

### 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.


80° 24' 20" W
80° 23' 40" W
552800
552900
553000
553100
553200
553300
553400
553500
553600
553700
37° 13' 5" N
37° 12' 44" N
4119200
4119100
4119000
4118900
4118800
4118700
18D
18C
18B
460
Mateer Cir
Grissom Ln
Ardmore St
460 Bus
29
W 29
Soil Map may not be valid at this scale.
Map Scale: 1:4,470 if printed on A landscape (11" x 8.5") sheet.
Meters
0 50 100 200 300
Feet
0 200 400 800 1200
N
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 16, Sep 5, 2023

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 |
|---|---|---|---|---|
| 18B | Groseclose-Urban land complex, 2 to 7 percent slopes | .32 | 38.4 | 43.9% |
| 18C | Groseclose-Urban land complex, 7 to 15 percent slopes | .32 | 35.5 | 40.6% |
| 18D | Groseclose-Urban land complex, 15 to 25 percent slopes | .32 | 12.4 | 14.2% |
| 29 | Udorthents and Urban land | | 1.0 | 1.2% |
| W | Water | | 0.2 | 0.2% |
| **Totals for Area of Interest** | | | **87.5** | **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 Health Properties

Soil health is defined as the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans. This folder contains information on soil properties that are important indicators of soil health.

## Soil Health - Soil Reaction (pH)

Soil reaction (pH) is a measure of acidity or alkalinity. Chemically, it is a measurement of the hydrogen ion activity [H+] in the soil solution. The pH scale ranges from 0 to 14; a pH of 7 is considered neutral. If pH values are greater than 7, the solution is considered basic or alkaline; if they are below 7, the solution is acidic.

Significance:

The acidity or alkalinity of a soil affects the availability of plant nutrients, the activity of microorganisms, and the solubility of soil minerals (Brady, 1990). In general, pH values between 6 and 7.5 are optimum for general crop growth. Site-specific interpretations for soil health will depend on specific land uses and crop tolerances. In acid soils, calcium and magnesium, nitrate-nitrogen, phosphorus, boron, and

molybdenum are deficient but aluminum and manganese are abundant, in some cases at levels toxic to some plants (USDA-NRCS, 2008). Phosphorus, iron, copper, zinc, and boron are frequently deficient in very alkaline soils. Bacterial populations and activity decline at low pH levels, whereas fungi adapt to a large range of pH (acidic and alkaline). Nitrification and nitrogen fixation are also inhibited by low pH (USDA-NRCS, 2008). To increase pH, liming, adding organic residues rich in basic cations, and rotating crops to interrupt the acidifying effect of leguminous crops are effective. Applying ammonium-based fertilizers, urea, sulfur, or ferrous sulfate; irrigating with acidifying fertilizers; or using acidifying residues (acid moss, pine needles, sawdust) decrease soil pH (USDA-NRCS, 2008).

Factors Affecting Soil Reaction:

Inherent factors.The natural soil pH reflects the combined effects of climate, vegetation, topography, parent material, and time. Temperature and rainfall are two major factors that control the intensity of leaching and soil mineral weathering. Acidity is generally associated with leached soils, and alkalinity is generally associated with soils in drier regions. In arid climates, soil weathering and leaching are less intense, cations accumulate, and the soil becomes neutral or alkaline. In soils where the pH is less than 5, aluminum becomes soluble and reacts with water to produce hydrogen ions. Sandy soils may acidify more easily compared to clay soils because they have a low buffering capacity and tend to leach more readily. Vegetation has an effect on soil pH through the type of organic matter that is added; certain types of vegetation are soil acidifying (USDA-NRCS, 2008).

Dynamic factors.The conversion of uncultivated land into cropland can result in drastic pH changes after a few years. These changes are caused by the removal of cations by crops, the acceleration of leaching, the effect of fertilizers and amendments, and the variations in organic matter content and soil buffering capacity (USDA-NRCS, 2008). Inorganic amendments (lime and gypsum) and organic amendments rich in cations increase soil pH. Ammonium from organic matter mineralization (nitrification), ammonium-based fertilizers, and sulfur compounds lower the pH. High rates of water percolation and infiltration can increase the leaching of cations and accelerate soil acidification.

Measurement:

The pH reported here is measured using the 1:1 soil to water ratio method (Soil Survey Staff, 2014). A crushed soil sample is mixed with an equal amount of water, and the pH of the suspension is measured.

References:

Brady, N.C. 1990. The nature and properties of soils. 10th ed. Macmillan Publishers, NY.

Smith, J.L., and J.W. Doran. 1996. Measurement and use of pH and electrical conductivity for soil quality analysis. In: J.W. Doran and A.J. Jones (eds.) Methods for Assessing Soil Quality. Soil Science Society of America Special Publication 49:169-185.

Soil Survey Staff. 2014. Kellogg Soil Survey Laboratory methods manual. Soil Survey Investigations Report No. 42, Version 5.0. R. Burt and Soil Survey Staff (eds.). U.S. Department of Agriculture, Natural Resources Conservation Service.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2008. Soil quality indicatorsSoil pH.

## Map—Soil Health - Soil Reaction (pH)


Map Scale: 1:4,470 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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**

- Ultra acid (pH < 3.5)
- Extremely acid (pH 3.5 - 4.4)
- Very strongly acid (pH 4.5 - 5.0)
- Strongly acid (pH 5.1 - 5.5)
- Moderately acid (pH 5.6 - 6.0)
- Slightly acid (pH 6.1 - 6.5)
- Neutral (pH 6.6 - 7.3)
- Slightly alkaline (pH 7.4 - 7.8)
- Moderately alkaline (pH 7.9 - 8.4)
- Strongly alkaline (pH 8.5 - 9.0)
- Very strongly alkaline (pH > 9.0)
- Not rated or not available

**Soil Rating Lines**

- Ultra acid (pH < 3.5)
- Extremely acid (pH 3.5 - 4.4)
- Very strongly acid (pH 4.5 - 5.0)
- Strongly acid (pH 5.1 - 5.5)
- Moderately acid (pH 5.6 - 6.0)
- Slightly acid (pH 6.1 - 6.5)
- Neutral (pH 6.6 - 7.3)
- Slightly alkaline (pH 7.4 - 7.8)
- Moderately alkaline (pH 7.9 - 8.4)
- Strongly alkaline (pH 8.5 - 9.0)
- Very strongly alkaline (pH > 9.0)
- Not rated or not available

**Soil Rating Points**

- Ultra acid (pH < 3.5)
- Extremely acid (pH 3.5 - 4.4)
- Very strongly acid (pH 4.5 - 5.0)
- Strongly acid (pH 5.1 - 5.5)
- Moderately acid (pH 5.6 - 6.0)
- Slightly acid (pH 6.1 - 6.5)
- Neutral (pH 6.6 - 7.3)
- Slightly alkaline (pH 7.4 - 7.8)
- Moderately alkaline (pH 7.9 - 8.4)
- Strongly alkaline (pH 8.5 - 9.0)
- Very strongly alkaline (pH > 9.0)
- 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 16, Sep 5, 2023

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—Soil Health - Soil Reaction (pH)

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 18B | Groseclose-Urban land complex, 2 to 7 percent slopes | 4.6 | 38.4 | 43.9% |
| 18C | Groseclose-Urban land complex, 7 to 15 percent slopes | 4.6 | 35.5 | 40.6% |
| 18D | Groseclose-Urban land complex, 15 to 25 percent slopes | 4.6 | 12.4 | 14.2% |
| 29 | Udorthents and Urban land | | 1.0 | 1.2% |
| W | Water | | 0.2 | 0.2% |
| **Totals for Area of Interest** | | | **87.5** | **100.0%** |

### Rating Options—Soil Health - Soil Reaction (pH)

*Aggregation Method:* Dominant Component

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

*Interpret Nulls as Zero:* No

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

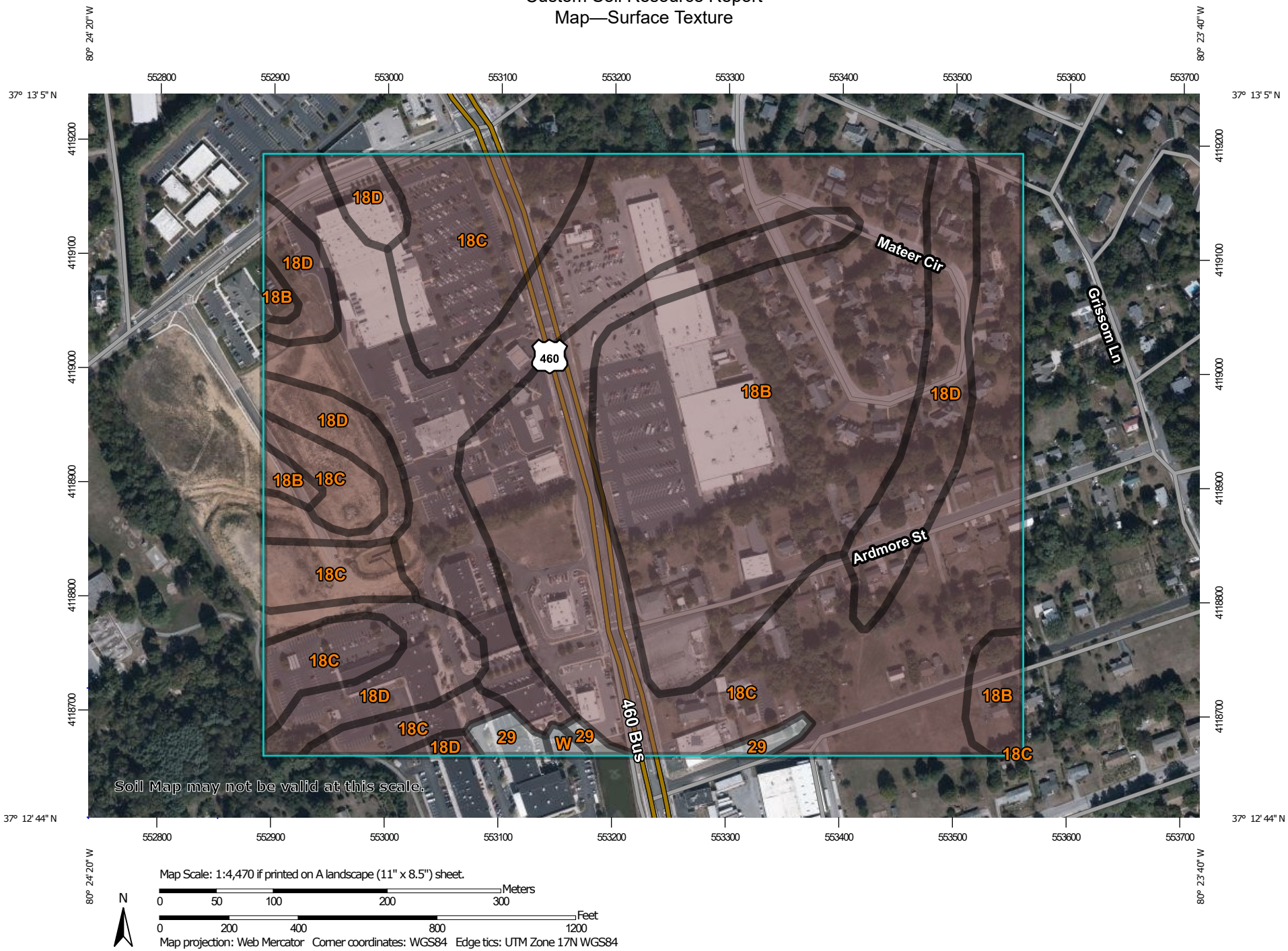
# Soil Physical Properties

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."




Map Scale: 1:4,470 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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**

- Loam
- Not rated or not available

**Soil Rating Lines**

- Loam
- Not rated or not available

**Soil Rating Points**

- 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.

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 16, Sep 5, 2023

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—Surface Texture

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 18B | Groseclose-Urban land complex, 2 to 7 percent slopes | Loam | 38.4 | 43.9% |
| 18C | Groseclose-Urban land complex, 7 to 15 percent slopes | Loam | 35.5 | 40.6% |
| 18D | Groseclose-Urban land complex, 15 to 25 percent slopes | Loam | 12.4 | 14.2% |
| 29 | Udorthents and Urban land | | 1.0 | 1.2% |
| W | Water | | 0.2 | 0.2% |
| **Totals for Area of Interest** | | | **87.5** | **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:

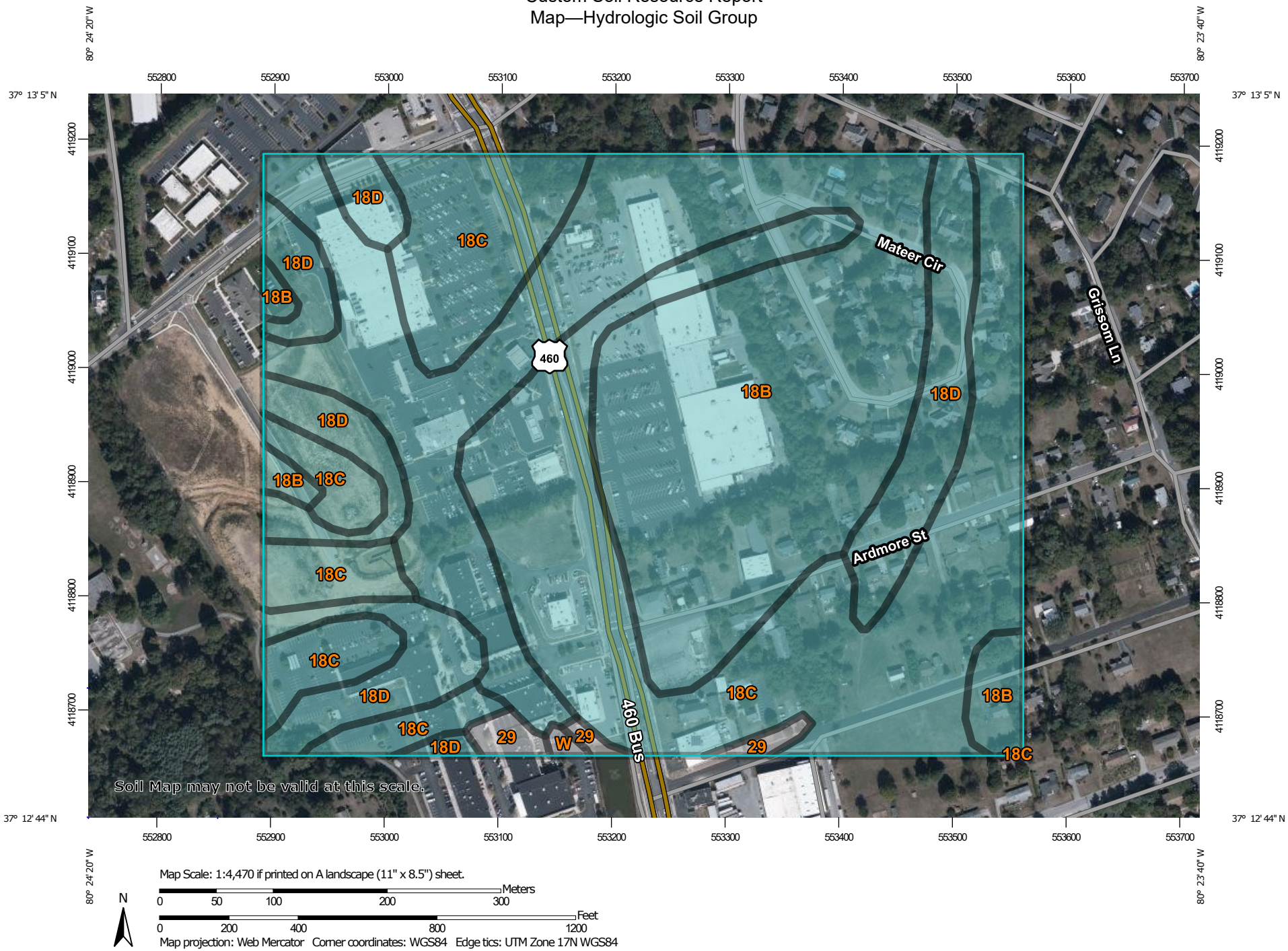
Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

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.


80° 24' 20" W
80° 23' 40" W
552800
552900
553000
553100
553200
553300
553400
553500
553600
553700
37° 13' 5" N
37° 12' 44" N
4119200
4119100
4119000
4118900
4118800
4118700
18D
18C
18B
460
Mateer Cir
Grissom Ln
Ardmore St
460 Bus
29
W 29
Soil Map may not be valid at this scale.
N
Map Scale: 1:4,470 if printed on A landscape (11" x 8.5") sheet.
Meters
0 50 100 200 300
Feet
0 200 400 800 1200
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**
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Soil Rating Lines**
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Soil Rating Points**
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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 16, Sep 5, 2023

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—Hydrologic Soil Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 18B | Groseclose-Urban land complex, 2 to 7 percent slopes | C | 38.4 | 43.9% |
| 18C | Groseclose-Urban land complex, 7 to 15 percent slopes | C | 35.5 | 40.6% |
| 18D | Groseclose-Urban land complex, 15 to 25 percent slopes | C | 12.4 | 14.2% |
| 29 | Udorthents and Urban land | | 1.0 | 1.2% |
| W | Water | | 0.2 | 0.2% |
| **Totals for Area of Interest** | | | **87.5** | **100.0%** |

### Rating Options—Hydrologic Soil Group

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

# Water Features

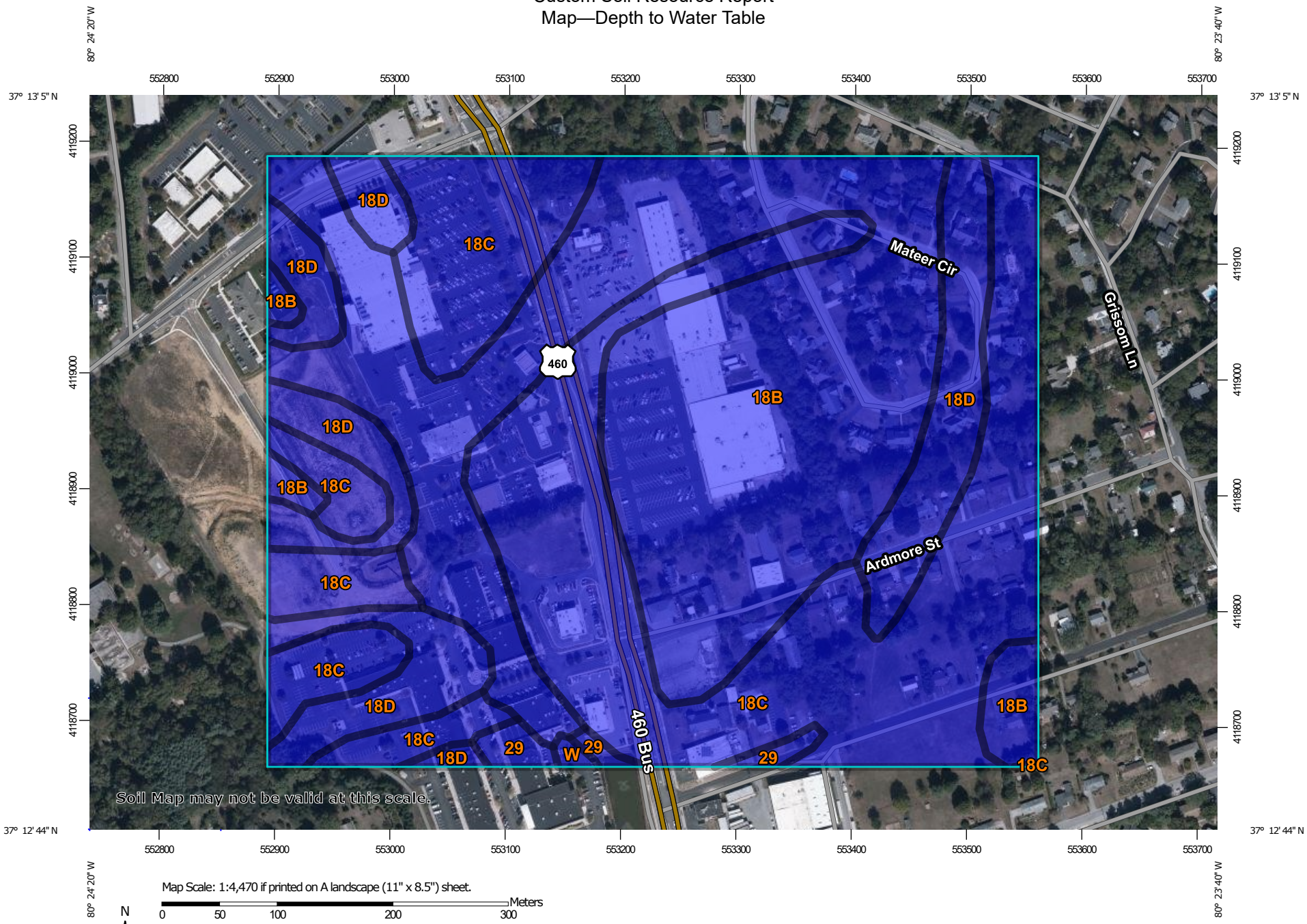
Water Features include ponding frequency, flooding frequency, and depth to water table.

## Depth to Water Table

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

## Map—Depth to Water Table




Map Scale: 1:4,470 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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**

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

**Soil Rating Lines**

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

**Soil Rating Points**

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

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 16, Sep 5, 2023

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—Depth to Water Table

| Map unit symbol | Map unit name | Rating (centimeters) | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 18B | Groseclose-Urban land complex, 2 to 7 percent slopes | >200 | 38.4 | 43.9% |
| 18C | Groseclose-Urban land complex, 7 to 15 percent slopes | >200 | 35.5 | 40.6% |
| 18D | Groseclose-Urban land complex, 15 to 25 percent slopes | >200 | 12.4 | 14.2% |
| 29 | Udorthents and Urban land | >200 | 1.0 | 1.2% |
| W | Water | >200 | 0.2 | 0.2% |
| **Totals for Area of Interest** | | | **87.5** | **100.0%** |

## Rating Options—Depth to Water Table

*Units of Measure:* centimeters

*Aggregation Method:* Dominant Component

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Lower

*Interpret Nulls as Zero:* No

*Beginning Month:* January

*Ending Month:* December

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# APPENDIX B:
# DRAINAGE MAPS


BALZER
& ASSOCIATES
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ENGINEERS / SURVEYORS

Roanoke / Richmond
New River Valley
Shenandoah Valley

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COMMONWEALTH OF VIRGINIA
JAMES RICHARD TAYLOR
Lic. No. 55142
4/1/24
PROFESSIONAL ENGINEER

# SEVEN BREW COFFEE

## PRE-DEVELOPMENT DRAINAGE MAP

MOUNT TABOR MAGISTERIAL DISTRICT
TOWN OF BLACKSBURG, VIRGINIA

| | |
|---|---|
| DRAWN BY | AWC |
| DESIGNED BY | AWC |
| CHECKED BY | JRT |
| DATE | 4/1/24 |
| SCALE | 1" = 40' |
| REVISIONS | |

SW3

PROJECT NO. 24230144.00

J:\25\24230144.00 SAS - BLACKSBURG SQUARE TBR\ROW\CIVIL\dwg\24230144 CUP.dwg PLOTTED: 4/1/2024 7:58:08 AM

WATERSHED
DRAINAGE AREA

SITE AREA
1.27 ACRES

POINT OF DISCHARGE

DOWNSTREAM CONVEYANCE SYSTEM

60" OUTFALL PIPE

LIMITS OF ANALYSIS
1% ANALYSIS POINT
CDA= ±192 ACRES

NAD83

200 0 200 400 600
1" = 200'


BALZER
& ASSOCIATES
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COMMONWEALTH OF VIRGINIA
JAMES RICHARD TAYLOR
Lic. No. 55142
4/1/24
PROFESSIONAL ENGINEER

# SEVEN BREW COFFEE

## WATERSHED DRAINAGE AREA

MOUNT TABOR MAGISTERIAL DISTRCT
TOWN OF BLACKSBURG, VIRGINIA

| | |
|---|---|
| DRAWN BY | AWC |
| DESIGNED BY | AWC |
| CHECKED BY | JRT |
| DATE | 4/1/24 |
| SCALE | 1" = 200' |
| REVISIONS | |

SW4

PROJECT NO. 24230144.00

J:\2023\24230144.00 SAS - BLACKSBURG SQUARE 7BREW\CIVIL\dwg\WATERSHED MAP.dwg PLOTTED: 4/1/2024 7:58:24 AM


BALZER & ASSOCIATES
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COMMONWEALTH OF VIRGINIA
JAMES RICHARD TAYLOR
Lic. No. 55142
4/1/24
PROFESSIONAL ENGINEER

# SEVEN BREW COFFEE

## POST-DEVELOPMENT DRAINAGE MAP

MOUNT TABOR MAGISTERIAL DISTRICT
TOWN OF BLACKSBURG, VIRGINIA

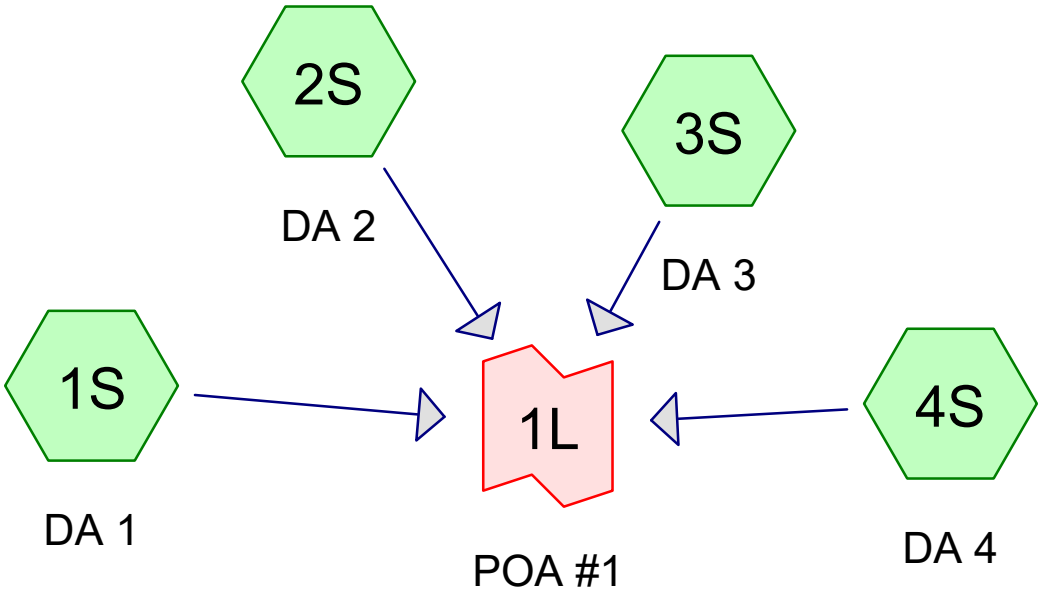
| | |
|---|---|
| DRAWN BY | AWC |
| DESIGNED BY | AWC |
| CHECKED BY | JRT |
| DATE | 4/1/24 |
| SCALE | 1" = 40' |
| REVISIONS | |

SW5

PROJECT NO. 24230144.00

J:\25\24230144.00 SAS - BLACKSBURG SQUARE TBR\ROW\CIVIL\dwg\24230144 CUP.dwg PLOTTED: 4/1/2024 7:58:32 AM

# APPENDIX C:
# STORMWATER QUANTITY CALCULATIONS




Subcat Reach Pond Link

**Routing Diagram for PRE DEV**
Prepared by Balzer & Associates, Inc, Printed 3/29/2024

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 0.966 | 80 | 1/2 acre lots, 25% imp, HSG C (2S) |
| 0.059 | 81 | 1/3 acre lots, 30% imp, HSG C (2S) |
| 0.179 | 83 | 1/4 acre lots, 38% imp, HSG C (1S, 2S) |
| 0.896 | 74 | >75% Grass cover, Good, HSG C (1S, 2S, 3S) |
| 0.129 | 98 | Impervious Cover, HSG C (1S) |
| 0.972 | 98 | Paved roads w/curbs & sewers, HSG C (1S, 2S, 3S) |
| 2.239 | 94 | Urban commercial, 85% imp, HSG C (1S, 2S, 3S, 4S) |
| **5.440** | **89** | **TOTAL AREA** |

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Link 1L: POA #1** Inflow=8.44 cfs 0.608 af
Primary=8.44 cfs 0.608 af

**Subcatchment1S: DA 1** Runoff Area=1.196 ac 51.73% Impervious Runoff Depth=1.27"
Flow Length=615' Tc=8.0 min CN=WQ Runoff=1.81 cfs 0.127 af

**Subcatchment2S: DA 2** Runoff Area=2.332 ac 47.52% Impervious Runoff Depth=1.11"
Flow Length=1,024' Tc=11.3 min CN=WQ Runoff=2.77 cfs 0.216 af

**Subcatchment3S: DA 3** Runoff Area=0.430 ac 80.19% Impervious Runoff Depth=1.70"
Tc=6.0 min CN=WQ Runoff=0.98 cfs 0.061 af

**Subcatchment4S: DA 4** Runoff Area=1.482 ac 85.00% Impervious Runoff Depth=1.65"
Tc=6.0 min CN=94 Runoff=3.49 cfs 0.204 af

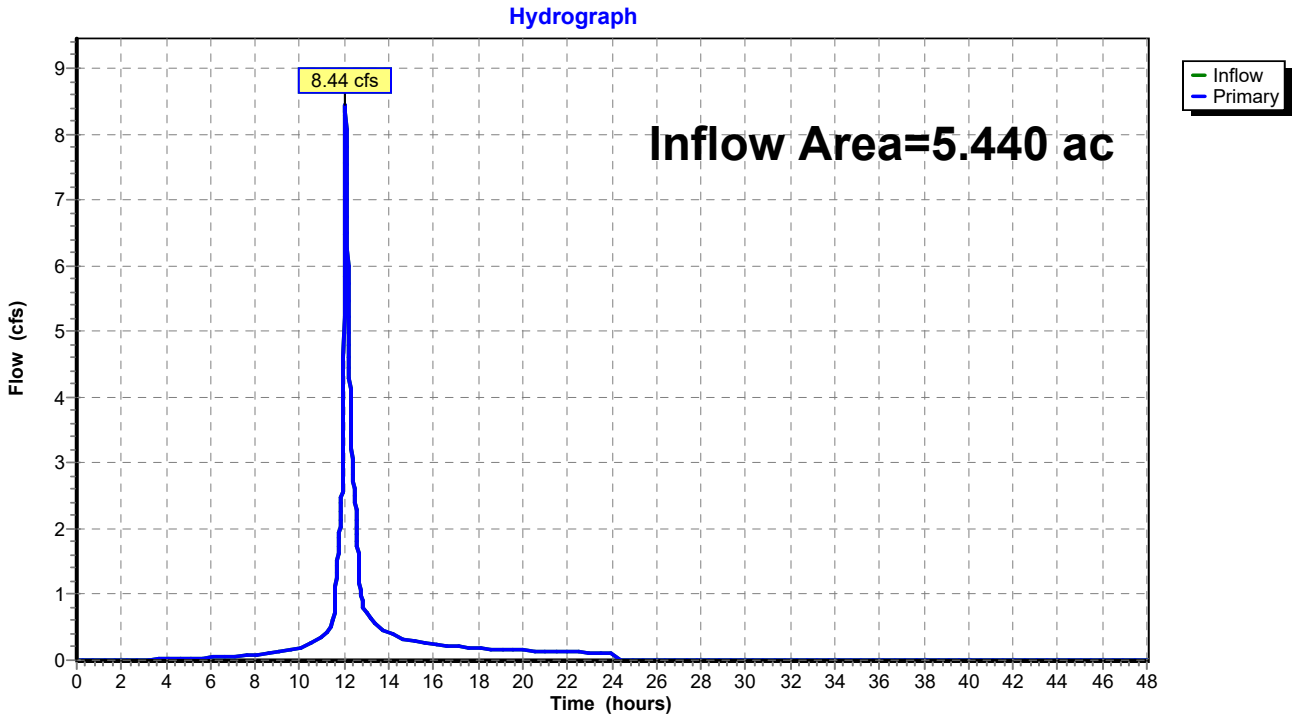
**Total Runoff Area = 5.440 ac Runoff Volume = 0.608 af Average Runoff Depth = 1.34"**
**38.76% Pervious = 2.109 ac 61.24% Impervious = 3.331 ac**

## Summary for Link 1L: POA #1

Inflow Area = 5.440 ac, 61.24% Impervious, Inflow Depth = 1.34" for 1-yr event
Inflow = 8.44 cfs @ 12.05 hrs, Volume= 0.608 af
Primary = 8.44 cfs @ 12.05 hrs, Volume= 0.608 af, Atten= 0%, Lag= 0.0 min

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

## Link 1L: POA #1



## Summary for Subcatchment 1S: DA 1

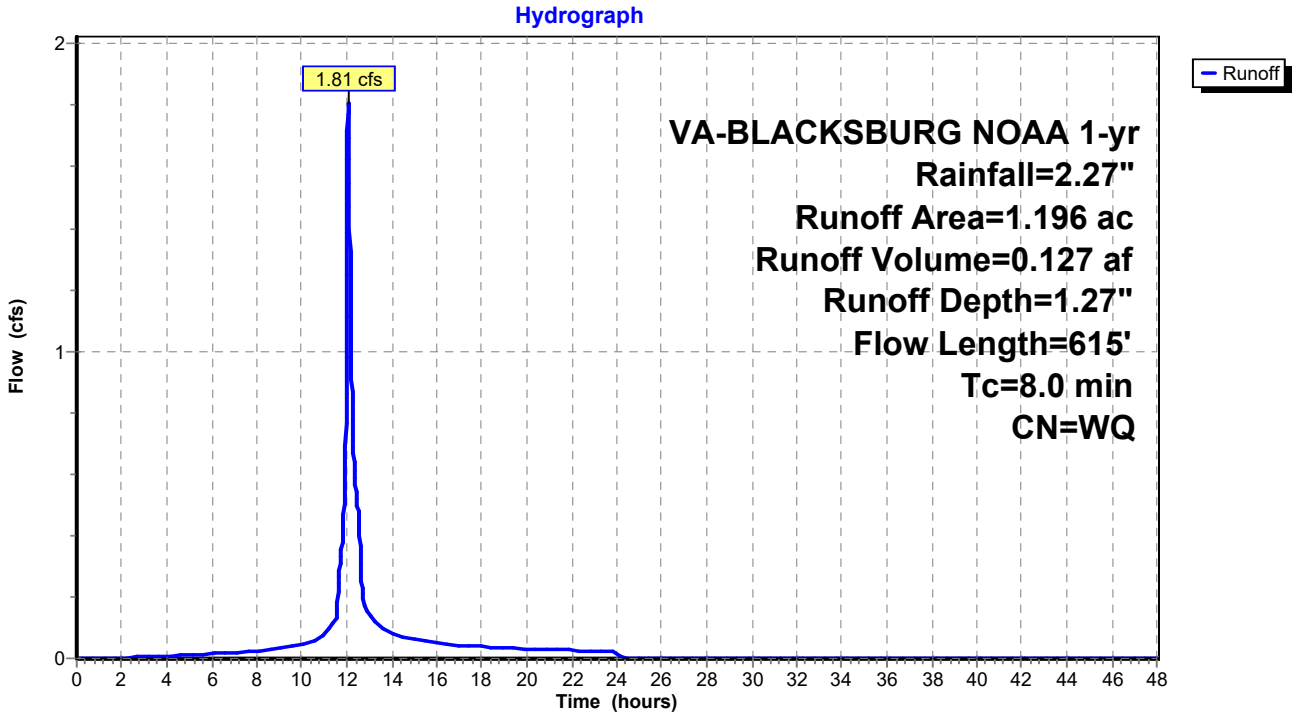
Runoff = 1.81 cfs @ 12.06 hrs, Volume= 0.127 af, Depth= 1.27"
Routed to Link 1L : POA #1

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 |
|---|---|---|---|
| | 0.389 | 98 | Paved roads w/curbs & sewers, HSG C |
| | 0.110 | 94 | Urban commercial, 85% imp, HSG C |
| | 0.019 | 83 | 1/4 acre lots, 38% imp, HSG C |
| | 0.549 | 74 | >75% Grass cover, Good, HSG C |
| * | 0.129 | 98 | Impervious Cover, HSG C |
| | 1.196 | | Weighted Average |
| | 0.577 | | 48.27% Pervious Area |
| | 0.619 | | 51.73% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | 100 | 0.0811 | 0.28 | | **Sheet Flow, Tc4** Grass: Short n= 0.150 P2= 2.76" |
| 0.2 | 56 | 0.1280 | 5.76 | | **Shallow Concentrated Flow, Tc5** Unpaved Kv= 16.1 fps |
| 1.8 | 459 | 0.0417 | 4.15 | | **Shallow Concentrated Flow, Tc6** Paved Kv= 20.3 fps |
| 8.0 | 615 | Total | | | |

## Subcatchment 1S: DA 1



## Summary for Subcatchment 2S: DA 2

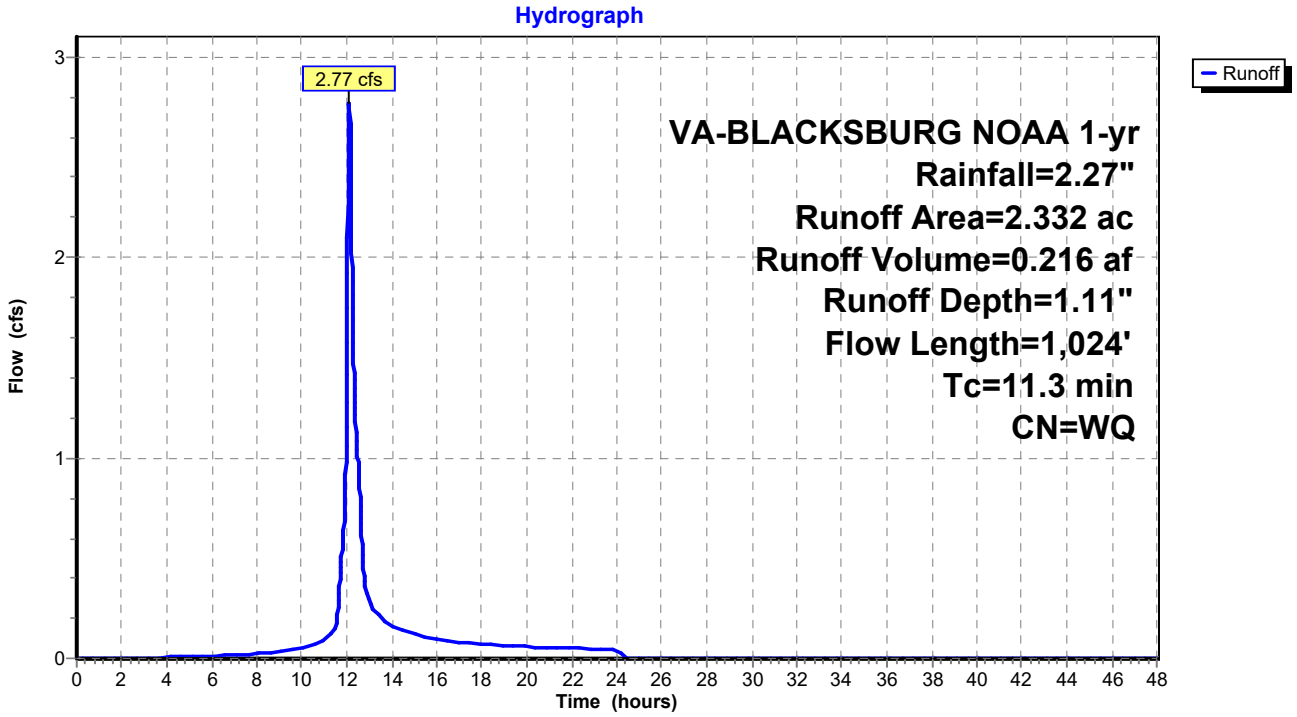
Runoff = 2.77 cfs @ 12.11 hrs, Volume= 0.216 af, Depth= 1.11"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.313 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.559 | 94 | Urban commercial, 85% imp, HSG C |
| 0.160 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 0.966 | 80 | 1/2 acre lots, 25% imp, HSG C |
| 0.059 | 81 | 1/3 acre lots, 30% imp, HSG C |
| 0.275 | 74 | >75% Grass cover, Good, HSG C |
| 2.332 | | Weighted Average |
| 1.224 | | 52.48% Pervious Area |
| 1.108 | | 47.52% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.7 | 100 | 0.0443 | 0.22 | | **Sheet Flow, Tc1**<br>Grass: Short n= 0.150 P2= 2.76" |
| 2.0 | 444 | 0.0532 | 3.71 | | **Shallow Concentrated Flow, Tc2**<br>Unpaved Kv= 16.1 fps |
| 1.6 | 480 | 0.0583 | 4.90 | | **Shallow Concentrated Flow, Tc3**<br>Paved Kv= 20.3 fps |
| 11.3 | 1,024 | Total | | | |

## Subcatchment 2S: DA 2



## Summary for Subcatchment 3S: DA 3

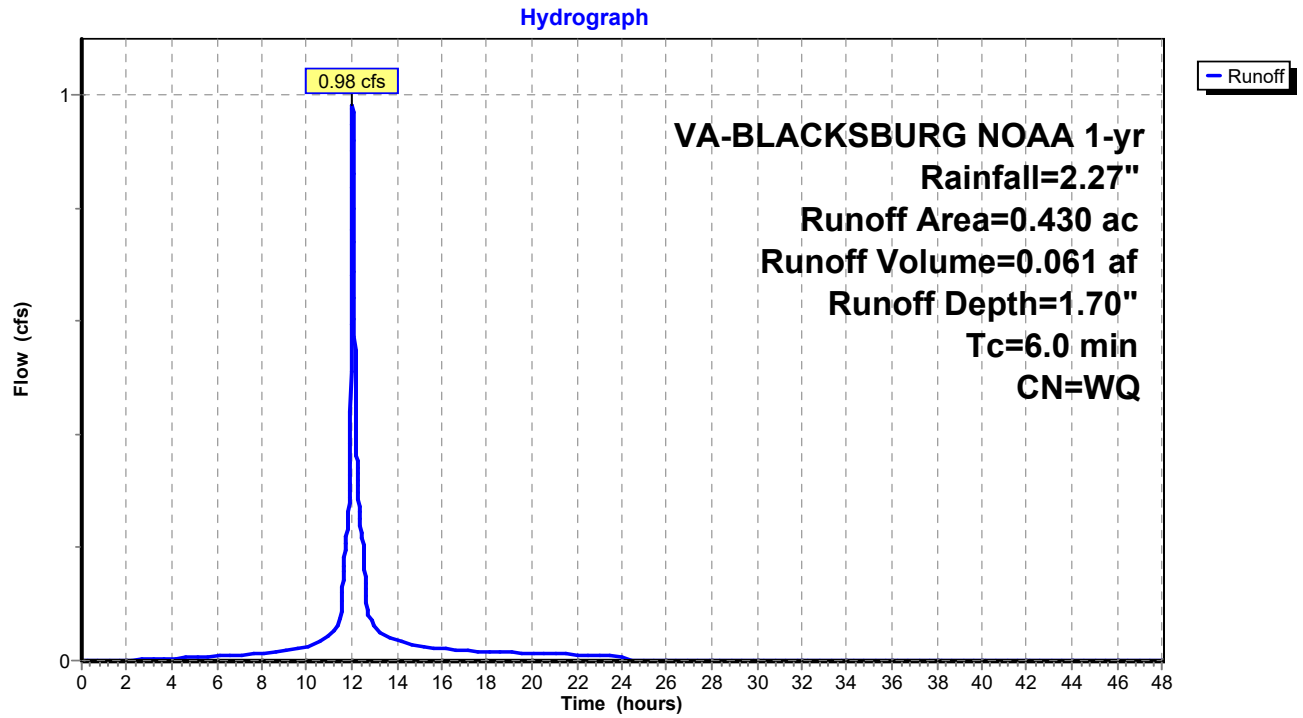
Runoff = 0.98 cfs @ 12.04 hrs, Volume= 0.061 af, Depth= 1.70"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.088 | 94 | Urban commercial, 85% imp, HSG C |
| 0.270 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.072 | 74 | >75% Grass cover, Good, HSG C |
| 0.430 | | Weighted Average |
| 0.085 | | 19.81% Pervious Area |
| 0.345 | | 80.19% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 3S: DA 3



## Summary for Subcatchment 4S: DA 4

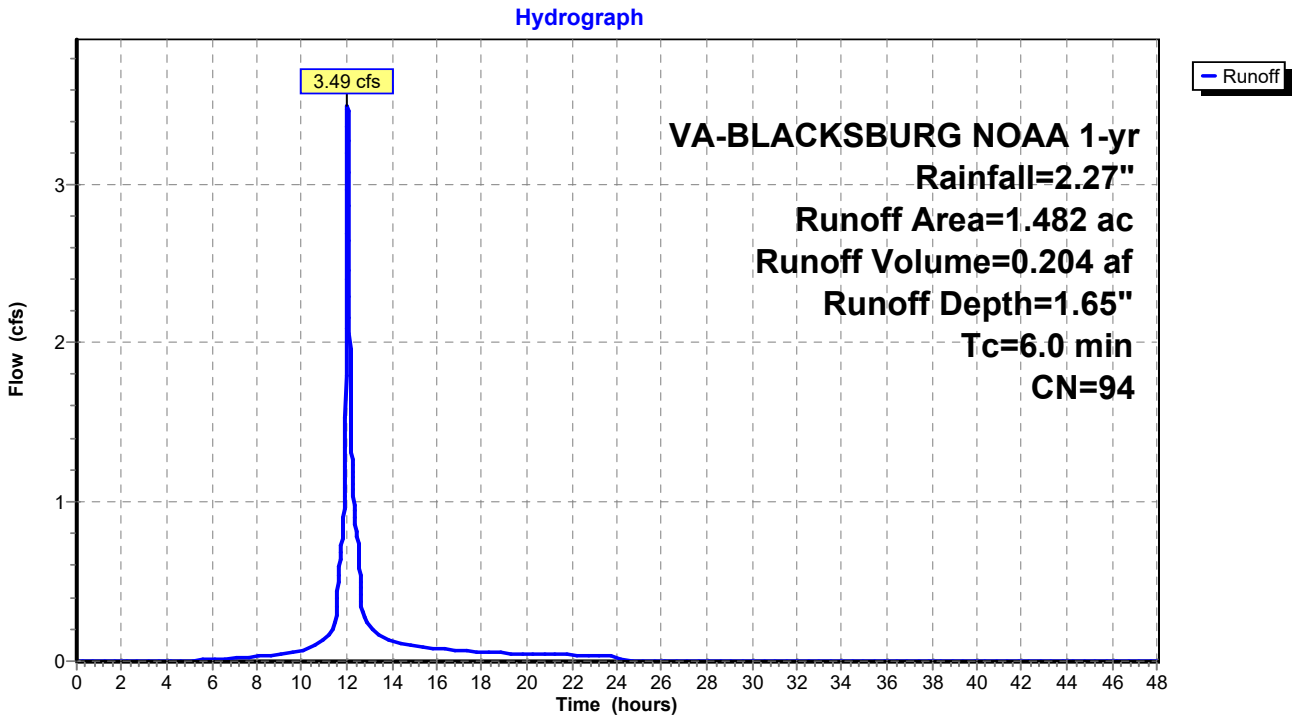
Runoff = 3.49 cfs @ 12.04 hrs, Volume= 0.204 af, Depth= 1.65"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 1.482 | 94 | Urban commercial, 85% imp, HSG C |
| 0.222 | | 15.00% Pervious Area |
| 1.260 | | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 4S: DA 4



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Link 1L: POA #1** Inflow=10.96 cfs 0.791 af
Primary=10.96 cfs 0.791 af

**Subcatchment1S: DA 1** Runoff Area=1.196 ac 51.73% Impervious Runoff Depth=1.65"
Flow Length=615' Tc=8.0 min CN=WQ Runoff=2.36 cfs 0.165 af

**Subcatchment2S: DA 2** Runoff Area=2.332 ac 47.52% Impervious Runoff Depth=1.49"
Flow Length=1,024' Tc=11.3 min CN=WQ Runoff=3.76 cfs 0.289 af

**Subcatchment3S: DA 3** Runoff Area=0.430 ac 80.19% Impervious Runoff Depth=2.14"
Tc=6.0 min CN=WQ Runoff=1.23 cfs 0.077 af

**Subcatchment4S: DA 4** Runoff Area=1.482 ac 85.00% Impervious Runoff Depth=2.11"
Tc=6.0 min CN=94 Runoff=4.41 cfs 0.260 af

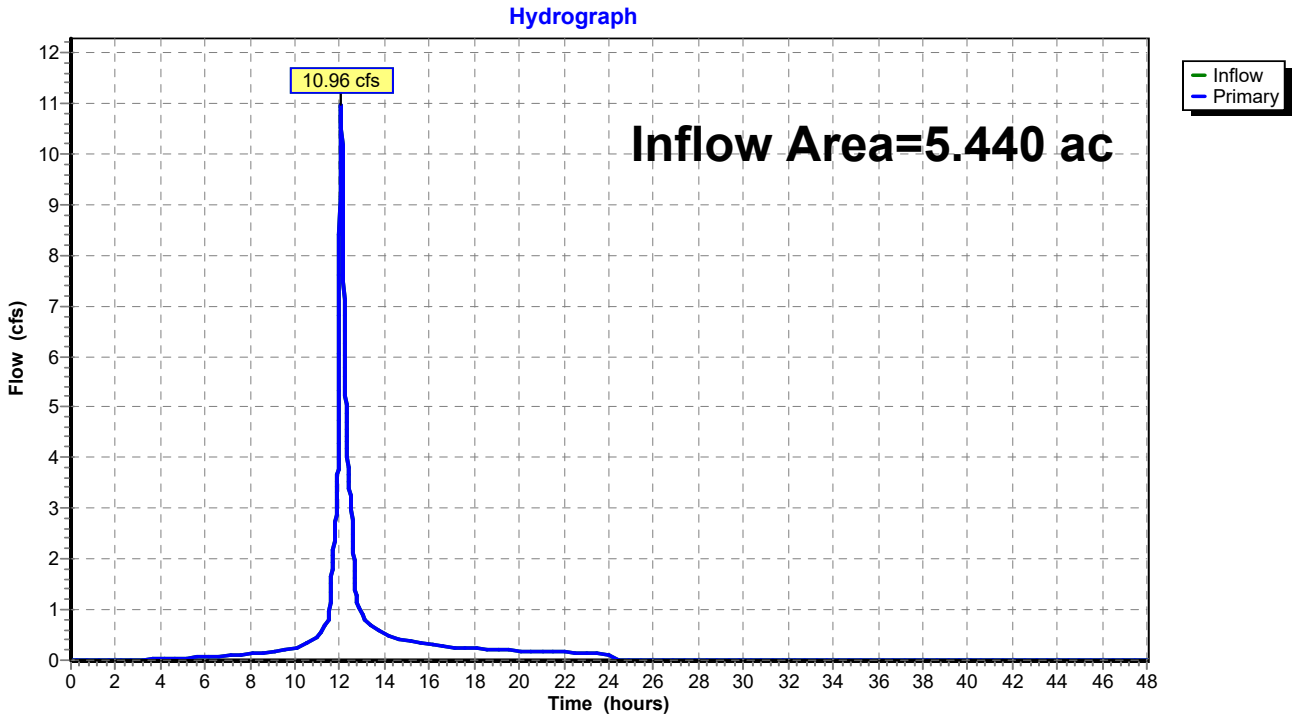
**Total Runoff Area = 5.440 ac Runoff Volume = 0.791 af Average Runoff Depth = 1.74"**
**38.76% Pervious = 2.109 ac 61.24% Impervious = 3.331 ac**

## Summary for Link 1L: POA #1

Inflow Area = 5.440 ac, 61.24% Impervious, Inflow Depth = 1.74" for 2-yr event
Inflow = 10.96 cfs @ 12.05 hrs, Volume= 0.791 af
Primary = 10.96 cfs @ 12.05 hrs, Volume= 0.791 af, Atten= 0%, Lag= 0.0 min

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

## Link 1L: POA #1



## Summary for Subcatchment 1S: DA 1

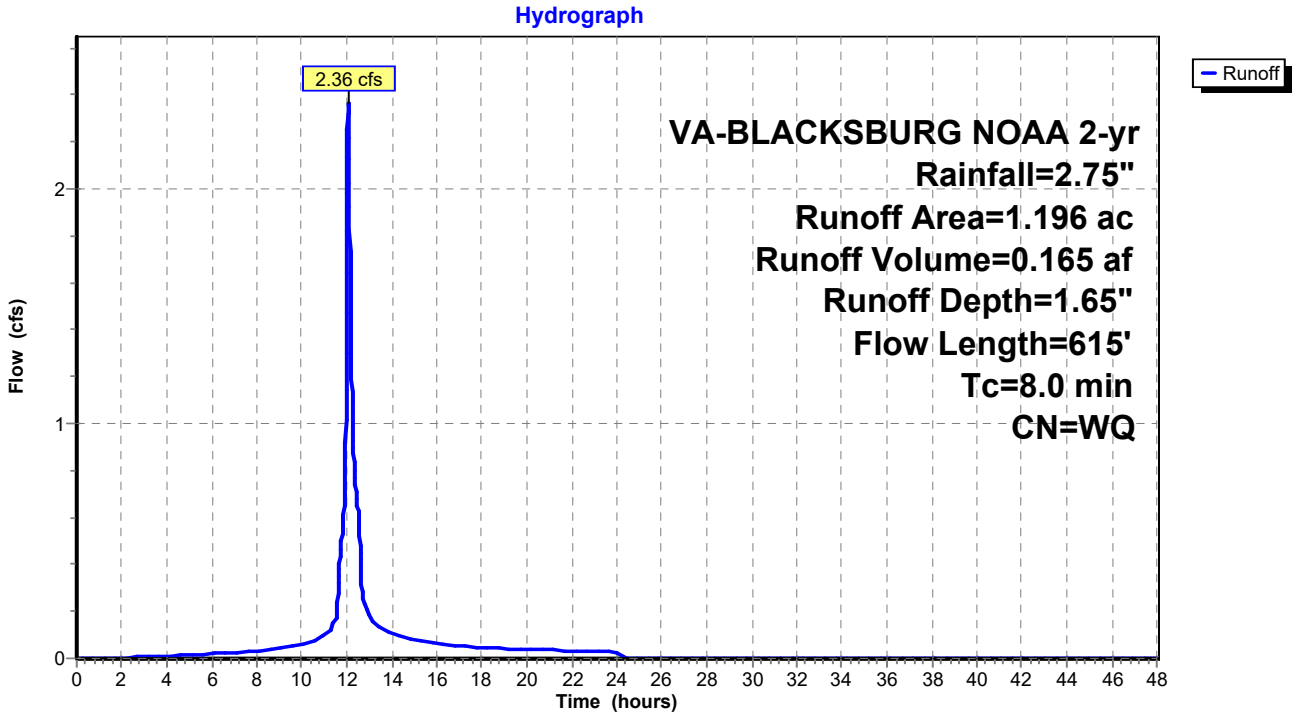
Runoff = 2.36 cfs @ 12.06 hrs, Volume= 0.165 af, Depth= 1.65"
Routed to Link 1L : POA #1

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 |
|---|---|---|---|
| | 0.389 | 98 | Paved roads w/curbs & sewers, HSG C |
| | 0.110 | 94 | Urban commercial, 85% imp, HSG C |
| | 0.019 | 83 | 1/4 acre lots, 38% imp, HSG C |
| | 0.549 | 74 | >75% Grass cover, Good, HSG C |
| * | 0.129 | 98 | Impervious Cover, HSG C |
| | 1.196 | | Weighted Average |
| | 0.577 | | 48.27% Pervious Area |
| | 0.619 | | 51.73% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | 100 | 0.0811 | 0.28 | | **Sheet Flow, Tc4** Grass: Short n= 0.150 P2= 2.76" |
| 0.2 | 56 | 0.1280 | 5.76 | | **Shallow Concentrated Flow, Tc5** Unpaved Kv= 16.1 fps |
| 1.8 | 459 | 0.0417 | 4.15 | | **Shallow Concentrated Flow, Tc6** Paved Kv= 20.3 fps |
| 8.0 | 615 | Total | | | |

## Subcatchment 1S: DA 1



## Summary for Subcatchment 2S: DA 2

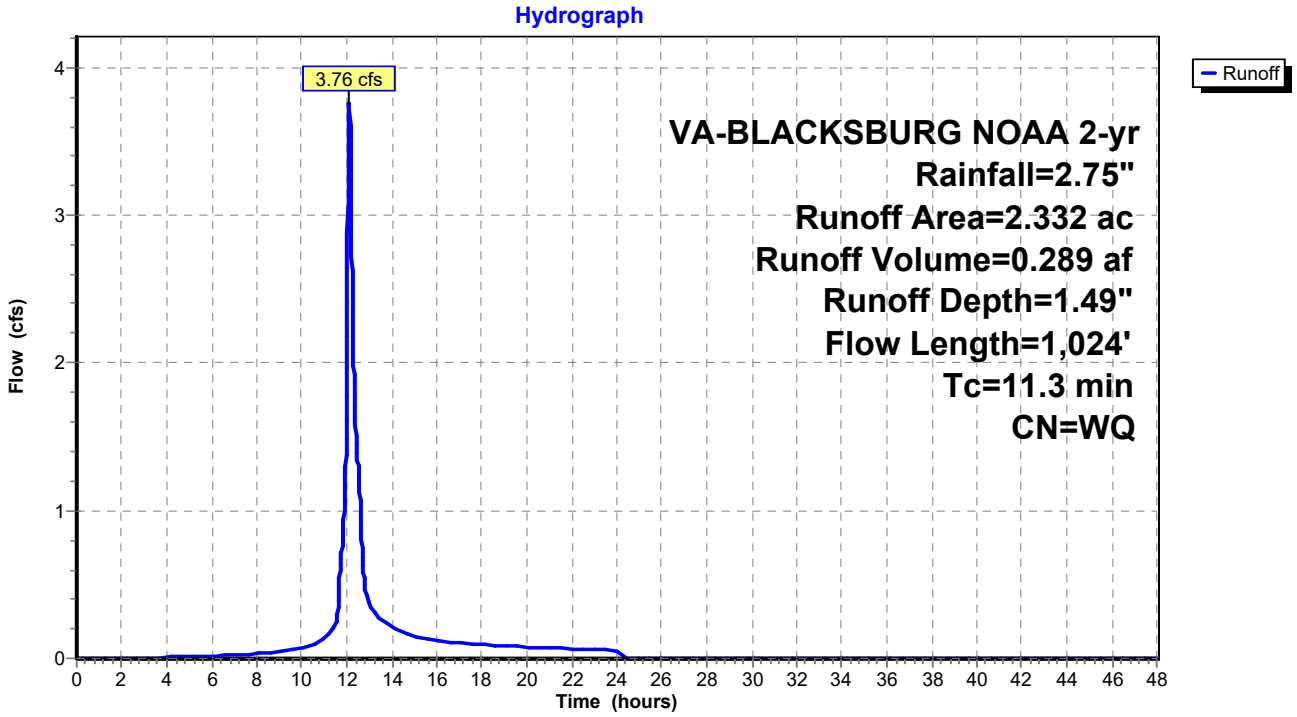
Runoff = 3.76 cfs @ 12.11 hrs, Volume= 0.289 af, Depth= 1.49"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.313 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.559 | 94 | Urban commercial, 85% imp, HSG C |
| 0.160 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 0.966 | 80 | 1/2 acre lots, 25% imp, HSG C |
| 0.059 | 81 | 1/3 acre lots, 30% imp, HSG C |
| 0.275 | 74 | >75% Grass cover, Good, HSG C |
| 2.332 | | Weighted Average |
| 1.224 | | 52.48% Pervious Area |
| 1.108 | | 47.52% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.7 | 100 | 0.0443 | 0.22 | | **Sheet Flow, Tc1** Grass: Short n= 0.150 P2= 2.76" |
| 2.0 | 444 | 0.0532 | 3.71 | | **Shallow Concentrated Flow, Tc2** Unpaved Kv= 16.1 fps |
| 1.6 | 480 | 0.0583 | 4.90 | | **Shallow Concentrated Flow, Tc3** Paved Kv= 20.3 fps |
| 11.3 | 1,024 | Total | | | |

## Subcatchment 2S: DA 2



## Summary for Subcatchment 3S: DA 3

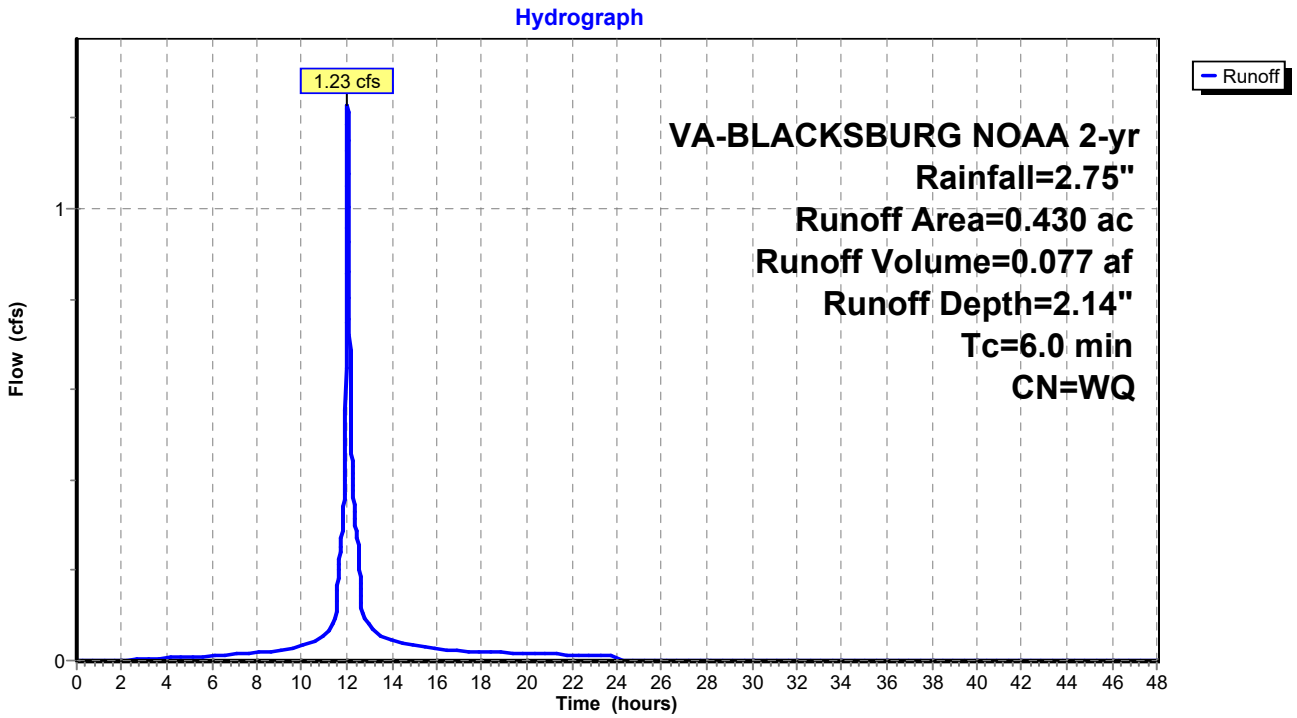
Runoff = 1.23 cfs @ 12.04 hrs, Volume= 0.077 af, Depth= 2.14"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.088 | 94 | Urban commercial, 85% imp, HSG C |
| 0.270 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.072 | 74 | >75% Grass cover, Good, HSG C |
| 0.430 | | Weighted Average |
| 0.085 | | 19.81% Pervious Area |
| 0.345 | | 80.19% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 3S: DA 3



## Summary for Subcatchment 4S: DA 4

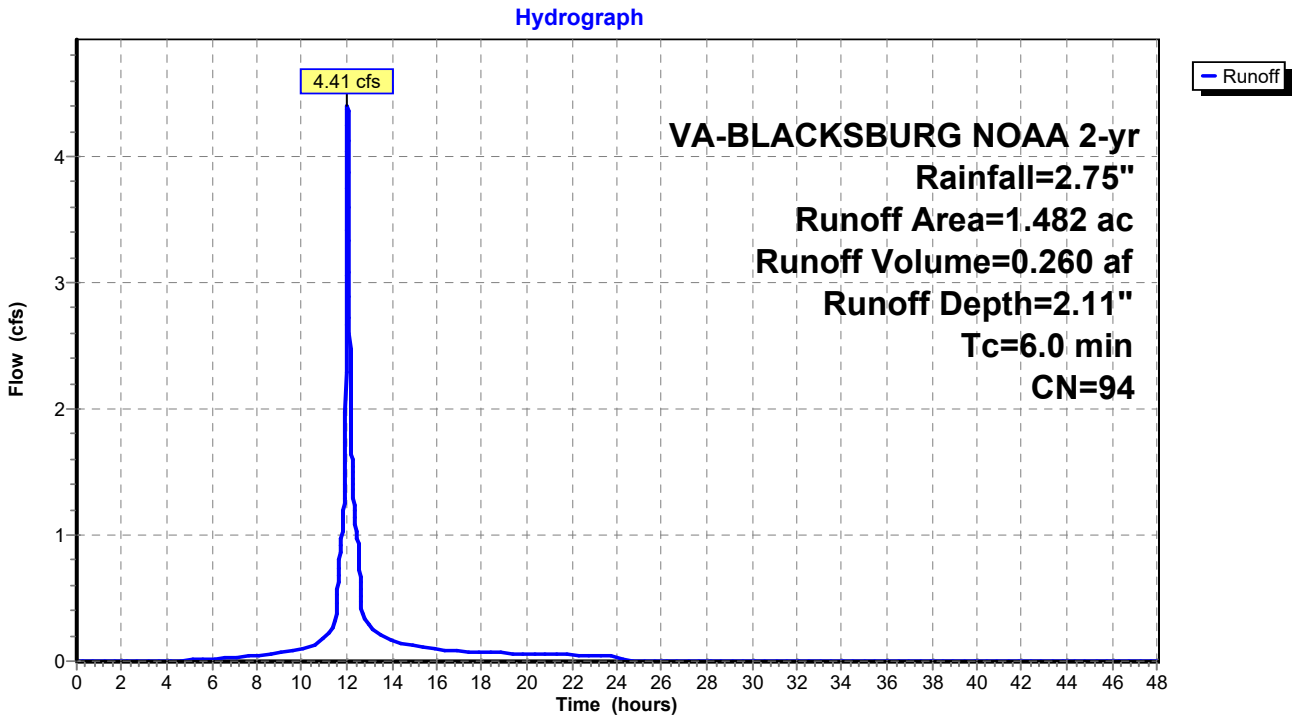
Runoff = 4.41 cfs @ 12.04 hrs, Volume= 0.260 af, Depth= 2.11"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 1.482 | 94 | Urban commercial, 85% imp, HSG C |
| 0.222 | | 15.00% Pervious Area |
| 1.260 | | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 4S: DA 4



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Link 1L: POA #1** Inflow=16.94 cfs 1.331 af
Primary=16.94 cfs 1.331 af

**Subcatchment1S: DA 1** Runoff Area=1.196 ac 51.73% Impervious Runoff Depth=2.78"
Flow Length=615' Tc=8.0 min CN=WQ Runoff=3.72 cfs 0.277 af

**Subcatchment2S: DA 2** Runoff Area=2.332 ac 47.52% Impervious Runoff Depth=2.63"
Flow Length=1,024' Tc=11.3 min CN=WQ Runoff=6.24 cfs 0.510 af

**Subcatchment3S: DA 3** Runoff Area=0.430 ac 80.19% Impervious Runoff Depth=3.40"
Tc=6.0 min CN=WQ Runoff=1.76 cfs 0.122 af

**Subcatchment4S: DA 4** Runoff Area=1.482 ac 85.00% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=94 Runoff=6.38 cfs 0.421 af

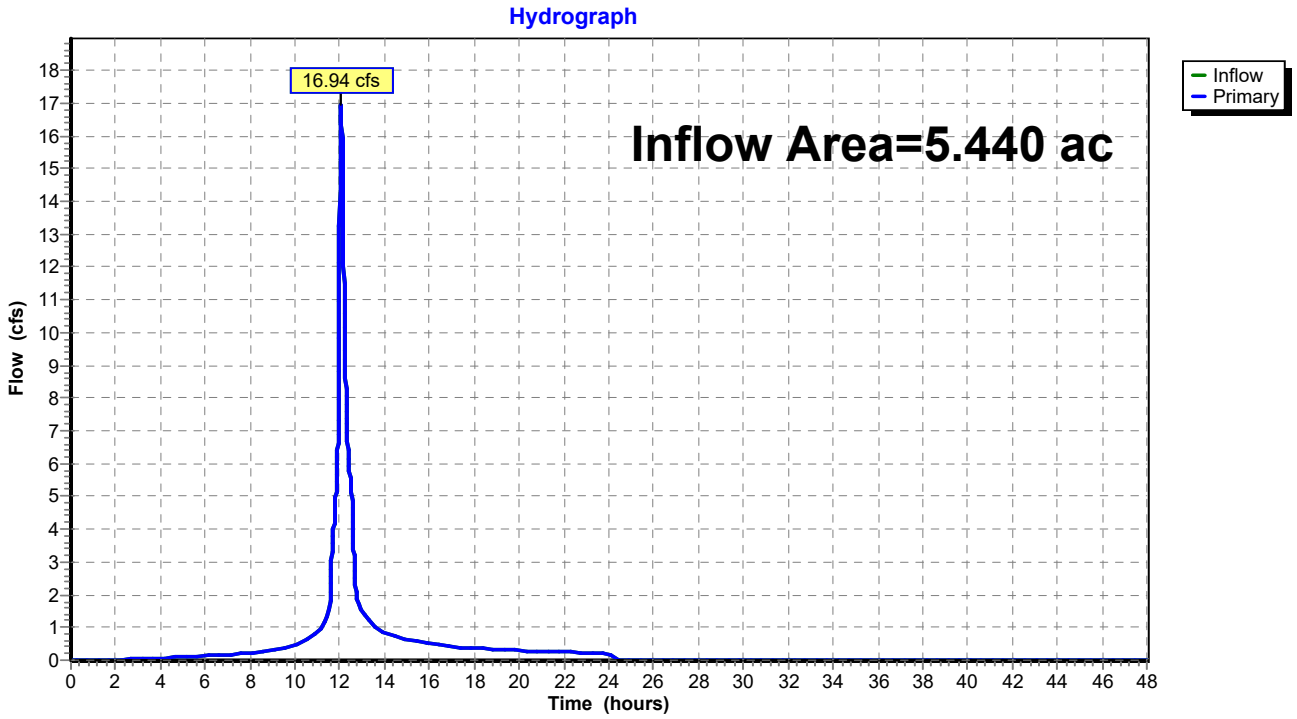
**Total Runoff Area = 5.440 ac Runoff Volume = 1.331 af Average Runoff Depth = 2.94"**
**38.76% Pervious = 2.109 ac 61.24% Impervious = 3.331 ac**

## Summary for Link 1L: POA #1

Inflow Area = 5.440 ac, 61.24% Impervious, Inflow Depth = 2.94" for 10-yr event
Inflow = 16.94 cfs @ 12.06 hrs, Volume= 1.331 af
Primary = 16.94 cfs @ 12.06 hrs, Volume= 1.331 af, Atten= 0%, Lag= 0.0 min

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

## Link 1L: POA #1



## Summary for Subcatchment 1S: DA 1

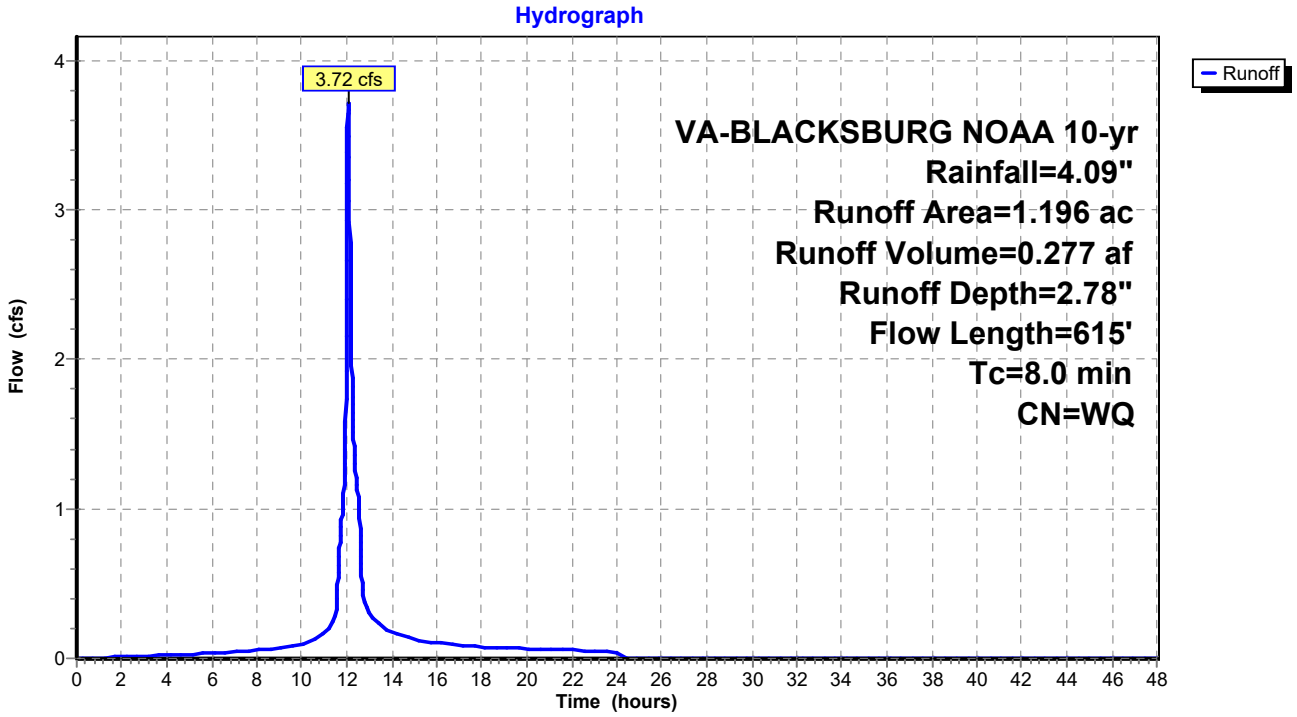
Runoff = 3.72 cfs @ 12.06 hrs, Volume= 0.277 af, Depth= 2.78"
Routed to Link 1L : POA #1

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 |
|---|---|---|---|
| | 0.389 | 98 | Paved roads w/curbs & sewers, HSG C |
| | 0.110 | 94 | Urban commercial, 85% imp, HSG C |
| | 0.019 | 83 | 1/4 acre lots, 38% imp, HSG C |
| | 0.549 | 74 | >75% Grass cover, Good, HSG C |
| * | 0.129 | 98 | Impervious Cover, HSG C |
| | 1.196 | | Weighted Average |
| | 0.577 | | 48.27% Pervious Area |
| | 0.619 | | 51.73% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | 100 | 0.0811 | 0.28 | | **Sheet Flow, Tc4** Grass: Short n= 0.150 P2= 2.76" |
| 0.2 | 56 | 0.1280 | 5.76 | | **Shallow Concentrated Flow, Tc5** Unpaved Kv= 16.1 fps |
| 1.8 | 459 | 0.0417 | 4.15 | | **Shallow Concentrated Flow, Tc6** Paved Kv= 20.3 fps |
| 8.0 | 615 | Total | | | |

## Subcatchment 1S: DA 1



## Summary for Subcatchment 2S: DA 2

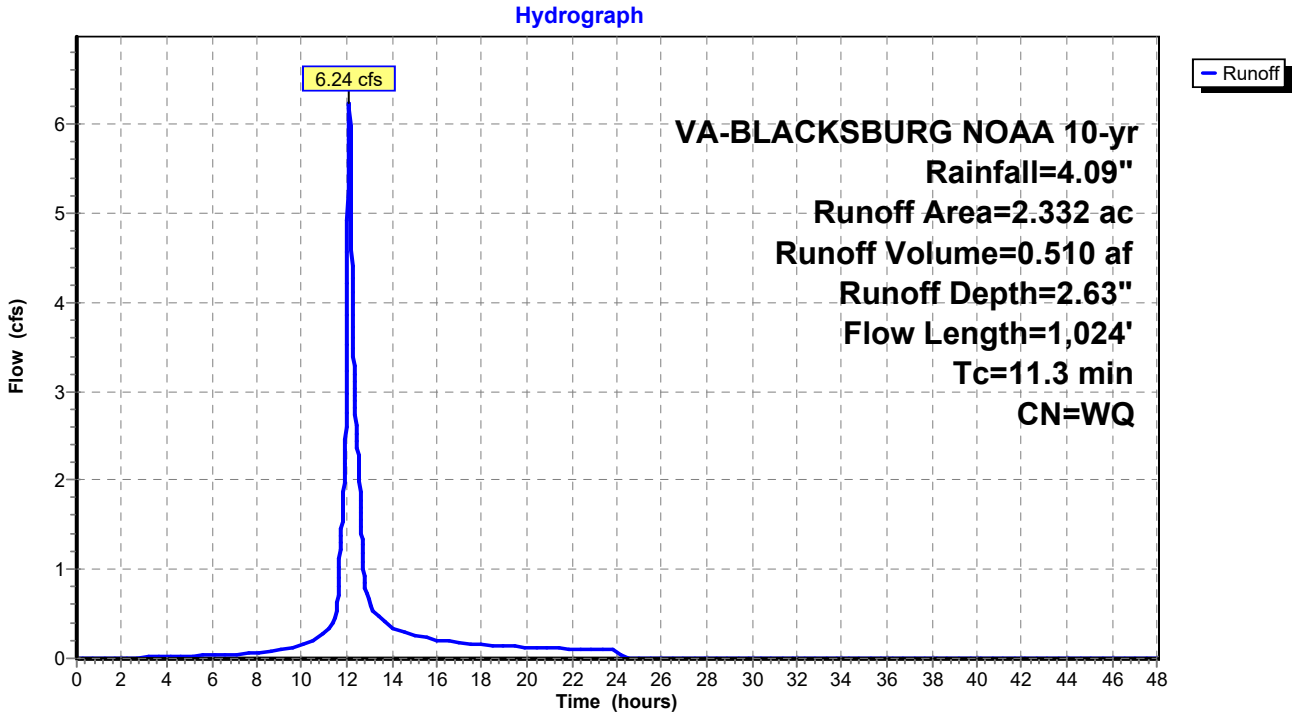
Runoff = 6.24 cfs @ 12.11 hrs, Volume= 0.510 af, Depth= 2.63"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.313 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.559 | 94 | Urban commercial, 85% imp, HSG C |
| 0.160 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 0.966 | 80 | 1/2 acre lots, 25% imp, HSG C |
| 0.059 | 81 | 1/3 acre lots, 30% imp, HSG C |
| 0.275 | 74 | >75% Grass cover, Good, HSG C |
| 2.332 | | Weighted Average |
| 1.224 | | 52.48% Pervious Area |
| 1.108 | | 47.52% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.7 | 100 | 0.0443 | 0.22 | | **Sheet Flow, Tc1**<br>Grass: Short n= 0.150 P2= 2.76" |
| 2.0 | 444 | 0.0532 | 3.71 | | **Shallow Concentrated Flow, Tc2**<br>Unpaved Kv= 16.1 fps |
| 1.6 | 480 | 0.0583 | 4.90 | | **Shallow Concentrated Flow, Tc3**<br>Paved Kv= 20.3 fps |
| 11.3 | 1,024 | Total | | | |

## Subcatchment 2S: DA 2



## Summary for Subcatchment 3S: DA 3

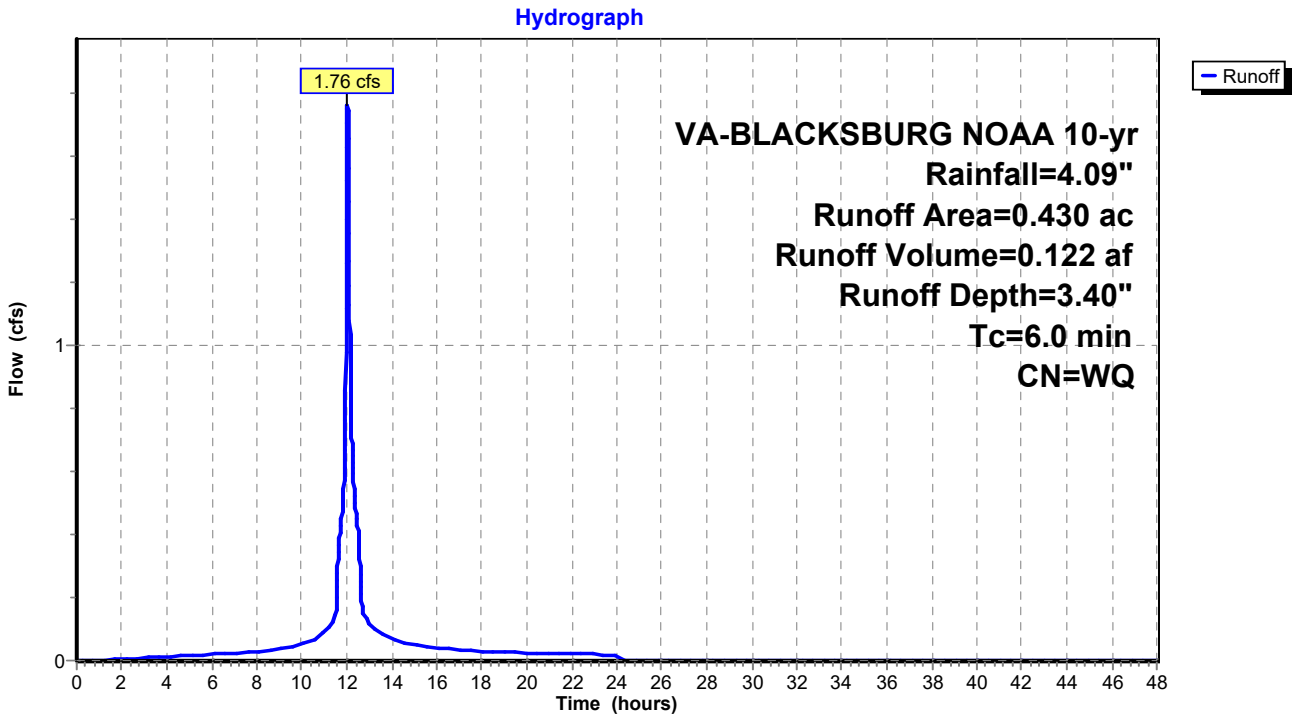
Runoff = 1.76 cfs @ 12.04 hrs, Volume= 0.122 af, Depth= 3.40"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.088 | 94 | Urban commercial, 85% imp, HSG C |
| 0.270 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.072 | 74 | >75% Grass cover, Good, HSG C |
| 0.430 | | Weighted Average |
| 0.085 | | 19.81% Pervious Area |
| 0.345 | | 80.19% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 3S: DA 3



## Summary for Subcatchment 4S: DA 4

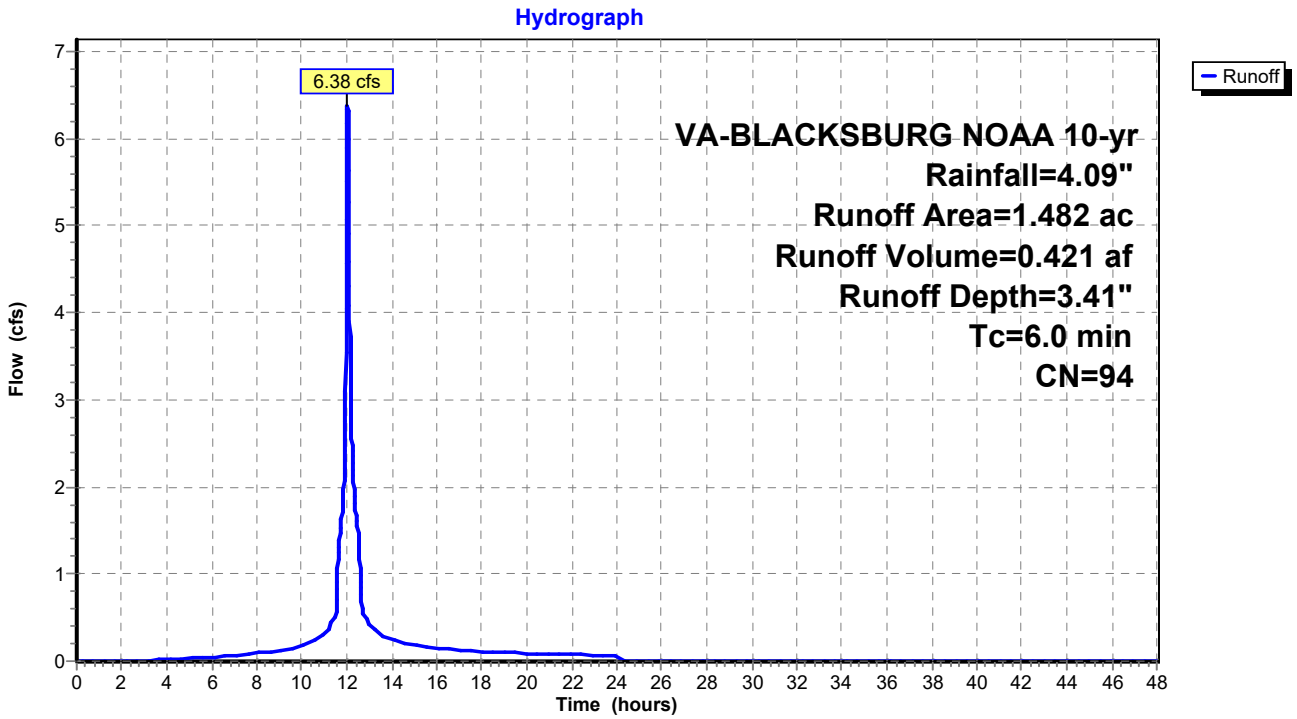
Runoff = 6.38 cfs @ 12.04 hrs, Volume= 0.421 af, Depth= 3.41"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 1.482 | 94 | Urban commercial, 85% imp, HSG C |
| 0.222 | | 15.00% Pervious Area |
| 1.260 | | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 4S: DA 4



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Link 1L: POA #1** Inflow=25.26 cfs 2.346 af
Primary=25.26 cfs 2.346 af

**Subcatchment1S: DA 1** Runoff Area=1.196 ac 51.73% Impervious Runoff Depth=4.96"
Flow Length=615' Tc=8.0 min CN=WQ Runoff=5.66 cfs 0.494 af

**Subcatchment2S: DA 2** Runoff Area=2.332 ac 47.52% Impervious Runoff Depth=4.81"
Flow Length=1,024' Tc=11.3 min CN=WQ Runoff=9.81 cfs 0.935 af

**Subcatchment3S: DA 3** Runoff Area=0.430 ac 80.19% Impervious Runoff Depth=5.70"
Tc=6.0 min CN=WQ Runoff=2.48 cfs 0.204 af

**Subcatchment4S: DA 4** Runoff Area=1.482 ac 85.00% Impervious Runoff Depth=5.77"
Tc=6.0 min CN=94 Runoff=8.87 cfs 0.713 af

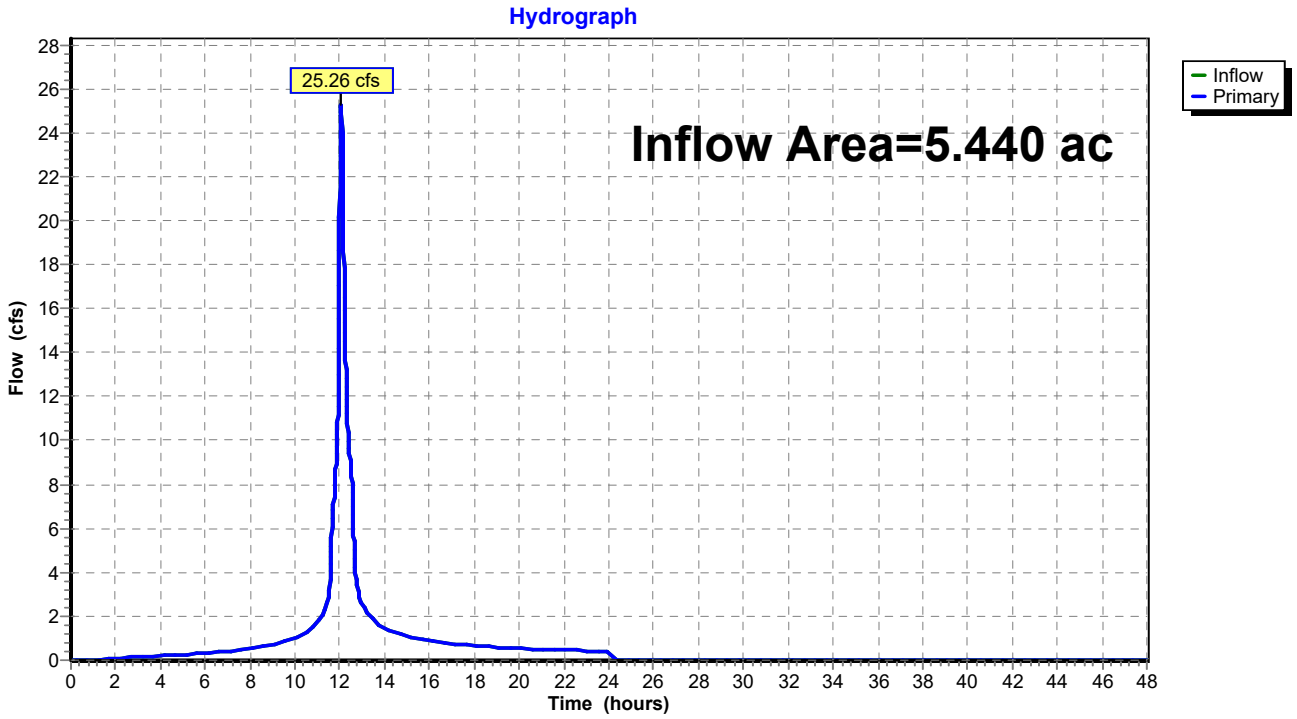
**Total Runoff Area = 5.440 ac Runoff Volume = 2.346 af Average Runoff Depth = 5.18"**
**38.76% Pervious = 2.109 ac 61.24% Impervious = 3.331 ac**

## Summary for Link 1L: POA #1

Inflow Area = 5.440 ac, 61.24% Impervious, Inflow Depth = 5.18" for 100-yr event
Inflow = 25.26 cfs @ 12.06 hrs, Volume= 2.346 af
Primary = 25.26 cfs @ 12.06 hrs, Volume= 2.346 af, Atten= 0%, Lag= 0.0 min

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

## Link 1L: POA #1



## Summary for Subcatchment 1S: DA 1

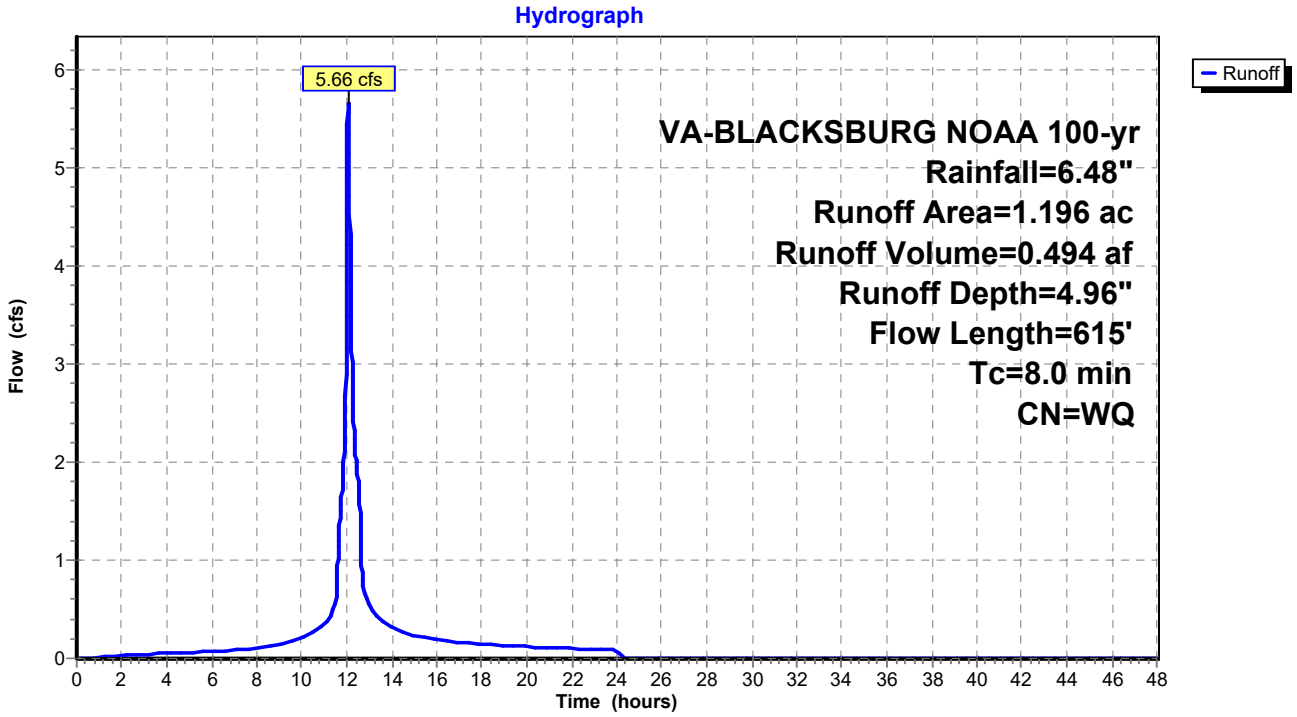
Runoff = 5.66 cfs @ 12.06 hrs, Volume= 0.494 af, Depth= 4.96"
Routed to Link 1L : POA #1

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 |
|---|---|---|---|
| | 0.389 | 98 | Paved roads w/curbs & sewers, HSG C |
| | 0.110 | 94 | Urban commercial, 85% imp, HSG C |
| | 0.019 | 83 | 1/4 acre lots, 38% imp, HSG C |
| | 0.549 | 74 | >75% Grass cover, Good, HSG C |
| * | 0.129 | 98 | Impervious Cover, HSG C |
| | 1.196 | | Weighted Average |
| | 0.577 | | 48.27% Pervious Area |
| | 0.619 | | 51.73% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | 100 | 0.0811 | 0.28 | | **Sheet Flow, Tc4** Grass: Short n= 0.150 P2= 2.76" |
| 0.2 | 56 | 0.1280 | 5.76 | | **Shallow Concentrated Flow, Tc5** Unpaved Kv= 16.1 fps |
| 1.8 | 459 | 0.0417 | 4.15 | | **Shallow Concentrated Flow, Tc6** Paved Kv= 20.3 fps |
| 8.0 | 615 | Total | | | |

## Subcatchment 1S: DA 1



## Summary for Subcatchment 2S: DA 2

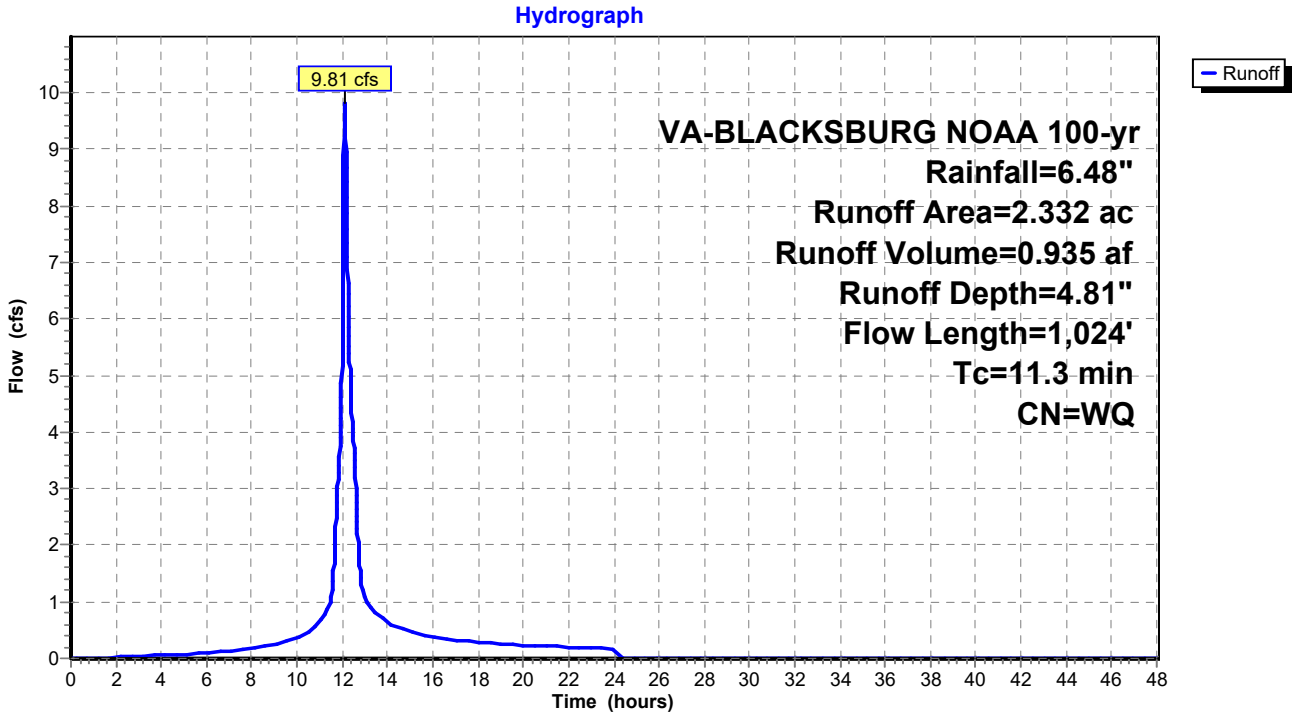
Runoff = 9.81 cfs @ 12.11 hrs, Volume= 0.935 af, Depth= 4.81"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.313 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.559 | 94 | Urban commercial, 85% imp, HSG C |
| 0.160 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 0.966 | 80 | 1/2 acre lots, 25% imp, HSG C |
| 0.059 | 81 | 1/3 acre lots, 30% imp, HSG C |
| 0.275 | 74 | >75% Grass cover, Good, HSG C |
| 2.332 | | Weighted Average |
| 1.224 | | 52.48% Pervious Area |
| 1.108 | | 47.52% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.7 | 100 | 0.0443 | 0.22 | | **Sheet Flow, Tc1**<br>Grass: Short n= 0.150 P2= 2.76" |
| 2.0 | 444 | 0.0532 | 3.71 | | **Shallow Concentrated Flow, Tc2**<br>Unpaved Kv= 16.1 fps |
| 1.6 | 480 | 0.0583 | 4.90 | | **Shallow Concentrated Flow, Tc3**<br>Paved Kv= 20.3 fps |
| 11.3 | 1,024 | Total | | | |

## Subcatchment 2S: DA 2



## Summary for Subcatchment 3S: DA 3

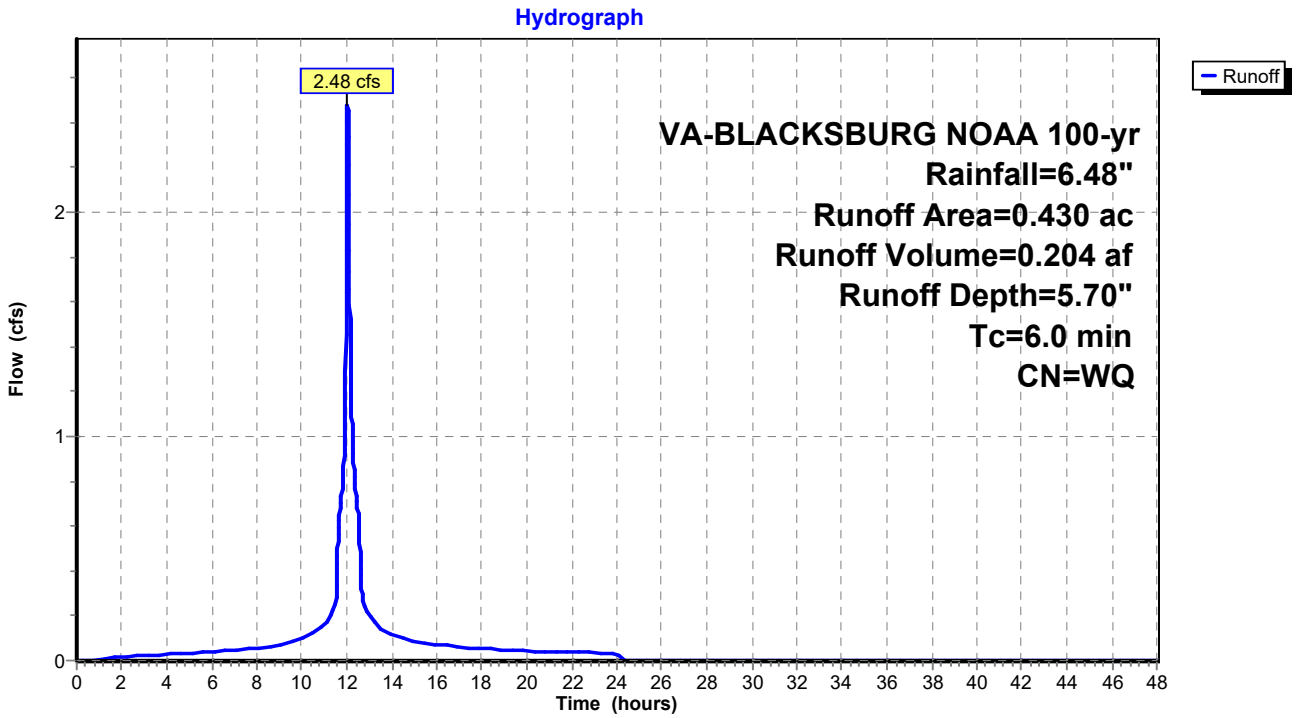
Runoff = 2.48 cfs @ 12.04 hrs, Volume= 0.204 af, Depth= 5.70"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.088 | 94 | Urban commercial, 85% imp, HSG C |
| 0.270 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.072 | 74 | >75% Grass cover, Good, HSG C |
| 0.430 | | Weighted Average |
| 0.085 | | 19.81% Pervious Area |
| 0.345 | | 80.19% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 3S: DA 3



## Summary for Subcatchment 4S: DA 4

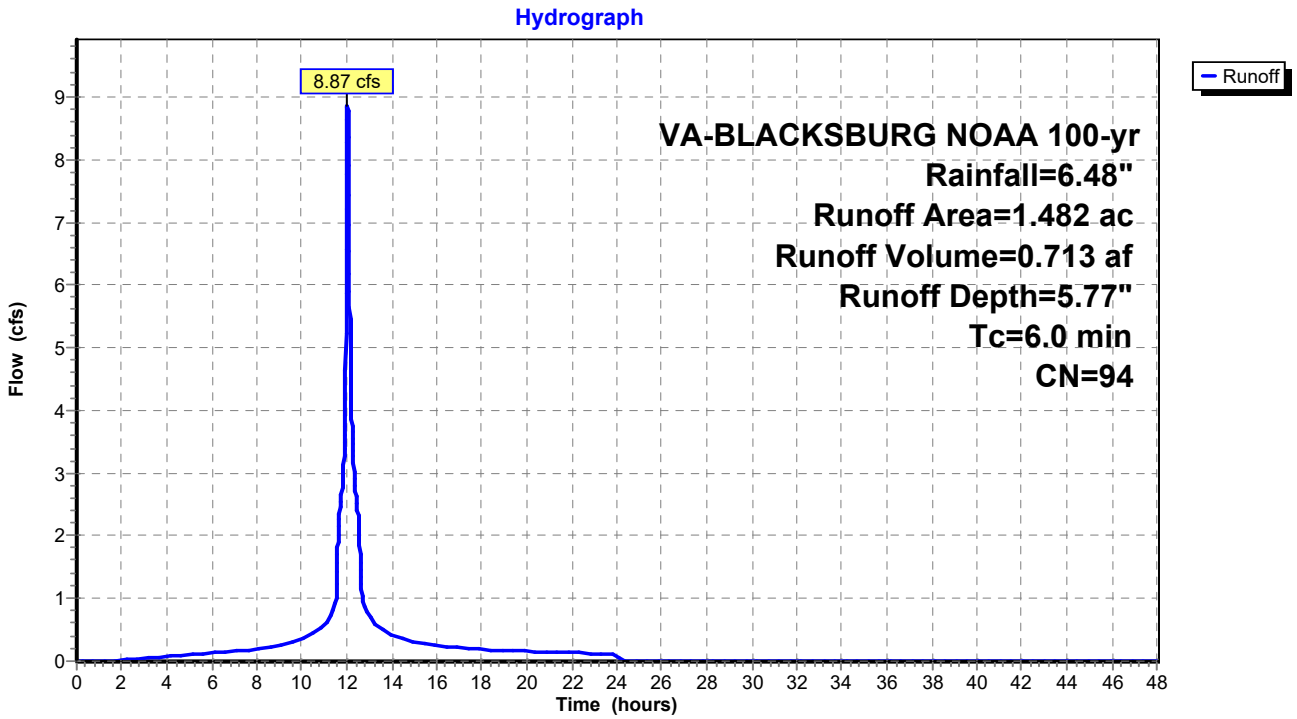
Runoff = 8.87 cfs @ 12.04 hrs, Volume= 0.713 af, Depth= 5.77"
Routed to Link 1L : POA #1

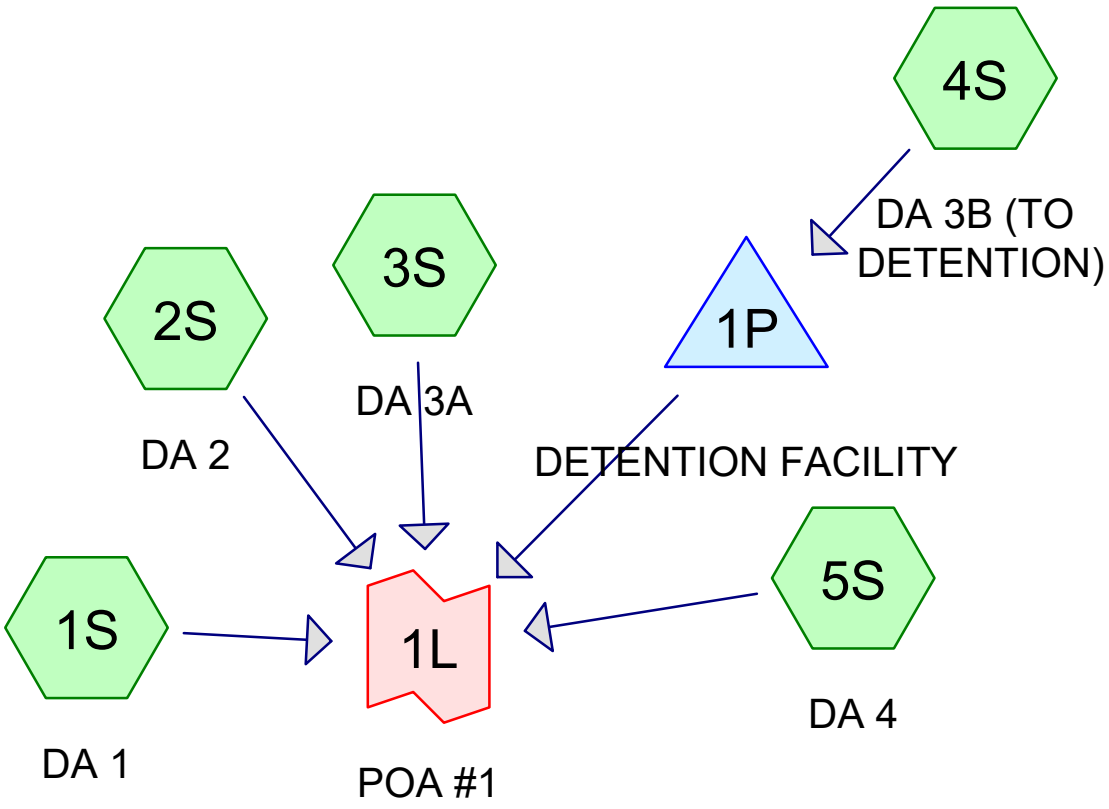
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
VA-BLACKSBURG NOAA 100-yr Rainfall=6.48"

| Area (ac) | CN | Description |
|---|---|---|
| 1.482 | 94 | Urban commercial, 85% imp, HSG C |
| 0.222 | | 15.00% Pervious Area |
| 1.260 | | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 4S: DA 4






Subcat Reach Pond Link

**Routing Diagram for POST DEV**
Prepared by Balzer & Associates, Inc, Printed 3/29/2024

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 0.966 | 80 | 1/2 acre lots, 25% imp, HSG C (2S) |
| 0.059 | 81 | 1/3 acre lots, 30% imp, HSG C (2S) |
| 0.179 | 83 | 1/4 acre lots, 38% imp, HSG C (1S, 2S) |
| 0.388 | 74 | >75% Grass cover, Good, HSG C (1S, 2S, 3S, 4S) |
| 0.637 | 98 | Impervious Cover, HSG C (2S, 4S) |
| 0.972 | 98 | Paved roads w/curbs & sewers, HSG C (1S, 2S, 3S) |
| 2.239 | 94 | Urban commercial, 85% imp, HSG C (1S, 2S, 3S, 4S, 5S) |
| **5.440** | **91** | **TOTAL AREA** |

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Link 1L: POA #1** Inflow=8.19 cfs 0.661 af
Primary=8.19 cfs 0.661 af

**Pond 1P: DETENTION FACILITY** Peak Elev=2,121.10' Storage=0.047 af Inflow=2.07 cfs 0.129 af
Outflow=0.85 cfs 0.117 af

**Subcatchment 1S: DA 1** Runoff Area=0.562 ac 84.11% Impervious Runoff Depth=1.76"
Tc=6.0 min CN=WQ Runoff=1.33 cfs 0.083 af

**Subcatchment 2S: DA 2** Runoff Area=2.152 ac 52.47% Impervious Runoff Depth=1.18"
Flow Length=1,024' Tc=11.3 min CN=WQ Runoff=2.73 cfs 0.211 af

**Subcatchment 3S: DA 3A** Runoff Area=0.353 ac 89.97% Impervious Runoff Depth=1.86"
Tc=6.0 min CN=WQ Runoff=0.88 cfs 0.055 af

**Subcatchment 4S: DA 3B (TO DETENTION)** Runoff Area=0.952 ac 74.80% Impervious Runoff Depth=1.63"
Tc=6.0 min CN=WQ Runoff=2.07 cfs 0.129 af

**Subcatchment 5S: DA 4** Runoff Area=1.421 ac 85.00% Impervious Runoff Depth=1.65"
Tc=6.0 min CN=94 Runoff=3.35 cfs 0.195 af

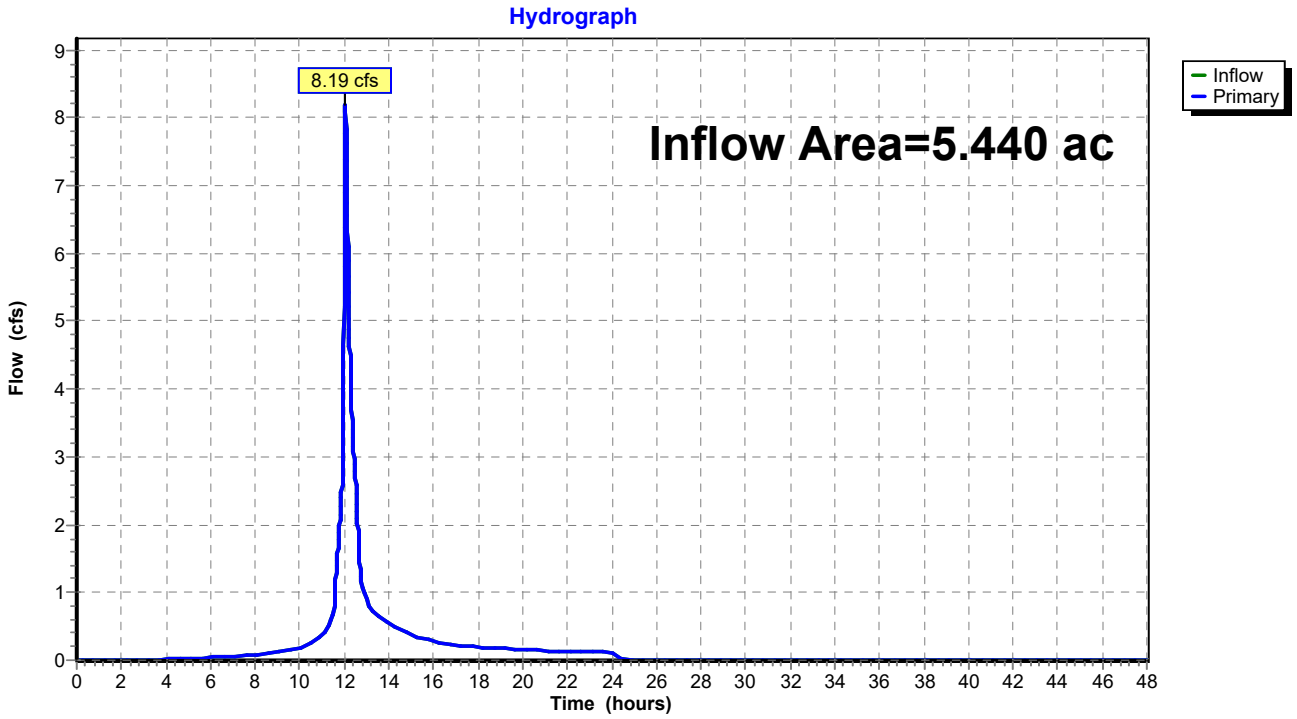
**Total Runoff Area = 5.440 ac Runoff Volume = 0.674 af Average Runoff Depth = 1.49"**
**29.42% Pervious = 1.601 ac 70.58% Impervious = 3.839 ac**

## Summary for Link 1L: POA #1

Inflow Area = 5.440 ac, 70.58% Impervious, Inflow Depth = 1.46" for 1-yr event
Inflow = 8.19 cfs @ 12.05 hrs, Volume= 0.661 af
Primary = 8.19 cfs @ 12.05 hrs, Volume= 0.661 af, Atten= 0%, Lag= 0.0 min

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

## Link 1L: POA #1



## Summary for Pond 1P: DETENTION FACILITY

Inflow Area = 0.952 ac, 74.80% Impervious, Inflow Depth = 1.63" for 1-yr event
Inflow = 2.07 cfs @ 12.04 hrs, Volume= 0.129 af
Outflow = 0.85 cfs @ 12.20 hrs, Volume= 0.117 af, Atten= 59%, Lag= 9.5 min
Primary = 0.85 cfs @ 12.20 hrs, Volume= 0.117 af
Routed to Link 1L : POA #1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 2,121.10' @ 12.20 hrs Surf.Area= 0.023 ac Storage= 0.047 af

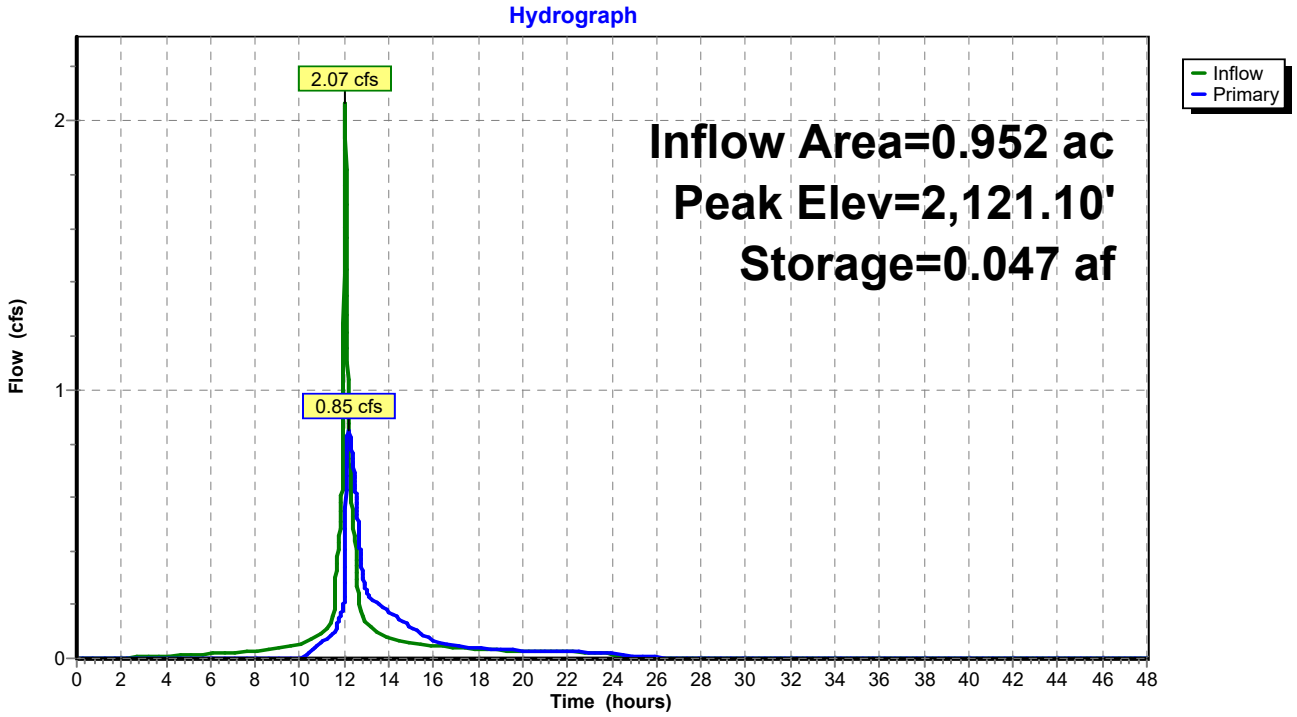
Plug-Flow detention time= 136.7 min calculated for 0.117 af (90% of inflow)
Center-of-Mass det. time= 84.8 min ( 862.6 - 777.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 2,118.50' | 0.090 af | **60.0" Round Pipe Storage**<br>L= 200.0' |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 2,118.40' | **18.0" Round Culvert**<br>L= 55.9' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 2,118.40' / 2,114.16' S= 0.0758 '/' Cc= 0.900<br>n= 0.020 Corrugated PE, corrugated interior, Flow Area= 1.77 sf |
| #2 | Device 1 | 2,119.50' | **3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads |
| #3 | Device 1 | 2,120.50' | **6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads |
| #4 | Device 1 | 2,123.00' | **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |

**Primary OutFlow** Max=0.85 cfs @ 12.20 hrs HW=2,121.10' (Free Discharge)
└**1=Culvert** (Passes 0.85 cfs of 11.89 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.29 cfs @ 5.85 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.56 cfs @ 2.85 fps)
  └**4=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Pond 1P: DETENTION FACILITY



## Summary for Subcatchment 1S: DA 1

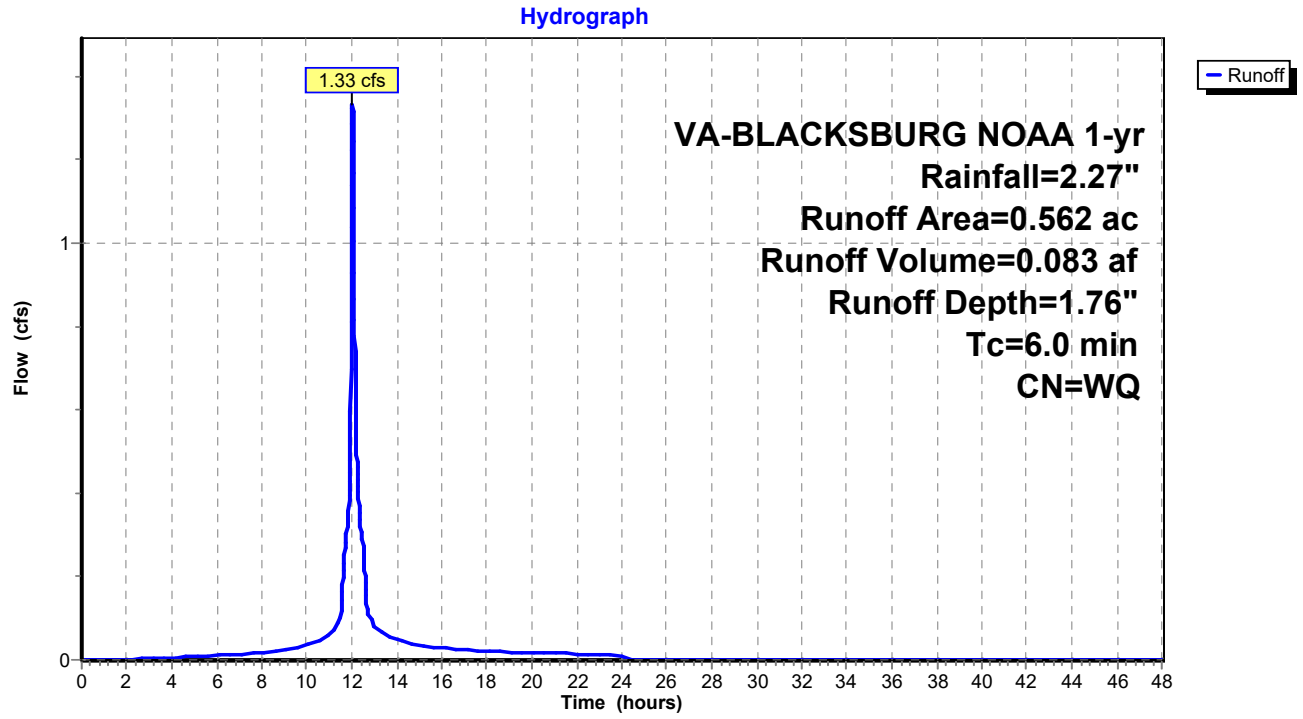
Runoff = 1.33 cfs @ 12.04 hrs, Volume= 0.083 af, Depth= 1.76"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.389 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.090 | 94 | Urban commercial, 85% imp, HSG C |
| 0.019 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 0.064 | 74 | >75% Grass cover, Good, HSG C |
| 0.562 | | Weighted Average |
| 0.089 | | 15.89% Pervious Area |
| 0.473 | | 84.11% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 1S: DA 1



## Summary for Subcatchment 2S: DA 2

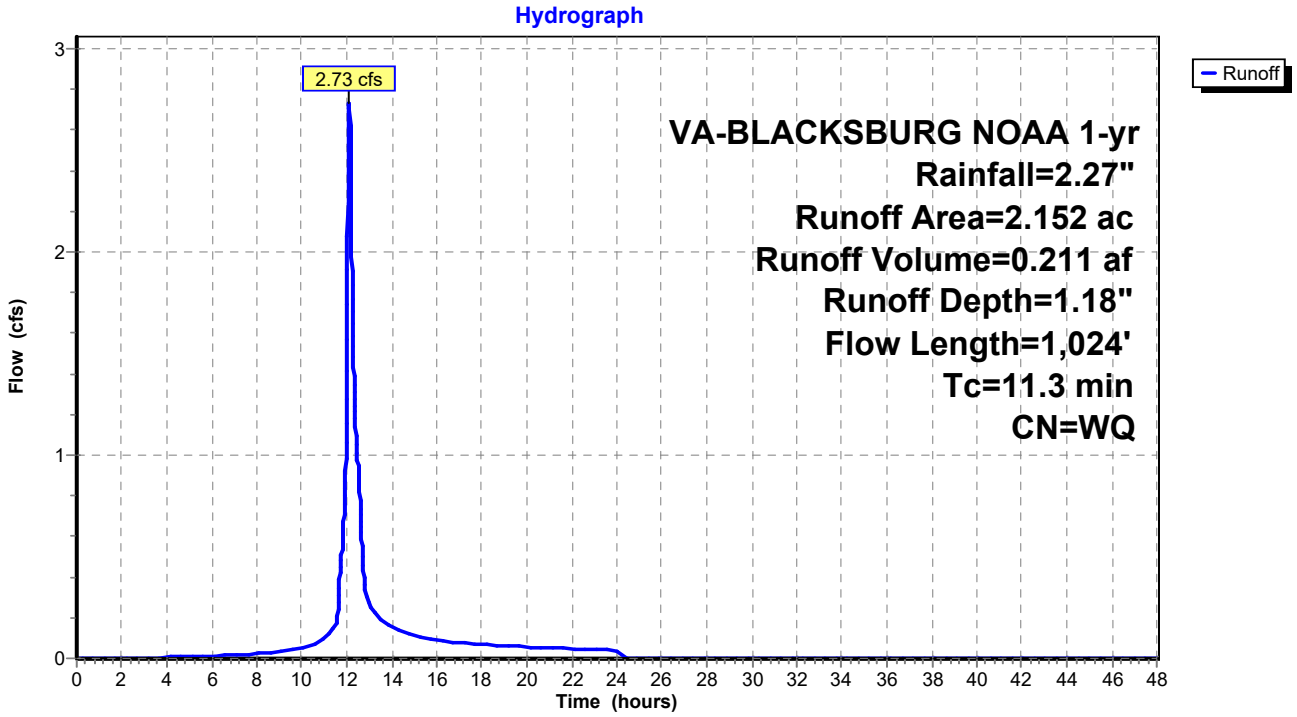
Runoff = 2.73 cfs @ 12.11 hrs, Volume= 0.211 af, Depth= 1.18"
Routed to Link 1L : POA #1

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 |
|---|---|---|---|
| | 0.313 | 98 | Paved roads w/curbs & sewers, HSG C |
| | 0.559 | 94 | Urban commercial, 85% imp, HSG C |
| | 0.160 | 83 | 1/4 acre lots, 38% imp, HSG C |
| | 0.966 | 80 | 1/2 acre lots, 25% imp, HSG C |
| | 0.059 | 81 | 1/3 acre lots, 30% imp, HSG C |
| | 0.074 | 74 | >75% Grass cover, Good, HSG C |
| * | 0.021 | 98 | Impervious Cover, HSG C |
| | 2.152 | | Weighted Average |
| | 1.023 | | 47.53% Pervious Area |
| | 1.129 | | 52.47% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.7 | 100 | 0.0443 | 0.22 | | **Sheet Flow, Tc1**<br>Grass: Short n= 0.150 P2= 2.76" |
| 2.0 | 444 | 0.0532 | 3.71 | | **Shallow Concentrated Flow, Tc2**<br>Unpaved Kv= 16.1 fps |
| 1.6 | 480 | 0.0583 | 4.90 | | **Shallow Concentrated Flow, Tc3**<br>Paved Kv= 20.3 fps |
| 11.3 | 1,024 | Total | | | |

## Subcatchment 2S: DA 2



## Summary for Subcatchment 3S: DA 3A

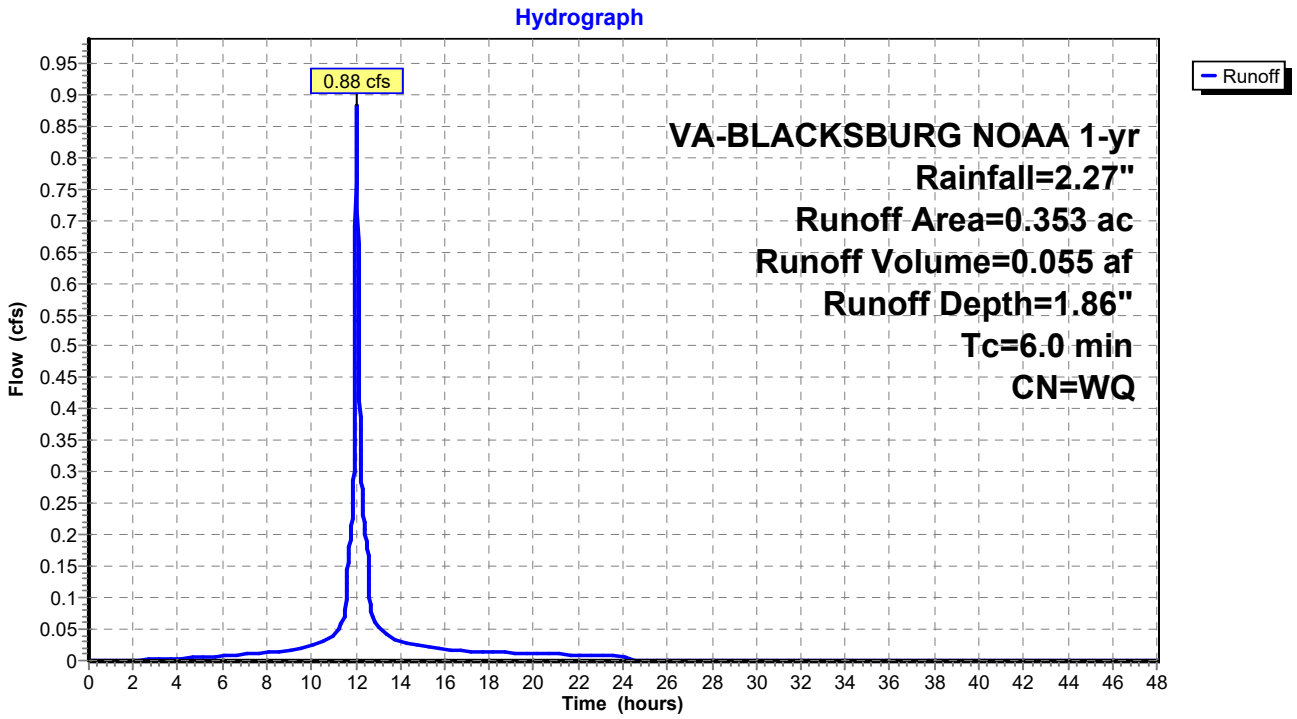
Runoff = 0.88 cfs @ 12.04 hrs, Volume= 0.055 af, Depth= 1.86"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.056 | 94 | Urban commercial, 85% imp, HSG C |
| 0.270 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.027 | 74 | >75% Grass cover, Good, HSG C |
| 0.353 | | Weighted Average |
| 0.035 | | 10.03% Pervious Area |
| 0.318 | | 89.97% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 3S: DA 3A



## Summary for Subcatchment 4S: DA 3B (TO DETENTION)

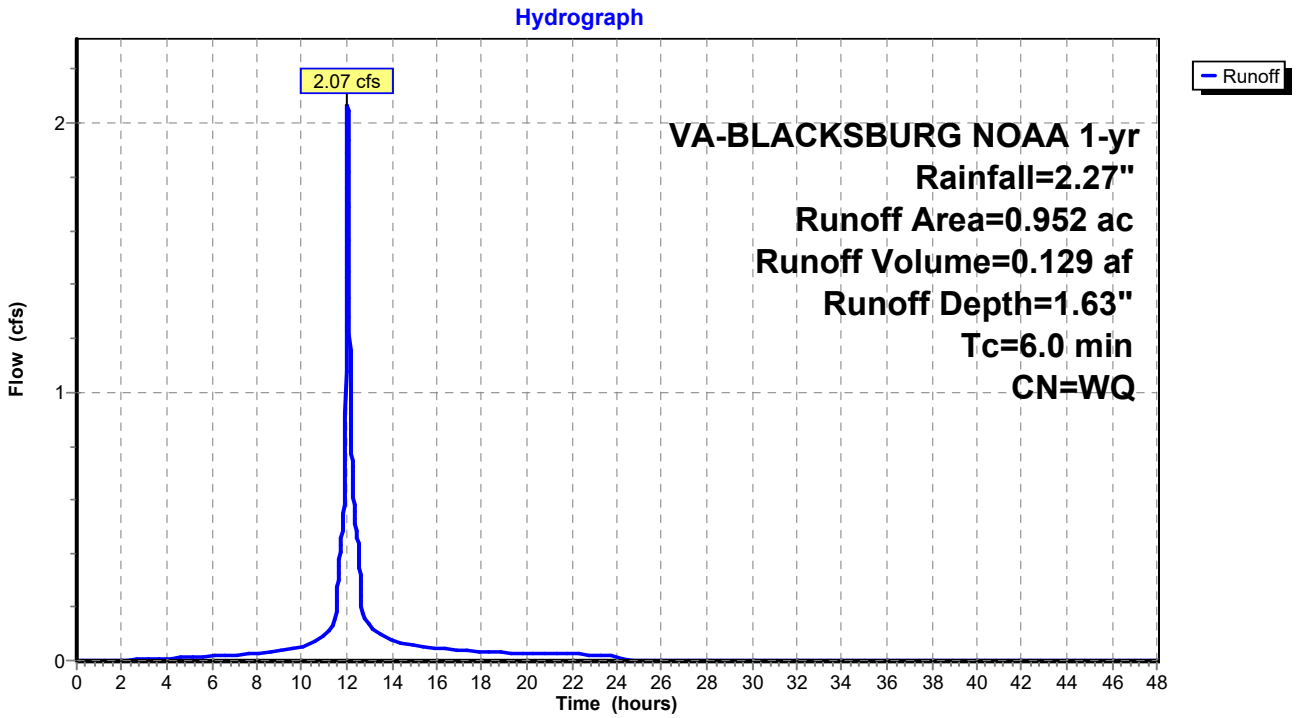
Runoff = 2.07 cfs @ 12.04 hrs, Volume= 0.129 af, Depth= 1.63"
Routed to Pond 1P : DETENTION FACILITY

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 |
|---|---|---|---|
| | 0.113 | 94 | Urban commercial, 85% imp, HSG C |
| * | 0.616 | 98 | Impervious Cover, HSG C |
| | 0.223 | 74 | >75% Grass cover, Good, HSG C |
| | 0.952 | | Weighted Average |
| | 0.240 | | 25.20% Pervious Area |
| | 0.712 | | 74.80% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 4S: DA 3B (TO DETENTION)



## Summary for Subcatchment 5S: DA 4

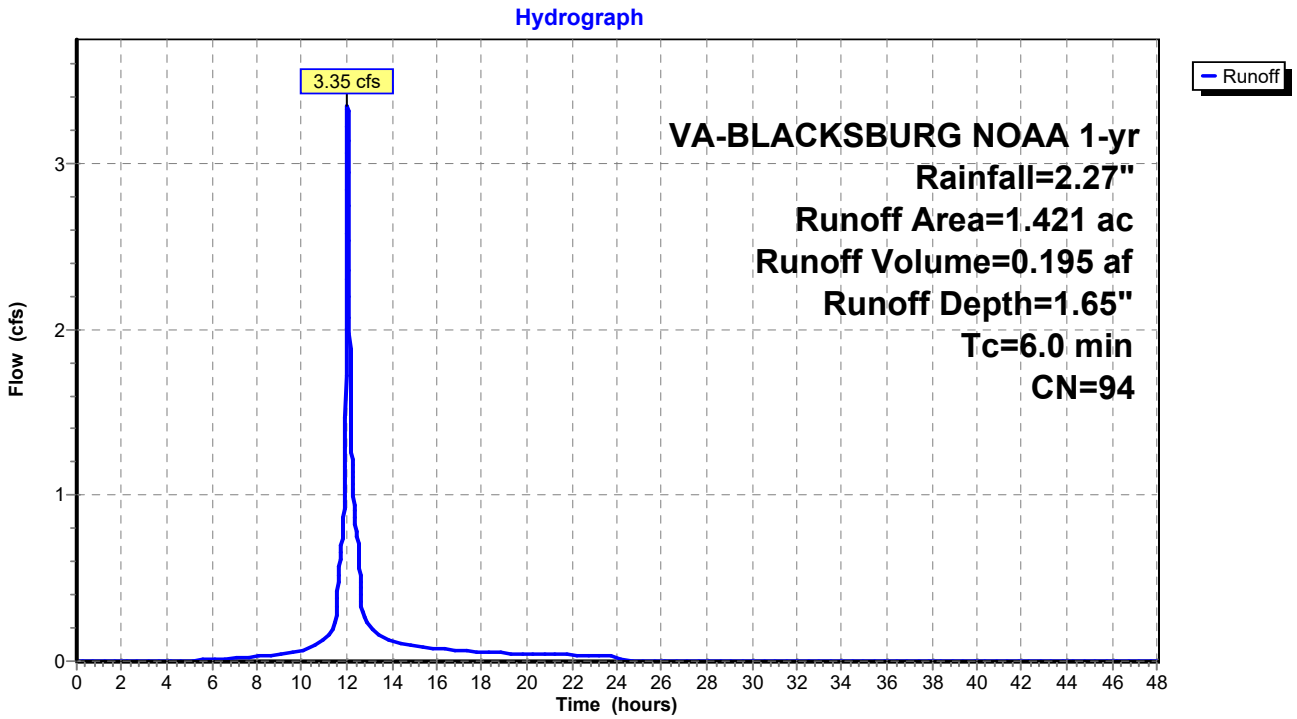
Runoff = 3.35 cfs @ 12.04 hrs, Volume= 0.195 af, Depth= 1.65"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 1.421 | 94 | Urban commercial, 85% imp, HSG C |
| 0.213 | | 15.00% Pervious Area |
| 1.208 | | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 5S: DA 4



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Link 1L: POA #1** Inflow=10.70 cfs 0.853 af
Primary=10.70 cfs 0.853 af

**Pond 1P: DETENTION FACILITY** Peak Elev=2,121.43' Storage=0.055 af Inflow=2.59 cfs 0.163 af
Outflow=1.10 cfs 0.150 af

**Subcatchment 1S: DA 1** Runoff Area=0.562 ac 84.11% Impervious Runoff Depth=2.21"
Tc=6.0 min CN=WQ Runoff=1.65 cfs 0.103 af

**Subcatchment 2S: DA 2** Runoff Area=2.152 ac 52.47% Impervious Runoff Depth=1.57"
Flow Length=1,024' Tc=11.3 min CN=WQ Runoff=3.67 cfs 0.281 af

**Subcatchment 3S: DA 3A** Runoff Area=0.353 ac 89.97% Impervious Runoff Depth=2.32"
Tc=6.0 min CN=WQ Runoff=1.09 cfs 0.068 af

**Subcatchment 4S: DA 3B (TO DETENTION)** Runoff Area=0.952 ac 74.80% Impervious Runoff Depth=2.06"
Tc=6.0 min CN=WQ Runoff=2.59 cfs 0.163 af

**Subcatchment 5S: DA 4** Runoff Area=1.421 ac 85.00% Impervious Runoff Depth=2.11"
Tc=6.0 min CN=94 Runoff=4.23 cfs 0.250 af

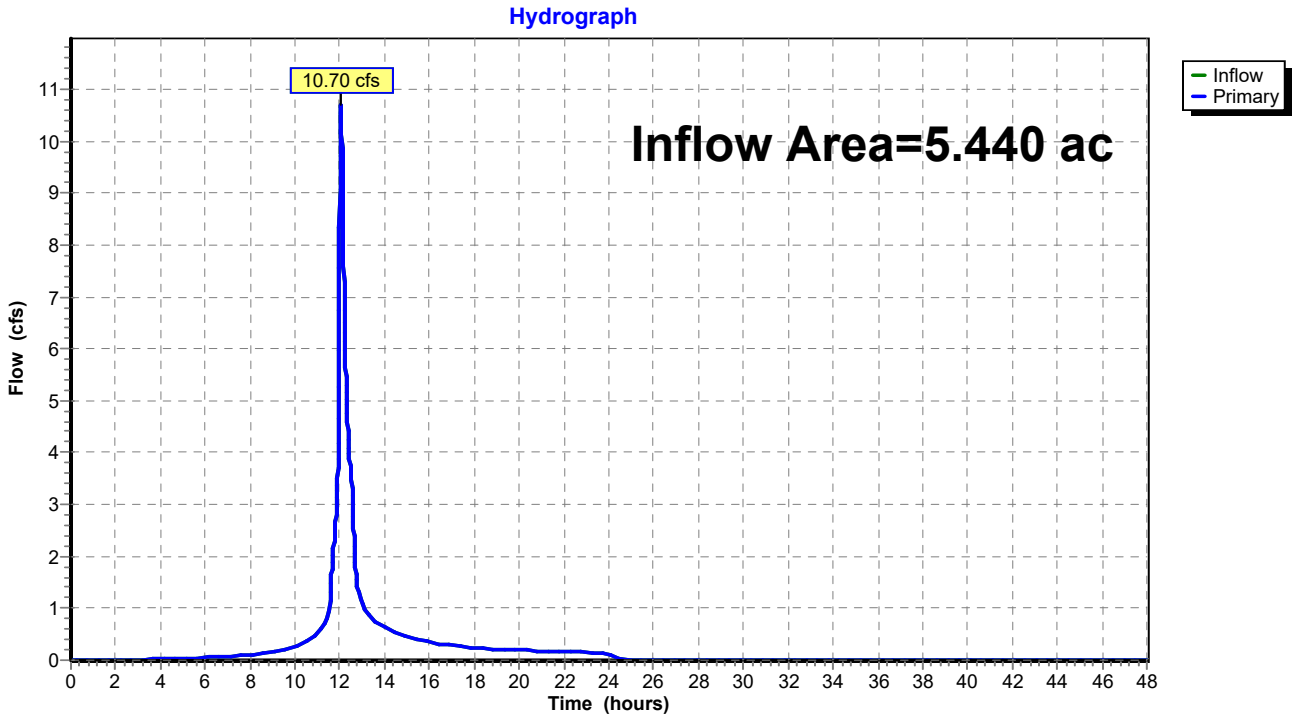
**Total Runoff Area = 5.440 ac Runoff Volume = 0.866 af Average Runoff Depth = 1.91"**
**29.42% Pervious = 1.601 ac 70.58% Impervious = 3.839 ac**

## Summary for Link 1L: POA #1

Inflow Area = 5.440 ac, 70.58% Impervious, Inflow Depth = 1.88" for 2-yr event
Inflow = 10.70 cfs @ 12.05 hrs, Volume= 0.853 af
Primary = 10.70 cfs @ 12.05 hrs, Volume= 0.853 af, Atten= 0%, Lag= 0.0 min

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

## Link 1L: POA #1



## Summary for Pond 1P: DETENTION FACILITY

Inflow Area = 0.952 ac, 74.80% Impervious, Inflow Depth = 2.06" for 2-yr event
Inflow = 2.59 cfs @ 12.04 hrs, Volume= 0.163 af
Outflow = 1.10 cfs @ 12.19 hrs, Volume= 0.150 af, Atten= 58%, Lag= 9.2 min
Primary = 1.10 cfs @ 12.19 hrs, Volume= 0.150 af
Routed to Link 1L : POA #1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 2,121.43' @ 12.19 hrs Surf.Area= 0.023 ac Storage= 0.055 af

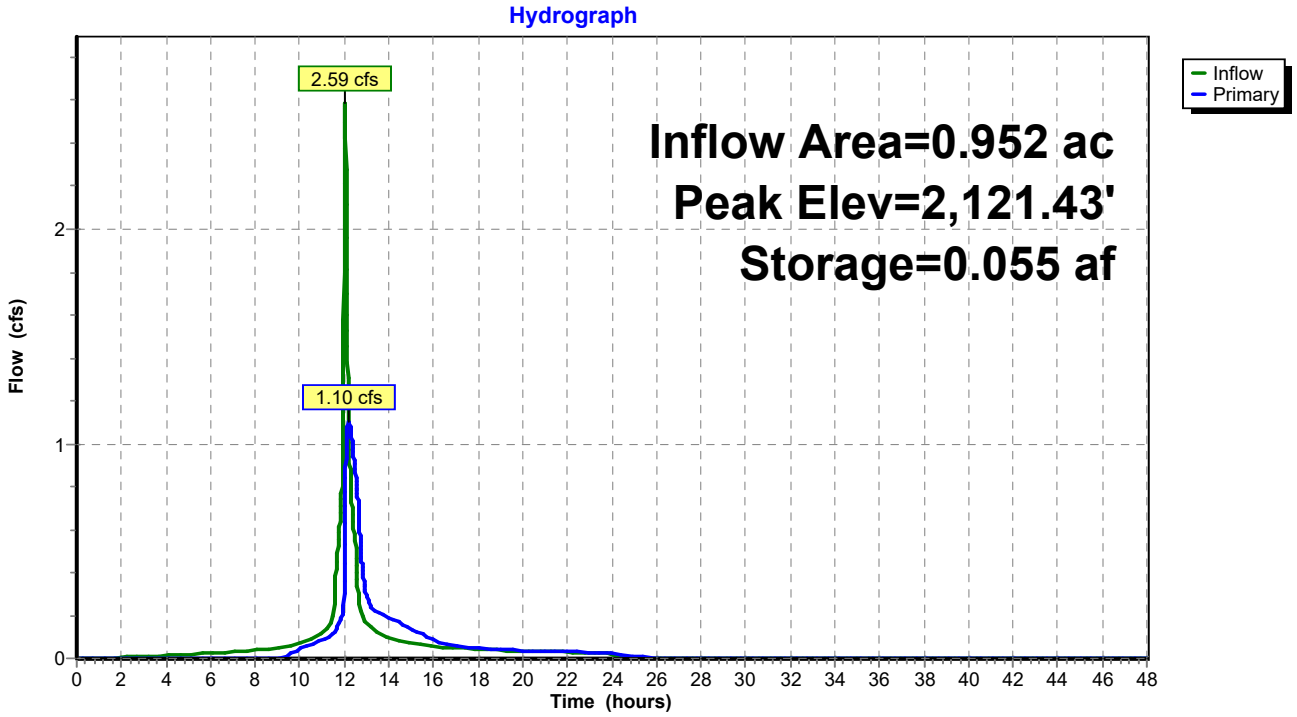
Plug-Flow detention time= 120.7 min calculated for 0.150 af (92% of inflow)
Center-of-Mass det. time= 77.3 min ( 851.1 - 773.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 2,118.50' | 0.090 af | **60.0" Round Pipe Storage**<br>L= 200.0' |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 2,118.40' | **18.0" Round Culvert**<br>L= 55.9' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 2,118.40' / 2,114.16' S= 0.0758 '/' Cc= 0.900<br>n= 0.020 Corrugated PE, corrugated interior, Flow Area= 1.77 sf |
| #2 | Device 1 | 2,119.50' | **3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads |
| #3 | Device 1 | 2,120.50' | **6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads |
| #4 | Device 1 | 2,123.00' | **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |

**Primary OutFlow** Max=1.10 cfs @ 12.19 hrs HW=2,121.43' (Free Discharge)
└**1=Culvert** (Passes 1.10 cfs of 12.86 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.32 cfs @ 6.48 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.78 cfs @ 3.98 fps)
  └**4=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Pond 1P: DETENTION FACILITY



## Summary for Subcatchment 1S: DA 1

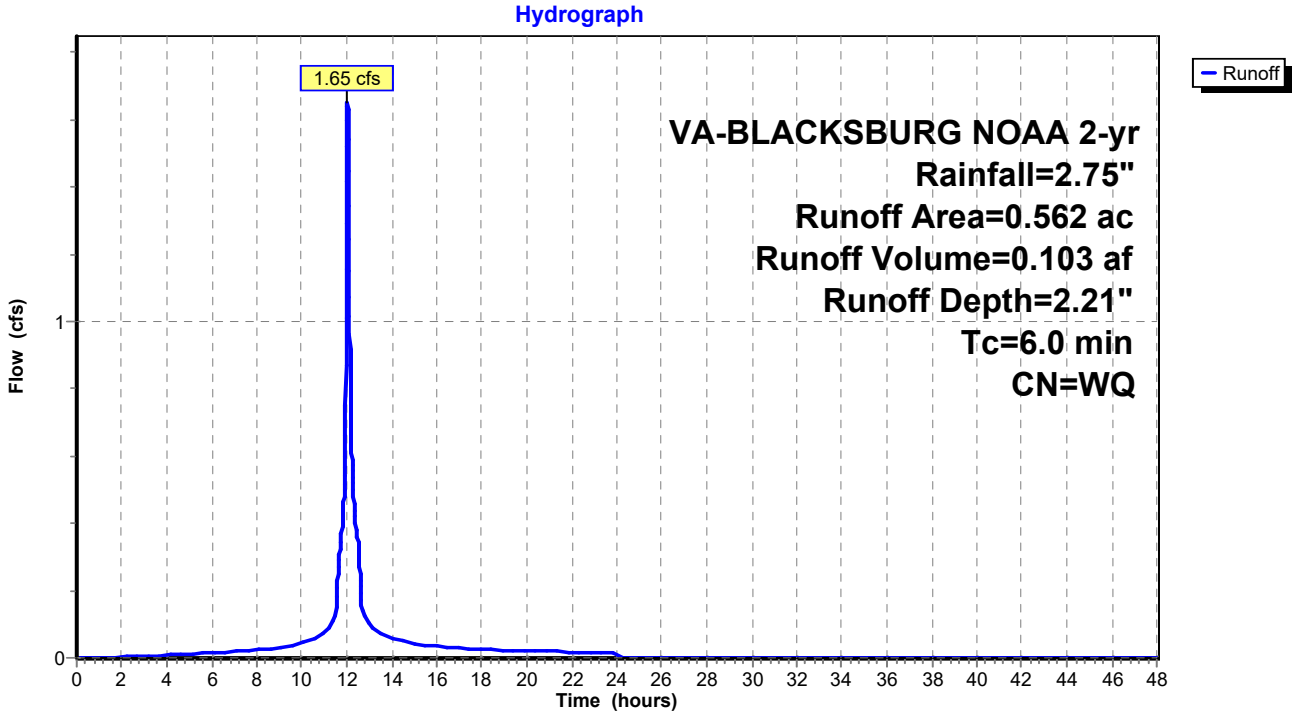
Runoff = 1.65 cfs @ 12.04 hrs, Volume= 0.103 af, Depth= 2.21"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.389 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.090 | 94 | Urban commercial, 85% imp, HSG C |
| 0.019 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 0.064 | 74 | >75% Grass cover, Good, HSG C |
| 0.562 | | Weighted Average |
| 0.089 | | 15.89% Pervious Area |
| 0.473 | | 84.11% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 1S: DA 1



## Summary for Subcatchment 2S: DA 2

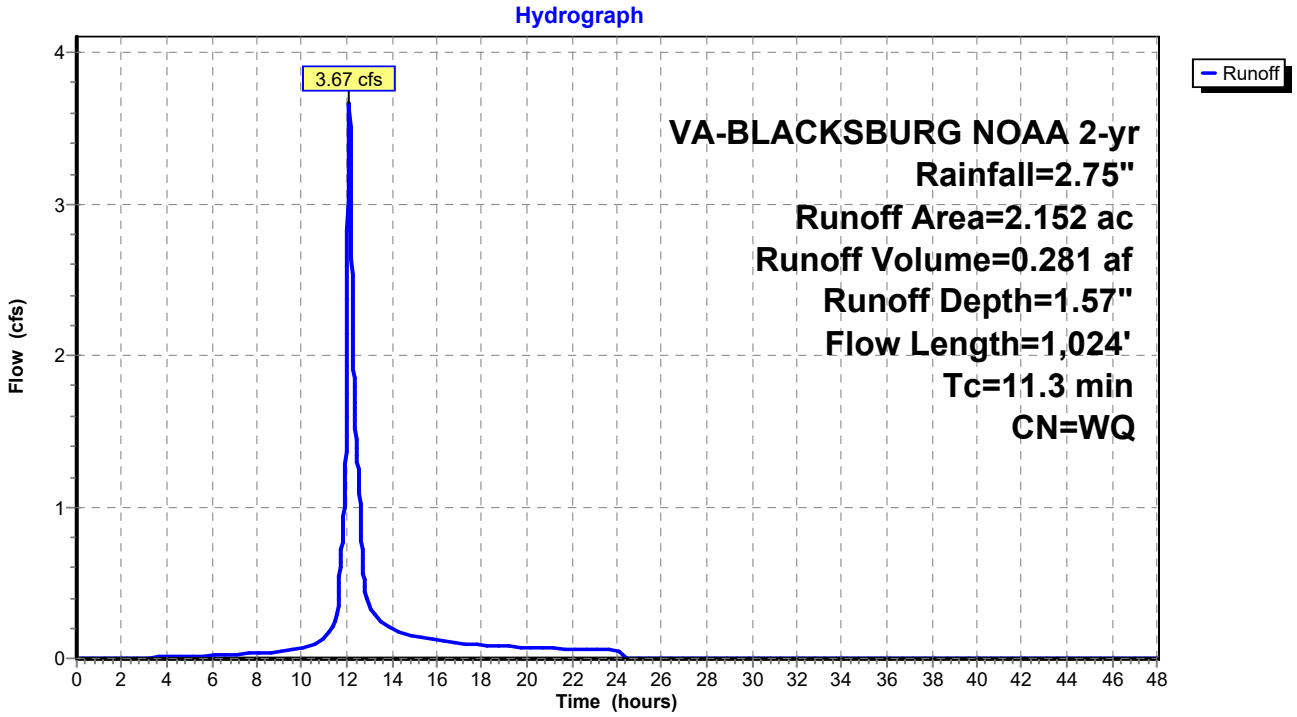
Runoff = 3.67 cfs @ 12.11 hrs, Volume= 0.281 af, Depth= 1.57"
Routed to Link 1L : POA #1

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 |
|---|---|---|---|
| | 0.313 | 98 | Paved roads w/curbs & sewers, HSG C |
| | 0.559 | 94 | Urban commercial, 85% imp, HSG C |
| | 0.160 | 83 | 1/4 acre lots, 38% imp, HSG C |
| | 0.966 | 80 | 1/2 acre lots, 25% imp, HSG C |
| | 0.059 | 81 | 1/3 acre lots, 30% imp, HSG C |
| | 0.074 | 74 | >75% Grass cover, Good, HSG C |
| * | 0.021 | 98 | Impervious Cover, HSG C |
| | 2.152 | | Weighted Average |
| | 1.023 | | 47.53% Pervious Area |
| | 1.129 | | 52.47% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.7 | 100 | 0.0443 | 0.22 | | **Sheet Flow, Tc1**<br>Grass: Short n= 0.150 P2= 2.76" |
| 2.0 | 444 | 0.0532 | 3.71 | | **Shallow Concentrated Flow, Tc2**<br>Unpaved Kv= 16.1 fps |
| 1.6 | 480 | 0.0583 | 4.90 | | **Shallow Concentrated Flow, Tc3**<br>Paved Kv= 20.3 fps |
| 11.3 | 1,024 | Total | | | |

## Subcatchment 2S: DA 2



## Summary for Subcatchment 3S: DA 3A

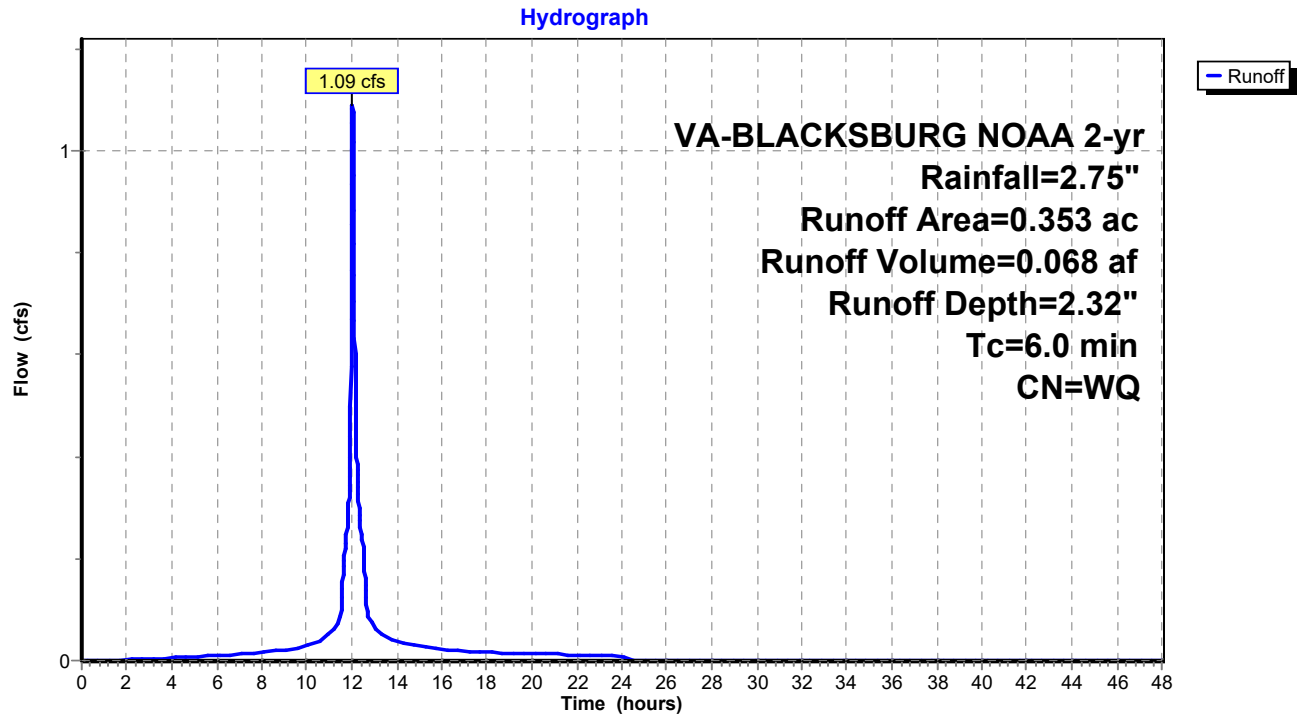
Runoff = 1.09 cfs @ 12.04 hrs, Volume= 0.068 af, Depth= 2.32"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.056 | 94 | Urban commercial, 85% imp, HSG C |
| 0.270 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.027 | 74 | >75% Grass cover, Good, HSG C |
| 0.353 | | Weighted Average |
| 0.035 | | 10.03% Pervious Area |
| 0.318 | | 89.97% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 3S: DA 3A



## Summary for Subcatchment 4S: DA 3B (TO DETENTION)

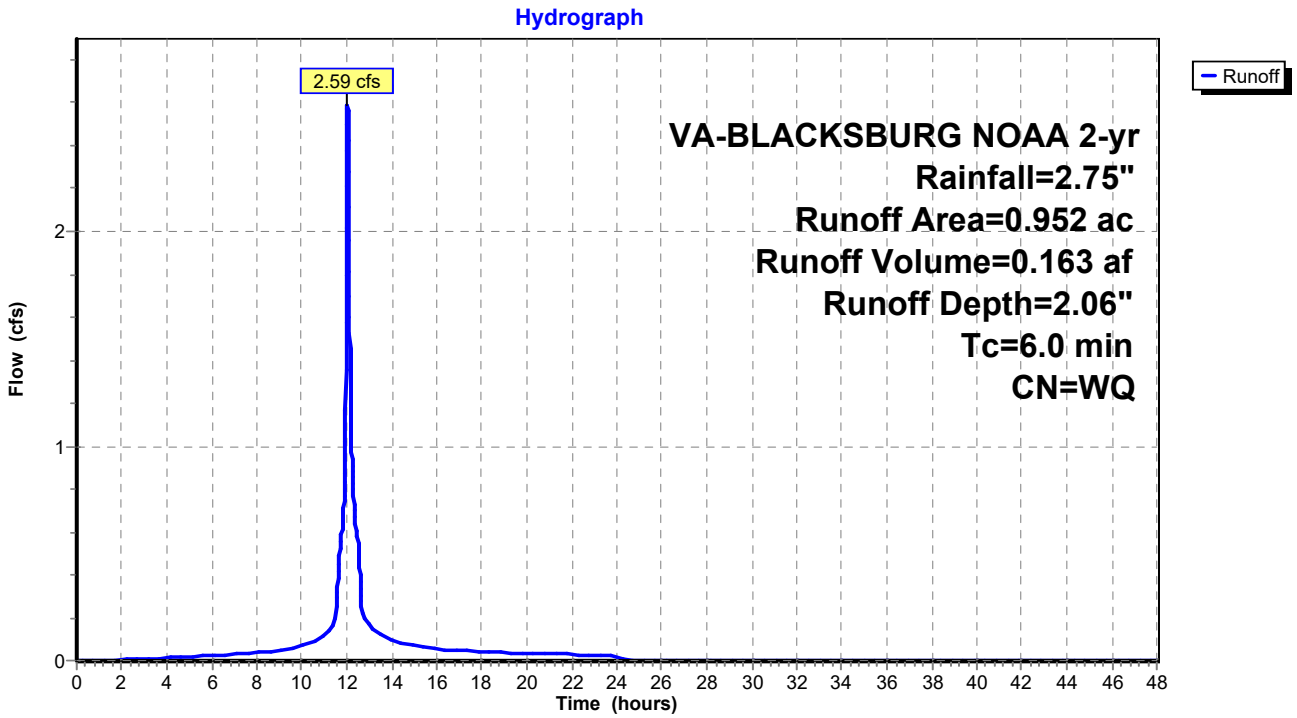
Runoff = 2.59 cfs @ 12.04 hrs, Volume= 0.163 af, Depth= 2.06"
Routed to Pond 1P : DETENTION FACILITY

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 |
|---|---|---|---|
| | 0.113 | 94 | Urban commercial, 85% imp, HSG C |
| * | 0.616 | 98 | Impervious Cover, HSG C |
| | 0.223 | 74 | >75% Grass cover, Good, HSG C |
| | 0.952 | | Weighted Average |
| | 0.240 | | 25.20% Pervious Area |
| | 0.712 | | 74.80% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 4S: DA 3B (TO DETENTION)



## Summary for Subcatchment 5S: DA 4

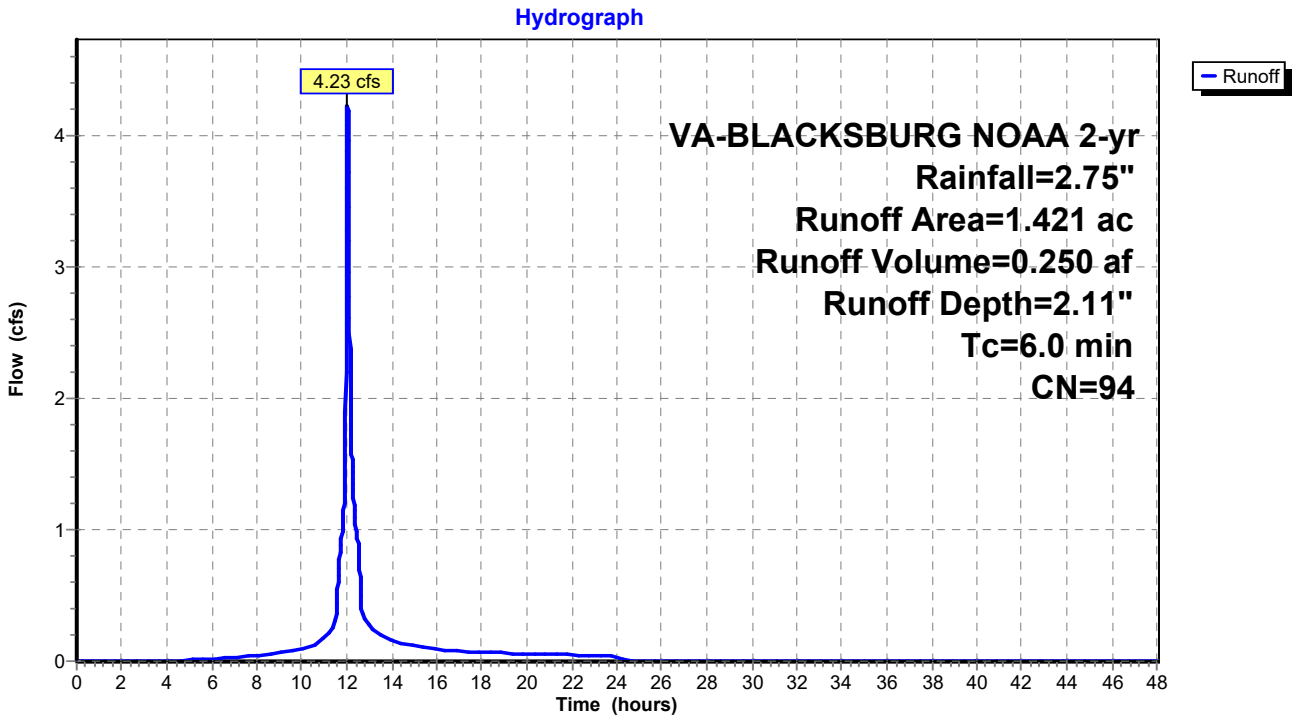
Runoff = 4.23 cfs @ 12.04 hrs, Volume= 0.250 af, Depth= 2.11"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 1.421 | 94 | Urban commercial, 85% imp, HSG C |
| 0.213 | | 15.00% Pervious Area |
| 1.208 | | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 5S: DA 4



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Link 1L: POA #1** Inflow=16.17 cfs 1.411 af
Primary=16.17 cfs 1.411 af

**Pond 1P: DETENTION FACILITY** Peak Elev=2,122.39' Storage=0.075 af Inflow=3.77 cfs 0.261 af
Outflow=1.60 cfs 0.248 af

**Subcatchment 1S: DA 1** Runoff Area=0.562 ac 84.11% Impervious Runoff Depth=3.48"
Tc=6.0 min CN=WQ Runoff=2.36 cfs 0.163 af

**Subcatchment 2S: DA 2** Runoff Area=2.152 ac 52.47% Impervious Runoff Depth=2.73"
Flow Length=1,024' Tc=11.3 min CN=WQ Runoff=5.98 cfs 0.489 af

**Subcatchment 3S: DA 3A** Runoff Area=0.353 ac 89.97% Impervious Runoff Depth=3.62"
Tc=6.0 min CN=WQ Runoff=1.53 cfs 0.106 af

**Subcatchment 4S: DA 3B (TO DETENTION)** Runoff Area=0.952 ac 74.80% Impervious Runoff Depth=3.29"
Tc=6.0 min CN=WQ Runoff=3.77 cfs 0.261 af

**Subcatchment 5S: DA 4** Runoff Area=1.421 ac 85.00% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=94 Runoff=6.11 cfs 0.404 af

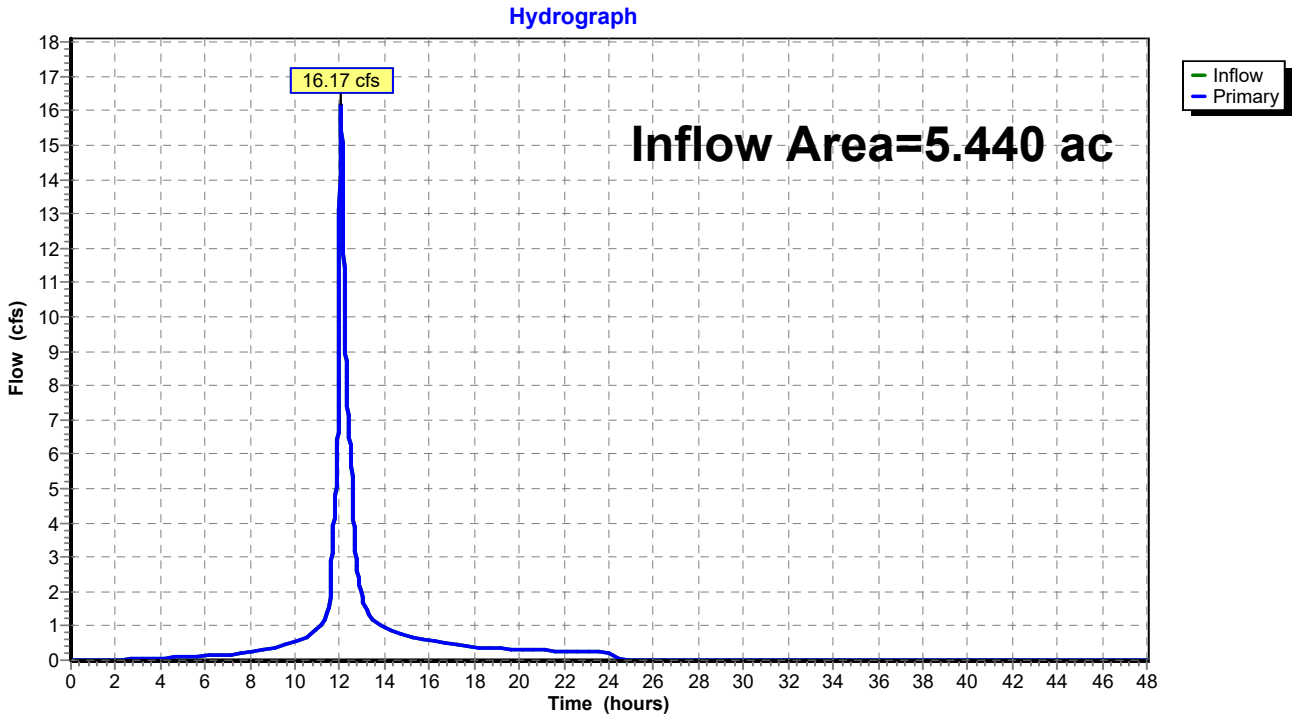
**Total Runoff Area = 5.440 ac Runoff Volume = 1.424 af Average Runoff Depth = 3.14"**
**29.42% Pervious = 1.601 ac 70.58% Impervious = 3.839 ac**

## Summary for Link 1L: POA #1

Inflow Area = 5.440 ac, 70.58% Impervious, Inflow Depth = 3.11" for 10-yr event
Inflow = 16.17 cfs @ 12.05 hrs, Volume= 1.411 af
Primary = 16.17 cfs @ 12.05 hrs, Volume= 1.411 af, Atten= 0%, Lag= 0.0 min

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

## Link 1L: POA #1



## Summary for Pond 1P: DETENTION FACILITY

Inflow Area = 0.952 ac, 74.80% Impervious, Inflow Depth = 3.29" for 10-yr event
Inflow = 3.77 cfs @ 12.04 hrs, Volume= 0.261 af
Outflow = 1.60 cfs @ 12.21 hrs, Volume= 0.248 af, Atten= 57%, Lag= 10.1 min
Primary = 1.60 cfs @ 12.21 hrs, Volume= 0.248 af
Routed to Link 1L : POA #1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 2,122.39' @ 12.21 hrs Surf.Area= 0.019 ac Storage= 0.075 af

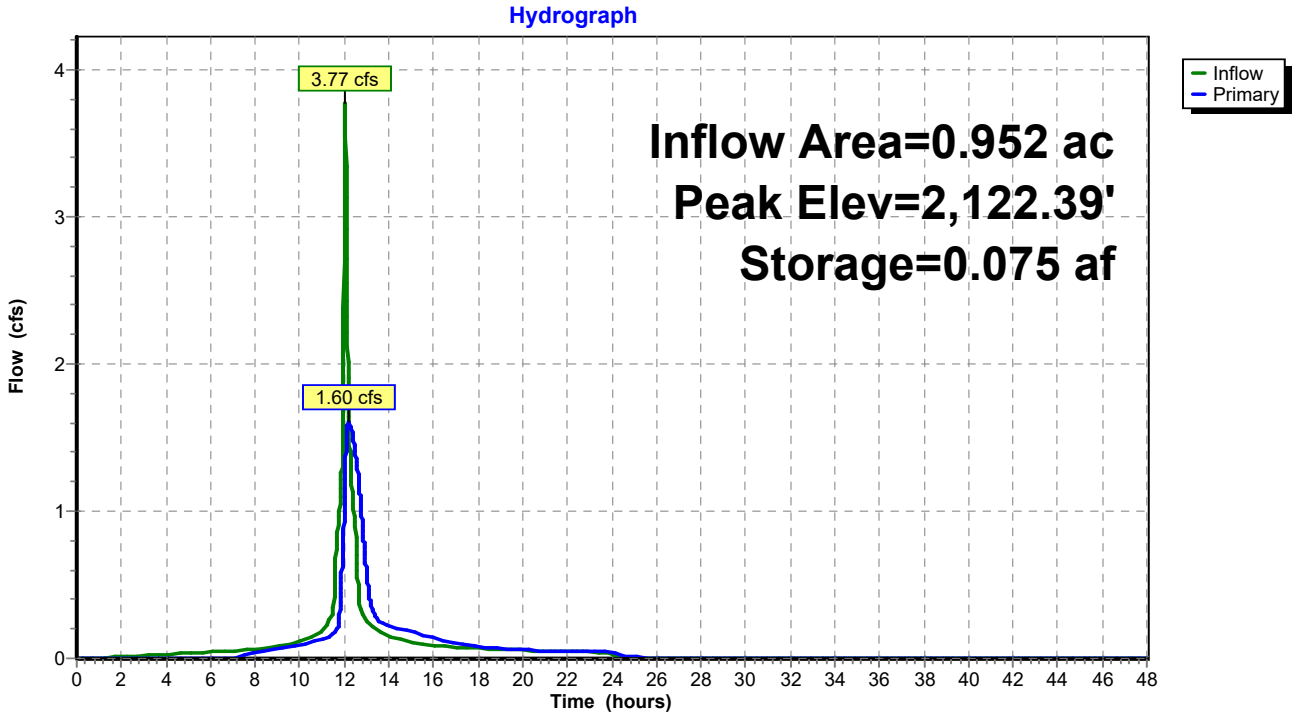
Plug-Flow detention time= 95.5 min calculated for 0.248 af (95% of inflow)
Center-of-Mass det. time= 65.9 min ( 832.9 - 767.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 2,118.50' | 0.090 af | **60.0" Round Pipe Storage**<br>L= 200.0' |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 2,118.40' | **18.0" Round Culvert**<br>L= 55.9' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 2,118.40' / 2,114.16' S= 0.0758 '/' Cc= 0.900<br>n= 0.020 Corrugated PE, corrugated interior, Flow Area= 1.77 sf |
| #2 | Device 1 | 2,119.50' | **3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads |
| #3 | Device 1 | 2,120.50' | **6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads |
| #4 | Device 1 | 2,123.00' | **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |

**Primary OutFlow** Max=1.60 cfs @ 12.21 hrs HW=2,122.39' (Free Discharge)
└**1=Culvert** (Passes 1.60 cfs of 15.31 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.39 cfs @ 8.00 fps)
  ├**3=Orifice/Grate** (Orifice Controls 1.21 cfs @ 6.16 fps)
  └**4=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Pond 1P: DETENTION FACILITY



## Summary for Subcatchment 1S: DA 1

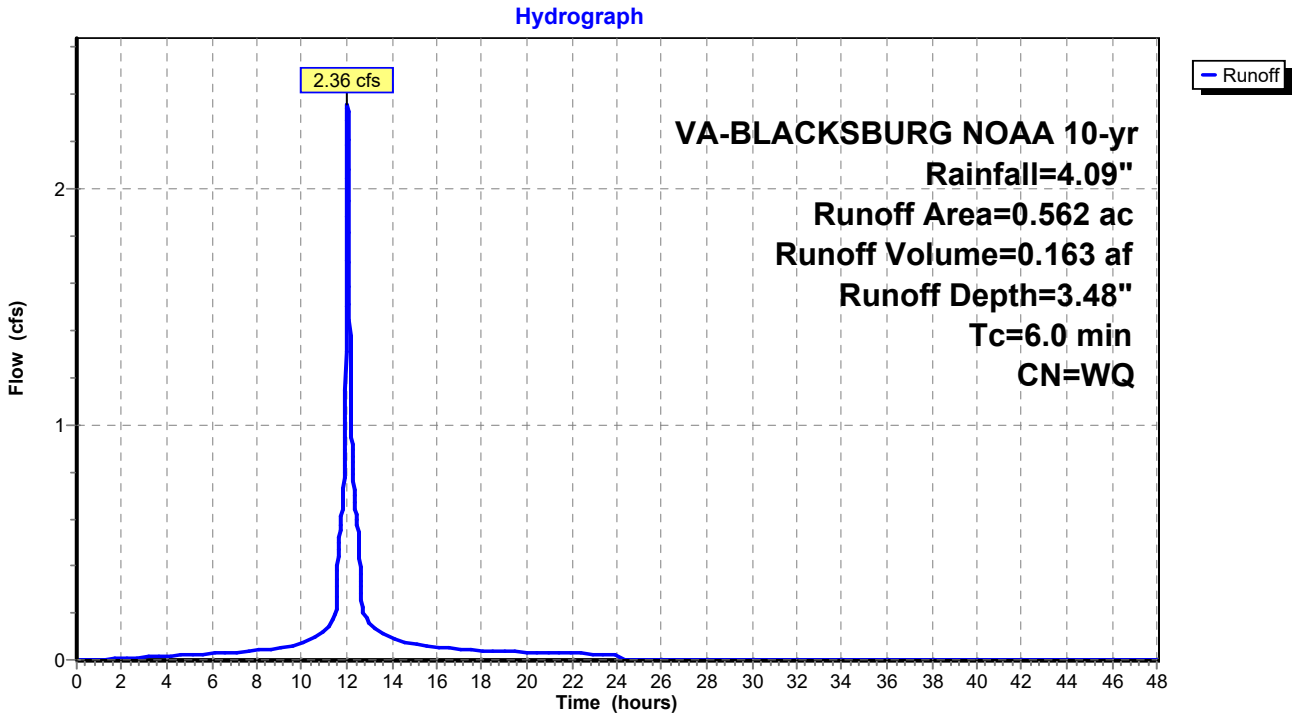
Runoff = 2.36 cfs @ 12.04 hrs, Volume= 0.163 af, Depth= 3.48"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.389 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.090 | 94 | Urban commercial, 85% imp, HSG C |
| 0.019 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 0.064 | 74 | >75% Grass cover, Good, HSG C |
| 0.562 | | Weighted Average |
| 0.089 | | 15.89% Pervious Area |
| 0.473 | | 84.11% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 1S: DA 1



## Summary for Subcatchment 2S: DA 2

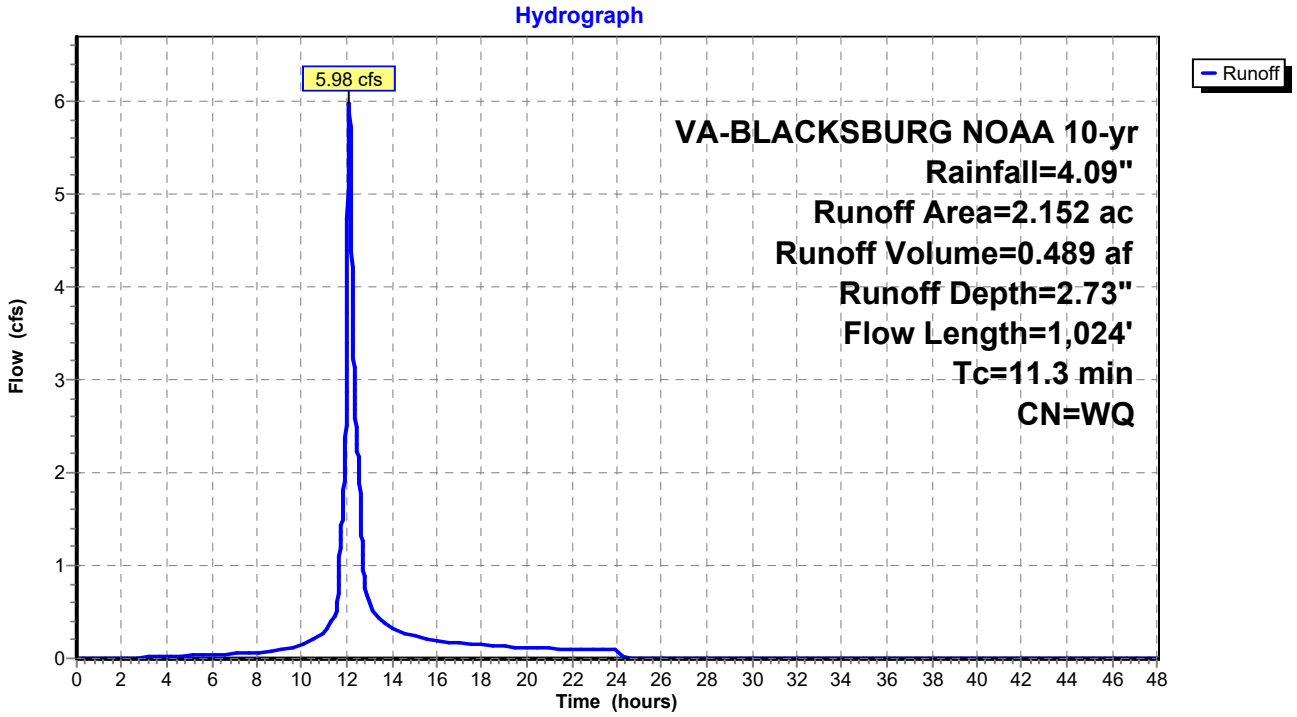
Runoff = 5.98 cfs @ 12.11 hrs, Volume= 0.489 af, Depth= 2.73"
Routed to Link 1L : POA #1

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 |
|---|---|---|---|
| | 0.313 | 98 | Paved roads w/curbs & sewers, HSG C |
| | 0.559 | 94 | Urban commercial, 85% imp, HSG C |
| | 0.160 | 83 | 1/4 acre lots, 38% imp, HSG C |
| | 0.966 | 80 | 1/2 acre lots, 25% imp, HSG C |
| | 0.059 | 81 | 1/3 acre lots, 30% imp, HSG C |
| | 0.074 | 74 | >75% Grass cover, Good, HSG C |
| * | 0.021 | 98 | Impervious Cover, HSG C |
| | 2.152 | | Weighted Average |
| | 1.023 | | 47.53% Pervious Area |
| | 1.129 | | 52.47% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.7 | 100 | 0.0443 | 0.22 | | **Sheet Flow, Tc1**<br>Grass: Short n= 0.150 P2= 2.76" |
| 2.0 | 444 | 0.0532 | 3.71 | | **Shallow Concentrated Flow, Tc2**<br>Unpaved Kv= 16.1 fps |
| 1.6 | 480 | 0.0583 | 4.90 | | **Shallow Concentrated Flow, Tc3**<br>Paved Kv= 20.3 fps |
| 11.3 | 1,024 | Total | | | |

## Subcatchment 2S: DA 2



## Summary for Subcatchment 3S: DA 3A

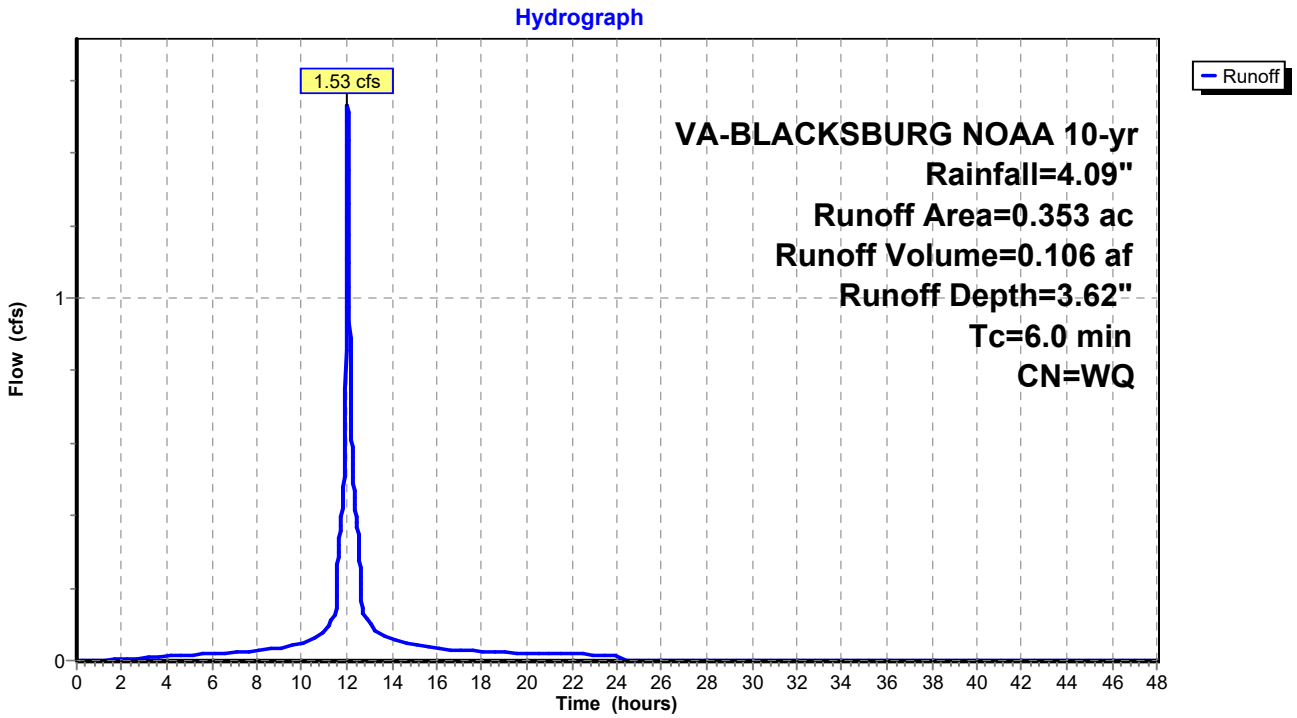
Runoff = 1.53 cfs @ 12.04 hrs, Volume= 0.106 af, Depth= 3.62"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.056 | 94 | Urban commercial, 85% imp, HSG C |
| 0.270 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.027 | 74 | >75% Grass cover, Good, HSG C |
| 0.353 | | Weighted Average |
| 0.035 | | 10.03% Pervious Area |
| 0.318 | | 89.97% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 3S: DA 3A



## Summary for Subcatchment 4S: DA 3B (TO DETENTION)

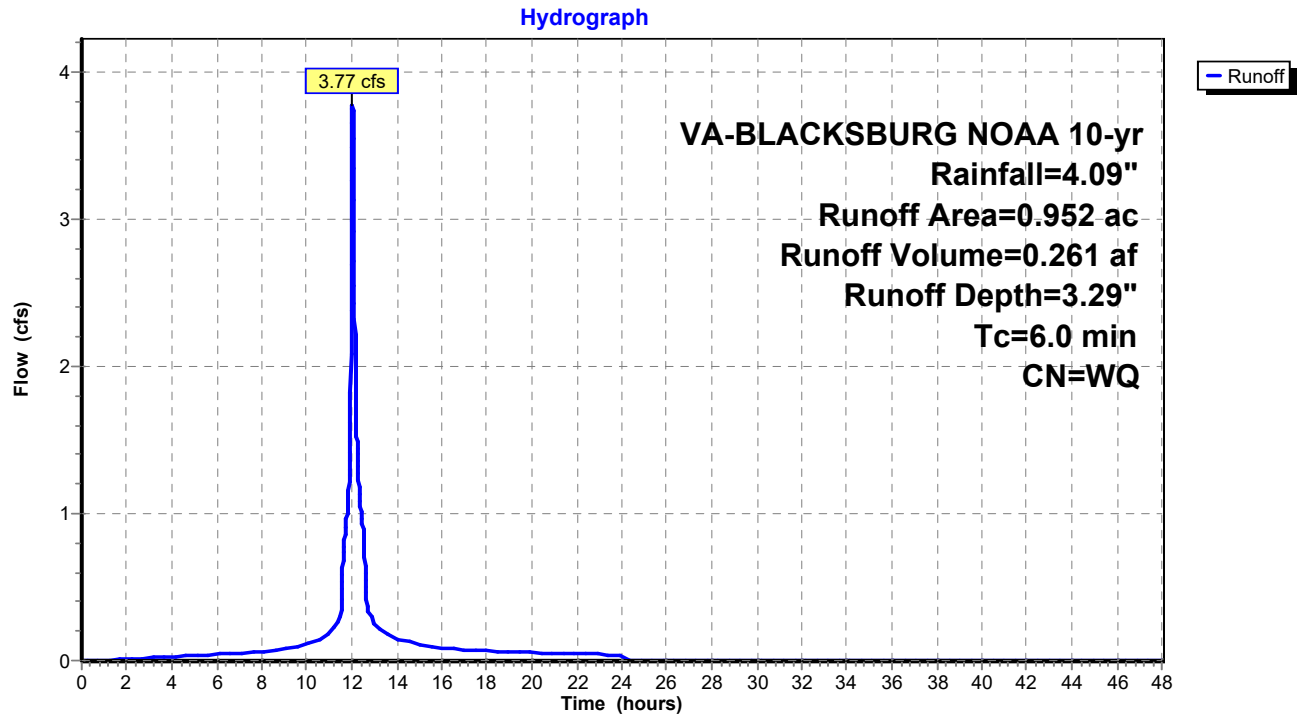
Runoff = 3.77 cfs @ 12.04 hrs, Volume= 0.261 af, Depth= 3.29"
Routed to Pond 1P : DETENTION FACILITY

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 |
|---|---|---|---|
| | 0.113 | 94 | Urban commercial, 85% imp, HSG C |
| * | 0.616 | 98 | Impervious Cover, HSG C |
| | 0.223 | 74 | >75% Grass cover, Good, HSG C |
| | 0.952 | | Weighted Average |
| | 0.240 | | 25.20% Pervious Area |
| | 0.712 | | 74.80% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 4S: DA 3B (TO DETENTION)



## Summary for Subcatchment 5S: DA 4

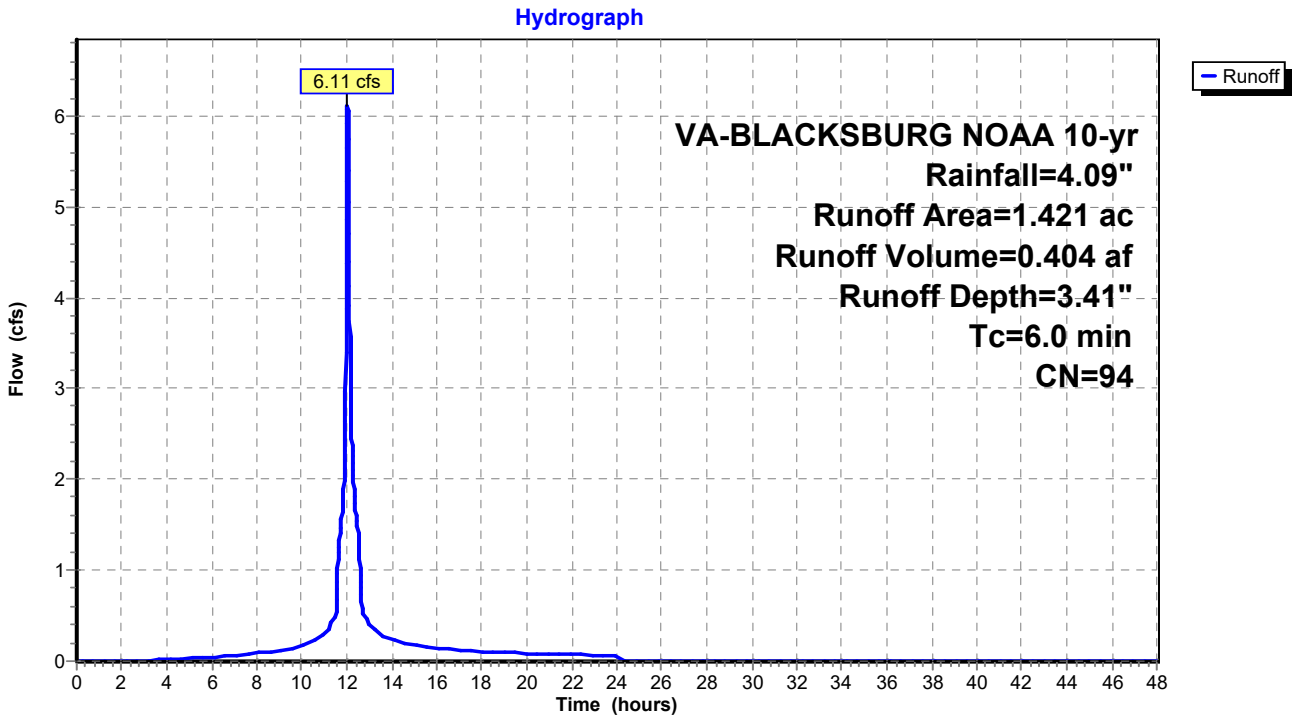
Runoff = 6.11 cfs @ 12.04 hrs, Volume= 0.404 af, Depth= 3.41"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 1.421 | 94 | Urban commercial, 85% imp, HSG C |
| 0.213 | | 15.00% Pervious Area |
| 1.208 | | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 5S: DA 4



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Link 1L: POA #1** Inflow=25.51 cfs 2.446 af
Primary=25.51 cfs 2.446 af

**Pond 1P: DETENTION FACILITY** Peak Elev=2,123.37' Storage=0.090 af Inflow=5.36 cfs 0.442 af
Outflow=4.59 cfs 0.429 af

**Subcatchment 1S: DA 1** Runoff Area=0.562 ac 84.11% Impervious Runoff Depth=5.81"
Tc=6.0 min CN=WQ Runoff=3.28 cfs 0.272 af

**Subcatchment 2S: DA 2** Runoff Area=2.152 ac 52.47% Impervious Runoff Depth=4.94"
Flow Length=1,024' Tc=11.3 min CN=WQ Runoff=9.26 cfs 0.886 af

**Subcatchment 3S: DA 3A** Runoff Area=0.353 ac 89.97% Impervious Runoff Depth=5.96"
Tc=6.0 min CN=WQ Runoff=2.10 cfs 0.175 af

**Subcatchment 4S: DA 3B (TO DETENTION)** Runoff Area=0.952 ac 74.80% Impervious Runoff Depth=5.57"
Tc=6.0 min CN=WQ Runoff=5.36 cfs 0.442 af

**Subcatchment 5S: DA 4** Runoff Area=1.421 ac 85.00% Impervious Runoff Depth=5.77"
Tc=6.0 min CN=94 Runoff=8.50 cfs 0.684 af

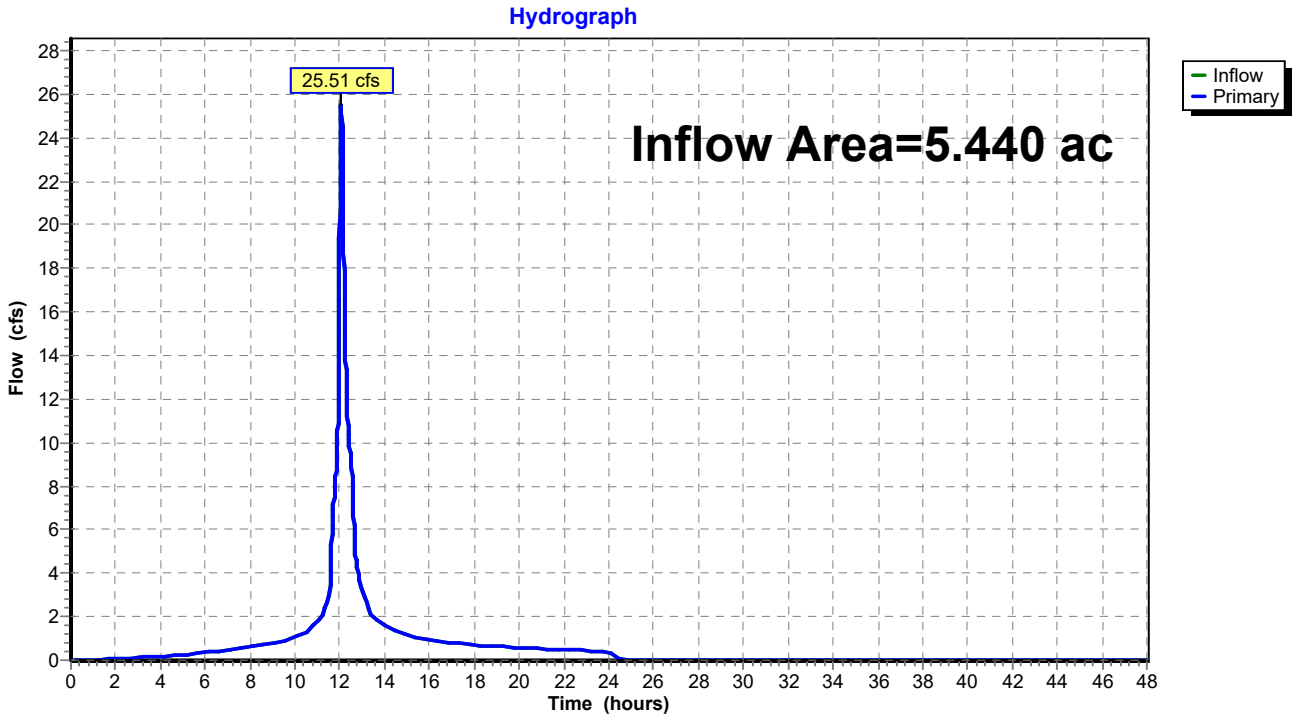
**Total Runoff Area = 5.440 ac Runoff Volume = 2.458 af Average Runoff Depth = 5.42"**
**29.42% Pervious = 1.601 ac 70.58% Impervious = 3.839 ac**

## Summary for Link 1L: POA #1

Inflow Area = 5.440 ac, 70.58% Impervious, Inflow Depth = 5.39" for 100-yr event
Inflow = 25.51 cfs @ 12.07 hrs, Volume= 2.446 af
Primary = 25.51 cfs @ 12.07 hrs, Volume= 2.446 af, Atten= 0%, Lag= 0.0 min

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

## Link 1L: POA #1



## Summary for Pond 1P: DETENTION FACILITY

Inflow Area = 0.952 ac, 74.80% Impervious, Inflow Depth = 5.57" for 100-yr event
Inflow = 5.36 cfs @ 12.04 hrs, Volume= 0.442 af
Outflow = 4.59 cfs @ 12.08 hrs, Volume= 0.429 af, Atten= 14%, Lag= 2.6 min
Primary = 4.59 cfs @ 12.08 hrs, Volume= 0.429 af
Routed to Link 1L : POA #1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 2,123.37' @ 12.08 hrs Surf.Area= 0.007 ac Storage= 0.090 af

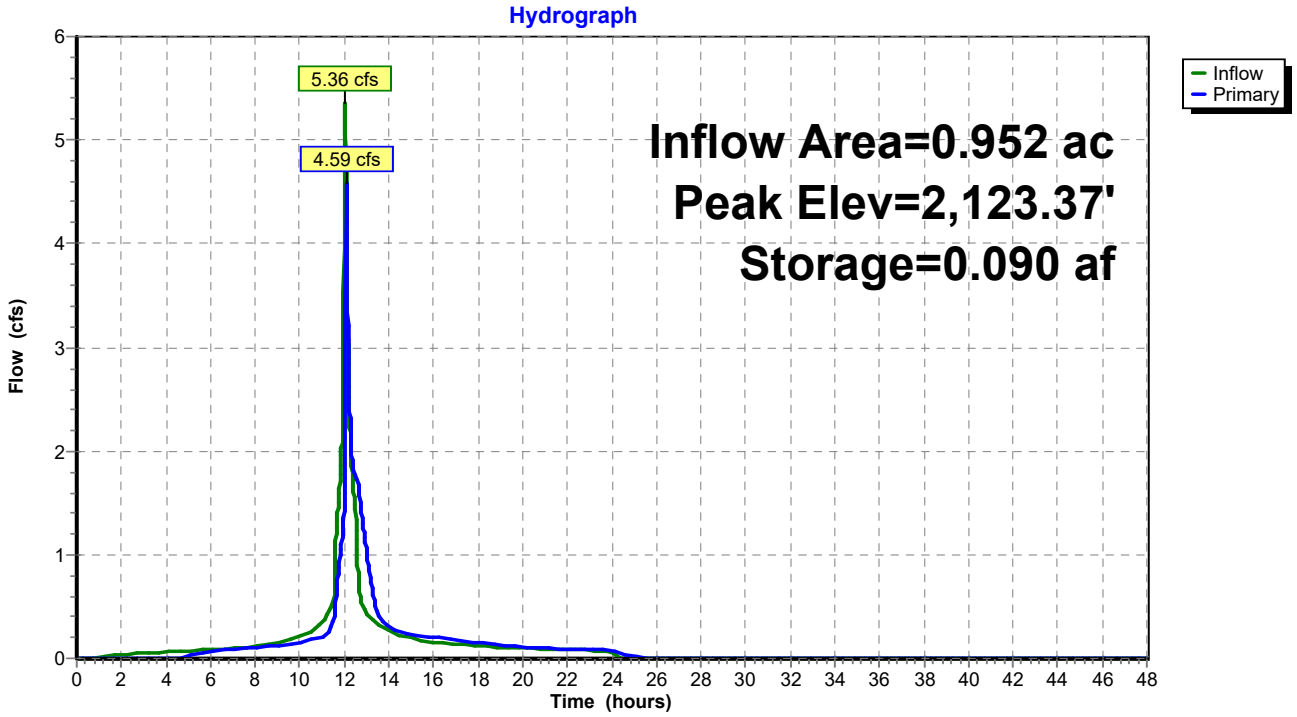
Plug-Flow detention time= 74.9 min calculated for 0.429 af (97% of inflow)
Center-of-Mass det. time= 56.4 min ( 817.5 - 761.1 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 2,118.50' | 0.090 af | **60.0" Round Pipe Storage**<br>L= 200.0' |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 2,118.40' | **18.0" Round Culvert**<br>L= 55.9' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 2,118.40' / 2,114.16' S= 0.0758 '/' Cc= 0.900<br>n= 0.020 Corrugated PE, corrugated interior, Flow Area= 1.77 sf |
| #2 | Device 1 | 2,119.50' | **3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads |
| #3 | Device 1 | 2,120.50' | **6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads |
| #4 | Device 1 | 2,123.00' | **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |

**Primary OutFlow** Max=4.57 cfs @ 12.08 hrs HW=2,123.37' (Free Discharge)
└**1=Culvert** (Passes 4.57 cfs of 17.47 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.46 cfs @ 9.31 fps)
  ├**3=Orifice/Grate** (Orifice Controls 1.53 cfs @ 7.79 fps)
  └**4=Broad-Crested Rectangular Weir** (Weir Controls 2.58 cfs @ 1.76 fps)

## Pond 1P: DETENTION FACILITY



## Summary for Subcatchment 1S: DA 1

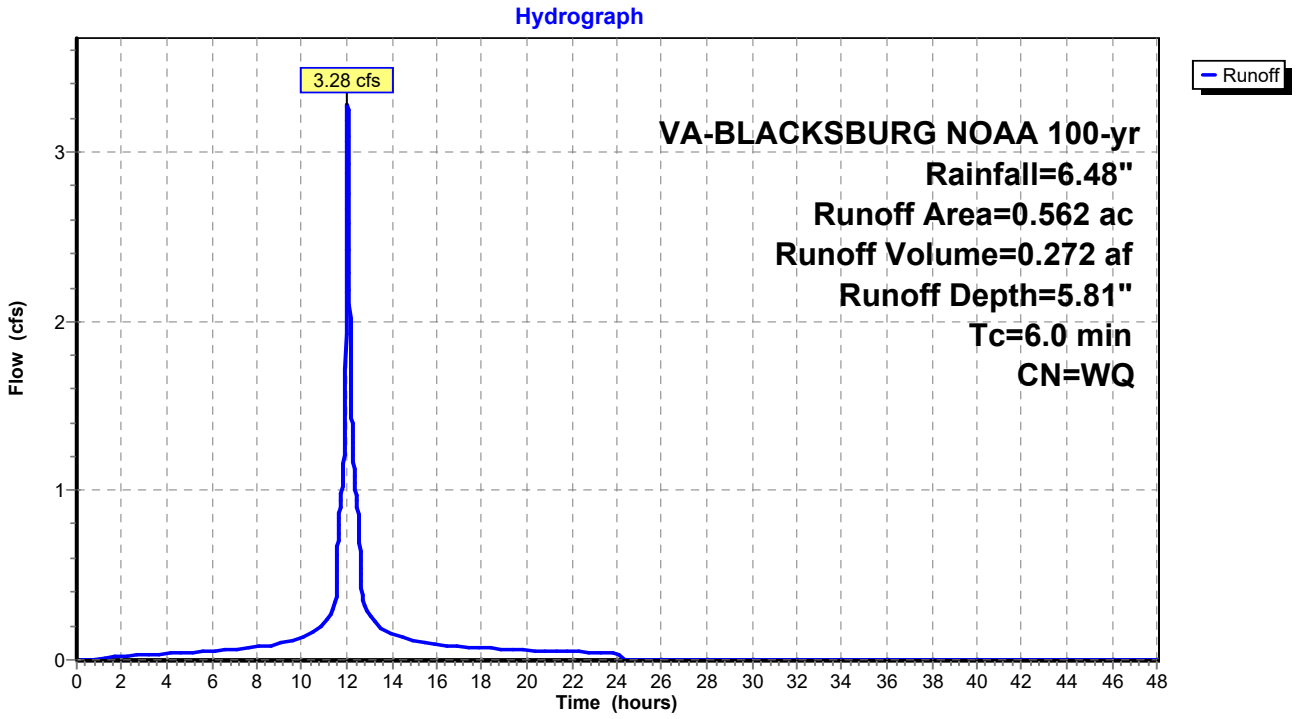
Runoff = 3.28 cfs @ 12.04 hrs, Volume= 0.272 af, Depth= 5.81"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.389 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.090 | 94 | Urban commercial, 85% imp, HSG C |
| 0.019 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 0.064 | 74 | >75% Grass cover, Good, HSG C |
| 0.562 | | Weighted Average |
| 0.089 | | 15.89% Pervious Area |
| 0.473 | | 84.11% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 1S: DA 1



## Summary for Subcatchment 2S: DA 2

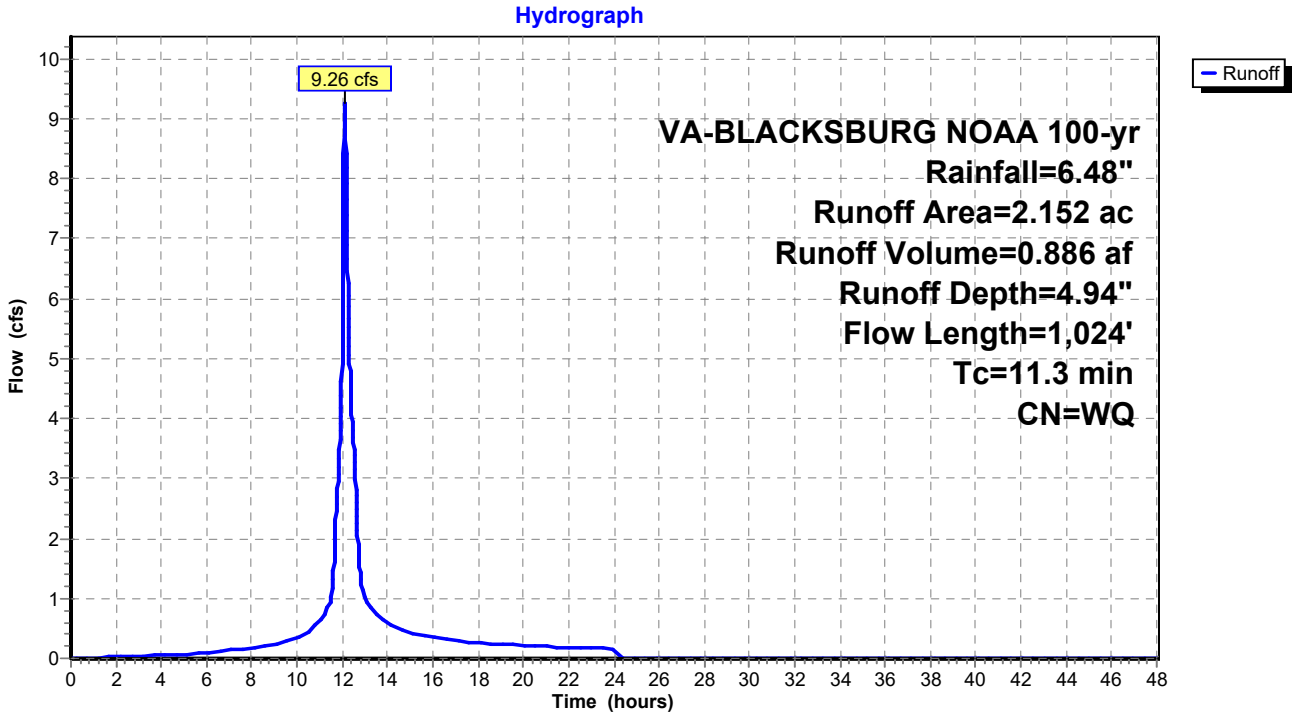
Runoff = 9.26 cfs @ 12.11 hrs, Volume= 0.886 af, Depth= 4.94"
Routed to Link 1L : POA #1

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 |
|---|---|---|---|
| | 0.313 | 98 | Paved roads w/curbs & sewers, HSG C |
| | 0.559 | 94 | Urban commercial, 85% imp, HSG C |
| | 0.160 | 83 | 1/4 acre lots, 38% imp, HSG C |
| | 0.966 | 80 | 1/2 acre lots, 25% imp, HSG C |
| | 0.059 | 81 | 1/3 acre lots, 30% imp, HSG C |
| | 0.074 | 74 | >75% Grass cover, Good, HSG C |
| * | 0.021 | 98 | Impervious Cover, HSG C |
| | 2.152 | | Weighted Average |
| | 1.023 | | 47.53% Pervious Area |
| | 1.129 | | 52.47% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.7 | 100 | 0.0443 | 0.22 | | **Sheet Flow, Tc1**<br>Grass: Short n= 0.150 P2= 2.76" |
| 2.0 | 444 | 0.0532 | 3.71 | | **Shallow Concentrated Flow, Tc2**<br>Unpaved Kv= 16.1 fps |
| 1.6 | 480 | 0.0583 | 4.90 | | **Shallow Concentrated Flow, Tc3**<br>Paved Kv= 20.3 fps |
| 11.3 | 1,024 | Total | | | |

## Subcatchment 2S: DA 2



## Summary for Subcatchment 3S: DA 3A

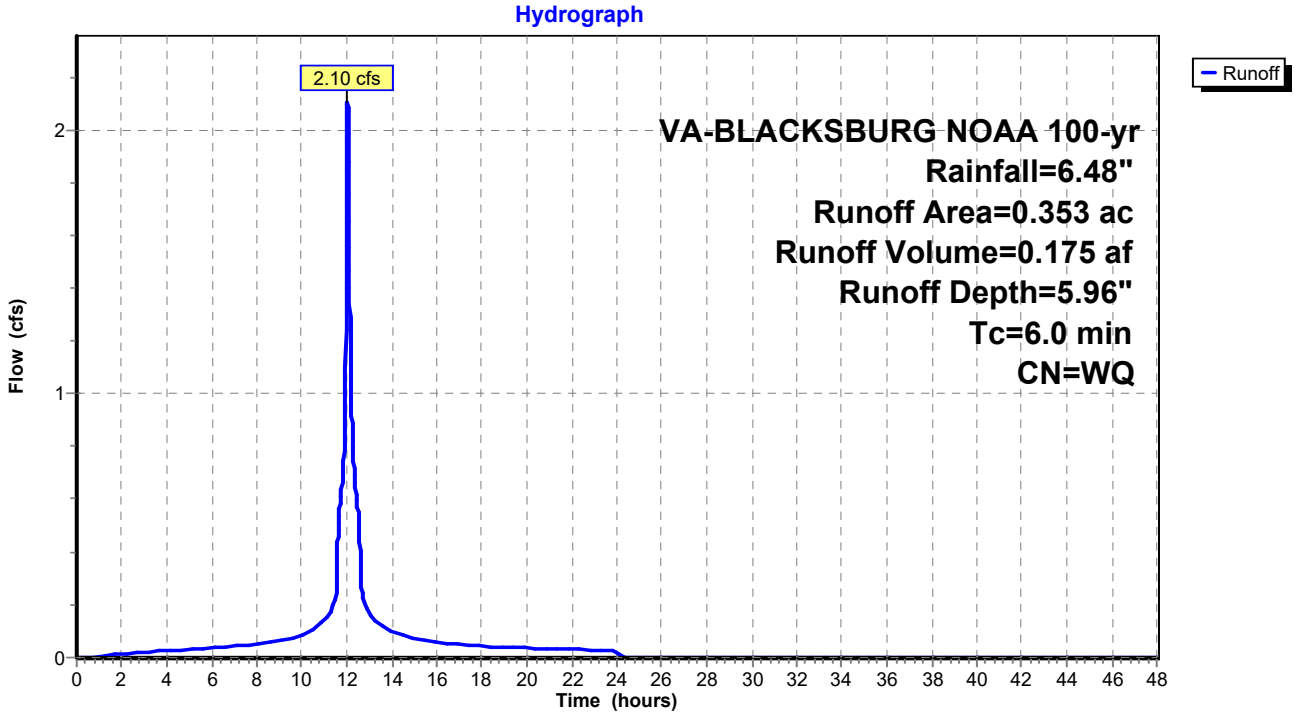
Runoff = 2.10 cfs @ 12.04 hrs, Volume= 0.175 af, Depth= 5.96"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 0.056 | 94 | Urban commercial, 85% imp, HSG C |
| 0.270 | 98 | Paved roads w/curbs & sewers, HSG C |
| 0.027 | 74 | >75% Grass cover, Good, HSG C |
| 0.353 | | Weighted Average |
| 0.035 | | 10.03% Pervious Area |
| 0.318 | | 89.97% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

### Subcatchment 3S: DA 3A



## Summary for Subcatchment 4S: DA 3B (TO DETENTION)

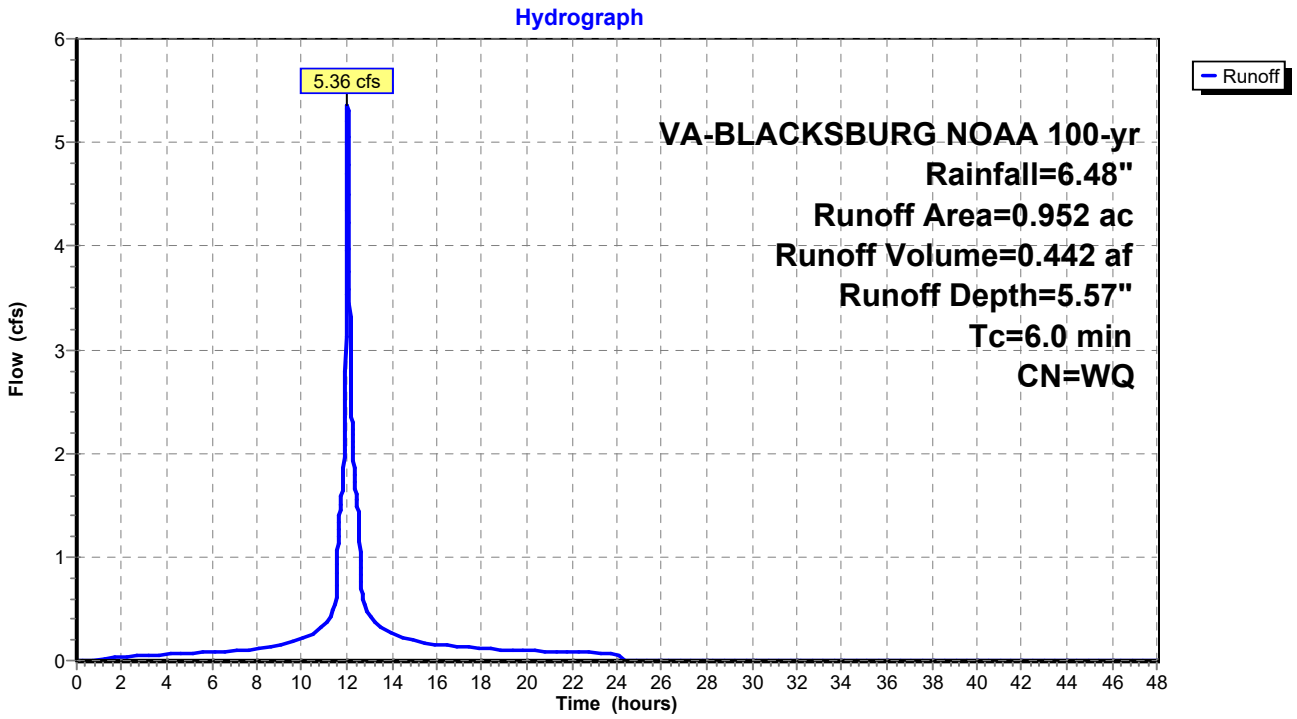
Runoff = 5.36 cfs @ 12.04 hrs, Volume= 0.442 af, Depth= 5.57"
Routed to Pond 1P : DETENTION FACILITY

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 |
|---|---|---|---|
| | 0.113 | 94 | Urban commercial, 85% imp, HSG C |
| * | 0.616 | 98 | Impervious Cover, HSG C |
| | 0.223 | 74 | >75% Grass cover, Good, HSG C |
| | 0.952 | | Weighted Average |
| | 0.240 | | 25.20% Pervious Area |
| | 0.712 | | 74.80% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 4S: DA 3B (TO DETENTION)



## Summary for Subcatchment 5S: DA 4

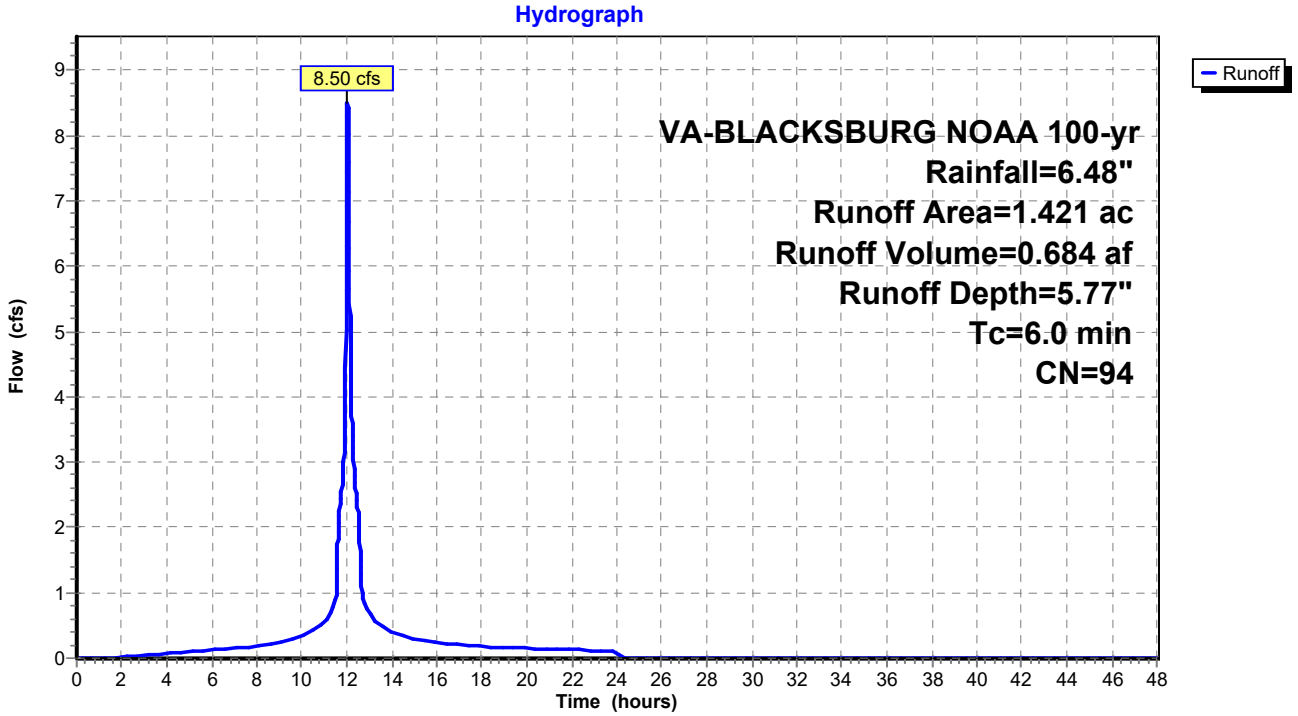
Runoff = 8.50 cfs @ 12.04 hrs, Volume= 0.684 af, Depth= 5.77"
Routed to Link 1L : POA #1

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 |
|---|---|---|
| 1.421 | 94 | Urban commercial, 85% imp, HSG C |
| 0.213 | | 15.00% Pervious Area |
| 1.208 | | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment 5S: DA 4



**Buoyancy Calculations**

The required downward force to counteract buoyant forces, assuming the worst-case scenario of the entire system being subject to uplifting forces has been calculated below.

**UNDERGROUND DETENTION FACILITY**

**BUOYANT FORCE:**

Total chamber volume (pipe): $V = 3{,}927\ ft^3$

$F = 3{,}927\ ft^3 \times 62.4 \frac{lb}{ft^3} = 245{,}045\ lb$

Factor of Safety = 1.25, therefore $F = 1.25 \times 245{,}045 = 306{,}306\ lb$

$F_{upward} = 306{,}306\ lb$

**DOWNWARD FORCE:**

Soil above system:

2' min. soil cover x 1,300 ft$^2$ basin area: $V_{soil} = 2\ ft \times 1{,}300\ ft^2 = 1{,}600\ ft^3$

$F_{soil} = 1{,}600\ ft^3 \times 100 \frac{lb}{ft^3} = 160{,}000\ lb$

Stone (including voids, 6" cover, 10" asphalt based):

$V = 1{,}733\ ft^3$

$F_{stone} = 1{,}733\ ft^3 \times 100 \frac{lb}{ft^3} = 173{,}300\ lb$

Asphalt (2" thick):

$V = 217\ ft^3$

$F_{asphalt} = 217\ ft^3 \times 150 \frac{lb}{ft^3} = 32{,}550\ lb$

$F_{downward} = 160{,}000 + 173{,}000 + 32{,}550 = 365{,}550\ lb$

**365,550 lb > 306,306 lb** (Design is OK)

# APPENDIX D:
# STORMWATER QUALITY CALCULATIONS

**DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 3.0**

*BMP Design Specifications List:* **2013 Draft Stds & Specs**

## Site Summary

Project Title: Blacksburg Square Seven Brew
Date: 45383

| | |
|---|---|
| **Total Rainfall (in):** | **43** |
| **Total Disturbed Acreage:** | **1.27** |

### Site Land Cover Summary

**Pre-ReDevelopment Land Cover (acres)**

| | 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)** | 0.00 | 0.00 | 0.92 | 0.00 | 0.92 | 72 |
| **Impervious Cover (acres)** | 0.00 | 0.00 | 0.35 | 0.00 | 0.35 | 28 |
| | | | | | 1.27 | 100 |

**Post-ReDevelopment Land Cover (acres)**

| | 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)** | 0.00 | 0.00 | 0.41 | 0.00 | 0.41 | 32 |
| **Impervious Cover (acres)** | 0.00 | 0.00 | 0.86 | 0.00 | 0.86 | 68 |
| | | | | | 1.27 | 100 |

**Site Tv and Land Cover Nutrient Loads**

| | Final Post-Development (Post-ReDevelopment & New Impervious) | Post-ReDevelopment | Post-Development (New Impervious) | Adjusted Pre-ReDevelopment |
|---|---|---|---|---|
| **Site Rv** | 0.71 | 0.56 | 0.95 | 0.56 |
| **Treatment Volume ($ft^3$)** | 3,293 | 1,534 | 1,759 | 1,534 |
| **TP Load (lb/yr)** | 2.07 | 0.96 | 1.11 | 0.96 |

| | | | |
|---|---|---|---|
| **Total TP Load Reduction Required (lb/yr)** | **1.09** | 0.19 | 0.90 |

| | Final Post-Development Load (Post-ReDevelopment & New Impervious) | Pre-ReDevelopment |
|---|---|---|
| **TN Load (lb/yr)** | 14.80 | 8.73 |

| Pre-ReDevelopment TP Load per acre (lb/acre/yr) | Final Post-Development TP Load per acre (lb/acre/yr) | Post-ReDevelopment TP Load per acre (lb/acre/yr) |
|---|---|---|
| **1.27** | **1.63** | **1.27** |

## Site Compliance Summary

| | |
|---|---|
| **Maximum % Reduction Required Below Pre-ReDevelopment Load** | 20% |

| | |
|---|---|
| **Total Runoff Volume Reduction ($ft^3$)** | 0 |
| **Total TP Load Reduction Achieved (lb/yr)** | 0.00 |
| **Total TN Load Reduction Achieved (lb/yr)** | 0.00 |
| **Remaining Post Development TP Load (lb/yr)** | 2.07 |
| **Remaining TP Load Reduction (lb/yr) Required** | **1.09** |

## 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) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Impervious Cover (acres) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total Area (acres) | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** |

## 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) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| TN Load Reduced (lb/yr) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

## Runoff Volume and CN Calculations

| | 1-year storm | 2-year storm | 10-year storm |
|---|---|---|---|
| Target Rainfall Event (in) | 0.00 | 0.00 | 0.00 |

| Drainage Areas | RV & CN | Drainage Area A | Drainage Area B | Drainage Area C | Drainage Area D | Drainage Area E |
|---|---|---|---|---|---|---|
| CN | | 0 | 0 | 0 | 0 | 0 |
| RR ($ft^3$) | | 0 | 0 | 0 | 0 | 0 |
| 1-year return period | RV wo RR (ws-in) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | RV w RR (ws-in) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | CN adjusted | 0 | 0 | 0 | 0 | 0 |
| 2-year return period | RV wo RR (ws-in) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | RV w RR (ws-in) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | CN adjusted | 0 | 0 | 0 | 0 | 0 |
| 10-year return period | RV wo RR (ws-in) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | RV w RR (ws-in) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | CN adjusted | 0 | 0 | 0 | 0 | 0 |