STORMWATER MANAGEMENT REPORT

for

Depot & Pine Street Redevelopment

Tax Map 23.01
Block 2301, Lots 11, 12 & 14-19
Verona Township
Essex County
New Jersey

prepared for

pirhl

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prepared by

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July 10, 2020

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PROJECT SUMMARY

The project proposes redevelopment of approximately 5.02± acres of land for affordable single-family apartment units within Verona Township, Essex County, New Jersey. The development site is located on Block 2301, Lots 11, 12 and 14 through 19 within the AR-2 Multi-Family Mid Rise Overlay (AR-2) District which is currently developed with a mix of commercial and residential uses and a former railway right-of-way. The redevelopment site is bounded to the north by Linn Drive, to the east by a mix of commercial and residential uses, to the south by Pine Street and west by Bloomfield Avenue (Essex County Route 506).

Site improvements for the project consist of 95 single family attached units (apartments) within three (3) multi-story buildings, interior paved access driveway and parking, underground utilities (water, sewer, electric, cable, telephones), several stormwater management facilities and ancillary landscaping and amenities. The main building consists of a 4-story structure containing 71 units with a gross floor area of 83,185± s.f. (21,825± s.f. first floor area), while the remaining two buildings each house 12 units within a 3-story structure having a gross floor area of 16,714± s.f. (5,630± s.f. first floor area). The project shall be serviced by existing public potable water supply and sanitary sewer collection with connection to the water and sewer mains present within Pine Street. Two roadway access points are proposed for the project with connections to Pine Street and Linn Drive, both municipal roadways.

This Stormwater Management Report was developed to demonstrate compliance with the requirements of the Verona Township Land Use Regulations, Essex County Land Development Regulations, New Jersey Department of Environmental Protection (NJDEP) Stormwater Rules at N.J.A.C. 7:8 and the Standards for Soil Erosion and Sediment Control in New Jersey.

PRE-DEVELOPMENT CONDITIONS

SURFACE COVER/DEVELOPMENT:

The major portion of the existing site consists of commercial buildings with paved and graveled parking/operational areas, several residential structures and open lawn area. The remainder of the site which is not utilized for the commercial or residential activity mainly consists of mature vegetation in the area of the former railway right-of-way. The overall project drainage area analyzed within this report includes only that portion of the site which will be redeveloped, totaling approximately 4.15± acres and a small off-site contributory area of 0.33± acres. The remaining 0.87± acres of the site will not be disturbed and subdivided for retention by the municipality.

TOPOGRAPHY:

The site generally slopes from a high point at the intersection of Linn Drive and Bloomfield Avenue toward Pine Street at the eastern boundary. The highest elevation is approximately 473± feet above mean sea level (AMSL) with fall to elevation 440± feet along the southeastern corner of the property. Topography gently slopes away from the high point elevation and then gradually steepens as it approaches the existing inlet located in Pine Street at the southeastern boundary. The existing inlet has a grate elevation of 438.66 with a 21" diameter RCP discharge connection to the remaining municipal stormwater collection system running within Pine Street to the east.

SOIL CONDITIONS:

Based on information provided in the *United States Department of Agriculture, Natural Resource Conservation Service, Web Soil Survey of Essex County, New Jersey*, soils within the project area are identified as:

- Boonton – Urban land, Boonton substratum complex, 0-8% slopes (BouB) – Type C

Subsurface soil investigations were performed by Melick and Tully within the project limits in March 2020. The results of the investigation indicate the subsurface soils are consistent with the characteristics of the Boonton series as listed in the Web Soil Survey.

HYDROLOGIC CONDITIONS:
Under the pre-developed conditions, the majority of stormwater runoff from the project area flows to the existing inlet located in Pine Street (near the southeastern property boundary) in one drainage watershed. Several smaller watersheds drain directly off-site to the properties to the east and Bloomfield Avenue. The main watershed drains from the north and west to the inlet within Pine Street and is identified as Drainage Area A1. Drainage Area A1 is further subdivided into on-site and off-site contributory areas for stormwater management calculation purposes. Drainage Areas A2 and A3 are portions of the site which drain directly to the adjacent properties to the east, while Drainage Area A4 is a small area draining to Bloomfield Avenue.

A summary of the pre-developed peak run-off rates for each watershed is included in Appendix B. Pre-developed drainage area calculations and hydrographs for all watersheds are included in Appendix C. All peak flow rates and hydrographs were calculated utilizing the Standard unit hydrograph. A brief summary of the results is as follows:

Watershed	2 yr. Storm	10 yr. Storm	100 yr. Storm
A1 ON-SITE (IMP)	5.01 cfs	7.65 cfs	12.74 cfs
A1 ON-SITE (PERV)	1.37 cfs	3.08 cfs	6.81 cfs
A1 OFF-SITE (IMP)	0.54 cfs	0.82 cfs	1.37 cfs
A1 OFF-SITE (PERV)	0.16 cfs	0.35 cfs	0.78 cfs
A2 (IMP)	0.13 cfs	0.21 cfs	0.34 cfs
A2 (PERV)	0.21 cfs	0.47 cfs	1.01 cfs
A3 (PERV)	0.10 cfs	0.24 cfs	0.53 cfs
A4 (IMP)	0.10 cfs	0.15 cfs	0.26 cfs

POST-DEVELOPMENT CONDITIONS

SURFACE COVER/DEVELOPMENT:
The project proposes construction of 95 affordable single-family apartment units, impervious internal access driveway, parking areas and sidewalks/pathways, open (lawn) space/bioretention areas, landscaping and amenities. The construction of the new development will be kept mainly to previously disturbed areas (for the former commercial and residential uses) and result in a minimal reduction in the existing on-site open/vegetated area. Off-site open space and wooded areas will not be disturbed as part of the project and shall remain in their current state. Stormwater management facilities shall be provided within the project limits for the provision of water quantity, quality and recharge control.

TOPOGRAPHY:
Topography in the project area will be altered as a result of the proposed development. Drainage from the developed on-site areas shall be modified to direct surface run-off to the new stormwater management facilities prior to discharge to the existing inlet in Pine Street. Topography for off-site areas shall remain the same as exists in the pre-development condition. Discharge locations for all drainage areas shall remain relatively consistent with pre-developed conditions.

SITE SOIL CONDITIONS:
As previously discussed, subsurface soil investigations were performed within the project limits in March 2020 to establish general subsurface conditions for use in developing the stormwater management facility design. Pertinent information from the soil investigation was used to establish soil type and depths to the existing seasonal high groundwater table. The soil information is included in this report as Appendix J.

HYDROLOGIC CONDITIONS:
In the post-developed condition, surface run-off from the project area generally flows from the same drainage watersheds as in the pre-developed condition. To demonstrate the necessary rate reduction requirements have been provided for the main portion of the site, the combined run-off from the on-site Drainage Area A1 (A1 ON-SITE) and the offsite drainage area (A1 OFF SITE) is compared to the combined discharge from the stormwater management facility and any post-developed disturbed surface area directly discharging to the existing inlet in Pine Street (BASIN 1 + A1). The surface run-off from remaining watersheds A2, A3 and A4 is also compared to the same watersheds in the pre-developed condition to confirm the rate reduction requirements have been satisfied for those areas.

One (1) stormwater management facility is proposed for collection and attenuation of surface run-off from the majority of the site prior to its discharge to the existing inlet on Pine Street. This facility, designated as Basin 1, consists of an underground storage system located near the Pine Street entrance to the development and will function as a detention basin to provide attenuation of post-developed surface run-off from the majority of the site. Basin 1 shall discharge directly to the existing inlet on Pine Street. Two (2) additional bioretention areas and a manufactured treatment device are also proposed to provide water quality treatment of the surface run-off from the site.

Post-developed drainage area calculations and hydrographs for all watersheds are included in Appendix E. A summary of the peak run-off rates to the proposed stormwater management basin is included in Appendix F. All peak flow rates and hydrographs were calculated utilizing the Standard unit hydrograph. A brief summary is as follows:

Watershed	2 yr. Storm	10 yr. Storm	100 yr. Storm
To Basin #1 (IMP)	5.82 cfs	8.89 cfs	14.80 cfs
To Basin #1 (PERV)	1.70 cfs	3.75 cfs	8.15 cfs
A1 (IMP)	1.72 cfs	2.62 cfs	4.37 cfs
A1 (PERV)	0.40 cfs	0.88 cfs	1.92 cfs
A2 (PERV)	0.17 cfs	0.38 cfs	0.83 cfs
A3 (PERV)	0.01 cfs	0.03 cfs	0.07 cfs

NOTE: All area for watershed A4 is collected by the on-site drainage system in the post-developed condition.

DESIGN METHODOLOGY

HYDROLOGIC AND HYDRAULIC CALCULATIONS:
The design, construction, and maintenance of stormwater management facilities proposed for the project will be in accordance with the Verona Township Land Use Regulations, Essex County Land Development Regulations, NJDEP Stormwater Management Rules and the Standards for Soil Erosion and Sediment Control in New Jersey. Calculations for pre-development and post-development discharge comparative analysis were prepared using the SCS TR-55 methodology for the 2, 10 and 100 year frequency, 24 hour storm. In accordance with the recommendations of the NJDEP Stormwater Best Management Practices Manual, hydrographs for the impervious and pervious areas within each on-site watershed have been

computed separately. The impervious areas consist of the new buildings, access driveways, sidewalks, pathways, patios and parking areas which are directly connected to the proposed stormwater collection systems. The pervious areas are comprised of all open space and wooded areas. Analysis and design of the stormwater pipe collection systems were prepared using the Rational Method for the 25 year storm.

CALCULATION SOFTWARE:
The calculations included within this report include hydrologic analysis by HydroCAD version 10.10-4a software developed by HydroCAD Software Solutions, Inc. The HydroCAD software was used to develop pre-developed and post-developed runoff hydrographs for comparison based on the U.S. Department of Agriculture Soil Conservation Service Technical Release 55 (SCS TR-55) methodology, considering the Standard Unit Hydrograph for all watersheds. Hydraflow™ Storm Sewers software by Intelisolve, Inc. was utilized to analyze and design the pipe collection systems using the Rational Method.

RUNOFF COEFFICIENT AND CURVE NUMBER VALUES:
As described above, soil classifications for use in establishing runoff curve numbers (CN) for each drainage area were taken from the *United States Department of Agriculture, Natural Resource Conservation Service, Web Soil Survey of Essex County, New Jersey*. Evaluation of these maps indicated that the soils within the project area should be analyzed as hydrologic soil group 'C', as defined within the U.S. Department of Agriculture Soil Conservation Service Manual "Urban Hydrology for Small Watersheds", v. 1986. Calculations assume woods and open space in good condition for the pre-developed and post-developed conditions.

Runoff CN values for developing SCS TR-55 hydrographs for the various cover conditions within each watershed were assigned to various surfaces as follows:

Ground Cover	CN Value
Impervious Areas (All Soils)	98
Woods – good condition ('C' Soils)	72
Open Space – good condition ('C' Soils)	74

Runoff coefficients for collection system calculations via the Rational Method were obtained from Table 7.1 of the Residential Site Improvement Standards as follows:

Ground Cover	C Value
Paved Areas/Streets & Roads (All Soils)	0.99
Open Space – Good Condition ('C' Soils)	0.51
Woods – Good Condition ('C' Soils)	0.45

PIPE FLOW CALCULATIONS:
Pipe flow calculations have been performed utilizing the Rational Method for estimating run-off to each inlet within the project area. The Manning equation was utilized to study proposed pipe capacities and velocities. Associated calculations determining peak run-off for each drainage area and substantiating capacity to convey peak runoff from the 25 year storm event are provided within Appendix H. Determination of the hydraulic grade line (water surface) within the stormwater collection systems are also provided within the pipe flow calculations to demonstrate the anticipated water surface will not extend above the grate/rim elevation of storm structures.

STORMWATER MANAGEMENT BASIN DESIGN:
The proposed stormwater management system for the project area will include the installation of several stormwater management facilities, with Basin 1 discharging directly to the existing inlet in Pine Street. Basin 1 is designed as an underground pipe storage system located beneath the proposed on-site parking area between Buildings B and C. The bioretention areas will connect to the on-site stormwater collection system upstream of Basin 1.

Basin 1 - Underground Storage System

The Underground Storage System is located in the southeastern portion of the site at the new access driveway location to Pine Street. This system will ultimately connect to the existing inlet located within Pine Street via a new 18 RCP pipe, with discharge to the existing municipal collection system extending eastward in Pine Street. The Underground Storage System is designed in accordance with Chapter 9.5 of the NJ Stormwater Best Practice (BMP) Manual with detention of collected run-off beneath a previously disturbed on-site area. The peak storage capacity of the Underground Storage System is approximately 30,318± cubic feet during the 100-year storm event and is provided by ten (10), 160 lengths of perforated CHDPE pipes within a 7.0 ft. deep x 60.0± wide stone trench, with a stone void ratio of 35%. The calculated volume of the system is 30,386± cubic feet. Discharge from the Underground Storage System will be controlled via an outlet structure with 7.5" diameter orifice and 6" wide weir. Emergency discharge will be provided via relief from the grate of the new Inlet #400 located in Pine Street with an elevation of 441.25.

Rainfall Event	Basin Inflow	Basin Outflow	Water Surface	Peak Storage
Water Quality Storm	5.21 cfs	0.83 cfs	437.62 ft.	5,924 c.f.
2 year Storm	7.34 cfs	1.77 cfs	438.76 ft.	13,417 c.f.
10 year Storm	12.37 cfs	3.50 cfs	439.80 ft.	20,822 c.f.
25 year Storm	15.93 cfs	5.61 cfs	440.48 ft.	25,003 c.f.
100 year Storm	22.52 cfs	12.21 cfs	441.98 ft.	30,318 c.f.

RUNOFF RATE REDUCTION:

The stormwater management regulations of the NJDEP require that the post-development peak runoff from the disturbed areas of the project be reduced below pre-development rates based on the SCS TR-55 method of stormwater runoff estimation for a 24 hour storm distribution under the 2, 10, and 100 year design storm frequencies. Required reductions are 50%, 75%, and 80% respectively of pre-development peak rates. For the project, four (4) discharge points from the developed portions of the site were analyzed which must comply with the NJDEP rate reduction requirements. Below is a comparative summary of the peak run-off rates:

Point of Analysis "EX INLET TWP" (Basin 1 + Area A1 TOTAL)						
Storm Event	**Pre On-Site Flow (A1 ON-SITE)**	**Required Reduction**	**Reduced Flow**	**Pre Off-Site Flow (A1 OFF-SITE)**	**Allowable Flow Rate**	**Post-Developed Peak Rate**
2 year	5.44 cfs	50%	2.72 cfs	0.57 cfs	3.29 cfs	3.28 cfs
10 year	8.88 cfs	75%	6.66 cfs	0.93 cfs	7.59 cfs	5.06 cfs
100 year	15.82 cfs	80%	12.66 cfs	1.63 cfs	14.29 cfs	14.19 cfs

Storm Event	Pre-Developed Peak Rate	Required Reduction	Allowable Peak Flow Rate	Post-Developed Peak Rate	NJDEP Rate Reduction Satisfied
Analysis Point "Area A2"					
2 year	0.33 cfs	50%	0.17 cfs	0.17 cfs	YES
10 year	0.65 cfs	75%	0.49 cfs	0.38 cfs	YES
100 year	1.33 cfs	80%	1.06 cfs	0.83 cfs	YES

Analysis Point "Area A3"					
2 year	0.10 cfs	50%	0.05 cfs	0.01 cfs	YES
10 year	0.24 cfs	75%	0.18 cfs	0.03 cfs	YES
100 year	0.53 cfs	80%	0.42 cfs	0.07 cfs	YES
Analysis Point "Area A4"					
2 year	0.10 cfs	50%	0.05 cfs	0.00 cfs	YES
10 year	0.15 cfs	75%	0.11 cfs	0.00 cfs	YES
100 year	0.21 cfs	80%	0.17 cfs	0.00 cfs	YES

GROUNDWATER RECHARGE:

NJDEP groundwater recharge requirements have been accommodated in the proposed stormwater management design. Groundwater recharge requirements, in the form of the NJGRS spreadsheet, are included in Appendix G. Two (2) oversized (36" diameter) perforated CHDPE pipes within a stone envelope will provide infiltration of the run-off from a portion of the roof of Building A. Each infiltration pipe has been designed to retain the volume of the water quality design storm from their contributory drainage area and provide sufficient capacity to recharge the deficit of the average annual recharge volume calculated in the NJGRS spreadsheet. The NJGRS spreadsheet was given the bottom area, depth, and contributory impervious area for the combined infiltration facilities and the spreadsheet calculated the effective depth necessary to accommodate the total Post Development Annual Recharge Deficit of 31,954 cubic feet. The effective depth was then compared to the design depth to confirm sufficient infiltration capacity was provided.

WATER QUALITY:

In order to comply with NJDEP requirements for water quality, measures for addressing and improving water quality of stormwater discharge from the project area have been incorporated into the stormwater management design. Surface run-off from the new impervious areas of the site will be conveyed to two (2) proposed bioretention areas and a manufactured treatment device, each of which provide water quality treatment. Run-off from the water quality design storm directed to each facility shall be treated via natural or mechanical methods. Since the project proposes redevelopment of existing impervious surface, 50% Total Suspended Solids (TSS) removal is required any new impervious within those areas. Any new impervious surfaces in excess of the existing amount shall require 80% TSS removal. Calculations demonstrating compliance with the applicable water quality requirements of the NJDEP are provided in Appendix G.

SOIL EROSION AND SEDIMENT CONTROL

A comprehensive and coordinated sediment control program will be implemented throughout the construction phases of the project in accordance with the New Jersey Soil Erosion and Sediment Control Act (Chapter 251, P.L. 1975), which will minimize the disturbance from the stormwater runoff, retard non-point pollution from sediment, and conserve and protect the environmental resources of the State. Calculations for conduit outlet protection and channel stability for the discharges to the bioretention areas are provided within Appendix I. The Soil Erosion and Sediment Control Plan, as proposed, will be reviewed by the Hudson-Essex-Passaic Soil Conservation District for plan certification approval in accordance with New Jersey State requirements.

CONCLUSION

The proposed stormwater management facilities have been designed to minimize the impact to the natural drainage features of the surrounding land uses. Based on the analysis, the project as proposed will have no significant detrimental impact on the existing downstream drainage systems. The proposed reduction of run-off rates below pre-developed rates at the overall points of analysis will comply with the NJDEP stormwater requirements. Provisions for groundwater recharge will mitigate loss of pervious land surface areas by allowing groundwater to recharge within the stormwater collection system. Providing groundwater recharge will maintain the health of the nearby water courses and aquifers. Water quality improvements implemented through the proposed bioretention areas and manufactured treatment device will improve the overall water quality of stormwater discharges from the project area. A summary of all post-developed peak run-off rates are included in Appendix D.

APPENDIX A

General Site Data

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,620 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Essex County, New Jersey
Survey Area Data: Version 15, Sep 16, 2019

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

Date(s) aerial images were photographed: Aug 25, 2014—Sep 27, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BouB	Boonton - Urban land, Boonton substratum complex, 0 to 8 percent slopes	9.7	79.2%
HokCh	Holyoke silt loam, 0 to 15 percent slopes, very rocky	0.1	0.5%
UdbonB	Udorthents, Boonton substratum, 0 to 8 percent slopes	2.5	20.2%
Totals for Area of Interest		**12.2**	**100.0%**

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate

pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Essex County, New Jersey

BouB—Boonton - Urban land, Boonton substratum complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: b12f
Elevation: 50 to 500 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Boonton and similar soils: 50 percent
Urban land, boonton substratum: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Boonton

Setting

Landform: Ground moraines
Landform position (three-dimensional): Upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy basal till derived from basalt

Typical profile

A - 0 to 5 inches: loam
BA - 5 to 8 inches: silt loam
BE - 8 to 17 inches: silt loam
Bt - 17 to 30 inches: silt loam
Btx1 - 30 to 40 inches: gravelly fine sandy loam
Btx2 - 40 to 47 inches: fine sandy loam
CBt1 - 47 to 58 inches: loamy sand
CBt2 - 58 to 72 inches: loamy sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Natural drainage class: Well drained
Runoff class: Low
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 storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C

Hydric soil rating: No

Description of Urban Land, Boonton Substratum

Setting

Landform: Ground moraines
Landform position (three-dimensional): Lower third of mountainflank, upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Surface covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material

Typical profile

H1 - 0 to 12 inches: material
H2 - 12 to 47 inches: silt loam
2CBt1 - 47 to 58 inches: loamy sand
2CBt2 - 58 to 72 inches: loamy sand

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Udorthents, boonton substratum

Percent of map unit: 10 percent
Landform: Ground moraines
Landform position (three-dimensional): Lower third of mountainflank, upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

HokCh—Holyoke silt loam, 0 to 15 percent slopes, very rocky

Map Unit Setting

National map unit symbol: b074
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Holyoke, very rocky, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Map—Hydrologic Soil Group

Map Scale: 1:1,620 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Essex County, New Jersey
Survey Area Data: Version 15, Sep 16, 2019

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

Date(s) aerial images were photographed: Aug 25, 2014—Sep 27, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BouB	Boonton - Urban land, Boonton substratum complex, 0 to 8 percent slopes	C	9.7	79.2%
HokCh	Holyoke silt loam, 0 to 15 percent slopes, very rocky	D	0.1	0.5%
UdbonB	Udorthents, Boonton substratum, 0 to 8 percent slopes	D	2.5	20.2%
Totals for Area of Interest			**12.2**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Table 2-2a Runoff curve numbers for urban areas [1]

Cover description: Cover type and hydrologic condition	Average percent impervious area [2]	Curve numbers for hydrologic soil group: A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

1 Average runoff condition, and $I_a = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands [1]

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment [2]	Hydrologic condition [3]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+ CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1] Average runoff condition, and I_a=0.2S
[2] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.
[3] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Table 2-2c Runoff curve numbers for other agricultural lands [1]

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. [2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. [3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 [4]	48	65	73
Woods—grass combination (orchard or tree farm). [5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. [6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 [4]	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

1 Average runoff condition, and $I_a = 0.2S$.
2 *Poor:* <50%) ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: > 75% ground cover and lightly or only occasionally grazed.
3 *Poor*: <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.
4 Actual curve number is less than 30; use CN = 30 for runoff computations.
5 CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.
6 *Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

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*** New Jersey Register, Vol. 45, No. 14, July 15, 2013 ***

TABLE 7.1

TYPICAL RUNOFF COEFFICIENTS (C VALUES) FOR 100 YEAR FREQUENCY STORM

TABLE 7.1

TYPICAL RUNOFF COEFFICIENTS (C VALUES) FOR 100 YEAR FREQUENCY STORM

Land Use Description		Hydrologic Soil Group A	B	C	D
Cultivated land:					
without conservation treatment		0.49	0.67	0.81	0.88
with conservation treatment		0.27	0.43	0.61	0.67
Pasture or range land:					
poor condition		0.38	0.63	0.78	0.84
good condition		NA	0.25	0.51	0.65
Meadow: good condition		NA	NA	0.44	0.61
Wood or forest land:					
thin stand, poor cover, no mulch		NA	NA	0.59	0.79
good cover		NA	NA	0.45	0.59
Open spaces, lawns, parks, golf courses, cemeteries:					
good condition, grass cover on 75% or more of area		NA	0.25	0.51	0.65
fair condition, grass cover on 50–75% of area		NA	0.45	0.63	0.74
Commercial and business areas (85% impervious)		0.84	0.90	0.93	0.96
Industrial districts (72% impervious)		0.67	0.81	0.88	0.92
Residential:					
Average lot size	Average impervious				
⅛ acre	65%	0.59	0.76	0.86	0.90
¼ acre	38%	0.25	0.55	0.70	0.80
⅓ acre	30%	NA	0.49	0.67	0.78
½ acre	25%	NA	0.45	0.65	0.76
1 acre	20%	NA	0.41	0.63	0.74
Paved parking lots, roofs, driveways, etc.		0.99	0.99	0.99	0.99
Streets and roads:					
paved with curbs and storm sewers		0.99	0.99	0.99	0.99
gravel		0.57	0.76	0.84	0.88
dirt		0.49	0.69	0.80	0.84

Note: NA denotes information is not available; design engineers should rely on another authoritative source.
Source: New Jersey Department of Environmental Protection, Technical Manual for Land Use Regulation Program, Bureaus of Inland and Coastal Regulations, Stream Encroachment Permits (Trenton, New Jersey: Department of Environmental Protection, Revised September 1995) p. 12.

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NEW JERSEY 24 HOUR RAINFALL FREQUENCY DATA

Rainfall amounts in Inches

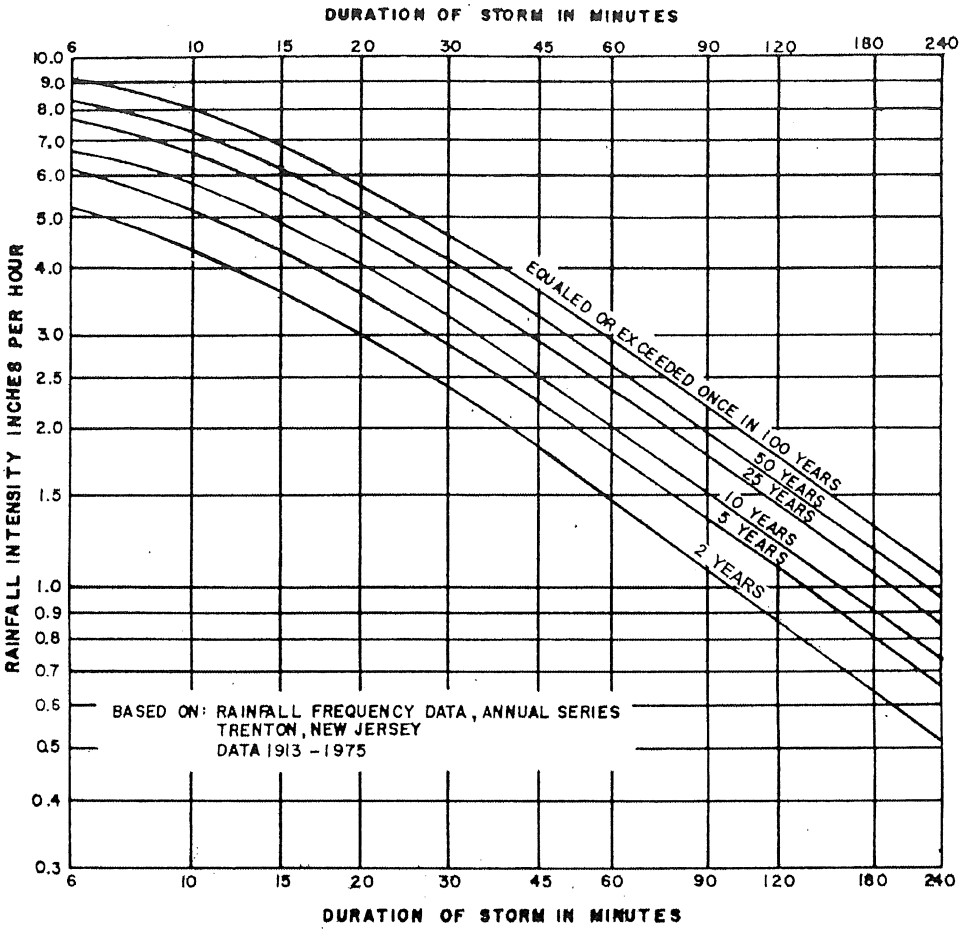
County	1 year	2 year	5 year	10 year	25 year	50 year	100 year
Atlantic	2.72	3.31	4.30	5.16	6.46	7.61	8.90
Bergen	2.75	3.34	4.27	5.07	6.28	7.32	8.47
Burlington	2.77	3.36	4.34	5.18	6.45	7.56	8.81
Camden	2.73	3.31	4.25	5.06	6.28	7.34	8.52
Cape May	2.67	3.25	4.22	5.07	6.34	7.47	8.73
Cumberland	2.69	3.27	4.25	5.09	6.37	7.49	8.76
Essex	2.85	3.44	4.40	5.22	6.44	7.49	8.66
Gloucester	2.71	3.29	4.24	5.05	6.29	7.36	8.55
Hudson	2.73	3.31	4.23	5.02	6.19	7.20	8.31
Hunterdon	2.80	3.38	4.26	5.00	6.09	7.02	8.03
Mercer	2.74	3.31	4.23	5.01	6.19	7.20	8.33
Middlesex	2.76	3.35	4.30	5.12	6.36	7.43	8.63
Monmouth	2.79	3.38	4.38	5.23	6.53	7.66	8.94
Morris	2.94	3.54	4.47	5.24	6.37	7.32	8.35
Ocean	2.81	3.42	4.45	5.33	6.68	7.87	9.20
Passaic	2.87	3.47	4.42	5.23	6.43	7.47	8.62
Salem	2.69	3.26	4.20	5.00	6.22	7.28	8.45
Somerset	2.76	3.34	4.25	5.01	6.15	7.13	8.21
Sussex	2.68	3.22	4.02	4.70	5.72	6.60	7.58
Union	2.80	3.39	4.35	5.17	6.42	7.49	8.69
Warren	2.78	3.34	4.18	4.89	5.93	6.83	7.82

Notes: The average point rainfall amounts listed above were developed from data contained in NOAA Atlas 14 Volume 2.

Point rainfall estimates for specific locations may be obtained from the Precipitation Frequency Data Server located at http://www.nws.noaa.gov/ohd/hdsc/

For most hydrologic design procedures, the rainfall amounts listed above may be rounded to the nearest tenth of an inch.

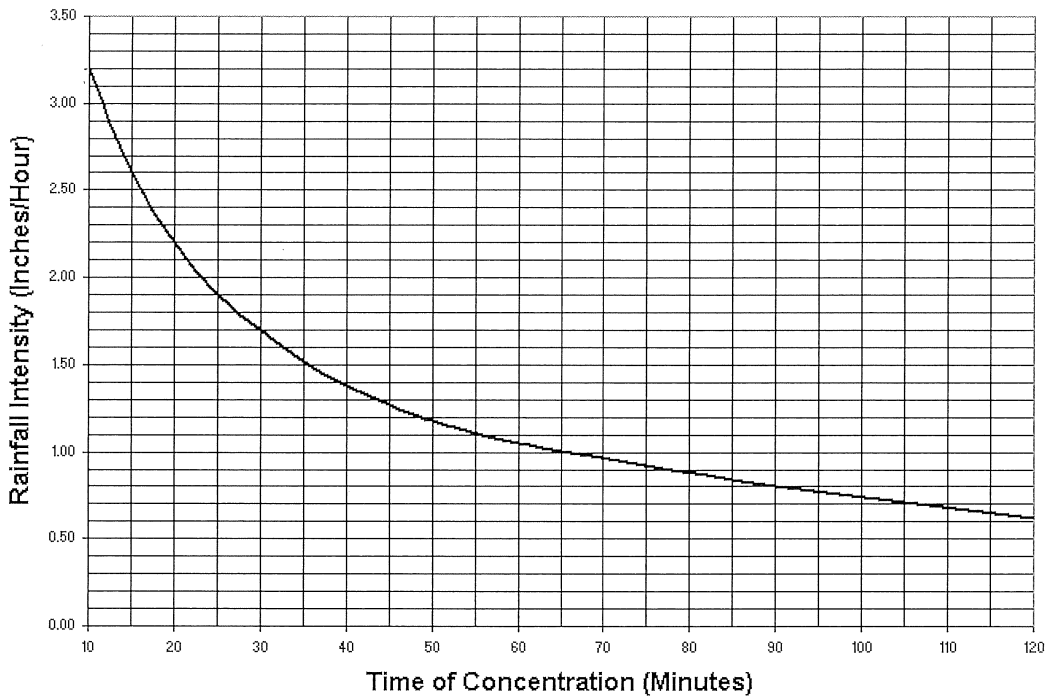
Figure 5-4: Rainfall Intensity-Duration-Frequency Curves



Note: Adapted from Figure 2.1-2 in the NJDEP *Technical Manual for Stream Encroachment Permits*.

Figure 5-3 was prepared for those using the Rational Method to compute stormwater quality design storm runoff peaks. It presents the stormwater quality design storm as a rainfall intensity-duration curve that allows the user to determine the appropriate rainfall intensity for the selected time of concentration.

Figure 5-3: NJDEP 1.25-Inch/2-Hour Stormwater Quality Design Storm Rainfall Intensity-Duration Curve



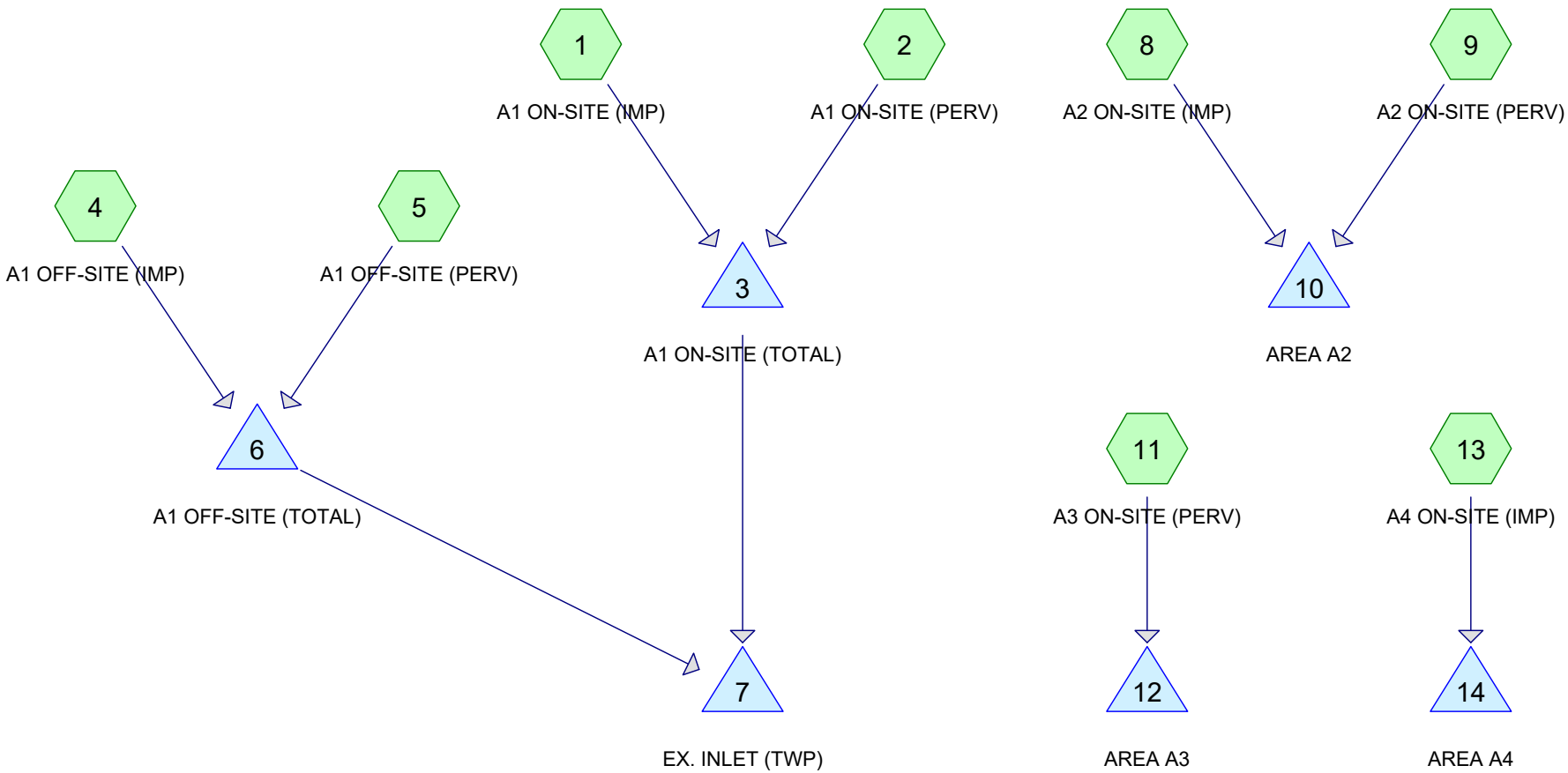
Finally, when using the Modified Rational Method to compute a stormwater quality design storm hydrograph, the entire 2-hour storm duration at an average intensity of 0.625-inches/hour can be used. Example 5-1 below demonstrates this procedure.

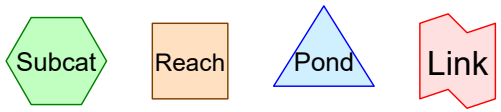
Important Note: While the stormwater quality design storm actually falls in a variable pattern, use of the 2-hour average rate described above and demonstrated in Example 5-1 is consistent with the assumptions of the Modified Rational Method. In addition, analysis and experience has shown that the structural BMPs that store and slowly release the stormwater quality design storm hydrograph (such as extended detention basins, wet ponds, bioretention facilities, constructed wetlands, and sand filters) are not particularly sensitive to rainfall pattern. If such sensitivity does exist for a particular BMP, the designer should use the NRCS methodology, which allows for consideration of the stormwater quality design storm's variable rainfall pattern.

APPENDIX B

Pre-Developed Peak Run-Off Rate Summary

2 yr. Storm
10 yr. Storm
100 yr. Storm





Routing Diagram for Pre-Development.Lots 11-19
Prepared by Toll Brothers, Inc., Printed 7/8/2020
HydroCAD® 10.10-4a s/n 11149 © 2020 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.260	74	>75% Grass cover, Good, HSG C (2, 5, 9)
1.800	98	Paved parking, HSG C (1, 8, 13)
0.160	98	Paved roads w/curbs & sewers, HSG C (4)
1.330	72	Woods/grass comb., Good, HSG C (2, 5, 11)
4.550	**84**	**TOTAL AREA**

Soil Listing (all nodes)

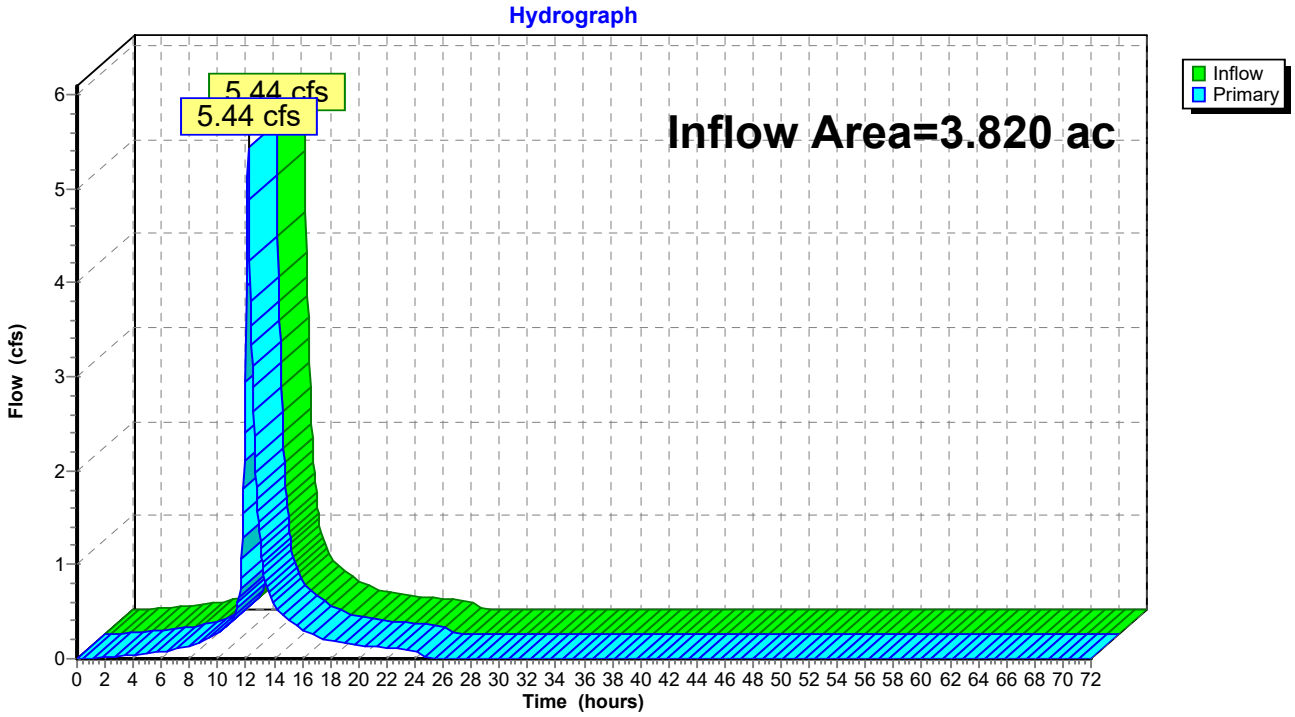
Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
4.550	HSG C	1, 2, 4, 5, 8, 9, 11, 13
0.000	HSG D	
0.000	Other	
4.550		**TOTAL AREA**

Summary for Pond 3: A1 ON-SITE (TOTAL)

Inflow Area = 3.820 ac, 45.29% Impervious, Inflow Depth = 2.08" for 2-YR event
Inflow = 5.44 cfs @ 12.14 hrs, Volume= 0.661 af
Primary = 5.44 cfs @ 12.14 hrs, Volume= 0.661 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 3: A1 ON-SITE (TOTAL)

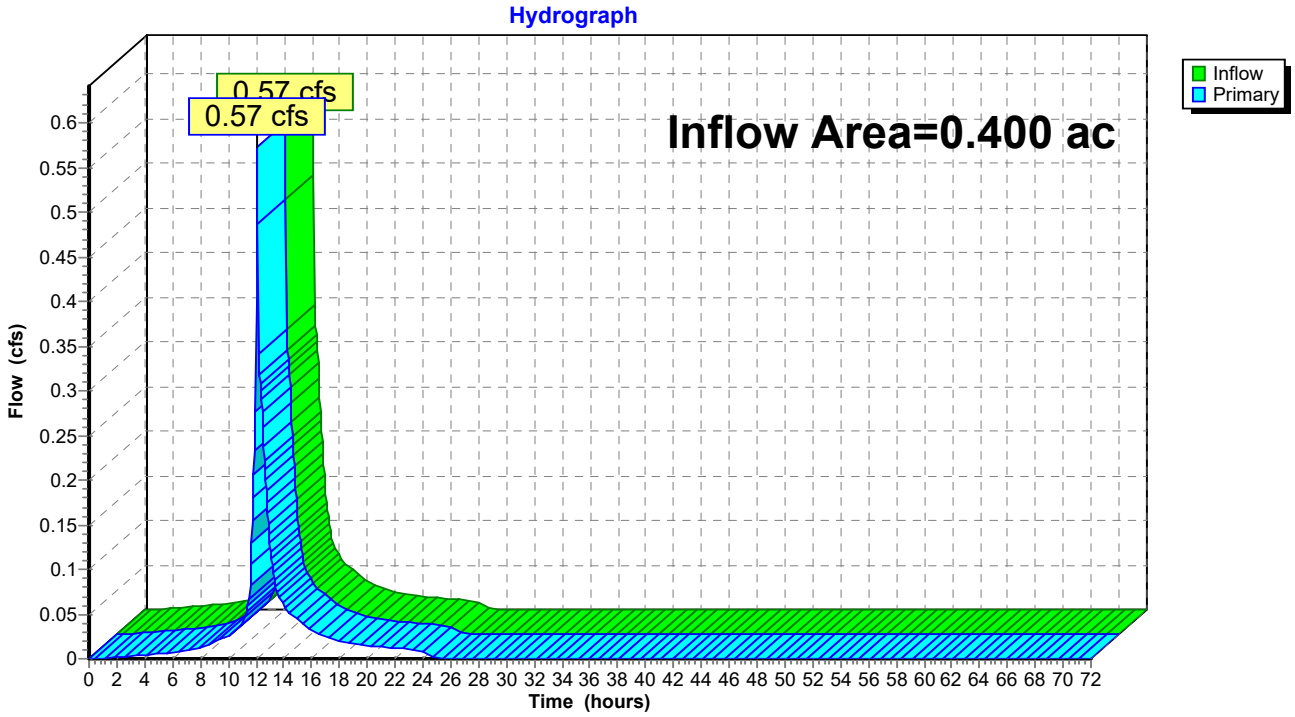


Summary for Pond 6: A1 OFF-SITE (TOTAL)

Inflow Area = 0.400 ac, 40.00% Impervious, Inflow Depth = 1.97" for 2-YR event
Inflow = 0.57 cfs @ 12.07 hrs, Volume= 0.066 af
Primary = 0.57 cfs @ 12.07 hrs, Volume= 0.066 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 6: A1 OFF-SITE (TOTAL)

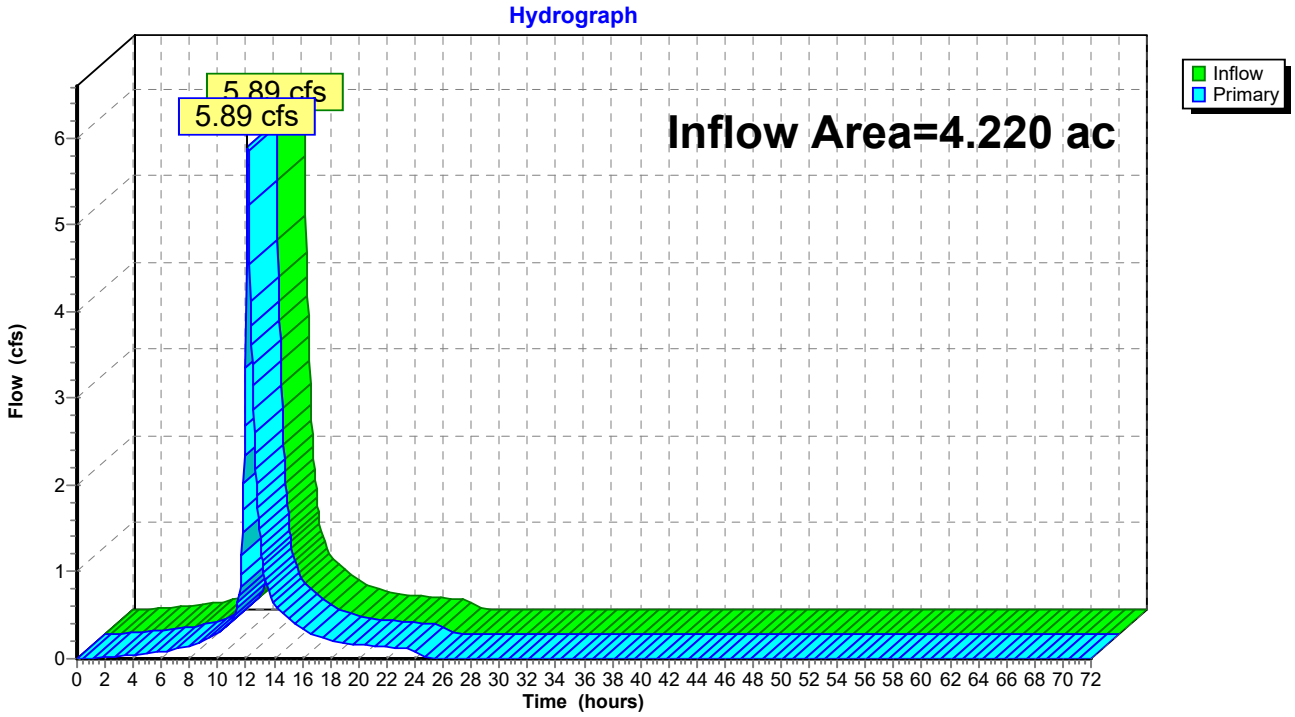


Summary for Pond 7: EX. INLET (TWP)

Inflow Area = 4.220 ac, 44.79% Impervious, Inflow Depth = 2.07" for 2-YR event
Inflow = 5.89 cfs @ 12.14 hrs, Volume= 0.726 af
Primary = 5.89 cfs @ 12.14 hrs, Volume= 0.726 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 7: EX. INLET (TWP)

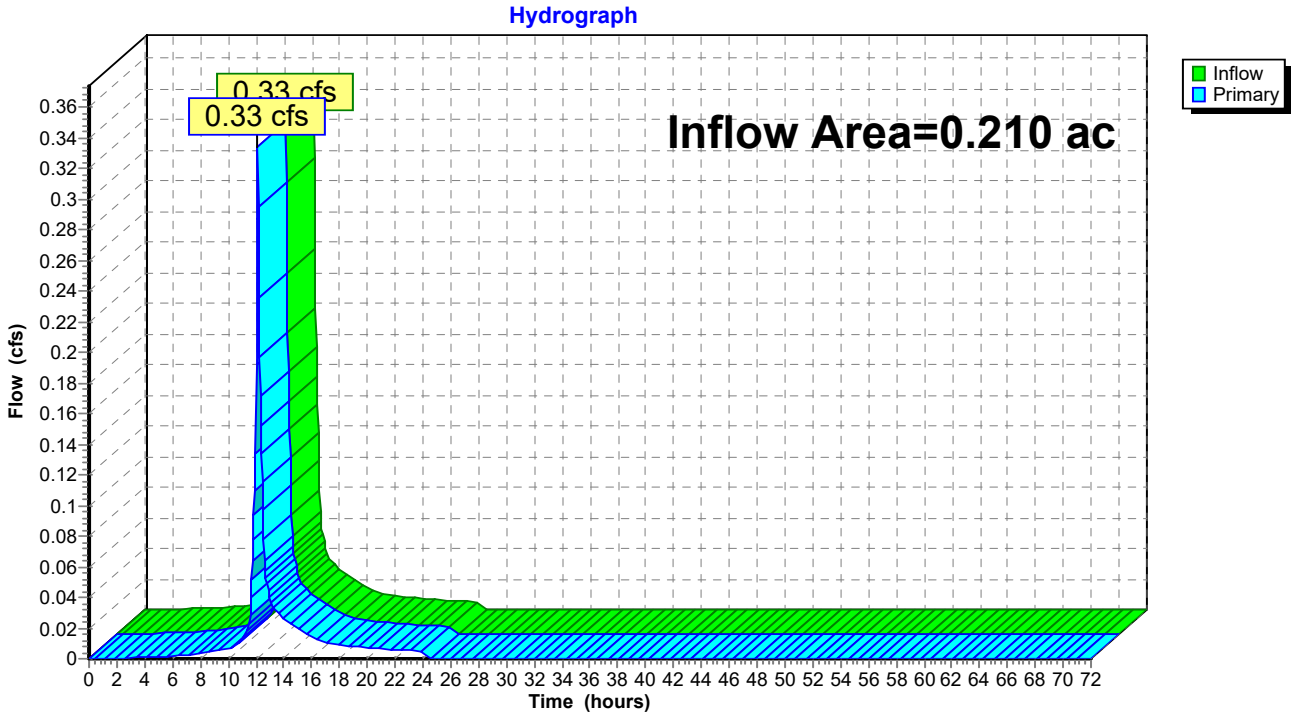


Summary for Pond 10: AREA A2

Inflow Area = 0.210 ac, 19.05% Impervious, Inflow Depth = 1.58" for 2-YR event
Inflow = 0.33 cfs @ 12.10 hrs, Volume= 0.028 af
Primary = 0.33 cfs @ 12.10 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 10: AREA A2

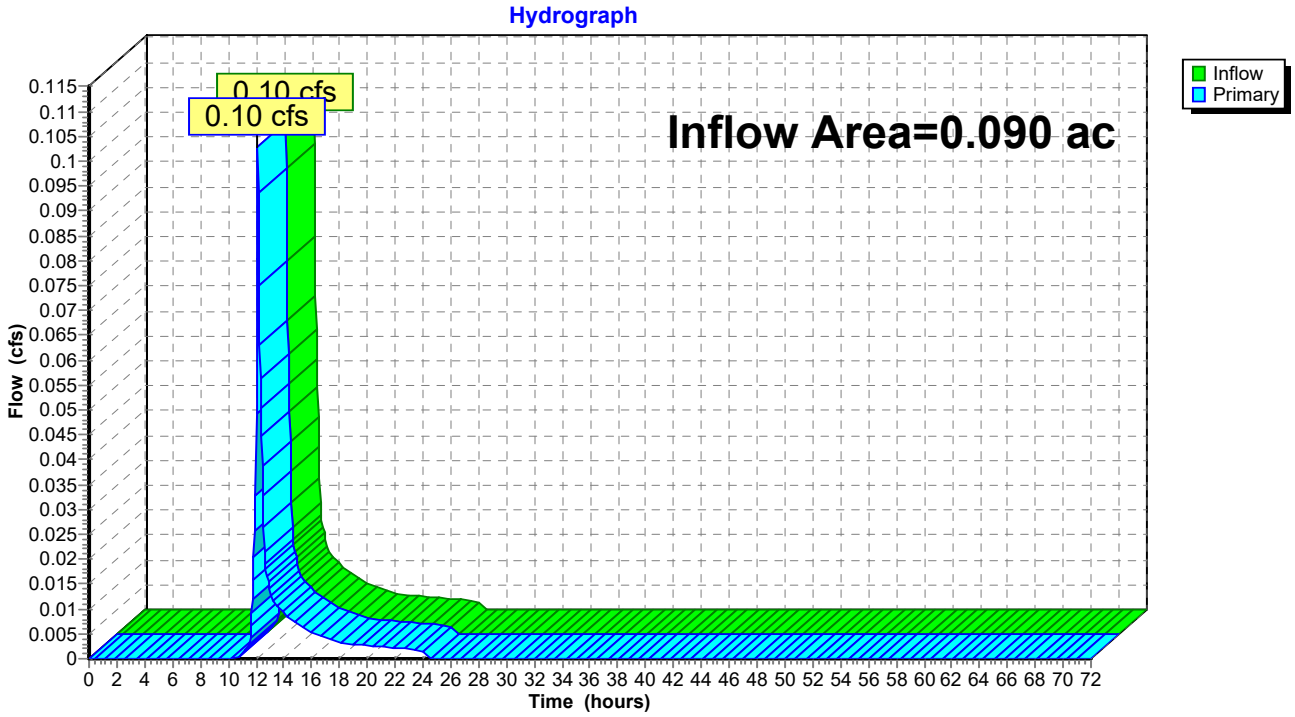


Summary for Pond 12: AREA A3

Inflow Area = 0.090 ac, 0.00% Impervious, Inflow Depth = 1.08" for 2-YR event
Inflow = 0.10 cfs @ 12.11 hrs, Volume= 0.008 af
Primary = 0.10 cfs @ 12.11 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 12: AREA A3

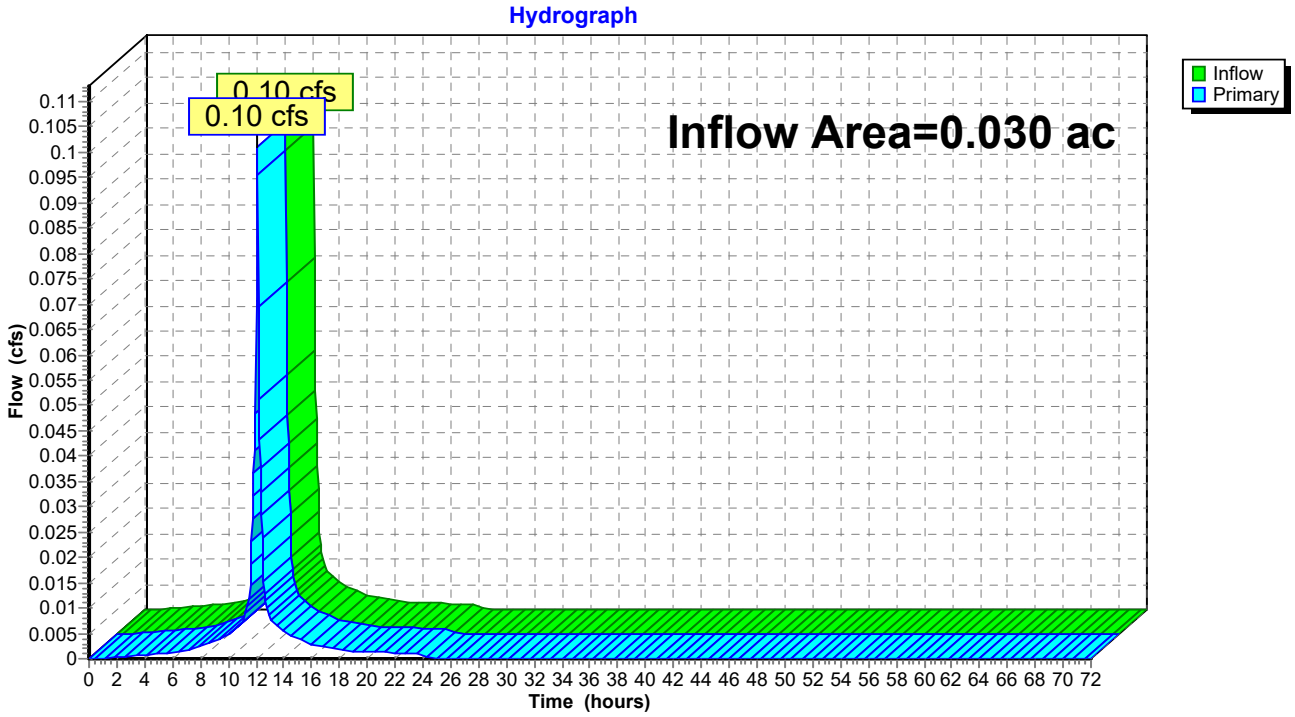


Summary for Pond 14: AREA A4

Inflow Area = 0.030 ac,100.00% Impervious, Inflow Depth = 3.21" for 2-YR event
Inflow = 0.10 cfs @ 12.07 hrs, Volume= 0.008 af
Primary = 0.10 cfs @ 12.07 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 14: AREA A4

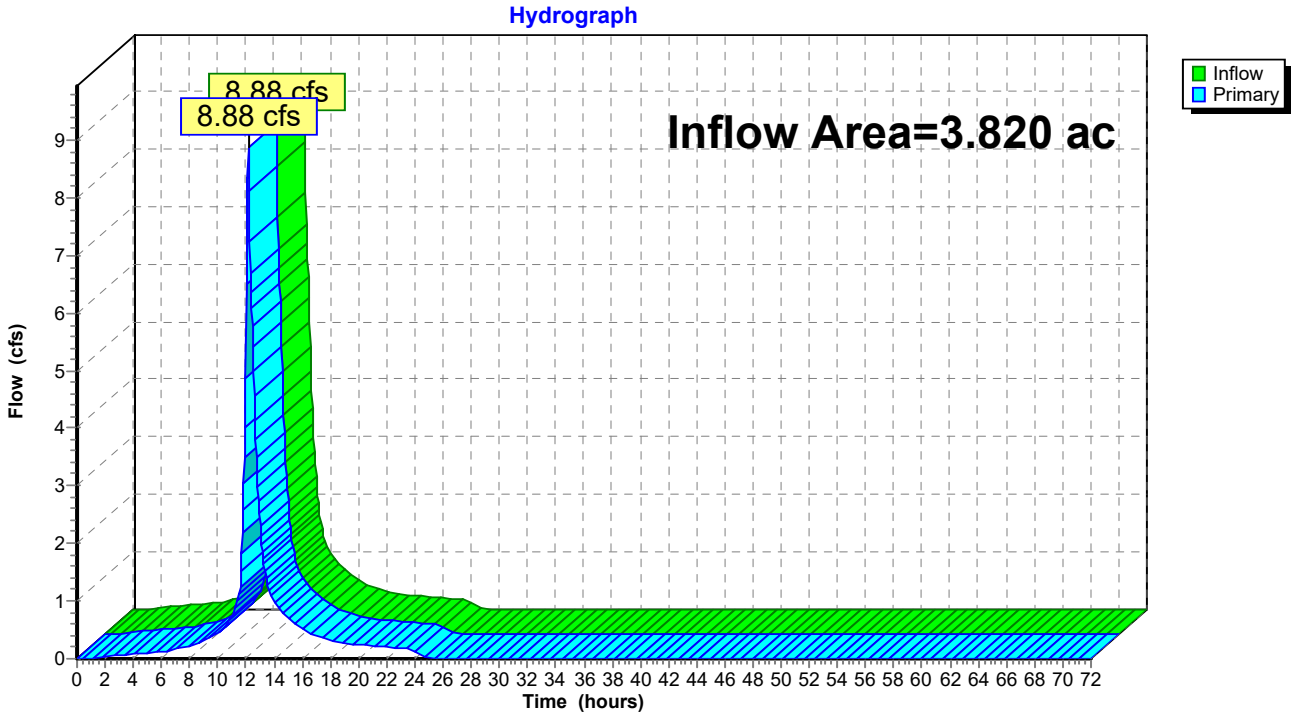


Summary for Pond 3: A1 ON-SITE (TOTAL)

Inflow Area = 3.820 ac, 45.29% Impervious, Inflow Depth = 3.60" for 10-YR event
Inflow = 8.88 cfs @ 12.15 hrs, Volume= 1.146 af
Primary = 8.88 cfs @ 12.15 hrs, Volume= 1.146 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 3: A1 ON-SITE (TOTAL)

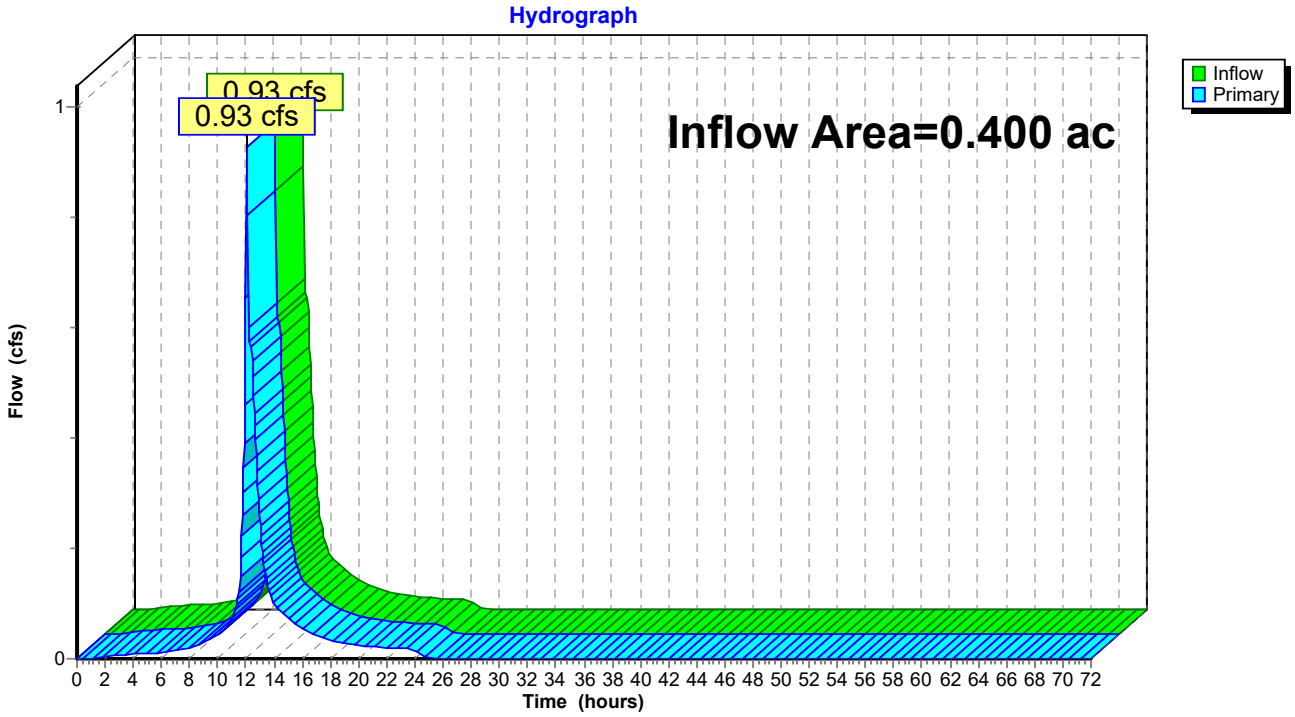


Summary for Pond 6: A1 OFF-SITE (TOTAL)

Inflow Area = 0.400 ac, 40.00% Impervious, Inflow Depth = 3.47" for 10-YR event
Inflow = 0.93 cfs @ 12.07 hrs, Volume= 0.116 af
Primary = 0.93 cfs @ 12.07 hrs, Volume= 0.116 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 6: A1 OFF-SITE (TOTAL)

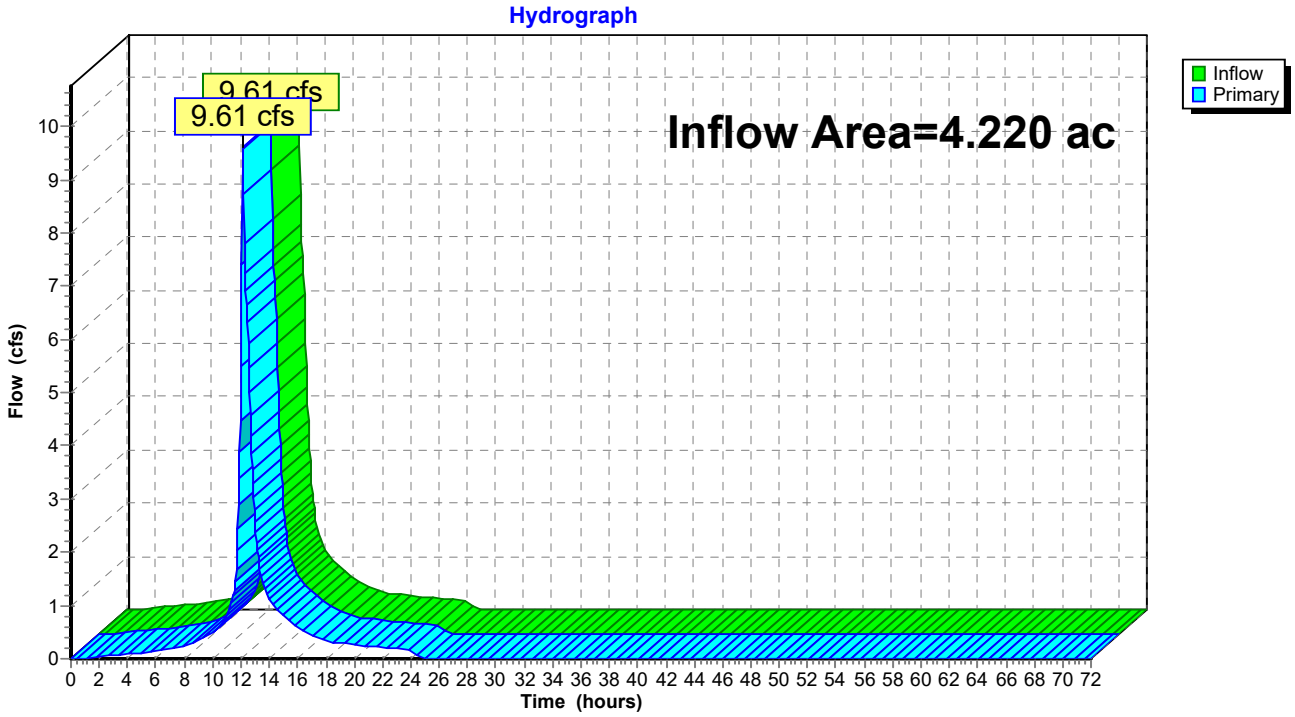


Summary for Pond 7: EX. INLET (TWP)

Inflow Area = 4.220 ac, 44.79% Impervious, Inflow Depth = 3.59" for 10-YR event
Inflow = 9.61 cfs @ 12.14 hrs, Volume= 1.261 af
Primary = 9.61 cfs @ 12.14 hrs, Volume= 1.261 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 7: EX. INLET (TWP)

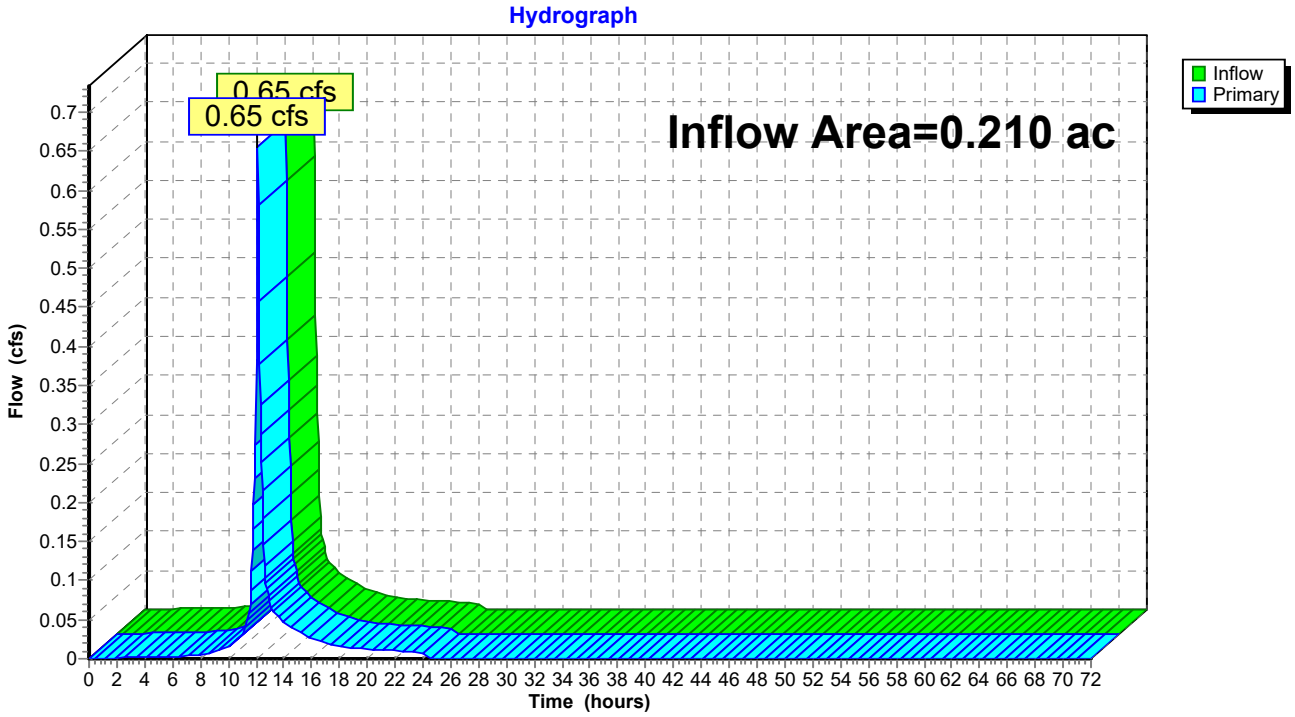


Summary for Pond 10: AREA A2

Inflow Area = 0.210 ac, 19.05% Impervious, Inflow Depth = 3.01" for 10-YR event
Inflow = 0.65 cfs @ 12.10 hrs, Volume= 0.053 af
Primary = 0.65 cfs @ 12.10 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 10: AREA A2

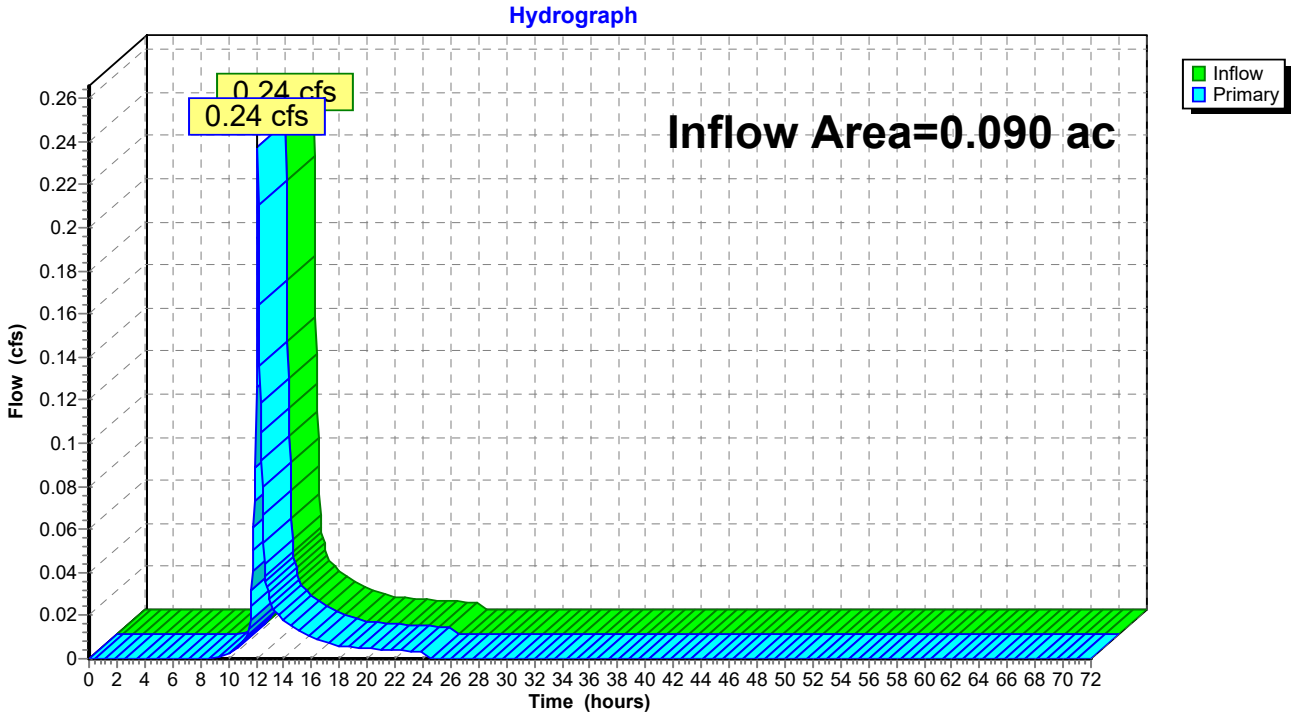


Summary for Pond 12: AREA A3

Inflow Area = 0.090 ac, 0.00% Impervious, Inflow Depth = 2.37" for 10-YR event
Inflow = 0.24 cfs @ 12.11 hrs, Volume= 0.018 af
Primary = 0.24 cfs @ 12.11 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 12: AREA A3

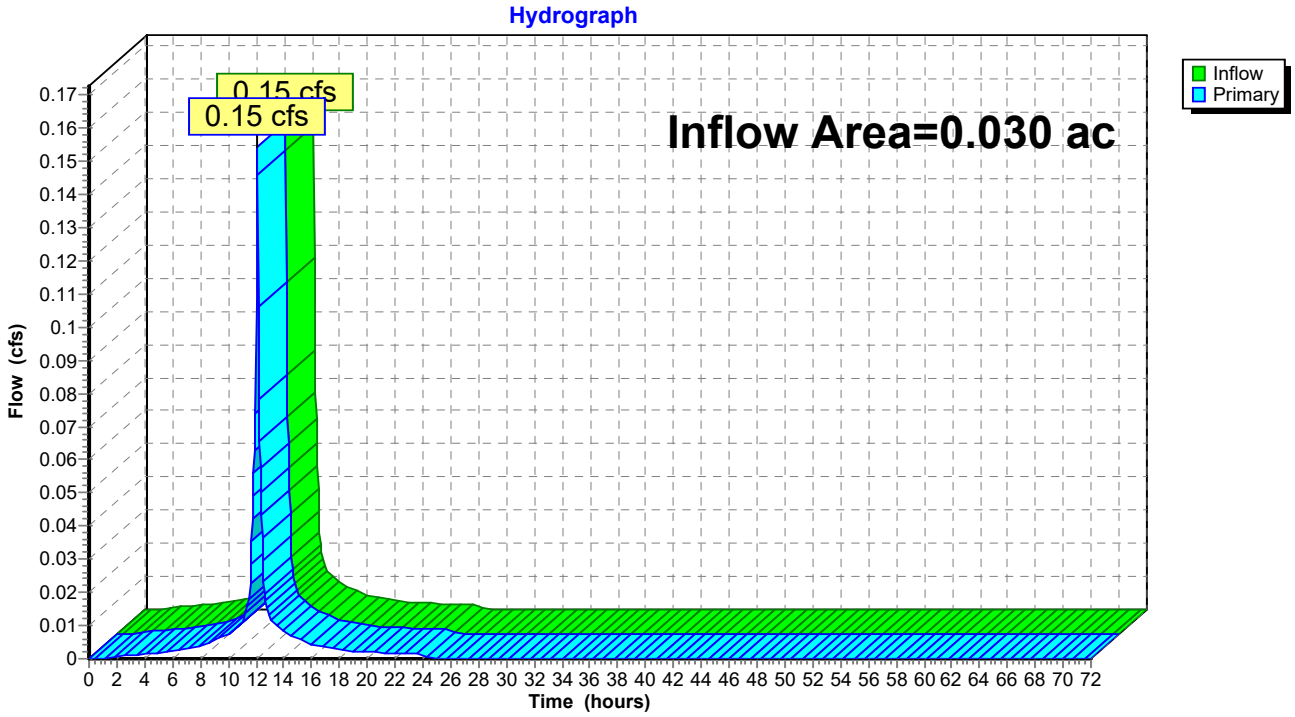


Summary for Pond 14: AREA A4

Inflow Area = 0.030 ac,100.00% Impervious, Inflow Depth = 4.98" for 10-YR event
Inflow = 0.15 cfs @ 12.07 hrs, Volume= 0.012 af
Primary = 0.15 cfs @ 12.07 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 14: AREA A4

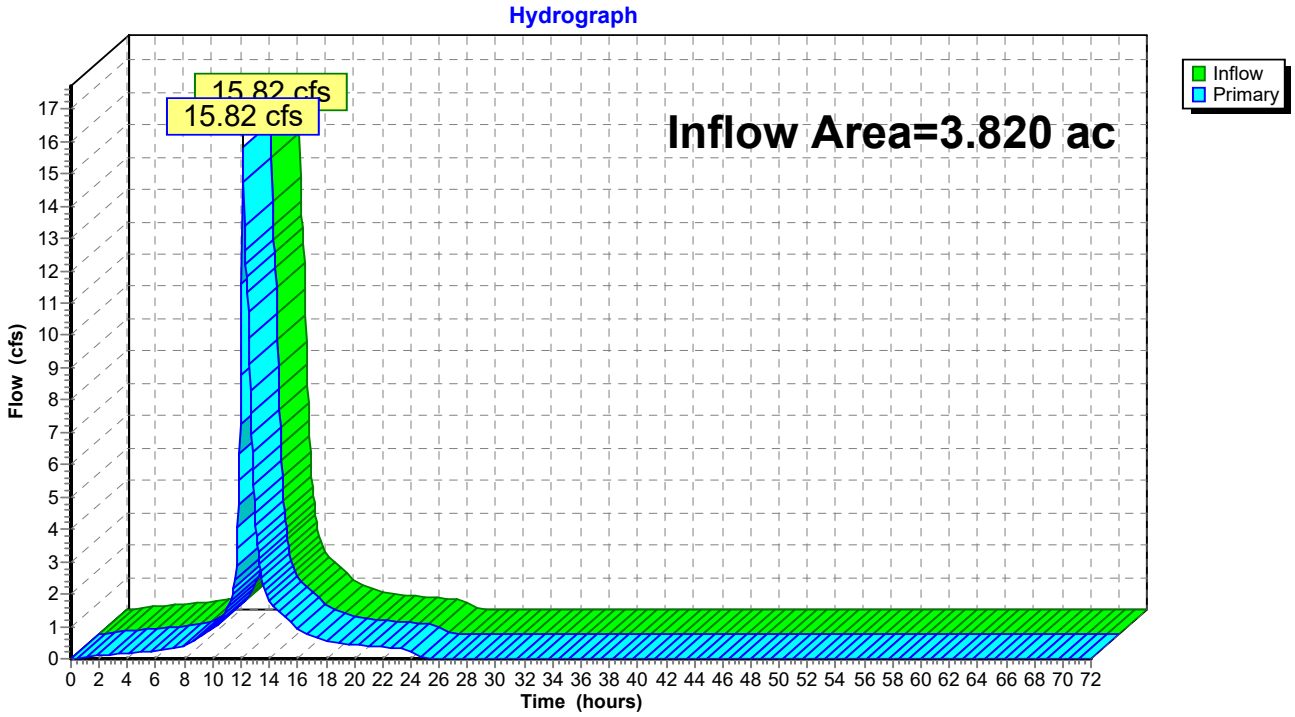


Summary for Pond 3: A1 ON-SITE (TOTAL)

Inflow Area = 3.820 ac, 45.29% Impervious, Inflow Depth = 6.77" for 100-YR event
Inflow = 15.82 cfs @ 12.15 hrs, Volume= 2.154 af
Primary = 15.82 cfs @ 12.15 hrs, Volume= 2.154 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 3: A1 ON-SITE (TOTAL)

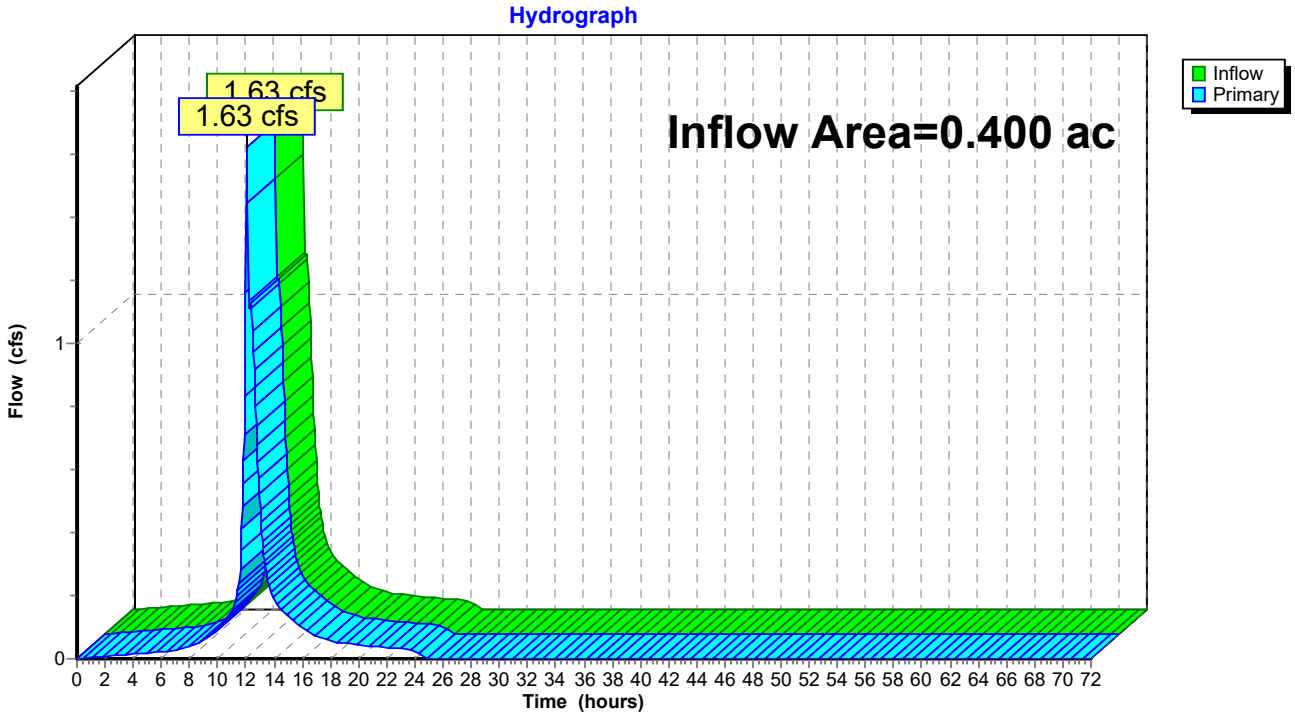


Summary for Pond 6: A1 OFF-SITE (TOTAL)

Inflow Area = 0.400 ac, 40.00% Impervious, Inflow Depth = 6.61" for 100-YR event
Inflow = 1.63 cfs @ 12.08 hrs, Volume= 0.220 af
Primary = 1.63 cfs @ 12.08 hrs, Volume= 0.220 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 6: A1 OFF-SITE (TOTAL)

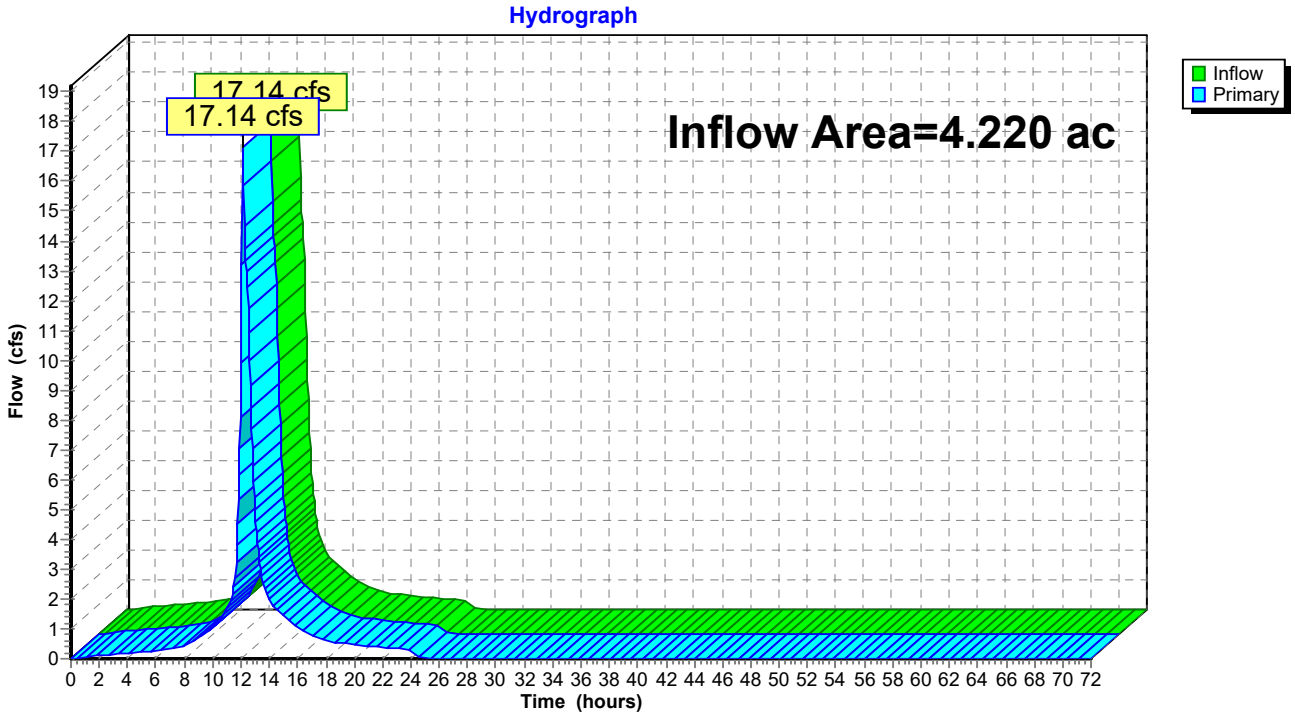


Summary for Pond 7: EX. INLET (TWP)

Inflow Area = 4.220 ac, 44.79% Impervious, Inflow Depth = 6.75" for 100-YR event
Inflow = 17.14 cfs @ 12.14 hrs, Volume= 2.374 af
Primary = 17.14 cfs @ 12.14 hrs, Volume= 2.374 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 7: EX. INLET (TWP)

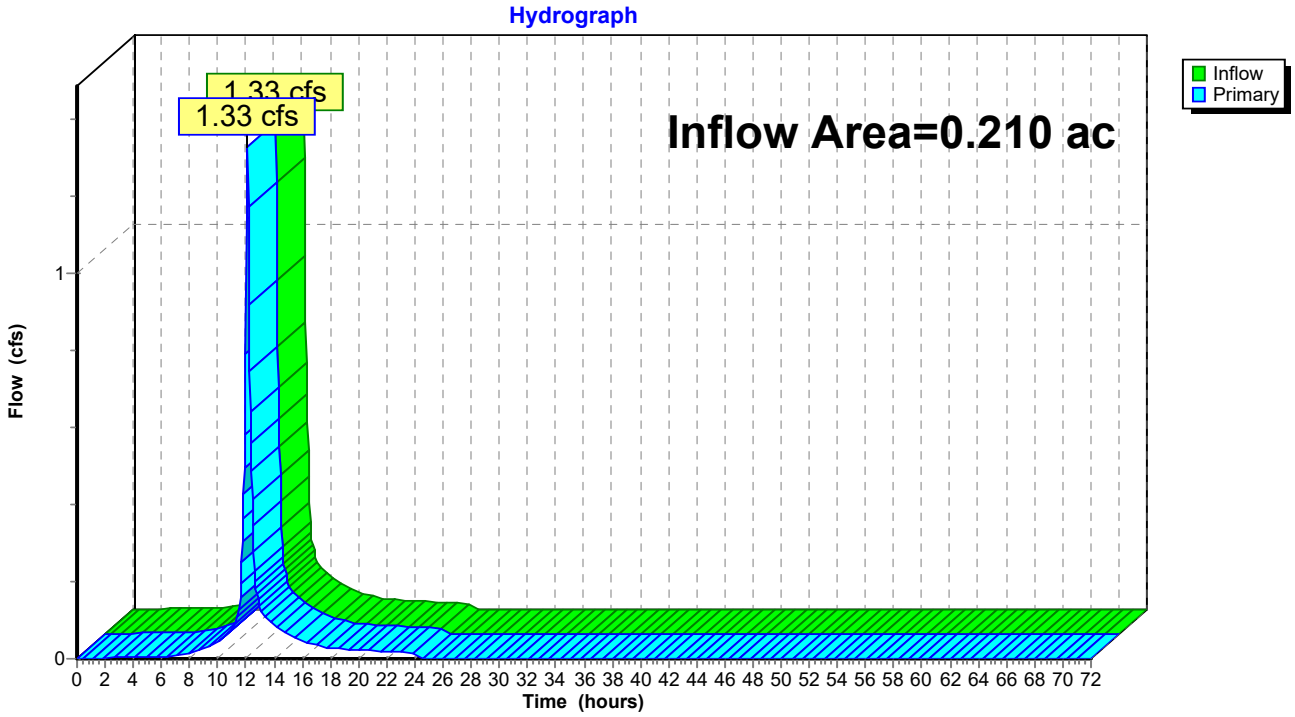


Summary for Pond 10: AREA A2

Inflow Area = 0.210 ac, 19.05% Impervious, Inflow Depth = 6.07" for 100-YR event
Inflow = 1.33 cfs @ 12.10 hrs, Volume= 0.106 af
Primary = 1.33 cfs @ 12.10 hrs, Volume= 0.106 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 10: AREA A2

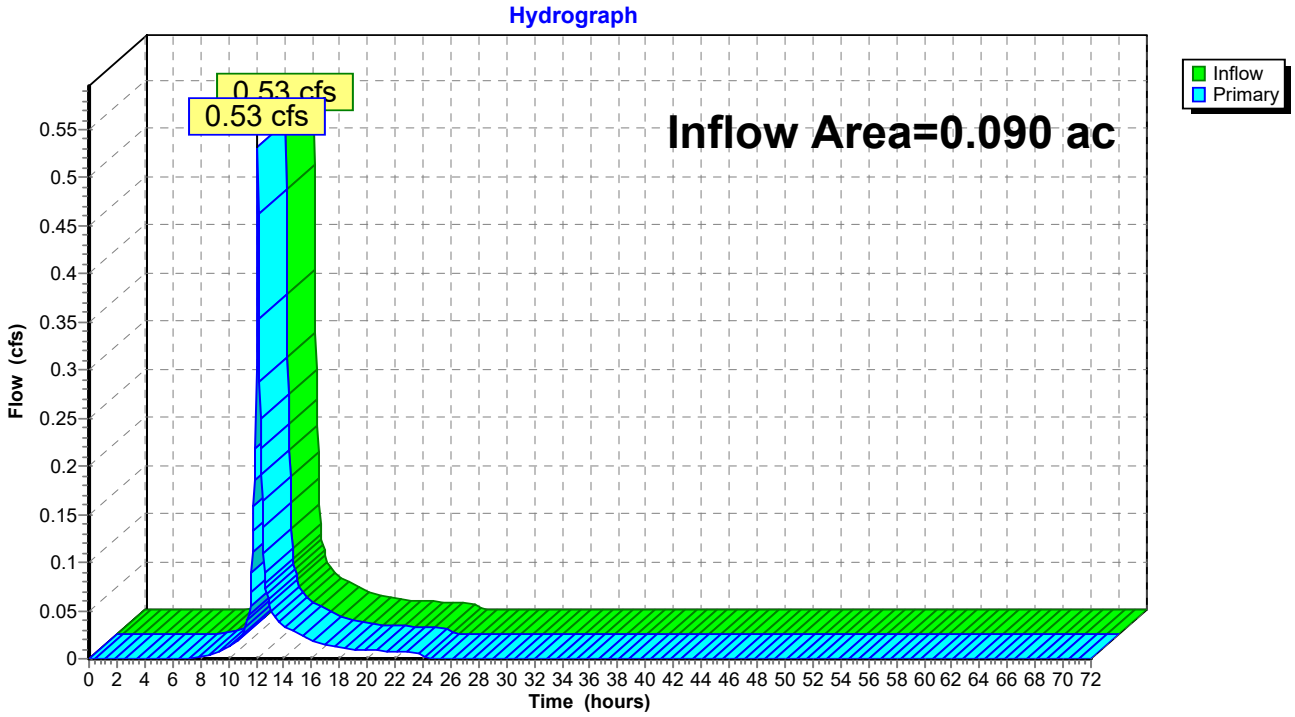


Summary for Pond 12: AREA A3

Inflow Area = 0.090 ac, 0.00% Impervious, Inflow Depth = 5.28" for 100-YR event
Inflow = 0.53 cfs @ 12.10 hrs, Volume= 0.040 af
Primary = 0.53 cfs @ 12.10 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 12: AREA A3

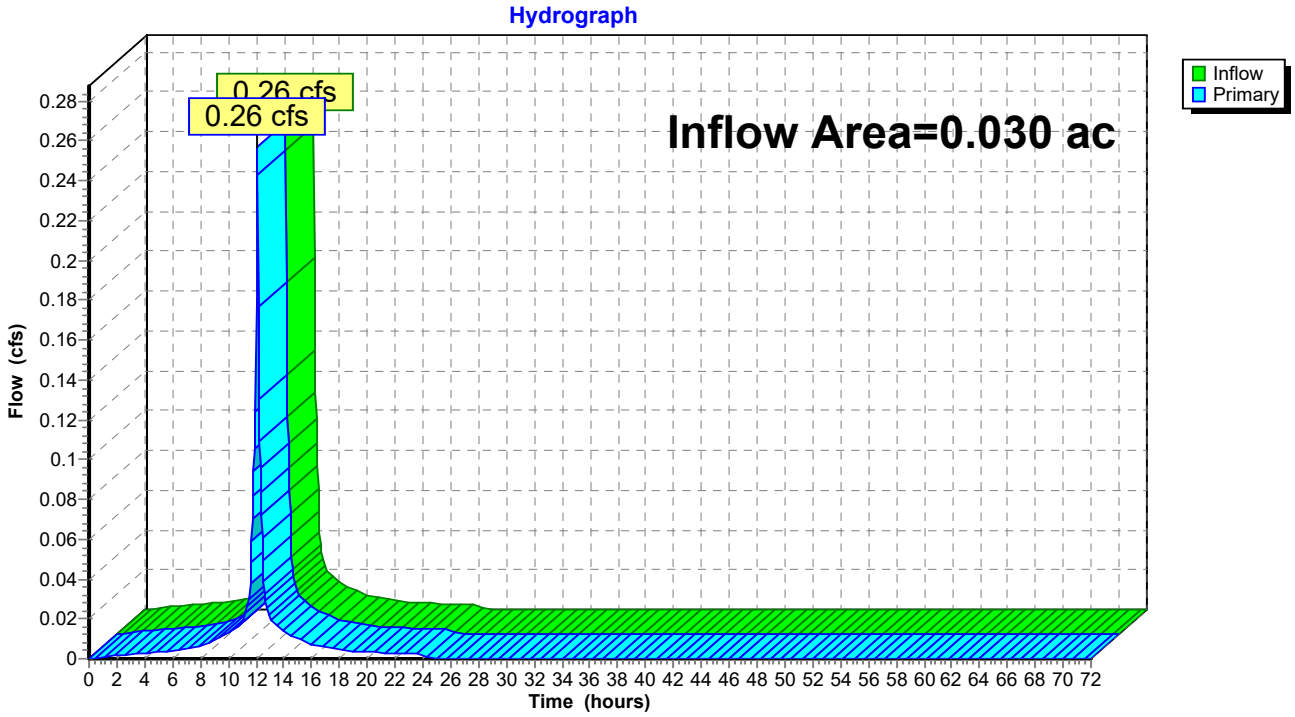


Summary for Pond 14: AREA A4

Inflow Area = 0.030 ac,100.00% Impervious, Inflow Depth = 8.42" for 100-YR event
Inflow = 0.26 cfs @ 12.07 hrs, Volume= 0.021 af
Primary = 0.26 cfs @ 12.07 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 14: AREA A4



APPENDIX C

Pre-Developed Hydrograph Calculations

2 yr. Storm
10 yr. Storm
100 yr. Storm

Summary for Subcatchment 1: A1 ON-SITE (IMP)

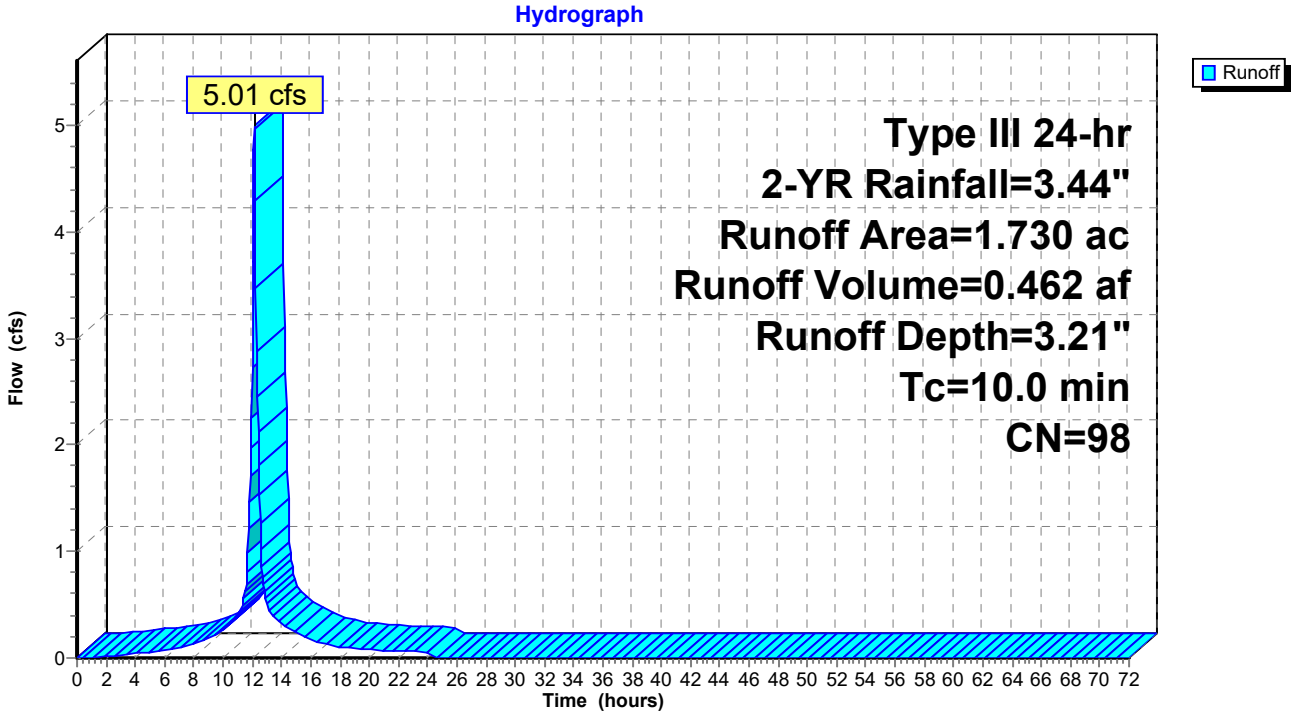
Runoff = 5.01 cfs @ 12.14 hrs, Volume= 0.462 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
1.730	98	Paved parking, HSG C
1.730		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, DIRECT ENTRY**

Subcatchment 1: A1 ON-SITE (IMP)



Hydrograph for Subcatchment 1: A1 ON-SITE (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.01
3.00	0.11	0.02	0.03
4.00	0.15	0.04	0.04
5.00	0.20	0.07	0.06
6.00	0.25	0.10	0.07
7.00	0.31	0.15	0.10
8.00	0.39	0.22	0.13
9.00	0.50	0.32	0.19
10.00	0.65	0.46	0.26
11.00	0.86	0.66	0.40
12.00	1.72	1.50	**2.74**
13.00	2.58	2.35	**0.52**
14.00	2.79	2.56	0.31
15.00	2.94	2.71	0.23
16.00	3.05	2.82	0.17
17.00	3.13	2.90	0.13
18.00	3.19	2.96	0.10
19.00	3.24	3.01	0.09
20.00	3.29	3.06	0.08
21.00	3.33	3.10	0.07
22.00	3.37	3.14	0.07
23.00	3.41	3.18	0.06
24.00	**3.44**	**3.21**	0.05
25.00	3.44	3.21	0.00
26.00	3.44	3.21	0.00
27.00	3.44	3.21	0.00
28.00	3.44	3.21	0.00
29.00	3.44	3.21	0.00
30.00	3.44	3.21	0.00
31.00	3.44	3.21	0.00
32.00	3.44	3.21	0.00
33.00	3.44	3.21	0.00
34.00	3.44	3.21	0.00
35.00	3.44	3.21	0.00
36.00	3.44	3.21	0.00
37.00	3.44	3.21	0.00
38.00	3.44	3.21	0.00
39.00	3.44	3.21	0.00
40.00	3.44	3.21	0.00
41.00	3.44	3.21	0.00
42.00	3.44	3.21	0.00
43.00	3.44	3.21	0.00
44.00	3.44	3.21	0.00
45.00	3.44	3.21	0.00
46.00	3.44	3.21	0.00
47.00	3.44	3.21	0.00
48.00	3.44	3.21	0.00
49.00	3.44	3.21	0.00
50.00	3.44	3.21	0.00
51.00	3.44	3.21	0.00
52.00	3.44	3.21	0.00
53.00	3.44	3.21	0.00
54.00	3.44	3.21	0.00
55.00	3.44	3.21	0.00
56.00	3.44	3.21	0.00
57.00	3.44	3.21	0.00
58.00	3.44	3.21	0.00
59.00	3.44	3.21	0.00
60.00	3.44	3.21	0.00
61.00	3.44	3.21	0.00
62.00	3.44	3.21	0.00
63.00	3.44	3.21	0.00
64.00	3.44	3.21	0.00
65.00	3.44	3.21	0.00
66.00	3.44	3.21	0.00
67.00	3.44	3.21	0.00
68.00	3.44	3.21	0.00
69.00	3.44	3.21	0.00
70.00	3.44	3.21	0.00
71.00	3.44	3.21	0.00
72.00	3.44	3.21	0.00

Summary for Subcatchment 1: A1 ON-SITE (IMP)

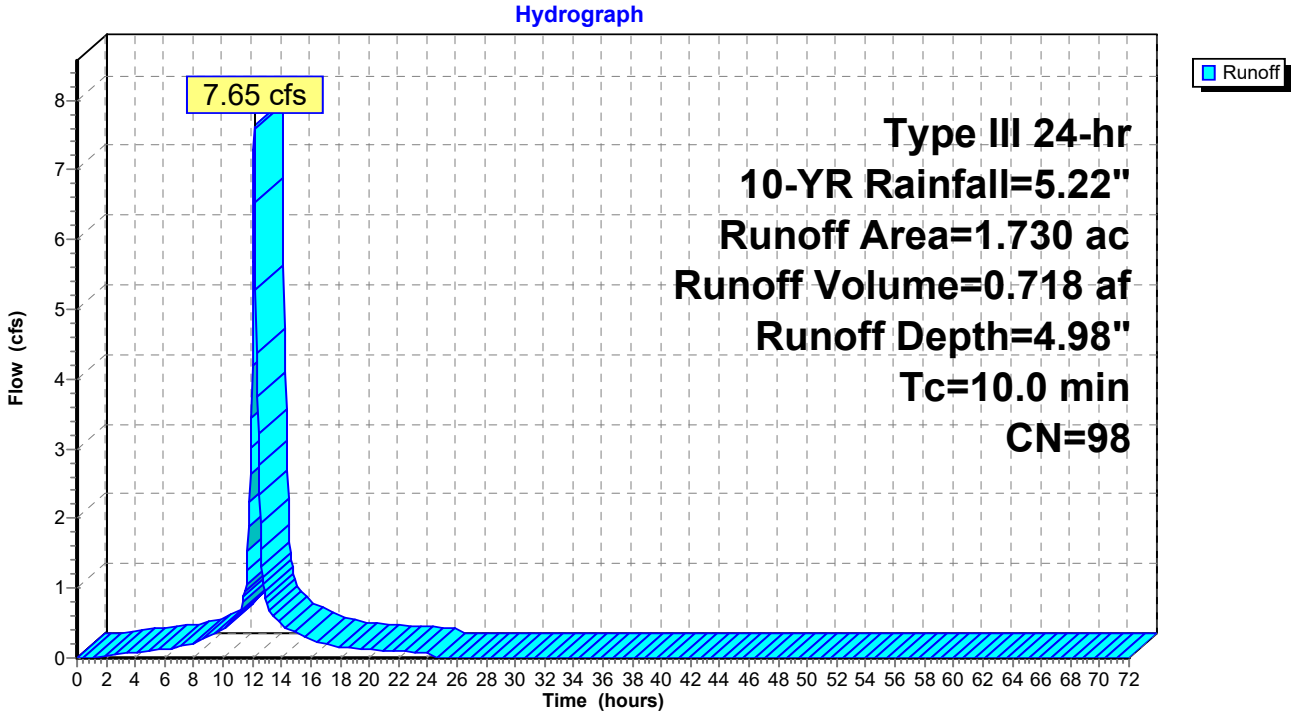
Runoff = 7.65 cfs @ 12.14 hrs, Volume= 0.718 af, Depth= 4.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
1.730	98	Paved parking, HSG C
1.730		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, DIRECT ENTRY**

Subcatchment 1: A1 ON-SITE (IMP)



Hydrograph for Subcatchment 1: A1 ON-SITE (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.02	0.03
3.00	0.16	0.04	0.06
4.00	0.22	0.09	0.08
5.00	0.30	0.14	0.10
6.00	0.38	0.21	0.12
7.00	0.47	0.29	0.16
8.00	0.60	0.41	0.21
9.00	0.76	0.56	0.31
10.00	0.99	0.78	0.42
11.00	1.30	1.09	0.62
12.00	2.61	2.38	**4.19**
13.00	3.91	3.68	**0.79**
14.00	4.23	4.00	0.48
15.00	4.46	4.22	0.36
16.00	4.62	4.39	0.25
17.00	4.75	4.51	0.20
18.00	4.84	4.61	0.15
19.00	4.92	4.69	0.13
20.00	5.00	4.76	0.12
21.00	5.06	4.82	0.11
22.00	5.12	4.88	0.10
23.00	5.17	4.94	0.09
24.00	**5.22**	**4.98**	0.08
25.00	5.22	4.98	0.00
26.00	5.22	4.98	0.00
27.00	5.22	4.98	0.00
28.00	5.22	4.98	0.00
29.00	5.22	4.98	0.00
30.00	5.22	4.98	0.00
31.00	5.22	4.98	0.00
32.00	5.22	4.98	0.00
33.00	5.22	4.98	0.00
34.00	5.22	4.98	0.00
35.00	5.22	4.98	0.00
36.00	5.22	4.98	0.00
37.00	5.22	4.98	0.00
38.00	5.22	4.98	0.00
39.00	5.22	4.98	0.00
40.00	5.22	4.98	0.00
41.00	5.22	4.98	0.00
42.00	5.22	4.98	0.00
43.00	5.22	4.98	0.00
44.00	5.22	4.98	0.00
45.00	5.22	4.98	0.00
46.00	5.22	4.98	0.00
47.00	5.22	4.98	0.00
48.00	5.22	4.98	0.00
49.00	5.22	4.98	0.00
50.00	5.22	4.98	0.00
51.00	5.22	4.98	0.00
52.00	5.22	4.98	0.00
53.00	5.22	4.98	0.00
54.00	5.22	4.98	0.00
55.00	5.22	4.98	0.00
56.00	5.22	4.98	0.00
57.00	5.22	4.98	0.00
58.00	5.22	4.98	0.00
59.00	5.22	4.98	0.00
60.00	5.22	4.98	0.00
61.00	5.22	4.98	0.00
62.00	5.22	4.98	0.00
63.00	5.22	4.98	0.00
64.00	5.22	4.98	0.00
65.00	5.22	4.98	0.00
66.00	5.22	4.98	0.00
67.00	5.22	4.98	0.00
68.00	5.22	4.98	0.00
69.00	5.22	4.98	0.00
70.00	5.22	4.98	0.00
71.00	5.22	4.98	0.00
72.00	5.22	4.98	0.00

Summary for Subcatchment 1: A1 ON-SITE (IMP)

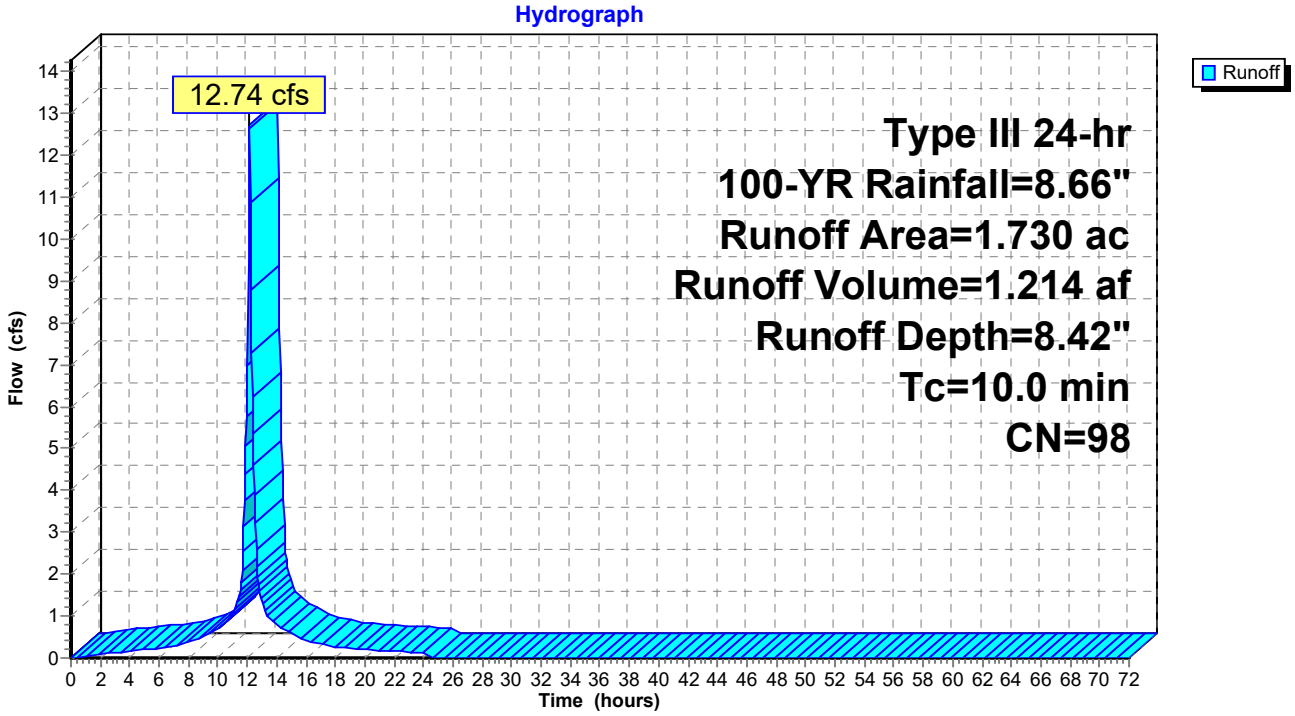
Runoff = 12.74 cfs @ 12.14 hrs, Volume= 1.214 af, Depth= 8.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
1.730	98	Paved parking, HSG C
1.730		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, DIRECT ENTRY**

Subcatchment 1: A1 ON-SITE (IMP)



Hydrograph for Subcatchment 1: A1 ON-SITE (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.01	0.04
2.00	0.17	0.05	0.09
3.00	0.27	0.12	0.13
4.00	0.37	0.21	0.16
5.00	0.49	0.31	0.19
6.00	0.62	0.43	0.22
7.00	0.78	0.58	0.29
8.00	0.99	0.78	0.37
9.00	1.26	1.05	0.53
10.00	1.64	1.41	0.70
11.00	2.17	1.94	1.04
12.00	4.33	4.09	**6.99**
13.00	6.49	6.26	**1.32**
14.00	7.02	6.78	0.80
15.00	7.40	7.16	0.59
16.00	7.67	7.43	0.42
17.00	7.88	7.64	0.33
18.00	8.04	7.80	0.25
19.00	8.17	7.93	0.22
20.00	8.29	8.05	0.20
21.00	8.40	8.16	0.18
22.00	8.49	8.25	0.16
23.00	8.58	8.34	0.15
24.00	**8.66**	**8.42**	0.13
25.00	8.66	8.42	0.00
26.00	8.66	8.42	0.00
27.00	8.66	8.42	0.00
28.00	8.66	8.42	0.00
29.00	8.66	8.42	0.00
30.00	8.66	8.42	0.00
31.00	8.66	8.42	0.00
32.00	8.66	8.42	0.00
33.00	8.66	8.42	0.00
34.00	8.66	8.42	0.00
35.00	8.66	8.42	0.00
36.00	8.66	8.42	0.00
37.00	8.66	8.42	0.00
38.00	8.66	8.42	0.00
39.00	8.66	8.42	0.00
40.00	8.66	8.42	0.00
41.00	8.66	8.42	0.00
42.00	8.66	8.42	0.00
43.00	8.66	8.42	0.00
44.00	8.66	8.42	0.00
45.00	8.66	8.42	0.00
46.00	8.66	8.42	0.00
47.00	8.66	8.42	0.00
48.00	8.66	8.42	0.00
49.00	8.66	8.42	0.00
50.00	8.66	8.42	0.00
51.00	8.66	8.42	0.00
52.00	8.66	8.42	0.00
53.00	8.66	8.42	0.00
54.00	8.66	8.42	0.00
55.00	8.66	8.42	0.00
56.00	8.66	8.42	0.00
57.00	8.66	8.42	0.00
58.00	8.66	8.42	0.00
59.00	8.66	8.42	0.00
60.00	8.66	8.42	0.00
61.00	8.66	8.42	0.00
62.00	8.66	8.42	0.00
63.00	8.66	8.42	0.00
64.00	8.66	8.42	0.00
65.00	8.66	8.42	0.00
66.00	8.66	8.42	0.00
67.00	8.66	8.42	0.00
68.00	8.66	8.42	0.00
69.00	8.66	8.42	0.00
70.00	8.66	8.42	0.00
71.00	8.66	8.42	0.00
72.00	8.66	8.42	0.00

Summary for Subcatchment 2: A1 ON-SITE (PERV)

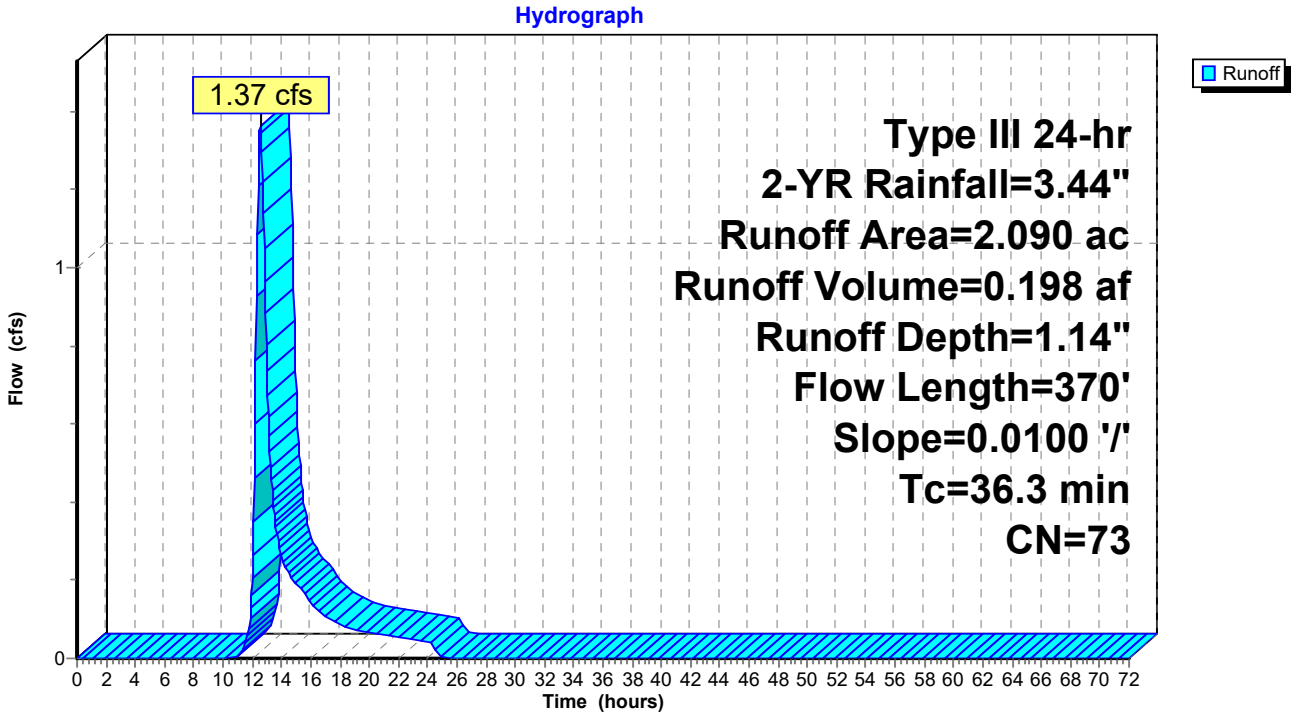
Runoff = 1.37 cfs @ 12.55 hrs, Volume= 0.198 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
1.000	74	>75% Grass cover, Good, HSG C
1.090	72	Woods/grass comb., Good, HSG C
2.090	73	Weighted Average
2.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.3	100	0.0100	0.06		**Sheet Flow, A1 ON-SITE (PERV)** Woods: Light underbrush n= 0.400 P2= 3.44"
9.0	270	0.0100	0.50		**Shallow Concentrated Flow, A1 ON-SITE (PERV)** Woodland Kv= 5.0 fps
36.3	370	Total			

Subcatchment 2: A1 ON-SITE (PERV)



Hydrograph for Subcatchment 2: A1 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.00
3.00	0.11	0.00	0.00
4.00	0.15	0.00	0.00
5.00	0.20	0.00	0.00
6.00	0.25	0.00	0.00
7.00	0.31	0.00	0.00
8.00	0.39	0.00	0.00
9.00	0.50	0.00	0.00
10.00	0.65	0.00	0.00
11.00	0.86	0.00	0.00
12.00	1.72	0.21	**0.21**
13.00	2.58	0.61	**0.74**
14.00	2.79	0.73	0.27
15.00	2.94	0.82	0.19
16.00	3.05	0.89	0.14
17.00	3.13	0.94	0.11
18.00	3.19	0.98	0.09
19.00	3.24	1.01	0.07
20.00	3.29	1.04	0.06
21.00	3.33	1.07	0.06
22.00	3.37	1.10	0.05
23.00	3.41	1.12	0.05
24.00	**3.44**	**1.14**	0.04
25.00	3.44	1.14	0.00
26.00	3.44	1.14	0.00
27.00	3.44	1.14	0.00
28.00	3.44	1.14	0.00
29.00	3.44	1.14	0.00
30.00	3.44	1.14	0.00
31.00	3.44	1.14	0.00
32.00	3.44	1.14	0.00
33.00	3.44	1.14	0.00
34.00	3.44	1.14	0.00
35.00	3.44	1.14	0.00
36.00	3.44	1.14	0.00
37.00	3.44	1.14	0.00
38.00	3.44	1.14	0.00
39.00	3.44	1.14	0.00
40.00	3.44	1.14	0.00
41.00	3.44	1.14	0.00
42.00	3.44	1.14	0.00
43.00	3.44	1.14	0.00
44.00	3.44	1.14	0.00
45.00	3.44	1.14	0.00
46.00	3.44	1.14	0.00
47.00	3.44	1.14	0.00
48.00	3.44	1.14	0.00
49.00	3.44	1.14	0.00
50.00	3.44	1.14	0.00
51.00	3.44	1.14	0.00
52.00	3.44	1.14	0.00
53.00	3.44	1.14	0.00
54.00	3.44	1.14	0.00
55.00	3.44	1.14	0.00
56.00	3.44	1.14	0.00
57.00	3.44	1.14	0.00
58.00	3.44	1.14	0.00
59.00	3.44	1.14	0.00
60.00	3.44	1.14	0.00
61.00	3.44	1.14	0.00
62.00	3.44	1.14	0.00
63.00	3.44	1.14	0.00
64.00	3.44	1.14	0.00
65.00	3.44	1.14	0.00
66.00	3.44	1.14	0.00
67.00	3.44	1.14	0.00
68.00	3.44	1.14	0.00
69.00	3.44	1.14	0.00
70.00	3.44	1.14	0.00
71.00	3.44	1.14	0.00
72.00	3.44	1.14	0.00

Summary for Subcatchment 2: A1 ON-SITE (PERV)

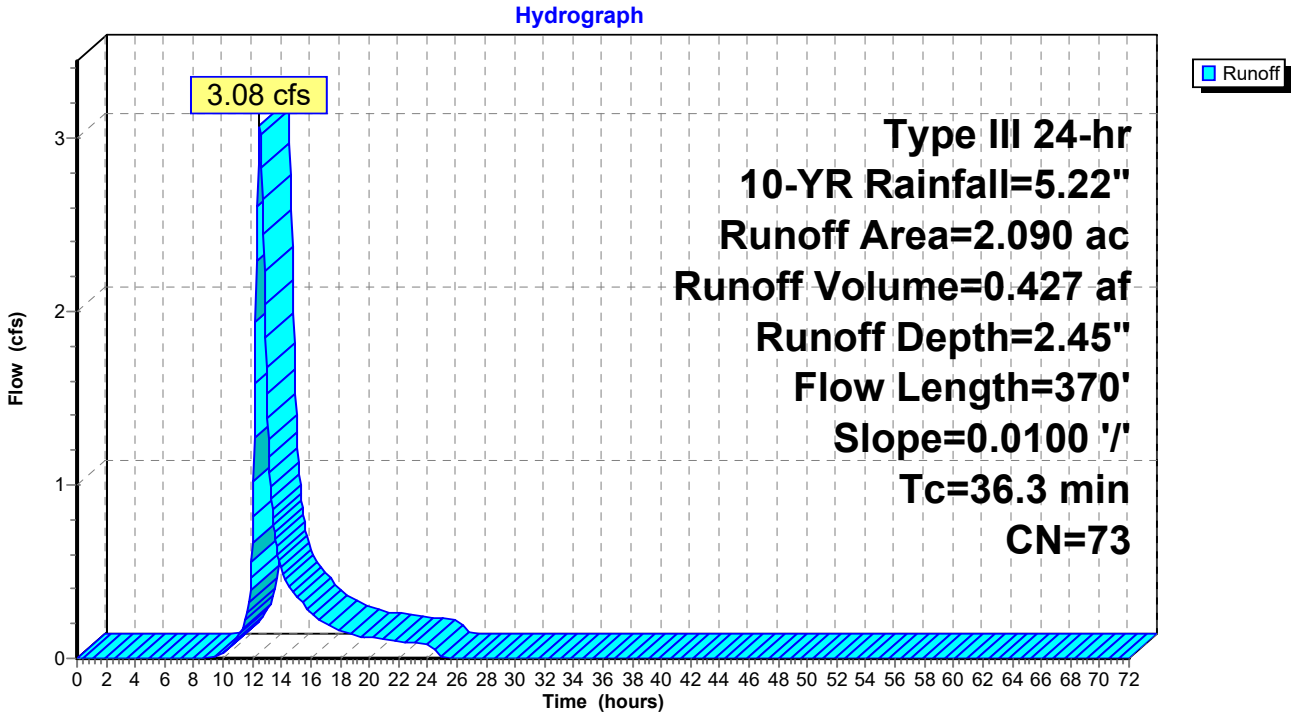
Runoff = 3.08 cfs @ 12.52 hrs, Volume= 0.427 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
1.000	74	>75% Grass cover, Good, HSG C
1.090	72	Woods/grass comb., Good, HSG C
2.090	73	Weighted Average
2.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.3	100	0.0100	0.06		**Sheet Flow, A1 ON-SITE (PERV)** Woods: Light underbrush n= 0.400 P2= 3.44"
9.0	270	0.0100	0.50		**Shallow Concentrated Flow, A1 ON-SITE (PERV)** Woodland Kv= 5.0 fps
36.3	370	Total			

Subcatchment 2: A1 ON-SITE (PERV)



Hydrograph for Subcatchment 2: A1 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.16	0.00	0.00
4.00	0.22	0.00	0.00
5.00	0.30	0.00	0.00
6.00	0.38	0.00	0.00
7.00	0.47	0.00	0.00
8.00	0.60	0.00	0.00
9.00	0.76	0.00	0.00
10.00	0.99	0.02	0.03
11.00	1.30	0.07	0.12
12.00	2.61	0.63	**0.67**
13.00	3.91	1.47	**1.53**
14.00	4.23	1.70	0.51
15.00	4.46	1.86	0.36
16.00	4.62	1.99	0.27
17.00	4.75	2.08	0.20
18.00	4.84	2.16	0.16
19.00	4.92	2.22	0.13
20.00	5.00	2.28	0.12
21.00	5.06	2.33	0.11
22.00	5.12	2.37	0.10
23.00	5.17	2.42	0.09
24.00	**5.22**	**2.45**	0.08
25.00	5.22	2.45	0.01
26.00	5.22	2.45	0.00
27.00	5.22	2.45	0.00
28.00	5.22	2.45	0.00
29.00	5.22	2.45	0.00
30.00	5.22	2.45	0.00
31.00	5.22	2.45	0.00
32.00	5.22	2.45	0.00
33.00	5.22	2.45	0.00
34.00	5.22	2.45	0.00
35.00	5.22	2.45	0.00
36.00	5.22	2.45	0.00
37.00	5.22	2.45	0.00
38.00	5.22	2.45	0.00
39.00	5.22	2.45	0.00
40.00	5.22	2.45	0.00
41.00	5.22	2.45	0.00
42.00	5.22	2.45	0.00
43.00	5.22	2.45	0.00
44.00	5.22	2.45	0.00
45.00	5.22	2.45	0.00
46.00	5.22	2.45	0.00
47.00	5.22	2.45	0.00
48.00	5.22	2.45	0.00
49.00	5.22	2.45	0.00
50.00	5.22	2.45	0.00
51.00	5.22	2.45	0.00
52.00	5.22	2.45	0.00
53.00	5.22	2.45	0.00
54.00	5.22	2.45	0.00
55.00	5.22	2.45	0.00
56.00	5.22	2.45	0.00
57.00	5.22	2.45	0.00
58.00	5.22	2.45	0.00
59.00	5.22	2.45	0.00
60.00	5.22	2.45	0.00
61.00	5.22	2.45	0.00
62.00	5.22	2.45	0.00
63.00	5.22	2.45	0.00
64.00	5.22	2.45	0.00
65.00	5.22	2.45	0.00
66.00	5.22	2.45	0.00
67.00	5.22	2.45	0.00
68.00	5.22	2.45	0.00
69.00	5.22	2.45	0.00
70.00	5.22	2.45	0.00
71.00	5.22	2.45	0.00
72.00	5.22	2.45	0.00

Summary for Subcatchment 2: A1 ON-SITE (PERV)

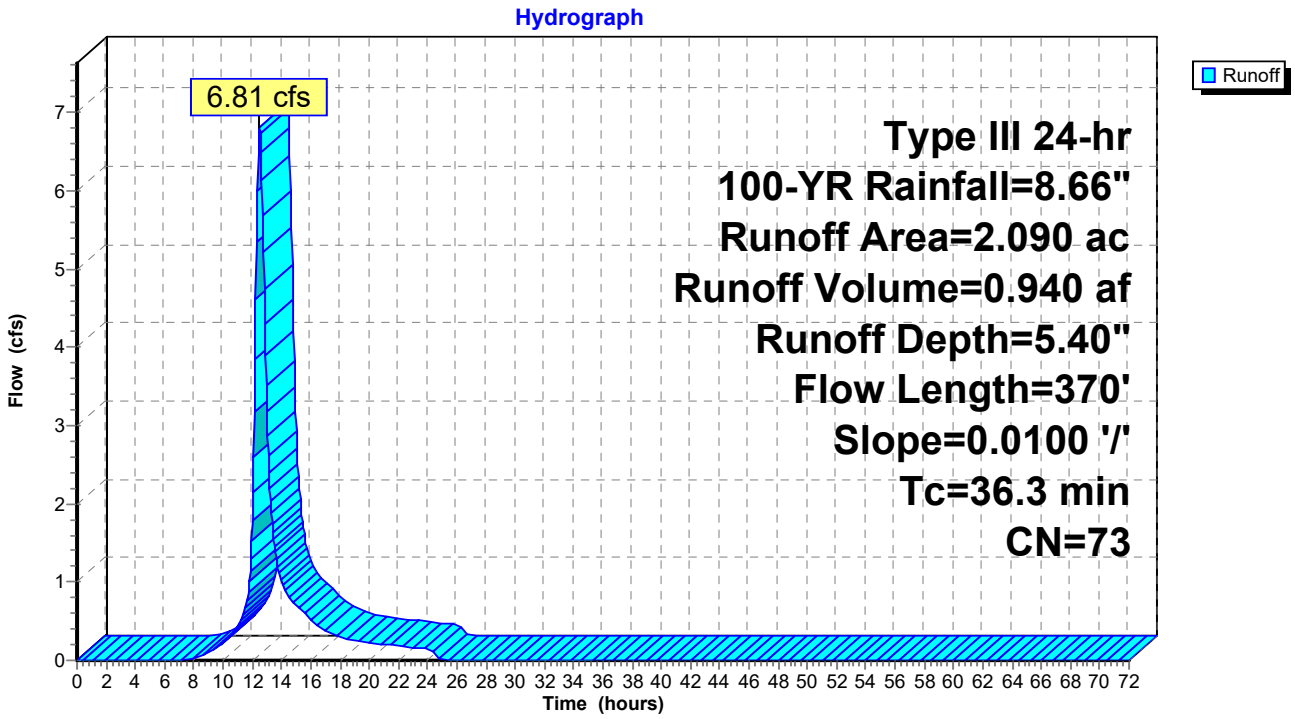
Runoff = 6.81 cfs @ 12.50 hrs, Volume= 0.940 af, Depth= 5.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
1.000	74	>75% Grass cover, Good, HSG C
1.090	72	Woods/grass comb., Good, HSG C
2.090	73	Weighted Average
2.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.3	100	0.0100	0.06		**Sheet Flow, A1 ON-SITE (PERV)** Woods: Light underbrush n= 0.400 P2= 3.44"
9.0	270	0.0100	0.50		**Shallow Concentrated Flow, A1 ON-SITE (PERV)** Woodland Kv= 5.0 fps
36.3	370	Total			

Subcatchment 2: A1 ON-SITE (PERV)



Hydrograph for Subcatchment 2: A1 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.00	0.00
3.00	0.27	0.00	0.00
4.00	0.37	0.00	0.00
5.00	0.49	0.00	0.00
6.00	0.62	0.00	0.00
7.00	0.78	0.00	0.00
8.00	0.99	0.02	0.03
9.00	1.26	0.06	0.10
10.00	1.64	0.18	0.22
11.00	2.17	0.40	0.45
12.00	4.33	1.77	**1.79**
13.00	6.49	3.50	**3.17**
14.00	7.02	3.96	1.01
15.00	7.40	4.28	0.70
16.00	7.67	4.52	0.52
17.00	7.88	4.70	0.38
18.00	8.04	4.84	0.30
19.00	8.17	4.96	0.25
20.00	8.29	5.07	0.22
21.00	8.40	5.16	0.20
22.00	8.49	5.25	0.19
23.00	8.58	5.33	0.17
24.00	**8.66**	**5.40**	0.15
25.00	8.66	5.40	0.01
26.00	8.66	5.40	0.00
27.00	8.66	5.40	0.00
28.00	8.66	5.40	0.00
29.00	8.66	5.40	0.00
30.00	8.66	5.40	0.00
31.00	8.66	5.40	0.00
32.00	8.66	5.40	0.00
33.00	8.66	5.40	0.00
34.00	8.66	5.40	0.00
35.00	8.66	5.40	0.00
36.00	8.66	5.40	0.00
37.00	8.66	5.40	0.00
38.00	8.66	5.40	0.00
39.00	8.66	5.40	0.00
40.00	8.66	5.40	0.00
41.00	8.66	5.40	0.00
42.00	8.66	5.40	0.00
43.00	8.66	5.40	0.00
44.00	8.66	5.40	0.00
45.00	8.66	5.40	0.00
46.00	8.66	5.40	0.00
47.00	8.66	5.40	0.00
48.00	8.66	5.40	0.00
49.00	8.66	5.40	0.00
50.00	8.66	5.40	0.00
51.00	8.66	5.40	0.00
52.00	8.66	5.40	0.00
53.00	8.66	5.40	0.00
54.00	8.66	5.40	0.00
55.00	8.66	5.40	0.00
56.00	8.66	5.40	0.00
57.00	8.66	5.40	0.00
58.00	8.66	5.40	0.00
59.00	8.66	5.40	0.00
60.00	8.66	5.40	0.00
61.00	8.66	5.40	0.00
62.00	8.66	5.40	0.00
63.00	8.66	5.40	0.00
64.00	8.66	5.40	0.00
65.00	8.66	5.40	0.00
66.00	8.66	5.40	0.00
67.00	8.66	5.40	0.00
68.00	8.66	5.40	0.00
69.00	8.66	5.40	0.00
70.00	8.66	5.40	0.00
71.00	8.66	5.40	0.00
72.00	8.66	5.40	0.00

Summary for Subcatchment 4: A1 OFF-SITE (IMP)

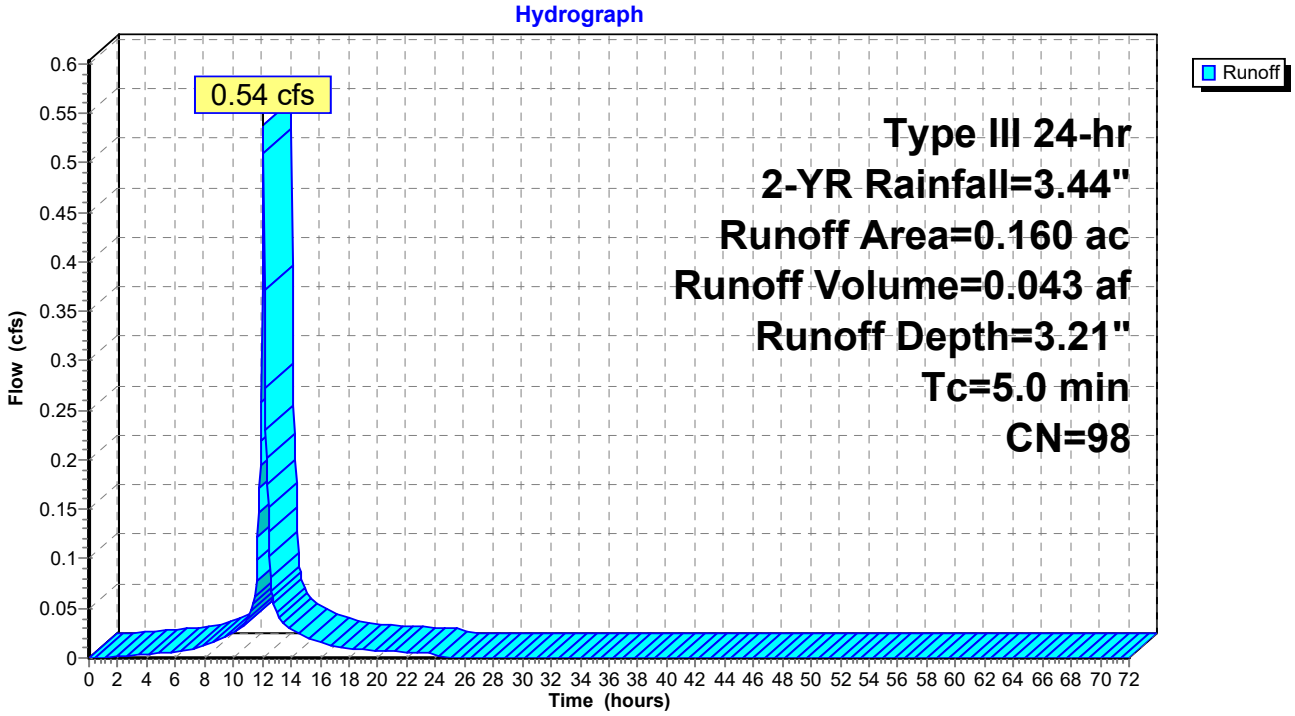
Runoff = 0.54 cfs @ 12.07 hrs, Volume= 0.043 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
0.160	98	Paved roads w/curbs & sewers, HSG C
0.160		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, DIRECT ENTRY**

Subcatchment 4: A1 OFF-SITE (IMP)



Hydrograph for Subcatchment 4: A1 OFF-SITE (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.00
3.00	0.11	0.02	0.00
4.00	0.15	0.04	0.00
5.00	0.20	0.07	0.01
6.00	0.25	0.10	0.01
7.00	0.31	0.15	0.01
8.00	0.39	0.22	0.01
9.00	0.50	0.32	0.02
10.00	0.65	0.46	0.02
11.00	0.86	0.66	0.04
12.00	1.72	1.50	**0.38**
13.00	2.58	2.35	**0.04**
14.00	2.79	2.56	0.03
15.00	2.94	2.71	0.02
16.00	3.05	2.82	0.01
17.00	3.13	2.90	0.01
18.00	3.19	2.96	0.01
19.00	3.24	3.01	0.01
20.00	3.29	3.06	0.01
21.00	3.33	3.10	0.01
22.00	3.37	3.14	0.01
23.00	3.41	3.18	0.01
24.00	**3.44**	**3.21**	0.00
25.00	3.44	3.21	0.00
26.00	3.44	3.21	0.00
27.00	3.44	3.21	0.00
28.00	3.44	3.21	0.00
29.00	3.44	3.21	0.00
30.00	3.44	3.21	0.00
31.00	3.44	3.21	0.00
32.00	3.44	3.21	0.00
33.00	3.44	3.21	0.00
34.00	3.44	3.21	0.00
35.00	3.44	3.21	0.00
36.00	3.44	3.21	0.00
37.00	3.44	3.21	0.00
38.00	3.44	3.21	0.00
39.00	3.44	3.21	0.00
40.00	3.44	3.21	0.00
41.00	3.44	3.21	0.00
42.00	3.44	3.21	0.00
43.00	3.44	3.21	0.00
44.00	3.44	3.21	0.00
45.00	3.44	3.21	0.00
46.00	3.44	3.21	0.00
47.00	3.44	3.21	0.00
48.00	3.44	3.21	0.00
49.00	3.44	3.21	0.00
50.00	3.44	3.21	0.00
51.00	3.44	3.21	0.00
52.00	3.44	3.21	0.00
53.00	3.44	3.21	0.00
54.00	3.44	3.21	0.00
55.00	3.44	3.21	0.00
56.00	3.44	3.21	0.00
57.00	3.44	3.21	0.00
58.00	3.44	3.21	0.00
59.00	3.44	3.21	0.00
60.00	3.44	3.21	0.00
61.00	3.44	3.21	0.00
62.00	3.44	3.21	0.00
63.00	3.44	3.21	0.00
64.00	3.44	3.21	0.00
65.00	3.44	3.21	0.00
66.00	3.44	3.21	0.00
67.00	3.44	3.21	0.00
68.00	3.44	3.21	0.00
69.00	3.44	3.21	0.00
70.00	3.44	3.21	0.00
71.00	3.44	3.21	0.00
72.00	3.44	3.21	0.00

Summary for Subcatchment 4: A1 OFF-SITE (IMP)

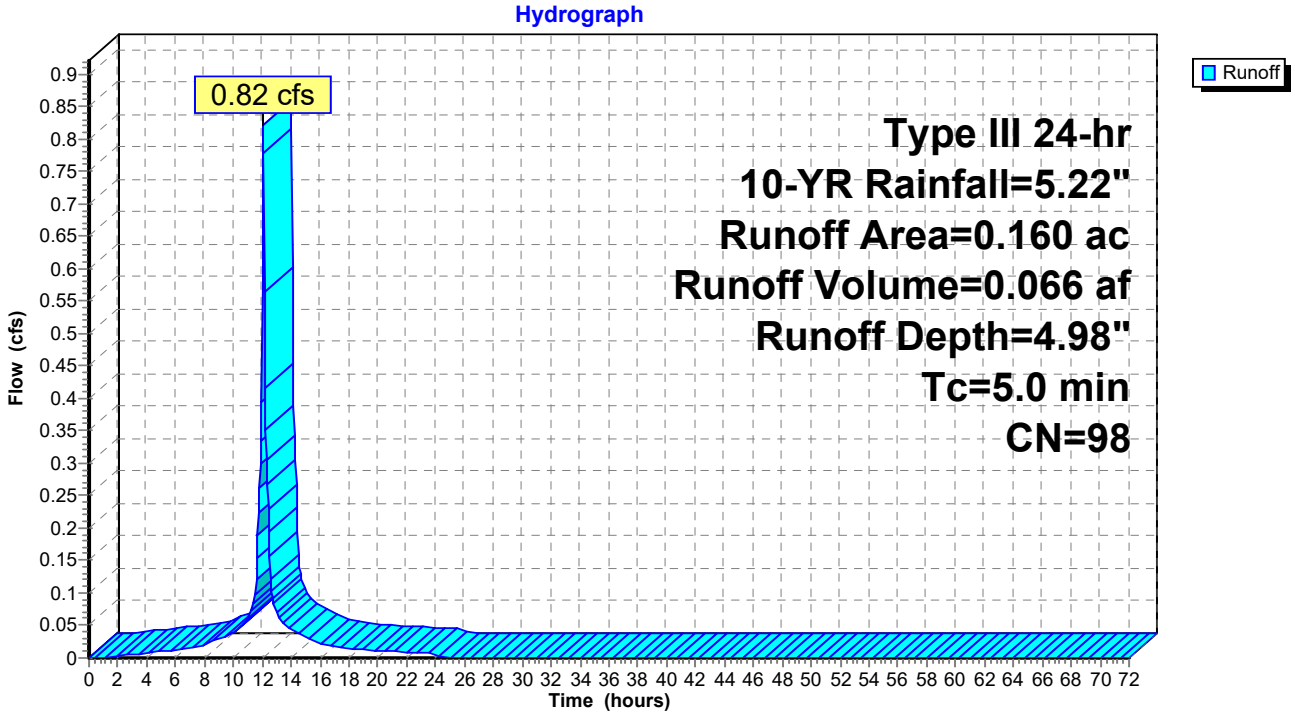
Runoff = 0.82 cfs @ 12.07 hrs, Volume= 0.066 af, Depth= 4.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
0.160	98	Paved roads w/curbs & sewers, HSG C
0.160		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, DIRECT ENTRY**

Subcatchment 4: A1 OFF-SITE (IMP)



Hydrograph for Subcatchment 4: A1 OFF-SITE (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.02	0.00
3.00	0.16	0.04	0.01
4.00	0.22	0.09	0.01
5.00	0.30	0.14	0.01
6.00	0.38	0.21	0.01
7.00	0.47	0.29	0.02
8.00	0.60	0.41	0.02
9.00	0.76	0.56	0.03
10.00	0.99	0.78	0.04
11.00	1.30	1.09	0.06
12.00	2.61	2.38	**0.58**
13.00	3.91	3.68	**0.07**
14.00	4.23	4.00	0.04
15.00	4.46	4.22	0.03
16.00	4.62	4.39	0.02
17.00	4.75	4.51	0.02
18.00	4.84	4.61	0.01
19.00	4.92	4.69	0.01
20.00	5.00	4.76	0.01
21.00	5.06	4.82	0.01
22.00	5.12	4.88	0.01
23.00	5.17	4.94	0.01
24.00	**5.22**	**4.98**	0.01
25.00	5.22	4.98	0.00
26.00	5.22	4.98	0.00
27.00	5.22	4.98	0.00
28.00	5.22	4.98	0.00
29.00	5.22	4.98	0.00
30.00	5.22	4.98	0.00
31.00	5.22	4.98	0.00
32.00	5.22	4.98	0.00
33.00	5.22	4.98	0.00
34.00	5.22	4.98	0.00
35.00	5.22	4.98	0.00
36.00	5.22	4.98	0.00
37.00	5.22	4.98	0.00
38.00	5.22	4.98	0.00
39.00	5.22	4.98	0.00
40.00	5.22	4.98	0.00
41.00	5.22	4.98	0.00
42.00	5.22	4.98	0.00
43.00	5.22	4.98	0.00
44.00	5.22	4.98	0.00
45.00	5.22	4.98	0.00
46.00	5.22	4.98	0.00
47.00	5.22	4.98	0.00
48.00	5.22	4.98	0.00
49.00	5.22	4.98	0.00
50.00	5.22	4.98	0.00
51.00	5.22	4.98	0.00
52.00	5.22	4.98	0.00
53.00	5.22	4.98	0.00
54.00	5.22	4.98	0.00
55.00	5.22	4.98	0.00
56.00	5.22	4.98	0.00
57.00	5.22	4.98	0.00
58.00	5.22	4.98	0.00
59.00	5.22	4.98	0.00
60.00	5.22	4.98	0.00
61.00	5.22	4.98	0.00
62.00	5.22	4.98	0.00
63.00	5.22	4.98	0.00
64.00	5.22	4.98	0.00
65.00	5.22	4.98	0.00
66.00	5.22	4.98	0.00
67.00	5.22	4.98	0.00
68.00	5.22	4.98	0.00
69.00	5.22	4.98	0.00
70.00	5.22	4.98	0.00
71.00	5.22	4.98	0.00
72.00	5.22	4.98	0.00

Summary for Subcatchment 4: A1 OFF-SITE (IMP)

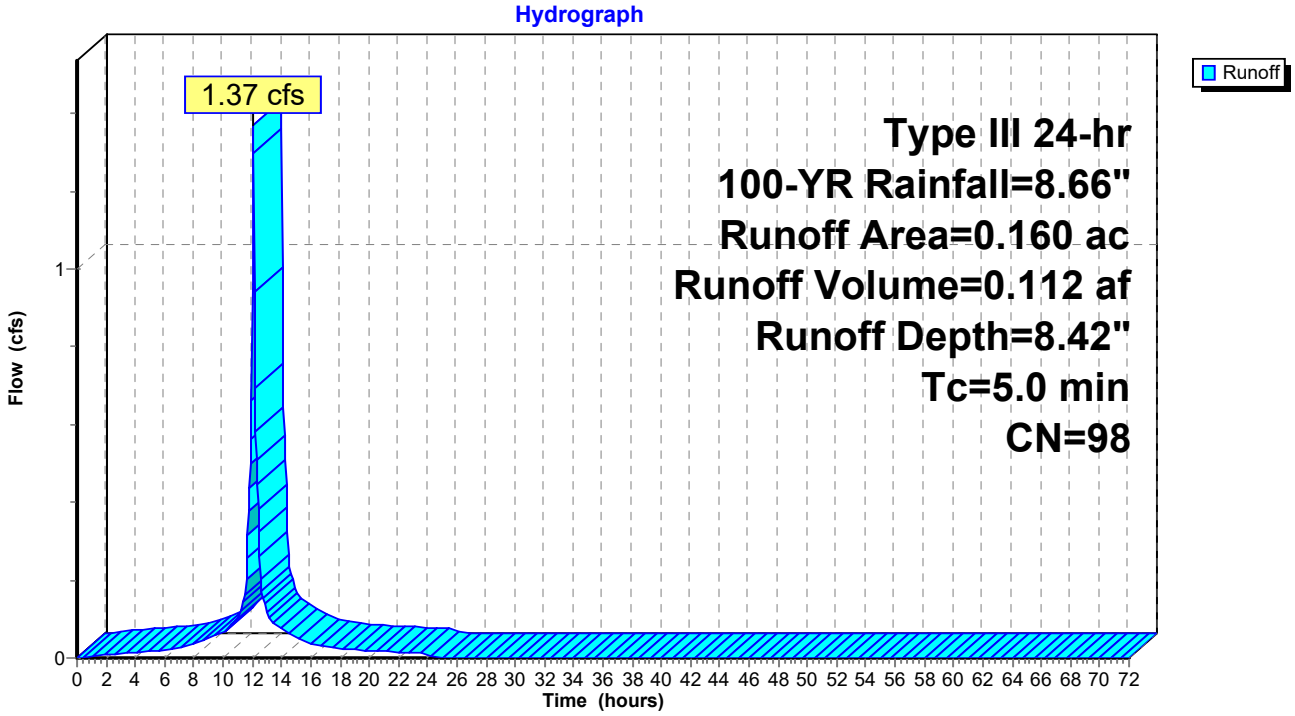
Runoff = 1.37 cfs @ 12.07 hrs, Volume= 0.112 af, Depth= 8.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
0.160	98	Paved roads w/curbs & sewers, HSG C
0.160		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, DIRECT ENTRY**

Subcatchment 4: A1 OFF-SITE (IMP)



Hydrograph for Subcatchment 4: A1 OFF-SITE (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.01	0.00
2.00	0.17	0.05	0.01
3.00	0.27	0.12	0.01
4.00	0.37	0.21	0.02
5.00	0.49	0.31	0.02
6.00	0.62	0.43	0.02
7.00	0.78	0.58	0.03
8.00	0.99	0.78	0.03
9.00	1.26	1.05	0.05
10.00	1.64	1.41	0.07
11.00	2.17	1.94	0.10
12.00	4.33	4.09	**0.96**
13.00	6.49	6.26	**0.11**
14.00	7.02	6.78	0.07
15.00	7.40	7.16	0.05
16.00	7.67	7.43	0.04
17.00	7.88	7.64	0.03
18.00	8.04	7.80	0.02
19.00	8.17	7.93	0.02
20.00	8.29	8.05	0.02
21.00	8.40	8.16	0.02
22.00	8.49	8.25	0.02
23.00	8.58	8.34	0.01
24.00	**8.66**	**8.42**	0.01
25.00	8.66	8.42	0.00
26.00	8.66	8.42	0.00
27.00	8.66	8.42	0.00
28.00	8.66	8.42	0.00
29.00	8.66	8.42	0.00
30.00	8.66	8.42	0.00
31.00	8.66	8.42	0.00
32.00	8.66	8.42	0.00
33.00	8.66	8.42	0.00
34.00	8.66	8.42	0.00
35.00	8.66	8.42	0.00
36.00	8.66	8.42	0.00
37.00	8.66	8.42	0.00
38.00	8.66	8.42	0.00
39.00	8.66	8.42	0.00
40.00	8.66	8.42	0.00
41.00	8.66	8.42	0.00
42.00	8.66	8.42	0.00
43.00	8.66	8.42	0.00
44.00	8.66	8.42	0.00
45.00	8.66	8.42	0.00
46.00	8.66	8.42	0.00
47.00	8.66	8.42	0.00
48.00	8.66	8.42	0.00
49.00	8.66	8.42	0.00
50.00	8.66	8.42	0.00
51.00	8.66	8.42	0.00
52.00	8.66	8.42	0.00
53.00	8.66	8.42	0.00
54.00	8.66	8.42	0.00
55.00	8.66	8.42	0.00
56.00	8.66	8.42	0.00
57.00	8.66	8.42	0.00
58.00	8.66	8.42	0.00
59.00	8.66	8.42	0.00
60.00	8.66	8.42	0.00
61.00	8.66	8.42	0.00
62.00	8.66	8.42	0.00
63.00	8.66	8.42	0.00
64.00	8.66	8.42	0.00
65.00	8.66	8.42	0.00
66.00	8.66	8.42	0.00
67.00	8.66	8.42	0.00
68.00	8.66	8.42	0.00
69.00	8.66	8.42	0.00
70.00	8.66	8.42	0.00
71.00	8.66	8.42	0.00
72.00	8.66	8.42	0.00

Summary for Subcatchment 8: A2 ON-SITE (IMP)

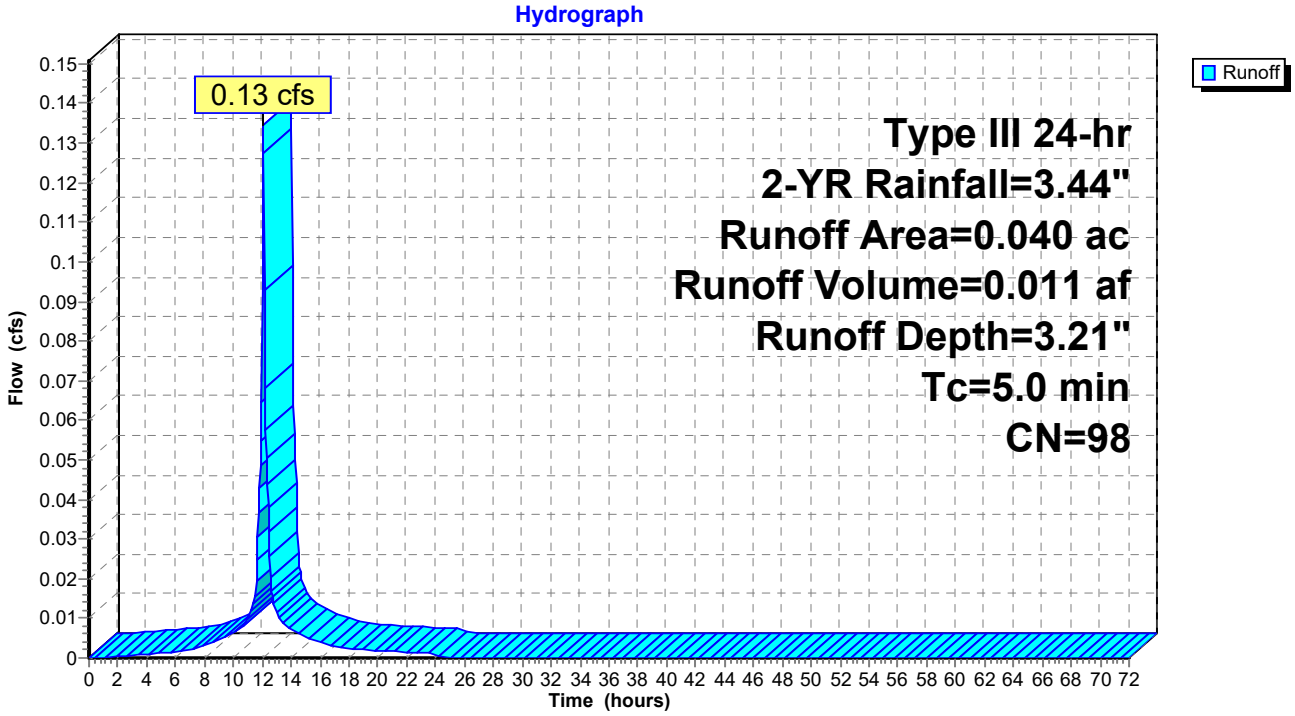
Runoff = 0.13 cfs @ 12.07 hrs, Volume= 0.011 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
0.040	98	Paved parking, HSG C
0.040		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, DIRECT ENTRY**

Subcatchment 8: A2 ON-SITE (IMP)



Hydrograph for Subcatchment 8: A2 ON-SITE (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.00
3.00	0.11	0.02	0.00
4.00	0.15	0.04	0.00
5.00	0.20	0.07	0.00
6.00	0.25	0.10	0.00
7.00	0.31	0.15	0.00
8.00	0.39	0.22	0.00
9.00	0.50	0.32	0.00
10.00	0.65	0.46	0.01
11.00	0.86	0.66	0.01
12.00	1.72	1.50	**0.09**
13.00	2.58	2.35	**0.01**
14.00	2.79	2.56	0.01
15.00	2.94	2.71	0.01
16.00	3.05	2.82	0.00
17.00	3.13	2.90	0.00
18.00	3.19	2.96	0.00
19.00	3.24	3.01	0.00
20.00	3.29	3.06	0.00
21.00	3.33	3.10	0.00
22.00	3.37	3.14	0.00
23.00	3.41	3.18	0.00
24.00	**3.44**	**3.21**	0.00
25.00	3.44	3.21	0.00
26.00	3.44	3.21	0.00
27.00	3.44	3.21	0.00
28.00	3.44	3.21	0.00
29.00	3.44	3.21	0.00
30.00	3.44	3.21	0.00
31.00	3.44	3.21	0.00
32.00	3.44	3.21	0.00
33.00	3.44	3.21	0.00
34.00	3.44	3.21	0.00
35.00	3.44	3.21	0.00
36.00	3.44	3.21	0.00
37.00	3.44	3.21	0.00
38.00	3.44	3.21	0.00
39.00	3.44	3.21	0.00
40.00	3.44	3.21	0.00
41.00	3.44	3.21	0.00
42.00	3.44	3.21	0.00
43.00	3.44	3.21	0.00
44.00	3.44	3.21	0.00
45.00	3.44	3.21	0.00
46.00	3.44	3.21	0.00
47.00	3.44	3.21	0.00
48.00	3.44	3.21	0.00
49.00	3.44	3.21	0.00
50.00	3.44	3.21	0.00
51.00	3.44	3.21	0.00
52.00	3.44	3.21	0.00
53.00	3.44	3.21	0.00
54.00	3.44	3.21	0.00
55.00	3.44	3.21	0.00
56.00	3.44	3.21	0.00
57.00	3.44	3.21	0.00
58.00	3.44	3.21	0.00
59.00	3.44	3.21	0.00
60.00	3.44	3.21	0.00
61.00	3.44	3.21	0.00
62.00	3.44	3.21	0.00
63.00	3.44	3.21	0.00
64.00	3.44	3.21	0.00
65.00	3.44	3.21	0.00
66.00	3.44	3.21	0.00
67.00	3.44	3.21	0.00
68.00	3.44	3.21	0.00
69.00	3.44	3.21	0.00
70.00	3.44	3.21	0.00
71.00	3.44	3.21	0.00
72.00	3.44	3.21	0.00

Summary for Subcatchment 8: A2 ON-SITE (IMP)

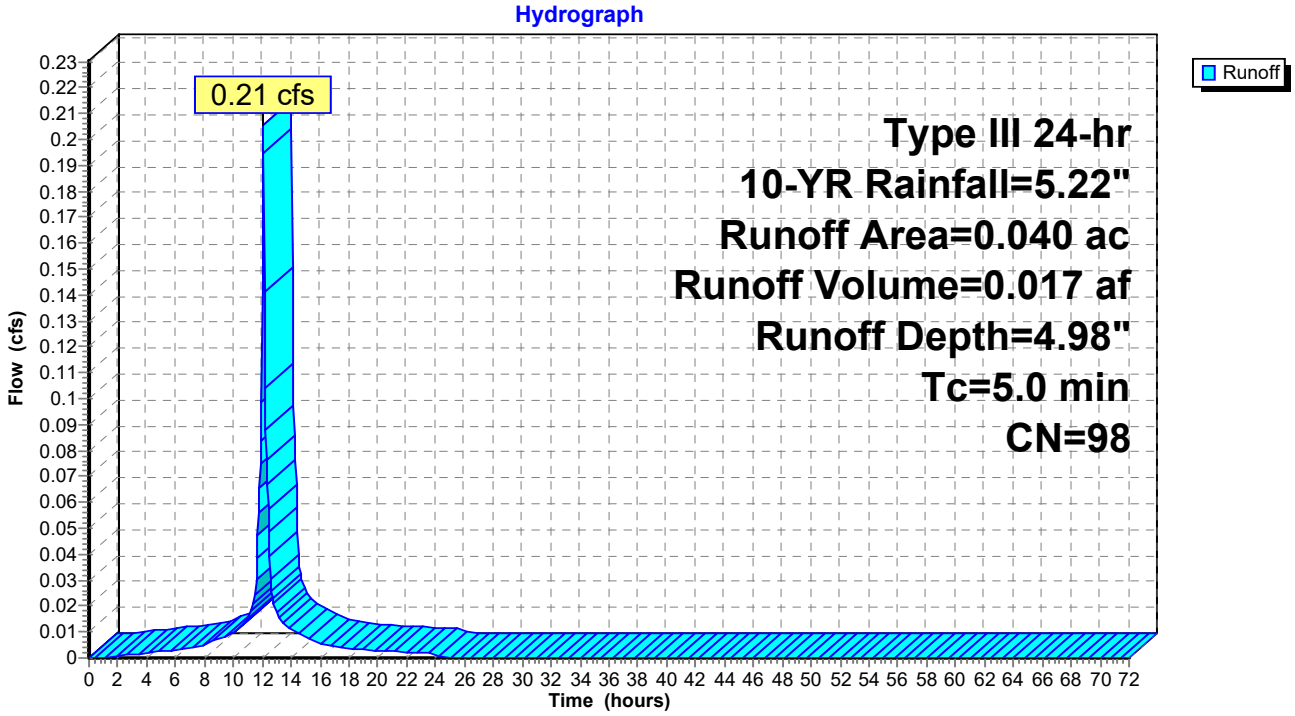
Runoff = 0.21 cfs @ 12.07 hrs, Volume= 0.017 af, Depth= 4.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
0.040	98	Paved parking, HSG C
0.040		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, DIRECT ENTRY**

Subcatchment 8: A2 ON-SITE (IMP)



Hydrograph for Subcatchment 8: A2 ON-SITE (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.02	0.00
3.00	0.16	0.04	0.00
4.00	0.22	0.09	0.00
5.00	0.30	0.14	0.00
6.00	0.38	0.21	0.00
7.00	0.47	0.29	0.00
8.00	0.60	0.41	0.00
9.00	0.76	0.56	0.01
10.00	0.99	0.78	0.01
11.00	1.30	1.09	0.01
12.00	2.61	2.38	**0.14**
13.00	3.91	3.68	**0.02**
14.00	4.23	4.00	0.01
15.00	4.46	4.22	0.01
16.00	4.62	4.39	0.01
17.00	4.75	4.51	0.00
18.00	4.84	4.61	0.00
19.00	4.92	4.69	0.00
20.00	5.00	4.76	0.00
21.00	5.06	4.82	0.00
22.00	5.12	4.88	0.00
23.00	5.17	4.94	0.00
24.00	**5.22**	**4.98**	0.00
25.00	5.22	4.98	0.00
26.00	5.22	4.98	0.00
27.00	5.22	4.98	0.00
28.00	5.22	4.98	0.00
29.00	5.22	4.98	0.00
30.00	5.22	4.98	0.00
31.00	5.22	4.98	0.00
32.00	5.22	4.98	0.00
33.00	5.22	4.98	0.00
34.00	5.22	4.98	0.00
35.00	5.22	4.98	0.00
36.00	5.22	4.98	0.00
37.00	5.22	4.98	0.00
38.00	5.22	4.98	0.00
39.00	5.22	4.98	0.00
40.00	5.22	4.98	0.00
41.00	5.22	4.98	0.00
42.00	5.22	4.98	0.00
43.00	5.22	4.98	0.00
44.00	5.22	4.98	0.00
45.00	5.22	4.98	0.00
46.00	5.22	4.98	0.00
47.00	5.22	4.98	0.00
48.00	5.22	4.98	0.00
49.00	5.22	4.98	0.00
50.00	5.22	4.98	0.00
51.00	5.22	4.98	0.00
52.00	5.22	4.98	0.00
53.00	5.22	4.98	0.00
54.00	5.22	4.98	0.00
55.00	5.22	4.98	0.00
56.00	5.22	4.98	0.00
57.00	5.22	4.98	0.00
58.00	5.22	4.98	0.00
59.00	5.22	4.98	0.00
60.00	5.22	4.98	0.00
61.00	5.22	4.98	0.00
62.00	5.22	4.98	0.00
63.00	5.22	4.98	0.00
64.00	5.22	4.98	0.00
65.00	5.22	4.98	0.00
66.00	5.22	4.98	0.00
67.00	5.22	4.98	0.00
68.00	5.22	4.98	0.00
69.00	5.22	4.98	0.00
70.00	5.22	4.98	0.00
71.00	5.22	4.98	0.00
72.00	5.22	4.98	0.00

Summary for Subcatchment 8: A2 ON-SITE (IMP)

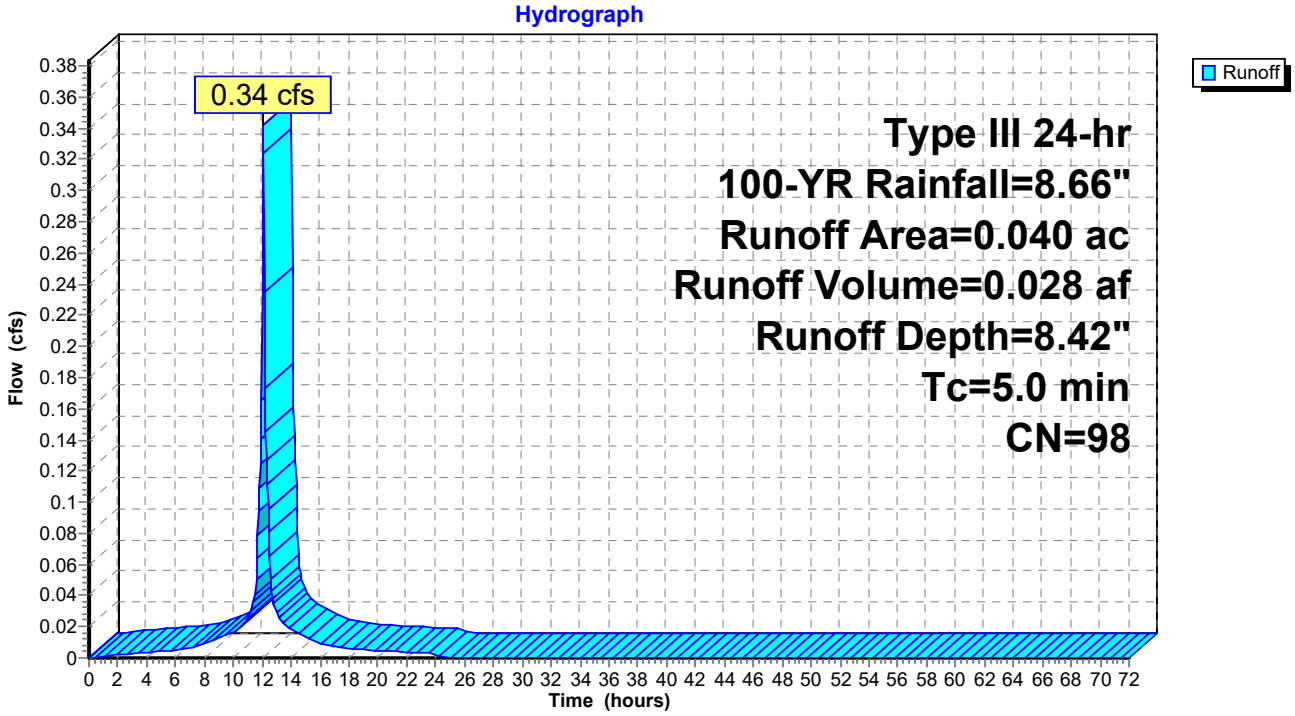
Runoff = 0.34 cfs @ 12.07 hrs, Volume= 0.028 af, Depth= 8.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
0.040	98	Paved parking, HSG C
0.040		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, DIRECT ENTRY**

Subcatchment 8: A2 ON-SITE (IMP)



Hydrograph for Subcatchment 8: A2 ON-SITE (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.01	0.00
2.00	0.17	0.05	0.00
3.00	0.27	0.12	0.00
4.00	0.37	0.21	0.00
5.00	0.49	0.31	0.00
6.00	0.62	0.43	0.01
7.00	0.78	0.58	0.01
8.00	0.99	0.78	0.01
9.00	1.26	1.05	0.01
10.00	1.64	1.41	0.02
11.00	2.17	1.94	0.02
12.00	4.33	4.09	**0.24**
13.00	6.49	6.26	**0.03**
14.00	7.02	6.78	0.02
15.00	7.40	7.16	0.01
16.00	7.67	7.43	0.01
17.00	7.88	7.64	0.01
18.00	8.04	7.80	0.01
19.00	8.17	7.93	0.01
20.00	8.29	8.05	0.00
21.00	8.40	8.16	0.00
22.00	8.49	8.25	0.00
23.00	8.58	8.34	0.00
24.00	**8.66**	**8.42**	0.00
25.00	8.66	8.42	0.00
26.00	8.66	8.42	0.00
27.00	8.66	8.42	0.00
28.00	8.66	8.42	0.00
29.00	8.66	8.42	0.00
30.00	8.66	8.42	0.00
31.00	8.66	8.42	0.00
32.00	8.66	8.42	0.00
33.00	8.66	8.42	0.00
34.00	8.66	8.42	0.00
35.00	8.66	8.42	0.00
36.00	8.66	8.42	0.00
37.00	8.66	8.42	0.00
38.00	8.66	8.42	0.00
39.00	8.66	8.42	0.00
40.00	8.66	8.42	0.00
41.00	8.66	8.42	0.00
42.00	8.66	8.42	0.00
43.00	8.66	8.42	0.00
44.00	8.66	8.42	0.00
45.00	8.66	8.42	0.00
46.00	8.66	8.42	0.00
47.00	8.66	8.42	0.00
48.00	8.66	8.42	0.00
49.00	8.66	8.42	0.00
50.00	8.66	8.42	0.00
51.00	8.66	8.42	0.00
52.00	8.66	8.42	0.00
53.00	8.66	8.42	0.00
54.00	8.66	8.42	0.00
55.00	8.66	8.42	0.00
56.00	8.66	8.42	0.00
57.00	8.66	8.42	0.00
58.00	8.66	8.42	0.00
59.00	8.66	8.42	0.00
60.00	8.66	8.42	0.00
61.00	8.66	8.42	0.00
62.00	8.66	8.42	0.00
63.00	8.66	8.42	0.00
64.00	8.66	8.42	0.00
65.00	8.66	8.42	0.00
66.00	8.66	8.42	0.00
67.00	8.66	8.42	0.00
68.00	8.66	8.42	0.00
69.00	8.66	8.42	0.00
70.00	8.66	8.42	0.00
71.00	8.66	8.42	0.00
72.00	8.66	8.42	0.00

Summary for Subcatchment 9: A2 ON-SITE (PERV)

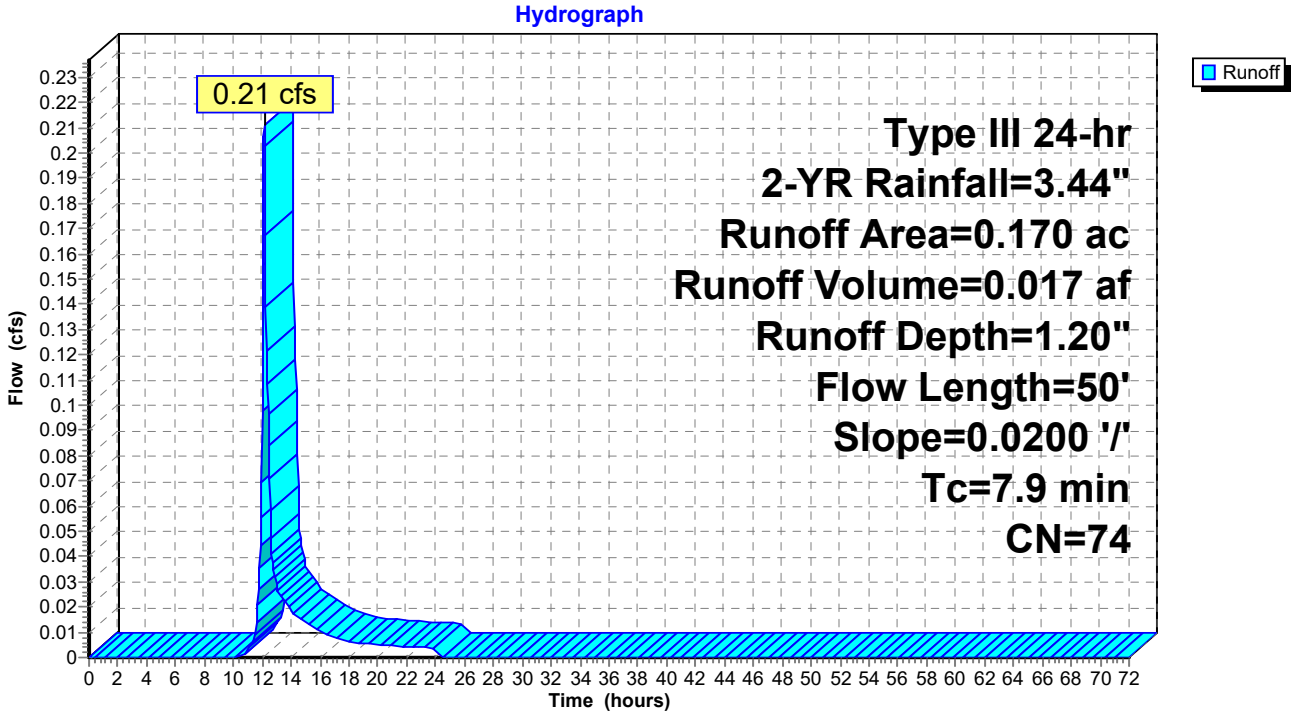
Runoff = 0.21 cfs @ 12.12 hrs, Volume= 0.017 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
0.170	74	>75% Grass cover, Good, HSG C
0.170		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0200	0.11		**Sheet Flow, A2 ON-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 9: A2 ON-SITE (PERV)



Hydrograph for Subcatchment 9: A2 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.00
3.00	0.11	0.00	0.00
4.00	0.15	0.00	0.00
5.00	0.20	0.00	0.00
6.00	0.25	0.00	0.00
7.00	0.31	0.00	0.00
8.00	0.39	0.00	0.00
9.00	0.50	0.00	0.00
10.00	0.65	0.00	0.00
11.00	0.86	0.01	0.00
12.00	1.72	0.23	**0.10**
13.00	2.58	0.65	**0.03**
14.00	2.79	0.78	0.02
15.00	2.94	0.87	0.01
16.00	3.05	0.94	0.01
17.00	3.13	0.99	0.01
18.00	3.19	1.03	0.01
19.00	3.24	1.07	0.01
20.00	3.29	1.10	0.01
21.00	3.33	1.13	0.00
22.00	3.37	1.15	0.00
23.00	3.41	1.18	0.00
24.00	**3.44**	**1.20**	0.00
25.00	3.44	1.20	0.00
26.00	3.44	1.20	0.00
27.00	3.44	1.20	0.00
28.00	3.44	1.20	0.00
29.00	3.44	1.20	0.00
30.00	3.44	1.20	0.00
31.00	3.44	1.20	0.00
32.00	3.44	1.20	0.00
33.00	3.44	1.20	0.00
34.00	3.44	1.20	0.00
35.00	3.44	1.20	0.00
36.00	3.44	1.20	0.00
37.00	3.44	1.20	0.00
38.00	3.44	1.20	0.00
39.00	3.44	1.20	0.00
40.00	3.44	1.20	0.00
41.00	3.44	1.20	0.00
42.00	3.44	1.20	0.00
43.00	3.44	1.20	0.00
44.00	3.44	1.20	0.00
45.00	3.44	1.20	0.00
46.00	3.44	1.20	0.00
47.00	3.44	1.20	0.00
48.00	3.44	1.20	0.00
49.00	3.44	1.20	0.00
50.00	3.44	1.20	0.00
51.00	3.44	1.20	0.00
52.00	3.44	1.20	0.00
53.00	3.44	1.20	0.00
54.00	3.44	1.20	0.00
55.00	3.44	1.20	0.00
56.00	3.44	1.20	0.00
57.00	3.44	1.20	0.00
58.00	3.44	1.20	0.00
59.00	3.44	1.20	0.00
60.00	3.44	1.20	0.00
61.00	3.44	1.20	0.00
62.00	3.44	1.20	0.00
63.00	3.44	1.20	0.00
64.00	3.44	1.20	0.00
65.00	3.44	1.20	0.00
66.00	3.44	1.20	0.00
67.00	3.44	1.20	0.00
68.00	3.44	1.20	0.00
69.00	3.44	1.20	0.00
70.00	3.44	1.20	0.00
71.00	3.44	1.20	0.00
72.00	3.44	1.20	0.00

Summary for Subcatchment 9: A2 ON-SITE (PERV)

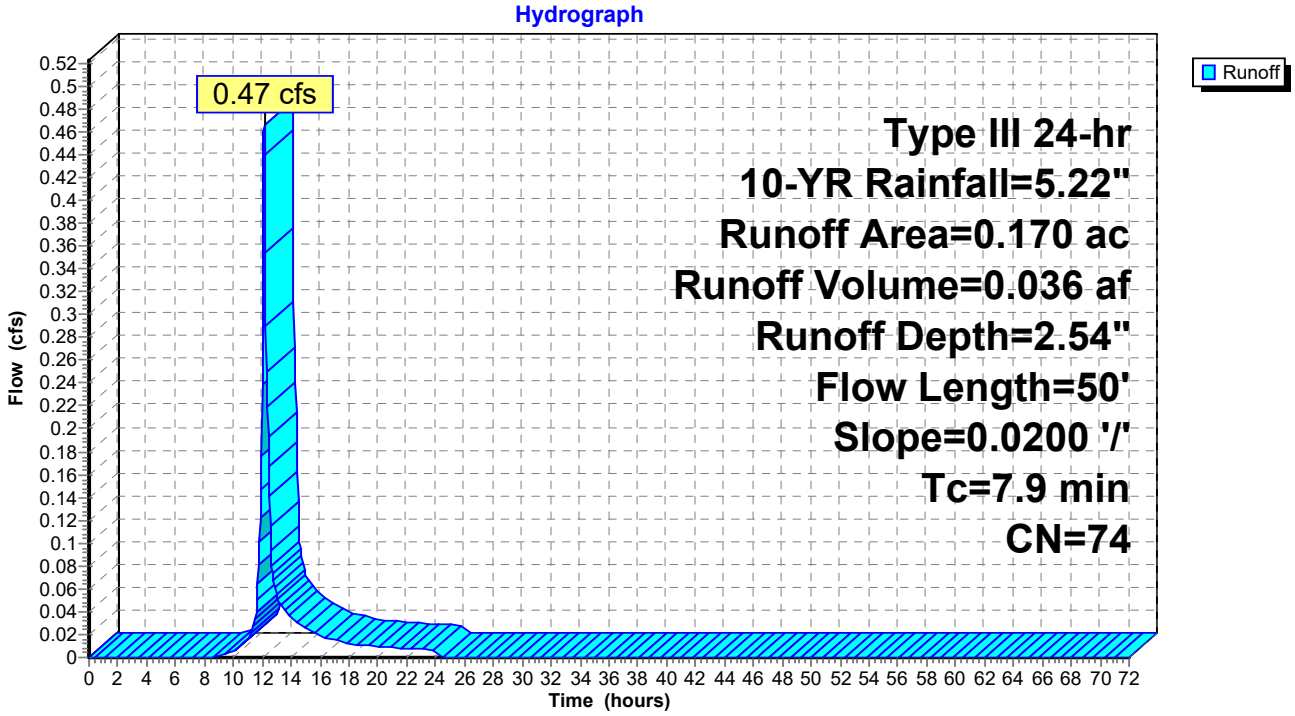
Runoff = 0.47 cfs @ 12.12 hrs, Volume= 0.036 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
0.170	74	>75% Grass cover, Good, HSG C
0.170		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0200	0.11		**Sheet Flow, A2 ON-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 9: A2 ON-SITE (PERV)



Hydrograph for Subcatchment 9: A2 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.16	0.00	0.00
4.00	0.22	0.00	0.00
5.00	0.30	0.00	0.00
6.00	0.38	0.00	0.00
7.00	0.47	0.00	0.00
8.00	0.60	0.00	0.00
9.00	0.76	0.00	0.00
10.00	0.99	0.02	0.01
11.00	1.30	0.09	0.02
12.00	2.61	0.67	**0.24**
13.00	3.91	1.53	**0.05**
14.00	4.23	1.77	0.03
15.00	4.46	1.94	0.03
16.00	4.62	2.07	0.02
17.00	4.75	2.16	0.02
18.00	4.84	2.24	0.01
19.00	4.92	2.30	0.01
20.00	5.00	2.36	0.01
21.00	5.06	2.41	0.01
22.00	5.12	2.46	0.01
23.00	5.17	2.50	0.01
24.00	**5.22**	**2.54**	0.01
25.00	5.22	2.54	0.00
26.00	5.22	2.54	0.00
27.00	5.22	2.54	0.00
28.00	5.22	2.54	0.00
29.00	5.22	2.54	0.00
30.00	5.22	2.54	0.00
31.00	5.22	2.54	0.00
32.00	5.22	2.54	0.00
33.00	5.22	2.54	0.00
34.00	5.22	2.54	0.00
35.00	5.22	2.54	0.00
36.00	5.22	2.54	0.00
37.00	5.22	2.54	0.00
38.00	5.22	2.54	0.00
39.00	5.22	2.54	0.00
40.00	5.22	2.54	0.00
41.00	5.22	2.54	0.00
42.00	5.22	2.54	0.00
43.00	5.22	2.54	0.00
44.00	5.22	2.54	0.00
45.00	5.22	2.54	0.00
46.00	5.22	2.54	0.00
47.00	5.22	2.54	0.00
48.00	5.22	2.54	0.00
49.00	5.22	2.54	0.00
50.00	5.22	2.54	0.00
51.00	5.22	2.54	0.00
52.00	5.22	2.54	0.00
53.00	5.22	2.54	0.00
54.00	5.22	2.54	0.00
55.00	5.22	2.54	0.00
56.00	5.22	2.54	0.00
57.00	5.22	2.54	0.00
58.00	5.22	2.54	0.00
59.00	5.22	2.54	0.00
60.00	5.22	2.54	0.00
61.00	5.22	2.54	0.00
62.00	5.22	2.54	0.00
63.00	5.22	2.54	0.00
64.00	5.22	2.54	0.00
65.00	5.22	2.54	0.00
66.00	5.22	2.54	0.00
67.00	5.22	2.54	0.00
68.00	5.22	2.54	0.00
69.00	5.22	2.54	0.00
70.00	5.22	2.54	0.00
71.00	5.22	2.54	0.00
72.00	5.22	2.54	0.00

Summary for Subcatchment 9: A2 ON-SITE (PERV)

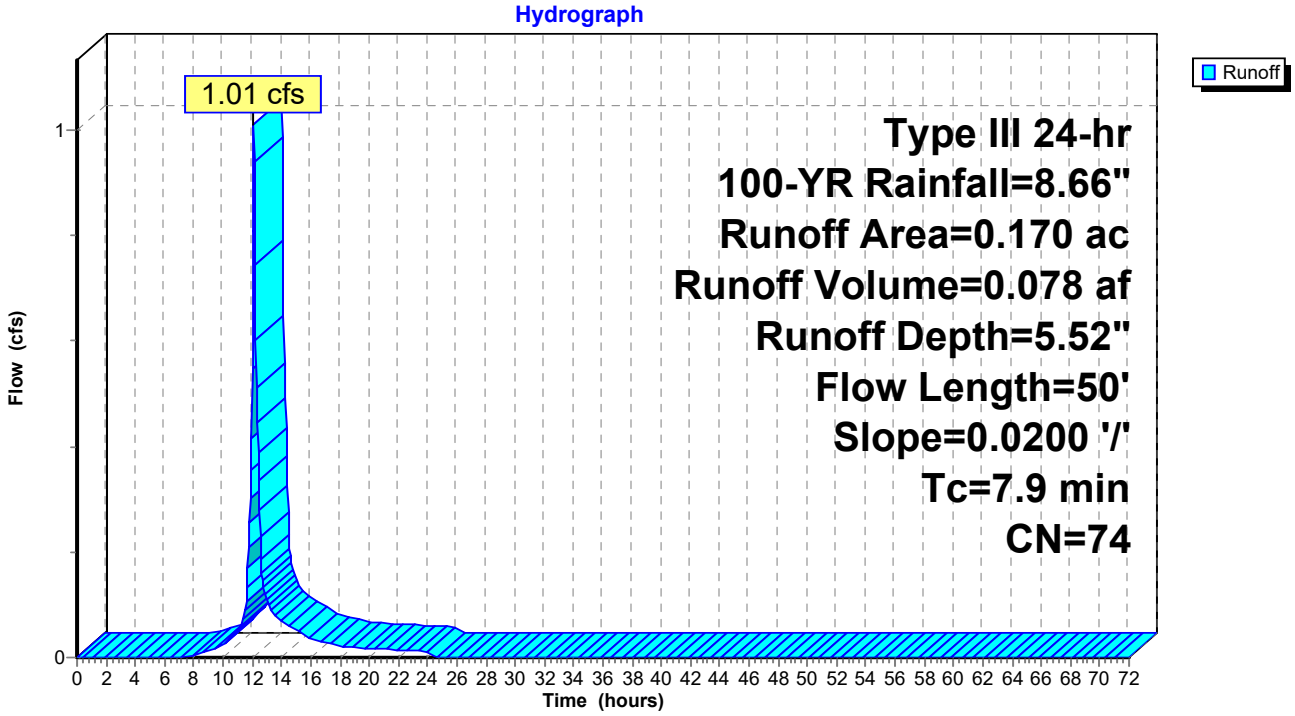
Runoff = 1.01 cfs @ 12.11 hrs, Volume= 0.078 af, Depth= 5.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
0.170	74	>75% Grass cover, Good, HSG C
0.170		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0200	0.11		**Sheet Flow, A2 ON-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 9: A2 ON-SITE (PERV)



Hydrograph for Subcatchment 9: A2 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.00	0.00
3.00	0.27	0.00	0.00
4.00	0.37	0.00	0.00
5.00	0.49	0.00	0.00
6.00	0.62	0.00	0.00
7.00	0.78	0.00	0.00
8.00	0.99	0.02	0.00
9.00	1.26	0.08	0.01
10.00	1.64	0.20	0.03
11.00	2.17	0.43	0.05
12.00	4.33	1.84	**0.55**
13.00	6.49	3.61	**0.11**
14.00	7.02	4.06	0.07
15.00	7.40	4.39	0.05
16.00	7.67	4.63	0.04
17.00	7.88	4.82	0.03
18.00	8.04	4.96	0.02
19.00	8.17	5.08	0.02
20.00	8.29	5.18	0.02
21.00	8.40	5.28	0.02
22.00	8.49	5.37	0.01
23.00	8.58	5.45	0.01
24.00	**8.66**	**5.52**	0.01
25.00	8.66	5.52	0.00
26.00	8.66	5.52	0.00
27.00	8.66	5.52	0.00
28.00	8.66	5.52	0.00
29.00	8.66	5.52	0.00
30.00	8.66	5.52	0.00
31.00	8.66	5.52	0.00
32.00	8.66	5.52	0.00
33.00	8.66	5.52	0.00
34.00	8.66	5.52	0.00
35.00	8.66	5.52	0.00
36.00	8.66	5.52	0.00
37.00	8.66	5.52	0.00
38.00	8.66	5.52	0.00
39.00	8.66	5.52	0.00
40.00	8.66	5.52	0.00
41.00	8.66	5.52	0.00
42.00	8.66	5.52	0.00
43.00	8.66	5.52	0.00
44.00	8.66	5.52	0.00
45.00	8.66	5.52	0.00
46.00	8.66	5.52	0.00
47.00	8.66	5.52	0.00
48.00	8.66	5.52	0.00
49.00	8.66	5.52	0.00
50.00	8.66	5.52	0.00
51.00	8.66	5.52	0.00
52.00	8.66	5.52	0.00
53.00	8.66	5.52	0.00
54.00	8.66	5.52	0.00
55.00	8.66	5.52	0.00
56.00	8.66	5.52	0.00
57.00	8.66	5.52	0.00
58.00	8.66	5.52	0.00
59.00	8.66	5.52	0.00
60.00	8.66	5.52	0.00
61.00	8.66	5.52	0.00
62.00	8.66	5.52	0.00
63.00	8.66	5.52	0.00
64.00	8.66	5.52	0.00
65.00	8.66	5.52	0.00
66.00	8.66	5.52	0.00
67.00	8.66	5.52	0.00
68.00	8.66	5.52	0.00
69.00	8.66	5.52	0.00
70.00	8.66	5.52	0.00
71.00	8.66	5.52	0.00
72.00	8.66	5.52	0.00

Summary for Subcatchment 11: A3 ON-SITE (PERV)

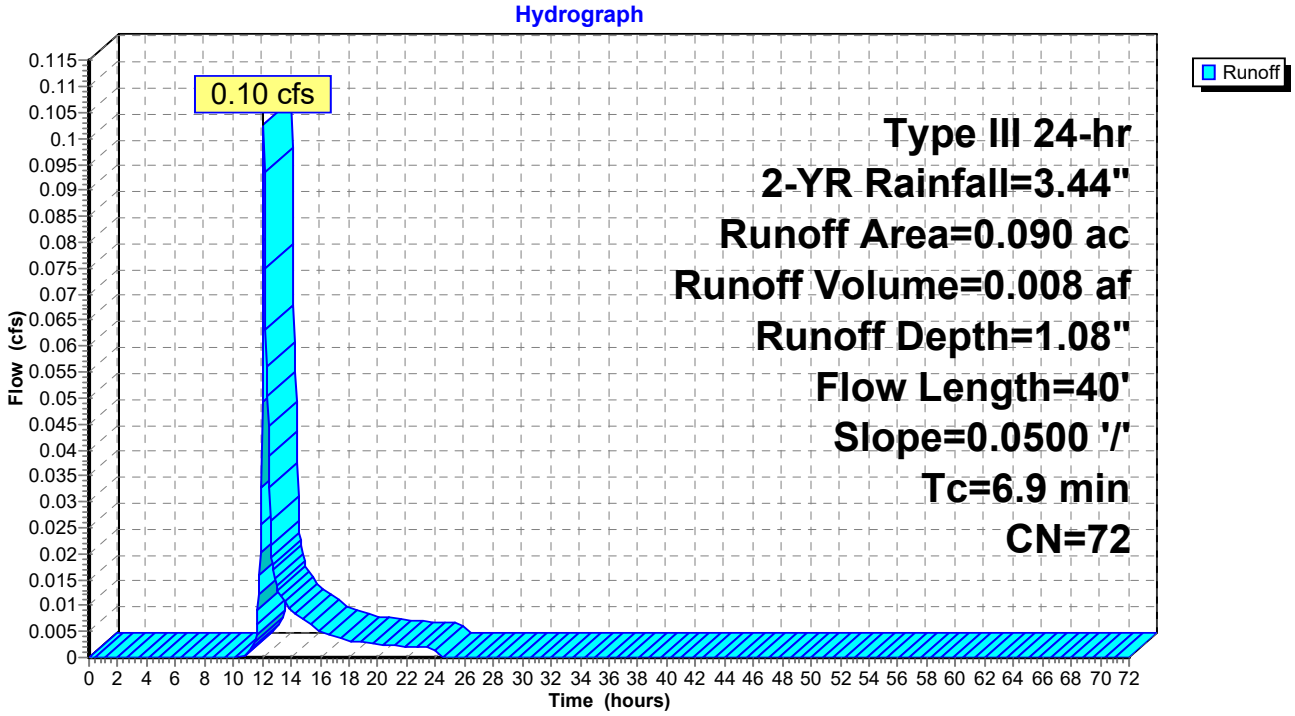
Runoff = 0.10 cfs @ 12.11 hrs, Volume= 0.008 af, Depth= 1.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
0.090	72	Woods/grass comb., Good, HSG C
0.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	40	0.0500	0.10		**Sheet Flow, A3 ON-SITE (PERV)** Woods: Light underbrush n= 0.400 P2= 3.44"

Subcatchment 11: A3 ON-SITE (PERV)



Hydrograph for Subcatchment 11: A3 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.00
3.00	0.11	0.00	0.00
4.00	0.15	0.00	0.00
5.00	0.20	0.00	0.00
6.00	0.25	0.00	0.00
7.00	0.31	0.00	0.00
8.00	0.39	0.00	0.00
9.00	0.50	0.00	0.00
10.00	0.65	0.00	0.00
11.00	0.86	0.00	0.00
12.00	1.72	0.18	**0.05**
13.00	2.58	0.57	**0.01**
14.00	2.79	0.69	0.01
15.00	2.94	0.77	0.01
16.00	3.05	0.84	0.01
17.00	3.13	0.89	0.00
18.00	3.19	0.92	0.00
19.00	3.24	0.96	0.00
20.00	3.29	0.99	0.00
21.00	3.33	1.01	0.00
22.00	3.37	1.04	0.00
23.00	3.41	1.06	0.00
24.00	**3.44**	**1.08**	0.00
25.00	3.44	1.08	0.00
26.00	3.44	1.08	0.00
27.00	3.44	1.08	0.00
28.00	3.44	1.08	0.00
29.00	3.44	1.08	0.00
30.00	3.44	1.08	0.00
31.00	3.44	1.08	0.00
32.00	3.44	1.08	0.00
33.00	3.44	1.08	0.00
34.00	3.44	1.08	0.00
35.00	3.44	1.08	0.00
36.00	3.44	1.08	0.00
37.00	3.44	1.08	0.00
38.00	3.44	1.08	0.00
39.00	3.44	1.08	0.00
40.00	3.44	1.08	0.00
41.00	3.44	1.08	0.00
42.00	3.44	1.08	0.00
43.00	3.44	1.08	0.00
44.00	3.44	1.08	0.00
45.00	3.44	1.08	0.00
46.00	3.44	1.08	0.00
47.00	3.44	1.08	0.00
48.00	3.44	1.08	0.00
49.00	3.44	1.08	0.00
50.00	3.44	1.08	0.00
51.00	3.44	1.08	0.00
52.00	3.44	1.08	0.00
53.00	3.44	1.08	0.00
54.00	3.44	1.08	0.00
55.00	3.44	1.08	0.00
56.00	3.44	1.08	0.00
57.00	3.44	1.08	0.00
58.00	3.44	1.08	0.00
59.00	3.44	1.08	0.00
60.00	3.44	1.08	0.00
61.00	3.44	1.08	0.00
62.00	3.44	1.08	0.00
63.00	3.44	1.08	0.00
64.00	3.44	1.08	0.00
65.00	3.44	1.08	0.00
66.00	3.44	1.08	0.00
67.00	3.44	1.08	0.00
68.00	3.44	1.08	0.00
69.00	3.44	1.08	0.00
70.00	3.44	1.08	0.00
71.00	3.44	1.08	0.00
72.00	3.44	1.08	0.00

Summary for Subcatchment 11: A3 ON-SITE (PERV)

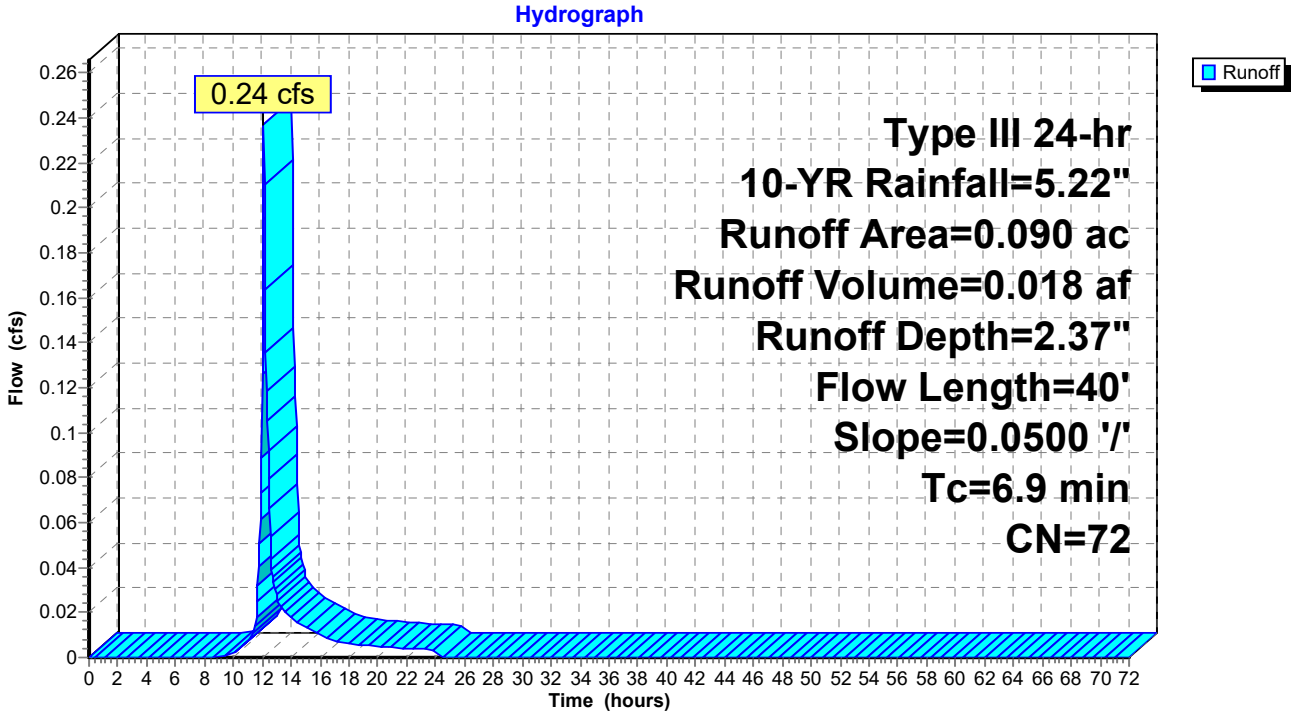
Runoff = 0.24 cfs @ 12.11 hrs, Volume= 0.018 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
0.090	72	Woods/grass comb., Good, HSG C
0.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	40	0.0500	0.10		**Sheet Flow, A3 ON-SITE (PERV)** Woods: Light underbrush n= 0.400 P2= 3.44"

Subcatchment 11: A3 ON-SITE (PERV)



Hydrograph for Subcatchment 11: A3 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.16	0.00	0.00
4.00	0.22	0.00	0.00
5.00	0.30	0.00	0.00
6.00	0.38	0.00	0.00
7.00	0.47	0.00	0.00
8.00	0.60	0.00	0.00
9.00	0.76	0.00	0.00
10.00	0.99	0.01	0.00
11.00	1.30	0.06	0.01
12.00	2.61	0.59	**0.13**
13.00	3.91	1.40	**0.03**
14.00	4.23	1.63	0.02
15.00	4.46	1.79	0.01
16.00	4.62	1.91	0.01
17.00	4.75	2.01	0.01
18.00	4.84	2.08	0.01
19.00	4.92	2.14	0.01
20.00	5.00	2.19	0.00
21.00	5.06	2.24	0.00
22.00	5.12	2.29	0.00
23.00	5.17	2.33	0.00
24.00	**5.22**	**2.37**	0.00
25.00	5.22	2.37	0.00
26.00	5.22	2.37	0.00
27.00	5.22	2.37	0.00
28.00	5.22	2.37	0.00
29.00	5.22	2.37	0.00
30.00	5.22	2.37	0.00
31.00	5.22	2.37	0.00
32.00	5.22	2.37	0.00
33.00	5.22	2.37	0.00
34.00	5.22	2.37	0.00
35.00	5.22	2.37	0.00
36.00	5.22	2.37	0.00
37.00	5.22	2.37	0.00
38.00	5.22	2.37	0.00
39.00	5.22	2.37	0.00
40.00	5.22	2.37	0.00
41.00	5.22	2.37	0.00
42.00	5.22	2.37	0.00
43.00	5.22	2.37	0.00
44.00	5.22	2.37	0.00
45.00	5.22	2.37	0.00
46.00	5.22	2.37	0.00
47.00	5.22	2.37	0.00
48.00	5.22	2.37	0.00
49.00	5.22	2.37	0.00
50.00	5.22	2.37	0.00
51.00	5.22	2.37	0.00
52.00	5.22	2.37	0.00
53.00	5.22	2.37	0.00
54.00	5.22	2.37	0.00
55.00	5.22	2.37	0.00
56.00	5.22	2.37	0.00
57.00	5.22	2.37	0.00
58.00	5.22	2.37	0.00
59.00	5.22	2.37	0.00
60.00	5.22	2.37	0.00
61.00	5.22	2.37	0.00
62.00	5.22	2.37	0.00
63.00	5.22	2.37	0.00
64.00	5.22	2.37	0.00
65.00	5.22	2.37	0.00
66.00	5.22	2.37	0.00
67.00	5.22	2.37	0.00
68.00	5.22	2.37	0.00
69.00	5.22	2.37	0.00
70.00	5.22	2.37	0.00
71.00	5.22	2.37	0.00
72.00	5.22	2.37	0.00

Summary for Subcatchment 11: A3 ON-SITE (PERV)

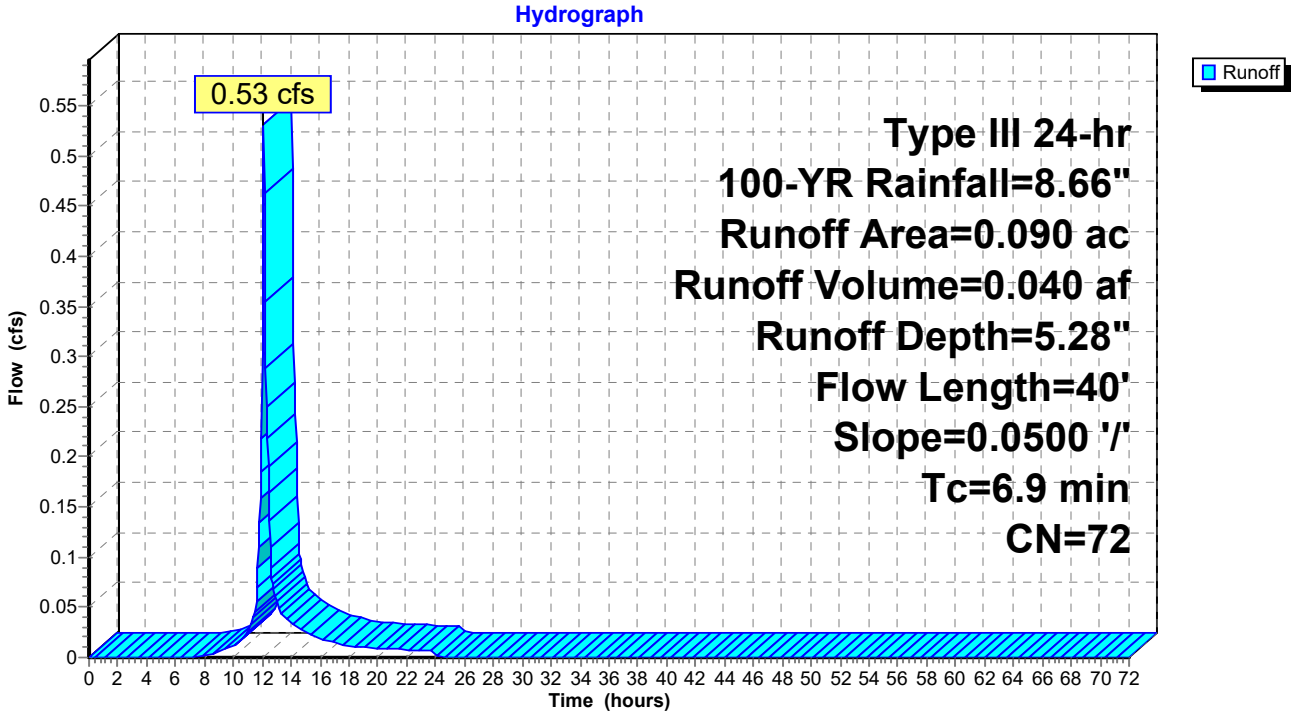
Runoff = 0.53 cfs @ 12.10 hrs, Volume= 0.040 af, Depth= 5.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
0.090	72	Woods/grass comb., Good, HSG C
0.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	40	0.0500	0.10		**Sheet Flow, A3 ON-SITE (PERV)** Woods: Light underbrush n= 0.400 P2= 3.44"

Subcatchment 11: A3 ON-SITE (PERV)



Hydrograph for Subcatchment 11: A3 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.00	0.00
3.00	0.27	0.00	0.00
4.00	0.37	0.00	0.00
5.00	0.49	0.00	0.00
6.00	0.62	0.00	0.00
7.00	0.78	0.00	0.00
8.00	0.99	0.01	0.00
9.00	1.26	0.05	0.01
10.00	1.64	0.16	0.01
11.00	2.17	0.36	0.02
12.00	4.33	1.70	**0.30**
13.00	6.49	3.40	**0.05**
14.00	7.02	3.85	0.03
15.00	7.40	4.17	0.03
16.00	7.67	4.41	0.02
17.00	7.88	4.59	0.01
18.00	8.04	4.73	0.01
19.00	8.17	4.84	0.01
20.00	8.29	4.95	0.01
21.00	8.40	5.04	0.01
22.00	8.49	5.13	0.01
23.00	8.58	5.21	0.01
24.00	**8.66**	**5.28**	0.01
25.00	8.66	5.28	0.00
26.00	8.66	5.28	0.00
27.00	8.66	5.28	0.00
28.00	8.66	5.28	0.00
29.00	8.66	5.28	0.00
30.00	8.66	5.28	0.00
31.00	8.66	5.28	0.00
32.00	8.66	5.28	0.00
33.00	8.66	5.28	0.00
34.00	8.66	5.28	0.00
35.00	8.66	5.28	0.00
36.00	8.66	5.28	0.00
37.00	8.66	5.28	0.00
38.00	8.66	5.28	0.00
39.00	8.66	5.28	0.00
40.00	8.66	5.28	0.00
41.00	8.66	5.28	0.00
42.00	8.66	5.28	0.00
43.00	8.66	5.28	0.00
44.00	8.66	5.28	0.00
45.00	8.66	5.28	0.00
46.00	8.66	5.28	0.00
47.00	8.66	5.28	0.00
48.00	8.66	5.28	0.00
49.00	8.66	5.28	0.00
50.00	8.66	5.28	0.00
51.00	8.66	5.28	0.00
52.00	8.66	5.28	0.00
53.00	8.66	5.28	0.00
54.00	8.66	5.28	0.00
55.00	8.66	5.28	0.00
56.00	8.66	5.28	0.00
57.00	8.66	5.28	0.00
58.00	8.66	5.28	0.00
59.00	8.66	5.28	0.00
60.00	8.66	5.28	0.00
61.00	8.66	5.28	0.00
62.00	8.66	5.28	0.00
63.00	8.66	5.28	0.00
64.00	8.66	5.28	0.00
65.00	8.66	5.28	0.00
66.00	8.66	5.28	0.00
67.00	8.66	5.28	0.00
68.00	8.66	5.28	0.00
69.00	8.66	5.28	0.00
70.00	8.66	5.28	0.00
71.00	8.66	5.28	0.00
72.00	8.66	5.28	0.00

Summary for Subcatchment 13: A4 ON-SITE (IMP)

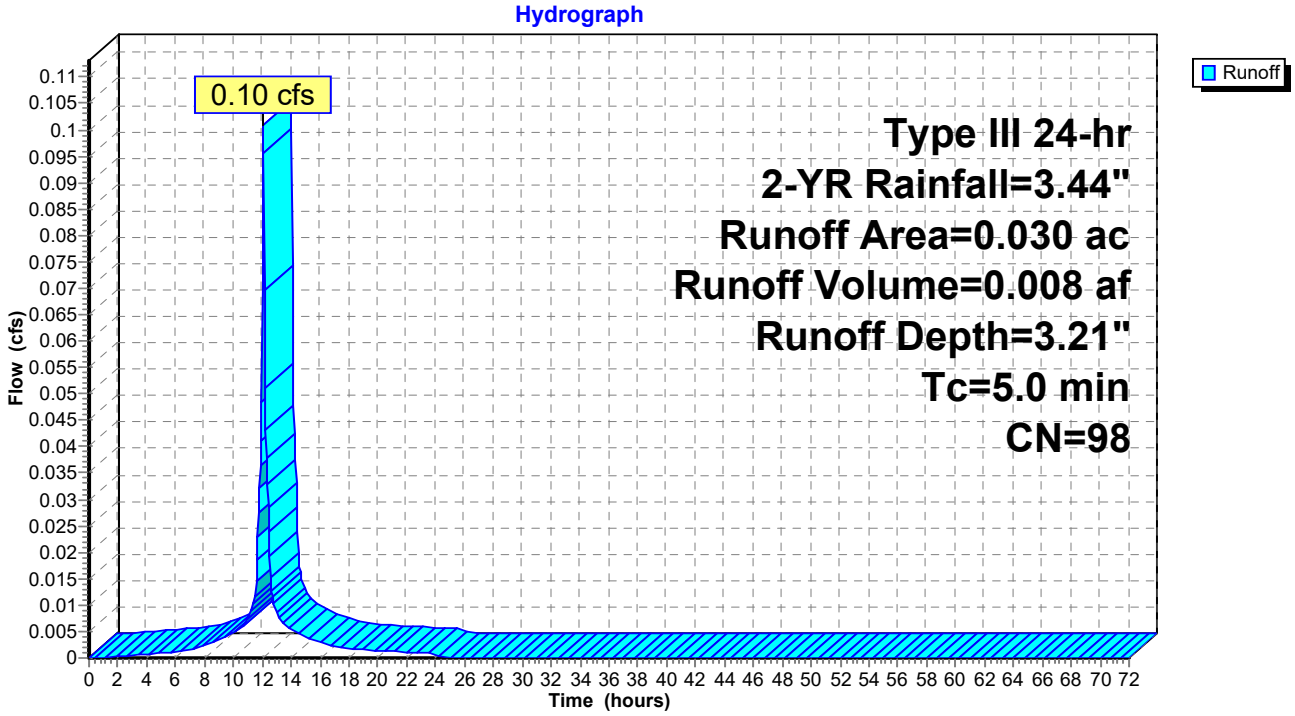
Runoff = 0.10 cfs @ 12.07 hrs, Volume= 0.008 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
0.030	98	Paved parking, HSG C
0.030		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, DIRECT ENTRY**

Subcatchment 13: A4 ON-SITE (IMP)



Hydrograph for Subcatchment 13: A4 ON-SITE (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.00
3.00	0.11	0.02	0.00
4.00	0.15	0.04	0.00
5.00	0.20	0.07	0.00
6.00	0.25	0.10	0.00
7.00	0.31	0.15	0.00
8.00	0.39	0.22	0.00
9.00	0.50	0.32	0.00
10.00	0.65	0.46	0.00
11.00	0.86	0.66	0.01
12.00	1.72	1.50	**0.07**
13.00	2.58	2.35	**0.01**
14.00	2.79	2.56	0.01
15.00	2.94	2.71	0.00
16.00	3.05	2.82	0.00
17.00	3.13	2.90	0.00
18.00	3.19	2.96	0.00
19.00	3.24	3.01	0.00
20.00	3.29	3.06	0.00
21.00	3.33	3.10	0.00
22.00	3.37	3.14	0.00
23.00	3.41	3.18	0.00
24.00	**3.44**	**3.21**	0.00
25.00	3.44	3.21	0.00
26.00	3.44	3.21	0.00
27.00	3.44	3.21	0.00
28.00	3.44	3.21	0.00
29.00	3.44	3.21	0.00
30.00	3.44	3.21	0.00
31.00	3.44	3.21	0.00
32.00	3.44	3.21	0.00
33.00	3.44	3.21	0.00
34.00	3.44	3.21	0.00
35.00	3.44	3.21	0.00
36.00	3.44	3.21	0.00
37.00	3.44	3.21	0.00
38.00	3.44	3.21	0.00
39.00	3.44	3.21	0.00
40.00	3.44	3.21	0.00
41.00	3.44	3.21	0.00
42.00	3.44	3.21	0.00
43.00	3.44	3.21	0.00
44.00	3.44	3.21	0.00
45.00	3.44	3.21	0.00
46.00	3.44	3.21	0.00
47.00	3.44	3.21	0.00
48.00	3.44	3.21	0.00
49.00	3.44	3.21	0.00
50.00	3.44	3.21	0.00
51.00	3.44	3.21	0.00
52.00	3.44	3.21	0.00
53.00	3.44	3.21	0.00
54.00	3.44	3.21	0.00
55.00	3.44	3.21	0.00
56.00	3.44	3.21	0.00
57.00	3.44	3.21	0.00
58.00	3.44	3.21	0.00
59.00	3.44	3.21	0.00
60.00	3.44	3.21	0.00
61.00	3.44	3.21	0.00
62.00	3.44	3.21	0.00
63.00	3.44	3.21	0.00
64.00	3.44	3.21	0.00
65.00	3.44	3.21	0.00
66.00	3.44	3.21	0.00
67.00	3.44	3.21	0.00
68.00	3.44	3.21	0.00
69.00	3.44	3.21	0.00
70.00	3.44	3.21	0.00
71.00	3.44	3.21	0.00
72.00	3.44	3.21	0.00

Summary for Subcatchment 13: A4 ON-SITE (IMP)

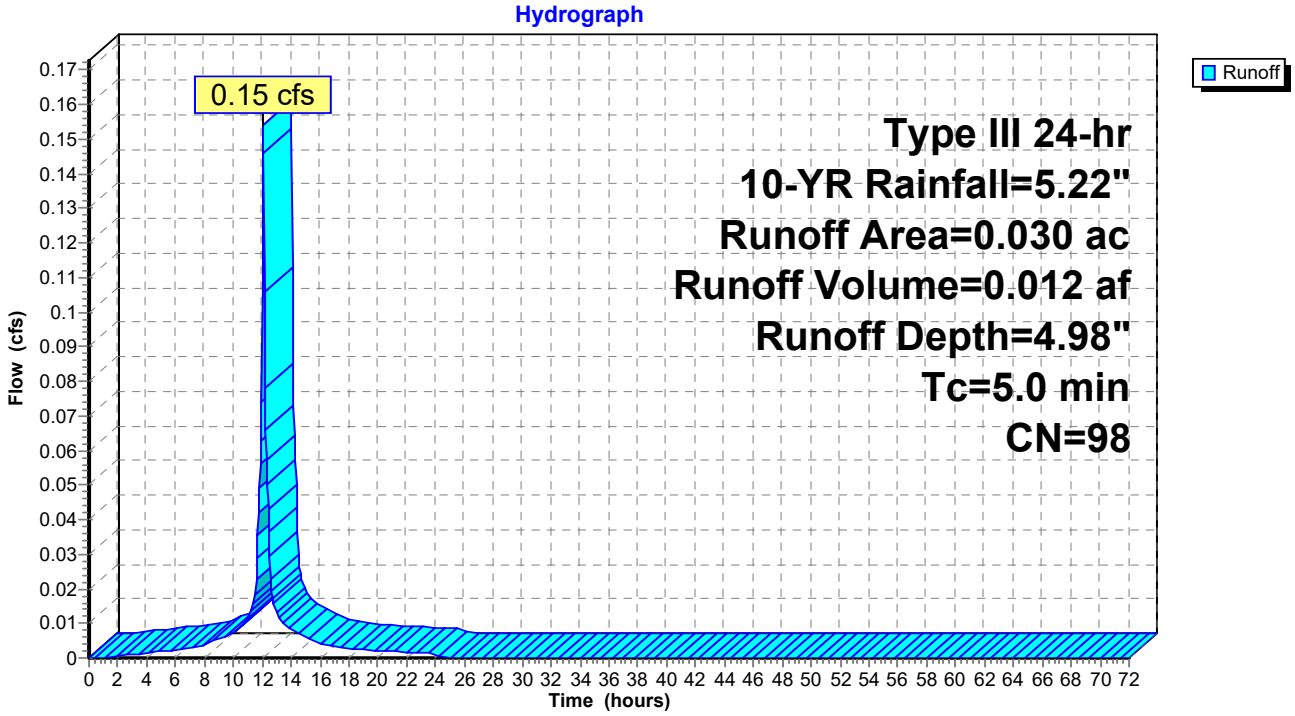
Runoff = 0.15 cfs @ 12.07 hrs, Volume= 0.012 af, Depth= 4.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
0.030	98	Paved parking, HSG C
0.030		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, DIRECT ENTRY**

Subcatchment 13: A4 ON-SITE (IMP)



Hydrograph for Subcatchment 13: A4 ON-SITE (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.02	0.00
3.00	0.16	0.04	0.00
4.00	0.22	0.09	0.00
5.00	0.30	0.14	0.00
6.00	0.38	0.21	0.00
7.00	0.47	0.29	0.00
8.00	0.60	0.41	0.00
9.00	0.76	0.56	0.01
10.00	0.99	0.78	0.01
11.00	1.30	1.09	0.01
12.00	2.61	2.38	**0.11**
13.00	3.91	3.68	**0.01**
14.00	4.23	4.00	0.01
15.00	4.46	4.22	0.01
16.00	4.62	4.39	0.00
17.00	4.75	4.51	0.00
18.00	4.84	4.61	0.00
19.00	4.92	4.69	0.00
20.00	5.00	4.76	0.00
21.00	5.06	4.82	0.00
22.00	5.12	4.88	0.00
23.00	5.17	4.94	0.00
24.00	**5.22**	**4.98**	0.00
25.00	5.22	4.98	0.00
26.00	5.22	4.98	0.00
27.00	5.22	4.98	0.00
28.00	5.22	4.98	0.00
29.00	5.22	4.98	0.00
30.00	5.22	4.98	0.00
31.00	5.22	4.98	0.00
32.00	5.22	4.98	0.00
33.00	5.22	4.98	0.00
34.00	5.22	4.98	0.00
35.00	5.22	4.98	0.00
36.00	5.22	4.98	0.00
37.00	5.22	4.98	0.00
38.00	5.22	4.98	0.00
39.00	5.22	4.98	0.00
40.00	5.22	4.98	0.00
41.00	5.22	4.98	0.00
42.00	5.22	4.98	0.00
43.00	5.22	4.98	0.00
44.00	5.22	4.98	0.00
45.00	5.22	4.98	0.00
46.00	5.22	4.98	0.00
47.00	5.22	4.98	0.00
48.00	5.22	4.98	0.00
49.00	5.22	4.98	0.00
50.00	5.22	4.98	0.00
51.00	5.22	4.98	0.00
52.00	5.22	4.98	0.00
53.00	5.22	4.98	0.00
54.00	5.22	4.98	0.00
55.00	5.22	4.98	0.00
56.00	5.22	4.98	0.00
57.00	5.22	4.98	0.00
58.00	5.22	4.98	0.00
59.00	5.22	4.98	0.00
60.00	5.22	4.98	0.00
61.00	5.22	4.98	0.00
62.00	5.22	4.98	0.00
63.00	5.22	4.98	0.00
64.00	5.22	4.98	0.00
65.00	5.22	4.98	0.00
66.00	5.22	4.98	0.00
67.00	5.22	4.98	0.00
68.00	5.22	4.98	0.00
69.00	5.22	4.98	0.00
70.00	5.22	4.98	0.00
71.00	5.22	4.98	0.00
72.00	5.22	4.98	0.00

Summary for Subcatchment 13: A4 ON-SITE (IMP)

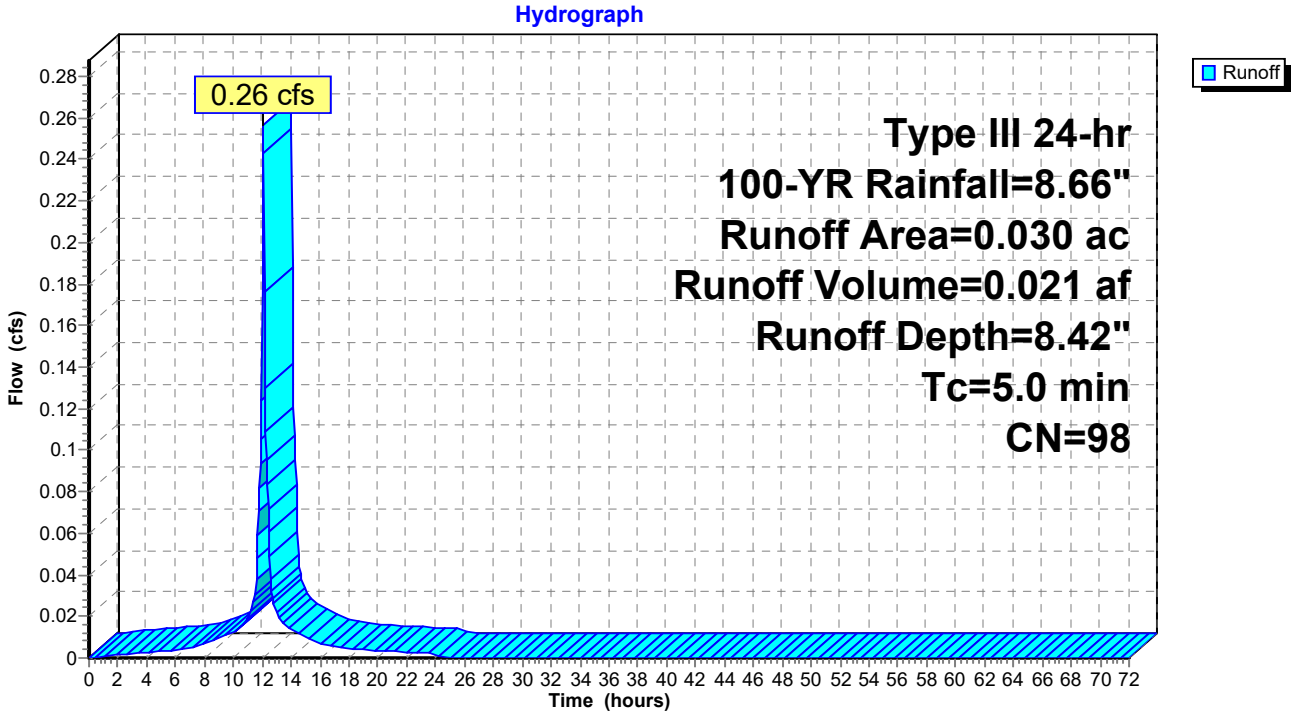
Runoff = 0.26 cfs @ 12.07 hrs, Volume= 0.021 af, Depth= 8.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
0.030	98	Paved parking, HSG C
0.030		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, DIRECT ENTRY**

Subcatchment 13: A4 ON-SITE (IMP)



Hydrograph for Subcatchment 13: A4 ON-SITE (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.01	0.00
2.00	0.17	0.05	0.00
3.00	0.27	0.12	0.00
4.00	0.37	0.21	0.00
5.00	0.49	0.31	0.00
6.00	0.62	0.43	0.00
7.00	0.78	0.58	0.01
8.00	0.99	0.78	0.01
9.00	1.26	1.05	0.01
10.00	1.64	1.41	0.01
11.00	2.17	1.94	0.02
12.00	4.33	4.09	**0.18**
13.00	6.49	6.26	**0.02**
14.00	7.02	6.78	0.01
15.00	7.40	7.16	0.01
16.00	7.67	7.43	0.01
17.00	7.88	7.64	0.01
18.00	8.04	7.80	0.00
19.00	8.17	7.93	0.00
20.00	8.29	8.05	0.00
21.00	8.40	8.16	0.00
22.00	8.49	8.25	0.00
23.00	8.58	8.34	0.00
24.00	**8.66**	**8.42**	0.00
25.00	8.66	8.42	0.00
26.00	8.66	8.42	0.00
27.00	8.66	8.42	0.00
28.00	8.66	8.42	0.00
29.00	8.66	8.42	0.00
30.00	8.66	8.42	0.00
31.00	8.66	8.42	0.00
32.00	8.66	8.42	0.00
33.00	8.66	8.42	0.00
34.00	8.66	8.42	0.00
35.00	8.66	8.42	0.00
36.00	8.66	8.42	0.00
37.00	8.66	8.42	0.00
38.00	8.66	8.42	0.00
39.00	8.66	8.42	0.00
40.00	8.66	8.42	0.00
41.00	8.66	8.42	0.00
42.00	8.66	8.42	0.00
43.00	8.66	8.42	0.00
44.00	8.66	8.42	0.00
45.00	8.66	8.42	0.00
46.00	8.66	8.42	0.00
47.00	8.66	8.42	0.00
48.00	8.66	8.42	0.00
49.00	8.66	8.42	0.00
50.00	8.66	8.42	0.00
51.00	8.66	8.42	0.00
52.00	8.66	8.42	0.00
53.00	8.66	8.42	0.00
54.00	8.66	8.42	0.00
55.00	8.66	8.42	0.00
56.00	8.66	8.42	0.00
57.00	8.66	8.42	0.00
58.00	8.66	8.42	0.00
59.00	8.66	8.42	0.00
60.00	8.66	8.42	0.00
61.00	8.66	8.42	0.00
62.00	8.66	8.42	0.00
63.00	8.66	8.42	0.00
64.00	8.66	8.42	0.00
65.00	8.66	8.42	0.00
66.00	8.66	8.42	0.00
67.00	8.66	8.42	0.00
68.00	8.66	8.42	0.00
69.00	8.66	8.42	0.00
70.00	8.66	8.42	0.00
71.00	8.66	8.42	0.00
72.00	8.66	8.42	0.00

Summary for Subcatchment 5: A1 OFF-SITE (PERV)

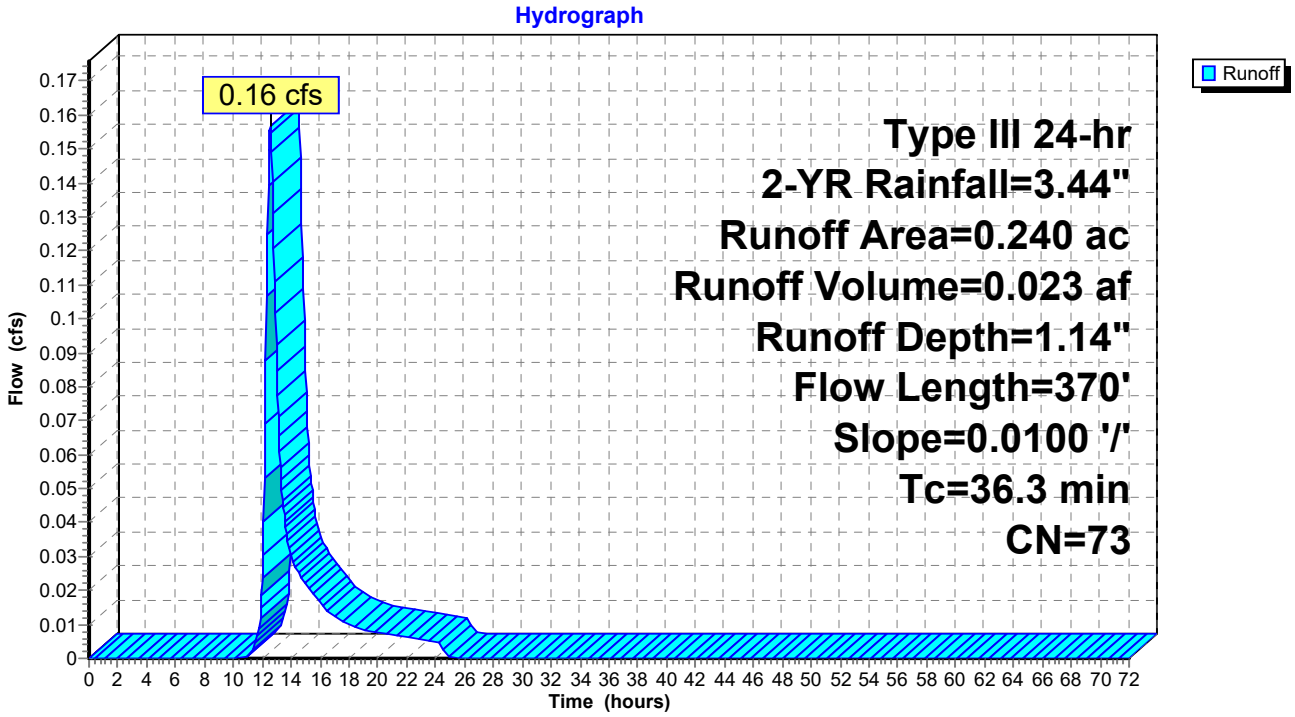
Runoff = 0.16 cfs @ 12.55 hrs, Volume= 0.023 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
0.150	72	Woods/grass comb., Good, HSG C
0.090	74	>75% Grass cover, Good, HSG C
0.240	73	Weighted Average
0.240		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.3	100	0.0100	0.06		**Sheet Flow, A1 OFF-SITE (PERV)** Woods: Light underbrush n= 0.400 P2= 3.44"
9.0	270	0.0100	0.50		**Shallow Concentrated Flow, A1 OFF-SITE (PERV)** Woodland Kv= 5.0 fps
36.3	370	Total			

Subcatchment 5: A1 OFF-SITE (PERV)



Hydrograph for Subcatchment 5: A1 OFF-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.00
3.00	0.11	0.00	0.00
4.00	0.15	0.00	0.00
5.00	0.20	0.00	0.00
6.00	0.25	0.00	0.00
7.00	0.31	0.00	0.00
8.00	0.39	0.00	0.00
9.00	0.50	0.00	0.00
10.00	0.65	0.00	0.00
11.00	0.86	0.00	0.00
12.00	1.72	0.21	**0.02**
13.00	2.58	0.61	**0.08**
14.00	2.79	0.73	0.03
15.00	2.94	0.82	0.02
16.00	3.05	0.89	0.02
17.00	3.13	0.94	0.01
18.00	3.19	0.98	0.01
19.00	3.24	1.01	0.01
20.00	3.29	1.04	0.01
21.00	3.33	1.07	0.01
22.00	3.37	1.10	0.01
23.00	3.41	1.12	0.01
24.00	**3.44**	**1.14**	0.01
25.00	3.44	1.14	0.00
26.00	3.44	1.14	0.00
27.00	3.44	1.14	0.00
28.00	3.44	1.14	0.00
29.00	3.44	1.14	0.00
30.00	3.44	1.14	0.00
31.00	3.44	1.14	0.00
32.00	3.44	1.14	0.00
33.00	3.44	1.14	0.00
34.00	3.44	1.14	0.00
35.00	3.44	1.14	0.00
36.00	3.44	1.14	0.00
37.00	3.44	1.14	0.00
38.00	3.44	1.14	0.00
39.00	3.44	1.14	0.00
40.00	3.44	1.14	0.00
41.00	3.44	1.14	0.00
42.00	3.44	1.14	0.00
43.00	3.44	1.14	0.00
44.00	3.44	1.14	0.00
45.00	3.44	1.14	0.00
46.00	3.44	1.14	0.00
47.00	3.44	1.14	0.00
48.00	3.44	1.14	0.00
49.00	3.44	1.14	0.00
50.00	3.44	1.14	0.00
51.00	3.44	1.14	0.00
52.00	3.44	1.14	0.00
53.00	3.44	1.14	0.00
54.00	3.44	1.14	0.00
55.00	3.44	1.14	0.00
56.00	3.44	1.14	0.00
57.00	3.44	1.14	0.00
58.00	3.44	1.14	0.00
59.00	3.44	1.14	0.00
60.00	3.44	1.14	0.00
61.00	3.44	1.14	0.00
62.00	3.44	1.14	0.00
63.00	3.44	1.14	0.00
64.00	3.44	1.14	0.00
65.00	3.44	1.14	0.00
66.00	3.44	1.14	0.00
67.00	3.44	1.14	0.00
68.00	3.44	1.14	0.00
69.00	3.44	1.14	0.00
70.00	3.44	1.14	0.00
71.00	3.44	1.14	0.00
72.00	3.44	1.14	0.00

Summary for Subcatchment 5: A1 OFF-SITE (PERV)

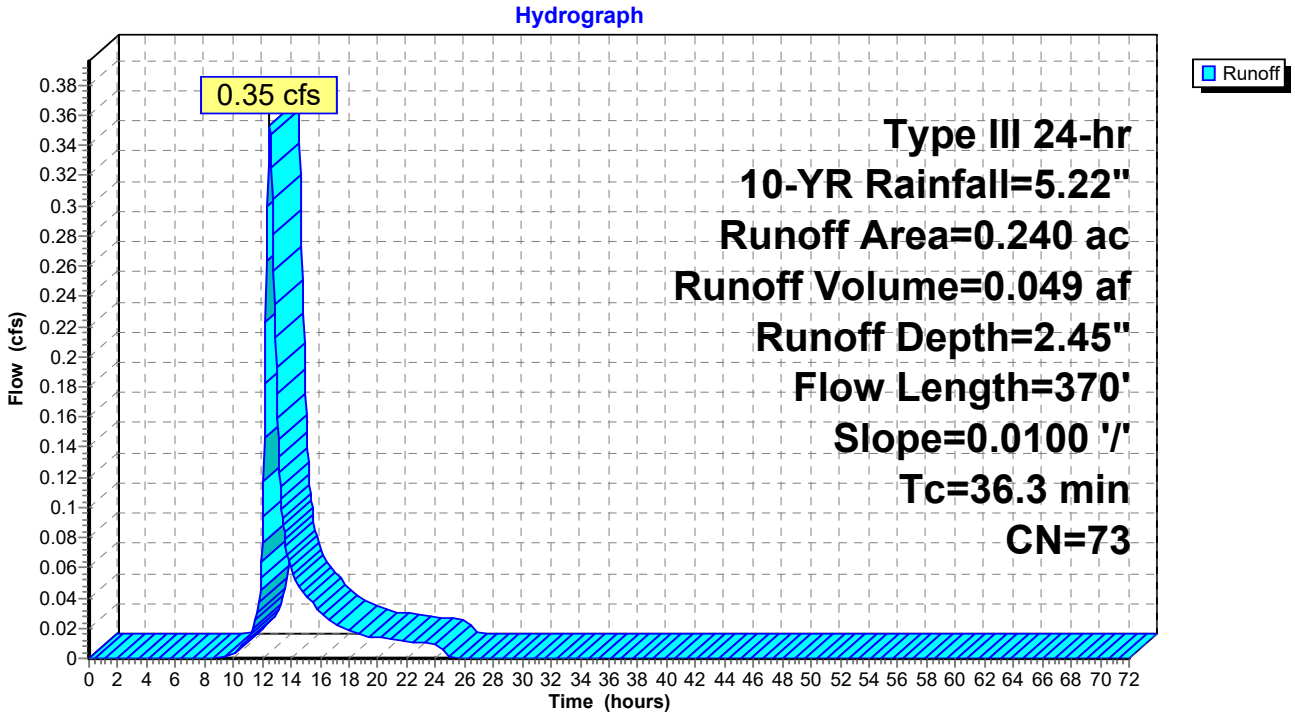
Runoff = 0.35 cfs @ 12.52 hrs, Volume= 0.049 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
0.150	72	Woods/grass comb., Good, HSG C
0.090	74	>75% Grass cover, Good, HSG C
0.240	73	Weighted Average
0.240		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.3	100	0.0100	0.06		**Sheet Flow, A1 OFF-SITE (PERV)** Woods: Light underbrush n= 0.400 P2= 3.44"
9.0	270	0.0100	0.50		**Shallow Concentrated Flow, A1 OFF-SITE (PERV)** Woodland Kv= 5.0 fps
36.3	370	Total			

Subcatchment 5: A1 OFF-SITE (PERV)



Hydrograph for Subcatchment 5: A1 OFF-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.16	0.00	0.00
4.00	0.22	0.00	0.00
5.00	0.30	0.00	0.00
6.00	0.38	0.00	0.00
7.00	0.47	0.00	0.00
8.00	0.60	0.00	0.00
9.00	0.76	0.00	0.00
10.00	0.99	0.02	0.00
11.00	1.30	0.07	0.01
12.00	2.61	0.63	**0.08**
13.00	3.91	1.47	**0.18**
14.00	4.23	1.70	0.06
15.00	4.46	1.86	0.04
16.00	4.62	1.99	0.03
17.00	4.75	2.08	0.02
18.00	4.84	2.16	0.02
19.00	4.92	2.22	0.02
20.00	5.00	2.28	0.01
21.00	5.06	2.33	0.01
22.00	5.12	2.37	0.01
23.00	5.17	2.42	0.01
24.00	**5.22**	**2.45**	0.01
25.00	5.22	2.45	0.00
26.00	5.22	2.45	0.00
27.00	5.22	2.45	0.00
28.00	5.22	2.45	0.00
29.00	5.22	2.45	0.00
30.00	5.22	2.45	0.00
31.00	5.22	2.45	0.00
32.00	5.22	2.45	0.00
33.00	5.22	2.45	0.00
34.00	5.22	2.45	0.00
35.00	5.22	2.45	0.00
36.00	5.22	2.45	0.00
37.00	5.22	2.45	0.00
38.00	5.22	2.45	0.00
39.00	5.22	2.45	0.00
40.00	5.22	2.45	0.00
41.00	5.22	2.45	0.00
42.00	5.22	2.45	0.00
43.00	5.22	2.45	0.00
44.00	5.22	2.45	0.00
45.00	5.22	2.45	0.00
46.00	5.22	2.45	0.00
47.00	5.22	2.45	0.00
48.00	5.22	2.45	0.00
49.00	5.22	2.45	0.00
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58.00	5.22	2.45	0.00
59.00	5.22	2.45	0.00
60.00	5.22	2.45	0.00
61.00	5.22	2.45	0.00
62.00	5.22	2.45	0.00
63.00	5.22	2.45	0.00
64.00	5.22	2.45	0.00
65.00	5.22	2.45	0.00
66.00	5.22	2.45	0.00
67.00	5.22	2.45	0.00
68.00	5.22	2.45	0.00
69.00	5.22	2.45	0.00
70.00	5.22	2.45	0.00
71.00	5.22	2.45	0.00
72.00	5.22	2.45	0.00

Summary for Subcatchment 5: A1 OFF-SITE (PERV)

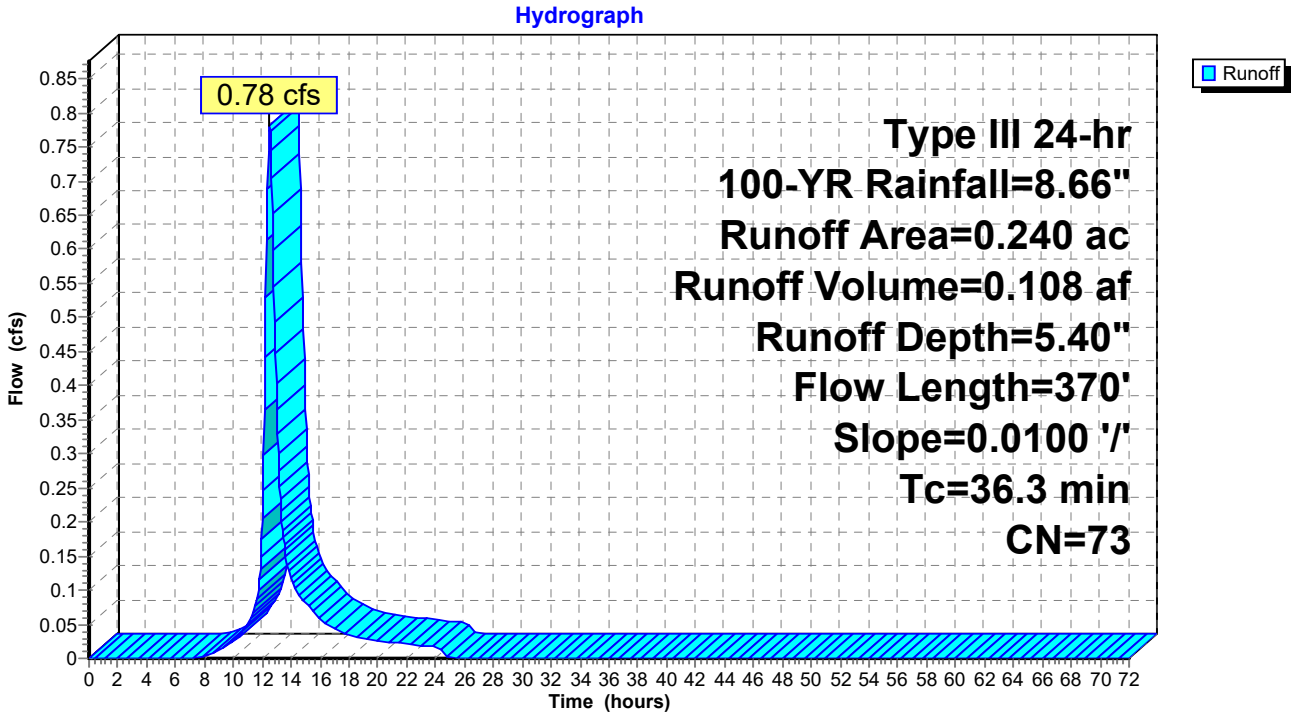
Runoff = 0.78 cfs @ 12.50 hrs, Volume= 0.108 af, Depth= 5.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
0.150	72	Woods/grass comb., Good, HSG C
0.090	74	>75% Grass cover, Good, HSG C
0.240	73	Weighted Average
0.240		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.3	100	0.0100	0.06		**Sheet Flow, A1 OFF-SITE (PERV)** Woods: Light underbrush n= 0.400 P2= 3.44"
9.0	270	0.0100	0.50		**Shallow Concentrated Flow, A1 OFF-SITE (PERV)** Woodland Kv= 5.0 fps
36.3	370	Total			

Subcatchment 5: A1 OFF-SITE (PERV)



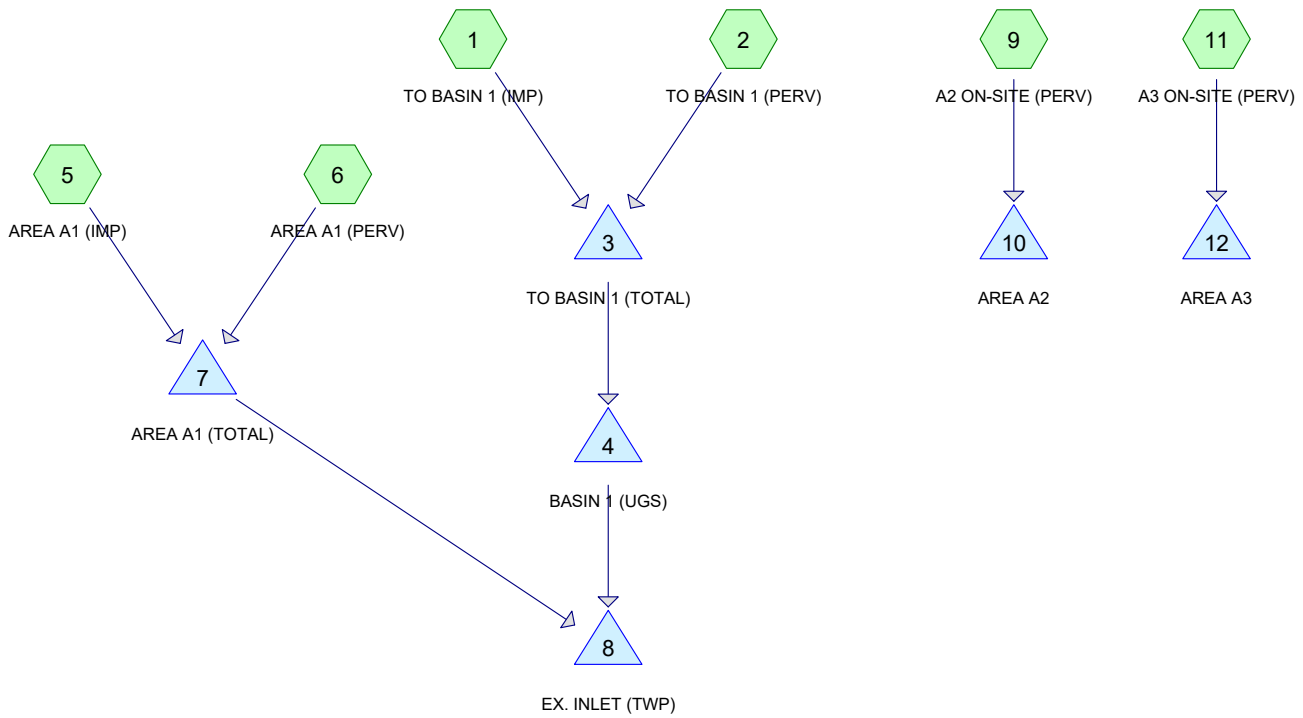
Hydrograph for Subcatchment 5: A1 OFF-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.00	0.00
3.00	0.27	0.00	0.00
4.00	0.37	0.00	0.00
5.00	0.49	0.00	0.00
6.00	0.62	0.00	0.00
7.00	0.78	0.00	0.00
8.00	0.99	0.02	0.00
9.00	1.26	0.06	0.01
10.00	1.64	0.18	0.03
11.00	2.17	0.40	0.05
12.00	4.33	1.77	**0.21**
13.00	6.49	3.50	**0.36**
14.00	7.02	3.96	0.12
15.00	7.40	4.28	0.08
16.00	7.67	4.52	0.06
17.00	7.88	4.70	0.04
18.00	8.04	4.84	0.03
19.00	8.17	4.96	0.03
20.00	8.29	5.07	0.03
21.00	8.40	5.16	0.02
22.00	8.49	5.25	0.02
23.00	8.58	5.33	0.02
24.00	**8.66**	**5.40**	0.02
25.00	8.66	5.40	0.00
26.00	8.66	5.40	0.00
27.00	8.66	5.40	0.00
28.00	8.66	5.40	0.00
29.00	8.66	5.40	0.00
30.00	8.66	5.40	0.00
31.00	8.66	5.40	0.00
32.00	8.66	5.40	0.00
33.00	8.66	5.40	0.00
34.00	8.66	5.40	0.00
35.00	8.66	5.40	0.00
36.00	8.66	5.40	0.00
37.00	8.66	5.40	0.00
38.00	8.66	5.40	0.00
39.00	8.66	5.40	0.00
40.00	8.66	5.40	0.00
41.00	8.66	5.40	0.00
42.00	8.66	5.40	0.00
43.00	8.66	5.40	0.00
44.00	8.66	5.40	0.00
45.00	8.66	5.40	0.00
46.00	8.66	5.40	0.00
47.00	8.66	5.40	0.00
48.00	8.66	5.40	0.00
49.00	8.66	5.40	0.00
50.00	8.66	5.40	0.00
51.00	8.66	5.40	0.00
52.00	8.66	5.40	0.00
53.00	8.66	5.40	0.00
54.00	8.66	5.40	0.00
55.00	8.66	5.40	0.00
56.00	8.66	5.40	0.00
57.00	8.66	5.40	0.00
58.00	8.66	5.40	0.00
59.00	8.66	5.40	0.00
60.00	8.66	5.40	0.00
61.00	8.66	5.40	0.00
62.00	8.66	5.40	0.00
63.00	8.66	5.40	0.00
64.00	8.66	5.40	0.00
65.00	8.66	5.40	0.00
66.00	8.66	5.40	0.00
67.00	8.66	5.40	0.00
68.00	8.66	5.40	0.00
69.00	8.66	5.40	0.00
70.00	8.66	5.40	0.00
71.00	8.66	5.40	0.00
72.00	8.66	5.40	0.00

APPENDIX D

Post-Developed Peak Run-Off Rate Summary

2 yr. Storm
10 yr. Storm
100 yr. Storm



Subcat Reach Pond Link

Routing Diagram for Post-Development.Lots 11-19
Prepared by Toll Brothers, Inc., Printed 7/8/2020
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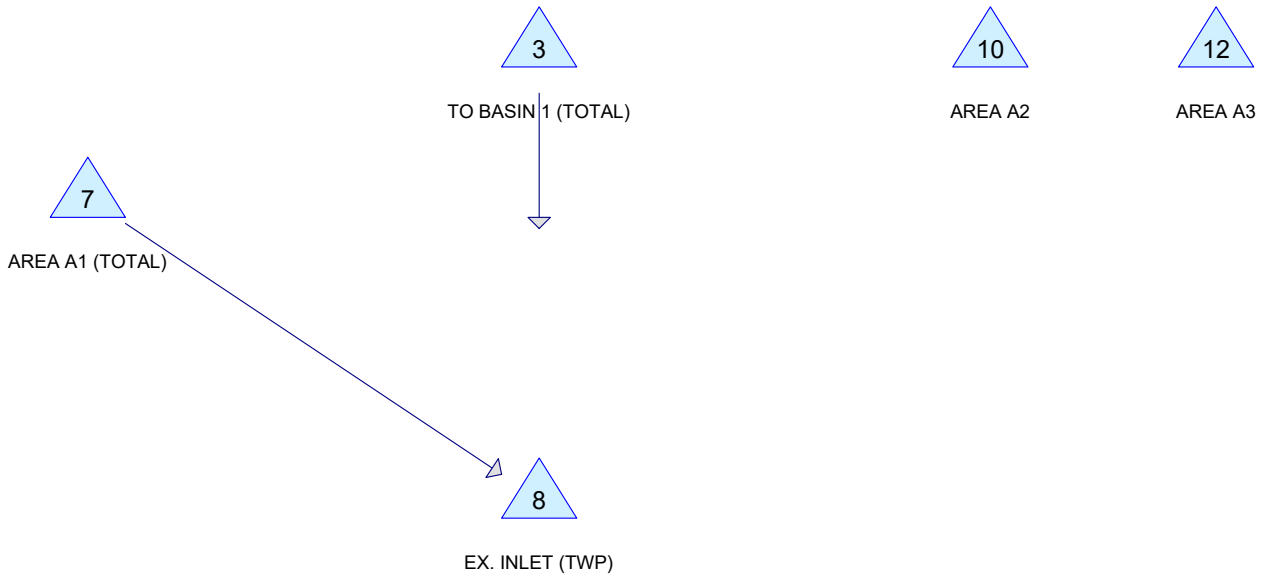
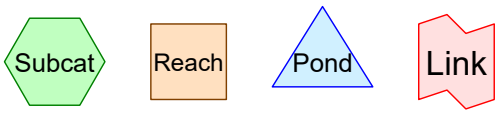
Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.920	74	>75% Grass cover, Good, HSG C (2, 6, 9, 11)
2.520	98	Paved parking, HSG C (1, 5)
0.150	72	Woods/grass comb., Good, HSG C (2)
4.590	**87**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
4.590	HSG C	1, 2, 5, 6, 9, 11
0.000	HSG D	
0.000	Other	
4.590		**TOTAL AREA**





Routing Diagram for Post-Development.Lots 11-19
Prepared by Toll Brothers, Inc., Printed 7/8/2020
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.000	**0**	**TOTAL AREA**

Soil Listing (selected nodes)

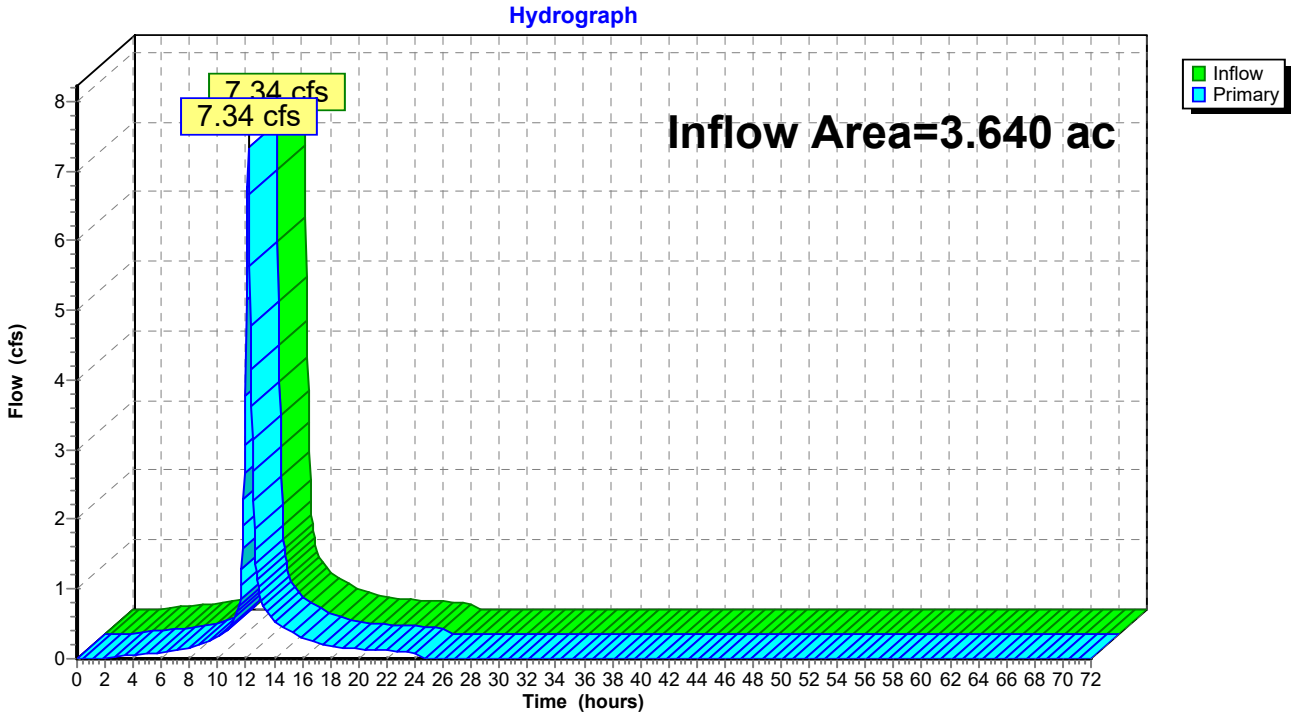
Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.000		**TOTAL AREA**

Summary for Pond 3: TO BASIN 1 (TOTAL)

Inflow Area = 3.640 ac, 55.22% Impervious, Inflow Depth = 2.31" for 2-YR event
Inflow = 7.34 cfs @ 12.15 hrs, Volume= 0.700 af
Primary = 7.34 cfs @ 12.15 hrs, Volume= 0.700 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 3: TO BASIN 1 (TOTAL)



Hydrograph for Pond 3: TO BASIN 1 (TOTAL)

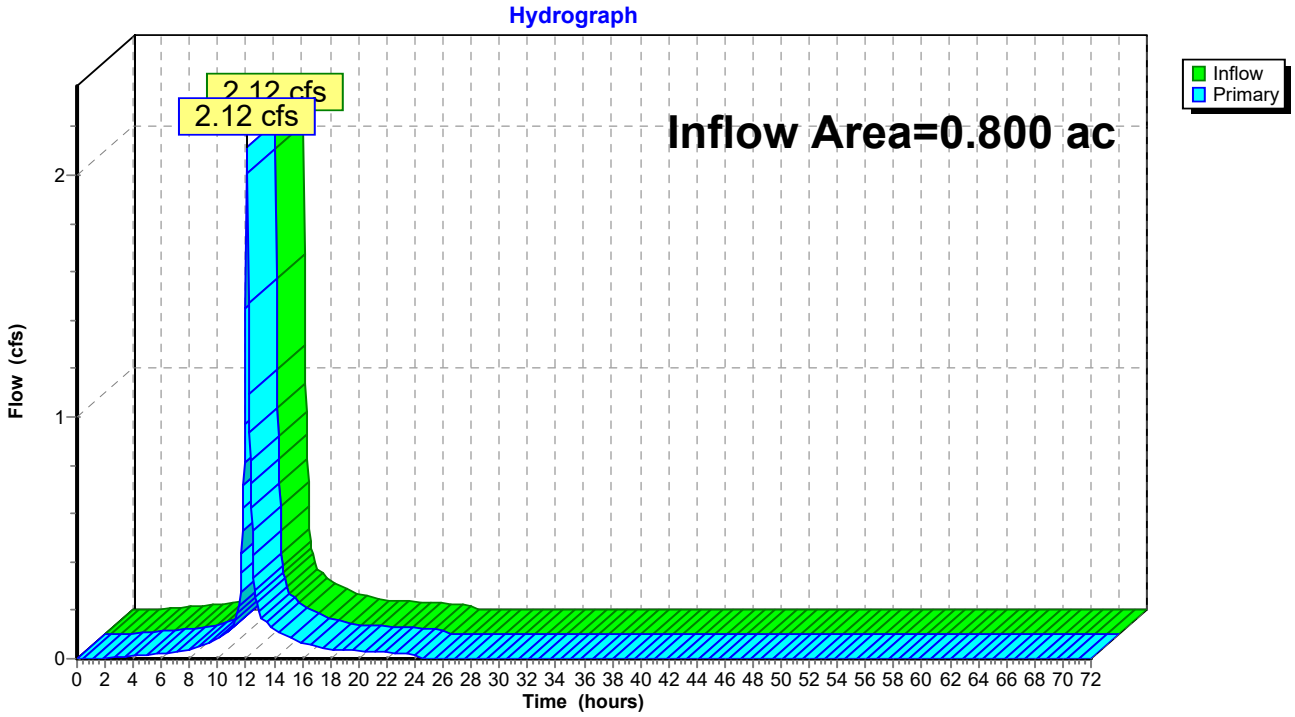
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.01		0.01	55.00	0.00		0.00
3.00	0.03		0.03	56.00	0.00		0.00
4.00	0.05		0.05	57.00	0.00		0.00
5.00	0.07		0.07	58.00	0.00		0.00
6.00	0.08		0.08	59.00	0.00		0.00
7.00	0.11		0.11	60.00	0.00		0.00
8.00	0.15		0.15	61.00	0.00		0.00
9.00	0.22		0.22	62.00	0.00		0.00
10.00	0.31		0.31	63.00	0.00		0.00
11.00	0.48		0.48	64.00	0.00		0.00
12.00	**3.78**		**3.78**	65.00	0.00		0.00
13.00	**0.90**		**0.90**	66.00	0.00		0.00
14.00	0.55		0.55	67.00	0.00		0.00
15.00	0.41		0.41	68.00	0.00		0.00
16.00	0.30		0.30	69.00	0.00		0.00
17.00	0.23		0.23	70.00	0.00		0.00
18.00	0.18		0.18	71.00	0.00		0.00
19.00	0.16		0.16	72.00	0.00		0.00
20.00	0.14		0.14				
21.00	0.13		0.13				
22.00	0.12		0.12				
23.00	0.11		0.11				
24.00	0.09		0.09				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 7: AREA A1 (TOTAL)

Inflow Area = 0.800 ac, 63.75% Impervious, Inflow Depth = 2.48" for 2-YR event
Inflow = 2.12 cfs @ 12.07 hrs, Volume= 0.165 af
Primary = 2.12 cfs @ 12.07 hrs, Volume= 0.165 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 7: AREA A1 (TOTAL)



Hydrograph for Pond 7: AREA A1 (TOTAL)

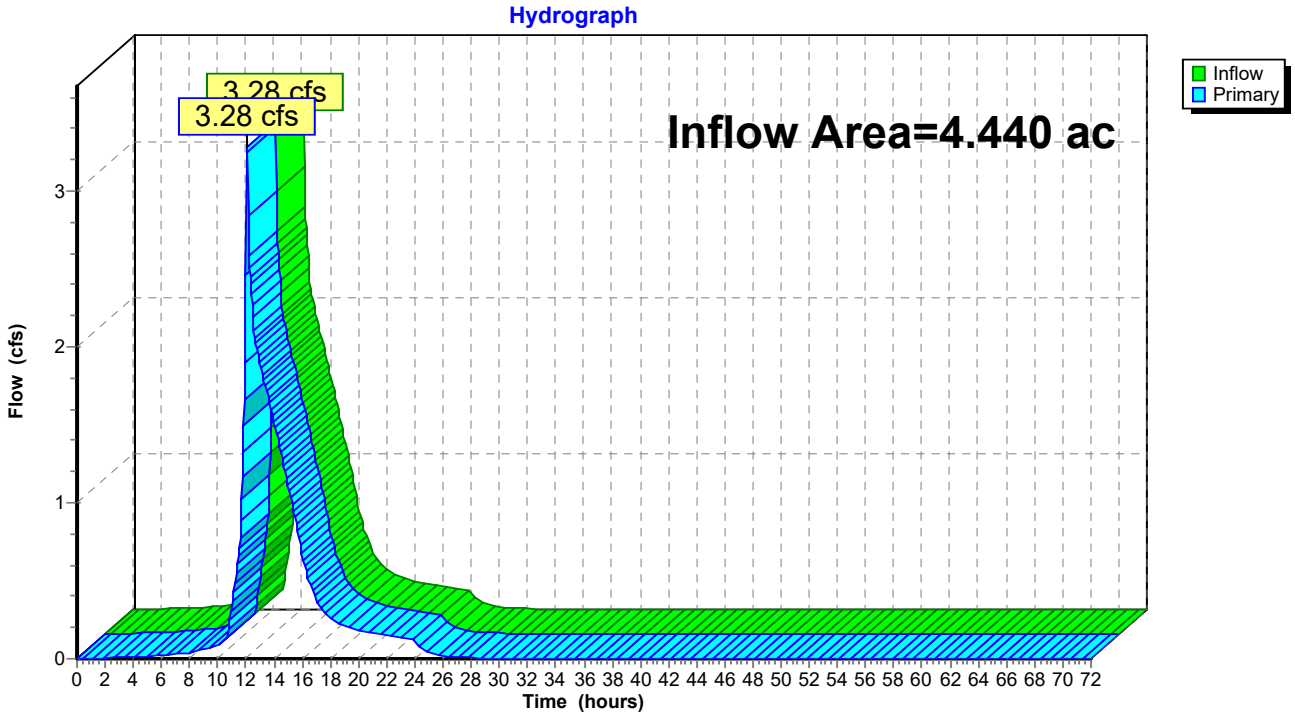
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.01		0.01	56.00	0.00		0.00
4.00	0.01		0.01	57.00	0.00		0.00
5.00	0.02		0.02	58.00	0.00		0.00
6.00	0.02		0.02	59.00	0.00		0.00
7.00	0.03		0.03	60.00	0.00		0.00
8.00	0.04		0.04	61.00	0.00		0.00
9.00	0.06		0.06	62.00	0.00		0.00
10.00	0.08		0.08	63.00	0.00		0.00
11.00	0.13		0.13	64.00	0.00		0.00
12.00	**1.45**		**1.45**	65.00	0.00		0.00
13.00	**0.19**		**0.19**	66.00	0.00		0.00
14.00	0.12		0.12	67.00	0.00		0.00
15.00	0.09		0.09	68.00	0.00		0.00
16.00	0.06		0.06	69.00	0.00		0.00
17.00	0.05		0.05	70.00	0.00		0.00
18.00	0.04		0.04	71.00	0.00		0.00
19.00	0.04		0.04	72.00	0.00		0.00
20.00	0.03		0.03				
21.00	0.03		0.03				
22.00	0.03		0.03				
23.00	0.02		0.02				
24.00	0.02		0.02				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 8: EX. INLET (TWP)

Inflow Area = 4.440 ac, 56.76% Impervious, Inflow Depth = 2.12" for 2-YR event
Inflow = 3.28 cfs @ 12.08 hrs, Volume= 0.783 af
Primary = 3.28 cfs @ 12.08 hrs, Volume= 0.783 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 8: EX. INLET (TWP)



Hydrograph for Pond 8: EX. INLET (TWP)

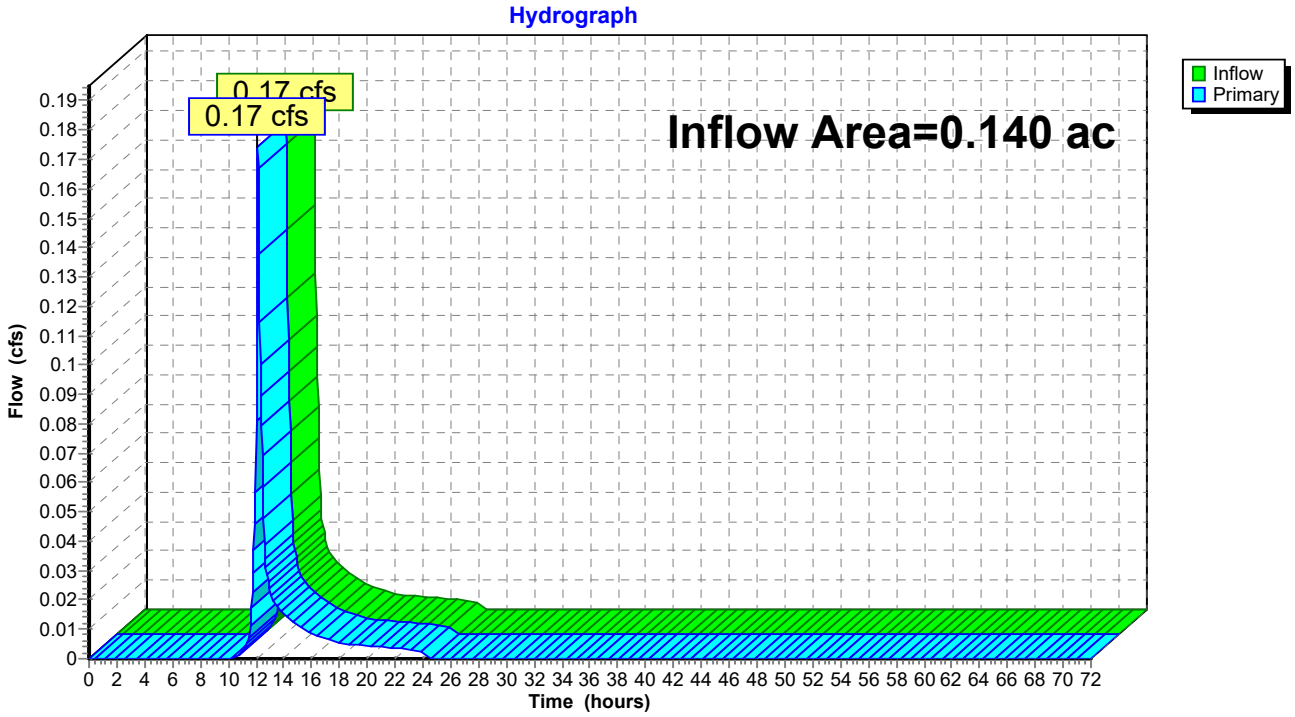
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.01		0.01	56.00	0.00		0.00
4.00	0.01		0.01	57.00	0.00		0.00
5.00	0.02		0.02	58.00	0.00		0.00
6.00	0.02		0.02	59.00	0.00		0.00
7.00	0.03		0.03	60.00	0.00		0.00
8.00	0.04		0.04	61.00	0.00		0.00
9.00	0.06		0.06	62.00	0.00		0.00
10.00	0.08		0.08	63.00	0.00		0.00
11.00	0.35		0.35	64.00	0.00		0.00
12.00	**2.46**		**2.46**	65.00	0.00		0.00
13.00	**1.89**		**1.89**	66.00	0.00		0.00
14.00	1.51		1.51	67.00	0.00		0.00
15.00	1.11		1.11	68.00	0.00		0.00
16.00	0.67		0.67	69.00	0.00		0.00
17.00	0.38		0.38	70.00	0.00		0.00
18.00	0.25		0.25	71.00	0.00		0.00
19.00	0.21		0.21	72.00	0.00		0.00
20.00	0.18		0.18				
21.00	0.17		0.17				
22.00	0.15		0.15				
23.00	0.14		0.14				
24.00	0.12		0.12				
25.00	0.04		0.04				
26.00	0.02		0.02				
27.00	0.01		0.01				
28.00	0.01		0.01				
29.00	0.01		0.01				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 10: AREA A2

Inflow Area = 0.140 ac, 0.00% Impervious, Inflow Depth = 1.20" for 2-YR event
Inflow = 0.17 cfs @ 12.12 hrs, Volume= 0.014 af
Primary = 0.17 cfs @ 12.12 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 10: AREA A2



Hydrograph for Pond 10: AREA A2

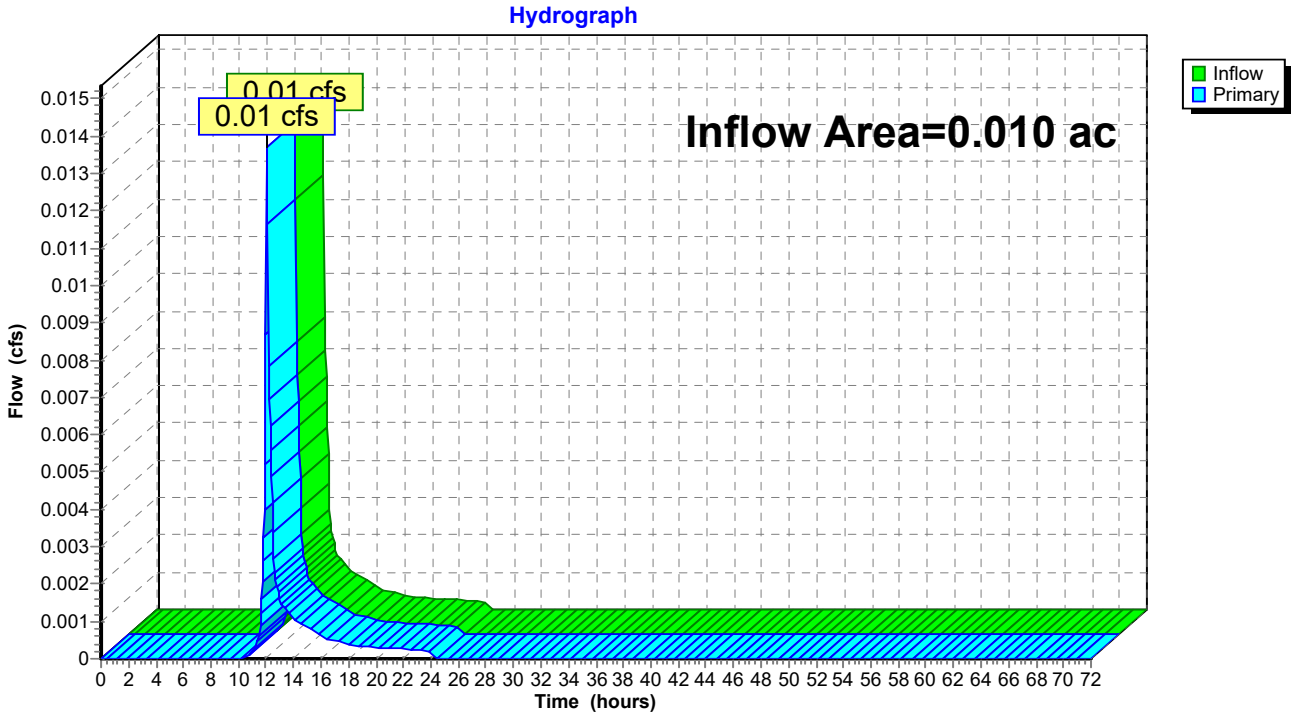
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.00		0.00	64.00	0.00		0.00
12.00	**0.08**		**0.08**	65.00	0.00		0.00
13.00	**0.02**		**0.02**	66.00	0.00		0.00
14.00	0.02		0.02	67.00	0.00		0.00
15.00	0.01		0.01	68.00	0.00		0.00
16.00	0.01		0.01	69.00	0.00		0.00
17.00	0.01		0.01	70.00	0.00		0.00
18.00	0.01		0.01	71.00	0.00		0.00
19.00	0.00		0.00	72.00	0.00		0.00
20.00	0.00		0.00				
21.00	0.00		0.00				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 12: AREA A3

Inflow Area = 0.010 ac, 0.00% Impervious, Inflow Depth = 1.20" for 2-YR event
Inflow = 0.01 cfs @ 12.08 hrs, Volume= 0.001 af
Primary = 0.01 cfs @ 12.08 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 12: AREA A3



Hydrograph for Pond 12: AREA A3

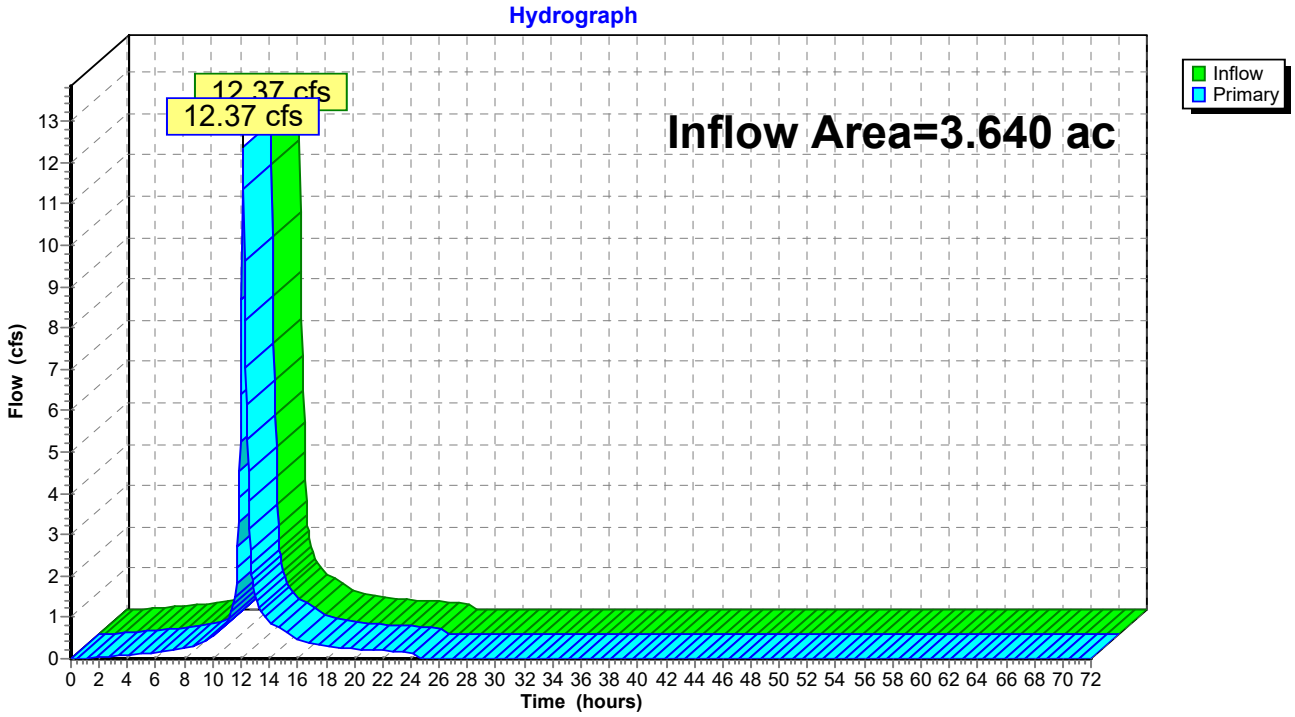
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.00		0.00	64.00	0.00		0.00
12.00	**0.01**		**0.01**	65.00	0.00		0.00
13.00	**0.00**		**0.00**	66.00	0.00		0.00
14.00	0.00		0.00	67.00	0.00		0.00
15.00	0.00		0.00	68.00	0.00		0.00
16.00	0.00		0.00	69.00	0.00		0.00
17.00	0.00		0.00	70.00	0.00		0.00
18.00	0.00		0.00	71.00	0.00		0.00
19.00	0.00		0.00	72.00	0.00		0.00
20.00	0.00		0.00				
21.00	0.00		0.00				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 3: TO BASIN 1 (TOTAL)

Inflow Area = 3.640 ac, 55.22% Impervious, Inflow Depth = 3.89" for 10-YR event
Inflow = 12.37 cfs @ 12.15 hrs, Volume= 1.180 af
Primary = 12.37 cfs @ 12.15 hrs, Volume= 1.180 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 3: TO BASIN 1 (TOTAL)



Hydrograph for Pond 3: TO BASIN 1 (TOTAL)

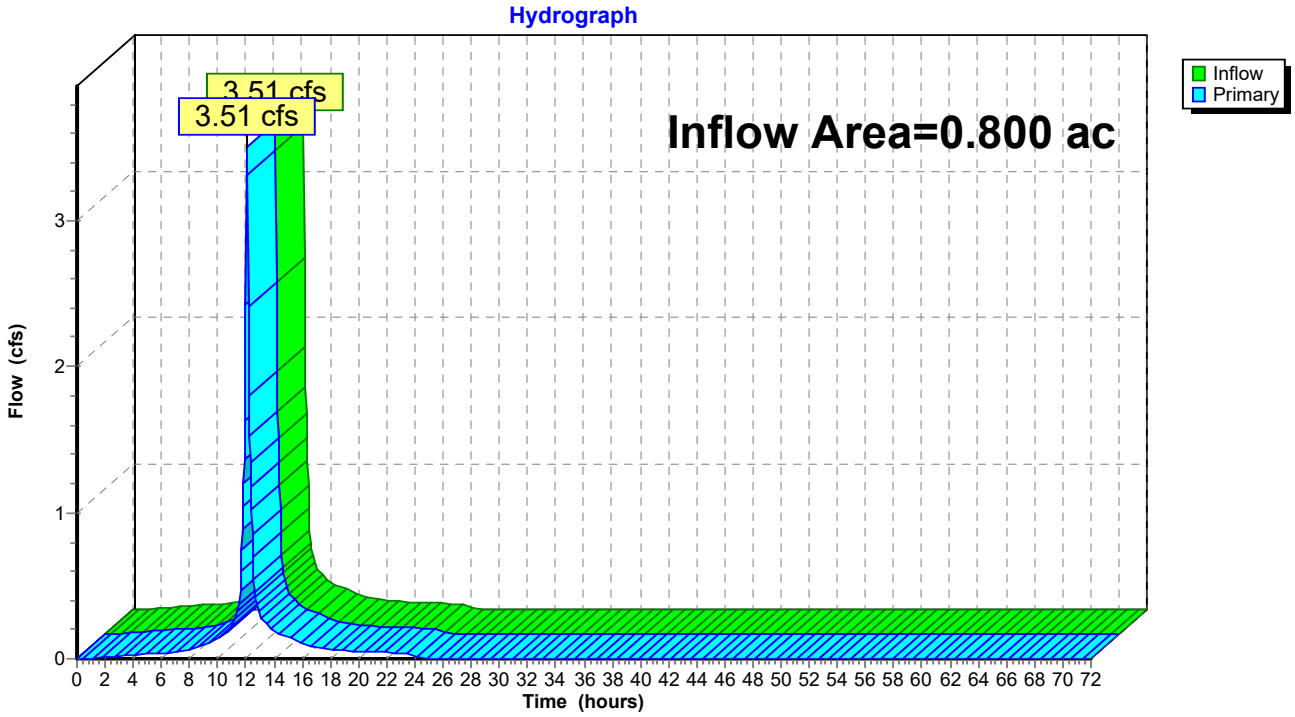
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00
1.00	0.00		0.00
2.00	0.04		0.04
3.00	0.07		0.07
4.00	0.10		0.10
5.00	0.12		0.12
6.00	0.14		0.14
7.00	0.19		0.19
8.00	0.25		0.25
9.00	0.36		0.36
10.00	0.53		0.53
11.00	0.86		0.86
12.00	**6.42**		**6.42**
13.00	**1.50**		**1.50**
14.00	0.90		0.90
15.00	0.68		0.68
16.00	0.48		0.48
17.00	0.38		0.38
18.00	0.29		0.29
19.00	0.26		0.26
20.00	0.23		0.23
21.00	0.21		0.21
22.00	0.19		0.19
23.00	0.17		0.17
24.00	0.15		0.15
25.00	0.00		0.00
26.00	0.00		0.00
27.00	0.00		0.00
28.00	0.00		0.00
29.00	0.00		0.00
30.00	0.00		0.00
31.00	0.00		0.00
32.00	0.00		0.00
33.00	0.00		0.00
34.00	0.00		0.00
35.00	0.00		0.00
36.00	0.00		0.00
37.00	0.00		0.00
38.00	0.00		0.00
39.00	0.00		0.00
40.00	0.00		0.00
41.00	0.00		0.00
42.00	0.00		0.00
43.00	0.00		0.00
44.00	0.00		0.00
45.00	0.00		0.00
46.00	0.00		0.00
47.00	0.00		0.00
48.00	0.00		0.00
49.00	0.00		0.00
50.00	0.00		0.00
51.00	0.00		0.00
52.00	0.00		0.00
53.00	0.00		0.00
54.00	0.00		0.00
55.00	0.00		0.00
56.00	0.00		0.00
57.00	0.00		0.00
58.00	0.00		0.00
59.00	0.00		0.00
60.00	0.00		0.00
61.00	0.00		0.00
62.00	0.00		0.00
63.00	0.00		0.00
64.00	0.00		0.00
65.00	0.00		0.00
66.00	0.00		0.00
67.00	0.00		0.00
68.00	0.00		0.00
69.00	0.00		0.00
70.00	0.00		0.00
71.00	0.00		0.00
72.00	0.00		0.00

Summary for Pond 7: AREA A1 (TOTAL)

Inflow Area = 0.800 ac, 63.75% Impervious, Inflow Depth = 4.10" for 10-YR event
Inflow = 3.51 cfs @ 12.07 hrs, Volume= 0.273 af
Primary = 3.51 cfs @ 12.07 hrs, Volume= 0.273 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 7: AREA A1 (TOTAL)



Hydrograph for Pond 7: AREA A1 (TOTAL)

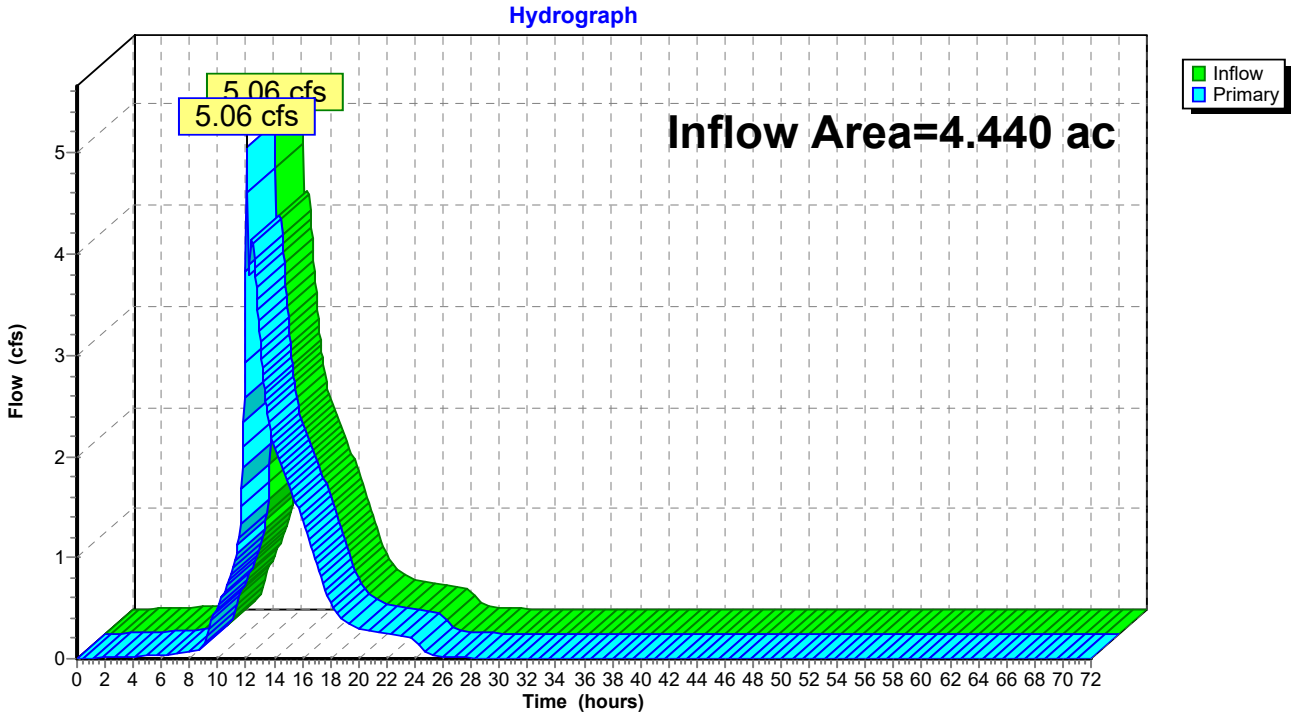
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.01		0.01	55.00	0.00		0.00
3.00	0.02		0.02	56.00	0.00		0.00
4.00	0.02		0.02	57.00	0.00		0.00
5.00	0.03		0.03	58.00	0.00		0.00
6.00	0.04		0.04	59.00	0.00		0.00
7.00	0.05		0.05	60.00	0.00		0.00
8.00	0.06		0.06	61.00	0.00		0.00
9.00	0.09		0.09	62.00	0.00		0.00
10.00	0.13		0.13	63.00	0.00		0.00
11.00	0.22		0.22	64.00	0.00		0.00
12.00	**2.42**		**2.42**	65.00	0.00		0.00
13.00	**0.30**		**0.30**	66.00	0.00		0.00
14.00	0.19		0.19	67.00	0.00		0.00
15.00	0.15		0.15	68.00	0.00		0.00
16.00	0.10		0.10	69.00	0.00		0.00
17.00	0.08		0.08	70.00	0.00		0.00
18.00	0.06		0.06	71.00	0.00		0.00
19.00	0.06		0.06	72.00	0.00		0.00
20.00	0.05		0.05				
21.00	0.05		0.05				
22.00	0.04		0.04				
23.00	0.04		0.04				
24.00	0.03		0.03				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 8: EX. INLET (TWP)

Inflow Area = 4.440 ac, 56.76% Impervious, Inflow Depth = 3.70" for 10-YR event
Inflow = 5.06 cfs @ 12.08 hrs, Volume= 1.370 af
Primary = 5.06 cfs @ 12.08 hrs, Volume= 1.370 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 8: EX. INLET (TWP)



Hydrograph for Pond 8: EX. INLET (TWP)

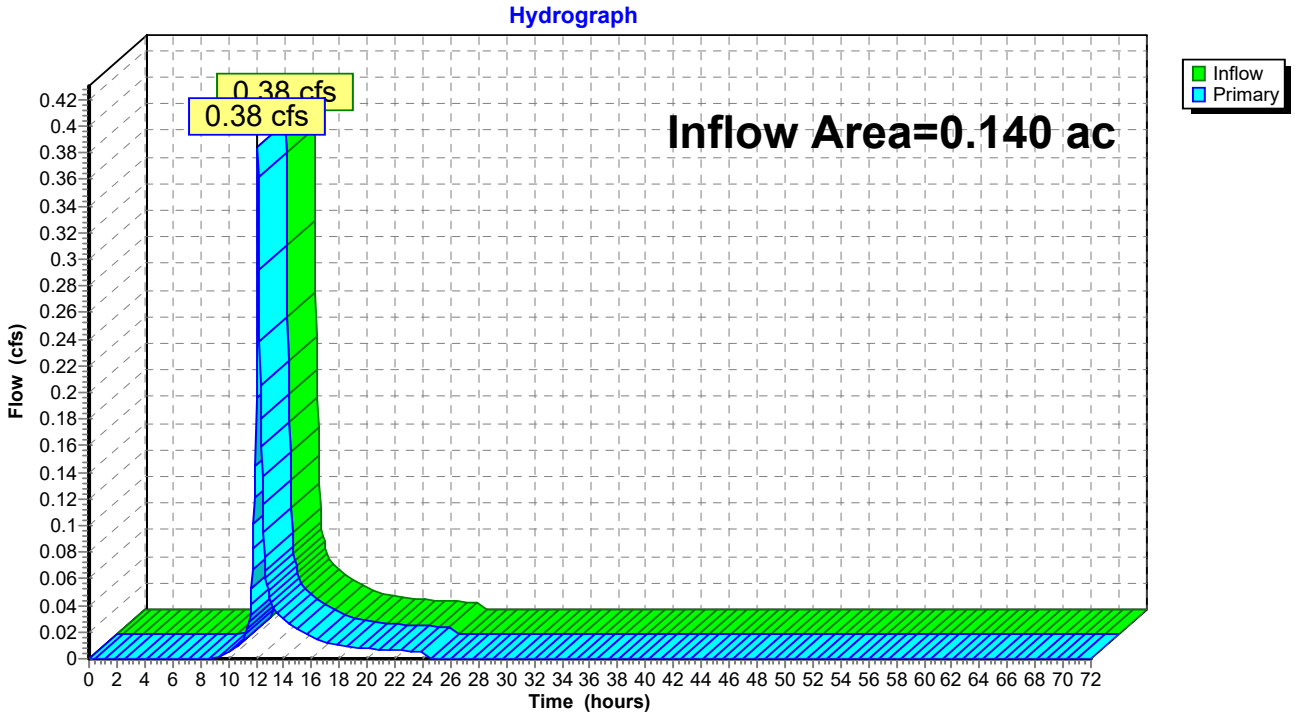
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00
1.00	0.00		0.00
2.00	0.01		0.01
3.00	0.02		0.02
4.00	0.02		0.02
5.00	0.03		0.03
6.00	0.04		0.04
7.00	0.05		0.05
8.00	0.06		0.06
9.00	0.13		0.13
10.00	0.52		0.52
11.00	0.86		0.86
12.00	**3.82**		**3.82**
13.00	**3.14**		**3.14**
14.00	2.10		2.10
15.00	1.75		1.75
16.00	1.36		1.36
17.00	0.95		0.95
18.00	0.55		0.55
19.00	0.37		0.37
20.00	0.30		0.30
21.00	0.27		0.27
22.00	0.24		0.24
23.00	0.22		0.22
24.00	0.20		0.20
25.00	0.05		0.05
26.00	0.02		0.02
27.00	0.01		0.01
28.00	0.01		0.01
29.00	0.01		0.01
30.00	0.00		0.00
31.00	0.00		0.00
32.00	0.00		0.00
33.00	0.00		0.00
34.00	0.00		0.00
35.00	0.00		0.00
36.00	0.00		0.00
37.00	0.00		0.00
38.00	0.00		0.00
39.00	0.00		0.00
40.00	0.00		0.00
41.00	0.00		0.00
42.00	0.00		0.00
43.00	0.00		0.00
44.00	0.00		0.00
45.00	0.00		0.00
46.00	0.00		0.00
47.00	0.00		0.00
48.00	0.00		0.00
49.00	0.00		0.00
50.00	0.00		0.00
51.00	0.00		0.00
52.00	0.00		0.00
53.00	0.00		0.00
54.00	0.00		0.00
55.00	0.00		0.00
56.00	0.00		0.00
57.00	0.00		0.00
58.00	0.00		0.00
59.00	0.00		0.00
60.00	0.00		0.00
61.00	0.00		0.00
62.00	0.00		0.00
63.00	0.00		0.00
64.00	0.00		0.00
65.00	0.00		0.00
66.00	0.00		0.00
67.00	0.00		0.00
68.00	0.00		0.00
69.00	0.00		0.00
70.00	0.00		0.00
71.00	0.00		0.00
72.00	0.00		0.00

Summary for Pond 10: AREA A2

Inflow Area = 0.140 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-YR event
Inflow = 0.38 cfs @ 12.12 hrs, Volume= 0.030 af
Primary = 0.38 cfs @ 12.12 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 10: AREA A2



Hydrograph for Pond 10: AREA A2

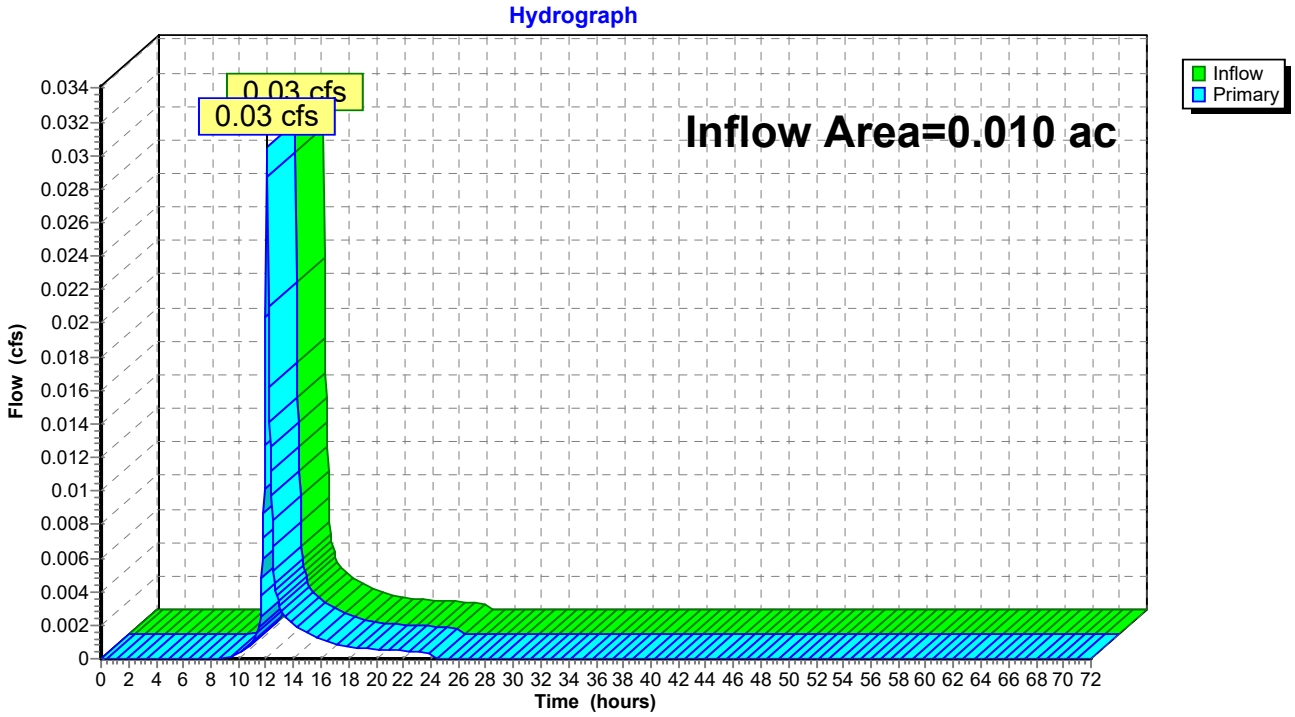
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.01		0.01	64.00	0.00		0.00
12.00	**0.20**		**0.20**	65.00	0.00		0.00
13.00	**0.04**		**0.04**	66.00	0.00		0.00
14.00	0.03		0.03	67.00	0.00		0.00
15.00	0.02		0.02	68.00	0.00		0.00
16.00	0.02		0.02	69.00	0.00		0.00
17.00	0.01		0.01	70.00	0.00		0.00
18.00	0.01		0.01	71.00	0.00		0.00
19.00	0.01		0.01	72.00	0.00		0.00
20.00	0.01		0.01				
21.00	0.01		0.01				
22.00	0.01		0.01				
23.00	0.01		0.01				
24.00	0.01		0.01				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 12: AREA A3

Inflow Area = 0.010 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-YR event
Inflow = 0.03 cfs @ 12.07 hrs, Volume= 0.002 af
Primary = 0.03 cfs @ 12.07 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 12: AREA A3



Hydrograph for Pond 12: AREA A3

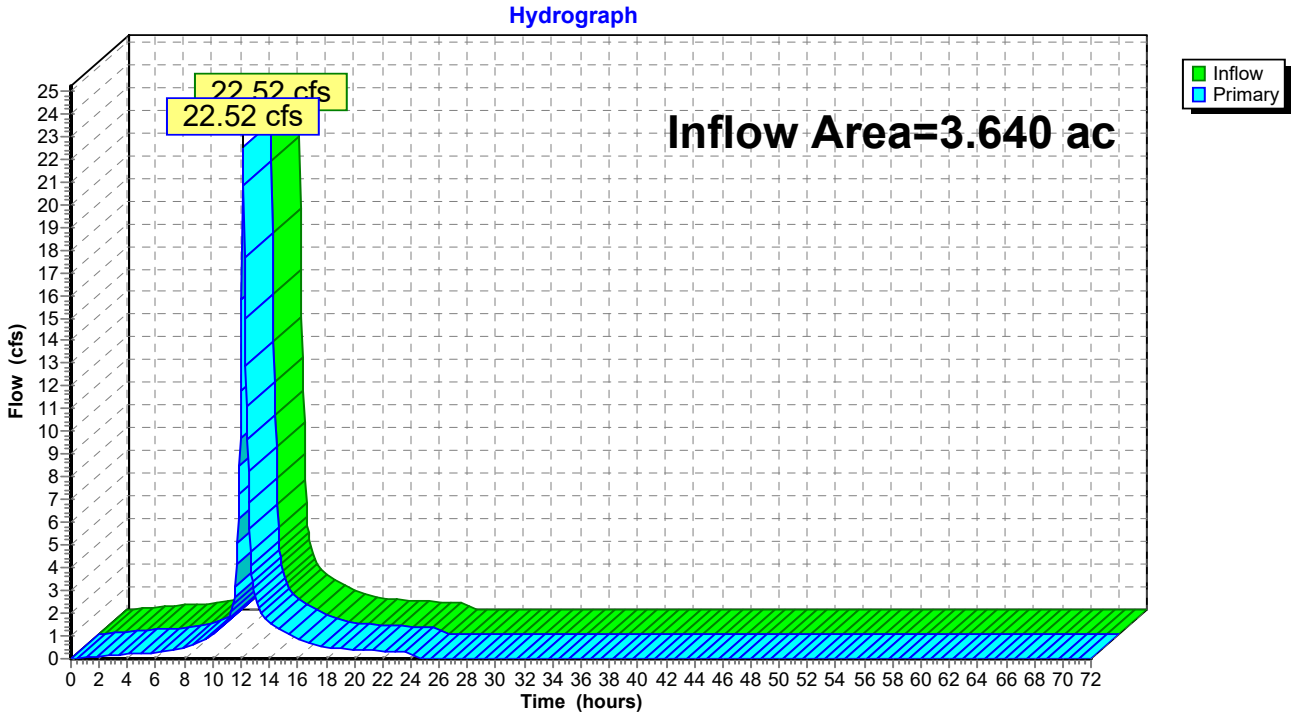
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.00		0.00	64.00	0.00		0.00
12.00	**0.02**		**0.02**	65.00	0.00		0.00
13.00	**0.00**		**0.00**	66.00	0.00		0.00
14.00	0.00		0.00	67.00	0.00		0.00
15.00	0.00		0.00	68.00	0.00		0.00
16.00	0.00		0.00	69.00	0.00		0.00
17.00	0.00		0.00	70.00	0.00		0.00
18.00	0.00		0.00	71.00	0.00		0.00
19.00	0.00		0.00	72.00	0.00		0.00
20.00	0.00		0.00				
21.00	0.00		0.00				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 3: TO BASIN 1 (TOTAL)

Inflow Area = 3.640 ac, 55.22% Impervious, Inflow Depth = 7.12" for 100-YR event
Inflow = 22.52 cfs @ 12.15 hrs, Volume= 2.160 af
Primary = 22.52 cfs @ 12.15 hrs, Volume= 2.160 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 3: TO BASIN 1 (TOTAL)



Hydrograph for Pond 3: TO BASIN 1 (TOTAL)

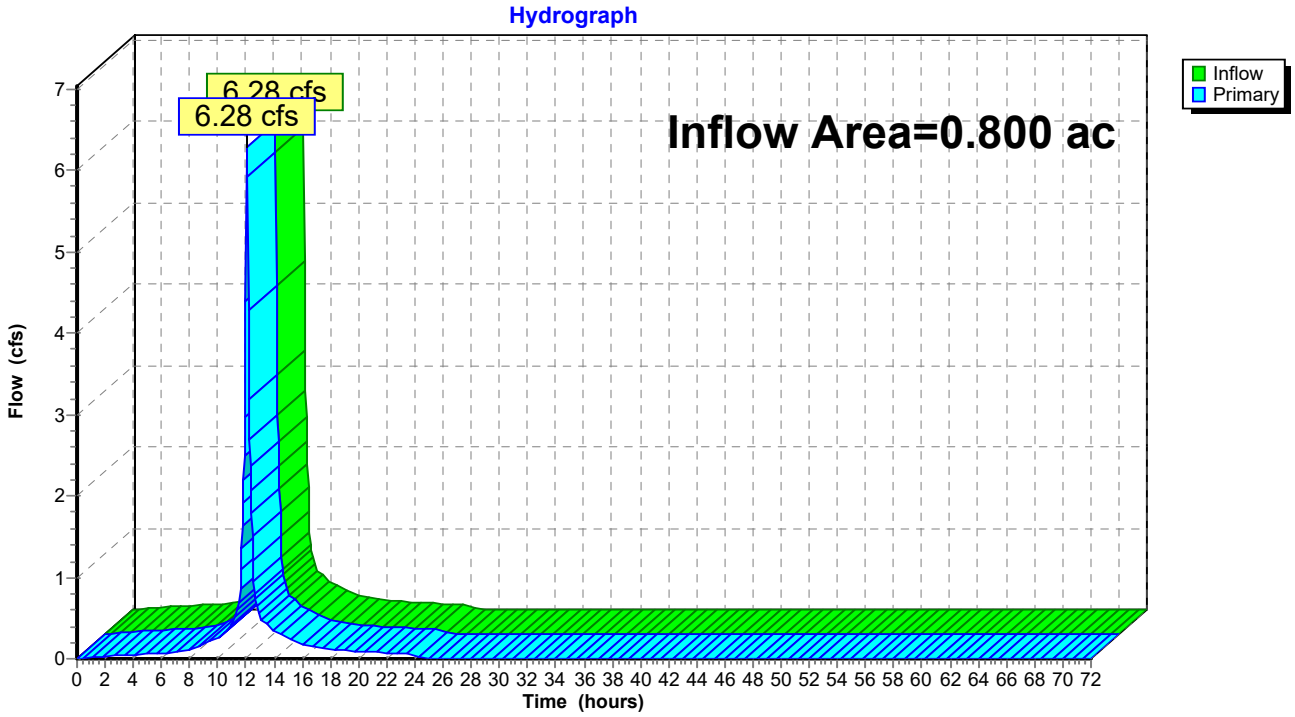
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.04		0.04	54.00	0.00		0.00
2.00	0.11		0.11	55.00	0.00		0.00
3.00	0.15		0.15	56.00	0.00		0.00
4.00	0.19		0.19	57.00	0.00		0.00
5.00	0.22		0.22	58.00	0.00		0.00
6.00	0.26		0.26	59.00	0.00		0.00
7.00	0.34		0.34	60.00	0.00		0.00
8.00	0.47		0.47	61.00	0.00		0.00
9.00	0.73		0.73	62.00	0.00		0.00
10.00	1.05		1.05	63.00	0.00		0.00
11.00	1.66		1.66	64.00	0.00		0.00
12.00	**11.82**		**11.82**	65.00	0.00		0.00
13.00	**2.67**		**2.67**	66.00	0.00		0.00
14.00	1.59		1.59	67.00	0.00		0.00
15.00	1.19		1.19	68.00	0.00		0.00
16.00	0.85		0.85	69.00	0.00		0.00
17.00	0.66		0.66	70.00	0.00		0.00
18.00	0.51		0.51	71.00	0.00		0.00
19.00	0.45		0.45	72.00	0.00		0.00
20.00	0.40		0.40				
21.00	0.37		0.37				
22.00	0.33		0.33				
23.00	0.30		0.30				
24.00	0.26		0.26				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 7: AREA A1 (TOTAL)

Inflow Area = 0.800 ac, 63.75% Impervious, Inflow Depth = 7.37" for 100-YR event
Inflow = 6.28 cfs @ 12.07 hrs, Volume= 0.491 af
Primary = 6.28 cfs @ 12.07 hrs, Volume= 0.491 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 7: AREA A1 (TOTAL)



Hydrograph for Pond 7: AREA A1 (TOTAL)

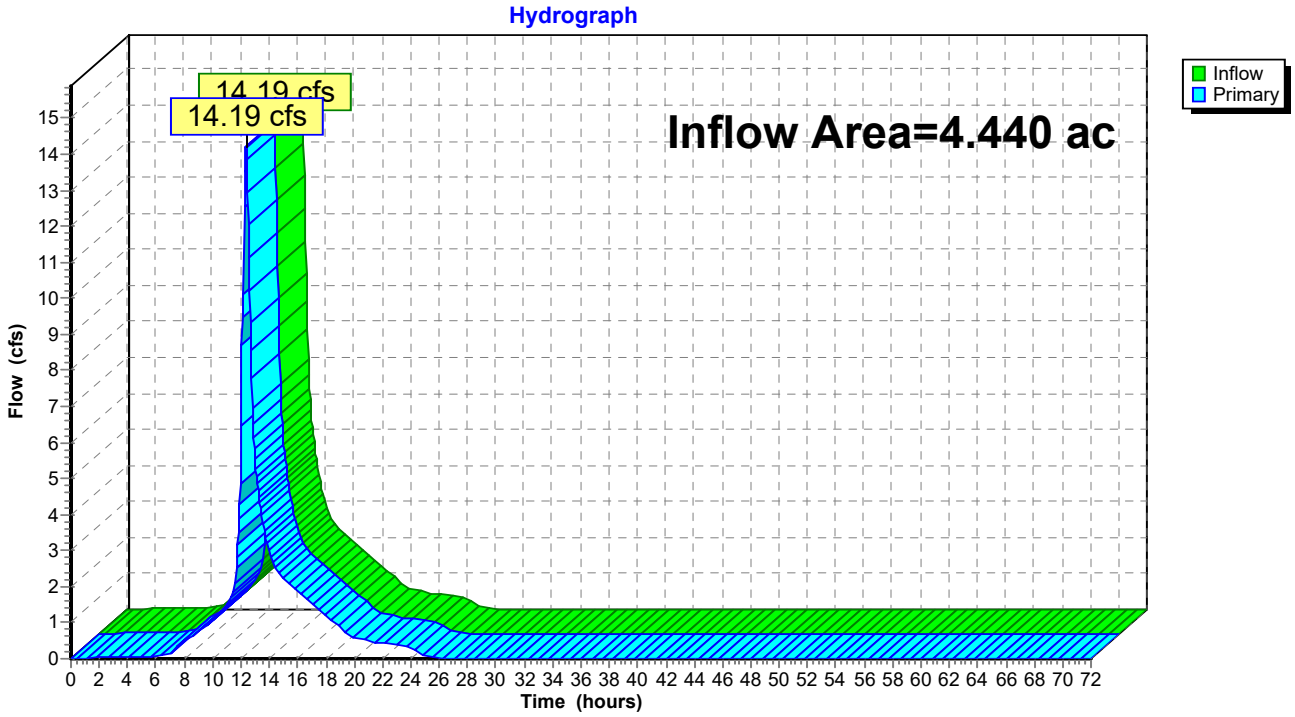
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00
1.00	0.01		0.01
2.00	0.03		0.03
3.00	0.04		0.04
4.00	0.05		0.05
5.00	0.06		0.06
6.00	0.07		0.07
7.00	0.09		0.09
8.00	0.12		0.12
9.00	0.18		0.18
10.00	0.26		0.26
11.00	0.40		0.40
12.00	**4.39**		**4.39**
13.00	**0.53**		**0.53**
14.00	0.34		0.34
15.00	0.26		0.26
16.00	0.18		0.18
17.00	0.14		0.14
18.00	0.11		0.11
19.00	0.10		0.10
20.00	0.09		0.09
21.00	0.08		0.08
22.00	0.07		0.07
23.00	0.07		0.07
24.00	0.06		0.06
25.00	0.00		0.00
26.00	0.00		0.00
27.00	0.00		0.00
28.00	0.00		0.00
29.00	0.00		0.00
30.00	0.00		0.00
31.00	0.00		0.00
32.00	0.00		0.00
33.00	0.00		0.00
34.00	0.00		0.00
35.00	0.00		0.00
36.00	0.00		0.00
37.00	0.00		0.00
38.00	0.00		0.00
39.00	0.00		0.00
40.00	0.00		0.00
41.00	0.00		0.00
42.00	0.00		0.00
43.00	0.00		0.00
44.00	0.00		0.00
45.00	0.00		0.00
46.00	0.00		0.00
47.00	0.00		0.00
48.00	0.00		0.00
49.00	0.00		0.00
50.00	0.00		0.00
51.00	0.00		0.00
52.00	0.00		0.00
53.00	0.00		0.00
54.00	0.00		0.00
55.00	0.00		0.00
56.00	0.00		0.00
57.00	0.00		0.00
58.00	0.00		0.00
59.00	0.00		0.00
60.00	0.00		0.00
61.00	0.00		0.00
62.00	0.00		0.00
63.00	0.00		0.00
64.00	0.00		0.00
65.00	0.00		0.00
66.00	0.00		0.00
67.00	0.00		0.00
68.00	0.00		0.00
69.00	0.00		0.00
70.00	0.00		0.00
71.00	0.00		0.00
72.00	0.00		0.00

Summary for Pond 8: EX. INLET (TWP)

Inflow Area = 4.440 ac, 56.76% Impervious, Inflow Depth = 6.94" for 100-YR event
Inflow = 14.19 cfs @ 12.36 hrs, Volume= 2.569 af
Primary = 14.19 cfs @ 12.36 hrs, Volume= 2.569 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 8: EX. INLET (TWP)



Hydrograph for Pond 8: EX. INLET (TWP)

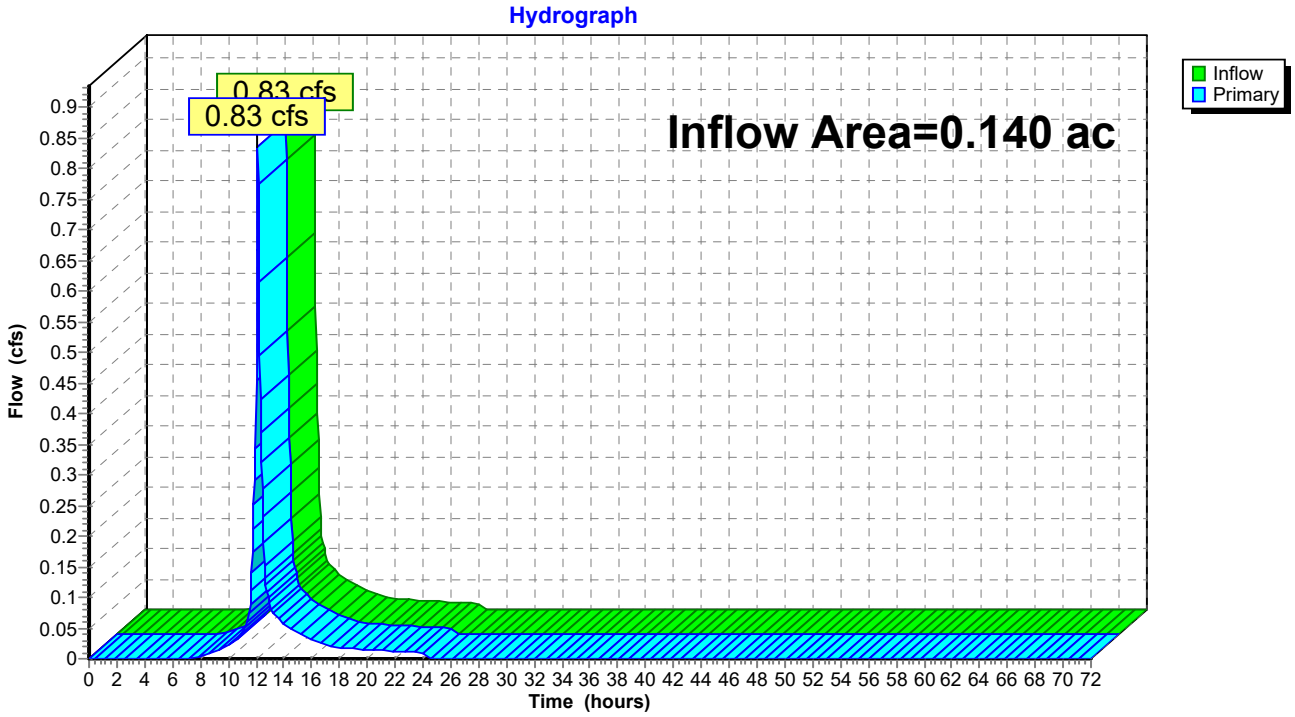
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00
1.00	0.01		0.01
2.00	0.03		0.03
3.00	0.04		0.04
4.00	0.05		0.05
5.00	0.06		0.06
6.00	0.07		0.07
7.00	0.16		0.16
8.00	0.48		0.48
9.00	0.75		0.75
10.00	1.06		1.06
11.00	1.49		1.49
12.00	**6.47**		**6.47**
13.00	**5.53**		**5.53**
14.00	2.95		2.95
15.00	2.20		2.20
16.00	1.87		1.87
17.00	1.54		1.54
18.00	1.19		1.19
19.00	0.85		0.85
20.00	0.60		0.60
21.00	0.49		0.49
22.00	0.43		0.43
23.00	0.39		0.39
24.00	0.34		0.34
25.00	0.07		0.07
26.00	0.03		0.03
27.00	0.02		0.02
28.00	0.01		0.01
29.00	0.01		0.01
30.00	0.00		0.00
31.00	0.00		0.00
32.00	0.00		0.00
33.00	0.00		0.00
34.00	0.00		0.00
35.00	0.00		0.00
36.00	0.00		0.00
37.00	0.00		0.00
38.00	0.00		0.00
39.00	0.00		0.00
40.00	0.00		0.00
41.00	0.00		0.00
42.00	0.00		0.00
43.00	0.00		0.00
44.00	0.00		0.00
45.00	0.00		0.00
46.00	0.00		0.00
47.00	0.00		0.00
48.00	0.00		0.00
49.00	0.00		0.00
50.00	0.00		0.00
51.00	0.00		0.00
52.00	0.00		0.00
53.00	0.00		0.00
54.00	0.00		0.00
55.00	0.00		0.00
56.00	0.00		0.00
57.00	0.00		0.00
58.00	0.00		0.00
59.00	0.00		0.00
60.00	0.00		0.00
61.00	0.00		0.00
62.00	0.00		0.00
63.00	0.00		0.00
64.00	0.00		0.00
65.00	0.00		0.00
66.00	0.00		0.00
67.00	0.00		0.00
68.00	0.00		0.00
69.00	0.00		0.00
70.00	0.00		0.00
71.00	0.00		0.00
72.00	0.00		0.00

Summary for Pond 10: AREA A2

Inflow Area = 0.140 ac, 0.00% Impervious, Inflow Depth = 5.52" for 100-YR event
Inflow = 0.83 cfs @ 12.11 hrs, Volume= 0.064 af
Primary = 0.83 cfs @ 12.11 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 10: AREA A2



Hydrograph for Pond 10: AREA A2

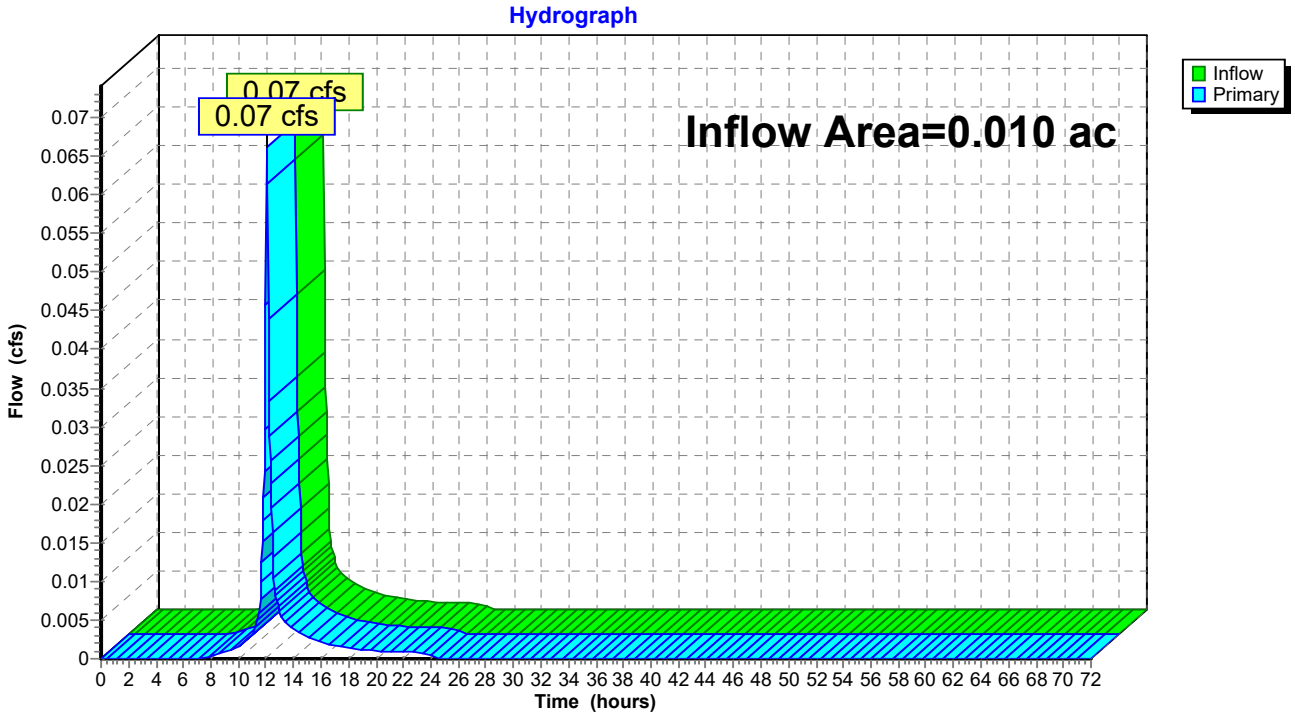
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00
1.00	0.00		0.00
2.00	0.00		0.00
3.00	0.00		0.00
4.00	0.00		0.00
5.00	0.00		0.00
6.00	0.00		0.00
7.00	0.00		0.00
8.00	0.00		0.00
9.00	0.01		0.01
10.00	0.02		0.02
11.00	0.04		0.04
12.00	**0.45**		**0.45**
13.00	**0.09**		**0.09**
14.00	0.06		0.06
15.00	0.04		0.04
16.00	0.03		0.03
17.00	0.02		0.02
18.00	0.02		0.02
19.00	0.02		0.02
20.00	0.01		0.01
21.00	0.01		0.01
22.00	0.01		0.01
23.00	0.01		0.01
24.00	0.01		0.01
25.00	0.00		0.00
26.00	0.00		0.00
27.00	0.00		0.00
28.00	0.00		0.00
29.00	0.00		0.00
30.00	0.00		0.00
31.00	0.00		0.00
32.00	0.00		0.00
33.00	0.00		0.00
34.00	0.00		0.00
35.00	0.00		0.00
36.00	0.00		0.00
37.00	0.00		0.00
38.00	0.00		0.00
39.00	0.00		0.00
40.00	0.00		0.00
41.00	0.00		0.00
42.00	0.00		0.00
43.00	0.00		0.00
44.00	0.00		0.00
45.00	0.00		0.00
46.00	0.00		0.00
47.00	0.00		0.00
48.00	0.00		0.00
49.00	0.00		0.00
50.00	0.00		0.00
51.00	0.00		0.00
52.00	0.00		0.00
53.00	0.00		0.00
54.00	0.00		0.00
55.00	0.00		0.00
56.00	0.00		0.00
57.00	0.00		0.00
58.00	0.00		0.00
59.00	0.00		0.00
60.00	0.00		0.00
61.00	0.00		0.00
62.00	0.00		0.00
63.00	0.00		0.00
64.00	0.00		0.00
65.00	0.00		0.00
66.00	0.00		0.00
67.00	0.00		0.00
68.00	0.00		0.00
69.00	0.00		0.00
70.00	0.00		0.00
71.00	0.00		0.00
72.00	0.00		0.00

Summary for Pond 12: AREA A3

Inflow Area = 0.010 ac, 0.00% Impervious, Inflow Depth = 5.52" for 100-YR event
Inflow = 0.07 cfs @ 12.07 hrs, Volume= 0.005 af
Primary = 0.07 cfs @ 12.07 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 12: AREA A3



Hydrograph for Pond 12: AREA A3

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00
1.00	0.00		0.00
2.00	0.00		0.00
3.00	0.00		0.00
4.00	0.00		0.00
5.00	0.00		0.00
6.00	0.00		0.00
7.00	0.00		0.00
8.00	0.00		0.00
9.00	0.00		0.00
10.00	0.00		0.00
11.00	0.00		0.00
12.00	**0.05**		**0.05**
13.00	**0.01**		**0.01**
14.00	0.00		0.00
15.00	0.00		0.00
16.00	0.00		0.00
17.00	0.00		0.00
18.00	0.00		0.00
19.00	0.00		0.00
20.00	0.00		0.00
21.00	0.00		0.00
22.00	0.00		0.00
23.00	0.00		0.00
24.00	0.00		0.00
25.00	0.00		0.00
26.00	0.00		0.00
27.00	0.00		0.00
28.00	0.00		0.00
29.00	0.00		0.00
30.00	0.00		0.00
31.00	0.00		0.00
32.00	0.00		0.00
33.00	0.00		0.00
34.00	0.00		0.00
35.00	0.00		0.00
36.00	0.00		0.00
37.00	0.00		0.00
38.00	0.00		0.00
39.00	0.00		0.00
40.00	0.00		0.00
41.00	0.00		0.00
42.00	0.00		0.00
43.00	0.00		0.00
44.00	0.00		0.00
45.00	0.00		0.00
46.00	0.00		0.00
47.00	0.00		0.00
48.00	0.00		0.00
49.00	0.00		0.00
50.00	0.00		0.00
51.00	0.00		0.00
52.00	0.00		0.00
53.00	0.00		0.00
54.00	0.00		0.00
55.00	0.00		0.00
56.00	0.00		0.00
57.00	0.00		0.00
58.00	0.00		0.00
59.00	0.00		0.00
60.00	0.00		0.00
61.00	0.00		0.00
62.00	0.00		0.00
63.00	0.00		0.00
64.00	0.00		0.00
65.00	0.00		0.00
66.00	0.00		0.00
67.00	0.00		0.00
68.00	0.00		0.00
69.00	0.00		0.00
70.00	0.00		0.00
71.00	0.00		0.00
72.00	0.00		0.00

APPENDIX E

Post-Developed Hydrograph Calculations

2 yr. Storm
10 yr. Storm
100 yr. Storm

Summary for Subcatchment 1: TO BASIN 1 (IMP)

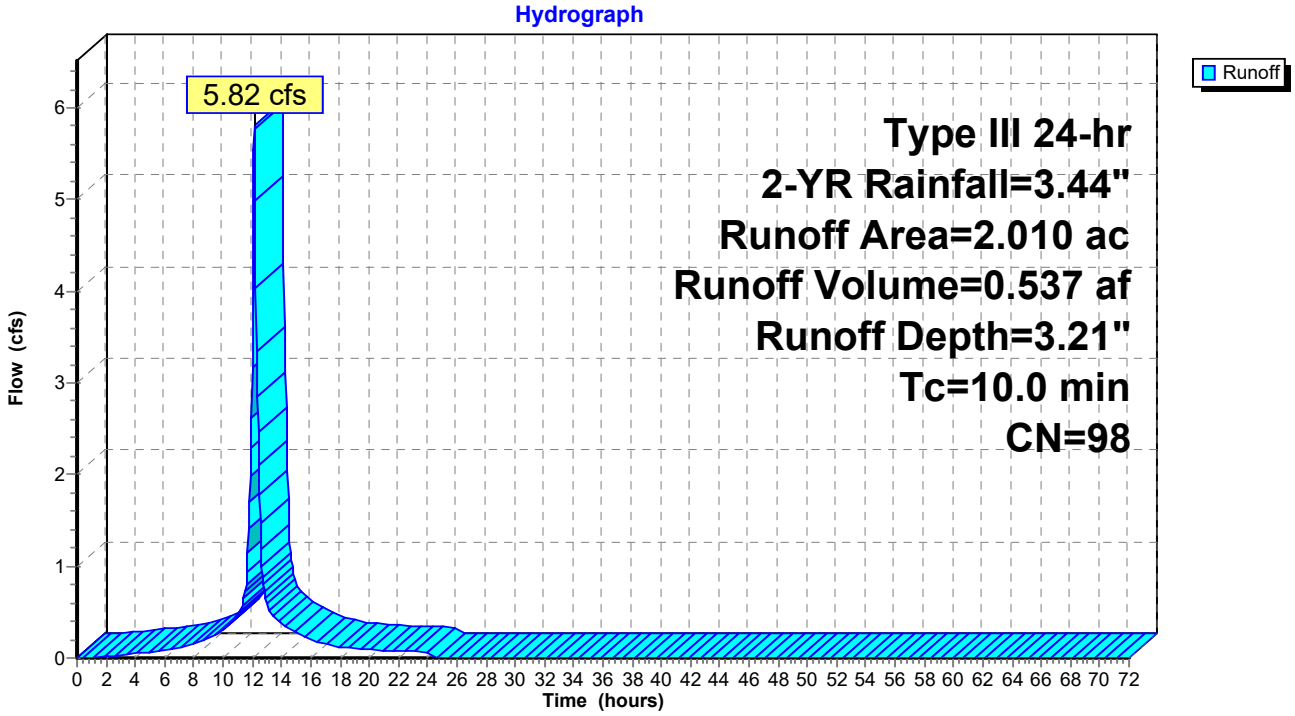
Runoff = 5.82 cfs @ 12.14 hrs, Volume= 0.537 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
2.010	98	Paved parking, HSG C
2.010		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, A1 ON-SITE (IMP)**

Subcatchment 1: TO BASIN 1 (IMP)



Hydrograph for Subcatchment 1: TO BASIN 1 (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.01
3.00	0.11	0.02	0.03
4.00	0.15	0.04	0.05
5.00	0.20	0.07	0.07
6.00	0.25	0.10	0.08
7.00	0.31	0.15	0.11
8.00	0.39	0.22	0.15
9.00	0.50	0.32	0.22
10.00	0.65	0.46	0.31
11.00	0.86	0.66	0.46
12.00	1.72	1.50	**3.18**
13.00	2.58	2.35	**0.60**
14.00	2.79	2.56	0.37
15.00	2.94	2.71	0.27
16.00	3.05	2.82	0.19
17.00	3.13	2.90	0.15
18.00	3.19	2.96	0.12
19.00	3.24	3.01	0.10
20.00	3.29	3.06	0.09
21.00	3.33	3.10	0.08
22.00	3.37	3.14	0.08
23.00	3.41	3.18	0.07
24.00	**3.44**	**3.21**	0.06
25.00	3.44	3.21	0.00
26.00	3.44	3.21	0.00
27.00	3.44	3.21	0.00
28.00	3.44	3.21	0.00
29.00	3.44	3.21	0.00
30.00	3.44	3.21	0.00
31.00	3.44	3.21	0.00
32.00	3.44	3.21	0.00
33.00	3.44	3.21	0.00
34.00	3.44	3.21	0.00
35.00	3.44	3.21	0.00
36.00	3.44	3.21	0.00
37.00	3.44	3.21	0.00
38.00	3.44	3.21	0.00
39.00	3.44	3.21	0.00
40.00	3.44	3.21	0.00
41.00	3.44	3.21	0.00
42.00	3.44	3.21	0.00
43.00	3.44	3.21	0.00
44.00	3.44	3.21	0.00
45.00	3.44	3.21	0.00
46.00	3.44	3.21	0.00
47.00	3.44	3.21	0.00
48.00	3.44	3.21	0.00
49.00	3.44	3.21	0.00
50.00	3.44	3.21	0.00
51.00	3.44	3.21	0.00
52.00	3.44	3.21	0.00
53.00	3.44	3.21	0.00
54.00	3.44	3.21	0.00
55.00	3.44	3.21	0.00
56.00	3.44	3.21	0.00
57.00	3.44	3.21	0.00
58.00	3.44	3.21	0.00
59.00	3.44	3.21	0.00
60.00	3.44	3.21	0.00
61.00	3.44	3.21	0.00
62.00	3.44	3.21	0.00
63.00	3.44	3.21	0.00
64.00	3.44	3.21	0.00
65.00	3.44	3.21	0.00
66.00	3.44	3.21	0.00
67.00	3.44	3.21	0.00
68.00	3.44	3.21	0.00
69.00	3.44	3.21	0.00
70.00	3.44	3.21	0.00
71.00	3.44	3.21	0.00
72.00	3.44	3.21	0.00

Summary for Subcatchment 1: TO BASIN 1 (IMP)

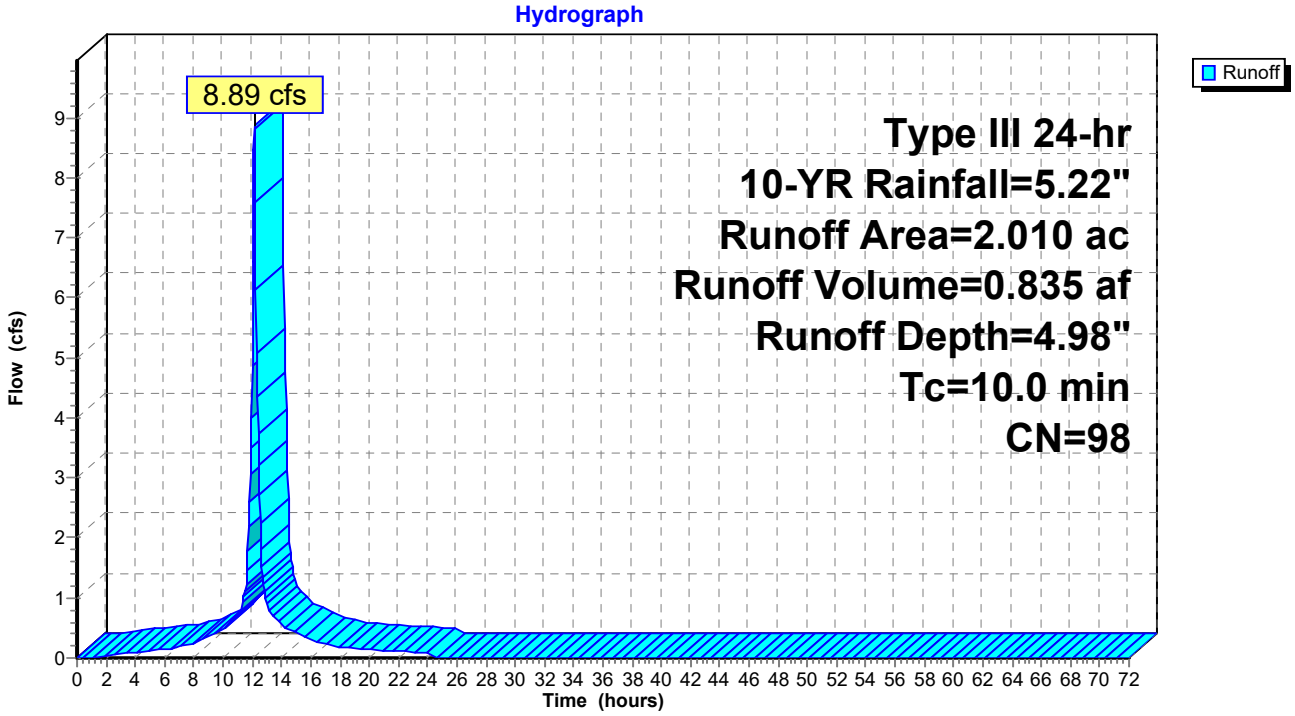
Runoff = 8.89 cfs @ 12.14 hrs, Volume= 0.835 af, Depth= 4.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
2.010	98	Paved parking, HSG C
2.010		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, A1 ON-SITE (IMP)**

Subcatchment 1: TO BASIN 1 (IMP)



Hydrograph for Subcatchment 1: TO BASIN 1 (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.02	0.04
3.00	0.16	0.04	0.07
4.00	0.22	0.09	0.10
5.00	0.30	0.14	0.12
6.00	0.38	0.21	0.14
7.00	0.47	0.29	0.19
8.00	0.60	0.41	0.25
9.00	0.76	0.56	0.36
10.00	0.99	0.78	0.48
11.00	1.30	1.09	0.72
12.00	2.61	2.38	**4.87**
13.00	3.91	3.68	**0.92**
14.00	4.23	4.00	0.56
15.00	4.46	4.22	0.41
16.00	4.62	4.39	0.29
17.00	4.75	4.51	0.23
18.00	4.84	4.61	0.18
19.00	4.92	4.69	0.16
20.00	5.00	4.76	0.14
21.00	5.06	4.82	0.13
22.00	5.12	4.88	0.12
23.00	5.17	4.94	0.10
24.00	**5.22**	**4.98**	0.09
25.00	5.22	4.98	0.00
26.00	5.22	4.98	0.00
27.00	5.22	4.98	0.00
28.00	5.22	4.98	0.00
29.00	5.22	4.98	0.00
30.00	5.22	4.98	0.00
31.00	5.22	4.98	0.00
32.00	5.22	4.98	0.00
33.00	5.22	4.98	0.00
34.00	5.22	4.98	0.00
35.00	5.22	4.98	0.00
36.00	5.22	4.98	0.00
37.00	5.22	4.98	0.00
38.00	5.22	4.98	0.00
39.00	5.22	4.98	0.00
40.00	5.22	4.98	0.00
41.00	5.22	4.98	0.00
42.00	5.22	4.98	0.00
43.00	5.22	4.98	0.00
44.00	5.22	4.98	0.00
45.00	5.22	4.98	0.00
46.00	5.22	4.98	0.00
47.00	5.22	4.98	0.00
48.00	5.22	4.98	0.00
49.00	5.22	4.98	0.00
50.00	5.22	4.98	0.00
51.00	5.22	4.98	0.00
52.00	5.22	4.98	0.00
53.00	5.22	4.98	0.00
54.00	5.22	4.98	0.00
55.00	5.22	4.98	0.00
56.00	5.22	4.98	0.00
57.00	5.22	4.98	0.00
58.00	5.22	4.98	0.00
59.00	5.22	4.98	0.00
60.00	5.22	4.98	0.00
61.00	5.22	4.98	0.00
62.00	5.22	4.98	0.00
63.00	5.22	4.98	0.00
64.00	5.22	4.98	0.00
65.00	5.22	4.98	0.00
66.00	5.22	4.98	0.00
67.00	5.22	4.98	0.00
68.00	5.22	4.98	0.00
69.00	5.22	4.98	0.00
70.00	5.22	4.98	0.00
71.00	5.22	4.98	0.00
72.00	5.22	4.98	0.00

Summary for Subcatchment 1: TO BASIN 1 (IMP)

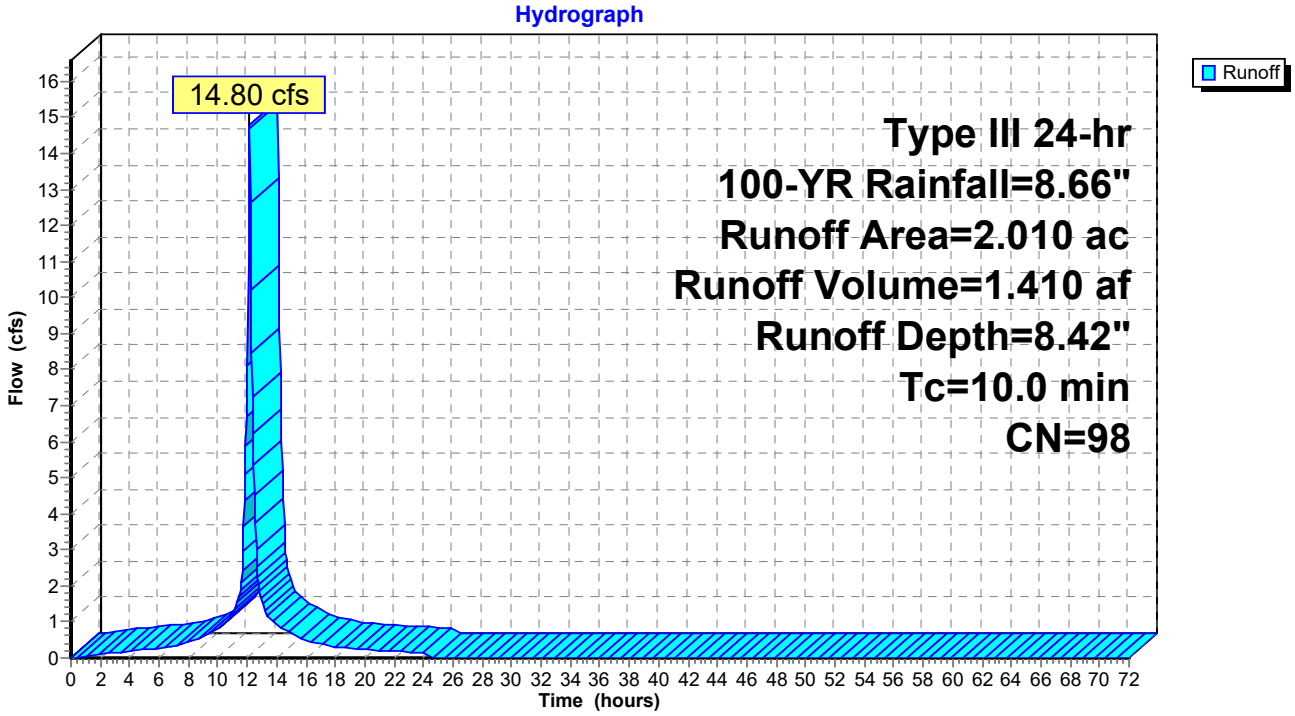
Runoff = 14.80 cfs @ 12.14 hrs, Volume= 1.410 af, Depth= 8.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
2.010	98	Paved parking, HSG C
2.010		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, A1 ON-SITE (IMP)**

Subcatchment 1: TO BASIN 1 (IMP)



Hydrograph for Subcatchment 1: TO BASIN 1 (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.01	0.04
2.00	0.17	0.05	0.11
3.00	0.27	0.12	0.15
4.00	0.37	0.21	0.19
5.00	0.49	0.31	0.22
6.00	0.62	0.43	0.26
7.00	0.78	0.58	0.34
8.00	0.99	0.78	0.43
9.00	1.26	1.05	0.61
10.00	1.64	1.41	0.82
11.00	2.17	1.94	1.21
12.00	4.33	4.09	**8.12**
13.00	6.49	6.26	**1.53**
14.00	7.02	6.78	0.92
15.00	7.40	7.16	0.69
16.00	7.67	7.43	0.49
17.00	7.88	7.64	0.38
18.00	8.04	7.80	0.29
19.00	8.17	7.93	0.26
20.00	8.29	8.05	0.23
21.00	8.40	8.16	0.21
22.00	8.49	8.25	0.19
23.00	8.58	8.34	0.17
24.00	**8.66**	**8.42**	0.15
25.00	8.66	8.42	0.00
26.00	8.66	8.42	0.00
27.00	8.66	8.42	0.00
28.00	8.66	8.42	0.00
29.00	8.66	8.42	0.00
30.00	8.66	8.42	0.00
31.00	8.66	8.42	0.00
32.00	8.66	8.42	0.00
33.00	8.66	8.42	0.00
34.00	8.66	8.42	0.00
35.00	8.66	8.42	0.00
36.00	8.66	8.42	0.00
37.00	8.66	8.42	0.00
38.00	8.66	8.42	0.00
39.00	8.66	8.42	0.00
40.00	8.66	8.42	0.00
41.00	8.66	8.42	0.00
42.00	8.66	8.42	0.00
43.00	8.66	8.42	0.00
44.00	8.66	8.42	0.00
45.00	8.66	8.42	0.00
46.00	8.66	8.42	0.00
47.00	8.66	8.42	0.00
48.00	8.66	8.42	0.00
49.00	8.66	8.42	0.00
50.00	8.66	8.42	0.00
51.00	8.66	8.42	0.00
52.00	8.66	8.42	0.00
53.00	8.66	8.42	0.00
54.00	8.66	8.42	0.00
55.00	8.66	8.42	0.00
56.00	8.66	8.42	0.00
57.00	8.66	8.42	0.00
58.00	8.66	8.42	0.00
59.00	8.66	8.42	0.00
60.00	8.66	8.42	0.00
61.00	8.66	8.42	0.00
62.00	8.66	8.42	0.00
63.00	8.66	8.42	0.00
64.00	8.66	8.42	0.00
65.00	8.66	8.42	0.00
66.00	8.66	8.42	0.00
67.00	8.66	8.42	0.00
68.00	8.66	8.42	0.00
69.00	8.66	8.42	0.00
70.00	8.66	8.42	0.00
71.00	8.66	8.42	0.00
72.00	8.66	8.42	0.00

Summary for Subcatchment 2: TO BASIN 1 (PERV)

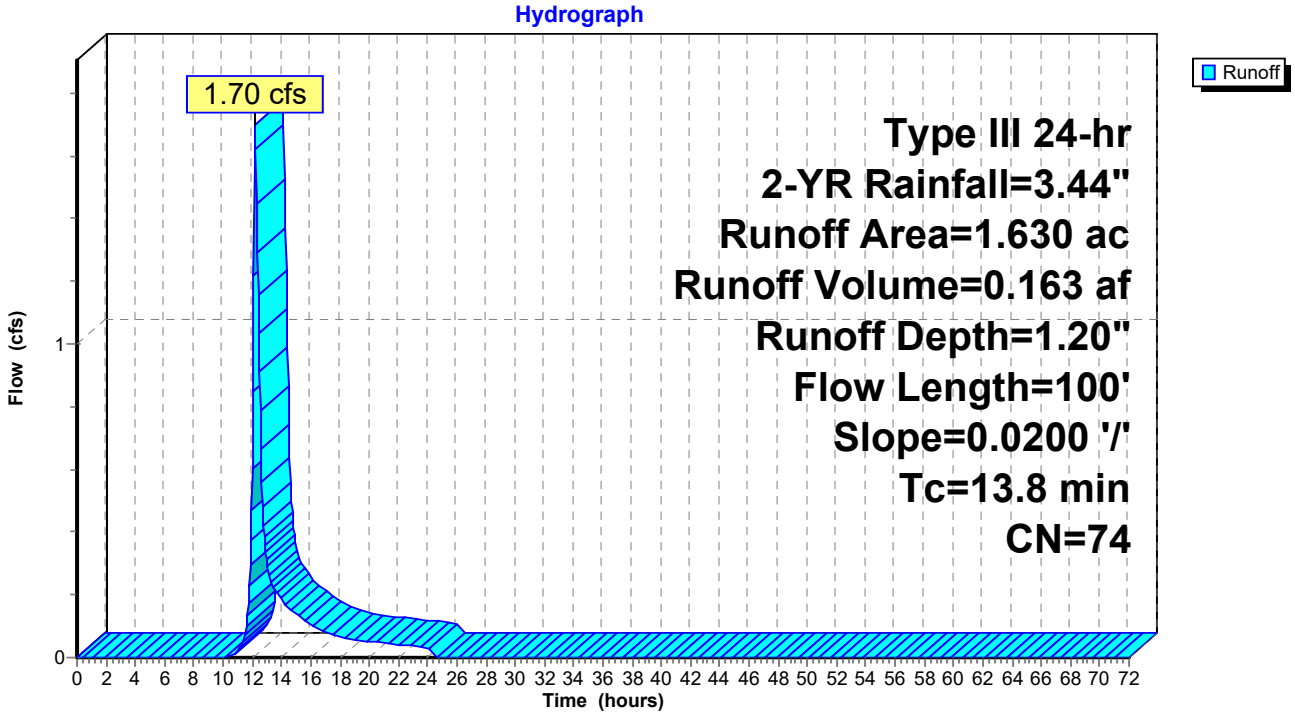
Runoff = 1.70 cfs @ 12.21 hrs, Volume= 0.163 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
1.480	74	>75% Grass cover, Good, HSG C
0.150	72	Woods/grass comb., Good, HSG C
1.630	74	Weighted Average
1.630		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	100	0.0200	0.12		**Sheet Flow, A1 ON-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 2: TO BASIN 1 (PERV)



Hydrograph for Subcatchment 2: TO BASIN 1 (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.00
3.00	0.11	0.00	0.00
4.00	0.15	0.00	0.00
5.00	0.20	0.00	0.00
6.00	0.25	0.00	0.00
7.00	0.31	0.00	0.00
8.00	0.39	0.00	0.00
9.00	0.50	0.00	0.00
10.00	0.65	0.00	0.00
11.00	0.86	0.01	0.02
12.00	1.72	0.23	**0.60**
13.00	2.58	0.65	**0.30**
14.00	2.79	0.78	0.18
15.00	2.94	0.87	0.14
16.00	3.05	0.94	0.10
17.00	3.13	0.99	0.08
18.00	3.19	1.03	0.06
19.00	3.24	1.07	0.06
20.00	3.29	1.10	0.05
21.00	3.33	1.13	0.05
22.00	3.37	1.15	0.04
23.00	3.41	1.18	0.04
24.00	**3.44**	**1.20**	0.03
25.00	3.44	1.20	0.00
26.00	3.44	1.20	0.00
27.00	3.44	1.20	0.00
28.00	3.44	1.20	0.00
29.00	3.44	1.20	0.00
30.00	3.44	1.20	0.00
31.00	3.44	1.20	0.00
32.00	3.44	1.20	0.00
33.00	3.44	1.20	0.00
34.00	3.44	1.20	0.00
35.00	3.44	1.20	0.00
36.00	3.44	1.20	0.00
37.00	3.44	1.20	0.00
38.00	3.44	1.20	0.00
39.00	3.44	1.20	0.00
40.00	3.44	1.20	0.00
41.00	3.44	1.20	0.00
42.00	3.44	1.20	0.00
43.00	3.44	1.20	0.00
44.00	3.44	1.20	0.00
45.00	3.44	1.20	0.00
46.00	3.44	1.20	0.00
47.00	3.44	1.20	0.00
48.00	3.44	1.20	0.00
49.00	3.44	1.20	0.00
50.00	3.44	1.20	0.00
51.00	3.44	1.20	0.00
52.00	3.44	1.20	0.00
53.00	3.44	1.20	0.00
54.00	3.44	1.20	0.00
55.00	3.44	1.20	0.00
56.00	3.44	1.20	0.00
57.00	3.44	1.20	0.00
58.00	3.44	1.20	0.00
59.00	3.44	1.20	0.00
60.00	3.44	1.20	0.00
61.00	3.44	1.20	0.00
62.00	3.44	1.20	0.00
63.00	3.44	1.20	0.00
64.00	3.44	1.20	0.00
65.00	3.44	1.20	0.00
66.00	3.44	1.20	0.00
67.00	3.44	1.20	0.00
68.00	3.44	1.20	0.00
69.00	3.44	1.20	0.00
70.00	3.44	1.20	0.00
71.00	3.44	1.20	0.00
72.00	3.44	1.20	0.00

Summary for Subcatchment 2: TO BASIN 1 (PERV)

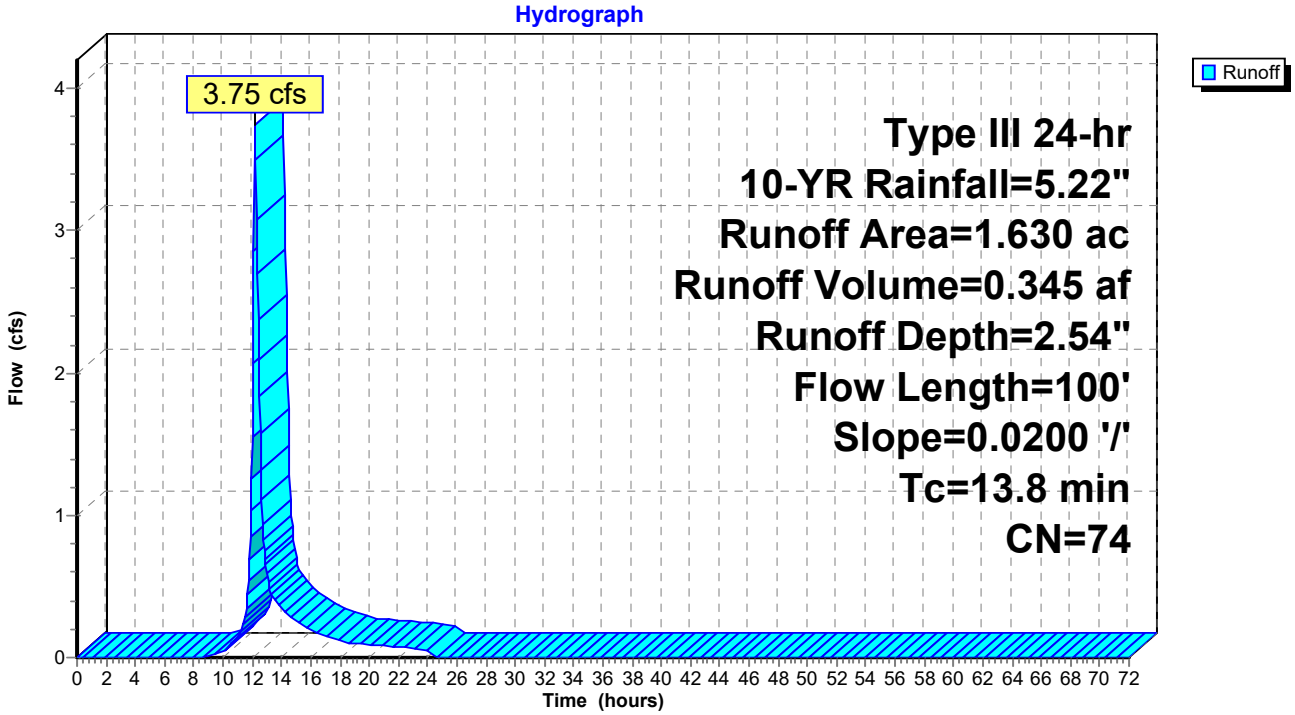
Runoff = 3.75 cfs @ 12.20 hrs, Volume= 0.345 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
1.480	74	>75% Grass cover, Good, HSG C
0.150	72	Woods/grass comb., Good, HSG C
1.630	74	Weighted Average
1.630		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	100	0.0200	0.12		**Sheet Flow, A1 ON-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 2: TO BASIN 1 (PERV)



Hydrograph for Subcatchment 2: TO BASIN 1 (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.16	0.00	0.00
4.00	0.22	0.00	0.00
5.00	0.30	0.00	0.00
6.00	0.38	0.00	0.00
7.00	0.47	0.00	0.00
8.00	0.60	0.00	0.00
9.00	0.76	0.00	0.00
10.00	0.99	0.02	0.05
11.00	1.30	0.09	0.14
12.00	2.61	0.67	**1.55**
13.00	3.91	1.53	**0.58**
14.00	4.23	1.77	0.35
15.00	4.46	1.94	0.26
16.00	4.62	2.07	0.19
17.00	4.75	2.16	0.15
18.00	4.84	2.24	0.12
19.00	4.92	2.30	0.10
20.00	5.00	2.36	0.09
21.00	5.06	2.41	0.08
22.00	5.12	2.46	0.08
23.00	5.17	2.50	0.07
24.00	**5.22**	**2.54**	0.06
25.00	5.22	2.54	0.00
26.00	5.22	2.54	0.00
27.00	5.22	2.54	0.00
28.00	5.22	2.54	0.00
29.00	5.22	2.54	0.00
30.00	5.22	2.54	0.00
31.00	5.22	2.54	0.00
32.00	5.22	2.54	0.00
33.00	5.22	2.54	0.00
34.00	5.22	2.54	0.00
35.00	5.22	2.54	0.00
36.00	5.22	2.54	0.00
37.00	5.22	2.54	0.00
38.00	5.22	2.54	0.00
39.00	5.22	2.54	0.00
40.00	5.22	2.54	0.00
41.00	5.22	2.54	0.00
42.00	5.22	2.54	0.00
43.00	5.22	2.54	0.00
44.00	5.22	2.54	0.00
45.00	5.22	2.54	0.00
46.00	5.22	2.54	0.00
47.00	5.22	2.54	0.00
48.00	5.22	2.54	0.00
49.00	5.22	2.54	0.00
50.00	5.22	2.54	0.00
51.00	5.22	2.54	0.00
52.00	5.22	2.54	0.00
53.00	5.22	2.54	0.00
54.00	5.22	2.54	0.00
55.00	5.22	2.54	0.00
56.00	5.22	2.54	0.00
57.00	5.22	2.54	0.00
58.00	5.22	2.54	0.00
59.00	5.22	2.54	0.00
60.00	5.22	2.54	0.00
61.00	5.22	2.54	0.00
62.00	5.22	2.54	0.00
63.00	5.22	2.54	0.00
64.00	5.22	2.54	0.00
65.00	5.22	2.54	0.00
66.00	5.22	2.54	0.00
67.00	5.22	2.54	0.00
68.00	5.22	2.54	0.00
69.00	5.22	2.54	0.00
70.00	5.22	2.54	0.00
71.00	5.22	2.54	0.00
72.00	5.22	2.54	0.00

Summary for Subcatchment 2: TO BASIN 1 (PERV)

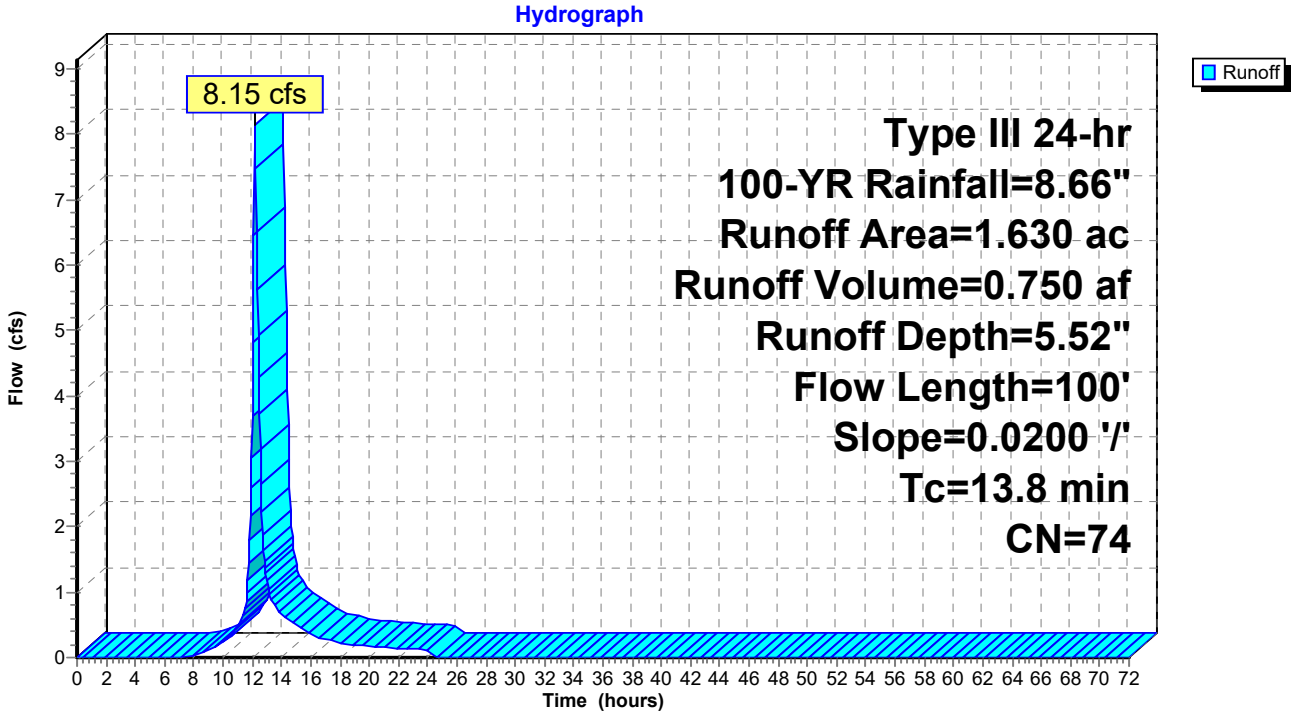
Runoff = 8.15 cfs @ 12.19 hrs, Volume= 0.750 af, Depth= 5.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
1.480	74	>75% Grass cover, Good, HSG C
0.150	72	Woods/grass comb., Good, HSG C
1.630	74	Weighted Average
1.630		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	100	0.0200	0.12		**Sheet Flow, A1 ON-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 2: TO BASIN 1 (PERV)



Hydrograph for Subcatchment 2: TO BASIN 1 (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.00	0.00
3.00	0.27	0.00	0.00
4.00	0.37	0.00	0.00
5.00	0.49	0.00	0.00
6.00	0.62	0.00	0.00
7.00	0.78	0.00	0.01
8.00	0.99	0.02	0.04
9.00	1.26	0.08	0.12
10.00	1.64	0.20	0.23
11.00	2.17	0.43	0.46
12.00	4.33	1.84	**3.70**
13.00	6.49	3.61	**1.14**
14.00	7.02	4.06	0.67
15.00	7.40	4.39	0.50
16.00	7.67	4.63	0.36
17.00	7.88	4.82	0.28
18.00	8.04	4.96	0.22
19.00	8.17	5.08	0.19
20.00	8.29	5.18	0.17
21.00	8.40	5.28	0.16
22.00	8.49	5.37	0.14
23.00	8.58	5.45	0.13
24.00	**8.66**	**5.52**	0.11
25.00	8.66	5.52	0.00
26.00	8.66	5.52	0.00
27.00	8.66	5.52	0.00
28.00	8.66	5.52	0.00
29.00	8.66	5.52	0.00
30.00	8.66	5.52	0.00
31.00	8.66	5.52	0.00
32.00	8.66	5.52	0.00
33.00	8.66	5.52	0.00
34.00	8.66	5.52	0.00
35.00	8.66	5.52	0.00
36.00	8.66	5.52	0.00
37.00	8.66	5.52	0.00
38.00	8.66	5.52	0.00
39.00	8.66	5.52	0.00
40.00	8.66	5.52	0.00
41.00	8.66	5.52	0.00
42.00	8.66	5.52	0.00
43.00	8.66	5.52	0.00
44.00	8.66	5.52	0.00
45.00	8.66	5.52	0.00
46.00	8.66	5.52	0.00
47.00	8.66	5.52	0.00
48.00	8.66	5.52	0.00
49.00	8.66	5.52	0.00
50.00	8.66	5.52	0.00
51.00	8.66	5.52	0.00
52.00	8.66	5.52	0.00
53.00	8.66	5.52	0.00
54.00	8.66	5.52	0.00
55.00	8.66	5.52	0.00
56.00	8.66	5.52	0.00
57.00	8.66	5.52	0.00
58.00	8.66	5.52	0.00
59.00	8.66	5.52	0.00
60.00	8.66	5.52	0.00
61.00	8.66	5.52	0.00
62.00	8.66	5.52	0.00
63.00	8.66	5.52	0.00
64.00	8.66	5.52	0.00
65.00	8.66	5.52	0.00
66.00	8.66	5.52	0.00
67.00	8.66	5.52	0.00
68.00	8.66	5.52	0.00
69.00	8.66	5.52	0.00
70.00	8.66	5.52	0.00
71.00	8.66	5.52	0.00
72.00	8.66	5.52	0.00

Summary for Subcatchment 5: AREA A1 (IMP)

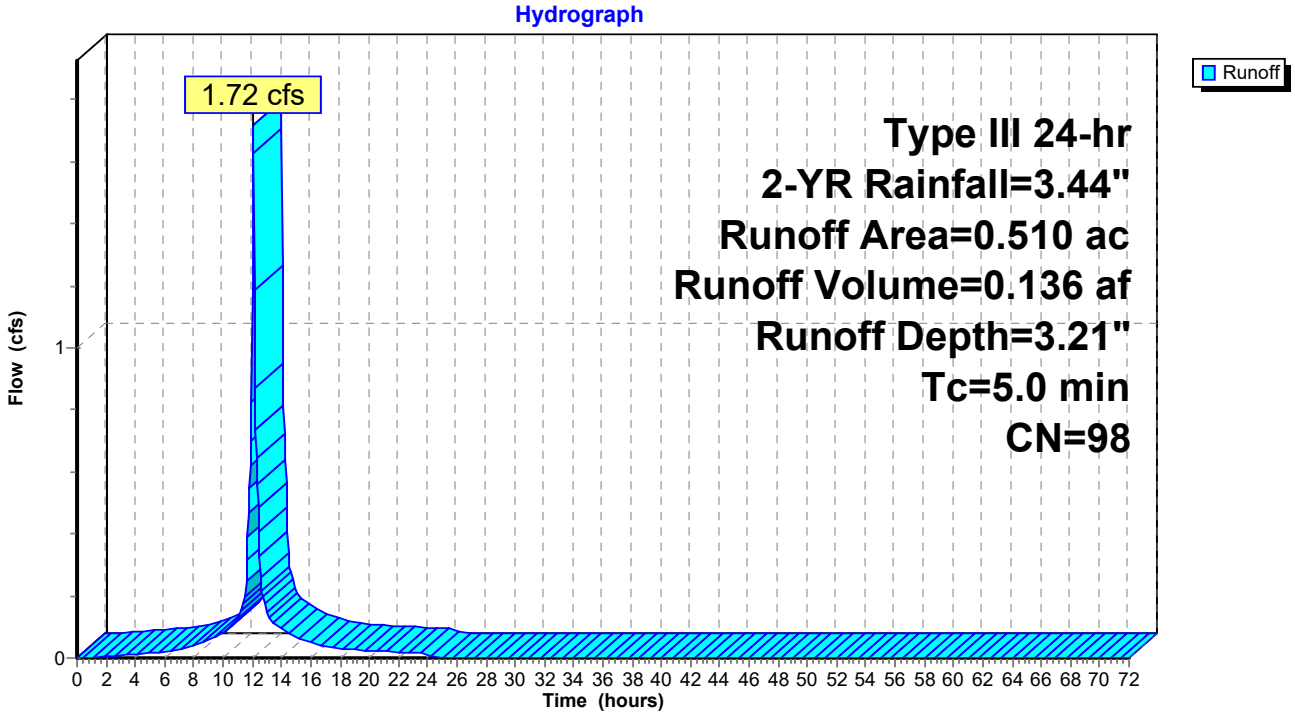
Runoff = 1.72 cfs @ 12.07 hrs, Volume= 0.136 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
0.510	98	Paved parking, HSG C
0.510		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, A1 OFF-SITE (IMP)**

Subcatchment 5: AREA A1 (IMP)



Hydrograph for Subcatchment 5: AREA A1 (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.00
3.00	0.11	0.02	0.01
4.00	0.15	0.04	0.01
5.00	0.20	0.07	0.02
6.00	0.25	0.10	0.02
7.00	0.31	0.15	0.03
8.00	0.39	0.22	0.04
9.00	0.50	0.32	0.06
10.00	0.65	0.46	0.08
11.00	0.86	0.66	0.12
12.00	1.72	1.50	**1.20**
13.00	2.58	2.35	**0.14**
14.00	2.79	2.56	0.09
15.00	2.94	2.71	0.07
16.00	3.05	2.82	0.05
17.00	3.13	2.90	0.04
18.00	3.19	2.96	0.03
19.00	3.24	3.01	0.03
20.00	3.29	3.06	0.02
21.00	3.33	3.10	0.02
22.00	3.37	3.14	0.02
23.00	3.41	3.18	0.02
24.00	**3.44**	**3.21**	0.02
25.00	3.44	3.21	0.00
26.00	3.44	3.21	0.00
27.00	3.44	3.21	0.00
28.00	3.44	3.21	0.00
29.00	3.44	3.21	0.00
30.00	3.44	3.21	0.00
31.00	3.44	3.21	0.00
32.00	3.44	3.21	0.00
33.00	3.44	3.21	0.00
34.00	3.44	3.21	0.00
35.00	3.44	3.21	0.00
36.00	3.44	3.21	0.00
37.00	3.44	3.21	0.00
38.00	3.44	3.21	0.00
39.00	3.44	3.21	0.00
40.00	3.44	3.21	0.00
41.00	3.44	3.21	0.00
42.00	3.44	3.21	0.00
43.00	3.44	3.21	0.00
44.00	3.44	3.21	0.00
45.00	3.44	3.21	0.00
46.00	3.44	3.21	0.00
47.00	3.44	3.21	0.00
48.00	3.44	3.21	0.00
49.00	3.44	3.21	0.00
50.00	3.44	3.21	0.00
51.00	3.44	3.21	0.00
52.00	3.44	3.21	0.00
53.00	3.44	3.21	0.00
54.00	3.44	3.21	0.00
55.00	3.44	3.21	0.00
56.00	3.44	3.21	0.00
57.00	3.44	3.21	0.00
58.00	3.44	3.21	0.00
59.00	3.44	3.21	0.00
60.00	3.44	3.21	0.00
61.00	3.44	3.21	0.00
62.00	3.44	3.21	0.00
63.00	3.44	3.21	0.00
64.00	3.44	3.21	0.00
65.00	3.44	3.21	0.00
66.00	3.44	3.21	0.00
67.00	3.44	3.21	0.00
68.00	3.44	3.21	0.00
69.00	3.44	3.21	0.00
70.00	3.44	3.21	0.00
71.00	3.44	3.21	0.00
72.00	3.44	3.21	0.00

Summary for Subcatchment 5: AREA A1 (IMP)

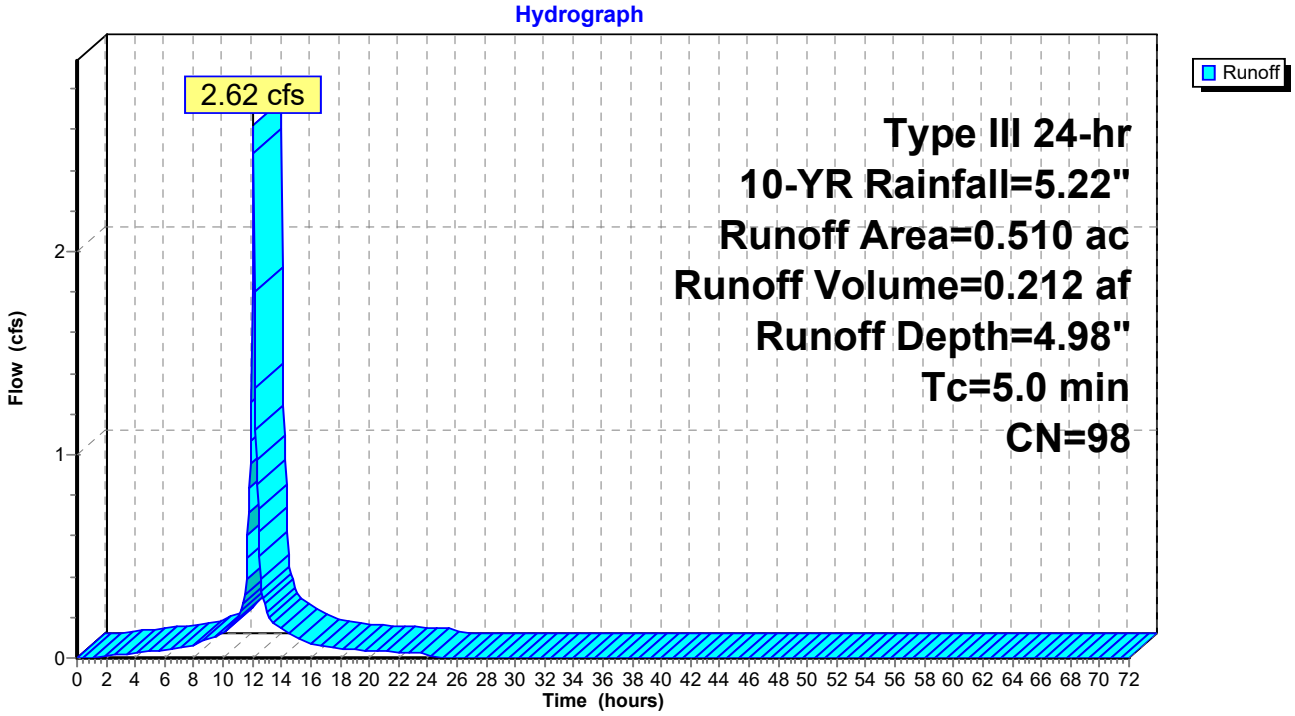
Runoff = 2.62 cfs @ 12.07 hrs, Volume= 0.212 af, Depth= 4.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
0.510	98	Paved parking, HSG C
0.510		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, A1 OFF-SITE (IMP)**

Subcatchment 5: AREA A1 (IMP)



Hydrograph for Subcatchment 5: AREA A1 (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.02	0.01
3.00	0.16	0.04	0.02
4.00	0.22	0.09	0.02
5.00	0.30	0.14	0.03
6.00	0.38	0.21	0.04
7.00	0.47	0.29	0.05
8.00	0.60	0.41	0.06
9.00	0.76	0.56	0.09
10.00	0.99	0.78	0.12
11.00	1.30	1.09	0.19
12.00	2.61	2.38	**1.84**
13.00	3.91	3.68	**0.21**
14.00	4.23	4.00	0.14
15.00	4.46	4.22	0.10
16.00	4.62	4.39	0.07
17.00	4.75	4.51	0.06
18.00	4.84	4.61	0.04
19.00	4.92	4.69	0.04
20.00	5.00	4.76	0.04
21.00	5.06	4.82	0.03
22.00	5.12	4.88	0.03
23.00	5.17	4.94	0.03
24.00	**5.22**	**4.98**	0.02
25.00	5.22	4.98	0.00
26.00	5.22	4.98	0.00
27.00	5.22	4.98	0.00
28.00	5.22	4.98	0.00
29.00	5.22	4.98	0.00
30.00	5.22	4.98	0.00
31.00	5.22	4.98	0.00
32.00	5.22	4.98	0.00
33.00	5.22	4.98	0.00
34.00	5.22	4.98	0.00
35.00	5.22	4.98	0.00
36.00	5.22	4.98	0.00
37.00	5.22	4.98	0.00
38.00	5.22	4.98	0.00
39.00	5.22	4.98	0.00
40.00	5.22	4.98	0.00
41.00	5.22	4.98	0.00
42.00	5.22	4.98	0.00
43.00	5.22	4.98	0.00
44.00	5.22	4.98	0.00
45.00	5.22	4.98	0.00
46.00	5.22	4.98	0.00
47.00	5.22	4.98	0.00
48.00	5.22	4.98	0.00
49.00	5.22	4.98	0.00
50.00	5.22	4.98	0.00
51.00	5.22	4.98	0.00
52.00	5.22	4.98	0.00
53.00	5.22	4.98	0.00
54.00	5.22	4.98	0.00
55.00	5.22	4.98	0.00
56.00	5.22	4.98	0.00
57.00	5.22	4.98	0.00
58.00	5.22	4.98	0.00
59.00	5.22	4.98	0.00
60.00	5.22	4.98	0.00
61.00	5.22	4.98	0.00
62.00	5.22	4.98	0.00
63.00	5.22	4.98	0.00
64.00	5.22	4.98	0.00
65.00	5.22	4.98	0.00
66.00	5.22	4.98	0.00
67.00	5.22	4.98	0.00
68.00	5.22	4.98	0.00
69.00	5.22	4.98	0.00
70.00	5.22	4.98	0.00
71.00	5.22	4.98	0.00
72.00	5.22	4.98	0.00

Summary for Subcatchment 5: AREA A1 (IMP)

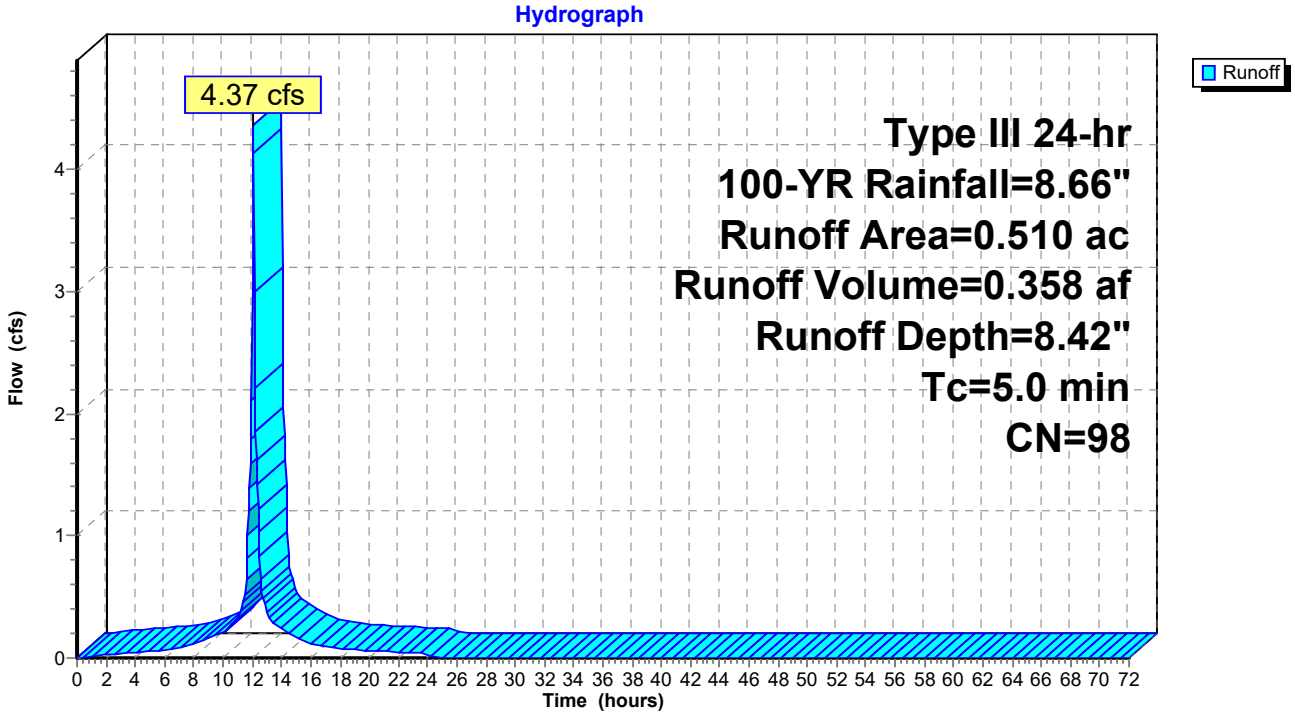
Runoff = 4.37 cfs @ 12.07 hrs, Volume= 0.358 af, Depth= 8.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
0.510	98	Paved parking, HSG C
0.510		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, A1 OFF-SITE (IMP)**

Subcatchment 5: AREA A1 (IMP)



Hydrograph for Subcatchment 5: AREA A1 (IMP)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.01	0.01
2.00	0.17	0.05	0.03
3.00	0.27	0.12	0.04
4.00	0.37	0.21	0.05
5.00	0.49	0.31	0.06
6.00	0.62	0.43	0.07
7.00	0.78	0.58	0.09
8.00	0.99	0.78	0.11
9.00	1.26	1.05	0.16
10.00	1.64	1.41	0.21
11.00	2.17	1.94	0.31
12.00	4.33	4.09	**3.06**
13.00	6.49	6.26	**0.36**
14.00	7.02	6.78	0.23
15.00	7.40	7.16	0.17
16.00	7.67	7.43	0.12
17.00	7.88	7.64	0.10
18.00	8.04	7.80	0.07
19.00	8.17	7.93	0.07
20.00	8.29	8.05	0.06
21.00	8.40	8.16	0.05
22.00	8.49	8.25	0.05
23.00	8.58	8.34	0.04
24.00	**8.66**	**8.42**	0.04
25.00	8.66	8.42	0.00
26.00	8.66	8.42	0.00
27.00	8.66	8.42	0.00
28.00	8.66	8.42	0.00
29.00	8.66	8.42	0.00
30.00	8.66	8.42	0.00
31.00	8.66	8.42	0.00
32.00	8.66	8.42	0.00
33.00	8.66	8.42	0.00
34.00	8.66	8.42	0.00
35.00	8.66	8.42	0.00
36.00	8.66	8.42	0.00
37.00	8.66	8.42	0.00
38.00	8.66	8.42	0.00
39.00	8.66	8.42	0.00
40.00	8.66	8.42	0.00
41.00	8.66	8.42	0.00
42.00	8.66	8.42	0.00
43.00	8.66	8.42	0.00
44.00	8.66	8.42	0.00
45.00	8.66	8.42	0.00
46.00	8.66	8.42	0.00
47.00	8.66	8.42	0.00
48.00	8.66	8.42	0.00
49.00	8.66	8.42	0.00
50.00	8.66	8.42	0.00
51.00	8.66	8.42	0.00
52.00	8.66	8.42	0.00
53.00	8.66	8.42	0.00
54.00	8.66	8.42	0.00
55.00	8.66	8.42	0.00
56.00	8.66	8.42	0.00
57.00	8.66	8.42	0.00
58.00	8.66	8.42	0.00
59.00	8.66	8.42	0.00
60.00	8.66	8.42	0.00
61.00	8.66	8.42	0.00
62.00	8.66	8.42	0.00
63.00	8.66	8.42	0.00
64.00	8.66	8.42	0.00
65.00	8.66	8.42	0.00
66.00	8.66	8.42	0.00
67.00	8.66	8.42	0.00
68.00	8.66	8.42	0.00
69.00	8.66	8.42	0.00
70.00	8.66	8.42	0.00
71.00	8.66	8.42	0.00
72.00	8.66	8.42	0.00

Summary for Subcatchment 6: AREA A1 (PERV)

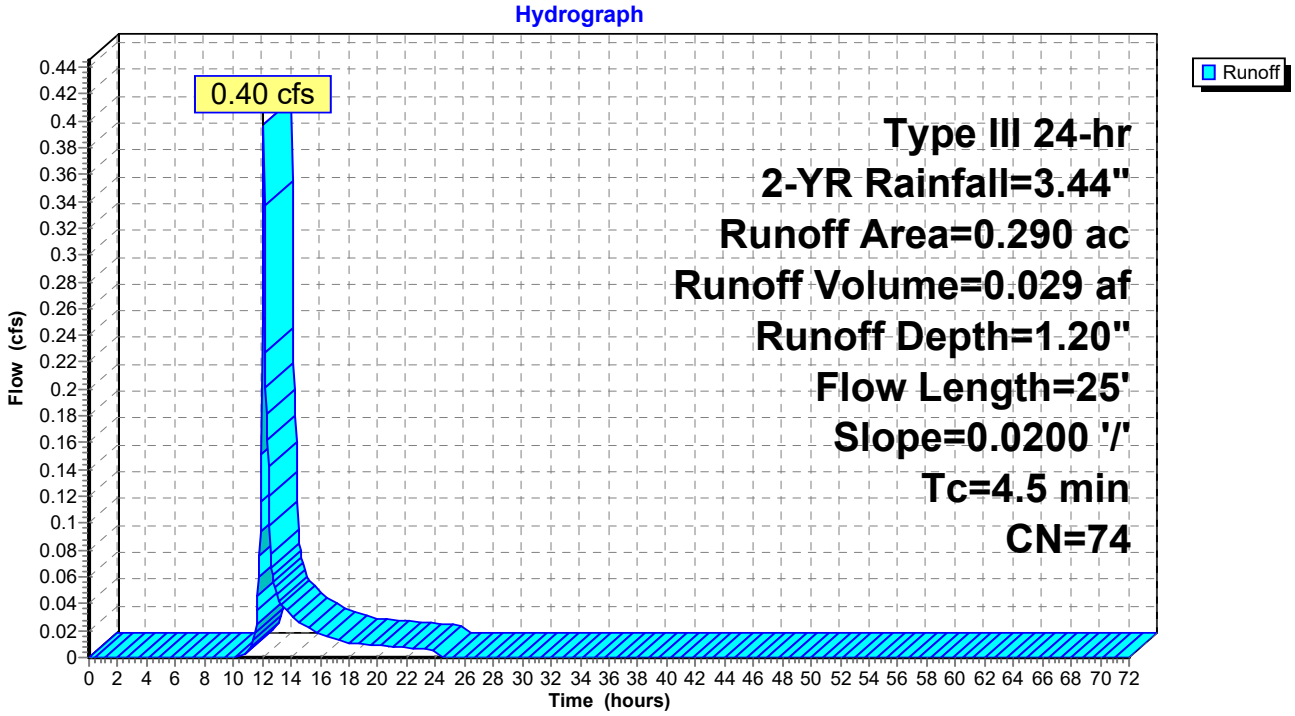
Runoff = 0.40 cfs @ 12.08 hrs, Volume= 0.029 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
0.290	74	>75% Grass cover, Good, HSG C
0.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	25	0.0200	0.09		**Sheet Flow, A1 OFF-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 6: AREA A1 (PERV)



Hydrograph for Subcatchment 6: AREA A1 (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.00
3.00	0.11	0.00	0.00
4.00	0.15	0.00	0.00
5.00	0.20	0.00	0.00
6.00	0.25	0.00	0.00
7.00	0.31	0.00	0.00
8.00	0.39	0.00	0.00
9.00	0.50	0.00	0.00
10.00	0.65	0.00	0.00
11.00	0.86	0.01	0.01
12.00	1.72	0.23	**0.25**
13.00	2.58	0.65	**0.05**
14.00	2.79	0.78	0.03
15.00	2.94	0.87	0.02
16.00	3.05	0.94	0.02
17.00	3.13	0.99	0.01
18.00	3.19	1.03	0.01
19.00	3.24	1.07	0.01
20.00	3.29	1.10	0.01
21.00	3.33	1.13	0.01
22.00	3.37	1.15	0.01
23.00	3.41	1.18	0.01
24.00	**3.44**	**1.20**	0.01
25.00	3.44	1.20	0.00
26.00	3.44	1.20	0.00
27.00	3.44	1.20	0.00
28.00	3.44	1.20	0.00
29.00	3.44	1.20	0.00
30.00	3.44	1.20	0.00
31.00	3.44	1.20	0.00
32.00	3.44	1.20	0.00
33.00	3.44	1.20	0.00
34.00	3.44	1.20	0.00
35.00	3.44	1.20	0.00
36.00	3.44	1.20	0.00
37.00	3.44	1.20	0.00
38.00	3.44	1.20	0.00
39.00	3.44	1.20	0.00
40.00	3.44	1.20	0.00
41.00	3.44	1.20	0.00
42.00	3.44	1.20	0.00
43.00	3.44	1.20	0.00
44.00	3.44	1.20	0.00
45.00	3.44	1.20	0.00
46.00	3.44	1.20	0.00
47.00	3.44	1.20	0.00
48.00	3.44	1.20	0.00
49.00	3.44	1.20	0.00
50.00	3.44	1.20	0.00
51.00	3.44	1.20	0.00
52.00	3.44	1.20	0.00
53.00	3.44	1.20	0.00
54.00	3.44	1.20	0.00
55.00	3.44	1.20	0.00
56.00	3.44	1.20	0.00
57.00	3.44	1.20	0.00
58.00	3.44	1.20	0.00
59.00	3.44	1.20	0.00
60.00	3.44	1.20	0.00
61.00	3.44	1.20	0.00
62.00	3.44	1.20	0.00
63.00	3.44	1.20	0.00
64.00	3.44	1.20	0.00
65.00	3.44	1.20	0.00
66.00	3.44	1.20	0.00
67.00	3.44	1.20	0.00
68.00	3.44	1.20	0.00
69.00	3.44	1.20	0.00
70.00	3.44	1.20	0.00
71.00	3.44	1.20	0.00
72.00	3.44	1.20	0.00

Summary for Subcatchment 6: AREA A1 (PERV)

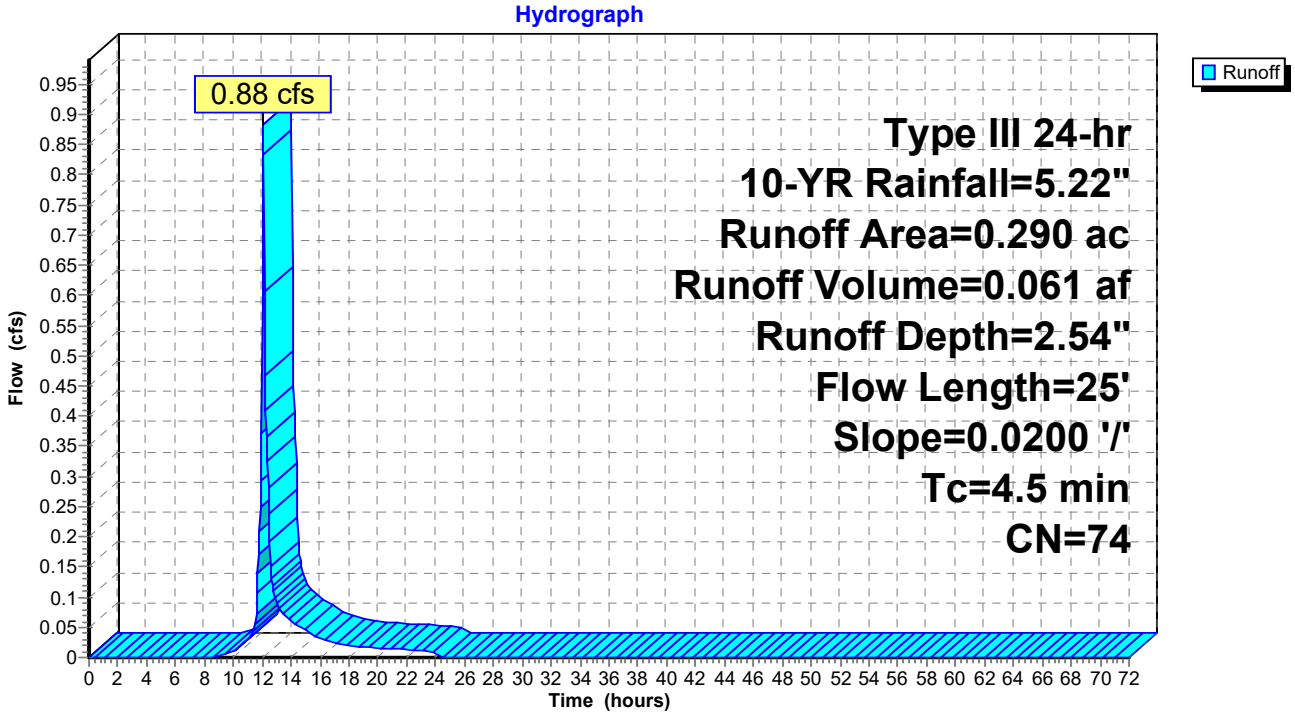
Runoff = 0.88 cfs @ 12.07 hrs, Volume= 0.061 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
0.290	74	>75% Grass cover, Good, HSG C
0.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	25	0.0200	0.09		**Sheet Flow, A1 OFF-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 6: AREA A1 (PERV)



Hydrograph for Subcatchment 6: AREA A1 (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.16	0.00	0.00
4.00	0.22	0.00	0.00
5.00	0.30	0.00	0.00
6.00	0.38	0.00	0.00
7.00	0.47	0.00	0.00
8.00	0.60	0.00	0.00
9.00	0.76	0.00	0.00
10.00	0.99	0.02	0.01
11.00	1.30	0.09	0.03
12.00	2.61	0.67	**0.59**
13.00	3.91	1.53	**0.09**
14.00	4.23	1.77	0.06
15.00	4.46	1.94	0.04
16.00	4.62	2.07	0.03
17.00	4.75	2.16	0.03
18.00	4.84	2.24	0.02
19.00	4.92	2.30	0.02
20.00	5.00	2.36	0.02
21.00	5.06	2.41	0.01
22.00	5.12	2.46	0.01
23.00	5.17	2.50	0.01
24.00	**5.22**	**2.54**	0.01
25.00	5.22	2.54	0.00
26.00	5.22	2.54	0.00
27.00	5.22	2.54	0.00
28.00	5.22	2.54	0.00
29.00	5.22	2.54	0.00
30.00	5.22	2.54	0.00
31.00	5.22	2.54	0.00
32.00	5.22	2.54	0.00
33.00	5.22	2.54	0.00
34.00	5.22	2.54	0.00
35.00	5.22	2.54	0.00
36.00	5.22	2.54	0.00
37.00	5.22	2.54	0.00
38.00	5.22	2.54	0.00
39.00	5.22	2.54	0.00
40.00	5.22	2.54	0.00
41.00	5.22	2.54	0.00
42.00	5.22	2.54	0.00
43.00	5.22	2.54	0.00
44.00	5.22	2.54	0.00
45.00	5.22	2.54	0.00
46.00	5.22	2.54	0.00
47.00	5.22	2.54	0.00
48.00	5.22	2.54	0.00
49.00	5.22	2.54	0.00
50.00	5.22	2.54	0.00
51.00	5.22	2.54	0.00
52.00	5.22	2.54	0.00
53.00	5.22	2.54	0.00
54.00	5.22	2.54	0.00
55.00	5.22	2.54	0.00
56.00	5.22	2.54	0.00
57.00	5.22	2.54	0.00
58.00	5.22	2.54	0.00
59.00	5.22	2.54	0.00
60.00	5.22	2.54	0.00
61.00	5.22	2.54	0.00
62.00	5.22	2.54	0.00
63.00	5.22	2.54	0.00
64.00	5.22	2.54	0.00
65.00	5.22	2.54	0.00
66.00	5.22	2.54	0.00
67.00	5.22	2.54	0.00
68.00	5.22	2.54	0.00
69.00	5.22	2.54	0.00
70.00	5.22	2.54	0.00
71.00	5.22	2.54	0.00
72.00	5.22	2.54	0.00

Summary for Subcatchment 6: AREA A1 (PERV)

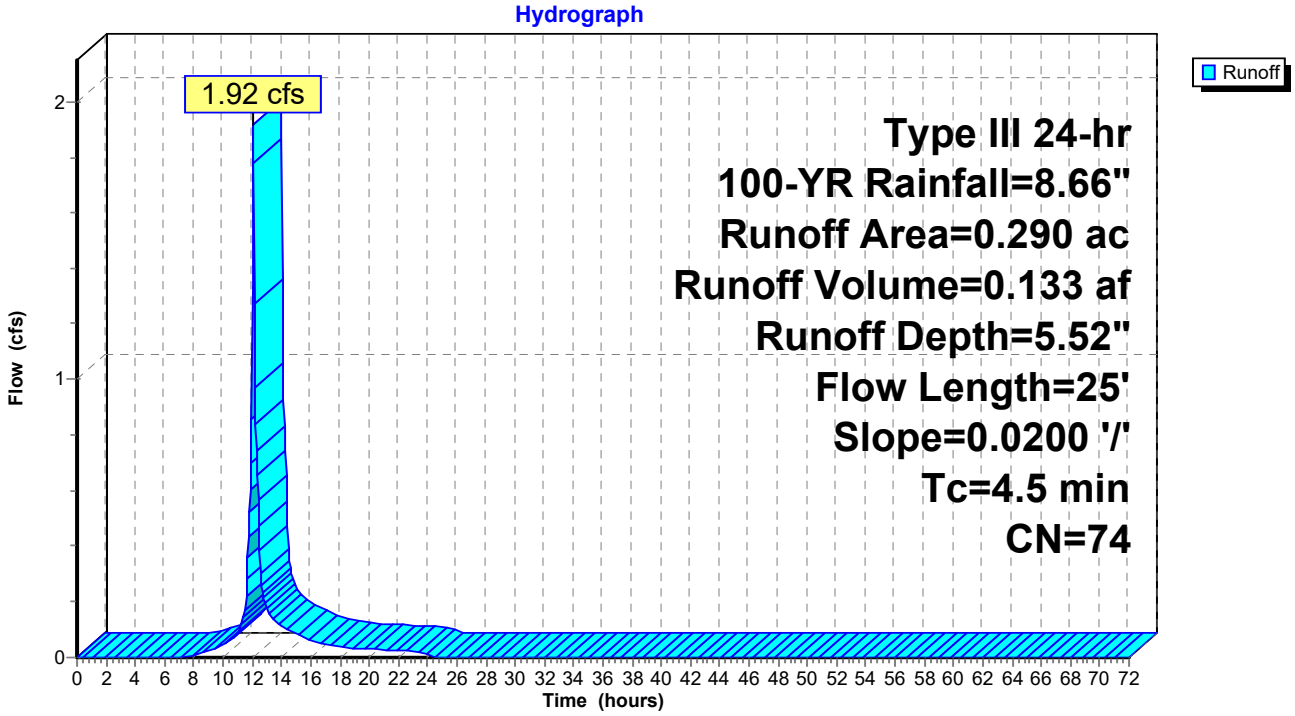
Runoff = 1.92 cfs @ 12.07 hrs, Volume= 0.133 af, Depth= 5.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
0.290	74	>75% Grass cover, Good, HSG C
0.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	25	0.0200	0.09		**Sheet Flow, A1 OFF-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 6: AREA A1 (PERV)



Hydrograph for Subcatchment 6: AREA A1 (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.00	0.00
3.00	0.27	0.00	0.00
4.00	0.37	0.00	0.00
5.00	0.49	0.00	0.00
6.00	0.62	0.00	0.00
7.00	0.78	0.00	0.00
8.00	0.99	0.02	0.01
9.00	1.26	0.08	0.02
10.00	1.64	0.20	0.04
11.00	2.17	0.43	0.09
12.00	4.33	1.84	**1.33**
13.00	6.49	3.61	**0.17**
14.00	7.02	4.06	0.11
15.00	7.40	4.39	0.09
16.00	7.67	4.63	0.06
17.00	7.88	4.82	0.05
18.00	8.04	4.96	0.04
19.00	8.17	5.08	0.03
20.00	8.29	5.18	0.03
21.00	8.40	5.28	0.03
22.00	8.49	5.37	0.02
23.00	8.58	5.45	0.02
24.00	**8.66**	**5.52**	0.02
25.00	8.66	5.52	0.00
26.00	8.66	5.52	0.00
27.00	8.66	5.52	0.00
28.00	8.66	5.52	0.00
29.00	8.66	5.52	0.00
30.00	8.66	5.52	0.00
31.00	8.66	5.52	0.00
32.00	8.66	5.52	0.00
33.00	8.66	5.52	0.00
34.00	8.66	5.52	0.00
35.00	8.66	5.52	0.00
36.00	8.66	5.52	0.00
37.00	8.66	5.52	0.00
38.00	8.66	5.52	0.00
39.00	8.66	5.52	0.00
40.00	8.66	5.52	0.00
41.00	8.66	5.52	0.00
42.00	8.66	5.52	0.00
43.00	8.66	5.52	0.00
44.00	8.66	5.52	0.00
45.00	8.66	5.52	0.00
46.00	8.66	5.52	0.00
47.00	8.66	5.52	0.00
48.00	8.66	5.52	0.00
49.00	8.66	5.52	0.00
50.00	8.66	5.52	0.00
51.00	8.66	5.52	0.00
52.00	8.66	5.52	0.00
53.00	8.66	5.52	0.00
54.00	8.66	5.52	0.00
55.00	8.66	5.52	0.00
56.00	8.66	5.52	0.00
57.00	8.66	5.52	0.00
58.00	8.66	5.52	0.00
59.00	8.66	5.52	0.00
60.00	8.66	5.52	0.00
61.00	8.66	5.52	0.00
62.00	8.66	5.52	0.00
63.00	8.66	5.52	0.00
64.00	8.66	5.52	0.00
65.00	8.66	5.52	0.00
66.00	8.66	5.52	0.00
67.00	8.66	5.52	0.00
68.00	8.66	5.52	0.00
69.00	8.66	5.52	0.00
70.00	8.66	5.52	0.00
71.00	8.66	5.52	0.00
72.00	8.66	5.52	0.00

Summary for Subcatchment 9: A2 ON-SITE (PERV)

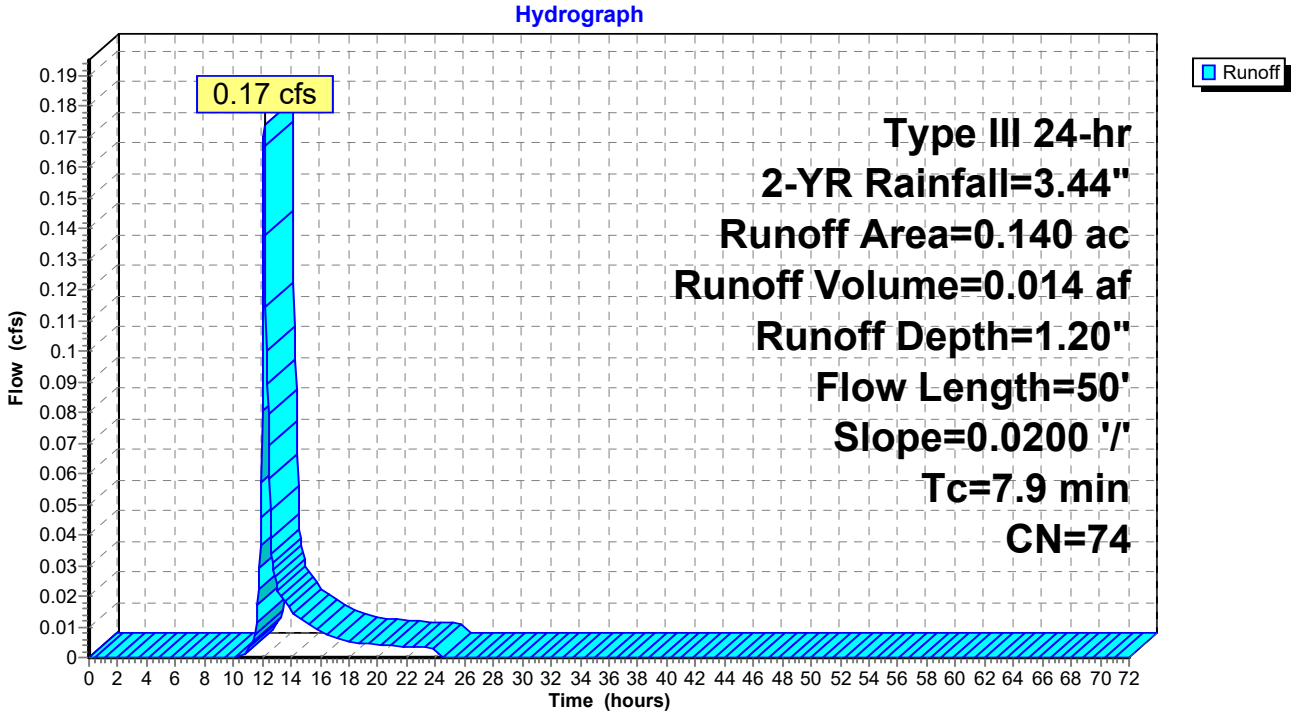
Runoff = 0.17 cfs @ 12.12 hrs, Volume= 0.014 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
0.140	74	>75% Grass cover, Good, HSG C
0.140		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0200	0.11		**Sheet Flow, A2 ON-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 9: A2 ON-SITE (PERV)



Hydrograph for Subcatchment 9: A2 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.00
3.00	0.11	0.00	0.00
4.00	0.15	0.00	0.00
5.00	0.20	0.00	0.00
6.00	0.25	0.00	0.00
7.00	0.31	0.00	0.00
8.00	0.39	0.00	0.00
9.00	0.50	0.00	0.00
10.00	0.65	0.00	0.00
11.00	0.86	0.01	0.00
12.00	1.72	0.23	**0.08**
13.00	2.58	0.65	**0.02**
14.00	2.79	0.78	0.02
15.00	2.94	0.87	0.01
16.00	3.05	0.94	0.01
17.00	3.13	0.99	0.01
18.00	3.19	1.03	0.01
19.00	3.24	1.07	0.00
20.00	3.29	1.10	0.00
21.00	3.33	1.13	0.00
22.00	3.37	1.15	0.00
23.00	3.41	1.18	0.00
24.00	**3.44**	**1.20**	0.00
25.00	3.44	1.20	0.00
26.00	3.44	1.20	0.00
27.00	3.44	1.20	0.00
28.00	3.44	1.20	0.00
29.00	3.44	1.20	0.00
30.00	3.44	1.20	0.00
31.00	3.44	1.20	0.00
32.00	3.44	1.20	0.00
33.00	3.44	1.20	0.00
34.00	3.44	1.20	0.00
35.00	3.44	1.20	0.00
36.00	3.44	1.20	0.00
37.00	3.44	1.20	0.00
38.00	3.44	1.20	0.00
39.00	3.44	1.20	0.00
40.00	3.44	1.20	0.00
41.00	3.44	1.20	0.00
42.00	3.44	1.20	0.00
43.00	3.44	1.20	0.00
44.00	3.44	1.20	0.00
45.00	3.44	1.20	0.00
46.00	3.44	1.20	0.00
47.00	3.44	1.20	0.00
48.00	3.44	1.20	0.00
49.00	3.44	1.20	0.00
50.00	3.44	1.20	0.00
51.00	3.44	1.20	0.00
52.00	3.44	1.20	0.00
53.00	3.44	1.20	0.00
54.00	3.44	1.20	0.00
55.00	3.44	1.20	0.00
56.00	3.44	1.20	0.00
57.00	3.44	1.20	0.00
58.00	3.44	1.20	0.00
59.00	3.44	1.20	0.00
60.00	3.44	1.20	0.00
61.00	3.44	1.20	0.00
62.00	3.44	1.20	0.00
63.00	3.44	1.20	0.00
64.00	3.44	1.20	0.00
65.00	3.44	1.20	0.00
66.00	3.44	1.20	0.00
67.00	3.44	1.20	0.00
68.00	3.44	1.20	0.00
69.00	3.44	1.20	0.00
70.00	3.44	1.20	0.00
71.00	3.44	1.20	0.00
72.00	3.44	1.20	0.00

Summary for Subcatchment 9: A2 ON-SITE (PERV)

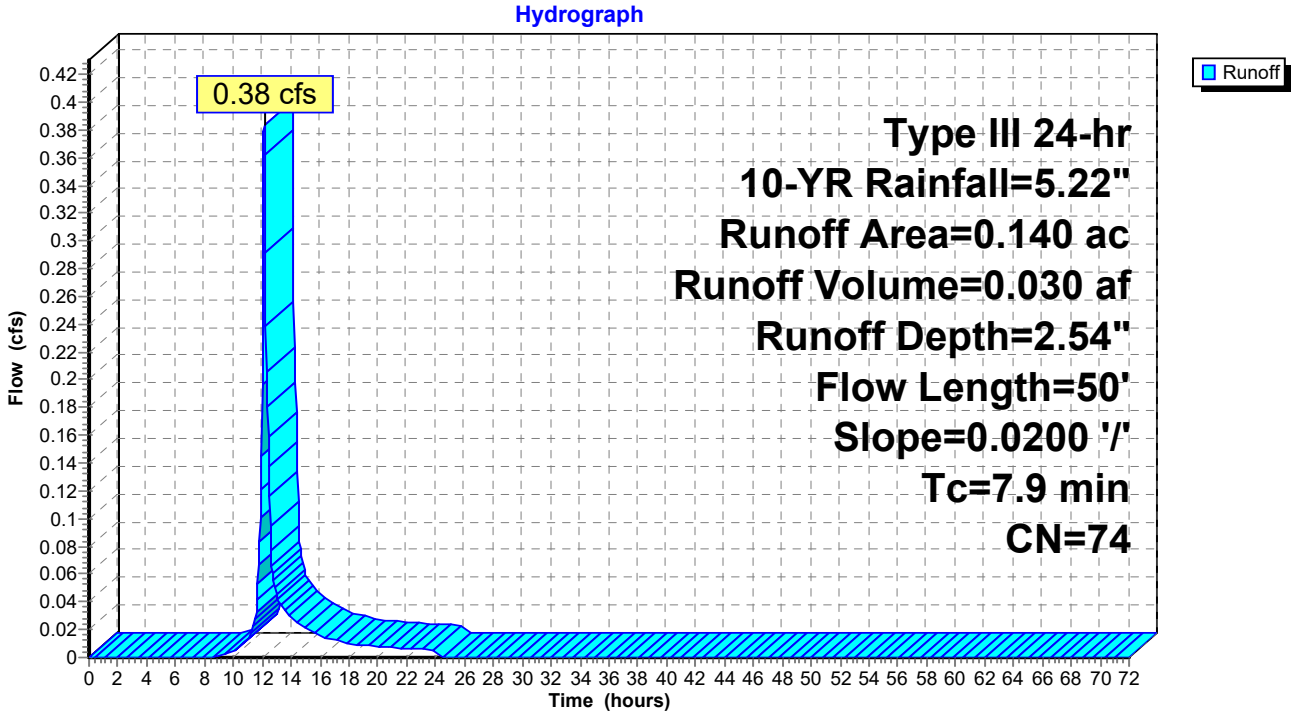
Runoff = 0.38 cfs @ 12.12 hrs, Volume= 0.030 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
0.140	74	>75% Grass cover, Good, HSG C
0.140		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0200	0.11		**Sheet Flow, A2 ON-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 9: A2 ON-SITE (PERV)



Hydrograph for Subcatchment 9: A2 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.16	0.00	0.00
4.00	0.22	0.00	0.00
5.00	0.30	0.00	0.00
6.00	0.38	0.00	0.00
7.00	0.47	0.00	0.00
8.00	0.60	0.00	0.00
9.00	0.76	0.00	0.00
10.00	0.99	0.02	0.00
11.00	1.30	0.09	0.01
12.00	2.61	0.67	**0.20**
13.00	3.91	1.53	**0.04**
14.00	4.23	1.77	0.03
15.00	4.46	1.94	0.02
16.00	4.62	2.07	0.02
17.00	4.75	2.16	0.01
18.00	4.84	2.24	0.01
19.00	4.92	2.30	0.01
20.00	5.00	2.36	0.01
21.00	5.06	2.41	0.01
22.00	5.12	2.46	0.01
23.00	5.17	2.50	0.01
24.00	**5.22**	**2.54**	0.01
25.00	5.22	2.54	0.00
26.00	5.22	2.54	0.00
27.00	5.22	2.54	0.00
28.00	5.22	2.54	0.00
29.00	5.22	2.54	0.00
30.00	5.22	2.54	0.00
31.00	5.22	2.54	0.00
32.00	5.22	2.54	0.00
33.00	5.22	2.54	0.00
34.00	5.22	2.54	0.00
35.00	5.22	2.54	0.00
36.00	5.22	2.54	0.00
37.00	5.22	2.54	0.00
38.00	5.22	2.54	0.00
39.00	5.22	2.54	0.00
40.00	5.22	2.54	0.00
41.00	5.22	2.54	0.00
42.00	5.22	2.54	0.00
43.00	5.22	2.54	0.00
44.00	5.22	2.54	0.00
45.00	5.22	2.54	0.00
46.00	5.22	2.54	0.00
47.00	5.22	2.54	0.00
48.00	5.22	2.54	0.00
49.00	5.22	2.54	0.00
50.00	5.22	2.54	0.00
51.00	5.22	2.54	0.00
52.00	5.22	2.54	0.00
53.00	5.22	2.54	0.00
54.00	5.22	2.54	0.00
55.00	5.22	2.54	0.00
56.00	5.22	2.54	0.00
57.00	5.22	2.54	0.00
58.00	5.22	2.54	0.00
59.00	5.22	2.54	0.00
60.00	5.22	2.54	0.00
61.00	5.22	2.54	0.00
62.00	5.22	2.54	0.00
63.00	5.22	2.54	0.00
64.00	5.22	2.54	0.00
65.00	5.22	2.54	0.00
66.00	5.22	2.54	0.00
67.00	5.22	2.54	0.00
68.00	5.22	2.54	0.00
69.00	5.22	2.54	0.00
70.00	5.22	2.54	0.00
71.00	5.22	2.54	0.00
72.00	5.22	2.54	0.00

Summary for Subcatchment 9: A2 ON-SITE (PERV)

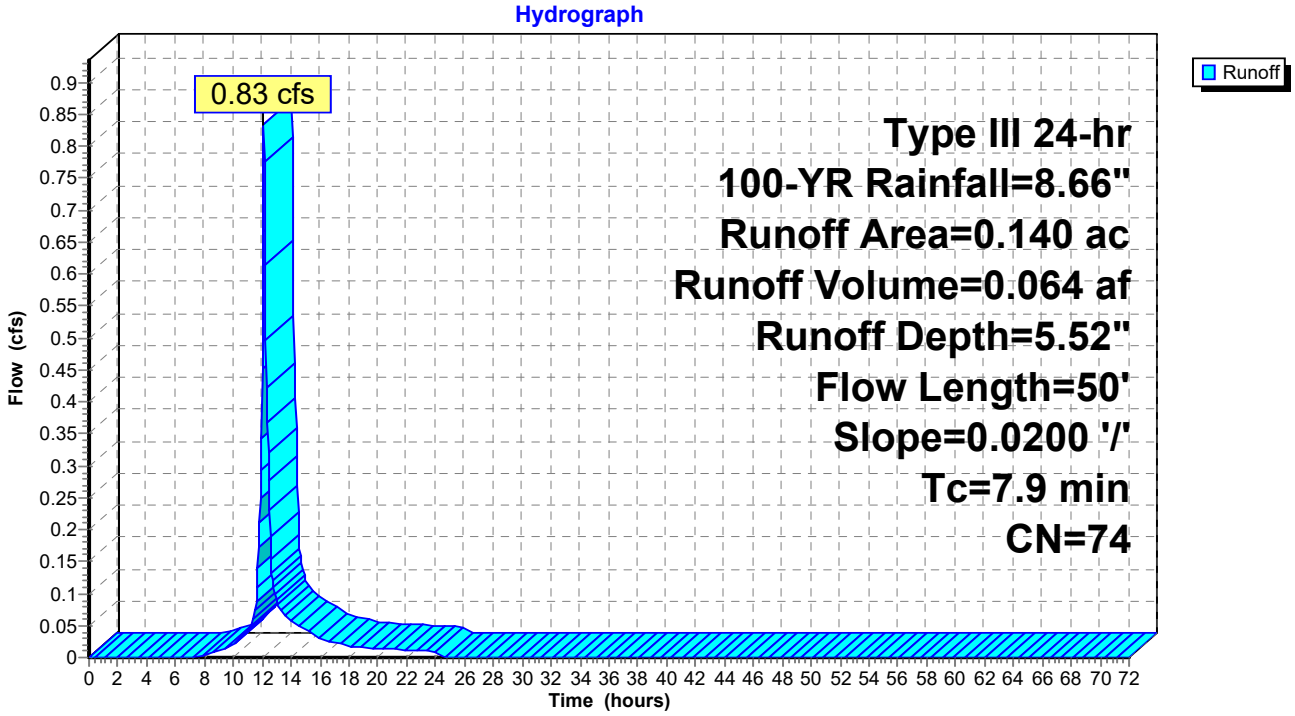
Runoff = 0.83 cfs @ 12.11 hrs, Volume= 0.064 af, Depth= 5.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
0.140	74	>75% Grass cover, Good, HSG C
0.140		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0200	0.11		**Sheet Flow, A2 ON-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 9: A2 ON-SITE (PERV)



Hydrograph for Subcatchment 9: A2 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.00	0.00
3.00	0.27	0.00	0.00
4.00	0.37	0.00	0.00
5.00	0.49	0.00	0.00
6.00	0.62	0.00	0.00
7.00	0.78	0.00	0.00
8.00	0.99	0.02	0.00
9.00	1.26	0.08	0.01
10.00	1.64	0.20	0.02
11.00	2.17	0.43	0.04
12.00	4.33	1.84	**0.45**
13.00	6.49	3.61	**0.09**
14.00	7.02	4.06	0.06
15.00	7.40	4.39	0.04
16.00	7.67	4.63	0.03
17.00	7.88	4.82	0.02
18.00	8.04	4.96	0.02
19.00	8.17	5.08	0.02
20.00	8.29	5.18	0.01
21.00	8.40	5.28	0.01
22.00	8.49	5.37	0.01
23.00	8.58	5.45	0.01
24.00	**8.66**	**5.52**	0.01
25.00	8.66	5.52	0.00
26.00	8.66	5.52	0.00
27.00	8.66	5.52	0.00
28.00	8.66	5.52	0.00
29.00	8.66	5.52	0.00
30.00	8.66	5.52	0.00
31.00	8.66	5.52	0.00
32.00	8.66	5.52	0.00
33.00	8.66	5.52	0.00
34.00	8.66	5.52	0.00
35.00	8.66	5.52	0.00
36.00	8.66	5.52	0.00
37.00	8.66	5.52	0.00
38.00	8.66	5.52	0.00
39.00	8.66	5.52	0.00
40.00	8.66	5.52	0.00
41.00	8.66	5.52	0.00
42.00	8.66	5.52	0.00
43.00	8.66	5.52	0.00
44.00	8.66	5.52	0.00
45.00	8.66	5.52	0.00
46.00	8.66	5.52	0.00
47.00	8.66	5.52	0.00
48.00	8.66	5.52	0.00
49.00	8.66	5.52	0.00
50.00	8.66	5.52	0.00
51.00	8.66	5.52	0.00
52.00	8.66	5.52	0.00
53.00	8.66	5.52	0.00
54.00	8.66	5.52	0.00
55.00	8.66	5.52	0.00
56.00	8.66	5.52	0.00
57.00	8.66	5.52	0.00
58.00	8.66	5.52	0.00
59.00	8.66	5.52	0.00
60.00	8.66	5.52	0.00
61.00	8.66	5.52	0.00
62.00	8.66	5.52	0.00
63.00	8.66	5.52	0.00
64.00	8.66	5.52	0.00
65.00	8.66	5.52	0.00
66.00	8.66	5.52	0.00
67.00	8.66	5.52	0.00
68.00	8.66	5.52	0.00
69.00	8.66	5.52	0.00
70.00	8.66	5.52	0.00
71.00	8.66	5.52	0.00
72.00	8.66	5.52	0.00

Summary for Subcatchment 11: A3 ON-SITE (PERV)

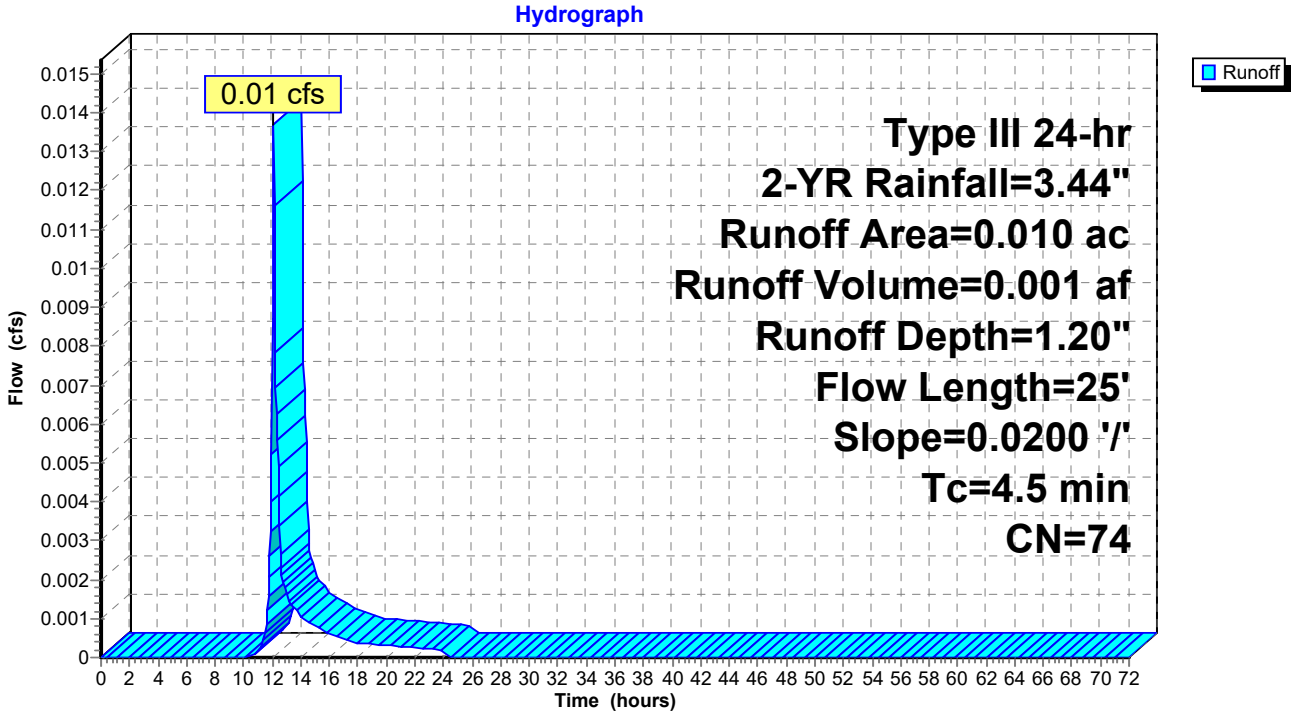
Runoff = 0.01 cfs @ 12.08 hrs, Volume= 0.001 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.44"

Area (ac)	CN	Description
0.010	74	>75% Grass cover, Good, HSG C
0.010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	25	0.0200	0.09		**Sheet Flow, A3 OFF-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 11: A3 ON-SITE (PERV)



Hydrograph for Subcatchment 11: A3 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.07	0.00	0.00
3.00	0.11	0.00	0.00
4.00	0.15	0.00	0.00
5.00	0.20	0.00	0.00
6.00	0.25	0.00	0.00
7.00	0.31	0.00	0.00
8.00	0.39	0.00	0.00
9.00	0.50	0.00	0.00
10.00	0.65	0.00	0.00
11.00	0.86	0.01	0.00
12.00	1.72	0.23	**0.01**
13.00	2.58	0.65	**0.00**
14.00	2.79	0.78	0.00
15.00	2.94	0.87	0.00
16.00	3.05	0.94	0.00
17.00	3.13	0.99	0.00
18.00	3.19	1.03	0.00
19.00	3.24	1.07	0.00
20.00	3.29	1.10	0.00
21.00	3.33	1.13	0.00
22.00	3.37	1.15	0.00
23.00	3.41	1.18	0.00
24.00	**3.44**	**1.20**	0.00
25.00	3.44	1.20	0.00
26.00	3.44	1.20	0.00
27.00	3.44	1.20	0.00
28.00	3.44	1.20	0.00
29.00	3.44	1.20	0.00
30.00	3.44	1.20	0.00
31.00	3.44	1.20	0.00
32.00	3.44	1.20	0.00
33.00	3.44	1.20	0.00
34.00	3.44	1.20	0.00
35.00	3.44	1.20	0.00
36.00	3.44	1.20	0.00
37.00	3.44	1.20	0.00
38.00	3.44	1.20	0.00
39.00	3.44	1.20	0.00
40.00	3.44	1.20	0.00
41.00	3.44	1.20	0.00
42.00	3.44	1.20	0.00
43.00	3.44	1.20	0.00
44.00	3.44	1.20	0.00
45.00	3.44	1.20	0.00
46.00	3.44	1.20	0.00
47.00	3.44	1.20	0.00
48.00	3.44	1.20	0.00
49.00	3.44	1.20	0.00
50.00	3.44	1.20	0.00
51.00	3.44	1.20	0.00
52.00	3.44	1.20	0.00
53.00	3.44	1.20	0.00
54.00	3.44	1.20	0.00
55.00	3.44	1.20	0.00
56.00	3.44	1.20	0.00
57.00	3.44	1.20	0.00
58.00	3.44	1.20	0.00
59.00	3.44	1.20	0.00
60.00	3.44	1.20	0.00
61.00	3.44	1.20	0.00
62.00	3.44	1.20	0.00
63.00	3.44	1.20	0.00
64.00	3.44	1.20	0.00
65.00	3.44	1.20	0.00
66.00	3.44	1.20	0.00
67.00	3.44	1.20	0.00
68.00	3.44	1.20	0.00
69.00	3.44	1.20	0.00
70.00	3.44	1.20	0.00
71.00	3.44	1.20	0.00
72.00	3.44	1.20	0.00

Summary for Subcatchment 11: A3 ON-SITE (PERV)

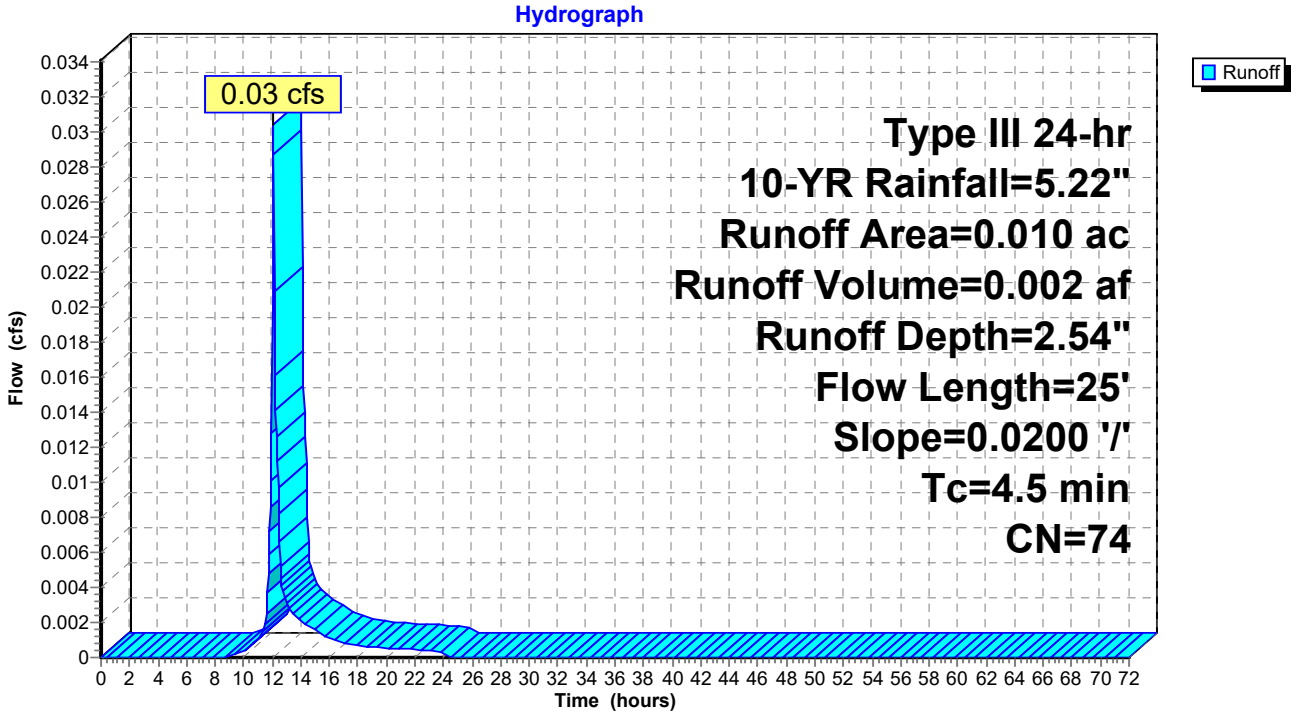
Runoff = 0.03 cfs @ 12.07 hrs, Volume= 0.002 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.22"

Area (ac)	CN	Description
0.010	74	>75% Grass cover, Good, HSG C
0.010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	25	0.0200	0.09		**Sheet Flow, A3 OFF-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 11: A3 ON-SITE (PERV)



Hydrograph for Subcatchment 11: A3 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.16	0.00	0.00
4.00	0.22	0.00	0.00
5.00	0.30	0.00	0.00
6.00	0.38	0.00	0.00
7.00	0.47	0.00	0.00
8.00	0.60	0.00	0.00
9.00	0.76	0.00	0.00
10.00	0.99	0.02	0.00
11.00	1.30	0.09	0.00
12.00	2.61	0.67	**0.02**
13.00	3.91	1.53	**0.00**
14.00	4.23	1.77	0.00
15.00	4.46	1.94	0.00
16.00	4.62	2.07	0.00
17.00	4.75	2.16	0.00
18.00	4.84	2.24	0.00
19.00	4.92	2.30	0.00
20.00	5.00	2.36	0.00
21.00	5.06	2.41	0.00
22.00	5.12	2.46	0.00
23.00	5.17	2.50	0.00
24.00	**5.22**	**2.54**	0.00
25.00	5.22	2.54	0.00
26.00	5.22	2.54	0.00
27.00	5.22	2.54	0.00
28.00	5.22	2.54	0.00
29.00	5.22	2.54	0.00
30.00	5.22	2.54	0.00
31.00	5.22	2.54	0.00
32.00	5.22	2.54	0.00
33.00	5.22	2.54	0.00
34.00	5.22	2.54	0.00
35.00	5.22	2.54	0.00
36.00	5.22	2.54	0.00
37.00	5.22	2.54	0.00
38.00	5.22	2.54	0.00
39.00	5.22	2.54	0.00
40.00	5.22	2.54	0.00
41.00	5.22	2.54	0.00
42.00	5.22	2.54	0.00
43.00	5.22	2.54	0.00
44.00	5.22	2.54	0.00
45.00	5.22	2.54	0.00
46.00	5.22	2.54	0.00
47.00	5.22	2.54	0.00
48.00	5.22	2.54	0.00
49.00	5.22	2.54	0.00
50.00	5.22	2.54	0.00
51.00	5.22	2.54	0.00
52.00	5.22	2.54	0.00
53.00	5.22	2.54	0.00
54.00	5.22	2.54	0.00
55.00	5.22	2.54	0.00
56.00	5.22	2.54	0.00
57.00	5.22	2.54	0.00
58.00	5.22	2.54	0.00
59.00	5.22	2.54	0.00
60.00	5.22	2.54	0.00
61.00	5.22	2.54	0.00
62.00	5.22	2.54	0.00
63.00	5.22	2.54	0.00
64.00	5.22	2.54	0.00
65.00	5.22	2.54	0.00
66.00	5.22	2.54	0.00
67.00	5.22	2.54	0.00
68.00	5.22	2.54	0.00
69.00	5.22	2.54	0.00
70.00	5.22	2.54	0.00
71.00	5.22	2.54	0.00
72.00	5.22	2.54	0.00

Summary for Subcatchment 11: A3 ON-SITE (PERV)

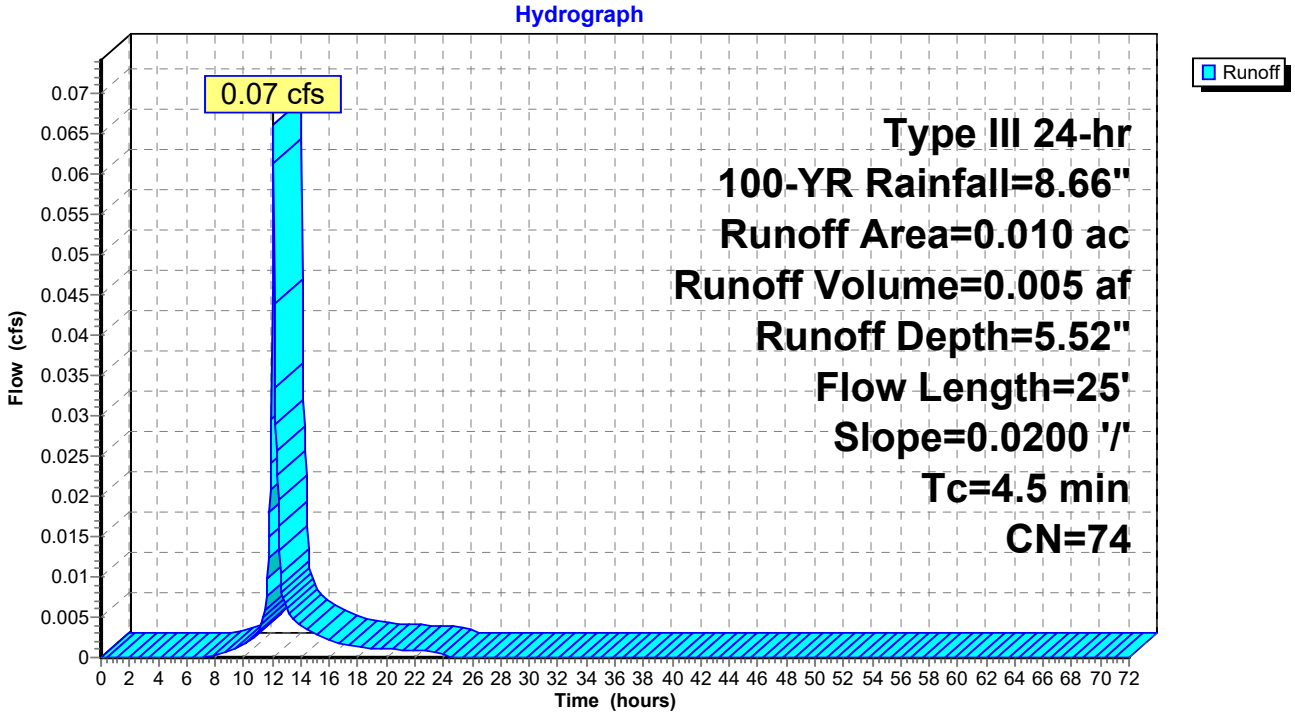
Runoff = 0.07 cfs @ 12.07 hrs, Volume= 0.005 af, Depth= 5.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.66"

Area (ac)	CN	Description
0.010	74	>75% Grass cover, Good, HSG C
0.010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	25	0.0200	0.09		**Sheet Flow, A3 OFF-SITE (PERV)** Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 11: A3 ON-SITE (PERV)



Hydrograph for Subcatchment 11: A3 ON-SITE (PERV)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.00	0.00
3.00	0.27	0.00	0.00
4.00	0.37	0.00	0.00
5.00	0.49	0.00	0.00
6.00	0.62	0.00	0.00
7.00	0.78	0.00	0.00
8.00	0.99	0.02	0.00
9.00	1.26	0.08	0.00
10.00	1.64	0.20	0.00
11.00	2.17	0.43	0.00
12.00	4.33	1.84	**0.05**
13.00	6.49	3.61	**0.01**
14.00	7.02	4.06	0.00
15.00	7.40	4.39	0.00
16.00	7.67	4.63	0.00
17.00	7.88	4.82	0.00
18.00	8.04	4.96	0.00
19.00	8.17	5.08	0.00
20.00	8.29	5.18	0.00
21.00	8.40	5.28	0.00
22.00	8.49	5.37	0.00
23.00	8.58	5.45	0.00
24.00	**8.66**	**5.52**	0.00
25.00	8.66	5.52	0.00
26.00	8.66	5.52	0.00
27.00	8.66	5.52	0.00
28.00	8.66	5.52	0.00
29.00	8.66	5.52	0.00
30.00	8.66	5.52	0.00
31.00	8.66	5.52	0.00
32.00	8.66	5.52	0.00
33.00	8.66	5.52	0.00
34.00	8.66	5.52	0.00
35.00	8.66	5.52	0.00
36.00	8.66	5.52	0.00
37.00	8.66	5.52	0.00
38.00	8.66	5.52	0.00
39.00	8.66	5.52	0.00
40.00	8.66	5.52	0.00
41.00	8.66	5.52	0.00
42.00	8.66	5.52	0.00
43.00	8.66	5.52	0.00
44.00	8.66	5.52	0.00
45.00	8.66	5.52	0.00
46.00	8.66	5.52	0.00
47.00	8.66	5.52	0.00
48.00	8.66	5.52	0.00
49.00	8.66	5.52	0.00
50.00	8.66	5.52	0.00
51.00	8.66	5.52	0.00
52.00	8.66	5.52	0.00
53.00	8.66	5.52	0.00
54.00	8.66	5.52	0.00
55.00	8.66	5.52	0.00
56.00	8.66	5.52	0.00
57.00	8.66	5.52	0.00
58.00	8.66	5.52	0.00
59.00	8.66	5.52	0.00
60.00	8.66	5.52	0.00
61.00	8.66	5.52	0.00
62.00	8.66	5.52	0.00
63.00	8.66	5.52	0.00
64.00	8.66	5.52	0.00
65.00	8.66	5.52	0.00
66.00	8.66	5.52	0.00
67.00	8.66	5.52	0.00
68.00	8.66	5.52	0.00
69.00	8.66	5.52	0.00
70.00	8.66	5.52	0.00
71.00	8.66	5.52	0.00
72.00	8.66	5.52	0.00

APPENDIX F

Post-Developed Basin Routing Calculations

Underground Storage System

2 yr. Storm
10 yr. Storm
25 yr. Storm
100 yr. Storm
Water Quality Design Storm

Summary for Pond 4: BASIN 1 (UGS)

Inflow Area = 3.640 ac, 55.22% Impervious, Inflow Depth = 2.31" for 2-YR event
Inflow = 7.34 cfs @ 12.15 hrs, Volume= 0.700 af
Outflow = 1.77 cfs @ 12.62 hrs, Volume= 0.617 af, Atten= 76%, Lag= 28.0 min
Primary = 1.77 cfs @ 12.62 hrs, Volume= 0.617 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 438.76' @ 12.62 hrs Surf.Area= 0.236 ac Storage= 0.308 af

Plug-Flow detention time= 169.1 min calculated for 0.617 af (88% of inflow)
Center-of-Mass det. time= 114.0 min (897.3 - 783.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	436.00'	0.335 af	**59.99'W x 171.00'L x 6.00'H Field A** 1.413 af Overall - 0.455 af Embedded = 0.958 af x 35.0% Voids
#2A	437.00'	0.362 af	**ADS N-12 42"** x 80 Inside #1 Inside= 41.1"W x 41.1"H => 9.20 sf x 20.00'L = 184.0 cf Outside= 48.0"W x 48.0"H => 11.56 sf x 20.00'L = 231.1 cf 80 Chambers in 10 Rows 57.99' Header x 9.20 sf x 2 = 1,067.1 cf Inside
		0.698 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	437.00'	**18.0" Round Culvert** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 437.00' / 436.48' S= 0.0400 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf
#2	Device 1	437.00'	**7.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	439.00'	**0.5' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 1	441.85'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.77 cfs @ 12.62 hrs HW=438.75' (Free Discharge)
└─**1=Culvert** (Passes 1.77 cfs of 8.53 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.77 cfs @ 5.78 fps)
  ├─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4: BASIN 1 (UGS) - Chamber Wizard Field A

Chamber Model = ADS N-12 42" (ADS N-12® Pipe)
Inside= 41.1"W x 41.1"H => 9.20 sf x 20.00'L = 184.0 cf
Outside= 48.0"W x 48.0"H => 11.56 sf x 20.00'L = 231.1 cf

48.0" Wide + 24.0" Spacing = 72.0" C-C Row Spacing

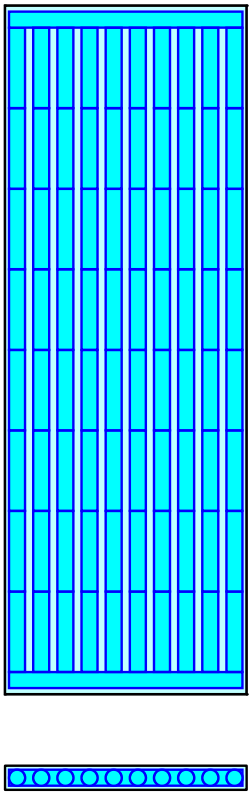
8 Chambers/Row x 20.00' Long +4.00' Header x 2 = 168.00' Row Length +18.0" End Stone x 2 = 171.00' Base Length
10 Rows x 48.0" Wide + 24.0" Spacing x 9 + 12.0" Side Stone x 2 = 59.99' Base Width
12.0" Stone Base + 48.0" Chamber Height + 12.0" Stone Cover = 6.00' Field Height

80 Chambers x 184.0 cf + 57.99' Header x 9.20 sf x 2 = 15,787.0 cf Chamber Storage
80 Chambers x 231.1 cf + 57.99' Header x 11.56 sf x 2 = 19,830.7 cf Displacement

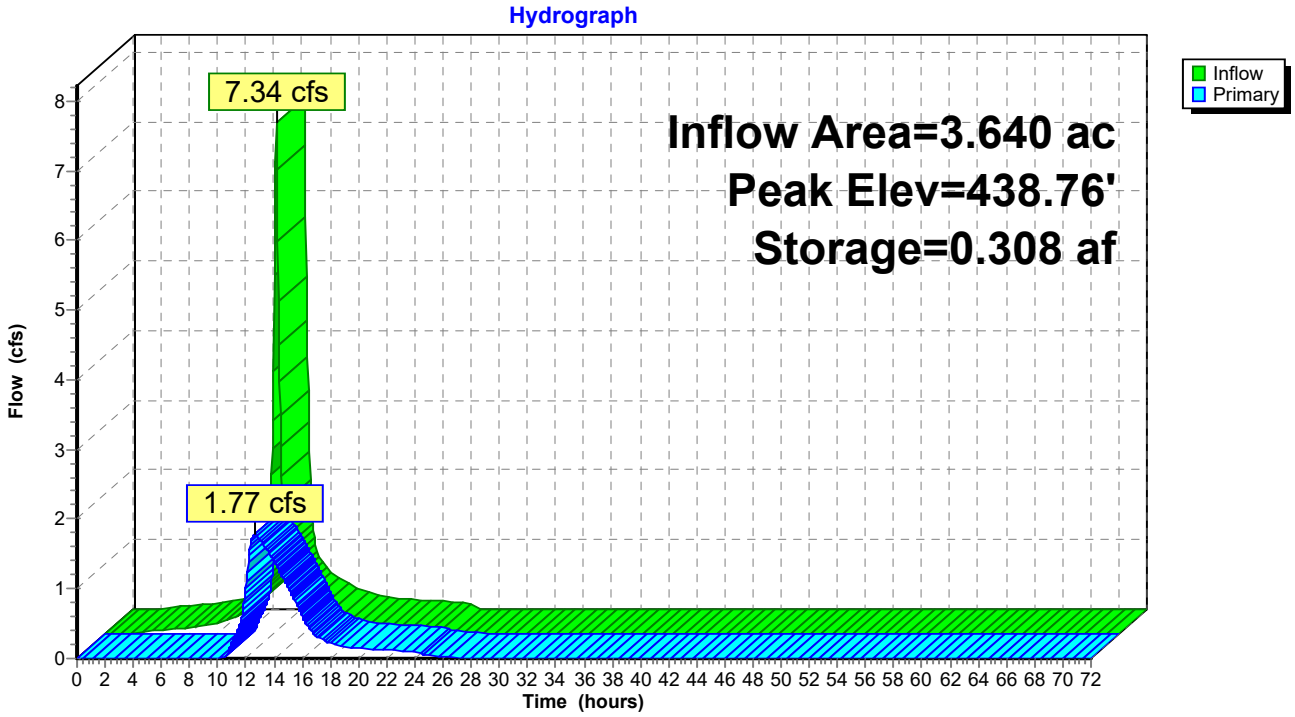
61,543.2 cf Field - 19,830.7 cf Chambers = 41,712.4 cf Stone x 35.0% Voids = 14,599.4 cf Stone Storage

Chamber Storage + Stone Storage = 30,386.4 cf = 0.698 af
Overall Storage Efficiency = 49.4%
Overall System Size = 171.00' x 59.99' x 6.00'

80 Chambers
2,279.4 cy Field
1,544.9 cy Stone



Pond 4: BASIN 1 (UGS)



Hydrograph for Pond 4: BASIN 1 (UGS)

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	436.00	0.00
2.50	0.02	0.001	436.01	0.00
5.00	0.07	0.010	436.12	0.00
7.50	0.13	0.029	436.36	0.00
10.00	**0.31**	0.072	436.88	0.00
12.50	**2.69**	**0.304**	**438.73**	**1.76**
15.00	0.41	**0.158**	**437.79**	**1.02**
17.50	0.21	0.101	437.29	0.26
20.00	0.14	0.097	437.22	0.15
22.50	0.11	0.095	437.19	0.12
25.00	0.00	0.090	437.11	0.04
27.50	0.00	0.086	437.05	0.01
30.00	0.00	0.085	437.03	0.00
32.50	0.00	0.084	437.02	0.00
35.00	0.00	0.084	437.02	0.00
37.50	0.00	0.084	437.02	0.00
40.00	0.00	0.083	437.01	0.00
42.50	0.00	0.083	437.01	0.00
45.00	0.00	0.083	437.01	0.00
47.50	0.00	0.083	437.01	0.00
50.00	0.00	0.083	437.01	0.00
52.50	0.00	0.083	437.01	0.00
55.00	0.00	0.083	437.00	0.00
57.50	0.00	0.083	437.00	0.00
60.00	0.00	0.083	437.00	0.00
62.50	0.00	0.083	437.00	0.00
65.00	0.00	0.083	437.00	0.00
67.50	0.00	0.083	437.00	0.00
70.00	0.00	0.083	437.00	0.00

Summary for Pond 4: BASIN 1 (UGS)

Inflow Area = 3.640 ac, 55.22% Impervious, Inflow Depth = 3.89" for 10-YR event
Inflow = 12.37 cfs @ 12.15 hrs, Volume= 1.180 af
Outflow = 3.50 cfs @ 12.57 hrs, Volume= 1.097 af, Atten= 72%, Lag= 25.4 min
Primary = 3.50 cfs @ 12.57 hrs, Volume= 1.097 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 439.80' @ 12.57 hrs Surf.Area= 0.236 ac Storage= 0.478 af

Plug-Flow detention time= 146.3 min calculated for 1.097 af (93% of inflow)
Center-of-Mass det. time= 108.0 min (885.8 - 777.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	436.00'	0.335 af	**59.99'W x 171.00'L x 6.00'H Field A** 1.413 af Overall - 0.455 af Embedded = 0.958 af x 35.0% Voids
#2A	437.00'	0.362 af	**ADS N-12 42"** x 80 Inside #1 Inside= 41.1"W x 41.1"H => 9.20 sf x 20.00'L = 184.0 cf Outside= 48.0"W x 48.0"H => 11.56 sf x 20.00'L = 231.1 cf 80 Chambers in 10 Rows 57.99' Header x 9.20 sf x 2 = 1,067.1 cf Inside
		0.698 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	437.00'	**18.0" Round Culvert** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 437.00' / 436.48' S= 0.0400 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf
#2	Device 1	437.00'	**7.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	439.00'	**0.5' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 1	441.85'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=3.49 cfs @ 12.57 hrs HW=439.79' (Free Discharge)
└─**1=Culvert** (Passes 3.49 cfs of 12.16 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.33 cfs @ 7.58 fps)
  ├─**3=Broad-Crested Rectangular Weir** (Weir Controls 1.16 cfs @ 2.93 fps)
  └─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4: BASIN 1 (UGS) - Chamber Wizard Field A

Chamber Model = ADS N-12 42" (ADS N-12® Pipe)
Inside= 41.1"W x 41.1"H => 9.20 sf x 20.00'L = 184.0 cf
Outside= 48.0"W x 48.0"H => 11.56 sf x 20.00'L = 231.1 cf

48.0" Wide + 24.0" Spacing = 72.0" C-C Row Spacing

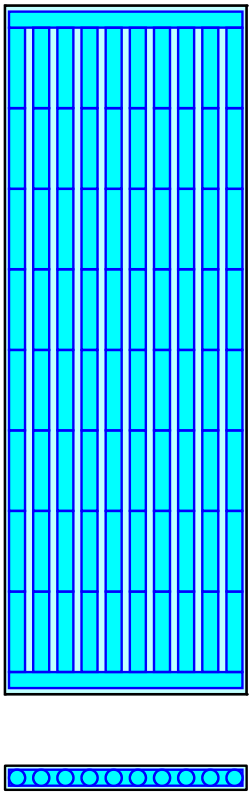
8 Chambers/Row x 20.00' Long +4.00' Header x 2 = 168.00' Row Length +18.0" End Stone x 2 = 171.00' Base Length
10 Rows x 48.0" Wide + 24.0" Spacing x 9 + 12.0" Side Stone x 2 = 59.99' Base Width
12.0" Stone Base + 48.0" Chamber Height + 12.0" Stone Cover = 6.00' Field Height

80 Chambers x 184.0 cf + 57.99' Header x 9.20 sf x 2 = 15,787.0 cf Chamber Storage
80 Chambers x 231.1 cf + 57.99' Header x 11.56 sf x 2 = 19,830.7 cf Displacement

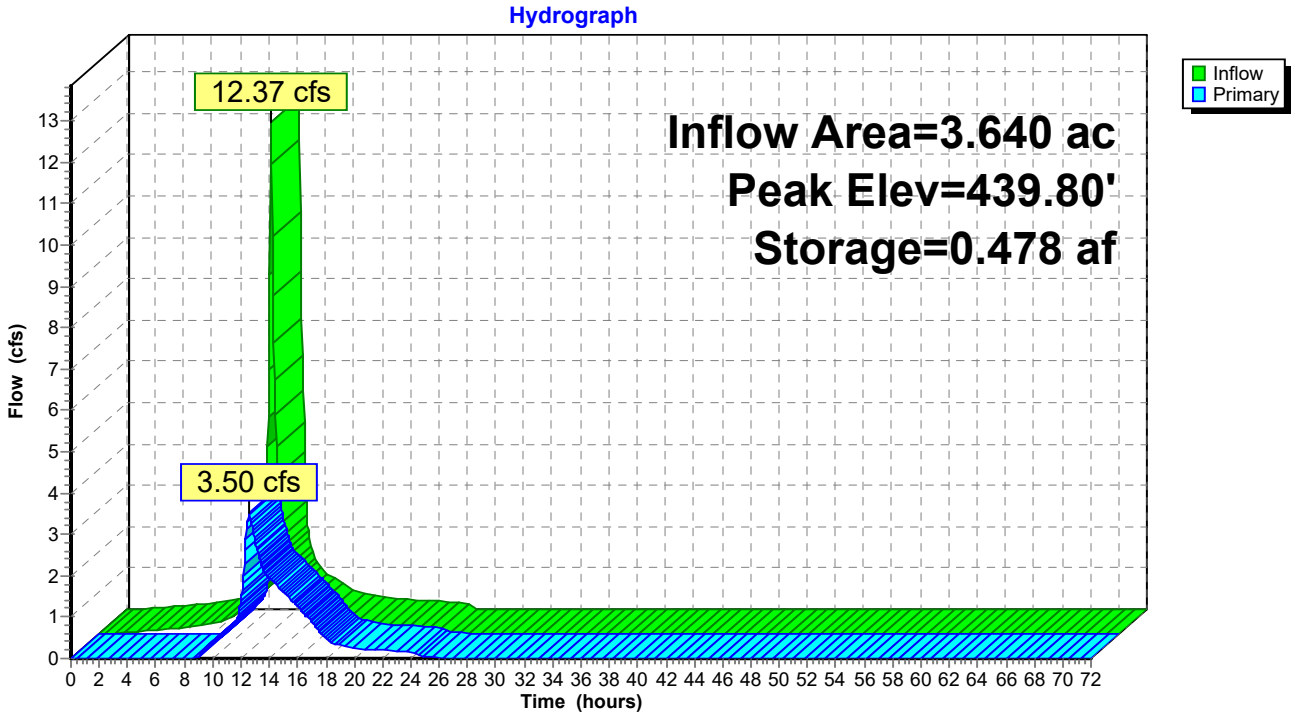
61,543.2 cf Field - 19,830.7 cf Chambers = 41,712.4 cf Stone x 35.0% Voids = 14,599.4 cf Stone Storage

Chamber Storage + Stone Storage = 30,386.4 cf = 0.698 af
Overall Storage Efficiency = 49.4%
Overall System Size = 171.00' x 59.99' x 6.00'

80 Chambers
2,279.4 cy Field
1,544.9 cy Stone



Pond 4: BASIN 1 (UGS)



Hydrograph for Pond 4: BASIN 1 (UGS)

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	436.00	0.00
2.50	0.05	0.004	436.05	0.00
5.00	0.12	0.022	436.27	0.00
7.50	0.22	0.055	436.67	0.00
10.00	**0.53**	0.107	437.37	0.39
12.50	**4.55**	**0.475**	**439.77**	**3.43**
15.00	0.68	**0.264**	**438.49**	**1.60**
17.50	0.34	0.124	437.52	0.67
20.00	0.23	0.101	437.29	0.25
22.50	0.18	0.099	437.25	0.19
25.00	0.00	0.091	437.12	0.05
27.50	0.00	0.086	437.05	0.01
30.00	0.00	0.085	437.03	0.00
32.50	0.00	0.084	437.02	0.00
35.00	0.00	0.084	437.02	0.00
37.50	0.00	0.084	437.02	0.00
40.00	0.00	0.083	437.01	0.00
42.50	0.00	0.083	437.01	0.00
45.00	0.00	0.083	437.01	0.00
47.50	0.00	0.083	437.01	0.00
50.00	0.00	0.083	437.01	0.00
52.50	0.00	0.083	437.01	0.00
55.00	0.00	0.083	437.00	0.00
57.50	0.00	0.083	437.00	0.00
60.00	0.00	0.083	437.00	0.00
62.50	0.00	0.083	437.00	0.00
65.00	0.00	0.083	437.00	0.00
67.50	0.00	0.083	437.00	0.00
70.00	0.00	0.083	437.00	0.00

Summary for Pond 4: BASIN 1 (UGS)

Inflow Area = 3.640 ac, 55.22% Impervious, Inflow Depth = 5.02" for 25-YR event
Inflow = 15.93 cfs @ 12.15 hrs, Volume= 1.522 af
Outflow = 5.61 cfs @ 12.51 hrs, Volume= 1.440 af, Atten= 65%, Lag= 21.8 min
Primary = 5.61 cfs @ 12.51 hrs, Volume= 1.440 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 440.48' @ 12.51 hrs Surf.Area= 0.236 ac Storage= 0.574 af

Plug-Flow detention time= 130.9 min calculated for 1.440 af (95% of inflow)
Center-of-Mass det. time= 99.7 min (874.5 - 774.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	436.00'	0.335 af	**59.99'W x 171.00'L x 6.00'H Field A** 1.413 af Overall - 0.455 af Embedded = 0.958 af x 35.0% Voids
#2A	437.00'	0.362 af	**ADS N-12 42"** x 80 Inside #1 Inside= 41.1"W x 41.1"H => 9.20 sf x 20.00'L = 184.0 cf Outside= 48.0"W x 48.0"H => 11.56 sf x 20.00'L = 231.1 cf 80 Chambers in 10 Rows 57.99' Header x 9.20 sf x 2 = 1,067.1 cf Inside
		0.698 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	437.00'	**18.0" Round Culvert** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 437.00' / 436.48' S= 0.0400 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf
#2	Device 1	437.00'	**7.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	439.00'	**0.5' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 1	441.85'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=5.60 cfs @ 12.51 hrs HW=440.47' (Free Discharge)
└─**1=Culvert** (Passes 5.60 cfs of 14.04 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.63 cfs @ 8.56 fps)
  ├─**3=Broad-Crested Rectangular Weir** (Weir Controls 2.97 cfs @ 4.03 fps)
  └─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4: BASIN 1 (UGS) - Chamber Wizard Field A

Chamber Model = ADS N-12 42" (ADS N-12® Pipe)
Inside= 41.1"W x 41.1"H => 9.20 sf x 20.00'L = 184.0 cf
Outside= 48.0"W x 48.0"H => 11.56 sf x 20.00'L = 231.1 cf

48.0" Wide + 24.0" Spacing = 72.0" C-C Row Spacing

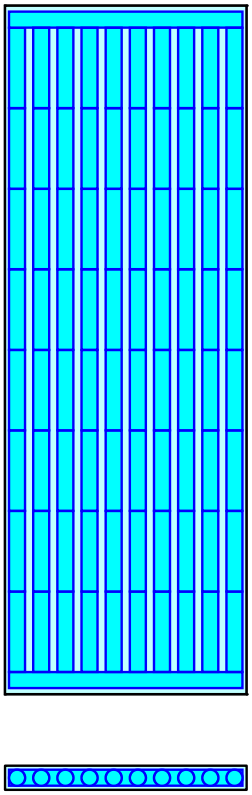
8 Chambers/Row x 20.00' Long +4.00' Header x 2 = 168.00' Row Length +18.0" End Stone x 2 = 171.00' Base Length
10 Rows x 48.0" Wide + 24.0" Spacing x 9 + 12.0" Side Stone x 2 = 59.99' Base Width
12.0" Stone Base + 48.0" Chamber Height + 12.0" Stone Cover = 6.00' Field Height

80 Chambers x 184.0 cf + 57.99' Header x 9.20 sf x 2 = 15,787.0 cf Chamber Storage
80 Chambers x 231.1 cf + 57.99' Header x 11.56 sf x 2 = 19,830.7 cf Displacement

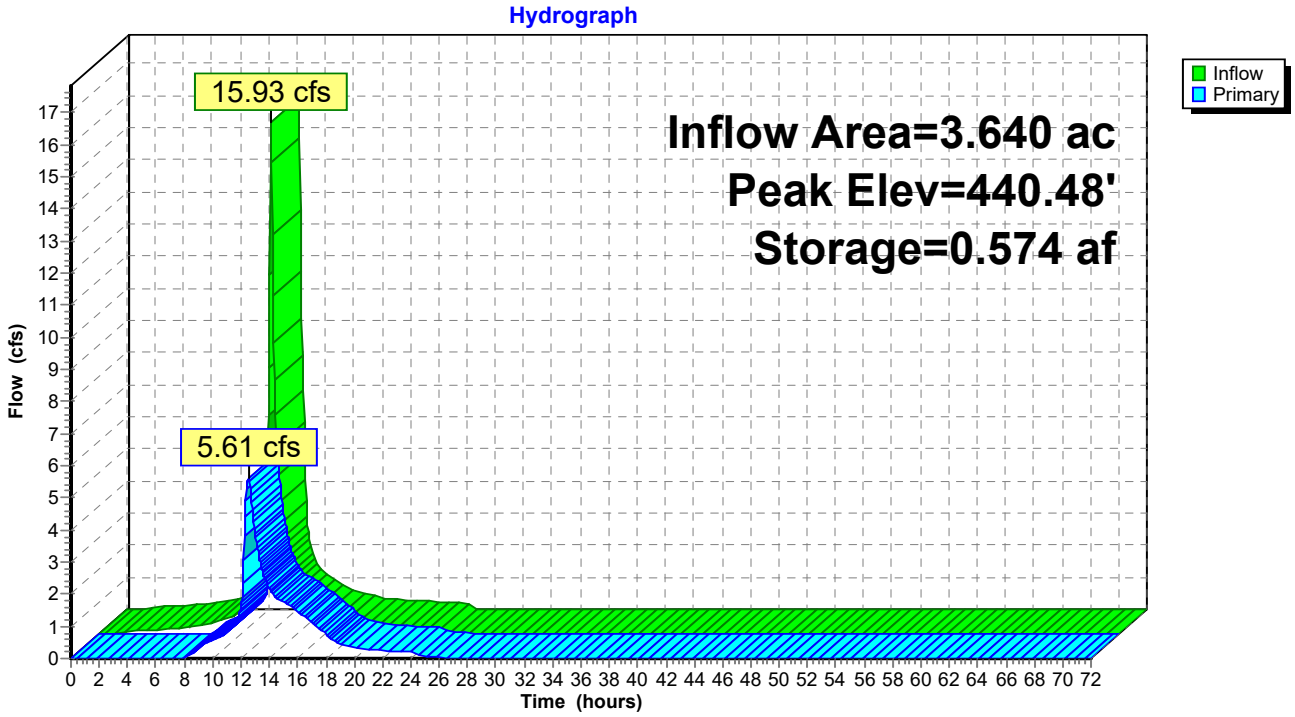
61,543.2 cf Field - 19,830.7 cf Chambers = 41,712.4 cf Stone x 35.0% Voids = 14,599.4 cf Stone Storage

Chamber Storage + Stone Storage = 30,386.4 cf = 0.698 af
Overall Storage Efficiency = 49.4%
Overall System Size = 171.00' x 59.99' x 6.00'

80 Chambers
2,279.4 cy Field
1,544.9 cy Stone



Pond 4: BASIN 1 (UGS)



Hydrograph for Pond 4: BASIN 1 (UGS)

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	436.00	0.00
2.50	0.08	0.007	436.08	0.00
5.00	0.16	0.031	436.38	0.00
7.50	0.28	0.074	436.89	0.00
10.00	**0.71**	0.117	437.46	0.56
12.50	**5.85**	**0.574**	**440.48**	**5.61**
15.00	0.86	0.307	438.75	1.77
17.50	0.42	0.147	437.71	0.93
20.00	0.29	0.105	437.34	0.33
22.50	0.23	0.101	437.28	0.24
25.00	0.00	0.092	437.13	0.06
27.50	0.00	0.086	437.05	0.01
30.00	0.00	0.085	437.03	0.00
32.50	0.00	0.084	437.02	0.00
35.00	0.00	0.084	437.02	0.00
37.50	0.00	0.084	437.02	0.00
40.00	0.00	0.084	437.01	0.00
42.50	0.00	0.083	437.01	0.00
45.00	0.00	0.083	437.01	0.00
47.50	0.00	0.083	437.01	0.00
50.00	0.00	0.083	437.01	0.00
52.50	0.00	0.083	437.01	0.00
55.00	0.00	0.083	437.00	0.00
57.50	0.00	0.083	437.00	0.00
60.00	0.00	0.083	437.00	0.00
62.50	0.00	0.083	437.00	0.00
65.00	0.00	0.083	437.00	0.00
67.50	0.00	0.083	437.00	0.00
70.00	0.00	0.083	437.00	0.00

Summary for Pond 4: BASIN 1 (UGS)

Inflow Area = 3.640 ac, 55.22% Impervious, Inflow Depth = 7.12" for 100-YR event
Inflow = 22.52 cfs @ 12.15 hrs, Volume= 2.160 af
Outflow = 12.21 cfs @ 12.37 hrs, Volume= 2.078 af, Atten= 46%, Lag= 13.3 min
Primary = 12.21 cfs @ 12.37 hrs, Volume= 2.078 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 441.98' @ 12.37 hrs Surf.Area= 0.236 ac Storage= 0.696 af

Plug-Flow detention time= 109.9 min calculated for 2.078 af (96% of inflow)
Center-of-Mass det. time= 86.6 min (857.1 - 770.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	436.00'	0.335 af	**59.99'W x 171.00'L x 6.00'H Field A** 1.413 af Overall - 0.455 af Embedded = 0.958 af x 35.0% Voids
#2A	437.00'	0.362 af	**ADS N-12 42"** x 80 Inside #1 Inside= 41.1"W x 41.1"H => 9.20 sf x 20.00'L = 184.0 cf Outside= 48.0"W x 48.0"H => 11.56 sf x 20.00'L = 231.1 cf 80 Chambers in 10 Rows 57.99' Header x 9.20 sf x 2 = 1,067.1 cf Inside
		0.698 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	437.00'	**18.0" Round Culvert** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 437.00' / 436.48' S= 0.0400 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf
#2	Device 1	437.00'	**7.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	439.00'	**0.5' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 1	441.85'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=12.07 cfs @ 12.37 hrs HW=441.96' (Free Discharge)
└─**1=Culvert** (Passes 12.07 cfs of 17.46 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 3.19 cfs @ 10.38 fps)
  ├─**3=Broad-Crested Rectangular Weir** (Weir Controls 8.47 cfs @ 5.71 fps)
  └─**4=Broad-Crested Rectangular Weir** (Weir Controls 0.42 cfs @ 0.94 fps)

Pond 4: BASIN 1 (UGS) - Chamber Wizard Field A

Chamber Model = ADS N-12 42" (ADS N-12® Pipe)
Inside= 41.1"W x 41.1"H => 9.20 sf x 20.00'L = 184.0 cf
Outside= 48.0"W x 48.0"H => 11.56 sf x 20.00'L = 231.1 cf

48.0" Wide + 24.0" Spacing = 72.0" C-C Row Spacing

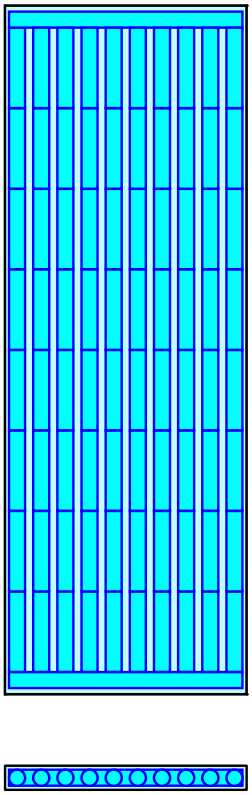
8 Chambers/Row x 20.00' Long +4.00' Header x 2 = 168.00' Row Length +18.0" End Stone x 2 = 171.00' Base Length
10 Rows x 48.0" Wide + 24.0" Spacing x 9 + 12.0" Side Stone x 2 = 59.99' Base Width
12.0" Stone Base + 48.0" Chamber Height + 12.0" Stone Cover = 6.00' Field Height

80 Chambers x 184.0 cf + 57.99' Header x 9.20 sf x 2 = 15,787.0 cf Chamber Storage
80 Chambers x 231.1 cf + 57.99' Header x 11.56 sf x 2 = 19,830.7 cf Displacement

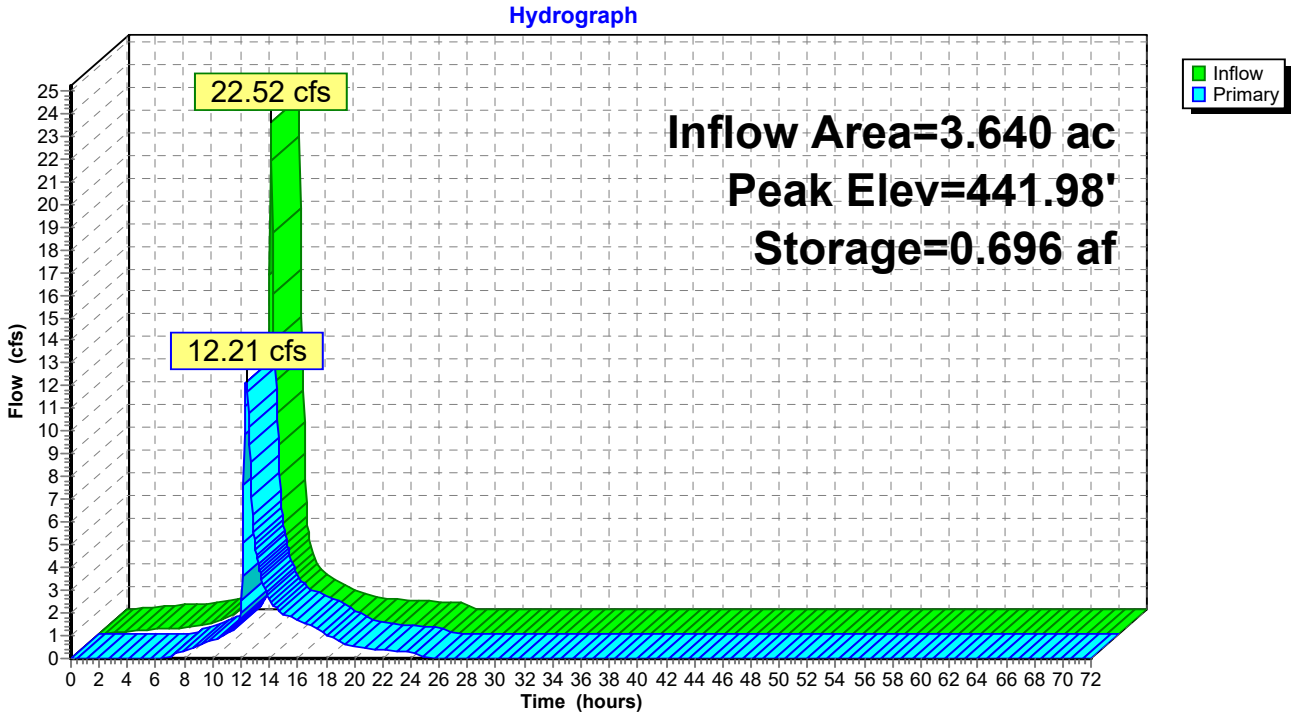
61,543.2 cf Field - 19,830.7 cf Chambers = 41,712.4 cf Stone x 35.0% Voids = 14,599.4 cf Stone Storage

Chamber Storage + Stone Storage = 30,386.4 cf = 0.698 af
Overall Storage Efficiency = 49.4%
Overall System Size = 171.00' x 59.99' x 6.00'

80 Chambers
2,279.4 cy Field
1,544.9 cy Stone



Pond 4: BASIN 1 (UGS)



Hydrograph for Pond 4: BASIN 1 (UGS)

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	436.00	0.00
2.50	0.13	0.012	436.15	0.00
5.00	0.22	0.049	436.60	0.00
7.50	0.41	0.101	437.29	0.25
10.00	**1.05**	**0.134**	**437.60**	**0.80**
12.50	**8.24**	**0.680**	**441.78**	**10.83**
15.00	1.19	0.354	439.03	1.94
17.50	0.59	0.192	438.02	1.24
20.00	0.40	0.114	437.43	0.51
22.50	0.32	0.105	437.34	0.34
25.00	0.00	0.093	437.15	0.07
27.50	0.00	0.087	437.06	0.01
30.00	0.00	0.085	437.03	0.00
32.50	0.00	0.084	437.03	0.00
35.00	0.00	0.084	437.02	0.00
37.50	0.00	0.084	437.02	0.00
40.00	0.00	0.084	437.01	0.00
42.50	0.00	0.083	437.01	0.00
45.00	0.00	0.083	437.01	0.00
47.50	0.00	0.083	437.01	0.00
50.00	0.00	0.083	437.01	0.00
52.50	0.00	0.083	437.01	0.00
55.00	0.00	0.083	437.00	0.00
57.50	0.00	0.083	437.00	0.00
60.00	0.00	0.083	437.00	0.00
62.50	0.00	0.083	437.00	0.00
65.00	0.00	0.083	437.00	0.00
67.50	0.00	0.083	437.00	0.00
70.00	0.00	0.083	437.00	0.00

Summary for Pond 4: BASIN 1 (UGS)

Inflow Area = 3.640 ac, 55.22% Impervious, Inflow Depth = 0.60" for WQ event
Inflow = 5.21 cfs @ 1.15 hrs, Volume= 0.183 af
Outflow = 0.83 cfs @ 1.65 hrs, Volume= 0.101 af, Atten= 84%, Lag= 30.0 min
Primary = 0.83 cfs @ 1.65 hrs, Volume= 0.101 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 437.62' @ 1.65 hrs Surf.Area= 0.236 ac Storage= 0.136 af

Plug-Flow detention time= 99.2 min calculated for 0.101 af (55% of inflow)
Center-of-Mass det. time= 87.3 min (162.4 - 75.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	436.00'	0.335 af	**59.99'W x 171.00'L x 6.00'H Field A** 1.413 af Overall - 0.455 af Embedded = 0.958 af x 35.0% Voids
#2A	437.00'	0.362 af	**ADS N-12 42"** x 80 Inside #1 Inside= 41.1"W x 41.1"H => 9.20 sf x 20.00'L = 184.0 cf Outside= 48.0"W x 48.0"H => 11.56 sf x 20.00'L = 231.1 cf 80 Chambers in 10 Rows 57.99' Header x 9.20 sf x 2 = 1,067.1 cf Inside
		0.698 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	437.00'	**18.0" Round Culvert** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 437.00' / 436.48' S= 0.0400 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf
#2	Device 1	437.00'	**7.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	439.00'	**0.5' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 1	441.85'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.82 cfs @ 1.65 hrs HW=437.62' (Free Discharge)
└─**1=Culvert** (Passes 0.82 cfs of 1.87 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.82 cfs @ 2.69 fps)
  ├─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4: BASIN 1 (UGS) - Chamber Wizard Field A

Chamber Model = ADS N-12 42" (ADS N-12® Pipe)
Inside= 41.1"W x 41.1"H => 9.20 sf x 20.00'L = 184.0 cf
Outside= 48.0"W x 48.0"H => 11.56 sf x 20.00'L = 231.1 cf

48.0" Wide + 24.0" Spacing = 72.0" C-C Row Spacing

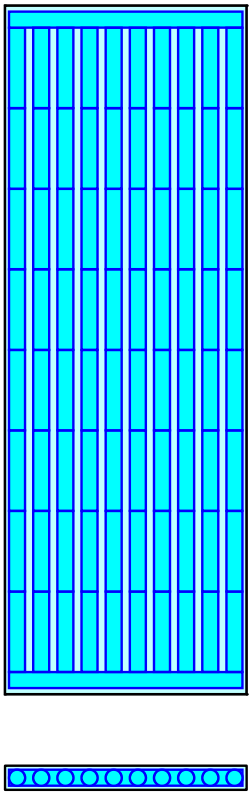
8 Chambers/Row x 20.00' Long +4.00' Header x 2 = 168.00' Row Length +18.0" End Stone x 2 = 171.00' Base Length
10 Rows x 48.0" Wide + 24.0" Spacing x 9 + 12.0" Side Stone x 2 = 59.99' Base Width
12.0" Stone Base + 48.0" Chamber Height + 12.0" Stone Cover = 6.00' Field Height

80 Chambers x 184.0 cf + 57.99' Header x 9.20 sf x 2 = 15,787.0 cf Chamber Storage
80 Chambers x 231.1 cf + 57.99' Header x 11.56 sf x 2 = 19,830.7 cf Displacement

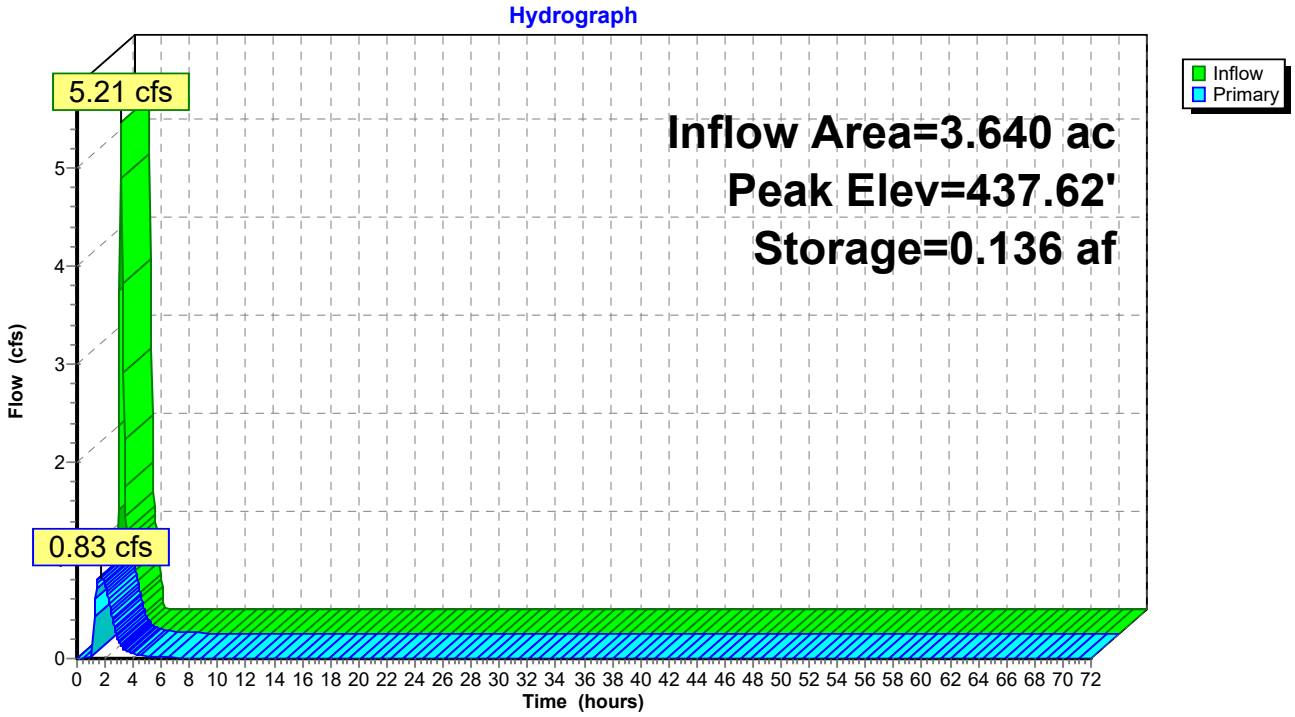
61,543.2 cf Field - 19,830.7 cf Chambers = 41,712.4 cf Stone x 35.0% Voids = 14,599.4 cf Stone Storage

Chamber Storage + Stone Storage = 30,386.4 cf = 0.698 af
Overall Storage Efficiency = 49.4%
Overall System Size = 171.00' x 59.99' x 6.00'

80 Chambers
2,279.4 cy Field
1,544.9 cy Stone



Pond 4: BASIN 1 (UGS)



Hydrograph for Pond 4: BASIN 1 (UGS)

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	**0.00**	**0.000**	**436.00**	**0.00**
2.50	**0.00**	**0.109**	**437.39**	**0.42**
5.00	0.00	0.088	437.08	0.02
7.50	0.00	0.086	437.04	0.01
10.00	0.00	0.085	437.03	0.00
12.50	0.00	0.084	437.02	0.00
15.00	0.00	0.084	437.02	0.00
17.50	0.00	0.084	437.01	0.00
20.00	0.00	0.083	437.01	0.00
22.50	0.00	0.083	437.01	0.00
25.00	0.00	0.083	437.01	0.00
27.50	0.00	0.083	437.01	0.00
30.00	0.00	0.083	437.01	0.00
32.50	0.00	0.083	437.00	0.00
35.00	0.00	0.083	437.00	0.00
37.50	0.00	0.083	437.00	0.00
40.00	0.00	0.083	437.00	0.00
42.50	0.00	0.083	437.00	0.00
45.00	0.00	0.083	437.00	0.00
47.50	0.00	0.083	437.00	0.00
50.00	0.00	0.083	437.00	0.00
52.50	0.00	0.083	437.00	0.00
55.00	0.00	0.083	437.00	0.00
57.50	0.00	0.082	437.00	0.00
60.00	0.00	0.082	437.00	0.00
62.50	0.00	0.082	437.00	0.00
65.00	0.00	0.082	437.00	0.00
67.50	0.00	0.082	437.00	0.00
70.00	0.00	0.082	437.00	0.00

APPENDIX G:

NJDEP Stormwater Management Calculations

STORMWATER QUANTITY CONTROL

Per the NJ Stormwater Management Regulations (N.J.A.C. 7:8), the post-developed peak discharge rate from the disturbed portion of the project site shall be 50% of the pre-developed peak discharge rate for the 2 year storm event, 75% for the 10 year storm event and 80% for the 100 year storm event. The table below lists the overall peak flow rate reductions for the four (4) drainage areas analyzed in the pre- and post-developed conditions. The calculated reductions satisfy the requirements of the NJDEP Stormwater Management Regulations (N.J.A.C. 7:8) for the 2, 10 and 100 year storm events.

Storm Event	Required Reduction	Allowable Peak Flow Rate	Post-Developed Peak Rate	NJDEP Rate Reduction Satisfied
Analysis Point "EX. INLET (TWP)" (Basin 1 + Area A1 TOTAL)				
2 year	50%	3.29 cfs	3.28 cfs	YES
10 year	75%	7.59 cfs	5.06 cfs	YES
100 year	80%	14.29 cfs	14.19 cfs	YES
Analysis Point "Area A2"				
2 year	50%	0.17 cfs	0.17 cfs	YES
10 year	75%	0.49 cfs	0.38 cfs	YES
100 year	80%	1.06 cfs	0.83 cfs	YES
Analysis Point "Area A3"				
2 year	50%	0.05 cfs	0.01 cfs	YES
10 year	75%	0.18 cfs	0.03 cfs	YES
100 year	80%	0.42 cfs	0.07 cfs	YES
Analysis Point "Area A4"				
2 year	50%	0.05 cfs	0.00 cfs	YES
10 year	75%	0.11 cfs	0.00 cfs	YES
100 year	80%	0.17 cfs	0.00 cfs	YES

STORMWATER QUALITY CONTROL

Per the NJ Stormwater Management Regulations (N.J.A.C. 7:8), 80% removal of Total Suspended Solids (TSS) and other pollutants is required for the developed portion of the site. However, the site contains existing impervious area that is being redeveloped; therefore, the required removal rate for previously developed impervious areas is 50%. Impervious building areas and lawns which generate "clean" surface-run-off do not require TSS removal. The required TSS removal rate for the site is calculated as follows:

Required Removal Ratio:

Existing Impervious Area (non-building) = 1.21 acres

Proposed Impervious Area (non-building) = 1.50 acres

Additional New Impervious Area (non-building) = 1.50 acres – 1.21 acres = 0.29 acres

$$\frac{1.21 \text{ ac. x } 50\% + 0.29 \text{ ac. X } 80\%}{1.50 \text{ acres}} = \textbf{55.8\% Required TSS Removal}$$

Provided Removal:

The expected TSS removal ratios for the proposed stormwater management best management practices (BMPs) as listed in Chapter 9.0 of the NJ Stormwater BMP Manual, latest edition are as follows:

Removal ratio for Bioretention Areas #1 & #2 (rain gardens) = **80% (each)**
(includes 24" soil bed and site tolerant grasses/plantings)

Removal ratio for Manufactured Treatment Device (MTD) #401 = **50%**

To achieve the removal ratios defined in Chapter 9.0 of the NJ BMP Manual, the bioretention areas must be capable of retaining the entire water quality design storm directed to those facilities and the MTD must be capable of accommodating the entire water quality design storm flow to that structure. Confirmation of the capacities of the proposed BMPs is provided below:

Bioretention Area #1 (rain garden):

a. Determine water quality storm runoff volume (using NRCS Weighted Average Volume)

- Volume from impervious areas:

  S = 1000/CN – 10 = 1000/98 – 10 = 0.20 inches
  0.2S = 0.2 x 0.20 = 0.04 inches
  0.8S = 0.8 x 0.20 = 0.16 inches

  $Q = (P – 0.2S)^2 / (P + 0.8S) = (1.25 – 0.04)^2 / (1.25 + 0.16) = 1.04$ inches

  V_{imp} = (1.04 inches/12 inches per foot) x 0.14 acres x 43,560 s.f. per acre
  V_{imp} = 528 c.f.

- Volume from pervious areas:

  S = 1000/CN – 10 = 1000/74 – 10 = 3.51 inches
  0.2S = 0.2 x 3.51 = 0.70 inches
  0.8S = 0.8 x 3.51 = 2.81 inches

  $Q = (P – 0.2S)^2 / (P + 0.8S) = (1.25 – 0.70)^2 / (1.25 + 2.81) = 0.19$ inches

  V_{perv} = (0.19 inches/12 inches per foot) x 0.04 acres x 43,560 s.f. per acre
  V_{perv} = 28 c.f.

- Water Quality Volume = $V_{imp} + V_{perv}$ = 528 c.f. + 28 c.f. = 556 c.f.

b. Determine Volume of Bioretention Area #1:

- 581 c.f. (below overflow grate elevation of 454.00)
- Depth of bioretention area below overflow grate = 1.5 ft.

  (See volume table for Bioretention Area #1 at the end of this Appendix)

c. Since Bioretention Area #1 retains the entire water quality design storm volume from the contributory drainage area, the TSS Removal Ratio from Chapter 9.1 of the NJ Stormwater BMP = **80%.**

<u>Bioretention Area #2 (rain garden)</u>:

a. Determine water quality storm runoff volume (using NRCS Weighted Average Volume)

- Volume from impervious areas:

  S = 1000/CN – 10 = 1000/98 – 10 = 0.20 inches
  0.2S = 0.2 x 0.20 = 0.04 inches
  0.8S = 0.8 x 0.20 = 0.16 inches

  $Q = (P – 0.2S)^2 / (P + 0.8S) = (1.25 – 0.04)^2 / (1.25 + 0.16) = 1.04$ inches

  V_{imp} = (1.04 inches/12 inches per foot) x 0.23 acres x 43,560 s.f. per acre
  V_{imp} = 868 c.f.

- Volume from pervious areas:

  S = 1000/CN – 10 = 1000/74 – 10 = 3.51 inches
  0.2S = 0.2 x 3.51 = 0.70 inches
  0.8S = 0.8 x 3.51 = 2.81 inches

  $Q = (P – 0.2S)^2 / (P + 0.8S) = (1.25 – 0.70)^2 / (1.25 + 2.81) = 0.19$ inches

  V_{perv} = (0.19 inches/12 inches per foot) x 0.15 acres x 43,560 s.f. per acre
  V_{perv} = 193 c.f.

- Water Quality Volume = $V_{imp} + V_{perv}$ = 868 c.f. + 103 c.f. = 971 c.f.

b. Determine Volume of Bioretention Area #1:

- 987 c.f. (below overflow grate elevation of 450.50)
- Depth of bioretention area below overflow grate = 1.5 ft.

  (See volume table for Bioretention Area #2 at the end of this Appendix)

c. Since Bioretention Area #2 retains the entire water quality design storm volume from the contributory drainage area, the TSS Removal Ratio from Chapter 9.1 of the NJ Stormwater BMP = **80%.**

Manufactured Treatment Device #401

Water Quality Design Storm Peak Flow Rate (Basin 1 Discharge + Inlet 405) = 1.98 cfs
Largest Storm Event (100-year) Peak Flow Rate (Basin 1 Discharge + Inlet 405) = 15.10 cfs

Inlet 405	Basin 1 Discharge (from routings)
Q = C x i x A	Q_{wq} = 0.83 cfs
T_c = 10 minutes; i_{wq} = 3.2"/hr., i_{100} = 8.0"/hr.	Q_{100} = 12.21 cfs
Q_{wq} = 0.95 x 3.2 x 0.38 = 1.15 cfs	
Q_{100} = 0.95 x 8.0 x 0.38 = 2.89 cfs	

The (MTD) selected for TSS removal is an 8 ft. diameter Downstream Defender manufactured by Hydro-International, Inc. which has been sized to treat the peak flow rate of the Water Quality Design Storm to the structure. The NJCAT certified capacity for the Downstream Defender is 50% if the specified flow limitations are met. Since the water quality design storm and 100-year peak flow rates to the MTD meet the rated capacity of the structure, **50% TSS removal can be expected**.

Overall Removal Ratio:

New Impervious Area to Inlet #400 (off-site) =	0.02 acres (parking)
New Impervious Area to Bioretention Area #1 =	0.14 acres (parking, sidewalk)
New Impervious Area to Bioretention Area #2 =	0.23 acres (parking, sidewalk)
New Impervious to MTD #401 =	1.11 acres (parking, sidewalk, patio)
TOTAL NEW IMPERVIOUS =	1.50 acres

$$\frac{0.02 \text{ ac.} \times 0\% + 0.14 \text{ ac.} \times 80\% + 0.23 \text{ ac.} \times 80\% + 1.11 \text{ ac.} \times 50\%}{1.50 \text{ acres}} = \mathbf{56.7\% \text{ Provided}}$$

Since the provided Overall Removal Ratio of **56.7% ≥ 55.8%** required, water quality requirements have been **SATISFIED** for stormwater discharge from the development.

STORMWATER RECHARGE CONTROL

Per the NJ Stormwater Management Regulations (N.J.A.C. 7:8), 100% of the site's average annual pre-developed groundwater recharge volume must be maintained after development. For groundwater recharge, two (2) infiltration pipes within a stone envelope have been proposed which accept "clean" run-off from portions of the roof area of Building A. Since run-off directed to the infiltration pipes is "clean", no pre-treatment is required. Each infiltration pipe has been designed to retain the entire volume of the water quality design storm from the contributory drainage area as follows:

Infiltration Pipe Inlet #107-Inlet #106

a. Determine water quality storm runoff volume (using NRCS Weighted Average Volume)

   - Volume from impervious areas:

     S = 1000/CN – 10 = 1000/98 – 10 = 0.20 inches
     0.2S = 0.2 x 0.20 = 0.04 inches
     0.8S = 0.8 x 0.20 = 0.16 inches

$Q = (P – 0.2S)^2 / (P + 0.8S) = (1.25 – 0.04)^2 / (1.25 + 0.16) = 1.04$ inches

V_{imp} = (1.04 inches/12 inches per foot) x 0.18 acres x 43,560 s.f. per acre
V_{imp} = 679 c.f.

- Volume from pervious areas:

  S = 1000/CN – 10 = 1000/74 – 10 = 3.51 inches
  0.2S = 0.2 x 3.51 = 0.70 inches
  0.8S = 0.8 x 3.51 = 2.81 inches

  $Q = (P – 0.2S)^2 / (P + 0.8S) = (1.25 – 0.70)^2 / (1.25 + 2.81) = 0.19$ inches

  V_{perv} = (0.19 inches/12 inches per foot) x 0.12 acres x 43,560 s.f. per acre
  V_{perv} = 83 c.f.

- Water Quality Volume = $V_{imp} + V_{perv}$ = 679 c.f. + 83 c.f. = 762 c.f.

b. Determine Volume of infiltration pipe:

- Portion of 36” diameter pipe below invert of 15” diameter pipe will be utilized for recharge

- Parameters for volume calculation:

Pipe Size (D) =	36” diameter perforated CHDPE = 3.0 ft.
Pipe Radius (r) =	D/2 = 1.5 ft.
Depth of Infiltration (h) =	36” pipe – 15” pipe = 21” = 1.75 ft.
Stone Bottom Area (W) =	5.00 ft. (12” envelope)
Stone Depth (H) =	2.75 ft. (12” base)
Stone Voids Ratio (VR) =	35%
Depth to SHWT =	≥ 2.0 ft.

- Volume of pipe (based on formula Area of Circular Segment given its Height)

  $V_{pipe} = A_{pipe} \times L_{pipe}$

  $A_{pipe} = r^2 \times \arccos((r-h)/2) – (r-h) \times (2rh – h^2)^{0.5}$
  $A_{pipe} = 1.5 \times \arccos((1.5-1.75)/2) – (1.5-1.75) \times (2 \times 1.5 \times 1.75 – 1.75^2)^{0.5}$
  A_{pipe} = 4.28 s.f.

  V_{pipe} = 4.28 s.f. x 107 ft. = 458 c.f.

- Volume of stone

  $V_{stone} = (W \times H - A_{pipe}) \times VR \times L_{pipe}$
  V_{stone} = (5 x 2.75 – 4.28) x 0.35 x 107
  V_{stone} = 354 c.f.

- Volume calculation:

  $V_{total} = V_{pipe} + V_{stone}$
  V_{total} = 458 c.f. + 354 c.f. = 812 c.f. > 762 c.f.

Infiltration Pipe Inlet #305-Inlet #304

a. Determine water quality storm runoff volume (using NRCS Weighted Average Volume)

- Volume from impervious areas:

  S = 1000/CN – 10 = 1000/98 – 10 = 0.20 inches
  0.2S = 0.2 x 0.20 = 0.04 inches
  0.8S = 0.8 x 0.20 = 0.16 inches

  $Q = (P – 0.2S)^2 / (P + 0.8S) = (1.25 – 0.04)^2 / (1.25 + 0.16) = 1.04$ inches

  V_{imp} = (1.04 inches/12 inches per foot) x 0.20 acres x 43,560 s.f. per acre
  V_{imp} = 755 c.f.

- Volume from pervious areas:

  S = 1000/CN – 10 = 1000/74 – 10 = 3.51 inches
  0.2S = 0.2 x 3.51 = 0.70 inches
  0.8S = 0.8 x 3.51 = 2.81 inches

  $Q = (P – 0.2S)^2 / (P + 0.8S) = (1.25 – 0.70)^2 / (1.25 + 2.81) = 0.19$ inches

  V_{perv} = (0.19 inches/12 inches per foot) x 0.0 acres x 43,560 s.f. per acre
  V_{perv} = 0 c.f.

- Water Quality Volume = $V_{imp} + V_{perv}$ = 755 c.f. + 0 c.f. = 755 c.f.

b. Determine Volume of infiltration pipe:

- Portion of 36” diameter pipe below invert of 15” diameter pipe will be utilized for recharge

- Parameters for volume calculation:

Pipe Size (D) =	36” diameter perforated CHDPE = 3.0 ft.
Pipe Radius (r) =	D/2 = 1.5 ft.
Depth of Infiltration (h) =	36” pipe – 15” pipe = 21” = 1.75 ft.
Stone Bottom Area (W) =	5.00 ft. (12” envelope)
Stone Depth (H) =	2.75 ft. (12” base)
Stone Voids Ratio (VR) =	35%
Depth to SHWT =	≥ 2.0 ft.

- Volume of pipe (based on formula Area of Circular Segment given its Height)

  $V_{pipe} = A_{pipe} \times L_{pipe}$

  $A_{pipe} = r^2 \times \arccos((r-h)/2) – (r-h) \times (2rh – h^2)^{0.5}$
  $A_{pipe} = 1.5 \times \arccos((1.5-1.75)/2) – (1.5-1.75) \times (2 \times 1.5 \times 1.75 – 1.75^2)^{0.5}$
  A_{pipe} = 4.28 s.f.

  V_{pipe} = 4.28 s.f. x 104 ft. = 445 c.f.

- Volume of stone

  $V_{stone} = (W \times H - A_{pipe}) \times VR \times L_{pipe}$
  $V_{stone} = (5 \times 2.75 – 4.28) \times 0.35 \times 104$
  $V_{stone} = 345$ c.f.

- Volume calculation:

  $V_{total} = V_{pipe} + V_{stone}$
  $V_{total} = 445$ c.f. + 345 c.f. = 790 c.f. > 755 c.f.

Considering the infiltration pipe trenches have a width of 5.00 ft., the total bottom area for both pipes is 1,055 s.f. (211 ft. x 5 ft.). Utilizing the New Jersey Groundwater Recharge Spreadsheet (NJGRS), an infiltration structure with a bottom area of 1,055 square feet located approximately 63 inches below existing grade must have a minimum depth of 8.1 inches to meet the annual BMP recharge requirements for the site. Since the proposed infiltration depth of the pipes is 21 inches, recharge requirements for the project have been satisfied.

Depot & Pine St. Redevelopment

Verona Township, Essex County, NJ
Bioretention Area Volume Analysis

By: JSK
Checked: AJG
Date: 07/10/20
Revised:

Bioretention Area #1

Elevation	Depth (feet)	Surface Area (sf)	Storage Volume (cf)	Sum of Volume (cf)
452.50		0		0
	0.50		90	
453.00		360		90
	1.00		491	
454.00		621		581
	1.00		784	
455.00		947		1,365
	0.50		512	
455.50		1,100		1,876

Outlet Structure

6" orifice (plug) = 452.50
Grate Elevation = 454.00

Basin Design

Overflow Grate Elevation = 454.00
Top of Berm = 455.50

Bioretention Area #2

Elevation	Depth (feet)	Surface Area (sf)	Storage Volume (cf)	Sum of Volume (cf)
449.00		0		0
	1.00		475	
450.00		949		475
	0.50		513	
450.50		1,101		987
	0.50		564	
451.00		1,154		1,551
	1.00		1,291	
452.00		1,427		2,841

Outlet Structure

6" orifice (plug) = 449.00
Grate Elevation = 450.50

Bioretention Area Design

Overflow Grate Elevation = 450.50
Top of Berm = 452.00

This is a regional document for **New Jersey**

New Jersey Stormwater Design Guide
Downstream Defender®

Rated for 50% TSS Removal by NJDEP

The Downstream Defender® is an advanced vortex separator certified by the New Jersey Department of Environmental Protection (NJDEP) for 50% TSS removal and independently verified by the New Jersey Corporation for Advanced Technologies (NJCAT).

The Downstream Defender® has been the approved product of choice for the majority of New Jersey Turnpike Authority installations.

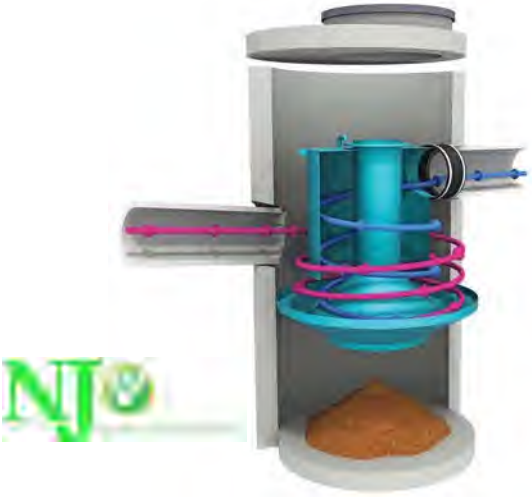


Table 1. Approved Treatment Flow Rates for the 1.25" / 2hr NJ Design Storm

Certified NJDEP Water Quality Treatment Flow Rate	Recommended Peak Online Flow	Downstream Defender® Model & Diameter	Maximum Pipe Size	Recommended Inlet pipe/outlet pipe size for offline design	Rim Elevation to Outlet Invert[1,2]	Outlet Invert to Sump Floor
(cfs)	(cfs)	(ft)	(in)	(in)	(ft)	(ft)
1.12	3.0	4	12	10 / 12	2.8	4.08
2.52	8.0	6	18	15 / 18	3.4	5.86
4.49	15.0	8	24	20 / 24	4.2	7.67
7.00	25.0	10	30	24 / 30	5.0	9.44
10.08	38.0	12	36	30 / 36	5.7	11.18

[1]Including 4" frame and cover.

[2] Please contact your Hydro representative at (703) 424-3340 for product applications involving shallow or minimum cover.

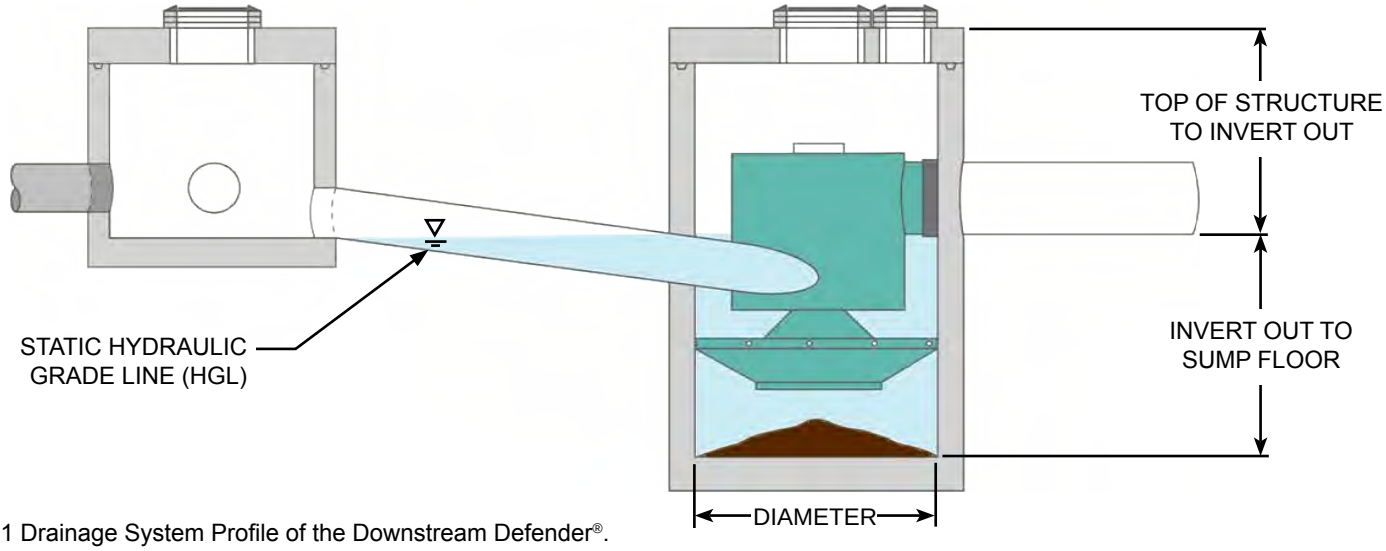


Fig.1 Drainage System Profile of the Downstream Defender®.

Downstream Defender®

Layout

Minimal Head Loss

The Downstream Defender® has a submerged tangential inlet and includes no internal orifices or weirs. These key features reduce the risk of blockage and decrease system headloss. The headloss through the Downstream Defender® is dependent on the pipe sizes. However, at recommended pipe sizes and NJDEP treatment flow rates, headloss through the Downstream Defender® will only be 2-3 inches.

Setting the Inverts of the Downstream Defender®

The inlet pipe of the Downstream Defender® enters the manhole tangentially to generate rotational flow and is submerged to reduce the risk of blockage and decrease system headloss. The inlet pipe invert is exactly one pipe diameter lower than the outlet invert. The outlet pipe is set to match, or be lower than the outlet invert of the upstream bypass/junction structures. With this configuration, the overall HGL is not adversely affected (Fig.1).

No Bypass Manhole – Online Configuration

The Downstream Defender® is certified by the NJDEP for Online Use (Fig.2). To prevent peak storm flows from washing previously captured pollutants out of stormwater treatment devices, NJDEP limits Online Use Designation to devices that are independently proven to prevent pollutant washout. As shown in Fig.2, an Online Downstream Defender® does not require an additional bypass or junction manhole and the entire peak storm flow is conveyed through its vortex chamber (i.e. there is no internal bypass).

A Downstream Defender® can be placed Online as long as the Water Quality Treatment Flow Rate (Refer to Table 1: Column 1) is greater than or equal to the "NJ Design Storm" flow rate and the drainage system pipe diameter is less than or equal to the Downstream Defender®'s maximum inlet pipe diameter (Refer to Table 1, Column 4). If the Downstream Defender®'s maximum inlet pipe size is too small compared to the drainage pipe, a larger model should be considered or a bypass/junction manhole should be provided.

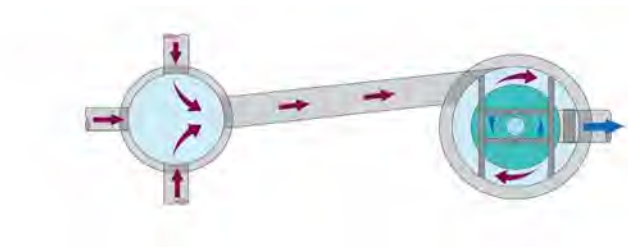


Fig.2 Online Downstream Defender®.

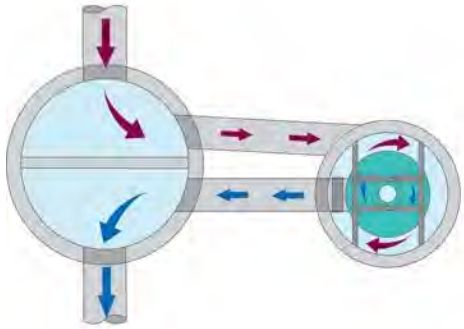


Fig.3 Offline Downstream Defender®.

Single Bypass/Junction Manhole – Offline Configuration

The Downstream Defender® can be designed with an external bypass or junction manhole (Fig.3). The advantages of this layout include diverting peak storm flows away from the treatment system, avoiding oversized treatment systems due to pipe size or peak flow and the treatment system can be located to avoid utilities or difficult maintenance and inspection areas.

Due to the flexibility of the Downstream Defender®'s internal components and tangential inlet, the offline design may only require one manhole for both bypass and junction.

Downstream Defender® Sizing Calculator for New Jersey Projects

Hydro International recommends that consultants considering a Downstream Defender® for use on a New Jersey project use Hydro International's online Downstream Defender® Sizing Calculator for Engineers.

Using basic project-specific inputs such as Water Quality Flow Rate, the calculator determines the most appropriate Downstream Defender® model size for the job (Fig.4).

As the Downstream Defender® is approved for online or offline use by NJDEP, the calculator also uses inputs such as Peak Flow Rate to recommend whether an offline configuration is more appropriate than an online configuration.

The Downstream Defender® Sizing Calculator for Engineers can also be used to generate site-specific detail drawings for either online or offline devices. Users may opt to submit their design to Hydro International for a technical review and pricing.

To use the online Sizing Calculator for Engineers visit http://sizingcalculator.hydro-int.com/.

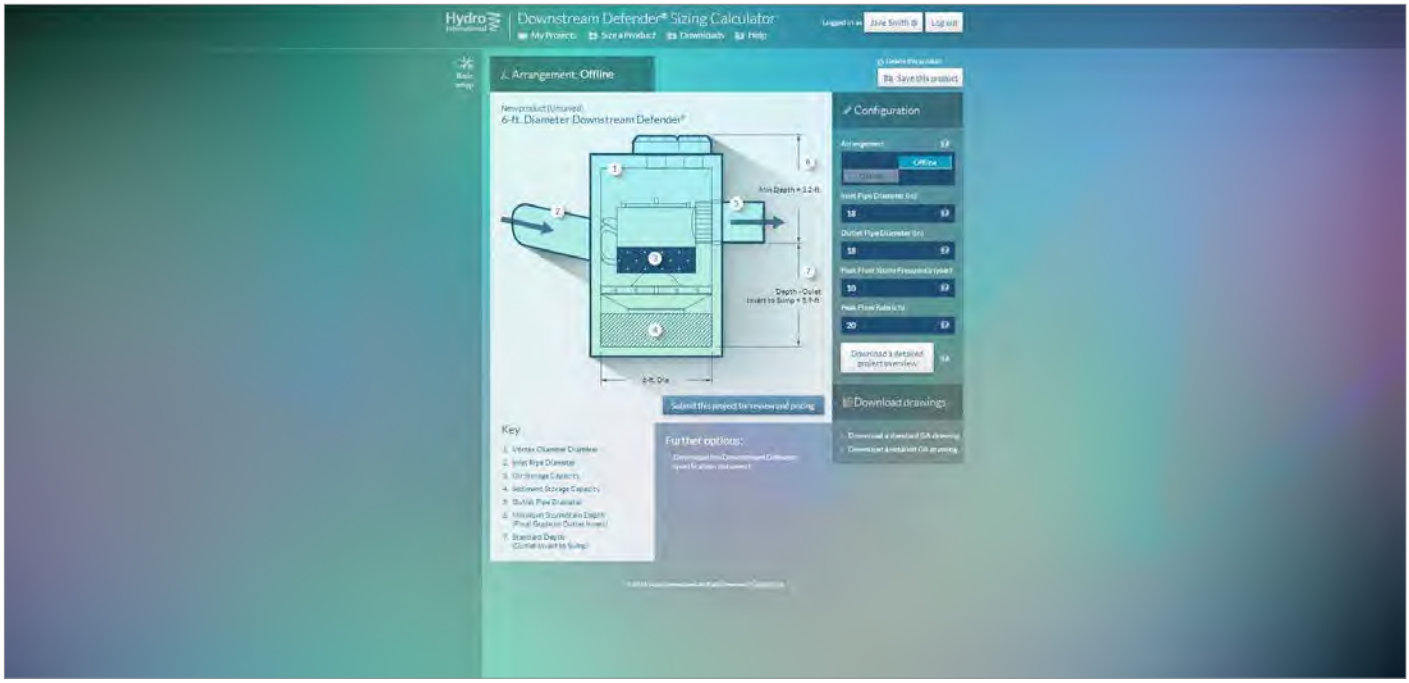


Fig.4 The Downstream Defender® Sizing Calculator for Engineers is an online tool that determines the most appropriate Downstream Defender® model size for a specific project.

Important Links

Downstream Defender® on Hydro International Site: http://www.hydro-int.com/us/products/downstream-defender
Interactive Downstream Defender® Sizing Calculator for Engineers: http://sizingcalculator.hydro-int.com/
NJDEP Certification Letter: http://www.njstormwater.org/pdf/downstream-defender-signed-final-certification-w-maintenance.pdf
NJCAT Testing Report: http://www.njcat.org/uploads/newDocs/DDVerificationReportFinal.pdf

New Jersey Representative - Nick Burns, E.I. (703) 424-3340 nburns@hydro-int.com
Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

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State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
401-02B
Post Office Box 420
Trenton, New Jersey 08625-0420
609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

BOB MARTIN
Commissioner

RECEIVED
AUG 24 2015
HYDRO INTERNATIONAL

August 18, 2015

Lisa Lemont, CPSWQ
Business Development Manager
Hydro International (Stormwater)
94 Hutchins Drive
Portland, ME 04102

Re: Revised MTD Lab Certification for the Downstream Defender Stormwater Treatment Device By Hydro International

TSS Removal Rate 50%

Dear Ms. Lemont:

This letter supersedes the previous certification letter dated January 21, 2015. Hydro International requested a new verification for the Downstream Defender Stormwater Treatment Device from the New Jersey Corporation for Advanced Technology (NJCAT) based on enhanced Maximum Treatment Flow Rate (MTFR).

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Hydro International has requested a Laboratory Certification for the Downstream Defender Stormwater Treatment Device.

The projects falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix for this device is published online at http://www.njcat.org/verification-process/technology-verification-database.html.

The NJDEP certifies the use of the Downstream Defender Stormwater Treatment Device by Hydro International at a TSS removal rate of 50% when designed, operated and maintained in accordance with the information provided in the Verification Appendix.

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance of the New Jersey Stormwater Best Management Practices Manual.

If you have any questions regarding the above information, please contact Mr. Titus Magnanao of my office at (609) 633-7021.

Sincerely,

James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

C: Chron File
Richard Magee, NJCAT
Madhu Guru, DLUR
Ravi Patraju, NJDEP
Titus Magnanao, BNPC

New Jersey Groundwater Recharge Spreadsheet
Version 2.0
November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ESSEX CO., VERONA BORO	48.9	1.67

Project Name:	PIRHL - Verona Twp.
Description:	Block 2301 - Lots 11-19
Analysis Date:	07/10/20

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	1.8	Impervious areas	Boonton	0.0	-
2	1.17	Open space	Boonton	14.9	63,486
3	1.18	Woods	Boonton	15.7	67,068
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11					
12					
13					
14					
15	0				
Total =	4.2			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				8.7	130,554

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	2.34	Impervious areas	Boonton	0.0	-
2	1.66	Open space	Boonton	14.9	90,074
3	0.15	Woods	Boonton	15.7	8,526
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	4.2			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				6.5	98,600

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	101,930
Post-Development Annual Recharge Deficit=	***31,954***	(cubic feet)	

Recharge Efficiency Parameters Calculations (area averages)

RWC=	3.49	(in)	DRWC=	0.00	(in)
ERWC =	0.58	(in)	EDRWC=	0.00	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

Project Name	Description	Analysis Date	BMP or LID Type
PIRHL - Verona Twp.	Block 2301 - Lots 11-19	07/10/20	Building A - Recharge Piping

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	1055.0	sq.ft
BMP Effective Depth, this is the design variable	dBMP	8.1	in
Upper level of the BMP surface (negative if above ground)	dBMPu	36.0	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	63.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	2	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.61	in
ERWC Modified to consider dEXC	EDRWC	0.00	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.00	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.62	in
Inches of Rainfall to capture	Pdesign	0.76	in
Recharge Provided Avg. over Imp. Area		26.7	in
Runoff Captured Avg. over imp. Area		26.7	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.07	unitless
BMP Volume	VBMP	714	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-> OK
dBMP Check---> OK
dEXC Check---> OK
BMP Location---> OK

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	31,954	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	14,375	sq.ft
Root Zone Water Capacity	RWC	3.69	in
RWC Modified to consider dEXC	DRWC	0.00	in
Climatic Factor	C-factor	1.67	no units
Average Annual P	Pavg	48.9	in
Recharge Requirement over Imp. Area	dr	3.8	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		31,954	cu.ft
Avg BMP Recharge Efficiency		100.0%	Represents % Infiltration Recharged
%Rainfall became Runoff		78.5%	%
%Runoff Infiltrated		69.5%	%
%Runoff Recharged		9.8%	%
%Rainfall Recharged		7.7%	%

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

APPENDIX H

Stormwater Collection System Design Calculations

25 yr. Storm

Depot and Pine Street Redevelopment
Township of Verona
Essex County, NJ

Date: 07/10/20
By: JSK
Chk'd: AJG
Revised:

Storm Sewer System Calculations

Mannings Equation Analysis

Design Data:

Design Storm:	25	year	(sump)
Intensity:	Trenton IDF Curve		
Tc to Inlets:	5	minute, minimum	
25yr Rainfall Intensity-Essex County	8.7	in/hr, maximum	
Roadway 'n'	0.013		
Pipe 'n'	0.01	for HDPE, 0.013 for RCP	
Pipe Cover	1.5	ft, minimum (roadways)	
	1.5	ft, minimum (lawn areas)	
Road X-Slope	2.08%	= 0.25	inches per foot
Runoff Coefficient	0.99	Impervious	
	0.25	'A' Soil Lawn (1)	
	0.25	'B' Soil Lawn	
	0.51	'C' Soil Lawn	
	0.65	'D' Soil Lawn	
	0.25	'A' Soil Woods (1)	
	0.25	'B' Soil Woods (1)	
	0.45	'C' Soil Woods	
	0.59	'D' Soil Woods	

Formulas:

Overland Flow

$Q=CiA$

Depot and Pine Street Redevelopment
Township of Verona
Essex County, NJ

Date: 07/10/20
By: JSK
Chk'd: AJG

Inlet No.	Inlet Drainage Area 'C' Value												travel time to inlet (min.)
	Impervious		Pervious										
	Imp. (ac.)	'C'	B Soil Lawn (ac.)	'C'	C Soil Lawn (ac.)	'C'	B Soil Woods (ac.)	'C'	C Soil Woods (ac.)	'C'	Total Area (ac.)	Overall 'C'	
100	0.00	0.99	0.00	0.25	0.00	0.51	0.00	0.15	0.00	0.45	0.00	0.00	0.00
101	0.07	0.99	0.00	0.25	0.06	0.51	0.00	0.15	0.00	0.45	0.13	0.77	5.00
102	0.21	0.99	0.00	0.25	0.04	0.51	0.00	0.15	0.00	0.45	0.25	0.91	5.00
103	0.46	0.99	0.00	0.25	0.15	0.51	0.00	0.15	0.00	0.45	0.61	0.87	5.00
104	0.14	0.99	0.00	0.25	0.04	0.51	0.00	0.15	0.00	0.45	0.18	0.88	5.00
105	0.12	0.99	0.00	0.25	0.05	0.51	0.00	0.15	0.00	0.45	0.17	0.85	10.00
106	0.08	0.99	0.00	0.25	0.16	0.51	0.00	0.15	0.00	0.45	0.24	0.67	10.00
107	0.19	0.99	0.00	0.25	0.11	0.51	0.00	0.15	0.00	0.45	0.30	0.81	10.00
Total Area	1.27				0.61				0.00				

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
8	7	107.000	0.30	0.30	0.81	0.24	0.24	10.0	10.0	6.8	1.65	8.39	3.05	15	1.00	458.15	459.22	458.80	459.73	463.50	463.75	IN107-IN106
7	6	75.000	0.24	0.54	0.67	0.16	0.40	10.0	11.3	6.4	2.60	8.39	3.73	15	1.00	457.40	458.15	458.15	458.80	461.50	463.50	IN106-IN105
6	3	128.000	0.17	0.71	0.85	0.14	0.55	10.0	11.9	6.3	3.45	18.77	8.07	15	5.00	451.00	457.40	451.36	458.15	455.05	461.50	IN105-IN102
5	3	38.000	0.18	0.18	0.88	0.16	0.16	5.0	5.0	8.7	1.38	13.27	2.24	15	2.50	447.55	448.50	448.70	448.96	455.05	454.00	IN104-IN102
4	3	60.000	0.61	0.61	0.87	0.53	0.53	5.0	5.0	8.7	4.61	8.39	6.03	15	1.00	449.50	450.10	450.16	450.97	455.05	453.70	IN103-IN102
3	1	42.000	0.25	1.75	0.91	0.23	1.46	5.0	12.7	6.1	8.95	13.27	9.58	15	2.50	446.50	447.55	447.25	448.70	453.50	455.05	IN102-MH100
2	1	27.000	0.13	0.13	0.77	0.10	0.10	5.0	5.0	8.7	0.87	8.39	3.66	15	1.00	446.50	446.77	446.77	447.14	453.50	450.00	IN101-MH100
1	End	12.000	0.00	1.88	0.00	0.00	1.57	0.0	12.8	6.1	9.52	0.00	0.99	42	0.00	437.00	437.00	440.50	440.50	453.18	453.50	MH100-UGS

System 100 | Number of lines: 8 | Run Date: 7/7/2020

NOTES:Intensity = 72.09 / (Inlet time + 8.90) ^ 0.80; Return period =Yrs. 25 ; c = cir e = ellip b = box

Depot and Pine Street Redevelopment
Township of Verona
Essex County, NJ

Date: 07/10/20
By: JSK
Chk'd: AJG

Inlet No.	Inlet Drainage Area 'C' Value												travel time to inlet (min.)
	Impervious		Pervious										
	Imp. (ac.)	'C'	B Soil Lawn (ac.)	'C'	C Soil Lawn (ac.)	'C'	B Soil Woods (ac.)	'C'	C Soil Woods (ac.)	'C'	Total Area (ac.)	Overall 'C'	
200	0.08	0.99	0.00	0.25	0.07	0.51	0.00	0.15	0.00	0.45	0.15	0.77	10.00
201	0.00	0.99	0.00	0.25	0.08	0.51	0.00	0.15	0.00	0.45	0.08	0.51	5.00
202	0.00	0.99	0.00	0.25	0.00	0.51	0.00	0.15	0.00	0.45	0.00	0.00	5.00
203	0.00	0.99	0.00	0.25	0.02	0.51	0.00	0.15	0.00	0.45	0.02	0.51	5.00
204	0.23	0.99	0.00	0.25	0.15	0.51	0.00	0.15	0.00	0.45	0.38	0.80	10.00
Total Area	0.31				0.32				0.00				

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
2	1	68.000	0.38	0.38	0.80	0.30	0.30	10.0	10.0	6.8	2.06	3.67	1.82	15	0.32	449.62	449.84	450.81	450.86	452.50	452.16	IN204-IN203
1	End	37.000	0.02	0.40	0.51	0.01	0.31	5.0	10.7	6.6	2.07	3.68	1.72	15	0.32	449.50	449.62	450.75	450.78	452.00	452.50	IN203-FES202

System202 | Number of lines: 2 | Run Date: 7/7/2020

NOTES:Intensity = 72.09 / (Inlet time + 8.90) ^ 0.80; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	t (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
2	1	35.000	0.08	0.08	0.51	0.04	0.04	5.0	5.0	8.7	2.42	8.39	4.94	15	1.00	444.65	445.00	445.11	445.62	450.25	450.50	IN201-IN200
1	End	23.000	0.15	0.23	0.77	0.12	0.16	10.0	10.0	6.8	3.13	0.00	0.33	42	0.00	437.00	437.00	440.50	440.50	452.50	450.25	IN200-UGS

System 200 | Number of lines: 2 | Run Date: 7/7/2020

NOTES:Intensity = 72.09 / (Inlet time + 8.90) ^ 0.80; Return period =Yrs. 25 ; c = cir e = ellip b = box

Depot and Pine Street Redevelopment
Township of Verona
Essex County, NJ

Date: 07/10/20
By: JSK
Chk'd: AJG

Inlet No.	Inlet Drainage Area 'C' Value												travel time to inlet (min.)
	Impervious		Pervious										
	Imp. (ac.)	'C'	B Soil Lawn (ac.)	'C'	C Soil Lawn (ac.)	'C'	B Soil Woods (ac.)	'C'	C Soil Woods (ac.)	'C'	Total Area (ac.)	Overall 'C'	
300	0.00	0.99	0.00	0.25	0.00	0.51	0.00	0.15	0.00	0.45	0.00	0.00	0.00
301	0.00	0.99	0.00	0.25	0.02	0.51	0.00	0.15	0.00	0.45	0.02	0.51	5.00
302	0.00	0.99	0.00	0.25	0.03	0.51	0.00	0.15	0.00	0.45	0.03	0.51	5.00
303	0.08	0.99	0.00	0.25	0.22	0.51	0.00	0.15	0.00	0.45	0.30	0.64	10.00
304	0.08	0.99	0.00	0.25	0.06	0.51	0.00	0.15	0.00	0.45	0.14	0.78	10.00
305	0.20	0.99	0.00	0.25	0.00	0.51	0.00	0.15	0.00	0.45	0.20	0.99	5.00
306	0.00	0.99	0.00	0.25	0.20	0.51	0.00	0.15	0.15	0.45	0.35	0.48	10.00
Total Area	0.36				0.53				0.15				

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
7	6	78.000	0.35	0.35	0.48	0.17	0.17	10.0	10.0	6.8	1.14	8.39	2.53	15	1.00	454.22	455.00	454.83	455.42	464.75	458.00	FES306-IN305
6	5	104.000	0.20	0.55	0.99	0.20	0.37	5.0	11.4	6.4	2.35	11.87	3.66	15	2.00	452.14	454.22	452.83	454.83	462.75	464.75	IN305-IN304
5	4	202.000	[illegible]	0.69	0.78	0.11	0.48	10.0	12.3	6.2	2.94	18.77	7.69	15	5.00	442.04	452.14	442.37	452.83	446.00	462.75	IN304-IN303
4	3	38.000	0.30	0.99	0.64	0.19	0.67	10.0	13.6	5.9	3.93	8.39	4.71	15	1.00	440.66	441.04	441.47	441.84	446.50	446.00	IN303-IN302
3	1	16.000	0.03	1.02	0.51	0.02	0.68	5.0	13.8	5.9	3.99	8.39	5.76	15	1.00	440.50	440.66	441.11	441.47	446.50	446.50	IN302-MH300
2	1	50.000	0.02	0.02	0.51	0.01	0.01	5.0	5.0	8.7	0.09	10.35	2.83	12	5.00	441.75	444.25	441.82	444.37	446.50	447.50	IN301-MH300
1	End	15.000	0.00	1.04	0.00	0.00	0.69	0.0	13.9	5.8	4.04	0.00	0.42	42	0.00	437.00	437.00	440.50	440.50	445.12	446.50	MH300-UGS

System 300 | Number of lines: 7 | Run Date: 7/7/2020

NOTES:Intensity = 72.09 / (Inlet time + 8.90) ^ 0.80; Return period =Yrs. 25 ; c = cir e = ellip b = box

Depot and Pine Street Redevelopment
Township of Verona
Essex County, NJ

Date: 07/10/20
By: JSK
Chk'd: AJG

Inlet No.	Inlet Drainage Area 'C' Value												travel time to inlet (min.)
	Impervious		Pervious										
	Imp. (ac.)	'C'	B Soil Lawn (ac.)	'C'	C Soil Lawn (ac.)	'C'	B Soil Woods (ac.)	'C'	C Soil Woods (ac.)	'C'	Total Area (ac.)	Overall 'C'	
400	0.14	0.99	0.00	0.25	0.22	0.51	0.00	0.15	0.00	0.45	0.36	0.70	10.00
401	0.00	0.99	0.00	0.25	0.00	0.51	0.00	0.15	0.00	0.45	0.00	0.00	0.00
402	0.00	0.99	0.00	0.25	0.00	0.51	0.00	0.15	0.00	0.45	0.00	0.00	0.00
403	0.07	0.99	0.00	0.25	0.00	0.51	0.00	0.15	0.00	0.45	0.07	0.99	5.00
404	0.00	0.99	0.00	0.25	0.02	0.51	0.00	0.15	0.00	0.45	0.02	0.51	5.00
405	0.35	0.99	0.00	0.25	0.03	0.51	0.00	0.15	0.00	0.45	0.38	0.95	10.00
Total Area	0.56				0.27				0.00				

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
2	1	65.000	0.02	0.02	0.51	0.01	0.01	5.0	5.0	8.7	0.09	10.35	2.83	12	5.00	441.50	444.75	441.57	444.87	445.75	447.50	IN404-MH403
1	End	13.000	0.07	0.09	0.99	0.07	0.08	5.0	14.6	5.7	0.45	0.00	0.05	42	0.00	437.00	437.00	440.50	440.50	445.00	445.75	MH403-UGS

System 403 | Number of lines: 2 | Run Date: 7/7/2020

NOTES:Intensity = 72.09 / (Inlet time + 8.90) ^ 0.80; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
4	3	33.000	0.38	0.38	0.95	0.36	0.36	10.0	10.0	6.8	2.45	8.39	4.96	15	1.00	440.50	440.83	440.96	441.46	444.50	443.75	IN405-OS402
3	2	3.000	0.00	0.38	0.00	0.00	0.36	0.0	10.3	6.7	8.03	26.14 (1)	9.41	18	3.67	438.89	439.00	439.46	440.10	443.50	444.50	OS402-MTD401
2	1	10.000	0.00	0.38	0.00	0.00	0.36	0.0	10.3	6.7	8.03	26.26	5.55	18	3.70	436.50	436.87	437.70	437.97	441.25	443.50	MTD401-IN400
1	End	56.000	0.36	0.74	0.70	0.25	0.61	10.0	10.3	6.7	9.72	14.31 (2)	5.95	18	1.86	435.46	436.50	436.96	437.70	438.66	441.25	IN400-EXINL

Includes 5.61 cfs peak discharge from Basin 1 (Underground Storage System)

(1) Pipe Capacity of OS402-IN400 = 26.14 cfs which is capable of passing the entire 100 year flow of 22.52 cfs to Basin 1 should the outlet structure openings become blocked.

(2) Pipe capacity of IN400-EXINL = 14.31 cfs which is capable of passing the combined 100 year (controlled) discharge from Basin 1 and direct flow from Area A1 which totals 14.19 cfs.

System 400 | Number of lines: 4 | Run Date: 7/10/2020

NOTES:Intensity = 72.09 / (Inlet time + 8.90) ^ 0.80; Return period =Yrs. 25 ; c = cir e = ellip b = box

APPENDIX I

Soil Erosion and Sediment Control Calculations

Conduit Outlet Protection

CONDUIT OUTLET PROTECTION

Deport Pine St. Redevelopment, Verona Township, NJ
ESE# 20024

Outlet ID = **FES 202**

Pipe Diameter =	**15**	inches	
Height (D_0) =	1.25	feet	
Width (W_0) =	1.25	feet	
Pipe Invert =	**449.50**	feet	
Tailwater Elevation =	**450.50**	feet	
Tailwater Depth (TW) =	1.00	feet	(Minimum TW = $0.2D_0$)

TW ≥ 0.5 Do

Q_{25} =	**2.07**	CFS	$q = \frac{Q}{W_0}$
q =	1.6560		
D_{50} =	0.039	feet	$D_{50} = \frac{0.02}{TW} q^{1.33}$
=	0.4694	inches	
Use D_{50} =	3	inches	(3" minimum)

	$TW < 0.5D_0$	$La = 1.8\left(\frac{q}{D_0^{0.5}}\right) + 7D_0$	$Wa = 3W_0 + La$
Use →	$TW \geq 0.5D_0$	$La = 3\left(\frac{q}{D_0^{0.5}}\right)$	$Wa = 3W_0 + 0.4La$

Length of Apron (La) =	4.44	feet
Use La =	4.0	feet
Width of Apron (Wa) =	5.35	feet
Use Wa =	5.5	feet

Conduit Outlet Protection for FES 202

D_{50} =	**3**	**inches**
Length of Apron =	**4**	**feet**
Width of Apron =	**5.5**	**feet**

Date: 7/10/20
Prepared By: JSK

Project Name	Description	Project Number
Depot and Pine Street Redevelopment	BIORETENTION AREA #1 STABILITY	20024

Project Location	Date
BLOCK 2301, LOTS 11, 12, 14-19 - VERONA TOWNSHIP, ESSEX COUNTY, NJ	07/10/20

Prepared by	Checked by	Checked by date	Revised by	Revision Checked by	Date Revised
JSK	AJG	07/10/20			

Prepare slope stability analysis below the curb-cut entrance for Bioretention Basin #1 in accordance with the Standard for Slope Protection Structures, Section 25 of the Standards for Soil Erosion and Sediment Control in NJ. According to the Standard, the stone size (D50) for channel slopes between 10% and 40% was determined using the equation below:

$$D_{50} = \left[\frac{q(S)^{0.58}}{3.93(10)^{-2}}\right]^{1/1.89}$$

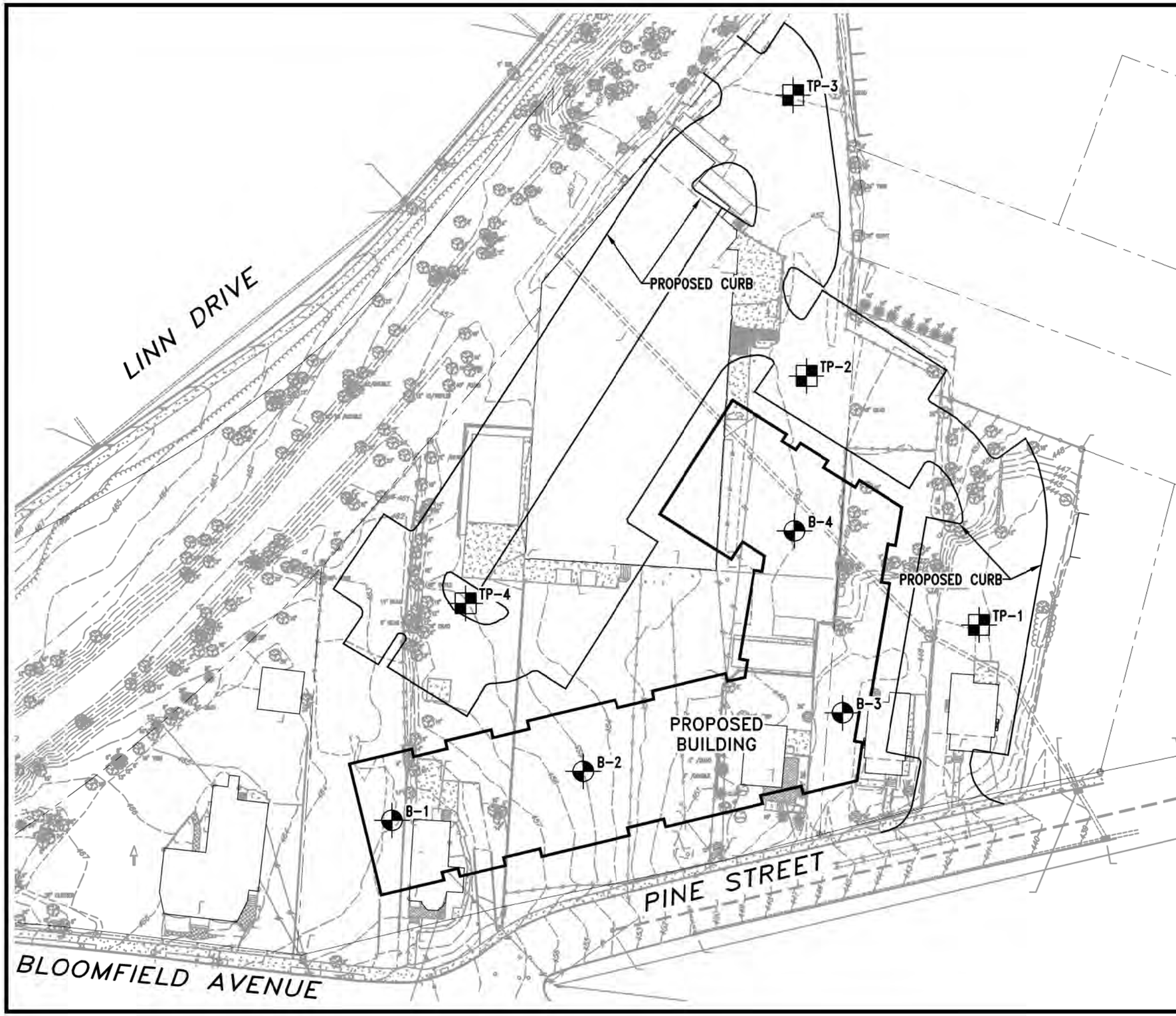
TOTAL DISCHARGE (25-yr) =	1.38	cfs
Width of Rip-Rap Apron (W) =	4	ft
Unit Discharge (q) =	0.11	Q_{25}/W
Slope (S) =	0.333	ft/ft
CALCULATED D_{50} =	4.08	inches
SPECIFIED D_{50} =	**4**	**inches @ 12" thick**

ESE CONSULTANTS

ENGINEERING · PLANNING · SURVEYING · ENVIRONMENTAL

APPENDIX J

Soil Test Pit Data



KEY:

B-1 NUMBER AND APPROXIMATE LOCATION OF BORINGS PERFORMED FOR THIS STUDY

TP-1 NUMBER AND APPROXIMATE LOCATION OF TEST PITS PERFORMED FOR THIS STUDY

NOTES:

1. This drawing is part of Melick–Tully and Associates, a Division of GZA, Report No. 26.0092074.00 and should be read together with the report for complete evaluation.
2. General layout was obtained from two drawings, the first prepared by Neglia Eng., entitled "Boundary and Topographic Survey Overall Boundary Lots 11, 12, 14, 15, 16, 17, 18, & 19 Block 2301" dated 11/17/19, scale 1"= 30', and the second a sketch entitled "Concept Plan VI" provided by the client, scale 1"= 20'.

PLOT PLAN

PROPOSED APARTMENTS AT VERONA
VERONA, NEW JERSEY
PIRHL

MELICK–TULLY AND ASSOCIATES
A Division of GZA
Geotechnical Engineers & Environmental Consultants
117 Canal Road
South Bound Brook, New Jersey 08880
(732) 356–3400

JOB NO.	FILE NO.
26.0092074.00	–

DR. BY	CHK. BY	DATE	SCALE	PLATE
VJD	KT	3/20/20	1"= 50'	2

TEST BORING LOG

MTA, a Division of GZA GeoEnvironmental, Inc
Engineers and Scientists

pirhl
Verona, NJ

EXPLORATION NO.: B-1
SHEET: 1 of 1
PROJECT NO: 26.0092074.00
REVIEWED BY: Kimberly Tully

Logged By: Ohm Patel
Drilling Co.: GDI
Driller: Mike/Cory

Type of Rig: Truck
Rig Model: Mobile B-61
Drilling Method: H.S.A.

Boring Location: See Plan
Ground Surface Elev. (ft.): 463
Date Start - Finish: 3/18/2020 - 3/18/2020
Final Boring Depth (ft.): 18

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.25/4

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
3/18/2020		NE	

Depth (ft)	Sample No.	Sample Depth (ft.)	Sample Blows (per 6 in.)	Sample SPT Value	Symbol	Sample Description and Identification	Depth (ft)	Water Content (%)	Remark
						2" Asphalt over 3" stone subbase			
	S1A	1-2			ML	Brown clayey silt, and fine to medium sand, trace fine gravel (very moist)(stiff)		20.7	
	S1B	2-3	3 9 3 1	12	SM	Brown fine to coarse sand, little silt, trace fine gravel (moist)(medium dense)		13.5	
	S2	3-5	4 5 6 9	11	ML	Brown clayey silt, little fine sand, little fine gravel (very moist)(stiff)		21.2	
5							5		
	S3	5-7	11 26 33 31	59	SP/SM	Brown fine to coarse sand, some fine gravel, little silt with cobbles (moist)(very dense) - grading to little fine gravel (moist)(dense)			
	S4	7-9	17 17 15 13	32				10.9	
10							10		
	S5	10-12	10 10 8 7	18	SP/SM	Brown fine to medium sand, trace silt (moist)(medium dense)			
15							15		
	S6	15-17	10 29 39 85	68	SP	Light brown-gray fine to medium sand, little fine to coarse gravel, trace silt (moist)(very dense) - grading with cobbles			
	S7	17.5	50/0"	100+		- auger refusal @ 18'			
20						End of exploration at 18 feet. Groundwater not encountered			
25									

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.: 3A

1- MTA BORING LOG WITH STRATUM LINES; 4/6/2020; 2:43:53 PM

TEST BORING LOG

MTA, a Division of GZA GeoEnvironmental, Inc
Engineers and Scientists

pirhl
Verona, NJ

EXPLORATION NO.: B-2
SHEET: 1 of 1
PROJECT NO: 26.0092074.00
REVIEWED BY: Kimberly Tully

Logged By: Ohm Patel
Drilling Co.: GDI
Driller: Mike/Cory

Type of Rig: Truck
Rig Model: Mobile B-61
Drilling Method: H.S.A.

Boring Location: See Plan
Ground Surface Elev. (ft.): 455
Date Start - Finish: 3/17/2020 - 3/17/2020
Final Boring Depth (ft.): 22

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 140
Auger or Casing O.D./I.D Dia (in.): 4.25/4

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
3/17/2020		NE	

Depth (ft)	Sample No.	Sample Depth (ft.)	Sample Blows (per 6 in.)	Sample SPT Value	Symbol	Sample Description and Identification	Depth (ft)	Water Content (%)	Remark
						3" Asphalt			
						Fill - Gray fine to coarse sand, some fine to coarse gravel, little silt (moist)(loose to medium dense)			
	S1	1-3	3 5 5 7	10		Light brown clayey silt, little fine sand, little fine gravel (very moist)(stiff to very stiff)		19.8	
5	S2	3-5	4 7 14 12	21	ML		5	19.3	
	S3	5-7	21 41 41 32	82		- grading with cobbles			
	S4	7-9	41 26 41 52	67		Brown fine to coarse sand, some fine to coarse gravel, trace silt with cobbles (moist)(very dense) - hard drilling @ 8'		4.9	
10	S5	10	50/3"	100+	SW/SM		10		
	S6	12-14	14 17 30 37	47		Brown fine to coarse sand, and fine to coarse gravel, trace silt (moist)(dense)		3.5	
15	S7	15-17	22 22 20 20	42	SP/SM	- grading to little silt (moist)(very dense)	15		
20	S8	20-22	25 44 15 43	59			20		
25						End of exploration at 22 feet. Groundwater not encountered			

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.: 3B

1- MTA BORING LOG WITH STRATUM LINES; 4/6/2020; 2:43:54 PM

TEST BORING LOG

MTA, a Division of GZA GeoEnvironmental, Inc
Engineers and Scientists

pirhl
Verona, NJ

EXPLORATION NO.: B-3
SHEET: 1 of 1
PROJECT NO: 26.0092074.00
REVIEWED BY: Kimberly Tully

Logged By: Ohm Patel
Drilling Co.: GDI
Driller: Mike/Cory

Type of Rig: Truck
Rig Model: Mobile B-61
Drilling Method: H.S.A.

Boring Location: See Plan
Ground Surface Elev. (ft.): 446
Date Start - Finish: 3/17/2020 - 3/17/2020
Final Boring Depth (ft.): 20.9

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 140
Auger or Casing O.D./I.D Dia (in.): 4.25/4

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
3/17/2020		NE	

Depth (ft)	Sample No.	Sample Depth (ft.)	Sample Blows (per 6 in.)	Sample SPT Value	Symbol	Sample Description and Identification	Depth (ft)	Water Content (%)	Remark
						Fill - Gray fine to coarse sand, some fine gravel, little silt (slightly moist)(medium dense)			
	S1	1-2	12 13 10 3	23	SM	Brown fine to coarse sand, little fine gravel, trace silt (moist)(medium dense)			
	S2	2-3	4 3 4 3	7	ML	Brown clayey silt, some fine to coarse sand, trace fine gravel (very moist)(medium)		22.9	
5							5		
	S3	5-7	5 12 13 28	25	ML	Brown clayey silt, little fine sand, trace fine gravel (slightly mottled)(very moist)(very stiff)			
	S4	7-9	45 28 29 25	57	SM	Brown fine to medium sand, and silt, little fine gravel with cobbles (very moist)(very dense)		19.3	
10							10		
	S5	10-12	15 21 18 19	39	SM	- grading to fine to medium sand, little silt with cobbles (moist)(dense)			
	S6	12-14	19 13 10 13	23	SM	- grading (medium dense)			
15							15		
	S7	15-17	18 32 87 81	100+	SM	Brown fine to coarse sand, and fine to coarse gravel, little silt with cobbles (moist)(very dense)			
20	S8	19.5-20.9	40 97 100/5"	100+	SM		20		
						End of exploration at 20.9 feet. Groundwater not encountered Hole was left open all day Hole collapsed @ 14'			
25									

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.: 3C

1- MTA BORING LOG WITH STRATUM LINES; 4/6/2020; 2:43:54 PM

TEST BORING LOG

MTA, a Division of GZA GeoEnvironmental, Inc
Engineers and Scientists

pirhl
Verona, NJ

EXPLORATION NO.: B-4
SHEET: 1 of 1
PROJECT NO: 26.0092074.00
REVIEWED BY: Kimberly Tully

Logged By: Ohm Patel
Drilling Co.: GDI
Driller: Mike/Cory

Type of Rig: Truck
Rig Model: Mobile B-61
Drilling Method: H.S.A.

Boring Location: See Plan
Ground Surface Elev. (ft.): 452
Date Start - Finish: 3/17/2020 - 3/17/2020
Final Boring Depth (ft.): 22

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 140
Auger or Casing O.D./I.D Dia (in.): 4.25/4

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
3/17/2020		NE	

Depth (ft)	Sample No.	Sample Depth (ft.)	Sample Blows (per 6 in.)	Sample SPT Value	Symbol	Sample Description and Identification	Depth (ft)	Water Content (%)	Remark
	S1	0-2	19 20 27 19	47		Fill - Red-brown fine to coarse gravel, some fine to coarse sand, little silt (slightly moist)(dense)		8.2	
	S2	2-4	17 15 9 12	24	SM	Red-brown fine to coarse sand, little fine gravel, little silt (moist)(medium dense)			
5							5		
	S3	5-7	5 5 3 13	8	ML	Brown clayey silt, little fine to medium sand (very moist)(medium to stiff)		18.4	
	S4	7-9	22 36 22 43	58	SP	Brown fine to coarse sand, little fine gravel, trace silt with cobbles (moist)(very dense)			
10							10		
	S5	10-12	13 17 19 20	36	SM	Brown fine to medium sand, little silt with cobbles (moist)(dense)		8.1	
15							15		
	S6	15-17	5 10 10 12	20	SP/SM .	- grading to trace silt (moist)(medium dense)			
20							20		
	S7	20-22	23 29 32 35	61	SM	Brown fine to coarse sand, little fine to coarse gravel, little silt (moist)(very dense)			
						End of exploration at 22 feet. Groundwater not encountered			
25									

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.: 3D

1- MTA BORING LOG WITH STRATUM LINES; 4/6/2020; 2:43:55 PM

TEST PIT LOG

MTA, a Division of GZA GeoEnvironmental, Inc
Engineers and Scientists

pirhl
Verona, NJ

EXPLORATION NO.: TP-1
SHEET: 1 of 1
PROJECT NO: 26.0092074.00
REVIEWED BY: Kim Tully

Logged By: Sean Stevenson
Contractor: J.A. Neary Excavating, Inc.
Operator: Paul

Test Pit Location: See Plan
Ground Surface Elev. (ft.): 444

Final Test Pit Depth (ft.): 12
Date Start - Finish: 3/16/2020 - 3/16/2020

Type of Excavator: Rubber-Tire Backhoe
Excavator Model: Case 580

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab.Time
3/16/20		NE	

Depth (ft)	Sample No.	Sample Depth (ft.)	Stratum Depth (in.)	Sample Description and Identification	Depth (ft)	Water Content (%)	Remark
1	S1	0.5	0-6	Topsoil - Brown (10YR, 4/3) sandy loam, 5% gravel, weak fine granular, moist, loose, gradual wavy boundary, few fine to medium roots	1		
2			6-42	Yellowish brown (10YR, 5/4) silty clay loam, 10% gravel, moderate medium subangular blocky, moist, friable, clear wavy boundary	2		
3	S2, T1	2.5			3	21.2	
4			42-108	Brown (10YR, 4/3) gravelly loamy sand, 30% gravel, 10% cobbles, weak fine granular, moist, loose, gradual wavy boundary	4		
5					5		
6	S3, T2	6			6	10.7	
7					7		
8					8		
9	S4, T3	9	108-144	Brown (10YR, 5/3) sand, 5% gravel, weak fine granular, moist, friable	9	6.7	
10					10		
11					11		
12					12		
13				End of exploration at 12 feet.			
14				Groundwater seepage not encountered			
15				Laboratory Tube Permeameter Permeabilty Test Results: >20 in/hr @ 9'			
16							
17							
18							
19							
20							

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.:4A

3B - MTA TEST PIT USDA; 4/6/2020; 2:49:24 PM

TEST PIT LOG

MTA, a Division of GZA GeoEnvironmental, Inc
Engineers and Scientists

pirhl
Verona, NJ

EXPLORATION NO.: TP-2
SHEET: 1 of 1
PROJECT NO: 26.0092074.00
REVIEWED BY: Kim Tully

Logged By: Sean Stevenson
Contractor: J.A. Neary Excavating, Inc.
Operator: Paul

Test Pit Location: See Plan
Ground Surface Elev. (ft.): 452

Final Test Pit Depth (ft.): 12
Date Start - Finish: 3/16/2020 - 3/16/2020

Type of Excavator: Rubber-Tire Backhoe
Excavator Model: Case 580

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab.Time
3/16/20		NE	

Depth (ft)	Sample No.	Sample Depth (ft.)	Stratum Depth (in.)	Sample Description and Identification	Depth (ft)	Water Content (%)	Remark
1, 2			0-28	Fill - Dense graded aggregate with pieces of brick and metal, abrupt irregular boundary, few fine roots encountered from 25" to 28"	1, 2		
3, 4, 5, 6	S1, T1	3.5	28-72	Possible Fill - Dark gray (10YR, 4/1) clay loam, moderate medium massive, very moist, firm, clear wavy boundary	3, 4, 5, 6	25.2	
7, 8, 9, 10	S2, T2	6.5	72-120	Brown (10YR, 4/3) loamy sand, 5% gravel, 5% cobbles, weak fine granular, very moist, firm	7, 8, 9, 10	19.2	
11, 12	S3, T3	10	120-144	Brown (10YR, 4/3) very gravelly sand, 45% gravel, 5% cobbles, weak fine granular, moist, friable	11, 12	10.2	
13, 14, 15, 16, 17, 18, 19, 20				End of exploration at 12 feet. Groundwater seepage not encountered Perched seepage in stone encountered from 25" to 28" Laboratory Tube Permeameter Permeability Test Results: <0.2 in/hr @ 3.5' 0.32 in/hr @ 6.5' >20 in/hr @ 10'			

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.:4B

3B - MTA TEST PIT USDA; 4/6/2020; 2:49:24 PM

TEST PIT LOG

MTA, a Division of GZA GeoEnvironmental, Inc
Engineers and Scientists

pirhl
Verona, NJ

EXPLORATION NO.: TP-3
SHEET: 1 of 1
PROJECT NO: 26.0092074.00
REVIEWED BY: Kim Tully

Logged By: Sean Stevenson
Contractor: J.A. Neary Excavating, Inc.
Operator: Paul

Test Pit Location: See Plan
Ground Surface Elev. (ft.): 452.5

Final Test Pit Depth (ft.): 12
Date Start - Finish: 3/16/2020 - 3/16/2020

Type of Excavator: Rubber-Tire Backhoe
Excavator Model: Case 580

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab.Time
3/16/20		NE	

Depth (ft)	Sample No.	Sample Depth (ft.)	Stratum Depth (in.)	Sample Description and Identification	Depth (ft)	Water Content (%)	Remark
1, 2	S1	1.5	0-24	Fill - Brown sandy loam with pieces of glass, metal and bricks, weak fine granular, moist, friable, abrupt smooth boundary, few fine roots	1, 2		
3, 4, 5	S2, T1	4	24-66	Brownish yellow (10YR, 6/6) sandy loam, 5% gravel, moderate medium subangular blocky, moist, friable, gradual wavy boundary	3, 4, 5		
6, 7, 8	S3, T2	6	66-102	Brown (10YR, 4/3) loamy sand, 10% gravel, weak fine granular blocky, moist, friable, gradual wavy boundary	6, 7, 8	13.0	
9, 10, 11, 12	S4, T3	9	102-144	Brown (10YR, 5/3) loamy sand, 5% gravel, weak fine granular, moist, friable	9, 10, 11, 12	13.0	
13, 14, 15, 16, 17, 18, 19, 20				End of exploration at 12 feet. Groundwater seepage not encountered Laboratory Tube Permeameter Permeability Test Results: 7.5 in/hr @ 6' 2.2 in/hr @ 9'			

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.:4C

3B - MTA TEST PIT USDA; 4/6/2020; 2:49:25 PM

TEST PIT LOG

MTA, a Division of GZA GeoEnvironmental, Inc
Engineers and Scientists

pirhl
Verona, NJ

EXPLORATION NO.: TP-4
SHEET: 1 of 1
PROJECT NO: 26.0092074.00
REVIEWED BY: Kim Tully

Logged By: Sean Stevenson
Contractor: J.A. Neary Excavating, Inc.
Operator: Paul

Test Pit Location: See Plan
Ground Surface Elev. (ft.): 456

Final Test Pit Depth (ft.): 12
Date Start - Finish: 3/16/2020 - 3/16/2020

Type of Excavator: Rubber-Tire Backhoe
Excavator Model: Case 580

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab.Time
3/16/20		NE	

Depth (ft)	Sample No.	Sample Depth (ft.)	Stratum Depth (in.)	Sample Description and Identification	Depth (ft)	Water Content (%)	Remark
1	S1, T1	1	0-6	Topsoil - Yellowish brown (10YR, 5/6) sandy loam, 5% gravel, weak fine granular, moist, loose, gradual irregular boundary, few fine roots	1		
2			6-36	Fill - Dark brown (10YR, 3/3) sandy loam with pieces of brick, 10% gravel, moderate medium subangular blocky, moist, friable, clear wavy boundary	2		
3	S2, T2	3			3		
4			36-120	Brown (10YR, 4/3) gravelly sand, 30% gravel, 5% cobbles, weak fine granular, moist, friable, gradual wavy boundary	4		
5					5		
6	S3, T3	6			6	8.6	
7					7		
8					8		
9					9		
10					10		
11	S4, T4	10.5	120-144	Brown (10YR, 5/3) sand, 10% gravel, 2% cobbles, weak fine granular, moist, friable	11	6.3	
12					12		
13				End of exploration at 12 feet.			
14				Groundwater seepage not encountered			
15				Laboratory Tube Permeameter Permeability Test Results: >20 in/hr @ 6' and 10.5 '			
16							
17							
18							
19							
20							

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.:4D

3B - MTA TEST PIT USDA; 4/6/2020; 2:49:25 PM

APPENDIX K

Drainage Area Maps

Pre-Developed
Post-Developed
Inlet Drainage

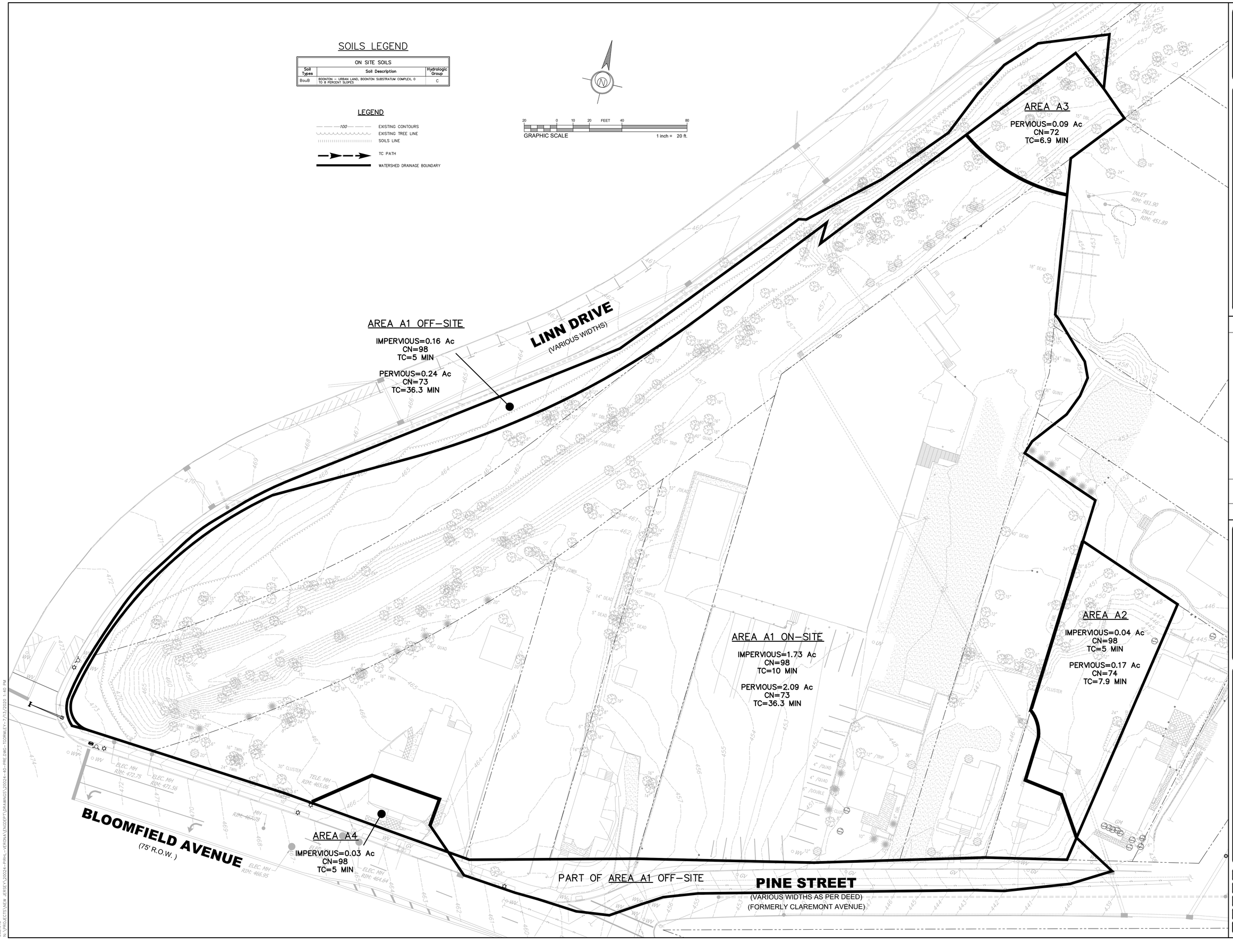
SOILS LEGEND

ON SITE SOILS		
Soil Types	Soil Description	Hydrologic Group
BouB	BOONTON – URBAN LAND, BOONTON SUBSTRATUM COMPLEX, 0 TO 8 PERCENT SLOPES	C

LEGEND

- 100 — EXISTING CONTOURS
- EXISTING TREE LINE
- SOILS LINE
- TC PATH
- WATERSHED DRAINAGE BOUNDARY

GRAPHIC SCALE: 20 0 10 20 FEET 40 80 — 1 inch = 20 ft.



DATE: 7/10/20
JAY S. KRUSE
PROFESSIONAL ENGINEER
N.J. LICENSE NO. 24GE04911500
NO. GE041556

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DRAINAGE AREA PLAN
PRE-DEVELOPMENT
STORM WATER MANAGEMENT
RESIDENTIAL REDEVELOPMENT
BLOCK 2301, LOTS 10-12 AND 14-16, TAX MAP #23.01
TOWNSHIP OF VERONA, ESSEX COUNT, NEW JERSEY

DATE: JULY 10, 2020	SCALE: 1"=20'
DESIGN:	DRAWN:
JOB NO.: 20024	FILE NAME: 20024-40-PRE
REF. NO.: SD40.01	
SHEET NO.: 1 OF 3	

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SOILS LEGEND

ON SITE SOILS		
Soil Types	Soil Description	Hydrologic Group
BouB	BOONTON – URBAN LAND, BOONTON SUBSTRATUM COMPLEX, 0 TO 8 PERCENT SLOPES	C

LEGEND

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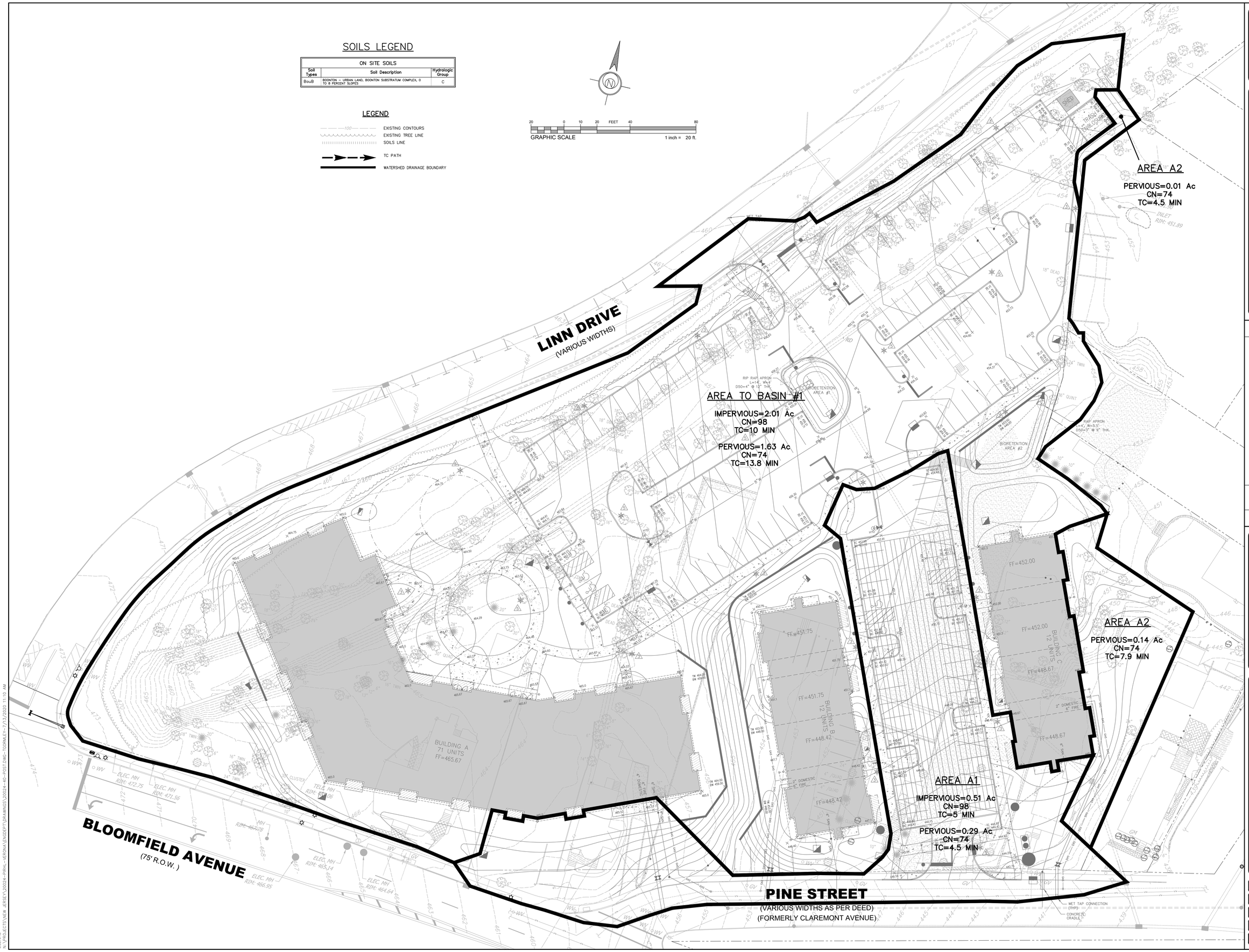
- EXISTING TREE LINE
- SOILS LINE
- TC PATH
- WATERSHED DRAINAGE BOUNDARY

GRAPHIC SCALE — 20 0 10 20 FEET 40 80 — 1 inch = 20 ft.



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RESIDENTIAL REDEVELOPMENT

BLOCK 2301, LOTS 10–12 AND 14–16, TAX MAP #23.01
TOWNSHIP OF VERONA, ESSEX COUNT, NEW JERSEY

DATE: JULY 10, 2020	SCALE: 1"=20'
DESIGN:	DRAWN:
JOB NO.: 20024	FILE NAME: 0024–40–POS
REF. NO.: SD40.02	
SHEET NO.: 2 OF 3	

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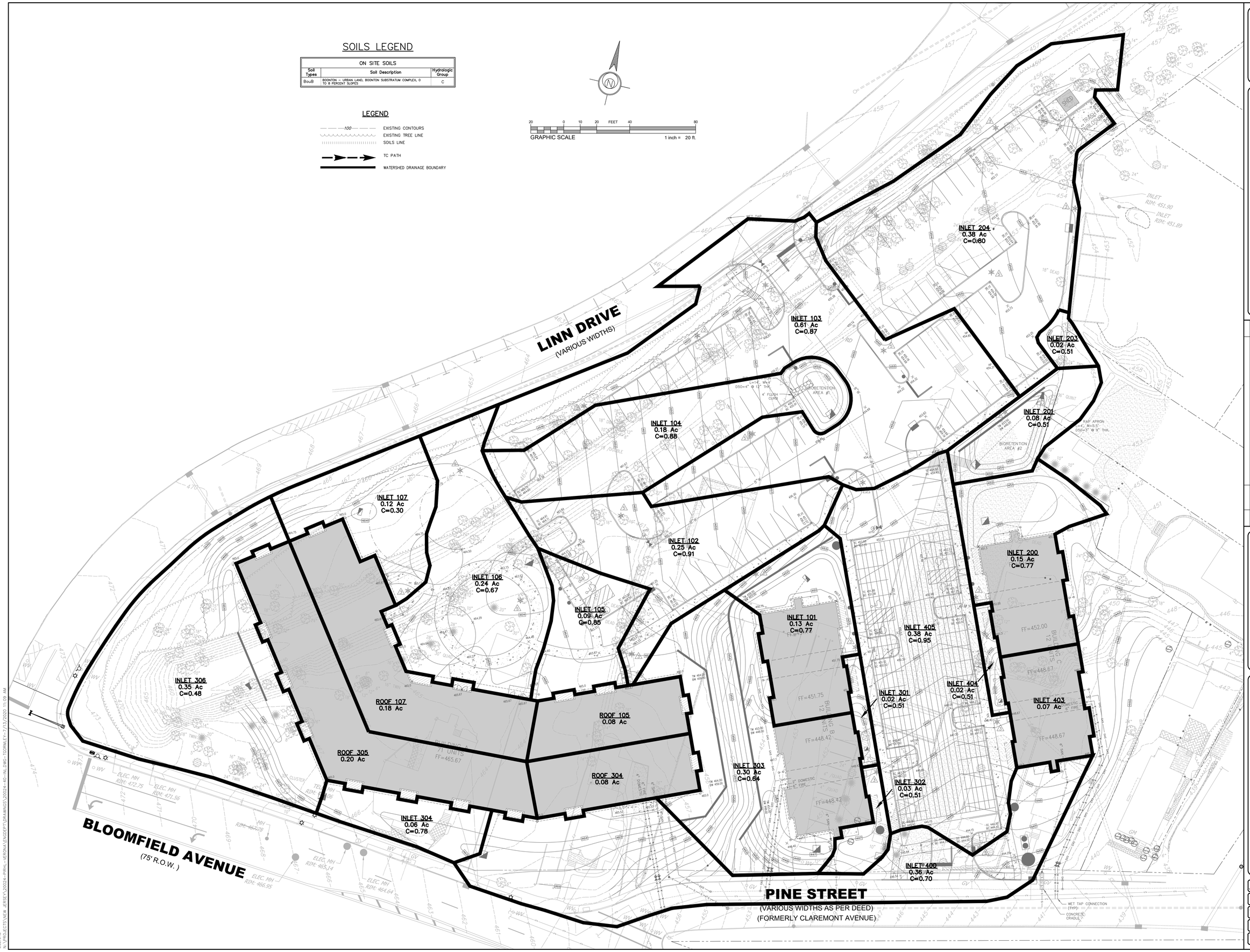
SOILS LEGEND

ON SITE SOILS		
Soil Types	Soil Description	Hydrologic Group
BouB	BOONTON – URBAN LAND, BOONTON SUBSTRATUM COMPLEX, 0 TO 8 PERCENT SLOPES	C

LEGEND

- EXISTING CONTOURS
- EXISTING TREE LINE
- SOILS LINE
- TC PATH
- WATERSHED DRAINAGE BOUNDARY

GRAPHIC SCALE — 1 inch = 20 ft.



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RESIDENTIAL REDEVELOPMENT
BLOCK 2301, LOTS 10–12 AND 14–16, TAX MAP #23.01
TOWNSHIP OF VERONA, ESSEX COUNT, NEW JERSEY

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JOB NO.: 20024	FILE NAME: 20024–40–INL
REF. NO.: DR40.03	
SHEET NO.: 3 OF 3	

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