Stormwater Report

Walnut Street & Commercial Street
Foxborough, Massachusetts 02035

Walnut Street Senior Development

December 16, 2022

JOB NO: ENG22-0480

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Table of Contents

1.0 Introduction:

The purpose of this report is to review, in a preliminary manner consistent with 760 CMR 56.05(2)(f), the utility and drainage systems that will serve the proposed development. The proposed location and types of sewerage, drainage, and water facilities will be discussed. The project applicant, OnyxGroup Realty & Development LLC, proposes a new senior housing development project at Walnut Street and Commercial Street in Foxborough. The project site is a 15.57 acre parcel of land bounded by Walnut Street to the north, Interstate 95 to the south, Route 140/Commercial Street to the east, and North High Street to the west (See Attachment A for locus plan).

2.0 General:

The proposed housing development will consist of three residential buildings with a total of 200 units along with outdoor amenity spaces and vehicular parking areas. Site work will include, but is not limited to, grading, drainage, utilities, paving and landscaping. Demolition efforts will primarily consist of tree clearing, as the site is mostly wooded. The site is currently undeveloped, consisting of an isolated wetland area surrounded by woodlands. The topography of the drainage study area slopes from west to east, with elevations ranging from 274-FT at North High Street to a low of approximately 236-FT at the northeast, at the intersection of Walnut Street and Commercial Street. NRCS soil mapping describes the site as being a mixture of Ridgebury FSL (HSG-D), Paxton FSL (HSG-C), and Woodbridge FSL (HSG-D). Test pits conducted on-site generally support the presence of HSG-C soils through the site. Soil mapping can be found in Attachment C of this report.

3.0 Water:

There is an 8-inch water main located in Walnut Street which abuts the project site. There is no data available at the Foxborough Water Department on the available volume and pressure within the main. Each of the three proposed buildings will be fully sprinklered, as a new 8” water main loop is proposed for the site. The proposed 8” main will connect to the existing 8” main at both the east and west entrances to the site. There are 4” domestic services and 6” fire services proposed for each building, along with four hydrants that will be located throughout the development. A flow test will be necessary to determine the adequacy of the existing water system to service the property.

4.0 Sewage Disposal:

There will be a total of 200 one-bedroom units on site which will produce 22,000 gpd of new sewer flow from the project. The estimated flow is based on the State Sanitary Code (Title 5). There is a proposed extension of a 3" low-pressure sewer force main that will be installed prior to the construction of the Walnut Street Senior Development. There are 8" gravity sewer services for each building that will discharge flows to 2,000 gallon septic tanks prior to entering E/One grinder pumps. Each building is proposed to have its own respective septic tank and grinder pump. Sewer flows will then enter the grinder pump and proceed to a proposed 3" force main, which will then connect to the force main extension in Walnut Street. The 3" forcemain is maintained throughout the development in an effort to maintain a pressurized sewerage system.

5.0 *Gas/Electric:*

An extension of the existing gas main adjacent to the Walnut Street – North High Street intersection is proposed to provide gas services to the proposed development. The proposed gas main extension will run from west to east and will enter the proposed development at the proposed western entrance to the site. Columbia Gas is the local utility and will determine the necessary main and service sizes after reviewing the required gas demand for the site. The site is served by above ground power lines located on poles within the right of way of Walnut Street. Electric services will be provided to the site via a connection to an existing utility pole north of the development. Each proposed building will require its own respective transformer. The local power company is NSTAR.

6.0 Stormwater Management

A summary of how DES Stormwater Management Standards will be addressed can be found below. Associated stormwater supporting data, exhibits, and calculations can be found in Attachments B through F.

Standard 1: No New Untreated Discharges

The proposed project will create no new untreated discharges. Within the drainage study area, total impervious area will be increased in comparison with existing conditions by approximately 214,000-SF. Approximately 213,000-SF± of impervious area will now undergo treatment via street sweeping, deep sump hooded catch basins, or infiltration basins. As such, existing stormwater discharges will meet Standard 1 to the maximum extent practicable. HydroCAD modeling of the site is provided in Attachment E.

Standard 2: Peak Rate Attenuation

Existing and proposed conditions were modeled using HydroCAD computer software and Town of Foxborough rainfall data. A table, summarizing peak discharges for the 2-Yr, 10-Yr, 25-Yr, 50-Yr and 100-Yr storm events can be found in Attachment F.1. The proposed design is such that peak runoff volumes and peak discharge rates do not exceed pre-development rates, even in the 100-year storm scenario.

To ensure that the work incorporates the performance standards recommended in the DEP's Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction, as depicted on the site plans.

Standard 3: Recharge

Standard 3 will be met by proposing two infiltration practices to provide recharge on site. The BMPs are designed to capture and infiltrate the required recharge volume for the increase in impervious area being proposed. Supporting calculations can be found in Attachment F.3 of this report.

Standard 4: Water Quality

All of the stormwater from impervious parking and driveway areas on the site will undergo treatment to bring TSS levels within regulated limits (>80% removal). Stormwater will undergo treatment from deep sump catch basins and infiltration basins with sediment forebays. Infiltration basins have been designed to provide treatment for the required Water Quality Volume. During construction, appropriate BMPs will be used to minimize sedimentation and soil erosion.

Although these areas do not generate a significant TSS load, runoff from all pedestrian/non-vehicular areas will be collected and discharged to either of the two proposed infiltration basins.

During the project, appropriate BMPs will be used to minimize sedimentation and soil erosion.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

This site is not considered a LUHPPL, as such, Standard 5 does not apply.

Standard 6: Critical Areas

There will be no new discharge to critical areas.

Standard 7: Redevelopments and Other Projects Subject to the Standards Only to the Maximum Extent Practicable

The proposed project is not a redevelopment and the requirements of Standard 7 are not applicable.

Standard 8: Construction Period Pollution Prevention and Erosion and Sediment Control

A detailed Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan will be incorporated into the final stormwater report. To ensure that the work incorporates the performance standards recommended in the DEP's Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction.

Standard 9: Operation and Maintenance Plan

An operations and maintenance plan will be incorporated into the final stormwater report.

Standard 10: Prohibition of Illicit Discharges

An illicit discharge compliance statement will be incorporated into the final stormwater report.

Attachment A - Locus Map

500 250 0 500

SCALE 1"= 500'

LOCUS MAP

Weston & Sampson℠

Weston & Sampson Engineers, Inc.

55 Walkers Brook Drive, Suite 100, Reading MA 01867

Attachment B - NRCS Soils Map, Soils Report, and HSG Classifications

United States Department of Agriculture

NRCS

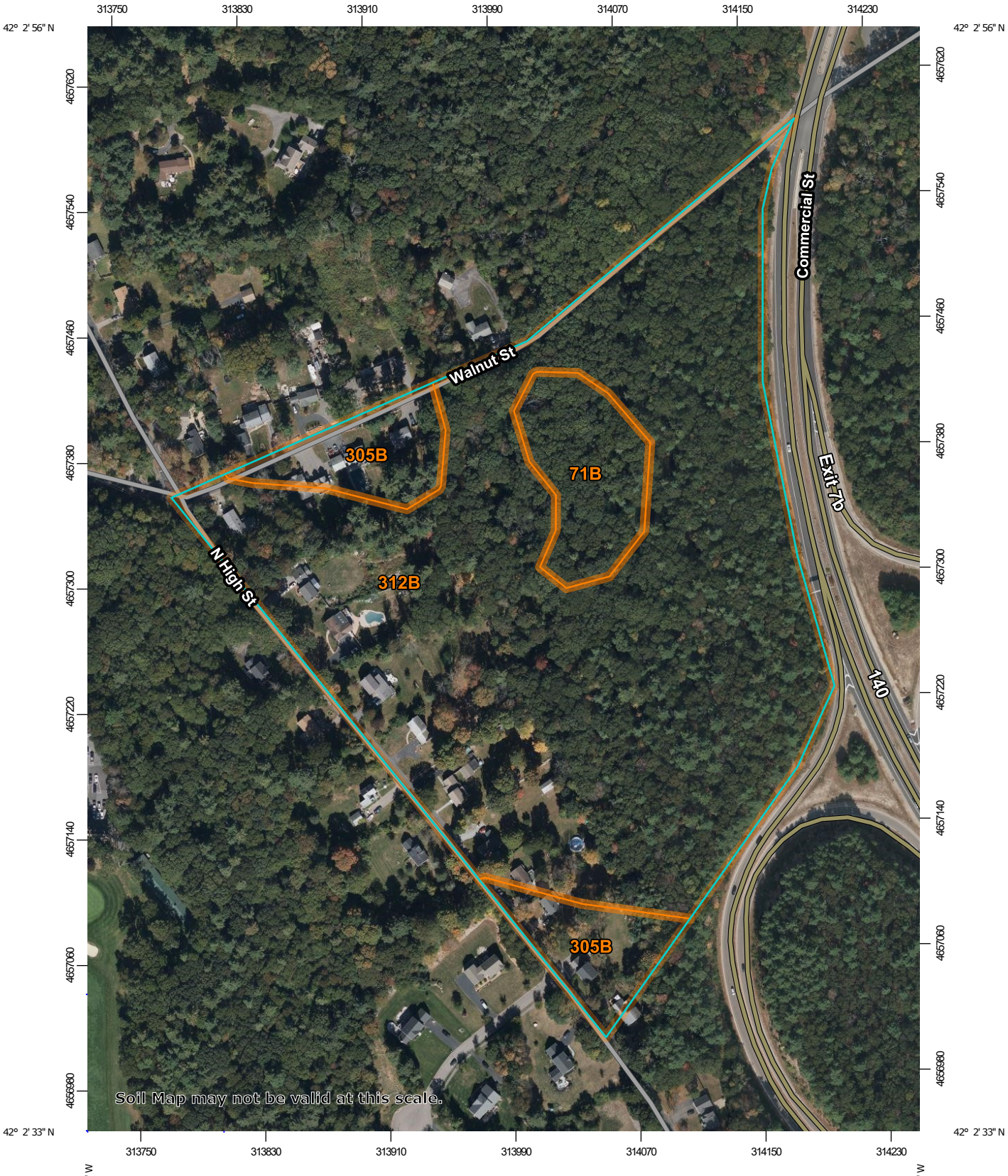
Natural Resources Conservation Service

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

Custom Soil Resource Report for Norfolk and Suffolk Counties, Massachusetts

June 3, 2022

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,430 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N 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 1:25,000.

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

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

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

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

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Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 17, Sep 3, 2021

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

Date(s) aerial images were photographed: Oct 4, 2020—Oct 19, 2020

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
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	2.0	6.9%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	2.8	9.7%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	24.3	83.4%
Totals for Area of Interest		**29.2**	**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.

Norfolk and Suffolk Counties, Massachusetts

71B—Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w69c
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Ridgebury, extremely stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ridgebury, Extremely Stony

Setting

Landform: Drumlins, depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 6 inches: fine sandy loam
Bw - 6 to 10 inches: sandy loam
Bg - 10 to 19 inches: gravelly sandy loam
Cd - 19 to 66 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 15 to 35 inches to densic material
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY009CT - Wet Till Depressions
Hydric soil rating: Yes

Minor Components

Woodbridge, extremely stony

Percent of map unit: 10 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Whitman, extremely stony

Percent of map unit: 8 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Paxton, extremely stony

Percent of map unit: 2 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

305B—Paxton fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t2qp
Elevation: 0 to 1,570 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Paxton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Paxton

Setting

Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex

Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 8 inches: fine sandy loam
Bw1 - 8 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: fine sandy loam
Cd - 26 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 18 to 39 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Woodbridge

Percent of map unit: 9 percent
Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury

Percent of map unit: 6 percent
Landform: Depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Toeslope, backslope, footslope
Landform position (three-dimensional): Base slope, head slope, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Charlton

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

312B—Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2t2qs
Elevation: 0 to 1,580 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Woodbridge, extremely stony, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Extremely Stony

Setting

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 9 inches: fine sandy loam
Bw1 - 9 to 20 inches: fine sandy loam
Bw2 - 20 to 32 inches: fine sandy loam
Cd - 32 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 19 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C/D
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

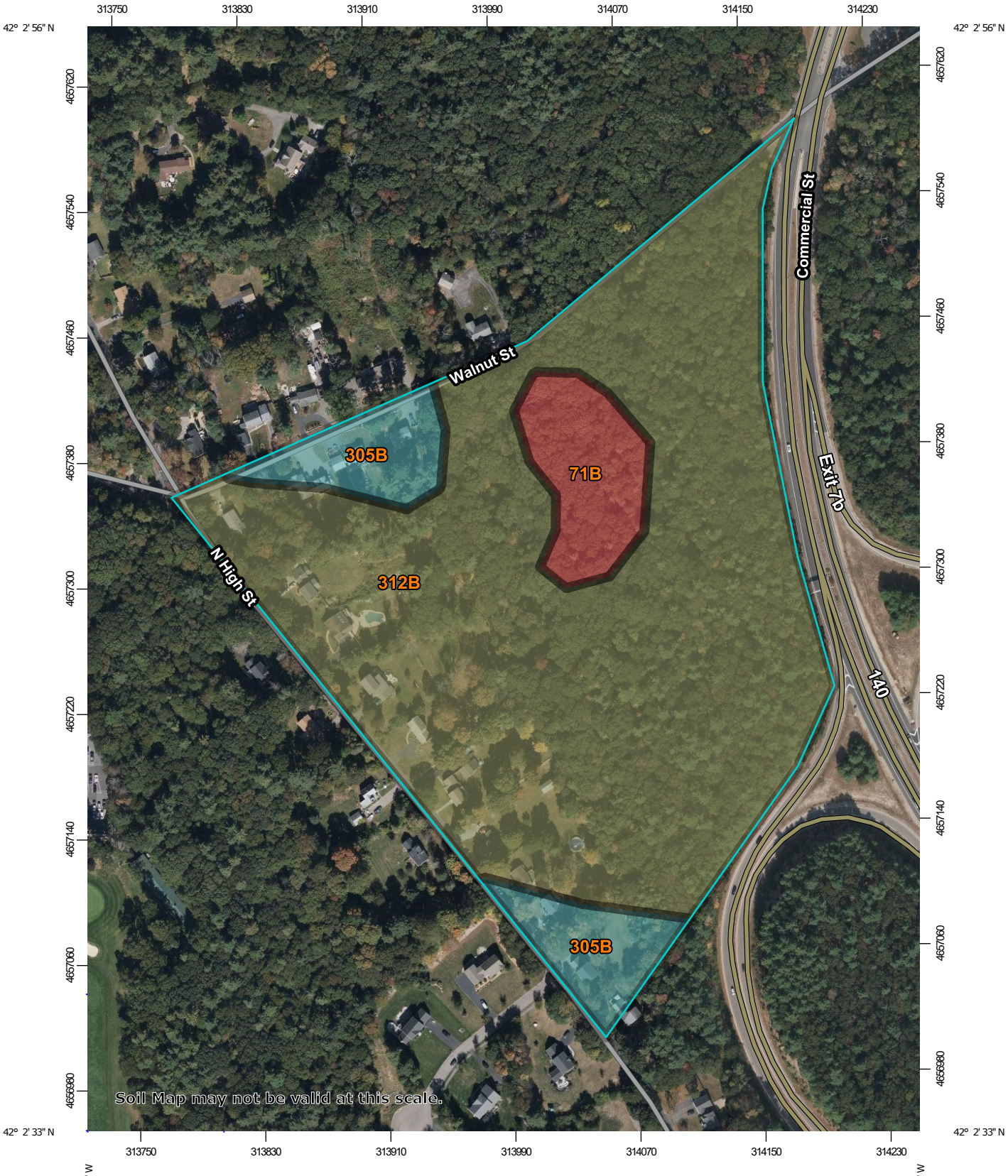
Paxton, extremely stony

Percent of map unit: 10 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 8 percent
Landform: Hills, drainageways, drumlins, depressions, ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Custom Soil Resource Report
Map—Hydrologic Soil Group



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N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N 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

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Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
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305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	2.8	9.7%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	C/D	24.3	83.4%
Totals for Area of Interest			**29.2**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Attachment C - Test Pit and Soil Boring Logs

Bay Colony Group, Inc.
Professional Civil Engineers & Land Surveyors

4 School Street, P.O. Box 9136
Foxborough, Massachusetts 02035
Telephone (508) 543-3939 • Fax (508) 543-8866
E-mail: mailbox@baycolonygroup.com

Perc Test 05/27/92
Walnut Street
Foxborough, MA
(Museum of Discovery)

Engineer: Karl Drown, R.S.

TH1

0 - 30	Topsoil & Subsoil
30 -120	Silty Sand & Gravel

Water @ 84" Rust @ 60" Depth: 54" Rate: 13 mpi

soak	11:55
start	12:11
12-9	12:34
9-6	1:11:37

TH2

0 - 40	Topsoil & Subsoil
40 -108	Silty Sand & Gravel

Water @ 84" Depth: 60" Rate: 10 mpi

soak	1:02
start	1:17
12-9	1:35
9-6	2:06

NAD83

ROUTE 140 – COMMERCIAL STREET

NO ACCESS

NO ACCESS

NO ACCESS

RAMP TO ROUTE 95 SOUTH

ASSESSORS MAPS 133 & 145
PARCEL 3604

AREA=16.0± acres (ASSESSORS PLAN LISTED)
15.0± acres (ASSESSORS PLAN CALCULATED)

ZONING: RESIDENTIAL–AGRICULTURAL R40

N/F
COMMONWEALTH OF
MASSACHUSETTS

WALNUT STREET

N/F
TOWN OF
FOXBOROUGH

N/F
PAUL PAON

N/F
CHARLES OLLIS, JR.

N/F
PAUL BORTOLOTTI, EX.

N/F
BURLEIGH & LEE
PROSSER, TR.

N/F
EDWARD GALLEY, JR.

N/F
KATHLEEN D. PELLETIER

N/F
JOHN, JR. & KATHLEEN
GRAY

N/F
JOHN & EILEEN DOYLE

N/F
CARL & RUTH BRASTOW

N/F
CAROL W. ANELLO

N/F
MAROUN & DIANA
AYOUB, TR.

N/F
MARY ANN O'LEARY

25' NO-DISTURB
ZONE LINE

ISOLATED
WETLAND

NORTH HIGH STREET

NOTES

1. ELEVATIONS, IN FEET, ARE REFERRED TO THE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88). HORIZONTAL DATUM IS BASED ON NORTH AMERICAN DATUM 1983 (NAD 83). CONTOUR INTERVAL IS 2 FEET.

2. PROPERTY LINE INFORMATION HAS BEEN TAKEN FROM THE TOWN OF FOXBOROUGH GEOGRAPHIC INFORMATION SYSTEM.

3. WETLAND FLAGS WERE PLACED BY PARE CORPORATION IN JULY, 2013 AND WERE LOCATED FROM AN ON THE GROUND SURVEY.

KEY:

HYD	HYDRANT	SW	STONE WALL
WG	WATER GATE	EHH	ELECTRIC HAND HOLE
WS	WATER SERVICE	UP	UTILITY POLE
GG	GAS GATE	LT	LIGHT
DMH	DRAIN MANHOLE	CB	CONC BOLLARD
CB	CATCH BASIN	GW	GUY WIRE
SMH	SEWER MANHOLE	SIGN	SIGN
EW	EXISTING WELL	SGC	SLOPED GRANITE CURB
–T–	UNDERGROUND TELE.	SMC	SLOPED METAL CURB
–D–	UNDERGROUND DRAIN	VCC	VERTICAL CONCRETE CURB
–G–	UNDERGROUND GAS	RCP	REINFORCED CONCRETE PIPE
–E–	UNDERGROUND ELEC.	CPP	CORRUGATED PLASTIC PIPE
EPLP	LEAD PLUG WITH ESCUTCHEON PIN	MB	MAILBOX
CB/DH	CONCRETE BOUND WITH DRILLHOLE		TREE
SB/DH	STONE BOUND WITH DRILLHOLE		PINE TREE
SWEL	SOLID WHITE EDGE LINE	SWLL	SOLID WHITE LANE LINE
SYEL	SOLID YELLOW EDGE LINE	DWLL	DASHED WHITE LANE LINE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

PROJECT:

Parcel 3604
Walnut Street
Foxborough
Massachusetts

PREPARED FOR:

Foxborough Housing Authority
90 N. Carl Annon Court
Foxborough, MA 02035

Bay Colony Group, Inc.
Professional Civil Engineers & Professional Land Surveyors

FOUR SCHOOL STREET
P.O. BOX 9136
FOXBOROUGH, MA 02035
508-543-3939

LOCUS 1"=1000'

STAMP

DRAWING TITLE

EXISTING CONDITIONS PLAN

SCALE: 1" = 60'

AUGUST 8, 2013	SHEET NUMBER
13-0172-WET	**1**

55 Walkers Brook Drive, Suite 100 Reading, MA 01867 (HQ)
Tel: 978.532.1900

November 1, 2022

Mr. Michael J. Mattos
Executive Director
Affordable Housing and Services Collaborative, Inc.
536 Granite Street
Braintree, MA 02184

RE: Preliminary Geotechnical Engineering Report
Proposed Walnut Street and Commercial Street (Route 140) Development
Foxborough, Massachusetts

Weston & Sampson Engineers, Inc. (Weston & Sampson) is pleased to present our geotechnical engineering report for the proposed residential development referenced above. Our project understanding is based on a site plan dated September 22, 2022 prepared by Weston & Sampson. Our services were completed in general accordance with our September 28, 2022 Proposal for Preliminary Geotechnical Engineering Services.

Information on the use of this report is provided in the document titled "Important Information about this Geotechnical Engineering Report" by Geoprofessional Business Association (GBA), Inc., as described in the Limitations section of this report.

PROJECT UNDERSTANDING

The proposed residential development is a currently undeveloped, heavily wooded parcel bound by Walnut Street to the north, Commercial Street (Route 140) to then east and south, and residential properties along North High Street to the west. The site location is shown on *Figure 1: Locus Map.*

The current development plan shows residential buildings, parking areas, and outdoor recreation areas on the eastern side of the parcel with wetland and undeveloped areas on the western side of the parcel. It has not yet been determined if the proposed buildings will include a below grade level. Proposed grading has also not been developed at this time

Ground surface elevations in the parcel slope downward from west to east from about El. 259. to El. 242. Elevations in this report reference the North American Vertical Datum of 1988 (NAVD88) and are in feet.

SUBSURFACE CONDITIONS

Geologic Setting

The United States Geological Survey (USG) "Surficial Material Map of the Mansfield Quandrangle" (2018) compiled by Byron D. Stone and Mary L. DiGiacomo-Cohen indicates the site is located in

an area of thin glacial till deposits composed predominantly of a nonsorted, non-stratified maxtrix of sand, silt, and clay with scattered cobbles and extending to depths between 10 and 15 feet. Occasional cobbles and boulders up to 4 feet (exposed dimension) were observed at the ground surface across the site. The buried portion of the boulders may be larger than the exposed dimension.

Test Pit Excavations by Others

Four test pits were excavated on the southern side of the parcel on May 16, 2022 by Bay Colony Group as part of the stormwater design. The test pit logs are included in *Appendix A: Test Pit Logs* and the locations are shown in *Figure 2: Site Plan.*

The test pits extended to depths between 11.0 and 12.8 feet. In each of the test pits below a depth of about 2 feet, the logs indicate that the sandy loam soils are very gravelly and cobbly.

Recent Subsurface Exploration Program

Subsurface conditions were explored on October 13, 2022 by advancing two borings (B-1 and B-2/B-2A) within the westbound lane of Walnut Street near to the site. Approximate boring locations are shown in *Figure 2: Boring Location Plan*. Weston & Sampson geotechnical engineering staff monitored boring activities, measured boring locations relative to existing site features, and prepared logs for each boring.

The borings were completed by Northern Drill Services, Inc. of Northborough, MA. Standard penetration tests (SPTs) were conducted in each boring by driving a split spoon sampler with an automatic hammer in general accordance with ASTM D1586. The borings were advanced to refusal. Copies of the boring logs along with the Guide to Subsurface Exploration Logs are included in *Appendix B*.

Following completion of drilling, the borings were backfilled with cuttings and the surface patched with asphalt cold patch.

Encountered Subsurface Conditions

Subsurface conditions encountered in the borings were generally consisted of pavement overlying fill, glacial till, and rock. The subsurface conditions encountered in the borings were generally consistent with mapped surficial geology.

Subsurface soil and groundwater conditions described below have been interpreted based on a limited number of explorations that were observed by Weston & Sampson. Variations may occur and should be expected between locations. The strata boundaries shown in our boring logs are based on our interpretations and the actual transitions may be gradual. Refer to the boring logs included in *Attachment B* for detailed descriptions of the soil samples collected. The general Unified Soil Classification System (USCS) designation(s) for each stratum is included in the descriptions below in parentheses. Depths provided below are relative to the existing ground surface at the time of drilling.

Surficial Materials – Surficial materials encountered in the borings which were advanced within Walnut Street consisted of 3 inches of asphalt concrete (AC) pavement or topsoil.

Fill – Dense fill was encountered below the AC pavement in both borings and extended to about 2.5 feet. The fill was generally comprised of varying amounts of fine to coarse sand, gravel, and non-plastic fines (SM and ML).

Glacial Till – Dense to very dense, native glacial till was encountered below the fill in both of the borings. The retrieved samples were generally described as fine to coarse SAND with few to some gravel and little to some non-plastic fines (SM) or fine to coarse gravel with few fines and trace sand (GM). In boring B-1, the glacial till extended to about 18.5 feet. Boring B-2 was terminated at about 9 feet at sampler and casing refusal within the till. This boring was offset to boring B-2A which terminated at sampler refusal within the glacial till at a depth of 22 feet.

Weathered Rock – Very dense weathered rock was encountered below the glacial till in boring B-1. The retrieved samples were generally described as fine to coarse SAND with some clayey fines and little fine (SC) and fine to coarse gravel with few fines and trace sand (GP-GM). Boring B-1 was terminated in the weathered rock at sampler refusal at a depth of 25.2 feet

Groundwater – Groundwater was not encountered in the borings. Groundwater was observed in the test pits at depths between 9 and 11.3 feet below existing grade. However, additional time may be required for groundwater to become evident in dense soil conditions. We anticipate that groundwater levels will fluctuate with season, variations in precipitation, construction in the area, and other factors. Perched groundwater conditions could exist close to the ground surface, especially during and after extended periods of wet weather.

PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

Based upon the borings advanced within Walnut Street adjacent to the northern side of the site, conditions encountered in the test pits, review of the regional geology and observations when walking the site, we anticipate that the subsurface conditions at the site will consist of forest mat overlying glacial till with cobbles and boulders. It is assumed that the fill encountered in the borings is related to the road construction and does not extend into the site. A bedrock outcrop is noted on the existing conditions plan to the southwest of the wetland area The extent of fill within the site is currently unknown.

These conditions are anticipated to be suitable for support of the proposed buildings on shallow spread footings bearing on the glacial till or bedrock with slabs on grade.

Forest mat, topsoil, fill, and other unsuitable soils, as determined by the engineer, should be completely removed from within the zone-of-influence (ZOI) beneath proposed structures and slabs, and the resulting excavation backfilled with compacted Structural Fill. The ZOI is defined by a plane extending horizontally away from the bottom edges of footings and slabs a distance of two feet in all directions and then down and away at 1Horizontal:1Vertical (1H:1V) slopes to the intersection with native, undisturbed soils.

Excavations to construct the proposed buildings will likely encounter cobbles and boulders,and may encounter bedrock. Cobbles, boulders, and bedrock should be removed from within 6 inches of the bottom of concrete structures. Therefore, over excavation should be anticipated for foundations and slabs.

Based on our understanding of the site conditions, we recommend performing a combination of test pits and borings. The location and quantity of the additional explorations will be based upon the proposed development plan and can be performed once access to the site is provided. Detailed geotechnical design and construction considerations can be provided following additional geotechnical explorations within the footprint of the proposed development.

LIMITATIONS

Observation of Construction

Satisfactory earthwork and foundation performance depends to a large degree on the quality of construction. Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions often requires experience; therefore, qualified personnel should visit the site with sufficient frequency to evaluate whether actual subsurface conditions differ from those anticipated. In addition, full-time construction observation of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications.

The recommendations in this report are preliminary as actual subsurface conditions may differ from those interpreted based on our subsurface explorations. In order for our recommendations to be considered final, we must be retained to observe the actual subsurface conditions encountered during construction. Our observations will allow us to interpret the actual conditions present during construction and adapt our recommendations if needed.

Variations of Subsurface Conditions and Use of Report

We have prepared this report for use by the owner, members of the design and construction team for the subject project and site, only. The data and report can be used for estimating purposes, but our report, conclusions, and interpretations should not be construed as a warranty of the subsurface conditions and are not applicable to other sites.

Explorations indicate soil conditions only at specific locations and only to the depths penetrated. They do not necessarily reflect subsurface conditions that may exist outside or between exploration locations. If subsurface conditions differing from those described are noted during the course of excavation and construction, reevaluation will be necessary and we should be consulted.

Site development plans and design details were considered preliminary at the time this report was prepared. If changes are made in site grades, configuration, design loads, or type of construction for the structure, the conclusions and recommendations may not be applicable. We should be consulted to provide additional geotechnical explorations, review final design drawings and specifications to see that our recommendations are suitably followed. If design changes are made,

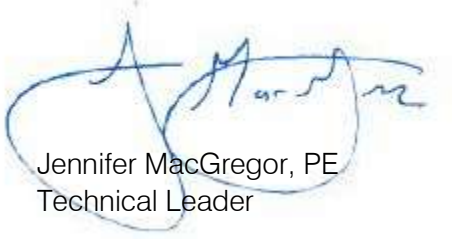
we should be retained to review our conclusions and recommendations and provide a written evaluation or modification. Additional geotechnical engineering analyses and explorations may be necessary.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, expressed or implied, is given. For additional information on the use of this report, please refer to the document titled "Important Information about This Geotechnical-Engineering Report" included in *Appendix C*.

It has been a pleasure assisting you with this project and we look forward to our continued involvement. Please call if you have any questions.

Sincerely,

WESTON & SAMPSON ENGINEERS, INC.



Jennifer MacGregor, PE
Technical Leader

Joseph P. Laird, PE
Senior Project Manager

Attachments:
Figure 1: Locus Map
Figure 2: Site Plan
Attachment A: Test Pit Log
Attachment B: Boring Logs
Attachment C: Important Information about This Geotechnical-Engineering Report (2 pages)

Prep byJACM:Rev by JPL

File path: \\wse03.local\WSE\Projects\Private\Foxborough Housing Development\Geotech\5.0 report\Prelim geotech\Foxborough housing_prelim geotech.docx

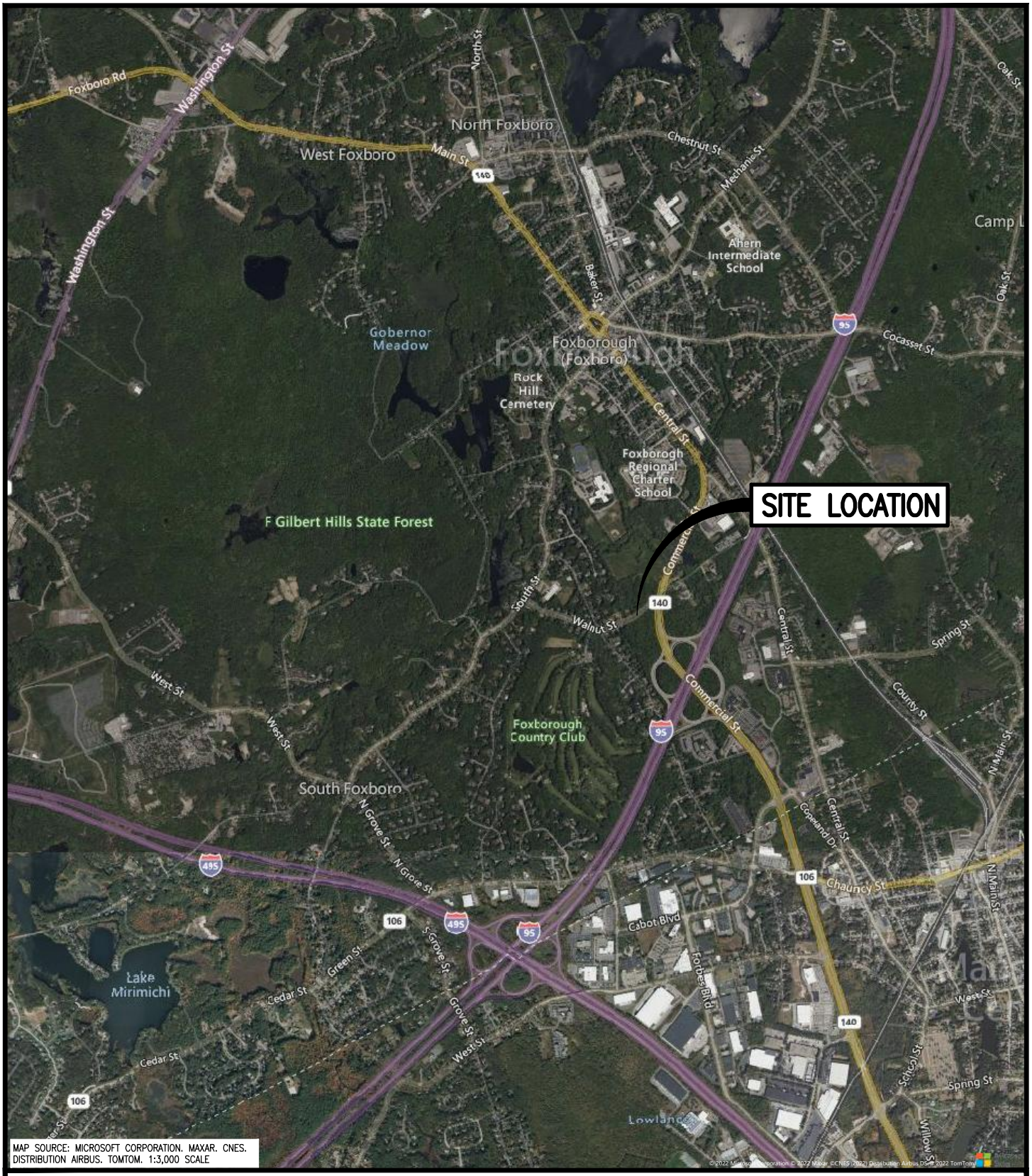


FIGURE 1
WALNUT STREET AND COMMERICAL STREET DEVELOPMENT
WALNUT STREET, FOXBOROUGH, MA

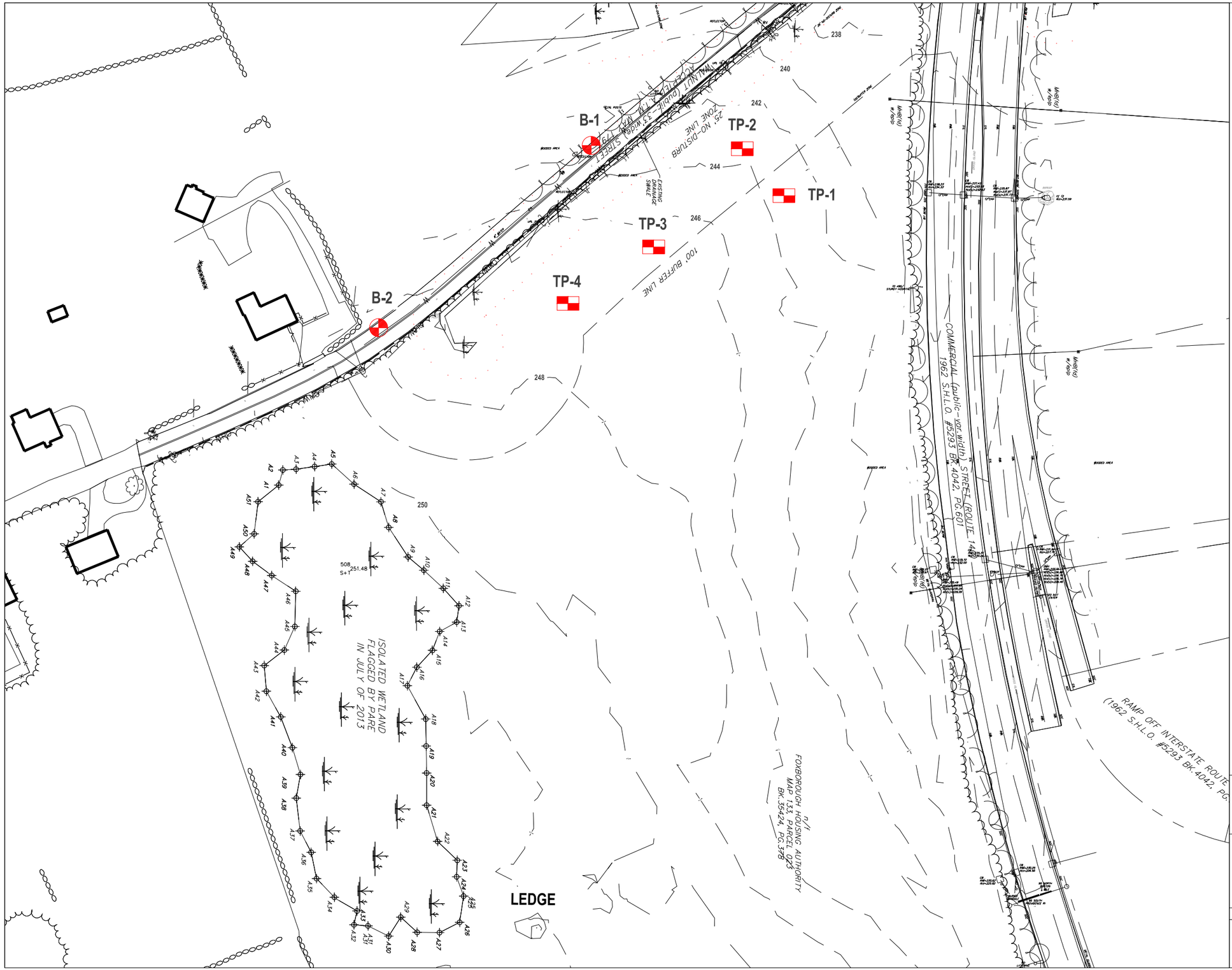
LOCUS MAP

SCALE: 1"=3000'

0 3000 6000

Weston & Sampson

\\wse03.local\WSE\Projects\Private\NextGrid Inc\Maine Geotechnical Support – 4 sites\Lewiston, ME Site\2.0 Technical Information\2.8 – Technical-CADD Figures\Figure 1 _Locus Map.dwg



NOTES:

1. THIS PLAN IS BASED ON THE SURVEY ENTITLED 'EXISTING CONDITIONS PLAN' PREPARED BY BAY COLONY GROUP, INC. DATED MAY 25, 2022
2. BORINGS WERE COMPLETED BY NORTHERN DRILL SERVICE, INC. OF NORTHBOROUGH MASSACHUSETTS AND OBSERVED BY WESTON & SAMPSON ENGINEERS, INC. ON OCTOBER, 13 2022.
3. TEST PITS WERE COMPLETED BY BAY COLONY GROUP, INC. ON MAY 16, 2022.
4. BORING LOCATIONS SHOWN ON THIS PLAN ARE APPROXIMATE AND BASED ON FIELD MEASUREMENTS RELATIVE TO EXISTING SITE FEATURES.

LEGEND:

B-# TEST BORING DESIGNATION AND APPROXIMATE LOCATION

TP-# TEST PIT DESIGNATION AND APPROXIMATE LOCATION

N

180 45 0 90 180

SCALE: 1"=90'

FIGURE 2
SITE PLAN

WALNUT STREET AND COMMERICAL STREET DEVELOPMENT
WALNUT STREET, FOXBOROUGH, MA

DESIGNED BY: JW	CHECKED BY: JM	DATE: OCTOBER 2022

Weston & Sampson℠

\\wse03.local\WSE\Projects\Private\Foxborough Housing Development\Geotech\3.1 CADD\Figure 2_Foxborough Site Plan.dwg

Attachment A

Test Pit Logs

No. 22-0133 Date: May 16, 2022

Commonwealth of Massachusetts

Foxborough , Massachusetts

Soil Suitability Assessment for On-Site Sewage Disposal

Performed By: Cameron Gray Date: May 16, 2022

Witnessed By: _____

Location Address or Lot #:	Owner's Name, Address, and , Telephone #:
Walnut Street Foxborough, MA New Construction: ☑ Repair ☐	Weston and Sampson 55 Walkers Brook Drive Reading, MA 978.532.1900

Office Review

Published Soil Survey Available: No ☐ Yes ☑

Year Published 1989 Publication Scale 1:25,000 Soil Map Unit Woodbridge FSL

Drainage Class C Soil Limitations Bedrock

Surficial Geology Report Available: No ☐ Yes ☑

Year Published 1992 Publication Scale 1:250,000

Geologic Material (Map Unit) Thin Till

Landform Glacial Outwash Plain

Flood Insurance Rate Map:

Above 500 year flood boundary No ☐ Yes ☑

Within 500 year flood boundary No ☑ Yes ☐

Within 100 year flood boundary No ☑ Yes ☐

Wetland Area:

National Wetland Inventory Map (map unit) _____

Wetlands Conservancy Program Map (map unit) _____

Current Water Resource Conditions (USGS): Month April, 2022

Range: Above Normal ☐ Normal ☑ Below Normal ☐

Other References Reviewed: _____

Location Address or Lot No. Walnut Street Foxborough, MA

On-site Review

Deep Hole Number: 1-2022 Date: 5/16/2022 Time: 0900 Weather: 65°/Cloudy

Location (identify on site plan) See site plan

Land Use Woods Slope (%) 1% Surface Stones Some

Vegetation Wooded

Landform Glacial Outwash Plain

Position on landscape (sketch on back) See site plan

Distances from:

Open Water Body	>200'	Drainageway	>100'
Possible Wet Area	>100'	Property Line	25'+/-
Drinking Water Well	>100'	Other	

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0" - 5"	A	Sandy Loam	10YR3/2		
5" - 26"	B	Sandy Loam	10YR5/6		
26" - 150"	C	Sandy Loam	2.5Y5/4		V-Gravelly, V-Cobbly, Few Stones

*MINIMUM OF TWO HOLES REQUIRED AT EVERY DISPOSAL AREA

Parent Material (geologic) Glacial outwash Depth to Bedrock:

Depth to Groundwater Standing Water in Hole: 146" Weeping from Pit Face: 136"

Estimated Seasonal High Groundwater: 136"

Location Address or Lot No. Walnut Street Foxborough, MA

On-site Review

Deep Hole Number: 2-2022 Date: 5/16/2022 Time: 0930 Weather: 65°/Cloudy

Location (identify on site plan) See site plan

Land Use Woods Slope (%) 1% Surface Stones Some

Vegetation Wooded

Landform Glacial Outwash Plain

Position on landscape (sketch on back) See site plan

Distances from:

Open Water Body	>200'	Drainageway	>100'
Possible Wet Area	>100'	Property Line	25'+/-
Drinking Water Well	>100'	Other	

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0" - 5"	A	Sandy Loam	10YR3/2		
5" - 25"	B	Sandy Loam	10YR5/6		
25" - 154"	C	Sandy Loam	2.5Y5/4		V-Gravelly, V-Cobbly, Few Stones

*MINIMUM OF TWO HOLES REQUIRED AT EVERY DISPOSAL AREA

Parent Material (geologic) Glacial outwash Depth to Bedrock:

Depth to Groundwater Standing Water in Hole: 144" Weeping from Pit Face:

Estimated Seasonal High Groundwater: 144"

Location Address or Lot No. Walnut Street Foxborough, MA

On-site Review

Deep Hole Number: 3-2022 Date: 5/16/2022 Time: 1000 Weather: 65°/Cloudy

Location (identify on site plan) See site plan

Land Use Woods Slope (%) 1% Surface Stones Some

Vegetation Wooded

Landform Glacial Outwash Plain

Position on landscape (sketch on back) See site plan

Distances from:

Open Water Body	>200'	Drainageway	>100'
Possible Wet Area	>100'	Property Line	25'+/-
Drinking Water Well	>100'	Other	

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0" - 5"	A	Sandy Loam	10YR3/2		
5" - 26"	B	Sandy Loam	10YR5/6		
26" - 132"	C	Sandy Loam	2.5Y5/4		V-Gravelly, V-Cobbly, Pockets of dense material with variegated color

*MINIMUM OF TWO HOLES REQUIRED AT EVERY DISPOSAL AREA

Parent Material (geologic) Glacial outwash Depth to Bedrock:

Depth to Groundwater Standing Water in Hole: 128" Weeping from Pit Face: 106"

Estimated Seasonal High Groundwater: 106"

Location Address or Lot No. Walnut Street Foxborough, MA

On-site Review

Deep Hole Number: 4-2022 Date: 5/16/2022 Time: 1030 Weather: 65°/Cloudy

Location (identify on site plan) See site plan

Land Use Woods Slope (%) 1% Surface Stones Some

Vegetation Wooded

Landform Glacial Outwash Plain

Position on landscape (sketch on back) See site plan

Distances from:

Open Water Body	>200'	Drainageway	>100'
Possible Wet Area	>100'	Property Line	25'+/-
Drinking Water Well	>100'	Other	

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0" - 5"	A	Sandy Loam	10YR3/2		
5" - 27"	B	Sandy Loam	10YR5/6		
27" - 136"	C	Sandy Loam	2.5Y5/4		V-Gravelly, V-Cobbly, Pockets of dense material with variegated color

*MINIMUM OF TWO HOLES REQUIRED AT EVERY DISPOSAL AREA

Parent Material (geologic) Glacial outwash Depth to Bedrock:

Depth to Groundwater Standing Water in Hole: 125" Weeping from Pit Face: 108"

Estimated Seasonal High Groundwater: 108"

Attachment B

Boring Logs

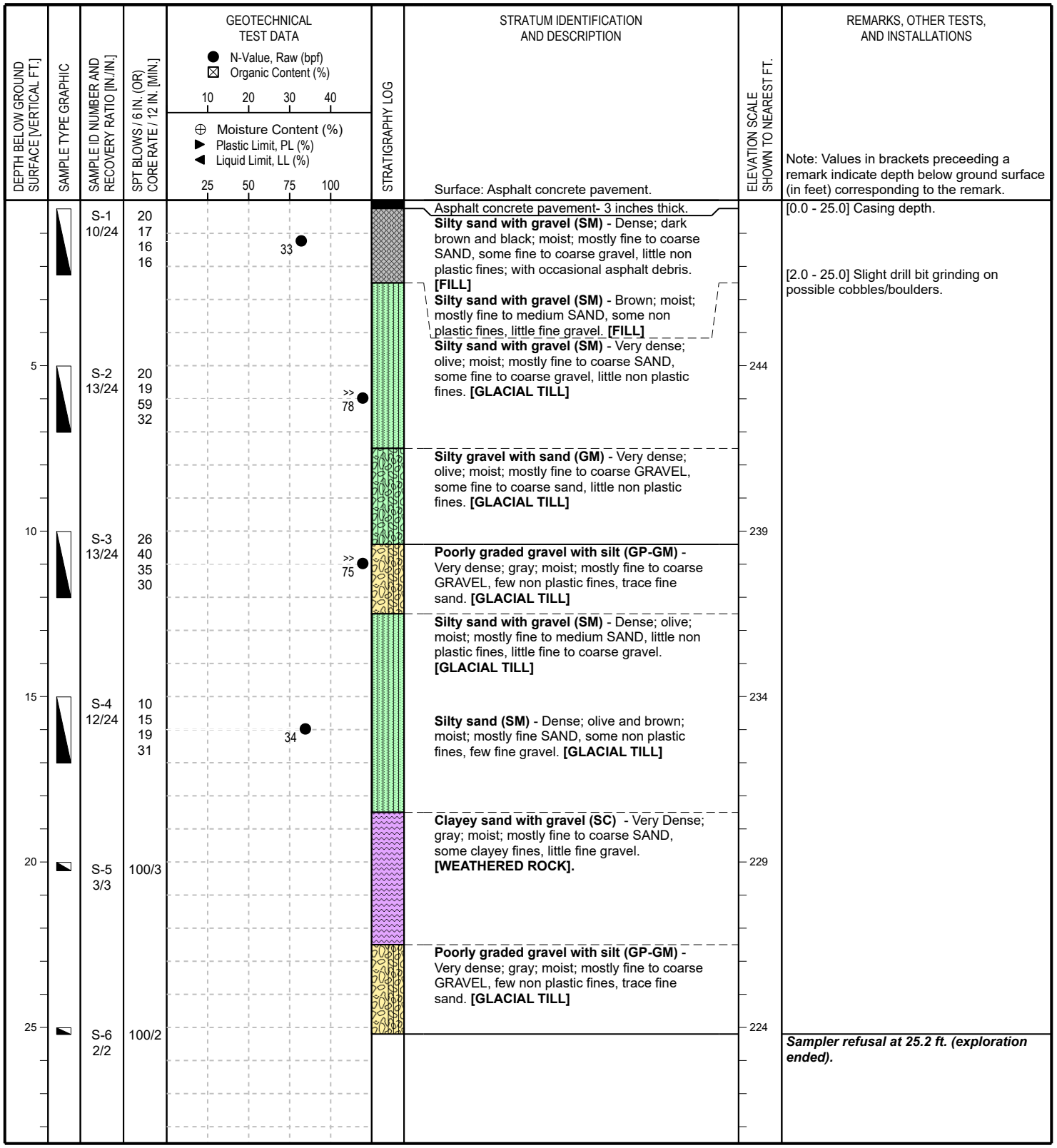
Weston & Sampson

WSE Project: ENG22-0467

Foxborough Housing Development
Walnut Street, Foxborough, MA

BORING ID: B-1

CONTRACTOR:	**Northern Drill Services, Inc.**	BORING LOCATION:	**See attached figure**	DATE START:	**October 13, 2022**
FOREMAN:	**Carl Beirlhom**	ADVANCE METHOD:	**Drive and Wash**	DATE FINISH:	**October 13, 2022**
LOGGED BY:	**J. Westgate, EIT**	AUGER DIAMETER:	**N/A**	GROUND EL:	**249.0 ± (NAVD88)**
CHECKED BY:	**J. MacGregor, PE**	SUPPORT CASING:	**Flush-Joint Casing (4" ID)**	FINAL DEPTH:	**25.2 ft. (Refusal)**
EQUIPMENT:	**Diedrich D-120, Truck Mounted**	CORING METHOD:	**N/A**	GRID COORDS:	
SPT HAMMER:	**Automatic (140-lb.)**	BACKFILL MATERIAL:	**Drill Cuttings and Asphalt Patch**	GRID SYSTEM:	**NAD83 State Plane (MA)**



Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

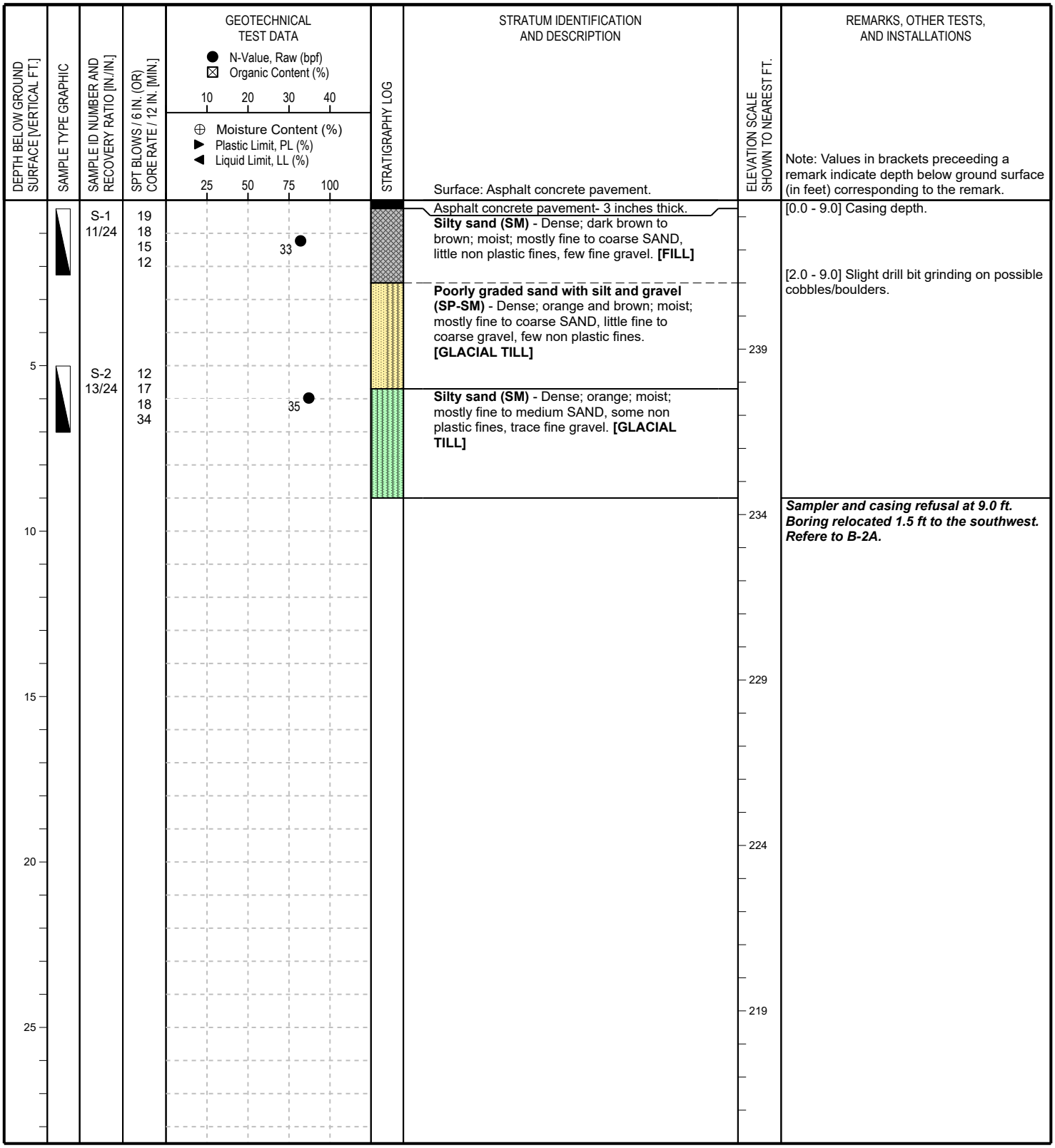
Weston & Sampson

WSE Project: ENG22-0467

Foxborough Housing Development
Walnut Street, Foxborough, MA

BORING ID: B-2

CONTRACTOR:	**Northern Drill Services, Inc.**	BORING LOCATION:	**See attached figure**	DATE START:	**October 13, 2022**
FOREMAN:	**Carl Beirlhom**	ADVANCE METHOD:	**Drive and Wash**	DATE FINISH:	**October 13, 2022**
LOGGED BY:	**J. Westgate, EIT**	AUGER DIAMETER:	**N/A**	GROUND EL:	**243.5 ± (NAVD88)**
CHECKED BY:	**J. MacGregor, PE**	SUPPORT CASING:	**Flush-Joint Casing (4" ID)**	FINAL DEPTH:	**9.0 ft. (Refusal)**
EQUIPMENT:	**Diedrich D-120, Truck Mounted**	CORING METHOD:	**N/A**	GRID COORDS:	
SPT HAMMER:	**Automatic (140-lb.)**	BACKFILL MATERIAL:	**Drill Cuttings and Asphalt Patch**	GRID SYSTEM:	**NAD83 State Plane (MA)**



Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG22-0467

Foxborough Housing Development
Walnut Street, Foxborough, MA

BORING ID: B-2A

CONTRACTOR:	**Northern Drill Services, Inc.**	BORING LOCATION:	**See attached figure**	DATE START:	**October 13, 2022**
FOREMAN:	**Carl Beirlhom**	ADVANCE METHOD:	**Drive and Wash**	DATE FINISH:	**October 13, 2022**
LOGGED BY:	**J. Westgate, EIT**	AUGER DIAMETER:	**N/A**	GROUND EL:	**243.5 ± (NAVD88)**
CHECKED BY:	**J. MacGregor, PE**	SUPPORT CASING:	**Flush-Joint Casing (4" ID)**	FINAL DEPTH:	**19.4 ft. (Refusal)**
EQUIPMENT:	**Diedrich D-120, Truck Mounted**	CORING METHOD:	**N/A**	GRID COORDS:	
SPT HAMMER:	**Automatic (140-lb.)**	BACKFILL MATERIAL:	**Drill Cuttings and Asphalt Patch**	GRID SYSTEM:	**NAD83 State Plane (MA)**

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
				● N-Value, Raw (bpf) ☒ Organic Content (%) 10 20 30 40 ⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ◀ Liquid Limit, LL (%) 25 50 75 100		Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
						Asphalt concrete pavement- 3 inches thick. See B-2 for more information on soil characteristics from 0-10 ft.		[0.0 - 9.0] Casing depth.
5							239	
10		S-1 11/24	44 17 11 22	28		**Silty gravel with sand (GM)** - Medium dense to very dense; brown; moist; mostly fine to coarse GRAVEL, little fine to coarse sand, little non plastic fines. **[GLACIAL TILL]**	234	
15		S-2 4/5	100/5				229	[15.0 - 19.0] Slight drill bit grinding on possible cobble/boulder.
20		S-3 5/5	100/5			**Silty sand with gravel (SM)** - Very dense; gray and olive; moist; some fine SAND, some fine gravel, some non plastic fines. **[GLACIAL TILL]**	224	***Sampler refusal at 19.4 ft. (exploration ended).***
25							219	

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

GUIDE TO SUBSURFACE EXPLORATION LOGS

Weston & Sampson℠

INDEX SHEET 1 GENERAL INFORMATION

GENERAL NOTES AND USE OF LOGS

1.) Explorations were made by ordinary and conventional methods and with care adequate for Weston & Sampson's study and/or design purposes. The exploration logs are part of a specific report prepared by Weston & Sampson for the referenced project and client, and are an integral part of that report. Information and interpretations are subject to the explanations and limitations stated in the report. Weston & Sampson is not responsible for any interpretations, assumptions, projections, or interpolations made by others.

2.) Exploration logs represent general conditions observed at the point of exploration on the date(s) stated. Boundary lines separating soil and rock layers (strata) represent approximate boundaries only and are shown as solid lines where observed and dashed lines where inferred based on drilling action. Actual transitions may be gradual and changes may occur over time.

3.) Soil and rock descriptions are based on visual-manual examination of recovered samples, direct observation in test pits (when permissible), and laboratory testing (when conducted).

4.) Water level observations were made at the times and under the conditions stated. Fluctuations should be be expected to vary with seasons and other factors. Use of fluids during drilling may affect water level observations. The absence of water level observations does not necessarily mean the exploration was dry or that subsurface water will not be encountered during construction.

5.) Standard split spoon samplers may not recover particles with any dimension larger than 1-3/8 inches. Reported gravel conditions or poor sample recovery may not reflect actual in-situ conditions.

6.) Sections of this guide provide a general overview of Weston & Sampson's practices and procedures for *identifying* and *describing* soil and rock. These procedures are predominantly based on ASTM D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)*, the International Society of Rock Mechanics (ISRM) standards, and the *Engineering Geology Field Manual* published by the Bureau of Reclamation. Not all aspects of this guide relating to description and identification procedures of soil and rock may be applicable in all circumstances.

SAMPLER GRAPHICS

- Split Spoon (Standard) 2" OD, 1-3/8" ID
- Split Spoon (Oversize) 3" OD, 2-3/8" ID
- Shelby or Piston Tube 3" OD, 2-7/8" ID
- Double-Tube Rock Core Barrel 2" Core Diameter
- Direct Push with Acetate Liner Various Liner Sizes
- A — Auger Sample *(from cuttings or hand auger)*
- G — Grab Sample *(manual, from discrete point)*
- C — Composite Sample *(multiple grab samples)*

WELL GRAPHICS

- Cement concrete seal around casing or riser pipe
- Bentonite seal around casing or riser pipe
- Cement grout seal around casing or riser pipe
- Soil backfill around riser pipe or beneath screen
- Gravel backfill around screen or riser pipe
- Sand backfill around screen or riser pipe (filter sand)
- Solid-wall riser; Sch. 40 PVC, 1" ID unless noted otherwise
- Slotted screen; Sch. 40 PVC, 1" ID with machined slots

CAVING / SEEPAGE TERMS

The following caving and/or seepage terms may appear on a test pit log.

Caving Term	Criteria
Minor	less than 1 cubic ft.
Moderate	1 to 3 cubic ft.
Severe	greater than 3 cubic ft.

Seepage Term	Criteria
Slow	less than 1 gpm
Moderate	1 to 3 gpm
Fast	greater than 3 gpm

KEY TO WATER LEVELS

- Observed in exploration during advancement.
- Measured in exploration at completion, prior to backfilling or well installation.
- Measured in exploration after the stated stabilization period, prior to backfilling, or in well installation if noted.

DEFINITIONS OF COMMON TERMS

Sample Recovery Ratio - The length of material recovered in a drive or push type sampler over the length of sampler penetration, in inches (e.g. 18/24).

Standard Penetration Test (*SPT*) - An in-situ test where a standard split-spoon sampler is driven a distance of 12 or 18 inches (after an initial 6-inch seating interval) using a 140-lb. hammer falling 30 inches for each blow.

SPT Blows - The number of hammer blows required to drive a split-spoon sampler each consecutive 6-inch interval during a *Standard Penetration Test*. If no discernable advancement of a split spoon sampler is made after 50 consecutive hammer blows, 50/X indicates *sampler refusal* and is the number of blows required to drive the sampler X inches.

SPT N-Value (*N*) - The uncorrected blow count representation of a soil's penetration resistance over a 12-inch interval after an initial 6-in. seating interval, reported in blows per foot (bpf). The N-value is correlated to soil engineering properties.

Auger Refusal - No discernable advancement of the auger over a period of 5 minutes with full rig down pressure applied.

Casing Refusal (Driven) - Casing penetration of less than 6 inches after a minimum 50 blows of a drop hammer weighing 300 lbs. or a minimum 100 blows of a drop hammer weighing 140 lbs.

PID Measurement - A measurement (electronic reading) taken in the field using a photoionization detector (PID) to detect the presence of volatile organic compounds in a soil sample. Values are reported as benzene equivalent units in parts per million (ppm) unless noted otherwise.

Rock Quality Designation (RQD) - A qualitative index measure of the degree of jointing and fracture of a rock core taken from a borehole. The RQD is defined as the sum length of solid core pieces 4 inches or longer divided by the run (cored) length, expressed as a percentage. Higher RQD values may indicate fewer joints and fractures in the rock mass.

Fill (Made Ground) - A deposit of soil and/or artificial waste materials that has been placed or altered by human processes.

LABORATORY TESTS AND FIELD MEASUREMENTS

MC	Moisture Content	IC	1D Incremental Consolidation
OC	Organic Content	VS	Laboratory Vane Shear
PL	Plastic Limit	US	Unconfined Compression
LL	Liquid Limit	TC	Triaxial Compression
GC	Gravel Content	PP	Pocket (Hand) Penetrometer
SC	Sand Content	TV	Torvane (Hand Vane)
FC	Fines Content	PID	Photoionization Detector
DS	Direct Shear	FID	Flame Ionization Detector

BORING ADVANCEMENT METHODS

Hollow-Stem Auger Drilling - Utilizes continuous flight auger sections with hollow stems to advance the borehole. Drill rods and a plug are inserted into the auger stem to prevent the entrance of soil cuttings into the augers.

Rotary Wash Drilling - Utilizes downward pressure and rotary action applied to a non-coring bit while washing the cuttings to the surface using a circulating fluid injected down the drill rods. The borehole is supported with either steel casing or the drilling fluid. Where a casing is used, the borehole is advanced sequentially by driving the casing to the desired depth and then cleaning out the casing. The process of driving and cleaning the casing is commonly referred to as the 'drive-and-wash' technique.

Continuous Sampling - Includes a variety of methods and procedures during which the borehole is advanced via continuous recovery of soil samples. *Direct Push* sampling is a common method that uses static downward pressure combined with percussive energy to drive a steel mandrel into the ground at continuous intervals while recovering soil samples in disposable acetate liners.

Rock Coring - Utilizes downward pressure and rotary action applied to a core barrel equipped with a diamond-set or tungsten carbide coring bit. During conventional coring, the entire barrel is retrieved from the hole upon completion of a core run. Wireline coring allows for removal of the inner barrel assembly containing the actual core while the the drill rods and outer barrel remain in the hole. Various types and sizes of core barrels and bits are used.

GUIDE TO SUBSURFACE EXPLORATION LOGS

Weston & Sampson℠

INDEX SHEET 2
SOIL DESCRIPTION

SOIL CONSTITUENTS

Naturally occurring soils consist of one or more of the following matrix constituents defined in terms of particle size.

Constituent		U.S. Sieve Size			Observed Size (in.)		
Gravel	(Coarse)	3/4 in.	-	3 in.	3/4	-	3
Gravel	(Fine)	No. 4	-	3/4 in.	1/5	-	3/4
Sand	(Coarse)	No. 10	-	No. 40	1/16	-	1/5
Sand	(Medium)	No. 40	-	No. 10	1/64	-	1/16
Sand	(Fine)	No. 200	-	No. 40	1/300	-	1/64
Fines	(Silt or Clay)	Smaller than		No. 200	Less than		1/300

SOIL IDENTIFICATION

Soil identification refers to the grouping of soils with similar physical characteristics into a category defined by a **group name** and corresponding **group symbol** based on estimation of the matrix soil constituents to the nearest 5% and simple manual tests. Proportions of cobbles, boulders, and other non-matrix soil materials are not considered during this procedure but are included in the overall soil description if observed or thought to be present. Refer to the following descriptions and tables adapted from ASTM D2488.

Coarse-Grained Soil - Coarse-grained soils contain fewer than 50% fines and are identified based on the following table.

Primary Constituent	Fines Percent	Type of Fines and Gradation		Group Symbol	Group Name [1]
GRAVEL *% gravel > % sand*	≤ 5%	well graded		GW	Well graded gravel
		poorly graded		GP	Poorly graded gravel
	10%	clayey fines	well graded	GW-GC	Well graded gravel with clay
			poorly graded	GP-GC	Poorly graded gravel with clay
		silty fines	well graded	GW-GM	Well graded gravel wth silt
			poorly graded	GP-GM	Poorly graded gravel with silt
	15% to 45%	clay fines		GC	Clayey gravel
		silt fines		GM	Silty gravel
SAND *% sand ≥ % gravel*	≤ 5%	well graded		SW	Well graded sand
		poorly graded		SP	Poorly graded sand
	10%	clayey fines	well graded	SW-SC	Well graded sand with clay
			poorly graded	SP-SC	Poorly graded sand with clay
		silty fines	well graded	SW-SM	Well graded sand with silt
			poorly graded	SP-SM	Poorly graded sand with silt
	15% to 45%	clay fines		SC	Clayey sand
		silt fines		SM	Silty sand

[1] If soil is a gravel and contains 15% or more sand, add "with sand" to the group name. If soil is a sand and contains 15% of more gravel, add "with gravel" to the group name.

Inorganic Fine-Grained Soil - Fine-grained soils contain 50% or more fines and are identified based on the following table.

Plasticity Criteria	Dry Strength	Coarse Fraction S = Sand, G = Gravel		Group Symbol	Group Name [1]
Medium	Medium to high	< 15% S + G		CL	Lean clay
		≥ 30%	% S ≥ % G	CL	Sandy lean clay
		S + G	% S < % G	CL	Gravelly lean clay
Non-plastic	None to low	< 15% S + G		ML	Silt
		≥ 30%	% S ≥ % G	ML	Sandy silt
		S + G	% S < % G	ML	Gravelly silt
High	High to very high	< 15% S + G		CH	Fat clay
		≥ 30%	% S ≥ % G	CH	Sandy fat clay
		S + G	% S < % G	CH	Gravelly fat clay
Low to Medium	Low to medium	< 15% S + G		MH	Elastic silt
		≥ 30%	% S ≥ % G	MH	Sandy elastic silt
		S + G	% S < % G	MH	Gravelly elastic silt

[1] If soil contains 15% to 25% sand or gravel, add "with sand" or "with gravel" to the group name.

Organic Fine-Grained Soil - Fine-grained soils that contain enough organic particles to influence the soil properties are identified as Organic Soil and assigned the group symbol **OL** or **OH**.

Highly Organic Soil (Peat) - Soils composed primarily of plant remains in various stages of decomposition are identified as Peat and given the group symbol **PT**. Peat usually has an organic odor, a dark brown to black color, and a texture ranging from fibrous (original plant structure intact or mostly intact) to amorphous (plant structure decomposed to fine particles).

SOIL DESCRIPTION

Soils are *described* in the following general sequence. Deviations may occur in some instances.

Identification Components

(1) Group Name and Group Symbol

Description Components

(2) Consistency (Fine-Grained) or Apparent Density (Coarse-Grained)
(3) Color (*note, the term "to" may be used to indicate a gradational change*)
(4) Soil Moisture
(5) Matrix Soil Constituents (Gravel, Sand, Fines)
  └► Proportion (*by weight*), particle size, plasticity of fines, angularity, etc.
(6) Non-Matrix Soil Materials and Proportions (*by volume*)
(7) Other Descriptive Information (Unusual Odor, Structure, Texture, etc.)
(8) [Geologic Formation Name or Soil Survey Unit]

SPT N-VALUE CORRELATIONS

Consistency	SPT N-Value	Apparent Density	SPT N-Value
Very soft	0 - 2	Very loose	0 - 5
Soft	2 - 4	Loose	5 - 10
Medium stiff	4 - 8	Medium dense	10 - 30
Stiff	8 - 15	Dense	30 - 50
Very stiff	15 - 30	Very dense	> 50
Hard	> 30		

SOIL MOISTURE

Dry..... Apparent absence of moisture; dry to the touch.
Moist..... Damp but no visible water.
Wet..... Visible free water; saturated.

PROPORTIONS / PERCENTAGES

Proportions of gravel, sand, and fines (excluding cobbles, boulders, and other constituents) are stated in the following terms indicating a range of percentages by weight (to nearest 5%) of the minus 3-in. soil fraction and add up to 100%.

Mostly ..... 50% - 100%
Some ..... 30% - 45%
Little ..... 15% - 25%
Few ..... 5% - 10%
Trace..... Less than 5%

Proportions of cobbles, boulders, and other non-matrix soil materials including artificial debris, roots, plant fibers, etc. are stated in the following terms indicating a range of percentages by volume (to the nearest 5%) of the total soil.

Numerous ..... 40% - 50%
Common ..... 25% - 35%
Occasional ..... 10% - 20%
Trace..... Less than 5%

PLASTICITY (FINES ONLY)

Non-plastic.....Dry specimen ball falls apart easily. Cannot be rolled into thread at any moisture content.
Low.....Dry specimen ball easily crushed with fingers. Can be rolled into 1/8-in. thread with some difficulty.
Medium.....Difficult to crush dry specimen ball with fingers. Easily rolled into 1/8-in. thread.
High.....Cannot crush dry specimen ball with fingers. Easily rolled and re-rolled into 1/8-in. thread.

COBBLES AND BOULDERS

Cobbles - Particles of rock that will pass a 12-in. square opening and be retained on a 3-in. sieve.

Boulders - Particles of rock that will not pass a 12-in. square opening.

Note: Where the percentage (by volume) of cobbles and/or boulders cannot be accurately or reliably estimated, the terms "with cobbles", "with boulders", or "with cobbles and boulders" may be used to indicate observed or inferred presence.

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INDEX SHEET 3
ROCK DESCRIPTION

ROCK DEFINITION

Where reported on an exploration log, *rock* is defined as any naturally formed aggregate of mineral matter occurring in larges masses or fragments. This definition of rock should not be taken as a replacement for any definitions relating to rock and/or rock excavation defined in construction documents. Intensely weathered or decomposed rock that is friable and can be reduced to gravel size particles or smaller by normal hand pressure is identified and described as soil. Poorly indurated formational materials which display both rock-like and soil-like properties are identified and described as rock followed by the soil description. In such cases, the term "poorly indurated" or "weakly cemented" is added to the rock name (e.g. weakly cemented sandstone).

ROCK IDENTIFICATION

Rock is identified by a combination of *rock type* (igneous, metamorphic, or sedimentary) followed by the the *rock name* (e.g. granite, schist, sandstone).

ROCK DESCRIPTION

Rock descriptions are presented in the following general sequence. The detail of description is dictated by the complexity and objectives of the project.

Identification Components

(1) Rock Type and Name

Description Components

(2) Rock Grain Size (*for clastic sedimentary rock*)
(3) Crystal Size (*for igneous and metamorphic rock*)
(4) Bedding Spacing (*for sedimentary rock*)
(5) Color
(6) Hardness and Weathering Descriptors
(7) Fracture Density
(8) [Geologic Formation Name]

ROCK QUALITY DESIGNATION

$$\text{RQD (\%)} = \frac{\Sigma \text{ Length of intact core pieces} \geq 4 \text{ inches}}{\text{Total length of core run (inches)}} \times 100$$

The RQD should correlate with the fracture density in most cases. Higher RDQ values generally indicate fewer joints and fractures.

GRAIN / CRYSTAL SIZE

Grain Size for Clastic Sedimentary Rock

The names of clastic sedimentary rocks are generally based on their predominant clast or grain size (e.g. fine sandstone, medium sandstone, coarse gravel conglomerate, cobble conglomerate, siltstone, claystone).

Crystal Size for Igneous and Metamorphic Rock

Grain Size Description	Average Crystal Size (in.)
Very coarse grained (pegmatitic)	Greater than or equal to 3/8
Coarse-grained	Between 3/16 and 3/8
Medium-grained	Between 1/32 and 3/16
Fine-grained	Between 1/250 and 1/32
Aphanitic	Less than or equal to 1/250

BEDDING SPACING

Bedding Description	Thickness / Spacing
Massive	Less than 10 ft.
Very thickly bedded	3 ft. to 10 ft.
Thickly bedded	1 ft. to 3 ft.
Moderately bedded	4 in. to 1 ft.
Thinly bedded	1 in. to 4 in.
Very thinly bedded	1/4 in. to 1 in.
Laminated	Less than 1/4 in.

Note: Bedding is generally only applicable to sedimentary or bedded volcanic rocks.

HARDNESS

Hardness	Criteria
Extremely hard	Cannot be scratched with a pocketknife or sharp pick. Can only be chipped with repeated heavy hammer blows.
Very hard	Cannot be scratched with a pocketknife or sharp pick with difficulty. Breaks with repeated heavy hammer blows.
Hard	Can be scratched with with a pocketknife or sharp pick with difficulty. Breaks with heavy hammer blows.
Moderately hard	Can be scratched with a pocketknife or sharp pick with light or moderate pressure. Breaks with moderate hammer blows.
Moderately soft	Can be grooved 1/16 in. deep with a pocketknife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Can be grooved or gouged easily with a pocketknife or sharp pick. Breaks with light to moderate manual pressure.
Very soft	Can be readily indented, grooved, or gouged with fingernail, or carved with a pocketknife. Breaks with light manual pressure.

WEATHERING (INTACT ROCK)

Weathering Description	Discoloration and/or Oxidation	General Characteristics
Fresh	Body of rock and fracture surfaces are not discolored or oxidized.	Rock texture unchanged. Hammer rings when crystalline rocks are struck.
Slightly weathered	Discoloration or oxidation limited to surface of, or short distance from, fractures. Most surfaces exhibit minor to complete discoloration.	Rock texture preserved. Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately weathered	Discoloration or oxidation extends usually throughout. Fe-Mg minerals appear rusty. All fracture surfaces are discolored or oxidized.	Rock texture generally preserved. Hammer does not ring when rock is struck. Body of rock slightly weakened.
Intensely weathered	Discoloration or oxidation throughout. Feldspar and Fe-Mg minerals altered to clay to some extent. All fracture surfaces are discolored or oxidized and friable.	Rock texture altered by chemical disintegration. Can usually be broken with moderate to heavy manual pressure or by light hammer blow . Body of rock is significantly weakened.
Decomposed	Discoloration or oxidation throughout but resistant minerals such as quartz may be unaltered. All feldspar and Fe-Mg minerals are completely altered to clay.	Resembles a soil; partial or complete remnant rock structure may be preserved. Can be granulated by hand. Resistant minerals may present as stringers or dikes.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures
Very slightly fractured	Core lengths greater than 3 ft.
Slightly fractured	Core lengths mostly from 1 ft. to 3 ft.
Moderately fractured	Core lengths mostly from 4 in. to 1 ft.
Intensely fractured	Core lengths mostly from 1 in. to 4 in.
Very intensely fractured	Mostly chips and fragments

Note: Fracture density is based on the fracture spacing in recovered core, measured along the core axis (excluding mechanical breaks).

Attachment C

Important Information about This Geotechnical-Engineering Report

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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Attachment D - Existing & Proposed Hydrologic Maps

Project:

WALNUT STREET SENIOR DEVELOPMENT

WALNUT STREET AND COMMERCIAL STREET, FOXBOROUGH, MA 02035

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Revisions:

No.	Date	Description

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Issued For:

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(NOT FOR CONSTRUCTION)

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Drawn By:	REB
Reviewed By:	JIP
Approved By:	JMJ
W&S Project No:	ENG22-0467
W&S File No:	-

Drawing Title:

EXISTING HYDROLOGIC MAP

Sheet Number:

FIG-1

P:\Private\Foxborough Housing Development\3Stormwater\CAD\Ex-HYDRO.dwg

Project:

WALNUT STREET SENIOR DEVELOPMENT

WALNUT STREET AND COMMERCIAL STREET, FOXBOROUGH, MA 02035

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No.	Date	Description

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Issued For:

REVIEW
(NOT FOR CONSTRUCTION)

Scale:	AS SHOWN
Date:	JUNE 20, 2022
Drawn By:	REB
Reviewed By:	JIP
Approved By:	JMJ
W&S Project No:	ENG22-0467
W&S File No:	-

Drawing Title:

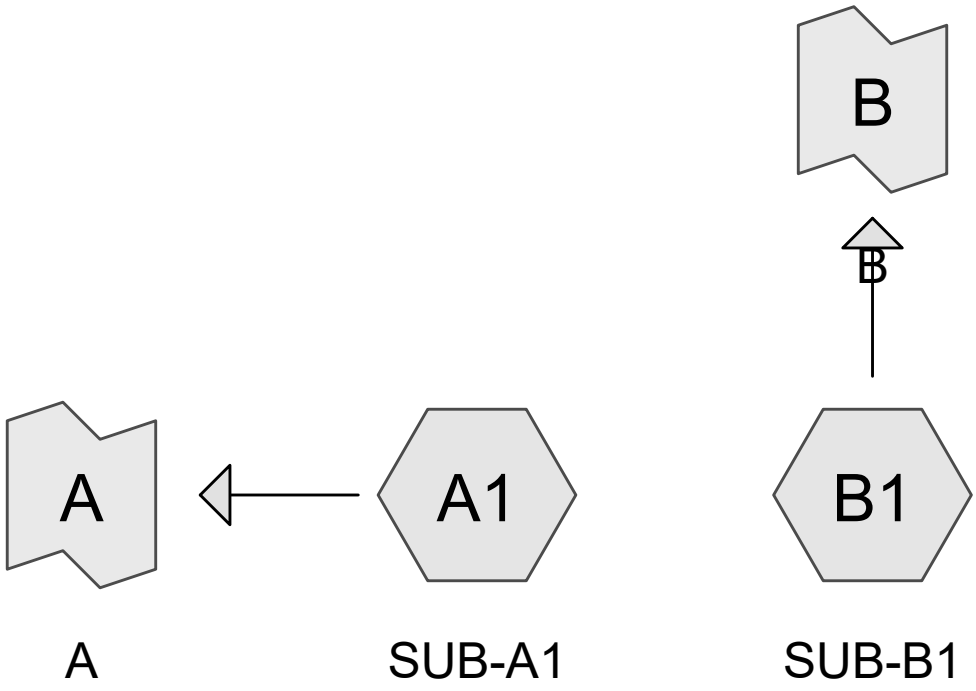
PROPOSED HYDROLOGIC MAP

Sheet Number:

FIG-2

\\wes53.local\WES\Projects\Private\Foxborough - Housing Development\Stormwater\CAD\PR-HYDRO.dwg

Attachment E - HydroCAD Reports



Subcat Reach Pond Link

Routing Diagram for HYDRO-EX
Prepared by Weston & Sampson, Printed 12/14/2022

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	Type III 24-hr		Default	24.00	1	3.43	2
2	10-year	Type III 24-hr		Default	24.00	1	5.24	2
3	25-year	Type III 24-hr		Default	24.00	1	6.37	2
4	50-year	Type III 24-hr		Default	24.00	1	7.21	2
5	100-year	Type III 24-hr		Default	24.00	1	8.11	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
154,730	74	>75% Grass cover, Good, HSG C (A1, B1)
30,059	98	Impervious Area (A1, B1)
778,490	70	Woods, Good, HSG C (A1, B1)
70,139	77	Woods, Good, HSG D (A1)
1,033,418	**72**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
933,220	HSG C	A1, B1
70,139	HSG D	A1
30,059	Other	A1, B1
1,033,418		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	0	154,730	0	0	154,730	>75% Grass cover, Good	
0	0	0	0	30,059	30,059	Impervious Area	
0	0	778,490	70,139	0	848,629	Woods, Good	
0	**0**	**933,220**	**70,139**	**30,059**	**1,033,418**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=566,702 sf 4.04% Impervious Runoff Depth=1.13"
Flow Length=1,620' Tc=32.8 min CN=73 Runoff=8.90 cfs 53,498 cf

SubcatchmentB1: SUB-B1 Runoff Area=466,716 sf 1.54% Impervious Runoff Depth=1.02"
Flow Length=1,046' Tc=25.7 min CN=71 Runoff=7.18 cfs 39,652 cf

Link A: A Inflow=8.90 cfs 53,498 cf
Primary=8.90 cfs 53,498 cf

Link B: B Inflow=7.18 cfs 39,652 cf
Primary=7.18 cfs 39,652 cf

Total Runoff Area = 1,033,418 sf Runoff Volume = 93,150 cf Average Runoff Depth = 1.08"
97.09% Pervious = 1,003,359 sf 2.91% Impervious = 30,059 sf

Summary for Subcatchment A1: SUB-A1

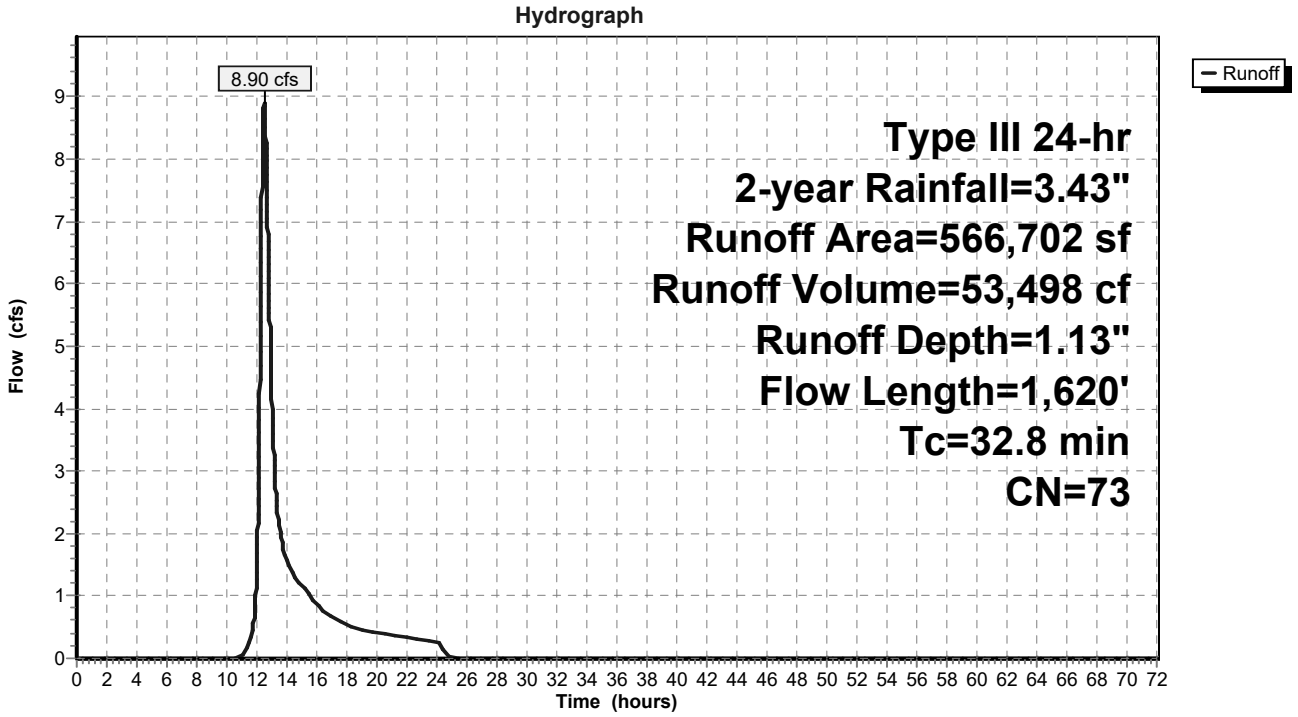
Runoff = 8.90 cfs @ 12.50 hrs, Volume= 53,498 cf, Depth= 1.13"
Routed to Link A : A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.43"

	Area (sf)	CN	Description
*	22,880	98	Impervious Area
	106,349	74	>75% Grass cover, Good, HSG C
	367,334	70	Woods, Good, HSG C
	70,139	77	Woods, Good, HSG D
	566,702	73	Weighted Average
	543,822		95.96% Pervious Area
	22,880		4.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
19.4	1,010	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	560	0.0200	6.38	76.61	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.035 Earth, dense weeds
32.8	1,620	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment B1: SUB-B1

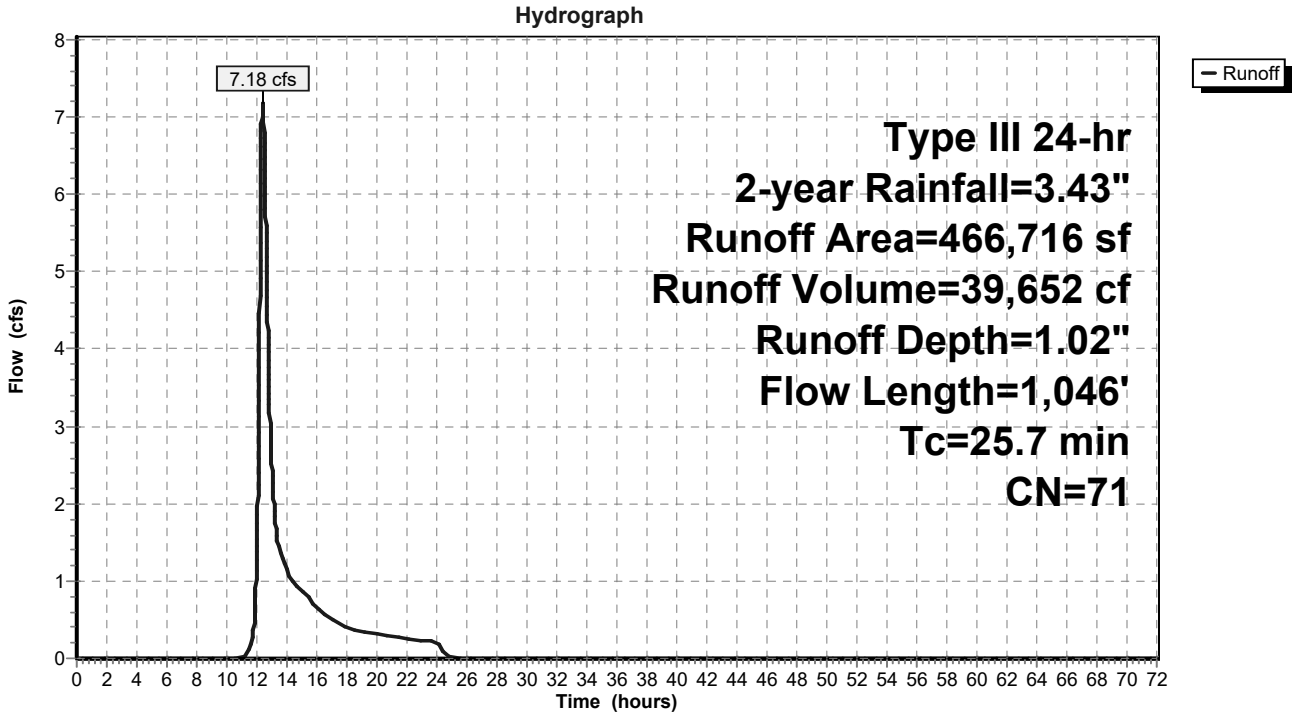
Runoff = 7.18 cfs @ 12.39 hrs, Volume= 39,652 cf, Depth= 1.02"
Routed to Link B : B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.43"

	Area (sf)	CN	Description
*	7,179	98	Impervious Area
	48,381	74	>75% Grass cover, Good, HSG C
	411,156	70	Woods, Good, HSG C
	466,716	71	Weighted Average
	459,537		98.46% Pervious Area
	7,179		1.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
2.9	208	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	77	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	431	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.2	280	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,046	Total			

Subcatchment B1: SUB-B1

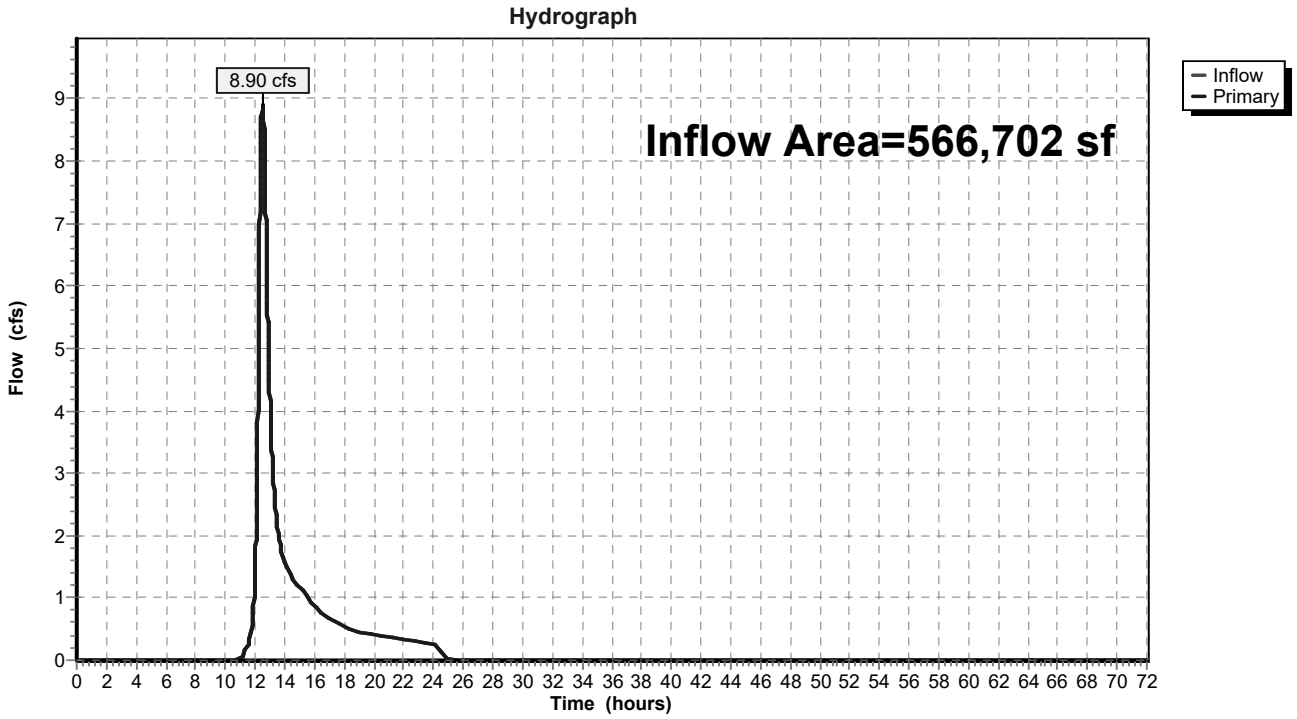


Summary for Link A: A

Inflow Area = 566,702 sf, 4.04% Impervious, Inflow Depth = 1.13" for 2-year event
Inflow = 8.90 cfs @ 12.50 hrs, Volume= 53,498 cf
Primary = 8.90 cfs @ 12.50 hrs, Volume= 53,498 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A

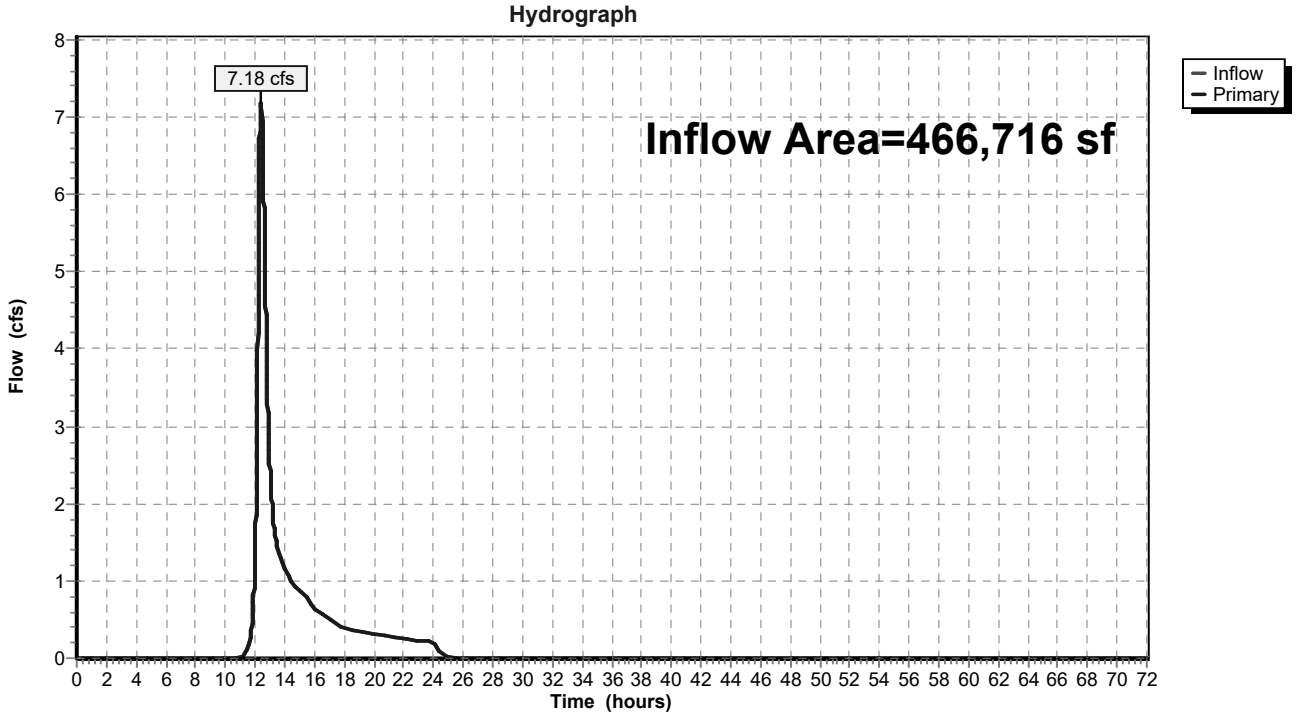


Summary for Link B: B

Inflow Area = 466,716 sf, 1.54% Impervious, Inflow Depth = 1.02" for 2-year event
Inflow = 7.18 cfs @ 12.39 hrs, Volume= 39,652 cf
Primary = 7.18 cfs @ 12.39 hrs, Volume= 39,652 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: B



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=566,702 sf 4.04% Impervious Runoff Depth=2.47"
Flow Length=1,620' Tc=32.8 min CN=73 Runoff=20.27 cfs 116,653 cf

SubcatchmentB1: SUB-B1 Runoff Area=466,716 sf 1.54% Impervious Runoff Depth=2.30"
Flow Length=1,046' Tc=25.7 min CN=71 Runoff=17.28 cfs 89,437 cf

Link A: A Inflow=20.27 cfs 116,653 cf
Primary=20.27 cfs 116,653 cf

Link B: B Inflow=17.28 cfs 89,437 cf
Primary=17.28 cfs 89,437 cf

Total Runoff Area = 1,033,418 sf Runoff Volume = 206,090 cf Average Runoff Depth = 2.39"
97.09% Pervious = 1,003,359 sf 2.91% Impervious = 30,059 sf

Summary for Subcatchment A1: SUB-A1

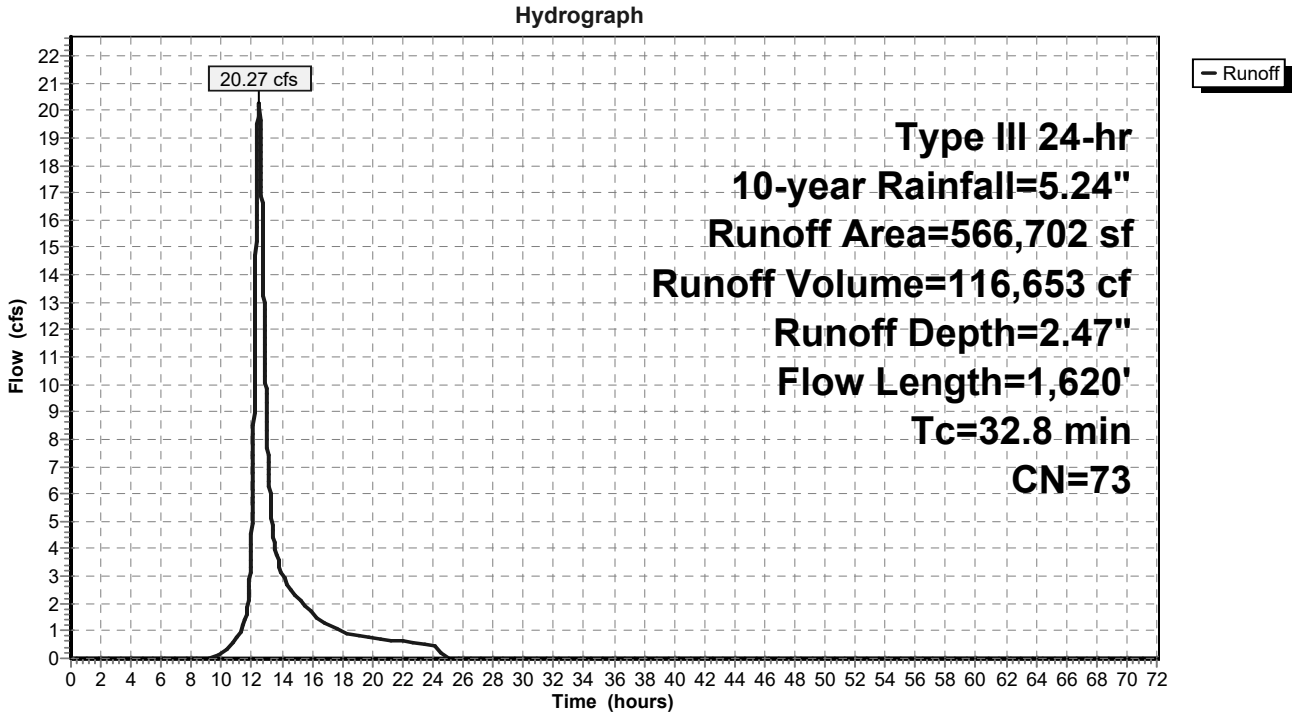
Runoff = 20.27 cfs @ 12.47 hrs, Volume= 116,653 cf, Depth= 2.47"
Routed to Link A : A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.24"

	Area (sf)	CN	Description
*	22,880	98	Impervious Area
	106,349	74	>75% Grass cover, Good, HSG C
	367,334	70	Woods, Good, HSG C
	70,139	77	Woods, Good, HSG D
	566,702	73	Weighted Average
	543,822		95.96% Pervious Area
	22,880		4.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
19.4	1,010	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	560	0.0200	6.38	76.61	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.035 Earth, dense weeds
32.8	1,620	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment B1: SUB-B1

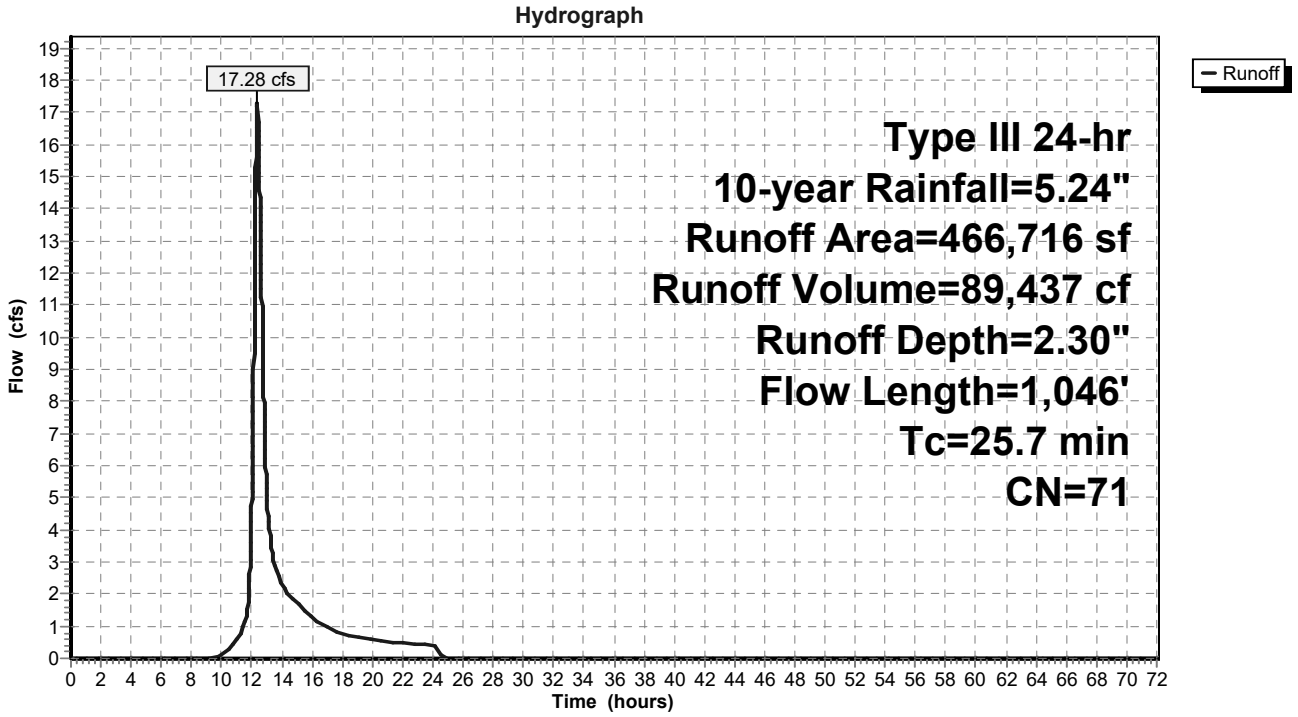
Runoff = 17.28 cfs @ 12.37 hrs, Volume= 89,437 cf, Depth= 2.30"
Routed to Link B : B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.24"

	Area (sf)	CN	Description
*	7,179	98	Impervious Area
	48,381	74	>75% Grass cover, Good, HSG C
	411,156	70	Woods, Good, HSG C
	466,716	71	Weighted Average
	459,537		98.46% Pervious Area
	7,179		1.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
2.9	208	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	77	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	431	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.2	280	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,046	Total			

Subcatchment B1: SUB-B1

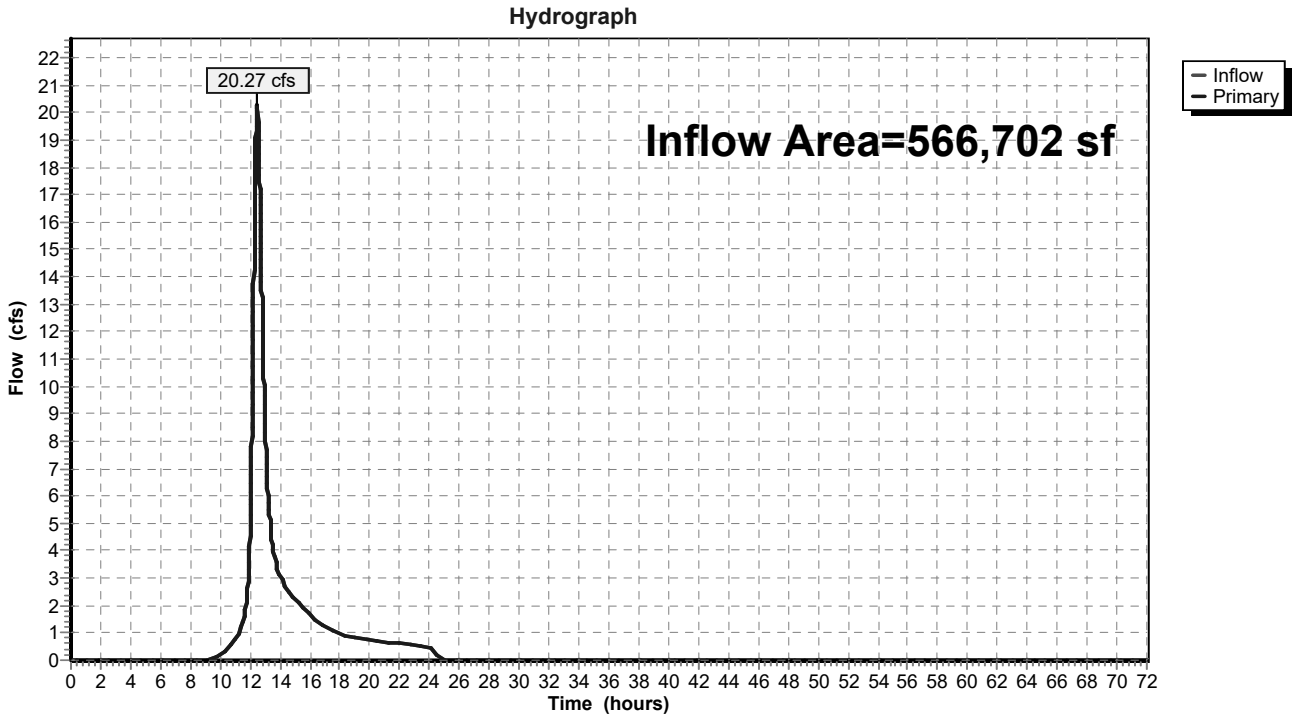


Summary for Link A: A

Inflow Area = 566,702 sf, 4.04% Impervious, Inflow Depth = 2.47" for 10-year event
Inflow = 20.27 cfs @ 12.47 hrs, Volume= 116,653 cf
Primary = 20.27 cfs @ 12.47 hrs, Volume= 116,653 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A

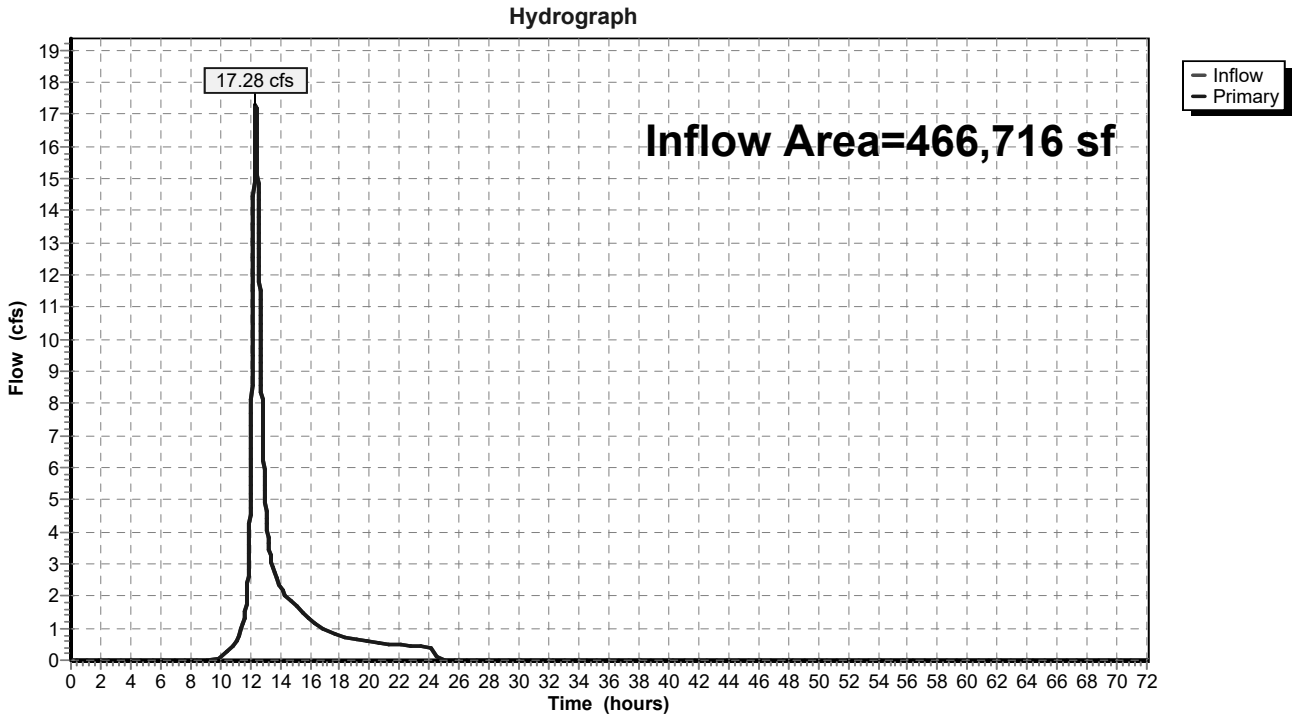


Summary for Link B: B

Inflow Area = 466,716 sf, 1.54% Impervious, Inflow Depth = 2.30" for 10-year event
Inflow = 17.28 cfs @ 12.37 hrs, Volume= 89,437 cf
Primary = 17.28 cfs @ 12.37 hrs, Volume= 89,437 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: B



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=566,702 sf 4.04% Impervious Runoff Depth=3.40"
Flow Length=1,620' Tc=32.8 min CN=73 Runoff=28.07 cfs 160,473 cf

SubcatchmentB1: SUB-B1 Runoff Area=466,716 sf 1.54% Impervious Runoff Depth=3.20"
Flow Length=1,046' Tc=25.7 min CN=71 Runoff=24.30 cfs 124,444 cf

Link A: A Inflow=28.07 cfs 160,473 cf
Primary=28.07 cfs 160,473 cf

Link B: B Inflow=24.30 cfs 124,444 cf
Primary=24.30 cfs 124,444 cf

Total Runoff Area = 1,033,418 sf Runoff Volume = 284,917 cf Average Runoff Depth = 3.31"
97.09% Pervious = 1,003,359 sf 2.91% Impervious = 30,059 sf

Summary for Subcatchment A1: SUB-A1

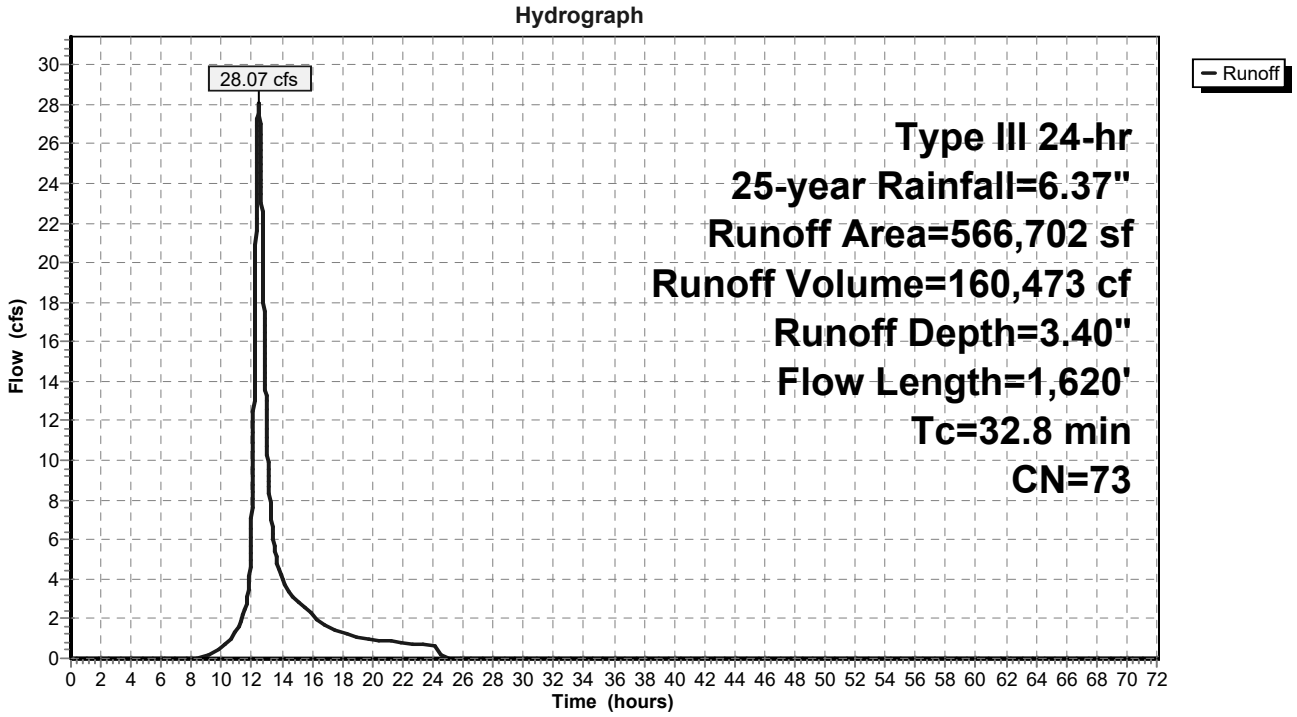
Runoff = 28.07 cfs @ 12.46 hrs, Volume= 160,473 cf, Depth= 3.40"
Routed to Link A : A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.37"

	Area (sf)	CN	Description
*	22,880	98	Impervious Area
	106,349	74	>75% Grass cover, Good, HSG C
	367,334	70	Woods, Good, HSG C
	70,139	77	Woods, Good, HSG D
	566,702	73	Weighted Average
	543,822		95.96% Pervious Area
	22,880		4.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
19.4	1,010	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	560	0.0200	6.38	76.61	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.035 Earth, dense weeds
32.8	1,620	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment B1: SUB-B1

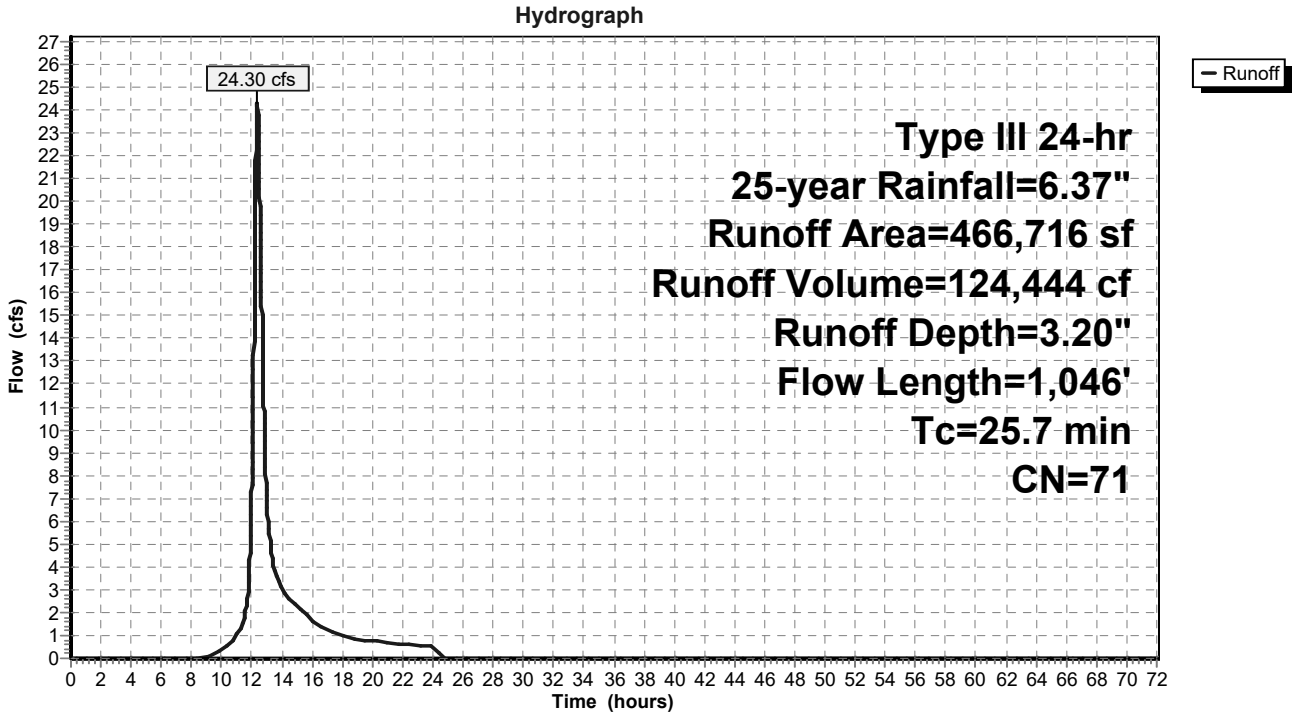
Runoff = 24.30 cfs @ 12.36 hrs, Volume= 124,444 cf, Depth= 3.20"
Routed to Link B : B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.37"

	Area (sf)	CN	Description
*	7,179	98	Impervious Area
	48,381	74	>75% Grass cover, Good, HSG C
	411,156	70	Woods, Good, HSG C
	466,716	71	Weighted Average
	459,537		98.46% Pervious Area
	7,179		1.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
2.9	208	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	77	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	431	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.2	280	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,046	Total			

Subcatchment B1: SUB-B1

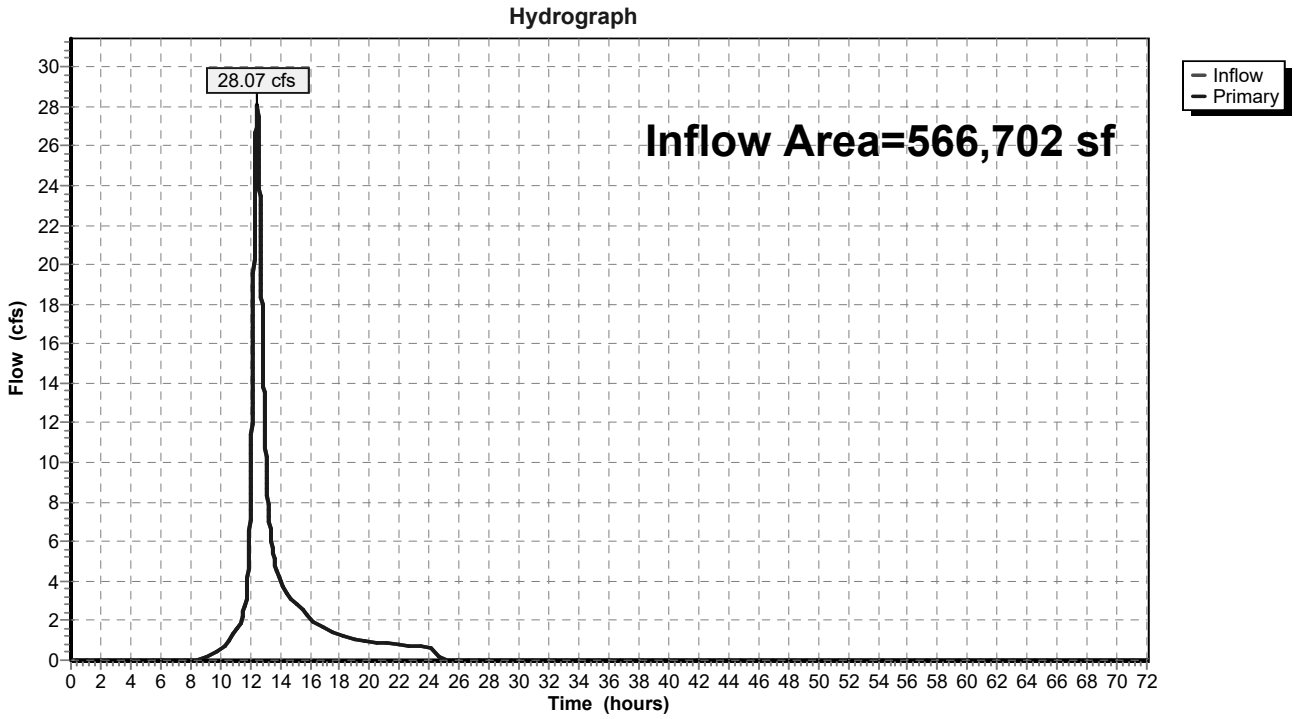


Summary for Link A: A

Inflow Area = 566,702 sf, 4.04% Impervious, Inflow Depth = 3.40" for 25-year event
Inflow = 28.07 cfs @ 12.46 hrs, Volume= 160,473 cf
Primary = 28.07 cfs @ 12.46 hrs, Volume= 160,473 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A

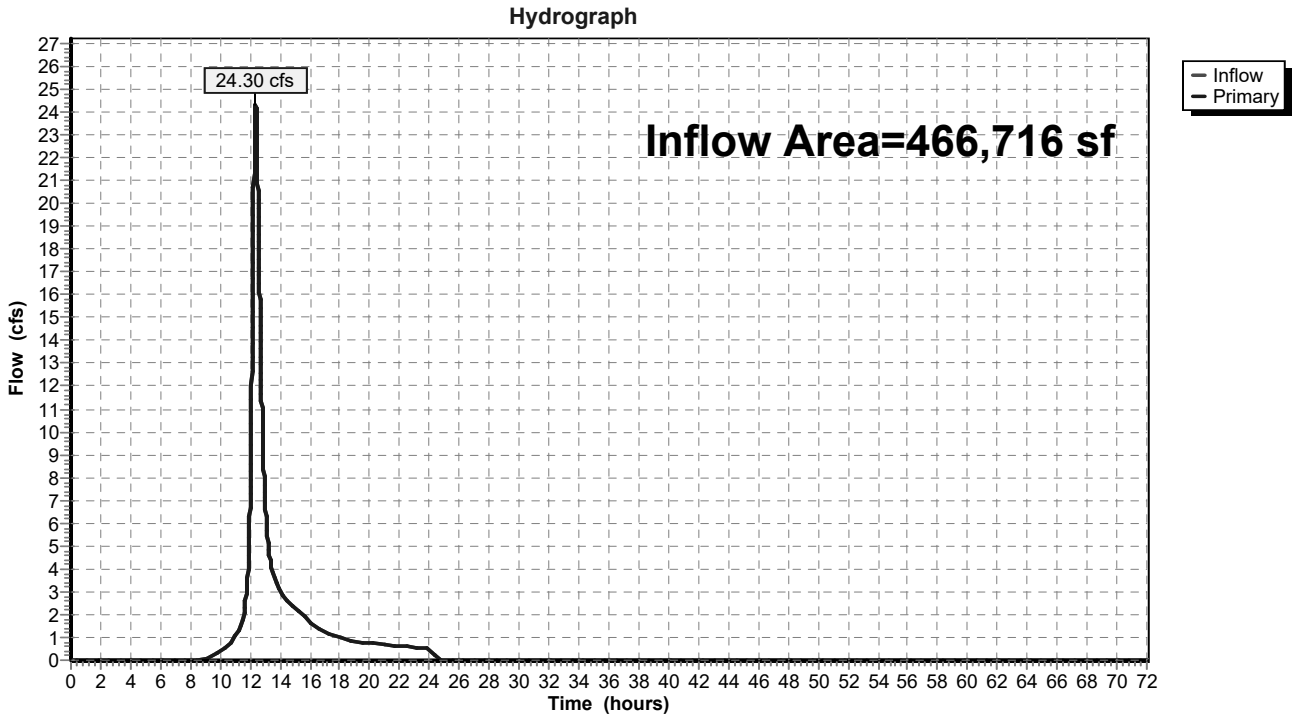


Summary for Link B: B

Inflow Area = 466,716 sf, 1.54% Impervious, Inflow Depth = 3.20" for 25-year event
Inflow = 24.30 cfs @ 12.36 hrs, Volume= 124,444 cf
Primary = 24.30 cfs @ 12.36 hrs, Volume= 124,444 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: B



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=566,702 sf 4.04% Impervious Runoff Depth=4.12"
Flow Length=1,620' Tc=32.8 min CN=73 Runoff=34.04 cfs 194,422 cf

SubcatchmentB1: SUB-B1 Runoff Area=466,716 sf 1.54% Impervious Runoff Depth=3.90"
Flow Length=1,046' Tc=25.7 min CN=71 Runoff=29.70 cfs 151,716 cf

Link A: A Inflow=34.04 cfs 194,422 cf
Primary=34.04 cfs 194,422 cf

Link B: B Inflow=29.70 cfs 151,716 cf
Primary=29.70 cfs 151,716 cf

Total Runoff Area = 1,033,418 sf Runoff Volume = 346,138 cf Average Runoff Depth = 4.02"
97.09% Pervious = 1,003,359 sf 2.91% Impervious = 30,059 sf

Summary for Subcatchment A1: SUB-A1

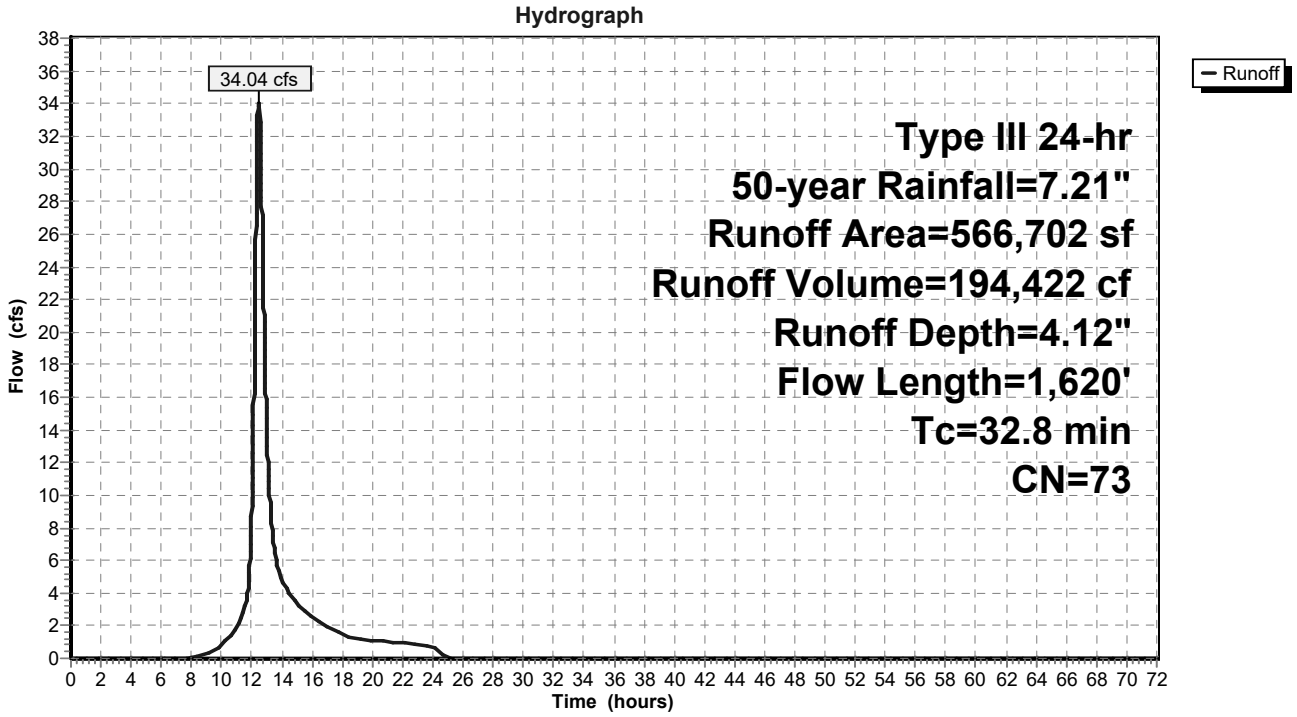
Runoff = 34.04 cfs @ 12.46 hrs, Volume= 194,422 cf, Depth= 4.12"
Routed to Link A : A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.21"

	Area (sf)	CN	Description
*	22,880	98	Impervious Area
	106,349	74	>75% Grass cover, Good, HSG C
	367,334	70	Woods, Good, HSG C
	70,139	77	Woods, Good, HSG D
	566,702	73	Weighted Average
	543,822		95.96% Pervious Area
	22,880		4.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
19.4	1,010	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	560	0.0200	6.38	76.61	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.035 Earth, dense weeds
32.8	1,620	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment B1: SUB-B1

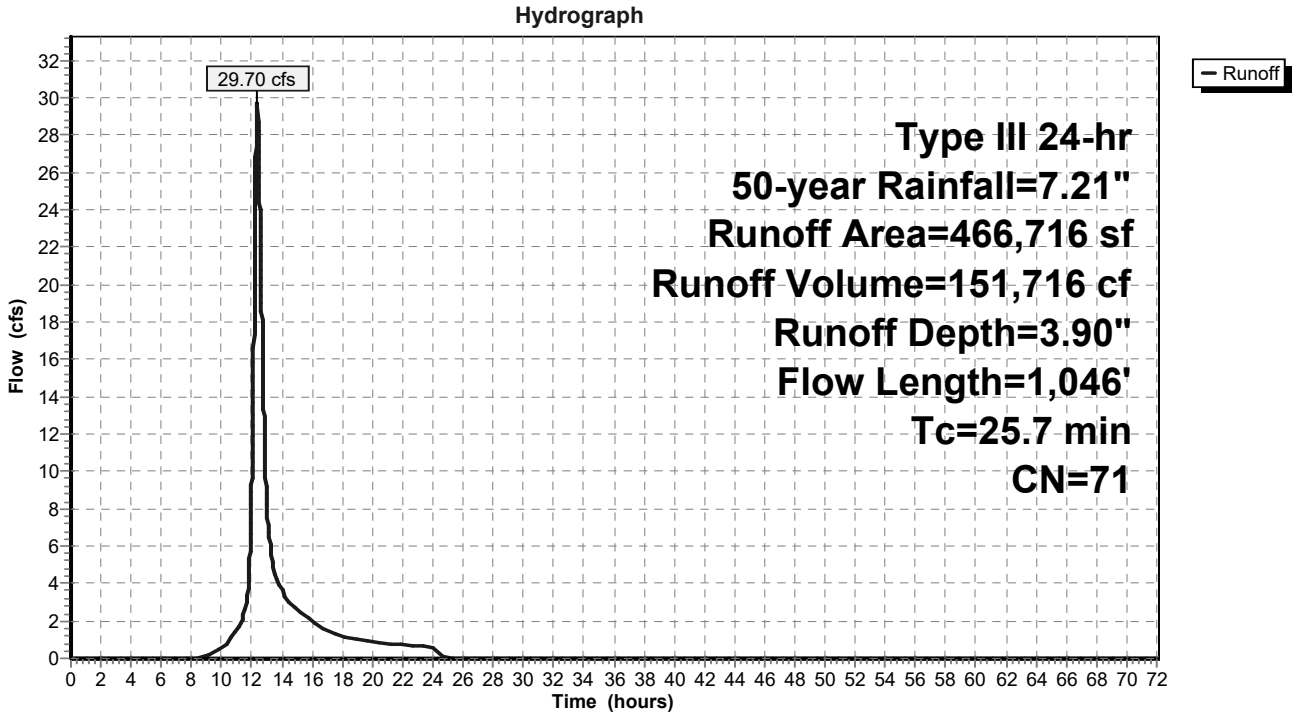
Runoff = 29.70 cfs @ 12.36 hrs, Volume= 151,716 cf, Depth= 3.90"
Routed to Link B : B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.21"

	Area (sf)	CN	Description
*	7,179	98	Impervious Area
	48,381	74	>75% Grass cover, Good, HSG C
	411,156	70	Woods, Good, HSG C
	466,716	71	Weighted Average
	459,537		98.46% Pervious Area
	7,179		1.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
2.9	208	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	77	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	431	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.2	280	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,046	Total			

Subcatchment B1: SUB-B1

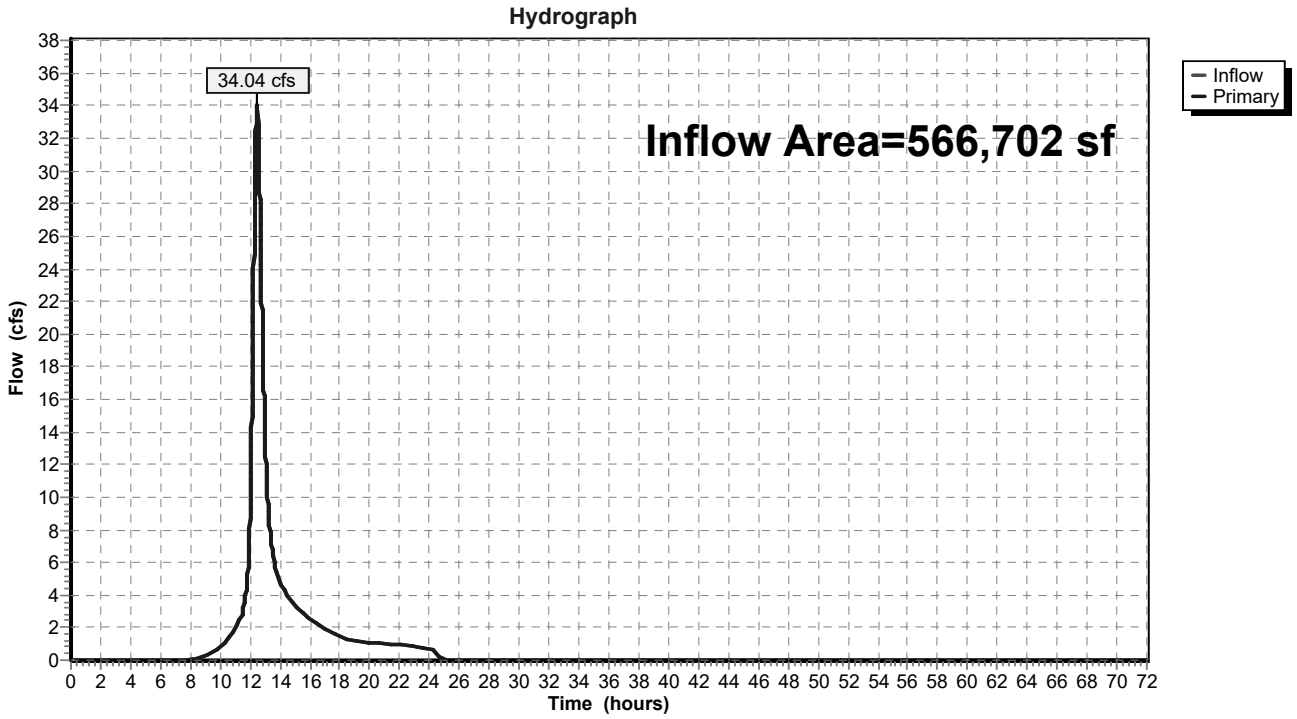


Summary for Link A: A

Inflow Area = 566,702 sf, 4.04% Impervious, Inflow Depth = 4.12" for 50-year event
Inflow = 34.04 cfs @ 12.46 hrs, Volume= 194,422 cf
Primary = 34.04 cfs @ 12.46 hrs, Volume= 194,422 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A

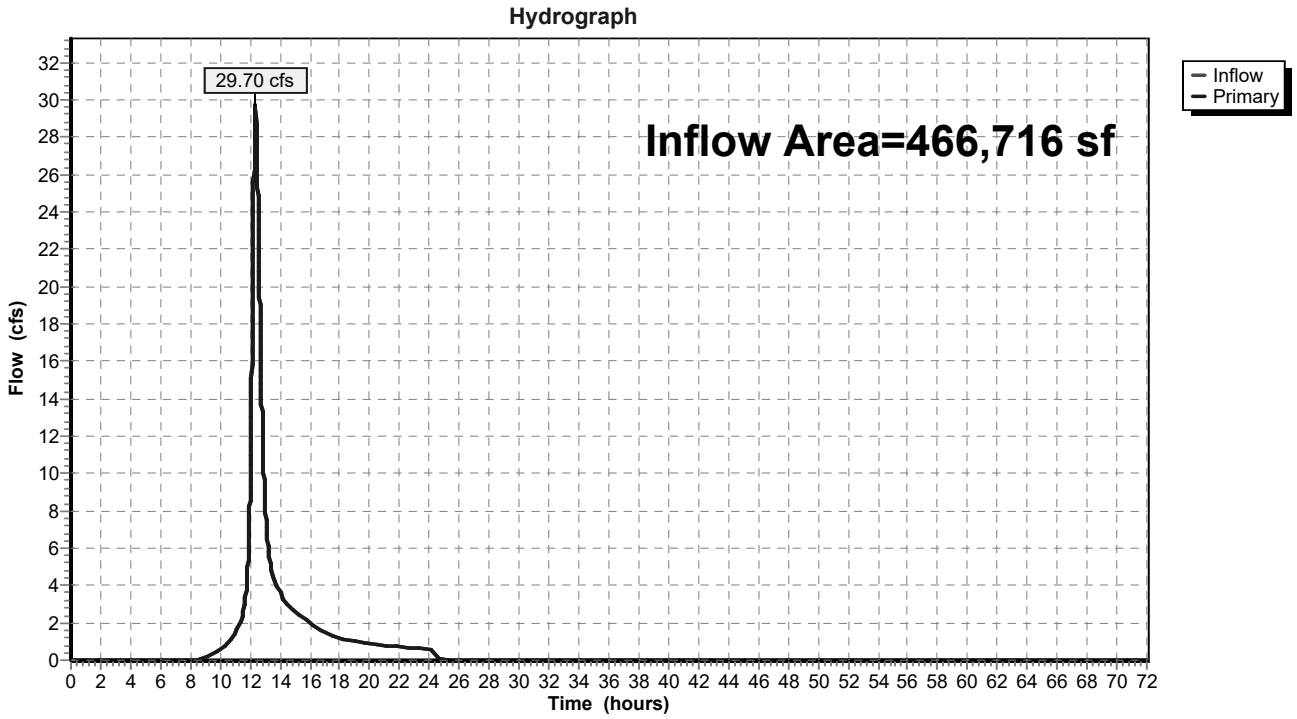


Summary for Link B: B

Inflow Area = 466,716 sf, 1.54% Impervious, Inflow Depth = 3.90" for 50-year event
Inflow = 29.70 cfs @ 12.36 hrs, Volume= 151,716 cf
Primary = 29.70 cfs @ 12.36 hrs, Volume= 151,716 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: B



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=566,702 sf 4.04% Impervious Runoff Depth=4.91"
Flow Length=1,620' Tc=32.8 min CN=73 Runoff=40.55 cfs 231,759 cf

SubcatchmentB1: SUB-B1 Runoff Area=466,716 sf 1.54% Impervious Runoff Depth=4.67"
Flow Length=1,046' Tc=25.7 min CN=71 Runoff=35.62 cfs 181,821 cf

Link A: A Inflow=40.55 cfs 231,759 cf
Primary=40.55 cfs 231,759 cf

Link B: B Inflow=35.62 cfs 181,821 cf
Primary=35.62 cfs 181,821 cf

Total Runoff Area = 1,033,418 sf Runoff Volume = 413,580 cf Average Runoff Depth = 4.80"
97.09% Pervious = 1,003,359 sf 2.91% Impervious = 30,059 sf

Summary for Subcatchment A1: SUB-A1

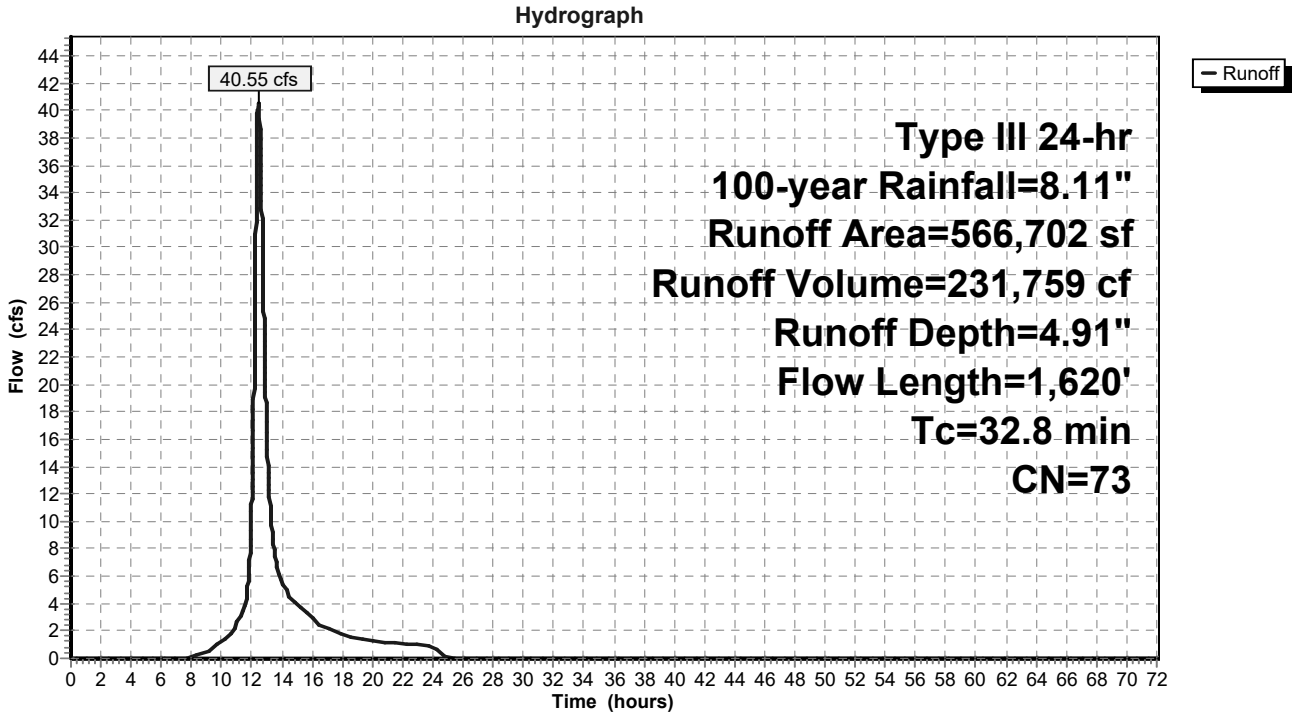
Runoff = 40.55 cfs @ 12.44 hrs, Volume= 231,759 cf, Depth= 4.91"
Routed to Link A : A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.11"

	Area (sf)	CN	Description
*	22,880	98	Impervious Area
	106,349	74	>75% Grass cover, Good, HSG C
	367,334	70	Woods, Good, HSG C
	70,139	77	Woods, Good, HSG D
	566,702	73	Weighted Average
	543,822		95.96% Pervious Area
	22,880		4.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
19.4	1,010	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	560	0.0200	6.38	76.61	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.035 Earth, dense weeds
32.8	1,620	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment B1: SUB-B1

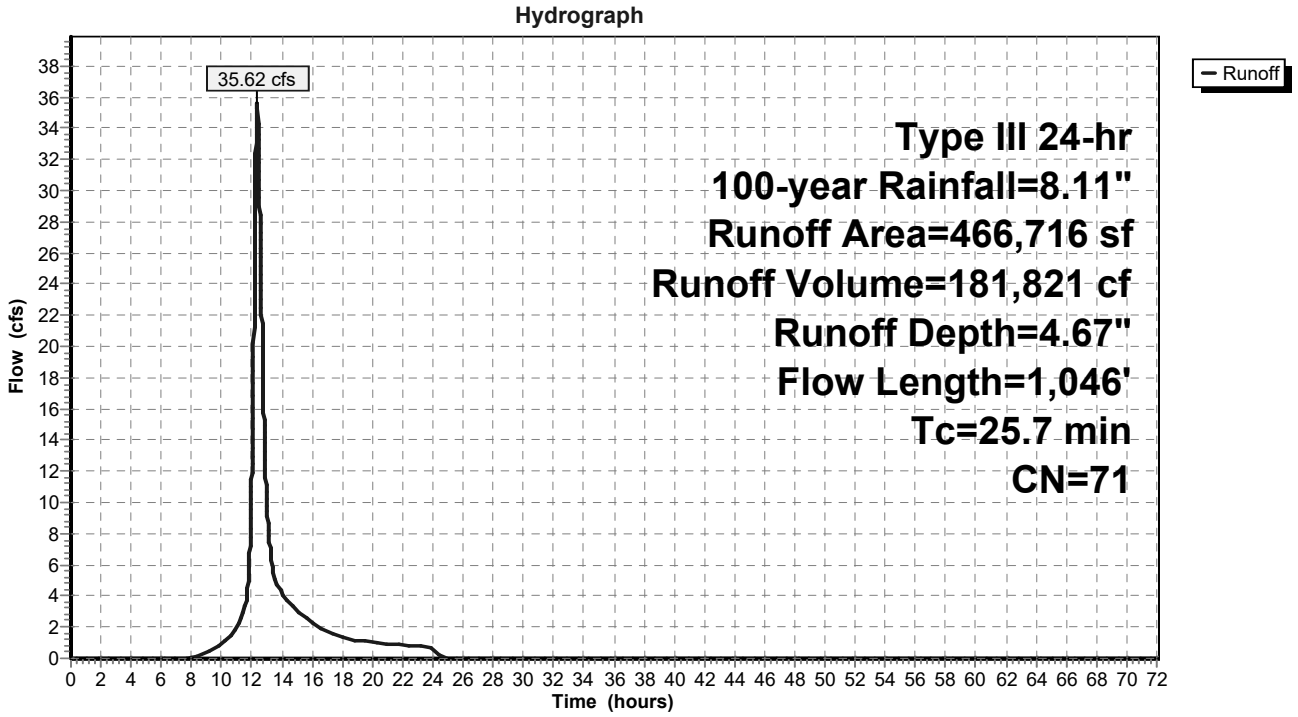
Runoff = 35.62 cfs @ 12.36 hrs, Volume= 181,821 cf, Depth= 4.67"
Routed to Link B : B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.11"

	Area (sf)	CN	Description
*	7,179	98	Impervious Area
	48,381	74	>75% Grass cover, Good, HSG C
	411,156	70	Woods, Good, HSG C
	466,716	71	Weighted Average
	459,537		98.46% Pervious Area
	7,179		1.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
2.9	208	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	77	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	431	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.2	280	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,046	Total			

Subcatchment B1: SUB-B1

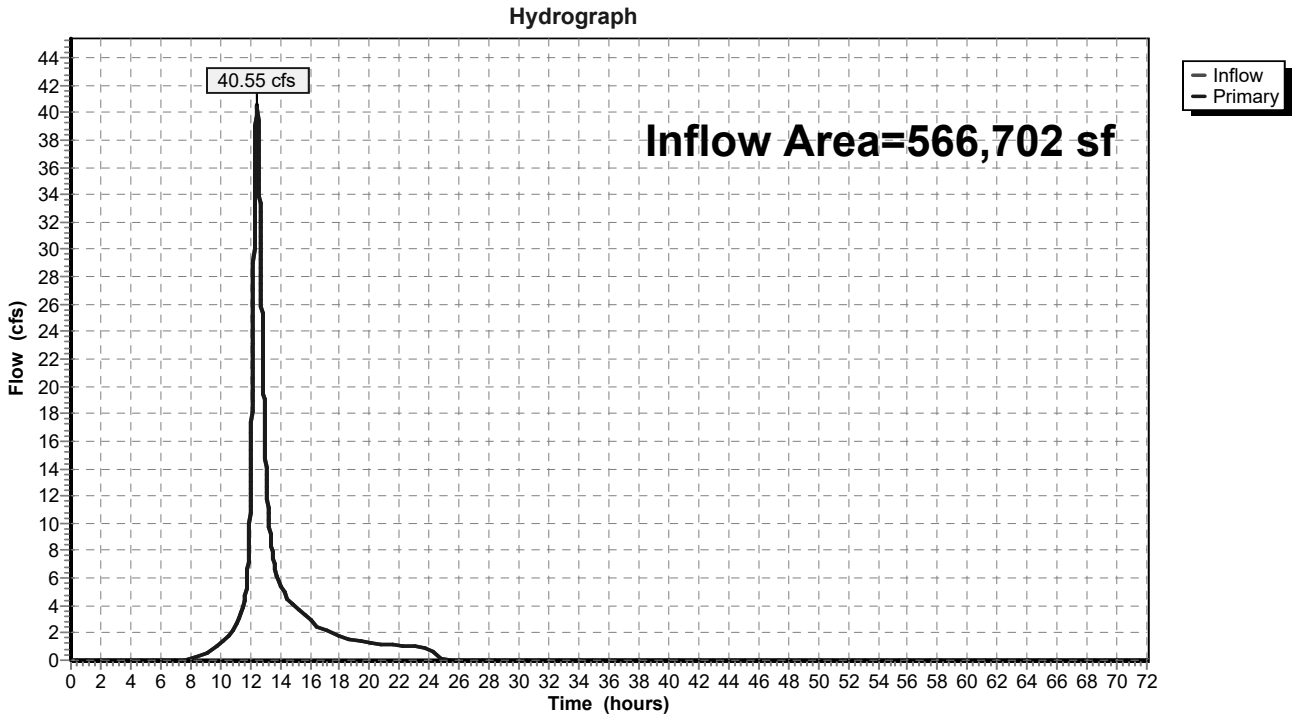


Summary for Link A: A

Inflow Area = 566,702 sf, 4.04% Impervious, Inflow Depth = 4.91" for 100-year event
Inflow = 40.55 cfs @ 12.44 hrs, Volume= 231,759 cf
Primary = 40.55 cfs @ 12.44 hrs, Volume= 231,759 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A

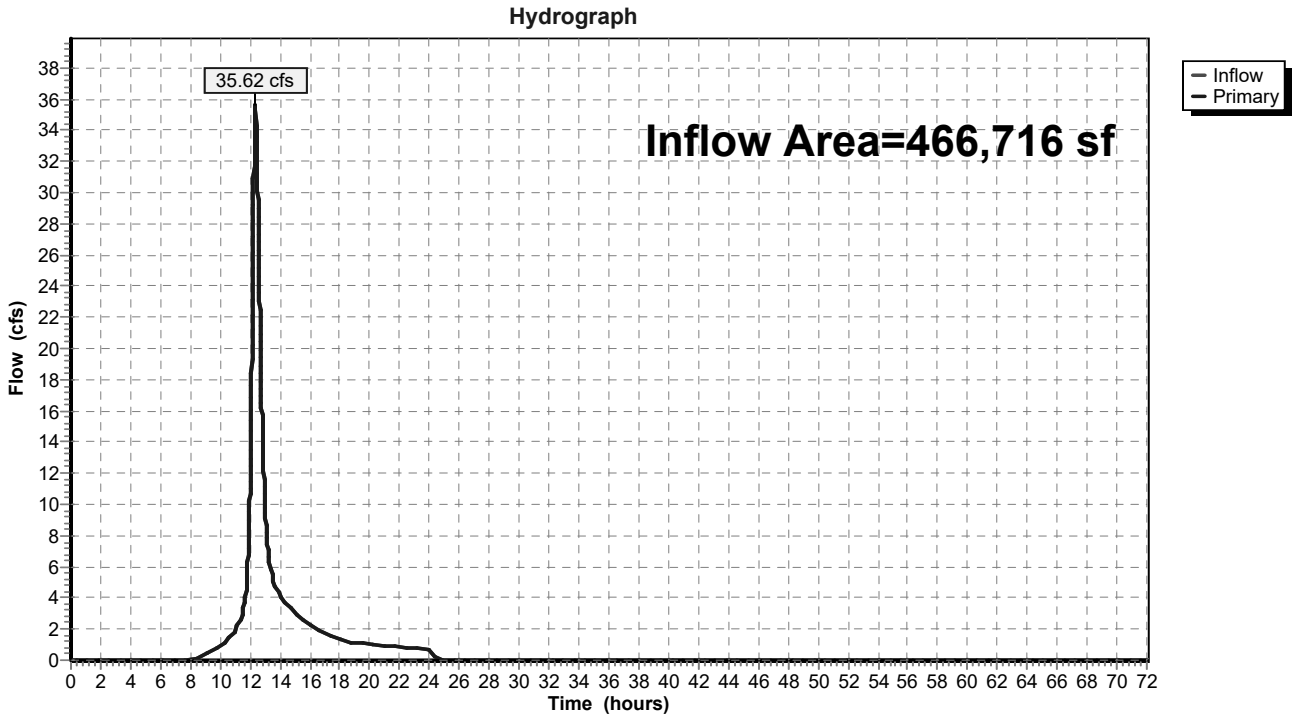


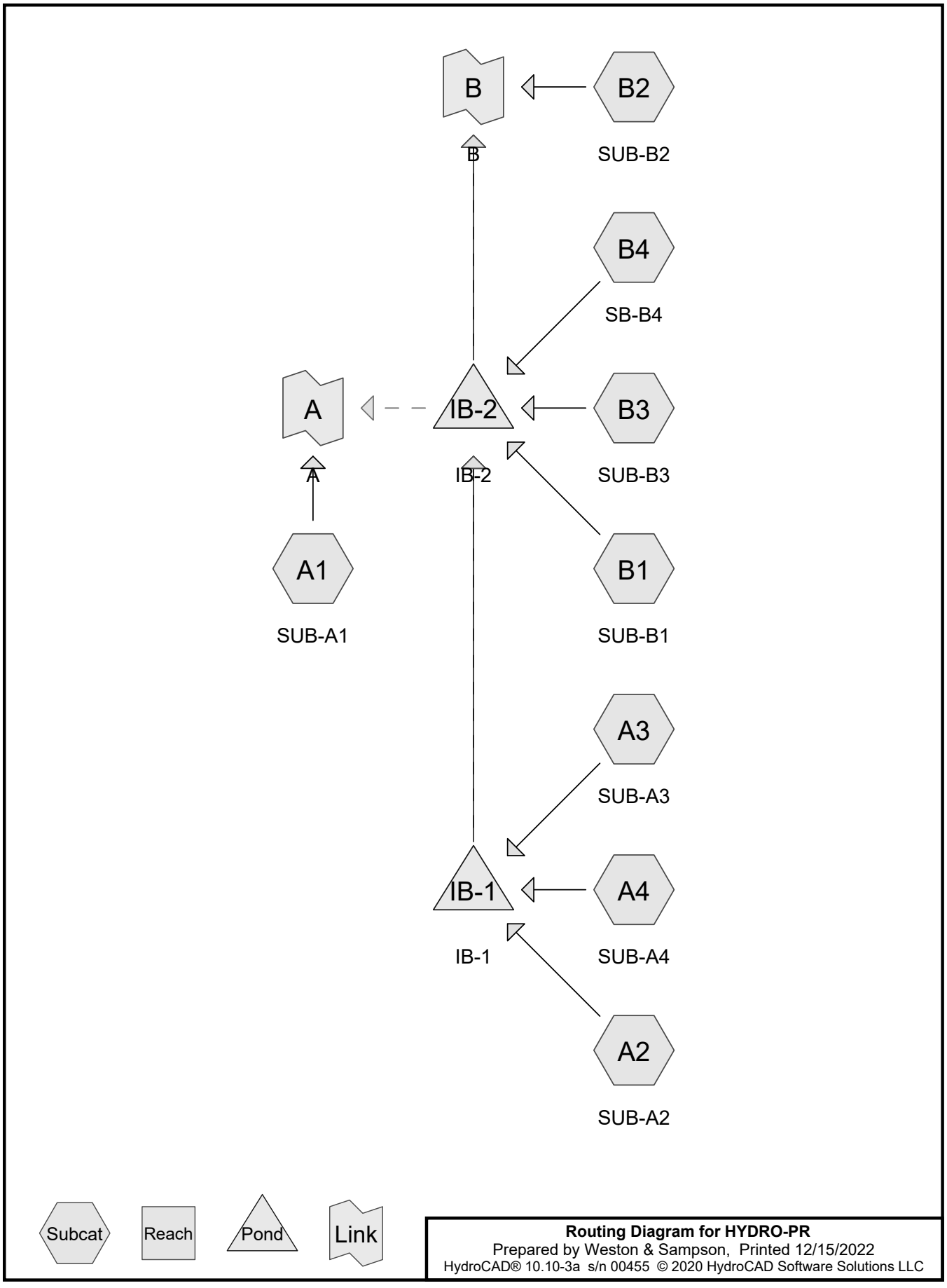
Summary for Link B: B

Inflow Area = 466,716 sf, 1.54% Impervious, Inflow Depth = 4.67" for 100-year event
Inflow = 35.62 cfs @ 12.36 hrs, Volume= 181,821 cf
Primary = 35.62 cfs @ 12.36 hrs, Volume= 181,821 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: B





Routing Diagram for HYDRO-PR
Prepared by Weston & Sampson, Printed 12/15/2022

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	Type III 24-hr		Default	24.00	1	3.43	2
2	10-year	Type III 24-hr		Default	24.00	1	5.24	2
3	25-year	Type III 24-hr		Default	24.00	1	6.37	2
4	50-year	Type III 24-hr		Default	24.00	1	7.21	2
5	100-year	Type III 24-hr		Default	24.00	1	8.11	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
382,287	74	>75% Grass cover, Good, HSG C (A1, A2, A4, B1, B2, B3)
1,864	96	Gravel surface, HSG C (A1, A2)
244,401	98	Impervious Area (A1, A2, A3, A4, B1, B3, B4)
9,648	98	Infiltration Basin Floor (A2, B1)
325,724	70	Woods, Good, HSG C (A1, A2, B1, B2)
69,494	77	Woods, Good, HSG D (A1, A2)
1,033,418	**79**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
709,875	HSG C	A1, A2, A4, B1, B2, B3
69,494	HSG D	A1, A2
254,049	Other	A1, A2, A3, A4, B1, B3, B4
1,033,418		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	382,287	0	0	382,287	>75% Grass cover, Good	
0	0	1,864	0	0	1,864	Gravel surface	
0	0	0	0	244,401	244,401	Impervious Area	
0	0	0	0	9,648	9,648	Infiltration Basin Floor	
0	0	325,724	69,494	0	395,218	Woods, Good	
0	**0**	**709,875**	**69,494**	**254,049**	**1,033,418**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	A2	0.00	0.00	835.0	0.0050	0.013	12.0	0.0	0.0
2	A4	0.00	0.00	330.0	0.0050	0.013	12.0	0.0	0.0
3	B1	0.00	0.00	983.0	0.0050	0.013	12.0	0.0	0.0
4	B3	0.00	0.00	580.0	0.0050	0.013	12.0	0.0	0.0
5	IB-1	241.38	241.00	76.0	0.0050	0.013	24.0	0.0	0.0
6	IB-2	241.28	241.13	30.0	0.0050	0.013	24.0	0.0	0.0
7	IB-2	238.25	238.00	50.0	0.0050	0.013	12.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: SUB-A1 Runoff Area=422,091 sf 5.83% Impervious Runoff Depth=1.19"
Flow Length=1,620' Tc=32.8 min CN=74 Runoff=7.04 cfs 41,923 cf

Subcatchment A2: SUB-A2 Runoff Area=197,483 sf 24.49% Impervious Runoff Depth=1.51"
Flow Length=1,333' Tc=13.6 min CN=79 Runoff=6.23 cfs 24,880 cf

Subcatchment A3: SUB-A3 Runoff Area=45,304 sf 100.00% Impervious Runoff Depth=3.20"
Flow Length=51' Slope=0.0200 '/' Tc=6.0 min CN=98 Runoff=3.47 cfs 12,069 cf

Subcatchment A4: SUB-A4 Runoff Area=38,793 sf 28.18% Impervious Runoff Depth=1.65"
Flow Length=515' Tc=8.4 min CN=81 Runoff=1.58 cfs 5,341 cf

Subcatchment B1: SUB-B1 Runoff Area=187,914 sf 46.61% Impervious Runoff Depth=1.96"
Flow Length=1,482' Tc=20.5 min CN=85 Runoff=6.61 cfs 30,623 cf

Subcatchment B2: SUB-B2 Runoff Area=67,056 sf 0.00% Impervious Runoff Depth=1.08"
Flow Length=438' Tc=14.5 min CN=72 Runoff=1.39 cfs 6,009 cf

Subcatchment B3: SUB-B3 Runoff Area=48,216 sf 22.19% Impervious Runoff Depth=1.51"
Flow Length=766' Tc=10.5 min CN=79 Runoff=1.67 cfs 6,074 cf

Subcatchment B4: SB-B4 Runoff Area=26,561 sf 100.00% Impervious Runoff Depth=3.20"
Flow Length=51' Slope=0.0200 '/' Tc=6.0 min CN=98 Runoff=2.03 cfs 7,076 cf

Pond IB-1: IB-1 Peak Elev=245.73' Storage=15,609 cf Inflow=10.07 cfs 42,289 cf
Discarded=0.29 cfs 22,701 cf Primary=3.75 cfs 19,588 cf Secondary=0.00 cfs 0 cf Outflow=4.04 cfs 42,289 cf

Pond IB-2: IB-2 Peak Elev=242.33' Storage=29,434 cf Inflow=11.05 cfs 63,361 cf
cfs 39,067 cf Primary=2.20 cfs 16,402 cf Secondary=0.00 cfs 0 cf Tertiary=0.60 cfs 7,893 cf Outflow=3.21 cfs 63,362 cf

Link A: A Inflow=7.07 cfs 49,815 cf
Primary=7.07 cfs 49,815 cf

Link B: B Inflow=2.42 cfs 22,412 cf
Primary=2.42 cfs 22,412 cf

Total Runoff Area = 1,033,418 sf Runoff Volume = 133,994 cf Average Runoff Depth = 1.56"
75.42% Pervious = 779,369 sf 24.58% Impervious = 254,049 sf

Summary for Subcatchment A1: SUB-A1

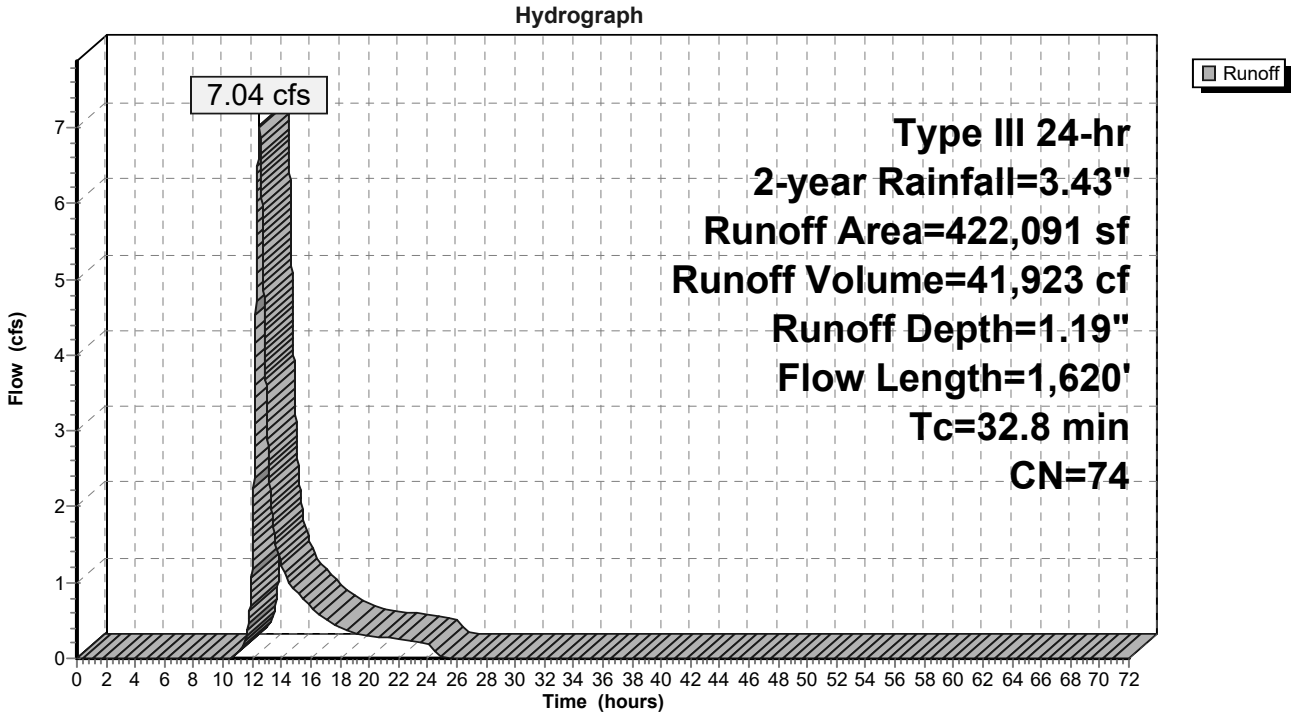
Runoff = 7.04 cfs @ 12.50 hrs, Volume= 41,923 cf, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.43"

	Area (sf)	CN	Description
	127,217	74	>75% Grass cover, Good, HSG C
	211,698	70	Woods, Good, HSG C
*	24,606	98	Impervious Area
	716	96	Gravel surface, HSG C
	57,854	77	Woods, Good, HSG D
	422,091	74	Weighted Average
	397,485		94.17% Pervious Area
	24,606		5.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.43"
19.4	1,010	0.0300	0.87		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
1.5	560	0.0200	6.38	76.61	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.035 Earth, dense weeds
32.8	1,620	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

[47] Hint: Peak is 247% of capacity of segment #6

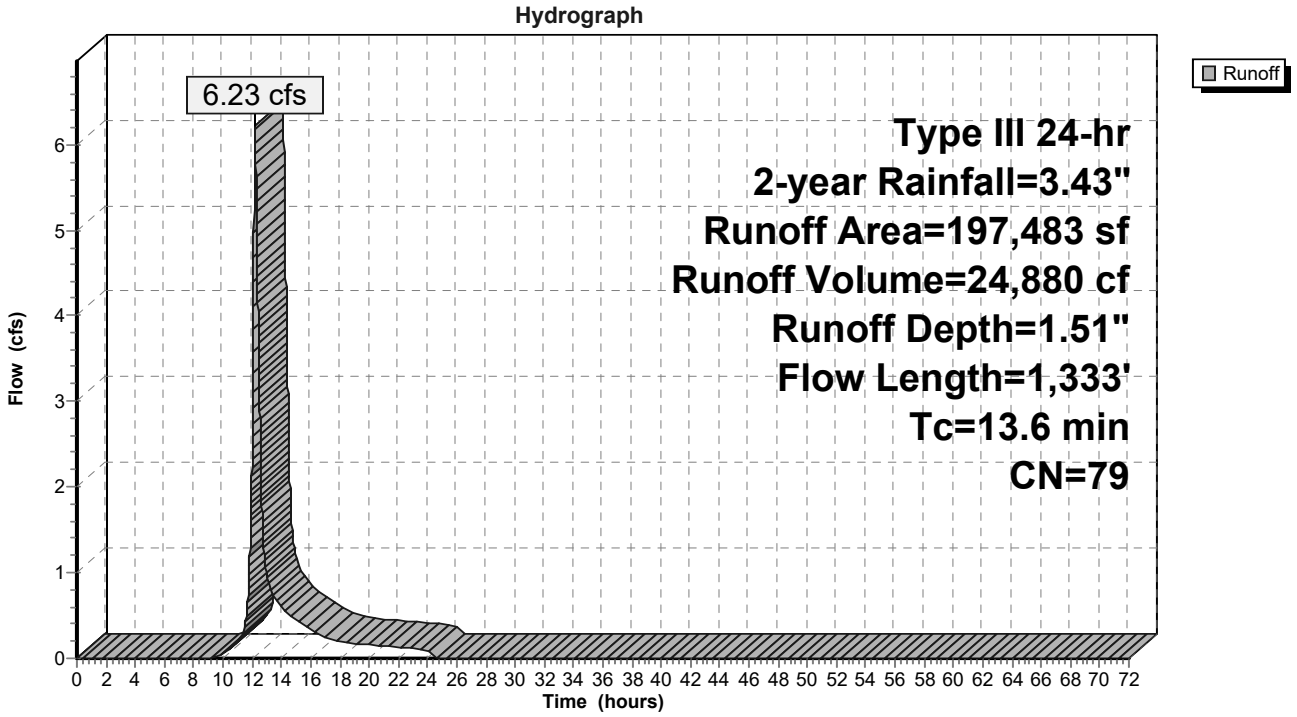
Runoff = 6.23 cfs @ 12.19 hrs, Volume= 24,880 cf, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.43"

	Area (sf)	CN	Description
	83,784	74	>75% Grass cover, Good, HSG C
	52,545	70	Woods, Good, HSG C
*	44,663	98	Impervious Area
	1,148	96	Gravel surface, HSG C
*	3,703	98	Infiltration Basin Floor
	11,640	77	Woods, Good, HSG D
	197,483	79	Weighted Average
	149,117		75.51% Pervious Area
	48,366		24.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
2.9	208	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	77	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	141	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	835	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
13.6	1,333	Total			

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

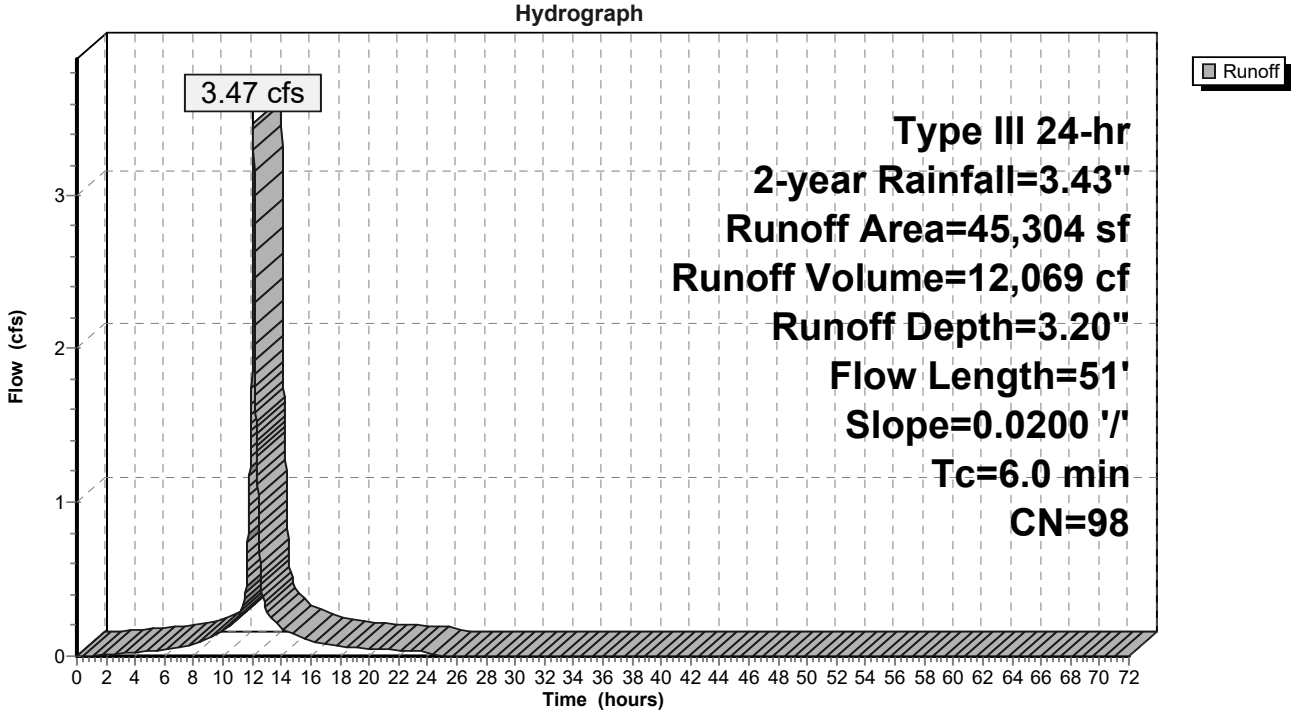
Runoff = 3.47 cfs @ 12.08 hrs, Volume= 12,069 cf, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.43"

	Area (sf)	CN	Description
*	45,304	98	Impervious Area
	45,304		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
0.0	1	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	51	Total, Increased to minimum Tc = 6.0 min			

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

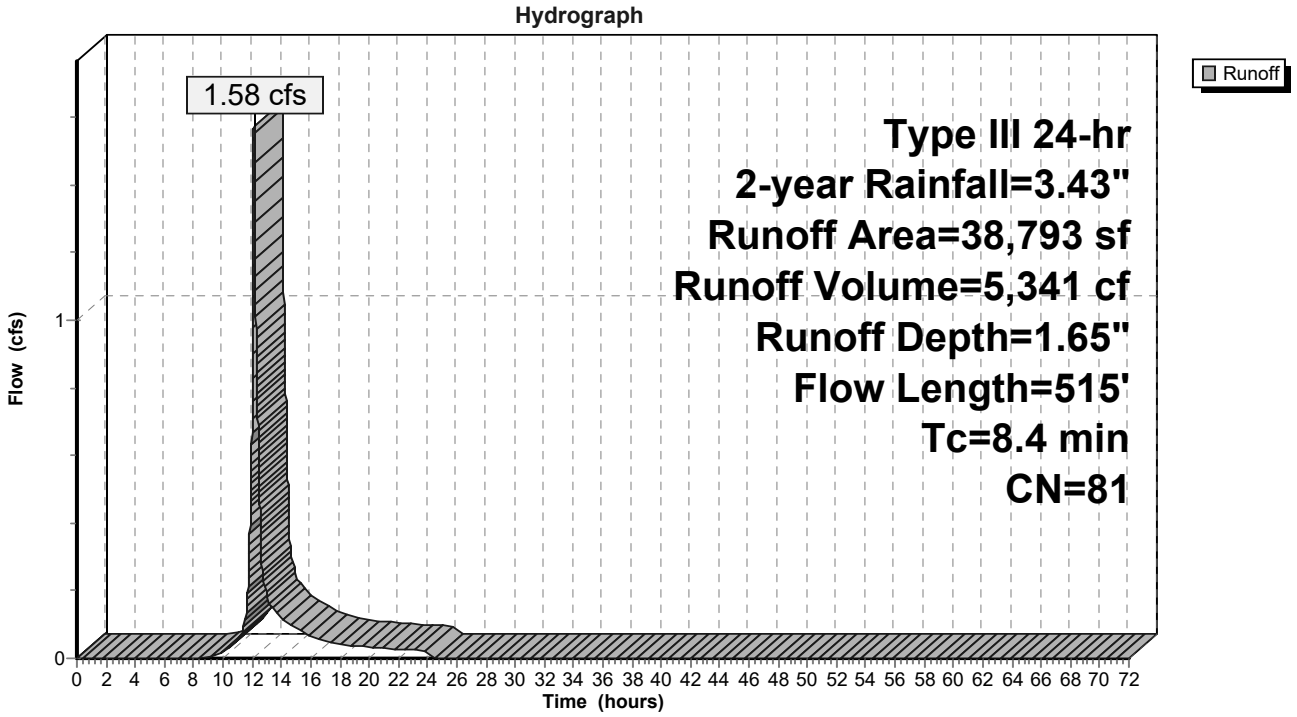
Runoff = 1.58 cfs @ 12.12 hrs, Volume= 5,341 cf, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.43"

	Area (sf)	CN	Description
	27,860	74	>75% Grass cover, Good, HSG C
*	10,933	98	Impervious Area
	38,793	81	Weighted Average
	27,860		71.82% Pervious Area
	10,933		28.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
0.0	8	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	70	0.0294	1.20		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	57	0.0221	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	330	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
8.4	515	Total			

Subcatchment A4: SUB-A4



Summary for Subcatchment B1: SUB-B1

[47] Hint: Peak is 262% of capacity of segment #5

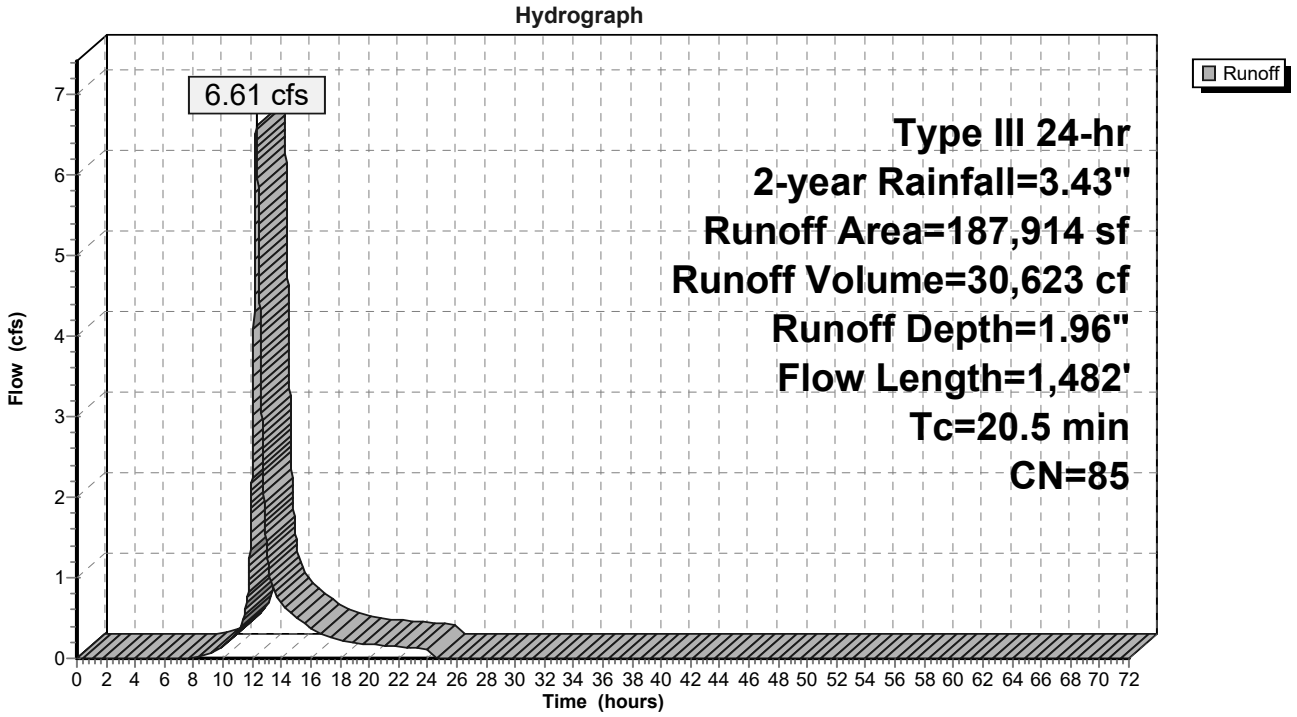
Runoff = 6.61 cfs @ 12.28 hrs, Volume= 30,623 cf, Depth= 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.43"

	Area (sf)	CN	Description
	76,568	74	>75% Grass cover, Good, HSG C
	23,764	70	Woods, Good, HSG C
*	81,637	98	Impervious Area
*	5,945	98	Infiltration Basin Floor
	187,914	85	Weighted Average
	100,332		53.39% Pervious Area
	87,582		46.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	50	0.0340	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
5.1	319	0.0435	1.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	28	0.1535	2.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	102	0.0245	3.18		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.1	983	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
20.5	1,482	Total			

Subcatchment B1: SUB-B1



Summary for Subcatchment B2: SUB-B2

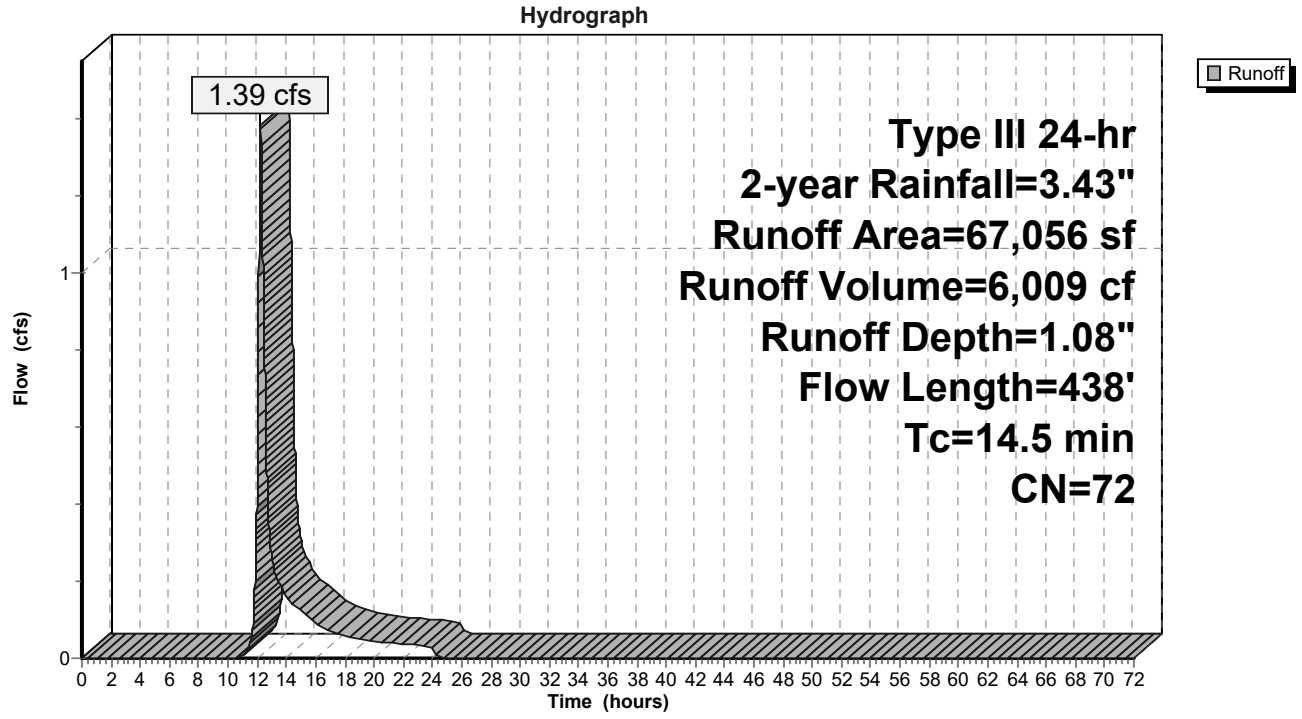
Runoff = 1.39 cfs @ 12.22 hrs, Volume= 6,009 cf, Depth= 1.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.43"

Area (sf)	CN	Description
29,339	74	>75% Grass cover, Good, HSG C
37,717	70	Woods, Good, HSG C
67,056	72	Weighted Average
67,056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
6.2	388	0.0438	1.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.5	438	Total			

Subcatchment B2: SUB-B2



Summary for Subcatchment B3: SUB-B3

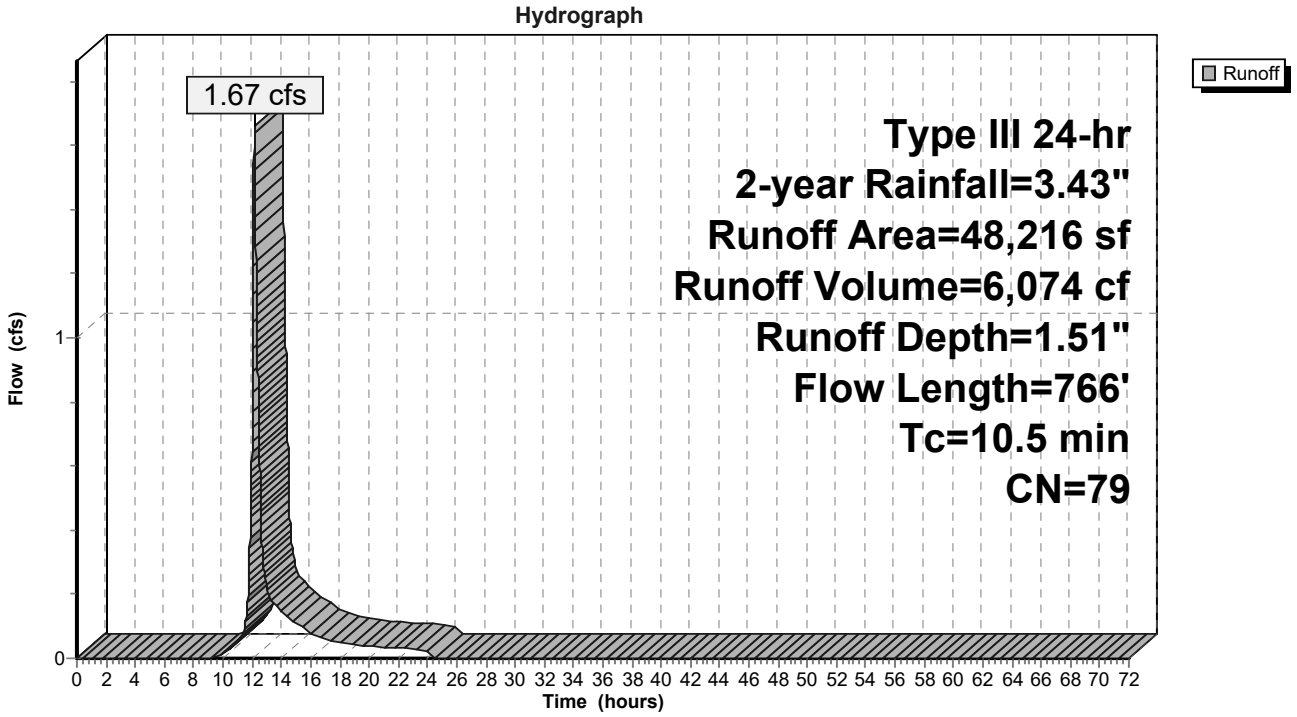
Runoff = 1.67 cfs @ 12.15 hrs, Volume= 6,074 cf, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.43"

	Area (sf)	CN	Description
	37,519	74	>75% Grass cover, Good, HSG C
*	10,697	98	Impervious Area
	48,216	79	Weighted Average
	37,519		77.81% Pervious Area
	10,697		22.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
0.6	40	0.0275	1.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	7	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	89	0.0202	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.0	580	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
10.5	766	Total			

Subcatchment B3: SUB-B3



Summary for Subcatchment B4: SB-B4

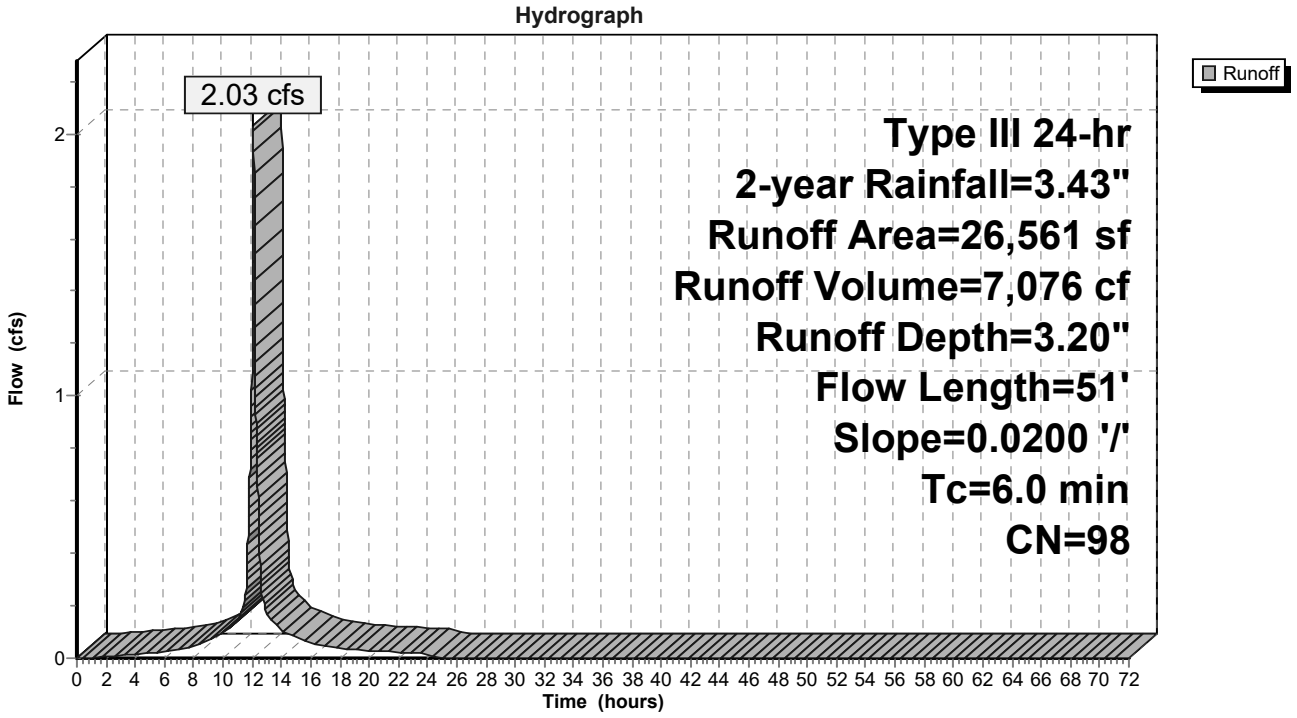
Runoff = 2.03 cfs @ 12.08 hrs, Volume= 7,076 cf, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.43"

	Area (sf)	CN	Description
*	26,561	98	Impervious Area
	26,561		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
0.0	1	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	51	Total, Increased to minimum Tc = 6.0 min			

Subcatchment B4: SB-B4



Summary for Pond IB-1: IB-1

Inflow Area = 281,580 sf, 37.15% Impervious, Inflow Depth = 1.80" for 2-year event
Inflow = 10.07 cfs @ 12.14 hrs, Volume= 42,289 cf
Outflow = 4.04 cfs @ 12.52 hrs, Volume= 42,289 cf, Atten= 60%, Lag= 22.7 min
Discarded = 0.29 cfs @ 12.52 hrs, Volume= 22,701 cf
Primary = 3.75 cfs @ 12.52 hrs, Volume= 19,588 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 245.73' @ 12.52 hrs Surf.Area= 12,248 sf Storage= 15,609 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 245.7 min (1,066.7 - 821.1)

Volume	Invert	Avail.Storage	Storage Description
#1	244.00'	44,476 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
244.00	3,703	0	0	3,703
245.00	11,077	7,062	7,062	11,083
246.00	12,689	11,874	18,935	12,740
247.00	14,351	13,511	32,447	14,453
247.80	15,732	12,029	44,476	15,877

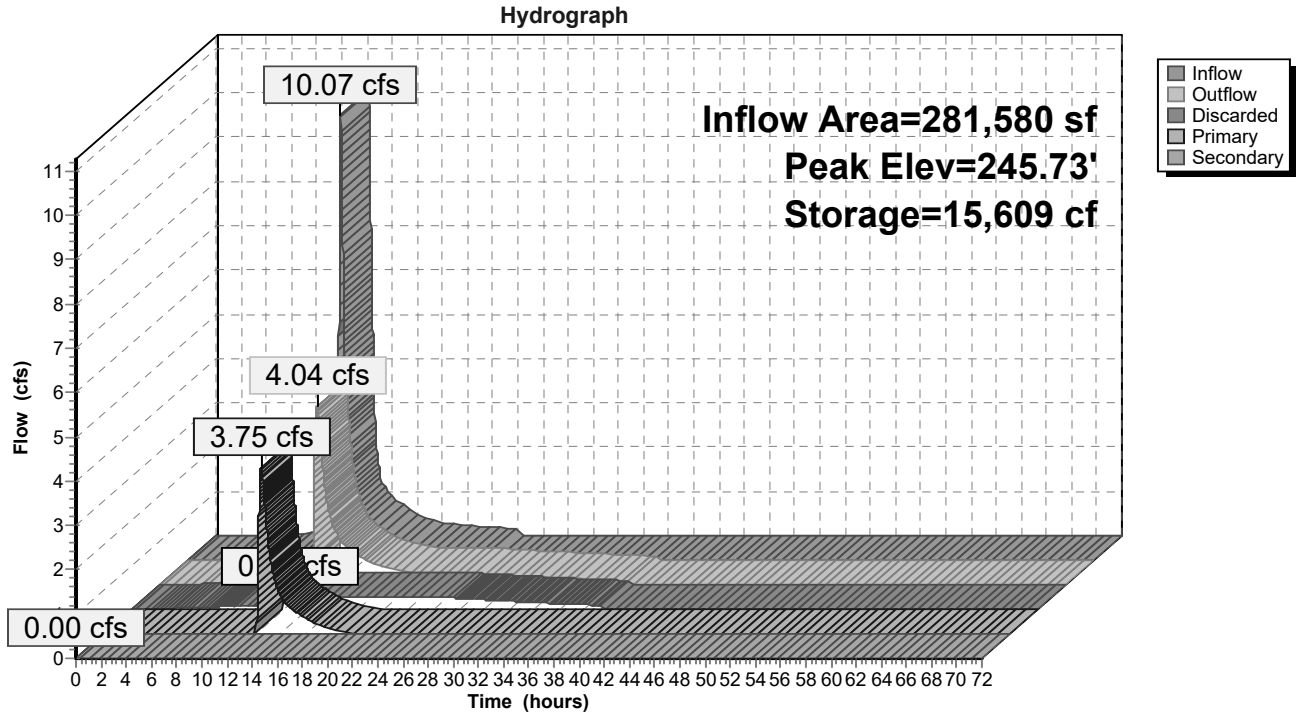
Device	Routing	Invert	Outlet Devices
#1	Secondary	246.80'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	244.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 4	246.20'	**48.0" x 48.0" Horiz. Orifice/Grate (OCS-1)** C= 0.600 Limited to weir flow at low heads
#4	Primary	241.38'	**24.0" Round Culvert (OCS-1)** L= 76.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 241.38' / 241.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#5	Device 4	245.20'	**36.0" W x 12.0" H Vert. Orifice/Grate (OCS-1)** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.29 cfs @ 12.52 hrs HW=245.73' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=3.75 cfs @ 12.52 hrs HW=245.73' TW=241.87' (Dynamic Tailwater)
└**4=Culvert (OCS-1)** (Passes 3.75 cfs of 26.64 cfs potential flow)
  └**3=Orifice/Grate (OCS-1)** (Controls 0.00 cfs)
  └**5=Orifice/Grate (OCS-1)** (Orifice Controls 3.75 cfs @ 2.34 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=244.00' TW=240.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: IB-1


Hydrograph
10.07 cfs
4.04 cfs
3.75 cfs
0.00 cfs
Inflow Area=281,580 sf
Peak Elev=245.73'
Storage=15,609 cf
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Pond IB-2: IB-2

Inflow Area = 544,271 sf, 42.16% Impervious, Inflow Depth = 1.40" for 2-year event
Inflow = 11.05 cfs @ 12.32 hrs, Volume= 63,361 cf
Outflow = 3.21 cfs @ 13.17 hrs, Volume= 63,362 cf, Atten= 71%, Lag= 51.0 min
Discarded = 0.41 cfs @ 13.17 hrs, Volume= 39,067 cf
Primary = 2.20 cfs @ 13.17 hrs, Volume= 16,402 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Tertiary = 0.60 cfs @ 13.17 hrs, Volume= 7,893 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 242.33' @ 13.17 hrs Surf.Area= 17,465 sf Storage= 29,434 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 433.4 min (1,257.6 - 824.2)

Volume	Invert	Avail.Storage	Storage Description
#1	240.00'	103,342 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
240.00	5,945	0	0	5,945
241.00	12,658	9,093	9,093	12,666
242.00	16,770	14,666	23,758	16,801
243.00	18,908	17,828	41,587	18,990
244.00	21,137	20,012	61,599	21,275
245.00	23,418	22,268	83,867	23,617
245.80	25,283	19,476	103,342	25,533

Device	Routing	Invert	Outlet Devices
#1	Secondary	244.80'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	240.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 5	242.00'	**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
#4	Device 5	243.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	241.28'	**24.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 241.28' / 241.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#6	Device 8	244.30'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 8	241.60'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.50 Width (feet) 0.00 1.50
#8	Tertiary	238.25'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 238.25' / 238.00' S= 0.0050 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

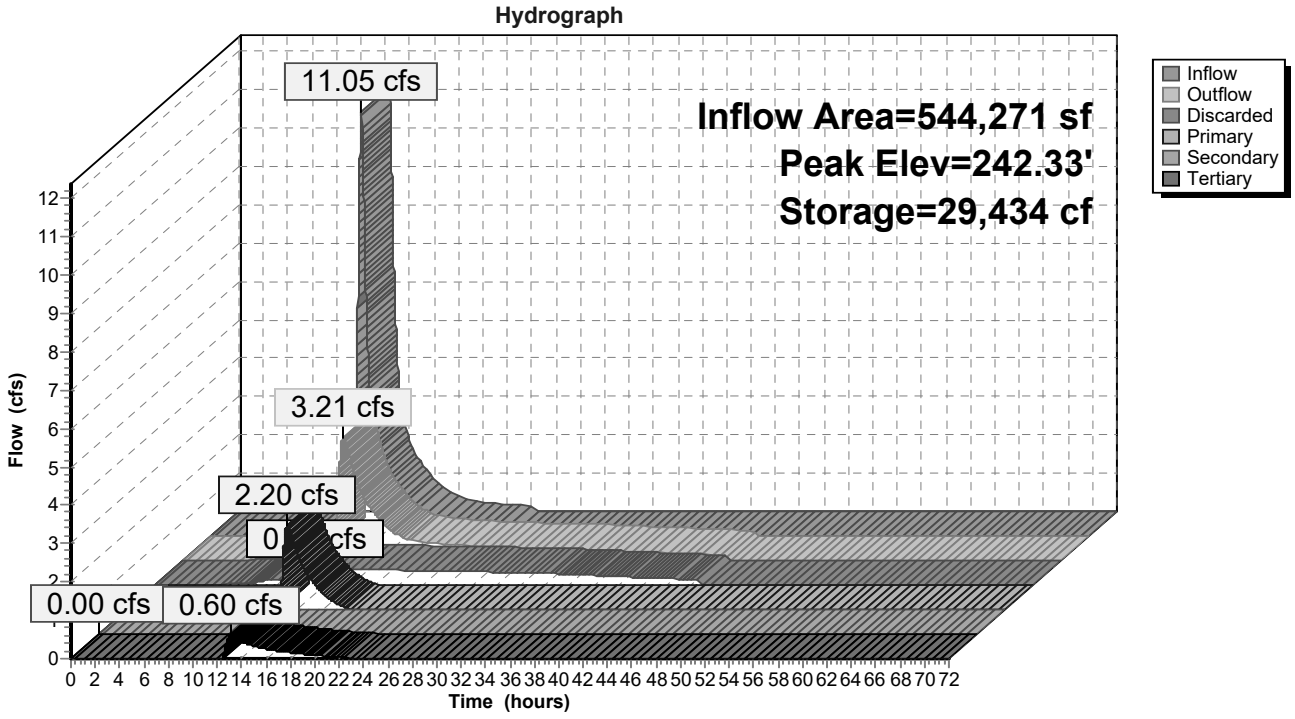
Discarded OutFlow Max=0.41 cfs @ 13.17 hrs HW=242.33' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.41 cfs)

Primary OutFlow Max=2.20 cfs @ 13.17 hrs HW=242.33' TW=0.00' (Dynamic Tailwater)
└**5=Culvert** (Passes 2.20 cfs of 4.23 cfs potential flow)
  ├**3=Broad-Crested Rectangular Weir** (Weir Controls 2.20 cfs @ 1.66 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=240.00' TW=0.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.60 cfs @ 13.17 hrs HW=242.33' TW=0.00' (Dynamic Tailwater)
└**8=Culvert** (Passes 0.60 cfs of 6.57 cfs potential flow)
  ├**6=Orifice/Grate** (Controls 0.00 cfs)
  └**7=Custom Weir/Orifice** (Weir Controls 0.60 cfs @ 2.24 fps)

Pond IB-2: IB-2

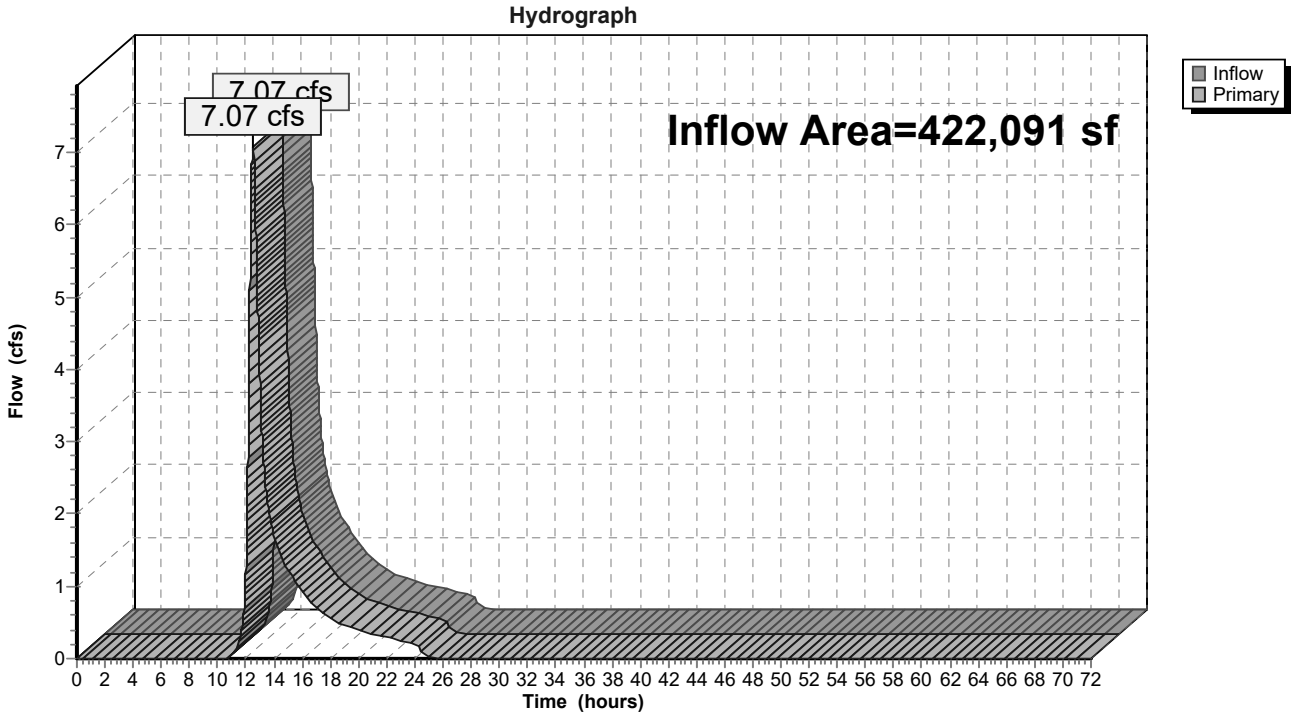


Summary for Link A: A

Inflow Area = 422,091 sf, 5.83% Impervious, Inflow Depth = 1.42" for 2-year event
Inflow = 7.07 cfs @ 12.50 hrs, Volume= 49,815 cf
Primary = 7.07 cfs @ 12.50 hrs, Volume= 49,815 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A

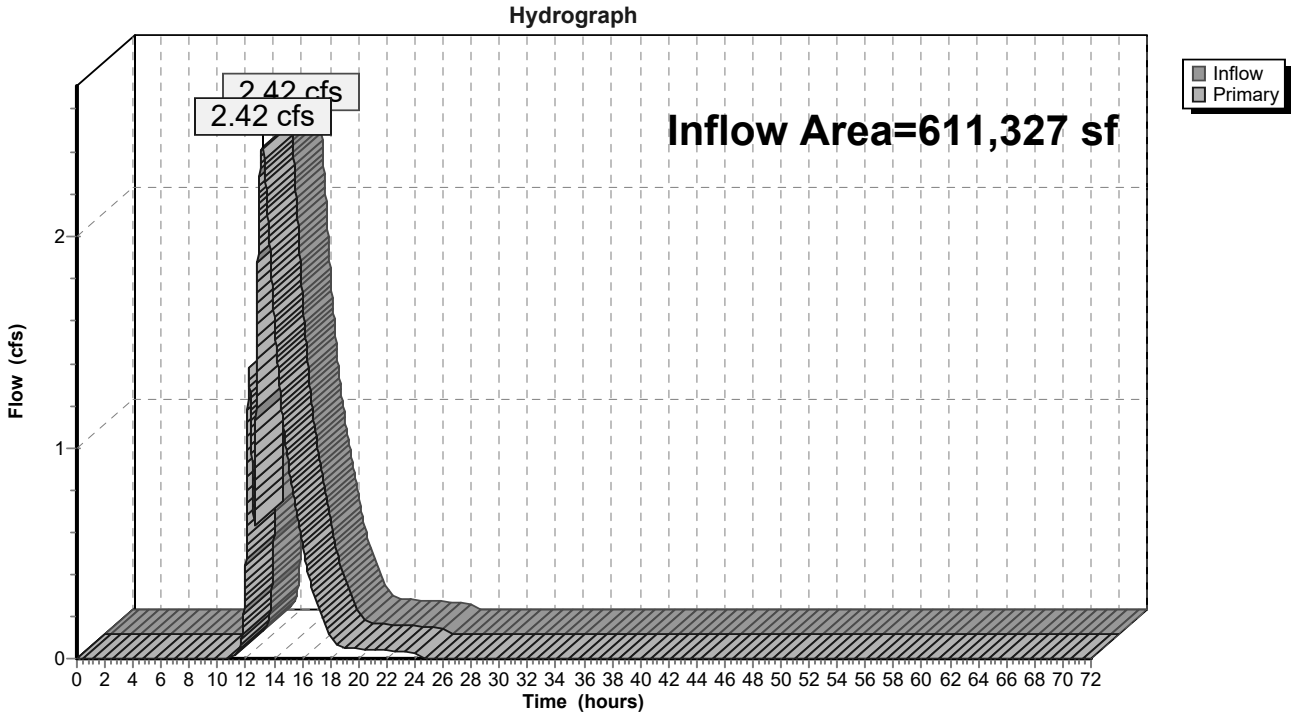


Summary for Link B: B

Inflow Area = 611,327 sf, 37.53% Impervious, Inflow Depth = 0.44" for 2-year event
Inflow = 2.42 cfs @ 13.15 hrs, Volume= 22,412 cf
Primary = 2.42 cfs @ 13.15 hrs, Volume= 22,412 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: B



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: SUB-A1 Runoff Area=422,091 sf 5.83% Impervious Runoff Depth=2.56"
Flow Length=1,620' Tc=32.8 min CN=74 Runoff=15.67 cfs 89,946 cf

Subcatchment A2: SUB-A2 Runoff Area=197,483 sf 24.49% Impervious Runoff Depth=3.01"
Flow Length=1,333' Tc=13.6 min CN=79 Runoff=12.57 cfs 49,525 cf

Subcatchment A3: SUB-A3 Runoff Area=45,304 sf 100.00% Impervious Runoff Depth=5.00"
Flow Length=51' Slope=0.0200 '/' Tc=6.0 min CN=98 Runoff=5.33 cfs 18,887 cf

Subcatchment A4: SUB-A4 Runoff Area=38,793 sf 28.18% Impervious Runoff Depth=3.20"
Flow Length=515' Tc=8.4 min CN=81 Runoff=3.07 cfs 10,339 cf

Subcatchment B1: SUB-B1 Runoff Area=187,914 sf 46.61% Impervious Runoff Depth=3.59"
Flow Length=1,482' Tc=20.5 min CN=85 Runoff=12.03 cfs 56,226 cf

Subcatchment B2: SUB-B2 Runoff Area=67,056 sf 0.00% Impervious Runoff Depth=2.38"
Flow Length=438' Tc=14.5 min CN=72 Runoff=3.27 cfs 13,323 cf

Subcatchment B3: SUB-B3 Runoff Area=48,216 sf 22.19% Impervious Runoff Depth=3.01"
Flow Length=766' Tc=10.5 min CN=79 Runoff=3.36 cfs 12,092 cf

Subcatchment B4: SB-B4 Runoff Area=26,561 sf 100.00% Impervious Runoff Depth=5.00"
Flow Length=51' Slope=0.0200 '/' Tc=6.0 min CN=98 Runoff=3.13 cfs 11,073 cf

Pond IB-1: IB-1 Peak Elev=246.30' Storage=22,867 cf Inflow=19.03 cfs 78,751 cf
Discarded=0.31 cfs 25,368 cf Primary=12.60 cfs 53,384 cf Secondary=0.00 cfs 0 cf Outflow=12.91 cfs 78,752 cf

Pond IB-2: IB-2 Peak Elev=243.16' Storage=44,614 cf Inflow=27.88 cfs 132,775 cf
44,090 cf Primary=11.15 cfs 65,796 cf Secondary=0.00 cfs 0 cf Tertiary=3.90 cfs 22,890 cf Outflow=15.50 cfs 132,776 cf

Link A: A Inflow=19.23 cfs 112,836 cf
Primary=19.23 cfs 112,836 cf

Link B: B Inflow=12.45 cfs 79,119 cf
Primary=12.45 cfs 79,119 cf

Total Runoff Area = 1,033,418 sf Runoff Volume = 261,411 cf Average Runoff Depth = 3.04"
75.42% Pervious = 779,369 sf 24.58% Impervious = 254,049 sf

Summary for Subcatchment A1: SUB-A1

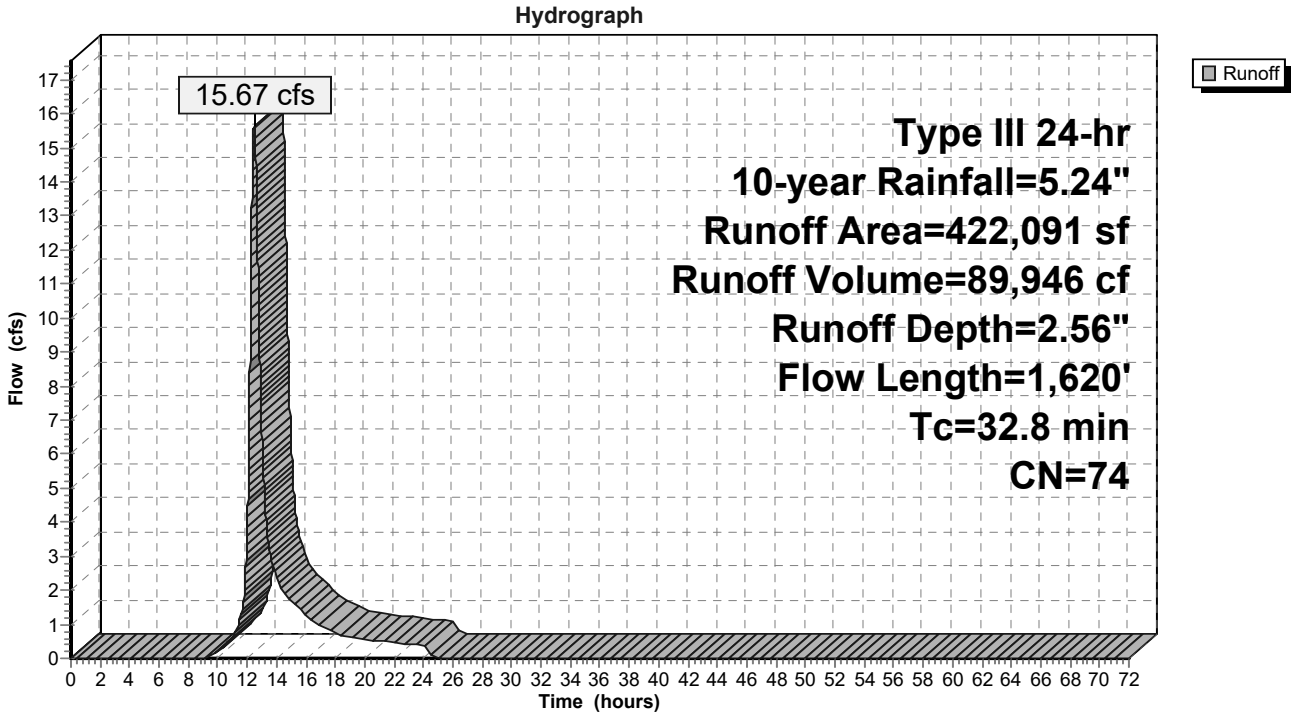
Runoff = 15.67 cfs @ 12.46 hrs, Volume= 89,946 cf, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.24"

	Area (sf)	CN	Description
	127,217	74	>75% Grass cover, Good, HSG C
	211,698	70	Woods, Good, HSG C
*	24,606	98	Impervious Area
	716	96	Gravel surface, HSG C
	57,854	77	Woods, Good, HSG D
	422,091	74	Weighted Average
	397,485		94.17% Pervious Area
	24,606		5.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.43"
19.4	1,010	0.0300	0.87		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
1.5	560	0.0200	6.38	76.61	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.035 Earth, dense weeds
32.8	1,620	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

[47] Hint: Peak is 499% of capacity of segment #6

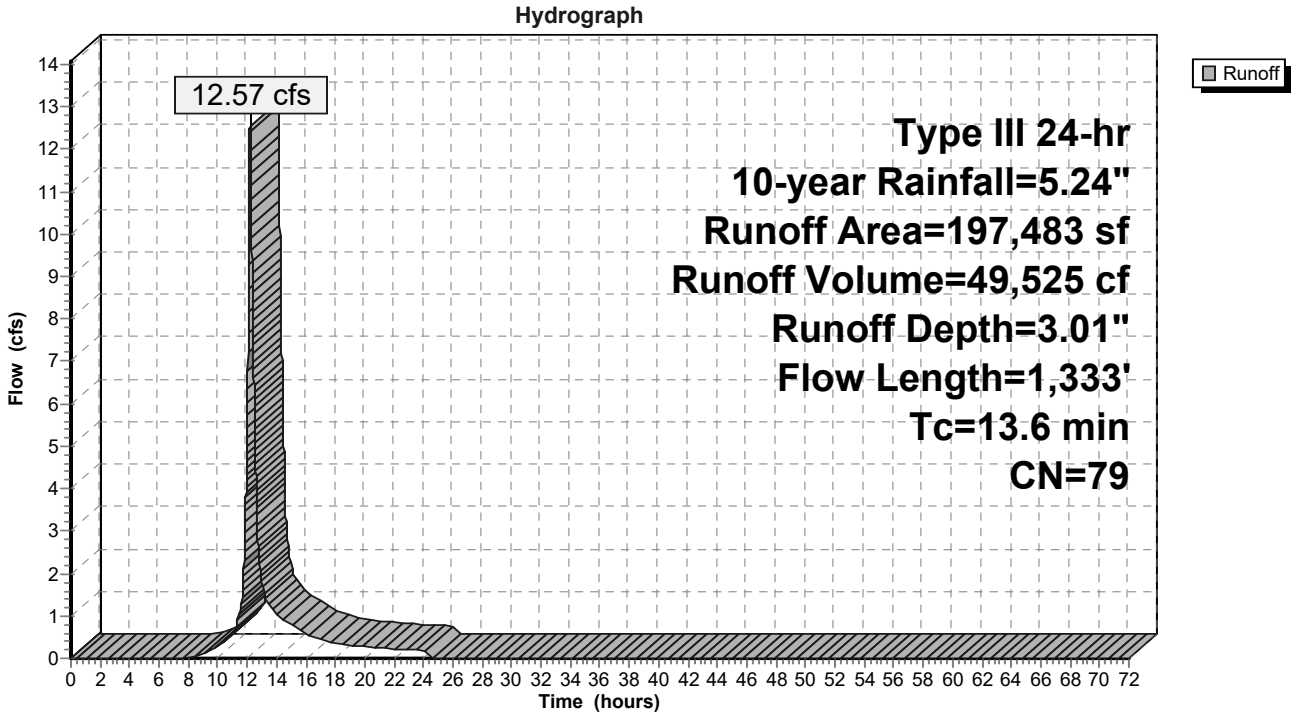
Runoff = 12.57 cfs @ 12.19 hrs, Volume= 49,525 cf, Depth= 3.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.24"

	Area (sf)	CN	Description
	83,784	74	>75% Grass cover, Good, HSG C
	52,545	70	Woods, Good, HSG C
*	44,663	98	Impervious Area
	1,148	96	Gravel surface, HSG C
*	3,703	98	Infiltration Basin Floor
	11,640	77	Woods, Good, HSG D
	197,483	79	Weighted Average
	149,117		75.51% Pervious Area
	48,366		24.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
2.9	208	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	77	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	141	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	835	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
13.6	1,333	Total			

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

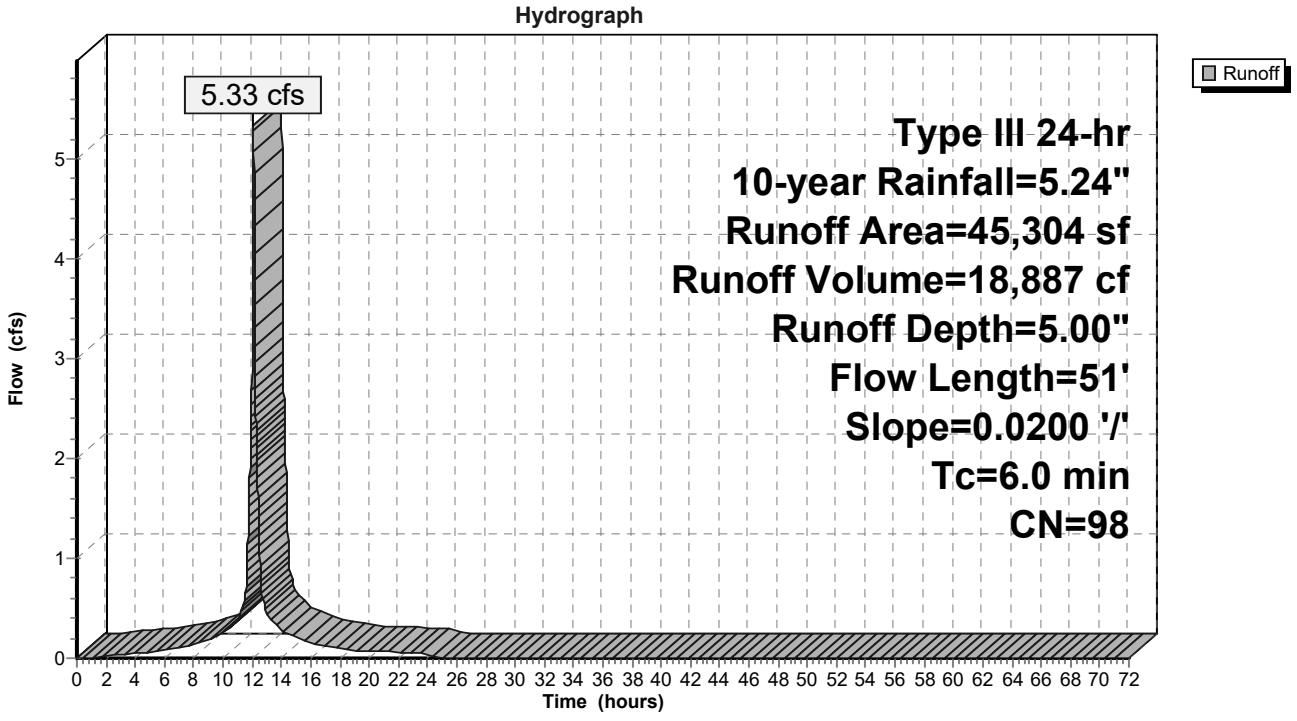
Runoff = 5.33 cfs @ 12.08 hrs, Volume= 18,887 cf, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.24"

	Area (sf)	CN	Description
*	45,304	98	Impervious Area
	45,304		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
0.0	1	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	51	Total, Increased to minimum Tc = 6.0 min			

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

[47] Hint: Peak is 122% of capacity of segment #5

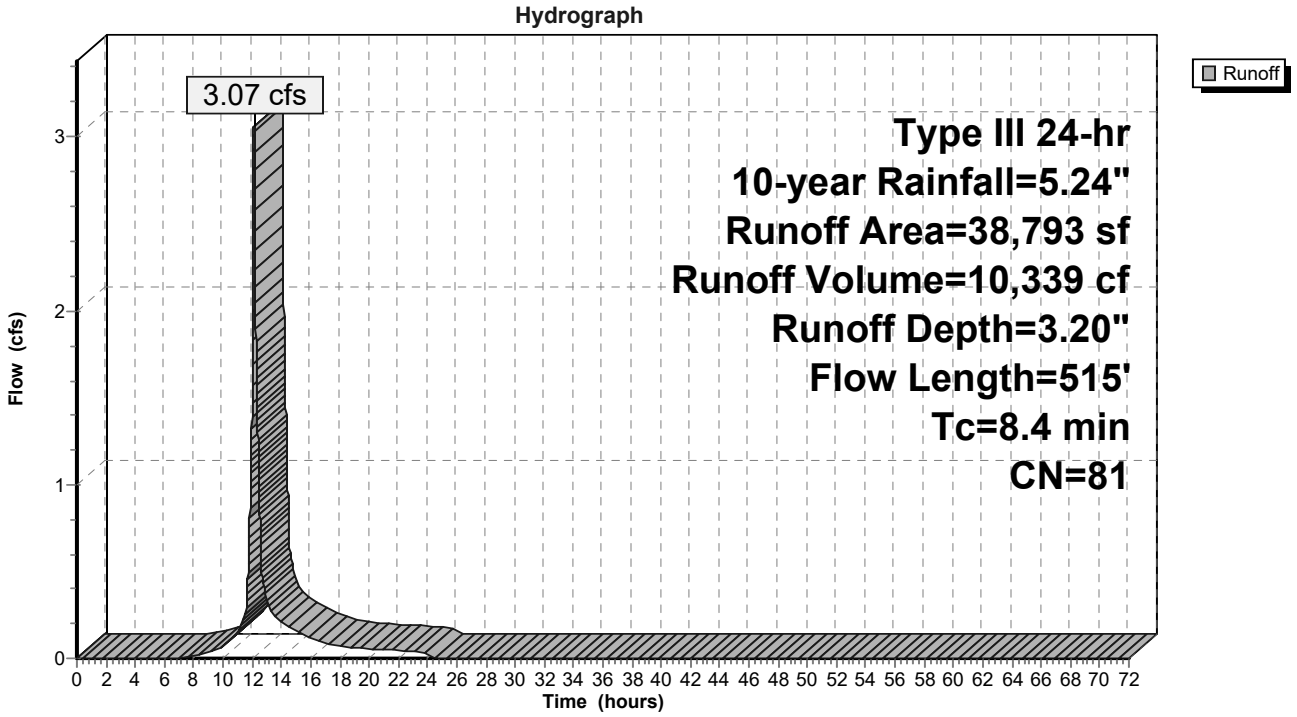
Runoff = 3.07 cfs @ 12.12 hrs, Volume= 10,339 cf, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.24"

	Area (sf)	CN	Description
	27,860	74	>75% Grass cover, Good, HSG C
*	10,933	98	Impervious Area
	38,793	81	Weighted Average
	27,860		71.82% Pervious Area
	10,933		28.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
0.0	8	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	70	0.0294	1.20		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	57	0.0221	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	330	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
8.4	515	Total			

Subcatchment A4: SUB-A4



Summary for Subcatchment B1: SUB-B1

[47] Hint: Peak is 478% of capacity of segment #5

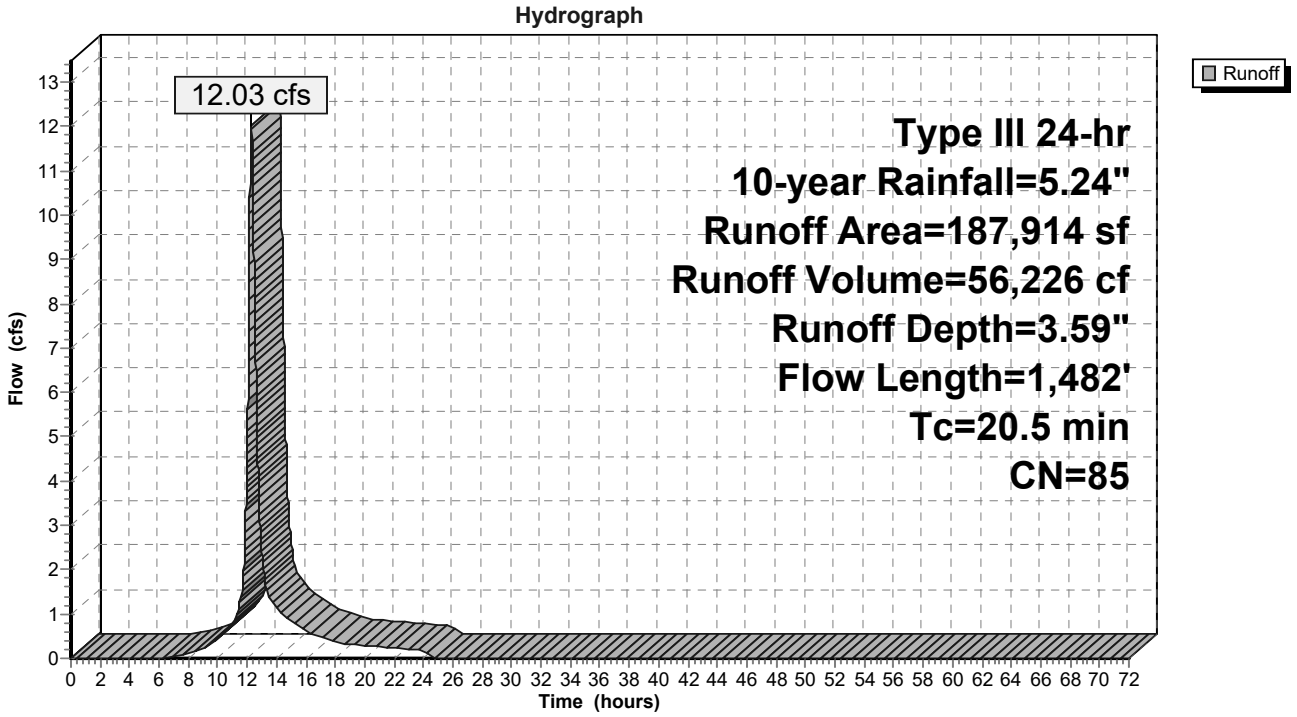
Runoff = 12.03 cfs @ 12.28 hrs, Volume= 56,226 cf, Depth= 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.24"

	Area (sf)	CN	Description
	76,568	74	>75% Grass cover, Good, HSG C
	23,764	70	Woods, Good, HSG C
*	81,637	98	Impervious Area
*	5,945	98	Infiltration Basin Floor
	187,914	85	Weighted Average
	100,332		53.39% Pervious Area
	87,582		46.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	50	0.0340	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
5.1	319	0.0435	1.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	28	0.1535	2.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	102	0.0245	3.18		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.1	983	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
20.5	1,482	Total			

Subcatchment B1: SUB-B1



Summary for Subcatchment B2: SUB-B2

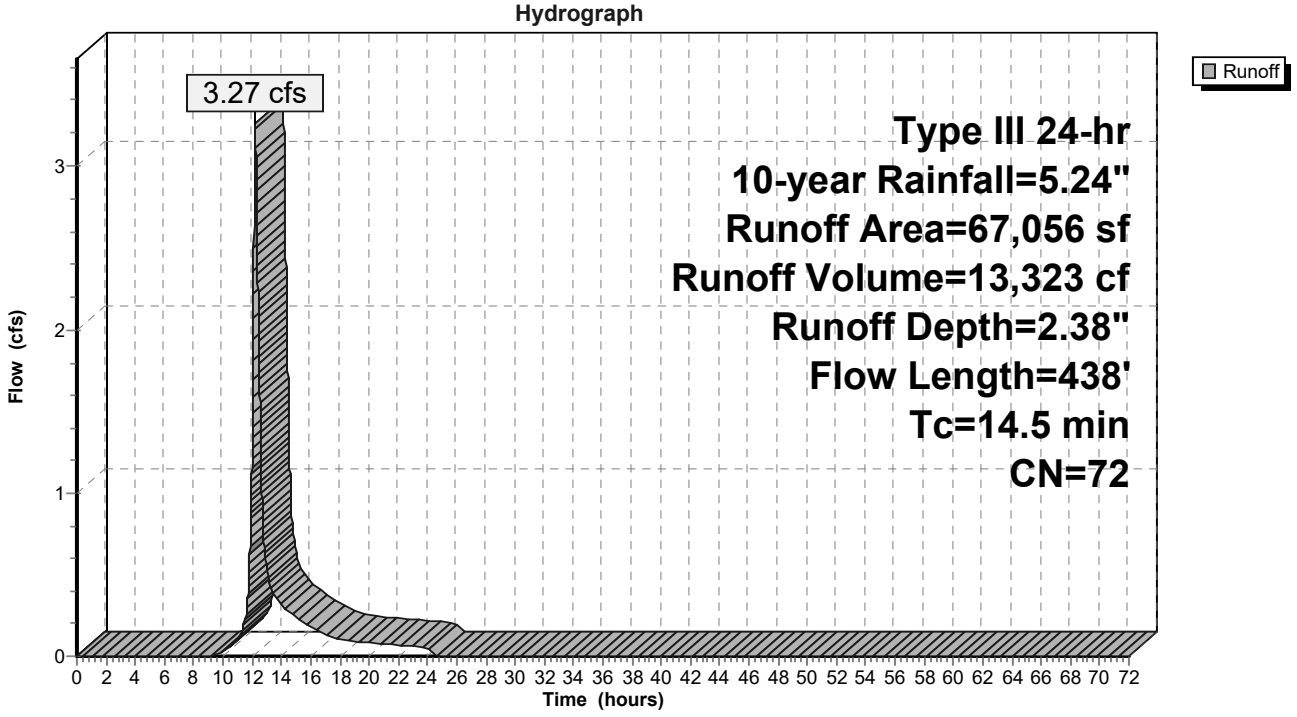
Runoff = 3.27 cfs @ 12.20 hrs, Volume= 13,323 cf, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.24"

Area (sf)	CN	Description
29,339	74	>75% Grass cover, Good, HSG C
37,717	70	Woods, Good, HSG C
67,056	72	Weighted Average
67,056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
6.2	388	0.0438	1.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.5	438	Total			

Subcatchment B2: SUB-B2



Summary for Subcatchment B3: SUB-B3

[47] Hint: Peak is 133% of capacity of segment #5

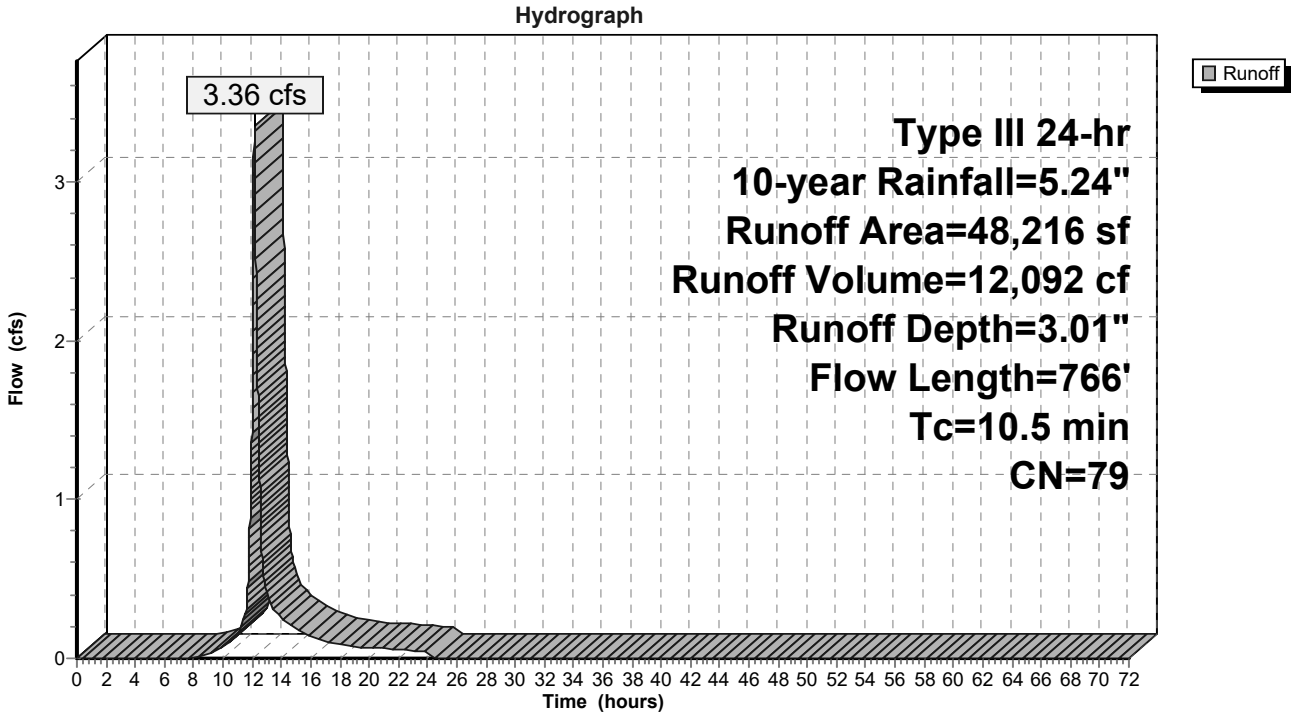
Runoff = 3.36 cfs @ 12.15 hrs, Volume= 12,092 cf, Depth= 3.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.24"

	Area (sf)	CN	Description
	37,519	74	>75% Grass cover, Good, HSG C
*	10,697	98	Impervious Area
	48,216	79	Weighted Average
	37,519		77.81% Pervious Area
	10,697		22.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
0.6	40	0.0275	1.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	7	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	89	0.0202	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.0	580	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
10.5	766	Total			

Subcatchment B3: SUB-B3



Summary for Subcatchment B4: SB-B4

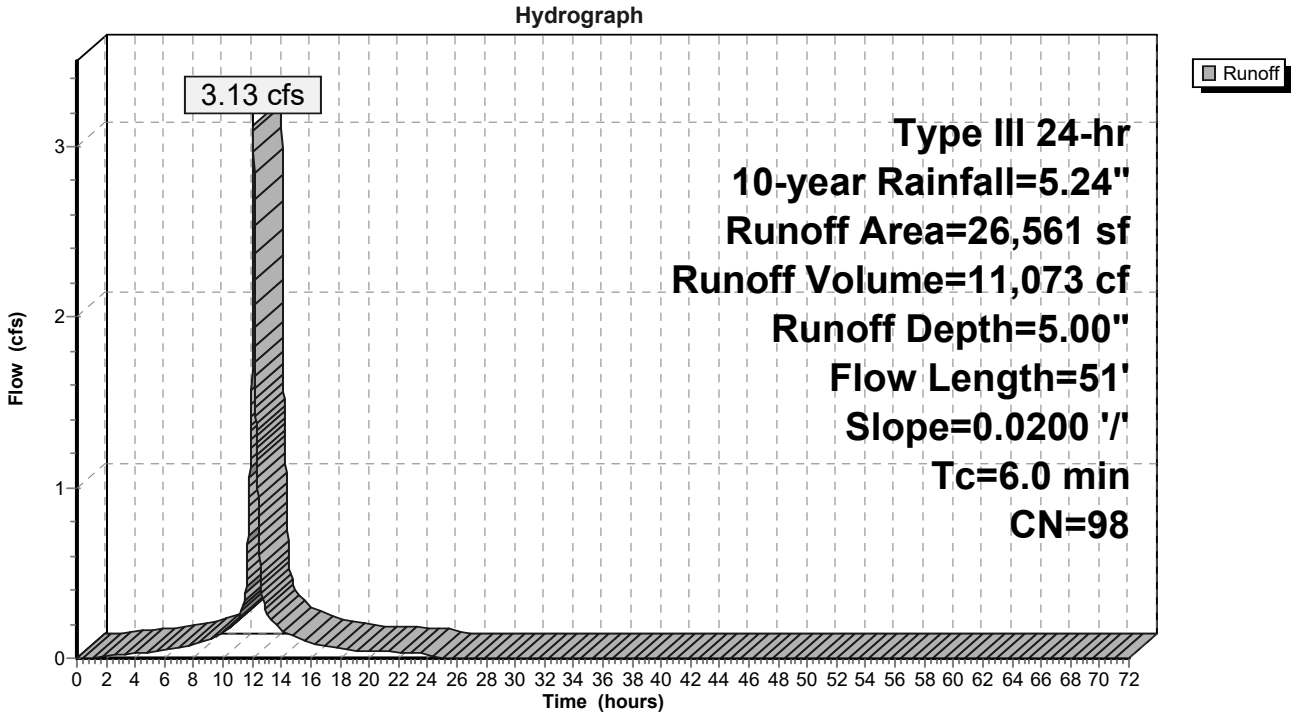
Runoff = 3.13 cfs @ 12.08 hrs, Volume= 11,073 cf, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.24"

	Area (sf)	CN	Description
*	26,561	98	Impervious Area
	26,561		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
0.0	1	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	51	Total, Increased to minimum Tc = 6.0 min			

Subcatchment B4: SB-B4



Summary for Pond IB-1: IB-1

Inflow Area = 281,580 sf, 37.15% Impervious, Inflow Depth = 3.36" for 10-year event
Inflow = 19.03 cfs @ 12.14 hrs, Volume= 78,751 cf
Outflow = 12.91 cfs @ 12.32 hrs, Volume= 78,752 cf, Atten= 32%, Lag= 10.7 min
Discarded = 0.31 cfs @ 12.32 hrs, Volume= 25,368 cf
Primary = 12.60 cfs @ 12.32 hrs, Volume= 53,384 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 246.30' @ 12.32 hrs Surf.Area= 13,183 sf Storage= 22,867 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 159.0 min (967.4 - 808.4)

Volume	Invert	Avail.Storage	Storage Description
#1	244.00'	44,476 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
244.00	3,703	0	0	3,703
245.00	11,077	7,062	7,062	11,083
246.00	12,689	11,874	18,935	12,740
247.00	14,351	13,511	32,447	14,453
247.80	15,732	12,029	44,476	15,877

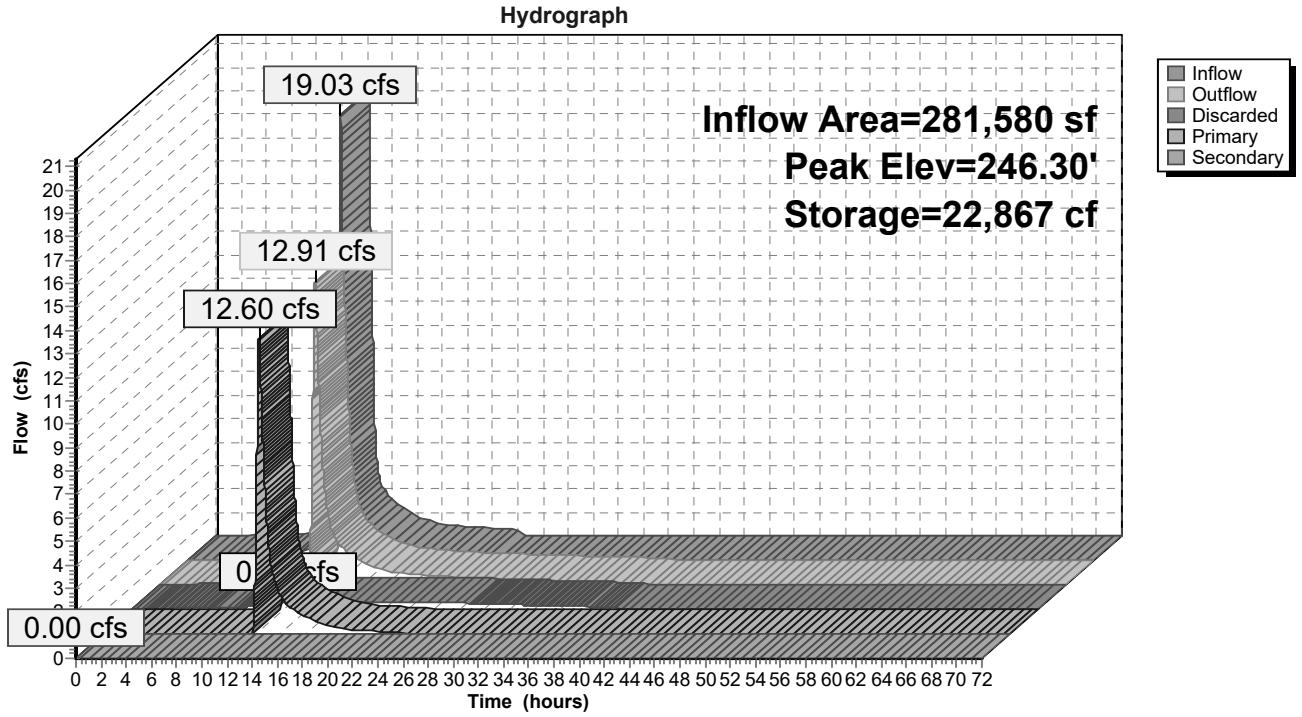
Device	Routing	Invert	Outlet Devices
#1	Secondary	246.80'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	244.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 4	246.20'	**48.0" x 48.0" Horiz. Orifice/Grate (OCS-1)** C= 0.600 Limited to weir flow at low heads
#4	Primary	241.38'	**24.0" Round Culvert (OCS-1)** L= 76.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 241.38' / 241.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#5	Device 4	245.20'	**36.0" W x 12.0" H Vert. Orifice/Grate (OCS-1)** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.31 cfs @ 12.32 hrs HW=246.30' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=12.60 cfs @ 12.32 hrs HW=246.30' TW=242.70' (Dynamic Tailwater)
└**4=Culvert (OCS-1)** (Passes 12.60 cfs of 28.72 cfs potential flow)
  ├**3=Orifice/Grate (OCS-1)** (Weir Controls 1.75 cfs @ 1.05 fps)
  └**5=Orifice/Grate (OCS-1)** (Orifice Controls 10.85 cfs @ 3.62 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=244.00' TW=240.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: IB-1


Hydrograph
19.03 cfs
12.91 cfs
12.60 cfs
0.00 cfs
Inflow Area=281,580 sf
Peak Elev=246.30'
Storage=22,867 cf
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Pond IB-2: IB-2

[95] Warning: Outlet Device #7 rise exceeded

Inflow Area = 544,271 sf, 42.16% Impervious, Inflow Depth = 2.93" for 10-year event
Inflow = 27.88 cfs @ 12.28 hrs, Volume= 132,775 cf
Outflow = 15.50 cfs @ 12.62 hrs, Volume= 132,776 cf, Atten= 44%, Lag= 20.2 min
Discarded = 0.46 cfs @ 12.62 hrs, Volume= 44,090 cf
Primary = 11.15 cfs @ 12.62 hrs, Volume= 65,796 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Tertiary = 3.90 cfs @ 12.62 hrs, Volume= 22,890 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 243.16' @ 12.62 hrs Surf.Area= 19,253 sf Storage= 44,614 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 250.3 min (1,066.1 - 815.8)

Volume	Invert	Avail.Storage	Storage Description
#1	240.00'	103,342 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
240.00	5,945	0	0	5,945
241.00	12,658	9,093	9,093	12,666
242.00	16,770	14,666	23,758	16,801
243.00	18,908	17,828	41,587	18,990
244.00	21,137	20,012	61,599	21,275
245.00	23,418	22,268	83,867	23,617
245.80	25,283	19,476	103,342	25,533

Device	Routing	Invert	Outlet Devices
#1	Secondary	244.80'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	240.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 5	242.00'	**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
#4	Device 5	243.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	241.28'	**24.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 241.28' / 241.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#6	Device 8	244.30'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 8	241.60'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.50 Width (feet) 0.00 1.50

#8 Tertiary 238.25' **12.0" Round Culvert**
L= 50.0' CPP, square edge headwall, Ke= 0.500
Inlet / Outlet Invert= 238.25' / 238.00' S= 0.0050 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

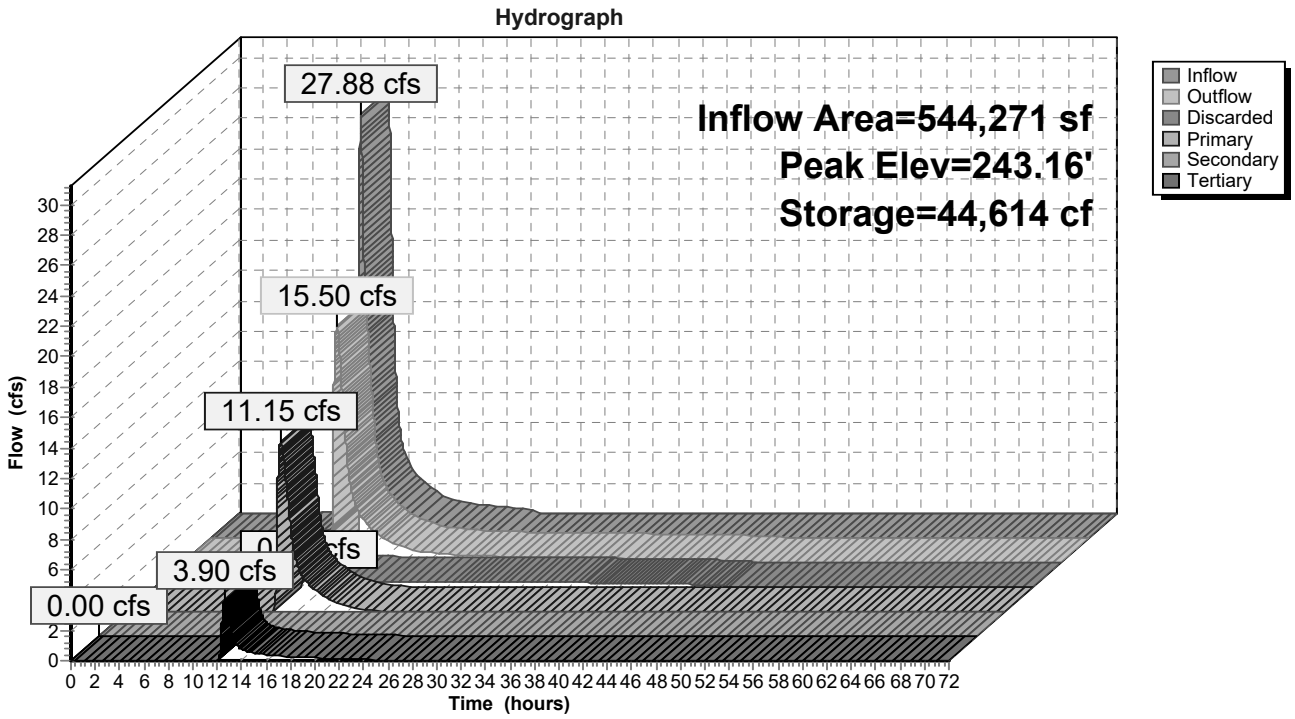
Discarded OutFlow Max=0.46 cfs @ 12.62 hrs HW=243.16' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.46 cfs)

Primary OutFlow Max=11.15 cfs @ 12.62 hrs HW=243.16' TW=0.00' (Dynamic Tailwater)
└**5=Culvert** (Barrel Controls 11.15 cfs @ 4.71 fps)
└**3=Broad-Crested Rectangular Weir** (Passes 11.15 cfs of 16.56 cfs potential flow)
└**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=240.00' TW=0.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Tertiary OutFlow Max=3.90 cfs @ 12.62 hrs HW=243.16' TW=0.00' (Dynamic Tailwater)
└**8=Culvert** (Passes 3.90 cfs of 7.34 cfs potential flow)
└**6=Orifice/Grate** (Controls 0.00 cfs)
└**7=Custom Weir/Orifice** (Orifice Controls 3.90 cfs @ 3.47 fps)

Pond IB-2: IB-2

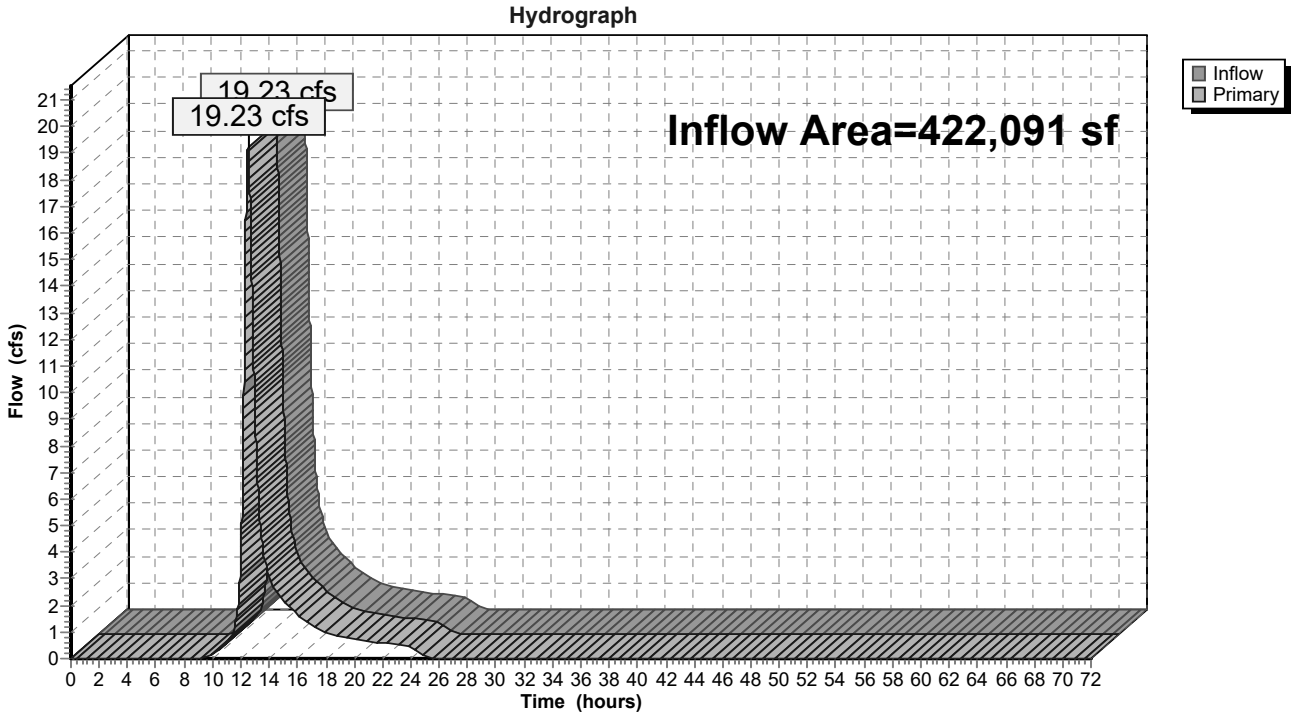


Summary for Link A: A

Inflow Area = 422,091 sf, 5.83% Impervious, Inflow Depth = 3.21" for 10-year event
Inflow = 19.23 cfs @ 12.50 hrs, Volume= 112,836 cf
Primary = 19.23 cfs @ 12.50 hrs, Volume= 112,836 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A

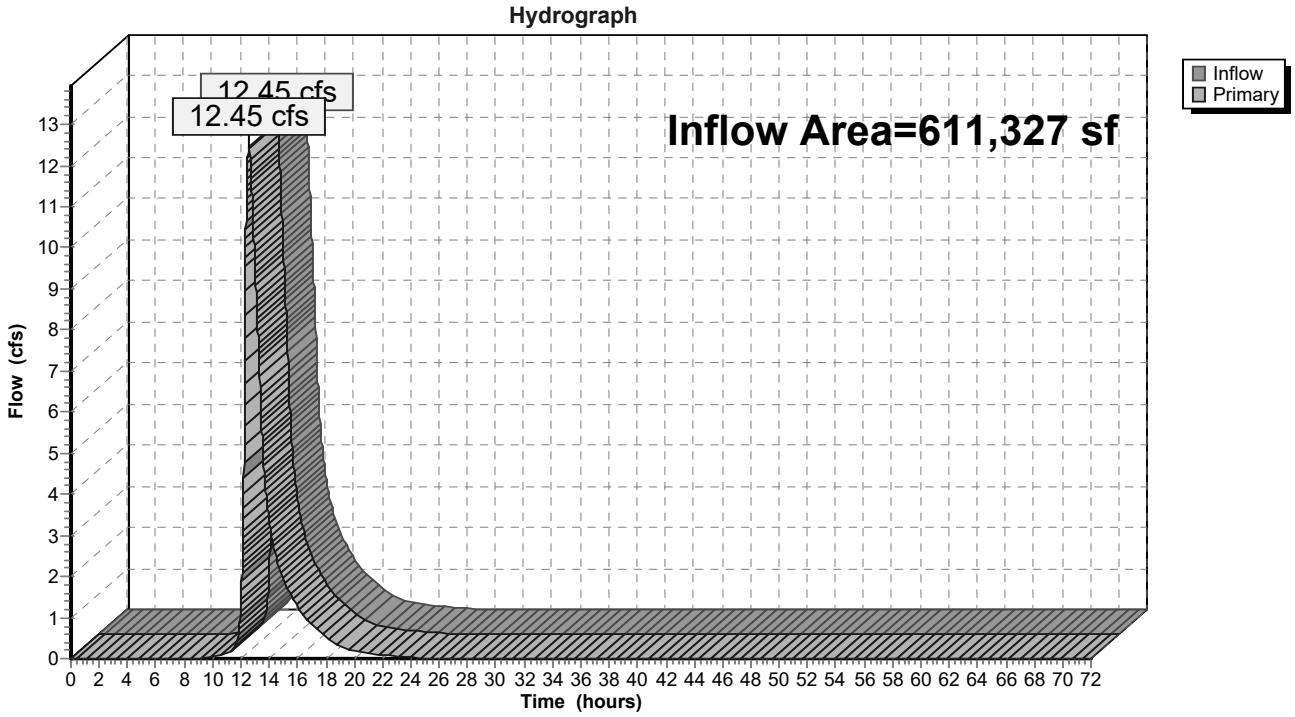


Summary for Link B: B

Inflow Area = 611,327 sf, 37.53% Impervious, Inflow Depth = 1.55" for 10-year event
Inflow = 12.45 cfs @ 12.55 hrs, Volume= 79,119 cf
Primary = 12.45 cfs @ 12.55 hrs, Volume= 79,119 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: B



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: SUB-A1 Runoff Area=422,091 sf 5.83% Impervious Runoff Depth=3.50"
Flow Length=1,620' Tc=32.8 min CN=74 Runoff=21.54 cfs 123,054 cf

Subcatchment A2: SUB-A2 Runoff Area=197,483 sf 24.49% Impervious Runoff Depth=4.01"
Flow Length=1,333' Tc=13.6 min CN=79 Runoff=16.71 cfs 66,021 cf

Subcatchment A3: SUB-A3 Runoff Area=45,304 sf 100.00% Impervious Runoff Depth=6.13"
Flow Length=51' Slope=0.0200 '/' Tc=6.0 min CN=98 Runoff=6.50 cfs 23,148 cf

Subcatchment A4: SUB-A4 Runoff Area=38,793 sf 28.18% Impervious Runoff Depth=4.22"
Flow Length=515' Tc=8.4 min CN=81 Runoff=4.03 cfs 13,650 cf

Subcatchment B1: SUB-B1 Runoff Area=187,914 sf 46.61% Impervious Runoff Depth=4.65"
Flow Length=1,482' Tc=20.5 min CN=85 Runoff=15.45 cfs 72,857 cf

Subcatchment B2: SUB-B2 Runoff Area=67,056 sf 0.00% Impervious Runoff Depth=3.30"
Flow Length=438' Tc=14.5 min CN=72 Runoff=4.56 cfs 18,432 cf

Subcatchment B3: SUB-B3 Runoff Area=48,216 sf 22.19% Impervious Runoff Depth=4.01"
Flow Length=766' Tc=10.5 min CN=79 Runoff=4.46 cfs 16,119 cf

Subcatchment B4: SB-B4 Runoff Area=26,561 sf 100.00% Impervious Runoff Depth=6.13"
Flow Length=51' Slope=0.0200 '/' Tc=6.0 min CN=98 Runoff=3.81 cfs 13,572 cf

Pond IB-1: IB-1 Peak Elev=246.48' Storage=25,178 cf Inflow=24.85 cfs 102,820 cf
Discarded=0.32 cfs 26,408 cf Primary=20.14 cfs 76,412 cf Secondary=0.00 cfs 0 cf Outflow=20.46 cfs 102,821 cf

Pond IB-2: IB-2 Peak Elev=243.76' Storage=56,623 cf Inflow=40.50 cfs 178,960 cf
46,157 cf Primary=15.97 cfs 98,064 cf Secondary=0.00 cfs 0 cf Tertiary=5.89 cfs 34,741 cf Outflow=22.35 cfs 178,962 cf

Link A: A Inflow=27.31 cfs 157,795 cf
Primary=27.31 cfs 157,795 cf

Link B: B Inflow=18.23 cfs 116,496 cf
Primary=18.23 cfs 116,496 cf

Total Runoff Area = 1,033,418 sf Runoff Volume = 346,853 cf Average Runoff Depth = 4.03"
75.42% Pervious = 779,369 sf 24.58% Impervious = 254,049 sf

Summary for Subcatchment A1: SUB-A1

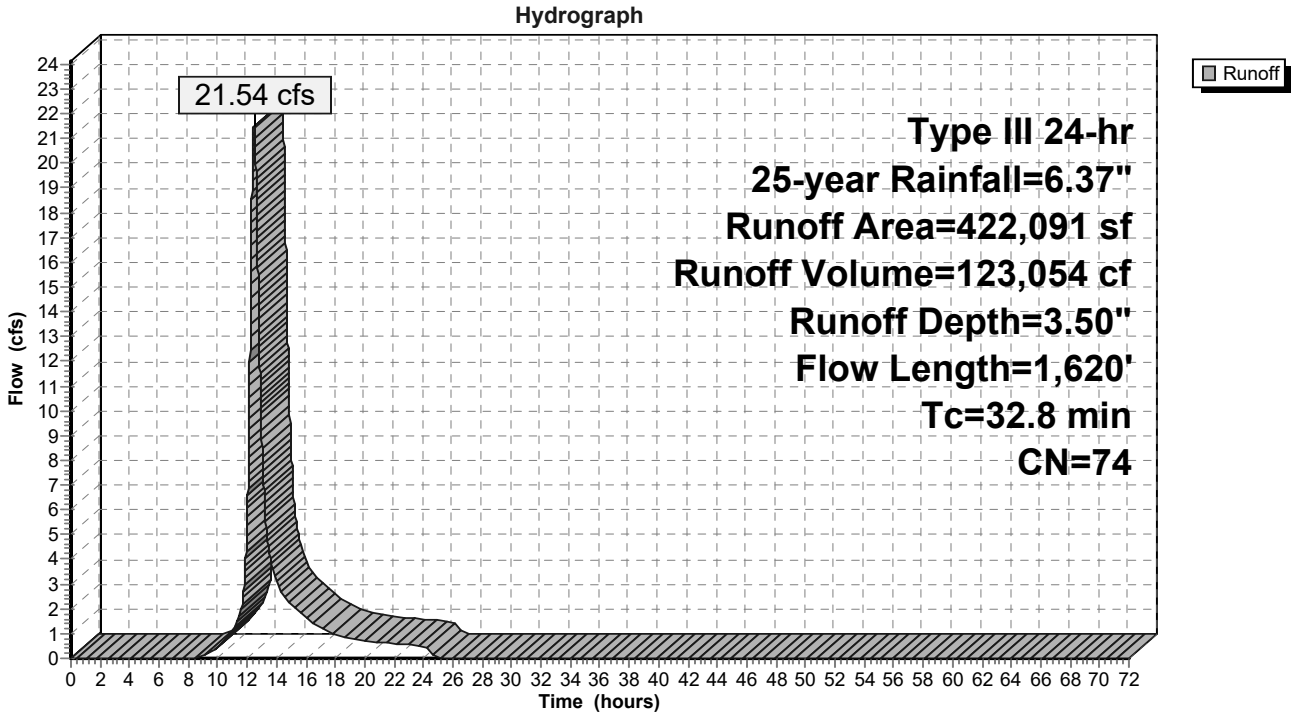
Runoff = 21.54 cfs @ 12.46 hrs, Volume= 123,054 cf, Depth= 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.37"

	Area (sf)	CN	Description
	127,217	74	>75% Grass cover, Good, HSG C
	211,698	70	Woods, Good, HSG C
*	24,606	98	Impervious Area
	716	96	Gravel surface, HSG C
	57,854	77	Woods, Good, HSG D
	422,091	74	Weighted Average
	397,485		94.17% Pervious Area
	24,606		5.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.43"
19.4	1,010	0.0300	0.87		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
1.5	560	0.0200	6.38	76.61	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.035 Earth, dense weeds
32.8	1,620	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

[47] Hint: Peak is 663% of capacity of segment #6

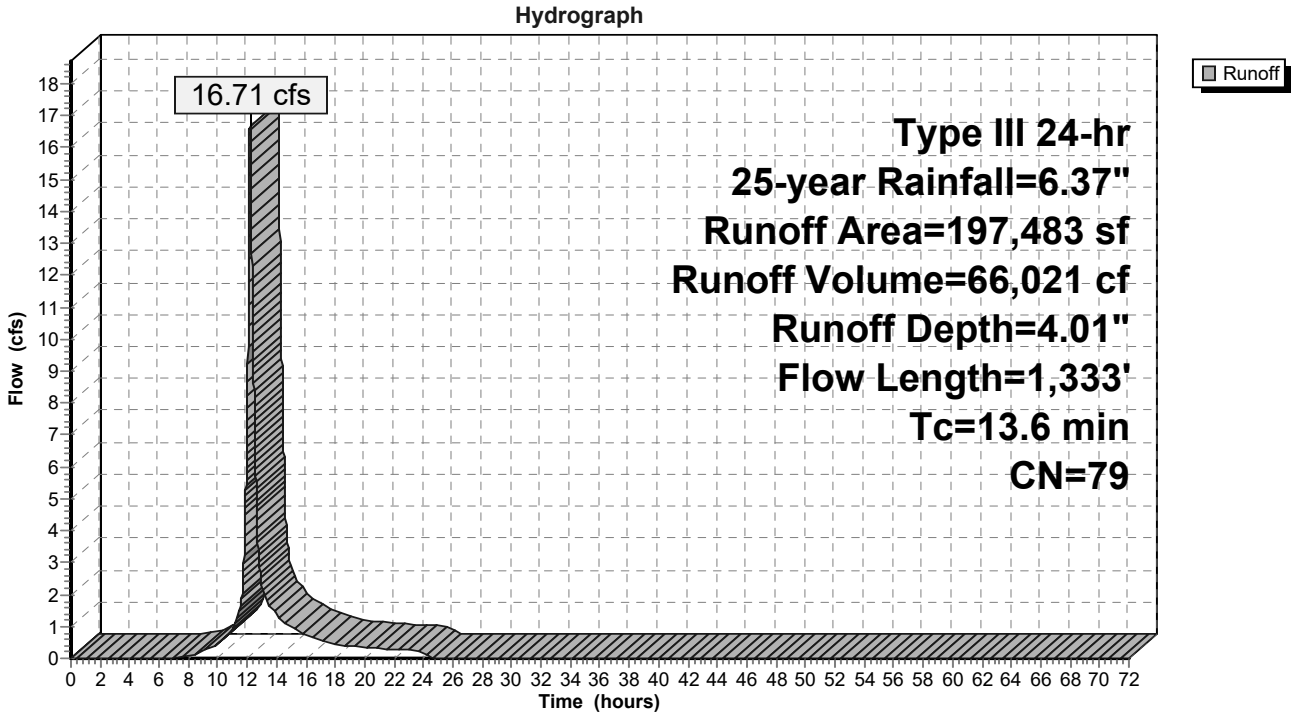
Runoff = 16.71 cfs @ 12.19 hrs, Volume= 66,021 cf, Depth= 4.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.37"

	Area (sf)	CN	Description
	83,784	74	>75% Grass cover, Good, HSG C
	52,545	70	Woods, Good, HSG C
*	44,663	98	Impervious Area
	1,148	96	Gravel surface, HSG C
*	3,703	98	Infiltration Basin Floor
	11,640	77	Woods, Good, HSG D
	197,483	79	Weighted Average
	149,117		75.51% Pervious Area
	48,366		24.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
2.9	208	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	77	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	141	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	835	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
13.6	1,333	Total			

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

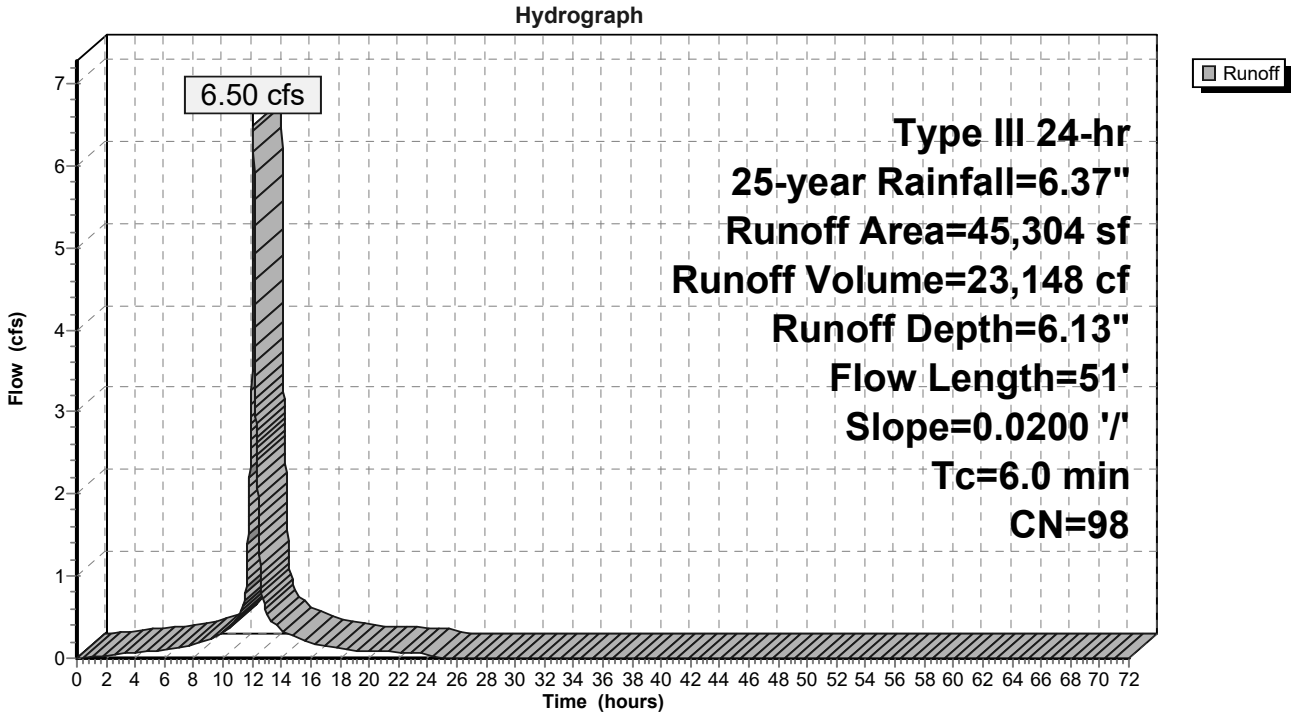
Runoff = 6.50 cfs @ 12.08 hrs, Volume= 23,148 cf, Depth= 6.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.37"

	Area (sf)	CN	Description
*	45,304	98	Impervious Area
	45,304		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
0.0	1	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	51	Total, Increased to minimum Tc = 6.0 min			

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

[47] Hint: Peak is 160% of capacity of segment #5

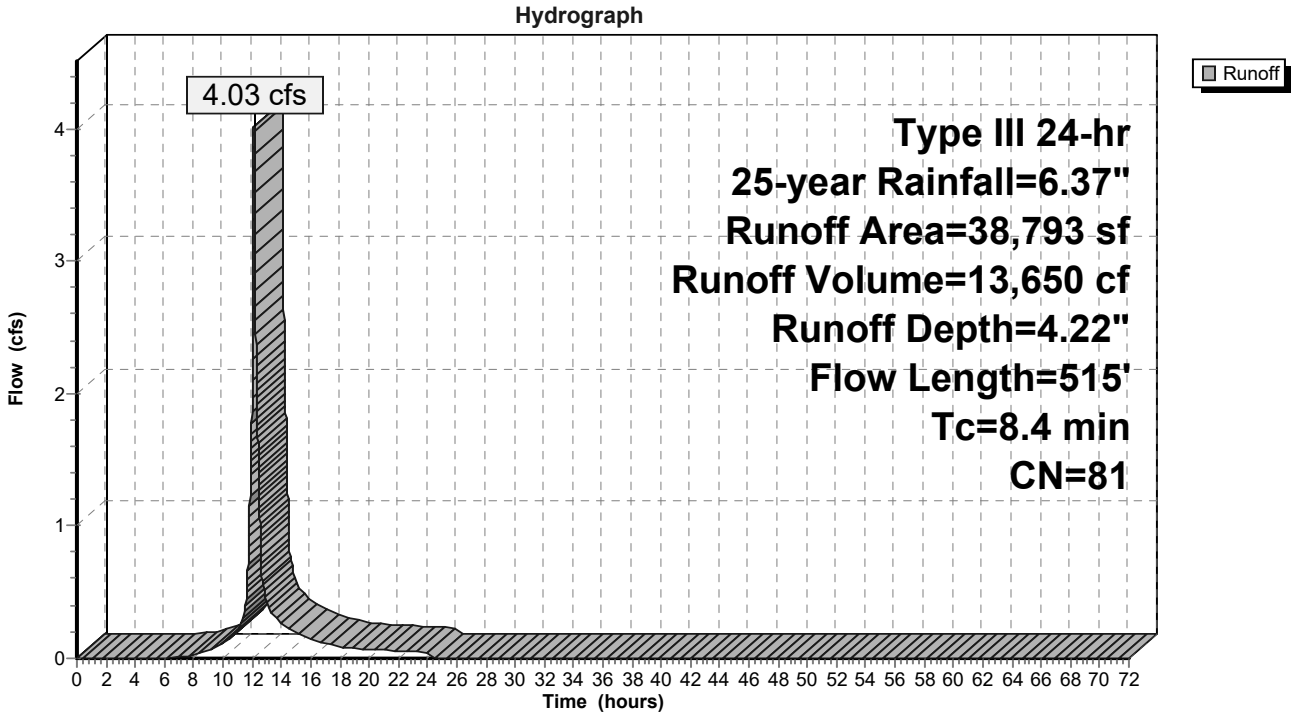
Runoff = 4.03 cfs @ 12.12 hrs, Volume= 13,650 cf, Depth= 4.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.37"

	Area (sf)	CN	Description
	27,860	74	>75% Grass cover, Good, HSG C
*	10,933	98	Impervious Area
	38,793	81	Weighted Average
	27,860		71.82% Pervious Area
	10,933		28.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
0.0	8	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	70	0.0294	1.20		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	57	0.0221	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	330	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
8.4	515	Total			

Subcatchment A4: SUB-A4



Summary for Subcatchment B1: SUB-B1

[47] Hint: Peak is 613% of capacity of segment #5

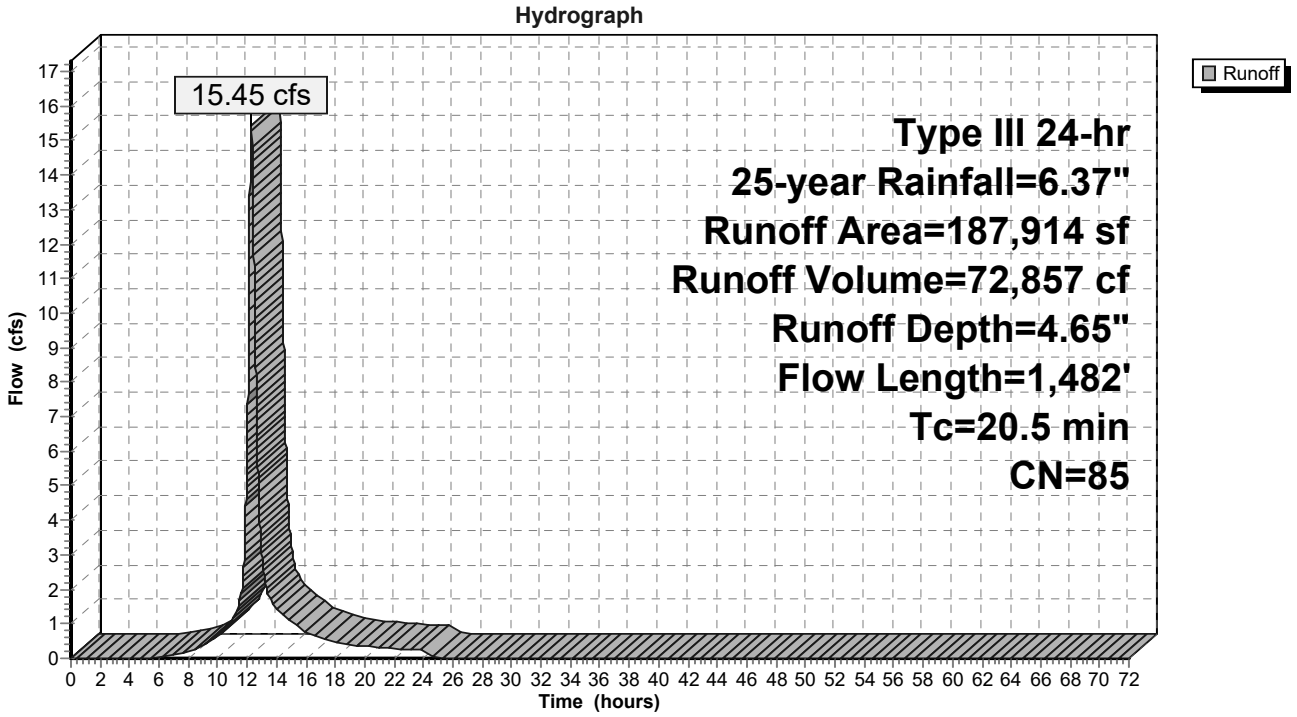
Runoff = 15.45 cfs @ 12.28 hrs, Volume= 72,857 cf, Depth= 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.37"

	Area (sf)	CN	Description
	76,568	74	>75% Grass cover, Good, HSG C
	23,764	70	Woods, Good, HSG C
*	81,637	98	Impervious Area
*	5,945	98	Infiltration Basin Floor
	187,914	85	Weighted Average
	100,332		53.39% Pervious Area
	87,582		46.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	50	0.0340	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
5.1	319	0.0435	1.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	28	0.1535	2.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	102	0.0245	3.18		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.1	983	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
20.5	1,482	Total			

Subcatchment B1: SUB-B1



Summary for Subcatchment B2: SUB-B2

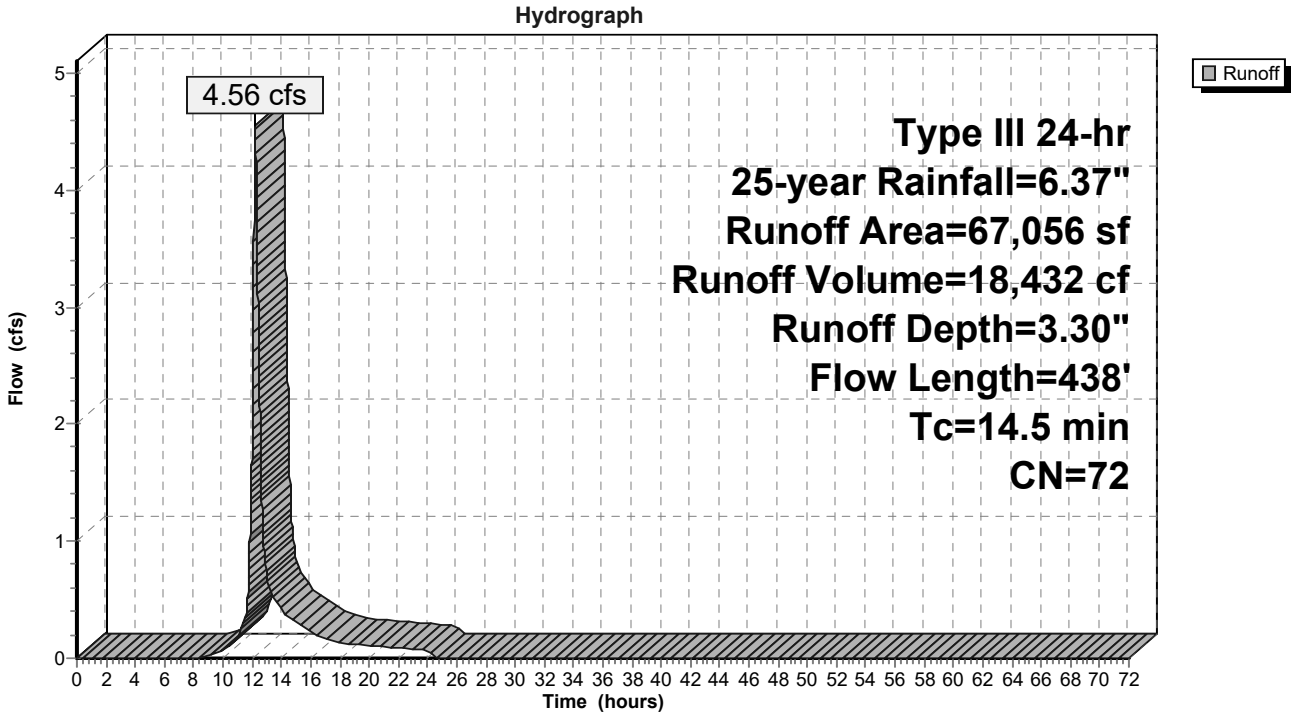
Runoff = 4.56 cfs @ 12.20 hrs, Volume= 18,432 cf, Depth= 3.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.37"

Area (sf)	CN	Description
29,339	74	>75% Grass cover, Good, HSG C
37,717	70	Woods, Good, HSG C
67,056	72	Weighted Average
67,056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
6.2	388	0.0438	1.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.5	438	Total			

Subcatchment B2: SUB-B2



Summary for Subcatchment B3: SUB-B3

[47] Hint: Peak is 177% of capacity of segment #5

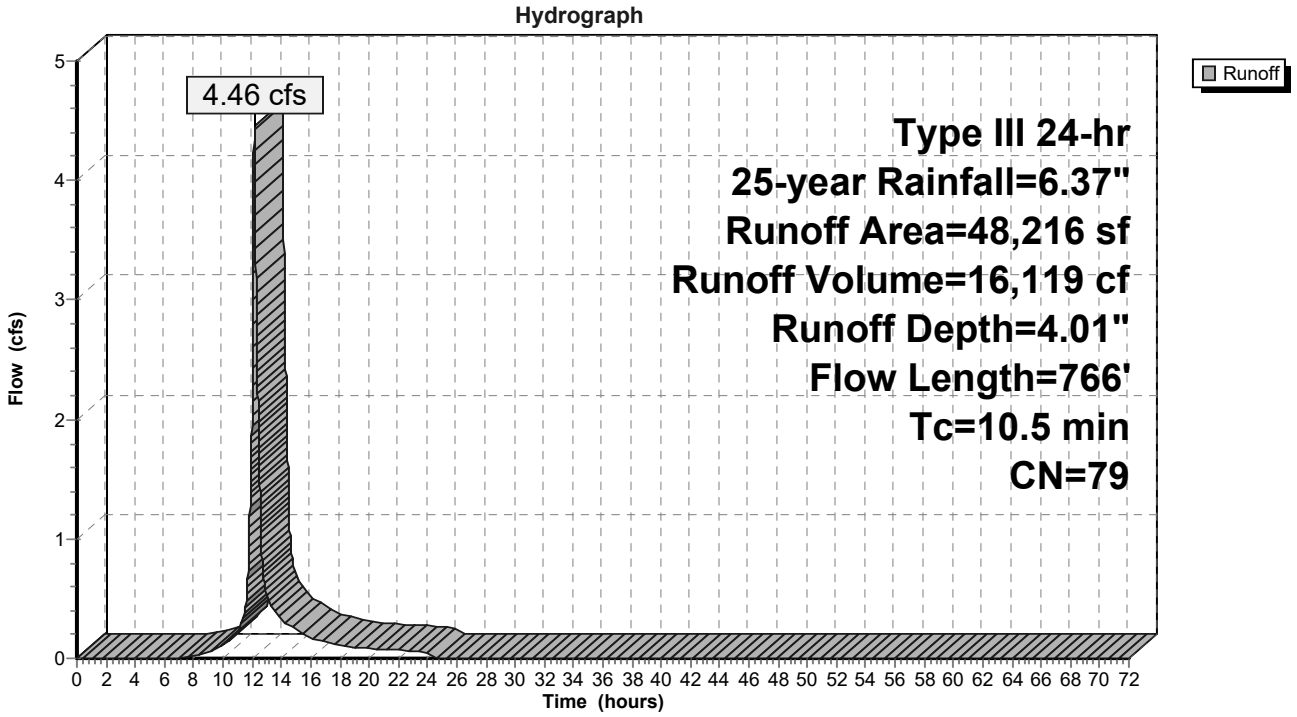
Runoff = 4.46 cfs @ 12.14 hrs, Volume= 16,119 cf, Depth= 4.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.37"

	Area (sf)	CN	Description
	37,519	74	>75% Grass cover, Good, HSG C
*	10,697	98	Impervious Area
	48,216	79	Weighted Average
	37,519		77.81% Pervious Area
	10,697		22.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
0.6	40	0.0275	1.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	7	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	89	0.0202	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.0	580	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
10.5	766	Total			

Subcatchment B3: SUB-B3



Summary for Subcatchment B4: SB-B4

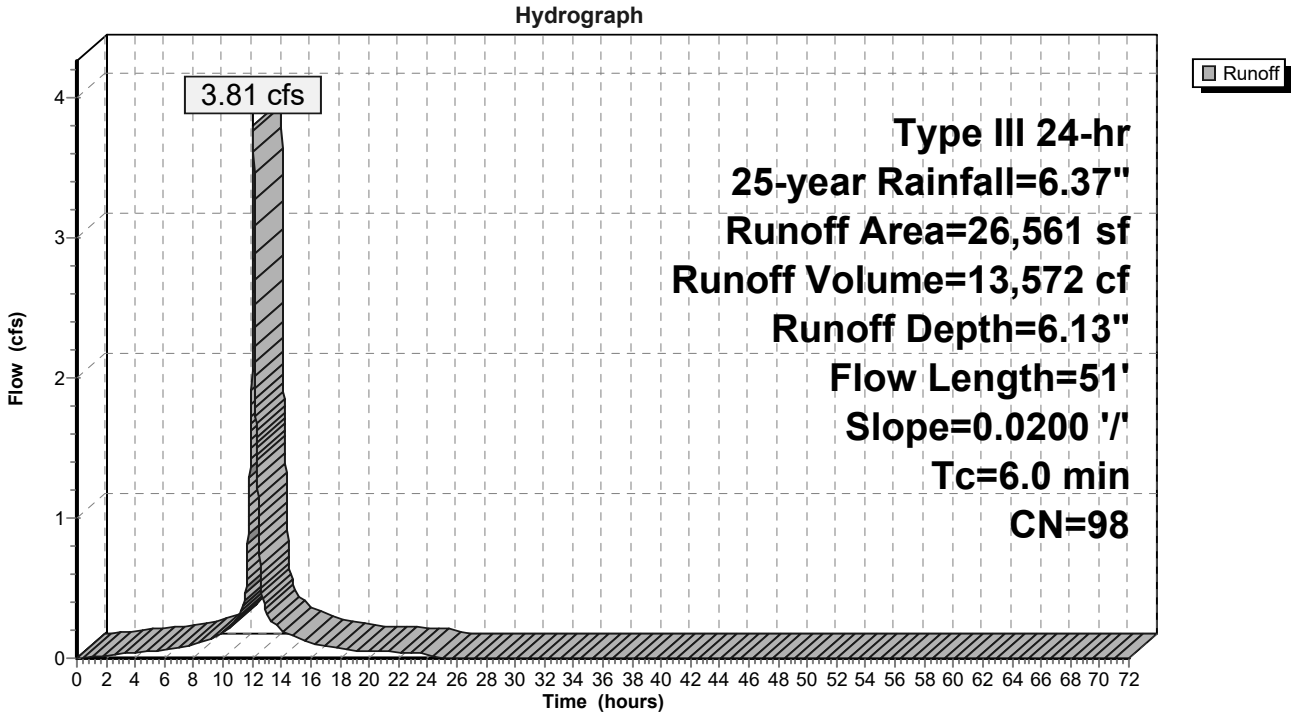
Runoff = 3.81 cfs @ 12.08 hrs, Volume= 13,572 cf, Depth= 6.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.37"

	Area (sf)	CN	Description
*	26,561	98	Impervious Area
	26,561		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
0.0	1	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	51	Total, Increased to minimum Tc = 6.0 min			

Subcatchment B4: SB-B4



Summary for Pond IB-1: IB-1

Inflow Area = 281,580 sf, 37.15% Impervious, Inflow Depth = 4.38" for 25-year event
Inflow = 24.85 cfs @ 12.14 hrs, Volume= 102,820 cf
Outflow = 20.46 cfs @ 12.25 hrs, Volume= 102,821 cf, Atten= 18%, Lag= 6.6 min
Discarded = 0.32 cfs @ 12.25 hrs, Volume= 26,408 cf
Primary = 20.14 cfs @ 12.25 hrs, Volume= 76,412 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 246.48' @ 12.25 hrs Surf.Area= 13,470 sf Storage= 25,178 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 131.0 min (933.7 - 802.6)

Volume	Invert	Avail.Storage	Storage Description
#1	244.00'	44,476 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
244.00	3,703	0	0	3,703
245.00	11,077	7,062	7,062	11,083
246.00	12,689	11,874	18,935	12,740
247.00	14,351	13,511	32,447	14,453
247.80	15,732	12,029	44,476	15,877

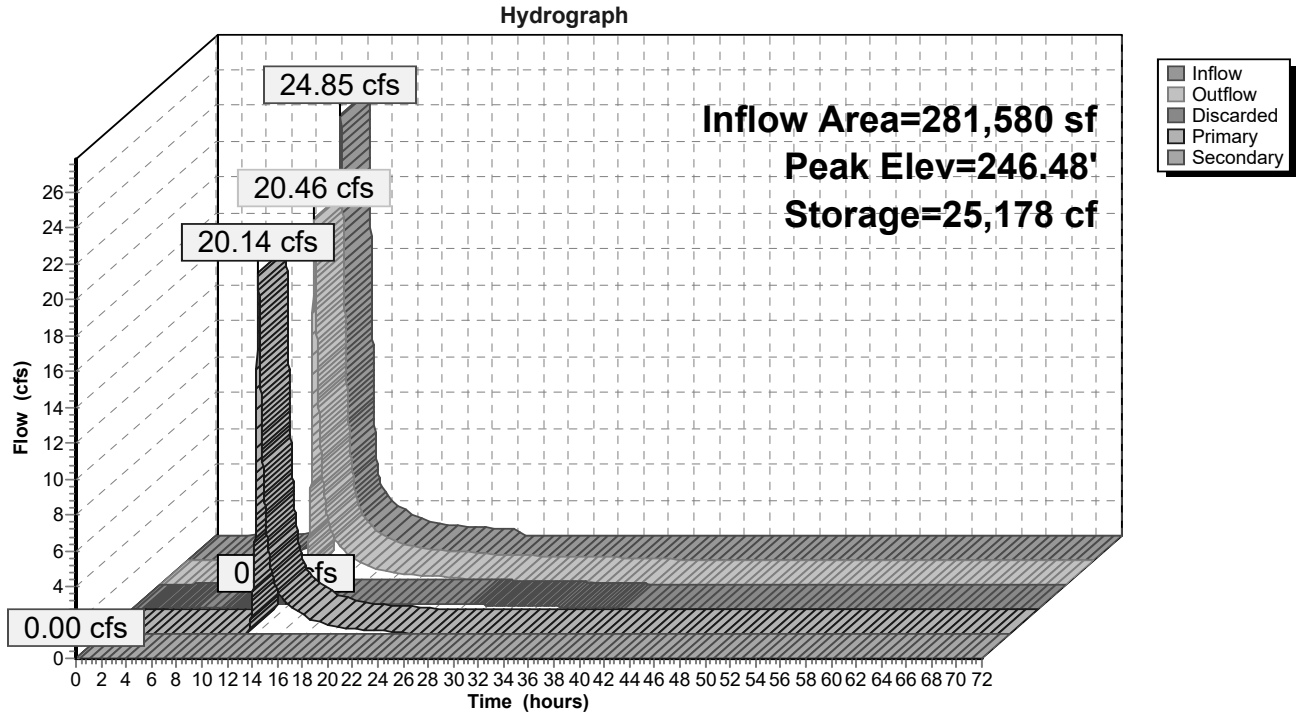
Device	Routing	Invert	Outlet Devices
#1	Secondary	246.80'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	244.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 4	246.20'	**48.0" x 48.0" Horiz. Orifice/Grate (OCS-1)** C= 0.600 Limited to weir flow at low heads
#4	Primary	241.38'	**24.0" Round Culvert (OCS-1)** L= 76.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 241.38' / 241.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#5	Device 4	245.20'	**36.0" W x 12.0" H Vert. Orifice/Grate (OCS-1)** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.32 cfs @ 12.25 hrs HW=246.48' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.32 cfs)

Primary OutFlow Max=20.13 cfs @ 12.25 hrs HW=246.48' TW=243.12' (Dynamic Tailwater)
└**4=Culvert (OCS-1)** (Passes 20.13 cfs of 27.72 cfs potential flow)
  ├**3=Orifice/Grate (OCS-1)** (Weir Controls 7.64 cfs @ 1.72 fps)
  └**5=Orifice/Grate (OCS-1)** (Orifice Controls 12.49 cfs @ 4.16 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=244.00' TW=240.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: IB-1


Hydrograph
24.85 cfs
20.46 cfs
20.14 cfs
0.00 cfs
Inflow Area=281,580 sf
Peak Elev=246.48'
Storage=25,178 cf
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Pond IB-2: IB-2

[95] Warning: Outlet Device #7 rise exceeded

Inflow Area = 544,271 sf, 42.16% Impervious, Inflow Depth = 3.95" for 25-year event
Inflow = 40.50 cfs @ 12.24 hrs, Volume= 178,960 cf
Outflow = 22.35 cfs @ 12.55 hrs, Volume= 178,962 cf, Atten= 45%, Lag= 18.4 min
Discarded = 0.49 cfs @ 12.55 hrs, Volume= 46,157 cf
Primary = 15.97 cfs @ 12.55 hrs, Volume= 98,064 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Tertiary = 5.89 cfs @ 12.55 hrs, Volume= 34,741 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 243.76' @ 12.55 hrs Surf.Area= 20,594 sf Storage= 56,623 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 201.1 min (1,013.4 - 812.3)

Volume	Invert	Avail.Storage	Storage Description
#1	240.00'	103,342 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
240.00	5,945	0	0	5,945
241.00	12,658	9,093	9,093	12,666
242.00	16,770	14,666	23,758	16,801
243.00	18,908	17,828	41,587	18,990
244.00	21,137	20,012	61,599	21,275
245.00	23,418	22,268	83,867	23,617
245.80	25,283	19,476	103,342	25,533

Device	Routing	Invert	Outlet Devices
#1	Secondary	244.80'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	240.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 5	242.00'	**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
#4	Device 5	243.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	241.28'	**24.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 241.28' / 241.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#6	Device 8	244.30'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 8	241.60'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.50 Width (feet) 0.00 1.50

#8 Tertiary 238.25' **12.0" Round Culvert**
L= 50.0' CPP, square edge headwall, Ke= 0.500
Inlet / Outlet Invert= 238.25' / 238.00' S= 0.0050 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

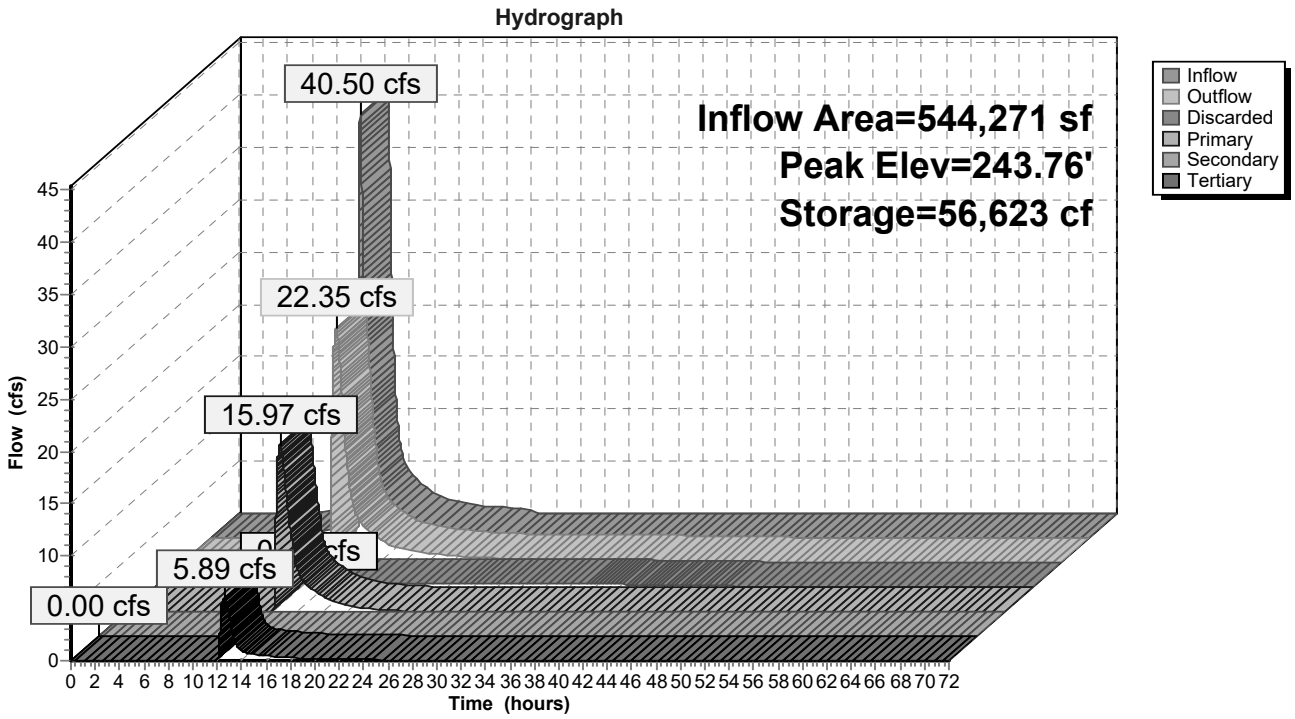
Discarded OutFlow Max=0.49 cfs @ 12.55 hrs HW=243.76' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.49 cfs)

Primary OutFlow Max=15.97 cfs @ 12.55 hrs HW=243.76' TW=0.00' (Dynamic Tailwater)
└**5=Culvert** (Barrel Controls 15.97 cfs @ 5.24 fps)
└**3=Broad-Crested Rectangular Weir** (Passes < 31.05 cfs potential flow)
└**4=Orifice/Grate** (Passes < 7.00 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=240.00' TW=0.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Tertiary OutFlow Max=5.89 cfs @ 12.55 hrs HW=243.76' TW=0.00' (Dynamic Tailwater)
└**8=Culvert** (Passes 5.89 cfs of 7.85 cfs potential flow)
└**6=Orifice/Grate** (Controls 0.00 cfs)
└**7=Custom Weir/Orifice** (Orifice Controls 5.89 cfs @ 5.23 fps)

Pond IB-2: IB-2

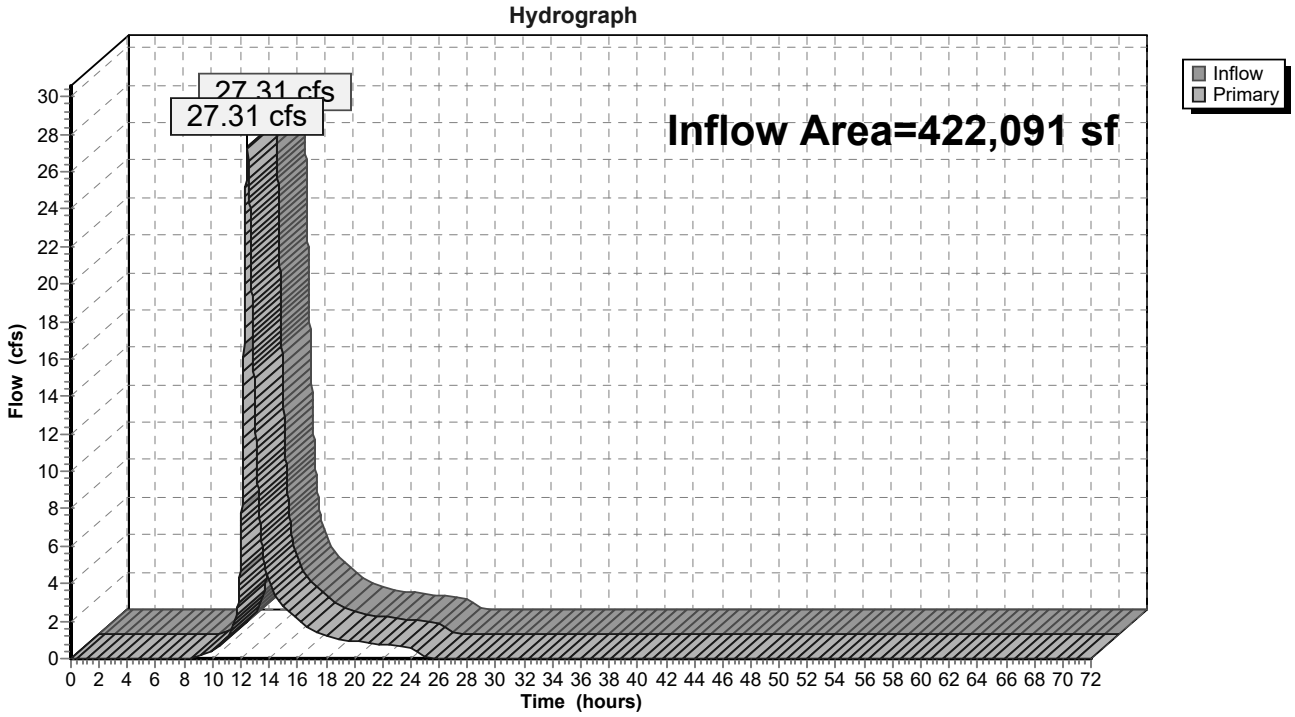


Summary for Link A: A

Inflow Area = 422,091 sf, 5.83% Impervious, Inflow Depth = 4.49" for 25-year event
Inflow = 27.31 cfs @ 12.47 hrs, Volume= 157,795 cf
Primary = 27.31 cfs @ 12.47 hrs, Volume= 157,795 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A

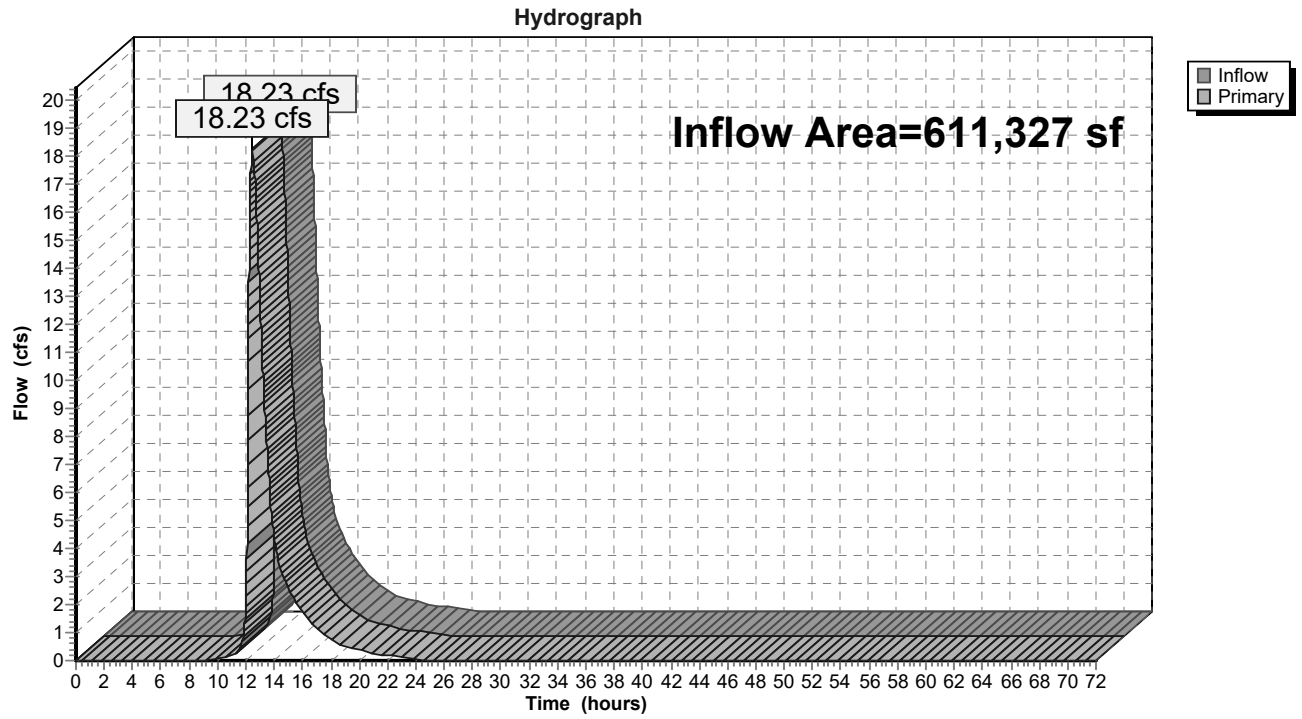


Summary for Link B: B

Inflow Area = 611,327 sf, 37.53% Impervious, Inflow Depth = 2.29" for 25-year event
Inflow = 18.23 cfs @ 12.46 hrs, Volume= 116,496 cf
Primary = 18.23 cfs @ 12.46 hrs, Volume= 116,496 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: B



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: SUB-A1 Runoff Area=422,091 sf 5.83% Impervious Runoff Depth=4.23"
Flow Length=1,620' Tc=32.8 min CN=74 Runoff=26.02 cfs 148,636 cf

Subcatchment A2: SUB-A2 Runoff Area=197,483 sf 24.49% Impervious Runoff Depth=4.78"
Flow Length=1,333' Tc=13.6 min CN=79 Runoff=19.82 cfs 78,614 cf

Subcatchment A3: SUB-A3 Runoff Area=45,304 sf 100.00% Impervious Runoff Depth=6.97"
Flow Length=51' Slope=0.0200 '/' Tc=6.0 min CN=98 Runoff=7.36 cfs 26,317 cf

Subcatchment A4: SUB-A4 Runoff Area=38,793 sf 28.18% Impervious Runoff Depth=5.00"
Flow Length=515' Tc=8.4 min CN=81 Runoff=4.75 cfs 16,166 cf

Subcatchment B1: SUB-B1 Runoff Area=187,914 sf 46.61% Impervious Runoff Depth=5.45"
Flow Length=1,482' Tc=20.5 min CN=85 Runoff=18.00 cfs 85,400 cf

Subcatchment B2: SUB-B2 Runoff Area=67,056 sf 0.00% Impervious Runoff Depth=4.01"
Flow Length=438' Tc=14.5 min CN=72 Runoff=5.55 cfs 22,400 cf

Subcatchment B3: SUB-B3 Runoff Area=48,216 sf 22.19% Impervious Runoff Depth=4.78"
Flow Length=766' Tc=10.5 min CN=79 Runoff=5.30 cfs 19,194 cf

Subcatchment B4: SB-B4 Runoff Area=26,561 sf 100.00% Impervious Runoff Depth=6.97"
Flow Length=51' Slope=0.0200 '/' Tc=6.0 min CN=98 Runoff=4.31 cfs 15,429 cf

Pond IB-1: IB-1 Peak Elev=246.57' Storage=26,454 cf Inflow=29.22 cfs 121,097 cf
Discarded=0.32 cfs 27,060 cf Primary=25.14 cfs 94,039 cf Secondary=0.00 cfs 0 cf Outflow=25.46 cfs 121,098 cf

Pond IB-2: IB-2 Peak Elev=244.23' Storage=66,590 cf Inflow=48.98 cfs 214,062 cf
7,317 cf Primary=19.34 cfs 123,299 cf Secondary=0.00 cfs 0 cf Tertiary=7.02 cfs 43,447 cf Outflow=26.88 cfs 214,063 cf

Link A: A Inflow=32.96 cfs 192,083 cf
Primary=32.96 cfs 192,083 cf

Link B: B Inflow=22.09 cfs 145,699 cf
Primary=22.09 cfs 145,699 cf

Total Runoff Area = 1,033,418 sf Runoff Volume = 412,156 cf Average Runoff Depth = 4.79"
75.42% Pervious = 779,369 sf 24.58% Impervious = 254,049 sf

Summary for Subcatchment A1: SUB-A1

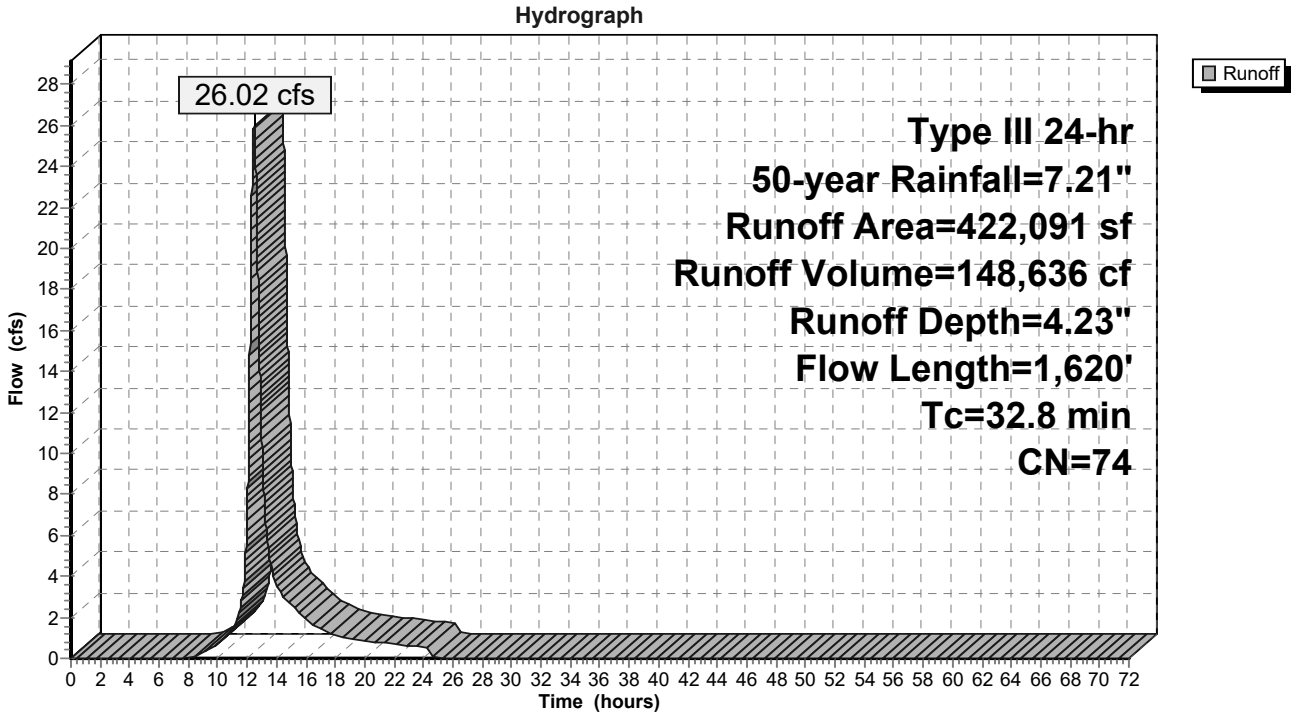
Runoff = 26.02 cfs @ 12.46 hrs, Volume= 148,636 cf, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.21"

	Area (sf)	CN	Description
	127,217	74	>75% Grass cover, Good, HSG C
	211,698	70	Woods, Good, HSG C
*	24,606	98	Impervious Area
	716	96	Gravel surface, HSG C
	57,854	77	Woods, Good, HSG D
	422,091	74	Weighted Average
	397,485		94.17% Pervious Area
	24,606		5.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.43"
19.4	1,010	0.0300	0.87		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
1.5	560	0.0200	6.38	76.61	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.035 Earth, dense weeds
32.8	1,620	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

[47] Hint: Peak is 787% of capacity of segment #6

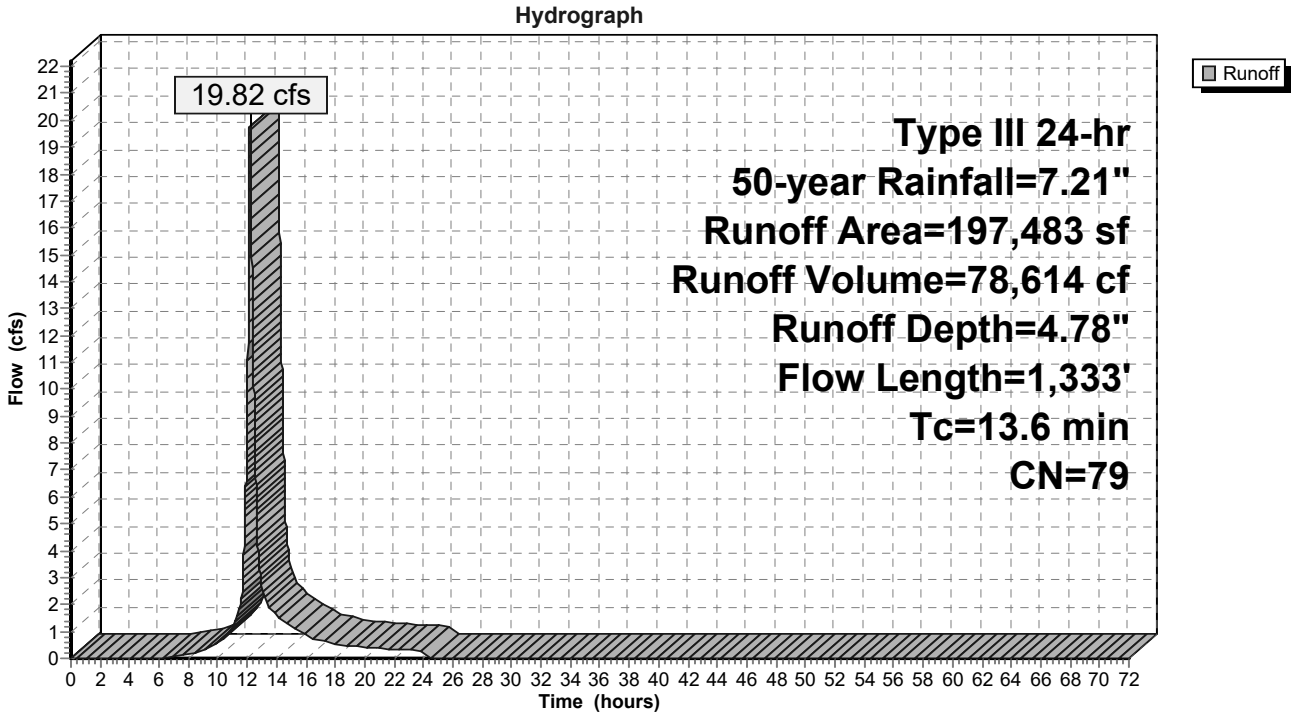
Runoff = 19.82 cfs @ 12.19 hrs, Volume= 78,614 cf, Depth= 4.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.21"

	Area (sf)	CN	Description
	83,784	74	>75% Grass cover, Good, HSG C
	52,545	70	Woods, Good, HSG C
*	44,663	98	Impervious Area
	1,148	96	Gravel surface, HSG C
*	3,703	98	Infiltration Basin Floor
	11,640	77	Woods, Good, HSG D
	197,483	79	Weighted Average
	149,117		75.51% Pervious Area
	48,366		24.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
2.9	208	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	77	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	141	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	835	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
13.6	1,333	Total			

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

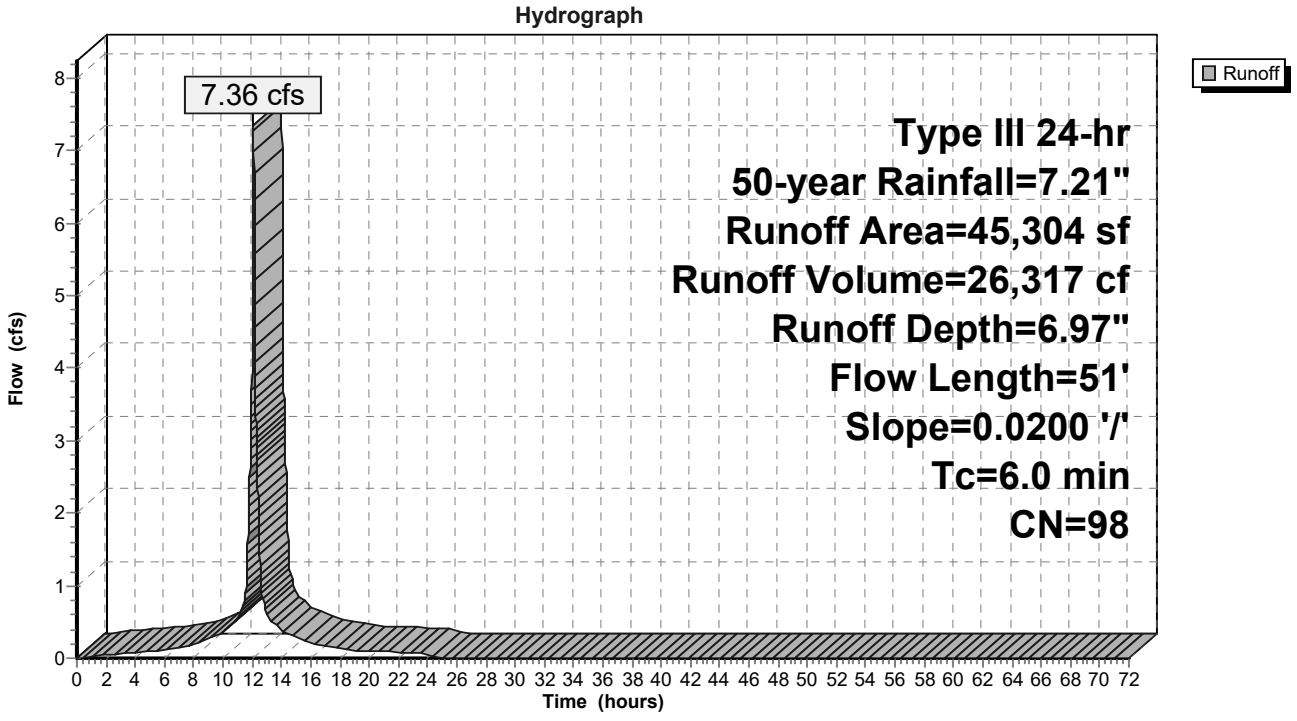
Runoff = 7.36 cfs @ 12.08 hrs, Volume= 26,317 cf, Depth= 6.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.21"

	Area (sf)	CN	Description
*	45,304	98	Impervious Area
	45,304		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
0.0	1	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	51	Total, Increased to minimum Tc = 6.0 min			

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

[47] Hint: Peak is 188% of capacity of segment #5

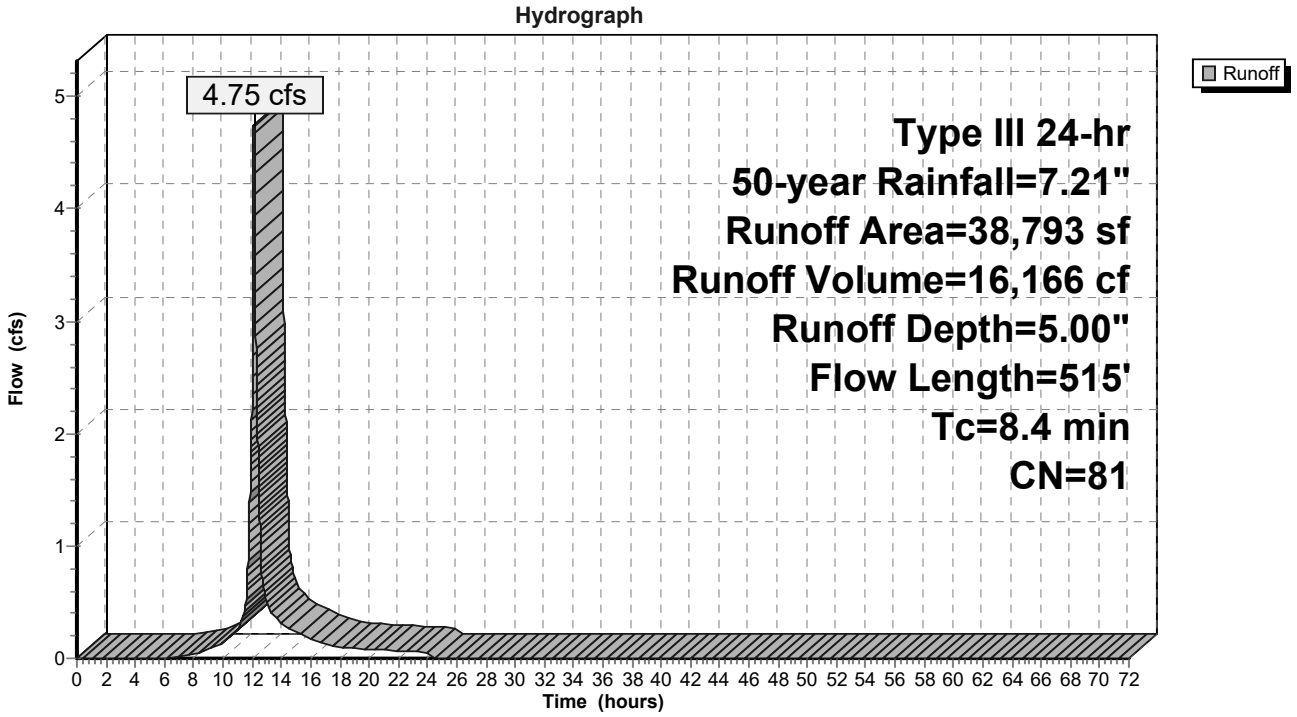
Runoff = 4.75 cfs @ 12.12 hrs, Volume= 16,166 cf, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.21"

	Area (sf)	CN	Description
	27,860	74	>75% Grass cover, Good, HSG C
*	10,933	98	Impervious Area
	38,793	81	Weighted Average
	27,860		71.82% Pervious Area
	10,933		28.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
0.0	8	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	70	0.0294	1.20		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	57	0.0221	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	330	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
8.4	515	Total			

Subcatchment A4: SUB-A4



Summary for Subcatchment B1: SUB-B1

[47] Hint: Peak is 714% of capacity of segment #5

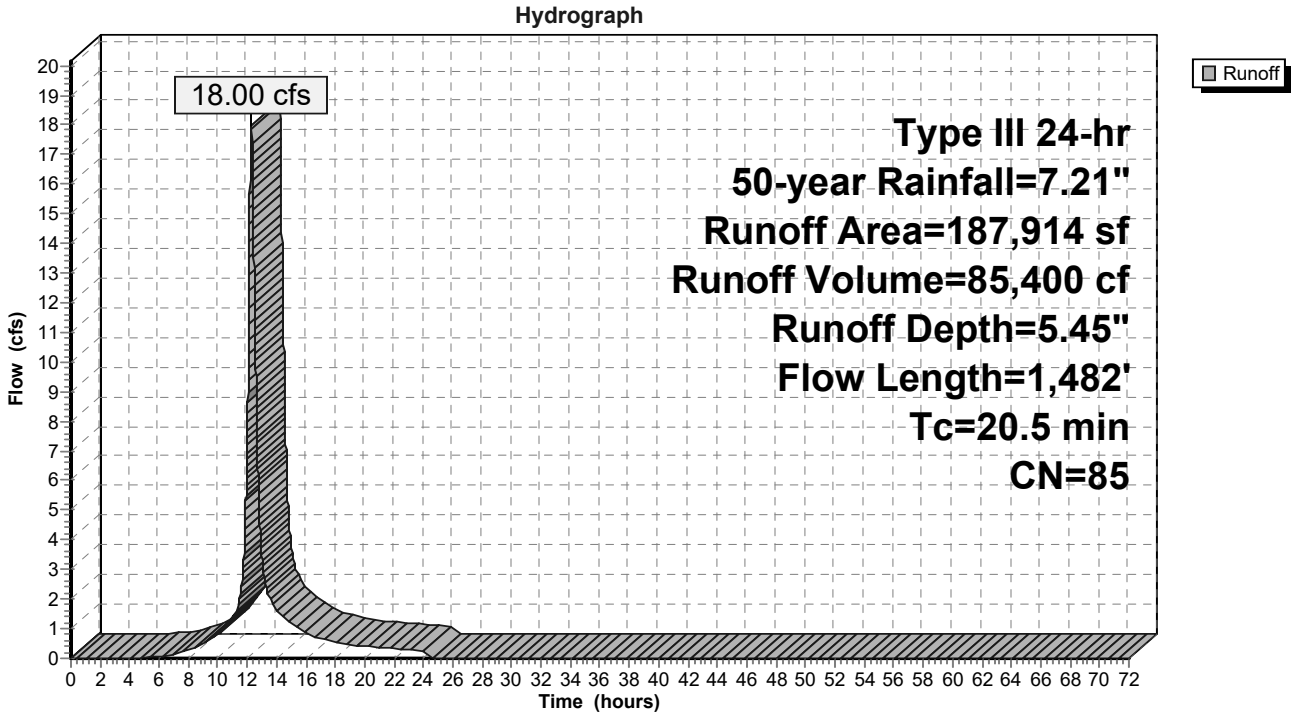
Runoff = 18.00 cfs @ 12.28 hrs, Volume= 85,400 cf, Depth= 5.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.21"

	Area (sf)	CN	Description
	76,568	74	>75% Grass cover, Good, HSG C
	23,764	70	Woods, Good, HSG C
*	81,637	98	Impervious Area
*	5,945	98	Infiltration Basin Floor
	187,914	85	Weighted Average
	100,332		53.39% Pervious Area
	87,582		46.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	50	0.0340	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
5.1	319	0.0435	1.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	28	0.1535	2.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	102	0.0245	3.18		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.1	983	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
20.5	1,482	Total			

Subcatchment B1: SUB-B1



Summary for Subcatchment B2: SUB-B2

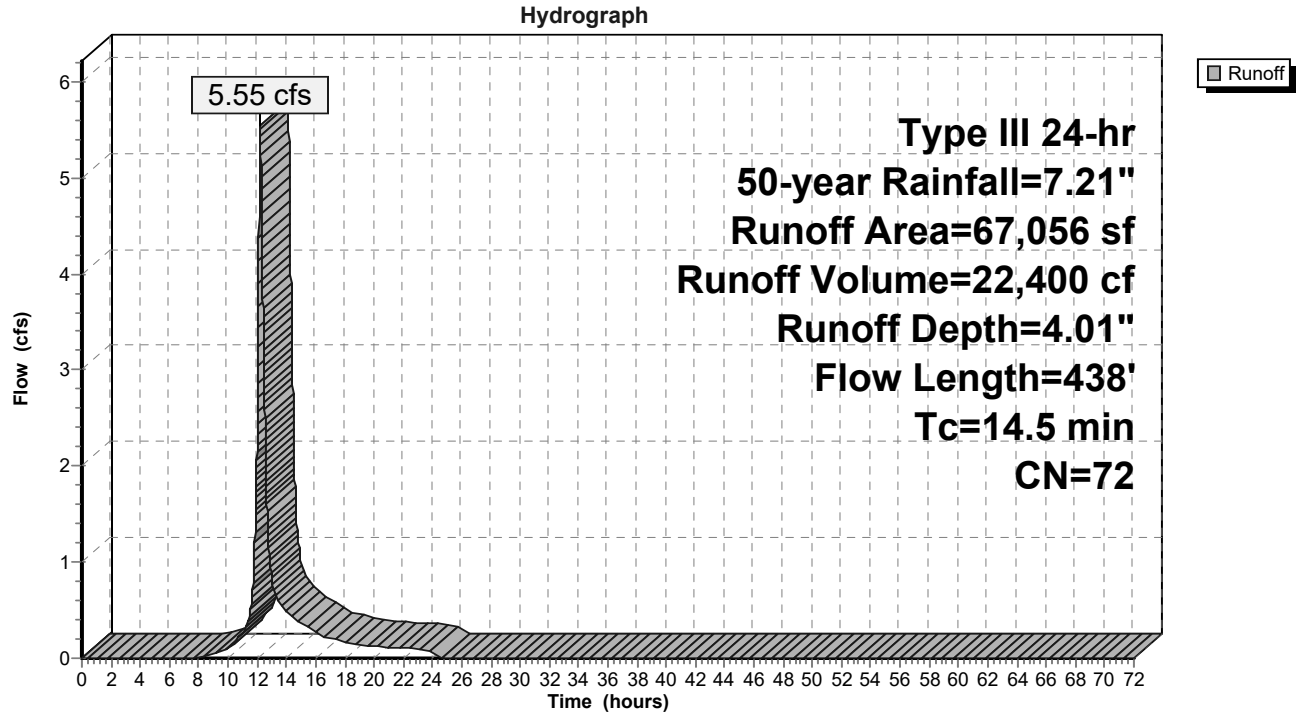
Runoff = 5.55 cfs @ 12.20 hrs, Volume= 22,400 cf, Depth= 4.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.21"

Area (sf)	CN	Description
29,339	74	>75% Grass cover, Good, HSG C
37,717	70	Woods, Good, HSG C
67,056	72	Weighted Average
67,056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
6.2	388	0.0438	1.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.5	438	Total			

Subcatchment B2: SUB-B2



Summary for Subcatchment B3: SUB-B3

[47] Hint: Peak is 210% of capacity of segment #5

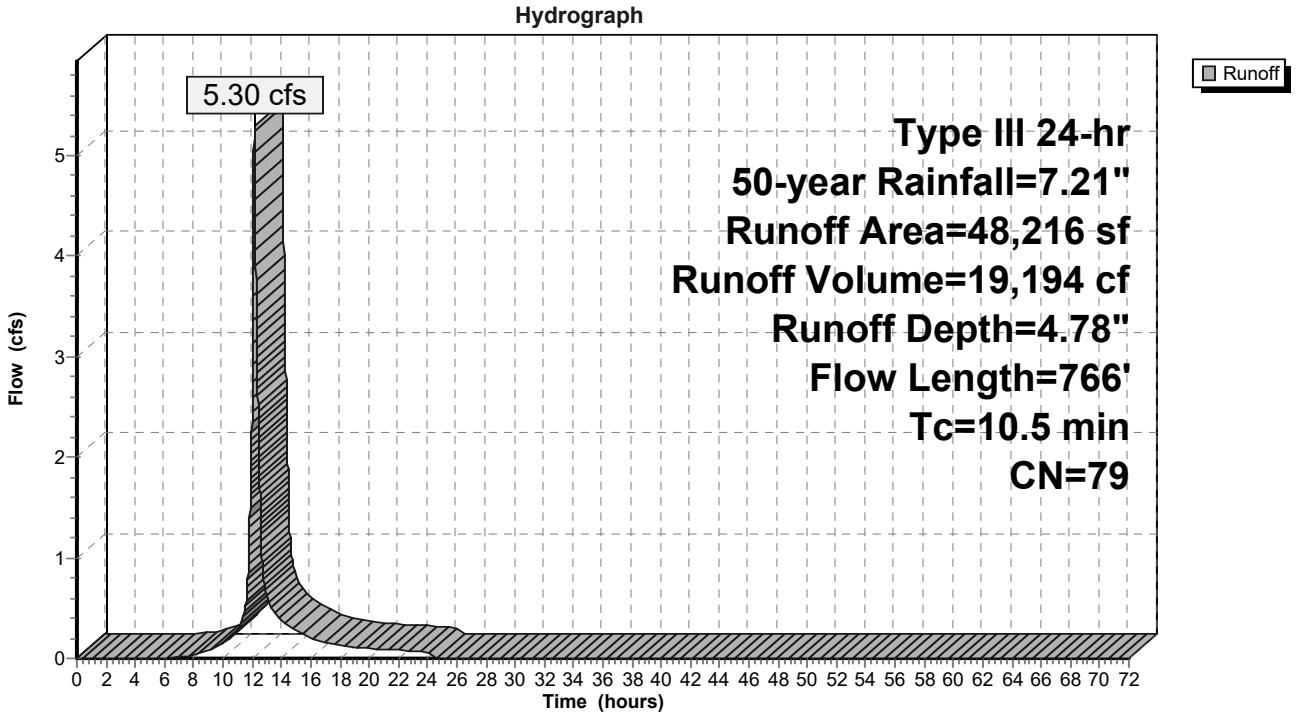
Runoff = 5.30 cfs @ 12.14 hrs, Volume= 19,194 cf, Depth= 4.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.21"

	Area (sf)	CN	Description
	37,519	74	>75% Grass cover, Good, HSG C
*	10,697	98	Impervious Area
	48,216	79	Weighted Average
	37,519		77.81% Pervious Area
	10,697		22.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
0.6	40	0.0275	1.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	7	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	89	0.0202	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.0	580	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
10.5	766	Total			

Subcatchment B3: SUB-B3



Summary for Subcatchment B4: SB-B4

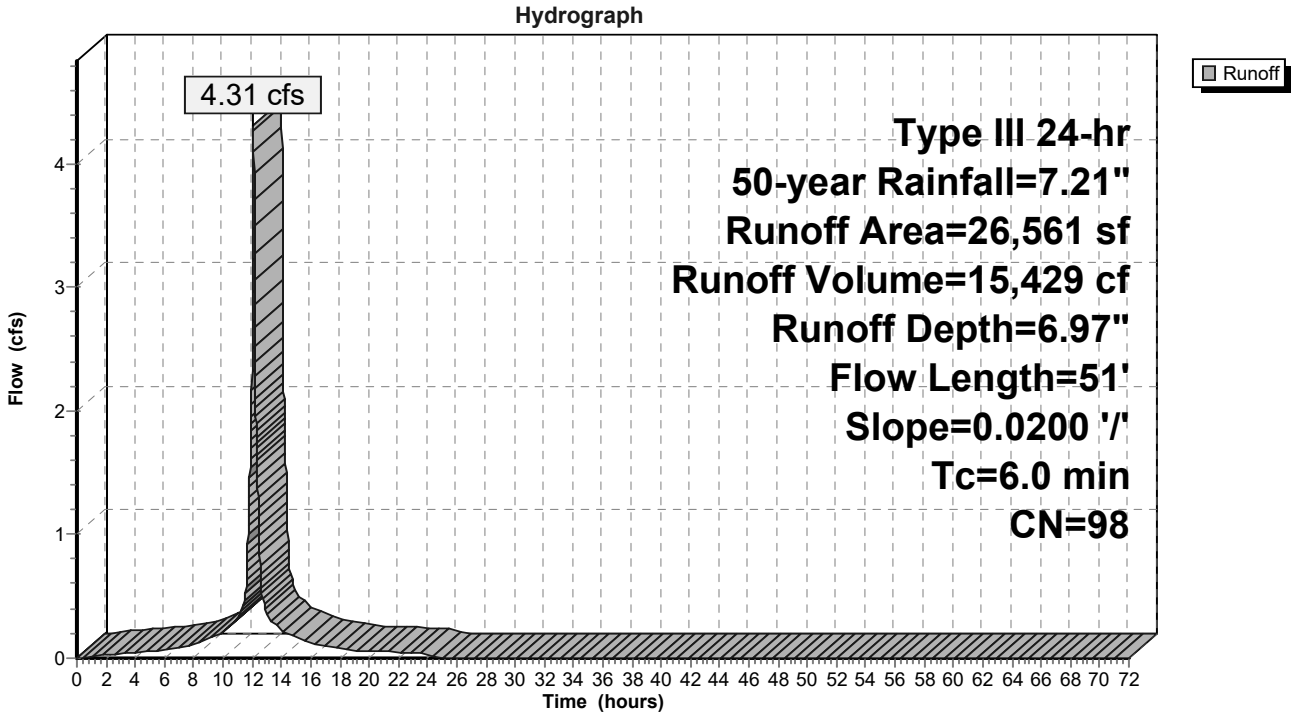
Runoff = 4.31 cfs @ 12.08 hrs, Volume= 15,429 cf, Depth= 6.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.21"

	Area (sf)	CN	Description
*	26,561	98	Impervious Area
	26,561		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
0.0	1	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	51	Total, Increased to minimum Tc = 6.0 min			

Subcatchment B4: SB-B4



Summary for Pond IB-1: IB-1

Inflow Area = 281,580 sf, 37.15% Impervious, Inflow Depth = 5.16" for 50-year event
Inflow = 29.22 cfs @ 12.14 hrs, Volume= 121,097 cf
Outflow = 25.46 cfs @ 12.23 hrs, Volume= 121,098 cf, Atten= 13%, Lag= 5.3 min
Discarded = 0.32 cfs @ 12.23 hrs, Volume= 27,060 cf
Primary = 25.14 cfs @ 12.23 hrs, Volume= 94,039 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 246.57' @ 12.23 hrs Surf.Area= 13,626 sf Storage= 26,454 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 116.7 min (915.7 - 799.0)

Volume	Invert	Avail.Storage	Storage Description
#1	244.00'	44,476 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
244.00	3,703	0	0	3,703
245.00	11,077	7,062	7,062	11,083
246.00	12,689	11,874	18,935	12,740
247.00	14,351	13,511	32,447	14,453
247.80	15,732	12,029	44,476	15,877

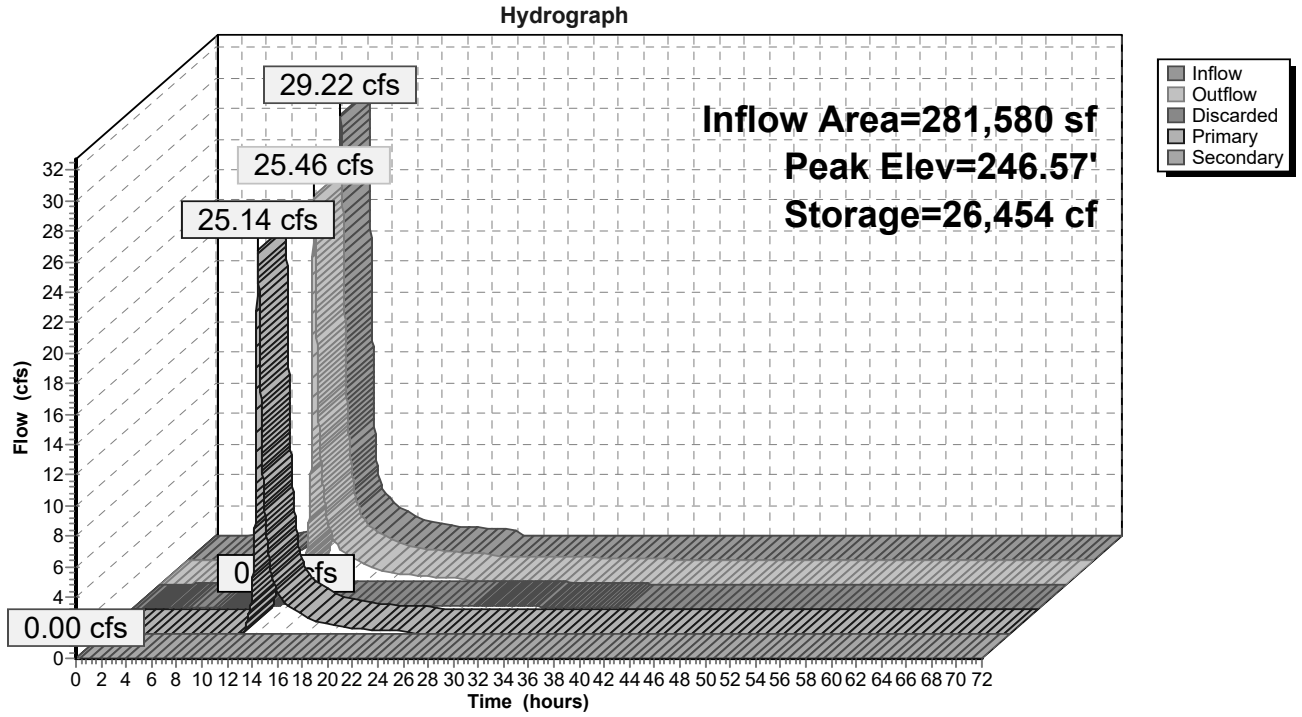
Device	Routing	Invert	Outlet Devices
#1	Secondary	246.80'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	244.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 4	246.20'	**48.0" x 48.0" Horiz. Orifice/Grate (OCS-1)** C= 0.600 Limited to weir flow at low heads
#4	Primary	241.38'	**24.0" Round Culvert (OCS-1)** L= 76.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 241.38' / 241.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#5	Device 4	245.20'	**36.0" W x 12.0" H Vert. Orifice/Grate (OCS-1)** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.32 cfs @ 12.23 hrs HW=246.57' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.32 cfs)

Primary OutFlow Max=25.14 cfs @ 12.23 hrs HW=246.57' TW=243.47' (Dynamic Tailwater)
└**4=Culvert (OCS-1)** (Passes 25.14 cfs of 26.65 cfs potential flow)
  ├**3=Orifice/Grate (OCS-1)** (Weir Controls 11.85 cfs @ 1.99 fps)
  └**5=Orifice/Grate (OCS-1)** (Orifice Controls 13.29 cfs @ 4.43 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=244.00' TW=240.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: IB-1


Hydrograph
29.22 cfs
25.46 cfs
25.14 cfs
0.00 cfs
Inflow Area=281,580 sf
Peak Elev=246.57'
Storage=26,454 cf
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Pond IB-2: IB-2

[95] Warning: Outlet Device #7 rise exceeded

Inflow Area = 544,271 sf, 42.16% Impervious, Inflow Depth = 4.72" for 50-year event
Inflow = 48.98 cfs @ 12.23 hrs, Volume= 214,062 cf
Outflow = 26.88 cfs @ 12.53 hrs, Volume= 214,063 cf, Atten= 45%, Lag= 18.2 min
Discarded = 0.51 cfs @ 12.53 hrs, Volume= 47,317 cf
Primary = 19.34 cfs @ 12.53 hrs, Volume= 123,299 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Tertiary = 7.02 cfs @ 12.53 hrs, Volume= 43,447 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 244.23' @ 12.53 hrs Surf.Area= 21,659 sf Storage= 66,590 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 176.7 min (986.5 - 809.7)

Volume	Invert	Avail.Storage	Storage Description
#1	240.00'	103,342 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
240.00	5,945	0	0	5,945
241.00	12,658	9,093	9,093	12,666
242.00	16,770	14,666	23,758	16,801
243.00	18,908	17,828	41,587	18,990
244.00	21,137	20,012	61,599	21,275
245.00	23,418	22,268	83,867	23,617
245.80	25,283	19,476	103,342	25,533

Device	Routing	Invert	Outlet Devices
#1	Secondary	244.80'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	240.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 5	242.00'	**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
#4	Device 5	243.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	241.28'	**24.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 241.28' / 241.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#6	Device 8	244.30'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 8	241.60'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.50 Width (feet) 0.00 1.50

#8 Tertiary 238.25' **12.0" Round Culvert**
L= 50.0' CPP, square edge headwall, Ke= 0.500
Inlet / Outlet Invert= 238.25' / 238.00' S= 0.0050 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

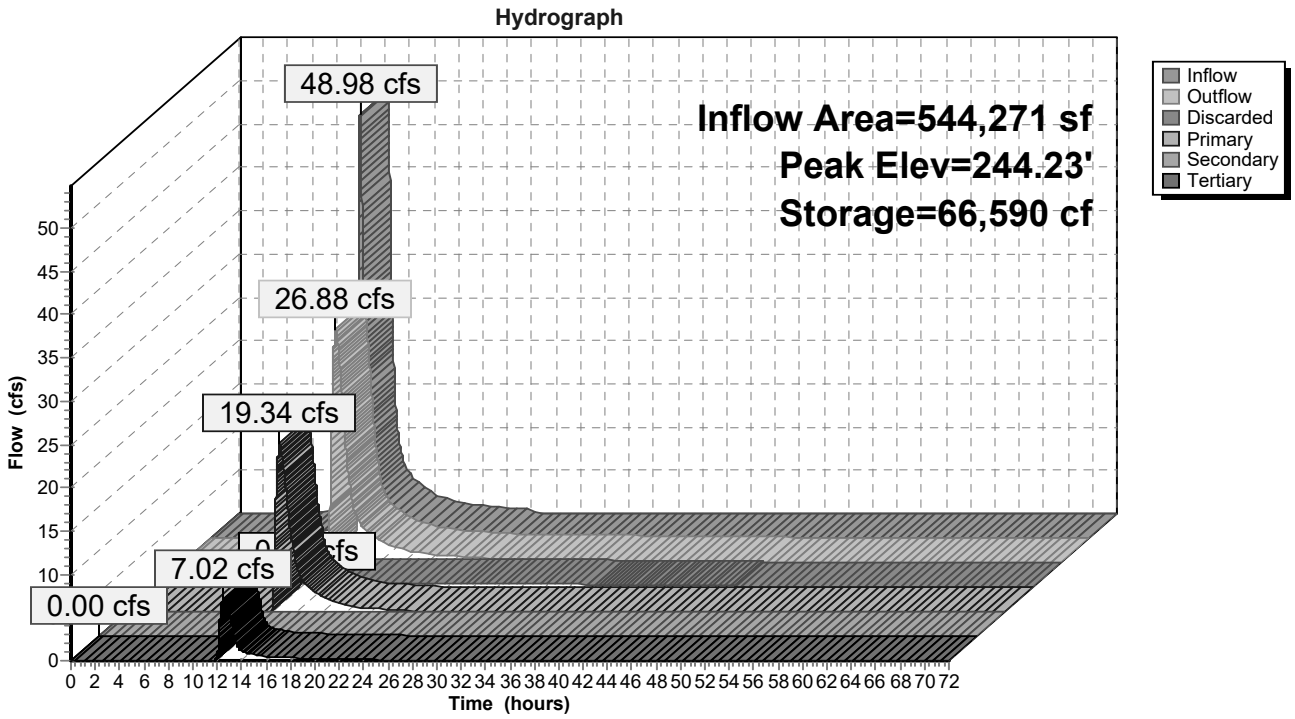
Discarded OutFlow Max=0.51 cfs @ 12.53 hrs HW=244.23' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.51 cfs)

Primary OutFlow Max=19.34 cfs @ 12.53 hrs HW=244.23' TW=0.00' (Dynamic Tailwater)
└**5=Culvert** (Barrel Controls 19.34 cfs @ 6.16 fps)
└**3=Broad-Crested Rectangular Weir** (Passes < 44.32 cfs potential flow)
└**4=Orifice/Grate** (Passes < 32.84 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=240.00' TW=0.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Tertiary OutFlow Max=7.02 cfs @ 12.53 hrs HW=244.23' TW=0.00' (Dynamic Tailwater)
└**8=Culvert** (Passes 7.02 cfs of 8.23 cfs potential flow)
└**6=Orifice/Grate** (Controls 0.00 cfs)
└**7=Custom Weir/Orifice** (Orifice Controls 7.02 cfs @ 6.24 fps)

Pond IB-2: IB-2

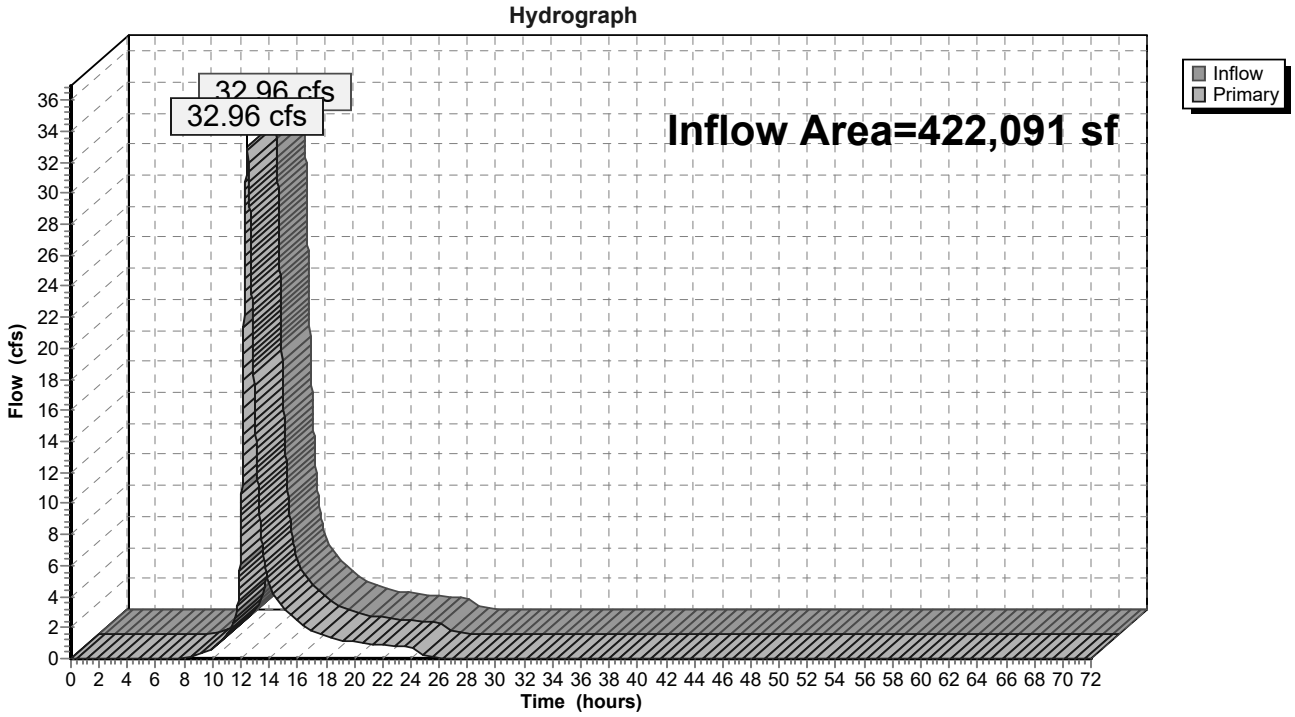


Summary for Link A: A

Inflow Area = 422,091 sf, 5.83% Impervious, Inflow Depth = 5.46" for 50-year event
Inflow = 32.96 cfs @ 12.46 hrs, Volume= 192,083 cf
Primary = 32.96 cfs @ 12.46 hrs, Volume= 192,083 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A

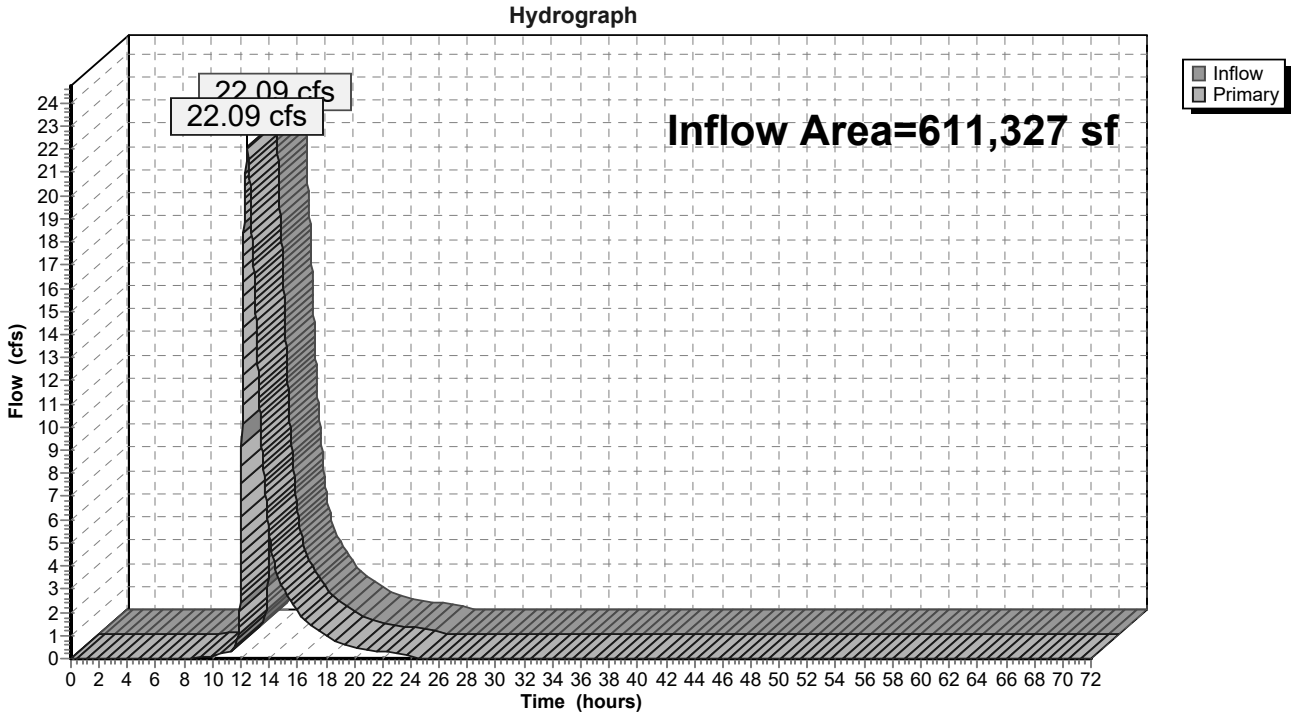


Summary for Link B: B

Inflow Area = 611,327 sf, 37.53% Impervious, Inflow Depth = 2.86" for 50-year event
Inflow = 22.09 cfs @ 12.46 hrs, Volume= 145,699 cf
Primary = 22.09 cfs @ 12.46 hrs, Volume= 145,699 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: B



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: SUB-A1 Runoff Area=422,091 sf 5.83% Impervious Runoff Depth=5.02"
Flow Length=1,620' Tc=32.8 min CN=74 Runoff=30.92 cfs 176,722 cf

Subcatchment A2: SUB-A2 Runoff Area=197,483 sf 24.49% Impervious Runoff Depth=5.61"
Flow Length=1,333' Tc=13.6 min CN=79 Runoff=23.17 cfs 92,330 cf

Subcatchment A3: SUB-A3 Runoff Area=45,304 sf 100.00% Impervious Runoff Depth=7.87"
Flow Length=51' Slope=0.0200 '/' Tc=6.0 min CN=98 Runoff=8.28 cfs 29,712 cf

Subcatchment A4: SUB-A4 Runoff Area=38,793 sf 28.18% Impervious Runoff Depth=5.85"
Flow Length=515' Tc=8.4 min CN=81 Runoff=5.51 cfs 18,899 cf

Subcatchment B1: SUB-B1 Runoff Area=187,914 sf 46.61% Impervious Runoff Depth=6.32"
Flow Length=1,482' Tc=20.5 min CN=85 Runoff=20.71 cfs 98,959 cf

Subcatchment B2: SUB-B2 Runoff Area=67,056 sf 0.00% Impervious Runoff Depth=4.79"
Flow Length=438' Tc=14.5 min CN=72 Runoff=6.63 cfs 26,773 cf

Subcatchment B3: SUB-B3 Runoff Area=48,216 sf 22.19% Impervious Runoff Depth=5.61"
Flow Length=766' Tc=10.5 min CN=79 Runoff=6.19 cfs 22,543 cf

Subcatchment B4: SB-B4 Runoff Area=26,561 sf 100.00% Impervious Runoff Depth=7.87"
Flow Length=51' Slope=0.0200 '/' Tc=6.0 min CN=98 Runoff=4.86 cfs 17,420 cf

Pond IB-1: IB-1 Peak Elev=246.74' Storage=28,729 cf Inflow=33.91 cfs 140,942 cf
Discarded=0.33 cfs 27,677 cf Primary=27.16 cfs 113,265 cf Secondary=0.00 cfs 0 cf Outflow=27.49 cfs 140,942 cf

Pond IB-2: IB-2 Peak Elev=244.67' Storage=76,188 cf Inflow=53.77 cfs 252,187 cf
8,390 cf Primary=22.83 cfs 150,712 cf Secondary=0.00 cfs 0 cf Tertiary=8.56 cfs 53,086 cf Outflow=31.93 cfs 252,188 cf

Link A: A Inflow=39.39 cfs 229,808 cf
Primary=39.39 cfs 229,808 cf

Link B: B Inflow=25.93 cfs 177,484 cf
Primary=25.93 cfs 177,484 cf

Total Runoff Area = 1,033,418 sf Runoff Volume = 483,357 cf Average Runoff Depth = 5.61"
75.42% Pervious = 779,369 sf 24.58% Impervious = 254,049 sf

Summary for Subcatchment A1: SUB-A1

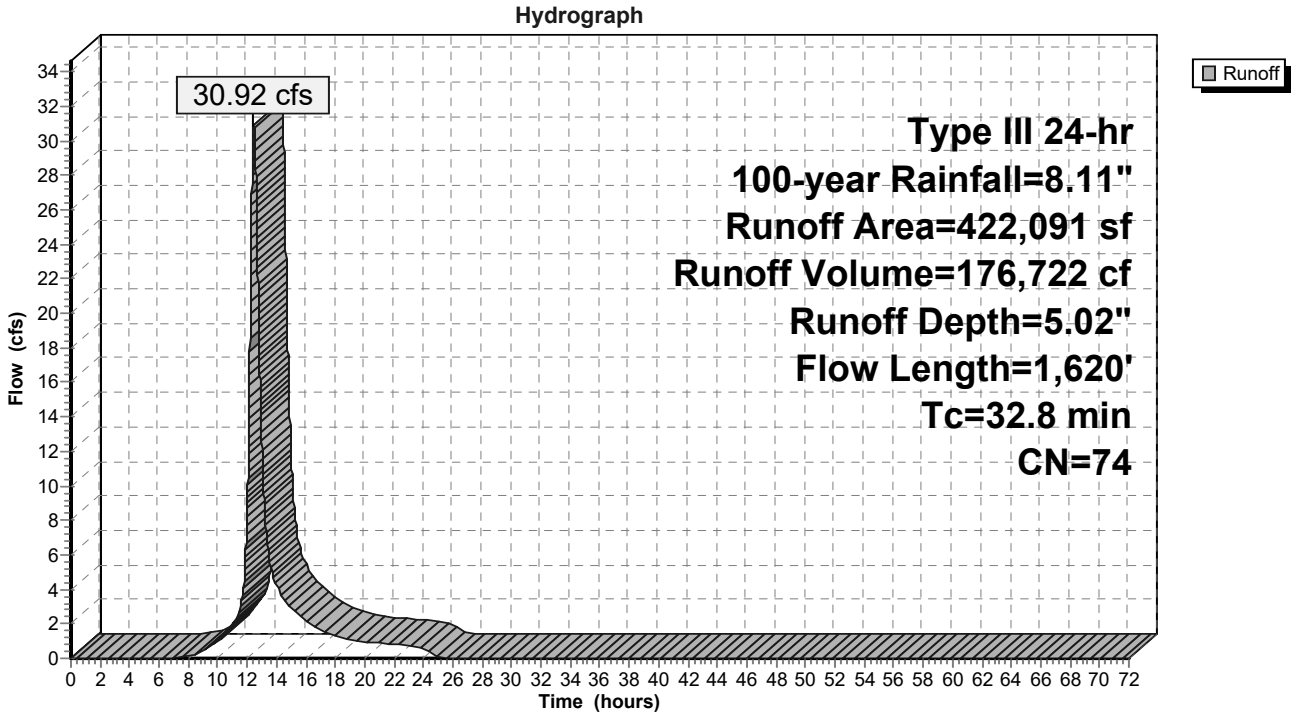
Runoff = 30.92 cfs @ 12.43 hrs, Volume= 176,722 cf, Depth= 5.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.11"

	Area (sf)	CN	Description
	127,217	74	>75% Grass cover, Good, HSG C
	211,698	70	Woods, Good, HSG C
*	24,606	98	Impervious Area
	716	96	Gravel surface, HSG C
	57,854	77	Woods, Good, HSG D
	422,091	74	Weighted Average
	397,485		94.17% Pervious Area
	24,606		5.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.43"
19.4	1,010	0.0300	0.87		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
1.5	560	0.0200	6.38	76.61	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.035 Earth, dense weeds
32.8	1,620	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

[47] Hint: Peak is 920% of capacity of segment #6

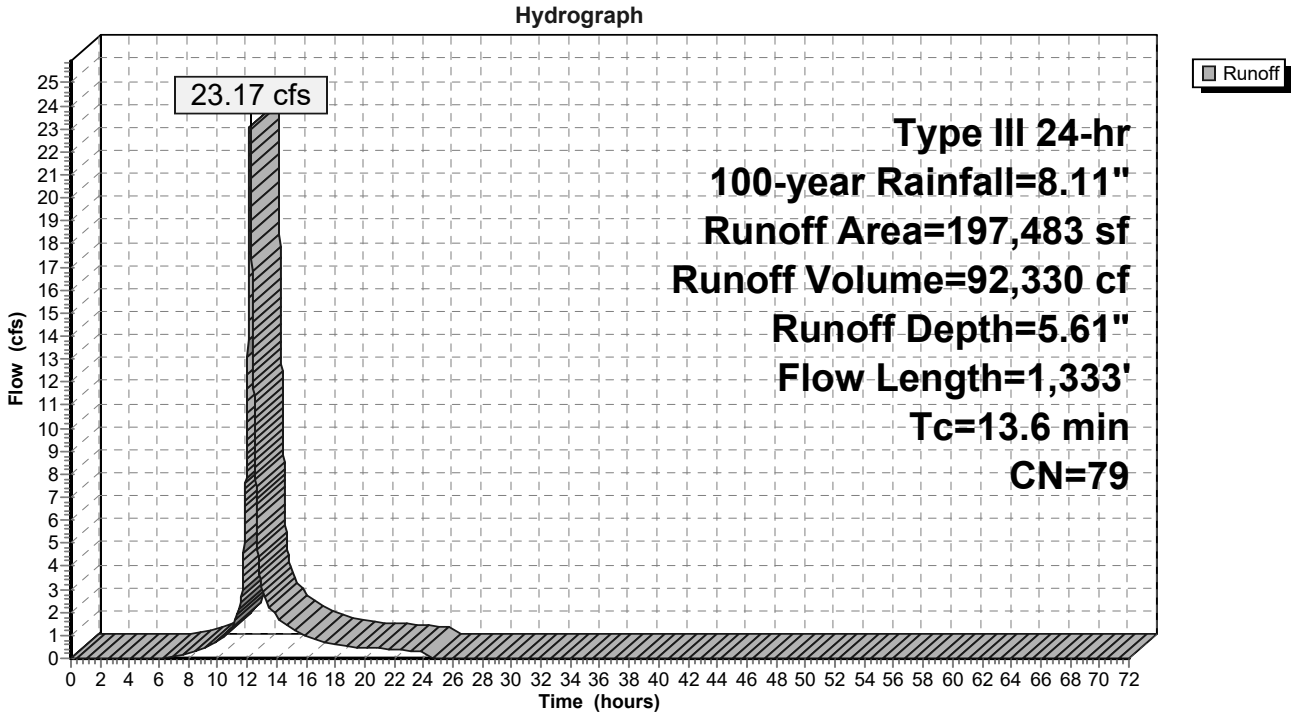
Runoff = 23.17 cfs @ 12.18 hrs, Volume= 92,330 cf, Depth= 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.11"

	Area (sf)	CN	Description
	83,784	74	>75% Grass cover, Good, HSG C
	52,545	70	Woods, Good, HSG C
*	44,663	98	Impervious Area
	1,148	96	Gravel surface, HSG C
*	3,703	98	Infiltration Basin Floor
	11,640	77	Woods, Good, HSG D
	197,483	79	Weighted Average
	149,117		75.51% Pervious Area
	48,366		24.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
2.9	208	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	77	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	141	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.3	835	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
13.6	1,333	Total			

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

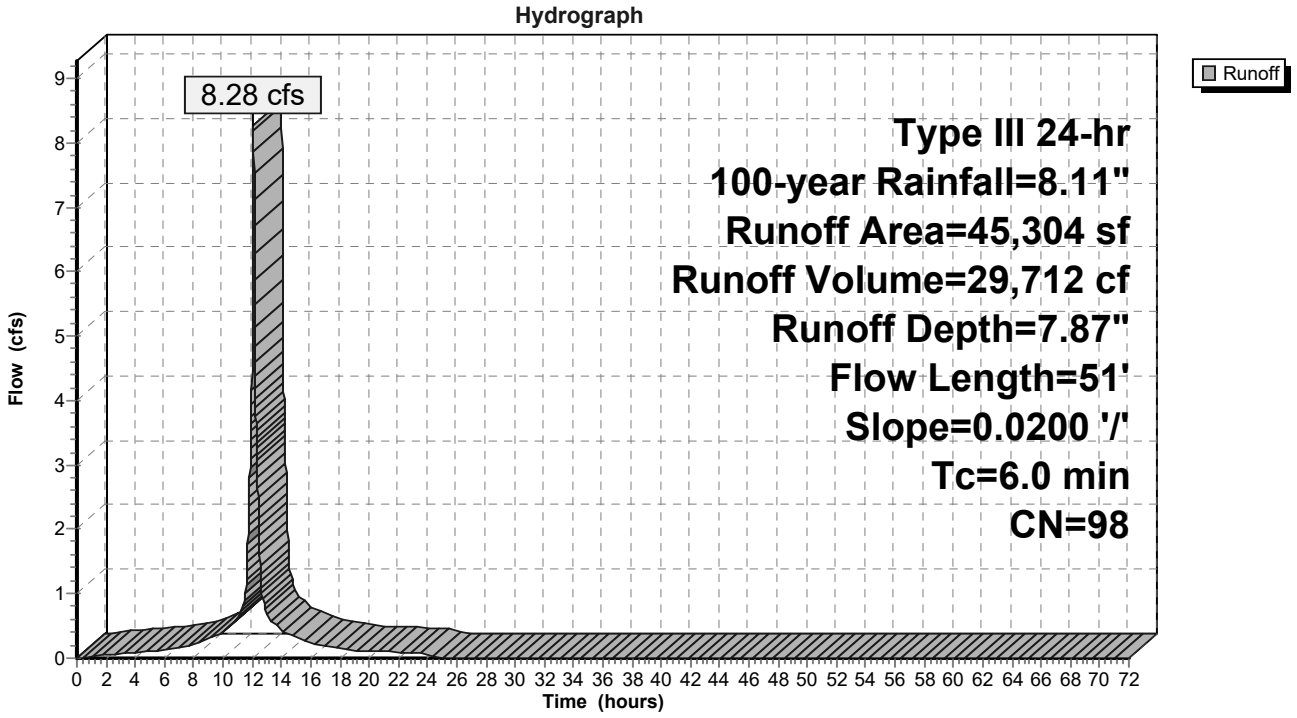
Runoff = 8.28 cfs @ 12.08 hrs, Volume= 29,712 cf, Depth= 7.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.11"

	Area (sf)	CN	Description
*	45,304	98	Impervious Area
	45,304		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
0.0	1	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	51	Total, Increased to minimum Tc = 6.0 min			

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

[47] Hint: Peak is 219% of capacity of segment #5

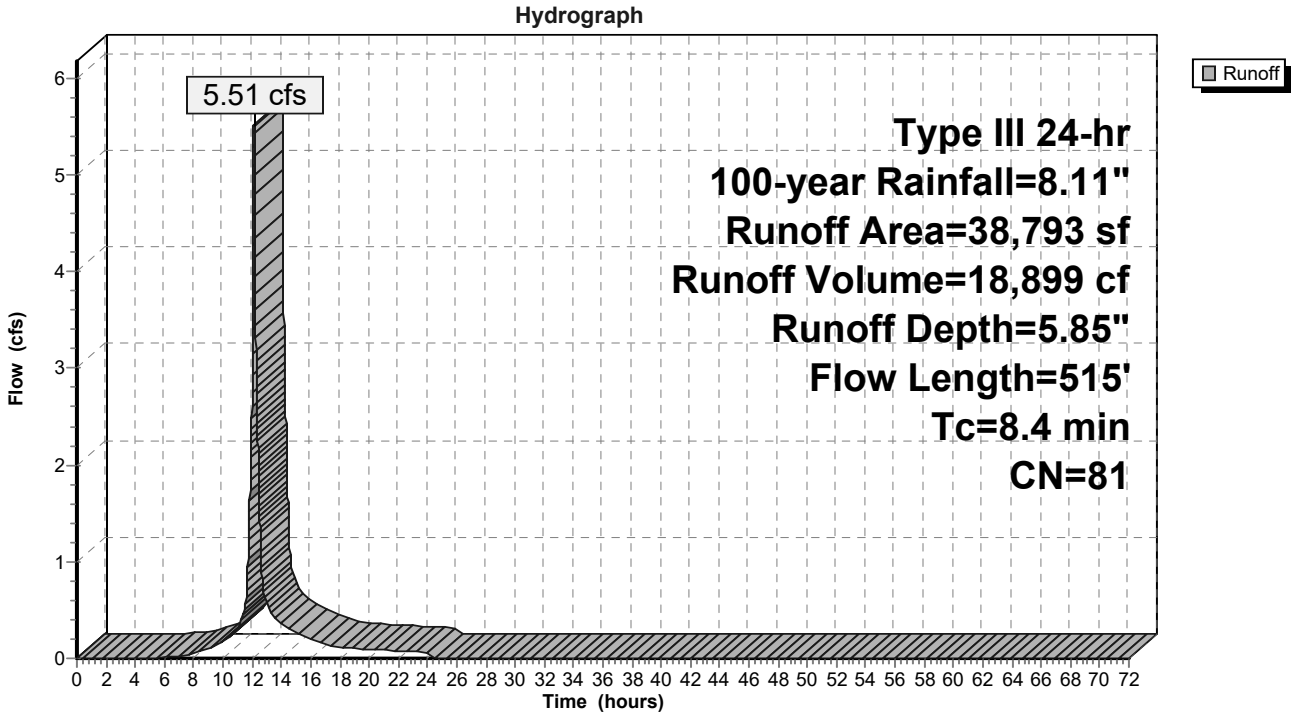
Runoff = 5.51 cfs @ 12.12 hrs, Volume= 18,899 cf, Depth= 5.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.11"

	Area (sf)	CN	Description
	27,860	74	>75% Grass cover, Good, HSG C
*	10,933	98	Impervious Area
	38,793	81	Weighted Average
	27,860		71.82% Pervious Area
	10,933		28.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
0.0	8	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	70	0.0294	1.20		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	57	0.0221	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	330	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
8.4	515	Total			

Subcatchment A4: SUB-A4



Summary for Subcatchment B1: SUB-B1

[47] Hint: Peak is 822% of capacity of segment #5

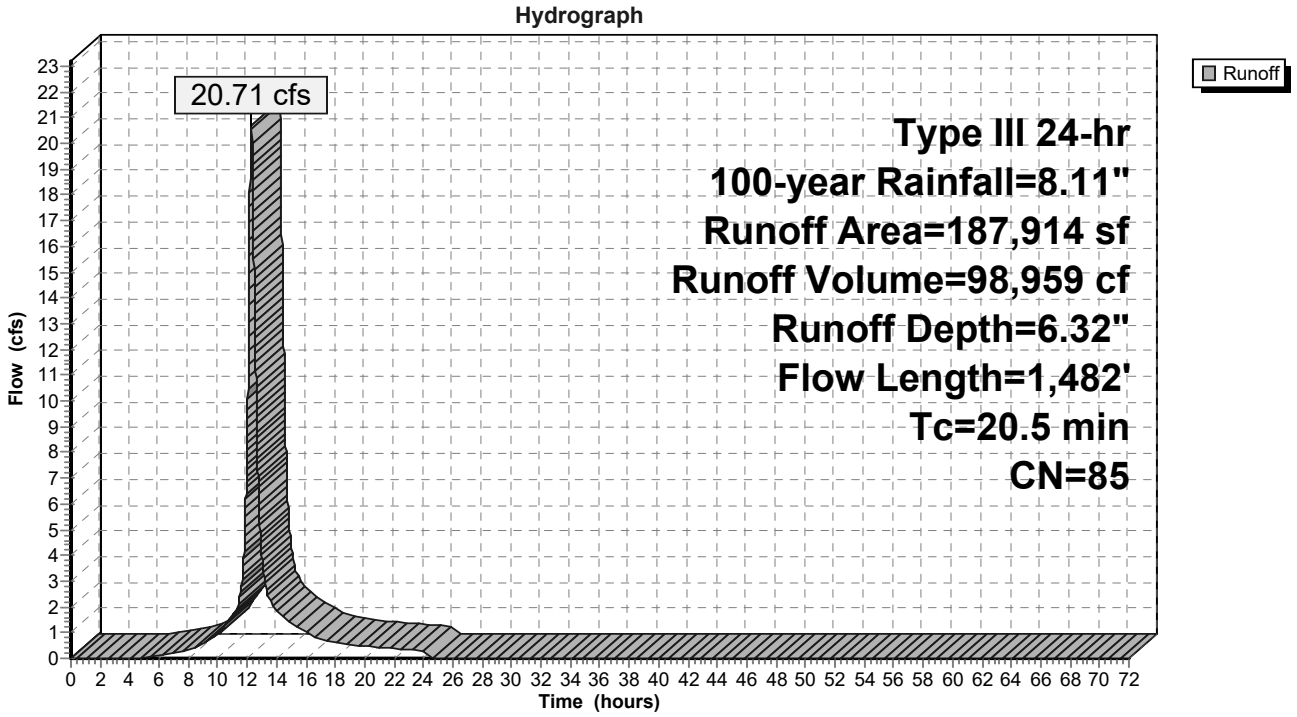
Runoff = 20.71 cfs @ 12.28 hrs, Volume= 98,959 cf, Depth= 6.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.11"

	Area (sf)	CN	Description
	76,568	74	>75% Grass cover, Good, HSG C
	23,764	70	Woods, Good, HSG C
*	81,637	98	Impervious Area
*	5,945	98	Infiltration Basin Floor
	187,914	85	Weighted Average
	100,332		53.39% Pervious Area
	87,582		46.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	50	0.0340	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
5.1	319	0.0435	1.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	28	0.1535	2.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	102	0.0245	3.18		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.1	983	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
20.5	1,482	Total			

Subcatchment B1: SUB-B1



Summary for Subcatchment B2: SUB-B2

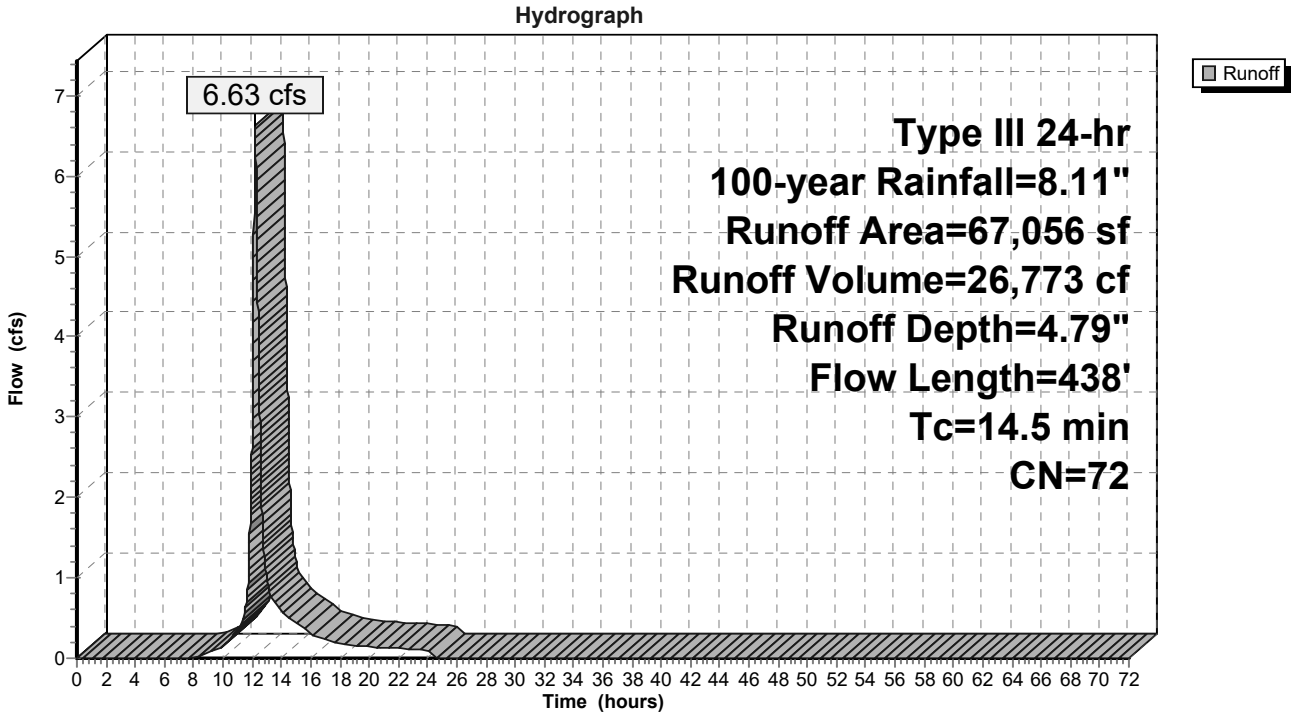
Runoff = 6.63 cfs @ 12.20 hrs, Volume= 26,773 cf, Depth= 4.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.11"

Area (sf)	CN	Description
29,339	74	>75% Grass cover, Good, HSG C
37,717	70	Woods, Good, HSG C
67,056	72	Weighted Average
67,056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.43"
6.2	388	0.0438	1.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.5	438	Total			

Subcatchment B2: SUB-B2



Summary for Subcatchment B3: SUB-B3

[47] Hint: Peak is 246% of capacity of segment #5

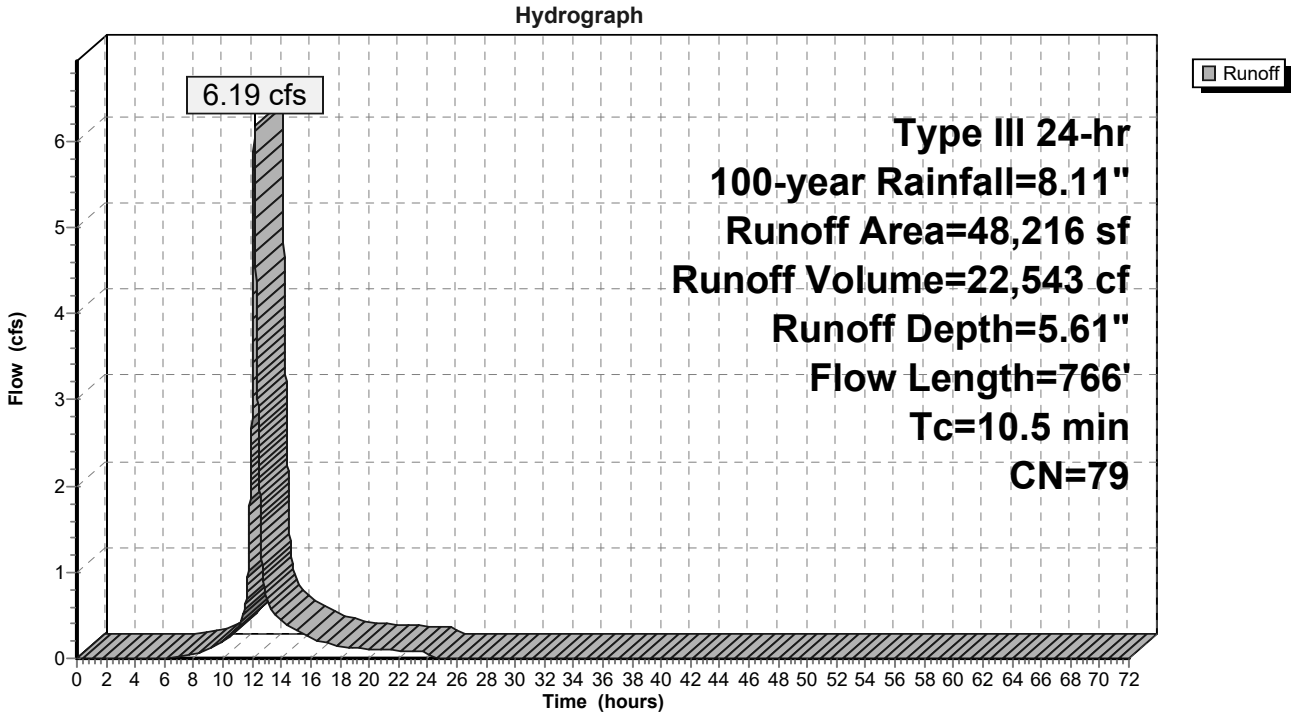
Runoff = 6.19 cfs @ 12.14 hrs, Volume= 22,543 cf, Depth= 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.11"

	Area (sf)	CN	Description
	37,519	74	>75% Grass cover, Good, HSG C
*	10,697	98	Impervious Area
	48,216	79	Weighted Average
	37,519		77.81% Pervious Area
	10,697		22.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.43"
0.6	40	0.0275	1.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	7	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	89	0.0202	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.0	580	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
10.5	766	Total			

Subcatchment B3: SUB-B3



Summary for Subcatchment B4: SB-B4

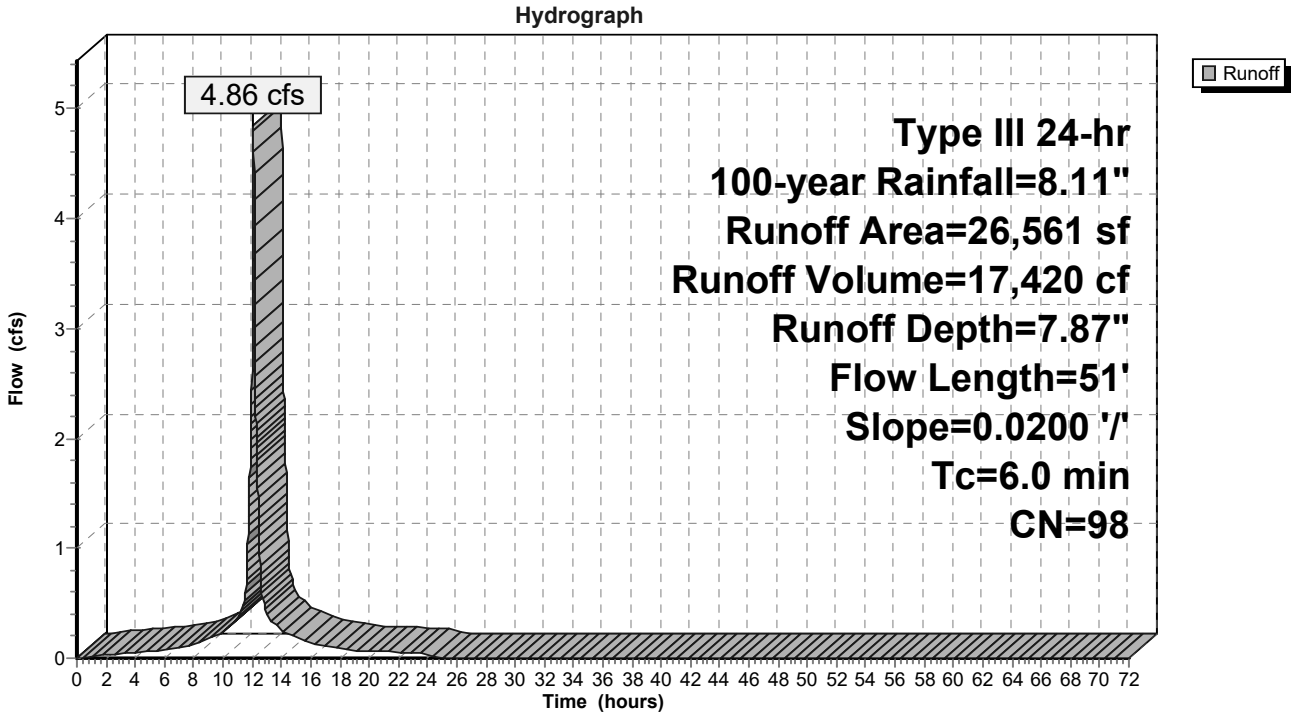
Runoff = 4.86 cfs @ 12.08 hrs, Volume= 17,420 cf, Depth= 7.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.11"

	Area (sf)	CN	Description
*	26,561	98	Impervious Area
	26,561		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
0.0	1	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	51	Total, Increased to minimum Tc = 6.0 min			

Subcatchment B4: SB-B4



Summary for Pond IB-1: IB-1

Inflow Area = 281,580 sf, 37.15% Impervious, Inflow Depth = 6.01" for 100-year event
Inflow = 33.91 cfs @ 12.14 hrs, Volume= 140,942 cf
Outflow = 27.49 cfs @ 12.16 hrs, Volume= 140,942 cf, Atten= 19%, Lag= 1.1 min
Discarded = 0.33 cfs @ 12.29 hrs, Volume= 27,677 cf
Primary = 27.16 cfs @ 12.16 hrs, Volume= 113,265 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 246.74' @ 12.29 hrs Surf.Area= 13,904 sf Storage= 28,729 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 105.3 min (900.9 - 795.6)

Volume	Invert	Avail.Storage	Storage Description
#1	244.00'	44,476 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
244.00	3,703	0	0	3,703
245.00	11,077	7,062	7,062	11,083
246.00	12,689	11,874	18,935	12,740
247.00	14,351	13,511	32,447	14,453
247.80	15,732	12,029	44,476	15,877

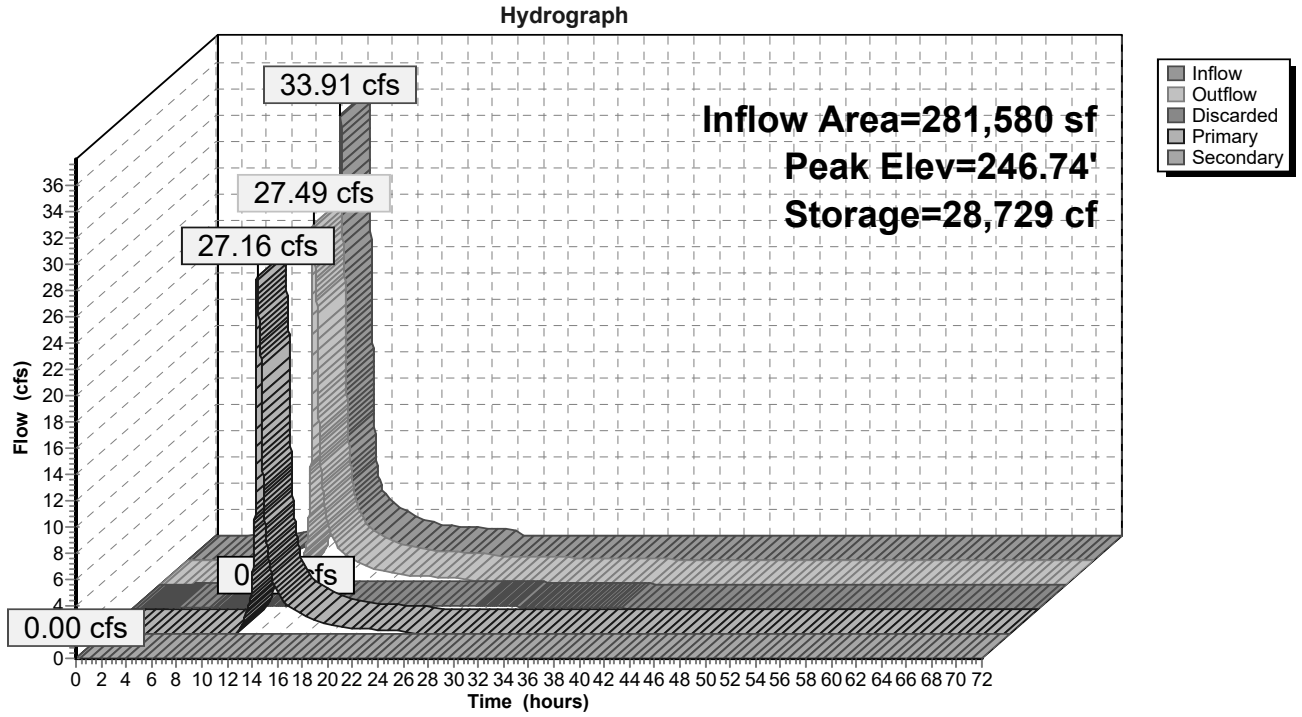
Device	Routing	Invert	Outlet Devices
#1	Secondary	246.80'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	244.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 4	246.20'	**48.0" x 48.0" Horiz. Orifice/Grate (OCS-1)** C= 0.600 Limited to weir flow at low heads
#4	Primary	241.38'	**24.0" Round Culvert (OCS-1)** L= 76.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 241.38' / 241.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#5	Device 4	245.20'	**36.0" W x 12.0" H Vert. Orifice/Grate (OCS-1)** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.33 cfs @ 12.29 hrs HW=246.74' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.33 cfs)

Primary OutFlow Max=26.89 cfs @ 12.16 hrs HW=246.62' TW=243.46' (Dynamic Tailwater)
└**4=Culvert (OCS-1)** (Inlet Controls 26.89 cfs @ 8.56 fps)
  ├**3=Orifice/Grate (OCS-1)** (Passes < 14.27 cfs potential flow)
  └**5=Orifice/Grate (OCS-1)** (Passes < 13.68 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=244.00' TW=240.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: IB-1


Hydrograph
33.91 cfs
27.49 cfs
27.16 cfs
0.00 cfs
Inflow Area=281,580 sf
Peak Elev=246.74'
Storage=28,729 cf
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Pond IB-2: IB-2

[95] Warning: Outlet Device #7 rise exceeded

Inflow Area = 544,271 sf, 42.16% Impervious, Inflow Depth = 5.56" for 100-year event
Inflow = 53.77 cfs @ 12.18 hrs, Volume= 252,187 cf
Outflow = 31.93 cfs @ 12.55 hrs, Volume= 252,188 cf, Atten= 41%, Lag= 21.7 min
Discarded = 0.54 cfs @ 12.55 hrs, Volume= 48,390 cf
Primary = 22.83 cfs @ 12.55 hrs, Volume= 150,712 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Tertiary = 8.56 cfs @ 12.55 hrs, Volume= 53,086 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 244.67' @ 12.55 hrs Surf.Area= 22,645 sf Storage= 76,188 cf

Plug-Flow detention time= 157.2 min calculated for 252,153 cf (100% of inflow)
Center-of-Mass det. time= 157.4 min (964.6 - 807.2)

Volume	Invert	Avail.Storage	Storage Description
#1	240.00'	103,342 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
240.00	5,945	0	0	5,945
241.00	12,658	9,093	9,093	12,666
242.00	16,770	14,666	23,758	16,801
243.00	18,908	17,828	41,587	18,990
244.00	21,137	20,012	61,599	21,275
245.00	23,418	22,268	83,867	23,617
245.80	25,283	19,476	103,342	25,533

Device	Routing	Invert	Outlet Devices
#1	Secondary	244.80'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	240.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 5	242.00'	**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
#4	Device 5	243.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	241.28'	**24.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 241.28' / 241.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#6	Device 8	244.30'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 8	241.60'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.50 Width (feet) 0.00 1.50

#8 Tertiary 238.25' **12.0" Round Culvert**
L= 50.0' CPP, square edge headwall, Ke= 0.500
Inlet / Outlet Invert= 238.25' / 238.00' S= 0.0050 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

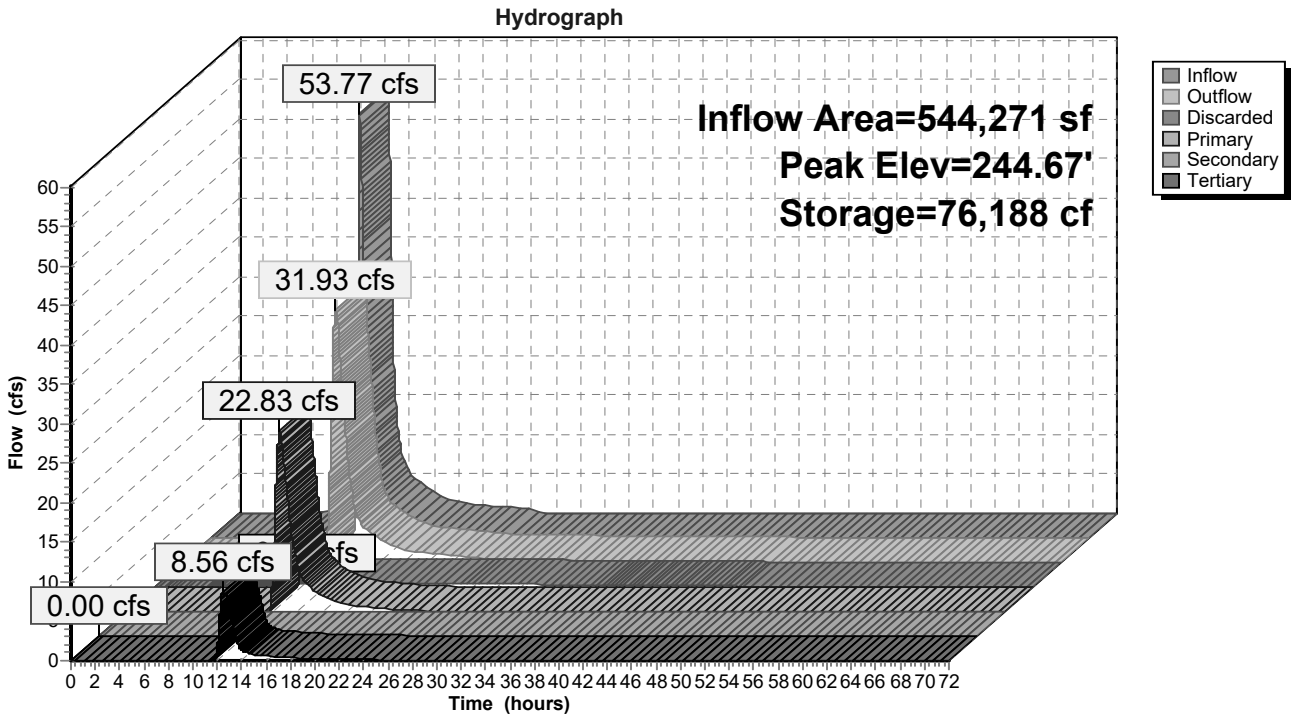
Discarded OutFlow Max=0.54 cfs @ 12.55 hrs HW=244.67' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.54 cfs)

Primary OutFlow Max=22.83 cfs @ 12.55 hrs HW=244.67' TW=0.00' (Dynamic Tailwater)
└**5=Culvert** (Barrel Controls 22.83 cfs @ 7.27 fps)
└**3=Broad-Crested Rectangular Weir** (Passes < 57.82 cfs potential flow)
└**4=Orifice/Grate** (Passes < 65.91 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=240.00' TW=0.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Tertiary OutFlow Max=8.56 cfs @ 12.55 hrs HW=244.67' TW=0.00' (Dynamic Tailwater)
└**8=Culvert** (Barrel Controls 8.56 cfs @ 10.90 fps)
└**6=Orifice/Grate** (Passes < 5.80 cfs potential flow)
└**7=Custom Weir/Orifice** (Passes < 7.92 cfs potential flow)

Pond IB-2: IB-2

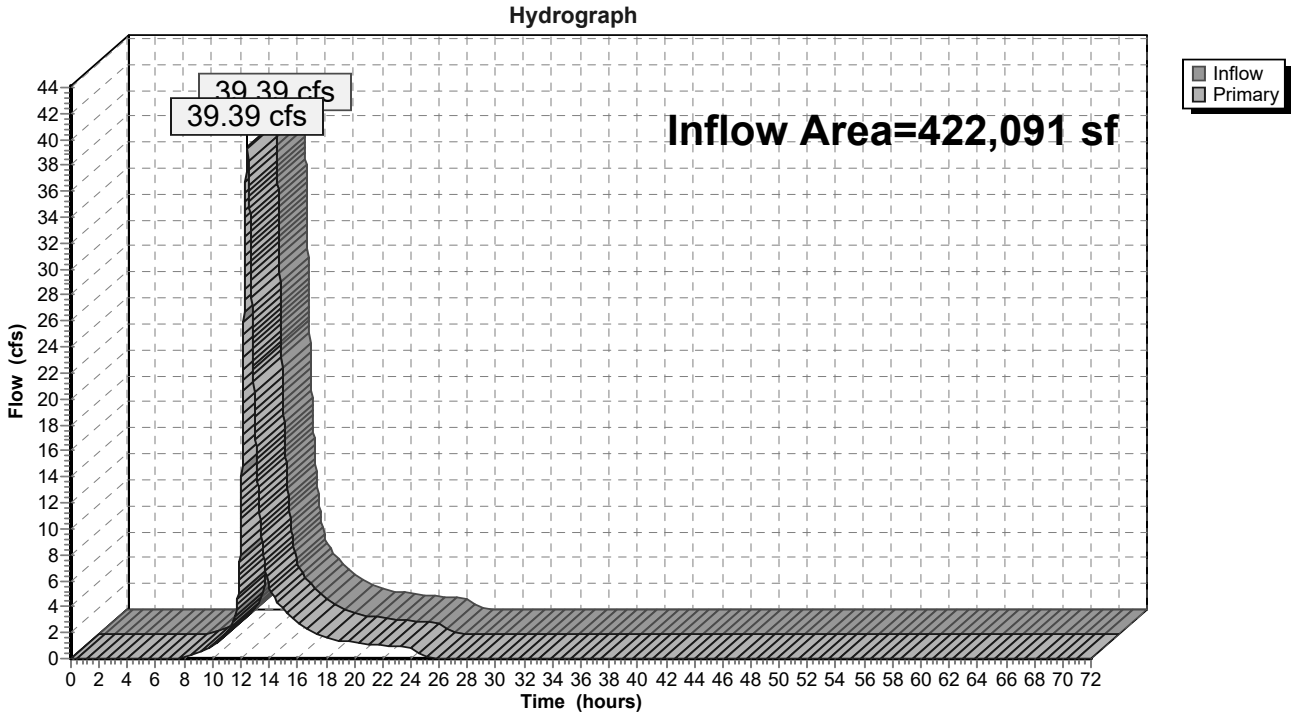


Summary for Link A: A

Inflow Area = 422,091 sf, 5.83% Impervious, Inflow Depth = 6.53" for 100-year event
Inflow = 39.39 cfs @ 12.45 hrs, Volume= 229,808 cf
Primary = 39.39 cfs @ 12.45 hrs, Volume= 229,808 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A

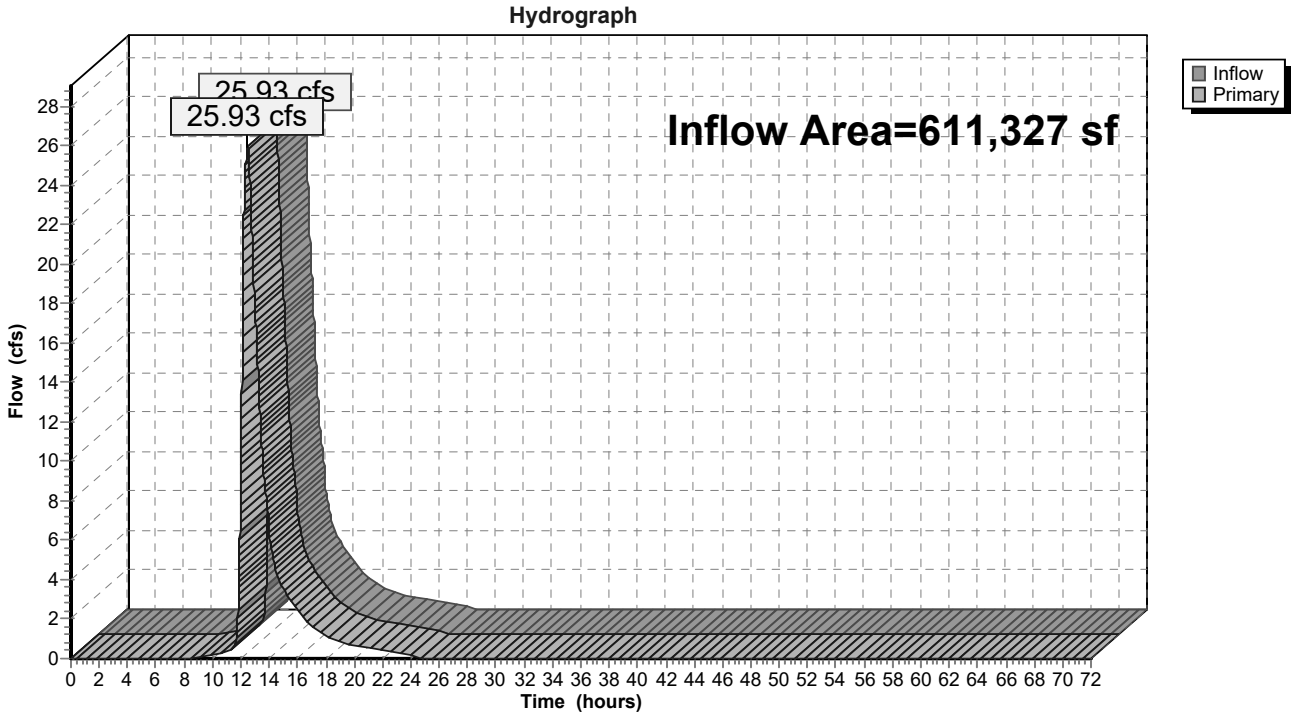


Summary for Link B: B

Inflow Area = 611,327 sf, 37.53% Impervious, Inflow Depth = 3.48" for 100-year event
Inflow = 25.93 cfs @ 12.47 hrs, Volume= 177,484 cf
Primary = 25.93 cfs @ 12.47 hrs, Volume= 177,484 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: B



Attachment F - Calculations

Attachment F.1 - Peak Discharge Summary

Walnut Street Senior Development
Foxborough, MA
Stormwater Discharge Summary Table
14-Dec-22

		Peak Discharge (cfs)		Runoff Volume (cf)	
Analysis Point	**24 Hr Storm**	**Pre-Development**	**Post-Development**	**Pre-Development**	**Post-Development**
A	2yr	9.09	**7.07**	53,498	**49,815**
	10yr	20.73	**19.23**	116,653	**112,836**
	25yr	28.70	**27.31**	160,473	**157,795**
	50yr	34.84	**32.96**	194,422	**192,083**
	100yr	41.52	**39.39**	231,759	**229,808**
B	2yr	7.18	**2.42**	39,652	**22,412**
	10yr	17.28	**12.45**	89,437	**79,119**
	25yr	24.30	**18.23**	124,444	**116,496**
	50yr	29.70	**22.09**	151,716	**145,699**
	100yr	35.62	**25.93**	181,821	**177,484**

Attachment F.2 - TSS Removal Worksheets

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Basin 1 (IB-1)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Infiltration Basin	**0.80**	**0.75**	**0.60**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**

Total TSS Removal = **85%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Walnut Street Senior Development**
Prepared By: **Dylan Erickson**
Date: **12/13/2022**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Basin 2 (IB-2)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Infiltration Basin	**0.80**	**0.75**	**0.60**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**

Total TSS Removal = **85%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Walnut Street Senior Development**
Prepared By: **Dylan Erickson**
Date: **12/13/2022**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Attachment F.3 – Recharge Volume Calculations

Walnut Street Senior Development
Recharge Volume Calculation

Required Recharge

Area Summary	
	Area (SF)*
Existing Impervious	30,059
Proposed Impervious	244,401
Required Recharge Area *(Proposed - Existing)*	214,342

* Areas calculated in HydroCAD

Note: Site consists of HSG C soils.

Hydrologic Soil Group Summary		
Group	Target Depth Factor (in)	Area (SF)
A	0.6	0
B	0.35	0
C	0.25	214,342
D	0.1	0

Required Recharge (*Rv*) Calculation:

Rv = Target Depth Factor x Δ Impervious Area
Rv = 0.6 x (1/12) x 214,342
Rv = 10,717 CF

Proposed Recharge Summary

Location	Volume (CF)*	Description
Infiltration Basin #1	9,308	IB-1
Infiltration Basin #2	17,396	IB-2
Total	26,704	

Rv = 10,717 CF
Provided recharge = 26,704 CF

Recharge Requirement is met.

*Note: Volume numbers listed above reflect static volume available in recharge systems. Actual volume of recharged water will be much higher due to dynamic action reflected in the HydroCAD analysis.

Attachment F.4 - Water Quality Volume Calculations

Walnut Street Senior Development
Water Quality Volume Calculation - IB#1
Dec-22

Required Water Quality Storage
Proposed Impervious Area sf x 1" x 1'/12"= Required WQ Storage CF

Location	Proposed Impervious Area (sqft)	Required WQ Storage (cf)	Provided WQ Storage (cf)	Description
Infiltration Basin One	96,149	8,012	9,308	IB-1

Walnut Street Senior Development
Water Quality Volume Calculation - IB#2
Dec-22

Required Water Quality Storage
Proposed Impervious Area sf x 1" x 1'/12"= Required WQ Storage CF

Location	Proposed Impervious Area (sqft)	Required WQ Storage (cf)	Provided WQ Storage (cf)	Description
Infiltration Basin Two	116,922	9,744	17,396	IB-2

Stage-Area-Storage for Pond IB-1: IB-1

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
244.00	3,703	3,703	0
244.01	3,757	3,757	37
244.02	3,812	3,812	75
244.03	3,867	3,867	114
244.04	3,922	3,922	152
244.05	3,978	3,978	192
244.06	4,034	4,035	232
244.07	4,091	4,091	273
244.08	4,148	4,148	314
244.09	4,205	4,206	356
244.10	4,263	4,263	398
244.11	4,321	4,322	441
244.12	4,380	4,380	484
244.13	4,439	4,439	528
244.14	4,498	4,499	573
244.15	4,558	4,558	618
244.16	4,618	4,619	664
244.17	4,678	4,679	711
244.18	4,739	4,740	758
244.19	4,801	4,802	806
244.20	4,862	4,863	854
244.21	4,925	4,926	903
244.22	4,987	4,988	952
244.23	5,050	5,051	1,003
244.24	5,113	5,114	1,053
244.25	5,177	5,178	1,105
244.26	5,241	5,242	1,157
244.27	5,306	5,307	1,210
244.28	5,370	5,372	1,263
244.29	5,436	5,437	1,317
244.30	5,501	5,503	1,372
244.31	5,567	5,569	1,427
244.32	5,634	5,635	1,483
244.33	5,701	5,702	1,540
244.34	5,768	5,770	1,597
244.35	5,836	5,837	1,655
244.36	5,904	5,905	1,714
244.37	5,972	5,974	1,773
244.38	6,041	6,043	1,833
244.39	6,110	6,112	1,894
244.40	6,180	6,182	1,955
244.41	6,250	6,252	2,018
244.42	6,320	6,322	2,080
244.43	6,391	6,393	2,144
244.44	6,462	6,464	2,208
244.45	6,533	6,536	2,273
244.46	6,605	6,608	2,339
244.47	6,678	6,680	2,405
244.48	6,751	6,753	2,473
244.49	6,824	6,826	2,540
244.50	6,897	6,900	2,609
244.51	6,971	6,974	2,678
244.52	7,046	7,048	2,748

Stage-Area-Storage for Pond IB-1: IB-1 (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
244.53	7,120	7,123	2,819
244.54	7,195	7,198	2,891
244.55	7,271	7,274	2,963
244.56	7,347	7,350	3,036
244.57	7,423	7,426	3,110
244.58	7,500	7,503	3,185
244.59	7,577	7,580	3,260
244.60	7,654	7,658	3,336
244.61	7,732	7,735	3,413
244.62	7,811	7,814	3,491
244.63	7,889	7,893	3,569
244.64	7,968	7,972	3,649
244.65	8,048	8,051	3,729
244.66	8,128	8,131	3,810
244.67	8,208	8,211	3,891
244.68	8,288	8,292	3,974
244.69	8,369	8,373	4,057
244.70	8,451	8,455	4,141
244.71	8,533	8,537	4,226
244.72	8,615	8,619	4,312
244.73	8,698	8,702	4,398
244.74	8,781	8,785	4,486
244.75	8,864	8,868	4,574
244.76	8,948	8,952	4,663
244.77	9,032	9,036	4,753
244.78	9,117	9,121	4,844
244.79	9,201	9,206	4,935
244.80	9,287	9,291	5,028
244.81	9,373	9,377	5,121
244.82	9,459	9,463	5,215
244.83	9,545	9,550	5,310
244.84	9,632	9,637	5,406
244.85	9,720	9,724	5,503
244.86	9,807	9,812	5,601
244.87	9,895	9,900	5,699
244.88	9,984	9,989	5,798
244.89	10,073	10,078	5,899
244.90	10,162	10,167	6,000
244.91	10,252	10,257	6,102
244.92	10,342	10,347	6,205
244.93	10,433	10,438	6,309
244.94	10,523	10,529	6,414
244.95	10,615	10,620	6,519
244.96	10,706	10,712	6,626
244.97	10,798	10,804	6,733
244.98	10,891	10,897	6,842
244.99	10,984	10,990	6,951
245.00	11,077	11,083	7,062
245.01	11,093	11,099	7,172
245.02	11,108	11,115	7,283
245.03	11,124	11,131	7,395
245.04	11,139	11,147	7,506
245.05	11,155	11,163	7,617

Stage-Area-Storage for Pond IB-1: IB-1 (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
245.06	11,171	11,179	7,729
245.07	11,186	11,195	7,841
245.08	11,202	11,211	7,953
245.09	11,218	11,227	8,065
245.10	11,233	11,244	8,177
245.11	11,249	11,260	8,289
245.12	11,265	11,276	8,402
245.13	11,280	11,292	8,515
245.14	11,296	11,308	8,628
245.15	11,312	11,324	8,741
245.16	11,328	11,341	8,854
245.17	11,343	11,357	8,967
245.18	11,359	11,373	9,081
245.19	11,375	11,389	9,194
245.20	11,391	11,405	9,308
245.21	11,406	11,422	9,422
245.22	11,422	11,438	9,536
245.23	11,438	11,454	9,651
245.24	11,454	11,470	9,765
245.25	11,470	11,487	9,880
245.26	11,486	11,503	9,994
245.27	11,501	11,519	10,109
245.28	11,517	11,536	10,225
245.29	11,533	11,552	10,340
245.30	11,549	11,568	10,455
245.31	11,565	11,585	10,571
245.32	11,581	11,601	10,686
245.33	11,597	11,617	10,802
245.34	11,613	11,634	10,918
245.35	11,629	11,650	11,035
245.36	11,645	11,667	11,151
245.37	11,661	11,683	11,268
245.38	11,677	11,700	11,384
245.39	11,693	11,716	11,501
245.40	11,709	11,732	11,618
245.41	11,725	11,749	11,735
245.42	11,741	11,765	11,853
245.43	11,757	11,782	11,970
245.44	11,773	11,798	12,088
245.45	11,789	11,815	12,205
245.46	11,805	11,831	12,323
245.47	11,821	11,848	12,442
245.48	11,837	11,864	12,560
245.49	11,853	11,881	12,678
245.50	11,869	11,898	12,797
245.51	11,885	11,914	12,916
245.52	11,902	11,931	13,035
245.53	11,918	11,947	13,154
245.54	11,934	11,964	13,273
245.55	11,950	11,981	13,392
245.56	11,966	11,997	13,512
245.57	11,982	12,014	13,632
245.58	11,999	12,031	13,752

Stage-Area-Storage for Pond IB-1: IB-1 (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
245.59	12,015	12,047	13,872
245.60	12,031	12,064	13,992
245.61	12,047	12,081	14,112
245.62	12,064	12,097	14,233
245.63	12,080	12,114	14,354
245.64	12,096	12,131	14,475
245.65	12,112	12,148	14,596
245.66	12,129	12,164	14,717
245.67	12,145	12,181	14,838
245.68	12,161	12,198	14,960
245.69	12,178	12,215	15,081
245.70	12,194	12,231	15,203
245.71	12,210	12,248	15,325
245.72	12,227	12,265	15,447
245.73	12,243	12,282	15,570
245.74	12,259	12,299	15,692
245.75	12,276	12,316	15,815
245.76	12,292	12,332	15,938
245.77	12,309	12,349	16,061
245.78	12,325	12,366	16,184
245.79	12,341	12,383	16,307
245.80	12,358	12,400	16,431
245.81	12,374	12,417	16,554
245.82	12,391	12,434	16,678
245.83	12,407	12,451	16,802
245.84	12,424	12,468	16,926
245.85	12,440	12,485	17,051
245.86	12,457	12,502	17,175
245.87	12,473	12,519	17,300
245.88	12,490	12,536	17,425
245.89	12,506	12,553	17,550
245.90	12,523	12,570	17,675
245.91	12,539	12,587	17,800
245.92	12,556	12,604	17,926
245.93	12,573	12,621	18,051
245.94	12,589	12,638	18,177
245.95	12,606	12,655	18,303
245.96	12,622	12,672	18,429
245.97	12,639	12,689	18,555
245.98	12,656	12,706	18,682
245.99	12,672	12,723	18,809
246.00	12,689	12,740	18,935
246.01	12,705	12,757	19,062
246.02	12,721	12,774	19,189
246.03	12,737	12,790	19,317
246.04	12,754	12,807	19,444
246.05	12,770	12,824	19,572
246.06	12,786	12,840	19,700
246.07	12,802	12,857	19,828
246.08	12,818	12,874	19,956
246.09	12,834	12,890	20,084
246.10	12,851	12,907	20,212
246.11	12,867	12,924	20,341

Stage-Area-Storage for Pond IB-1: IB-1 (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
246.12	12,883	12,940	20,470
246.13	12,899	12,957	20,599
246.14	12,916	12,974	20,728
246.15	12,932	12,991	20,857
246.16	12,948	13,007	20,986
246.17	12,964	13,024	21,116
246.18	12,981	13,041	21,246
246.19	12,997	13,058	21,375
246.20	13,013	13,075	21,506
246.21	13,030	13,091	21,636
246.22	13,046	13,108	21,766
246.23	13,062	13,125	21,897
246.24	13,079	13,142	22,027
246.25	13,095	13,159	22,158
246.26	13,111	13,176	22,289
246.27	13,128	13,192	22,420
246.28	13,144	13,209	22,552
246.29	13,160	13,226	22,683
246.30	13,177	13,243	22,815
246.31	13,193	13,260	22,947
246.32	13,210	13,277	23,079
246.33	13,226	13,294	23,211
246.34	13,243	13,311	23,343
246.35	13,259	13,328	23,476
246.36	13,276	13,345	23,609
246.37	13,292	13,362	23,741
246.38	13,309	13,379	23,874
246.39	13,325	13,396	24,008
246.40	13,342	13,413	24,141
246.41	13,358	13,430	24,274
246.42	13,375	13,447	24,408
246.43	13,391	13,464	24,542
246.44	13,408	13,481	24,676
246.45	13,424	13,498	24,810
246.46	13,441	13,515	24,944
246.47	13,457	13,532	25,079
246.48	13,474	13,549	25,214
246.49	13,491	13,566	25,348
246.50	13,507	13,583	25,483
246.51	13,524	13,601	25,619
246.52	13,540	13,618	25,754
246.53	13,557	13,635	25,889
246.54	13,574	13,652	26,025
246.55	13,590	13,669	26,161
246.56	13,607	13,686	26,297
246.57	13,624	13,704	26,433
246.58	13,641	13,721	26,569
246.59	13,657	13,738	26,706
246.60	13,674	13,755	26,842
246.61	13,691	13,772	26,979
246.62	13,707	13,790	27,116
246.63	13,724	13,807	27,253
246.64	13,741	13,824	27,391

Stage-Area-Storage for Pond IB-1: IB-1 (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
246.65	13,758	13,842	27,528
246.66	13,774	13,859	27,666
246.67	13,791	13,876	27,804
246.68	13,808	13,893	27,942
246.69	13,825	13,911	28,080
246.70	13,842	13,928	28,218
246.71	13,858	13,945	28,357
246.72	13,875	13,963	28,495
246.73	13,892	13,980	28,634
246.74	13,909	13,997	28,773
246.75	13,926	14,015	28,912
246.76	13,943	14,032	29,052
246.77	13,960	14,050	29,191
246.78	13,977	14,067	29,331
246.79	13,993	14,084	29,471
246.80	14,010	14,102	29,611
246.81	14,027	14,119	29,751
246.82	14,044	14,137	29,891
246.83	14,061	14,154	30,032
246.84	14,078	14,172	30,173
246.85	14,095	14,189	30,313
246.86	14,112	14,207	30,454
246.87	14,129	14,224	30,596
246.88	14,146	14,242	30,737
246.89	14,163	14,259	30,879
246.90	14,180	14,277	31,020
246.91	14,197	14,294	31,162
246.92	14,214	14,312	31,304
246.93	14,231	14,330	31,446
246.94	14,248	14,347	31,589
246.95	14,265	14,365	31,731
246.96	14,283	14,382	31,874
246.97	14,300	14,400	32,017
246.98	14,317	14,418	32,160
246.99	14,334	14,435	32,303
247.00	14,351	14,453	32,447
247.01	14,368	14,470	32,590
247.02	14,385	14,488	32,734
247.03	14,402	14,505	32,878
247.04	14,419	14,522	33,022
247.05	14,435	14,540	33,167
247.06	14,452	14,557	33,311
247.07	14,469	14,575	33,456
247.08	14,486	14,592	33,600
247.09	14,503	14,610	33,745
247.10	14,520	14,627	33,890
247.11	14,537	14,645	34,036
247.12	14,554	14,662	34,181
247.13	14,571	14,680	34,327
247.14	14,588	14,697	34,473
247.15	14,605	14,715	34,619
247.16	14,622	14,732	34,765
247.17	14,639	14,750	34,911

Stage-Area-Storage for Pond IB-1: IB-1 (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
247.18	14,656	14,768	35,057
247.19	14,673	14,785	35,204
247.20	14,690	14,803	35,351
247.21	14,707	14,820	35,498
247.22	14,724	14,838	35,645
247.23	14,742	14,856	35,792
247.24	14,759	14,873	35,940
247.25	14,776	14,891	36,088
247.26	14,793	14,908	36,235
247.27	14,810	14,926	36,383
247.28	14,827	14,944	36,532
247.29	14,844	14,961	36,680
247.30	14,861	14,979	36,829
247.31	14,879	14,997	36,977
247.32	14,896	15,015	37,126
247.33	14,913	15,032	37,275
247.34	14,930	15,050	37,424
247.35	14,947	15,068	37,574
247.36	14,965	15,086	37,723
247.37	14,982	15,103	37,873
247.38	14,999	15,121	38,023
247.39	15,016	15,139	38,173
247.40	15,034	15,157	38,323
247.41	15,051	15,174	38,474
247.42	15,068	15,192	38,624
247.43	15,085	15,210	38,775
247.44	15,103	15,228	38,926
247.45	15,120	15,246	39,077
247.46	15,137	15,264	39,228
247.47	15,155	15,282	39,380
247.48	15,172	15,299	39,531
247.49	15,189	15,317	39,683
247.50	15,207	15,335	39,835
247.51	15,224	15,353	39,987
247.52	15,241	15,371	40,140
247.53	15,259	15,389	40,292
247.54	15,276	15,407	40,445
247.55	15,294	15,425	40,598
247.56	15,311	15,443	40,751
247.57	15,328	15,461	40,904
247.58	15,346	15,479	41,057
247.59	15,363	15,497	41,211
247.60	15,381	15,515	41,365
247.61	15,398	15,533	41,519
247.62	15,416	15,551	41,673
247.63	15,433	15,569	41,827
247.64	15,451	15,587	41,981
247.65	15,468	15,605	42,136
247.66	15,486	15,623	42,291
247.67	15,503	15,641	42,446
247.68	15,521	15,659	42,601
247.69	15,538	15,677	42,756
247.70	15,556	15,695	42,911

Stage-Area-Storage for Pond IB-1: IB-1 (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
247.71	15,573	15,713	43,067
247.72	15,591	15,732	43,223
247.73	15,609	15,750	43,379
247.74	15,626	15,768	43,535
247.75	15,644	15,786	43,691
247.76	15,661	15,804	43,848
247.77	15,679	15,822	44,005
247.78	15,697	15,840	44,162
247.79	15,714	15,859	44,319
247.80	**15,732**	**15,877**	**44,476**

Stage-Area-Storage for Pond IB-2: IB-2

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
240.00	5,945	5,945	0
240.02	6,055	6,055	120
240.04	6,165	6,166	242
240.06	6,277	6,278	367
240.08	6,390	6,390	493
240.10	6,503	6,504	622
240.12	6,618	6,619	753
240.14	6,734	6,735	887
240.16	6,851	6,852	1,023
240.18	6,968	6,970	1,161
240.20	7,087	7,088	1,302
240.22	7,207	7,208	1,444
240.24	7,327	7,329	1,590
240.26	7,449	7,451	1,738
240.28	7,572	7,574	1,888
240.30	7,696	7,698	2,040
240.32	7,820	7,823	2,196
240.34	7,946	7,949	2,353
240.36	8,073	8,076	2,513
240.38	8,201	8,203	2,676
240.40	8,329	8,332	2,842
240.42	8,459	8,462	3,009
240.44	8,590	8,593	3,180
240.46	8,722	8,725	3,353
240.48	8,854	8,858	3,529
240.50	8,988	8,992	3,707
240.52	9,123	9,127	3,888
240.54	9,259	9,263	4,072
240.56	9,395	9,400	4,259
240.58	9,533	9,538	4,448
240.60	9,672	9,677	4,640
240.62	9,812	9,817	4,835
240.64	9,953	9,958	5,032
240.66	10,094	10,100	5,233
240.68	10,237	10,242	5,436
240.70	10,381	10,386	5,642
240.72	10,526	10,531	5,851
240.74	10,671	10,677	6,063
240.76	10,818	10,824	6,278
240.78	10,966	10,972	6,496
240.80	11,115	11,121	6,717
240.82	11,265	11,271	6,941
240.84	11,415	11,422	7,168
240.86	11,567	11,574	7,397
240.88	11,720	11,727	7,630
240.90	11,874	11,881	7,866
240.92	12,029	12,036	8,105
240.94	12,185	12,192	8,347
240.96	12,341	12,349	8,593
240.98	12,499	12,507	8,841
241.00	12,658	12,666	9,093
241.02	12,735	12,743	9,347
241.04	12,811	12,821	9,602

Stage-Area-Storage for Pond IB-2: IB-2 (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
241.06	12,888	12,898	9,859
241.08	12,966	12,976	10,118
241.10	13,043	13,054	10,378
241.12	13,121	13,132	10,639
241.14	13,199	13,210	10,902
241.16	13,277	13,289	11,167
241.18	13,356	13,368	11,434
241.20	13,434	13,447	11,701
241.22	13,513	13,526	11,971
241.24	13,592	13,606	12,242
241.26	13,672	13,685	12,515
241.28	13,751	13,765	12,789
241.30	13,831	13,846	13,065
241.32	13,911	13,926	13,342
241.34	13,991	14,007	13,621
241.36	14,072	14,088	13,902
241.38	14,153	14,169	14,184
241.40	14,234	14,250	14,468
241.42	14,315	14,332	14,753
241.44	14,396	14,414	15,040
241.46	14,478	14,496	15,329
241.48	14,560	14,578	15,620
241.50	14,642	14,661	15,912
241.52	14,724	14,744	16,205
241.54	14,807	14,827	16,501
241.56	14,890	14,910	16,797
241.58	14,973	14,994	17,096
241.60	15,056	15,077	17,396
241.62	15,139	15,161	17,698
241.64	15,223	15,245	18,002
241.66	15,307	15,330	18,307
241.68	15,391	15,415	18,614
241.70	15,476	15,499	18,923
241.72	15,560	15,585	19,233
241.74	15,645	15,670	19,545
241.76	15,730	15,756	19,859
241.78	15,816	15,841	20,175
241.80	15,901	15,927	20,492
241.82	15,987	16,014	20,811
241.84	16,073	16,100	21,131
241.86	16,160	16,187	21,454
241.88	16,246	16,274	21,778
241.90	16,333	16,361	22,103
241.92	16,420	16,449	22,431
241.94	16,507	16,536	22,760
241.96	16,594	16,624	23,091
241.98	16,682	16,712	23,424
242.00	16,770	16,801	23,758
242.02	16,812	16,843	24,094
242.04	16,853	16,886	24,431
242.06	16,895	16,928	24,768
242.08	16,936	16,971	25,107
242.10	16,978	17,014	25,446

Stage-Area-Storage for Pond IB-2: IB-2 (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
242.12	17,020	17,057	25,786
242.14	17,062	17,099	26,127
242.16	17,103	17,142	26,468
242.18	17,145	17,185	26,811
242.20	17,187	17,228	27,154
242.22	17,229	17,271	27,498
242.24	17,271	17,314	27,843
242.26	17,314	17,357	28,189
242.28	17,356	17,401	28,536
242.30	17,398	17,444	28,883
242.32	17,440	17,487	29,232
242.34	17,483	17,530	29,581
242.36	17,525	17,574	29,931
242.38	17,567	17,617	30,282
242.40	17,610	17,661	30,634
242.42	17,652	17,704	30,986
242.44	17,695	17,748	31,340
242.46	17,738	17,792	31,694
242.48	17,780	17,835	32,049
242.50	17,823	17,879	32,405
242.52	17,866	17,923	32,762
242.54	17,909	17,967	33,120
242.56	17,951	18,011	33,479
242.58	17,994	18,055	33,838
242.60	18,037	18,099	34,198
242.62	18,080	18,143	34,560
242.64	18,124	18,187	34,922
242.66	18,167	18,231	35,285
242.68	18,210	18,275	35,648
242.70	18,253	18,320	36,013
242.72	18,296	18,364	36,378
242.74	18,340	18,409	36,745
242.76	18,383	18,453	37,112
242.78	18,427	18,497	37,480
242.80	18,470	18,542	37,849
242.82	18,514	18,587	38,219
242.84	18,557	18,631	38,590
242.86	18,601	18,676	38,961
242.88	18,645	18,721	39,334
242.90	18,688	18,766	39,707
242.92	18,732	18,810	40,081
242.94	18,776	18,855	40,456
242.96	18,820	18,900	40,832
242.98	18,864	18,945	41,209
243.00	18,908	18,990	41,587
243.02	18,951	19,035	41,965
243.04	18,995	19,079	42,345
243.06	19,038	19,124	42,725
243.08	19,082	19,169	43,106
243.10	19,125	19,213	43,488
243.12	19,169	19,258	43,871
243.14	19,213	19,303	44,255
243.16	19,256	19,347	44,640

Stage-Area-Storage for Pond IB-2: IB-2 (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
243.18	19,300	19,392	45,025
243.20	19,344	19,437	45,412
243.22	19,388	19,482	45,799
243.24	19,432	19,527	46,187
243.26	19,476	19,572	46,576
243.28	19,520	19,617	46,966
243.30	19,564	19,663	47,357
243.32	19,608	19,708	47,749
243.34	19,652	19,753	48,142
243.36	19,696	19,798	48,535
243.38	19,740	19,844	48,929
243.40	19,785	19,889	49,325
243.42	19,829	19,935	49,721
243.44	19,873	19,980	50,118
243.46	19,918	20,026	50,516
243.48	19,962	20,071	50,915
243.50	20,007	20,117	51,314
243.52	20,052	20,163	51,715
243.54	20,096	20,208	52,116
243.56	20,141	20,254	52,519
243.58	20,186	20,300	52,922
243.60	20,230	20,346	53,326
243.62	20,275	20,392	53,731
243.64	20,320	20,438	54,137
243.66	20,365	20,484	54,544
243.68	20,410	20,530	54,952
243.70	20,455	20,576	55,360
243.72	20,500	20,623	55,770
243.74	20,546	20,669	56,180
243.76	20,591	20,715	56,592
243.78	20,636	20,762	57,004
243.80	20,681	20,808	57,417
243.82	20,727	20,855	57,831
243.84	20,772	20,901	58,246
243.86	20,817	20,948	58,662
243.88	20,863	20,994	59,079
243.90	20,909	21,041	59,497
243.92	20,954	21,088	59,915
243.94	21,000	21,135	60,335
243.96	21,045	21,181	60,755
243.98	21,091	21,228	61,177
244.00	21,137	21,275	61,599
244.02	21,181	21,321	62,022
244.04	21,226	21,367	62,446
244.06	21,271	21,412	62,871
244.08	21,315	21,458	63,297
244.10	21,360	21,504	63,724
244.12	21,405	21,550	64,151
244.14	21,449	21,596	64,580
244.16	21,494	21,642	65,009
244.18	21,539	21,688	65,440
244.20	21,584	21,734	65,871
244.22	21,629	21,780	66,303

Stage-Area-Storage for Pond IB-2: IB-2 (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
244.24	21,674	21,826	66,736
244.26	21,719	21,872	67,170
244.28	21,764	21,919	67,605
244.30	21,809	21,965	68,041
244.32	21,854	22,011	68,477
244.34	21,899	22,058	68,915
244.36	21,945	22,104	69,353
244.38	21,990	22,151	69,793
244.40	22,035	22,197	70,233
244.42	22,081	22,244	70,674
244.44	22,126	22,291	71,116
244.46	22,172	22,337	71,559
244.48	22,217	22,384	72,003
244.50	22,263	22,431	72,448
244.52	22,309	22,478	72,893
244.54	22,354	22,525	73,340
244.56	22,400	22,572	73,788
244.58	22,446	22,619	74,236
244.60	22,492	22,666	74,685
244.62	22,537	22,713	75,136
244.64	22,583	22,760	75,587
244.66	22,629	22,807	76,039
244.68	22,675	22,854	76,492
244.70	22,721	22,902	76,946
244.72	22,768	22,949	77,401
244.74	22,814	22,996	77,857
244.76	22,860	23,044	78,313
244.78	22,906	23,091	78,771
244.80	22,952	23,139	79,230
244.82	22,999	23,186	79,689
244.84	23,045	23,234	80,150
244.86	23,092	23,282	80,611
244.88	23,138	23,329	81,073
244.90	23,185	23,377	81,537
244.92	23,231	23,425	82,001
244.94	23,278	23,473	82,466
244.96	23,325	23,521	82,932
244.98	23,371	23,569	83,399
245.00	23,418	23,617	83,867
245.02	23,464	23,664	84,336
245.04	23,510	23,711	84,805
245.06	23,555	23,758	85,276
245.08	23,601	23,805	85,747
245.10	23,647	23,852	86,220
245.12	23,693	23,900	86,693
245.14	23,739	23,947	87,168
245.16	23,785	23,994	87,643
245.18	23,831	24,042	88,119
245.20	23,878	24,089	88,596
245.22	23,924	24,136	89,074
245.24	23,970	24,184	89,553
245.26	24,016	24,232	90,033
245.28	24,063	24,279	90,514

Stage-Area-Storage for Pond IB-2: IB-2 (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
245.30	24,109	24,327	90,996
245.32	24,155	24,375	91,478
245.34	24,202	24,422	91,962
245.36	24,248	24,470	92,446
245.38	24,295	24,518	92,932
245.40	24,342	24,566	93,418
245.42	24,388	24,614	93,905
245.44	24,435	24,662	94,394
245.46	24,482	24,710	94,883
245.48	24,528	24,758	95,373
245.50	24,575	24,806	95,864
245.52	24,622	24,854	96,356
245.54	24,669	24,902	96,849
245.56	24,716	24,951	97,343
245.58	24,763	24,999	97,837
245.60	24,810	25,047	98,333
245.62	24,857	25,096	98,830
245.64	24,904	25,144	99,327
245.66	24,951	25,193	99,826
245.68	24,999	25,241	100,325
245.70	25,046	25,290	100,826
245.72	25,093	25,338	101,327
245.74	25,141	25,387	101,830
245.76	25,188	25,436	102,333
245.78	25,236	25,485	102,837
245.80	**25,283**	**25,533**	**103,342**

Attachment F.5 - Forebay Sizing Calculations

Sediment Forebay Sizing: Infiltration Basin 1 (IB-1)

Forebay Volume:

Min. Required Volume = 0.1 Inch x Impervious Area

Impervious Area	39,713	sqft
Min. Required Volume	331	cuft
Volume Provided	366	

Volume Provided Worksheet:

Contour El. (ft)	Area (sqft)	Inc. Volume (cuft)	Cum. Volume (cuft)
244.00	70	0	0
245.00	172	121	**121**
246.00	318	245	**366**

Sediment Forebay Sizing: Infiltration Basin 2 (IB-2)

Forebay Volume:

Min. Required Volume = 0.1 Inch x Impervious Area

Impervious Area	77,157	sqft
Min. Required Volume	643	cuft
Volume Provided	724	

Volume Provided Worksheet:

Contour El. (ft)	Area (sqft)	Inc. Volume (cuft)	Cum. Volume (cuft)
241.00	13	0	0
242.00	162	88	**88**
243.00	308	235	**323**
244.00	495	402	**724**