STORMWATER MANAGEMENT REPORT

for

756 HOLDING, LLC

Located at

BLOCK 903; LOTS 2 & 6

In

TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NJ

Has been prepared for

RICHARD STAVOLA

PO BOX 482
RED BANK, NJ 07701

On

November 5, 2021

InSite Project No. 18-864-01

Jason L. Fichter, PE, PP
NJPE 43118– NJPP 5726

InSite Engineering, LLC
1955 Route 34, Suite 1A • Wall, NJ 07719
732-531-7100 (ph) • 732-531-7344 (fx) • InSite@InSiteEng.net • www.InSiteEng.net
Licensed in NJ, PA, DE, NY, CT, MD, NC, DC, & CO

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INTRODUCTION

This stormwater management report is being submitted as part of the development application for 756 Holding, LLC, located on Block 903; Lots 2 & 6, as shown on Sheet 9 of the Official Tax Map of Neptune, Monmouth County, New Jersey. This report was prepared in accordance with the Township of Neptune, Monmouth County, the State Soil Conservation District (SCD) Standards, the New Jersey Department of Environmental Protection (NJDEP) as well as current industry standards and practices for stormwater management.

The project is considered a "major development" in terms of stormwater by disturbing more than one acre and complies with stormwater quantity reductions, stormwater quality, and groundwater recharge by means of the proposed infiltration basin.

PROJECT LOCATION

The property is zoned within the R-3 Moderate Density Single-Family Residential Zone where single-family residential is a permitted use. The site has frontages on West Bangs Avenue (County Road 17) to the north and Neptune Boulevard to the east. The surrounding area consists primarily of single-family residential uses along with some multi family, light industrial, and office uses.

FLOOD HAZARD AREA

According to FEMA's current Effective FIRM entitled, "FIRM Flood Insurance Rate Map", Map Number #34025C0333F, dated 09/25/09, the site is located in Zone X, with no base flood elevation. The site is not located in a flood hazard area.

SOIL CHARACTERISTICS

The existing soil classifications for the site are based on the USDA NRCS Web Soil Survey. The survey is useful at the planning level to draw general conclusions about the suitability of a site for certain land uses. Based on the NRCS data, the site consists of the following soil type:

SOIL NAME	HYDROLOGIC GROUP
EvuB – Evesboro-Urban lnd complex, 0 to5 percent slopes	A

PRE-DEVELOPMENT CONDITIONS

Lot 2 is undeveloped and wooded and Lot 6 is partially developed with a driveway to a residential dwelling and building foundation remains. Existing Drainage Area 1 is the site area that is to be disturbed.

Refer to Appendix B for detailed calculations for each drainage area's runoff curve number (CN), hydrologic soil group(s) (HSG), associated areas, time of concentration (Tc), peak flow rates, and hydrographs. Refer to Appendix E for the Pre-Development Drainage Area Map.

POST-DEVELOPMENT CONDITIONS

The project proposes ten single-family lots including constructing a cul-de-sac, a stormwater management surface basin, utility improvements, lighting and landscaping.

A summary of drainage areas for the pre-development condition follows below:

Area 1: Site area that flows into the proposed basin
Area 2: Site area that flows into West Bangs Avenue
Area 3: Undisturbed site area that flows into the basin but does not require reductions
Area 4: Offsite area that flows into the basin but does not require reductions

Refer to Appendix C for detailed calculations for each drainage area's runoff curve number (CN), hydrologic soil group(s) (HSG), associated areas, time of concentration (Tc), peak flow rates, and hydrographs. Refer to Appendix E for the Post-Development Drainage Area Map.

GEOTECHNICAL INFORMATION

Geotechnical information for this application is based on the report and plans prepared by Whitestone Associates, Inc., entitled "Stormwater Management Area Evaluation & Groundwater Mounding Analysis", being dated 05/21/20. According to boring and test pits, the seasonal high groundwater was encountered at a depth between 5 and 5.5 feet below ground surface. The highest groundwater elevation within the basin footprint is elevation 31.50 (SPP-2 & SPP-3), whereas the bottom of the infiltration basin is at elevation 34.00, thus complying with the two-foot separation requirement. The basin drains within 72 hours using a design infiltration rate of 2.3 inches per hour, which is half of the slowest tested infiltration rate of 4.6 inches per hour for SPP-2. The soil boring, test pit logs, and infiltration results are provided in Appendix D.

STORMWATER MANAGEMENT SUMMARY

Methods of determining stormwater runoff and peak discharge follow the procedures as outlined in "Urban Hydrology for Small Watersheds", Soil Conservation Service Technical Release No. 55. Rainfall data for each storm event is taken from New Jersey 24-hour Rainfall Frequency Data (NOAA Atlas 14 Volume 2). Stormwater hydrographs were performed using HydroCAD Software Solutions' "HydroCAD 10.00" computer program. The following 24-hour storm events were studied using the SCS TR-20 runoff method, NOAA Region D rainfall distribution, and the Standard Unit Hydrograph (SCS):

West Long Branch NOAA Station, Monmouth County	
Storm Frequency (Years)	Rainfall (Inches)
2	3.50
10	5.42
25	6.77
100	9.28

Pre- and Post-development computations for the resultant hydrographs, routing computations, and runoff volumes are appended, respectively, to this report. For each drainage area, the following summaries were generated:

Pre- and Post-Development Flow Rates

Storm (Year)	Pre-Development Peak Flow (cfs)	Reduction	Allowable Peak Flow (cfs)	Flow from Undisturbed and Offsite Area (cfs)	Total Allowable Flow to Neptune Boulevard (cfs)	Post-Development Peak Flow (cfs)
2	0.14	50%	0.07	0.00	0.07	0.06
10	0.22	75%	0.17	0.01	0.18	0.18
25	0.27	-	-	0.04	-	0.47
100	0.80	80%	0.64	0.40	1.04	0.94

Under pre-development conditions, this drainage area reaches Neptune Boulevard. Under post-development conditions, this drainage area contains the proposed development and is directed into the proposed infiltration basin and ultimately discharges to the inlet on Neptune Boulevard. Undisturbed and offsite areas also drain to the proposed infiltration basin which has been included for basin volume sizing, however, this area is not required to receive peak flow rate reductions. Therefore, under post-development conditions, the peak flow rates from the undisturbed drainage areas are added to the reduced peak flows to calculate the actual allowable peak flow rate. The table above demonstrates that the post-development flows meet existing flows or are reduced, and therefore complies with stormwater quantity requirements for all storm events.

A Hantush spreadsheet and calculations are provided in Appendix D which outlines compliance with groundwater mounding. The mounding is approximately 2.9 feet at the midpoint of the basin. The bottom of the sand layer (34.40) is 2.9 feet above the seasonal high water table. Therefore, the elevated groundwater table will not reach the bottom of the basin and this basin configuration can infiltrate the post-construction stormwater runoff generated by the WQDS. The effect of the mounding is approximately 50 feet from the center of the basin. The closest homes are approximately 75 feet from the midpoint of the basin. Therefore, the homes are outside the influence area of the groundwater mounding.

WATER QUALITY N.J.A.C. 7:8-5.5

NJDEP regulations require that water quality treatment be provided for the proposed site runoff. The water quality standards require that stormwater management measures be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff generated from the water quality design storm for new asphalt areas by 80% of the anticipated load from the developed site and 50% for the existing asphalt areas, expressed as an annual average.

All impervious surfaces within this drainage area are captured and directed into the proposed infiltration basin which provides 80% TSS removal, therefore complying with stormwater quality requirements. The first stage orifice is set to the water surface elevation for the NJDEP water quality storm event to ensure infiltration.

GROUNDWATER RECHARGE N.J.A.C. 7:8-5.4(A)2

In accordance with N.J.A.C. 7:8-5.4(a).2.ii, groundwater recharge does not apply to projects within the "urban redevelopment area". An Urban Redevelopment Area is defined, per N.J.A.C. 7:8 1.2, as development portions of areas delineated on the State Plan Policy Map as the Metropolitan Planning Area. The proposed development is located within Planning Area 1 (Urban Planning Area) and is not required to meet groundwater recharge. However, groundwater recharge is provided through infiltration within the sand layer in the basin, which is inherently beneficial.

SOIL EROSION AND SEDIMENT CONTROL

In accordance with the Soil Erosion and Sediment Control Act, soil erosion measures will be incorporated into the design and graphically depicted on the Soil Erosion and Sediment Control Plans. These measures consist of, but are not limited to:

- Sediment Barriers and Silt Fences
- Stabilized Construction Access
- Topsoil Stockpiles
- Temporary and Permanent Stabilization

CONCLUSION

The project is considered a "major development" in terms of stormwater by disturbing more than one acre and complies with stormwater quantity reductions, stormwater quality, and groundwater recharge by means of the proposed infiltration basin.

APPENDIX A

Tax Map

USGS Map

Soils Map

FEMA Map

InSite Engineering, LLC
1955 Route 34, Suite 1A • Wall, NJ 07719
732-531-7100 (ph) • 732-531-7344 (fx) • InSite@InSiteEng.net • www.InSiteEng.net
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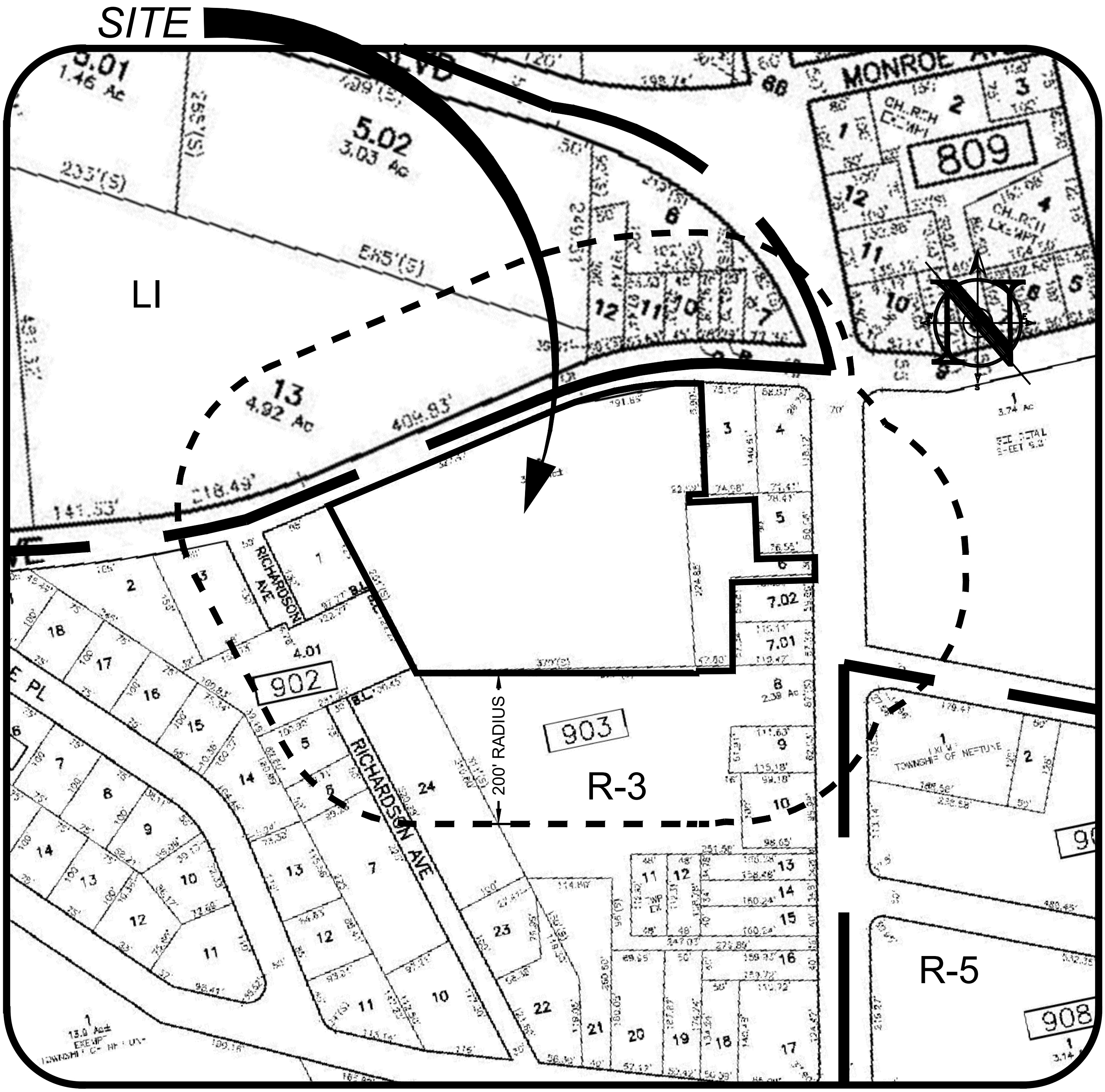


PLAN

200 0 200

Scale 1"=200'

TAX MAP EXHIBIT

InSite Engineering, LLC
CERTIFICATE OF AUTHORIZATION:
24GA28083200
1955 ROUTE 34, SUITE 1A
WALL, NJ 07719
732-531-7100 (Ph)
732-531-7344 (Fax)
InSite@InSiteEng.net www.InSiteEng.net

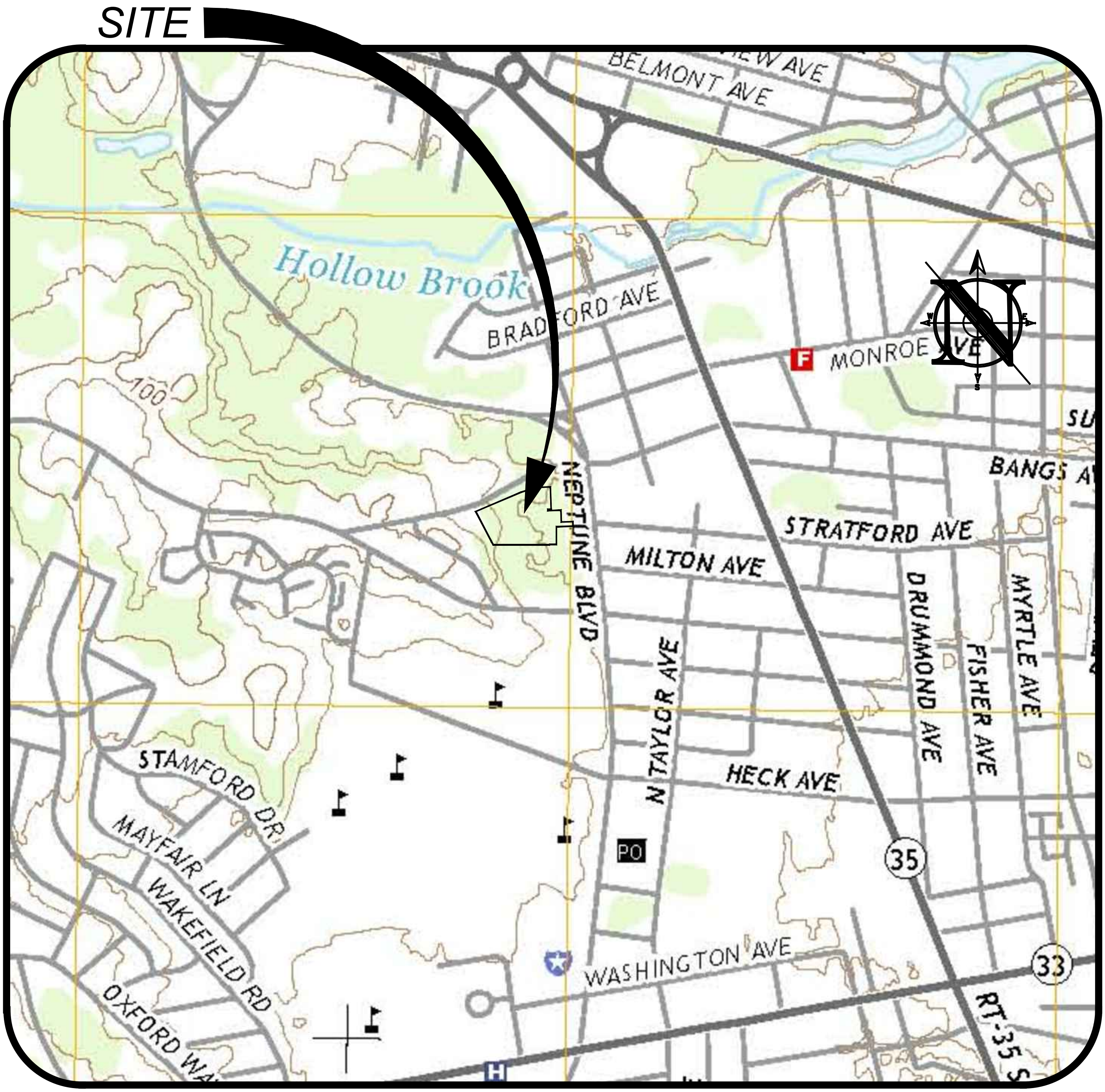
INSITE Engineering • Surveying • Planning

Site Location:
BLOCK 903, LOTS 2 & 6
WEST BANGS AVENUE
TOWNSHIP OF NEPTUNE, MONMOUTH COUNTY, NJ

InSite Project No.
16-864-01
Drawing No.
16-864-01
Date
December 15, 2020

Reference:
TAX MAP #9
TOWNSHIP OF NEPTUNE, MONMOUTH COUNTY, NJ
DECEMBER 2013

Revisions



PLAN

1,000 0 1,000

Scale 1"=1,000'

USGS MAP EXHIBIT

InSite
Engineering • Surveying • Planning

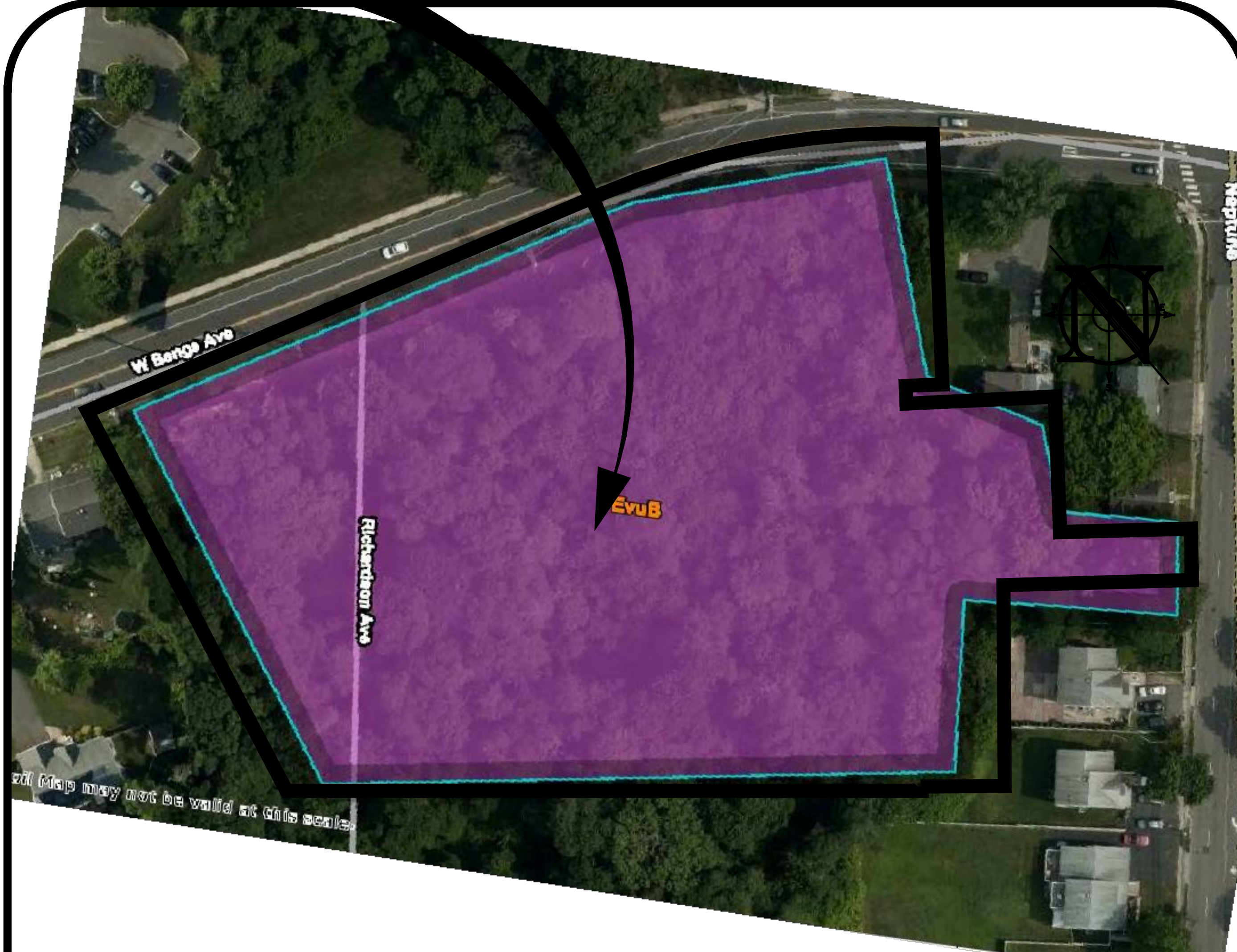
InSite Engineering, LLC
CERTIFICATE OF AUTHORIZATION: 24GA28083200
1955 ROUTE 34, SUITE 1A
WALL, NJ 07719
732-531-7100 (Ph)
732-531-7344 (Fax)
InSite@InSiteEng.net www.InSiteEng.net

Site Location:
BLOCK 903, LOTS 2 & 6
WEST BANGS AVENUE
TOWNSHIP OF NEPTUNE, MONMOUTH COUNTY, NJ

Reference:
UNITED STATES GEOLOGICAL SURVEY
TOWNSHIP OF NEPTUNE, MONMOUTH COUNTY, NJ

InSite Project No.
16-864-01
Drawing No.
16-864-01
Date
December 15, 2020

Revisions



Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EvuB	Evesboro-Urban land complex, 0 to 5 percent slopes	A	3.4	100.0%
Totals for Area of Interest			**3.4**	**100.0%**

PLAN

1,000 0 1,000

Scale 1"=1,000'

SOIL MAP EXHIBIT

INSITE Engineering • Surveying • Planning

InSite Engineering, LLC
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732-531-7100 (Ph)
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Site Location:
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TOWNSHIP OF NEPTUNE, MONMOUTH COUNTY, NJ

InSite Project No.
16-864-01
Drawing No.
16-864-01
Date
December 15, 2020

Reference:
USDA WEB SOIL SURVEY

Revisions

PLAN

1,000 0 1,000

Scale 1"=1,000'

EFFECTIVE FEMA MAP EXHIBIT

INSITE Engineering • Surveying • Planning

InSite Engineering, LLC
CERTIFICATE OF AUTHORIZATION: 24GA28083200
1955 ROUTE 34, SUITE 1A
WALL, NJ 07719
732-531-7100 (Ph)
732-531-7344 (Fax)
InSite@InSiteEng.net www.InSiteEng.net

Site Location:
BLOCK 903, LOTS 2 & 6
WEST BANGS AVENUE
TOWNSHIP OF NEPTUNE, MONMOUTH COUNTY, NJ

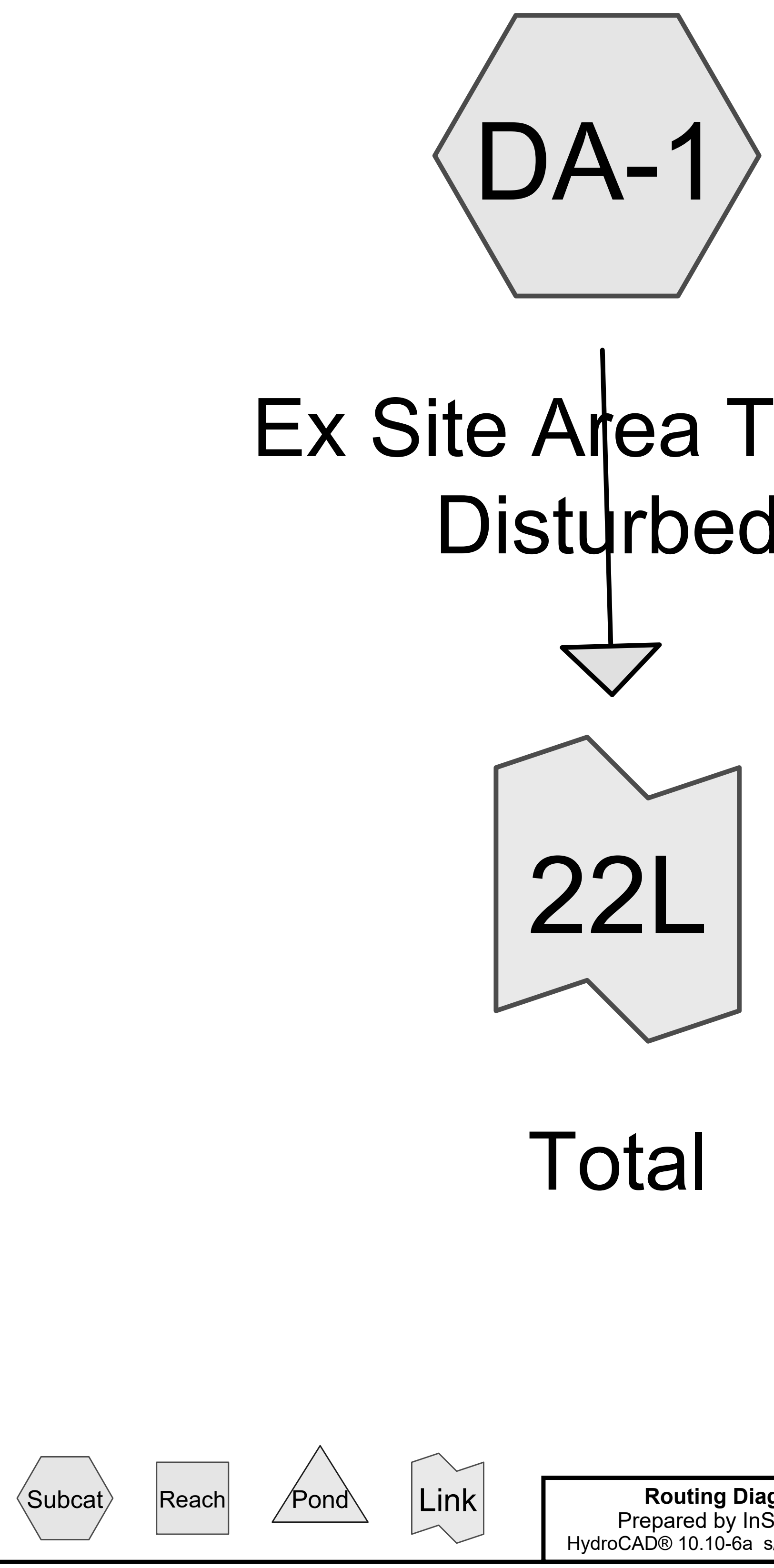
Reference:
FLOOD INSURANCE RATE MAP
MONMOUTH COUNT, NJ
MAP NUMBER 34025C0333F
DATED 09/25/09

InSite Project No.
16-864-01
Drawing No.
16-864-01
Date
December 15, 2020

Revisions

APPENDIX B

Pre-Development Flow Calculations



Routing Diagram for 211105 r0 Monmouth County
Prepared by InSite Engineering LLC, Printed 11/10/2021
HydroCAD® 10.10-6a s/n 03018 © 2020 HydroCAD Software Solutions LLC

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA-1: Ex Site Area To Be Runoff Area=2.775 ac 2.59% Impervious Runoff Depth=0.08"
Flow Length=419' Tc=26.6 min CN=30/98 Runoff=0.14 cfs 0.020 af

Link 22L: Total Inflow=0.14 cfs 0.020 af
Primary=0.14 cfs 0.020 af

Total Runoff Area = 2.775 ac Runoff Volume = 0.020 af Average Runoff Depth = 0.08"
97.41% Pervious = 2.703 ac 2.59% Impervious = 0.072 ac

Summary for Subcatchment DA-1: Ex Site Area To Be Disturbed

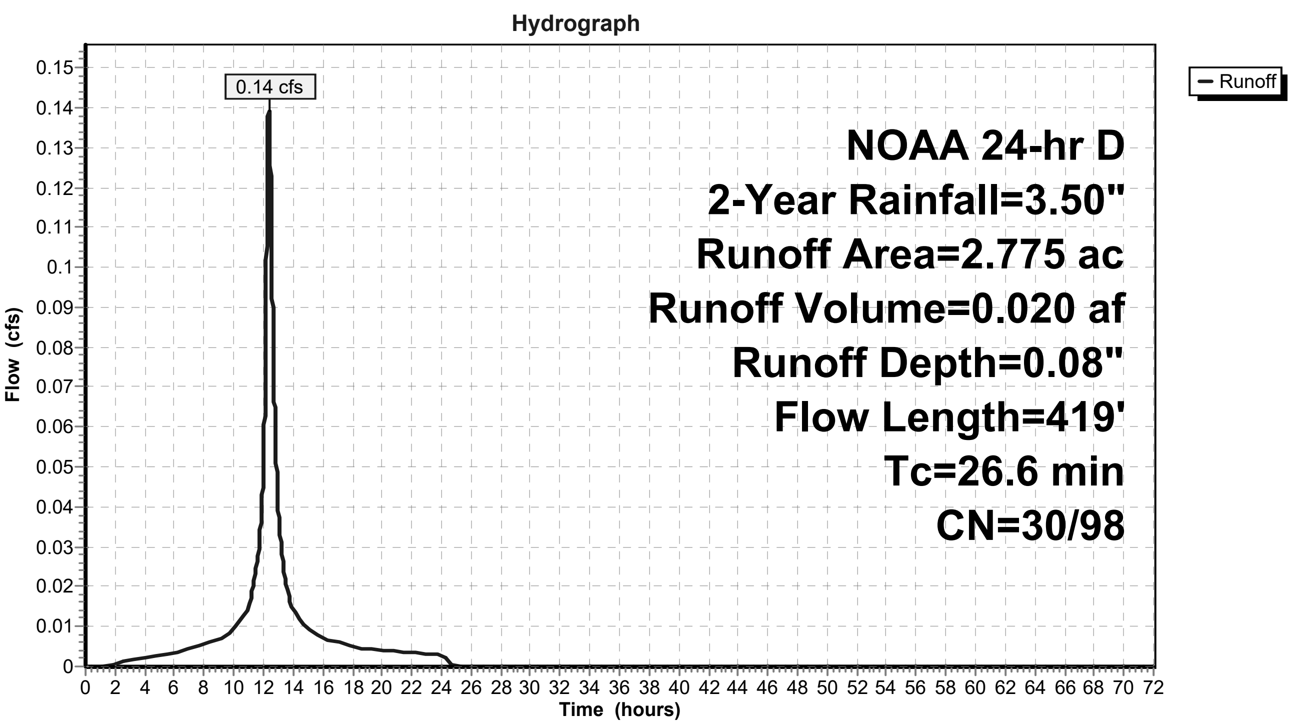
Runoff = 0.14 cfs @ 12.36 hrs, Volume= 0.020 af, Depth= 0.08"
Routed to Link 22L : Total

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	2.703	30	Woods, Good, HSG A
	0.072	98	Paved parking, HSG A
	2.775	32	Weighted Average
	2.703	30	97.41% Pervious Area
	0.072	98	2.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.2	100	0.0280	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
7.0	195	0.0087	0.47		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.4	124	0.0097	1.48		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
26.6	419	Total			

Subcatchment DA-1: Ex Site Area To Be Disturbed

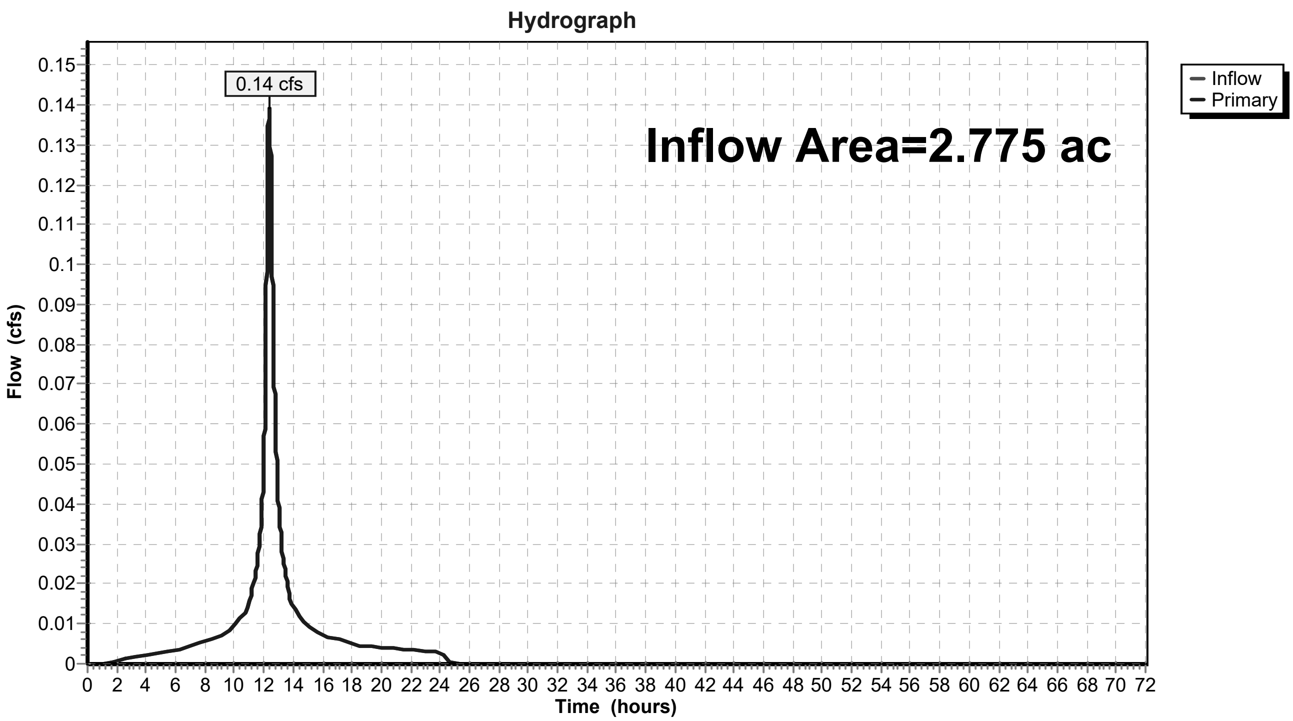


Summary for Link 22L: Total

Inflow Area = 2.775 ac, 2.59% Impervious, Inflow Depth = 0.08" for 2-Year event
Inflow = 0.14 cfs @ 12.36 hrs, Volume= 0.020 af
Primary = 0.14 cfs @ 12.36 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

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

Link 22L: Total



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA-1: Ex Site Area To Be Runoff Area=2.775 ac 2.59% Impervious Runoff Depth=0.16"
Flow Length=419' Tc=26.6 min CN=30/98 Runoff=0.22 cfs 0.036 af

Link 22L: Total Inflow=0.22 cfs 0.036 af
Primary=0.22 cfs 0.036 af

Total Runoff Area = 2.775 ac Runoff Volume = 0.036 af Average Runoff Depth = 0.16"
97.41% Pervious = 2.703 ac 2.59% Impervious = 0.072 ac

Summary for Subcatchment DA-1: Ex Site Area To Be Disturbed

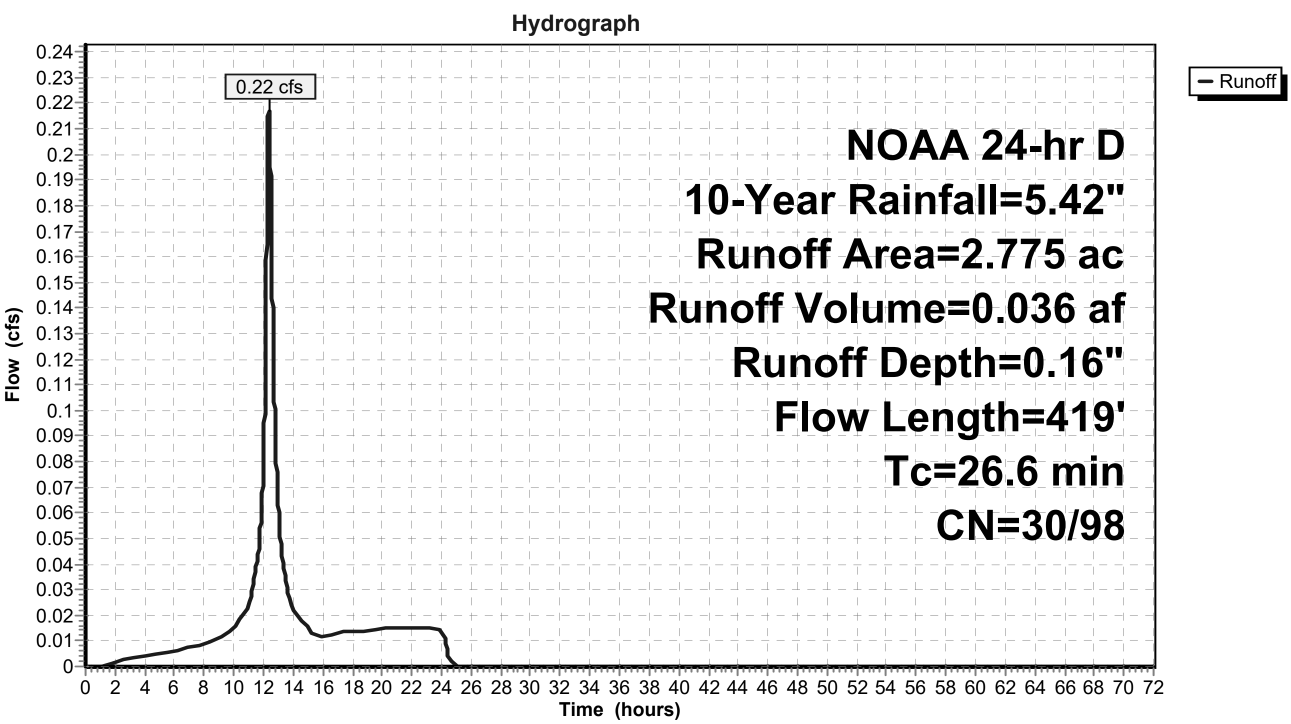
Runoff = 0.22 cfs @ 12.36 hrs, Volume= 0.036 af, Depth= 0.16"
Routed to Link 22L : Total

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.42"

	Area (ac)	CN	Description
*	2.703	30	Woods, Good, HSG A
	0.072	98	Paved parking, HSG A
	2.775	32	Weighted Average
	2.703	30	97.41% Pervious Area
	0.072	98	2.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.2	100	0.0280	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
7.0	195	0.0087	0.47		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.4	124	0.0097	1.48		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
26.6	419	Total			

Subcatchment DA-1: Ex Site Area To Be Disturbed

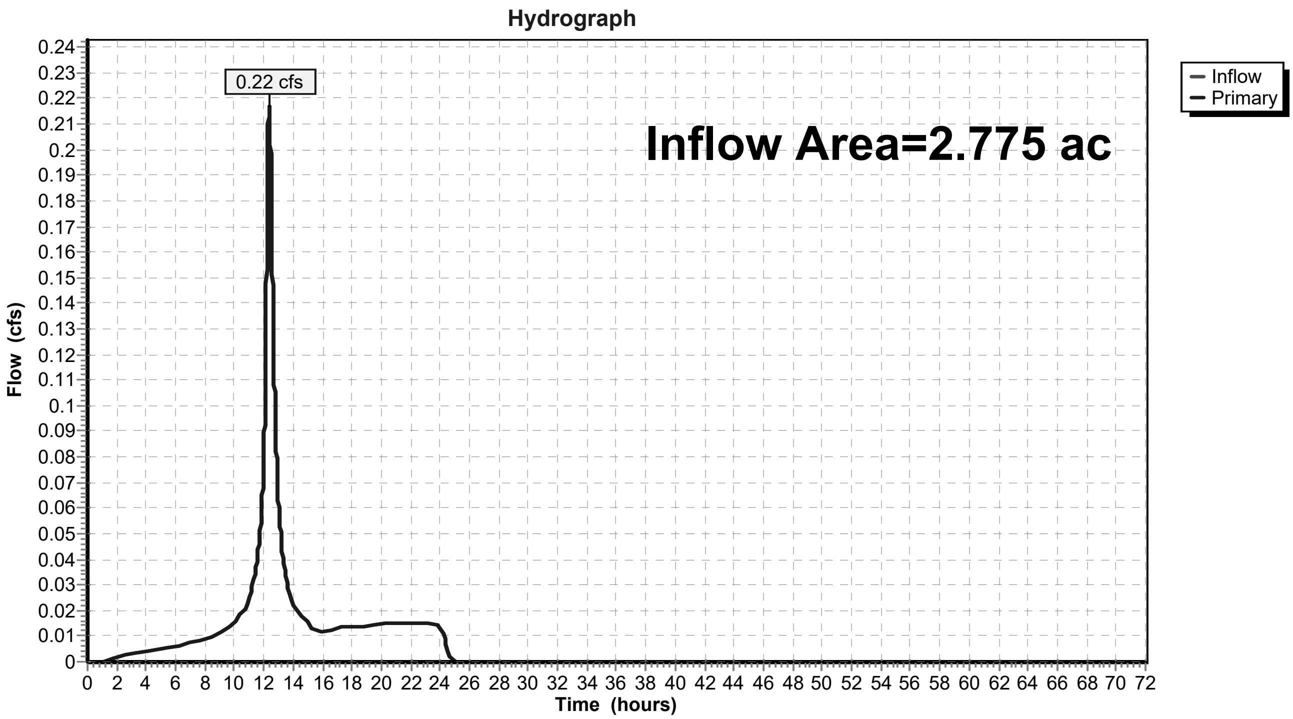


Summary for Link 22L: Total

Inflow Area = 2.775 ac, 2.59% Impervious, Inflow Depth = 0.16" for 10-Year event
Inflow = 0.22 cfs @ 12.36 hrs, Volume= 0.036 af
Primary = 0.22 cfs @ 12.36 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

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

Link 22L: Total



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA-1: Ex Site Area To Be Runoff Area=2.775 ac 2.59% Impervious Runoff Depth=0.34"
Flow Length=419' Tc=26.6 min CN=30/98 Runoff=0.27 cfs 0.078 af

Link 22L: Total Inflow=0.27 cfs 0.078 af
Primary=0.27 cfs 0.078 af

Total Runoff Area = 2.775 ac Runoff Volume = 0.078 af Average Runoff Depth = 0.34"
97.41% Pervious = 2.703 ac 2.59% Impervious = 0.072 ac

Summary for Subcatchment DA-1: Ex Site Area To Be Disturbed

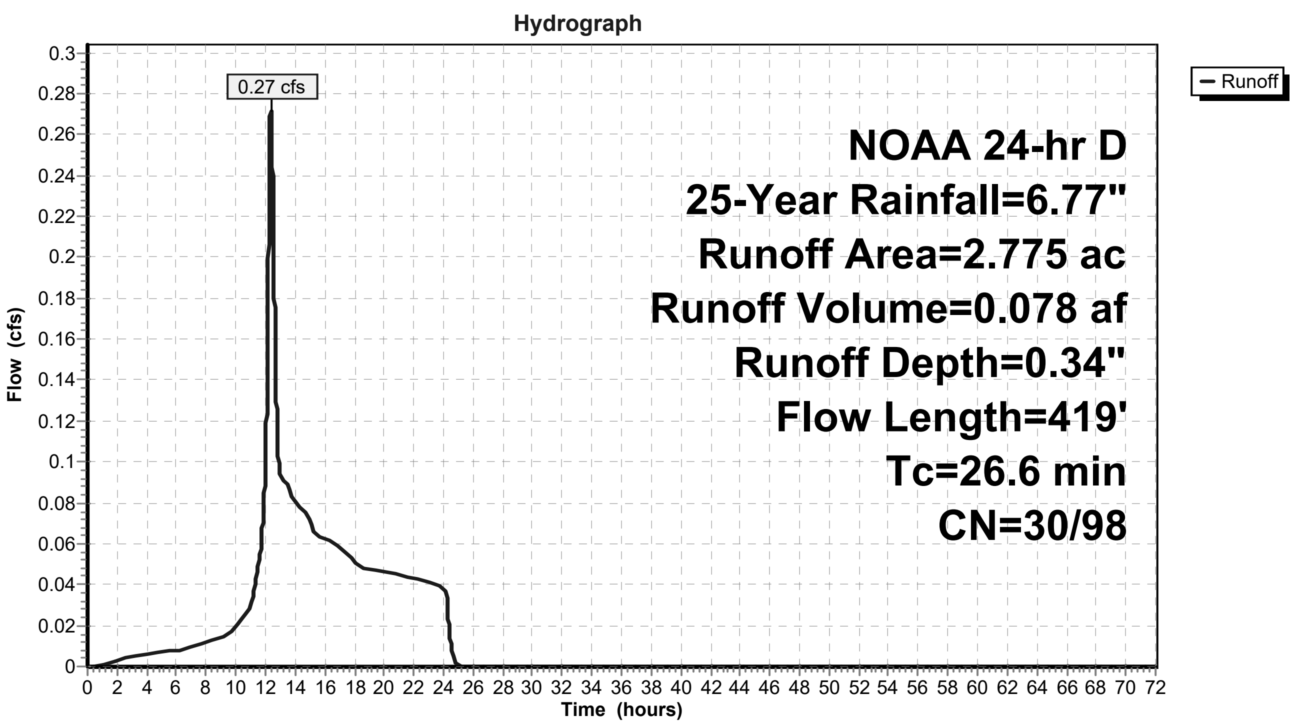
Runoff = 0.27 cfs @ 12.36 hrs, Volume= 0.078 af, Depth= 0.34"
Routed to Link 22L : Total

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.77"

	Area (ac)	CN	Description
*	2.703	30	Woods, Good, HSG A
	0.072	98	Paved parking, HSG A
	2.775	32	Weighted Average
	2.703	30	97.41% Pervious Area
	0.072	98	2.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.2	100	0.0280	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
7.0	195	0.0087	0.47		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.4	124	0.0097	1.48		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
26.6	419	Total			

Subcatchment DA-1: Ex Site Area To Be Disturbed

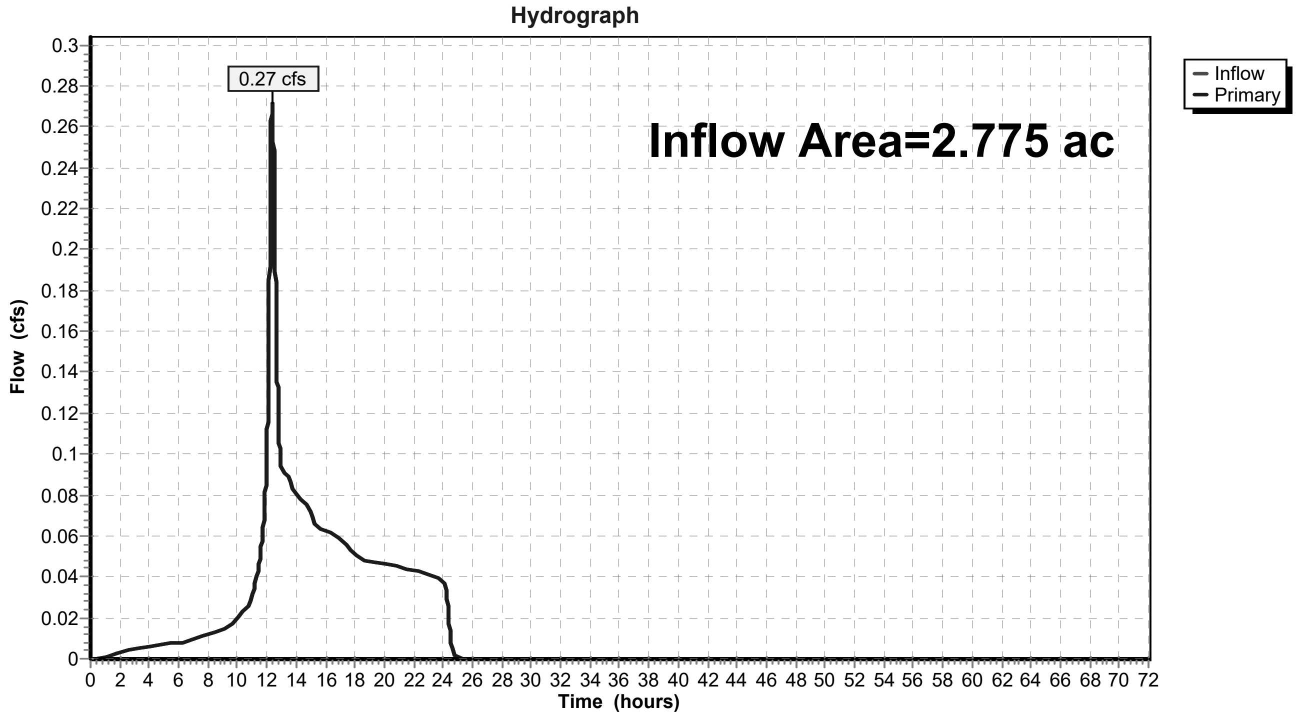


Summary for Link 22L: Total

Inflow Area =	2.775 ac,	2.59% Impervious, Inflow Depth = 0.34"	for 25-Year event	
Inflow =	0.27 cfs @	12.36 hrs, Volume=	0.078 af	
Primary =	0.27 cfs @	12.36 hrs, Volume=	0.078 af,	Atten= 0%, Lag= 0.0 min

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

Link 22L: Total



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA-1: Ex Site Area To Be Runoff Area=2.775 ac 2.59% Impervious Runoff Depth=0.98"
Flow Length=419' Tc=26.6 min CN=30/98 Runoff=0.80 cfs 0.226 af

Link 22L: Total Inflow=0.80 cfs 0.226 af
Primary=0.80 cfs 0.226 af

Total Runoff Area = 2.775 ac Runoff Volume = 0.226 af Average Runoff Depth = 0.98"
97.41% Pervious = 2.703 ac 2.59% Impervious = 0.072 ac

Summary for Subcatchment DA-1: Ex Site Area To Be Disturbed

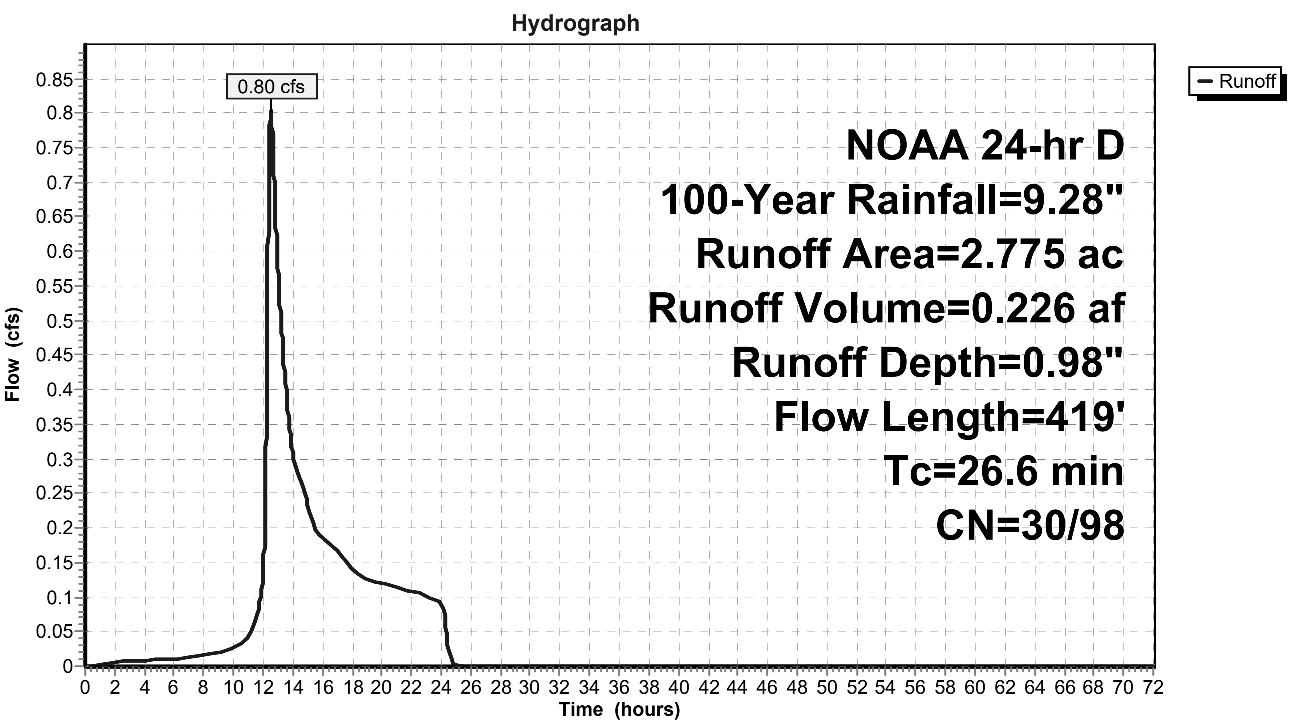
Runoff = 0.80 cfs @ 12.51 hrs, Volume= 0.226 af, Depth= 0.98"
Routed to Link 22L : Total

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=9.28"

	Area (ac)	CN	Description
*	2.703	30	Woods, Good, HSG A
	0.072	98	Paved parking, HSG A
	2.775	32	Weighted Average
	2.703	30	97.41% Pervious Area
	0.072	98	2.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.2	100	0.0280	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
7.0	195	0.0087	0.47		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.4	124	0.0097	1.48		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
26.6	419	Total			

Subcatchment DA-1: Ex Site Area To Be Disturbed

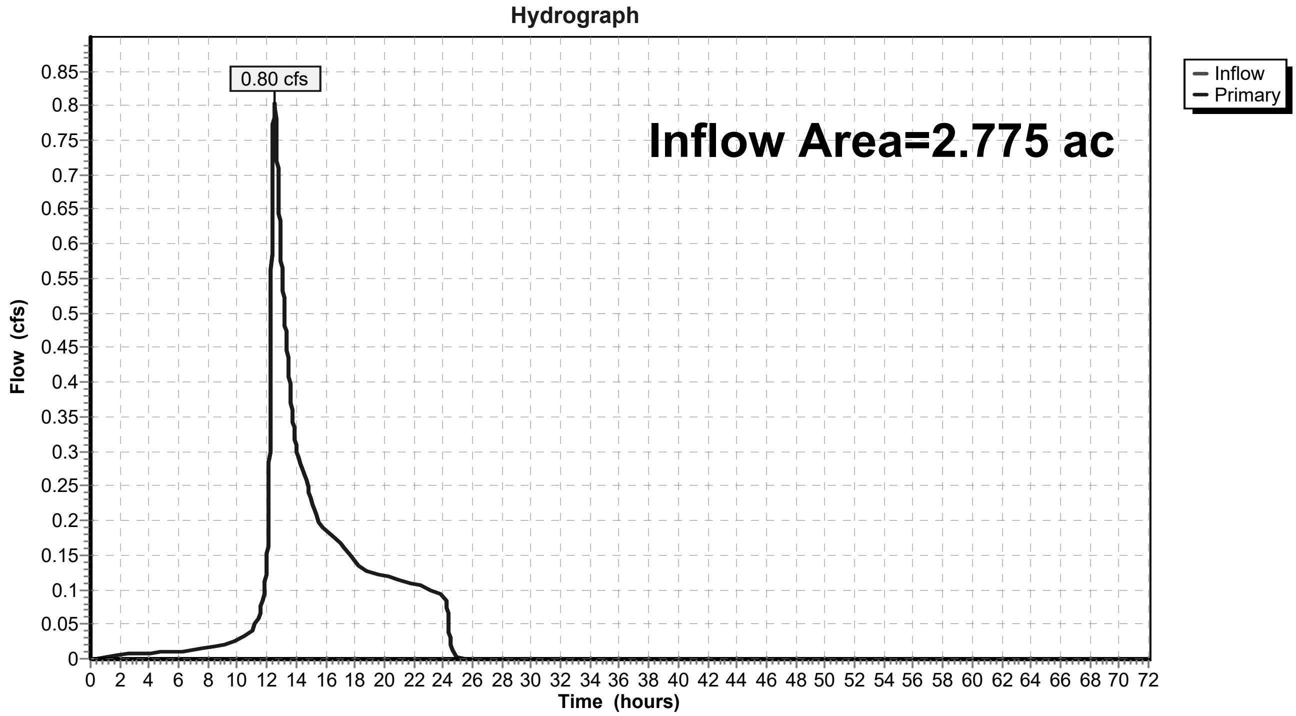


Summary for Link 22L: Total

Inflow Area = 2.775 ac, 2.59% Impervious, Inflow Depth = 0.98" for 100-Year event
Inflow = 0.80 cfs @ 12.51 hrs, Volume= 0.226 af
Primary = 0.80 cfs @ 12.51 hrs, Volume= 0.226 af, Atten= 0%, Lag= 0.0 min

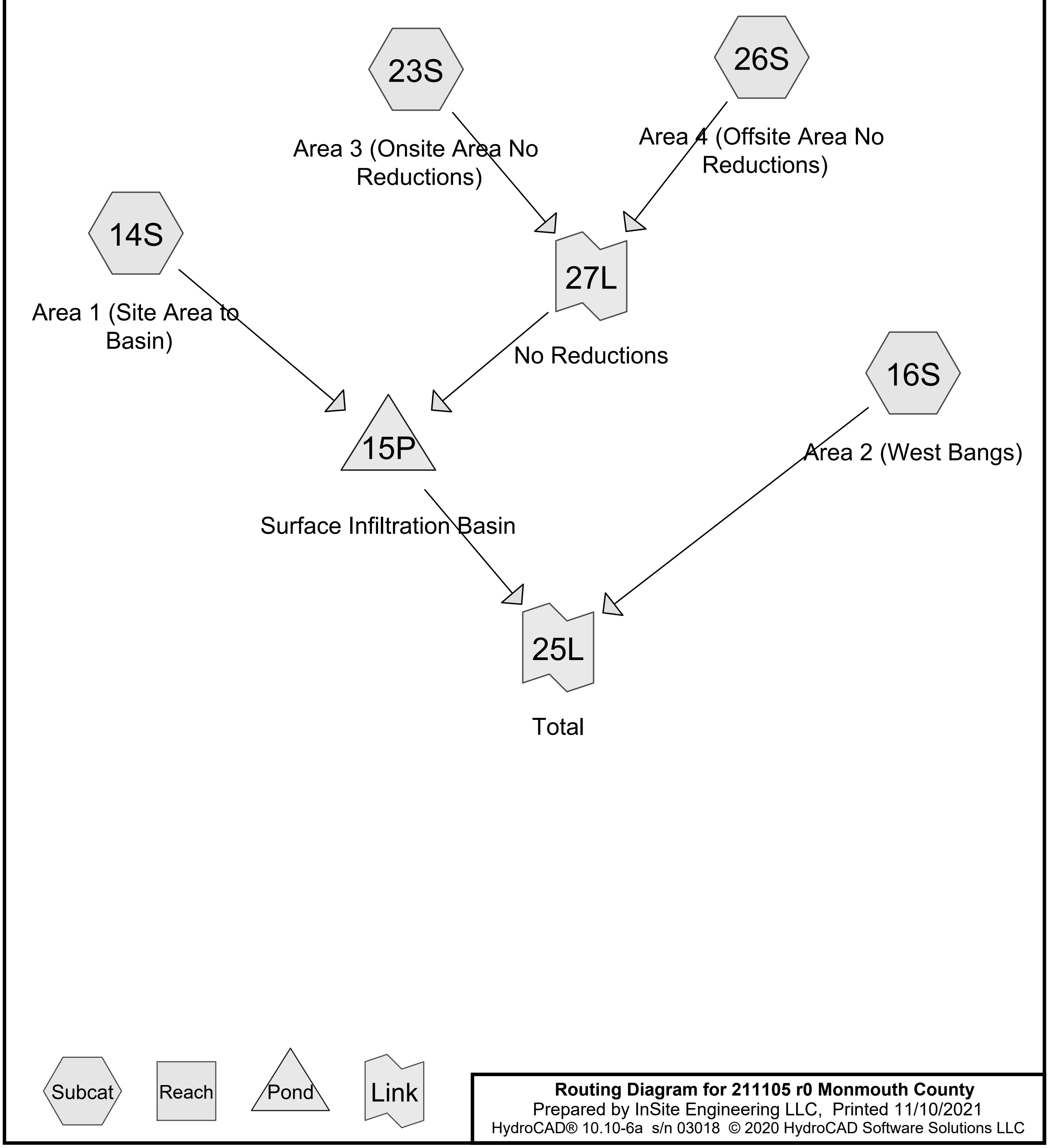
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 22L: Total



APPENDIX C

Post-Development Flow Calculations



Routing Diagram for 211105 r0 Monmouth County
Prepared by InSite Engineering LLC, Printed 11/10/2021
HydroCAD® 10.10-6a s/n 03018 © 2020 HydroCAD Software Solutions LLC

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 14S: Area 1 (Site Area to Runoff Area=2.705 ac 49.57% Impervious Runoff Depth=0.51"
Tc=10.0 min CN=39/98 Runoff=3.49 cfs 0.116 af

Subcatchment 16S: Area 2 (West Bangs) Runoff Area=0.070 ac 20.00% Impervious Runoff Depth=0.21"
Tc=10.0 min CN=39/98 Runoff=0.04 cfs 0.001 af

Subcatchment 23S: Area 3 (Onsite Area No Runoff Area=0.902 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=335' Tc=18.9 min CN=30/0 Runoff=0.00 cfs 0.000 af

Subcatchment 26S: Area 4 (Offsite Area No Runoff Area=0.984 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=502' Tc=19.5 min CN=30/0 Runoff=0.00 cfs 0.000 af

Pond 15P: Surface Infiltration Basin Peak Elev=35.21' Storage=2,861 cf Inflow=3.49 cfs 0.116 af
Discarded=0.50 cfs 0.116 af Primary=0.00 cfs 0.000 af Outflow=0.50 cfs 0.116 af

Link 25L: Total Inflow=0.04 cfs 0.001 af
Primary=0.04 cfs 0.001 af

Link 27L: No Reductions Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 4.661 ac Runoff Volume = 0.117 af Average Runoff Depth = 0.30"
70.93% Pervious = 3.306 ac 29.07% Impervious = 1.355 ac

Summary for Subcatchment 14S: Area 1 (Site Area to Basin)

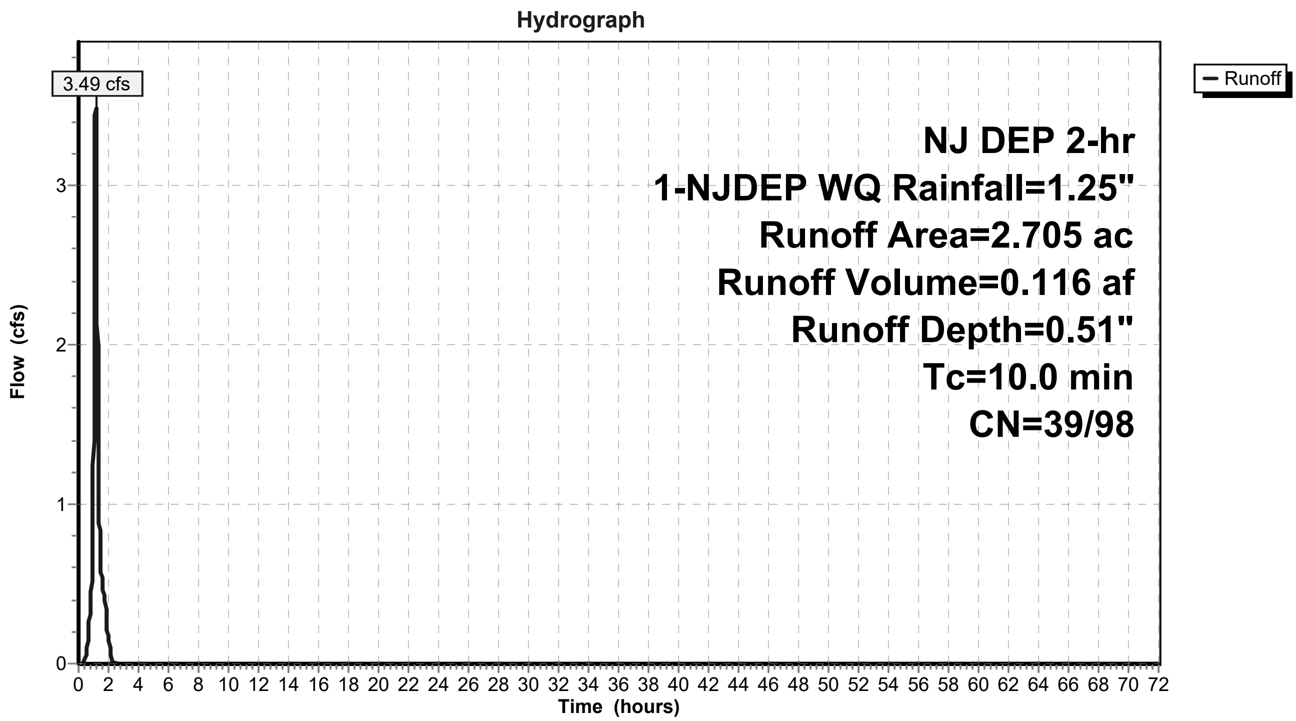
Runoff = 3.49 cfs @ 1.15 hrs, Volume= 0.116 af, Depth= 0.51"
Routed to Pond 15P : Surface Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr 1-NJDEP WQ Rainfall=1.25"

Area (ac)	CN	Description
1.341	98	Paved parking, HSG A
1.364	39	>75% Grass cover, Good, HSG A
2.705	68	Weighted Average
1.364	39	50.43% Pervious Area
1.341	98	49.57% Impervious Area

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

Subcatchment 14S: Area 1 (Site Area to Basin)



Summary for Subcatchment 16S: Area 2 (West Bangs)

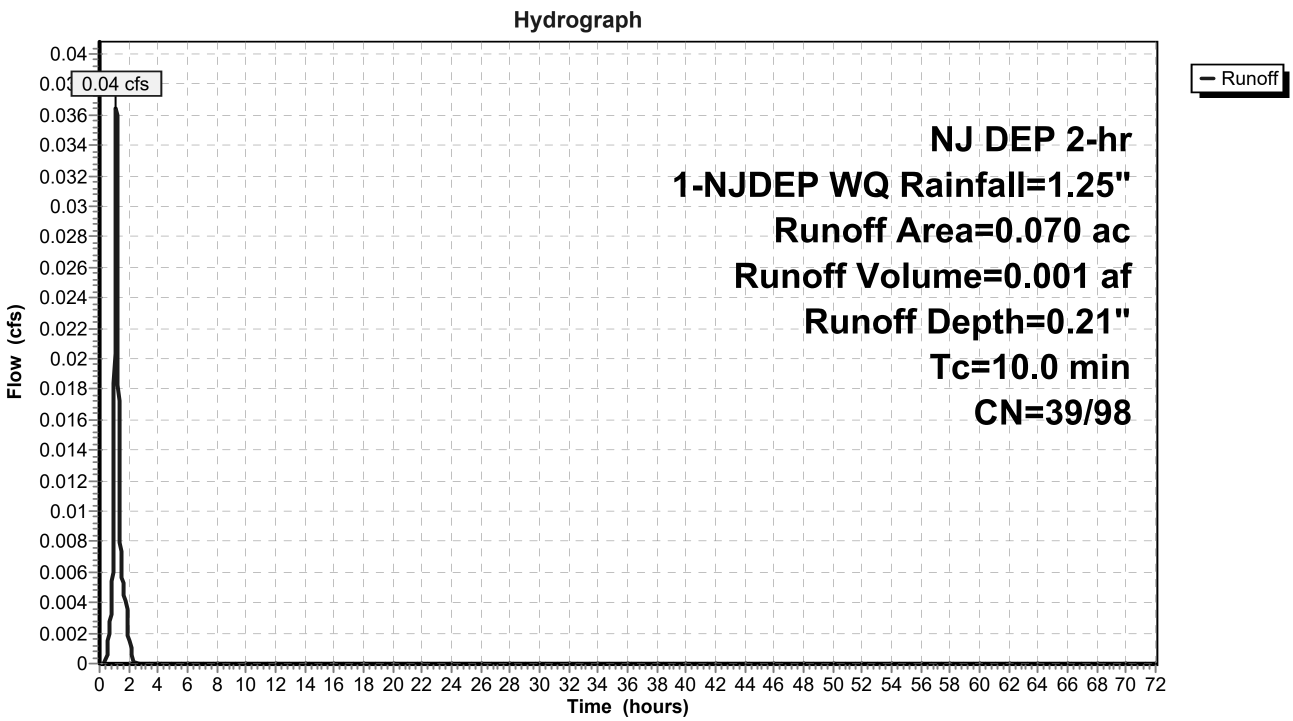
Runoff = 0.04 cfs @ 1.15 hrs, Volume= 0.001 af, Depth= 0.21"
Routed to Link 25L : Total

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr 1-NJDEP WQ Rainfall=1.25"

Area (ac)	CN	Description
0.014	98	Paved parking, HSG A
0.056	39	>75% Grass cover, Good, HSG A
0.070	51	Weighted Average
0.056	39	80.00% Pervious Area
0.014	98	20.00% Impervious Area

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

Subcatchment 16S: Area 2 (West Bangs)



Summary for Subcatchment 23S: Area 3 (Onsite Area No Reductions)

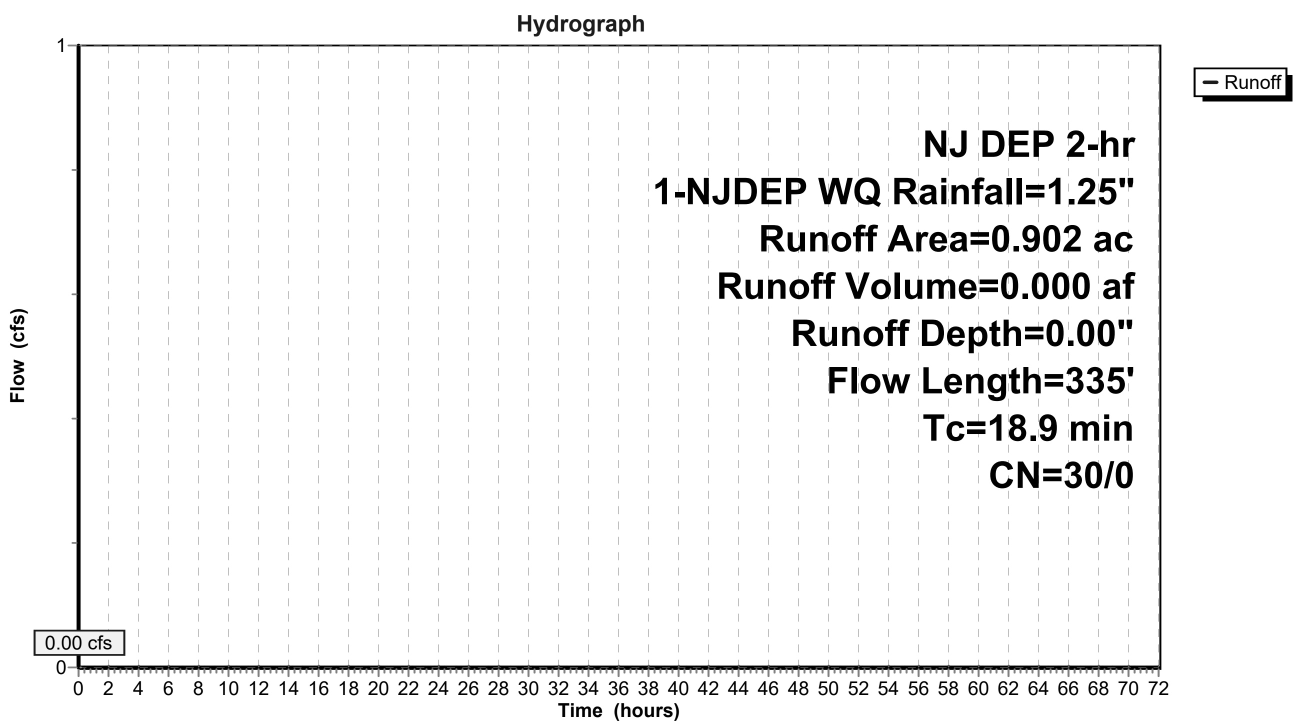
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 27L : No Reductions

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr 1-NJDEP WQ Rainfall=1.25"

Area (ac)	CN	Description
0.902	30	Woods, Good, HSG A
0.902	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0360	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
1.5	87	0.0356	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	148	0.0331	2.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
18.9	335	Total			

Subcatchment 23S: Area 3 (Onsite Area No Reductions)



Summary for Subcatchment 26S: Area 4 (Offsite Area No Reductions)

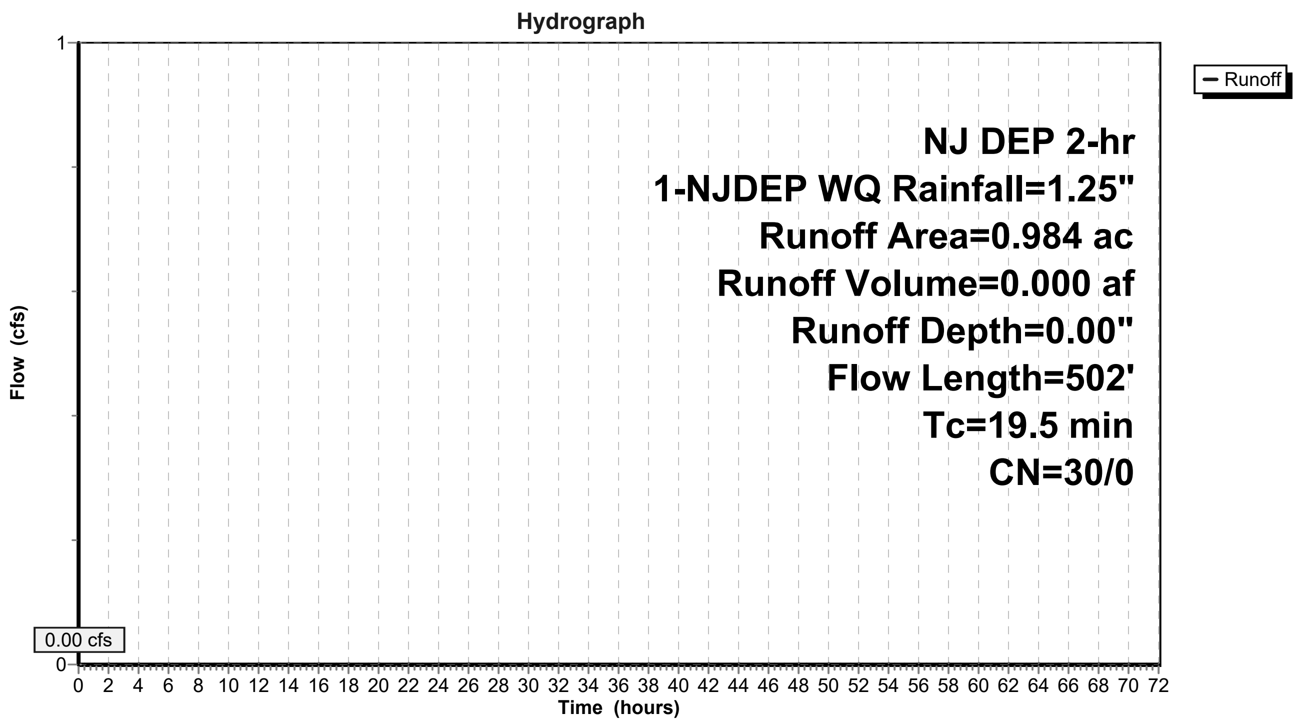
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 27L : No Reductions

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr 1-NJDEP WQ Rainfall=1.25"

Area (ac)	CN	Description
0.984	30	Woods, Good, HSG A
0.984	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0470	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	174	0.1210	1.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	70	0.0329	0.91		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	79	0.0051	1.07		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.5	79	0.0196	2.84		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.5	502	Total			

Subcatchment 26S: Area 4 (Offsite Area No Reductions)



Summary for Pond 15P: Surface Infiltration Basin

Inflow Area = 4.591 ac, 29.21% Impervious, Inflow Depth = 0.30" for 1-NJDEP WQ event
Inflow = 3.49 cfs @ 1.15 hrs, Volume= 0.116 af
Outflow = 0.50 cfs @ 1.61 hrs, Volume= 0.116 af, Atten= 86%, Lag= 28.0 min
Discarded = 0.50 cfs @ 1.61 hrs, Volume= 0.116 af
Primary = 0.00 cfs @ 1.61 hrs, Volume= 0.000 af
Routed to Link 25L : Total

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 35.21' @ 1.61 hrs Surf.Area= 9,307 sf Storage= 2,861 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 53.3 min (127.3 - 74.0)

Volume	Invert	Avail.Storage	Storage Description
#1	34.90'	33,615 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

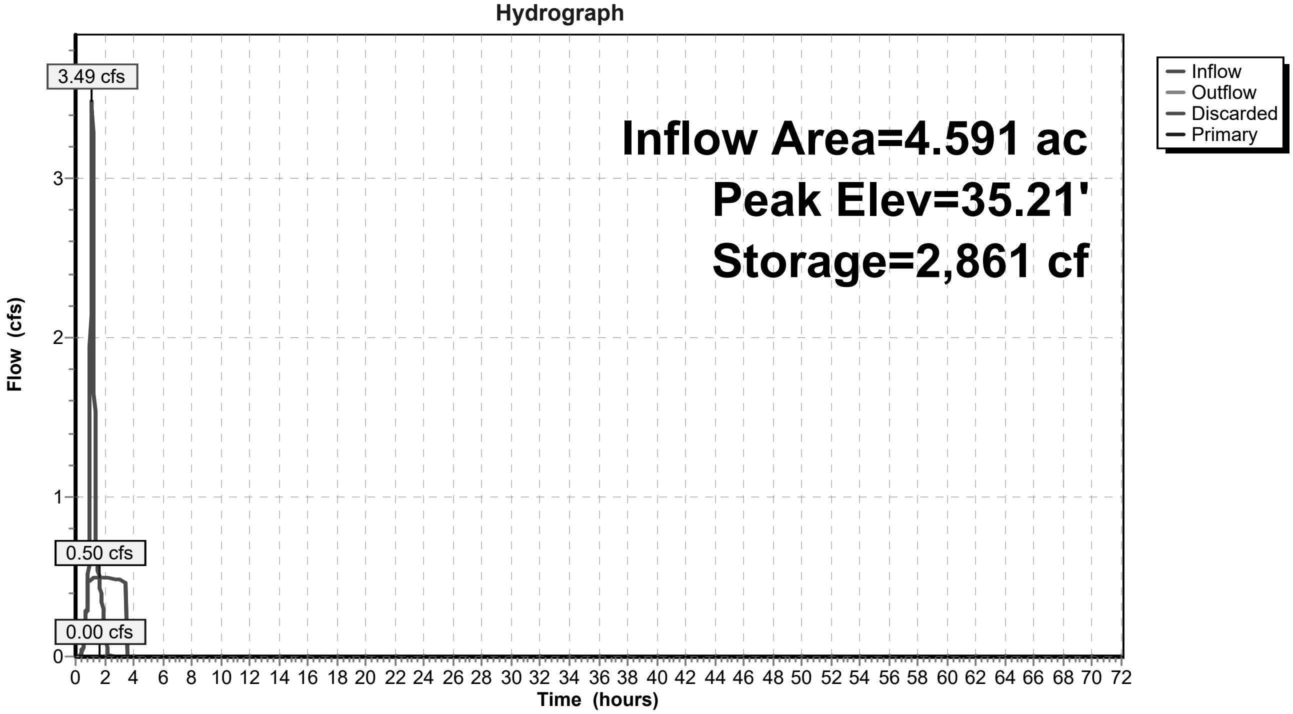
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.90	8,928	0	0
35.00	9,047	899	899
36.00	10,262	9,655	10,553
37.00	11,520	10,891	21,444
38.00	12,821	12,171	33,615

Device	Routing	Invert	Outlet Devices
#1	Primary	33.65'	**15.0" Round Culvert** L= 134.0' Ke= 0.500 Inlet / Outlet Invert= 33.65' / 28.57' S= 0.0379 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	35.21'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	35.80'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	34.90'	**2.300 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.50 cfs @ 1.61 hrs HW=35.21' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.50 cfs)

Primary OutFlow Max=0.00 cfs @ 1.61 hrs HW=35.21' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.00 cfs of 5.73 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.21 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 15P: Surface Infiltration Basin

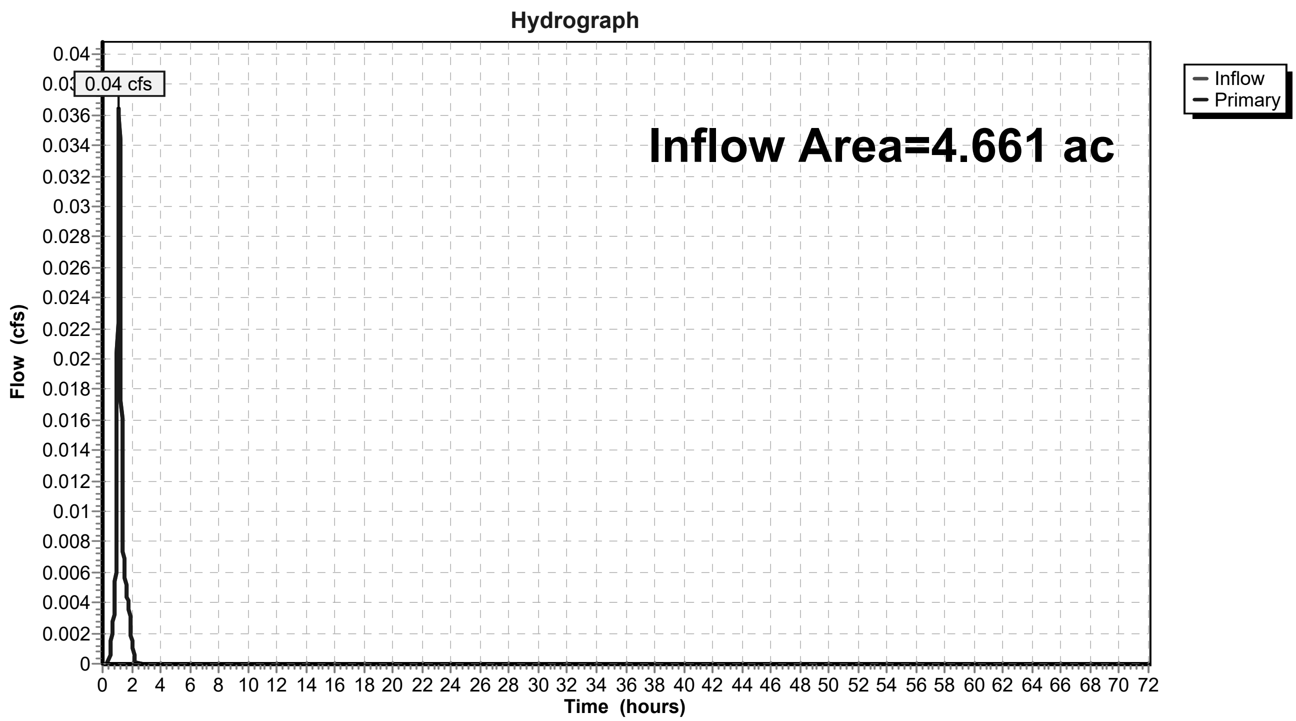


Summary for Link 25L: Total

Inflow Area =	4.661 ac, 29.07% Impervious, Inflow Depth = 0.00"	for 1-NJDEP WQ event
Inflow =	0.04 cfs @ 1.15 hrs, Volume=	0.001 af
Primary =	0.04 cfs @ 1.15 hrs, Volume=	0.001 af, Atten= 0%, Lag= 0.0 min

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

Link 25L: Total

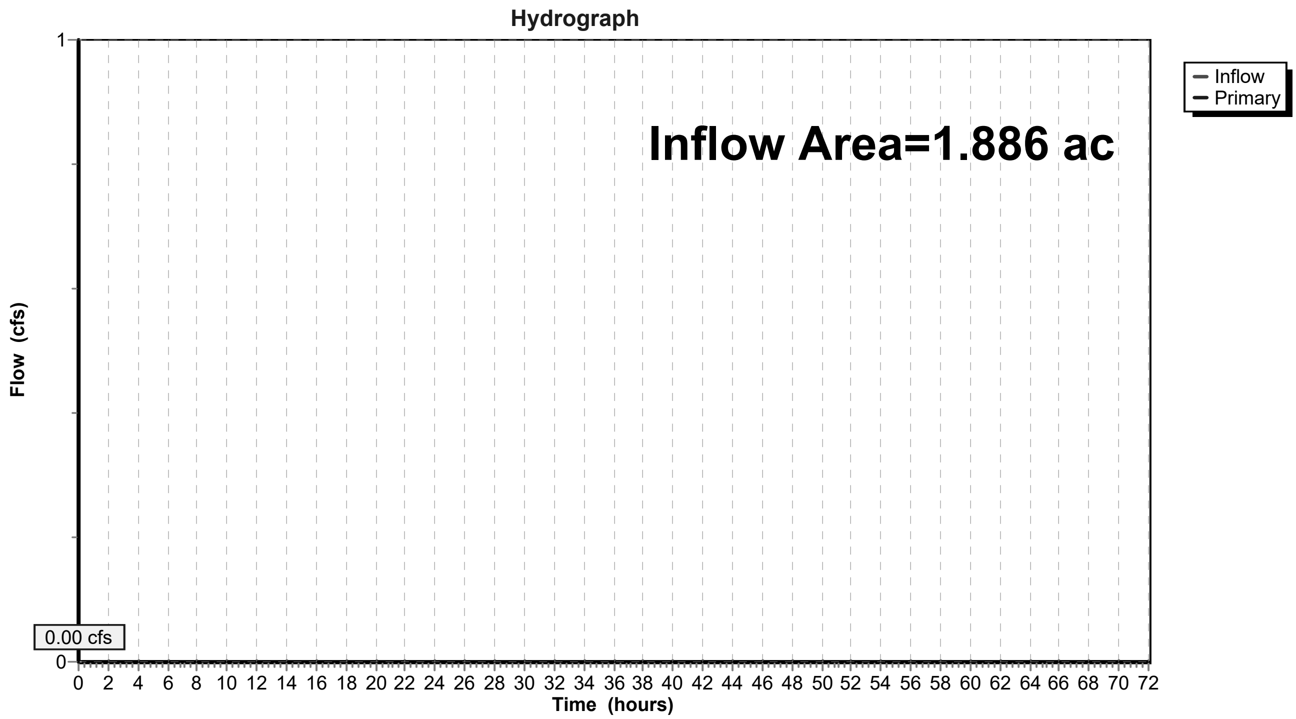


Summary for Link 27L: No Reductions

Inflow Area = 1.886 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-NJDEP WQ event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 15P : Surface Infiltration Basin

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

Link 27L: No Reductions



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 14S: Area 1 (Site Area to Runoff Area=2.705 ac 49.57% Impervious Runoff Depth=1.62"
Tc=10.0 min CN=39/98 Runoff=3.87 cfs 0.366 af

Subcatchment 16S: Area 2 (West Bangs) Runoff Area=0.070 ac 20.00% Impervious Runoff Depth=0.66"
Tc=10.0 min CN=39/98 Runoff=0.04 cfs 0.004 af

Subcatchment 23S: Area 3 (Onsite Area No Runoff Area=0.902 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=335' Tc=18.9 min CN=30/0 Runoff=0.00 cfs 0.000 af

Subcatchment 26S: Area 4 (Offsite Area No Runoff Area=0.984 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=502' Tc=19.5 min CN=30/0 Runoff=0.00 cfs 0.000 af

Pond 15P: Surface Infiltration Basin Peak Elev=35.38' Storage=4,470 cf Inflow=3.87 cfs 0.366 af
Discarded=0.51 cfs 0.360 af Primary=0.05 cfs 0.006 af Outflow=0.56 cfs 0.366 af

Link 25L: Total Inflow=0.06 cfs 0.010 af
Primary=0.06 cfs 0.010 af

Link 27L: No Reductions Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 4.661 ac Runoff Volume = 0.370 af Average Runoff Depth = 0.95"
70.93% Pervious = 3.306 ac 29.07% Impervious = 1.355 ac

Summary for Subcatchment 14S: Area 1 (Site Area to Basin)

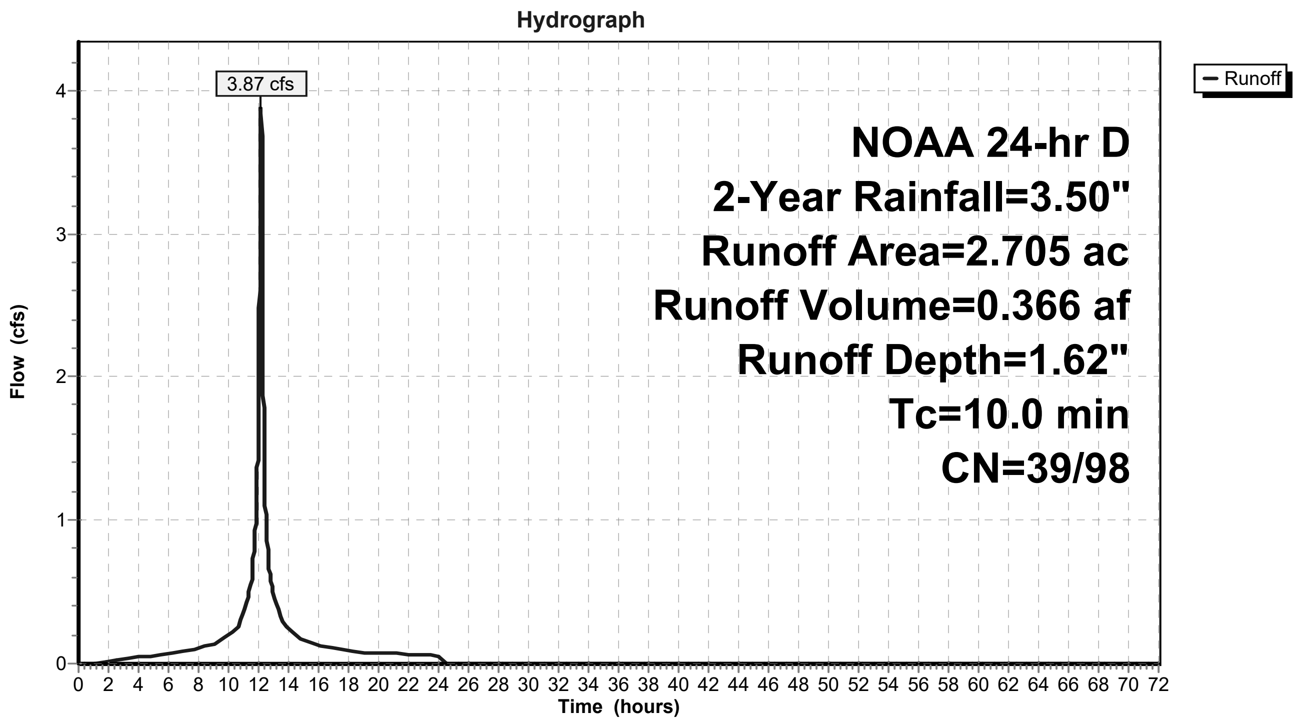
Runoff = 3.87 cfs @ 12.17 hrs, Volume= 0.366 af, Depth= 1.62"
Routed to Pond 15P : Surface Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.50"

Area (ac)	CN	Description
1.341	98	Paved parking, HSG A
1.364	39	>75% Grass cover, Good, HSG A
2.705	68	Weighted Average
1.364	39	50.43% Pervious Area
1.341	98	49.57% Impervious Area

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

Subcatchment 14S: Area 1 (Site Area to Basin)



Summary for Subcatchment 16S: Area 2 (West Bangs)

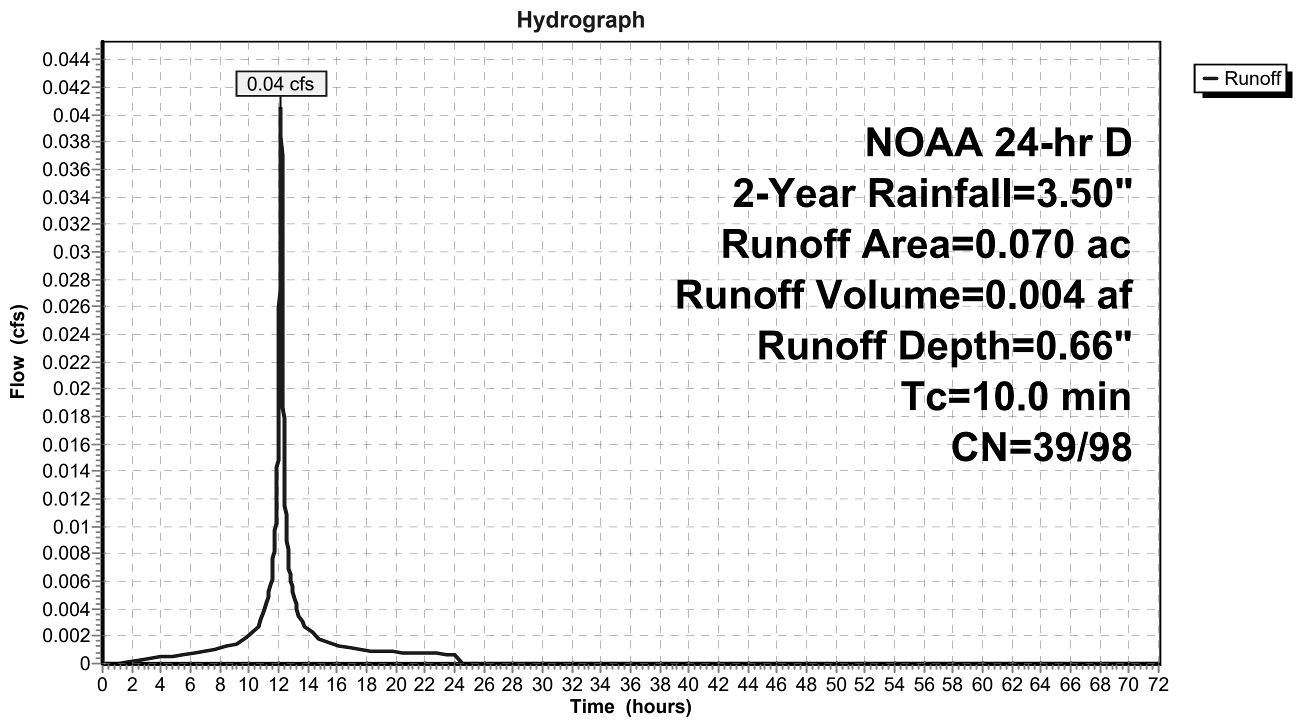
Runoff = 0.04 cfs @ 12.17 hrs, Volume= 0.004 af, Depth= 0.66"
Routed to Link 25L : Total

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.50"

Area (ac)	CN	Description
0.014	98	Paved parking, HSG A
0.056	39	>75% Grass cover, Good, HSG A
0.070	51	Weighted Average
0.056	39	80.00% Pervious Area
0.014	98	20.00% Impervious Area

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

Subcatchment 16S: Area 2 (West Bangs)



Summary for Subcatchment 23S: Area 3 (Onsite Area No Reductions)

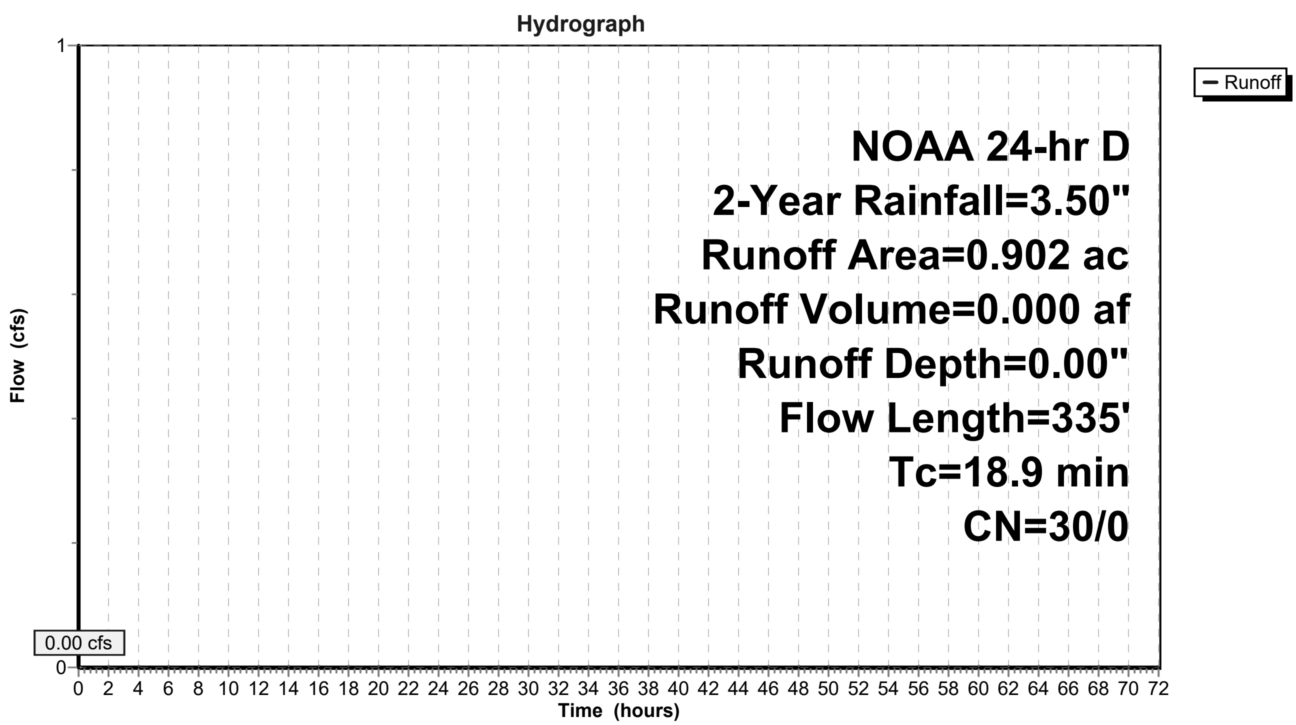
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 27L : No Reductions

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.50"

Area (ac)	CN	Description
0.902	30	Woods, Good, HSG A
0.902	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0360	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
1.5	87	0.0356	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	148	0.0331	2.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
18.9	335	Total			

Subcatchment 23S: Area 3 (Onsite Area No Reductions)



Summary for Subcatchment 26S: Area 4 (Offsite Area No Reductions)

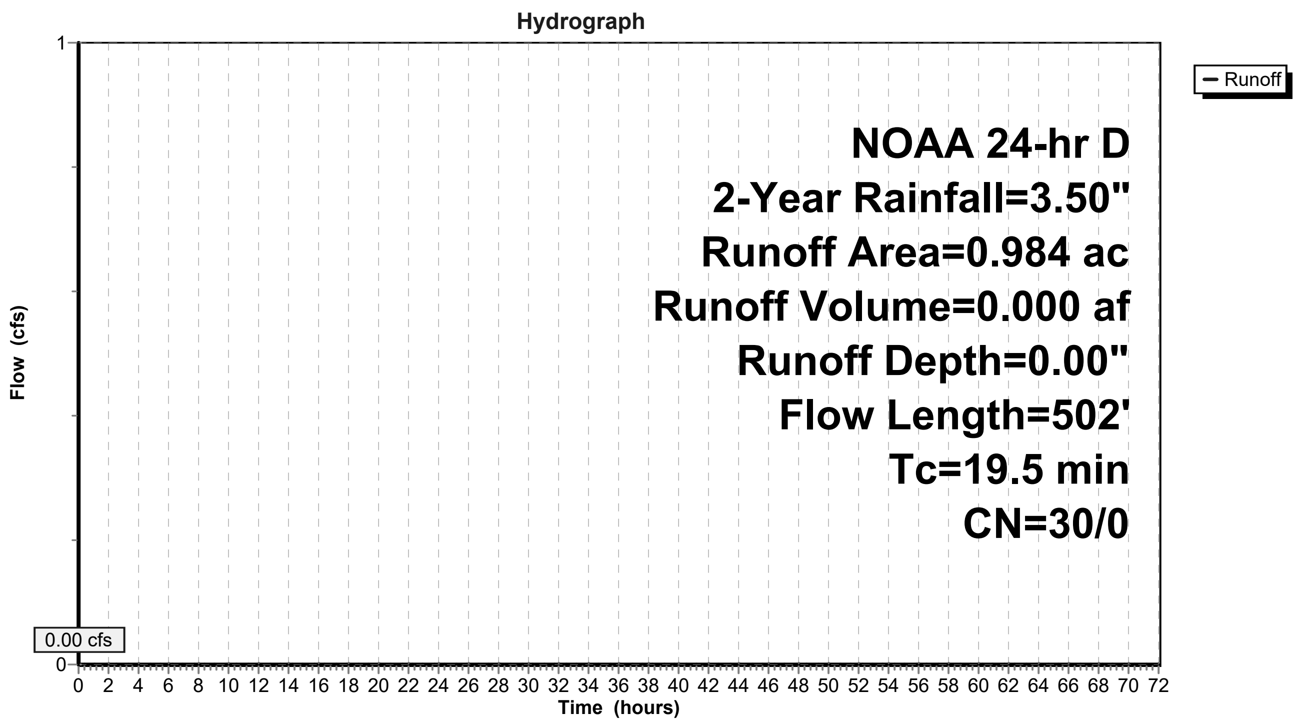
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 27L : No Reductions

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.50"

Area (ac)	CN	Description
0.984	30	Woods, Good, HSG A
0.984	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0470	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	174	0.1210	1.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	70	0.0329	0.91		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	79	0.0051	1.07		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.5	79	0.0196	2.84		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.5	502	Total			

Subcatchment 26S: Area 4 (Offsite Area No Reductions)



Summary for Pond 15P: Surface Infiltration Basin

Inflow Area = 4.591 ac, 29.21% Impervious, Inflow Depth = 0.96" for 2-Year event
Inflow = 3.87 cfs @ 12.17 hrs, Volume= 0.366 af
Outflow = 0.56 cfs @ 12.87 hrs, Volume= 0.366 af, Atten= 86%, Lag= 41.8 min
Discarded = 0.51 cfs @ 12.87 hrs, Volume= 0.360 af
Primary = 0.05 cfs @ 12.87 hrs, Volume= 0.006 af
Routed to Link 25L : Total

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 35.38' @ 12.87 hrs Surf.Area= 9,514 sf Storage= 4,470 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 51.8 min (813.3 - 761.5)

Volume	Invert	Avail.Storage	Storage Description
#1	34.90'	33,615 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

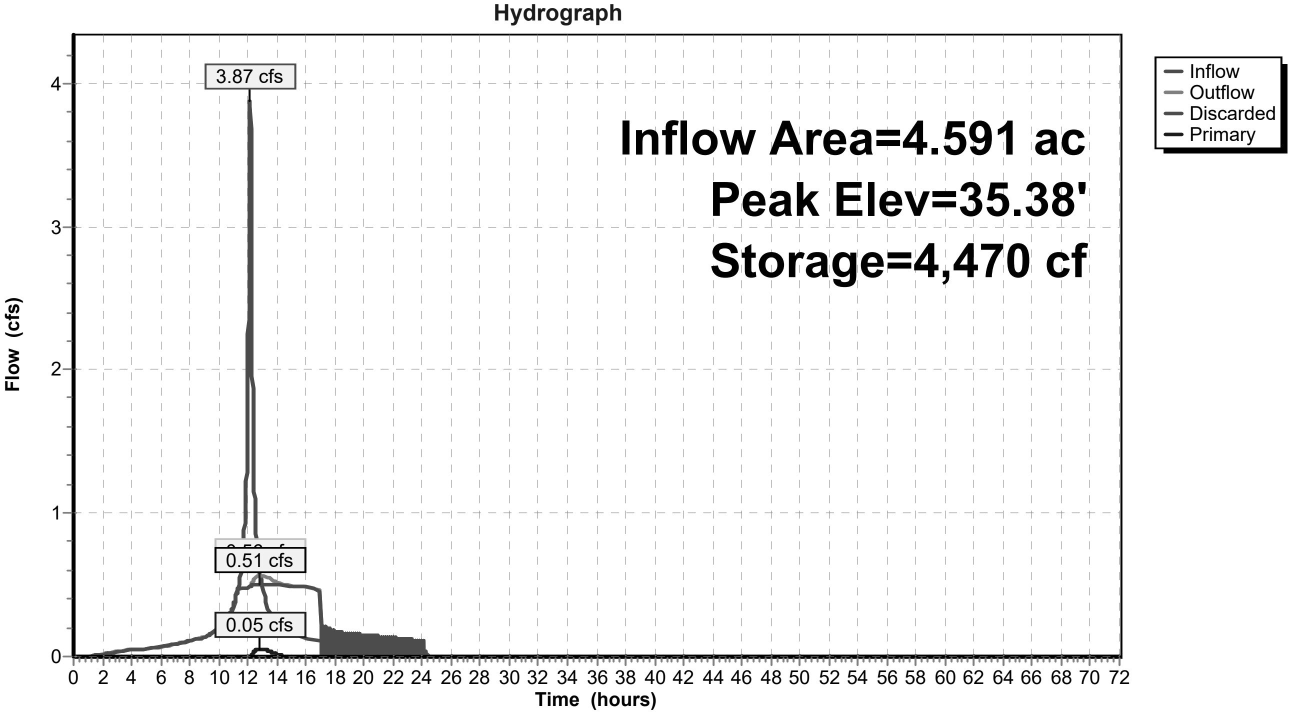
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.90	8,928	0	0
35.00	9,047	899	899
36.00	10,262	9,655	10,553
37.00	11,520	10,891	21,444
38.00	12,821	12,171	33,615

Device	Routing	Invert	Outlet Devices
#1	Primary	33.65'	**15.0" Round Culvert** L= 134.0' Ke= 0.500 Inlet / Outlet Invert= 33.65' / 28.57' S= 0.0379 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	35.21'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	35.80'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	34.90'	**2.300 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.51 cfs @ 12.87 hrs HW=35.38' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.51 cfs)

Primary OutFlow Max=0.05 cfs @ 12.87 hrs HW=35.38' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.05 cfs of 6.22 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 1.42 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 15P: Surface Infiltration Basin

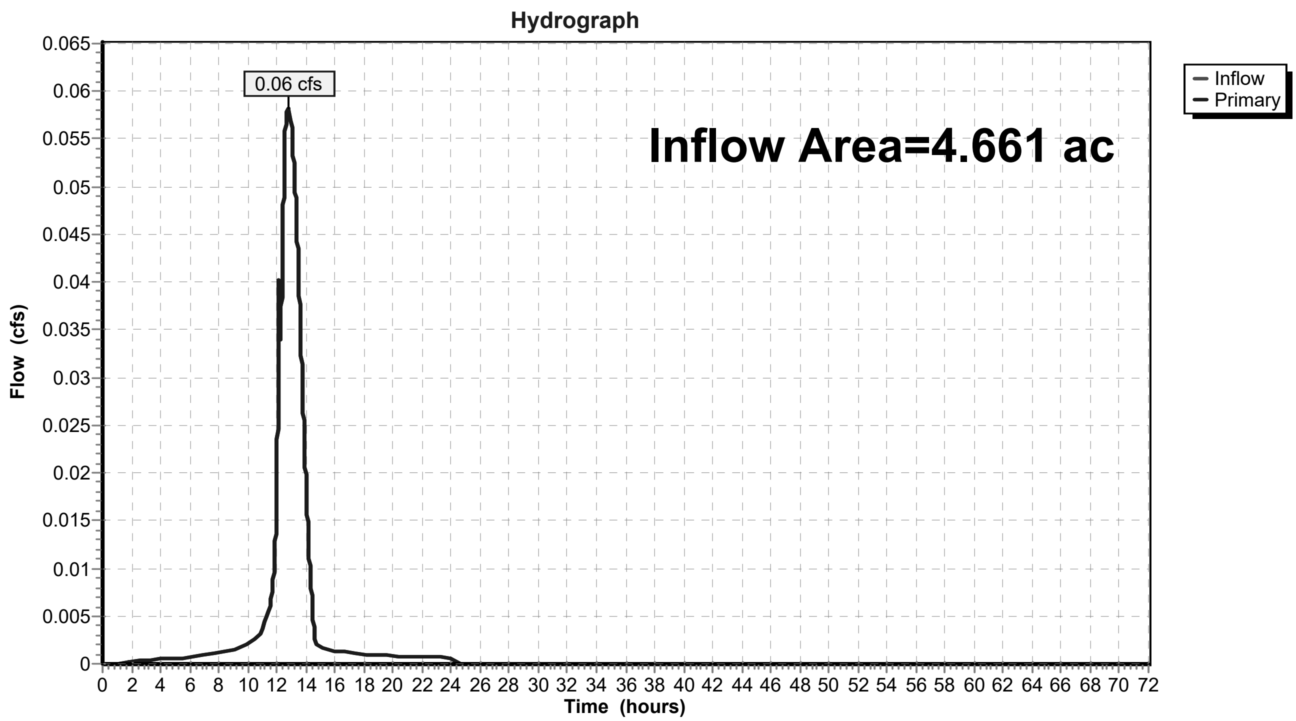


Summary for Link 25L: Total

Inflow Area =	4.661 ac, 29.07% Impervious, Inflow Depth = 0.03"	for 2-Year event	
Inflow =	0.06 cfs @ 12.81 hrs, Volume=	0.010 af	
Primary =	0.06 cfs @ 12.81 hrs, Volume=	0.010 af, Atten= 0%, Lag= 0.0 min	

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

Link 25L: Total

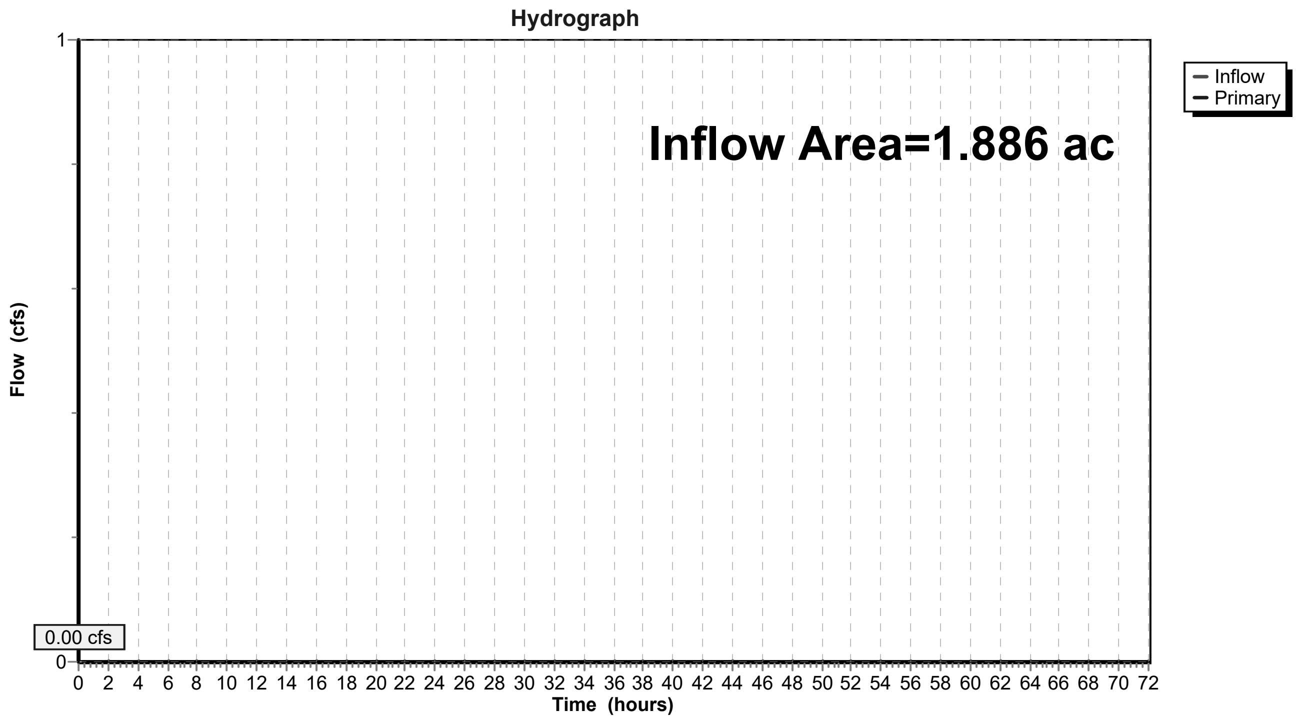


Summary for Link 27L: No Reductions

Inflow Area = 1.886 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 15P : Surface Infiltration Basin

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

Link 27L: No Reductions



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 14S: Area 1 (Site Area to Runoff Area=2.705 ac 49.57% Impervious Runoff Depth=2.72"
Tc=10.0 min CN=39/98 Runoff=6.04 cfs 0.612 af

Subcatchment 16S: Area 2 (West Bangs) Runoff Area=0.070 ac 20.00% Impervious Runoff Depth=1.27"
Tc=10.0 min CN=39/98 Runoff=0.06 cfs 0.007 af

Subcatchment 23S: Area 3 (Onsite Area No Runoff Area=0.902 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=335' Tc=18.9 min CN=30/0 Runoff=0.00 cfs 0.002 af

Subcatchment 26S: Area 4 (Offsite Area No Runoff Area=0.984 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=502' Tc=19.5 min CN=30/0 Runoff=0.00 cfs 0.002 af

Pond 15P: Surface Infiltration Basin Peak Elev=35.82' Storage=8,718 cf Inflow=6.04 cfs 0.616 af
Discarded=0.53 cfs 0.563 af Primary=0.17 cfs 0.053 af Outflow=0.70 cfs 0.616 af

Link 25L: Total Inflow=0.18 cfs 0.061 af
Primary=0.18 cfs 0.061 af

Link 27L: No Reductions Inflow=0.01 cfs 0.004 af
Primary=0.01 cfs 0.004 af

Total Runoff Area = 4.661 ac Runoff Volume = 0.624 af Average Runoff Depth = 1.61"
70.93% Pervious = 3.306 ac 29.07% Impervious = 1.355 ac

Summary for Subcatchment 14S: Area 1 (Site Area to Basin)

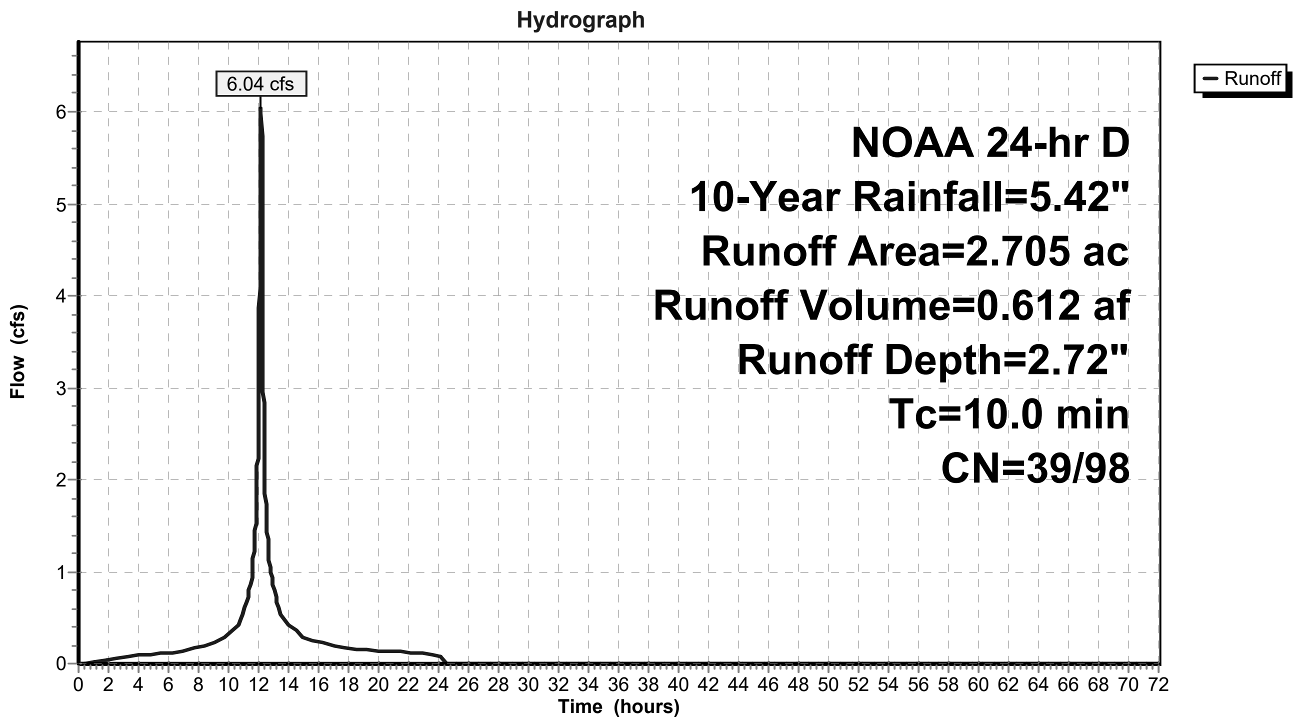
Runoff = 6.04 cfs @ 12.17 hrs, Volume= 0.612 af, Depth= 2.72"
Routed to Pond 15P : Surface Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.42"

Area (ac)	CN	Description
1.341	98	Paved parking, HSG A
1.364	39	>75% Grass cover, Good, HSG A
2.705	68	Weighted Average
1.364	39	50.43% Pervious Area
1.341	98	49.57% Impervious Area

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

Subcatchment 14S: Area 1 (Site Area to Basin)



Summary for Subcatchment 16S: Area 2 (West Bangs)

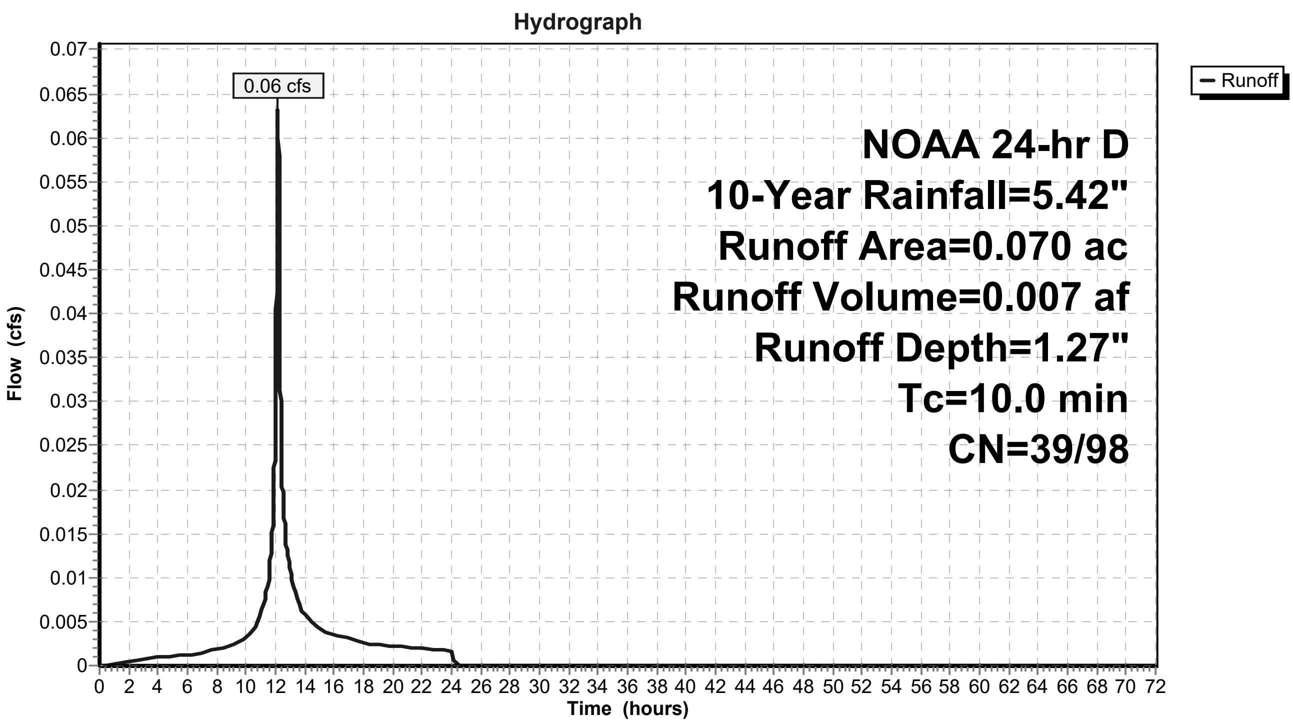
Runoff = 0.06 cfs @ 12.17 hrs, Volume= 0.007 af, Depth= 1.27"
Routed to Link 25L : Total

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.42"

Area (ac)	CN	Description
0.014	98	Paved parking, HSG A
0.056	39	>75% Grass cover, Good, HSG A
0.070	51	Weighted Average
0.056	39	80.00% Pervious Area
0.014	98	20.00% Impervious Area

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

Subcatchment 16S: Area 2 (West Bangs)



Summary for Subcatchment 23S: Area 3 (Onsite Area No Reductions)

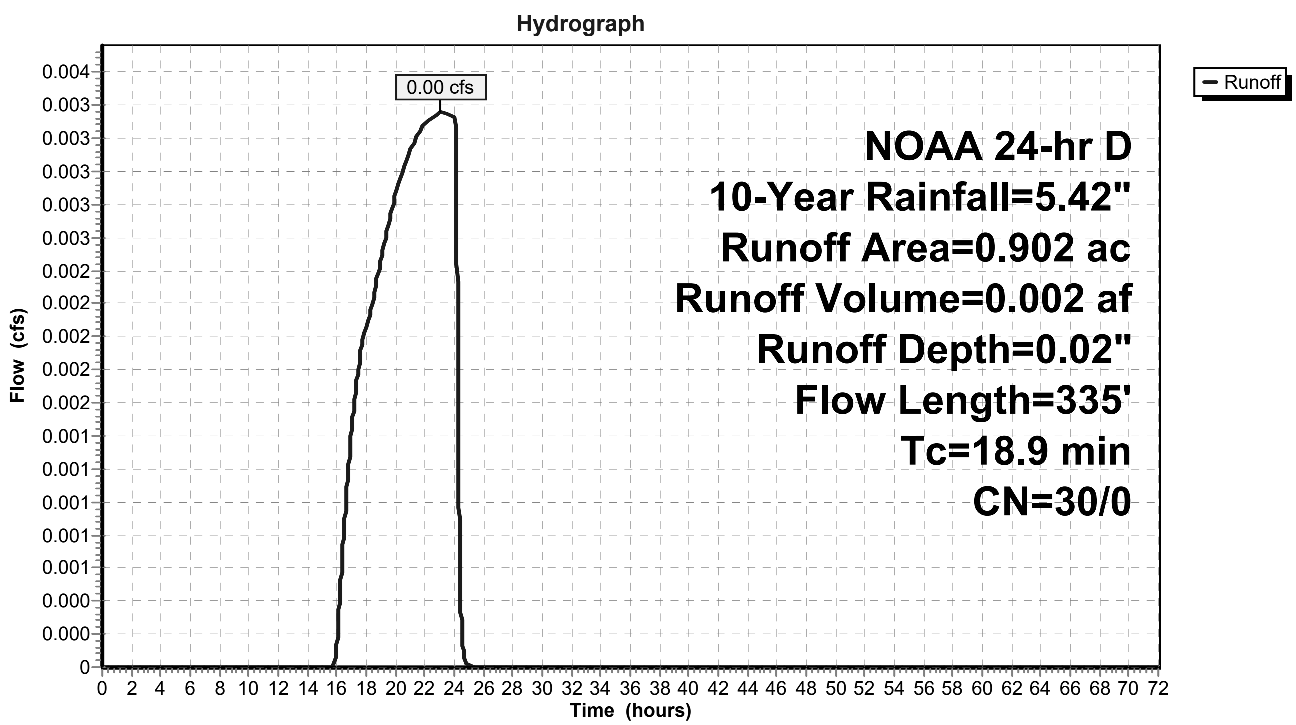
Runoff = 0.00 cfs @ 23.04 hrs, Volume= 0.002 af, Depth= 0.02"
Routed to Link 27L : No Reductions

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.42"

Area (ac)	CN	Description
0.902	30	Woods, Good, HSG A
0.902	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0360	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
1.5	87	0.0356	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	148	0.0331	2.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
18.9	335	Total			

Subcatchment 23S: Area 3 (Onsite Area No Reductions)



Summary for Subcatchment 26S: Area 4 (Offsite Area No Reductions)

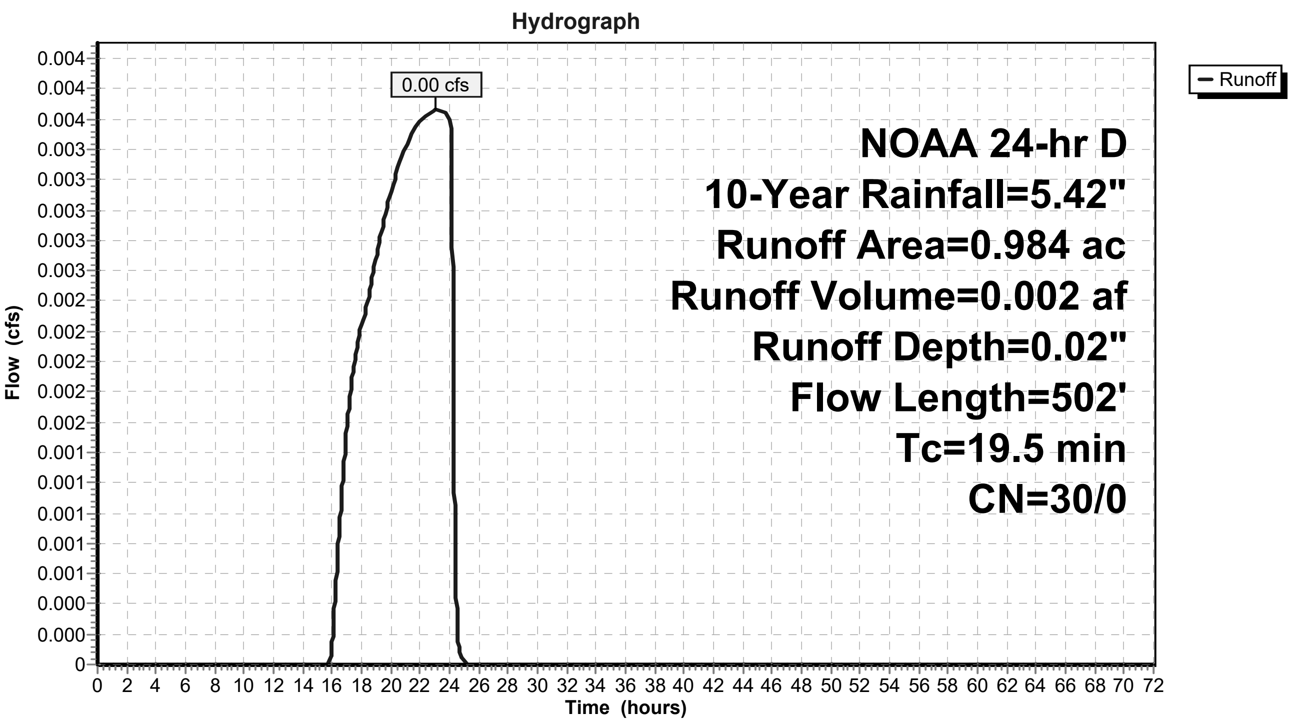
Runoff = 0.00 cfs @ 23.03 hrs, Volume= 0.002 af, Depth= 0.02"
Routed to Link 27L : No Reductions

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.42"

Area (ac)	CN	Description
0.984	30	Woods, Good, HSG A
0.984	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0470	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	174	0.1210	1.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	70	0.0329	0.91		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	79	0.0051	1.07		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.5	79	0.0196	2.84		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.5	502	Total			

Subcatchment 26S: Area 4 (Offsite Area No Reductions)



Summary for Pond 15P: Surface Infiltration Basin

Inflow Area = 4.591 ac, 29.21% Impervious, Inflow Depth = 1.61" for 10-Year event
Inflow = 6.04 cfs @ 12.17 hrs, Volume= 0.616 af
Outflow = 0.70 cfs @ 13.18 hrs, Volume= 0.616 af, Atten= 88%, Lag= 60.6 min
Discarded = 0.53 cfs @ 13.18 hrs, Volume= 0.563 af
Primary = 0.17 cfs @ 13.18 hrs, Volume= 0.053 af
Routed to Link 25L : Total

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 35.82' @ 13.18 hrs Surf.Area= 10,042 sf Storage= 8,718 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 96.5 min (865.2 - 768.7)

Volume	Invert	Avail.Storage	Storage Description
#1	34.90'	33,615 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

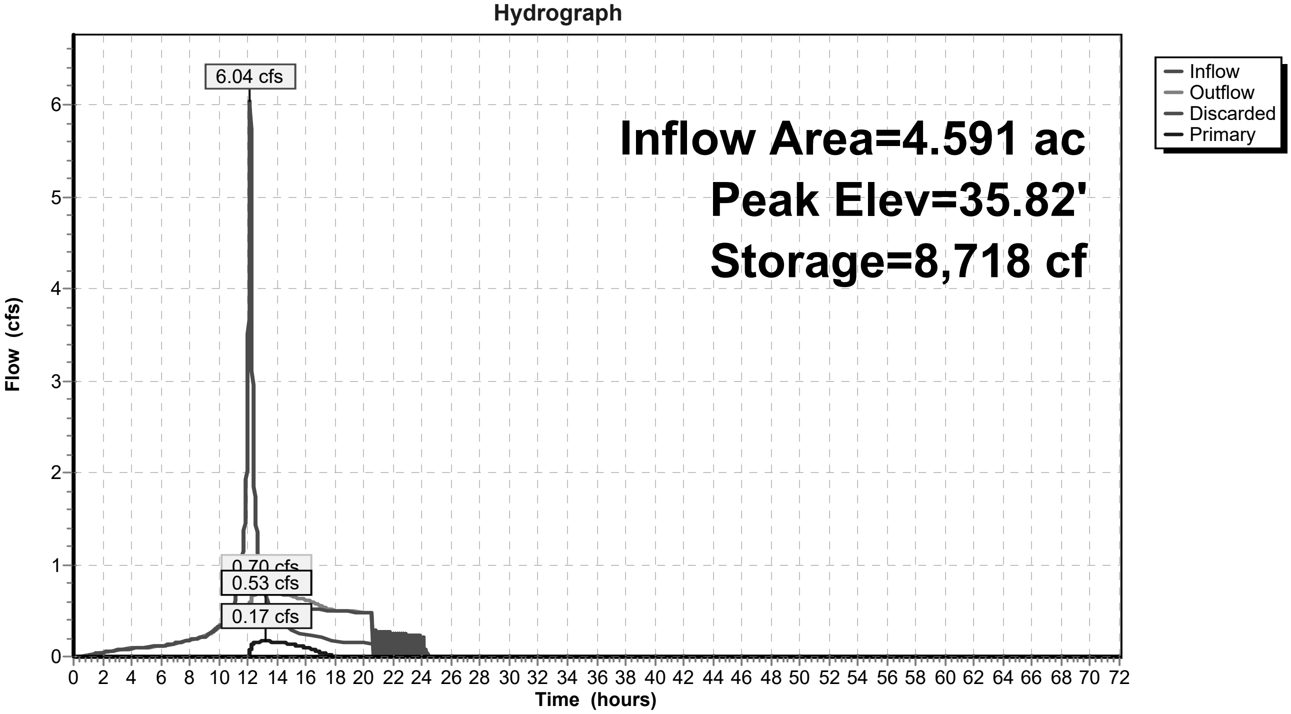
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.90	8,928	0	0
35.00	9,047	899	899
36.00	10,262	9,655	10,553
37.00	11,520	10,891	21,444
38.00	12,821	12,171	33,615

Device	Routing	Invert	Outlet Devices
#1	Primary	33.65'	**15.0" Round Culvert** L= 134.0' Ke= 0.500 Inlet / Outlet Invert= 33.65' / 28.57' S= 0.0379 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	35.21'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	35.80'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	34.90'	**2.300 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.53 cfs @ 13.18 hrs HW=35.82' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.53 cfs)

Primary OutFlow Max=0.17 cfs @ 13.18 hrs HW=35.82' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.17 cfs of 7.34 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.16 cfs @ 3.35 fps)
  └─**3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.47 fps)

Pond 15P: Surface Infiltration Basin

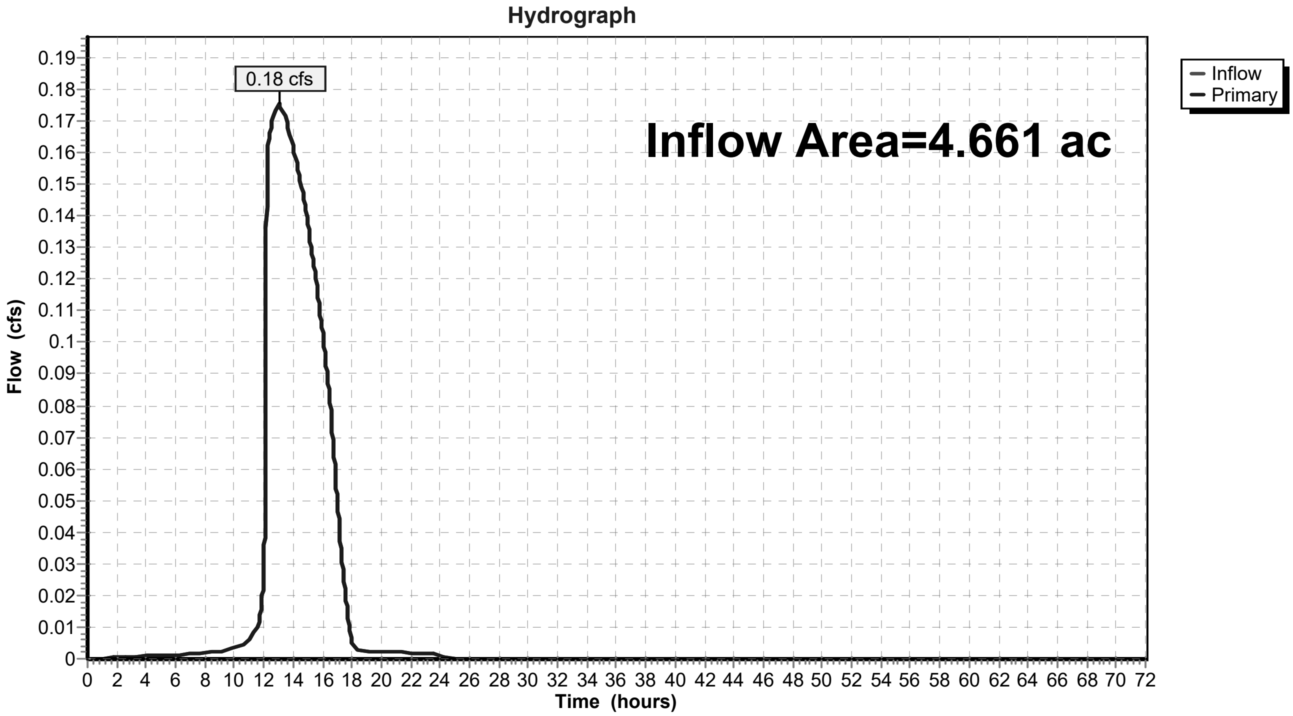


Summary for Link 25L: Total

Inflow Area =	4.661 ac, 29.07% Impervious, Inflow Depth = 0.16"	for 10-Year event	
Inflow =	0.18 cfs @ 13.06 hrs, Volume=	0.061 af	
Primary =	0.18 cfs @ 13.06 hrs, Volume=	0.061 af,	Atten= 0%, Lag= 0.0 min

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

Link 25L: Total

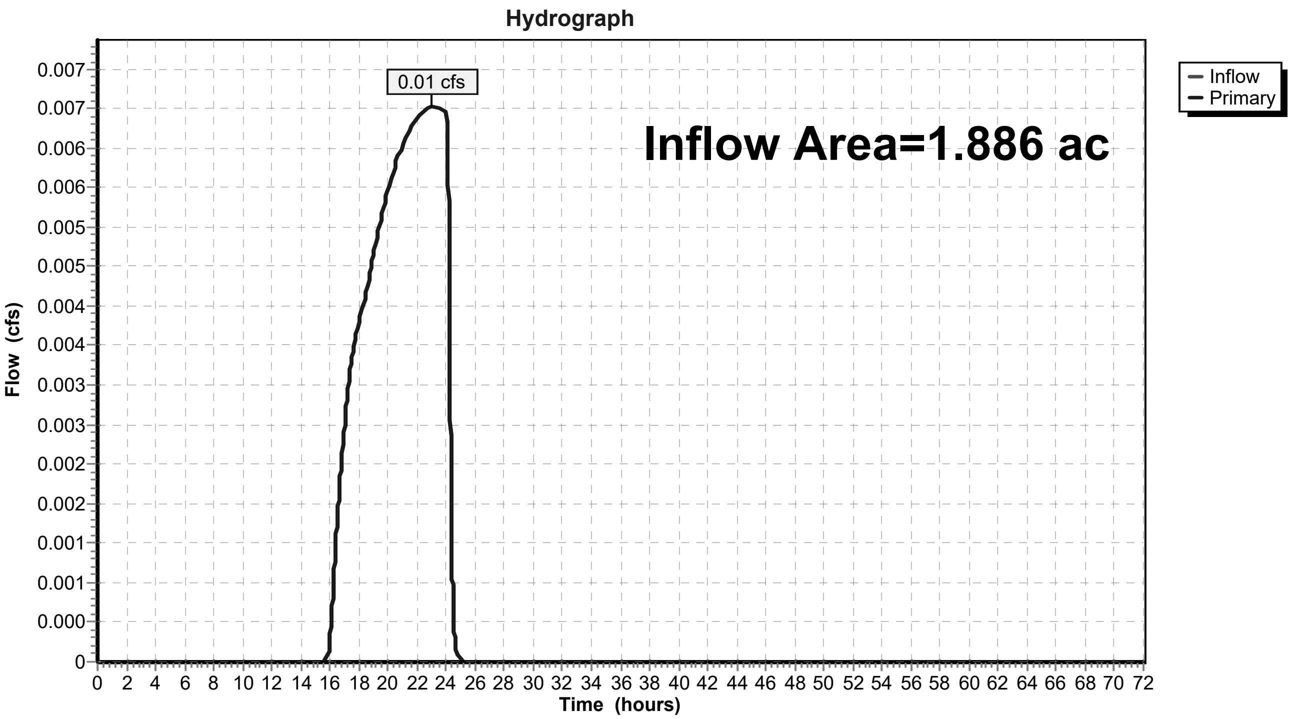


Summary for Link 27L: No Reductions

Inflow Area = 1.886 ac, 0.00% Impervious, Inflow Depth = 0.02" for 10-Year event
Inflow = 0.01 cfs @ 23.03 hrs, Volume= 0.004 af
Primary = 0.01 cfs @ 23.03 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 15P : Surface Infiltration Basin

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

Link 27L: No Reductions



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 14S: Area 1 (Site Area to Runoff Area=2.705 ac 49.57% Impervious Runoff Depth=3.58"
Tc=10.0 min CN=39/98 Runoff=7.91 cfs 0.808 af

Subcatchment 16S: Area 2 (West Bangs) Runoff Area=0.070 ac 20.00% Impervious Runoff Depth=1.86"
Tc=10.0 min CN=39/98 Runoff=0.09 cfs 0.011 af

Subcatchment 23S: Area 3 (Onsite Area No Runoff Area=0.902 ac 0.00% Impervious Runoff Depth=0.17"
Flow Length=335' Tc=18.9 min CN=30/0 Runoff=0.02 cfs 0.013 af

Subcatchment 26S: Area 4 (Offsite Area No Runoff Area=0.984 ac 0.00% Impervious Runoff Depth=0.17"
Flow Length=502' Tc=19.5 min CN=30/0 Runoff=0.02 cfs 0.014 af

Pond 15P: Surface Infiltration Basin Peak Elev=36.14' Storage=12,054 cf Inflow=7.91 cfs 0.835 af
Discarded=0.56 cfs 0.698 af Primary=0.45 cfs 0.137 af Outflow=1.01 cfs 0.835 af

Link 25L: Total Inflow=0.47 cfs 0.148 af
Primary=0.47 cfs 0.148 af

Link 27L: No Reductions Inflow=0.04 cfs 0.027 af
Primary=0.04 cfs 0.027 af

Total Runoff Area = 4.661 ac Runoff Volume = 0.846 af Average Runoff Depth = 2.18"
70.93% Pervious = 3.306 ac 29.07% Impervious = 1.355 ac

Summary for Subcatchment 14S: Area 1 (Site Area to Basin)

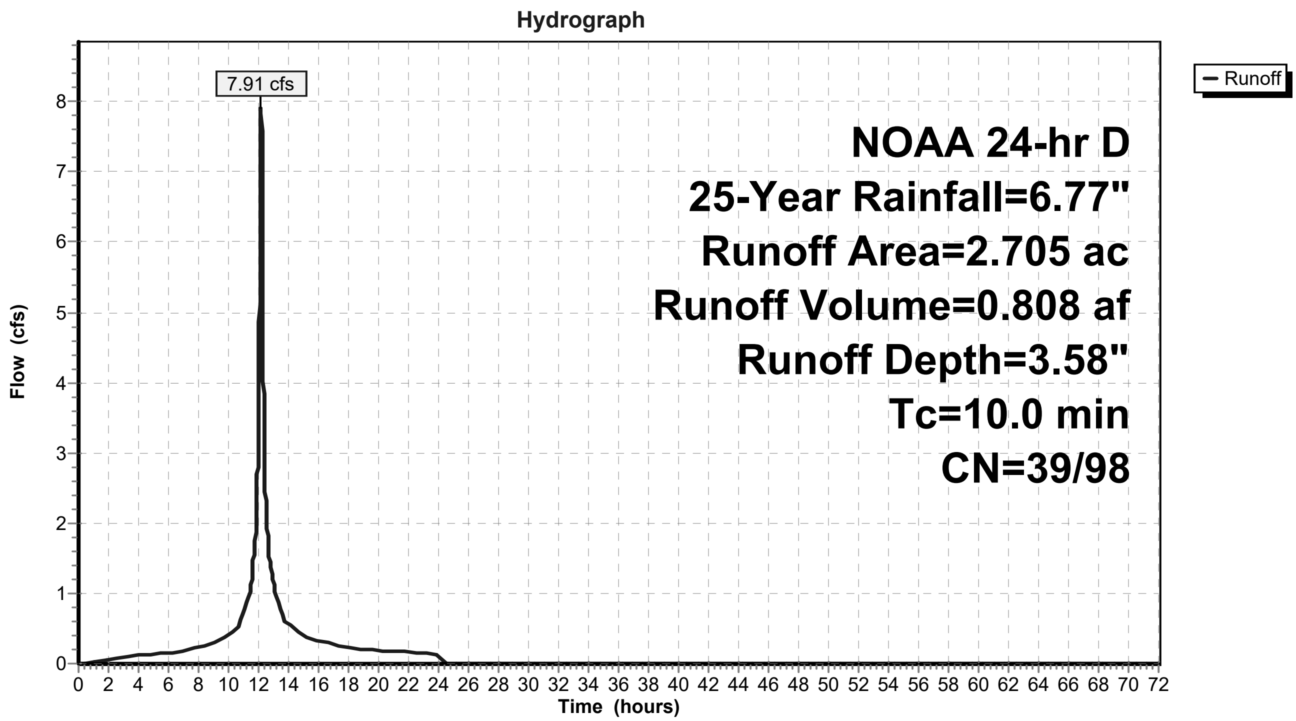
Runoff = 7.91 cfs @ 12.17 hrs, Volume= 0.808 af, Depth= 3.58"
Routed to Pond 15P : Surface Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.77"

Area (ac)	CN	Description
1.341	98	Paved parking, HSG A
1.364	39	>75% Grass cover, Good, HSG A
2.705	68	Weighted Average
1.364	39	50.43% Pervious Area
1.341	98	49.57% Impervious Area

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

Subcatchment 14S: Area 1 (Site Area to Basin)



Summary for Subcatchment 16S: Area 2 (West Bangs)

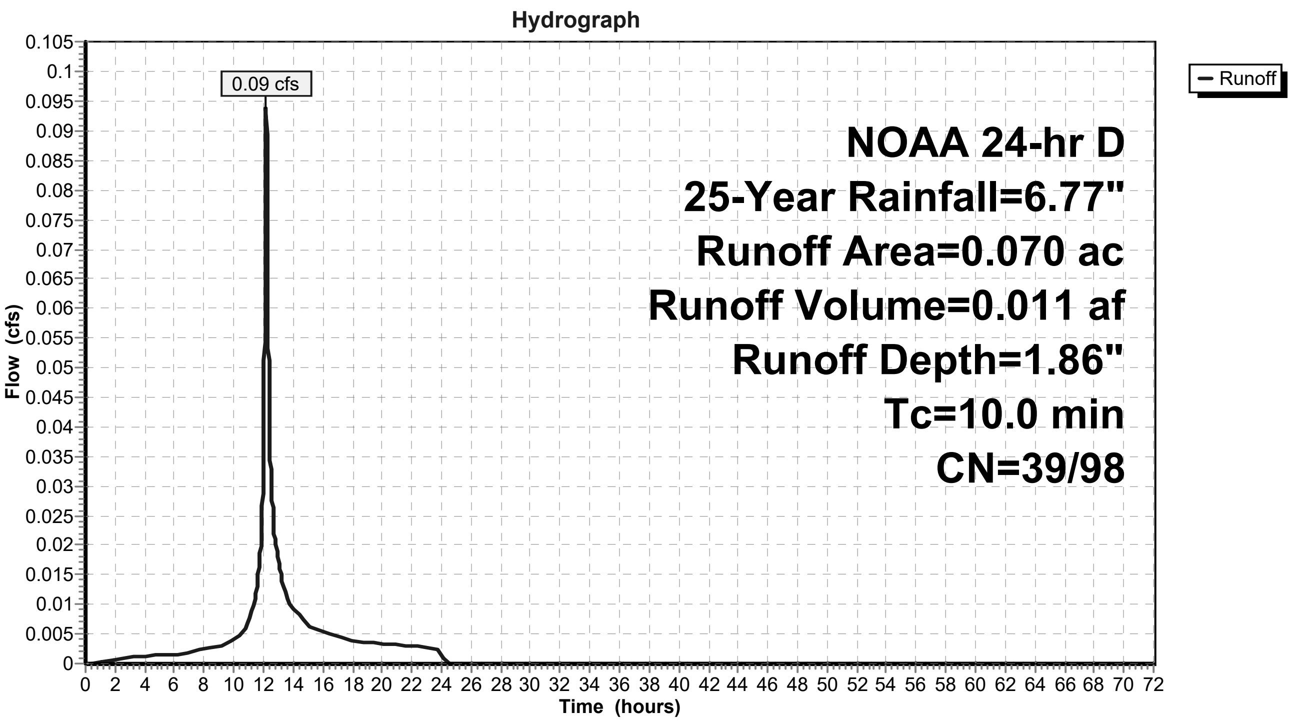
Runoff = 0.09 cfs @ 12.18 hrs, Volume= 0.011 af, Depth= 1.86"
Routed to Link 25L : Total

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.77"

Area (ac)	CN	Description
0.014	98	Paved parking, HSG A
0.056	39	>75% Grass cover, Good, HSG A
0.070	51	Weighted Average
0.056	39	80.00% Pervious Area
0.014	98	20.00% Impervious Area

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

Subcatchment 16S: Area 2 (West Bangs)



Summary for Subcatchment 23S: Area 3 (Onsite Area No Reductions)

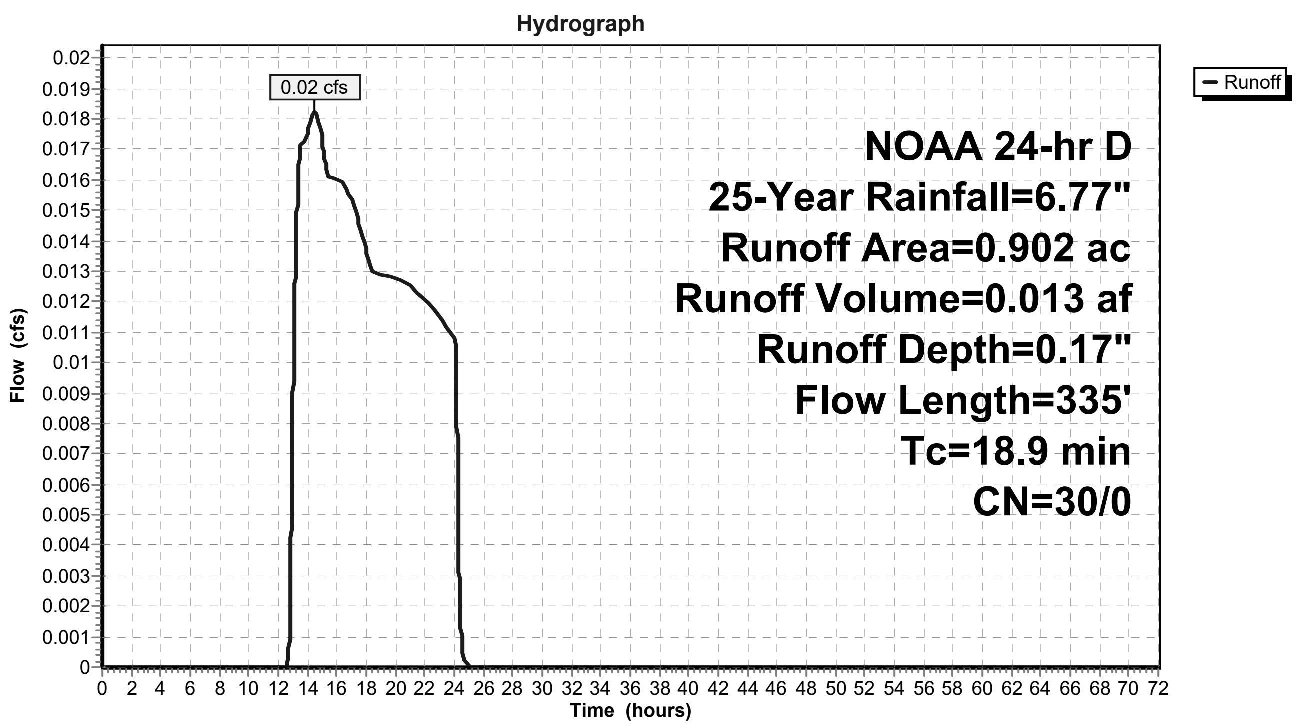
Runoff = 0.02 cfs @ 14.47 hrs, Volume= 0.013 af, Depth= 0.17"
Routed to Link 27L : No Reductions

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.77"

Area (ac)	CN	Description
0.902	30	Woods, Good, HSG A
0.902	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0360	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
1.5	87	0.0356	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	148	0.0331	2.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
18.9	335	Total			

Subcatchment 23S: Area 3 (Onsite Area No Reductions)



Summary for Subcatchment 26S: Area 4 (Offsite Area No Reductions)

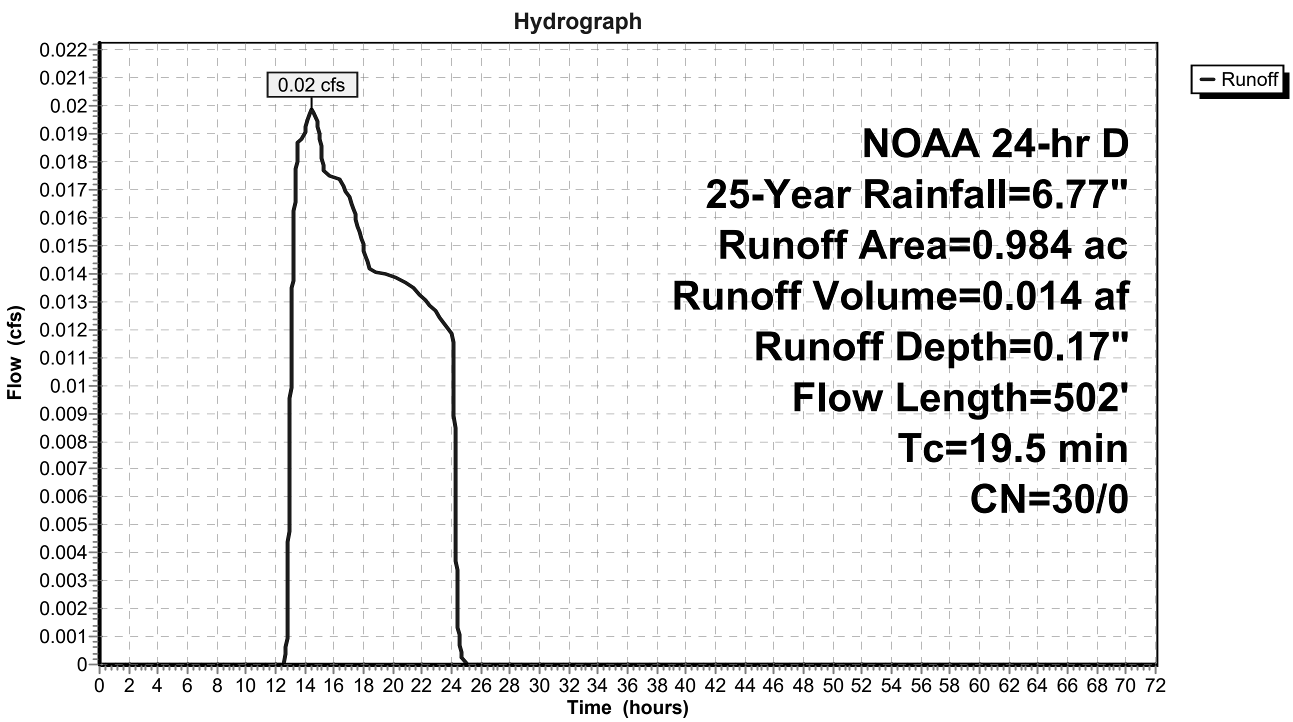
Runoff = 0.02 cfs @ 14.45 hrs, Volume= 0.014 af, Depth= 0.17"
Routed to Link 27L : No Reductions

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.77"

Area (ac)	CN	Description
0.984	30	Woods, Good, HSG A
0.984	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0470	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	174	0.1210	1.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	70	0.0329	0.91		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	79	0.0051	1.07		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.5	79	0.0196	2.84		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.5	502	Total			

Subcatchment 26S: Area 4 (Offsite Area No Reductions)



Summary for Pond 15P: Surface Infiltration Basin

Inflow Area = 4.591 ac, 29.21% Impervious, Inflow Depth = 2.18" for 25-Year event
Inflow = 7.91 cfs @ 12.17 hrs, Volume= 0.835 af
Outflow = 1.01 cfs @ 13.15 hrs, Volume= 0.835 af, Atten= 87%, Lag= 58.6 min
Discarded = 0.56 cfs @ 13.15 hrs, Volume= 0.698 af
Primary = 0.45 cfs @ 13.15 hrs, Volume= 0.137 af
Routed to Link 25L : Total

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 36.14' @ 13.15 hrs Surf.Area= 10,444 sf Storage= 12,054 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 122.4 min (901.4 - 779.0)

Volume	Invert	Avail.Storage	Storage Description
#1	34.90'	33,615 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

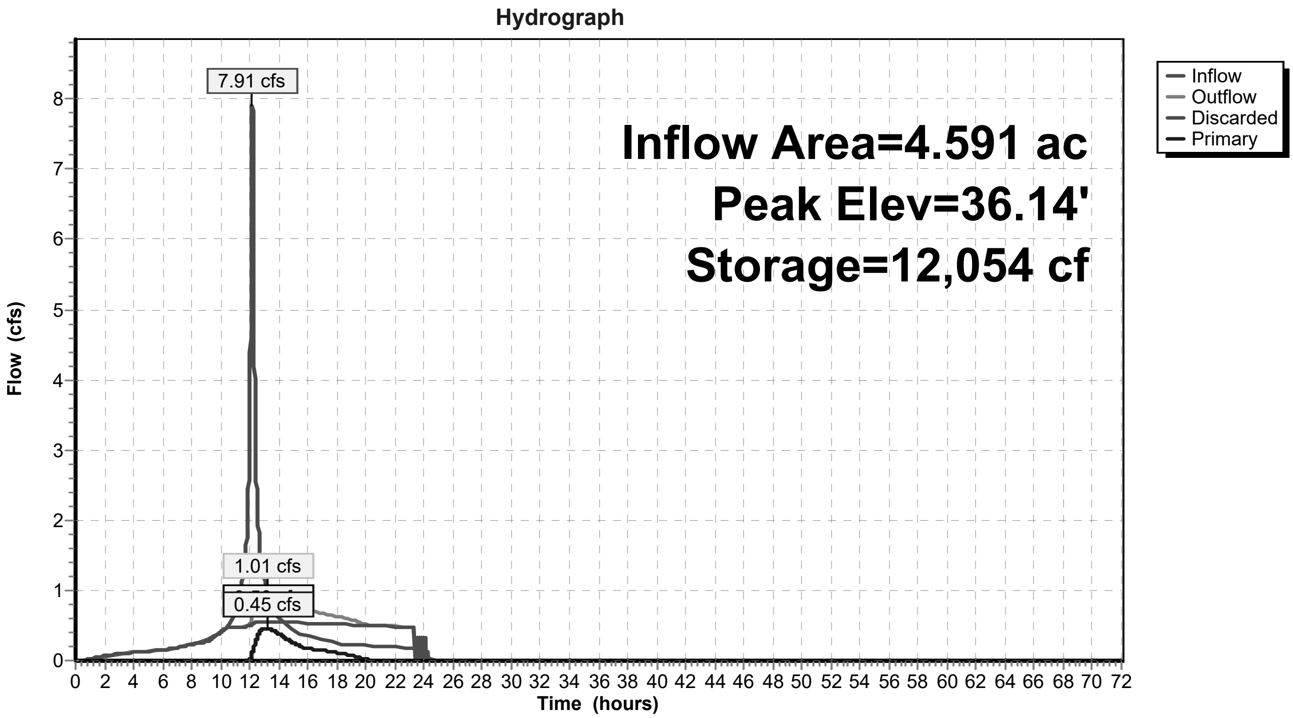
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.90	8,928	0	0
35.00	9,047	899	899
36.00	10,262	9,655	10,553
37.00	11,520	10,891	21,444
38.00	12,821	12,171	33,615

Device	Routing	Invert	Outlet Devices
#1	Primary	33.65'	**15.0" Round Culvert** L= 134.0' Ke= 0.500 Inlet / Outlet Invert= 33.65' / 28.57' S= 0.0379 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	35.21'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	35.80'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	34.90'	**2.300 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.56 cfs @ 13.15 hrs HW=36.14' (Free Discharge)
4=Exfiltration (Exfiltration Controls 0.56 cfs)

Primary OutFlow Max=0.45 cfs @ 13.15 hrs HW=36.14' TW=0.00' (Dynamic Tailwater)
1=Culvert (Passes 0.45 cfs of 8.08 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.21 cfs @ 4.33 fps)
3=Orifice/Grate (Orifice Controls 0.24 cfs @ 2.00 fps)

Pond 15P: Surface Infiltration Basin

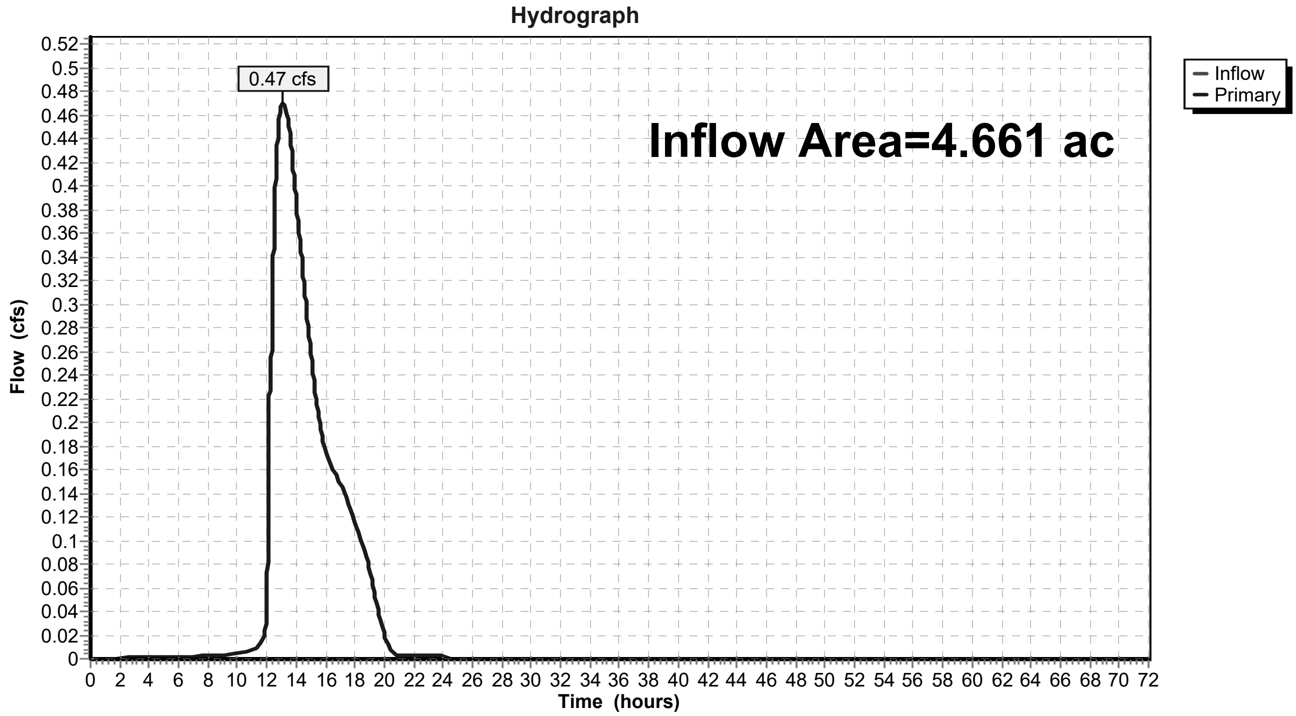


Summary for Link 25L: Total

Inflow Area =	4.661 ac, 29.07% Impervious, Inflow Depth = 0.38"	for 25-Year event
Inflow =	0.47 cfs @ 13.10 hrs, Volume=	0.148 af
Primary =	0.47 cfs @ 13.10 hrs, Volume=	0.148 af, Atten= 0%, Lag= 0.0 min

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

Link 25L: Total

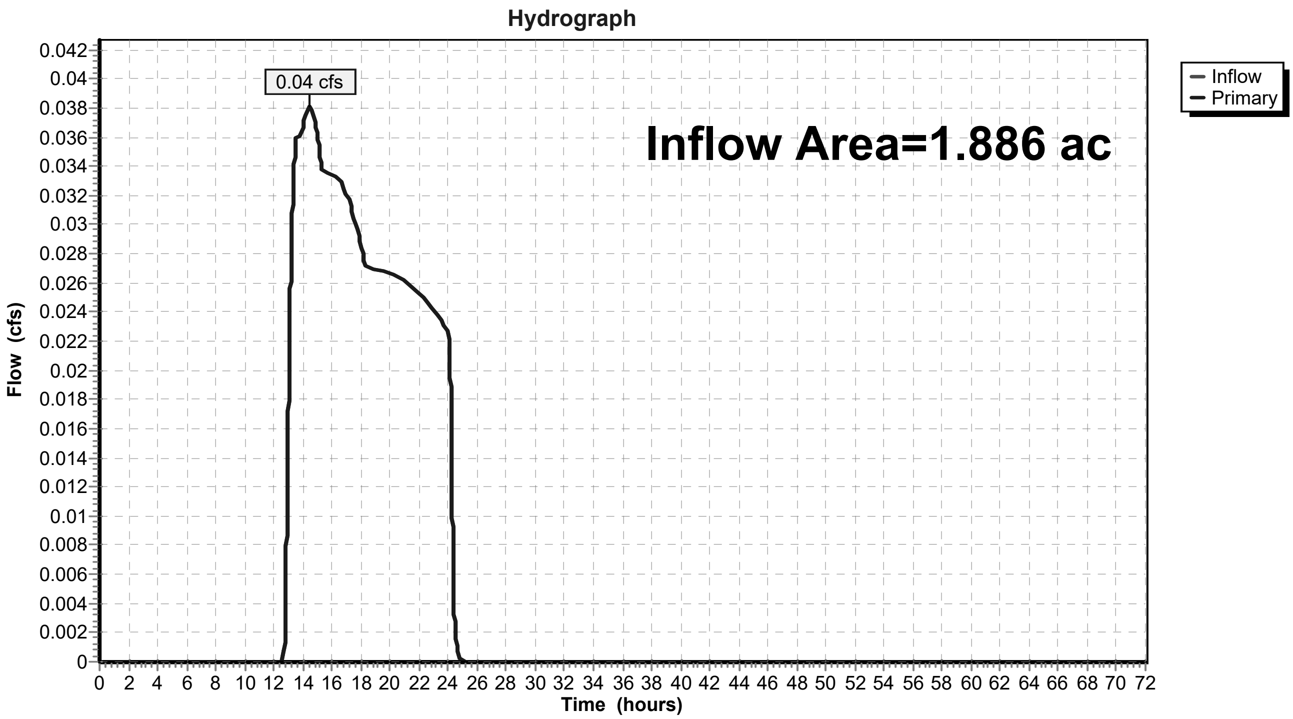


Summary for Link 27L: No Reductions

Inflow Area = 1.886 ac, 0.00% Impervious, Inflow Depth = 0.17" for 25-Year event
Inflow = 0.04 cfs @ 14.46 hrs, Volume= 0.027 af
Primary = 0.04 cfs @ 14.46 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 15P : Surface Infiltration Basin

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

Link 27L: No Reductions



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 14S: Area 1 (Site Area to Runoff Area=2.705 ac 49.57% Impervious Runoff Depth=5.36"
Tc=10.0 min CN=39/98 Runoff=12.26 cfs 1.208 af

Subcatchment 16S: Area 2 (West Bangs) Runoff Area=0.070 ac 20.00% Impervious Runoff Depth=3.20"
Tc=10.0 min CN=39/98 Runoff=0.19 cfs 0.019 af

Subcatchment 23S: Area 3 (Onsite Area No Runoff Area=0.902 ac 0.00% Impervious Runoff Depth=0.76"
Flow Length=335' Tc=18.9 min CN=30/0 Runoff=0.19 cfs 0.057 af

Subcatchment 26S: Area 4 (Offsite Area No Runoff Area=0.984 ac 0.00% Impervious Runoff Depth=0.76"
Flow Length=502' Tc=19.5 min CN=30/0 Runoff=0.21 cfs 0.062 af

Pond 15P: Surface Infiltration Basin Peak Elev=36.93' Storage=20,590 cf Inflow=12.31 cfs 1.327 af
Discarded=0.61 cfs 0.897 af Primary=0.93 cfs 0.431 af Outflow=1.54 cfs 1.327 af

Link 25L: Total Inflow=0.95 cfs 0.449 af
Primary=0.95 cfs 0.449 af

Link 27L: No Reductions Inflow=0.40 cfs 0.120 af
Primary=0.40 cfs 0.120 af

Total Runoff Area = 4.661 ac Runoff Volume = 1.346 af Average Runoff Depth = 3.47"
70.93% Pervious = 3.306 ac 29.07% Impervious = 1.355 ac

Summary for Subcatchment 14S: Area 1 (Site Area to Basin)

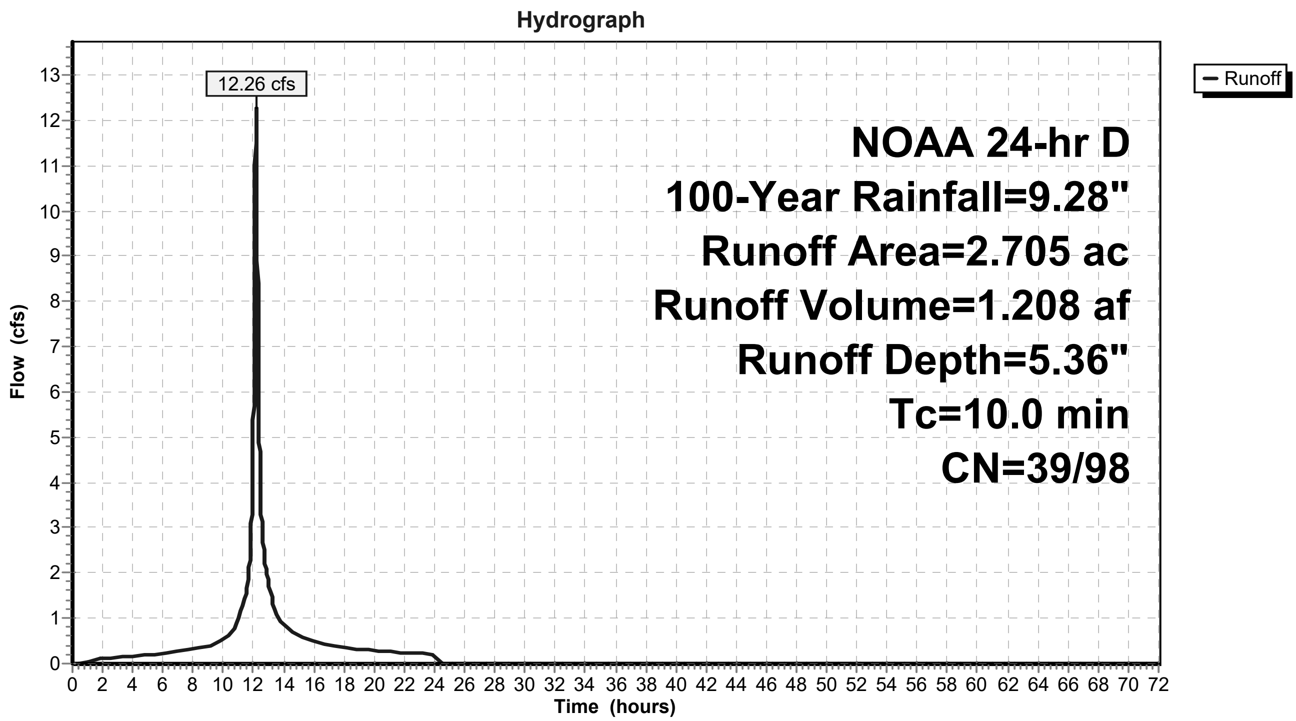
Runoff = 12.26 cfs @ 12.17 hrs, Volume= 1.208 af, Depth= 5.36"
Routed to Pond 15P : Surface Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=9.28"

Area (ac)	CN	Description
1.341	98	Paved parking, HSG A
1.364	39	>75% Grass cover, Good, HSG A
2.705	68	Weighted Average
1.364	39	50.43% Pervious Area
1.341	98	49.57% Impervious Area

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

Subcatchment 14S: Area 1 (Site Area to Basin)



Summary for Subcatchment 16S: Area 2 (West Bangs)

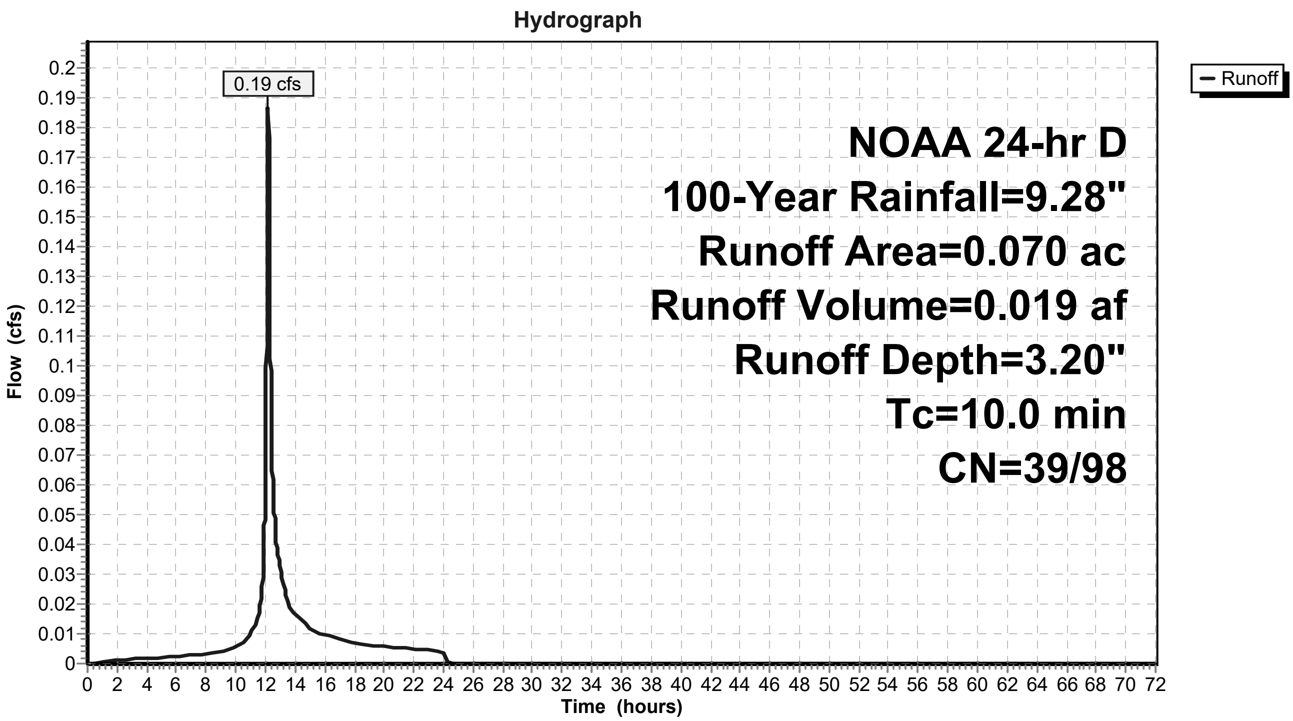
Runoff = 0.19 cfs @ 12.18 hrs, Volume= 0.019 af, Depth= 3.20"
Routed to Link 25L : Total

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=9.28"

Area (ac)	CN	Description
0.014	98	Paved parking, HSG A
0.056	39	>75% Grass cover, Good, HSG A
0.070	51	Weighted Average
0.056	39	80.00% Pervious Area
0.014	98	20.00% Impervious Area

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

Subcatchment 16S: Area 2 (West Bangs)



Summary for Subcatchment 23S: Area 3 (Onsite Area No Reductions)

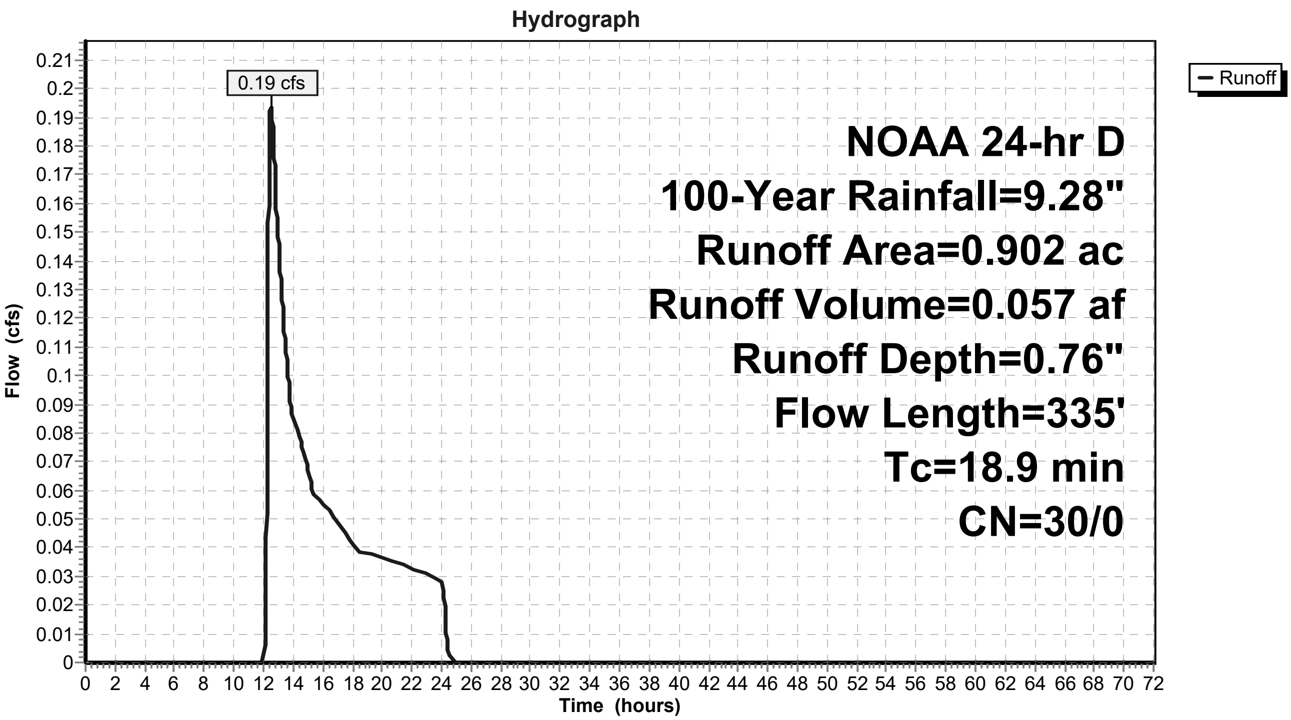
Runoff = 0.19 cfs @ 12.49 hrs, Volume= 0.057 af, Depth= 0.76"
Routed to Link 27L : No Reductions

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=9.28"

Area (ac)	CN	Description
0.902	30	Woods, Good, HSG A
0.902	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0360	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
1.5	87	0.0356	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	148	0.0331	2.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
18.9	335	Total			

Subcatchment 23S: Area 3 (Onsite Area No Reductions)



Summary for Subcatchment 26S: Area 4 (Offsite Area No Reductions)

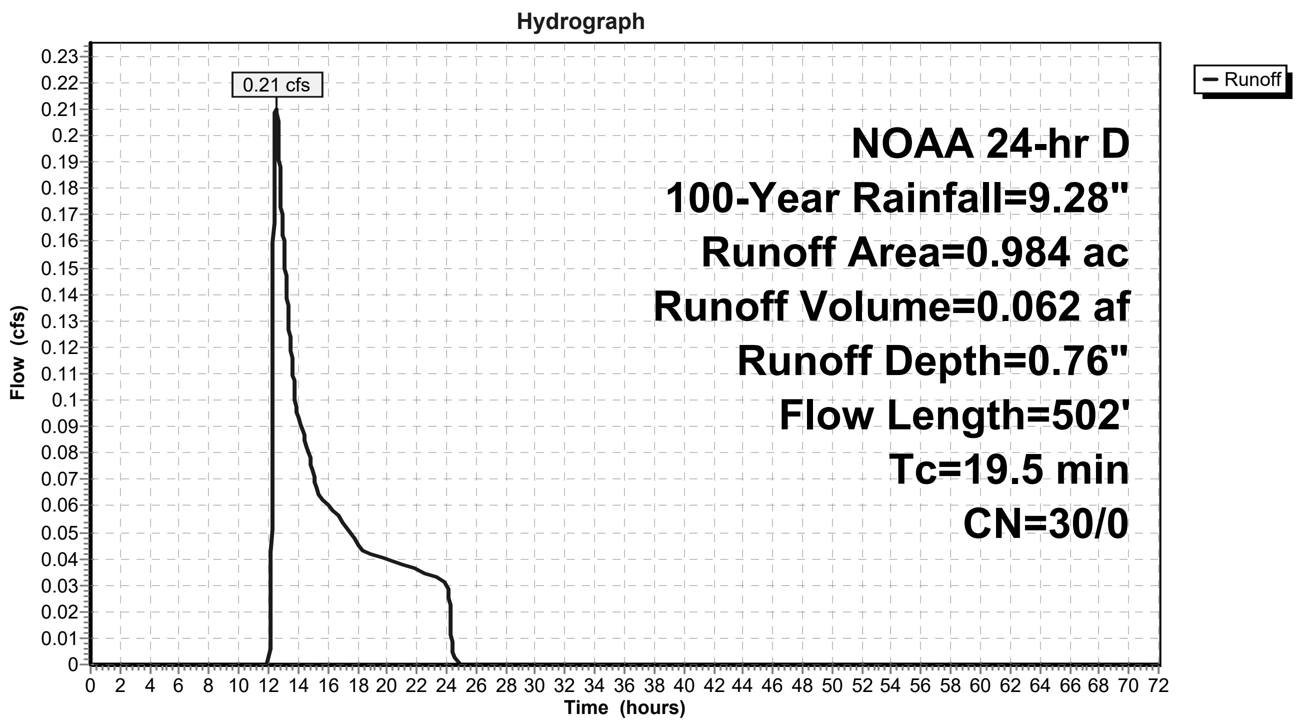
Runoff = 0.21 cfs @ 12.50 hrs, Volume= 0.062 af, Depth= 0.76"
Routed to Link 27L : No Reductions

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=9.28"

Area (ac)	CN	Description
0.984	30	Woods, Good, HSG A
0.984	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0470	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	174	0.1210	1.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	70	0.0329	0.91		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	79	0.0051	1.07		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.5	79	0.0196	2.84		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.5	502	Total			

Subcatchment 26S: Area 4 (Offsite Area No Reductions)



Summary for Pond 15P: Surface Infiltration Basin

Inflow Area = 4.591 ac, 29.21% Impervious, Inflow Depth = 3.47" for 100-Year event
Inflow = 12.31 cfs @ 12.17 hrs, Volume= 1.327 af
Outflow = 1.54 cfs @ 13.35 hrs, Volume= 1.327 af, Atten= 88%, Lag= 70.7 min
Discarded = 0.61 cfs @ 13.35 hrs, Volume= 0.897 af
Primary = 0.93 cfs @ 13.35 hrs, Volume= 0.431 af
Routed to Link 25L : Total

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 36.93' @ 13.35 hrs Surf.Area= 11,426 sf Storage= 20,590 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 155.9 min (947.1 - 791.1)

Volume	Invert	Avail.Storage	Storage Description
#1	34.90'	33,615 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

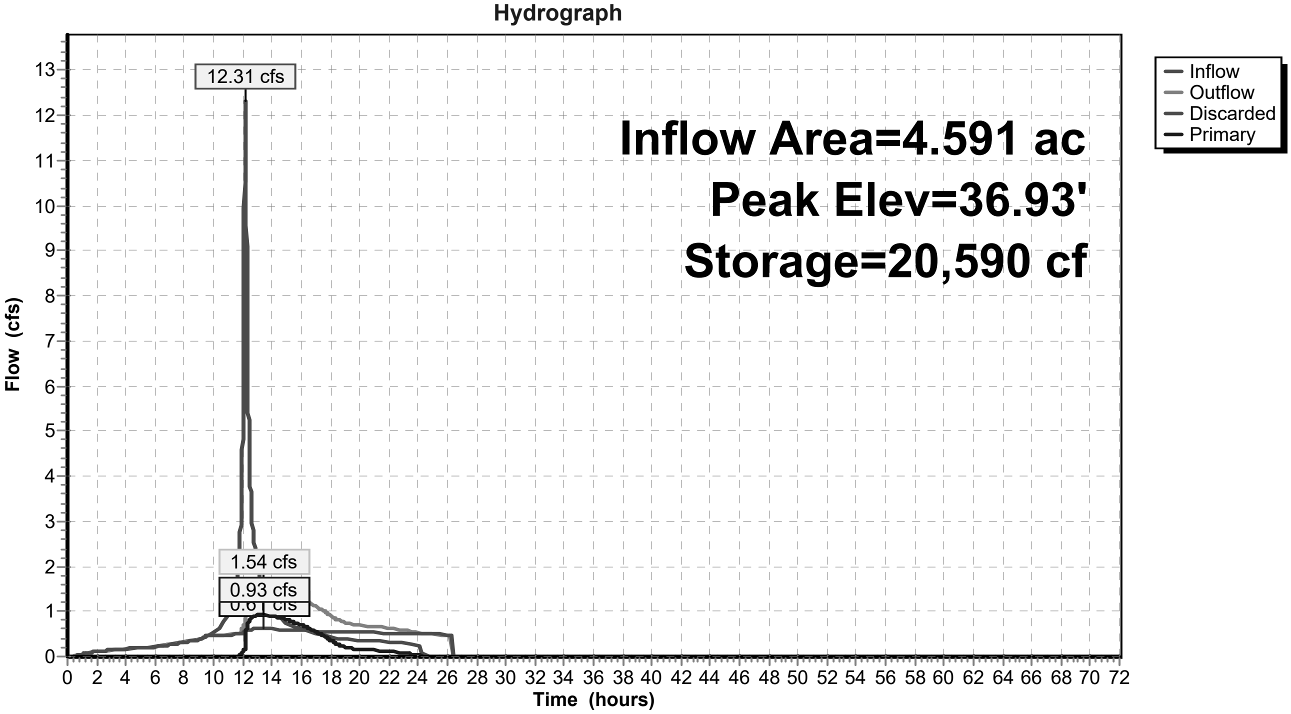
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.90	8,928	0	0
35.00	9,047	899	899
36.00	10,262	9,655	10,553
37.00	11,520	10,891	21,444
38.00	12,821	12,171	33,615

Device	Routing	Invert	Outlet Devices
#1	Primary	33.65'	**15.0" Round Culvert** L= 134.0' Ke= 0.500 Inlet / Outlet Invert= 33.65' / 28.57' S= 0.0379 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	35.21'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	35.80'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	34.90'	**2.300 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.61 cfs @ 13.35 hrs HW=36.93' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.61 cfs)

Primary OutFlow Max=0.93 cfs @ 13.35 hrs HW=36.93' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.93 cfs of 9.62 cfs potential flow)
├─**2=Orifice/Grate** (Orifice Controls 0.30 cfs @ 6.07 fps)
└─**3=Orifice/Grate** (Orifice Controls 0.63 cfs @ 4.61 fps)

Pond 15P: Surface Infiltration Basin

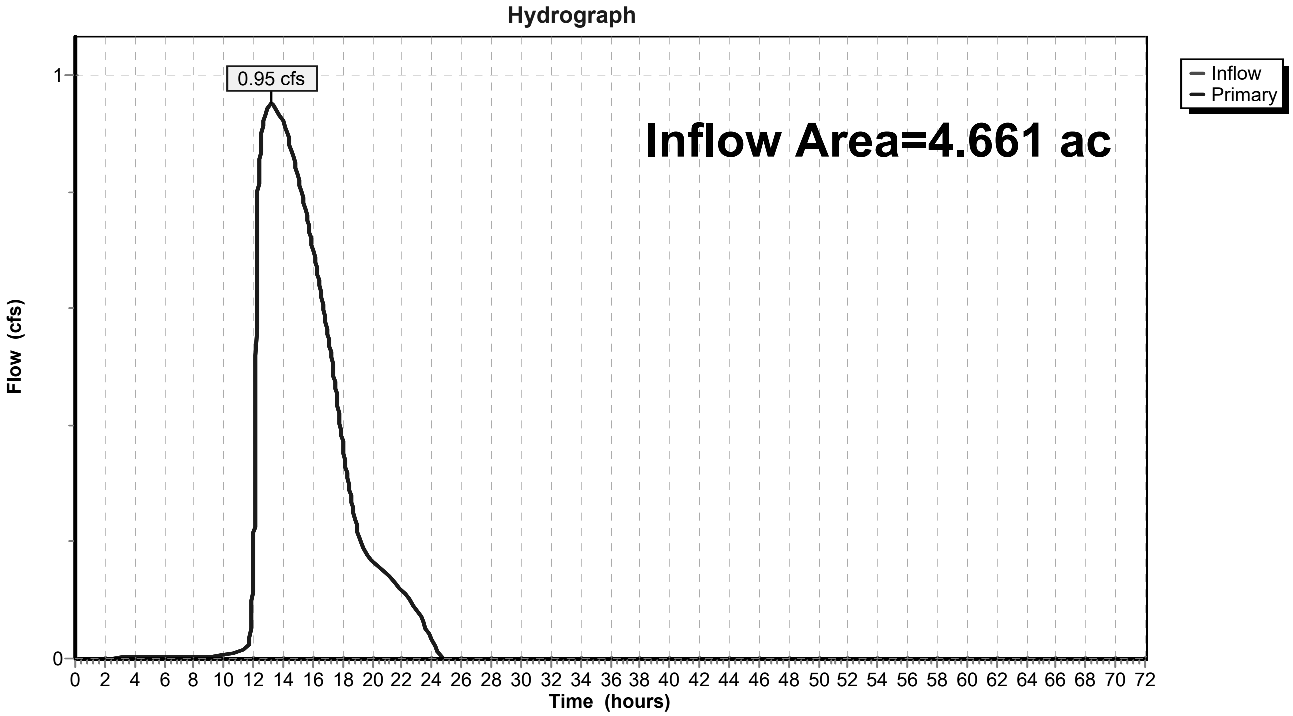


Summary for Link 25L: Total

Inflow Area = 4.661 ac, 29.07% Impervious, Inflow Depth = 1.16" for 100-Year event
Inflow = 0.95 cfs @ 13.23 hrs, Volume= 0.449 af
Primary = 0.95 cfs @ 13.23 hrs, Volume= 0.449 af, Atten= 0%, Lag= 0.0 min

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

Link 25L: Total

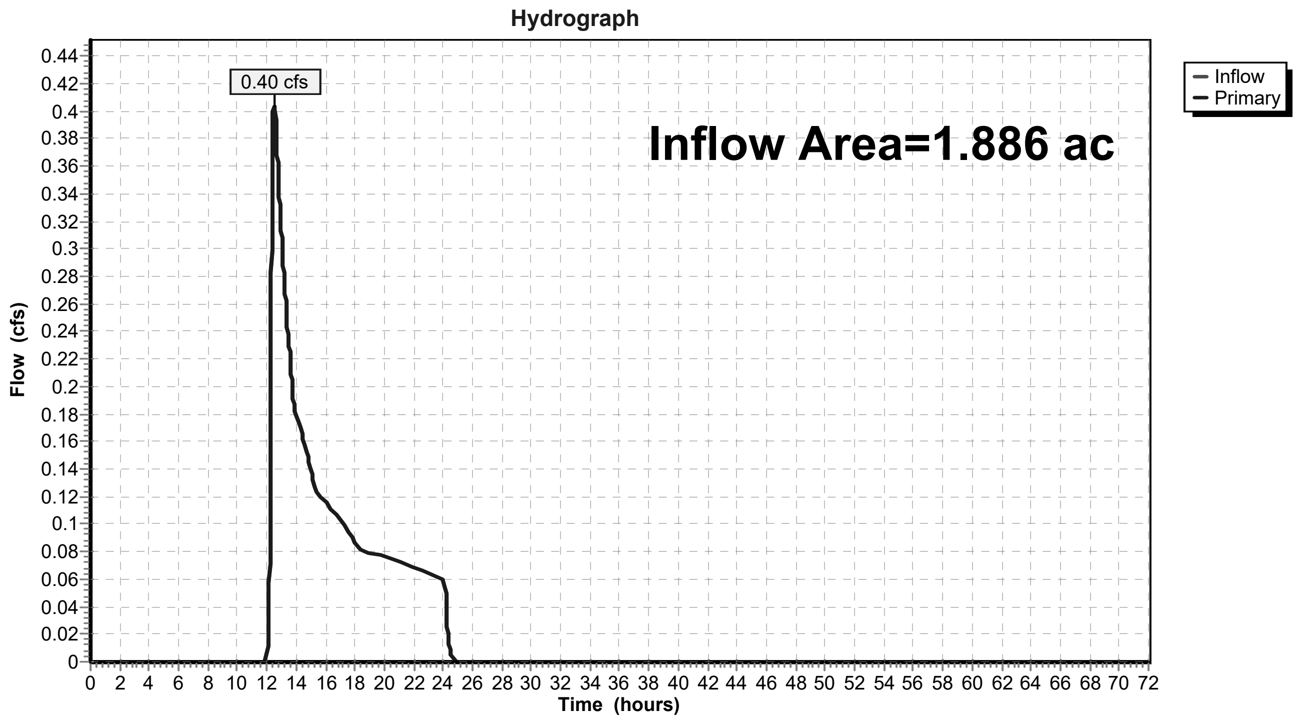


Summary for Link 27L: No Reductions

Inflow Area = 1.886 ac, 0.00% Impervious, Inflow Depth = 0.76" for 100-Year event
Inflow = 0.40 cfs @ 12.50 hrs, Volume= 0.120 af
Primary = 0.40 cfs @ 12.50 hrs, Volume= 0.120 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 15P : Surface Infiltration Basin

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

Link 27L: No Reductions



APPENDIX D

Basin Drain Down Time

Hantush Spreadsheet

Conduit Outlet Protection Design

Emergency Spillway Design

Geotechnical Information

Hydrograph for Pond 15P: Surface Infiltration Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	34.90	0.00	0.00	0.00
2.00	0.11	0	34.90	0.11	0.11	0.00
4.00	0.17	0	34.90	0.17	0.17	0.00
6.00	0.21	0	34.90	0.21	0.21	0.00
8.00	0.32	0	34.90	0.32	0.32	0.00
10.00	0.56	64	34.91	0.48	0.48	0.00
12.00	**5.38**	**6,018**	**35.55**	**0.63**	**0.52**	**0.11**
14.00	**1.05**	**19,909**	**36.87**	**1.50**	**0.60**	**0.90**
16.00	0.60	15,419	36.46	1.27	0.58	0.69
18.00	0.42	11,187	36.06	0.91	0.55	0.36
20.00	0.36	8,419	35.79	0.69	0.53	0.16
22.00	0.32	6,098	35.55	0.63	0.52	0.11
24.00	0.27	3,990	35.33	0.53	0.50	0.03
26.00	0.00	596	34.97	0.48	0.48	0.00
28.00	0.00	0	34.90	0.00	0.00	0.00
30.00	0.00	0	34.90	0.00	0.00	0.00
32.00	0.00	0	34.90	0.00	0.00	0.00
34.00	0.00	0	34.90	0.00	0.00	0.00
36.00	0.00	0	34.90	0.00	0.00	0.00
38.00	0.00	0	34.90	0.00	0.00	0.00
40.00	0.00	0	34.90	0.00	0.00	0.00
42.00	0.00	0	34.90	0.00	0.00	0.00
44.00	0.00	0	34.90	0.00	0.00	0.00
46.00	0.00	0	34.90	0.00	0.00	0.00
48.00	0.00	0	34.90	0.00	0.00	0.00
50.00	0.00	0	34.90	0.00	0.00	0.00
52.00	0.00	0	34.90	0.00	0.00	0.00
54.00	0.00	0	34.90	0.00	0.00	0.00
56.00	0.00	0	34.90	0.00	0.00	0.00
58.00	0.00	0	34.90	0.00	0.00	0.00
60.00	0.00	0	34.90	0.00	0.00	0.00
62.00	0.00	0	34.90	0.00	0.00	0.00
64.00	0.00	0	34.90	0.00	0.00	0.00
66.00	0.00	0	34.90	0.00	0.00	0.00
68.00	0.00	0	34.90	0.00	0.00	0.00
70.00	0.00	0	34.90	0.00	0.00	0.00
72.00	0.00	0	34.90	0.00	0.00	0.00

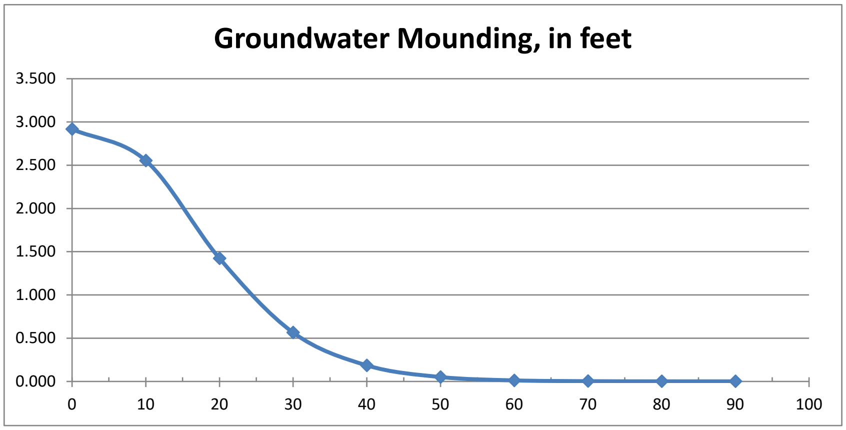
Input Values

2.30	*R*	**Recharge rate (permeability rate) (in/hr)**
0.150	**Sy**	**Specific yield, Sy (dimensionless)** **default value is 0.15; max value is 0.2 provided that a lab test data is submitted**
11.50	**Kh**	**Horizontal hydraulic conductivity (in/hr)** **Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan**
16.850	**x**	**1/2 length of basin (x direction, in feet)**
132.500	**y**	**1/2 width of basin (y direction, in feet)**
2.95	**t**	**Duration of infiltration period (hours)**
10.00	**hi(0)**	**Initial thickness of saturated zone (feet)**

12.917	**h(max)**	**Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
2.917	**Δh(max)**	**Maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
2.917	**0**
2.553	**10**
1.424	**20**
0.565	**30**
0.186	**40**
0.051	**50**
0.012	**60**
0.003	**70**
0.002	**80**
0.001	**90**

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

MSG HOLDINGS
BLOCK 903, LOTS 2+6
West Bangs Ave + Neptune Blvd, Neptune

Infiltration Rate, $R = 4.6$ in/hr $/2 = 2.3$ in/hr

Infiltration Area = 8,928 SF

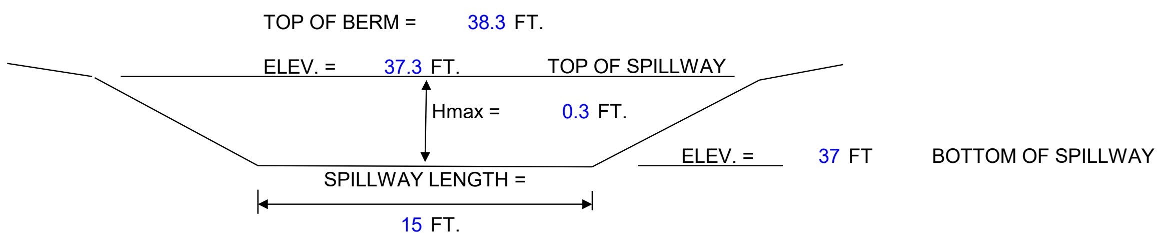
Approximate: $x = 265' / 2 = 132.5'$

$y = 33.7' / 2 = 16.85'$

WQDS Volume Infiltrated = 0.116 acf = 5,053 CF

Duration of Infiltration, $t(\text{hrs}) = \dfrac{5{,}053 \text{ CF} \times 12 \text{ in/ft}}{8{,}928 \text{ SF} \times 2.3 \text{ in/hr}} = 2.95$ hrs

EMERGENCY SPILLWAY CALCULATIONS



- **Spillway Capacity:**

Spillway calculation based on weir equation: Q = CLH**3/2

'C' = weir coefficient: Use 3.3

Qmax through spillway = 8.1

Spillway designed to pass 10 year flow

10 year flow = 6.04 CFS HEADWATER DEPTH = 0.25 FT.

ALLOWABLE HEADWATER DEPTH 0.3 FT. WHICH IS GREATER THAN REQUIERED
THEREFORE WEIR HAS CAPACITY

FREEBOARD 10-YI 1.05 FT. SINCE GREATER THAN OR EQUALS

STABILITY:

Q=AV OR V=Q/A

Q	(FLOW, CFS)	6.0
A	(AREA, SF)	4.5
V	(VELOCITY, FPS)	1.34

WHICH IS LESS THEN 2 FPS AS REQUIRED BY SCD
CHAPTER 18-1, TABLE 18-1 FOR LOAMY SAND

InSite Engineering LLC

Project Name: **756 Holding, LLC**
Project #: **16-864-01**
Date: **11/4/2021**
Structure Name:
Pipe Diameter (in.): **18**

CONDUIT OUTLET PROTECTION

Inside Width, W_o =	1.5	ft
Inside Height, D_o =	1.5	ft
Design Flow, Q_{25} =	7.91	cfs
(Q/W_o) q =	5.27	cfs/ft
Tailwater, TW2-yr =	0.30	ft
Assumed (TW = 0.2Do)		

Pipe Invert = 34.90
1/2 D_o = Pipe C/L = 35.65

If TW Elev < 1/2 D_o

Length of Apron $L_a = 1.8\left(\frac{q}{D_o^{1/2}}\right) + 7D_o$

L_a = 18.3 ft **USE 18 ft**

Width of Apron $W_a = 3\ W_o + L_a$

W_a = 22.8 ft **USE 23 ft**

If TW Elev ≥ 1/2 D_o

Length of Apron $L_a = 3\left(\frac{q}{D_o^{1/2}}\right)$

L_a = 12.9 ft **USE 13 ft**

Width of Apron $W_a = 3\ W_o + 0.4\ L_a$

W_a = 9.7 ft **USE 10 ft**

RipRap Size $D_{50} = \frac{0.016}{TW} q^{1.33}$

D_{50} = 0.5 ft

D_{50} = 5.8 in **USE 6 in**

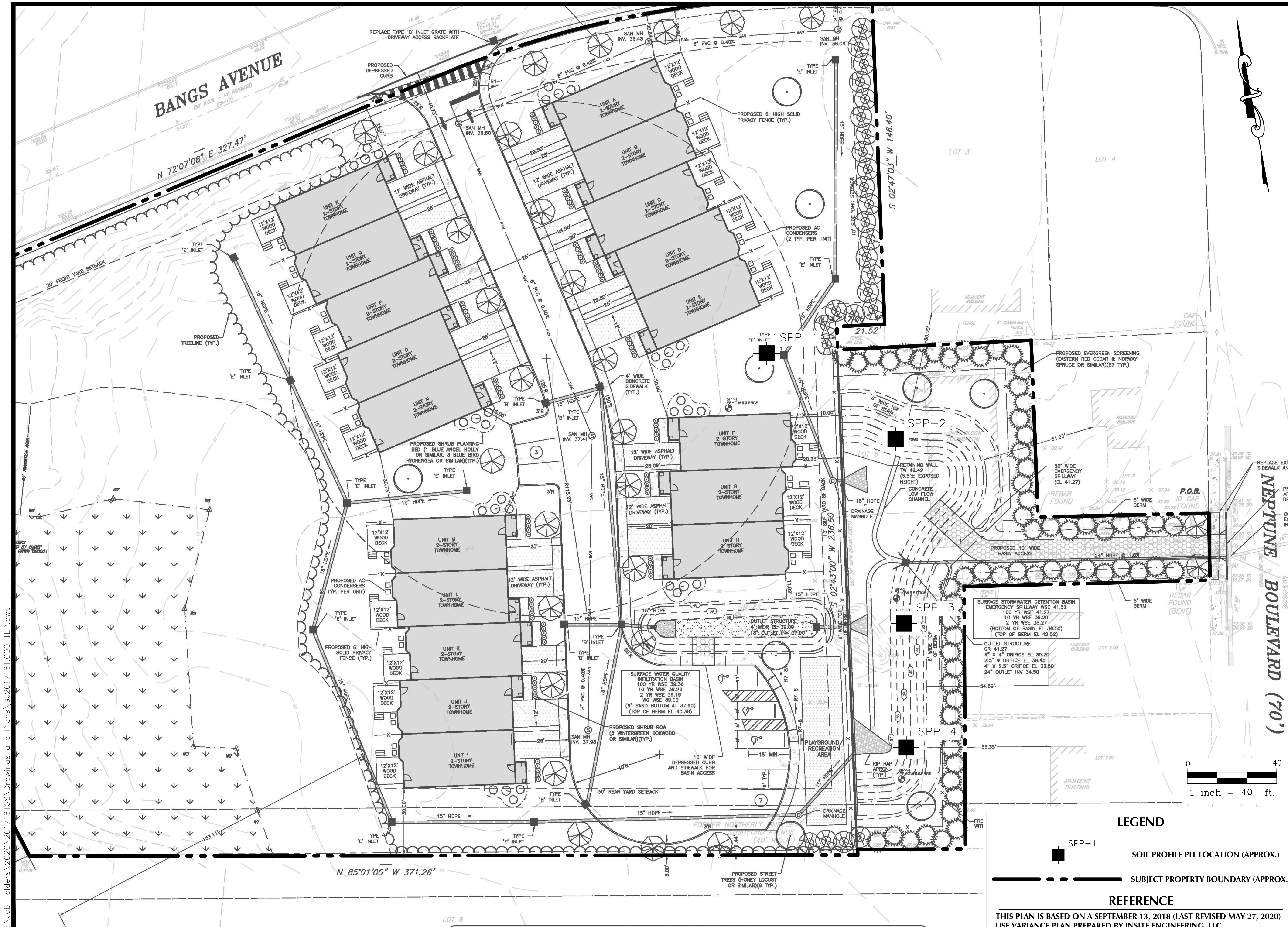
Apron Thickness Th = $2D_{50}$ ft with filter fabric

Th = 1.0 ft with filter fabric **USE 12 in**

RipRap Volume $V = \frac{1/2(3W_o+W_a)(L_a)(Th)}{27}$

V = 9.0 cy

FIGURE 1
Soil Profile Pit Location Plan



LEGEND

SPP-1 SOIL PROFILE PIT LOCATION (APPROX.)

SUBJECT PROPERTY BOUNDARY (APPROX.)

REFERENCE

THIS PLAN IS BASED ON A SEPTEMBER 13, 2018 (LAST REVISED MAY 27, 2020) USE VARIANCE PLAN PREPARED BY INSITE ENGINEERING, LLC.

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants
2430 HIGHWAY 34 BUILDING B, SUITE 101 MANASQUAN, NJ 08736
908.668.7777 WHITESTONEASSOC.COM

DRAWING TITLE:
SOIL PROFILE PIT LOCATION PLAN

CLIENT:
756 HOLDING, LLC

PROJECT:
PROPOSED RESIDENTIAL DEVELOPMENT
WEST BANGS AVENUE & NEPTUNE BOULEVARD
NEPTUNE, MONMOUTH COUNTY, NJ

PROJECT #: GS2017161.000	
DESIGNED BY: GR	PROJ. MGR.: KK
DATE: 5/27/20	FIGURE: 1
SCALE: 1" = 40'	

WHITESTONE ASSOCIATES, INC.

APPENDIX A
Records of Subsurface Exploration

RECORD OF SUBSURFACE EXPLORATION

WHITESTONE ASSOCIATES, INC.

Soil Profile Pit No.: **SPP-1**

Project:	Proposed Residential Development	**WAI Project No.:**	GS2017161.000
Location:	West Bangs Avenue & Neptune Boulevard, Neptune, Monmouth County, NJ	**Client:**	756 Holding, LLC

Surface Elevation:	± 40.0 feet	**Date Started:**	5/13/2020	**Water Depth | Elevation (feet bgs) | (feet)**	**Estimated Seasonal High Groundwater Depth | Elevation (feet bgs) | (feet)**
Termination Depth:	12.0 feet bgs	**Date Completed:**	5/13/2020		
Proposed Location:	SWM Basin	**Logged By:**	RL	**During:** 5.0 | 35.0	
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**At Completion:** 5.0 | 35.0	**At Completion:** 5.0 | 35.0
Test Method:	Visual Observation	**Rig Type:**	Komatsu	**24 Hours:** --- | ---	

SAMPLE INFORMATION Depth (feet)	Number	Type	DEPTH inches	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
			0 - 1.5	TOPSOIL	18" Topsoil	
1.5 - 5	S-1	BAG	1.5 - 5	COASTAL PLAIN DEPOSITS	(10 YR 6/3) Pale Brown SANDY LOAM; Moist; Friable; Fine, Moderate, Crumb Structure; Fibrous Root; Few, Fine, Faint Mottling @ 5.0 fbgs	Some Fine Grained Sand and Silt
5 - 12	S-2	BAG	5 - 12		(10 YR 4/4) Dark Yellowish Brown SILT; Wet; Firm; Fine, Moderate, Blocky Structure; No Roots; No Mottling	
					Soil Profile Pit SPP-1 Terminated at a Depth of 12.0 Feet Below Ground Surface	

Depth scale (feet): 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0, 15.0

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-2

Project:	Proposed Residential Development	**WAI Project No.:**	GS2017161.000
Location:	West Bangs Avenue & Neptune Boulevard, Neptune, Monmouth County, NJ	**Client:**	756 Holding, LLC

Surface Elevation:	± 40.0 feet	**Date Started:**	5/13/2020		**Water Depth (feet bgs)** | **Elevation (feet)**		**Estimated Seasonal High Groundwater Depth (feet bgs)** | **Elevation (feet)**
Termination Depth:	12.0 feet bgs	**Date Completed:**	5/13/2020	**During:**	5.0 | 35.0	**At Completion:**	5.0 | 35.0
Proposed Location:	SWM Basin	**Logged By:**	RL	**At Completion:**	5.0 | 35.0		
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**24 Hours:**	--- | ---		
Test Method:	Visual Observation	**Rig Type:**	Komatsu				

SAMPLE INFORMATION			DEPTH		HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet	inches			
			0.0				
				0 - 1.75	TOPSOIL	20" Topsoil	
			1.0				
1.75 - 5.5	S-1	BAG	2.0 – 5.0	1.75 - 5.5	COASTAL PLAIN DEPOSITS	(10 YR 6/3) Pale Brown SANDY LOAM; Moist; Friable; Fine, Moderate, Crumb Structure; Fibrous Root; Few, Fine, Faint Mottling @ 5.0 fbgs	
5.5 - 12	S-2	BAG	6.0 – 12.0	5.5 - 12		(10 YR 4/4) Dark Yellowish Brown SILT; Wet; Firm; Fine, Moderate, Blocky Structure; No Roots; No Mottling	
			13.0 – 15.0			Soil Profile Pit SPP-2 Terminated at a Depth of 12.0 Feet Below Ground Surface	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed

RECORD OF SUBSURFACE EXPLORATION

WHITESTONE ASSOCIATES, INC.

Soil Profile Pit No.: SPP-3

Page 1 of 1

Project:	Proposed Residential Development	**WAI Project No.:**	GS2017161.000
Location:	West Bangs Avenue & Neptune Boulevard, Neptune, Monmouth County, NJ	**Client:**	756 Holding, LLC

Surface Elevation:	± 39.5 feet	**Date Started:**	5/13/2020
Termination Depth:	12.0 feet bgs	**Date Completed:**	5/13/2020
Proposed Location:	SWM Basin	**Logged By:**	RL
Excavating Method:	Test Pit Excavation	**Contractor:**	TS
Test Method:	Visual Observation	**Rig Type:**	Komatsu

	Water Depth (feet bgs)	Elevation (feet)
During:	5.5	34.0
At Completion:	5.5	34.0
24 Hours:	---	---

Estimated Seasonal High	Groundwater Depth (feet bgs)	Elevation (feet)
At Completion:	5.5	34.0

SAMPLE INFORMATION Depth (feet)	Number	Type	DEPTH feet	inches	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
			0.0	0 - 2	TOPSOIL	24" Topsoil	
2 - 6	S-1	BAG	2.0	2 - 6	COASTAL PLAIN DEPOSITS	(10 YR 6/3) Pale Brown SANDY LOAM; Moist; Friable; Fine, Moderate, Crumb Structure; Fibrous Root; Few, Fine, Faint Mottling @ 5.5 fbgs	Water Seepage @ 5.5 fbgs
6 - 12	S-2	BAG	6.0	6 - 12		(10 YR 4/4) Dark Yellowish Brown SILT; Wet; Firm; Fine, Moderate, Blocky Structure; No Roots; No Mottling	
			12.0			Soil Profile Pit SPP-3 Terminated at a Depth of 12.0 Feet Below Ground Surface	

Depth scale (feet): 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0, 15.0

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-4

Project:	Proposed Residential Development	**WAI Project No.:**	GS2017161.000
Location:	West Bangs Avenue & Neptune Boulevard, Neptune, Monmouth County, NJ	**Client:**	756 Holding, LLC

Surface Elevation:	± 39.5 feet	**Date Started:**	5/13/2020	**Water Depth (feet bgs) | Elevation (feet)**		**Estimated Seasonal High Groundwater Depth (feet bgs) | Elevation (feet)**
Termination Depth:	12.0 feet bgs	**Date Completed:**	5/13/2020			
Proposed Location:	SWM Basin	**Logged By:**	RL	**During:**	5.0 | 34.5	
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**At Completion:**	5.0 | 34.5	**At Completion:** 5.0 | 34.5
Test Method:	Visual Observation	**Rig Type:**	Komatsu	**24 Hours:**	--- | ---	

SAMPLE INFORMATION			DEPTH		HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet	inches			
			0.0	0 - 1	TOPSOIL	12" Topsoil	
1 - 5	S-1	BAG	1.0 – 5.0	1 - 5	COASTAL PLAIN DEPOSITS	(10 YR 6/3) Pale Brown SANDY LOAM; Moist; Friable; Fine, Moderate, Crumb Structure; Fibrous Root; Few, Fine, Faint Mottling @ 5.0 fbgs	Water Seepage @ 5.0 fbgs
5 - 12	S-2	BAG	5.0 – 12.0	5 - 12		(10 YR 4/4) Dark Yellowish Brown SILT; Wet; Firm; Fine, Moderate, BLocky Structure; No Roots; No Mottling	
			12.0 – 15.0			Soil Profile Pit SPP-4 Terminated at a Depth of 12.0 Feet Below Ground Surface	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed

APPENDIX B
Infiltration Test Results

WHITESTONE ASSOCIATES, INC.

INFILTRATION TEST

Client:	756 Holding, LLC	**Test Hole No.:**	SPP-1
Project:	Proposed Residential Development	**Date:**	5/13/2020
Location:	Neptune, Monmouth County, NJ	**Weather:**	Clear
File No.	GS2017161.000	**Field Engineer:**	RL
Surf. Elev.	40.00	**Test Depth Ft. | Elev.:**	3.00 | 37.00

Reading No.	Time		Water Level Reading (inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/Hour)
	Start	Finish	Start	Finish			
PS	9:00 A.M.	12:00 P.M.	12.0	0.0	12.0	1.0	4.0
1	12:00 P.M.	12:30 P.M.	7.0	4.5	2.5	0.5	5.0
2	12:30 P.M.	1:00 P.M.	7.0	4.5	2.5	0.5	5.0
3	1:00 P.M.	1:30 P.M.	7.0	4.5	2.5	0.5	5.0

Field *i* = 5.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE ASSOCIATES, INC.

INFILTRATION TEST

Client:	756 Holding, LLC	**Test Hole No.:**	SPP-2
Project:	Proposed Residential Development	**Date:**	5/13/2020
Location:	Neptune, Monmouth County, NJ	**Weather:**	Clear
File No.	GS2017161.000	**Field Engineer:**	RL
Surf. Elev.	40.00	**Test Depth Ft. | Elev.:**	3.00 | 37.00

Reading No.	Time		Water Level Reading (inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/Hour)
	Start	Finish	Start	Finish			
PS	9:20 A.M.	12:20 P.M.	12.0	0.0	12.0	3.0	4.0
1	12:20 P.M.	12:50 P.M.	7.0	4.8	2.2	0.5	4.4
2	12:50 P.M.	1:20 P.M.	7.0	4.7	2.3	0.5	4.6
3	1:20 P.M.	1:50 P.M.	7.0	4.7	2.3	0.5	4.6

Field i = 4.6 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE ASSOCIATES, INC.

INFILTRATION TEST

Client:	756 Holding, LLC	**Test Hole No.:**	SPP-3
Project:	Proposed Residential Development	**Date:**	5/13/2020
Location:	Neptune, Monmouth County, NJ	**Weather:**	Clear
File No.	GS2017161.000	**Field Engineer:**	RL
Surf. Elev.	39.50	**Test Depth Ft. | Elev.:**	3.50 | 36.00

Reading No.	Time		Water Level Reading (inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/Hour)
	Start	Finish	Start	Finish			
PS	9:45 A.M.	12:45 P.M.	12.0	0.0	12.0	3.0	4.0
1	12:45 P.M.	1:15 P.M.	7.0	4.5	2.5	0.5	5.0
2	1:15 P.M.	1:45 P.M.	7.0	4.4	2.6	0.5	5.2
3	1:45 P.M.	2:15 P.M.	7.0	4.4	2.6	0.5	5.2

Field *i* = 5.2 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

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INFILTRATION TEST

Client:	756 Holding, LLC	**Test Hole No.:**	SPP-4
Project:	Proposed Residential Development	**Date:**	5/13/2020
Location:	Neptune, Monmouth County, NJ	**Weather:**	Clear
File No.	GS2017161.000	**Field Engineer:**	RL
Surf. Elev.	39.50	**Test Depth Ft. | Elev.:**	2.00 | 37.50

Reading No.	Time		Water Level Reading (inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/Hour)
	Start	Finish	Start	Finish			
PS	10:10 A.M.	1:10 P.M.	12.0	0.0	12.0	3.0	4.0
1	1:10 P.M.	1:40 P.M.	7.0	4.1	2.9	0.5	5.8
2	1:40 P.M.	2:10 P.M.	7.0	4.2	2.8	0.5	5.6
3	2:10 P.M.	2:40 P.M.	7.0	4.2	2.8	0.5	5.6

Field *i* = 5.6 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

APPENDIX E

Pre-Development Drainage Map

Post-Development Drainage Map

InSite Engineering, LLC
1955 Route 34, Suite 1A • Wall, NJ 07719
732-531-7100 (ph) • 732-531-7344 (fx) • InSite@InSiteEng.net • www.InSiteEng.net
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