

DRAINAGE REPORT

Stormwater Mitigation Plan

September 08, 2021

Property Located at:

121 Upper Pattagansett Rd.
East Lyme, CT 06333

Prepared For:

Project: Nottingham Hills Subdivision Phase V

English Harbour Asset Management, LLC
38 Granite Street
New London, CT 06320

Prepared By:

Timothy A. May, P.E.
May Engineering, LLC
1297 Route 163
Oakdale, CT 03670



SITE DESCRIPTION:

The site is a 64 acre wooded parcel located along the northern shore of Pattagansett Lake. Specifically, the site is located at 121 Upper Pattagansett Rd in the town of East Lyme, CT. The parcel was previously used as a camp for the Girl Scouts of America. The existing site is partially developed with paved/gravel roads and camp buildings. The site is wooded with mature deciduous trees with dense understory trees and brush. There are slopes ranging from 3% to 12%. The soil type is primarily a hydraulic soil group B consisting of Canton-Charlton, Hinkley gravel and Charlton-Hollis series. The soil types were evaluated for their permeability and have a moderate infiltration rate. The proposed site development is for 9 residential subdivision lots.

The drainage areas for the proposed site development is split into two drainage areas labeled Drainage Area A (27 ac) and Area B (14.0 ac). See drawing titled Drainage Areas. Drainage Area is 27.0 ac that flows into a wetland settling basin on the north side of Upper Pattagansett Rd, then through a 12" reinforced concrete pipe (rcp) culvert flowing into Pattagansett Lake. Primarily the stormwater flows are shallow concentrated flows that flow north to south across Drainage Area A, with limited channel flows for the last 250 ft, before entering a wetland settling basin before the 12 rcp culvert. There are some instances of intermittent channelized flows along the gravel road, then the flows returns back to shallow concentrated flows.

Drainage Area B is a 14.0 ac wooded drainage area that stormwater flows from northwest to the southeast. The stormwater flow is characterized as shallow concentrated with no observed channelized flows. It is noted in site walks and observations that due to the topography and physical natural boundaries along the northern side of Upper Pattagansett Rd, these limit the discharge across the road or to any down-stream collection system.

RATIONALE FOR DESIGN:

A drainage analysis is required to evaluate stormwater runoff associated with site development. A site evaluation along with a drainage analysis was conducted for estimating the stormwater runoff and for designing the proposed storm water biofilter pond, driveway swales and rain gardens for the roof runoff from residential houses. The proposed biofilter depicted on drawing titled Biofilter Detention Design Pond is designed to collect upland stormwater flows, and remove suspended soils and solids prior to discharging flows into Pattagansett Lake. The plant species are specifically selected to target and clean nutrient-overloaded stormwater to improve water quality. For each of the proposed 8 residential lots, the roof drains and portions of the impervious areas will be diverted to rain gardens to capture and infiltrate significant portions of that stormwater runoff. The driveway stormwater swales will capture stormwater to divert and reduce stomwater from flowing onto Upper Pattagansett Rd. The rain gardens are very effective in retaining storm water from impervious areas and infiltrate large quantities of the roof stormwater runoff. This reduction leads to overall reduction in the volume of storm water along with the reduction in the peak runoff that flows into Pattagansett Lake. Each Rain Garden is sized to receive and treat a 1" Water Quality Volume (WQV) from a residential house with a roof area of 1,800 sf. This was evaluated and determined that a typical rain garden with an area of 200 sf and a depth of 1.5 has the adequate WQV treatment volume.

METHODOLOGY AND RESULTS

Drainage Analysis. The SCS TR-20 drainage analysis method is used to determine the storm water runoff amount, which is used to design and size the proposed biofilter and rain gardens system. The storm frequency values used for the calculations herein include the 2-year, 10-year 25-year and 100-year storm rainfall events. The storm water model software used for this analysis is *HydroCAD[®] 10.00-22*, in which the SCS TR-20 method was used. Infiltration rate used for exfiltration is 0.5 ft/hr which is based on hydraulic soil group B permeability characteristics. In-sit-u pecculation testing for septic systems along with *UNIFIED SOIL CLASSIFICATION SYSTEM* (USCS) verified infiltration used for storm water modeling purposes.

May Engineering, LLC

Civil Engineering, Site Planning, and Consulting

1297 RT 163 Oakdale, CT 06370 Cell: 860 884-9671 Email: mayengineering@sbcglobal.net

Drainage area A is split into two sub-catchment areas (a 20 AC and 7 AC sub-catchment) to accurately size the detention pond because only the 20 AC area flows into the proposed detention pond.

Water Quality Volume (WQV) determination for Drainage Area A - sub-catchment area for stormwater renovation biofilter pond (20.0 AC) will provide pollutant reduction, runoff volume reduction, groundwater recharge, stream channel protection and peak flow control. WQV

Drainage Area A - sub-catchment area for stormwater renovation pond & Rain Gardens $WQV = \frac{(1'')(R)(A)}{12}$

R = volumetric runoff coefficient = 0.05+0.009(I)

I = percent impervious cover = 8%

A = site area in acres = 20.0AC

WQV = **0.203 ac-ft**

Biofilter Retention Pond provides 20,837 cf or **0.48 ac-ft** (*2.4 times the required WQV for water quality improvement*)

The Following are the tabulated results for existing and proposed storm events:

Area A

Storm Event	Existing (cfs)	Proposed(cfs)	Reduction(cfs)	% Change
Q₂	5.64	3.19	2.45	43%
Q₁₀	17.27	12.29	4.9	39%
Q₂₅	26.54	23.97	2.57	35%
Q₁₀₀	42.75	32.3	10.45	24%

Area B

Storm Event	Existing (cfs)	Proposed(cfs)	Reduction(cfs)	% Change
Q₂	2.68	1.43	1.25	47%
Q₁₀	7.8	6.55	1.25	16%
Q₂₅	11.8	10.59	1.25	10%
Q₁₀₀	18.9	17.6	1.3	7%

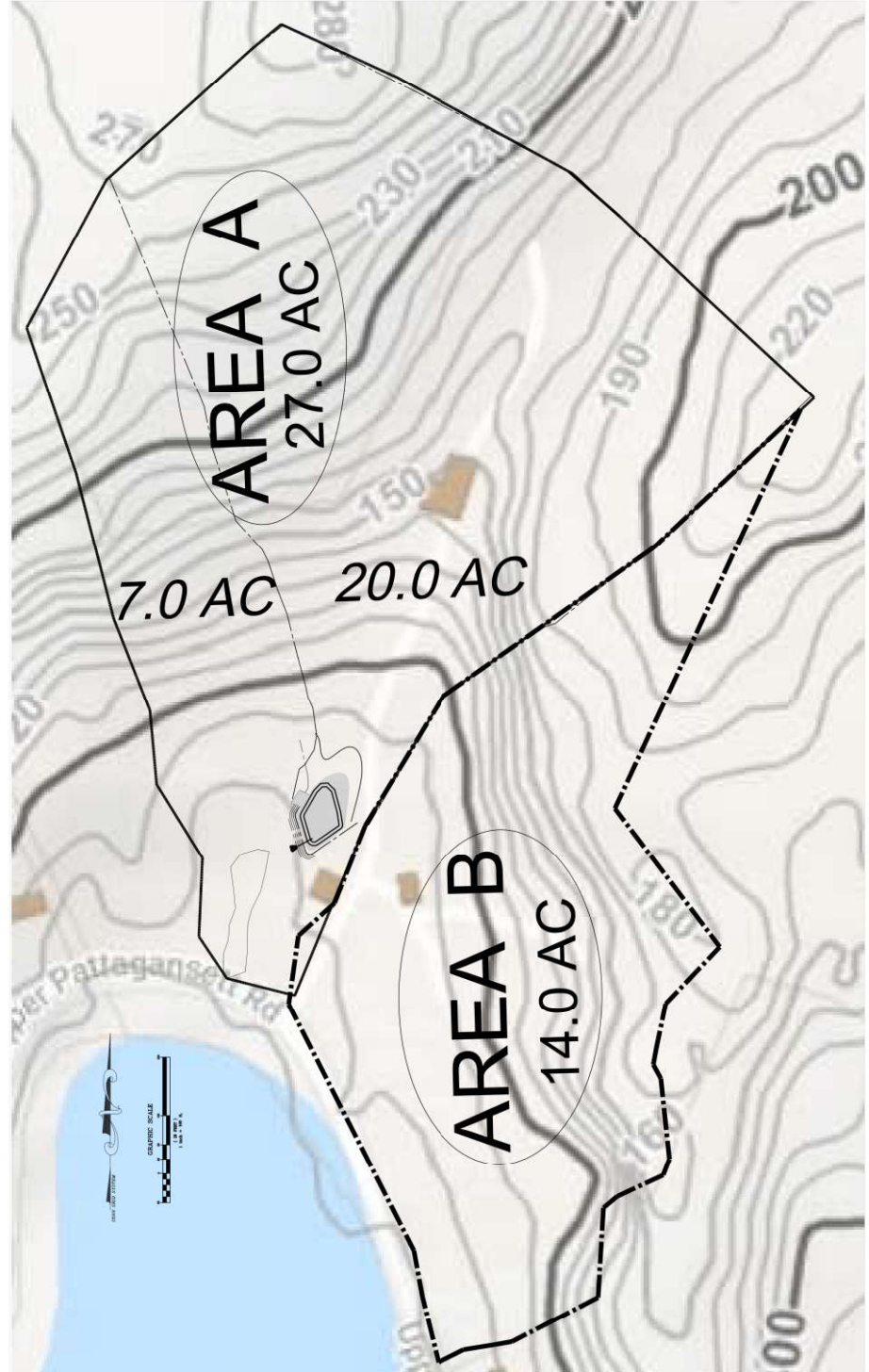
SUMMARY

The stormwater calculations above for the "Proposed" subdivision including the biofilter and the rain gardens show that a reduction in peak storm water runoff volume and reduction in the amount of stormwater is possible. This stormwater flow reduction and retention along with infiltration will remove suspended solids, decreasing the nutrient loading that will improve the water quality of stormwater flowing into Pattagansett Lake. The best management practices used in the design for Nottingham Hills Subdivision Phase V storm water management plan are designs recommended by the State of Connecticut Storm Water de



APPENDIX

- Drawing DRAINAGE AREAS A & B
- Soils Map for 121 Upper Pattagansett
- Drainage Calculations for Area A Existing
- Drainage Calculations for Area A Proposed
- Drainage Calculations for Area B Existing
- Drainage Calculations for Area B Proposed



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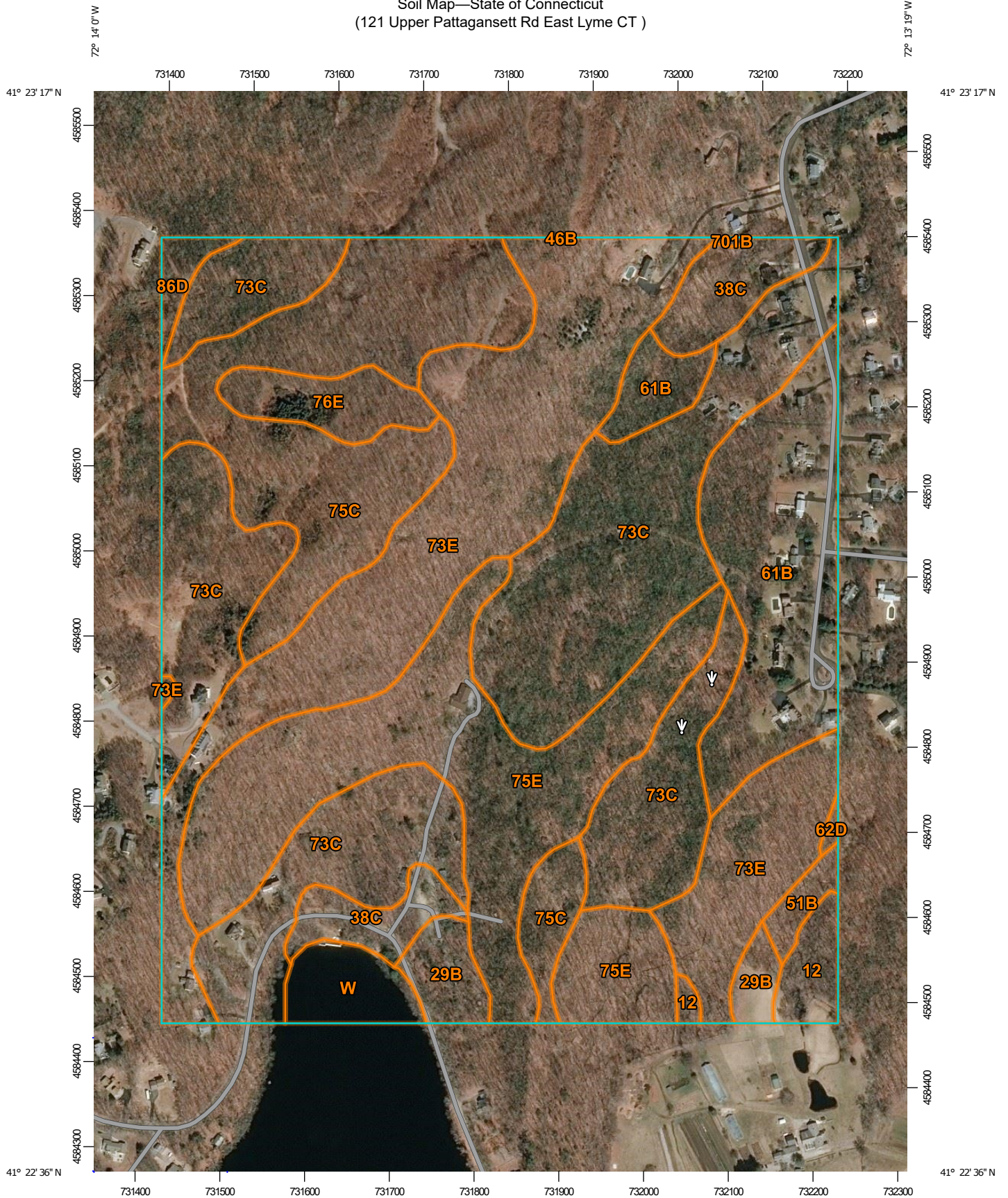
DRAINAGE AREAS

SCALE: 1"=100' & as noted	SHEET
DATE: 16 AUG 2021	
JOB NUMBER	1 of 2

For Property
 Nottingham Hills
 Subdivision Phase V
 121 Upper Pattagansett Road
 EAST LYME, CT 06333

DESCRIPTION: Drainage Area

Soil Map—State of Connecticut
(121 Upper Pattagansett Rd East Lyme CT)



Map Scale: 1:6,180 if printed on A portrait (8.5" x 11") sheet.

0 50 100 200 300 Meters

0 300 600 1200 1800 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: State of Connecticut

Survey Area Data: Version 20, Jun 9, 2020

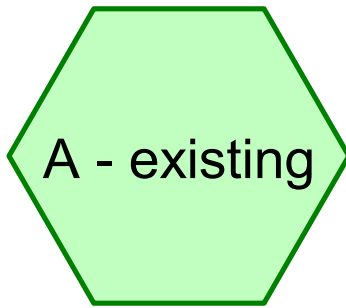
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 20, 2019—Mar 27, 2019

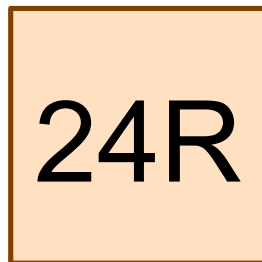
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

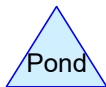
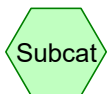
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12	Raypol silt loam	2.5	1.3%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	3.6	2.0%
38C	Hinckley loamy sand, 3 to 15 percent slopes	6.6	3.6%
46B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	0.0	0.0%
51B	Sutton fine sandy loam, 0 to 8 percent slopes, very stony	1.2	0.6%
61B	Canton and Charlton fine sandy loams, 0 to 8 percent slopes, very stony	18.1	9.9%
62D	Canton and Charlton fine sandy loams, 15 to 35 percent slopes, extremely stony	0.2	0.1%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	51.6	28.2%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	36.5	20.0%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	24.9	13.6%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	29.5	16.2%
76E	Rock outcrop-Hollis complex, 3 to 45 percent slopes	3.8	2.1%
86D	Paxton and Montauk fine sandy loams, 15 to 35 percent slopes, extremely stony	1.2	0.6%
701B	Ninigret fine sandy loam, 3 to 8 percent slopes	0.1	0.0%
W	Water	3.2	1.7%
Totals for Area of Interest		182.8	100.0%



27.0 AC



Outfall



Area A Existing Nottingham Hills Subdivision Phase V

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
27.000	60	Woods, Fair, HSG B (A - existing)
27.000	60	TOTAL AREA

Area A Existing Nottingham Hills Subdivision Phase V

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Soil Listing (all nodes)

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

Area A Existing Nottingham Hills Subdivision Phase V

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	27.000	0.000	0.000	0.000	27.000	Woods, Fair	A - existing
0.000	27.000	0.000	0.000	0.000	27.000	TOTAL AREA	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 24R: Outfall

Inflow=5.64 cfs 0.945 af
Outflow=5.64 cfs 0.945 af

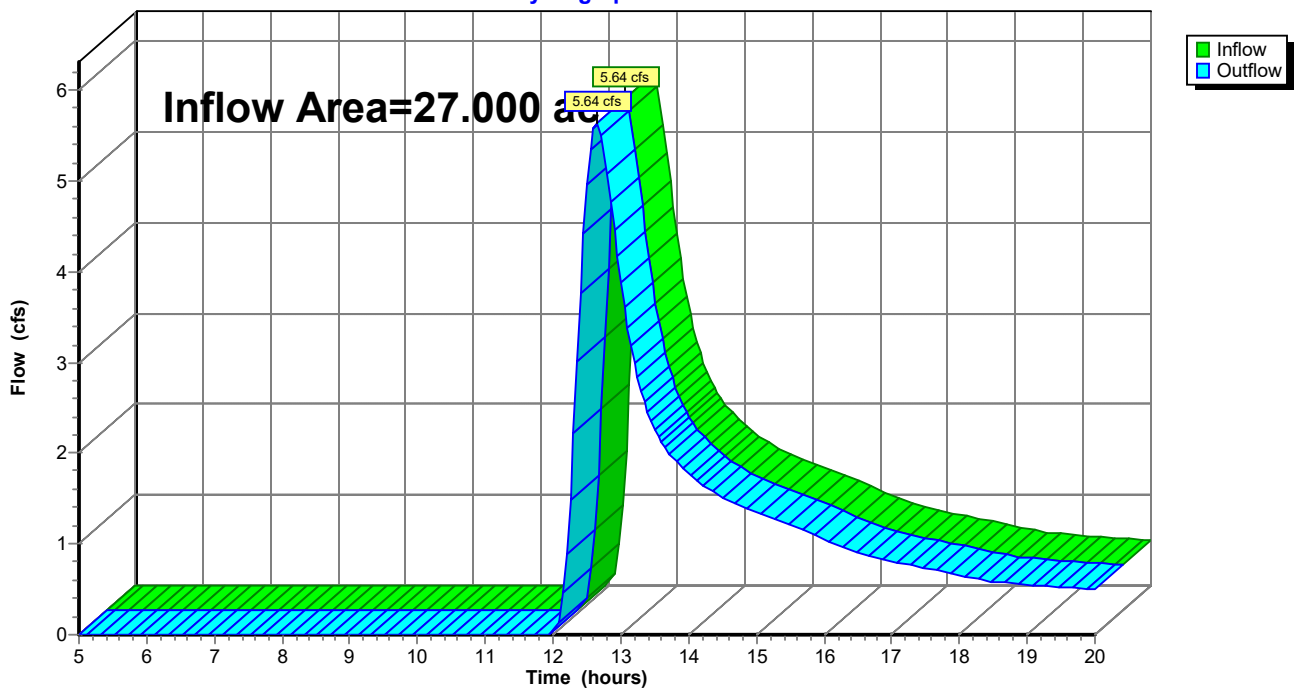
Summary for Reach 24R: Outfall

Inflow Area = 27.000 ac, 0.00% Impervious, Inflow Depth > 0.42" for 2-year event
Inflow = 5.64 cfs @ 12.64 hrs, Volume= 0.945 af
Outflow = 5.64 cfs @ 12.64 hrs, Volume= 0.945 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 24R: Outfall

Hydrograph



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 24R: Outfall

Inflow=17.27 cfs 2.367 af
Outflow=17.27 cfs 2.367 af

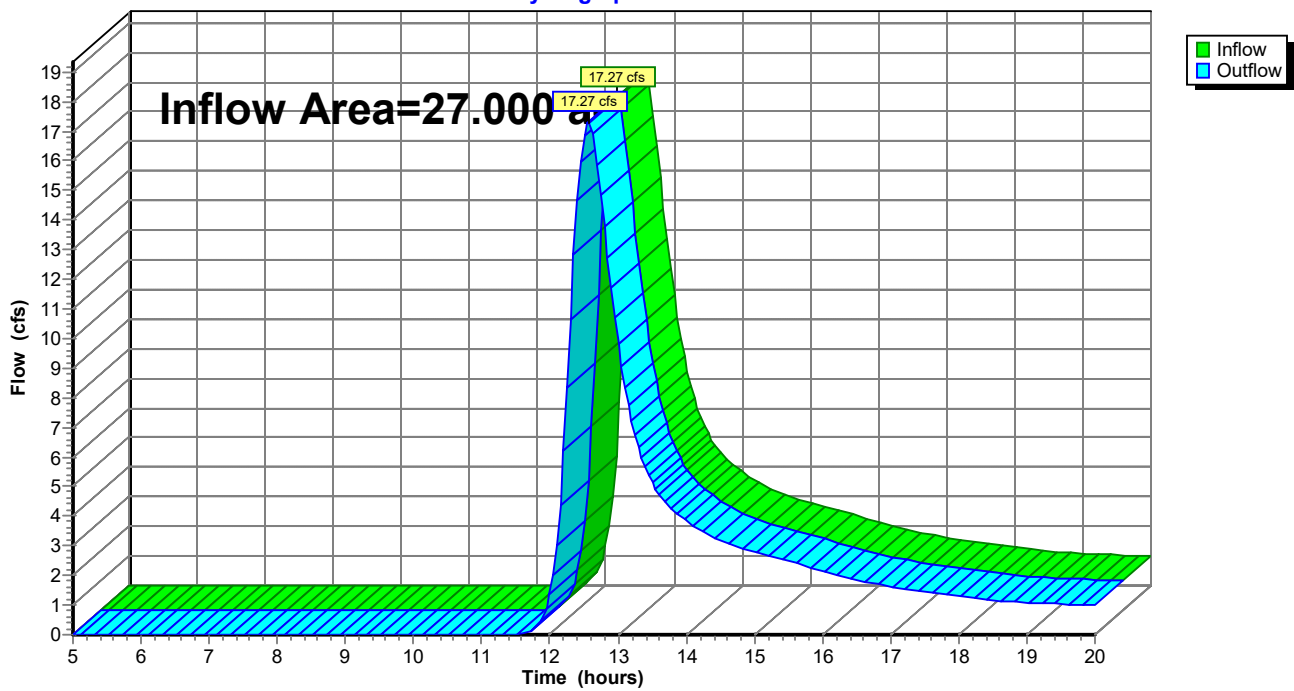
Summary for Reach 24R: Outfall

Inflow Area = 27.000 ac, 0.00% Impervious, Inflow Depth > 1.05" for 10 year event
 Inflow = 17.27 cfs @ 12.57 hrs, Volume= 2.367 af
 Outflow = 17.27 cfs @ 12.57 hrs, Volume= 2.367 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 24R: Outfall

Hydrograph



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 24R: Outfall

Inflow=26.54 cfs 3.487 af
Outflow=26.54 cfs 3.487 af

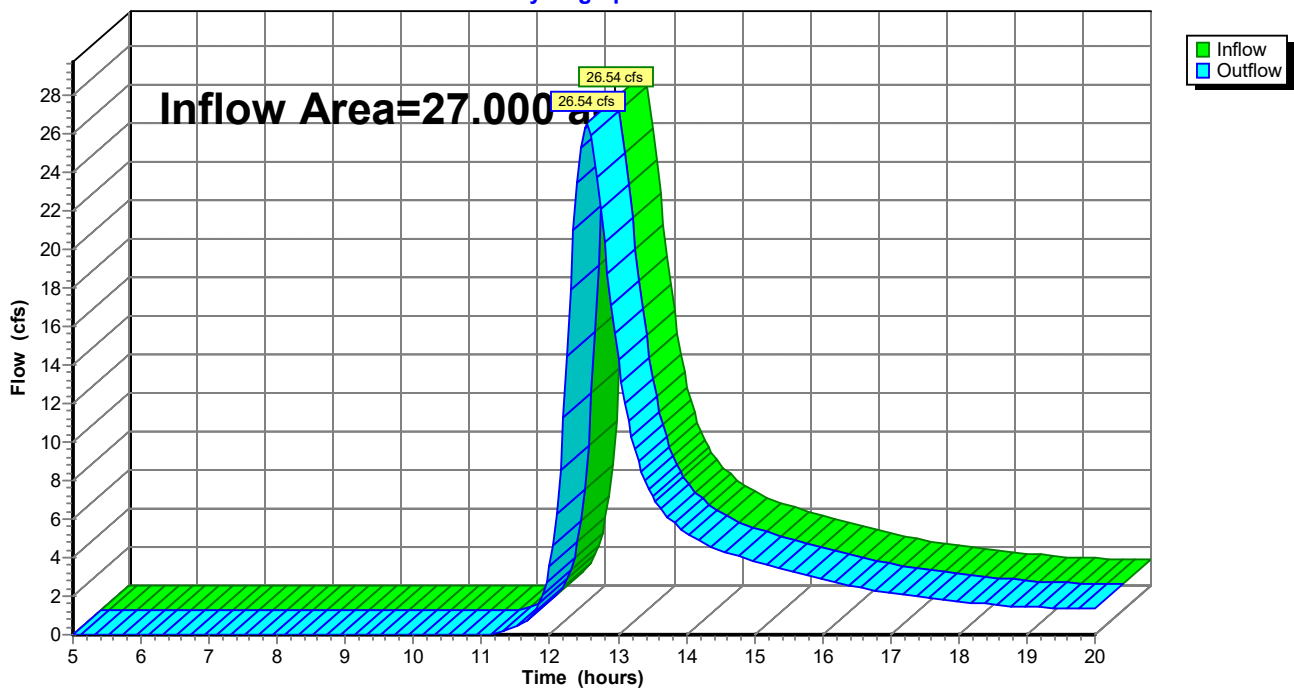
Summary for Reach 24R: Outfall

Inflow Area = 27.000 ac, 0.00% Impervious, Inflow Depth > 1.55" for 25 year event
 Inflow = 26.54 cfs @ 12.54 hrs, Volume= 3.487 af
 Outflow = 26.54 cfs @ 12.54 hrs, Volume= 3.487 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 24R: Outfall

Hydrograph



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 24R: Outfall

Inflow=33.26 cfs 4.301 af

Outflow=33.26 cfs 4.301 af

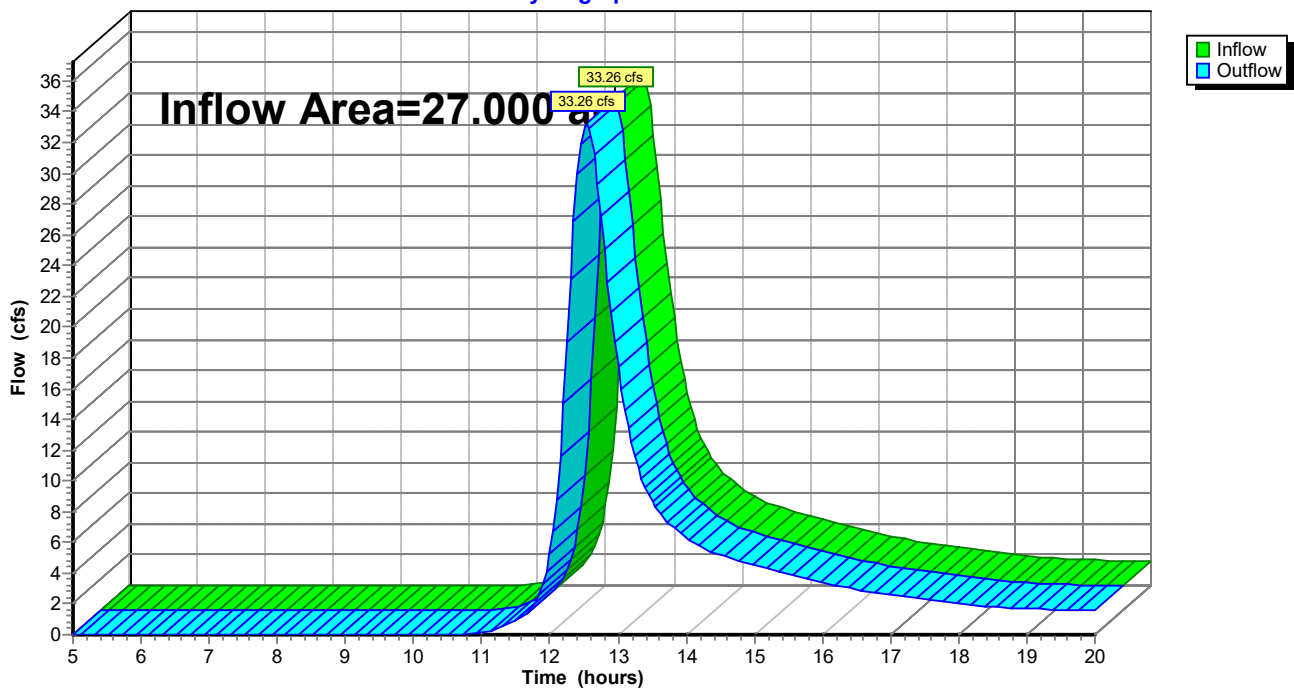
Summary for Reach 24R: Outfall

Inflow Area = 27.000 ac, 0.00% Impervious, Inflow Depth > 1.91" for 50 year event
Inflow = 33.26 cfs @ 12.53 hrs, Volume= 4.301 af
Outflow = 33.26 cfs @ 12.53 hrs, Volume= 4.301 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 24R: Outfall

Hydrograph



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 24R: Outfall

Inflow=42.75 cfs 5.454 af
Outflow=42.75 cfs 5.454 af

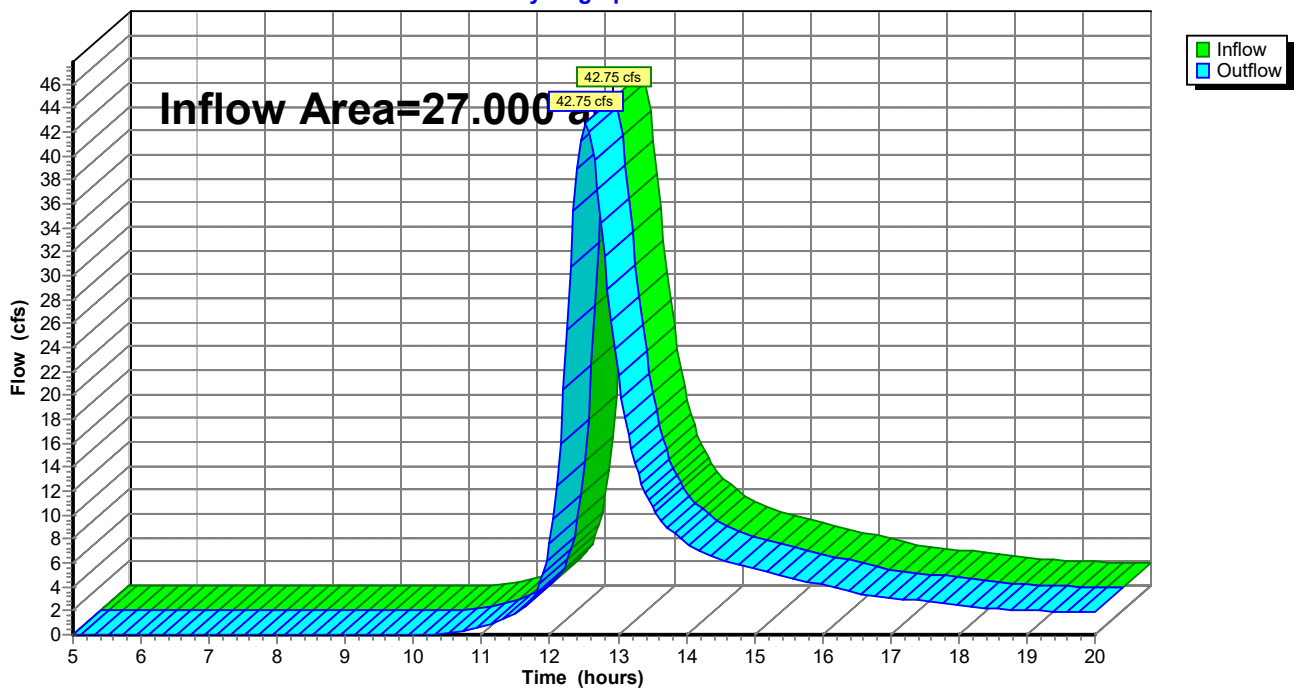
Summary for Reach 24R: Outfall

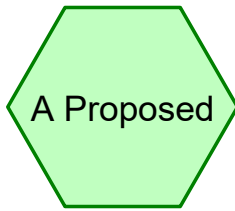
Inflow Area = 27.000 ac, 0.00% Impervious, Inflow Depth > 2.42" for 100 year event
Inflow = 42.75 cfs @ 12.52 hrs, Volume= 5.454 af
Outflow = 42.75 cfs @ 12.52 hrs, Volume= 5.454 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

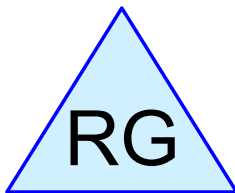
Reach 24R: Outfall

Hydrograph

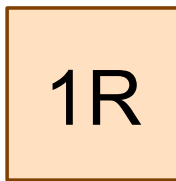




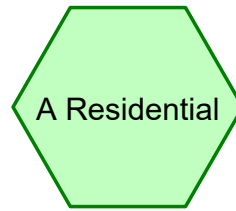
20.0 AC



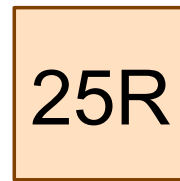
SW Renovation



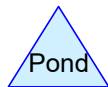
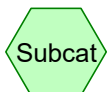
15" pipe outfall



7.0 AC



Outfall



Routing Diagram for Area A PROPOSED Nottingham Hills Subdivision Phase V
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Area A PROPOSED Nottingham Hills Subdivision Phase V

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
8.500	65	2 acre lots, 12% imp, HSG B (A Proposed, A Residential)
18.500	60	Woods, Fair, HSG B (A Proposed)
27.000	62	TOTAL AREA

Area A PROPOSED Nottingham Hills Subdivision Phase V

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
27.000	HSG B	A Proposed, A Residential
0.000	HSG C	
0.000	HSG D	
0.000	Other	
27.000		TOTAL AREA

Area A PROPOSED Nottingham Hills Subdivision Phase V

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	8.500	0.000	0.000	0.000	8.500	2 acre lots, 12% imp	A Proposed, A Residential
0.000	18.500	0.000	0.000	0.000	18.500	Woods, Fair	A Proposed
0.000	27.000	0.000	0.000	0.000	27.000	TOTAL AREA	

Time span=5.00-24.00 hrs, dt=0.10 hrs, 191 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 1R: 15" pipe outfall Avg. Flow Depth=0.31' Max Vel=9.72 fps Inflow=2.27 cfs 0.717 af
15.0" Round Pipe n=0.010 L=31.0' S=0.0419 '/' Capacity=17.20 cfs Outflow=2.28 cfs 0.716 af

Reach 25R: Outfall Inflow=3.19 cfs 1.121 af
Outflow=3.19 cfs 1.121 af

Summary for Reach 1R: 15" pipe outfall

Inflow Area = 20.000 ac, 0.90% Impervious, Inflow Depth > 0.43" for 2-year event
 Inflow = 2.27 cfs @ 13.35 hrs, Volume= 0.717 af
 Outflow = 2.28 cfs @ 13.34 hrs, Volume= 0.716 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-24.00 hrs, dt= 0.10 hrs

Max. Velocity= 9.72 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 6.62 fps, Avg. Travel Time= 0.1 min

Peak Storage= 7 cf @ 13.34 hrs

Average Depth at Peak Storage= 0.31'

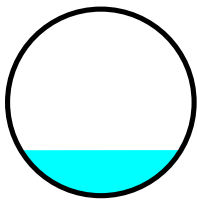
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 17.20 cfs

15.0" Round Pipe

n= 0.010 PVC, smooth interior

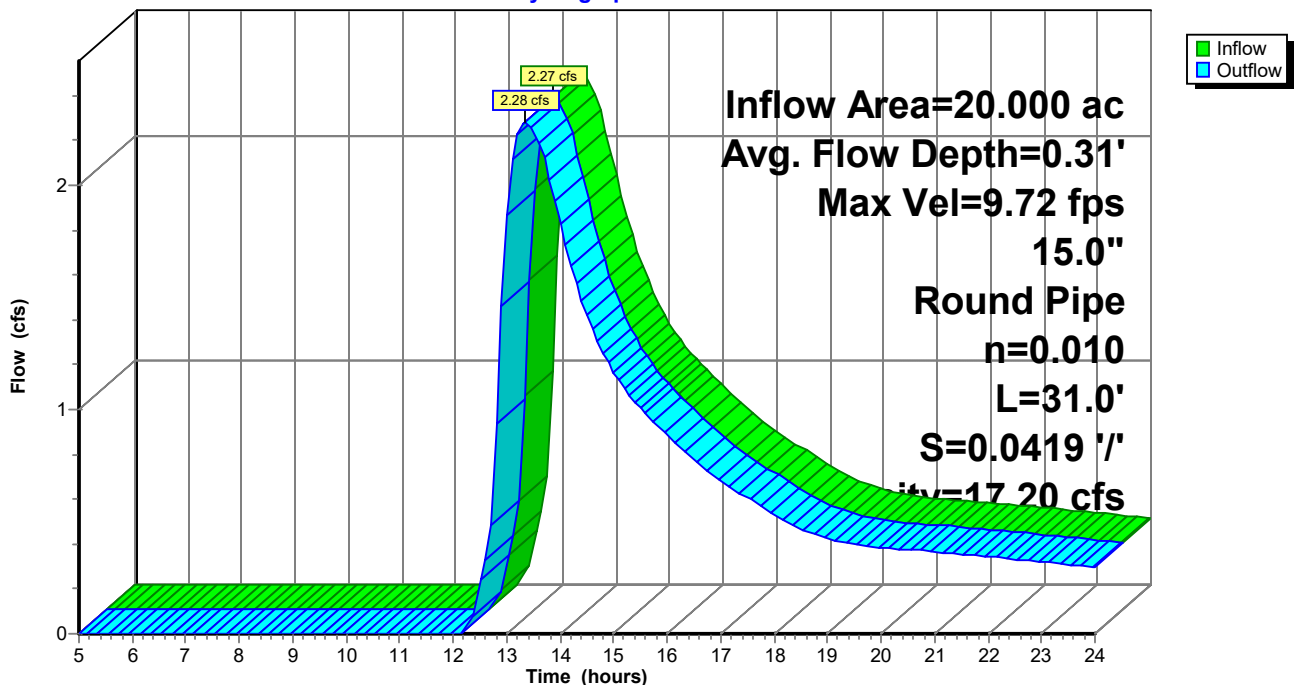
Length= 31.0' Slope= 0.0419 '/'

Inlet Invert= 79.80', Outlet Invert= 78.50'



Reach 1R: 15" pipe outfall

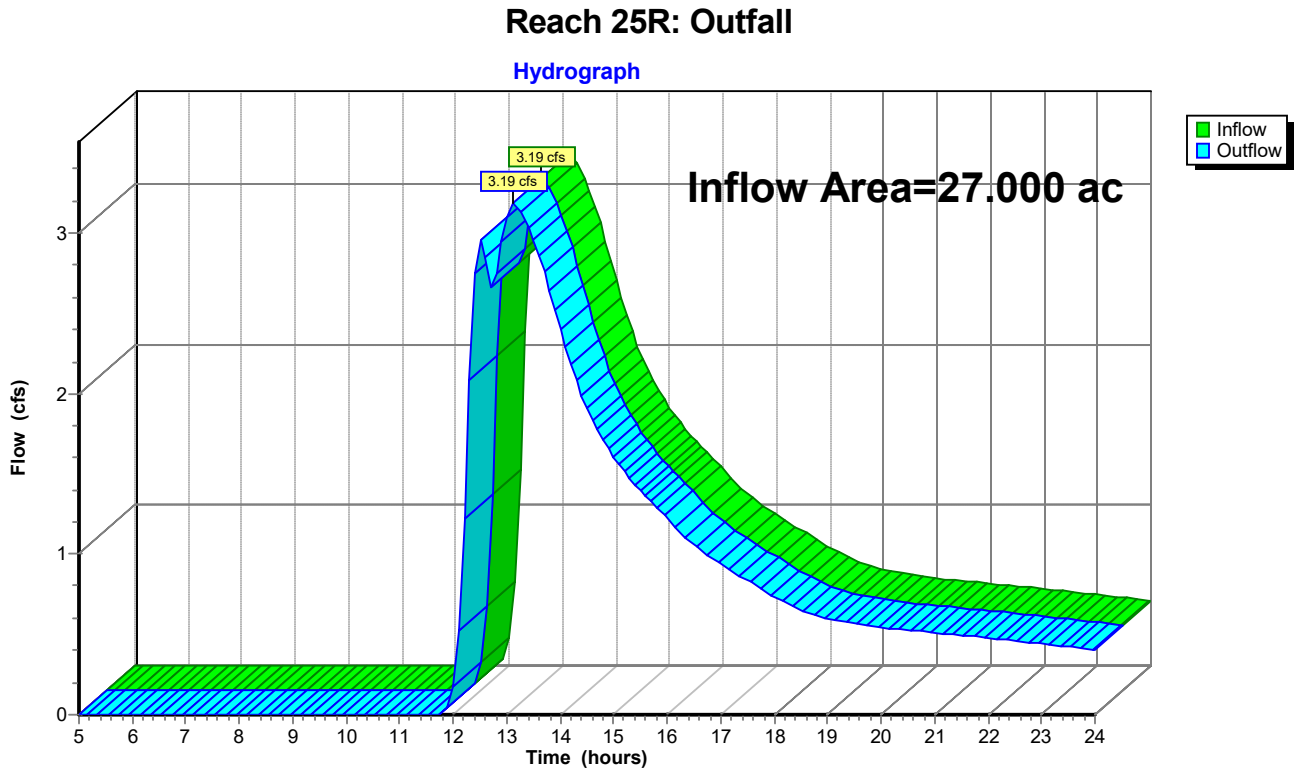
Hydrograph



Summary for Reach 25R: Outfall

Inflow Area = 27.000 ac, 3.78% Impervious, Inflow Depth > 0.50" for 2-year event
 Inflow = 3.19 cfs @ 13.13 hrs, Volume= 1.121 af
 Outflow = 3.19 cfs @ 13.13 hrs, Volume= 1.121 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-24.00 hrs, dt= 0.10 hrs



Area A PROPOSED Nottingham Hills Subdivision Pha *Type III 24-hr 10 year Rainfall=4.80"*

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Time span=5.00-24.00 hrs, dt=0.10 hrs, 191 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 1R: 15" pipe outfall

Avg. Flow Depth=0.67' Max Vel=14.37 fps Inflow=9.52 cfs 1.823 af

15.0" Round Pipe n=0.010 L=31.0' S=0.0419 '/' Capacity=17.20 cfs Outflow=9.54 cfs 1.823 af

Reach 25R: Outfall

Inflow=12.29 cfs 2.705 af

Outflow=12.29 cfs 2.705 af

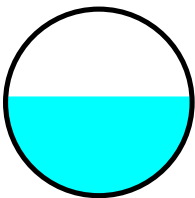
Summary for Reach 1R: 15" pipe outfall

Inflow Area = 20.000 ac, 0.90% Impervious, Inflow Depth > 1.09" for 10 year event
 Inflow = 9.52 cfs @ 12.99 hrs, Volume= 1.823 af
 Outflow = 9.54 cfs @ 12.99 hrs, Volume= 1.823 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-24.00 hrs, dt= 0.10 hrs
 Max. Velocity= 14.37 fps, Min. Travel Time= 0.0 min
 Avg. Velocity = 8.38 fps, Avg. Travel Time= 0.1 min

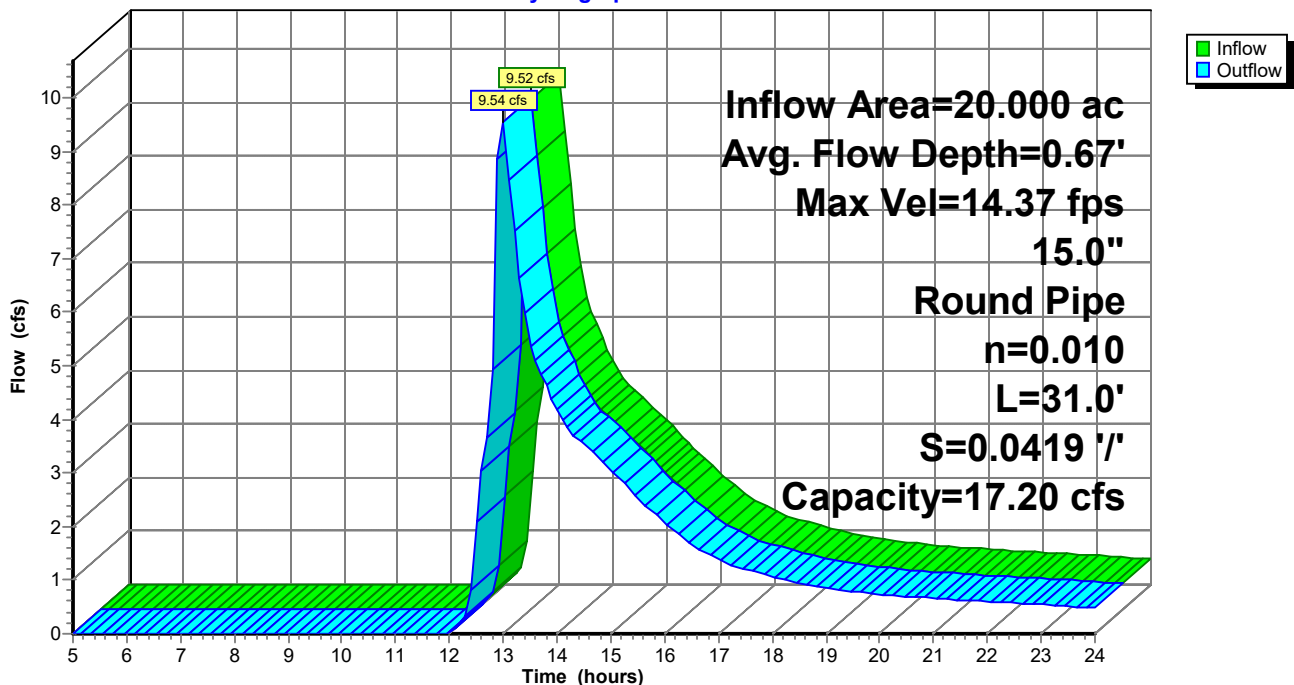
Peak Storage= 21 cf @ 12.99 hrs
 Average Depth at Peak Storage= 0.67'
 Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 17.20 cfs

15.0" Round Pipe
 n= 0.010 PVC, smooth interior
 Length= 31.0' Slope= 0.0419 '/'
 Inlet Invert= 79.80', Outlet Invert= 78.50'



Reach 1R: 15" pipe outfall

Hydrograph



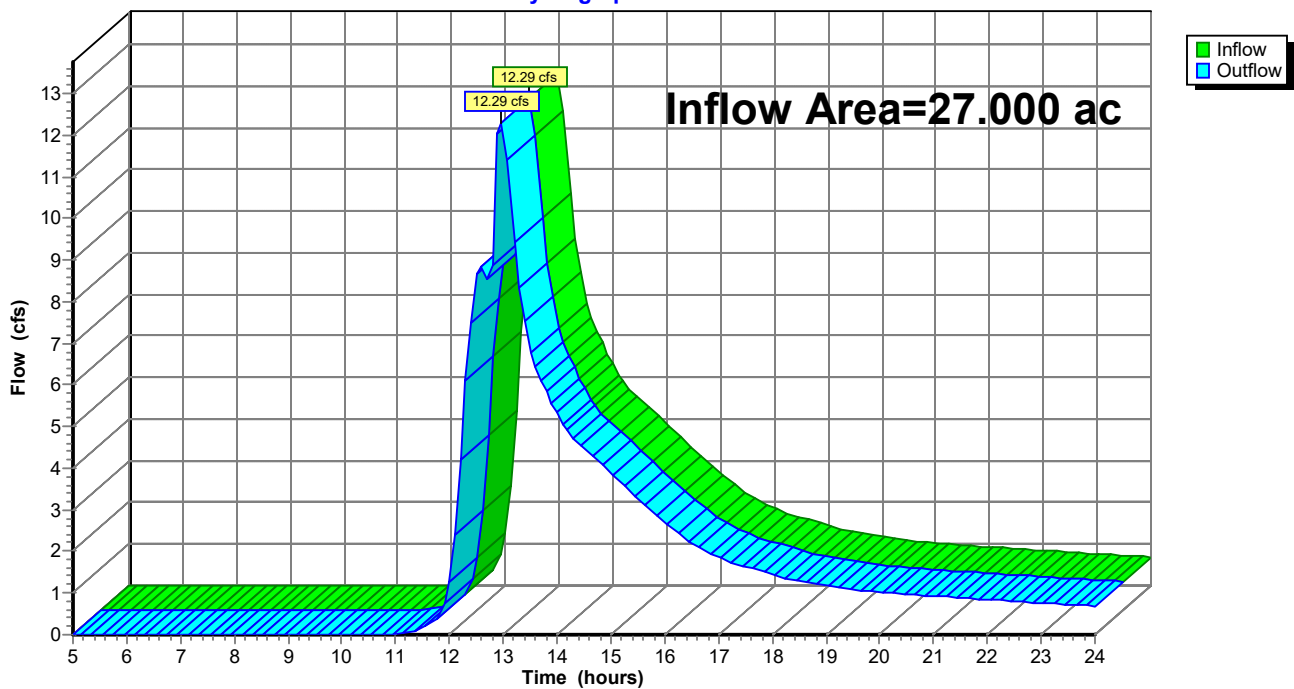
Summary for Reach 25R: Outfall

Inflow Area = 27.000 ac, 3.78% Impervious, Inflow Depth > 1.20" for 10 year event
Inflow = 12.29 cfs @ 12.96 hrs, Volume= 2.705 af
Outflow = 12.29 cfs @ 12.96 hrs, Volume= 2.705 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-24.00 hrs, dt= 0.10 hrs

Reach 25R: Outfall

Hydrograph



Area A PROPOSED Nottingham Hills Subdivision Phase V Type III 24-hr 25 year Rainfall=5.70"

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Time span=5.00-24.00 hrs, dt=0.10 hrs, 191 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 1R: 15" pipe outfall

Avg. Flow Depth=1.04' Max Vel=15.96 fps Inflow=17.78 cfs 2.704 af

15.0" Round Pipe n=0.010 L=31.0' S=0.0419 '/' Capacity=17.20 cfs Outflow=17.72 cfs 2.704 af

Reach 25R: Outfall

Inflow=23.97 cfs 3.942 af

Outflow=23.97 cfs 3.942 af

Area A PROPOSED Nottingham Hills Subdivision Phase V Type III 24-hr 25 year Rainfall=5.70"

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Summary for Reach 1R: 15" pipe outfall

Inflow Area = 20.000 ac, 0.90% Impervious, Inflow Depth > 1.62" for 25 year event
 Inflow = 17.78 cfs @ 12.75 hrs, Volume= 2.704 af
 Outflow = 17.72 cfs @ 12.75 hrs, Volume= 2.704 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-24.00 hrs, dt= 0.10 hrs

Max. Velocity= 15.96 fps, Min. Travel Time= 0.0 min

Avg. Velocity = 9.08 fps, Avg. Travel Time= 0.1 min

Peak Storage= 34 cf @ 12.75 hrs

Average Depth at Peak Storage= 1.04'

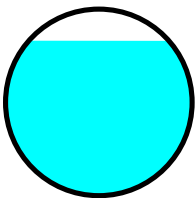
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 17.20 cfs

15.0" Round Pipe

n= 0.010 PVC, smooth interior

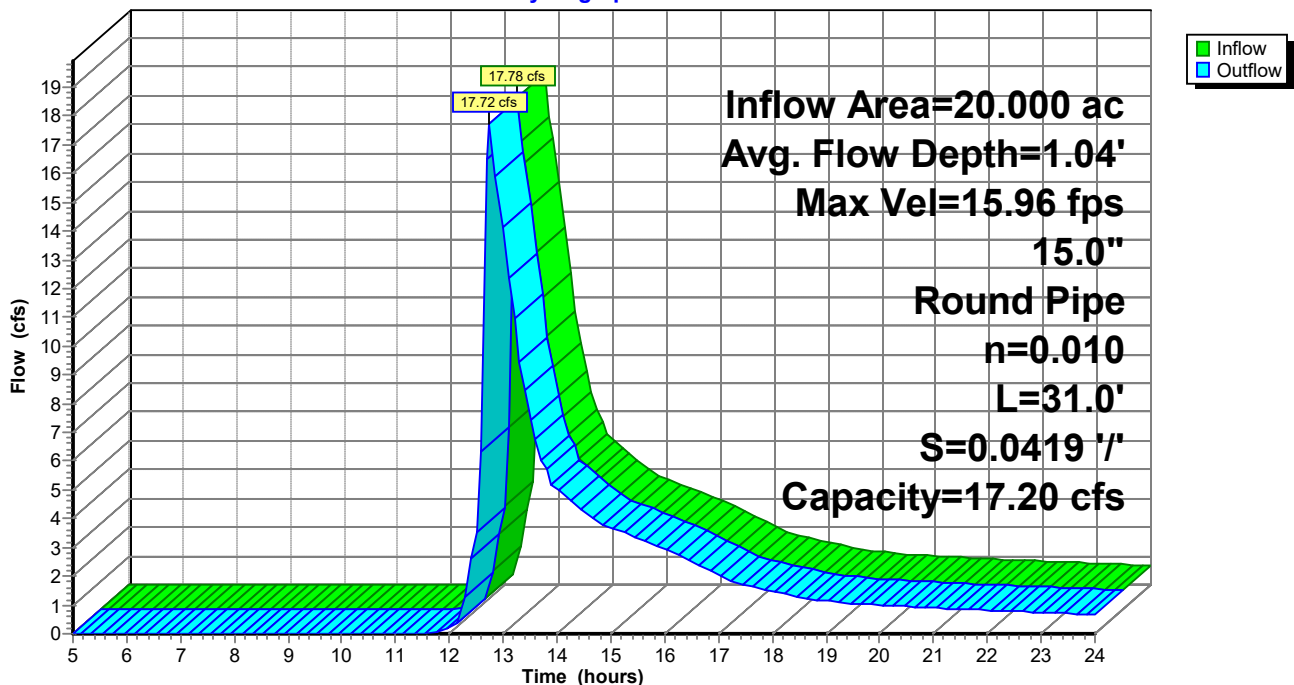
Length= 31.0' Slope= 0.0419 '/'

Inlet Invert= 79.80', Outlet Invert= 78.50'



Reach 1R: 15" pipe outfall

Hydrograph



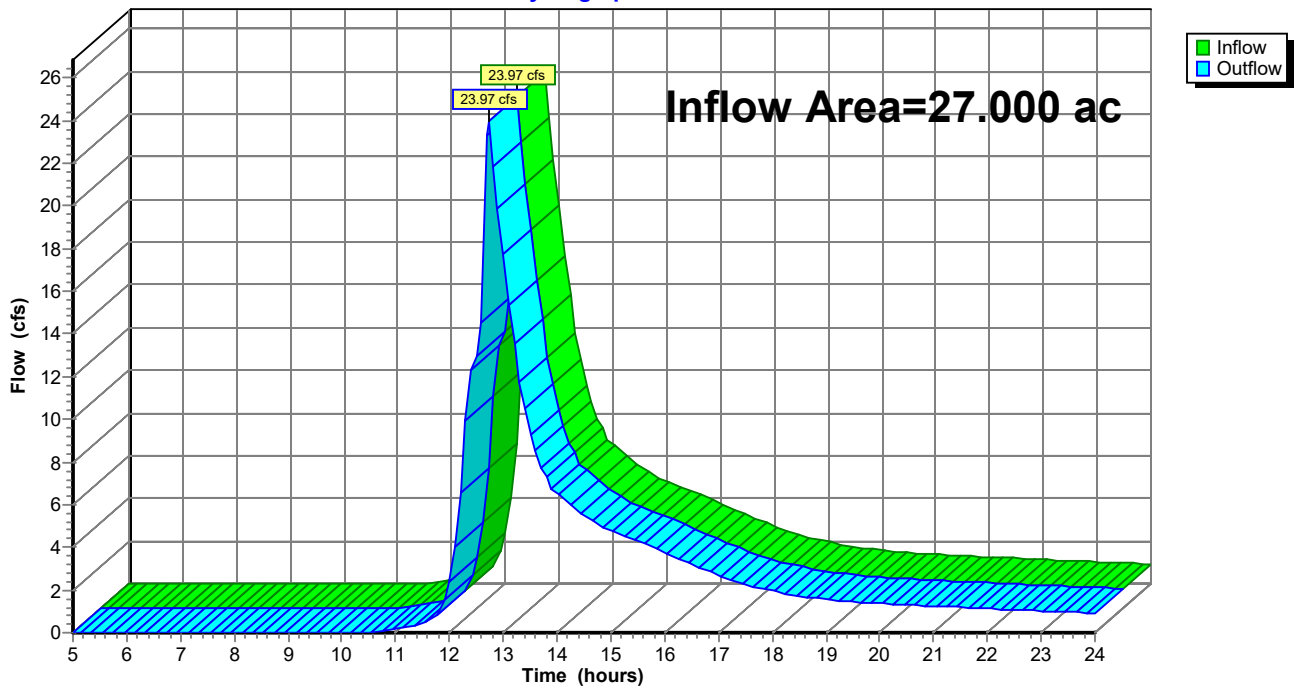
Summary for Reach 25R: Outfall

Inflow Area = 27.000 ac, 3.78% Impervious, Inflow Depth > 1.75" for 25 year event
Inflow = 23.97 cfs @ 12.74 hrs, Volume= 3.942 af
Outflow = 23.97 cfs @ 12.74 hrs, Volume= 3.942 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-24.00 hrs, dt= 0.10 hrs

Reach 25R: Outfall

Hydrograph



Time span=5.00-24.00 hrs, dt=0.10 hrs, 191 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 1R: 15" pipe outfall Avg. Flow Depth=1.25' Max Vel=15.30 fps Inflow=26.57 cfs 4.247 af
15.0" Round Pipe n=0.010 L=31.0' S=0.0419 '/' Capacity=17.20 cfs Outflow=17.20 cfs 4.247 af

Reach 25R: Outfall Inflow=32.03 cfs 6.091 af
Outflow=32.03 cfs 6.091 af

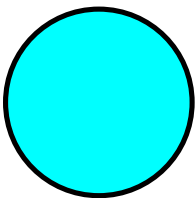
Summary for Reach 1R: 15" pipe outfall

Inflow Area = 20.000 ac, 0.90% Impervious, Inflow Depth > 2.55" for 100 year event
 Inflow = 26.57 cfs @ 12.74 hrs, Volume= 4.247 af
 Outflow = 17.20 cfs @ 12.60 hrs, Volume= 4.247 af, Atten= 35%, Lag= 0.0 min

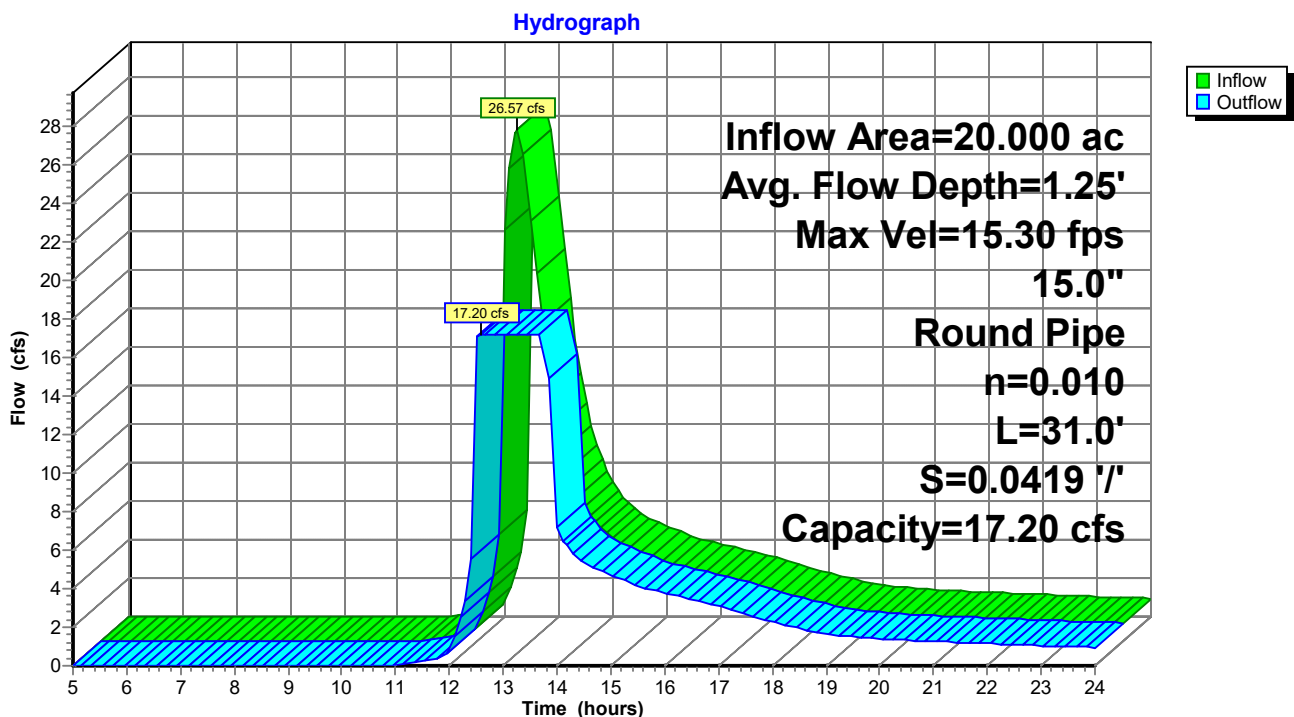
Routing by Stor-Ind+Trans method, Time Span= 5.00-24.00 hrs, dt= 0.10 hrs
 Max. Velocity= 15.30 fps, Min. Travel Time= 0.0 min
 Avg. Velocity = 9.69 fps, Avg. Travel Time= 0.1 min

Peak Storage= 38 cf @ 12.50 hrs
 Average Depth at Peak Storage= 1.25'
 Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 17.20 cfs

15.0" Round Pipe
 n= 0.010 PVC, smooth interior
 Length= 31.0' Slope= 0.0419 '/'
 Inlet Invert= 79.80', Outlet Invert= 78.50'



Reach 1R: 15" pipe outfall



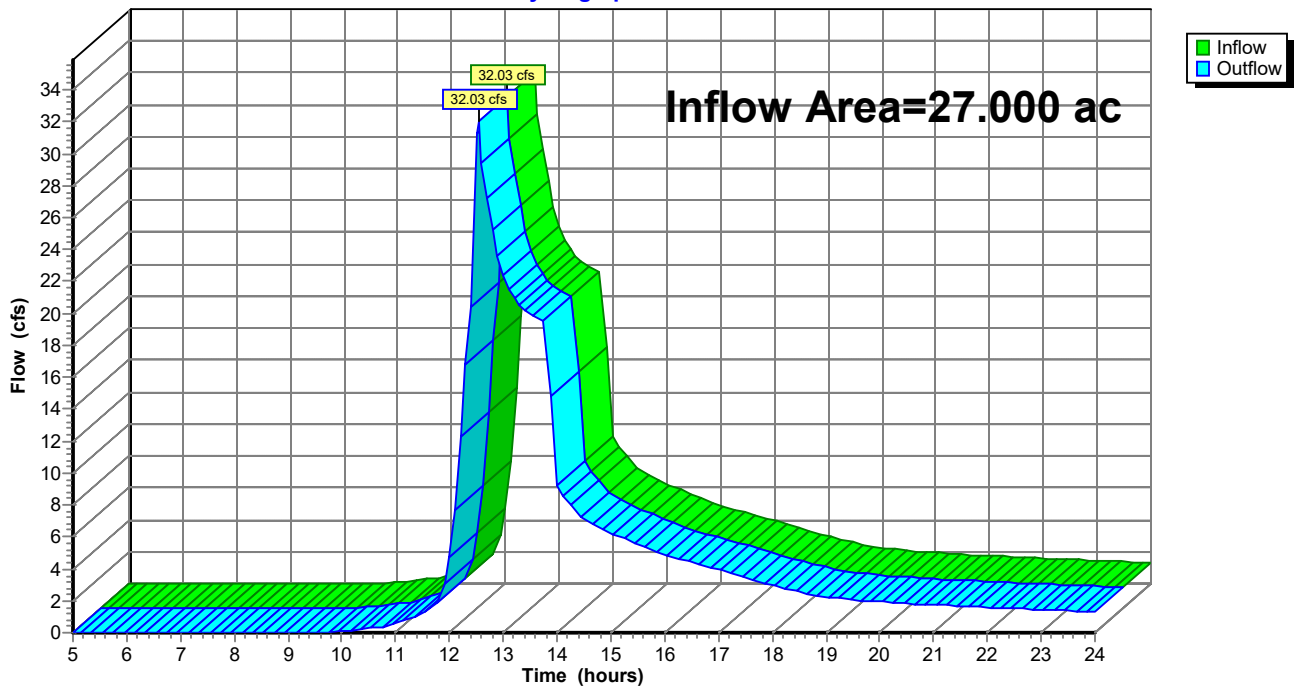
Summary for Reach 25R: Outfall

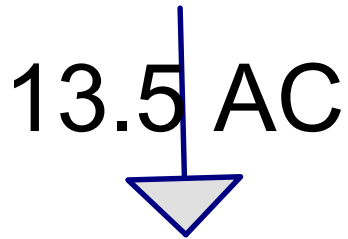
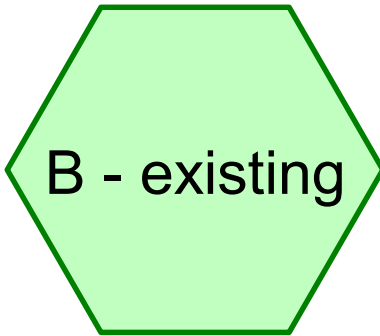
Inflow Area = 27.000 ac, 3.78% Impervious, Inflow Depth > 2.71" for 100 year event
Inflow = 32.03 cfs @ 12.54 hrs, Volume= 6.091 af
Outflow = 32.03 cfs @ 12.54 hrs, Volume= 6.091 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-24.00 hrs, dt= 0.10 hrs

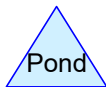
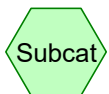
Reach 25R: Outfall

Hydrograph





Outfall



Area B Existing Nottingham Hills Subdivision Phase VPrepared by May Engineering, LLC Timothy May, PE
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Page 2**Area Listing (all nodes)**

Area (acres)	CN	Description (subcatchment-numbers)
12.500	60	Woods, Fair, HSG B (B - existing)
1.000	73	Woods/grass comb., Poor, HSG B (B - existing)
13.500	61	TOTAL AREA

Area B Existing Nottingham Hills Subdivision Phase V

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Soil Listing (all nodes)

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

Area B Existing Nottingham Hills Subdivision Phase V

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	12.500	0.000	0.000	0.000	12.500	Woods, Fair	B - existing
0.000	1.000	0.000	0.000	0.000	1.000	Woods/grass comb., Poor	B - existing
0.000	13.500	0.000	0.000	0.000	13.500	TOTAL AREA	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 24R: Outfall

Inflow=2.68 cfs 0.509 af
Outflow=2.68 cfs 0.509 af

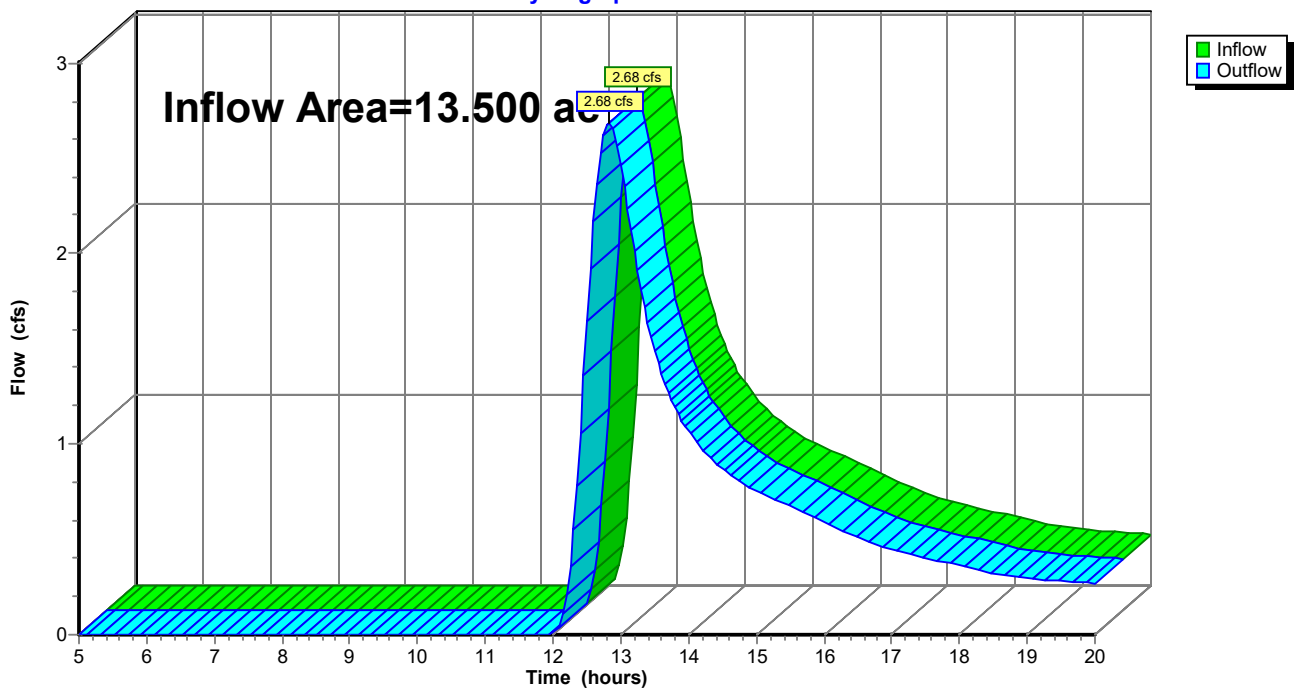
Summary for Reach 24R: Outfall

Inflow Area = 13.500 ac, 0.00% Impervious, Inflow Depth > 0.45" for 2-year event
Inflow = 2.68 cfs @ 12.83 hrs, Volume= 0.509 af
Outflow = 2.68 cfs @ 12.83 hrs, Volume= 0.509 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 24R: Outfall

Hydrograph



Area B Existing Nottingham Hills Subdivision Phase V *Type III 24-hr 10 year Rainfall=4.80"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 24R: Outfall

Inflow=7.80 cfs 1.243 af

Outflow=7.80 cfs 1.243 af

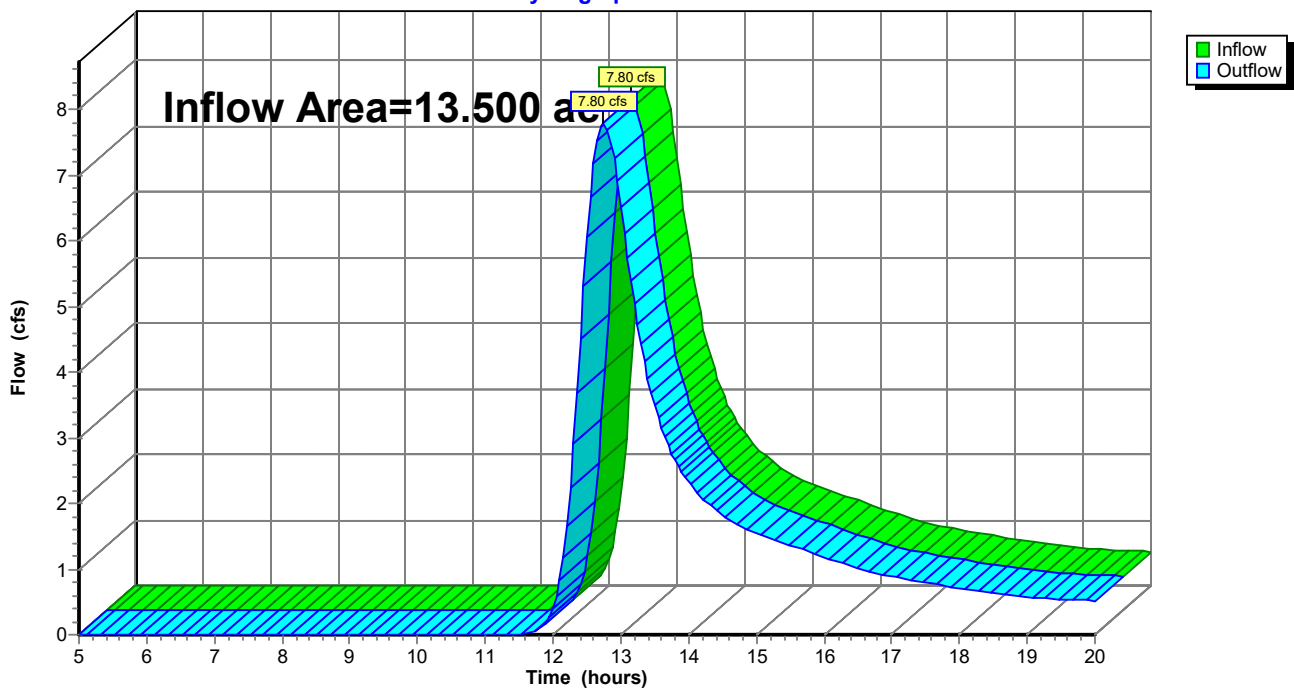
Summary for Reach 24R: Outfall

Inflow Area = 13.500 ac, 0.00% Impervious, Inflow Depth > 1.10" for 10 year event
Inflow = 7.80 cfs @ 12.75 hrs, Volume= 1.243 af
Outflow = 7.80 cfs @ 12.75 hrs, Volume= 1.243 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 24R: Outfall

Hydrograph



Area B Existing Nottingham Hills Subdivision Phase V *Type III 24-hr 25 year Rainfall=5.70"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 24R: Outfall

Inflow=11.84 cfs 1.816 af

Outflow=11.84 cfs 1.816 af

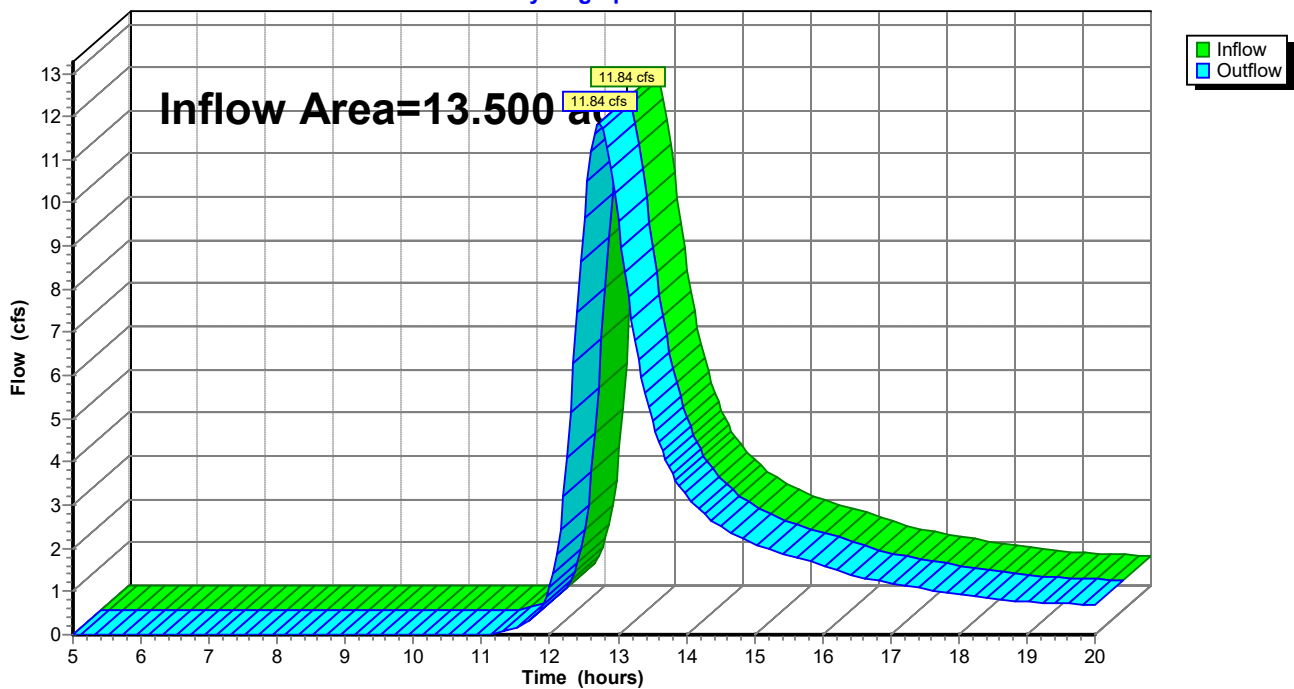
Summary for Reach 24R: Outfall

Inflow Area = 13.500 ac, 0.00% Impervious, Inflow Depth > 1.61" for 25 year event
Inflow = 11.84 cfs @ 12.72 hrs, Volume= 1.816 af
Outflow = 11.84 cfs @ 12.72 hrs, Volume= 1.816 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 24R: Outfall

Hydrograph



Area B Existing Nottingham Hills Subdivision Phase *Type III 24-hr 100 year Rainfall=7.10"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 24R: Outfall

Inflow=18.85 cfs 2.817 af

Outflow=18.85 cfs 2.817 af

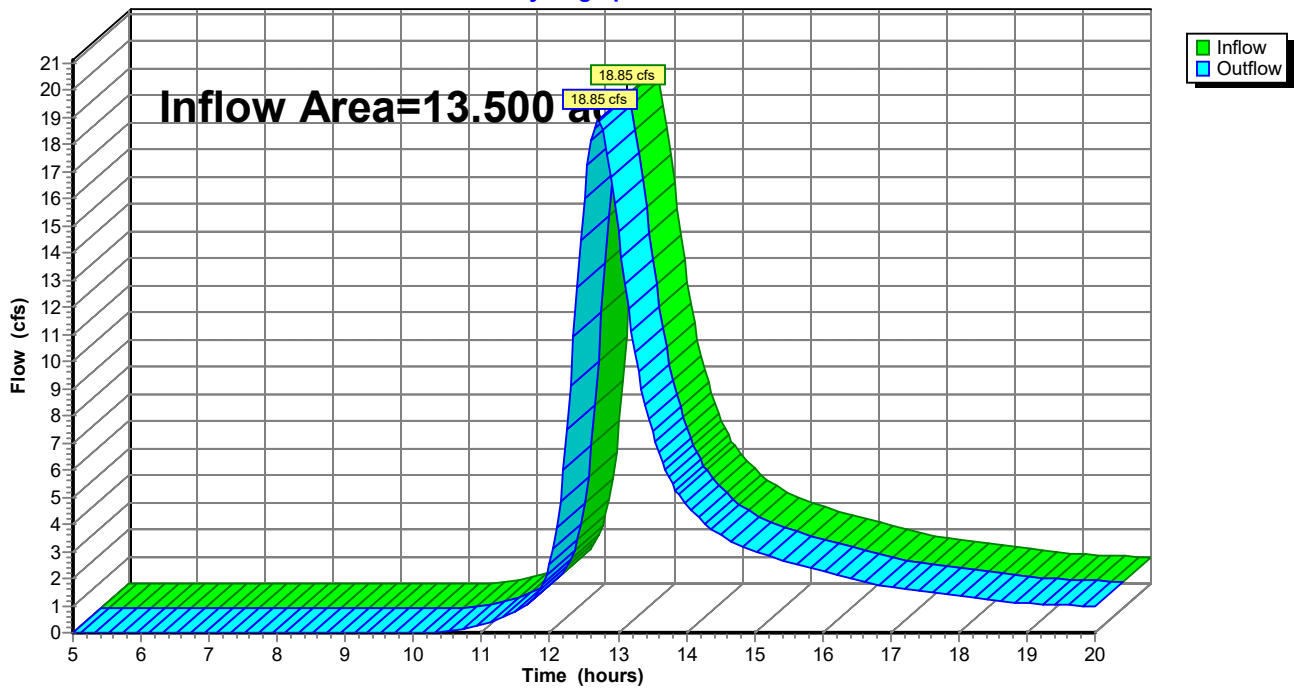
Summary for Reach 24R: Outfall

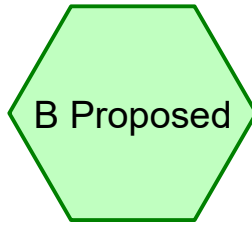
Inflow Area = 13.500 ac, 0.00% Impervious, Inflow Depth > 2.50" for 100 year event
Inflow = 18.85 cfs @ 12.71 hrs, Volume= 2.817 af
Outflow = 18.85 cfs @ 12.71 hrs, Volume= 2.817 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

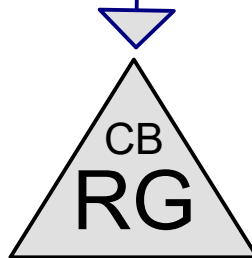
Reach 24R: Outfall

Hydrograph

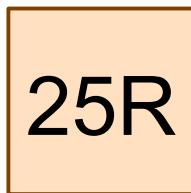




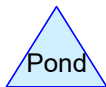
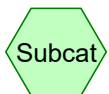
13.5 AC



Rain Garden Exfiltration



Outfall



Area B PROPOSED Nottingham Hills Subdivision Phase V

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Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.500	65	2 acre lots, 12% imp, HSG B (B Proposed)
10.000	60	Woods, Fair, HSG B (B Proposed)
13.500	61	TOTAL AREA

Area B PROPOSED Nottingham Hills Subdivision Phase V

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Soil Listing (all nodes)

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

Area B PROPOSED Nottingham Hills Subdivision Phase V

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	3.500	0.000	0.000	0.000	3.500	2 acre lots, 12% imp	B Proposed
0.000	10.000	0.000	0.000	0.000	10.000	Woods, Fair	B Proposed
0.000	13.500	0.000	0.000	0.000	13.500	TOTAL AREA	

Area B PROPOSED Nottingham Hills Subdivision Phas *Type III 24-hr 2-year Rainfall=3.40"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 25R: Outfall

Inflow=1.43 cfs 0.080 af

Outflow=1.43 cfs 0.080 af

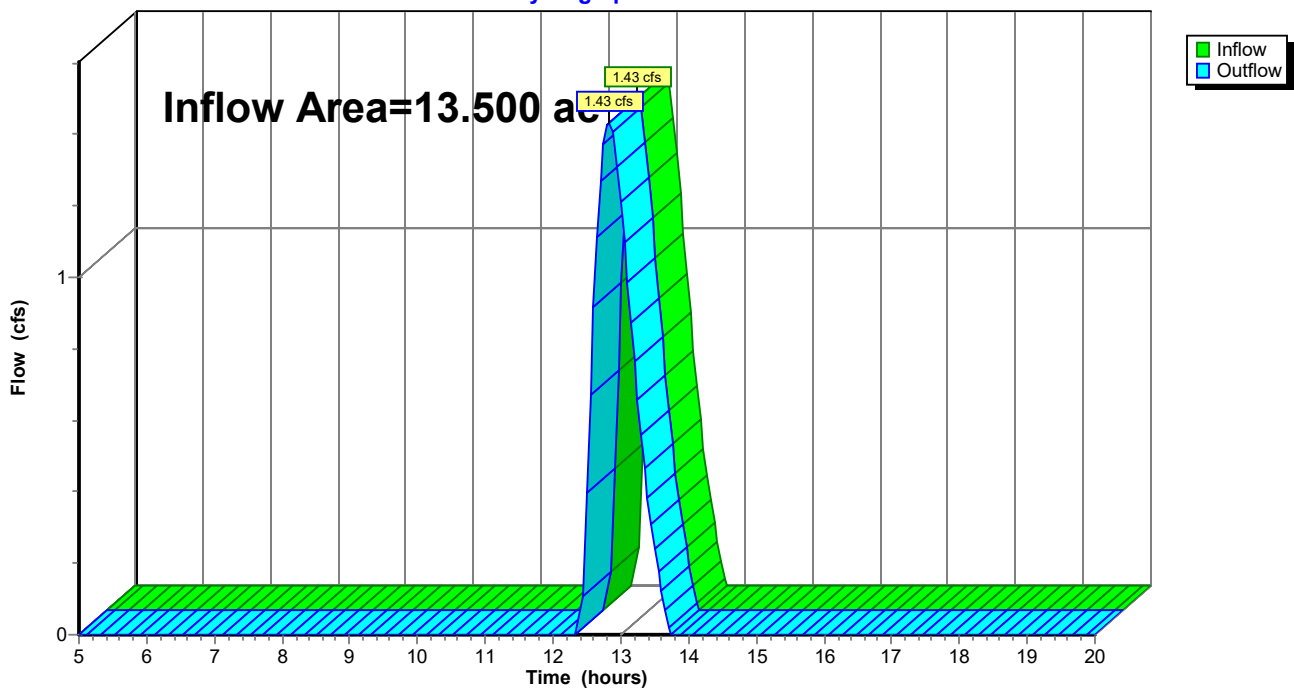
Summary for Reach 25R: Outfall

Inflow Area = 13.500 ac, 3.11% Impervious, Inflow Depth = 0.07" for 2-year event
 Inflow = 1.43 cfs @ 12.83 hrs, Volume= 0.080 af
 Outflow = 1.43 cfs @ 12.83 hrs, Volume= 0.080 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 25R: Outfall

Hydrograph



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 25R: Outfall

Inflow=6.55 cfs 0.584 af
Outflow=6.55 cfs 0.584 af

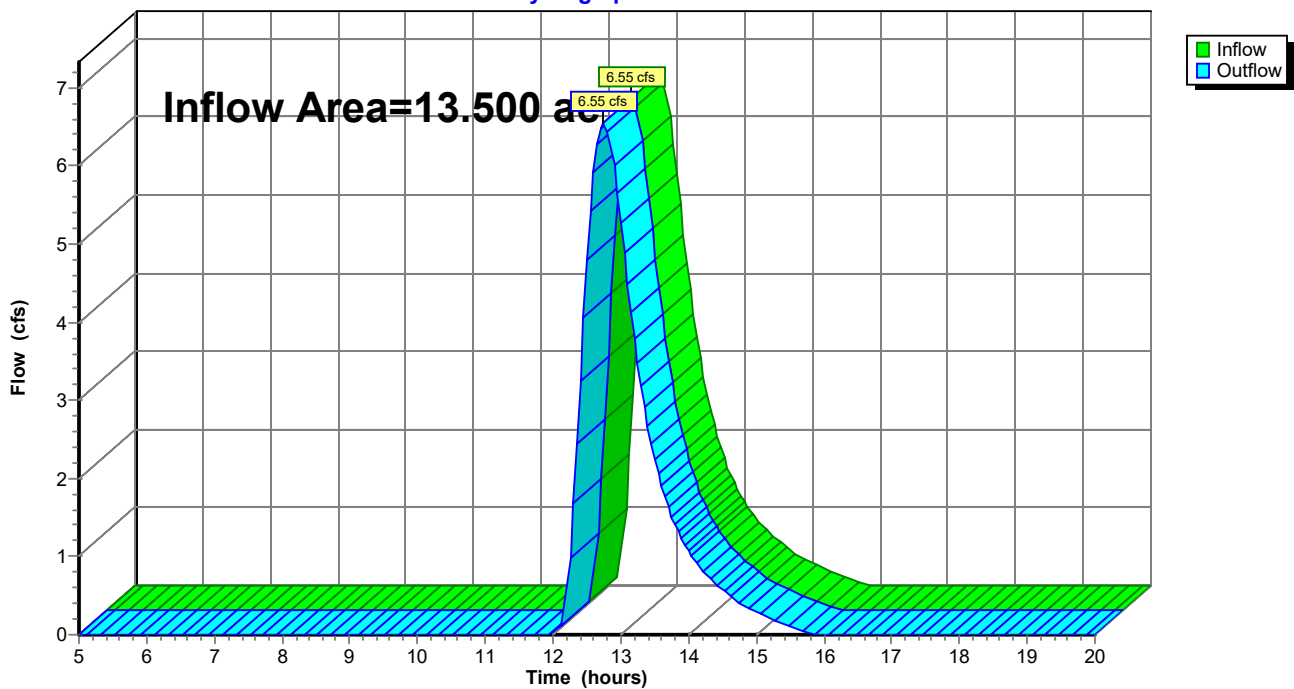
Summary for Reach 25R: Outfall

Inflow Area = 13.500 ac, 3.11% Impervious, Inflow Depth = 0.52" for 10 year event
Inflow = 6.55 cfs @ 12.75 hrs, Volume= 0.584 af
Outflow = 6.55 cfs @ 12.75 hrs, Volume= 0.584 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 25R: Outfall

Hydrograph



Area B PROPOSED Nottingham Hills Subdivision Pha *Type III 24-hr 25 year Rainfall=5.70"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 25R: Outfall

Inflow=10.59 cfs 1.059 af

Outflow=10.59 cfs 1.059 af

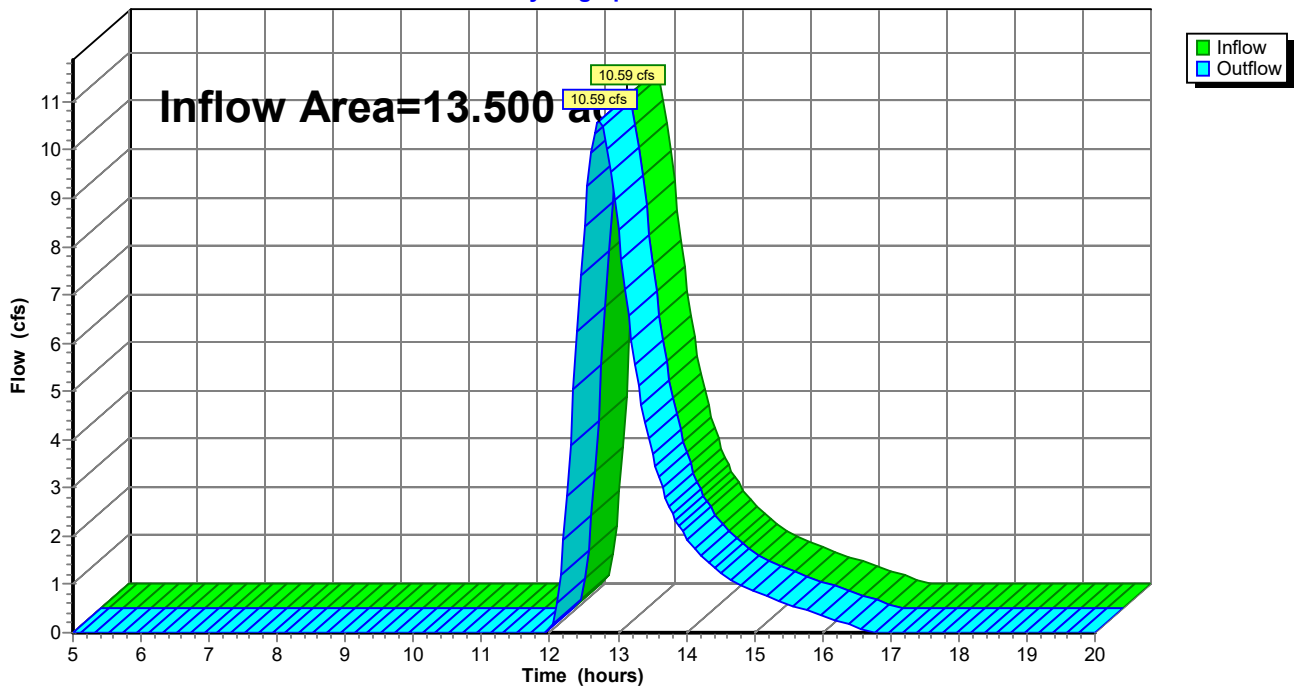
Summary for Reach 25R: Outfall

Inflow Area = 13.500 ac, 3.11% Impervious, Inflow Depth = 0.94" for 25 year event
Inflow = 10.59 cfs @ 12.72 hrs, Volume= 1.059 af
Outflow = 10.59 cfs @ 12.72 hrs, Volume= 1.059 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 25R: Outfall

Hydrograph



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 25R: Outfall

Inflow=17.60 cfs 1.940 af
Outflow=17.60 cfs 1.940 af

Summary for Reach 25R: Outfall

Inflow Area = 13.500 ac, 3.11% Impervious, Inflow Depth = 1.72" for 100 year event
Inflow = 17.60 cfs @ 12.71 hrs, Volume= 1.940 af
Outflow = 17.60 cfs @ 12.71 hrs, Volume= 1.940 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 25R: Outfall

Hydrograph

