10-13-2021 Town Council Meeting
Responses to Council Questions

<u>ITEM #8:</u> Close the Legislative Hearing and Consider a Conditional Zoning Application - Residence Inn and Summit Place Townhomes, 101-111 Erwin Road, Mixed Use-Village-Conditional Zoning District (MU-V-CZD)

Council Question:
Stormwater has been and continues to be a concern regarding this proposed project. Can we receive a presentation from the Town's stormwater staff laying out the concerns/issues and the proposed adequacy of the proposed solutions with particular reference to the impact on Summerfield Crossing?

***Staff Response**:*
Stormwater staff will be participating in the staff presentation at Wednesday's meeting. A revised staff presentation with additional slides is attached.

Council Question:
Per the packet materials, can you share more as to why staff agreed to a 19.1' easement when they would like to see a 30' easement? What is the impact of that tradeoff?

***Staff Response**:*
The applicant was hesitant to grant the full 30' easement so Town staff determined it was better to agree to the reduced easement to ensure that some measure is taken to facilitate construction of the multi-use path in the future, as designated in the Mobility and Connectivity Plan. While the path is expected to stay within the existing Dobbins Drive right of way, the potential impact of the reduced easement is that the Town may need to acquire additional easements in the future, which would add cost for any future project.

Council Question:
How wide is the existing sidewalk on Erwin?

***Staff Response**:*
The existing sidewalk on Erwin Rd is 5' wide.

Council Question:
Will the applicant be required to provide a PIL for the future path on Dobbins?

***Staff Response**:*
The applicant and Town staff have not discussed or agreed upon a payment-in-lieu for the future path.

10-13-2021 Town Council Meeting
Responses to Council Questions

Council Question:
Can you ask the applicant to consider including secure e-bike storage in the design?

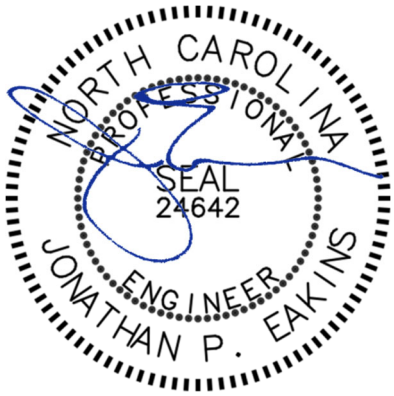
***Applicant Response**:*
If the Council would like to include this as a stipulation, we will accept it.

- *We can provide secure storage at both hotel and townhomes.*
- *Townhomes have space for added e-bike storage in garages or outside on "lot".*
- *Hotel can provide secure storage. We have looked at various storage racks [hanging, front wheel in racks, etc.]. If secure for hotel means inside, we will have some design work to do before we can ID how to put e-bike and regular bike storage in the same place. Some of the available common areas may need to be vetted with Fire Dept for corridor access, etc.*

DRAFT STUDY AND ANALYSIS
SWALES AT SUMMERFIELD BOUNDARY

RESIDENCE INN HOTEL – SUMMIT PLACE TOWNHOMES
Chapel Hill, North Carolina

September 16, 2021
Revised October 7, 2021



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INTRODUCTION

The Residence Inn-Summit Place townhome project is currently in the review process for a Mixed Use - Village Conditional Zoning District approval.

This study has been prepared at the request of the Town of Chapel Hill based on input from residents of the Summerfield Crossing neighborhood and analyzes stormwater runoff issues along a segment of the southwest boundary of the Residence Inn Parcel adjacent to the Summerfield Crossing neighborhood. This study only addresses potential solutions for issues at Summerfield Crossing that could be implemented on the Residence Inn parcel. Solutions outside the Residence Inn parcel that may alleviate other existing conditions are outside the scope of this study.

A draft stormwater impact statement for the proposed Residence Inn-Summit Place townhomes project has been prepared under separate cover. This analysis has been prepared as a separate, stand-alone analysis that independent of any development at the Residence Inn-Summit Place townhome sites.

BACKGROUND AND GENERAL INFORMATION

The existing townhome units at 116 and 118 Woodbridge Lane experience standing water at the front of the units during relatively small rainfall events. This study primarily analyzes potential solutions for the conditions at this location. However, locations south of this area may also receive benefits from proposed solutions.

Under current conditions, stormwater runoff from some areas of the existing Residence Inn hotel parcel flows across the hotel parcel boundary into the Summerfield Crossing neighborhood. Based on field topography in the area, there is a drainage divide between the unit at 120 Woodbridge Lane and 118 Woodbridge Lane. Generally, flow near the unit at 120 Woodbridge flows north and flow near the unit at 118 Woodbridge flows south. A topographic map based on field survey is include as an appendix to this report.

POTENTIAL SOLUTION

A swale flowing south to convey runoff parallel to the Residence Inn property boundary was studied to determine the effects on downstream and offsite properties. The swale is intended to intercept surface flow towards the southwest hotel boundary and discharge the flow towards the existing low area at the Resource Conservation Area (RCA) before flowing onto the Summerfield Crossing neighborhood property.

METHODOLOGY

Drainage Areas and SCS Curve Numbers

Drainage areas were delineated based on existing and proposed grading and calculated using CAD software to determine the area of each land use within the drainage area. Composite SCS Curve Numbers were calculated based on the values in Table 2.2 of the TOCHDM.

Drainage area maps are included in the appendix to this report.

Runoff Calculations

Runoff flowrates were calculated using Hydrology Studio software for several storm events. The software utilizes the SCS Methodology to determine peak flow rates.

Channels, Swales and Ditches

Channels were analyzed for the multiple storm events using Hydrology Studio/Channel Studio which calculates one-dimensional water surface profiles for steady, gradually varied flow in open channels for subcritical as well as supercritical flow regimes. The basic computational procedure is based on the solution of the one-dimensional energy equation. Energy losses are evaluated by friction using Manning's equation and using contraction/expansion coefficients multiplied by the change in velocity head. Flow velocities are limited to 4 feet per second in accordance with Section 2.6.2 of the TOCHDM.

Rainfall Depths

The following rainfall depths used in the calculations for this report were taken from the TOCHDM.

Rainfall event	Rainfall Depth (inches)
1-year, 24-hour	See note
2-year, 24-hour	3.60
10-year, 24-hour	5.38
25-year, 24-hour	6.41
100-year, 24-hour	8.00

Notes:

1. Only the 10-year and 100-year rainfall events were analyzed for runoff flowrates. Additional rainfall events are included for reference only.
2. The TOCHDM specifies the 1-year, 24-hour runoff to be 80% of the 2-year, 24-hour runoff and is not based on a rainfall depth.

RUNOFF ANALYSIS

Drainage area and runoff data for different conditions is summarized below. Refer to the appendix to this report for locations of each drainage area. Program output that calculates discharge is also included in the appendix to this report.

South Flowing Swale

Data for a swale to intercept surface flow that begins east of 118 Woodbridge Lane and flows south is summarized below.

Drainage Area 5 – South Flowing Swale			
	Existing conditions	To Swale	Swale Bypass
Drainage area	0.86 acres	0.65 acres	0.21 acres
SCS CN	79	80	77
Time of concentration	5.0 minutes	5.0 minutes	5.0 minutes
Q10	4.3 cfs	3.3 cfs	1.0 cfs
Q100	7.5 cfs	5.7 cfs	1.7 cfs

Flow towards 118 Woodbridge Lane

Data for the area that flows towards 118 Woodbridge Lane is summarized below. The data noted for the Swale Bypass assumes construction of the south flowing swale intercepts surface flow toward 118 Woodbridge Lane

Drainage Area 7 – Flow Towards 118 Woodbridge Lane		
	Existing Conditions	Swale Bypass
Drainage area	0.12 acres	0.07 acres
SCS CN	77	77
Time of concentration	5.0 minutes	5.0 minutes
Q10	0.6 cfs	0.4 cfs
Q100	1.0 cfs	0.7 cfs

SWALE ANALYSIS

Data from the Runoff Analysis was used for calculations related to the swale that may be used to intercept flow from crossing portions of the Residence Inn hotel boundary. Data the swale is summarized in the table below. Program output that calculates parameters in the swale is included in the appendix to this report.

South Flowing Swale

South Flowing Swale		
	Q10	Q100
Discharge to swale	3.3 cfs	5.7 cfs
Flow depth	0.4 feet	0.5 feet
Flow velocity	2.9 ft/sec	3.4 ft/sec
Swale bottom width	2.0 feet	
Swale depth	1.5 feet	
Longitudinal swale slope	2.0%	
Swale side slopes	3:1	
Manning's n	0.030	

CONCLUSION

Based on the results of this analysis, we believe that construction of a swale along the southwestern border between the Residence Inn hotel and Summerfield Crossing neighborhood will reduce the flow across the property boundary, including reducing flow towards the front of the townhome located at 118 Woodbridge Lane. Additional details for this analysis can be found in the Appendix.

APPENDICES

Appendix A – Existing Topography

Appendix B – Drainage Area Maps

Appendix C – Runoff Calculations

Appendix D – Swale Calculations

APPENDIX A
EXISTING TOPOGRAPHY

EXISTING PARKING

SURVEYED LOCATION
OF WETLANDS

EXISTING STORMWATER CONTROL
MEASURE EASEMENT

100'
BUFFER

EXISTING SANITARY
SEWER EASEMENT
TO BE ABANDONED

118 WOODBRIDGE

120 WOODBRIDGE

EXISTING SANITARY
SEWER EASEMENT

50 0 25 50 100

SCALE: 1"=50'

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CLIENT:
SUMMIT HOSPITALITY GROUP

RESIDENCE INN-SUMMIT PLACE TOWNHOMES
SWALE ANALYSIS
CHAPEL HILL, NC

EXISTING CONDITIONS

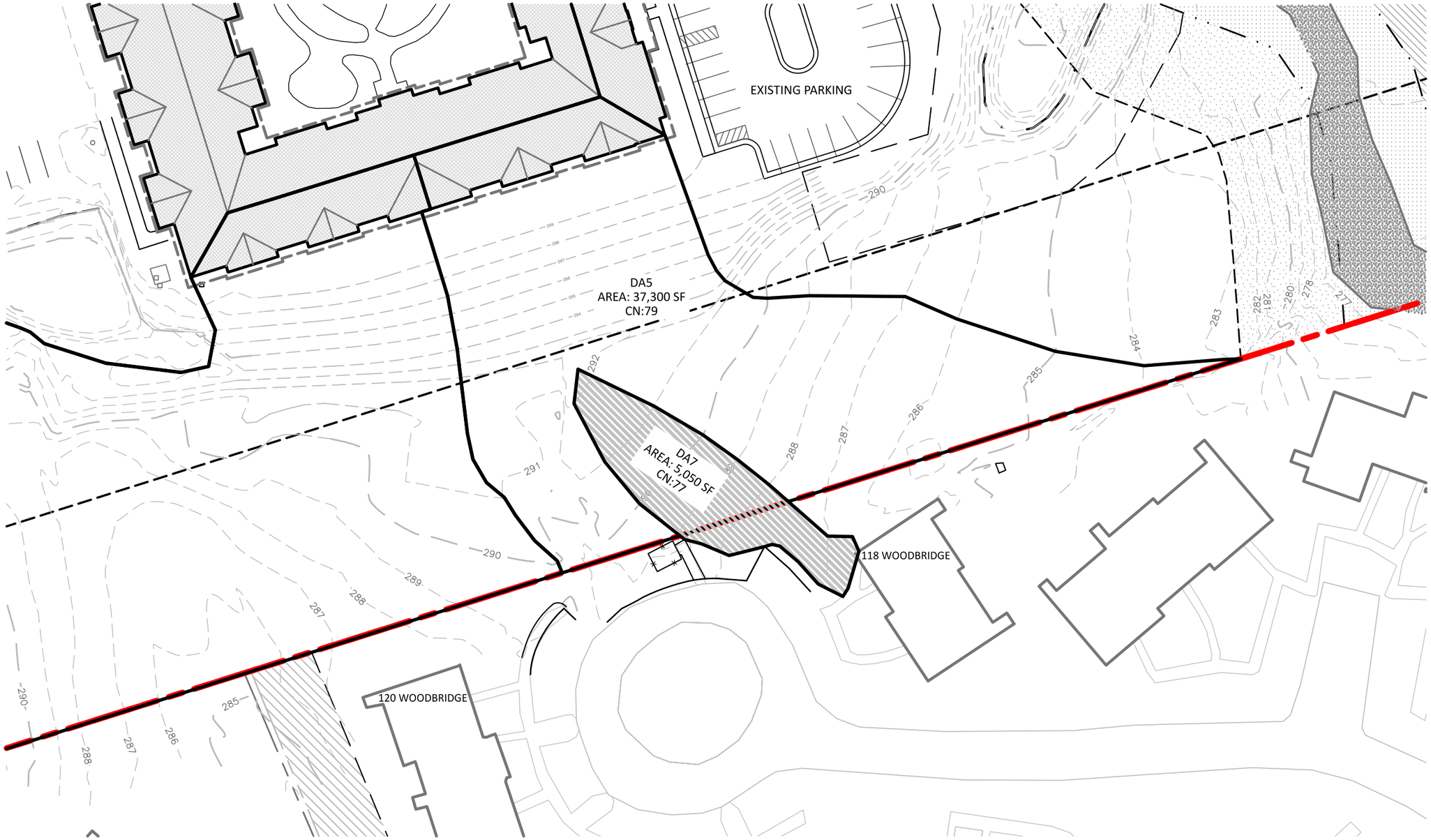
PROJECT NO:

SCALE:
1"=50'

DATE:
2021-09-16

SHEET NO:
1

APPENDIX B
DRAINAGE AREA MAPS



50 0 25 50 100

SCALE: 1"=50'

PREPARED BY:
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NCBELS License P-0751

CLIENT:
SUMMIT HOSPITALITY GROUP

RESIDENCE INN-SUMMIT PLACE TOWNHOMES
SWALE ANALYSIS
CHAPEL HILL, NC

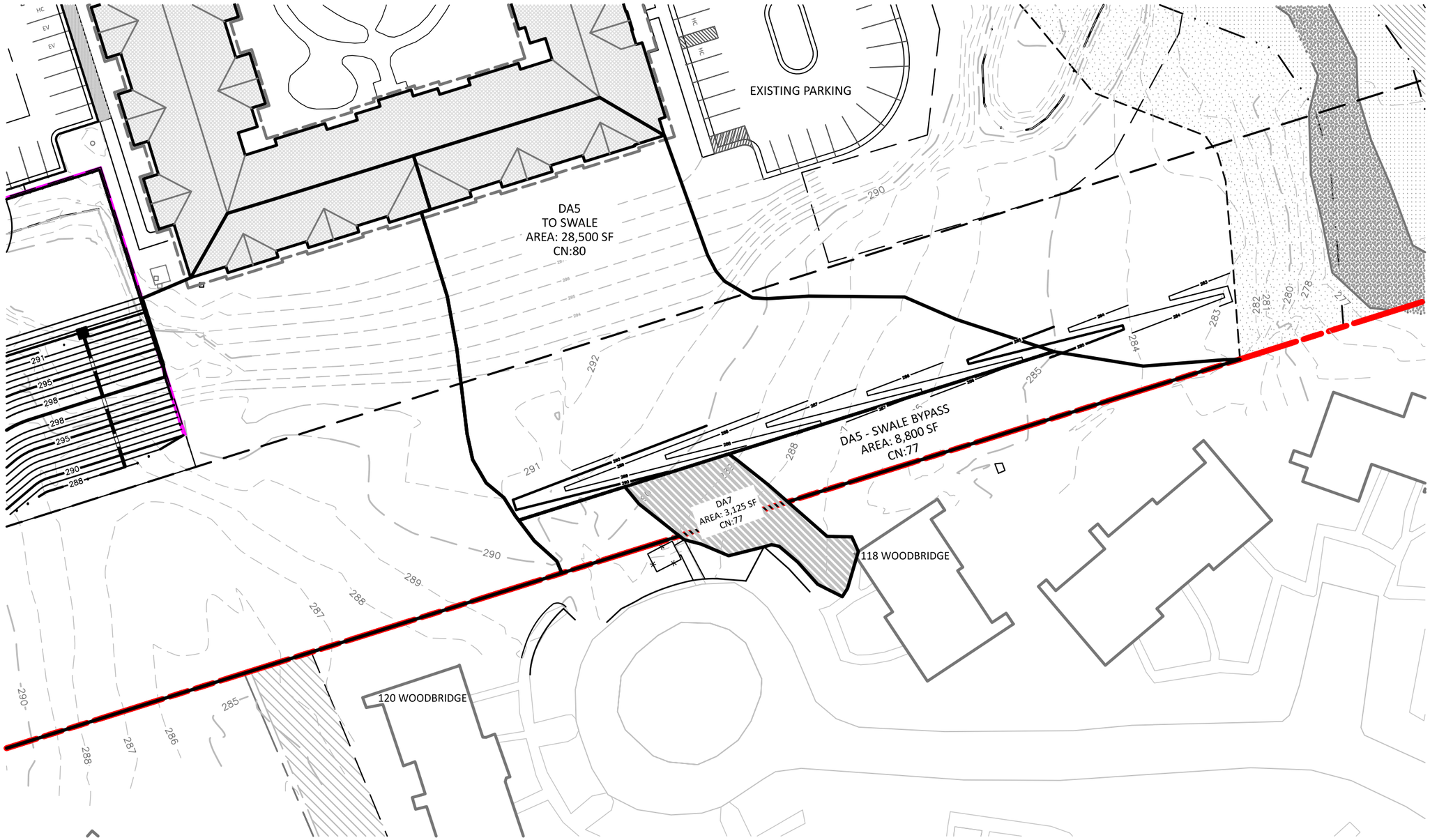
EXISTING DRAINAGE AREAS

PROJECT NO:

SCALE:
1"=50'

DATE:
2021-10-07

SHEET NO:
2.1



50 0 25 50 100

SCALE: 1"=50'

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SUMMIT HOSPITALITY GROUP

RESIDENCE INN-SUMMIT PLACE TOWNHOMES
SWALE ANALYSIS
CHAPEL HILL, NC

EXISTING DRAINAGE AREAS

PROJECT NO:

SCALE:
1"=50'

DATE:
2021-10-07

SHEET NO:
2.2

APPENDIX C
RUNOFF CALCULATIONS

Basin Model

Hydrology Studio v 3.0.0.20

Project Name:

10-07-2021

Hydrograph by Return Period

Project Name:

10-07-2021

Hydrology Studio v 3.0.0.20

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Outflow (cfs)							
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
1	NRCS Runoff	Pre DA5	1.705	2.409			4.341	5.526		7.450
2	NRCS Runoff	Post DA5 TO SWALE	1.362	1.903			3.377	4.281		5.738
3	NRCS Runoff	Post DA5 SWALE BYPASS	0.371	0.537			0.998	1.284		1.749
4	NRCS Runoff	Pre DA TO 118 WOODBRIDGE	0.215	0.310			0.575	0.738		1.004
5	NRCS Runoff	Post DA TO 118 WOODBIRDGE	0.145	0.208			0.385	0.494		0.671

Hydrograph 1-yr Summary

Project Name:

10-07-2021

Hydrology Studio v 3.0.0.20

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	NRCS Runoff	Pre DA5	1.705	11.97	3,429	----		
2	NRCS Runoff	Post DA5 TO SWALE	1.362	11.97	2,735	----		
3	NRCS Runoff	Post DA5 SWALE BYPASS	0.371	11.97	751	----		
4	NRCS Runoff	Pre DA TO 118 WOODBRIDGE	0.215	11.97	435	----		
5	NRCS Runoff	Post DA TO 118 WOODBIRDGE	0.145	11.97	292	----		

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

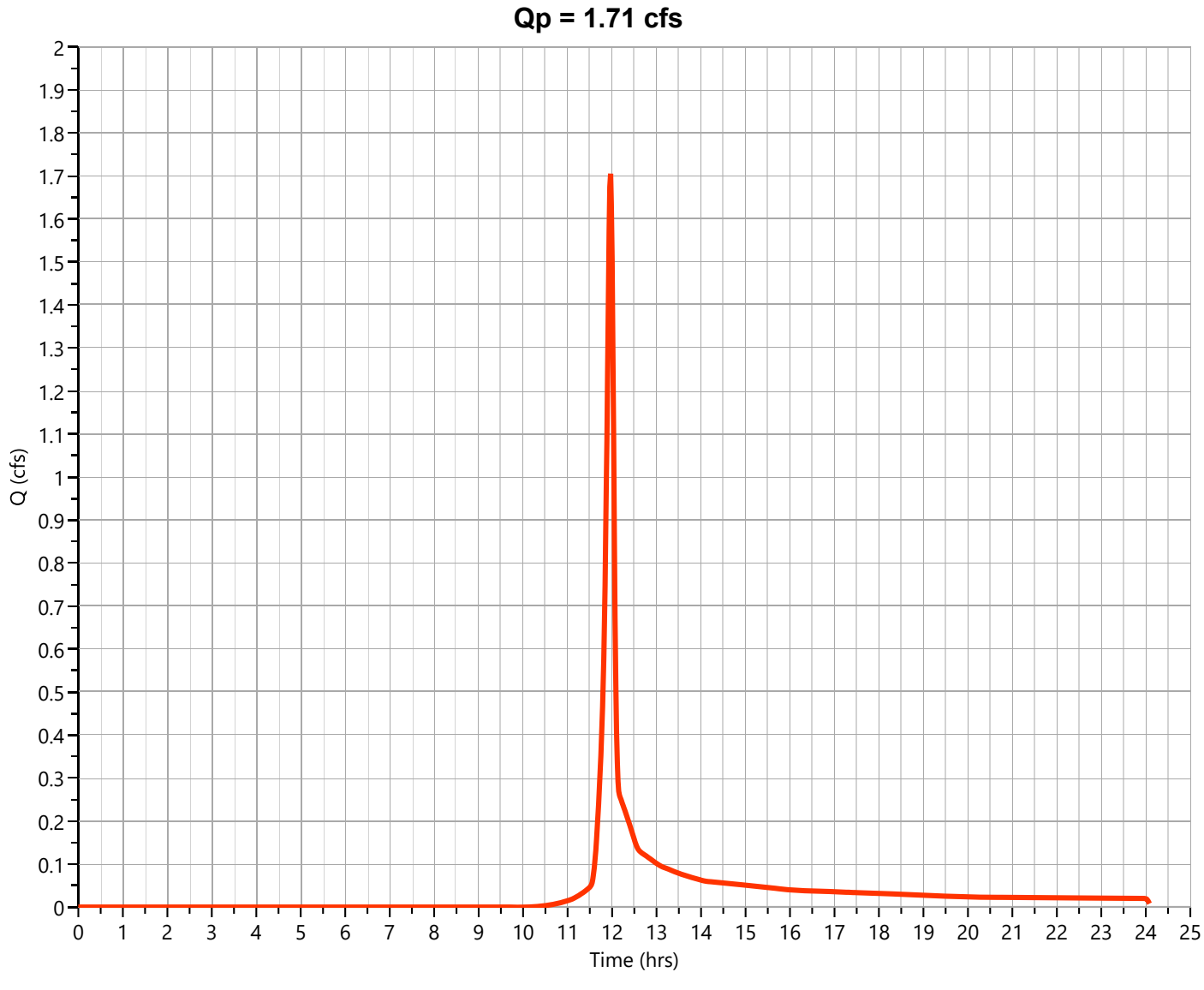
Pre DA5

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.705 cfs
Storm Frequency	= 1-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 3,429 cuft
Drainage Area	= 0.86 ac	Curve Number	= 78.99*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 2.83 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.06	98	Impervious
0.15	80	Grass/open
0.65	77	Woods
0.86	**79**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

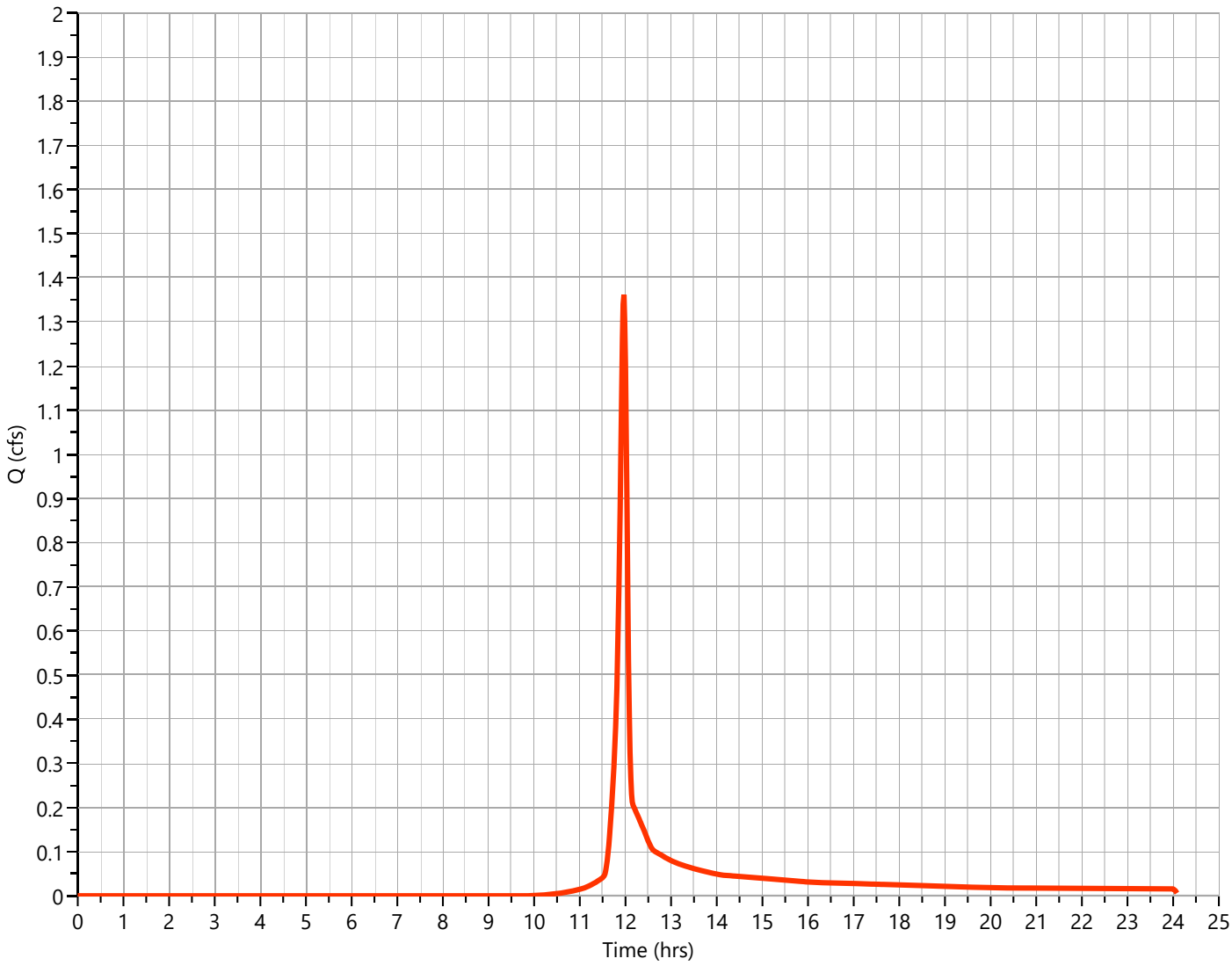
Post DA5 TO SWALE

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.362 cfs
Storm Frequency	= 1-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 2,735 cuft
Drainage Area	= 0.65 ac	Curve Number	= 80*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 2.83 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.06	98	Impervious
0.15	80	Grass/open
0.44	77	Woods
0.65	**80**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

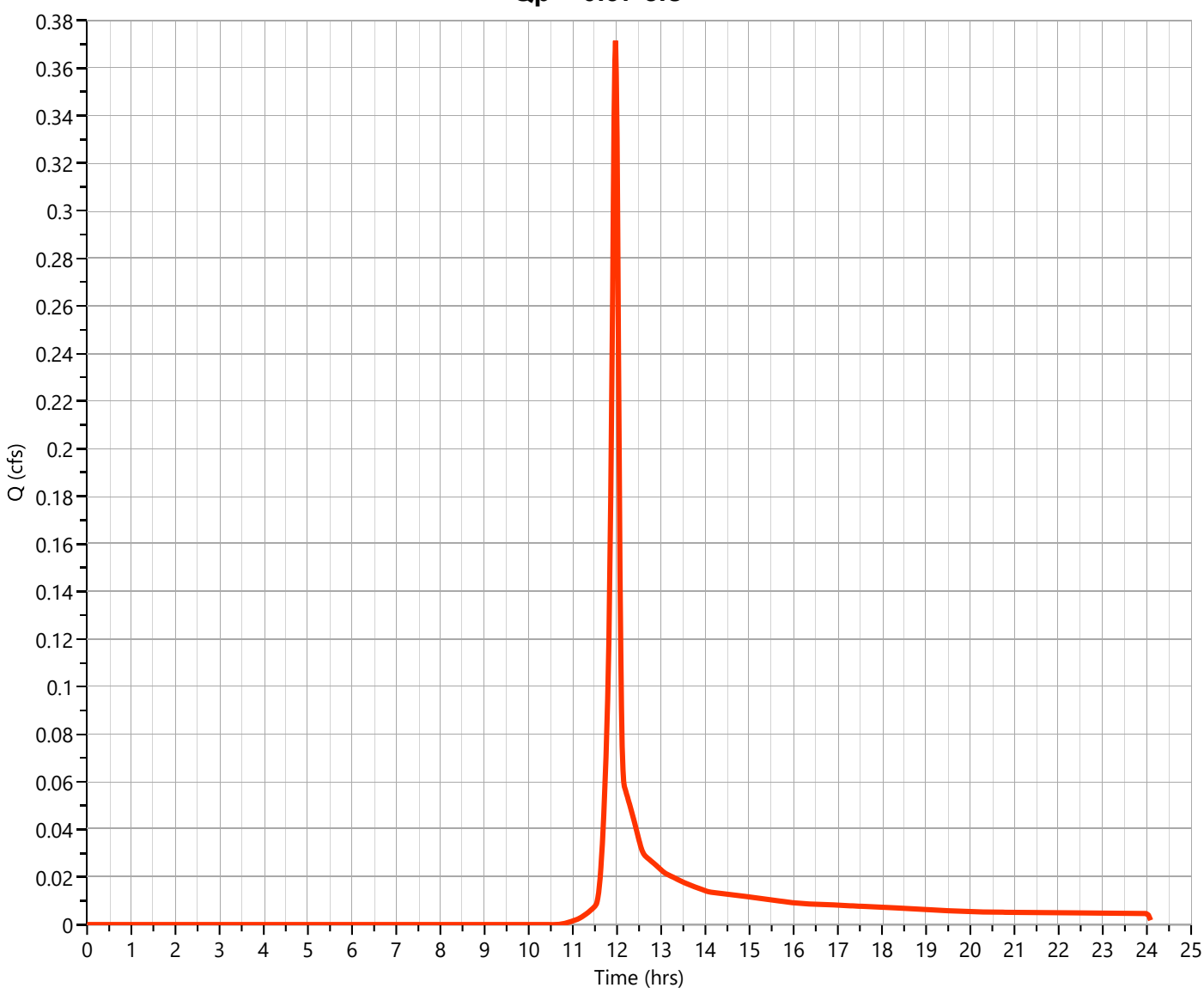
Post DA5 SWALE BYPASS

Hyd. No. 3

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.371 cfs
Storm Frequency	= 1-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 751 cuft
Drainage Area	= 0.21 ac	Curve Number	= 77*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 2.83 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.21	77	Woods
0.21	**77**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

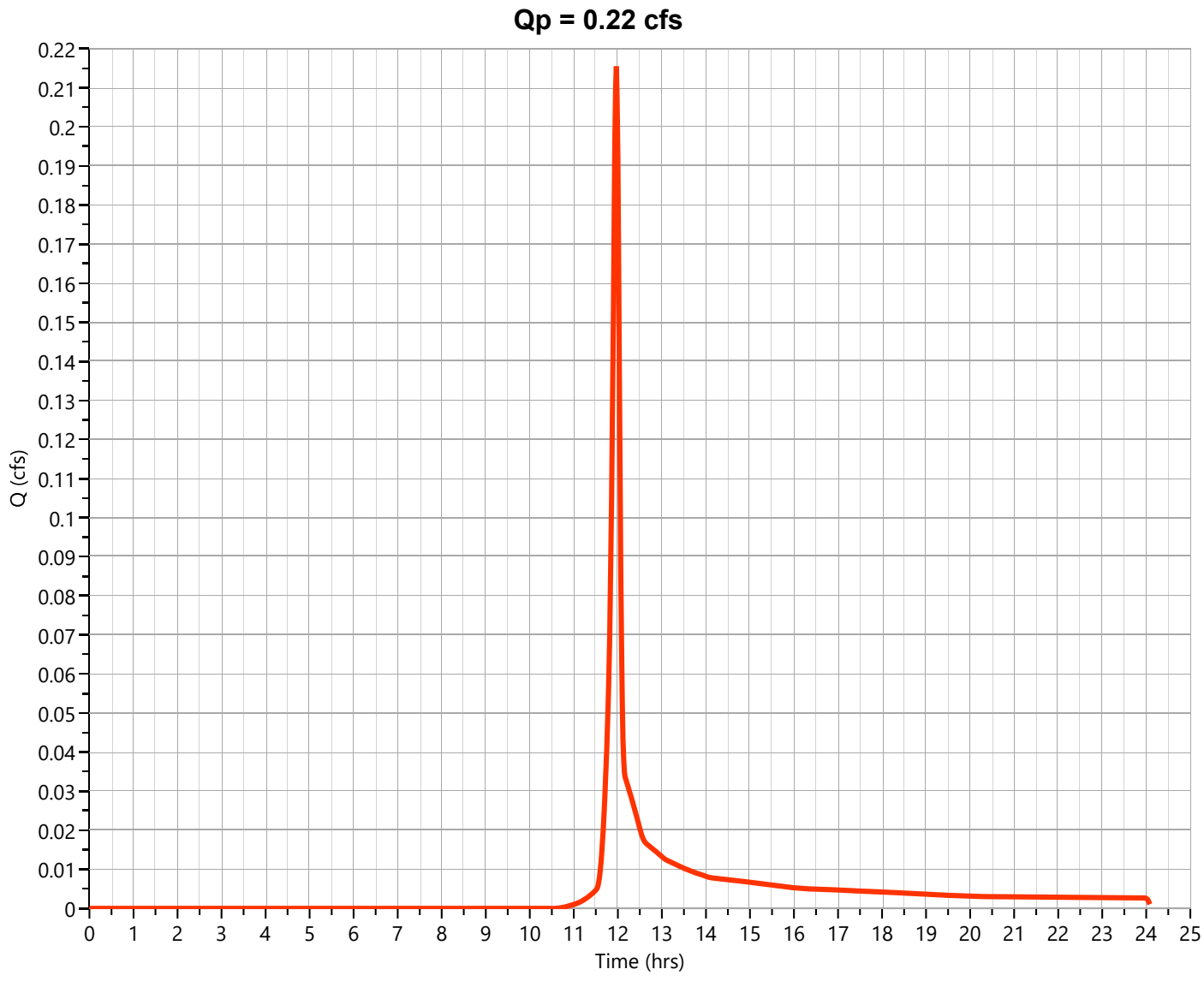
Pre DA TO 118 WOODBRIDGE

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.215 cfs
Storm Frequency	= 1-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 435 cuft
Drainage Area	= 0.12 ac	Curve Number	= 77.25*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 2.83 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.11	77	Woods
0.01	80	Grass/open
0.12	**77**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

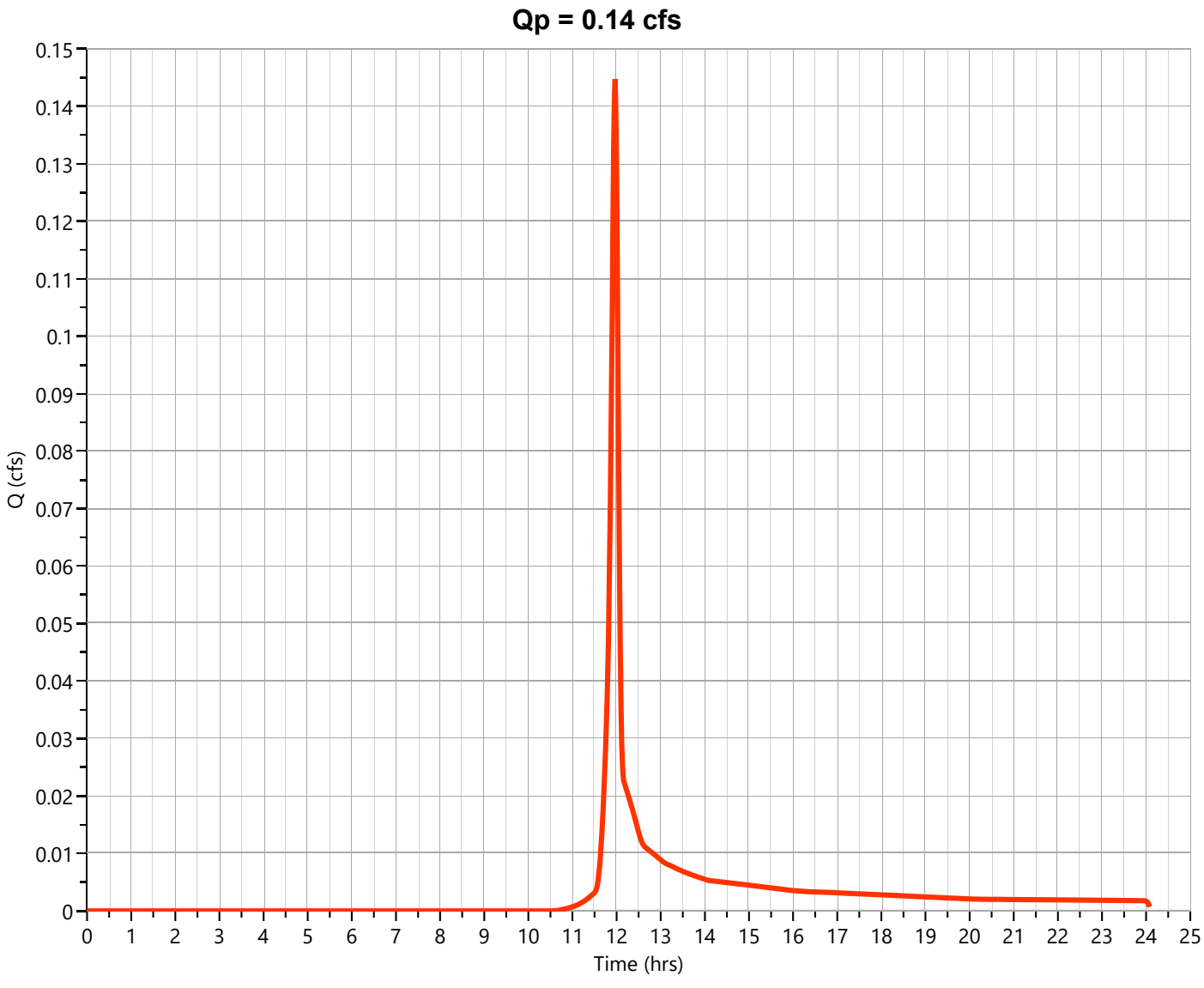
Post DA TO 118 WOODBIRDGE

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.145 cfs
Storm Frequency	= 1-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 292 cuft
Drainage Area	= 0.08 ac	Curve Number	= 77.38*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 2.83 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.07	77	Woods
0.01	80	Grass/open
0.08	**77**	Weighted CN Method Employed



Hydrograph 2-yr Summary

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	NRCS Runoff	Pre DA5	2.409	11.97	4,840	----		
2	NRCS Runoff	Post DA5 TO SWALE	1.903	11.97	3,828	----		
3	NRCS Runoff	Post DA5 SWALE BYPASS	0.537	11.97	1,078	----		
4	NRCS Runoff	Pre DA TO 118 WOODBRIDGE	0.310	11.97	623	----		
5	NRCS Runoff	Post DA TO 118 WOODBIRDGE	0.208	11.97	418	----		

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

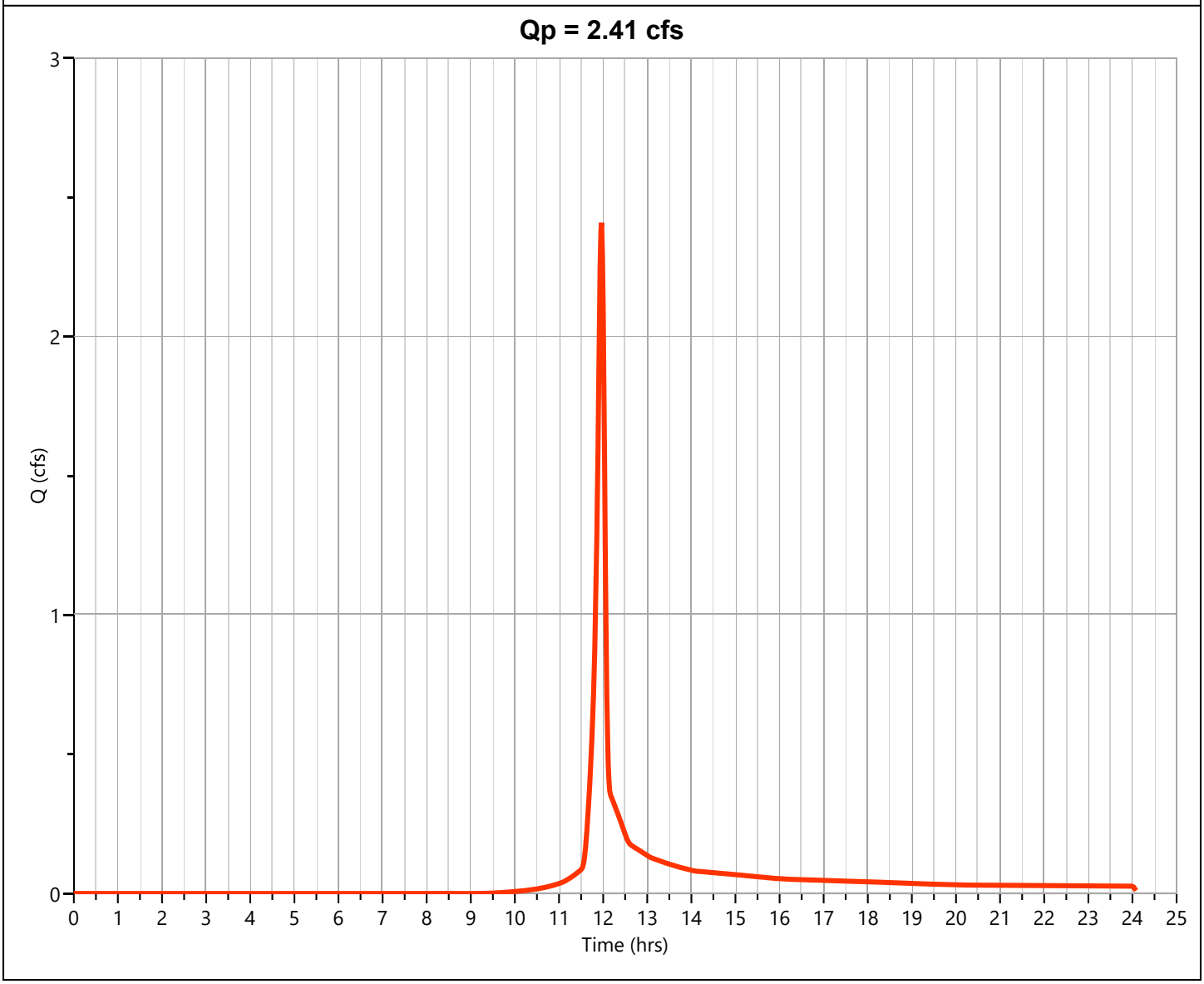
Pre DA5

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.409 cfs
Storm Frequency	= 2-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 4,840 cuft
Drainage Area	= 0.86 ac	Curve Number	= 78.99*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 3.42 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.06	98	Impervious
0.15	80	Grass/open
0.65	77	Woods
0.86	**79**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

Post DA5 TO SWALE

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.903 cfs
Storm Frequency	= 2-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 3,828 cuft
Drainage Area	= 0.65 ac	Curve Number	= 80*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 3.42 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
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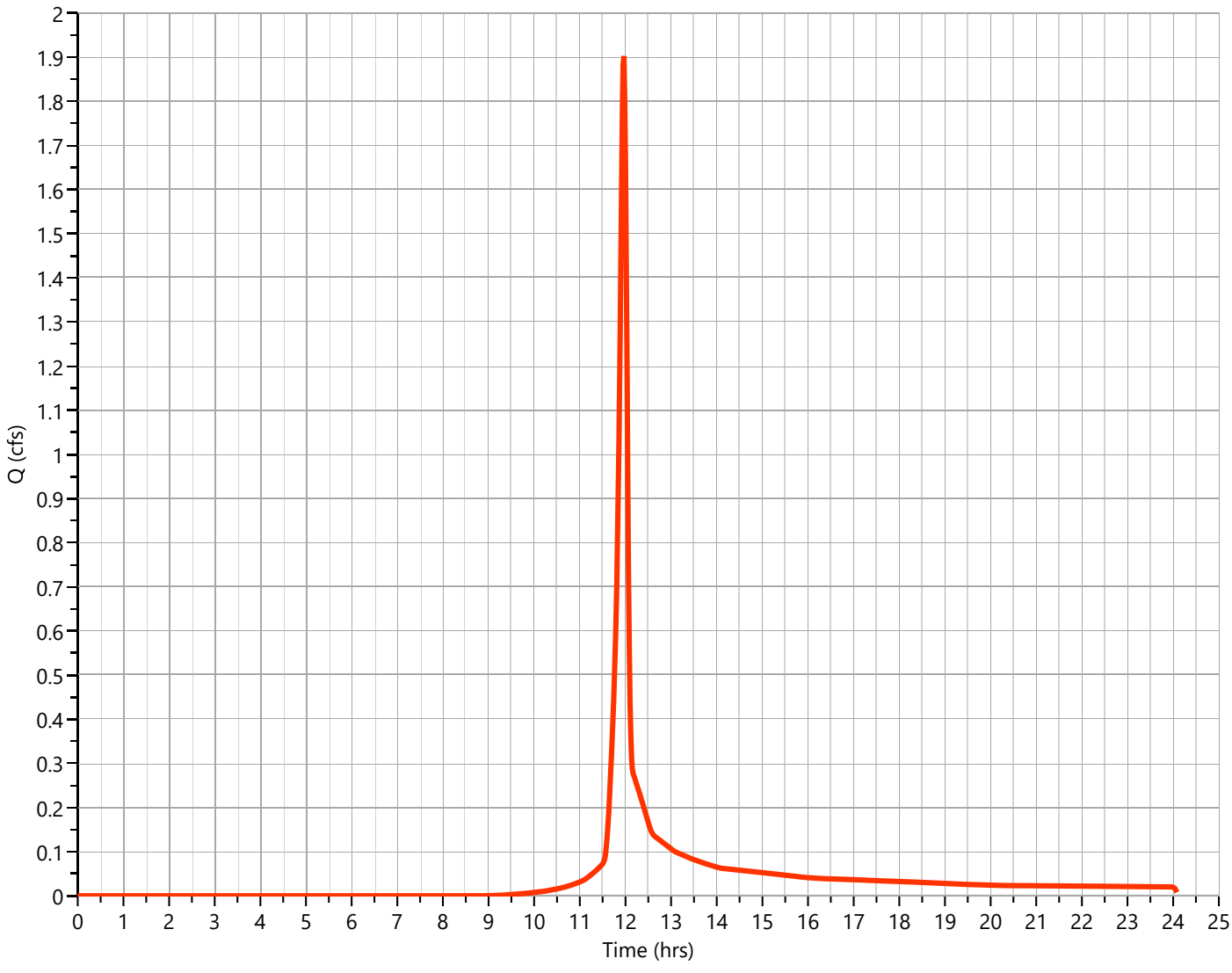
0.15	80	Grass/open
0.44	77	Woods
0.65	**80**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

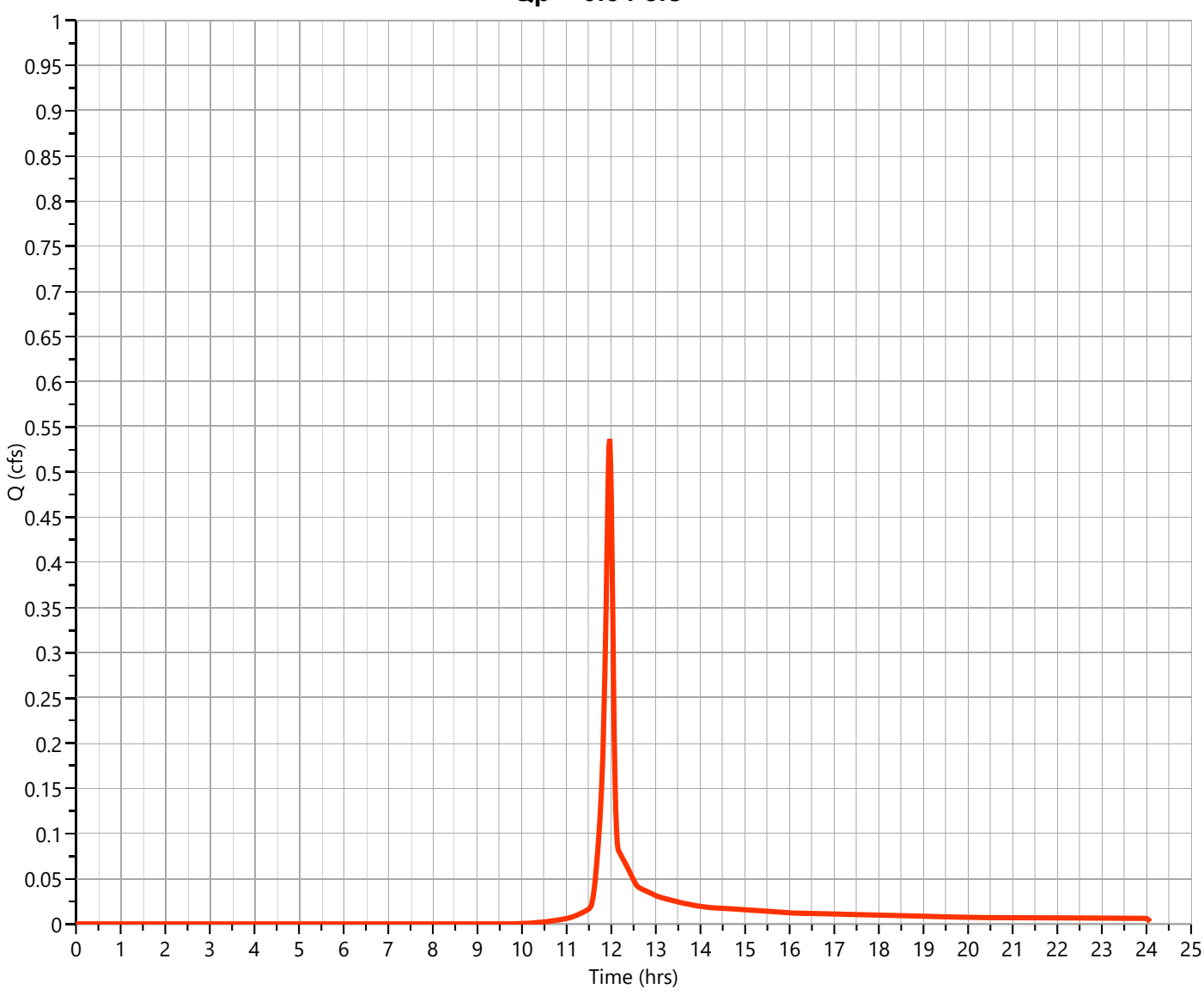
Post DA5 SWALE BYPASS

Hyd. No. 3

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.537 cfs
Storm Frequency	= 2-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 1,078 cuft
Drainage Area	= 0.21 ac	Curve Number	= 77*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 3.42 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.21	77	Woods
0.21	**77**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

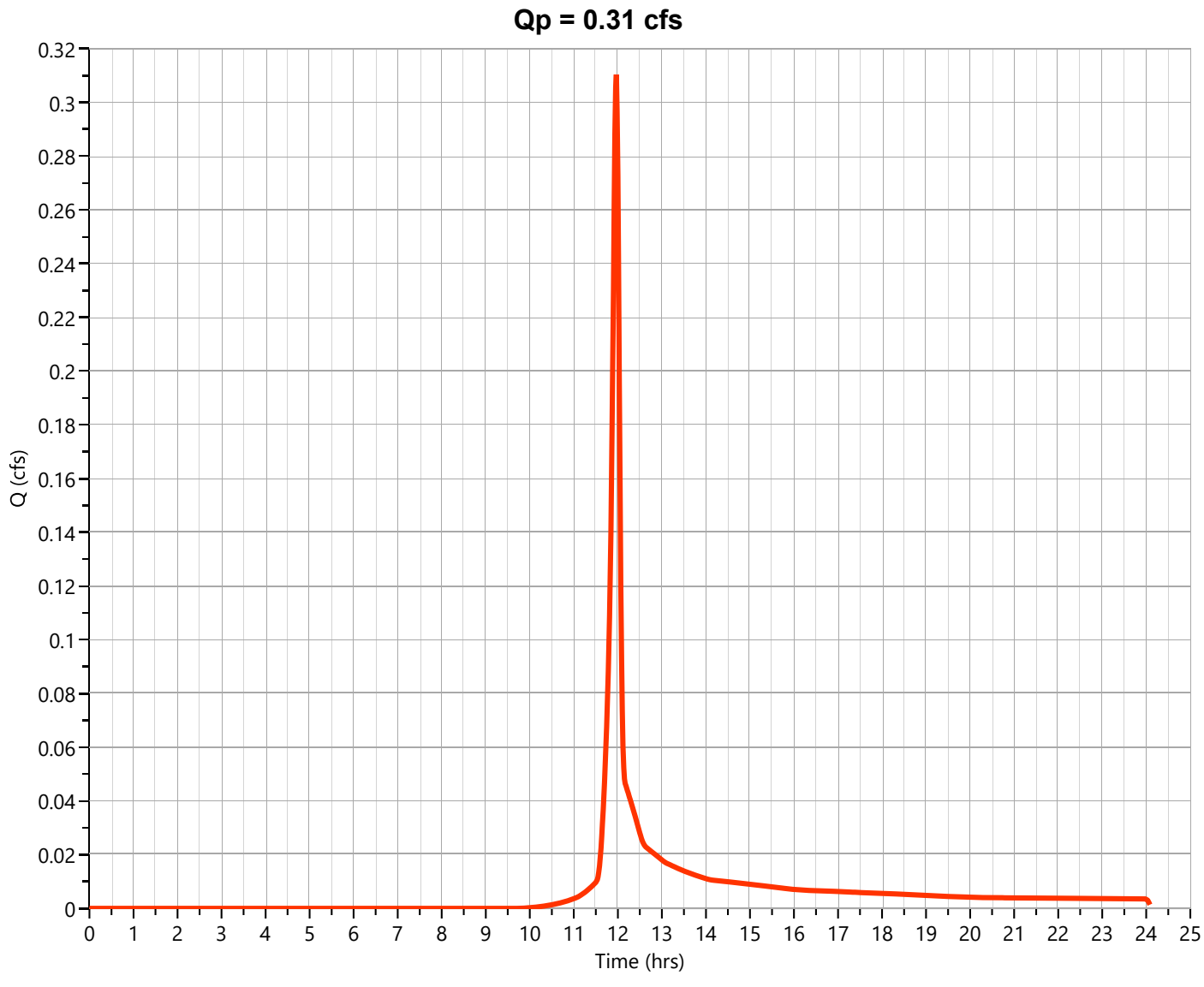
Pre DA TO 118 WOODBRIDGE

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.310 cfs
Storm Frequency	= 2-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 623 cuft
Drainage Area	= 0.12 ac	Curve Number	= 77.25*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 3.42 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.11	77	Woods
0.01	80	Grass/open
0.12	**77**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

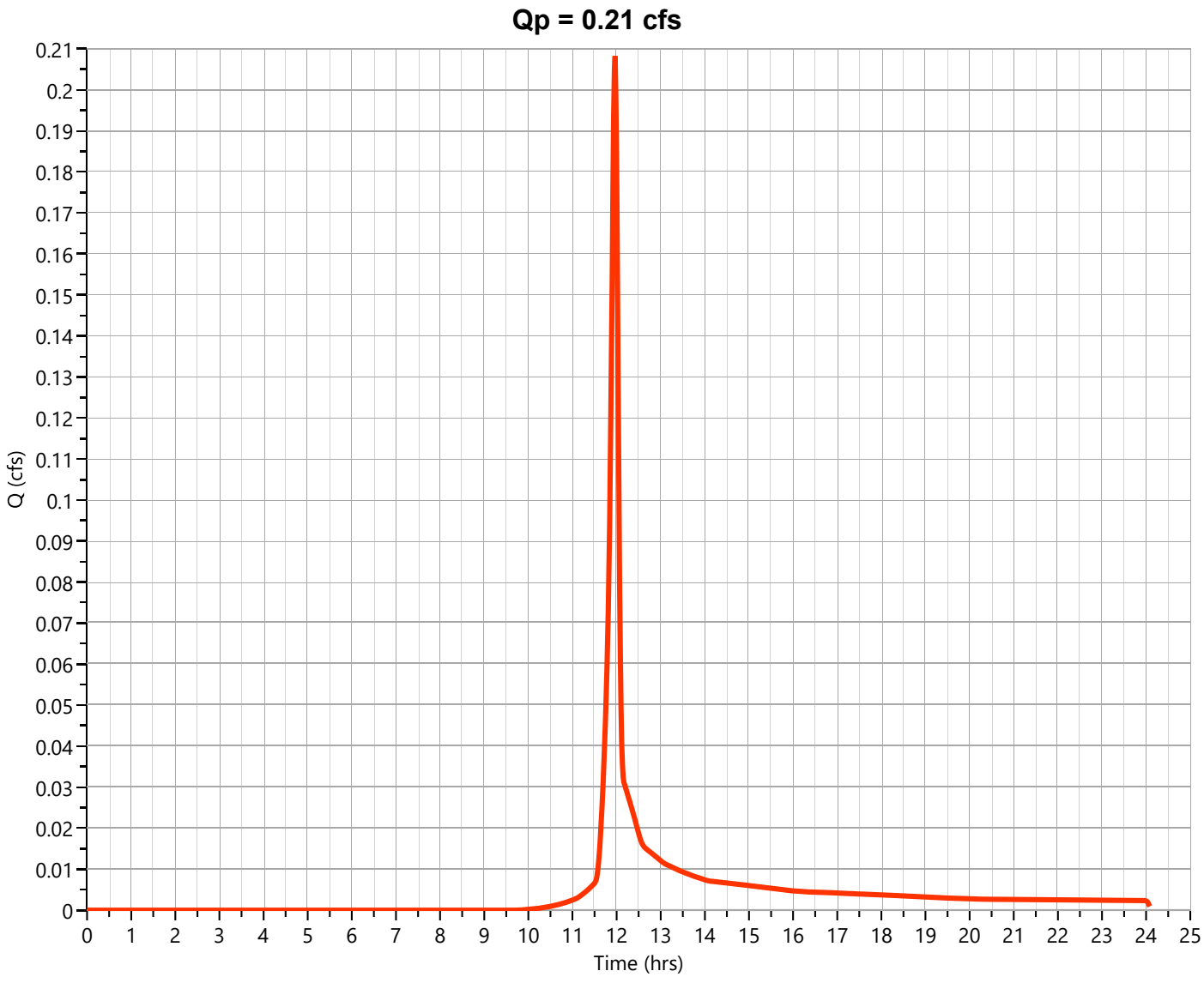
Post DA TO 118 WOODBIRDGE

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.208 cfs
Storm Frequency	= 2-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 418 cuft
Drainage Area	= 0.08 ac	Curve Number	= 77.38*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 3.42 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.07	77	Woods
0.01	80	Grass/open
0.08	**77**	Weighted CN Method Employed



Hydrograph 10-yr Summary

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	NRCS Runoff	Pre DA5	4.341	11.97	8,851	----		
2	NRCS Runoff	Post DA5 TO SWALE	3.377	11.97	6,912	----		
3	NRCS Runoff	Post DA5 SWALE BYPASS	0.998	11.97	2,023	----		
4	NRCS Runoff	Pre DA TO 118 WOODBRIDGE	0.575	11.97	1,166	----		
5	NRCS Runoff	Post DA TO 118 WOODBIRDGE	0.385	11.97	780	----		

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

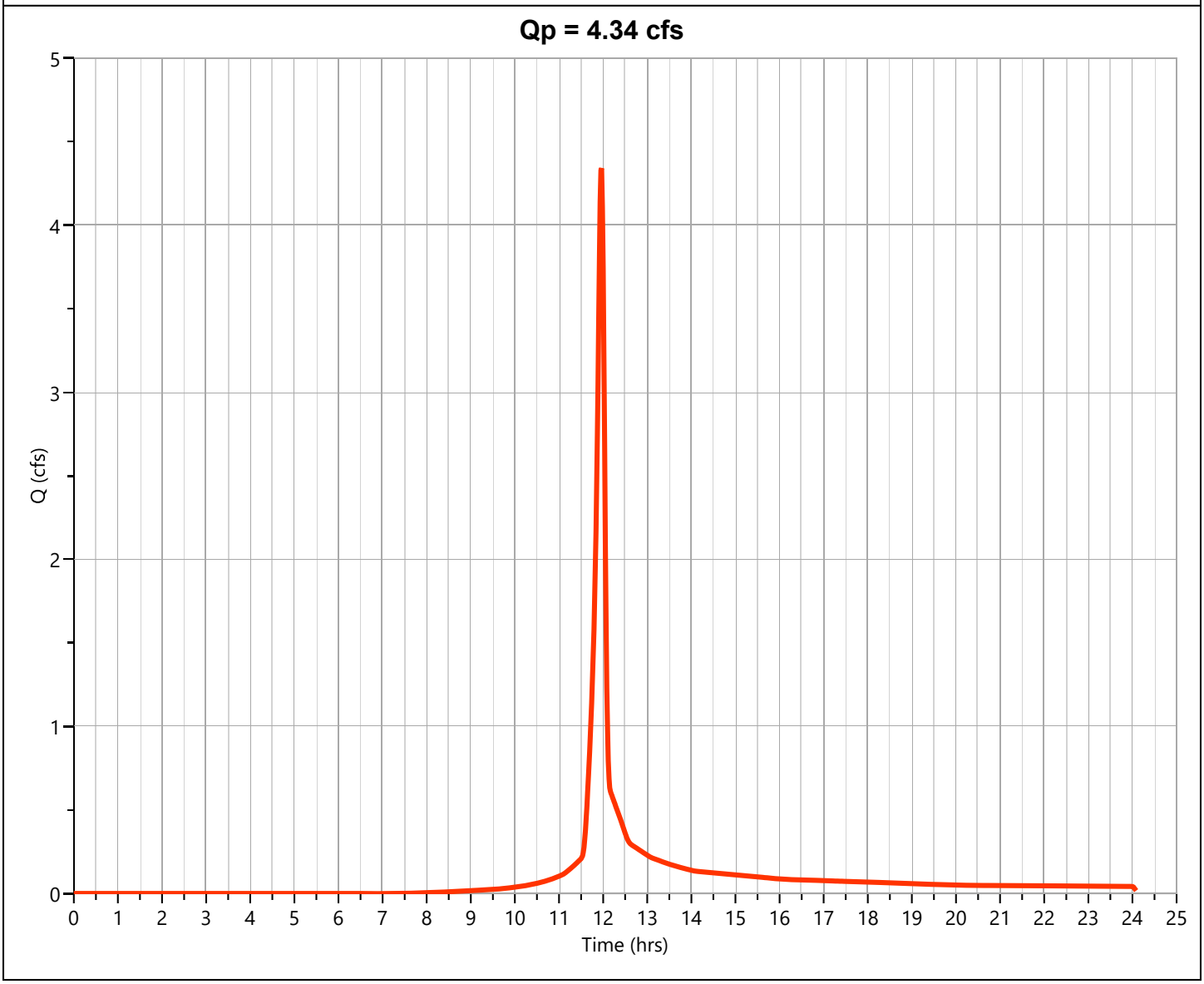
Pre DA5

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 4.341 cfs
Storm Frequency	= 10-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 8,851 cuft
Drainage Area	= 0.86 ac	Curve Number	= 78.99*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 4.94 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.06	98	Impervious
0.15	80	Grass/open
0.65	77	Woods
0.86	**79**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

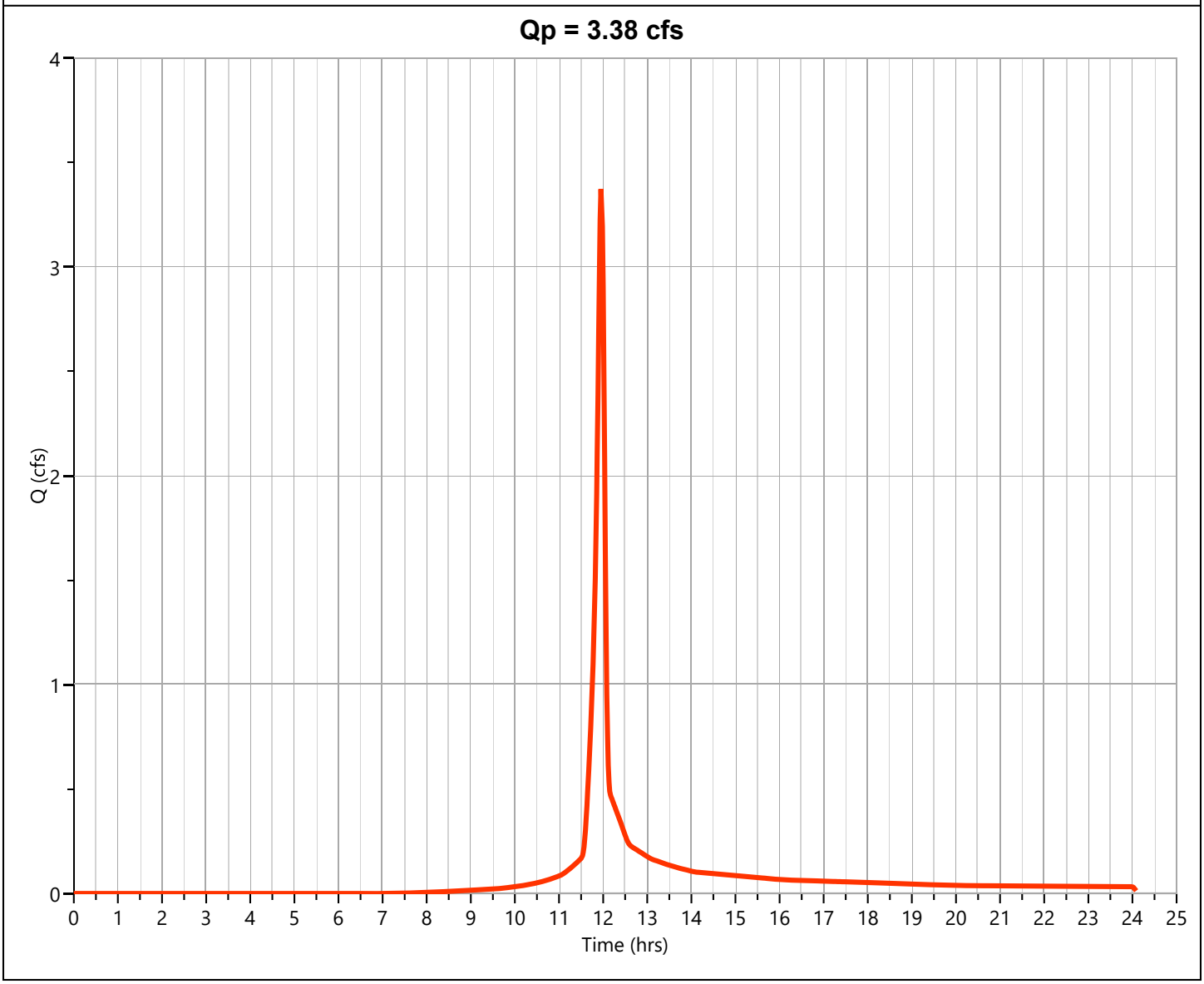
Post DA5 TO SWALE

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.377 cfs
Storm Frequency	= 10-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 6,912 cuft
Drainage Area	= 0.65 ac	Curve Number	= 80*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 4.94 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.06	98	Impervious
0.15	80	Grass/open
0.44	77	Woods
0.65	**80**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

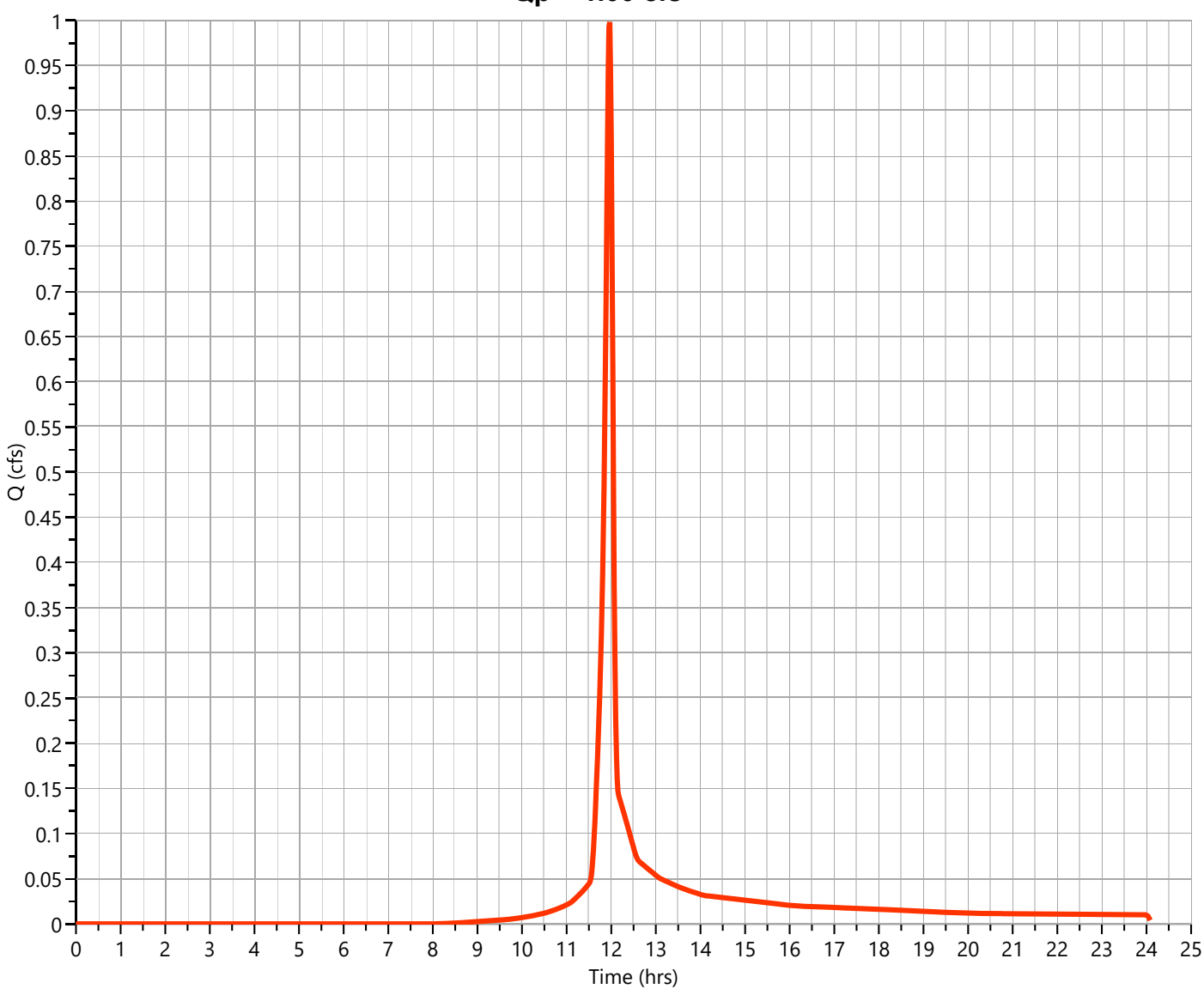
Post DA5 SWALE BYPASS

Hyd. No. 3

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.998 cfs
Storm Frequency	= 10-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 2,023 cuft
Drainage Area	= 0.21 ac	Curve Number	= 77*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 4.94 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.21	77	Woods
0.21	**77**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

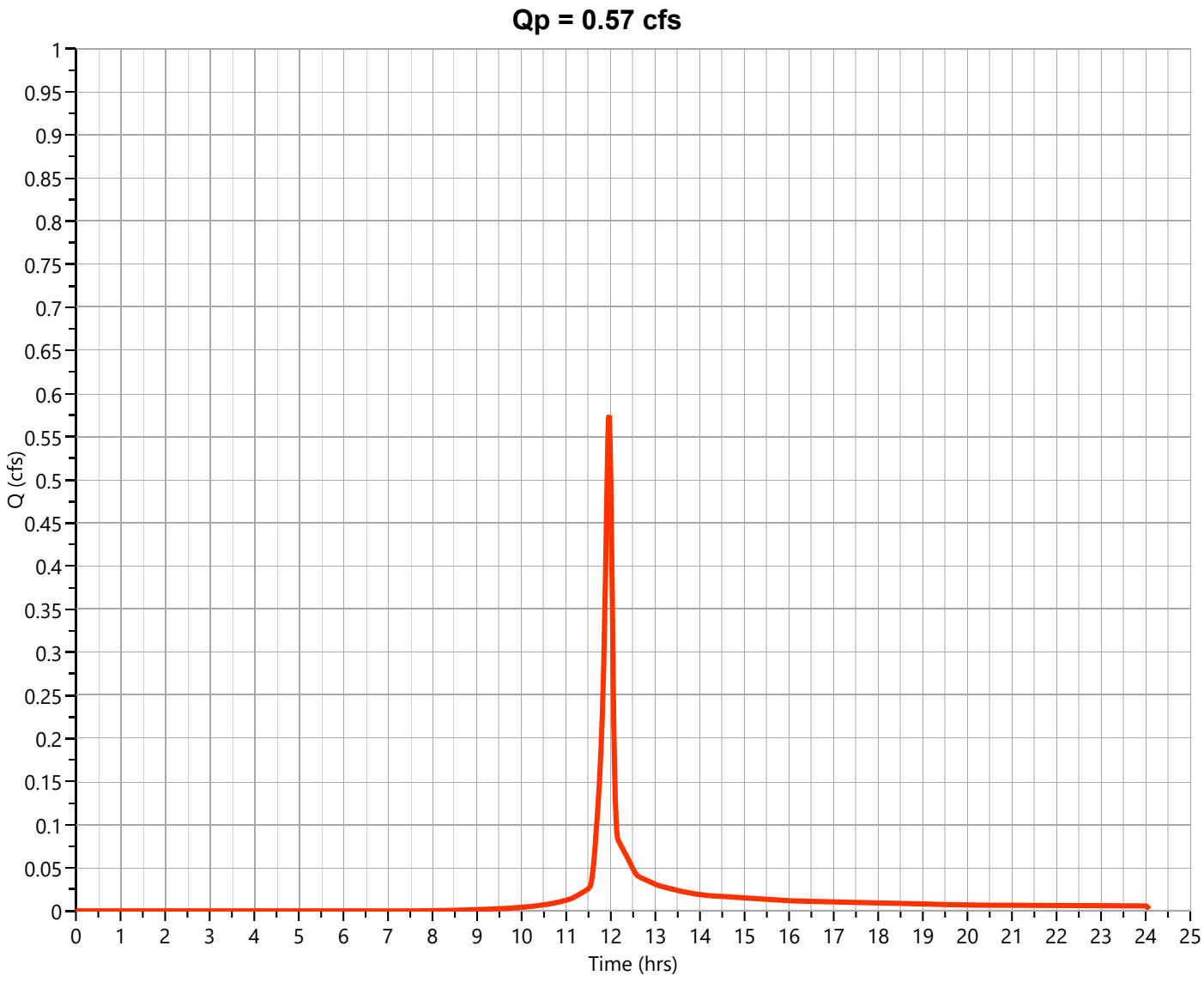
Pre DA TO 118 WOODBRIDGE

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.575 cfs
Storm Frequency	= 10-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 1,166 cuft
Drainage Area	= 0.12 ac	Curve Number	= 77.25*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 4.94 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.11	77	Woods
0.01	80	Grass/open
0.12	**77**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

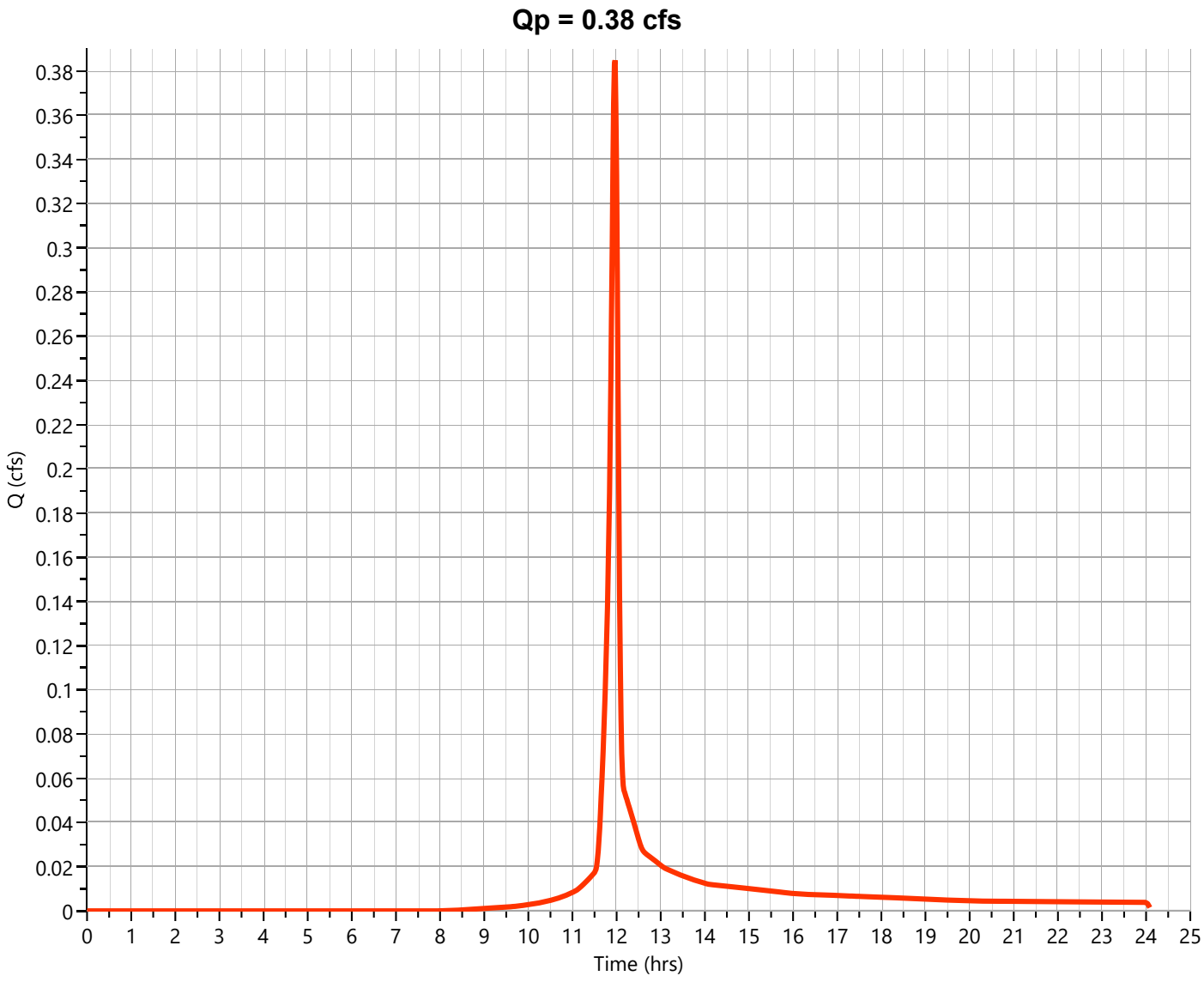
Post DA TO 118 WOODBIRDGE

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.385 cfs
Storm Frequency	= 10-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 780 cuft
Drainage Area	= 0.08 ac	Curve Number	= 77.38*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 4.94 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.07	77	Woods
0.01	80	Grass/open
0.08	**77**	Weighted CN Method Employed



Hydrograph 25-yr Summary

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	NRCS Runoff	Pre DA5	5.526	11.95	11,384	----		
2	NRCS Runoff	Post DA5 TO SWALE	4.281	11.95	8,850	----		
3	NRCS Runoff	Post DA5 SWALE BYPASS	1.284	11.97	2,625	----		
4	NRCS Runoff	Pre DA TO 118 WOODBRIDGE	0.738	11.97	1,511	----		
5	NRCS Runoff	Post DA TO 118 WOODBIRDGE	0.494	11.97	1,011	----		

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

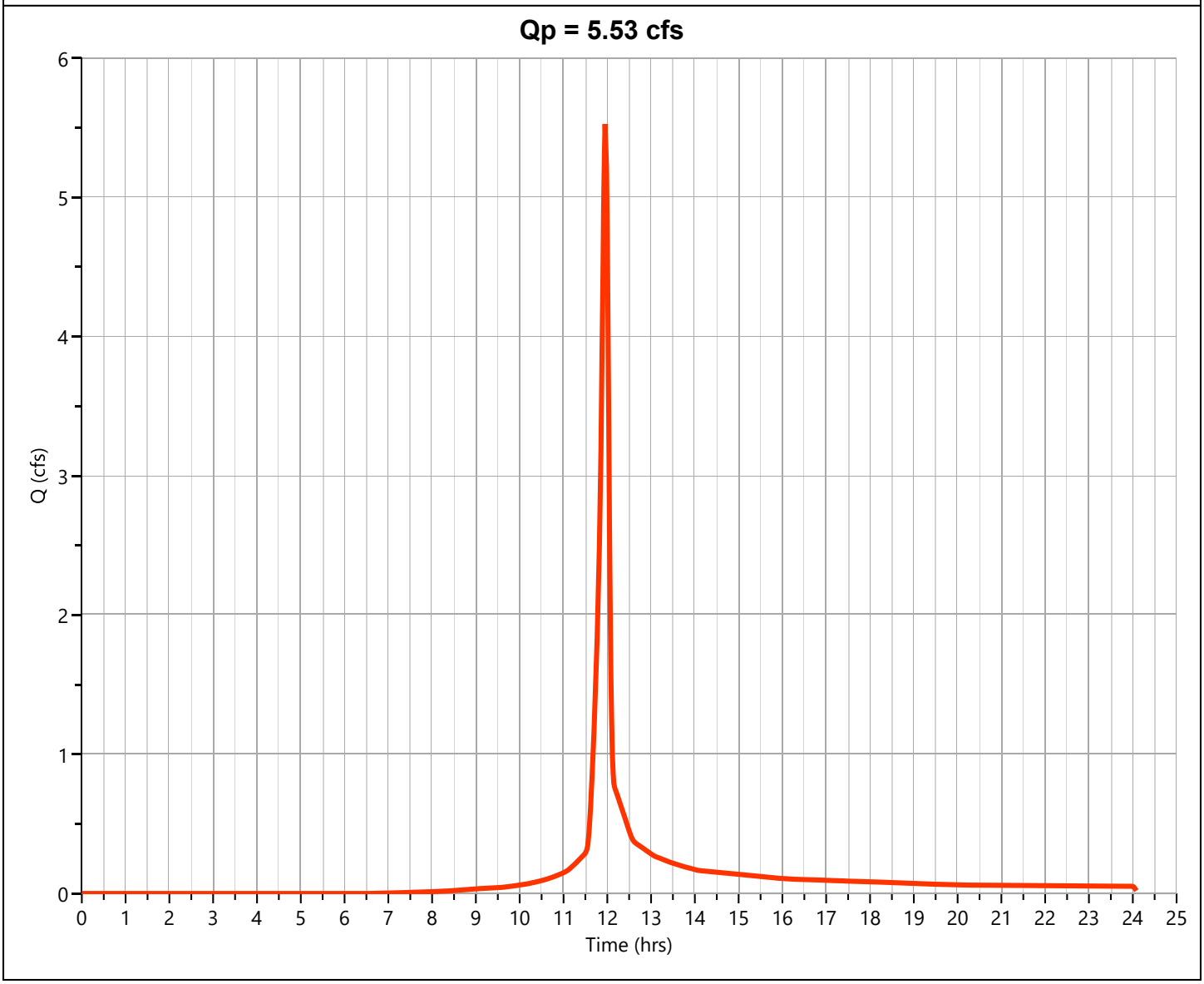
Pre DA5

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 5.526 cfs
Storm Frequency	= 25-yr	Time to Peak	= 11.95 hrs
Time Interval	= 1 min	Runoff Volume	= 11,384 cuft
Drainage Area	= 0.86 ac	Curve Number	= 78.99*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 5.84 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.06	98	Impervious
0.15	80	Grass/open
0.65	77	Woods
0.86	**79**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

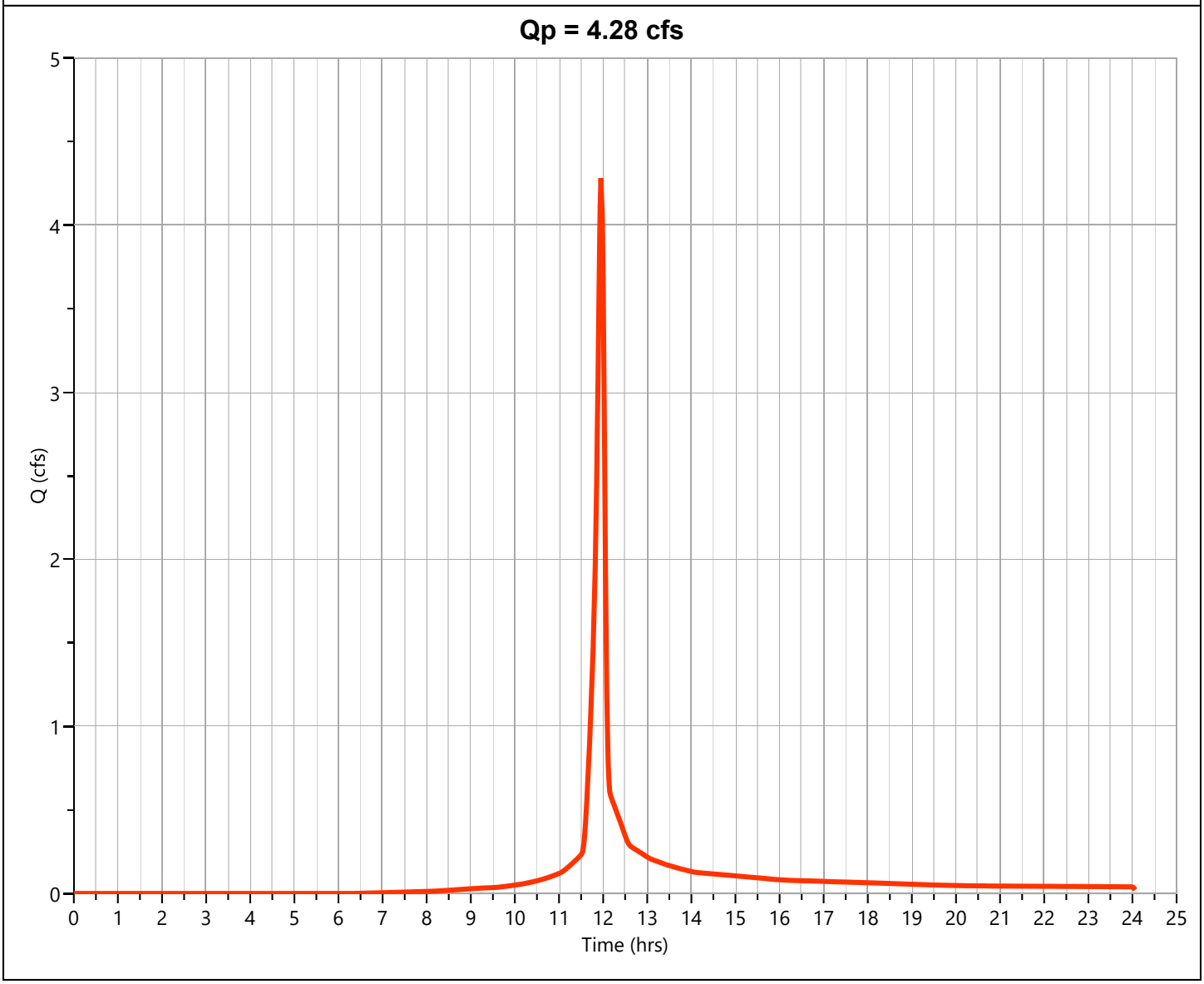
Post DA5 TO SWALE

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 4.281 cfs
Storm Frequency	= 25-yr	Time to Peak	= 11.95 hrs
Time Interval	= 1 min	Runoff Volume	= 8,850 cuft
Drainage Area	= 0.65 ac	Curve Number	= 80*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 5.84 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.06	98	Impervious
0.15	80	Grass/open
0.44	77	Woods
0.65	**80**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

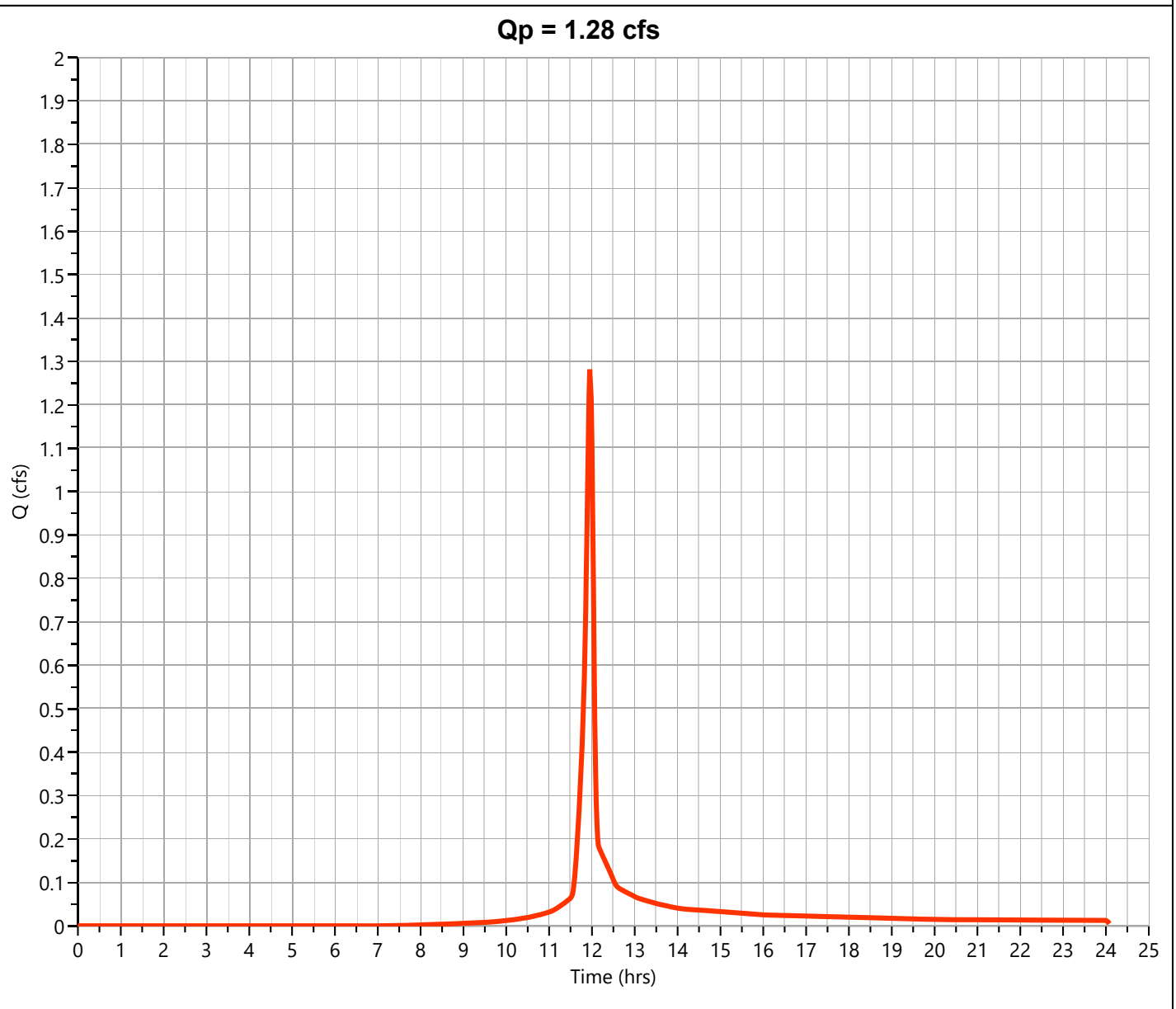
Post DA5 SWALE BYPASS

Hyd. No. 3

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.284 cfs
Storm Frequency	= 25-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 2,625 cuft
Drainage Area	= 0.21 ac	Curve Number	= 77*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 5.84 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.21	77	Woods
0.21	**77**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

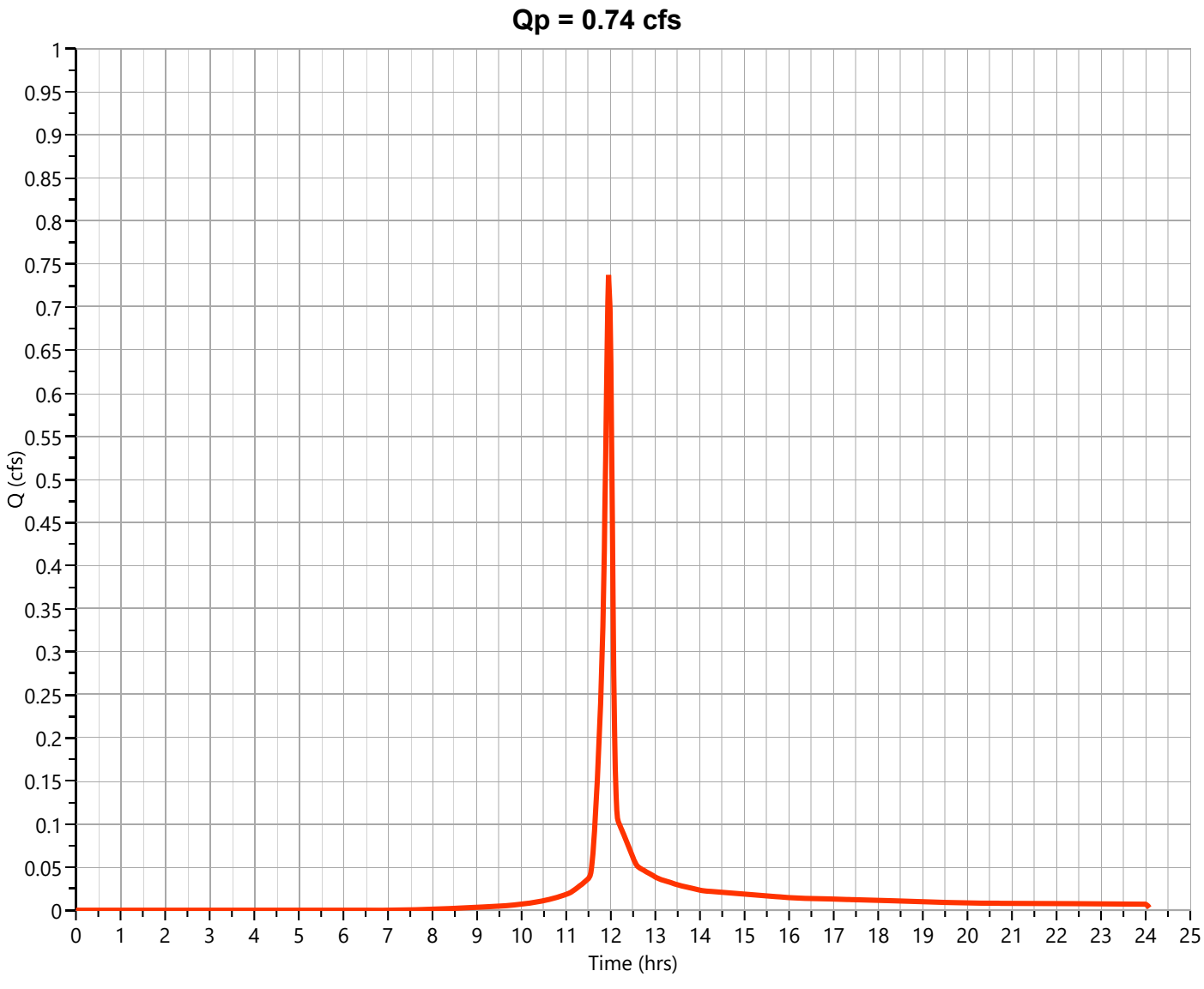
Pre DA TO 118 WOODBRIDGE

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.738 cfs
Storm Frequency	= 25-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 1,511 cuft
Drainage Area	= 0.12 ac	Curve Number	= 77.25*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 5.84 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.11	77	Woods
0.01	80	Grass/open
0.12	**77**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

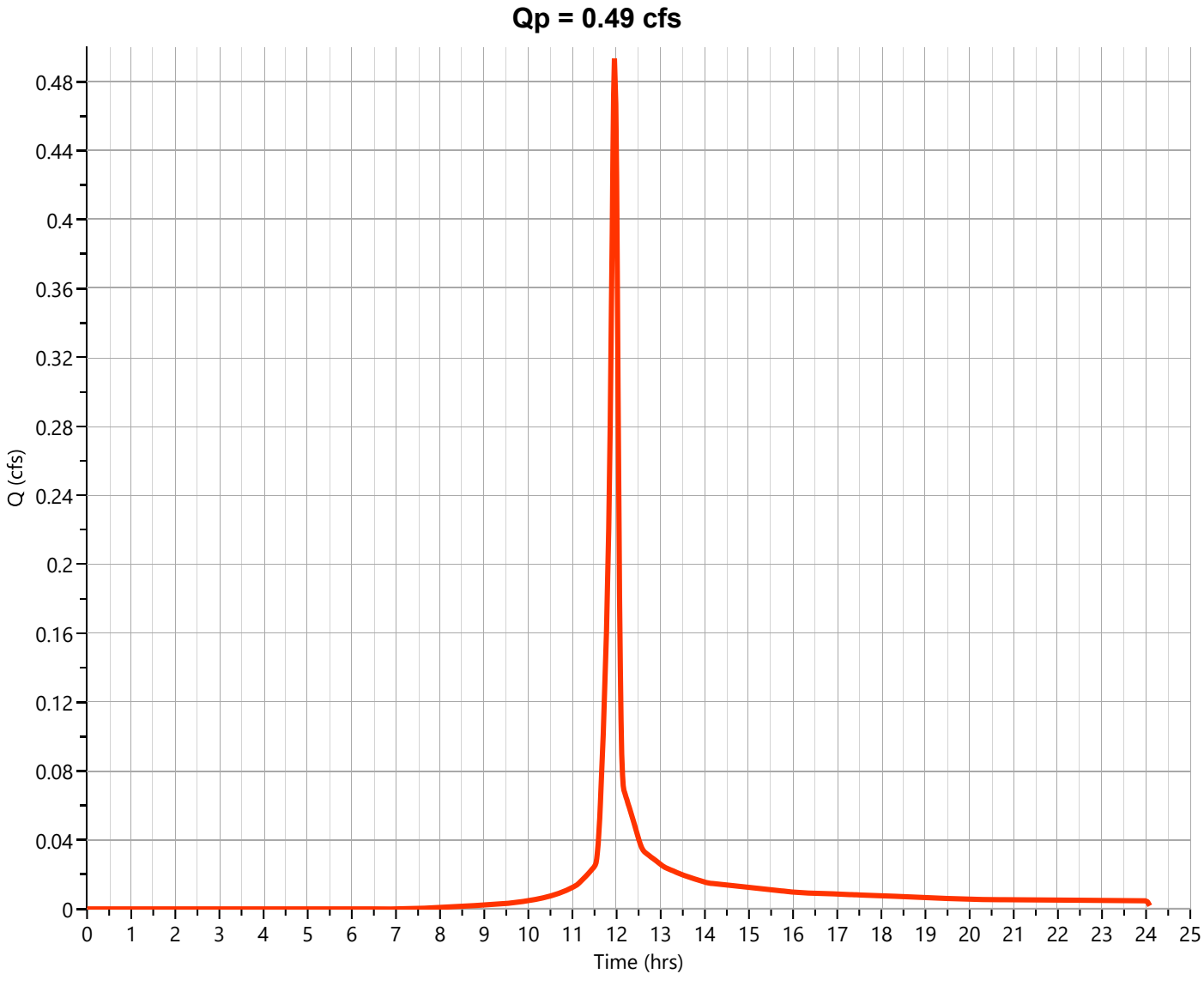
Post DA TO 118 WOODBIRDGE

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.494 cfs
Storm Frequency	= 25-yr	Time to Peak	= 11.97 hrs
Time Interval	= 1 min	Runoff Volume	= 1,011 cuft
Drainage Area	= 0.08 ac	Curve Number	= 77.38*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 5.84 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.07	77	Woods
0.01	80	Grass/open
0.08	**77**	Weighted CN Method Employed



Hydrograph 100-yr Summary

Project Name:

10-07-2021

Hydrology Studio v 3.0.0.20

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	NRCS Runoff	Pre DA5	7.450	11.95	15,553	----		
2	NRCS Runoff	Post DA5 TO SWALE	5.738	11.95	12,030	----		
3	NRCS Runoff	Post DA5 SWALE BYPASS	1.749	11.95	3,623	----		
4	NRCS Runoff	Pre DA TO 118 WOODBRIDGE	1.004	11.95	2,083	----		
5	NRCS Runoff	Post DA TO 118 WOODBIRDGE	0.671	11.95	1,393	----		

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

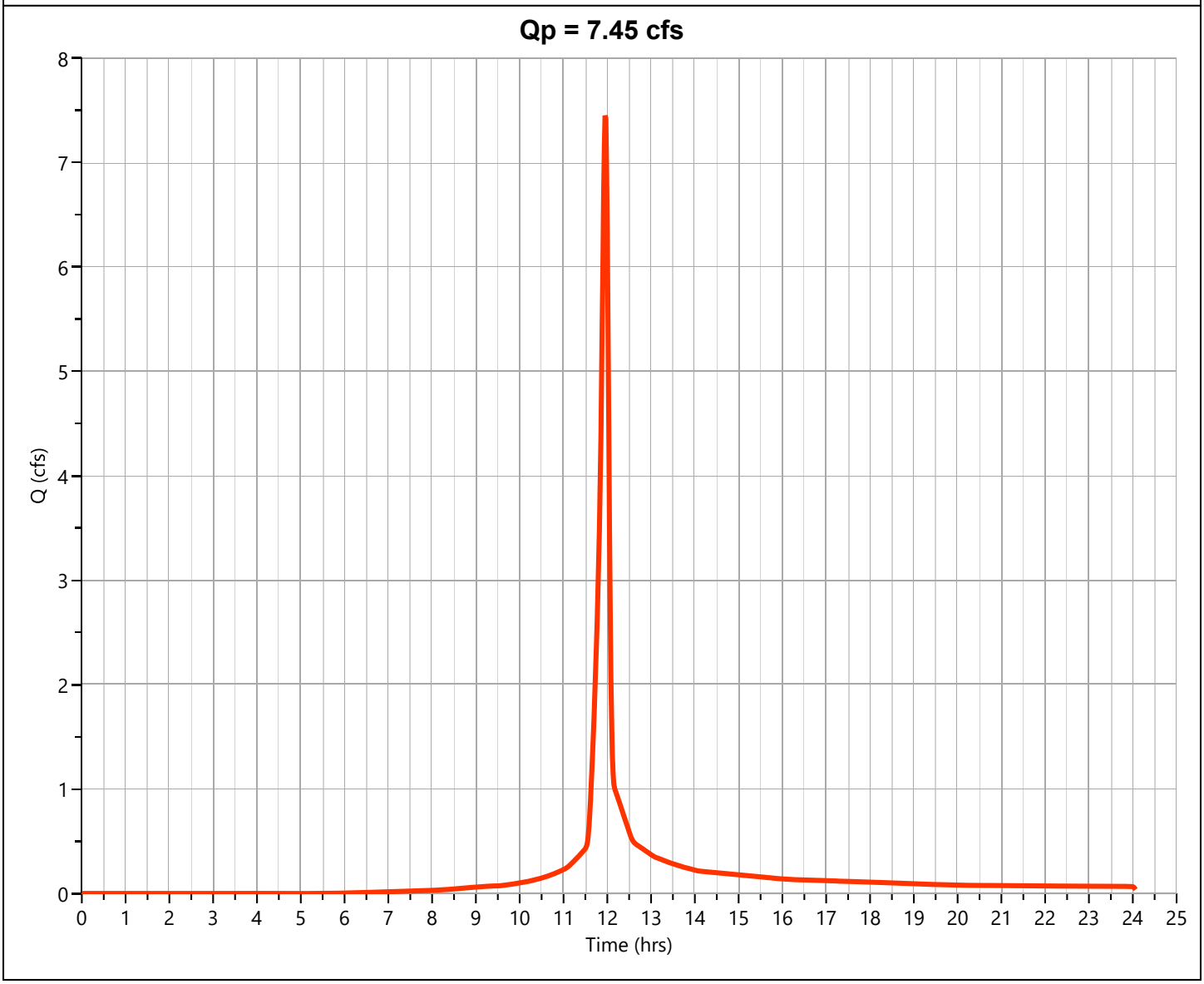
Pre DA5

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 7.450 cfs
Storm Frequency	= 100-yr	Time to Peak	= 11.95 hrs
Time Interval	= 1 min	Runoff Volume	= 15,553 cuft
Drainage Area	= 0.86 ac	Curve Number	= 78.99*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 7.27 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.06	98	Impervious
0.15	80	Grass/open
0.65	77	Woods
0.86	**79**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

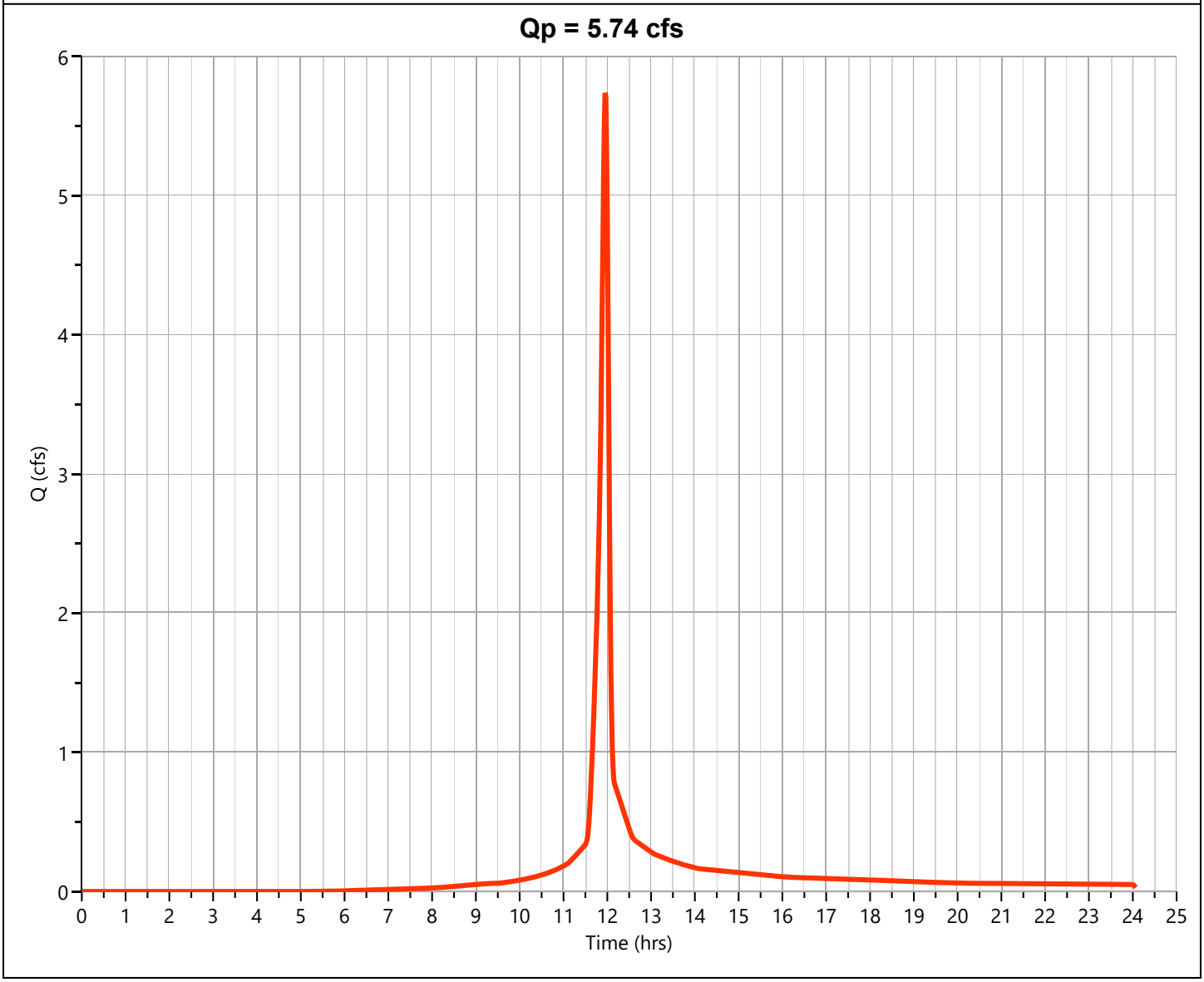
Post DA5 TO SWALE

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 5.738 cfs
Storm Frequency	= 100-yr	Time to Peak	= 11.95 hrs
Time Interval	= 1 min	Runoff Volume	= 12,030 cuft
Drainage Area	= 0.65 ac	Curve Number	= 80*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 7.27 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.06	98	Impervious
0.15	80	Grass/open
0.44	77	Woods
0.65	**80**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

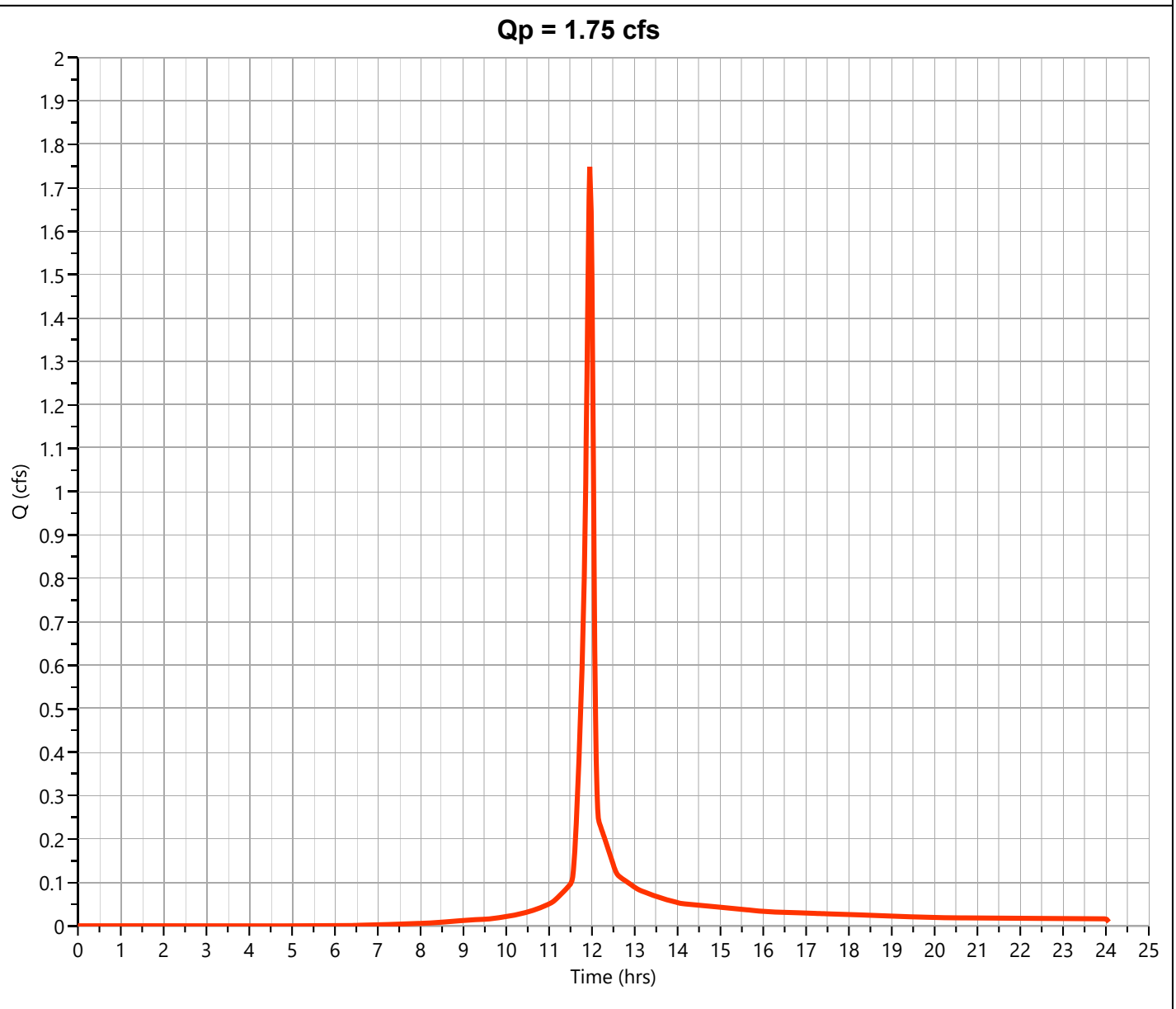
Post DA5 SWALE BYPASS

Hyd. No. 3

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.749 cfs
Storm Frequency	= 100-yr	Time to Peak	= 11.95 hrs
Time Interval	= 1 min	Runoff Volume	= 3,623 cuft
Drainage Area	= 0.21 ac	Curve Number	= 77*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 7.27 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.21	77	Woods
0.21	**77**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

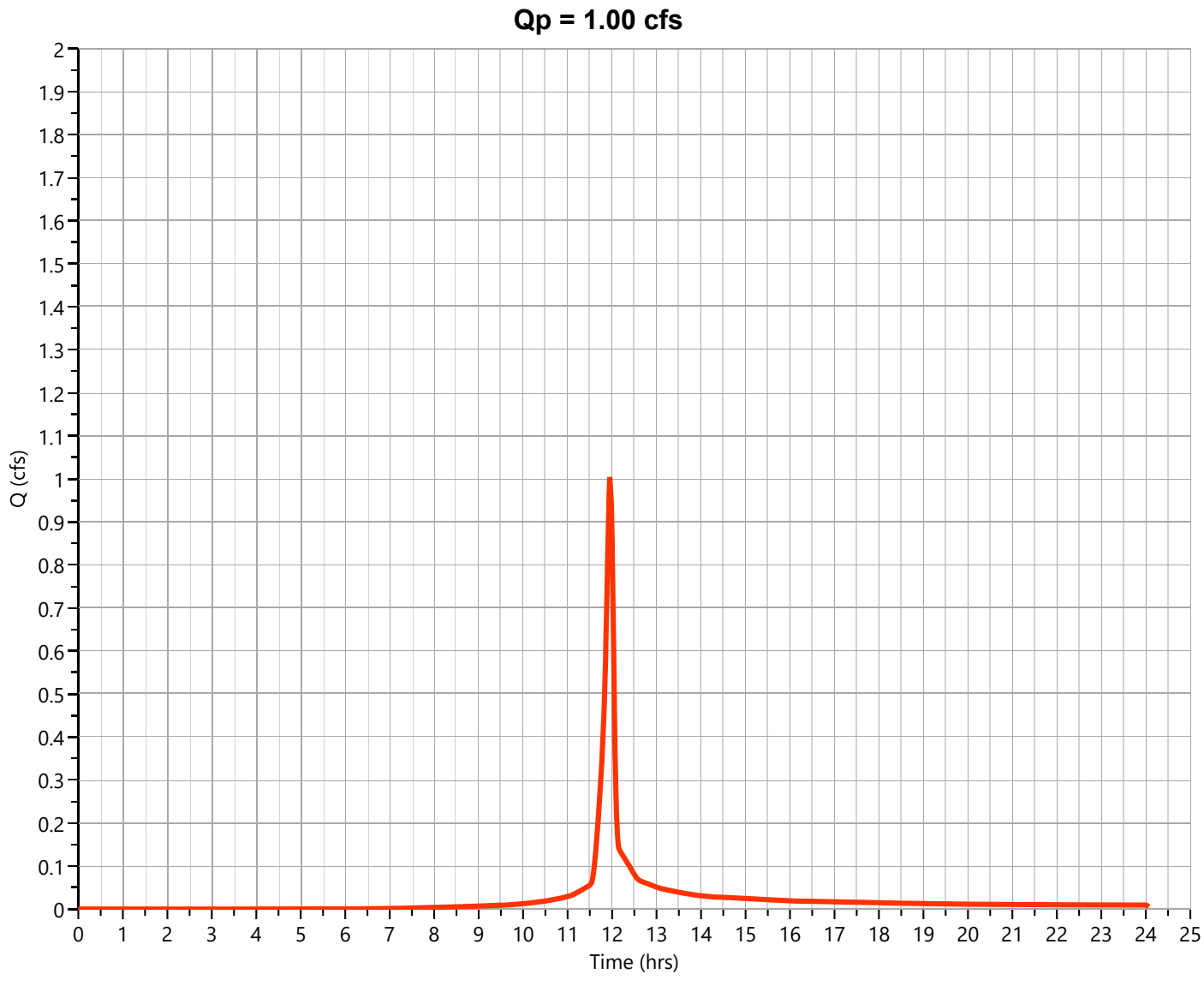
Pre DA TO 118 WOODBRIDGE

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.004 cfs
Storm Frequency	= 100-yr	Time to Peak	= 11.95 hrs
Time Interval	= 1 min	Runoff Volume	= 2,083 cuft
Drainage Area	= 0.12 ac	Curve Number	= 77.25*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 7.27 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.11	77	Woods
0.01	80	Grass/open
0.12	**77**	Weighted CN Method Employed



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.20

10-07-2021

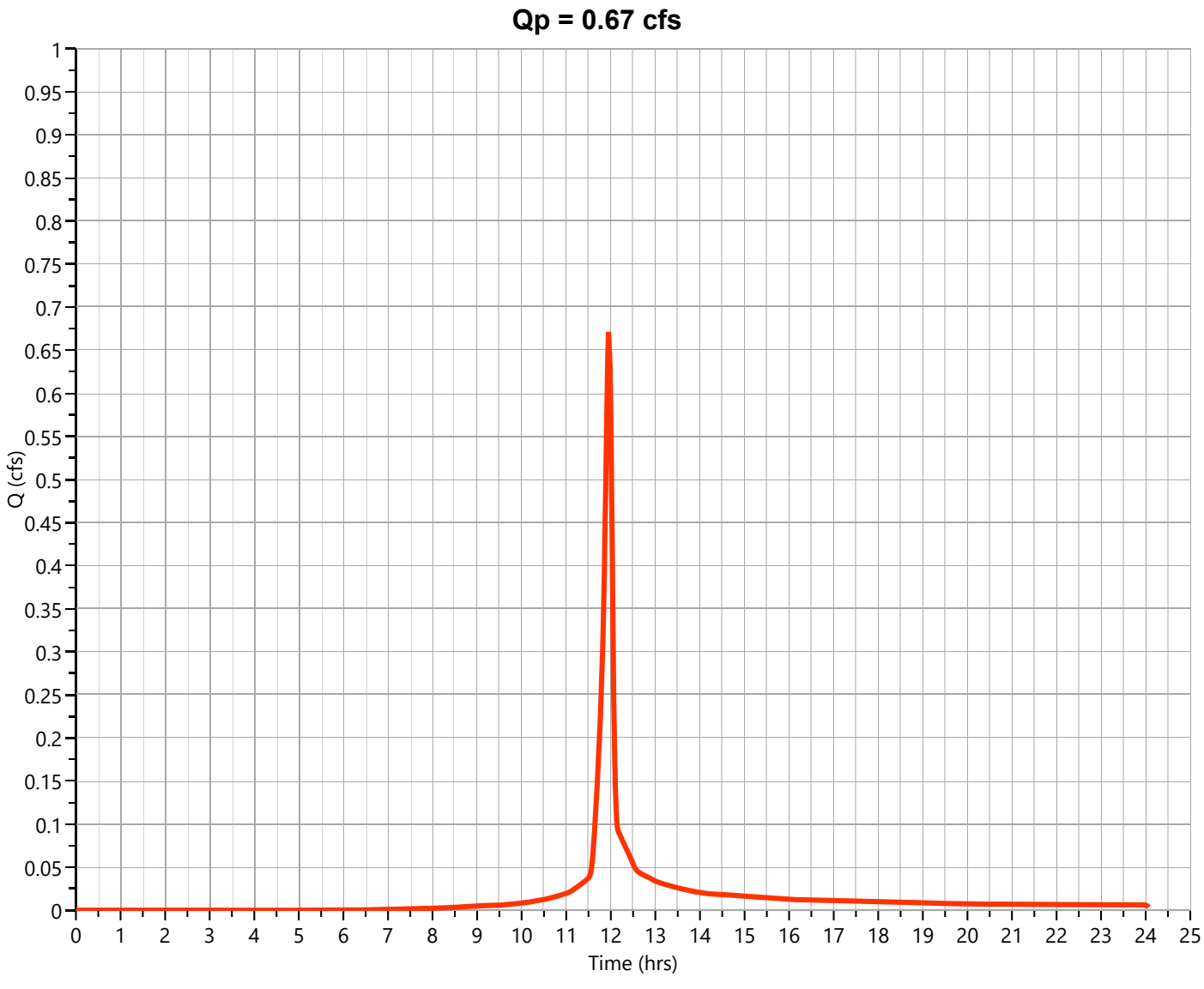
Post DA TO 118 WOODBIRDGE

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.671 cfs
Storm Frequency	= 100-yr	Time to Peak	= 11.95 hrs
Time Interval	= 1 min	Runoff Volume	= 1,393 cuft
Drainage Area	= 0.08 ac	Curve Number	= 77.38*
Tc Method	= User	Time of Conc. (Tc)	= 5.0 min
Total Rainfall	= 7.27 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484

*** Composite CN Worksheet**

AREA (ac)	CN	DESCRIPTION
0.07	77	Woods
0.01	80	Grass/open
0.08	**77**	Weighted CN Method Employed



APPENDIX D
SWALE CALCULATIONS

Channel Report

Project filename: SWALES ALONG WESTERN HOTEL BOUNDARY AT SUMMERFIELD CROSSING.stx

Studio Express by Hydrology Studio v 1.0.0.9

09-14-2021

SOUTH SWALE - FROM DA5

Channel 1

TRAPEZOIDAL

Bottom Width = 2.00 ft

Side Slope Left, z:1 = 3.00

Side Slope Right, z:1 = 3.00

Total Depth = 1.50 ft

Invert Elevation = 100.00 ft

Channel Slope = 2.000 %

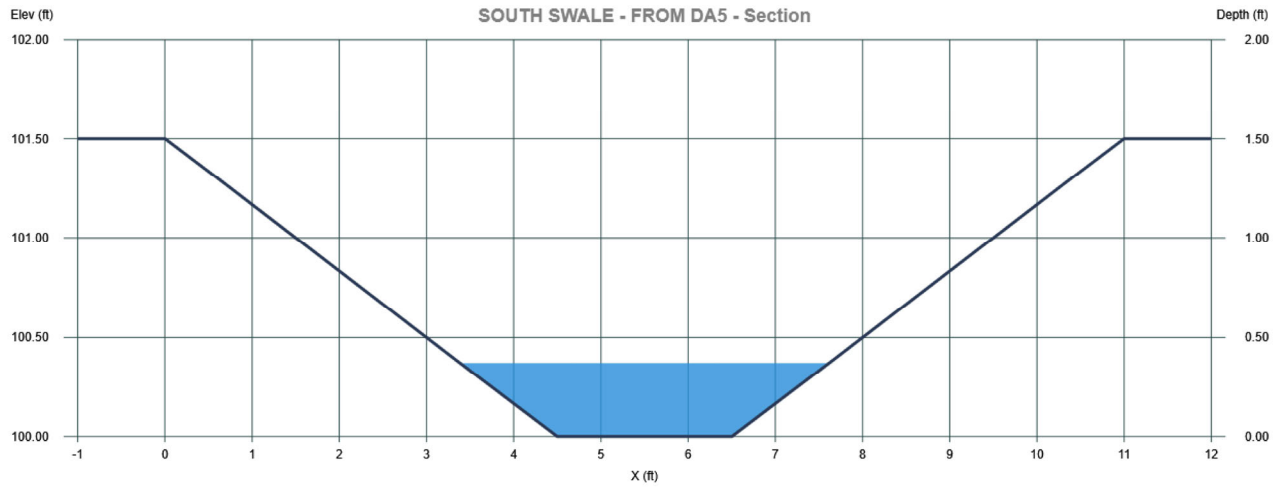
Manning's n = 0.030

DISCHARGE

Method = User-defined

CALCULATION SAMPLE Q10

Flow	Depth	Area	Velocity	WP	n-value	Crit Depth	HGL	EGL	Max Shear	Top Width
(cfs)	(ft)	(sqft)	(ft/s)	(ft)		(ft)	(ft)	(ft)	(lb/sqft)	(ft)
3.30	0.37	1.15	2.87	4.34	0.030	0.37	100.37	100.50	0.46	4.22



Channel Report

Project filename: SWALES ALONG WESTERN HOTEL BOUNDARY AT SUMMERFIELD CROSSING.stx

Studio Express by Hydrology Studio v 1.0.0.9

09-14-2021

SOUTH SWALE - FROM DA5

Channel 1

TRAPEZOIDAL

Bottom Width = 2.00 ft

Side Slope Left, z:1 = 3.00

Side Slope Right, z:1 = 3.00

Total Depth = 1.50 ft

Invert Elevation = 100.00 ft

Channel Slope = 2.000 %

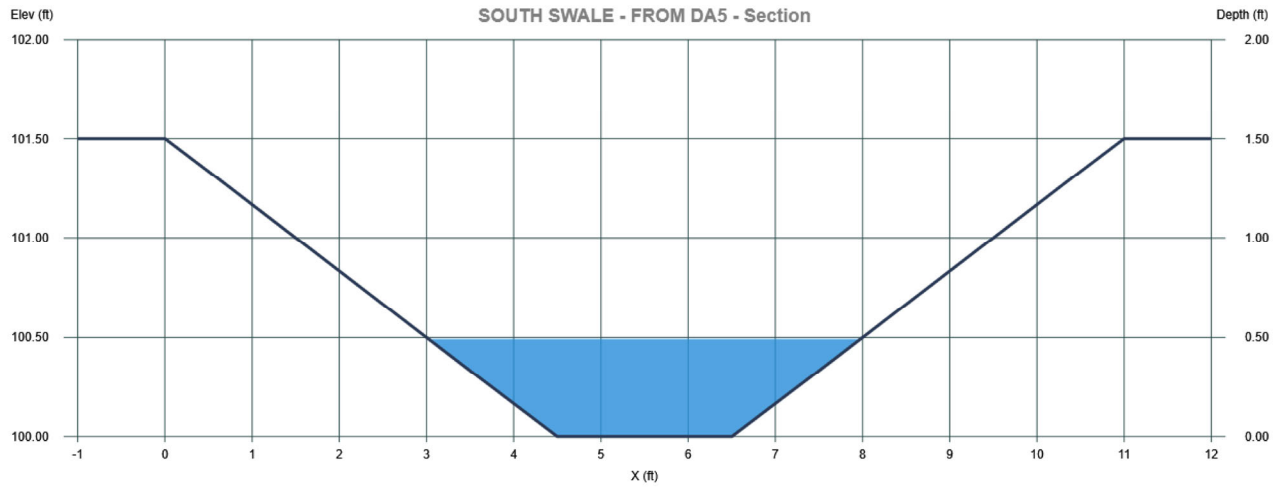
Manning's n = 0.030

DISCHARGE

Method = User-defined

CALCULATION SAMPLE Q100

Flow	Depth	Area	Velocity	WP	n-value	Crit Depth	HGL	EGL	Max Shear	Top Width
(cfs)	(ft)	(sqft)	(ft/s)	(ft)		(ft)	(ft)	(ft)	(lb/sqft)	(ft)
5.70	0.49	1.70	3.35	5.10	0.030	0.50	100.49	100.66	0.61	4.94



PROPOSAL

Wayne L. Adams, Inc.
P.O Box 995
Garner, NC 27529
(919)662-0095

PROPOSAL TO: RADWAY DESIGN **Phone** **Date 10/11/21**

Street **Job Name**
SWALE INSTALLATION –RESIDENCE INN

City, State and Zip Code **Job Location**

Date of Plans **Job Phone**

ROUGH BUDGET COST AT THIS TIME---PROPOSED SWALE ESTIMATED LENGTH 350 LF

INSTALL EROSION CONTROL CONSTRUCTION ENTRANCE & REMOVE LATER-- LOCATED AT RESIDENCE INN PARKING LOT

INSTALL ESTIMATED 920 LF TREE FENCE BOTH SIDES OF SWALE & 400 SILT FENCE ON DOWN HILL SIDE OF SWALE

HAUL IN MATERIAL & REMOVE LATER -- TO CREATE ROADWAY FOR TRUCKS TO ENTER SWALE SITE

CLEAR AND REMOVE TREES 20 -25 FOOT WIDE FOR TEMP. ACCESS ROAD FROM LOWER PARKING LOT AT RESIDENCE INN TO GAIN ACCESS TO PROPOSED SWALE WORK AREA & INSTALL TREE AND SILT FENCE AS NEEDED

TEMP BARRIADES INSTALLED IN RESIDENCE INN PARKING LOT

CLEAR & REMOVE TREES IN SWALE AREA ESTIMATED 420 LF X 25 FT WIDE

STRIP TROPSOIL FROM SWALE AREA AND HAUL OFF SITE FOR DISPOSAL

CUT & FILL PROPOSED SWALE TO GRADE +/.20 PER PLAN – **NO** HAUL OFF ANY EXCESS MATERIAL/DIRT FROM SWALE

REPAIR CURB IN RESIDENCE INN PARKING LOT UP TO 50 ft ONLY

DRESS UP AND SEED TEMP ACCESS ROAD W/ MATTING

DRESS UP AND SEED SWALE AREA WITH SEED & MATTING

REMOVE ALL TREE FENCE & SILT FENCE

We Propose hereby to furnish material and labor – complete in accordance with above specifications, for the sum of:

_____dollars **($ 168,000.00)**

BILLED ON 25TH OF MONTH—PAYMENT DUE ON 10TH OF FOLLOWING MONTH—PRICES ARE GOOD FOR 15 DAYS ONLY—FROM DATE OF PROPOSAL

Acceptance of PROPOSAL- The above prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work as specified. Payment will be made as outlined above.

ANY AND ALL LEGAL FEES PAID OUT BY WAYNE L. ADAMS INC TO COLLECT UNPAID INVOICES, OVER 30 DAYS LATE FROM DATE OF INVOICE—WILL BE REPAID TO WAYNE L. ADAMS INC., BY OWNER OF PROJECT OR GENERAL CONTRACTOR. 1.5% ADDITIONAL COST TO BE ADDED TO ALL INVOICES OVER 30 DAYS PAST DUE DATE.

Signature_____

Signature_____

Date of Acceptance:

PROPOSAL

Wayne L. Adams, Inc.
P.O Box 995
Garner, NC 27529
(919)662-0095

PROPOSAL TO: RADWAY DESIGN **Phone** **Date 10/11/21**

Street	**Job Name** SWALE INSTALLATION –RESIDENCE INN
City, State and Zip Code	**Job Location**
Date of Plans	**Job Phone**

BID DOES NOT INCLUDE THE FOLLOWING ITEMS: UNDERCUT BAD / WET SOIL, TRENCH OR ROCK REMOVAL, PERMITS, FEES, BONDS, ENCROACHMENTS, DIRT MOISTURE CONTROL/ (WETTING OR DRYING), SOIL TESTING, LIQUIDATED DAMAGES, TREE & PLANT INSTALLATION, NPDES RAINFALL RECORDS MAINTAINED, REMOVAL OR DISPOSAL OF ANY HAZARDOUS MATERIAL, SURVEY, REPAIR OR REPLACE ANY PART OF THE SWALE DURING CONSTRUCTION & AFTER CONSTRUCTION DUE TO RAIN / WATER RUN-OFF, REPAIR OR REMOVE ANY EROSION CONTROL DAMAGE OUTSIDE OF THE SWALE WORK AREA, ASPHALT REPAIR, ANY ADDITIONAL EROSION CONTROL REQUIRED BEYOND WHAT IS INCLUDED IN PROPOSAL, HAUL OFF ANY EXCESS SWALE MATERIAL/ DIRT

NOTES:
WAYNE L. ADAMS INC WILL NOT BE RESPONIBLE FOR DAMAGE OR REPLACEMENT/OR COST OF ANY TREES DAMAGED DURING CONSTRUCTION OR AFTER CONSTRUCTION IS COMPLETED

ALL SEEDING IS FOR ONE TIME INSTALLATION—NO DETAIL PROVIDED

ADDITIONAL COST MAY APPLY AFTER PLANS ARE APPROVED AND SENT OUT FOR REVIEW

ANY ASPAHLT REPAIR WILL BE AT $185.00 SY (SAWCUT, REMOVE NO MORE THAN 2.5" ASPHALT AND REPLACE WITH UP TO 2.5" ASPHALT--- EACH PAVING JOB WILL BE $2200.00 FOR MOBILIZATION

We Propose hereby to furnish material and labor – complete in accordance with above specifications, for the sum of:

_____dollars **($)**

BILLED ON 25TH OF MONTH—PAYMENT DUE ON 10TH OF FOLLOWING MONTH—PRICES ARE GOOD FOR 15 DAYS ONLY—FROM DATE OF PROPOSAL

Acceptance of PROPOSAL- The above prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work as specified. Payment will be made as outlined above.
ANY AND ALL LEGAL FEES PAID OUT BY WAYNE L. ADAMS INC TO COLLECT UNPAID INVOICES, OVER 30 DAYS LATE FROM DATE OF INVOICE—WILL BE REPAID TO WAYNE L. ADAMS INC., BY OWNER OF PROJECT OR GENERAL CONTRACTOR. 1.5% ADDITIONAL COST TO BE ADDED TO ALL INVOICES OVER 30 DAYS PAST DUE DATE.

Signature_____

Signature_____

Date of Acceptance: _____