STORMWATER MANAGEMENT REPORT

Proposed Parking Structure

250 King of Prussia Road

Radnor Township, Delaware County, Pennsylvania

Prepared for

BDN 250 King of Prussia I, LP

2929 Walnut Street
Philadelphia, PA 19104

Prepared By:

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LEC Project No:	**200002**
Date:	**February 19, 2021**
Revised:	**May 3, 2021**

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LANDCORE
Engineering Consultants, P.C.

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1.0 PROJECT DESCRIPTION

The applicant is proposing the redevelopment of a portion of the property located at 250 King of Prussia Road (PIN 36-02-01158-00. The project proposes the construction of a new 32,660-sf parking structure with associated parking, utilities and stormwater management systems. A project location map can be found in the appendix.

Tract Area: **8.28 acres**
Limit of Disturbance: **0.93 acres**

2.0 SITE CHARACTERISTICS

2.1 EXISTING CONDITIONS

The area of work is currently a fully developed paved surface parking lot. The site slopes southeast to a series of inlets in a shared access drive and then conveyed to the nearby outfall via an existing storm pipe network. The site is gradually sloping in a northwest to southeast direction. Surface runoff is generally sheet flow or shallow concentrated flow intercepted in a conveyance channel within the access road. Therefore, a single point of interest will be utilized for regulatory requirements.

The project is located within the B-1 SWM District according to the Radnor Township Stormwater Management Districts map.

2.2 PROPOSED CONDITIONS

The project proposes the construction of a new parking structure and the associated modifications to the existing parking lot. These improvements include curb and pavement demolition, the re-routing of an 8" sanitary main, minor modifications to the existing primary structure, and one underground extended detention basin. The proposed areas will receive pre-treatment with the installation of inlet snouts and sumps.

2.3 RECEIVING WATERS

The SITE is within the Hardings Run Creek watershed. The creek is immediately downstream of the Creek. Runoff from the site is intercepted by onsite inlets and conveyed by a pipe network to the creek. This section of the watercourse is classified as Cold Water Fishery (CWF) on the Pennsylvania Department of Environmental Protection (PADEP) Chapter 93 classification list.

2.4 PROJECT AREA SOILS

The site was evaluated using the latest soil survey information and mapped accordingly. The soil types for this site were obtained from the United States Department of Agriculture NRCS Web Soil

Survey and a custom report generated (see Appendix). The mapped area extended beyond the property boundary line to ensure adequate coverage of the site.

Table 1: Site Soils

Soil ID	Description	Slopes	Hydrologic Soil Group
GrB2	Glenville silt loam	3% - 8%	C/D
Md	Made land, gabbro and diabase materials	-	D

Soil Infiltration Characteristics: Soils investigations were performed on site in accordance with a concept sketch for the proposed development. Infiltration practices are *not proposed* based on the results of the investigation. See Geotechnical Report, by others, for more detailed information.

2.5 FLOODPLAINS

The site does NOT lie within a regulated flood area. FEMA's Flood Insurance Rate Map for Delaware County, PA, map numbers "42045C0036F", effective on 11/18/2009, designates the site and surrounding area as "Zone X" or "Areas determined to be outside the 0.2% (500-year) annual chance floodplain" (see Map in Appendix).

2.6 WETLANDS

There are no wetlands located within the project limits.

3.0 DESIGN CRITERIA

The stormwater design standards for the development are set forth by Radnor Township "Stormwater Management" ordinance. Specific design standards and project site conditions are as follows:

3.1 RADNOR TOWNSHIP STORMWATER MANAGEMENT ORDINANCE (ORDINANCE NO. 2005-11)

1. §405-A.2.a Groundwater Recharge: the recharge (infiltration) volume (Rev) to be captured and infiltrated shall be the volume difference between the pre-development two-year, twenty-four-hour storm event and post-development two-year, twenty-four-hour storm event.

   A waiver from section 405 is requested due to the infeasibility of infiltration. Refer to the Geotechnical Report, prepared by others, for justification based on restrictive soils.

2. §406.D Water Quality Requirements: provide for replication of preconstruction stormwater infiltration and runoff conditions so that post-construction stormwater

discharges do not degrade the physical, chemical, or biological characteristics of the receiving waters.

3. §407.A Streambank Erosion Requirements: the primary requirement is to design a BMP to detain the proposed conditions two-year, twenty-four-hour design storm to the existing conditions one-year flow using the SCS Type II distribution. Additionally, provisions shall be made so that the proposed conditions one-year storm takes a minimum of 24 hours to drain from the facility from a point where the maximum volume of water from the one-year storm is captured. Release of water can begin at the start of the storm (i.e., the invert of the water quality orifice is at the invert of the facility).

4. §151-24 Peak Rate Control: In Stormwater District B-1 the design storm criteria for peak runoff rate control are designed to reduce the post-development peak flow to the predevelopment peak flow. Development sites must control proposed conditions runoff rates to the existing conditions as follows:

Table 2: Allowable Post Development Release Rates

Design Storm	Pre-Developed Release Rate
2-yr	1-yr
5-yr	1-yr
10-yr	5-yr
25-yr	10-yr
50-yr	25-yr
100-yr	100-yr

METHODOLOGY

The SCS Method was utilized to analyze the pre-development and post-development stormwater flows. The computer program "Hydrocad" Ver. 10 by "Hydrocad Software Solutions LLC" was used to calculate and plot the runoff hydrographs. The SCS Method incorporates the time of concentration, CN values, 24-hour rainfall and associated drainage area to calculate the runoff rates. Input values were obtained from: existing and proposed site conditions, PennDOT Design Manual No. 2, PADEP Erosion and Sediment Pollution Control Program Manual, PA DEP BMP Manual and the Stormwater Management requirements of the Township of Limerick.

3.2 RUNOFF CURVE NUMBER (CN)

To determine the existing and proposed conditions weighted runoff curve numbers, the drainage areas were broken down into the various land cover types for each hydrological soil group as obtained by the Montgomery County Soils map. CN values for pre-development and post development conditions were taken from Radnor SWM ordinance Appendix Runoff Curve Numbers. See the Runoff Calculations CN Worksheet in the Appendix of this report.

Since the site is fully developed, for the purpose of the hydrological study, all soils type will be considered belong to Hydrologic Group "D".

3.3 Rational Coefficient (c)

The conveyance systems have been designed using the rational equations to determine peak runoff rates within the systems. The cover conditions within the respective structure/systems drainage area was evaluated conservatively as 100% impervious in accordance with the following coefficients per Appendix Table F-3:

Table 3: Rational Equation Coefficients

Cover Type	Coefficient (c)
Paved Parking Lots	0.99

3.4 Time of Concentration (TOC)

Time of concentrations where determined based on the methodology specified in the USDA Urban Hydrology for Small Watersheds (TR55) manual. Since the time of concentration for the pre-developed condition was less than six, the minimum time of concentration of 6 minutes was utilized.

3.5 Design Storm Rainfall

Design storm rainfall values were taken from Appendix Table F-1. Storm intensity values were taken from NOAA Atlas 14, Volume 2, Version 3, location Wayne, PA. See Appendix for NOAA rainfall report.

3.6 Runoff Hydrograph

Hydrographs for the 1-yr through 100-yr storms were computed with the SCS TR-55 Method utilizing Hydrocad version 10.0 software and the weighted CN's and time of concentration values computed as mentioned above. See the runoff hydrograph in the Appendix of this report for details.

4.0 Analysis

4.1 Peak Rate Analysis

Pre-Development: Runoff from the project site flows via sheet flow and shallow concentrated flow to the existing network of inlets and pipes in the shared access road to the southeast where it is then conveyed to an outfall in the adjacent creek. The project site has been analyzed with single study point, EX-A. As shown in the routing diagram, the pre-development conditions were subdivided into 2 categories: the portions within the limit of disturbance which define the reduction requirements in the post development condition, and those areas that are outside of the LOD. Off-site areas will utilize the present cover conditions for pre- and post-development calculations without adjustment.

This area was also divided to isolate the on-site flows in the pre-development condition for use in the required release rate calculations.

- Drainage Area EX-A: the area to be disturbed and those arears immediately upstream of the disturbance area that is tributary to the creek.

Post-Development: The post-development drainage nodes are described as follows (refer to the drainage area maps in the appendix):

- Drainage Area A1: The area tributary to the proposed underground storm system, both disturbed and undisturbed.
- Drainage Area A2: The area bypassing the proposed underground storm system, both disturbed and undisturbed.
- UG-01: A new 36" ADS underground storm system designed to provide the required rate reductions.
- A: The composite hydrograph of UG-01 and A2

The following table summarizes the peak rate analysis for the project.

Table 4: Peak Discharge Summary

	EX-A								A	
STORM EVENT	LOD RUNOFF (CFS)	TARGET RATE* EX COND. DESIGN STORM	TARGET RATE* RATE (CFS)		NON-LOD RUNOFF (CFS)		ALLOWABLE RUNOFF (CFS)		RUN-OFF (CFS)	NET CHANGE (CFS)
1-YEAR	1.72	1-YEAR	1.72	+	5.12	=	6.84		6.20	***-0.64***
2-YEAR	2.36	1-YEAR	1.72	+	6.89	=	8.61		8.16	***-0.45***
5-YEAR	3.26	1-YEAR	1.72	+	9.32	=	11.04		10.78	***-0.26***
10-YEAR	4.18	5-YEAR	3.26	+	11.8	=	15.06		13.43	***-1.63***
25-YEAR	5.11	10-YEAR	4.18	+	14.3	=	18.48		16.04	***-2.44***
50-YEAR	6.06	25-YEAR	5.11	+	16.83	=	21.94		21.26	***-0.68***
100-YEAR	7.24	100-YEAR	7.24	+	20	=	27.24		24.74	***-2.50***
* PER TABLE 408.1										

Stream Bank Erosion (Dewatering): The stormwater ordinance requires the 1 year storm event be detained for a minimum of 24 hours. The controls will dewater in greater than 24 hours (refer to the appendix for calculations.) The proposed diameter of the orifice is 1" and is protected from clogging by the upstream 48" water quality manifold which is sumped 12" lower than the 36" pipes in UG-01.

4.2 RECHARGE VOLUME

See the REv/WQv calculation worksheet in the appendix for the required recharge volume.

A waiver from section 405 is requested due to the infeasibility of infiltration. Refer to the Geotechnical Report, prepared by others, for justification based on restrictive soils.

4.3 WATER QUALITY DESIGN

See the REv/WQv calculation worksheet in the appendix for the required Water Quality volume. The

During the 2-year storm event, 11,539 cf is routed through a 48" water quality manifold that is sumped 12" lower than the rest of the 36" pipes within UG-01 which will trap suspended solids. This volume is much greater than the required WQ volume.

4.4 CONVEYANCE DESIGN

Storm sewers have been designed for inlet capacity and conveyance of the 25-yr storm design storm for structures within the tributary are of the peak control device. The Rational Method was utilized to analyze the stormwater flows. The rainfall intensities are taken from NOAA Atlas 14, Volume 2, Version 3. The "Hydraflow Storm Sewers" design data is located in the Appendix of the report.

The computer program "Hydraflow Storm Sewers Extension for Autocad Civil 3D" Ver. 2019 by Autodesk is utilized to design the proposed storm sewer conveyance system.

4.5 DOWNSTREAM ANALYSIS

As shown above, the peak rates for the 1 - 100 year storms have been reduced when compared to pre-development rates. Erosion potential is a function of velocity of flow, which is directly proportional to flow rate. Therefore, a reduction in the overall rate from the development areas will correspond to a similar reduction is velocity, thereby reducing erosion of the downstream channel.

5.0 CONCLUSIONS

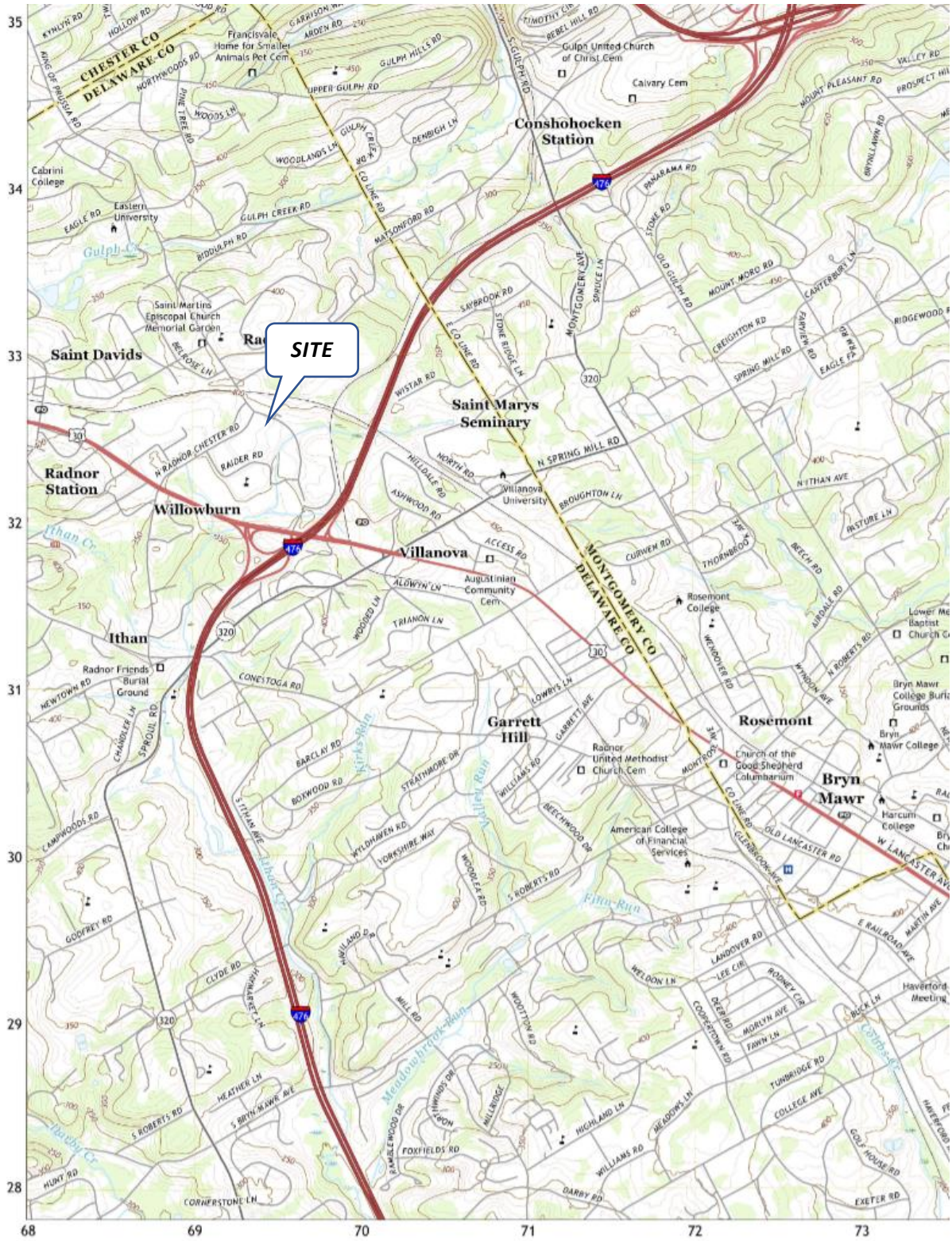
The stormwater management facility design detailed within this Stormwater Management Report meets the standards set forth by the Radnor Township Stormwater Management Ordinance to the maximum extent possible. While strict adherence to the Recharge and Water Quality cannot be achieved, the stream will nonetheless benefit from the proposed rate reductions which are greater than those required by the Ordinance, and the water quality benefits offered by the water quality sump in UG-01.

6.0 REFERENCES

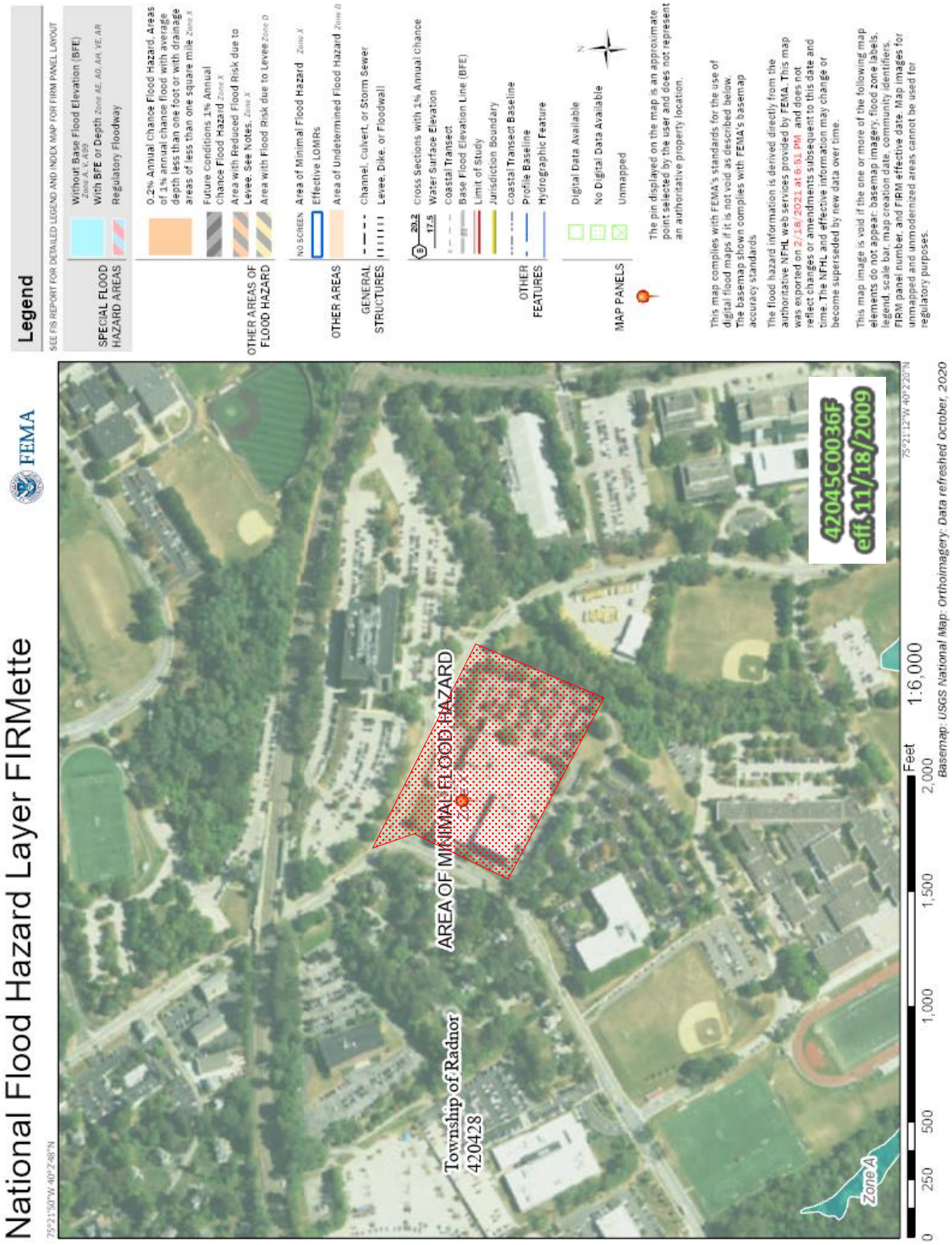
- Radnor Township Stormwater Management Ordinance.
- Radnor Township Subdivision and Land Development Ordinance.
- "Erosion and Sediment Pollution Control Program Manual". Commonwealth of Pennsylvania, Department of Environmental Protection, Office of Water Management. March 2012.
- "USDA Urban Hydrology for Small Watersheds Technical Release 55 (TR55)"

APPENDIX A: SUPPORTING DOCUMENTS

A.1 PROJECT LOCATION MAP



A.2 FEMA FLOOD INSURANCE RATE MAP



A.3 NOAA PRECIPITATION FREQUENCY DATA

NOAA Atlas 14, Volume 2, Version 3
Location name: Wayne, Pennsylvania, USA*
Latitude: 40.0429°, Longitude: -75.3586°
Elevation: 392.21 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.18** (3.84-4.55)	**4.97** (4.57-5.41)	**5.83** (5.34-6.34)	**6.43** (5.89-7.00)	**7.14** (6.50-7.76)	**7.62** (6.91-8.30)	**8.10** (7.31-8.83)	**8.51** (7.63-9.31)	**8.98** (7.98-9.86)	**9.32** (8.22-10.3)
10-min	**3.34** (3.07-3.63)	**3.97** (3.66-4.33)	**4.67** (4.28-5.08)	**5.14** (4.71-5.59)	**5.69** (5.18-6.19)	**6.07** (5.50-6.61)	**6.44** (5.81-7.02)	**6.74** (6.05-7.37)	**7.10** (6.31-7.80)	**7.34** (6.47-8.10)
15-min	**2.78** (2.56-3.02)	**3.33** (3.06-3.63)	**3.94** (3.61-4.28)	**4.33** (3.97-4.72)	**4.81** (4.38-5.23)	**5.12** (4.64-5.58)	**5.42** (4.89-5.91)	**5.67** (5.09-6.20)	**5.96** (5.30-6.54)	**6.14** (5.42-6.78)
30-min	**1.90** (1.75-2.07)	**2.30** (2.12-2.51)	**2.80** (2.56-3.04)	**3.14** (2.88-3.42)	**3.56** (3.24-3.87)	**3.86** (3.50-4.20)	**4.15** (3.75-4.53)	**4.42** (3.96-4.83)	**4.74** (4.21-5.21)	**4.98** (4.39-5.49)
60-min	**1.19** (1.09-1.29)	**1.44** (1.33-1.57)	**1.79** (1.64-1.95)	**2.04** (1.87-2.23)	**2.37** (2.16-2.58)	**2.62** (2.37-2.85)	**2.86** (2.58-3.12)	**3.10** (2.78-3.39)	**3.40** (3.02-3.74)	**3.63** (3.20-4.01)
2-hr	**0.712** (0.650-0.780)	**0.864** (0.791-0.946)	**1.08** (0.984-1.18)	**1.24** (1.13-1.36)	**1.46** (1.32-1.59)	**1.62** (1.46-1.78)	**1.79** (1.60-1.96)	**1.96** (1.74-2.15)	**2.19** (1.92-2.41)	**2.36** (2.05-2.61)
3-hr	**0.518** (0.474-0.568)	**0.628** (0.575-0.689)	**0.786** (0.717-0.861)	**0.906** (0.824-0.992)	**1.07** (0.963-1.17)	**1.19** (1.07-1.30)	**1.32** (1.18-1.45)	**1.45** (1.28-1.59)	**1.62** (1.42-1.79)	**1.76** (1.52-1.95)
6-hr	**0.324** (0.296-0.356)	**0.391** (0.359-0.431)	**0.487** (0.445-0.536)	**0.565** (0.514-0.620)	**0.674** (0.608-0.738)	**0.761** (0.681-0.833)	**0.853** (0.756-0.935)	**0.949** (0.832-1.04)	**1.08** (0.934-1.20)	**1.19** (1.01-1.32)
12-hr	**0.196** (0.179-0.217)	**0.236** (0.216-0.262)	**0.296** (0.270-0.327)	**0.346** (0.314-0.382)	**0.418** (0.375-0.460)	**0.479** (0.426-0.526)	**0.544** (0.478-0.600)	**0.615** (0.533-0.680)	**0.718** (0.609-0.797)	**0.804** (0.669-0.895)
24-hr	**0.113** (0.104-0.124)	**0.136** (0.125-0.149)	**0.171** (0.157-0.187)	**0.200** (0.183-0.219)	**0.242** (0.221-0.264)	**0.278** (0.252-0.302)	**0.316** (0.285-0.343)	**0.357** (0.320-0.388)	**0.417** (0.369-0.453)	**0.467** (0.409-0.507)
2-day	**0.065** (0.060-0.071)	**0.079** (0.072-0.086)	**0.099** (0.091-0.108)	**0.116** (0.106-0.126)	**0.139** (0.127-0.152)	**0.159** (0.144-0.173)	**0.179** (0.162-0.195)	**0.202** (0.180-0.220)	**0.233** (0.207-0.254)	**0.259** (0.228-0.282)
3-day	**0.046** (0.042-0.050)	**0.055** (0.051-0.061)	**0.069** (0.064-0.076)	**0.081** (0.074-0.088)	**0.097** (0.088-0.106)	**0.111** (0.100-0.120)	**0.125** (0.113-0.136)	**0.140** (0.126-0.153)	**0.162** (0.144-0.176)	**0.179** (0.158-0.196)
4-day	**0.036** (0.033-0.040)	**0.044** (0.040-0.048)	**0.055** (0.050-0.060)	**0.063** (0.058-0.069)	**0.076** (0.069-0.083)	**0.086** (0.079-0.094)	**0.098** (0.088-0.106)	**0.109** (0.098-0.119)	**0.126** (0.112-0.137)	**0.140** (0.123-0.152)
7-day	**0.024** (0.022-0.026)	**0.029** (0.027-0.032)	**0.036** (0.033-0.039)	**0.042** (0.038-0.045)	**0.050** (0.046-0.054)	**0.056** (0.051-0.061)	**0.063** (0.058-0.069)	**0.071** (0.064-0.077)	**0.082** (0.073-0.089)	**0.090** (0.080-0.098)
10-day	**0.019** (0.018-0.021)	**0.023** (0.021-0.025)	**0.028** (0.026-0.030)	**0.032** (0.030-0.035)	**0.038** (0.035-0.041)	**0.042** (0.039-0.046)	**0.047** (0.043-0.051)	**0.052** (0.048-0.056)	**0.059** (0.053-0.064)	**0.065** (0.058-0.070)
20-day	**0.013** (0.012-0.014)	**0.015** (0.014-0.017)	**0.018** (0.017-0.020)	**0.021** (0.019-0.022)	**0.024** (0.022-0.026)	**0.026** (0.025-0.028)	**0.029** (0.027-0.031)	**0.031** (0.029-0.034)	**0.035** (0.032-0.037)	**0.038** (0.034-0.040)
30-day	**0.011** (0.010-0.011)	**0.013** (0.012-0.013)	**0.015** (0.014-0.016)	**0.017** (0.016-0.017)	**0.019** (0.018-0.020)	**0.020** (0.019-0.021)	**0.022** (0.021-0.023)	**0.024** (0.022-0.025)	**0.026** (0.024-0.027)	**0.027** (0.025-0.029)
45-day	**0.009** (0.009-0.010)	**0.011** (0.010-0.011)	**0.012** (0.012-0.013)	**0.014** (0.013-0.014)	**0.015** (0.014-0.016)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.018** (0.017-0.019)	**0.020** (0.018-0.021)	**0.021** (0.019-0.022)
60-day	**0.008** (0.008-0.009)	**0.010** (0.009-0.010)	**0.011** (0.010-0.012)	**0.012** (0.011-0.013)	**0.013** (0.013-0.014)	**0.014** (0.014-0.015)	**0.015** (0.014-0.016)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.018** (0.017-0.019)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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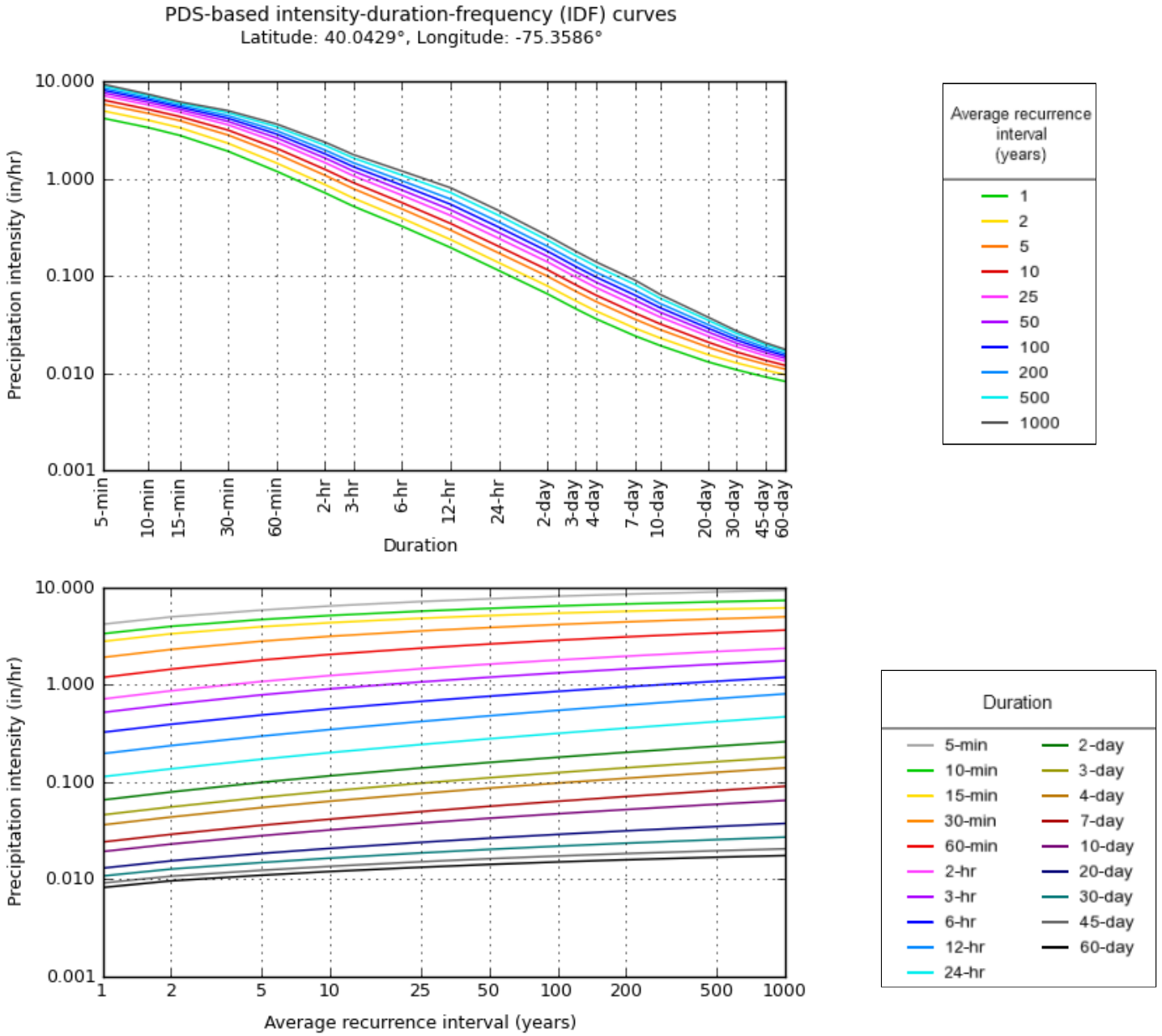
PF graphical



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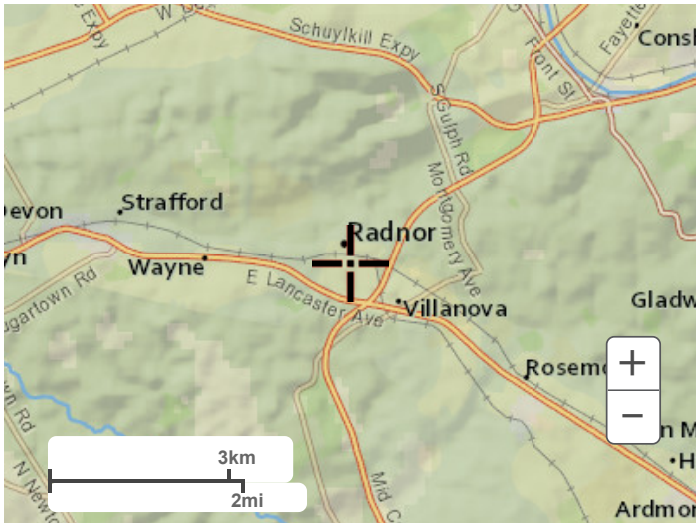
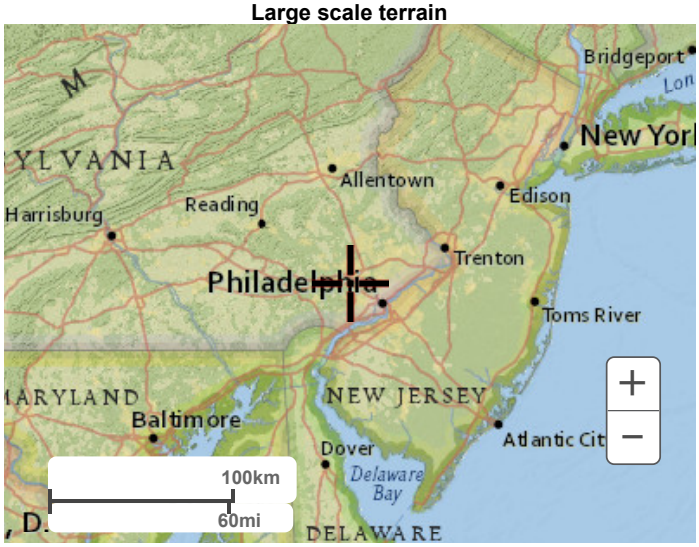
Maps & aerials

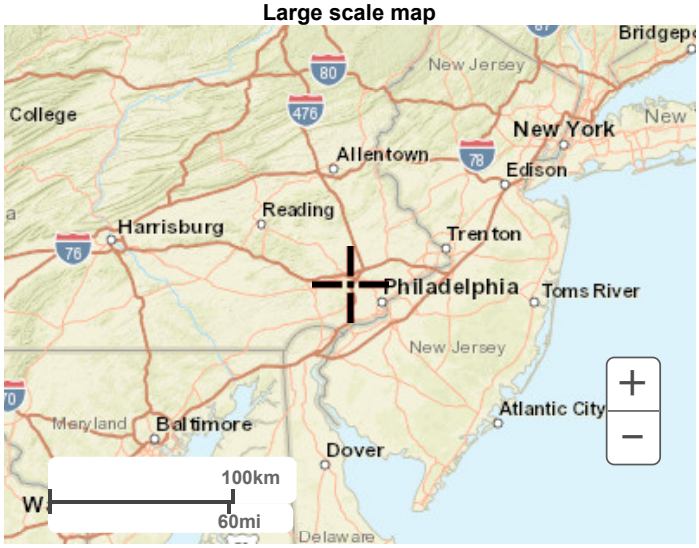
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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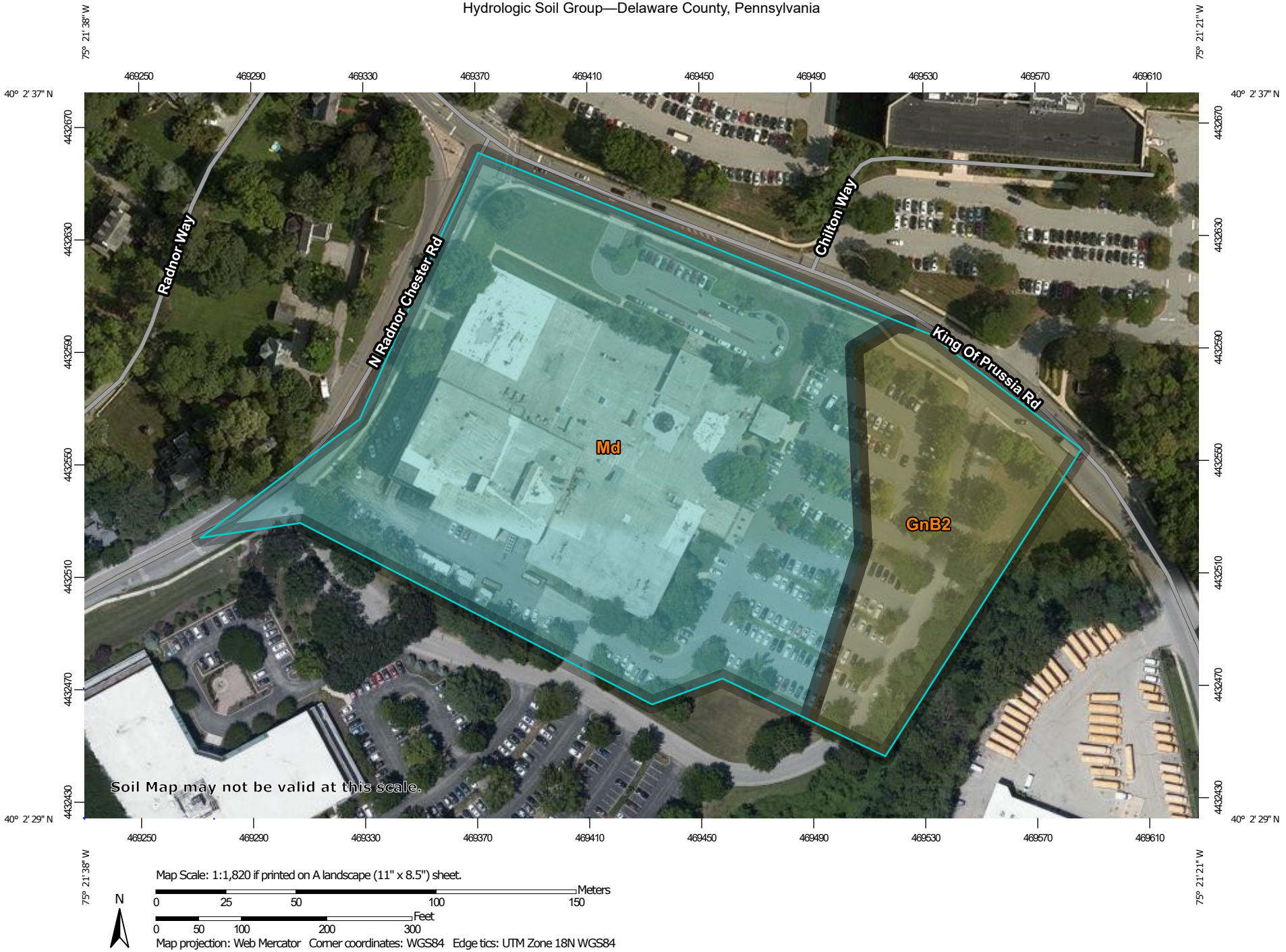
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

APPENDIX B: SITE SOILS INVESTIGATION

B.1 NRCS CUSTOM WEB SOIL SURVEY



Map Scale: 1:1,820 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Delaware County, Pennsylvania
Survey Area Data: Version 18, Jun 5, 2020

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

Date(s) aerial images were photographed: Jul 25, 2014—Jul 10, 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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
GnB2	Glenville silt loam, 3 to 8 percent slopes, moderately eroded	C/D	1.9	21.9%
Md	Made land, gabbro and diabase materials	C	6.7	78.1%
Totals for Area of Interest			**8.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

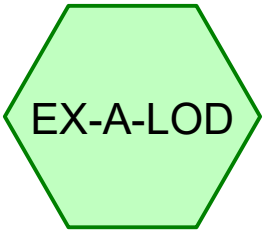
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

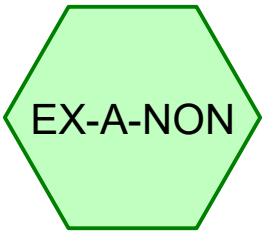
Tie-break Rule: Higher

APPENDIX C: PEAK RATE ANALYSIS

C.1 PRE-DEVELOPMENT ANALYSIS



WITHIN LOD



NON-LOD

Subcat Reach Pond Link

Routing Diagram for 200002 SWM (UNDERDRAIN)
Prepared by LANDCORE Engineering Consultants, Printed 2/18/2021

Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-A-LOD: WITHIN LOD Runoff Area=40,628 sf 54.57% Impervious Runoff Depth=1.63"
Flow Length=766' Tc=6.0 min CN=74/98 Runoff=1.72 cfs 5,511 cf

Subcatchment EX-A-NON: NON-LOD Runoff Area=108,994 sf 65.61% Impervious Runoff Depth=1.82"
Tc=6.0 min CN=74/98 Runoff=5.12 cfs 16,512 cf

Total Runoff Area = 149,622 sf Runoff Volume = 22,023 cf Average Runoff Depth = 1.77"
37.39% Pervious = 55,946 sf 62.61% Impervious = 93,676 sf

Summary for Subcatchment EX-A-LOD: WITHIN LOD

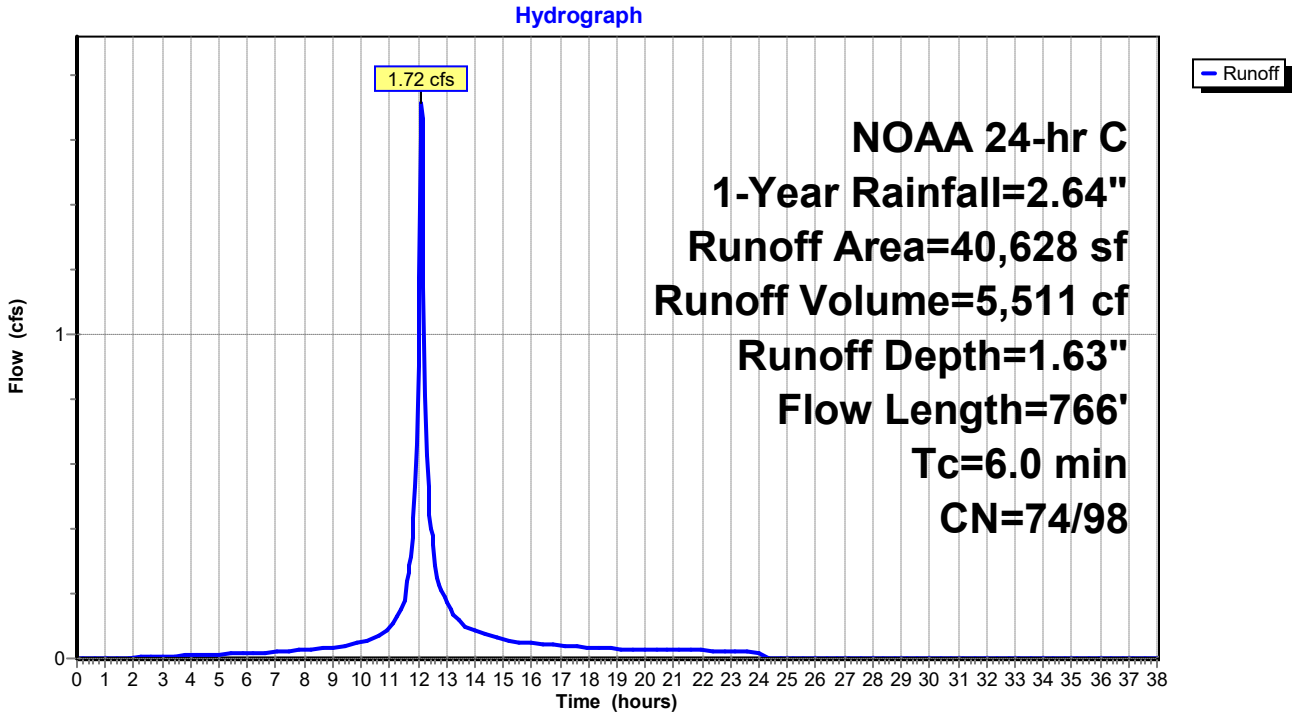
Runoff = 1.72 cfs @ 12.13 hrs, Volume= 5,511 cf, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 1-Year Rainfall=2.64"

	Area (sf)	CN	Description
*	22,170	98	EX. IMPERVIOUS
	18,458	74	>75% Grass cover, Good, HSG C
	40,628	87	Weighted Average
	18,458	74	45.43% Pervious Area
	22,170	98	54.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	273	0.0385	3.98		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	227	0.0412	4.12		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	49	0.0130	5.20	6.38	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015 Concrete sewer w/manholes & inlets
0.2	65	0.0234	6.98	8.56	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	65	0.0272	7.52	9.23	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	87	0.0479	9.98	12.25	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
2.6	766	Total, Increased to minimum Tc = 6.0 min			

Subcatchment EX-A-LOD: WITHIN LOD



Summary for Subcatchment EX-A-NON: NON-LOD

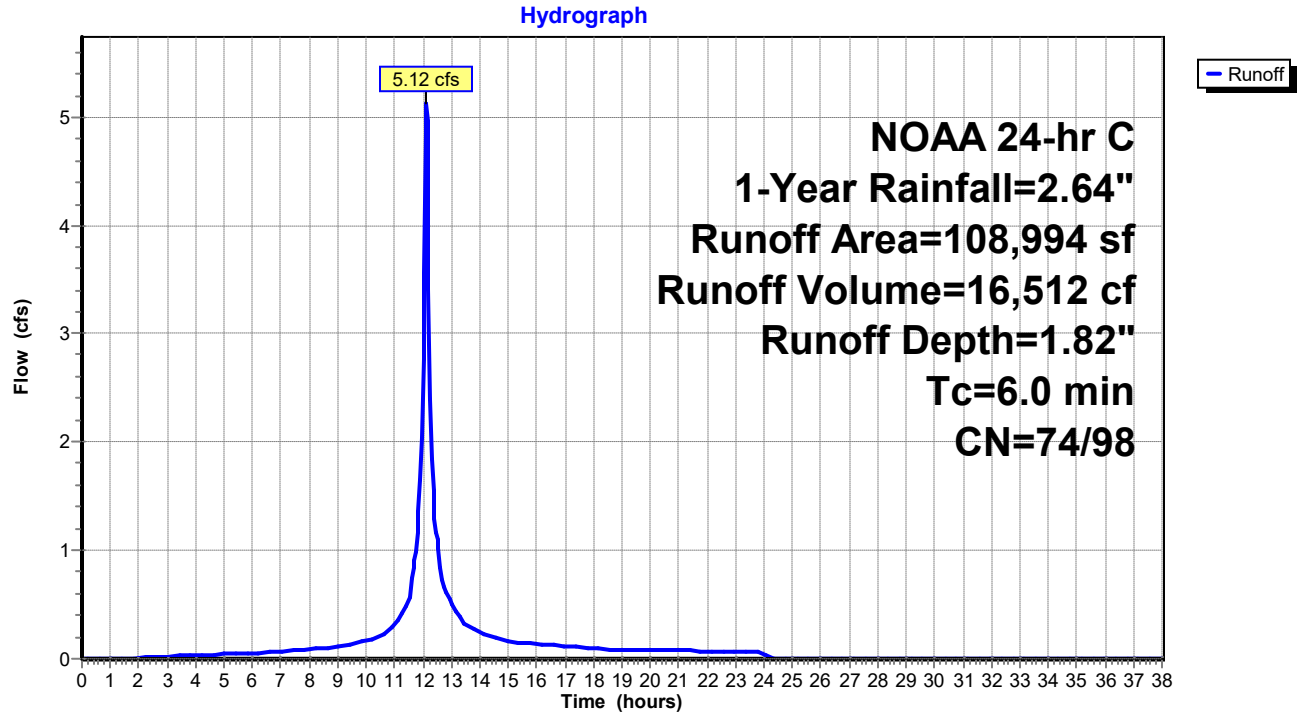
Runoff = 5.12 cfs @ 12.13 hrs, Volume= 16,512 cf, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 1-Year Rainfall=2.64"

	Area (sf)	CN	Description
*	71,506	98	EX. IMPERVIOUS
	37,488	74	>75% Grass cover, Good, HSG C
	108,994	90	Weighted Average
	37,488	74	34.39% Pervious Area
	71,506	98	65.61% Impervious Area

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

Subcatchment EX-A-NON: NON-LOD



Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-A-LOD: WITHIN LOD Runoff Area=40,628 sf 54.57% Impervious Runoff Depth=2.23"
Flow Length=766' Tc=6.0 min CN=74/98 Runoff=2.36 cfs 7,537 cf

Subcatchment EX-A-NON: NON-LOD Runoff Area=108,994 sf 65.61% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=74/98 Runoff=6.89 cfs 22,208 cf

Total Runoff Area = 149,622 sf Runoff Volume = 29,745 cf Average Runoff Depth = 2.39"
37.39% Pervious = 55,946 sf 62.61% Impervious = 93,676 sf

Summary for Subcatchment EX-A-LOD: WITHIN LOD

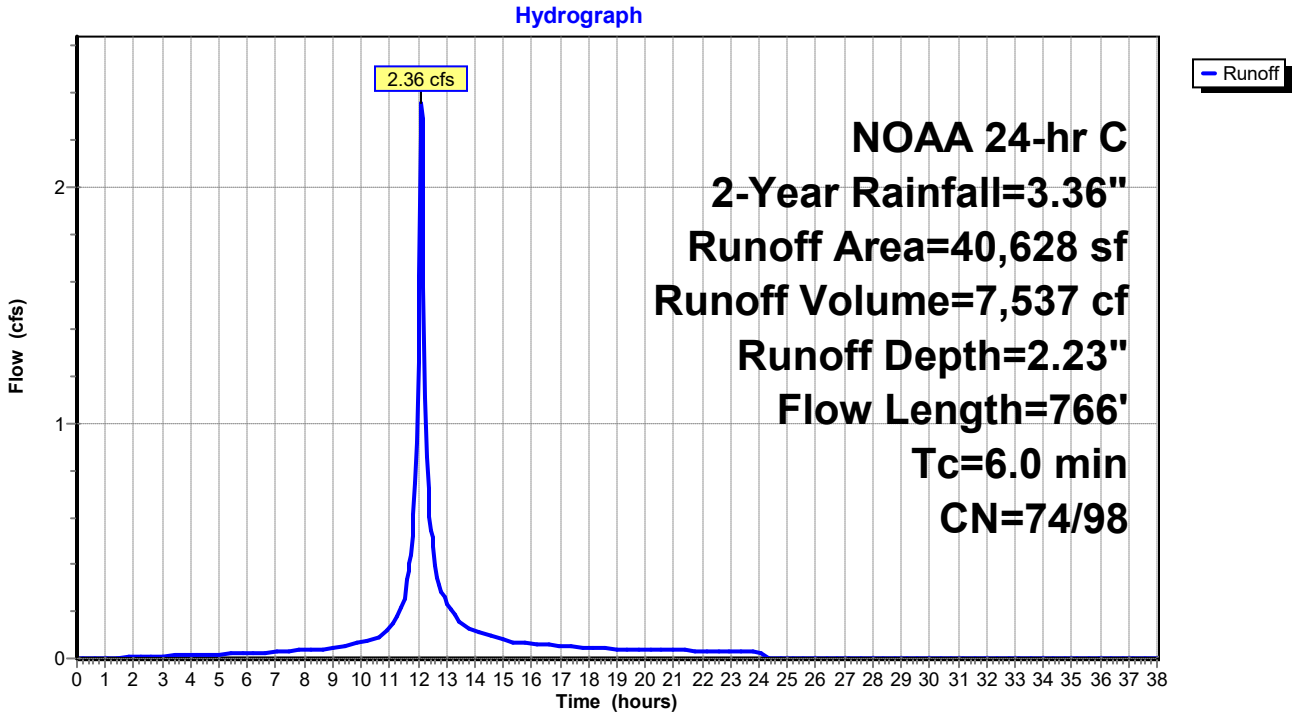
Runoff = 2.36 cfs @ 12.13 hrs, Volume= 7,537 cf, Depth= 2.23"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Rainfall=3.36"

	Area (sf)	CN	Description
*	22,170	98	EX. IMPERVIOUS
	18,458	74	>75% Grass cover, Good, HSG C
	40,628	87	Weighted Average
	18,458	74	45.43% Pervious Area
	22,170	98	54.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	273	0.0385	3.98		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	227	0.0412	4.12		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	49	0.0130	5.20	6.38	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015 Concrete sewer w/manholes & inlets
0.2	65	0.0234	6.98	8.56	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	65	0.0272	7.52	9.23	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	87	0.0479	9.98	12.25	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
2.6	766	Total, Increased to minimum Tc = 6.0 min			

Subcatchment EX-A-LOD: WITHIN LOD



Summary for Subcatchment EX-A-NON: NON-LOD

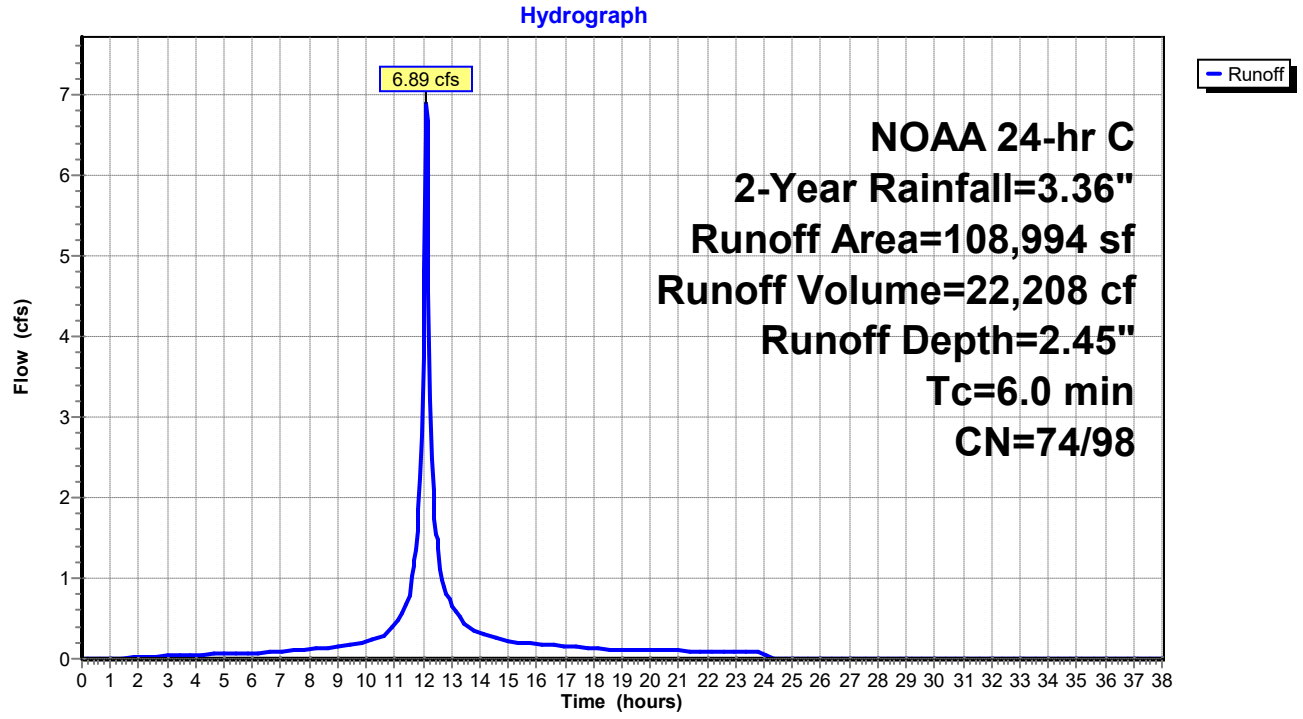
Runoff = 6.89 cfs @ 12.13 hrs, Volume= 22,208 cf, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Rainfall=3.36"

	Area (sf)	CN	Description
*	71,506	98	EX. IMPERVIOUS
	37,488	74	>75% Grass cover, Good, HSG C
	108,994	90	Weighted Average
	37,488	74	34.39% Pervious Area
	71,506	98	65.61% Impervious Area

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

Subcatchment EX-A-NON: NON-LOD



Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-A-LOD: WITHIN LOD Runoff Area=40,628 sf 54.57% Impervious Runoff Depth=3.06"
Flow Length=766' Tc=6.0 min CN=74/98 Runoff=3.26 cfs 10,368 cf

Subcatchment EX-A-NON: NON-LOD Runoff Area=108,994 sf 65.61% Impervious Runoff Depth=3.31"
Tc=6.0 min CN=74/98 Runoff=9.32 cfs 30,071 cf

Total Runoff Area = 149,622 sf Runoff Volume = 40,439 cf Average Runoff Depth = 3.24"
37.39% Pervious = 55,946 sf 62.61% Impervious = 93,676 sf

Summary for Subcatchment EX-A-LOD: WITHIN LOD

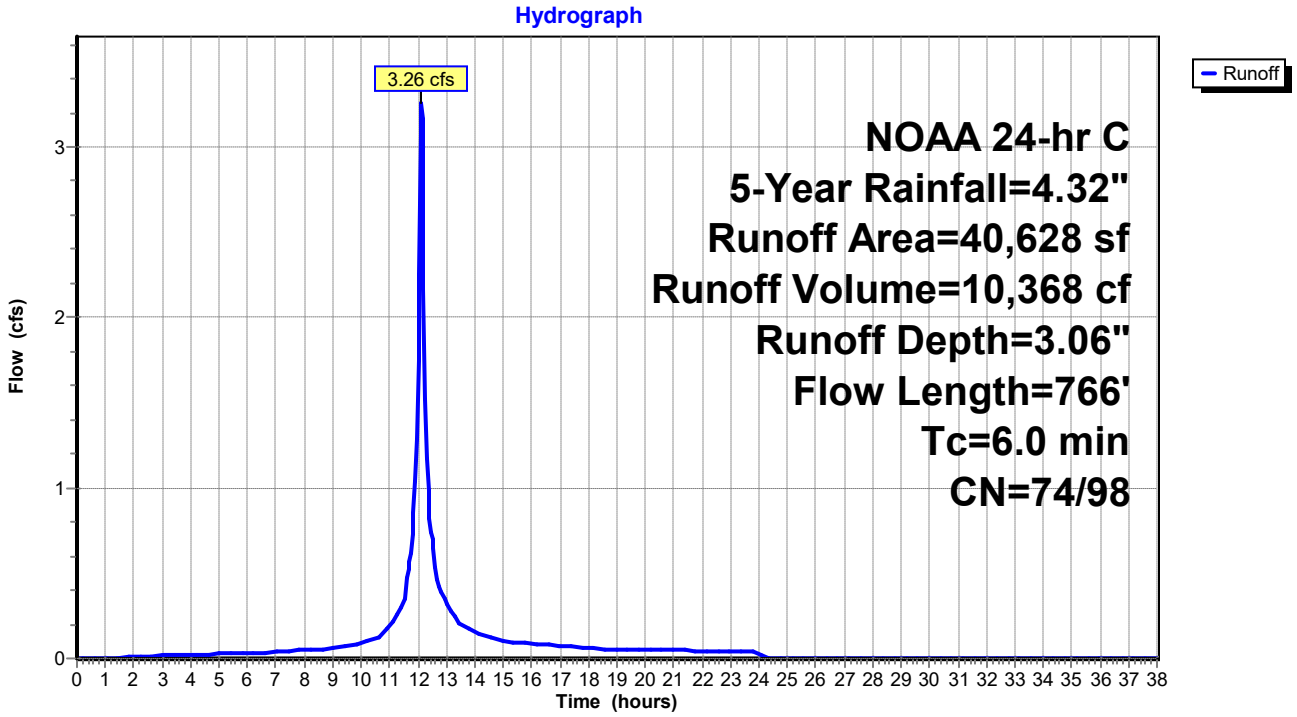
Runoff = 3.26 cfs @ 12.13 hrs, Volume= 10,368 cf, Depth= 3.06"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 5-Year Rainfall=4.32"

	Area (sf)	CN	Description
*	22,170	98	EX. IMPERVIOUS
	18,458	74	>75% Grass cover, Good, HSG C
	40,628	87	Weighted Average
	18,458	74	45.43% Pervious Area
	22,170	98	54.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	273	0.0385	3.98		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	227	0.0412	4.12		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	49	0.0130	5.20	6.38	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015 Concrete sewer w/manholes & inlets
0.2	65	0.0234	6.98	8.56	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	65	0.0272	7.52	9.23	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	87	0.0479	9.98	12.25	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
2.6	766	Total, Increased to minimum Tc = 6.0 min			

Subcatchment EX-A-LOD: WITHIN LOD



Summary for Subcatchment EX-A-NON: NON-LOD

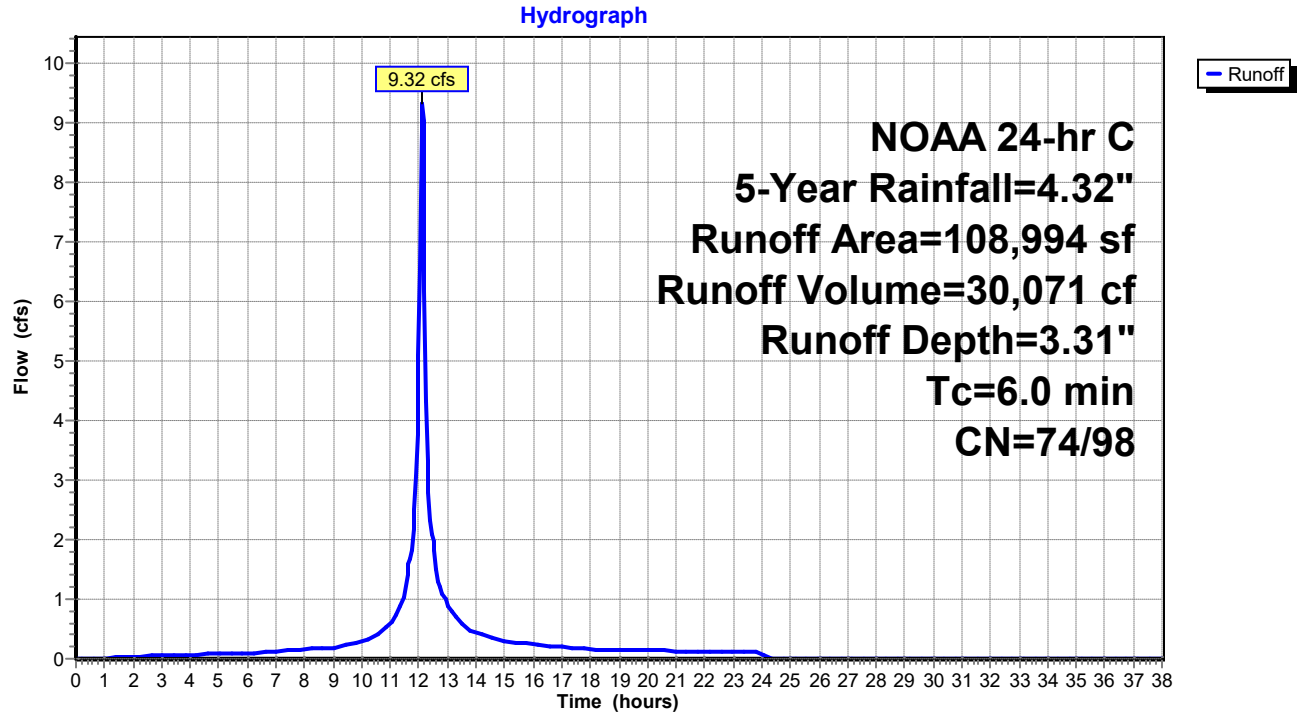
Runoff = 9.32 cfs @ 12.13 hrs, Volume= 30,071 cf, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 5-Year Rainfall=4.32"

	Area (sf)	CN	Description
*	71,506	98	EX. IMPERVIOUS
	37,488	74	>75% Grass cover, Good, HSG C
	108,994	90	Weighted Average
	37,488	74	34.39% Pervious Area
	71,506	98	65.61% Impervious Area

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

Subcatchment EX-A-NON: NON-LOD



Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-A-LOD: WITHIN LOD Runoff Area=40,628 sf 54.57% Impervious Runoff Depth=3.93"
Flow Length=766' Tc=6.0 min CN=74/98 Runoff=4.18 cfs 13,300 cf

Subcatchment EX-A-NON: NON-LOD Runoff Area=108,994 sf 65.61% Impervious Runoff Depth=4.20"
Tc=6.0 min CN=74/98 Runoff=11.80 cfs 38,139 cf

Total Runoff Area = 149,622 sf Runoff Volume = 51,438 cf Average Runoff Depth = 4.13"
37.39% Pervious = 55,946 sf 62.61% Impervious = 93,676 sf

Summary for Subcatchment EX-A-LOD: WITHIN LOD

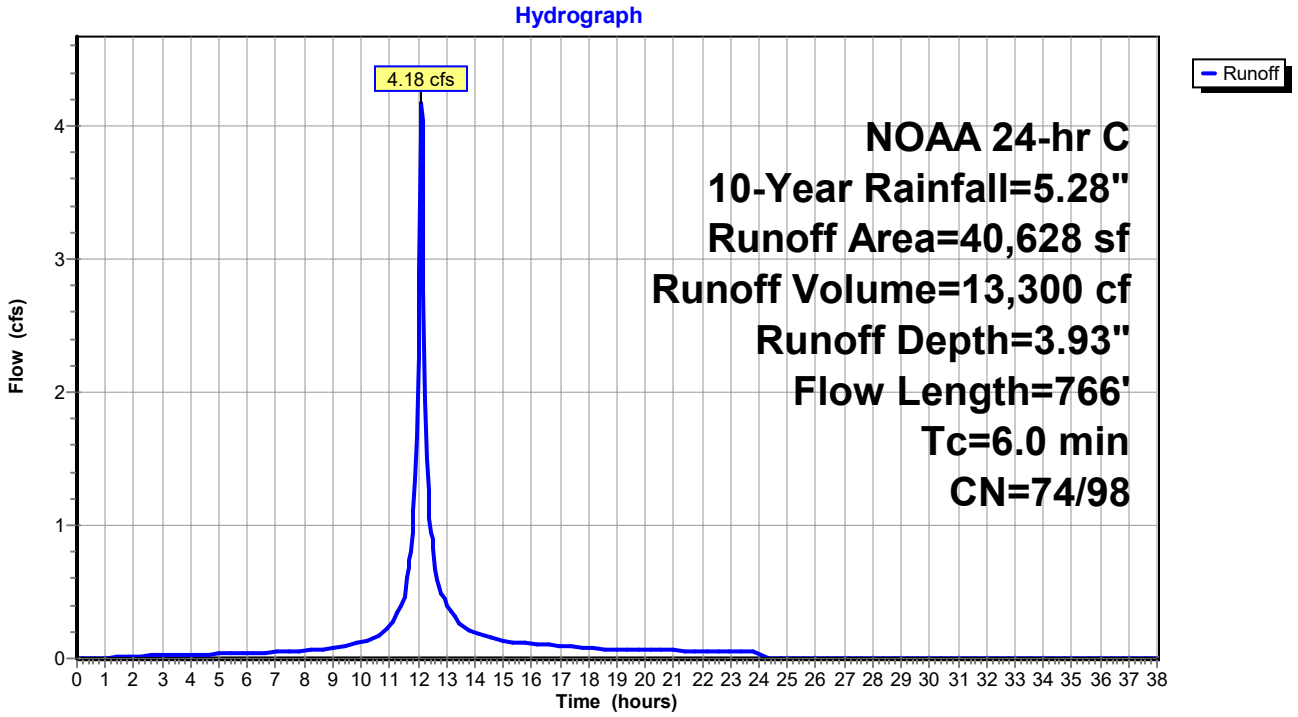
Runoff = 4.18 cfs @ 12.13 hrs, Volume= 13,300 cf, Depth= 3.93"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Rainfall=5.28"

	Area (sf)	CN	Description
*	22,170	98	EX. IMPERVIOUS
	18,458	74	>75% Grass cover, Good, HSG C
	40,628	87	Weighted Average
	18,458	74	45.43% Pervious Area
	22,170	98	54.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	273	0.0385	3.98		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	227	0.0412	4.12		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	49	0.0130	5.20	6.38	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015 Concrete sewer w/manholes & inlets
0.2	65	0.0234	6.98	8.56	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	65	0.0272	7.52	9.23	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	87	0.0479	9.98	12.25	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
2.6	766	Total, Increased to minimum Tc = 6.0 min			

Subcatchment EX-A-LOD: WITHIN LOD



Summary for Subcatchment EX-A-NON: NON-LOD

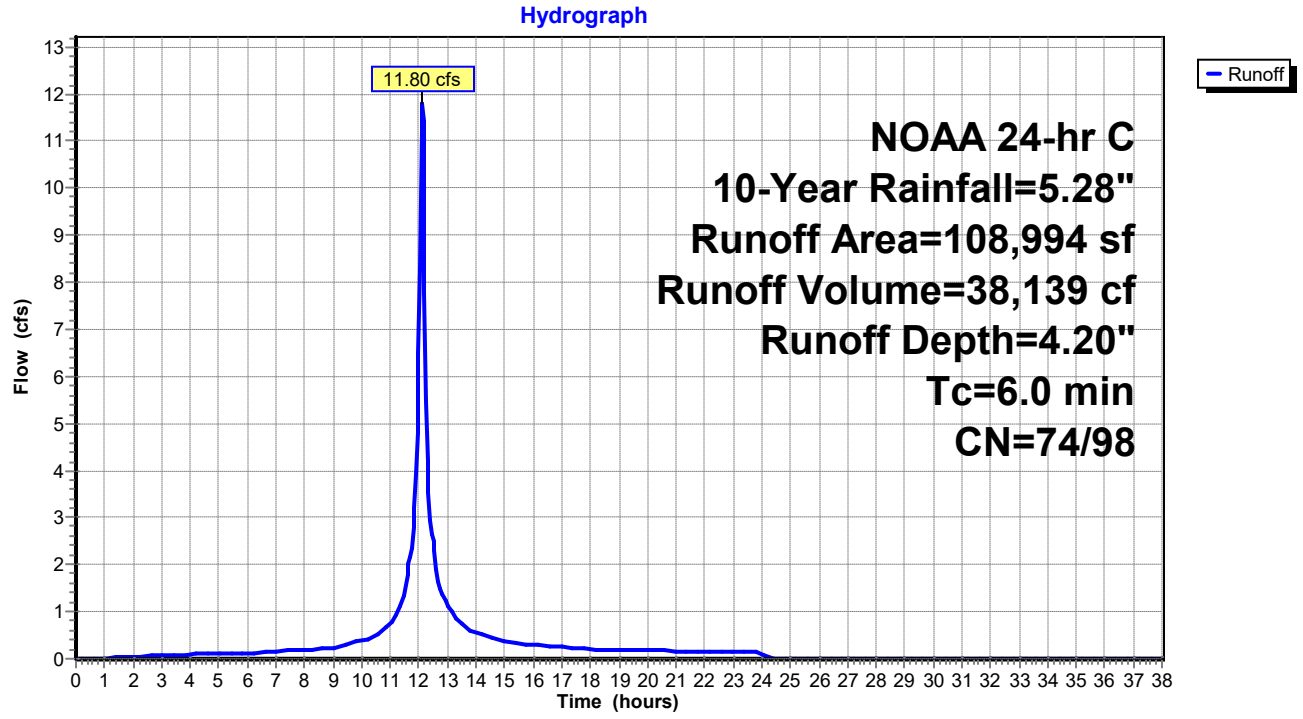
Runoff = 11.80 cfs @ 12.13 hrs, Volume= 38,139 cf, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Rainfall=5.28"

	Area (sf)	CN	Description
*	71,506	98	EX. IMPERVIOUS
	37,488	74	>75% Grass cover, Good, HSG C
	108,994	90	Weighted Average
	37,488	74	34.39% Pervious Area
	71,506	98	65.61% Impervious Area

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

Subcatchment EX-A-NON: NON-LOD



Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-A-LOD: WITHIN LOD Runoff Area=40,628 sf 54.57% Impervious Runoff Depth=4.81"
Flow Length=766' Tc=6.0 min CN=74/98 Runoff=5.11 cfs 16,299 cf

Subcatchment EX-A-NON: NON-LOD Runoff Area=108,994 sf 65.61% Impervious Runoff Depth=5.10"
Tc=6.0 min CN=74/98 Runoff=14.30 cfs 46,346 cf

Total Runoff Area = 149,622 sf Runoff Volume = 62,645 cf Average Runoff Depth = 5.02"
37.39% Pervious = 55,946 sf 62.61% Impervious = 93,676 sf

Summary for Subcatchment EX-A-LOD: WITHIN LOD

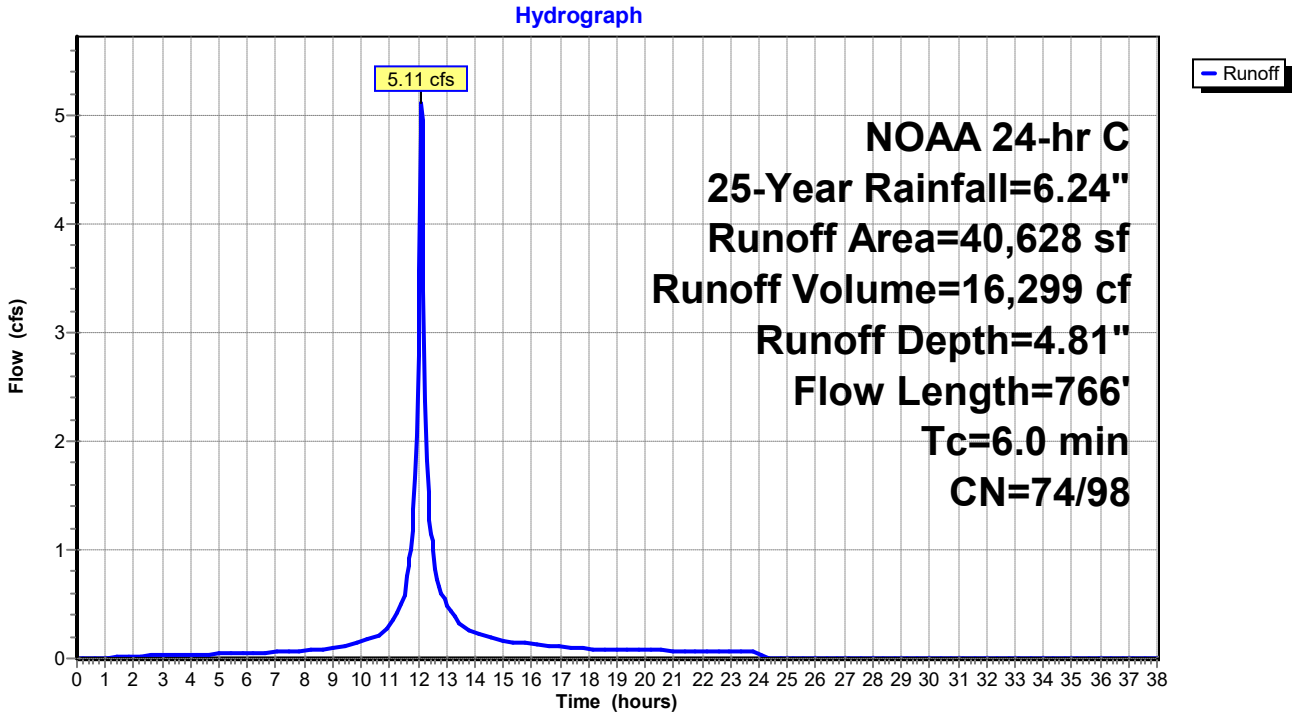
Runoff = 5.11 cfs @ 12.13 hrs, Volume= 16,299 cf, Depth= 4.81"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Rainfall=6.24"

	Area (sf)	CN	Description
*	22,170	98	EX. IMPERVIOUS
	18,458	74	>75% Grass cover, Good, HSG C
	40,628	87	Weighted Average
	18,458	74	45.43% Pervious Area
	22,170	98	54.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	273	0.0385	3.98		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	227	0.0412	4.12		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	49	0.0130	5.20	6.38	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015 Concrete sewer w/manholes & inlets
0.2	65	0.0234	6.98	8.56	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	65	0.0272	7.52	9.23	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	87	0.0479	9.98	12.25	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
2.6	766	Total, Increased to minimum Tc = 6.0 min			

Subcatchment EX-A-LOD: WITHIN LOD



Summary for Subcatchment EX-A-NON: NON-LOD

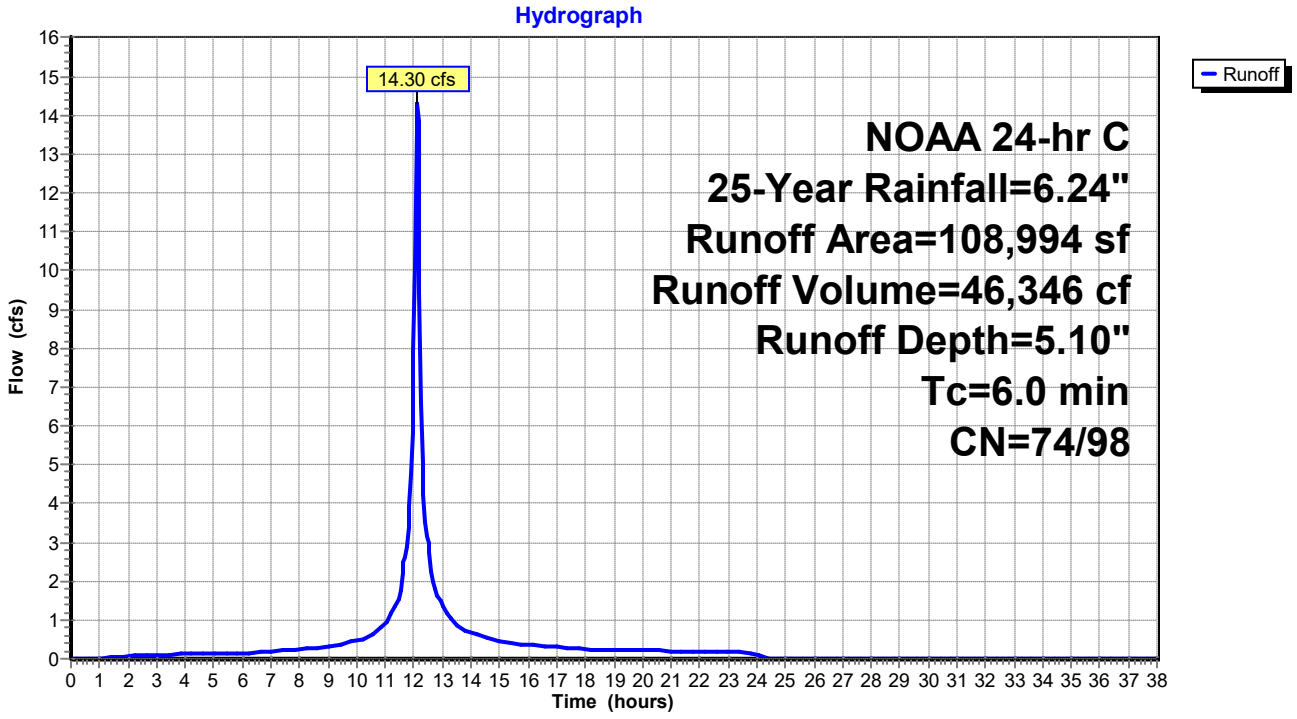
Runoff = 14.30 cfs @ 12.13 hrs, Volume= 46,346 cf, Depth= 5.10"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Rainfall=6.24"

	Area (sf)	CN	Description
*	71,506	98	EX. IMPERVIOUS
	37,488	74	>75% Grass cover, Good, HSG C
	108,994	90	Weighted Average
	37,488	74	34.39% Pervious Area
	71,506	98	65.61% Impervious Area

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

Subcatchment EX-A-NON: NON-LOD



Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-A-LOD: WITHIN LOD Runoff Area=40,628 sf 54.57% Impervious Runoff Depth=5.71"
Flow Length=766' Tc=6.0 min CN=74/98 Runoff=6.06 cfs 19,346 cf

Subcatchment EX-A-NON: NON-LOD Runoff Area=108,994 sf 65.61% Impervious Runoff Depth=6.02"
Tc=6.0 min CN=74/98 Runoff=16.83 cfs 54,652 cf

Total Runoff Area = 149,622 sf Runoff Volume = 73,998 cf Average Runoff Depth = 5.93"
37.39% Pervious = 55,946 sf 62.61% Impervious = 93,676 sf

Summary for Subcatchment EX-A-LOD: WITHIN LOD

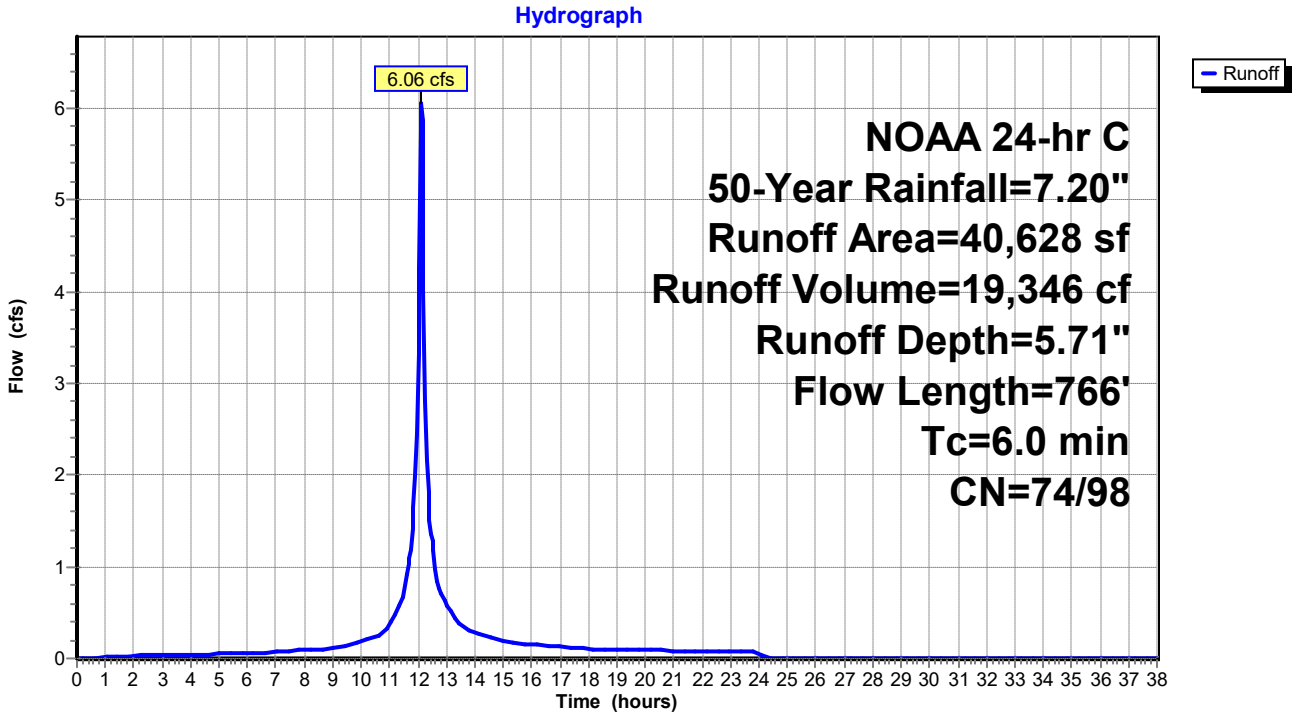
Runoff = 6.06 cfs @ 12.13 hrs, Volume= 19,346 cf, Depth= 5.71"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 50-Year Rainfall=7.20"

	Area (sf)	CN	Description
*	22,170	98	EX. IMPERVIOUS
	18,458	74	>75% Grass cover, Good, HSG C
	40,628	87	Weighted Average
	18,458	74	45.43% Pervious Area
	22,170	98	54.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	273	0.0385	3.98		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	227	0.0412	4.12		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	49	0.0130	5.20	6.38	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015 Concrete sewer w/manholes & inlets
0.2	65	0.0234	6.98	8.56	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	65	0.0272	7.52	9.23	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	87	0.0479	9.98	12.25	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
2.6	766	Total, Increased to minimum Tc = 6.0 min			

Subcatchment EX-A-LOD: WITHIN LOD



Summary for Subcatchment EX-A-NON: NON-LOD

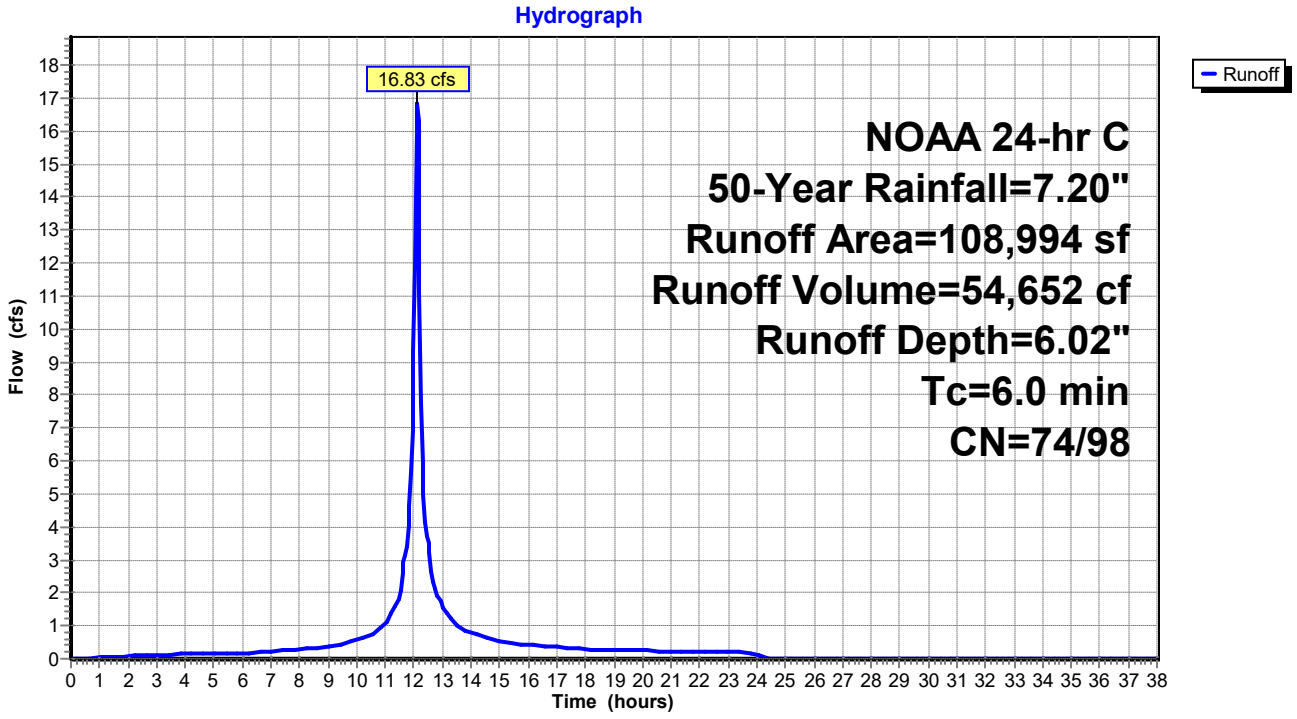
Runoff = 16.83 cfs @ 12.13 hrs, Volume= 54,652 cf, Depth= 6.02"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 50-Year Rainfall=7.20"

	Area (sf)	CN	Description
*	71,506	98	EX. IMPERVIOUS
	37,488	74	>75% Grass cover, Good, HSG C
	108,994	90	Weighted Average
	37,488	74	34.39% Pervious Area
	71,506	98	65.61% Impervious Area

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

Subcatchment EX-A-NON: NON-LOD



Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-A-LOD: WITHIN LOD Runoff Area=40,628 sf 54.57% Impervious Runoff Depth=6.85"
Flow Length=766' Tc=6.0 min CN=74/98 Runoff=7.24 cfs 23,205 cf

Subcatchment EX-A-NON: NON-LOD Runoff Area=108,994 sf 65.61% Impervious Runoff Depth=7.17"
Tc=6.0 min CN=74/98 Runoff=20.00 cfs 65,134 cf

Total Runoff Area = 149,622 sf Runoff Volume = 88,339 cf Average Runoff Depth = 7.08"
37.39% Pervious = 55,946 sf 62.61% Impervious = 93,676 sf

Summary for Subcatchment EX-A-LOD: WITHIN LOD

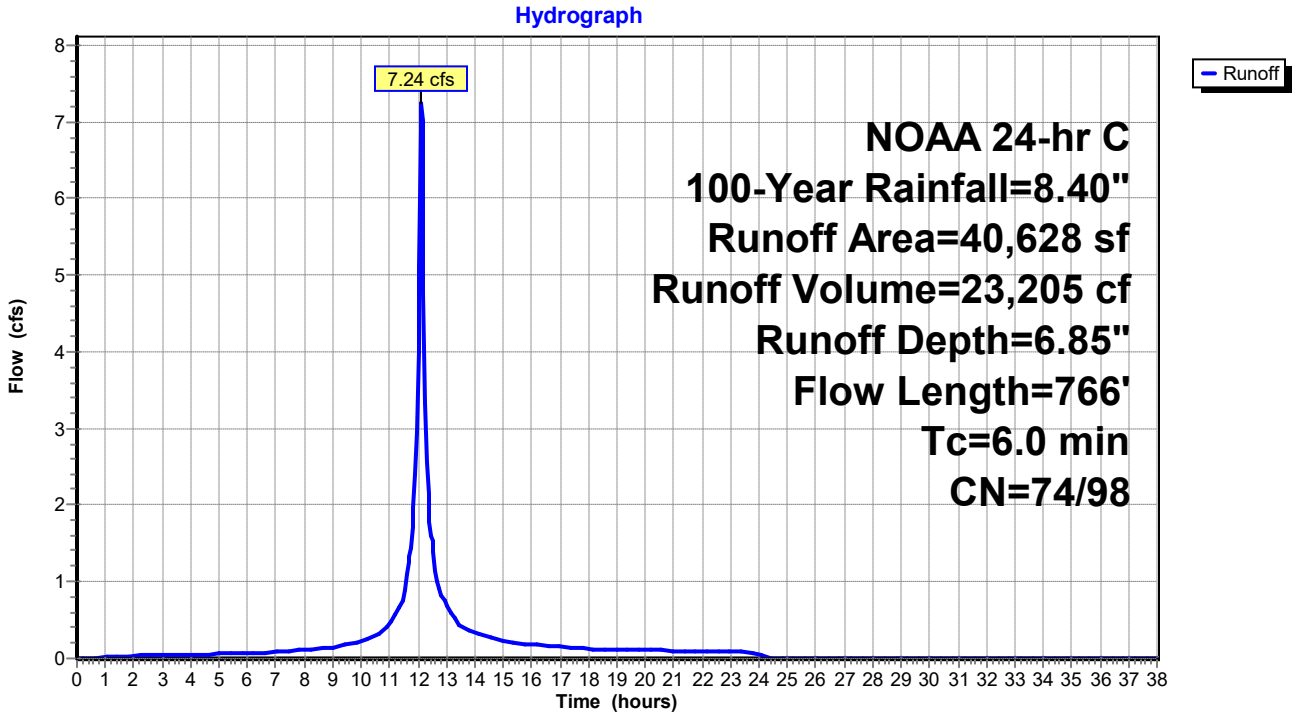
Runoff = 7.24 cfs @ 12.13 hrs, Volume= 23,205 cf, Depth= 6.85"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.40"

	Area (sf)	CN	Description
*	22,170	98	EX. IMPERVIOUS
	18,458	74	>75% Grass cover, Good, HSG C
	40,628	87	Weighted Average
	18,458	74	45.43% Pervious Area
	22,170	98	54.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	273	0.0385	3.98		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	227	0.0412	4.12		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	49	0.0130	5.20	6.38	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015 Concrete sewer w/manholes & inlets
0.2	65	0.0234	6.98	8.56	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	65	0.0272	7.52	9.23	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
0.1	87	0.0479	9.98	12.25	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
2.6	766	Total, Increased to minimum Tc = 6.0 min			

Subcatchment EX-A-LOD: WITHIN LOD



Summary for Subcatchment EX-A-NON: NON-LOD

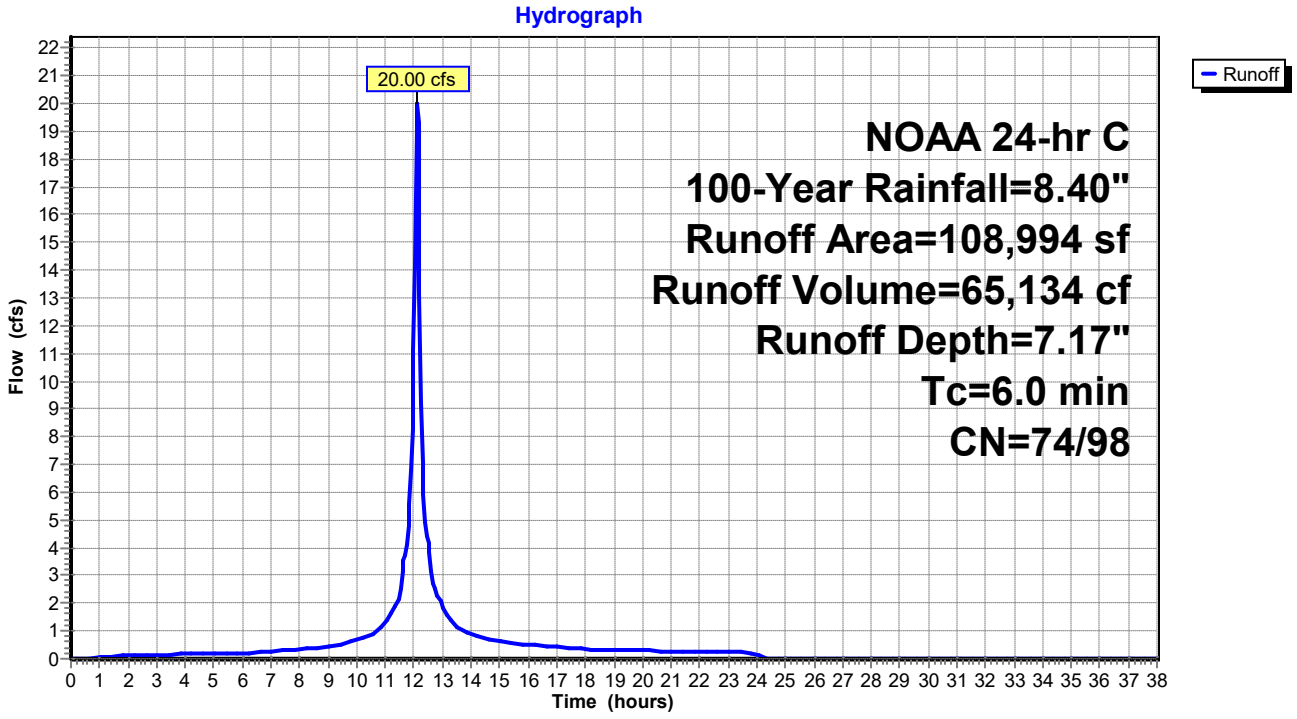
Runoff = 20.00 cfs @ 12.13 hrs, Volume= 65,134 cf, Depth= 7.17"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.40"

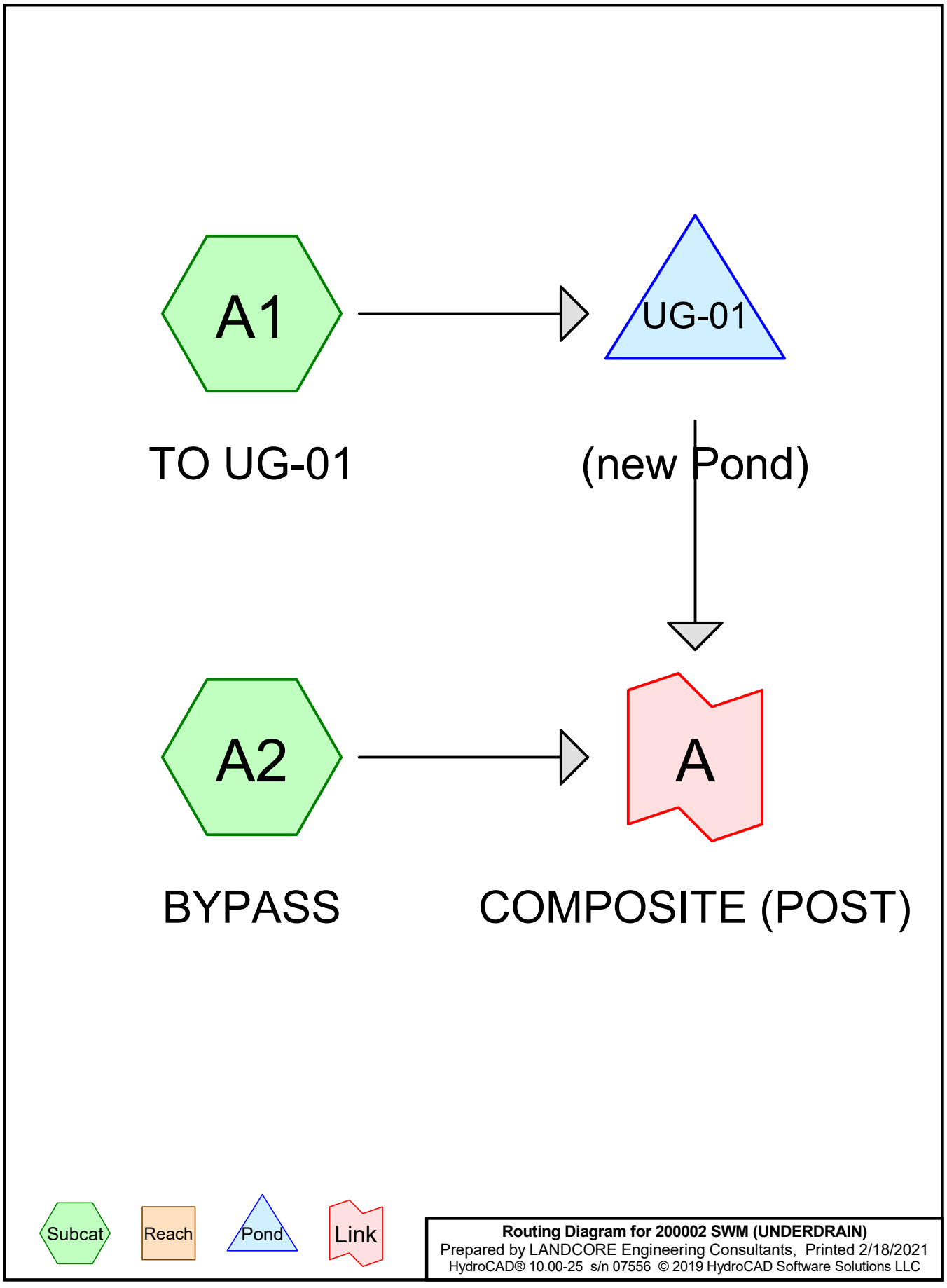
	Area (sf)	CN	Description
*	71,506	98	EX. IMPERVIOUS
	37,488	74	>75% Grass cover, Good, HSG C
	108,994	90	Weighted Average
	37,488	74	34.39% Pervious Area
	71,506	98	65.61% Impervious Area

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

Subcatchment EX-A-NON: NON-LOD



C.2 POST-DEVELOPMENT ANALYSIS



Routing Diagram for 200002 SWM (UNDERDRAIN)
Prepared by LANDCORE Engineering Consultants, Printed 2/18/2021

Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: TO UG-01 Runoff Area=48,590 sf 86.02% Impervious Runoff Depth=2.17"
Tc=6.0 min CN=74/98 Runoff=2.71 cfs 8,784 cf

Subcatchment A2: BYPASS Runoff Area=101,032 sf 64.46% Impervious Runoff Depth=1.80"
Tc=6.0 min CN=74/98 Runoff=4.70 cfs 15,139 cf

Pond UG-01: (new Pond) Peak Elev=367.72' Storage=2,477 cf Inflow=2.71 cfs 8,784 cf
Outflow=1.67 cfs 8,695 cf

Link A: COMPOSITE (POST) Inflow=6.20 cfs 23,835 cf
Primary=6.20 cfs 23,835 cf

Total Runoff Area = 149,622 sf Runoff Volume = 23,923 cf Average Runoff Depth = 1.92"
28.54% Pervious = 42,699 sf 71.46% Impervious = 106,923 sf

Summary for Subcatchment A1: TO UG-01

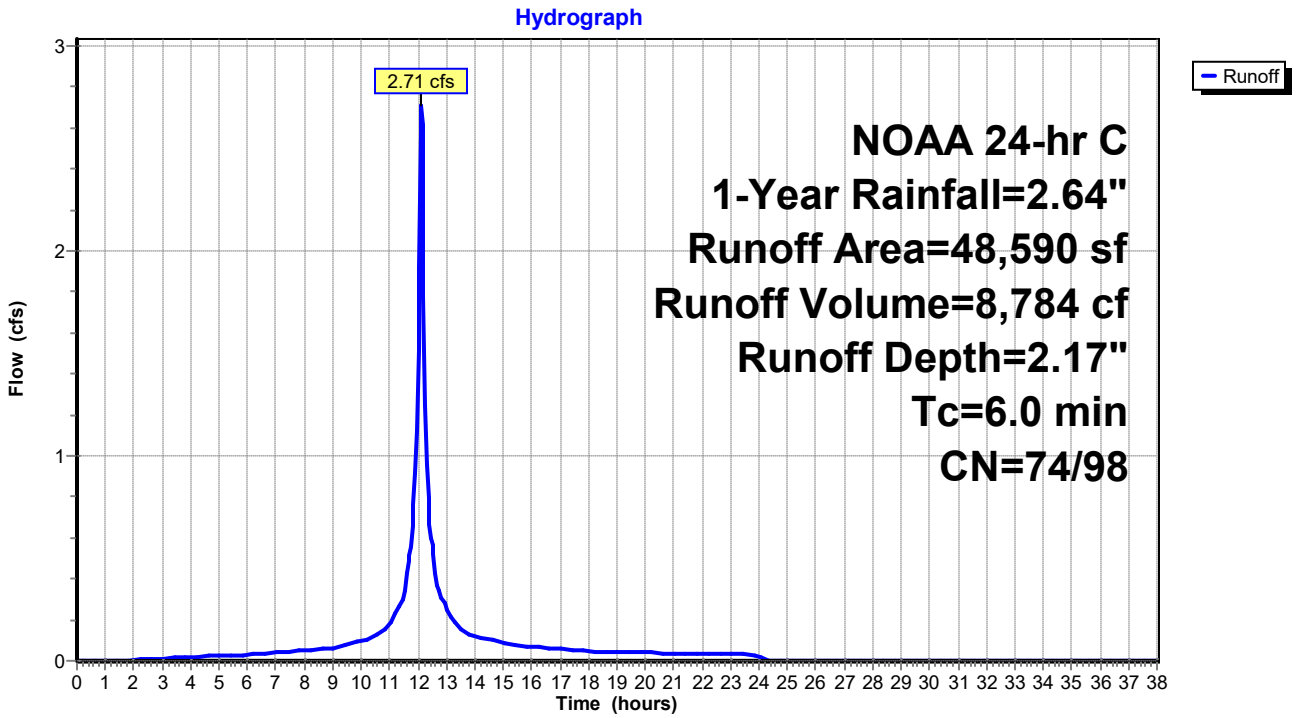
Runoff = 2.71 cfs @ 12.13 hrs, Volume= 8,784 cf, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 1-Year Rainfall=2.64"

	Area (sf)	CN	Description
*	25,342	98	LOD Impervious
*	1,267	74	LOD Grass HSG C
*	16,457	98	NON-LOD Impervious
*	5,524	74	NON-LOD Grass HSG C
	48,590	95	Weighted Average
	6,791	74	13.98% Pervious Area
	41,799	98	86.02% Impervious Area

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

Subcatchment A1: TO UG-01



Summary for Subcatchment A2: BYPASS

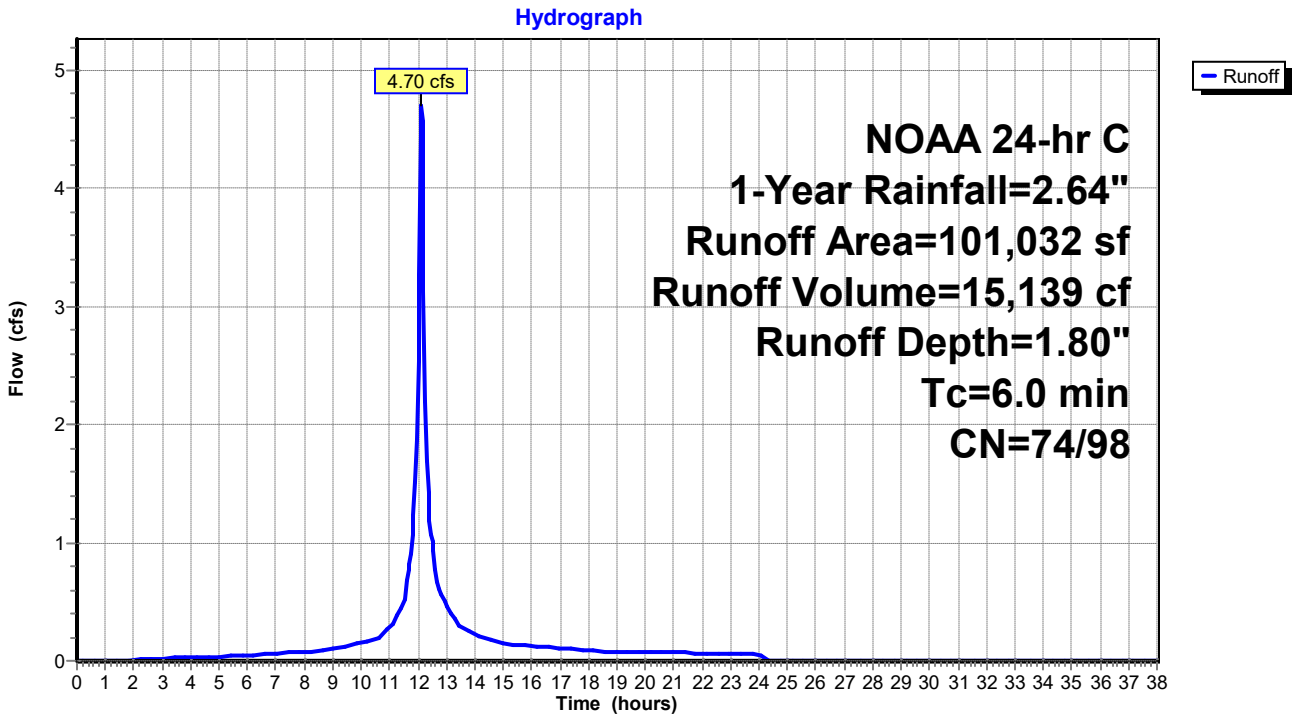
Runoff = 4.70 cfs @ 12.13 hrs, Volume= 15,139 cf, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 1-Year Rainfall=2.64"

	Area (sf)	CN	Description
*	10,035	98	LOD Impervious
*	3,984	74	LOD Grass HSG C
*	55,089	98	NON-LOD Impervious
*	31,924	74	NON-LOD Grass HSG C
	101,032	89	Weighted Average
	35,908	74	35.54% Pervious Area
	65,124	98	64.46% Impervious Area

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

Subcatchment A2: BYPASS



Summary for Pond UG-01: (new Pond)

Inflow Area = 48,590 sf, 86.02% Impervious, Inflow Depth = 2.17" for 1-Year event
Inflow = 2.71 cfs @ 12.13 hrs, Volume= 8,784 cf
Outflow = 1.67 cfs @ 12.21 hrs, Volume= 8,695 cf, Atten= 38%, Lag= 5.3 min
Primary = 1.67 cfs @ 12.21 hrs, Volume= 8,695 cf

Routing by Stor-Ind method, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 367.72' @ 12.21 hrs Surf.Area= 2,931 sf Storage= 2,477 cf

Plug-Flow detention time= 169.7 min calculated for 8,684 cf (99% of inflow)
Center-of-Mass det. time= 164.0 min (931.2 - 767.2)

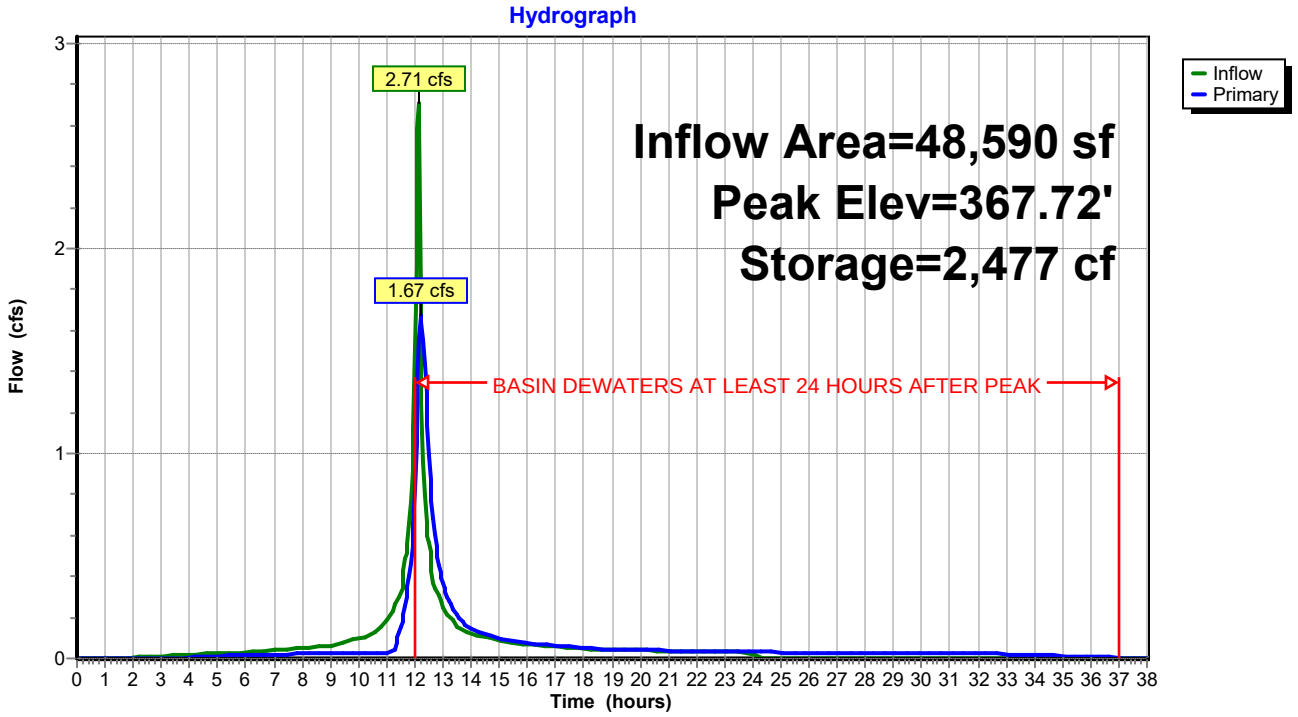
Volume	Invert	Avail.Storage	Storage Description
#1A	365.61'	0 cf	**29.75'W x 87.00'L x 4.50'H Field A** 11,647 cf Overall - 4,781 cf Embedded = 6,867 cf x 0.0% Voids
#2A	366.11'	3,830 cf	**ADS N-12 36"** x 24 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 24 Chambers in 6 Rows 29.75' Header x 7.10 sf x 2 = 422.4 cf Inside
#3	365.11'	1,131 cf	**48.0" Round Pipe Storage** L= 90.0'
		4,961 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	365.32'	**15.0" Round Culvert** L= 51.0' Ke= 0.200 Inlet / Outlet Invert= 365.32' / 365.07' S= 0.0049 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	369.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	367.00'	**12.0" W x 6.0" H Vert. rec orifice** C= 0.600
#4	Device 1	365.61'	**1.0" Vert. 1inch orifice** C= 0.600

Primary OutFlow Max=1.66 cfs @ 12.21 hrs HW=367.72' (Free Discharge)
└**1=Culvert** (Passes 1.66 cfs of 7.82 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=rec orifice** (Orifice Controls 1.62 cfs @ 3.25 fps)
  └**4=1inch orifice** (Orifice Controls 0.04 cfs @ 6.92 fps)

Pond UG-01: (new Pond)

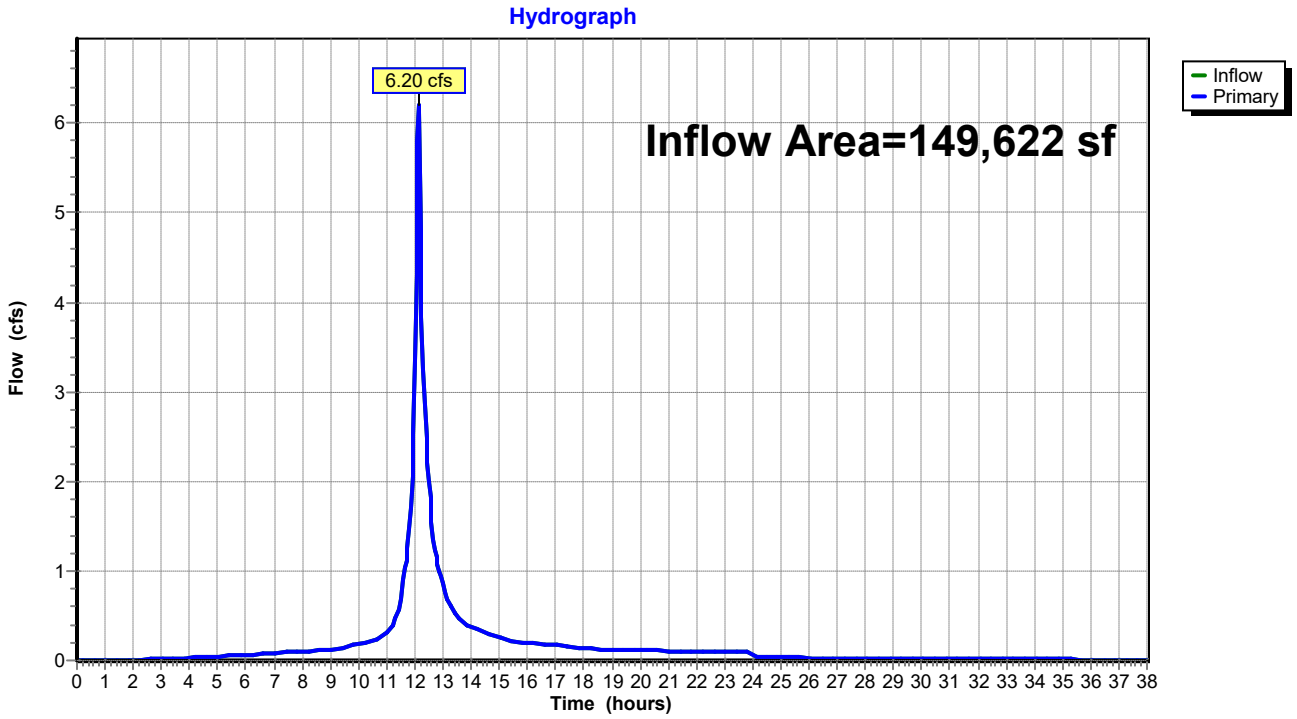


Summary for Link A: COMPOSITE (POST)

Inflow Area = 149,622 sf, 71.46% Impervious, Inflow Depth > 1.91" for 1-Year event
Inflow = 6.20 cfs @ 12.14 hrs, Volume= 23,835 cf
Primary = 6.20 cfs @ 12.14 hrs, Volume= 23,835 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs

Link A: COMPOSITE (POST)



Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: TO UG-01 Runoff Area=48,590 sf 86.02% Impervious Runoff Depth=2.85"
Tc=6.0 min CN=74/98 Runoff=3.53 cfs 11,539 cf

Subcatchment A2: BYPASS Runoff Area=101,032 sf 64.46% Impervious Runoff Depth=2.42"
Tc=6.0 min CN=74/98 Runoff=6.33 cfs 20,394 cf

Pond UG-01: (new Pond) Peak Elev=367.95' Storage=2,917 cf Inflow=3.53 cfs 11,539 cf
Outflow=2.04 cfs 11,450 cf

Link A: COMPOSITE (POST) Inflow=8.16 cfs 31,844 cf
Primary=8.16 cfs 31,844 cf

Total Runoff Area = 149,622 sf Runoff Volume = 31,933 cf Average Runoff Depth = 2.56"
28.54% Pervious = 42,699 sf 71.46% Impervious = 106,923 sf

Summary for Subcatchment A1: TO UG-01

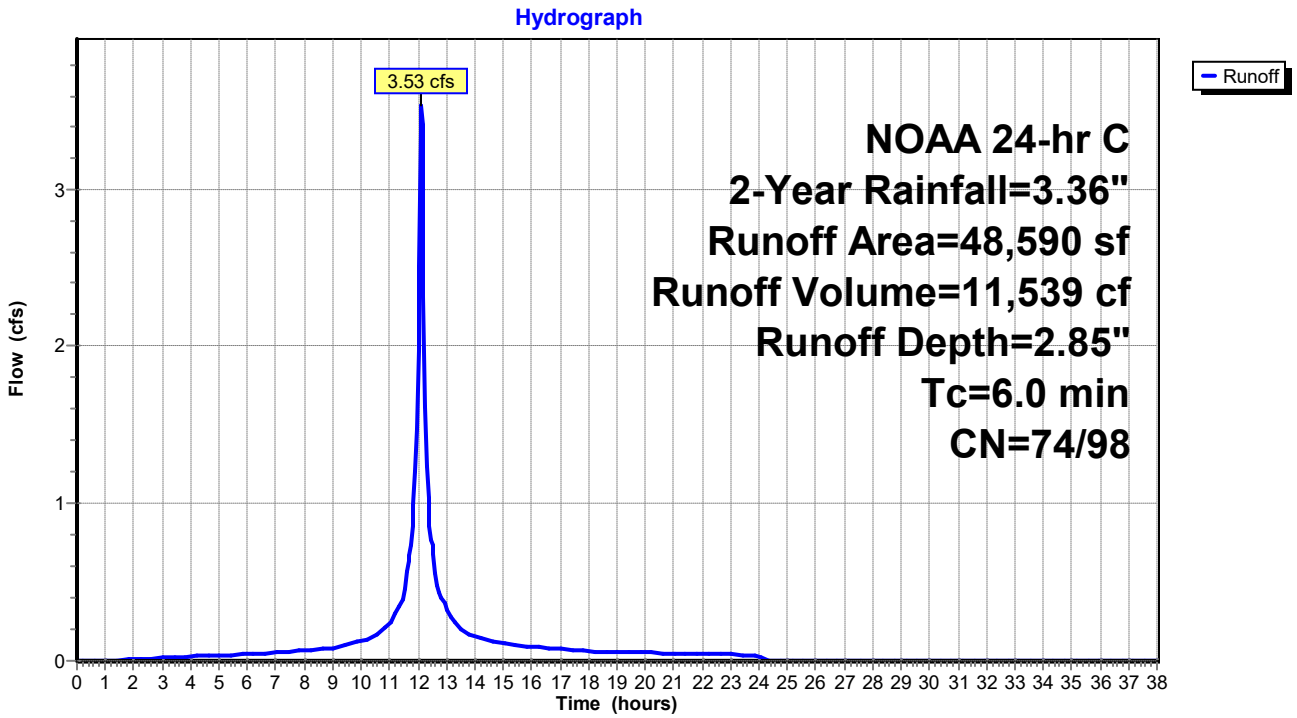
Runoff = 3.53 cfs @ 12.13 hrs, Volume= 11,539 cf, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Rainfall=3.36"

	Area (sf)	CN	Description
*	25,342	98	LOD Impervious
*	1,267	74	LOD Grass HSG C
*	16,457	98	NON-LOD Impervious
*	5,524	74	NON-LOD Grass HSG C
	48,590	95	Weighted Average
	6,791	74	13.98% Pervious Area
	41,799	98	86.02% Impervious Area

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

Subcatchment A1: TO UG-01



Summary for Subcatchment A2: BYPASS

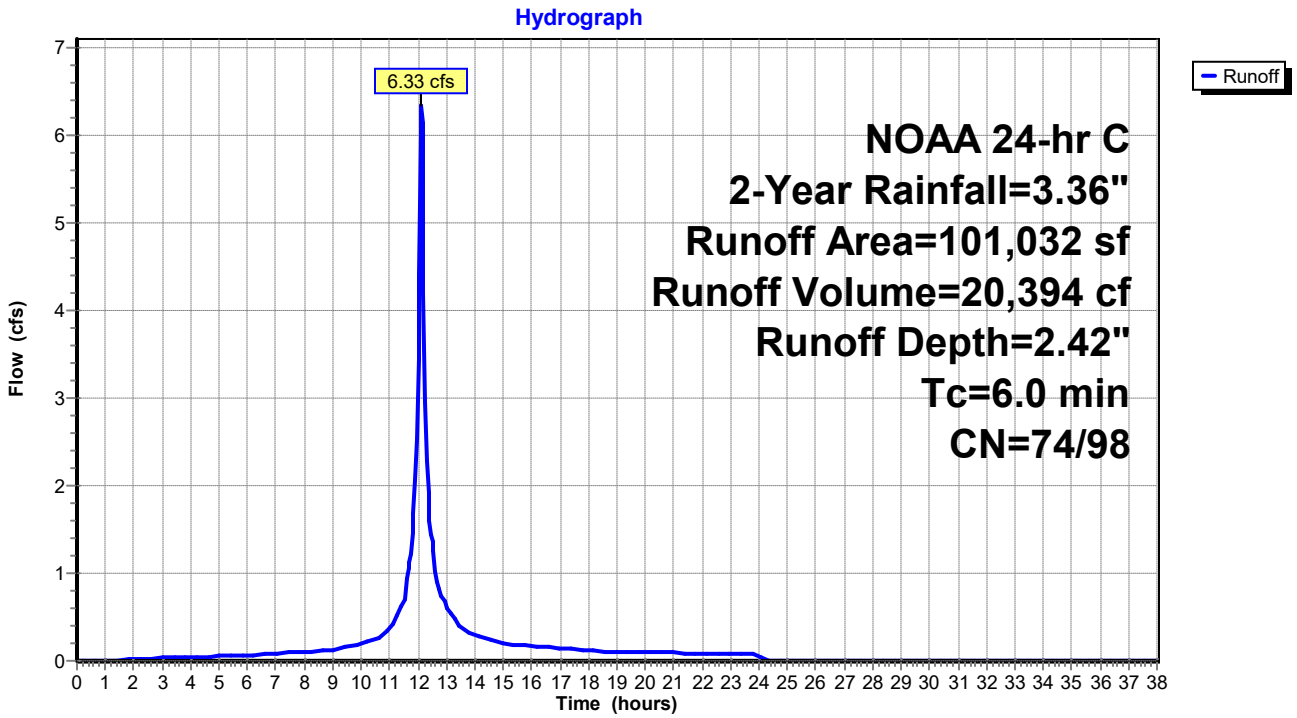
Runoff = 6.33 cfs @ 12.13 hrs, Volume= 20,394 cf, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Rainfall=3.36"

	Area (sf)	CN	Description
*	10,035	98	LOD Impervious
*	3,984	74	LOD Grass HSG C
*	55,089	98	NON-LOD Impervious
*	31,924	74	NON-LOD Grass HSG C
	101,032	89	Weighted Average
	35,908	74	35.54% Pervious Area
	65,124	98	64.46% Impervious Area

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

Subcatchment A2: BYPASS



Summary for Pond UG-01: (new Pond)

Inflow Area = 48,590 sf, 86.02% Impervious, Inflow Depth = 2.85" for 2-Year event
Inflow = 3.53 cfs @ 12.13 hrs, Volume= 11,539 cf
Outflow = 2.04 cfs @ 12.22 hrs, Volume= 11,450 cf, Atten= 42%, Lag= 5.7 min
Primary = 2.04 cfs @ 12.22 hrs, Volume= 11,450 cf

Routing by Stor-Ind method, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 367.95' @ 12.22 hrs Surf.Area= 2,915 sf Storage= 2,917 cf

Plug-Flow detention time= 141.1 min calculated for 11,450 cf (99% of inflow)
Center-of-Mass det. time= 135.9 min (898.4 - 762.5)

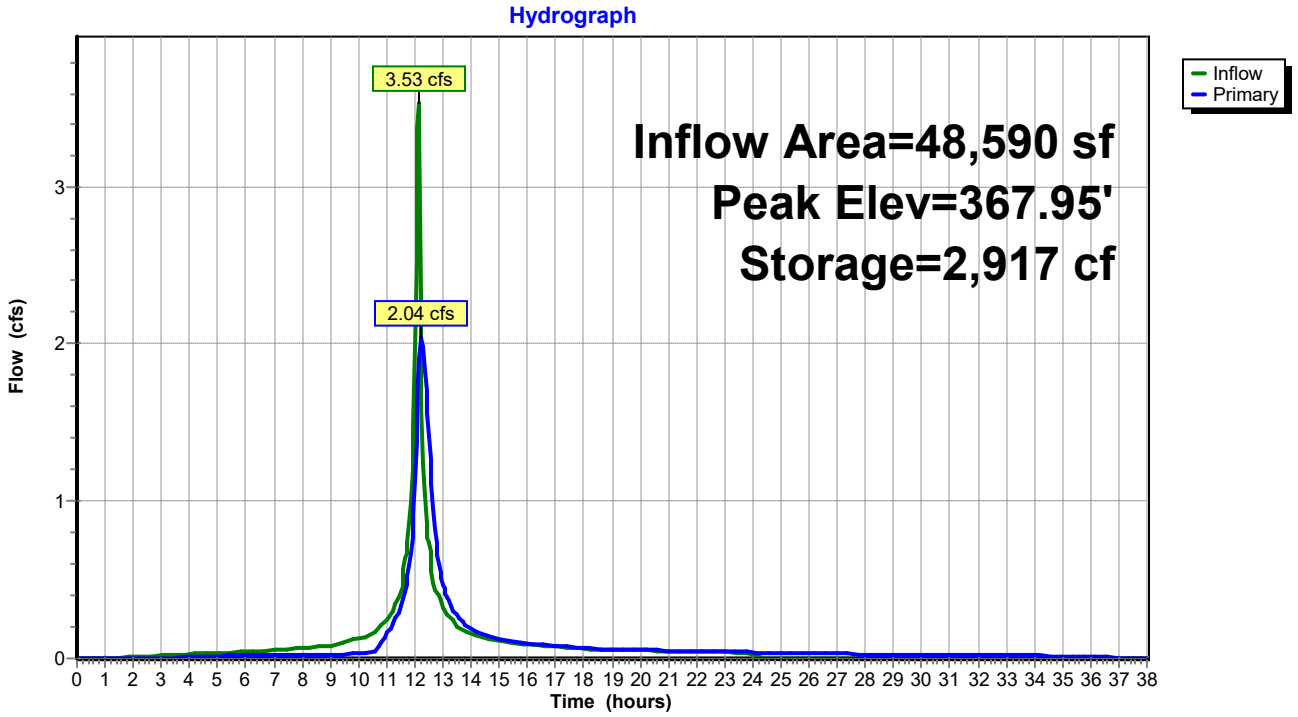
Volume	Invert	Avail.Storage	Storage Description
#1A	365.61'	0 cf	**29.75'W x 87.00'L x 4.50'H Field A** 11,647 cf Overall - 4,781 cf Embedded = 6,867 cf x 0.0% Voids
#2A	366.11'	3,830 cf	**ADS N-12 36"** x 24 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 24 Chambers in 6 Rows 29.75' Header x 7.10 sf x 2 = 422.4 cf Inside
#3	365.11'	1,131 cf	**48.0" Round Pipe Storage** L= 90.0'
		4,961 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	365.32'	**15.0" Round Culvert** L= 51.0' Ke= 0.200 Inlet / Outlet Invert= 365.32' / 365.07' S= 0.0049 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	369.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	367.00'	**12.0" W x 6.0" H Vert. rec orifice** C= 0.600
#4	Device 1	365.61'	**1.0" Vert. 1inch orifice** C= 0.600

Primary OutFlow Max=2.02 cfs @ 12.22 hrs HW=367.94' (Free Discharge)
└**1=Culvert** (Passes 2.02 cfs of 8.42 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=rec orifice** (Orifice Controls 1.98 cfs @ 3.97 fps)
  └**4=1inch orifice** (Orifice Controls 0.04 cfs @ 7.28 fps)

Pond UG-01: (new Pond)

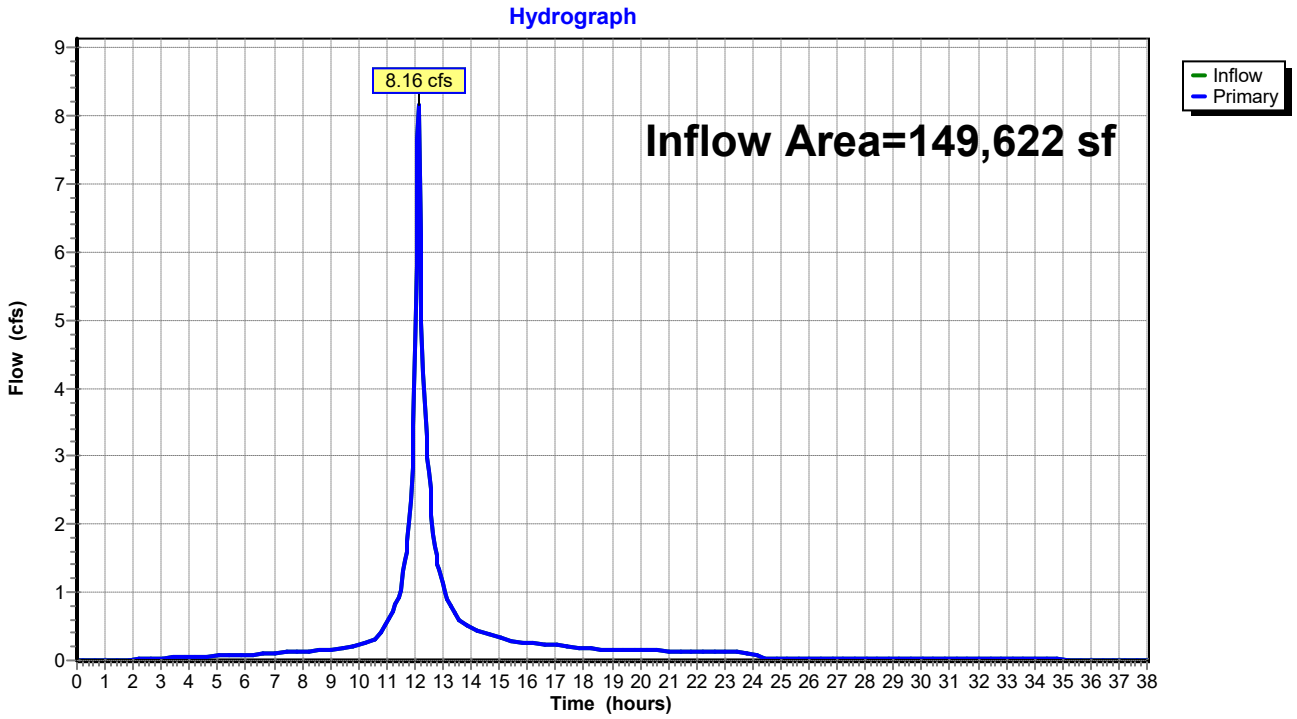


Summary for Link A: COMPOSITE (POST)

Inflow Area = 149,622 sf, 71.46% Impervious, Inflow Depth > 2.55" for 2-Year event
Inflow = 8.16 cfs @ 12.13 hrs, Volume= 31,844 cf
Primary = 8.16 cfs @ 12.13 hrs, Volume= 31,844 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs

Link A: COMPOSITE (POST)



Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: TO UG-01 Runoff Area=48,590 sf 86.02% Impervious Runoff Depth=3.77"
Tc=6.0 min CN=74/98 Runoff=4.64 cfs 15,265 cf

Subcatchment A2: BYPASS Runoff Area=101,032 sf 64.46% Impervious Runoff Depth=3.28"
Tc=6.0 min CN=74/98 Runoff=8.58 cfs 27,657 cf

Pond UG-01: (new Pond) Peak Elev=368.28' Storage=3,547 cf Inflow=4.64 cfs 15,265 cf
Outflow=2.48 cfs 15,175 cf

Link A: COMPOSITE (POST) Inflow=10.78 cfs 42,832 cf
Primary=10.78 cfs 42,832 cf

Total Runoff Area = 149,622 sf Runoff Volume = 42,922 cf Average Runoff Depth = 3.44"
28.54% Pervious = 42,699 sf 71.46% Impervious = 106,923 sf

Summary for Subcatchment A1: TO UG-01

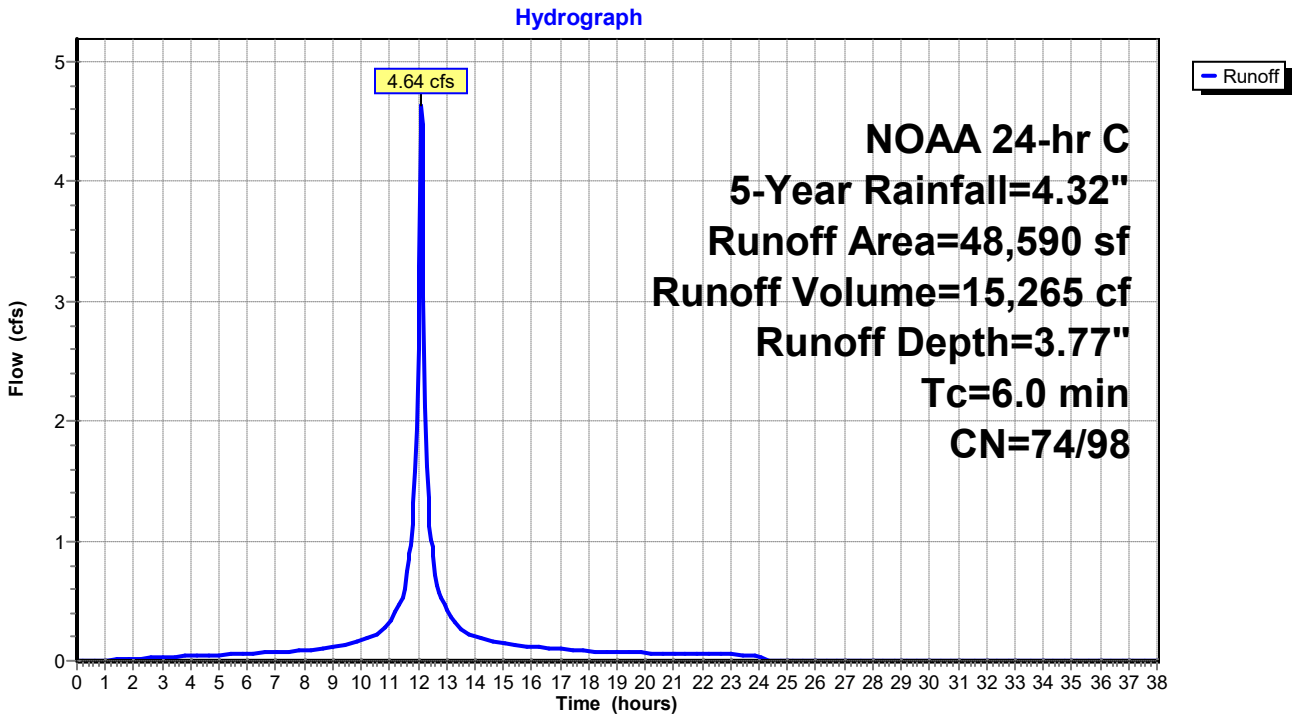
Runoff = 4.64 cfs @ 12.13 hrs, Volume= 15,265 cf, Depth= 3.77"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 5-Year Rainfall=4.32"

	Area (sf)	CN	Description
*	25,342	98	LOD Impervious
*	1,267	74	LOD Grass HSG C
*	16,457	98	NON-LOD Impervious
*	5,524	74	NON-LOD Grass HSG C
	48,590	95	Weighted Average
	6,791	74	13.98% Pervious Area
	41,799	98	86.02% Impervious Area

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

Subcatchment A1: TO UG-01



Summary for Subcatchment A2: BYPASS

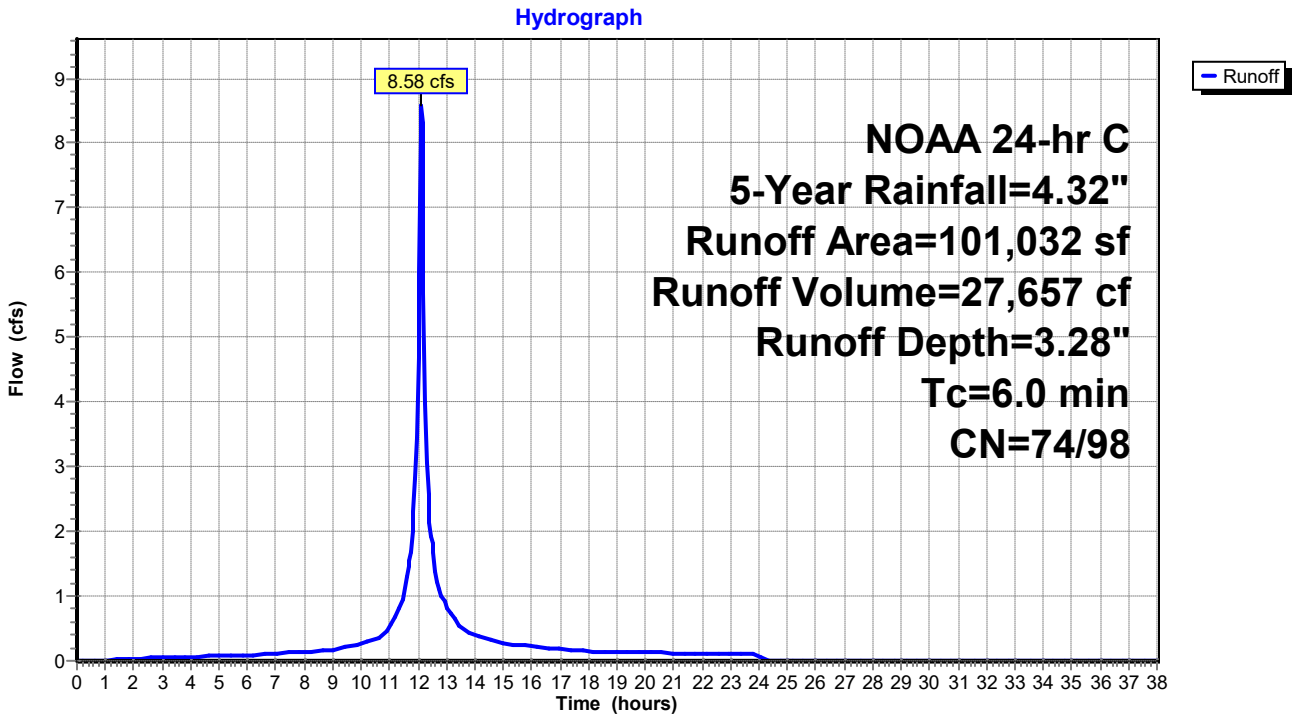
Runoff = 8.58 cfs @ 12.13 hrs, Volume= 27,657 cf, Depth= 3.28"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 5-Year Rainfall=4.32"

	Area (sf)	CN	Description
*	10,035	98	LOD Impervious
*	3,984	74	LOD Grass HSG C
*	55,089	98	NON-LOD Impervious
*	31,924	74	NON-LOD Grass HSG C
	101,032	89	Weighted Average
	35,908	74	35.54% Pervious Area
	65,124	98	64.46% Impervious Area

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

Subcatchment A2: BYPASS



Summary for Pond UG-01: (new Pond)

Inflow Area = 48,590 sf, 86.02% Impervious, Inflow Depth = 3.77" for 5-Year event
Inflow = 4.64 cfs @ 12.13 hrs, Volume= 15,265 cf
Outflow = 2.48 cfs @ 12.23 hrs, Volume= 15,175 cf, Atten= 47%, Lag= 6.4 min
Primary = 2.48 cfs @ 12.23 hrs, Volume= 15,175 cf

Routing by Stor-Ind method, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 368.28' @ 12.23 hrs Surf.Area= 2,880 sf Storage= 3,547 cf

Plug-Flow detention time= 115.8 min calculated for 15,155 cf (99% of inflow)
Center-of-Mass det. time= 112.8 min (870.9 - 758.1)

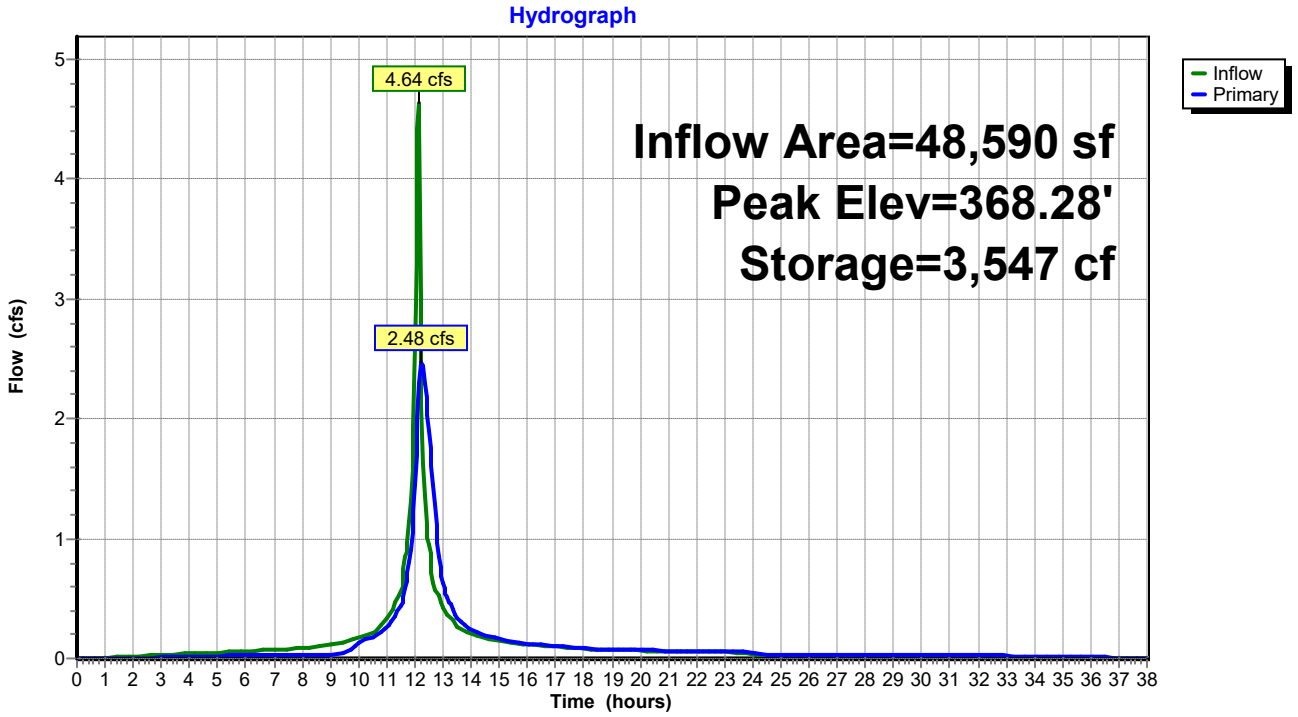
Volume	Invert	Avail.Storage	Storage Description
#1A	365.61'	0 cf	**29.75'W x 87.00'L x 4.50'H Field A** 11,647 cf Overall - 4,781 cf Embedded = 6,867 cf x 0.0% Voids
#2A	366.11'	3,830 cf	**ADS N-12 36"** x 24 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 24 Chambers in 6 Rows 29.75' Header x 7.10 sf x 2 = 422.4 cf Inside
#3	365.11'	1,131 cf	**48.0" Round Pipe Storage** L= 90.0'
		4,961 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	365.32'	**15.0" Round Culvert** L= 51.0' Ke= 0.200 Inlet / Outlet Invert= 365.32' / 365.07' S= 0.0049 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	369.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	367.00'	**12.0" W x 6.0" H Vert. rec orifice** C= 0.600
#4	Device 1	365.61'	**1.0" Vert. 1inch orifice** C= 0.600

Primary OutFlow Max=2.47 cfs @ 12.23 hrs HW=368.27' (Free Discharge)
└**1=Culvert** (Passes 2.47 cfs of 9.25 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=rec orifice** (Orifice Controls 2.43 cfs @ 4.85 fps)
  └**4=1inch orifice** (Orifice Controls 0.04 cfs @ 7.79 fps)

Pond UG-01: (new Pond)

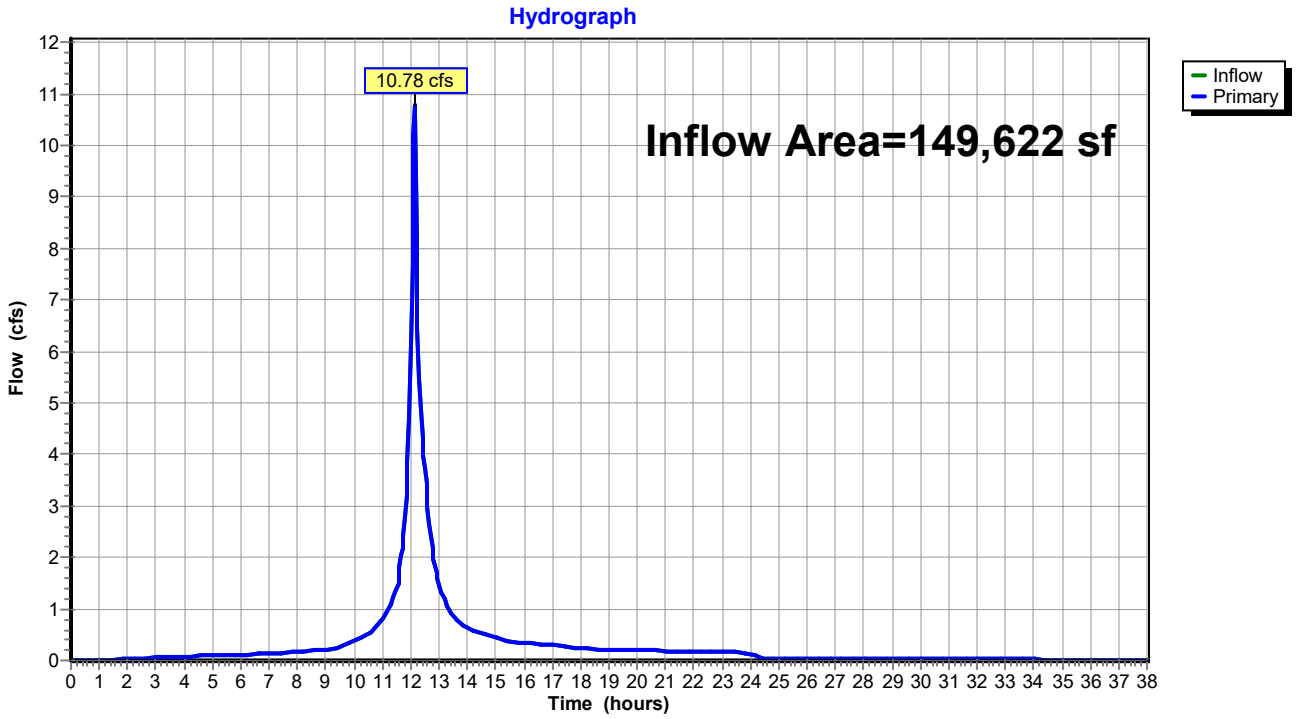


Summary for Link A: COMPOSITE (POST)

Inflow Area = 149,622 sf, 71.46% Impervious, Inflow Depth > 3.44" for 5-Year event
Inflow = 10.78 cfs @ 12.13 hrs, Volume= 42,832 cf
Primary = 10.78 cfs @ 12.13 hrs, Volume= 42,832 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs

Link A: COMPOSITE (POST)



Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: TO UG-01 Runoff Area=48,590 sf 86.02% Impervious Runoff Depth=4.70"
Tc=6.0 min CN=74/98 Runoff=5.75 cfs 19,031 cf

Subcatchment A2: BYPASS Runoff Area=101,032 sf 64.46% Impervious Runoff Depth=4.17"
Tc=6.0 min CN=74/98 Runoff=10.88 cfs 35,116 cf

Pond UG-01: (new Pond) Peak Elev=368.68' Storage=4,239 cf Inflow=5.75 cfs 19,031 cf
Outflow=2.92 cfs 18,939 cf

Link A: COMPOSITE (POST) Inflow=13.43 cfs 54,055 cf
Primary=13.43 cfs 54,055 cf

Total Runoff Area = 149,622 sf Runoff Volume = 54,147 cf Average Runoff Depth = 4.34"
28.54% Pervious = 42,699 sf 71.46% Impervious = 106,923 sf

Summary for Subcatchment A1: TO UG-01

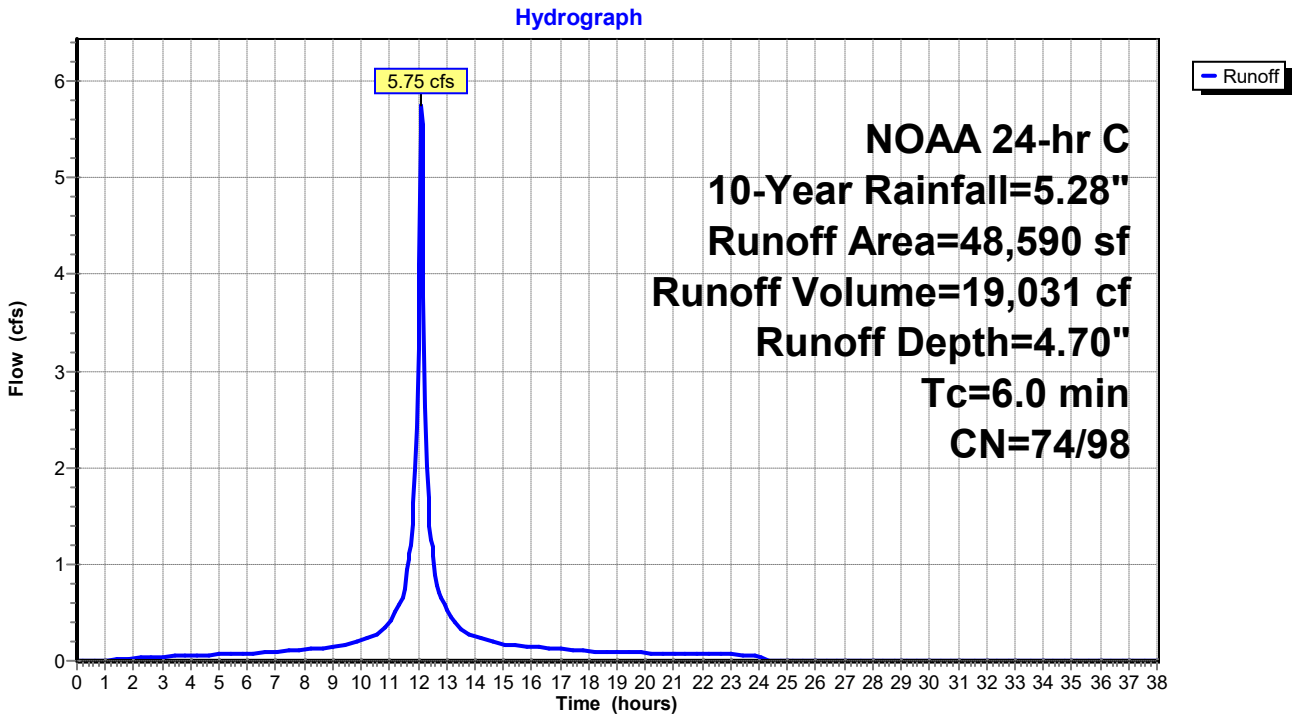
Runoff = 5.75 cfs @ 12.13 hrs, Volume= 19,031 cf, Depth= 4.70"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Rainfall=5.28"

	Area (sf)	CN	Description
*	25,342	98	LOD Impervious
*	1,267	74	LOD Grass HSG C
*	16,457	98	NON-LOD Impervious
*	5,524	74	NON-LOD Grass HSG C
	48,590	95	Weighted Average
	6,791	74	13.98% Pervious Area
	41,799	98	86.02% Impervious Area

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

Subcatchment A1: TO UG-01



Summary for Subcatchment A2: BYPASS

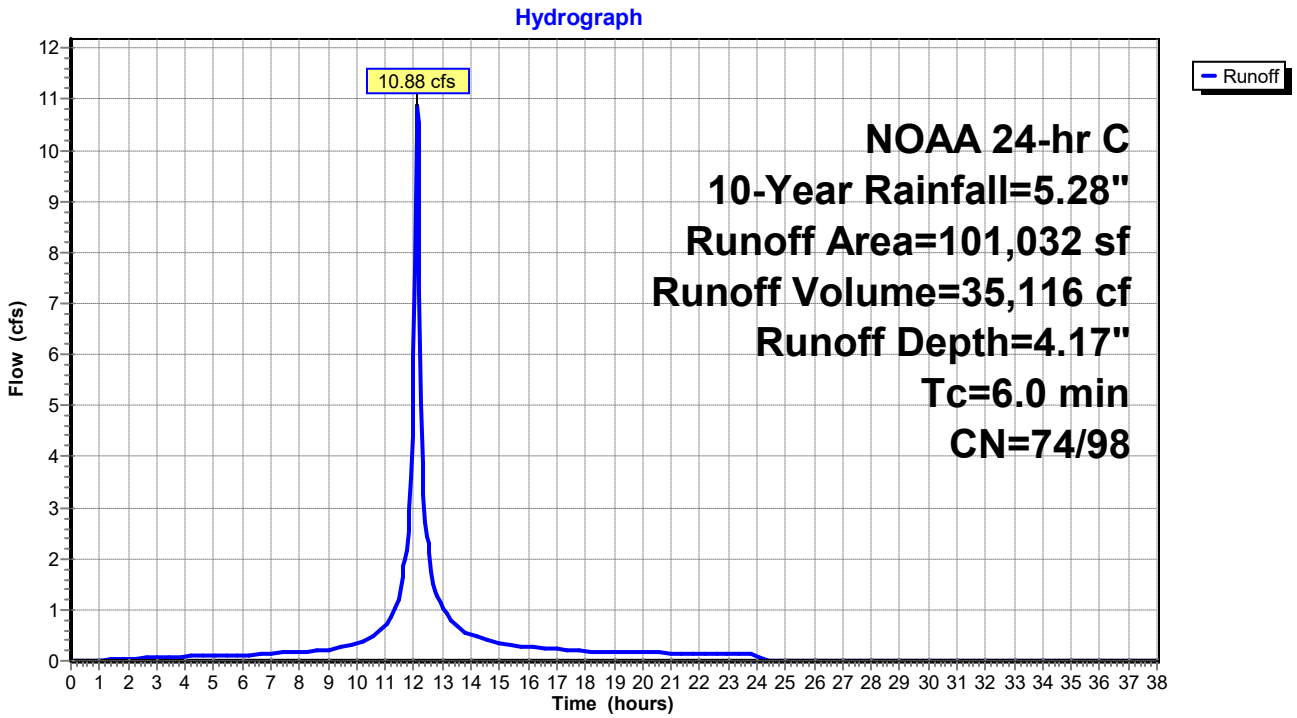
Runoff = 10.88 cfs @ 12.13 hrs, Volume= 35,116 cf, Depth= 4.17"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Rainfall=5.28"

	Area (sf)	CN	Description
*	10,035	98	LOD Impervious
*	3,984	74	LOD Grass HSG C
*	55,089	98	NON-LOD Impervious
*	31,924	74	NON-LOD Grass HSG C
	101,032	89	Weighted Average
	35,908	74	35.54% Pervious Area
	65,124	98	64.46% Impervious Area

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

Subcatchment A2: BYPASS



Summary for Pond UG-01: (new Pond)

Inflow Area = 48,590 sf, 86.02% Impervious, Inflow Depth = 4.70" for 10-Year event
Inflow = 5.75 cfs @ 12.13 hrs, Volume= 19,031 cf
Outflow = 2.92 cfs @ 12.24 hrs, Volume= 18,939 cf, Atten= 49%, Lag= 6.9 min
Primary = 2.92 cfs @ 12.24 hrs, Volume= 18,939 cf

Routing by Stor-Ind method, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 368.68' @ 12.24 hrs Surf.Area= 2,812 sf Storage= 4,239 cf

Plug-Flow detention time= 100.1 min calculated for 18,914 cf (99% of inflow)
Center-of-Mass det. time= 97.8 min (852.7 - 754.9)

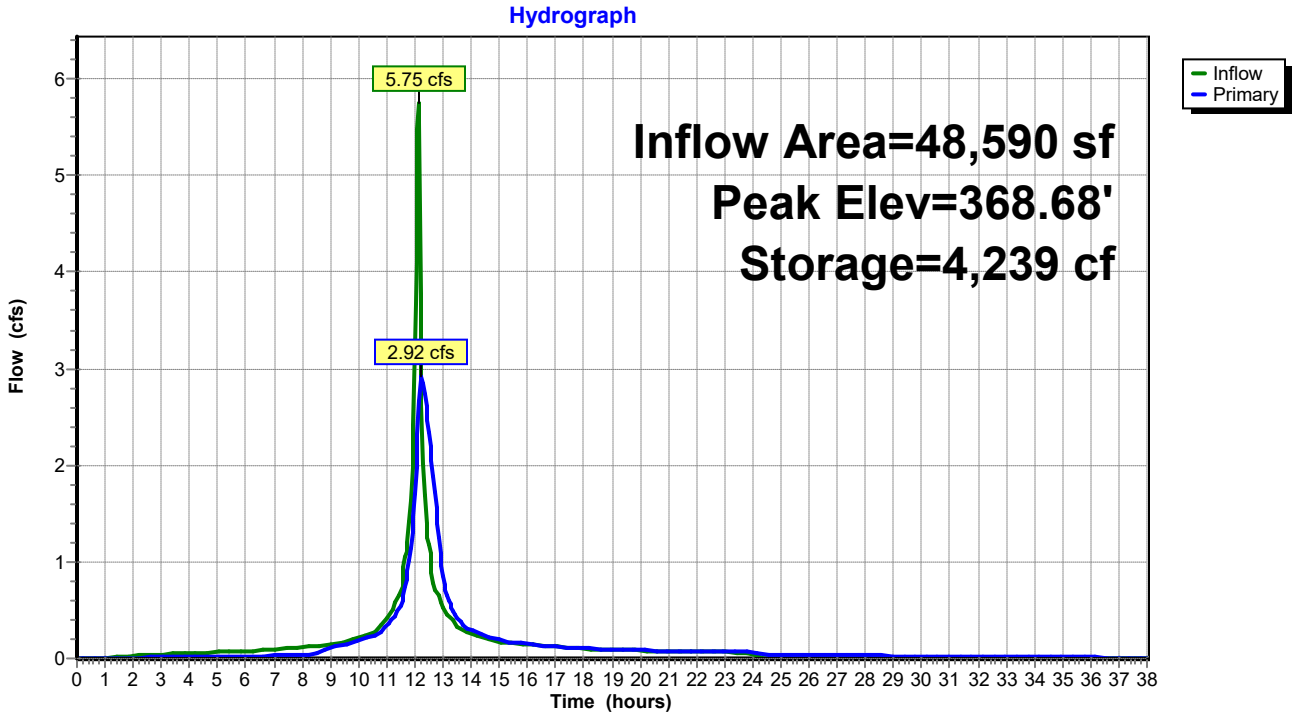
Volume	Invert	Avail.Storage	Storage Description
#1A	365.61'	0 cf	**29.75'W x 87.00'L x 4.50'H Field A** 11,647 cf Overall - 4,781 cf Embedded = 6,867 cf x 0.0% Voids
#2A	366.11'	3,830 cf	**ADS N-12 36"** x 24 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 24 Chambers in 6 Rows 29.75' Header x 7.10 sf x 2 = 422.4 cf Inside
#3	365.11'	1,131 cf	**48.0" Round Pipe Storage** L= 90.0'
		4,961 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	365.32'	**15.0" Round Culvert** L= 51.0' Ke= 0.200 Inlet / Outlet Invert= 365.32' / 365.07' S= 0.0049 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	369.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	367.00'	**12.0" W x 6.0" H Vert. rec orifice** C= 0.600
#4	Device 1	365.61'	**1.0" Vert. 1inch orifice** C= 0.600

Primary OutFlow Max=2.91 cfs @ 12.24 hrs HW=368.67' (Free Discharge)
└**1=Culvert** (Passes 2.91 cfs of 10.15 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**3=rec orifice** (Orifice Controls 2.87 cfs @ 5.73 fps)
  └**4=1inch orifice** (Orifice Controls 0.05 cfs @ 8.37 fps)

Pond UG-01: (new Pond)

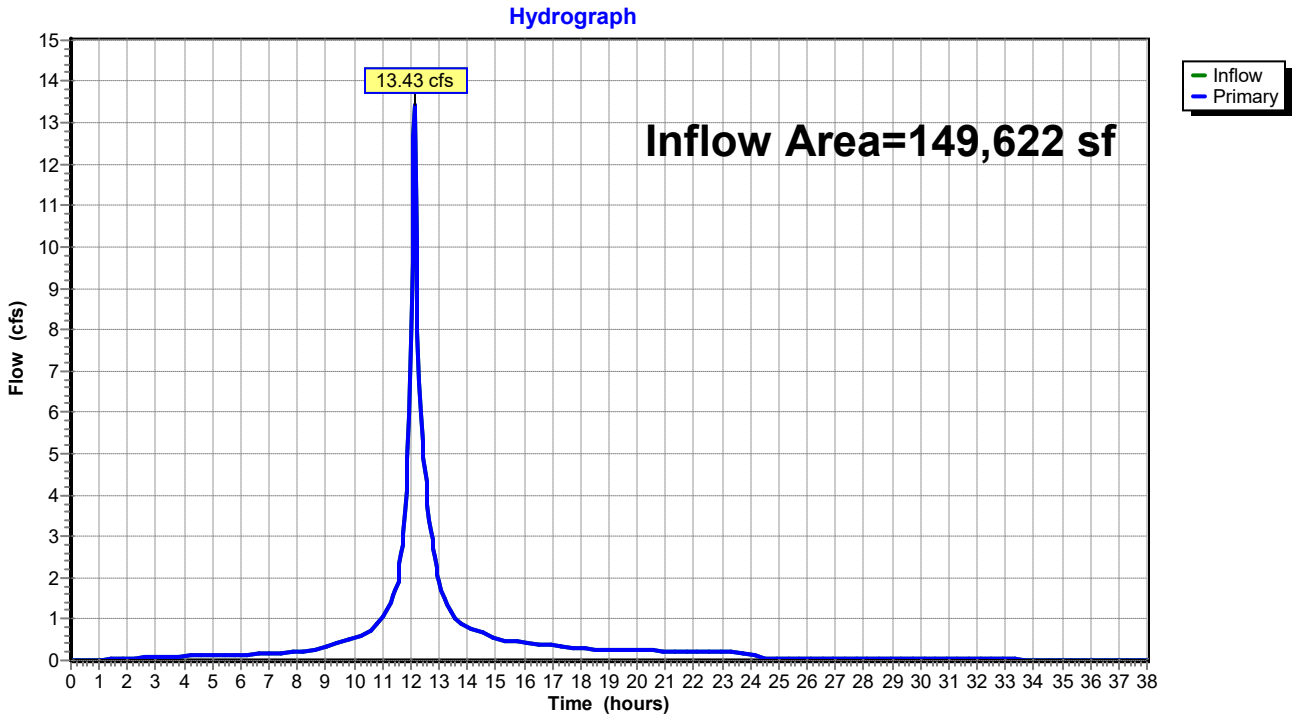


Summary for Link A: COMPOSITE (POST)

Inflow Area = 149,622 sf, 71.46% Impervious, Inflow Depth > 4.34" for 10-Year event
Inflow = 13.43 cfs @ 12.13 hrs, Volume= 54,055 cf
Primary = 13.43 cfs @ 12.13 hrs, Volume= 54,055 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs

Link A: COMPOSITE (POST)



Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: TO UG-01 Runoff Area=48,590 sf 86.02% Impervious Runoff Depth=5.64"
Tc=6.0 min CN=74/98 Runoff=6.86 cfs 22,822 cf

Subcatchment A2: BYPASS Runoff Area=101,032 sf 64.46% Impervious Runoff Depth=5.07"
Tc=6.0 min CN=74/98 Runoff=13.20 cfs 42,708 cf

Pond UG-01: (new Pond) Peak Elev=369.17' Storage=4,859 cf Inflow=6.86 cfs 22,822 cf
Outflow=4.12 cfs 22,749 cf

Link A: COMPOSITE (POST) Inflow=16.03 cfs 65,457 cf
Primary=16.03 cfs 65,457 cf

Total Runoff Area = 149,622 sf Runoff Volume = 65,530 cf Average Runoff Depth = 5.26"
28.54% Pervious = 42,699 sf 71.46% Impervious = 106,923 sf

Summary for Subcatchment A1: TO UG-01

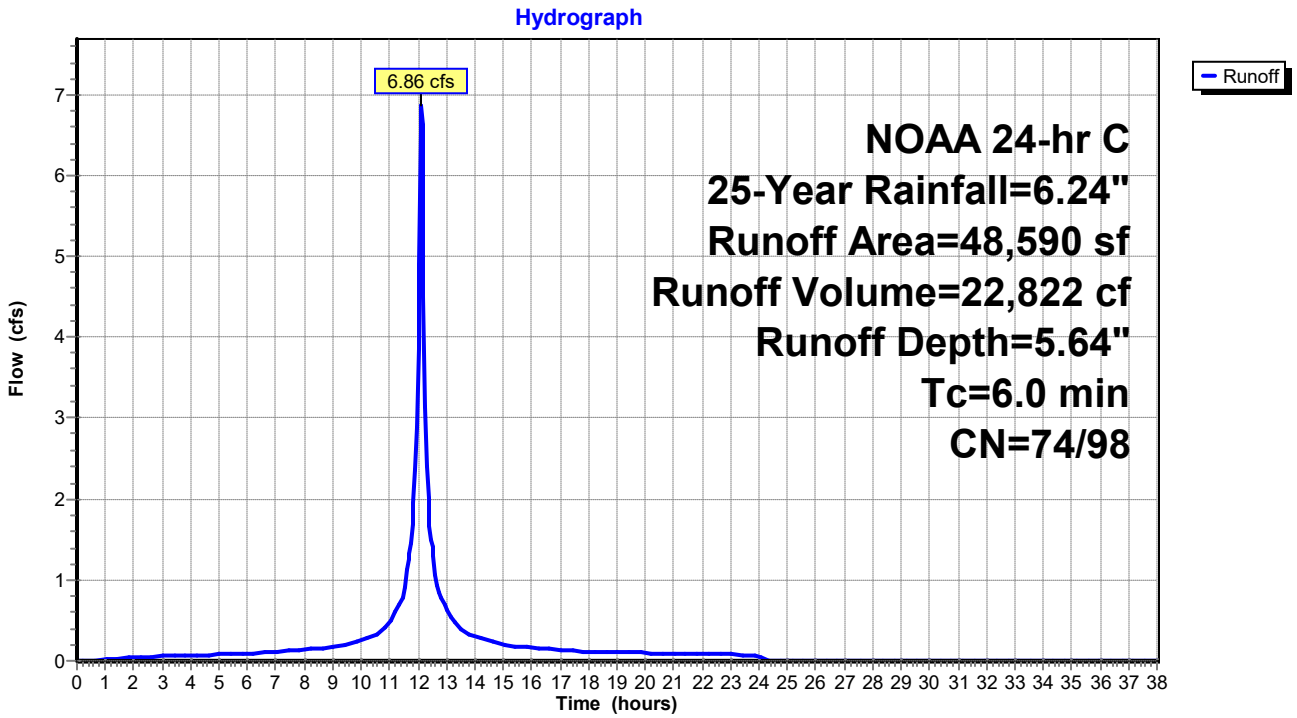
Runoff = 6.86 cfs @ 12.13 hrs, Volume= 22,822 cf, Depth= 5.64"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Rainfall=6.24"

	Area (sf)	CN	Description
*	25,342	98	LOD Impervious
*	1,267	74	LOD Grass HSG C
*	16,457	98	NON-LOD Impervious
*	5,524	74	NON-LOD Grass HSG C
	48,590	95	Weighted Average
	6,791	74	13.98% Pervious Area
	41,799	98	86.02% Impervious Area

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

Subcatchment A1: TO UG-01



Summary for Subcatchment A2: BYPASS

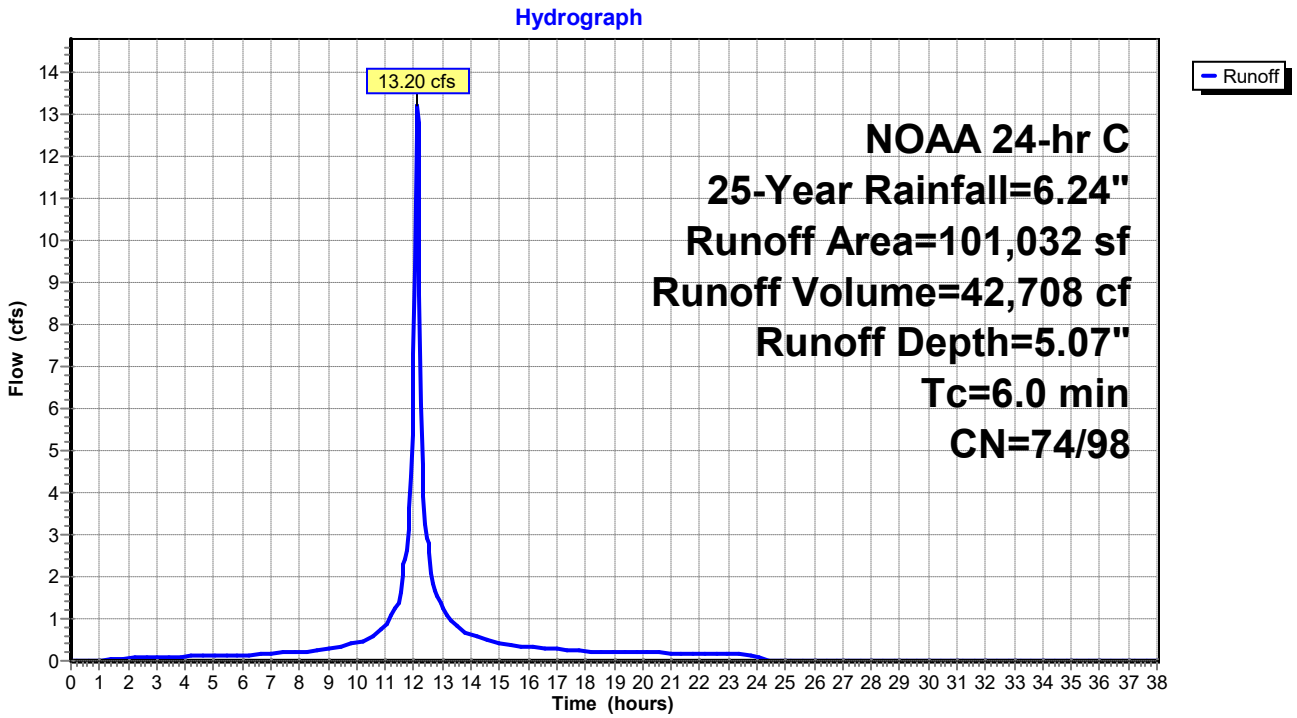
Runoff = 13.20 cfs @ 12.13 hrs, Volume= 42,708 cf, Depth= 5.07"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Rainfall=6.24"

	Area (sf)	CN	Description
*	10,035	98	LOD Impervious
*	3,984	74	LOD Grass HSG C
*	55,089	98	NON-LOD Impervious
*	31,924	74	NON-LOD Grass HSG C
	101,032	89	Weighted Average
	35,908	74	35.54% Pervious Area
	65,124	98	64.46% Impervious Area

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

Subcatchment A2: BYPASS



Summary for Pond UG-01: (new Pond)

Inflow Area = 48,590 sf, 86.02% Impervious, Inflow Depth = 5.64" for 25-Year event
Inflow = 6.86 cfs @ 12.13 hrs, Volume= 22,822 cf
Outflow = 4.12 cfs @ 12.21 hrs, Volume= 22,749 cf, Atten= 40%, Lag= 5.2 min
Primary = 4.12 cfs @ 12.21 hrs, Volume= 22,749 cf

Routing by Stor-Ind method, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 369.17' @ 12.22 hrs Surf.Area= 2,588 sf Storage= 4,859 cf

Plug-Flow detention time= 88.0 min calculated for 22,719 cf (100% of inflow)
Center-of-Mass det. time= 86.7 min (839.2 - 752.4)

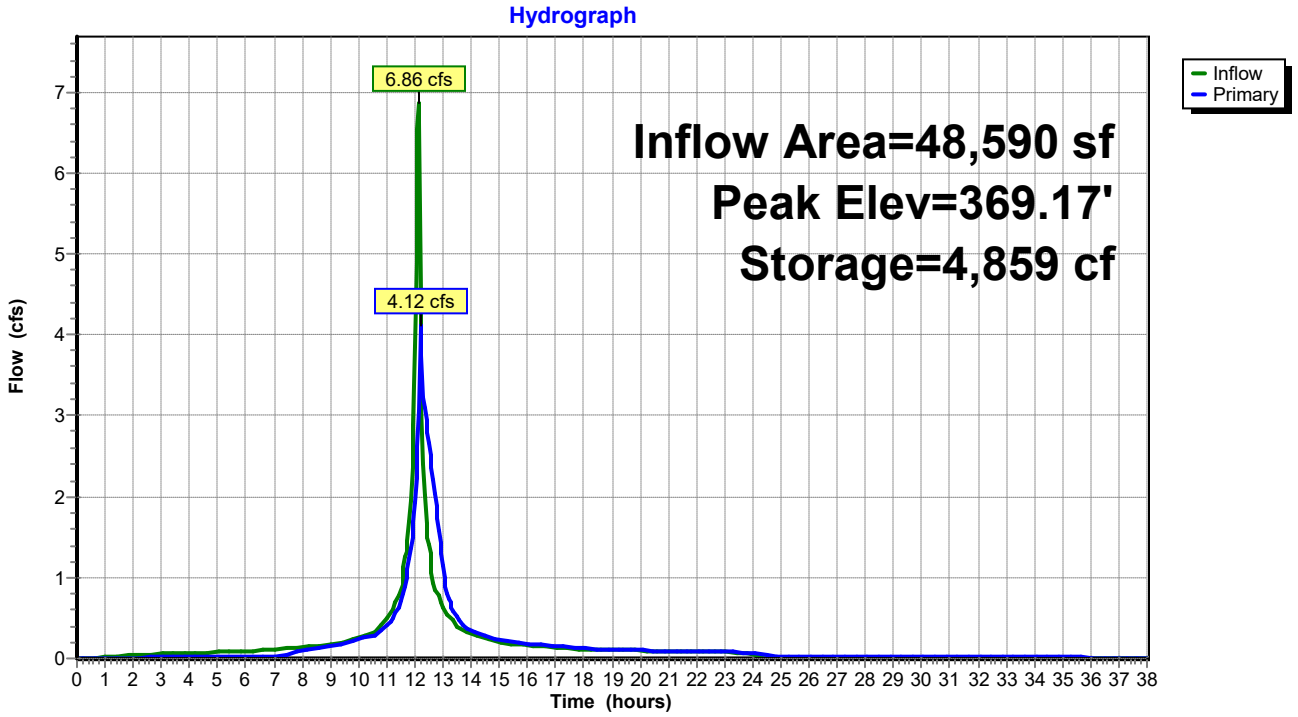
Volume	Invert	Avail.Storage	Storage Description
#1A	365.61'	0 cf	**29.75'W x 87.00'L x 4.50'H Field A** 11,647 cf Overall - 4,781 cf Embedded = 6,867 cf x 0.0% Voids
#2A	366.11'	3,830 cf	**ADS N-12 36"** x 24 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 24 Chambers in 6 Rows 29.75' Header x 7.10 sf x 2 = 422.4 cf Inside
#3	365.11'	1,131 cf	**48.0" Round Pipe Storage** L= 90.0'
		4,961 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	365.32'	**15.0" Round Culvert** L= 51.0' Ke= 0.200 Inlet / Outlet Invert= 365.32' / 365.07' S= 0.0049 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	369.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	367.00'	**12.0" W x 6.0" H Vert. rec orifice** C= 0.600
#4	Device 1	365.61'	**1.0" Vert. 1inch orifice** C= 0.600

Primary OutFlow Max=3.98 cfs @ 12.21 hrs HW=369.13' (Free Discharge)
└**1=Culvert** (Passes 3.98 cfs of 11.10 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.63 cfs @ 1.19 fps)
  ├**3=rec orifice** (Orifice Controls 3.30 cfs @ 6.60 fps)
  └**4=1inch orifice** (Orifice Controls 0.05 cfs @ 8.98 fps)

Pond UG-01: (new Pond)

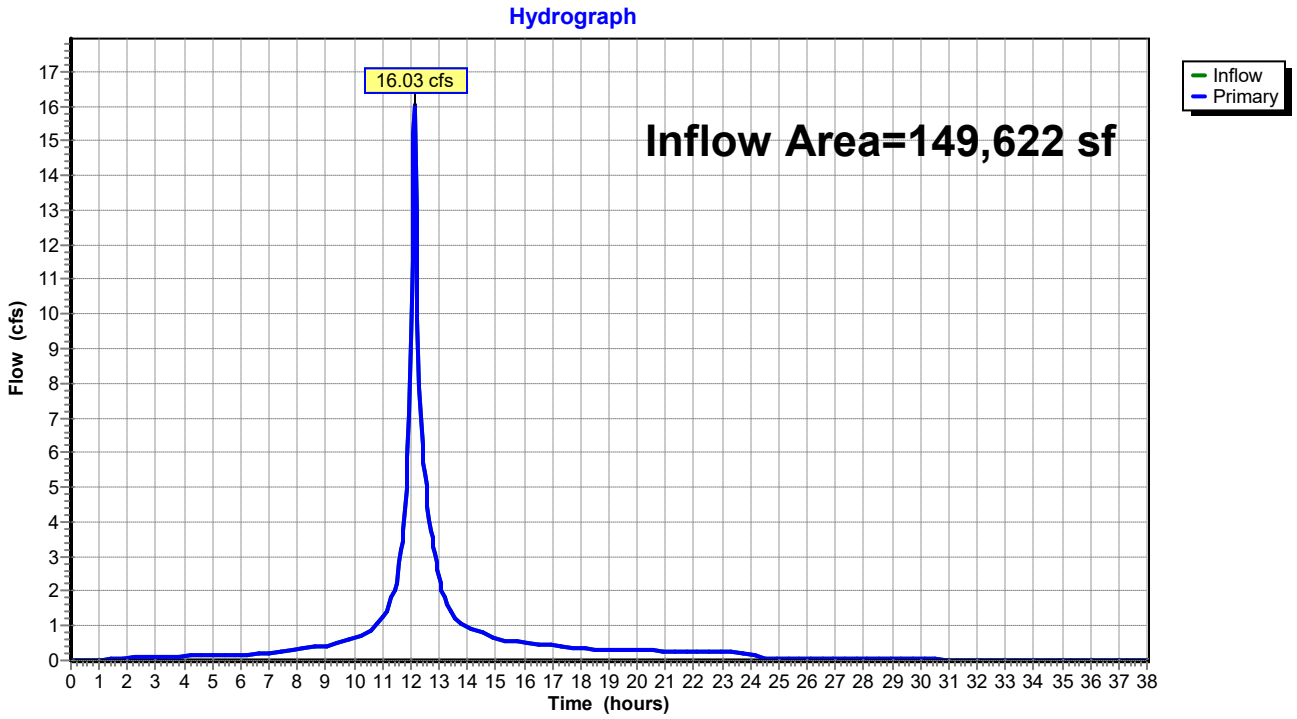


Summary for Link A: COMPOSITE (POST)

Inflow Area = 149,622 sf, 71.46% Impervious, Inflow Depth > 5.25" for 25-Year event
Inflow = 16.03 cfs @ 12.13 hrs, Volume= 65,457 cf
Primary = 16.03 cfs @ 12.13 hrs, Volume= 65,457 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs

Link A: COMPOSITE (POST)



Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: TO UG-01 Runoff Area=48,590 sf 86.02% Impervious Runoff Depth=6.58"
Tc=6.0 min CN=74/98 Runoff=7.98 cfs 26,632 cf

Subcatchment A2: BYPASS Runoff Area=101,032 sf 64.46% Impervious Runoff Depth=5.99"
Tc=6.0 min CN=74/98 Runoff=15.54 cfs 50,394 cf

Pond UG-01: (new Pond) Peak Elev=369.39' Storage=4,961 cf Inflow=7.98 cfs 26,632 cf
Outflow=6.26 cfs 26,445 cf

Link A: COMPOSITE (POST) Inflow=21.26 cfs 76,839 cf
Primary=21.26 cfs 76,839 cf

Total Runoff Area = 149,622 sf Runoff Volume = 77,027 cf Average Runoff Depth = 6.18"
28.54% Pervious = 42,699 sf 71.46% Impervious = 106,923 sf

Summary for Subcatchment A1: TO UG-01

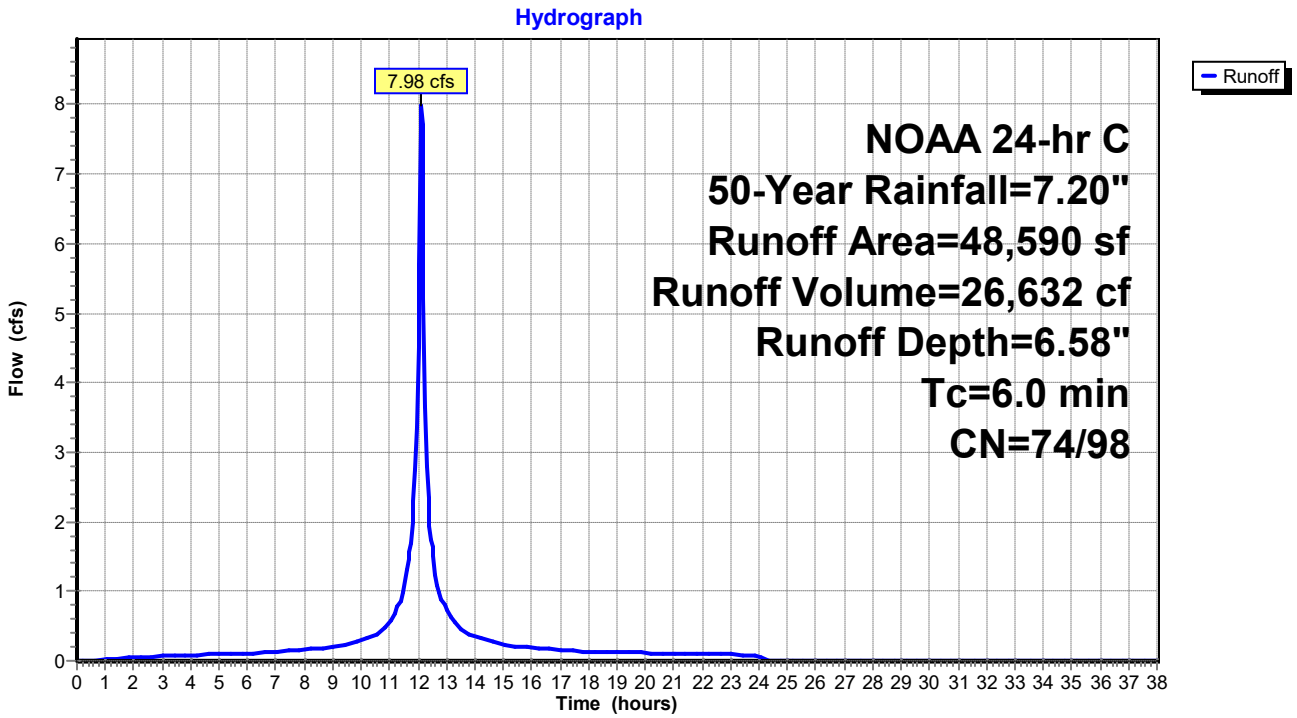
Runoff = 7.98 cfs @ 12.13 hrs, Volume= 26,632 cf, Depth= 6.58"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 50-Year Rainfall=7.20"

	Area (sf)	CN	Description
*	25,342	98	LOD Impervious
*	1,267	74	LOD Grass HSG C
*	16,457	98	NON-LOD Impervious
*	5,524	74	NON-LOD Grass HSG C
	48,590	95	Weighted Average
	6,791	74	13.98% Pervious Area
	41,799	98	86.02% Impervious Area

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

Subcatchment A1: TO UG-01



Summary for Subcatchment A2: BYPASS

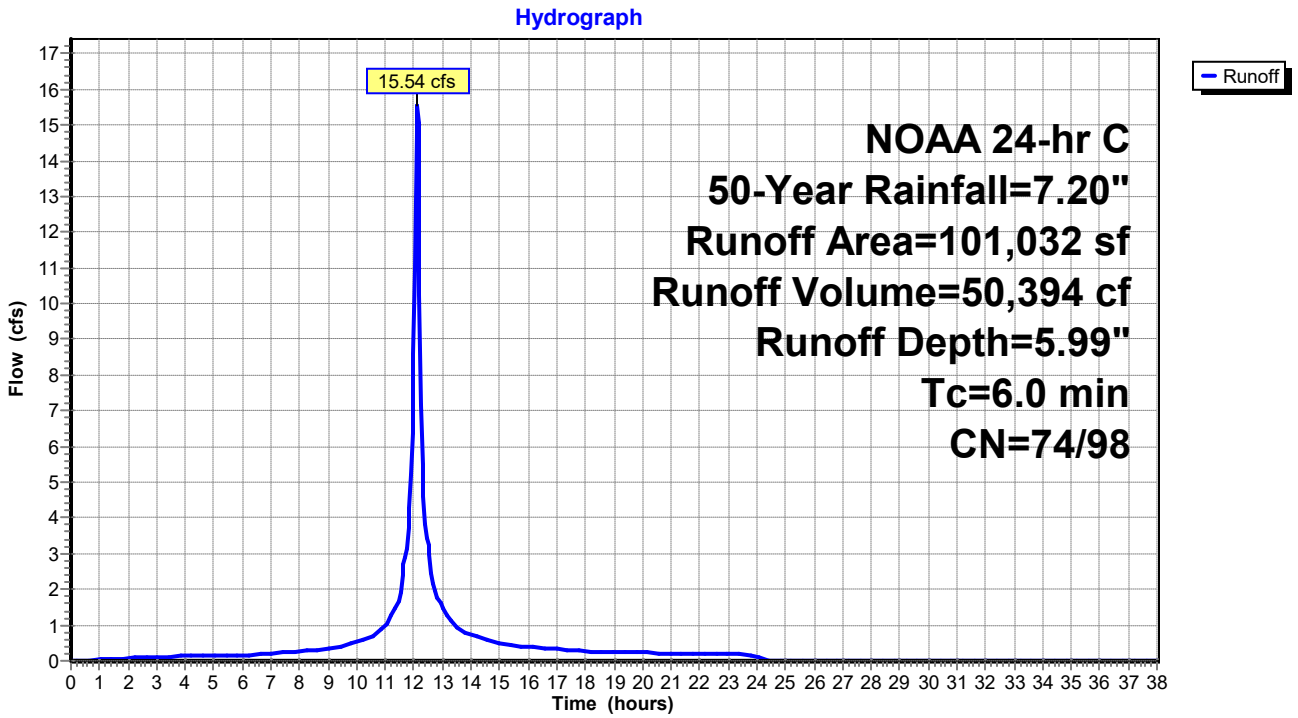
Runoff = 15.54 cfs @ 12.13 hrs, Volume= 50,394 cf, Depth= 5.99"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 50-Year Rainfall=7.20"

	Area (sf)	CN	Description
*	10,035	98	LOD Impervious
*	3,984	74	LOD Grass HSG C
*	55,089	98	NON-LOD Impervious
*	31,924	74	NON-LOD Grass HSG C
	101,032	89	Weighted Average
	35,908	74	35.54% Pervious Area
	65,124	98	64.46% Impervious Area

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

Subcatchment A2: BYPASS



Summary for Pond UG-01: (new Pond)

Inflow Area = 48,590 sf, 86.02% Impervious, Inflow Depth = 6.58" for 50-Year event
Inflow = 7.98 cfs @ 12.13 hrs, Volume= 26,632 cf
Outflow = 6.26 cfs @ 12.16 hrs, Volume= 26,445 cf, Atten= 22%, Lag= 2.1 min
Primary = 6.26 cfs @ 12.16 hrs, Volume= 26,445 cf

Routing by Stor-Ind method, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 369.39' @ 12.17 hrs Surf.Area= 2,588 sf Storage= 4,961 cf

Plug-Flow detention time= 83.1 min calculated for 26,445 cf (99% of inflow)
Center-of-Mass det. time= 78.3 min (828.7 - 750.4)

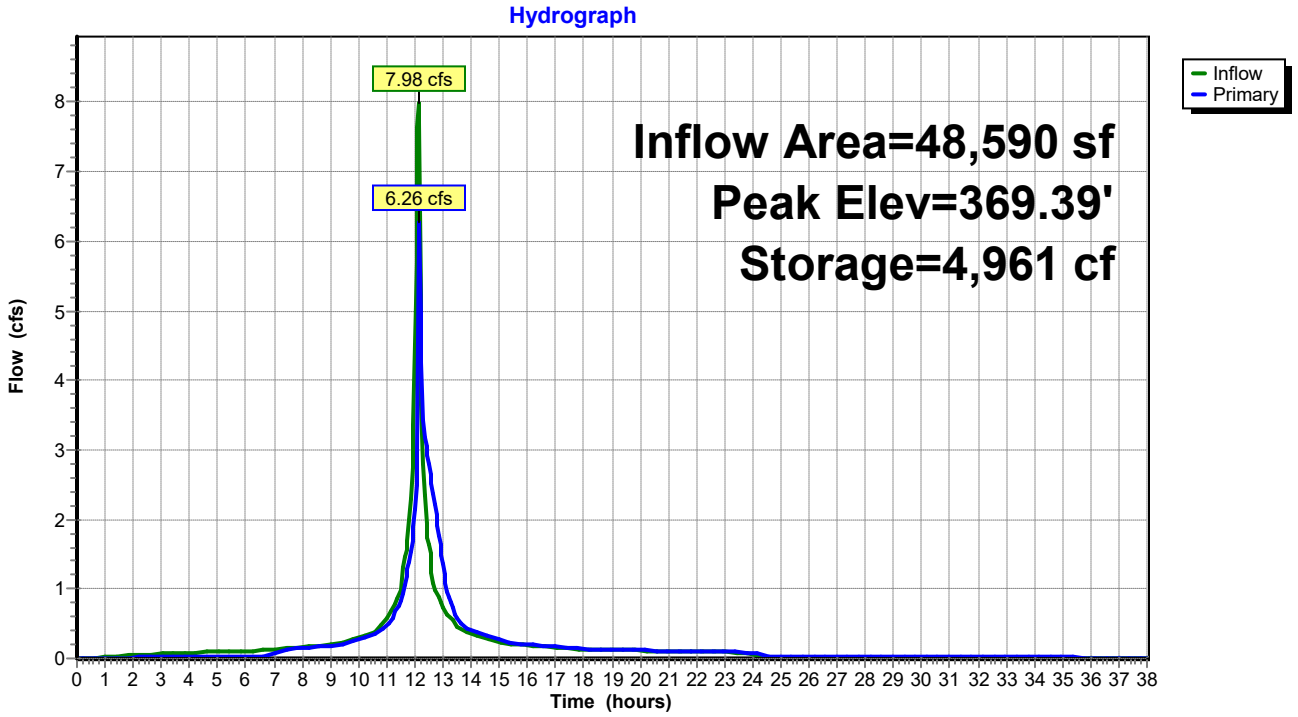
Volume	Invert	Avail.Storage	Storage Description
#1A	365.61'	0 cf	**29.75'W x 87.00'L x 4.50'H Field A** 11,647 cf Overall - 4,781 cf Embedded = 6,867 cf x 0.0% Voids
#2A	366.11'	3,830 cf	**ADS N-12 36"** x 24 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 24 Chambers in 6 Rows 29.75' Header x 7.10 sf x 2 = 422.4 cf Inside
#3	365.11'	1,131 cf	**48.0" Round Pipe Storage** L= 90.0'
		4,961 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	365.32'	**15.0" Round Culvert** L= 51.0' Ke= 0.200 Inlet / Outlet Invert= 365.32' / 365.07' S= 0.0049 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	369.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	367.00'	**12.0" W x 6.0" H Vert. rec orifice** C= 0.600
#4	Device 1	365.61'	**1.0" Vert. 1inch orifice** C= 0.600

Primary OutFlow Max=5.85 cfs @ 12.16 hrs HW=369.32' (Free Discharge)
└**1=Culvert** (Passes 5.85 cfs of 11.47 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Weir Controls 2.34 cfs @ 1.85 fps)
  ├**3=rec orifice** (Orifice Controls 3.46 cfs @ 6.93 fps)
  └**4=1inch orifice** (Orifice Controls 0.05 cfs @ 9.22 fps)

Pond UG-01: (new Pond)

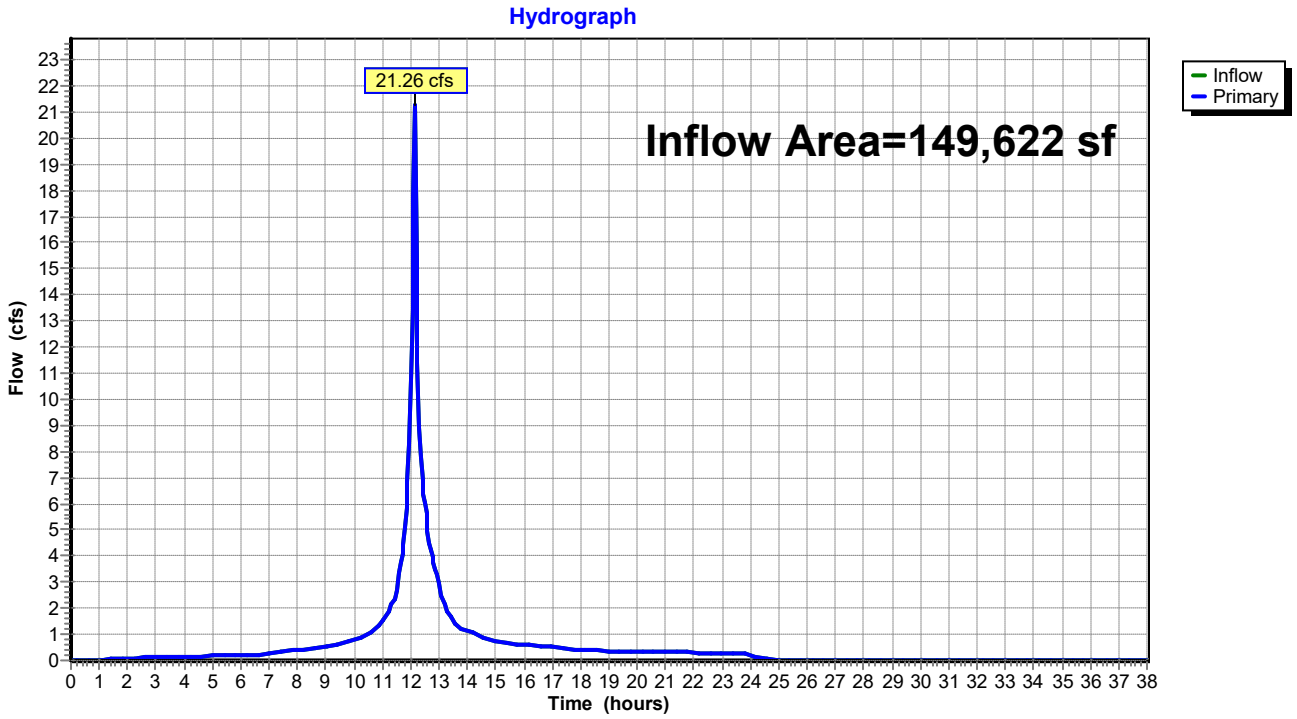


Summary for Link A: COMPOSITE (POST)

Inflow Area = 149,622 sf, 71.46% Impervious, Inflow Depth > 6.16" for 50-Year event
Inflow = 21.26 cfs @ 12.14 hrs, Volume= 76,839 cf
Primary = 21.26 cfs @ 12.14 hrs, Volume= 76,839 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs

Link A: COMPOSITE (POST)



Time span=0.00-38.00 hrs, dt=0.05 hrs, 761 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: TO UG-01 Runoff Area=48,590 sf 86.02% Impervious Runoff Depth=7.76"
Tc=6.0 min CN=74/98 Runoff=9.39 cfs 31,414 cf

Subcatchment A2: BYPASS Runoff Area=101,032 sf 64.46% Impervious Runoff Depth=7.14"
Tc=6.0 min CN=74/98 Runoff=18.49 cfs 60,098 cf

Pond UG-01: (new Pond) Peak Elev=369.38' Storage=4,961 cf Inflow=9.39 cfs 31,414 cf
Outflow=6.56 cfs 30,394 cf

Link A: COMPOSITE (POST) Inflow=24.74 cfs 90,492 cf
Primary=24.74 cfs 90,492 cf

Total Runoff Area = 149,622 sf Runoff Volume = 91,512 cf Average Runoff Depth = 7.34"
28.54% Pervious = 42,699 sf 71.46% Impervious = 106,923 sf

Summary for Subcatchment A1: TO UG-01

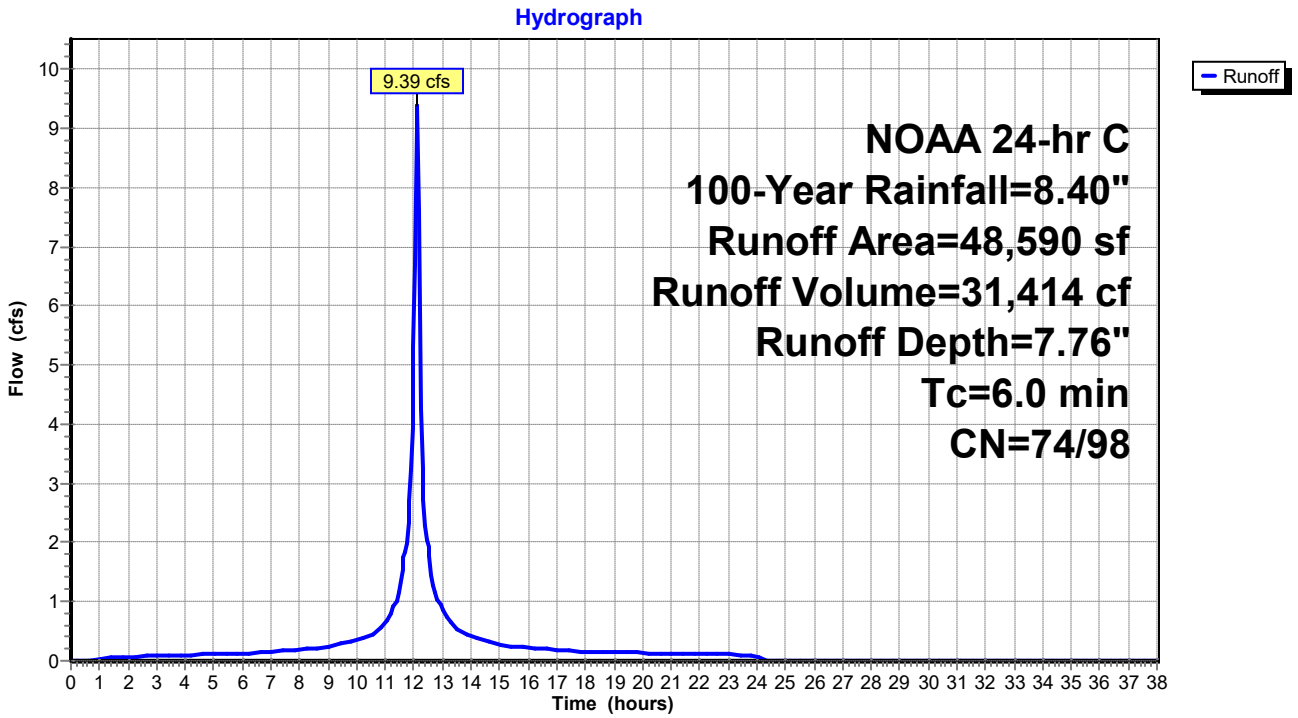
Runoff = 9.39 cfs @ 12.13 hrs, Volume= 31,414 cf, Depth= 7.76"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.40"

	Area (sf)	CN	Description
*	25,342	98	LOD Impervious
*	1,267	74	LOD Grass HSG C
*	16,457	98	NON-LOD Impervious
*	5,524	74	NON-LOD Grass HSG C
	48,590	95	Weighted Average
	6,791	74	13.98% Pervious Area
	41,799	98	86.02% Impervious Area

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

Subcatchment A1: TO UG-01



Summary for Subcatchment A2: BYPASS

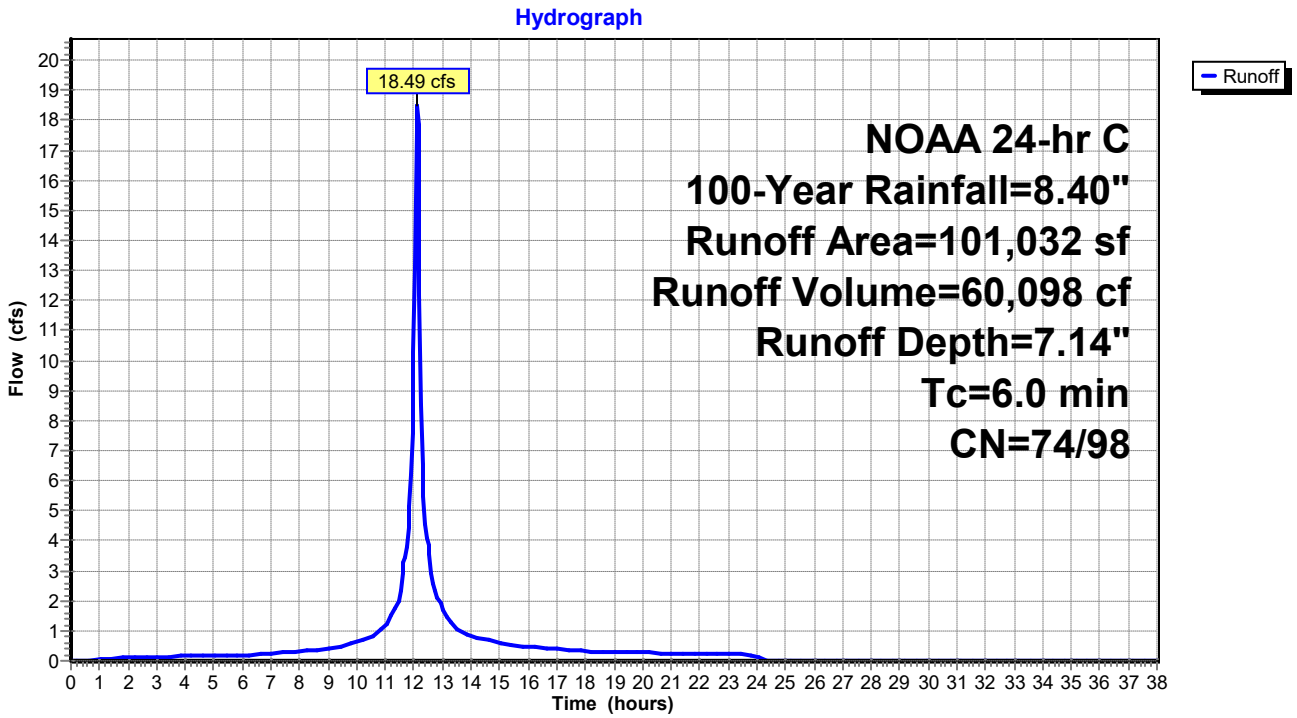
Runoff = 18.49 cfs @ 12.13 hrs, Volume= 60,098 cf, Depth= 7.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-38.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=8.40"

	Area (sf)	CN	Description
*	10,035	98	LOD Impervious
*	3,984	74	LOD Grass HSG C
*	55,089	98	NON-LOD Impervious
*	31,924	74	NON-LOD Grass HSG C
	101,032	89	Weighted Average
	35,908	74	35.54% Pervious Area
	65,124	98	64.46% Impervious Area

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

Subcatchment A2: BYPASS



Summary for Pond UG-01: (new Pond)

Inflow Area = 48,590 sf, 86.02% Impervious, Inflow Depth = 7.76" for 100-Year event
Inflow = 9.39 cfs @ 12.13 hrs, Volume= 31,414 cf
Outflow = 6.56 cfs @ 12.15 hrs, Volume= 30,394 cf, Atten= 30%, Lag= 1.6 min
Primary = 6.56 cfs @ 12.15 hrs, Volume= 30,394 cf

Routing by Stor-Ind method, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 369.38' @ 12.15 hrs Surf.Area= 2,588 sf Storage= 4,961 cf

Plug-Flow detention time= 92.7 min calculated for 30,394 cf (97% of inflow)
Center-of-Mass det. time= 72.0 min (820.5 - 748.4)

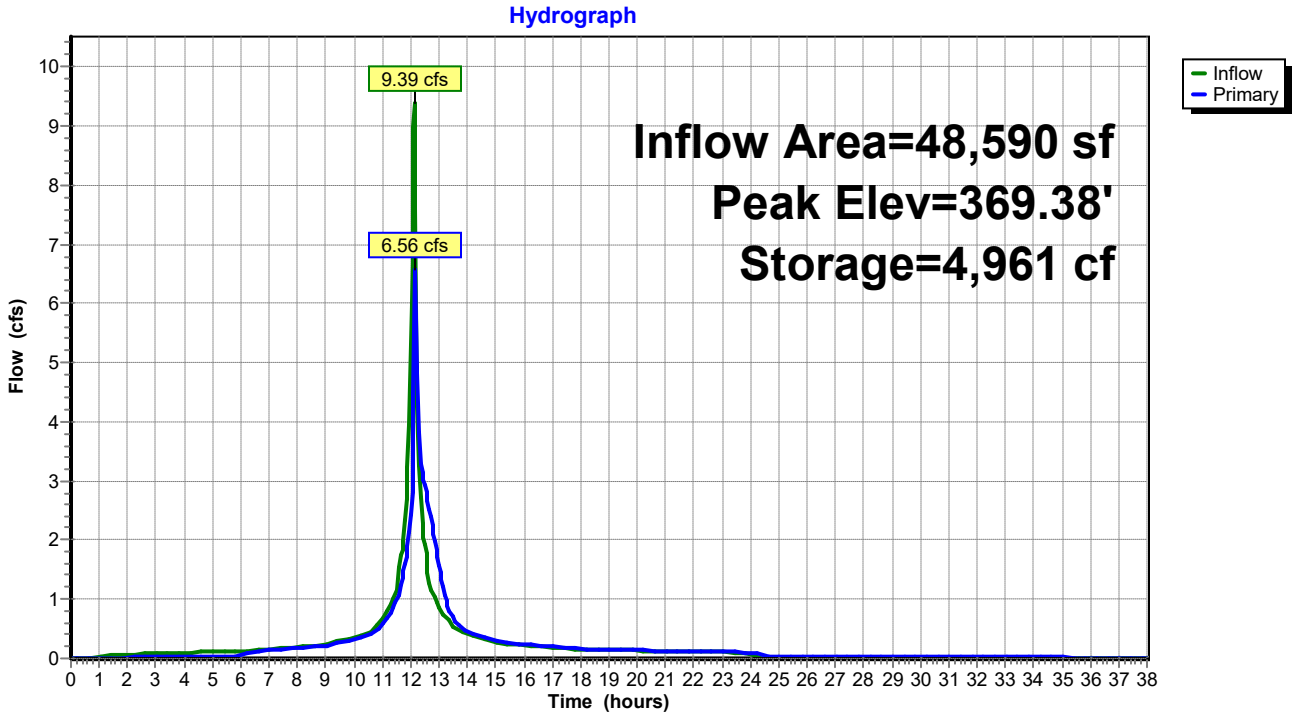
Volume	Invert	Avail.Storage	Storage Description
#1A	365.61'	0 cf	**29.75'W x 87.00'L x 4.50'H Field A** 11,647 cf Overall - 4,781 cf Embedded = 6,867 cf x 0.0% Voids
#2A	366.11'	3,830 cf	**ADS N-12 36"** x 24 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 24 Chambers in 6 Rows 29.75' Header x 7.10 sf x 2 = 422.4 cf Inside
#3	365.11'	1,131 cf	**48.0" Round Pipe Storage** L= 90.0'
		4,961 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	365.32'	**15.0" Round Culvert** L= 51.0' Ke= 0.200 Inlet / Outlet Invert= 365.32' / 365.07' S= 0.0049 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	369.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	367.00'	**12.0" W x 6.0" H Vert. rec orifice** C= 0.600
#4	Device 1	365.61'	**1.0" Vert. 1inch orifice** C= 0.600

Primary OutFlow Max=6.45 cfs @ 12.15 hrs HW=369.37' (Free Discharge)
└**1=Culvert** (Passes 6.45 cfs of 11.56 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Weir Controls 2.89 cfs @ 1.99 fps)
  ├**3=rec orifice** (Orifice Controls 3.50 cfs @ 7.01 fps)
  └**4=1inch orifice** (Orifice Controls 0.05 cfs @ 9.28 fps)

Pond UG-01: (new Pond)

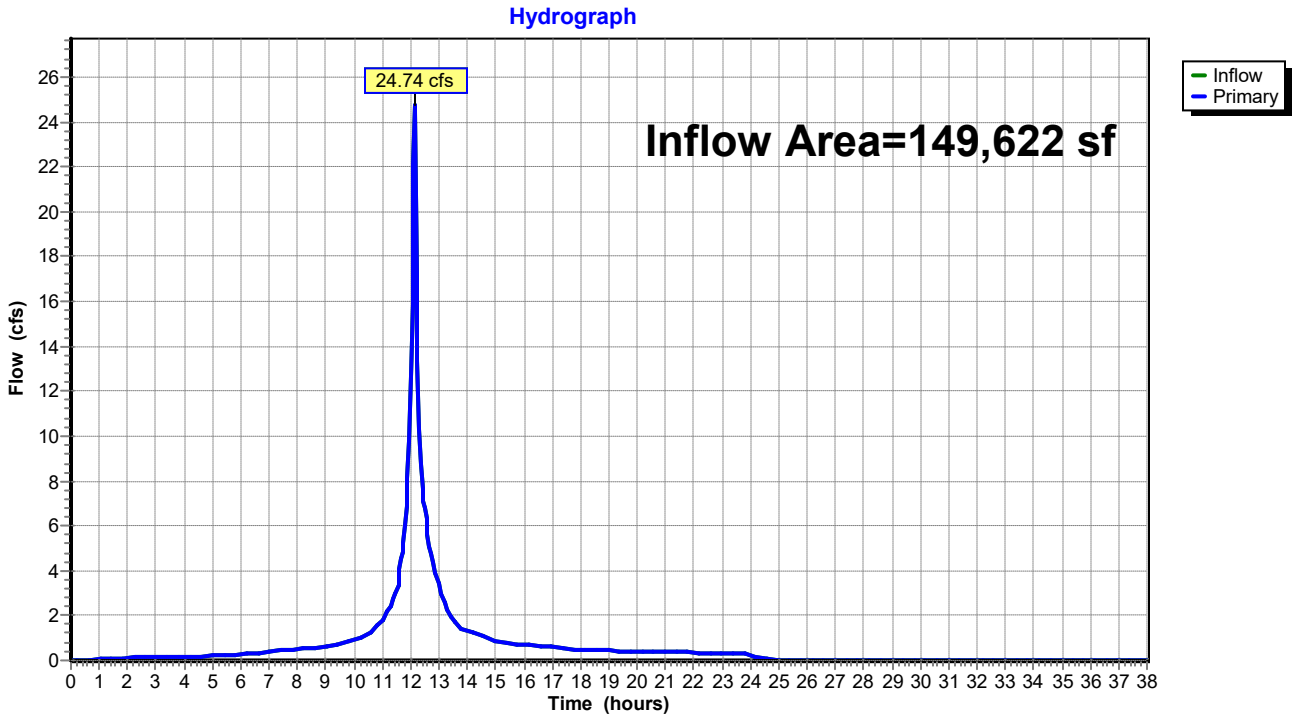


Summary for Link A: COMPOSITE (POST)

Inflow Area = 149,622 sf, 71.46% Impervious, Inflow Depth > 7.26" for 100-Year event
Inflow = 24.74 cfs @ 12.14 hrs, Volume= 90,492 cf
Primary = 24.74 cfs @ 12.14 hrs, Volume= 90,492 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-38.00 hrs, dt= 0.05 hrs

Link A: COMPOSITE (POST)



C.3 DEWATERING SUMMARY

Hydrograph for Pond UG-01: (new Pond)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)	
0.00	0.00	0	365.11	0.00	
1.00	0.00	0	365.11	0.00	
2.00	0.01	15	365.27	0.00	
3.00	0.02	68	365.55	0.00	
4.00	0.03	135	365.82	0.01	
5.00	0.03	197	366.03	0.02	
6.00	0.04	265	366.25	0.02	
7.00	0.05	354	366.43	0.02	
8.00	0.07	484	366.56	0.03	
9.00	0.08	658	366.70	0.03	
10.00	0.13	931	366.88	0.03	
11.00	0.24	1,323	367.11	0.15	
12.00	**1.97**	**2,018**	**367.49**	**1.13**	**PEAK**
13.00	**0.33**	**1,597**	**367.26**	**0.47**	
14.00	0.16	1,355	367.13	0.19	
15.00	0.11	1,289	367.09	0.12	
16.00	0.09	1,250	367.07	0.09	
17.00	0.07	1,230	367.06	0.08	
18.00	0.06	1,209	367.05	0.07	
19.00	0.05	1,193	367.04	0.06	
20.00	0.05	1,185	367.03	0.05	
21.00	0.05	1,178	367.03	0.05	
22.00	0.04	1,172	367.03	0.05	
23.00	0.04	1,165	367.02	0.04	
24.00	0.04	1,159	367.02	0.04	
25.00	0.00	1,058	366.96	0.03	
26.00	0.00	951	366.89	0.03	
27.00	0.00	847	366.83	0.03	
28.00	0.00	746	366.76	0.03	
29.00	0.00	648	366.69	0.03	
30.00	0.00	554	366.62	0.03	
31.00	0.00	463	366.54	0.02	
32.00	0.00	375	366.46	0.02	
33.00	0.00	293	366.33	0.02	
34.00	0.00	222	366.11	0.02	
35.00	0.00	165	365.92	0.01	
36.00	0.00	124	365.78	0.01	**BASIN DEWATERS 24 HOURS AFTER PEAK**
37.00	0.00	99	365.68	0.00	
38.00	0.00	90	365.64	0.00	

Stage-Area-Storage for Pond UG-01: (new Pond)

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
365.11	0	367.71	2,451
365.16	3	367.76	2,548
365.21	8	367.81	2,646
365.26	14	367.86	2,744
365.31	21	367.91	2,842
365.36	29	367.96	2,939
365.41	39	368.01	3,036
365.46	48	368.06	3,133
365.51	59	368.11	3,229
365.56	70	368.16	3,324
365.61	82	368.21	3,418
365.66	94	368.26	3,512
365.71	106	368.31	3,604
365.76	119	368.36	3,695
365.81	133	368.41	3,785
365.86	147	368.46	3,874
365.91	161	368.51	3,960
365.96	176	368.56	4,045
366.01	190	368.61	4,129
366.06	206	368.66	4,210
366.11	221	368.71	4,289
366.16	237	368.76	4,365
366.21	253	368.81	4,439
366.26	269	368.86	4,510
366.31	285	368.91	4,577
366.36	302	368.96	4,641
366.41	334	369.01	4,701
366.46	377	369.06	4,757
366.51	426	369.11	4,806
366.56	482	369.16	4,849
366.61	542	369.21	4,888
366.66	607	369.26	4,920
366.71	675	369.31	4,946
366.76	746	369.36	**4,960**
366.81	821	369.41	**4,961**
366.86	898	369.46	4,961
366.91	978	369.51	4,961
366.96	1,060	369.56	4,961
367.01	1,143	369.61	4,961
367.06	1,229	369.66	4,961
367.11	1,317	369.71	4,961
367.16	1,406	369.76	4,961
367.21	1,496	369.81	4,961
367.26	1,588	369.86	4,961
367.31	1,681	369.91	4,961
367.36	1,775	369.96	4,961
367.41	1,869	370.01	4,961
367.46	1,965	370.06	4,961
367.51	2,061	370.11	4,961
367.56	2,158		
367.61	2,255		
367.66	2,353		

APPENDIX D: VOLUME & WATER QUALITY ANALYSIS

D.1 RADNOR TOWNSHIP REV & WQV CALCULATION

Municipal REv/WQv Calculations

Project: **Proposed Parking Structure** Date: **2/18/2021**

Location: **Radnor Township, Delaware County** Prepared by: **MPL**

Checked By: **DAT**

Groundwater Recharge Calculation (Disturbed Area)

REv = (1 inch)*(new impervious)÷ 12

New Impervious Area (I) =	**34,388**	sf
REv =	**2,866**	cf
	0.066	acre-feet

Water Quality Calculation (Disturbed Area)

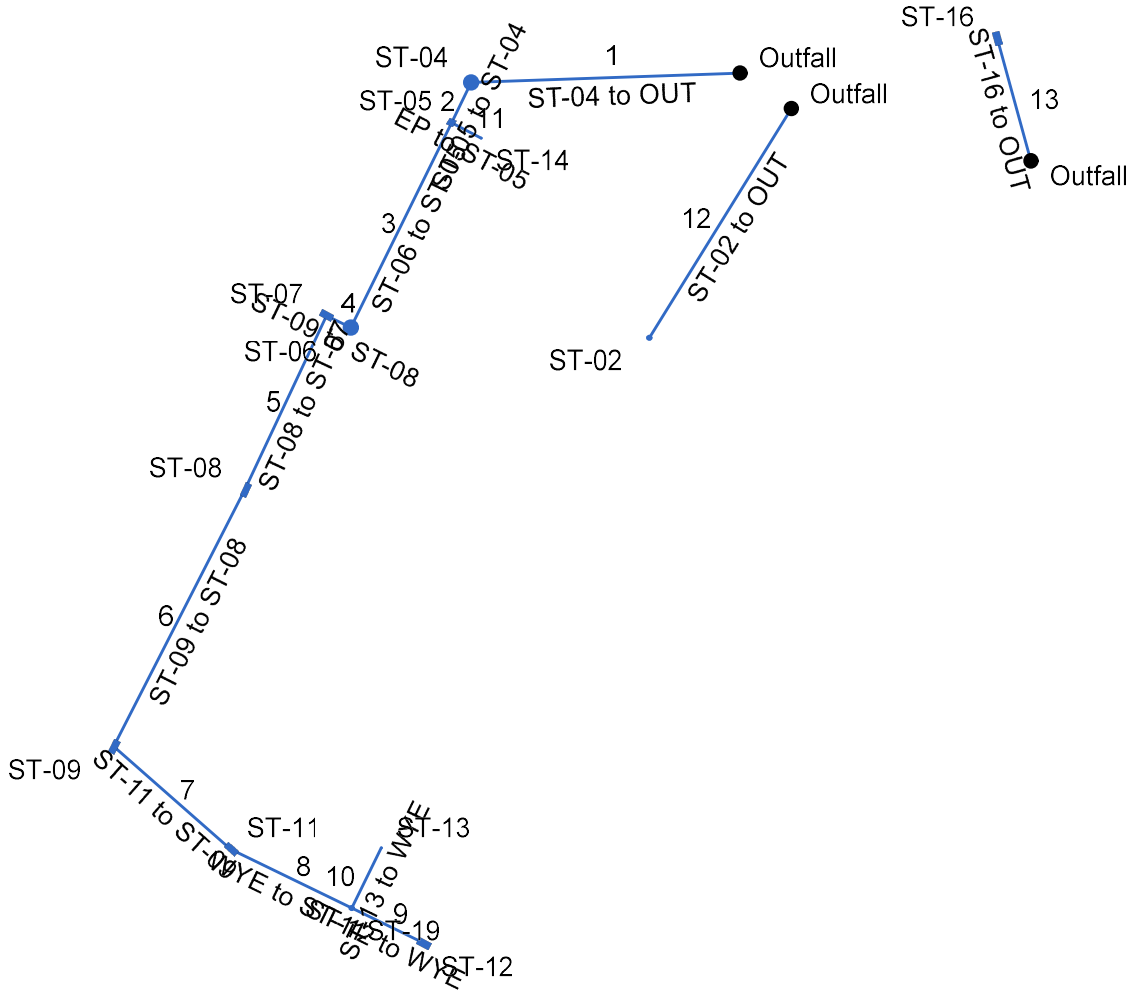
WQv = [(P)(Rv)(A)] ÷ 12

P =	1	*Inches of rainfall (per section 406.D.)*
A =	1.115	*Area of the project contributing to the water quality BMP (acre)*
I =	86	*Percent of the area that is impervious surface*
Rv =	0.824	*0.05 + 0.009(I)*
WQv =	**0.077**	**Water quality volume (acre-feet)**
	3,337	**Water quality volume (cubic feet)**

APPENDIX E: CONVEYANCE DESIGN

E.1 STORM SEWER DESIGNS

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: 200002StormDrain20210505.stm	Number of lines: 13	Date: 5/7/2021

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	80.000	0.00	0.67	0.00	0.00	0.66	0.0	11.9	5.5	7.94	7.94	7.13	15	1.29	368.00	369.03	369.02	370.14	370.88	373.57	ST-04 to OUT
2	1	13.388	0.04	0.67	0.99	0.04	0.66	5.0	11.9	5.5	5.06	5.06	4.70	15	0.52	369.23	369.30	370.25	370.33	373.57	374.54	ST-05 to ST-04
3	2	68.137	0.04	0.62	0.99	0.04	0.61	5.0	11.5	5.5	4.94	4.94	4.59	15	0.50	370.60	370.94	371.62	371.96	374.54	374.07	ST-06 to ST-05
4	3	7.973	0.14	0.58	0.99	0.14	0.57	5.0	11.5	5.6	4.95	4.95	4.20	15	0.50	371.14	371.18	372.29	372.32	374.07	375.60	ST-09 to ST-08
5	4	57.207	0.17	0.44	0.99	0.17	0.44	5.0	11.1	5.6	4.98	4.98	4.06	15	0.51	371.38	371.67	372.74	373.03	375.60	376.55	ST-08 to ST-07
6	5	86.092	0.04	0.27	0.99	0.04	0.27	5.0	10.2	5.8	5.00	5.00	4.08	15	0.51	371.87	372.31	373.16	373.55	376.55	379.25	ST-09 to ST-08
7	6	46.351	0.01	0.23	0.99	0.01	0.23	5.0	9.8	5.9	2.72	2.72	3.46	12	0.50	372.51	372.74	373.93	374.16	379.25	379.60	ST-11 to ST-09
8	7	40.000	0.00	0.22	0.00	0.00	0.22	0.0	9.4	6.0	2.73	2.73	3.47	12	0.50	372.94	373.14	374.25	374.45	379.60	377.00	WYE to ST-11
9	8	24.000	0.01	0.01	0.99	0.01	0.01	5.0	5.0	7.1	2.73	2.73	3.47	12	0.50	373.14	373.26	374.64	374.76	377.00	377.20	ST-12 to WYE
10	8	20.000	0.21	0.21	0.99	0.21	0.21	5.0	5.0	7.1	3.86	3.86	4.91	12	1.00	371.73	371.93	374.64	374.84	377.00	373.83	ST-13 to WYE
11	2	9.998	0.01	0.01	0.99	0.01	0.01	5.0	5.0	7.1	1.36	1.36	7.42	6	5.00	370.50	371.00	370.91	371.49	374.54	371.57	EP to ST-05
12	End	80.494	0.53	0.53	0.99	0.52	0.52	5.0	5.0	7.1	5.46	5.46	7.53	12	2.00	368.00	369.61	368.82	370.55	0.00	371.71	ST-02 to OUT
13	End	38.000	0.27	0.27	0.82	0.22	0.22	5.0	5.0	7.1	8.02	8.02	7.20	15	1.32	364.50	365.00	365.52	366.12	370.88	369.85	ST-16 to OUT

Project File: 200002StormDrain20210505.stm

Number of lines: 13

Run Date: 5/7/2021

NOTES:Intensity = 56.17 / (Inlet time + 11.10) ^ 0.74; Return period =Yrs. 25 ; Total flows limited to full flow capacities ; c = cir e = ellip b = box

APPENDIX F: DRAINAGE MAPS

KING OF PRUSSIA ROAD
(MAJOR COLLECTOR)
(50' WIDE R.O.W.)
TWO WAY TRAFFIC

RADNOR CHESTER ROAD
(A.K.A. S.R. 1021)
(MAJOR COLLECTOR)
(VARIABLE WIDTH R.O.W.)
(ASPHALT ROADWAY)
TWO WAY TRAFFIC

LEGAL R.O.W. LINE
TITLE LINE
(ASPHALT ROADWAY)

R = 425.00'
L = 260.30'
Δ = 35°05'31"
CHB = S44°12'14"E
CHD = 256.25'

R = 700.00'
L = 207.33'
D = 16°58'11"
CHB = S53°15'54"E
CHD = 206.57'

N26°39'30"W 40.21'
N26°39'30"W 21.00'
N20°03'30"E 13.00'
N16°21'30"W 59.00'
208.09'
N32°00'30"E
371.36'
S61°45'00"E
S33°22'00"W 337.67'
S35°34'05"W 201.24'
N54°06'40"W
N39°56'30"W 487.23'
202.75'
N56°20'21"W 3.50
N20°03'30"E 39.51'
N68°06'30"E 71.02'

R = 60.00'
L = 50.65'
Δ = 48°22'00"
CHB = N07°49'30"E
CHD = 49.16'

R = 385.28'
L = 67.87'
Δ = 10°05'34"
CHB = N37°37'09"E
CHD = 67.78'

Md GnB2

EX-A1
EX-A2

1-STORY BUILDING 28,766 SF

2-STORY BUILDING 40,248 SF (1ST & 2ND FLOOR)

MULT-LEVEL OFFICE BUILDING

4-STORY BUILDING 2 STORIES OF INTERNAL PARKING 23,958 SF 2 STORIES OF OFFICE USE 25,761 SF

TAX MAP 36
BLOCK 15 UNIT 41

PARCEL #36-02-01158-00
LANDS N/F
THE TRUSTEES OF THE UNIVERSITY OF PENNSYLVANIA
OWNER AND OPERATOR OF
THE UNIVERSITY OF PENNSYLVANIA HEALTH SYSTEM
D.B. 1406, PG. 2018

250 KING OF PRUSSIA ROAD
GROSS TRACT AREA = 8.2937 ACRES
EXTERIOR BUILDING FOOTPRINT AREA = 3.144 ACRES

TAX MAP 36
BLOCK 15 UNIT 43
PARCEL ID. NO. 36-02-01233-12
LANDS N/F
RADNOR FEE OWNER, LLC
RB 5585 PG 1614

259 RADNOR CHESTER ROAD

TAX MAP 36
BLOCK 15 UNIT 43
PARCEL ID. NO. 36-02-01233-12
LANDS N/F
RADNOR FEE OWNER, LLC
RB 5585 PG 1614

259 RADNOR CHESTER ROAD

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PA1CALL.org
TICKET #: 20203382043

GRAPHIC SCALE
30 0 15 30 60 120
1 INCH = 30 FEET

DRAINAGE AREA SUMMARY

NAME	DESCRIPTION	AREA
EX-A1	DISTURBED AREA	42,972 SF
EX-A2	NON-DISTURBED AREA	19,650 SF
TOTAL		62,622 SF

NO.	REV. DATE	BY	REVISION / PROPOSED IMPROVEMENTS
1	2021-05-19	MKL	COMMENT

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
D. ALEXANDER TWEEDIE
ENGINEER
No. PE071873

D. ALEXANDER TWEEDIE
PROFESSIONAL ENGINEER
PENNSYLVANIA LICENSE No. 071873

NOT FOR CONSTRUCTION

PROJECT No: 200302
DRAWN BY: MP LARDI
CHECKED BY: DA TWEEDIE
CAD ID. #: APP-F_DAAL_200002

LANDCORE
Engineering Consultants, P.C.
PO BOX 27332 #65201 PHILADELPHIA, PENNSYLVANIA 19101-6535
PHONE 215-836-2100 | FAX 215-525-5420
LANDCORECONSULTING.COM

PROJECT: BRANDYWINE REALTY TRUST
PROPOSED PARKING STRUCTURE
250 KING OF PRUSSIA ROAD
RADNOR TOWNSHIP
DELAWARE COUNTY, PA.

TITLE: EXISTING CONDITIONS DRAINAGE ARE IMAP

SCALE: (H) AS NOTED (V)
DATE: 2021 • 02 • 18
SHEET: EDAM 12
REV. No: 1

KING OF PRUSSIA ROAD
(MAJOR COLLECTOR)
(50' WIDE R.O.W.)
TWO WAY TRAFFIC

RADNOR CHESTER ROAD
(A.K.A. S.R. 1021)
(MAJOR COLLECTOR)
(VARIABLE WIDTH R.O.W.)
(ASPHALT ROADWAY)
TWO WAY TRAFFIC

LEGAL R.O.W. LINE
TITLE LINE
(ASPHALT ROADWAY)
LEGAL R.O.W. LINE

R = 425.00'
L = 260.30'
Δ = 35°05'31"
CHB = S44°12'14"E
CHD = 256.25'

R = 700.00'
L = 207.33'
D = 16°58'11"
CHB = S53°15'54"E
CHD = 206.57'

N26°39'30"W 40.21'
N26°39'30"W 21.00'
N20°03'30"E 13.00'
N16°21'30"W 55.00'
S61°45'00"E 371.36'
S33°22'00"W 337.67'
S35°34'05"W 201.24'
N32°00'30"E 208.09'
N56°20'21"W 3.50
N30°03'30"E 195.31'
N60°00'30"E 7.00'
N39°59'30"W 205.75'
N54°06'40"W 487.23'

R = 60.00'
L = 50.65'
Δ = 48°22'00"
CHB = N07°49'30"E
CHD = 49.16'

R = 385.28'
L = 67.87'
Δ = 10°05'34"
CHB = N37°37'09"E
CHD = 67.78'

Md GnB2

TAX MAP 36
BLOCK 15 UNIT 43
PARCEL ID. NO. 36-02-01233-12
LANDS N/F
RADNOR FEE OWNER, LLC
RB 5585 PG 1614
259 RADNOR CHESTER ROAD

TAX MAP 36
BLOCK 15 UNIT 41
PARCEL #36-02-01158-00
LANDS N/F
THE TRUSTEES OF THE UNIVERSITY OF PENNSYLVANIA
OWNER AND OPERATOR OF
THE UNIVERSITY OF PENNSYLVANIA HEALTH SYSTEM
D.B. 1406, PG. 2018
250 KING OF PRUSSIA ROAD
GROSS TRACT AREA = 8.2307 ACRES
EXTERIOR BUILDING FOOTPRINT AREA = 3.744 ACRES

A1 (NON-LOD TO RG-01)
A1 (LOD TO RG-01)
A2 (DIRECT DICHARGE)

ST-01 CLEANOUT (12")
ST-02 MANHOLE (4' DIA) RIM:373.57 INV (SW):369.23 INV (E):369.30
ST-03 15" FES INV (W):368.00
ST-04 MANHOLE (4' DIA) RIM:373.57 INV (SW):369.23 INV (E):369.30
ST-05 YARD INLET 24" GR:374.54 INV (SE):370.50 INV (SW):370.60 INV (NE):369.30
ST-06 MANHOLE (4' DIA) GR:375.35 INV (NW):371.14 INV (NE):370.94
ST-07 C INLET GR:375.60 INV (SW):371.38 INV (SE):371.19
ST-08 M INLET GR:376.10 INV (SW):371.30 INV (NE):371.10
ST-09 C INLET GR:379.25 INV (SE):372.51 INV (NE):372.31
ST-10 M INLET GR:378.60 INV (SE):372.94 INV (NW):372.74
ST-11 M INLET GR:378.60 INV (SE):372.94 INV (NW):372.74
ST-12 M INLET GR:377.20 INV (NW):373.26
ST-13 ROOF DRAIN
ST-14 EMERGENCY ELEVATOR PUMP DRAIN INV (NW):371.00
ST-15 DOG HOUSE MH RIM:370.20 INV (N):364.50
ST-16 C INLET GR:369.80 INV (S):365.00
ST-17 ROOF DRAIN INV (W):369.61

80 LF - 15" HDPE @ 1.29%
69 LF - 15" HDPE @ 5.00%
14 LF - 12" HDPE @ 0.52%
10 LF - 6" HDPE @ 5.00%
9 LF - 15" HDPE @ 0.50%
58 LF - 15" HDPE @ 0.51%
87 LF - 15" HDPE @ 0.51%
47 LF - 12" HDPE @ 0.50%
41 LF - 12" HDPE @ 0.50%
20 LF - 12" HDPE @ 0.51%
38 LF - 15" RCP @ 1.32%
CROSSING: 15" HDPE BOTTOM: 370.49 8" PVC TOP: 369.46 CLEARANCE: 1.03" CONC. ENCASEMENT REQUIRED

RAIN GARDEN RG-01
OUTLET STRUCTURE "OS-01" TO REPLACE EXIST. INLET GRT. 369.49
EMERGENCY SPILLWAY ELEV. 370.00
TOP OF BERM 371.00
SEE DETAILED ACCESSIBLE ROUTE GRADING PLAN
1-STORY BUILDING 28,766 SF
2-STORY BUILDING 40,248 SF (1ST & 2ND FLOOR)
MULT-LEVEL OFFICE BUILDING
4-STORY BUILDING 2 STORIES OF INTERIOR PARKING 23,958 SF 2 STORIES OF OFFICE USE 23,767 SF
2ND STORY OVERHANG

DRAINAGE AREA SUMMARY

NAME	DESCRIPTION	AREA
A1 (LOD)	DISTURBED AREA	35,191 SF
A1 (NON-LOD)	NON-DISTURBED AREA	19,650 SF
A2	DISTURBED DIRECT DISCHARGE	7,781 SF
TOTAL		62,622 SF

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TICKET #: 20203382043

GRAPHIC SCALE
30 0 15 30 60 120
1 INCH = 30 FEET

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MICHAEL RATZZ @ 2021-2-20, 2:35 PM

NO.	DATE	REVISION	BY
	2021-01-19	ADDITIONAL PRODUCTION IN PROPOSED IMPERVIOUS	

MARK	REV.	DATE	COMMENT

D. ALEXANDER TWEEDIE
REGISTERED PROFESSIONAL ENGINEER
No. PE071873
COMMONWEALTH OF PENNSYLVANIA

D. ALEXANDER TWEEDIE
PROFESSIONAL ENGINEER
PENNSYLVANIA LICENSE No. 071873
NOT FOR CONSTRUCTION

PROJECT No: 200002
DRAWN BY: MP, ARDI
CHECKED BY: DA TWEEDIE
CAD I.D. #: APP-F_DAM_200002

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PO BOX 27533 #56287
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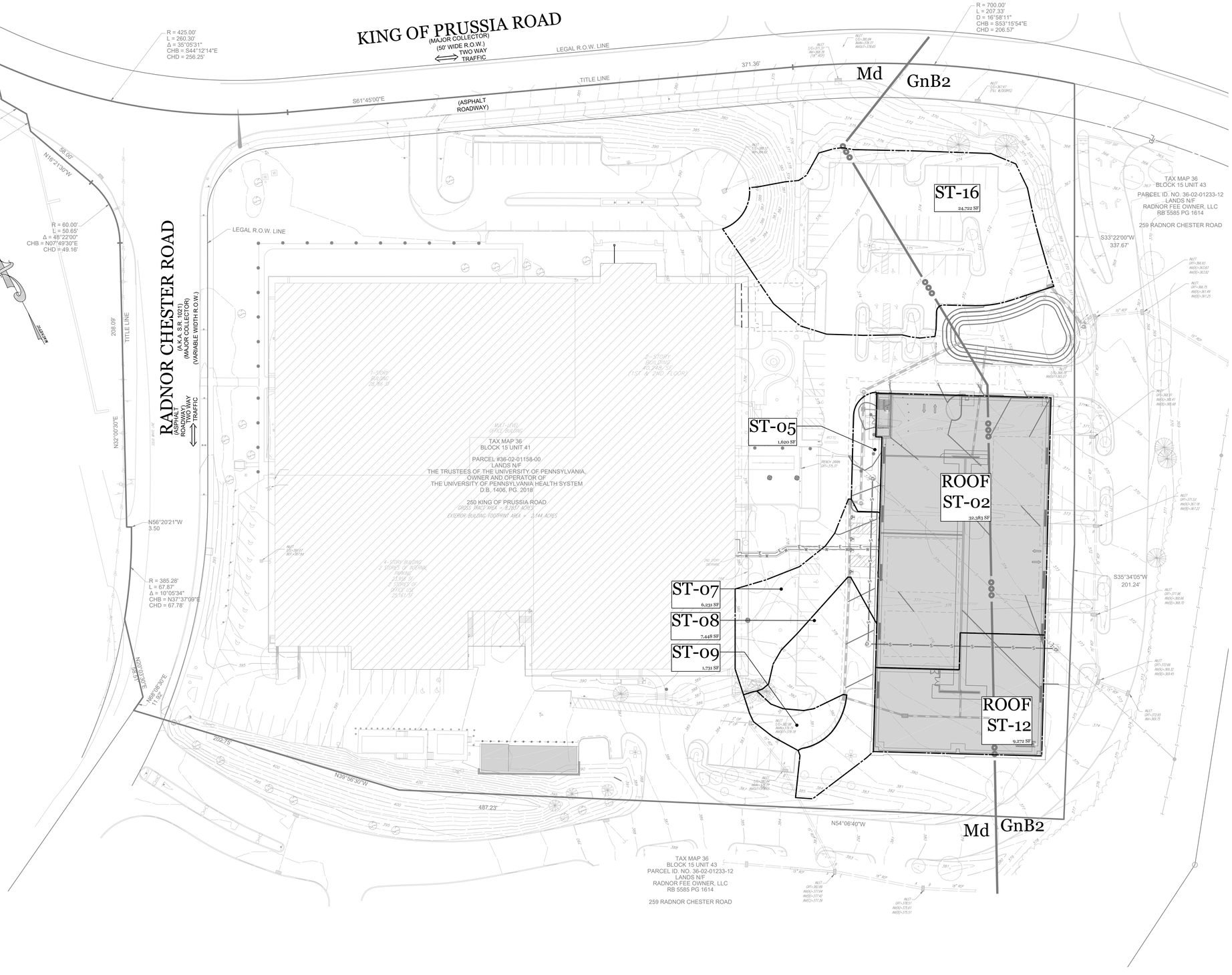
LANDCORECONSULTING.COM

PROJECT: BRANDYWINE REALTY TRUST
PROPOSED PARKING STRUCTURE
250 KING OF PRUSSIA ROAD
RADNOR TOWNSHIP
DELAWARE COUNTY, PA

TITLE: PROPOSED CONDITIONS DRAINAGE AREA MAP

SCALE: (H) AS NOTED (V) -
DATE: 2021 - 02 - 18
SHEET: PDAM 12
REV. No: 1



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TICKET #: 20203382043

GRAPHIC SCALE
30 0 15 30 60 120
1 INCH = 30 FEET

BY	MARK	REV.	DATE	COMMENT

REV.	DATE	ISSUED FOR
	2021-05-19	PRELIMINARY PLAN SUBMISSION

D. ALEXANDER TWEEDIE
REGISTERED PROFESSIONAL ENGINEER
No. PE071873
COMMONWEALTH OF PENNSYLVANIA

D. ALEXANDER TWEEDIE
PROFESSIONAL ENGINEER
PENNSYLVANIA LICENSE No. 071873
NOT FOR CONSTRUCTION

PROJECT No: 200002
DRAWN BY: MP LARDI
CHECKED BY: DA TWEEDIE
CAD I.D. #: APP-F_DAM_200002

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PROJECT: BRANDYWINE REALTY TRUST
PROPOSED PARKING STRUCTURE
250 KING OF PRUSSIA ROAD
RADNOR TOWNSHIP
DELAWARE COUNTY, PA

TITLE: INLET DRAINAGE AREAS

SCALE: (H) AS NOTED
(V) -

DATE: 2021 - 02 - 18

SHEET: IMAP 12

REV.No: 1

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