STORMWATER MANAGEMENT REPORT

For

PROJECT HIGHLANDS
210 SHUNPIKE ROAD
CROMWELL, CONNECTICUT

Prepared for:

Scannell Properties #576, LLC
8801 River Crossing Boulevard, Suite 300
Indianapolis, IN 46240

Prepared By:

Langan CT, Inc.
555 Long Wharf Drive
New Haven, Connecticut 06511

Timothy S. Onderko
Connecticut P.E. No. 25760

Joshua K. Hannant
Connecticut P.E. No. 26852

LANGAN

Revised May 3, 2022
140225401

TABLE OF CONTENTS

Page No.

EXECUTIVE SUMMARY 1

1.0 INTRODUCTION 1

1.1 General 1
1.2 Site Location 1
1.3 Existing Conditions 1
1.4 Project Description 2
1.5 FEMA 2
1.6 Soil Conditions & Infiltration Testing 2

2.0 STORMWATER MANAGEMENT 4

2.1 Design Criteria 4
2.2 Design Methodology 5
2.3 Existing Runoff Discharges (See Appendix A for Calculations) 5
2.4 Proposed Runoff Discharges (See Appendix B for Calculations) 6

3.0 STORMWATER QUALITY (See Appendix C for Calculations) 12

3.1 Stormwater Quality Improvements 12

4.0 STORM DRAINAGE COLLECTION SYSTEM DESIGN (See Appendix D for Calculations) 14

4.1 Design Criteria 14
4.2 Design Methodology 14
4.3 Storm Drainage Collection Summary 15

5.0 ACCESS ROAD STREAM CROSSING CULVERT 15

6.0 CONCLUSION 15

7.0 REFERENCES 16

TABLE OF CONTENTS
(Continued)

FIGURES

Figure 1	Aerial Location Map
Figure 2	USGS Location Map
Figure 3	FEMA Map
Figure 4	NRCS Soil Map
Figure 5	Zoning Map

DRAWINGS

Drawing CG100	Overall Grading & Drainage Plan (Under Separate Cover)
Drawing CG101	Grading & Drainage Plan I (Under Separate Cover)
Drawing CG102	Grading & Drainage Plan II (Under Separate Cover)
Drawing CG103	Grading & Drainage Plan III (Under Separate Cover)
Drawing CG104	Grading & Drainage Plan IV (Under Separate Cover)
Drawing CG105	Grading & Drainage Plan V (Under Separate Cover)
Drawing CG106	Grading & Drainage Plan VI (Under Separate Cover)
Drawing CG107	Grading & Drainage Plan VII (Under Separate Cover)
Drawing CG108	Grading & Drainage Plan VIII (Under Separate Cover)
Drawing CG109	Grading & Drainage Plan IX (Under Separate Cover)
Drawing CG110	Grading & Drainage Plan X (Under Separate Cover)
Drawing CG111	Grading & Drainage Plan XI (Under Separate Cover)
Drawing EX-WS	Existing Watershed Map
Drawing PR-WS	Proposed Watershed Map
Drawing DA-CB	Drainage Area Map

APPENDICES

Appendix A	Existing Stormwater Discharge Calculations
Appendix B	Proposed Stormwater Discharge Calculations
Appendix C	Groundwater Recharge and Stormwater Quality Calculations
Appendix D	Stormwater Collection System Calculations
Appendix E	Culvert Capacity Calculations
Appendix F	Gutter Flow Analysis
Appendix G	NOAA Atlas 14 Rainfall Depths & Intensities
Appendix H	Operations and Maintenance
Appendix I	Boring, Test Pit, and Hydraulic Conductivity Test Data

EXECUTIVE SUMMARY

This stormwater management report has been prepared in support of the proposed development of a ±250.1 acre site located at 210 Shunpike Road in the Town of Cromwell, Connecticut. The proposed development includes a warehouse building with loading docks, trailer parking spaces, employee parking, and associated site improvements including drainage, utilities, and landscaping.

The project site consists of several adjacent parcels, which together form the project site referred to as Project Highlands. The site is bound by Shunpike Road to the west, industrial and commercial properties to the northwest and southwest, residential properties and Geer Street to the south, and the Cromwell Middle School parcel to the east (see Figure 1). The northernmost property line of the project site abuts the Town of Rocky Hill. The site is located within Flood Zone X (unshaded) and Flood Zone A per FEMA Flood Insurance Rate Maps 09007C0018G and 09007C0106G, both effective August 28, 2008 (see Figure 3).

The proposed development includes the construction of a warehouse building with a footprint of approximately 1,042,840 SF. The proposed site also includes 163 loading docks, 518 trailer parking spaces, and 369 associate parking spaces. Existing grades will be modified to accommodate the proposed development and the operational needs of the facility.

Hydrologically, the project site is located within the Mattabesset regional drainage basin. The site occupies a nominal portion of the roughly 38.8 square mile watershed. Under the proposed conditions, the majority of the site will drain through closed pipe networks to stormwater treatment systems before discharging at a controlled rate. The existing hydrology of the site is being maintained to the maximum extent possible.

This stormwater management report has been designed in general accordance with the 2004 Connecticut Stormwater Quality Manual and includes several stormwater Best Management Practices (BMPs) to treat and attenuate increases in runoff from the project site. It is the opinion of this office and the findings of this report that the proposed stormwater system, as designed, will effectively manage the quality and quantity of stormwater runoff for the proposed development.

1.0 INTRODUCTION

1.1 General

This stormwater management report has been prepared in support of the proposed distribution facility to be located at 210 Shunpike Road in the Town of Cromwell, Connecticut, and addresses the engineering design of the proposed stormwater conveyance and management systems.

1.2 Site Location

The project site is comprised of 12 parcels: Map 25, Lots 3, 4, and 72 (partial), Map 35, Lots 9 (partial), 53, 54, 55, 58, 61, 63, and 69, and Map 36, Lot 10. The full project site consists of ±250.1 acres and has frontage on both Shunpike Road to the west and Geer Street to the south. The site is also bound by industrial and commercial properties to the northwest, a commercial parcel to the southwest, residential properties to the south, and the Cromwell Middle School parcel to the east (see Figure 1). The northernmost property line of the project site abuts the Town of Rocky Hill.

1.3 Existing Conditions

The majority of the site was previously used for farming and consists of open fields and access drives. There are also many wooded area onsite, a few formerly residential buildings along Geer Street, and a 105' wide gas easement to Algonquin Gas Transmission, LLC running east and west in the northern portion of the project site. The site also contains multiple wetland areas. There are wetlands and a vernal pool along the eastern property line, wetlands and vernal pools in the northern portion of the site, wetlands and vernal pools in the center of the site, and streams in the northwest and southwest portions of the property.

Much of the site is comprised of relatively flat rolling farm fields. Within the vast majority of the project limits of disturbance, existing topography varies from ±146 to ±131. Most of the site generally pitches from east to west, with various high and low points throughout the site. The wetlands along the eastern property line in the north of the site are at ±130, wetlands along the northwest property lines vary from ±123 to ±127, wetlands in the center of the parcel are at ±131, and the wetlands and stream in the western area of the site are at ±130. Existing grades at the southern end of the property along Geer Street are as high as ±162.

1.4 Project Description

The proposed project consists of a warehouse building with a footprint of approximately 1,042,840 SF, as well as 163 loading docks, 518 trailer parking spaces, 369 associate parking spaces, and associated site improvements including drainage, utilities, and landscaping. Existing grades will be modified to accommodate the proposed development and the operational needs of the facility.

Further information on specific proposed watersheds can be found in Section 2.4 of this report.

1.5 FEMA

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), map numbers 09007C0018G and 09007C0106G, both effective August 28, 2008, the site is primarily located within Flood Zone X (unshaded). A portion of the site also falls within Flood Zone A, in the northernmost area of the site and along southwestern and western property lines (see Figure 3).

Zone X (unshaded) is considered a Low Risk Area and described by FEMA as areas determined to be outside the 0.2% annual chance (or 500-year) floodplain. No base flood elevations or base flood depths are shown within this zone.

Zone A is considered a Special Flood Hazard Area subject to flooding by the 1% annual chance (or 100-year) flood. No base flood elevations or base flood depths are shown within this zone.

1.6 Soil Conditions & Infiltration Testing

According to the USDA Natural Resources Conservation Service (NRCS) Web Soil Survey, the main soil types onsite are Hartford sandy loam, Manchester gravelly sandy loam, Sudbury sandy loam, and Branford silt loam. The Web Soil Survey has classified these soils as hydrologic soil groups A and B. See Table 1 for all soil types onsite per Web Soil Survey (see Figure 4).

A geotechnical investigation was conducted on the site that included multiple borings, test pits, and permeability tests. The findings from this investigation are consistent with the NRCS soil survey. In addition, permeability tests reveal infiltration rates of 60 inches/hour with the exception of one test on the east side of the site that was 8 inches/hour. However, no credit for infiltration was taken in

this report for any of the proposed stormwater BMPs. Refer to Appendix I for boring, test pit, and hydraulic conductivity test result.

Table 1: NRCS Soil Survey

Hydrologic Soil Group - Summary by Map Unit- State of Connecticut

Map Unit Symbol	Map Unit Name	Rating
13	Walpole Sandy Loam, 0-3% Slopes	B/D
15	Scarboro Muck, 0-3% Slopes	A/D
17	Timakwa and Natchaug Soils, 0-2% Slopes	B/D
20A	Ellington Silt Loam, 0-5% Slopes	B
23A	Sudbury Sandy Loam, 0-5% Slopes	B
30A	Branford Silt Loam, 0-3% Slopes	B
30B	Branford Silt Loam, 3-8% Slopes	B
33A	Hartford Sandy Loam, 0-3% Slopes	A
33B	Hartford Sandy Loam, 3-8% Slopes	A
35A	Penwood Loamy Sand, 0-3% Slopes	A
37A	Manchester Gravelly Sandy Loam, 0-3% Slopes	A
37C	Manchester Gravelly Sandy Loam, 3-15% Slopes	A
37E	Manchester Gravelly Sandy Loam, 15-45% Slopes	A
40A	Ludlow Silt Loam, 0-3% Slopes	C
40B	Ludlow Silt Loam, 3-8% Slopes	C
87B	Weathersfield Loam, 3-8% Slopes	C
306	Udorthents-Urban Land Complex	B
W	Water	

Soils are classified into hydrologic soil groups (HSG) to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSGs, which are A, B, C and D, are one element used to determine runoff curve numbers and analyzing stormwater characteristics of a site.

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.

Soils within the limits of disturbance have been classified as predominantly hydrological soil groups A and B, with a small area classified as hydrological soil group C (see Figure 4 and Watershed Maps). These soils have a high rate of water transmission.

2.0 STORMWATER MANAGEMENT

2.1 Design Criteria

Proposed peak flow rates and volumes at all points of discharge from the site were analyzed to compare proposed discharge rates with the existing condition.

The storms analyzed include the following:

- A 2-year, 24-hour storm consisting of 3.31 inches of rainfall
- A 10-year, 24-hour storm consisting of 5.16 inches of rainfall
- A 25-year, 24-hour storm consisting of 6.31 inches of rainfall
- A 50-year, 24-hour storm consisting of 7.16 inches of rainfall
- A 100-year, 24-hour storm consisting of 8.09 inches of rainfall

These events are based on the "NOAA Atlas 14 Point Precipitation Frequency Estimates: CT" as presented in Appendix G of this report. Middletown 4 W Station is the closest station in proximity to the site.

2.2 Design Methodology

The peak runoff discharges for existing and proposed conditions were analyzed using the Soil Conservation Service (SCS) methodology, which outlines procedures for calculating peak rates of runoff resulting from precipitation events, and procedures for developing runoff hydrographs. Values for area, curve number and time of concentration were calculated for existing and proposed conditions.

The curve number "CN" is a land-sensitive coefficient that dictates the relationship between total rainfall depth and direct stormwater runoff for watersheds. The soils within the watersheds are divided into hydrologic soil groups (A, B, C and D) as previously described.

The time of concentration, Tc, is defined as the time for runoff to travel from the hydraulically most distant point in the watershed to a point of interest. Values of time of concentration were determined for existing and proposed conditions based on land cover and slope of the flow path, using methods outlined in the SCS methodology.

For this study, a 24-hour SCS Type III standard rainfall distribution was used to determine the peak flow rate to all points of discharge from the site.

2.3 Existing Runoff Discharges (See Appendix A for Calculations)

The existing drainage conditions were delineated into seven watershed areas: Watersheds A-1, B-1, C-1, D-1, E-1, F-1, G-1a, and G-1b flowing to seven separate design points. Refer to the attached Existing Conditions Watershed Map for a depiction of the existing watersheds, flow paths, and design points for the site.

Watershed A-1, consisting of ±12.12 acres, includes portions of the site at the southwest corner of the property that sheds runoff overland to Design Point A. Design Point A is designated herein as the stormwater drainage system on Geer Street flowing west.

Watershed B-1, consisting of ±74.20 acres, includes a central portion of the site that sheds runoff overland to Design Point B. Design Point B is designated herein as an existing watercourse that originates west of the development area and flows west then north to Shunpike Road.

Watershed C-1, consisting of ±26.20 acres, includes a central portion of the site that sheds runoff overland to Design Point C. Design Point C is designated herein as an existing vernal pool located in the center of the site.

Watershed D-1, consisting of ±29.05 acres, includes a portion of the site at the northeast corner of the property that sheds runoff overland to Design Point D. Design Point D is designated herein as the existing wetland and FEMA Flood Hazard Zone A located along the northern boundary of the site.

Watershed E-1, consisting of ±3.94 acres, includes a small portion of the site located along the eastern boundary that sheds runoff overland to Design Point E. Design Point E is designated herein as an existing vernal pool located along the eastern boundary of the site.

Watershed F-1, consisting of ±37.74 acres, includes a large wooded area located along the northern property line at the northwest corner of the site. Runoff from this area flows north overland to an unnamed watercourse that flows west to a culvert entrance near Shunpike Road, which is designated herein as Design Point F.

Watershed G-1a, consisting of ±5.21 acres, includes a wooded area to the west along Shunpike Road that aligns with the remains of an old farm road. Runoff from this area sheds overland to a watercourse that flows north to a second culvert entrance near Shunpike Road, which is designated herein as Design Point G.

Watershed G-1b, consisting of ±9.11 acres, includes a wooded area to the west of the site that sheds runoff south to a watercourse that discharges to Design Point G.

2.4 Proposed Runoff Discharges (See Appendix B for Calculations)

The proposed conditions drainage patterns maintains the same discharge locations as under the existing conditions: Design Points A, B, C, D, E, F and G. To accurately model and route the proposed runoff through the various stormwater management features and design points, the proposed site was divided into eighteen sub-watersheds, herein identified as A-1, B-1, B-2, B-3, B-4,

B-5, C-1, D-1, D-2, E-1, E-2, F-1, F-2, F-3, G-1a, G-1b, G-1c, and G-2, flowing to seven separate design points.

Watershed A-1, consisting of ±1.67 acres, includes a small portion of the site at the southwest corner that will shed runoff overland to Design Point A, the existing Geer Street drainage system flowing west.

Watershed B-1, consisting of ±26.29 acres, includes a portion of the site located west of the proposed building and parking areas that will shed runoff overland to Design Point B, the existing watercourse that originates west of the development area and flows west then north to Shunpike Road.

Watershed B-2, consisting of ±23.96 acres, includes the eastern half of the proposed building, and adjacent truck parking and loading area to the east. Runoff from this area will be captured by various drain inlets and routed to an underground detention/infiltration system (UG Detention System B-2) to be located east of the proposed building. This system includes 1,850 "Retain-It" 3.5 foot tall concrete infiltration units in a 10 x 185 array with an outlet control structure designed to retain the Water Quality Volume of runoff from its contributing drainage area, and to help attenuate runoff rates to less than pre-construction conditions at Design Point B for up to a 100-year storm event.

Watershed B-3, consisting of ±11.97 acres, includes the western half of the proposed building. Runoff from this area will be captured by various roof drains and routed to an underground detention/infiltration system (UG Detention System B-3) to be located west of the proposed building. This system includes 800 "Retain-It" 4 foot tall concrete infiltration units in a 4 x 200 array with an outlet control structure designed to retain the Water Quality Volume of runoff from its contributing drainage area, and to help attenuate runoff rates to less than pre-construction conditions at Design Point B for up to a 100-year storm event. The outflow from this system is directed to Extended Detention Basin B-5.

Watershed B-4, consisting of ±7.41 acres, includes the southern portion of the truck parking and loading area on the west side of the building, the south emergency access driveway, the drive aisle along southern side of the building, and adjacent landscaped areas. Runoff from this area will be captured and routed to a proposed extended detention basin (Detention Basin B-4) that will be located at the southwest corner of the proposed building. This basin is designed to further

attenuate peak runoff rates to less than pre-construction conditions at Design Point B for up to a 100-year storm event. The outflow from this system is directed to Design Point B.

Watershed B-5, consisting of ±16.31 acres, includes the middle portion of the truck parking and loading area on the west side of the building, and the truck access driveway and guard house to the west. Runoff from this area will be captured and routed to a proposed extended detention basin (Detention Basin B-5) that will be located between the guard house and the western truck parking court. This basin is designed to further attenuate peak runoff rates to less than pre-construction conditions at Design Point B for up to a 100-year storm event. The outflow from this system converges with the outflow from Detention Basin B-4 and flows to Design Point B via a 36 inch diameter storm drain.

Watershed C-1, consisting of ±15.48 acres, includes a portion of the site west of the proposed development area that will shed runoff overland to Design Point C, a vernal pool located at the center of the property.

Watershed D-1, consisting of ±23.11 acres, includes a portion of the site at the northeast corner, outside the limit of disturbance, that will shed runoff overland to Design Point D, the existing wetland and FEMA Flood Hazard Zone A located along the northern boundary of the site.

Watershed D-2, consisting of ±7.58 acres, includes the northern portion of the truck parking and loading area on the west side of the building and the employee parking area north of the building. Runoff from this area will be captured and routed to a proposed infiltration basin (Infiltration Basin D-2) that will be located at the northwest corner of the proposed building. This basin was designed to retain, at a minimum, the Water Quality Volume of runoff from its contributing drainage area. However, additional storage is provided for the complete retention to the 100-year runoff volume. As a result, peak runoff rates will be reduced to less than pre-construction conditions at Design Point D for all storms up to and including the 100 year event.

Watershed E-1, consisting of ±5.81 acres, includes a small portion of the site located along the east boundary that sheds runoff overland to Design Point E, an existing vernal pool located along the east boundary of the site.

Watershed E-2, consisting of ±9.75 acres, includes the existing residential properties to remain that are located at the southeast corner of the site. Runoff from this area will flow overland to the northeast then west onto the subject property where is it captured by a proposed infiltration basin (Infiltration Basin E-2) located along the eastern property line. This basin was designed to retain the Water Quality Volume of runoff from its contributing drainage area and to help attenuate runoff rates to less than pre-construction conditions at Design Point E for up to and including a 100-year storm event. The outflow from this system will converge with overland runoff from Watershed E-1, at Design Point E, the existing vernal pool located along the east boundary of the site.

Watershed F-1, consisting of ±34.38 acres, includes a large wooded portion of the site located between the proposed access road and the northern property line. Runoff from this area will flow north overland to the unnamed watercourse that flows west to Design Point F, an existing culvert entrance near Shunpike Road.

Watershed F-2, consisting of ±2.41 acres, includes the east portion of the proposed access road and adjacent lawn and landscaped areas. Runoff from this area will be routed, via a system of swales and leak-offs, to a proposed infiltration basin (Infiltration Basin F-2), located on the north side of this section of the access roadway. This basin was designed to retain, at a minimum, the Water Quality Volume of runoff for its contributing drainage area. However, additional storage is provided for the complete retention to the 100-year runoff volume. As a result, peak runoff rates will be reduced to less than pre-construction conditions at Design Point F for all storms up to and including the 100-year event.

Watershed F-3, consisting of ±1.79 acres, includes an east / central portion of the proposed access road and adjacent lawn and landscaped areas. Runoff from this area will be routed, via a system of swales and leak-offs, to a proposed infiltration basin (Infiltration Basin F-3) located on the north side of this section of the access roadway. This basin was designed to retain, at a minimum, the Water Quality Volume of runoff for its contributing drainage area. However, additional storage is provided for the complete retention to the 100-year runoff volume. As a result, peak runoff rates will be reduced to less than pre-construction conditions at Design Point F for all storms up to and including the 100-year event.

Watershed G-1a, consisting of ±4.52 acres, includes the western most portion of the proposed access road and adjacent lawn and landscaped areas. Runoff from

this area will flow overland to Design Point G, an existing culvert entrance near Shunpike Road.

Watershed G-1b, consisting of ±4.63 acres, includes a wooded area to the west of site and south of the proposed access road that sheds runoff south to a watercourse that ultimately flows to Design Point G.

Watershed G-1c, consisting of ±0.82 acres, includes a west portion of the proposed access roadway that gets captured by two proposed catch basins. Runoff from this area will flows to via storm drain to Design Point G.

Watershed G-2, consisting of ±0.56 acres, includes the west / central portion of the proposed access road and adjacent lawn and landscaped areas. Runoff from this area will be routed, via a system of swales and leak-offs, to a proposed infiltration basin (Infiltration Basin G-2) located on the north side of this section of the access roadway. This basin was designed to retain, at a minimum, the Water Quality Volume of runoff for its contributing drainage area. However, additional storage is provided for the complete retention of the 50-year runoff volume. As a result, peak runoff rates will be reduced to less than pre-construction conditions at Design Point G for all storms up to and including the 100-year event. The minimal outflow from this system will converge with the site generated runoff from drainage areas G-1a, G-1b, and G-1c at Design Point G.

The proposed development will result in decreases in runoff at Design Points A, B, C, D, E, and F. However, in this analysis, Design Point G will have a small unavoidable increase in runoff during the 2 year event, as a result of its location on the property. Since all design points ultimately converge downstream of Design Point G, and decreases in runoff are observed everywhere else on-site, the small increase in runoff rates at Design Point G will not have any impact on the site or surrounding downstream areas. See Table 2 for a summary of existing vs proposed runoff rates at all designs points for the 2, 10, 25, 50, and 100-year storm events.

Table 2: Peak Runoff Rate Comparison (cubic-feet per second)

Design Point	Condition	2-Year Storm	10-Year Storm	25-Year Storm	50-Year Storm	100-Year Storm
A	Pre (cfs)	0.15	3.06	6.93	10.52	14.96
	Post (cfs)	0.02	0.41	1.01	1.59	2.33
	% Delta	-86.7%	-86.6%	-85.4%	-84.9%	-84.4%
B	Pre (cfs)	0.54	9.70	23.64	37.18	54.19
	Post (cfs)	0.55	7.34	18.50	28.40	40.13
	% Delta	1.9%	-24.3%	-21.7%	-23.6%	-25.9%
C	Pre (cfs)	1.20	13.81	27.97	40.06	54.50
	Post (cfs)	1.29	9.18	16.53	22.72	30.01
	% Delta	7.5%	-33.5%	-40.9%	-43.3%	-44.9%
D	Pre (cfs)	0.52	10.38	22.50	33.36	46.44
	Post (cfs)	0.45	8.83	19.15	28.39	39.52
	% Delta	-13.5%	-14.9%	-14.9%	-14.9%	-14.9%
E	Pre (cfs)	0.01	0.50	1.83	3.49	6.13
	Post (cfs)	0.01	0.43	1.58	3.02	5.31
	% Delta	0.0%	-14.0%	-13.7%	-13.5%	-13.4%
F	Pre (cfs)	4.01	22.81	39.15	52.61	68.29
	Post (cfs)	3.12	19.73	34.55	46.83	61.26
	% Delta	-22.2%	-13.5%	-11.7%	-11.0%	-10.3%
G	Pre (cfs)	2.36	10.35	16.81	22.05	28.12
	Post (cfs)	2.80	9.17	14.05	17.92	22.33
	% Delta	18.6%	-11.4%	-16.4%	-18.7%	-20.6%

3.0 STORMWATER QUALITY (SEE APPENDIX C FOR CALCULATIONS)

3.1 Stormwater Quality Improvements

The proposed drainage systems have been designed to accommodate the Groundwater Recharge Volume (GRV) and to temporarily store and infiltrate the Water Quality Volume (WQV) for each contributing drainage area. The WQV is defined in CTDEP's Stormwater Quality Manual as follows:

"The water quality volume (WQV) is the amount of stormwater runoff from any given storm that should be captured and treated in order to remove a majority of stormwater pollutants on an average annual basis. The recommended WQV, which results in the capture and treatment of the entire runoff volume for 90 percent of the average annual storm events, is equivalent to the runoff associated with the first one-inch of rainfall."

The GRV is defined within CTDEEP's Stormwater Quality Manual as follows:

"The groundwater recharge criterion is intended to maintain pre-development annual groundwater recharge volumes by capturing and infiltrating stormwater runoff. The objective of the groundwater recharge criterion is to maintain water table levels, stream baseflow, and wetland moisture levels. The groundwater recharge volume is the post-development design recharge volume required to minimize the loss of annual pre-development groundwater recharge."

The proposed stormwater management plan and drainage systems have been designed to treat the Water Quality Volume (WQV) through infiltration practices, in accordance with the 2004 Connecticut Stormwater Quality Manual. Treatment measures include landscaped areas, two-foot deep-sump catch basins, hydrodynamic separators, sediment forebays, infiltration basins, and preformed scour holes.

All stormwater to be treated on the site is collected via roof leader drains or deep-sump catch basins and conveyed through a closed pipe drainage network. The catch basin sumps provide an initial opportunity to settle suspended particles before the water is conveyed to its respective treatment practice. The closed pipe drainage networks then discharge to nine separate stormwater Best Management

Practices (BMPs) which provide adequate storage to retain and infiltrate, at a minimum, the required WQV for each contributing watershed.

All stormwater BMPs have been designed to hold, at a minimum, the Water Quality Volume for each respective drainage area, with additional storage provided to attenuate peak runoff rates to less than pre-construction conditions for all storms up to and including the 100 year event. See Table 3 below for a summary of each stormwater BMP, its capacity, and associated sizing requirements. In addition, see Table 4 for drawdown calculations.

Table 3: Summary or Stormwater BMPs and Associated Design Criteria.

BMP ID	Contributing Watershed ID	Contributing Watershed Area (ac)	Water Quality Volume (cf)	Groundwater Recharge Volume (cf)	Runoff Volume Retained (cf)	Bottom Elevation of System (ft)	Average Groundwater Elevation (ft)
UG Detention System B-2	B-2	23.96	76,647	65,865	273,663	134.00	131.80
UG Detention System B-3	B-3	11.97	41,279		104,370	134.00	132.18
Extended Detention Basin B-4	B-4	7.41	10,068		0	132.50	130.80
Extended Detention Basin B-5	B-5	16.31	38,636		0	132.50	131.10
Infiltration Basin D-2	D-2	7.58	17,907		172,213	131.50	128.76
Infiltration Basin E-2	E-2	9.75	-		65,632	138.50	135.20
Infiltration Basin F-2	F-2	2.41	4,488		51,435	130.00	129.40
Infiltration Basin F-3	F-3	1.79	3,036		33,542	131.00	127.07
Infiltration Basin G-2	G-2	0.56	624		8,116	132.00	127.33

Table 4: Summary or Stormwater BMPs and Drawdown Calculations.

BMP ID	System Footprint (sf)	Retention Volume (cf)	Design Infiltration Rate (in/hr)	Drawdown Time (hr)
UG Detention System B-2	121,524	273,663	1	27.02
UG Detention System B-3	54,468	104,370	1	22.99
Extended Detention Basin B-4	0	0	n/a	n/a
Extended Detention Basin B-5	0	0	n/a	n/a
Infiltration Basin D-2	30,777	172,213	1	67.15
Infiltration Basin E-2	31,545	65,632	1	24.97
Infiltration Basin F-2	9,565	51,435	1	64.53
Infiltration Basin F-3	5,159	33,542	1	78.02
Infiltration Basin G-2	1,785	8,116	1	54.56

The combination of the aforementioned treatment facilities have been designed with the objective of removing a minimum of 80% of total suspended solids (TSS).

4.0 STORM DRAINAGE COLLECTION SYSTEM DESIGN (SEE APPENDIX D FOR CALCULATIONS)

4.1 Design Criteria

The proposed subsurface storm drainage collection system is designed to convey the 25-year design storm event throughout the site without overtopping surcharging of drainage structures.

4.2 Design Methodology

The storm drainage system components were analyzed using the Rational Method for estimating runoff for a 25-year design storm event. The site was divided into subareas, each contributing runoff to an individual catch basin inlet or roof drain. A value for area, time of concentration, and runoff coefficient was calculated for each contributing subarea.

Values of time of concentration were selected based on land cover and flow path slope from the hydraulically most distant point in the subarea to the appropriate inlet. The average runoff coefficient, which is the ratio of peak runoff rate to the average rainfall rate for the period known as the time of concentration, was chosen using the following values:

CONDITION	**C**
Grass/Landscaping	0.30
Paved/Impervious/Roof Areas	0.90

Rainfall intensities were selected from the intensity-duration-frequency curve for Connecticut as presented in the "NOAA Atlas 14 Point Precipitation Frequency estimates: CT" for the "Middletown 4 W" station, see Appendix G. Storm drainage pipes were then sized based on calculated design flows using the Rational Method, and verified by solving for the hydraulic grade line throughout the pipe networks using the manning equation. Starting downstream tailwater elevations used for calculating hydraulic grade lines for each pipe network were set equal to the calculated maximum 25 year water surface elevations for each downstream BMP.

4.3 Storm Drainage Collection Summary

The runoff from the development will be collected using a conventional roof drain, catch basin, and manhole system. The collection system was designed to convey the 25-year storm without overtopping any of the proposed catch basins on-site. In the event of larger storms, excess overland flows will be directed away from proposed structures and other sensitive site features.

5.0 CULVERT DESIGN FOR ACCESS ROAD STREAM CROSSING

In order to construct the proposed access roadway from the west, a culvert crossing is required. According to the 2000 ConnDOT Drainage Manual, new culvert crossings with watersheds less than or equal to one square mile, shall be designed to convey the 50-year design storm with a minimum of one foot of freeboard. In addition, the culvert shall have an openness ratio greater than 0.82-feet, to provide for adequate passage of wildlife. Culvert openness is identified as the cross-sectional area of the culvert divided by its length.

According to the data collected from StreatStats, the contributing watershed for the subject culverts is approximately 0.68 square miles and has an associated 50-year design flow rate of 198 cfs. StreamStats is a web application that provides access to spatial analytical tools for water-resources engineering and design purposes. The map-based interface can be used to delineate drainage areas, get basin characteristics, and estimate flow statistics.

Based on the data obtained, geometery of the culvert area, and design requirements, the ideal culvert cross-section is a three sided box culvert with an opening of 5-feet tall by 16-feet wide. The proposed culvert length will be 60ft at a slope of 0.5%. Refer to Appendix E for design calculations and reference data.

6.0 CONCLUSION

The proposed stormwater management system has been designed in general accordance with the Town of Cromwell requirements, the 2004 CTDEEP Stormwater Quality Manual, and the 2000 CTDOT Drainage Manual. The system incorporates stormwater quality measures to promote groundwater recharge and minimize passage of pollutants to downstream receiving waters. It has also been designed to provide peak runoff rate

attenuation to significantly reduce the peak rate and volume of stormwater runoff leaving the site under proposed conditions.

It is the opinion of this office and the findings of this report that the proposed stormwater system, as proposed, will effectively manage the quality and quantity of stormwater runoff for the proposed development.

7.0 REFERENCES

1. Town of Cromwell Zoning Regulations

2. Connecticut Guidelines for Soil Erosion and Sediment Control, The Connecticut Council on Soil and Water Conservation, 2002.

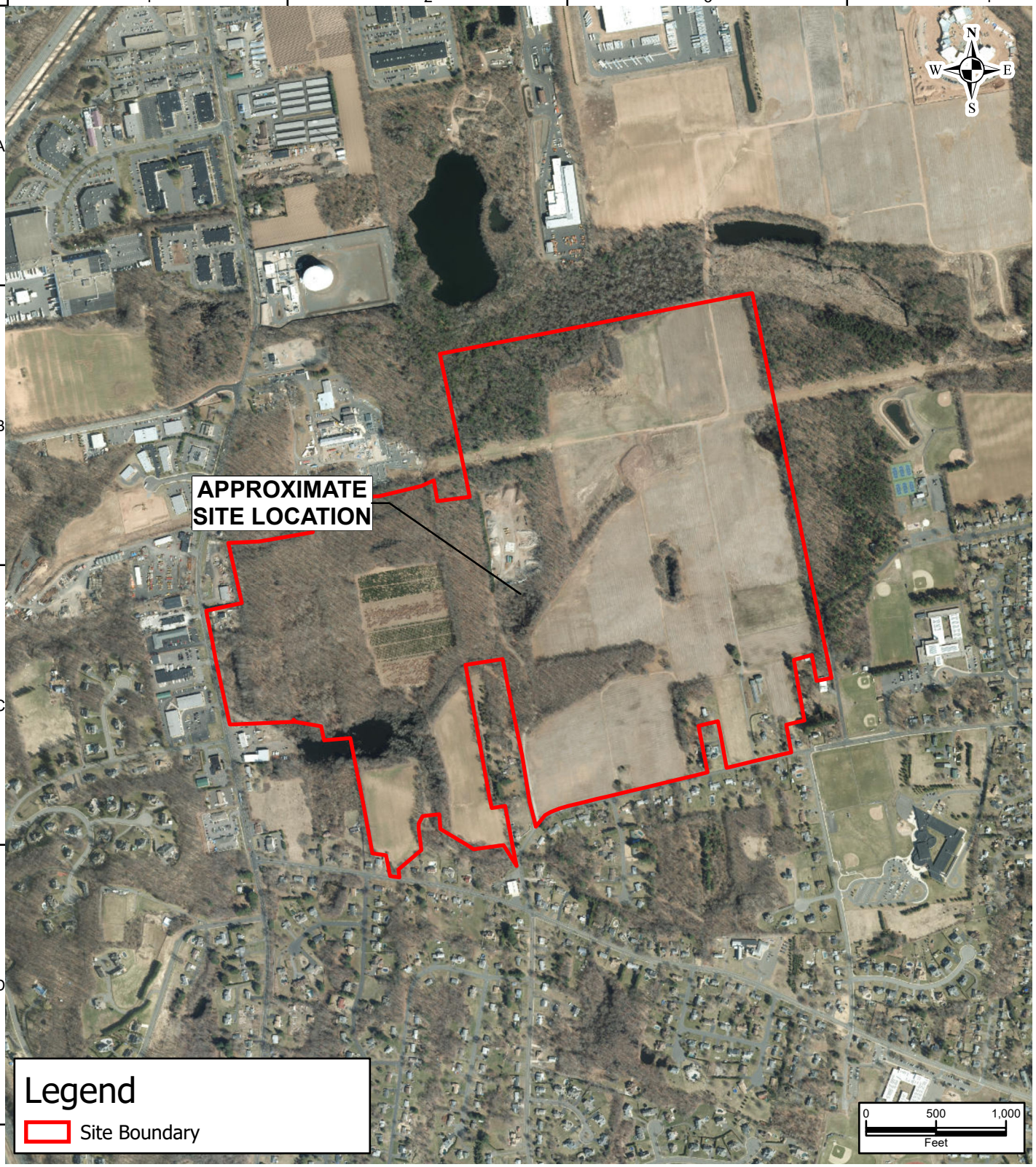
3. Web Soil Survey of Middlesex County, Connecticut, United States Department of Agriculture, 1958.

4. Urban Hydrology for Small Watersheds, Technical Release 55, United States Department of Agriculture, Soil Conservation Service, June 1986.

5. Connecticut Stormwater Quality Manual, Connecticut Department of Environmental Protection, 2004.

6. ConnDOT Drainage Manual, Connecticut Department of Transportation, 2000.

7. NOAA Atlas 14 Rainfall Depths & Intensities, https://hdsc.nws.noaa.gov/hdsc/pfds/



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community; Esri, DigitalGlobe, Earthstar Geographics, CNES/Airbus DS, GeoEye, USDA FSA, USGS, Aerogrid, IGN, IGP, and the GIS User Community

LANGAN
Long Wharf Maritime Center, 555 Long Wharf Drive
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International
Collectively known as Langan

Project
PROJECT HIGHLANDS
CROMWELL
COUNTY MIDDLESEX CONNECTICUT

Drawing Title
AERIAL

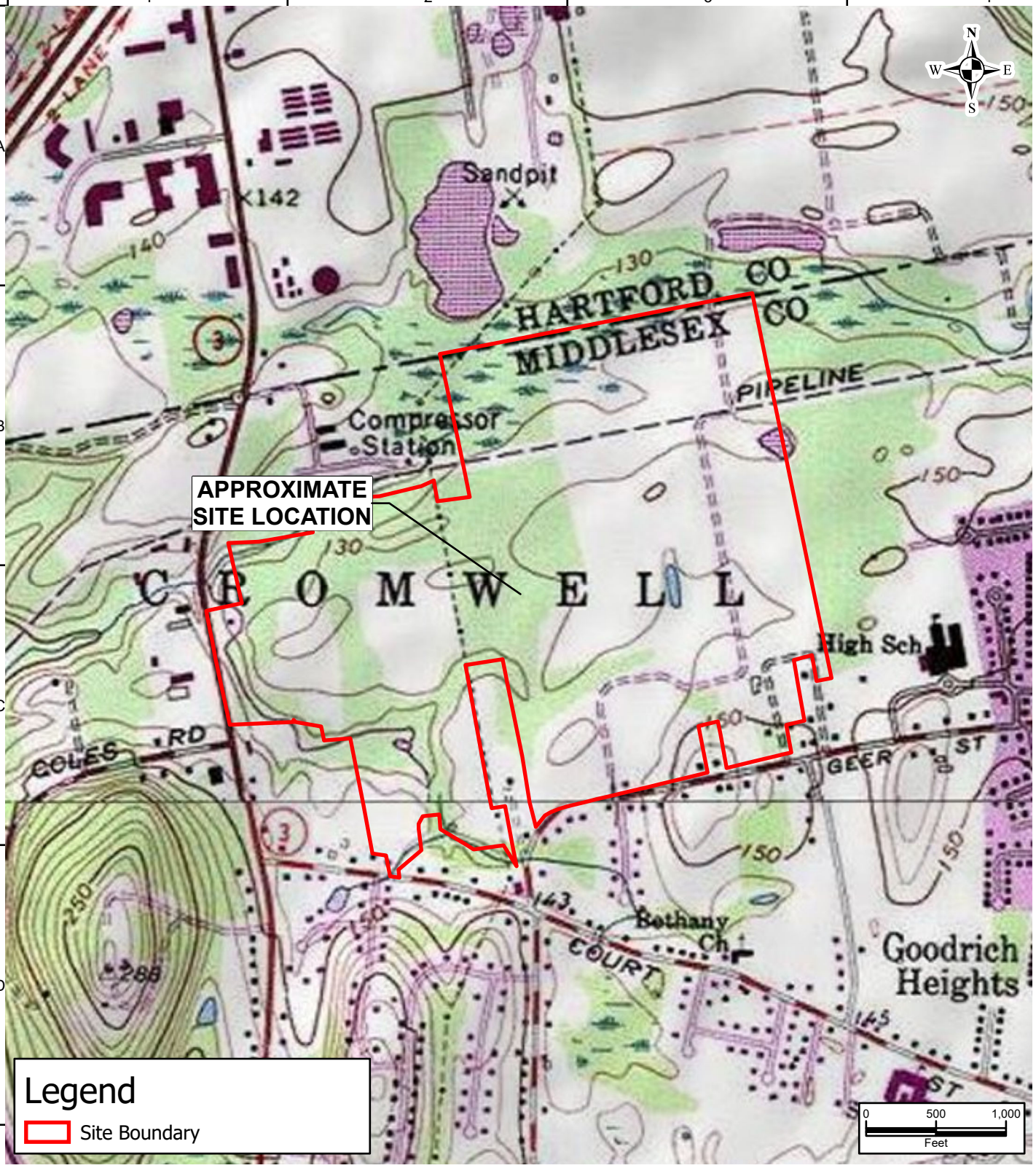
Project No.	140225401
Date	9/7/2021
Scale	1:1,000
Drawn By	Site Analyzer
Submission Date	09/17/2021

Figure 1

Sheet 1 of 5

© 2021 Langan

Disclaimer: This information is produced by an automated system and may not be complete. The absence of a feature is not a confirmation that the feature is not present at the subject location. Information produced is in the public domain and unless noted has not been field verified or provided for any specific use. Users are also cautioned to confirm the information shown is suitable for their intended use.
Spatial Reference: NAD 1983 StatePlane Connecticut FIPS 0600 Feet



Copyright:© 2013 National Geographic Society, i-cubed; © 2013 National Geographic Society, i-cubed

LANGAN
Long Wharf Maritime Center, 555 Long Wharf Drive
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International
Collectively known as Langan

Project
PROJECT HIGHLANDS
CROMWELL
COUNTY MIDDLESEX CONNECTICUT

Drawing Title
SITE LOCATION

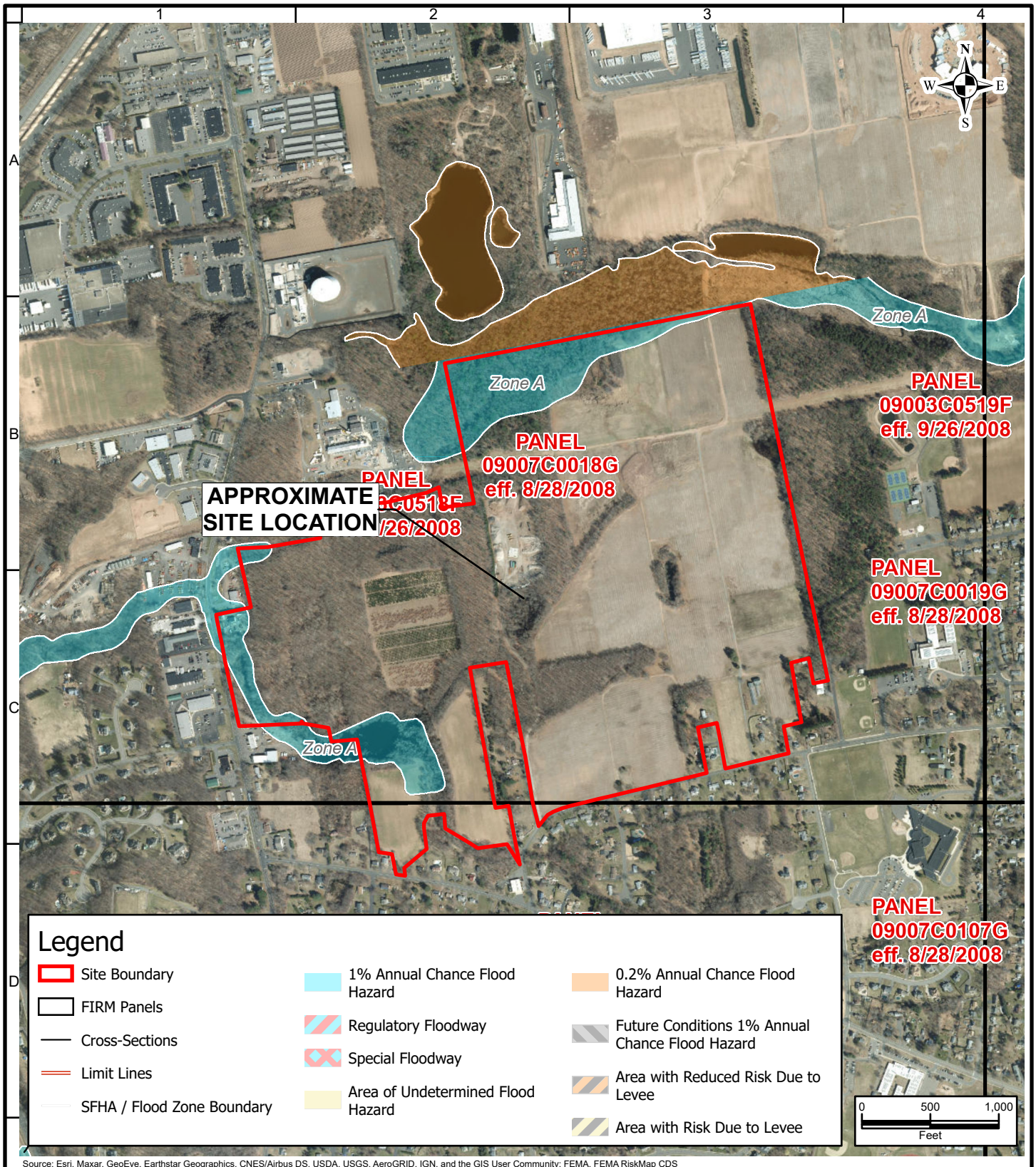
Project No.	140225401
Date	9/7/2021
Scale	1:1,000
Drawn By	Site Analyzer
Submission Date	09/17/2021

Figure 2

Sheet 2 of 5

© 2021 Langan

Disclaimer: This information is produced by an automated system and may not be complete. The absence of a feature is not a confirmation that the feature is not present at the subject location. Information produced is in the public domain and unless noted has not been field verified or provided for any specific use. Users are also cautioned to confirm the information shown is suitable for their intended use.
Spatial Reference: NAD 1983 StatePlane Connecticut FIPS 0600 Feet



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community; FEMA, FEMA RiskMap CDS

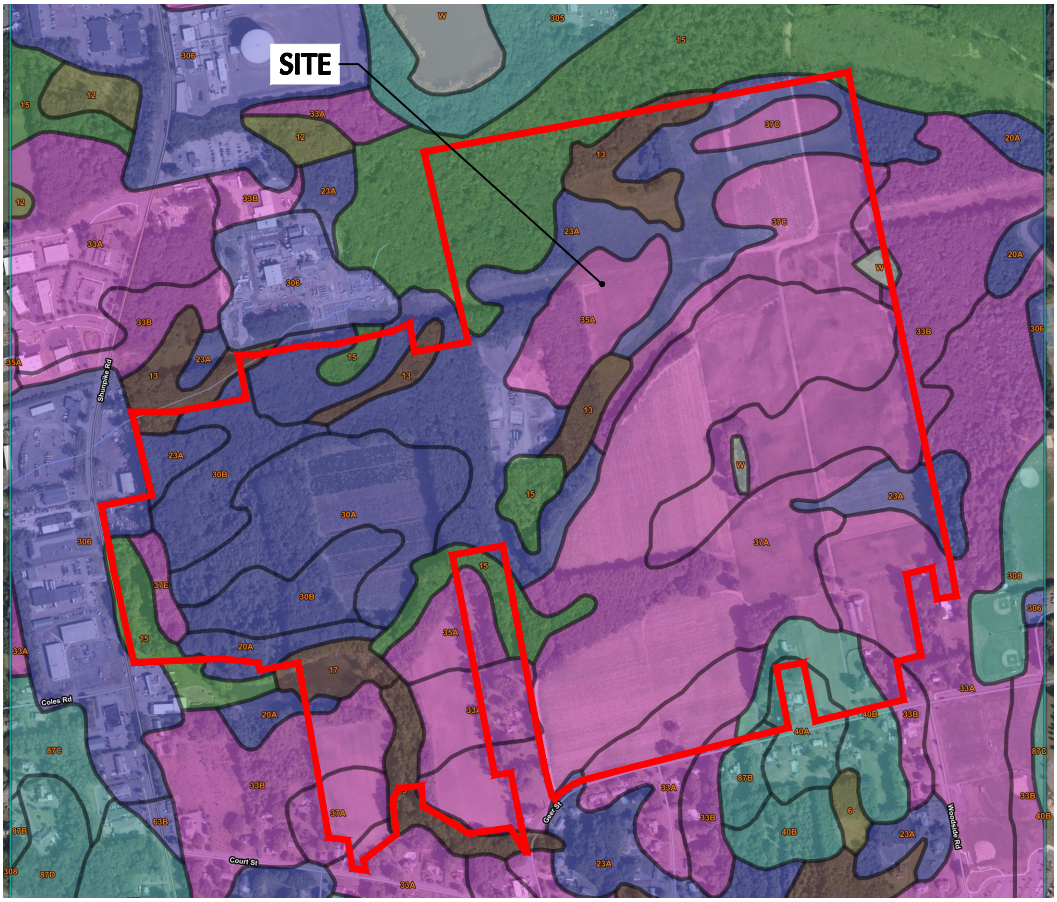
LANGAN
Long Wharf Maritime Center, 555 Long Wharf Drive
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International
Collectively known as Langan

Project	PROJECT HIGHLANDS
	CROMWELL
COUNTY	MIDDLESEX
	CONNECTICUT
Drawing Title	**EFFECTIVE FEMA FIRM**
Project No.	140225401
Date	9/7/2021
Scale	1:1,000
Drawn By	Site Analyzer
Submission Date	09/17/2021
Figure	3
	Sheet 3 of 5

© 2021 Langan

Disclaimer: This information is produced by an automated system and may not be complete. The absence of a feature is not a confirmation that the feature is not present at the subject location. Information produced is in the public domain and unless noted has not been field verified or provided for any specific use. Users are also cautioned to confirm the information shown is suitable for their intended use.

Spatial Reference: NAD 1983 StatePlane Connecticut FIPS 0600 Feet



SOIL TYPE LEGEND

SYMBOL	NAME	RATING
13	WALPOLE SANDY LOAM, 0–3% SLOPES	B/D
15	SCARBORO MUCK, 0–3% SLOPES	A/D
17	TIMAKWA AND NATCHAUG SOILS, 0–2% SLOPES	B/D
20A	ELLINGTON SILT LOAM, 0–5% SLOPES	B
23A	SUDBURY SANDY LOAM, 0–5% SLOPES	B
30A	BRANFORD SILT LOAM, 0–3% SLOPES	B
30B	BRANFORD SILT LOAM, 3–8% SLOPES	B
33A	HARTFORD SANDY LOAM, 0–3% SLOPES	A
33B	HARTFORD SANDY LOAM, 3–8% SLOPES	A
35A	PENWOOD LOAMY SAND, 0–3% SLOPES	A
37A	MANCHESTER GRAVELLY SANDY LOAM, 0–3% SLOPES	A
37C	MANCHESTER GRAVELLY SANDY LOAM, 3–15% SLOPES	A
37E	MANCHESTER GRAVELLY SANDY LOAM, 15–45% SLOPES	A
40A	LUDLOW SILT LOAM, 0–3% SLOPES	C
40B	LUDLOW SILT LOAM, 3–8% SLOPES	C
87B	WEATHERSFIELD LOAM, 3–8% SLOPES	C
306	UDORTHENTS–URBAN LAND COMPLEX	B
W	WATER	

NOTES:
1. BASEMAP OBTAINED FROM USDA NATURAL RESOURCES CONSERVATION SERVICE (NRCS) WEB SOIL SURVEY MAP SERVICE ACCESSED 06 AUGUST 2021.

1000 0 500 1000

SCALE: 1 INCH = 1000 FEET

LANGAN
Langan CT, Inc.
555 Long Wharf Drive
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

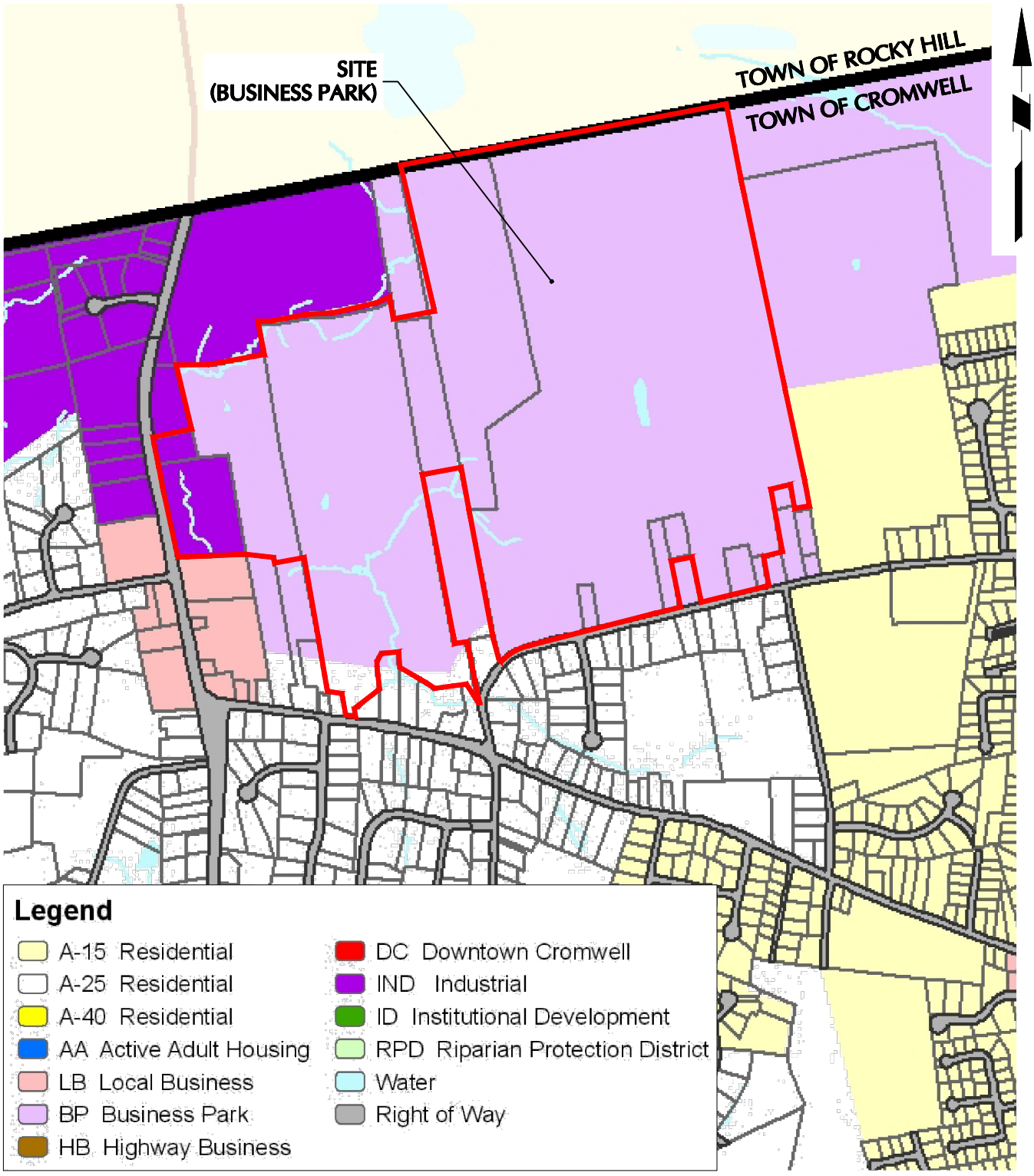
Project: PROJECT HIGHLANDS
CROMWELL CONNECTICUT

Drawing Title: SOIL SURVEY MAP

Project No. 140225401
Date 09/17/2021
Drawn By CMD
Checked By DTG

Drawing No. FG04

© 2020 Langan



BASEMAP NOTES:

1. OFFICIAL ZONING MAP EFFECTIVE MAY 1, 2011. MAP OBTAINED FROM TOWN OF CROMWELL WEBSITE, ACCESSED 06 AUGUST 2021.

1000 0 500 1000

SCALE: 1 INCH = 1000 FEET

LANGAN

Langan CT, Inc.
555 Long Wharf Drive
New Haven, CT 06511

T: 203.562.5771 F: 203.789.6142 www.langan.com

Project
PROJECT HIGHLANDS
76 GEER STREET
CROMWELL CONNECTICUT

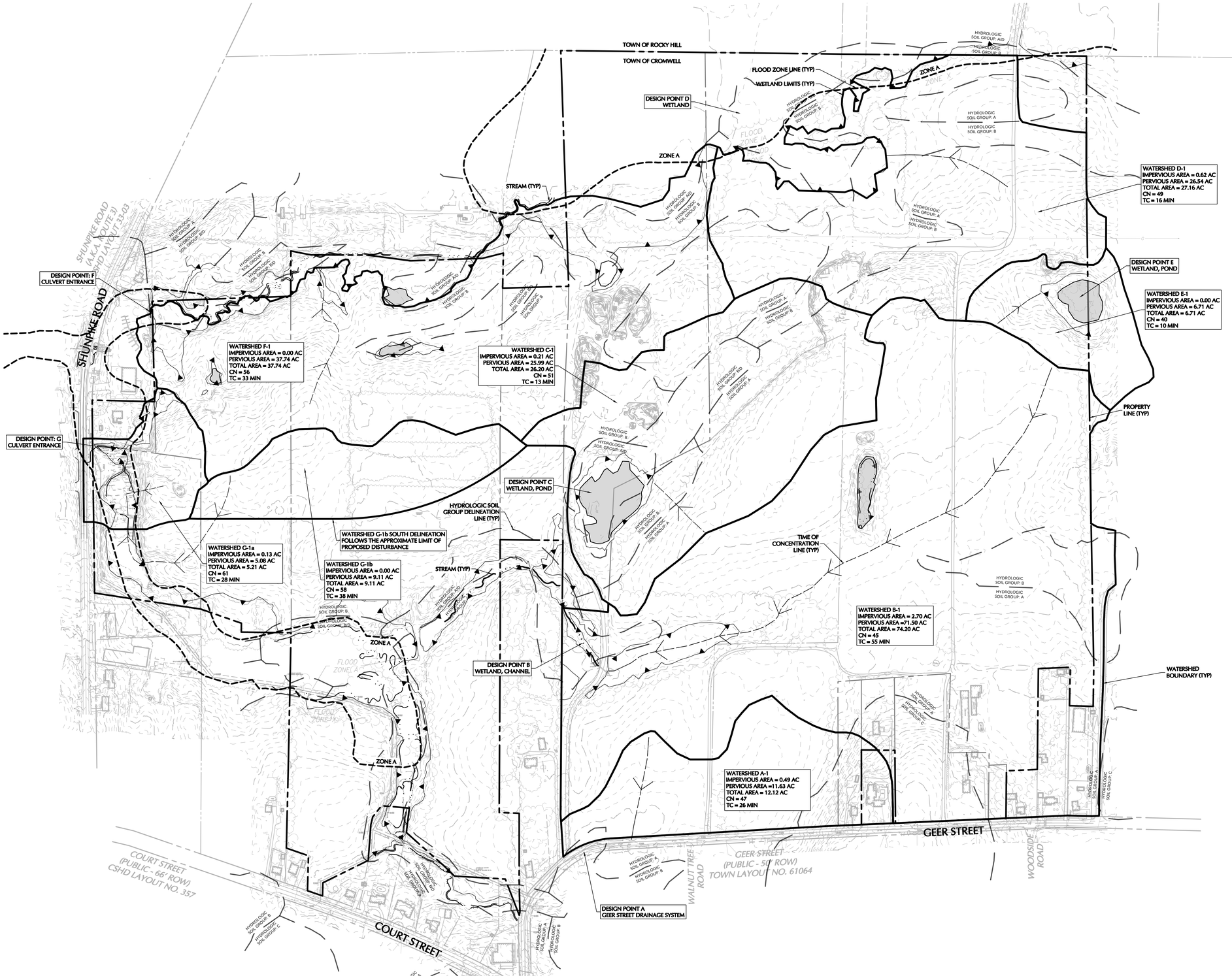
Drawing Title
ZONING MAP

Project No. 140225401
Date 09/17/2021
Drawn By CMD
Checked By DTG

Drawing No.
FG05

© 2020 Langan

Date: 9/7/2021 Time: 11:33 User: afedus Style Table: Langan.stb Layout: FG 05 Document Code: FG05-140225401-0201-GI101-0101



200 0 100 200
SCALE: 1 INCH = 200 FEET

FOR PERMITTING ONLY, NOT FOR CONSTRUCTION

Date	Description	No.

Revisions

Signature Date

LANGAN

Langan CT, Inc.
555 Long Wharf Drive
New Haven, CT 06511

T: 203.562.5771 F: 203.789.6142 www.langan.com

Project

PROJECT HIGHLANDS

210 SHUNPIKE ROAD
CROMWELL CONNECTICUT

Drawing Title

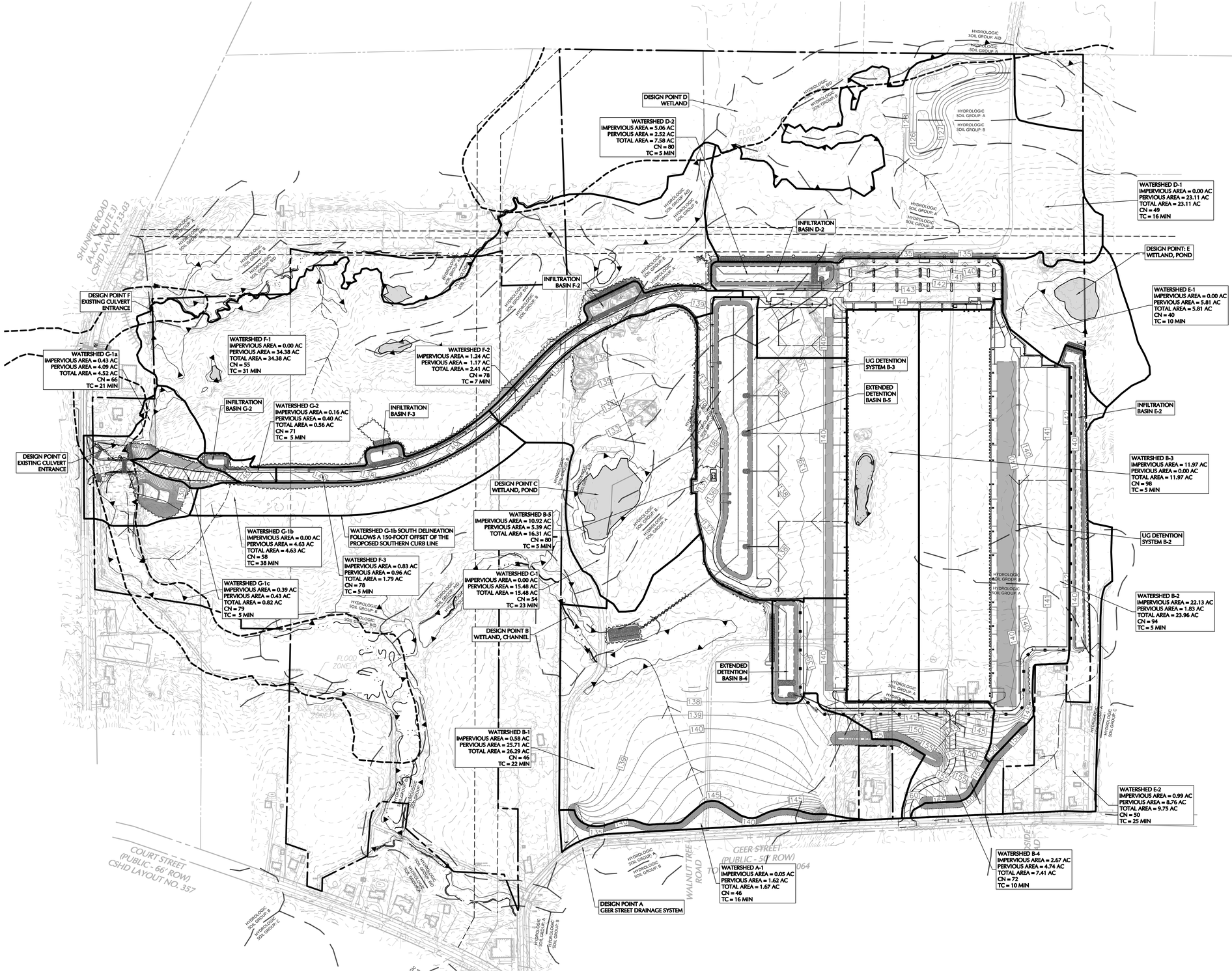
EXISTING WATERSHED MAP

Project No.	Drawing No.
140225401	EX-WS
Date: 05/03/2022	
Drawn By: JKH	
Checked By: TSO	

LANGAN
Project No. 140225401

©2021 Langan

Date: 5/2/2022 Time: 14:22 User: jhannant Style Table: Langan.stb Layout: EX-WS Document Code: 140225401-0201-CG103-0101



200 0 100 200
SCALE: 1 INCH = 200 FEET

FOR PERMITTING ONLY, NOT FOR CONSTRUCTION

Date	Description	No.
Revisions		

Signature Date

LANGAN

Langan CT, Inc.

555 Long Wharf Drive
New Haven, CT 06511

T: 203.562.5771 F: 203.789.6142 www.langan.com

Project

PROJECT HIGHLANDS

210 SHUNPIKE ROAD
CROMWELL CONNECTICUT

Drawing Title

PROPOSED WATERSHED MAP

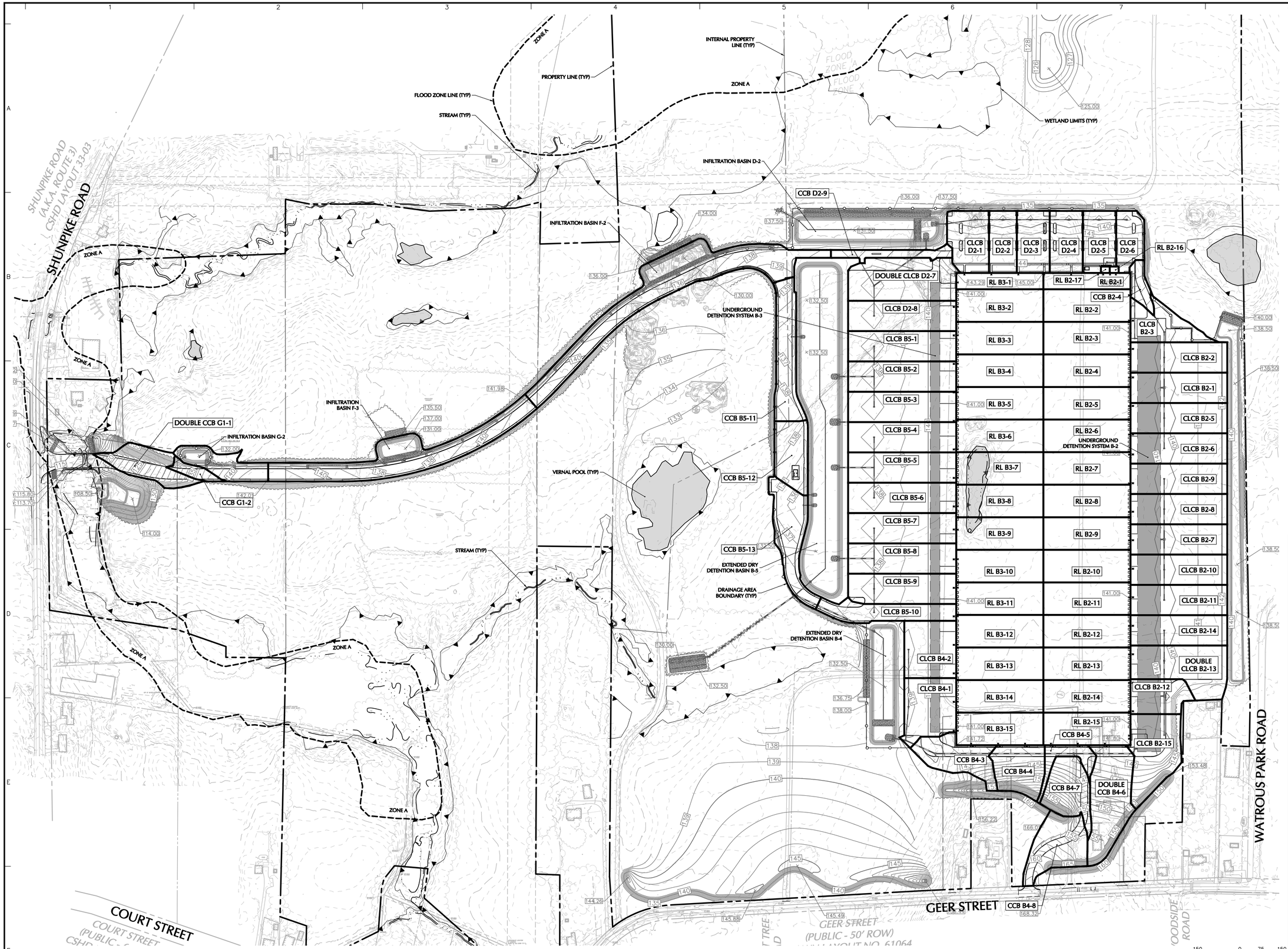
Project No.	Drawing No.
140225401	PR-WS
Date: 05/03/2022	
Drawn By: JKH	
Checked By: TSO	

LANGAN

Project No. 140225401

©2021 Langan

Date: 5/2/2022 Time: 14:25 User: jhannant Style Table: Langan.stb Layout: PR-WS Document Code: 140225401-0201-CG104-0101



FOR PERMITTING ONLY, NOT FOR CONSTRUCTION

Date	Description	No.
Revisions		

Signature Date

LANGAN

Langan CT, Inc.
555 Long Wharf Drive
New Haven, CT 06511

T: 203.562.5771 F: 203.789.6142 www.langan.com

Project

PROJECT HIGHLANDS

210 SHUNPIKE ROAD
CROMWELL CONNECTICUT

Drawing Title

DRAINAGE AREA MAP

Project No.	Drawing No.
140225401	DA-CB
Date: 05/03/2022	
Drawn By: ALF	
Checked By: TDO	

LANGAN

Project No. 140225401

© 2021 Langan

Date: 5/2/2022 Time: 09:59 User: afedus Style Table: Langan.stb Layout: DA-CB Document Code: 140225401-0201-CG104-0102

APPENDIX A

Existing Stormwater Discharge Calculations

LANGAN

Project Highlands - Cromwell, CT
Watershed Summary

Existing Conditions

Area ID	A_{Total} (ac)	A_{Imp} (ac)	A_{perm} (ac)	CN	Tc (min)	WQV (ft^3)	WQF (ft^3/s)	Q_{2YR} (ft^3/s)	Q_{10Yr} (ft^3/s)	Q_{25Yr} (ft^3/s)	Q_{50Yr} (ft^3/s)	Q_{100Yr} (ft^3/s)	Downstream Routing
A-1	12.12	0.49	11.63	47	26	-	-	0.15	3.06	6.93	10.52	14.96	-> DP-A
B-1	74.20	2.70	71.50	45	55	-	-	0.54	9.70	23.64	37.18	54.19	-> DP-B
C-1	26.20	0.21	25.99	51	13	-	-	1.20	13.81	27.97	40.06	54.50	-> DP-C
D-1	27.16	0.62	26.54	49	16	-	-	0.52	10.38	22.50	33.36	46.44	-> DP-D
E-1	6.71	0.00	6.71	40	10	-	-	0.01	0.50	1.83	3.49	6.13	-> DP-E
F-1	37.74	0.00	37.74	56	33	-	-	4.01	22.81	39.15	52.61	68.29	-> DP-F
G-1a	5.21	0.13	5.08	61	28	-	-	1.23	4.78	7.57	9.79	12.35	-> DP-G
G-1b	9.11	0.00	9.11	58	38	-	-	1.26	5.97	9.87	13.04	16.75	-> DP-G
Total	198.45	4.15	194.30	-	-	-	-	-	-	-	-	-	

Notes:

1. Refer to the Existing Conditions Watershed Map for a depiction of existing watersheds, flow paths, and location of downstream design points.
2. Calculations for existing conditions Drainage Areas, Curve Numbers, Time of Concentrations, Peak Flow Rates, and Runoff Volumes are provided in Appendix A.
3. Calculations for Water Quality Volume (WQV) and Water Quality Flow (WQF) are not provided for existing conditions.

TABLE OF CONTENTS

Project Reports
1 Routing Diagram
2 Rainfall Events Listing
3 Area Listing (all nodes)

2yr Event
4 Node Listing
5 Subcat 1S: ExWS A-1
7 Subcat 2S: ExWS B-1
9 Subcat 3S: ExWS C-1
10 Subcat 4S: ExWS D-1
11 Subcat 5S: ExWS E-1
12 Subcat 8S: ExWS F-1
13 Subcat 9S: ExWS G-1a
15 Subcat 10S: ExWS G-1b
16 Pond 6P: Pond E-1
18 Link 7L: Design Point E
19 Link 11L: Design Point G

10yr Event
20 Node Listing
21 Subcat 1S: ExWS A-1
23 Subcat 2S: ExWS B-1
25 Subcat 3S: ExWS C-1
26 Subcat 4S: ExWS D-1
27 Subcat 5S: ExWS E-1
28 Subcat 8S: ExWS F-1
29 Subcat 9S: ExWS G-1a
31 Subcat 10S: ExWS G-1b
32 Pond 6P: Pond E-1
34 Link 7L: Design Point E
35 Link 11L: Design Point G

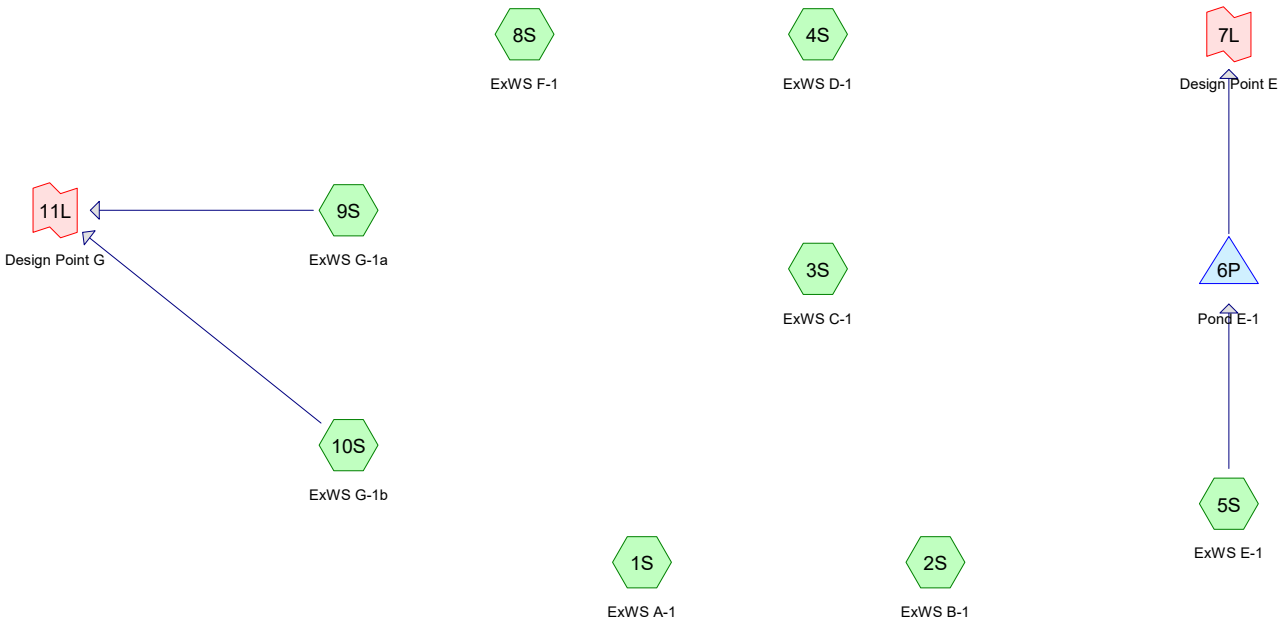
25yr Event
36 Node Listing
37 Subcat 1S: ExWS A-1
39 Subcat 2S: ExWS B-1
41 Subcat 3S: ExWS C-1
42 Subcat 4S: ExWS D-1
43 Subcat 5S: ExWS E-1
44 Subcat 8S: ExWS F-1
45 Subcat 9S: ExWS G-1a
47 Subcat 10S: ExWS G-1b
48 Pond 6P: Pond E-1
50 Link 7L: Design Point E
51 Link 11L: Design Point G

50yr Event

52 Node Listing
53 Subcat 1S: ExWS A-1
55 Subcat 2S: ExWS B-1
57 Subcat 3S: ExWS C-1
58 Subcat 4S: ExWS D-1
59 Subcat 5S: ExWS E-1
60 Subcat 8S: ExWS F-1
61 Subcat 9S: ExWS G-1a
63 Subcat 10S: ExWS G-1b
64 Pond 6P: Pond E-1
66 Link 7L: Design Point E
67 Link 11L: Design Point G

100yr Event

68 Node Listing
69 Subcat 1S: ExWS A-1
71 Subcat 2S: ExWS B-1
73 Subcat 3S: ExWS C-1
74 Subcat 4S: ExWS D-1
75 Subcat 5S: ExWS E-1
76 Subcat 8S: ExWS F-1
77 Subcat 9S: ExWS G-1a
79 Subcat 10S: ExWS G-1b
80 Pond 6P: Pond E-1
82 Link 7L: Design Point E
83 Link 11L: Design Point G



Subcat Reach Pond Link

Routing Diagram for 20220428 Existing Conditions

Prepared by Langan Engineering and Environmental Services, Printed 4/28/2022

HydroCAD® 10.10-6a s/n 11011 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2yr	Type III 24-hr		Default	24.00	1	3.31	2
2	10yr	Type III 24-hr		Default	24.00	1	5.16	2
3	25yr	Type III 24-hr		Default	24.00	1	6.31	2
4	50yr	Type III 24-hr		Default	24.00	1	7.16	2
5	100yr	Type III 24-hr		Default	24.00	1	8.09	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
93.49	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S, 4S, 5S, 8S)
27.02	61	>75% Grass cover, Good, HSG B (1S, 2S, 3S, 4S, 8S, 9S, 10S)
5.14	74	>75% Grass cover, Good, HSG C (1S, 2S)
0.91	76	Gravel roads, HSG A (8S)
4.26	85	Gravel roads, HSG B (3S, 8S)
4.15	98	Paved parking, HSG A (1S, 2S, 3S, 4S, 9S)
16.51	30	Woods, Good, HSG A (1S, 2S, 3S, 4S, 5S, 8S)
37.57	55	Woods, Good, HSG B (3S, 8S, 9S, 10S)
0.96	70	Woods, Good, HSG C (1S, 2S)
8.44	77	Woods, Good, HSG D (2S, 3S, 5S, 8S, 9S)
198.45	**49**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: ExWS A-1 Runoff Area=12.12 ac 4.04% Impervious Runoff Depth=0.09"
Flow Length=440' Tc=26 min CN=47 Runoff=0.15 cfs 0.091 af

Subcatchment 2S: ExWS B-1 Runoff Area=74.20 ac 3.64% Impervious Runoff Depth=0.06"
Flow Length=2,415' Tc=55 min CN=45 Runoff=0.54 cfs 0.354 af

Subcatchment 3S: ExWS C-1 Runoff Area=26.20 ac 0.80% Impervious Runoff Depth=0.18"
Flow Length=300' Tc=13 min CN=51 Runoff=1.20 cfs 0.383 af

Subcatchment 4S: ExWS D-1 Runoff Area=27.16 ac 2.28% Impervious Runoff Depth=0.13"
Flow Length=550' Tc=16 min CN=49 Runoff=0.52 cfs 0.293 af

Subcatchment 5S: ExWS E-1 Runoff Area=6.71 ac 0.00% Impervious Runoff Depth=0.01"
Flow Length=225' Tc=10 min CN=40 Runoff=0.01 cfs 0.004 af

Subcatchment 8S: ExWS F-1 Runoff Area=37.74 ac 0.00% Impervious Runoff Depth=0.31"
Flow Length=650' Tc=33 min CN=56 Runoff=4.01 cfs 0.991 af

Subcatchment 9S: ExWS G-1a Runoff Area=5.21 ac 2.50% Impervious Runoff Depth=0.49"
Flow Length=130' Tc=28 min CN=61 Runoff=1.23 cfs 0.213 af

Subcatchment 10S: ExWS G-1b Runoff Area=9.11 ac 0.00% Impervious Runoff Depth=0.38"
Flow Length=955' Tc=38 min CN=58 Runoff=1.26 cfs 0.289 af

Pond 6P: Pond E-1 Peak Elev=130.21' Storage=153 cf Inflow=0.01 cfs 0.004 af
Outflow=0.00 cfs 0.000 af

Link 7L: Design Point E Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 11L: Design Point G Inflow=2.36 cfs 0.502 af
Primary=2.36 cfs 0.502 af

Total Runoff Area = 198.45 ac Runoff Volume = 2.617 af Average Runoff Depth = 0.16"
97.91% Pervious = 194.30 ac 2.09% Impervious = 4.15 ac

Summary for Subcatchment 1S: ExWS A-1

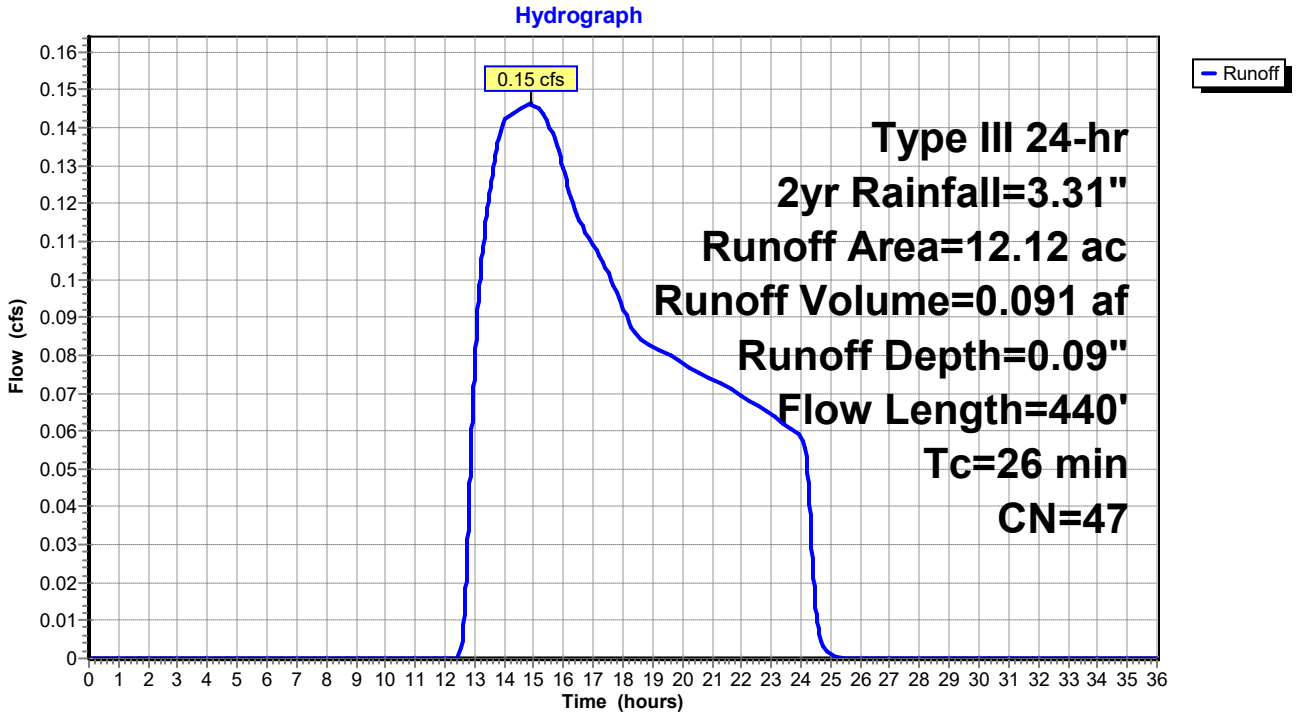
Runoff = 0.15 cfs @ 14.88 hrs, Volume= 0.091 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
0.49	98	Paved parking, HSG A
9.24	39	>75% Grass cover, Good, HSG A
0.14	61	>75% Grass cover, Good, HSG B
1.29	74	>75% Grass cover, Good, HSG C
0.23	30	Woods, Good, HSG A
0.73	70	Woods, Good, HSG C
12.12	47	Weighted Average
11.63		95.96% Pervious Area
0.49		4.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20	100	0.0080	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
2	225	0.0151	1.98		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4	115	0.0009	0.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
26	440	Total			

Subcatchment 1S: ExWS A-1



Summary for Subcatchment 2S: ExWS B-1

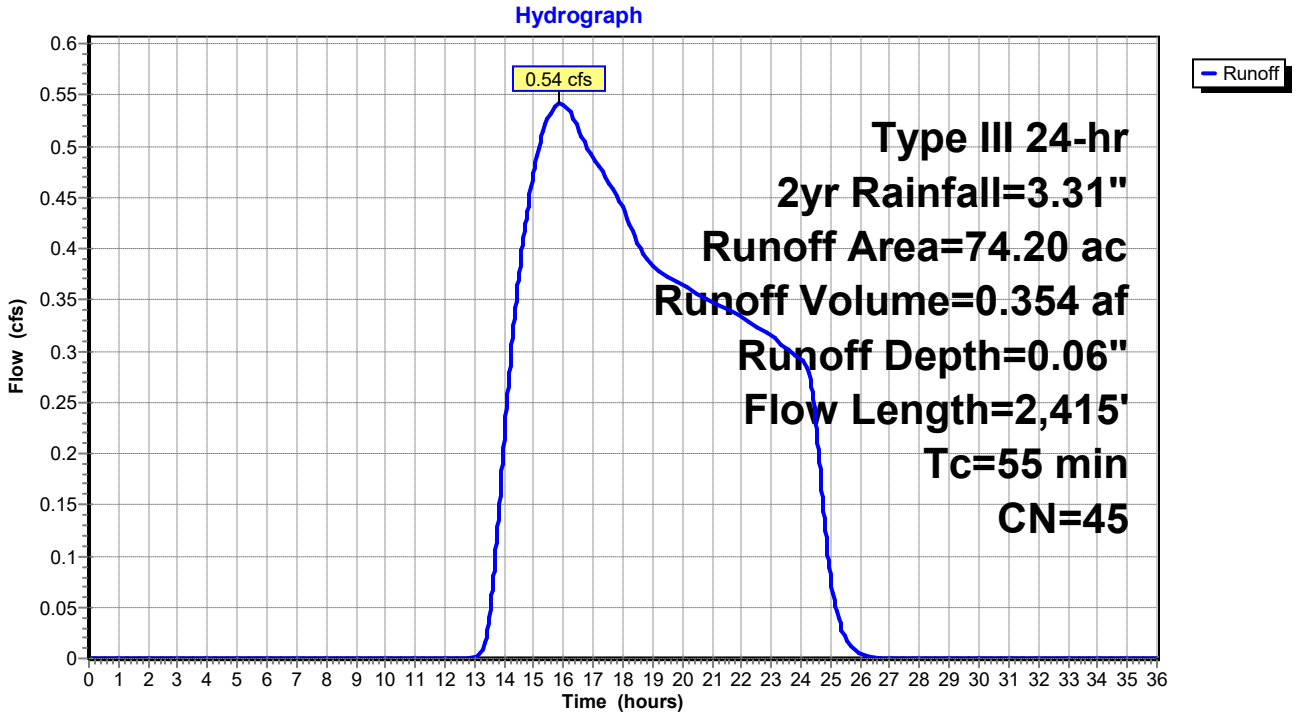
Runoff = 0.54 cfs @ 15.83 hrs, Volume= 0.354 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
2.70	98	Paved parking, HSG A
54.03	39	>75% Grass cover, Good, HSG A
3.93	61	>75% Grass cover, Good, HSG B
3.85	74	>75% Grass cover, Good, HSG C
7.05	30	Woods, Good, HSG A
0.23	70	Woods, Good, HSG C
2.41	77	Woods, Good, HSG D
74.20	45	Weighted Average
71.50		96.36% Pervious Area
2.70		3.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	100	0.0100	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
6	475	0.0061	1.26		**Shallow Concentrated Flow,** Kv= 16.1 fps
15	740	0.0027	0.84		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15	1,100	0.0057	1.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
55	2,415	Total			

Subcatchment 2S: ExWS B-1



Summary for Subcatchment 3S: ExWS C-1

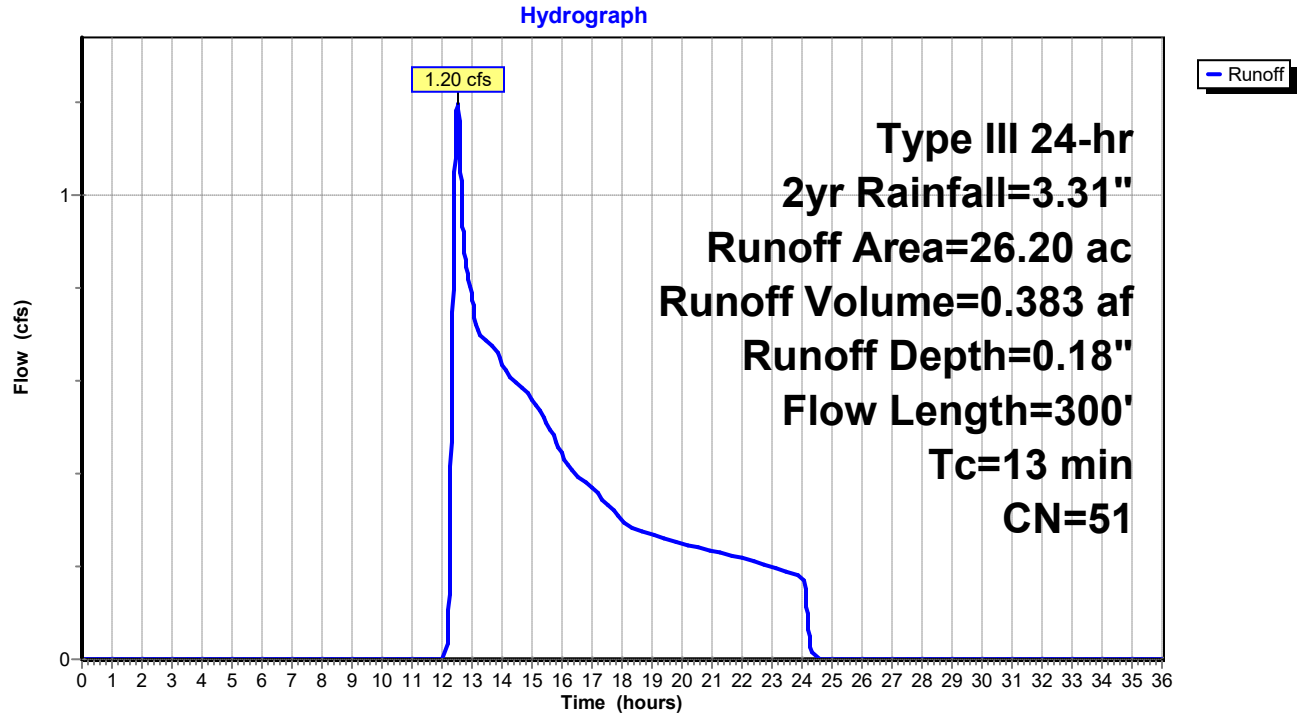
Runoff = 1.20 cfs @ 12.52 hrs, Volume= 0.383 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
0.21	98	Paved parking, HSG A
2.89	85	Gravel roads, HSG B
11.51	39	>75% Grass cover, Good, HSG A
2.50	61	>75% Grass cover, Good, HSG B
2.62	30	Woods, Good, HSG A
4.44	55	Woods, Good, HSG B
2.03	77	Woods, Good, HSG D
26.20	51	Weighted Average
25.99		99.20% Pervious Area
0.21		0.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0280	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	200	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
13	300	Total			

Subcatchment 3S: ExWS C-1



Summary for Subcatchment 4S: ExWS D-1

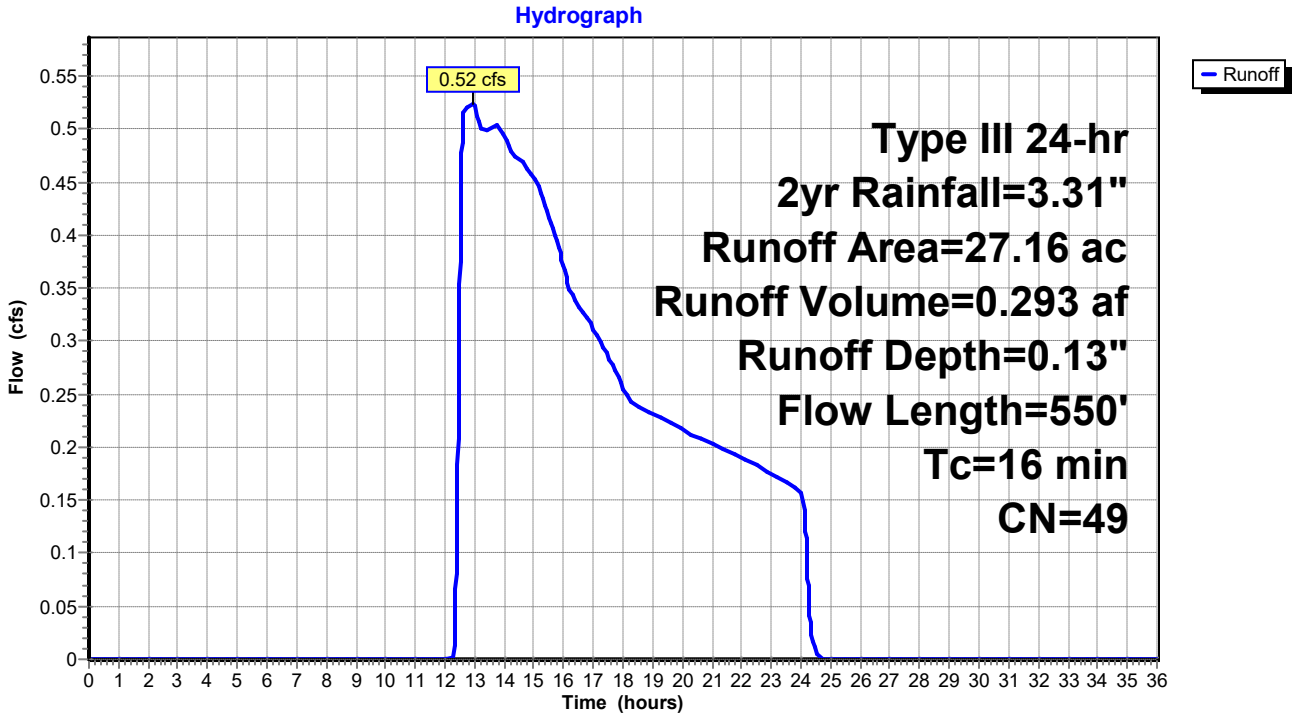
Runoff = 0.52 cfs @ 12.96 hrs, Volume= 0.293 af, Depth= 0.13"
Routed to nonexistent node 6L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
0.62	98	Paved parking, HSG A
15.13	39	>75% Grass cover, Good, HSG A
11.15	61	>75% Grass cover, Good, HSG B
0.26	30	Woods, Good, HSG A
27.16	49	Weighted Average
26.54		97.72% Pervious Area
0.62		2.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0300	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	165	0.0242	2.50		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	285	0.0077	1.41		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16	550	Total			

Subcatchment 4S: ExWS D-1



Summary for Subcatchment 5S: ExWS E-1

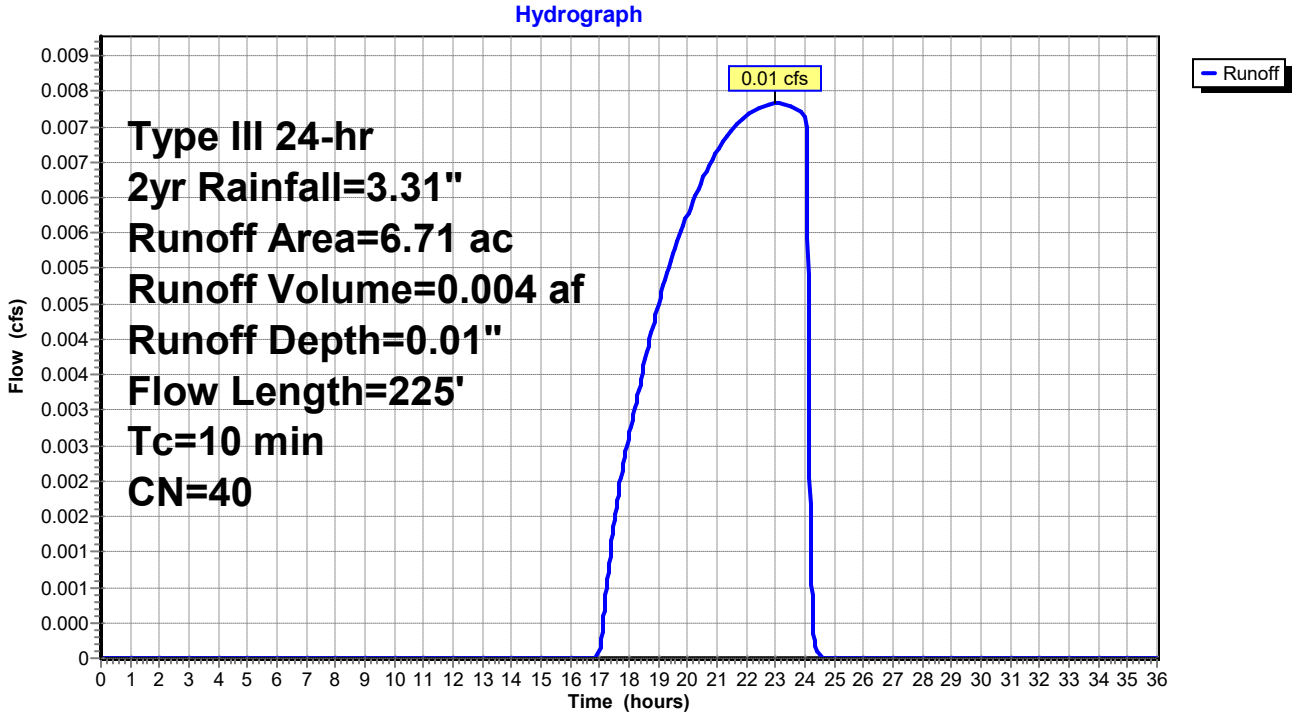
Runoff = 0.01 cfs @ 22.99 hrs, Volume= 0.004 af, Depth= 0.01"
Routed to Pond 6P : Pond E-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
2.79	39	>75% Grass cover, Good, HSG A
2.99	30	Woods, Good, HSG A
0.93	77	Woods, Good, HSG D
6.71	40	Weighted Average
6.71		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	100	0.0650	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	25	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	100	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10	225	Total			

Subcatchment 5S: ExWS E-1



Summary for Subcatchment 8S: ExWS F-1

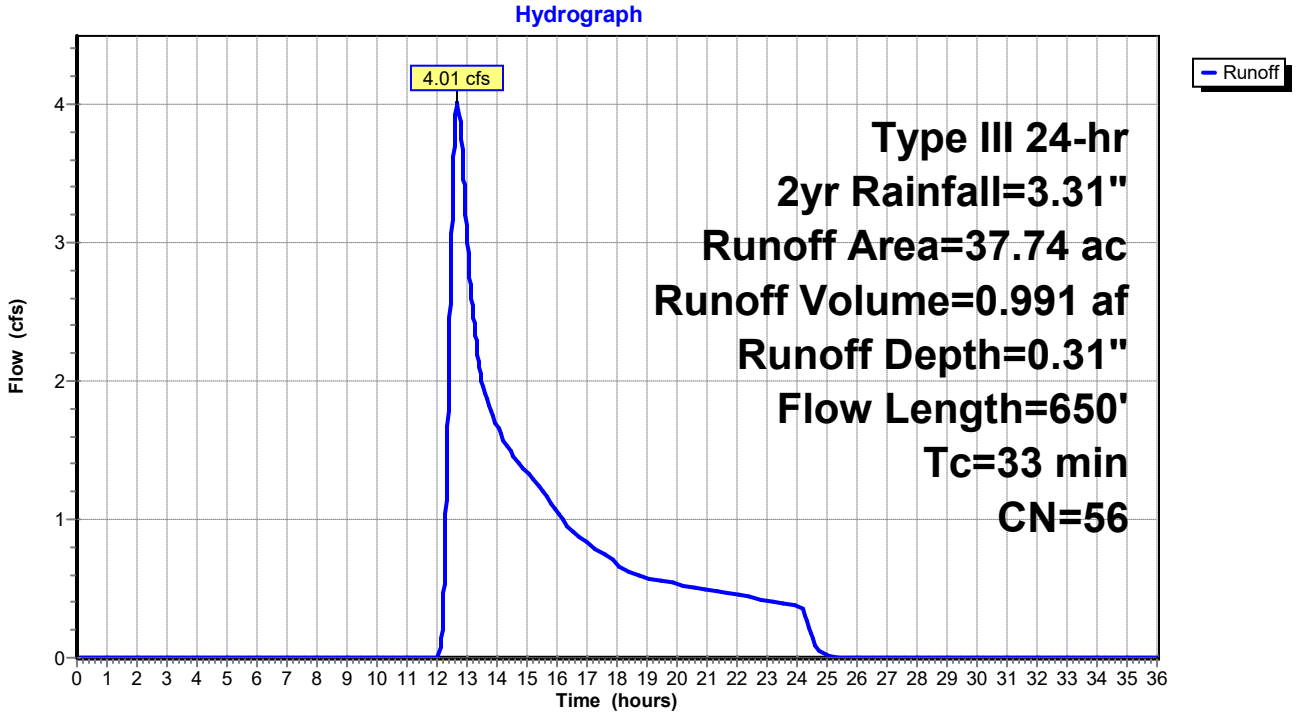
Runoff = 4.01 cfs @ 12.69 hrs, Volume= 0.991 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
0.91	76	Gravel roads, HSG A
1.37	85	Gravel roads, HSG B
0.79	39	>75% Grass cover, Good, HSG A
4.64	61	>75% Grass cover, Good, HSG B
3.36	30	Woods, Good, HSG A
24.66	55	Woods, Good, HSG B
2.01	77	Woods, Good, HSG D
37.74	56	Weighted Average
37.74		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30	100	0.0340	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	550	0.0396	3.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
33	650	Total			

Subcatchment 8S: ExWS F-1



Summary for Subcatchment 9S: ExWS G-1a

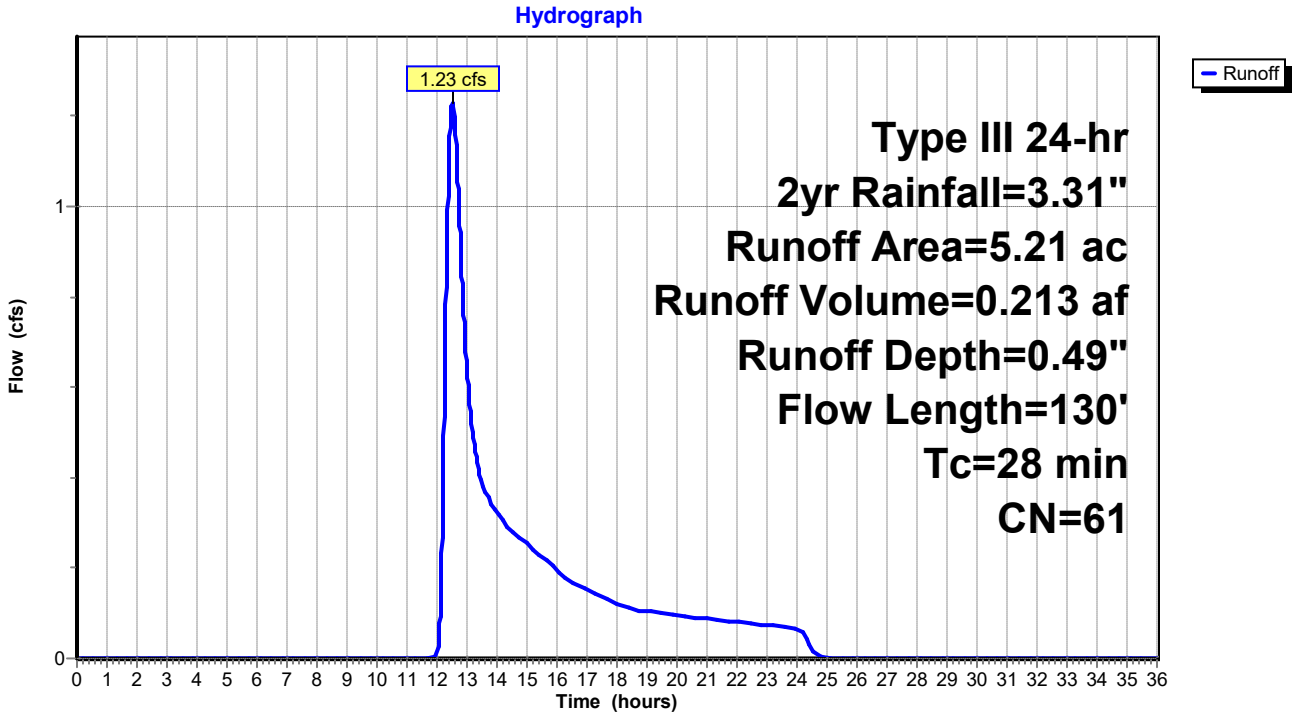
Runoff = 1.23 cfs @ 12.53 hrs, Volume= 0.213 af, Depth= 0.49"
Routed to Link 11L : Design Point G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
0.13	98	Paved parking, HSG A
0.25	61	>75% Grass cover, Good, HSG B
3.77	55	Woods, Good, HSG B
1.06	77	Woods, Good, HSG D
5.21	61	Weighted Average
5.08		97.50% Pervious Area
0.13		2.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15	38	0.0263	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
8	30	0.0733	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
5	32	0.3688	0.12		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
0	30	0.4000	10.18		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
28	130	Total			

Subcatchment 9S: ExWS G-1a



Summary for Subcatchment 10S: ExWS G-1b

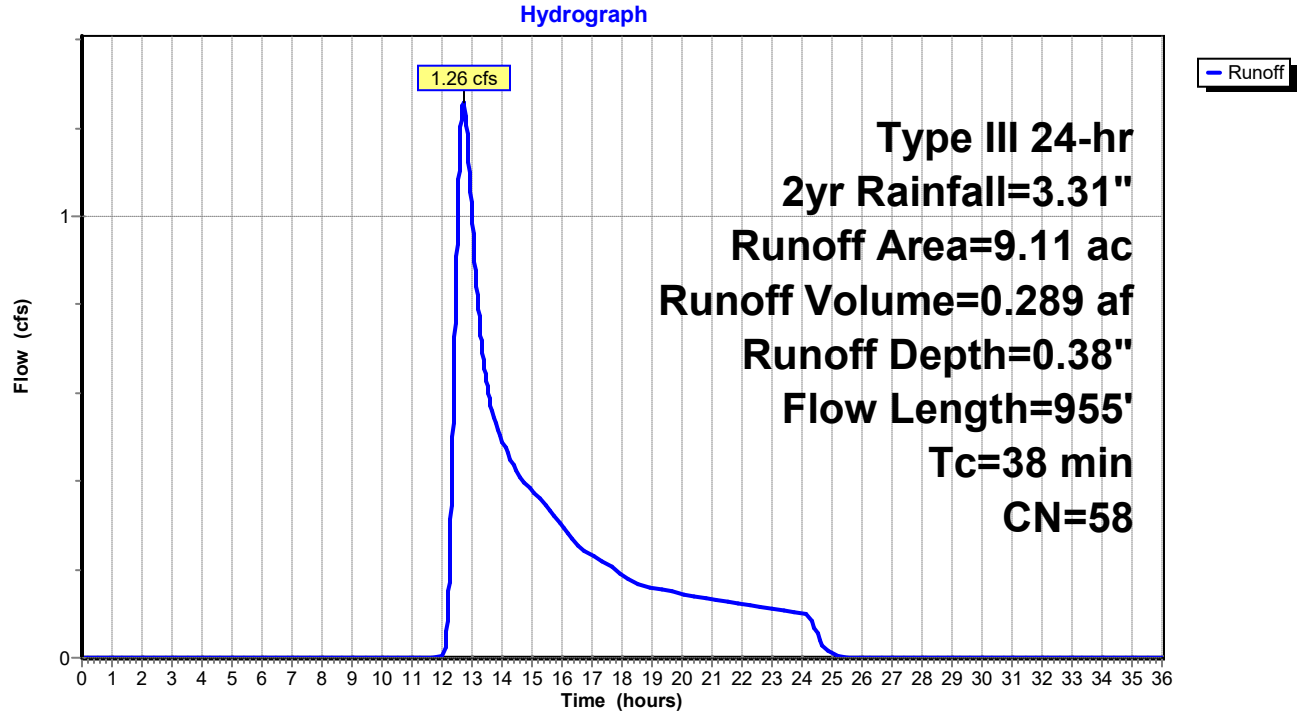
Runoff = 1.26 cfs @ 12.71 hrs, Volume= 0.289 af, Depth= 0.38"
Routed to Link 11L : Design Point G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
4.41	61	>75% Grass cover, Good, HSG B
4.70	55	Woods, Good, HSG B
9.11	58	Weighted Average
9.11		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31	100	0.0300	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	355	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	185	0.0950	4.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	315	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38	955	Total			

Subcatchment 10S: ExWS G-1b



Summary for Pond 6P: Pond E-1

Inflow Area = 6.71 ac, 0.00% Impervious, Inflow Depth = 0.01" for 2yr event
Inflow = 0.01 cfs @ 22.99 hrs, Volume= 0.004 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 7L : Design Point E

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 130.21' @ 24.57 hrs Surf.Area= 15,592 sf Storage= 153 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

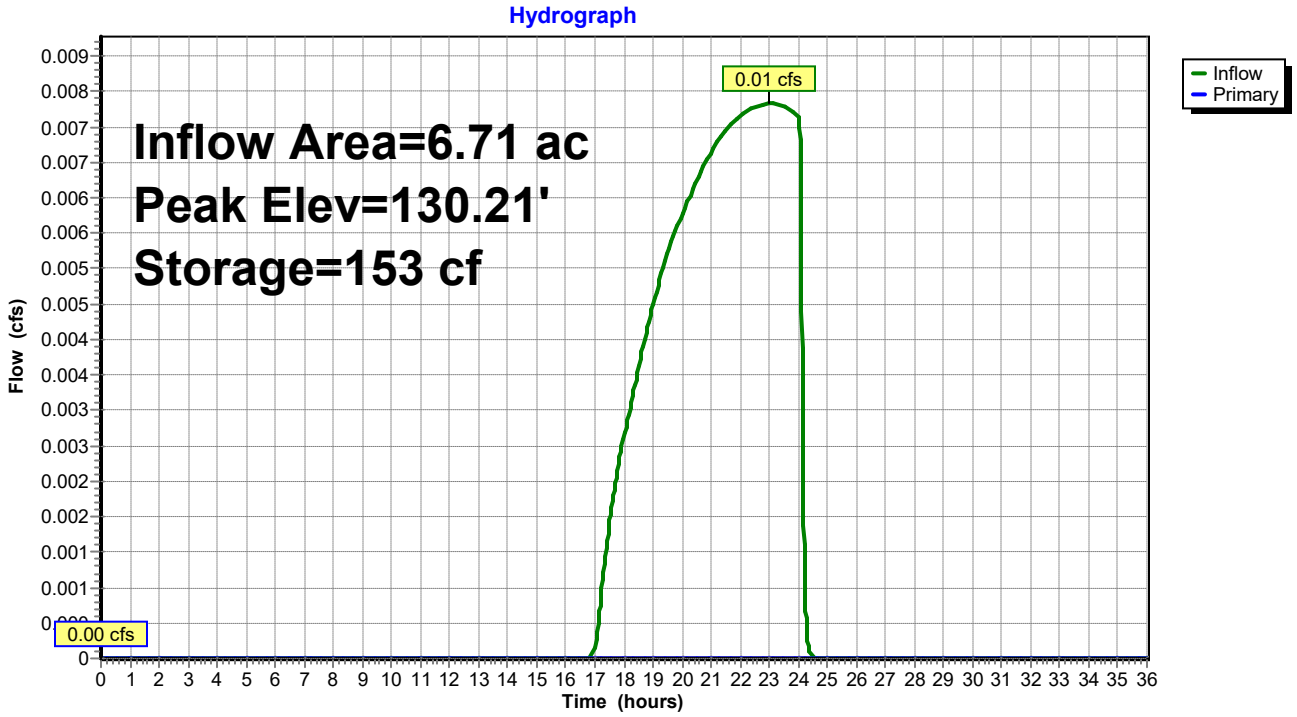
Volume	Invert	Avail.Storage	Storage Description
#1	130.20'	504,295 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.20	15,572	0	0
131.00	17,190	13,105	13,105
132.00	33,435	25,313	38,417
133.00	47,240	40,338	78,755
134.00	62,274	54,757	133,512
135.00	78,197	70,236	203,747
136.00	92,539	85,368	289,115
137.00	106,598	99,569	388,684
138.00	124,625	115,612	504,295

Device	Routing	Invert	Outlet Devices
#1	Primary	137.30'	**35.0' long + 3.0 '/' SideZ x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.20' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Pond E-1

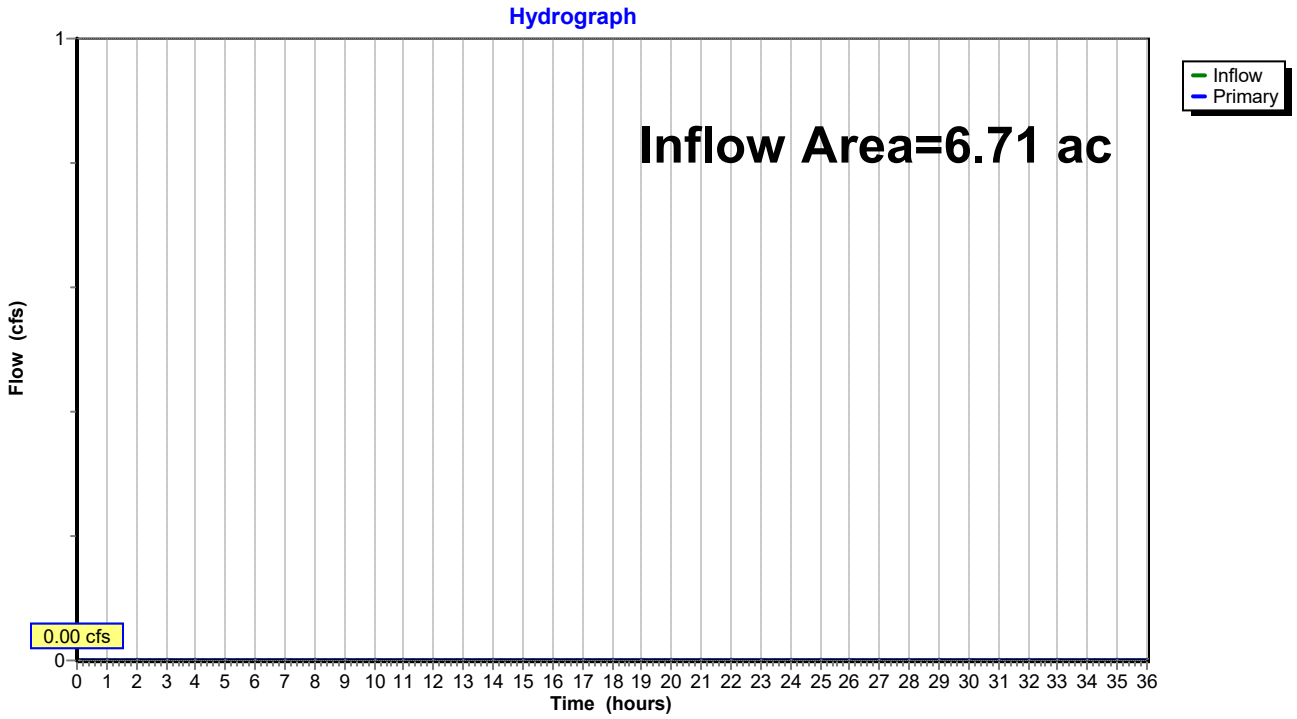


Summary for Link 7L: Design Point E

Inflow Area = 6.71 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 7L: Design Point E

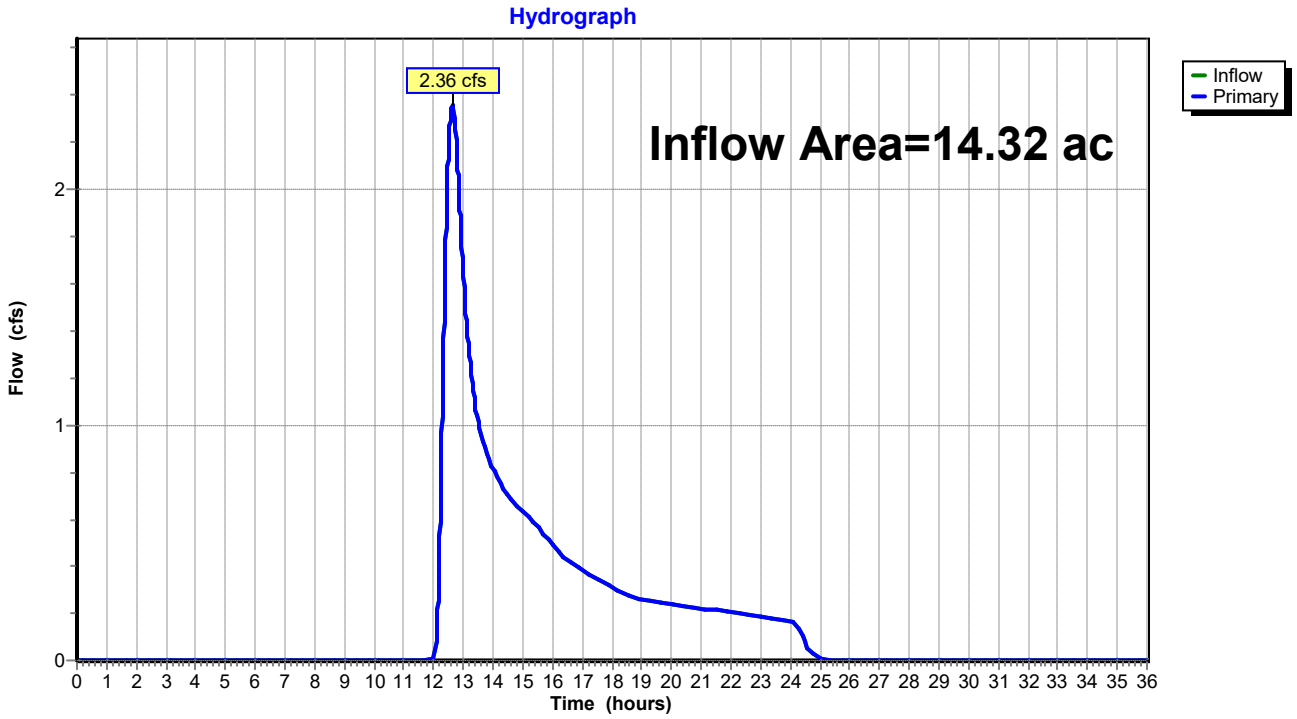


Summary for Link 11L: Design Point G

Inflow Area = 14.32 ac, 0.91% Impervious, Inflow Depth = 0.42" for 2yr event
Inflow = 2.36 cfs @ 12.63 hrs, Volume= 0.502 af
Primary = 2.36 cfs @ 12.63 hrs, Volume= 0.502 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 11L: Design Point G



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: ExWS A-1 Runoff Area=12.12 ac 4.04% Impervious Runoff Depth=0.59"
Flow Length=440' Tc=26 min CN=47 Runoff=3.06 cfs 0.601 af

Subcatchment 2S: ExWS B-1 Runoff Area=74.20 ac 3.64% Impervious Runoff Depth=0.49"
Flow Length=2,415' Tc=55 min CN=45 Runoff=9.70 cfs 3.052 af

Subcatchment 3S: ExWS C-1 Runoff Area=26.20 ac 0.80% Impervious Runoff Depth=0.82"
Flow Length=300' Tc=13 min CN=51 Runoff=13.81 cfs 1.782 af

Subcatchment 4S: ExWS D-1 Runoff Area=27.16 ac 2.28% Impervious Runoff Depth=0.70"
Flow Length=550' Tc=16 min CN=49 Runoff=10.38 cfs 1.590 af

Subcatchment 5S: ExWS E-1 Runoff Area=6.71 ac 0.00% Impervious Runoff Depth=0.27"
Flow Length=225' Tc=10 min CN=40 Runoff=0.50 cfs 0.152 af

Subcatchment 8S: ExWS F-1 Runoff Area=37.74 ac 0.00% Impervious Runoff Depth=1.13"
Flow Length=650' Tc=33 min CN=56 Runoff=22.81 cfs 3.539 af

Subcatchment 9S: ExWS G-1a Runoff Area=5.21 ac 2.50% Impervious Runoff Depth=1.47"
Flow Length=130' Tc=28 min CN=61 Runoff=4.78 cfs 0.637 af

Subcatchment 10S: ExWS G-1b Runoff Area=9.11 ac 0.00% Impervious Runoff Depth=1.26"
Flow Length=955' Tc=38 min CN=58 Runoff=5.97 cfs 0.955 af

Pond 6P: Pond E-1 Peak Elev=130.61' Storage=6,622 cf Inflow=0.50 cfs 0.152 af
Outflow=0.00 cfs 0.000 af

Link 7L: Design Point E Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 11L: Design Point G Inflow=10.35 cfs 1.591 af
Primary=10.35 cfs 1.591 af

Total Runoff Area = 198.45 ac Runoff Volume = 12.308 af Average Runoff Depth = 0.74"
97.91% Pervious = 194.30 ac 2.09% Impervious = 4.15 ac

Summary for Subcatchment 1S: ExWS A-1

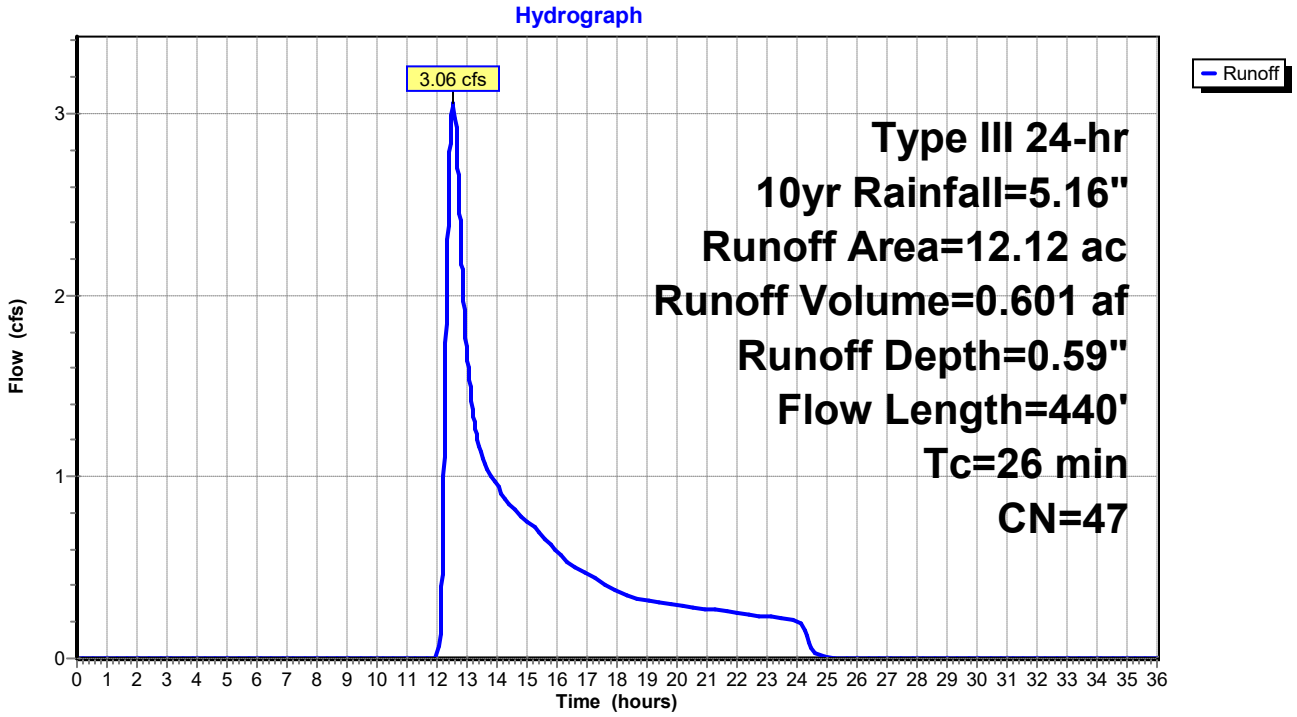
Runoff = 3.06 cfs @ 12.54 hrs, Volume= 0.601 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
0.49	98	Paved parking, HSG A
9.24	39	>75% Grass cover, Good, HSG A
0.14	61	>75% Grass cover, Good, HSG B
1.29	74	>75% Grass cover, Good, HSG C
0.23	30	Woods, Good, HSG A
0.73	70	Woods, Good, HSG C
12.12	47	Weighted Average
11.63		95.96% Pervious Area
0.49		4.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20	100	0.0080	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
2	225	0.0151	1.98		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4	115	0.0009	0.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
26	440	Total			

Subcatchment 1S: ExWS A-1



Summary for Subcatchment 2S: ExWS B-1

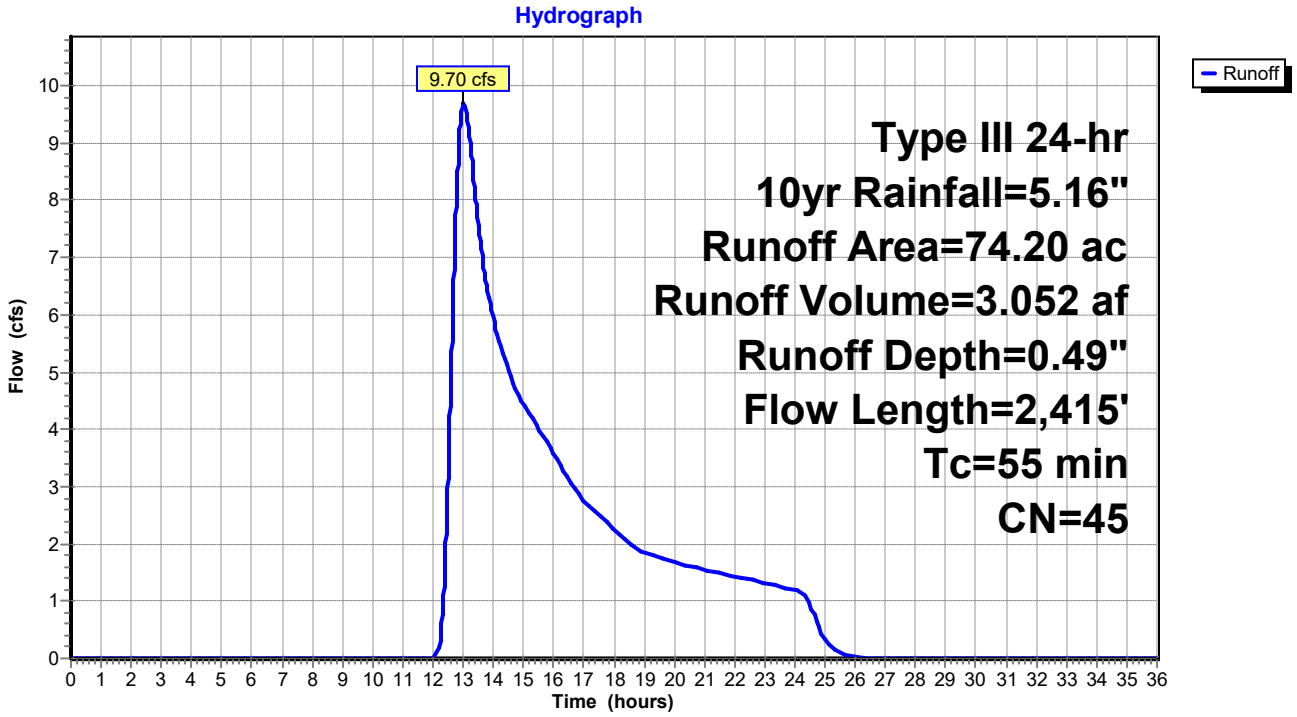
Runoff = 9.70 cfs @ 13.02 hrs, Volume= 3.052 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
2.70	98	Paved parking, HSG A
54.03	39	>75% Grass cover, Good, HSG A
3.93	61	>75% Grass cover, Good, HSG B
3.85	74	>75% Grass cover, Good, HSG C
7.05	30	Woods, Good, HSG A
0.23	70	Woods, Good, HSG C
2.41	77	Woods, Good, HSG D
74.20	45	Weighted Average
71.50		96.36% Pervious Area
2.70		3.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	100	0.0100	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
6	475	0.0061	1.26		**Shallow Concentrated Flow,** Kv= 16.1 fps
15	740	0.0027	0.84		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15	1,100	0.0057	1.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
55	2,415	Total			

Subcatchment 2S: ExWS B-1



Summary for Subcatchment 3S: ExWS C-1

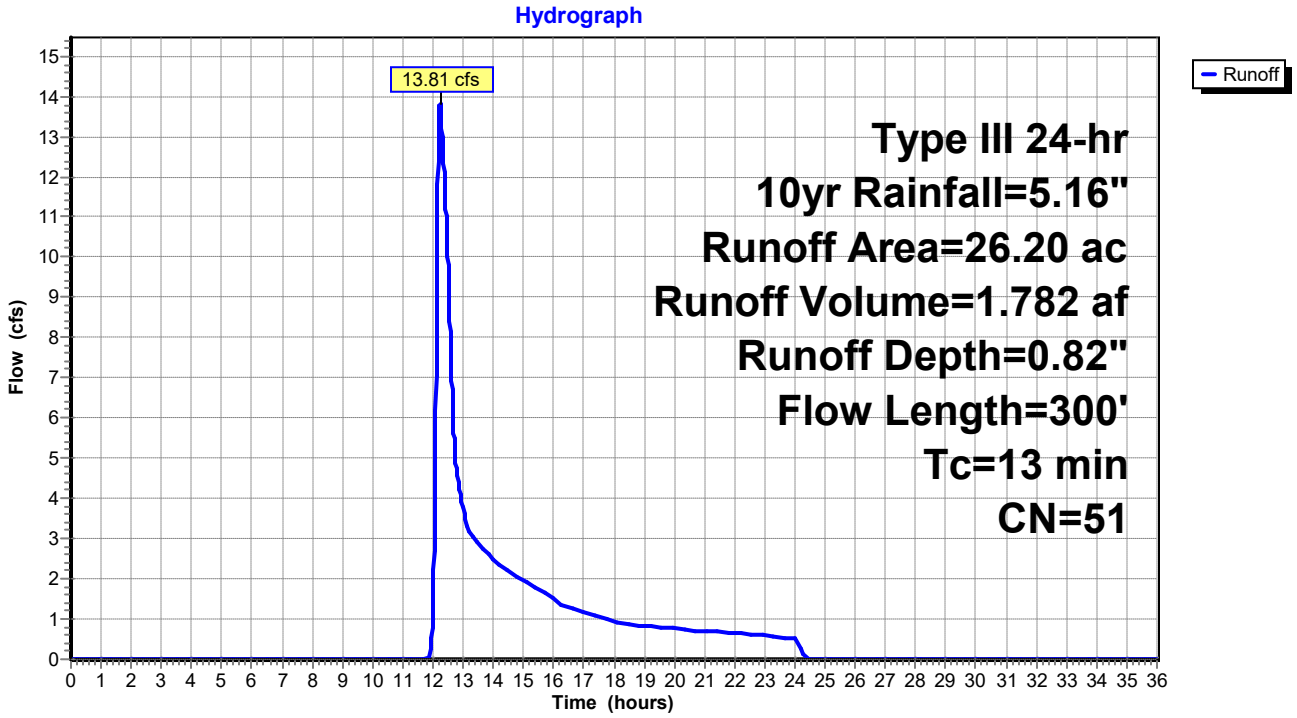
Runoff = 13.81 cfs @ 12.23 hrs, Volume= 1.782 af, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
0.21	98	Paved parking, HSG A
2.89	85	Gravel roads, HSG B
11.51	39	>75% Grass cover, Good, HSG A
2.50	61	>75% Grass cover, Good, HSG B
2.62	30	Woods, Good, HSG A
4.44	55	Woods, Good, HSG B
2.03	77	Woods, Good, HSG D
26.20	51	Weighted Average
25.99		99.20% Pervious Area
0.21		0.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0280	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	200	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
13	300	Total			

Subcatchment 3S: ExWS C-1



Summary for Subcatchment 4S: ExWS D-1

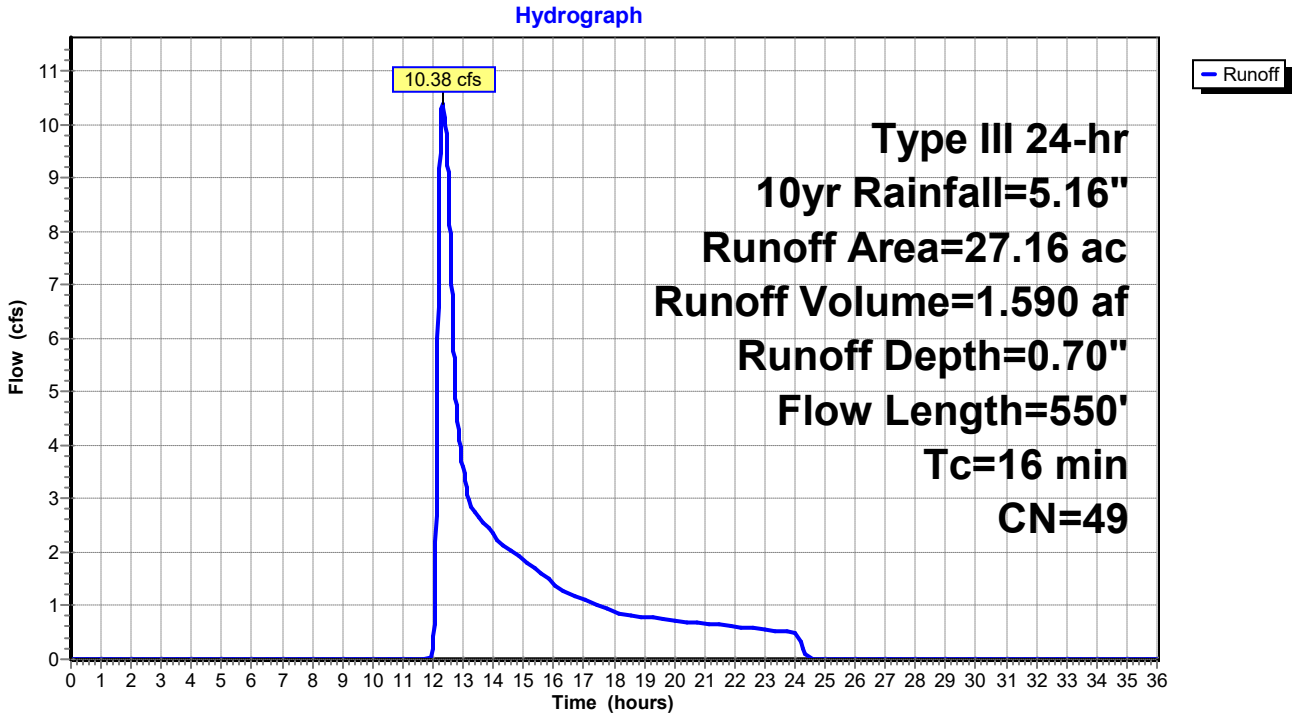
Runoff = 10.38 cfs @ 12.32 hrs, Volume= 1.590 af, Depth= 0.70"
Routed to nonexistent node 6L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
0.62	98	Paved parking, HSG A
15.13	39	>75% Grass cover, Good, HSG A
11.15	61	>75% Grass cover, Good, HSG B
0.26	30	Woods, Good, HSG A
27.16	49	Weighted Average
26.54		97.72% Pervious Area
0.62		2.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0300	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	165	0.0242	2.50		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	285	0.0077	1.41		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16	550	Total			

Subcatchment 4S: ExWS D-1



Summary for Subcatchment 5S: ExWS E-1

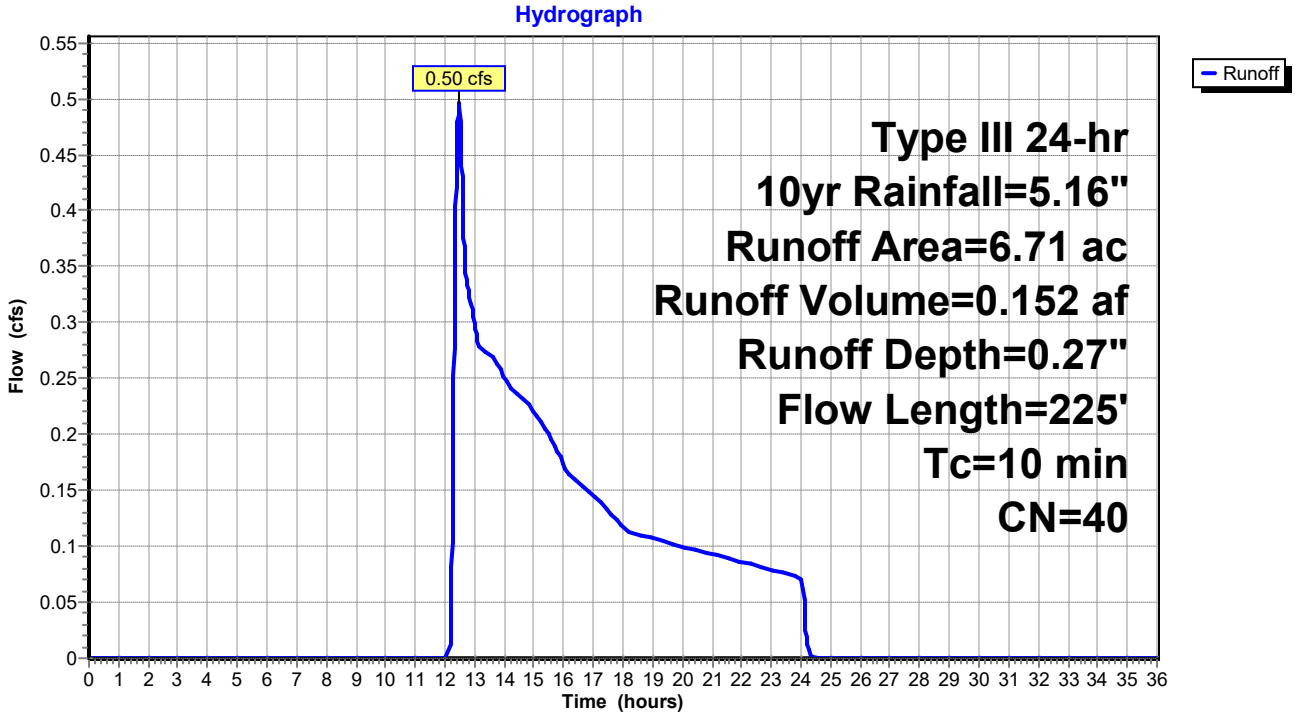
Runoff = 0.50 cfs @ 12.48 hrs, Volume= 0.152 af, Depth= 0.27"
Routed to Pond 6P : Pond E-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
2.79	39	>75% Grass cover, Good, HSG A
2.99	30	Woods, Good, HSG A
0.93	77	Woods, Good, HSG D
6.71	40	Weighted Average
6.71		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	100	0.0650	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	25	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	100	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10	225	Total			

Subcatchment 5S: ExWS E-1



Summary for Subcatchment 8S: ExWS F-1

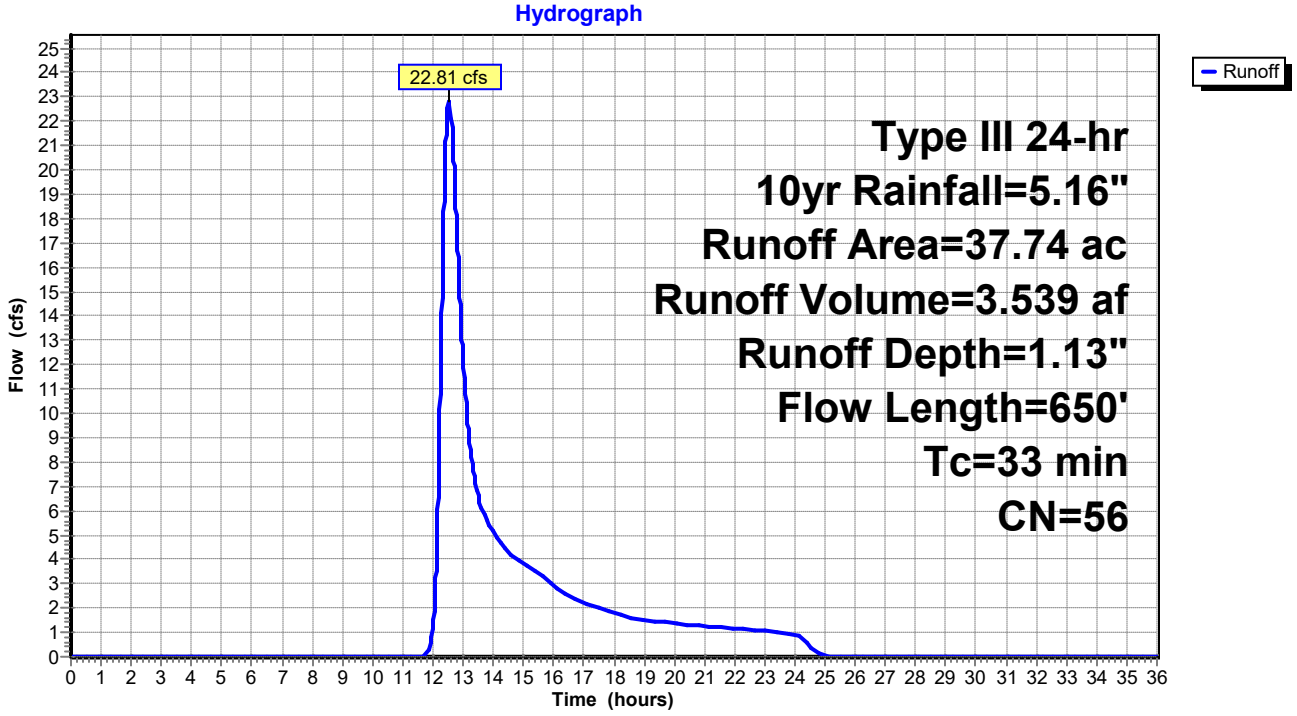
Runoff = 22.81 cfs @ 12.54 hrs, Volume= 3.539 af, Depth= 1.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
0.91	76	Gravel roads, HSG A
1.37	85	Gravel roads, HSG B
0.79	39	>75% Grass cover, Good, HSG A
4.64	61	>75% Grass cover, Good, HSG B
3.36	30	Woods, Good, HSG A
24.66	55	Woods, Good, HSG B
2.01	77	Woods, Good, HSG D
37.74	56	Weighted Average
37.74		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30	100	0.0340	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	550	0.0396	3.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
33	650	Total			

Subcatchment 8S: ExWS F-1



Summary for Subcatchment 9S: ExWS G-1a

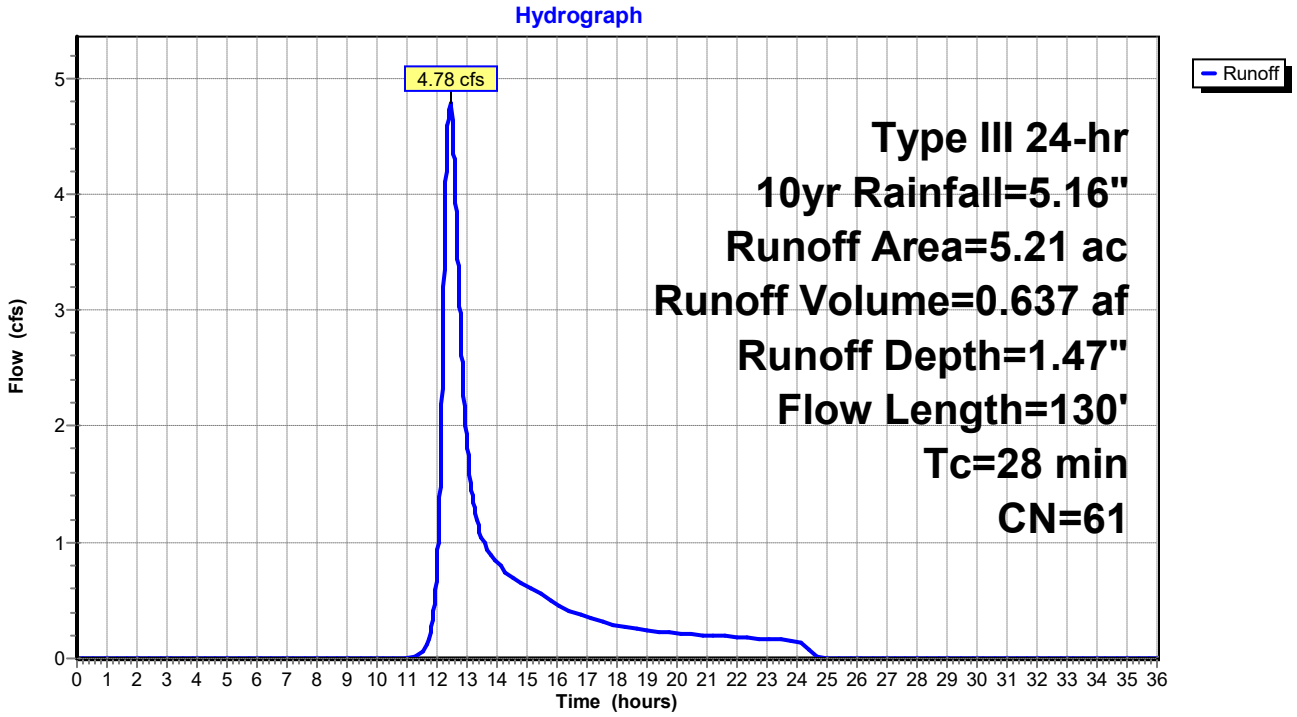
Runoff = 4.78 cfs @ 12.44 hrs, Volume= 0.637 af, Depth= 1.47"
Routed to Link 11L : Design Point G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
0.13	98	Paved parking, HSG A
0.25	61	>75% Grass cover, Good, HSG B
3.77	55	Woods, Good, HSG B
1.06	77	Woods, Good, HSG D
5.21	61	Weighted Average
5.08		97.50% Pervious Area
0.13		2.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15	38	0.0263	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
8	30	0.0733	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
5	32	0.3688	0.12		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
0	30	0.4000	10.18		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
28	130	Total			

Subcatchment 9S: ExWS G-1a



Summary for Subcatchment 10S: ExWS G-1b

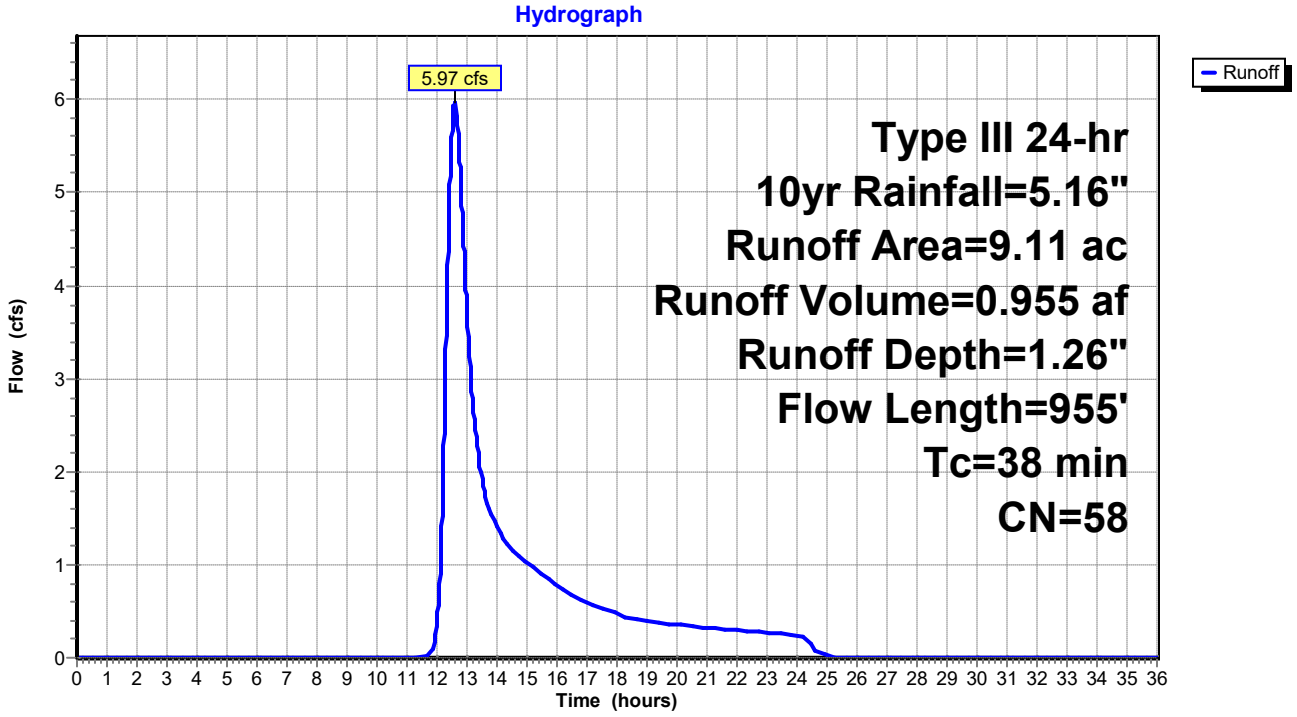
Runoff = 5.97 cfs @ 12.62 hrs, Volume= 0.955 af, Depth= 1.26"
Routed to Link 11L : Design Point G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
4.41	61	>75% Grass cover, Good, HSG B
4.70	55	Woods, Good, HSG B
9.11	58	Weighted Average
9.11		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31	100	0.0300	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	355	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	185	0.0950	4.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	315	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38	955	Total			

Subcatchment 10S: ExWS G-1b



Summary for Pond 6P: Pond E-1

Inflow Area = 6.71 ac, 0.00% Impervious, Inflow Depth = 0.27" for 10yr event
Inflow = 0.50 cfs @ 12.48 hrs, Volume= 0.152 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 7L : Design Point E

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 130.61' @ 24.57 hrs Surf.Area= 16,410 sf Storage= 6,622 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

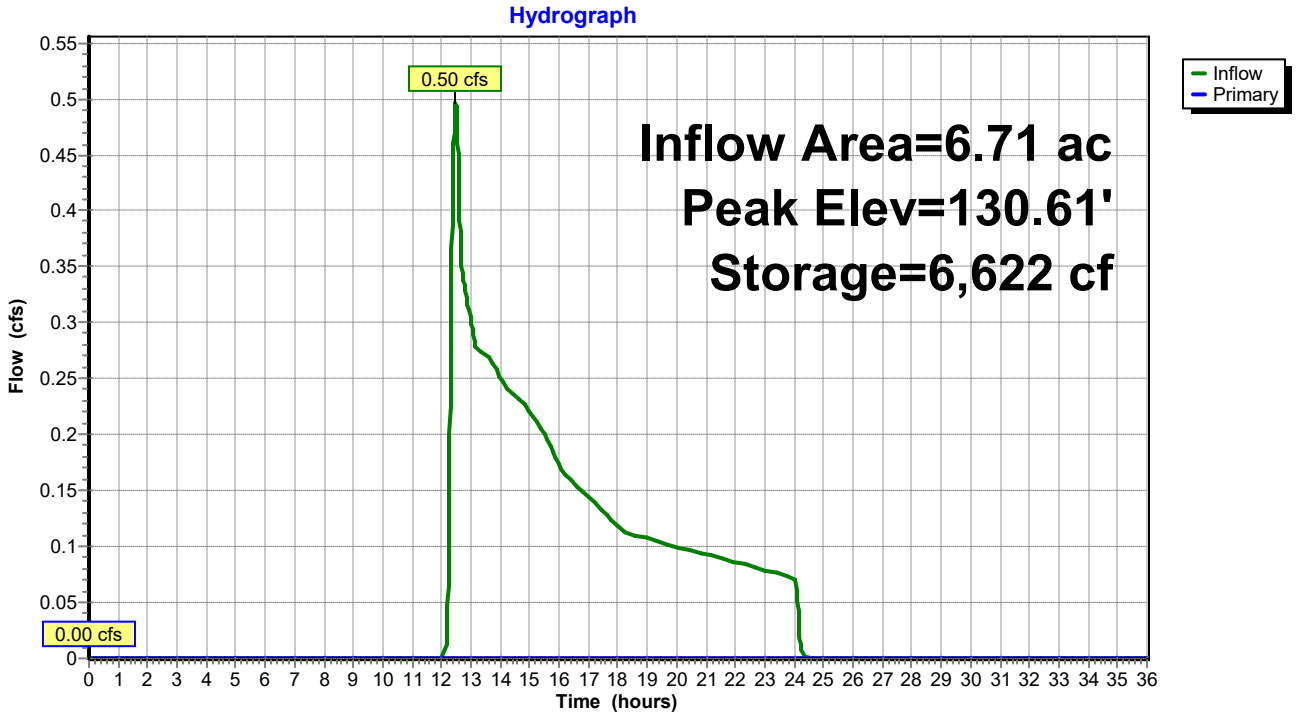
Volume	Invert	Avail.Storage	Storage Description
#1	130.20'	504,295 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.20	15,572	0	0
131.00	17,190	13,105	13,105
132.00	33,435	25,313	38,417
133.00	47,240	40,338	78,755
134.00	62,274	54,757	133,512
135.00	78,197	70,236	203,747
136.00	92,539	85,368	289,115
137.00	106,598	99,569	388,684
138.00	124,625	115,612	504,295

Device	Routing	Invert	Outlet Devices
#1	Primary	137.30'	**35.0' long + 3.0 '/' SideZ x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.20' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Pond E-1

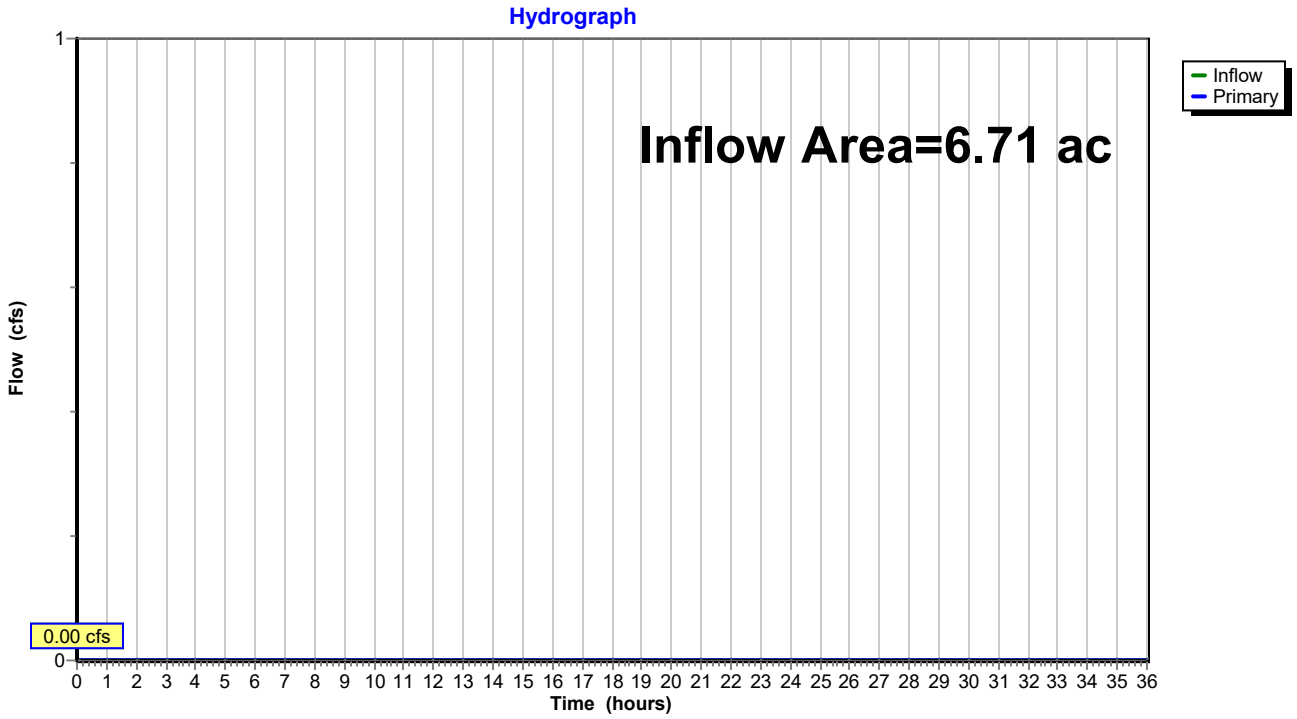


Summary for Link 7L: Design Point E

Inflow Area = 6.71 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 7L: Design Point E

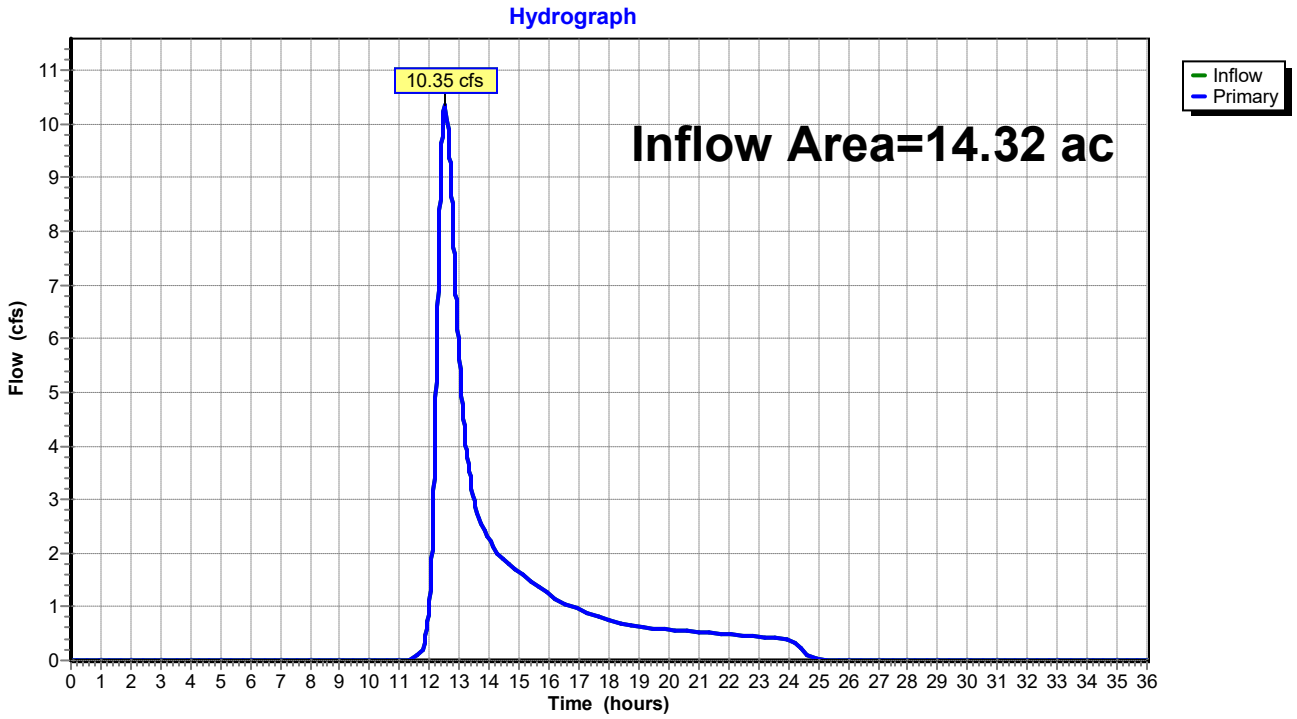


Summary for Link 11L: Design Point G

Inflow Area = 14.32 ac, 0.91% Impervious, Inflow Depth = 1.33" for 10yr event
Inflow = 10.35 cfs @ 12.54 hrs, Volume= 1.591 af
Primary = 10.35 cfs @ 12.54 hrs, Volume= 1.591 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 11L: Design Point G



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: ExWS A-1 Runoff Area=12.12 ac 4.04% Impervious Runoff Depth=1.07"
Flow Length=440' Tc=26 min CN=47 Runoff=6.93 cfs 1.083 af

Subcatchment 2S: ExWS B-1 Runoff Area=74.20 ac 3.64% Impervious Runoff Depth=0.93"
Flow Length=2,415' Tc=55 min CN=45 Runoff=23.64 cfs 5.743 af

Subcatchment 3S: ExWS C-1 Runoff Area=26.20 ac 0.80% Impervious Runoff Depth=1.38"
Flow Length=300' Tc=13 min CN=51 Runoff=27.97 cfs 3.004 af

Subcatchment 4S: ExWS D-1 Runoff Area=27.16 ac 2.28% Impervious Runoff Depth=1.22"
Flow Length=550' Tc=16 min CN=49 Runoff=22.50 cfs 2.765 af

Subcatchment 5S: ExWS E-1 Runoff Area=6.71 ac 0.00% Impervious Runoff Depth=0.60"
Flow Length=225' Tc=10 min CN=40 Runoff=1.83 cfs 0.335 af

Subcatchment 8S: ExWS F-1 Runoff Area=37.74 ac 0.00% Impervious Runoff Depth=1.78"
Flow Length=650' Tc=33 min CN=56 Runoff=39.15 cfs 5.607 af

Subcatchment 9S: ExWS G-1a Runoff Area=5.21 ac 2.50% Impervious Runoff Depth=2.22"
Flow Length=130' Tc=28 min CN=61 Runoff=7.57 cfs 0.962 af

Subcatchment 10S: ExWS G-1b Runoff Area=9.11 ac 0.00% Impervious Runoff Depth=1.95"
Flow Length=955' Tc=38 min CN=58 Runoff=9.87 cfs 1.483 af

Pond 6P: Pond E-1 Peak Elev=131.08' Storage=14,575 cf Inflow=1.83 cfs 0.335 af
Outflow=0.00 cfs 0.000 af

Link 7L: Design Point E Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 11L: Design Point G Inflow=16.81 cfs 2.445 af
Primary=16.81 cfs 2.445 af

Total Runoff Area = 198.45 ac Runoff Volume = 20.981 af Average Runoff Depth = 1.27"
97.91% Pervious = 194.30 ac 2.09% Impervious = 4.15 ac

Summary for Subcatchment 1S: ExWS A-1

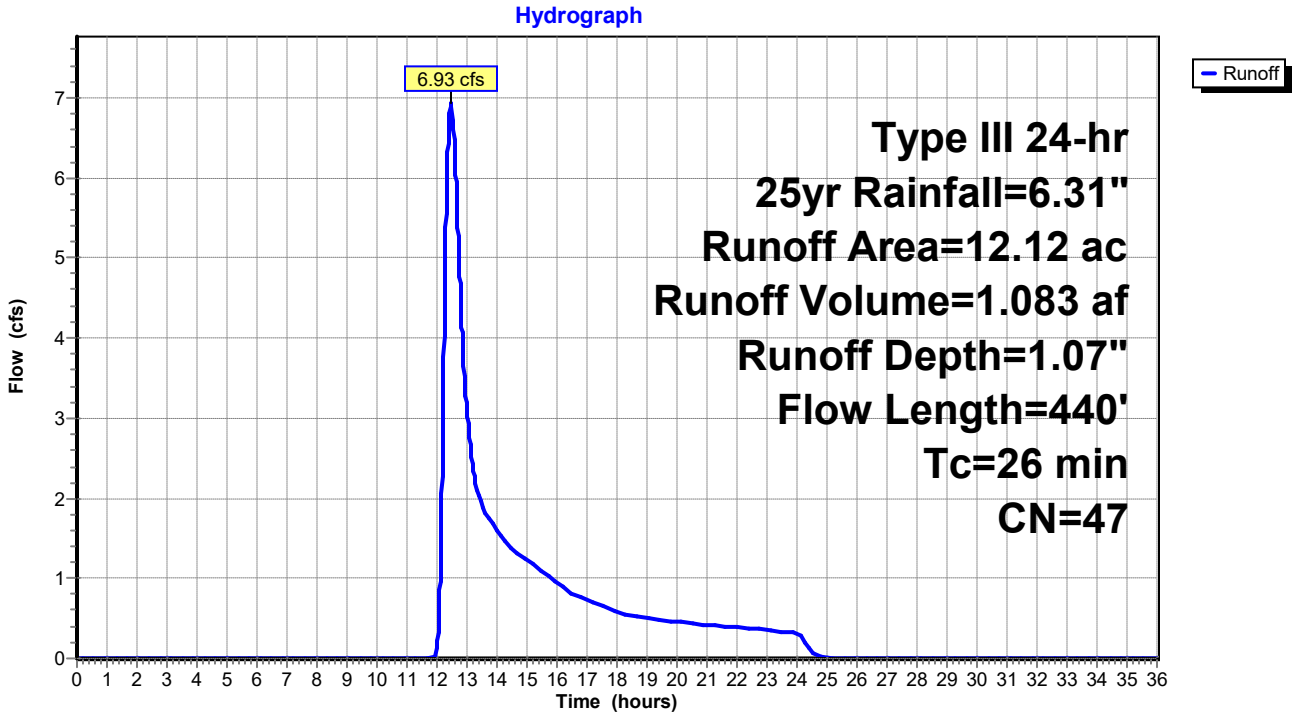
Runoff = 6.93 cfs @ 12.45 hrs, Volume= 1.083 af, Depth= 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
0.49	98	Paved parking, HSG A
9.24	39	>75% Grass cover, Good, HSG A
0.14	61	>75% Grass cover, Good, HSG B
1.29	74	>75% Grass cover, Good, HSG C
0.23	30	Woods, Good, HSG A
0.73	70	Woods, Good, HSG C
12.12	47	Weighted Average
11.63		95.96% Pervious Area
0.49		4.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20	100	0.0080	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
2	225	0.0151	1.98		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4	115	0.0009	0.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
26	440	Total			

Subcatchment 1S: ExWS A-1



Summary for Subcatchment 2S: ExWS B-1

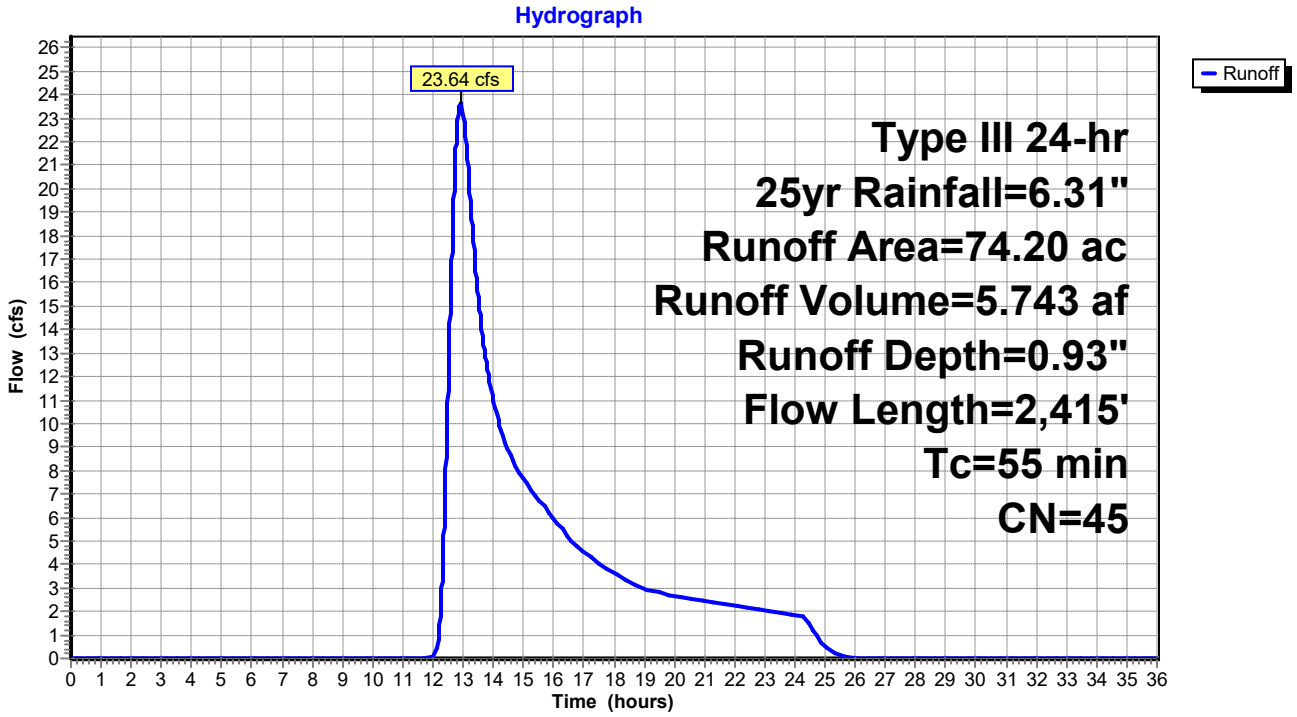
Runoff = 23.64 cfs @ 12.90 hrs, Volume= 5.743 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
2.70	98	Paved parking, HSG A
54.03	39	>75% Grass cover, Good, HSG A
3.93	61	>75% Grass cover, Good, HSG B
3.85	74	>75% Grass cover, Good, HSG C
7.05	30	Woods, Good, HSG A
0.23	70	Woods, Good, HSG C
2.41	77	Woods, Good, HSG D
74.20	45	Weighted Average
71.50		96.36% Pervious Area
2.70		3.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	100	0.0100	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
6	475	0.0061	1.26		**Shallow Concentrated Flow,** Kv= 16.1 fps
15	740	0.0027	0.84		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15	1,100	0.0057	1.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
55	2,415	Total			

Subcatchment 2S: ExWS B-1



Summary for Subcatchment 3S: ExWS C-1

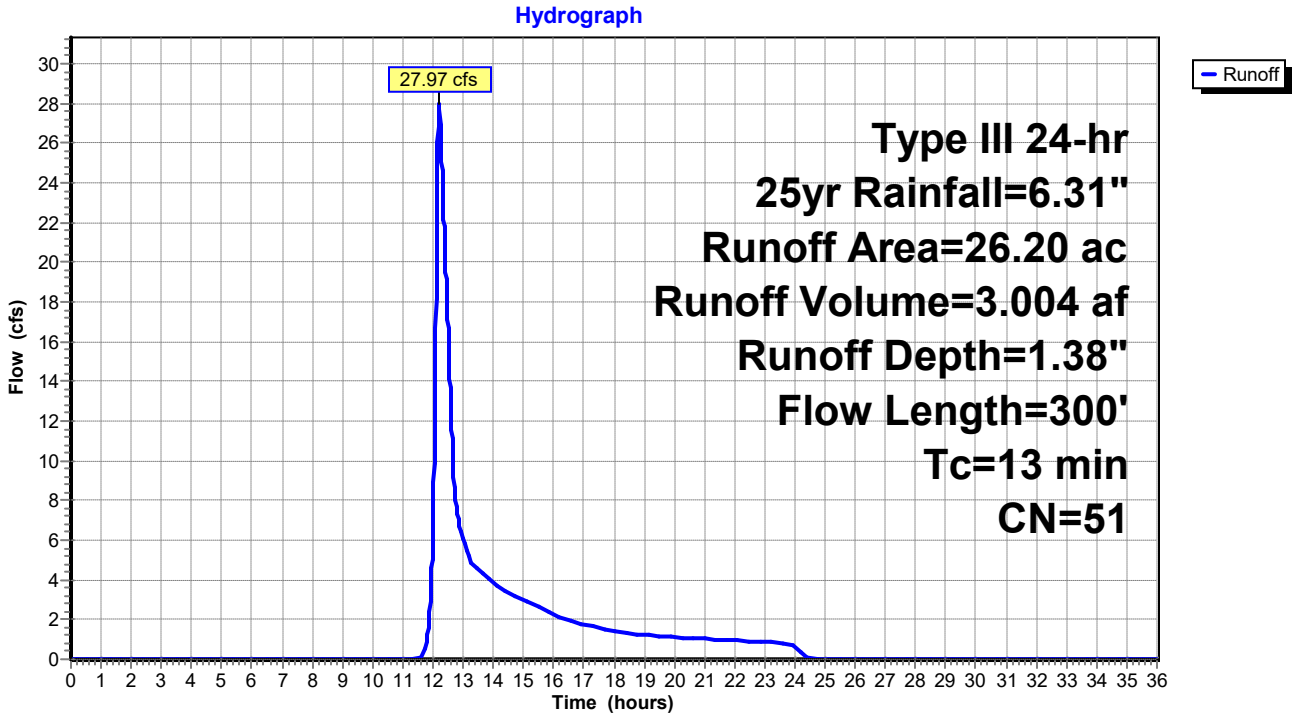
Runoff = 27.97 cfs @ 12.21 hrs, Volume= 3.004 af, Depth= 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
0.21	98	Paved parking, HSG A
2.89	85	Gravel roads, HSG B
11.51	39	>75% Grass cover, Good, HSG A
2.50	61	>75% Grass cover, Good, HSG B
2.62	30	Woods, Good, HSG A
4.44	55	Woods, Good, HSG B
2.03	77	Woods, Good, HSG D
26.20	51	Weighted Average
25.99		99.20% Pervious Area
0.21		0.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0280	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	200	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
13	300	Total			

Subcatchment 3S: ExWS C-1



Summary for Subcatchment 4S: ExWS D-1

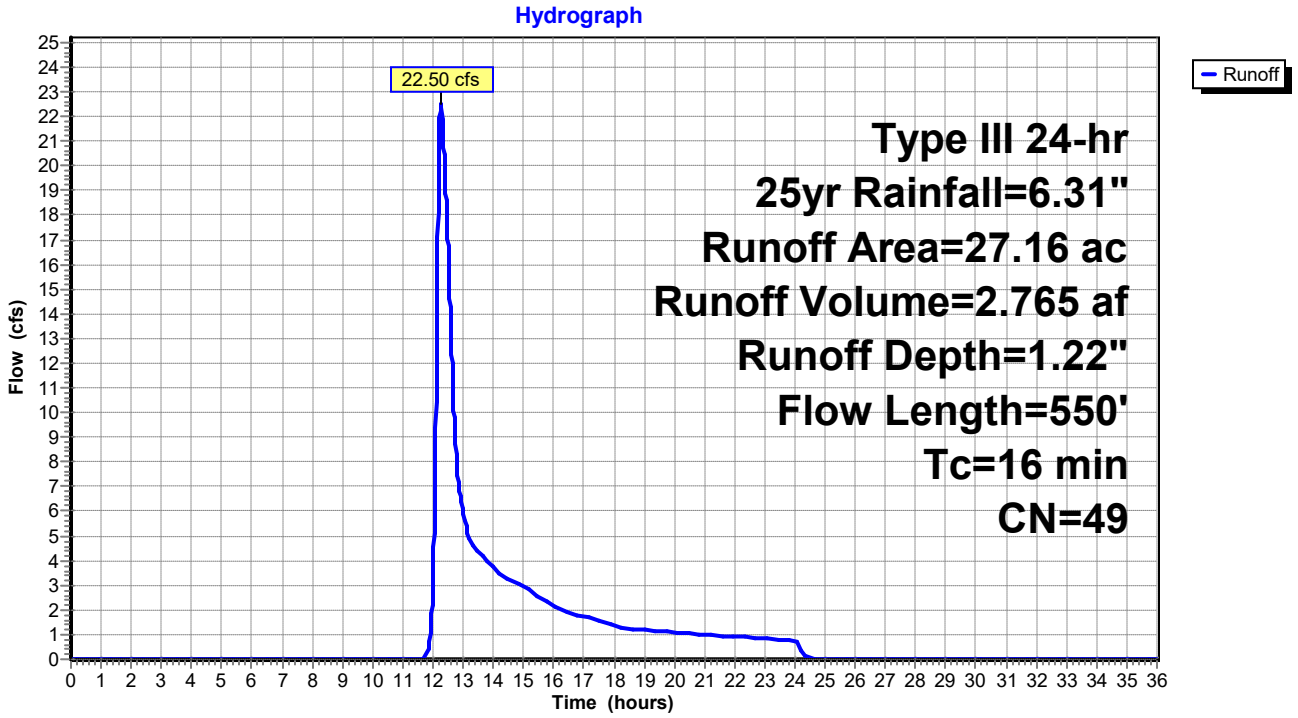
Runoff = 22.50 cfs @ 12.27 hrs, Volume= 2.765 af, Depth= 1.22"
Routed to nonexistent node 6L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
0.62	98	Paved parking, HSG A
15.13	39	>75% Grass cover, Good, HSG A
11.15	61	>75% Grass cover, Good, HSG B
0.26	30	Woods, Good, HSG A
27.16	49	Weighted Average
26.54		97.72% Pervious Area
0.62		2.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0300	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	165	0.0242	2.50		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	285	0.0077	1.41		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16	550	Total			

Subcatchment 4S: ExWS D-1



Summary for Subcatchment 5S: ExWS E-1

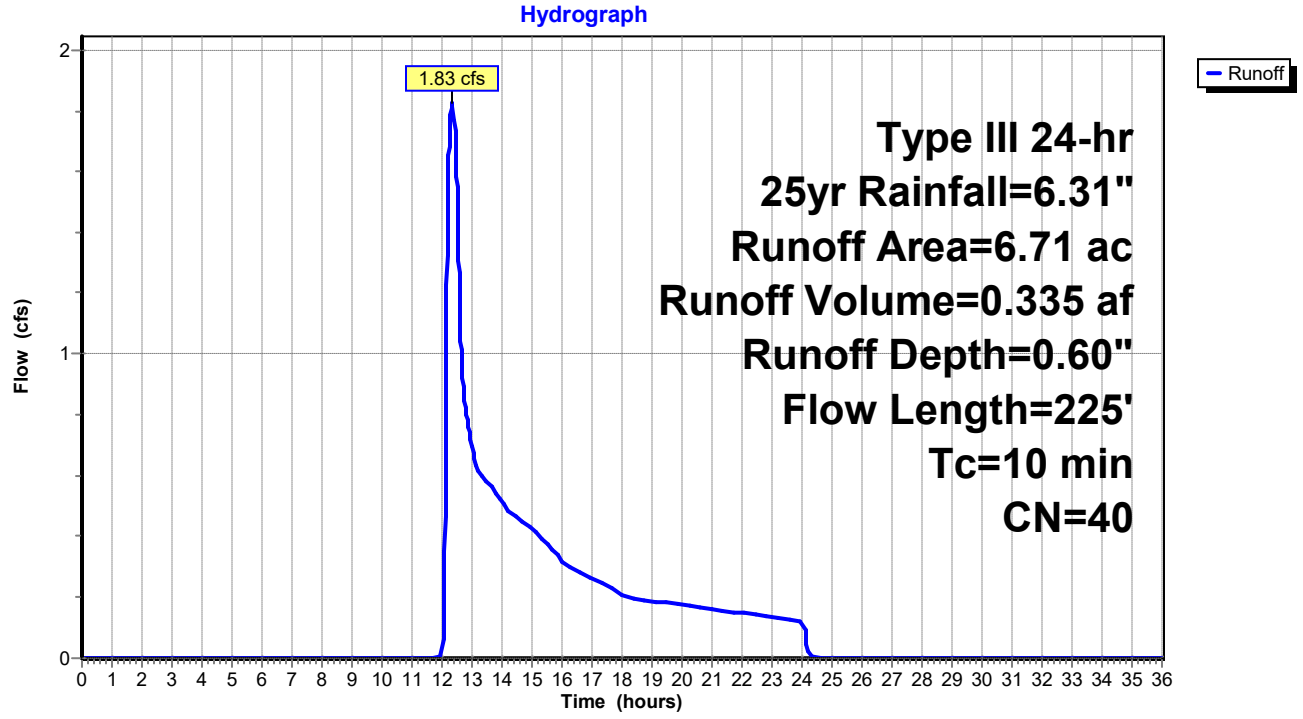
Runoff = 1.83 cfs @ 12.35 hrs, Volume= 0.335 af, Depth= 0.60"
Routed to Pond 6P : Pond E-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
2.79	39	>75% Grass cover, Good, HSG A
2.99	30	Woods, Good, HSG A
0.93	77	Woods, Good, HSG D
6.71	40	Weighted Average
6.71		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	100	0.0650	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	25	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	100	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10	225	Total			

Subcatchment 5S: ExWS E-1



Summary for Subcatchment 8S: ExWS F-1

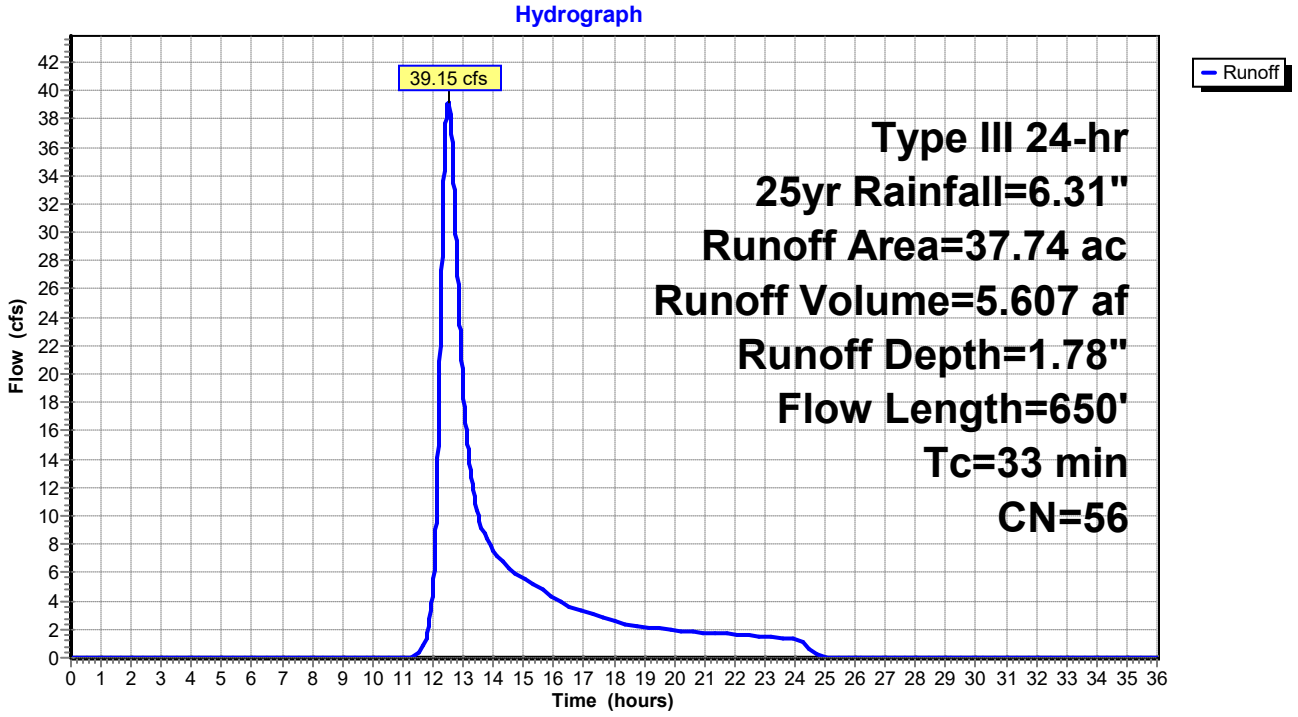
Runoff = 39.15 cfs @ 12.51 hrs, Volume= 5.607 af, Depth= 1.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
0.91	76	Gravel roads, HSG A
1.37	85	Gravel roads, HSG B
0.79	39	>75% Grass cover, Good, HSG A
4.64	61	>75% Grass cover, Good, HSG B
3.36	30	Woods, Good, HSG A
24.66	55	Woods, Good, HSG B
2.01	77	Woods, Good, HSG D
37.74	56	Weighted Average
37.74		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30	100	0.0340	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	550	0.0396	3.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
33	650	Total			

Subcatchment 8S: ExWS F-1



Summary for Subcatchment 9S: ExWS G-1a

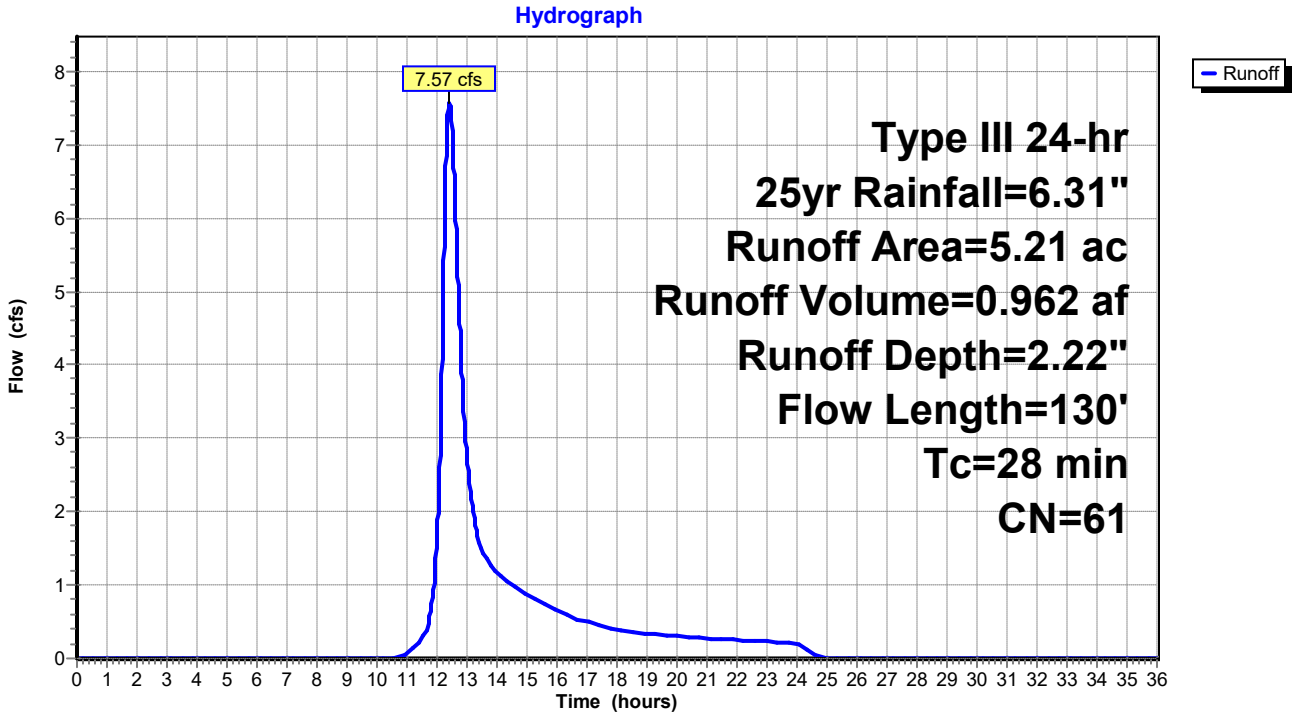
Runoff = 7.57 cfs @ 12.41 hrs, Volume= 0.962 af, Depth= 2.22"
Routed to Link 11L : Design Point G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
0.13	98	Paved parking, HSG A
0.25	61	>75% Grass cover, Good, HSG B
3.77	55	Woods, Good, HSG B
1.06	77	Woods, Good, HSG D
5.21	61	Weighted Average
5.08		97.50% Pervious Area
0.13		2.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15	38	0.0263	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
8	30	0.0733	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
5	32	0.3688	0.12		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
0	30	0.4000	10.18		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
28	130	Total			

Subcatchment 9S: ExWS G-1a



Summary for Subcatchment 10S: ExWS G-1b

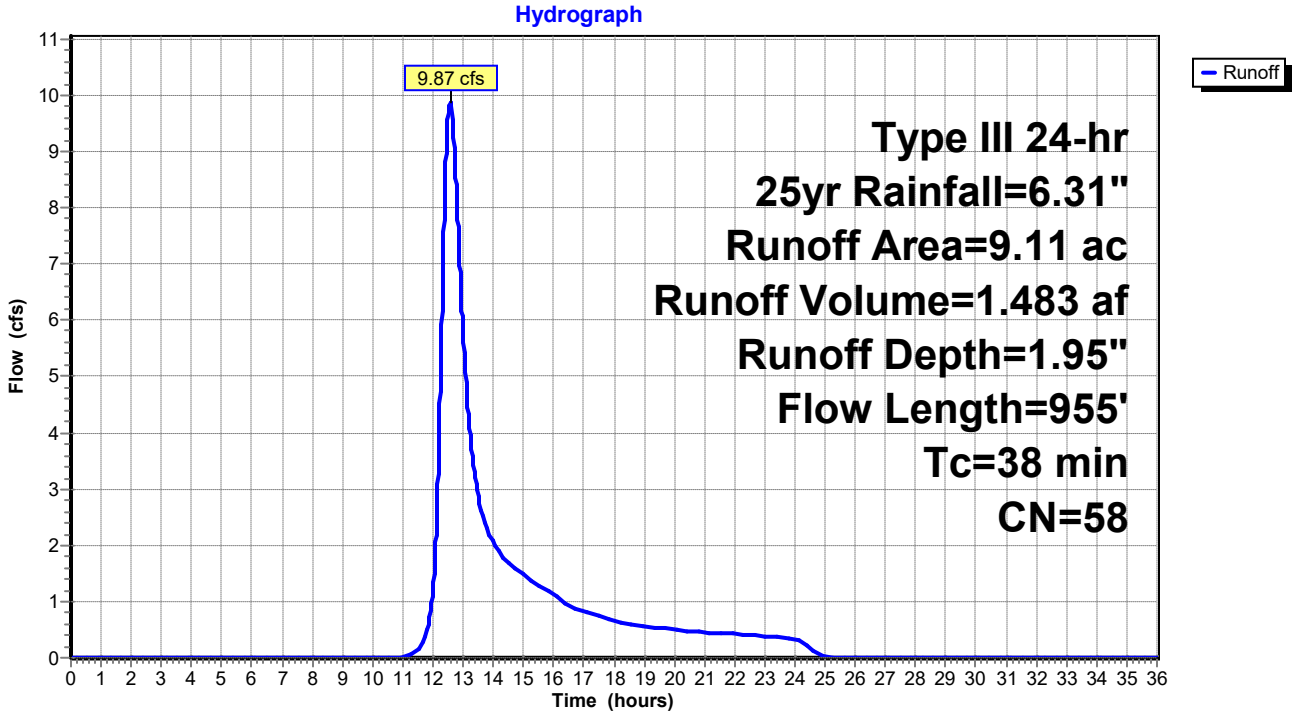
Runoff = 9.87 cfs @ 12.58 hrs, Volume= 1.483 af, Depth= 1.95"
Routed to Link 11L : Design Point G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
4.41	61	>75% Grass cover, Good, HSG B
4.70	55	Woods, Good, HSG B
9.11	58	Weighted Average
9.11		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31	100	0.0300	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	355	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	185	0.0950	4.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	315	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38	955	Total			

Subcatchment 10S: ExWS G-1b



Summary for Pond 6P: Pond E-1

Inflow Area = 6.71 ac, 0.00% Impervious, Inflow Depth = 0.60" for 25yr event
Inflow = 1.83 cfs @ 12.35 hrs, Volume= 0.335 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 7L : Design Point E

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 131.08' @ 24.57 hrs Surf.Area= 18,527 sf Storage= 14,575 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

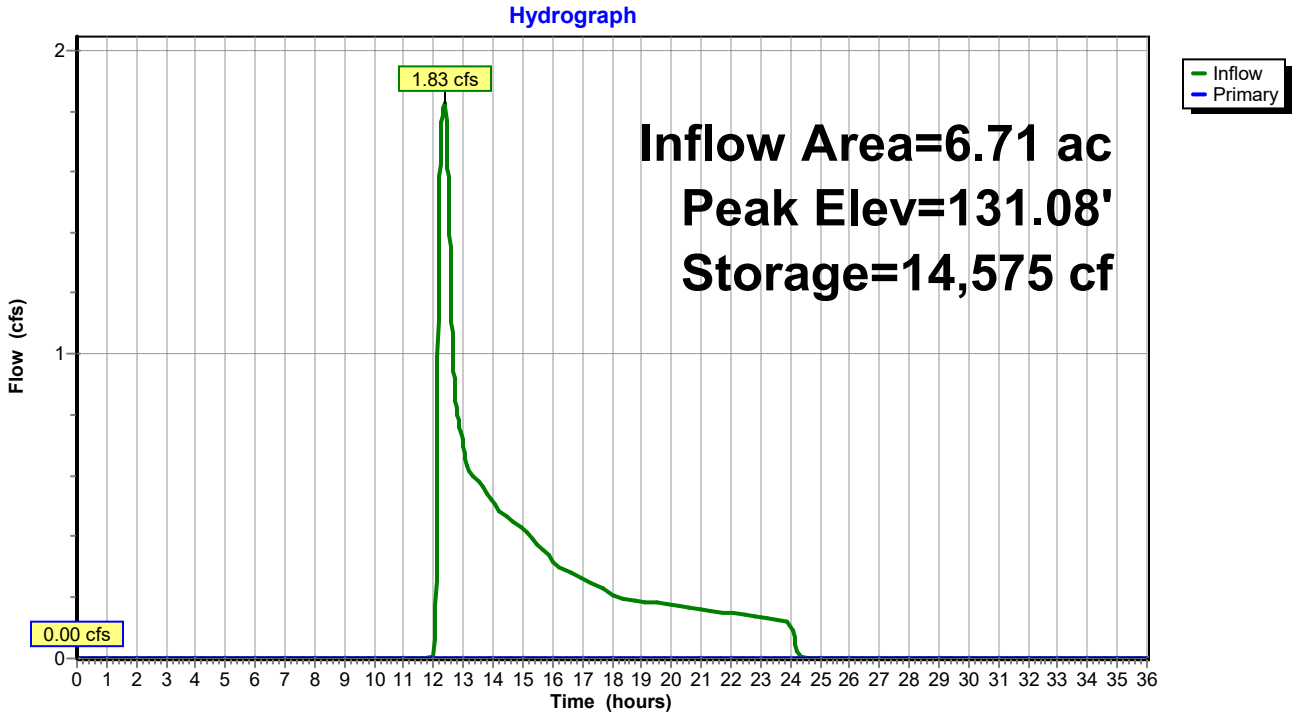
Volume	Invert	Avail.Storage	Storage Description
#1	130.20'	504,295 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.20	15,572	0	0
131.00	17,190	13,105	13,105
132.00	33,435	25,313	38,417
133.00	47,240	40,338	78,755
134.00	62,274	54,757	133,512
135.00	78,197	70,236	203,747
136.00	92,539	85,368	289,115
137.00	106,598	99,569	388,684
138.00	124,625	115,612	504,295

Device	Routing	Invert	Outlet Devices
#1	Primary	137.30'	**35.0' long + 3.0 '/' SideZ x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.20' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Pond E-1

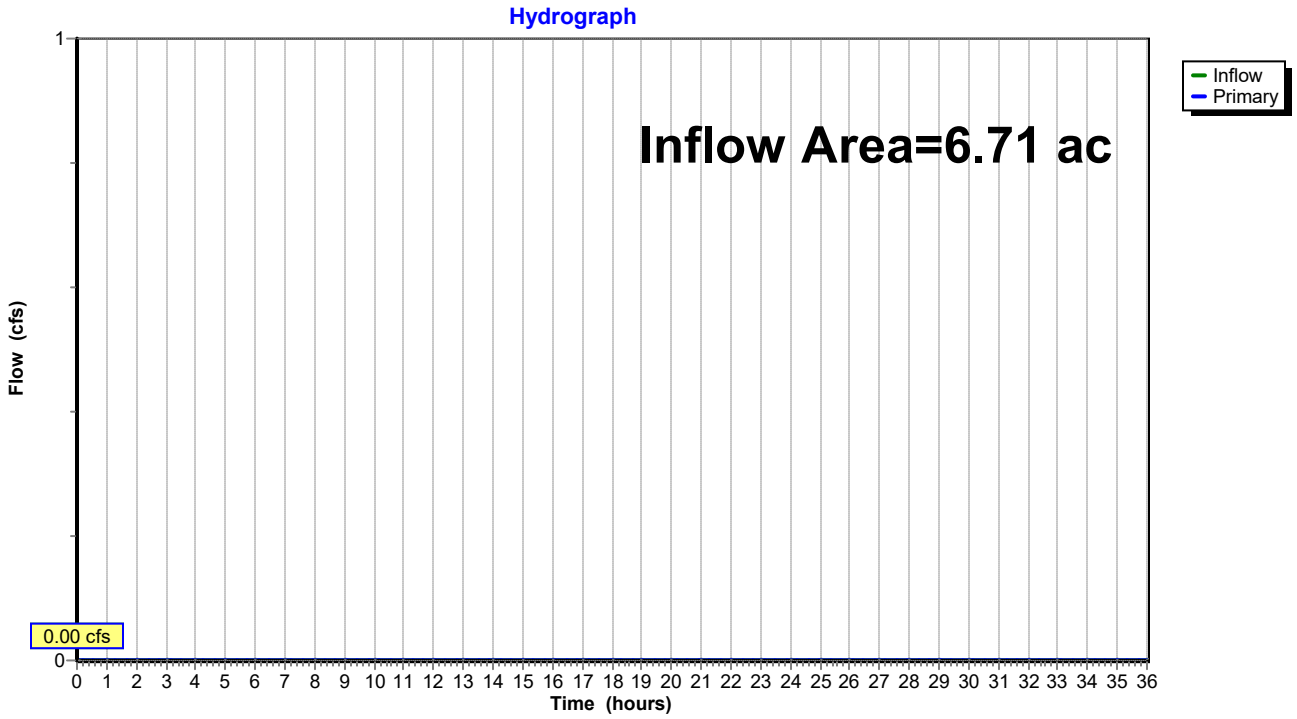


Summary for Link 7L: Design Point E

Inflow Area = 6.71 ac, 0.00% Impervious, Inflow Depth = 0.00" for 25yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 7L: Design Point E

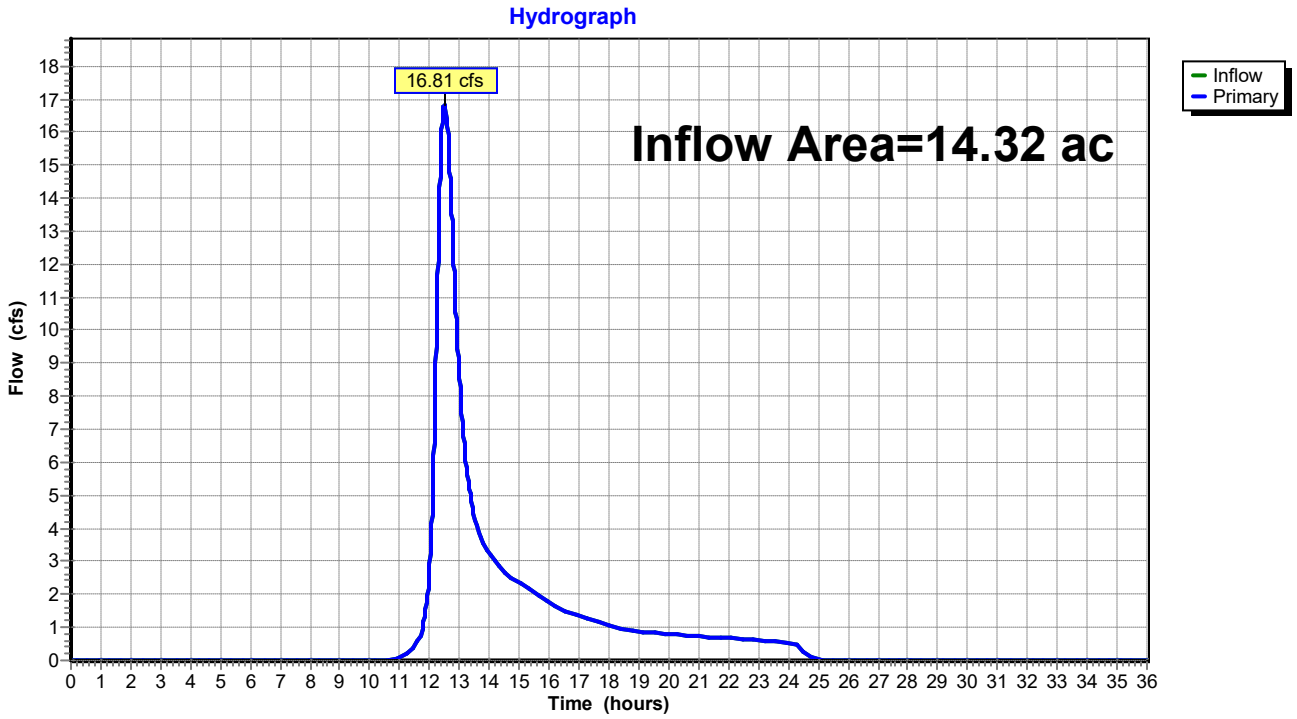


Summary for Link 11L: Design Point G

Inflow Area = 14.32 ac, 0.91% Impervious, Inflow Depth = 2.05" for 25yr event
Inflow = 16.81 cfs @ 12.50 hrs, Volume= 2.445 af
Primary = 16.81 cfs @ 12.50 hrs, Volume= 2.445 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 11L: Design Point G



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: ExWS A-1 Runoff Area=12.12 ac 4.04% Impervious Runoff Depth=1.49"
Flow Length=440' Tc=26 min CN=47 Runoff=10.52 cfs 1.502 af

Subcatchment 2S: ExWS B-1 Runoff Area=74.20 ac 3.64% Impervious Runoff Depth=1.31"
Flow Length=2,415' Tc=55 min CN=45 Runoff=37.18 cfs 8.118 af

Subcatchment 3S: ExWS C-1 Runoff Area=26.20 ac 0.80% Impervious Runoff Depth=1.85"
Flow Length=300' Tc=13 min CN=51 Runoff=40.06 cfs 4.036 af

Subcatchment 4S: ExWS D-1 Runoff Area=27.16 ac 2.28% Impervious Runoff Depth=1.67"
Flow Length=550' Tc=16 min CN=49 Runoff=33.36 cfs 3.769 af

Subcatchment 5S: ExWS E-1 Runoff Area=6.71 ac 0.00% Impervious Runoff Depth=0.90"
Flow Length=225' Tc=10 min CN=40 Runoff=3.49 cfs 0.505 af

Subcatchment 8S: ExWS F-1 Runoff Area=37.74 ac 0.00% Impervious Runoff Depth=2.32"
Flow Length=650' Tc=33 min CN=56 Runoff=52.61 cfs 7.305 af

Subcatchment 9S: ExWS G-1a Runoff Area=5.21 ac 2.50% Impervious Runoff Depth=2.82"
Flow Length=130' Tc=28 min CN=61 Runoff=9.79 cfs 1.223 af

Subcatchment 10S: ExWS G-1b Runoff Area=9.11 ac 0.00% Impervious Runoff Depth=2.52"
Flow Length=955' Tc=38 min CN=58 Runoff=13.04 cfs 1.912 af

Pond 6P: Pond E-1 Peak Elev=131.43' Storage=22,000 cf Inflow=3.49 cfs 0.505 af
Outflow=0.00 cfs 0.000 af

Link 7L: Design Point E Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 11L: Design Point G Inflow=22.05 cfs 3.136 af
Primary=22.05 cfs 3.136 af

Total Runoff Area = 198.45 ac Runoff Volume = 28.370 af Average Runoff Depth = 1.72"
97.91% Pervious = 194.30 ac 2.09% Impervious = 4.15 ac

Summary for Subcatchment 1S: ExWS A-1

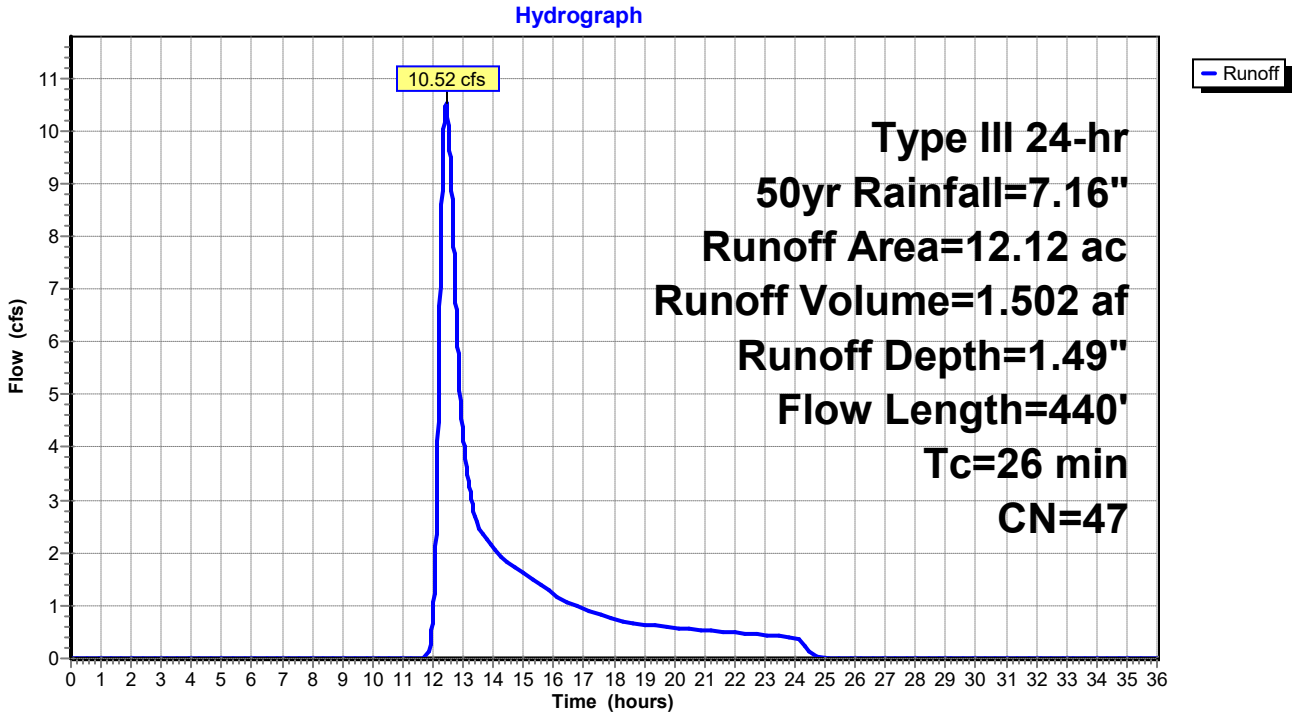
Runoff = 10.52 cfs @ 12.44 hrs, Volume= 1.502 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
0.49	98	Paved parking, HSG A
9.24	39	>75% Grass cover, Good, HSG A
0.14	61	>75% Grass cover, Good, HSG B
1.29	74	>75% Grass cover, Good, HSG C
0.23	30	Woods, Good, HSG A
0.73	70	Woods, Good, HSG C
12.12	47	Weighted Average
11.63		95.96% Pervious Area
0.49		4.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20	100	0.0080	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
2	225	0.0151	1.98		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4	115	0.0009	0.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
26	440	Total			

Subcatchment 1S: ExWS A-1



Summary for Subcatchment 2S: ExWS B-1

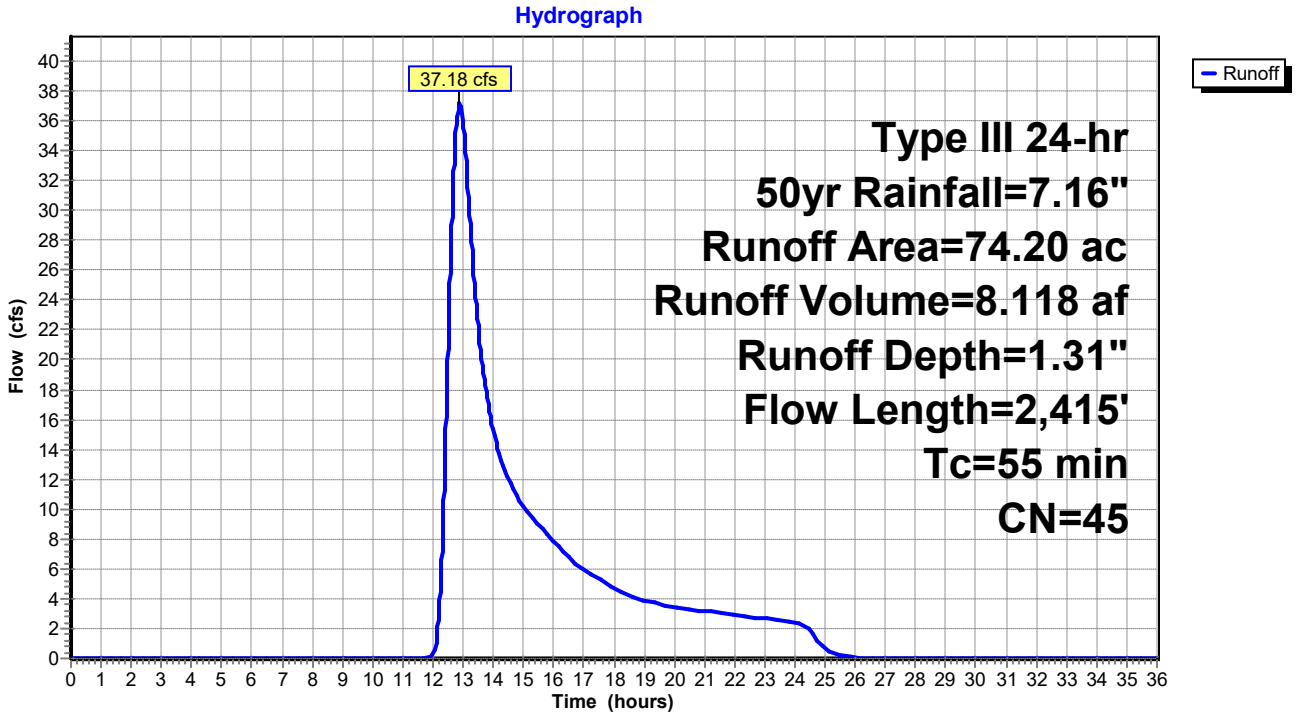
Runoff = 37.18 cfs @ 12.89 hrs, Volume= 8.118 af, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
2.70	98	Paved parking, HSG A
54.03	39	>75% Grass cover, Good, HSG A
3.93	61	>75% Grass cover, Good, HSG B
3.85	74	>75% Grass cover, Good, HSG C
7.05	30	Woods, Good, HSG A
0.23	70	Woods, Good, HSG C
2.41	77	Woods, Good, HSG D
74.20	45	Weighted Average
71.50		96.36% Pervious Area
2.70		3.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	100	0.0100	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
6	475	0.0061	1.26		**Shallow Concentrated Flow,** Kv= 16.1 fps
15	740	0.0027	0.84		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15	1,100	0.0057	1.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
55	2,415	Total			

Subcatchment 2S: ExWS B-1



Summary for Subcatchment 3S: ExWS C-1

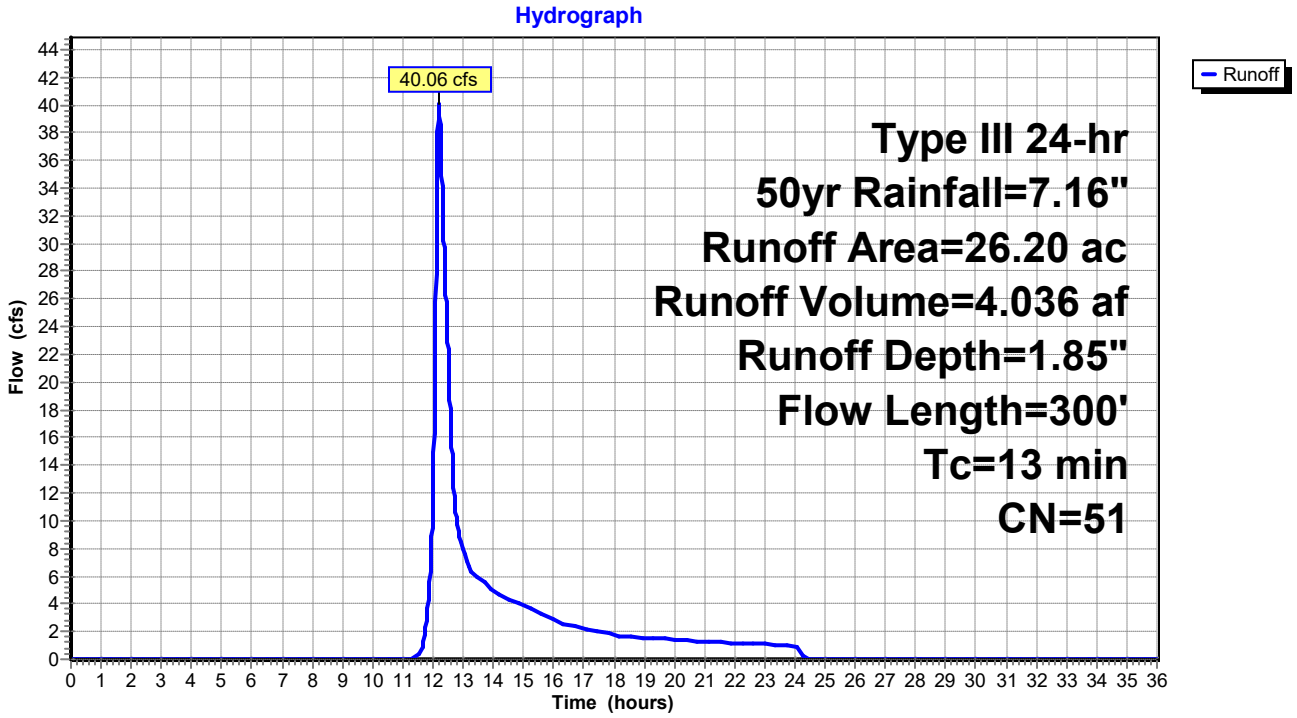
Runoff = 40.06 cfs @ 12.20 hrs, Volume= 4.036 af, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
0.21	98	Paved parking, HSG A
2.89	85	Gravel roads, HSG B
11.51	39	>75% Grass cover, Good, HSG A
2.50	61	>75% Grass cover, Good, HSG B
2.62	30	Woods, Good, HSG A
4.44	55	Woods, Good, HSG B
2.03	77	Woods, Good, HSG D
26.20	51	Weighted Average
25.99		99.20% Pervious Area
0.21		0.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0280	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	200	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
13	300	Total			

Subcatchment 3S: ExWS C-1



Summary for Subcatchment 4S: ExWS D-1

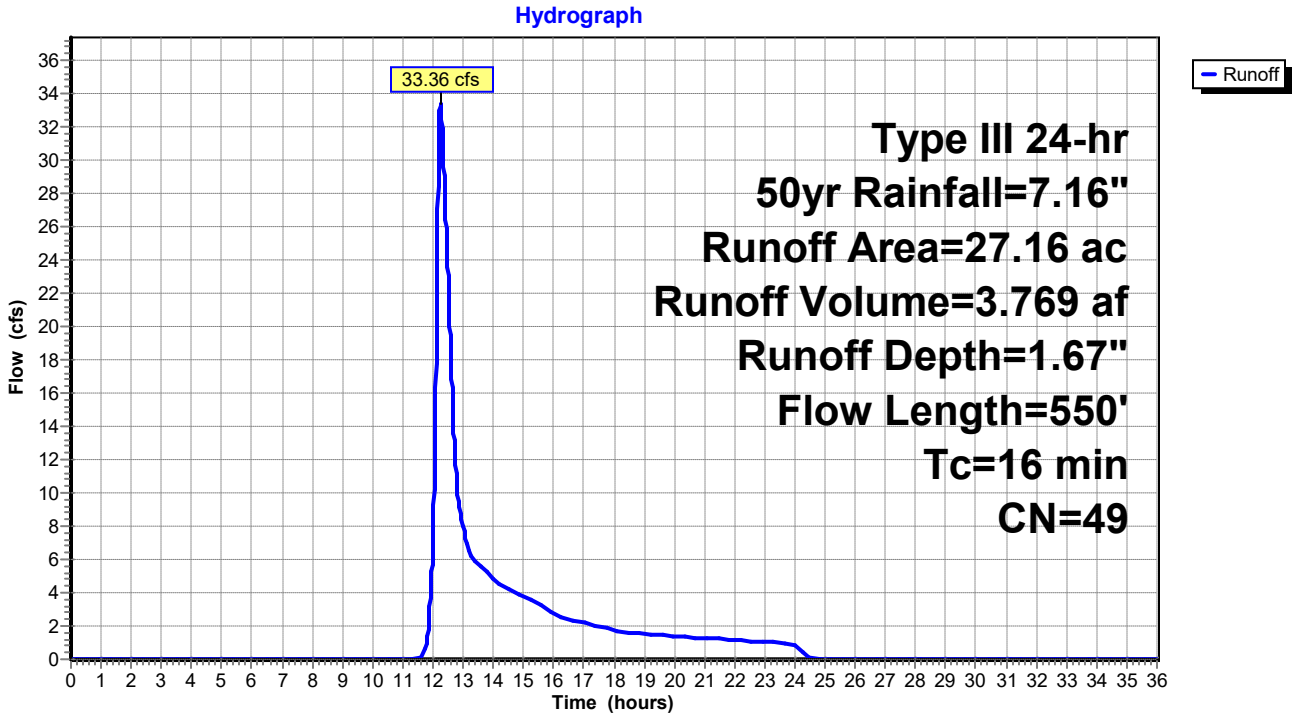
Runoff = 33.36 cfs @ 12.25 hrs, Volume= 3.769 af, Depth= 1.67"
Routed to nonexistent node 6L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
0.62	98	Paved parking, HSG A
15.13	39	>75% Grass cover, Good, HSG A
11.15	61	>75% Grass cover, Good, HSG B
0.26	30	Woods, Good, HSG A
27.16	49	Weighted Average
26.54		97.72% Pervious Area
0.62		2.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0300	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	165	0.0242	2.50		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	285	0.0077	1.41		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16	550	Total			

Subcatchment 4S: ExWS D-1



Summary for Subcatchment 5S: ExWS E-1

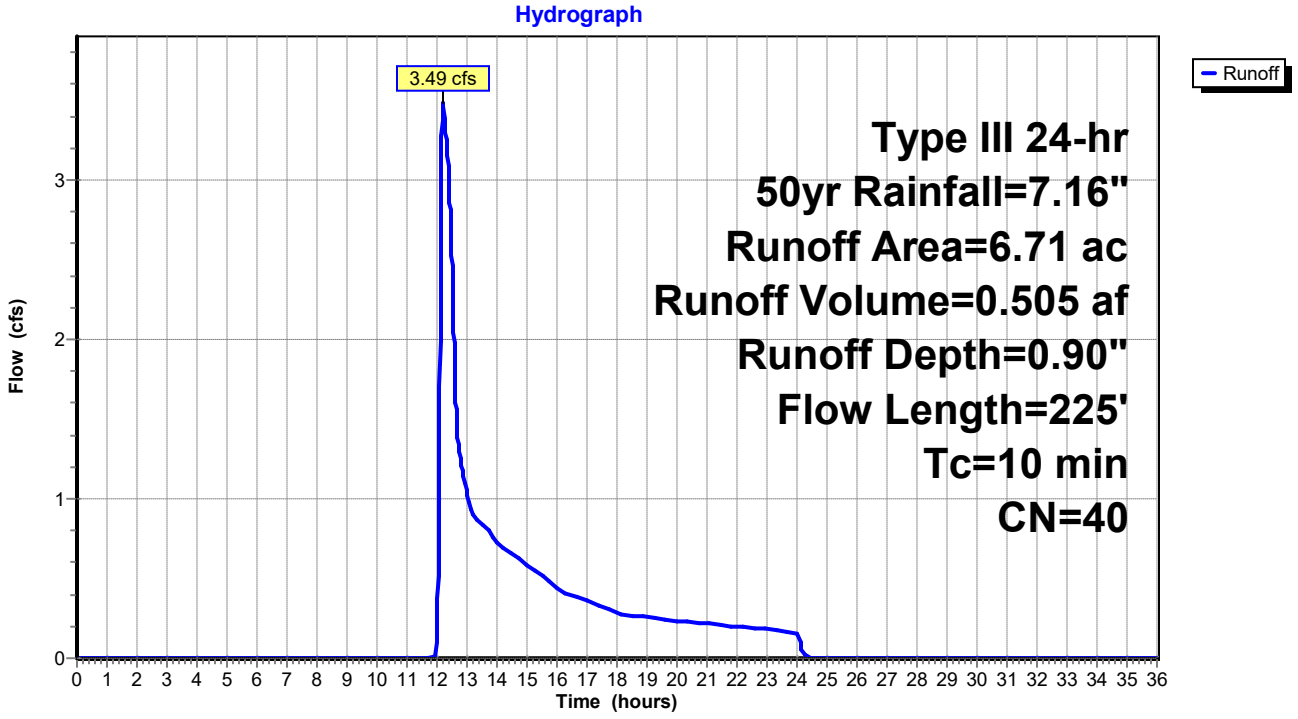
Runoff = 3.49 cfs @ 12.21 hrs, Volume= 0.505 af, Depth= 0.90"
Routed to Pond 6P : Pond E-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
2.79	39	>75% Grass cover, Good, HSG A
2.99	30	Woods, Good, HSG A
0.93	77	Woods, Good, HSG D
6.71	40	Weighted Average
6.71		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	100	0.0650	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	25	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	100	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10	225	Total			

Subcatchment 5S: ExWS E-1



Summary for Subcatchment 8S: ExWS F-1

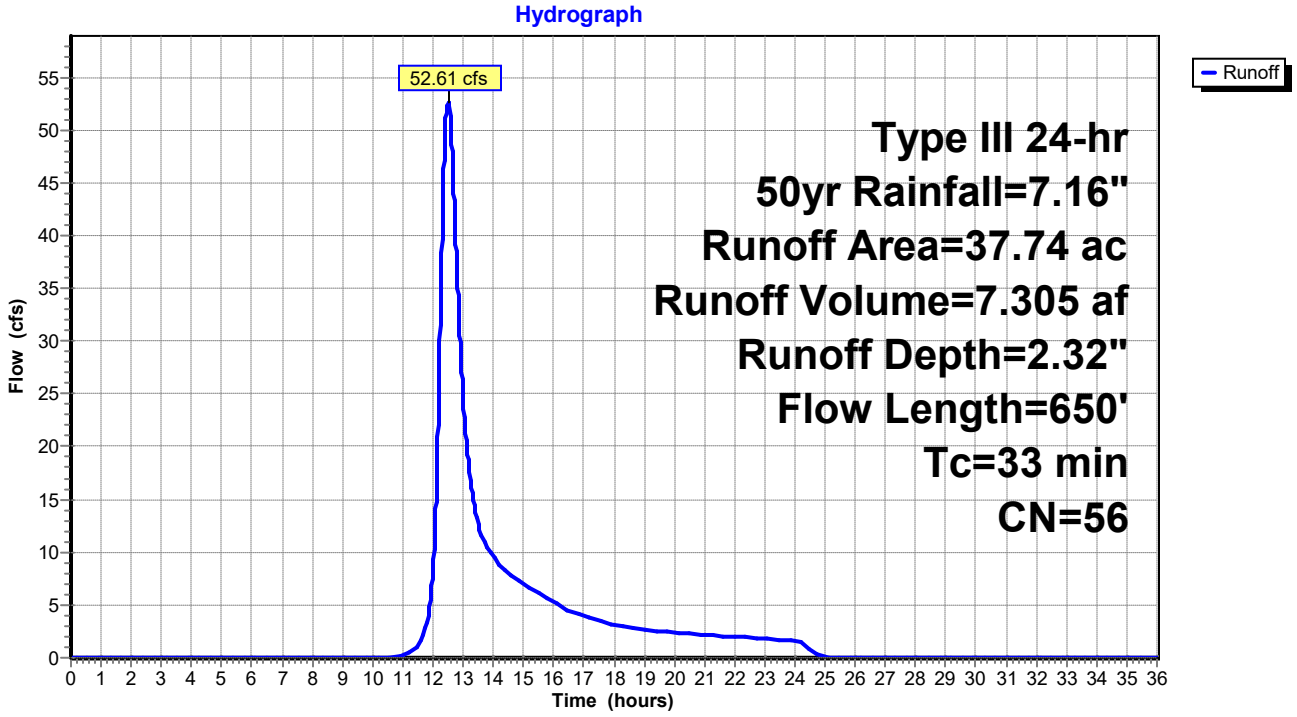
Runoff = 52.61 cfs @ 12.50 hrs, Volume= 7.305 af, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
0.91	76	Gravel roads, HSG A
1.37	85	Gravel roads, HSG B
0.79	39	>75% Grass cover, Good, HSG A
4.64	61	>75% Grass cover, Good, HSG B
3.36	30	Woods, Good, HSG A
24.66	55	Woods, Good, HSG B
2.01	77	Woods, Good, HSG D
37.74	56	Weighted Average
37.74		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30	100	0.0340	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	550	0.0396	3.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
33	650	Total			

Subcatchment 8S: ExWS F-1



Summary for Subcatchment 9S: ExWS G-1a

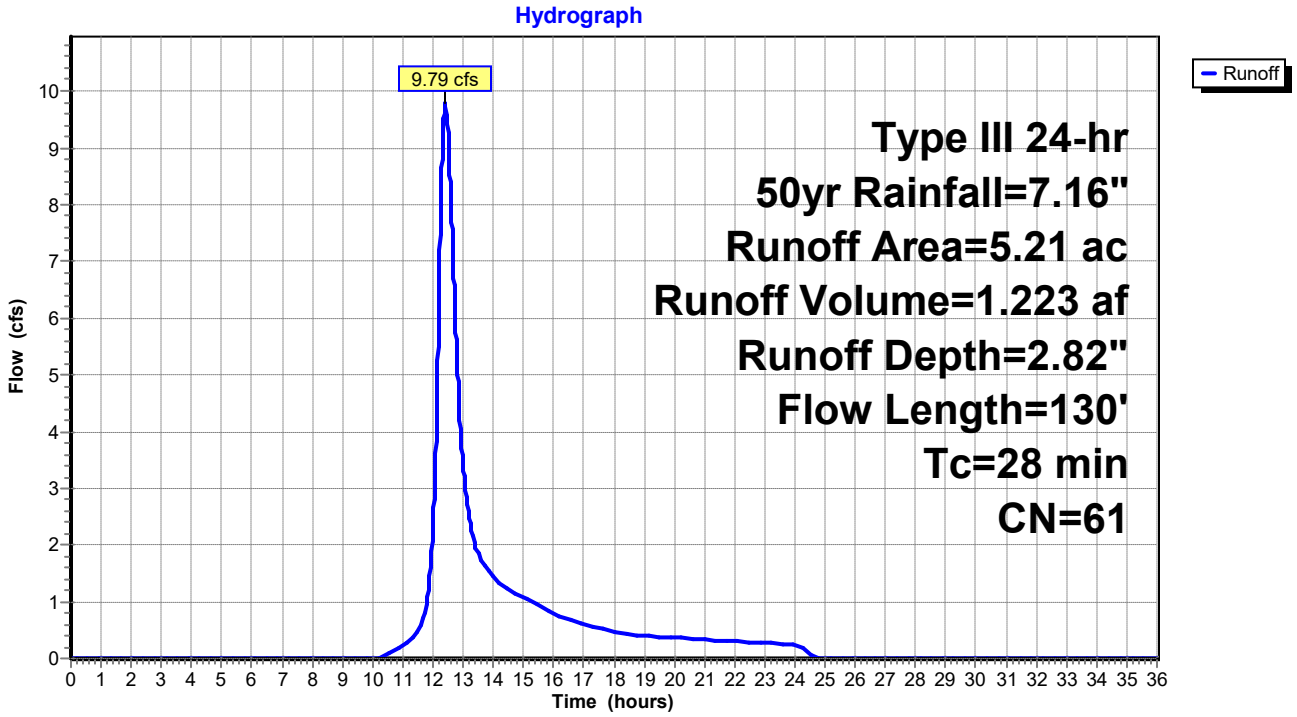
Runoff = 9.79 cfs @ 12.41 hrs, Volume= 1.223 af, Depth= 2.82"
Routed to Link 11L : Design Point G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
0.13	98	Paved parking, HSG A
0.25	61	>75% Grass cover, Good, HSG B
3.77	55	Woods, Good, HSG B
1.06	77	Woods, Good, HSG D
5.21	61	Weighted Average
5.08		97.50% Pervious Area
0.13		2.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15	38	0.0263	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
8	30	0.0733	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
5	32	0.3688	0.12		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
0	30	0.4000	10.18		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
28	130	Total			

Subcatchment 9S: ExWS G-1a



Summary for Subcatchment 10S: ExWS G-1b

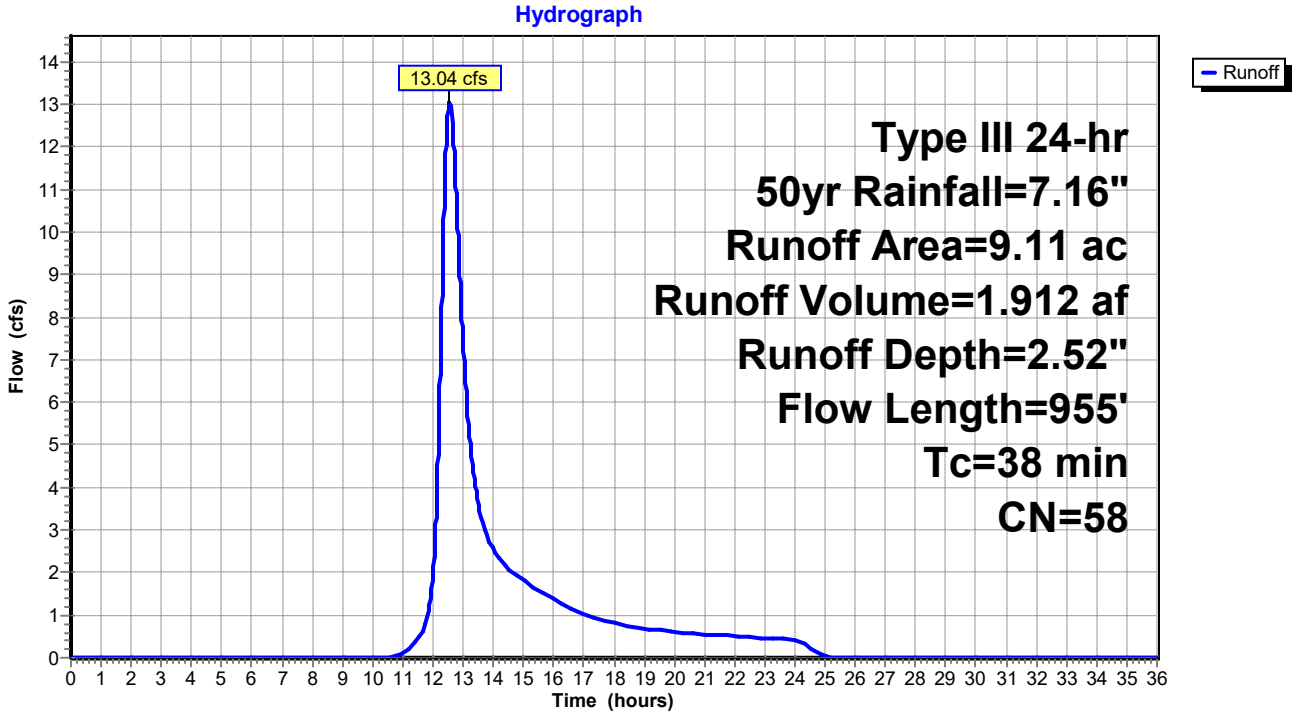
Runoff = 13.04 cfs @ 12.55 hrs, Volume= 1.912 af, Depth= 2.52"
Routed to Link 11L : Design Point G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
4.41	61	>75% Grass cover, Good, HSG B
4.70	55	Woods, Good, HSG B
9.11	58	Weighted Average
9.11		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31	100	0.0300	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	355	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	185	0.0950	4.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	315	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38	955	Total			

Subcatchment 10S: ExWS G-1b



Summary for Pond 6P: Pond E-1

Inflow Area = 6.71 ac, 0.00% Impervious, Inflow Depth = 0.90" for 50yr event
Inflow = 3.49 cfs @ 12.21 hrs, Volume= 0.505 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 7L : Design Point E

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 131.43' @ 24.57 hrs Surf.Area= 24,176 sf Storage= 22,000 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

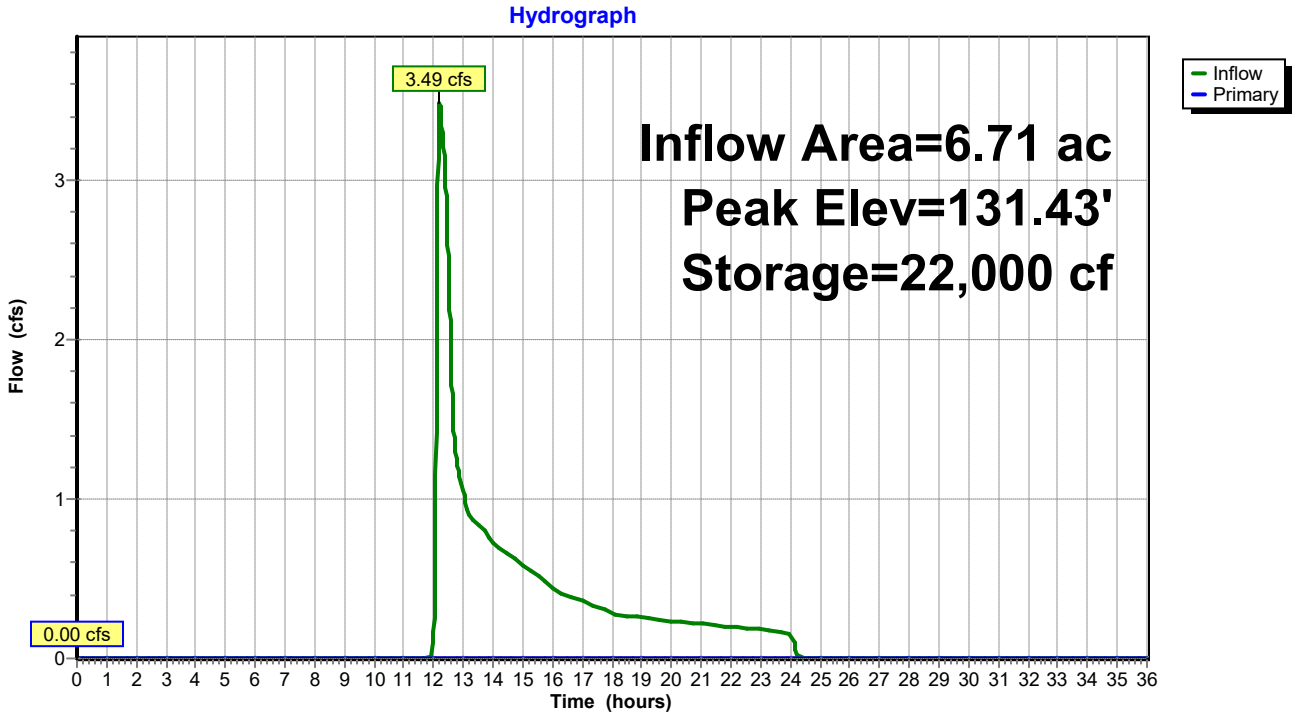
Volume	Invert	Avail.Storage	Storage Description
#1	130.20'	504,295 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.20	15,572	0	0
131.00	17,190	13,105	13,105
132.00	33,435	25,313	38,417
133.00	47,240	40,338	78,755
134.00	62,274	54,757	133,512
135.00	78,197	70,236	203,747
136.00	92,539	85,368	289,115
137.00	106,598	99,569	388,684
138.00	124,625	115,612	504,295

Device	Routing	Invert	Outlet Devices
#1	Primary	137.30'	**35.0' long + 3.0 '/' SideZ x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.20' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Pond E-1

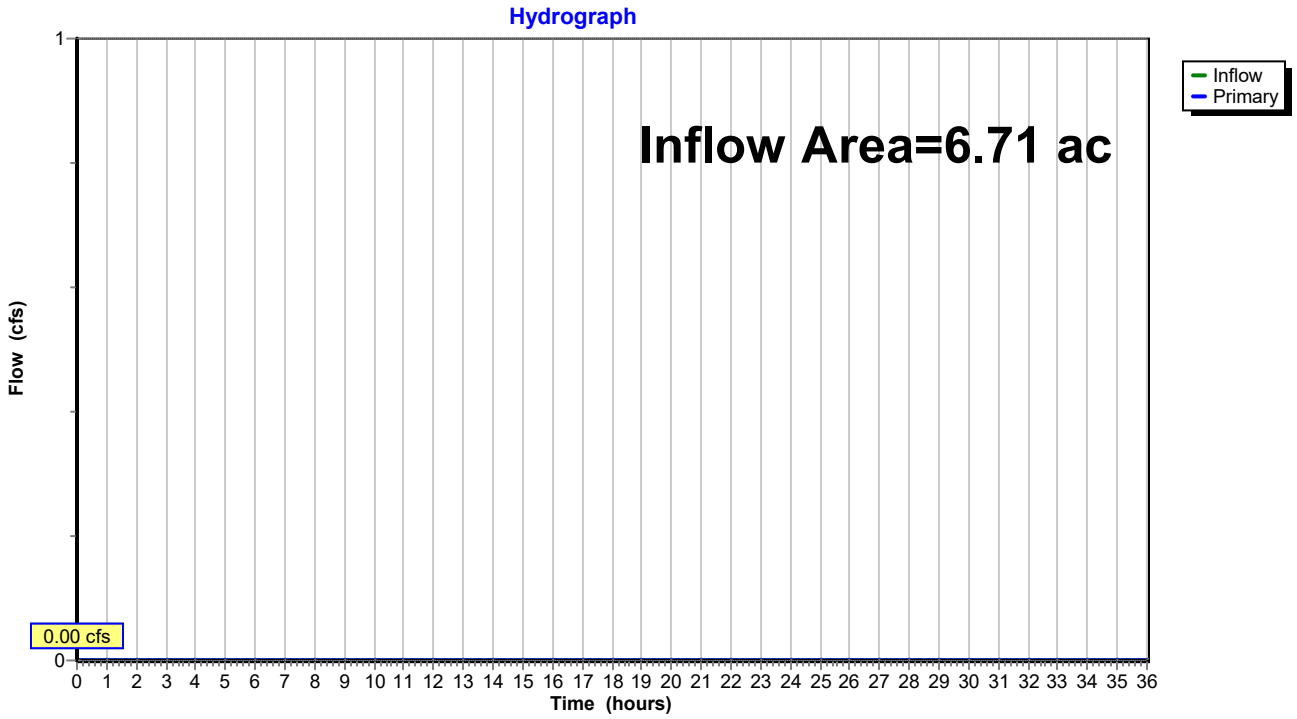


Summary for Link 7L: Design Point E

Inflow Area = 6.71 ac, 0.00% Impervious, Inflow Depth = 0.00" for 50yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 7L: Design Point E

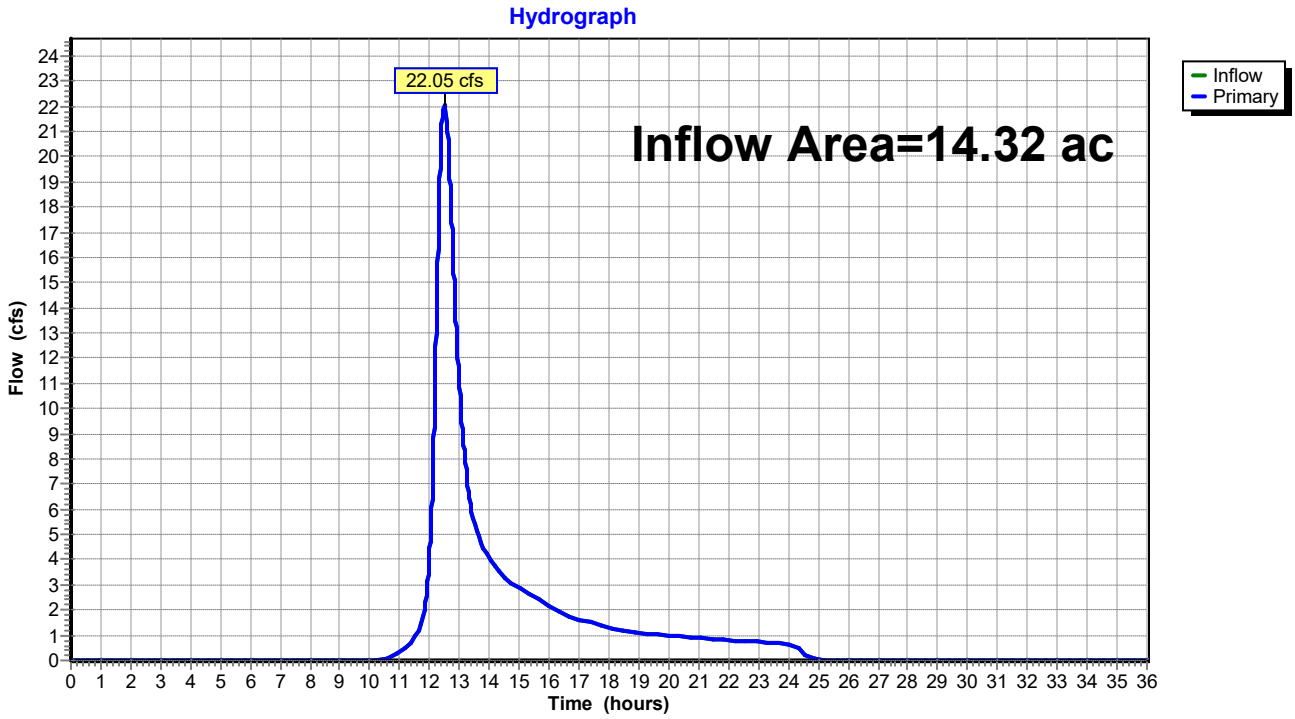


Summary for Link 11L: Design Point G

Inflow Area = 14.32 ac, 0.91% Impervious, Inflow Depth = 2.63" for 50yr event
Inflow = 22.05 cfs @ 12.49 hrs, Volume= 3.136 af
Primary = 22.05 cfs @ 12.49 hrs, Volume= 3.136 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 11L: Design Point G



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: ExWS A-1 Runoff Area=12.12 ac 4.04% Impervious Runoff Depth=1.99"
Flow Length=440' Tc=26 min CN=47 Runoff=14.96 cfs 2.009 af

Subcatchment 2S: ExWS B-1 Runoff Area=74.20 ac 3.64% Impervious Runoff Depth=1.78"
Flow Length=2,415' Tc=55 min CN=45 Runoff=54.19 cfs 11.030 af

Subcatchment 3S: ExWS C-1 Runoff Area=26.20 ac 0.80% Impervious Runoff Depth=2.41"
Flow Length=300' Tc=13 min CN=51 Runoff=54.50 cfs 5.266 af

Subcatchment 4S: ExWS D-1 Runoff Area=27.16 ac 2.28% Impervious Runoff Depth=2.20"
Flow Length=550' Tc=16 min CN=49 Runoff=46.44 cfs 4.977 af

Subcatchment 5S: ExWS E-1 Runoff Area=6.71 ac 0.00% Impervious Runoff Depth=1.29"
Flow Length=225' Tc=10 min CN=40 Runoff=6.13 cfs 0.721 af

Subcatchment 8S: ExWS F-1 Runoff Area=37.74 ac 0.00% Impervious Runoff Depth=2.96"
Flow Length=650' Tc=33 min CN=56 Runoff=68.29 cfs 9.296 af

Subcatchment 9S: ExWS G-1a Runoff Area=5.21 ac 2.50% Impervious Runoff Depth=3.51"
Flow Length=130' Tc=28 min CN=61 Runoff=12.35 cfs 1.525 af

Subcatchment 10S: ExWS G-1b Runoff Area=9.11 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=955' Tc=38 min CN=58 Runoff=16.75 cfs 2.412 af

Pond 6P: Pond E-1 Peak Elev=131.78' Storage=31,411 cf Inflow=6.13 cfs 0.721 af
Outflow=0.00 cfs 0.000 af

Link 7L: Design Point E Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 11L: Design Point G Inflow=28.12 cfs 3.938 af
Primary=28.12 cfs 3.938 af

Total Runoff Area = 198.45 ac Runoff Volume = 37.237 af Average Runoff Depth = 2.25"
97.91% Pervious = 194.30 ac 2.09% Impervious = 4.15 ac

Summary for Subcatchment 1S: ExWS A-1

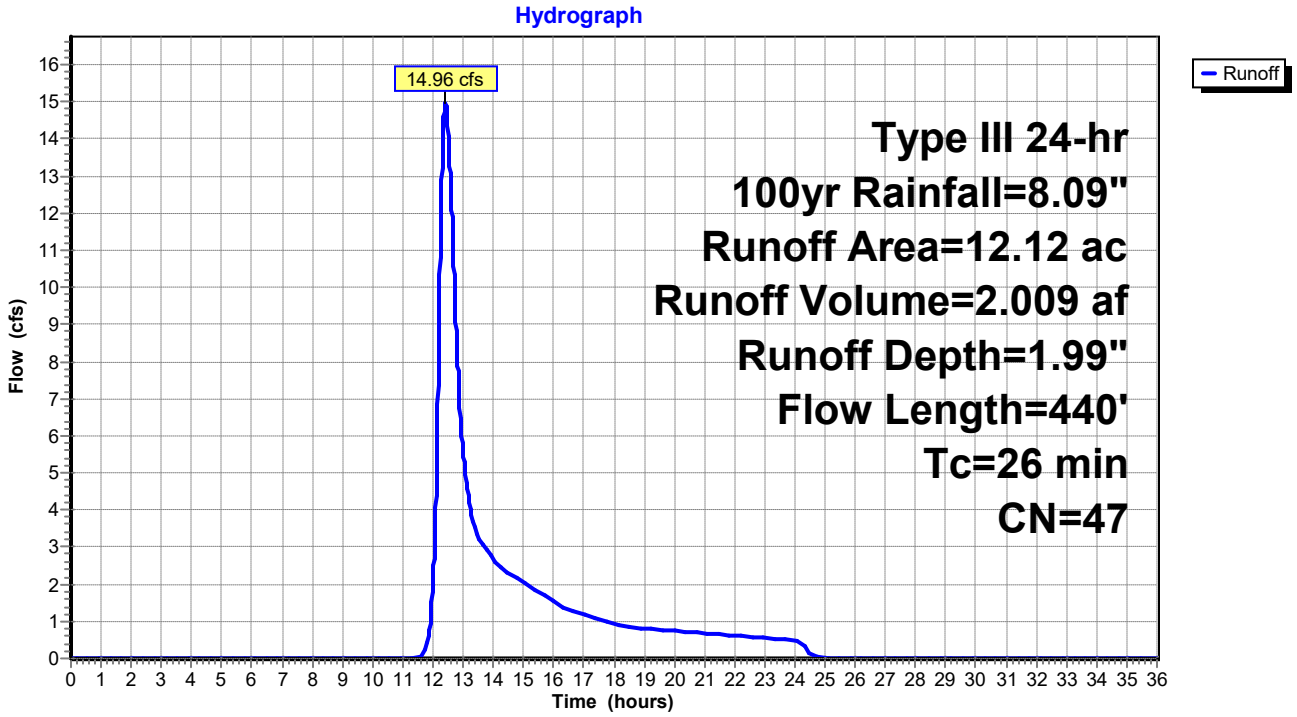
Runoff = 14.96 cfs @ 12.42 hrs, Volume= 2.009 af, Depth= 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
0.49	98	Paved parking, HSG A
9.24	39	>75% Grass cover, Good, HSG A
0.14	61	>75% Grass cover, Good, HSG B
1.29	74	>75% Grass cover, Good, HSG C
0.23	30	Woods, Good, HSG A
0.73	70	Woods, Good, HSG C
12.12	47	Weighted Average
11.63		95.96% Pervious Area
0.49		4.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20	100	0.0080	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
2	225	0.0151	1.98		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4	115	0.0009	0.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
26	440	Total			

Subcatchment 1S: ExWS A-1



Summary for Subcatchment 2S: ExWS B-1

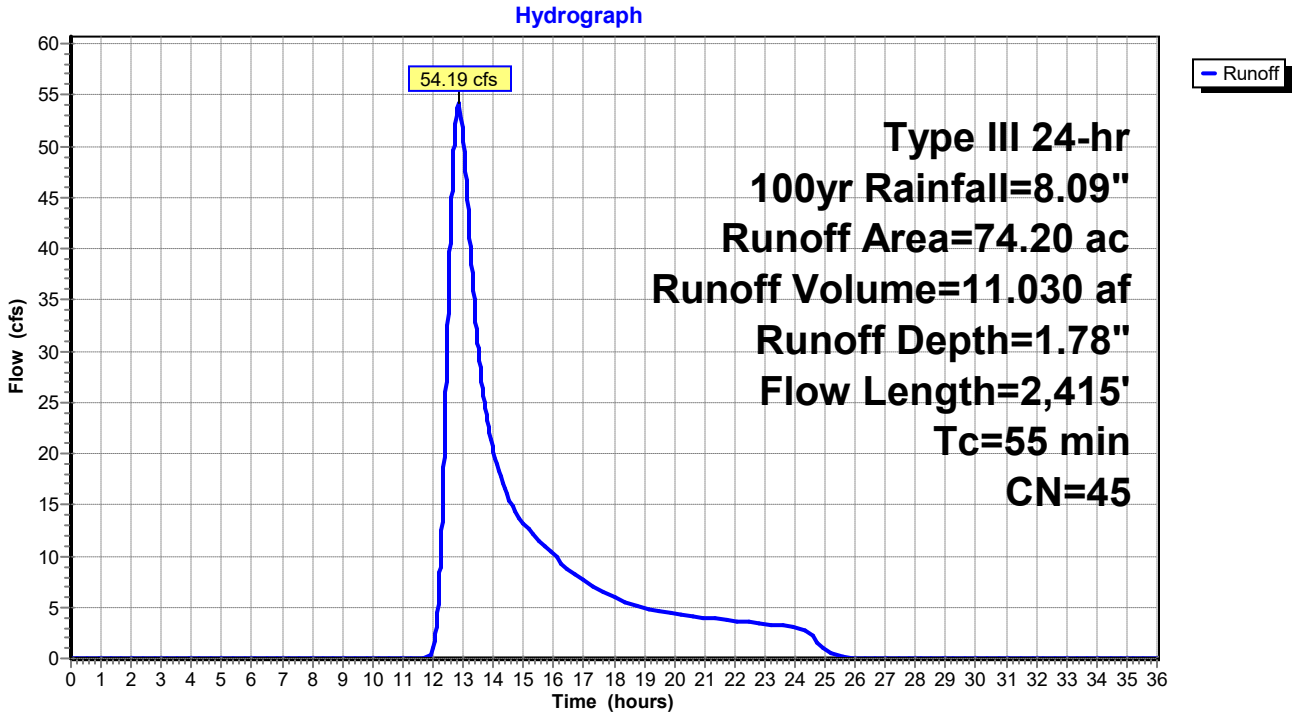
Runoff = 54.19 cfs @ 12.84 hrs, Volume= 11.030 af, Depth= 1.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
2.70	98	Paved parking, HSG A
54.03	39	>75% Grass cover, Good, HSG A
3.93	61	>75% Grass cover, Good, HSG B
3.85	74	>75% Grass cover, Good, HSG C
7.05	30	Woods, Good, HSG A
0.23	70	Woods, Good, HSG C
2.41	77	Woods, Good, HSG D
74.20	45	Weighted Average
71.50		96.36% Pervious Area
2.70		3.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	100	0.0100	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
6	475	0.0061	1.26		**Shallow Concentrated Flow,** Kv= 16.1 fps
15	740	0.0027	0.84		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15	1,100	0.0057	1.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
55	2,415	Total			

Subcatchment 2S: ExWS B-1



Summary for Subcatchment 3S: ExWS C-1

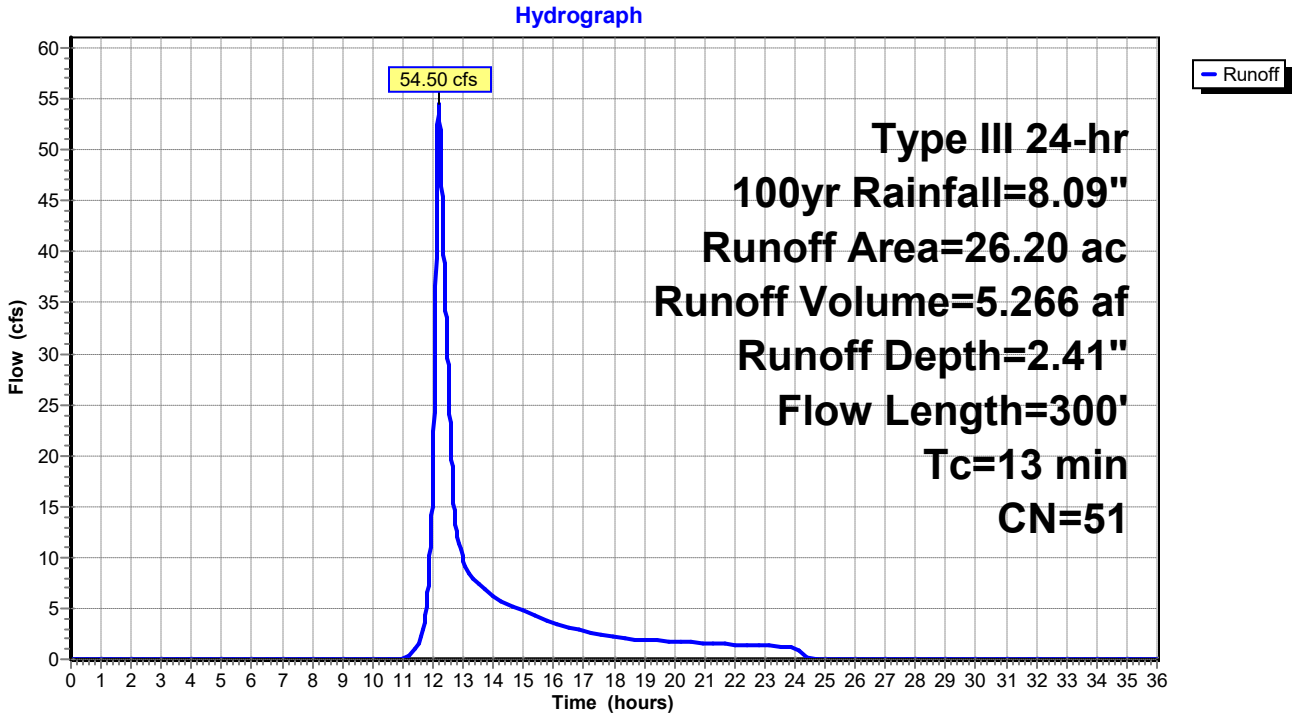
Runoff = 54.50 cfs @ 12.20 hrs, Volume= 5.266 af, Depth= 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
0.21	98	Paved parking, HSG A
2.89	85	Gravel roads, HSG B
11.51	39	>75% Grass cover, Good, HSG A
2.50	61	>75% Grass cover, Good, HSG B
2.62	30	Woods, Good, HSG A
4.44	55	Woods, Good, HSG B
2.03	77	Woods, Good, HSG D
26.20	51	Weighted Average
25.99		99.20% Pervious Area
0.21		0.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0280	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	200	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
13	300	Total			

Subcatchment 3S: ExWS C-1



Summary for Subcatchment 4S: ExWS D-1

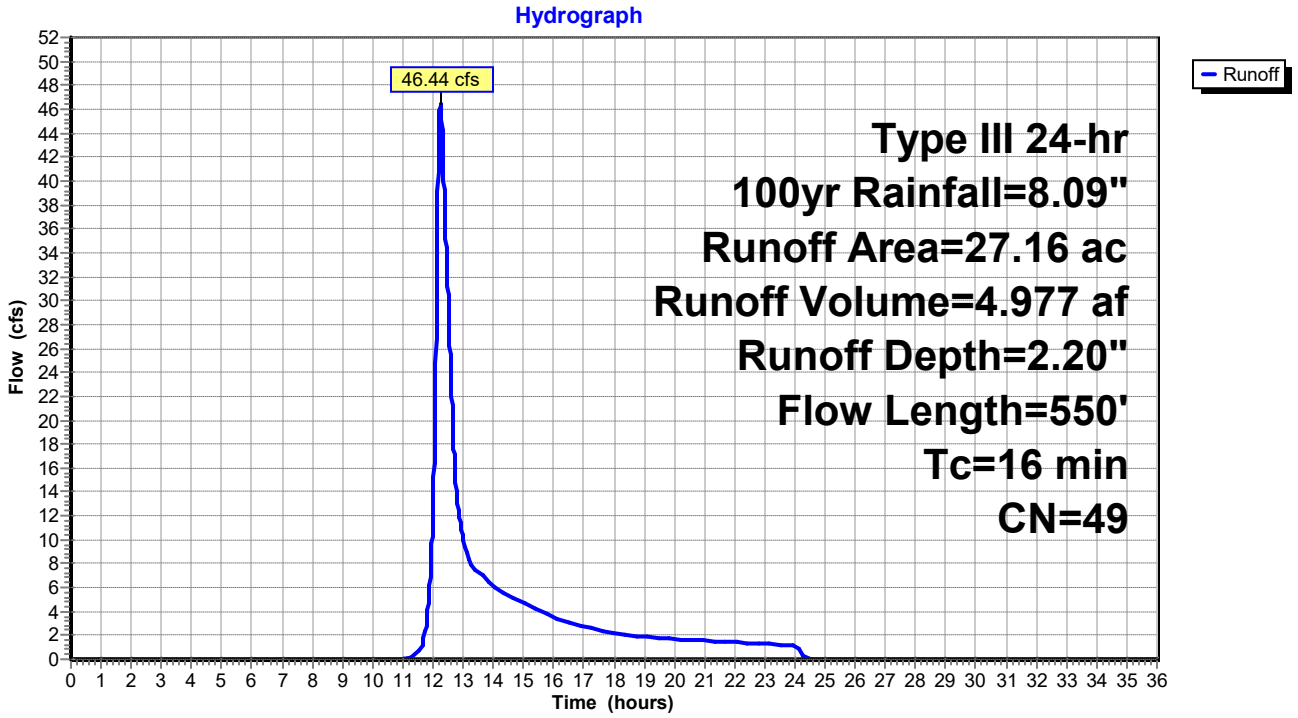
Runoff = 46.44 cfs @ 12.25 hrs, Volume= 4.977 af, Depth= 2.20"
Routed to nonexistent node 6L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
0.62	98	Paved parking, HSG A
15.13	39	>75% Grass cover, Good, HSG A
11.15	61	>75% Grass cover, Good, HSG B
0.26	30	Woods, Good, HSG A
27.16	49	Weighted Average
26.54		97.72% Pervious Area
0.62		2.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0300	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	165	0.0242	2.50		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	285	0.0077	1.41		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16	550	Total			

Subcatchment 4S: ExWS D-1



Summary for Subcatchment 5S: ExWS E-1

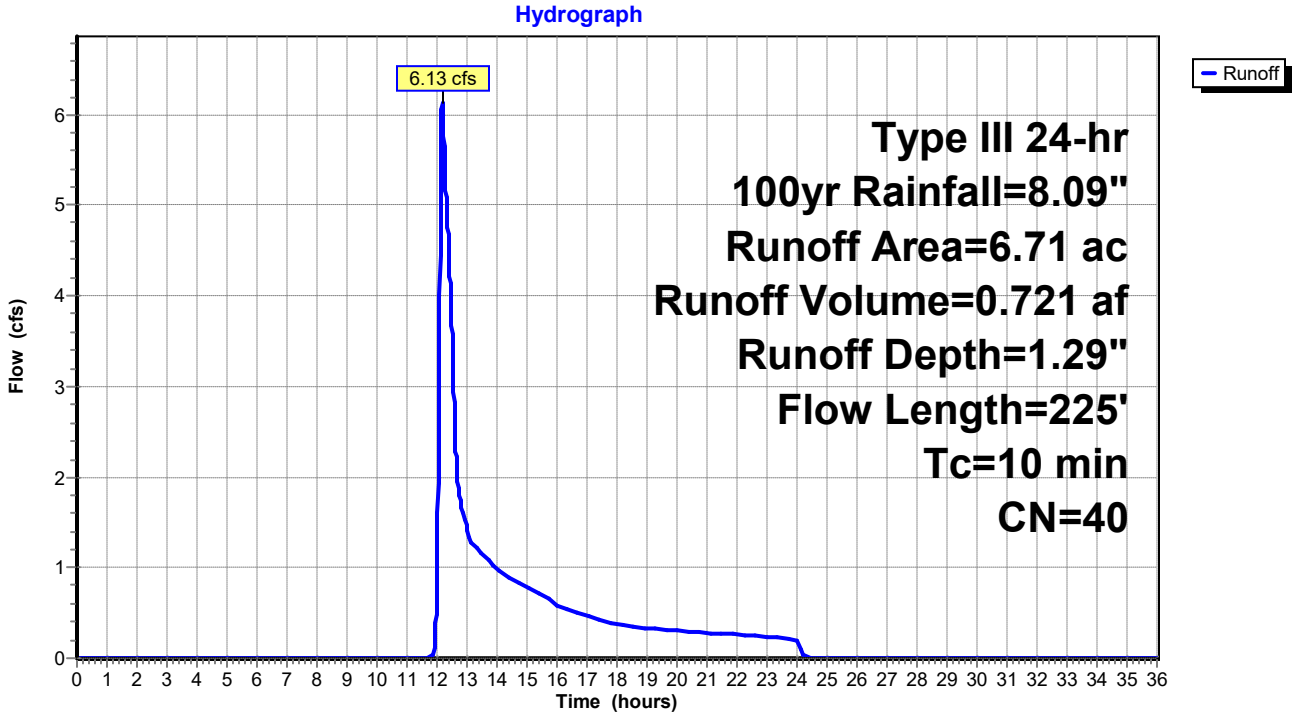
Runoff = 6.13 cfs @ 12.18 hrs, Volume= 0.721 af, Depth= 1.29"
Routed to Pond 6P : Pond E-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
2.79	39	>75% Grass cover, Good, HSG A
2.99	30	Woods, Good, HSG A
0.93	77	Woods, Good, HSG D
6.71	40	Weighted Average
6.71		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	100	0.0650	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	25	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	100	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10	225	Total			

Subcatchment 5S: ExWS E-1



Summary for Subcatchment 8S: ExWS F-1

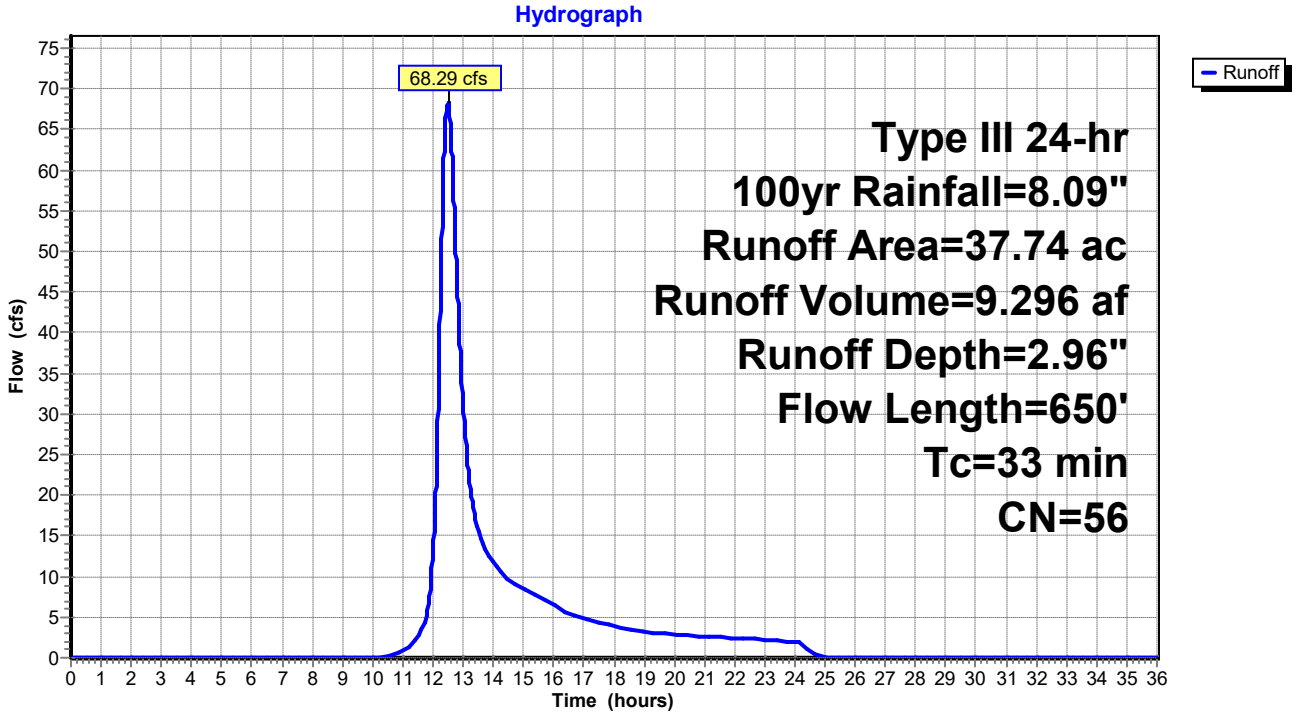
Runoff = 68.29 cfs @ 12.50 hrs, Volume= 9.296 af, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
0.91	76	Gravel roads, HSG A
1.37	85	Gravel roads, HSG B
0.79	39	>75% Grass cover, Good, HSG A
4.64	61	>75% Grass cover, Good, HSG B
3.36	30	Woods, Good, HSG A
24.66	55	Woods, Good, HSG B
2.01	77	Woods, Good, HSG D
37.74	56	Weighted Average
37.74		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30	100	0.0340	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	550	0.0396	3.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
33	650	Total			

Subcatchment 8S: ExWS F-1



Summary for Subcatchment 9S: ExWS G-1a

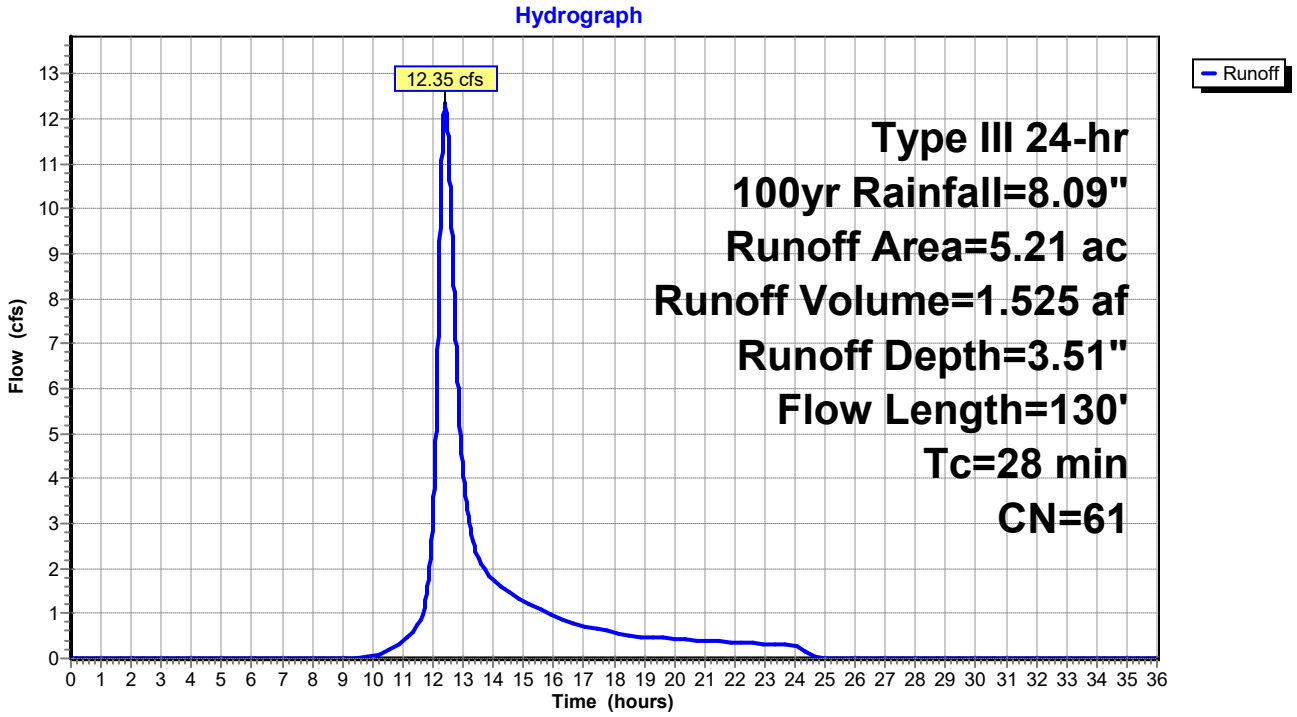
Runoff = 12.35 cfs @ 12.41 hrs, Volume= 1.525 af, Depth= 3.51"
Routed to Link 11L : Design Point G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
0.13	98	Paved parking, HSG A
0.25	61	>75% Grass cover, Good, HSG B
3.77	55	Woods, Good, HSG B
1.06	77	Woods, Good, HSG D
5.21	61	Weighted Average
5.08		97.50% Pervious Area
0.13		2.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15	38	0.0263	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
8	30	0.0733	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
5	32	0.3688	0.12		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
0	30	0.4000	10.18		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
28	130	Total			

Subcatchment 9S: ExWS G-1a



Summary for Subcatchment 10S: ExWS G-1b

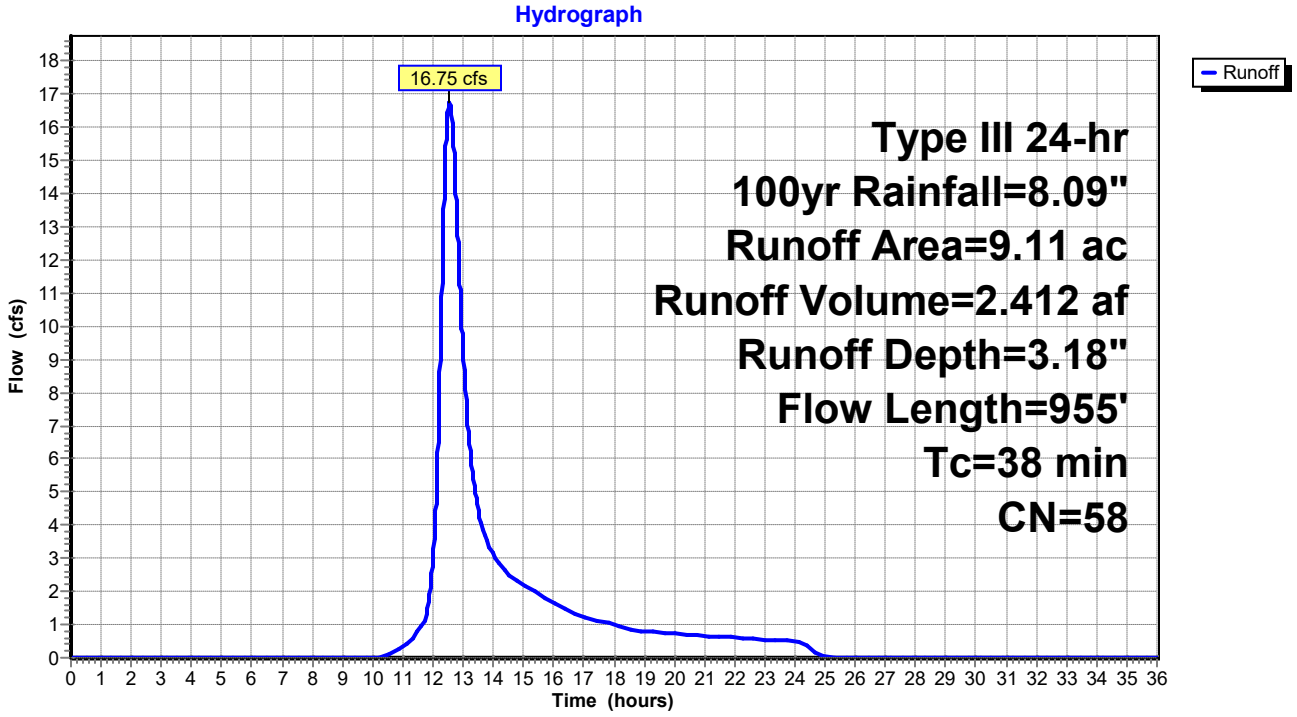
Runoff = 16.75 cfs @ 12.54 hrs, Volume= 2.412 af, Depth= 3.18"
Routed to Link 11L : Design Point G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
4.41	61	>75% Grass cover, Good, HSG B
4.70	55	Woods, Good, HSG B
9.11	58	Weighted Average
9.11		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31	100	0.0300	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	355	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	185	0.0950	4.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	315	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38	955	Total			

Subcatchment 10S: ExWS G-1b



Summary for Pond 6P: Pond E-1

Inflow Area = 6.71 ac, 0.00% Impervious, Inflow Depth = 1.29" for 100yr event
Inflow = 6.13 cfs @ 12.18 hrs, Volume= 0.721 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 7L : Design Point E

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 131.78' @ 24.57 hrs Surf.Area= 29,837 sf Storage= 31,411 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

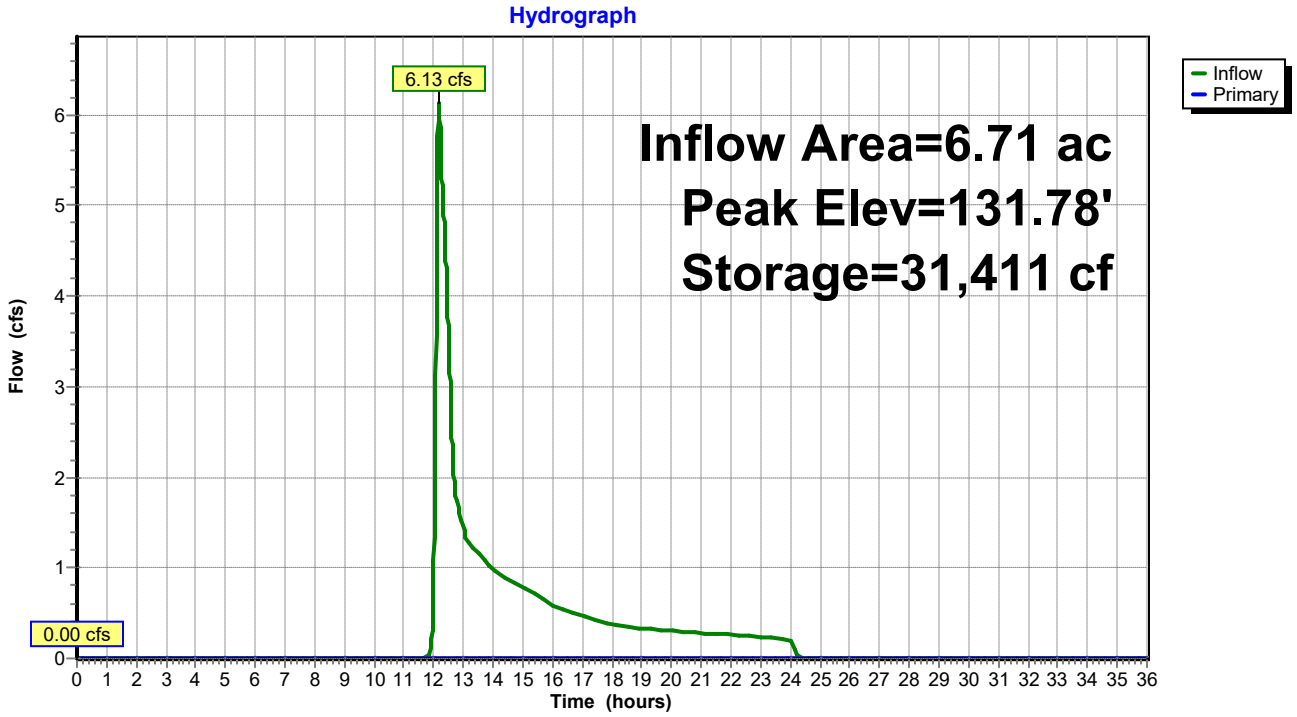
Volume	Invert	Avail.Storage	Storage Description
#1	130.20'	504,295 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.20	15,572	0	0
131.00	17,190	13,105	13,105
132.00	33,435	25,313	38,417
133.00	47,240	40,338	78,755
134.00	62,274	54,757	133,512
135.00	78,197	70,236	203,747
136.00	92,539	85,368	289,115
137.00	106,598	99,569	388,684
138.00	124,625	115,612	504,295

Device	Routing	Invert	Outlet Devices
#1	Primary	137.30'	**35.0' long + 3.0 '/' SideZ x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.20' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Pond E-1

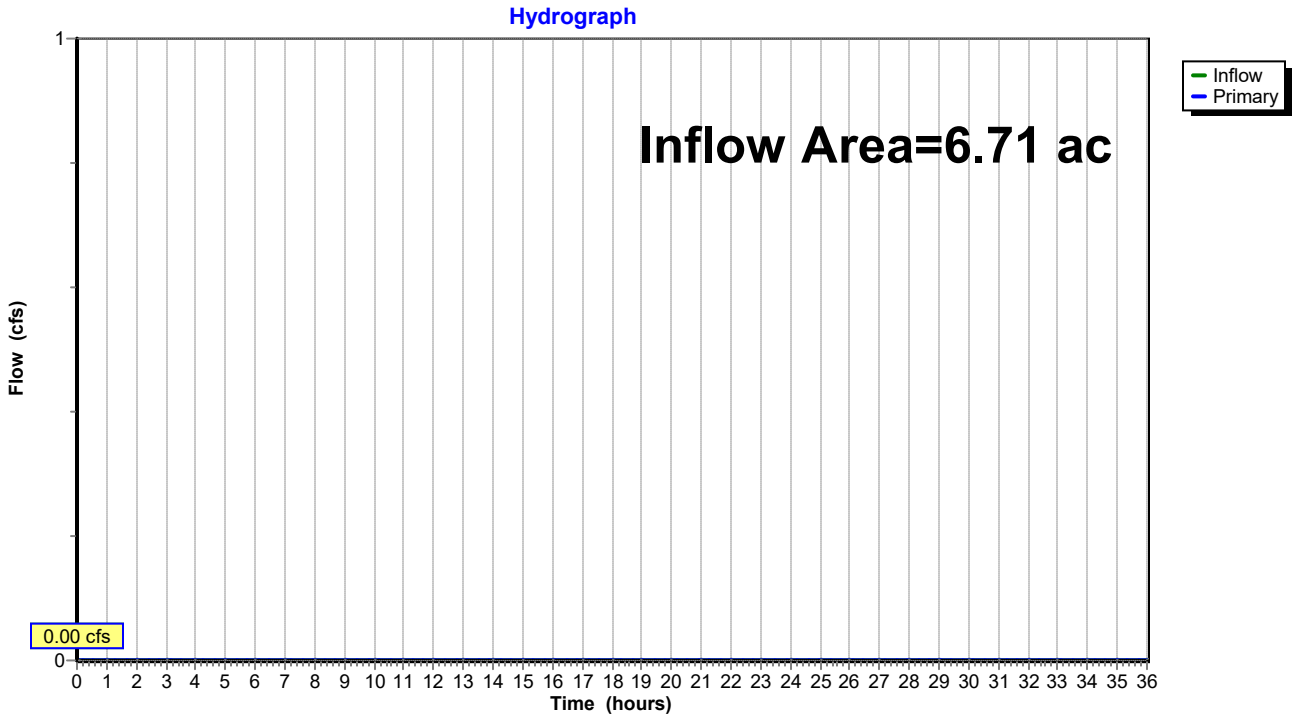


Summary for Link 7L: Design Point E

Inflow Area = 6.71 ac, 0.00% Impervious, Inflow Depth = 0.00" for 100yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 7L: Design Point E

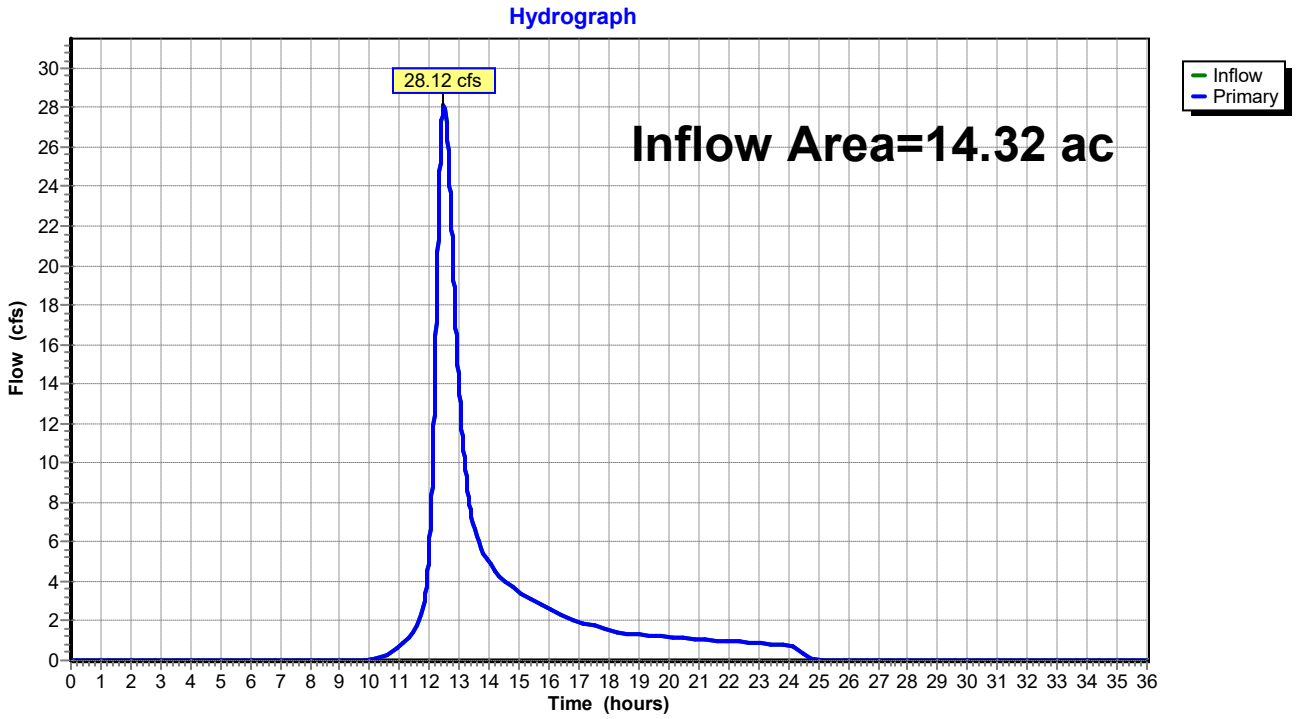


Summary for Link 11L: Design Point G

Inflow Area = 14.32 ac, 0.91% Impervious, Inflow Depth = 3.30" for 100yr event
Inflow = 28.12 cfs @ 12.48 hrs, Volume= 3.938 af
Primary = 28.12 cfs @ 12.48 hrs, Volume= 3.938 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 11L: Design Point G



APPENDIX B

Proposed Stormwater Discharge Calculations

LANGAN

Project Highlands - Cromwell, CT
Watershed Summary

Proposed Conditions

Area ID	A_{Total} (ac)	A_{Imp} (ac)	A_{perm} (ac)	CN	Tc (min)	WQV (ft^3)	WQF (ft^3/s)	Q_{2YR} (ft^3/s)	Q_{10Yr} (ft^3/s)	Q_{25Yr} (ft^3/s)	Q_{50Yr} (ft^3/s)	Q_{100Yr} (ft^3/s)	Downstream Routing
A-1	1.67	0.05	1.62	46	16	-	-	0.02	0.41	1.01	1.59	2.33	-> DP-A
B-1	26.29	0.58	25.71	46	22	-	-	0.25	6.02	14.33	22.32	32.36	-> DP-B
B-2	23.96	22.13	1.83	94	5	76,647	23.09	73.74	120.59	149.39	170.57	193.67	-> Sys B-2 -> Sys B-4 -> DP-B
B-3	11.97	11.97	0.00	98	5	41,279	12.44	39.88	62.62	76.71	87.12	98.49	-> Sys B-3 -> Sys B-5 -> DP-B
B-4	7.41	2.67	4.74	72	10	10,068	2.38	7.03	17.44	24.62	30.11	36.22	-> Sys B-4 -> DP-B
B-5	16.31	10.92	5.39	80	5	38,636	11.64	29.24	60.10	80.07	94.96	111.30	-> Sys B-5 -> DP-B
C-1	15.48	0.00	15.48	54	23	-	-	1.29	9.18	16.53	22.72	30.01	-> DP-C
D-1	23.11	0.00	23.11	49	16	-	-	0.45	8.83	19.15	28.39	39.52	-> DP-D
D-2	7.58	5.06	2.52	80	5	17,907	5.40	13.59	27.93	37.21	44.13	51.73	-> Sys D-2 -> DP-D
E-1	5.81	0.00	5.81	40	10	-	-	0.01	0.43	1.58	3.02	5.31	-> DP-E
E-2	9.75	0.99	8.76	50	25	-	-	0.26	3.71	7.49	10.79	14.79	-> Sys E-2 -> DP-E
F-1	34.38	0.00	34.38	55	31	-	-	3.12	19.73	34.55	46.83	61.26	-> DP-F
F-2	2.41	1.24	1.17	78	7	4,488	1.21	3.63	7.77	10.49	12.53	14.78	-> Sys F-2 -> DP-F
F-3	1.79	0.83	0.96	78	5	3,036	0.82	2.90	6.20	8.37	9.99	11.78	-> Sys F-3 -> DP-F
G-1a	4.52	0.43	4.09	66	21	2,225	0.30	2.02	6.17	9.20	11.57	14.26	-> DP-G
G-1b	4.63	0.00	4.63	58	38	-	-	0.64	3.03	5.01	6.63	8.51	-> DP-G
G-1c	0.82	0.39	0.43	79	5	1,423	0.38	1.40	2.93	3.93	4.68	5.50	-> DP-G
G-2	0.56	0.16	0.40	71	5	624	0.17	0.59	1.51	2.14	2.63	3.17	-> Sys G-2 -> DP-G
Total	198.45	57.42	141.03	-	-	-	-	-	-	-	-	-	

Notes:

1. Refer to the Proposed Conditions Watershed Map for a depiction of existing watersheds, flow paths, BMPs, and location of downstream design points.
2. Calculations for proposed conditions Drainage Areas, Curve Numbers, Time of Concentrations, Peak Flow Rates, and Runoff Volumes are provided in Appendix A.
3. Calculations for proposed conditions Water Quality Volume (WQV) and Water Quality Flow (WQF) are provided in Appendix C.

TABLE OF CONTENTS

Project Reports
1 Routing Diagram
2 Rainfall Events Listing
3 Area Listing (all nodes)

2yr Event
4 Node Listing
7 Subcat 1S: PrWS A-1
8 Subcat 2S: PrWS B-1
10 Subcat 3S: PrWS B-2
11 Subcat 5S: PrWS B-3
12 Subcat 7S: PrWS B-4
14 Subcat 9S: PrWS B-5
15 Subcat 12S: PrWS C-1
16 Subcat 13S: PrWS D-1
17 Subcat 14S: PrWS D-2
18 Subcat 17S: PrWS E-1
19 Subcat 18S: PrWS E-2
21 Subcat 22S: PrWS F-1
22 Subcat 23S: PrWS F-2
24 Subcat 25S: PrWS F-3
26 Subcat 28S: PrWS G-1a
27 Subcat 29S: PrWS G-1b
29 Subcat 30S: PrWS G-1c
30 Subcat 31S: PrWS G-2
31 Pond 4P: UG Detention System B-2
34 Pond 6P: UG Detention System B-3
37 Pond 8P: Extended Detention Basin B-4
39 Pond 10P: Extended Detention Basin B-5
41 Pond 15P: Infiltration Basin D-2
43 Pond 19P: Infiltration Basin E-2
45 Pond 20P: Existing Basin E-1
47 Pond 24P: Infiltration Basin F-2
49 Pond 26P: Infiltration Basin F-3
51 Pond 32P: Infiltration Basin G-2
53 Link 11L: Design Point: B
54 Link 16L: Design Point: D
55 Link 21L: Design Point: E
56 Link 27L: Design Point: F
57 Link 33L: Design Point: G

10yr Event
58 Node Listing
61 Subcat 1S: PrWS A-1
62 Subcat 2S: PrWS B-1
64 Subcat 3S: PrWS B-2

65 Subcat 5S: PrWS B-3
66 Subcat 7S: PrWS B-4
68 Subcat 9S: PrWS B-5
69 Subcat 12S: PrWS C-1
70 Subcat 13S: PrWS D-1
71 Subcat 14S: PrWS D-2
72 Subcat 17S: PrWS E-1
73 Subcat 18S: PrWS E-2
75 Subcat 22S: PrWS F-1
76 Subcat 23S: PrWS F-2
78 Subcat 25S: PrWS F-3
80 Subcat 28S: PrWS G-1a
81 Subcat 29S: PrWS G-1b
83 Subcat 30S: PrWS G-1c
84 Subcat 31S: PrWS G-2
85 Pond 4P: UG Detention System B-2
88 Pond 6P: UG Detention System B-3
91 Pond 8P: Extended Detention Basin B-4
93 Pond 10P: Extended Detention Basin B-5
95 Pond 15P: Infiltration Basin D-2
97 Pond 19P: Infiltration Basin E-2
99 Pond 20P: Existing Basin E-1
101 Pond 24P: Infiltration Basin F-2
103 Pond 26P: Infiltration Basin F-3
105 Pond 32P: Infiltration Basin G-2
107 Link 11L: Design Point: B
108 Link 16L: Design Point: D
109 Link 21L: Design Point: E
110 Link 27L: Design Point: F
111 Link 33L: Design Point: G

25yr Event
112 Node Listing
115 Subcat 1S: PrWS A-1
116 Subcat 2S: PrWS B-1
118 Subcat 3S: PrWS B-2
119 Subcat 5S: PrWS B-3
120 Subcat 7S: PrWS B-4
122 Subcat 9S: PrWS B-5
123 Subcat 12S: PrWS C-1
124 Subcat 13S: PrWS D-1
125 Subcat 14S: PrWS D-2
126 Subcat 17S: PrWS E-1
127 Subcat 18S: PrWS E-2
129 Subcat 22S: PrWS F-1
130 Subcat 23S: PrWS F-2
132 Subcat 25S: PrWS F-3
134 Subcat 28S: PrWS G-1a

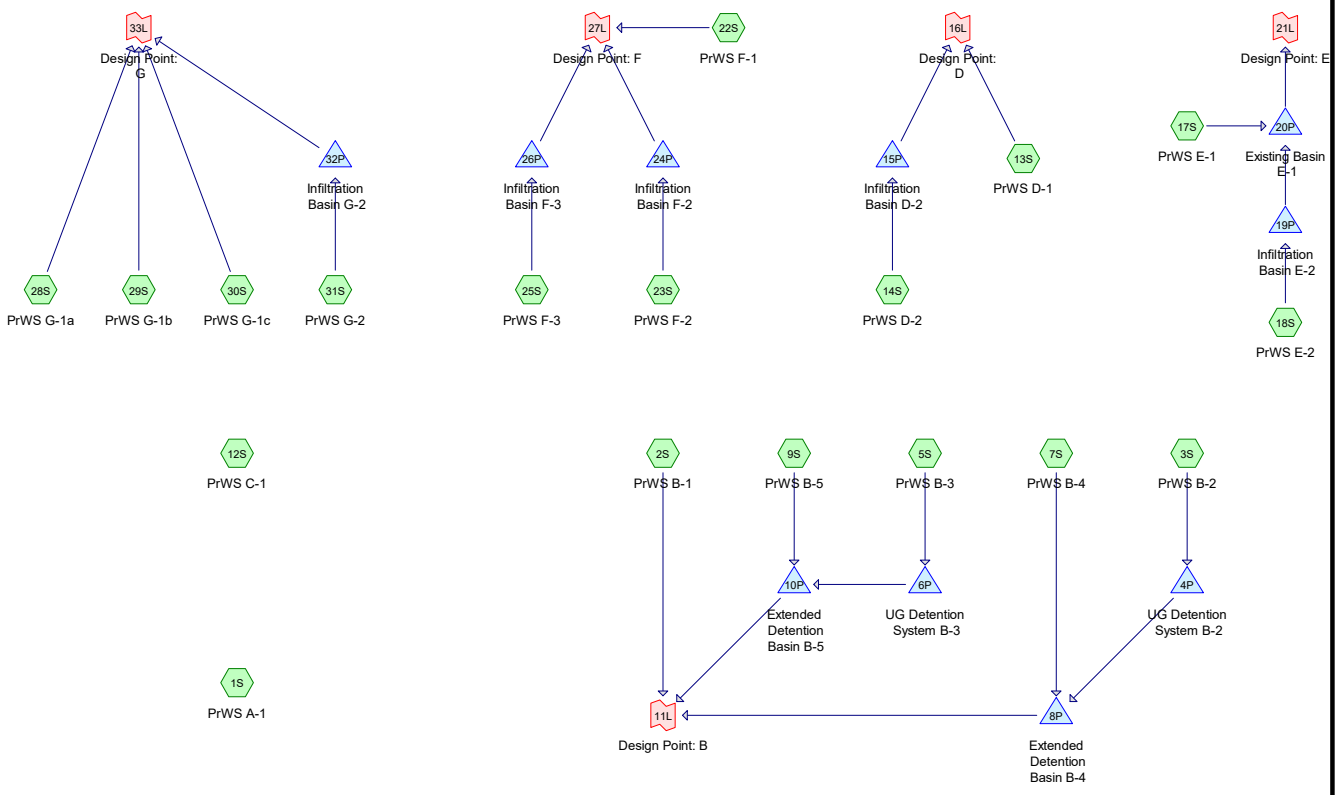
135 Subcat 29S: PrWS G-1b
137 Subcat 30S: PrWS G-1c
138 Subcat 31S: PrWS G-2
139 Pond 4P: UG Detention System B-2
142 Pond 6P: UG Detention System B-3
145 Pond 8P: Extended Detention Basin B-4
147 Pond 10P: Extended Detention Basin B-5
149 Pond 15P: Infiltration Basin D-2
151 Pond 19P: Infiltration Basin E-2
153 Pond 20P: Existing Basin E-1
155 Pond 24P: Infiltration Basin F-2
157 Pond 26P: Infiltration Basin F-3
159 Pond 32P: Infiltration Basin G-2
161 Link 11L: Design Point: B
162 Link 16L: Design Point: D
163 Link 21L: Design Point: E
164 Link 27L: Design Point: F
165 Link 33L: Design Point: G

50yr Event
166 Node Listing
169 Subcat 1S: PrWS A-1
170 Subcat 2S: PrWS B-1
172 Subcat 3S: PrWS B-2
173 Subcat 5S: PrWS B-3
174 Subcat 7S: PrWS B-4
176 Subcat 9S: PrWS B-5
177 Subcat 12S: PrWS C-1
178 Subcat 13S: PrWS D-1
179 Subcat 14S: PrWS D-2
180 Subcat 17S: PrWS E-1
181 Subcat 18S: PrWS E-2
183 Subcat 22S: PrWS F-1
184 Subcat 23S: PrWS F-2
186 Subcat 25S: PrWS F-3
188 Subcat 28S: PrWS G-1a
189 Subcat 29S: PrWS G-1b
191 Subcat 30S: PrWS G-1c
192 Subcat 31S: PrWS G-2
193 Pond 4P: UG Detention System B-2
196 Pond 6P: UG Detention System B-3
199 Pond 8P: Extended Detention Basin B-4
201 Pond 10P: Extended Detention Basin B-5
203 Pond 15P: Infiltration Basin D-2
205 Pond 19P: Infiltration Basin E-2
207 Pond 20P: Existing Basin E-1
209 Pond 24P: Infiltration Basin F-2
211 Pond 26P: Infiltration Basin F-3

213 Pond 32P: Infiltration Basin G-2
215 Link 11L: Design Point: B
216 Link 16L: Design Point: D
217 Link 21L: Design Point: E
218 Link 27L: Design Point: F
219 Link 33L: Design Point: G

100yr Event

220 Node Listing
223 Subcat 1S: PrWS A-1
224 Subcat 2S: PrWS B-1
226 Subcat 3S: PrWS B-2
227 Subcat 5S: PrWS B-3
228 Subcat 7S: PrWS B-4
230 Subcat 9S: PrWS B-5
231 Subcat 12S: PrWS C-1
232 Subcat 13S: PrWS D-1
233 Subcat 14S: PrWS D-2
234 Subcat 17S: PrWS E-1
235 Subcat 18S: PrWS E-2
237 Subcat 22S: PrWS F-1
238 Subcat 23S: PrWS F-2
240 Subcat 25S: PrWS F-3
242 Subcat 28S: PrWS G-1a
243 Subcat 29S: PrWS G-1b
245 Subcat 30S: PrWS G-1c
246 Subcat 31S: PrWS G-2
247 Pond 4P: UG Detention System B-2
250 Pond 6P: UG Detention System B-3
253 Pond 8P: Extended Detention Basin B-4
255 Pond 10P: Extended Detention Basin B-5
257 Pond 15P: Infiltration Basin D-2
259 Pond 19P: Infiltration Basin E-2
261 Pond 20P: Existing Basin E-1
263 Pond 24P: Infiltration Basin F-2
265 Pond 26P: Infiltration Basin F-3
267 Pond 32P: Infiltration Basin G-2
269 Link 11L: Design Point: B
270 Link 16L: Design Point: D
271 Link 21L: Design Point: E
272 Link 27L: Design Point: F
273 Link 33L: Design Point: G



Subcat Reach Pond Link

Routing Diagram for 20220501 Proposed Conditions

Prepared by Langan Engineering and Environmental Services, Printed 5/1/2022

HydroCAD® 10.10-6a s/n 11011 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2yr	Type III 24-hr		Default	24.00	1	3.31	2
2	10yr	Type III 24-hr		Default	24.00	1	5.16	2
3	25yr	Type III 24-hr		Default	24.00	1	6.31	2
4	50yr	Type III 24-hr		Default	24.00	1	7.16	2
5	100yr	Type III 24-hr		Default	24.00	1	8.09	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
53.31	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S, 7S, 9S, 12S, 13S, 14S, 17S, 18S, 22S, 23S)
31.35	61	>75% Grass cover, Good, HSG B (1S, 2S, 3S, 9S, 12S, 13S, 14S, 18S, 22S, 23S, 25S, 28S, 29S, 30S, 31S)
5.85	74	>75% Grass cover, Good, HSG C (1S, 2S, 7S, 18S)
57.42	98	Paved parking, HSG A (1S, 2S, 3S, 5S, 7S, 9S, 14S, 18S, 23S, 25S, 28S, 30S, 31S)
10.86	30	Woods, Good, HSG A (1S, 2S, 12S, 13S, 17S, 22S)
31.67	55	Woods, Good, HSG B (12S, 22S, 28S, 29S, 31S)
7.99	77	Woods, Good, HSG D (2S, 12S, 17S, 22S, 28S)
198.45	**64**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: PrWS A-1 Runoff Area=1.67 ac 2.99% Impervious Runoff Depth=0.07"
Flow Length=100' Slope=0.0150 '/' Tc=16 min CN=46 Runoff=0.02 cfs 0.010 af

Subcatchment 2S: PrWS B-1 Runoff Area=26.29 ac 2.21% Impervious Runoff Depth=0.07"
Flow Length=820' Tc=22 min CN=46 Runoff=0.25 cfs 0.160 af

Subcatchment 3S: PrWS B-2 Runoff Area=23.96 ac 92.36% Impervious Runoff Depth=2.65"
Tc=5 min CN=94 Runoff=73.74 cfs 5.293 af

Subcatchment 5S: PrWS B-3 Runoff Area=11.97 ac 100.00% Impervious Runoff Depth=3.08"
Tc=5 min CN=98 Runoff=39.88 cfs 3.069 af

Subcatchment 7S: PrWS B-4 Runoff Area=7.41 ac 36.03% Impervious Runoff Depth=1.00"
Flow Length=854' Tc=10 min CN=72 Runoff=7.03 cfs 0.617 af

Subcatchment 9S: PrWS B-5 Runoff Area=16.31 ac 66.95% Impervious Runoff Depth=1.49"
Tc=5 min CN=80 Runoff=29.24 cfs 2.021 af

Subcatchment 12S: PrWS C-1 Runoff Area=15.48 ac 0.00% Impervious Runoff Depth=0.25"
Flow Length=540' Tc=23 min CN=54 Runoff=1.29 cfs 0.329 af

Subcatchment 13S: PrWS D-1 Runoff Area=23.11 ac 0.00% Impervious Runoff Depth=0.13"
Flow Length=550' Tc=16 min CN=49 Runoff=0.45 cfs 0.250 af

Subcatchment 14S: PrWS D-2 Runoff Area=7.58 ac 66.75% Impervious Runoff Depth=1.49"
Tc=5 min CN=80 Runoff=13.59 cfs 0.939 af

Subcatchment 17S: PrWS E-1 Runoff Area=5.81 ac 0.00% Impervious Runoff Depth=0.01"
Flow Length=225' Tc=10 min CN=40 Runoff=0.01 cfs 0.003 af

Subcatchment 18S: PrWS E-2 Runoff Area=9.75 ac 10.15% Impervious Runoff Depth=0.15"
Flow Length=1,010' Tc=25 min CN=50 Runoff=0.26 cfs 0.123 af

Subcatchment 22S: PrWS F-1 Runoff Area=34.38 ac 0.00% Impervious Runoff Depth=0.28"
Flow Length=618' Slope=0.0400 '/' Tc=31 min CN=55 Runoff=3.12 cfs 0.814 af

Subcatchment 23S: PrWS F-2 Runoff Area=2.41 ac 51.45% Impervious Runoff Depth=1.35"
Flow Length=637' Tc=7 min CN=78 Runoff=3.63 cfs 0.272 af

Subcatchment 25S: PrWS F-3 Runoff Area=1.79 ac 46.37% Impervious Runoff Depth=1.35"
Flow Length=487' Tc=5 min CN=78 Runoff=2.90 cfs 0.202 af

Subcatchment 28S: PrWS G-1a Runoff Area=4.52 ac 9.51% Impervious Runoff Depth=0.70"
Flow Length=250' Tc=21 min CN=66 Runoff=2.02 cfs 0.263 af

Subcatchment 29S: PrWS G-1b Runoff Area=4.63 ac 0.00% Impervious Runoff Depth=0.38"
Flow Length=855' Tc=38 min CN=58 Runoff=0.64 cfs 0.147 af

Subcatchment 30S: PrWS G-1c Runoff Area=0.82 ac 47.56% Impervious Runoff Depth=1.42"
Tc=5 min CN=79 Runoff=1.40 cfs 0.097 af

Subcatchment 31S: PrWS G-2 Runoff Area=0.56 ac 28.57% Impervious Runoff Depth=0.94"
Tc=5 min CN=71 Runoff=0.59 cfs 0.044 af

Pond 4P: UG Detention System B-2 Peak Elev=135.93' Storage=230,542 cf Inflow=73.74 cfs 5.293 af
Outflow=0.00 cfs 0.000 af

Pond 6P: UG Detention System B-3 Peak Elev=136.20' Storage=2.609 af Inflow=39.88 cfs 3.069 af
Outflow=0.87 cfs 0.666 af

Pond 8P: Extended Detention Basin B-4 Peak Elev=133.29' Storage=21,183 cf Inflow=7.03 cfs 0.617 af
Outflow=0.15 cfs 0.358 af

Pond 10P: Extended Detention Basin B-5 Peak Elev=133.33' Storage=103,511 cf Inflow=29.24 cfs 2.687 af
Outflow=0.24 cfs 0.625 af

Pond 15P: Infiltration Basin D-2 Peak Elev=132.75' Storage=40,916 cf Inflow=13.59 cfs 0.939 af
Outflow=0.00 cfs 0.000 af

Pond 19P: Infiltration Basin E-2 Peak Elev=138.66' Storage=5,370 cf Inflow=0.26 cfs 0.123 af
Outflow=0.00 cfs 0.000 af

Pond 20P: Existing Basin E-1 Peak Elev=130.21' Storage=132 cf Inflow=0.01 cfs 0.003 af
Outflow=0.00 cfs 0.000 af

Pond 24P: Infiltration Basin F-2 Peak Elev=131.13' Storage=11,850 cf Inflow=3.63 cfs 0.272 af
Outflow=0.00 cfs 0.000 af

Pond 26P: Infiltration Basin F-3 Peak Elev=132.50' Storage=8,801 cf Inflow=2.90 cfs 0.202 af
Outflow=0.00 cfs 0.000 af

Pond 32P: Infiltration Basin G-2 Peak Elev=132.93' Storage=1,921 cf Inflow=0.59 cfs 0.044 af
Outflow=0.00 cfs 0.000 af

Link 11L: Design Point: B Inflow=0.55 cfs 1.143 af
Primary=0.55 cfs 1.143 af

Link 16L: Design Point: D Inflow=0.45 cfs 0.250 af
Primary=0.45 cfs 0.250 af

Link 21L: Design Point: E Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 27L: Design Point: F Inflow=3.12 cfs 0.814 af
Primary=3.12 cfs 0.814 af

Link 33L: Design Point: G Inflow=2.80 cfs 0.507 af
Primary=2.80 cfs 0.507 af

Total Runoff Area = 198.45 ac Runoff Volume = 14.653 af Average Runoff Depth = 0.89"
71.07% Pervious = 141.03 ac 28.93% Impervious = 57.42 ac

Summary for Subcatchment 1S: PrWS A-1

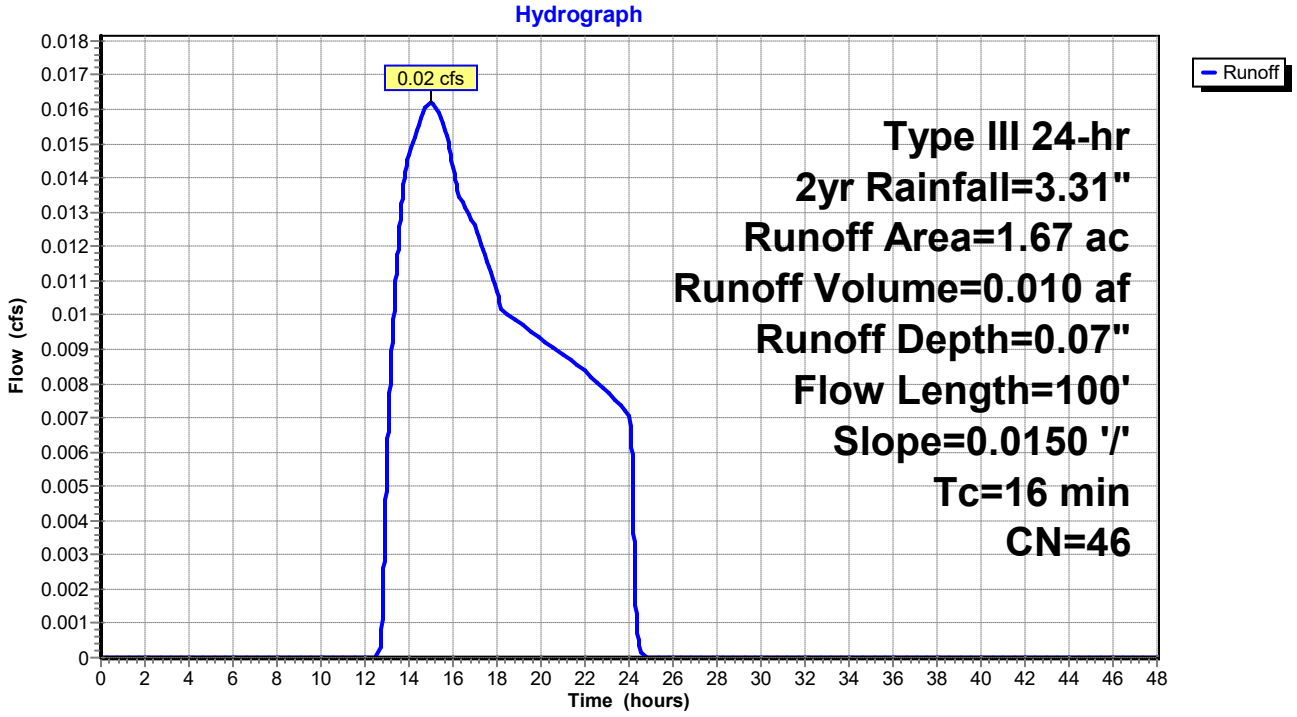
Runoff = 0.02 cfs @ 14.99 hrs, Volume= 0.010 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
0.05	98	Paved parking, HSG A
1.26	39	>75% Grass cover, Good, HSG A
0.12	61	>75% Grass cover, Good, HSG B
0.18	74	>75% Grass cover, Good, HSG C
0.06	30	Woods, Good, HSG A
1.67	46	Weighted Average
1.62		97.01% Pervious Area
0.05		2.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16	100	0.0150	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"

Subcatchment 1S: PrWS A-1



Summary for Subcatchment 2S: PrWS B-1

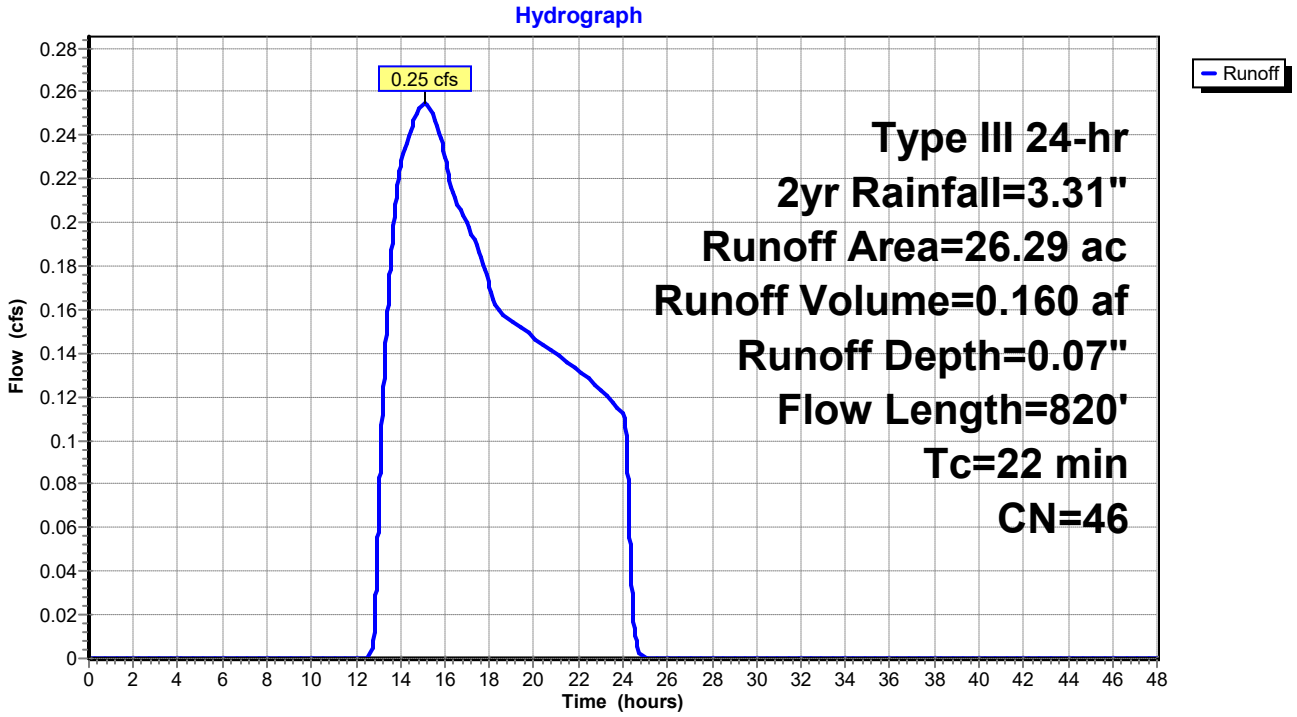
Runoff = 0.25 cfs @ 15.08 hrs, Volume= 0.160 af, Depth= 0.07"
Routed to Link 11L : Design Point: B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
0.58	98	Paved parking, HSG A
16.93	39	>75% Grass cover, Good, HSG A
0.01	61	>75% Grass cover, Good, HSG B
2.83	74	>75% Grass cover, Good, HSG C
3.94	30	Woods, Good, HSG A
2.00	77	Woods, Good, HSG D
26.29	46	Weighted Average
25.71		97.79% Pervious Area
0.58		2.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16	100	0.0150	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
4	475	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	55	0.0820	4.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2	190	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
22	820	Total			

Subcatchment 2S: PrWS B-1



Summary for Subcatchment 3S: PrWS B-2

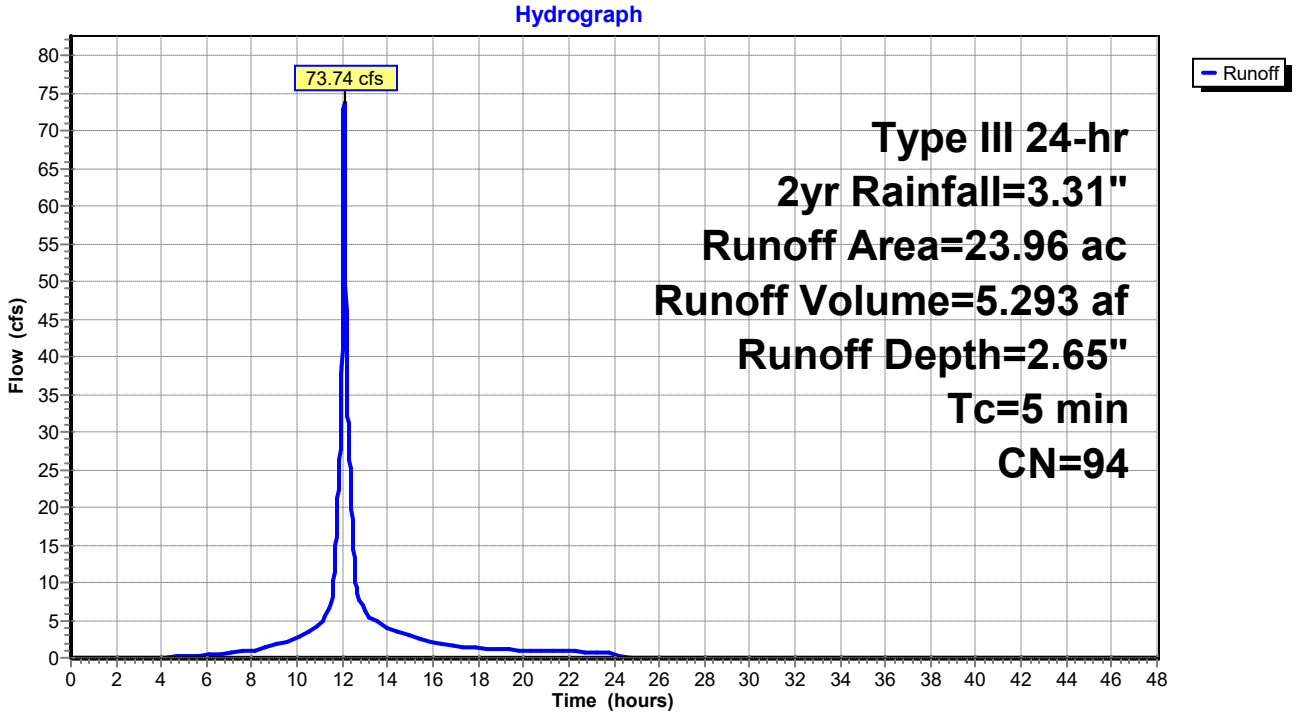
Runoff = 73.74 cfs @ 12.07 hrs, Volume= 5.293 af, Depth= 2.65"
Routed to Pond 4P : UG Detention System B-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
22.13	98	Paved parking, HSG A
1.76	39	>75% Grass cover, Good, HSG A
0.07	61	>75% Grass cover, Good, HSG B
23.96	94	Weighted Average
1.83		7.64% Pervious Area
22.13		92.36% Impervious Area

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

Subcatchment 3S: PrWS B-2



Summary for Subcatchment 5S: PrWS B-3

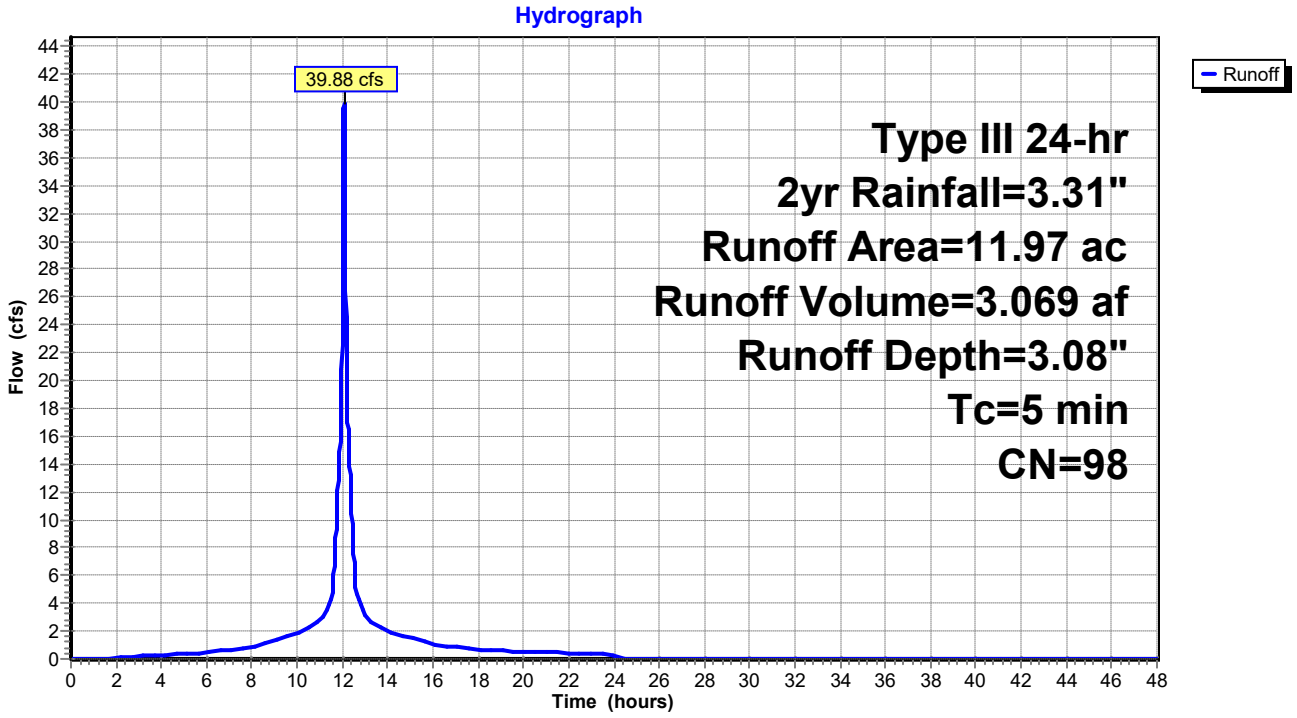
Runoff = 39.88 cfs @ 12.07 hrs, Volume= 3.069 af, Depth= 3.08"
Routed to Pond 6P : UG Detention System B-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
11.97	98	Paved parking, HSG A
11.97		100.00% Impervious Area

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

Subcatchment 5S: PrWS B-3



Summary for Subcatchment 7S: PrWS B-4

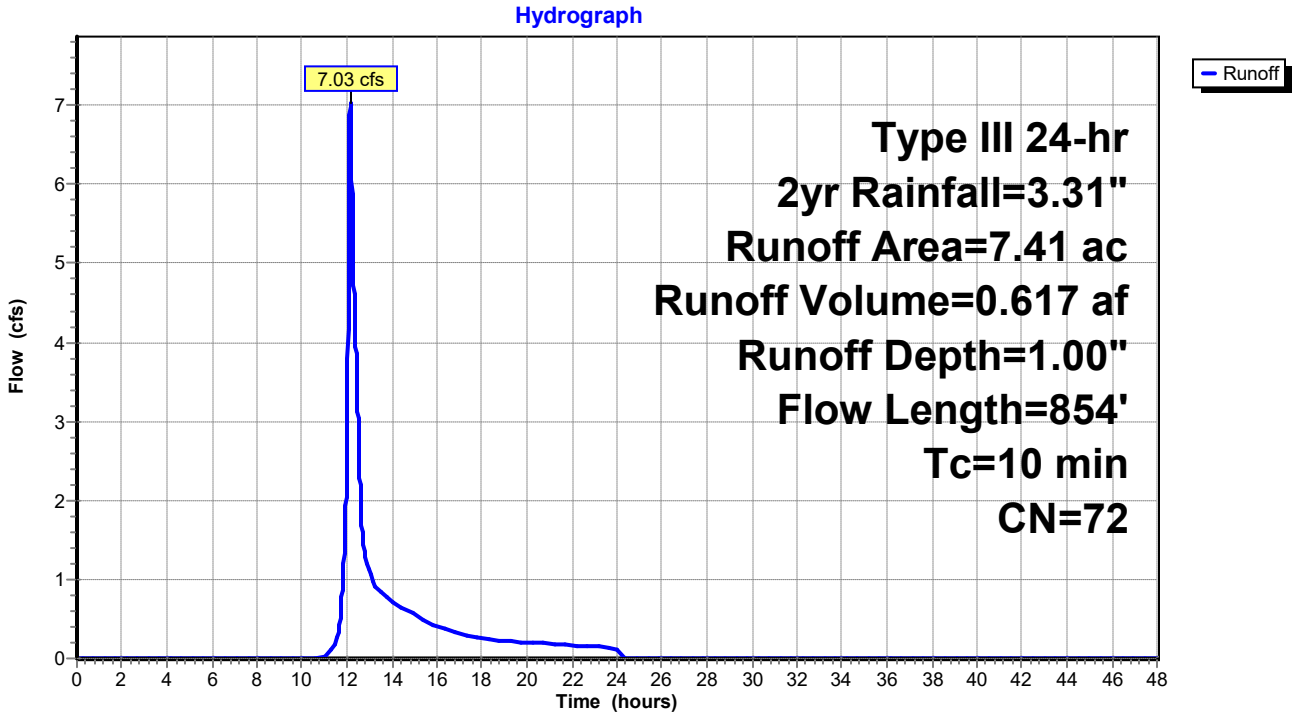
Runoff = 7.03 cfs @ 12.15 hrs, Volume= 0.617 af, Depth= 1.00"
Routed to Pond 8P : Extended Detention Basin B-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
2.67	98	Paved parking, HSG A
2.34	39	>75% Grass cover, Good, HSG A
2.40	74	>75% Grass cover, Good, HSG C
7.41	72	Weighted Average
4.74		63.97% Pervious Area
2.67		36.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8	100	0.0870	0.21		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	70	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	44	0.0170	5.91	4.65	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
2	640	0.0030	6.26	78.68	**Pipe Channel,** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
10	854	Total			

Subcatchment 7S: PrWS B-4



Summary for Subcatchment 9S: PrWS B-5

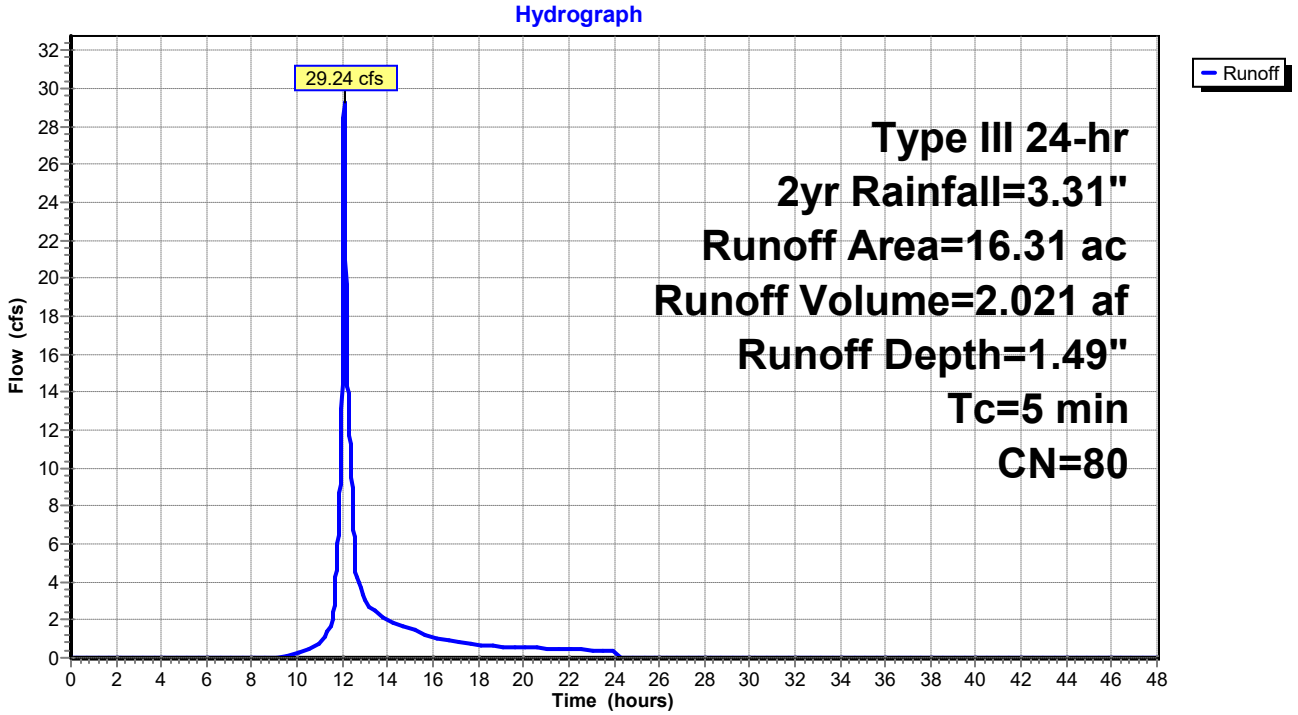
Runoff = 29.24 cfs @ 12.08 hrs, Volume= 2.021 af, Depth= 1.49"
Routed to Pond 10P : Extended Detention Basin B-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
10.92	98	Paved parking, HSG A
4.39	39	>75% Grass cover, Good, HSG A
1.00	61	>75% Grass cover, Good, HSG B
16.31	80	Weighted Average
5.39		33.05% Pervious Area
10.92		66.95% Impervious Area

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

Subcatchment 9S: PrWS B-5



Summary for Subcatchment 12S: PrWS C-1

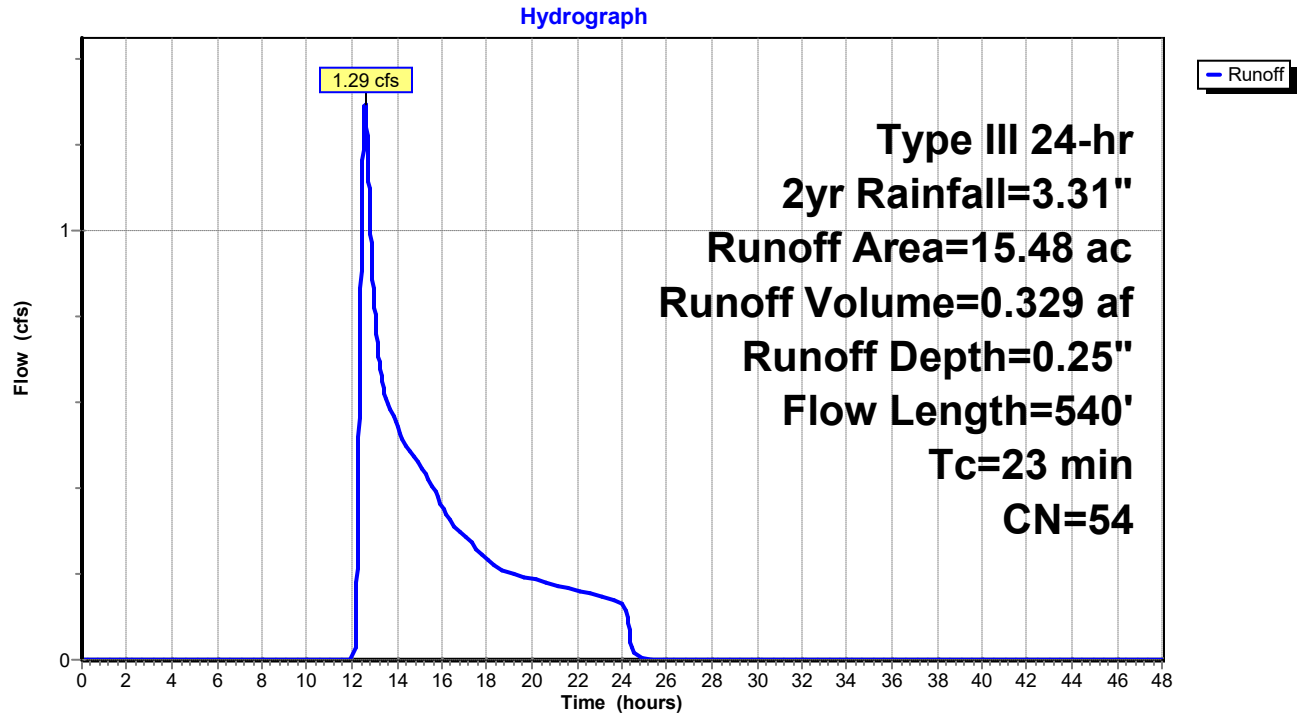
Runoff = 1.29 cfs @ 12.60 hrs, Volume= 0.329 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
2.82	39	>75% Grass cover, Good, HSG A
4.75	61	>75% Grass cover, Good, HSG B
1.44	30	Woods, Good, HSG A
4.44	55	Woods, Good, HSG B
2.03	77	Woods, Good, HSG D
15.48	54	Weighted Average
15.48		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	100	0.0100	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
4	395	0.0090	1.53		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	45	0.0220	2.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
23	540	Total			

Subcatchment 12S: PrWS C-1



Summary for Subcatchment 13S: PrWS D-1

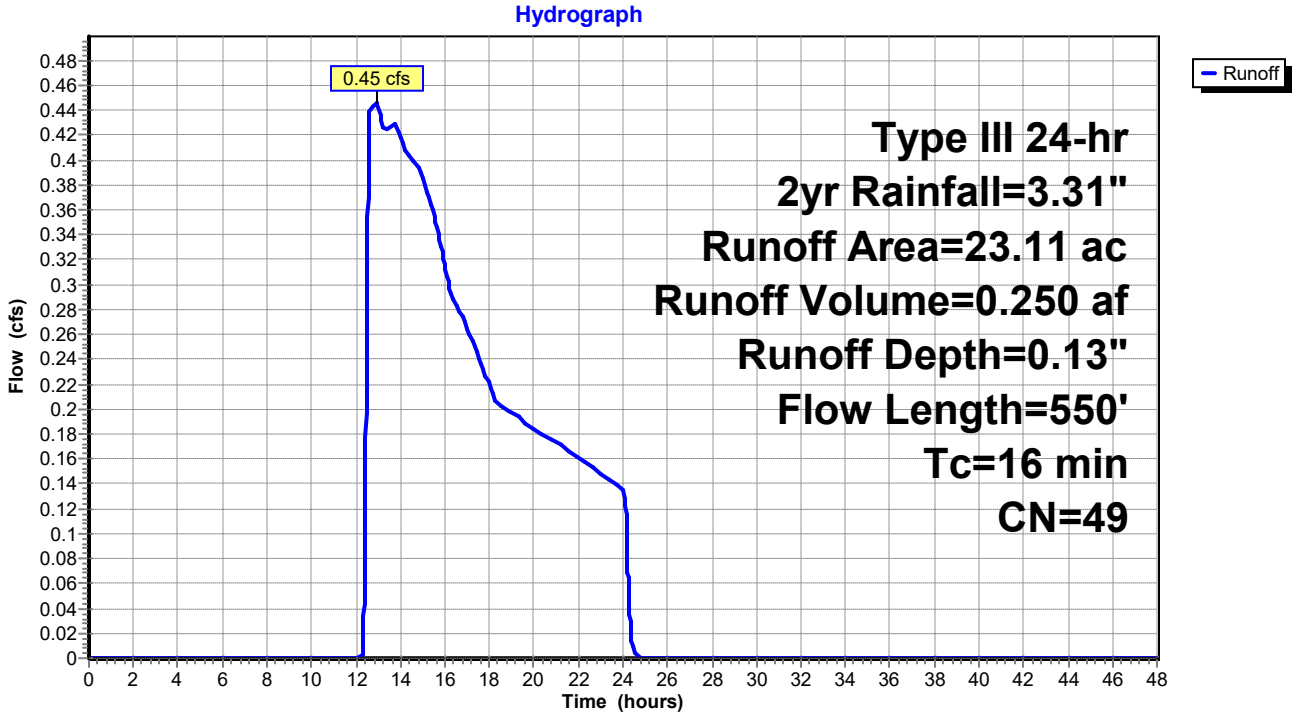
Runoff = 0.45 cfs @ 12.96 hrs, Volume= 0.250 af, Depth= 0.13"
Routed to Link 16L : Design Point: D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
12.27	39	>75% Grass cover, Good, HSG A
10.58	61	>75% Grass cover, Good, HSG B
0.26	30	Woods, Good, HSG A
23.11	49	Weighted Average
23.11		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0300	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	165	0.0240	2.49		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	285	0.0080	1.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16	550	Total			

Subcatchment 13S: PrWS D-1



Summary for Subcatchment 14S: PrWS D-2

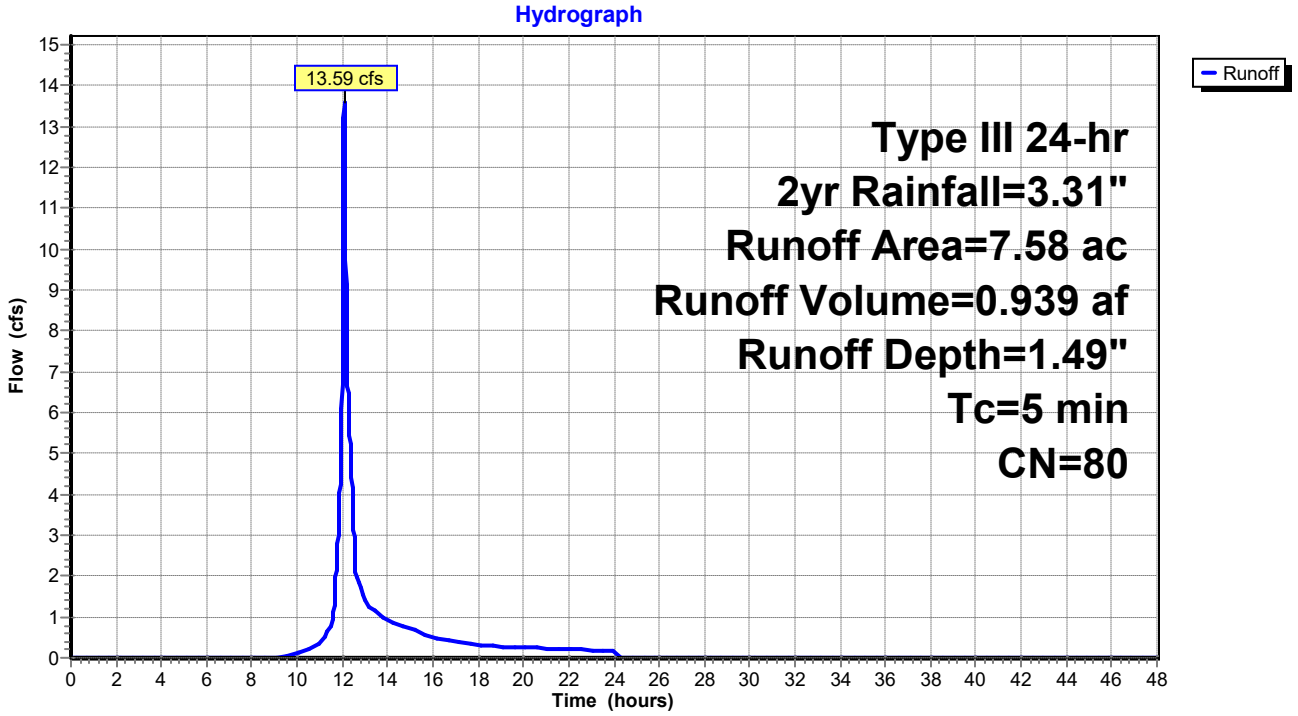
Runoff = 13.59 cfs @ 12.08 hrs, Volume= 0.939 af, Depth= 1.49"
Routed to Pond 15P : Infiltration Basin D-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
5.06	98	Paved parking, HSG A
1.90	39	>75% Grass cover, Good, HSG A
0.62	61	>75% Grass cover, Good, HSG B
7.58	80	Weighted Average
2.52		33.25% Pervious Area
5.06		66.75% Impervious Area

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

Subcatchment 14S: PrWS D-2



Summary for Subcatchment 17S: PrWS E-1

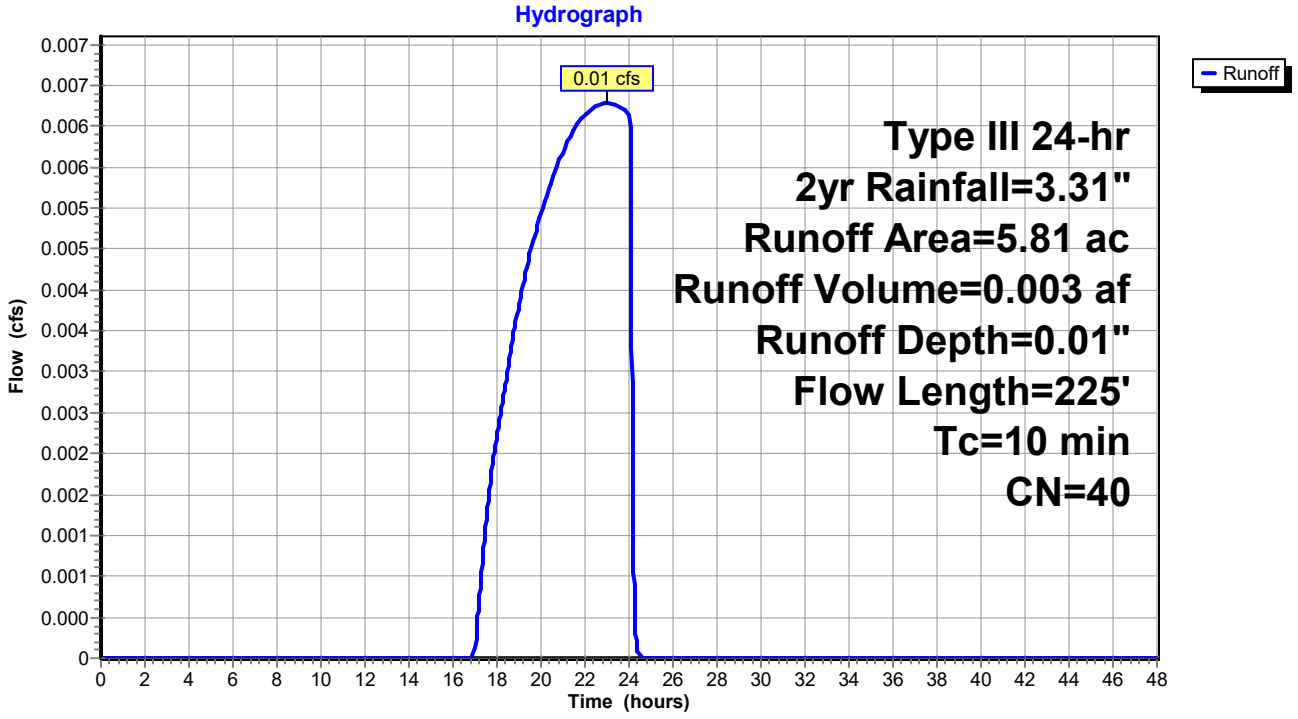
Runoff = 0.01 cfs @ 22.99 hrs, Volume= 0.003 af, Depth= 0.01"
Routed to Pond 20P : Existing Basin E-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
1.91	39	>75% Grass cover, Good, HSG A
2.97	30	Woods, Good, HSG A
0.93	77	Woods, Good, HSG D
5.81	40	Weighted Average
5.81		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	100	0.0650	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	25	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	100	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10	225	Total			

Subcatchment 17S: PrWS E-1



Summary for Subcatchment 18S: PrWS E-2

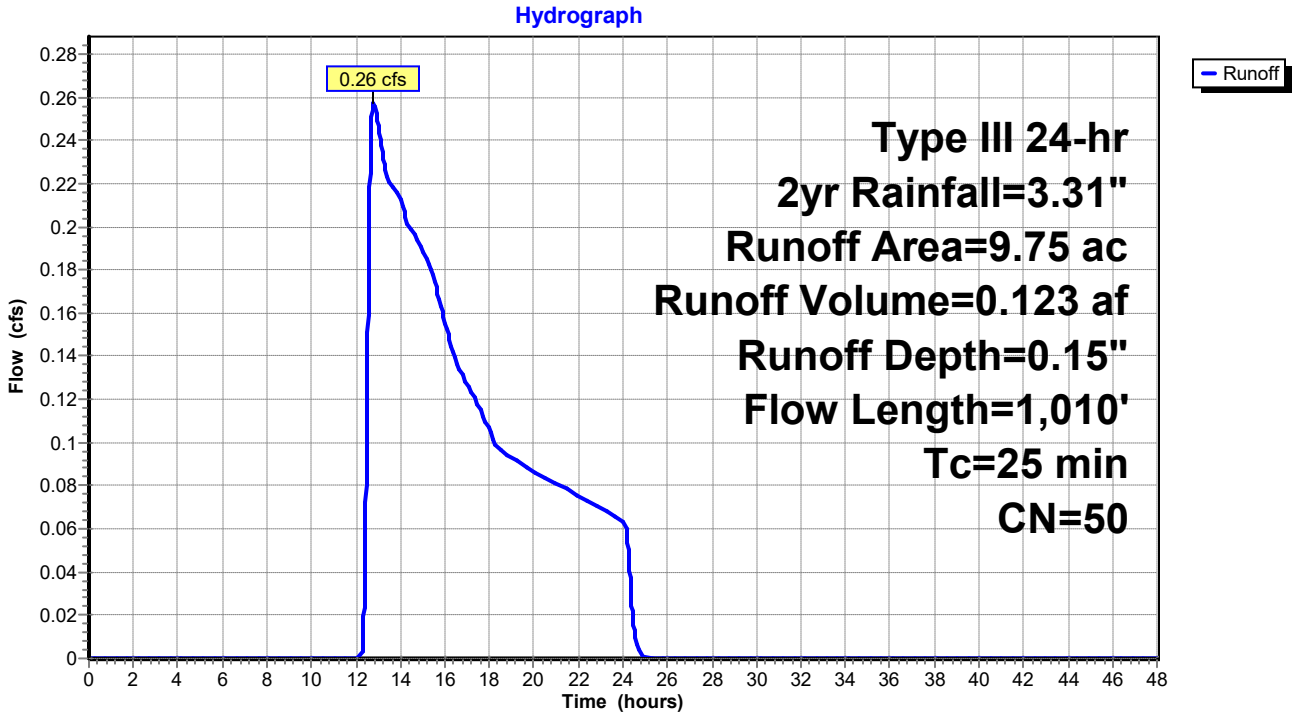
Runoff = 0.26 cfs @ 12.80 hrs, Volume= 0.123 af, Depth= 0.15"
Routed to Pond 19P : Infiltration Basin E-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
0.99	98	Paved parking, HSG A
6.78	39	>75% Grass cover, Good, HSG A
1.54	61	>75% Grass cover, Good, HSG B
0.44	74	>75% Grass cover, Good, HSG C
9.75	50	Weighted Average
8.76		89.85% Pervious Area
0.99		10.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13	100	0.0230	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
7	550	0.0060	1.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4	250	0.0040	1.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	110	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
25	1,010	Total			

Subcatchment 18S: PrWS E-2



Summary for Subcatchment 22S: PrWS F-1

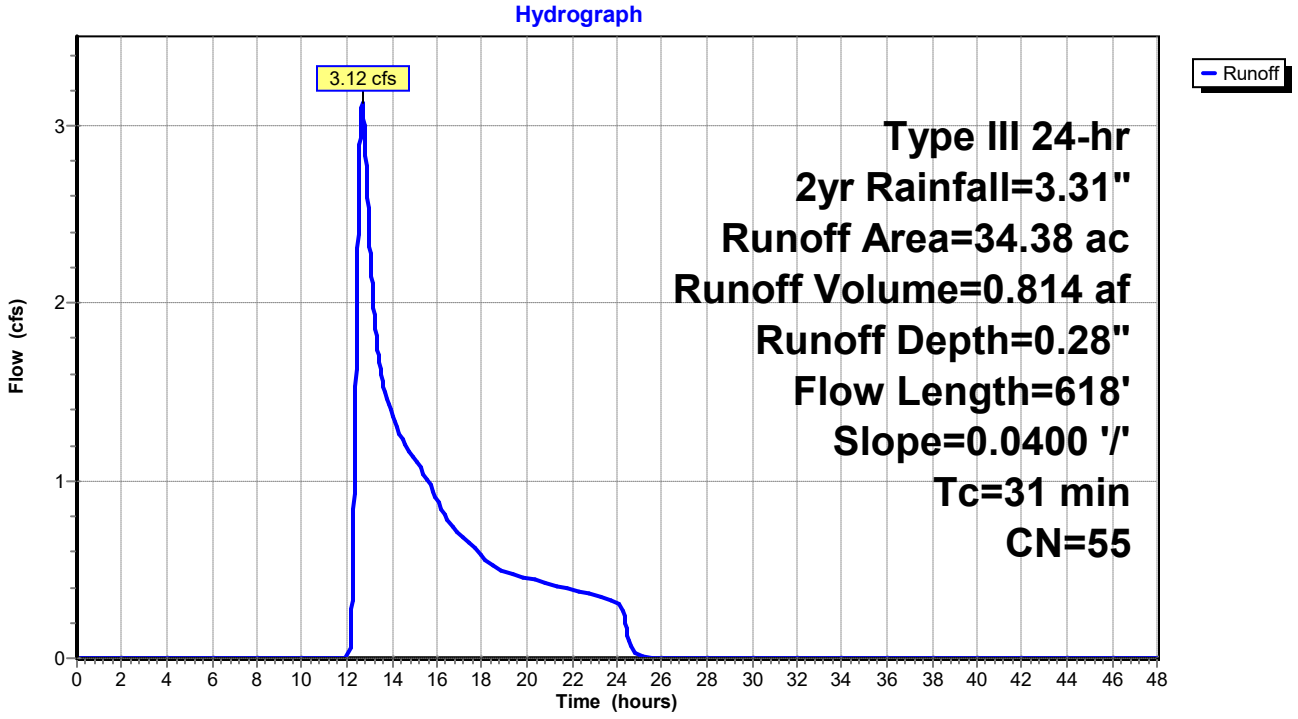
Runoff = 3.12 cfs @ 12.68 hrs, Volume= 0.814 af, Depth= 0.28"
Routed to Link 27L : Design Point: F

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
0.71	39	>75% Grass cover, Good, HSG A
6.24	61	>75% Grass cover, Good, HSG B
2.19	30	Woods, Good, HSG A
23.23	55	Woods, Good, HSG B
2.01	77	Woods, Good, HSG D
34.38	55	Weighted Average
34.38		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	518	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
31	618	Total			

Subcatchment 22S: PrWS F-1



Summary for Subcatchment 23S: PrWS F-2

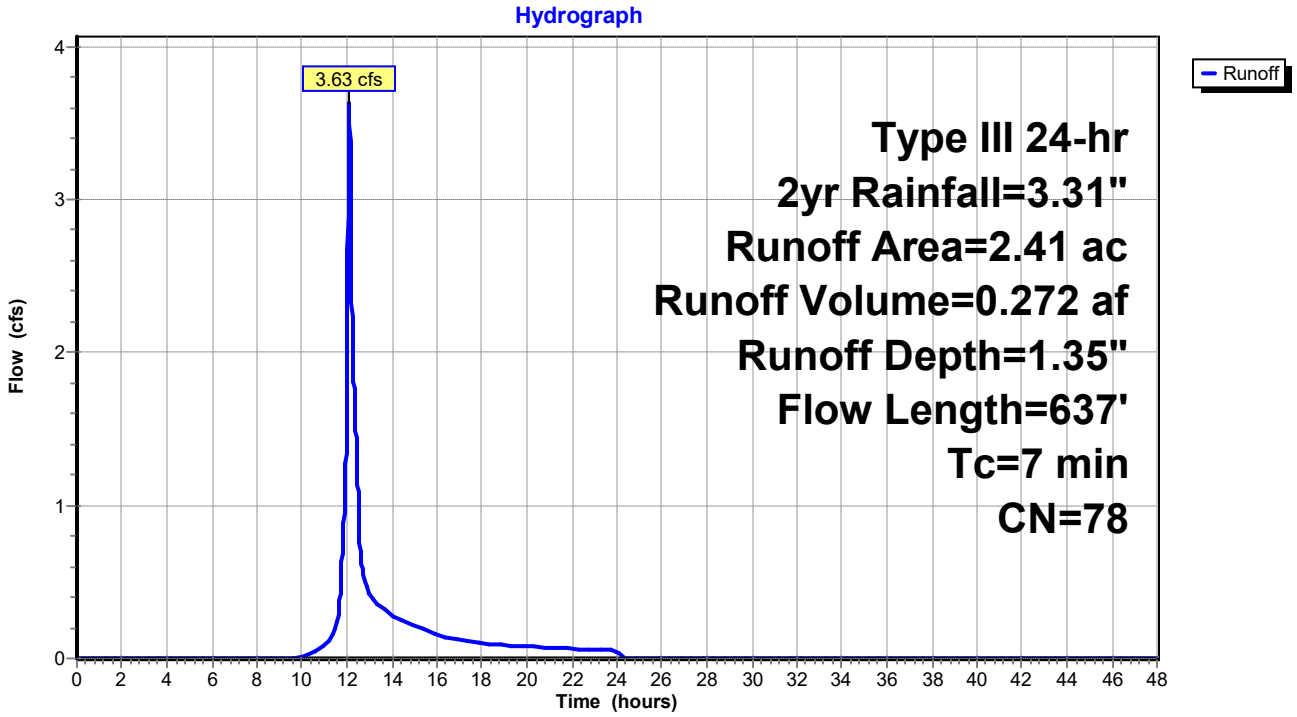
Runoff = 3.63 cfs @ 12.11 hrs, Volume= 0.272 af, Depth= 1.35"
Routed to Pond 24P : Infiltration Basin F-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
1.24	98	Paved parking, HSG A
0.24	39	>75% Grass cover, Good, HSG A
0.93	61	>75% Grass cover, Good, HSG B
2.41	78	Weighted Average
1.17		48.55% Pervious Area
1.24		51.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.31"
1	100	0.0060	1.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	15	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5	475	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	12	0.3330	9.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7	637	Total			

Subcatchment 23S: PrWS F-2



Summary for Subcatchment 25S: PrWS F-3

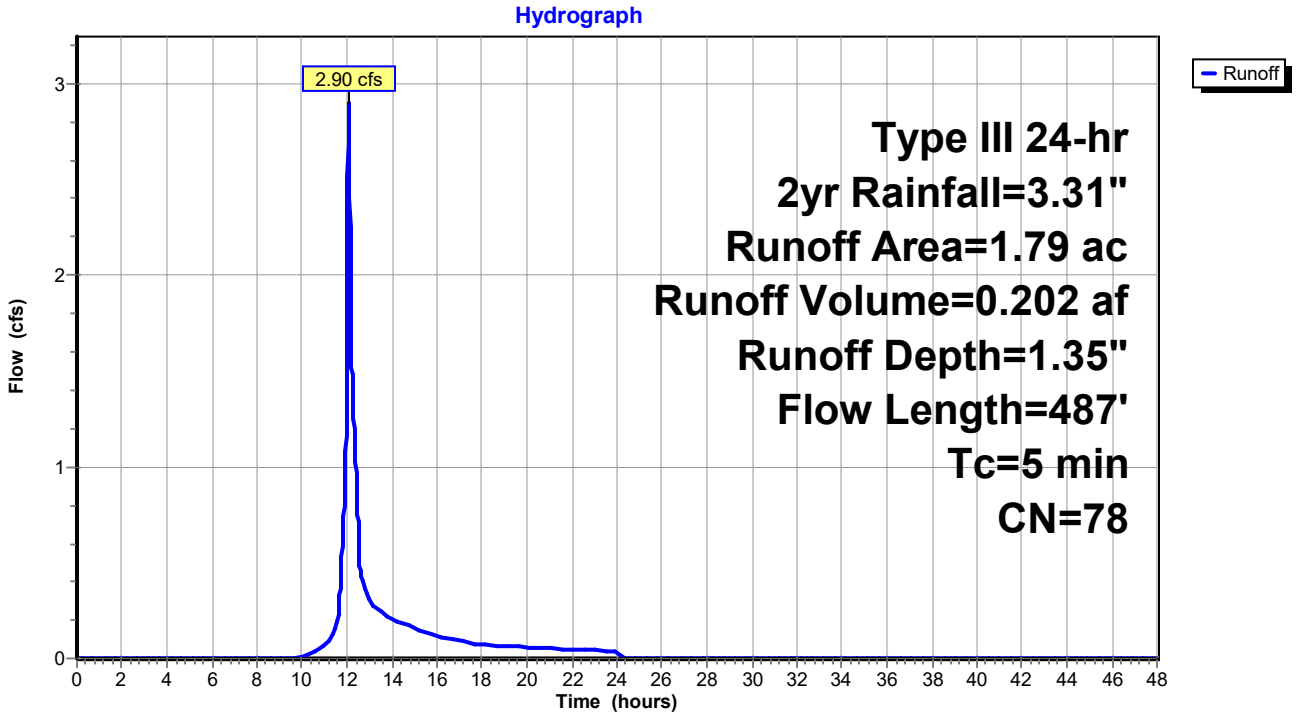
Runoff = 2.90 cfs @ 12.08 hrs, Volume= 0.202 af, Depth= 1.35"
Routed to Pond 26P : Infiltration Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
0.83	98	Paved parking, HSG A
0.96	61	>75% Grass cover, Good, HSG B
1.79	78	Weighted Average
0.96		53.63% Pervious Area
0.83		46.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.31"
1	100	0.0060	1.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	15	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	325	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	12	0.3330	9.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5	487	Total			

Subcatchment 25S: PrWS F-3



Summary for Subcatchment 28S: PrWS G-1a

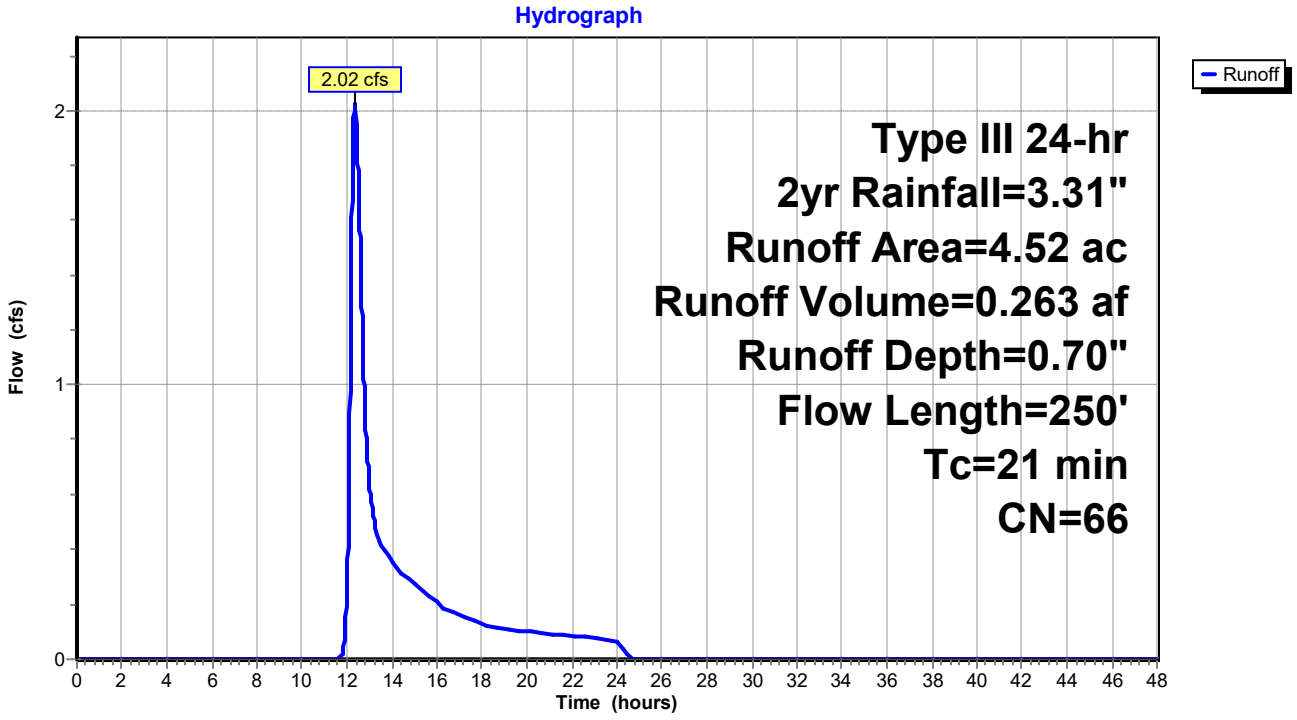
Runoff = 2.02 cfs @ 12.34 hrs, Volume= 0.263 af, Depth= 0.70"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
0.43	98	Paved parking, HSG A
1.26	61	>75% Grass cover, Good, HSG B
1.81	55	Woods, Good, HSG B
1.02	77	Woods, Good, HSG D
4.52	66	Weighted Average
4.09		90.49% Pervious Area
0.43		9.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17	40	0.0230	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	60	0.3330	0.33		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	150	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
21	250	Total			

Subcatchment 28S: PrWS G-1a



Summary for Subcatchment 29S: PrWS G-1b

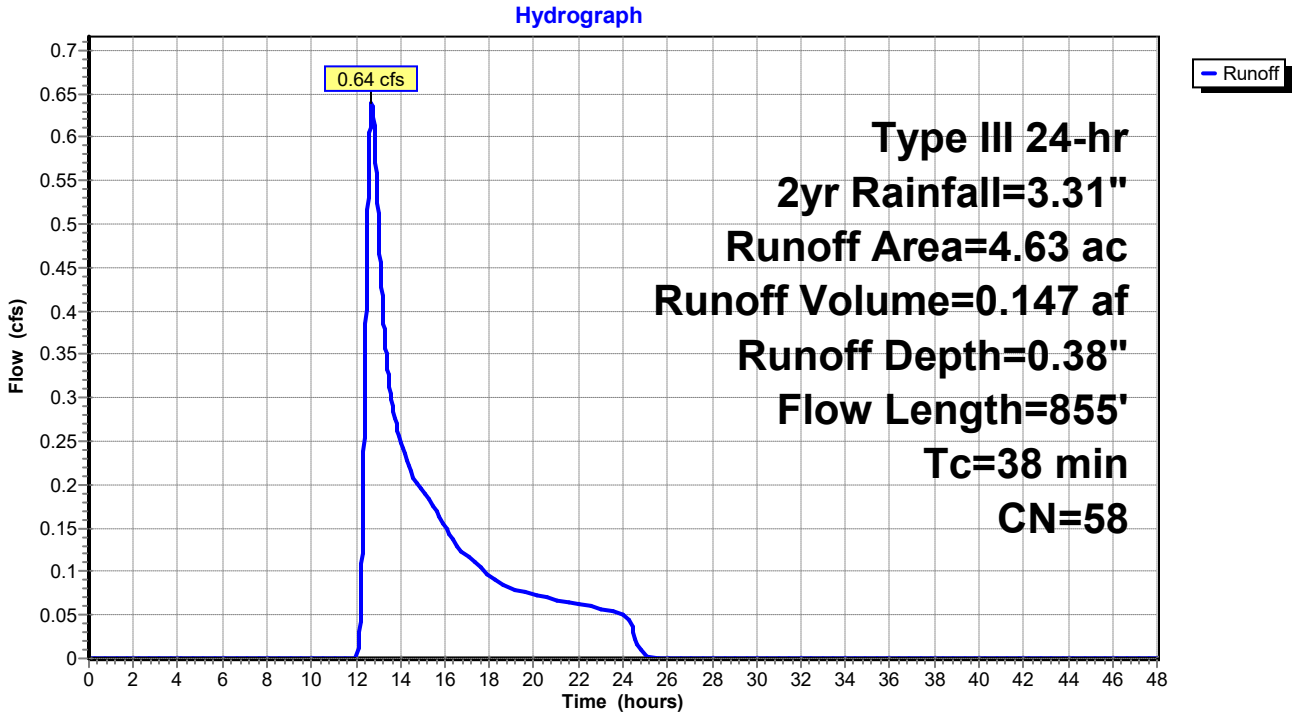
Runoff = 0.64 cfs @ 12.71 hrs, Volume= 0.147 af, Depth= 0.38"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
2.49	61	>75% Grass cover, Good, HSG B
2.14	55	Woods, Good, HSG B
4.63	58	Weighted Average
4.63		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10	35	0.0570	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
22	65	0.0320	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
2	275	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	180	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	300	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38	855	Total			

Subcatchment 29S: PrWS G-1b



Summary for Subcatchment 30S: PrWS G-1c

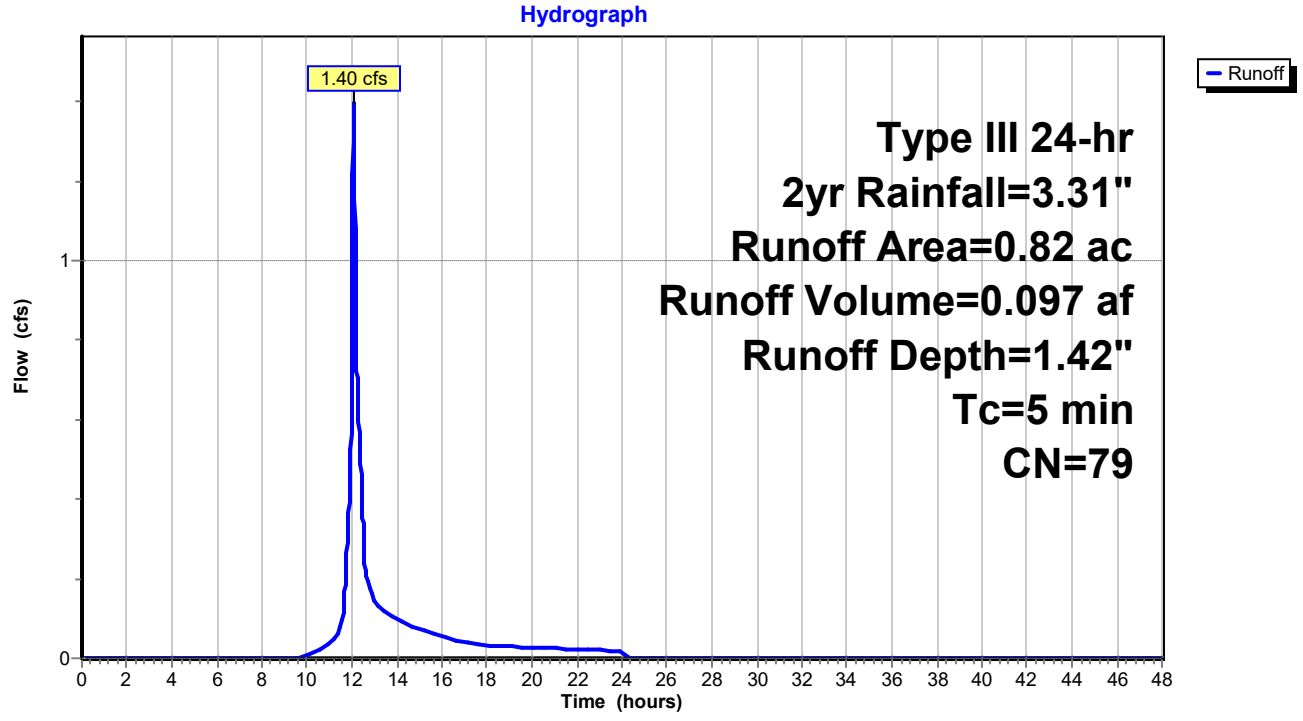
Runoff = 1.40 cfs @ 12.08 hrs, Volume= 0.097 af, Depth= 1.42"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
0.39	98	Paved parking, HSG A
0.43	61	>75% Grass cover, Good, HSG B
0.82	79	Weighted Average
0.43		52.44% Pervious Area
0.39		47.56% Impervious Area

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

Subcatchment 30S: PrWS G-1c



Summary for Subcatchment 31S: PrWS G-2

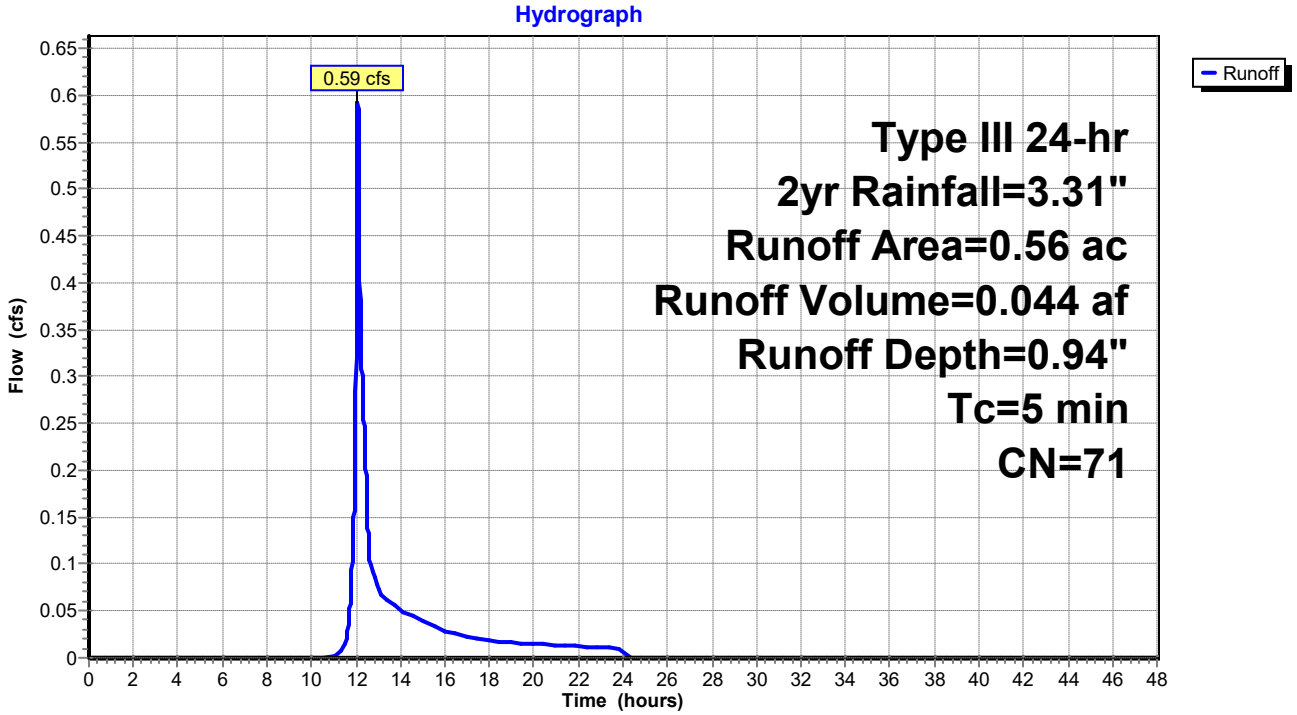
Runoff = 0.59 cfs @ 12.08 hrs, Volume= 0.044 af, Depth= 0.94"
Routed to Pond 32P : Infiltration Basin G-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.31"

Area (ac)	CN	Description
0.16	98	Paved parking, HSG A
0.35	61	>75% Grass cover, Good, HSG B
0.05	55	Woods, Good, HSG B
0.56	71	Weighted Average
0.40		71.43% Pervious Area
0.16		28.57% Impervious Area

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

Subcatchment 31S: PrWS G-2



Summary for Pond 4P: UG Detention System B-2

Inflow Area = 23.96 ac, 92.36% Impervious, Inflow Depth = 2.65" for 2yr event
Inflow = 73.74 cfs @ 12.07 hrs, Volume= 5.293 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 8P : Extended Detention Basin B-4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 135.93' @ 24.29 hrs Surf.Area= 121,524 sf Storage= 230,542 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	53,816 cf	**82.00'W x 1,482.00'L x 5.17'H Field A** 627,874 cf Overall - 493,333 cf Embedded = 134,541 cf x 40.0% Voids
#2A	134.00'	369,049 cf	**retain_it retain_it 3.5'** x 1850 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 10 Rows adjusted for 2,394.5 cf perimeter wall
		422,866 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	135.12'	**36.0" Round Culvert** L= 870.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 135.12' / 132.50' S= 0.0030 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	136.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.24 1.25 4.00 Width (feet) 4.00 4.00 8.00 8.00

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=133.50' TW=132.50' (Dynamic Tailwater)
↑**1=Culvert** (Controls 0.00 cfs)
↑**2=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 4P: UG Detention System B-2 - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it®)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
10 Rows adjusted for 2,394.5 cf perimeter wall

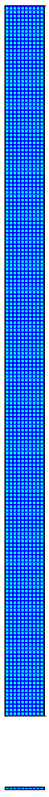
185 Chambers/Row x 8.00' Long = 1,480.00' Row Length +12.0" End Stone x 2 = 1,482.00' Base Length
10 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 82.00' Base Width
6.0" Stone Base + 50.0" Chamber Height + 6.0" Stone Cover = 5.17' Field Height

6.1 cf Sidewall x 185 x 2 + 6.1 cf Endwall x 10 x 2 = 2,394.5 cf Perimeter Wall
1,850 Chambers x 200.8 cf - 2,394.5 cf Perimeter wall = 369,049.3 cf Chamber Storage
1,850 Chambers x 266.7 cf = 493,333.3 cf Displacement

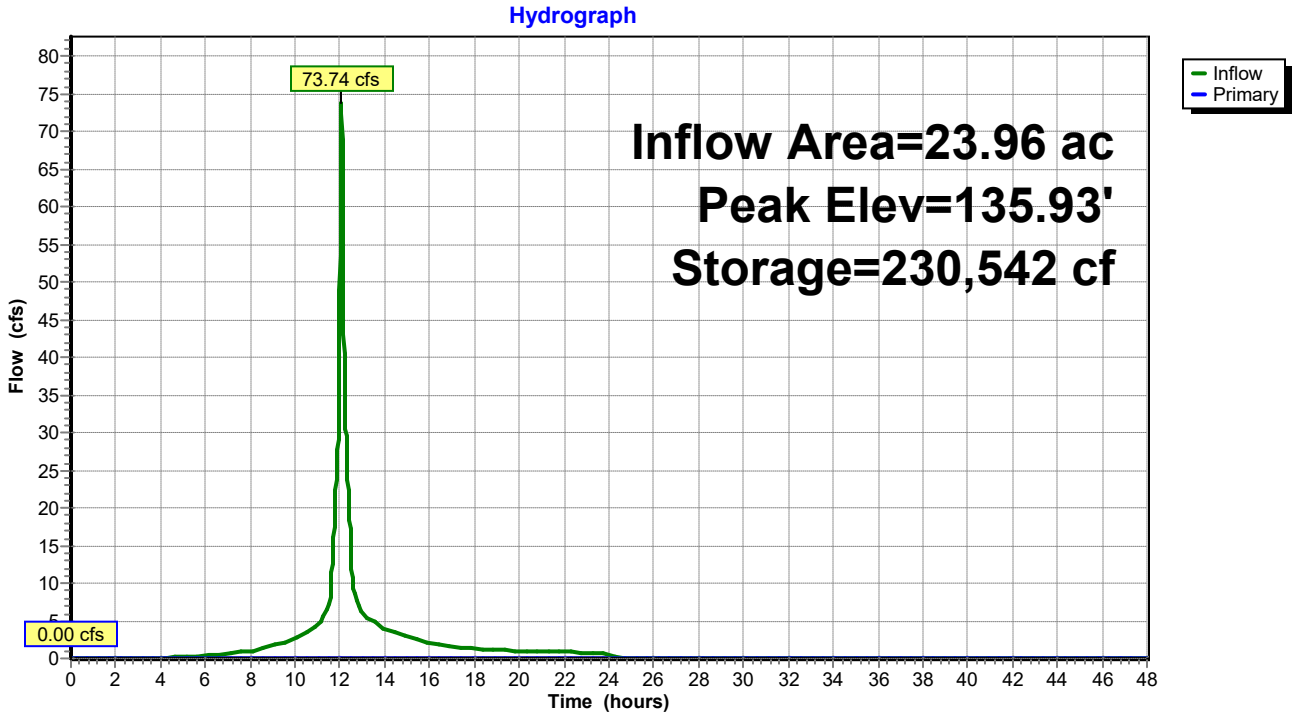
627,874.0 cf Field - 493,333.3 cf Chambers = 134,540.7 cf Stone x 40.0% Voids = 53,816.3 cf Stone Storage

Chamber Storage + Stone Storage = 422,865.5 cf = 9.708 af
Overall Storage Efficiency = 67.3%
Overall System Size = 1,482.00' x 82.00' x 5.17'

1,850 Chambers
23,254.6 cy Field
4,983.0 cy Stone



Pond 4P: UG Detention System B-2



Summary for Pond 6P: UG Detention System B-3

Inflow Area = 11.97 ac,100.00% Impervious, Inflow Depth = 3.08" for 2yr event
Inflow = 39.88 cfs @ 12.07 hrs, Volume= 3.069 af
Outflow = 0.87 cfs @ 16.88 hrs, Volume= 0.666 af, Atten= 98%, Lag= 288.7 min
Primary = 0.87 cfs @ 16.88 hrs, Volume= 0.666 af
Routed to Pond 10P : Extended Detention Basin B-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 136.20' @ 16.88 hrs Surf.Area= 1.25 ac Storage= 2.609 af

Plug-Flow detention time= 724.3 min calculated for 0.666 af (22% of inflow)
Center-of-Mass det. time= 491.6 min (1,246.4 - 754.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	0.390 af	**34.00'W x 1,602.00'L x 5.17'H Field A** 6.460 af Overall - 5.485 af Embedded = 0.975 af x 40.0% Voids
#2A	134.00'	4.171 af	**retain_it retain_it 4.0'** x 800 Inside #1 Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf 4 Rows adjusted for 3,080.2 cf perimeter wall
		4.561 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**36.0" Round Culvert** L= 310.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 134.00' / 132.50' S= 0.0048 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	136.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.49 1.50 3.00 Width (feet) 3.00 3.00 6.00 6.00

Primary OutFlow Max=0.87 cfs @ 16.88 hrs HW=136.20' TW=133.12' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.87 cfs of 26.45 cfs potential flow)
↑**2=Custom Weir/Orifice** (Weir Controls 0.87 cfs @ 1.46 fps)

Pond 6P: UG Detention System B-3 - Chamber Wizard Field A

Chamber Model = retain_it retain_it 4.0' (retain-it®)
Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf
Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf
4 Rows adjusted for 3,080.2 cf perimeter wall

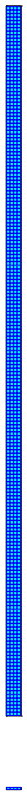
200 Chambers/Row x 8.00' Long = 1,600.00' Row Length +12.0" End Stone x 2 = 1,602.00' Base Length
4 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 34.00' Base Width
6.0" Stone Base + 56.0" Chamber Height = 5.17' Field Height

7.5 cf Sidewall x 200 x 2 + 7.5 cf Endwall x 4 x 2 = 3,080.2 cf Perimeter Wall
800 Chambers x 230.9 cf - 3,080.2 cf Perimeter wall = 181,671.5 cf Chamber Storage
800 Chambers x 298.7 cf = 238,933.3 cf Displacement

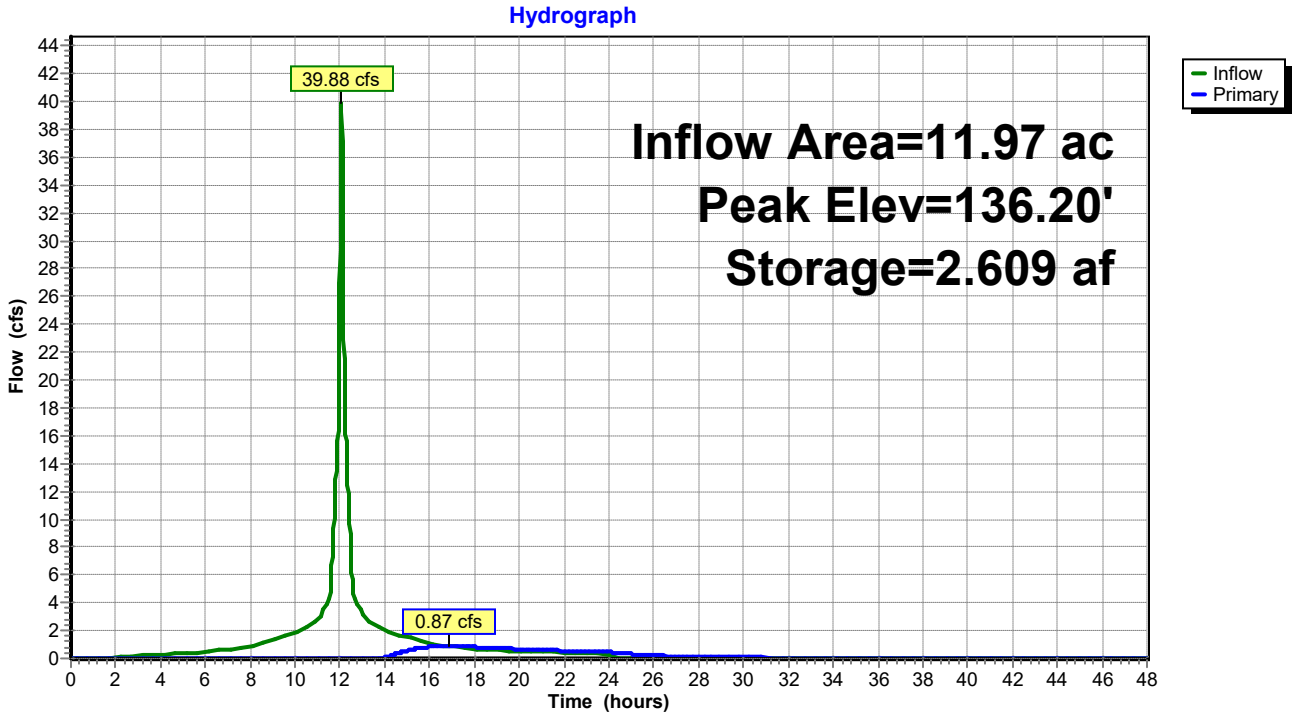
281,418.0 cf Field - 238,933.3 cf Chambers = 42,484.7 cf Stone x 40.0% Voids = 16,993.9 cf Stone Storage

Chamber Storage + Stone Storage = 198,665.3 cf = 4.561 af
Overall Storage Efficiency = 70.6%
Overall System Size = 1,602.00' x 34.00' x 5.17'

800 Chambers
10,422.9 cy Field
1,573.5 cy Stone



Pond 6P: UG Detention System B-3



Summary for Pond 8P: Extended Detention Basin B-4

Inflow Area = 31.37 ac, 79.06% Impervious, Inflow Depth = 0.24" for 2yr event
Inflow = 7.03 cfs @ 12.15 hrs, Volume= 0.617 af
Outflow = 0.15 cfs @ 23.11 hrs, Volume= 0.358 af, Atten= 98%, Lag= 657.8 min
Primary = 0.15 cfs @ 23.11 hrs, Volume= 0.358 af
Routed to Link 11L : Design Point: B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 133.29' @ 23.11 hrs Surf.Area= 27,843 sf Storage= 21,183 cf

Plug-Flow detention time= 1,005.4 min calculated for 0.358 af (58% of inflow)
Center-of-Mass det. time= 880.9 min (1,751.1 - 870.2)

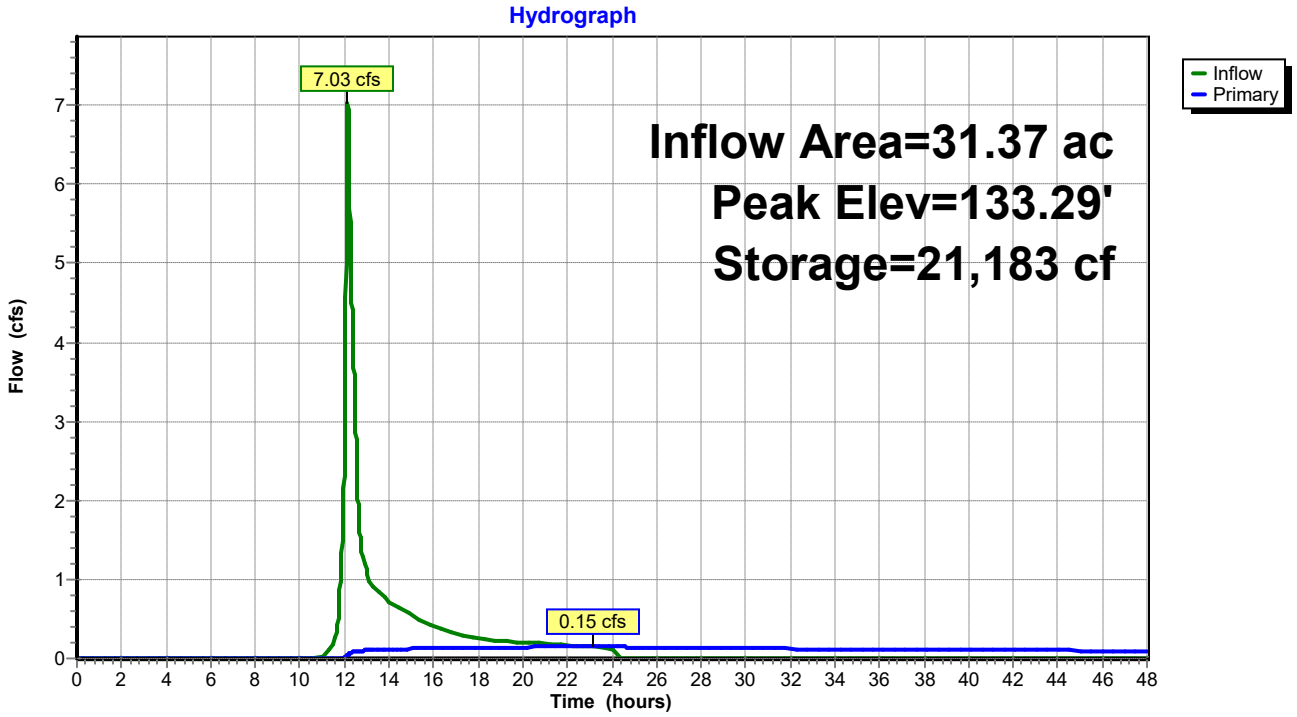
Volume	Invert	Avail.Storage	Storage Description
#1	132.50'	163,645 cf	**Detention Basin B-4 (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.50	25,654	0	0
133.00	27,028	13,171	13,171
134.00	29,819	28,424	41,594
135.00	32,666	31,243	72,837
136.00	35,570	34,118	106,955
137.00	38,530	37,050	144,005
137.50	40,032	19,641	163,645

Device	Routing	Invert	Outlet Devices
#1	Primary	132.50'	**36.0" Round Culvert** L= 312.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 132.50' / 131.16' S= 0.0043 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	132.50'	**2.5" Vert. 2.5in Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	133.25'	**10.0" Vert. (2x) 10in Orifice X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	136.00'	**36.0" x 24.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.15 cfs @ 23.11 hrs HW=133.29' TW=132.50' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.15 cfs of 2.93 cfs potential flow)
  ├─**2=2.5in Orifice** (Orifice Controls 0.14 cfs @ 3.99 fps)
  ├─**3=(2x) 10in Orifice** (Orifice Controls 0.01 cfs @ 0.70 fps)
  └─**4=Overflow CB** (Controls 0.00 cfs)

Pond 8P: Extended Detention Basin B-4



Summary for Pond 10P: Extended Detention Basin B-5

Inflow Area = 28.28 ac, 80.94% Impervious, Inflow Depth > 1.14" for 2yr event
Inflow = 29.24 cfs @ 12.08 hrs, Volume= 2.687 af
Outflow = 0.24 cfs @ 25.84 hrs, Volume= 0.625 af, Atten= 99%, Lag= 825.6 min
Primary = 0.24 cfs @ 25.84 hrs, Volume= 0.625 af
Routed to Link 11L : Design Point: B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 133.33' @ 25.84 hrs Surf.Area= 127,858 sf Storage= 103,511 cf

Plug-Flow detention time= 1,106.6 min calculated for 0.625 af (23% of inflow)
Center-of-Mass det. time= 873.5 min (1,814.4 - 940.8)

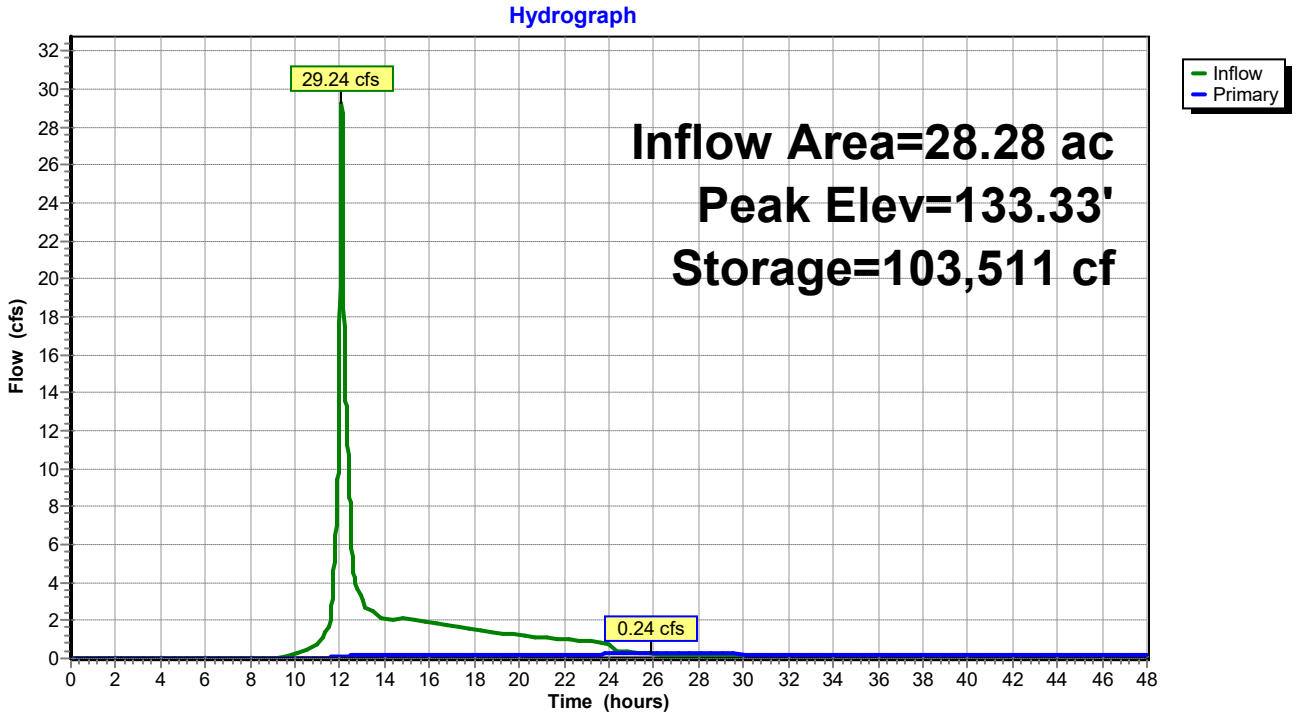
Volume	Invert	Avail.Storage	Storage Description
#1	132.50'	951,536 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.50	121,607	0	0
133.00	125,365	61,743	61,743
134.00	132,923	129,144	190,887
135.00	140,538	136,731	327,618
136.00	148,209	144,374	471,991
137.00	155,937	152,073	624,064
138.00	163,722	159,830	783,894
139.00	171,563	167,643	951,536

Device	Routing	Invert	Outlet Devices
#1	Primary	131.50'	**24.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 131.50' / 131.16' S= 0.0045 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	131.50'	**3.0" Vert. 3in Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	133.25'	**8.0" Vert. 8in Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	135.00'	**24.0" x 36.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.24 cfs @ 25.84 hrs HW=133.33' TW=132.50' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.24 cfs of 11.53 cfs potential flow)
  ├**2=3in Orifice** (Orifice Controls 0.22 cfs @ 4.39 fps)
  ├**3=8in Orifice** (Orifice Controls 0.02 cfs @ 0.96 fps)
  └**4=Overflow CB** (Controls 0.00 cfs)

Pond 10P: Extended Detention Basin B-5



Summary for Pond 15P: Infiltration Basin D-2

Inflow Area = 7.58 ac, 66.75% Impervious, Inflow Depth = 1.49" for 2yr event
Inflow = 13.59 cfs @ 12.08 hrs, Volume= 0.939 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 16L : Design Point: D

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 132.75' @ 24.29 hrs Surf.Area= 34,870 sf Storage= 40,916 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

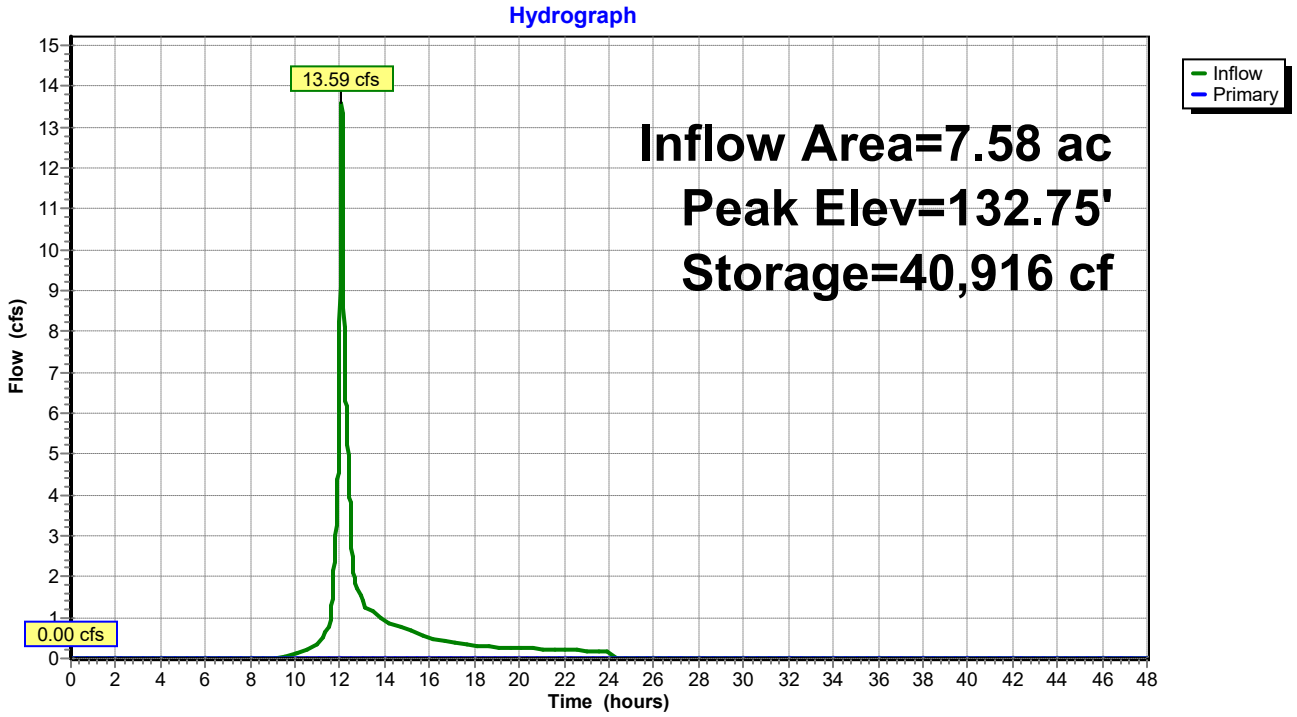
Volume	Invert	Avail.Storage	Storage Description
#1	131.50'	245,101 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
131.50	30,777	0	0
132.00	32,406	15,796	15,796
133.00	35,705	34,056	49,851
134.00	39,062	37,384	87,235
135.00	42,475	40,769	128,003
136.00	45,944	44,210	172,213
137.00	49,470	47,707	219,920
137.50	51,254	25,181	245,101

Device	Routing	Invert	Outlet Devices
#1	Primary	136.00'	**450.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=131.50' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 15P: Infiltration Basin D-2



Summary for Pond 19P: Infiltration Basin E-2

Inflow Area = 9.75 ac, 10.15% Impervious, Inflow Depth = 0.15" for 2yr event
Inflow = 0.26 cfs @ 12.80 hrs, Volume= 0.123 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 20P : Existing Basin E-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 138.66' @ 25.40 hrs Surf.Area= 35,786 sf Storage= 5,370 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

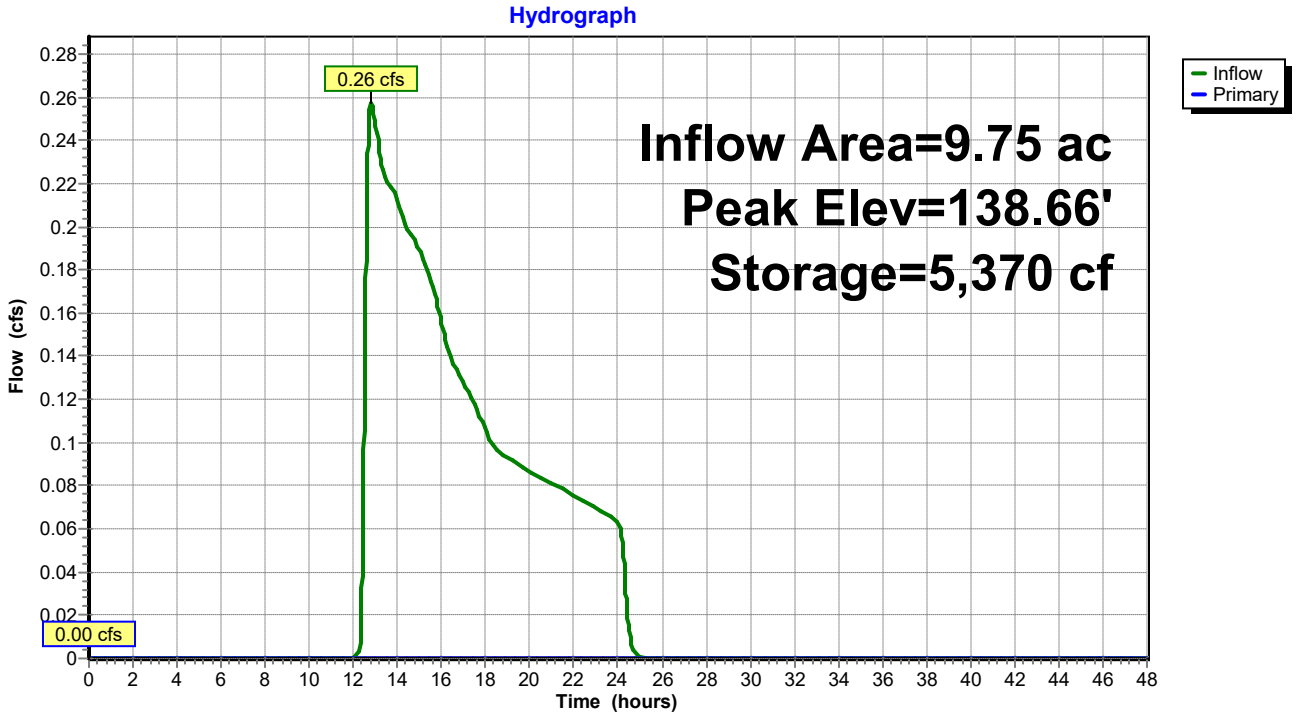
Volume	Invert	Avail.Storage	Storage Description
#1	138.50'	115,575 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
138.50	31,545	0	0
139.00	44,838	19,096	19,096
140.00	48,235	46,537	65,632
141.00	51,650	49,943	115,575

Device	Routing	Invert	Outlet Devices
#1	Primary	140.00'	**70.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=138.50' TW=130.20' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 19P: Infiltration Basin E-2



Summary for Pond 20P: Existing Basin E-1

Inflow Area = 15.56 ac, 6.36% Impervious, Inflow Depth = 0.00" for 2yr event
Inflow = 0.01 cfs @ 22.99 hrs, Volume= 0.003 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 21L : Design Point: E

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 130.21' @ 24.57 hrs Surf.Area= 15,589 sf Storage= 132 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

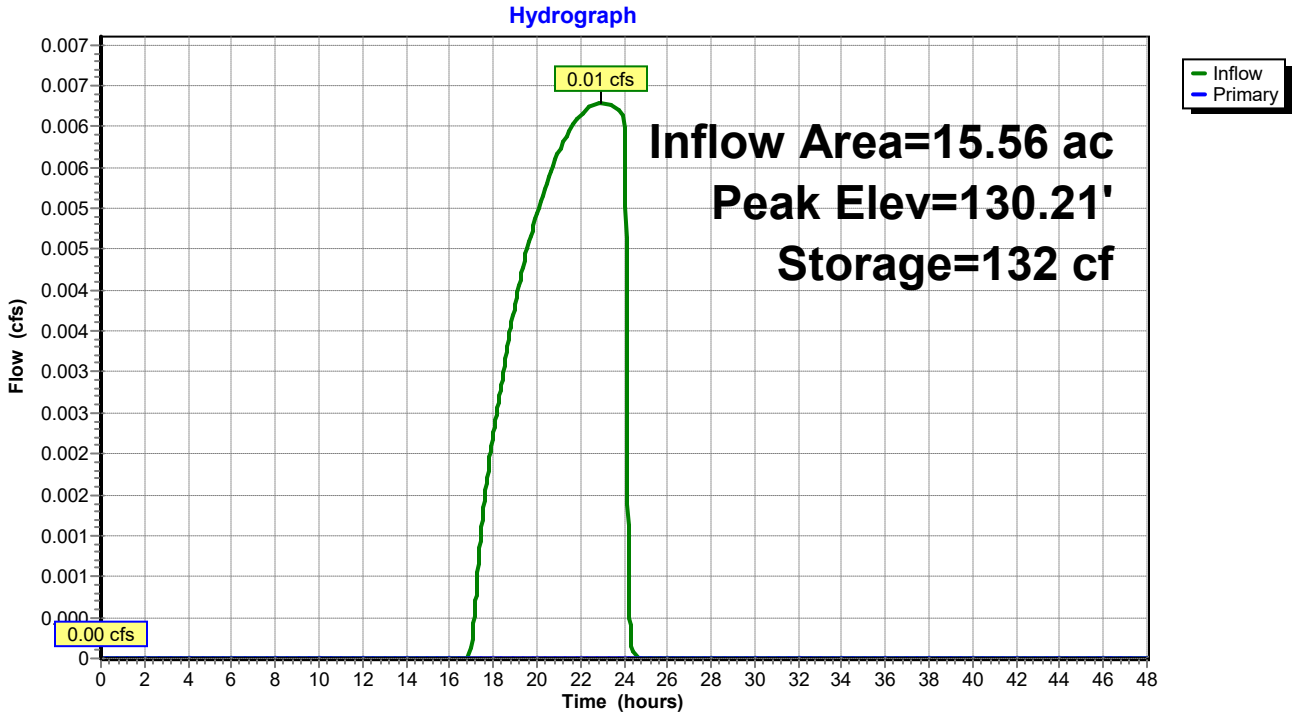
Volume	Invert	Avail.Storage	Storage Description
#1	130.20'	504,295 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.20	15,572	0	0
131.00	17,190	13,105	13,105
132.00	33,435	25,313	38,417
133.00	47,240	40,338	78,755
134.00	62,274	54,757	133,512
135.00	78,197	70,236	203,747
136.00	92,539	85,368	289,115
137.00	106,598	99,569	388,684
138.00	124,625	115,612	504,295

Device	Routing	Invert	Outlet Devices
#1	Primary	137.30'	**35.0' long + 3.0 '/' SideZ x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.20' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 20P: Existing Basin E-1



Summary for Pond 24P: Infiltration Basin F-2

Inflow Area = 2.41 ac, 51.45% Impervious, Inflow Depth = 1.35" for 2yr event
Inflow = 3.63 cfs @ 12.11 hrs, Volume= 0.272 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 27L : Design Point: F

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 131.13' @ 24.40 hrs Surf.Area= 11,380 sf Storage= 11,850 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

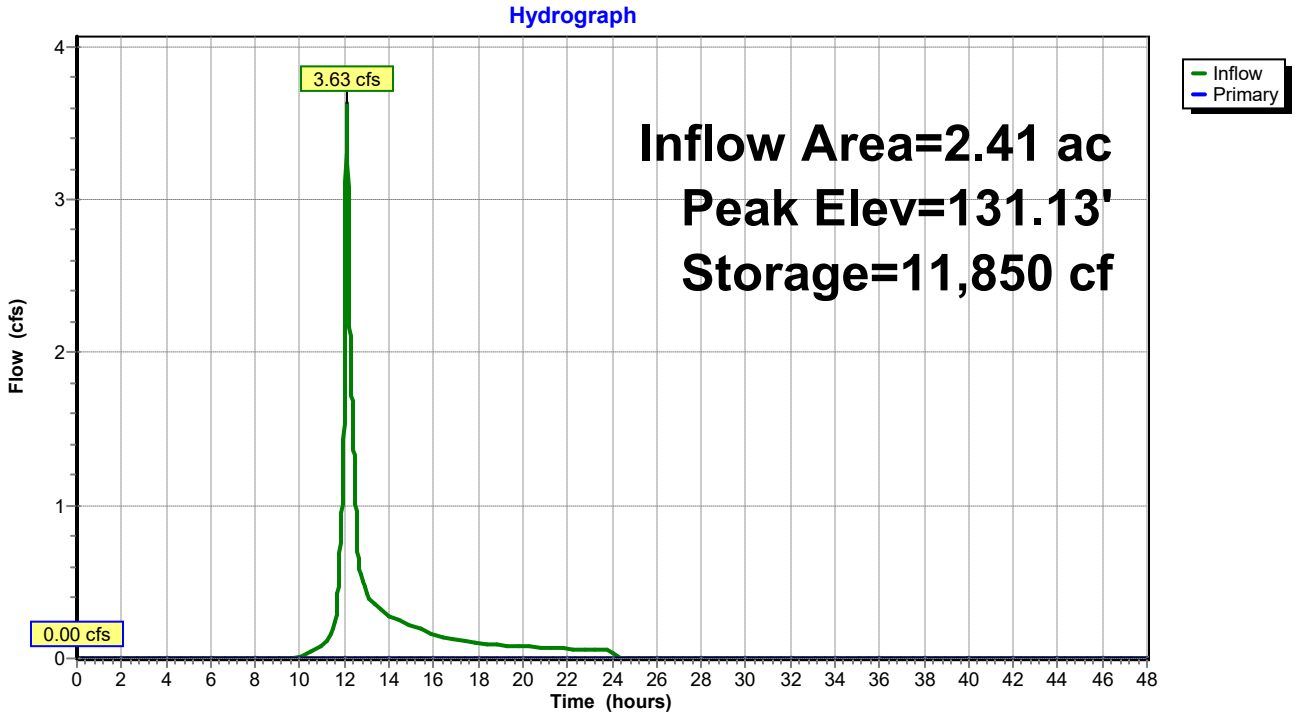
Volume	Invert	Avail.Storage	Storage Description
#1	130.00'	78,726 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.00	9,565	0	0
131.00	11,162	10,364	10,364
132.00	12,816	11,989	22,353
133.00	14,527	13,672	36,024
134.00	16,294	15,411	51,435
135.00	18,811	17,553	68,987
135.50	20,146	9,739	78,726

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**168.0' long + 3.0 '/' SideZ x 168.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 24P: Infiltration Basin F-2



Summary for Pond 26P: Infiltration Basin F-3

Inflow Area = 1.79 ac, 46.37% Impervious, Inflow Depth = 1.35" for 2yr event
Inflow = 2.90 cfs @ 12.08 hrs, Volume= 0.202 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 27L : Design Point: F

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 132.50' @ 24.29 hrs Surf.Area= 6,625 sf Storage= 8,801 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

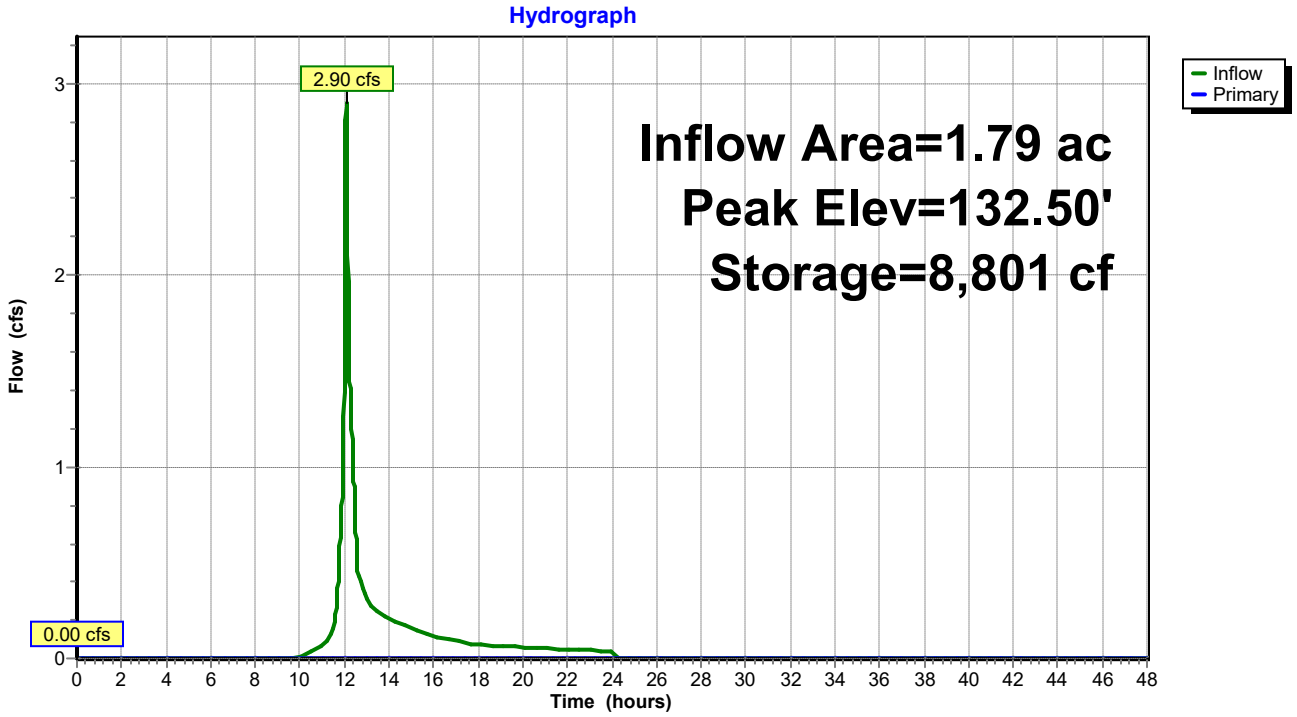
Volume	Invert	Avail.Storage	Storage Description
#1	131.00'	51,929 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
131.00	5,159	0	0
132.00	6,120	5,640	5,640
133.00	7,138	6,629	12,269
134.00	8,213	7,676	19,944
135.00	9,345	8,779	28,723
135.50	9,932	4,819	33,542
136.00	11,697	5,407	38,950
137.00	14,261	12,979	51,929

Device	Routing	Invert	Outlet Devices
#1	Primary	135.50'	**70.0' long + 3.0 '/' SideZ x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=131.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 26P: Infiltration Basin F-3



Summary for Pond 32P: Infiltration Basin G-2

Inflow Area = 0.56 ac, 28.57% Impervious, Inflow Depth = 0.94" for 2yr event
Inflow = 0.59 cfs @ 12.08 hrs, Volume= 0.044 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 33L : Design Point: G

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 132.93' @ 24.29 hrs Surf.Area= 2,329 sf Storage= 1,921 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

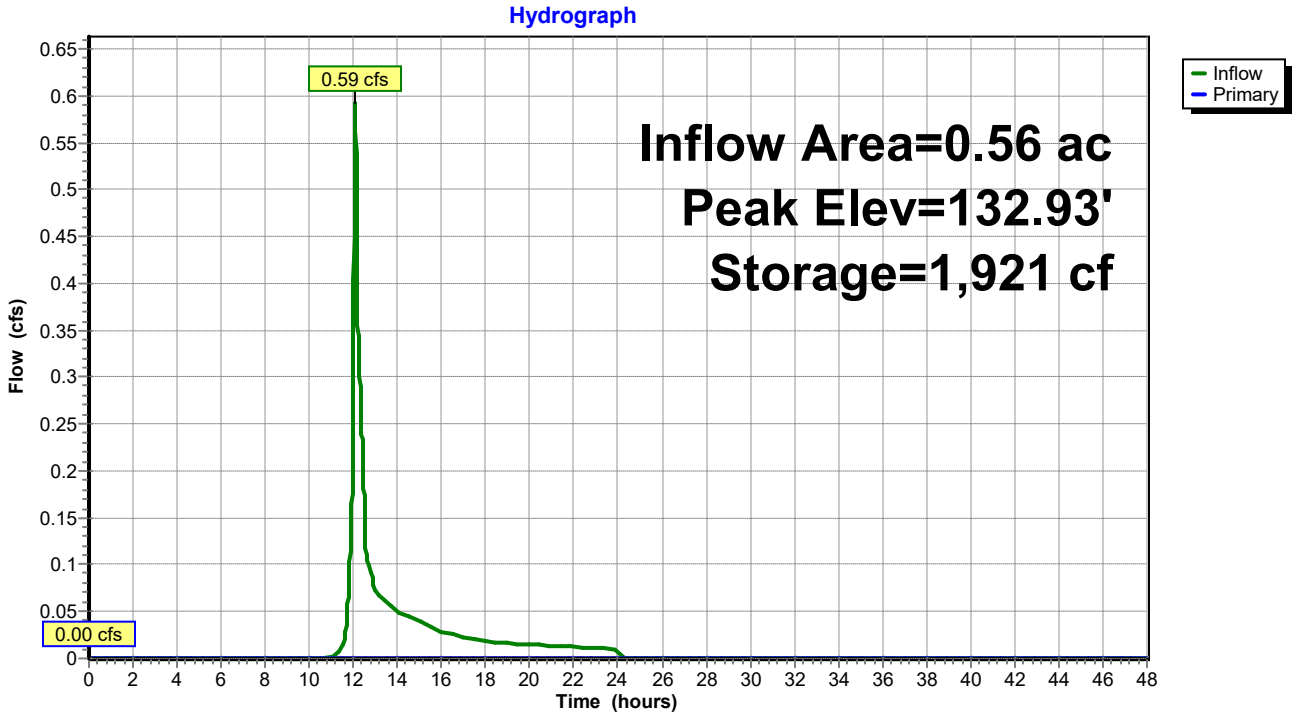
Volume	Invert	Avail.Storage	Storage Description
#1	132.00'	14,518 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.00	1,785	0	0
133.00	2,367	2,076	2,076
134.00	3,006	2,687	4,763
135.00	3,701	3,354	8,116
136.00	4,452	4,077	12,193
136.50	4,849	2,325	14,518

Device	Routing	Invert	Outlet Devices
#1	Primary	130.00'	**15.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 130.00' / 126.25' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf
#2	Device 1	135.00'	**24.0" x 36.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=132.00' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.00 cfs of 6.93 cfs potential flow)
↑**2=Overflow CB** (Controls 0.00 cfs)

Pond 32P: Infiltration Basin G-2



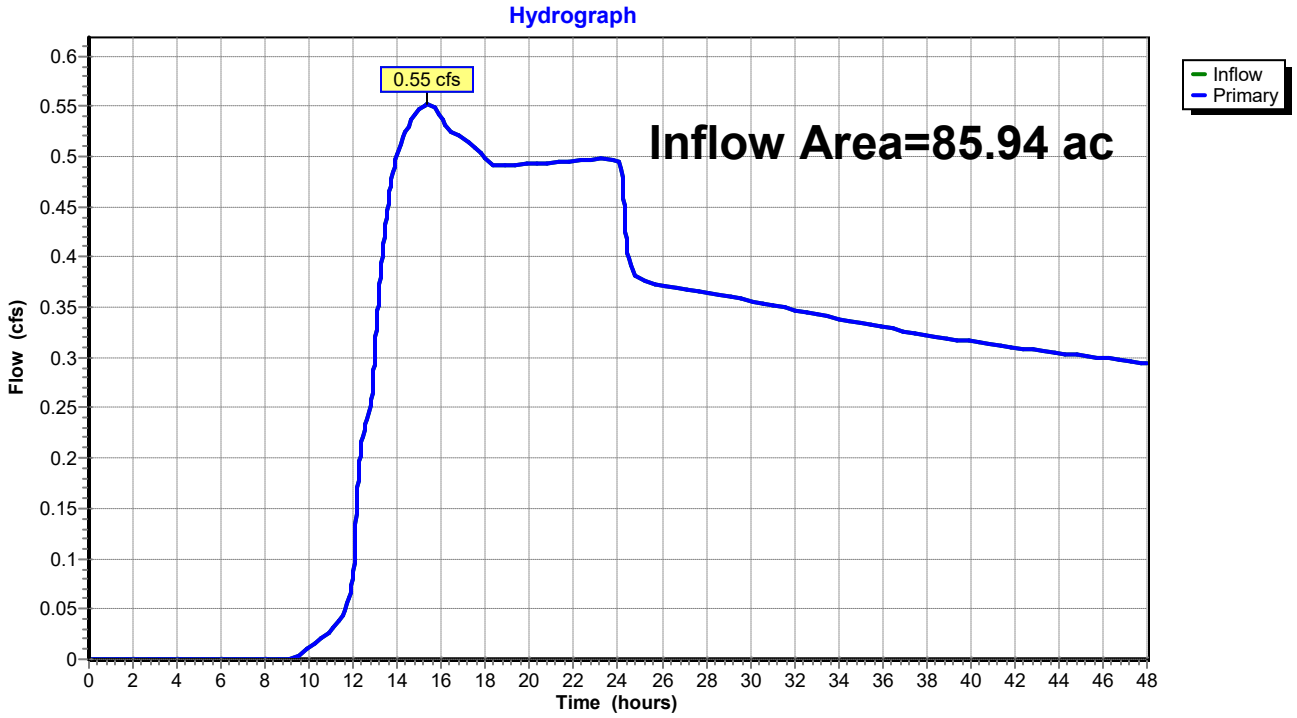
Summary for Link 11L: Design Point: B

Inflow Area = 85.94 ac, 56.17% Impervious, Inflow Depth > 0.16" for 2yr event
Inflow = 0.55 cfs @ 15.33 hrs, Volume= 1.143 af
Primary = 0.55 cfs @ 15.33 hrs, Volume= 1.143 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Fixed water surface Elevation= 132.50'

Link 11L: Design Point: B

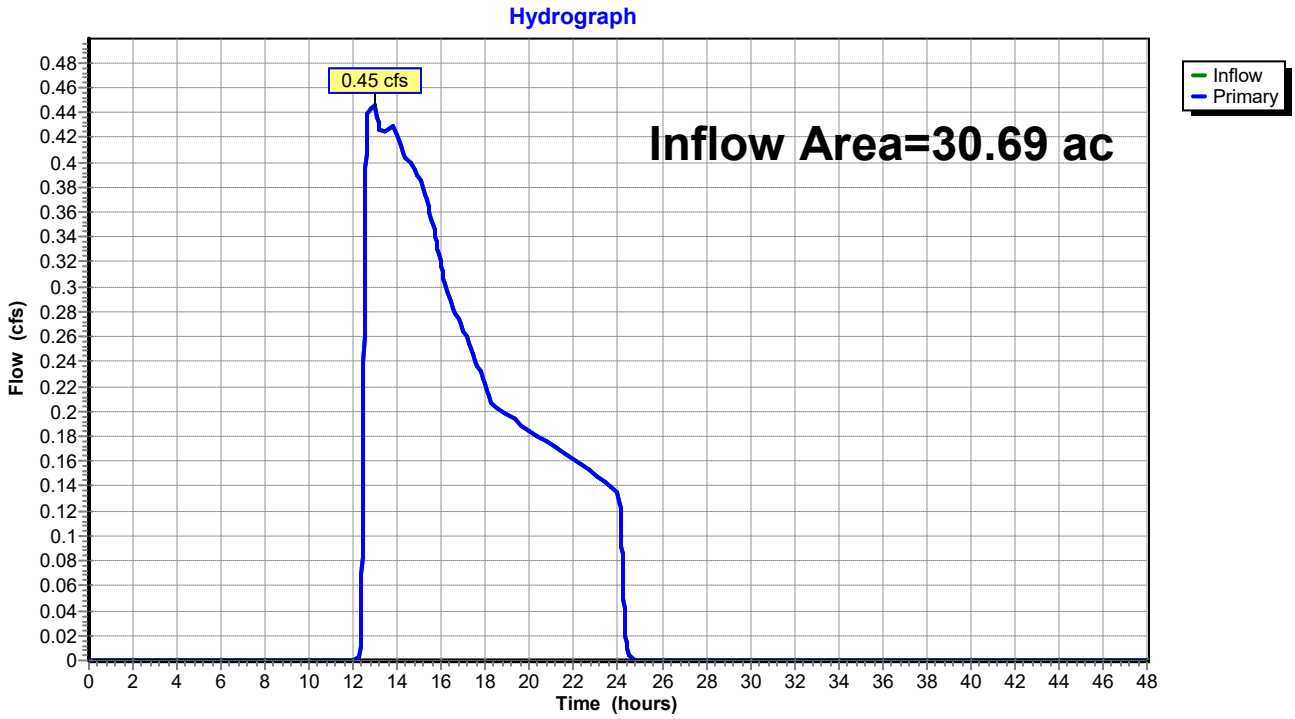


Summary for Link 16L: Design Point: D

Inflow Area = 30.69 ac, 16.49% Impervious, Inflow Depth = 0.10" for 2yr event
Inflow = 0.45 cfs @ 12.96 hrs, Volume= 0.250 af
Primary = 0.45 cfs @ 12.96 hrs, Volume= 0.250 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 16L: Design Point: D

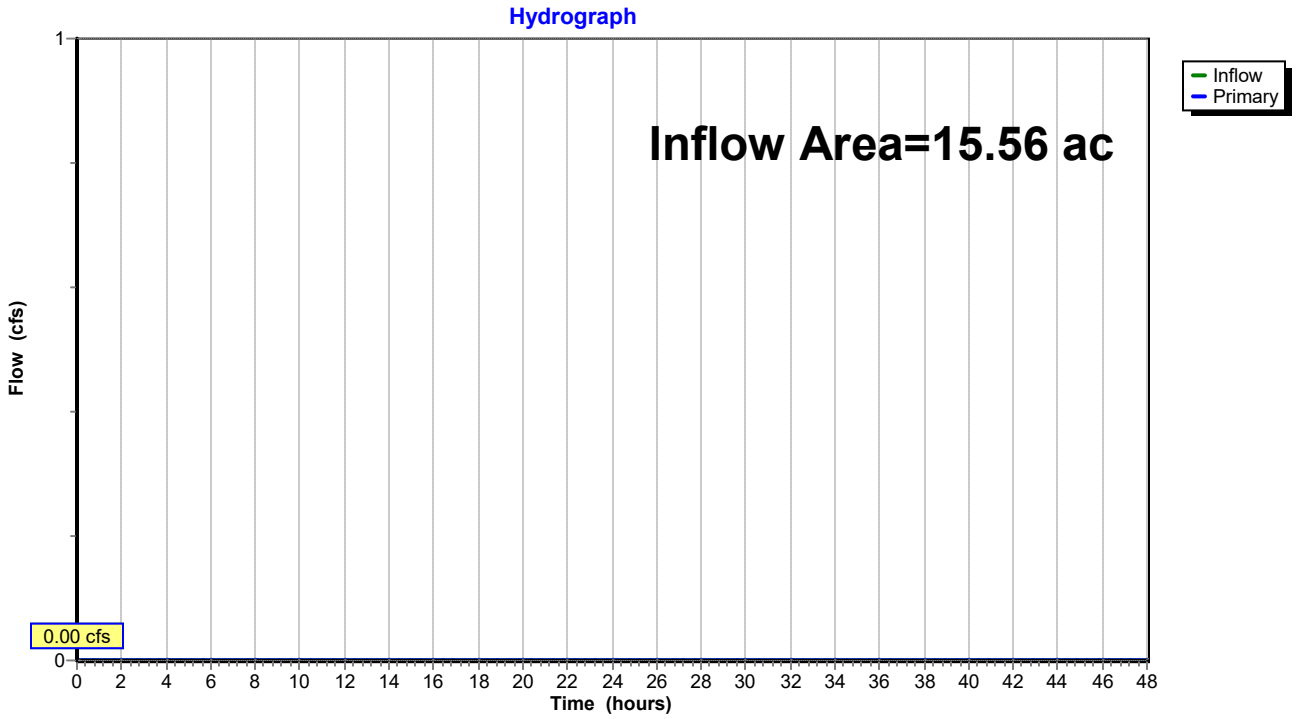


Summary for Link 21L: Design Point: E

Inflow Area = 15.56 ac, 6.36% Impervious, Inflow Depth = 0.00" for 2yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 21L: Design Point: E

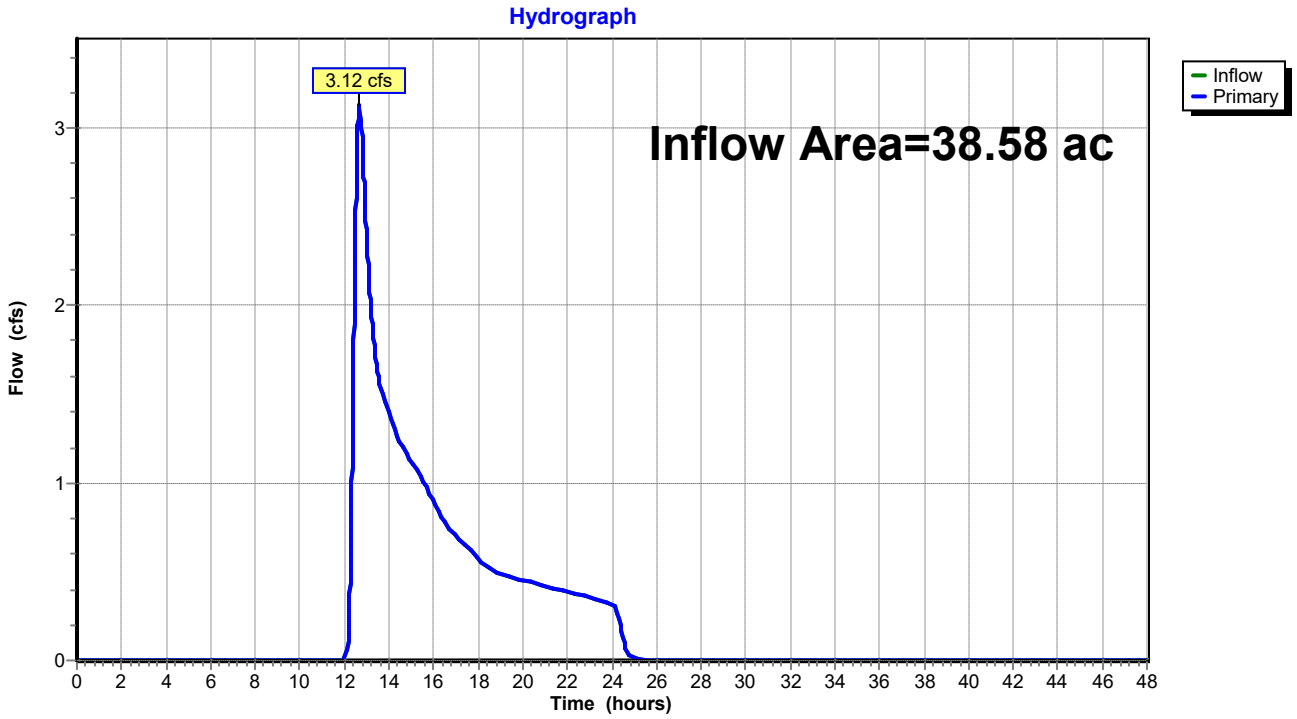


Summary for Link 27L: Design Point: F

Inflow Area = 38.58 ac, 5.37% Impervious, Inflow Depth = 0.25" for 2yr event
Inflow = 3.12 cfs @ 12.68 hrs, Volume= 0.814 af
Primary = 3.12 cfs @ 12.68 hrs, Volume= 0.814 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 27L: Design Point: F

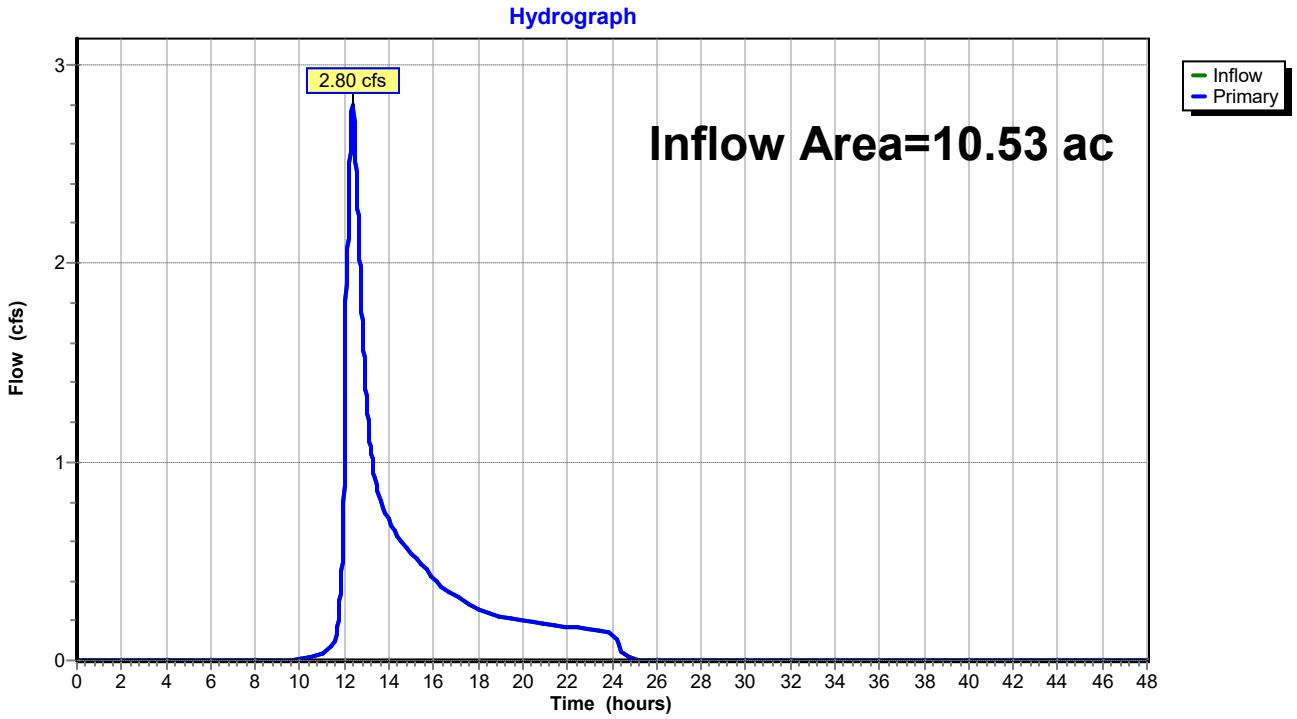


Summary for Link 33L: Design Point: G

Inflow Area = 10.53 ac, 9.31% Impervious, Inflow Depth = 0.58" for 2yr event
Inflow = 2.80 cfs @ 12.35 hrs, Volume= 0.507 af
Primary = 2.80 cfs @ 12.35 hrs, Volume= 0.507 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 33L: Design Point: G



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: PrWS A-1 Runoff Area=1.67 ac 2.99% Impervious Runoff Depth=0.54"
Flow Length=100' Slope=0.0150 '/' Tc=16 min CN=46 Runoff=0.41 cfs 0.076 af

Subcatchment 2S: PrWS B-1 Runoff Area=26.29 ac 2.21% Impervious Runoff Depth=0.54"
Flow Length=820' Tc=22 min CN=46 Runoff=6.02 cfs 1.191 af

Subcatchment 3S: PrWS B-2 Runoff Area=23.96 ac 92.36% Impervious Runoff Depth=4.47"
Tc=5 min CN=94 Runoff=120.59 cfs 8.917 af

Subcatchment 5S: PrWS B-3 Runoff Area=11.97 ac 100.00% Impervious Runoff Depth=4.92"
Tc=5 min CN=98 Runoff=62.62 cfs 4.911 af

Subcatchment 7S: PrWS B-4 Runoff Area=7.41 ac 36.03% Impervious Runoff Depth=2.32"
Flow Length=854' Tc=10 min CN=72 Runoff=17.44 cfs 1.434 af

Subcatchment 9S: PrWS B-5 Runoff Area=16.31 ac 66.95% Impervious Runoff Depth=3.03"
Tc=5 min CN=80 Runoff=60.10 cfs 4.122 af

Subcatchment 12S: PrWS C-1 Runoff Area=15.48 ac 0.00% Impervious Runoff Depth=1.00"
Flow Length=540' Tc=23 min CN=54 Runoff=9.18 cfs 1.287 af

Subcatchment 13S: PrWS D-1 Runoff Area=23.11 ac 0.00% Impervious Runoff Depth=0.70"
Flow Length=550' Tc=16 min CN=49 Runoff=8.83 cfs 1.353 af

Subcatchment 14S: PrWS D-2 Runoff Area=7.58 ac 66.75% Impervious Runoff Depth=3.03"
Tc=5 min CN=80 Runoff=27.93 cfs 1.916 af

Subcatchment 17S: PrWS E-1 Runoff Area=5.81 ac 0.00% Impervious Runoff Depth=0.27"
Flow Length=225' Tc=10 min CN=40 Runoff=0.43 cfs 0.132 af

Subcatchment 18S: PrWS E-2 Runoff Area=9.75 ac 10.15% Impervious Runoff Depth=0.76"
Flow Length=1,010' Tc=25 min CN=50 Runoff=3.71 cfs 0.617 af

Subcatchment 22S: PrWS F-1 Runoff Area=34.38 ac 0.00% Impervious Runoff Depth=1.06"
Flow Length=618' Slope=0.0400 '/' Tc=31 min CN=55 Runoff=19.73 cfs 3.039 af

Subcatchment 23S: PrWS F-2 Runoff Area=2.41 ac 51.45% Impervious Runoff Depth=2.85"
Flow Length=637' Tc=7 min CN=78 Runoff=7.77 cfs 0.572 af

Subcatchment 25S: PrWS F-3 Runoff Area=1.79 ac 46.37% Impervious Runoff Depth=2.85"
Flow Length=487' Tc=5 min CN=78 Runoff=6.20 cfs 0.425 af

Subcatchment 28S: PrWS G-1a Runoff Area=4.52 ac 9.51% Impervious Runoff Depth=1.84"
Flow Length=250' Tc=21 min CN=66 Runoff=6.17 cfs 0.692 af

Subcatchment 29S: PrWS G-1b Runoff Area=4.63 ac 0.00% Impervious Runoff Depth=1.26"
Flow Length=855' Tc=38 min CN=58 Runoff=3.03 cfs 0.485 af

Subcatchment 30S: PrWS G-1c Runoff Area=0.82 ac 47.56% Impervious Runoff Depth=2.94"
Tc=5 min CN=79 Runoff=2.93 cfs 0.201 af

Subcatchment 31S: PrWS G-2 Runoff Area=0.56 ac 28.57% Impervious Runoff Depth=2.24"
Tc=5 min CN=71 Runoff=1.51 cfs 0.104 af

Pond 4P: UG Detention System B-2 Peak Elev=136.50' Storage=291,039 cf Inflow=120.59 cfs 8.917 af
Outflow=4.63 cfs 3.415 af

Pond 6P: UG Detention System B-3 Peak Elev=136.77' Storage=3.217 af Inflow=62.62 cfs 4.911 af
Outflow=6.59 cfs 2.507 af

Pond 8P: Extended Detention Basin B-4 Peak Elev=134.41' Storage=54,040 cf Inflow=17.44 cfs 4.848 af
Outflow=4.75 cfs 4.409 af

Pond 10P: Extended Detention Basin B-5 Peak Elev=134.23' Storage=221,615 cf Inflow=60.10 cfs 6.629 af
Outflow=1.66 cfs 3.555 af

Pond 15P: Infiltration Basin D-2 Peak Elev=133.90' Storage=83,452 cf Inflow=27.93 cfs 1.916 af
Outflow=0.00 cfs 0.000 af

Pond 19P: Infiltration Basin E-2 Peak Elev=139.17' Storage=26,855 cf Inflow=3.71 cfs 0.617 af
Outflow=0.00 cfs 0.000 af

Pond 20P: Existing Basin E-1 Peak Elev=130.56' Storage=5,734 cf Inflow=0.43 cfs 0.132 af
Outflow=0.00 cfs 0.000 af

Pond 24P: Infiltration Basin F-2 Peak Elev=132.20' Storage=24,916 cf Inflow=7.77 cfs 0.572 af
Outflow=0.00 cfs 0.000 af

Pond 26P: Infiltration Basin F-3 Peak Elev=133.82' Storage=18,506 cf Inflow=6.20 cfs 0.425 af
Outflow=0.00 cfs 0.000 af

Pond 32P: Infiltration Basin G-2 Peak Elev=133.93' Storage=4,550 cf Inflow=1.51 cfs 0.104 af
Outflow=0.00 cfs 0.000 af

Link 11L: Design Point: B Inflow=7.34 cfs 9.154 af
Primary=7.34 cfs 9.154 af

Link 16L: Design Point: D Inflow=8.83 cfs 1.353 af
Primary=8.83 cfs 1.353 af

Link 21L: Design Point: E Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 27L: Design Point: F Inflow=19.73 cfs 3.039 af
Primary=19.73 cfs 3.039 af

Link 33L: Design Point: G Inflow=9.17 cfs 1.378 af
Primary=9.17 cfs 1.378 af

Total Runoff Area = 198.45 ac Runoff Volume = 31.472 af Average Runoff Depth = 1.90"
71.07% Pervious = 141.03 ac 28.93% Impervious = 57.42 ac

Summary for Subcatchment 1S: PrWS A-1

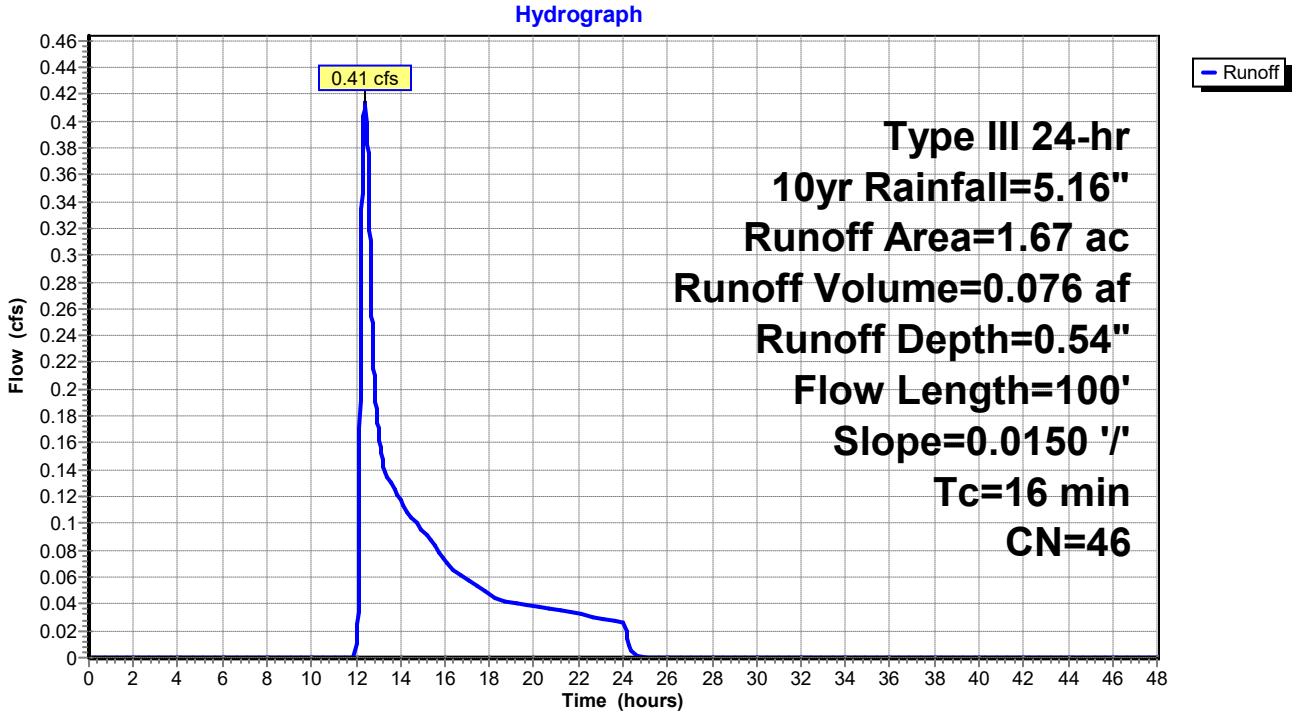
Runoff = 0.41 cfs @ 12.42 hrs, Volume= 0.076 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
0.05	98	Paved parking, HSG A
1.26	39	>75% Grass cover, Good, HSG A
0.12	61	>75% Grass cover, Good, HSG B
0.18	74	>75% Grass cover, Good, HSG C
0.06	30	Woods, Good, HSG A
1.67	46	Weighted Average
1.62		97.01% Pervious Area
0.05		2.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16	100	0.0150	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"

Subcatchment 1S: PrWS A-1



Summary for Subcatchment 2S: PrWS B-1

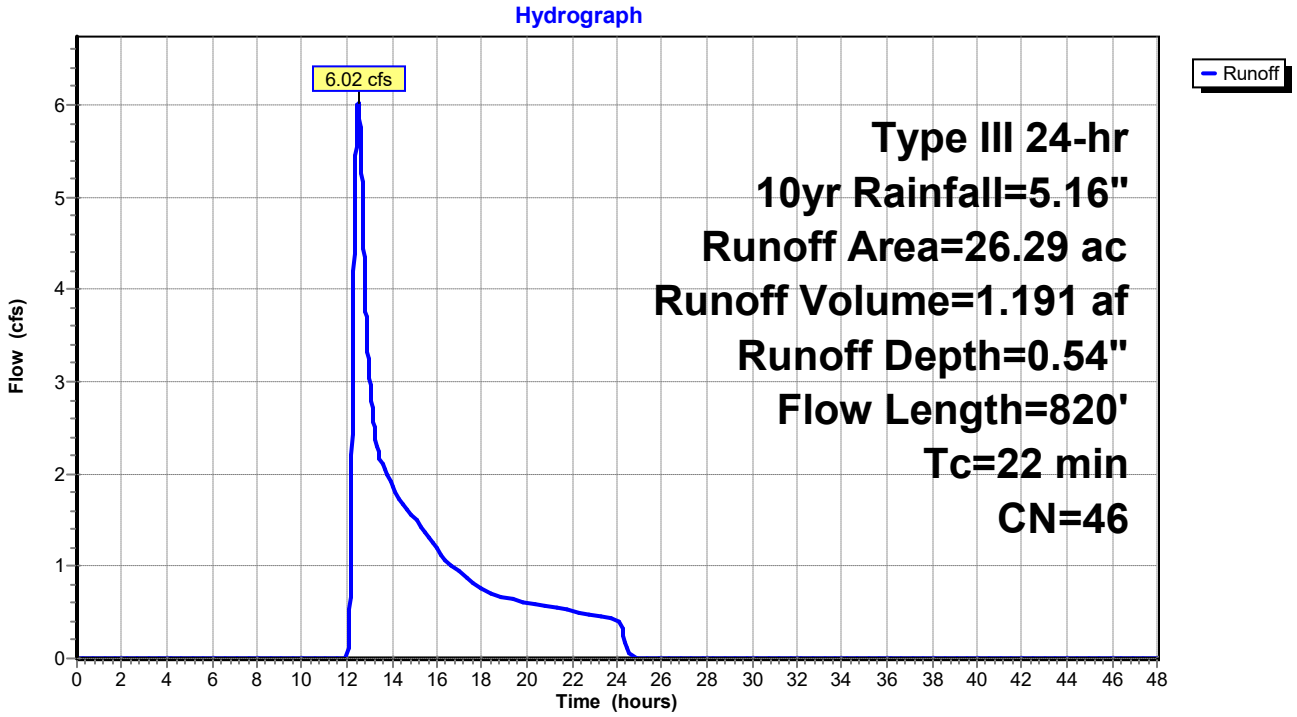
Runoff = 6.02 cfs @ 12.50 hrs, Volume= 1.191 af, Depth= 0.54"
Routed to Link 11L : Design Point: B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
0.58	98	Paved parking, HSG A
16.93	39	>75% Grass cover, Good, HSG A
0.01	61	>75% Grass cover, Good, HSG B
2.83	74	>75% Grass cover, Good, HSG C
3.94	30	Woods, Good, HSG A
2.00	77	Woods, Good, HSG D
26.29	46	Weighted Average
25.71		97.79% Pervious Area
0.58		2.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16	100	0.0150	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
4	475	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	55	0.0820	4.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2	190	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
22	820	Total			

Subcatchment 2S: PrWS B-1



Summary for Subcatchment 3S: PrWS B-2

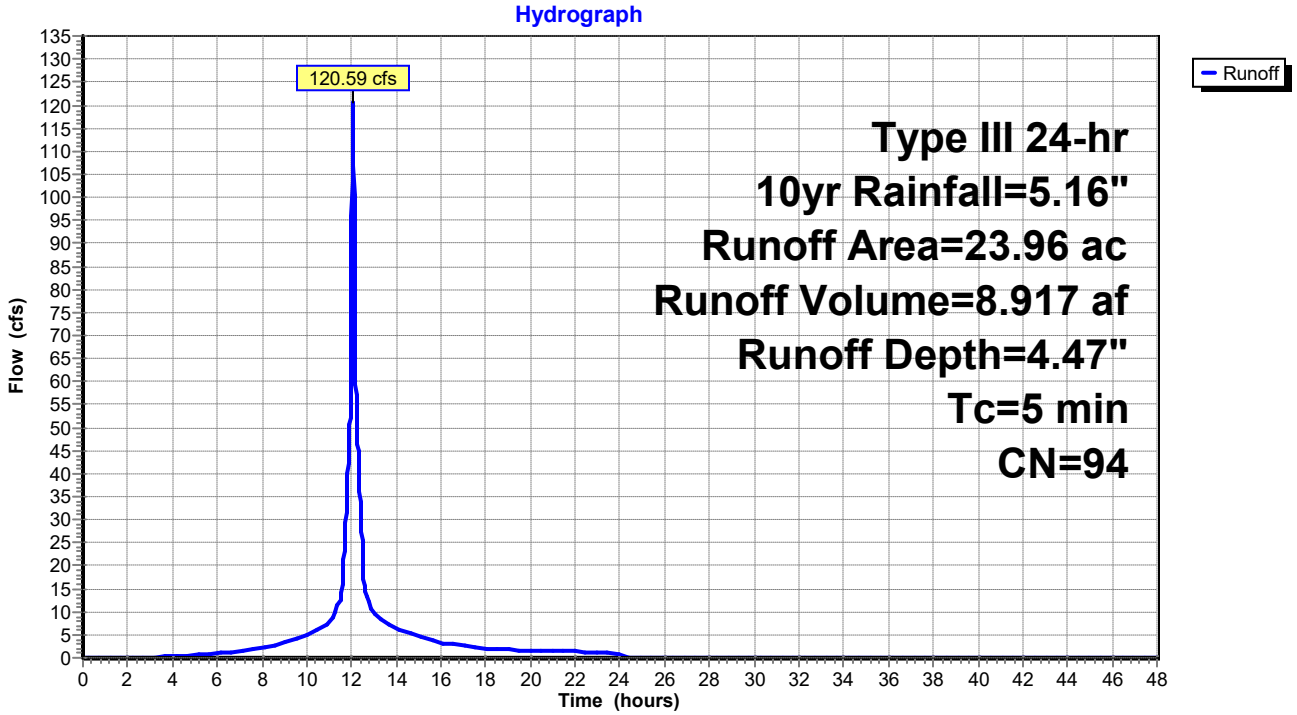
Runoff = 120.59 cfs @ 12.07 hrs, Volume= 8.917 af, Depth= 4.47"
Routed to Pond 4P : UG Detention System B-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
22.13	98	Paved parking, HSG A
1.76	39	>75% Grass cover, Good, HSG A
0.07	61	>75% Grass cover, Good, HSG B
23.96	94	Weighted Average
1.83		7.64% Pervious Area
22.13		92.36% Impervious Area

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

Subcatchment 3S: PrWS B-2



Summary for Subcatchment 5S: PrWS B-3

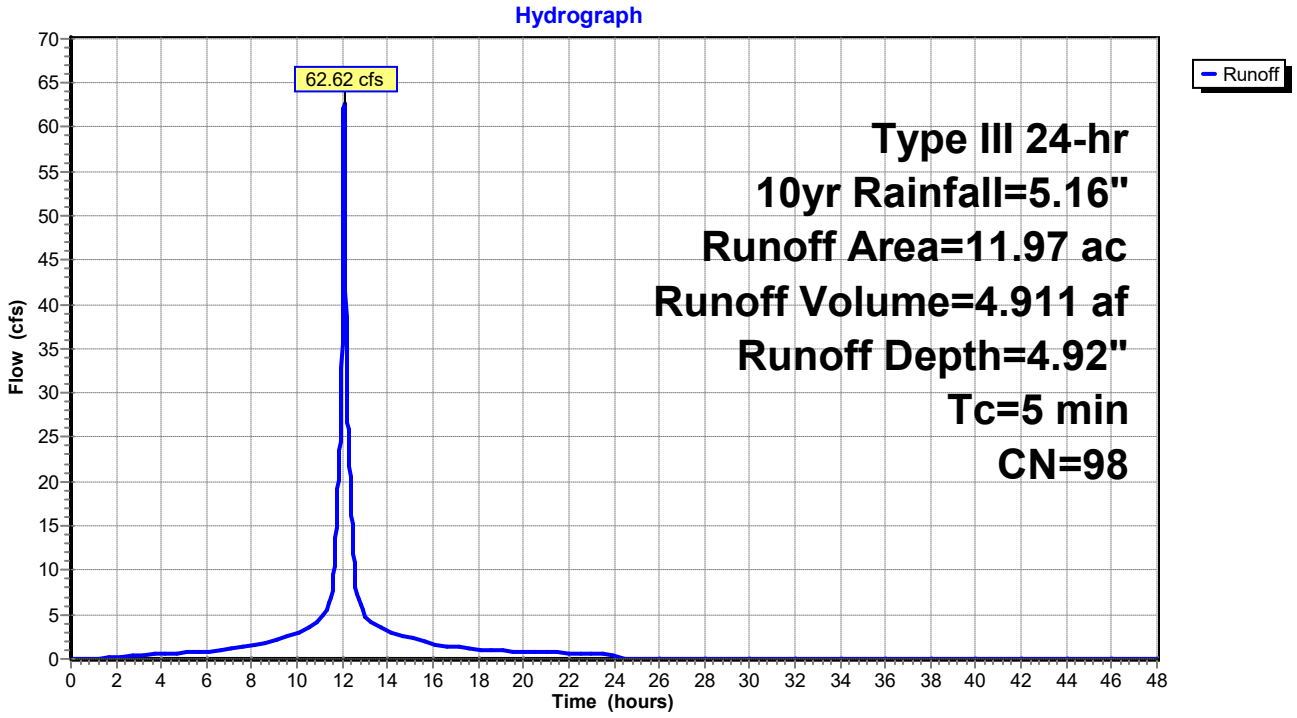
Runoff = 62.62 cfs @ 12.07 hrs, Volume= 4.911 af, Depth= 4.92"
Routed to Pond 6P : UG Detention System B-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
11.97	98	Paved parking, HSG A
11.97		100.00% Impervious Area

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

Subcatchment 5S: PrWS B-3



Summary for Subcatchment 7S: PrWS B-4

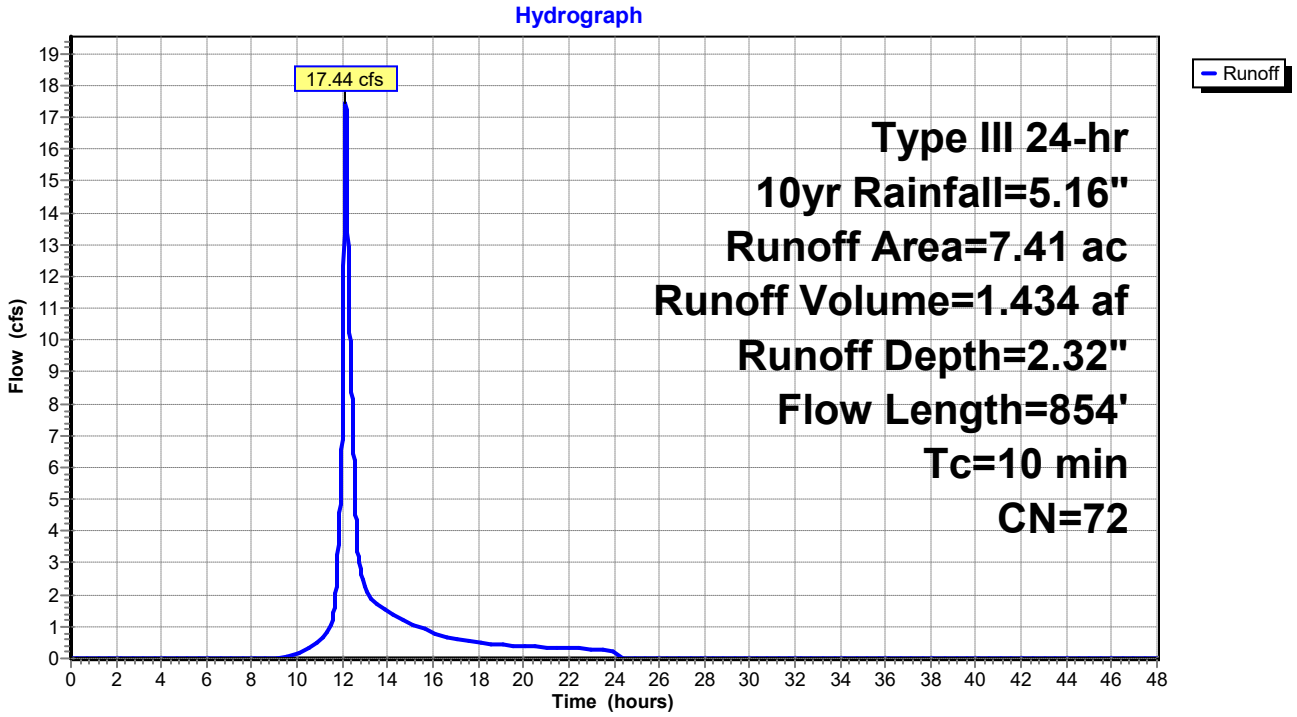
Runoff = 17.44 cfs @ 12.14 hrs, Volume= 1.434 af, Depth= 2.32"
Routed to Pond 8P : Extended Detention Basin B-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
2.67	98	Paved parking, HSG A
2.34	39	>75% Grass cover, Good, HSG A
2.40	74	>75% Grass cover, Good, HSG C
7.41	72	Weighted Average
4.74		63.97% Pervious Area
2.67		36.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8	100	0.0870	0.21		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	70	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	44	0.0170	5.91	4.65	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
2	640	0.0030	6.26	78.68	**Pipe Channel,** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
10	854	Total			

Subcatchment 7S: PrWS B-4



Summary for Subcatchment 9S: PrWS B-5

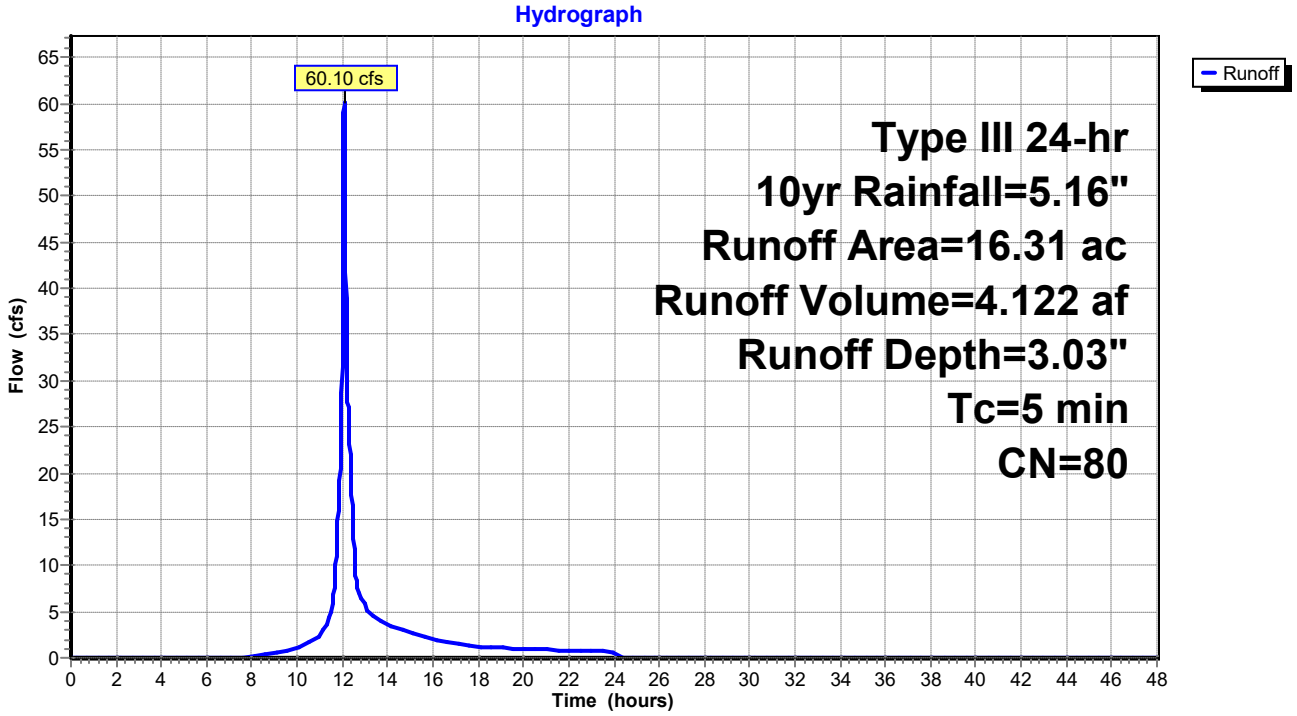
Runoff = 60.10 cfs @ 12.07 hrs, Volume= 4.122 af, Depth= 3.03"
Routed to Pond 10P : Extended Detention Basin B-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
10.92	98	Paved parking, HSG A
4.39	39	>75% Grass cover, Good, HSG A
1.00	61	>75% Grass cover, Good, HSG B
16.31	80	Weighted Average
5.39		33.05% Pervious Area
10.92		66.95% Impervious Area

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

Subcatchment 9S: PrWS B-5



Summary for Subcatchment 12S: PrWS C-1

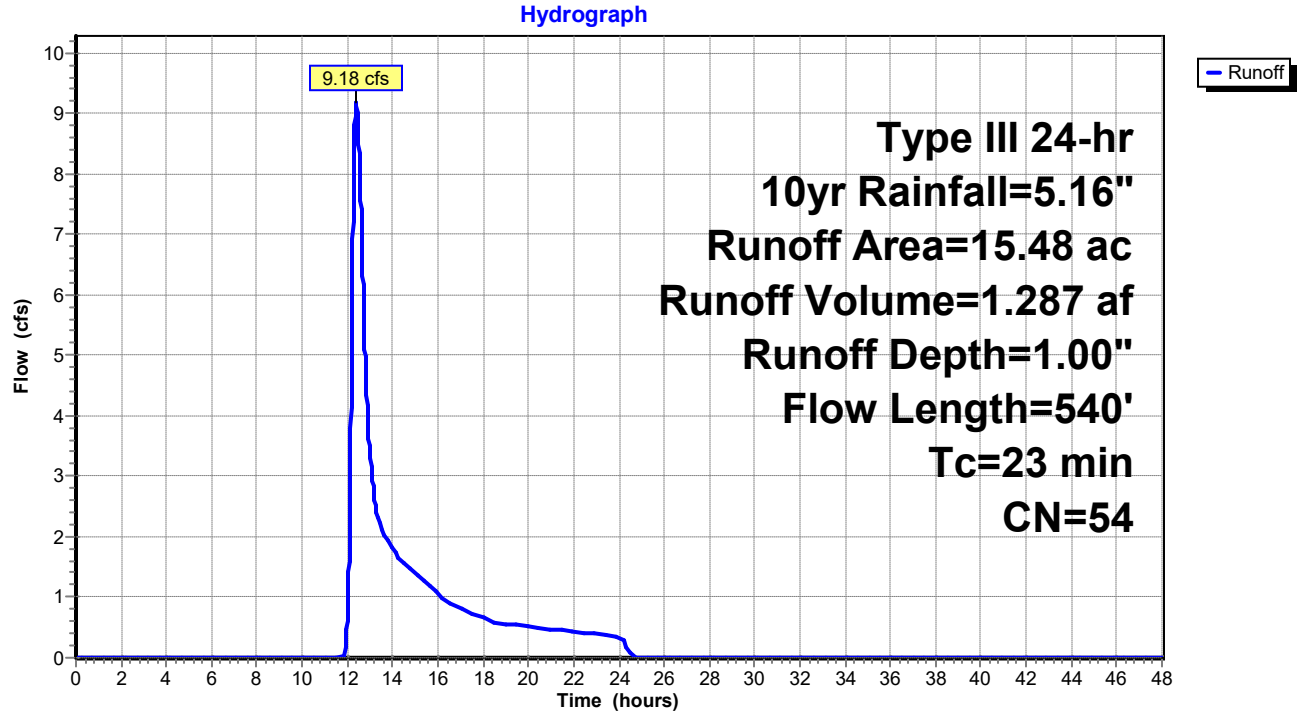
Runoff = 9.18 cfs @ 12.39 hrs, Volume= 1.287 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
2.82	39	>75% Grass cover, Good, HSG A
4.75	61	>75% Grass cover, Good, HSG B
1.44	30	Woods, Good, HSG A
4.44	55	Woods, Good, HSG B
2.03	77	Woods, Good, HSG D
15.48	54	Weighted Average
15.48		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	100	0.0100	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
4	395	0.0090	1.53		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	45	0.0220	2.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
23	540	Total			

Subcatchment 12S: PrWS C-1



Summary for Subcatchment 13S: PrWS D-1

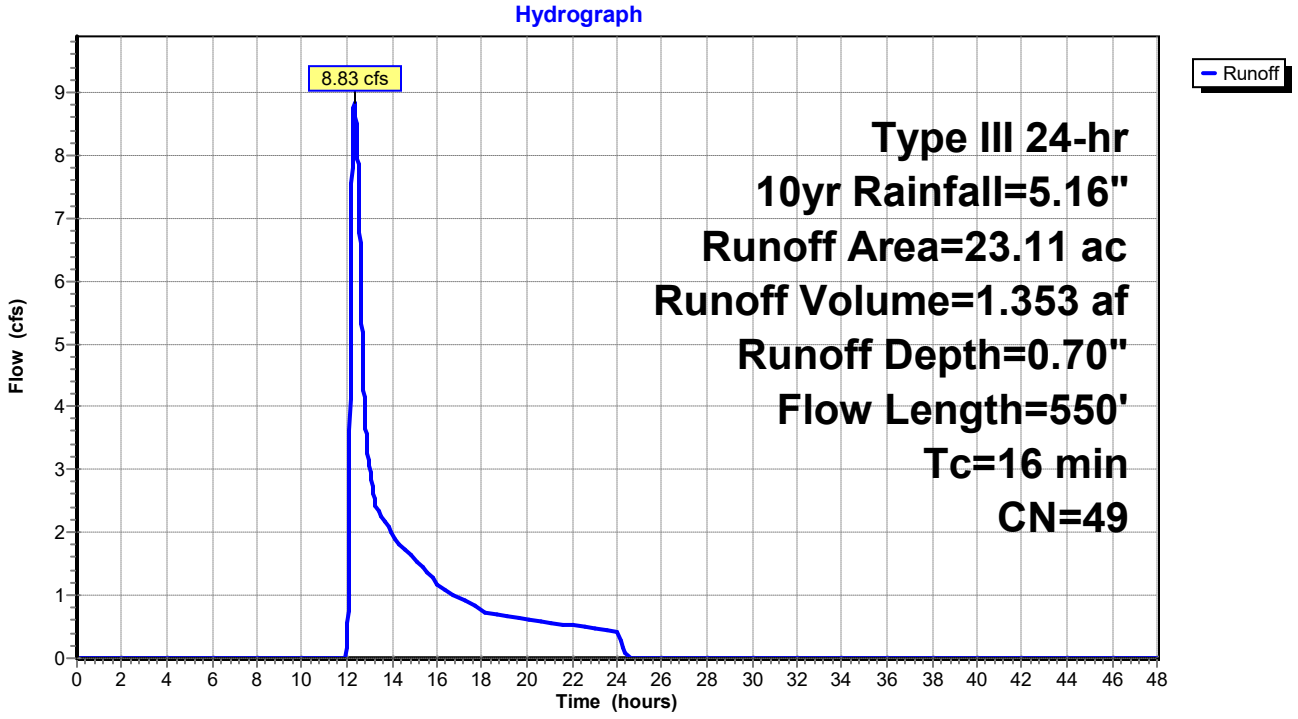
Runoff = 8.83 cfs @ 12.32 hrs, Volume= 1.353 af, Depth= 0.70"
Routed to Link 16L : Design Point: D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
12.27	39	>75% Grass cover, Good, HSG A
10.58	61	>75% Grass cover, Good, HSG B
0.26	30	Woods, Good, HSG A
23.11	49	Weighted Average
23.11		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0300	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	165	0.0240	2.49		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	285	0.0080	1.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16	550	Total			

Subcatchment 13S: PrWS D-1



Summary for Subcatchment 14S: PrWS D-2

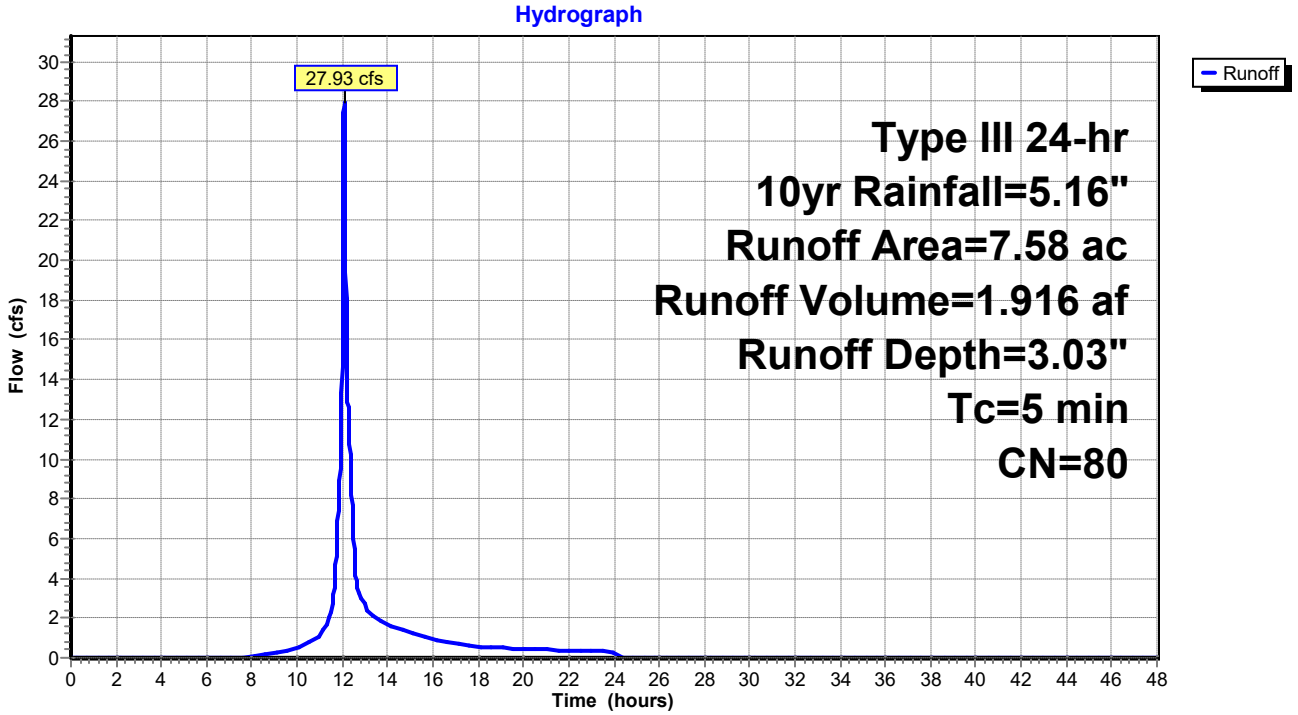
Runoff = 27.93 cfs @ 12.07 hrs, Volume= 1.916 af, Depth= 3.03"
Routed to Pond 15P : Infiltration Basin D-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
5.06	98	Paved parking, HSG A
1.90	39	>75% Grass cover, Good, HSG A
0.62	61	>75% Grass cover, Good, HSG B
7.58	80	Weighted Average
2.52		33.25% Pervious Area
5.06		66.75% Impervious Area

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

Subcatchment 14S: PrWS D-2



Summary for Subcatchment 17S: PrWS E-1

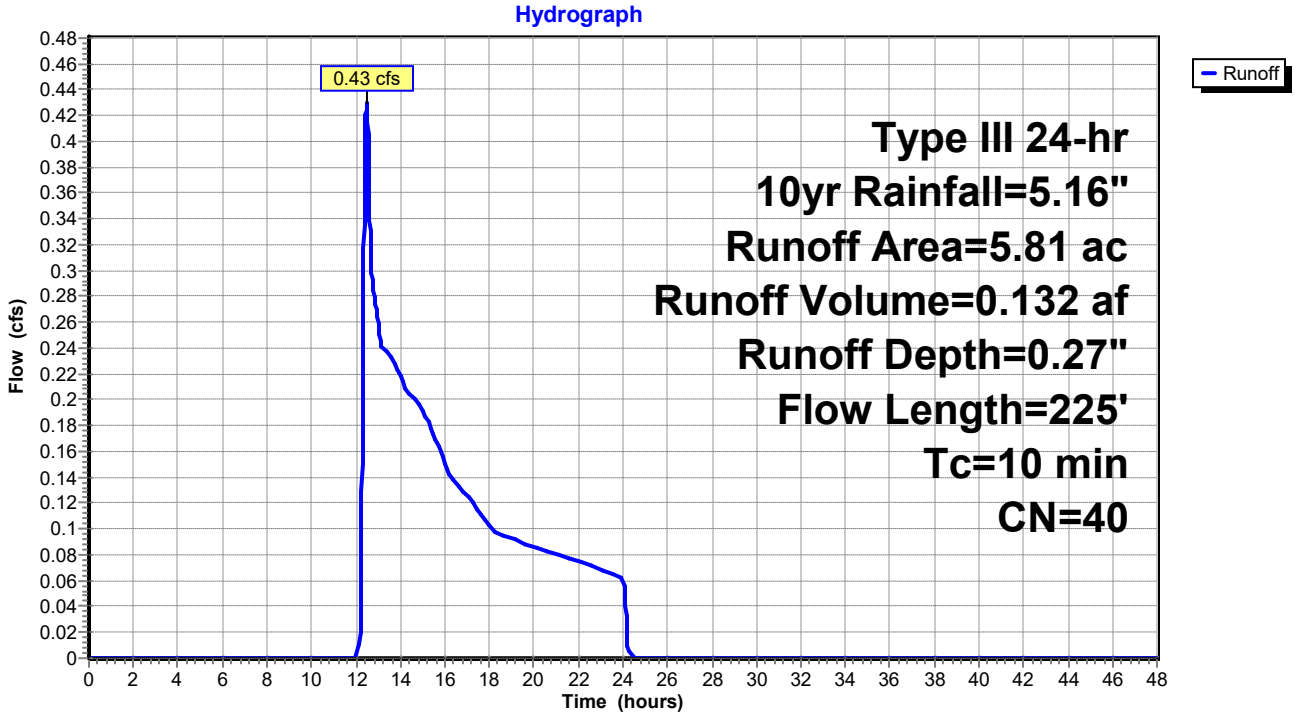
Runoff = 0.43 cfs @ 12.48 hrs, Volume= 0.132 af, Depth= 0.27"
Routed to Pond 20P : Existing Basin E-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
1.91	39	>75% Grass cover, Good, HSG A
2.97	30	Woods, Good, HSG A
0.93	77	Woods, Good, HSG D
5.81	40	Weighted Average
5.81		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	100	0.0650	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	25	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	100	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10	225	Total			

Subcatchment 17S: PrWS E-1



Summary for Subcatchment 18S: PrWS E-2

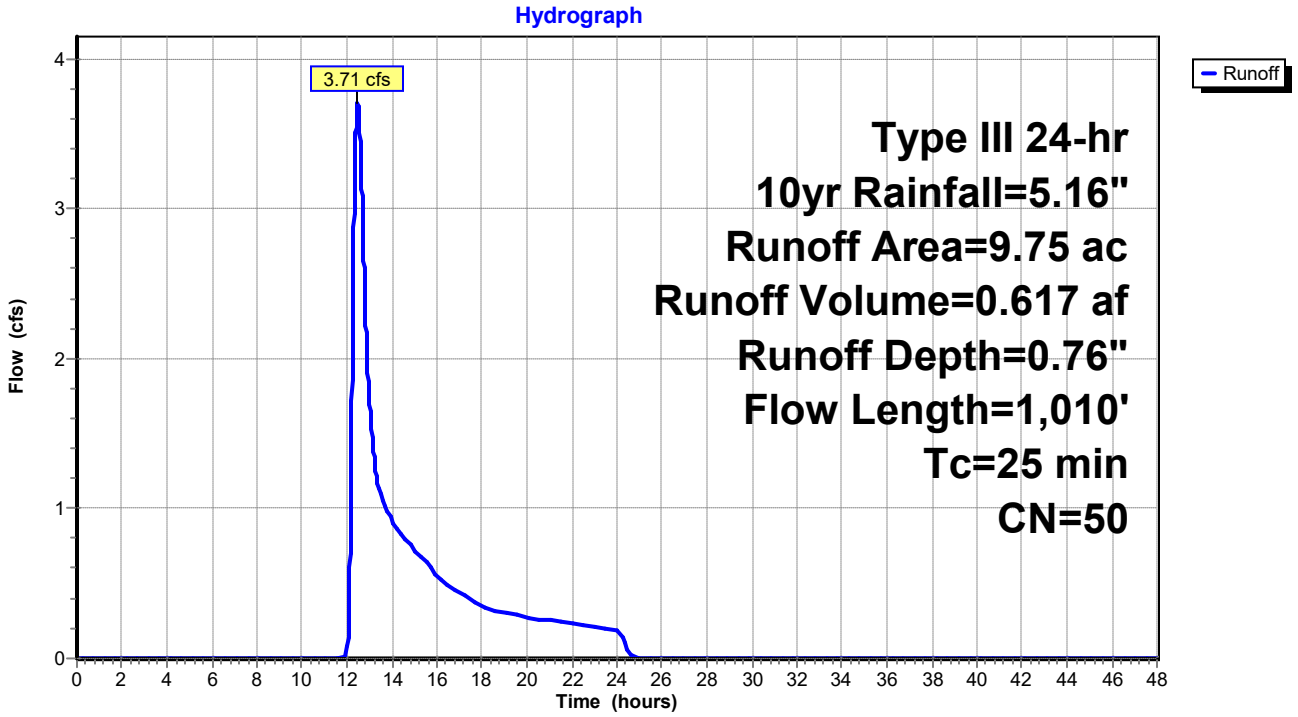
Runoff = 3.71 cfs @ 12.47 hrs, Volume= 0.617 af, Depth= 0.76"
Routed to Pond 19P : Infiltration Basin E-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
0.99	98	Paved parking, HSG A
6.78	39	>75% Grass cover, Good, HSG A
1.54	61	>75% Grass cover, Good, HSG B
0.44	74	>75% Grass cover, Good, HSG C
9.75	50	Weighted Average
8.76		89.85% Pervious Area
0.99		10.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13	100	0.0230	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
7	550	0.0060	1.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4	250	0.0040	1.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	110	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
25	1,010	Total			

Subcatchment 18S: PrWS E-2



Summary for Subcatchment 22S: PrWS F-1

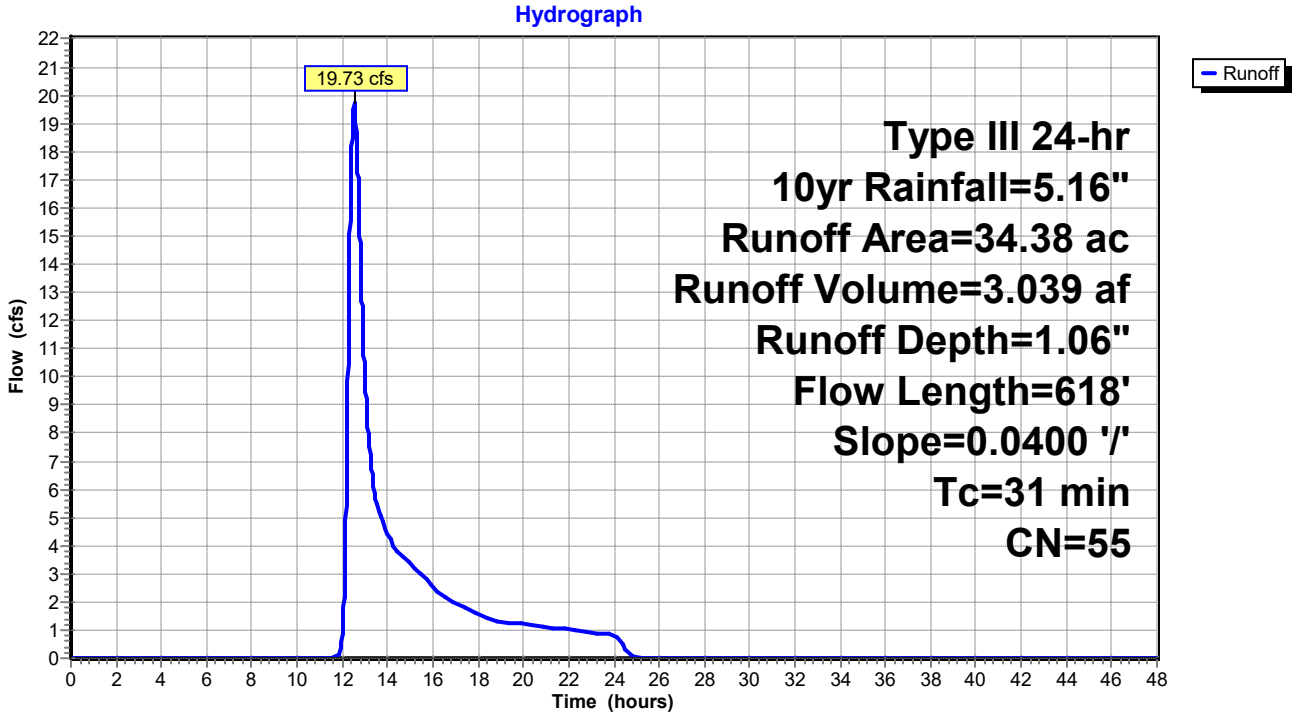
Runoff = 19.73 cfs @ 12.51 hrs, Volume= 3.039 af, Depth= 1.06"
Routed to Link 27L : Design Point: F

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
0.71	39	>75% Grass cover, Good, HSG A
6.24	61	>75% Grass cover, Good, HSG B
2.19	30	Woods, Good, HSG A
23.23	55	Woods, Good, HSG B
2.01	77	Woods, Good, HSG D
34.38	55	Weighted Average
34.38		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	518	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
31	618	Total			

Subcatchment 22S: PrWS F-1



Summary for Subcatchment 23S: PrWS F-2

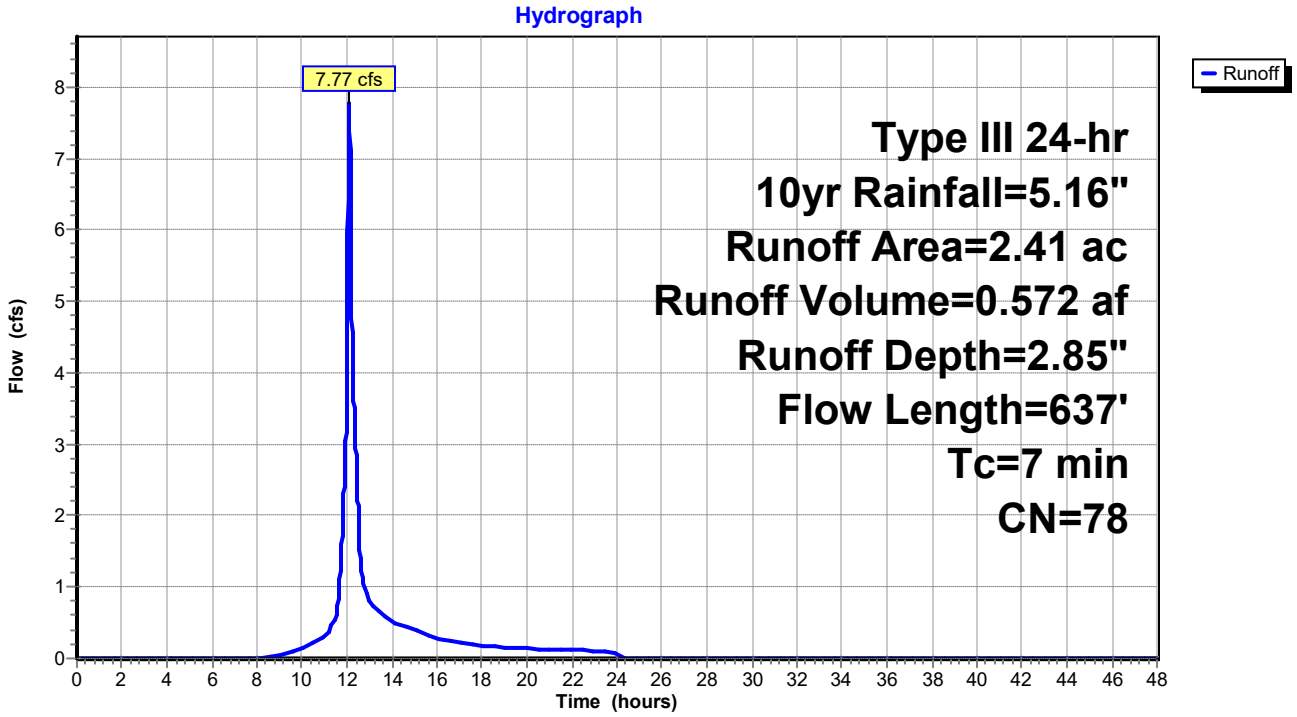
Runoff = 7.77 cfs @ 12.10 hrs, Volume= 0.572 af, Depth= 2.85"
Routed to Pond 24P : Infiltration Basin F-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
1.24	98	Paved parking, HSG A
0.24	39	>75% Grass cover, Good, HSG A
0.93	61	>75% Grass cover, Good, HSG B
2.41	78	Weighted Average
1.17		48.55% Pervious Area
1.24		51.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.31"
1	100	0.0060	1.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	15	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5	475	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	12	0.3330	9.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7	637	Total			

Subcatchment 23S: PrWS F-2



Summary for Subcatchment 25S: PrWS F-3

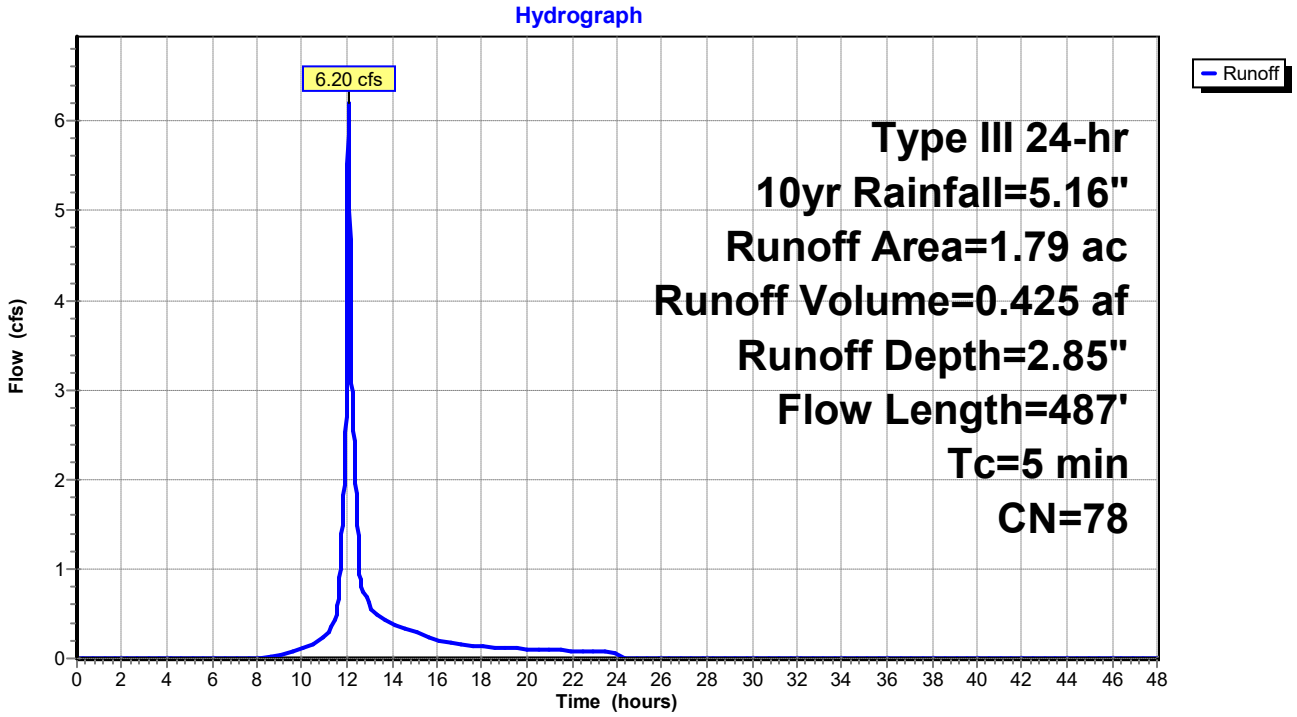
Runoff = 6.20 cfs @ 12.07 hrs, Volume= 0.425 af, Depth= 2.85"
Routed to Pond 26P : Infiltration Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
0.83	98	Paved parking, HSG A
0.96	61	>75% Grass cover, Good, HSG B
1.79	78	Weighted Average
0.96		53.63% Pervious Area
0.83		46.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.31"
1	100	0.0060	1.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	15	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	325	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	12	0.3330	9.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5	487	Total			

Subcatchment 25S: PrWS F-3



Summary for Subcatchment 28S: PrWS G-1a

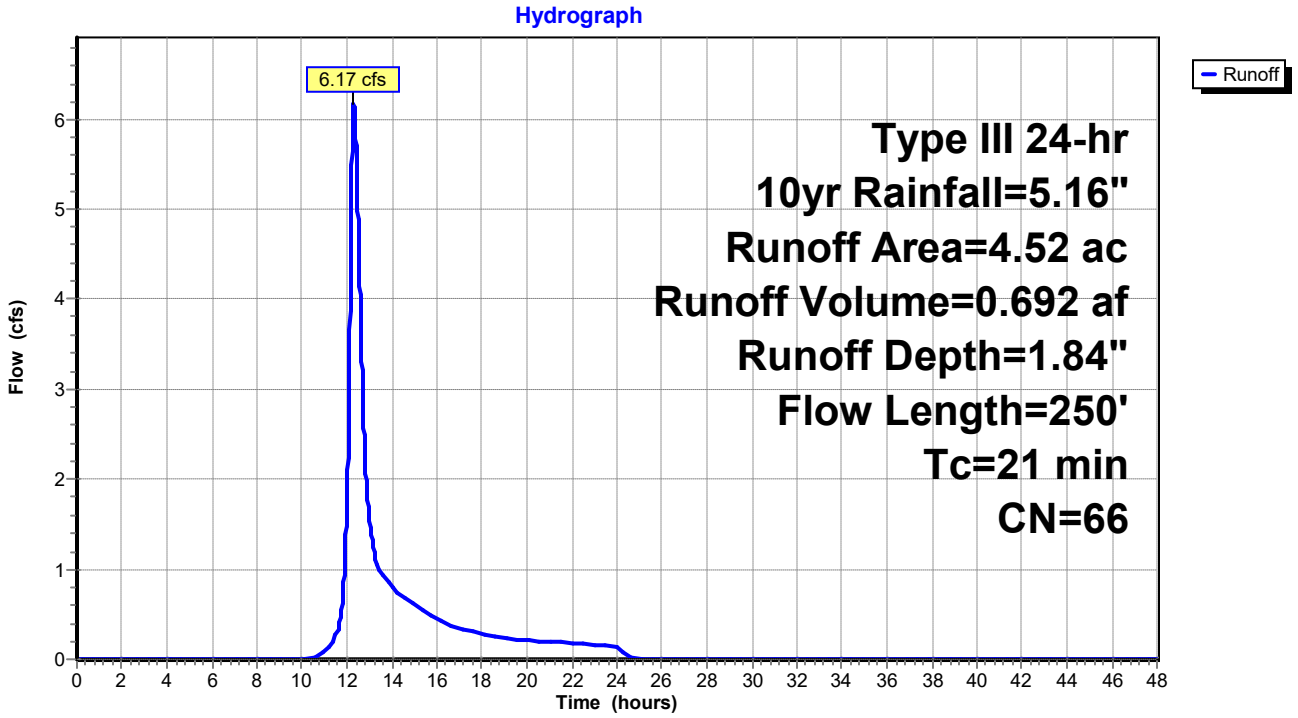
Runoff = 6.17 cfs @ 12.30 hrs, Volume= 0.692 af, Depth= 1.84"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
0.43	98	Paved parking, HSG A
1.26	61	>75% Grass cover, Good, HSG B
1.81	55	Woods, Good, HSG B
1.02	77	Woods, Good, HSG D
4.52	66	Weighted Average
4.09		90.49% Pervious Area
0.43		9.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17	40	0.0230	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	60	0.3330	0.33		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	150	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
21	250	Total			

Subcatchment 28S: PrWS G-1a



Summary for Subcatchment 29S: PrWS G-1b

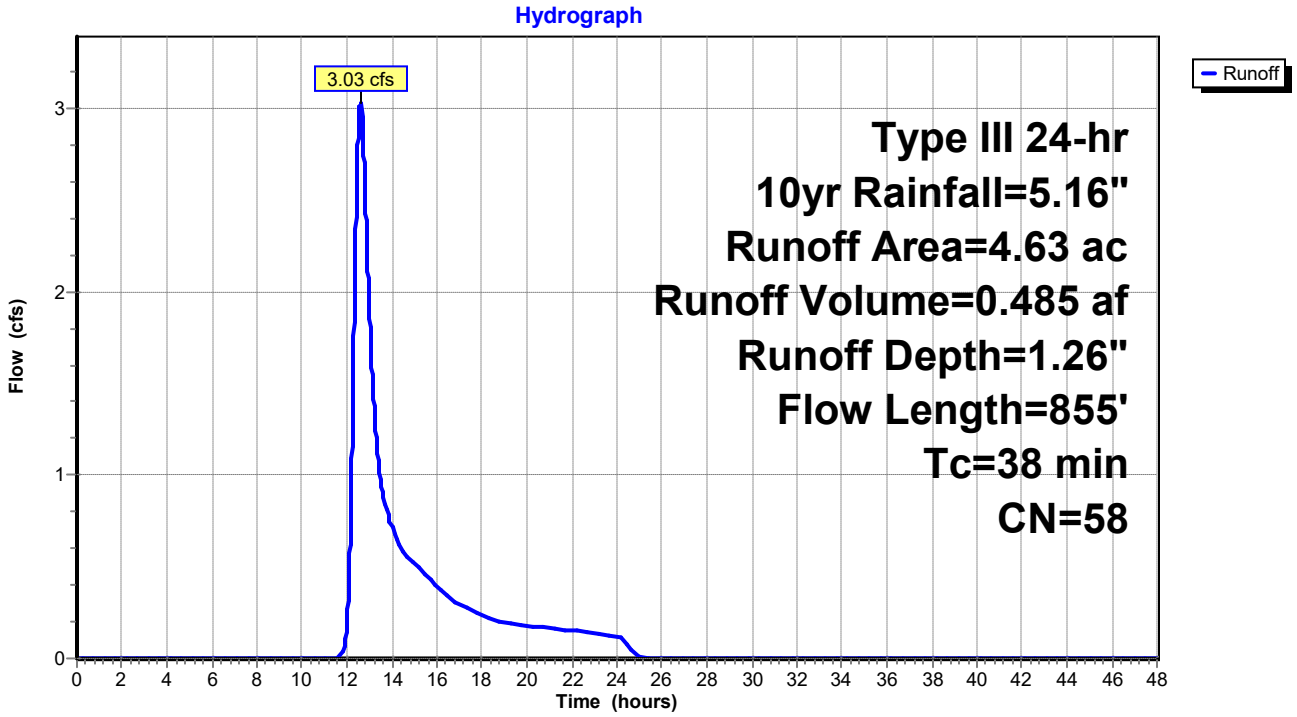
Runoff = 3.03 cfs @ 12.62 hrs, Volume= 0.485 af, Depth= 1.26"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
2.49	61	>75% Grass cover, Good, HSG B
2.14	55	Woods, Good, HSG B
4.63	58	Weighted Average
4.63		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10	35	0.0570	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
22	65	0.0320	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
2	275	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	180	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	300	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38	855	Total			

Subcatchment 29S: PrWS G-1b



Summary for Subcatchment 30S: PrWS G-1c

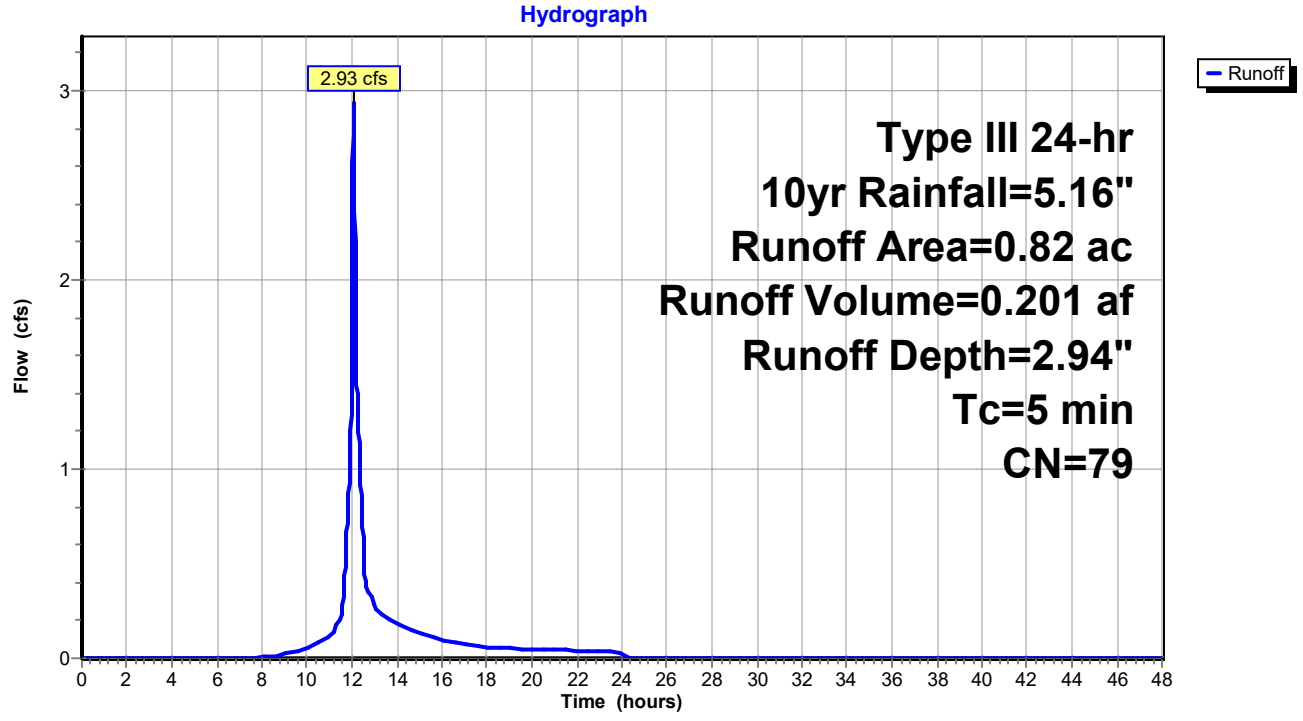
Runoff = 2.93 cfs @ 12.07 hrs, Volume= 0.201 af, Depth= 2.94"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
0.39	98	Paved parking, HSG A
0.43	61	>75% Grass cover, Good, HSG B
0.82	79	Weighted Average
0.43		52.44% Pervious Area
0.39		47.56% Impervious Area

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

Subcatchment 30S: PrWS G-1c



Summary for Subcatchment 31S: PrWS G-2

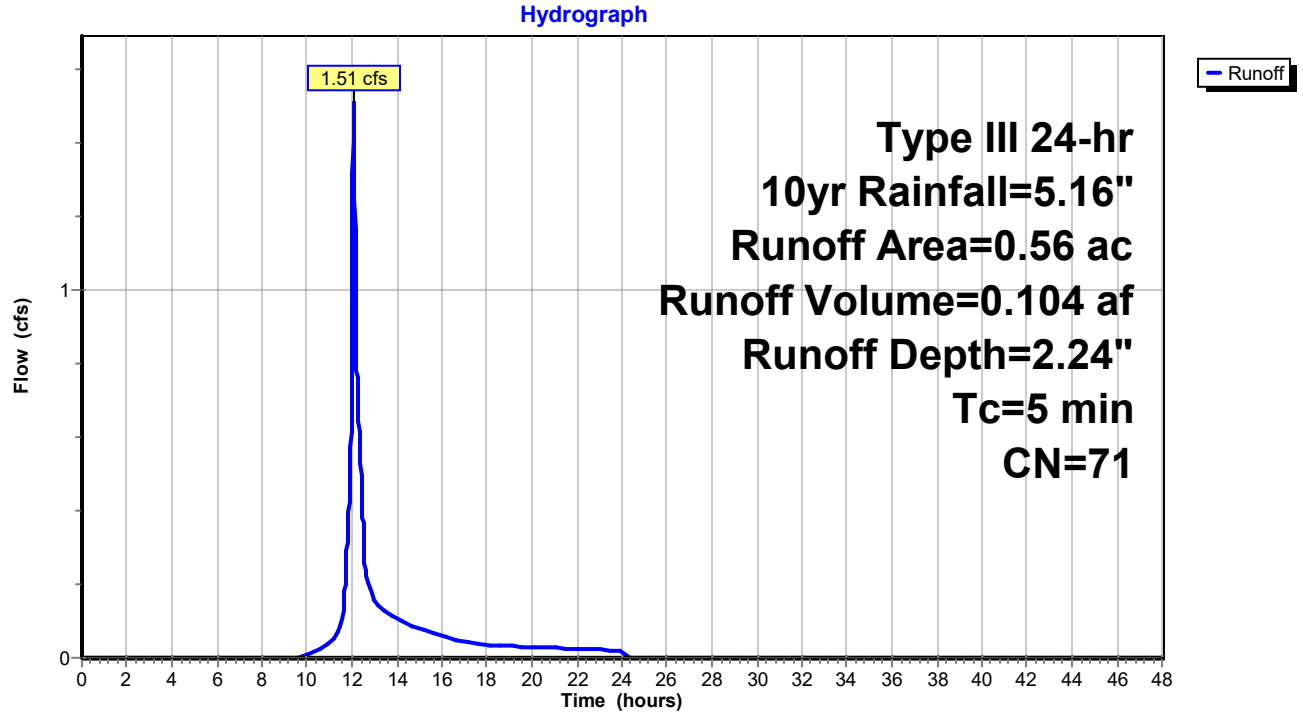
Runoff = 1.51 cfs @ 12.08 hrs, Volume= 0.104 af, Depth= 2.24"
Routed to Pond 32P : Infiltration Basin G-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10yr Rainfall=5.16"

Area (ac)	CN	Description
0.16	98	Paved parking, HSG A
0.35	61	>75% Grass cover, Good, HSG B
0.05	55	Woods, Good, HSG B
0.56	71	Weighted Average
0.40		71.43% Pervious Area
0.16		28.57% Impervious Area

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

Subcatchment 31S: PrWS G-2



Summary for Pond 4P: UG Detention System B-2

Inflow Area = 23.96 ac, 92.36% Impervious, Inflow Depth = 4.47" for 10yr event
Inflow = 120.59 cfs @ 12.07 hrs, Volume= 8.917 af
Outflow = 4.63 cfs @ 15.05 hrs, Volume= 3.415 af, Atten= 96%, Lag= 178.9 min
Primary = 4.63 cfs @ 15.05 hrs, Volume= 3.415 af
Routed to Pond 8P : Extended Detention Basin B-4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 136.50' @ 15.05 hrs Surf.Area= 121,524 sf Storage= 291,039 cf

Plug-Flow detention time= 528.9 min calculated for 3.414 af (38% of inflow)
Center-of-Mass det. time= 389.7 min (1,161.4 - 771.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	53,816 cf	**82.00'W x 1,482.00'L x 5.17'H Field A** 627,874 cf Overall - 493,333 cf Embedded = 134,541 cf x 40.0% Voids
#2A	134.00'	369,049 cf	**retain_it retain_it 3.5'** x 1850 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 10 Rows adjusted for 2,394.5 cf perimeter wall
		422,866 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	135.12'	**36.0" Round Culvert** L= 870.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 135.12' / 132.50' S= 0.0030 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	136.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.24 1.25 4.00 Width (feet) 4.00 4.00 8.00 8.00

Primary OutFlow Max=4.63 cfs @ 15.05 hrs HW=136.50' TW=134.29' (Dynamic Tailwater)
↑**1=Culvert** (Passes 4.63 cfs of 9.14 cfs potential flow)
↑**2=Custom Weir/Orifice** (Weir Controls 4.63 cfs @ 2.32 fps)

Pond 4P: UG Detention System B-2 - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it®)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
10 Rows adjusted for 2,394.5 cf perimeter wall

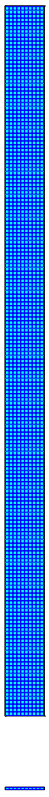
185 Chambers/Row x 8.00' Long = 1,480.00' Row Length +12.0" End Stone x 2 = 1,482.00' Base Length
10 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 82.00' Base Width
6.0" Stone Base + 50.0" Chamber Height + 6.0" Stone Cover = 5.17' Field Height

6.1 cf Sidewall x 185 x 2 + 6.1 cf Endwall x 10 x 2 = 2,394.5 cf Perimeter Wall
1,850 Chambers x 200.8 cf - 2,394.5 cf Perimeter wall = 369,049.3 cf Chamber Storage
1,850 Chambers x 266.7 cf = 493,333.3 cf Displacement

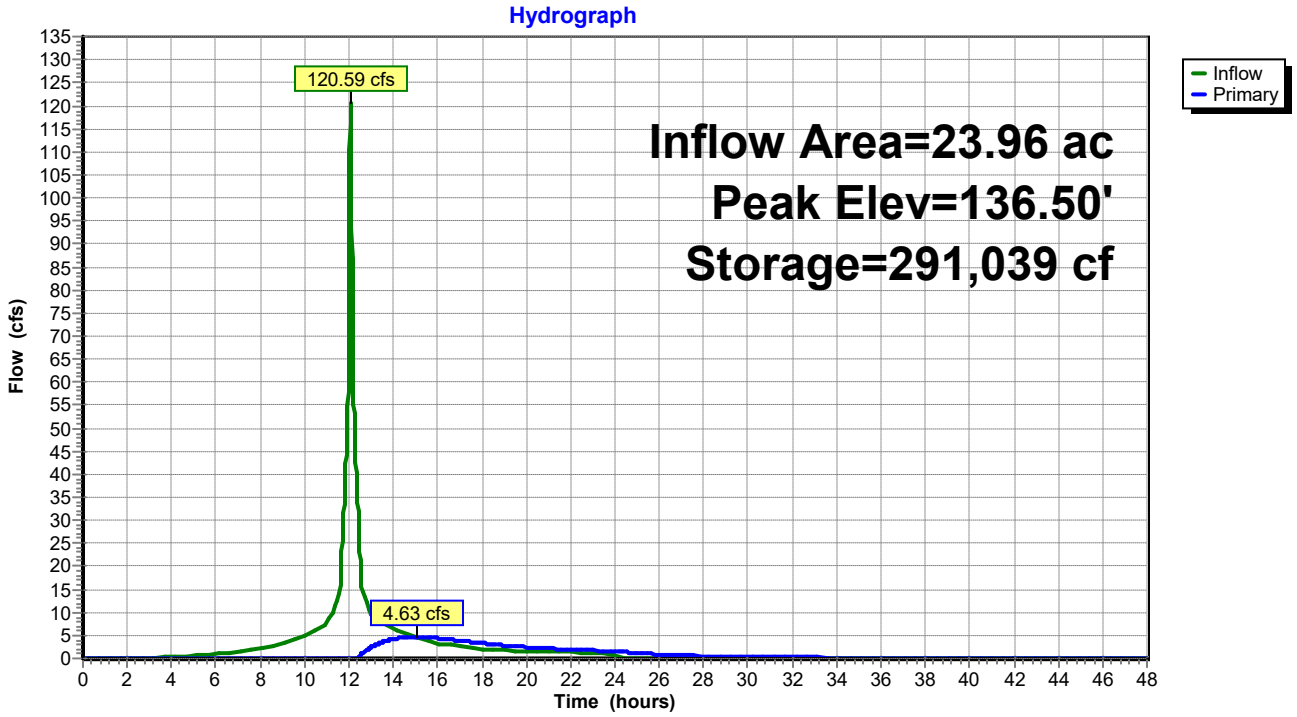
627,874.0 cf Field - 493,333.3 cf Chambers = 134,540.7 cf Stone x 40.0% Voids = 53,816.3 cf Stone Storage

Chamber Storage + Stone Storage = 422,865.5 cf = 9.708 af
Overall Storage Efficiency = 67.3%
Overall System Size = 1,482.00' x 82.00' x 5.17'

1,850 Chambers
23,254.6 cy Field
4,983.0 cy Stone



Pond 4P: UG Detention System B-2



Summary for Pond 6P: UG Detention System B-3

Inflow Area = 11.97 ac,100.00% Impervious, Inflow Depth = 4.92" for 10yr event
Inflow = 62.62 cfs @ 12.07 hrs, Volume= 4.911 af
Outflow = 6.59 cfs @ 12.72 hrs, Volume= 2.507 af, Atten= 89%, Lag= 38.9 min
Primary = 6.59 cfs @ 12.72 hrs, Volume= 2.507 af
Routed to Pond 10P : Extended Detention Basin B-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 136.77' @ 12.72 hrs Surf.Area= 1.25 ac Storage= 3.217 af

Plug-Flow detention time= 381.6 min calculated for 2.507 af (51% of inflow)
Center-of-Mass det. time= 254.0 min (1,000.6 - 746.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	0.390 af	**34.00'W x 1,602.00'L x 5.17'H Field A** 6.460 af Overall - 5.485 af Embedded = 0.975 af x 40.0% Voids
#2A	134.00'	4.171 af	**retain_it retain_it 4.0'** x 800 Inside #1 Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf 4 Rows adjusted for 3,080.2 cf perimeter wall
		4.561 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**36.0" Round Culvert** L= 310.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 134.00' / 132.50' S= 0.0048 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	136.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.49 1.50 3.00 Width (feet) 3.00 3.00 6.00 6.00

Primary OutFlow Max=6.59 cfs @ 12.72 hrs HW=136.77' TW=133.43' (Dynamic Tailwater)
↑**1=Culvert** (Passes 6.59 cfs of 37.08 cfs potential flow)
↑**2=Custom Weir/Orifice** (Weir Controls 6.59 cfs @ 2.87 fps)

Pond 6P: UG Detention System B-3 - Chamber Wizard Field A

Chamber Model = retain_it retain_it 4.0' (retain-it®)
Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf
Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf
4 Rows adjusted for 3,080.2 cf perimeter wall

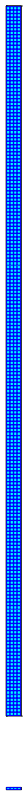
200 Chambers/Row x 8.00' Long = 1,600.00' Row Length +12.0" End Stone x 2 = 1,602.00' Base Length
4 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 34.00' Base Width
6.0" Stone Base + 56.0" Chamber Height = 5.17' Field Height

7.5 cf Sidewall x 200 x 2 + 7.5 cf Endwall x 4 x 2 = 3,080.2 cf Perimeter Wall
800 Chambers x 230.9 cf - 3,080.2 cf Perimeter wall = 181,671.5 cf Chamber Storage
800 Chambers x 298.7 cf = 238,933.3 cf Displacement

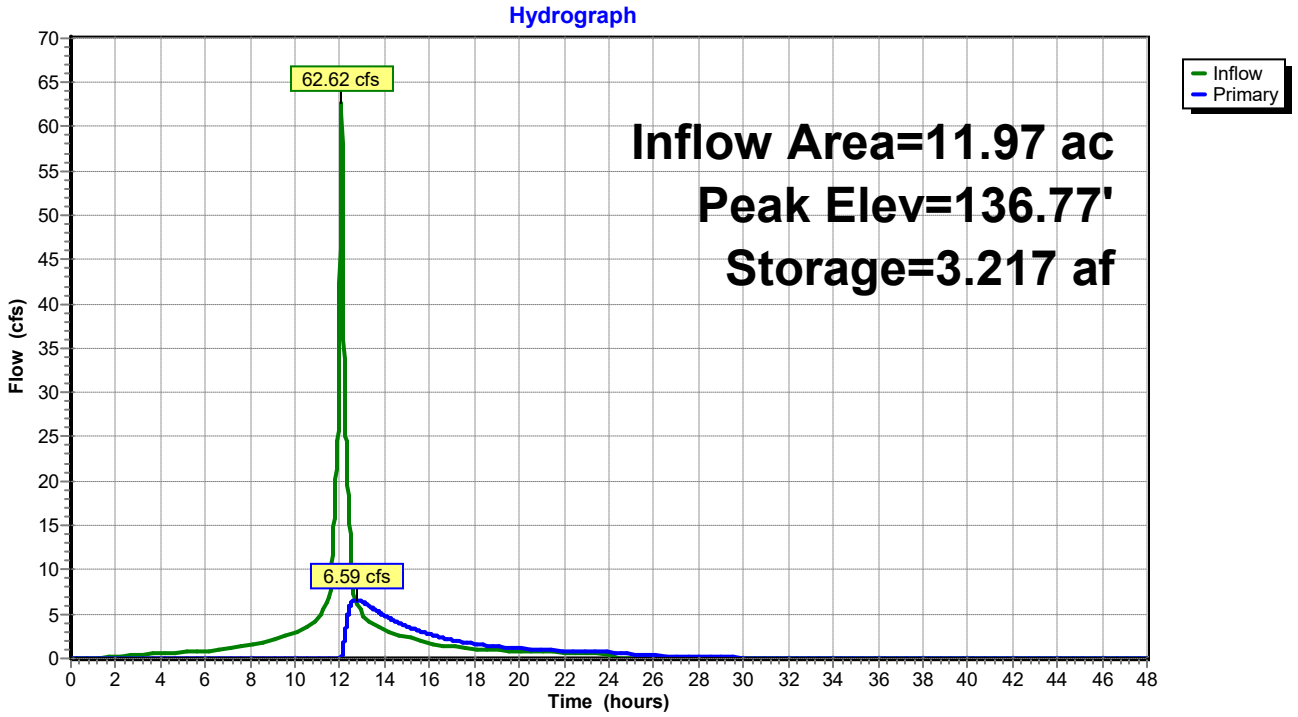
281,418.0 cf Field - 238,933.3 cf Chambers = 42,484.7 cf Stone x 40.0% Voids = 16,993.9 cf Stone Storage

Chamber Storage + Stone Storage = 198,665.3 cf = 4.561 af
Overall Storage Efficiency = 70.6%
Overall System Size = 1,602.00' x 34.00' x 5.17'

800 Chambers
10,422.9 cy Field
1,573.5 cy Stone



Pond 6P: UG Detention System B-3



Summary for Pond 8P: Extended Detention Basin B-4

Inflow Area = 31.37 ac, 79.06% Impervious, Inflow Depth > 1.85" for 10yr event
Inflow = 17.44 cfs @ 12.14 hrs, Volume= 4.848 af
Outflow = 4.75 cfs @ 16.60 hrs, Volume= 4.409 af, Atten= 73%, Lag= 267.3 min
Primary = 4.75 cfs @ 16.60 hrs, Volume= 4.409 af
Routed to Link 11L : Design Point: B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 134.41' @ 16.60 hrs Surf.Area= 30,985 sf Storage= 54,040 cf

Plug-Flow detention time= 245.0 min calculated for 4.409 af (91% of inflow)
Center-of-Mass det. time= 169.4 min (1,237.2 - 1,067.7)

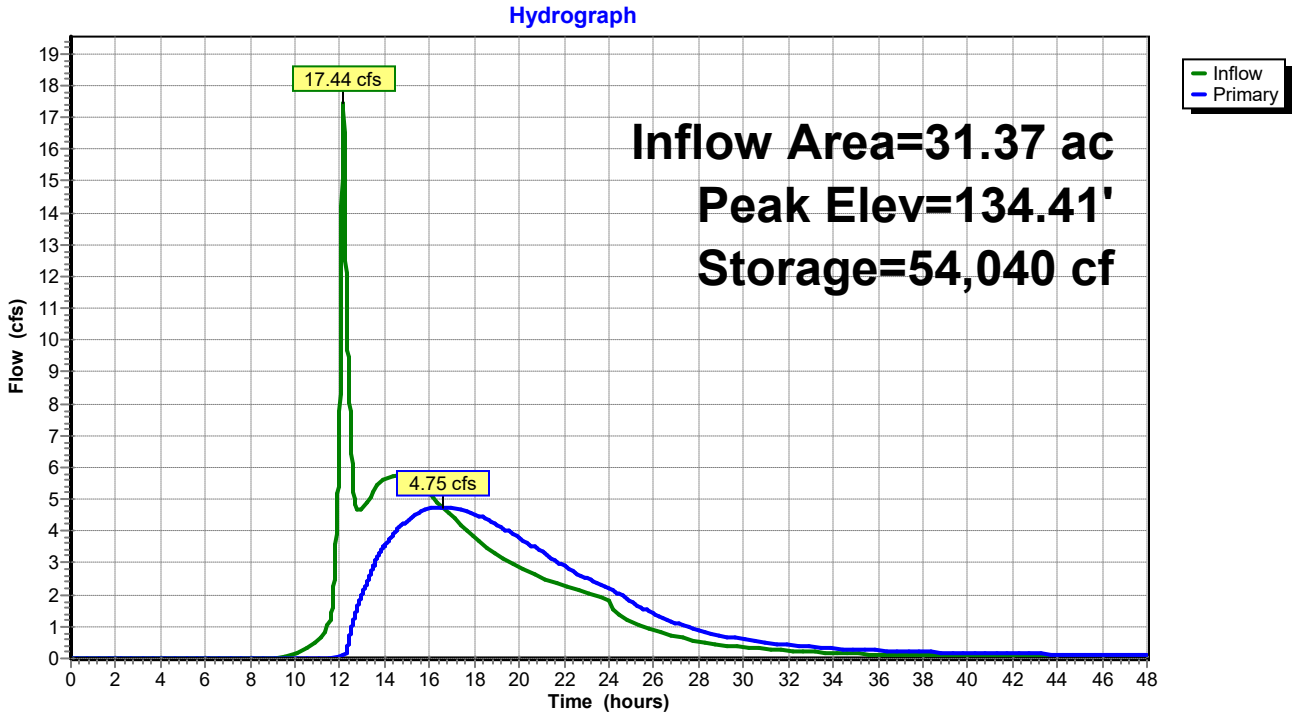
Volume	Invert	Avail.Storage	Storage Description
#1	132.50'	163,645 cf	**Detention Basin B-4 (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.50	25,654	0	0
133.00	27,028	13,171	13,171
134.00	29,819	28,424	41,594
135.00	32,666	31,243	72,837
136.00	35,570	34,118	106,955
137.00	38,530	37,050	144,005
137.50	40,032	19,641	163,645

Device	Routing	Invert	Outlet Devices
#1	Primary	132.50'	**36.0" Round Culvert** L= 312.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 132.50' / 131.16' S= 0.0043 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	132.50'	**2.5" Vert. 2.5in Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	133.25'	**10.0" Vert. (2x) 10in Orifice X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	136.00'	**36.0" x 24.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.75 cfs @ 16.60 hrs HW=134.41' TW=132.50' (Dynamic Tailwater)
- **1=Culvert** (Passes 4.75 cfs of 20.18 cfs potential flow)
  - **2=2.5in Orifice** (Orifice Controls 0.22 cfs @ 6.47 fps)
  - **3=(2x) 10in Orifice** (Orifice Controls 4.53 cfs @ 4.15 fps)
  - **4=Overflow CB** (Controls 0.00 cfs)

Pond 8P: Extended Detention Basin B-4



Summary for Pond 10P: Extended Detention Basin B-5

Inflow Area = 28.28 ac, 80.94% Impervious, Inflow Depth > 2.81" for 10yr event
Inflow = 60.10 cfs @ 12.07 hrs, Volume= 6.629 af
Outflow = 1.66 cfs @ 22.07 hrs, Volume= 3.555 af, Atten= 97%, Lag= 599.9 min
Primary = 1.66 cfs @ 22.07 hrs, Volume= 3.555 af
Routed to Link 11L : Design Point: B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 134.23' @ 22.07 hrs Surf.Area= 134,672 sf Storage= 221,615 cf

Plug-Flow detention time= 945.4 min calculated for 3.555 af (54% of inflow)
Center-of-Mass det. time= 790.6 min (1,678.6 - 888.0)

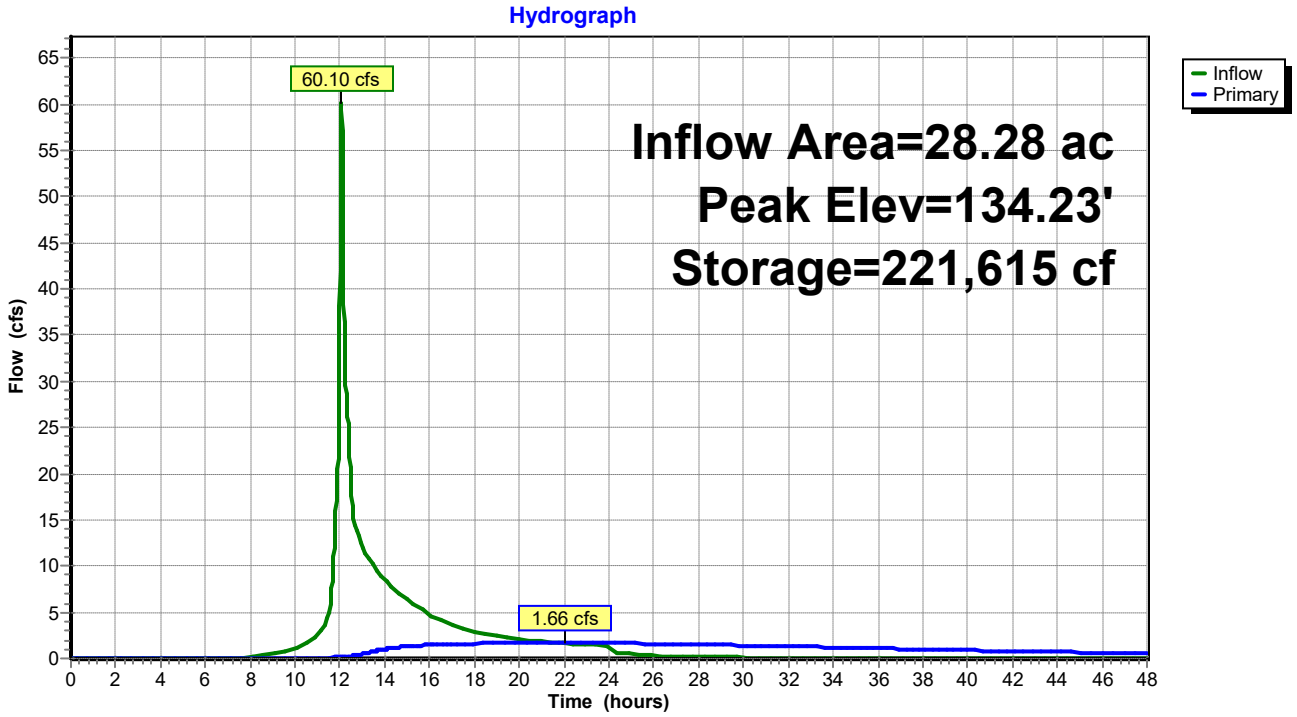
Volume	Invert	Avail.Storage	Storage Description
#1	132.50'	951,536 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.50	121,607	0	0
133.00	125,365	61,743	61,743
134.00	132,923	129,144	190,887
135.00	140,538	136,731	327,618
136.00	148,209	144,374	471,991
137.00	155,937	152,073	624,064
138.00	163,722	159,830	783,894
139.00	171,563	167,643	951,536

Device	Routing	Invert	Outlet Devices
#1	Primary	131.50'	**24.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 131.50' / 131.16' S= 0.0045 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	131.50'	**3.0" Vert. 3in Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	133.25'	**8.0" Vert. 8in Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	135.00'	**24.0" x 36.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.66 cfs @ 22.07 hrs HW=134.23' TW=132.50' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.66 cfs of 17.70 cfs potential flow)
  ├**2=3in Orifice** (Orifice Controls 0.31 cfs @ 6.33 fps)
  ├**3=8in Orifice** (Orifice Controls 1.35 cfs @ 3.87 fps)
  └**4=Overflow CB** (Controls 0.00 cfs)

Pond 10P: Extended Detention Basin B-5



Summary for Pond 15P: Infiltration Basin D-2

Inflow Area = 7.58 ac, 66.75% Impervious, Inflow Depth = 3.03" for 10yr event
Inflow = 27.93 cfs @ 12.07 hrs, Volume= 1.916 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 16L : Design Point: D

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 133.90' @ 24.29 hrs Surf.Area= 38,736 sf Storage= 83,452 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

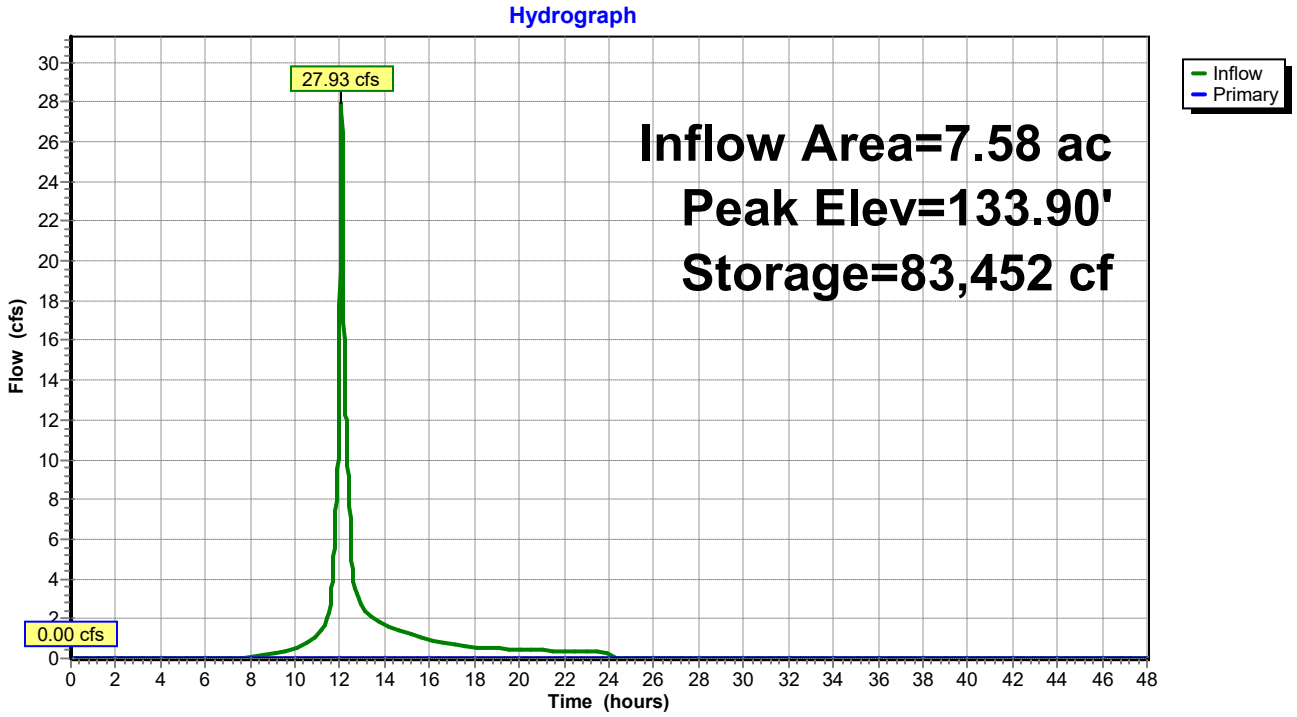
Volume	Invert	Avail.Storage	Storage Description
#1	131.50'	245,101 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
131.50	30,777	0	0
132.00	32,406	15,796	15,796
133.00	35,705	34,056	49,851
134.00	39,062	37,384	87,235
135.00	42,475	40,769	128,003
136.00	45,944	44,210	172,213
137.00	49,470	47,707	219,920
137.50	51,254	25,181	245,101

Device	Routing	Invert	Outlet Devices
#1	Primary	136.00'	**450.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=131.50' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 15P: Infiltration Basin D-2



Summary for Pond 19P: Infiltration Basin E-2

Inflow Area = 9.75 ac, 10.15% Impervious, Inflow Depth = 0.76" for 10yr event
Inflow = 3.71 cfs @ 12.47 hrs, Volume= 0.617 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 20P : Existing Basin E-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 139.17' @ 25.40 hrs Surf.Area= 45,422 sf Storage= 26,855 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

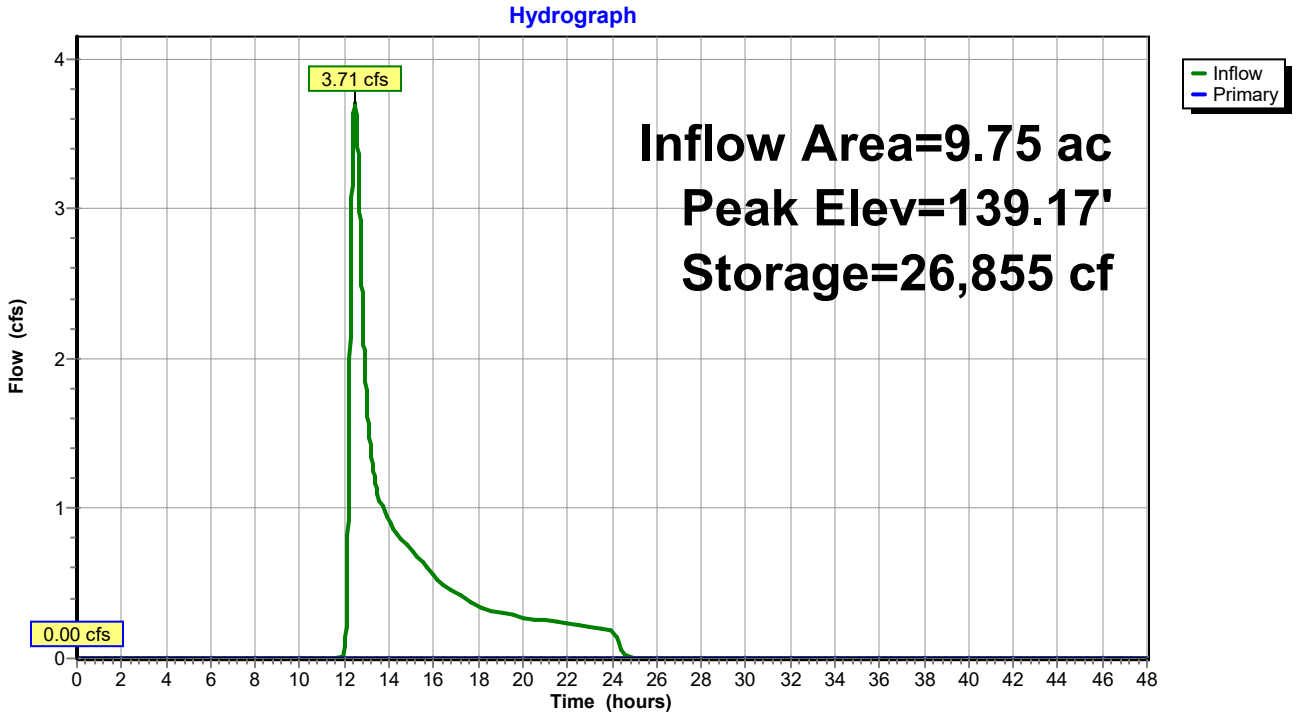
Volume	Invert	Avail.Storage	Storage Description
#1	138.50'	115,575 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
138.50	31,545	0	0
139.00	44,838	19,096	19,096
140.00	48,235	46,537	65,632
141.00	51,650	49,943	115,575

Device	Routing	Invert	Outlet Devices
#1	Primary	140.00'	**70.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=138.50' TW=130.20' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 19P: Infiltration Basin E-2



Summary for Pond 20P: Existing Basin E-1

Inflow Area = 15.56 ac, 6.36% Impervious, Inflow Depth = 0.10" for 10yr event
Inflow = 0.43 cfs @ 12.48 hrs, Volume= 0.132 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 21L : Design Point: E

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 130.56' @ 24.57 hrs Surf.Area= 16,300 sf Storage= 5,734 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

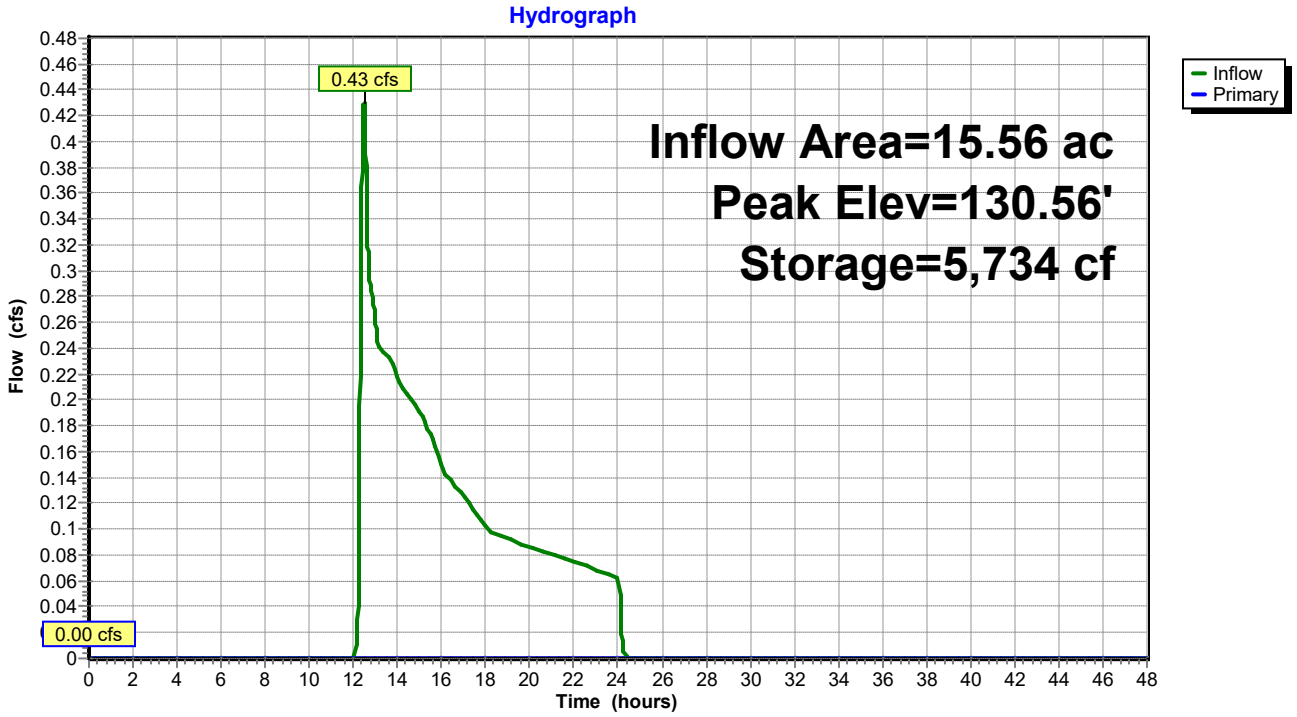
Volume	Invert	Avail.Storage	Storage Description
#1	130.20'	504,295 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.20	15,572	0	0
131.00	17,190	13,105	13,105
132.00	33,435	25,313	38,417
133.00	47,240	40,338	78,755
134.00	62,274	54,757	133,512
135.00	78,197	70,236	203,747
136.00	92,539	85,368	289,115
137.00	106,598	99,569	388,684
138.00	124,625	115,612	504,295

Device	Routing	Invert	Outlet Devices
#1	Primary	137.30'	**35.0' long + 3.0 '/' SideZ x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.20' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 20P: Existing Basin E-1



Summary for Pond 24P: Infiltration Basin F-2

Inflow Area = 2.41 ac, 51.45% Impervious, Inflow Depth = 2.85" for 10yr event
Inflow = 7.77 cfs @ 12.10 hrs, Volume= 0.572 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 27L : Design Point: F

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 132.20' @ 24.40 hrs Surf.Area= 13,154 sf Storage= 24,916 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

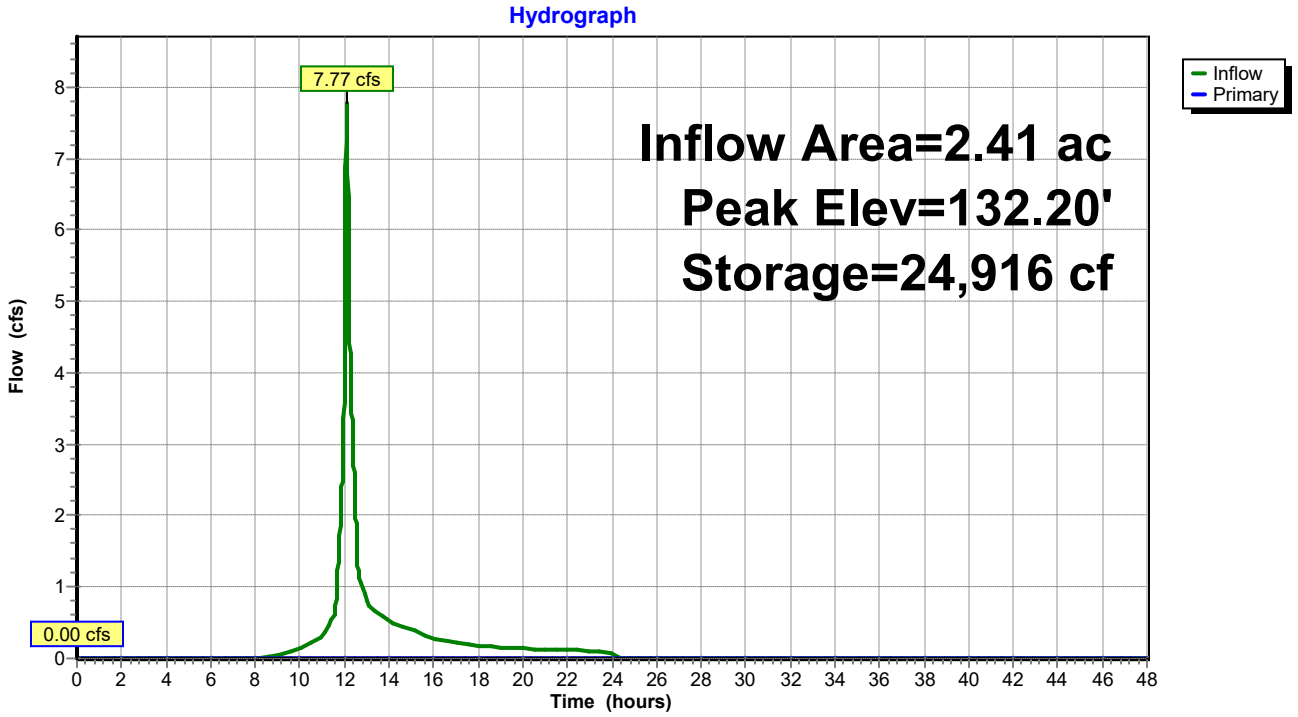
Volume	Invert	Avail.Storage	Storage Description
#1	130.00'	78,726 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.00	9,565	0	0
131.00	11,162	10,364	10,364
132.00	12,816	11,989	22,353
133.00	14,527	13,672	36,024
134.00	16,294	15,411	51,435
135.00	18,811	17,553	68,987
135.50	20,146	9,739	78,726

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**168.0' long + 3.0 '/' SideZ x 168.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 24P: Infiltration Basin F-2



Summary for Pond 26P: Infiltration Basin F-3

Inflow Area = 1.79 ac, 46.37% Impervious, Inflow Depth = 2.85" for 10yr event
Inflow = 6.20 cfs @ 12.07 hrs, Volume= 0.425 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 27L : Design Point: F

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 133.82' @ 24.29 hrs Surf.Area= 8,023 sf Storage= 18,506 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

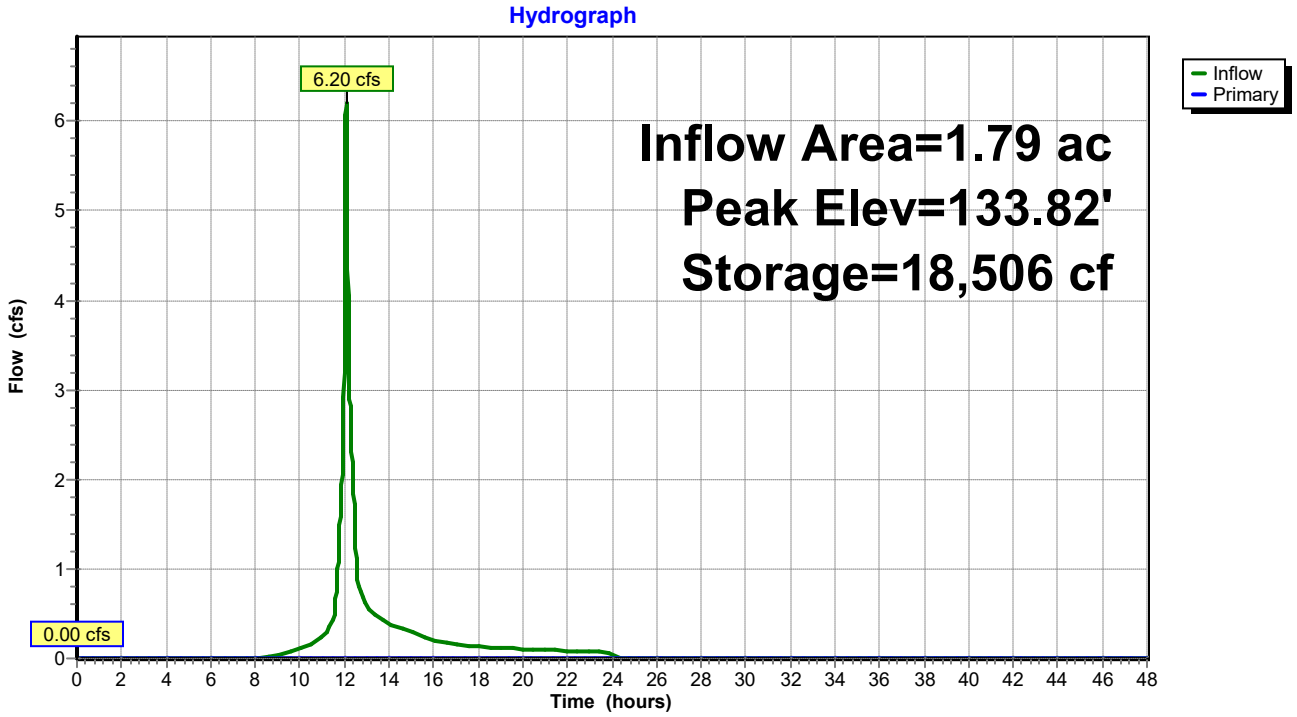
Volume	Invert	Avail.Storage	Storage Description
#1	131.00'	51,929 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
131.00	5,159	0	0
132.00	6,120	5,640	5,640
133.00	7,138	6,629	12,269
134.00	8,213	7,676	19,944
135.00	9,345	8,779	28,723
135.50	9,932	4,819	33,542
136.00	11,697	5,407	38,950
137.00	14,261	12,979	51,929

Device	Routing	Invert	Outlet Devices
#1	Primary	135.50'	**70.0' long + 3.0 '/' SideZ x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=131.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 26P: Infiltration Basin F-3



Summary for Pond 32P: Infiltration Basin G-2

Inflow Area = 0.56 ac, 28.57% Impervious, Inflow Depth = 2.24" for 10yr event
Inflow = 1.51 cfs @ 12.08 hrs, Volume= 0.104 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 33L : Design Point: G

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 133.93' @ 24.29 hrs Surf.Area= 2,960 sf Storage= 4,550 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

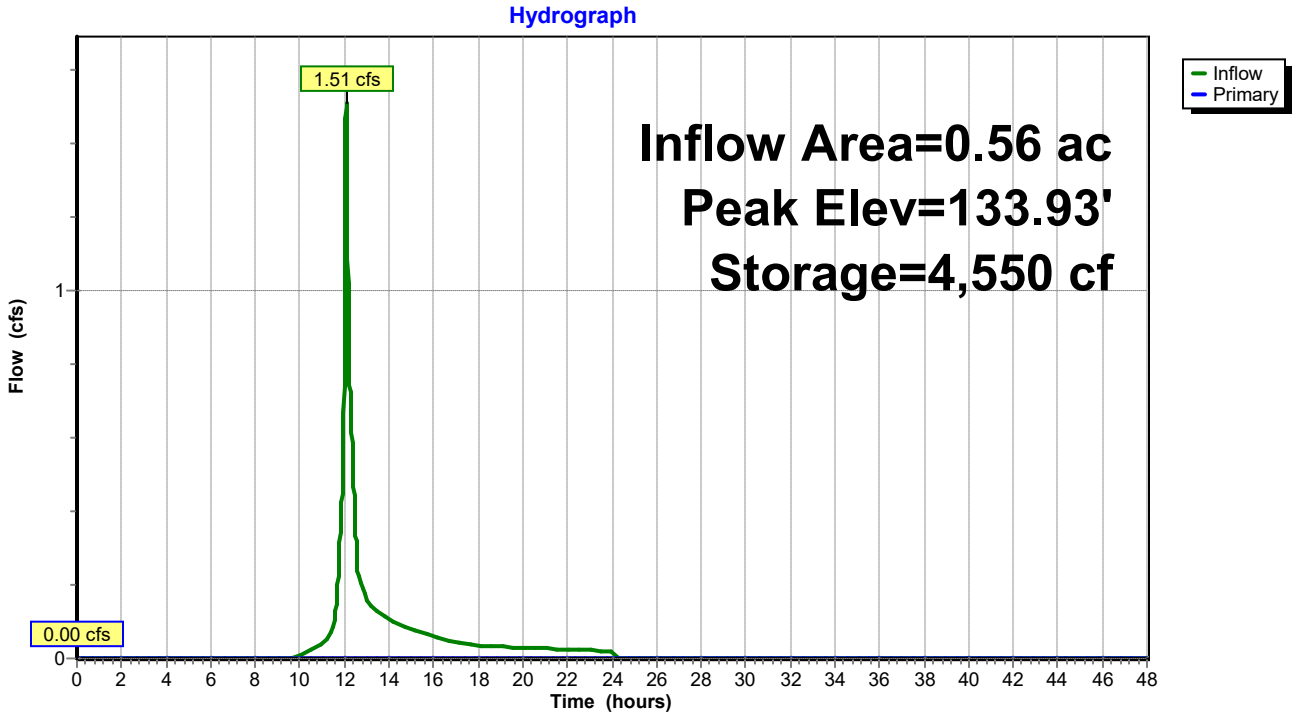
Volume	Invert	Avail.Storage	Storage Description
#1	132.00'	14,518 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.00	1,785	0	0
133.00	2,367	2,076	2,076
134.00	3,006	2,687	4,763
135.00	3,701	3,354	8,116
136.00	4,452	4,077	12,193
136.50	4,849	2,325	14,518

Device	Routing	Invert	Outlet Devices
#1	Primary	130.00'	**15.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 130.00' / 126.25' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf
#2	Device 1	135.00'	**24.0" x 36.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=132.00' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.00 cfs of 6.93 cfs potential flow)
↑**2=Overflow CB** (Controls 0.00 cfs)

Pond 32P: Infiltration Basin G-2



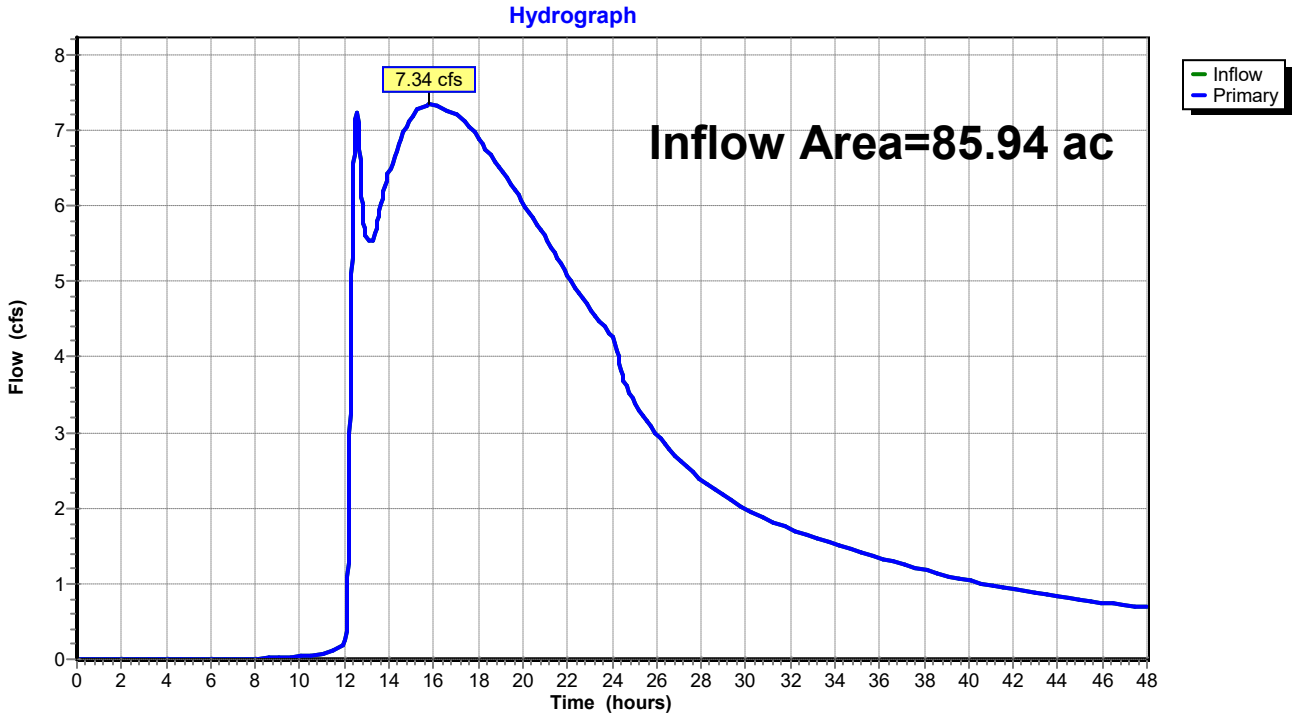
Summary for Link 11L: Design Point: B

Inflow Area = 85.94 ac, 56.17% Impervious, Inflow Depth > 1.28" for 10yr event
Inflow = 7.34 cfs @ 15.82 hrs, Volume= 9.154 af
Primary = 7.34 cfs @ 15.82 hrs, Volume= 9.154 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Fixed water surface Elevation= 132.50'

Link 11L: Design Point: B

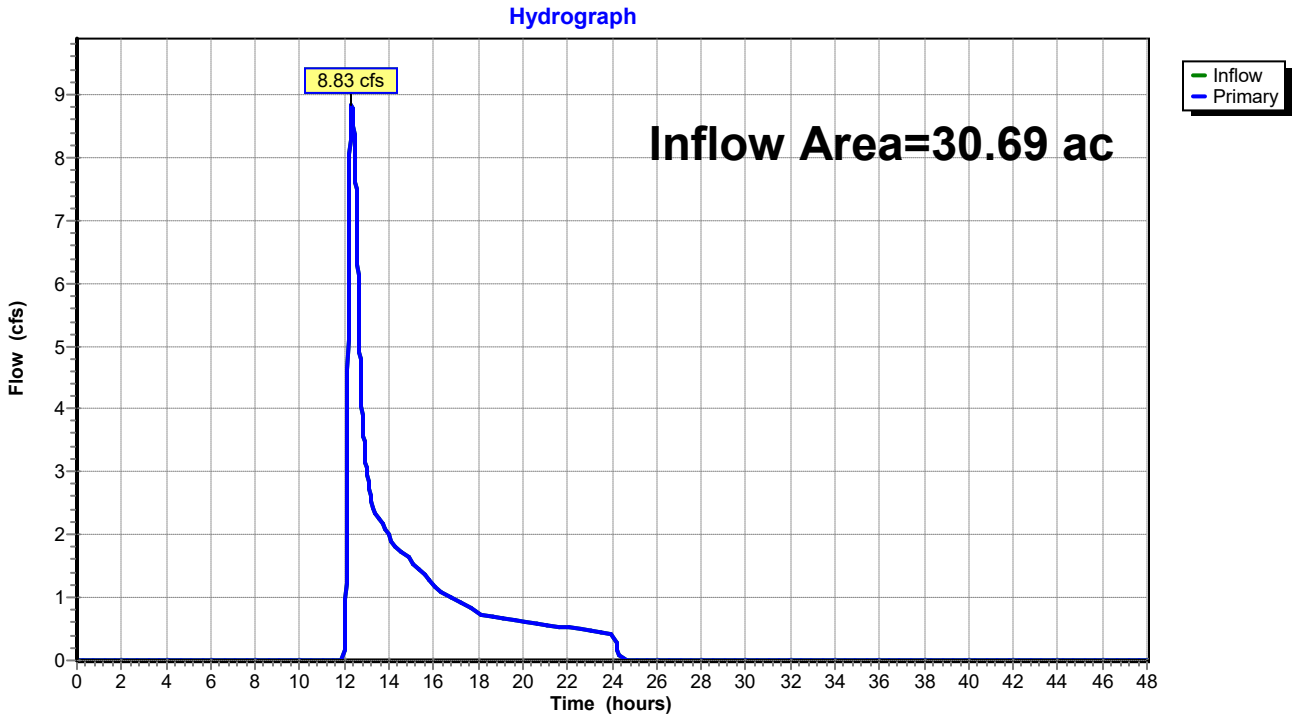


Summary for Link 16L: Design Point: D

Inflow Area = 30.69 ac, 16.49% Impervious, Inflow Depth = 0.53" for 10yr event
Inflow = 8.83 cfs @ 12.32 hrs, Volume= 1.353 af
Primary = 8.83 cfs @ 12.32 hrs, Volume= 1.353 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 16L: Design Point: D

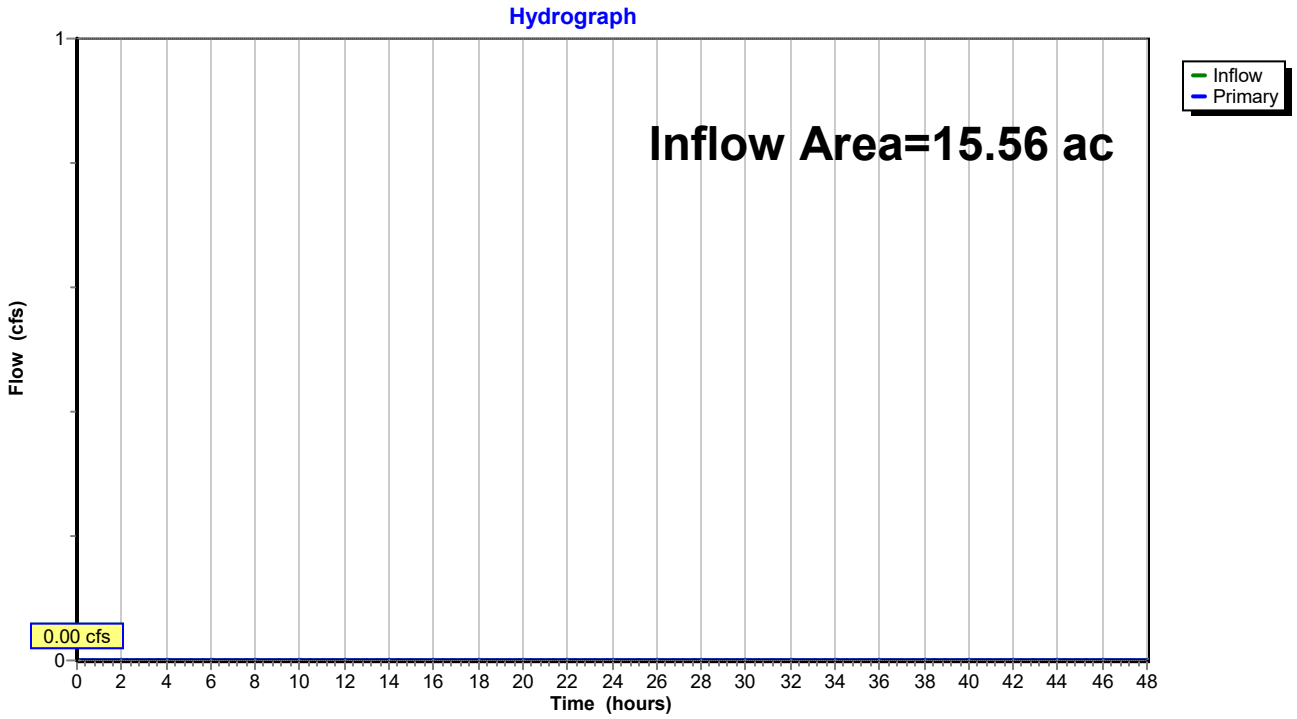


Summary for Link 21L: Design Point: E

Inflow Area = 15.56 ac, 6.36% Impervious, Inflow Depth = 0.00" for 10yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 21L: Design Point: E

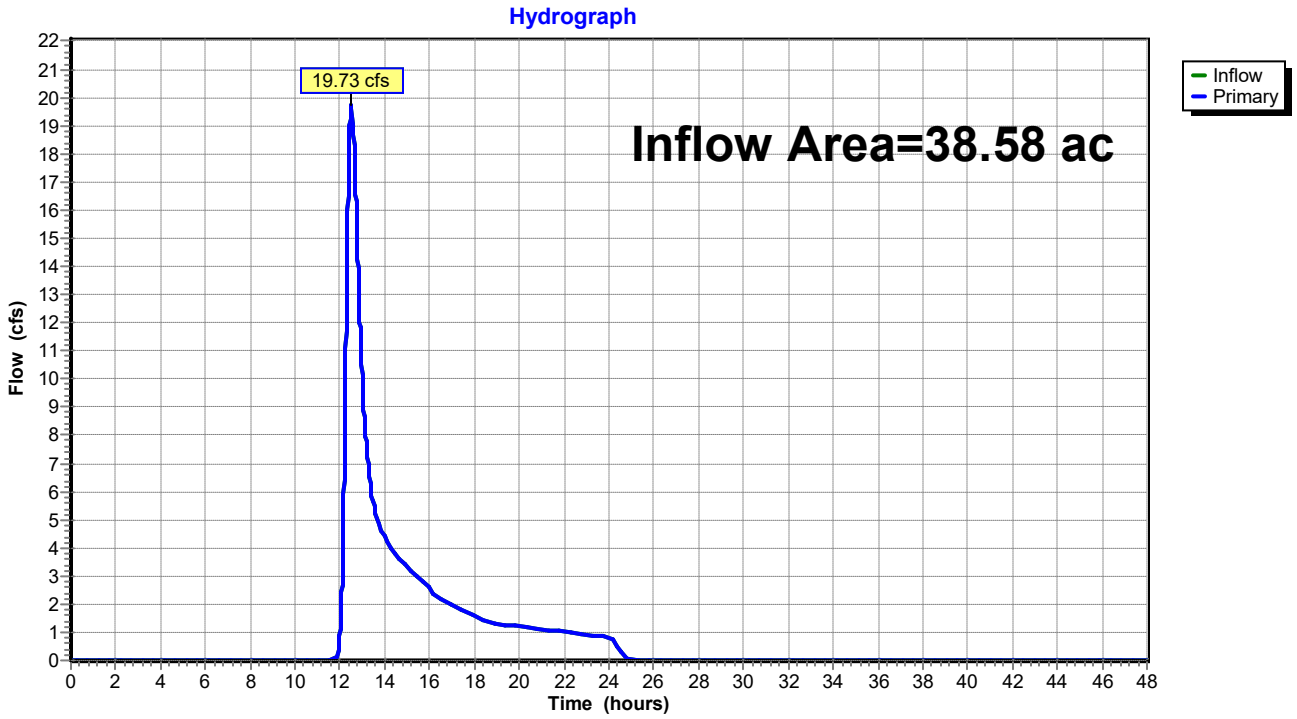


Summary for Link 27L: Design Point: F

Inflow Area = 38.58 ac, 5.37% Impervious, Inflow Depth = 0.95" for 10yr event
Inflow = 19.73 cfs @ 12.51 hrs, Volume= 3.039 af
Primary = 19.73 cfs @ 12.51 hrs, Volume= 3.039 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 27L: Design Point: F

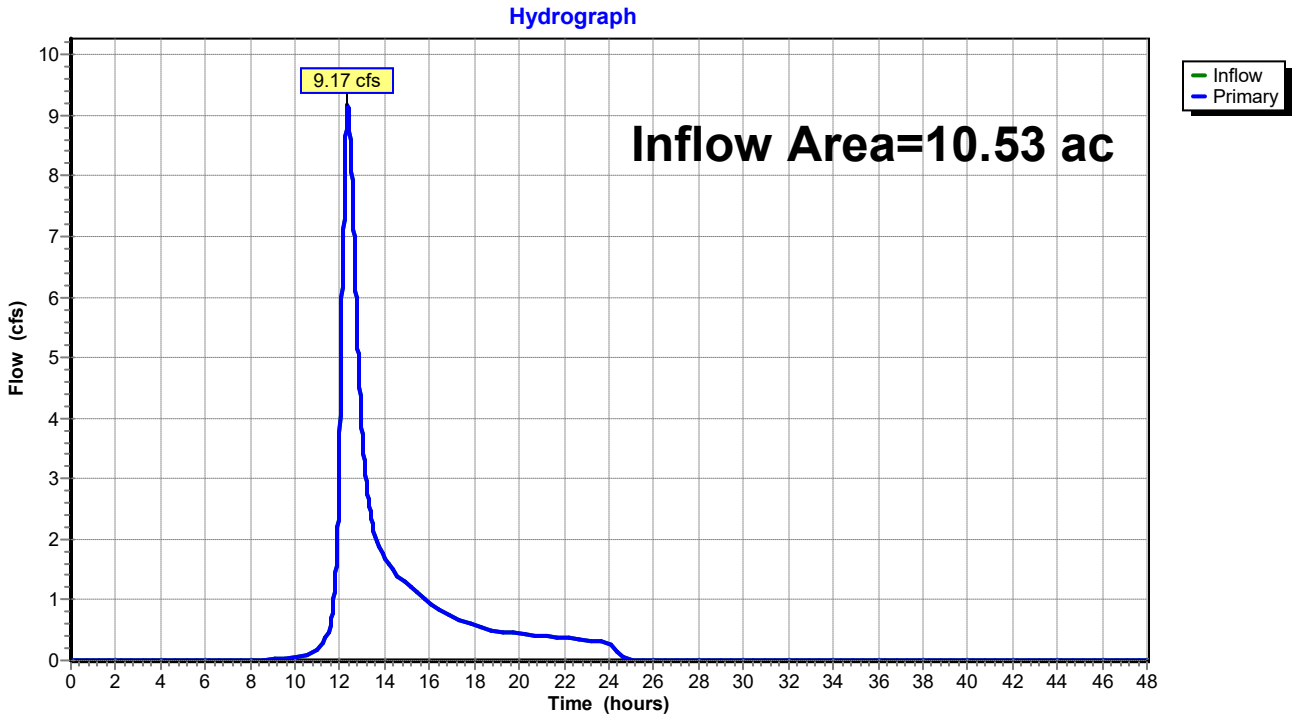


Summary for Link 33L: Design Point: G

Inflow Area = 10.53 ac, 9.31% Impervious, Inflow Depth = 1.57" for 10yr event
Inflow = 9.17 cfs @ 12.34 hrs, Volume= 1.378 af
Primary = 9.17 cfs @ 12.34 hrs, Volume= 1.378 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 33L: Design Point: G



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: PrWS A-1 Runoff Area=1.67 ac 2.99% Impervious Runoff Depth=1.00"
Flow Length=100' Slope=0.0150 '/' Tc=16 min CN=46 Runoff=1.01 cfs 0.139 af

Subcatchment 2S: PrWS B-1 Runoff Area=26.29 ac 2.21% Impervious Runoff Depth=1.00"
Flow Length=820' Tc=22 min CN=46 Runoff=14.33 cfs 2.190 af

Subcatchment 3S: PrWS B-2 Runoff Area=23.96 ac 92.36% Impervious Runoff Depth=5.60"
Tc=5 min CN=94 Runoff=149.39 cfs 11.189 af

Subcatchment 5S: PrWS B-3 Runoff Area=11.97 ac 100.00% Impervious Runoff Depth=6.07"
Tc=5 min CN=98 Runoff=76.71 cfs 6.056 af

Subcatchment 7S: PrWS B-4 Runoff Area=7.41 ac 36.03% Impervious Runoff Depth=3.25"
Flow Length=854' Tc=10 min CN=72 Runoff=24.62 cfs 2.006 af

Subcatchment 9S: PrWS B-5 Runoff Area=16.31 ac 66.95% Impervious Runoff Depth=4.06"
Tc=5 min CN=80 Runoff=80.07 cfs 5.521 af

Subcatchment 12S: PrWS C-1 Runoff Area=15.48 ac 0.00% Impervious Runoff Depth=1.62"
Flow Length=540' Tc=23 min CN=54 Runoff=16.53 cfs 2.085 af

Subcatchment 13S: PrWS D-1 Runoff Area=23.11 ac 0.00% Impervious Runoff Depth=1.22"
Flow Length=550' Tc=16 min CN=49 Runoff=19.15 cfs 2.352 af

Subcatchment 14S: PrWS D-2 Runoff Area=7.58 ac 66.75% Impervious Runoff Depth=4.06"
Tc=5 min CN=80 Runoff=37.21 cfs 2.566 af

Subcatchment 17S: PrWS E-1 Runoff Area=5.81 ac 0.00% Impervious Runoff Depth=0.60"
Flow Length=225' Tc=10 min CN=40 Runoff=1.58 cfs 0.290 af

Subcatchment 18S: PrWS E-2 Runoff Area=9.75 ac 10.15% Impervious Runoff Depth=1.30"
Flow Length=1,010' Tc=25 min CN=50 Runoff=7.49 cfs 1.055 af

Subcatchment 22S: PrWS F-1 Runoff Area=34.38 ac 0.00% Impervious Runoff Depth=1.70"
Flow Length=618' Slope=0.0400 '/' Tc=31 min CN=55 Runoff=34.55 cfs 4.868 af

Subcatchment 23S: PrWS F-2 Runoff Area=2.41 ac 51.45% Impervious Runoff Depth=3.85"
Flow Length=637' Tc=7 min CN=78 Runoff=10.49 cfs 0.774 af

Subcatchment 25S: PrWS F-3 Runoff Area=1.79 ac 46.37% Impervious Runoff Depth=3.85"
Flow Length=487' Tc=5 min CN=78 Runoff=8.37 cfs 0.575 af

Subcatchment 28S: PrWS G-1a Runoff Area=4.52 ac 9.51% Impervious Runoff Depth=2.67"
Flow Length=250' Tc=21 min CN=66 Runoff=9.20 cfs 1.007 af

Subcatchment 29S: PrWS G-1b Runoff Area=4.63 ac 0.00% Impervious Runoff Depth=1.95"
Flow Length=855' Tc=38 min CN=58 Runoff=5.01 cfs 0.754 af

Subcatchment 30S: PrWS G-1c Runoff Area=0.82 ac 47.56% Impervious Runoff Depth=3.96"
Tc=5 min CN=79 Runoff=3.93 cfs 0.270 af

Subcatchment 31S: PrWS G-2 Runoff Area=0.56 ac 28.57% Impervious Runoff Depth=3.15"
Tc=5 min CN=71 Runoff=2.14 cfs 0.147 af

Pond 4P: UG Detention System B-2 Peak Elev=136.84' Storage=327,085 cf Inflow=149.39 cfs 11.189 af
Outflow=10.05 cfs 5.685 af

Pond 6P: UG Detention System B-3 Peak Elev=137.24' Storage=3.728 af Inflow=76.71 cfs 6.056 af
Outflow=13.61 cfs 3.653 af

Pond 8P: Extended Detention Basin B-4 Peak Elev=135.77' Storage=98,761 cf Inflow=25.16 cfs 7.691 af
Outflow=7.90 cfs 7.247 af

Pond 10P: Extended Detention Basin B-5 Peak Elev=134.84' Storage=305,749 cf Inflow=83.25 cfs 9.174 af
Outflow=2.25 cfs 5.359 af

Pond 15P: Infiltration Basin D-2 Peak Elev=134.61' Storage=111,770 cf Inflow=37.21 cfs 2.566 af
Outflow=0.00 cfs 0.000 af

Pond 19P: Infiltration Basin E-2 Peak Elev=139.59' Storage=45,944 cf Inflow=7.49 cfs 1.055 af
Outflow=0.00 cfs 0.000 af

Pond 20P: Existing Basin E-1 Peak Elev=130.97' Storage=12,620 cf Inflow=1.58 cfs 0.290 af
Outflow=0.00 cfs 0.000 af

Pond 24P: Infiltration Basin F-2 Peak Elev=132.84' Storage=33,716 cf Inflow=10.49 cfs 0.774 af
Outflow=0.00 cfs 0.000 af

Pond 26P: Infiltration Basin F-3 Peak Elev=134.60' Storage=25,042 cf Inflow=8.37 cfs 0.575 af
Outflow=0.00 cfs 0.000 af

Pond 32P: Infiltration Basin G-2 Peak Elev=134.52' Storage=6,404 cf Inflow=2.14 cfs 0.147 af
Outflow=0.00 cfs 0.000 af

Link 11L: Design Point: B Inflow=18.50 cfs 14.797 af
Primary=18.50 cfs 14.797 af

Link 16L: Design Point: D Inflow=19.15 cfs 2.352 af
Primary=19.15 cfs 2.352 af

Link 21L: Design Point: E Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 27L: Design Point: F Inflow=34.55 cfs 4.868 af
Primary=34.55 cfs 4.868 af

Link 33L: Design Point: G Inflow=14.05 cfs 2.031 af
Primary=14.05 cfs 2.031 af

Total Runoff Area = 198.45 ac Runoff Volume = 43.845 af Average Runoff Depth = 2.65"
71.07% Pervious = 141.03 ac 28.93% Impervious = 57.42 ac

Summary for Subcatchment 1S: PrWS A-1

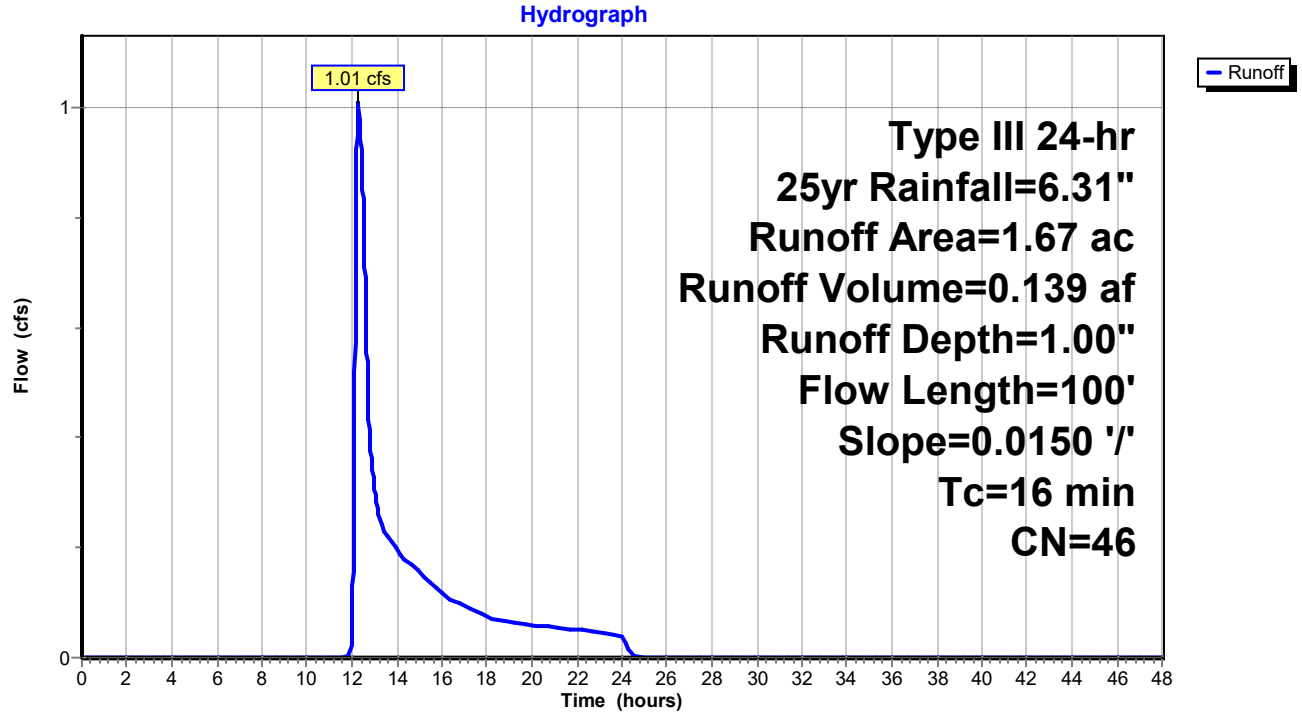
Runoff = 1.01 cfs @ 12.29 hrs, Volume= 0.139 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
0.05	98	Paved parking, HSG A
1.26	39	>75% Grass cover, Good, HSG A
0.12	61	>75% Grass cover, Good, HSG B
0.18	74	>75% Grass cover, Good, HSG C
0.06	30	Woods, Good, HSG A
1.67	46	Weighted Average
1.62		97.01% Pervious Area
0.05		2.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16	100	0.0150	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"

Subcatchment 1S: PrWS A-1



Summary for Subcatchment 2S: PrWS B-1

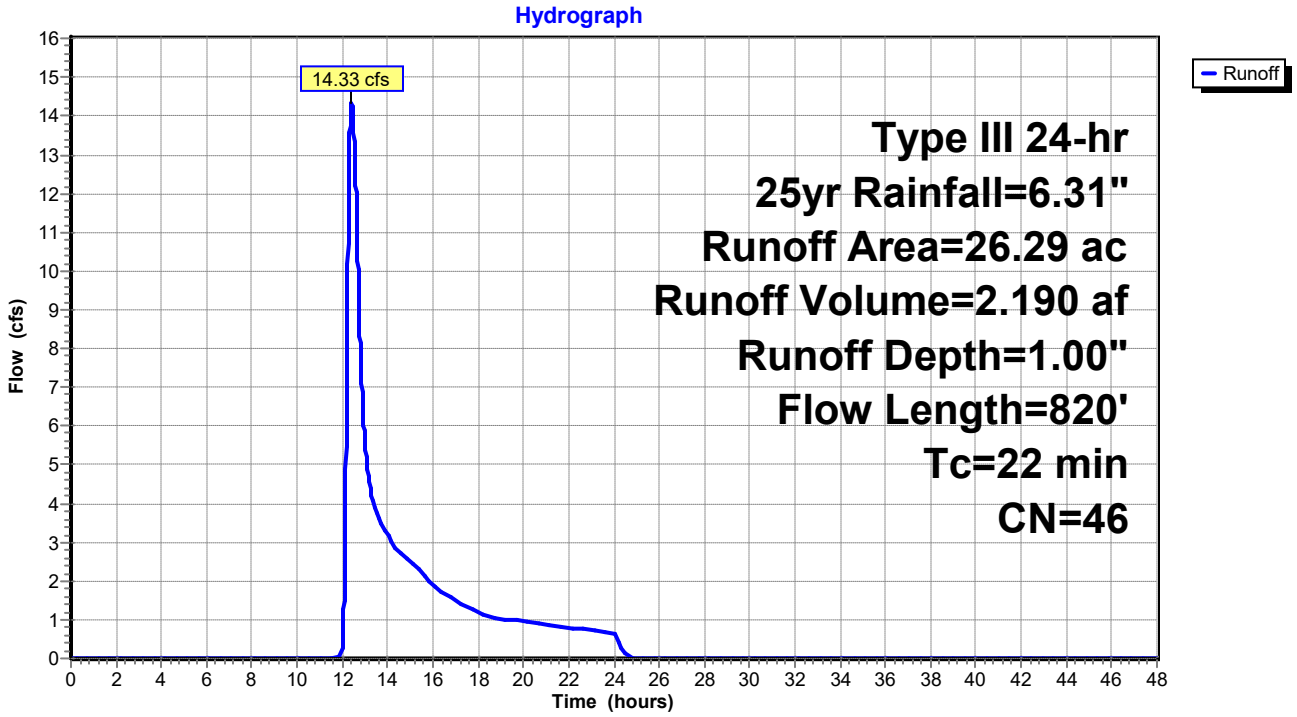
Runoff = 14.33 cfs @ 12.40 hrs, Volume= 2.190 af, Depth= 1.00"
Routed to Link 11L : Design Point: B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
0.58	98	Paved parking, HSG A
16.93	39	>75% Grass cover, Good, HSG A
0.01	61	>75% Grass cover, Good, HSG B
2.83	74	>75% Grass cover, Good, HSG C
3.94	30	Woods, Good, HSG A
2.00	77	Woods, Good, HSG D
26.29	46	Weighted Average
25.71		97.79% Pervious Area
0.58		2.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16	100	0.0150	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
4	475	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	55	0.0820	4.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2	190	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
22	820	Total			

Subcatchment 2S: PrWS B-1



Summary for Subcatchment 3S: PrWS B-2

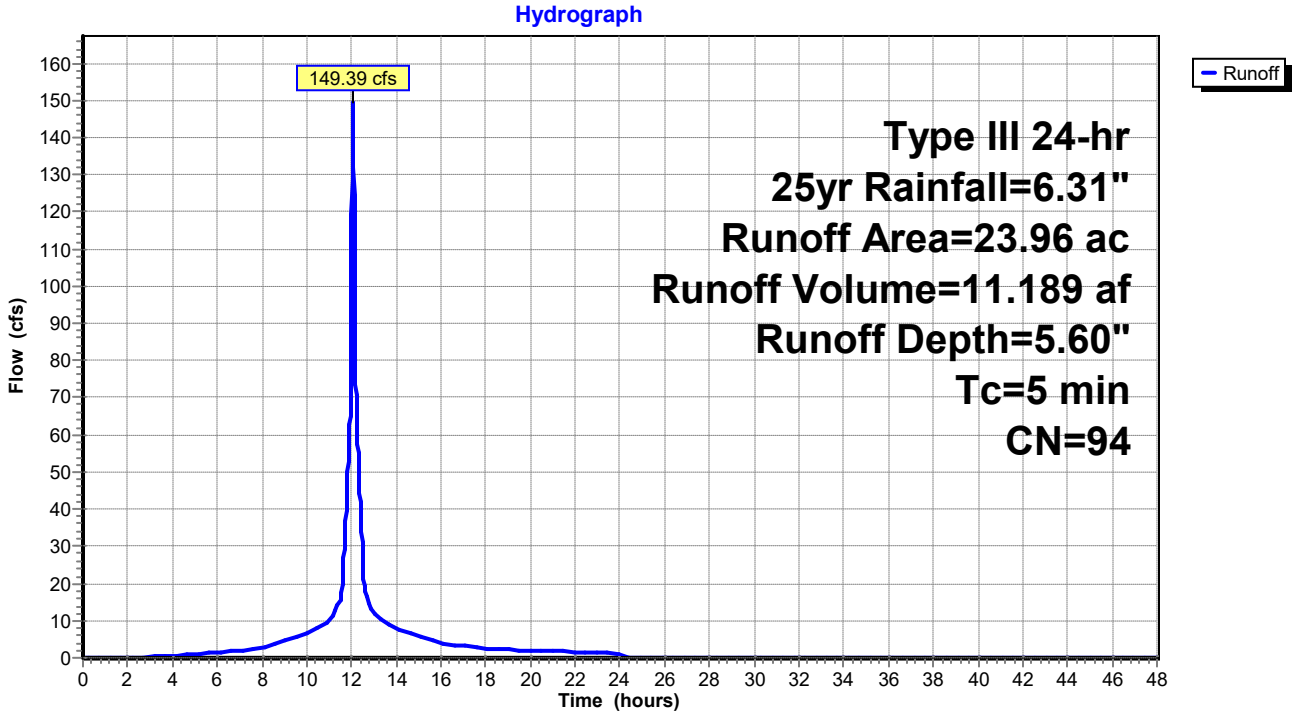
Runoff = 149.39 cfs @ 12.07 hrs, Volume= 11.189 af, Depth= 5.60"
Routed to Pond 4P : UG Detention System B-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
22.13	98	Paved parking, HSG A
1.76	39	>75% Grass cover, Good, HSG A
0.07	61	>75% Grass cover, Good, HSG B
23.96	94	Weighted Average
1.83		7.64% Pervious Area
22.13		92.36% Impervious Area

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

Subcatchment 3S: PrWS B-2



Summary for Subcatchment 5S: PrWS B-3

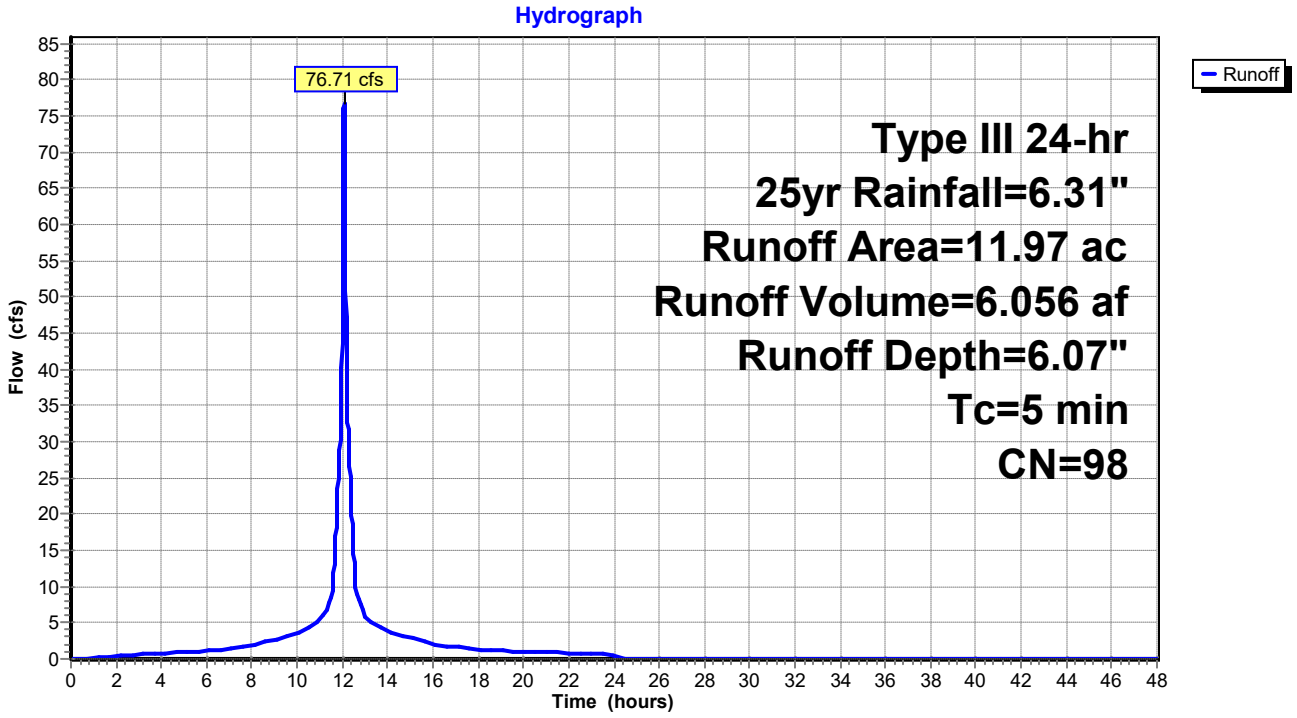
Runoff = 76.71 cfs @ 12.07 hrs, Volume= 6.056 af, Depth= 6.07"
Routed to Pond 6P : UG Detention System B-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
11.97	98	Paved parking, HSG A
11.97		100.00% Impervious Area

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

Subcatchment 5S: PrWS B-3



Summary for Subcatchment 7S: PrWS B-4

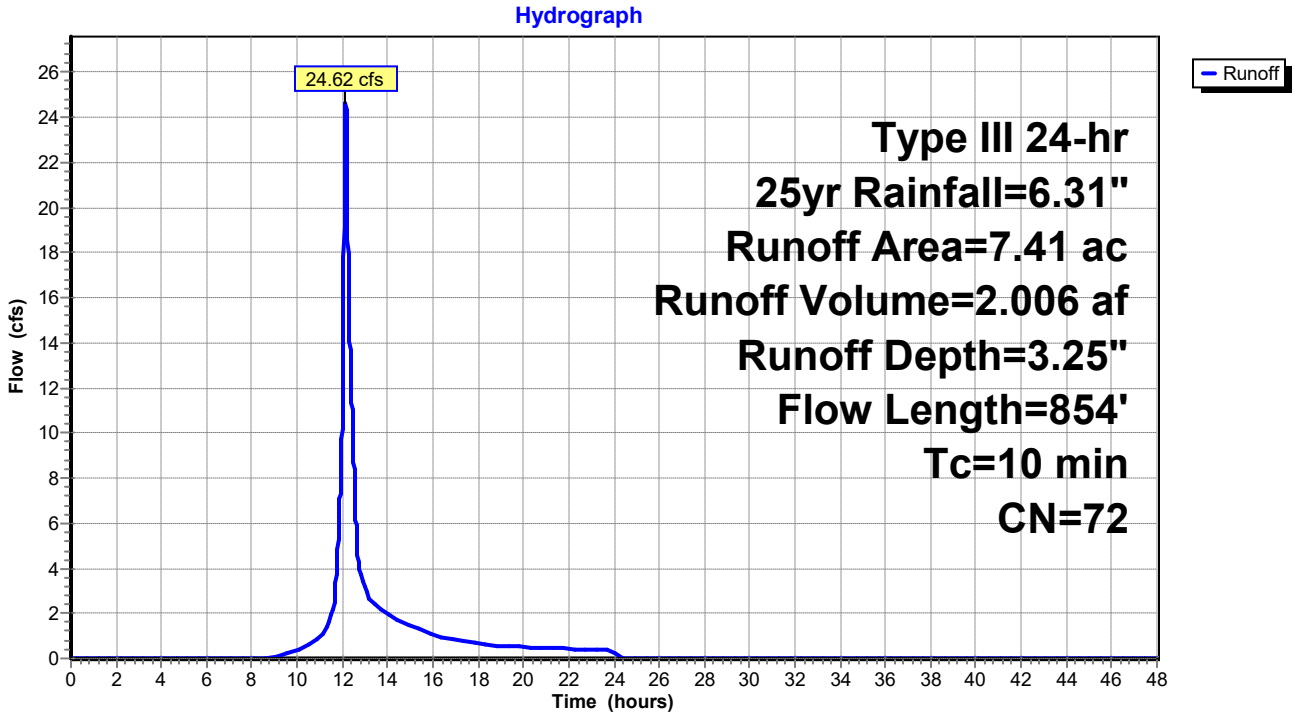
Runoff = 24.62 cfs @ 12.14 hrs, Volume= 2.006 af, Depth= 3.25"
Routed to Pond 8P : Extended Detention Basin B-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
2.67	98	Paved parking, HSG A
2.34	39	>75% Grass cover, Good, HSG A
2.40	74	>75% Grass cover, Good, HSG C
7.41	72	Weighted Average
4.74		63.97% Pervious Area
2.67		36.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8	100	0.0870	0.21		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	70	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	44	0.0170	5.91	4.65	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
2	640	0.0030	6.26	78.68	**Pipe Channel,** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
10	854	Total			

Subcatchment 7S: PrWS B-4



Summary for Subcatchment 9S: PrWS B-5

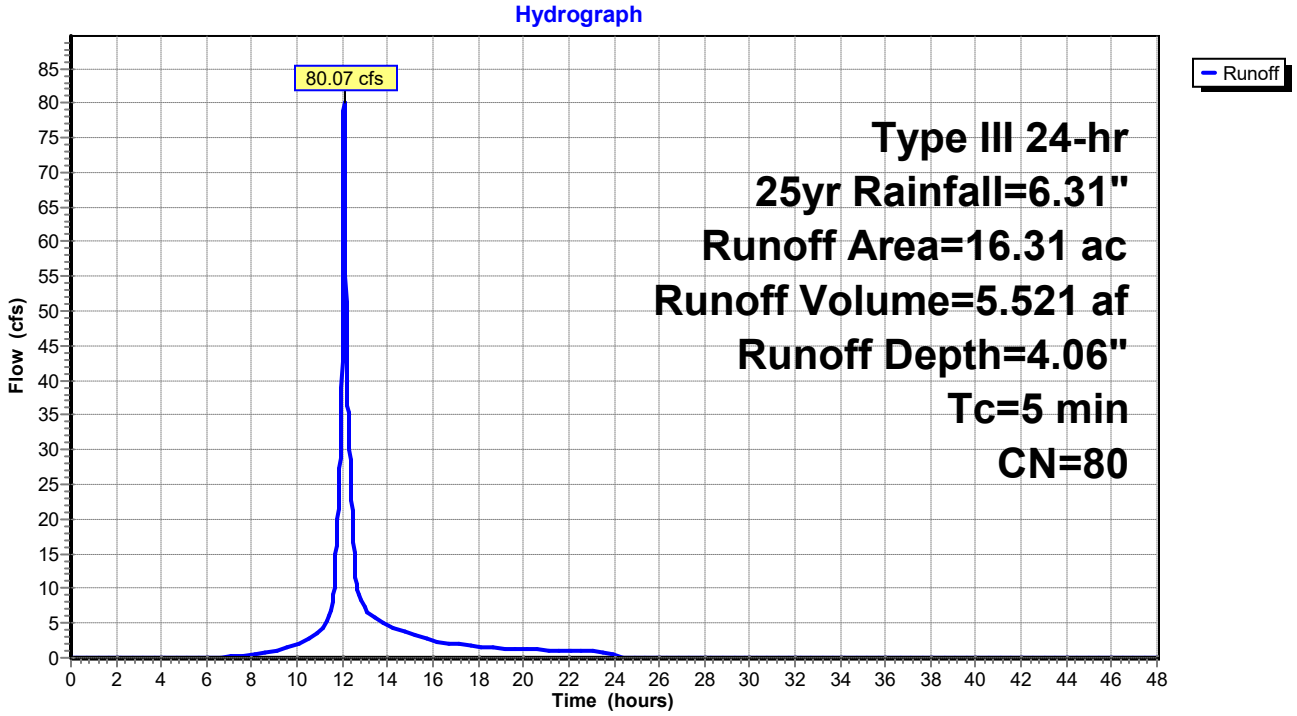
Runoff = 80.07 cfs @ 12.07 hrs, Volume= 5.521 af, Depth= 4.06"
Routed to Pond 10P : Extended Detention Basin B-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
10.92	98	Paved parking, HSG A
4.39	39	>75% Grass cover, Good, HSG A
1.00	61	>75% Grass cover, Good, HSG B
16.31	80	Weighted Average
5.39		33.05% Pervious Area
10.92		66.95% Impervious Area

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

Subcatchment 9S: PrWS B-5



Summary for Subcatchment 12S: PrWS C-1

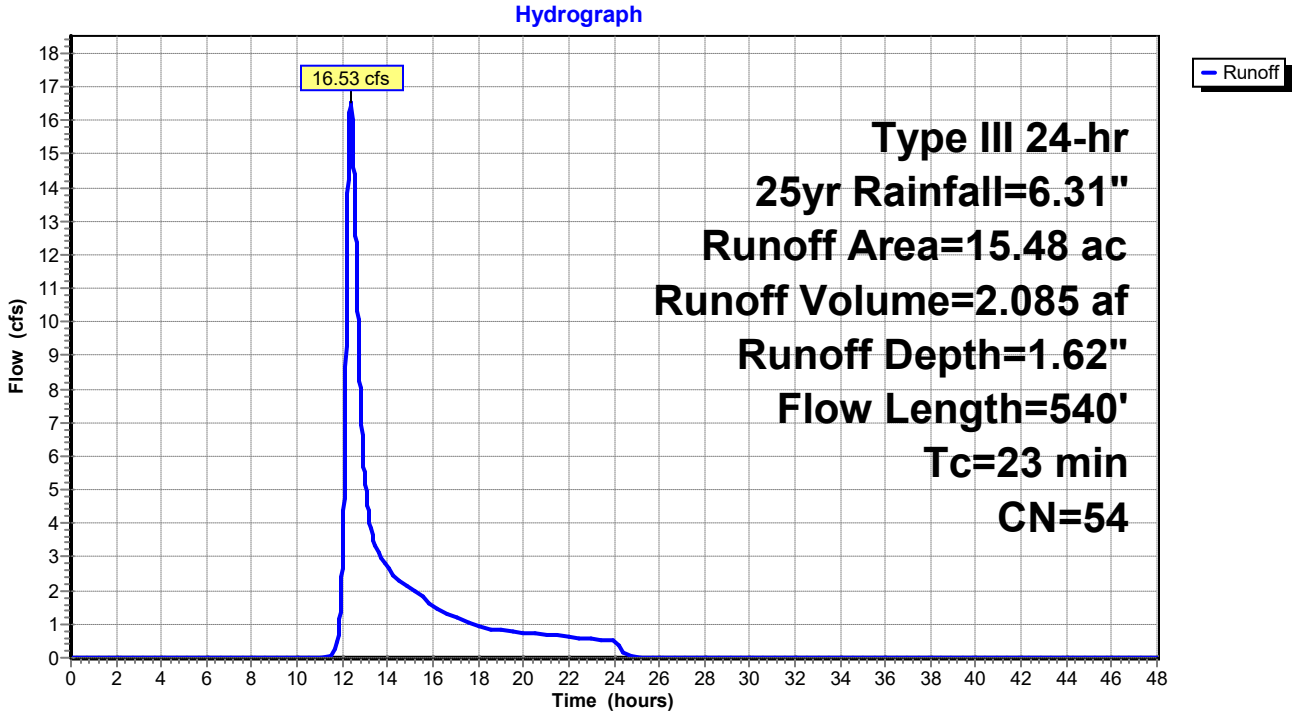
Runoff = 16.53 cfs @ 12.36 hrs, Volume= 2.085 af, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
2.82	39	>75% Grass cover, Good, HSG A
4.75	61	>75% Grass cover, Good, HSG B
1.44	30	Woods, Good, HSG A
4.44	55	Woods, Good, HSG B
2.03	77	Woods, Good, HSG D
15.48	54	Weighted Average
15.48		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	100	0.0100	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
4	395	0.0090	1.53		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	45	0.0220	2.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
23	540	Total			

Subcatchment 12S: PrWS C-1



Summary for Subcatchment 13S: PrWS D-1

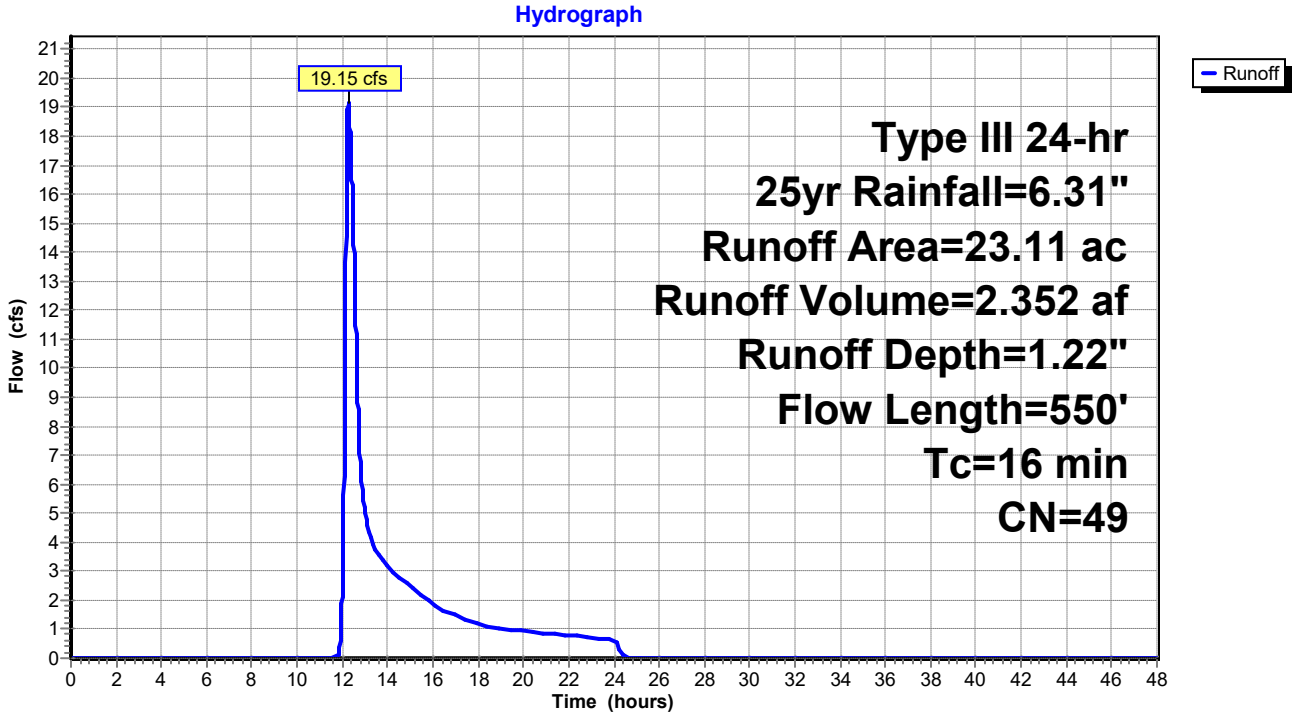
Runoff = 19.15 cfs @ 12.27 hrs, Volume= 2.352 af, Depth= 1.22"
Routed to Link 16L : Design Point: D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
12.27	39	>75% Grass cover, Good, HSG A
10.58	61	>75% Grass cover, Good, HSG B
0.26	30	Woods, Good, HSG A
23.11	49	Weighted Average
23.11		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0300	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	165	0.0240	2.49		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	285	0.0080	1.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16	550	Total			

Subcatchment 13S: PrWS D-1



Summary for Subcatchment 14S: PrWS D-2

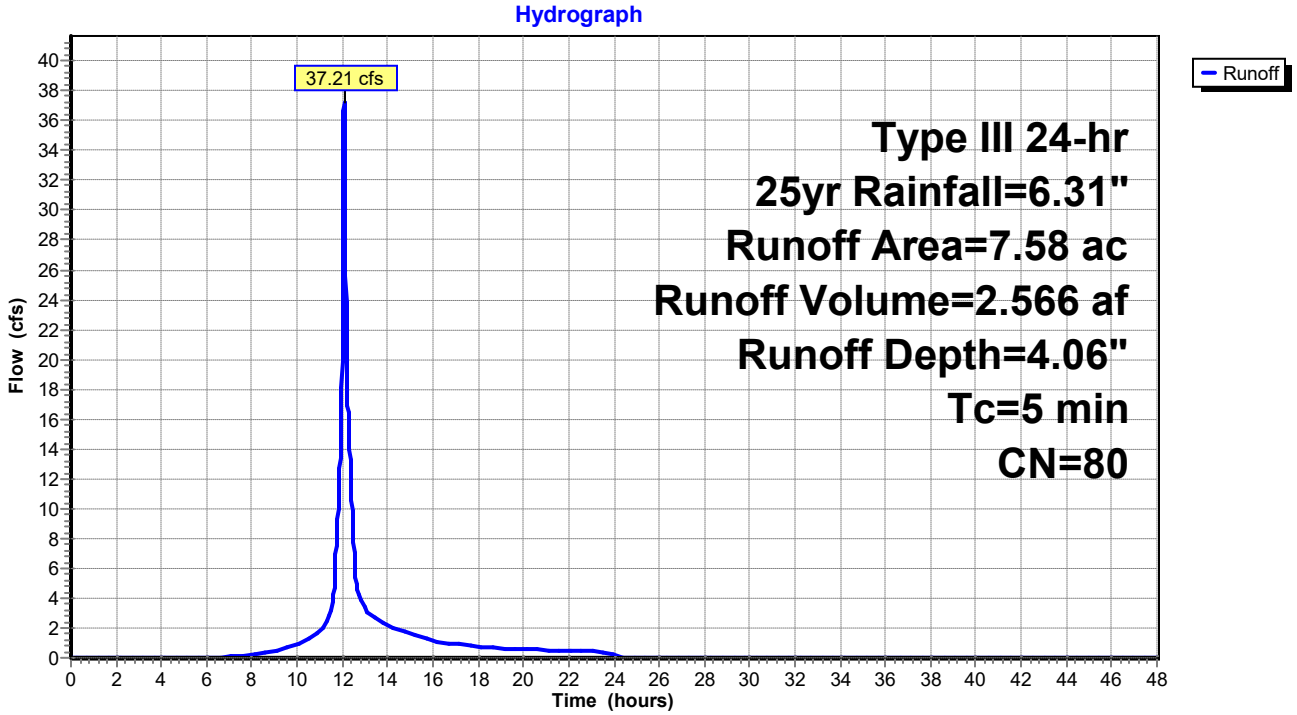
Runoff = 37.21 cfs @ 12.07 hrs, Volume= 2.566 af, Depth= 4.06"
Routed to Pond 15P : Infiltration Basin D-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
5.06	98	Paved parking, HSG A
1.90	39	>75% Grass cover, Good, HSG A
0.62	61	>75% Grass cover, Good, HSG B
7.58	80	Weighted Average
2.52		33.25% Pervious Area
5.06		66.75% Impervious Area

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

Subcatchment 14S: PrWS D-2



Summary for Subcatchment 17S: PrWS E-1

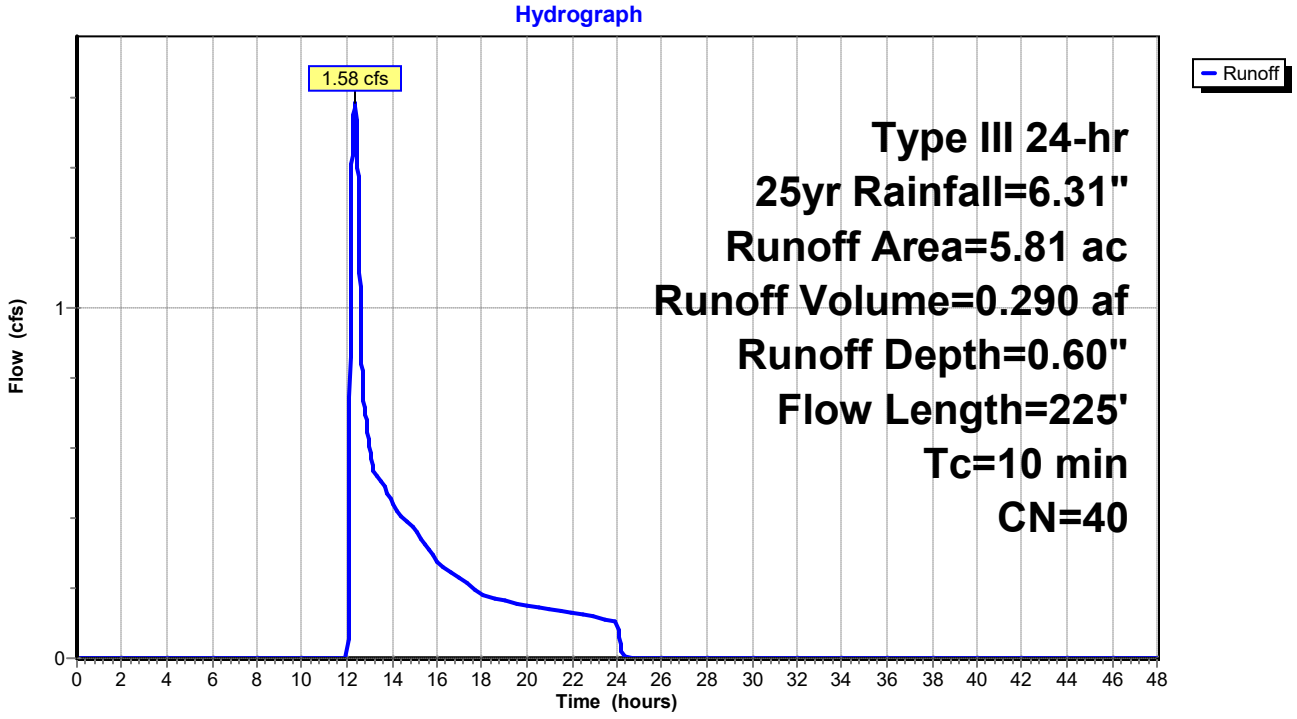
Runoff = 1.58 cfs @ 12.35 hrs, Volume= 0.290 af, Depth= 0.60"
Routed to Pond 20P : Existing Basin E-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
1.91	39	>75% Grass cover, Good, HSG A
2.97	30	Woods, Good, HSG A
0.93	77	Woods, Good, HSG D
5.81	40	Weighted Average
5.81		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	100	0.0650	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	25	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	100	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10	225	Total			

Subcatchment 17S: PrWS E-1



Summary for Subcatchment 18S: PrWS E-2

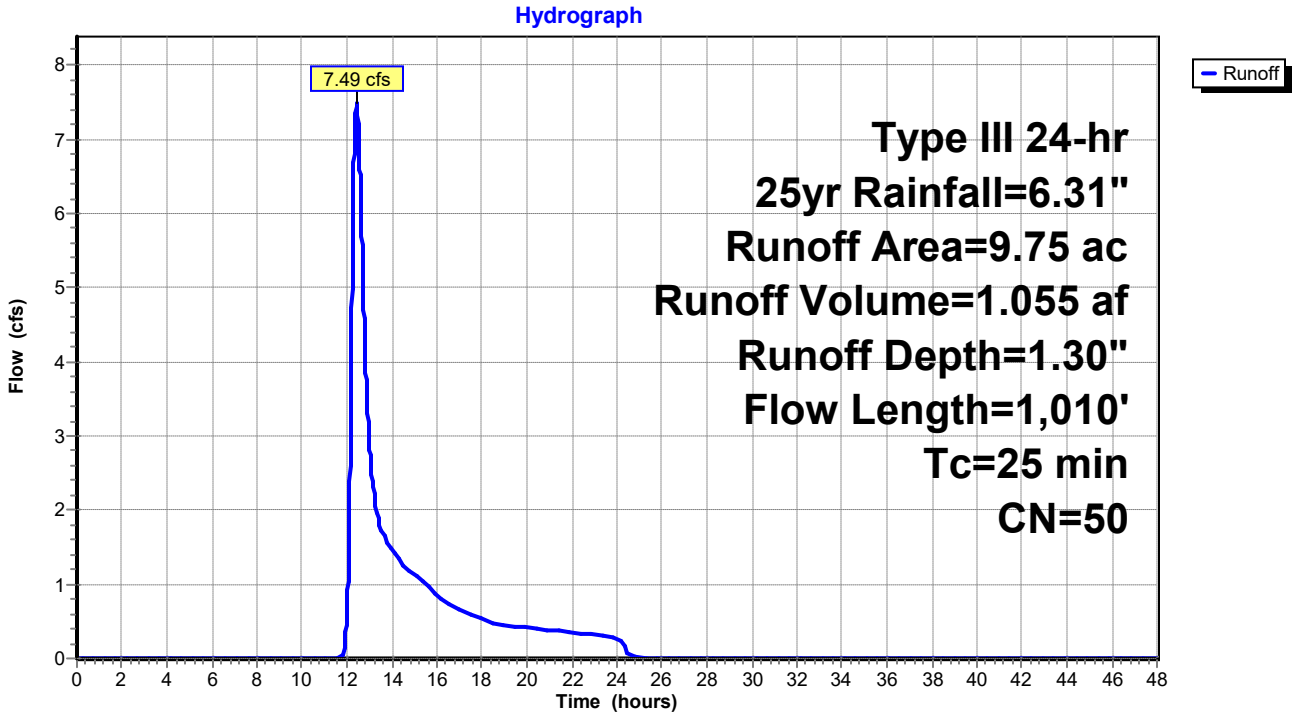
Runoff = 7.49 cfs @ 12.42 hrs, Volume= 1.055 af, Depth= 1.30"
Routed to Pond 19P : Infiltration Basin E-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
0.99	98	Paved parking, HSG A
6.78	39	>75% Grass cover, Good, HSG A
1.54	61	>75% Grass cover, Good, HSG B
0.44	74	>75% Grass cover, Good, HSG C
9.75	50	Weighted Average
8.76		89.85% Pervious Area
0.99		10.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13	100	0.0230	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
7	550	0.0060	1.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4	250	0.0040	1.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	110	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
25	1,010	Total			

Subcatchment 18S: PrWS E-2



Summary for Subcatchment 22S: PrWS F-1

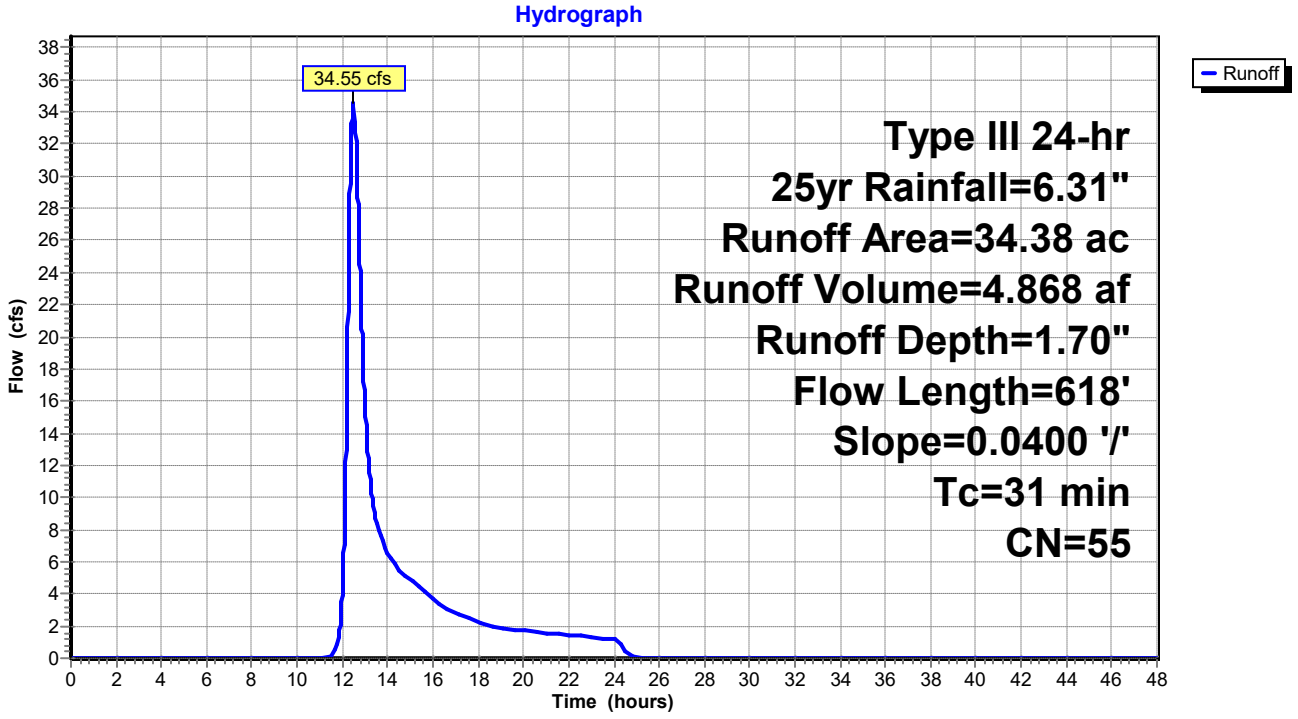
Runoff = 34.55 cfs @ 12.50 hrs, Volume= 4.868 af, Depth= 1.70"
Routed to Link 27L : Design Point: F

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
0.71	39	>75% Grass cover, Good, HSG A
6.24	61	>75% Grass cover, Good, HSG B
2.19	30	Woods, Good, HSG A
23.23	55	Woods, Good, HSG B
2.01	77	Woods, Good, HSG D
34.38	55	Weighted Average
34.38		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	518	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
31	618	Total			

Subcatchment 22S: PrWS F-1



Summary for Subcatchment 23S: PrWS F-2

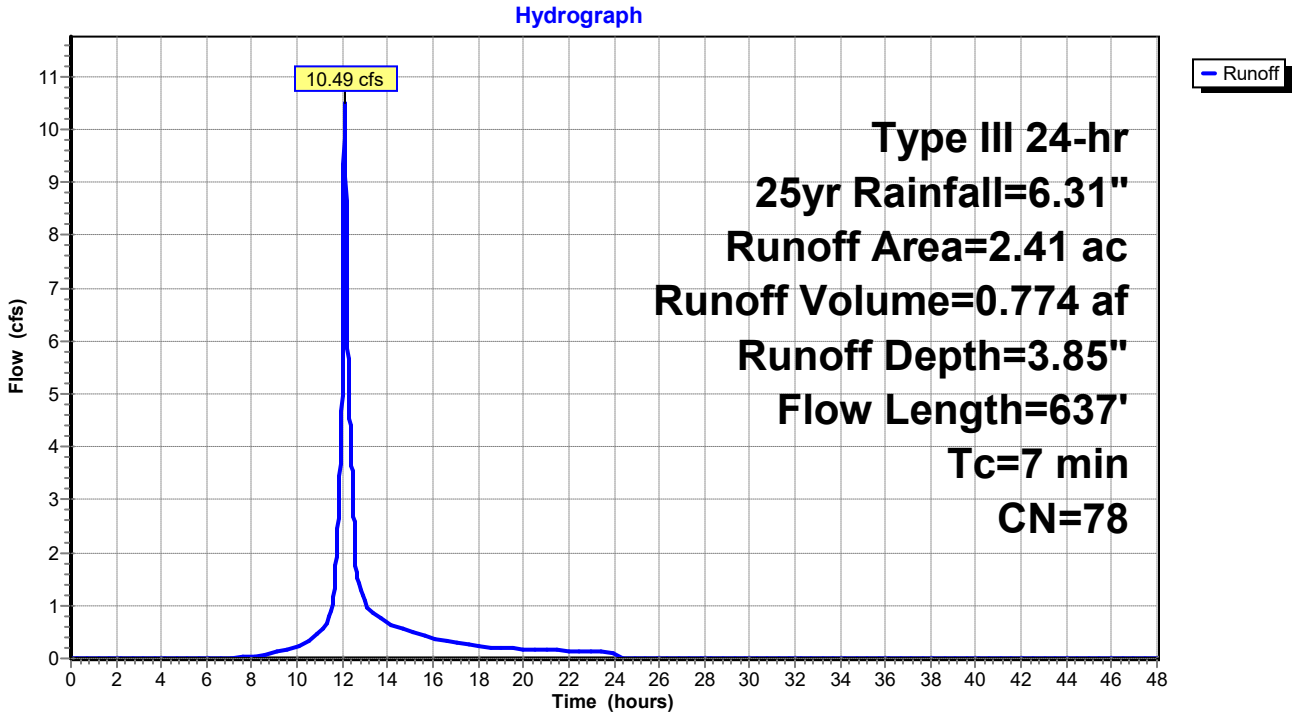
Runoff = 10.49 cfs @ 12.10 hrs, Volume= 0.774 af, Depth= 3.85"
Routed to Pond 24P : Infiltration Basin F-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
1.24	98	Paved parking, HSG A
0.24	39	>75% Grass cover, Good, HSG A
0.93	61	>75% Grass cover, Good, HSG B
2.41	78	Weighted Average
1.17		48.55% Pervious Area
1.24		51.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.31"
1	100	0.0060	1.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	15	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5	475	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	12	0.3330	9.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7	637	Total			

Subcatchment 23S: PrWS F-2



Summary for Subcatchment 25S: PrWS F-3

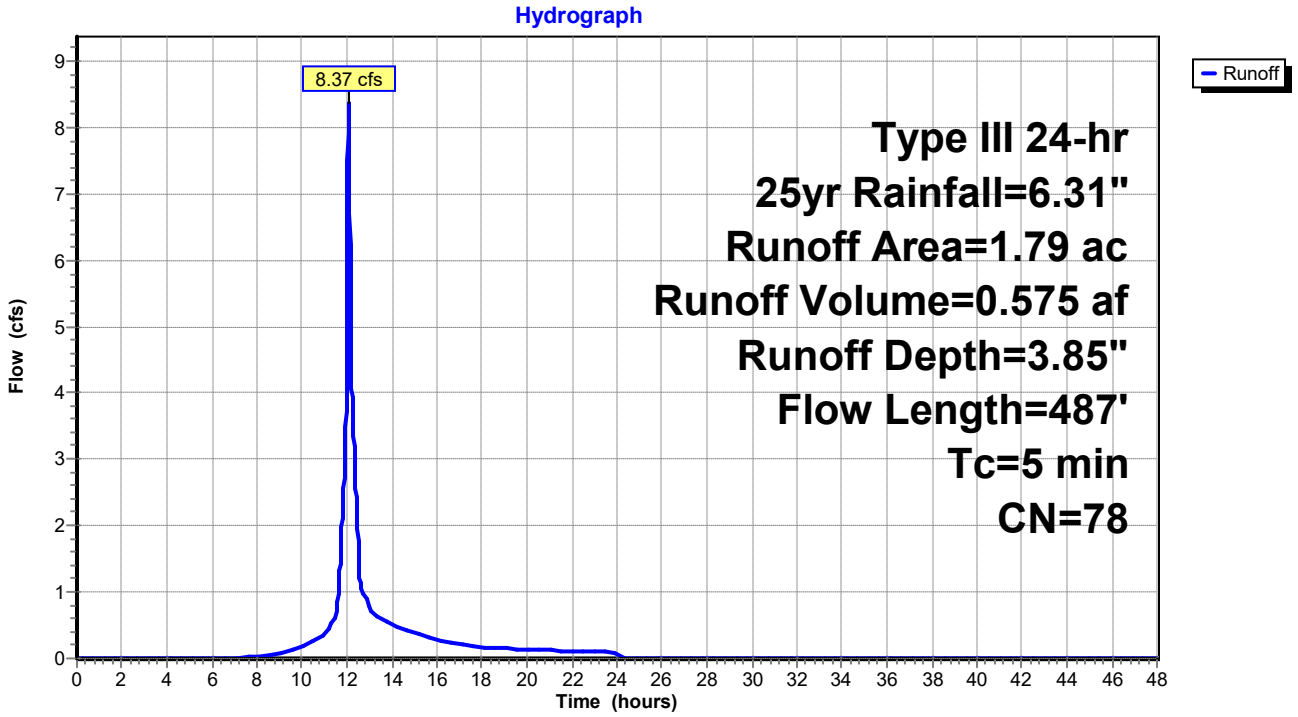
Runoff = 8.37 cfs @ 12.07 hrs, Volume= 0.575 af, Depth= 3.85"
Routed to Pond 26P : Infiltration Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
0.83	98	Paved parking, HSG A
0.96	61	>75% Grass cover, Good, HSG B
1.79	78	Weighted Average
0.96		53.63% Pervious Area
0.83		46.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.31"
1	100	0.0060	1.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	15	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	325	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	12	0.3330	9.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5	487	Total			

Subcatchment 25S: PrWS F-3



Summary for Subcatchment 28S: PrWS G-1a

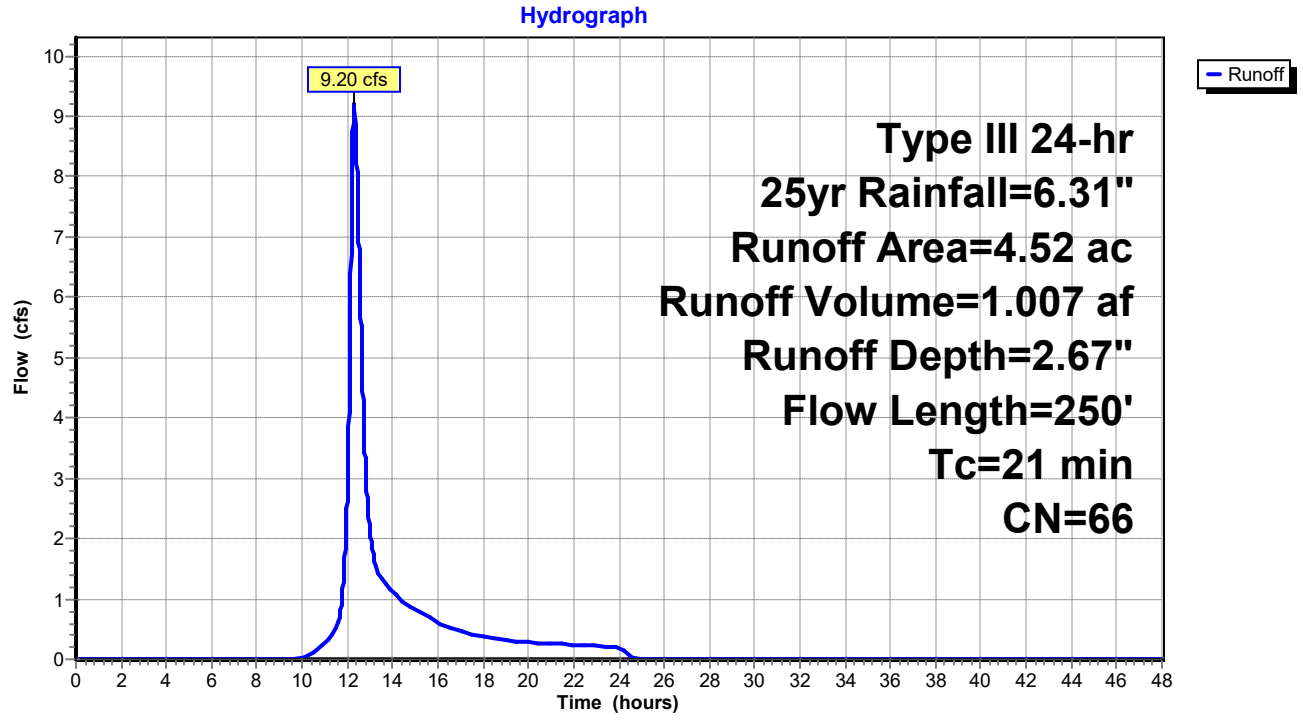
Runoff = 9.20 cfs @ 12.30 hrs, Volume= 1.007 af, Depth= 2.67"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
0.43	98	Paved parking, HSG A
1.26	61	>75% Grass cover, Good, HSG B
1.81	55	Woods, Good, HSG B
1.02	77	Woods, Good, HSG D
4.52	66	Weighted Average
4.09		90.49% Pervious Area
0.43		9.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17	40	0.0230	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	60	0.3330	0.33		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	150	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
21	250	Total			

Subcatchment 28S: PrWS G-1a



Summary for Subcatchment 29S: PrWS G-1b

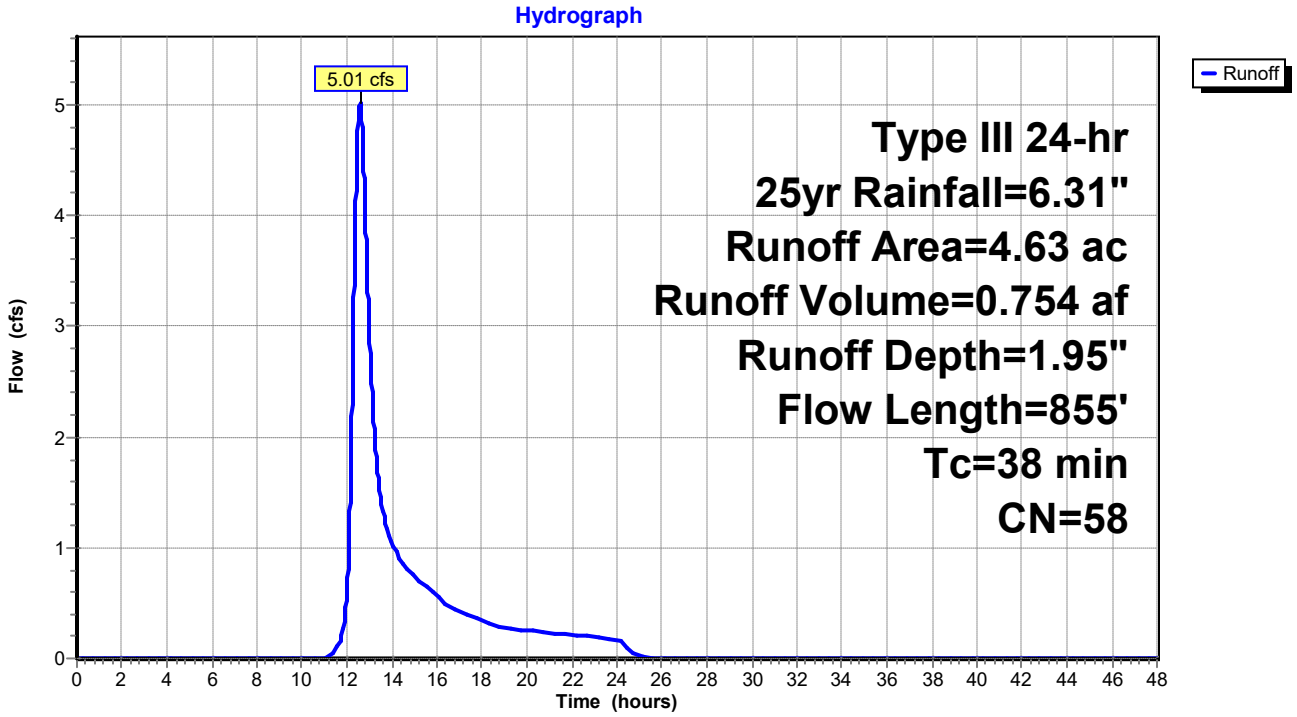
Runoff = 5.01 cfs @ 12.58 hrs, Volume= 0.754 af, Depth= 1.95"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
2.49	61	>75% Grass cover, Good, HSG B
2.14	55	Woods, Good, HSG B
4.63	58	Weighted Average
4.63		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10	35	0.0570	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
22	65	0.0320	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
2	275	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	180	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	300	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38	855	Total			

Subcatchment 29S: PrWS G-1b



Summary for Subcatchment 30S: PrWS G-1c

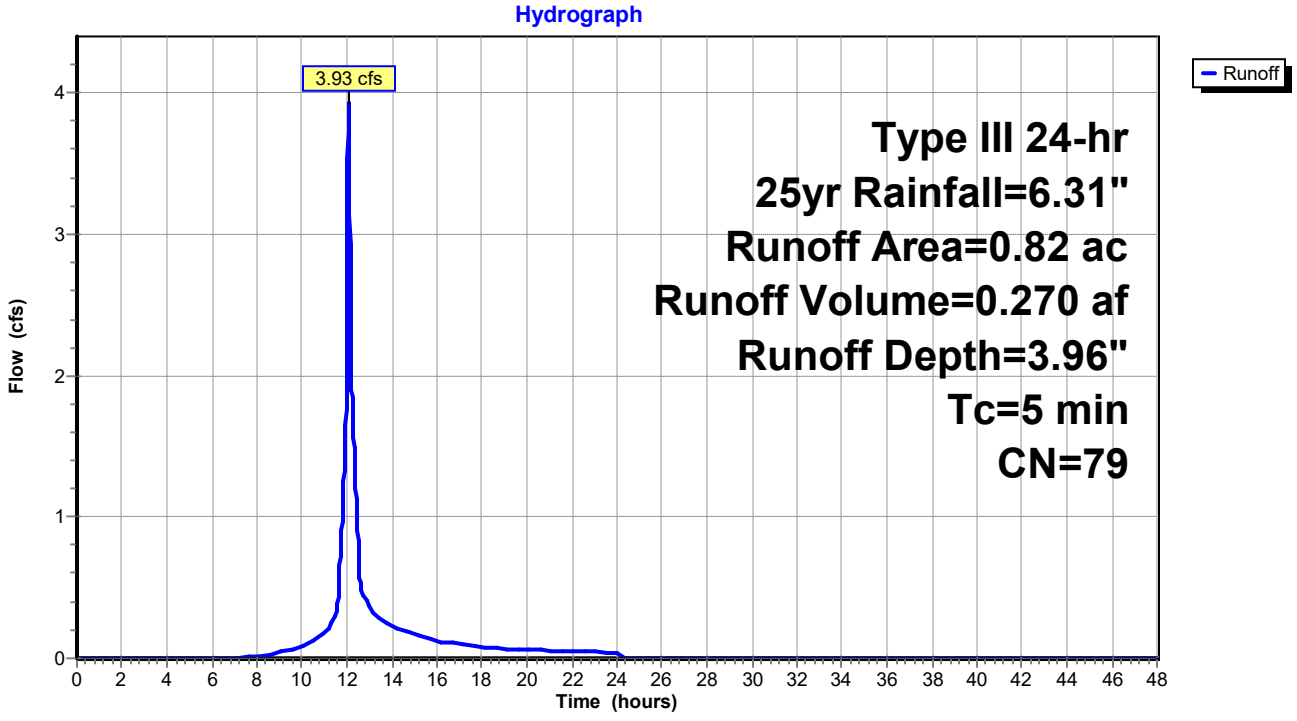
Runoff = 3.93 cfs @ 12.07 hrs, Volume= 0.270 af, Depth= 3.96"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
0.39	98	Paved parking, HSG A
0.43	61	>75% Grass cover, Good, HSG B
0.82	79	Weighted Average
0.43		52.44% Pervious Area
0.39		47.56% Impervious Area

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

Subcatchment 30S: PrWS G-1c



Summary for Subcatchment 31S: PrWS G-2

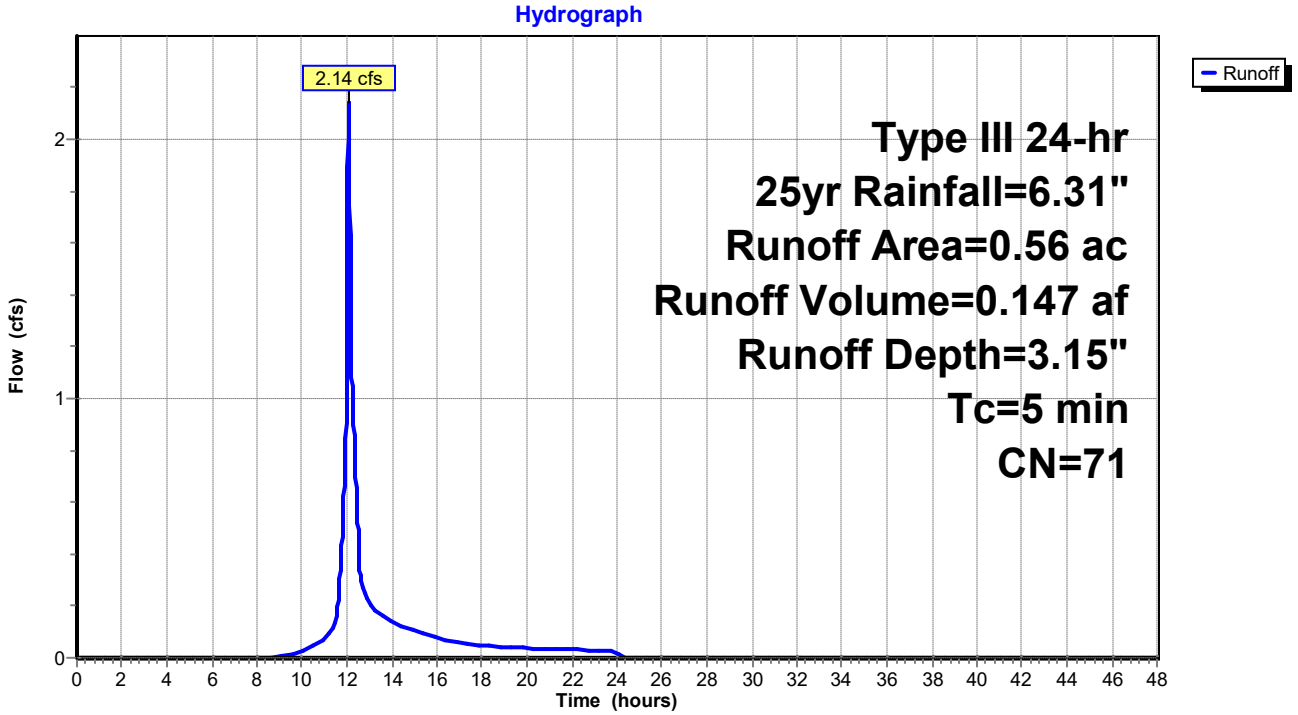
Runoff = 2.14 cfs @ 12.08 hrs, Volume= 0.147 af, Depth= 3.15"
Routed to Pond 32P : Infiltration Basin G-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=6.31"

Area (ac)	CN	Description
0.16	98	Paved parking, HSG A
0.35	61	>75% Grass cover, Good, HSG B
0.05	55	Woods, Good, HSG B
0.56	71	Weighted Average
0.40		71.43% Pervious Area
0.16		28.57% Impervious Area

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

Subcatchment 31S: PrWS G-2



Summary for Pond 4P: UG Detention System B-2

Inflow Area = 23.96 ac, 92.36% Impervious, Inflow Depth = 5.60" for 25yr event
Inflow = 149.39 cfs @ 12.07 hrs, Volume= 11.189 af
Outflow = 10.05 cfs @ 13.33 hrs, Volume= 5.685 af, Atten= 93%, Lag= 75.8 min
Primary = 10.05 cfs @ 13.33 hrs, Volume= 5.685 af
Routed to Pond 8P : Extended Detention Basin B-4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 136.84' @ 13.33 hrs Surf.Area= 121,524 sf Storage= 327,085 cf

Plug-Flow detention time= 423.0 min calculated for 5.685 af (51% of inflow)
Center-of-Mass det. time= 304.5 min (1,070.7 - 766.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	53,816 cf	**82.00'W x 1,482.00'L x 5.17'H Field A** 627,874 cf Overall - 493,333 cf Embedded = 134,541 cf x 40.0% Voids
#2A	134.00'	369,049 cf	**retain_it retain_it 3.5'** x 1850 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 10 Rows adjusted for 2,394.5 cf perimeter wall
		422,866 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	135.12'	**36.0" Round Culvert** L= 870.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 135.12' / 132.50' S= 0.0030 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	136.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.24 1.25 4.00 Width (feet) 4.00 4.00 8.00 8.00

Primary OutFlow Max=10.05 cfs @ 13.33 hrs HW=136.84' TW=134.93' (Dynamic Tailwater)
↑**1=Culvert** (Passes 10.05 cfs of 12.43 cfs potential flow)
↑**2=Custom Weir/Orifice** (Weir Controls 10.05 cfs @ 3.00 fps)

Pond 4P: UG Detention System B-2 - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it®)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
10 Rows adjusted for 2,394.5 cf perimeter wall

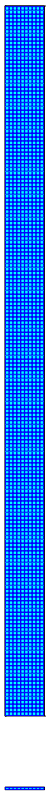
185 Chambers/Row x 8.00' Long = 1,480.00' Row Length +12.0" End Stone x 2 = 1,482.00' Base Length
10 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 82.00' Base Width
6.0" Stone Base + 50.0" Chamber Height + 6.0" Stone Cover = 5.17' Field Height

6.1 cf Sidewall x 185 x 2 + 6.1 cf Endwall x 10 x 2 = 2,394.5 cf Perimeter Wall
1,850 Chambers x 200.8 cf - 2,394.5 cf Perimeter wall = 369,049.3 cf Chamber Storage
1,850 Chambers x 266.7 cf = 493,333.3 cf Displacement

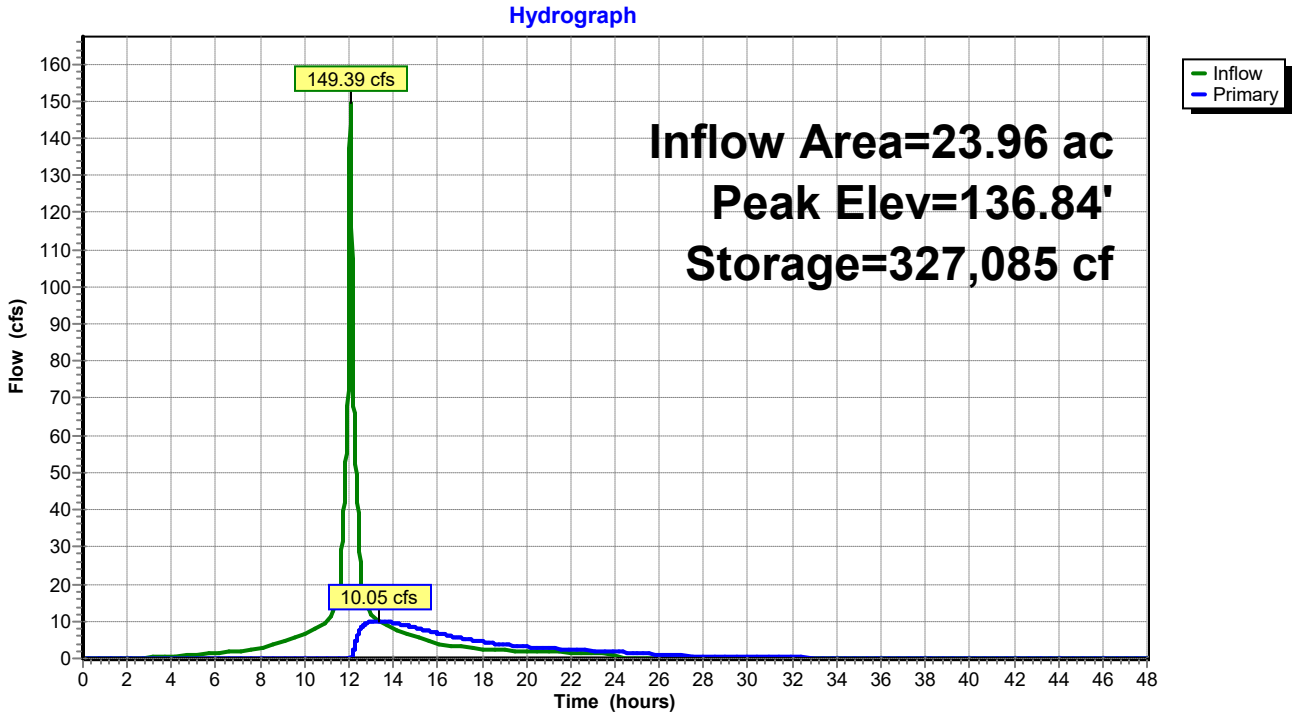
627,874.0 cf Field - 493,333.3 cf Chambers = 134,540.7 cf Stone x 40.0% Voids = 53,816.3 cf Stone Storage

Chamber Storage + Stone Storage = 422,865.5 cf = 9.708 af
Overall Storage Efficiency = 67.3%
Overall System Size = 1,482.00' x 82.00' x 5.17'

1,850 Chambers
23,254.6 cy Field
4,983.0 cy Stone



Pond 4P: UG Detention System B-2



Summary for Pond 6P: UG Detention System B-3

Inflow Area = 11.97 ac,100.00% Impervious, Inflow Depth = 6.07" for 25yr event
Inflow = 76.71 cfs @ 12.07 hrs, Volume= 6.056 af
Outflow = 13.61 cfs @ 12.51 hrs, Volume= 3.653 af, Atten= 82%, Lag= 26.3 min
Primary = 13.61 cfs @ 12.51 hrs, Volume= 3.653 af
Routed to Pond 10P : Extended Detention Basin B-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 137.24' @ 12.51 hrs Surf.Area= 1.25 ac Storage= 3.728 af

Plug-Flow detention time= 325.8 min calculated for 3.652 af (60% of inflow)
Center-of-Mass det. time= 214.7 min (958.1 - 743.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	0.390 af	**34.00'W x 1,602.00'L x 5.17'H Field A** 6.460 af Overall - 5.485 af Embedded = 0.975 af x 40.0% Voids
#2A	134.00'	4.171 af	**retain_it retain_it 4.0'** x 800 Inside #1 Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf 4 Rows adjusted for 3,080.2 cf perimeter wall
		4.561 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**36.0" Round Culvert** L= 310.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 134.00' / 132.50' S= 0.0048 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	136.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.49 1.50 3.00 Width (feet) 3.00 3.00 6.00 6.00

Primary OutFlow Max=13.61 cfs @ 12.51 hrs HW=137.24' TW=133.72' (Dynamic Tailwater)
↑**1=Culvert** (Passes 13.61 cfs of 44.93 cfs potential flow)
↑**2=Custom Weir/Orifice** (Weir Controls 13.61 cfs @ 3.65 fps)

Pond 6P: UG Detention System B-3 - Chamber Wizard Field A

Chamber Model = retain_it retain_it 4.0' (retain-it®)
Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf
Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf
4 Rows adjusted for 3,080.2 cf perimeter wall

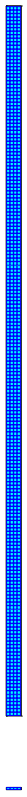
200 Chambers/Row x 8.00' Long = 1,600.00' Row Length +12.0" End Stone x 2 = 1,602.00' Base Length
4 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 34.00' Base Width
6.0" Stone Base + 56.0" Chamber Height = 5.17' Field Height

7.5 cf Sidewall x 200 x 2 + 7.5 cf Endwall x 4 x 2 = 3,080.2 cf Perimeter Wall
800 Chambers x 230.9 cf - 3,080.2 cf Perimeter wall = 181,671.5 cf Chamber Storage
800 Chambers x 298.7 cf = 238,933.3 cf Displacement

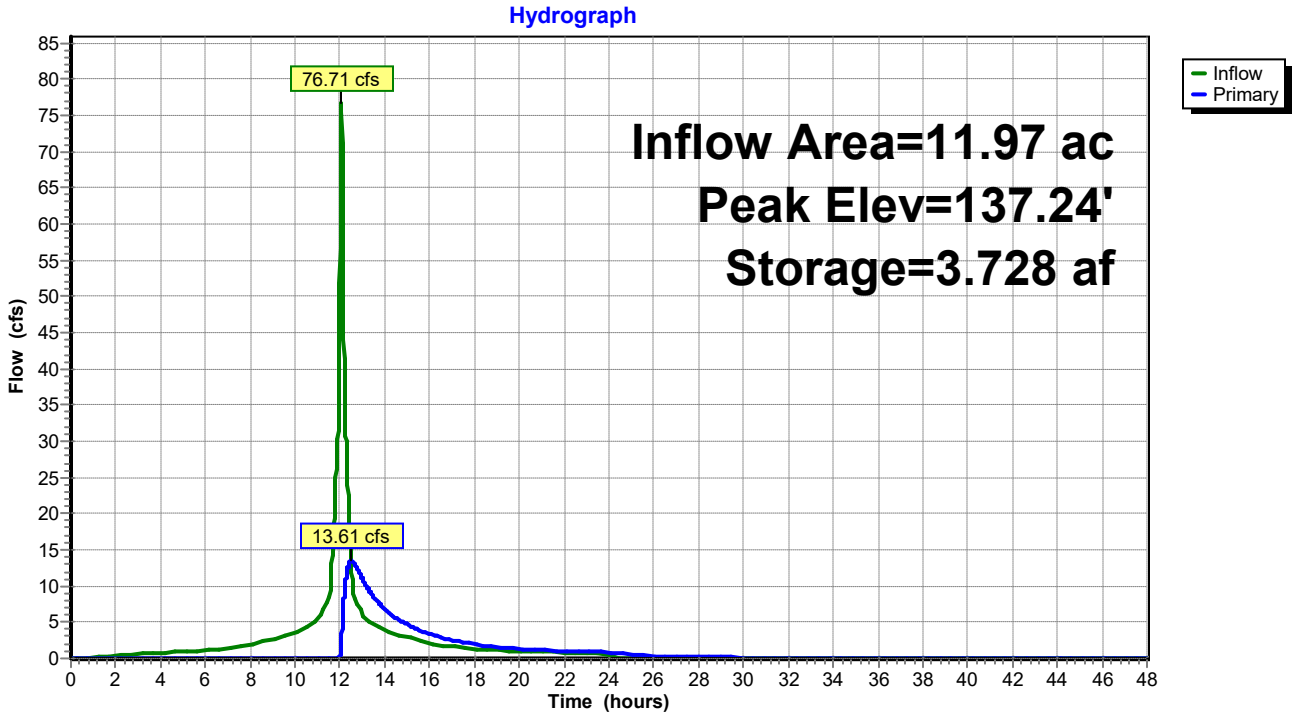
281,418.0 cf Field - 238,933.3 cf Chambers = 42,484.7 cf Stone x 40.0% Voids = 16,993.9 cf Stone Storage

Chamber Storage + Stone Storage = 198,665.3 cf = 4.561 af
Overall Storage Efficiency = 70.6%
Overall System Size = 1,602.00' x 34.00' x 5.17'

800 Chambers
10,422.9 cy Field
1,573.5 cy Stone



Pond 6P: UG Detention System B-3



Summary for Pond 8P: Extended Detention Basin B-4

Inflow Area = 31.37 ac, 79.06% Impervious, Inflow Depth > 2.94" for 25yr event
Inflow = 25.16 cfs @ 12.15 hrs, Volume= 7.691 af
Outflow = 7.90 cfs @ 15.98 hrs, Volume= 7.247 af, Atten= 69%, Lag= 229.8 min
Primary = 7.90 cfs @ 15.98 hrs, Volume= 7.247 af
Routed to Link 11L : Design Point: B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 135.77' @ 15.98 hrs Surf.Area= 34,895 sf Storage= 98,761 cf

Plug-Flow detention time= 220.4 min calculated for 7.245 af (94% of inflow)
Center-of-Mass det. time= 168.9 min (1,178.2 - 1,009.2)

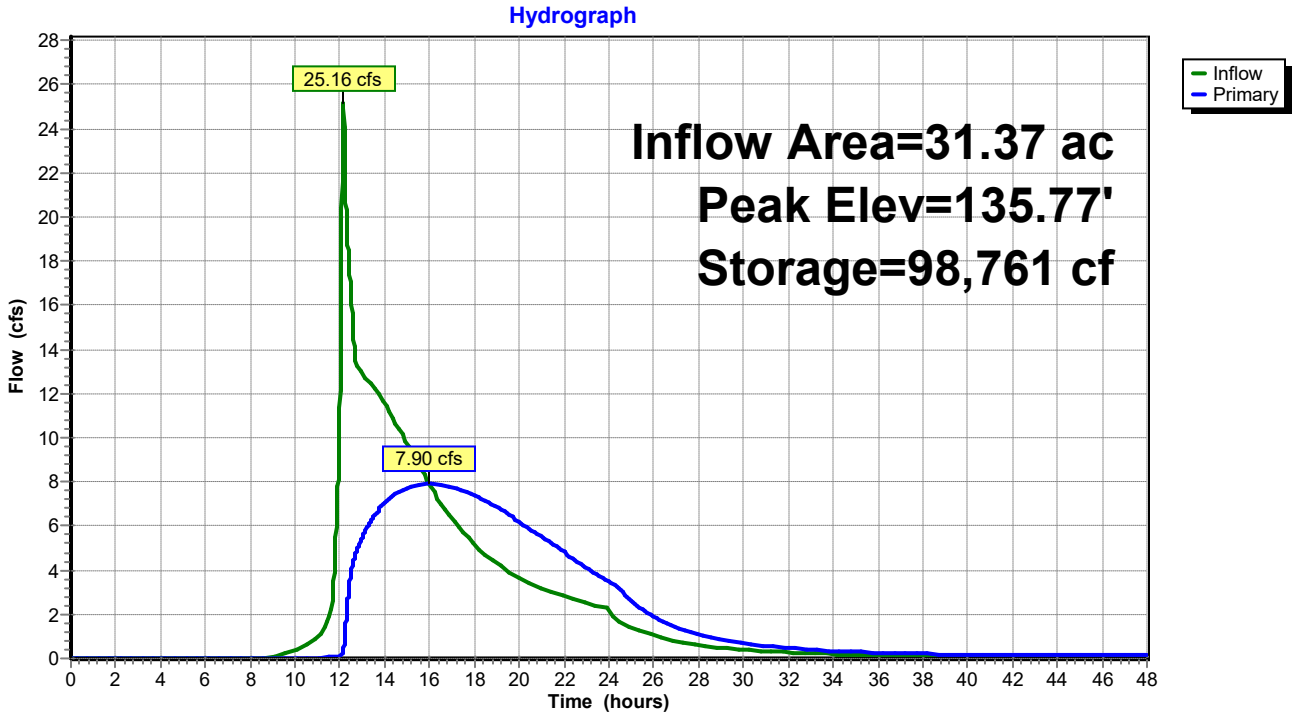
Volume	Invert	Avail.Storage	Storage Description
#1	132.50'	163,645 cf	**Detention Basin B-4 (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.50	25,654	0	0
133.00	27,028	13,171	13,171
134.00	29,819	28,424	41,594
135.00	32,666	31,243	72,837
136.00	35,570	34,118	106,955
137.00	38,530	37,050	144,005
137.50	40,032	19,641	163,645

Device	Routing	Invert	Outlet Devices
#1	Primary	132.50'	**36.0" Round Culvert** L= 312.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 132.50' / 131.16' S= 0.0043 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	132.50'	**2.5" Vert. 2.5in Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	133.25'	**10.0" Vert. (2x) 10in Orifice X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	136.00'	**36.0" x 24.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.90 cfs @ 15.98 hrs HW=135.77' TW=132.50' (Dynamic Tailwater)
- **1=Culvert** (Passes 7.90 cfs of 43.95 cfs potential flow)
  - **2=2.5in Orifice** (Orifice Controls 0.29 cfs @ 8.56 fps)
  - **3=(2x) 10in Orifice** (Orifice Controls 7.61 cfs @ 6.98 fps)
  - **4=Overflow CB** (Controls 0.00 cfs)

Pond 8P: Extended Detention Basin B-4



Summary for Pond 10P: Extended Detention Basin B-5

Inflow Area = 28.28 ac, 80.94% Impervious, Inflow Depth = 3.89" for 25yr event
Inflow = 83.25 cfs @ 12.08 hrs, Volume= 9.174 af
Outflow = 2.25 cfs @ 21.20 hrs, Volume= 5.359 af, Atten= 97%, Lag= 547.2 min
Primary = 2.25 cfs @ 21.20 hrs, Volume= 5.359 af
Routed to Link 11L : Design Point: B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 134.84' @ 21.20 hrs Surf.Area= 139,348 sf Storage= 305,749 cf

Plug-Flow detention time= 978.9 min calculated for 5.358 af (58% of inflow)
Center-of-Mass det. time= 842.1 min (1,711.8 - 869.7)

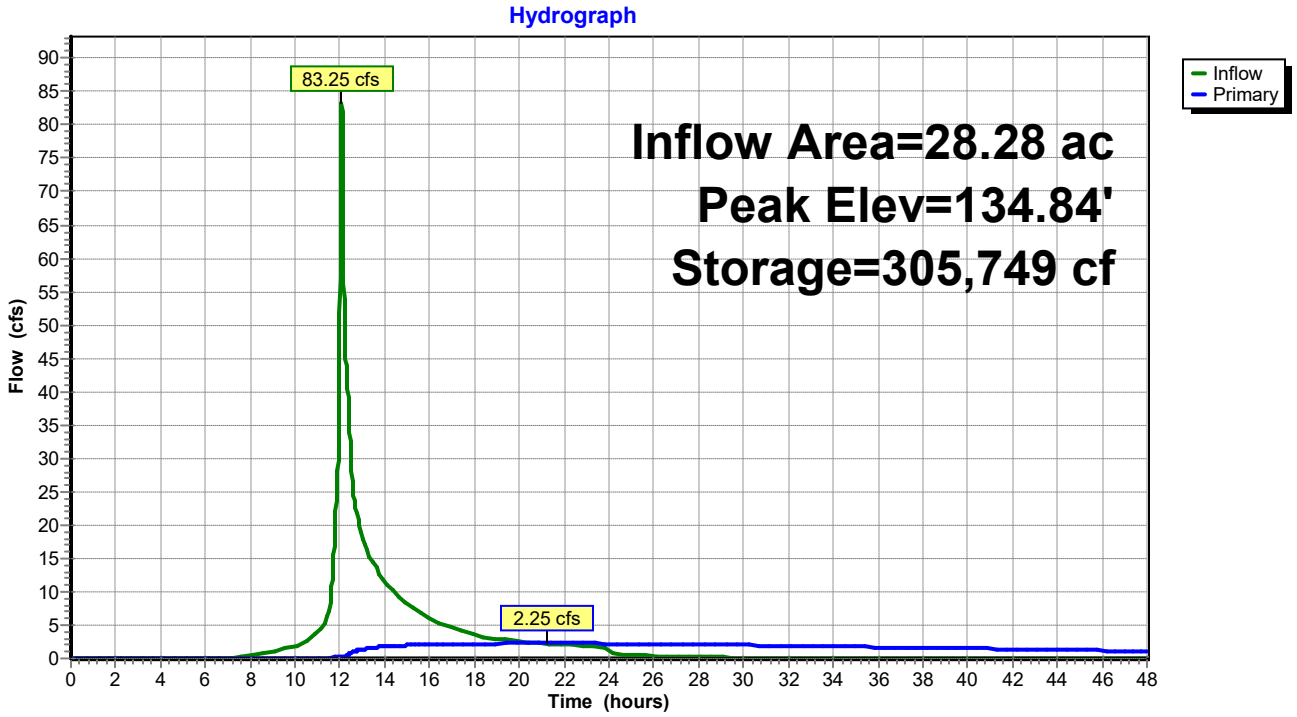
Volume	Invert	Avail.Storage	Storage Description
#1	132.50'	951,536 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.50	121,607	0	0
133.00	125,365	61,743	61,743
134.00	132,923	129,144	190,887
135.00	140,538	136,731	327,618
136.00	148,209	144,374	471,991
137.00	155,937	152,073	624,064
138.00	163,722	159,830	783,894
139.00	171,563	167,643	951,536

Device	Routing	Invert	Outlet Devices
#1	Primary	131.50'	**24.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 131.50' / 131.16' S= 0.0045 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	131.50'	**3.0" Vert. 3in Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	133.25'	**8.0" Vert. 8in Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	135.00'	**24.0" x 36.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.25 cfs @ 21.20 hrs HW=134.84' TW=132.50' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.25 cfs of 22.21 cfs potential flow)
  ├**2=3in Orifice** (Orifice Controls 0.36 cfs @ 7.37 fps)
  ├**3=8in Orifice** (Orifice Controls 1.89 cfs @ 5.41 fps)
  └**4=Overflow CB** (Controls 0.00 cfs)

Pond 10P: Extended Detention Basin B-5



Summary for Pond 15P: Infiltration Basin D-2

Inflow Area = 7.58 ac, 66.75% Impervious, Inflow Depth = 4.06" for 25yr event
Inflow = 37.21 cfs @ 12.07 hrs, Volume= 2.566 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 16L : Design Point: D

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 134.61' @ 24.29 hrs Surf.Area= 41,150 sf Storage= 111,770 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

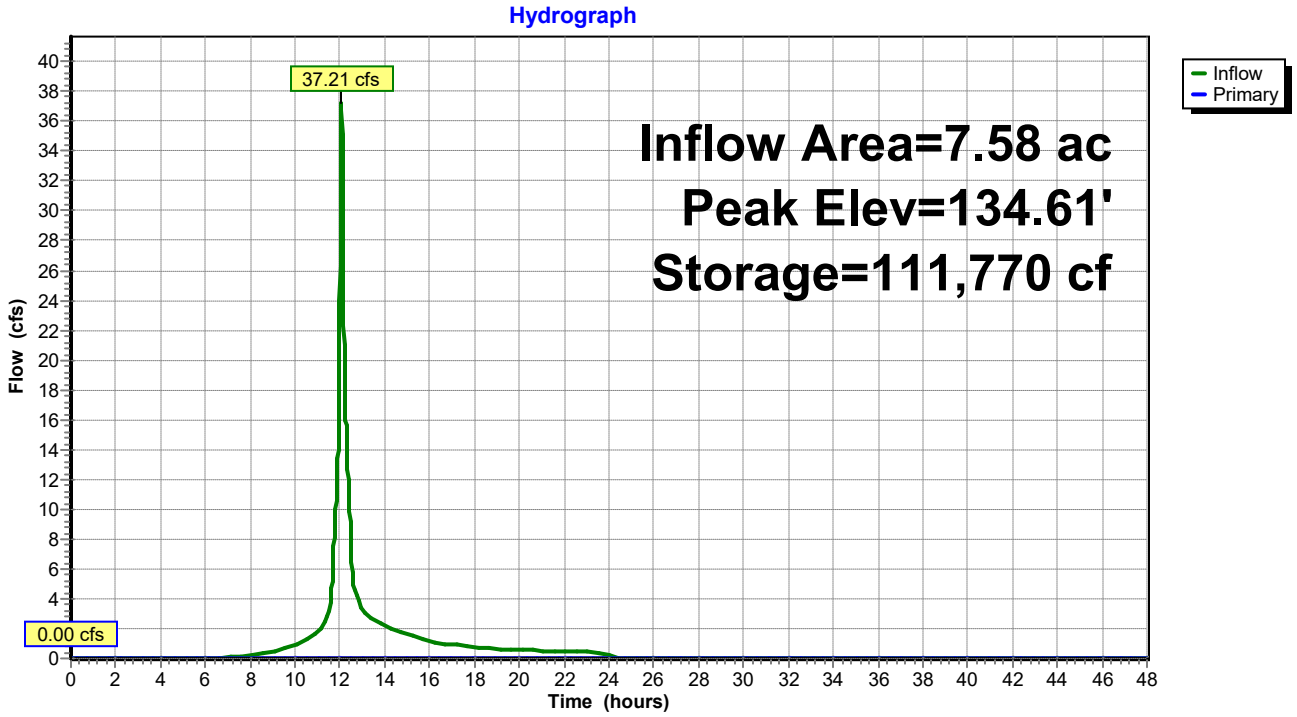
Volume	Invert	Avail.Storage	Storage Description
#1	131.50'	245,101 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
131.50	30,777	0	0
132.00	32,406	15,796	15,796
133.00	35,705	34,056	49,851
134.00	39,062	37,384	87,235
135.00	42,475	40,769	128,003
136.00	45,944	44,210	172,213
137.00	49,470	47,707	219,920
137.50	51,254	25,181	245,101

Device	Routing	Invert	Outlet Devices
#1	Primary	136.00'	**450.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=131.50' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 15P: Infiltration Basin D-2



Summary for Pond 19P: Infiltration Basin E-2

Inflow Area = 9.75 ac, 10.15% Impervious, Inflow Depth = 1.30" for 25yr event
Inflow = 7.49 cfs @ 12.42 hrs, Volume= 1.055 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 20P : Existing Basin E-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 139.59' @ 25.40 hrs Surf.Area= 46,828 sf Storage= 45,944 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

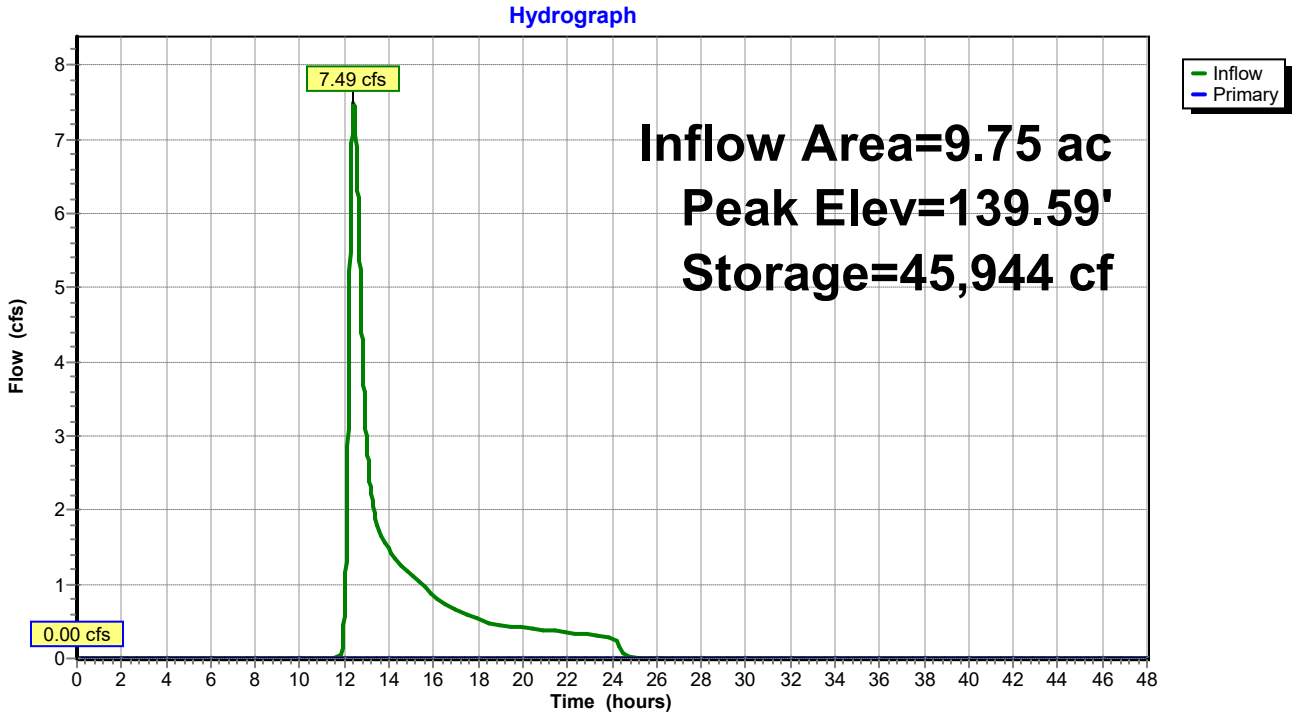
Volume	Invert	Avail.Storage	Storage Description
#1	138.50'	115,575 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
138.50	31,545	0	0
139.00	44,838	19,096	19,096
140.00	48,235	46,537	65,632
141.00	51,650	49,943	115,575

Device	Routing	Invert	Outlet Devices
#1	Primary	140.00'	**70.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=138.50' TW=130.20' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 19P: Infiltration Basin E-2



Summary for Pond 20P: Existing Basin E-1

Inflow Area = 15.56 ac, 6.36% Impervious, Inflow Depth = 0.22" for 25yr event
Inflow = 1.58 cfs @ 12.35 hrs, Volume= 0.290 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 21L : Design Point: E

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 130.97' @ 24.57 hrs Surf.Area= 17,133 sf Storage= 12,620 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

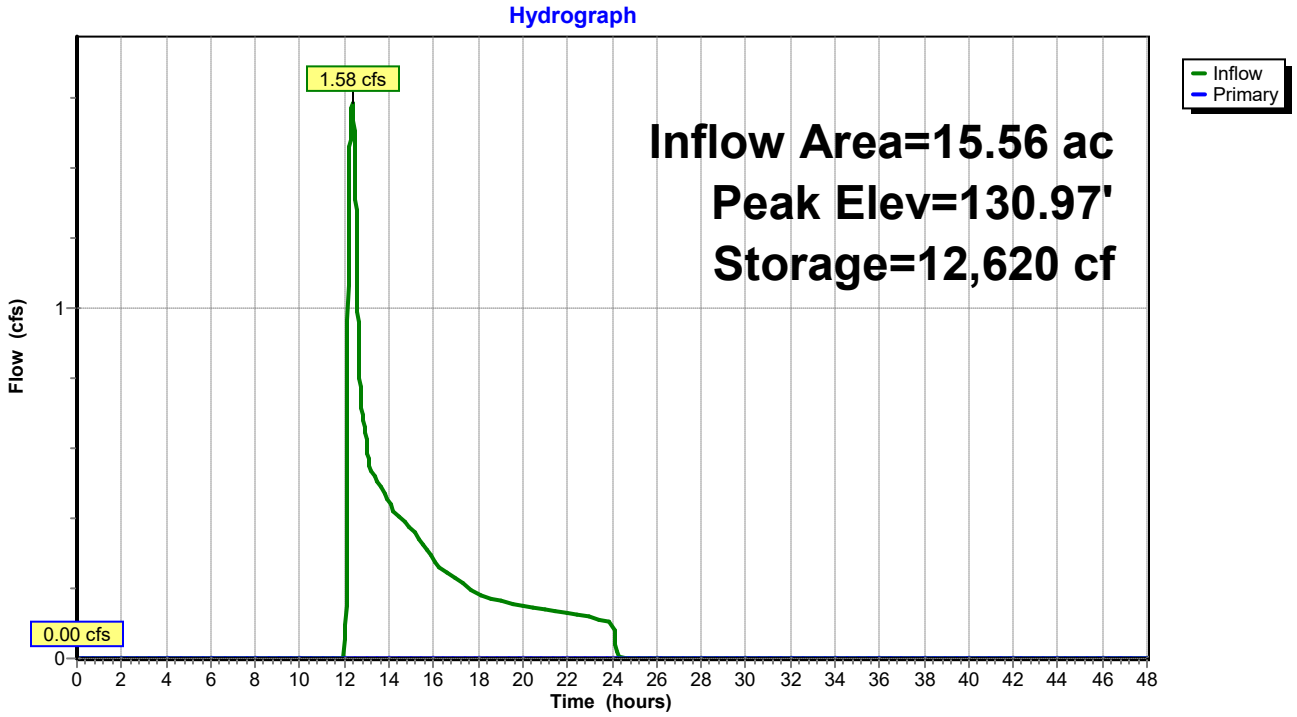
Volume	Invert	Avail.Storage	Storage Description
#1	130.20'	504,295 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.20	15,572	0	0
131.00	17,190	13,105	13,105
132.00	33,435	25,313	38,417
133.00	47,240	40,338	78,755
134.00	62,274	54,757	133,512
135.00	78,197	70,236	203,747
136.00	92,539	85,368	289,115
137.00	106,598	99,569	388,684
138.00	124,625	115,612	504,295

Device	Routing	Invert	Outlet Devices
#1	Primary	137.30'	**35.0' long + 3.0 '/' SideZ x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.20' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 20P: Existing Basin E-1



Summary for Pond 24P: Infiltration Basin F-2

Inflow Area = 2.41 ac, 51.45% Impervious, Inflow Depth = 3.85" for 25yr event
Inflow = 10.49 cfs @ 12.10 hrs, Volume= 0.774 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 27L : Design Point: F

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 132.84' @ 24.40 hrs Surf.Area= 14,253 sf Storage= 33,716 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

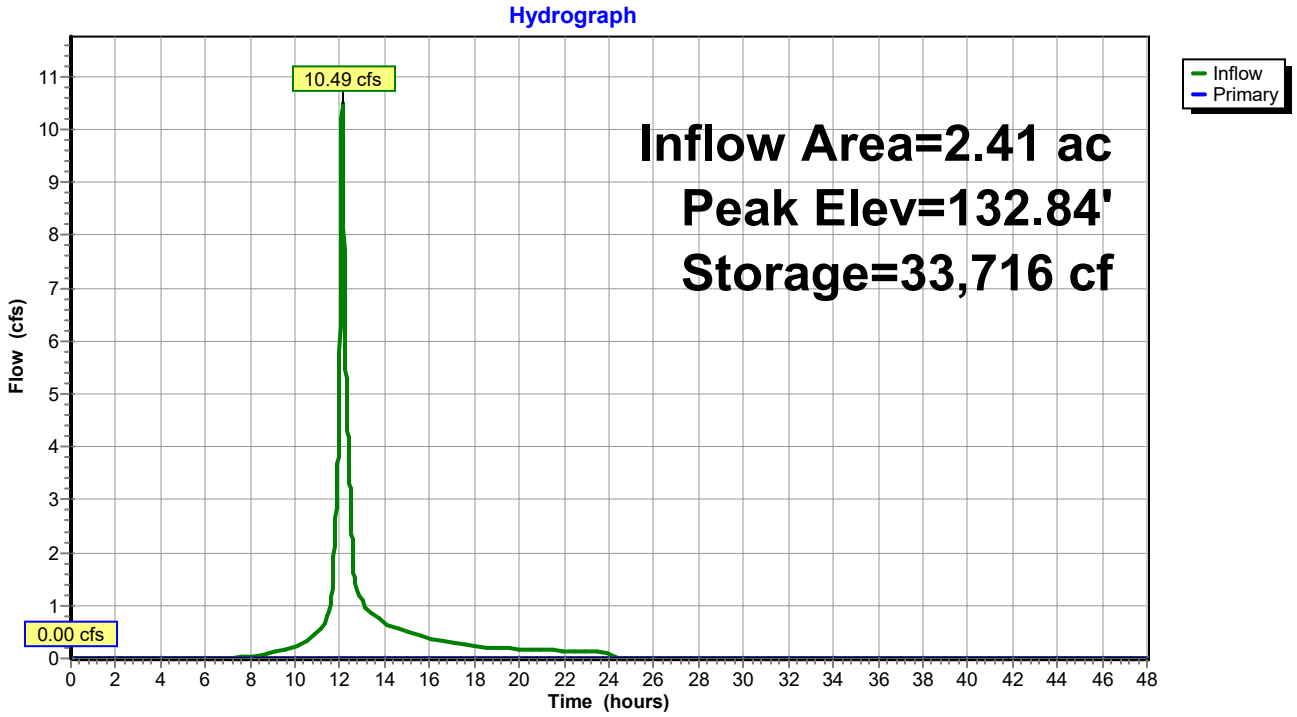
Volume	Invert	Avail.Storage	Storage Description
#1	130.00'	78,726 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.00	9,565	0	0
131.00	11,162	10,364	10,364
132.00	12,816	11,989	22,353
133.00	14,527	13,672	36,024
134.00	16,294	15,411	51,435
135.00	18,811	17,553	68,987
135.50	20,146	9,739	78,726

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**168.0' long + 3.0 '/' SideZ x 168.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 24P: Infiltration Basin F-2



Summary for Pond 26P: Infiltration Basin F-3

Inflow Area = 1.79 ac, 46.37% Impervious, Inflow Depth = 3.85" for 25yr event
Inflow = 8.37 cfs @ 12.07 hrs, Volume= 0.575 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 27L : Design Point: F

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 134.60' @ 24.29 hrs Surf.Area= 8,888 sf Storage= 25,042 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

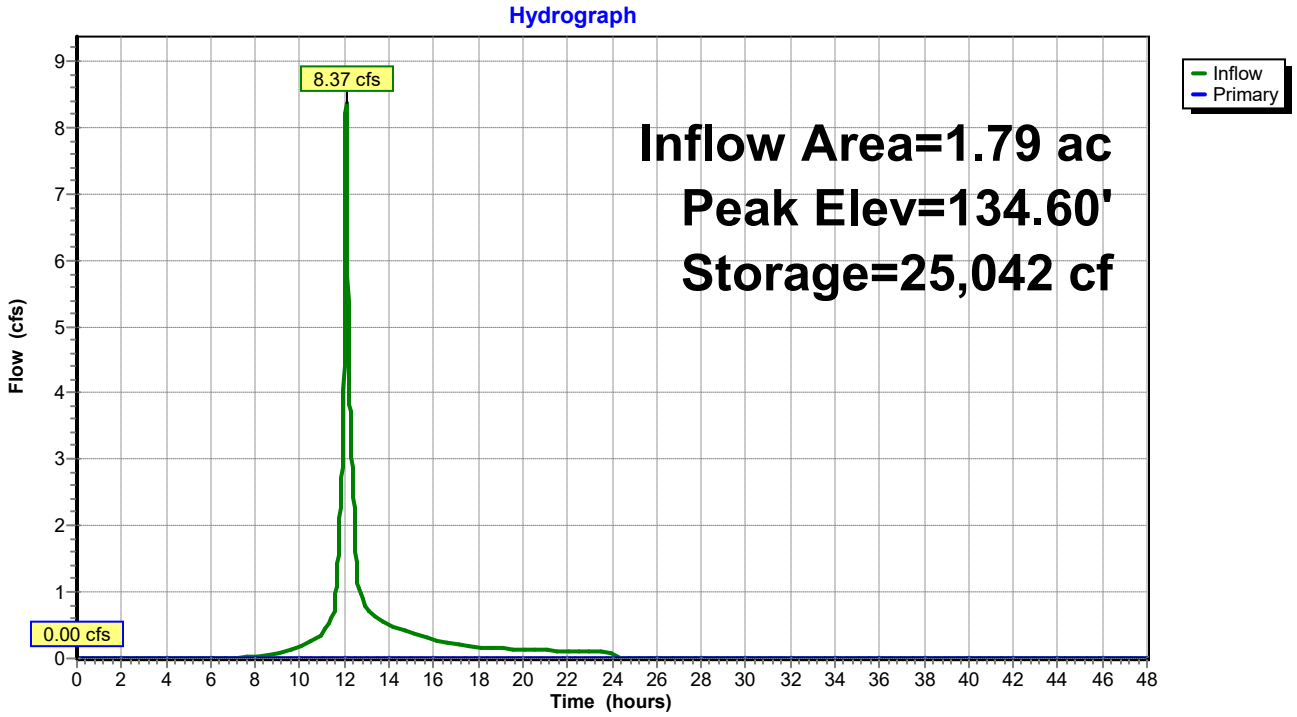
Volume	Invert	Avail.Storage	Storage Description
#1	131.00'	51,929 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
131.00	5,159	0	0
132.00	6,120	5,640	5,640
133.00	7,138	6,629	12,269
134.00	8,213	7,676	19,944
135.00	9,345	8,779	28,723
135.50	9,932	4,819	33,542
136.00	11,697	5,407	38,950
137.00	14,261	12,979	51,929

Device	Routing	Invert	Outlet Devices
#1	Primary	135.50'	**70.0' long + 3.0 '/' SideZ x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=131.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 26P: Infiltration Basin F-3



Summary for Pond 32P: Infiltration Basin G-2

Inflow Area = 0.56 ac, 28.57% Impervious, Inflow Depth = 3.15" for 25yr event
Inflow = 2.14 cfs @ 12.08 hrs, Volume= 0.147 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 33L : Design Point: G

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 134.52' @ 24.29 hrs Surf.Area= 3,364 sf Storage= 6,404 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

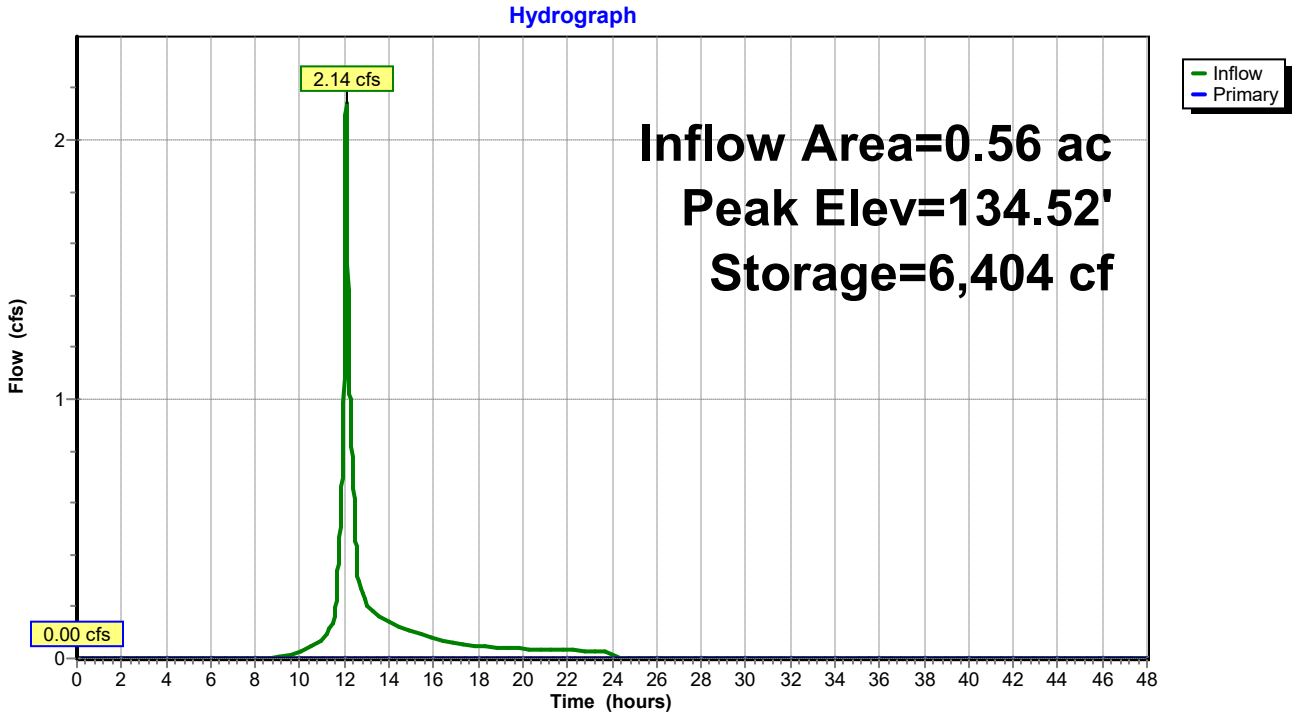
Volume	Invert	Avail.Storage	Storage Description
#1	132.00'	14,518 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.00	1,785	0	0
133.00	2,367	2,076	2,076
134.00	3,006	2,687	4,763
135.00	3,701	3,354	8,116
136.00	4,452	4,077	12,193
136.50	4,849	2,325	14,518

Device	Routing	Invert	Outlet Devices
#1	Primary	130.00'	**15.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 130.00' / 126.25' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf
#2	Device 1	135.00'	**24.0" x 36.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=132.00' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.00 cfs of 6.93 cfs potential flow)
↑**2=Overflow CB** (Controls 0.00 cfs)

Pond 32P: Infiltration Basin G-2



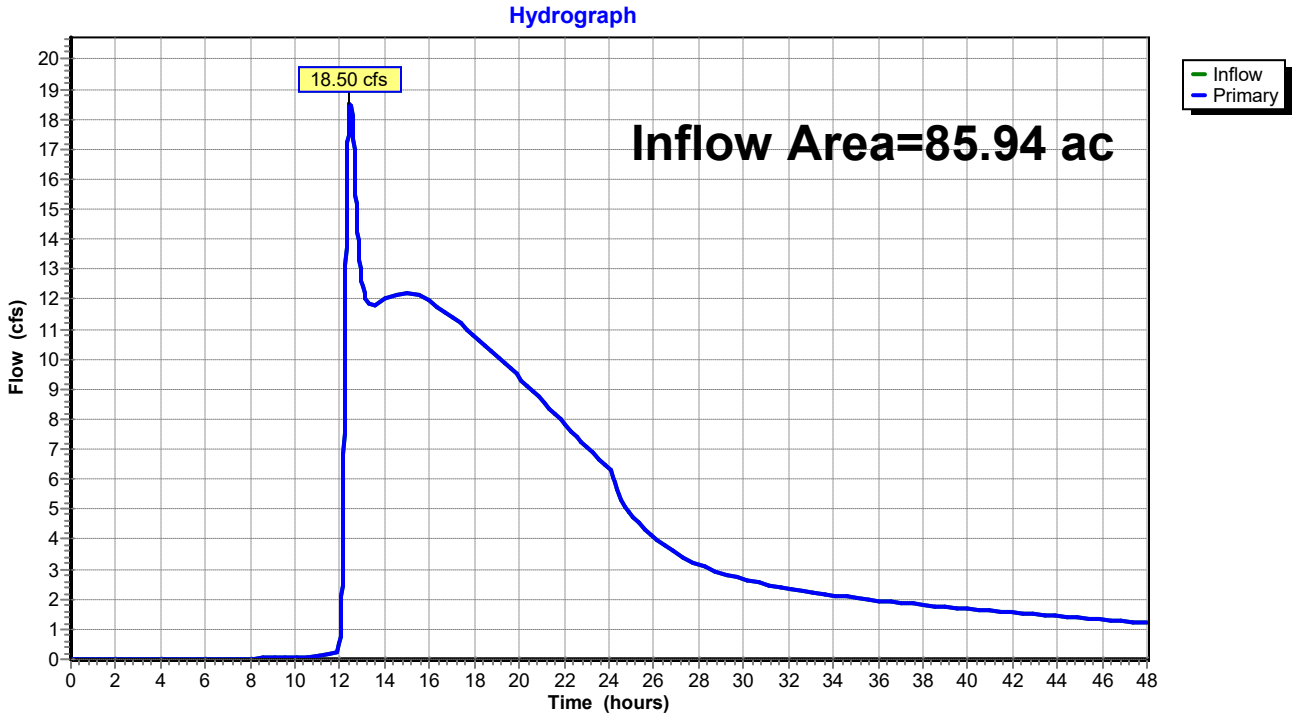
Summary for Link 11L: Design Point: B

Inflow Area = 85.94 ac, 56.17% Impervious, Inflow Depth > 2.07" for 25yr event
Inflow = 18.50 cfs @ 12.44 hrs, Volume= 14.797 af
Primary = 18.50 cfs @ 12.44 hrs, Volume= 14.797 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Fixed water surface Elevation= 132.50'

Link 11L: Design Point: B

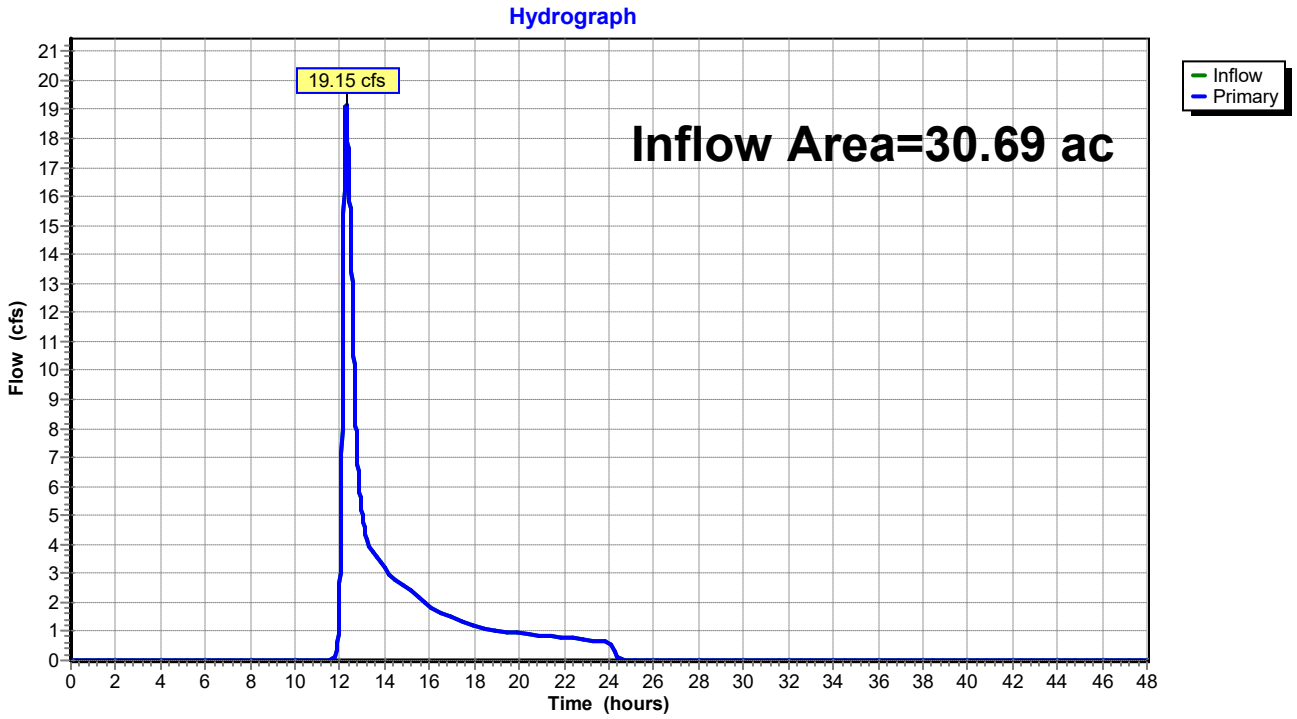


Summary for Link 16L: Design Point: D

Inflow Area = 30.69 ac, 16.49% Impervious, Inflow Depth = 0.92" for 25yr event
Inflow = 19.15 cfs @ 12.27 hrs, Volume= 2.352 af
Primary = 19.15 cfs @ 12.27 hrs, Volume= 2.352 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 16L: Design Point: D

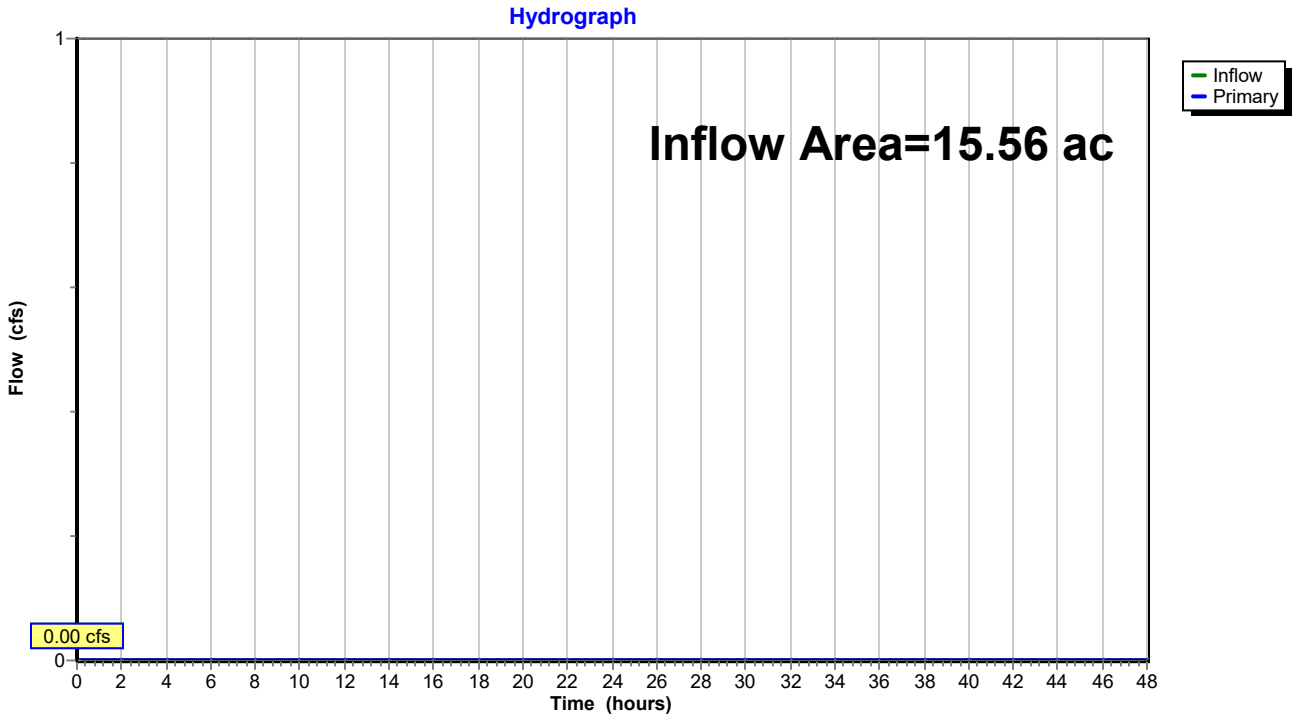


Summary for Link 21L: Design Point: E

Inflow Area = 15.56 ac, 6.36% Impervious, Inflow Depth = 0.00" for 25yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 21L: Design Point: E

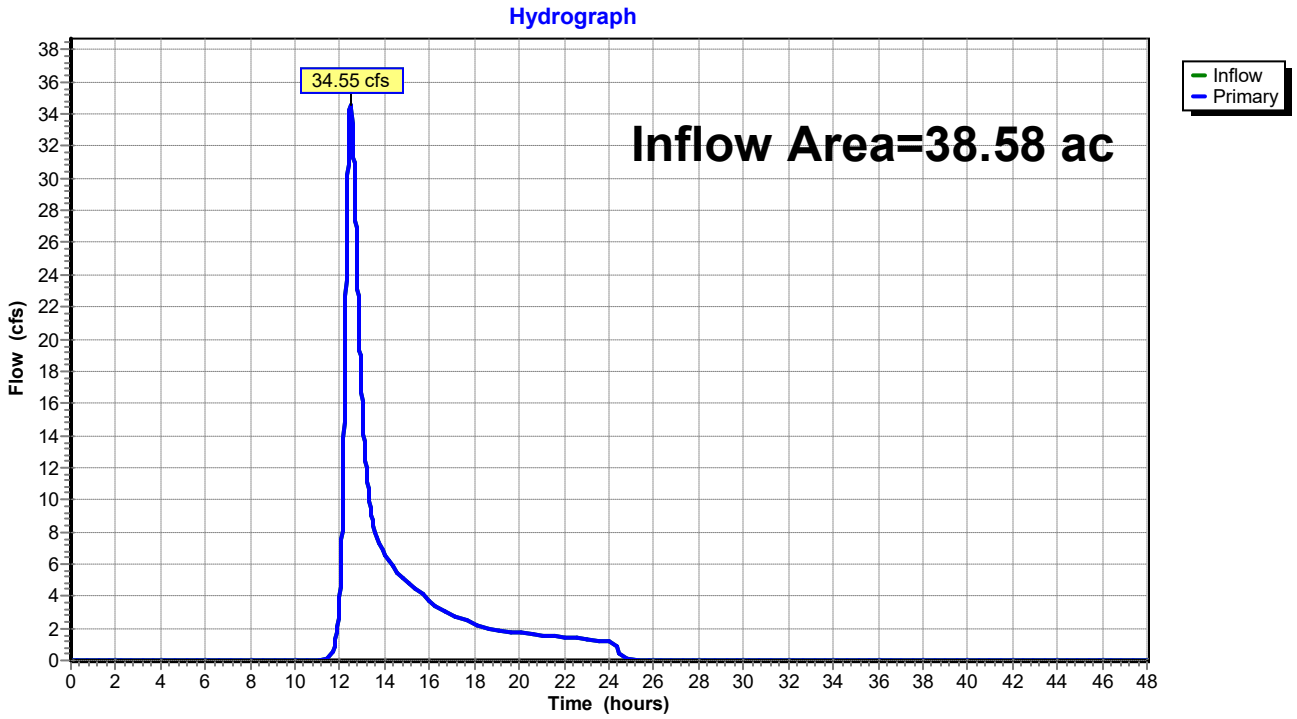


Summary for Link 27L: Design Point: F

Inflow Area = 38.58 ac, 5.37% Impervious, Inflow Depth = 1.51" for 25yr event
Inflow = 34.55 cfs @ 12.50 hrs, Volume= 4.868 af
Primary = 34.55 cfs @ 12.50 hrs, Volume= 4.868 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 27L: Design Point: F

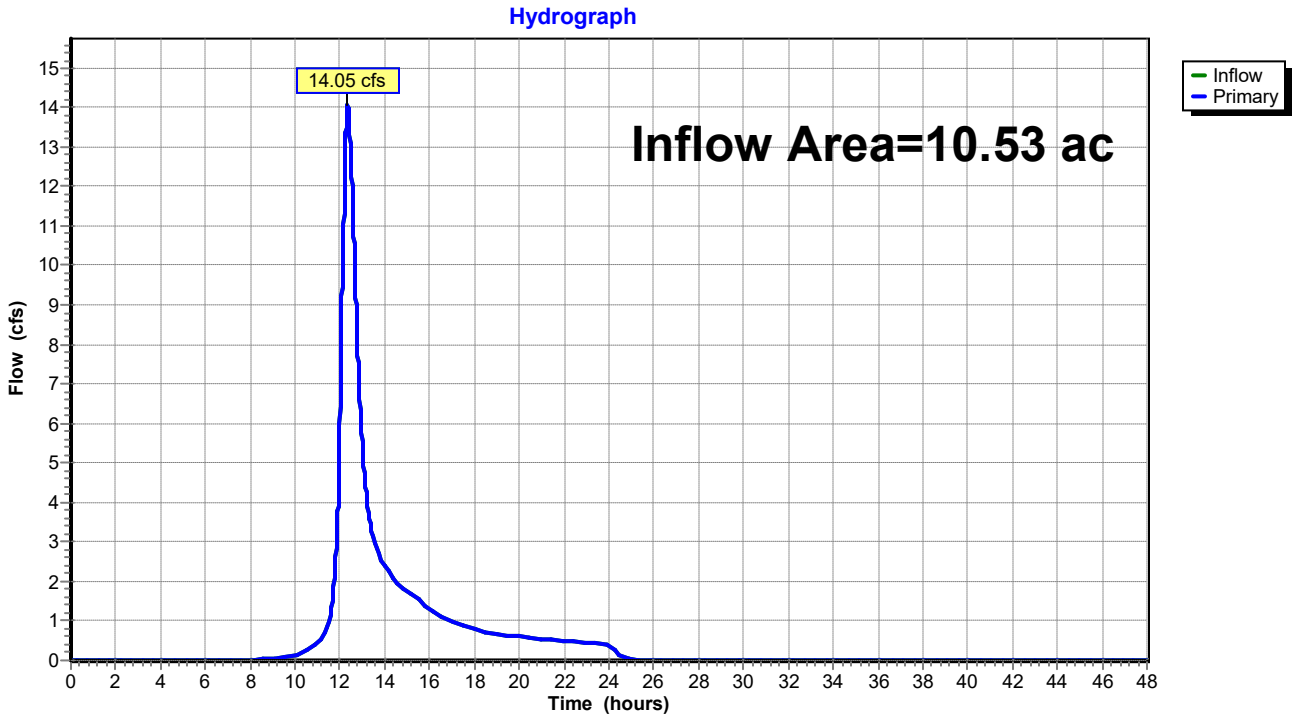


Summary for Link 33L: Design Point: G

Inflow Area = 10.53 ac, 9.31% Impervious, Inflow Depth = 2.31" for 25yr event
Inflow = 14.05 cfs @ 12.34 hrs, Volume= 2.031 af
Primary = 14.05 cfs @ 12.34 hrs, Volume= 2.031 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 33L: Design Point: G



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: PrWS A-1 Runoff Area=1.67 ac 2.99% Impervious Runoff Depth=1.40"
Flow Length=100' Slope=0.0150 '/' Tc=16 min CN=46 Runoff=1.59 cfs 0.195 af

Subcatchment 2S: PrWS B-1 Runoff Area=26.29 ac 2.21% Impervious Runoff Depth=1.40"
Flow Length=820' Tc=22 min CN=46 Runoff=22.32 cfs 3.065 af

Subcatchment 3S: PrWS B-2 Runoff Area=23.96 ac 92.36% Impervious Runoff Depth=6.45"
Tc=5 min CN=94 Runoff=170.57 cfs 12.873 af

Subcatchment 5S: PrWS B-3 Runoff Area=11.97 ac 100.00% Impervious Runoff Depth=6.92"
Tc=5 min CN=98 Runoff=87.12 cfs 6.903 af

Subcatchment 7S: PrWS B-4 Runoff Area=7.41 ac 36.03% Impervious Runoff Depth=3.97"
Flow Length=854' Tc=10 min CN=72 Runoff=30.11 cfs 2.449 af

Subcatchment 9S: PrWS B-5 Runoff Area=16.31 ac 66.95% Impervious Runoff Depth=4.84"
Tc=5 min CN=80 Runoff=94.96 cfs 6.582 af

Subcatchment 12S: PrWS C-1 Runoff Area=15.48 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=540' Tc=23 min CN=54 Runoff=22.72 cfs 2.748 af

Subcatchment 13S: PrWS D-1 Runoff Area=23.11 ac 0.00% Impervious Runoff Depth=1.67"
Flow Length=550' Tc=16 min CN=49 Runoff=28.39 cfs 3.207 af

Subcatchment 14S: PrWS D-2 Runoff Area=7.58 ac 66.75% Impervious Runoff Depth=4.84"
Tc=5 min CN=80 Runoff=44.13 cfs 3.059 af

Subcatchment 17S: PrWS E-1 Runoff Area=5.81 ac 0.00% Impervious Runoff Depth=0.90"
Flow Length=225' Tc=10 min CN=40 Runoff=3.02 cfs 0.437 af

Subcatchment 18S: PrWS E-2 Runoff Area=9.75 ac 10.15% Impervious Runoff Depth=1.76"
Flow Length=1,010' Tc=25 min CN=50 Runoff=10.79 cfs 1.427 af

Subcatchment 22S: PrWS F-1 Runoff Area=34.38 ac 0.00% Impervious Runoff Depth=2.23"
Flow Length=618' Slope=0.0400 '/' Tc=31 min CN=55 Runoff=46.83 cfs 6.378 af

Subcatchment 23S: PrWS F-2 Runoff Area=2.41 ac 51.45% Impervious Runoff Depth=4.62"
Flow Length=637' Tc=7 min CN=78 Runoff=12.53 cfs 0.928 af

Subcatchment 25S: PrWS F-3 Runoff Area=1.79 ac 46.37% Impervious Runoff Depth=4.62"
Flow Length=487' Tc=5 min CN=78 Runoff=9.99 cfs 0.689 af

Subcatchment 28S: PrWS G-1a Runoff Area=4.52 ac 9.51% Impervious Runoff Depth=3.33"
Flow Length=250' Tc=21 min CN=66 Runoff=11.57 cfs 1.255 af

Subcatchment 29S: PrWS G-1b Runoff Area=4.63 ac 0.00% Impervious Runoff Depth=2.52"
Flow Length=855' Tc=38 min CN=58 Runoff=6.63 cfs 0.972 af

Subcatchment 30S: PrWS G-1c Runoff Area=0.82 ac 47.56% Impervious Runoff Depth=4.73"
Tc=5 min CN=79 Runoff=4.68 cfs 0.323 af

Subcatchment 31S: PrWS G-2 Runoff Area=0.56 ac 28.57% Impervious Runoff Depth=3.86"
Tc=5 min CN=71 Runoff=2.63 cfs 0.180 af

Pond 4P: UG Detention System B-2 Peak Elev=137.15' Storage=360,265 cf Inflow=170.57 cfs 12.873 af
Outflow=16.13 cfs 7.368 af

Pond 6P: UG Detention System B-3 Peak Elev=137.57' Storage=4.078 af Inflow=87.12 cfs 6.903 af
Outflow=19.49 cfs 4.500 af

Pond 8P: Extended Detention Basin B-4 Peak Elev=136.22' Storage=114,692 cf Inflow=34.80 cfs 9.816 af
Outflow=11.97 cfs 9.369 af

Pond 10P: Extended Detention Basin Peak Elev=135.16' Storage=350,720 cf Inflow=102.47 cfs 11.081 af
Outflow=4.66 cfs 6.919 af

Pond 15P: Infiltration Basin D-2 Peak Elev=135.12' Storage=133,238 cf Inflow=44.13 cfs 3.059 af
Outflow=0.00 cfs 0.000 af

Pond 19P: Infiltration Basin E-2 Peak Elev=139.93' Storage=62,160 cf Inflow=10.79 cfs 1.427 af
Outflow=0.00 cfs 0.000 af

Pond 20P: Existing Basin E-1 Peak Elev=131.30' Storage=19,049 cf Inflow=3.02 cfs 0.437 af
Outflow=0.00 cfs 0.000 af

Pond 24P: Infiltration Basin F-2 Peak Elev=133.30' Storage=40,419 cf Inflow=12.53 cfs 0.928 af
Outflow=0.00 cfs 0.000 af

Pond 26P: Infiltration Basin F-3 Peak Elev=135.14' Storage=30,021 cf Inflow=9.99 cfs 0.689 af
Outflow=0.00 cfs 0.000 af

Pond 32P: Infiltration Basin G-2 Peak Elev=134.93' Storage=7,844 cf Inflow=2.63 cfs 0.180 af
Outflow=0.00 cfs 0.000 af

Link 11L: Design Point: B Inflow=28.40 cfs 19.353 af
Primary=28.40 cfs 19.353 af

Link 16L: Design Point: D Inflow=28.39 cfs 3.207 af
Primary=28.39 cfs 3.207 af

Link 21L: Design Point: E Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 27L: Design Point: F Inflow=46.83 cfs 6.378 af
Primary=46.83 cfs 6.378 af

Link 33L: Design Point: G Inflow=17.92 cfs 2.550 af
Primary=17.92 cfs 2.550 af

Total Runoff Area = 198.45 ac Runoff Volume = 53.670 af Average Runoff Depth = 3.25"
71.07% Pervious = 141.03 ac 28.93% Impervious = 57.42 ac

Summary for Subcatchment 1S: PrWS A-1

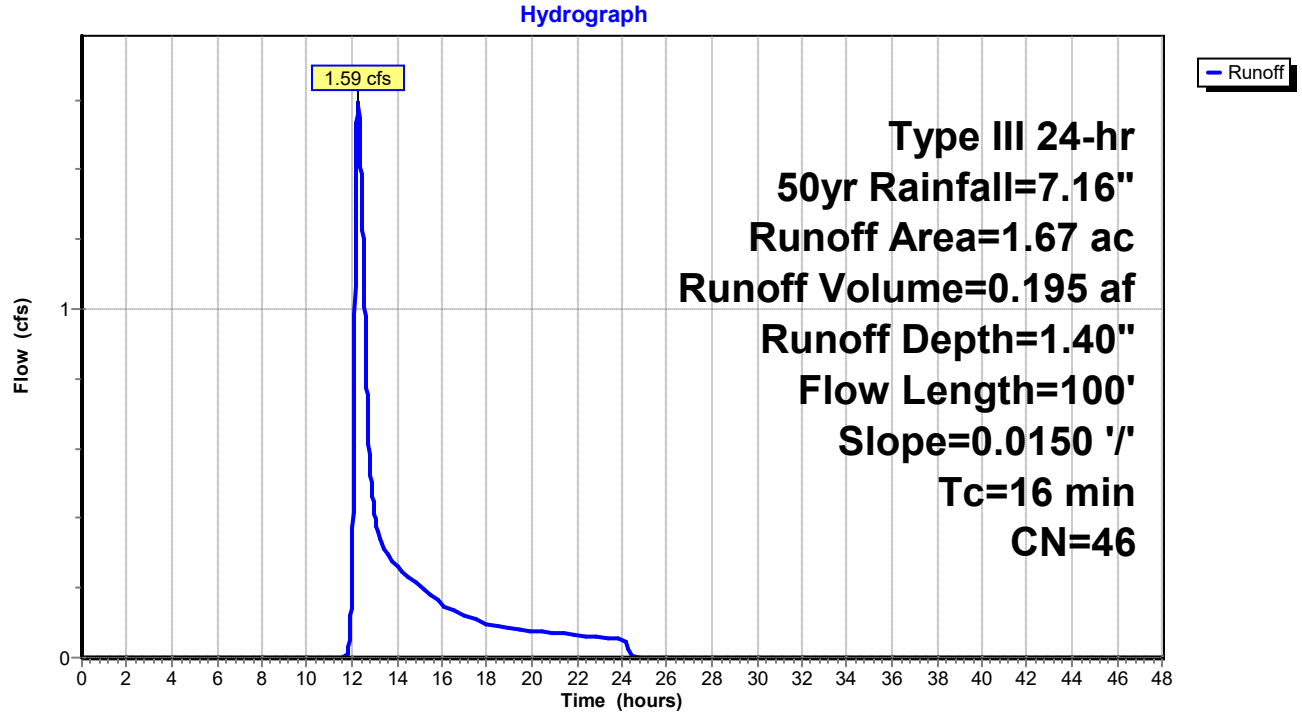
Runoff = 1.59 cfs @ 12.27 hrs, Volume= 0.195 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
0.05	98	Paved parking, HSG A
1.26	39	>75% Grass cover, Good, HSG A
0.12	61	>75% Grass cover, Good, HSG B
0.18	74	>75% Grass cover, Good, HSG C
0.06	30	Woods, Good, HSG A
1.67	46	Weighted Average
1.62		97.01% Pervious Area
0.05		2.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16	100	0.0150	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"

Subcatchment 1S: PrWS A-1



Summary for Subcatchment 2S: PrWS B-1

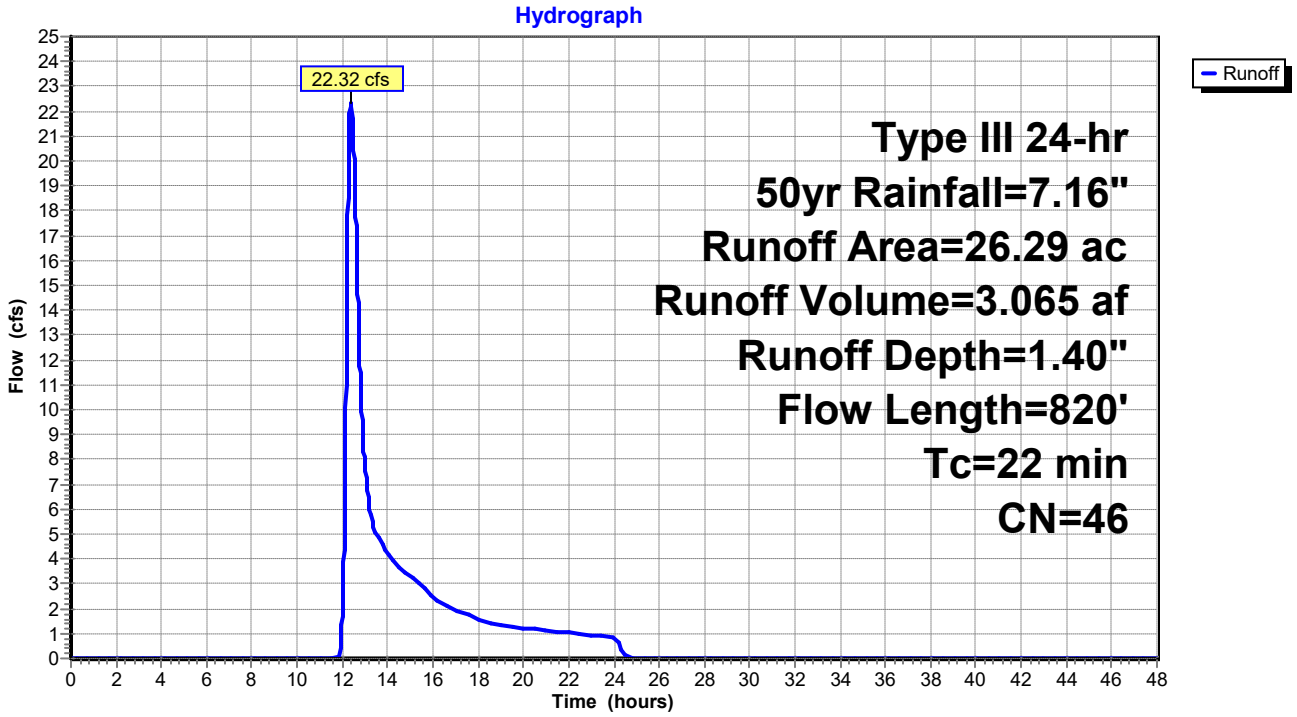
Runoff = 22.32 cfs @ 12.37 hrs, Volume= 3.065 af, Depth= 1.40"
Routed to Link 11L : Design Point: B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
0.58	98	Paved parking, HSG A
16.93	39	>75% Grass cover, Good, HSG A
0.01	61	>75% Grass cover, Good, HSG B
2.83	74	>75% Grass cover, Good, HSG C
3.94	30	Woods, Good, HSG A
2.00	77	Woods, Good, HSG D
26.29	46	Weighted Average
25.71		97.79% Pervious Area
0.58		2.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16	100	0.0150	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
4	475	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	55	0.0820	4.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2	190	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
22	820	Total			

Subcatchment 2S: PrWS B-1



Summary for Subcatchment 3S: PrWS B-2

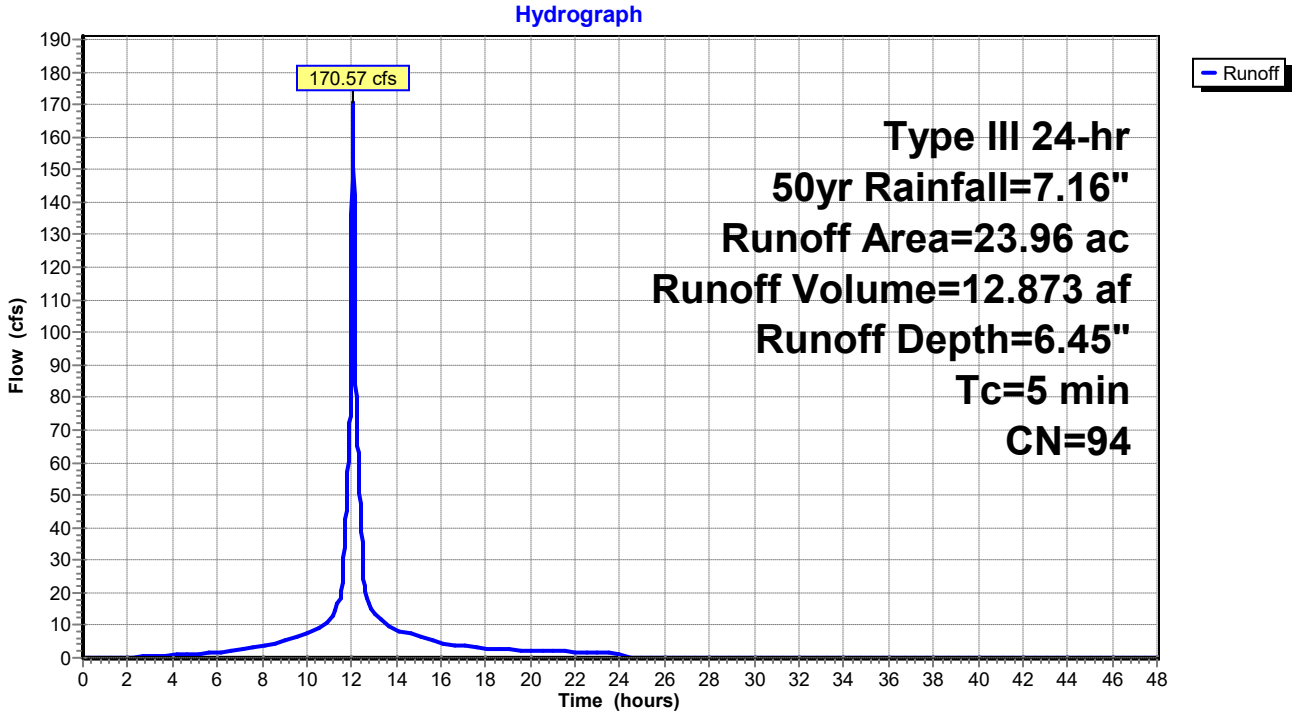
Runoff = 170.57 cfs @ 12.07 hrs, Volume= 12.873 af, Depth= 6.45"
Routed to Pond 4P : UG Detention System B-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
22.13	98	Paved parking, HSG A
1.76	39	>75% Grass cover, Good, HSG A
0.07	61	>75% Grass cover, Good, HSG B
23.96	94	Weighted Average
1.83		7.64% Pervious Area
22.13		92.36% Impervious Area

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

Subcatchment 3S: PrWS B-2



Summary for Subcatchment 5S: PrWS B-3

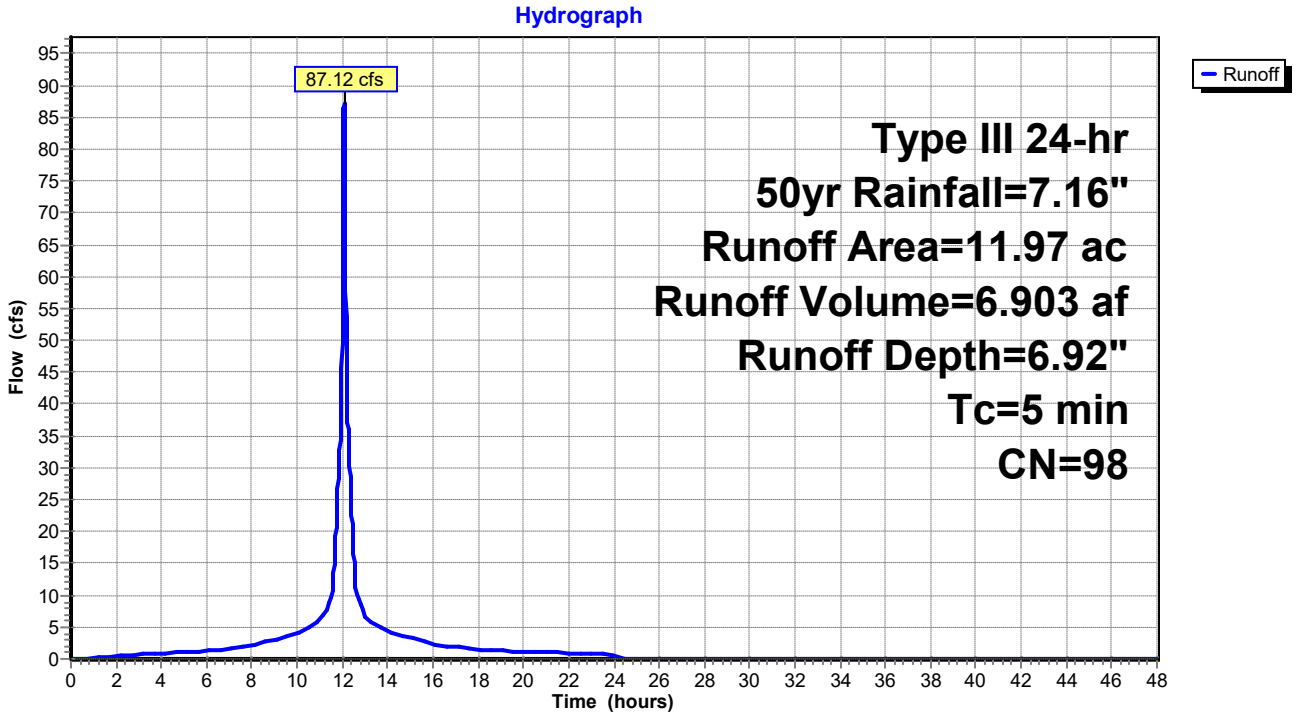
Runoff = 87.12 cfs @ 12.07 hrs, Volume= 6.903 af, Depth= 6.92"
Routed to Pond 6P : UG Detention System B-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
11.97	98	Paved parking, HSG A
11.97		100.00% Impervious Area

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

Subcatchment 5S: PrWS B-3



Summary for Subcatchment 7S: PrWS B-4

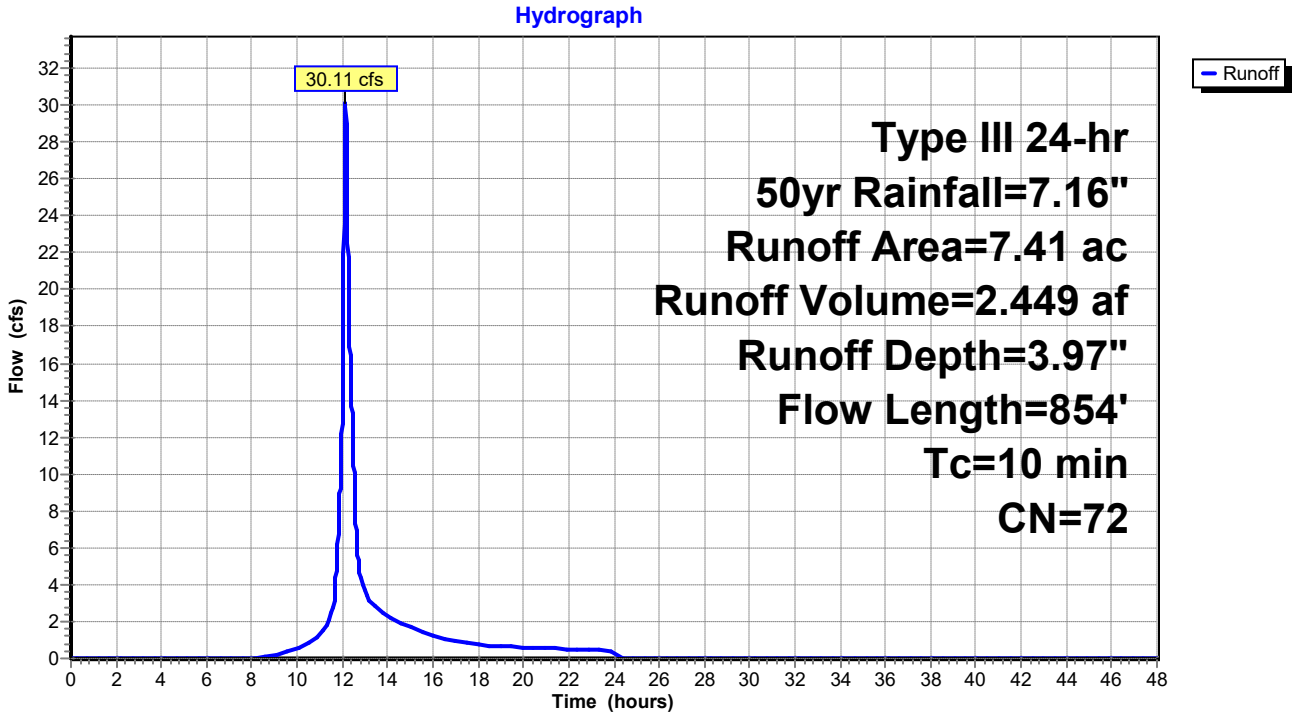
Runoff = 30.11 cfs @ 12.14 hrs, Volume= 2.449 af, Depth= 3.97"
Routed to Pond 8P : Extended Detention Basin B-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
2.67	98	Paved parking, HSG A
2.34	39	>75% Grass cover, Good, HSG A
2.40	74	>75% Grass cover, Good, HSG C
7.41	72	Weighted Average
4.74		63.97% Pervious Area
2.67		36.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8	100	0.0870	0.21		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	70	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	44	0.0170	5.91	4.65	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
2	640	0.0030	6.26	78.68	**Pipe Channel,** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
10	854	Total			

Subcatchment 7S: PrWS B-4



Summary for Subcatchment 9S: PrWS B-5

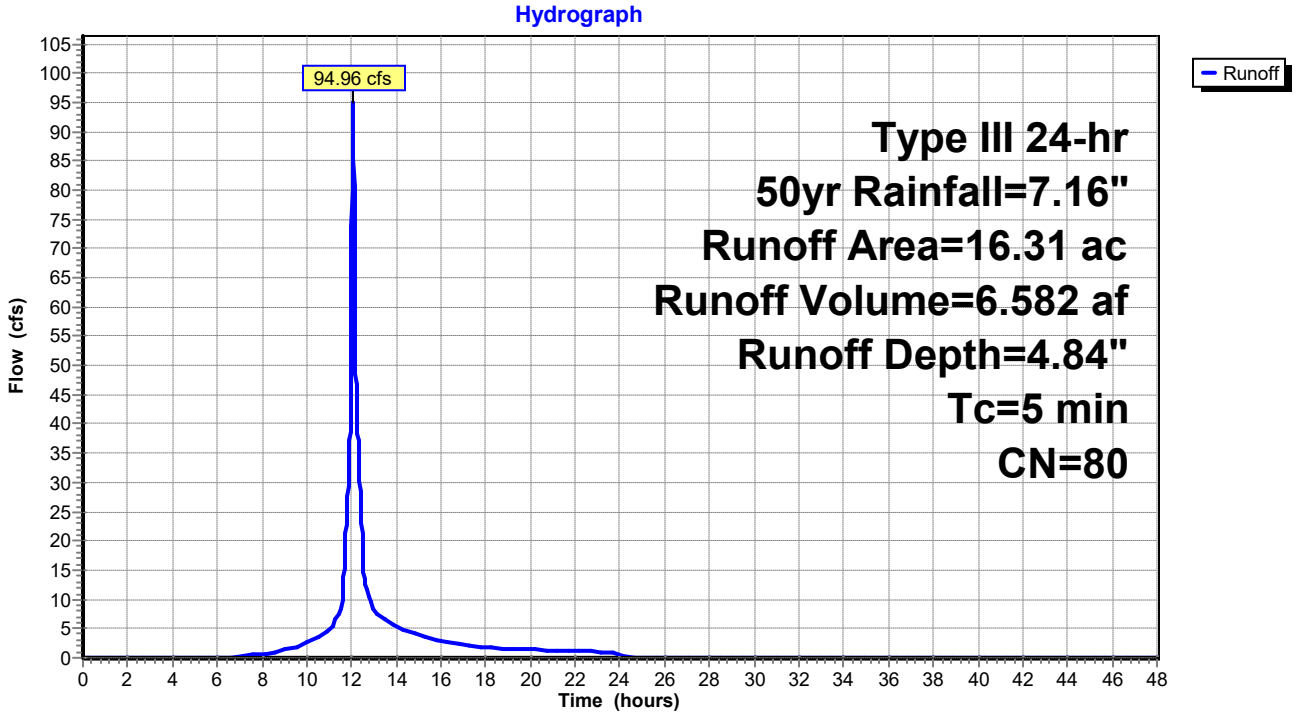
Runoff = 94.96 cfs @ 12.07 hrs, Volume= 6.582 af, Depth= 4.84"
Routed to Pond 10P : Extended Detention Basin B-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
10.92	98	Paved parking, HSG A
4.39	39	>75% Grass cover, Good, HSG A
1.00	61	>75% Grass cover, Good, HSG B
16.31	80	Weighted Average
5.39		33.05% Pervious Area
10.92		66.95% Impervious Area

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

Subcatchment 9S: PrWS B-5



Summary for Subcatchment 12S: PrWS C-1

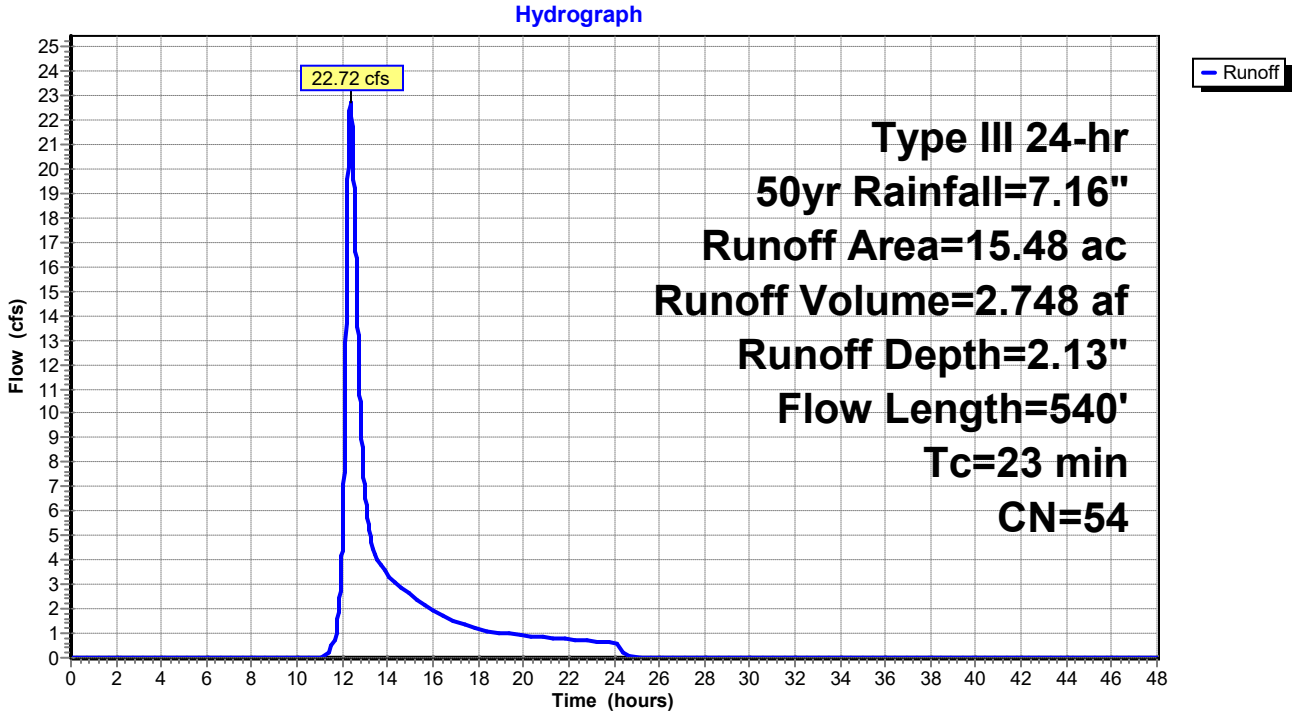
Runoff = 22.72 cfs @ 12.35 hrs, Volume= 2.748 af, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
2.82	39	>75% Grass cover, Good, HSG A
4.75	61	>75% Grass cover, Good, HSG B
1.44	30	Woods, Good, HSG A
4.44	55	Woods, Good, HSG B
2.03	77	Woods, Good, HSG D
15.48	54	Weighted Average
15.48		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	100	0.0100	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
4	395	0.0090	1.53		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	45	0.0220	2.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
23	540	Total			

Subcatchment 12S: PrWS C-1



Summary for Subcatchment 13S: PrWS D-1

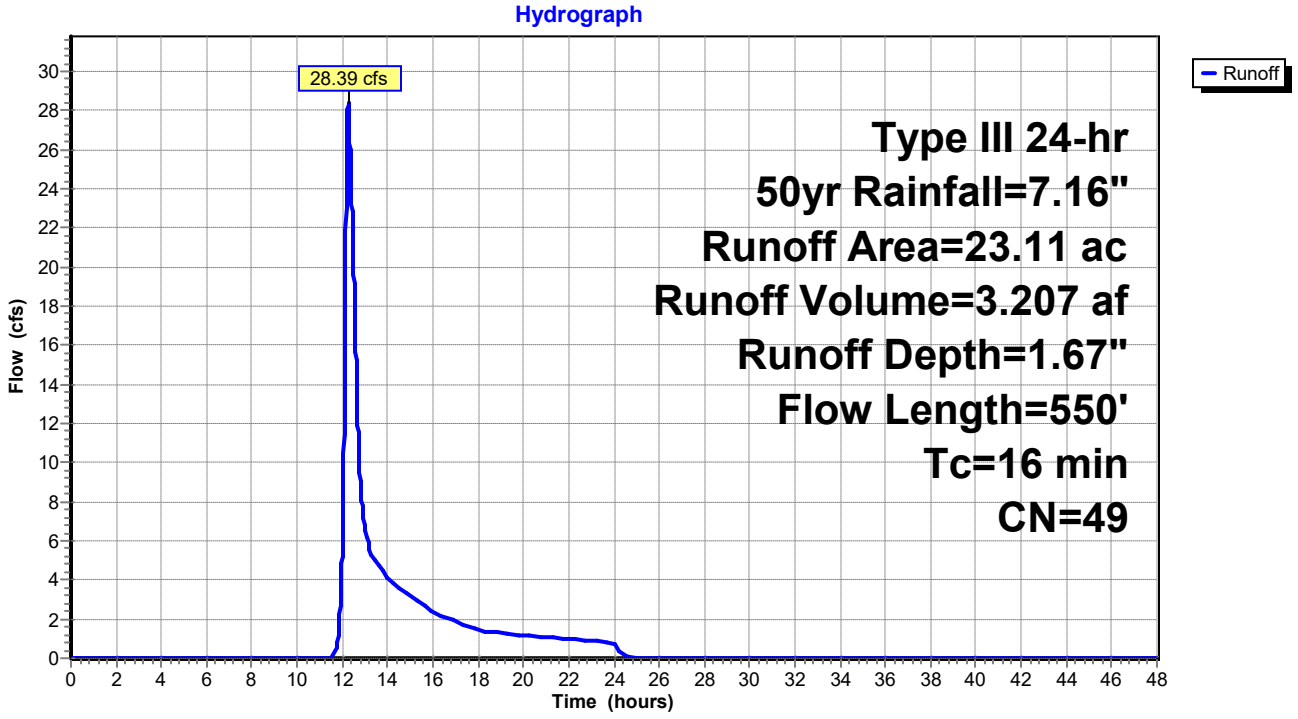
Runoff = 28.39 cfs @ 12.25 hrs, Volume= 3.207 af, Depth= 1.67"
Routed to Link 16L : Design Point: D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
12.27	39	>75% Grass cover, Good, HSG A
10.58	61	>75% Grass cover, Good, HSG B
0.26	30	Woods, Good, HSG A
23.11	49	Weighted Average
23.11		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0300	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	165	0.0240	2.49		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	285	0.0080	1.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16	550	Total			

Subcatchment 13S: PrWS D-1



Summary for Subcatchment 14S: PrWS D-2

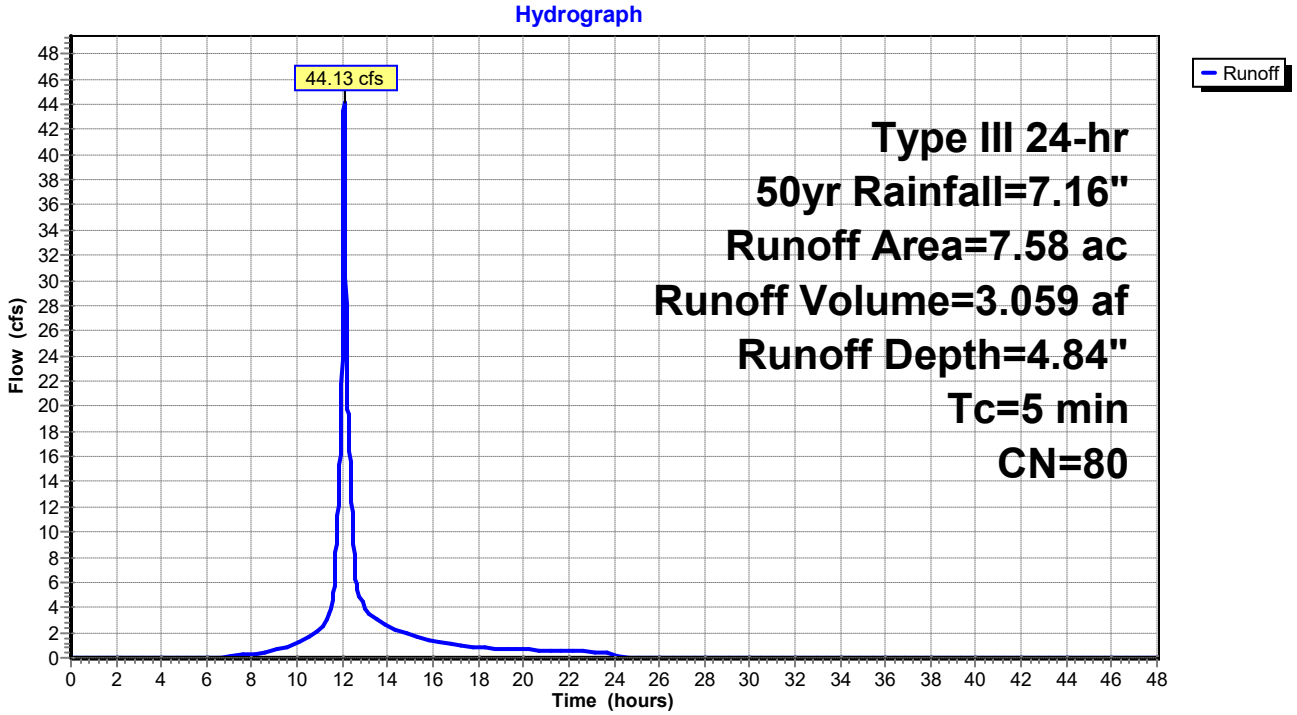
Runoff = 44.13 cfs @ 12.07 hrs, Volume= 3.059 af, Depth= 4.84"
Routed to Pond 15P : Infiltration Basin D-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
5.06	98	Paved parking, HSG A
1.90	39	>75% Grass cover, Good, HSG A
0.62	61	>75% Grass cover, Good, HSG B
7.58	80	Weighted Average
2.52		33.25% Pervious Area
5.06		66.75% Impervious Area

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

Subcatchment 14S: PrWS D-2



Summary for Subcatchment 17S: PrWS E-1

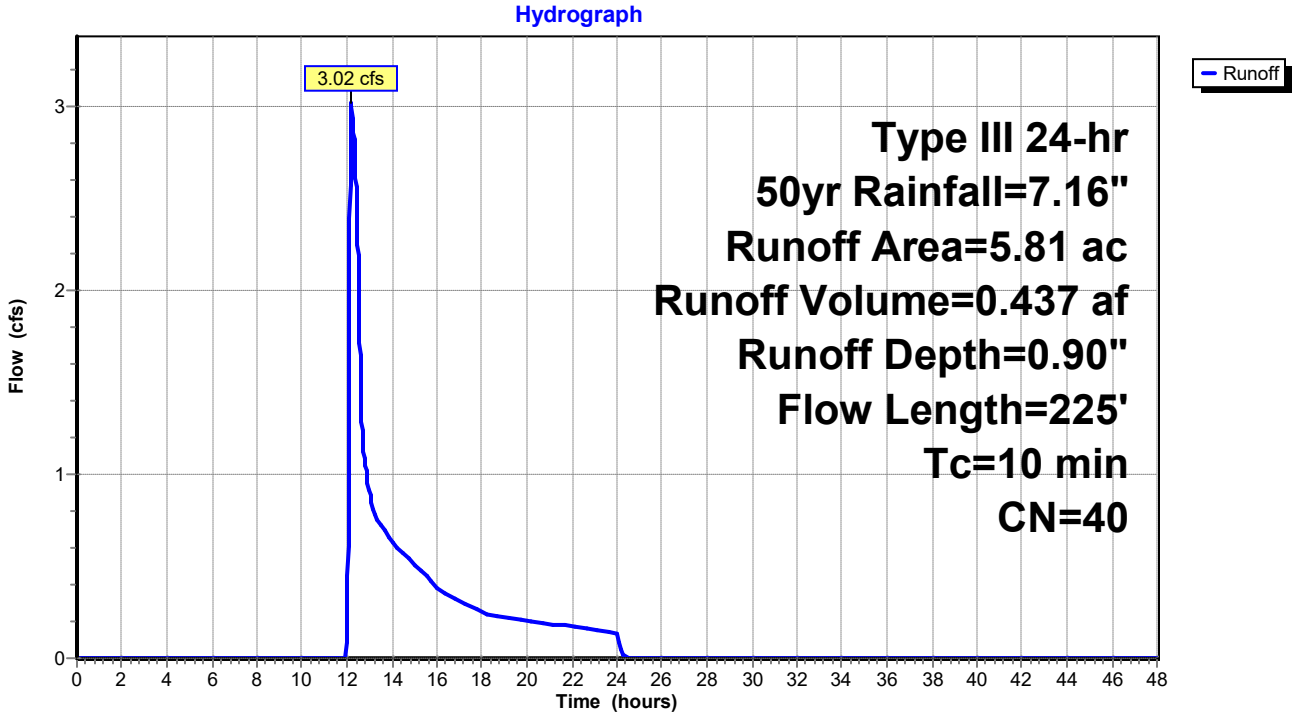
Runoff = 3.02 cfs @ 12.21 hrs, Volume= 0.437 af, Depth= 0.90"
Routed to Pond 20P : Existing Basin E-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
1.91	39	>75% Grass cover, Good, HSG A
2.97	30	Woods, Good, HSG A
0.93	77	Woods, Good, HSG D
5.81	40	Weighted Average
5.81		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	100	0.0650	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	25	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	100	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10	225	Total			

Subcatchment 17S: PrWS E-1



Summary for Subcatchment 18S: PrWS E-2

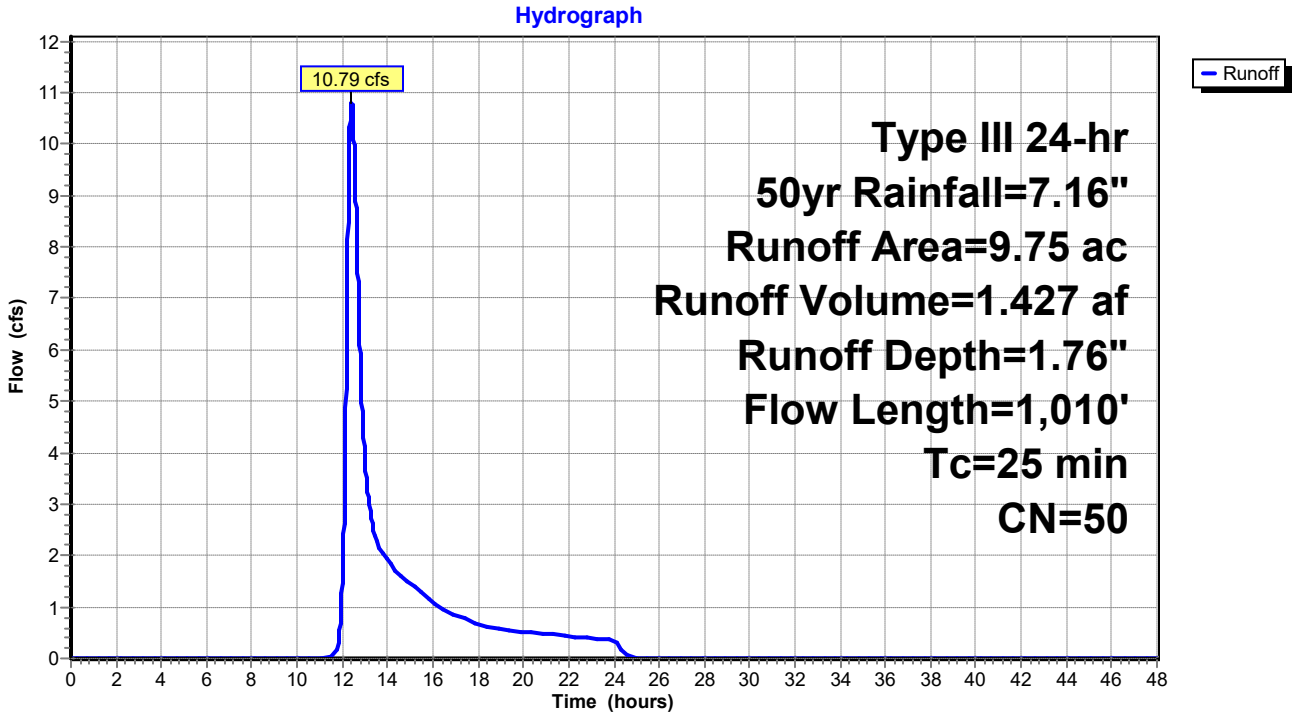
Runoff = 10.79 cfs @ 12.41 hrs, Volume= 1.427 af, Depth= 1.76"
Routed to Pond 19P : Infiltration Basin E-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
0.99	98	Paved parking, HSG A
6.78	39	>75% Grass cover, Good, HSG A
1.54	61	>75% Grass cover, Good, HSG B
0.44	74	>75% Grass cover, Good, HSG C
9.75	50	Weighted Average
8.76		89.85% Pervious Area
0.99		10.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13	100	0.0230	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
7	550	0.0060	1.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4	250	0.0040	1.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	110	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
25	1,010	Total			

Subcatchment 18S: PrWS E-2



Summary for Subcatchment 22S: PrWS F-1

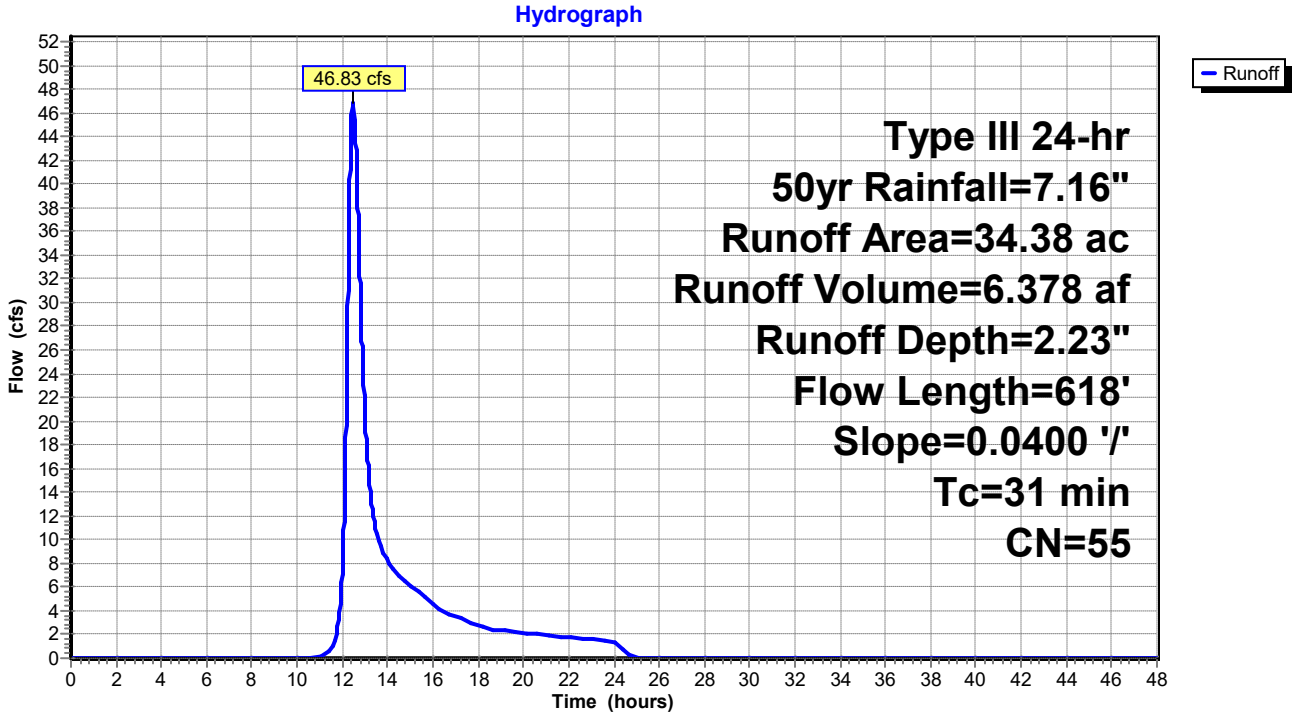
Runoff = 46.83 cfs @ 12.47 hrs, Volume= 6.378 af, Depth= 2.23"
Routed to Link 27L : Design Point: F

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
0.71	39	>75% Grass cover, Good, HSG A
6.24	61	>75% Grass cover, Good, HSG B
2.19	30	Woods, Good, HSG A
23.23	55	Woods, Good, HSG B
2.01	77	Woods, Good, HSG D
34.38	55	Weighted Average
34.38		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	518	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
31	618	Total			

Subcatchment 22S: PrWS F-1



Summary for Subcatchment 23S: PrWS F-2

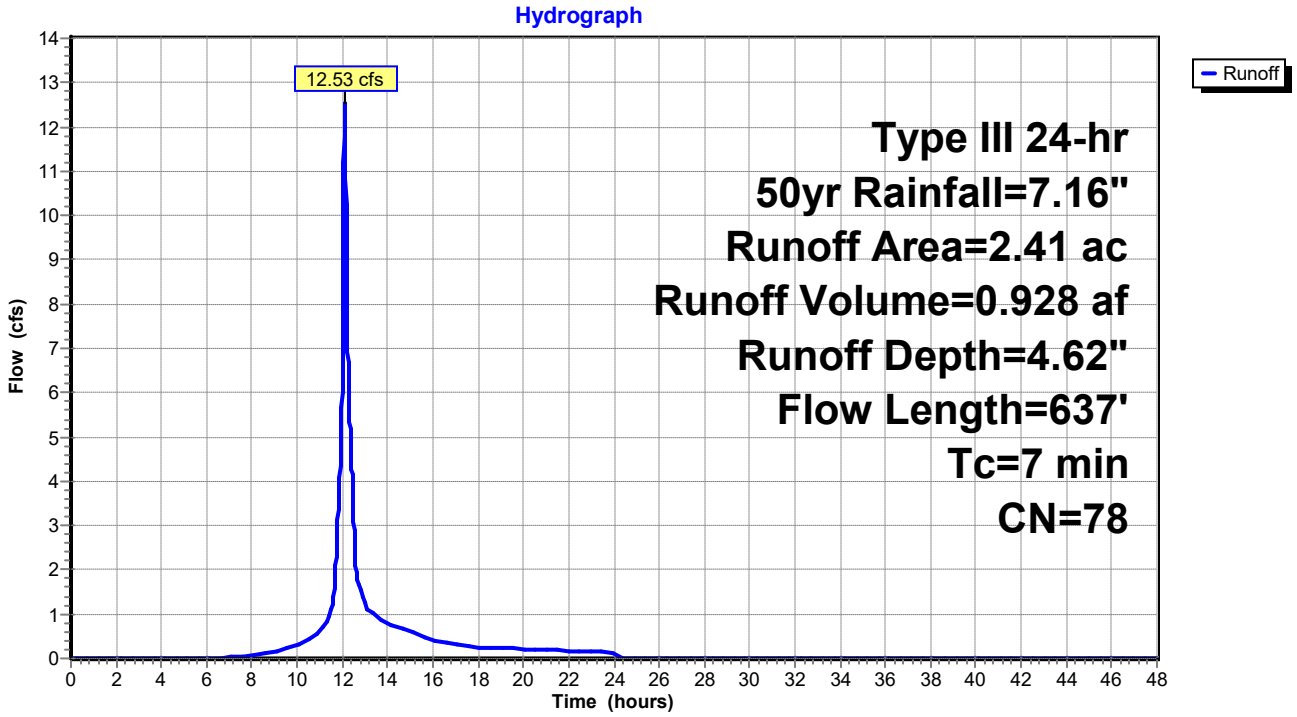
Runoff = 12.53 cfs @ 12.10 hrs, Volume= 0.928 af, Depth= 4.62"
Routed to Pond 24P : Infiltration Basin F-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
1.24	98	Paved parking, HSG A
0.24	39	>75% Grass cover, Good, HSG A
0.93	61	>75% Grass cover, Good, HSG B
2.41	78	Weighted Average
1.17		48.55% Pervious Area
1.24		51.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.31"
1	100	0.0060	1.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	15	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5	475	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	12	0.3330	9.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7	637	Total			

Subcatchment 23S: PrWS F-2



Summary for Subcatchment 25S: PrWS F-3

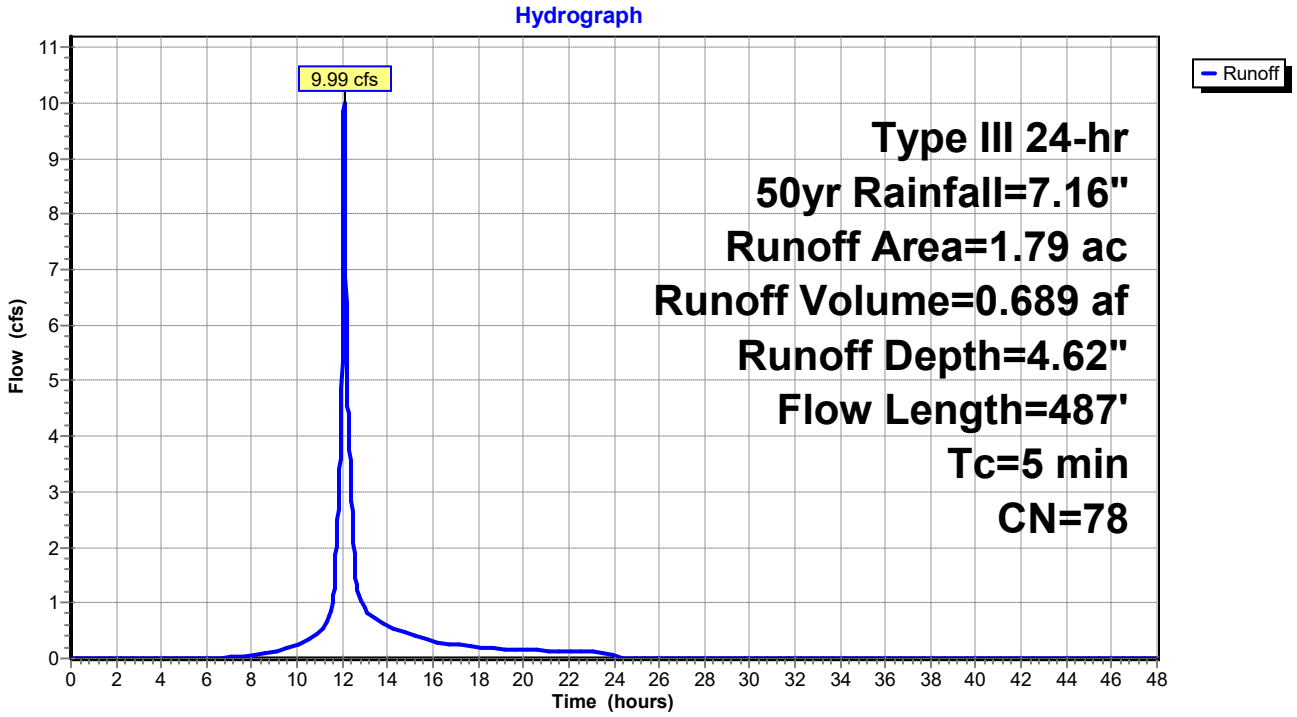
Runoff = 9.99 cfs @ 12.07 hrs, Volume= 0.689 af, Depth= 4.62"
Routed to Pond 26P : Infiltration Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
0.83	98	Paved parking, HSG A
0.96	61	>75% Grass cover, Good, HSG B
1.79	78	Weighted Average
0.96		53.63% Pervious Area
0.83		46.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.31"
1	100	0.0060	1.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	15	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	325	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	12	0.3330	9.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5	487	Total			

Subcatchment 25S: PrWS F-3



Summary for Subcatchment 28S: PrWS G-1a

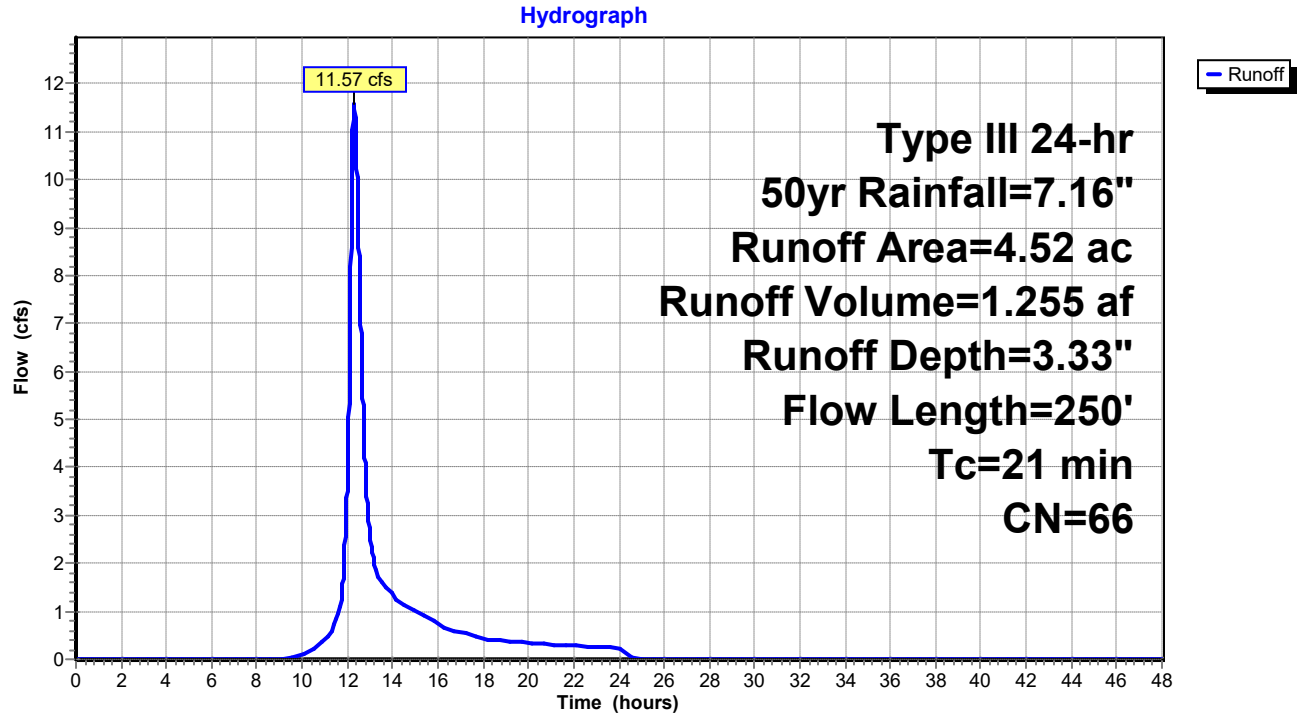
Runoff = 11.57 cfs @ 12.30 hrs, Volume= 1.255 af, Depth= 3.33"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
0.43	98	Paved parking, HSG A
1.26	61	>75% Grass cover, Good, HSG B
1.81	55	Woods, Good, HSG B
1.02	77	Woods, Good, HSG D
4.52	66	Weighted Average
4.09		90.49% Pervious Area
0.43		9.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17	40	0.0230	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	60	0.3330	0.33		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	150	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
21	250	Total			

Subcatchment 28S: PrWS G-1a



Summary for Subcatchment 29S: PrWS G-1b

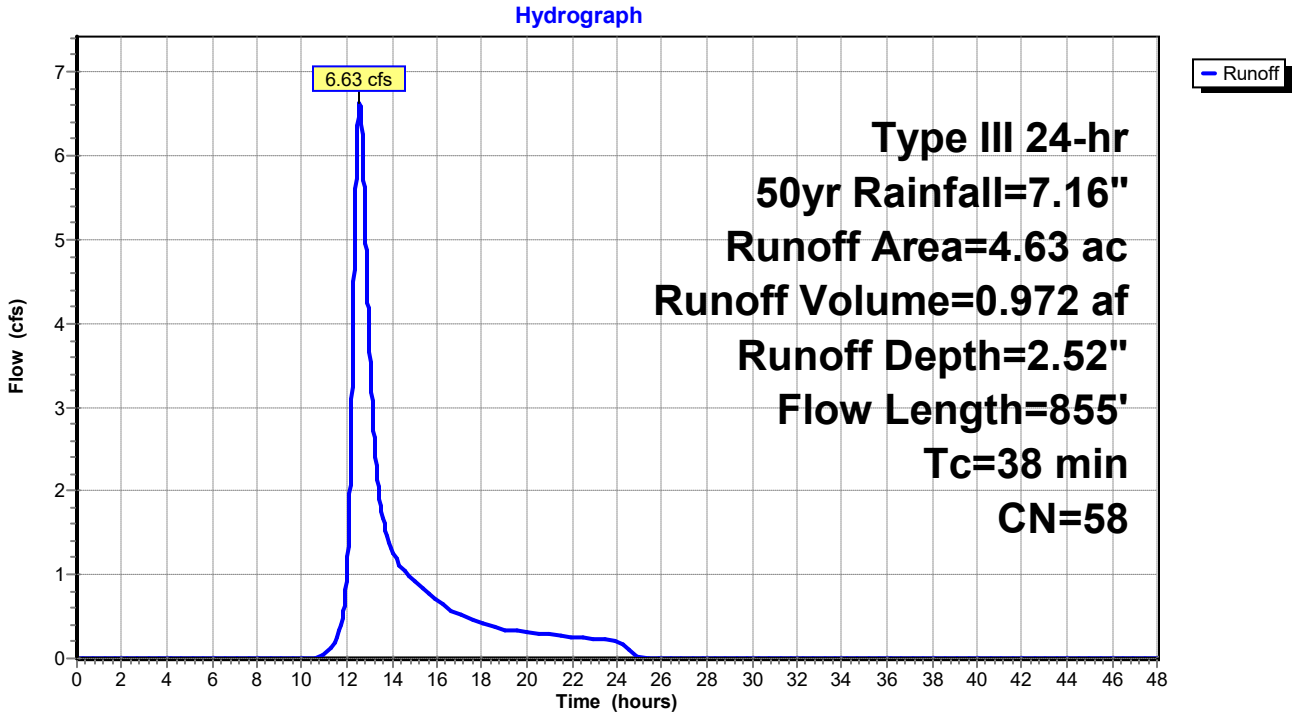
Runoff = 6.63 cfs @ 12.55 hrs, Volume= 0.972 af, Depth= 2.52"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
2.49	61	>75% Grass cover, Good, HSG B
2.14	55	Woods, Good, HSG B
4.63	58	Weighted Average
4.63		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10	35	0.0570	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
22	65	0.0320	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
2	275	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	180	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	300	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38	855	Total			

Subcatchment 29S: PrWS G-1b



Summary for Subcatchment 30S: PrWS G-1c

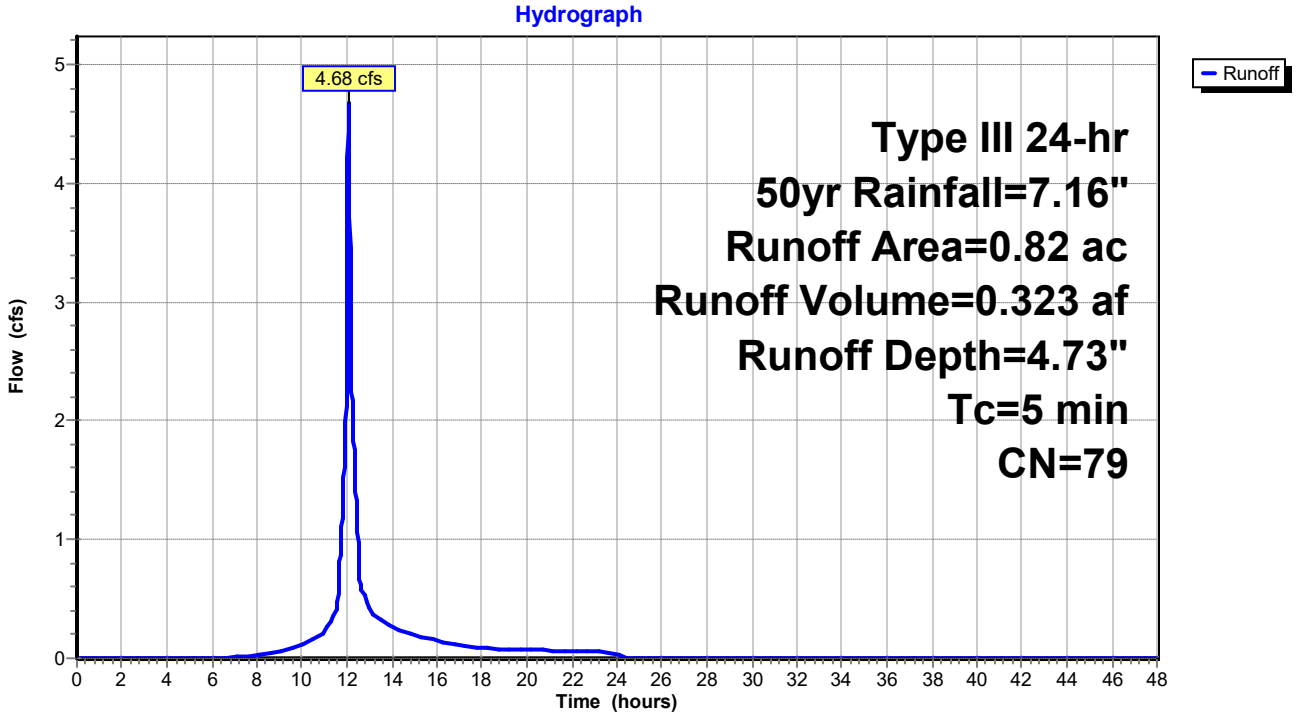
Runoff = 4.68 cfs @ 12.07 hrs, Volume= 0.323 af, Depth= 4.73"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
0.39	98	Paved parking, HSG A
0.43	61	>75% Grass cover, Good, HSG B
0.82	79	Weighted Average
0.43		52.44% Pervious Area
0.39		47.56% Impervious Area

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

Subcatchment 30S: PrWS G-1c



Summary for Subcatchment 31S: PrWS G-2

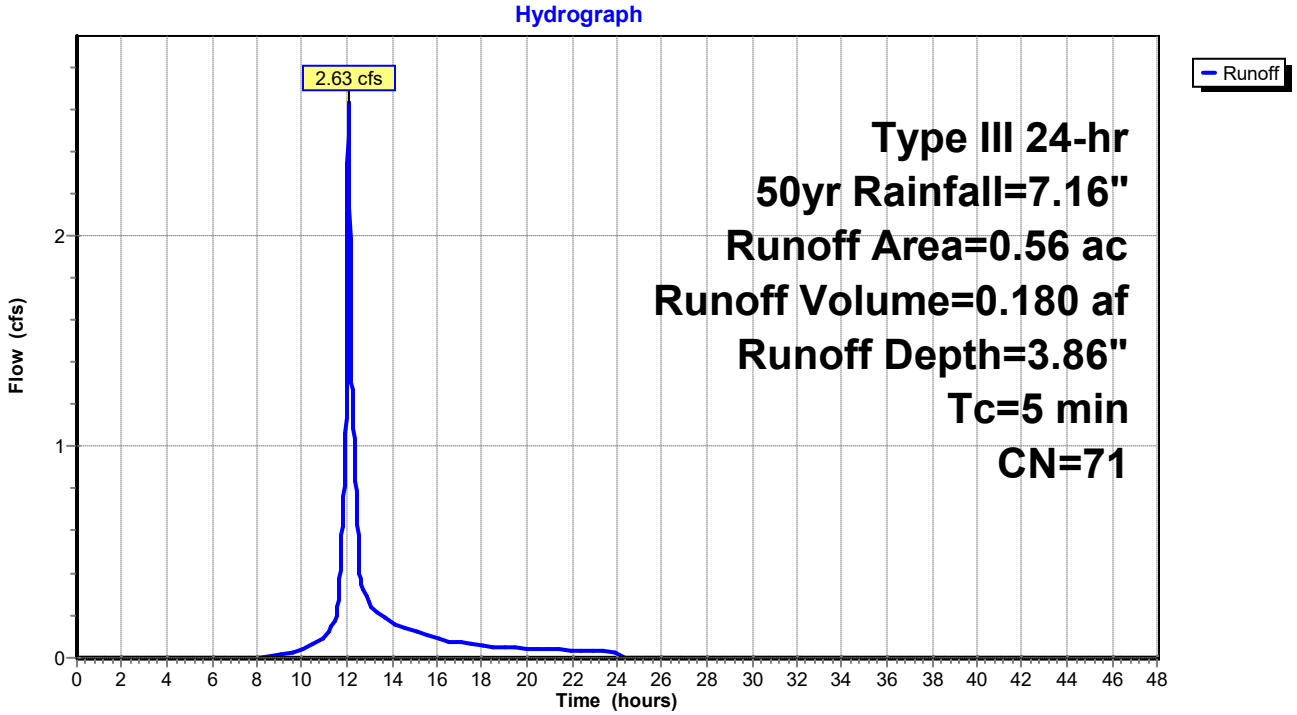
Runoff = 2.63 cfs @ 12.08 hrs, Volume= 0.180 af, Depth= 3.86"
Routed to Pond 32P : Infiltration Basin G-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 50yr Rainfall=7.16"

Area (ac)	CN	Description
0.16	98	Paved parking, HSG A
0.35	61	>75% Grass cover, Good, HSG B
0.05	55	Woods, Good, HSG B
0.56	71	Weighted Average
0.40		71.43% Pervious Area
0.16		28.57% Impervious Area

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

Subcatchment 31S: PrWS G-2



Summary for Pond 4P: UG Detention System B-2

Inflow Area = 23.96 ac, 92.36% Impervious, Inflow Depth = 6.45" for 50yr event
Inflow = 170.57 cfs @ 12.07 hrs, Volume= 12.873 af
Outflow = 16.13 cfs @ 12.82 hrs, Volume= 7.368 af, Atten= 91%, Lag= 44.8 min
Primary = 16.13 cfs @ 12.82 hrs, Volume= 7.368 af
Routed to Pond 8P : Extended Detention Basin B-4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 137.15' @ 12.86 hrs Surf.Area= 121,524 sf Storage= 360,265 cf

Plug-Flow detention time= 397.7 min calculated for 7.366 af (57% of inflow)
Center-of-Mass det. time= 288.1 min (1,051.2 - 763.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	53,816 cf	**82.00'W x 1,482.00'L x 5.17'H Field A** 627,874 cf Overall - 493,333 cf Embedded = 134,541 cf x 40.0% Voids
#2A	134.00'	369,049 cf	**retain_it retain_it 3.5'** x 1850 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 10 Rows adjusted for 2,394.5 cf perimeter wall
		422,866 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	135.12'	**36.0" Round Culvert** L= 870.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 135.12' / 132.50' S= 0.0030 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	136.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.24 1.25 4.00 Width (feet) 4.00 4.00 8.00 8.00

Primary OutFlow Max=16.13 cfs @ 12.82 hrs HW=137.15' TW=135.27' (Dynamic Tailwater)
↑**1=Culvert** (Passes 16.13 cfs of 16.19 cfs potential flow)
↑**2=Custom Weir/Orifice** (Weir Controls 16.13 cfs @ 3.51 fps)

Pond 4P: UG Detention System B-2 - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it®)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
10 Rows adjusted for 2,394.5 cf perimeter wall

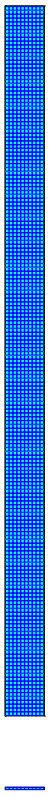
185 Chambers/Row x 8.00' Long = 1,480.00' Row Length +12.0" End Stone x 2 = 1,482.00' Base Length
10 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 82.00' Base Width
6.0" Stone Base + 50.0" Chamber Height + 6.0" Stone Cover = 5.17' Field Height

6.1 cf Sidewall x 185 x 2 + 6.1 cf Endwall x 10 x 2 = 2,394.5 cf Perimeter Wall
1,850 Chambers x 200.8 cf - 2,394.5 cf Perimeter wall = 369,049.3 cf Chamber Storage
1,850 Chambers x 266.7 cf = 493,333.3 cf Displacement

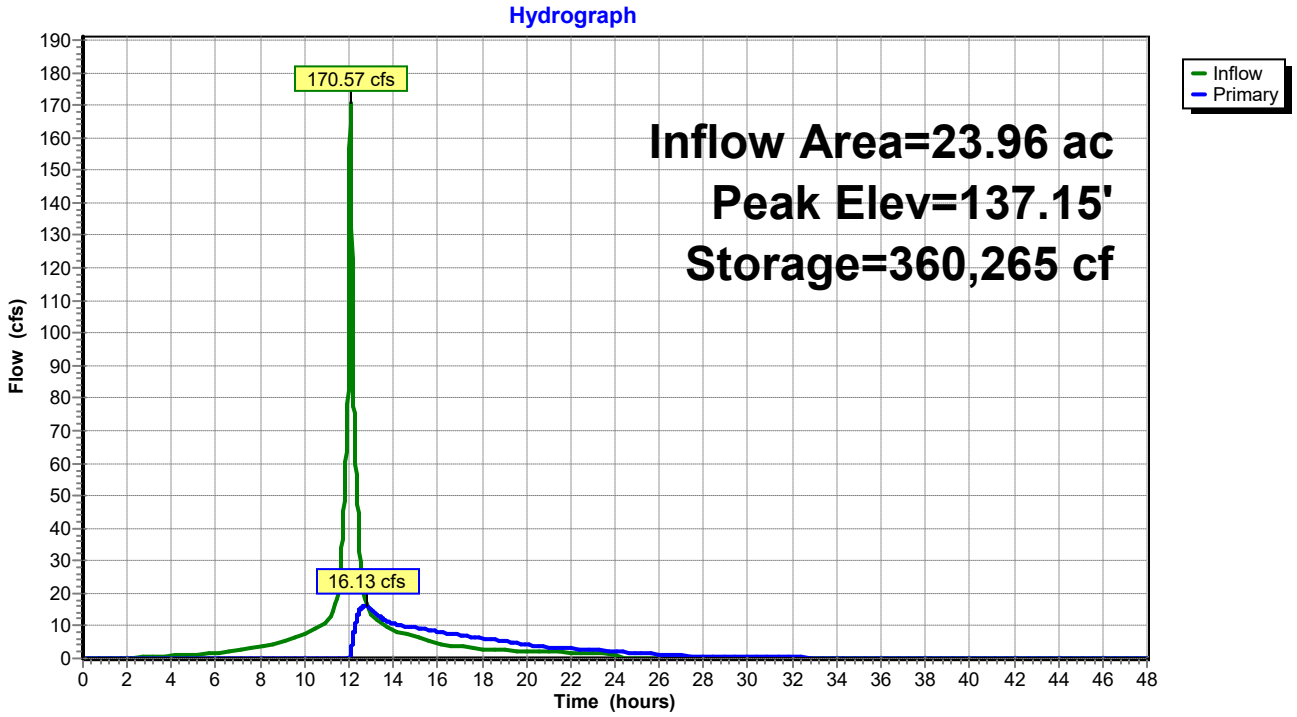
627,874.0 cf Field - 493,333.3 cf Chambers = 134,540.7 cf Stone x 40.0% Voids = 53,816.3 cf Stone Storage

Chamber Storage + Stone Storage = 422,865.5 cf = 9.708 af
Overall Storage Efficiency = 67.3%
Overall System Size = 1,482.00' x 82.00' x 5.17'

1,850 Chambers
23,254.6 cy Field
4,983.0 cy Stone



Pond 4P: UG Detention System B-2



Summary for Pond 6P: UG Detention System B-3

Inflow Area = 11.97 ac,100.00% Impervious, Inflow Depth = 6.92" for 50yr event
Inflow = 87.12 cfs @ 12.07 hrs, Volume= 6.903 af
Outflow = 19.49 cfs @ 12.46 hrs, Volume= 4.500 af, Atten= 78%, Lag= 23.1 min
Primary = 19.49 cfs @ 12.46 hrs, Volume= 4.500 af
Routed to Pond 10P : Extended Detention Basin B-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 137.57' @ 12.46 hrs Surf.Area= 1.25 ac Storage= 4.078 af

Plug-Flow detention time= 301.1 min calculated for 4.500 af (65% of inflow)
Center-of-Mass det. time= 197.0 min (938.8 - 741.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	0.390 af	**34.00'W x 1,602.00'L x 5.17'H Field A** 6.460 af Overall - 5.485 af Embedded = 0.975 af x 40.0% Voids
#2A	134.00'	4.171 af	**retain_it retain_it 4.0'** x 800 Inside #1 Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf 4 Rows adjusted for 3,080.2 cf perimeter wall
		4.561 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**36.0" Round Culvert** L= 310.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 134.00' / 132.50' S= 0.0048 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	136.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.49 1.50 3.00 Width (feet) 3.00 3.00 6.00 6.00

Primary OutFlow Max=19.49 cfs @ 12.46 hrs HW=137.57' TW=133.96' (Dynamic Tailwater)
↑**1=Culvert** (Passes 19.49 cfs of 48.95 cfs potential flow)
↑**2=Custom Weir/Orifice** (Weir Controls 19.49 cfs @ 3.96 fps)

Pond 6P: UG Detention System B-3 - Chamber Wizard Field A

Chamber Model = retain_it retain_it 4.0' (retain-it®)
Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf
Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf
4 Rows adjusted for 3,080.2 cf perimeter wall

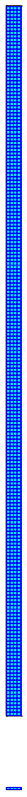
200 Chambers/Row x 8.00' Long = 1,600.00' Row Length +12.0" End Stone x 2 = 1,602.00' Base Length
4 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 34.00' Base Width
6.0" Stone Base + 56.0" Chamber Height = 5.17' Field Height

7.5 cf Sidewall x 200 x 2 + 7.5 cf Endwall x 4 x 2 = 3,080.2 cf Perimeter Wall
800 Chambers x 230.9 cf - 3,080.2 cf Perimeter wall = 181,671.5 cf Chamber Storage
800 Chambers x 298.7 cf = 238,933.3 cf Displacement

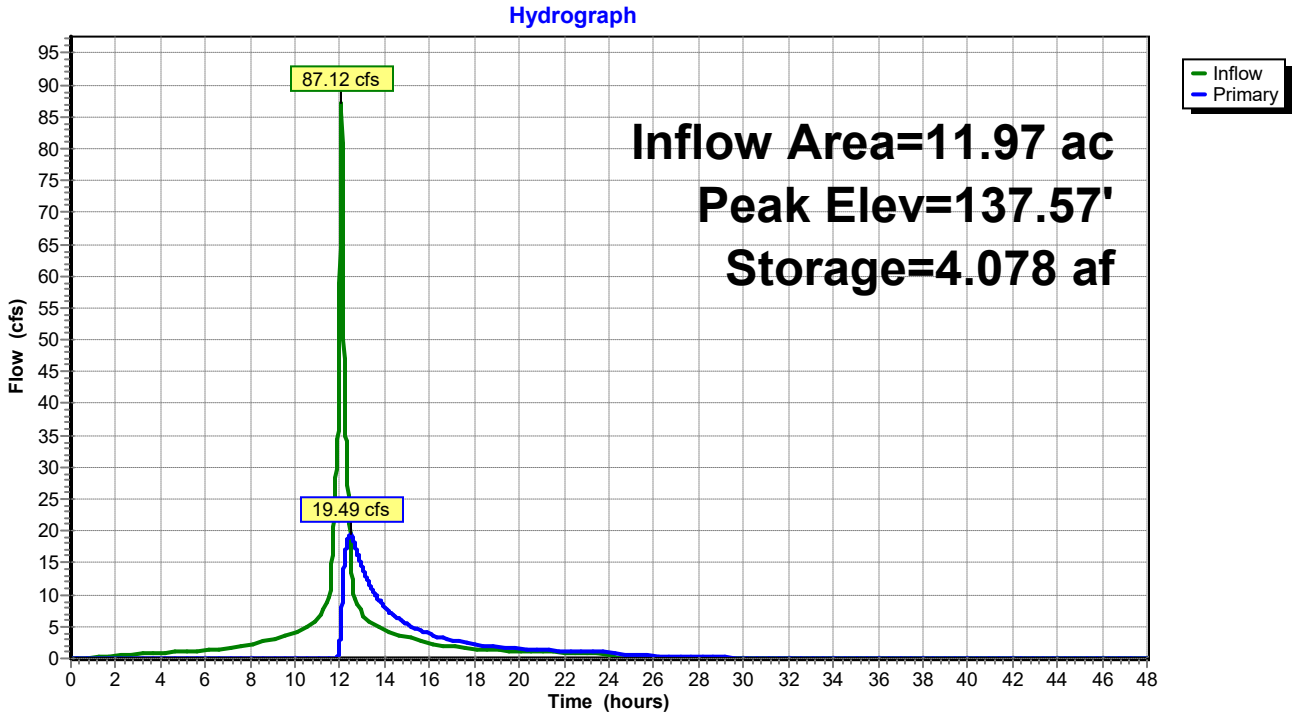
281,418.0 cf Field - 238,933.3 cf Chambers = 42,484.7 cf Stone x 40.0% Voids = 16,993.9 cf Stone Storage

Chamber Storage + Stone Storage = 198,665.3 cf = 4.561 af
Overall Storage Efficiency = 70.6%
Overall System Size = 1,602.00' x 34.00' x 5.17'

800 Chambers
10,422.9 cy Field
1,573.5 cy Stone



Pond 6P: UG Detention System B-3



Summary for Pond 8P: Extended Detention Basin B-4

Inflow Area = 31.37 ac, 79.06% Impervious, Inflow Depth > 3.76" for 50yr event
Inflow = 34.80 cfs @ 12.16 hrs, Volume= 9.816 af
Outflow = 11.97 cfs @ 14.48 hrs, Volume= 9.369 af, Atten= 66%, Lag= 139.2 min
Primary = 11.97 cfs @ 14.48 hrs, Volume= 9.369 af
Routed to Link 11L : Design Point: B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 136.22' @ 14.48 hrs Surf.Area= 36,208 sf Storage= 114,692 cf

Plug-Flow detention time= 207.7 min calculated for 9.369 af (95% of inflow)
Center-of-Mass det. time= 165.8 min (1,161.6 - 995.8)

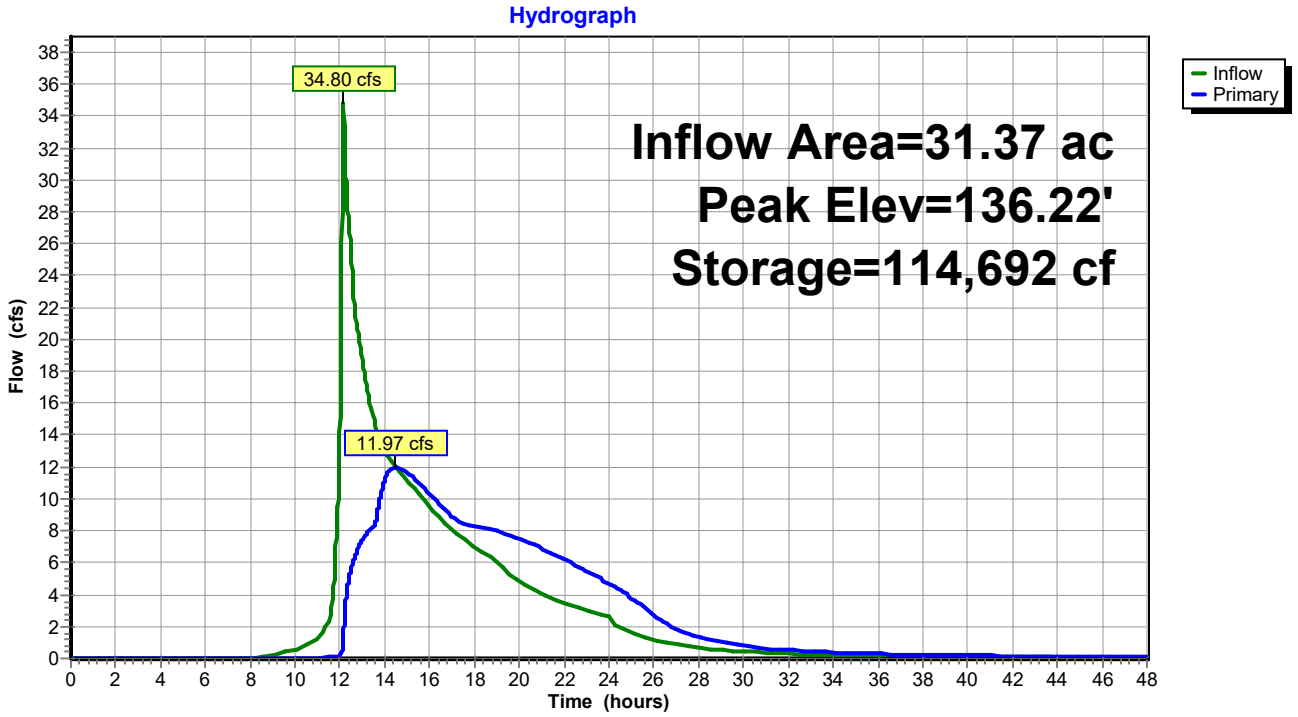
Volume	Invert	Avail.Storage	Storage Description
#1	132.50'	163,645 cf	**Detention Basin B-4 (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.50	25,654	0	0
133.00	27,028	13,171	13,171
134.00	29,819	28,424	41,594
135.00	32,666	31,243	72,837
136.00	35,570	34,118	106,955
137.00	38,530	37,050	144,005
137.50	40,032	19,641	163,645

Device	Routing	Invert	Outlet Devices
#1	Primary	132.50'	**36.0" Round Culvert** L= 312.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 132.50' / 131.16' S= 0.0043 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	132.50'	**2.5" Vert. 2.5in Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	133.25'	**10.0" Vert. (2x) 10in Orifice X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	136.00'	**36.0" x 24.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=11.97 cfs @ 14.48 hrs HW=136.22' TW=132.50' (Dynamic Tailwater)
- **1=Culvert** (Passes 11.97 cfs of 49.31 cfs potential flow)
  - **2=2.5in Orifice** (Orifice Controls 0.31 cfs @ 9.15 fps)
  - **3=(2x) 10in Orifice** (Orifice Controls 8.39 cfs @ 7.69 fps)
  - **4=Overflow CB** (Weir Controls 3.27 cfs @ 1.52 fps)

Pond 8P: Extended Detention Basin B-4



Summary for Pond 10P: Extended Detention Basin B-5

Inflow Area = 28.28 ac, 80.94% Impervious, Inflow Depth = 4.70" for 50yr event
Inflow = 102.47 cfs @ 12.08 hrs, Volume= 11.081 af
Outflow = 4.66 cfs @ 17.40 hrs, Volume= 6.919 af, Atten= 95%, Lag= 319.2 min
Primary = 4.66 cfs @ 17.40 hrs, Volume= 6.919 af
Routed to Link 11L : Design Point: B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 135.16' @ 17.40 hrs Surf.Area= 141,793 sf Storage= 350,720 cf

Plug-Flow detention time= 894.9 min calculated for 6.919 af (62% of inflow)
Center-of-Mass det. time= 768.7 min (1,628.7 - 860.0)

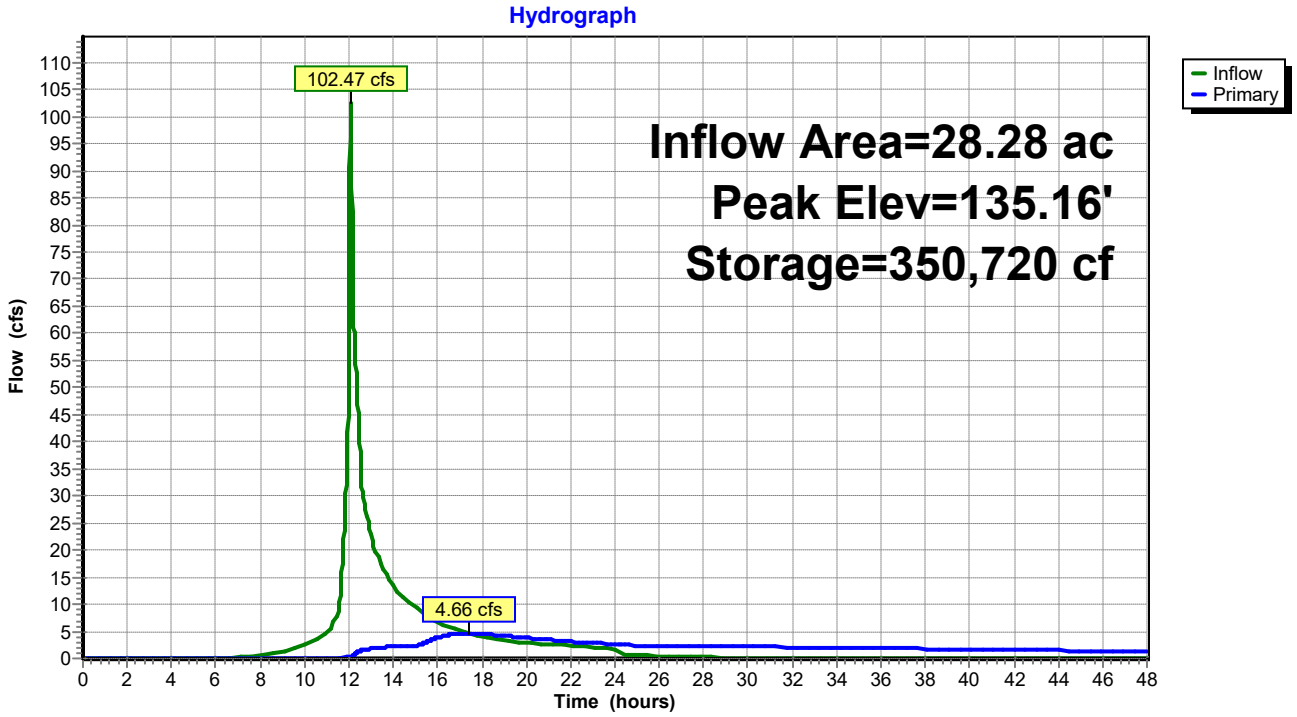
Volume	Invert	Avail.Storage	Storage Description
#1	132.50'	951,536 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.50	121,607	0	0
133.00	125,365	61,743	61,743
134.00	132,923	129,144	190,887
135.00	140,538	136,731	327,618
136.00	148,209	144,374	471,991
137.00	155,937	152,073	624,064
138.00	163,722	159,830	783,894
139.00	171,563	167,643	951,536

Device	Routing	Invert	Outlet Devices
#1	Primary	131.50'	**24.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 131.50' / 131.16' S= 0.0045 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	131.50'	**3.0" Vert. 3in Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	133.25'	**8.0" Vert. 8in Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	135.00'	**24.0" x 36.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.66 cfs @ 17.40 hrs HW=135.16' TW=132.50' (Dynamic Tailwater)
└**1=Culvert** (Passes 4.66 cfs of 24.23 cfs potential flow)
  ├**2=3in Orifice** (Orifice Controls 0.39 cfs @ 7.86 fps)
  ├**3=8in Orifice** (Orifice Controls 2.11 cfs @ 6.05 fps)
  └**4=Overflow CB** (Weir Controls 2.16 cfs @ 1.32 fps)

Pond 10P: Extended Detention Basin B-5



Summary for Pond 15P: Infiltration Basin D-2

Inflow Area = 7.58 ac, 66.75% Impervious, Inflow Depth = 4.84" for 50yr event
Inflow = 44.13 cfs @ 12.07 hrs, Volume= 3.059 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 16L : Design Point: D

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 135.12' @ 24.29 hrs Surf.Area= 42,900 sf Storage= 133,238 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

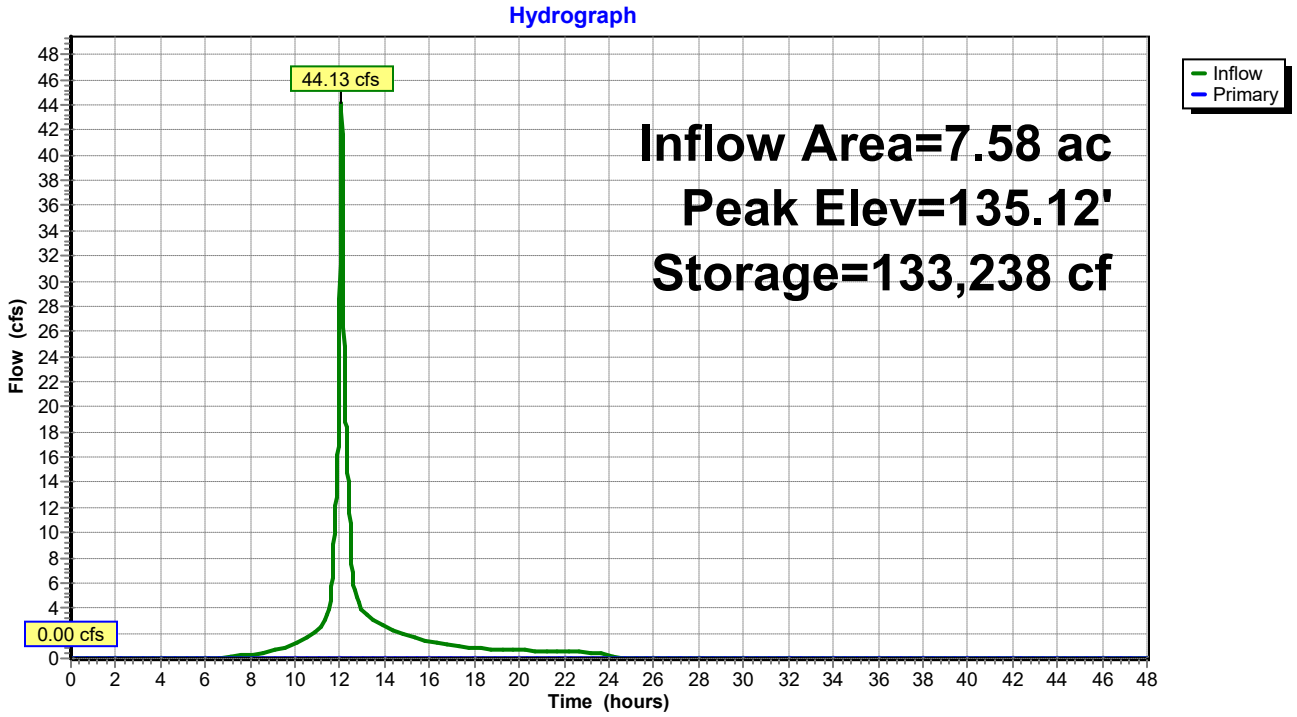
Volume	Invert	Avail.Storage	Storage Description
#1	131.50'	245,101 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
131.50	30,777	0	0
132.00	32,406	15,796	15,796
133.00	35,705	34,056	49,851
134.00	39,062	37,384	87,235
135.00	42,475	40,769	128,003
136.00	45,944	44,210	172,213
137.00	49,470	47,707	219,920
137.50	51,254	25,181	245,101

Device	Routing	Invert	Outlet Devices
#1	Primary	136.00'	**450.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=131.50' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 15P: Infiltration Basin D-2



Summary for Pond 19P: Infiltration Basin E-2

Inflow Area = 9.75 ac, 10.15% Impervious, Inflow Depth = 1.76" for 50yr event
Inflow = 10.79 cfs @ 12.41 hrs, Volume= 1.427 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 20P : Existing Basin E-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 139.93' @ 25.40 hrs Surf.Area= 47,990 sf Storage= 62,160 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

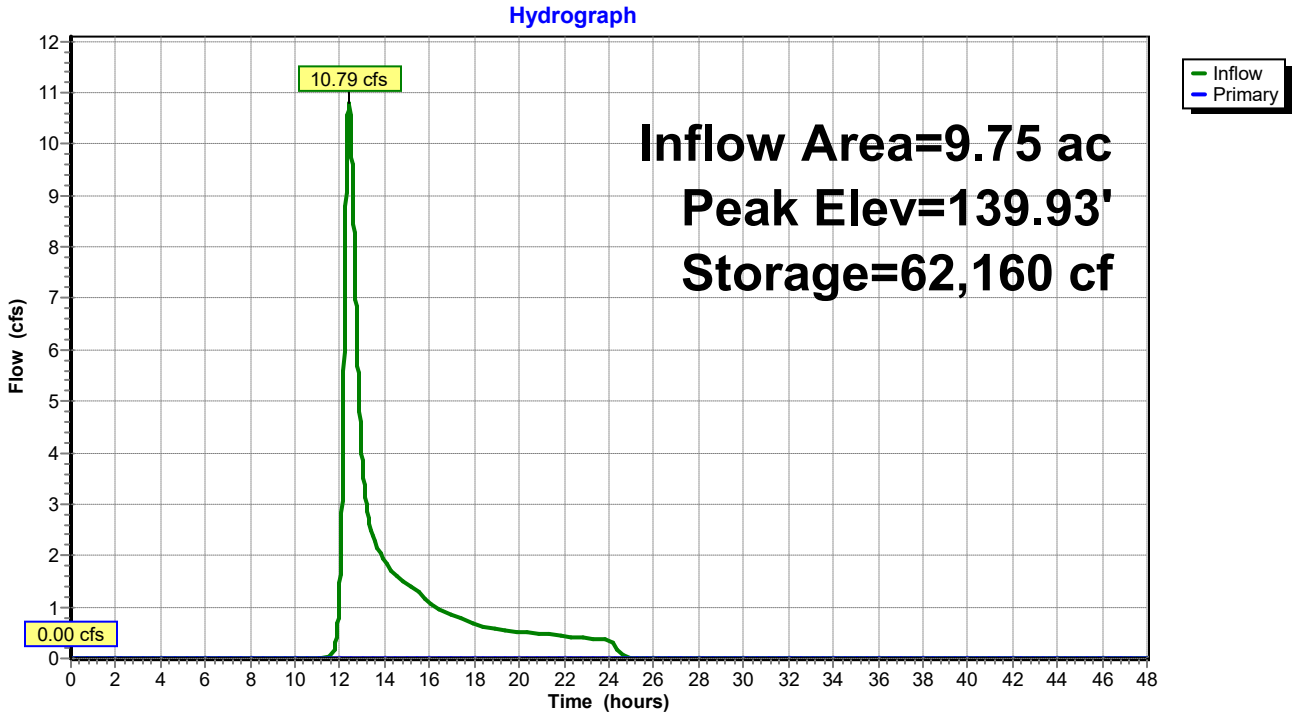
Volume	Invert	Avail.Storage	Storage Description
#1	138.50'	115,575 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
138.50	31,545	0	0
139.00	44,838	19,096	19,096
140.00	48,235	46,537	65,632
141.00	51,650	49,943	115,575

Device	Routing	Invert	Outlet Devices
#1	Primary	140.00'	**70.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=138.50' TW=130.20' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 19P: Infiltration Basin E-2



Summary for Pond 20P: Existing Basin E-1

Inflow Area = 15.56 ac, 6.36% Impervious, Inflow Depth = 0.34" for 50yr event
Inflow = 3.02 cfs @ 12.21 hrs, Volume= 0.437 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 21L : Design Point: E

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 131.30' @ 24.57 hrs Surf.Area= 22,105 sf Storage= 19,049 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

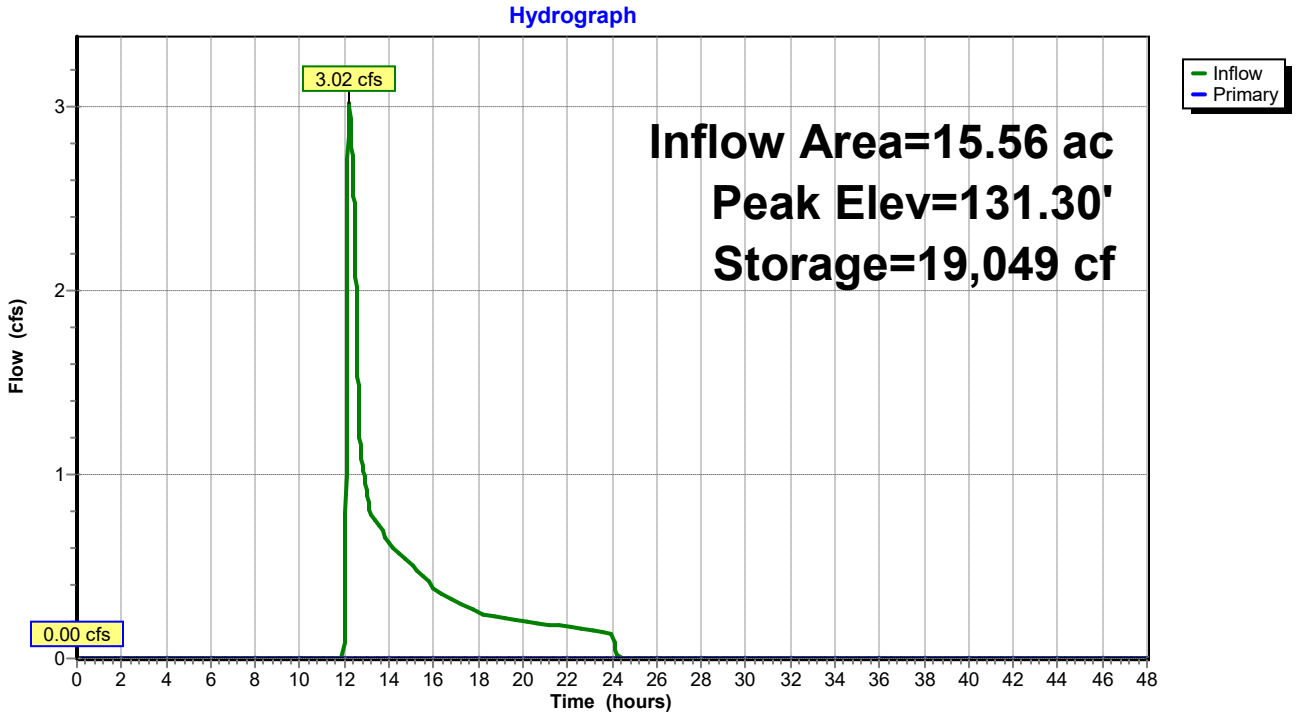
Volume	Invert	Avail.Storage	Storage Description
#1	130.20'	504,295 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.20	15,572	0	0
131.00	17,190	13,105	13,105
132.00	33,435	25,313	38,417
133.00	47,240	40,338	78,755
134.00	62,274	54,757	133,512
135.00	78,197	70,236	203,747
136.00	92,539	85,368	289,115
137.00	106,598	99,569	388,684
138.00	124,625	115,612	504,295

Device	Routing	Invert	Outlet Devices
#1	Primary	137.30'	**35.0' long + 3.0 '/' SideZ x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.20' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 20P: Existing Basin E-1



Summary for Pond 24P: Infiltration Basin F-2

Inflow Area = 2.41 ac, 51.45% Impervious, Inflow Depth = 4.62" for 50yr event
Inflow = 12.53 cfs @ 12.10 hrs, Volume= 0.928 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 27L : Design Point: F

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 133.30' @ 24.40 hrs Surf.Area= 15,052 sf Storage= 40,419 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

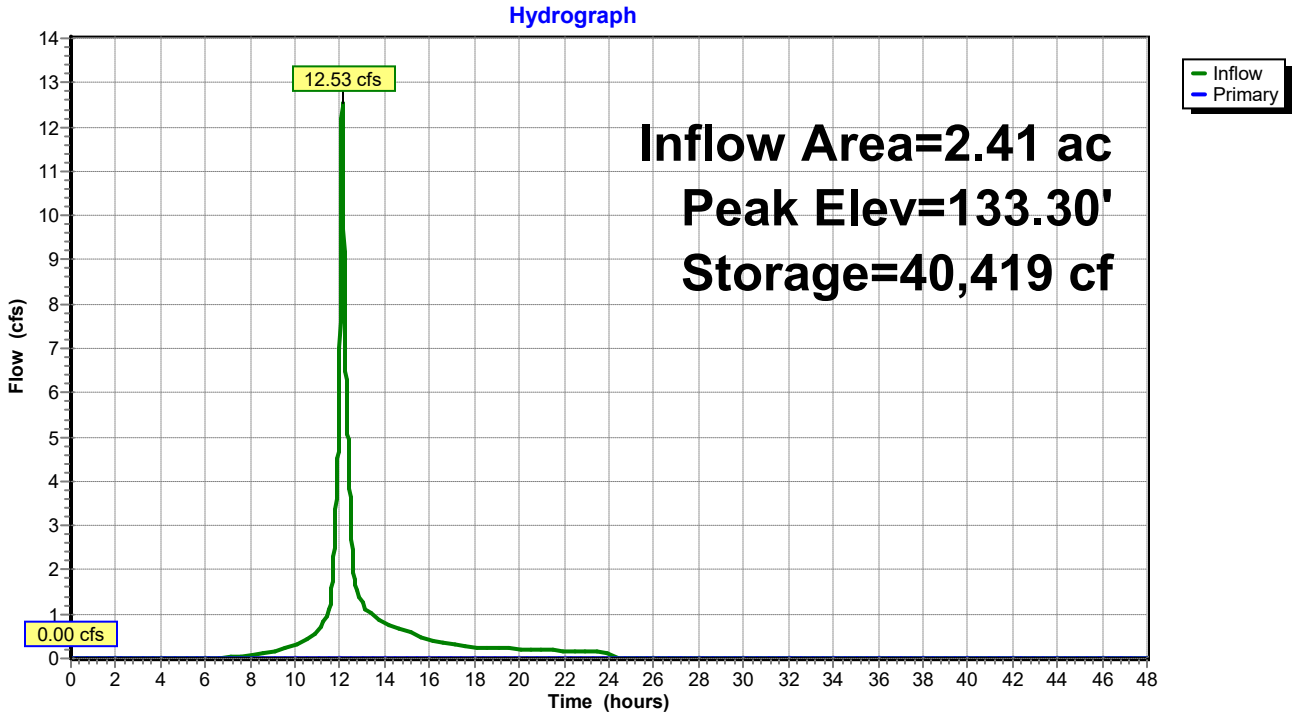
Volume	Invert	Avail.Storage	Storage Description
#1	130.00'	78,726 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.00	9,565	0	0
131.00	11,162	10,364	10,364
132.00	12,816	11,989	22,353
133.00	14,527	13,672	36,024
134.00	16,294	15,411	51,435
135.00	18,811	17,553	68,987
135.50	20,146	9,739	78,726

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**168.0' long + 3.0 '/' SideZ x 168.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 24P: Infiltration Basin F-2



Summary for Pond 26P: Infiltration Basin F-3

Inflow Area = 1.79 ac, 46.37% Impervious, Inflow Depth = 4.62" for 50yr event
Inflow = 9.99 cfs @ 12.07 hrs, Volume= 0.689 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 27L : Design Point: F

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 135.14' @ 24.29 hrs Surf.Area= 9,507 sf Storage= 30,021 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

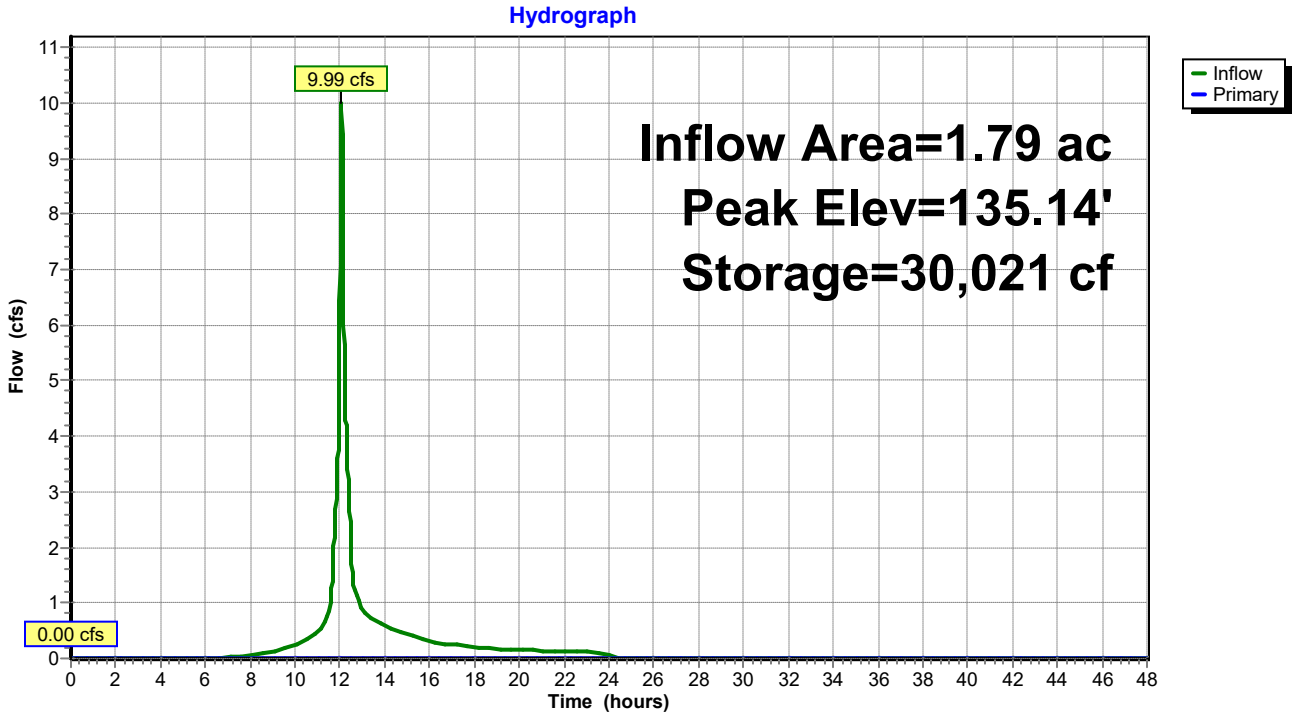
Volume	Invert	Avail.Storage	Storage Description
#1	131.00'	51,929 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
131.00	5,159	0	0
132.00	6,120	5,640	5,640
133.00	7,138	6,629	12,269
134.00	8,213	7,676	19,944
135.00	9,345	8,779	28,723
135.50	9,932	4,819	33,542
136.00	11,697	5,407	38,950
137.00	14,261	12,979	51,929

Device	Routing	Invert	Outlet Devices
#1	Primary	135.50'	**70.0' long + 3.0 '/' SideZ x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=131.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 26P: Infiltration Basin F-3



Summary for Pond 32P: Infiltration Basin G-2

Inflow Area = 0.56 ac, 28.57% Impervious, Inflow Depth = 3.86" for 50yr event
Inflow = 2.63 cfs @ 12.08 hrs, Volume= 0.180 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 33L : Design Point: G

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 134.93' @ 24.29 hrs Surf.Area= 3,649 sf Storage= 7,844 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

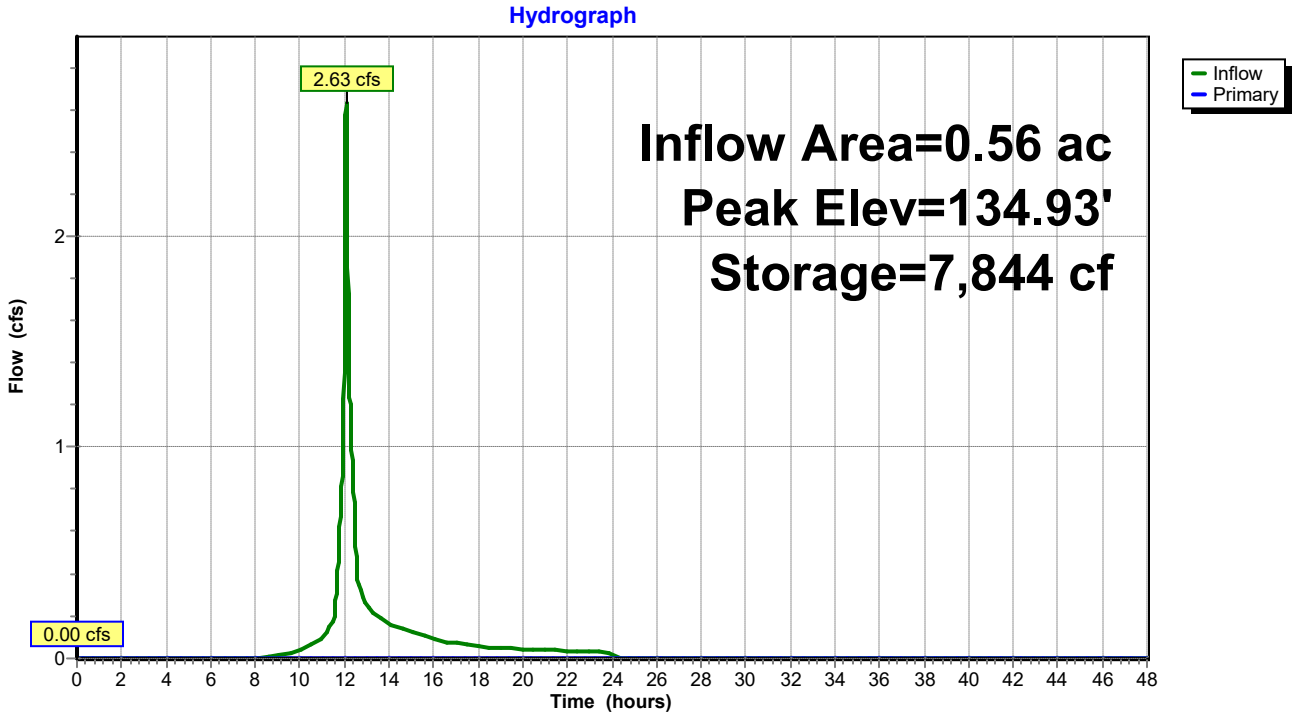
Volume	Invert	Avail.Storage	Storage Description
#1	132.00'	14,518 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.00	1,785	0	0
133.00	2,367	2,076	2,076
134.00	3,006	2,687	4,763
135.00	3,701	3,354	8,116
136.00	4,452	4,077	12,193
136.50	4,849	2,325	14,518

Device	Routing	Invert	Outlet Devices
#1	Primary	130.00'	**15.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 130.00' / 126.25' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf
#2	Device 1	135.00'	**24.0" x 36.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=132.00' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.00 cfs of 6.93 cfs potential flow)
↑**2=Overflow CB** (Controls 0.00 cfs)

Pond 32P: Infiltration Basin G-2



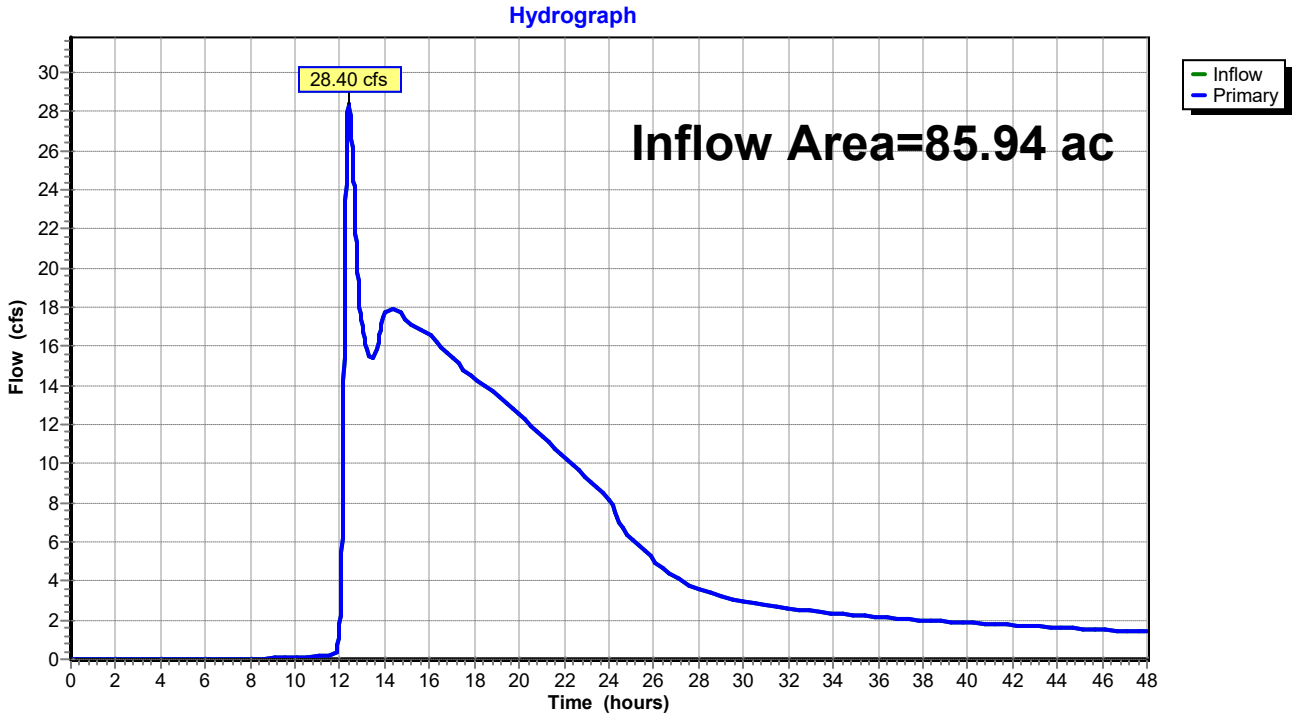
Summary for Link 11L: Design Point: B

Inflow Area = 85.94 ac, 56.17% Impervious, Inflow Depth > 2.70" for 50yr event
Inflow = 28.40 cfs @ 12.40 hrs, Volume= 19.353 af
Primary = 28.40 cfs @ 12.40 hrs, Volume= 19.353 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Fixed water surface Elevation= 132.50'

Link 11L: Design Point: B

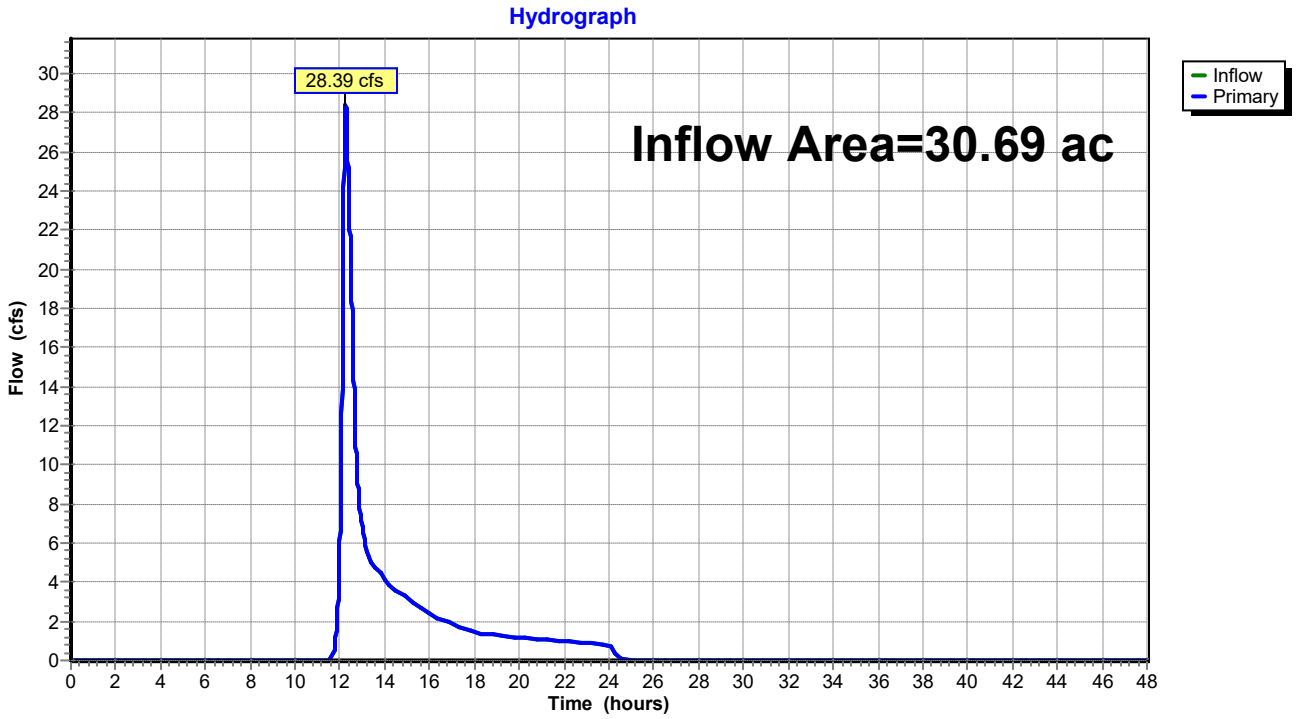


Summary for Link 16L: Design Point: D

Inflow Area = 30.69 ac, 16.49% Impervious, Inflow Depth = 1.25" for 50yr event
Inflow = 28.39 cfs @ 12.25 hrs, Volume= 3.207 af
Primary = 28.39 cfs @ 12.25 hrs, Volume= 3.207 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 16L: Design Point: D

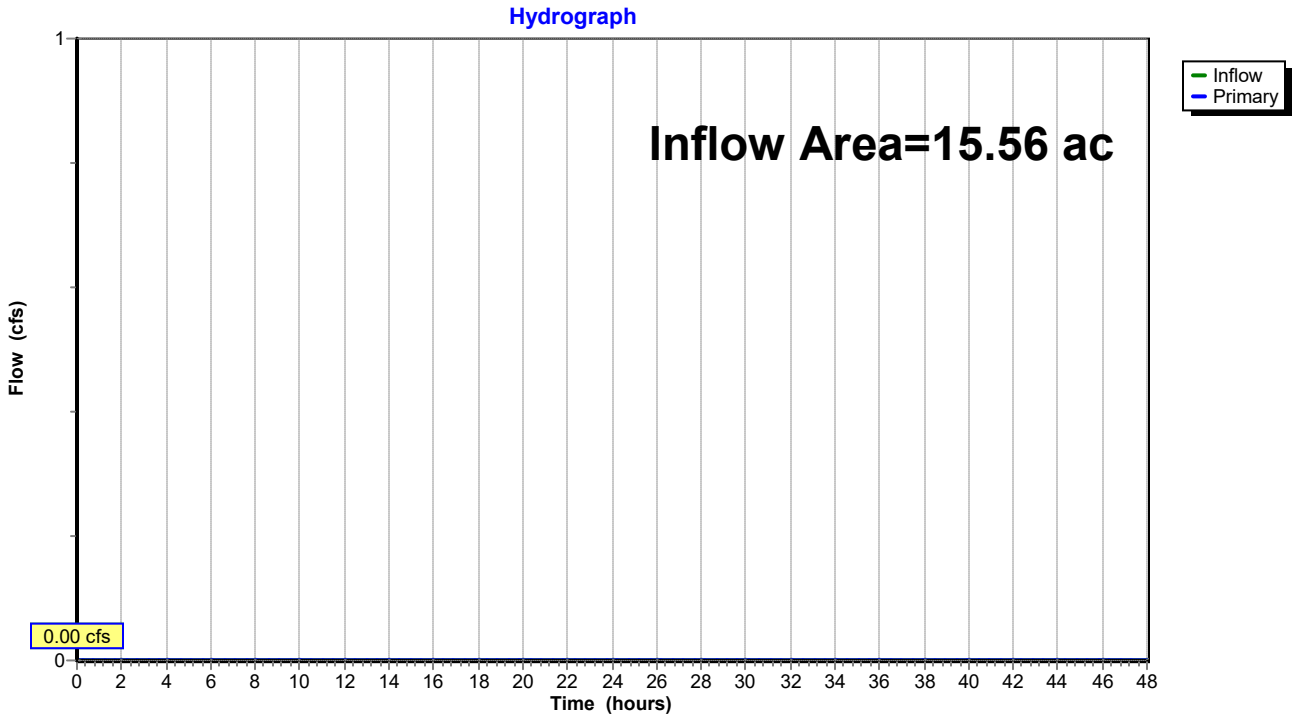


Summary for Link 21L: Design Point: E

Inflow Area = 15.56 ac, 6.36% Impervious, Inflow Depth = 0.00" for 50yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 21L: Design Point: E

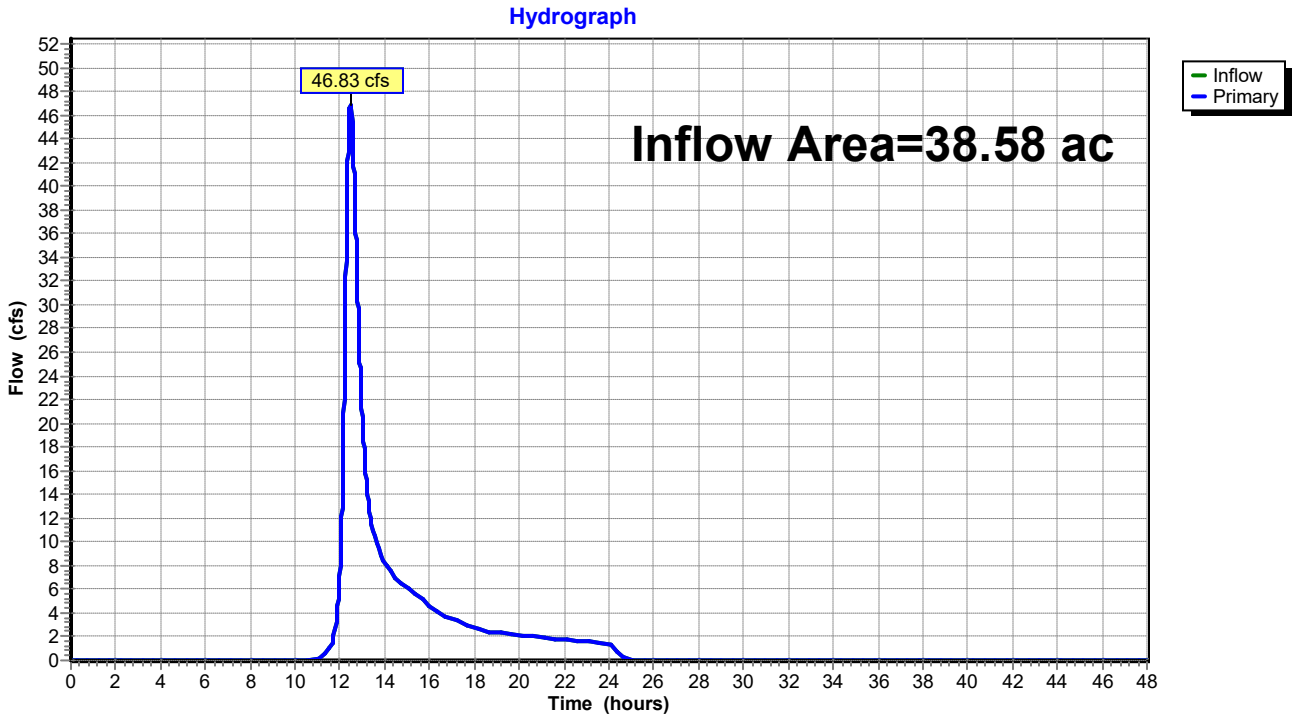


Summary for Link 27L: Design Point: F

Inflow Area = 38.58 ac, 5.37% Impervious, Inflow Depth = 1.98" for 50yr event
Inflow = 46.83 cfs @ 12.47 hrs, Volume= 6.378 af
Primary = 46.83 cfs @ 12.47 hrs, Volume= 6.378 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 27L: Design Point: F

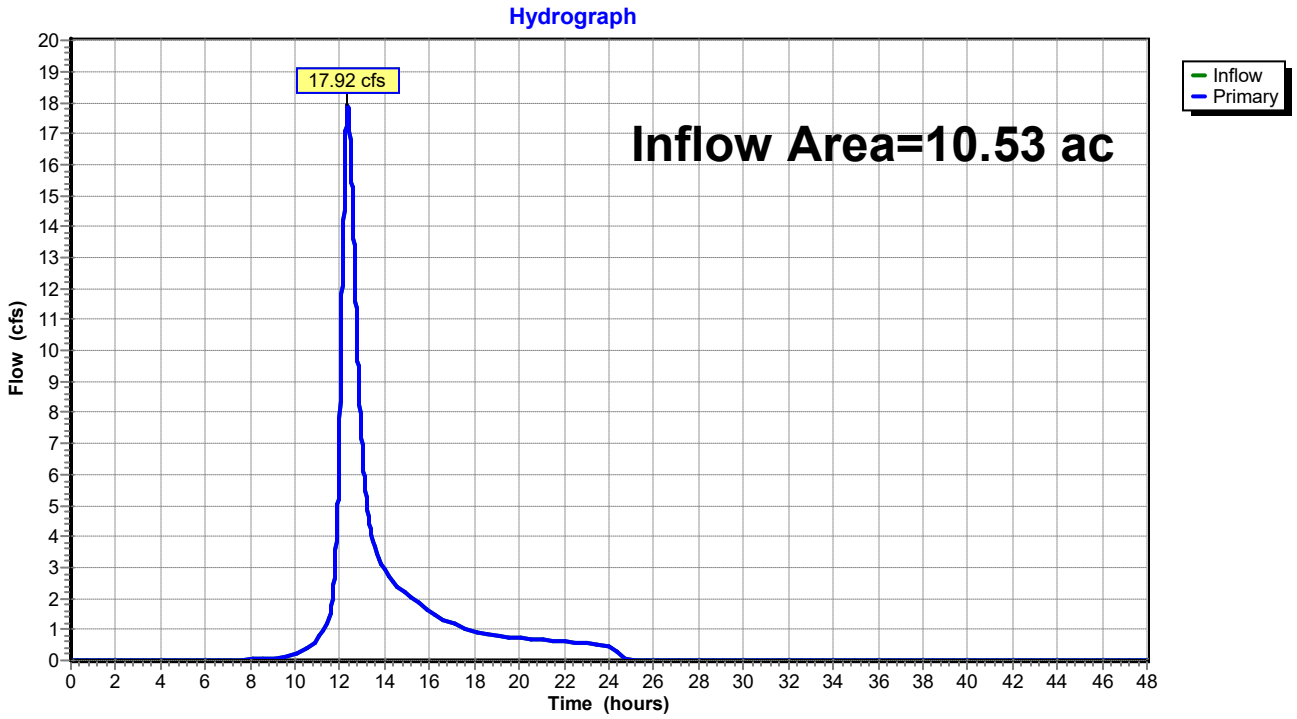


Summary for Link 33L: Design Point: G

Inflow Area = 10.53 ac, 9.31% Impervious, Inflow Depth = 2.91" for 50yr event
Inflow = 17.92 cfs @ 12.34 hrs, Volume= 2.550 af
Primary = 17.92 cfs @ 12.34 hrs, Volume= 2.550 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 33L: Design Point: G



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: PrWS A-1 Runoff Area=1.67 ac 2.99% Impervious Runoff Depth=1.89"
Flow Length=100' Slope=0.0150 '/' Tc=16 min CN=46 Runoff=2.33 cfs 0.262 af

Subcatchment 2S: PrWS B-1 Runoff Area=26.29 ac 2.21% Impervious Runoff Depth=1.89"
Flow Length=820' Tc=22 min CN=46 Runoff=32.36 cfs 4.132 af

Subcatchment 3S: PrWS B-2 Runoff Area=23.96 ac 92.36% Impervious Runoff Depth=7.37"
Tc=5 min CN=94 Runoff=193.67 cfs 14.718 af

Subcatchment 5S: PrWS B-3 Runoff Area=11.97 ac 100.00% Impervious Runoff Depth=7.85"
Tc=5 min CN=98 Runoff=98.49 cfs 7.831 af

Subcatchment 7S: PrWS B-4 Runoff Area=7.41 ac 36.03% Impervious Runoff Depth=4.77"
Flow Length=854' Tc=10 min CN=72 Runoff=36.22 cfs 2.948 af

Subcatchment 9S: PrWS B-5 Runoff Area=16.31 ac 66.95% Impervious Runoff Depth=5.71"
Tc=5 min CN=80 Runoff=111.30 cfs 7.760 af

Subcatchment 12S: PrWS C-1 Runoff Area=15.48 ac 0.00% Impervious Runoff Depth=2.74"
Flow Length=540' Tc=23 min CN=54 Runoff=30.01 cfs 3.530 af

Subcatchment 13S: PrWS D-1 Runoff Area=23.11 ac 0.00% Impervious Runoff Depth=2.20"
Flow Length=550' Tc=16 min CN=49 Runoff=39.52 cfs 4.235 af

Subcatchment 14S: PrWS D-2 Runoff Area=7.58 ac 66.75% Impervious Runoff Depth=5.71"
Tc=5 min CN=80 Runoff=51.73 cfs 3.606 af

Subcatchment 17S: PrWS E-1 Runoff Area=5.81 ac 0.00% Impervious Runoff Depth=1.29"
Flow Length=225' Tc=10 min CN=40 Runoff=5.31 cfs 0.624 af

Subcatchment 18S: PrWS E-2 Runoff Area=9.75 ac 10.15% Impervious Runoff Depth=2.31"
Flow Length=1,010' Tc=25 min CN=50 Runoff=14.79 cfs 1.873 af

Subcatchment 22S: PrWS F-1 Runoff Area=34.38 ac 0.00% Impervious Runoff Depth=2.85"
Flow Length=618' Slope=0.0400 '/' Tc=31 min CN=55 Runoff=61.26 cfs 8.153 af

Subcatchment 23S: PrWS F-2 Runoff Area=2.41 ac 51.45% Impervious Runoff Depth=5.47"
Flow Length=637' Tc=7 min CN=78 Runoff=14.78 cfs 1.099 af

Subcatchment 25S: PrWS F-3 Runoff Area=1.79 ac 46.37% Impervious Runoff Depth=5.47"
Flow Length=487' Tc=5 min CN=78 Runoff=11.78 cfs 0.817 af

Subcatchment 28S: PrWS G-1a Runoff Area=4.52 ac 9.51% Impervious Runoff Depth=4.08"
Flow Length=250' Tc=21 min CN=66 Runoff=14.26 cfs 1.537 af

Subcatchment 29S: PrWS G-1b Runoff Area=4.63 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=855' Tc=38 min CN=58 Runoff=8.51 cfs 1.226 af

Subcatchment 30S: PrWS G-1c Runoff Area=0.82 ac 47.56% Impervious Runoff Depth=5.59"
Tc=5 min CN=79 Runoff=5.50 cfs 0.382 af

Subcatchment 31S: PrWS G-2 Runoff Area=0.56 ac 28.57% Impervious Runoff Depth=4.66"
Tc=5 min CN=71 Runoff=3.17 cfs 0.217 af

Pond 4P: UG Detention System B-2 Peak Elev=138.00' Storage=398,348 cf Inflow=193.67 cfs 14.718 af
Outflow=30.53 cfs 9.212 af

Pond 6P: UG Detention System B-3 Peak Elev=137.87' Storage=4.406 af Inflow=98.49 cfs 7.831 af
Outflow=27.52 cfs 5.427 af

Pond 8P: Extended Detention Basin B-4 Peak Elev=136.42' Storage=122,275 cf Inflow=47.58 cfs 12.160 af
Outflow=18.05 cfs 11.709 af

Pond 10P: Extended Detention Basin Peak Elev=135.35' Storage=376,771 cf Inflow=124.25 cfs 13.187 af
Outflow=9.30 cfs 8.981 af

Pond 15P: Infiltration Basin D-2 Peak Elev=135.67' Storage=157,097 cf Inflow=51.73 cfs 3.606 af
Outflow=0.00 cfs 0.000 af

Pond 19P: Infiltration Basin E-2 Peak Elev=140.03' Storage=66,883 cf Inflow=14.79 cfs 1.873 af
Outflow=0.78 cfs 0.366 af

Pond 20P: Existing Basin E-1 Peak Elev=132.14' Storage=43,146 cf Inflow=5.31 cfs 0.990 af
Outflow=0.00 cfs 0.000 af

Pond 24P: Infiltration Basin F-2 Peak Elev=133.78' Storage=47,891 cf Inflow=14.78 cfs 1.099 af
Outflow=0.00 cfs 0.000 af

Pond 26P: Infiltration Basin F-3 Peak Elev=135.51' Storage=33,636 cf Inflow=11.78 cfs 0.817 af
Outflow=0.16 cfs 0.047 af

Pond 32P: Infiltration Basin G-2 Peak Elev=135.02' Storage=8,180 cf Inflow=3.17 cfs 0.217 af
Outflow=0.07 cfs 0.031 af

Link 11L: Design Point: B Inflow=40.13 cfs 24.822 af
Primary=40.13 cfs 24.822 af

Link 16L: Design Point: D Inflow=39.52 cfs 4.235 af
Primary=39.52 cfs 4.235 af

Link 21L: Design Point: E Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 27L: Design Point: F Inflow=61.26 cfs 8.200 af
Primary=61.26 cfs 8.200 af

Link 33L: Design Point: G Inflow=22.33 cfs 3.176 af
Primary=22.33 cfs 3.176 af

Total Runoff Area = 198.45 ac Runoff Volume = 64.952 af Average Runoff Depth = 3.93"
71.07% Pervious = 141.03 ac 28.93% Impervious = 57.42 ac

Summary for Subcatchment 1S: PrWS A-1

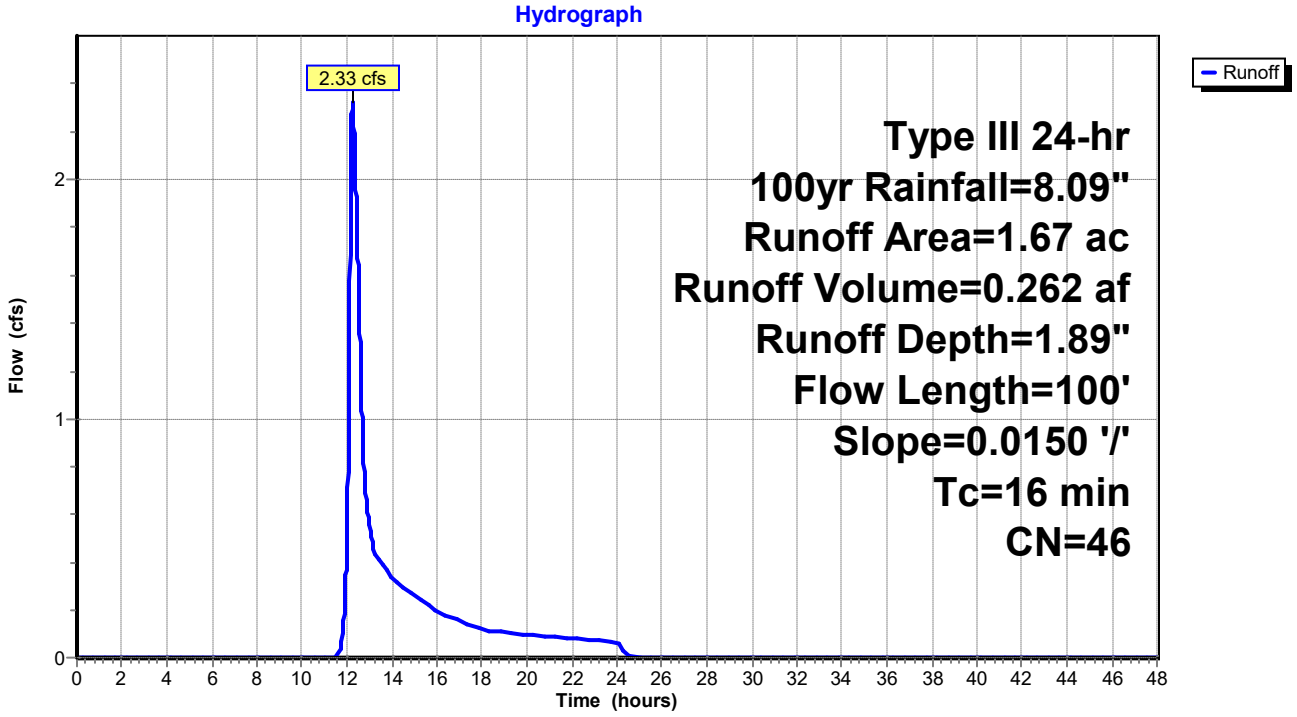
Runoff = 2.33 cfs @ 12.25 hrs, Volume= 0.262 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
0.05	98	Paved parking, HSG A
1.26	39	>75% Grass cover, Good, HSG A
0.12	61	>75% Grass cover, Good, HSG B
0.18	74	>75% Grass cover, Good, HSG C
0.06	30	Woods, Good, HSG A
1.67	46	Weighted Average
1.62		97.01% Pervious Area
0.05		2.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16	100	0.0150	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"

Subcatchment 1S: PrWS A-1



Summary for Subcatchment 2S: PrWS B-1

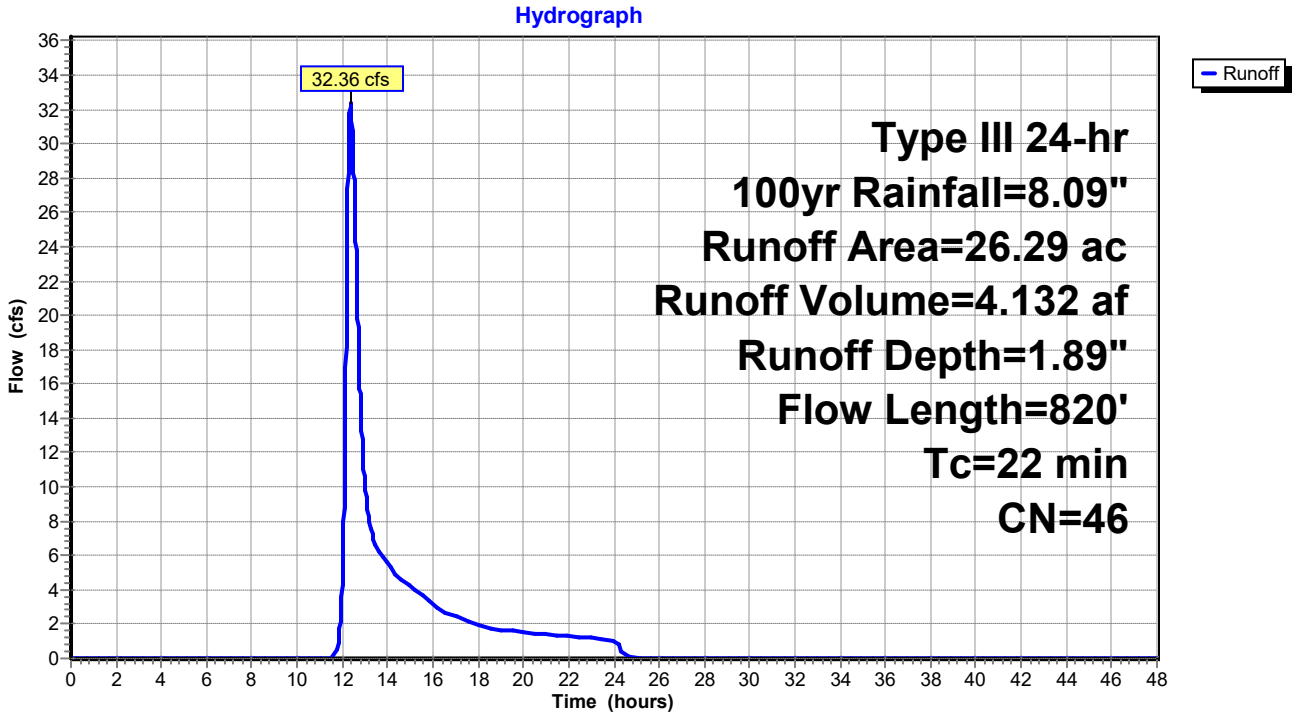
Runoff = 32.36 cfs @ 12.35 hrs, Volume= 4.132 af, Depth= 1.89"
Routed to Link 11L : Design Point: B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
0.58	98	Paved parking, HSG A
16.93	39	>75% Grass cover, Good, HSG A
0.01	61	>75% Grass cover, Good, HSG B
2.83	74	>75% Grass cover, Good, HSG C
3.94	30	Woods, Good, HSG A
2.00	77	Woods, Good, HSG D
26.29	46	Weighted Average
25.71		97.79% Pervious Area
0.58		2.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16	100	0.0150	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
4	475	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	55	0.0820	4.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2	190	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
22	820	Total			

Subcatchment 2S: PrWS B-1



Summary for Subcatchment 3S: PrWS B-2

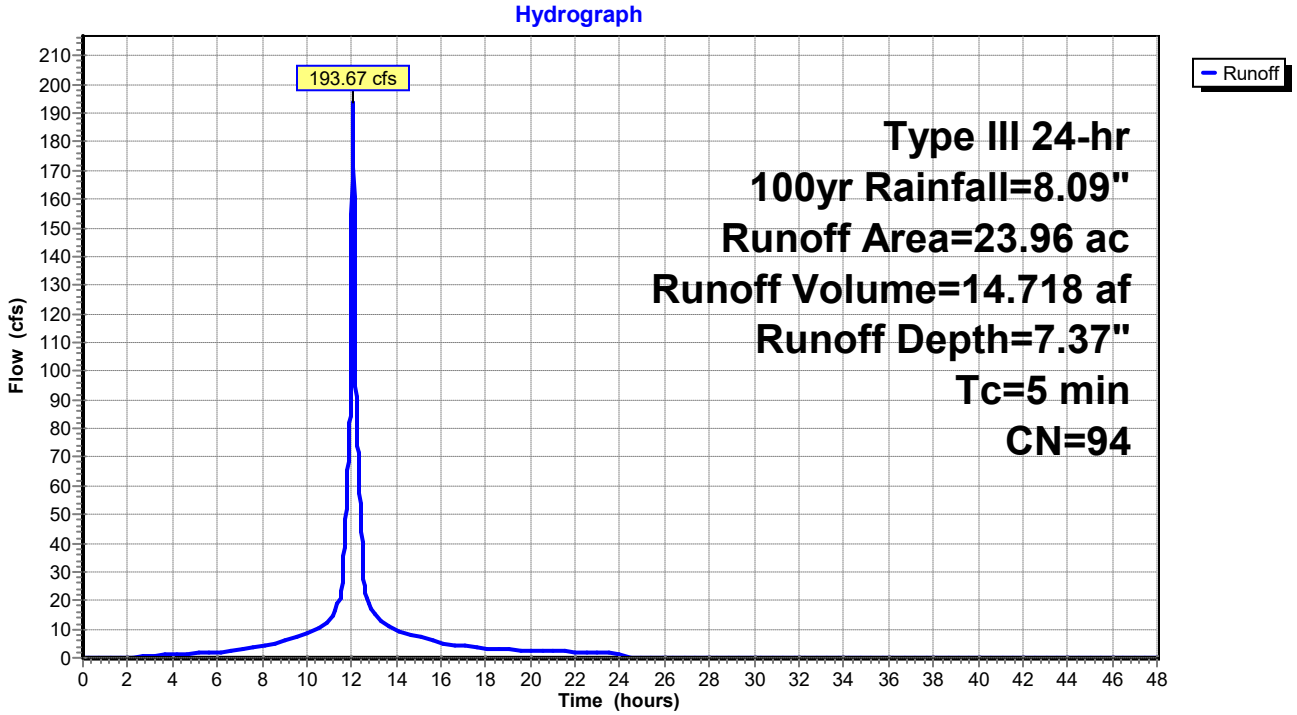
Runoff = 193.67 cfs @ 12.07 hrs, Volume= 14.718 af, Depth= 7.37"
Routed to Pond 4P : UG Detention System B-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
22.13	98	Paved parking, HSG A
1.76	39	>75% Grass cover, Good, HSG A
0.07	61	>75% Grass cover, Good, HSG B
23.96	94	Weighted Average
1.83		7.64% Pervious Area
22.13		92.36% Impervious Area

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

Subcatchment 3S: PrWS B-2



Summary for Subcatchment 5S: PrWS B-3

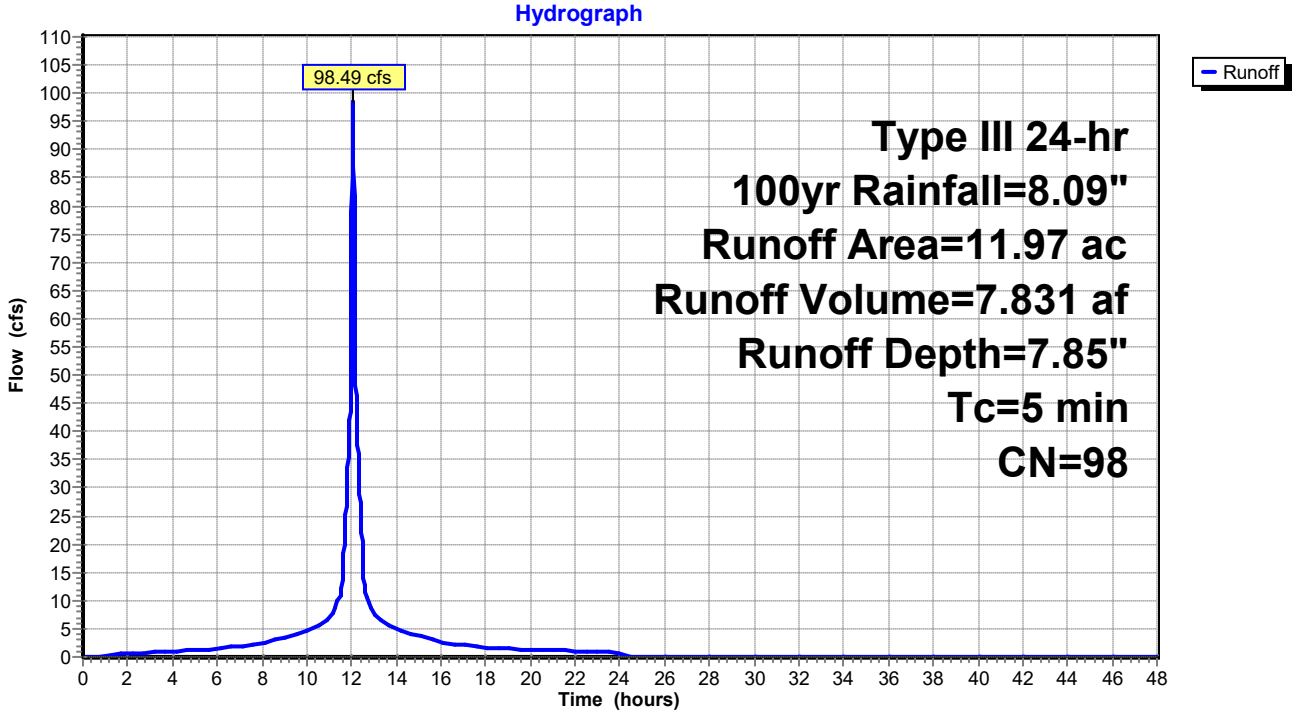
Runoff = 98.49 cfs @ 12.07 hrs, Volume= 7.831 af, Depth= 7.85"
Routed to Pond 6P : UG Detention System B-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
11.97	98	Paved parking, HSG A
11.97		100.00% Impervious Area

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

Subcatchment 5S: PrWS B-3



Summary for Subcatchment 7S: PrWS B-4

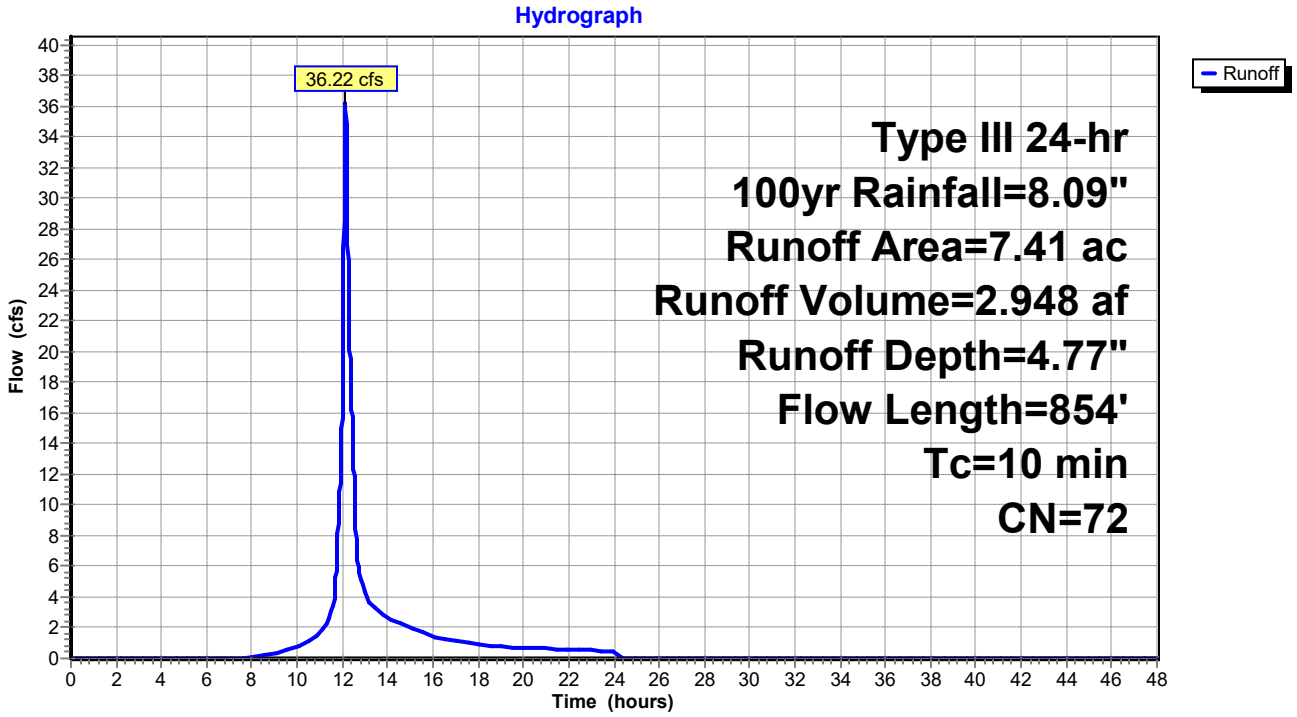
Runoff = 36.22 cfs @ 12.14 hrs, Volume= 2.948 af, Depth= 4.77"
Routed to Pond 8P : Extended Detention Basin B-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
2.67	98	Paved parking, HSG A
2.34	39	>75% Grass cover, Good, HSG A
2.40	74	>75% Grass cover, Good, HSG C
7.41	72	Weighted Average
4.74		63.97% Pervious Area
2.67		36.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8	100	0.0870	0.21		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	70	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	44	0.0170	5.91	4.65	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
2	640	0.0030	6.26	78.68	**Pipe Channel,** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
10	854	Total			

Subcatchment 7S: PrWS B-4



Summary for Subcatchment 9S: PrWS B-5

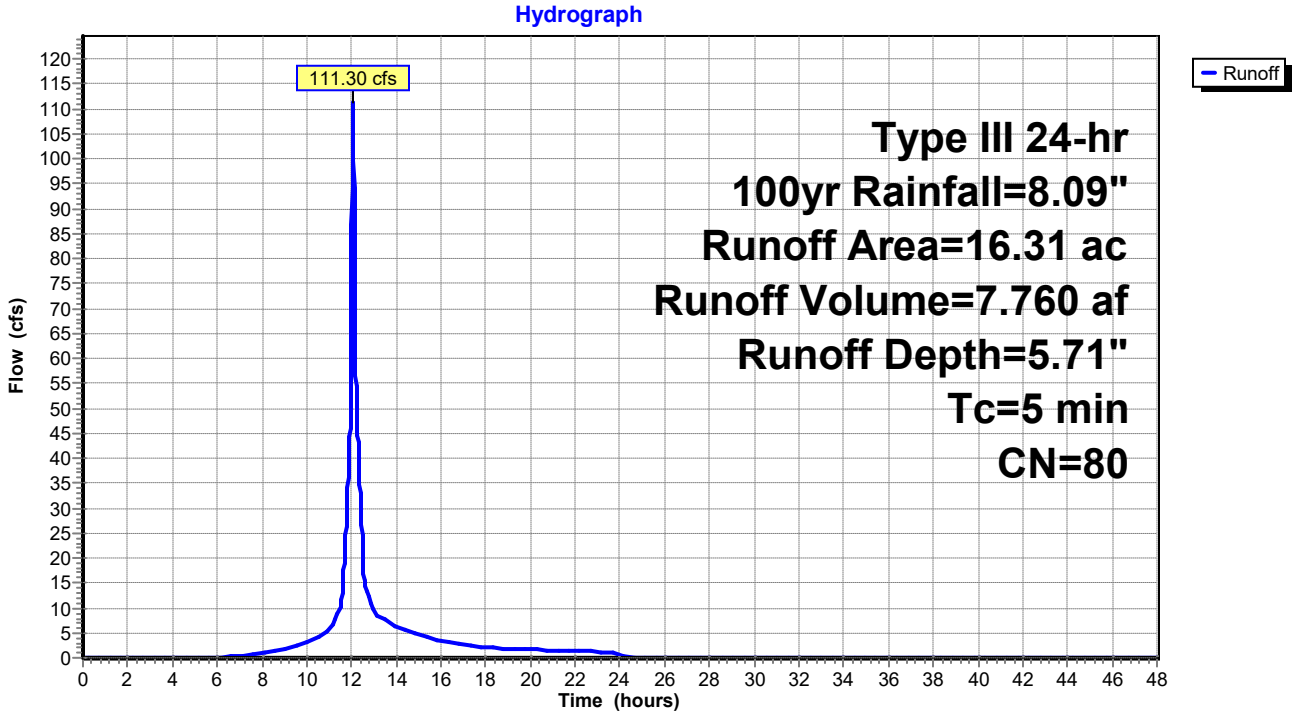
Runoff = 111.30 cfs @ 12.07 hrs, Volume= 7.760 af, Depth= 5.71"
Routed to Pond 10P : Extended Detention Basin B-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
10.92	98	Paved parking, HSG A
4.39	39	>75% Grass cover, Good, HSG A
1.00	61	>75% Grass cover, Good, HSG B
16.31	80	Weighted Average
5.39		33.05% Pervious Area
10.92		66.95% Impervious Area

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

Subcatchment 9S: PrWS B-5



Summary for Subcatchment 12S: PrWS C-1

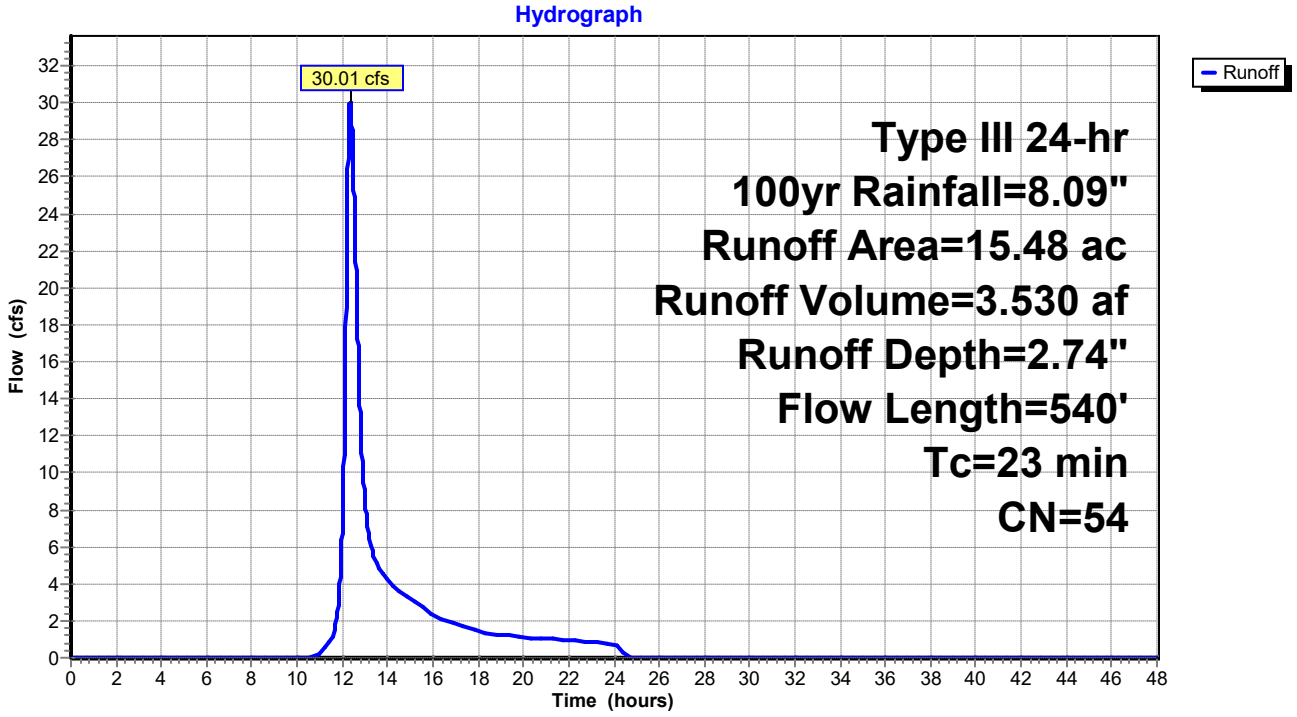
Runoff = 30.01 cfs @ 12.34 hrs, Volume= 3.530 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
2.82	39	>75% Grass cover, Good, HSG A
4.75	61	>75% Grass cover, Good, HSG B
1.44	30	Woods, Good, HSG A
4.44	55	Woods, Good, HSG B
2.03	77	Woods, Good, HSG D
15.48	54	Weighted Average
15.48		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	100	0.0100	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
4	395	0.0090	1.53		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	45	0.0220	2.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
23	540	Total			

Subcatchment 12S: PrWS C-1



Summary for Subcatchment 13S: PrWS D-1

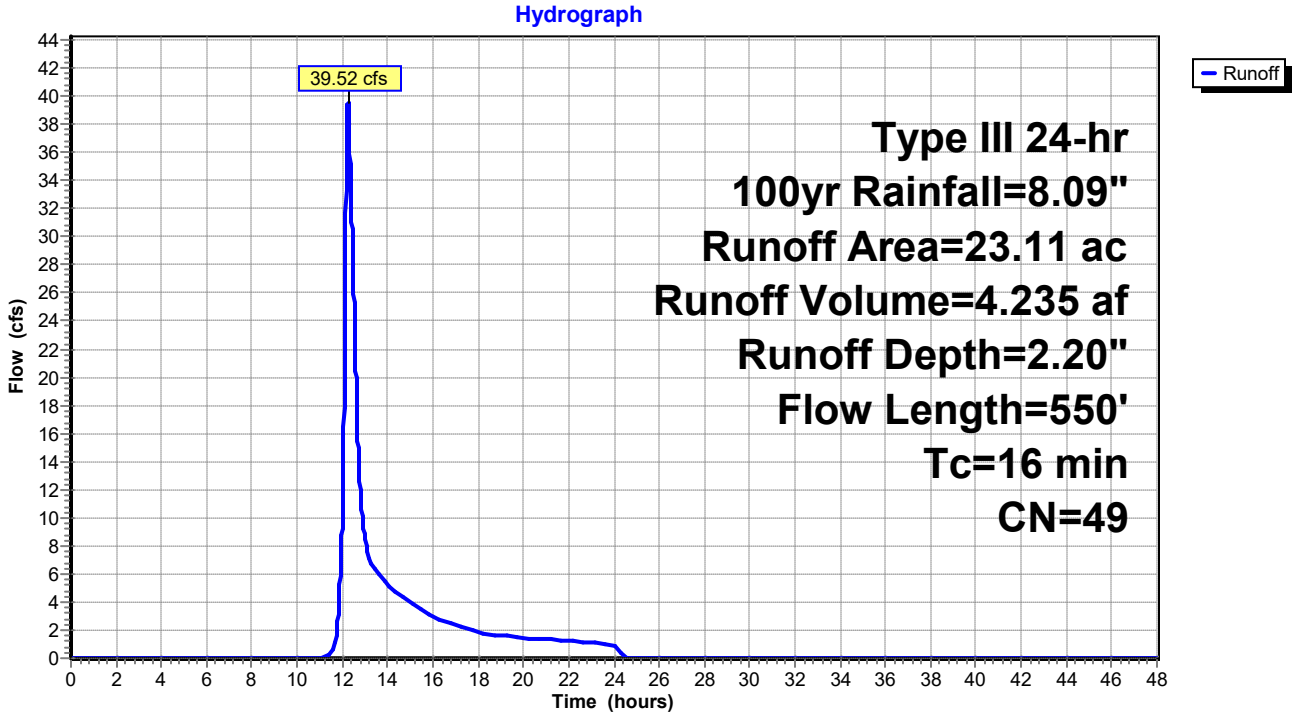
Runoff = 39.52 cfs @ 12.25 hrs, Volume= 4.235 af, Depth= 2.20"
Routed to Link 16L : Design Point: D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
12.27	39	>75% Grass cover, Good, HSG A
10.58	61	>75% Grass cover, Good, HSG B
0.26	30	Woods, Good, HSG A
23.11	49	Weighted Average
23.11		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12	100	0.0300	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	165	0.0240	2.49		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	285	0.0080	1.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16	550	Total			

Subcatchment 13S: PrWS D-1



Summary for Subcatchment 14S: PrWS D-2

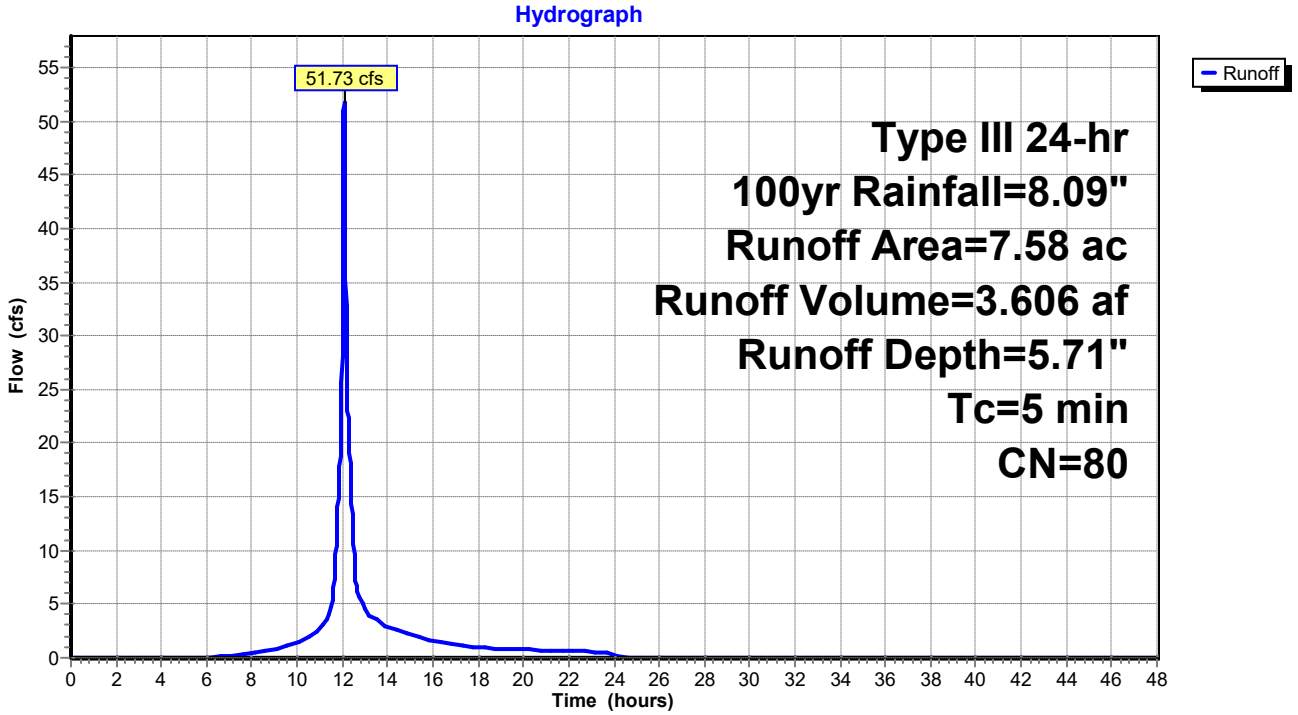
Runoff = 51.73 cfs @ 12.07 hrs, Volume= 3.606 af, Depth= 5.71"
Routed to Pond 15P : Infiltration Basin D-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
5.06	98	Paved parking, HSG A
1.90	39	>75% Grass cover, Good, HSG A
0.62	61	>75% Grass cover, Good, HSG B
7.58	80	Weighted Average
2.52		33.25% Pervious Area
5.06		66.75% Impervious Area

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

Subcatchment 14S: PrWS D-2



Summary for Subcatchment 17S: PrWS E-1

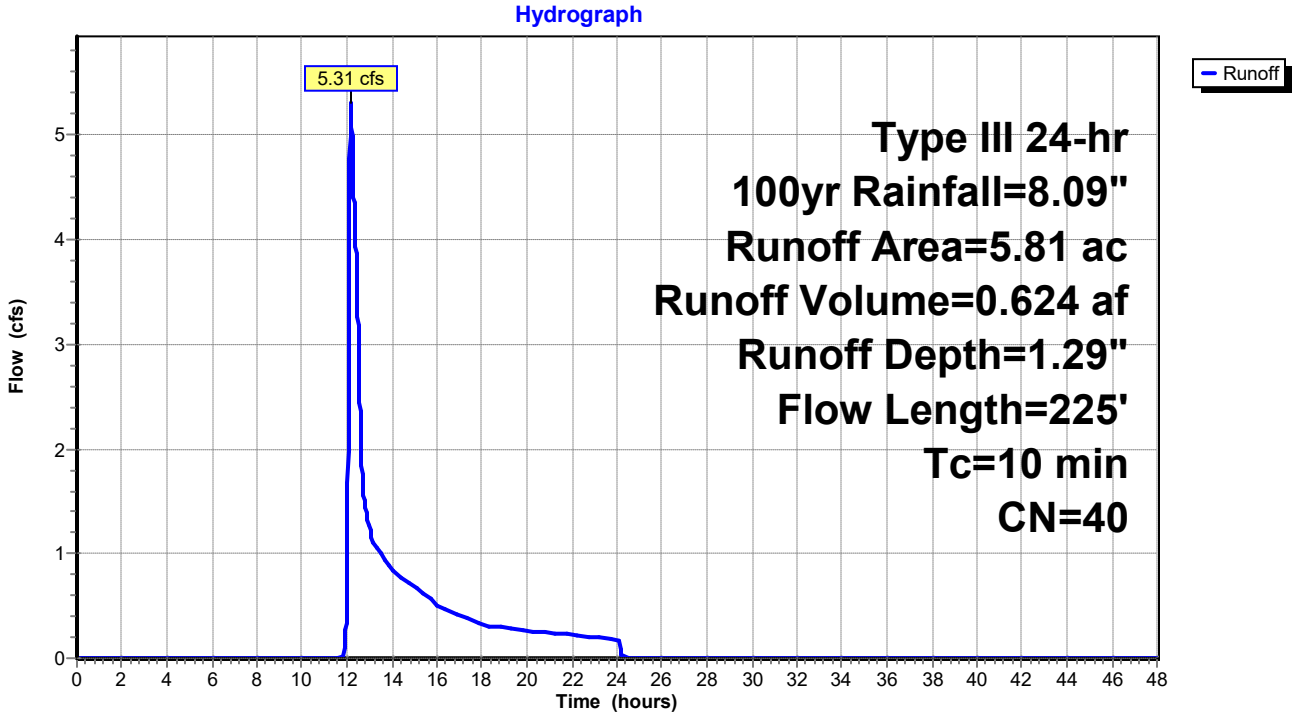
Runoff = 5.31 cfs @ 12.18 hrs, Volume= 0.624 af, Depth= 1.29"
Routed to Pond 20P : Existing Basin E-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
1.91	39	>75% Grass cover, Good, HSG A
2.97	30	Woods, Good, HSG A
0.93	77	Woods, Good, HSG D
5.81	40	Weighted Average
5.81		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	100	0.0650	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0	25	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	100	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10	225	Total			

Subcatchment 17S: PrWS E-1



Summary for Subcatchment 18S: PrWS E-2

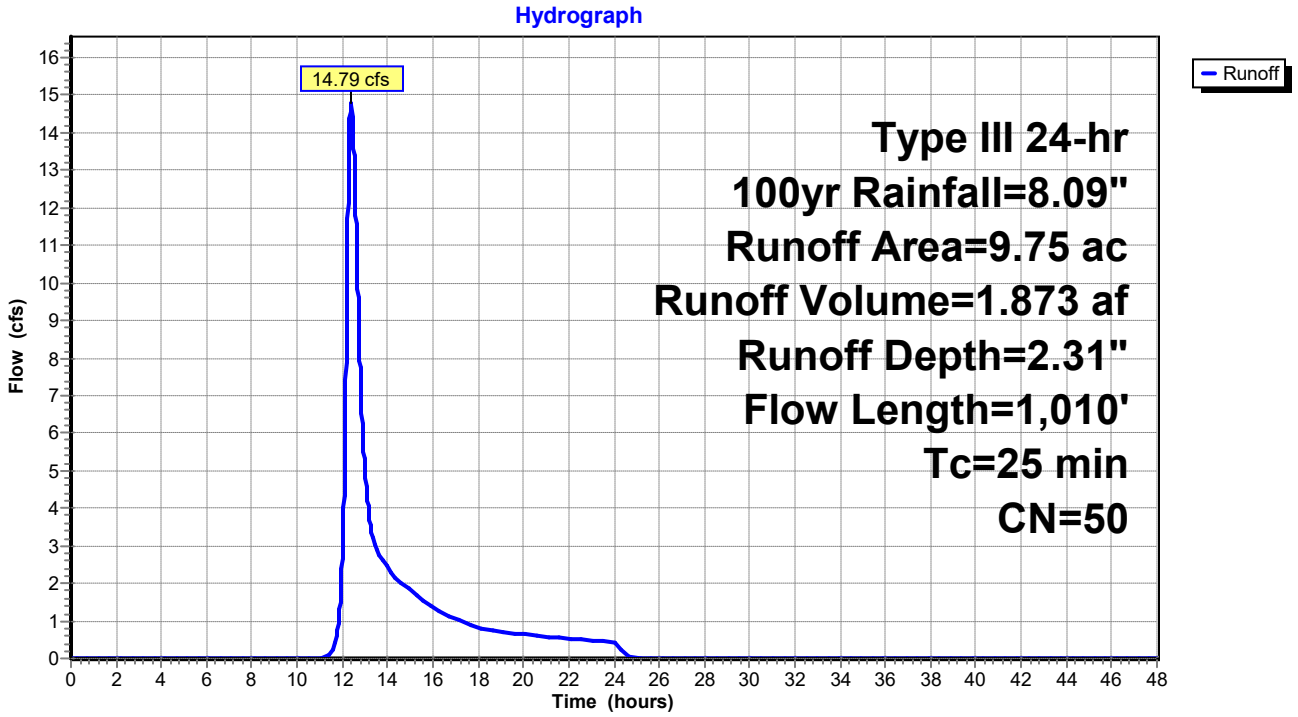
Runoff = 14.79 cfs @ 12.39 hrs, Volume= 1.873 af, Depth= 2.31"
Routed to Pond 19P : Infiltration Basin E-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
0.99	98	Paved parking, HSG A
6.78	39	>75% Grass cover, Good, HSG A
1.54	61	>75% Grass cover, Good, HSG B
0.44	74	>75% Grass cover, Good, HSG C
9.75	50	Weighted Average
8.76		89.85% Pervious Area
0.99		10.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13	100	0.0230	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
7	550	0.0060	1.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4	250	0.0040	1.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	110	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
25	1,010	Total			

Subcatchment 18S: PrWS E-2



Summary for Subcatchment 22S: PrWS F-1

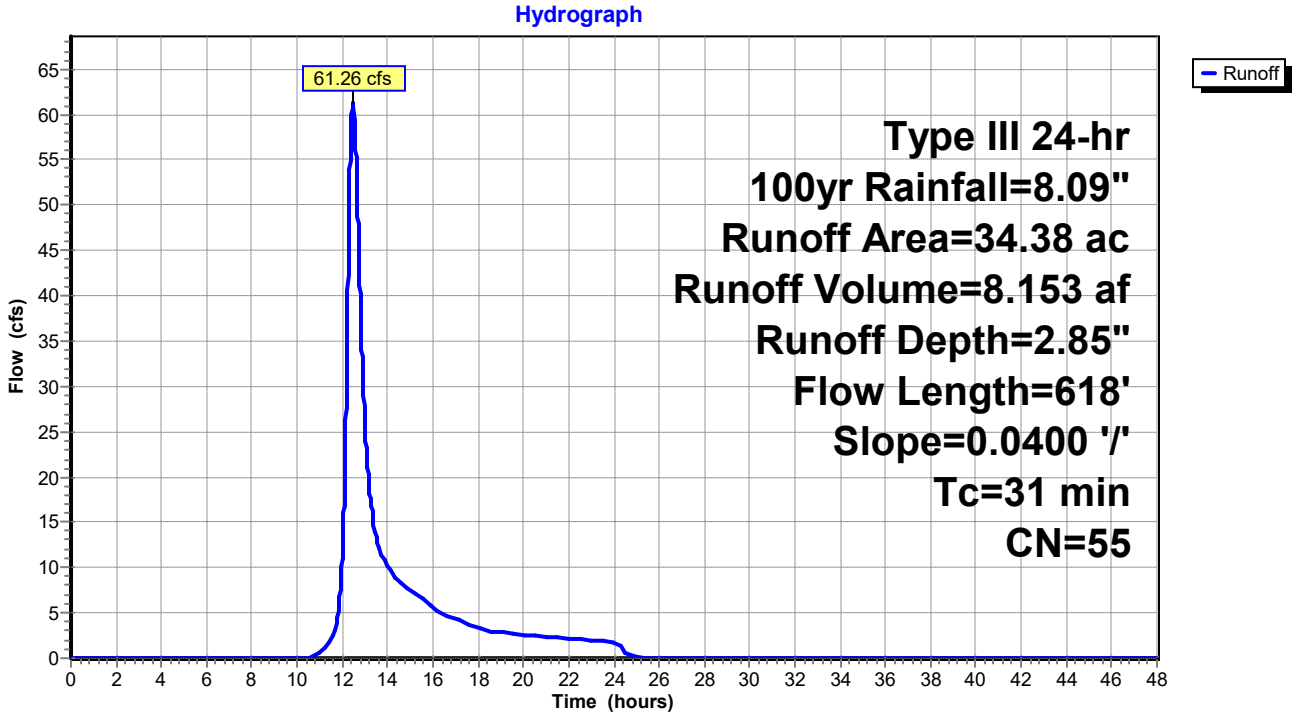
Runoff = 61.26 cfs @ 12.47 hrs, Volume= 8.153 af, Depth= 2.85"
Routed to Link 27L : Design Point: F

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
0.71	39	>75% Grass cover, Good, HSG A
6.24	61	>75% Grass cover, Good, HSG B
2.19	30	Woods, Good, HSG A
23.23	55	Woods, Good, HSG B
2.01	77	Woods, Good, HSG D
34.38	55	Weighted Average
34.38		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	518	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
31	618	Total			

Subcatchment 22S: PrWS F-1



Summary for Subcatchment 23S: PrWS F-2

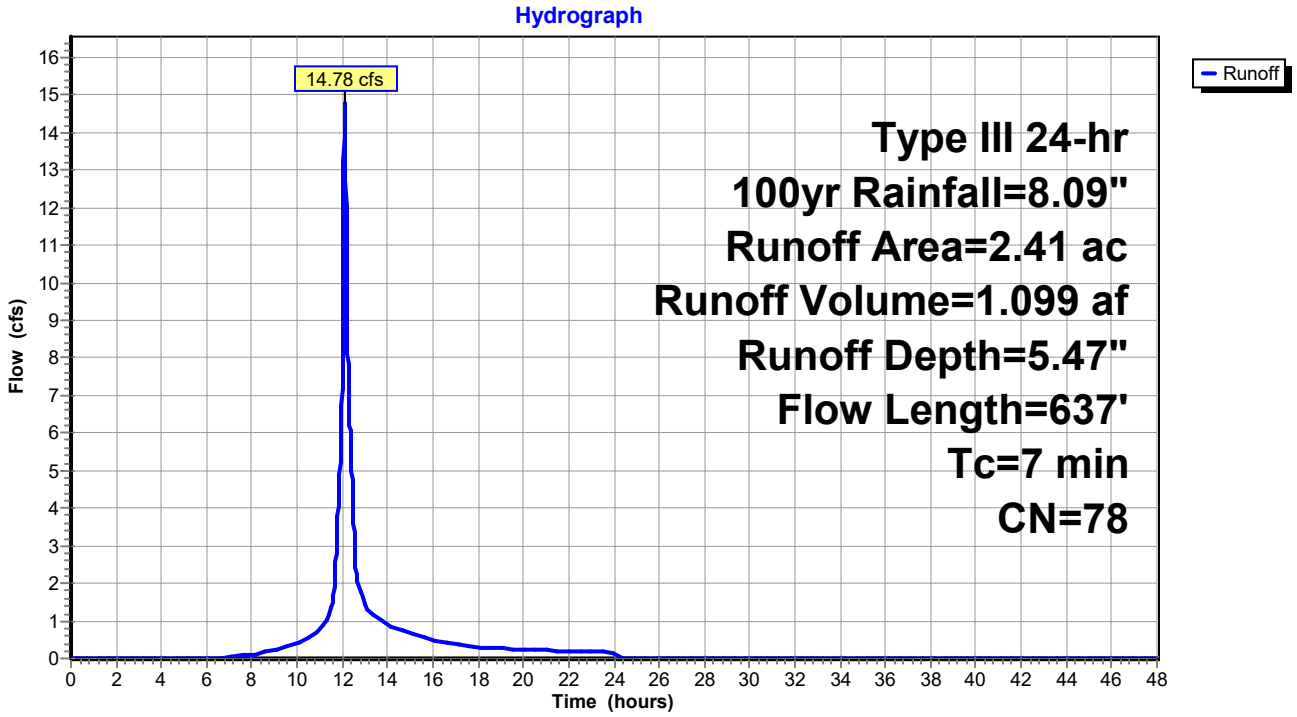
Runoff = 14.78 cfs @ 12.10 hrs, Volume= 1.099 af, Depth= 5.47"
Routed to Pond 24P : Infiltration Basin F-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
1.24	98	Paved parking, HSG A
0.24	39	>75% Grass cover, Good, HSG A
0.93	61	>75% Grass cover, Good, HSG B
2.41	78	Weighted Average
1.17		48.55% Pervious Area
1.24		51.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.31"
1	100	0.0060	1.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	15	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5	475	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	12	0.3330	9.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7	637	Total			

Subcatchment 23S: PrWS F-2



Summary for Subcatchment 25S: PrWS F-3

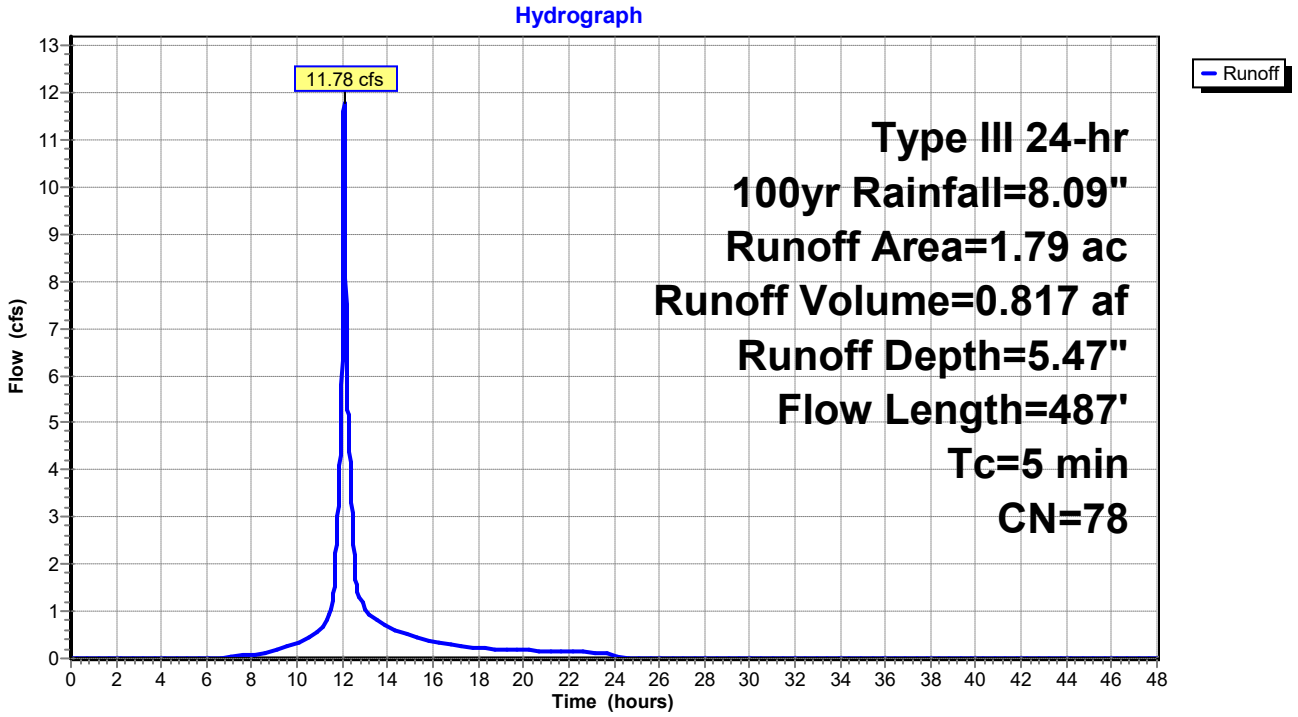
Runoff = 11.78 cfs @ 12.07 hrs, Volume= 0.817 af, Depth= 5.47"
Routed to Pond 26P : Infiltration Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
0.83	98	Paved parking, HSG A
0.96	61	>75% Grass cover, Good, HSG B
1.79	78	Weighted Average
0.96		53.63% Pervious Area
0.83		46.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1	35	0.0200	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.31"
1	100	0.0060	1.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0	15	0.1270	5.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	325	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0	12	0.3330	9.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5	487	Total			

Subcatchment 25S: PrWS F-3



Summary for Subcatchment 28S: PrWS G-1a

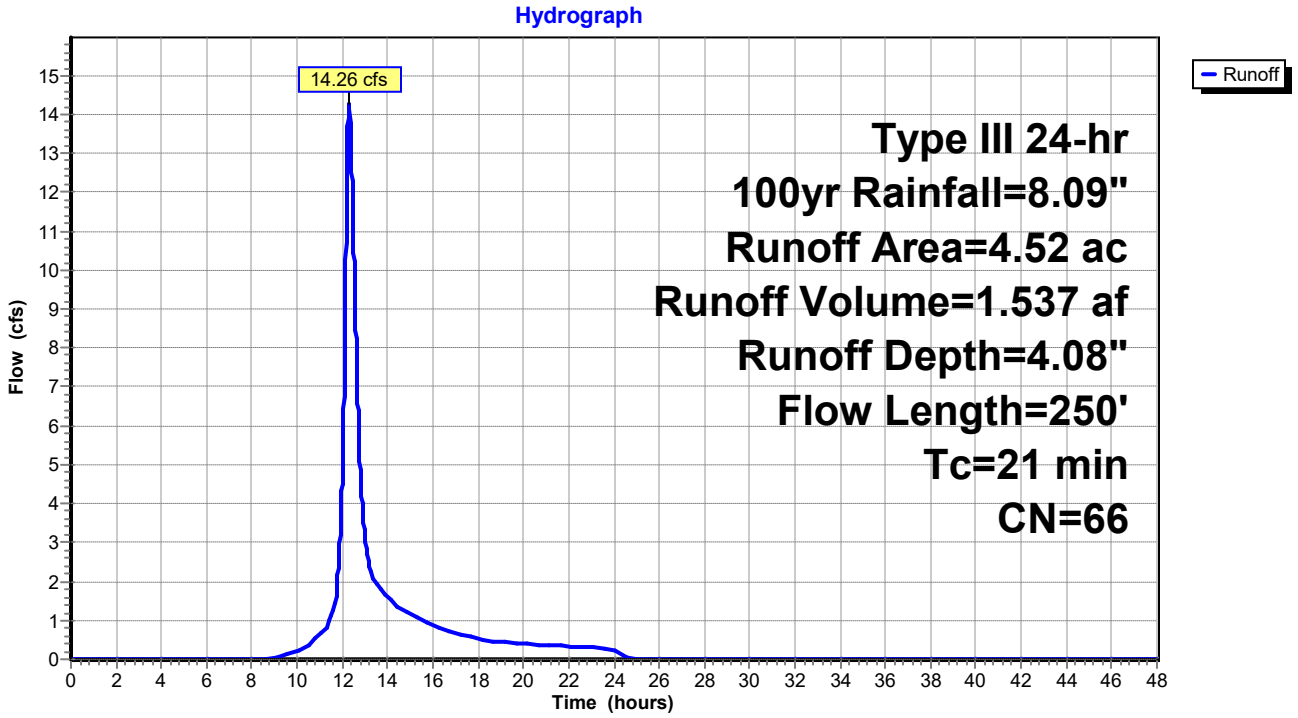
Runoff = 14.26 cfs @ 12.30 hrs, Volume= 1.537 af, Depth= 4.08"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
0.43	98	Paved parking, HSG A
1.26	61	>75% Grass cover, Good, HSG B
1.81	55	Woods, Good, HSG B
1.02	77	Woods, Good, HSG D
4.52	66	Weighted Average
4.09		90.49% Pervious Area
0.43		9.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17	40	0.0230	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
3	60	0.3330	0.33		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
1	150	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
21	250	Total			

Subcatchment 28S: PrWS G-1a



Summary for Subcatchment 29S: PrWS G-1b

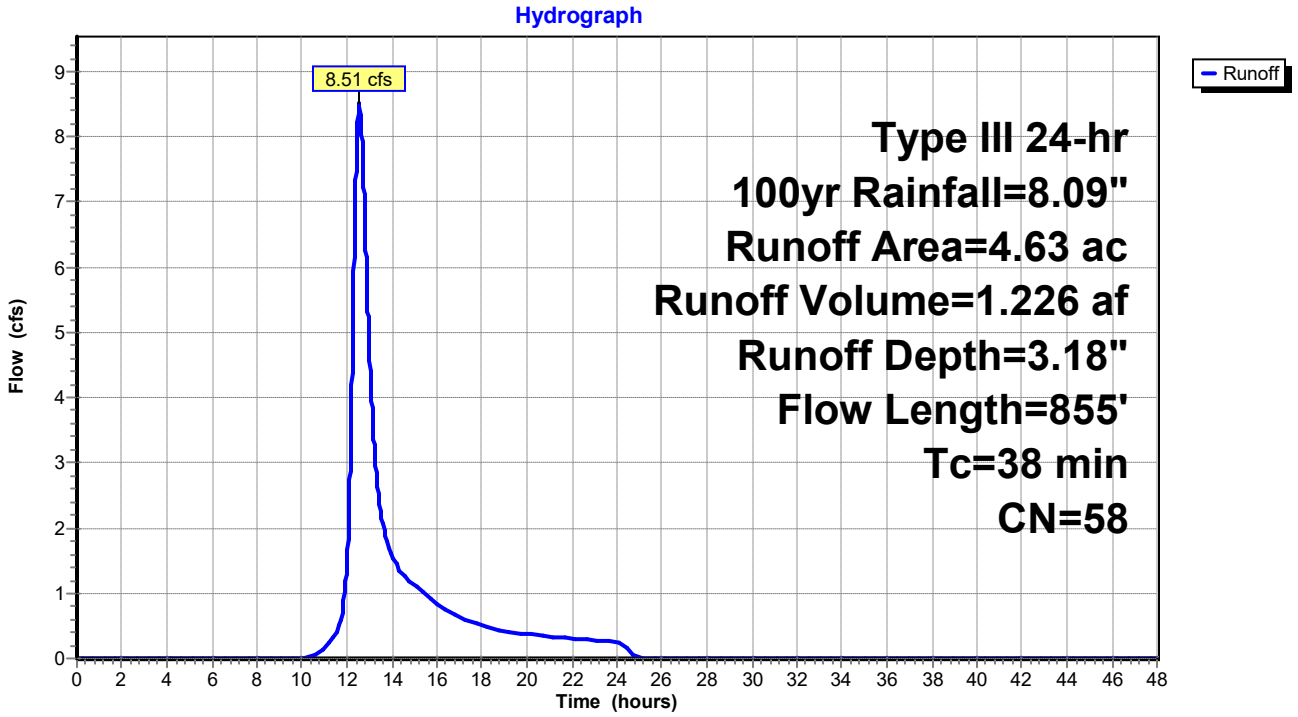
Runoff = 8.51 cfs @ 12.54 hrs, Volume= 1.226 af, Depth= 3.18"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
2.49	61	>75% Grass cover, Good, HSG B
2.14	55	Woods, Good, HSG B
4.63	58	Weighted Average
4.63		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10	35	0.0570	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
22	65	0.0320	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.31"
2	275	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1	180	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3	300	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38	855	Total			

Subcatchment 29S: PrWS G-1b



Summary for Subcatchment 30S: PrWS G-1c

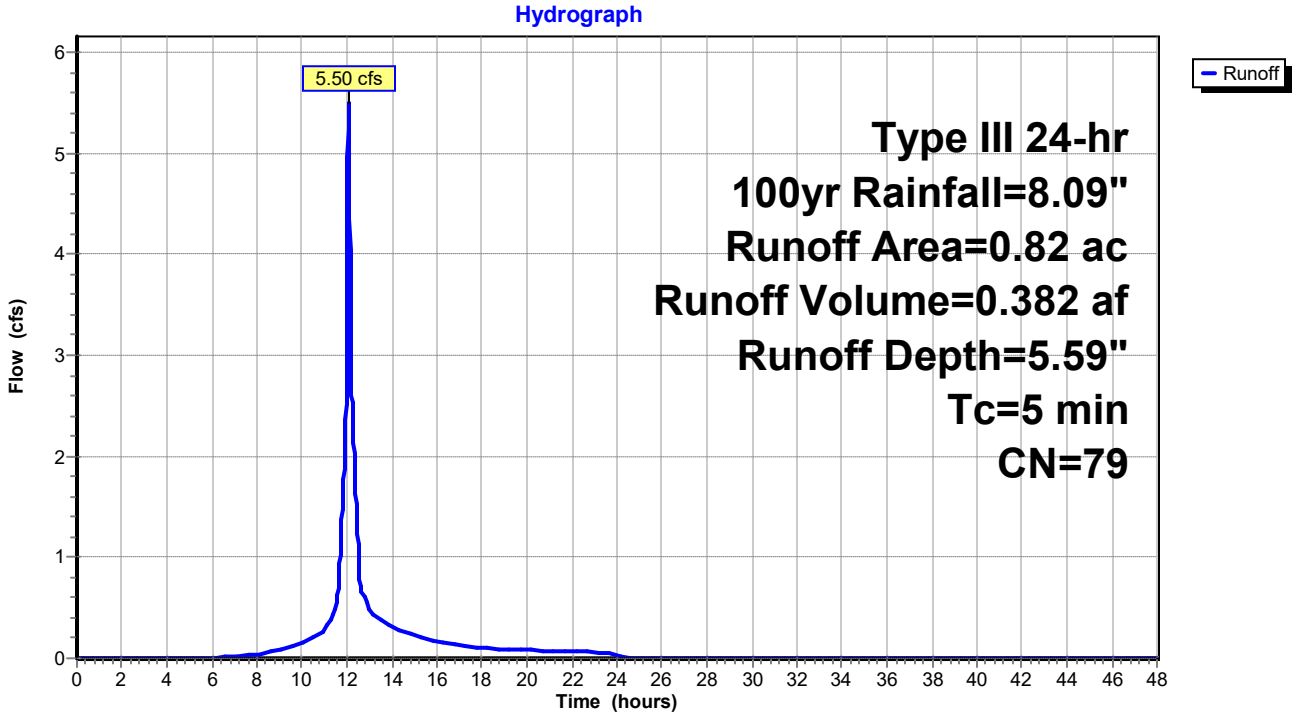
Runoff = 5.50 cfs @ 12.07 hrs, Volume= 0.382 af, Depth= 5.59"
Routed to Link 33L : Design Point: G

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
0.39	98	Paved parking, HSG A
0.43	61	>75% Grass cover, Good, HSG B
0.82	79	Weighted Average
0.43		52.44% Pervious Area
0.39		47.56% Impervious Area

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

Subcatchment 30S: PrWS G-1c



Summary for Subcatchment 31S: PrWS G-2

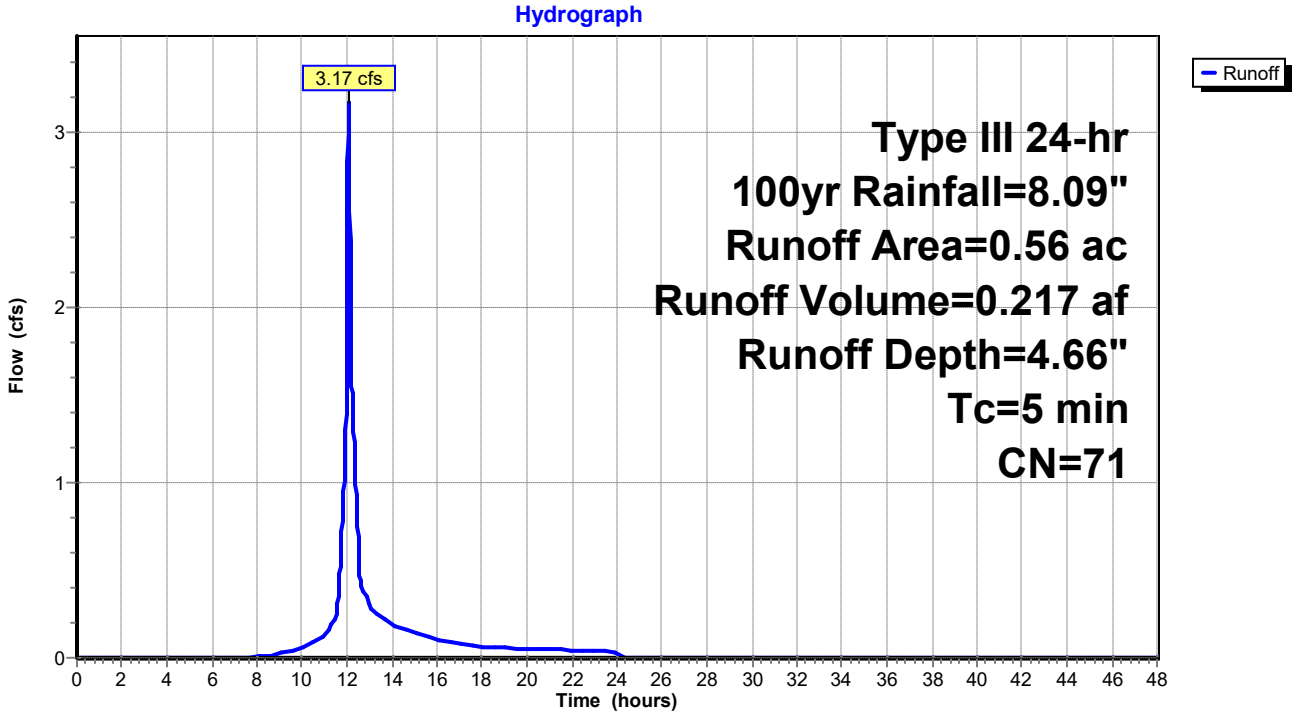
Runoff = 3.17 cfs @ 12.07 hrs, Volume= 0.217 af, Depth= 4.66"
Routed to Pond 32P : Infiltration Basin G-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=8.09"

Area (ac)	CN	Description
0.16	98	Paved parking, HSG A
0.35	61	>75% Grass cover, Good, HSG B
0.05	55	Woods, Good, HSG B
0.56	71	Weighted Average
0.40		71.43% Pervious Area
0.16		28.57% Impervious Area

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

Subcatchment 31S: PrWS G-2



Summary for Pond 4P: UG Detention System B-2

Inflow Area = 23.96 ac, 92.36% Impervious, Inflow Depth = 7.37" for 100yr event
Inflow = 193.67 cfs @ 12.07 hrs, Volume= 14.718 af
Outflow = 30.53 cfs @ 12.53 hrs, Volume= 9.212 af, Atten= 84%, Lag= 27.7 min
Primary = 30.53 cfs @ 12.53 hrs, Volume= 9.212 af
Routed to Pond 8P : Extended Detention Basin B-4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 138.00' @ 12.53 hrs Surf.Area= 121,524 sf Storage= 398,348 cf

Plug-Flow detention time= 374.9 min calculated for 9.210 af (63% of inflow)
Center-of-Mass det. time= 272.0 min (1,032.2 - 760.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	53,816 cf	**82.00'W x 1,482.00'L x 5.17'H Field A** 627,874 cf Overall - 493,333 cf Embedded = 134,541 cf x 40.0% Voids
#2A	134.00'	369,049 cf	**retain_it retain_it 3.5'** x 1850 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 10 Rows adjusted for 2,394.5 cf perimeter wall
		422,866 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	135.12'	**36.0" Round Culvert** L= 870.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 135.12' / 132.50' S= 0.0030 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	136.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.24 1.25 4.00 Width (feet) 4.00 4.00 8.00 8.00

Primary OutFlow Max=30.43 cfs @ 12.53 hrs HW=137.99' TW=135.52' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 30.43 cfs @ 5.61 fps)
↑**2=Custom Weir/Orifice** (Passes 30.43 cfs of 45.21 cfs potential flow)

Pond 4P: UG Detention System B-2 - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it®)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
10 Rows adjusted for 2,394.5 cf perimeter wall

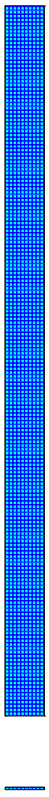
185 Chambers/Row x 8.00' Long = 1,480.00' Row Length +12.0" End Stone x 2 = 1,482.00' Base Length
10 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 82.00' Base Width
6.0" Stone Base + 50.0" Chamber Height + 6.0" Stone Cover = 5.17' Field Height

6.1 cf Sidewall x 185 x 2 + 6.1 cf Endwall x 10 x 2 = 2,394.5 cf Perimeter Wall
1,850 Chambers x 200.8 cf - 2,394.5 cf Perimeter wall = 369,049.3 cf Chamber Storage
1,850 Chambers x 266.7 cf = 493,333.3 cf Displacement

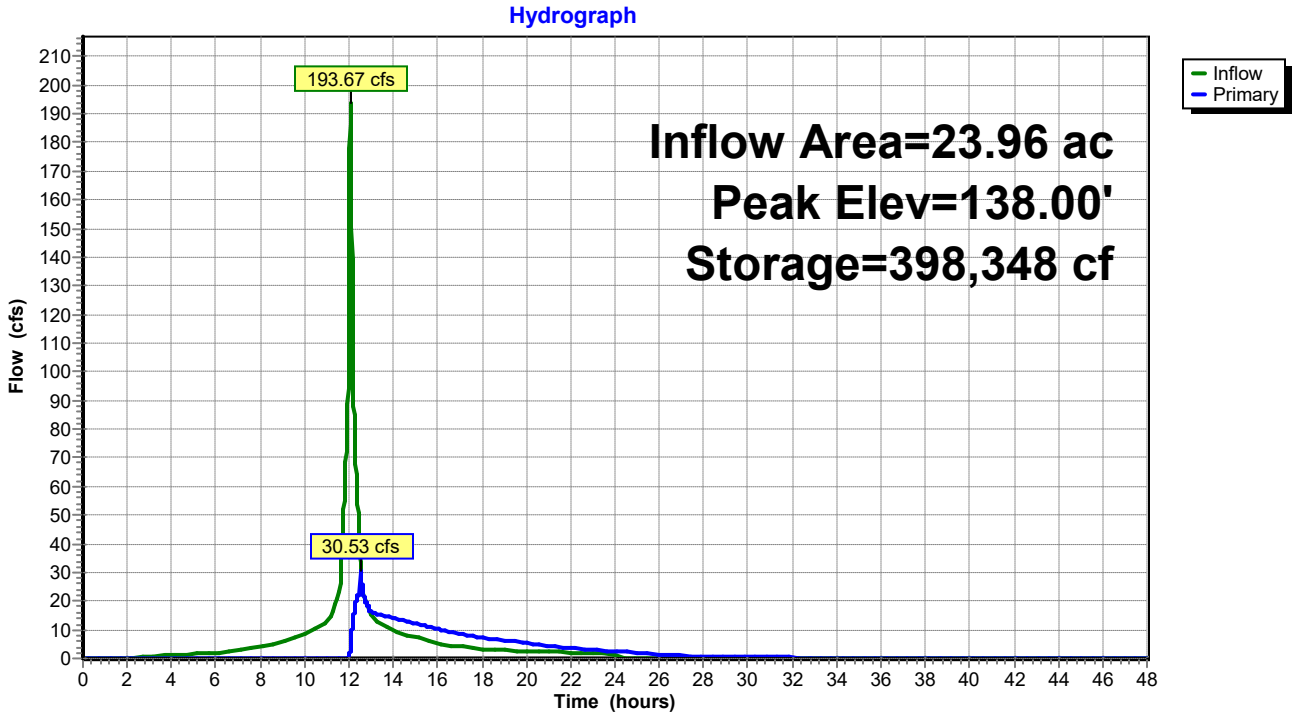
627,874.0 cf Field - 493,333.3 cf Chambers = 134,540.7 cf Stone x 40.0% Voids = 53,816.3 cf Stone Storage

Chamber Storage + Stone Storage = 422,865.5 cf = 9.708 af
Overall Storage Efficiency = 67.3%
Overall System Size = 1,482.00' x 82.00' x 5.17'

1,850 Chambers
23,254.6 cy Field
4,983.0 cy Stone



Pond 4P: UG Detention System B-2



Summary for Pond 6P: UG Detention System B-3

Inflow Area = 11.97 ac,100.00% Impervious, Inflow Depth = 7.85" for 100yr event
Inflow = 98.49 cfs @ 12.07 hrs, Volume= 7.831 af
Outflow = 27.52 cfs @ 12.39 hrs, Volume= 5.427 af, Atten= 72%, Lag= 19.3 min
Primary = 27.52 cfs @ 12.39 hrs, Volume= 5.427 af
Routed to Pond 10P : Extended Detention Basin B-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 137.87' @ 12.39 hrs Surf.Area= 1.25 ac Storage= 4.406 af

Plug-Flow detention time= 280.4 min calculated for 5.427 af (69% of inflow)
Center-of-Mass det. time= 182.6 min (922.8 - 740.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	0.390 af	**34.00'W x 1,602.00'L x 5.17'H Field A** 6.460 af Overall - 5.485 af Embedded = 0.975 af x 40.0% Voids
#2A	134.00'	4.171 af	**retain_it retain_it 4.0'** x 800 Inside #1 Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf 4 Rows adjusted for 3,080.2 cf perimeter wall
		4.561 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**36.0" Round Culvert** L= 310.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 134.00' / 132.50' S= 0.0048 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	136.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.49 1.50 3.00 Width (feet) 3.00 3.00 6.00 6.00

Primary OutFlow Max=27.52 cfs @ 12.39 hrs HW=137.87' TW=134.21' (Dynamic Tailwater)
↑**1=Culvert** (Passes 27.52 cfs of 51.94 cfs potential flow)
↑**2=Custom Weir/Orifice** (Weir Controls 27.52 cfs @ 4.07 fps)

Pond 6P: UG Detention System B-3 - Chamber Wizard Field A

Chamber Model = retain_it retain_it 4.0' (retain-it®)
Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf
Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf
4 Rows adjusted for 3,080.2 cf perimeter wall

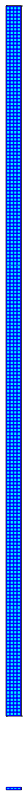
200 Chambers/Row x 8.00' Long = 1,600.00' Row Length +12.0" End Stone x 2 = 1,602.00' Base Length
4 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 34.00' Base Width
6.0" Stone Base + 56.0" Chamber Height = 5.17' Field Height

7.5 cf Sidewall x 200 x 2 + 7.5 cf Endwall x 4 x 2 = 3,080.2 cf Perimeter Wall
800 Chambers x 230.9 cf - 3,080.2 cf Perimeter wall = 181,671.5 cf Chamber Storage
800 Chambers x 298.7 cf = 238,933.3 cf Displacement

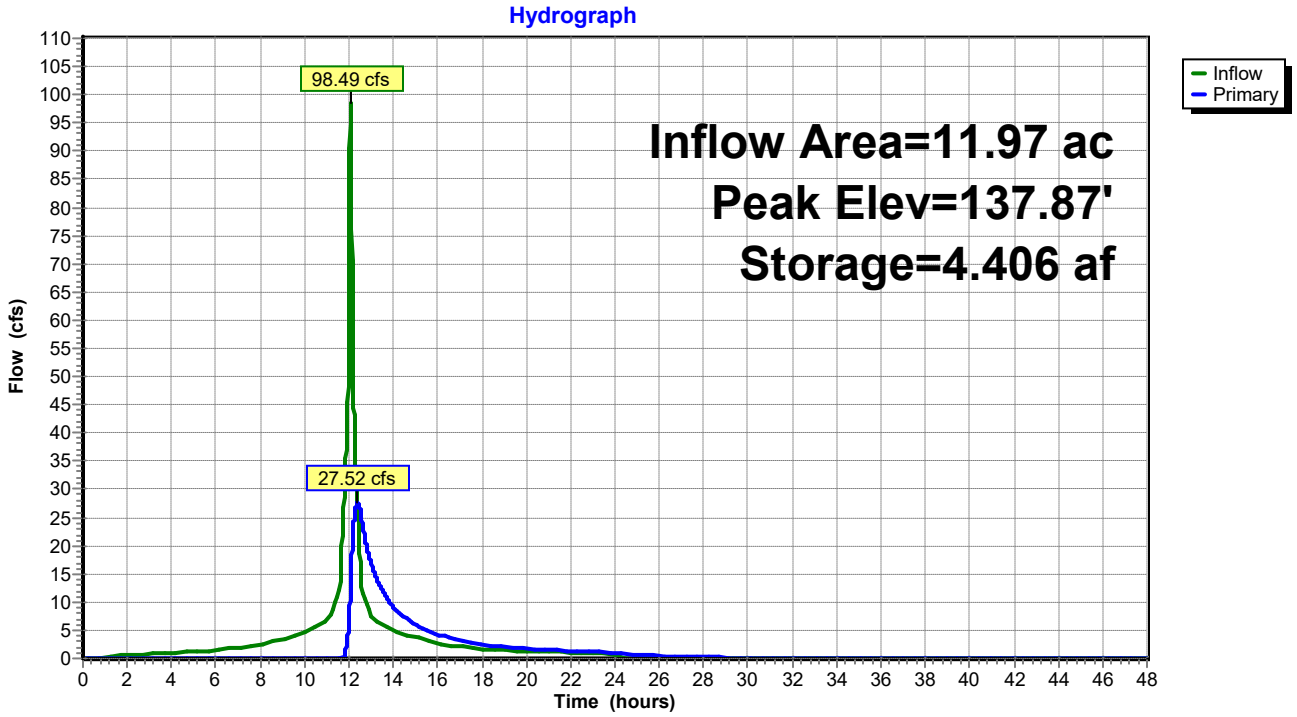
281,418.0 cf Field - 238,933.3 cf Chambers = 42,484.7 cf Stone x 40.0% Voids = 16,993.9 cf Stone Storage

Chamber Storage + Stone Storage = 198,665.3 cf = 4.561 af
Overall Storage Efficiency = 70.6%
Overall System Size = 1,602.00' x 34.00' x 5.17'

800 Chambers
10,422.9 cy Field
1,573.5 cy Stone



Pond 6P: UG Detention System B-3



Summary for Pond 8P: Extended Detention Basin B-4

Inflow Area = 31.37 ac, 79.06% Impervious, Inflow Depth > 4.65" for 100yr event
Inflow = 47.58 cfs @ 12.16 hrs, Volume= 12.160 af
Outflow = 18.05 cfs @ 13.57 hrs, Volume= 11.709 af, Atten= 62%, Lag= 84.7 min
Primary = 18.05 cfs @ 13.57 hrs, Volume= 11.709 af
Routed to Link 11L : Design Point: B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 136.42' @ 13.57 hrs Surf.Area= 36,823 sf Storage= 122,275 cf

Plug-Flow detention time= 182.7 min calculated for 11.709 af (96% of inflow)
Center-of-Mass det. time= 147.7 min (1,129.4 - 981.7)

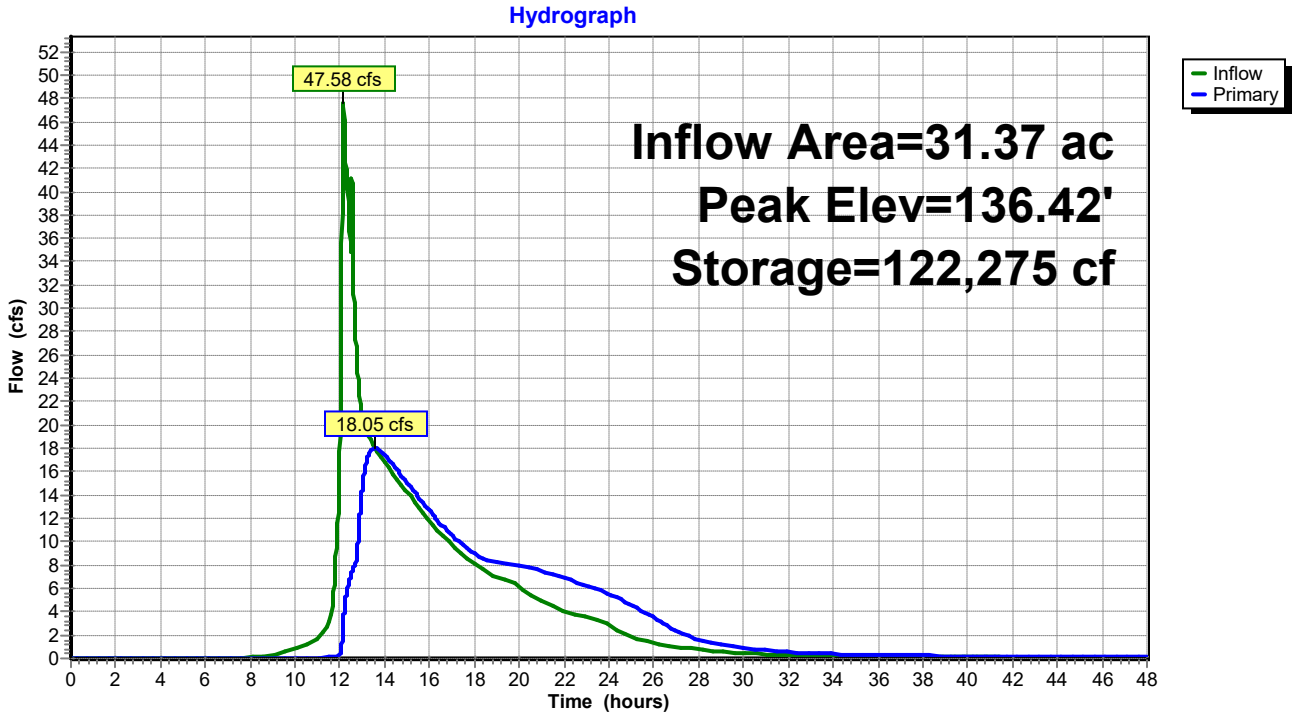
Volume	Invert	Avail.Storage	Storage Description
#1	132.50'	163,645 cf	**Detention Basin B-4 (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.50	25,654	0	0
133.00	27,028	13,171	13,171
134.00	29,819	28,424	41,594
135.00	32,666	31,243	72,837
136.00	35,570	34,118	106,955
137.00	38,530	37,050	144,005
137.50	40,032	19,641	163,645

Device	Routing	Invert	Outlet Devices
#1	Primary	132.50'	**36.0" Round Culvert** L= 312.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 132.50' / 131.16' S= 0.0043 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Device 1	132.50'	**2.5" Vert. 2.5in Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	133.25'	**10.0" Vert. (2x) 10in Orifice X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	136.00'	**36.0" x 24.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=18.05 cfs @ 13.57 hrs HW=136.42' TW=132.50' (Dynamic Tailwater)
└─**1=Culvert** (Passes 18.05 cfs of 50.16 cfs potential flow)
  ├─**2=2.5in Orifice** (Orifice Controls 0.32 cfs @ 9.41 fps)
  ├─**3=(2x) 10in Orifice** (Orifice Controls 8.72 cfs @ 7.99 fps)
  └─**4=Overflow CB** (Weir Controls 9.00 cfs @ 2.13 fps)

Pond 8P: Extended Detention Basin B-4



Summary for Pond 10P: Extended Detention Basin B-5

Inflow Area = 28.28 ac, 80.94% Impervious, Inflow Depth = 5.60" for 100yr event
Inflow = 124.25 cfs @ 12.08 hrs, Volume= 13.187 af
Outflow = 9.30 cfs @ 15.42 hrs, Volume= 8.981 af, Atten= 93%, Lag= 200.5 min
Primary = 9.30 cfs @ 15.42 hrs, Volume= 8.981 af
Routed to Link 11L : Design Point: B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 135.35' @ 15.42 hrs Surf.Area= 143,196 sf Storage= 376,771 cf

Plug-Flow detention time= 747.6 min calculated for 8.979 af (68% of inflow)
Center-of-Mass det. time= 634.2 min (1,485.6 - 851.4)

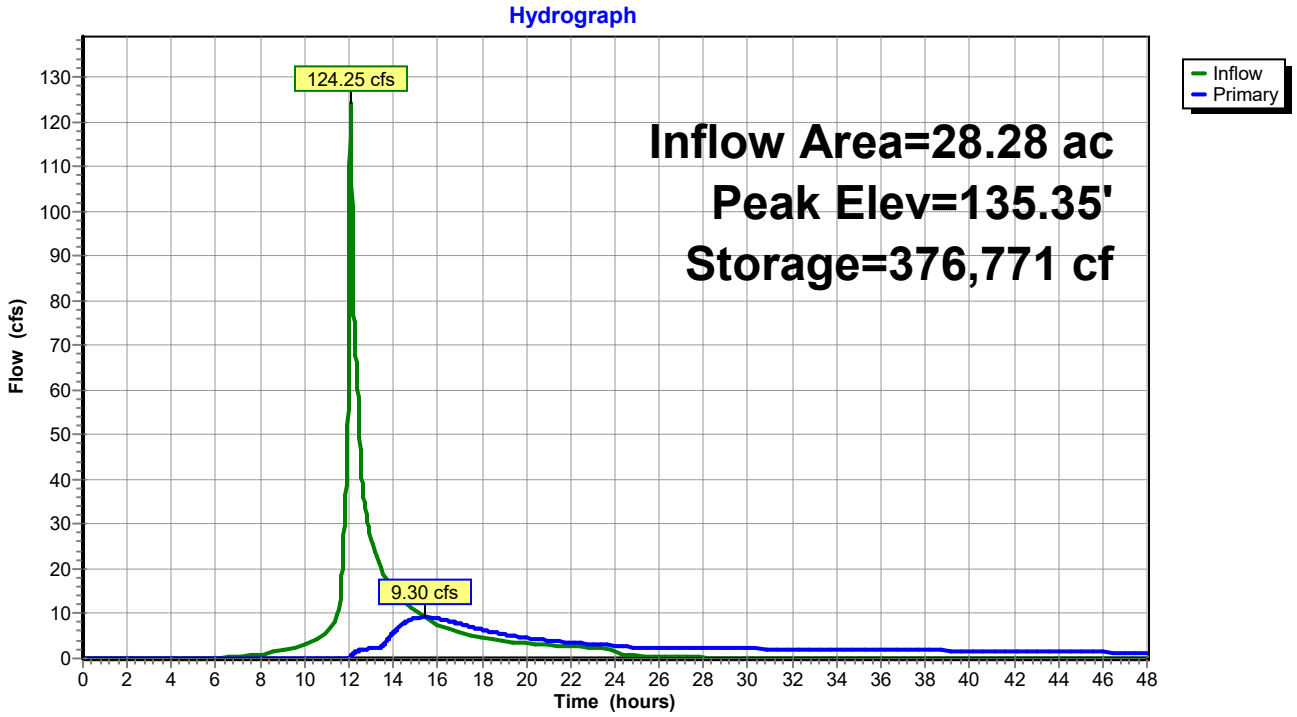
Volume	Invert	Avail.Storage	Storage Description
#1	132.50'	951,536 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.50	121,607	0	0
133.00	125,365	61,743	61,743
134.00	132,923	129,144	190,887
135.00	140,538	136,731	327,618
136.00	148,209	144,374	471,991
137.00	155,937	152,073	624,064
138.00	163,722	159,830	783,894
139.00	171,563	167,643	951,536

Device	Routing	Invert	Outlet Devices
#1	Primary	131.50'	**24.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 131.50' / 131.16' S= 0.0045 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	131.50'	**3.0" Vert. 3in Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	133.25'	**8.0" Vert. 8in Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	135.00'	**24.0" x 36.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=9.30 cfs @ 15.42 hrs HW=135.35' TW=132.50' (Dynamic Tailwater)
└**1=Culvert** (Passes 9.30 cfs of 25.31 cfs potential flow)
  ├**2=3in Orifice** (Orifice Controls 0.40 cfs @ 8.12 fps)
  ├**3=8in Orifice** (Orifice Controls 2.23 cfs @ 6.39 fps)
  └**4=Overflow CB** (Weir Controls 6.67 cfs @ 1.92 fps)

Pond 10P: Extended Detention Basin B-5



Summary for Pond 15P: Infiltration Basin D-2

Inflow Area = 7.58 ac, 66.75% Impervious, Inflow Depth = 5.71" for 100yr event
Inflow = 51.73 cfs @ 12.07 hrs, Volume= 3.606 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 16L : Design Point: D

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 135.67' @ 24.29 hrs Surf.Area= 44,788 sf Storage= 157,097 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

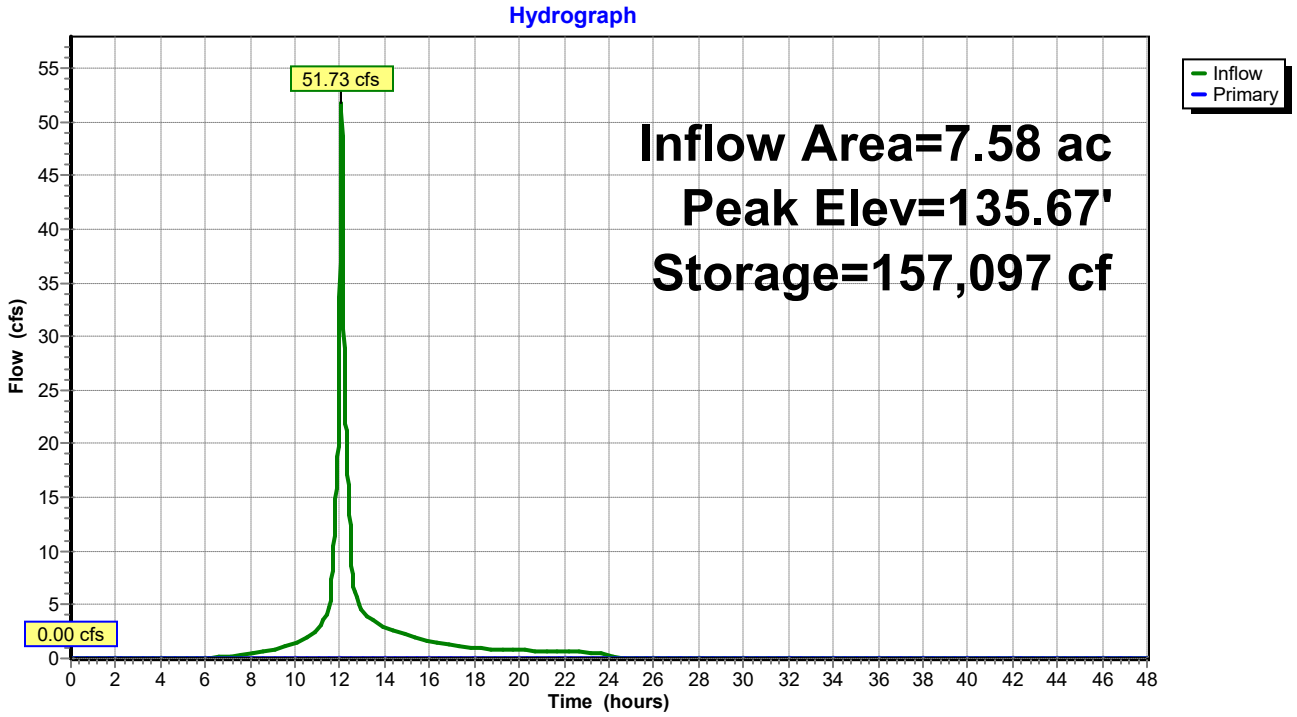
Volume	Invert	Avail.Storage	Storage Description
#1	131.50'	245,101 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
131.50	30,777	0	0
132.00	32,406	15,796	15,796
133.00	35,705	34,056	49,851
134.00	39,062	37,384	87,235
135.00	42,475	40,769	128,003
136.00	45,944	44,210	172,213
137.00	49,470	47,707	219,920
137.50	51,254	25,181	245,101

Device	Routing	Invert	Outlet Devices
#1	Primary	136.00'	**450.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=131.50' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 15P: Infiltration Basin D-2



Summary for Pond 19P: Infiltration Basin E-2

Inflow Area = 9.75 ac, 10.15% Impervious, Inflow Depth = 2.31" for 100yr event
Inflow = 14.79 cfs @ 12.39 hrs, Volume= 1.873 af
Outflow = 0.78 cfs @ 18.22 hrs, Volume= 0.366 af, Atten= 95%, Lag= 349.6 min
Primary = 0.78 cfs @ 18.22 hrs, Volume= 0.366 af
Routed to Pond 20P : Existing Basin E-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 140.03' @ 18.22 hrs Surf.Area= 48,323 sf Storage= 66,883 cf

Plug-Flow detention time= 519.5 min calculated for 0.366 af (20% of inflow)
Center-of-Mass det. time= 364.8 min (1,252.3 - 887.6)

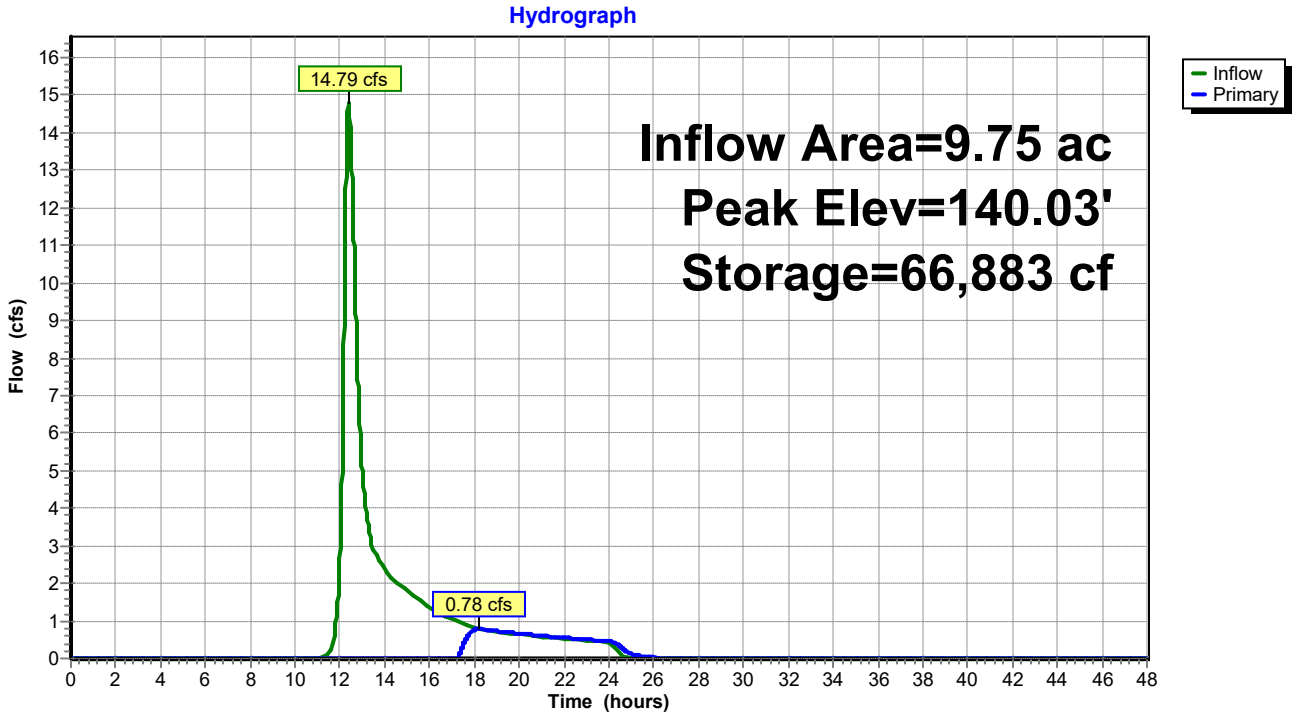
Volume	Invert	Avail.Storage	Storage Description
#1	138.50'	115,575 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
138.50	31,545	0	0
139.00	44,838	19,096	19,096
140.00	48,235	46,537	65,632
141.00	51,650	49,943	115,575

Device	Routing	Invert	Outlet Devices
#1	Primary	140.00'	**70.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.78 cfs @ 18.22 hrs HW=140.03' TW=131.51' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Weir Controls 0.78 cfs @ 0.43 fps)

Pond 19P: Infiltration Basin E-2



Summary for Pond 20P: Existing Basin E-1

Inflow Area = 15.56 ac, 6.36% Impervious, Inflow Depth = 0.76" for 100yr event
Inflow = 5.31 cfs @ 12.18 hrs, Volume= 0.990 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 21L : Design Point: E

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 132.14' @ 48.00 hrs Surf.Area= 35,333 sf Storage= 43,146 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

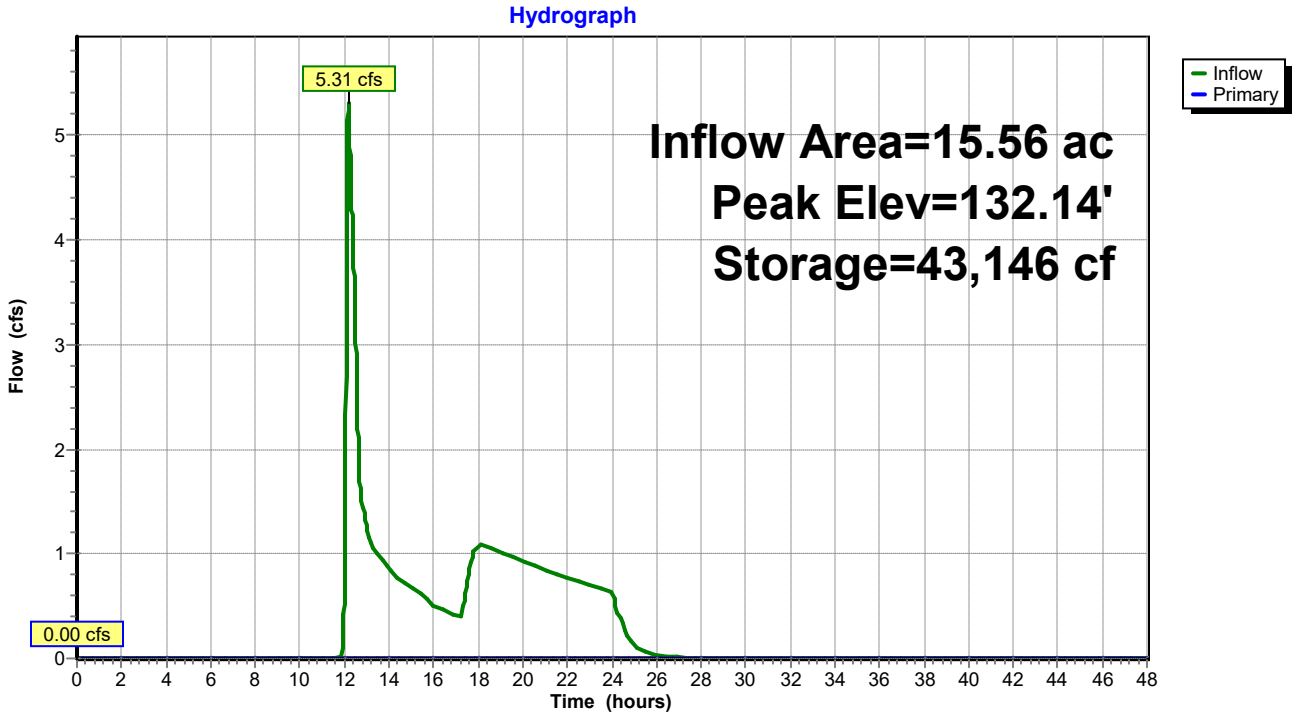
Volume	Invert	Avail.Storage	Storage Description
#1	130.20'	504,295 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.20	15,572	0	0
131.00	17,190	13,105	13,105
132.00	33,435	25,313	38,417
133.00	47,240	40,338	78,755
134.00	62,274	54,757	133,512
135.00	78,197	70,236	203,747
136.00	92,539	85,368	289,115
137.00	106,598	99,569	388,684
138.00	124,625	115,612	504,295

Device	Routing	Invert	Outlet Devices
#1	Primary	137.30'	**35.0' long + 3.0 '/' SideZ x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.20' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 20P: Existing Basin E-1



Summary for Pond 24P: Infiltration Basin F-2

Inflow Area = 2.41 ac, 51.45% Impervious, Inflow Depth = 5.47" for 100yr event
Inflow = 14.78 cfs @ 12.10 hrs, Volume= 1.099 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 27L : Design Point: F

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 133.78' @ 24.40 hrs Surf.Area= 15,905 sf Storage= 47,891 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

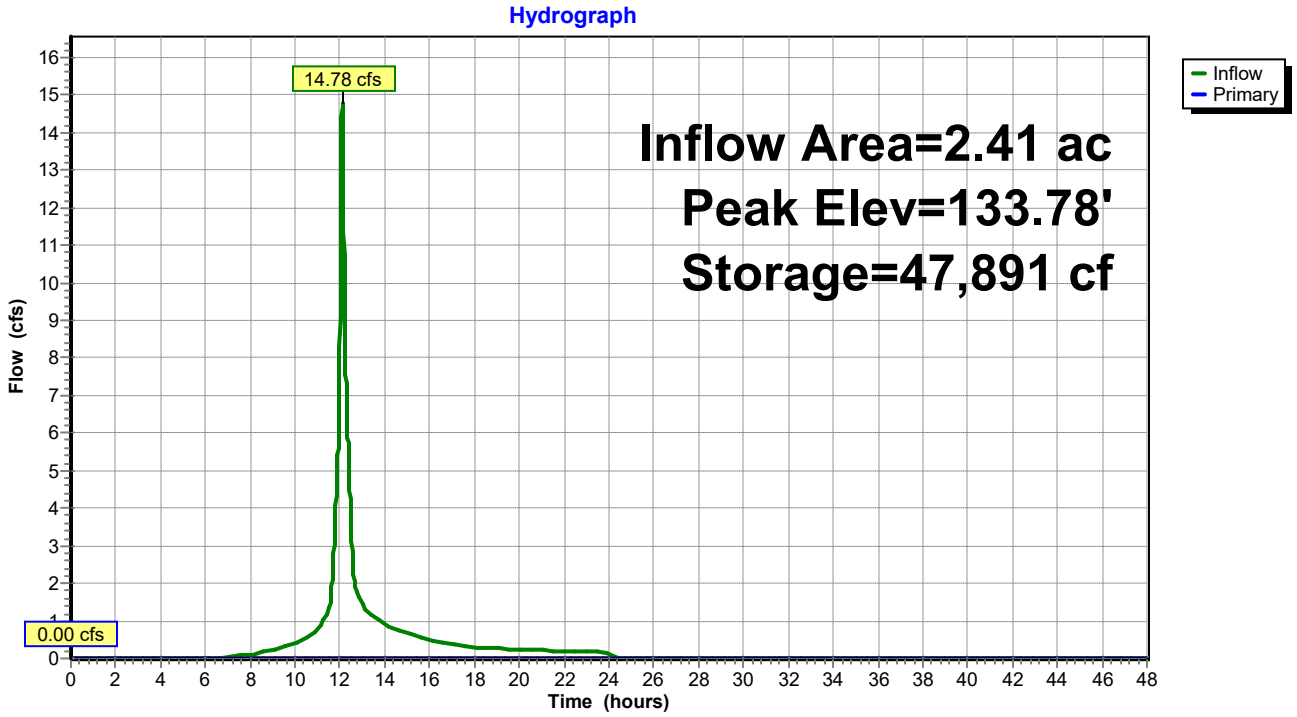
Volume	Invert	Avail.Storage	Storage Description
#1	130.00'	78,726 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
130.00	9,565	0	0
131.00	11,162	10,364	10,364
132.00	12,816	11,989	22,353
133.00	14,527	13,672	36,024
134.00	16,294	15,411	51,435
135.00	18,811	17,553	68,987
135.50	20,146	9,739	78,726

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**168.0' long + 3.0 '/' SideZ x 168.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=130.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 24P: Infiltration Basin F-2



Summary for Pond 26P: Infiltration Basin F-3

Inflow Area = 1.79 ac, 46.37% Impervious, Inflow Depth = 5.47" for 100yr event
Inflow = 11.78 cfs @ 12.07 hrs, Volume= 0.817 af
Outflow = 0.16 cfs @ 20.74 hrs, Volume= 0.047 af, Atten= 99%, Lag= 520.0 min
Primary = 0.16 cfs @ 20.74 hrs, Volume= 0.047 af
Routed to Link 27L : Design Point: F

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 135.51' @ 20.74 hrs Surf.Area= 9,965 sf Storage= 33,636 cf

Plug-Flow detention time= 774.5 min calculated for 0.047 af (6% of inflow)
Center-of-Mass det. time= 523.7 min (1,329.9 - 806.1)

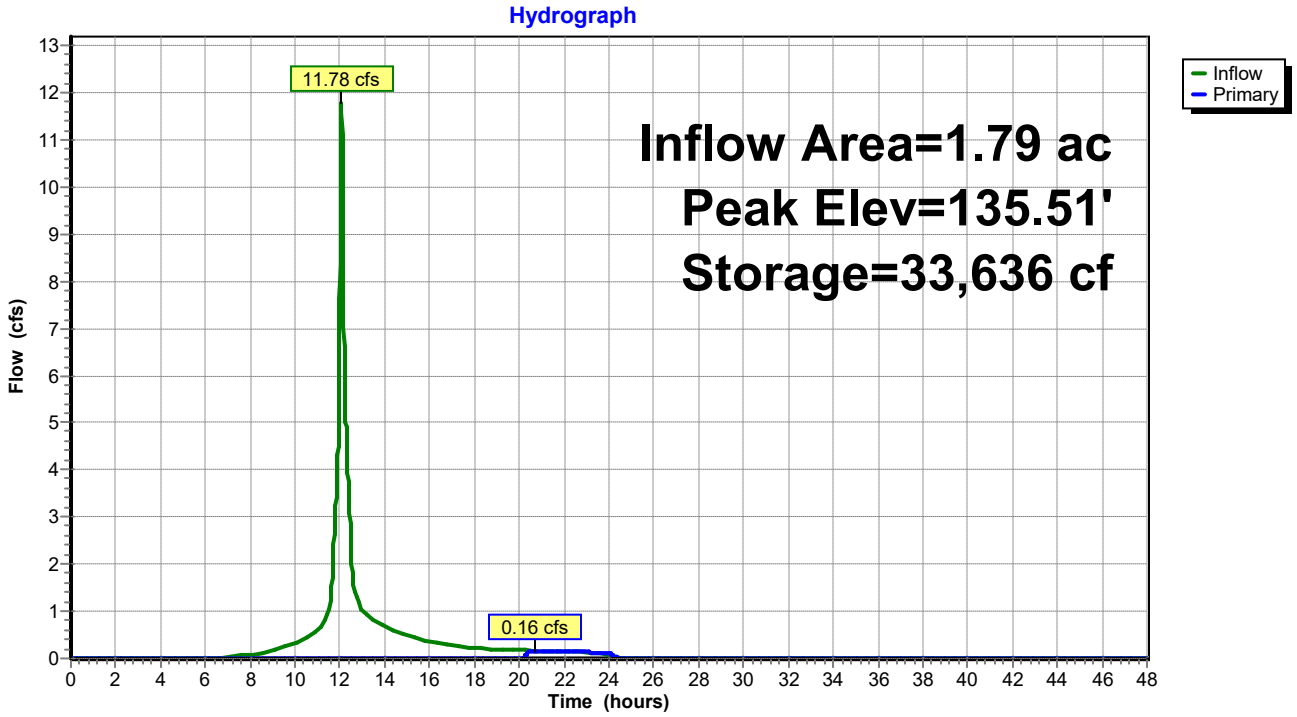
Volume	Invert	Avail.Storage	Storage Description
#1	131.00'	51,929 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
131.00	5,159	0	0
132.00	6,120	5,640	5,640
133.00	7,138	6,629	12,269
134.00	8,213	7,676	19,944
135.00	9,345	8,779	28,723
135.50	9,932	4,819	33,542
136.00	11,697	5,407	38,950
137.00	14,261	12,979	51,929

Device	Routing	Invert	Outlet Devices
#1	Primary	135.50'	**70.0' long + 3.0 '/' SideZ x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.16 cfs @ 20.74 hrs HW=135.51' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Weir Controls 0.16 cfs @ 0.25 fps)

Pond 26P: Infiltration Basin F-3



Summary for Pond 32P: Infiltration Basin G-2

Inflow Area = 0.56 ac, 28.57% Impervious, Inflow Depth = 4.66" for 100yr event
Inflow = 3.17 cfs @ 12.07 hrs, Volume= 0.217 af
Outflow = 0.07 cfs @ 17.48 hrs, Volume= 0.031 af, Atten= 98%, Lag= 324.2 min
Primary = 0.07 cfs @ 17.48 hrs, Volume= 0.031 af
Routed to Link 33L : Design Point: G

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 135.02' @ 17.48 hrs Surf.Area= 3,714 sf Storage= 8,180 cf

Plug-Flow detention time= 556.3 min calculated for 0.031 af (14% of inflow)
Center-of-Mass det. time= 393.3 min (1,214.6 - 821.3)

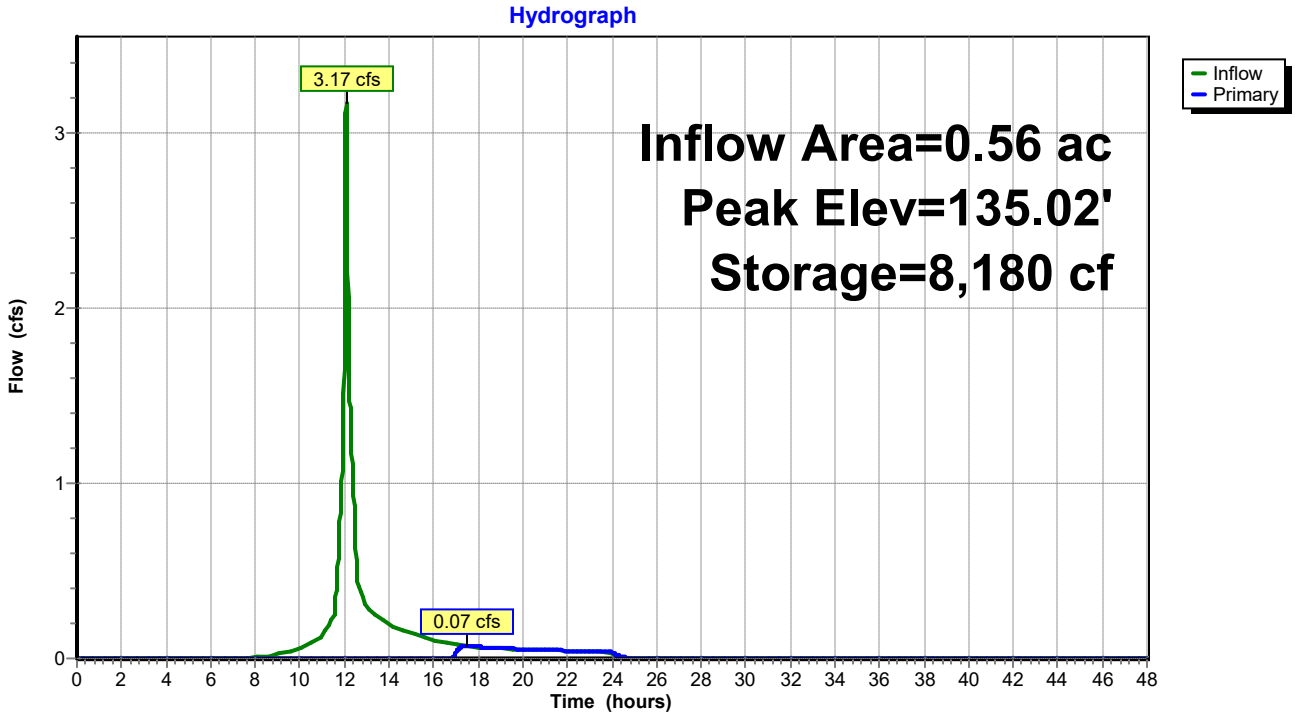
Volume	Invert	Avail.Storage	Storage Description
#1	132.00'	14,518 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.00	1,785	0	0
133.00	2,367	2,076	2,076
134.00	3,006	2,687	4,763
135.00	3,701	3,354	8,116
136.00	4,452	4,077	12,193
136.50	4,849	2,325	14,518

Device	Routing	Invert	Outlet Devices
#1	Primary	130.00'	**15.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 130.00' / 126.25' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf
#2	Device 1	135.00'	**24.0" x 36.0" Horiz. Overflow CB** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.07 cfs @ 17.48 hrs HW=135.02' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.07 cfs of 12.38 cfs potential flow)
↑—**2=Overflow CB** (Weir Controls 0.07 cfs @ 0.43 fps)

Pond 32P: Infiltration Basin G-2



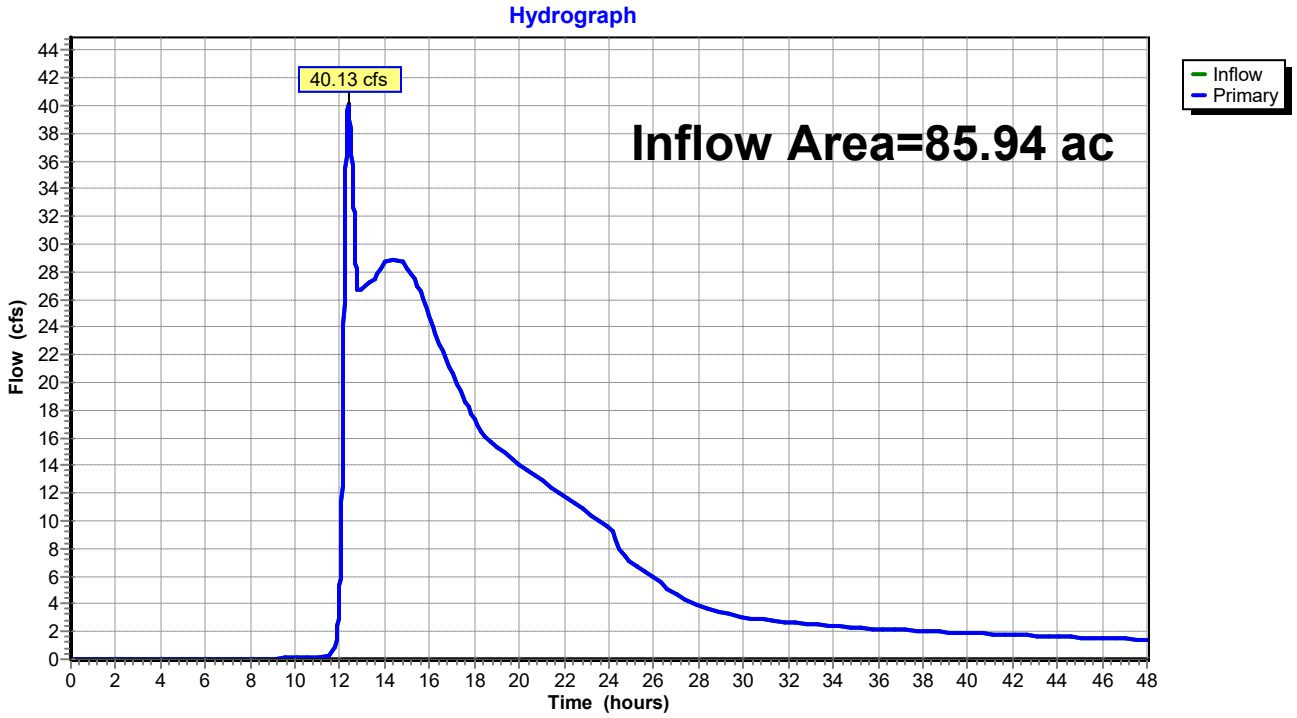
Summary for Link 11L: Design Point: B

Inflow Area = 85.94 ac, 56.17% Impervious, Inflow Depth > 3.47" for 100yr event
Inflow = 40.13 cfs @ 12.37 hrs, Volume= 24.822 af
Primary = 40.13 cfs @ 12.37 hrs, Volume= 24.822 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Fixed water surface Elevation= 132.50'

Link 11L: Design Point: B

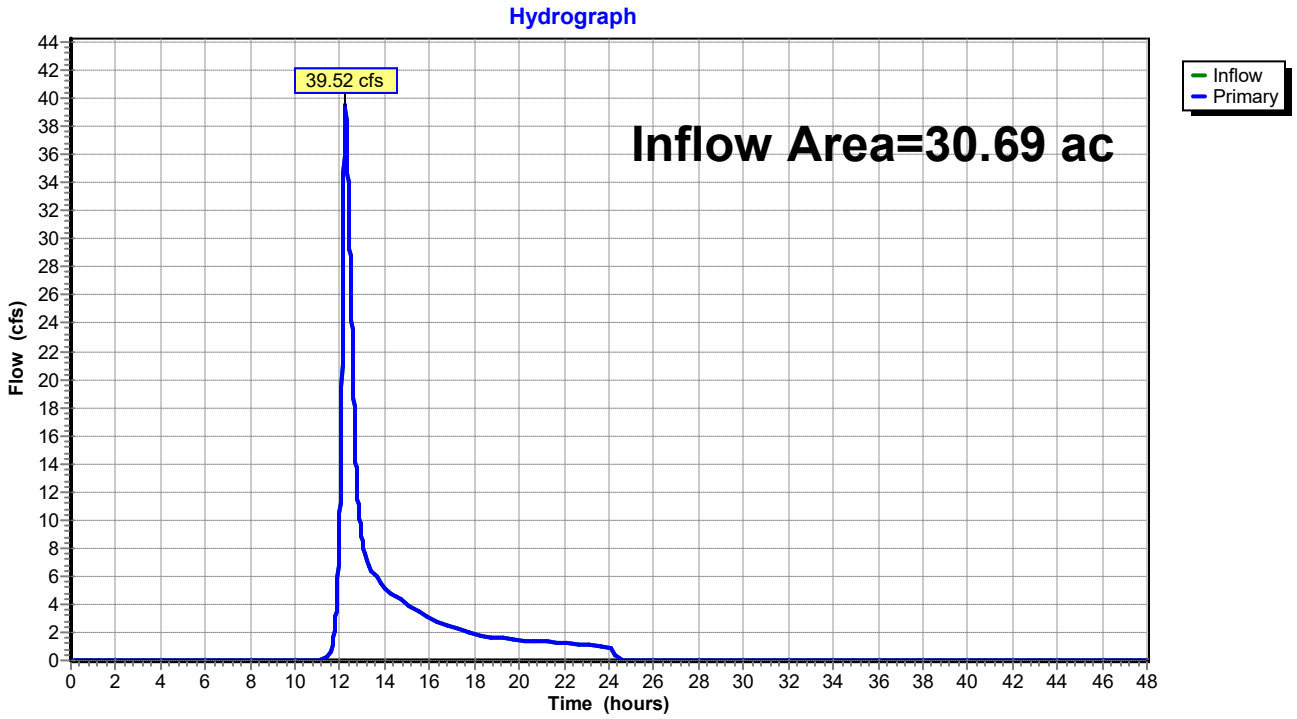


Summary for Link 16L: Design Point: D

Inflow Area = 30.69 ac, 16.49% Impervious, Inflow Depth = 1.66" for 100yr event
Inflow = 39.52 cfs @ 12.25 hrs, Volume= 4.235 af
Primary = 39.52 cfs @ 12.25 hrs, Volume= 4.235 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 16L: Design Point: D

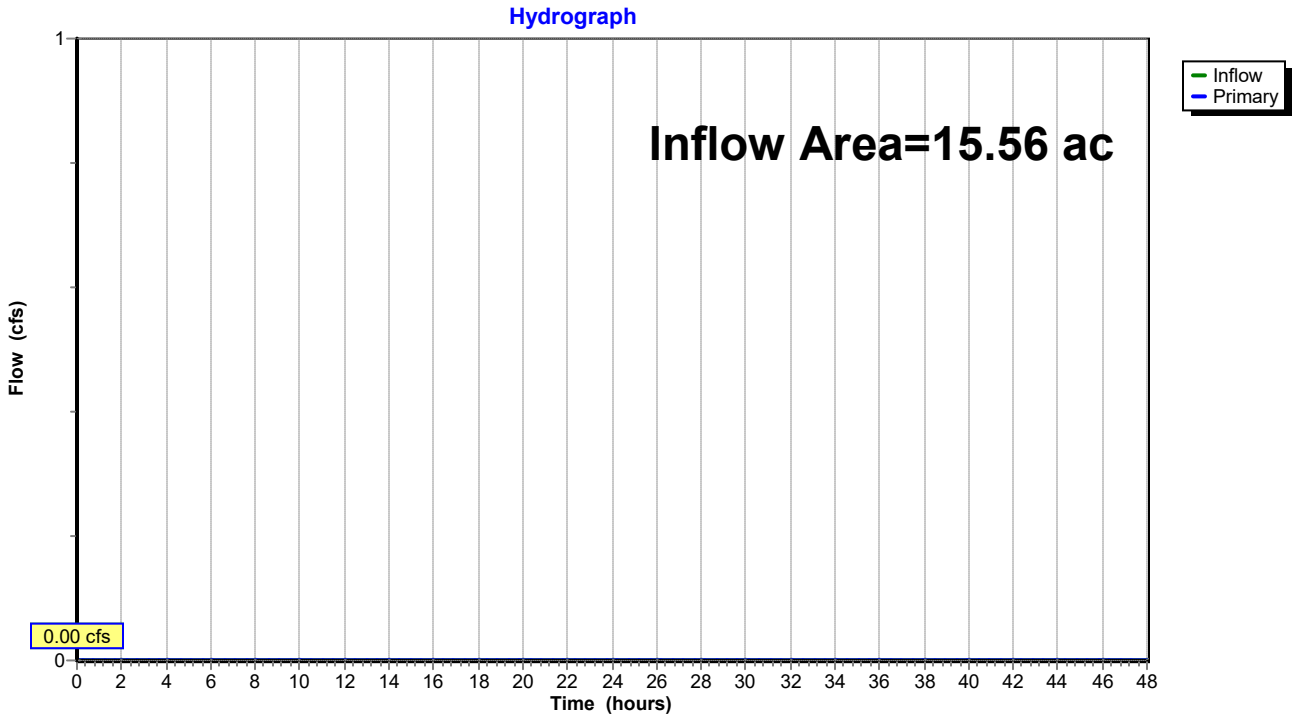


Summary for Link 21L: Design Point: E

Inflow Area = 15.56 ac, 6.36% Impervious, Inflow Depth = 0.00" for 100yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 21L: Design Point: E

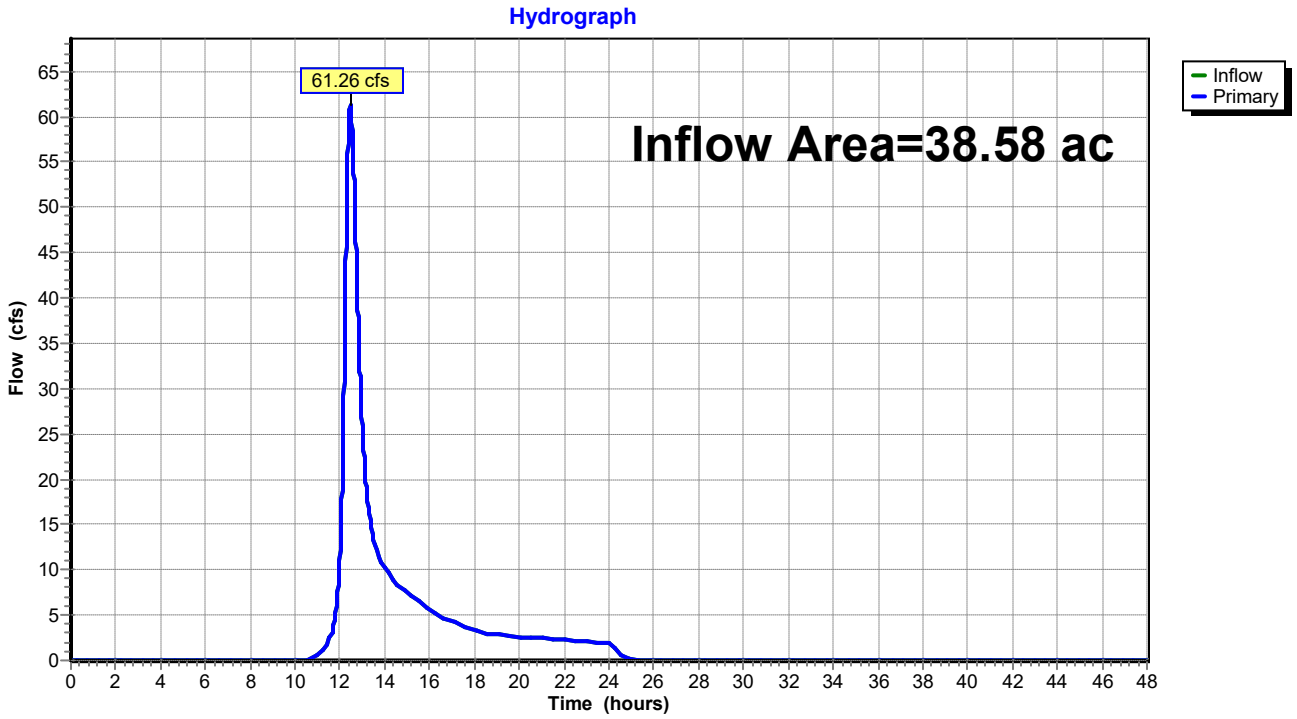


Summary for Link 27L: Design Point: F

Inflow Area = 38.58 ac, 5.37% Impervious, Inflow Depth = 2.55" for 100yr event
Inflow = 61.26 cfs @ 12.47 hrs, Volume= 8.200 af
Primary = 61.26 cfs @ 12.47 hrs, Volume= 8.200 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 27L: Design Point: F

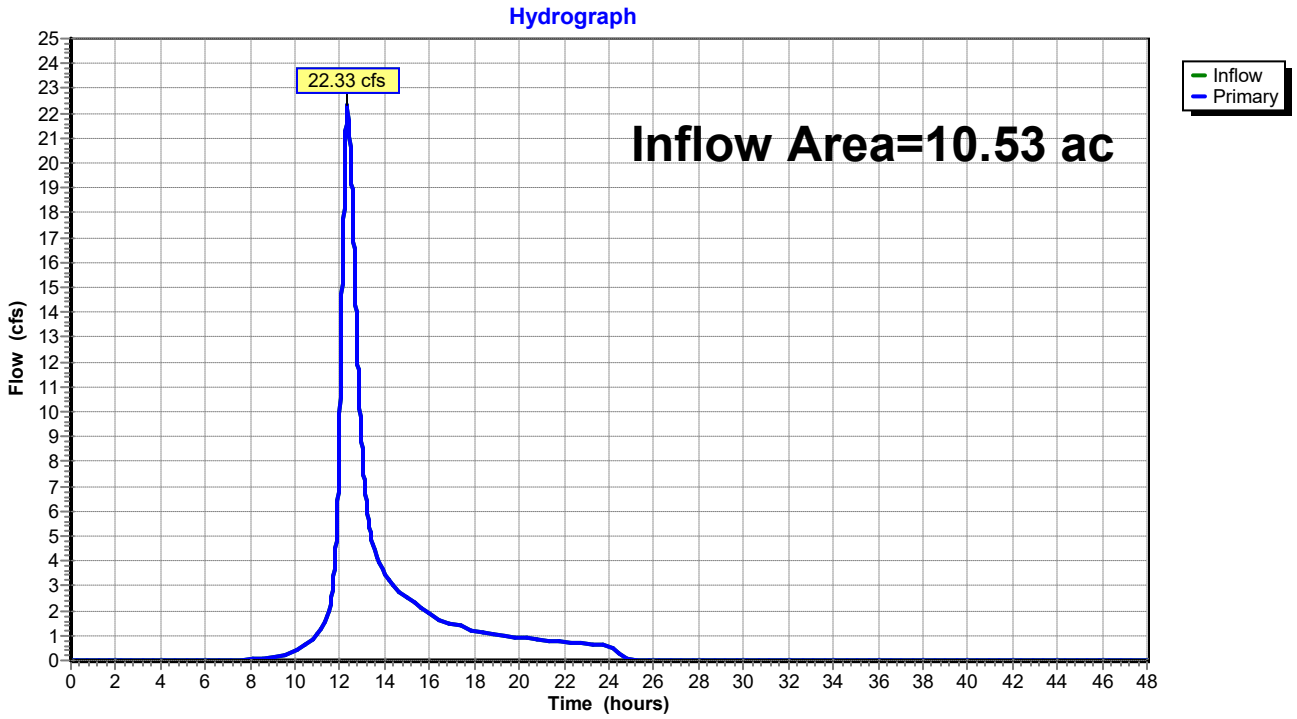


Summary for Link 33L: Design Point: G

Inflow Area = 10.53 ac, 9.31% Impervious, Inflow Depth = 3.62" for 100yr event
Inflow = 22.33 cfs @ 12.34 hrs, Volume= 3.176 af
Primary = 22.33 cfs @ 12.34 hrs, Volume= 3.176 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 33L: Design Point: G



APPENDIX C

Groundwater Recharge and Stormwater Quality Calculations

LANGAN

GROUNDWATER RECHARGE VOLUME CALCULATIONS

Methodology: Calculate Groundwater Recharge Volume (GRV)

Reference: Connecticut Stormwater Quality Manual, 2004

Applicable Site Information:

Approximate Area of HSG-A Soils	114.18	ac	57.5%	of Site
Approximate Area of HSG-B Soils	66.02	ac	33.3%	of Site
Approximate Area of HSG-C Soils	6.75	ac	3.4%	of Site
Approximate Area of HSG-D Soils	11.50	ac	5.8%	of Site
Total Site Area Analyzed	198.45	ac		
Proposed Impervious Site Coverage	57.42	ac		
Proposed Percent Impervious Coverage	28.93	%		

Groundwater Recharge Requirements: (Per CT Stormwater Quality Manual)

Req'd Recharge Depth for HSG-A Soils	0.40	in
Req'd Recharge Depth for HSG-B Soils	0.25	in
Req'd Recharge Depth for HSG-C Soils	0.10	in
Req'd Recharge Depth for HSG-D Soils	0.00	in

Calculate Weighted Groundwater Recharge Depth: (For Sites with Multiple HSG Soil Groups)

Soil Group	Recharge Depth (in)	% of Site	R*A
HSG-A	0.40	57.5%	0.230
HSG-B	0.25	33.3%	0.083
HSG-C	0.10	3.4%	0.003
HSG-D	0.00	5.8%	0.000
Weighted Groundwater Recharge Depth			0.316 in

Calculate Required Groundwater Recharge Volume for Site: (Per CT Stormwater Quality Manual)

Total Site Area (A)	198.45	ac	
Proposed Percent Impervious Coverage (I)	0.2893	dec	
Weighted Groundwater Recharge Depth	0.316	in	
Groundwater Recharge Volume (GRV)	**1.51**	**ac ft**	GRV = (D/12)*(A)*(I)
	65,865	**cf**	

	BY	JKH	DATE	4/27/2022	PROJ NO.	140225401
	CKD	TSO	DATE		SHEET	1 of 1

STORMWATER QUALITY CALCULATIONS

Methodology: Water Quality Volume and Flow

Reference: 2004 Stormwater Quality Manual

$$WQV = \frac{(1")(R)(A)}{12}$$

WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area (acres)

$$WQF = (q_u)(A)(Q)$$

WQF = water quality flow (cfs)
q_u = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)
= [WQV (acre-feet)]x[12 (inches/foot)] / Drainage area (acres)

Site Characteristics

Watershed ID:	**PrWS B-2**			
Area	23.96	acres	0.03744	mi^2
Impervious Area	22.13	acres		
Tc	5	min	0.083	hrs
I	92.4	%		
R = 0.05+ 0.009(I) =	0.881			
WQV =	**1.76**	**acre-ft**	76,647	cf
Q = WQV x 12/A =	0.88	inches		

determine qu using NRCS Runoff Curve Number

P = 1.0 inch

$$CN = \frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$$

CN = 99

Determine I_a, table 4-1 Chapter 4 TR-55

I_a = 0.041

Determine q_u, Exhibit 4-III Chapter 4 TR-55

q_u = 700 csm/in

WQF = 23.09 cfs

		BY	JKH	DATE	4/27/2022	PROJ NO.	140225401
		CKD	TSO	DATE		SHEET	1 of 10

STORMWATER QUALITY CALCULATIONS

Methodology: Water Quality Volume and Flow

Reference: 2004 Stormwater Quality Manual

$$WQV = \frac{(1")(R)(A)}{12}$$

WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area (acres)

$$WQF = (q_u)(A)(Q)$$

WQF = water quality flow (cfs)
q_u = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)
= [WQV (acre-feet)]x[12 (inches/foot)] / Drainage area (acres)

Site Characteristics

Watershed ID:	**PrWS B-3**		
Area	11.97	acres	0.01870 mi^2
Impervious Area	11.97	acres	
Tc	5	min	0.083 hrs
I	100.0	%	
R = 0.05+ 0.009(I) =	0.950		
WQV =	**0.95**	**acre-ft**	41,279 cf
Q = WQV x 12/A =	0.95	inches	

determine qu using NRCS Runoff Curve Number

P = 1.0 inch

$$CN = \frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$$

CN = 100

Determine I_a, table 4-1 Chapter 4 TR-55

I_a = 0.041

Determine q_u, Exhibit 4-III Chapter 4 TR-55

q_u = 700 csm/in

WQF = 12.44 cfs

		BY	JKH	DATE	4/27/2022	PROJ NO.	140225401
		CKD	TSO	DATE		SHEET	2 of 10

STORMWATER QUALITY CALCULATIONS

Methodology: Water Quality Volume and Flow

Reference: 2004 Stormwater Quality Manual

$$WQV = \frac{(1")(R)(A)}{12}$$

WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area (acres)

$$WQF = (q_u)(A)(Q)$$

WQF = water quality flow (cfs)
q_u = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)
= [WQV (acre-feet)]x[12 (inches/foot)] / Drainage area (acres)

Site Characteristics

Watershed ID:	**PrWS B-4**		
Area	7.41	acres	0.01158 mi^2
Impervious Area	2.67	acres	
Tc	10	min	0.167 hrs
I	36.0	%	
R = 0.05+ 0.009(I) =	0.374		
WQV =	**0.23**	**acre-ft**	10,068 cf
Q = WQV x 12/A =	0.37	inches	

determine qu using NRCS Runoff Curve Number

P = 1.0 inch

$$CN = \frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$$

CN = 91

Determine I_a, table 4-1 Chapter 4 TR-55

I_a = 0.198

Determine q_u, Exhibit 4-III Chapter 4 TR-55

q_u = 550 csm/in

WQF = 2.38 cfs

		BY	JKH	DATE	4/27/2022	PROJ NO.	140225401
		CKD	TSO	DATE		SHEET	3 of 10

STORMWATER QUALITY CALCULATIONS

Methodology: Water Quality Volume and Flow

Reference: 2004 Stormwater Quality Manual

$$WQV = \frac{(1")(R)(A)}{12}$$

WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area (acres)

$$WQF = (q_u)(A)(Q)$$

WQF = water quality flow (cfs)
q_u = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)
= [WQV (acre-feet)]x[12 (inches/foot)] / Drainage area (acres)

Site Characteristics

Watershed ID:	**PrWS B-5**			
Area	16.31	acres	0.02548	mi^2
Impervious Area	10.92	acres		
Tc	5	min	0.083	hrs
I	67.0	%		
R = 0.05+ 0.009(I) =	0.653			
WQV =	**0.89**	**acre-ft**	38,636	cf

Q = WQV x 12/A = 0.65 inches

determine qu using NRCS Runoff Curve Number

P = 1.0 inch

$$CN = \frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$$

CN = 96

Determine I_a, table 4-1 Chapter 4 TR-55

I_a = 0.083

Determine q_u, Exhibit 4-III Chapter 4 TR-55

q_u = 700 csm/in

WQF = 11.64 cfs

		BY	JKH	DATE	4/27/2022	PROJ NO.	140225401
		CKD	TSO	DATE		SHEET	4 of 10

STORMWATER QUALITY CALCULATIONS

Methodology: Water Quality Volume and Flow

Reference: 2004 Stormwater Quality Manual

$$WQV = \frac{(1")(R)(A)}{12}$$

WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area (acres)

$$WQF = (q_u)(A)(Q)$$

WQF = water quality flow (cfs)
q_u = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)
= [WQV (acre-feet)]x[12 (inches/foot)] / Drainage area (acres)

Site Characteristics

Watershed ID: **PrWS D-2**

Area	7.58	acres	0.01184	mi^2
Impervious Area	5.06	acres		
Tc	5	min	0.083	hrs
I	66.8	%		
R = 0.05+ 0.009(I) =	0.651			
WQV =	**0.41**	**acre-ft**	17,907	cf
Q = WQV x 12/A =	0.65	inches		

determine qu using NRCS Runoff Curve Number

P = 1.0 inch

$$CN = \frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$$

CN = 96

Determine I_a, table 4-1 Chapter 4 TR-55

I_a = 0.083

Determine q_u, Exhibit 4-III Chapter 4 TR-55

q_u = 700 csm/in

WQF = 5.40 cfs

		BY	JKH	DATE	4/27/2022	PROJ NO.	140225401
		CKD	TSO	DATE		SHEET	5 of 10

STORMWATER QUALITY CALCULATIONS

Methodology: Water Quality Volume and Flow

Reference: 2004 Stormwater Quality Manual

$$WQV = \frac{(1")(R)(A)}{12}$$

WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area (acres)

$$WQF = (q_u)(A)(Q)$$

WQF = water quality flow (cfs)
q_u = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)
= [WQV (acre-feet)]x[12 (inches/foot)] / Drainage area (acres)

Site Characteristics

Watershed ID: **PrWS F-2**

Area	2.41	acres	0.00377 mi^2
Impervious Area	1.24	acres	
Tc	7	min	0.117 hrs
I	51.5	%	
R = 0.05+ 0.009(I) =	0.513		
WQV =	**0.10**	**acre-ft**	4,488 cf
Q = WQV x 12/A =	0.51	inches	

determine qu using NRCS Runoff Curve Number

P = 1.0 inch

$$CN = \frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$$

CN = 94

Determine I_a, table 4-1 Chapter 4 TR-55

I_a = 0.128

Determine q_u, Exhibit 4-III Chapter 4 TR-55

q_u = 625 csm/in

WQF = **1.21** cfs

		BY	JKH	DATE	4/27/2022	PROJ NO.	140225401
		CKD	TSO	DATE		SHEET	6 of 10

STORMWATER QUALITY CALCULATIONS

Methodology: Water Quality Volume and Flow

Reference: 2004 Stormwater Quality Manual

$$WQV = \frac{(1")(R)(A)}{12}$$

WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area (acres)

$$WQF = (q_u)(A)(Q)$$

WQF = water quality flow (cfs)
q_u = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)
= [WQV (acre-feet)]x[12 (inches/foot)] / Drainage area (acres)

Site Characteristics

Watershed ID:	**PrWS F-3**		
Area	1.79 acres	0.00280	mi^2
Impervious Area	0.83 acres		
Tc	5 min	0.083	hrs
I	46.4 %		
R = 0.05+ 0.009(I) =	0.467		
WQV =	**0.07 acre-ft**	3,036	cf
Q = WQV x 12/A =	0.47 inches		

determine qu using NRCS Runoff Curve Number

P = 1.0 inch

$$CN = \frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$$

CN = 93

Determine I_a, table 4-1 Chapter 4 TR-55

I_a = 0.151

Determine q_u, Exhibit 4-III Chapter 4 TR-55

q_u = 625 csm/in

WQF = 0.82 cfs

		BY	JKH	DATE	4/27/2022	PROJ NO.	140225401
		CKD	TSO	DATE		SHEET	7 of 10

STORMWATER QUALITY CALCULATIONS

Methodology: Water Quality Volume and Flow

Reference: 2004 Stormwater Quality Manual

$$WQV = \frac{(1")(R)(A)}{12}$$

WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area (acres)

$$WQF = (q_u)(A)(Q)$$

WQF = water quality flow (cfs)
q_u = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)
= [WQV (acre-feet)]x[12 (inches/foot)] / Drainage area (acres)

Site Characteristics

Watershed ID:	**PrWS G-1a**		
Area	4.52 acres	0.00706	mi^2
Impervious Area	0.43 acres		
Tc	21 min	0.350	hrs
I	9.5 %		
R = 0.05+ 0.009(I) =	0.136		
WQV =	**0.05 acre-ft**	2,225	cf
Q = WQV x 12/A =	0.14 inches		

determine qu using NRCS Runoff Curve Number

P = 1.0 inch

$$CN = \frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$$

CN = 83

Determine I_a, table 4-1 Chapter 4 TR-55

I_a = 0.410

Determine q_u, Exhibit 4-III Chapter 4 TR-55

q_u = 310 csm/in

WQF = 0.30 cfs

STORMWATER QUALITY CALCULATIONS

Methodology: Water Quality Volume and Flow

Reference: 2004 Stormwater Quality Manual

$$WQV = \frac{(1")(R)(A)}{12}$$

WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area (acres)

$$WQF = (q_u)(A)(Q)$$

WQF = water quality flow (cfs)
q_u = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)
= [WQV (acre-feet)]x[12 (inches/foot)] / Drainage area (acres)

Site Characteristics

Watershed ID: **PrWS G-1c**

Area	0.82	acres	0.00128	mi^2
Impervious Area	0.39	acres		
Tc	5	min	0.083	hrs
I	47.6	%		
R = 0.05+ 0.009(I) =	0.478			
WQV =	**0.03**	**acre-ft**	1,423	cf
Q = WQV x 12/A =	0.48	inches		

determine qu using NRCS Runoff Curve Number

P = 1.0 inch

$$CN = \frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$$

CN = 94

Determine I_a, table 4-1 Chapter 4 TR-55

I_a = 0.128

Determine q_u, Exhibit 4-III Chapter 4 TR-55

q_u = 625 csm/in

WQF = 0.38 cfs

		BY	JKH	DATE	4/27/2022	PROJ NO.	140225401
		CKD	TSO	DATE		SHEET	9 of 10

STORMWATER QUALITY CALCULATIONS

Methodology: Water Quality Volume and Flow

Reference: 2004 Stormwater Quality Manual

$$WQV = \frac{(1")(R)(A)}{12}$$

WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area (acres)

$$WQF = (q_u)(A)(Q)$$

WQF = water quality flow (cfs)
q_u = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)
= [WQV (acre-feet)]x[12 (inches/foot)] / Drainage area (acres)

Site Characteristics

Watershed ID:	**PrWS G-2**		
Area	0.56 acres	0.00088	mi^2
Impervious Area	0.16 acres		
Tc	5 min	0.083	hrs
I	28.6 %		
R = 0.05+ 0.009(I) =	0.307		
WQV =	**0.01 acre-ft**	624	cf

Q = WQV x 12/A = 0.31 inches

determine qu using NRCS Runoff Curve Number

P = 1.0 inch

$$CN = \frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$$

CN = 90

Determine I_a, table 4-1 Chapter 4 TR-55

I_a = 0.222

Determine q_u, Exhibit 4-III Chapter 4 TR-55

q_u = 625 csm/in

WQF = 0.17 cfs

		BY	JKH	DATE	4/27/2022	PROJ NO.	140225401
		CKD	TSO	DATE		SHEET	10 of 10

Langan
Engineering and Environmental Services

APPENDIX D

Stormwater Collection System Calculations

LANGAN

Project **Project Highlands** By **ALF** Date **4/28/2022**

Location **210 Shunpike Road, Cromwell, CT** Checked **TSO** Date **5/3/2022**

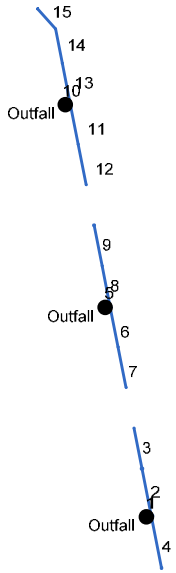
Circle one: Present (Developed) Job No. **140225401**

1. Rational 'C' Runoff Coefficient & Area Calculations

Catchment Area	Total Area		Impervious (C=.9)		Pervious (C=0.3)		Percent Impervious	C
	SF	AC	SF	AC	SF	AC		
RL B2-1	17,980	0.413	17,980	0.413	0	0.000	100%	0.90
RL B2-2	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-3	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-4	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-5	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-6	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-7	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-8	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-9	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-10	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-11	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-12	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-13	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-14	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-15	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B2-16	726	0.017	726	0.017	0	0.000	100%	0.90
RL B2-17	726	0.017	726	0.017	0	0.000	100%	0.90
CLCB B2-1	37,206	0.854	35,208	0.808	1,998	0.046	95%	0.87
CLCB B2-2	37,206	0.854	35,208	0.808	1,998	0.046	95%	0.87
CLCB B2-3	28,775	0.661	15,990	0.367	12,785	0.294	56%	0.63
CCB B2-4	9,794	0.225	5,042	0.116	4,752	0.109	51%	0.61
CLCB B2-5	37,206	0.854	35,208	0.808	1,998	0.046	95%	0.87
CLCB B2-6	37,206	0.854	35,208	0.808	1,998	0.046	95%	0.87
CLCB B2-7	37,206	0.854	35,208	0.808	1,998	0.046	95%	0.87
CLCB B2-8	37,206	0.854	35,208	0.808	1,998	0.046	95%	0.87
CLCB B2-9	37,206	0.854	35,208	0.808	1,998	0.046	95%	0.87
CLCB B2-10	37,206	0.854	35,208	0.808	1,998	0.046	95%	0.87
CLCB B2-11	37,206	0.854	35,208	0.808	1,998	0.046	95%	0.87
CLCB B2-12	24,874	0.571	16,461	0.378	8,414	0.193	66%	0.70
DOUBLE CLCB B2-13	50,613	1.162	39,260	0.901	11,353	0.261	78%	0.77
CLCB B2-14	37,206	0.854	35,208	0.808	1,998	0.046	95%	0.87
CLCB B2-15	46,573	1.069	16,355	0.375	30,218	0.694	35%	0.51
RL B3-1	17,980	0.413	17,980	0.413	0	0.000	100%	0.90
RL B3-2	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B3-3	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B3-4	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B3-5	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B3-6	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B3-7	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B3-8	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B3-9	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B3-10	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B3-11	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B3-12	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B3-13	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
RL B3-14	35,960	0.826	35,960	0.826	0	0.000	100%	0.90

RL B3-15	35,960	0.826	35,960	0.826	0	0.000	100%	0.90
CLCB B4-1	39,582	0.909	37,641	0.864	1,941	0.045	95%	0.87
CLCB B4-2	37,740	0.866	37,740	0.866	0	0.000	100%	0.90
CCB B4-3	32,364	0.743	11,348	0.261	21,015	0.482	35%	0.51
CCB B4-4	30,664	0.704	6,622	0.152	24,042	0.552	22%	0.43
CCB B4-5	12,696	0.291	7,146	0.164	5,550	0.127	56%	0.64
DOUBLE CCB B4-6	53,030	1.217	4,745	0.109	48,285	1.108	9%	0.35
CCB B4-7	31,298	0.719	4,820	0.111	26,479	0.608	15%	0.39
CCB B4-8	37,902	0.870	8,623	0.198	29,279	0.672	23%	0.44
CLCB B5-1	41,580	0.955	41,580	0.955	0	0.000	100%	0.90
CLCB B5-2	41,580	0.955	41,580	0.955	0	0.000	100%	0.90
CLCB B5-3	41,580	0.955	41,580	0.955	0	0.000	100%	0.90
CLCB B5-4	41,580	0.955	41,580	0.955	0	0.000	100%	0.90
CLCB B5-5	41,580	0.955	41,580	0.955	0	0.000	100%	0.90
CLCB B5-6	41,580	0.955	41,580	0.955	0	0.000	100%	0.90
CLCB B5-7	41,580	0.955	41,580	0.955	0	0.000	100%	0.90
CLCB B5-8	41,580	0.955	41,580	0.955	0	0.000	100%	0.90
CLCB B5-9	41,163	0.945	40,256	0.924	907	0.021	98%	0.89
CLCB B5-10	30,434	0.699	26,875	0.617	3,559	0.082	88%	0.83
CCB B5-11	38,468	0.883	28,129	0.646	10,339	0.237	73%	0.74
CCB B5-12	27,999	0.643	22,897	0.526	5,102	0.117	82%	0.79
CCB B5-13	39,135	0.898	28,039	0.644	11,096	0.255	72%	0.73
CLCB D2-1	30,660	0.704	26,269	0.603	4,391	0.101	86%	0.81
CLCB D2-2	21,879	0.502	18,669	0.429	3,210	0.074	85%	0.81
CLCB D2-3	25,850	0.593	21,835	0.501	4,015	0.092	84%	0.81
CLCB D2-4	26,084	0.599	21,489	0.493	4,595	0.105	82%	0.79
CLCB D2-5	24,942	0.573	23,134	0.531	1,808	0.042	93%	0.86
CLCB D2-6	19,339	0.444	16,002	0.367	3,337	0.077	83%	0.80
DOUBLE CLCB D2-7	56,979	1.308	40,345	0.926	16,634	0.382	71%	0.72
CLCB D2-8	41,580	0.955	41,580	0.955	0	0.000	100%	0.90
CCB D2-9	13,238	0.304	12,416	0.285	822	0.019	94%	0.86
DOUBLE CCB G1-1	28,706	0.659	13,259	0.304	15,447	0.355	46%	0.58
CCB G1-2	6,945	0.159	4,309	0.099	2,636	0.061	62%	0.67

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



Project File: Network B-2 - Prkg Lot CBs.stm	Number of lines: 15	Date: 4/28/2022

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	13.000	0.57	3.66	0.70	0.40	2.58	5.0	6.6	8.0	20.68	35.54	4.21	30	1.00	134.25	134.38	136.84	136.88	137.54	140.34	PIPE-133
2	1	126.000	1.16	2.02	0.77	0.89	1.64	5.0	5.8	8.5	13.84	25.13	2.82	30	0.50	134.38	135.01	137.50	137.69	140.34	139.26	PIPE-178
3	2	108.000	0.85	0.85	0.87	0.74	0.74	5.0	5.0	9.0	6.71	13.86	2.14	24	0.50	135.01	135.55	137.75	137.88	139.26	139.26	PIPE-130
4	1	138.684	1.07	1.07	0.51	0.55	0.55	5.0	5.0	9.0	4.92	10.79	2.79	18	0.90	134.38	135.63	137.50	137.76	140.34	139.36	PIPE-132
5	End	13.000	0.85	4.27	0.87	0.74	3.72	5.0	6.5	8.0	29.85	44.77	4.64	36	0.60	134.25	134.33	136.84	136.86	137.54	140.58	PIPE-131
6	5	108.000	0.85	1.71	0.87	0.74	1.49	5.0	5.8	8.5	12.56	27.53	2.56	30	0.60	134.33	134.98	137.63	137.76	140.58	139.26	PIPE-174
7	6	108.000	0.85	0.85	0.87	0.74	0.74	5.0	5.0	9.0	6.71	15.18	2.14	24	0.60	134.98	135.62	137.82	137.94	139.26	139.26	PIPE-127
8	5	108.000	0.85	1.71	0.87	0.74	1.49	5.0	5.8	8.5	12.56	27.53	2.56	30	0.60	134.33	134.98	137.63	137.76	140.58	139.26	PIPE-177
9	8	108.000	0.85	0.85	0.87	0.74	0.74	5.0	5.0	9.0	6.71	15.18	2.14	24	0.60	134.98	135.62	137.82	137.94	139.26	139.26	PIPE-176
10	End	13.000	0.85	4.30	0.87	0.74	3.53	5.0	7.6	7.5	26.37	27.53	5.37	30	0.60	134.25	134.33	136.84	136.91	137.54	140.09	PIPE-125
11	10	108.000	0.85	1.71	0.87	0.74	1.49	5.0	5.8	8.5	12.56	25.13	2.56	30	0.50	134.33	134.87	137.92	138.06	140.09	139.26	PIPE-172
12	11	108.000	0.85	0.85	0.87	0.74	0.74	5.0	5.0	9.0	6.71	13.86	2.14	24	0.50	134.87	135.41	138.11	138.23	139.26	139.26	PIPE-124
13	10	108.000	0.85	1.74	0.87	0.74	1.30	5.0	6.8	7.9	10.26	25.13	2.09	30	0.50	134.33	134.87	137.92	138.01	140.09	139.26	PIPE-120
14	13	90.866	0.66	0.89	0.63	0.42	0.55	5.0	5.7	8.5	4.71	13.86	1.50	24	0.50	134.87	135.32	138.05	138.10	139.26	139.26	PIPE-119
15	14	70.716	0.22	0.22	0.61	0.14	0.14	5.0	5.0	9.0	1.24	4.73	1.58	12	1.50	135.32	136.38	138.13	138.20	139.26	140.37	PIPE-171

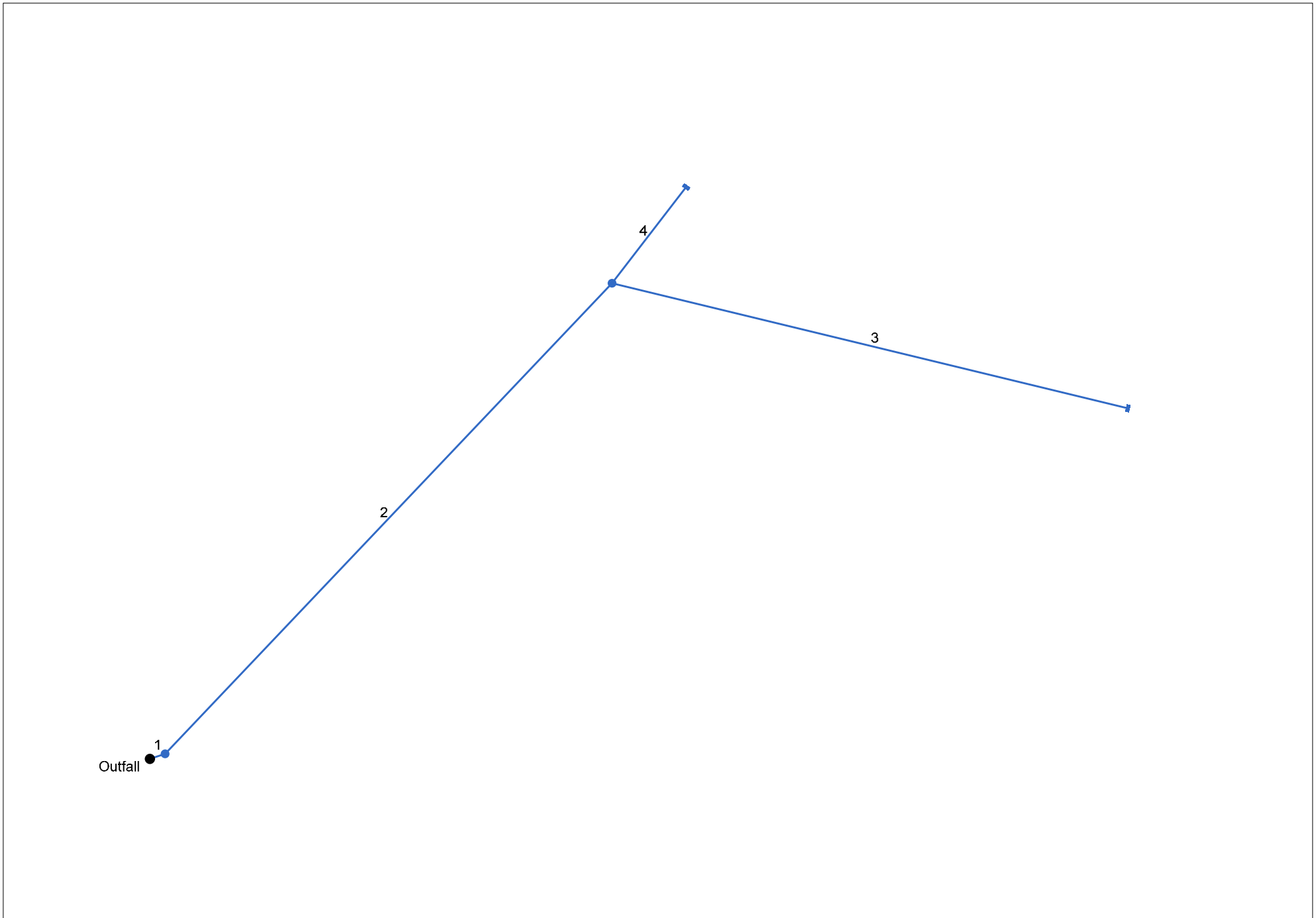
Project File: Network B-2 - Prkg Lot CBs.stm

Number of lines: 15

Run Date: 4/28/2022

NOTES:Intensity = 44.57 / (Inlet time + 3.90) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

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



Project File: Network B (Outfall).stm	Number of lines: 4	Date: 5/2/2022

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	9.289	0.00	0.00	0.00	0.00	0.00	0.0	4.5	0.0	10.08	41.06	1.61	36	0.32	130.00	130.03	132.50	132.50	133.33	134.19	PIPE-189
2	1	377.185	0.00	0.00	0.00	0.00	0.00	0.0	1.7	0.0	10.08	39.55	2.28	36	0.30	130.03	131.16	132.52	132.62	134.19	139.94	PIPE-188 (1)
3	2	307.748	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	7.85	37.75	3.02	36	0.27	131.16	132.00	132.74	132.97	139.94	135.84	PIPE-186
4	2	70.736	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.23	16.99	2.14	24	0.48	131.16	131.50	132.74	132.02	139.94	134.17	PIPE-188

Project File: Network B (Outfall).stm

Number of lines: 4

Run Date: 5/2/2022

NOTES:Intensity = 44.57 / (Inlet time + 3.90) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

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	9.289	0.00	0.00	0.00	0.00	0.00	0.0	2.6	0.0	29.59	41.06	4.72	36	0.32	130.00	130.03	132.50	132.51	133.33	134.19	PIPE-189
2	1	377.185	0.00	0.00	0.00	0.00	0.00	0.0	1.4	0.0	29.59	39.55	5.04	36	0.30	130.03	131.16	132.70	133.25	134.19	139.94	PIPE-188 (1)
3	2	307.748	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	20.24	37.75	3.73	36	0.27	131.16	132.00	133.69	133.90	139.94	135.84	PIPE-186
4	2	70.736	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	9.35	16.99	2.98	24	0.48	131.16	131.50	133.69	133.79	139.94	134.17	PIPE-188

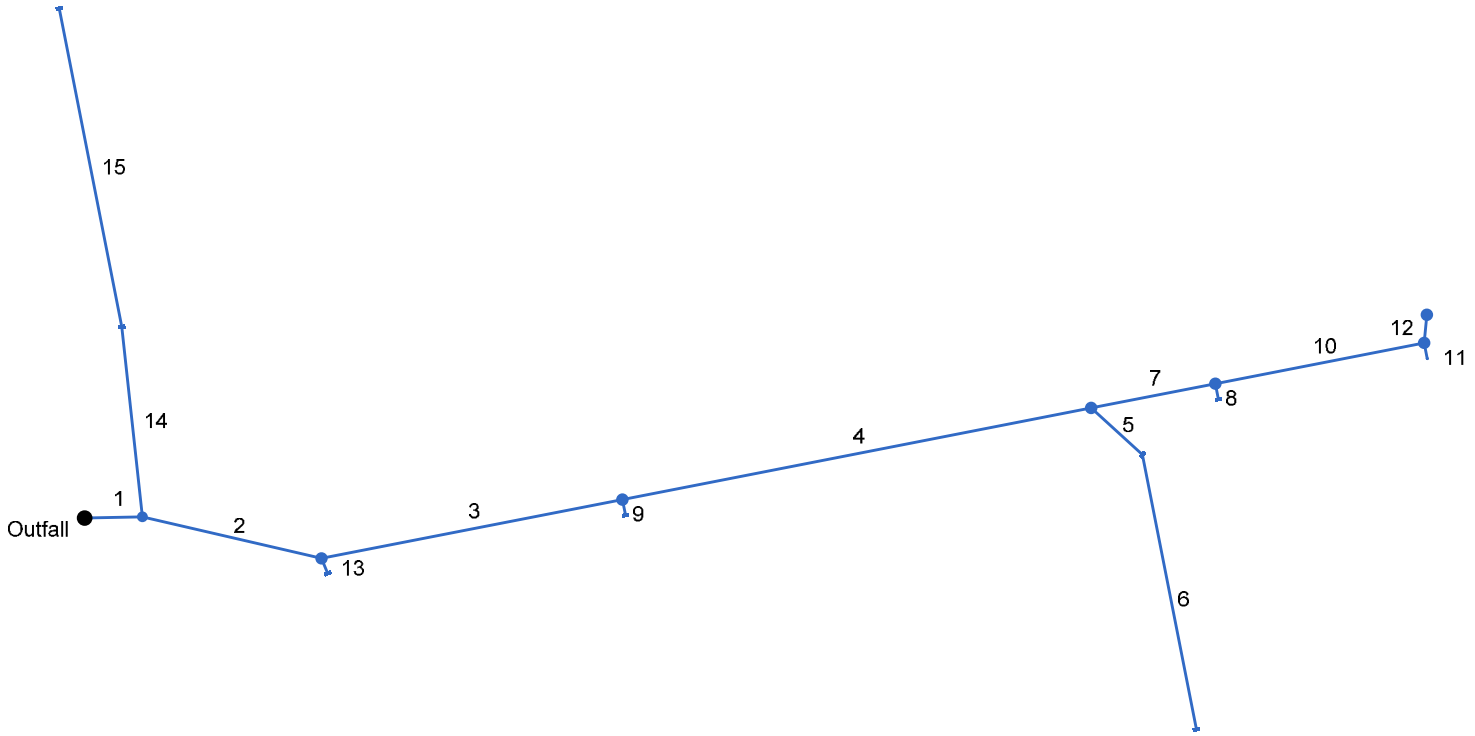
Project File: Network B (Outfall).stm

Number of lines: 4

Run Date: 5/2/2022

NOTES:Intensity = 56.94 / (Inlet time + 3.80) ^ 0.73; Return period =Yrs. 100 ; c = cir e = ellip b = box

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



Project File: Network B-4.stm	Number of lines: 15	Date: 4/28/2022

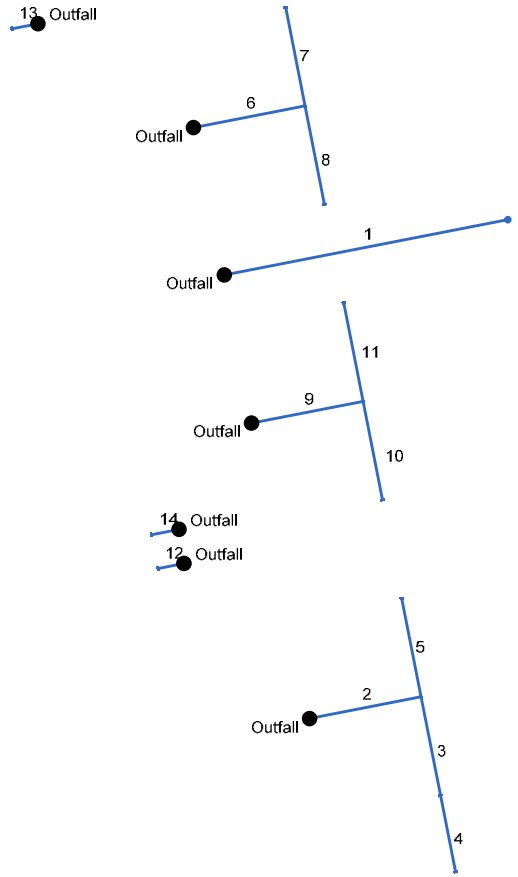
Storm Sewer Tabulation

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	36.273	0.00	6.32	0.00	0.00	3.53	0.0	9.8	6.6	33.30	39.79	4.71	36	0.30	132.50	132.61	135.75	135.83	135.83	140.37	PIPE-190
2	1	115.325	0.00	4.54	0.00	0.00	1.95	0.0	9.2	6.8	23.34	39.23	3.30	36	0.29	132.61	132.95	136.17	136.29	140.37	139.41	PIPE-146
3	2	192.420	0.00	3.80	0.00	0.00	1.58	0.0	8.2	7.2	21.45	39.67	3.04	36	0.30	132.95	133.53	136.44	136.60	139.41	141.87	PIPE-216
4	3	299.643	0.00	3.10	0.00	0.00	1.28	0.0	6.5	8.0	20.32	39.60	3.04	36	0.30	133.53	134.43	136.75	136.95	141.87	142.63	PIPE-215
5	4	43.583	0.72	1.59	0.39	0.28	0.66	5.0	5.6	8.6	5.71	5.48	7.67	12	2.02	137.49	138.37	138.35	139.32	142.63	142.49	PIPE-157
6	5	176.039	0.87	0.87	0.44	0.38	0.38	5.0	5.0	9.0	3.46	6.89	4.86	12	3.19	138.39	144.00	139.32	144.79	142.49	150.48	PIPE-156
7	4	79.414	0.00	1.51	0.00	0.00	0.61	0.0	6.0	8.4	15.18	39.72	2.38	36	0.30	134.43	134.67	137.08	137.10	142.63	141.99	PIPE-214
8	7	10.000	0.29	0.29	0.64	0.19	0.19	5.0	5.0	9.0	1.68	3.86	4.26	12	1.00	137.63	137.73	138.09	138.28	141.99	141.89	PIPE-217
9	3	10.000	0.70	0.70	0.43	0.30	0.30	5.0	5.0	9.0	2.72	3.86	4.95	12	1.00	137.61	137.71	138.23	138.42	141.87	141.77	PIPE-153
10	7	133.523	0.00	1.22	0.00	0.00	0.43	0.0	5.0	9.0	13.90	39.55	2.37	36	0.30	134.67	135.07	137.20	137.23	141.99	140.92	PIPE-213
11	10	10.000	1.22	1.22	0.35	0.43	0.43	5.0	5.0	9.0	3.86	3.86	5.55	12	1.00	136.57	136.67	137.39	137.50	140.92	140.82	PIPE-151
12	10	17.720	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	10.05	38.37	1.78	36	0.28	135.07	135.12	137.33	137.33	140.92	141.04	PIPE-212
13	2	10.198	0.74	0.74	0.51	0.38	0.38	5.0	5.0	9.0	3.41	3.82	4.34	12	0.98	134.90	135.00	136.44	136.51	139.41	139.23	PIPE-219
14	1	120.212	0.91	1.78	0.87	0.79	1.57	5.0	5.8	8.4	13.30	19.74	4.23	24	0.65	132.61	133.39	136.17	136.53	140.37	138.28	PIPE-192
15	14	204.000	0.87	0.87	0.90	0.78	0.78	5.0	5.0	9.0	7.07	8.80	4.00	18	0.60	133.39	134.61	136.67	137.45	138.28	138.28	PIPE-191

Project File: Network B-4.stm | Number of lines: 15 | Run Date: 4/28/2022

NOTES:Intensity = 44.57 / (Inlet time + 3.90) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

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



Project File: Network B-5-UPDATE.stm	Number of lines: 14	Date: 5/1/2022

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	309.926	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	13.61	50.26	3.80	36	0.48	132.50	134.00	134.86	135.17	135.83	140.08	PIPE-198
2	End	121.902	0.95	3.54	0.90	0.86	3.13	5.0	6.3	8.2	25.55	25.14	5.38	30	0.50	132.50	133.11	134.86	135.38	135.46	137.54	PIPE-241 (1)
3	2	108.000	0.94	1.64	0.89	0.84	1.42	5.0	5.8	8.5	11.99	13.86	3.82	24	0.50	133.11	133.65	136.42	136.83	137.54	137.54	PIPE-240
4	3	84.000	0.70	0.70	0.83	0.58	0.58	5.0	5.0	9.0	5.25	13.86	1.67	24	0.50	133.65	134.07	136.94	137.00	137.54	137.78	PIPE-239
5	2	108.000	0.95	0.95	0.90	0.86	0.86	5.0	5.0	9.0	7.72	15.21	2.46	24	0.60	133.11	133.76	136.42	136.59	137.54	137.54	PIPE-243
6	End	121.902	0.95	2.85	0.90	0.86	2.57	5.0	5.7	8.5	21.86	27.51	4.91	30	0.60	132.50	133.23	134.86	135.20	135.46	137.54	PIPE-236
7	6	108.000	0.95	0.95	0.90	0.86	0.86	5.0	5.0	9.0	7.72	15.21	2.46	24	0.60	133.23	133.88	136.17	136.34	137.54	137.54	PIPE-234
8	6	108.000	0.95	0.95	0.90	0.86	0.86	5.0	5.0	9.0	7.72	15.21	2.46	24	0.60	133.23	133.88	136.17	136.34	137.54	137.54	PIPE-235
9	End	121.902	0.95	2.85	0.90	0.86	2.57	5.0	5.7	8.5	21.86	27.51	4.91	30	0.60	132.50	133.23	134.86	135.20	134.59	137.54	PIPE-244
10	9	108.000	0.95	0.95	0.90	0.86	0.86	5.0	5.0	9.0	7.72	15.21	2.46	24	0.60	133.23	133.88	136.17	136.34	137.54	137.54	PIPE-237
11	9	108.000	0.95	0.95	0.90	0.86	0.86	5.0	5.0	9.0	7.72	15.21	2.46	24	0.60	133.23	133.88	136.17	136.34	137.54	137.54	PIPE-238
12	End	28.420	0.90	0.90	0.73	0.66	0.66	5.0	5.0	9.0	5.93	6.39	3.36	18	0.49	132.50	132.64	134.86	134.98	134.33	135.13	PIPE-232
13	End	28.451	0.88	0.88	0.74	0.65	0.65	5.0	5.0	9.0	5.88	9.03	3.33	18	0.98	132.50	132.78	134.86	134.98	134.25	136.00	PIPE-179
14	End	30.408	0.64	0.64	0.79	0.51	0.51	5.0	5.0	9.0	4.57	7.99	2.58	18	0.49	132.50	132.65	134.86	134.91	127.05	135.50	PIPE-245

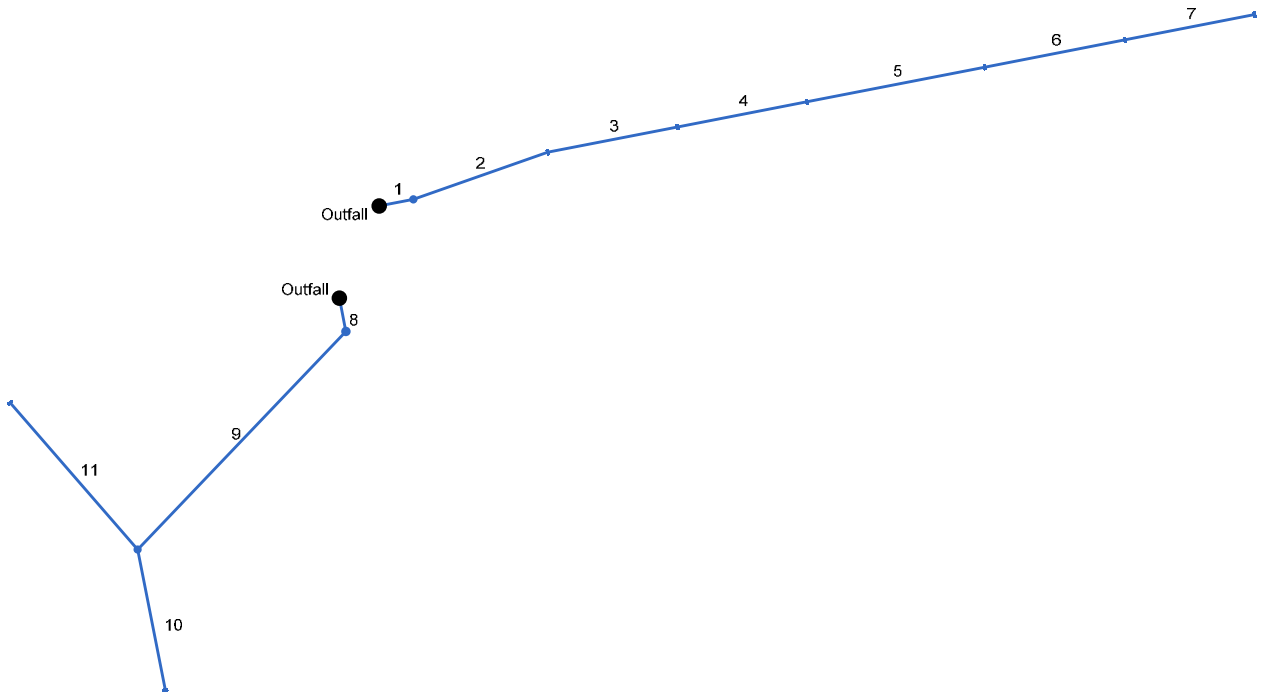
Project File: Network B-5-UPDATE.stm

Number of lines: 14

Run Date: 5/1/2022

NOTES:Intensity = 44.57 / (Inlet time + 3.90) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

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



Project File: Network D-2.stm	Number of lines: 11	Date: 4/28/2022

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	26.113	0.00	3.41	0.00	0.00	2.78	0.0	8.3	7.2	19.88	26.61	6.33	24	1.18	131.50	131.81	134.61	134.78	134.25	140.80	PIPE-163
2	1	106.940	0.70	3.41	0.81	0.57	2.78	5.0	8.1	7.3	20.21	21.92	6.43	24	0.80	131.81	132.66	134.89	135.62	140.80	138.85	PIPE-196
3	2	99.000	0.50	2.71	0.81	0.41	2.21	5.0	7.7	7.4	16.38	21.92	5.21	24	0.80	132.66	133.46	135.94	136.39	138.85	138.85	PIPE-162
4	3	99.000	0.59	2.21	0.81	0.48	1.80	5.0	7.4	7.6	13.69	18.17	4.36	24	0.55	133.46	134.00	136.60	136.91	138.85	138.85	PIPE-161
5	4	136.000	0.60	1.62	0.79	0.47	1.32	5.0	6.7	8.0	10.50	14.54	3.34	24	0.55	134.00	134.75	137.05	137.45	138.85	138.85	PIPE-160
6	5	107.000	0.57	1.02	0.86	0.49	0.85	5.0	5.9	8.4	7.13	14.54	2.27	24	0.55	134.75	135.34	137.53	137.67	138.85	138.85	PIPE-159
7	6	99.000	0.44	0.44	0.80	0.36	0.36	5.0	5.0	9.0	3.21	6.75	1.81	18	0.55	135.34	135.88	137.71	137.84	138.85	138.85	PIPE-158
8	End	25.581	0.00	2.57	0.00	0.00	2.06	0.0	6.7	7.9	16.35	43.04	3.33	30	0.94	131.50	131.74	134.61	134.64	134.33	141.59	PIPE-197
9	8	226.895	1.31	2.57	0.72	0.94	2.06	5.0	5.8	8.5	17.53	29.74	3.91	30	0.70	131.74	133.33	134.79	135.29	141.59	137.54	PIPE-167
10	9	108.000	0.95	0.95	0.90	0.86	0.86	5.0	5.0	9.0	7.76	8.04	4.39	18	0.50	133.33	133.87	135.57	136.07	137.54	137.54	PIPE-166
11	9	146.265	0.30	0.30	0.86	0.26	0.26	5.0	5.0	9.0	2.36	4.40	3.18	12	1.30	133.33	135.23	135.57	136.07	137.54	138.56	PIPE-169

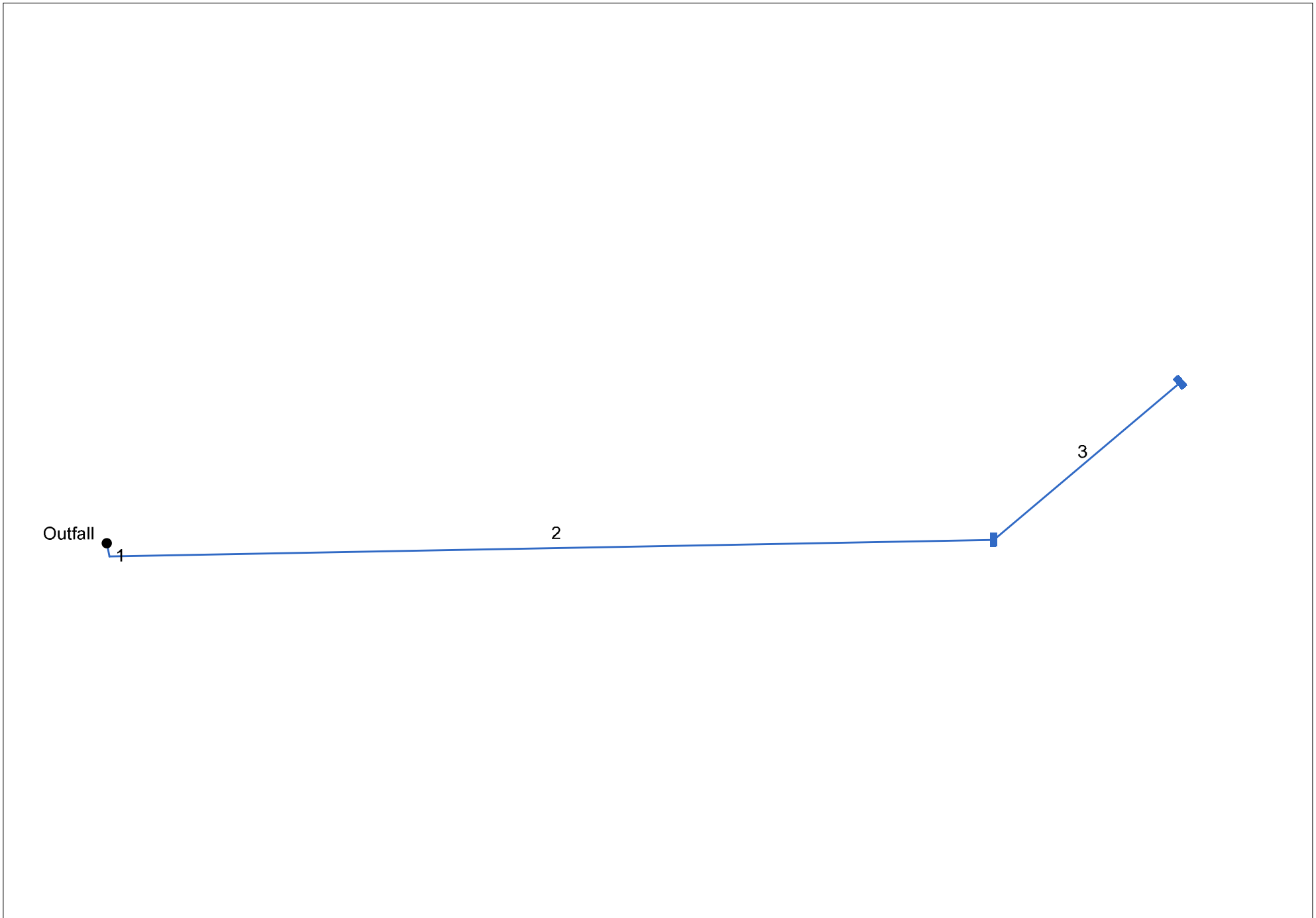
Project File: Network D-2.stm

Number of lines: 11

Run Date: 4/28/2022

NOTES:Intensity = 44.57 / (Inlet time + 3.90) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

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



Project File: Network G.stm	Number of lines: 3	Date: 5/2/2022

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	4.000	0.66	0.82	0.58	0.38	0.49	5.0	5.8	8.4	4.22	7.00	4.87	15	1.00	110.00	110.04	110.83	110.87	111.45	117.56	PIPE-117
2	1	262.552	0.16	0.16	0.67	0.11	0.11	5.0	5.0	9.0	1.05	15.64	5.15	15	5.00	113.16	126.29	113.38	126.69	117.56	130.00	PIPE-180
3	2	72.759	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.08	4.92	1.50	15	0.49	129.64	130.00	129.75	130.11	130.00	135.00	PIPE-231

Project File: Network G.stm | Number of lines: 3 | Run Date: 5/2/2022

NOTES:Intensity = 44.57 / (Inlet time + 3.90) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

APPENDIX E

Culvert Capacity Calculations

CULVERT DESIGN CALCULATIONS

Methodology: Calculate Culvert Capacity, Openness and Freeboard

Reference: ConnDOT Drainage Manual, 2000
Army Corps CT General Permit, Appendix G - Sream Crossing BMPs
USGS StreamStats (http://streamstats.usgs.gov)
Hydraflow Express Extension for AutoDesk Civil3d

Design Requirements: (Per ConnDOT Drainage Manual / Army Corps BMPs)

Design Storm	50	yr	(Drainage Area < 1.0 mi^2)
Min. Allowable Freeboard	1	ft	
Min. Span Length Required	≥ 1.2 * BFW		
Culvert Openness	> 0.82	ft	= (Rise * Span) / Length

Proposed Culvert Geometry: (Per Plan Sheet CG101)

Upstream Invert El.	108.00	ft
Downstream Invert El.	107.70	ft
Maximum Allowable Rise	5	ft
Culvert Length	60	ft
Culvert Slope	0.005	ft/ft
Top of Embankment El.	115.5	ft
Top Width of Embankment	50	ft
Crest Length of Embankment	45	ft

Streamstats Flow Data: (See Attached)

Drainage Area	0.68	mi^2
50 Year Peak Flow Rate	198	cfs
100 Year Peak Flow Rate	240	cfs

Account for Urbanization of Watershed: (Per ConnDOT Drainage Manual Section 6.13)

Basin Development Factor	6		(ConnDOT Drainage Manual, Section 6.13.2)
Adjusted 50 Year Peak Flow Rate	295	cfs	(ConnDOT Drainage Manual, Equation 6.21)
Adjusted 100 Year Peak Flow Rate	349	cfs	(ConnDOT Drainage Manual, Equation 6.22)

Calculate Required Minimum Required Span Length: (Per CT General Permit, Appendix G)

Approximate Bank Full Width (BFW)	10	ft	
Span Requirement Criteria	≥ 1.2 * BFW		
Minimum Required Span Length	12.00	ft	(16ft Span Length Proposed)
Actual (BFW / Span) Ratio Provided	1.60		

Calculate Required Culvert Span Based on Openness Criteria: (Per CT General Permit, Appendix G)

Min. Req'd Span = 0.82 * (Length / Rise) = 0.82*(60/5) = 9.84 ft (16ft Span LengthProposed)

Proposed Culvert Size: 5ft H x 16ft W x 60ft L

	BY	JKH	DATE	4/27/2022	PROJ NO.	140225401
	CKD	TSO	DATE		SHEET	1 of 2

Calculate Freeboard for 50 Year Storm Event: (5ft x 16 ft Box Culvert)

50 Year Design Peak flow Rate	295	cfs	
50 Year Tailwater El.	113.89	ft	(HW for downstream culvert, see attached calculations)
Calculated Headwater El.	114.17	ft	(See attached Hydraflow Express Results)
Top of Embankment El.	115.50	ft	
Freeboard	1.33	ft	

Calculate Freeboard for 100 Year Storm Event: (5ft x 16 ft Box Culvert)

100 Year Design Peak flow Rate	349	cfs	
100 Year Tailwater El.	114.10	ft	(HW for downstream culvert, see attached calculations)
Calculated Headwater El.	114.49	ft	(See attached Hydraflow Express Results)
Top of Embankment El.	115.50	ft	
Freeboard	1.01	ft	

Calculate Capacity of Proposed Low Flow Channel

Stream Channel Base Flow Rate	0.50	cfs	(Observed in the field on 1/26/2022)
Channel Bottom Width	2	ft	
Channel Side Slope	2	ft/ft	
Channel Depth	1	ft	
Channel Top Width	6	ft	
Manning's Coefficient	0.035		
Channel Length	60	ft	
Upstream Invert	107.00	ft	
Downstream Invert	106.70	ft	
Channel Slope	0.005	ft/ft	
Capacity at Full Depth	8.71	cfs	

Culvert Report

Downstream 60in Culvert (50yr Event)

Invert Elev Dn (ft)	=	104.02
Pipe Length (ft)	=	560.00
Slope (%)	=	0.56
Invert Elev Up (ft)	=	107.15
Rise (in)	=	60.0
Shape	=	Circular
Span (in)	=	60.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

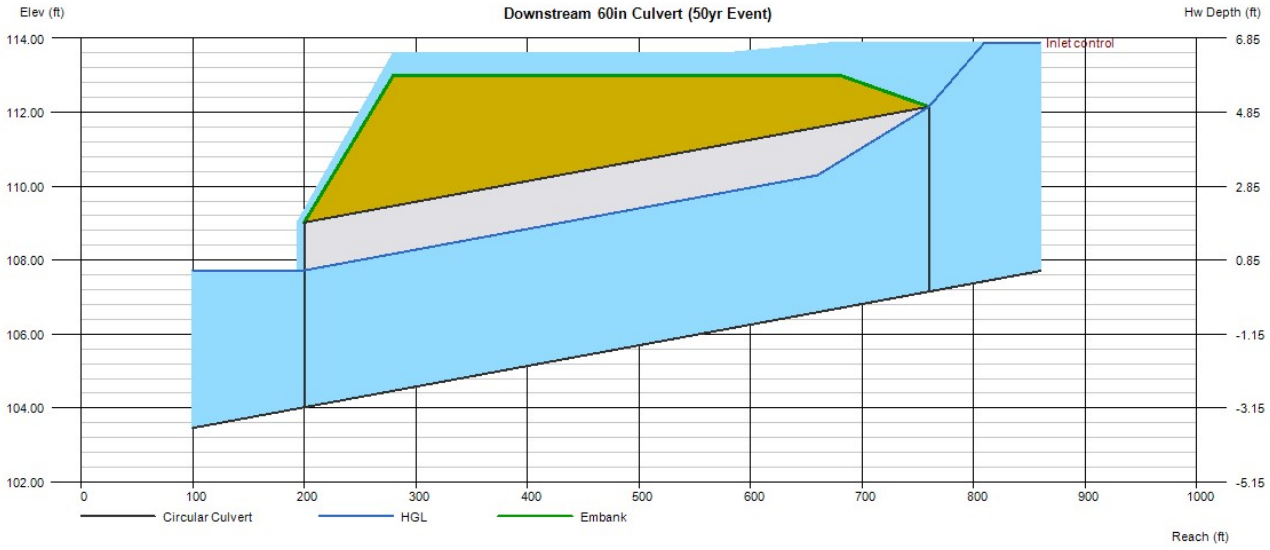
Top Elevation (ft)	=	113.00
Top Width (ft)	=	400.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	295.00
Qmax (cfs)	=	295.00
Tailwater Elev (ft)	=	Normal

Highlighted

Qtotal (cfs)	=	295.00
Qpipe (cfs)	=	167.22
Qovertop (cfs)	=	127.78
Veloc Dn (ft/s)	=	10.72
Veloc Up (ft/s)	=	10.72
HGL Dn (ft)	=	107.72
HGL Up (ft)	=	110.85
Hw Elev (ft)	=	113.89
Hw/D (ft)	=	1.35
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 19 2022

Downstream 60in Culvert (100yr Event)

Invert Elev Dn (ft)	=	104.02
Pipe Length (ft)	=	560.00
Slope (%)	=	0.56
Invert Elev Up (ft)	=	107.15
Rise (in)	=	60.0
Shape	=	Circular
Span (in)	=	60.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

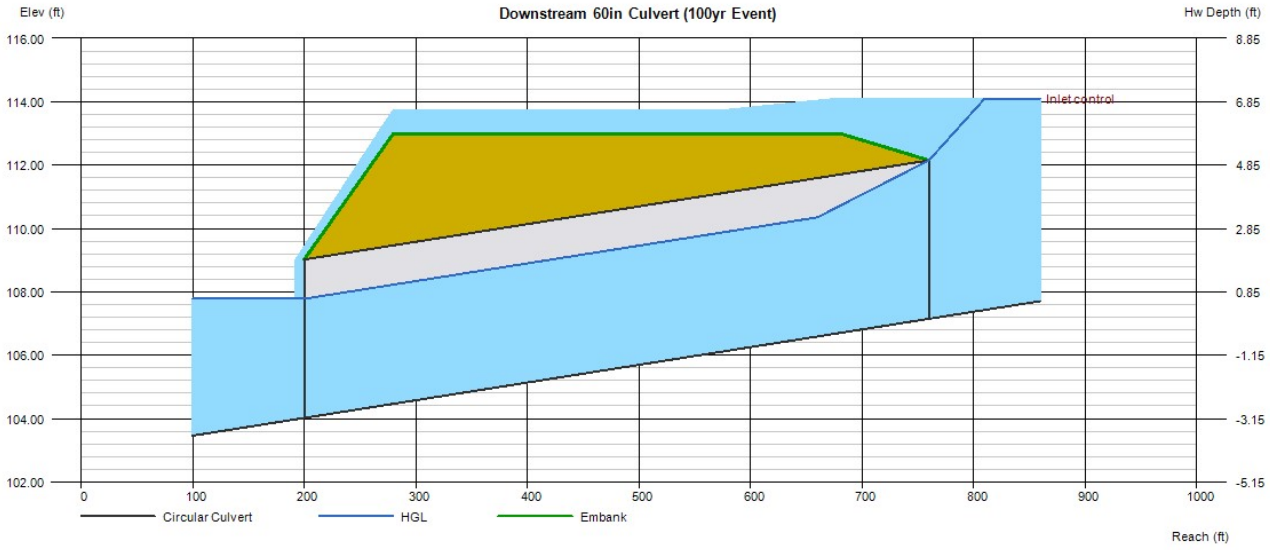
Top Elevation (ft)	=	113.00
Top Width (ft)	=	400.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	349.00
Qmax (cfs)	=	349.00
Tailwater Elev (ft)	=	Normal

Highlighted

Qtotal (cfs)	=	349.00
Qpipe (cfs)	=	172.45
Qovertop (cfs)	=	176.55
Veloc Dn (ft/s)	=	10.88
Veloc Up (ft/s)	=	10.88
HGL Dn (ft)	=	107.78
HGL Up (ft)	=	110.91
Hw Elev (ft)	=	114.10
Hw/D (ft)	=	1.39
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Apr 28 2022

Proposed Box Culvert (50yr Event)

Invert Elev Dn (ft)	=	107.70
Pipe Length (ft)	=	60.00
Slope (%)	=	0.50
Invert Elev Up (ft)	=	108.00
Rise (in)	=	60.0
Shape	=	Box
Span (in)	=	192.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Flared Wingwalls, Top Edge Bevel
Culvert Entrance	=	45D wingwall flare d=0.043D
Coeff. K,M,c,Y,k	=	0.51, 0.667, 0.0309, 0.8, 0.2

Embankment

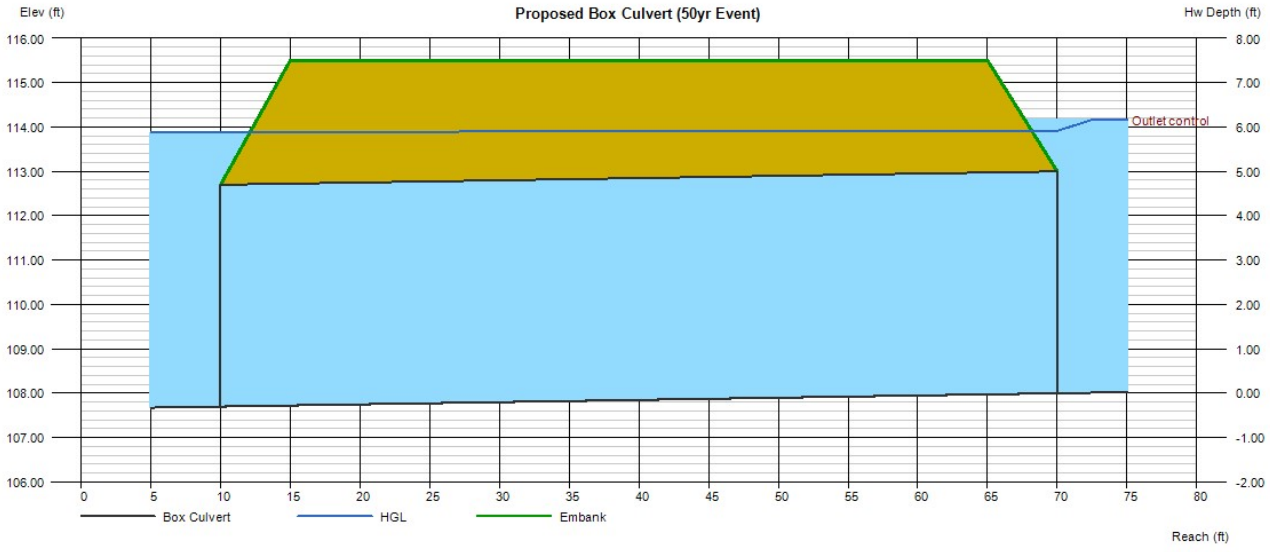
Top Elevation (ft)	=	115.50
Top Width (ft)	=	50.00
Crest Width (ft)	=	45.00

Calculations

Qmin (cfs)	=	295.00
Qmax (cfs)	=	295.00
Tailwater Elev (ft)	=	113.89

Highlighted

Qtotal (cfs)	=	295.00
Qpipe (cfs)	=	295.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.69
Veloc Up (ft/s)	=	3.69
HGL Dn (ft)	=	113.89
HGL Up (ft)	=	113.91
Hw Elev (ft)	=	114.17
Hw/D (ft)	=	1.23
Flow Regime	=	Outlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Apr 28 2022

Proposed Box Culvert (100yr Event)

Invert Elev Dn (ft)	=	107.70
Pipe Length (ft)	=	60.00
Slope (%)	=	0.50
Invert Elev Up (ft)	=	108.00
Rise (in)	=	60.0
Shape	=	Box
Span (in)	=	192.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Flared Wingwalls, Top Edge Bevel
Culvert Entrance	=	45D wingwall flare d=0.043D
Coeff. K,M,c,Y,k	=	0.51, 0.667, 0.0309, 0.8, 0.2

Embankment

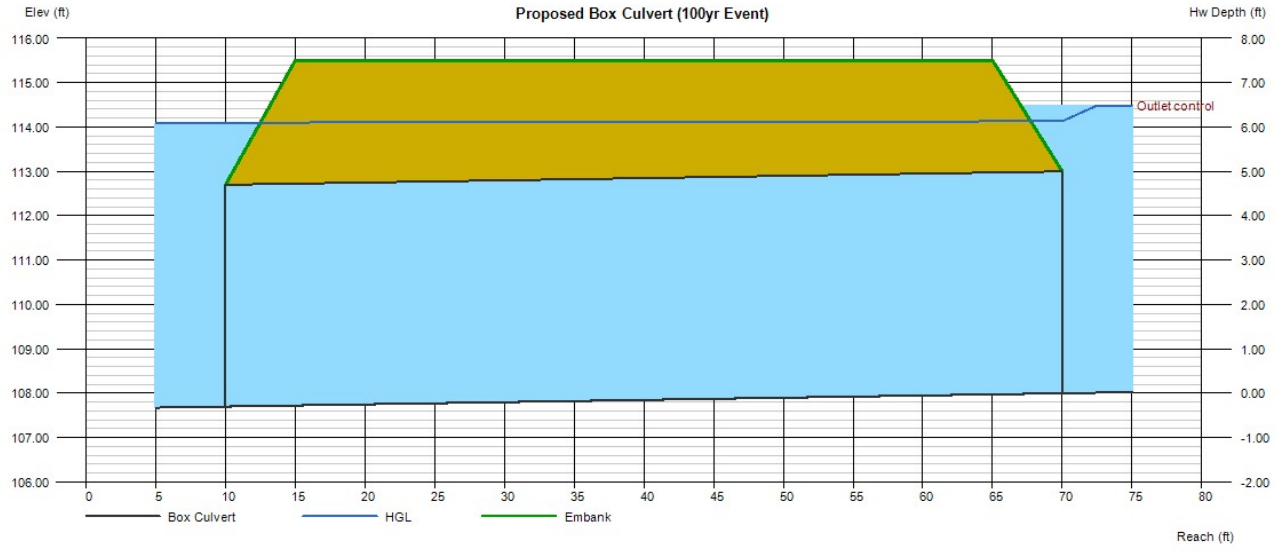
Top Elevation (ft)	=	115.50
Top Width (ft)	=	50.00
Crest Width (ft)	=	45.00

Calculations

Qmin (cfs)	=	349.00
Qmax (cfs)	=	349.00
Tailwater Elev (ft)	=	114.10

Highlighted

Qtotal (cfs)	=	349.00
Qpipe (cfs)	=	349.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.36
Veloc Up (ft/s)	=	4.36
HGL Dn (ft)	=	114.10
HGL Up (ft)	=	114.13
Hw Elev (ft)	=	114.49
Hw/D (ft)	=	1.30
Flow Regime	=	Outlet Control



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Feb 18 2022

Proposed Low Flow Channel

Trapezoidal

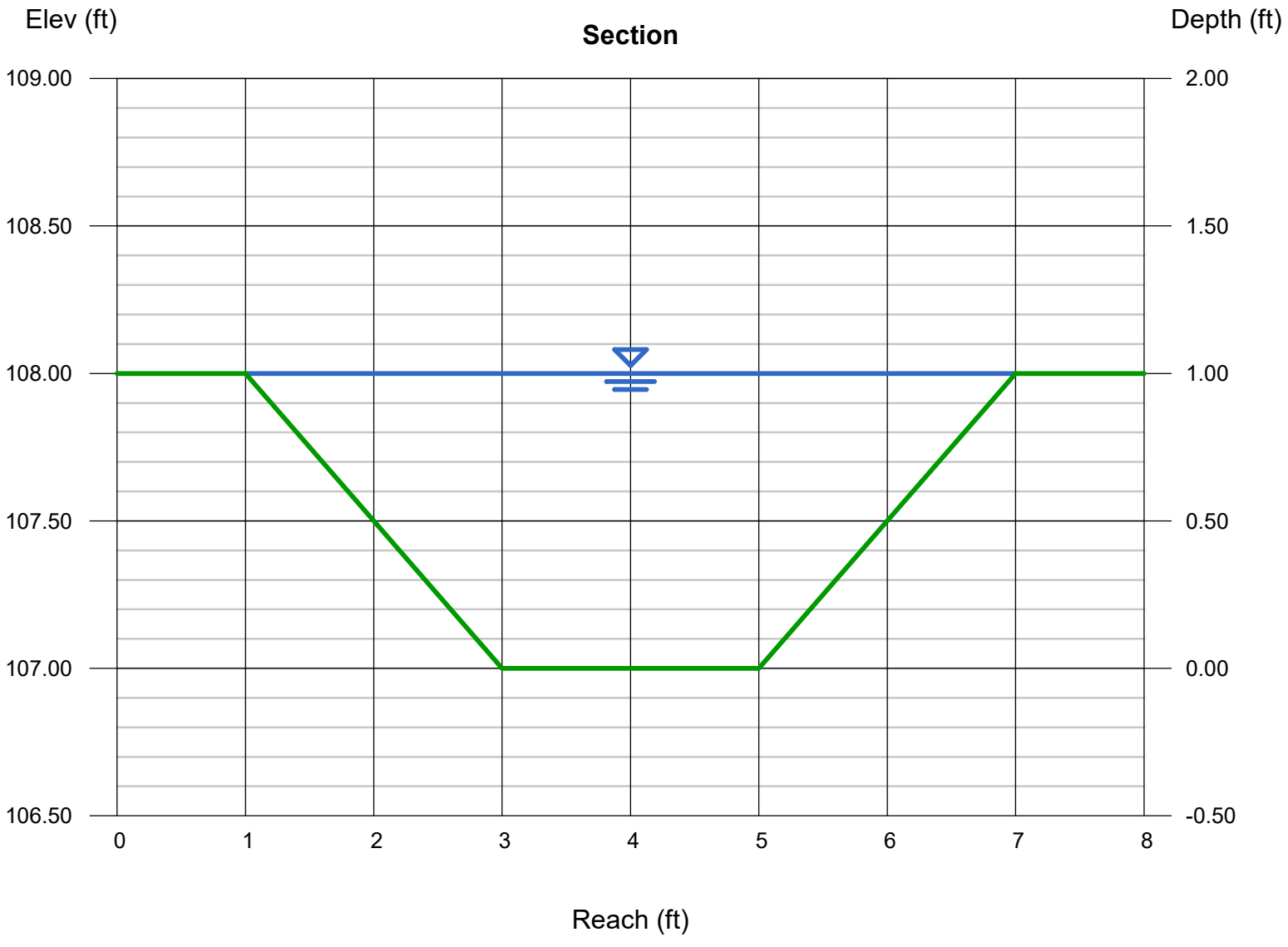
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 107.00
Slope (%)	= 0.50
N-Value	= 0.035

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

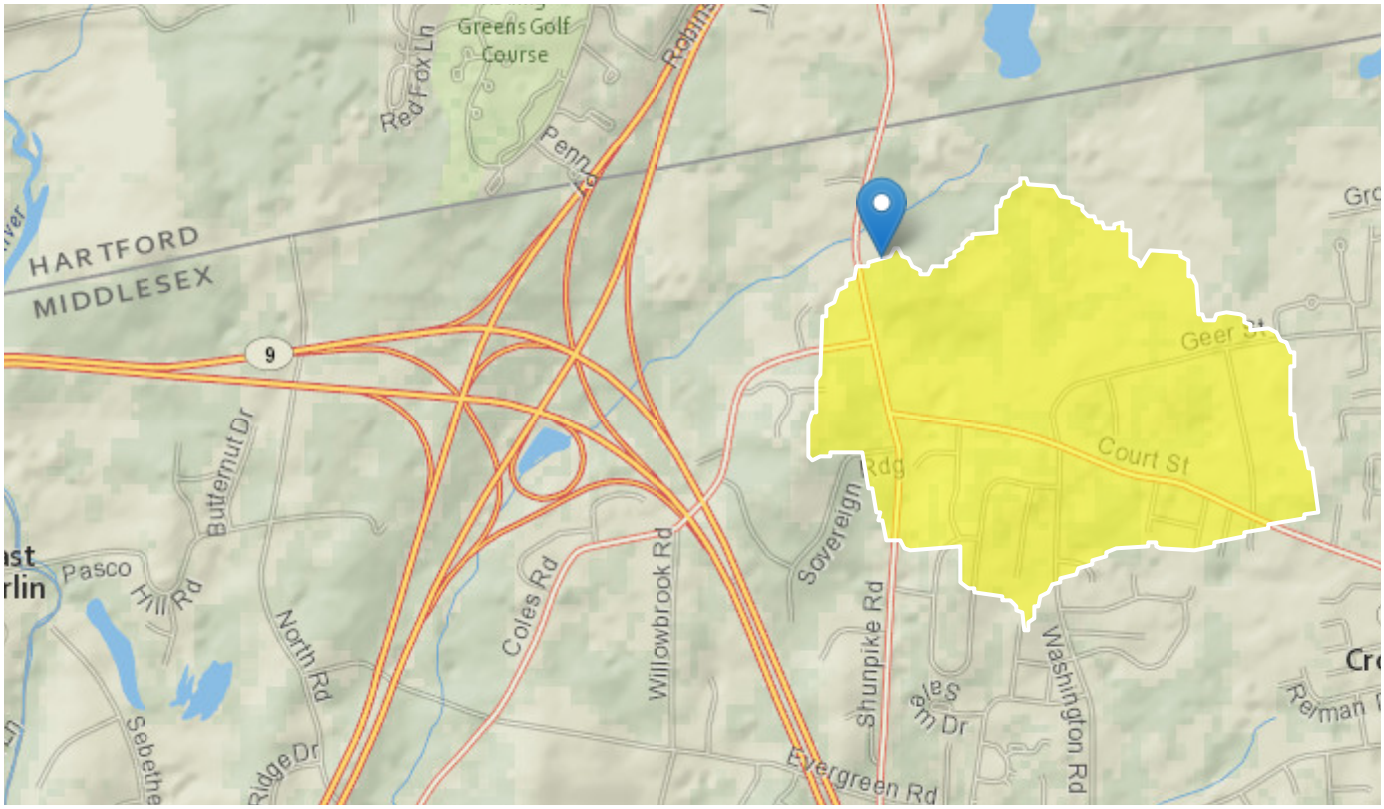
Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 8.712
Area (sqft)	= 4.00
Velocity (ft/s)	= 2.18
Wetted Perim (ft)	= 6.47
Crit Depth, Yc (ft)	= 0.67
Top Width (ft)	= 6.00
EGL (ft)	= 1.07



Project Highlands - Shunpike Road, Cromwell CT

Region ID: CT
Workspace ID: CT20211012202101924000
Clicked Point (Latitude, Longitude): 41.62882, -72.67585
Time: 2021-10-12 16:21:26 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.68	square miles
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	2.96	inches
SSURGOCCDD	Percentage of area with hydrologic soil types C, D, or C/D from SSURGO	0.2462	percent
I24H5Y	Maximum 24-hour precipitation that occurs on average once in 5 years	4.16	inches

Parameter Code	Parameter Description	Value	Unit
I24H10Y	Maximum 24-hour precipitation that occurs on average once in 10 years	5.07	inches
I24H25Y	Maximum 24-hour precipitation that occurs on average once in 25 years	6.27	inches
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	7.18	inches
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	8.09	inches
I24H200Y	Maximum 24-hour precipitation that occurs on average once in 200 years	9.49	inches
I24H500Y	Maximum 24-hour precipitation that occurs on average once in 500 years	11.33	inches

Peak-Flow Statistics Parameters [Statewide DA only SIR 2020 5054]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.68	square miles	0.69	325

Peak-Flow Statistics Parameters [Statewide Multiparameter SIR 2020 5054]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.68	square miles	0.69	325
I24H2Y	24 Hour 2 Year Precipitation	2.96	inches	2.77	3.32
SSURGOCCDD	Percent soil type C or D from SSURGO	0.2462	percent	0.118	0.945
I24H5Y	24 Hour 5 Year Precipitation	4.16	inches	4	4.7
I24H10Y	24 Hour 10 Year Precipitation	5.07	inches	4.86	5.79
I24H25Y	24 Hour 25 Year Precipitation	6.27	inches	5.99	7.22
I24H50Y	24 Hour 50 Year Precipitation	7.18	inches	6.81	8.3
I24H100Y	24 Hour 100 Year Precipitation	8.09	inches	7.62	9.38
I24H200Y	24 Hour 200 YearPrecipitation	9.49	inches	8.7	11.22
I24H500Y	24 Hour 500 Year Precipitation	11.33	inches	10.1	13.64

Peak-Flow Statistics Disclaimers [Statewide DA only SIR 2020 5054]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Peak-Flow Statistics Flow Report [Statewide DA only SIR 2020 5054]

Statistic	Value	Unit
Drainage Area Only 50-percent AEP flood	47.5	ft^3/s
Drainage Area Only 20-percent AEP flood	84	ft^3/s
Drainage Area Only 10-percent AEP flood	115	ft^3/s
Drainage Area Only 4-percent AEP flood	160	ft^3/s
Drainage Area Only 2-percent AEP flood	198	ft^3/s
Drainage Area Only 1-percent AEP flood	240	ft^3/s
Drainage Area Only 0.5-percent AEP flood	287	ft^3/s
Drainage Area Only 0.2-percent AEP flood	357	ft^3/s

Peak-Flow Statistics Disclaimers [Statewide Multiparameter SIR 2020 5054]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Peak-Flow Statistics Flow Report [Statewide Multiparameter SIR 2020 5054]

Statistic	Value	Unit
50-percent AEP flood	25.5	ft^3/s
20-percent AEP flood	48	ft^3/s
10-percent AEP flood	68.8	ft^3/s
4-percent AEP flood	101	ft^3/s
2-percent AEP flood	129	ft^3/s
1-percent AEP flood	160	ft^3/s
0.5-percent AEP flood	205	ft^3/s
0.2-percent AEP flood	269	ft^3/s

Peak-Flow Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit

Statistic	Value	Unit
Drainage Area Only 50-percent AEP flood	47.5	ft^3/s
Drainage Area Only 20-percent AEP flood	84	ft^3/s
Drainage Area Only 10-percent AEP flood	115	ft^3/s
Drainage Area Only 4-percent AEP flood	160	ft^3/s
Drainage Area Only 2-percent AEP flood	198	ft^3/s
Drainage Area Only 1-percent AEP flood	240	ft^3/s
Drainage Area Only 0.5-percent AEP flood	287	ft^3/s
Drainage Area Only 0.2-percent AEP flood	357	ft^3/s
50-percent AEP flood	25.5	ft^3/s
20-percent AEP flood	48	ft^3/s
10-percent AEP flood	68.8	ft^3/s
4-percent AEP flood	101	ft^3/s
2-percent AEP flood	129	ft^3/s
1-percent AEP flood	160	ft^3/s
0.5-percent AEP flood	205	ft^3/s
0.2-percent AEP flood	269	ft^3/s

Peak-Flow Statistics Citations

Ahearn, E.A., and Hodgkins, G.A.,2020, Estimating flood magnitude and frequency on streams and rivers in Connecticut, based on data through water year 2015: U.S. Geological Survey Scientific Investigations Report 2020–5054, 42 p. (https://doi.org/10.3133/sir20205054)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

USGS Software Disclaimer: This software has been approved for release by the U.S. Geological Survey (USGS). Although the software has been subjected to rigorous review, the USGS reserves the right to update the software as needed pursuant to further analysis and review. No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the software and related material nor shall the fact of release constitute any such warranty. Furthermore, the software is released on condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from its authorized or unauthorized use.

USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.6.2
StreamStats Services Version: 1.2.22
NSS Services Version: 2.1.2

APPENDIX F

Gutter Flow Calculations

Project Highlands - Cromwell, CT
Gutter Flow Calculations

Gutter Flow Analysis

Procedure	*Conn DOT Drainage Manual (Sec 11.9)*
Reference	*Conn DOT Drainage Manual (Sec 11.7)*
	HydraFlow Express

Design Criteria

Design Storm Frequency	10 yr	
Shoulder Width	2 ft	
Lane Width	16 ft	
Allowable Spread	10 ft	Shoulder + (Lane Width/2)

Proposed Swale Details:

Bottom Width (B)	2 ft
Top Width (T)	14 ft
Depth of Swale (h)	2 ft
Side Slope (Z)	3:1 ft/ft
Longitudinal Slope (S)	16 ft

Gutter Location / Description	Gutter Slope (ft/ft)	Cross Slope (ft/ft)	Drainage Area (ac)	Impervious Coverage (%)	Weighted Runoff Coefficent	10 Year Catchment Flow Rate (cfs)	Carryover Flow Rate (cfs)	Design Flow Rate (cfs)	Length of Curb Opening Req'd for 100% Capture (ft)	Length of Curb Opening Proposed (ft)	Inlet Efficiency	Flow Rate Captured (cfs)	Flow Rate Bypassed (cfs)	Depth of Flow in Gutter (ft)	Width of Flow in Gutter (ft)
Northerly Gutters to Basin F-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flowing East to Leak-off #1 on grade	0.010	0.020	0.134	82.1%	0.77	0.77	0.00	0.77	19.17	6	0.49	0.38	0.39	0.12	6.06
Flowing East to Leak-off #2 on grade	0.010	0.020	0.143	81.0%	0.77	0.82	0.39	1.21	23.13	6	0.42	0.51	0.71	0.14	7.17
Flowing East to Leak-off #3 on grade	0.010	0.020	0.141	81.2%	0.77	0.81	0.71	1.51	25.40	6	0.38	0.58	0.93	0.16	7.79
Flowing East to Leak-off #4 on grade	0.010	0.020	0.139	81.3%	0.77	0.80	0.93	1.73	26.86	6	0.37	0.63	1.10	0.16	8.19
Flowing West to Leak-off #1 on grade	0.010	0.020	0.308	93.3%	0.85	1.96	0.00	1.96	28.31	12	0.63	1.23	0.73	0.17	8.58
Flowing West to Leak-off #2 on grade	0.010	0.020	0.273	88.2%	0.82	1.67	0.73	2.39	30.78	12	0.59	1.41	0.98	0.18	9.25
To leak-off at sag	-	0.020	0.325	81.1%	0.77	1.86	2.08	3.94	-	15	-	3.94	0.00	0.20	9.86
---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northerly Gutters to Basin F-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flowing East to Leak-off #1 on grade	0.010	0.020	0.134	82.1%	0.77	0.77	0.00	0.77	19.16	6	0.49	0.38	0.39	0.12	6.06
Flowing East to Leak-off #2 on grade	0.010	0.020	0.145	80.7%	0.77	0.83	0.39	1.22	23.21	6	0.42	0.51	0.71	0.14	7.19
Flowing East to Leak-off #3 on grade	0.010	0.020	0.149	80.3%	0.76	0.85	0.71	1.56	25.72	6	0.38	0.59	0.97	0.16	7.88
Flowing West to Leak-off #1 on grade	0.010	0.020	0.111	82.8%	0.78	0.65	0.00	0.65	17.75	6	0.52	0.34	0.31	0.11	5.66
Flowing West to Leak-off #2 on grade	0.010	0.020	0.143	80.9%	0.77	0.82	0.31	1.12	22.42	6	0.43	0.48	0.64	0.14	6.97
Flowing West to Leak-off #3 on grade	0.010	0.020	0.147	80.5%	0.76	0.84	0.64	1.48	25.15	6	0.39	0.57	0.91	0.15	7.72
To leak-off at sag	-	0.020	0.197	78.7%	0.75	1.10	1.87	2.98	-	12	-	2.98	0.00	0.19	9.49
---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northerly Gutter to Basin G-2 and Shunpike Road	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flowing West to Basin G-2, Leak-off #1 on grade	0.016	0.020	0.104	84.2%	0.789	0.61	0.00	0.61	19.95	6	0.47	0.29	0.32	0.10	5.09
Flowing West to Basin G-2, Leak-off #2 on grade	0.027	0.020	0.088	83.8%	0.787	0.52	0.32	0.84	26.69	6	0.37	0.31	0.53	0.10	5.18
Flowing West to CCB G1-2	0.050	0.020	0.177	52.9%	0.570	0.75	0.53	1.28	38.40	-	-	0.56	0.72	0.11	5.41
Flowing West to CCB G1-1	0.050	0.020	0.641	45.5%	0.519	2.48	0.72	3.20	56.39	-	-	1.87	1.34	0.15	7.63
Flowing to Leak-off at Driveway Entrance Sag	0.030	0.020	0.310	81.7%	0.772	1.78	1.34	3.12	47.86	12	-	3.12	0.00	0.20	9.80

Maximum 10-yr Design Flow for Roadside Swale **2.39 cfs**
Maximum Capacity of Roadside Swale with 1ft of Freeboard **17.25 cfs** (See next sheet for calculation)

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Apr 29 2022

<Name>

Trapezoidal

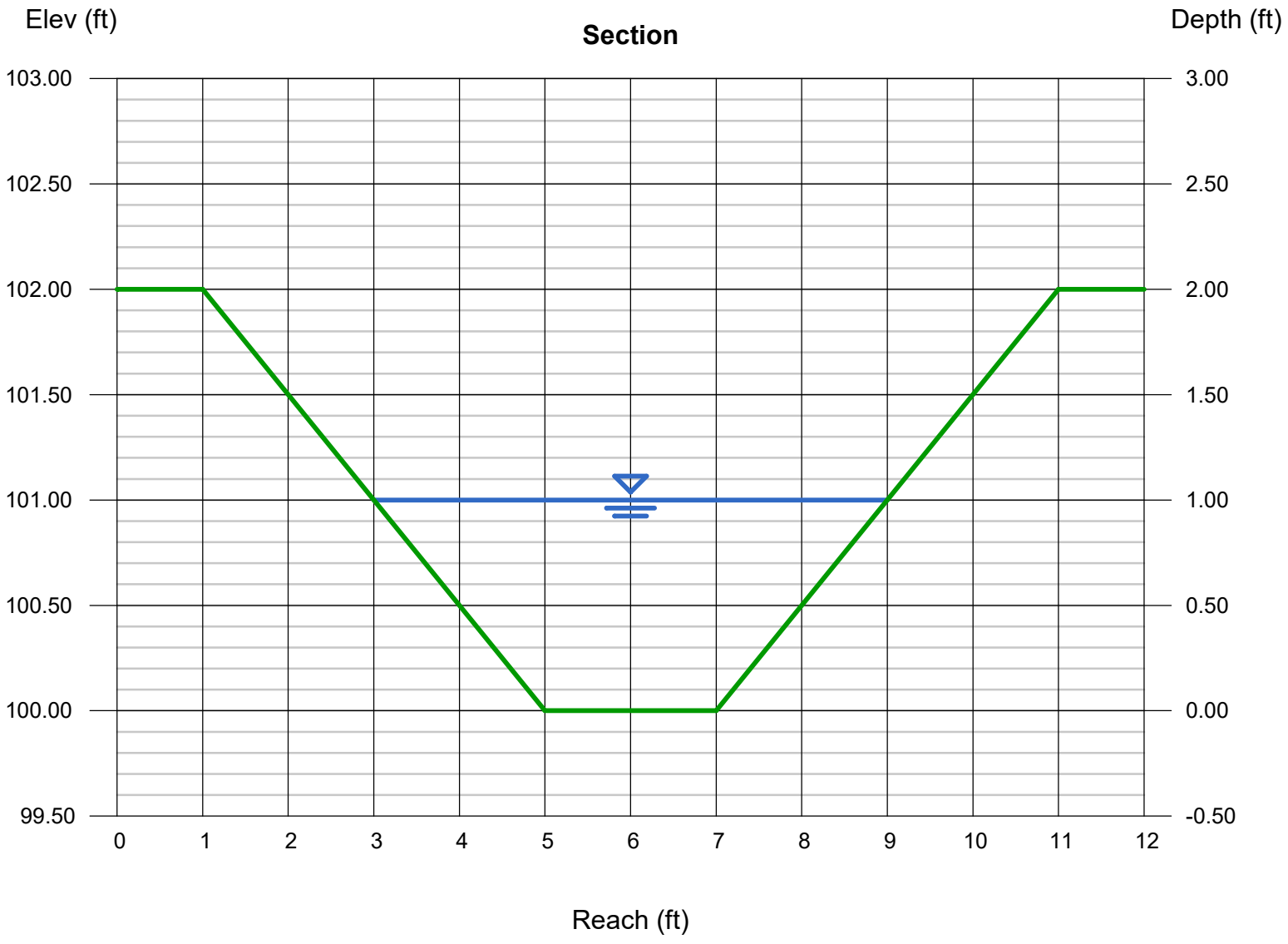
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.025

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 1.00

Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 17.25
Area (sqft)	= 4.00
Velocity (ft/s)	= 4.31
Wetted Perim (ft)	= 6.47
Crit Depth, Yc (ft)	= 0.97
Top Width (ft)	= 6.00
EGL (ft)	= 1.29



APPENDIX G

NOAA Atlas 14 Rainfall Depths & Intensities

LANGAN

NOAA Atlas 14, Volume 10, Version 3
MIDDLETOWN 4 W
Station ID: 06-4767
Location name: Middletown, Connecticut, USA*
Latitude: 41.55°, Longitude: -72.7167°
Elevation:
Elevation (station metadata): 369 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

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)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.328** (0.257-0.407)	**0.401** (0.313-0.498)	**0.520** (0.405-0.648)	**0.618** (0.479-0.776)	**0.754** (0.565-0.991)	**0.857** (0.628-1.15)	**0.964** (0.686-1.34)	**1.08** (0.730-1.55)	**1.25** (0.813-1.85)	**1.39** (0.881-2.10)
10-min	**0.464** (0.363-0.577)	**0.568** (0.444-0.706)	**0.737** (0.575-0.920)	**0.877** (0.680-1.10)	**1.07** (0.801-1.40)	**1.21** (0.891-1.63)	**1.37** (0.972-1.90)	**1.54** (1.03-2.19)	**1.78** (1.15-2.63)	**1.97** (1.25-2.98)
15-min	**0.546** (0.428-0.679)	**0.668** (0.522-0.830)	**0.866** (0.675-1.08)	**1.03** (0.798-1.29)	**1.26** (0.942-1.65)	**1.43** (1.05-1.92)	**1.61** (1.14-2.24)	**1.81** (1.22-2.58)	**2.09** (1.35-3.09)	**2.32** (1.47-3.50)
30-min	**0.751** (0.587-0.932)	**0.912** (0.713-1.13)	**1.18** (0.916-1.47)	**1.40** (1.08-1.75)	**1.70** (1.27-2.23)	**1.93** (1.41-2.59)	**2.16** (1.54-3.02)	**2.43** (1.64-3.47)	**2.81** (1.82-4.16)	**3.12** (1.98-4.71)
60-min	**0.955** (0.747-1.19)	**1.16** (0.904-1.44)	**1.49** (1.16-1.86)	**1.76** (1.36-2.21)	**2.14** (1.60-2.81)	**2.42** (1.78-3.25)	**2.72** (1.94-3.79)	**3.05** (2.06-4.36)	**3.53** (2.29-5.23)	**3.92** (2.48-5.93)
2-hr	**1.26** (0.999-1.56)	**1.52** (1.20-1.87)	**1.93** (1.52-2.39)	**2.27** (1.78-2.83)	**2.74** (2.08-3.58)	**3.09** (2.29-4.14)	**3.47** (2.50-4.84)	**3.91** (2.65-5.55)	**4.59** (2.98-6.74)	**5.16** (3.28-7.74)
3-hr	**1.47** (1.17-1.81)	**1.76** (1.40-2.16)	**2.23** (1.77-2.75)	**2.63** (2.06-3.26)	**3.16** (2.41-4.13)	**3.56** (2.66-4.76)	**4.00** (2.90-5.58)	**4.52** (3.07-6.39)	**5.33** (3.48-7.81)	**6.03** (3.83-9.01)
6-hr	**1.87** (1.50-2.27)	**2.24** (1.79-2.73)	**2.84** (2.27-3.48)	**3.34** (2.65-4.11)	**4.04** (3.10-5.23)	**4.55** (3.42-6.04)	**5.10** (3.74-7.08)	**5.79** (3.95-8.12)	**6.85** (4.48-9.97)	**7.76** (4.95-11.5)
12-hr	**2.29** (1.86-2.77)	**2.77** (2.24-3.35)	**3.56** (2.87-4.32)	**4.21** (3.37-5.14)	**5.11** (3.96-6.56)	**5.77** (4.38-7.60)	**6.49** (4.78-8.94)	**7.37** (5.05-10.3)	**8.72** (5.73-12.6)	**9.88** (6.32-14.6)
24-hr	**2.69** (2.20-3.22)	**3.31** (2.71-3.97)	**4.32** (3.52-5.20)	**5.16** (4.17-6.25)	**6.31** (4.93-8.07)	**7.16** (5.48-9.39)	**8.09** (6.02-11.1)	**9.25** (6.37-12.8)	**11.1** (7.28-15.9)	**12.6** (8.10-18.5)
2-day	**3.06** (2.53-3.63)	**3.83** (3.16-4.56)	**5.09** (4.19-6.08)	**6.14** (5.01-7.38)	**7.58** (5.99-9.65)	**8.63** (6.68-11.3)	**9.80** (7.39-13.5)	**11.3** (7.82-15.6)	**13.8** (9.10-19.7)	**16.0** (10.3-23.2)
3-day	**3.33** (2.77-3.94)	**4.18** (3.48-4.96)	**5.58** (4.62-6.64)	**6.74** (5.54-8.07)	**8.34** (6.63-10.6)	**9.50** (7.40-12.4)	**10.8** (8.19-14.8)	**12.5** (8.67-17.2)	**15.3** (10.1-21.8)	**17.8** (11.5-25.8)
4-day	**3.57** (2.99-4.22)	**4.49** (3.75-5.30)	**5.98** (4.97-7.09)	**7.22** (5.96-8.61)	**8.92** (7.12-11.3)	**10.2** (7.94-13.2)	**11.5** (8.78-15.8)	**13.4** (9.29-18.3)	**16.3** (10.8-23.2)	**19.0** (12.3-27.5)
7-day	**4.26** (3.59-4.99)	**5.28** (4.44-6.19)	**6.95** (5.82-8.18)	**8.33** (6.93-9.88)	**10.2** (8.22-12.9)	**11.6** (9.13-15.0)	**13.2** (10.0-17.9)	**15.2** (10.6-20.6)	**18.4** (12.2-25.9)	**21.2** (13.7-30.5)
10-day	**4.95** (4.19-5.77)	**6.03** (5.10-7.04)	**7.79** (6.57-9.14)	**9.26** (7.74-10.9)	**11.3** (9.08-14.1)	**12.8** (10.0-16.3)	**14.4** (10.9-19.3)	**16.4** (11.5-22.2)	**19.7** (13.1-27.6)	**22.5** (14.6-32.2)
20-day	**7.13** (6.10-8.25)	**8.28** (7.08-9.60)	**10.2** (8.66-11.8)	**11.7** (9.91-13.7)	**13.9** (11.2-17.1)	**15.5** (12.2-19.5)	**17.2** (13.0-22.6)	**19.2** (13.5-25.7)	**22.1** (14.8-30.8)	**24.6** (16.0-35.0)
30-day	**8.96** (7.72-10.3)	**10.1** (8.73-11.7)	**12.1** (10.4-14.0)	**13.7** (11.6-16.0)	**15.9** (12.9-19.4)	**17.6** (13.9-21.9)	**19.3** (14.6-25.0)	**21.2** (15.0-28.3)	**23.8** (16.1-33.0)	**25.9** (16.9-36.8)
45-day	**11.2** (9.74-12.9)	**12.5** (10.8-14.3)	**14.5** (12.5-16.7)	**16.1** (13.8-18.7)	**18.4** (15.0-22.2)	**20.2** (16.0-24.8)	**21.9** (16.5-27.9)	**23.7** (16.9-31.4)	**26.0** (17.6-35.8)	**27.7** (18.1-39.2)
60-day	**13.1** (11.4-15.0)	**14.4** (12.5-16.4)	**16.4** (14.2-18.9)	**18.1** (15.6-21.0)	**20.5** (16.8-24.6)	**22.3** (17.7-27.3)	**24.1** (18.2-30.5)	**25.8** (18.4-34.1)	**27.9** (18.9-38.3)	**29.4** (19.2-41.4)

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

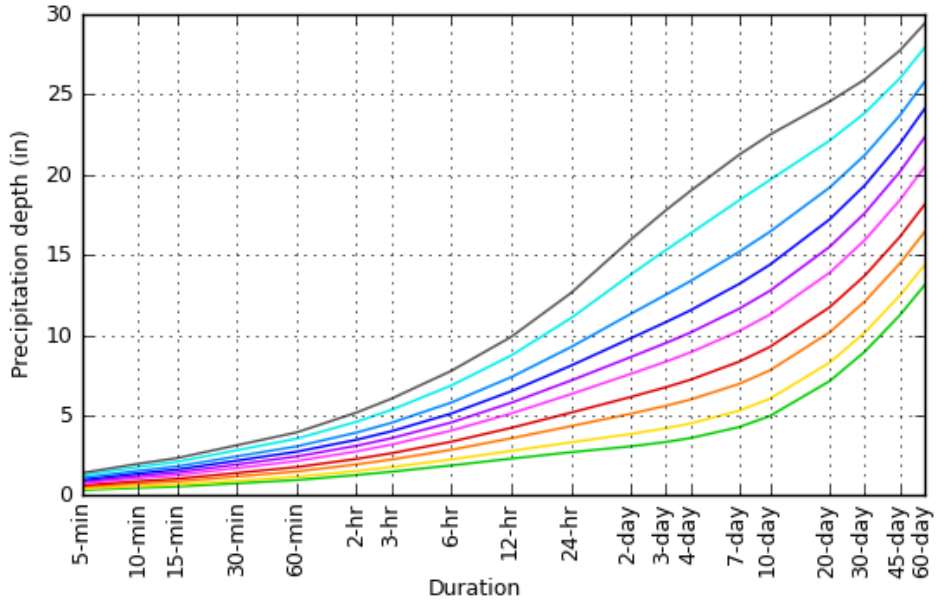
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper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

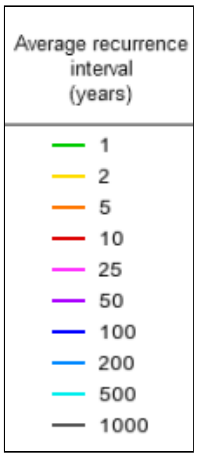
Please refer to NOAA Atlas 14 document for more information.

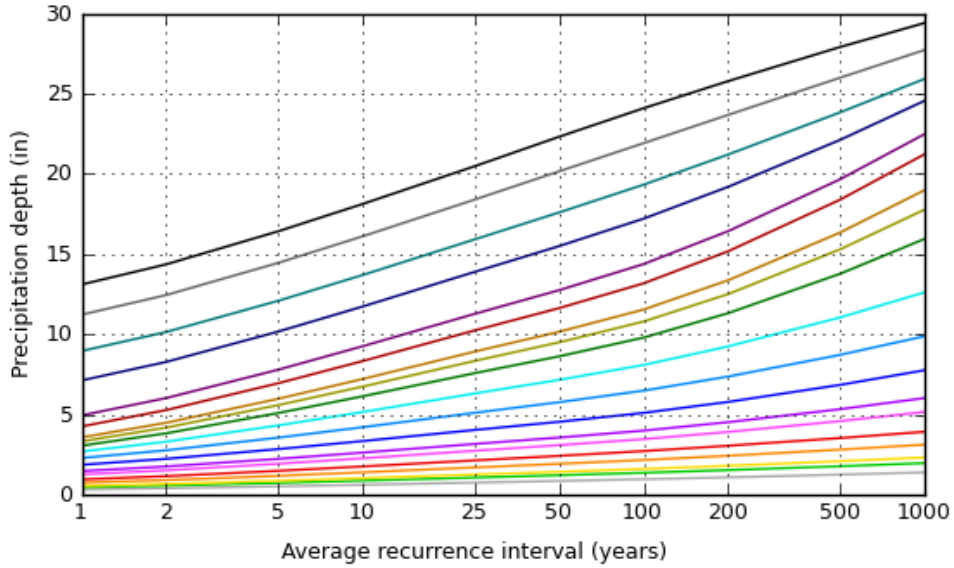
Back to Top

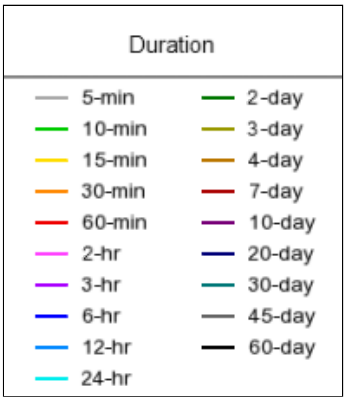
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 41.5500°, Longitude: -72.7167°









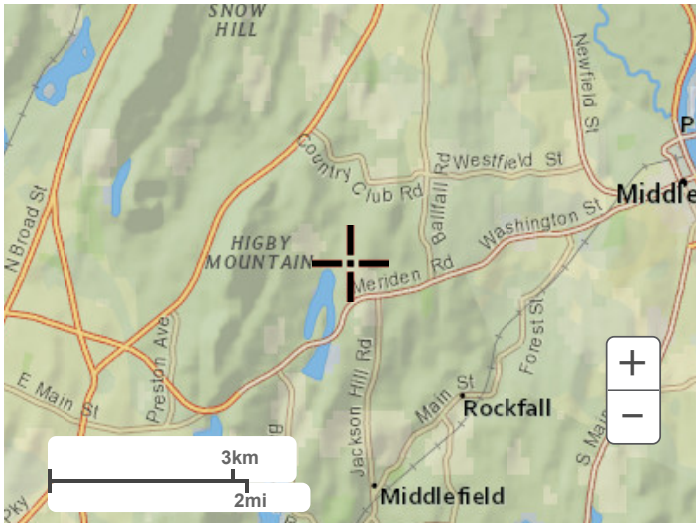
NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Thu Jul 22 18:36:07 2021

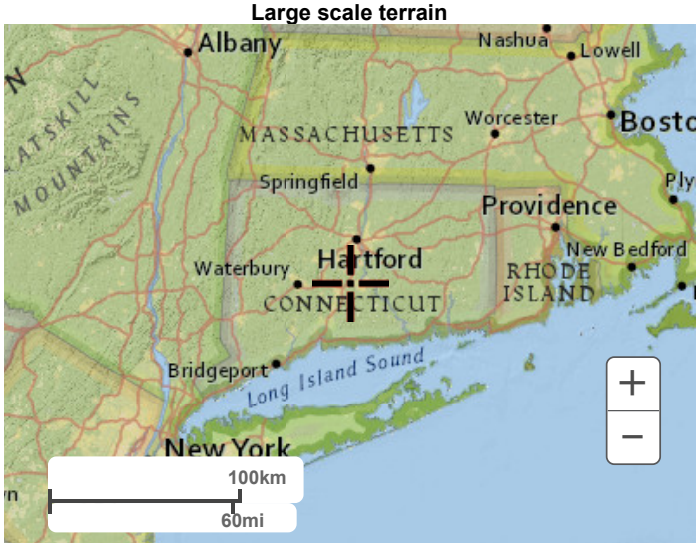
Back to Top

Maps & aerials

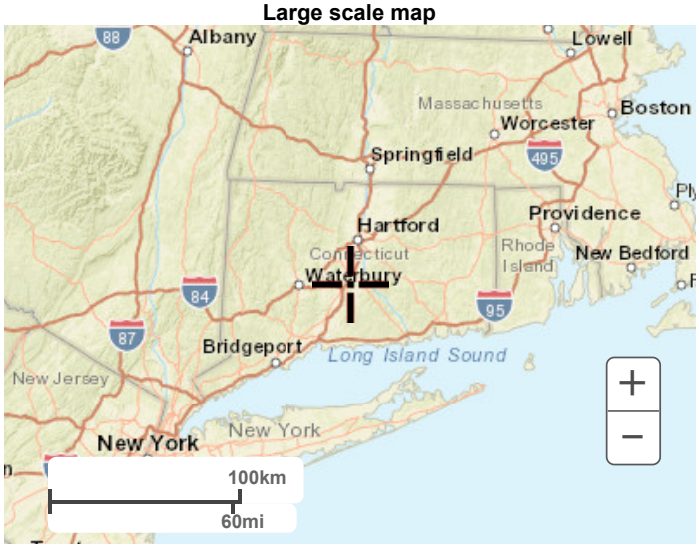
Small scale terrain



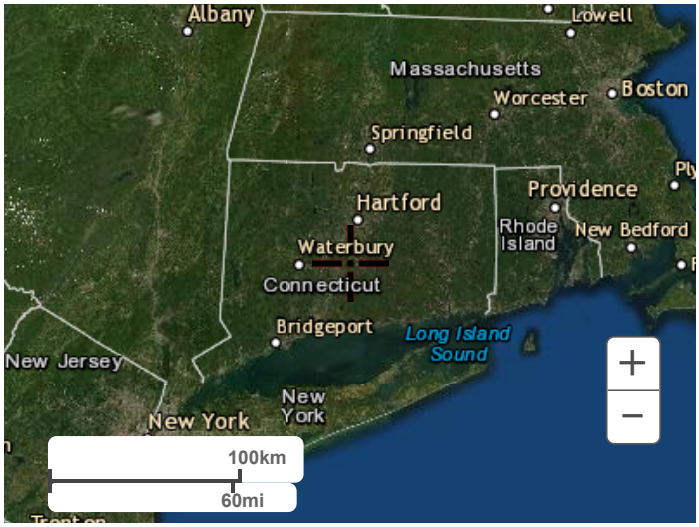
Large scale terrain



Large scale map



Large scale aerial



Back to Top

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

Disclaimer

NOAA Atlas 14, Volume 10, Version 3
Location name: Middletown, Connecticut, USA*
Latitude: 41.55°, Longitude: -72.7167°
Elevation: 427.38 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

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	**3.94** (3.08-4.88)	**4.81** (3.76-5.98)	**6.24** (4.86-7.78)	**7.42** (5.75-9.31)	**9.05** (6.78-11.9)	**10.3** (7.54-13.8)	**11.6** (8.23-16.1)	**13.0** (8.76-18.5)	**15.0** (9.76-22.2)	**16.7** (10.6-25.2)
10-min	**2.78** (2.18-3.46)	**3.41** (2.66-4.24)	**4.42** (3.45-5.52)	**5.26** (4.08-6.61)	**6.41** (4.81-8.42)	**7.28** (5.35-9.77)	**8.20** (5.83-11.4)	**9.21** (6.21-13.1)	**10.7** (6.91-15.8)	**11.8** (7.48-17.9)
15-min	**2.18** (1.71-2.72)	**2.67** (2.09-3.32)	**3.46** (2.70-4.33)	**4.12** (3.19-5.18)	**5.03** (3.77-6.60)	**5.71** (4.19-7.67)	**6.43** (4.58-8.95)	**7.22** (4.87-10.3)	**8.36** (5.42-12.4)	**9.28** (5.87-14.0)
30-min	**1.50** (1.17-1.86)	**1.82** (1.43-2.27)	**2.35** (1.83-2.93)	**2.79** (2.16-3.50)	**3.40** (2.54-4.46)	**3.85** (2.83-5.17)	**4.33** (3.08-6.03)	**4.86** (3.28-6.94)	**5.62** (3.64-8.32)	**6.24** (3.95-9.43)
60-min	**0.955** (0.747-1.19)	**1.16** (0.904-1.44)	**1.49** (1.16-1.86)	**1.76** (1.36-2.21)	**2.14** (1.60-2.81)	**2.42** (1.78-3.25)	**2.72** (1.94-3.79)	**3.05** (2.06-4.36)	**3.53** (2.29-5.23)	**3.92** (2.48-5.93)
2-hr	**0.632** (0.500-0.780)	**0.758** (0.598-0.936)	**0.964** (0.759-1.19)	**1.14** (0.888-1.41)	**1.37** (1.04-1.79)	**1.54** (1.15-2.07)	**1.73** (1.25-2.42)	**1.96** (1.33-2.78)	**2.29** (1.49-3.37)	**2.58** (1.64-3.87)
3-hr	**0.490** (0.390-0.602)	**0.586** (0.466-0.720)	**0.744** (0.588-0.917)	**0.874** (0.687-1.08)	**1.05** (0.803-1.37)	**1.19** (0.886-1.59)	**1.33** (0.967-1.86)	**1.51** (1.02-2.13)	**1.78** (1.16-2.60)	**2.01** (1.28-3.00)
6-hr	**0.312** (0.250-0.379)	**0.373** (0.299-0.455)	**0.474** (0.379-0.580)	**0.558** (0.443-0.687)	**0.674** (0.518-0.873)	**0.759** (0.571-1.01)	**0.852** (0.624-1.18)	**0.966** (0.659-1.36)	**1.14** (0.748-1.66)	**1.30** (0.827-1.93)
12-hr	**0.190** (0.154-0.230)	**0.230** (0.186-0.278)	**0.295** (0.238-0.358)	**0.349** (0.280-0.426)	**0.424** (0.328-0.545)	**0.479** (0.363-0.631)	**0.539** (0.397-0.742)	**0.612** (0.419-0.853)	**0.724** (0.475-1.05)	**0.820** (0.525-1.21)
24-hr	**0.112** (0.092-0.134)	**0.138** (0.113-0.165)	**0.180** (0.147-0.217)	**0.215** (0.174-0.260)	**0.263** (0.206-0.336)	**0.298** (0.228-0.391)	**0.337** (0.251-0.463)	**0.385** (0.265-0.534)	**0.461** (0.303-0.662)	**0.526** (0.337-0.771)
2-day	**0.064** (0.053-0.076)	**0.080** (0.066-0.095)	**0.106** (0.087-0.127)	**0.128** (0.104-0.154)	**0.158** (0.125-0.201)	**0.180** (0.139-0.235)	**0.204** (0.154-0.281)	**0.236** (0.163-0.325)	**0.287** (0.190-0.410)	**0.332** (0.214-0.484)
3-day	**0.046** (0.038-0.055)	**0.058** (0.048-0.069)	**0.078** (0.064-0.092)	**0.094** (0.077-0.112)	**0.116** (0.092-0.147)	**0.132** (0.103-0.172)	**0.150** (0.114-0.206)	**0.174** (0.120-0.238)	**0.212** (0.141-0.302)	**0.247** (0.159-0.358)
4-day	**0.037** (0.031-0.044)	**0.047** (0.039-0.055)	**0.062** (0.052-0.074)	**0.075** (0.062-0.090)	**0.093** (0.074-0.118)	**0.106** (0.083-0.138)	**0.120** (0.091-0.165)	**0.139** (0.097-0.191)	**0.170** (0.113-0.241)	**0.198** (0.128-0.286)
7-day	**0.025** (0.021-0.030)	**0.031** (0.026-0.037)	**0.041** (0.035-0.049)	**0.050** (0.041-0.059)	**0.061** (0.049-0.077)	**0.069** (0.054-0.089)	**0.078** (0.060-0.106)	**0.090** (0.063-0.123)	**0.109** (0.073-0.154)	**0.126** (0.082-0.182)
10-day	**0.021** (0.017-0.024)	**0.025** (0.021-0.029)	**0.032** (0.027-0.038)	**0.039** (0.032-0.046)	**0.047** (0.038-0.059)	**0.053** (0.042-0.068)	**0.060** (0.046-0.080)	**0.068** (0.048-0.093)	**0.082** (0.055-0.115)	**0.094** (0.061-0.134)
20-day	**0.015** (0.013-0.017)	**0.017** (0.015-0.020)	**0.021** (0.018-0.025)	**0.024** (0.021-0.029)	**0.029** (0.023-0.036)	**0.032** (0.025-0.041)	**0.036** (0.027-0.047)	**0.040** (0.028-0.054)	**0.046** (0.031-0.064)	**0.051** (0.033-0.073)
30-day	**0.012** (0.011-0.014)	**0.014** (0.012-0.016)	**0.017** (0.014-0.019)	**0.019** (0.016-0.022)	**0.022** (0.018-0.027)	**0.024** (0.019-0.030)	**0.027** (0.020-0.035)	**0.029** (0.021-0.039)	**0.033** (0.022-0.046)	**0.036** (0.023-0.051)
45-day	**0.010** (0.009-0.012)	**0.012** (0.010-0.013)	**0.013** (0.012-0.015)	**0.015** (0.013-0.017)	**0.017** (0.014-0.021)	**0.019** (0.015-0.023)	**0.020** (0.015-0.026)	**0.022** (0.016-0.029)	**0.024** (0.016-0.033)	**0.026** (0.017-0.036)
60-day	**0.009** (0.008-0.010)	**0.010** (0.009-0.011)	**0.011** (0.010-0.013)	**0.013** (0.011-0.015)	**0.014** (0.012-0.017)	**0.015** (0.012-0.019)	**0.017** (0.013-0.021)	**0.018** (0.013-0.024)	**0.019** (0.013-0.027)	**0.020** (0.013-0.029)

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

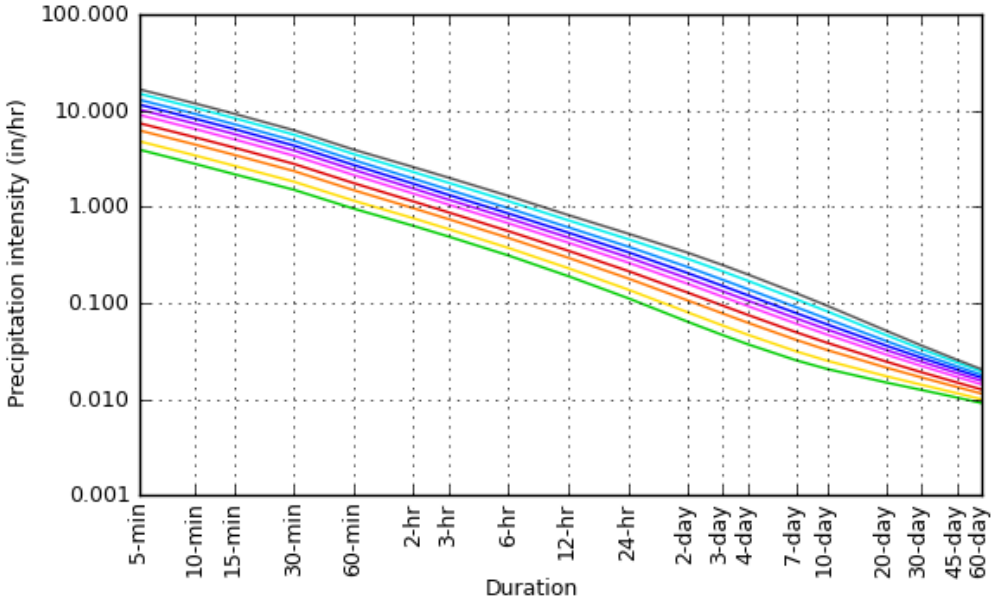
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper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

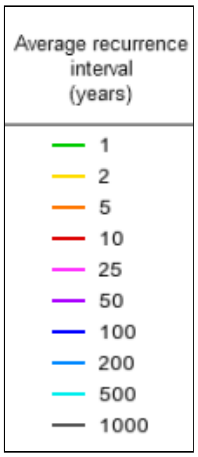
Please refer to NOAA Atlas 14 document for more information.

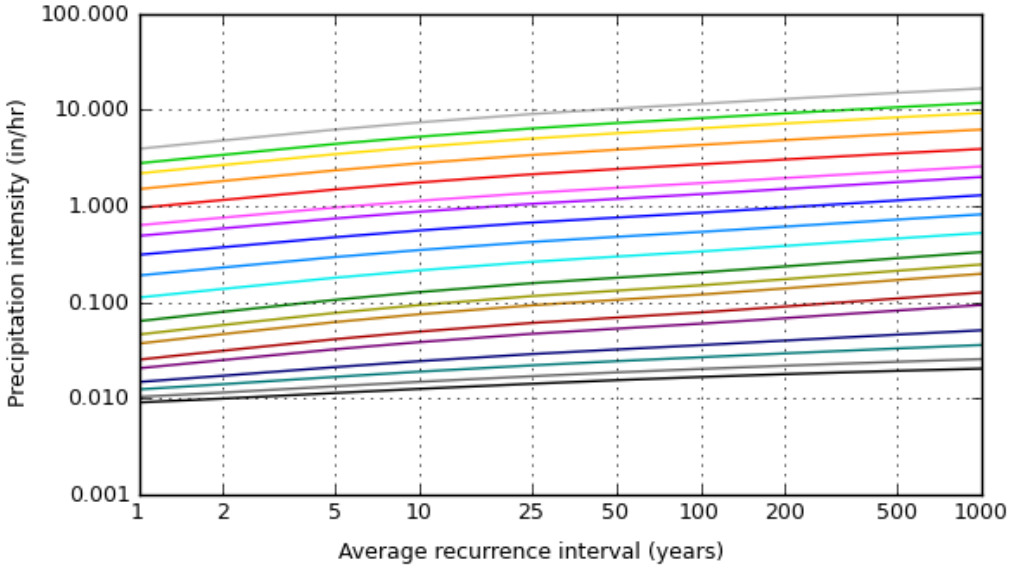
Back to Top

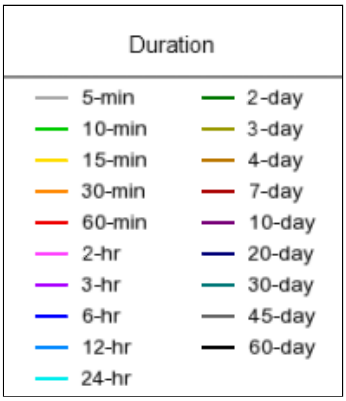
PF graphical

PDS-based intensity-duration-frequency (IDF) curves
Latitude: 41.5500°, Longitude: -72.7167°









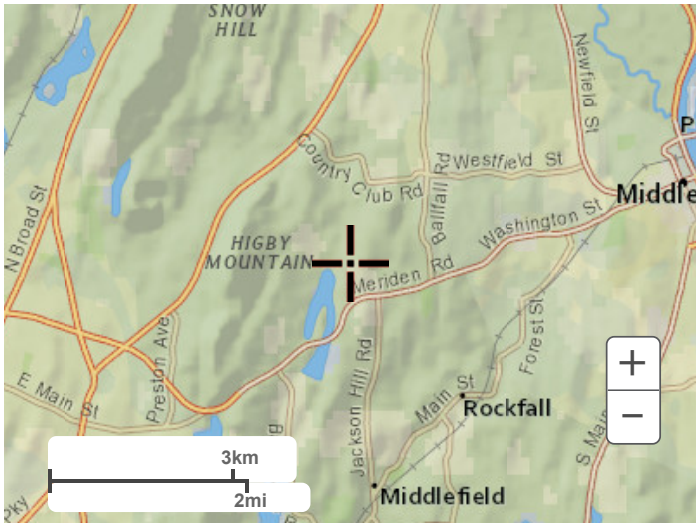
NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Thu Jul 22 18:36:48 2021

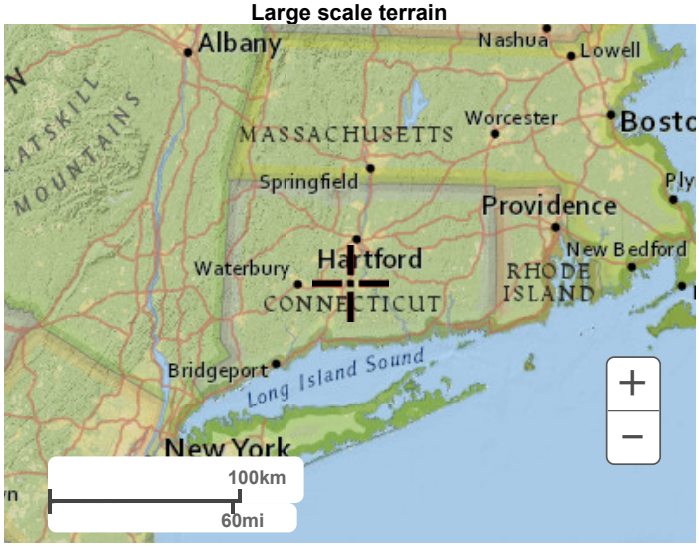
Back to Top

Maps & aerials

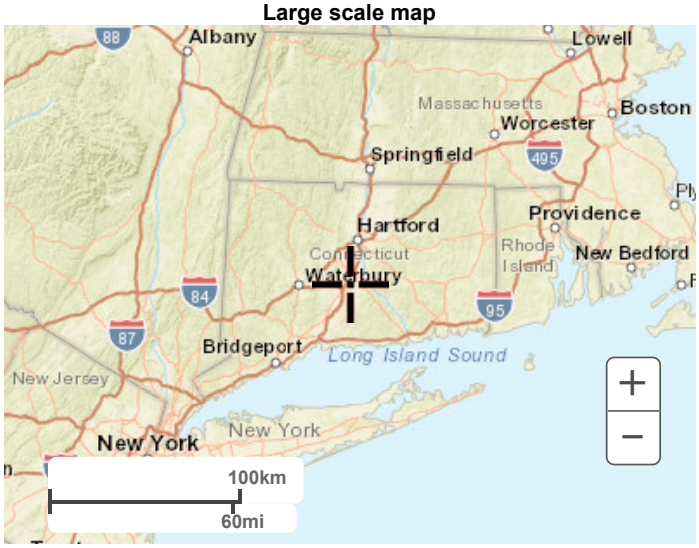
Small scale terrain



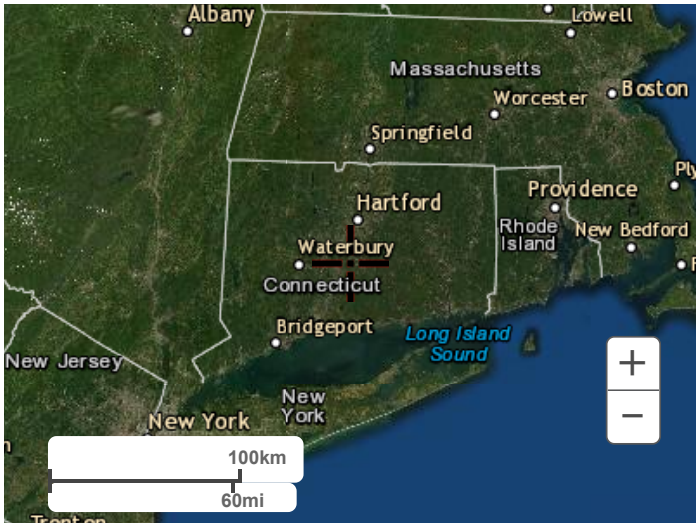
Large scale terrain



Large scale map



Large scale aerial



Back to Top

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

Disclaimer

APPENDIX H

Operation and Maintenance

LANGAN

Operation and Maintenance Manual
Project Highlands
Cromwell, Connecticut

Regular inspection and maintenance of the stormwater management system and uphill areas is necessary to ensure proper operation. These costs will be the responsibility of the developer.

Inspections of the stormwater management system shall be conducted monthly based on the following tables:

Site Areas:

Inspection and Maintenance

Check for:	***Corrective Measure:***
Erosion	Install erosion control measures and provide stabilization measures
Spillage	Contain spill as close to source as possible with a dike of absorbent materials installed to protect drainage inlets, stormwater areas, or downstream wetlands and streams. All hazardous waste material, including absorbent materials must be disposed of by a licensed hazardous waste transporter and disposed of in an environmentally acceptable manner
Sediment Accumulation	Stabilize any disturbed areas uphill of where the sedimentation is occurring. Use temporary erosion control measures (i.e. silt fence, straw bales) to filter stormwater runoff.
Trash	Pick up and dispose of trash and litter in an environmentally acceptable manner.

Routine Maintenance

Maintenance Measure:	***Frequency:***
Pavement Sweeping	Parking area and paved areas shall be swept annually between April 1st and July 1st.

Catch Basins and Pipe:

All catch basins shall be inspected annually between May 1st and September 15th.

Inspection and Maintenance

Check for:	***Corrective Measure:***
Trash, Sediment, and Debris at Grate	Remove trash, sediment, and debris and dispose of in an environmentally acceptable manner.
Sediment & Trash Accumulation in Sump	Remove sediment from sumps if depth of deposits is greater than one-half the depth from the bottom of the catch basin to the invert of the lowest pipe in the basin.
Pipe blockages	Flush pipes to remove blockages. TV inspect as required.

At a minimum the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

Maintenance Measure:	***Frequency:***
Sediment Removal	Minimum one time per year: Remove sediment and trash from catch basin sumps and grates and pipe inverts. Dispose of sediment and trash in an environmentally acceptable manner.

Underground Detention Systems

Inspection and Maintenance

Check for:	***Corrective Measure:***
Sediment Accumulation	Remove sediment when accumulation exceeds 3 inches throughout the length of the pipes.
Trash and Debris	Remove trash and debris and dispose of in an environmentally acceptable manner.
Cracks in pipe	Repair or replace broken pipes

At a minimum, the following maintenance measures shall be provided at the frequency listed in the following table:

Maintenance Measure:	***Frequency:***
Sediment & Floatable Removal	Minimum one time per year: Remove sediment and floatables mechanically rather than flushing. If flushing is the only option then great care must be taken not to flush sediments downstream into native waters. Dispose of sediment in an environmentally acceptable manner.

Sediment Forebays

Sediment forebays shall be inspected monthly. Forebays shall be inspected for invasive vegetation every 6 months.

Inspection and Maintenance

Check for:	***Corrective Measure:***
Sediment Accumulation	Remove sediment from the forebay as necessary. After removing sediment, replace any vegetation damaged during the clean-out by either reseeding or re-sodding.
Erosion	Install erosion control measures and provide stabilization measures. Undercut or eroded areas shall be repaired within 30 days of documentation.

At a minimum, the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

Maintenance Measure:	***Frequency:***
Sediment Removal	Clean out and remove sediment at least four times per year. Check for sediment accumulation, rilling, gullying, and general damage to the sediment forebay. Sediment shall be disposed of off-site in a proper manner.
Mowing	Grass in sediment forebay shall not exceed 6”.

Infiltration Basins

Infiltration Basins shall be inspected monthly. Inspect after every major storm during first 3 months of operation and monthly thereafter. Infiltration basins shall be inspected for invasive vegetation every 6 months.

Inspection and Maintenance

Check for:	***Corrective Measure:***
Erosion and cracking	Install erosion control measures and provide stabilization measures. Undercut or eroded areas shall be repaired within 30 days of documentation.
Sediment Accumulation	Remove sediment from the basin as necessary. Wait until floor of the basin is thoroughly dry before removing sediment.
Trash and Debris	Remove trash and debris and dispose of in an environmentally acceptable manner.
Signs of differential settlement	Repair and replace basin floor with suitable, permeable material. Use deep tilling to break up clogged surfaces, and revegetate immediately.
Invasive and excess vegetation	Remove excess vegetation from infiltration basin. Revegetate as needed.
Condition of rip-rap	Area should be cleared of all sediment deposits and invasive plant species. Damage and deterioration of the area shall be repaired immediately.

At a minimum, the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

Maintenance Measure:	***Frequency:***
Mowing	Twice a year: (FOR INFILTRATION BASINS ONLY) mow the buffer area, side slopes, and basin bottom. Remove trash and debris, grass clippings and accumulated organic matter.

Preformed Scour Holes and Rip Rap Aprons

Scour holes shall be inspected monthly.

Inspection and Maintenance

Check for:	***Corrective Measure:***
Condition of rip-rap	Area should be cleared of all sediment deposits and invasive plant species. Damage and deterioration of the area shall be repaired immediately.
Dislodged material	Replace dislodged material to scour hole

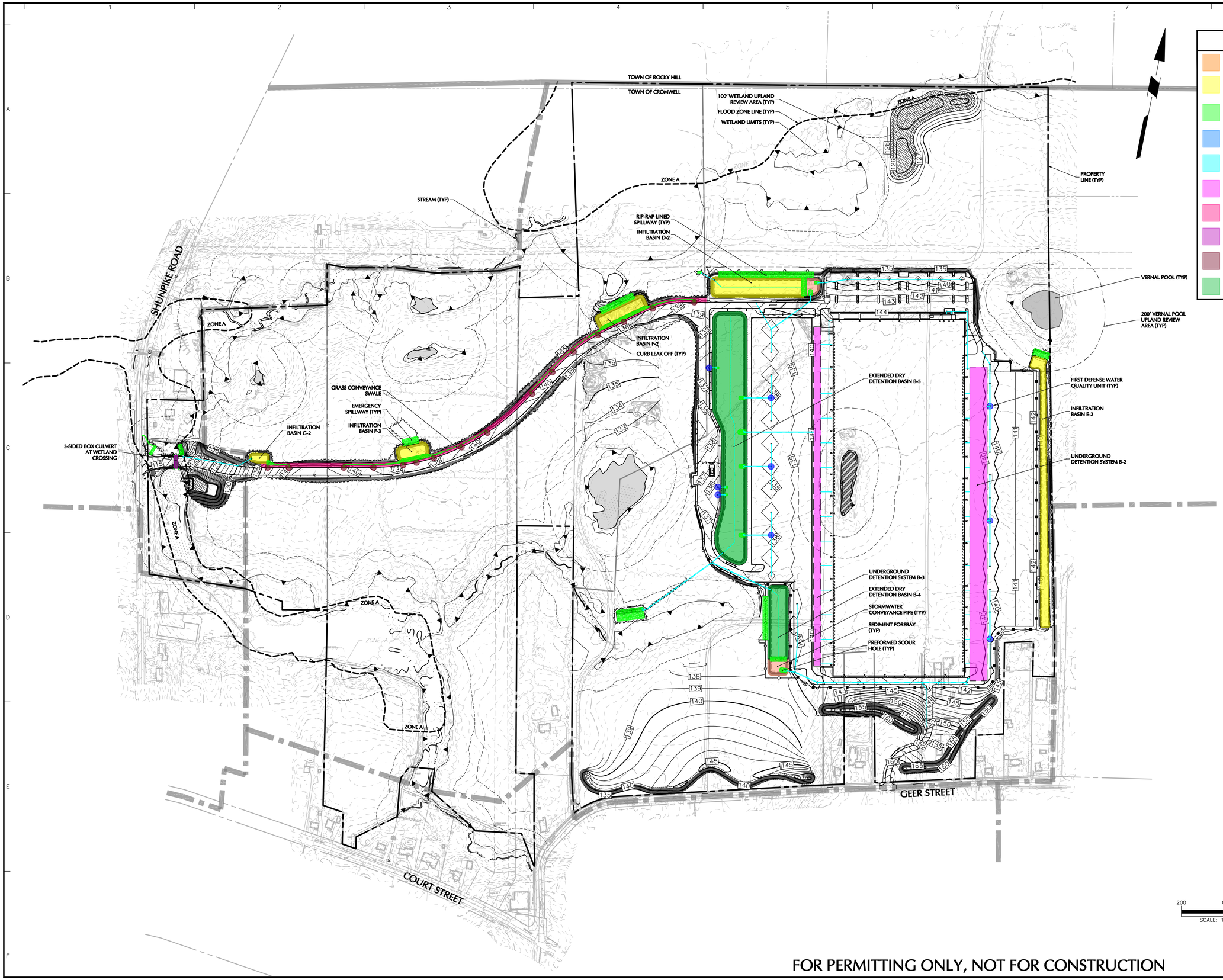
Water Quality Units

Water quality units shall be inspected and cleaned in strict accordance with the manufacturer's recommendations and requirements. Clean the units using the methods specified by the manufacturer.

STORMWATER MANAGEMENT SYSTEM INSPECTION AND MAINTENANCE CHECKLIST (SHEET 1 OF 2)

Project Highlands – Cromwell, CT Date: Days Since Last Precipitation Event:	Time:	Inspector: Site Conditions:

Inspection Item	**Satisfactory? Yes (Y) or No (N)**		**Comments or Corrective Measures Taken**
Site Areas			
Erosion	Y	N	
Spillage	Y	N	
Sediment Accumulation	Y	N	
Trash	Y	N	
Catch Basins and Pipe			
Trash, Sediment, and Debris at Grate	Y	N	
Sediment & Trash Accumulation in Sump	Y	N	
Pipe blockages	Y	N	
Hydrodynamic Separators			
Performed Maintenance per Attached Documents	Y	N	
Infiltration Basins			
Sediment Accumulation	Y	N	
Trash and Debris	Y	N	
Cracks in Pipe	Y	N	
Sediment Forebays			
Sediment Accumulation	Y	N	
Erosion	Y	N	



LEGEND

- SEDIMENT FOREBAY
- INFILTRATION BASIN
- RIP-RAP PROTECTION/ PREFORMED SCOUR HOLE (PERMANENT OUTLET PROTECTION)
- FIRST DEFENSE WATER QUALITY UNIT
- STORMWATER CONVEYANCE PIPE
- UNDERGROUND DETENTION BASIN
- GRASS CONVEYANCE SWALE
- BOX CULVERT
- CURB LEAK OFF
- EXTENDED DRY DETENTION BASIN

200 0 100 200
SCALE: 1" = 200'

FOR PERMITTING ONLY, NOT FOR CONSTRUCTION

Date	Description	No.
Revisions		

Signature Date

LANGAN
Langan CT, Inc.
555 Long Wharf Drive
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

Project
PROJECT HIGHLANDS
210 SHUNPIKE ROAD
CROMWELL CONNECTICUT

Drawing Title
LONG TERM O&M FIGURE

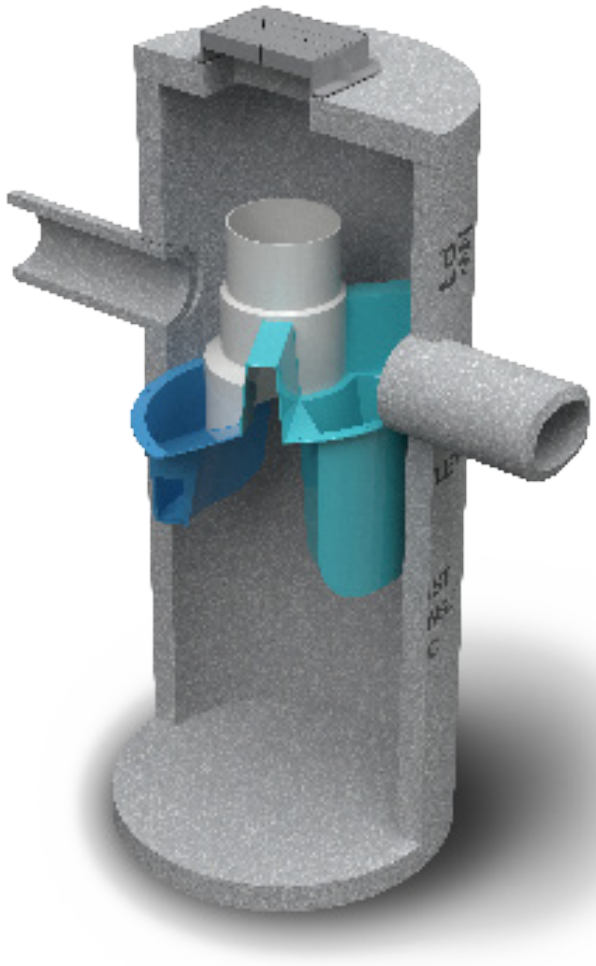
Project No.	Figure
140225401	FIG. 01
Date: 05/03/2022	
Drawn By: MS	
Checked By: DTG	

LANGAN
Project No. 140225401

© 2021 Langan

Date: 5/2/2022 Time: 11:44 User: jmontagno Style Table: Langan.stb Layout: Layout1 Document Code: FG01-140225401-0501-CG101-0101

Hydro International



Operation and Maintenance Manual

First Defense® High Capacity and First Defense®Optimum

Vortex Separator for Stormwater Treatment

Table of Contents

3 First Defense® by Hydro International
- Introduction
- Operation
- Pollutant Capture and Retention

4 Model Sizes & Configurations
- First Defense® Components

5 Maintenance
- Overview
- Maintenance Equipment Considerations
- Determining Your Maintenance Schedule

6 Maintenance Procedures
- Inspection
- Floatables and Sediment Clean Out

8 First Defense® Installation Log

9 First Defense® Inspection and Maintenance Log

COPYRIGHT STATEMENT: The contents of this manual, including the graphics contained herein, are intended for the use of the recipient to whom the document and all associated information are directed. Hydro International plc owns the copyright of this document, which is supplied in confidence. It must not be used for any purpose other than that for which it is supplied and must not be reproduced, in whole or in part stored in a retrieval system or transmitted in any form or by any means without prior permission in writing from Hydro International plc. First Defense® is a trademarked hydrodynamic vortex separation device of Hydro International plc. A patent covering the First Defense® has been granted.

DISCLAIMER: Information and data contained in this manual is exclusively for the purpose of assisting in the operation and maintenance of Hydro International plc's First Defense®. No warranty is given nor can liability be accepted for use of this information for any other purpose. Hydro International plc has a policy of continuous product development and reserves the right to amend specifications without notice.

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints.

The two product models described in this guide are the First Defense® High Capacity and the First Defense® Optimum; they are inspected and maintained identically.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig.1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for “offline” arrangements using separate junction manholes
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

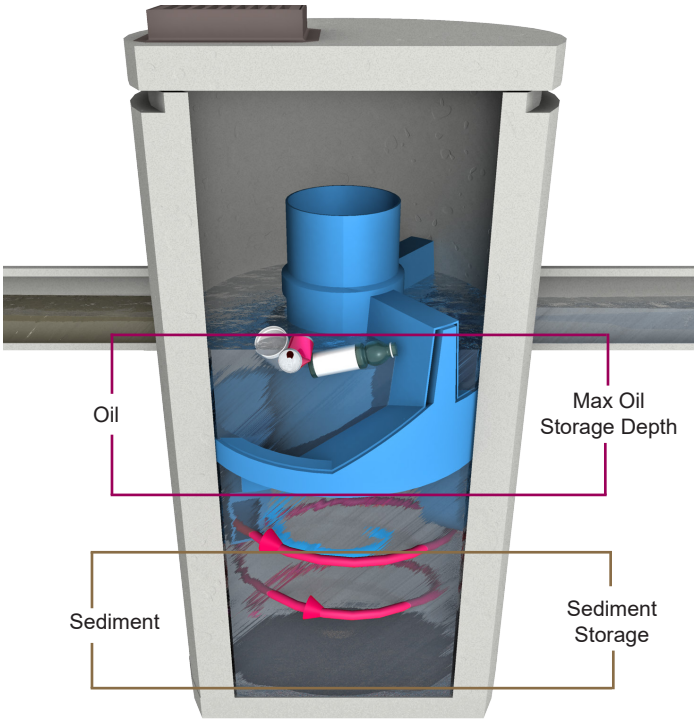


Fig.1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components have modified geometries allowing greater design flexibility to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2). First Defense® model sizes (diameter) are shown in Table 1.

III. Maintenance

First Defense® Components

1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Sediment Storage**
8. **Inlet Grate or Cover**

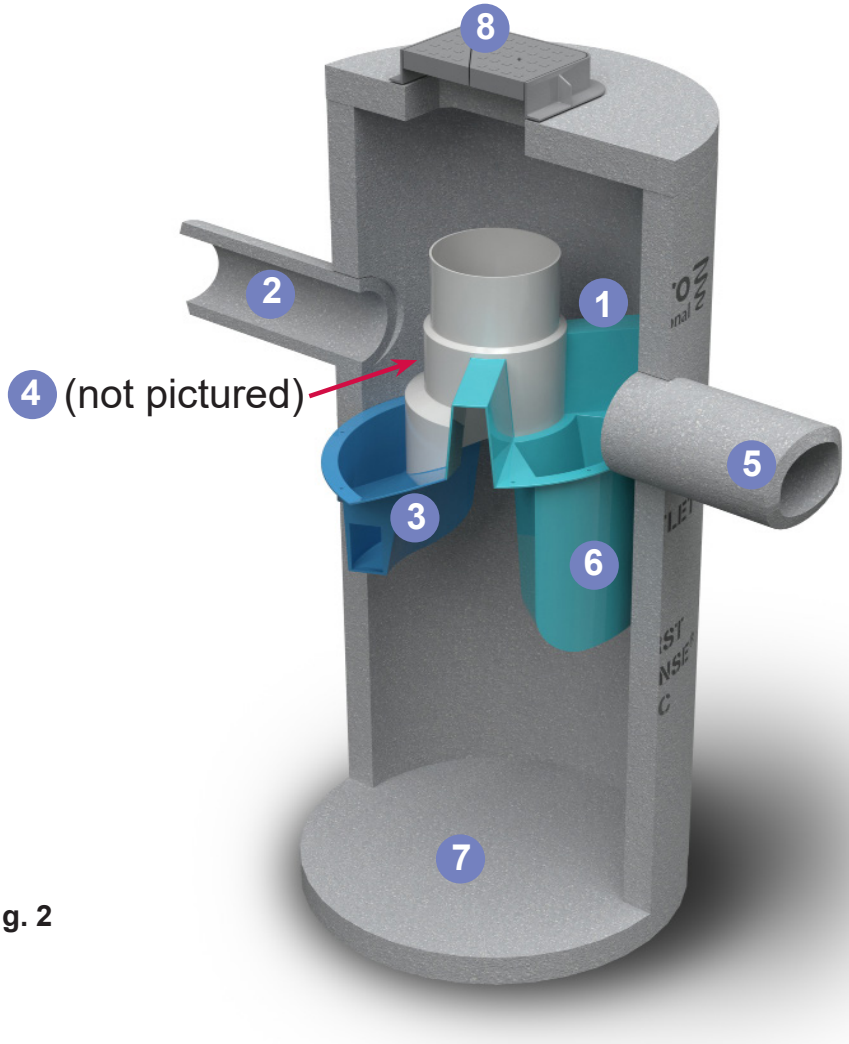


Fig. 2

Table 1

First Defense® Model Sizes
(ft / m) diameter
3 / 0.9
4 / 1.2
5 / 1.5
6 / 1.8
7 / 2.1
8 / 2.4
10 / 3.0

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense® have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.

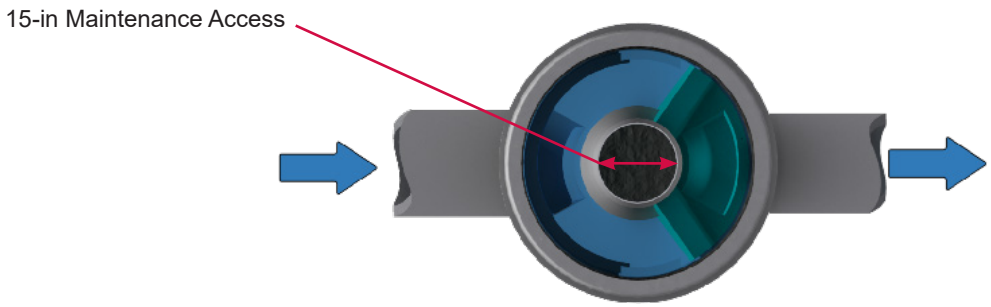


Fig.3 The central opening to the sump of the First Defense®is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / flotables removal, for First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.4).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.

- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.



Fig.4 Floatables are removed with a vactor hose

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge Judge®)
- Vactor truck (flexible hose recommended)
- First Defense® Maintenance Log

Floatables and Sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.

4. Remove oil and floatables stored on the surface of the water with the vactor hose or with the skimmer or net

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).

6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor

7. Retract the vactor hose from the vessel.

8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.

9. Securely replace the grate or lid.

Maintenance at a Glance

Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.	

First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL SIZE (CIRCLE ONE): [3-FT] [4-FT] [5-FT] [6-FT] [7-FT] [8-FT] [10-FT]

INLET (CIRCLE ALL THAT APPLY): GRATED INLET (CATCH BASIN) INLET PIPE (FLOW THROUGH)

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

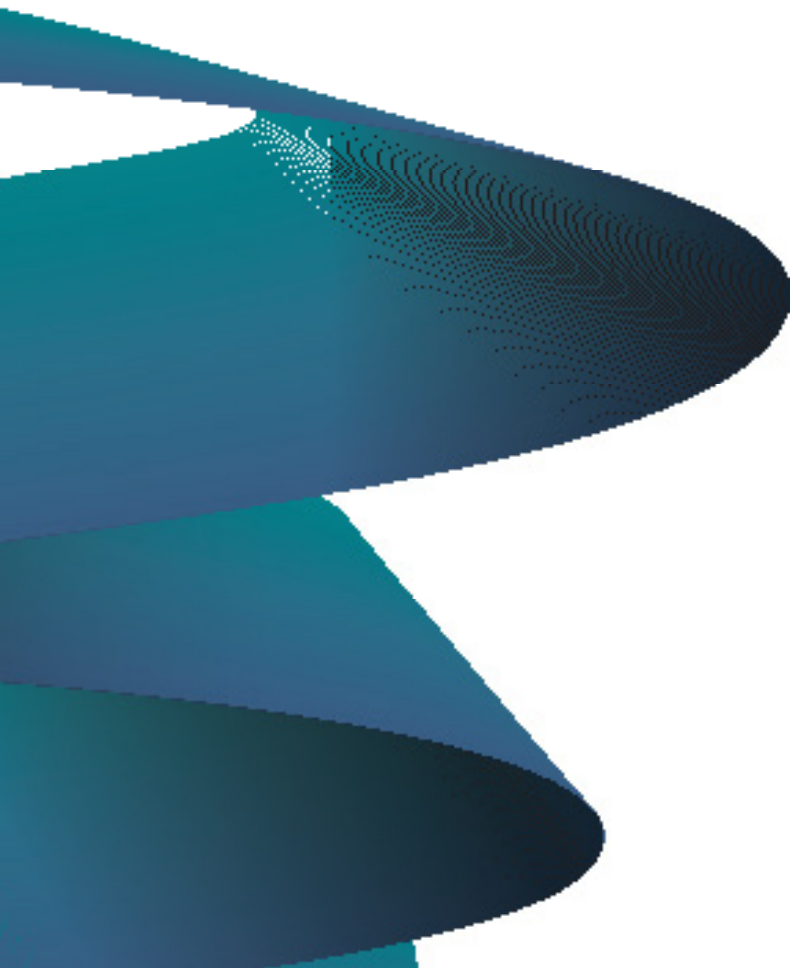
First Defense® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment Depth Measured	Volume of Sediment Removed	Site Activity and Comments

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Hydro International



Stormwater Solutions

94 Hutchins Drive
Portland, ME 04102

Tel: (207) 756-6200
Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

www.hydro-int.com

Turning Water Around...®

FD_O+M_K_2105

STORMWATER MANAGEMENT SYSTEM INSPECTION AND MAINTENANCE CHECKLIST (SHEET 2 OF 2)

Project Highlands – Cromwell, CT Date: Days Since Last Precipitation Event:		Time:	Inspector: Site Conditions:
Inspection Item	**Satisfactory? Yes (Y) or No (N)**		**Comments or Corrective Measures Taken**
Above Ground Stormwater Basin			
Erosion / Cracking	Y	N	
Sediment Accumulation	Y	N	
Trash and Debris	Y	N	
Signs of Differential Settlement	Y	N	
Invasive and Excess Vegetation	Y	N	
Condition of Rip-Rap	Y	N	
Preformed Scour Holes and Rip Rap Aprons			
Condition of Rip-Rap	Y	N	
Dislodged Material	Y	N	

APPENDIX I

Boring, Test Pit, and Hydraulic Conductivity Test Data

Project Highlands
Cromwell, CT
GEI Project No. 2102942
Test Pit GW Data

Boring/Test Pit ID	Location Ref.	GS Elevation (Current)	Depth to GW	GW El.
TP-1	Basin D-2	133.5	5.0	128.5
TP-2		132.5	4.0	128.5
TP-3	Basin E-2	142.0	NE	N/A
TP-4		140.0	4.5	135.5
TP-5	Basin B-4	135.0	3.5	131.5
TP-6		135.5	5.7	129.8
TP-7	Wet Pond B-5	137.5	7.0	130.5
TP-8		136.0	5.8	130.2
TP-9	Near Geer Street	135.0	5.7	129.3
TP-10	Wet Pond B-5	137.5	7.8	129.7
TP-11	Wet Pond B-5	137.5	6.3	131.2
TP-12	Basin B-4	137.5	6.7	130.8
TP-13	Basin E-2	141.0	> 8.0	< 133.0
TP-14	Basin E-2	145.0	> 7.9	< 137.1
TP-15	West Underground Inf	142.5	> 7.0	< 135.5
TP-16	West Underground Inf	138.0	8.0	130.0
TP-17	Basin D-2	133.0	6.8	126.2
TP-18	North Wetland Creation Area	131.5	6.3	125.2
TP-19		131.0	6.2	124.8
TP-20		130.0	4.3	125.7
TP-21		129.0	3.8	125.2
TP-22		130.5	5.2	125.3
TP-23		131.0	6.0	125.0
TP-24		131.0	5.8	125.2
WC-1		129.0	3.2	125.8
WC-2		128.0	2.1	125.9
WC-3		129.0	4.5	124.5
WC-4		130.0	6.2	123.8
WC-5		130.0	4.9	125.1
WC-6		128.0	2.8	125.2
WC-7		128.5	2.8	125.7
TP-25	Basin F-2	136.5	6.0	130.5
TP-26	Basin F-3	135.0	6.0	129.0
TP-27	Basin F-3	135.0	6.3	128.7
TP-28	Basin F-4	135.0	8.6	126.4
TP-29	Basin F-4	135.0	8.0	127.0
TP-30	Basin G-2	137.5	> 9.0	< 128.5
TP-31	Basin G-2	138.0	>10.0	< 128.0
TP-32	West Wetland Creation	122.0	> 12.0	< 110.0
TP-33	West Underground Inf	143.0	> 10.0	< 133.0
TP-34		141.5	> 11.0	< 130.5
TP-35		137.5	6.0	131.5
TP-36	East Underground Inf	145.0	4.5	140.5
TP-37		140.0	> 8.0	< 132.0
TP-38		141.0	11.3	129.7

Project Highlands
Cromwell, CT
GEI Project No. 2102942
Monitoring Well GW Data

Well ID	Location Ref.		GS Elevation (Current)	Bottom Depth (bgs)	Well Bottom El.	12/23/2021		1/5/2022		2/23/2022		3/10/2022	
MW-1	SB-2	Wet Pond B-5	138.0	15.0	123.0	8.25	129.8	8.35	129.7	7.85	130.2	7.5	130.5
MW-2	SB-3		137.5	15.0	122.5	6.83	130.7	6.81	130.7	6.19	131.3	5.9	131.7
MW-3	SB-4	Basin B-4	137.5	15.0	122.5	6.43	131.1	6.42	131.1	5.79	131.7	5.4	132.2
MW-4	WC-7	North Wetland Area	128.5	9.0	119.5	2.85	125.7	2.78	125.7	2.37	126.1	3.0	125.6
MW-5	WC-6		128.0	9.0	119.0	2.87	125.1	2.76	125.2	2.33	125.7	2.7	125.4
MW-6			131.5	10.0	121.5							6.5	125.1
MW-7			130.0	10.0	120.0							5.1	124.9
MW-8			130.0	10.0	120.0							4.1	125.9
MW-9	TP-25	Basin F-2	136.5	12.0	124.5							6.4	130.1
MW-10	TP-26/27	Basin F-3	135	12.0	123.0							5.6	129.4
MW-11	TP-28/29	Basin F-4	135	12.0	123.0							7.2	127.8
MW-12	TP-30/31	Basin G-2	137.5	12.0	125.5							dry	< 125.5
MW-13	TP-33	West Underground Inf	143	10.0	133.0							dry	< 133
MW-14	TP-34		141.5	12.0	129.5							10.8	130.8
MW-15	TP-35		137.5	9.0	128.5							4.4	133.1
MW-16	TP-36	East Underground Inf	145	14.0	131.0							4.4	140.6
MW-17	TP-37		140	10.0	130.0							5.4	134.6
MW-18	TP-38		141	10.0	131.0							dry	< 131
MW-19		Potential Basin	136	12.0	124.0							3.0	133.0
MW-20			140	12.0	128.0							9.6	130.4

GEI Consultants, Inc.
Project Highlands
GEI Proj # 2102942- 1.1
Guelph Permeameter Testing
Test Date 12/23/2021

Field Data TP-11

Reservoir Combined
Unit Set 9.0"
Depth of Test 4.0'
Depth to GW 6.3'
GEI Rep. Bosede Akereyeni
Soil Type NARROWLY GRADED SAND WITH GRAVEL (SP); ~85% F- sand, ~10% F-M gravel, ~5% NP fines, reddish brown, damp.

Water Level in Well 5 cm *

Time (min)	Time Change (min)	Water Level in Res. (cm)	Change in Res. Water Level (cm)	Rate of Change (cm/min)
0.0833		3.3		
0.167	0.08	11.5	8.2	98.01
0.25	0.08	21	9.5	114.46
0.333	0.08	31	10	120.48
0.420	0.09	38	7	80.46
0.50	0.08	46	8	100.00
0.583	0.08	55	9	108.43
0.667	0.08	62	7	83.33
0.75	0.08	68	6	72.29
0.833	0.08	74	6	72.29
	Steady Rate of Change, R_1 (cm/min)			**75.97**

Water Level in Well 10 cm

Time (min)	Time Change (min)	Water Level in Res. (cm)	Change in Res. Water Level (cm)	Rate of Change (cm/min)
0.083		5		
0.166	0.08	12	7	84.34
0.25	0.08	17.5	5.5	65.48
0.330	0.08	22.2	4.7	58.75
0.417	0.09	26	3.8	43.85
0.500	0.08	32	6	72.00
0.580	0.08	37	5	62.50
0.660	0.08	41	4	50.00
0.750	0.09	44.5	3.5	38.89
0.833	0.08	49	4.5	54.22
0.92	0.09	53	4	45.98
1.0	0.08	57.5	4.5	56.25
1.084	0.08	61.2	3.7	44.05
1.167	0.08	65.2	4	48.19
1.25	0.08	69	3.8	45.78
	Steady Rate of Change, R2 (cm/min)			**46.01**

GEI Consultants, Inc. **Calc. by:** B. Akereyeni **Date:** 12/23/2021
GEI Proj # 2102942-1.1 **Check by:** M. Glunt **Date:** 1/4/2022
Guelph Permeameter Testing - TP-11

Single Head Method - Test 1

Test Data and Information

• Reservoir		-	Combined		
• Reservoir Cross-Sectional Area		-	35.22	cm^2	(Provided on Permeameter)
• Water Head Height	H_1	-	5	cm	
• Borehole Radius	a	-	3.2	cm	Assumed slightly larger than 3cm rad. hand auger
• Soil Texture-Structure Category		-	3		(Table 2)
• Steady State Rate of Water Level Change	R_1	-	**75.97**	cm/min	(Obtained during testing)

Test Calculations and Results

• Microscopic Capillary Length Factor	α*	-	0.12	cm^{-1}	(Table 2: Based on Soil Texture-Structure Category)
• Shape Factor	C_1	-	0.768		(Table 2: Based on Soil Texture-Structure Category)
• Volumetric Flow Rate	Q_1	-	44.5947	cm^3/sec	(Table 3: One Head, Combined Reservoir)
• Soil Saturated Hydraulic Conductivity	K_{fs}	-	7.716E-02	cm/sec	(Table 3: One Head, Combined Reservoir)
• Soil Matrix Flux Potential	Φ_m	-	6.430E-01	cm^2/sec	(Table 3: One Head, Combined Reservoir)

Single Head Method - Test 2

Test Data and Information

• Reservoir		-	Combined		
• Reservoir Cross-Sectional Area		-	35.22	cm^2	(Provided on Permeameter)
• Water Head Height	H_2	-	10	cm	
• Borehole Radius	a	-	3.2	cm	Assumed slightly larger than 3cm rad. hand auger
• Soil Texture-Structure Category		-	3		(Table 2)
• Steady State Rate of Water Level Change	R_2	-	**46.01**	cm/min	(Obtained during testing)

Test Calculations and Results

• Microscopic Capillary Length Factor	α*	-	0.12	cm^{-1}	(Table 2: Based on Soil Texture-Structure Category)
• Shape Factor	C_2	-	1.234		(Table 2: Based on Soil Texture-Structure Category)
• Volumetric Flow Rate	Q_2	-	27.0066026	cm^3/sec	(Table 3: One Head, Combined Reservoir)
• Soil Saturated Hydraulic Conductivity	K_{fs}	-	2.797E-02	cm/sec	(Table 3: One Head, Combined Reservoir)
• Soil Matrix Flux Potential	Φ_m	-	2.331E-01	cm^2/sec	(Table 3: One Head, Combined Reservoir)

Test Averages

• Soil Saturated Hydraulic Conductivity	K_{fs}	-	**5.256E-02**	cm/sec
			74.5	in/hour

GEI Consultants, Inc.
Project Highlands
GEI Proj # 2102942-1.1
Guelph Permeameter Testing
Test Date 12/23/2021

Field Data TP-12

Reservoir Combined
Unit Set 15"
Depth of Test 4.0'
Depth to GW 6.7'
GEI Rep. Bosede Akereyeni
Soil Description WIDELY GRADED GRAVELLY SAND (SW); ~60% F-C SAND, ~35% F-C gravel, ~5% NP fines, brown, damp.

Water Level in Well **5 cm** *

Time (min)	Time Change (min)	Water Level in Res. (cm)	Change in Res. Water Level (cm)	Rate of Change (cm/min)
0.083		3		
0.167	0.08	7.5	4.5	53.57
0.250	0.08	13.5	6	72.29
0.333	0.08	18.3	4.8	57.83
0.420	0.09	22.5	4.2	48.28
0.500	0.08	26.5	4	50.00
0.583	0.08	30.7	4.2	50.60
0.667	0.08	34.7	4	47.62
0.750	0.08	38.6	3.9	46.99
0.833	0.08	42.3	3.7	44.58
0.920	0.09	46	3.7	42.53
1.000	0.08	49.2	3.2	40.00
1.083	0.08	54.5	5.3	63.86
1.167	0.08	58	3.5	41.67
1.25	0.08	62.1	4.1	49.40
1.330	0.08	66	3.9	48.75
1.417	0.09	70	4	45.89
1.501	0.08	73.5	3.5	41.92

Steady Rate of Change, R_1 (cm/min) **45.52**

Water Level in Well **10 cm**

Time (min)	Time Change	Water Level	Change in Res.	Rate of Change
0.083		4.5		
0.167	0.08	12	7.5	89.29
0.250	0.08	19	7	84.34
0.333	0.08	25.8	6.8	81.93
0.420	0.09	33	7.2	82.76
0.500	0.08	38	5	62.50
0.583	0.08	43	5	60.24
0.667	0.08	49	6	71.43
0.750	0.08	56	7	84.34
0.833	0.08	62	6	72.29
0.920	0.09	67	5	57.47
1.000	0.08	73	6	75.00

Steady Rate of Change, R_1 (cm/min) **68.25**

GEI Consultants, Inc. **Calc. by:** B. Akereyeni **Date:** 12/23/2021
GEI Proj # 2102942-1.1 **Check by:** M. Glunt **Date:** 1/4/2022
Guelph Permeameter Testing - TP-12

Single Head Method - Test 1

Test Data and Information

• Reservoir		-	Combined		
• Reservoir Cross-Sectional Area		-	35.22	cm^2	(Provided on Permeameter)
• Water Head Height	H_1	-	5	cm	
• Borehole Radius	a	-	3.2	cm	Assumed slightly larger than 3cm rad. hand auger
• Soil Texture-Structure Category		-	4		(Table 2)
• Steady State Rate of Water Level Change	R_1	-	**45.52**	cm/min	(Obtained during testing)

Test Calculations and Results

• Microscopic Capillary Length Factor	α*	-	0.36	cm^{-1}	(Table 2: Based on Soil Texture-Structure Category)
• Shape Factor	C_1	-	0.768		(Table 2: Based on Soil Texture-Structure Category)
• Volumetric Flow Rate	Q_1	-	26.7193	cm^3/sec	(Table 3: One Head, Combined Reservoir)
• Soil Saturated Hydraulic Conductivity	K_{fs}	-	7.623E-02	cm/sec	(Table 3: One Head, Combined Reservoir)
• Soil Matrix Flux Potential	Φ_m	-	2.117E-01	cm^2/sec	(Table 3: One Head, Combined Reservoir)

Single Head Method - Test 2

Test Data and Information

• Reservoir		-	Combined		
• Reservoir Cross-Sectional Area		-	35.22	cm^2	(Provided on Permeameter)
• Water Head Height	H_2	-	10	cm	
• Borehole Radius	a	-	3.2	cm	Assumed slightly larger than 3cm rad. hand auger
• Soil Texture-Structure Category		-	4		(Table 2)
• Steady State Rate of Water Level Change	R_2	-	**68.25**	cm/min	(Obtained during testing)

Test Calculations and Results

• Microscopic Capillary Length Factor	α*	-	0.36	cm^{-1}	(Table 2: Based on Soil Texture-Structure Category)
• Shape Factor	C_2	-	1.234		(Table 2: Based on Soil Texture-Structure Category)
• Volumetric Flow Rate	Q_2	-	40.06478904	cm^3/sec	(Table 3: One Head, Combined Reservoir)
• Soil Saturated Hydraulic Conductivity	K_{fs}	-	5.868E-02	cm/sec	(Table 3: One Head, Combined Reservoir)
• Soil Matrix Flux Potential	Φ_m	-	1.630E-01	cm^2/sec	(Table 3: One Head, Combined Reservoir)

Test Averages

• Soil Saturated Hydraulic Conductivity	K_{fs}	-	**7.623E-02**	cm/sec
			108.0	in/hour

GEI Consultants, Inc.
Project Highlands
GEI Proj # 2102942-1.1
Guelph Permeameter Testing
Test Date 12/23/2021

Field Data TP-13

Reservoir Combined
Unit Set 9"
Depth of Test 4.0'
Depth to GW < 8.0'
GEI Rep. Bosede Akereyeni
Soil Description NARROWLY GRADED SAND (SP); ~95% F- sand, ~5% NP fines, brown, damp.

Water Level in Well **5 cm** *

Time (min)	Time Change (min)	Water Level in Res. (cm)	Change in Res. Water Level (cm)	Rate of Change (cm/min)
0.083		2		
0.167	0.08	5	3	35.71
0.250	0.08	7	2	24.10
0.333	0.08	8.5	1.5	18.07
0.420	0.09	10.6	2.1	24.14
0.500	0.08	12.5	1.9	23.75
0.583	0.08	14.2	1.7	20.48
0.667	0.08	15.9	1.7	20.24
0.750	0.08	17.4	1.5	18.07
0.833	0.08	19.1	1.7	20.48
0.920	0.09	20.2	1.1	12.64
1.000	0.08	21.9	1.7	21.25
1.083	0.08	23.4	1.5	18.07
1.167	0.08	24.6	1.2	14.29
1.250	0.08	26.4	1.8	21.69
1.333	0.08	27.9	1.5	18.07
1.420	0.09	27.4	-0.5	-5.75
1.498	0.08	30.5	3.1	39.63
1.581	0.08	32.2	1.7	20.52
1.664	0.08	33.5	1.3	15.70
1.747	0.08	35.2	1.7	20.52
1.830	0.08	36.4	1.2	14.49
1.912	0.08	37.9	1.5	18.11
1.995	0.08	39	1.1	13.28
2.078	0.08	40.5	1.5	18.11
2.161	0.08	41.9	1.4	16.90
2.240	0.08	43.5	1.6	20.22
2.327	0.09	44.6	1.1	12.71
2.410	0.08	46	1.4	16.77
2.492	0.08	47.1	1.1	13.39
2.575	0.08	48.5	1.4	16.90
2.658	0.08	50	1.5	18.11
2.741	0.08	51.2	1.2	14.49
2.820	0.08	52.5	1.3	16.38
2.906	0.09	54.2	1.7	19.70
2.989	0.08	55.3	1.1	13.28
3.072	0.08	56.9	1.6	19.31
	Steady Rate of Change, R_1 (cm/min)			**17.43**

Water Level in Well **10 cm**

Time (min)	Time Change (min)	Water Level in Res. (cm)	Change in Res. Water Level (cm)	Rate of Change (cm/min)
0.083		3		
0.167	0.08	8	5	59.52
0.250	0.08	12	4	48.19
0.333	0.08	16.3	4.3	51.81
0.420	0.09	19.5	3.2	36.78
0.500	0.08	23	3.5	43.75
0.583	0.08	26.5	3.5	42.17
0.667	0.08	29.5	3	35.71
0.750	0.08	33	3.5	42.17
0.833	0.08	36	3	36.14
0.920	0.09	39	3	34.48
1.000	0.08	42	3	37.50
1.083	0.08	45	3	36.14
1.167	0.08	47.6	2.6	30.95
1.250	0.08	50.3	2.7	32.53
1.333	0.08	53.3	3	36.14
1.420	0.09	58	4.7	54.02
1.498	0.08	60.2	2.2	28.12
1.581	0.08	62.5	2.3	27.77
1.664	0.08	64.5	2	24.15
1.747	0.08	67	2.5	30.18
1.830	0.08	69	2	24.15
1.912	0.08	71.5	2.5	30.18
1.995	0.08	73.2	1.7	20.52
2.078	0.08	75.7	2.5	30.18
	Steady Rate of Change, R2 (cm/min)			**26.96**

GEI Consultants, Inc. **Calc. by:** B. Akereyeni **Date:** 12/23/2021
GEI Proj # 2102942-1.1 **Check by:** M. Glunt **Date:** 1/4/2021
Guelph Permeameter Testing - TP-13

Single Head Method - Test 1

Test Data and Information

• Reservoir		-	Combined		
• Reservoir Cross-Sectional Area		-	35.22	cm^2	(Provided on Permeameter)
• Water Head Height	H_1	-	5	cm	
• Borehole Radius	a	-	3.2	cm	Assumed slightly larger than 3cm rad. hand auger
• Soil Texture-Structure Category		-	3		(Table 2)
• Steady State Rate of Water Level Change	R_1	-	**17.43**	cm/min	(Obtained during testing)

Test Calculations and Results

• Microscopic Capillary Length Factor	α*	-	0.12	cm^{-1}	(Table 2: Based on Soil Texture-Structure Category)
• Shape Factor	C_1	-	0.768		(Table 2: Based on Soil Texture-Structure Category)
• Volumetric Flow Rate	Q_1	-	10.2307	cm^3/sec	(Table 3: One Head, Combined Reservoir)
• Soil Saturated Hydraulic Conductivity	K_{fs}	-	1.770E-02	cm/sec	(Table 3: One Head, Combined Reservoir)
• Soil Matrix Flux Potential	Φ_m	-	1.475E-01	cm^2/sec	(Table 3: One Head, Combined Reservoir)

Single Head Method - Test 2

Test Data and Information

• Reservoir		-	Combined		
• Reservoir Cross-Sectional Area		-	35.22	cm^2	(Provided on Permeameter)
• Water Head Height	H_2	-	10	cm	
• Borehole Radius	a	-	3.2	cm	Assumed slightly larger than 3cm rad. hand auger
• Soil Texture-Structure Category		-	3		(Table 2)
• Steady State Rate of Water Level Change	R_2	-	**26.96**	cm/min	(Obtained during testing)

Test Calculations and Results

• Microscopic Capillary Length Factor	α*	-	0.12	cm^{-1}	(Table 2: Based on Soil Texture-Structure Category)
• Shape Factor	C_2	-	1.234		(Table 2: Based on Soil Texture-Structure Category)
• Volumetric Flow Rate	Q_2	-	15.82746924	cm^3/sec	(Table 3: One Head, Combined Reservoir)
• Soil Saturated Hydraulic Conductivity	K_{fs}	-	1.639E-02	cm/sec	(Table 3: One Head, Combined Reservoir)
• Soil Matrix Flux Potential	Φ_m	-	1.366E-01	cm^2/sec	(Table 3: One Head, Combined Reservoir)

Test Averages

• Soil Saturated Hydraulic Conductivity	K_{fs}	-	**1.705E-02**	cm/sec
			24.2	in/hour

GEI Consultants, Inc.
Project Highlands
GEI Proj # 2102942-1.1
Guelph Permeameter Testing
Test Date 12/23/2021

Field Data TP-17

Reservoir Combined
Unit Set 12"
Depth of Test 4.0'
Depth to GW 6.8'
GEI Rep. Bosede Akereyeni
Soil Description WIDELY GRADED SAND WITH GRAVEL (SW); ~50% F-C SAND, ~45% F-C gravel, ~5% NP fines, brown, damp.

Water Level in Well 5 cm

Time (min)	Time Change (min)	Water Level in Res. (cm)	Change in Res. Water Level (cm)	Rate of Change (cm/min)
0.08		1		
0.17	0.08	5.5	4.5	53.57
0.25	0.08	8	2.5	30.12
0.33	0.08	10	2	24.10
0.42	0.09	12.9	2.9	33.33
0.50	0.08	14.2	1.3	16.25
0.58	0.08	16.2	2	24.10
0.67	0.08	18	1.8	21.43
0.75	0.08	20	2	24.10
0.83	0.08	21.5	1.5	18.07
0.92	0.09	23	1.5	17.24
1.00	0.08	24.9	1.9	23.75
1.08	0.08	26.4	1.5	18.07
1.17	0.08	28.4	2	23.81
1.25	0.08	29.8	1.4	16.87
1.33	0.08	31	1.2	14.46
1.42	0.09	33	2	22.99
1.50	0.08	34.5	1.5	18.75
1.58	0.08	36	1.5	18.07
1.67	0.08	37.8	1.8	21.43
1.75	0.08	39.5	1.7	20.48
1.83	0.08	41	1.5	18.00
1.92	0.09	42	1	11.54
2.00	0.08	44	2	25.00
2.08	0.08	45.7	1.7	20.21
2.17	0.08	47.2	1.5	18.00
2.25	0.08	48.8	1.6	19.20
		Steady Rate of Change, R_1 (cm/min)		**19.13**

Water Level in Well 10 cm

Time (min)	Time Change (min)	Water Level in Res. (cm)	Change in Res. Water Level (cm)	Rate of Change (cm/min)
0.083		5.5		
0.167	0.08	11	5.5	65.48
0.25	0.08	15	4	48.19
0.333	0.08	19	4	48.19
0.42	0.09	22.5	3.5	40.23
0.5	0.08	25.6	3.1	38.75
0.583	0.08	28.5	2.9	34.94
0.667	0.08	31.4	2.9	34.52
0.75	0.08	34	2.6	31.33
0.833	0.08	36.8	2.8	33.73
0.92	0.09	39.2	2.4	27.59
1	0.08	41.2	2	25.00
1.083	0.08	44	2.8	33.73
1.167	0.08	46.7	2.7	32.14
1.25	0.08	48.9	2.2	26.51
1.333	0.08	51	2.1	25.30
1.42	0.09	53.1	2.1	24.14
1.5	0.08	55	1.9	23.75
1.583	0.08	58.3	3.3	39.76
1.667	0.08	60	1.7	20.24
1.750	0.08	62.5	2.5	30.12
1.833	0.08	65	2.5	30.00
1.920	0.09	67.5	2.5	28.85
2.000	0.08	70	2.5	31.25
2.08	0.08	72.5	2.5	29.82
2.17	0.08	75	2.5	30.03
		Steady Rate of Change, R2 (cm/min)		**30.36**

GEI Consultants, Inc. **Calc. by:** B. Akereyeni **Date:** 12/23/2021
GEI Proj # 2102942-1.1 **Check by:** M. Glunt **Date:** 1/4/2022
Guelph Permeameter Testing - TP-17

Single Head Method - Test 1

Test Data and Information

• Reservoir		-	Combined		
• Reservoir Cross-Sectional Area		-	35.22	cm^2	(Provided on Permeameter)
• Water Head Height	H_1	-	5	cm	
• Borehole Radius	a	-	3.2	cm	Assumed slightly larger than 3cm rad. hand auger
• Soil Texture-Structure Category		-	4		(Table 2)
• Steady State Rate of Water Level Change	R_1	-	**19.13**	cm/min	(Obtained during testing)

Test Calculations and Results

• Microscopic Capillary Length Factor	α*	-	0.36	cm^{-1}	(Table 2: Based on Soil Texture-Structure Category)
• Shape Factor	C_1	-	0.768		(Table 2: Based on Soil Texture-Structure Category)
• Volumetric Flow Rate	Q_1	-	11.2319	cm^3/sec	(Table 3: One Head, Combined Reservoir)
• Soil Saturated Hydraulic Conductivity	K_{fs}	-	3.204E-02	cm/sec	(Table 3: One Head, Combined Reservoir)
• Soil Matrix Flux Potential	Φ_m	-	8.901E-02	cm^2/sec	(Table 3: One Head, Combined Reservoir)

Single Head Method - Test 2

Test Data and Information

• Reservoir		-	Combined		
• Reservoir Cross-Sectional Area		-	35.22	cm^2	(Provided on Permeameter)
• Water Head Height	H_2	-	10	cm	
• Borehole Radius	a	-	3.2	cm	Assumed slightly larger than 3cm rad. hand auger
• Soil Texture-Structure Category		-	4		(Table 2)
• Steady State Rate of Water Level Change	R_2	-	**30.36**	cm/min	(Obtained during testing)

Test Calculations and Results

• Microscopic Capillary Length Factor	α*	-	0.36	cm^{-1}	(Table 2: Based on Soil Texture-Structure Category)
• Shape Factor	C_2	-	1.234		(Table 2: Based on Soil Texture-Structure Category)
• Volumetric Flow Rate	Q_2	-	17.82378066	cm^3/sec	(Table 3: One Head, Combined Reservoir)
• Soil Saturated Hydraulic Conductivity	K_{fs}	-	2.610E-02	cm/sec	(Table 3: One Head, Combined Reservoir)
• Soil Matrix Flux Potential	Φ_m	-	7.251E-02	cm^2/sec	(Table 3: One Head, Combined Reservoir)

Test Averages

• Soil Saturated Hydraulic Conductivity	K_{fs}	-	**2.907E-02**	cm/sec
			41.2	in/hour

Table 2

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121\left(H_2/a\right)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091\left(H_1/a\right)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091\left(H_2/a\right)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$

Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Table 3

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi\left(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1)\right)}$ $G_2 = \frac{H_1 C_2}{\pi\left(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1)\right)}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi\left(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1)\right)}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi\left(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1)\right)}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).