

STORMWATER MANAGEMENT REPORT

Prepared for:

LAWRENCE LOGISTICS CENTER

40 Enterprise Avenue

Block 601, Lots 1-8
Township of Lawrence

Block 23201, Lot 1
City of Trenton

Mercer County, New Jersey

Prepared by:

BOHLER //

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February 2022

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1. Introduction

The subject property is located at 40 Enterprise Avenue in the Township of Lawrence and City of Trenton, Mercer County, New Jersey. The property is identified as Block 601, Lots 1-8 on the Township of Lawrence and Block 23201, Lot 1 on the City of Trenton Tax Maps. The property is a total of 17.127 acres in size and will hereafter be referred to as “the site”. The site is bordered to the north by US Route 1 with the Delaware and Raritan Canal State Park Trail beyond; to the east by Assunpink Creek and Assunpink Boulevard with neighboring residential zone beyond; to the west by US Route 1 and neighboring industrial properties; and to the south by Enterprise Avenue. A tax map and aerial map is included at the beginning of Appendix C for reference.

The site currently consists industrial buildings with ancillary parking, sidewalks, driveways, stormwater and utility improvements. Site improvements include the construction of a proposed warehouse/distribution center building with ancillary parking, sidewalks, driveways, stormwater and utility improvements. A proposed stormwater management system will convey the runoff from the proposed development and impervious areas.

This report summarizes the design objectives, methodology, and calculations for the conveyance, treatment and discharge of stormwater runoff leaving the site and is meant to accompany the Site Plan documents prepared by Bohler Engineering. Pre-development and post-development conditions are examined for stormwater quantity analysis, water quality analysis, groundwater recharge, soil erosion and sediment control, and low impact development based on the *NJDEP Stormwater Management Regulations* of March 2020.

2. Pre-Development Site Conditions

The site contains a total area of 17.127 acres. The studied watershed area is a total of 16.232 acres in size and consists of four unique drainage areas: Existing Drainage Area #1, Existing Drainage Area #2, Existing Drainage Area #3 and Existing Drainage Area #4, which are described in more detail below. In the pre-development condition, the site consists of industrial buildings with ancillary parking, sidewalks, and driveways. Currently, the runoff generated on site outfalls to the Assunpink Creek or the Enterprise Avenue Right-of-Way. The Existing Drainage Area Map in Appendix C illustrates the limits of each existing drainage area and how they relate to the existing site conditions.

2.1 Points of Analysis

The Existing Drainage Area Map in Appendix C illustrates the identified points of analysis and how it relates to the existing topography on the site.

2.1.1 Existing Drainage Area #1

Located to the north of the proposed site, Existing Drainage Area #1 contains 14.578 acres of land, of which 12.834 acres are impervious surface, and includes most of the existing site improvements. The topography of the area slopes from west to east from a maximum elevation of approximately 57 to a minimum elevation of approximately 35 with slopes ranging from 0.5% to 100%. A CN value of 77 (woods), 80 (grass) and 98 (impervious) were used for pervious and impervious areas, with a calculated time of concentration of 10.2 minutes for pervious and 8.6 minutes for impervious areas. The runoff from Existing Drainage Area #1 flows through the site to the Assunpink Creek in both the existing and proposed conditions and will be accounted for in the proposed stormwater management design.

2.1.2 Existing Drainage Area #2

Located to the southeast of the proposed site, Existing Drainage Area #2 contains 0.985 acres of land, of which 0.785 acres are impervious surface, and includes the existing east driveway. The topography of the area slopes from north to south from a maximum elevation of approximately 50 to a minimum elevation of approximately 46 with slopes ranging from 0.2% to 5.4%. A CN of 80 and 98 were used for pervious and impervious, respectively, with a calculated time of concentration of 11.4 minutes for pervious and 5.2 minutes for impervious areas. The runoff from Existing Drainage Area #2 flows through the site to the Enterprise Avenue Right-of-Way into an inlet located to the east of the existing east driveway in both the existing and proposed conditions and will be accounted for in the proposed stormwater management design.

2.1.3 Existing Drainage Area #3

Located to the southwest of the proposed site, Existing Drainage Area #3 contains 0.606 acres of land, of which 0.309 acres are impervious surface, and includes the existing west driveway. The topography of the area slopes from north to south from a maximum elevation of approximately 50 to a minimum elevation of approximately 48.5 with slopes ranging from 0.5% to 2%. A CN of 80 and 98 were used for pervious and impervious, respectively, with a calculated time of concentration of 19.1 minutes for pervious and 3.6 minutes for impervious areas. The runoff from Existing Drainage Area #3 flows through the site to the

Enterprise Avenue Right-of-Way into an inlet located to the east of the existing west driveway in both the existing and proposed conditions and will be accounted for in the proposed stormwater management design.

2.1.4 Existing Drainage Area #4

Located to the southwest corner of the proposed site, Existing Drainage Area #4 contains 0.063 acres of land, of which 0.026 acres are impervious surface. The topography of the area slopes from north to south from a maximum elevation of approximately 50 to a minimum elevation of approximately 49 with slopes ranging from 3% to 6.5%. A CN of 80 and 98 were used for pervious and impervious, respectively, with a calculated time of concentration of 2.8 minutes for pervious and 0.2 minutes for impervious areas. The runoff from Existing Drainage Area #4 flows through the site to the Enterprise Avenue Right-of-Way into the gutter line and flows to the west of the existing site in both the existing and proposed conditions and will be accounted for in the proposed stormwater management design.

2.2 Pre-Development Flow Summary

TABLE 2.1

DATA	EXISTING DRAINAGE AREA #1	EXISTING DRAINAGE AREA #2	EXISTING DRAINAGE AREA #3	EXISTING DRAINAGE AREA #4
Area (acres)	14.758	0.985	0.606	0.063
Impervious (acres)	12.384	0.785	0.309	0.026
2 Yr. Flow (CFS)	38.93	2.80	1.26	0.15
10 Yr. Flow (CFS)	60.57	4.38	2.04	0.25
25 Yr. Flow (CFS)	75.66	5.49	2.58	0.33
100 Yr. Flow (CFS)	103.08	7.49	3.58	0.47

3. Post-Development Site Conditions

The post-development condition for the site includes the construction of a single warehouse/distribution center building with associated parking fields, driveways, sidewalks, utility infrastructure, stormwater mechanical treatment devices, bioretention basin, and other site improvements. Banked parking is included in the scope of the proposed improvements; the construction of the banked parking is included as part of this stormwater analysis. The proposed site is designed in a manner that generally maintains the existing drainage patterns. The studied watershed area in the post-development condition contains the same 16.232-acre area that was studied in the pre-development condition and consists of four unique drainage areas: Proposed

Drainage Area #1, Proposed Drainage Area #2, Proposed Drainage Area #3, and Proposed Drainage Area #4, which are described in more detail below.

A proposed stormwater conveyance system will collect the runoff from the proposed buildings and impervious areas via inlets, manholes, and stormwater piping and redirect it to the proposed bioretention basin, and mechanical treatment devices on the site. The construction of the proposed improvements will create approximately 11.031 acres of impervious coverage on the site in the post-development condition. The Proposed Drainage Area Map in Appendix C illustrates the limits of each proposed drainage area and how they relate to the proposed site conditions.

3.1 Points of Analysis

The four drainage areas in the post development condition flow to the same point of analysis identified in the existing condition. As noted above, the Proposed Drainage Area Map in Appendix C illustrates the identified point of analysis and how it relates to the proposed topography on the site.

3.1.1 Proposed Drainage Area #1

Proposed Drainage Area #1 consists of approximately 15.241 acres of land, of which 10.682 acres are impervious surface, and includes the proposed warehouse/distribution center buildings, parking fields, sidewalks, driveways, stormwater and utility infrastructure. The drainage area also contains grass and landscape areas. A CN value of 98 and 80 were used for impervious and pervious areas, respectively, with a calculated time of concentration of 4.6 and 1.5 minutes for impervious areas and 16.8 and 4.0 minutes for pervious areas. The runoff from Proposed Drainage Area #1 is partially routed through the bioretention basin or manufactured treatment device into the stormwater conveyance system, and ultimately flows to Assunpink Creek. The routing of the runoff from Proposed Drainage Area #1 is depicted on the Proposed Drainage Area Map in Appendix C.

The proposed peak runoff rates for Proposed Drainage Area #1 are analyzed at the discharge point into Assunpink Creek. The flows tributary to this Point of Analysis from Proposed Drainage Area #1 meets the stormwater management criteria set forth in N.J.A.C. § 7:8-5.6(b)2; there is no increase compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the 2-, 10-, and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. Refer to Section 3.3 for a comparison of pre-development flows to the post-development flows and volumes. Refer to Sections 2.2 and 3.3 for pre-development and post-development flows, respectively.

3.1.2 Proposed Drainage Area #2

Proposed Drainage Area #2 consists of approximately 0.465 acres of land, of which 0.128 acres are impervious surface, and includes the east driveway. The drainage area also contains grass and landscape areas. A CN value of 98 and 80 were used for impervious and pervious areas, respectively, with a calculated time of concentration of 7.2 minutes for pervious and 1.8 minutes for impervious areas. The runoff from Proposed Drainage Area #2 flows overland to the Enterprise Avenue right-of-way to the inlet located to the east of the proposed east driveway. The routing of the runoff from Proposed Drainage Area #2 is depicted on the Proposed Drainage Area Map in Appendix C.

The proposed runoff from Proposed Drainage Area #2 meets the stormwater management criteria set forth in NJAC § 7:8-5.6(b)1. The proposed runoff hydrograph for Proposed Drainage Area #2 does not exceed the existing runoff hydrograph for Existing Drainage Area #2 for the same storm events at any point along the hydrograph. Refer to Sections 2.2 and 3.3 for pre-development and post-development flows, respectively.

3.1.3 Proposed Drainage Area #3

Proposed Drainage Area #3 consists of approximately 0.474 acres of land, of which 0.187 acres are impervious surface, and includes the west driveway. The drainage area also contains grass and landscape areas. A CN value of 98 and 80 were used for impervious and pervious areas, respectively, with a calculated time of concentration of 8.8 minutes for pervious and 3.2 minutes for impervious areas. The runoff from Proposed Drainage Area #3 flows into the conveyance system onsite through a manufactured treatment device into the Enterprise Avenue right-of-way to the inlet located to the east of the proposed west driveway. The routing of the runoff from Proposed Drainage Area #3 is depicted on the Proposed Drainage Area Map in Appendix C.

The proposed runoff from Proposed Drainage Area #3 meets the stormwater management criteria set forth in NJAC § 7:8-5.6(b)1. The proposed runoff hydrograph for Proposed Drainage Area #3 does not exceed the existing runoff hydrograph for Existing Drainage Area #3 for the same storm events at any point along the hydrograph. Refer to Sections 2.2 and 3.3 for pre-development and post-development flows, respectively.

3.1.4 Proposed Drainage Area #4

Proposed Drainage Area #4 consists of approximately 0.052 acres of land, of which 0.034 acres are impervious surface. The drainage area also contains grass and landscape areas. A CN value of 98 and 80 were used for impervious and pervious areas, respectively, with a calculated time of concentration of 2.2 minutes for pervious and 0.5 minutes for impervious areas. The runoff from Proposed Drainage Area #4 flows overland to the Enterprise Avenue Right-of-Way into the gutter line and flows to the west of the existing site. The routing of the runoff from Proposed Drainage Area #4 is depicted on the Proposed Drainage Area Map in Appendix C.

The proposed runoff from Proposed Drainage Area #4 meets the stormwater management criteria set forth in NJAC § 7:8-5.6(b)1. The proposed runoff hydrograph for Proposed Drainage Area #4 does not exceed the existing runoff hydrograph for Existing Drainage Area #4 for the same storm events at any point along the hydrograph. Refer to Sections 2.2 and 3.3 for pre-development and post-development flows, respectively.

3.2 Proposed Structural Stormwater Management Strategies

The four drainage areas in the post development condition flow to the same points of analysis identified in the existing condition. Two of the drainage areas, Proposed Drainage Area #1, and Proposed Drainage Area #3, flow through the proposed on-site stormwater management system, which is described in more detail below.

3.2.1 Bio-Retention Systems

As part of the stormwater management design of the proposed site, a bioretention basin is proposed to capture water from impervious areas and surrounding disturbed areas and treat stormwater runoff from Proposed Drainage Area #1. The bioretention system meets the minimum requirements outlined in the New Jersey Stormwater Best Management Practices Manual by providing 18 inches of soil bed depth and a subsoil permeability rate of 1.0 inch per hour minimum (design rate of 0.50 in/hr). The bioretention basins are designed to contain and treat the entire Water Quality Design Storm volume without overflow by providing a 12-inch maximum ponding depth for the flat bottom systems. The proposed bioretention basin contains underdrains which are provided at a minimum of 1' separation between the bottom of the bioretention basin and the seasonal high ground water table. Further, the proposed bioretention basins achieve 80% TSS removal per NJDEP BMP and 90% per DRCC Section 7.45-8.7 Table 2 by providing an 18-inch soil bed in addition to a terrestrial forested community.

The bioretention basin receives stormwater runoff from approximately 2.769 acres of the proposed improvements, of which 1.588 acres are impervious surface. Stormwater runoff from the Water Quality event is designed to be infiltrated to an underdrain system comprised of an 8" underdrain which is sized to convey twice the design flow rate of the sand layer and will allow the system to drain within 72 hours. The underdrains, in addition to the basin overflow for all storm events greater than the Water Quality Storm up to the 100-year storm, will be routed to the onsite stormwater conveyance system through the Outlet Control Structure #1 to the point of discharge.

3.2.2 Manufactured Treatment Devices

Four (4) manufactured treatment devices are proposed to treat runoff from the Water Quality Design Storm for 80% TSS removal before being conveyed offsite. Three (3) 8' x 20.0' Stormfilters by Contech will be used in parallel to treat stormwater runoff for the truck court area as part of Proposed Drainage Area #1. The remaining manufactured treatment device, a 6.0' x 12.0' Up-Flo Filtration Systems by Hydro International, will be used to treat stormwater runoff for the proposed west driveway. The Manufactured Treatment Devices will treat the runoff from the Water Quality Design Storm for 80% TSS removal before being discharged off site.

3.3 Post-Development Flow Summary

Table 3.3

PROPOSED DRAINAGE AREA #1 FLOWS

	PDA 1-A	PDA 1-B (Bioretention Basin)	Proposed Drainage Area #1
Total Area (Ac.)	12.472	2.769	15.241
Impervious Area (Ac.)	9.094	1.588	10.682
2 yr. Flow (cfs)	33.08	3.30	34.46
10 yr. Flow (cfs)	51.87	8.70	60.09
100 yr. Flow (cfs)	88.93	12.78	101.67

DRAINAGE AREA #1 FLOW, VOLUME, & PEAK TIME SUMMARY

	Flow (CFS)		Volume (af)		Time to Peak (hrs)	
	EDA #1	PDA #1	EDA #1	PDA #1	EDA #1	PDA #1
2 yr.	38.93	34.46	3.479	3.285	12.16	12.11
10 yr.	60.57	60.09	5.487	5.326	12.16	12.11
100 yr.	103.08	101.67	9.463	9.423	12.16	12.11

The proposed runoff from Proposed Drainage Area #1 is analyzed at the Point of Analysis, the discharge into Assunpink Creek. The site and adjacent lots exist in a flood hazard area where the Design Flood Hazard Elevation for the 100-year Storm Event is el 47.0-48.0 per FEMA FIRM 34021C0226F dated July 20, 2016 which submerges the Point of Analysis. Flows tributary to the Point of Analysis from Proposed Drainage Area #1 meet the stormwater management criteria set forth in N.J.A.C. § 7:8-5.6(b)2, where there is no increase compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the 2-, 10-, and 100-year storm events and that the increased volume of change in timing of stormwater runoff will not increase flood damage at or downstream of the site.

For all storm events, the peak runoff rate and volume decreases compared to existing conditions. The time to peak for each storm event from existing to proposed conditions occurs approximately 0.05 hrs, however, the change in time to peak does not impact the peak flow within the channel for Assunpink Creek.

As part of the stormwater analysis, the flow in Assunpink Creek was modeled and compared against the existing and proposed flow for the site. An approximated flow was generated for the 2-, 10-, and 100-year storm events for the channel utilizing Stream Stats data for the upstream watershed area and FEMA channel data. The peak and stormwater runoff for the proposed site occurs and drains prior to the occurrence of the peak runoff of the Assunpink Creek. Therefore, it is anticipated that the post-construction stormwater design will not increase flood damage at or downstream of the site due to the decrease in peak flow, decrease in stormwater runoff, or change in timing of stormwater runoff.

PROPOSED DRAINAGE AREA #2 FLOW SUMMARY

	Existing	Proposed
Total Area (Ac.)	0.985	0.465
Impervious Area (Ac.)	0.785	0.128
2 yr. Flow (cfs)	2.80	0.94
10 yr. Flow (cfs)	4.38	1.67
100 yr. Flow (cfs)	7.49	3.14

PROPOSED DRAINAGE AREA #3 FLOW SUMMARY

	Existing	Proposed
Total Area (Ac.)	0.606	0.474
Impervious Area (Ac.)	0.309	0.187
2 yr. Flow (cfs)	1.26	1.11
10 yr. Flow (cfs)	2.04	1.90
100 yr. Flow (cfs)	3.58	3.48

PROPOSED DRAINAGE AREA #4 FLOW SUMMARY

	Existing	Proposed
Total Area (Ac.)	0.063	0.052
Impervious Area (Ac.)	0.026	0.034
2 yr. Flow (cfs)	0.15	0.14
10 yr. Flow (cfs)	0.25	0.22
100 yr. Flow (cfs)	0.47	0.39

4. Stormwater Management Design Methodology

In accordance with the NJDEP Stormwater Management Regulations, the proposed development must meet the requirements, if appropriate, for stormwater quantity reductions, water quality, groundwater recharge, soil erosion and sediment control, and low impact development. The following sections describe how each of the above items are addressed on site in the post-development condition.

4.1 Stormwater Quantity Controls

The Assessment of stormwater quantity has been based upon the Soil Conservation Service Method (SCS) Unit Hydrograph as described in Technical Release Number 55 (TR55), "Urban Hydrology for Small Watersheds". Theoretical storms are modeled with the 24-Hour SCS Unit Dimensionless Hydrograph using the NOAA Atlas 14 Type C rainfall distribution and recurrence intervals of 2, 10, and 100 years. Hydrograph creation and routings are accomplished using the *HydroCAD* Version 10.00 program by HydroCAD Software Solutions, LLC. The following techniques from the *NJDEP Stormwater Management Regulations* is being applied to each drainage area as noted in section 3.3:

1. NJAC § 7:8-5.6(b)1 states for stormwater runoff leaving the site, post-development runoff hydrographs for the 2-, 10-, and 100-year storms do not exceed, at any point in time, the pre-development runoff hydrographs for the same storm events. The above section of the NJAC will be applied to drainage areas that, under proposed conditions, will remain unchanged or have a net decrease in impervious coverage.
2. NJAC § 7:8-5.6(B)2 states that there is no increase to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the 2-, 10-, and 100-year

storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site.

The study requires the establishment of a point of analysis, as indicated in Section 2. Existing and proposed CN and Tc calculations, as well as existing and proposed hydrographs are provided in Appendix A. The information below describes the methodology in which the stormwater calculations were procured.

4.1.1 Site Soils

Site soil information has been obtained from the USDA Natural Resources Conservation Service (NRCS) web soil survey database, last revised in 2015. The major soil types present on site include Udorthets gravely substratum and Udorthets stratified substratum, which is classified as Hydrologic Soil Group Type D soils; therefore, values used in the CN and time of concentration calculations are associated with Type D soils.

4.1.2 Rainfall Data

Rainfall data used in the stormwater calculations of this report are obtained from several different sources based on the latest NJDEP stormwater regulations. The Water Quality storm event is based on the NJDEP BMP Manual Chapter 5 definition of having a total rainfall depth of 1.25 inches and a total duration of two (2) hours. Twenty-four-hour rainfall frequency data in Mercer County for all other storms is obtained from the NOAA Atlas 14, Volume 2, Precipitation-Frequency Atlas of the United States, updated in 2006 and listed in the table below:

TABLE 4.1

Event (year)	1	2	5	10	25	50	100
Rainfall (in)	2.74	3.31	4.23	5.01	6.19	7.20	8.33

4.1.3 Pipe Sizing

Calculations for sizing the stormwater pipe networks associated with the proposed stormwater management conveyance system can be found in Appendix B of this report. The Rational Method has been used to size the storm piping for the 25-year storm event. The calculations are conservatively based on a time of concentration of 10 minutes to any inlet. An Inlet Area Map is included in Appendix C.

4.2 Water Quality Controls

Water quality analysis is based on the requirements of NJAC § 7:8-5.5, which requires 80% TSS removal of post-development runoff from the net increase of motor vehicle surface areas (MVSA) before discharging the runoff.

Existing MVSA: 6.825 Acres

Proposed MVSA: 4.928 Acres

Increase of MVSA = 4.928 acres – 6.825 acres = -1.897 acres < 0.25 acres, therefore NJDEP Water Quality standards are NOT applied for post-construction conditions

Although the proposed design does not trigger Water Quality Analysis per NJAC § 7:8-5.5, TSS removal is provided by utilizing a bioretention basin and manufactured treatment devices.

The proposed stormwater management design incorporates TSS removal to meet Delaware and Raritan Canal Commission Water Quality Standards for 80% TSS Removal for new pavement areas. Per DRCC section 7.45-8.7 Table 2, bioretention systems provide 90% TSS removal and the manufactured treatment devices, as certified by NJCAT, provide 80% TSS removal. The proposed bioretention basin and manufactured treatment devices onsite will treat stormwater runoff from the new pavement areas for 90% and 80% TSS removal, respectively, and therefore will meet DRCC Water Quality Standards to treat stormwater runoff from pre- to post- construction conditions.

4.3 Groundwater Recharge

The NJDEP Stormwater Management Regulations require that a proposed land development site comply with either of the following groundwater recharge requirements:

1. Demonstrate that 100% of the site's average annual pre-developed groundwater recharge volume will be maintained after development; or
2. Demonstrate that 100 percent of the difference between the site's pre-development and post-development 2-year runoff volume is infiltrated.

The subject site is a known contaminated site with soil and groundwater contamination that exceed NJDEP standards. Due to the conditions described above, no groundwater recharge is proposed as part of the stormwater management facilities on site. In addition, the site is fully development within Planning Area 1 and is further exempt from the requirements.

4.4 Soil Erosion and Sediment Control

The Soil Erosion and Sediment Control plans and details are included within the Site Plan documents prepared by Bohler Engineering and must be followed throughout construction. Silt fences, stabilized construction entrances, a temporary stockpile and inlet filters are proposed during construction. This report and the Site Plan documents prepared by Bohler Engineering are being submitted to the Township of Lawrence and Mercer Soil Conservation District for approval.

4.5 Low-Impact Development and Non-Structural Stormwater Management Facilities

In accordance with the NJDEP regulations and the latest *New Jersey Stormwater Best Management Practices Manual*, several non-structural stormwater management strategies have been incorporated into the design of the site and are listed below:

4.5.1 Vegetation and Landscaping

A comprehensive Landscape Plan has been incorporated into the design of the proposed improvements on the site that provides low maintenance landscaping. The use of lawn areas has been minimized where applicable and fertilizers and pesticides are to be used sparingly.

4.5.1.1 Preservation of Natural Areas

The design of the improvements proposed on the site has preserved critical natural areas as part of the development. Areas that are forested, within riparian corridors or that have demonstrated high groundwater recharge capabilities have been identified on site and are specifically left outside the limits of disturbance of the proposed development. The natural areas will be protected during construction as required by other NJDEP regulations and permits to ensure these areas remain preserved in the future.

4.5.1.2 Native Ground Cover

Native plants including ground cover, shrubs and trees instead of turf grass have been proposed as part of the landscape design for the site. The native plantings will also require little or no irrigation once they are established.

4.5.1.3 Vegetative Filters and Buffers

Vegetative filters and buffers are used as part of the proposed design to intercept sheet flow from impervious areas to help increase the time of concentration and provide some water quality treatment prior to entering the proposed stormwater conveyance system. These vegetative filters and buffers differ from the vegetative filter strips in that they do not meet the requirements to achieve 60%-80% TSS removal but still provide some inherent benefit to the treatment of stormwater runoff. These buffer areas are not part of the calculated water treatment methodology used on site.

4.5.2 Minimize Land Disturbance

The proposed design of the site incorporates the preservation of existing vegetative areas that will remain undisturbed. The undisturbed areas will be protected during construction as required by other NJDEP regulations and permits to ensure these areas remain undisturbed in the future

4.5.3 Impervious Area Management

Impervious areas are the primary source of additional runoff in the post-development site condition. The sections below describe the measures that have been taken in the proposed site design to minimize the amount of impervious proposed on site

4.5.3.1 Streets, Sidewalks, and Parking, Driveway Areas

As part of the proposed site design, the minimum allowable parking and drive aisle sizes, in accordance with local ordinances, are used in lieu of larger stalls and aisles to reduce the amount of impervious surface in the post-development condition.

4.5.4 Preventative Source Controls

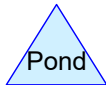
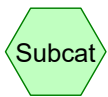
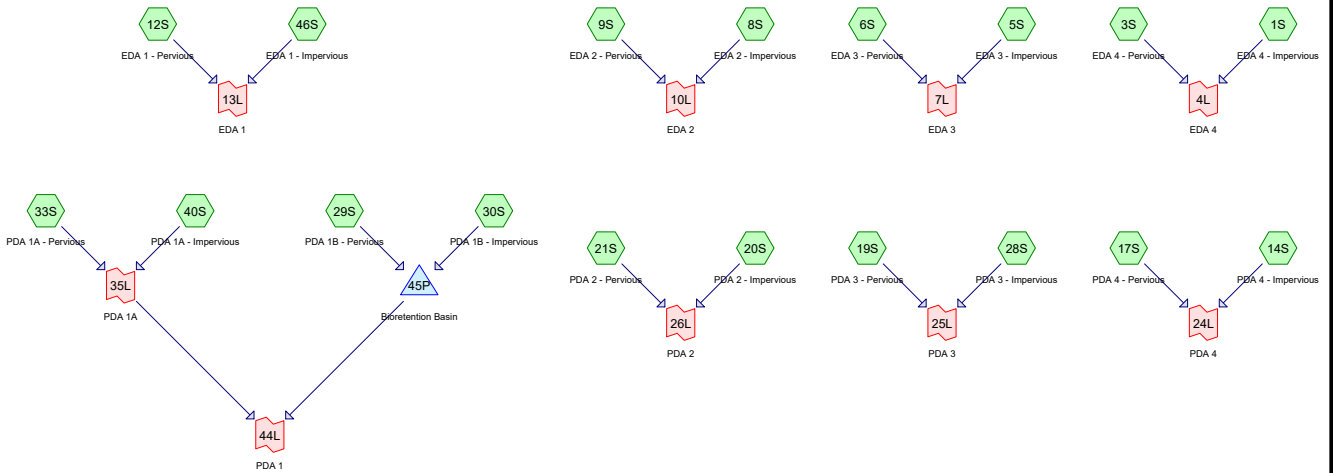
Floatable and total suspended solids are routinely eliminated using the bioretention basin and manufactured treatment device.

5. Conclusions

As demonstrated in the above sections, the stormwater management plan for the proposed development meets the *NJDEP Stormwater Management Regulations* of March 2020, and addresses the requirements for stormwater quantity reductions, water quality, groundwater recharge, soil erosion and sediment control, and low impact development. As a result of the design calculations contained herein, Bohler Engineering anticipates that the stormwater design will not have a negative impact to surrounding areas.

A. PRE- vs. POST-DEVELOPMENT HYDROGRAPHS

- ◆ **Water Quality Storm Event**
- ◆ **2-Year Storm Event**
- ◆ **10-Year Storm Event**
- ◆ **25-Year Storm Event**
- ◆ **100-Year Storm Event**



Routing Diagram for ex-pr
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ex-pr

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Summary for Subcatchment 1S: EDA 4 - Impervious

Runoff = 0.08 cfs @ 1.01 hrs, Volume= 0.002 af, Depth= 1.03"

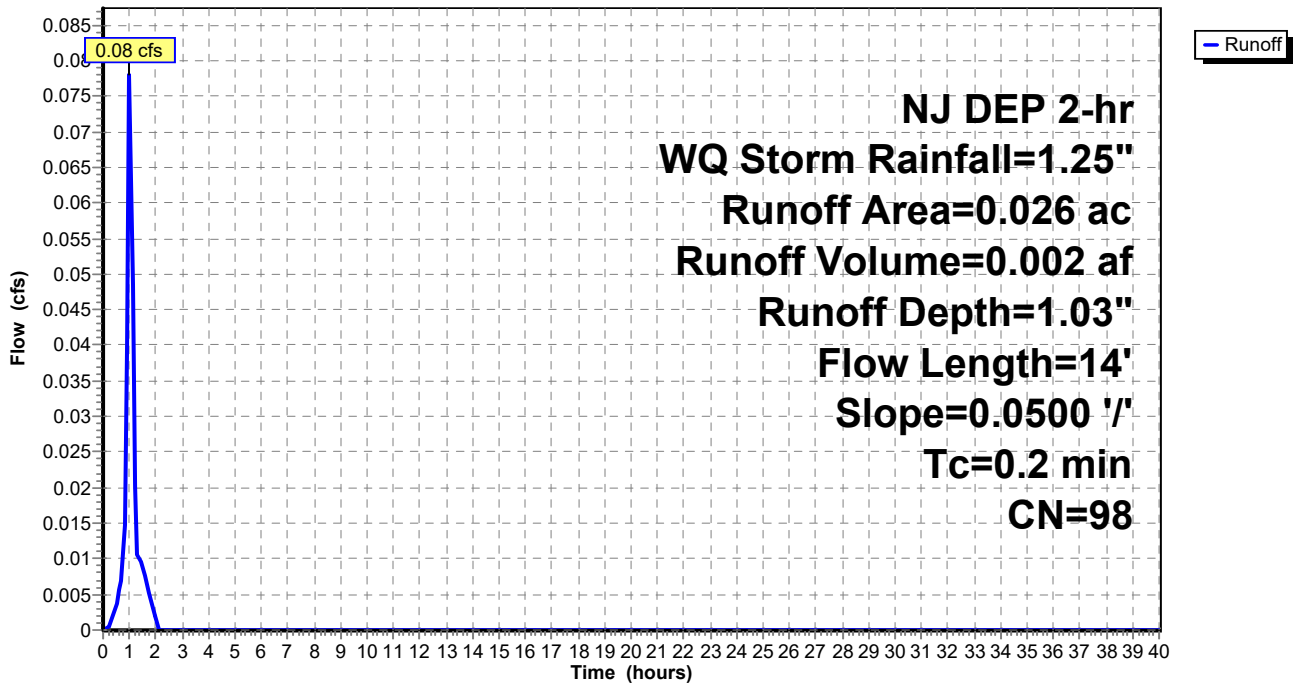
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.026	98	Paved parking, HSG D
0.026		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0500	1.36		Sheet Flow, D-E Smooth surfaces n= 0.011 P2= 3.31"

Subcatchment 1S: EDA 4 - Impervious

Hydrograph



ex-pr

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Summary for Subcatchment 3S: EDA 4 - Pervious

Runoff = 0.02 cfs @ 1.12 hrs, Volume= 0.001 af, Depth= 0.17"

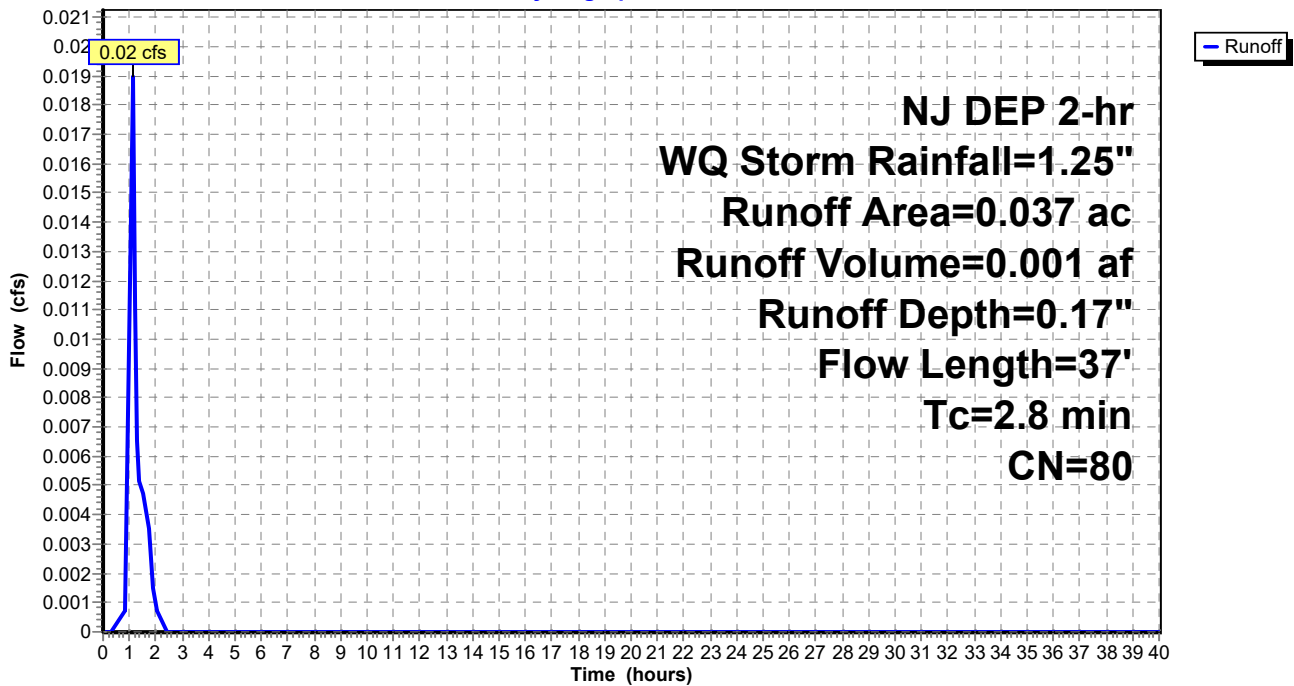
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.037	80	>75% Grass cover, Good, HSG D
0.037		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.31"
0.1	12	0.0650	1.47		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.31"
2.8	37	Total			

Subcatchment 3S: EDA 4 - Pervious

Hydrograph



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Summary for Subcatchment 5S: EDA 3 - Impervious

Runoff = 0.88 cfs @ 1.06 hrs, Volume= 0.027 af, Depth= 1.03"

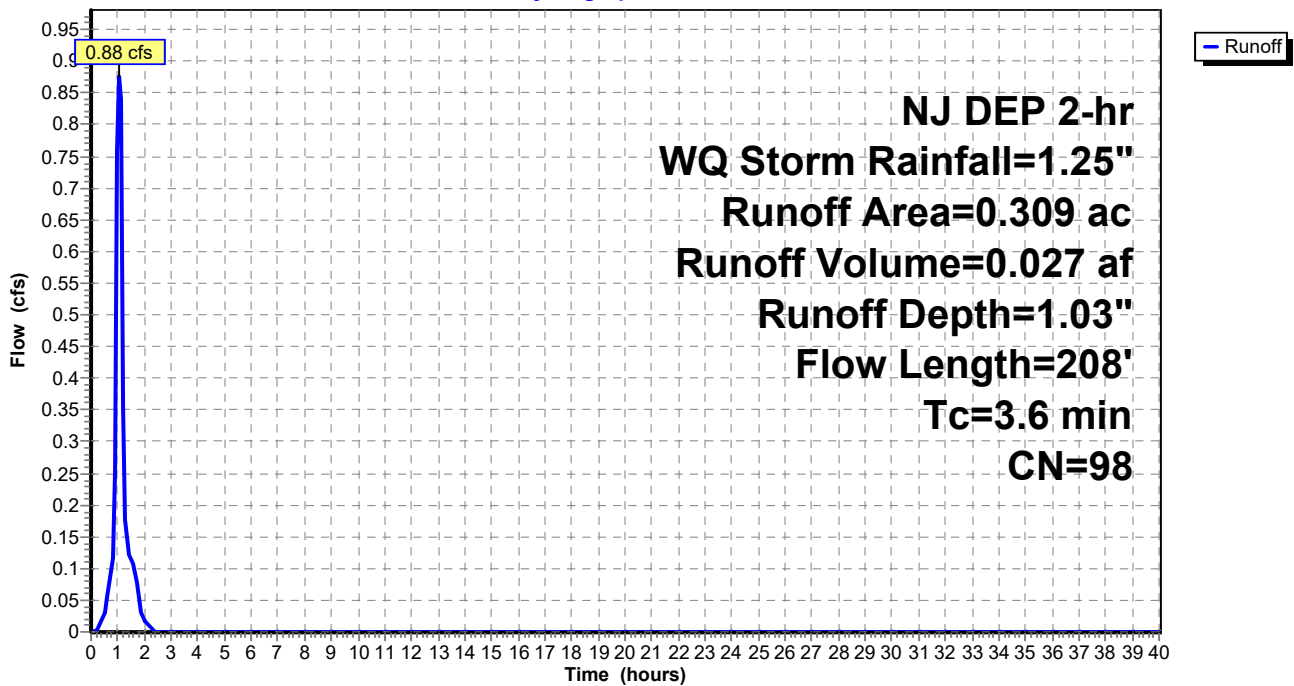
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.309	98	Paved parking, HSG D
0.309		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	100	0.0040	0.73		Sheet Flow, F-G Smooth surfaces n= 0.011 P2= 3.31"
1.3	108	0.0050	1.44		Shallow Concentrated Flow, G-H Paved Kv= 20.3 fps
3.6	208	Total			

Subcatchment 5S: EDA 3 - Impervious

Hydrograph



ex-pr

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Summary for Subcatchment 6S: EDA 3 - Pervious

Runoff = 0.08 cfs @ 1.36 hrs, Volume= 0.004 af, Depth= 0.17"

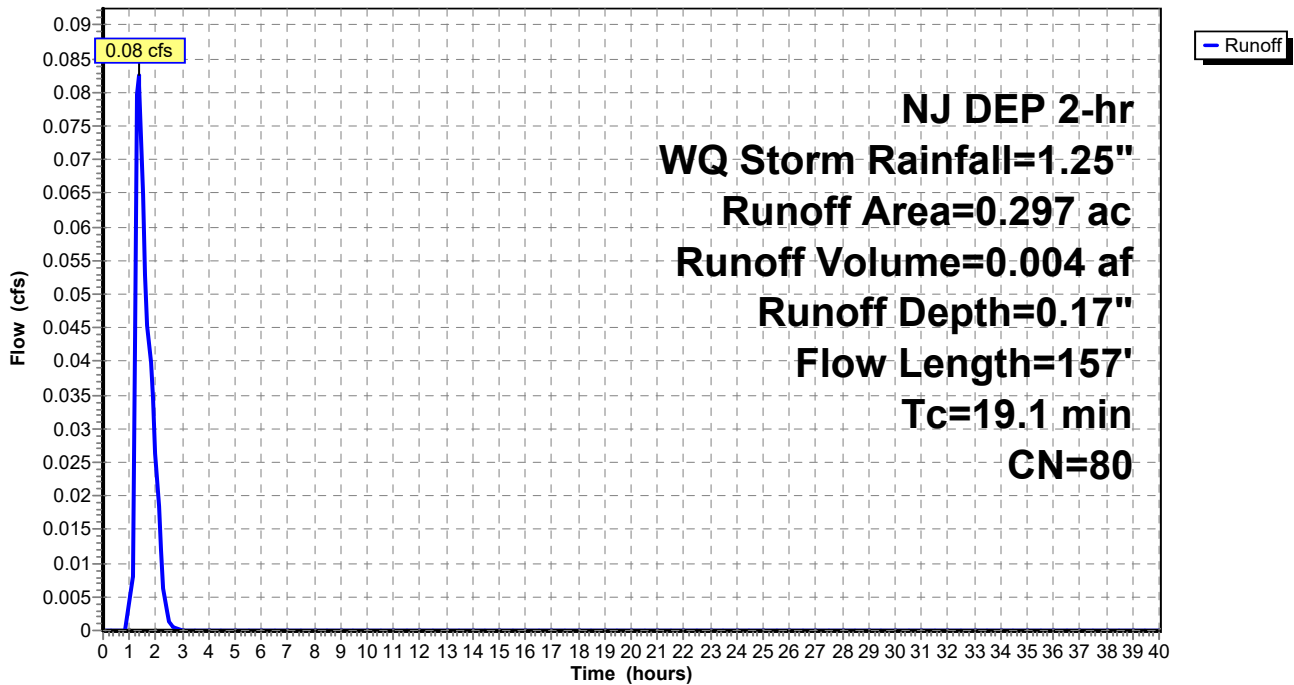
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.297	80	>75% Grass cover, Good, HSG D
0.297		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	72	0.0100	0.12		Sheet Flow, I-J Grass: Short n= 0.150 P2= 3.31"
8.4	42	0.0050	0.08		Sheet Flow, J-K Grass: Short n= 0.150 P2= 3.31"
0.9	28	0.0050	0.49		Shallow Concentrated Flow, K-L Short Grass Pasture Kv= 7.0 fps
0.0	15	0.0100	5.94	10.50	Pipe Channel, K-H 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
19.1	157	Total			

Subcatchment 6S: EDA 3 - Pervious

Hydrograph



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Summary for Subcatchment 8S: EDA 2 - Impervious

Runoff = 2.23 cfs @ 1.09 hrs, Volume= 0.068 af, Depth= 1.03"

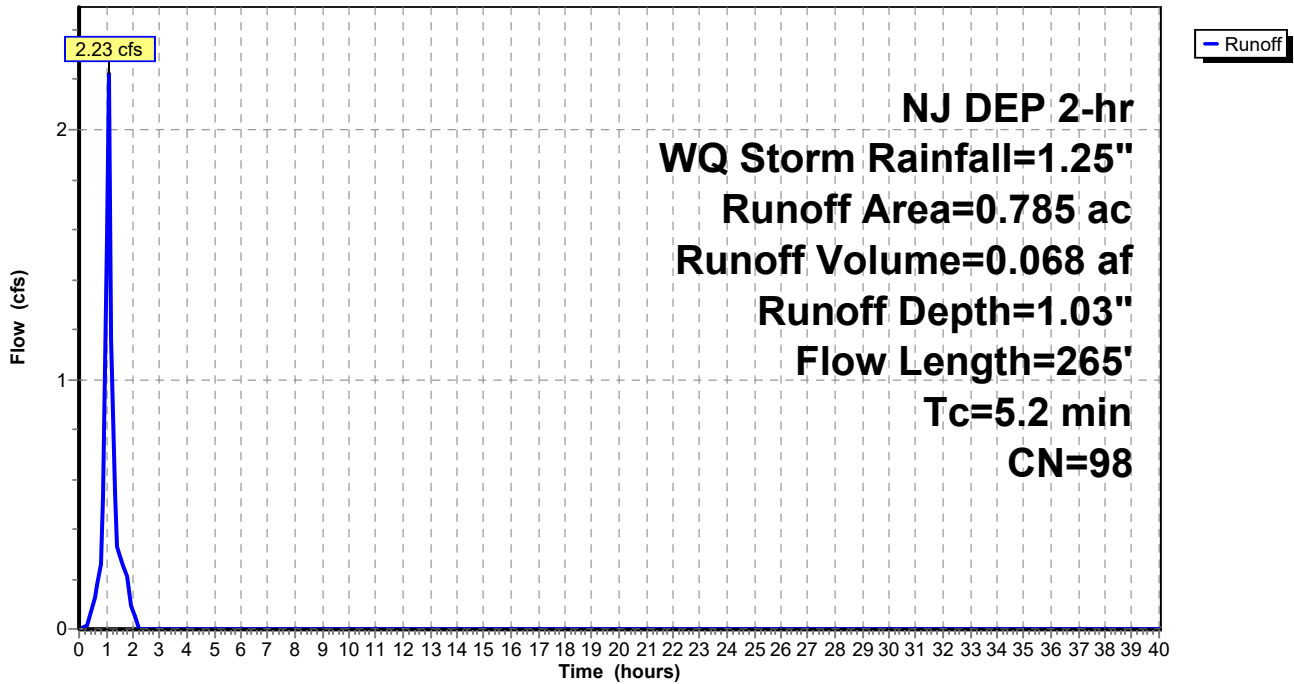
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.785	98	Paved parking, HSG D
0.785		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	30	0.0040	0.58		Sheet Flow, P-Q Smooth surfaces n= 0.011 P2= 3.31"
1.5	80	0.0170	0.91		Shallow Concentrated Flow, Q-M Short Grass Pasture Kv= 7.0 fps
2.8	155	0.0020	0.91		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
5.2	265	Total			

Subcatchment 8S: EDA 2 - Impervious

Hydrograph



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Summary for Subcatchment 9S: EDA 2 - Pervious

Runoff = 0.07 cfs @ 1.24 hrs, Volume= 0.003 af, Depth= 0.17"

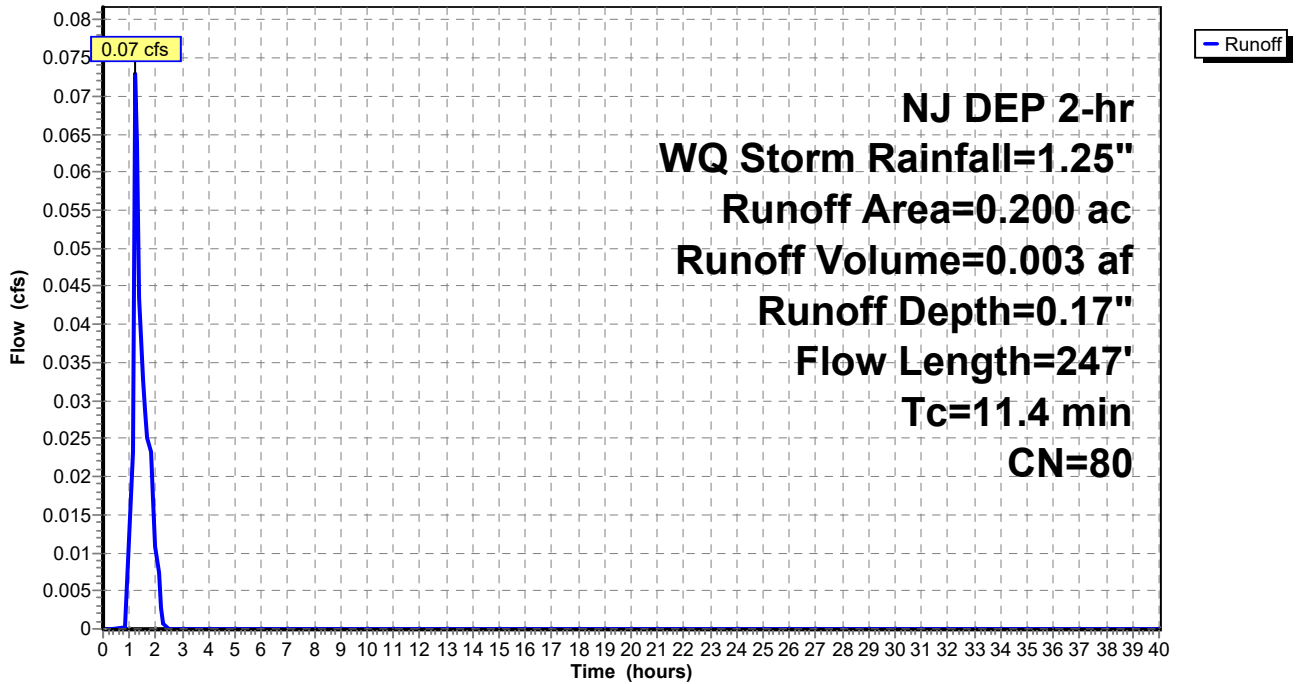
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.200	80	>75% Grass cover, Good, HSG D
0.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	78	0.0170	0.15		Sheet Flow, L-M Grass: Short n= 0.150 P2= 3.31"
0.2	14	0.0540	1.40		Sheet Flow, M-N Smooth surfaces n= 0.011 P2= 3.31"
2.8	155	0.0020	0.91		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
11.4	247	Total			

Subcatchment 9S: EDA 2 - Pervious

Hydrograph



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Summary for Subcatchment 12S: EDA 1 - Pervious

Runoff = 0.41 cfs @ 1.24 hrs, Volume= 0.017 af, Depth= 0.12"

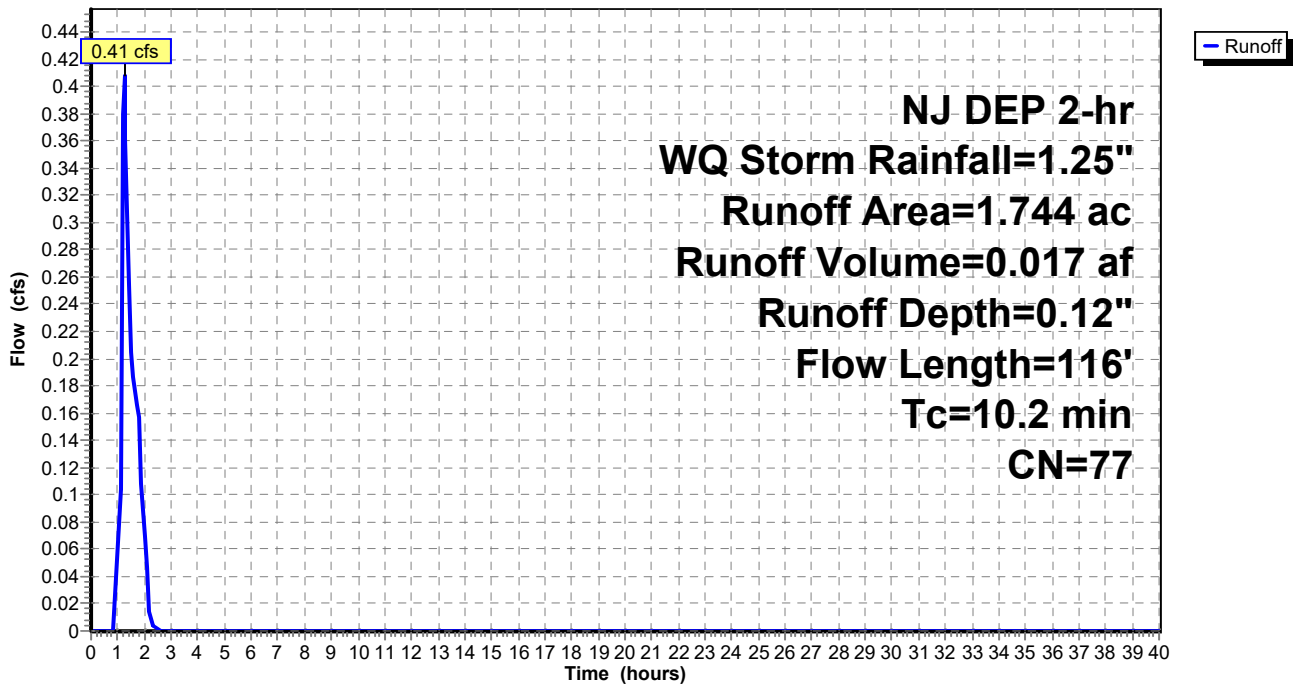
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
1.610	77	Woods, Good, HSG D
0.134	80	>75% Grass cover, Good, HSG D
1.744	77	Weighted Average
1.744		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	41	0.0250	0.07		Sheet Flow, R-S Woods: Light underbrush n= 0.400 P2= 3.31"
0.6	60	0.1170	1.71		Shallow Concentrated Flow, S-T Woodland Kv= 5.0 fps
0.1	15	0.2670	2.58		Shallow Concentrated Flow, T-U Woodland Kv= 5.0 fps
10.2	116	Total			

Subcatchment 12S: EDA 1 - Pervious

Hydrograph



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Summary for Subcatchment 14S: PDA 4 - Impervious

Runoff = 0.10 cfs @ 1.01 hrs, Volume= 0.003 af, Depth= 1.03"

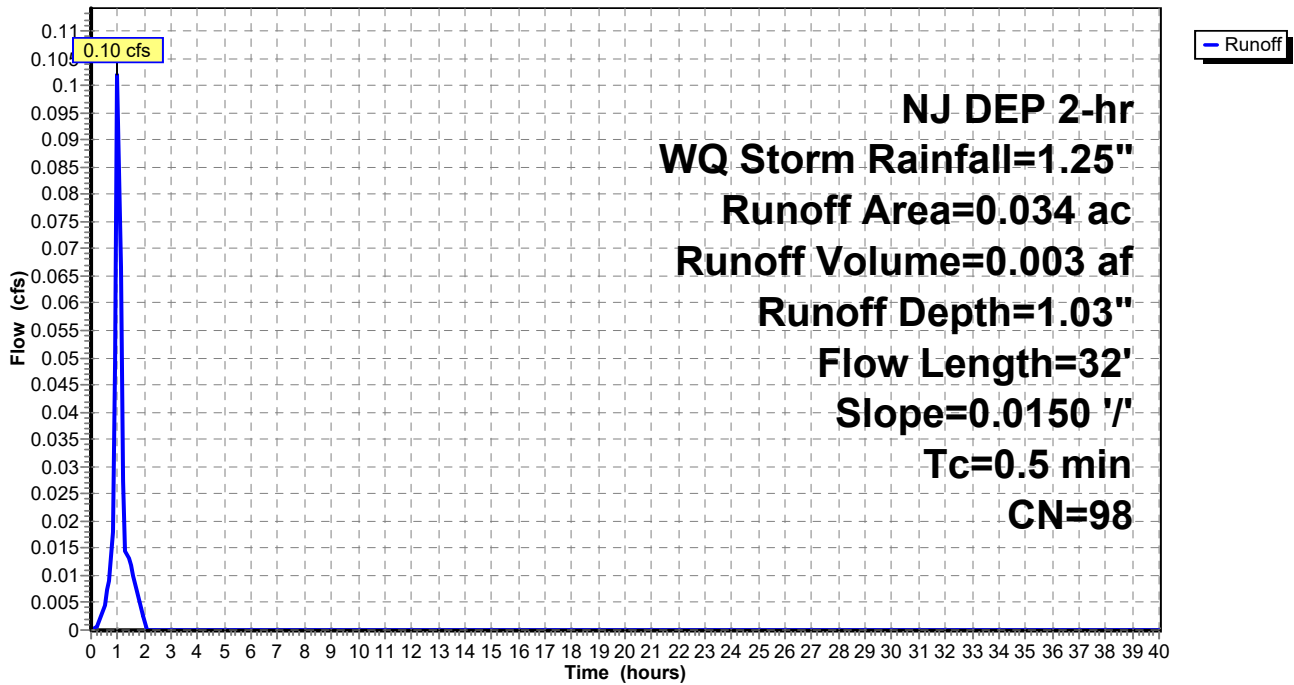
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.034	98	Paved parking, HSG D
0.034		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	32	0.0150	0.99		Sheet Flow, D-E Smooth surfaces n= 0.011 P2= 3.31"

Subcatchment 14S: PDA 4 - Impervious

Hydrograph



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Summary for Subcatchment 17S: PDA 4 - Pervious

Runoff = 0.01 cfs @ 1.11 hrs, Volume= 0.000 af, Depth= 0.17"

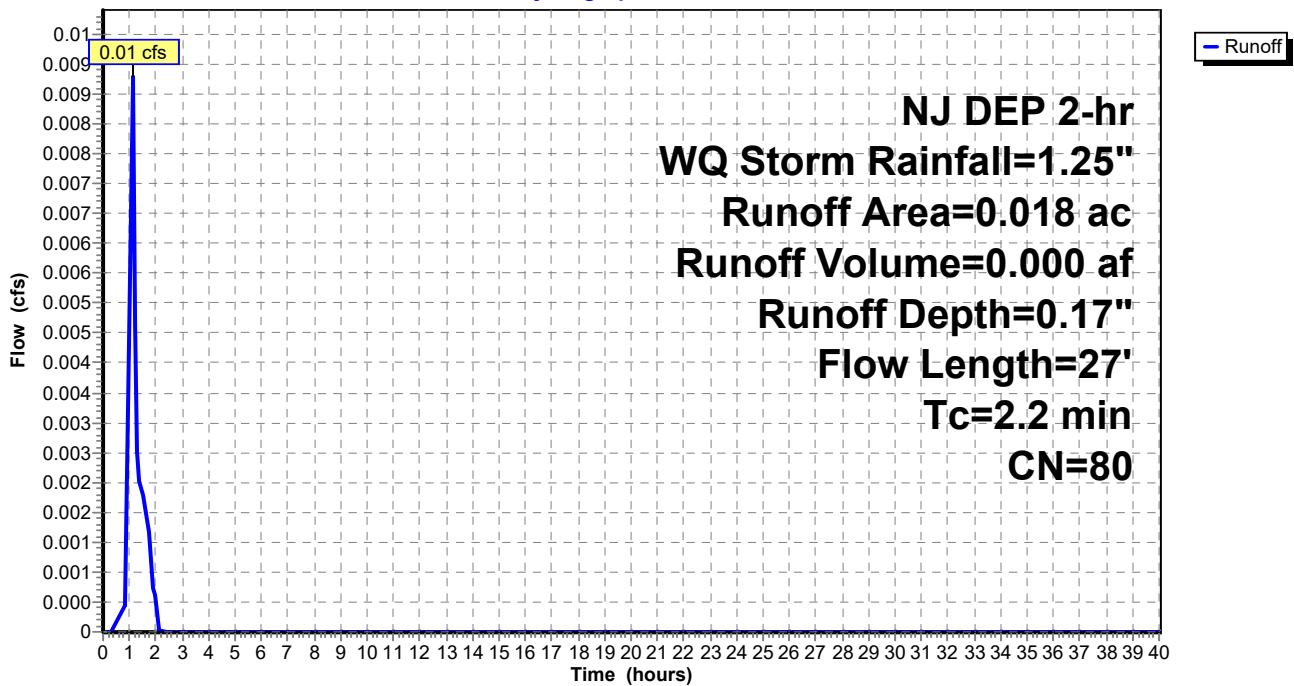
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.018	80	>75% Grass cover, Good, HSG D
0.018		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	15	0.0200	0.12		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.31"
0.1	12	0.0625	1.44		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.31"
2.2	27	Total			

Subcatchment 17S: PDA 4 - Pervious

Hydrograph



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Summary for Subcatchment 19S: PDA 3 - Pervious

Runoff = 0.12 cfs @ 1.19 hrs, Volume= 0.004 af, Depth= 0.17"

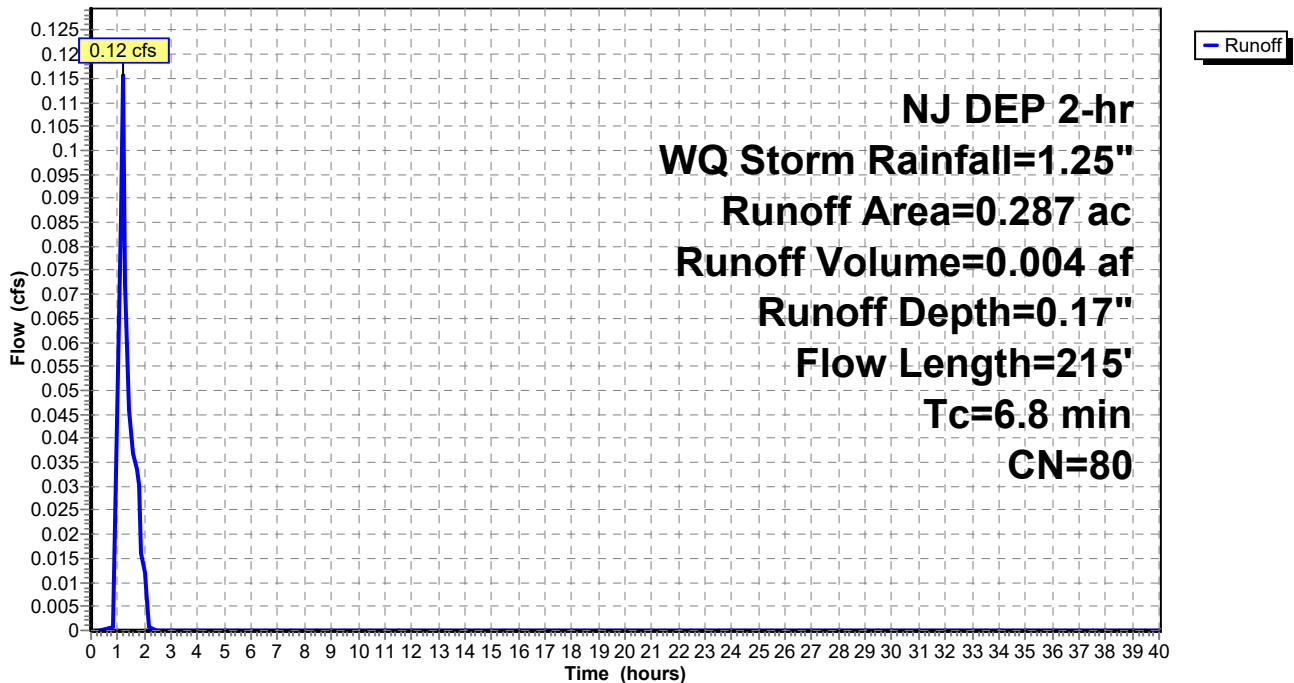
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.287	80	>75% Grass cover, Good, HSG D
0.287		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	45	0.0150	0.13		Sheet Flow, J-K Grass: Short n= 0.150 P2= 3.31"
0.6	75	0.0100	2.03		Shallow Concentrated Flow, K-L Paved Kv= 20.3 fps
0.5	95	0.0030	3.26	5.75	Pipe Channel, L-I 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
6.8	215	Total			

Subcatchment 19S: PDA 3 - Pervious

Hydrograph



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Summary for Subcatchment 20S: PDA 2 - Impervious

Runoff = 0.38 cfs @ 1.03 hrs, Volume= 0.011 af, Depth= 1.03"

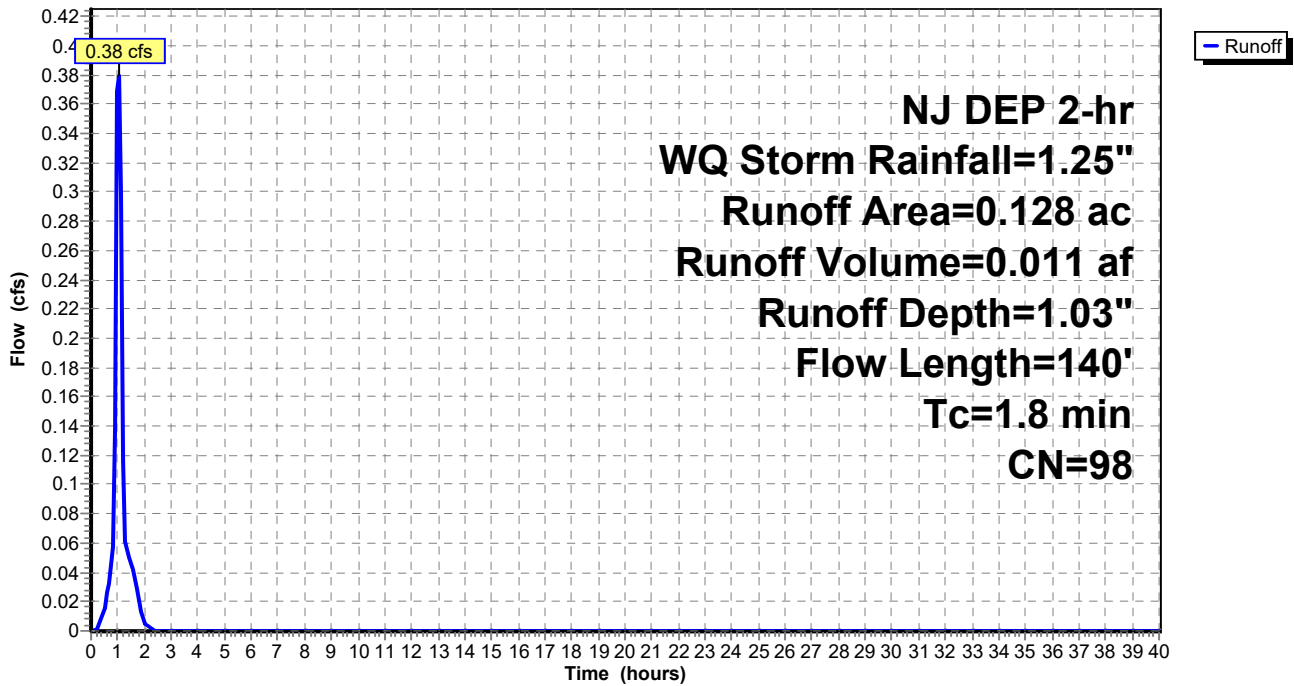
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.128	98	Paved parking, HSG D
0.128		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.0150	1.04		Sheet Flow, M-N Smooth surfaces n= 0.011 P2= 3.31"
0.3	50	0.0150	2.49		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
0.9	50	0.0020	0.91		Shallow Concentrated Flow, O-P Paved Kv= 20.3 fps
1.8	140	Total			

Subcatchment 20S: PDA 2 - Impervious

Hydrograph



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Summary for Subcatchment 21S: PDA 2 - Pervious

Runoff = 0.14 cfs @ 1.20 hrs, Volume= 0.005 af, Depth= 0.17"

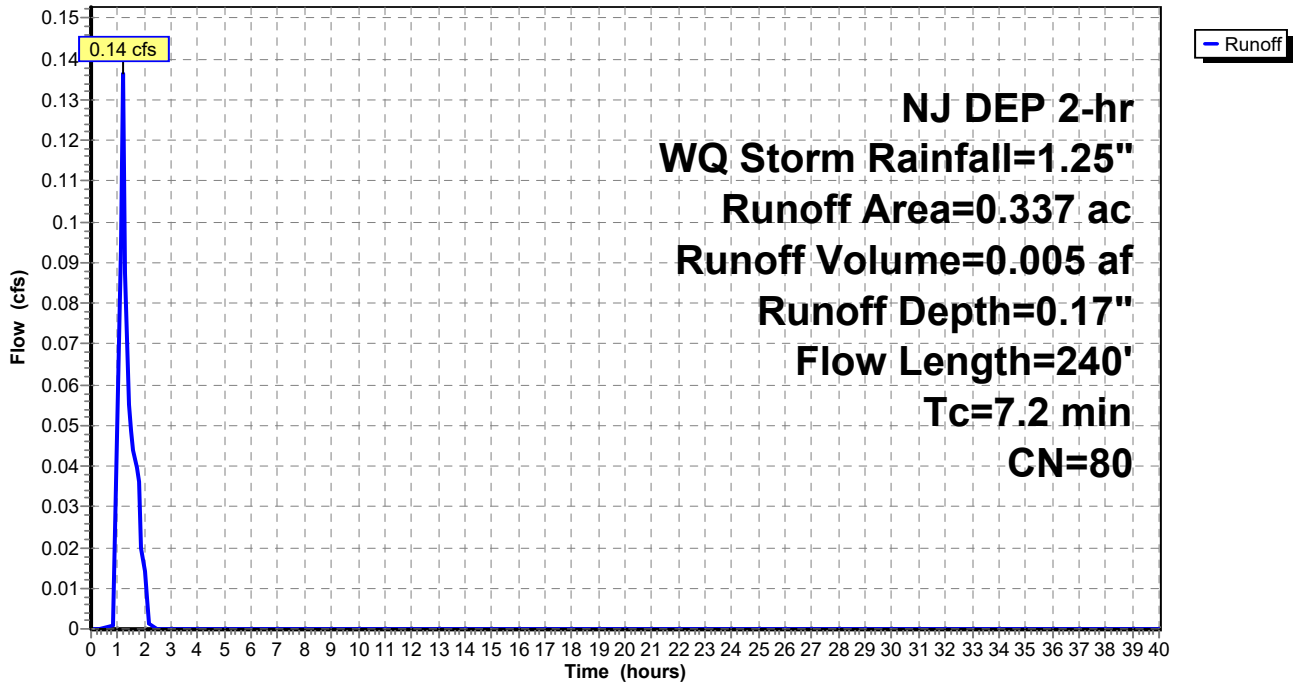
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.337	80	>75% Grass cover, Good, HSG D
0.337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	75	0.1000	0.31		Sheet Flow, Q-R Grass: Short n= 0.150 P2= 3.31"
1.3	60	0.0125	0.78		Shallow Concentrated Flow, R-S Short Grass Pasture Kv= 7.0 fps
1.9	105	0.0020	0.91		Shallow Concentrated Flow, S-P Paved Kv= 20.3 fps
7.2	240	Total			

Subcatchment 21S: PDA 2 - Pervious

Hydrograph



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Summary for Subcatchment 28S: PDA 3 - Impervious

Runoff = 0.53 cfs @ 1.06 hrs, Volume= 0.016 af, Depth= 1.03"

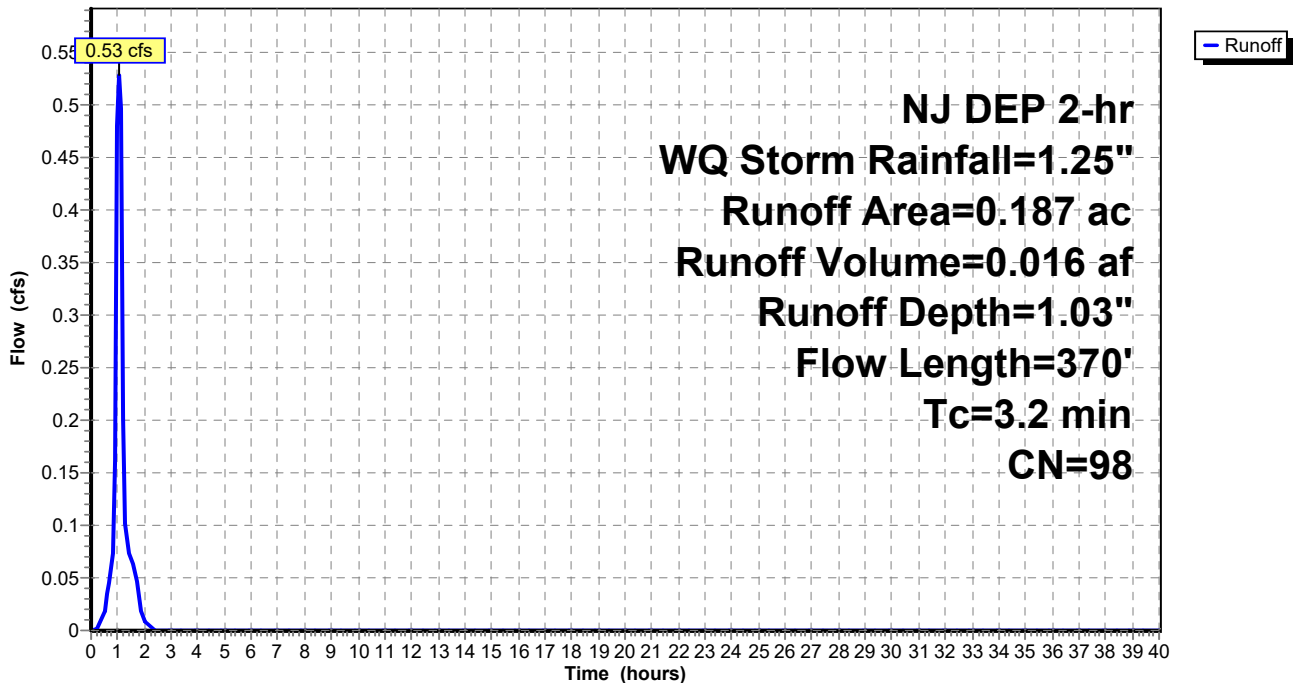
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.187	98	Paved parking, HSG D
0.187		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.06		Sheet Flow, F-G Smooth surfaces n= 0.011 P2= 3.31"
1.0	150	0.0150	2.49		Shallow Concentrated Flow, G-H Paved Kv= 20.3 fps
0.6	120	0.0030	3.26	5.75	Pipe Channel, H-I 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
3.2	370	Total			

Subcatchment 28S: PDA 3 - Impervious

Hydrograph



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Summary for Subcatchment 29S: PDA 1B - Pervious

Runoff = 0.57 cfs @ 1.13 hrs, Volume= 0.017 af, Depth= 0.17"

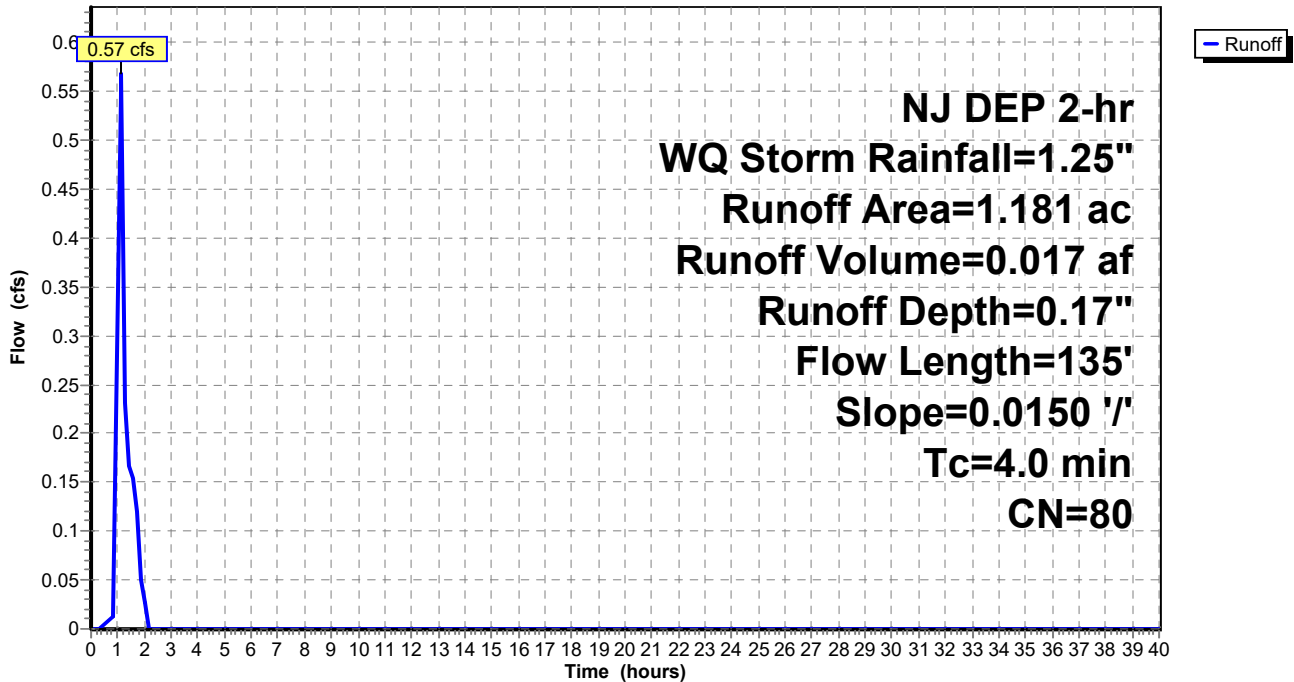
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
1.181	80	>75% Grass cover, Good, HSG D
1.181		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	18	0.0150	0.11		Sheet Flow, AD-AE Grass: Short n= 0.150 P2= 3.31"
1.1	82	0.0150	1.20		Sheet Flow, AE-AF Smooth surfaces n= 0.011 P2= 3.31"
0.2	35	0.0150	2.49		Shallow Concentrated Flow, AF-AC Paved Kv= 20.3 fps
4.0	135	Total			

Subcatchment 29S: PDA 1B - Pervious

Hydrograph



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Summary for Subcatchment 30S: PDA 1B - Impervious

Runoff = 4.74 cfs @ 1.02 hrs, Volume= 0.137 af, Depth= 1.03"

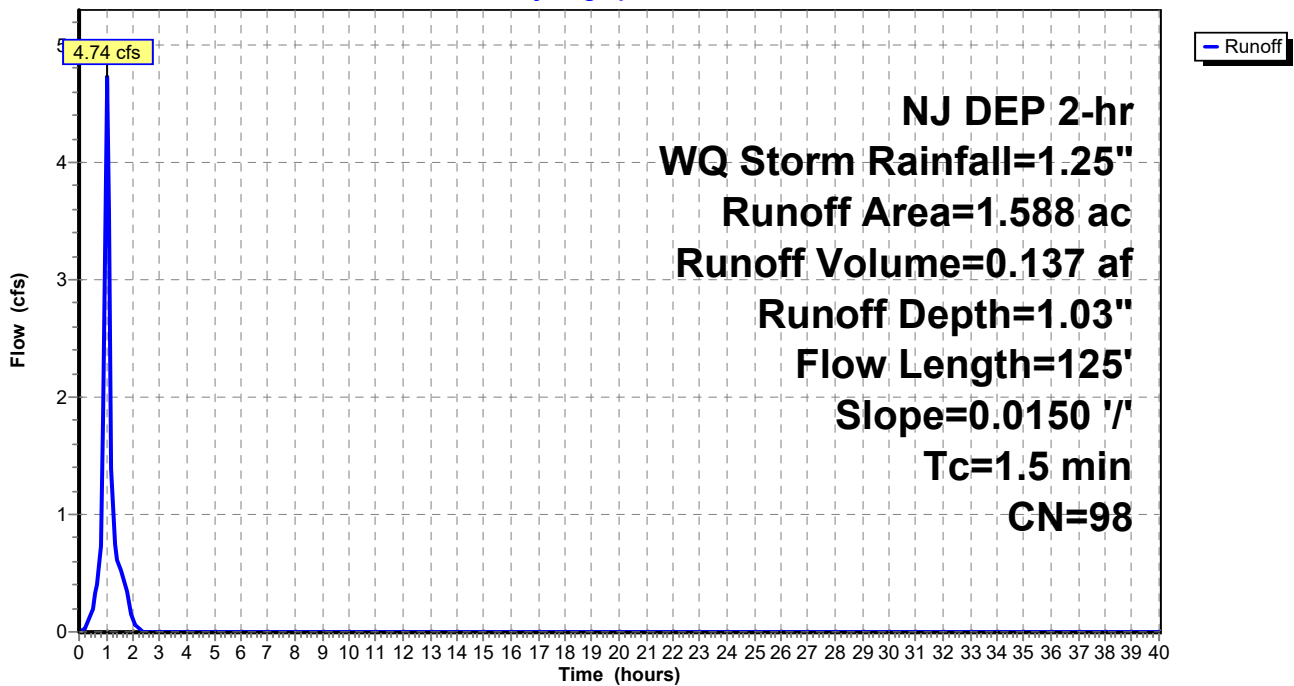
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
1.588	98	Paved parking, HSG C
1.588		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AA-AB Smooth surfaces n= 0.011 P2= 3.31"
0.2	25	0.0150	2.49		Shallow Concentrated Flow, AB-AC Paved Kv= 20.3 fps
1.5	125	Total			

Subcatchment 30S: PDA 1B - Impervious

Hydrograph



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Summary for Subcatchment 33S: PDA 1A - Pervious

Runoff = 0.89 cfs @ 1.33 hrs, Volume= 0.043 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
1.768	80	>75% Grass cover, Good, HSG D
1.610	77	Woods, Good, HSG D
3.378	79	Weighted Average
3.378		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		Sheet Flow, AG-AH Grass: Short n= 0.150 P2= 3.31"
1.5	90	0.0200	0.99		Shallow Concentrated Flow, AH-AI Short Grass Pasture Kv= 7.0 fps
2.7	422	0.0025	2.63	3.23	Pipe Channel, AI-AJ 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
2.6	807	0.0050	5.09	16.00	Pipe Channel, AJ-X 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.3	117	0.0050	6.67	47.16	Pipe Channel, X-Y 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
16.8	1,581	Total			

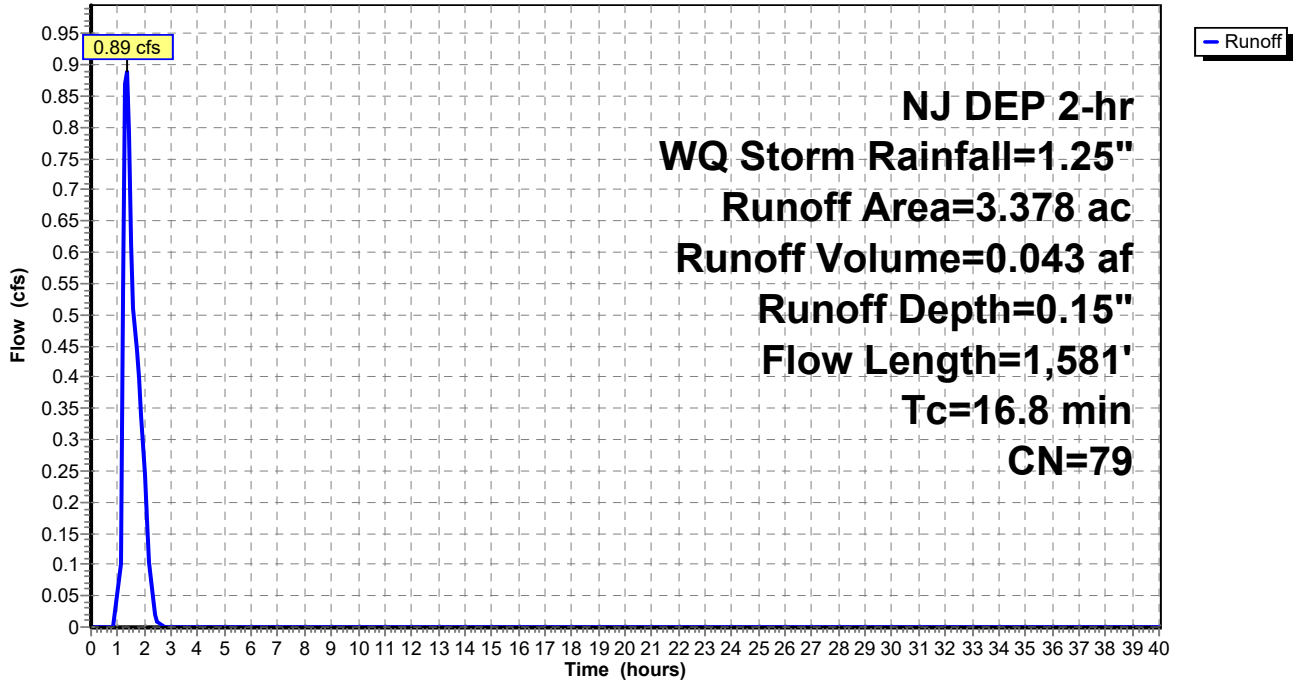
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Subcatchment 33S: PDA 1A - Pervious

Hydrograph



ex-pr

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Summary for Subcatchment 40S: PDA 1A - Impervious

Runoff = 25.93 cfs @ 1.08 hrs, Volume= 0.784 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
9.094	98	Paved parking, HSG C
9.094		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AQ-AR Smooth surfaces n= 0.011 P2= 3.31"
0.6	90	0.0150	2.49		Shallow Concentrated Flow, AR-AS Paved Kv= 20.3 fps
0.1	181	0.3500	35.17	62.14	Pipe Channel, AS-Y (18 inch) 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
1.0	222	0.0025	3.60	11.31	Pipe Channel, AS-Y (24 inch - Section 1) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
1.0	247	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 2) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.5	134	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 3) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
4.6	1,019	Total			

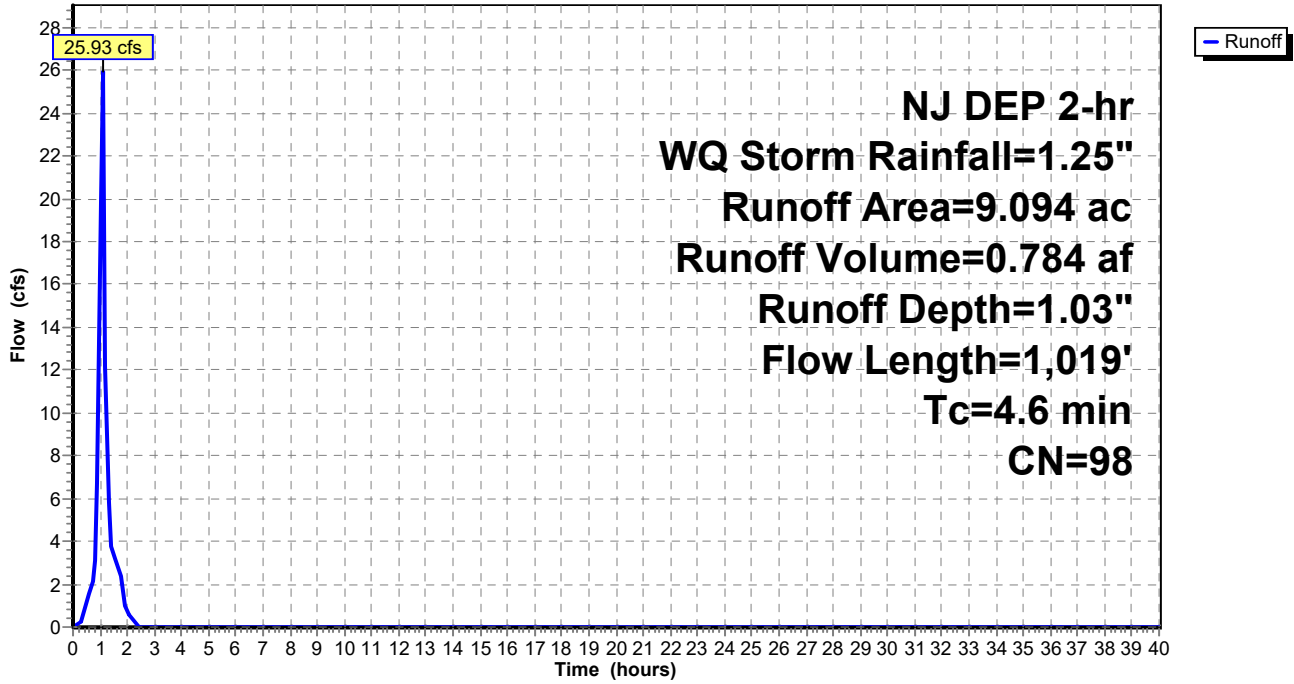
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Subcatchment 40S: PDA 1A - Impervious

Hydrograph



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Summary for Subcatchment 46S: EDA 1 - Impervious

Runoff = 33.04 cfs @ 1.12 hrs, Volume= 1.106 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
12.834	98	Paved parking, HSG C
12.834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	58	0.0010	0.38		Sheet Flow, V-W Smooth surfaces n= 0.011 P2= 3.31"
1.1	42	0.0040	0.62		Sheet Flow, W-X Smooth surfaces n= 0.011 P2= 3.31"
0.8	90	0.0080	1.82		Shallow Concentrated Flow, X-Y Paved Kv= 20.3 fps
0.8	175	0.0050	3.72	4.57	Pipe Channel, Y-Z 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
3.3	1,235	0.0075	6.24	19.59	Pipe Channel, Z-AA 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
8.6	1,600	Total			

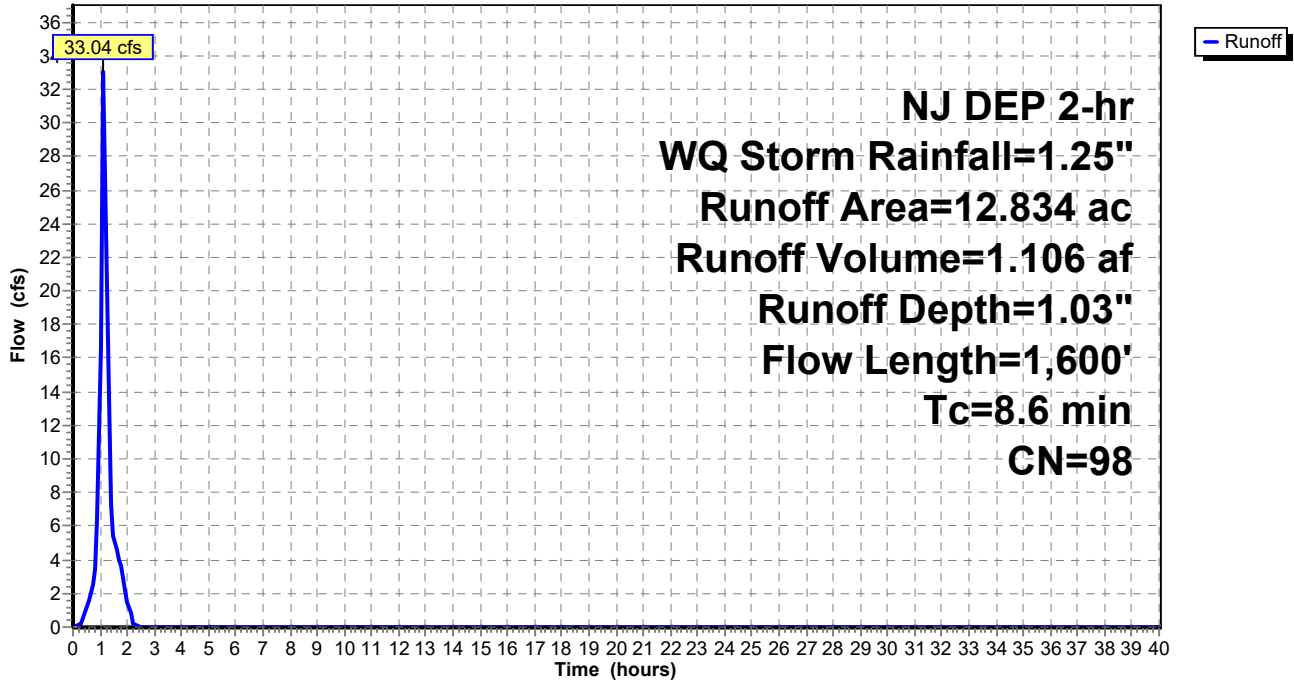
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Subcatchment 46S: EDA 1 - Impervious

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Summary for Pond 45P: Bioretention Basin

Inflow Area = 2.769 ac, 57.35% Impervious, Inflow Depth = 0.67" for WQ Storm event
 Inflow = 4.89 cfs @ 1.03 hrs, Volume= 0.154 af
 Outflow = 0.20 cfs @ 1.93 hrs, Volume= 0.154 af, Atten= 96%, Lag= 53.5 min
 Primary = 0.20 cfs @ 1.93 hrs, Volume= 0.154 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 Peak Elev= 48.33' @ 1.93 hrs Surf.Area= 17,691 sf Storage= 5,632 cf

Plug-Flow detention time= 243.8 min calculated for 0.154 af (100% of inflow)
 Center-of-Mass det. time= 243.4 min (311.2 - 67.8)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	18,218 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	16,690	0	0
49.00	19,745	18,218	18,218

Device	Routing	Invert	Outlet Devices
#1	Primary	43.94'	18.0" Round Culvert L= 205.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 43.94' / 43.32' S= 0.0030 ' /' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	48.00'	1.000 in/hr Exfiltration X 0.50 over Surface area
#3	Device 1	48.35'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.20 cfs @ 1.93 hrs HW=48.33' (Free Discharge)

- 1=Culvert (Passes 0.20 cfs of 11.94 cfs potential flow)
- 2=Exfiltration (Exfiltration Controls 0.20 cfs)
- 3=Orifice/Grate (Controls 0.00 cfs)

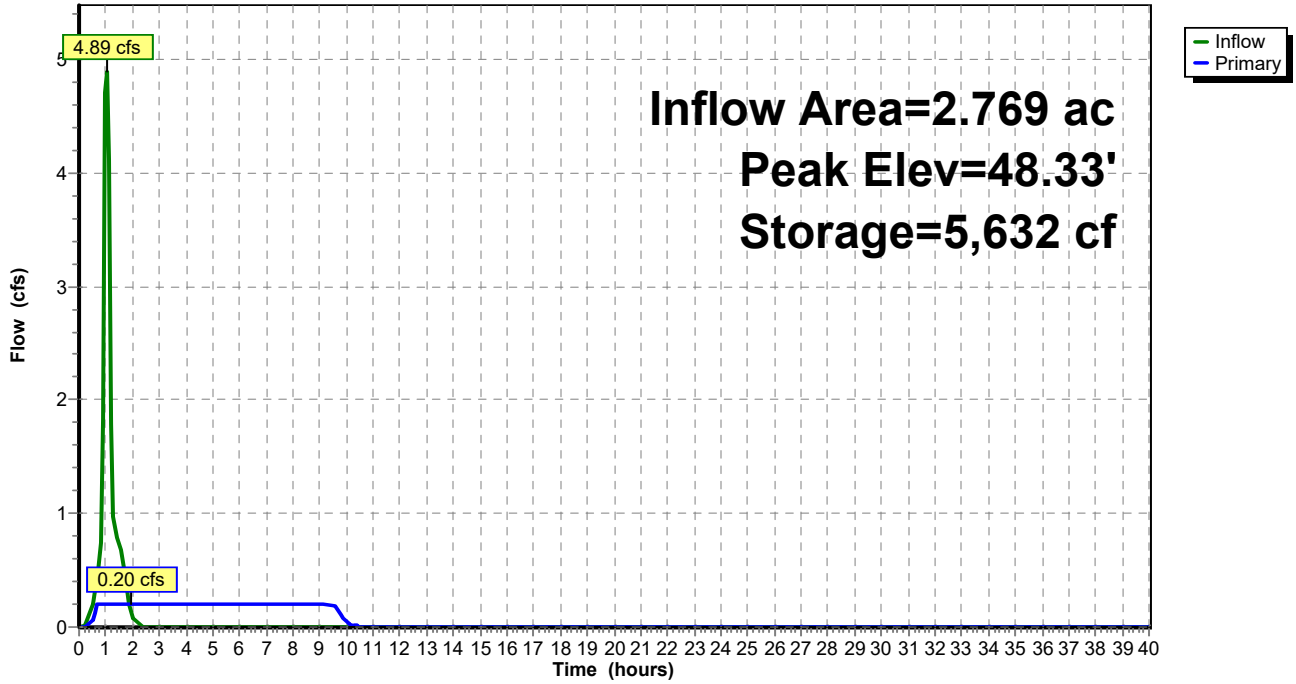
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Pond 45P: Bioretention Basin

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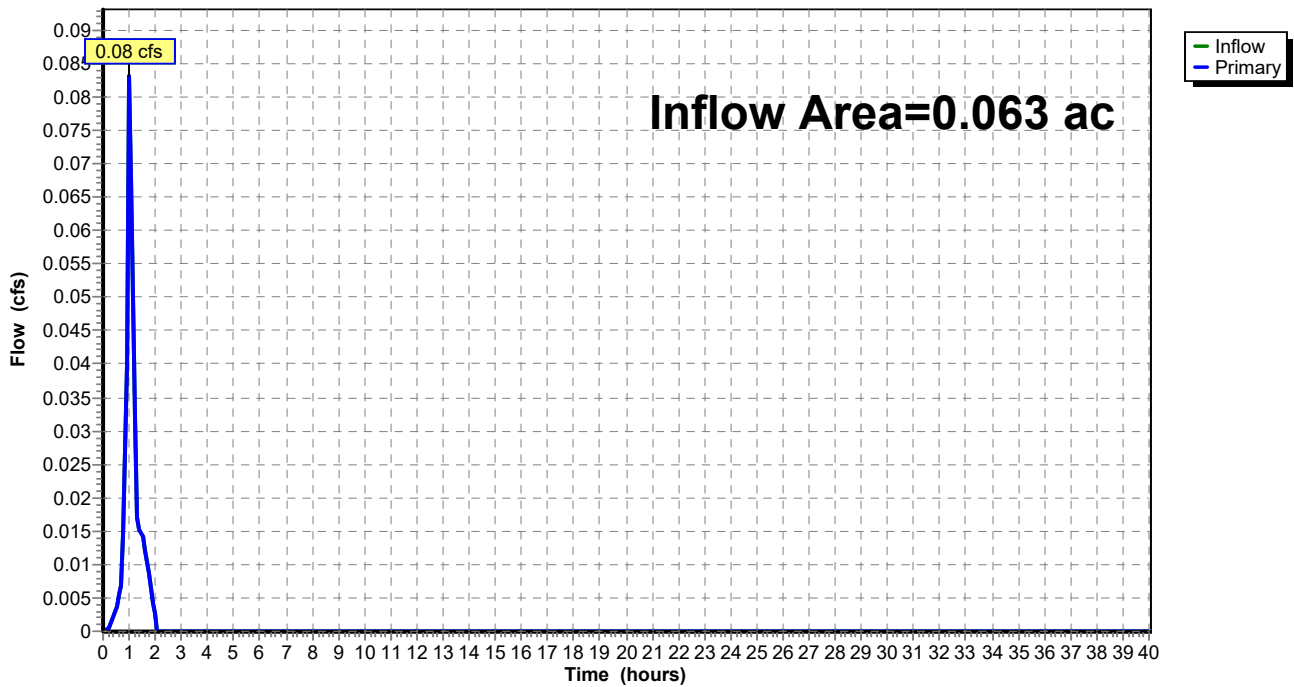
Summary for Link 4L: EDA 4

Inflow Area = 0.063 ac, 41.27% Impervious, Inflow Depth = 0.53" for WQ Storm event
Inflow = 0.08 cfs @ 1.02 hrs, Volume= 0.003 af
Primary = 0.08 cfs @ 1.02 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 4L: EDA 4

Hydrograph



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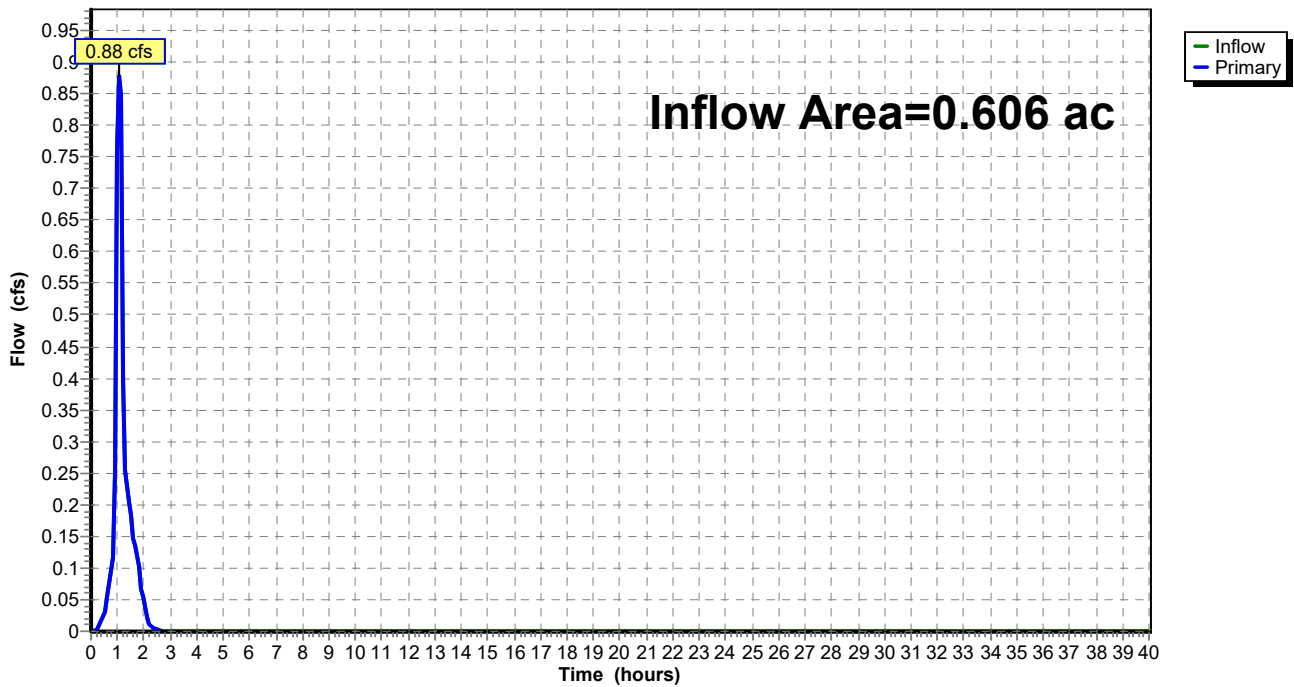
Summary for Link 7L: EDA 3

Inflow Area = 0.606 ac, 50.99% Impervious, Inflow Depth = 0.61" for WQ Storm event
Inflow = 0.88 cfs @ 1.07 hrs, Volume= 0.031 af
Primary = 0.88 cfs @ 1.07 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 7L: EDA 3

Hydrograph



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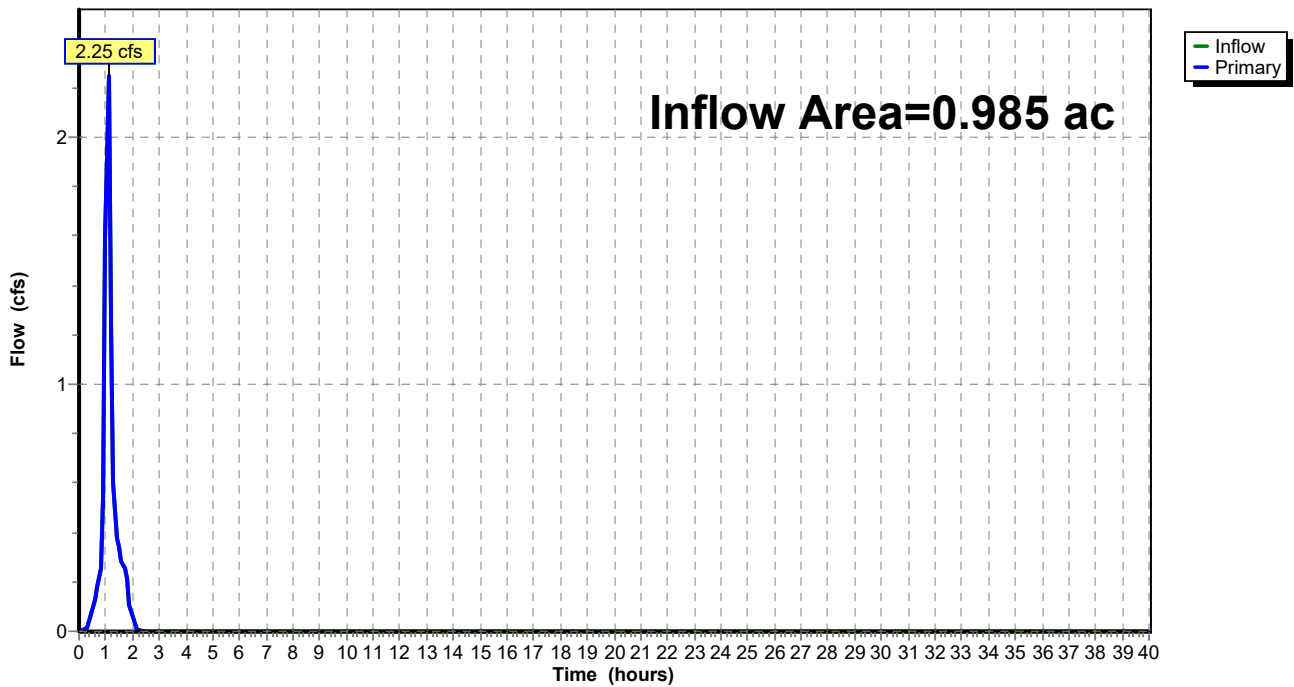
Summary for Link 10L: EDA 2

Inflow Area = 0.985 ac, 79.70% Impervious, Inflow Depth = 0.86" for WQ Storm event
Inflow = 2.25 cfs @ 1.09 hrs, Volume= 0.071 af
Primary = 2.25 cfs @ 1.09 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 10L: EDA 2

Hydrograph



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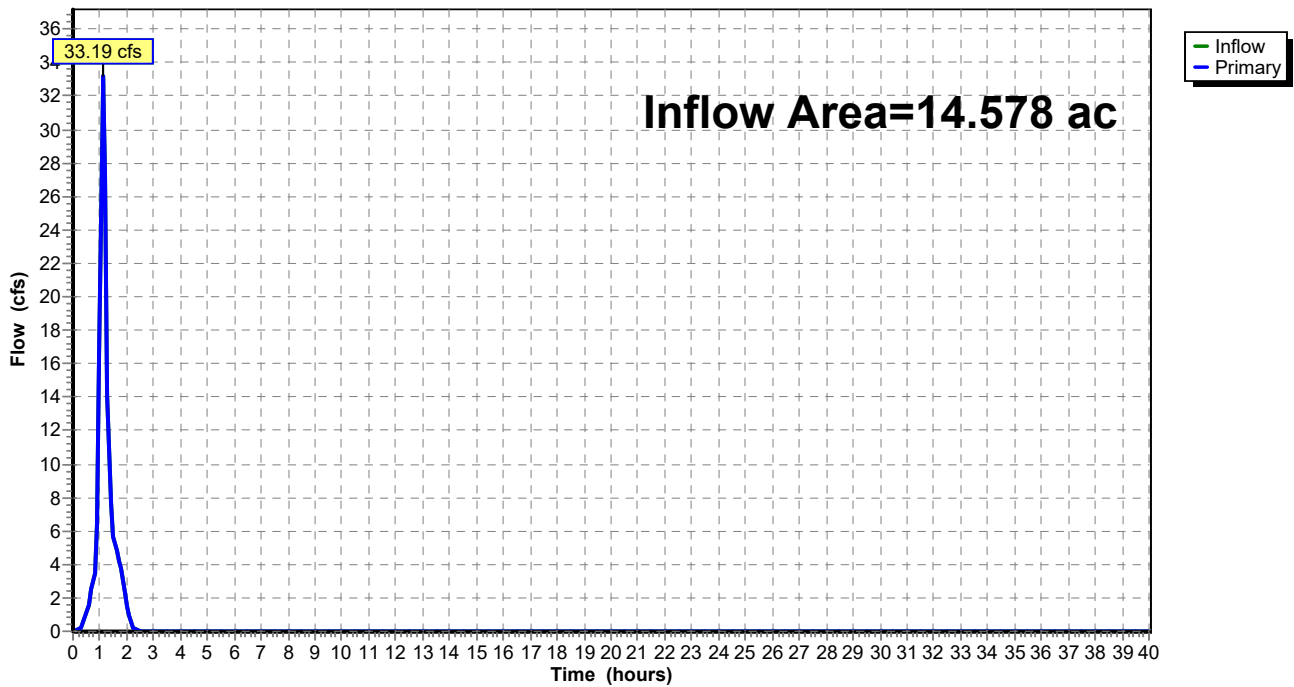
Summary for Link 13L: EDA 1

Inflow Area = 14.578 ac, 88.04% Impervious, Inflow Depth = 0.92" for WQ Storm event
Inflow = 33.19 cfs @ 1.13 hrs, Volume= 1.123 af
Primary = 33.19 cfs @ 1.13 hrs, Volume= 1.123 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 13L: EDA 1

Hydrograph



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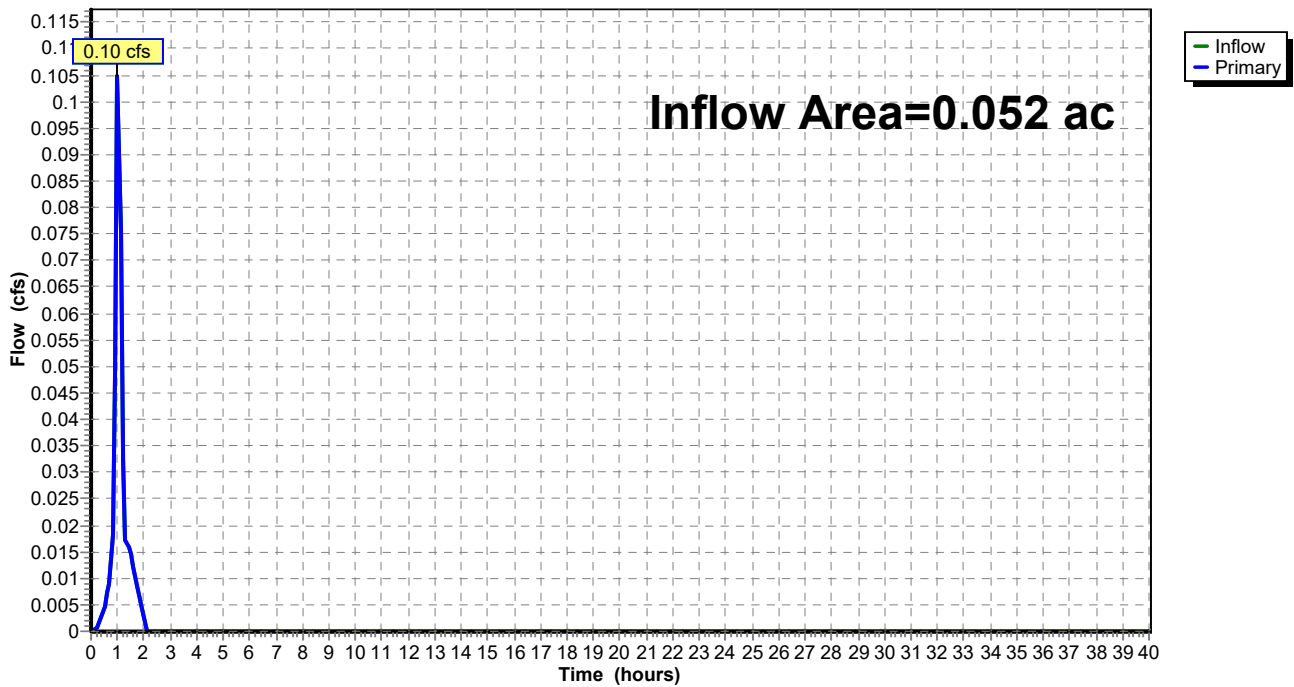
Summary for Link 24L: PDA 4

Inflow Area = 0.052 ac, 65.38% Impervious, Inflow Depth = 0.74" for WQ Storm event
Inflow = 0.10 cfs @ 1.02 hrs, Volume= 0.003 af
Primary = 0.10 cfs @ 1.02 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 24L: PDA 4

Hydrograph



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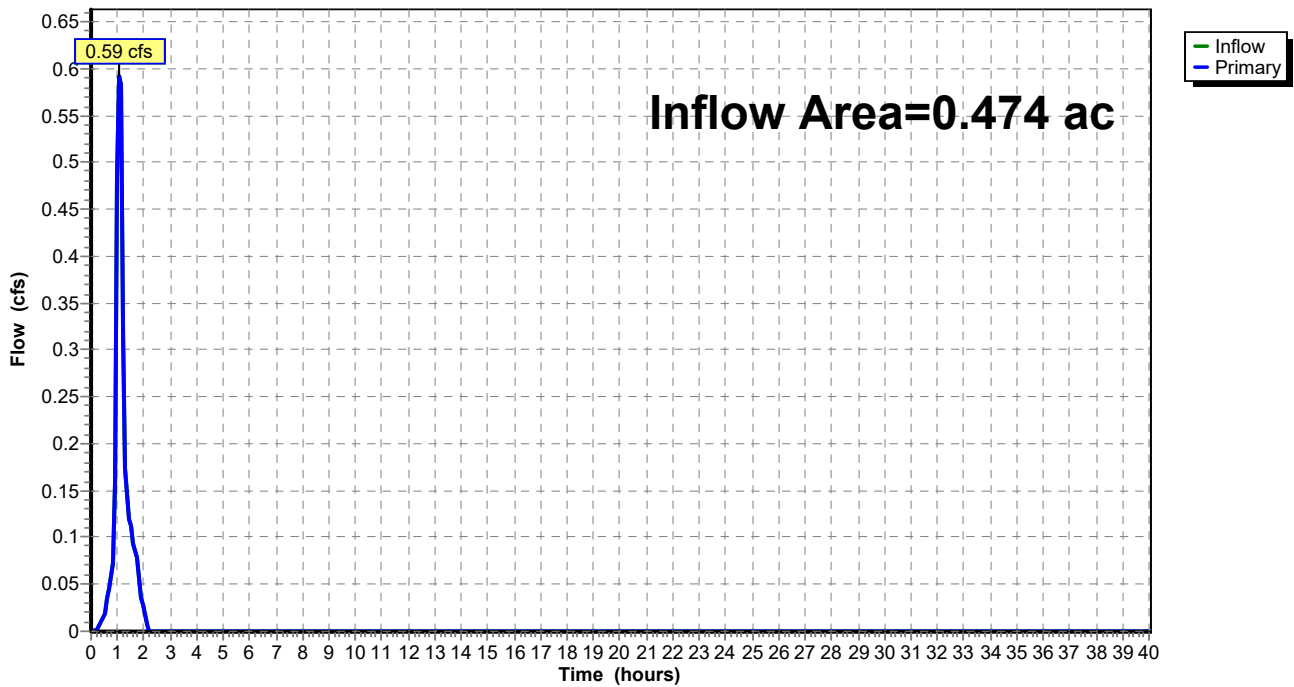
Summary for Link 25L: PDA 3

Inflow Area = 0.474 ac, 39.45% Impervious, Inflow Depth = 0.51" for WQ Storm event
Inflow = 0.59 cfs @ 1.08 hrs, Volume= 0.020 af
Primary = 0.59 cfs @ 1.08 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 25L: PDA 3

Hydrograph



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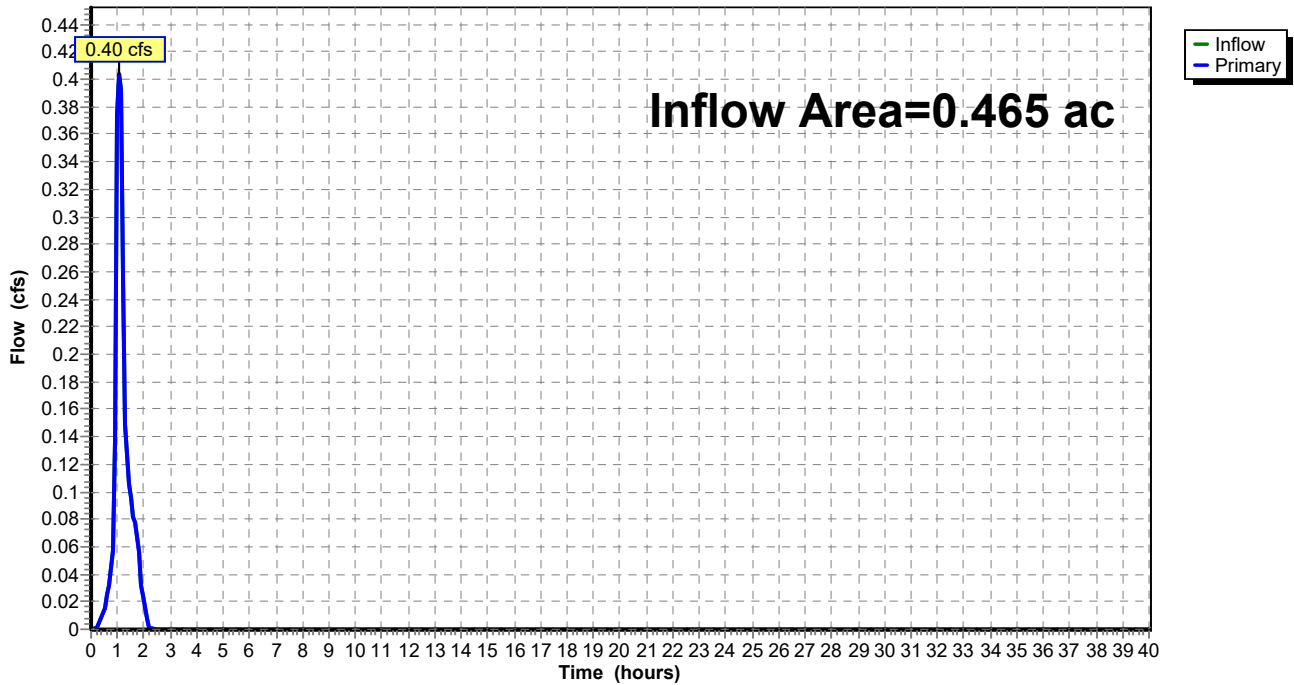
Summary for Link 26L: PDA 2

Inflow Area = 0.465 ac, 27.53% Impervious, Inflow Depth = 0.41" for WQ Storm event
Inflow = 0.40 cfs @ 1.06 hrs, Volume= 0.016 af
Primary = 0.40 cfs @ 1.06 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 26L: PDA 2

Hydrograph



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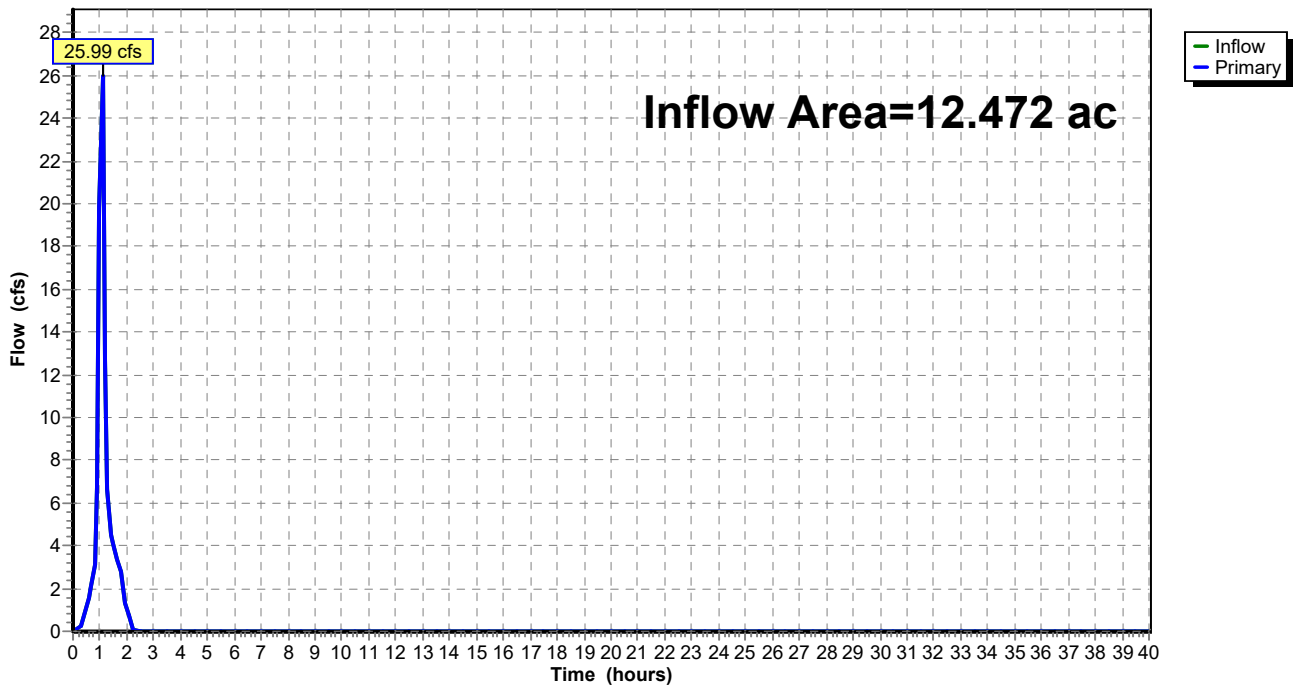
Summary for Link 35L: PDA 1A

Inflow Area = 12.472 ac, 72.92% Impervious, Inflow Depth = 0.80" for WQ Storm event
Inflow = 25.99 cfs @ 1.08 hrs, Volume= 0.827 af
Primary = 25.99 cfs @ 1.08 hrs, Volume= 0.827 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 35L: PDA 1A

Hydrograph



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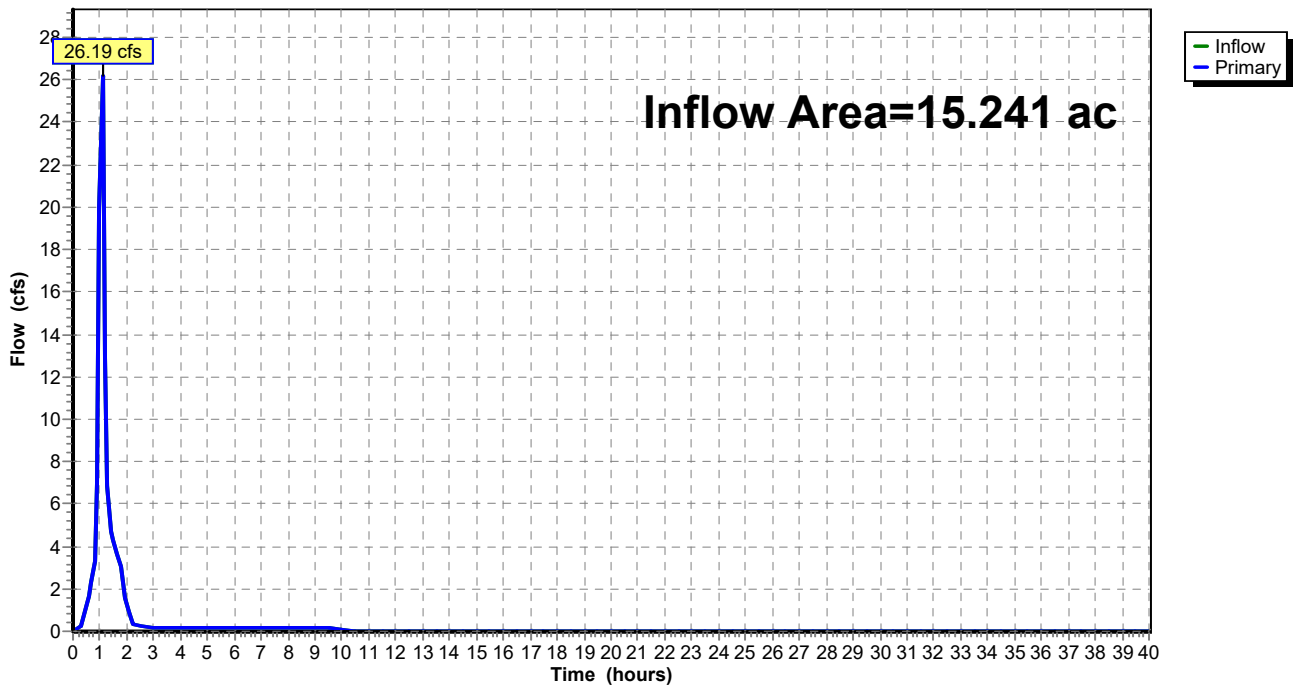
Summary for Link 44L: PDA 1

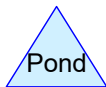
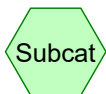
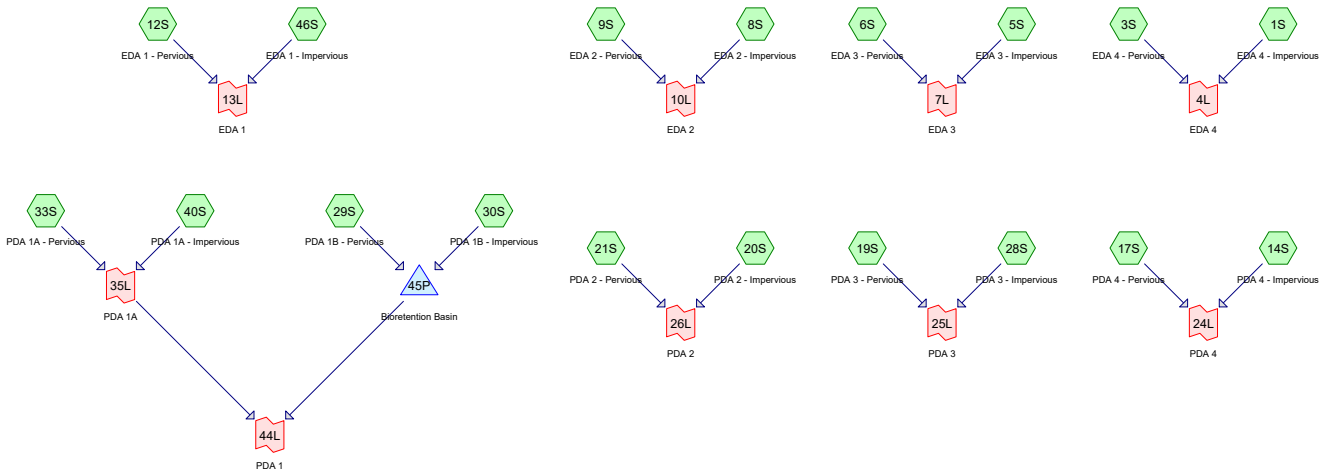
Inflow Area = 15.241 ac, 70.09% Impervious, Inflow Depth = 0.77" for WQ Storm event
Inflow = 26.19 cfs @ 1.08 hrs, Volume= 0.981 af
Primary = 26.19 cfs @ 1.08 hrs, Volume= 0.981 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 44L: PDA 1

Hydrograph





Routing Diagram for ex-pr
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Summary for Subcatchment 1S: EDA 4 - Impervious

Runoff = 0.08 cfs @ 12.03 hrs, Volume= 0.007 af, Depth= 3.08"

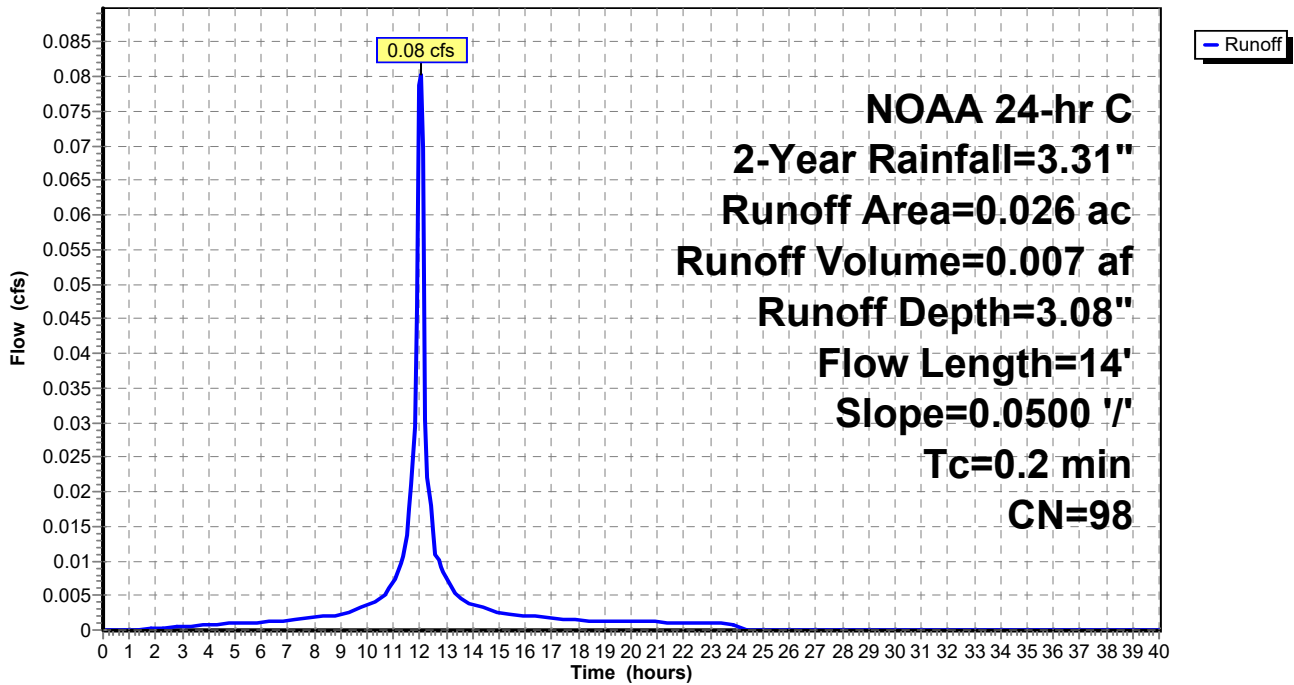
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
0.026	98	Paved parking, HSG D
0.026		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0500	1.36		Sheet Flow, D-E Smooth surfaces n= 0.011 P2= 3.31"

Subcatchment 1S: EDA 4 - Impervious

Hydrograph



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Summary for Subcatchment 3S: EDA 4 - Pervious

Runoff = 0.07 cfs @ 12.09 hrs, Volume= 0.005 af, Depth= 1.49"

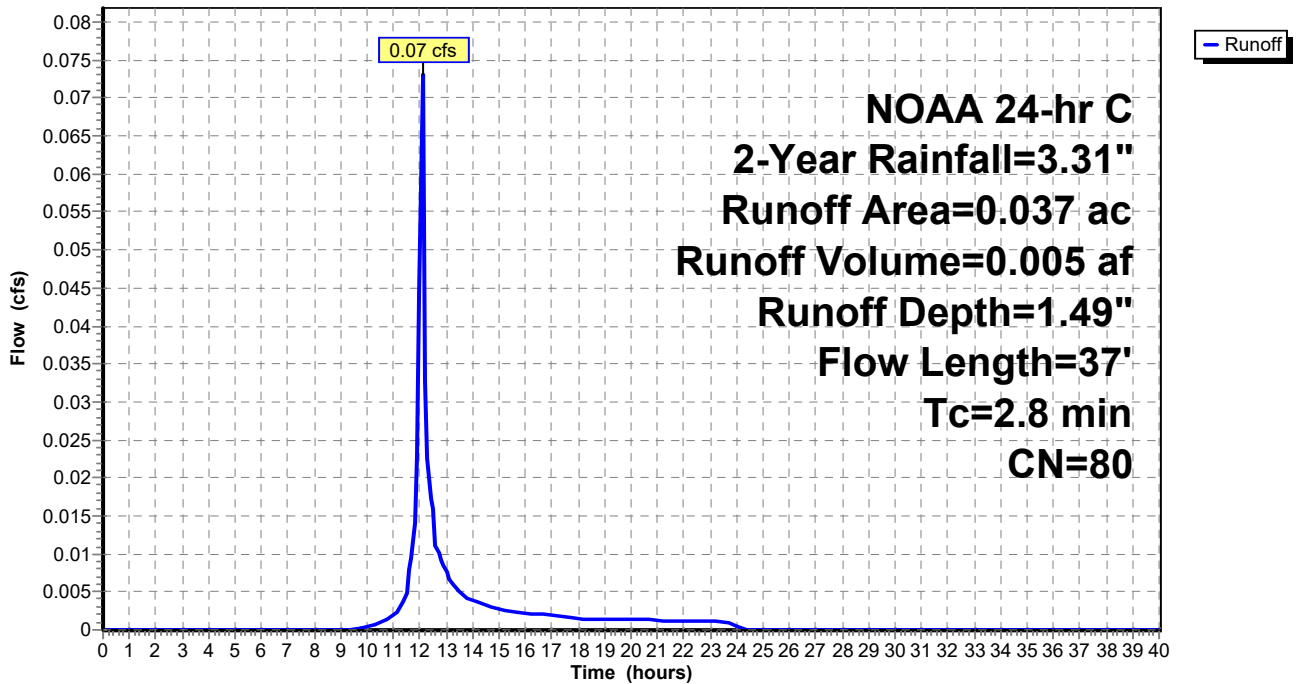
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
0.037	80	>75% Grass cover, Good, HSG D
0.037		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.31"
0.1	12	0.0650	1.47		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.31"
2.8	37	Total			

Subcatchment 3S: EDA 4 - Pervious

Hydrograph



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Summary for Subcatchment 5S: EDA 3 - Impervious

Runoff = 1.08 cfs @ 12.09 hrs, Volume= 0.079 af, Depth= 3.08"

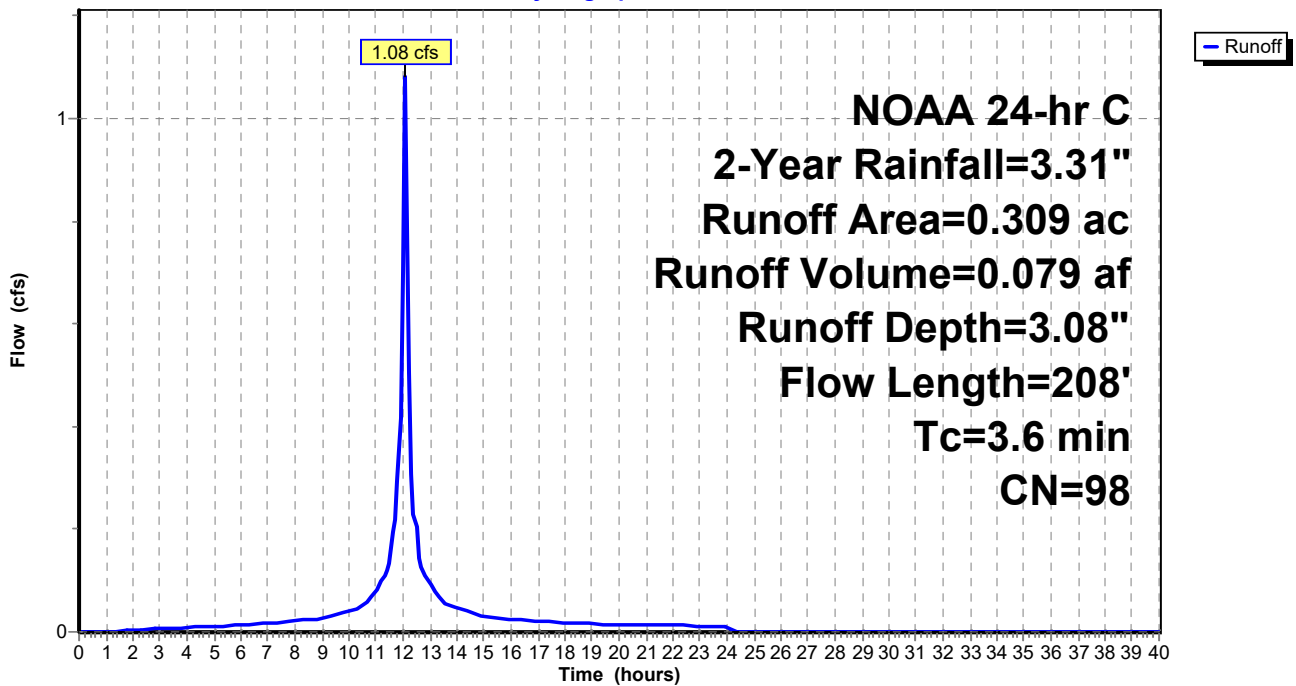
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
0.309	98	Paved parking, HSG D
0.309		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	100	0.0040	0.73		Sheet Flow, F-G Smooth surfaces n= 0.011 P2= 3.31"
1.3	108	0.0050	1.44		Shallow Concentrated Flow, G-H Paved Kv= 20.3 fps
3.6	208	Total			

Subcatchment 5S: EDA 3 - Impervious

Hydrograph



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Summary for Subcatchment 6S: EDA 3 - Pervious

Runoff = 0.37 cfs @ 12.30 hrs, Volume= 0.037 af, Depth= 1.49"

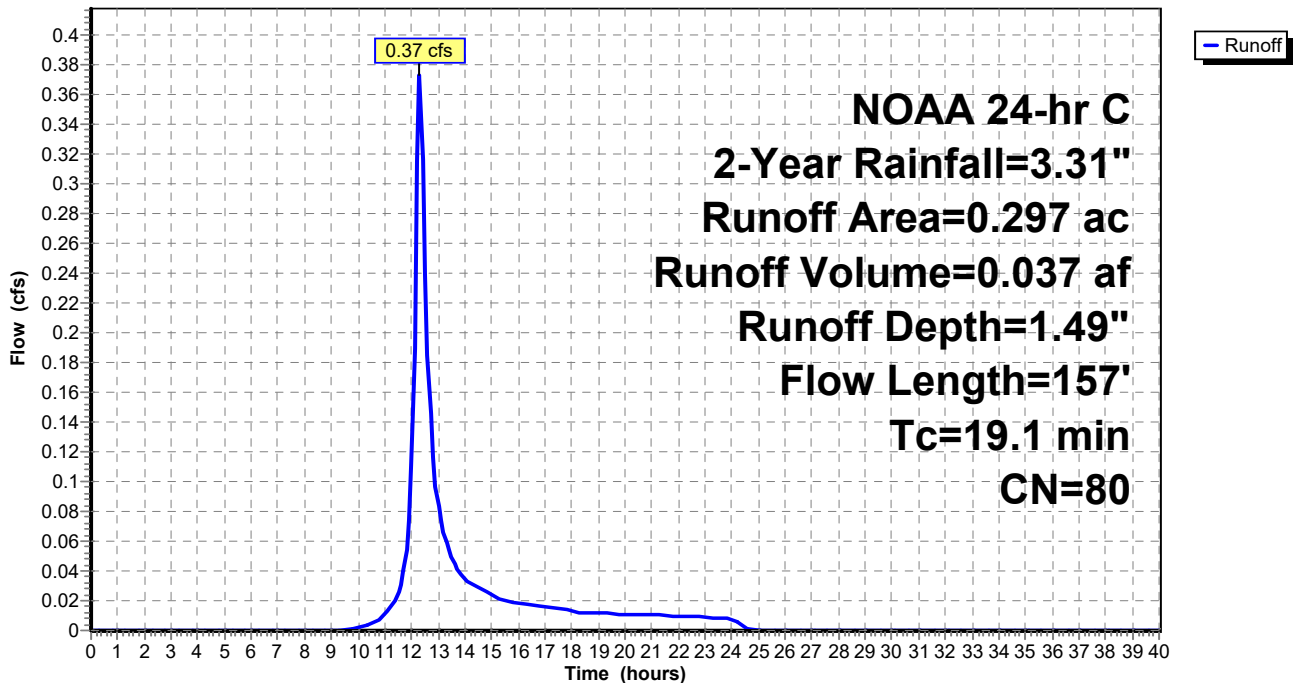
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
0.297	80	>75% Grass cover, Good, HSG D
0.297		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	72	0.0100	0.12		Sheet Flow, I-J Grass: Short n= 0.150 P2= 3.31"
8.4	42	0.0050	0.08		Sheet Flow, J-K Grass: Short n= 0.150 P2= 3.31"
0.9	28	0.0050	0.49		Shallow Concentrated Flow, K-L Short Grass Pasture Kv= 7.0 fps
0.0	15	0.0100	5.94	10.50	Pipe Channel, K-H 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
19.1	157	Total			

Subcatchment 6S: EDA 3 - Pervious

Hydrograph



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Summary for Subcatchment 8S: EDA 2 - Impervious

Runoff = 2.58 cfs @ 12.10 hrs, Volume= 0.201 af, Depth= 3.08"

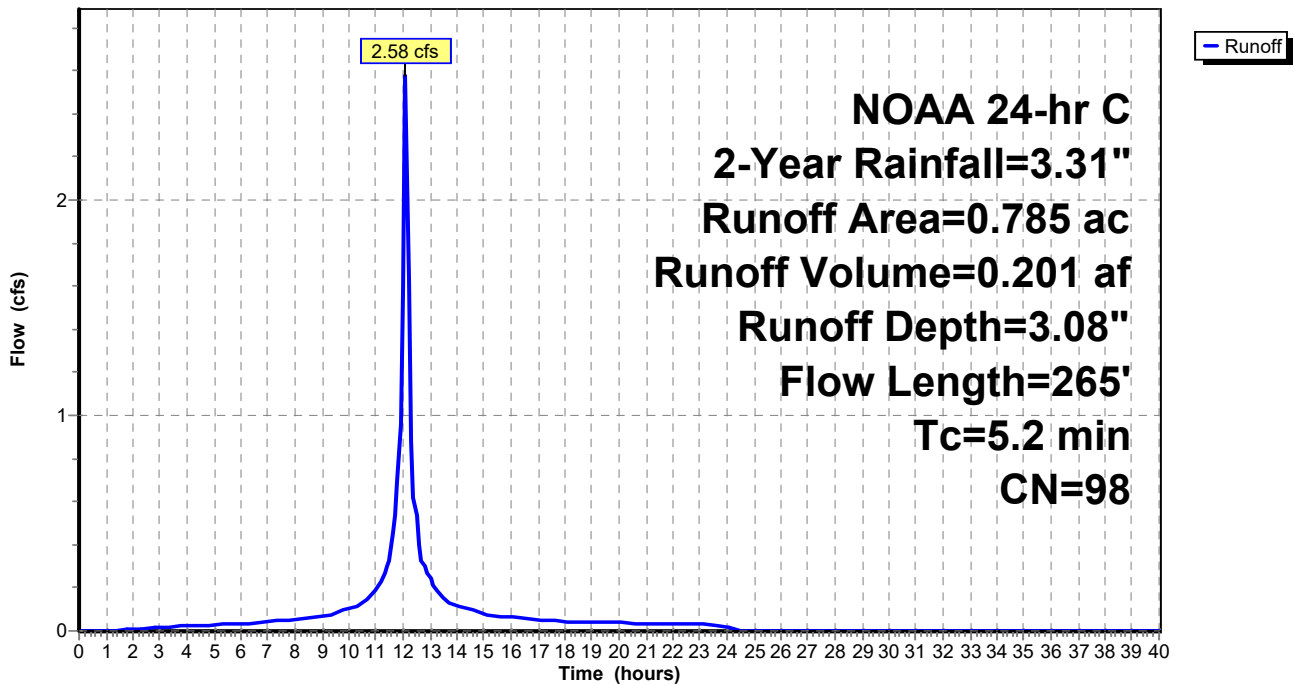
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
0.785	98	Paved parking, HSG D
0.785		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	30	0.0040	0.58		Sheet Flow, P-Q Smooth surfaces n= 0.011 P2= 3.31"
1.5	80	0.0170	0.91		Shallow Concentrated Flow, Q-M Short Grass Pasture Kv= 7.0 fps
2.8	155	0.0020	0.91		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
5.2	265	Total			

Subcatchment 8S: EDA 2 - Impervious

Hydrograph



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Summary for Subcatchment 9S: EDA 2 - Pervious

Runoff = 0.31 cfs @ 12.20 hrs, Volume= 0.025 af, Depth= 1.49"

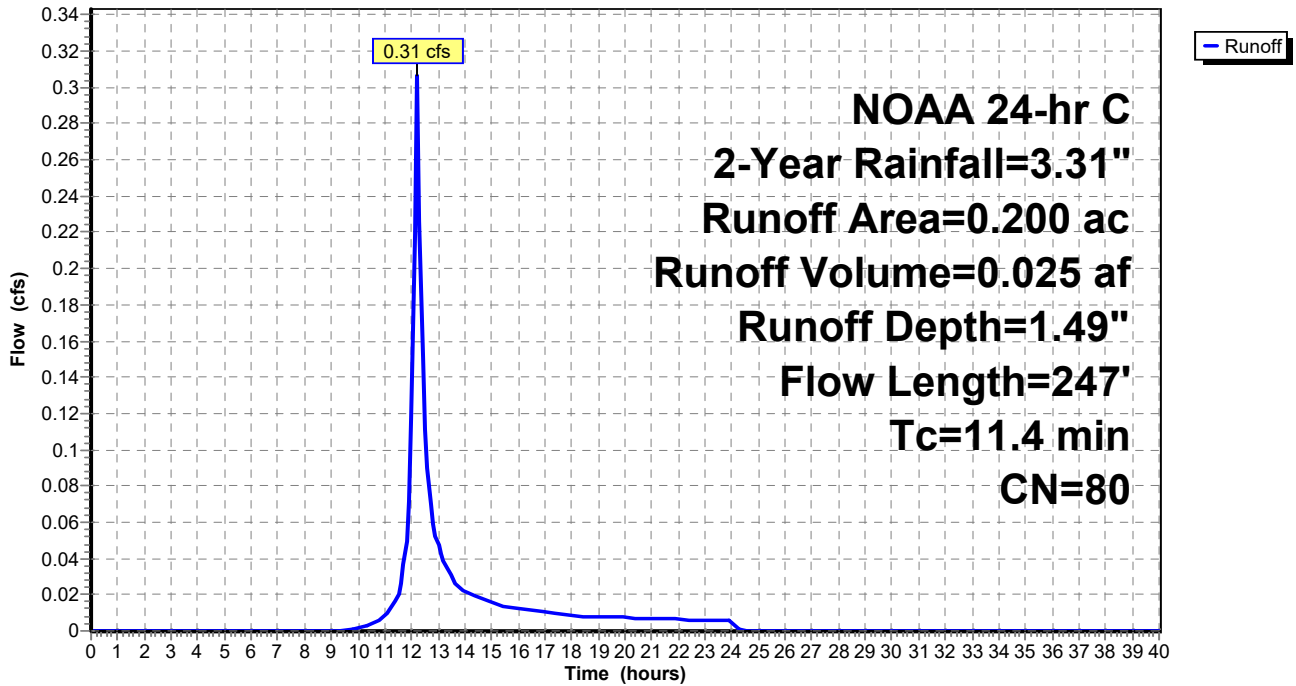
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
0.200	80	>75% Grass cover, Good, HSG D
0.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	78	0.0170	0.15		Sheet Flow, L-M Grass: Short n= 0.150 P2= 3.31"
0.2	14	0.0540	1.40		Sheet Flow, M-N Smooth surfaces n= 0.011 P2= 3.31"
2.8	155	0.0020	0.91		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
11.4	247	Total			

Subcatchment 9S: EDA 2 - Pervious

Hydrograph



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Summary for Subcatchment 12S: EDA 1 - Pervious

Runoff = 2.36 cfs @ 12.19 hrs, Volume= 0.188 af, Depth= 1.29"

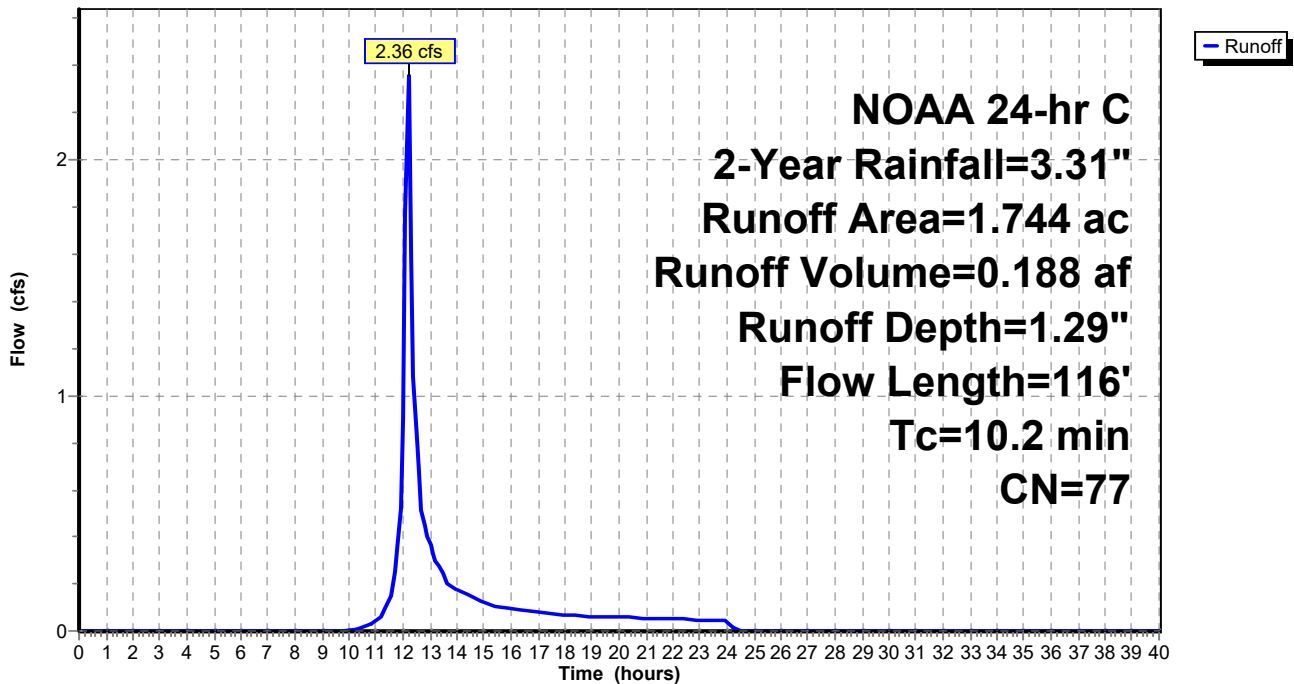
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
1.610	77	Woods, Good, HSG D
0.134	80	>75% Grass cover, Good, HSG D
1.744	77	Weighted Average
1.744		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	41	0.0250	0.07		Sheet Flow, R-S Woods: Light underbrush n= 0.400 P2= 3.31"
0.6	60	0.1170	1.71		Shallow Concentrated Flow, S-T Woodland Kv= 5.0 fps
0.1	15	0.2670	2.58		Shallow Concentrated Flow, T-U Woodland Kv= 5.0 fps
10.2	116	Total			

Subcatchment 12S: EDA 1 - Pervious

Hydrograph



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Summary for Subcatchment 14S: PDA 4 - Impervious

Runoff = 0.10 cfs @ 12.04 hrs, Volume= 0.009 af, Depth= 3.08"

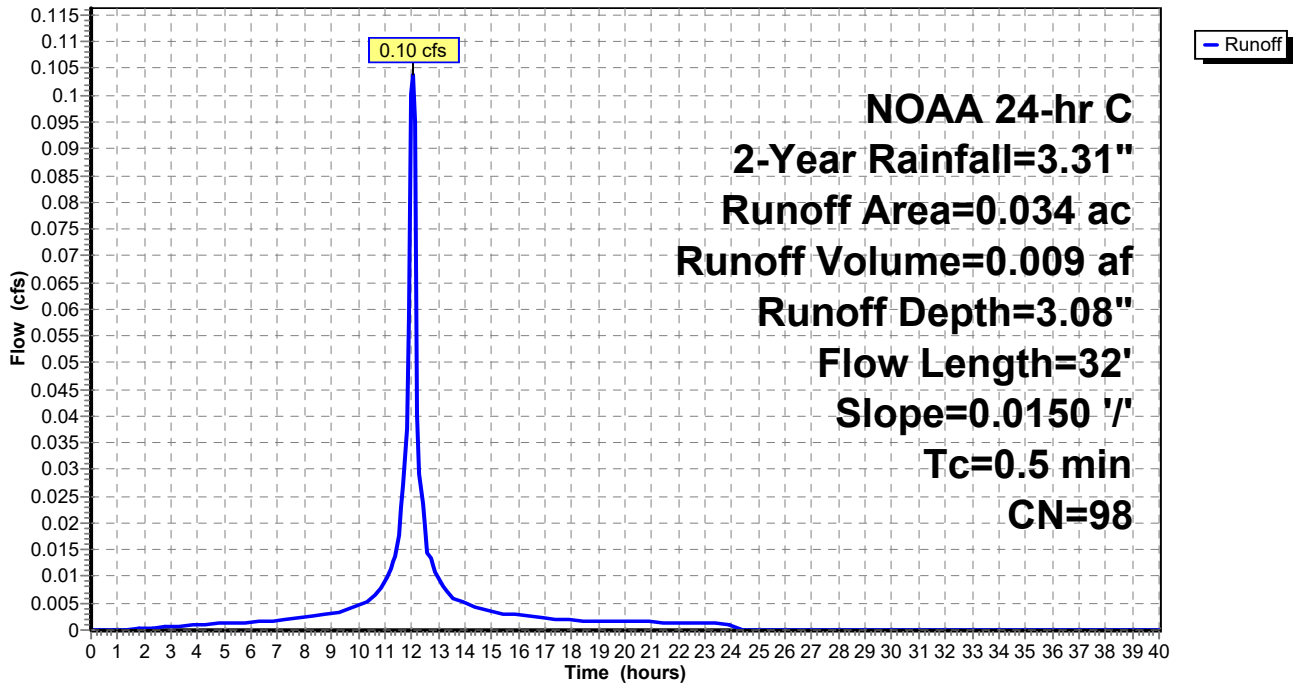
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
0.034	98	Paved parking, HSG D
0.034		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	32	0.0150	0.99		Sheet Flow, D-E Smooth surfaces n= 0.011 P2= 3.31"

Subcatchment 14S: PDA 4 - Impervious

Hydrograph



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Summary for Subcatchment 17S: PDA 4 - Pervious

Runoff = 0.04 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 1.49"

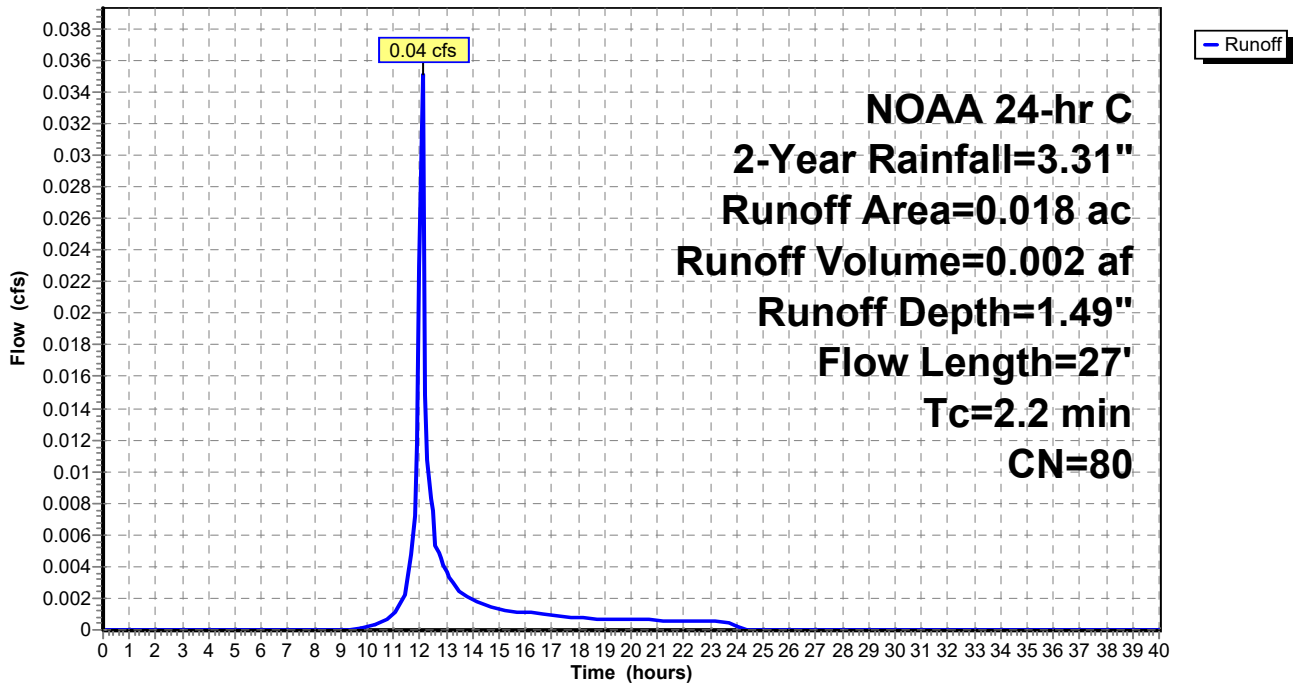
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
0.018	80	>75% Grass cover, Good, HSG D
0.018		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	15	0.0200	0.12		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.31"
0.1	12	0.0625	1.44		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.31"
2.2	27	Total			

Subcatchment 17S: PDA 4 - Pervious

Hydrograph



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Summary for Subcatchment 19S: PDA 3 - Pervious

Runoff = 0.47 cfs @ 12.13 hrs, Volume= 0.036 af, Depth= 1.49"

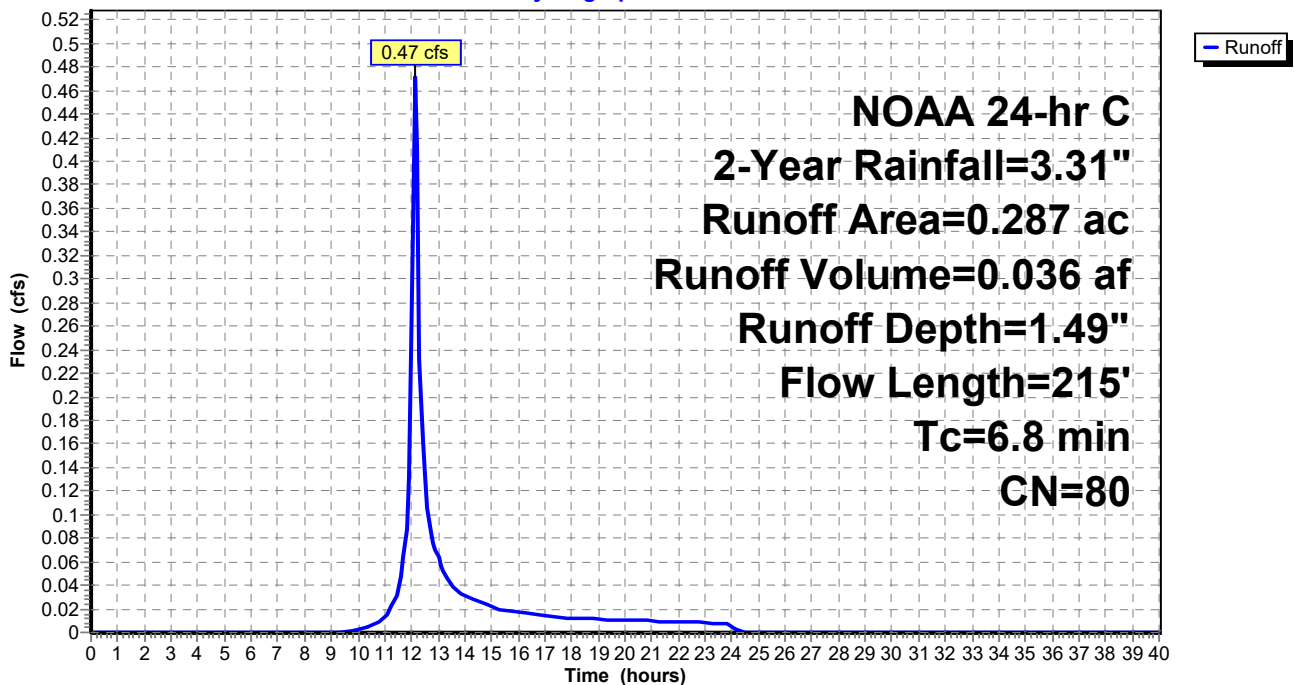
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
0.287	80	>75% Grass cover, Good, HSG D
0.287		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	45	0.0150	0.13		Sheet Flow, J-K Grass: Short n= 0.150 P2= 3.31"
0.6	75	0.0100	2.03		Shallow Concentrated Flow, K-L Paved Kv= 20.3 fps
0.5	95	0.0030	3.26	5.75	Pipe Channel, L-I 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
6.8	215	Total			

Subcatchment 19S: PDA 3 - Pervious

Hydrograph



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Summary for Subcatchment 20S: PDA 2 - Impervious

Runoff = 0.43 cfs @ 12.07 hrs, Volume= 0.033 af, Depth= 3.08"

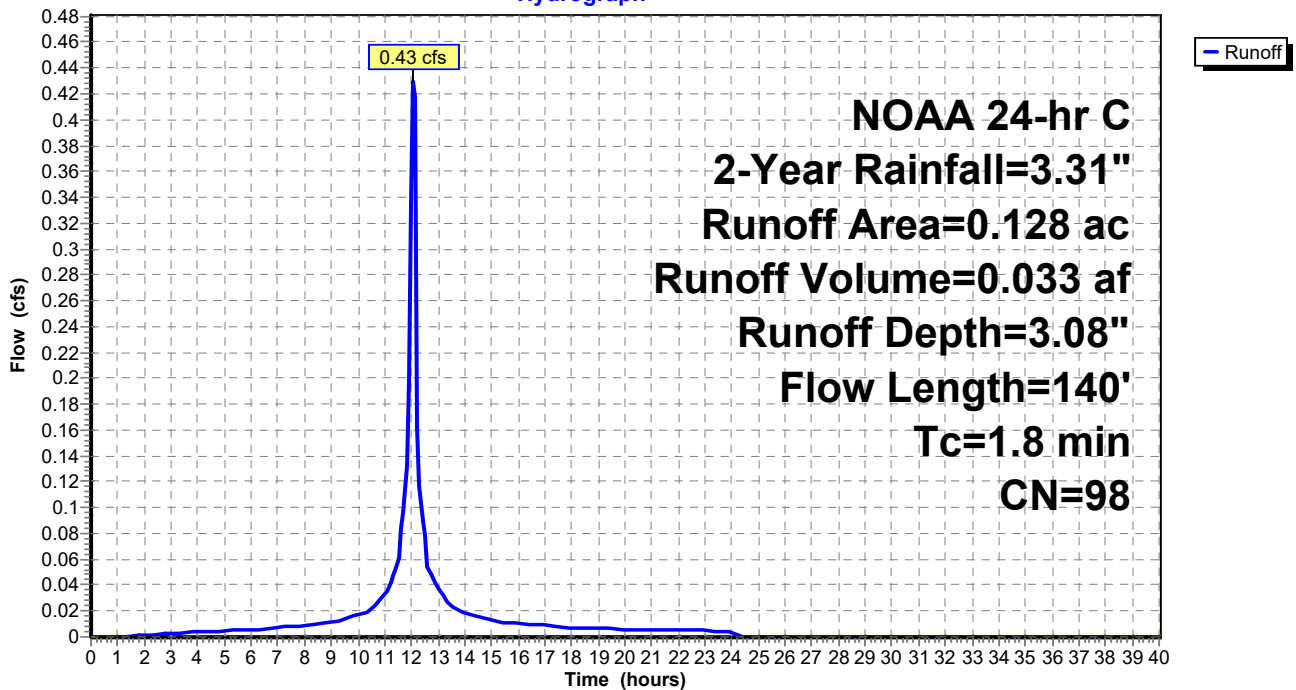
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
0.128	98	Paved parking, HSG D
0.128		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.0150	1.04		Sheet Flow, M-N Smooth surfaces n= 0.011 P2= 3.31"
0.3	50	0.0150	2.49		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
0.9	50	0.0020	0.91		Shallow Concentrated Flow, O-P Paved Kv= 20.3 fps
1.8	140	Total			

Subcatchment 20S: PDA 2 - Impervious

Hydrograph



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Summary for Subcatchment 21S: PDA 2 - Pervious

Runoff = 0.54 cfs @ 12.14 hrs, Volume= 0.042 af, Depth= 1.49"

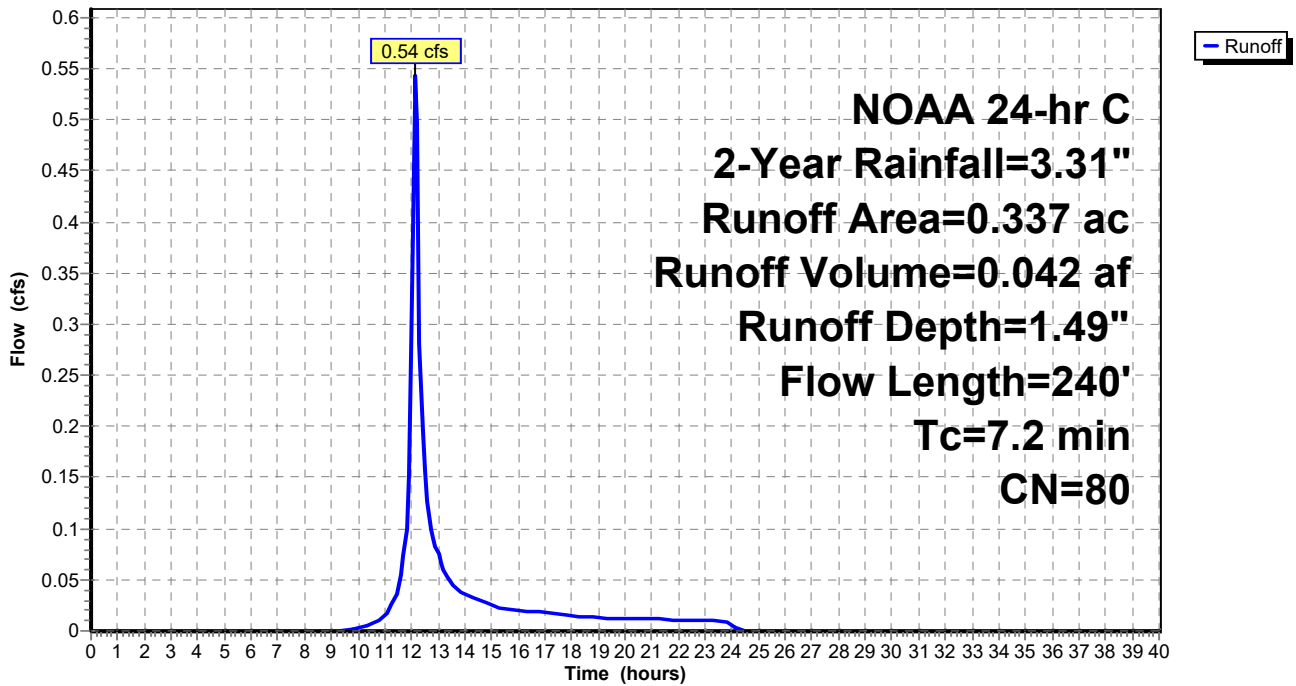
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
0.337	80	>75% Grass cover, Good, HSG D
0.337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	75	0.1000	0.31		Sheet Flow, Q-R Grass: Short n= 0.150 P2= 3.31"
1.3	60	0.0125	0.78		Shallow Concentrated Flow, R-S Short Grass Pasture Kv= 7.0 fps
1.9	105	0.0020	0.91		Shallow Concentrated Flow, S-P Paved Kv= 20.3 fps
7.2	240	Total			

Subcatchment 21S: PDA 2 - Pervious

Hydrograph



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Summary for Subcatchment 28S: PDA 3 - Impervious

Runoff = 0.66 cfs @ 12.09 hrs, Volume= 0.048 af, Depth= 3.08"

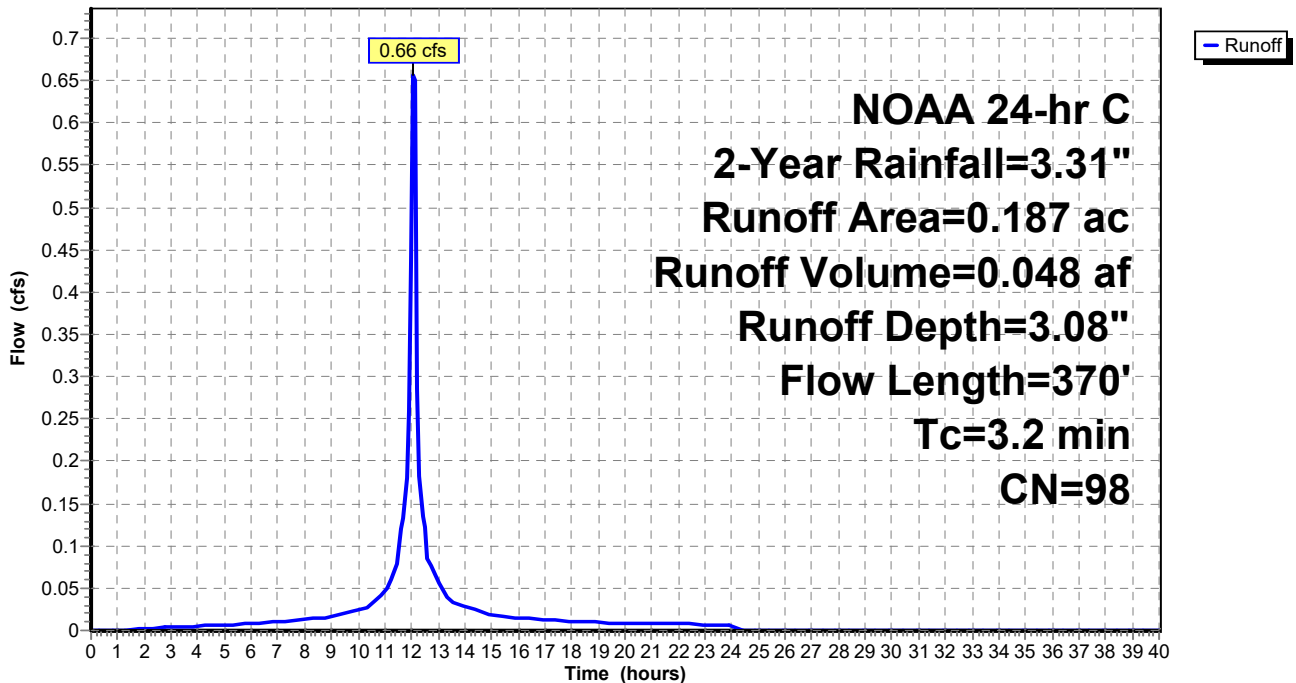
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
0.187	98	Paved parking, HSG D
0.187		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.06		Sheet Flow, F-G Smooth surfaces n= 0.011 P2= 3.31"
1.0	150	0.0150	2.49		Shallow Concentrated Flow, G-H Paved Kv= 20.3 fps
0.6	120	0.0030	3.26	5.75	Pipe Channel, H-I 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
3.2	370	Total			

Subcatchment 28S: PDA 3 - Impervious

Hydrograph



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Summary for Subcatchment 29S: PDA 1B - Pervious

Runoff = 2.27 cfs @ 12.10 hrs, Volume= 0.146 af, Depth= 1.49"

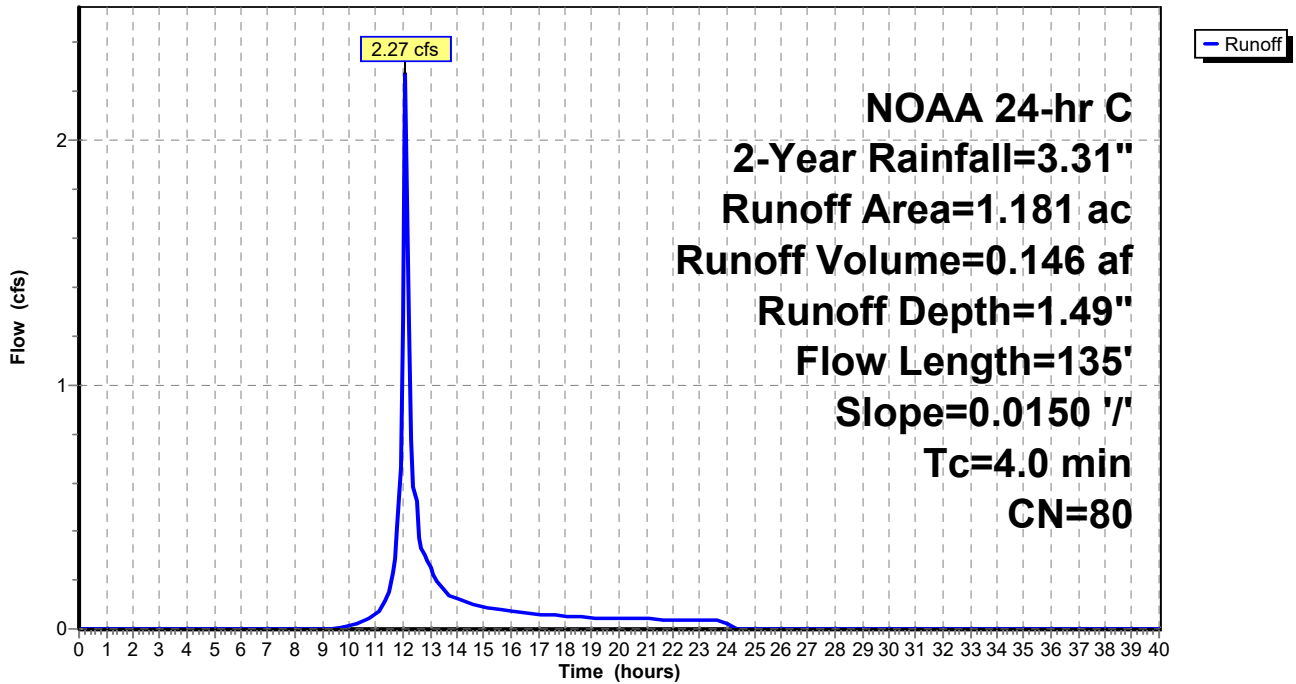
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
1.181	80	>75% Grass cover, Good, HSG D
1.181		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	18	0.0150	0.11		Sheet Flow, AD-AE Grass: Short n= 0.150 P2= 3.31"
1.1	82	0.0150	1.20		Sheet Flow, AE-AF Smooth surfaces n= 0.011 P2= 3.31"
0.2	35	0.0150	2.49		Shallow Concentrated Flow, AF-AC Paved Kv= 20.3 fps
4.0	135	Total			

Subcatchment 29S: PDA 1B - Pervious

Hydrograph



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Summary for Subcatchment 30S: PDA 1B - Impervious

Runoff = 5.21 cfs @ 12.07 hrs, Volume= 0.407 af, Depth= 3.08"

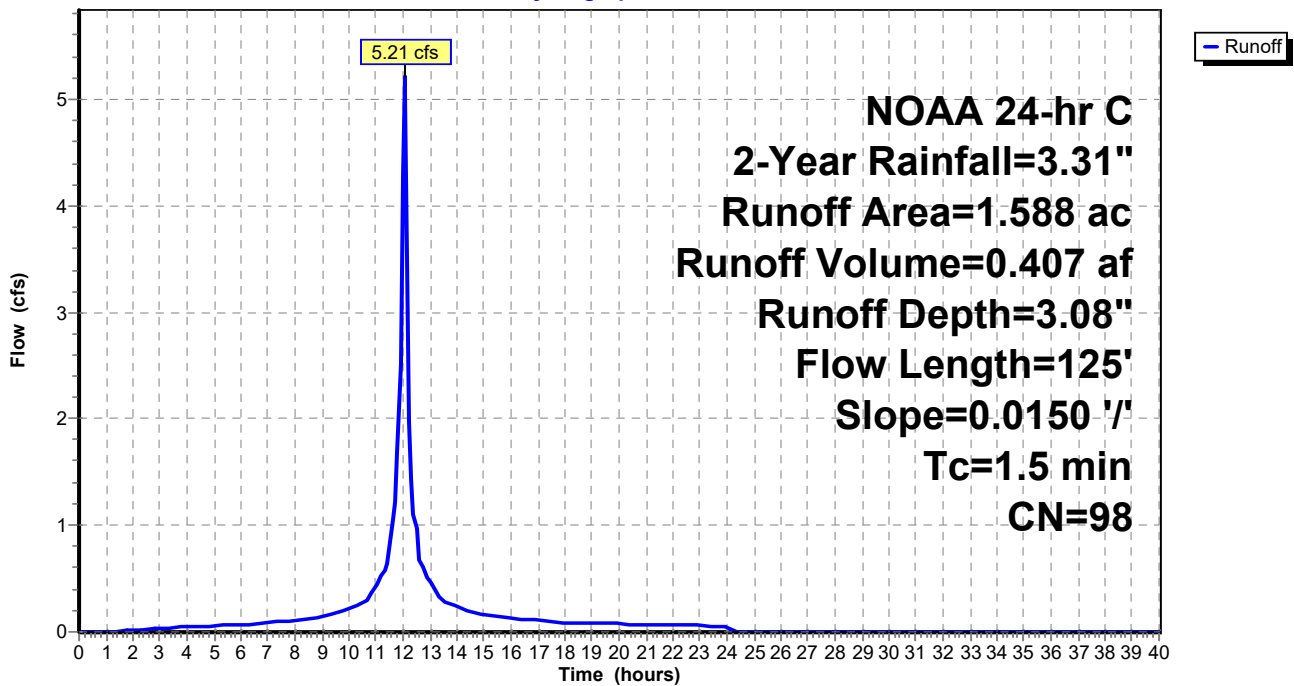
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
1.588	98	Paved parking, HSG C
1.588		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AA-AB Smooth surfaces n= 0.011 P2= 3.31"
0.2	25	0.0150	2.49		Shallow Concentrated Flow, AB-AC Paved Kv= 20.3 fps
1.5	125	Total			

Subcatchment 30S: PDA 1B - Impervious

Hydrograph



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Summary for Subcatchment 33S: PDA 1A - Pervious

Runoff = 4.20 cfs @ 12.27 hrs, Volume= 0.400 af, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
1.768	80	>75% Grass cover, Good, HSG D
1.610	77	Woods, Good, HSG D
3.378	79	Weighted Average
3.378		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		Sheet Flow, AG-AH Grass: Short n= 0.150 P2= 3.31"
1.5	90	0.0200	0.99		Shallow Concentrated Flow, AH-AI Short Grass Pasture Kv= 7.0 fps
2.7	422	0.0025	2.63	3.23	Pipe Channel, AI-AJ 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
2.6	807	0.0050	5.09	16.00	Pipe Channel, AJ-X 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.3	117	0.0050	6.67	47.16	Pipe Channel, X-Y 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
16.8	1,581	Total			

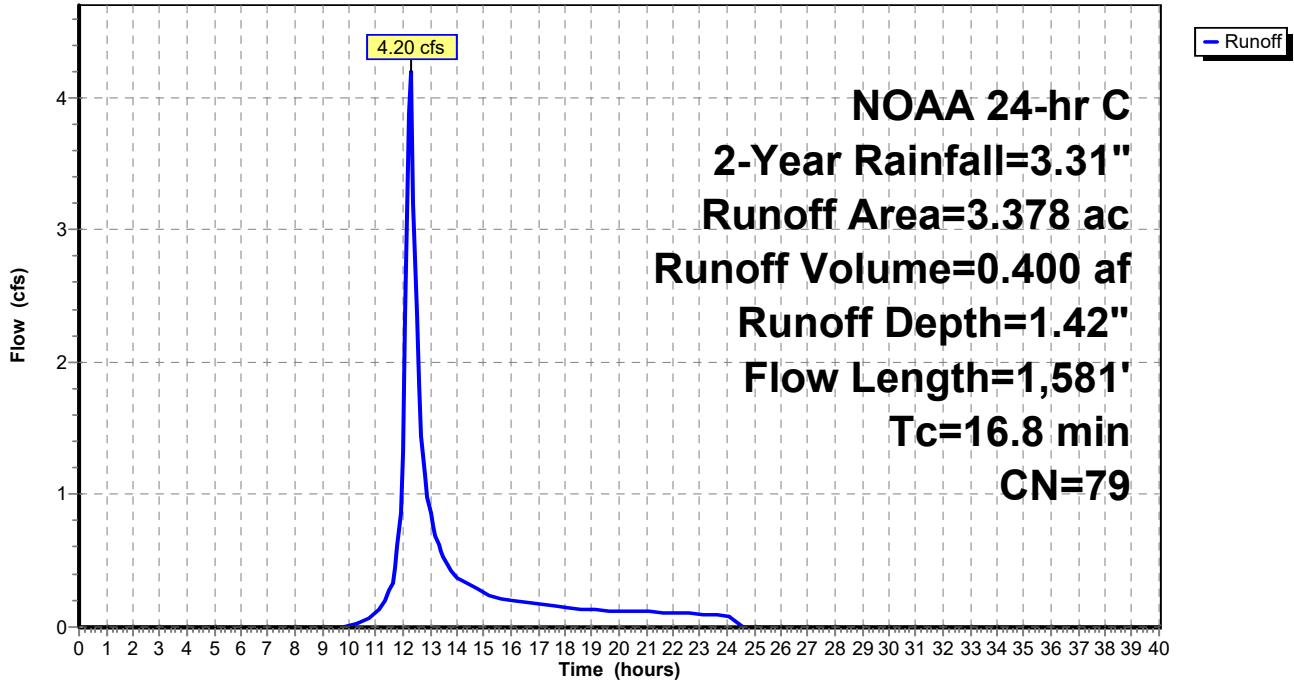
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Subcatchment 33S: PDA 1A - Pervious

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Summary for Subcatchment 40S: PDA 1A - Impervious

Runoff = 30.75 cfs @ 12.10 hrs, Volume= 2.332 af, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
9.094	98	Paved parking, HSG C
9.094		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AQ-AR Smooth surfaces n= 0.011 P2= 3.31"
0.6	90	0.0150	2.49		Shallow Concentrated Flow, AR-AS Paved Kv= 20.3 fps
0.1	181	0.3500	35.17	62.14	Pipe Channel, AS-Y (18 inch) 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
1.0	222	0.0025	3.60	11.31	Pipe Channel, AS-Y (24 inch - Section 1) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
1.0	247	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 2) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.5	134	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 3) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
4.6	1,019	Total			

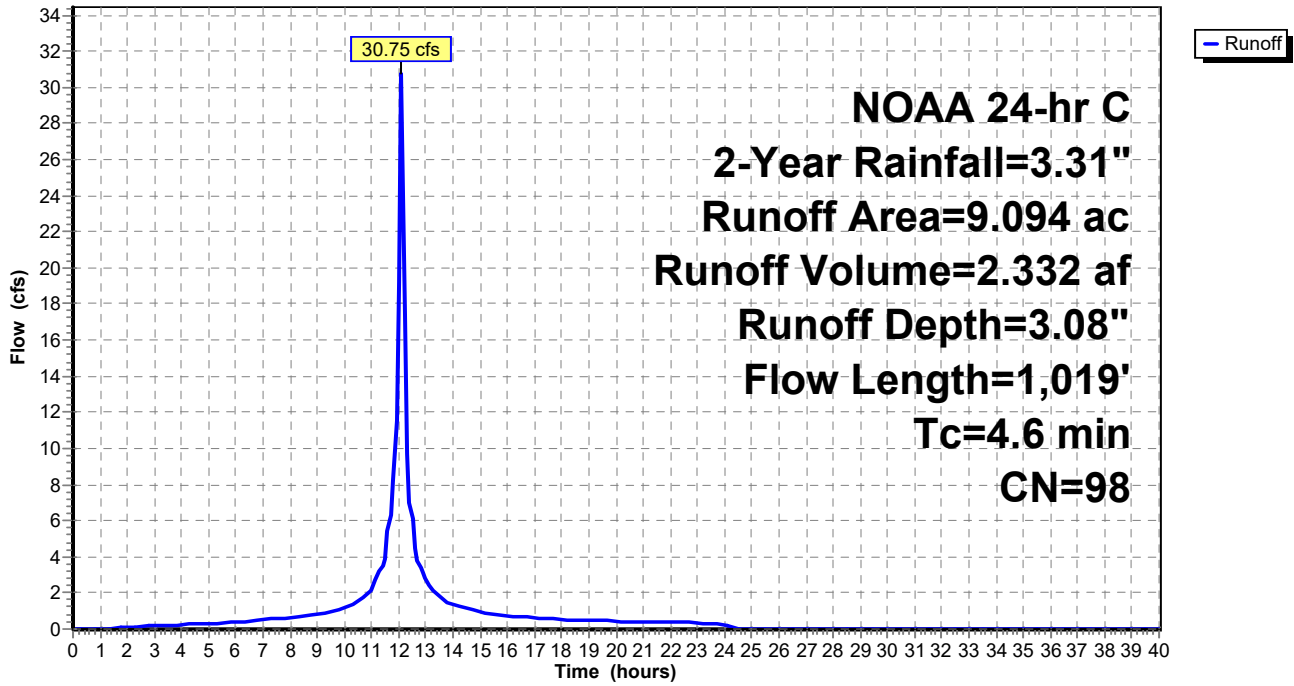
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Subcatchment 40S: PDA 1A - Impervious

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Summary for Subcatchment 46S: EDA 1 - Impervious

Runoff = 36.66 cfs @ 12.16 hrs, Volume= 3.291 af, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
12.834	98	Paved parking, HSG C
12.834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	58	0.0010	0.38		Sheet Flow, V-W Smooth surfaces n= 0.011 P2= 3.31"
1.1	42	0.0040	0.62		Sheet Flow, W-X Smooth surfaces n= 0.011 P2= 3.31"
0.8	90	0.0080	1.82		Shallow Concentrated Flow, X-Y Paved Kv= 20.3 fps
0.8	175	0.0050	3.72	4.57	Pipe Channel, Y-Z 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
3.3	1,235	0.0075	6.24	19.59	Pipe Channel, Z-AA 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
8.6	1,600	Total			

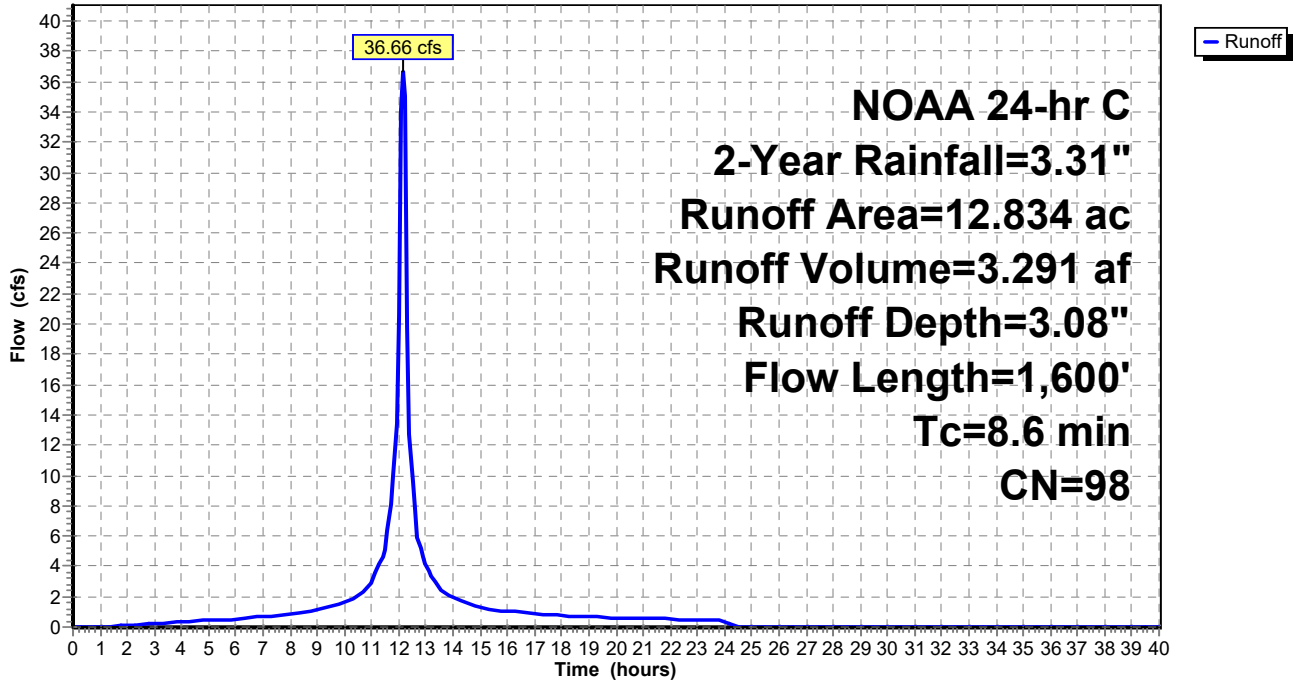
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Subcatchment 46S: EDA 1 - Impervious

Hydrograph



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Summary for Pond 45P: Bioretention Basin

Inflow Area = 2.769 ac, 57.35% Impervious, Inflow Depth = 2.40" for 2-Year event
 Inflow = 7.42 cfs @ 12.08 hrs, Volume= 0.554 af
 Outflow = 3.30 cfs @ 12.24 hrs, Volume= 0.554 af, Atten= 56%, Lag= 9.6 min
 Primary = 3.30 cfs @ 12.24 hrs, Volume= 0.554 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 Peak Elev= 48.48' @ 12.24 hrs Surf.Area= 18,162 sf Storage= 8,394 cf

Plug-Flow detention time= 199.9 min calculated for 0.552 af (100% of inflow)
 Center-of-Mass det. time= 200.2 min (976.7 - 776.4)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	18,218 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	16,690	0	0
49.00	19,745	18,218	18,218

Device	Routing	Invert	Outlet Devices
#1	Primary	43.94'	18.0" Round Culvert L= 205.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 43.94' / 43.32' S= 0.0030 ' S= 0.0030 ' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	48.00'	1.000 in/hr Exfiltration X 0.50 over Surface area
#3	Device 1	48.35'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=3.06 cfs @ 12.24 hrs HW=48.47' (Free Discharge)

- 1=Culvert (Passes 3.06 cfs of 12.18 cfs potential flow)
- 2=Exfiltration (Exfiltration Controls 0.21 cfs)
- 3=Orifice/Grate (Weir Controls 2.85 cfs @ 1.15 fps)

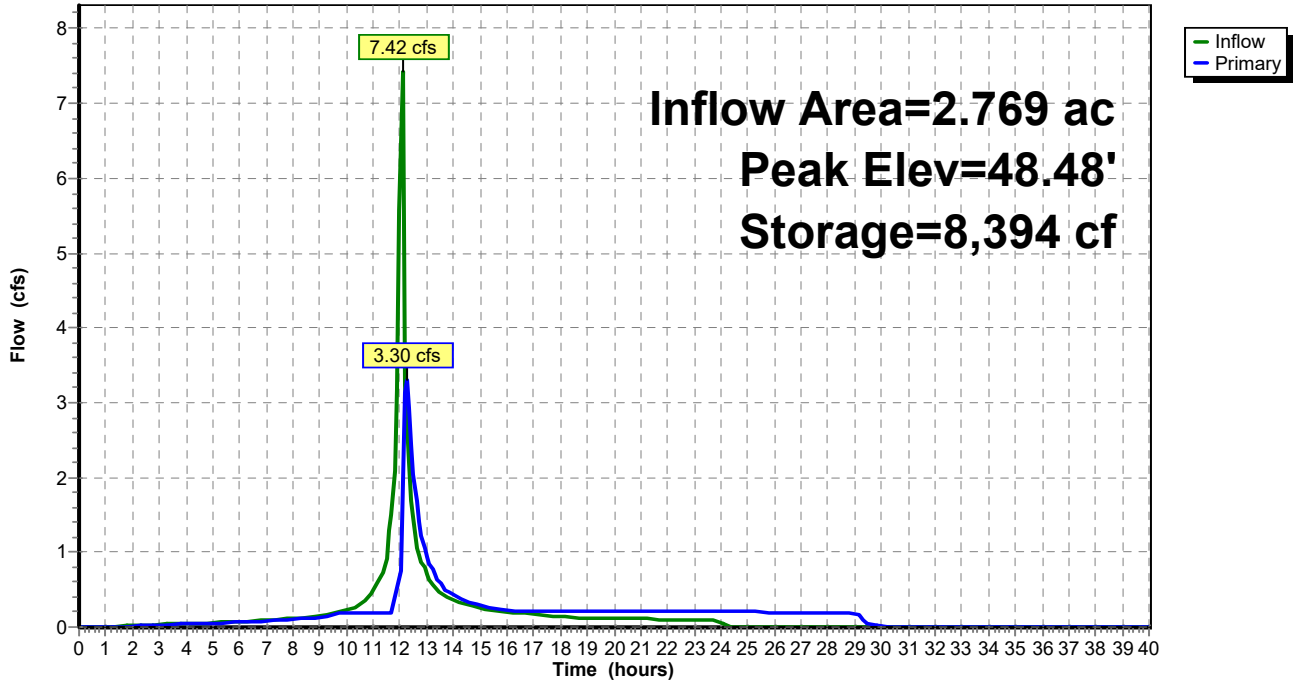
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Pond 45P: Bioretention Basin

Hydrograph



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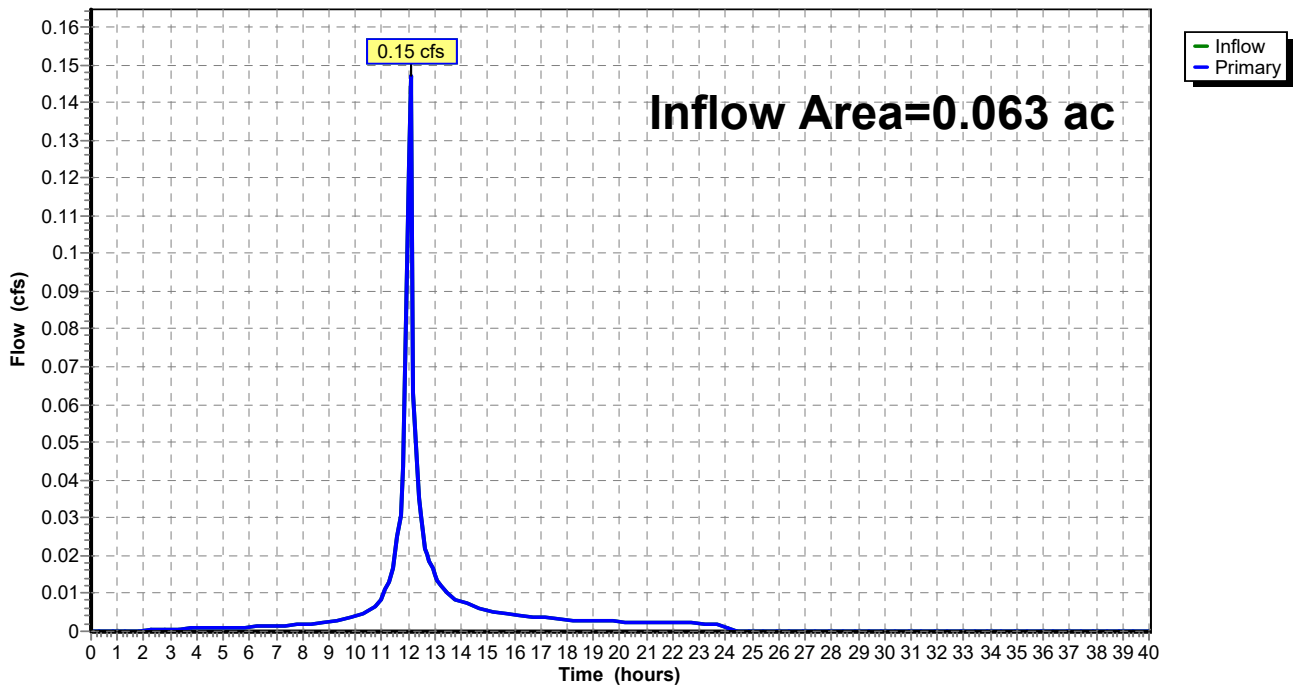
Summary for Link 4L: EDA 4

Inflow Area = 0.063 ac, 41.27% Impervious, Inflow Depth = 2.14" for 2-Year event
Inflow = 0.15 cfs @ 12.07 hrs, Volume= 0.011 af
Primary = 0.15 cfs @ 12.07 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 4L: EDA 4

Hydrograph



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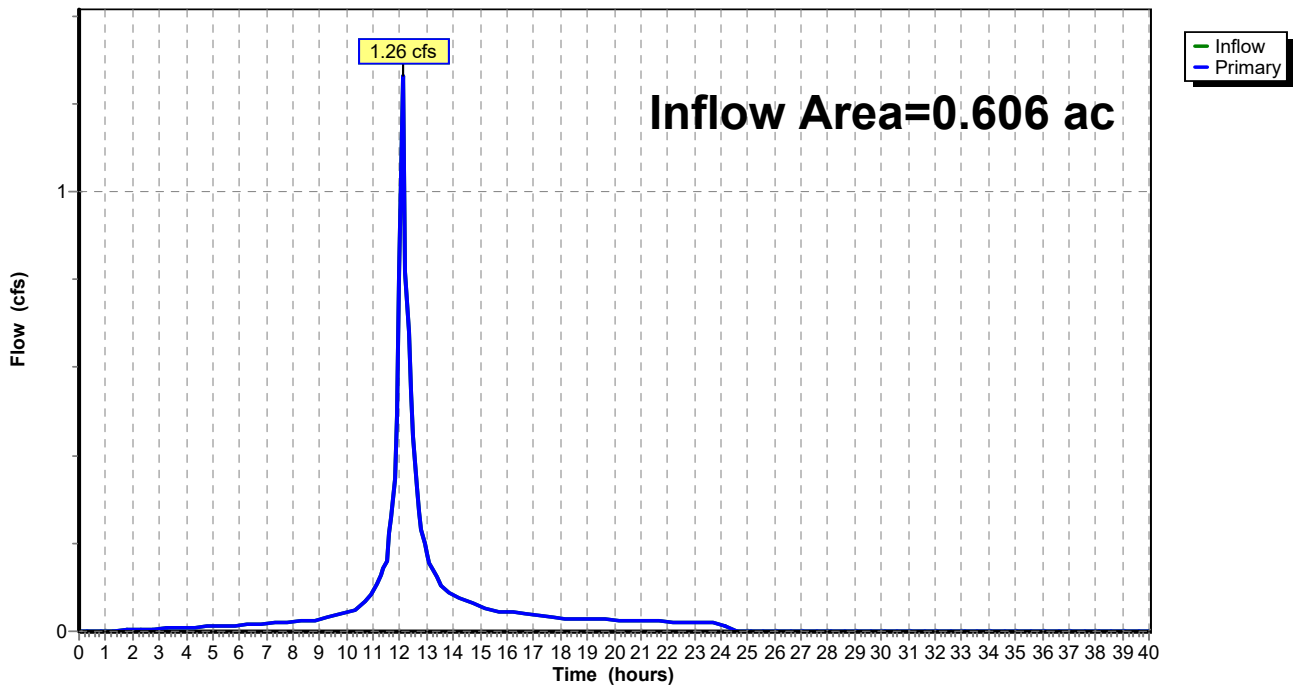
Summary for Link 7L: EDA 3

Inflow Area = 0.606 ac, 50.99% Impervious, Inflow Depth = 2.30" for 2-Year event
Inflow = 1.26 cfs @ 12.10 hrs, Volume= 0.116 af
Primary = 1.26 cfs @ 12.10 hrs, Volume= 0.116 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 7L: EDA 3

Hydrograph



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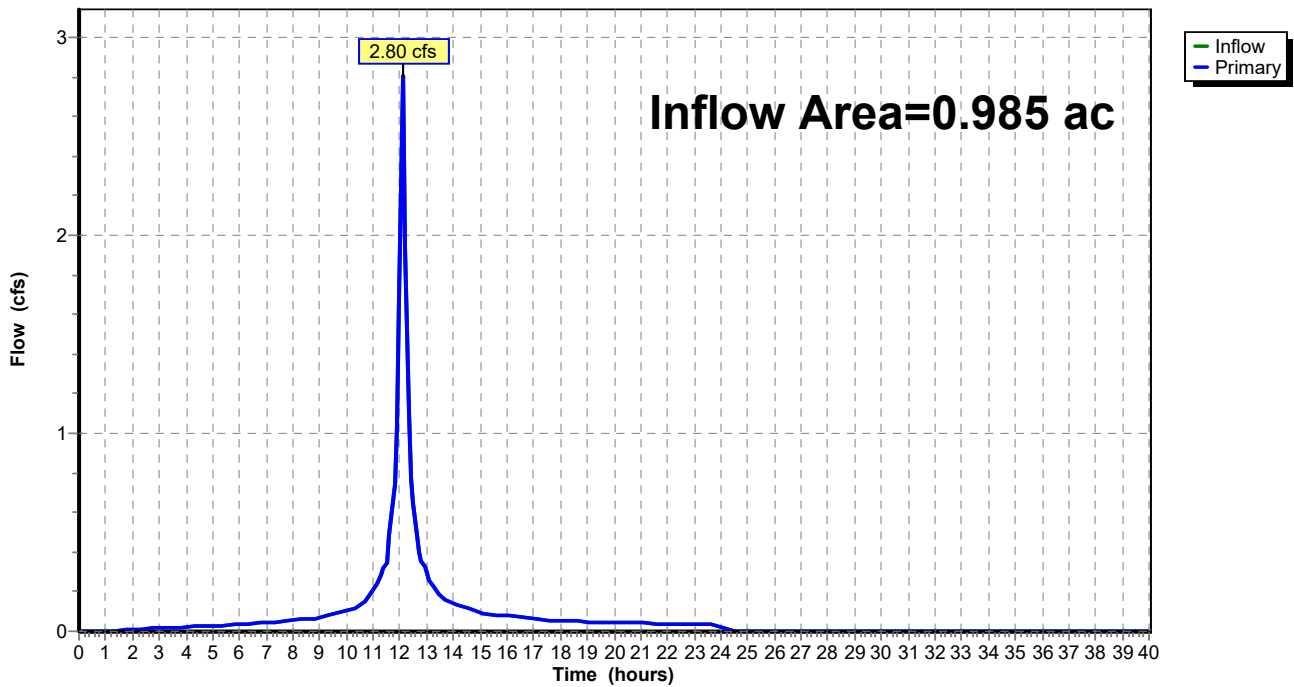
Summary for Link 10L: EDA 2

Inflow Area = 0.985 ac, 79.70% Impervious, Inflow Depth = 2.75" for 2-Year event
Inflow = 2.80 cfs @ 12.11 hrs, Volume= 0.226 af
Primary = 2.80 cfs @ 12.11 hrs, Volume= 0.226 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 10L: EDA 2

Hydrograph



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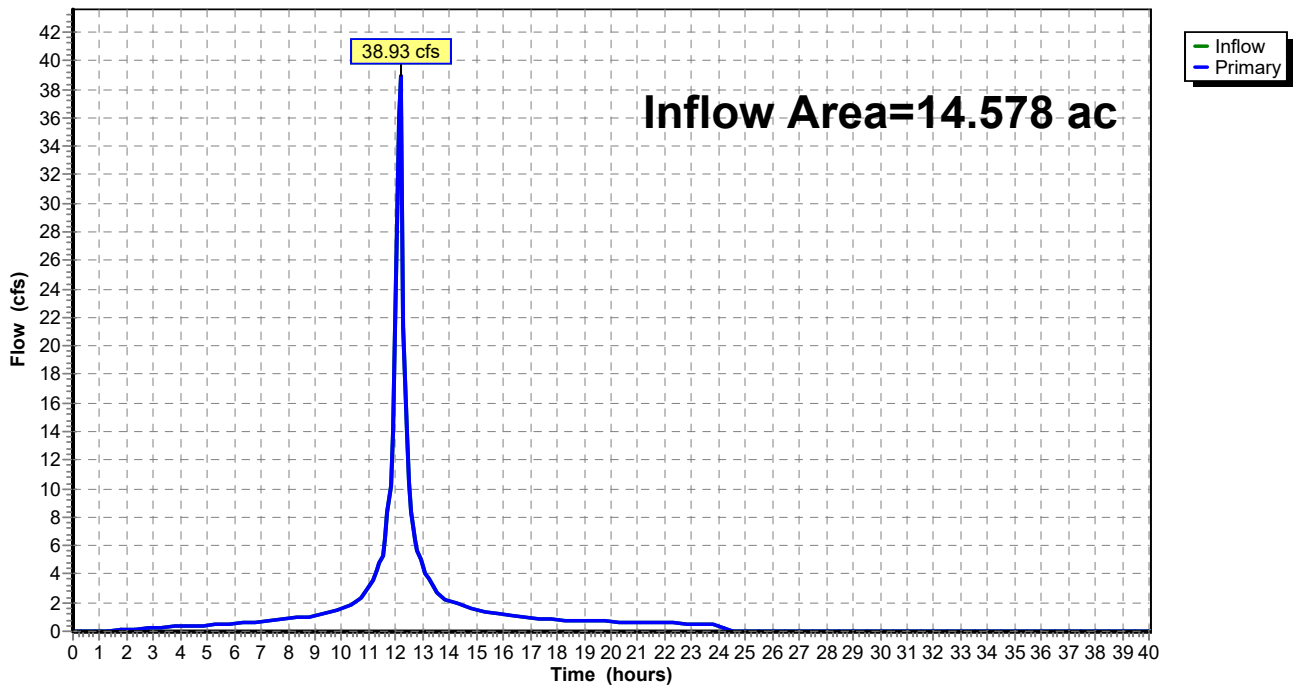
Summary for Link 13L: EDA 1

Inflow Area = 14.578 ac, 88.04% Impervious, Inflow Depth = 2.86" for 2-Year event
Inflow = 38.93 cfs @ 12.16 hrs, Volume= 3.479 af
Primary = 38.93 cfs @ 12.16 hrs, Volume= 3.479 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 13L: EDA 1

Hydrograph



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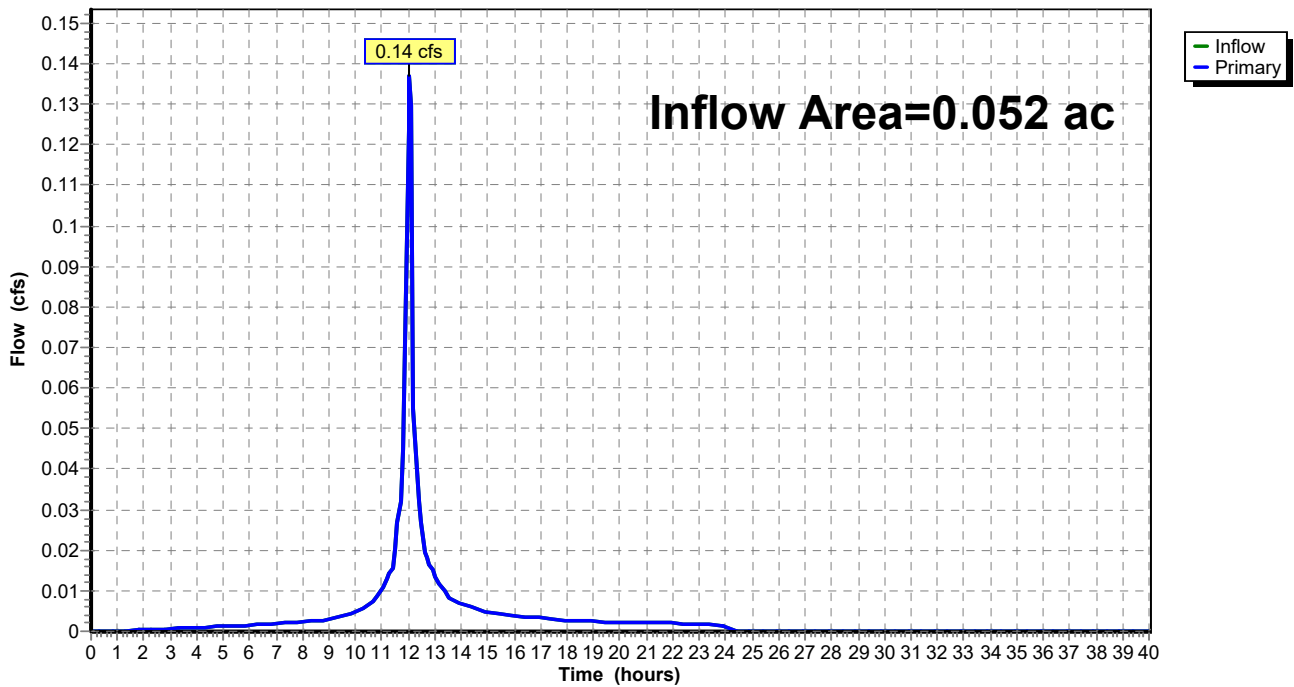
Summary for Link 24L: PDA 4

Inflow Area = 0.052 ac, 65.38% Impervious, Inflow Depth = 2.53" for 2-Year event
Inflow = 0.14 cfs @ 12.06 hrs, Volume= 0.011 af
Primary = 0.14 cfs @ 12.06 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 24L: PDA 4

Hydrograph



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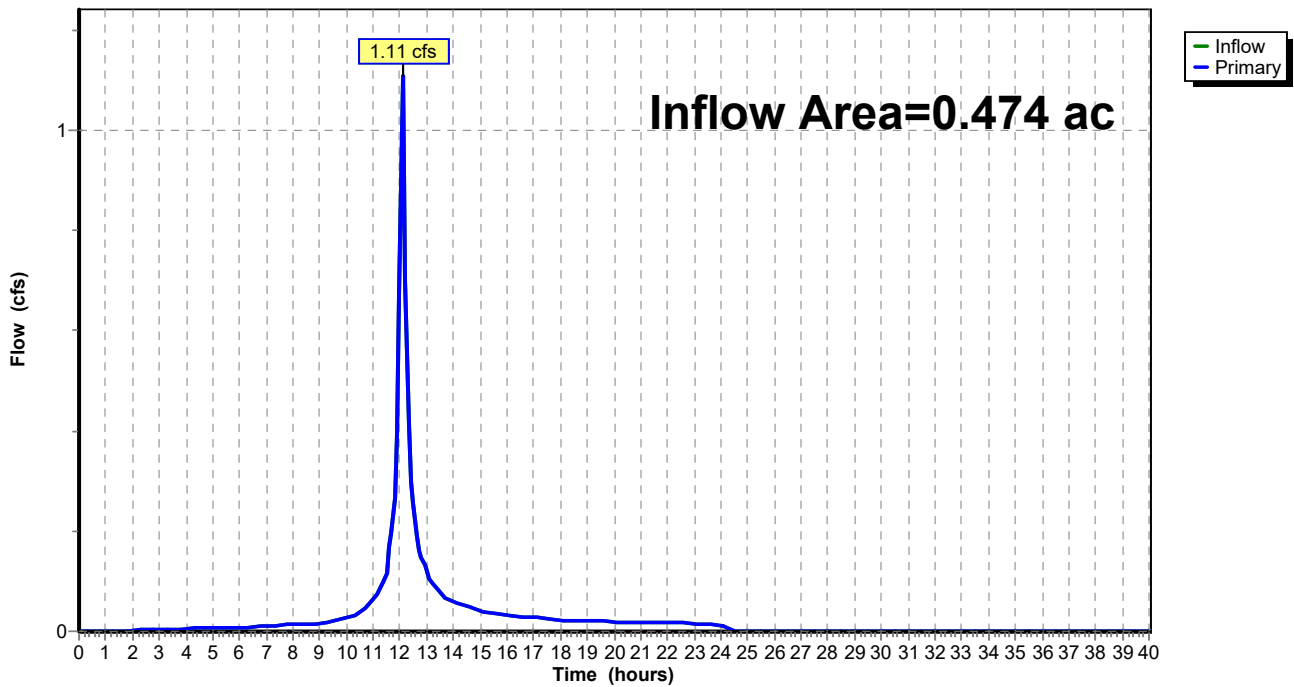
Summary for Link 25L: PDA 3

Inflow Area = 0.474 ac, 39.45% Impervious, Inflow Depth = 2.11" for 2-Year event
Inflow = 1.11 cfs @ 12.10 hrs, Volume= 0.084 af
Primary = 1.11 cfs @ 12.10 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 25L: PDA 3

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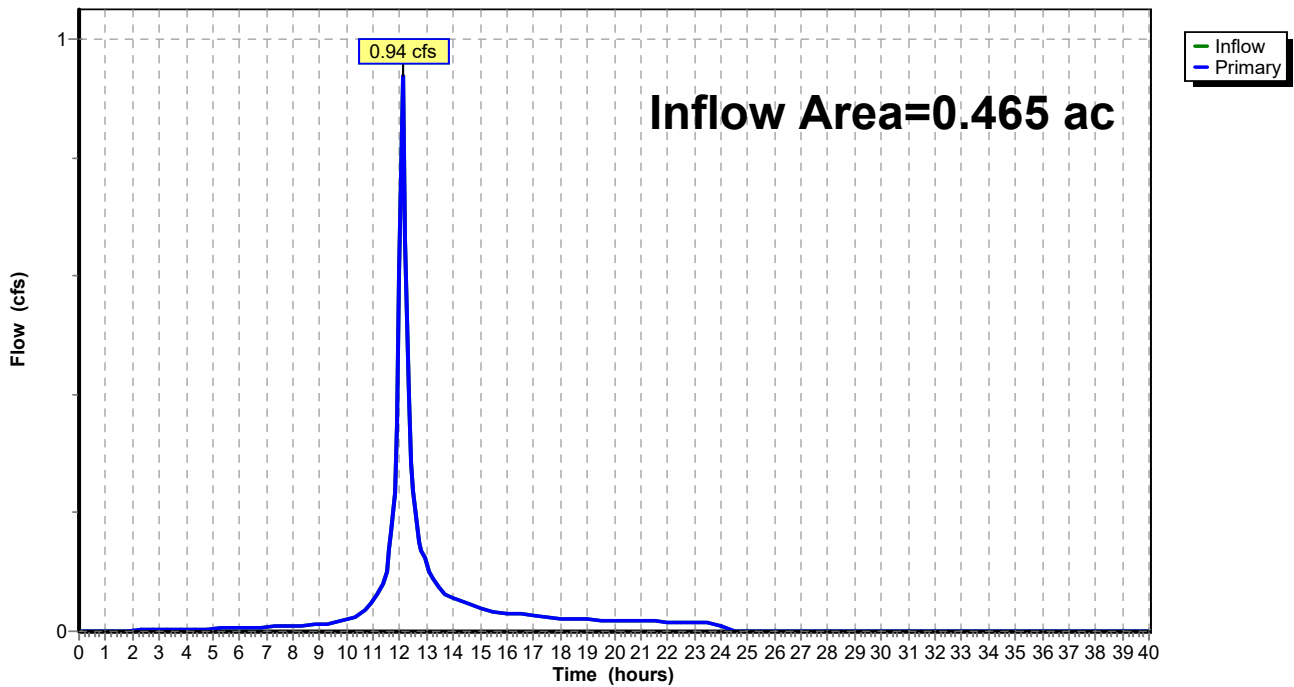
Summary for Link 26L: PDA 2

Inflow Area = 0.465 ac, 27.53% Impervious, Inflow Depth = 1.92" for 2-Year event
Inflow = 0.94 cfs @ 12.10 hrs, Volume= 0.075 af
Primary = 0.94 cfs @ 12.10 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 26L: PDA 2

Hydrograph



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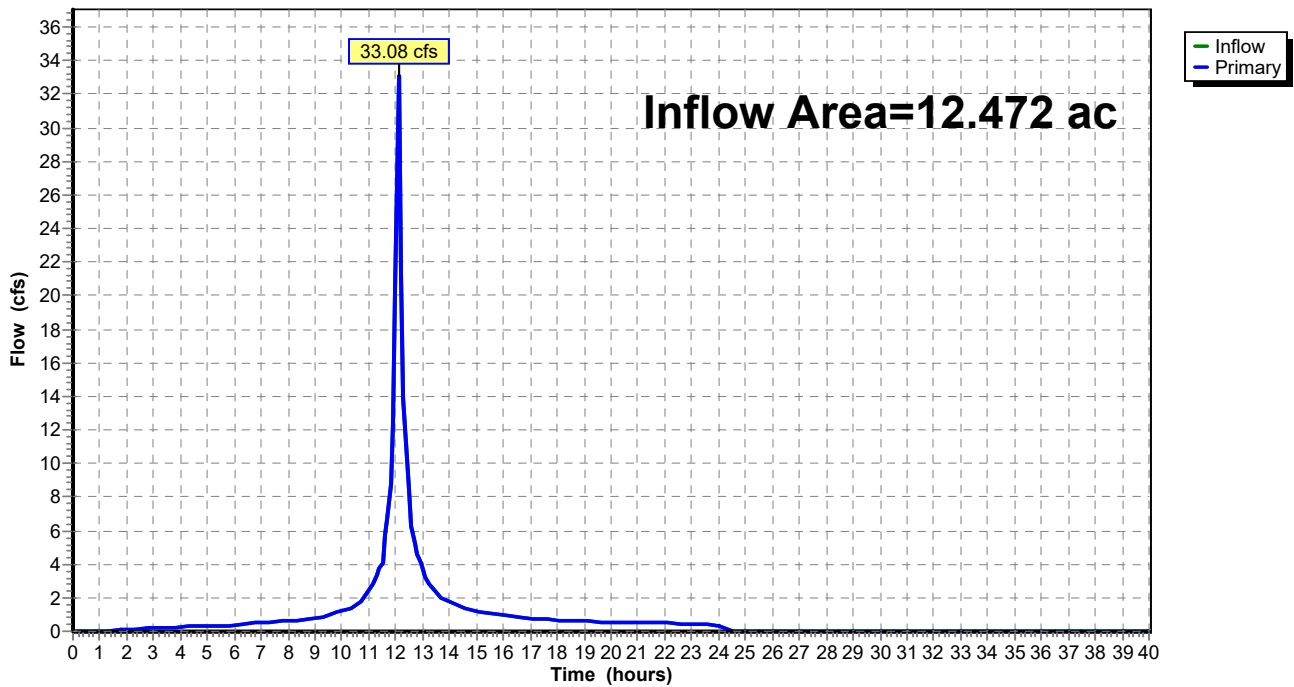
Summary for Link 35L: PDA 1A

Inflow Area = 12.472 ac, 72.92% Impervious, Inflow Depth = 2.63" for 2-Year event
Inflow = 33.08 cfs @ 12.10 hrs, Volume= 2.732 af
Primary = 33.08 cfs @ 12.10 hrs, Volume= 2.732 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 35L: PDA 1A

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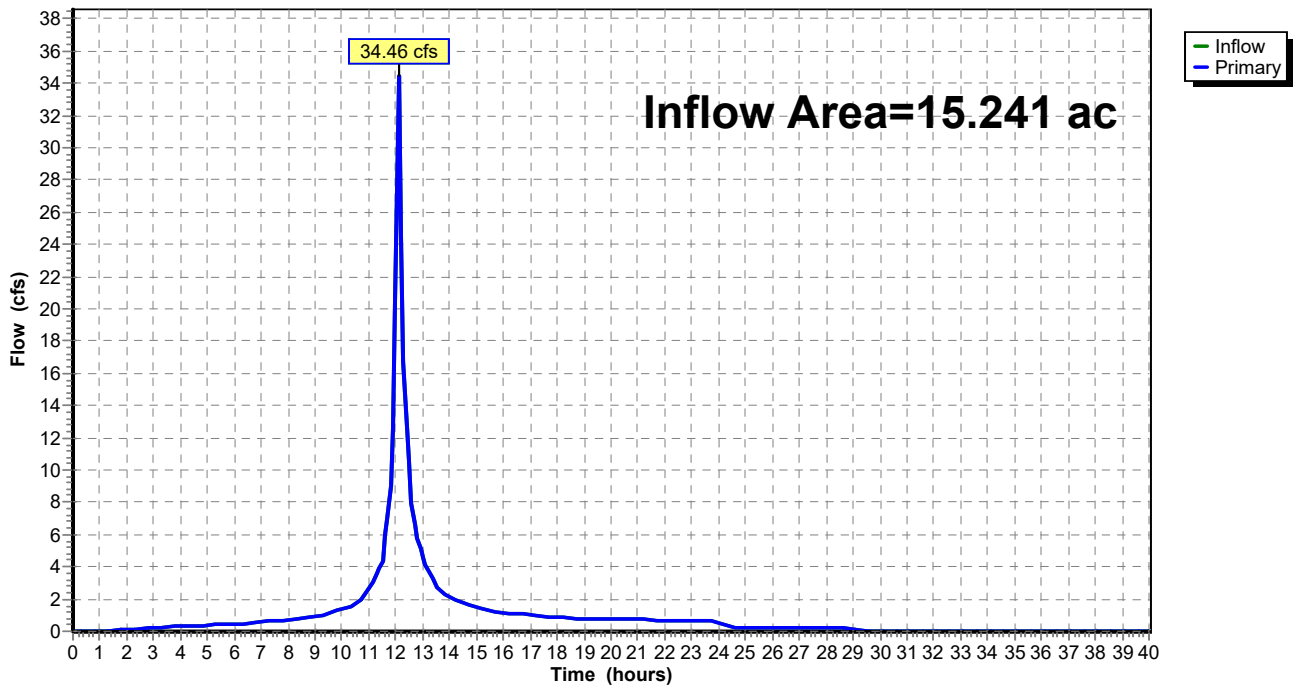
Summary for Link 44L: PDA 1

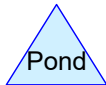
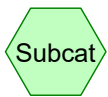
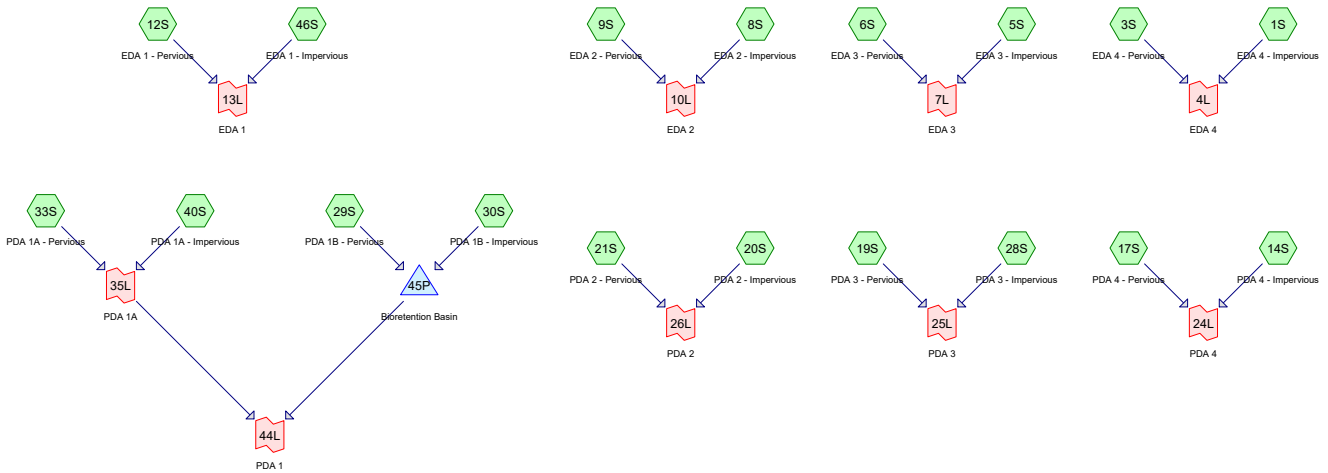
Inflow Area = 15.241 ac, 70.09% Impervious, Inflow Depth = 2.59" for 2-Year event
Inflow = 34.46 cfs @ 12.11 hrs, Volume= 3.285 af
Primary = 34.46 cfs @ 12.11 hrs, Volume= 3.285 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 44L: PDA 1

Hydrograph





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Summary for Subcatchment 1S: EDA 4 - Impervious

Runoff = 0.12 cfs @ 12.03 hrs, Volume= 0.010 af, Depth= 4.77"

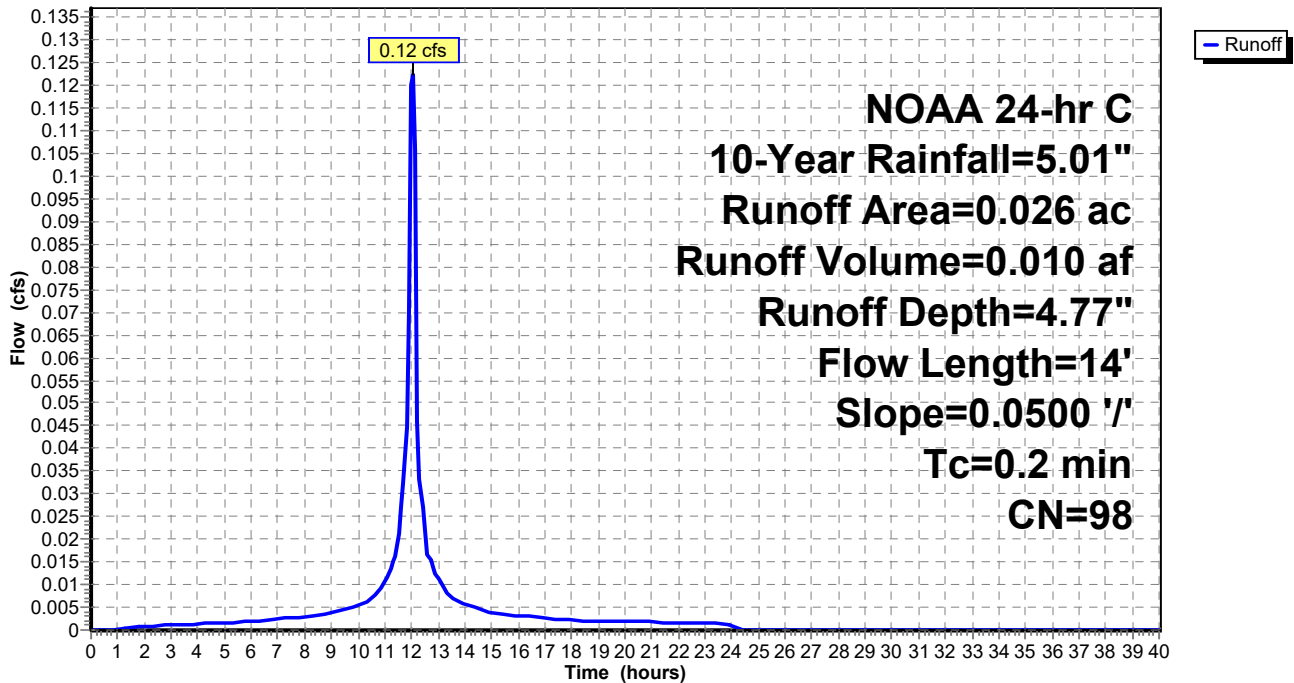
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
0.026	98	Paved parking, HSG D
0.026		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0500	1.36		Sheet Flow, D-E Smooth surfaces n= 0.011 P2= 3.31"

Subcatchment 1S: EDA 4 - Impervious

Hydrograph



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Summary for Subcatchment 3S: EDA 4 - Pervious

Runoff = 0.14 cfs @ 12.09 hrs, Volume= 0.009 af, Depth= 2.90"

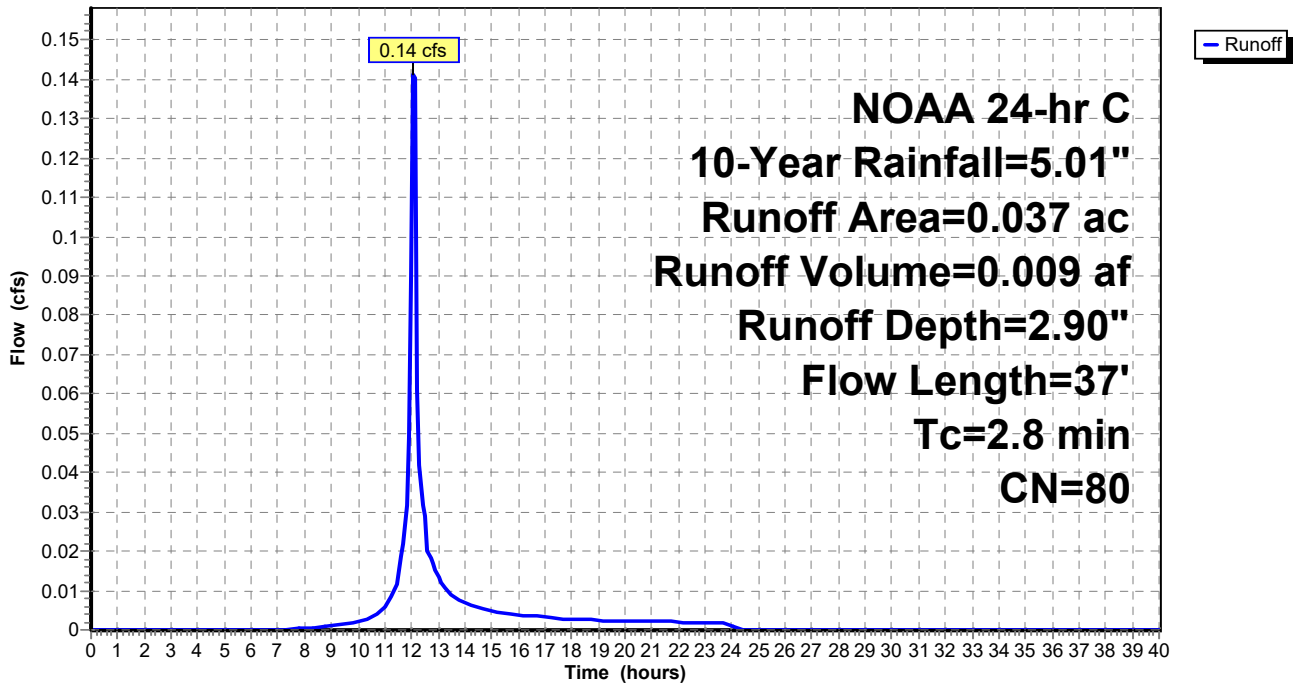
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
0.037	80	>75% Grass cover, Good, HSG D
0.037		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.31"
0.1	12	0.0650	1.47		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.31"
2.8	37	Total			

Subcatchment 3S: EDA 4 - Pervious

Hydrograph



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Summary for Subcatchment 5S: EDA 3 - Impervious

Runoff = 1.65 cfs @ 12.09 hrs, Volume= 0.123 af, Depth= 4.77"

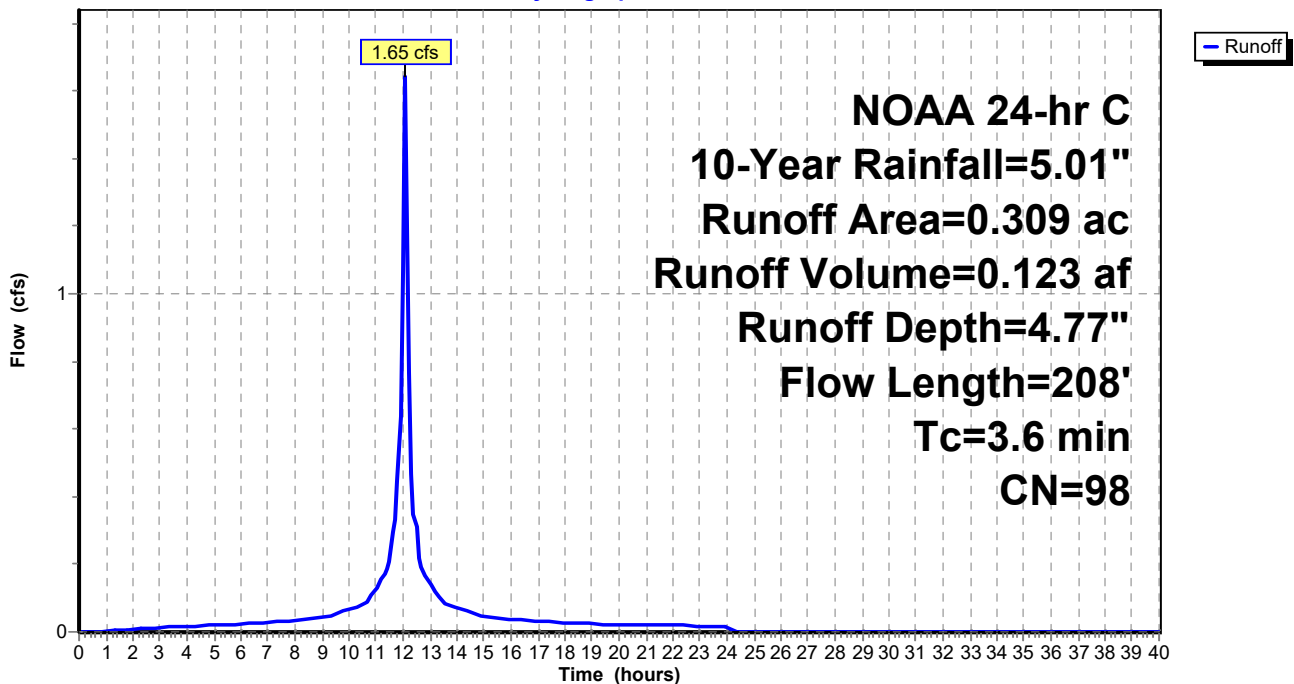
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
0.309	98	Paved parking, HSG D
0.309		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	100	0.0040	0.73		Sheet Flow, F-G Smooth surfaces n= 0.011 P2= 3.31"
1.3	108	0.0050	1.44		Shallow Concentrated Flow, G-H Paved Kv= 20.3 fps
3.6	208	Total			

Subcatchment 5S: EDA 3 - Impervious

Hydrograph



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Summary for Subcatchment 6S: EDA 3 - Pervious

Runoff = 0.73 cfs @ 12.29 hrs, Volume= 0.072 af, Depth= 2.90"

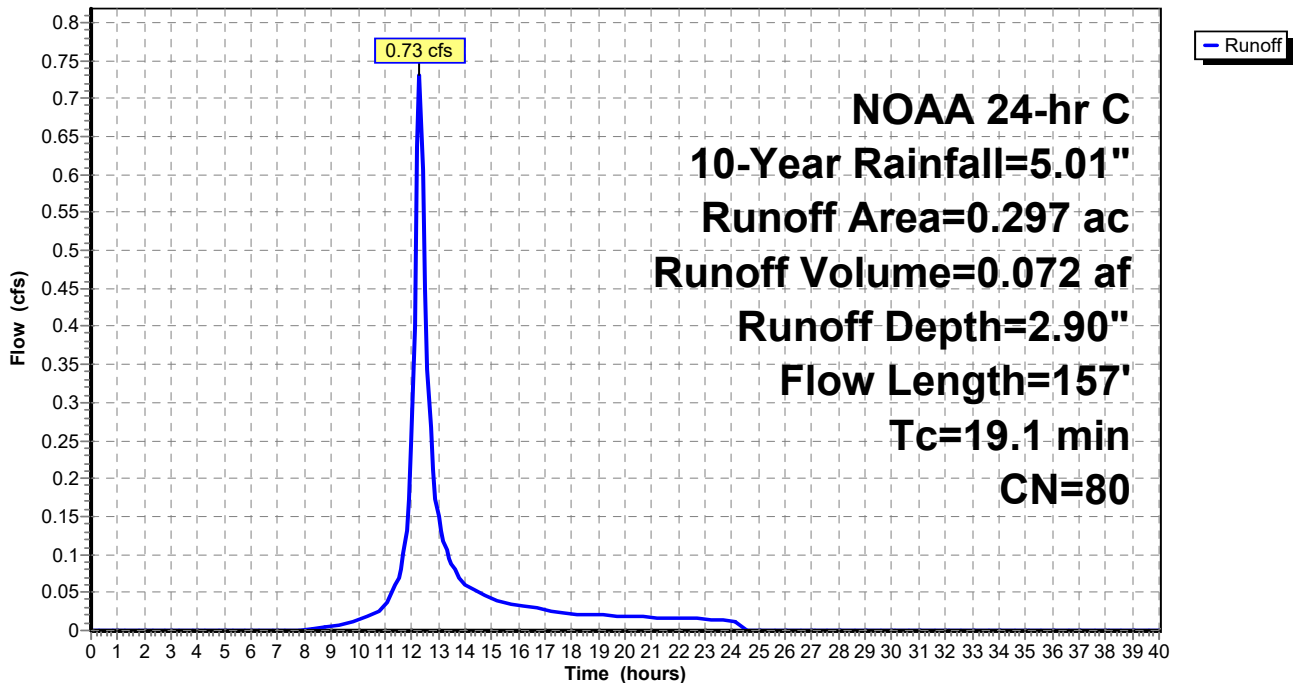
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
0.297	80	>75% Grass cover, Good, HSG D
0.297		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	72	0.0100	0.12		Sheet Flow, I-J Grass: Short n= 0.150 P2= 3.31"
8.4	42	0.0050	0.08		Sheet Flow, J-K Grass: Short n= 0.150 P2= 3.31"
0.9	28	0.0050	0.49		Shallow Concentrated Flow, K-L Short Grass Pasture Kv= 7.0 fps
0.0	15	0.0100	5.94	10.50	Pipe Channel, K-H 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
19.1	157	Total			

Subcatchment 6S: EDA 3 - Pervious

Hydrograph



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Summary for Subcatchment 8S: EDA 2 - Impervious

Runoff = 3.93 cfs @ 12.10 hrs, Volume= 0.312 af, Depth= 4.77"

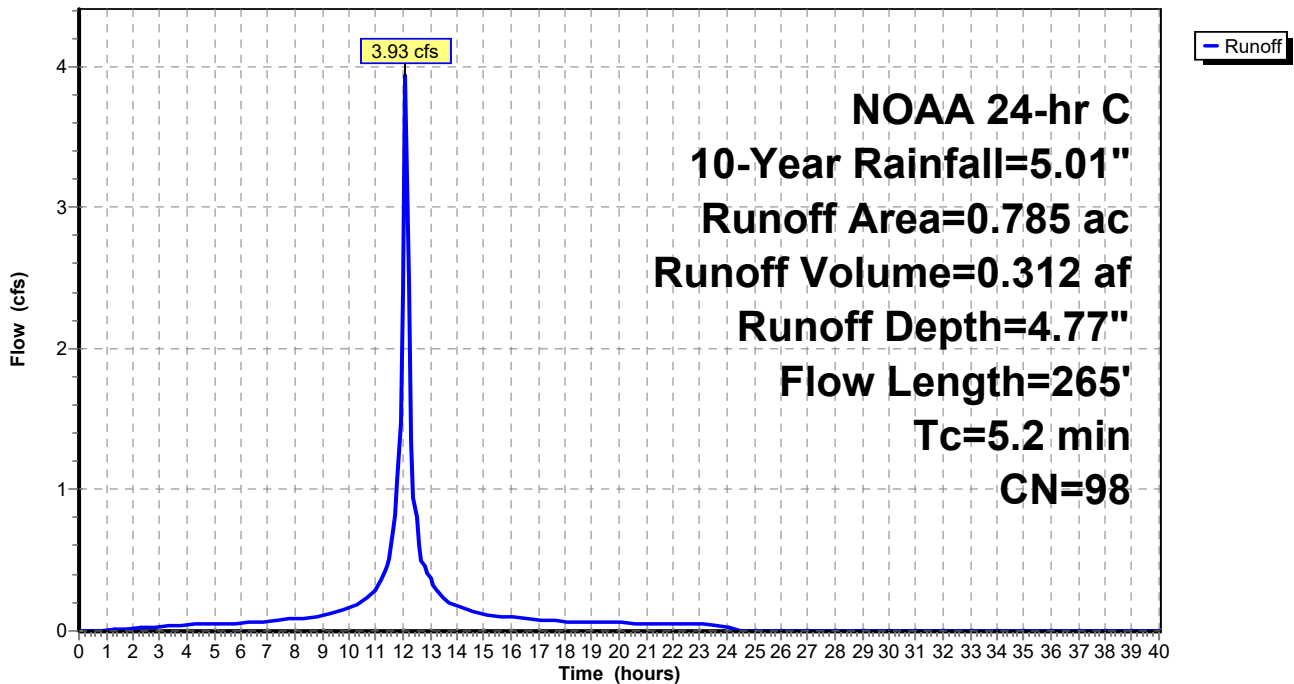
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
0.785	98	Paved parking, HSG D
0.785		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	30	0.0040	0.58		Sheet Flow, P-Q Smooth surfaces n= 0.011 P2= 3.31"
1.5	80	0.0170	0.91		Shallow Concentrated Flow, Q-M Short Grass Pasture Kv= 7.0 fps
2.8	155	0.0020	0.91		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
5.2	265	Total			

Subcatchment 8S: EDA 2 - Impervious

Hydrograph



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Summary for Subcatchment 9S: EDA 2 - Pervious

Runoff = 0.60 cfs @ 12.20 hrs, Volume= 0.048 af, Depth= 2.90"

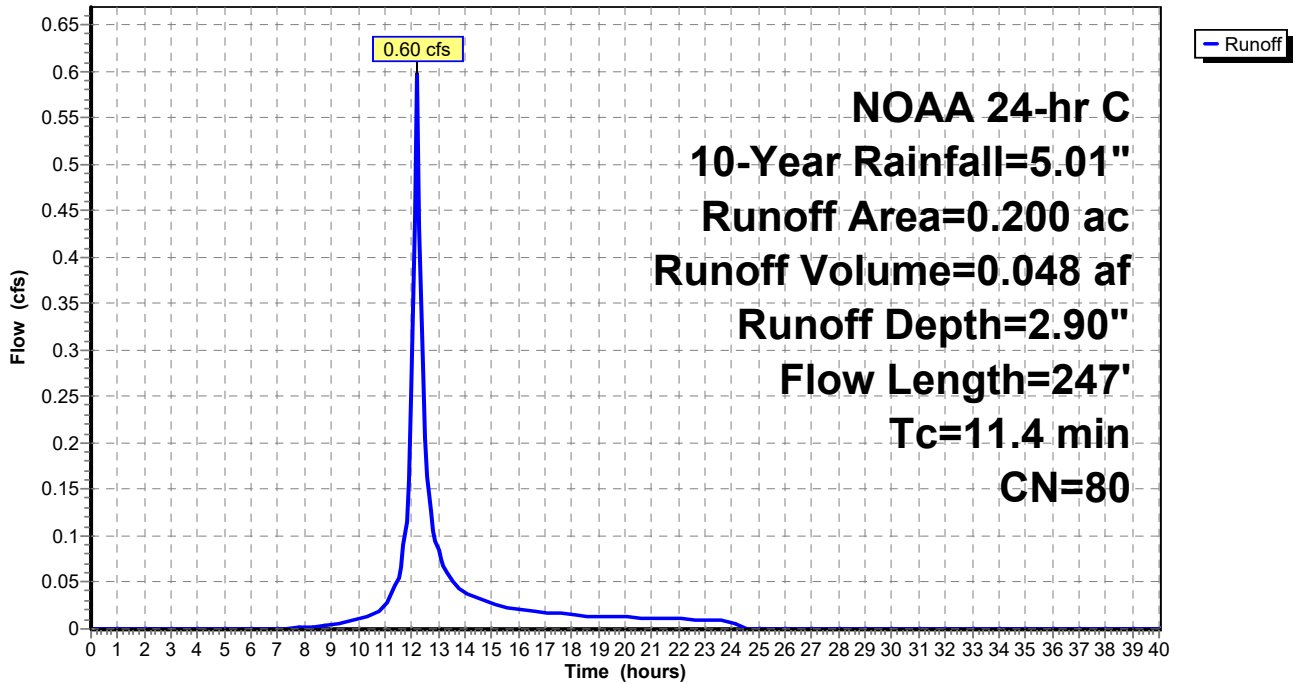
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
0.200	80	>75% Grass cover, Good, HSG D
0.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	78	0.0170	0.15		Sheet Flow, L-M Grass: Short n= 0.150 P2= 3.31"
0.2	14	0.0540	1.40		Sheet Flow, M-N Smooth surfaces n= 0.011 P2= 3.31"
2.8	155	0.0020	0.91		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
11.4	247	Total			

Subcatchment 9S: EDA 2 - Pervious

Hydrograph



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Summary for Subcatchment 12S: EDA 1 - Pervious

Runoff = 4.85 cfs @ 12.19 hrs, Volume= 0.382 af, Depth= 2.63"

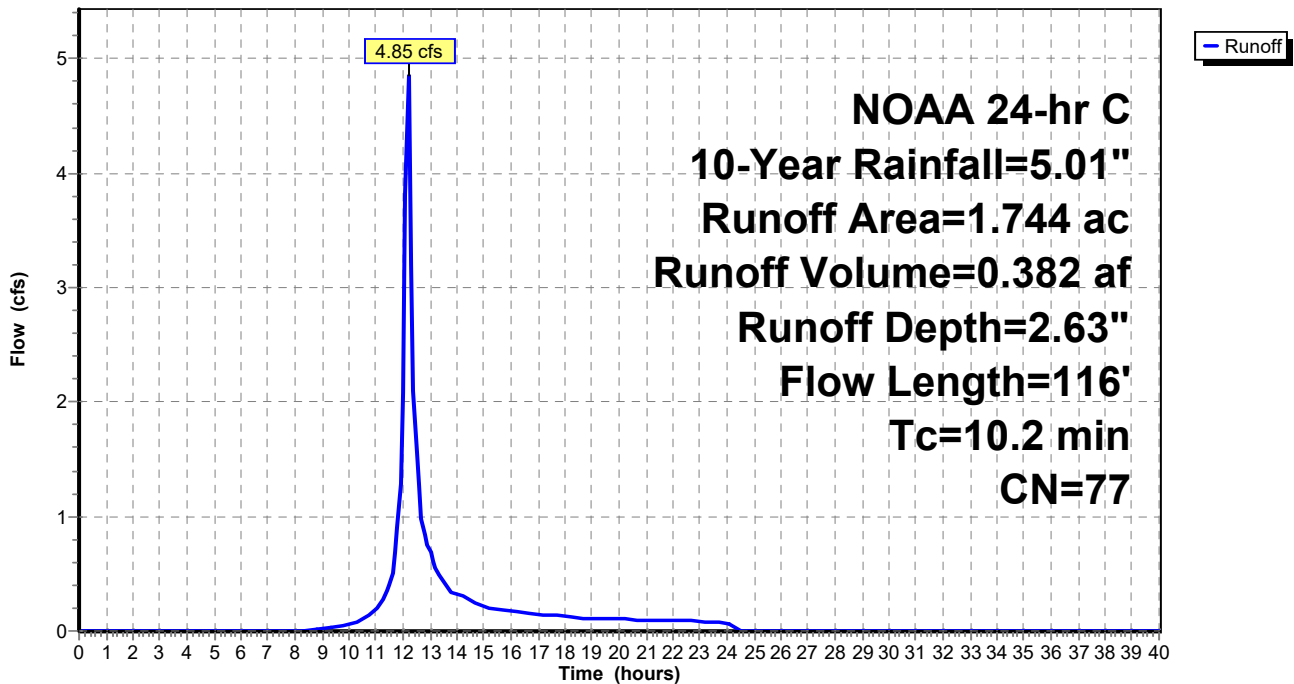
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
1.610	77	Woods, Good, HSG D
0.134	80	>75% Grass cover, Good, HSG D
1.744	77	Weighted Average
1.744		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	41	0.0250	0.07		Sheet Flow, R-S Woods: Light underbrush n= 0.400 P2= 3.31"
0.6	60	0.1170	1.71		Shallow Concentrated Flow, S-T Woodland Kv= 5.0 fps
0.1	15	0.2670	2.58		Shallow Concentrated Flow, T-U Woodland Kv= 5.0 fps
10.2	116	Total			

Subcatchment 12S: EDA 1 - Pervious

Hydrograph



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Summary for Subcatchment 14S: PDA 4 - Impervious

Runoff = 0.16 cfs @ 12.04 hrs, Volume= 0.014 af, Depth= 4.77"

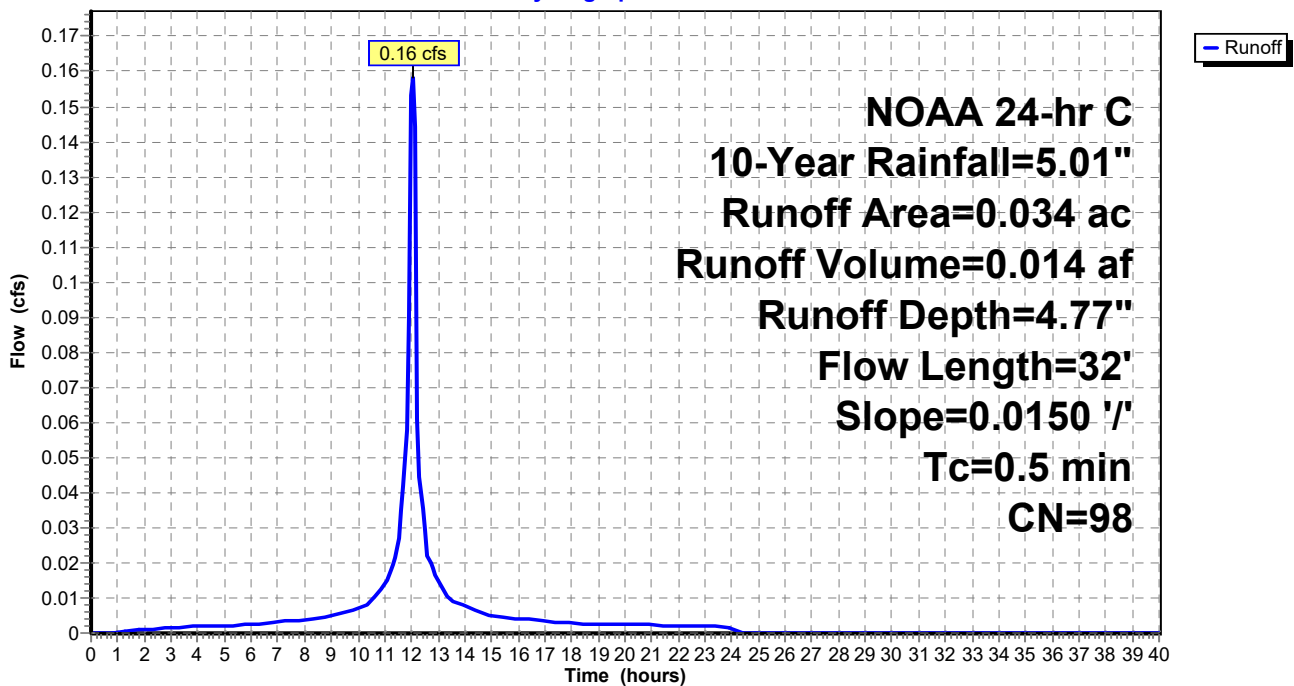
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
0.034	98	Paved parking, HSG D
0.034		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	32	0.0150	0.99		Sheet Flow, D-E Smooth surfaces n= 0.011 P2= 3.31"

Subcatchment 14S: PDA 4 - Impervious

Hydrograph



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Summary for Subcatchment 17S: PDA 4 - Pervious

Runoff = 0.07 cfs @ 12.08 hrs, Volume= 0.004 af, Depth= 2.90"

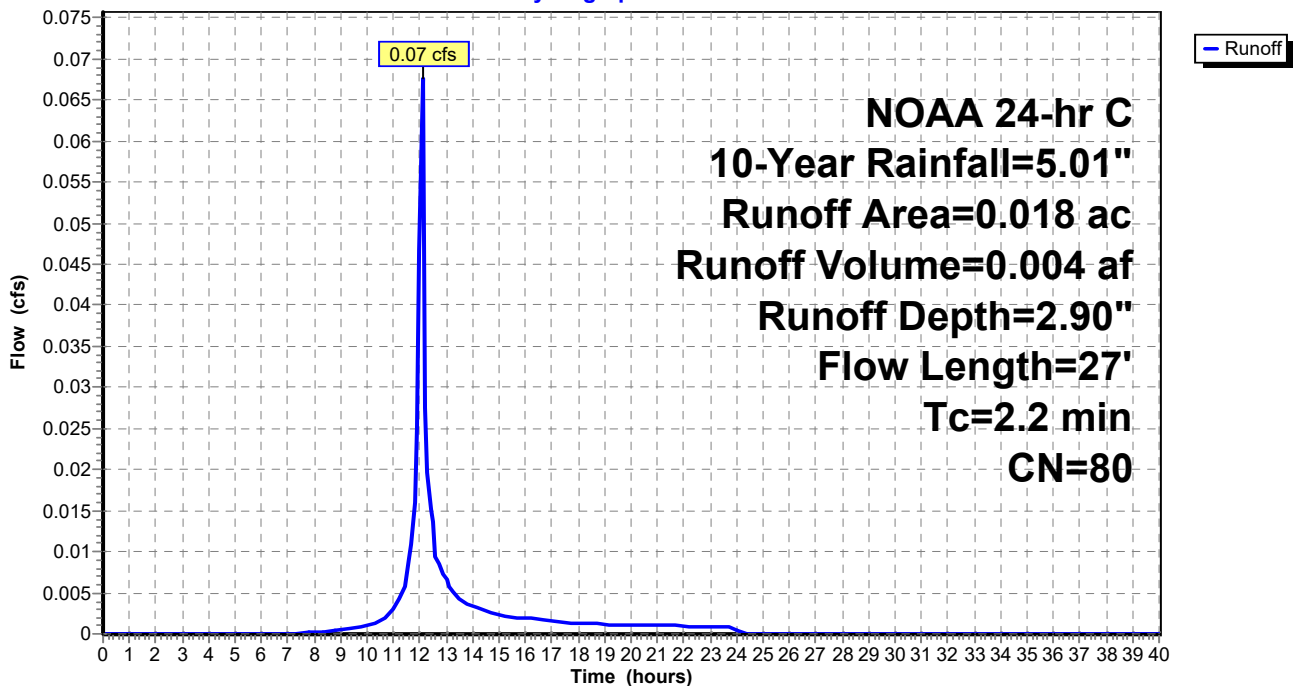
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
0.018	80	>75% Grass cover, Good, HSG D
0.018		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	15	0.0200	0.12		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.31"
0.1	12	0.0625	1.44		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.31"
2.2	27	Total			

Subcatchment 17S: PDA 4 - Pervious

Hydrograph



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Summary for Subcatchment 19S: PDA 3 - Pervious

Runoff = 0.92 cfs @ 12.13 hrs, Volume= 0.069 af, Depth= 2.90"

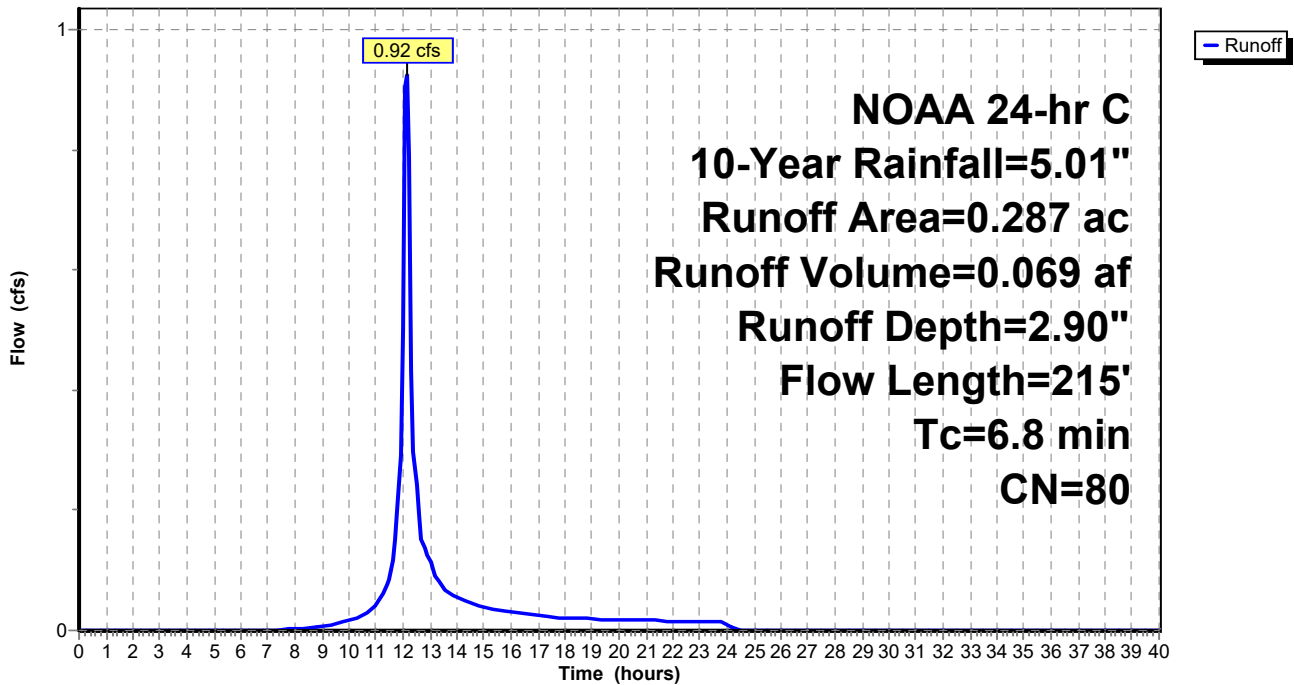
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
0.287	80	>75% Grass cover, Good, HSG D
0.287		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	45	0.0150	0.13		Sheet Flow, J-K Grass: Short n= 0.150 P2= 3.31"
0.6	75	0.0100	2.03		Shallow Concentrated Flow, K-L Paved Kv= 20.3 fps
0.5	95	0.0030	3.26	5.75	Pipe Channel, L-I 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
6.8	215	Total			

Subcatchment 19S: PDA 3 - Pervious

Hydrograph



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Summary for Subcatchment 20S: PDA 2 - Impervious

Runoff = 0.65 cfs @ 12.07 hrs, Volume= 0.051 af, Depth= 4.77"

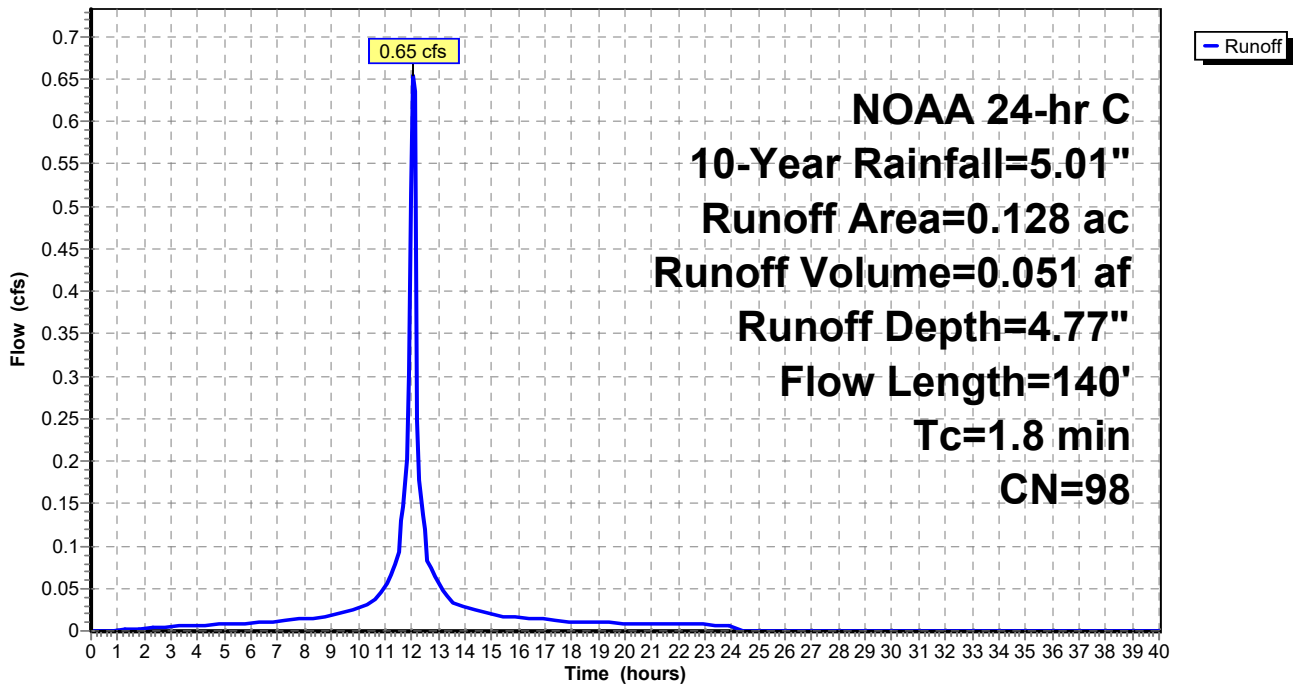
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
0.128	98	Paved parking, HSG D
0.128		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.0150	1.04		Sheet Flow, M-N Smooth surfaces n= 0.011 P2= 3.31"
0.3	50	0.0150	2.49		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
0.9	50	0.0020	0.91		Shallow Concentrated Flow, O-P Paved Kv= 20.3 fps
1.8	140	Total			

Subcatchment 20S: PDA 2 - Impervious

Hydrograph



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Summary for Subcatchment 21S: PDA 2 - Pervious

Runoff = 1.06 cfs @ 12.14 hrs, Volume= 0.081 af, Depth= 2.90"

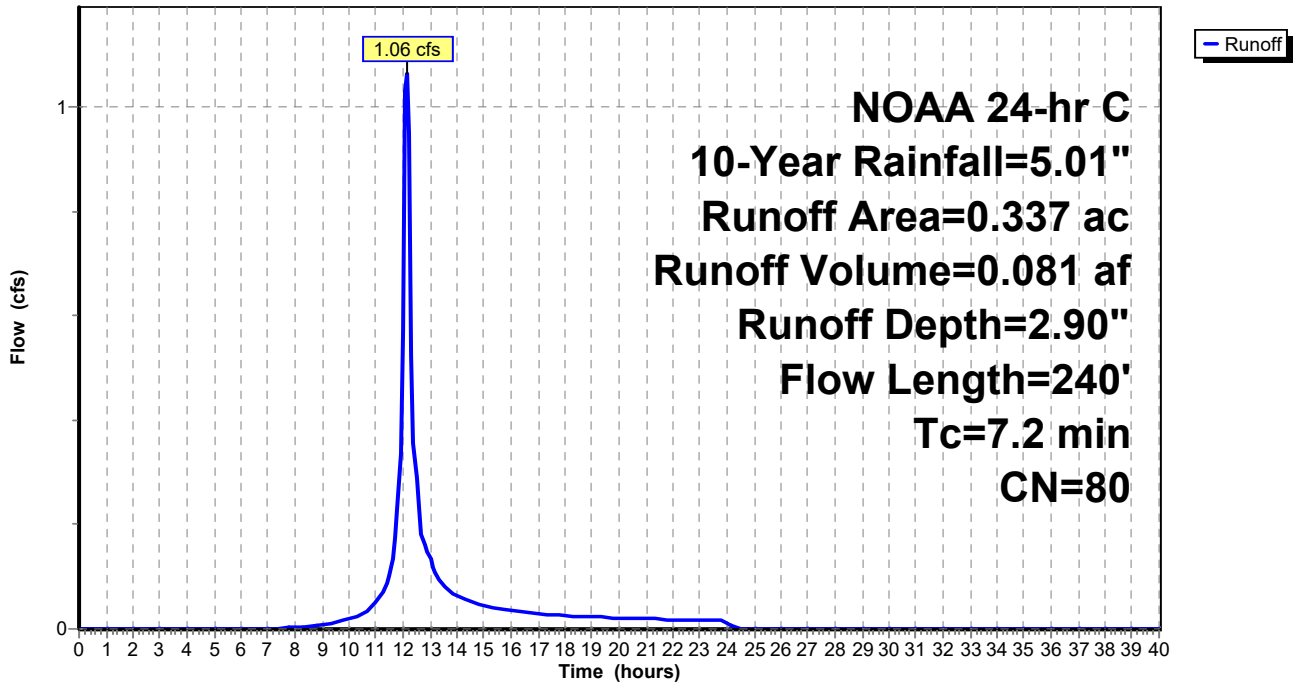
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
0.337	80	>75% Grass cover, Good, HSG D
0.337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	75	0.1000	0.31		Sheet Flow, Q-R Grass: Short n= 0.150 P2= 3.31"
1.3	60	0.0125	0.78		Shallow Concentrated Flow, R-S Short Grass Pasture Kv= 7.0 fps
1.9	105	0.0020	0.91		Shallow Concentrated Flow, S-P Paved Kv= 20.3 fps
7.2	240	Total			

Subcatchment 21S: PDA 2 - Pervious

Hydrograph



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Summary for Subcatchment 28S: PDA 3 - Impervious

Runoff = 1.00 cfs @ 12.09 hrs, Volume= 0.074 af, Depth= 4.77"

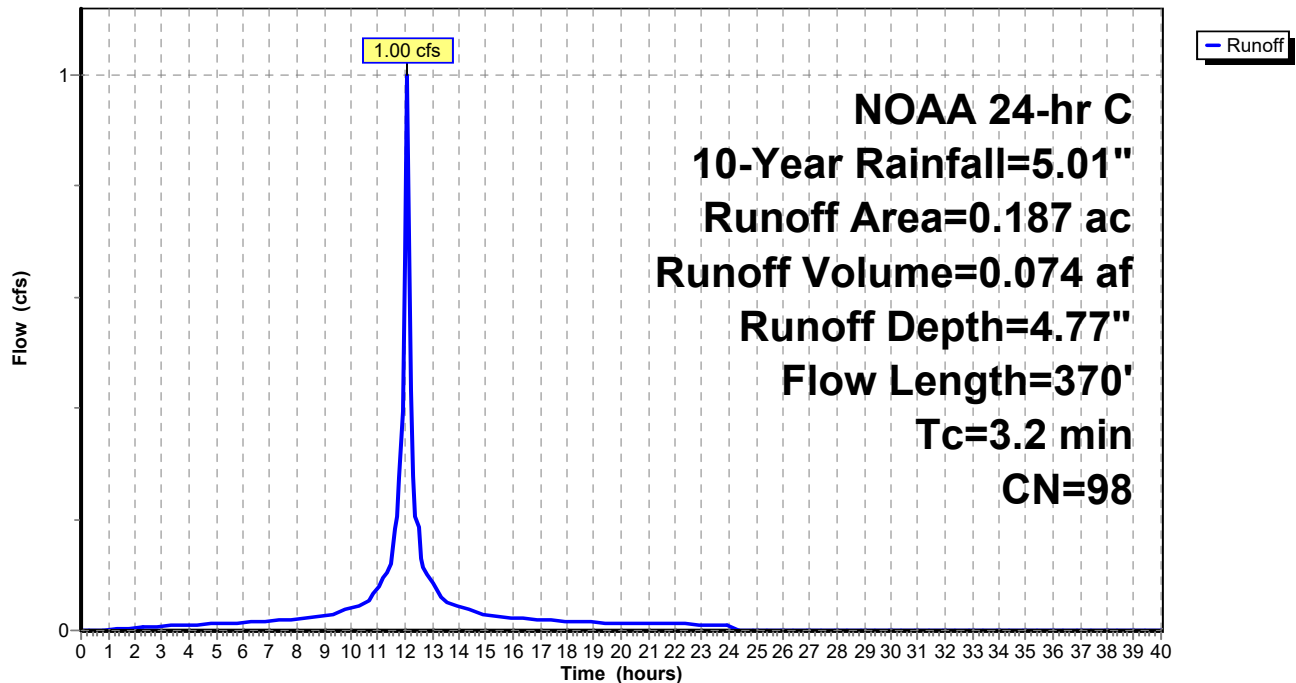
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
0.187	98	Paved parking, HSG D
0.187		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.06		Sheet Flow, F-G Smooth surfaces n= 0.011 P2= 3.31"
1.0	150	0.0150	2.49		Shallow Concentrated Flow, G-H Paved Kv= 20.3 fps
0.6	120	0.0030	3.26	5.75	Pipe Channel, H-I 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
3.2	370	Total			

Subcatchment 28S: PDA 3 - Impervious

Hydrograph



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Summary for Subcatchment 29S: PDA 1B - Pervious

Runoff = 4.42 cfs @ 12.10 hrs, Volume= 0.286 af, Depth= 2.90"

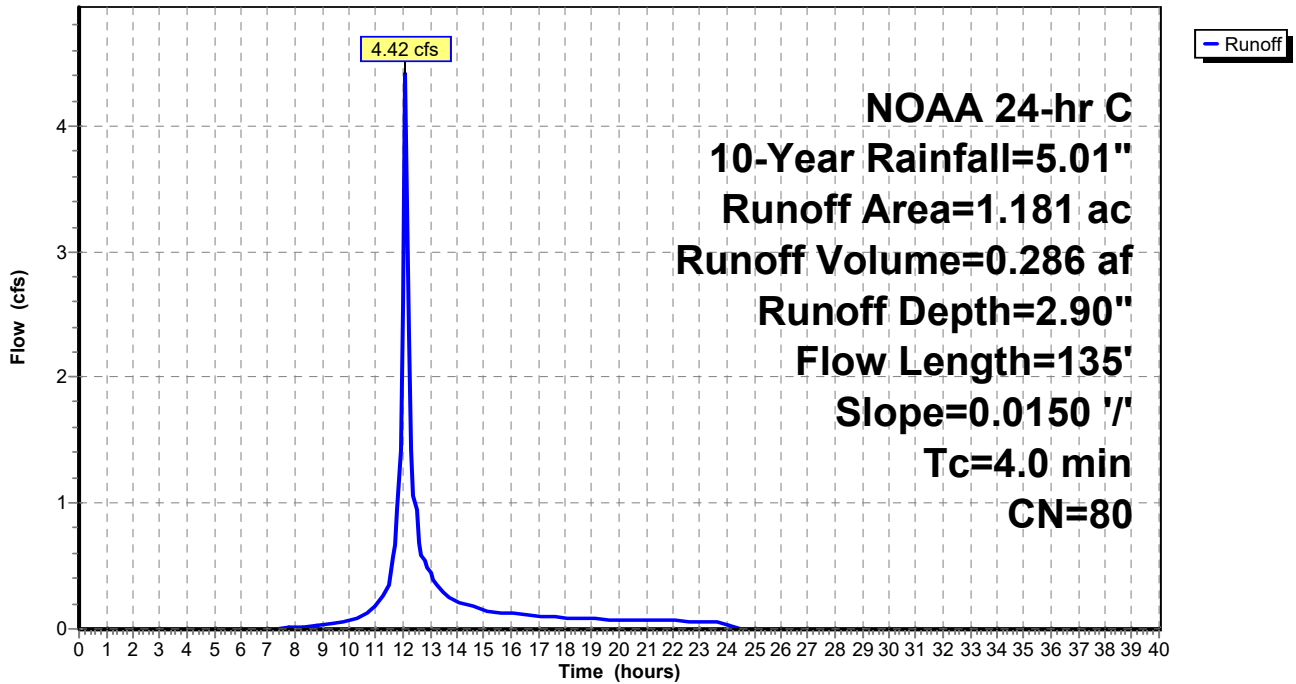
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
1.181	80	>75% Grass cover, Good, HSG D
1.181		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	18	0.0150	0.11		Sheet Flow, AD-AE Grass: Short n= 0.150 P2= 3.31"
1.1	82	0.0150	1.20		Sheet Flow, AE-AF Smooth surfaces n= 0.011 P2= 3.31"
0.2	35	0.0150	2.49		Shallow Concentrated Flow, AF-AC Paved Kv= 20.3 fps
4.0	135	Total			

Subcatchment 29S: PDA 1B - Pervious

Hydrograph



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Summary for Subcatchment 30S: PDA 1B - Impervious

Runoff = 7.94 cfs @ 12.07 hrs, Volume= 0.632 af, Depth= 4.77"

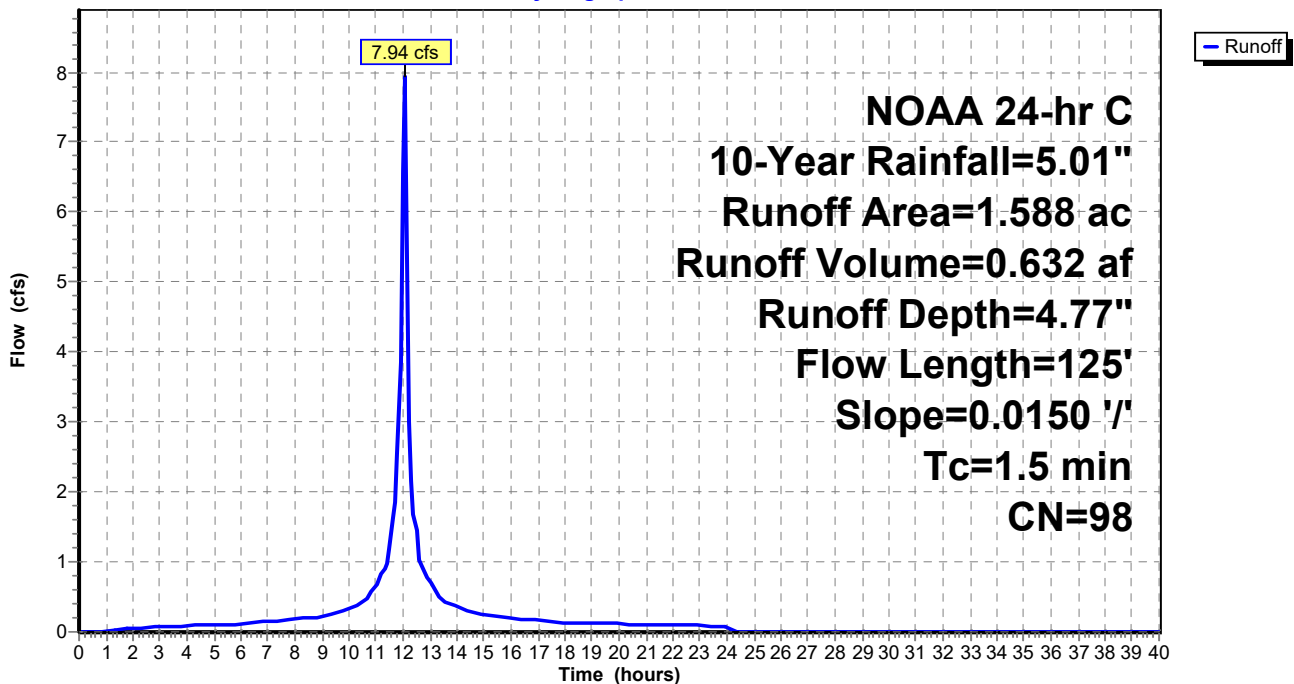
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
1.588	98	Paved parking, HSG C
1.588		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AA-AB Smooth surfaces n= 0.011 P2= 3.31"
0.2	25	0.0150	2.49		Shallow Concentrated Flow, AB-AC Paved Kv= 20.3 fps
1.5	125	Total			

Subcatchment 30S: PDA 1B - Impervious

Hydrograph



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Summary for Subcatchment 33S: PDA 1A - Pervious

Runoff = 8.36 cfs @ 12.26 hrs, Volume= 0.791 af, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
1.768	80	>75% Grass cover, Good, HSG D
1.610	77	Woods, Good, HSG D
3.378	79	Weighted Average
3.378		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		Sheet Flow, AG-AH Grass: Short n= 0.150 P2= 3.31"
1.5	90	0.0200	0.99		Shallow Concentrated Flow, AH-AI Short Grass Pasture Kv= 7.0 fps
2.7	422	0.0025	2.63	3.23	Pipe Channel, AI-AJ 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
2.6	807	0.0050	5.09	16.00	Pipe Channel, AJ-X 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.3	117	0.0050	6.67	47.16	Pipe Channel, X-Y 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
16.8	1,581	Total			

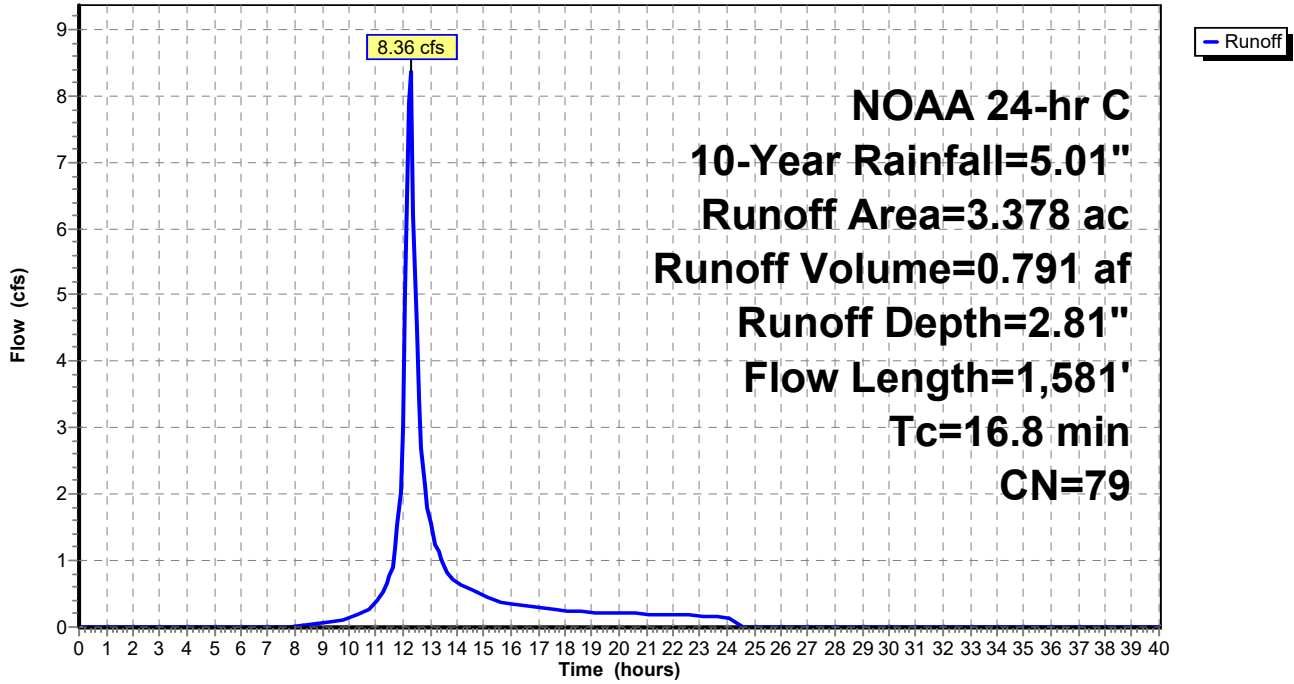
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Subcatchment 33S: PDA 1A - Pervious

Hydrograph



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Summary for Subcatchment 40S: PDA 1A - Impervious

Runoff = 46.86 cfs @ 12.10 hrs, Volume= 3.617 af, Depth= 4.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
9.094	98	Paved parking, HSG C
9.094		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AQ-AR Smooth surfaces n= 0.011 P2= 3.31"
0.6	90	0.0150	2.49		Shallow Concentrated Flow, AR-AS Paved Kv= 20.3 fps
0.1	181	0.3500	35.17	62.14	Pipe Channel, AS-Y (18 inch) 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
1.0	222	0.0025	3.60	11.31	Pipe Channel, AS-Y (24 inch - Section 1) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
1.0	247	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 2) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.5	134	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 3) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
4.6	1,019	Total			

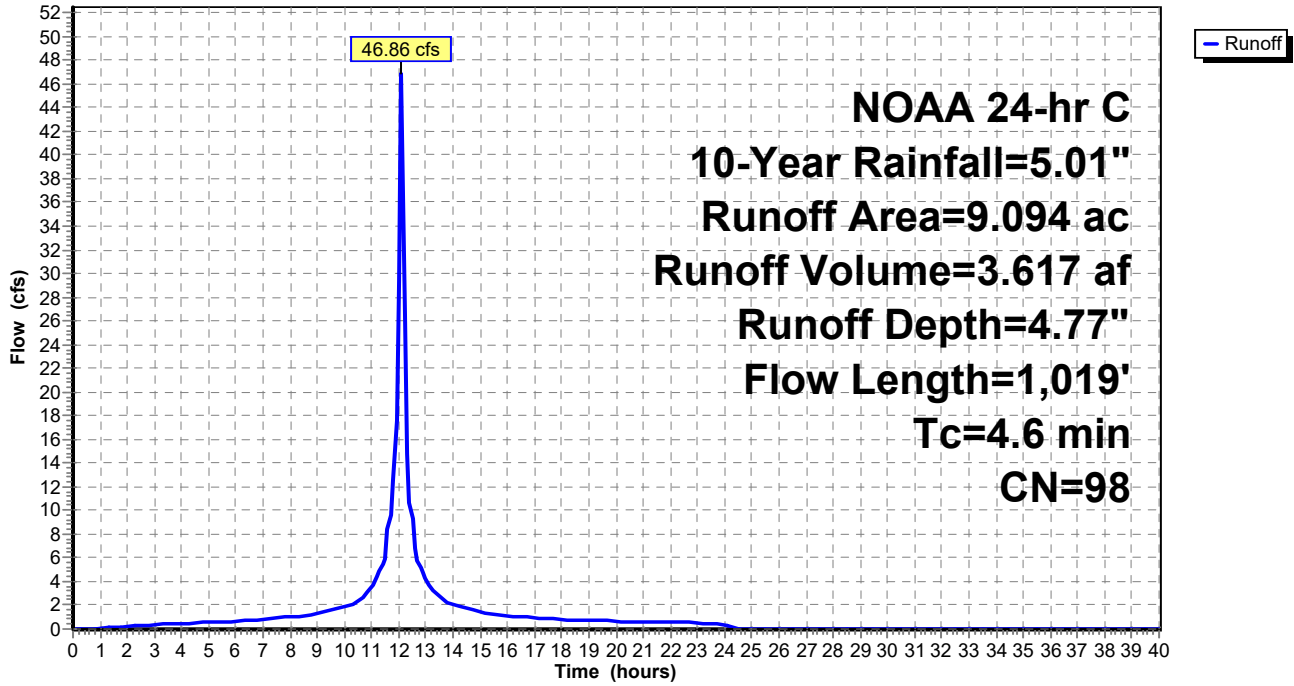
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Subcatchment 40S: PDA 1A - Impervious

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Summary for Subcatchment 46S: EDA 1 - Impervious

Runoff = 55.85 cfs @ 12.16 hrs, Volume= 5.105 af, Depth= 4.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
12.834	98	Paved parking, HSG C
12.834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	58	0.0010	0.38		Sheet Flow, V-W Smooth surfaces n= 0.011 P2= 3.31"
1.1	42	0.0040	0.62		Sheet Flow, W-X Smooth surfaces n= 0.011 P2= 3.31"
0.8	90	0.0080	1.82		Shallow Concentrated Flow, X-Y Paved Kv= 20.3 fps
0.8	175	0.0050	3.72	4.57	Pipe Channel, Y-Z 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
3.3	1,235	0.0075	6.24	19.59	Pipe Channel, Z-AA 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
8.6	1,600	Total			

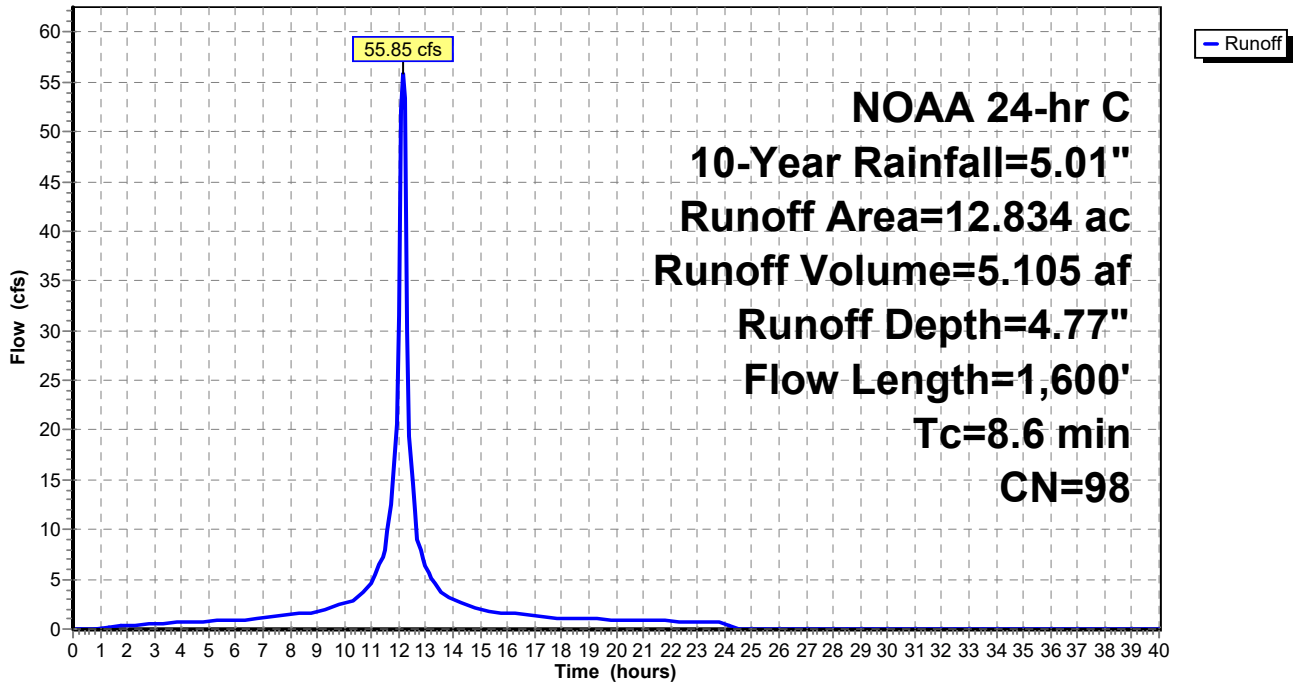
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Subcatchment 46S: EDA 1 - Impervious

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Summary for Pond 45P: Bioretention Basin

Inflow Area = 2.769 ac, 57.35% Impervious, Inflow Depth = 3.97" for 10-Year event
 Inflow = 12.26 cfs @ 12.08 hrs, Volume= 0.917 af
 Outflow = 8.70 cfs @ 12.16 hrs, Volume= 0.917 af, Atten= 29%, Lag= 5.0 min
 Primary = 8.70 cfs @ 12.16 hrs, Volume= 0.917 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 Peak Elev= 48.61' @ 12.16 hrs Surf.Area= 18,543 sf Storage= 10,685 cf

Plug-Flow detention time= 153.7 min calculated for 0.915 af (100% of inflow)
 Center-of-Mass det. time= 154.5 min (923.6 - 769.0)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	18,218 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	16,690	0	0
49.00	19,745	18,218	18,218

Device	Routing	Invert	Outlet Devices
#1	Primary	43.94'	18.0" Round Culvert L= 205.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 43.94' / 43.32' S= 0.0030 ' S= 0.0030 ' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	48.00'	1.000 in/hr Exfiltration X 0.50 over Surface area
#3	Device 1	48.35'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=8.36 cfs @ 12.16 hrs HW=48.60' (Free Discharge)

- 1=Culvert (Passes 8.36 cfs of 12.39 cfs potential flow)
- 2=Exfiltration (Exfiltration Controls 0.21 cfs)
- 3=Orifice/Grate (Weir Controls 8.14 cfs @ 1.63 fps)

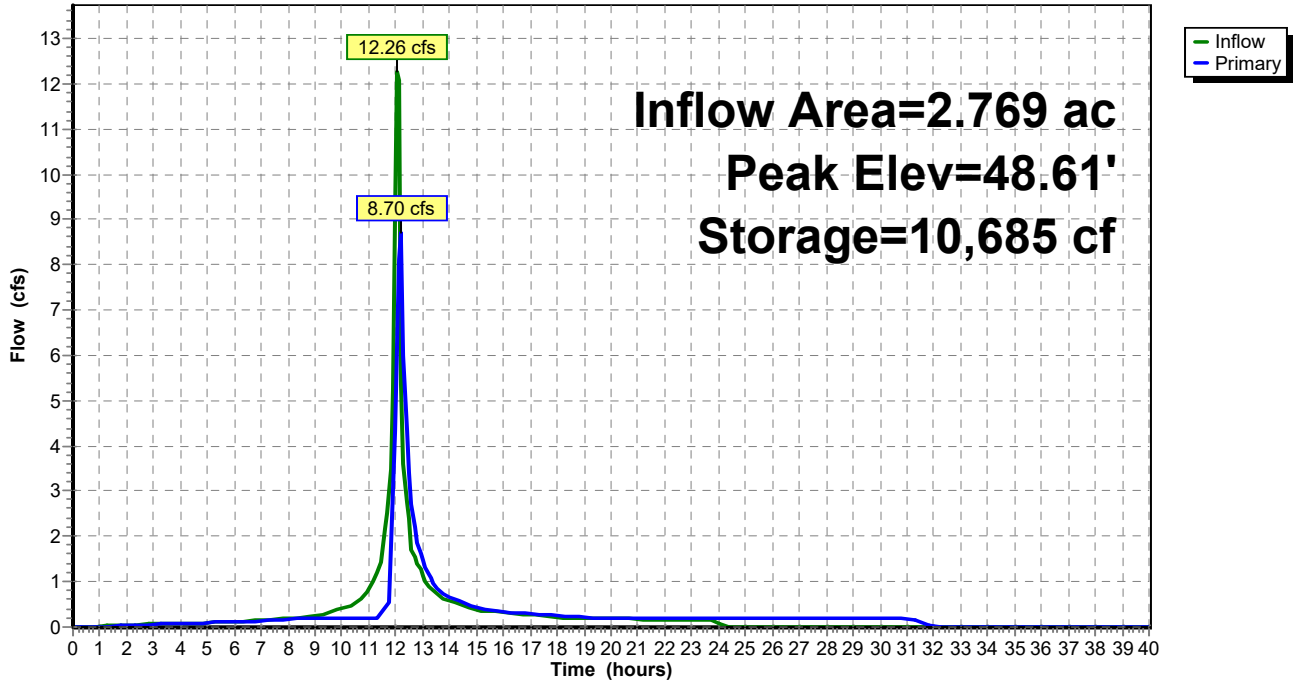
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Pond 45P: Bioretention Basin

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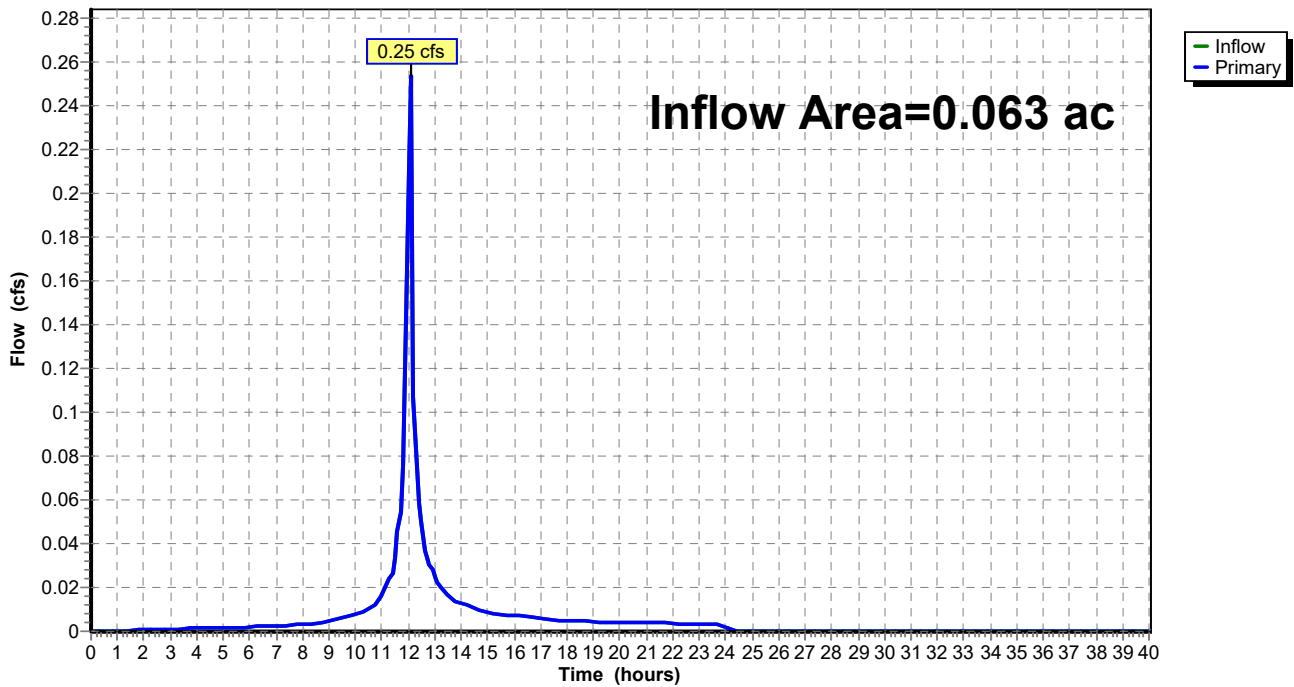
Summary for Link 4L: EDA 4

Inflow Area = 0.063 ac, 41.27% Impervious, Inflow Depth = 3.67" for 10-Year event
Inflow = 0.25 cfs @ 12.07 hrs, Volume= 0.019 af
Primary = 0.25 cfs @ 12.07 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 4L: EDA 4

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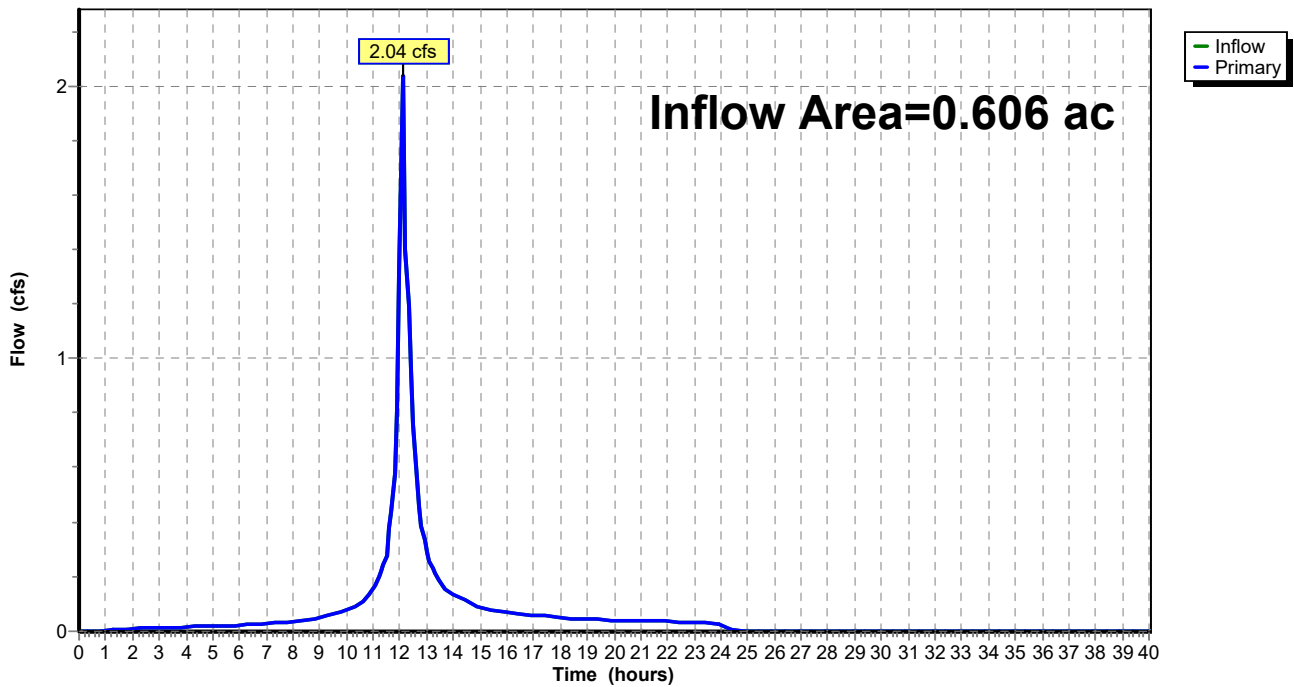
Summary for Link 7L: EDA 3

Inflow Area = 0.606 ac, 50.99% Impervious, Inflow Depth = 3.86" for 10-Year event
Inflow = 2.04 cfs @ 12.10 hrs, Volume= 0.195 af
Primary = 2.04 cfs @ 12.10 hrs, Volume= 0.195 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 7L: EDA 3

Hydrograph



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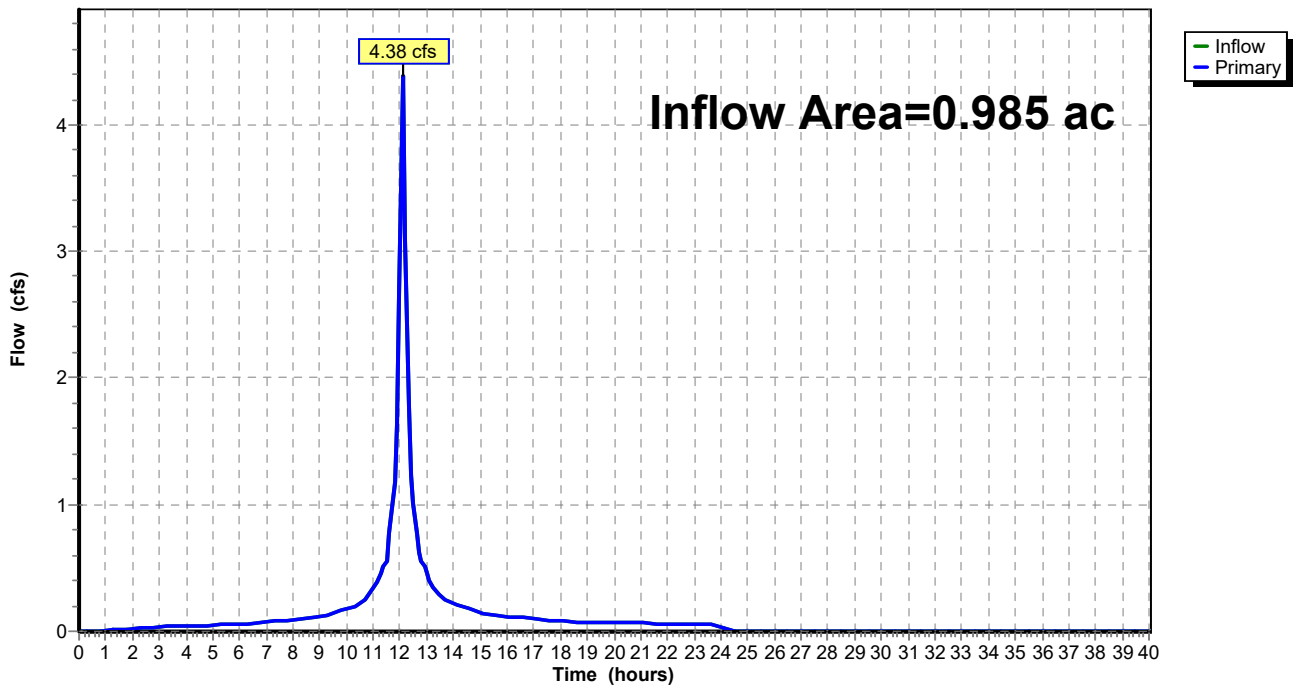
Summary for Link 10L: EDA 2

Inflow Area = 0.985 ac, 79.70% Impervious, Inflow Depth = 4.39" for 10-Year event
Inflow = 4.38 cfs @ 12.11 hrs, Volume= 0.361 af
Primary = 4.38 cfs @ 12.11 hrs, Volume= 0.361 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 10L: EDA 2

Hydrograph



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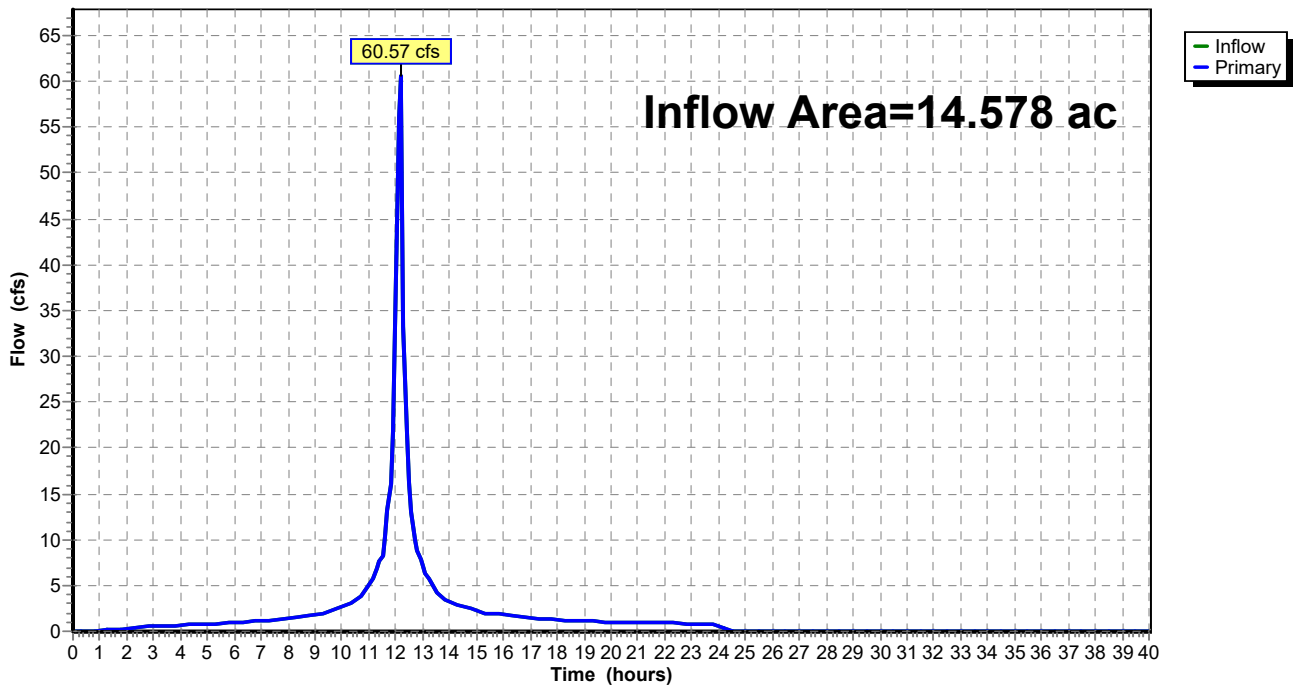
Summary for Link 13L: EDA 1

Inflow Area = 14.578 ac, 88.04% Impervious, Inflow Depth = 4.52" for 10-Year event
Inflow = 60.57 cfs @ 12.16 hrs, Volume= 5.487 af
Primary = 60.57 cfs @ 12.16 hrs, Volume= 5.487 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 13L: EDA 1

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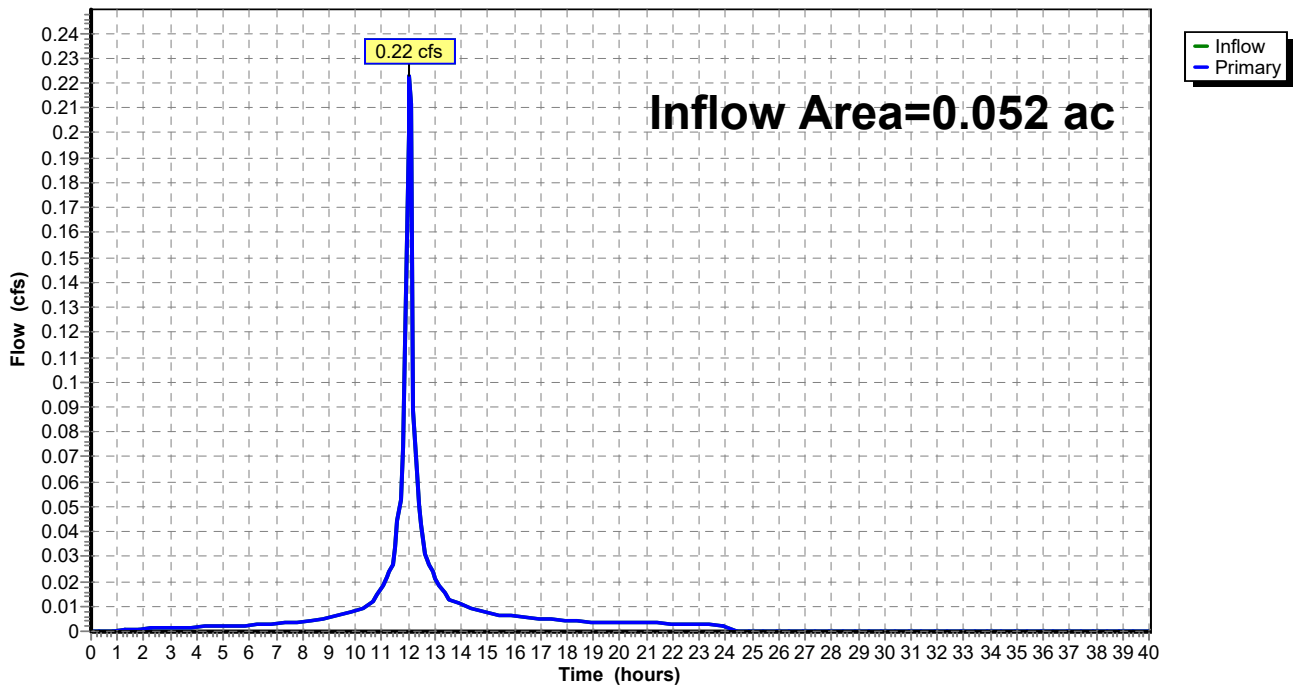
Summary for Link 24L: PDA 4

Inflow Area = 0.052 ac, 65.38% Impervious, Inflow Depth = 4.13" for 10-Year event
Inflow = 0.22 cfs @ 12.06 hrs, Volume= 0.018 af
Primary = 0.22 cfs @ 12.06 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 24L: PDA 4

Hydrograph



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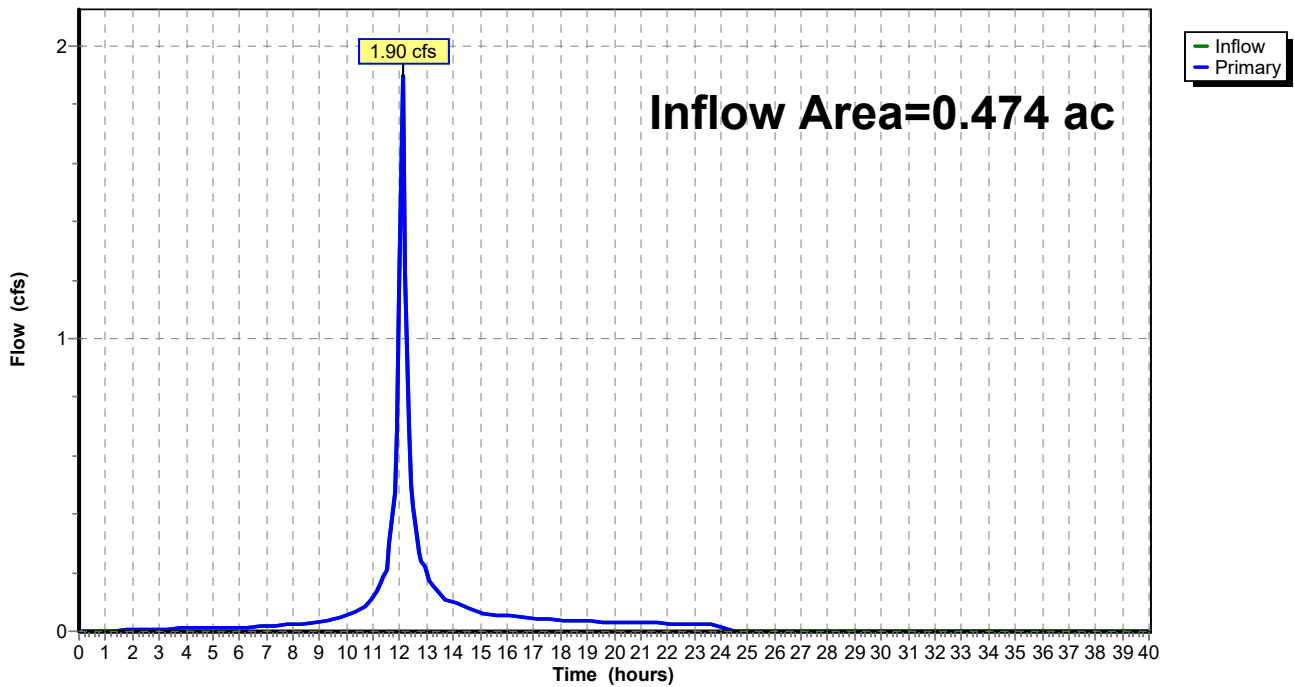
Summary for Link 25L: PDA 3

Inflow Area = 0.474 ac, 39.45% Impervious, Inflow Depth = 3.64" for 10-Year event
Inflow = 1.90 cfs @ 12.10 hrs, Volume= 0.144 af
Primary = 1.90 cfs @ 12.10 hrs, Volume= 0.144 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 25L: PDA 3

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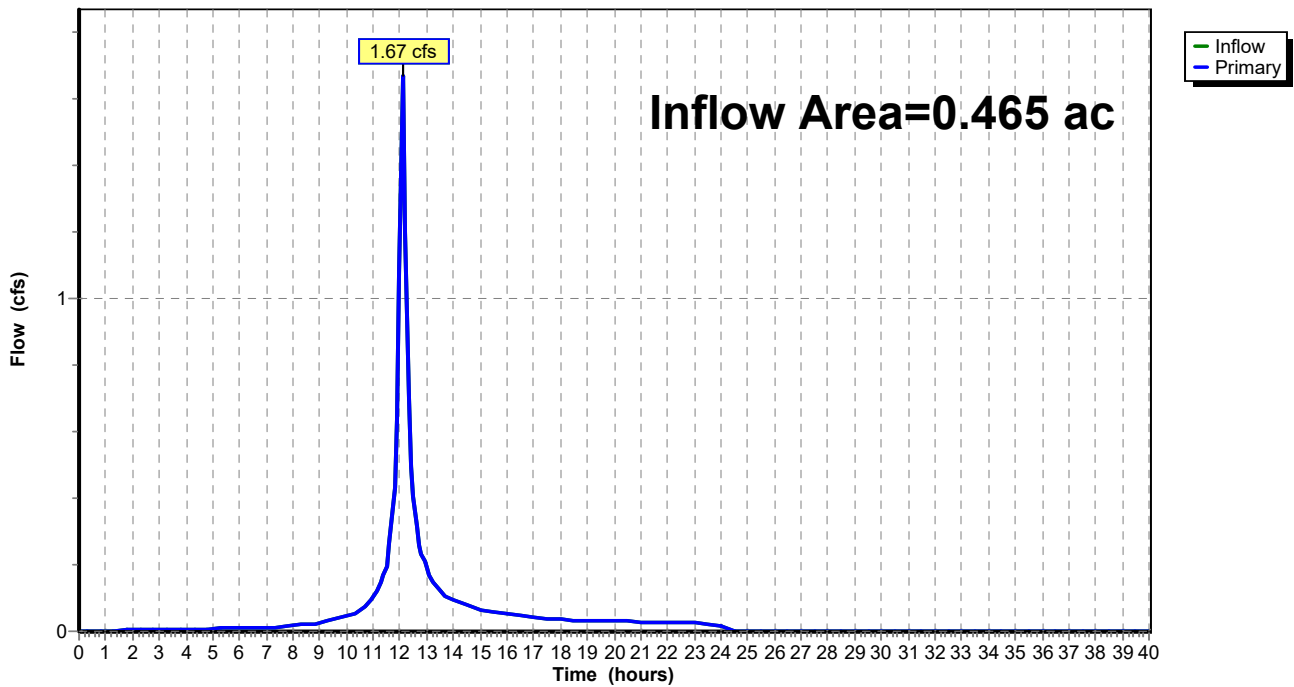
Summary for Link 26L: PDA 2

Inflow Area = 0.465 ac, 27.53% Impervious, Inflow Depth = 3.42" for 10-Year event
Inflow = 1.67 cfs @ 12.11 hrs, Volume= 0.132 af
Primary = 1.67 cfs @ 12.11 hrs, Volume= 0.132 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 26L: PDA 2

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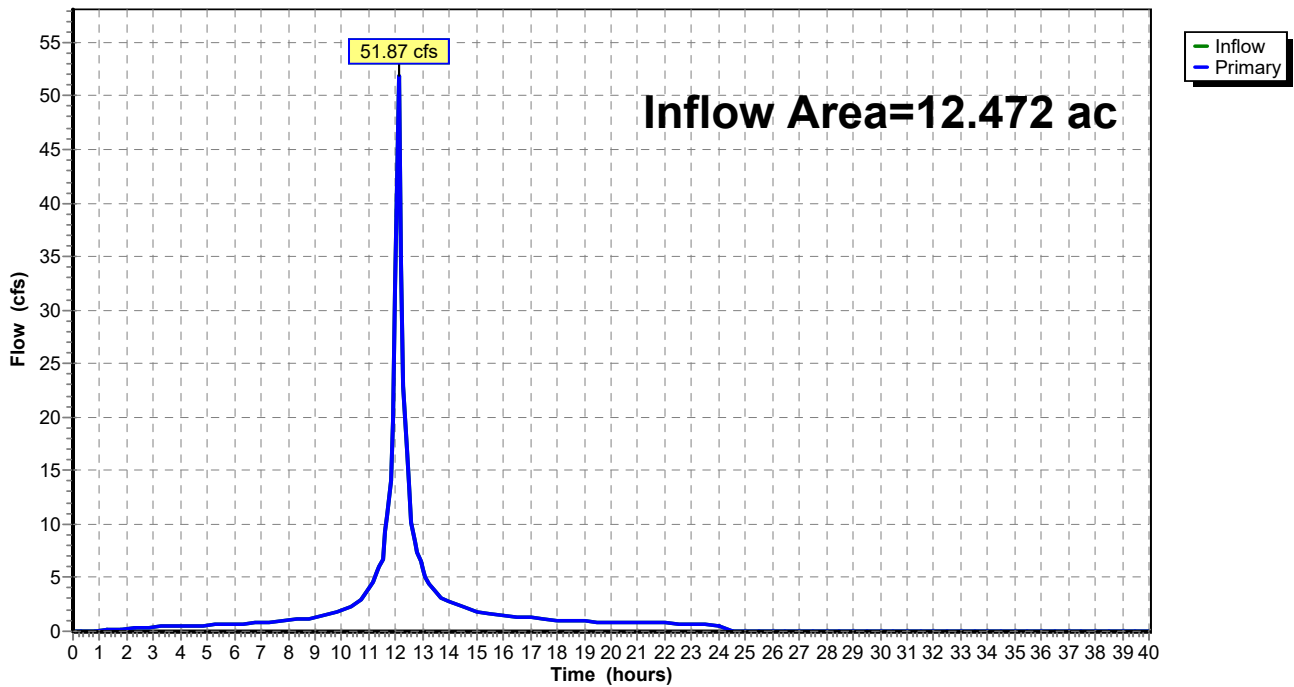
Summary for Link 35L: PDA 1A

Inflow Area = 12.472 ac, 72.92% Impervious, Inflow Depth = 4.24" for 10-Year event
Inflow = 51.87 cfs @ 12.10 hrs, Volume= 4.408 af
Primary = 51.87 cfs @ 12.10 hrs, Volume= 4.408 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 35L: PDA 1A

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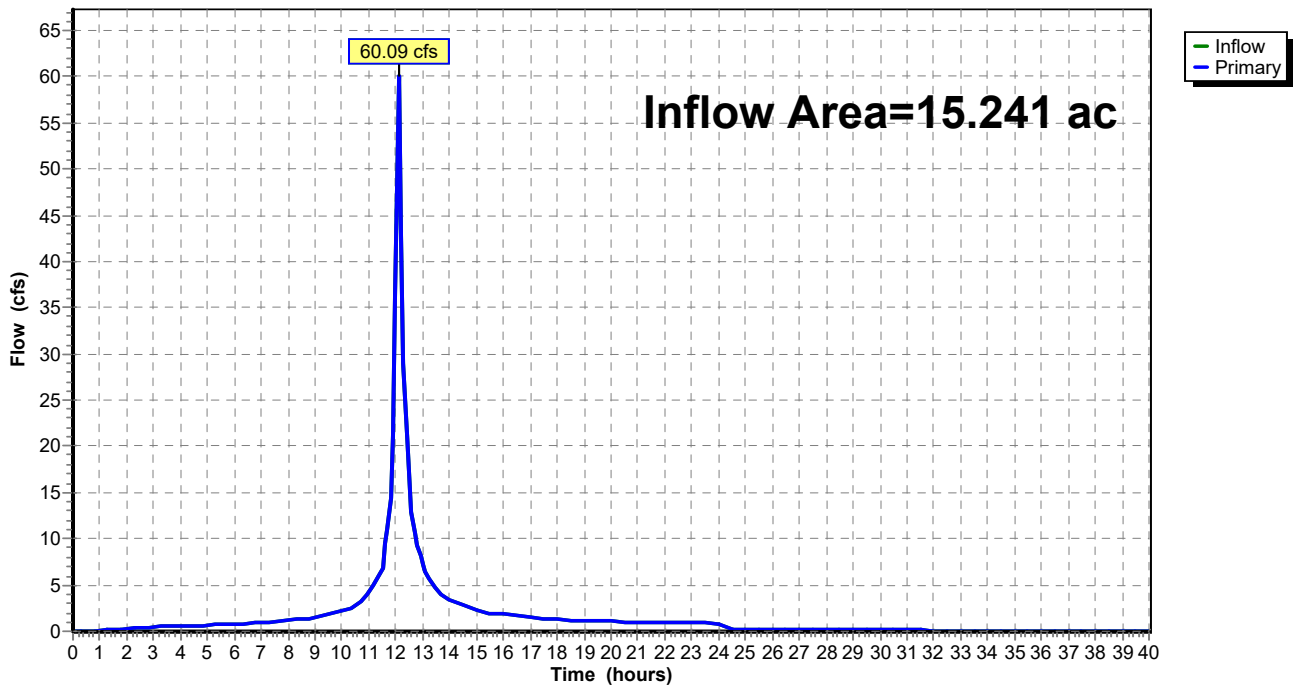
Summary for Link 44L: PDA 1

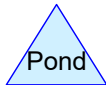
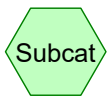
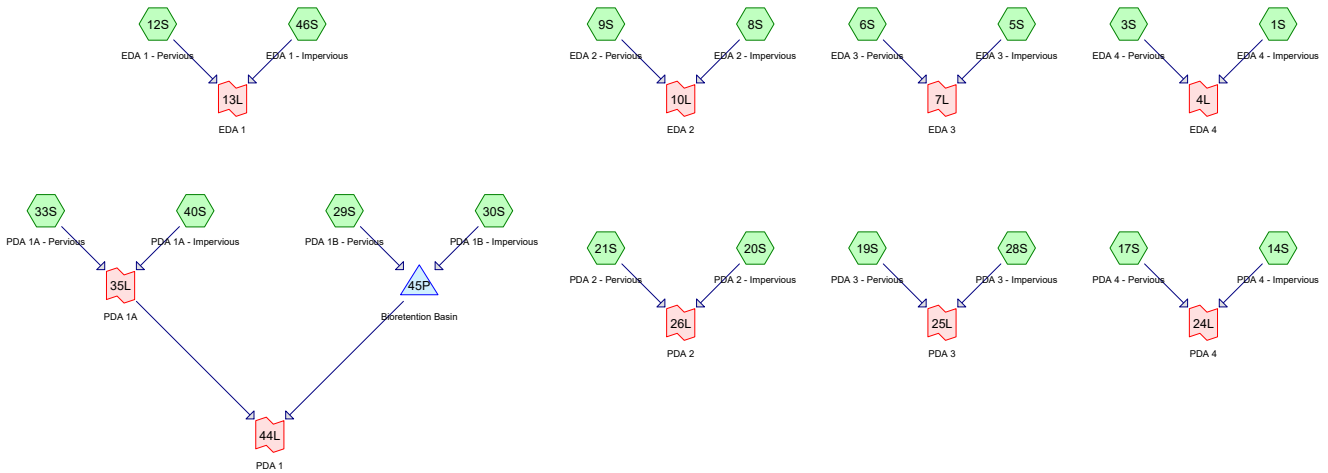
Inflow Area = 15.241 ac, 70.09% Impervious, Inflow Depth = 4.19" for 10-Year event
Inflow = 60.09 cfs @ 12.11 hrs, Volume= 5.326 af
Primary = 60.09 cfs @ 12.11 hrs, Volume= 5.326 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 44L: PDA 1

Hydrograph





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Summary for Subcatchment 1S: EDA 4 - Impervious

Runoff = 0.15 cfs @ 12.03 hrs, Volume= 0.013 af, Depth= 5.95"

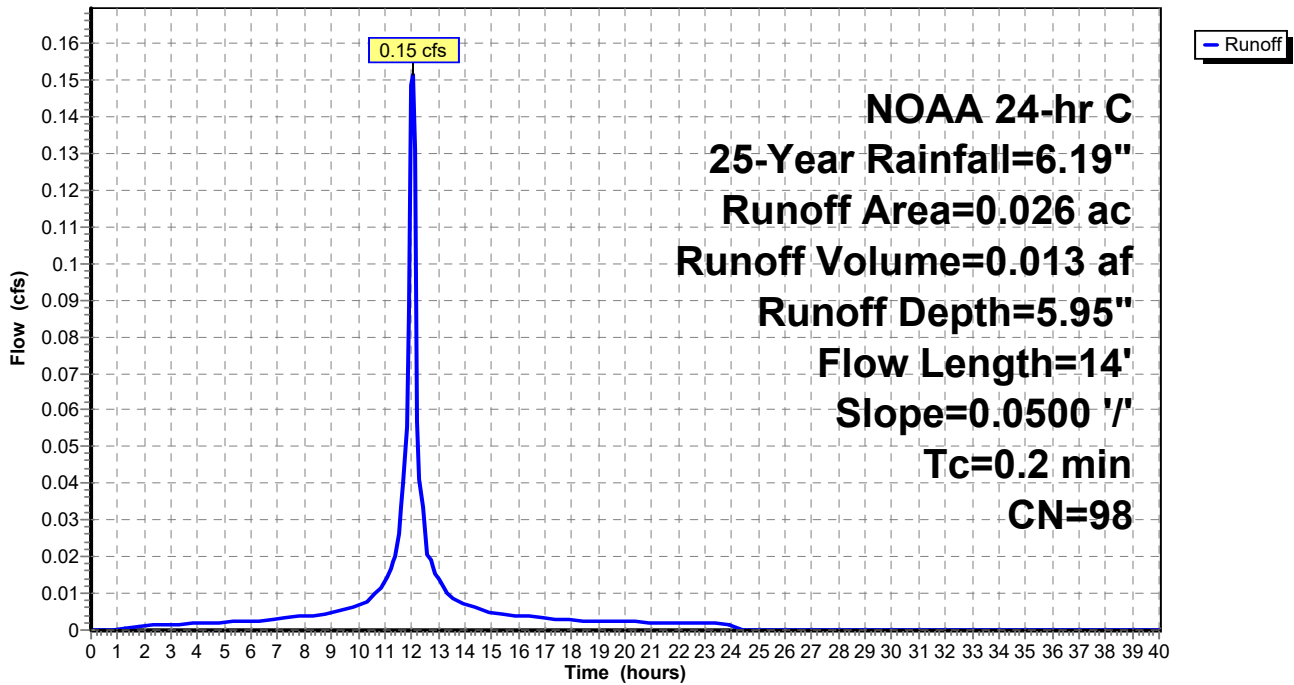
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
0.026	98	Paved parking, HSG D
0.026		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0500	1.36		Sheet Flow, D-E Smooth surfaces n= 0.011 P2= 3.31"

Subcatchment 1S: EDA 4 - Impervious

Hydrograph



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Summary for Subcatchment 3S: EDA 4 - Pervious

Runoff = 0.19 cfs @ 12.09 hrs, Volume= 0.012 af, Depth= 3.95"

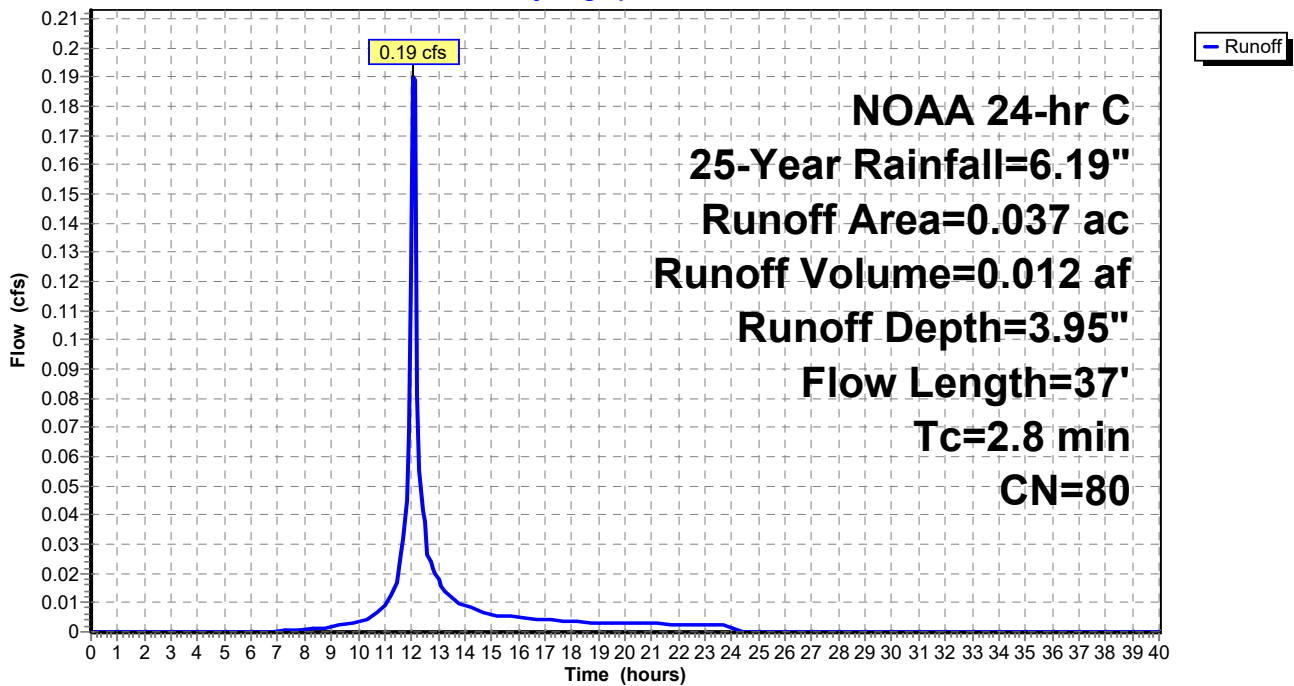
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
0.037	80	>75% Grass cover, Good, HSG D
0.037		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.31"
0.1	12	0.0650	1.47		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.31"
2.8	37	Total			

Subcatchment 3S: EDA 4 - Pervious

Hydrograph



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Summary for Subcatchment 5S: EDA 3 - Impervious

Runoff = 2.04 cfs @ 12.09 hrs, Volume= 0.153 af, Depth= 5.95"

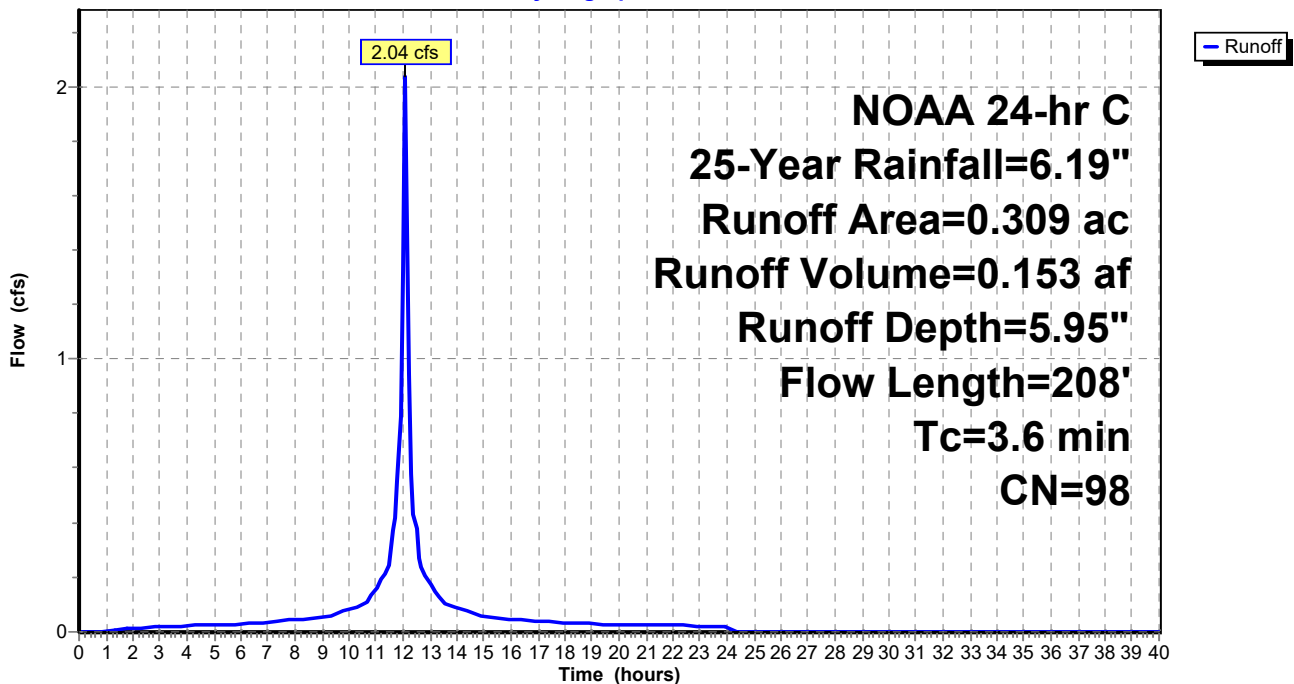
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
0.309	98	Paved parking, HSG D
0.309		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	100	0.0040	0.73		Sheet Flow, F-G Smooth surfaces n= 0.011 P2= 3.31"
1.3	108	0.0050	1.44		Shallow Concentrated Flow, G-H Paved Kv= 20.3 fps
3.6	208	Total			

Subcatchment 5S: EDA 3 - Impervious

Hydrograph



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Summary for Subcatchment 6S: EDA 3 - Pervious

Runoff = 0.99 cfs @ 12.29 hrs, Volume= 0.098 af, Depth= 3.95"

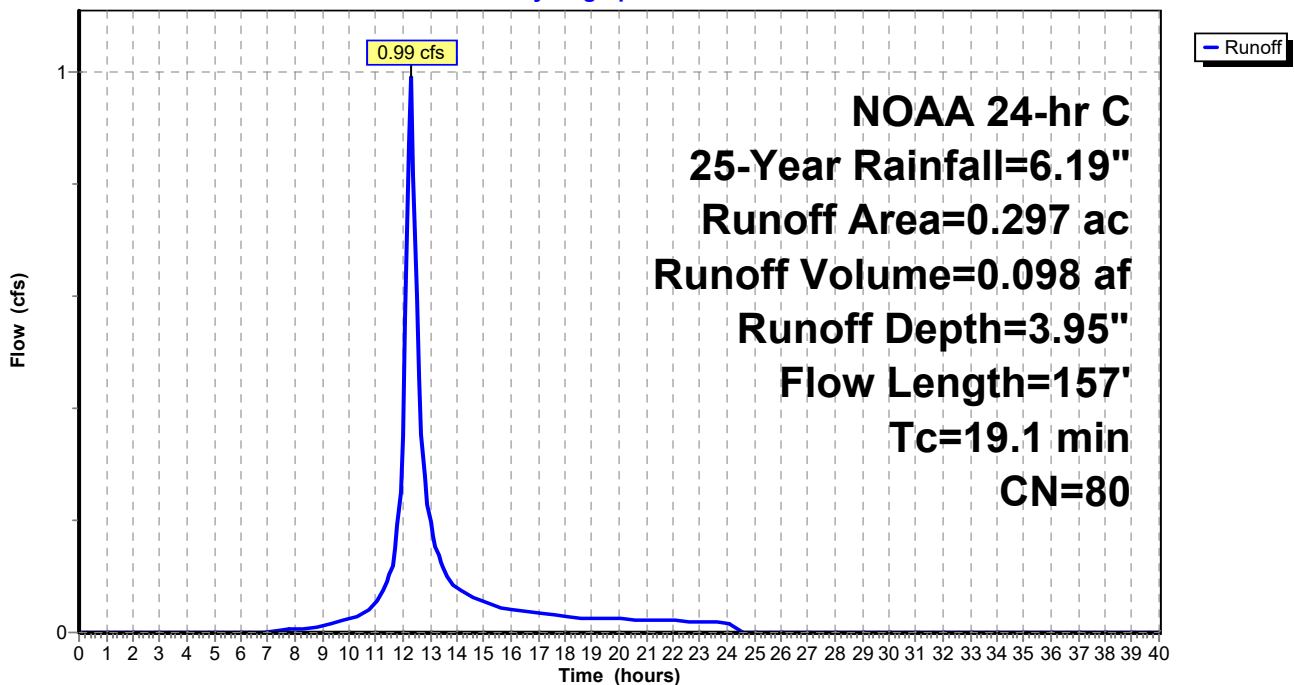
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
0.297	80	>75% Grass cover, Good, HSG D
0.297		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	72	0.0100	0.12		Sheet Flow, I-J Grass: Short n= 0.150 P2= 3.31"
8.4	42	0.0050	0.08		Sheet Flow, J-K Grass: Short n= 0.150 P2= 3.31"
0.9	28	0.0050	0.49		Shallow Concentrated Flow, K-L Short Grass Pasture Kv= 7.0 fps
0.0	15	0.0100	5.94	10.50	Pipe Channel, K-H 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
19.1	157	Total			

Subcatchment 6S: EDA 3 - Pervious

Hydrograph



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Summary for Subcatchment 8S: EDA 2 - Impervious

Runoff = 4.87 cfs @ 12.10 hrs, Volume= 0.389 af, Depth= 5.95"

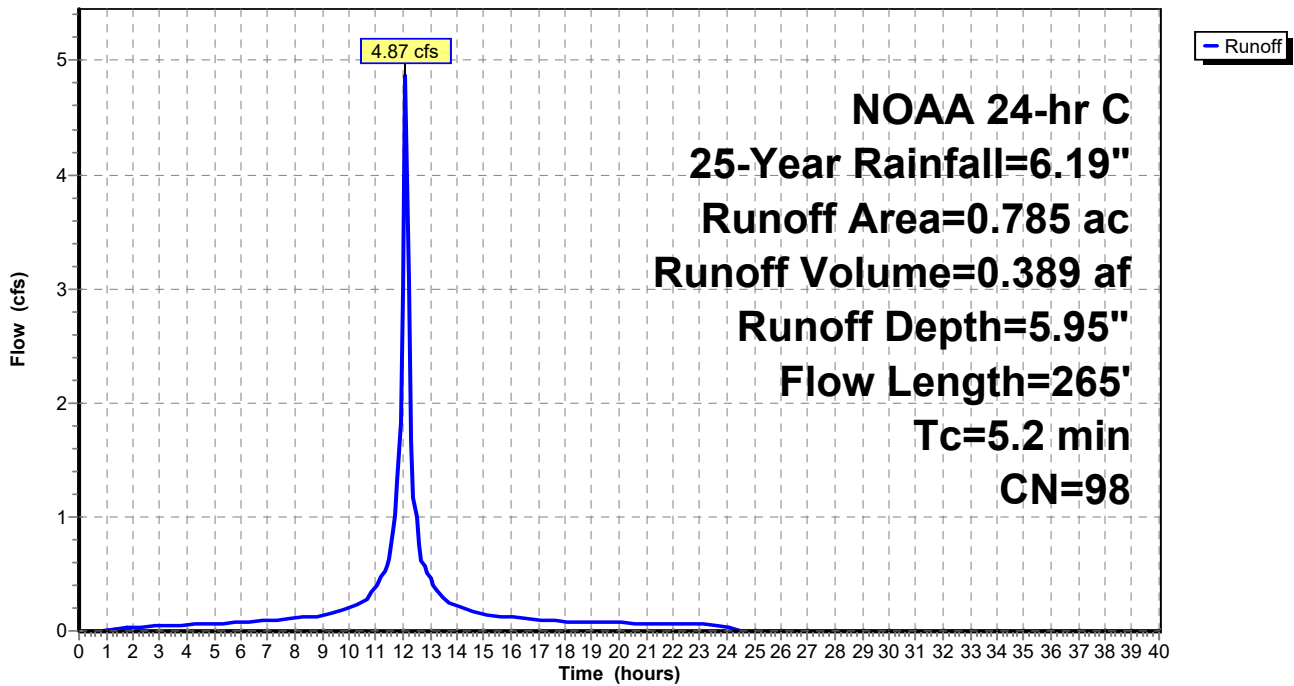
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
0.785	98	Paved parking, HSG D
0.785		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	30	0.0040	0.58		Sheet Flow, P-Q Smooth surfaces n= 0.011 P2= 3.31"
1.5	80	0.0170	0.91		Shallow Concentrated Flow, Q-M Short Grass Pasture Kv= 7.0 fps
2.8	155	0.0020	0.91		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
5.2	265	Total			

Subcatchment 8S: EDA 2 - Impervious

Hydrograph



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Summary for Subcatchment 9S: EDA 2 - Pervious

Runoff = 0.81 cfs @ 12.20 hrs, Volume= 0.066 af, Depth= 3.95"

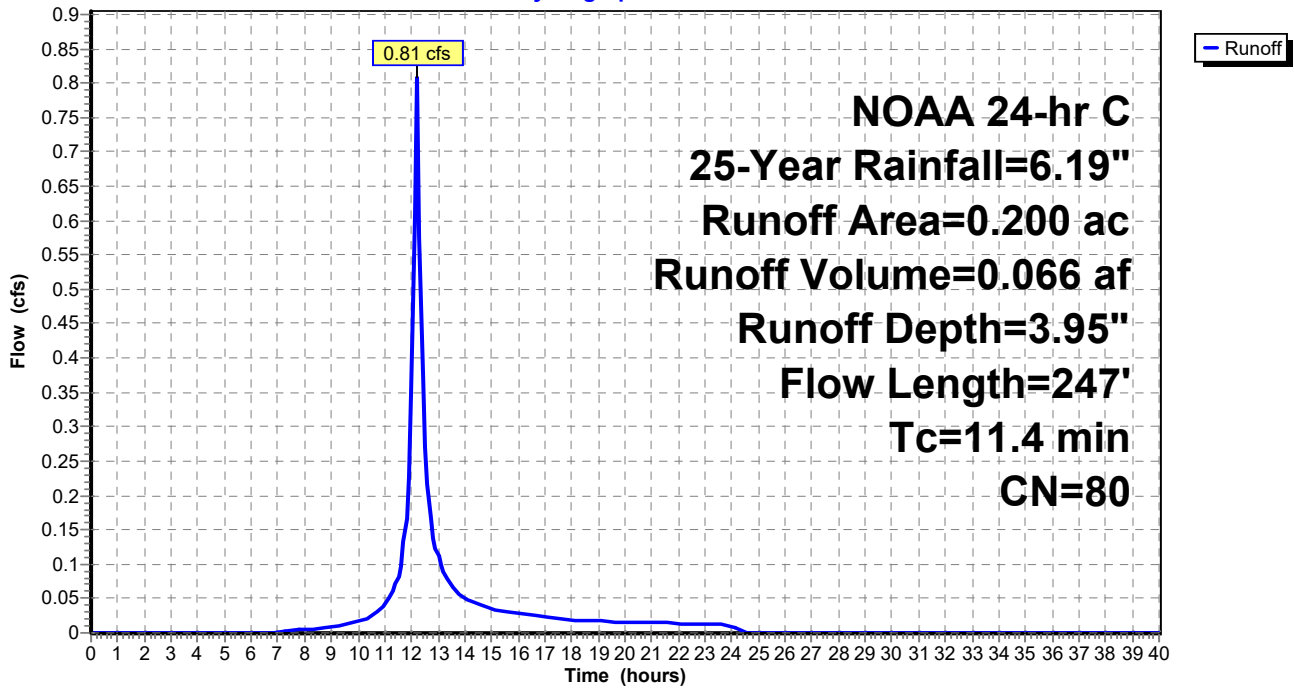
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
0.200	80	>75% Grass cover, Good, HSG D
0.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	78	0.0170	0.15		Sheet Flow, L-M Grass: Short n= 0.150 P2= 3.31"
0.2	14	0.0540	1.40		Sheet Flow, M-N Smooth surfaces n= 0.011 P2= 3.31"
2.8	155	0.0020	0.91		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
11.4	247	Total			

Subcatchment 9S: EDA 2 - Pervious

Hydrograph



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Summary for Subcatchment 12S: EDA 1 - Pervious

Runoff = 6.69 cfs @ 12.19 hrs, Volume= 0.530 af, Depth= 3.65"

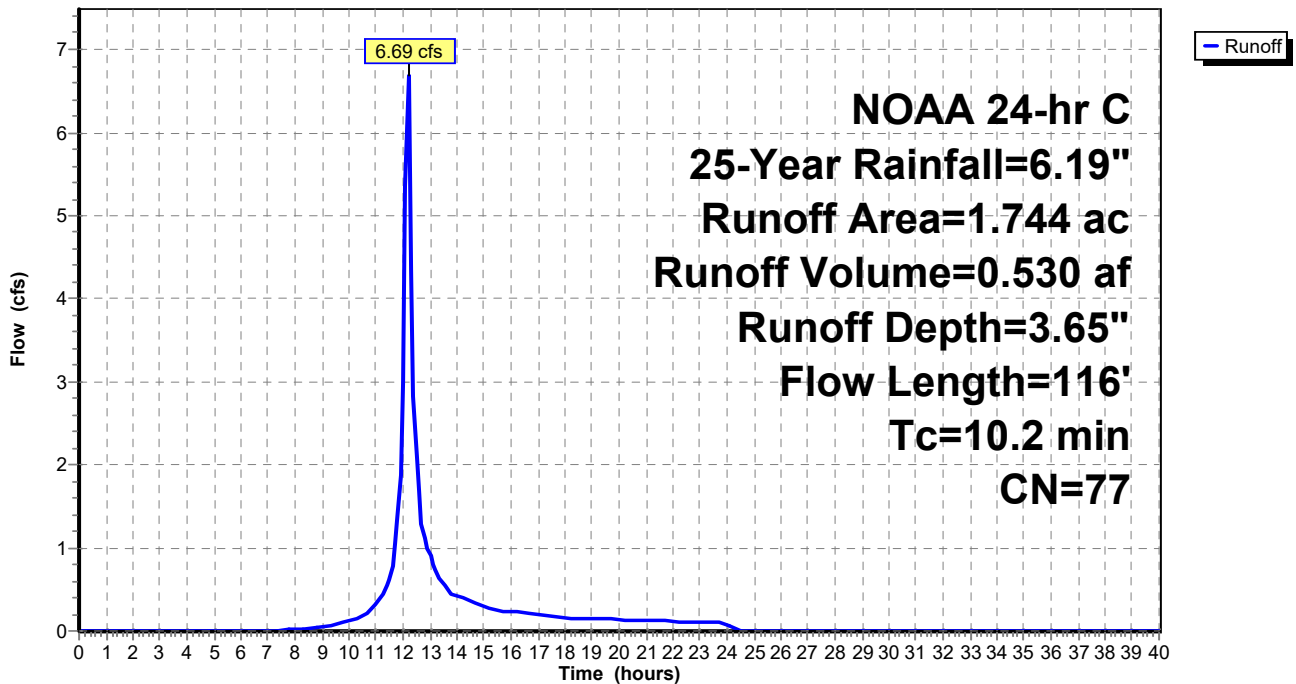
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
1.610	77	Woods, Good, HSG D
0.134	80	>75% Grass cover, Good, HSG D
1.744	77	Weighted Average
1.744		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	41	0.0250	0.07		Sheet Flow, R-S Woods: Light underbrush n= 0.400 P2= 3.31"
0.6	60	0.1170	1.71		Shallow Concentrated Flow, S-T Woodland Kv= 5.0 fps
0.1	15	0.2670	2.58		Shallow Concentrated Flow, T-U Woodland Kv= 5.0 fps
10.2	116	Total			

Subcatchment 12S: EDA 1 - Pervious

Hydrograph



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Summary for Subcatchment 14S: PDA 4 - Impervious

Runoff = 0.20 cfs @ 12.04 hrs, Volume= 0.017 af, Depth= 5.95"

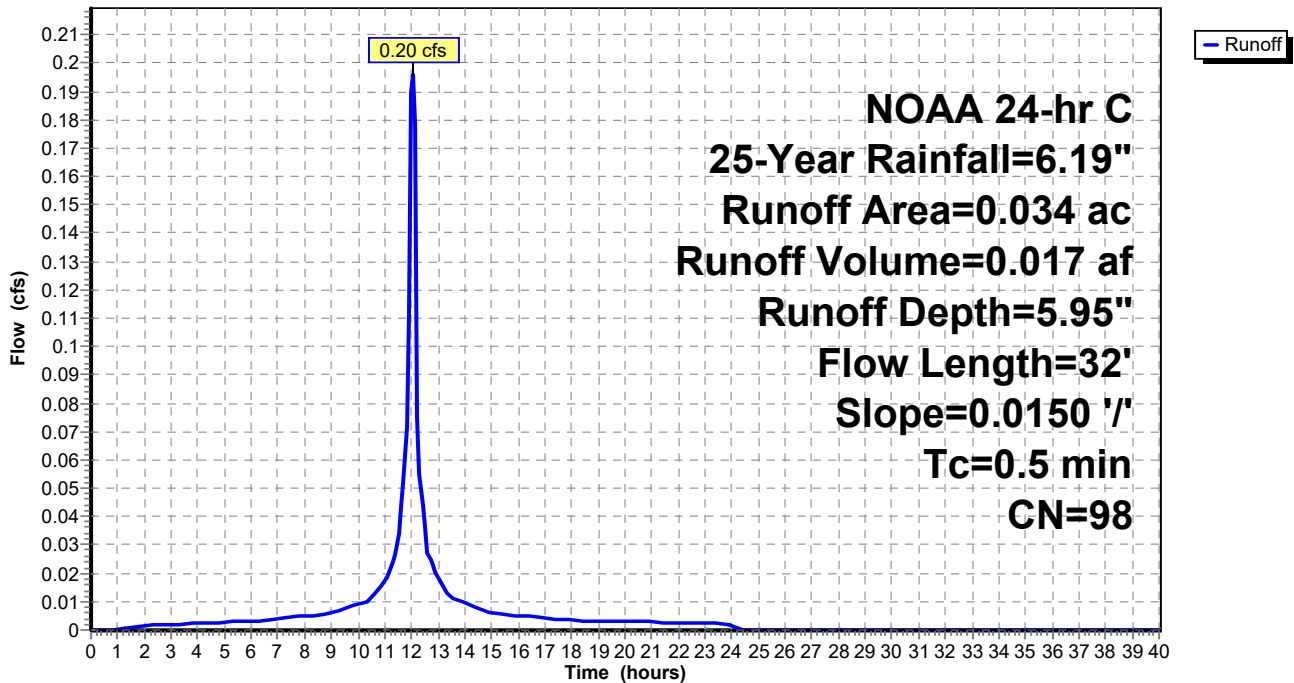
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
0.034	98	Paved parking, HSG D
0.034		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	32	0.0150	0.99		Sheet Flow, D-E Smooth surfaces n= 0.011 P2= 3.31"

Subcatchment 14S: PDA 4 - Impervious

Hydrograph



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Summary for Subcatchment 17S: PDA 4 - Pervious

Runoff = 0.09 cfs @ 12.08 hrs, Volume= 0.006 af, Depth= 3.95"

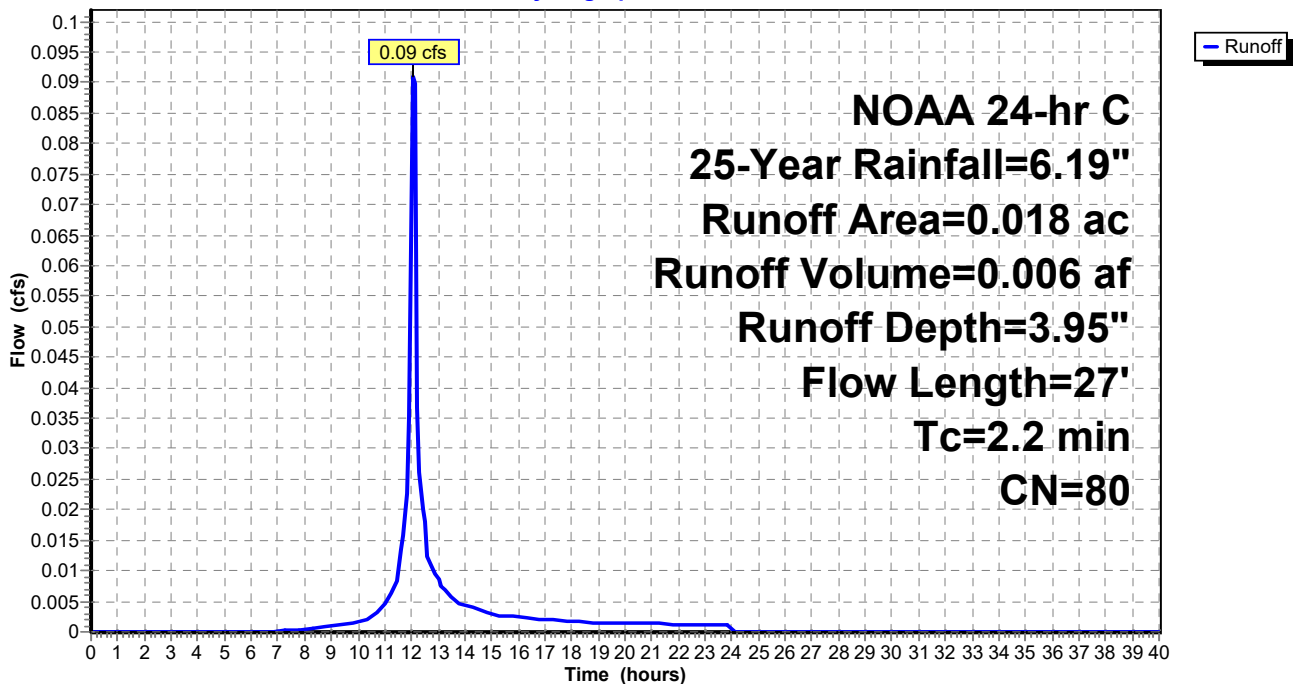
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
0.018	80	>75% Grass cover, Good, HSG D
0.018		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	15	0.0200	0.12		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.31"
0.1	12	0.0625	1.44		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.31"
2.2	27	Total			

Subcatchment 17S: PDA 4 - Pervious

Hydrograph



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Summary for Subcatchment 19S: PDA 3 - Pervious

Runoff = 1.25 cfs @ 12.13 hrs, Volume= 0.095 af, Depth= 3.95"

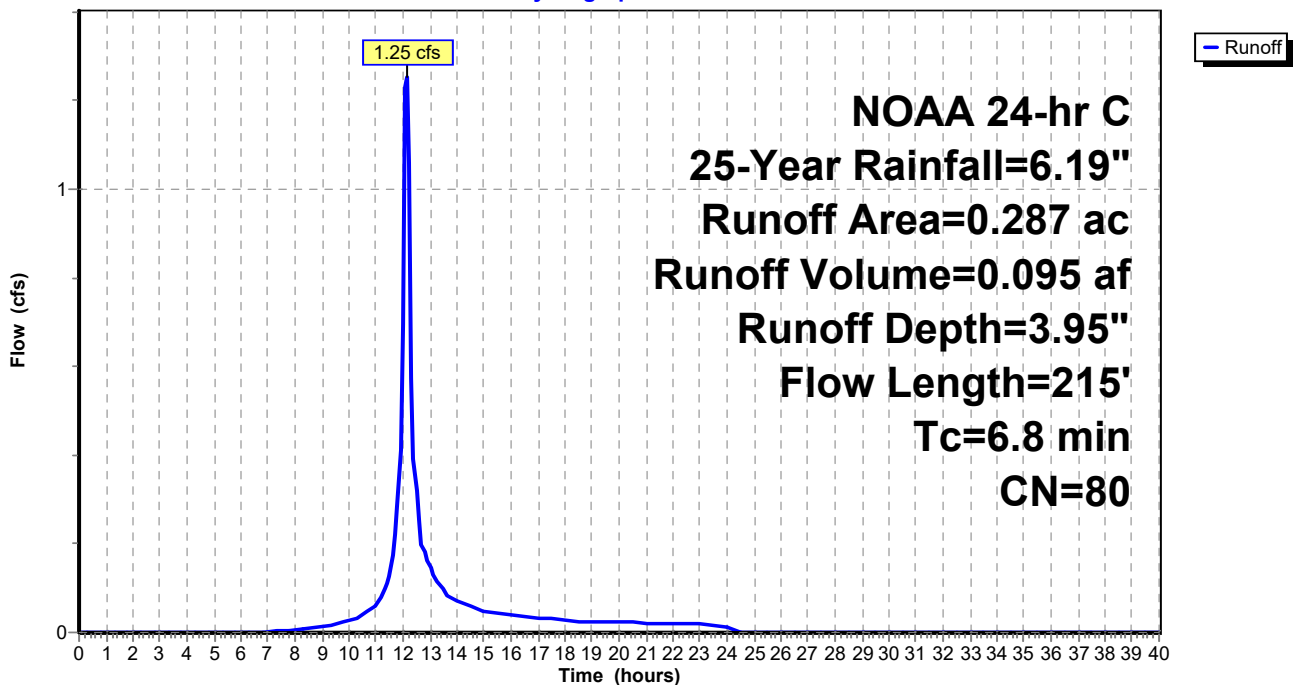
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
0.287	80	>75% Grass cover, Good, HSG D
0.287		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	45	0.0150	0.13		Sheet Flow, J-K Grass: Short n= 0.150 P2= 3.31"
0.6	75	0.0100	2.03		Shallow Concentrated Flow, K-L Paved Kv= 20.3 fps
0.5	95	0.0030	3.26	5.75	Pipe Channel, L-I 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
6.8	215	Total			

Subcatchment 19S: PDA 3 - Pervious

Hydrograph



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Summary for Subcatchment 20S: PDA 2 - Impervious

Runoff = 0.81 cfs @ 12.07 hrs, Volume= 0.063 af, Depth= 5.95"

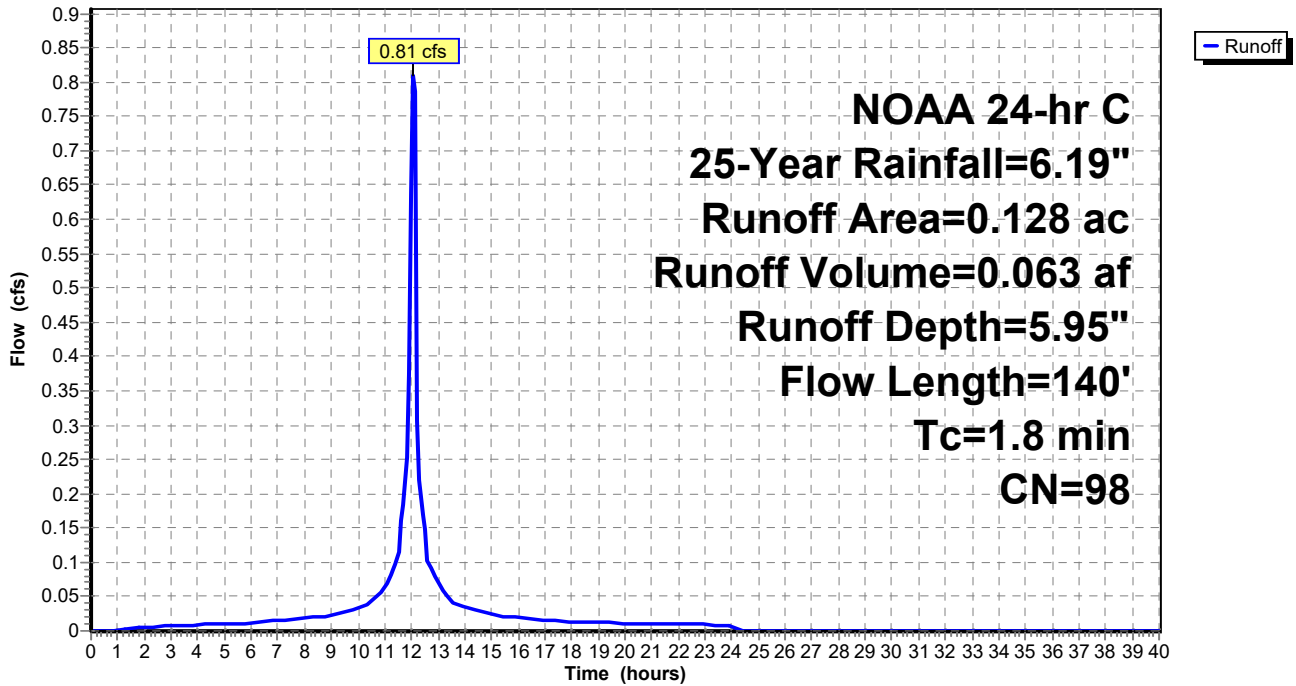
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
0.128	98	Paved parking, HSG D
0.128		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.0150	1.04		Sheet Flow, M-N Smooth surfaces n= 0.011 P2= 3.31"
0.3	50	0.0150	2.49		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
0.9	50	0.0020	0.91		Shallow Concentrated Flow, O-P Paved Kv= 20.3 fps
1.8	140	Total			

Subcatchment 20S: PDA 2 - Impervious

Hydrograph



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Summary for Subcatchment 21S: PDA 2 - Pervious

Runoff = 1.44 cfs @ 12.13 hrs, Volume= 0.111 af, Depth= 3.95"

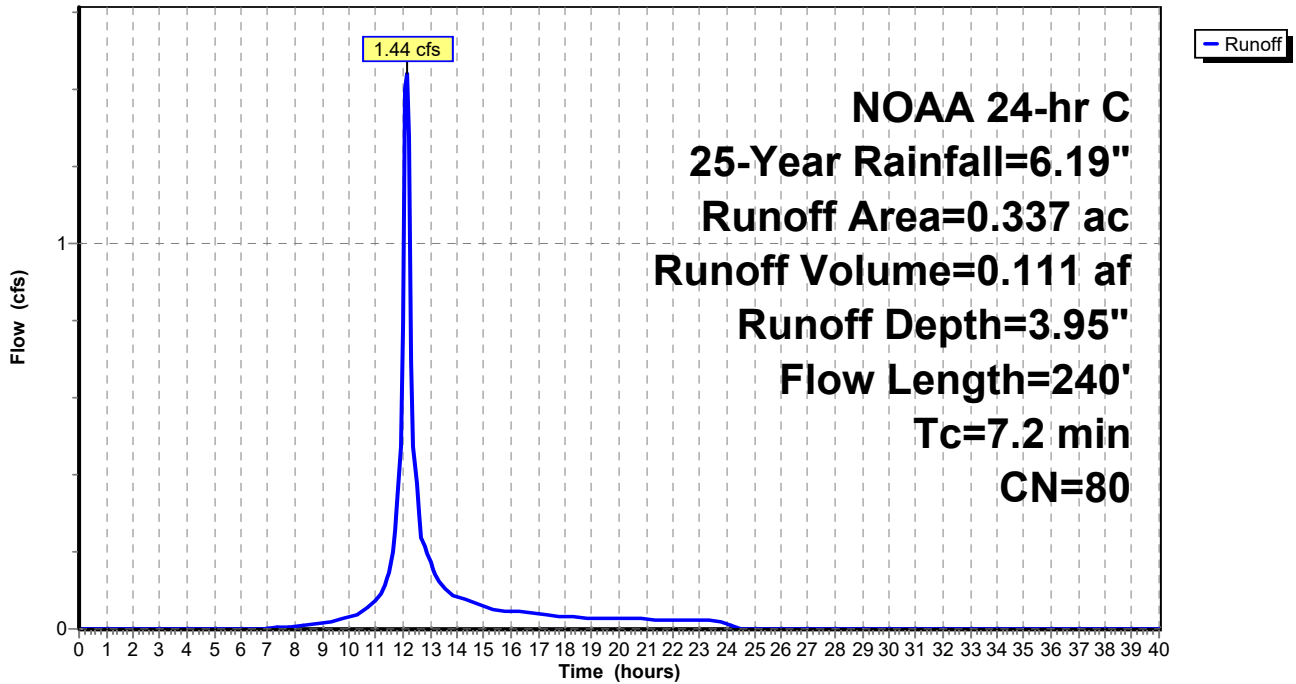
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
0.337	80	>75% Grass cover, Good, HSG D
0.337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	75	0.1000	0.31		Sheet Flow, Q-R Grass: Short n= 0.150 P2= 3.31"
1.3	60	0.0125	0.78		Shallow Concentrated Flow, R-S Short Grass Pasture Kv= 7.0 fps
1.9	105	0.0020	0.91		Shallow Concentrated Flow, S-P Paved Kv= 20.3 fps
7.2	240	Total			

Subcatchment 21S: PDA 2 - Pervious

Hydrograph



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Summary for Subcatchment 28S: PDA 3 - Impervious

Runoff = 1.24 cfs @ 12.09 hrs, Volume= 0.093 af, Depth= 5.95"

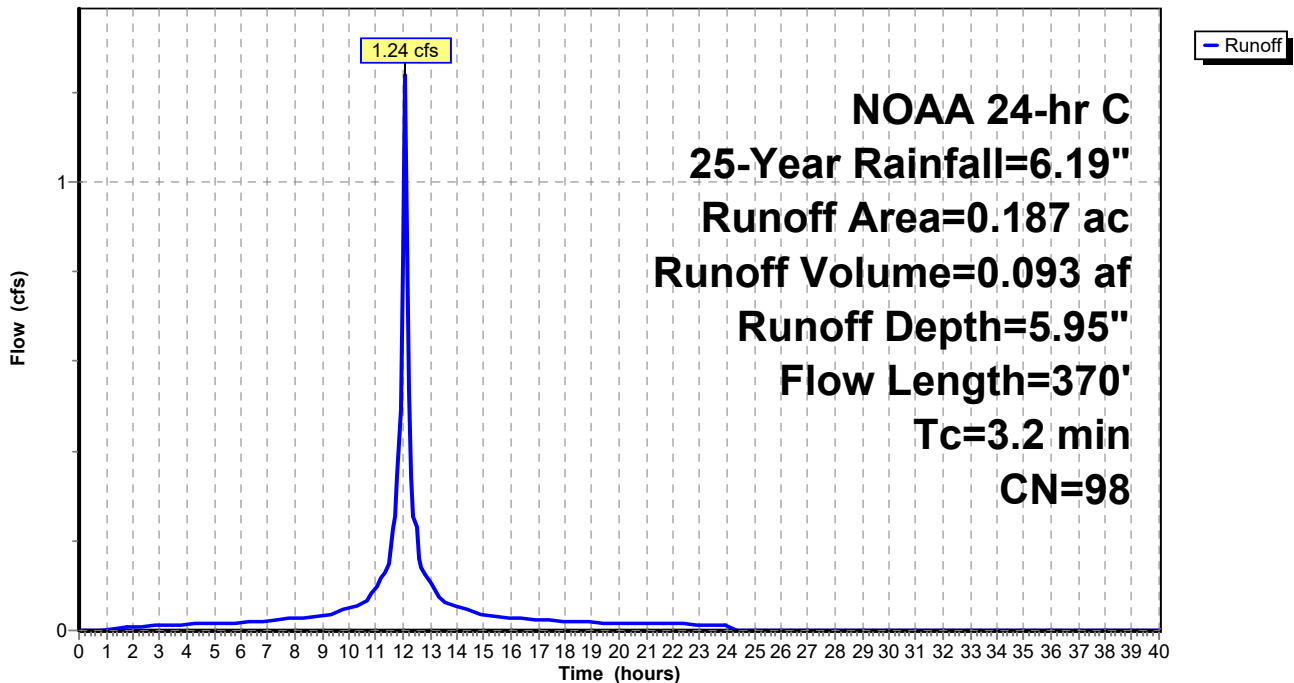
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
0.187	98	Paved parking, HSG D
0.187		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.06		Sheet Flow, F-G Smooth surfaces n= 0.011 P2= 3.31"
1.0	150	0.0150	2.49		Shallow Concentrated Flow, G-H Paved Kv= 20.3 fps
0.6	120	0.0030	3.26	5.75	Pipe Channel, H-I 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
3.2	370	Total			

Subcatchment 28S: PDA 3 - Impervious

Hydrograph



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Summary for Subcatchment 29S: PDA 1B - Pervious

Runoff = 5.96 cfs @ 12.10 hrs, Volume= 0.389 af, Depth= 3.95"

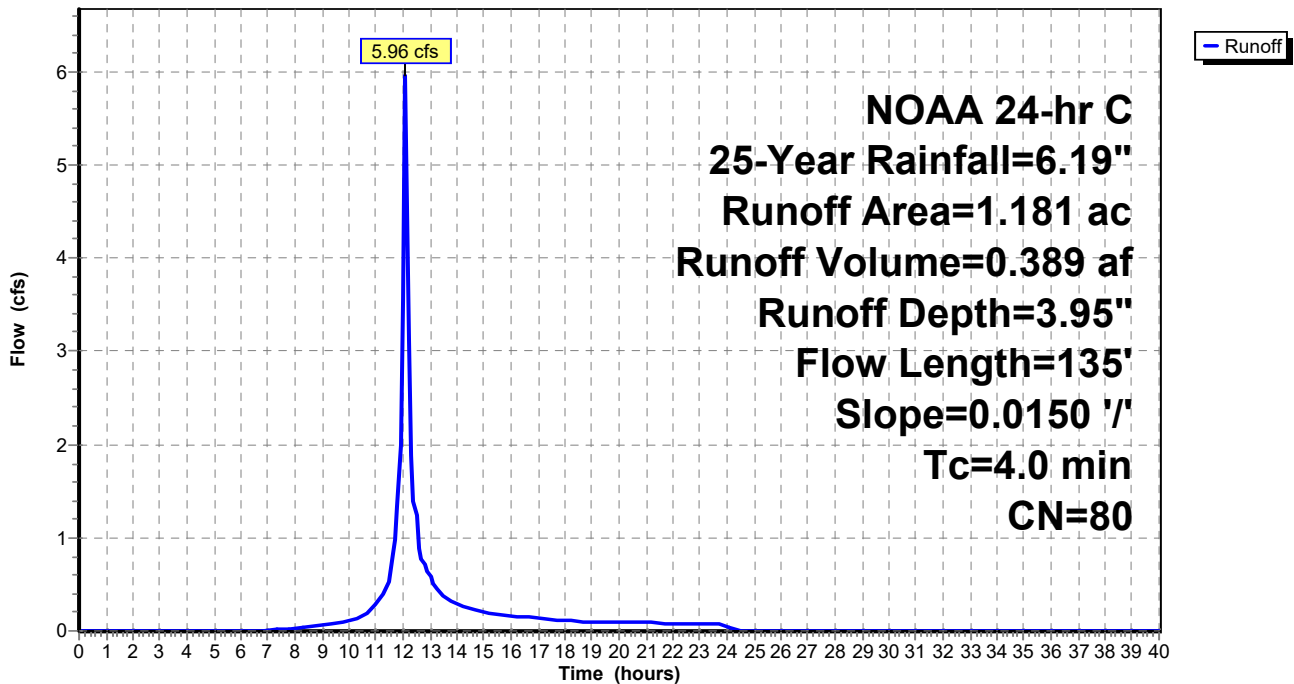
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
1.181	80	>75% Grass cover, Good, HSG D
1.181		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	18	0.0150	0.11		Sheet Flow, AD-AE Grass: Short n= 0.150 P2= 3.31"
1.1	82	0.0150	1.20		Sheet Flow, AE-AF Smooth surfaces n= 0.011 P2= 3.31"
0.2	35	0.0150	2.49		Shallow Concentrated Flow, AF-AC Paved Kv= 20.3 fps
4.0	135	Total			

Subcatchment 29S: PDA 1B - Pervious

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Summary for Subcatchment 30S: PDA 1B - Impervious

Runoff = 9.82 cfs @ 12.07 hrs, Volume= 0.788 af, Depth= 5.95"

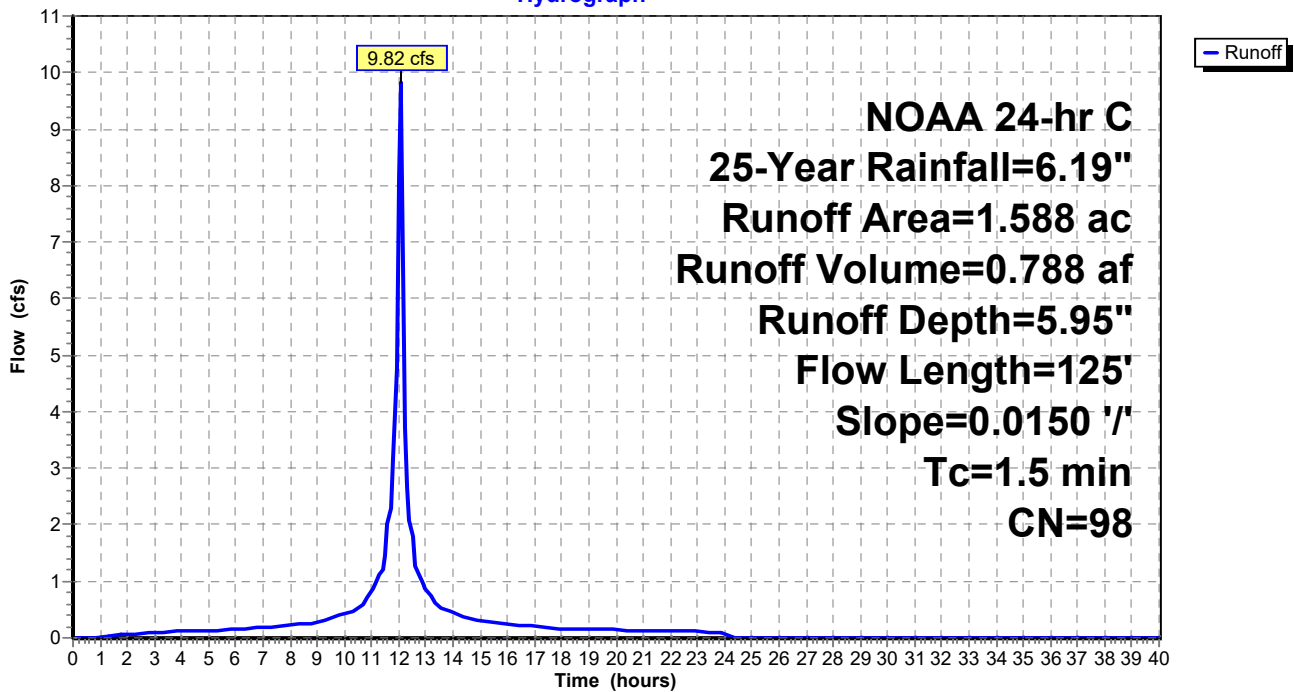
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
1.588	98	Paved parking, HSG C
1.588		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AA-AB Smooth surfaces n= 0.011 P2= 3.31"
0.2	25	0.0150	2.49		Shallow Concentrated Flow, AB-AC Paved Kv= 20.3 fps
1.5	125	Total			

Subcatchment 30S: PDA 1B - Impervious

Hydrograph



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Summary for Subcatchment 33S: PDA 1A - Pervious

Runoff = 11.40 cfs @ 12.26 hrs, Volume= 1.084 af, Depth= 3.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
1.768	80	>75% Grass cover, Good, HSG D
1.610	77	Woods, Good, HSG D
3.378	79	Weighted Average
3.378		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		Sheet Flow, AG-AH Grass: Short n= 0.150 P2= 3.31"
1.5	90	0.0200	0.99		Shallow Concentrated Flow, AH-AI Short Grass Pasture Kv= 7.0 fps
2.7	422	0.0025	2.63	3.23	Pipe Channel, AI-AJ 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
2.6	807	0.0050	5.09	16.00	Pipe Channel, AJ-X 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.3	117	0.0050	6.67	47.16	Pipe Channel, X-Y 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
16.8	1,581	Total			

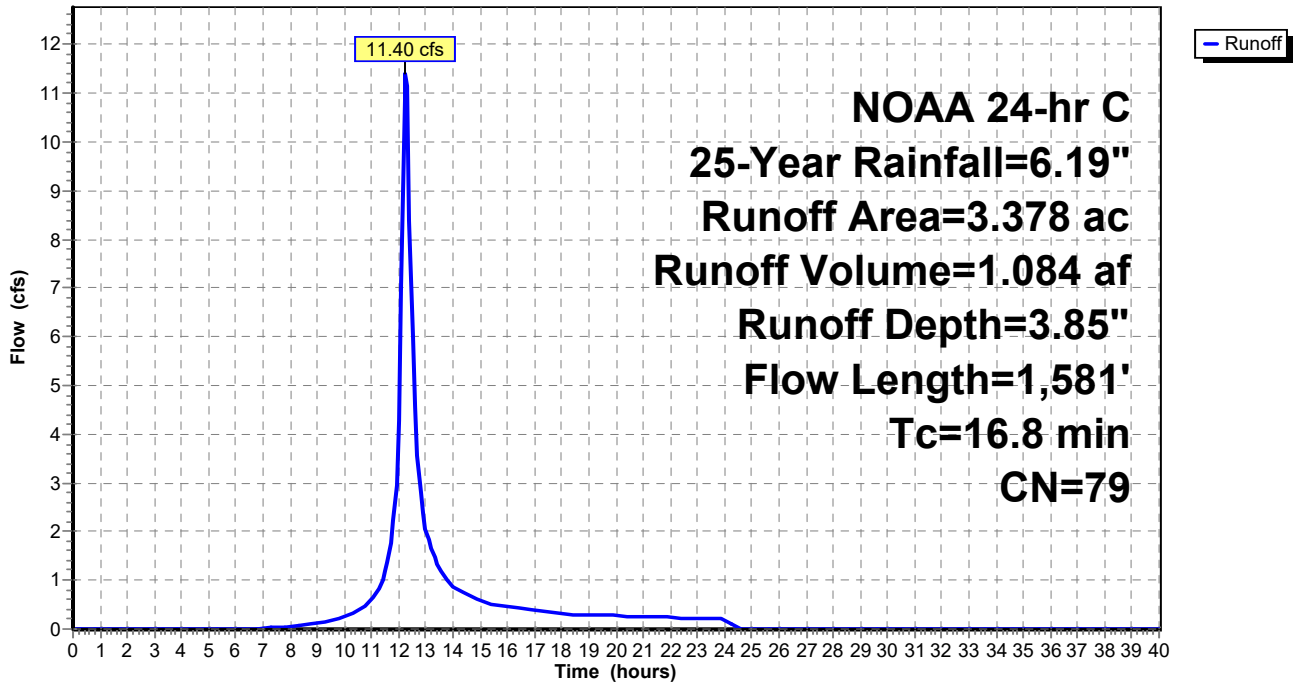
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Subcatchment 33S: PDA 1A - Pervious

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Summary for Subcatchment 40S: PDA 1A - Impervious

Runoff = 58.00 cfs @ 12.10 hrs, Volume= 4.510 af, Depth= 5.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
9.094	98	Paved parking, HSG C
9.094		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AQ-AR Smooth surfaces n= 0.011 P2= 3.31"
0.6	90	0.0150	2.49		Shallow Concentrated Flow, AR-AS Paved Kv= 20.3 fps
0.1	181	0.3500	35.17	62.14	Pipe Channel, AS-Y (18 inch) 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
1.0	222	0.0025	3.60	11.31	Pipe Channel, AS-Y (24 inch - Section 1) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
1.0	247	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 2) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.5	134	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 3) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
4.6	1,019	Total			

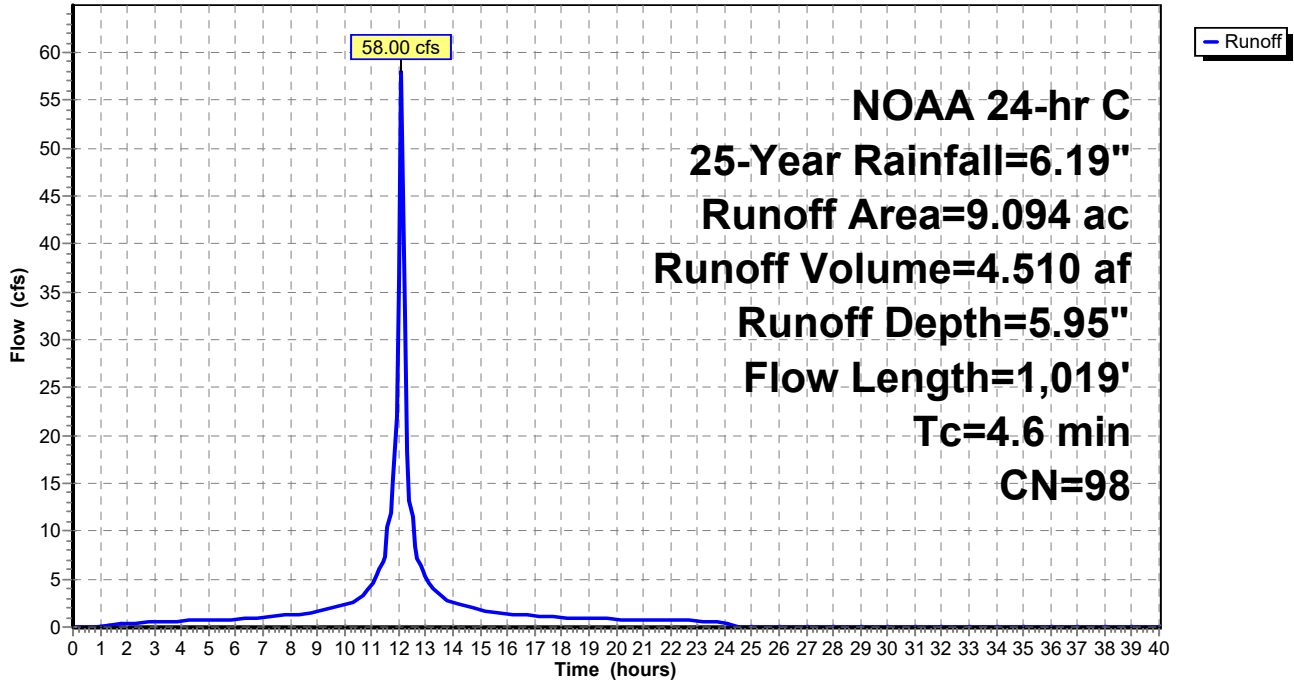
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Subcatchment 40S: PDA 1A - Impervious

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Summary for Subcatchment 46S: EDA 1 - Impervious

Runoff = 69.13 cfs @ 12.16 hrs, Volume= 6.365 af, Depth= 5.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 25-Year Rainfall=6.19"

Area (ac)	CN	Description
12.834	98	Paved parking, HSG C
12.834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	58	0.0010	0.38		Sheet Flow, V-W Smooth surfaces n= 0.011 P2= 3.31"
1.1	42	0.0040	0.62		Sheet Flow, W-X Smooth surfaces n= 0.011 P2= 3.31"
0.8	90	0.0080	1.82		Shallow Concentrated Flow, X-Y Paved Kv= 20.3 fps
0.8	175	0.0050	3.72	4.57	Pipe Channel, Y-Z 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
3.3	1,235	0.0075	6.24	19.59	Pipe Channel, Z-AA 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
8.6	1,600	Total			

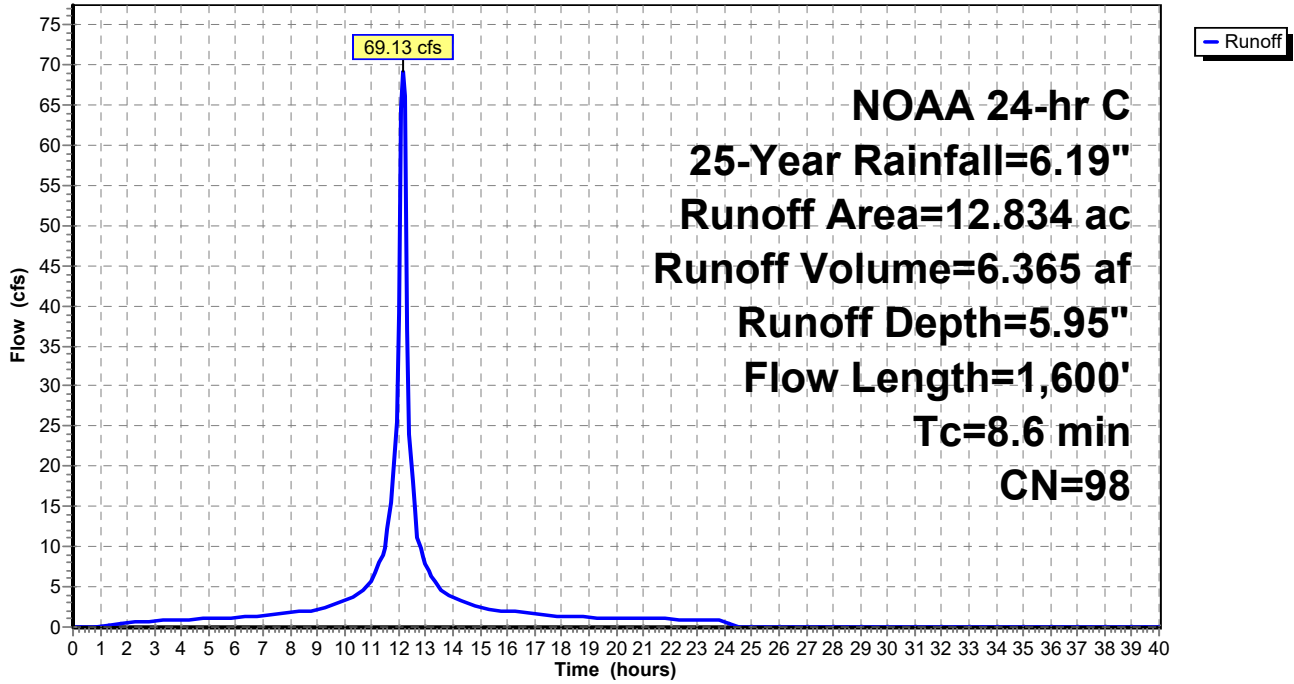
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Subcatchment 46S: EDA 1 - Impervious

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Summary for Pond 45P: Bioretention Basin

Inflow Area = 2.769 ac, 57.35% Impervious, Inflow Depth = 5.10" for 25-Year event
 Inflow = 15.67 cfs @ 12.08 hrs, Volume= 1.177 af
 Outflow = 11.84 cfs @ 12.15 hrs, Volume= 1.177 af, Atten= 24%, Lag= 4.0 min
 Primary = 11.84 cfs @ 12.15 hrs, Volume= 1.177 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 Peak Elev= 48.67' @ 12.15 hrs Surf.Area= 18,727 sf Storage= 11,810 cf

Plug-Flow detention time= 131.9 min calculated for 1.174 af (100% of inflow)
 Center-of-Mass det. time= 132.8 min (898.1 - 765.3)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	18,218 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	16,690	0	0
49.00	19,745	18,218	18,218

Device	Routing	Invert	Outlet Devices
#1	Primary	43.94'	18.0" Round Culvert L= 205.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 43.94' / 43.32' S= 0.0030 ' S= 0.0030 ' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	48.00'	1.000 in/hr Exfiltration X 0.50 over Surface area
#3	Device 1	48.35'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=11.29 cfs @ 12.15 hrs HW=48.66' (Free Discharge)

- 1=Culvert (Passes 11.29 cfs of 12.49 cfs potential flow)
- 2=Exfiltration (Exfiltration Controls 0.22 cfs)
- 3=Orifice/Grate (Weir Controls 11.08 cfs @ 1.81 fps)

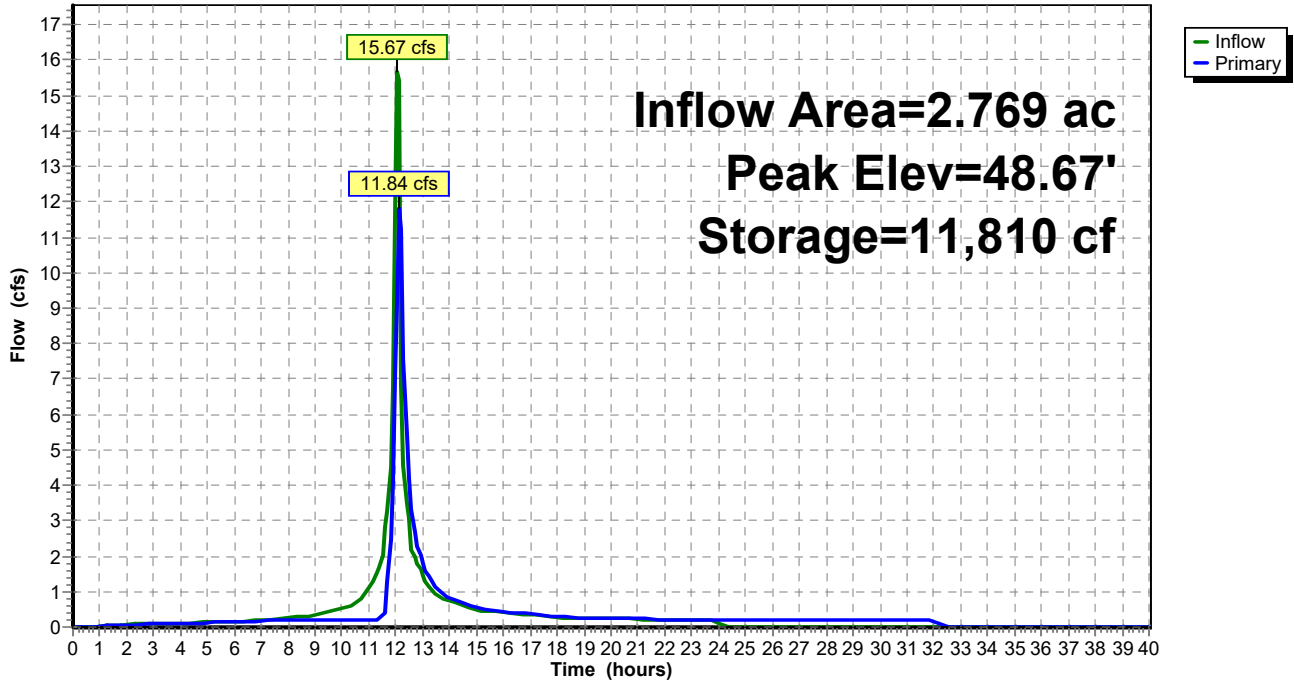
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Pond 45P: Bioretention Basin

Hydrograph



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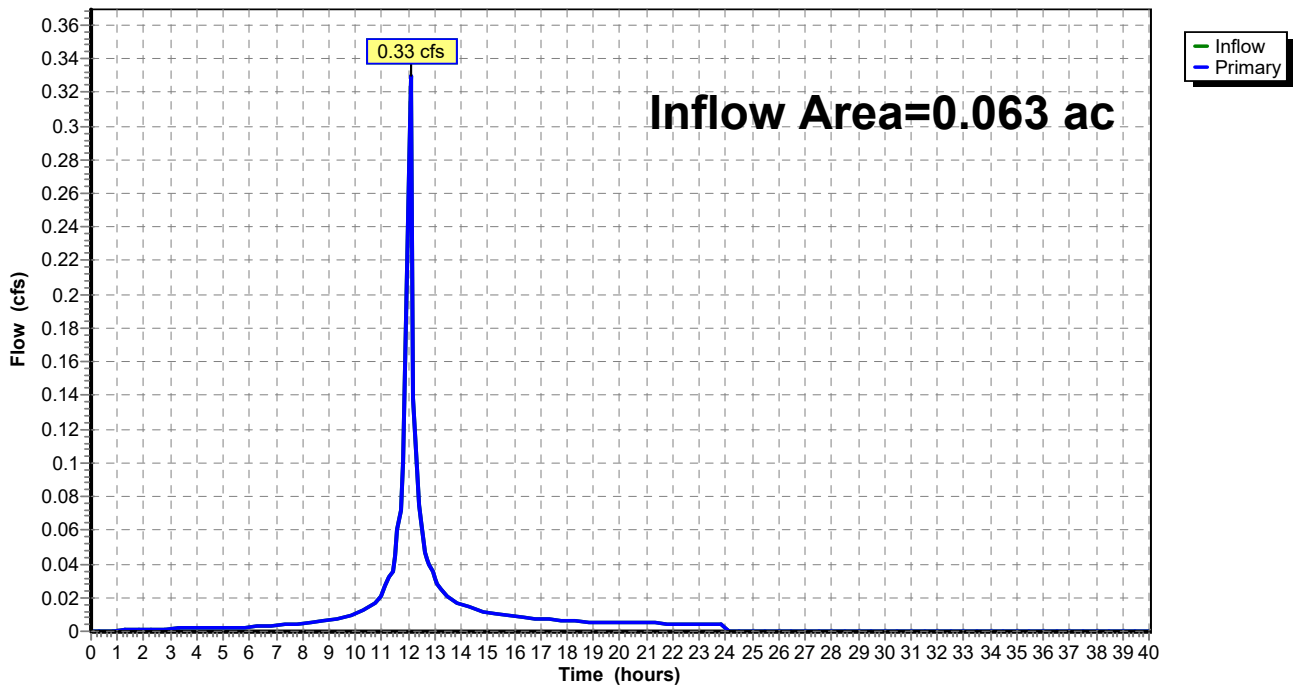
Summary for Link 4L: EDA 4

Inflow Area = 0.063 ac, 41.27% Impervious, Inflow Depth = 4.78" for 25-Year event
Inflow = 0.33 cfs @ 12.07 hrs, Volume= 0.025 af
Primary = 0.33 cfs @ 12.07 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 4L: EDA 4

Hydrograph



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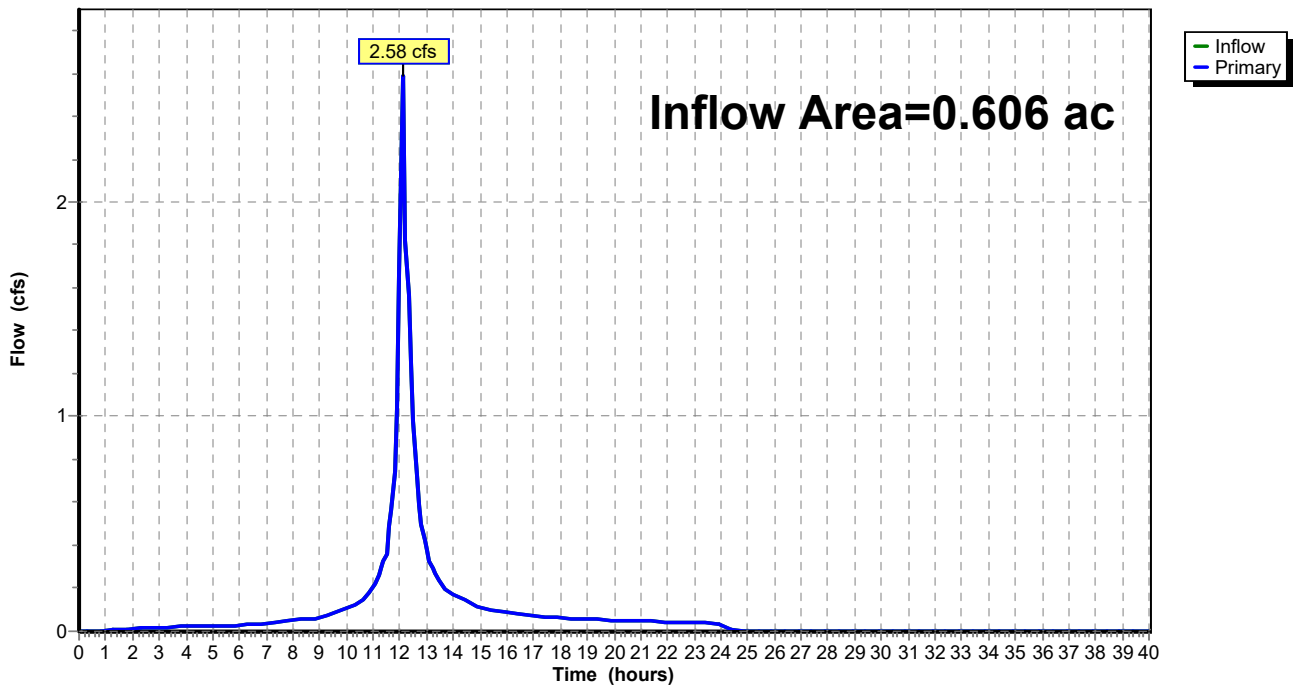
Summary for Link 7L: EDA 3

Inflow Area = 0.606 ac, 50.99% Impervious, Inflow Depth = 4.97" for 25-Year event
Inflow = 2.58 cfs @ 12.10 hrs, Volume= 0.251 af
Primary = 2.58 cfs @ 12.10 hrs, Volume= 0.251 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 7L: EDA 3

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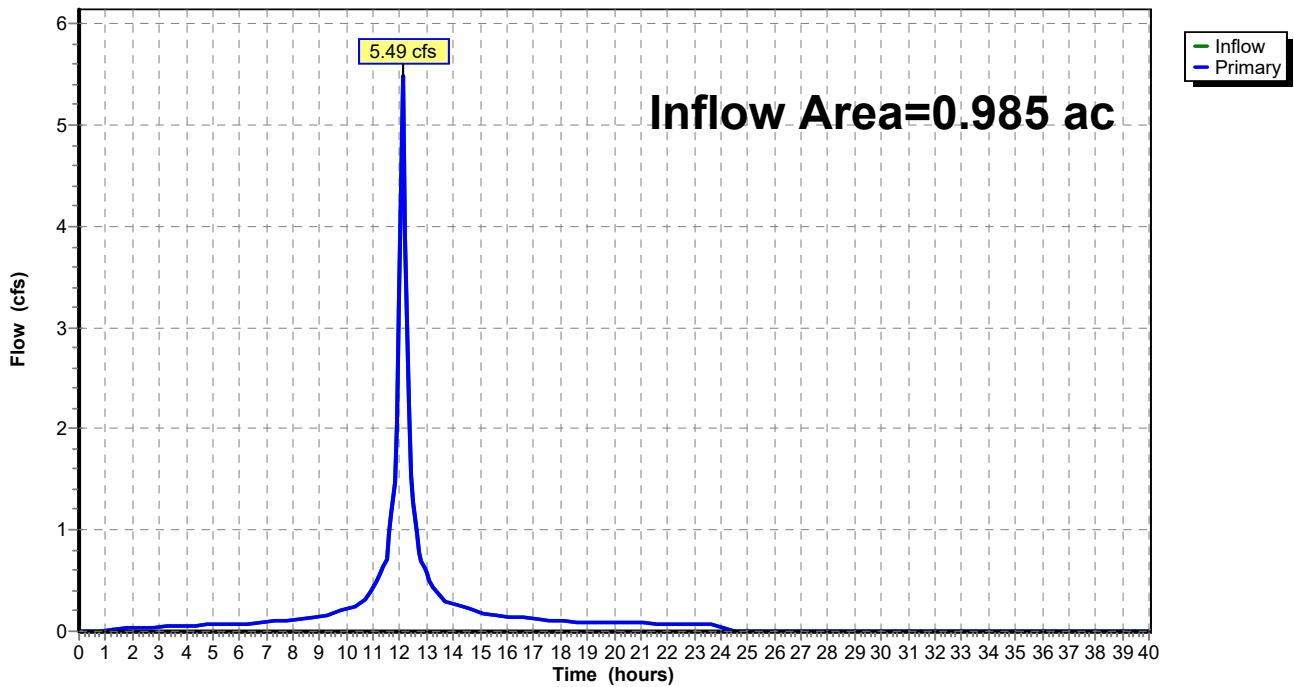
Summary for Link 10L: EDA 2

Inflow Area = 0.985 ac, 79.70% Impervious, Inflow Depth = 5.55" for 25-Year event
Inflow = 5.49 cfs @ 12.11 hrs, Volume= 0.455 af
Primary = 5.49 cfs @ 12.11 hrs, Volume= 0.455 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 10L: EDA 2

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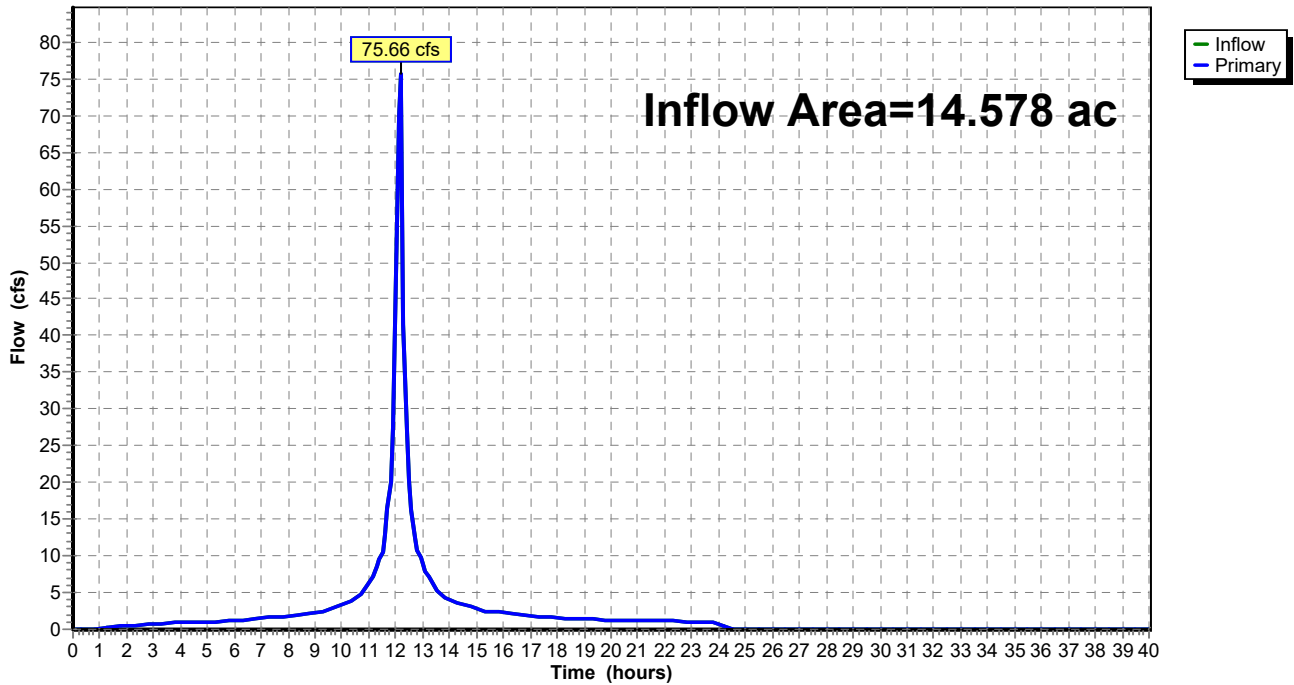
Summary for Link 13L: EDA 1

Inflow Area = 14.578 ac, 88.04% Impervious, Inflow Depth = 5.68" for 25-Year event
Inflow = 75.66 cfs @ 12.16 hrs, Volume= 6.895 af
Primary = 75.66 cfs @ 12.16 hrs, Volume= 6.895 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 13L: EDA 1

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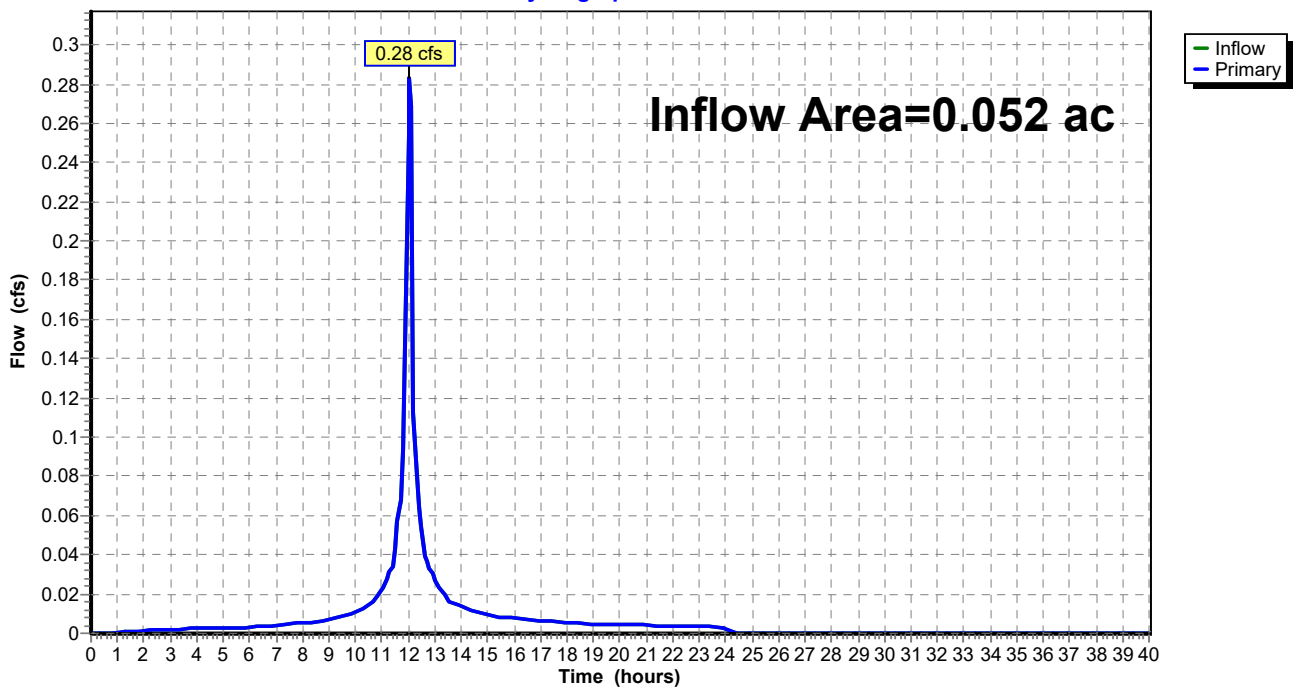
Summary for Link 24L: PDA 4

Inflow Area = 0.052 ac, 65.38% Impervious, Inflow Depth = 5.26" for 25-Year event
Inflow = 0.28 cfs @ 12.06 hrs, Volume= 0.023 af
Primary = 0.28 cfs @ 12.06 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 24L: PDA 4

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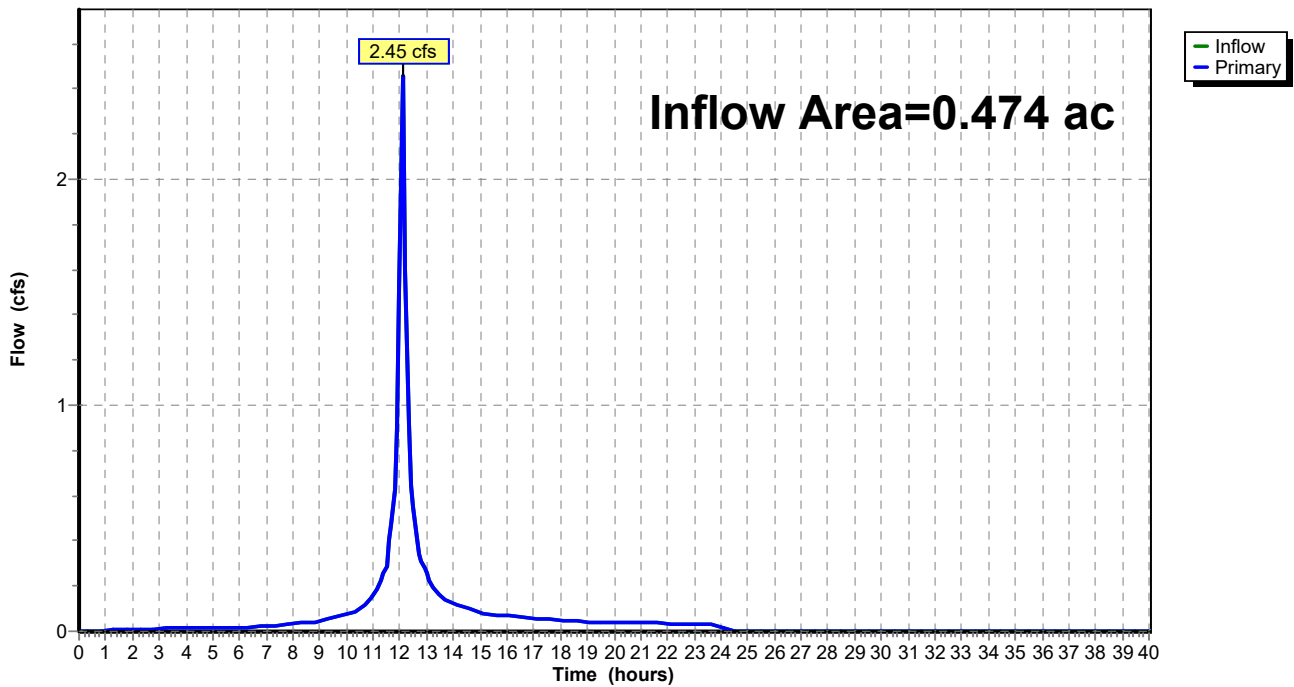
Summary for Link 25L: PDA 3

Inflow Area = 0.474 ac, 39.45% Impervious, Inflow Depth = 4.74" for 25-Year event
Inflow = 2.45 cfs @ 12.10 hrs, Volume= 0.187 af
Primary = 2.45 cfs @ 12.10 hrs, Volume= 0.187 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 25L: PDA 3

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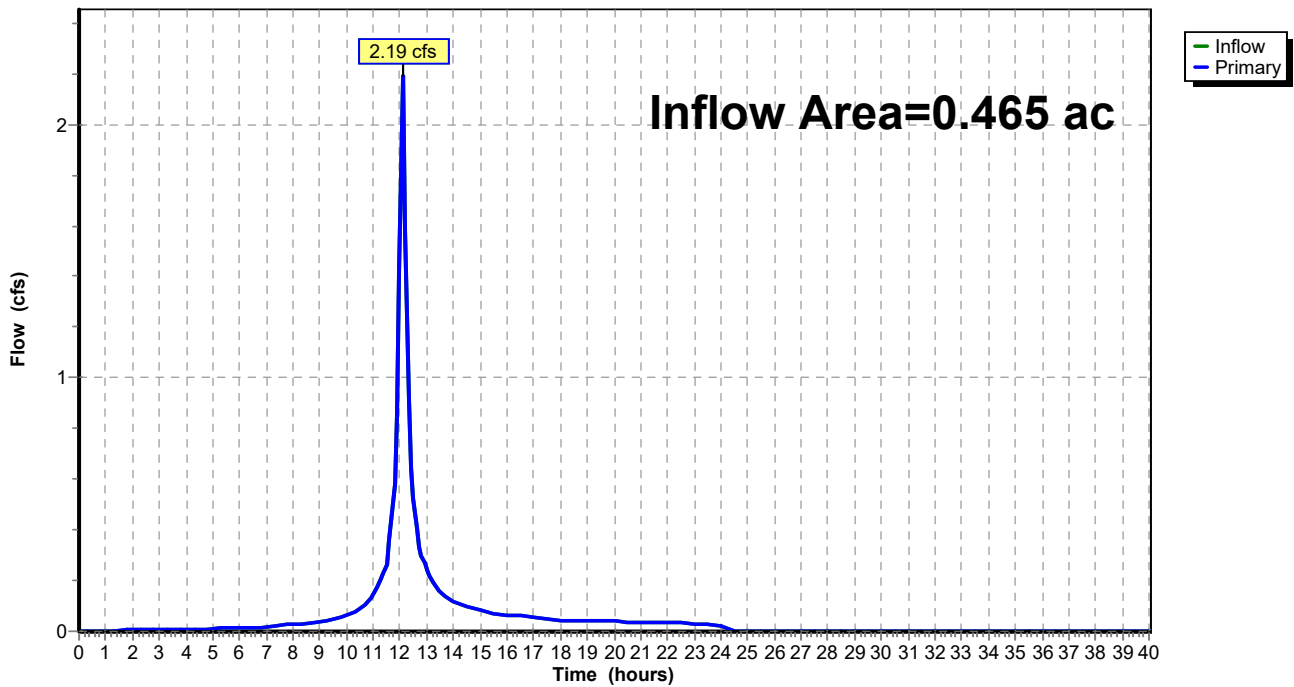
Summary for Link 26L: PDA 2

Inflow Area = 0.465 ac, 27.53% Impervious, Inflow Depth = 4.50" for 25-Year event
Inflow = 2.19 cfs @ 12.11 hrs, Volume= 0.175 af
Primary = 2.19 cfs @ 12.11 hrs, Volume= 0.175 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 26L: PDA 2

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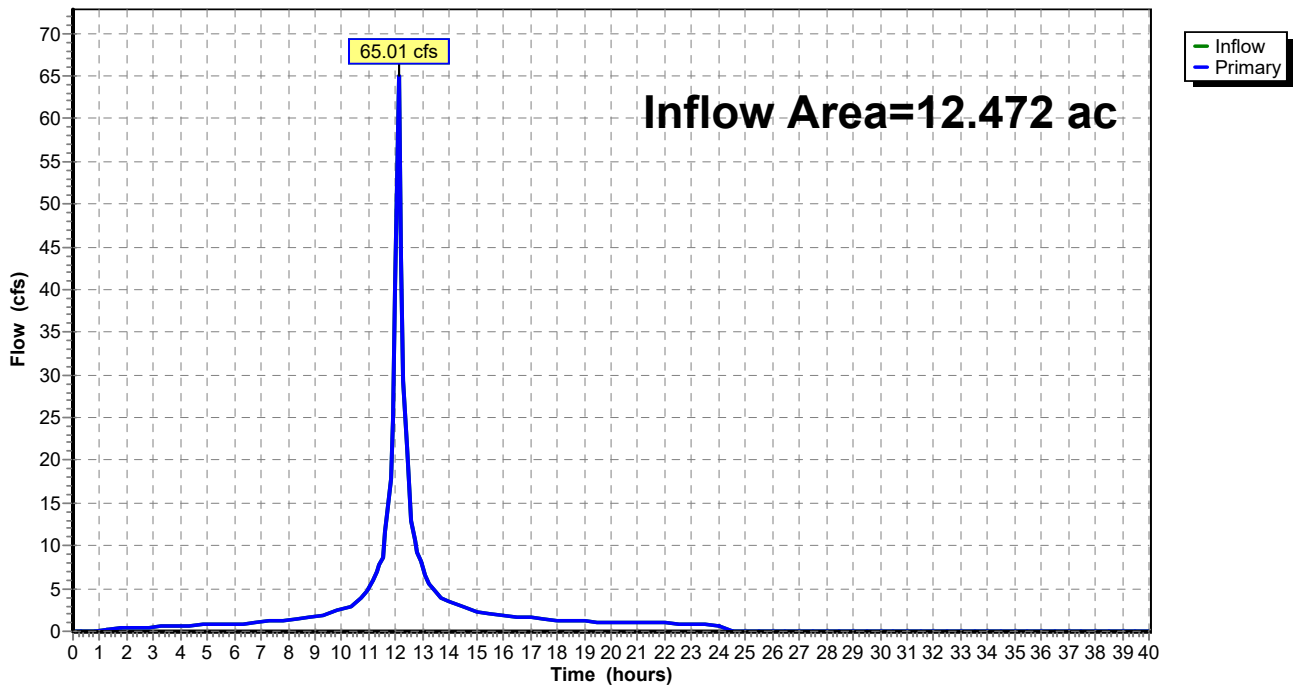
Summary for Link 35L: PDA 1A

Inflow Area = 12.472 ac, 72.92% Impervious, Inflow Depth = 5.38" for 25-Year event
Inflow = 65.01 cfs @ 12.10 hrs, Volume= 5.594 af
Primary = 65.01 cfs @ 12.10 hrs, Volume= 5.594 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 35L: PDA 1A

Hydrograph



ex-pr

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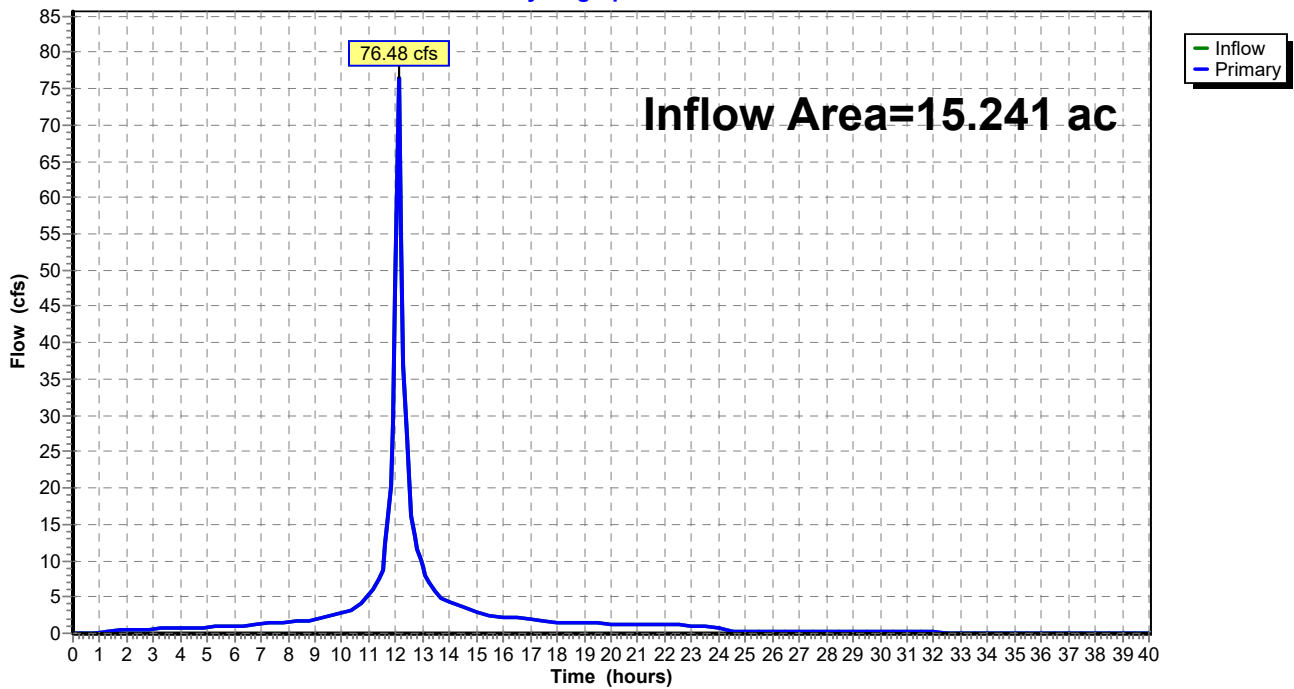
Summary for Link 44L: PDA 1

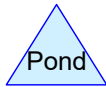
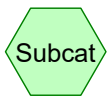
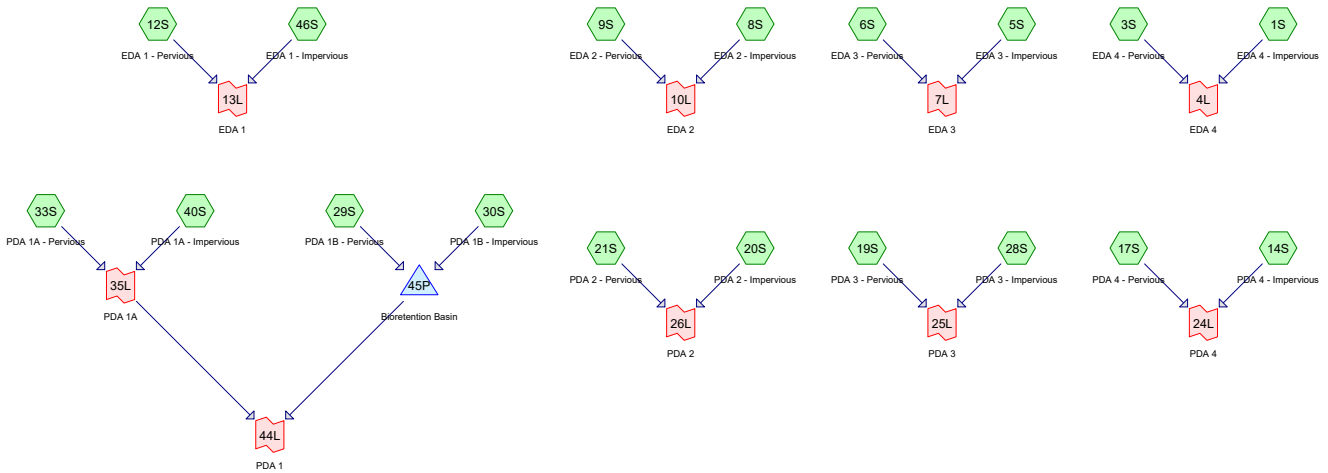
Inflow Area = 15.241 ac, 70.09% Impervious, Inflow Depth = 5.33" for 25-Year event
Inflow = 76.48 cfs @ 12.11 hrs, Volume= 6.771 af
Primary = 76.48 cfs @ 12.11 hrs, Volume= 6.771 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 44L: PDA 1

Hydrograph





Routing Diagram for ex-pr
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Summary for Subcatchment 1S: EDA 4 - Impervious

Runoff = 0.20 cfs @ 12.03 hrs, Volume= 0.018 af, Depth= 8.09"

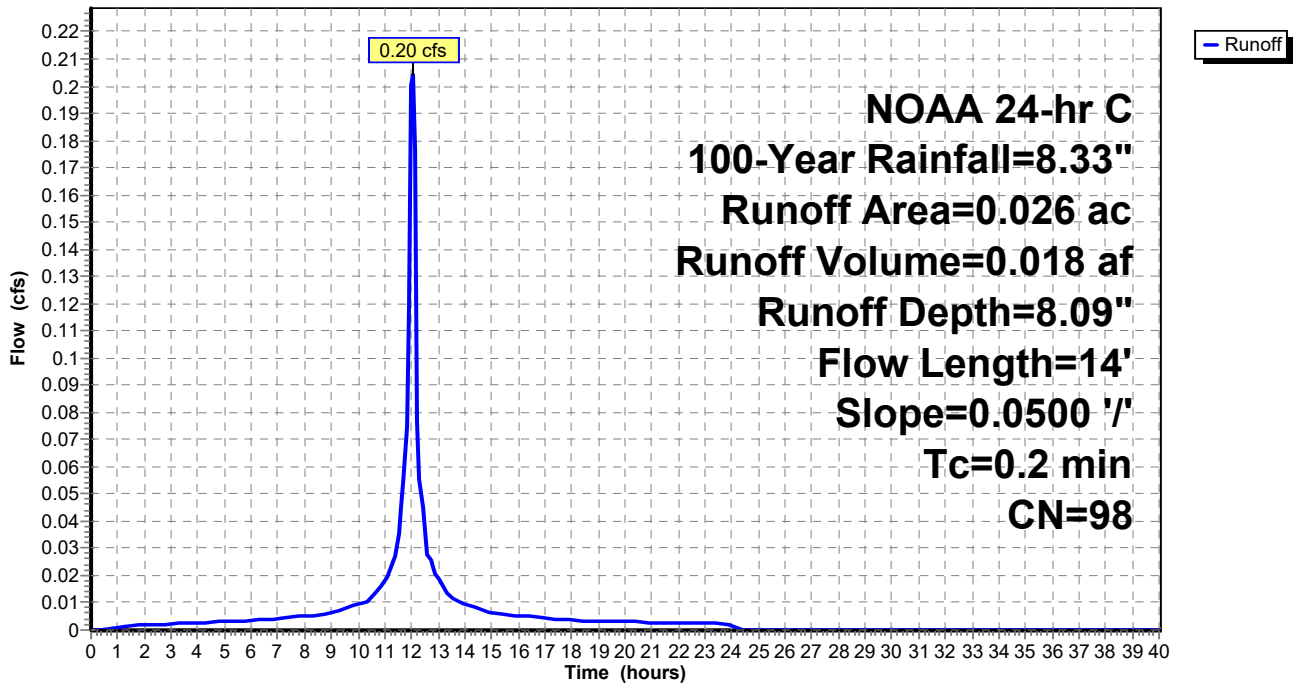
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
0.026	98	Paved parking, HSG D
0.026		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0500	1.36		Sheet Flow, D-E Smooth surfaces n= 0.011 P2= 3.31"

Subcatchment 1S: EDA 4 - Impervious

Hydrograph



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Summary for Subcatchment 3S: EDA 4 - Pervious

Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.018 af, Depth= 5.94"

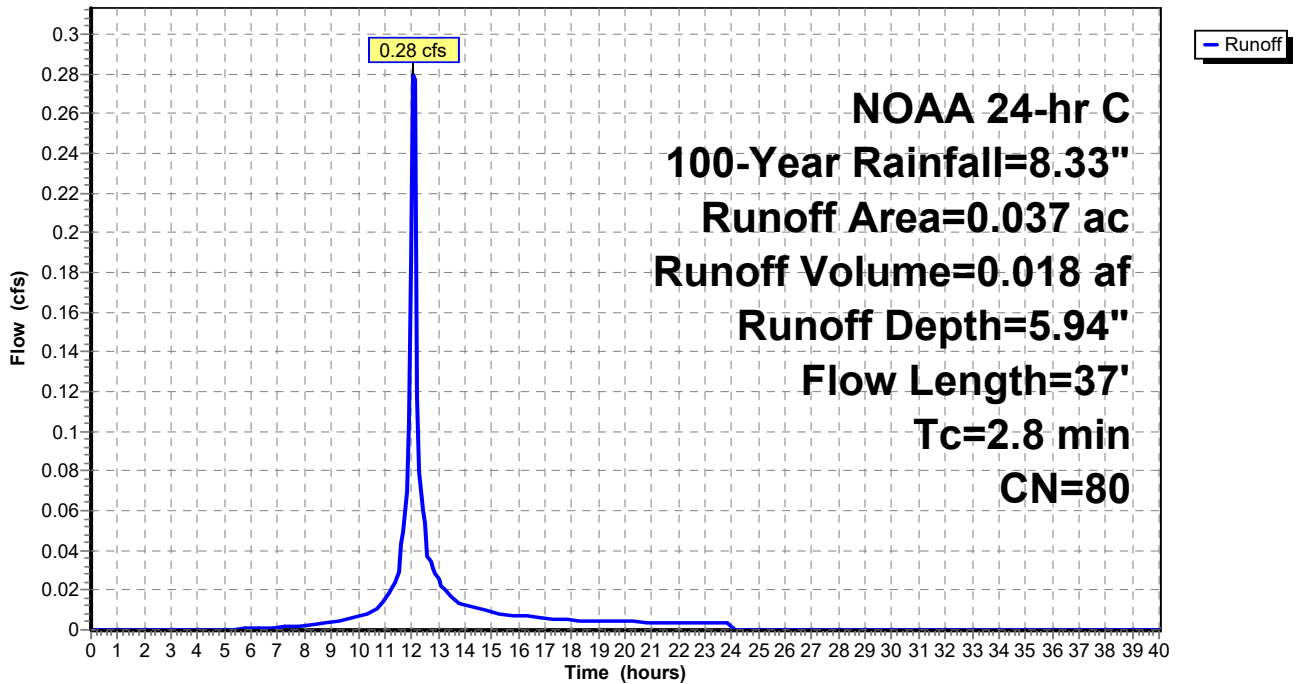
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
0.037	80	>75% Grass cover, Good, HSG D
0.037		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.31"
0.1	12	0.0650	1.47		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.31"
2.8	37	Total			

Subcatchment 3S: EDA 4 - Pervious

Hydrograph



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Summary for Subcatchment 5S: EDA 3 - Impervious

Runoff = 2.75 cfs @ 12.09 hrs, Volume= 0.208 af, Depth= 8.09"

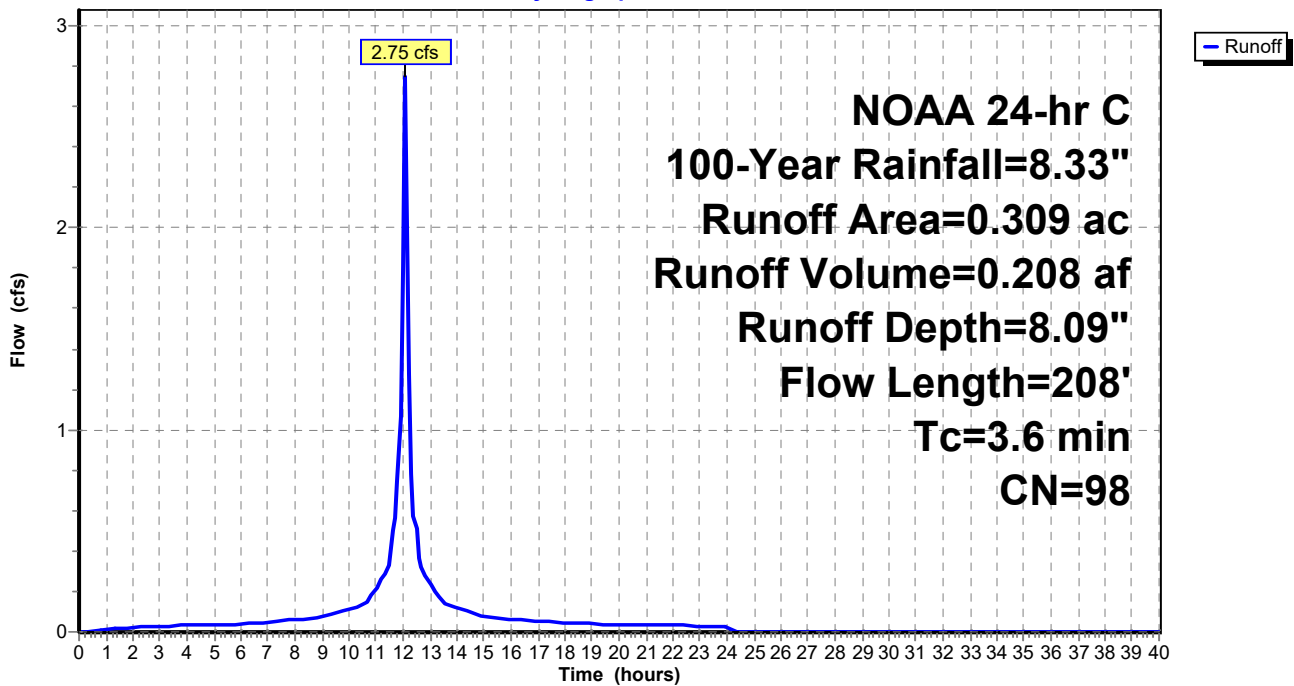
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
0.309	98	Paved parking, HSG D
0.309		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	100	0.0040	0.73		Sheet Flow, F-G Smooth surfaces n= 0.011 P2= 3.31"
1.3	108	0.0050	1.44		Shallow Concentrated Flow, G-H Paved Kv= 20.3 fps
3.6	208	Total			

Subcatchment 5S: EDA 3 - Impervious

Hydrograph



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Summary for Subcatchment 6S: EDA 3 - Pervious

Runoff = 1.46 cfs @ 12.29 hrs, Volume= 0.147 af, Depth= 5.94"

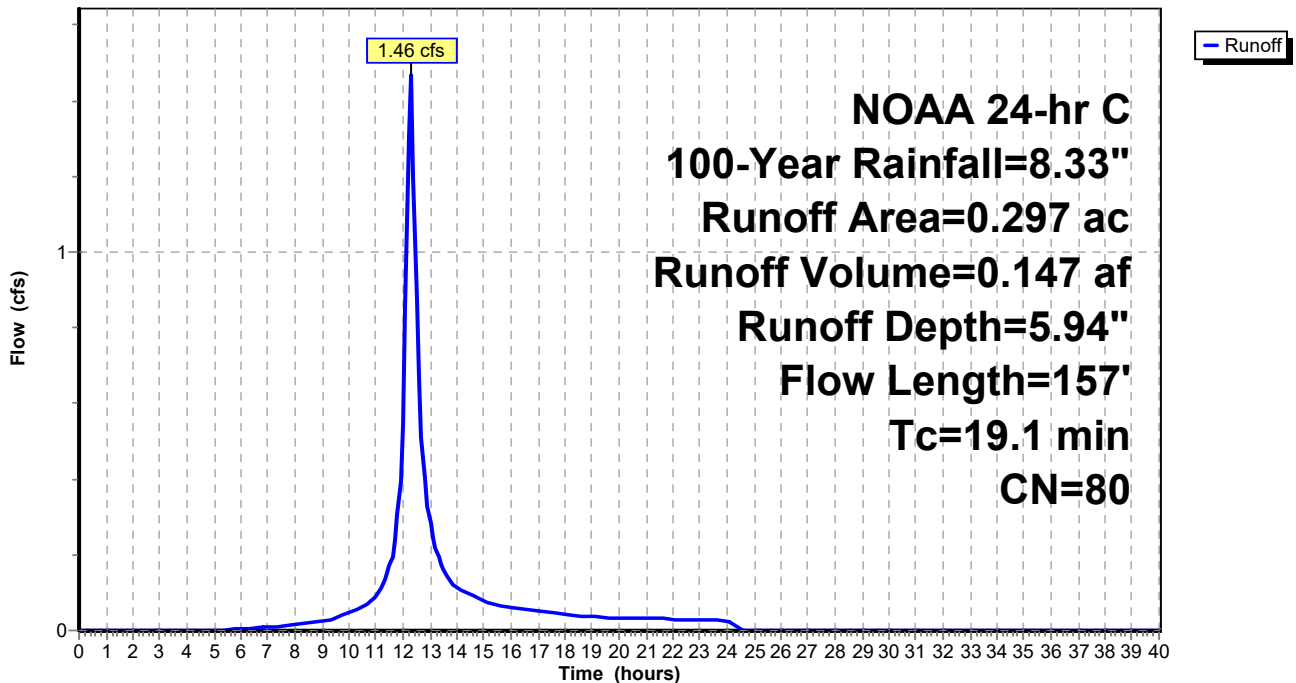
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
0.297	80	>75% Grass cover, Good, HSG D
0.297		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	72	0.0100	0.12		Sheet Flow, I-J Grass: Short n= 0.150 P2= 3.31"
8.4	42	0.0050	0.08		Sheet Flow, J-K Grass: Short n= 0.150 P2= 3.31"
0.9	28	0.0050	0.49		Shallow Concentrated Flow, K-L Short Grass Pasture Kv= 7.0 fps
0.0	15	0.0100	5.94	10.50	Pipe Channel, K-H 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
19.1	157	Total			

Subcatchment 6S: EDA 3 - Pervious

Hydrograph



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Summary for Subcatchment 8S: EDA 2 - Impervious

Runoff = 6.56 cfs @ 12.10 hrs, Volume= 0.529 af, Depth= 8.09"

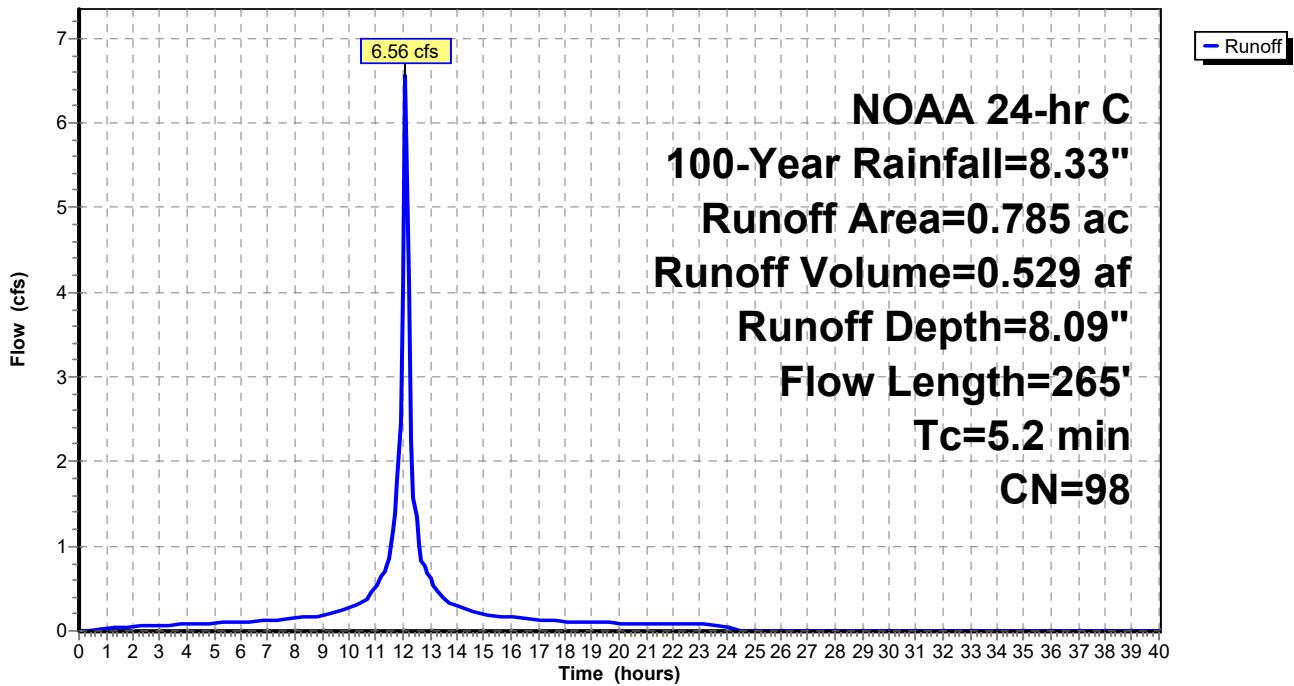
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
0.785	98	Paved parking, HSG D
0.785		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	30	0.0040	0.58		Sheet Flow, P-Q Smooth surfaces n= 0.011 P2= 3.31"
1.5	80	0.0170	0.91		Shallow Concentrated Flow, Q-M Short Grass Pasture Kv= 7.0 fps
2.8	155	0.0020	0.91		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
5.2	265	Total			

Subcatchment 8S: EDA 2 - Impervious

Hydrograph



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Summary for Subcatchment 9S: EDA 2 - Pervious

Runoff = 1.19 cfs @ 12.19 hrs, Volume= 0.099 af, Depth= 5.94"

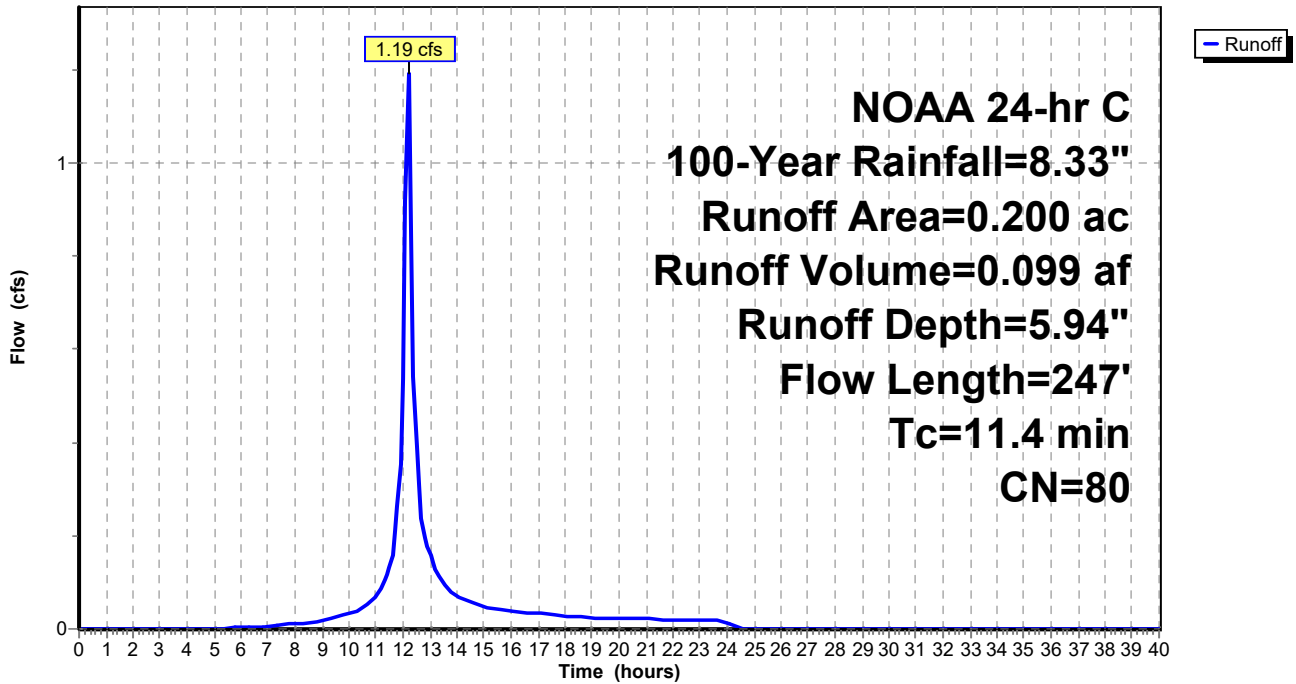
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
0.200	80	>75% Grass cover, Good, HSG D
0.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	78	0.0170	0.15		Sheet Flow, L-M Grass: Short n= 0.150 P2= 3.31"
0.2	14	0.0540	1.40		Sheet Flow, M-N Smooth surfaces n= 0.011 P2= 3.31"
2.8	155	0.0020	0.91		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
11.4	247	Total			

Subcatchment 9S: EDA 2 - Pervious

Hydrograph



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Summary for Subcatchment 12S: EDA 1 - Pervious

Runoff = 10.09 cfs @ 12.18 hrs, Volume= 0.811 af, Depth= 5.58"

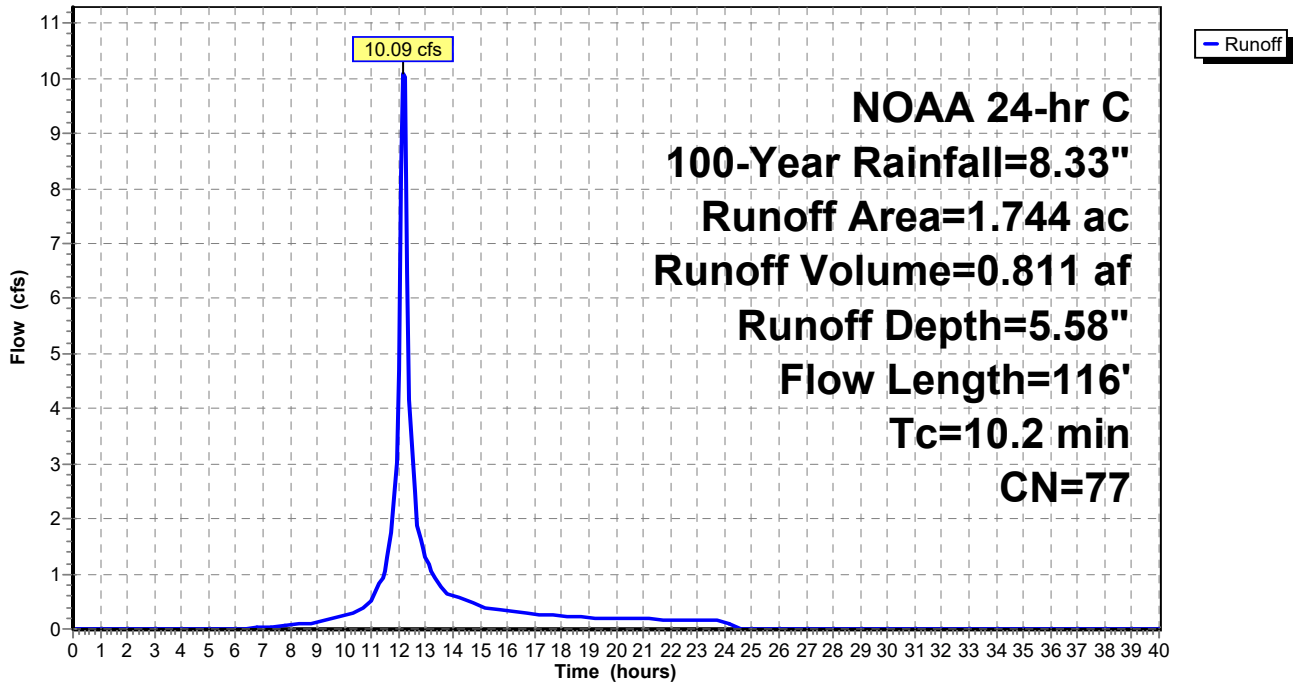
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
1.610	77	Woods, Good, HSG D
0.134	80	>75% Grass cover, Good, HSG D
1.744	77	Weighted Average
1.744		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	41	0.0250	0.07		Sheet Flow, R-S Woods: Light underbrush n= 0.400 P2= 3.31"
0.6	60	0.1170	1.71		Shallow Concentrated Flow, S-T Woodland Kv= 5.0 fps
0.1	15	0.2670	2.58		Shallow Concentrated Flow, T-U Woodland Kv= 5.0 fps
10.2	116	Total			

Subcatchment 12S: EDA 1 - Pervious

Hydrograph



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Summary for Subcatchment 14S: PDA 4 - Impervious

Runoff = 0.26 cfs @ 12.04 hrs, Volume= 0.023 af, Depth= 8.09"

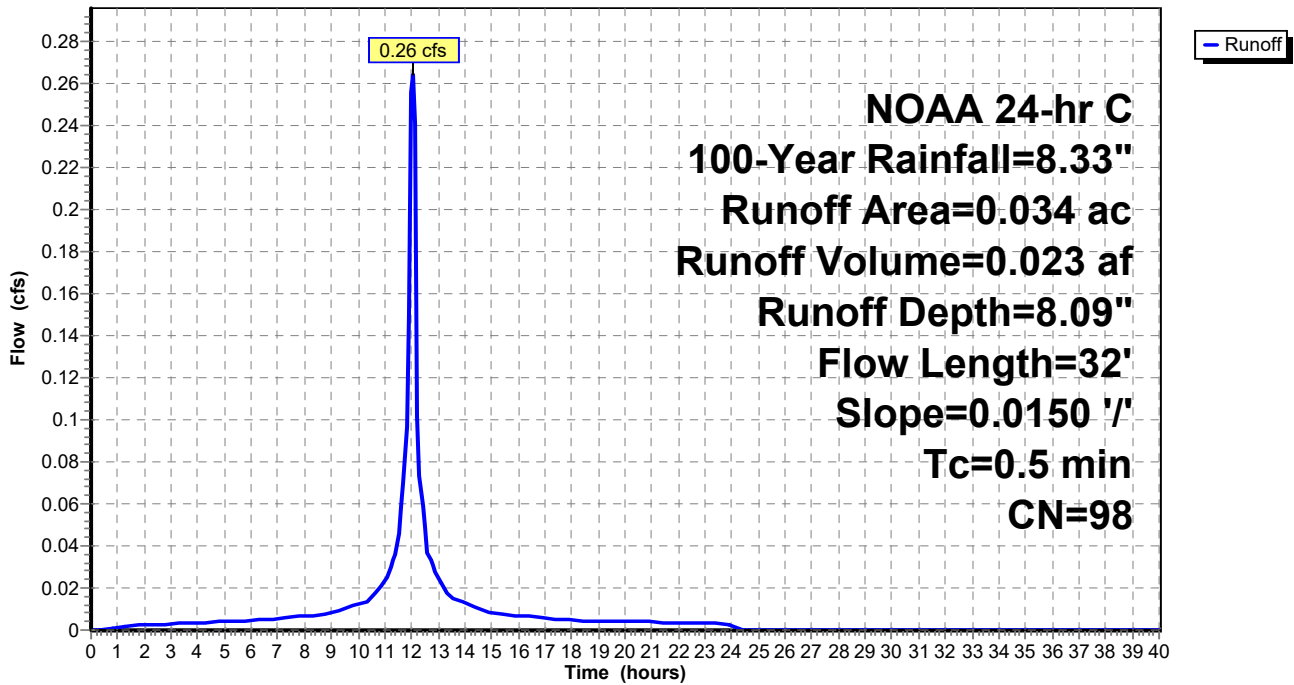
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
0.034	98	Paved parking, HSG D
0.034		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	32	0.0150	0.99		Sheet Flow, D-E Smooth surfaces n= 0.011 P2= 3.31"

Subcatchment 14S: PDA 4 - Impervious

Hydrograph



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Summary for Subcatchment 17S: PDA 4 - Pervious

Runoff = 0.13 cfs @ 12.08 hrs, Volume= 0.009 af, Depth= 5.94"

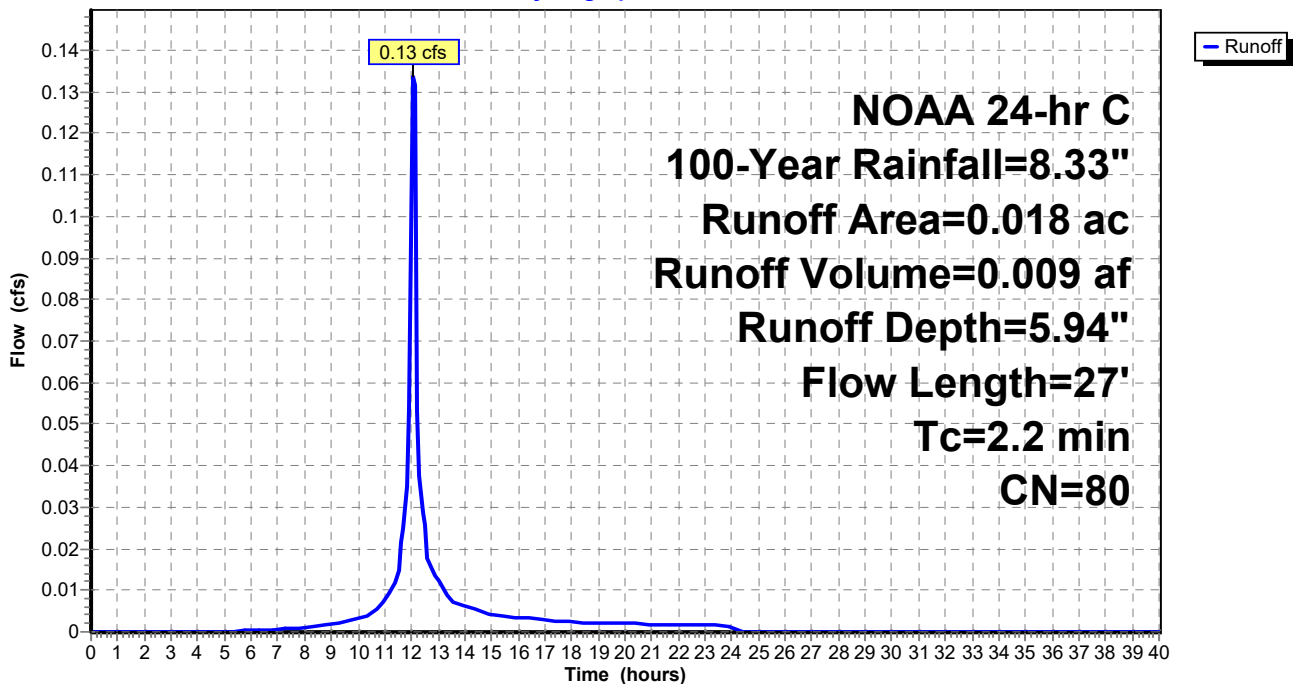
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
0.018	80	>75% Grass cover, Good, HSG D
0.018		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	15	0.0200	0.12		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.31"
0.1	12	0.0625	1.44		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.31"
2.2	27	Total			

Subcatchment 17S: PDA 4 - Pervious

Hydrograph



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Summary for Subcatchment 19S: PDA 3 - Pervious

Runoff = 1.85 cfs @ 12.12 hrs, Volume= 0.142 af, Depth= 5.94"

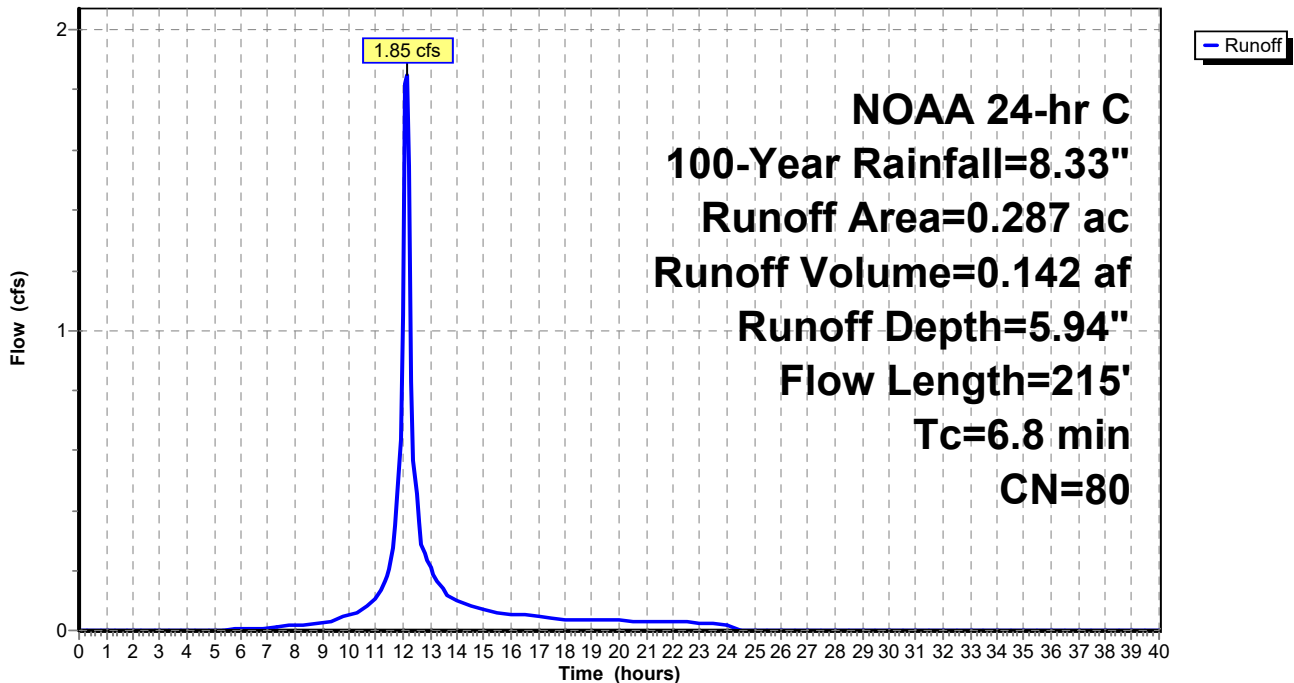
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
0.287	80	>75% Grass cover, Good, HSG D
0.287		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	45	0.0150	0.13		Sheet Flow, J-K Grass: Short n= 0.150 P2= 3.31"
0.6	75	0.0100	2.03		Shallow Concentrated Flow, K-L Paved Kv= 20.3 fps
0.5	95	0.0030	3.26	5.75	Pipe Channel, L-I 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
6.8	215	Total			

Subcatchment 19S: PDA 3 - Pervious

Hydrograph



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Summary for Subcatchment 20S: PDA 2 - Impervious

Runoff = 1.09 cfs @ 12.07 hrs, Volume= 0.086 af, Depth= 8.09"

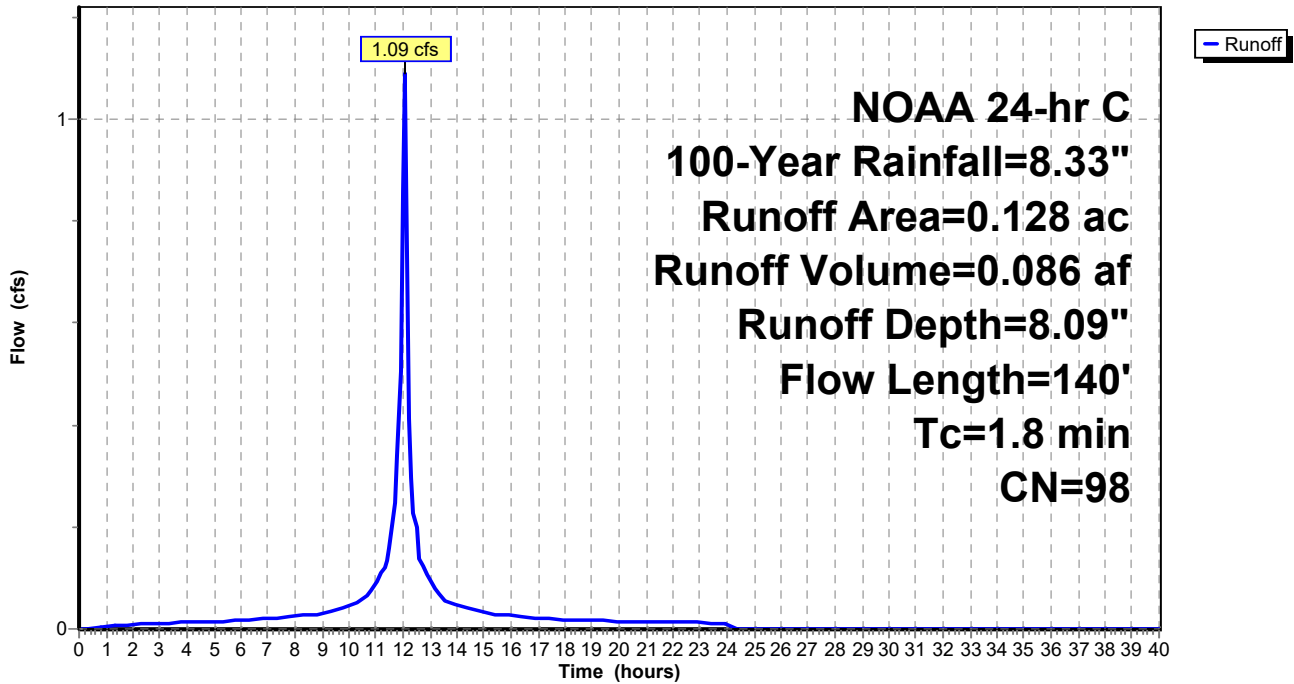
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
0.128	98	Paved parking, HSG D
0.128		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.0150	1.04		Sheet Flow, M-N Smooth surfaces n= 0.011 P2= 3.31"
0.3	50	0.0150	2.49		Shallow Concentrated Flow, N-O Paved Kv= 20.3 fps
0.9	50	0.0020	0.91		Shallow Concentrated Flow, O-P Paved Kv= 20.3 fps
1.8	140	Total			

Subcatchment 20S: PDA 2 - Impervious

Hydrograph



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Summary for Subcatchment 21S: PDA 2 - Pervious

Runoff = 2.13 cfs @ 12.13 hrs, Volume= 0.167 af, Depth= 5.94"

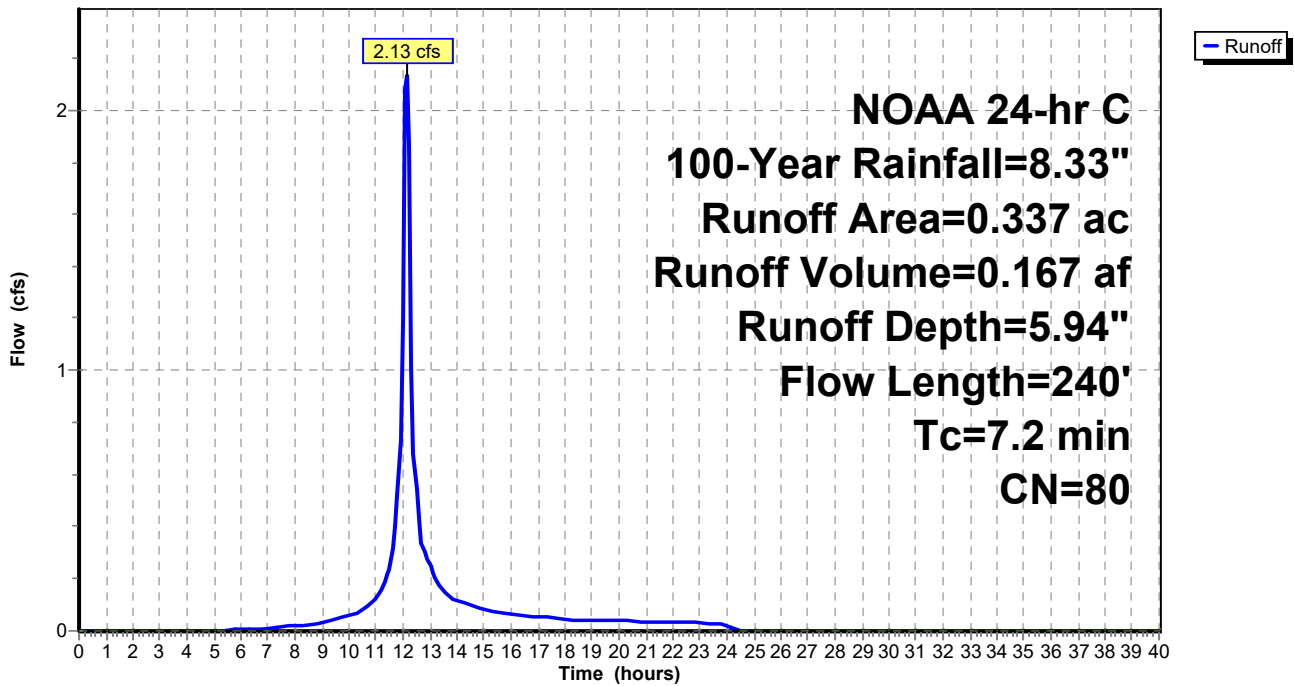
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
0.337	80	>75% Grass cover, Good, HSG D
0.337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	75	0.1000	0.31		Sheet Flow, Q-R Grass: Short n= 0.150 P2= 3.31"
1.3	60	0.0125	0.78		Shallow Concentrated Flow, R-S Short Grass Pasture Kv= 7.0 fps
1.9	105	0.0020	0.91		Shallow Concentrated Flow, S-P Paved Kv= 20.3 fps
7.2	240	Total			

Subcatchment 21S: PDA 2 - Pervious

Hydrograph



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Summary for Subcatchment 28S: PDA 3 - Impervious

Runoff = 1.67 cfs @ 12.09 hrs, Volume= 0.126 af, Depth= 8.09"

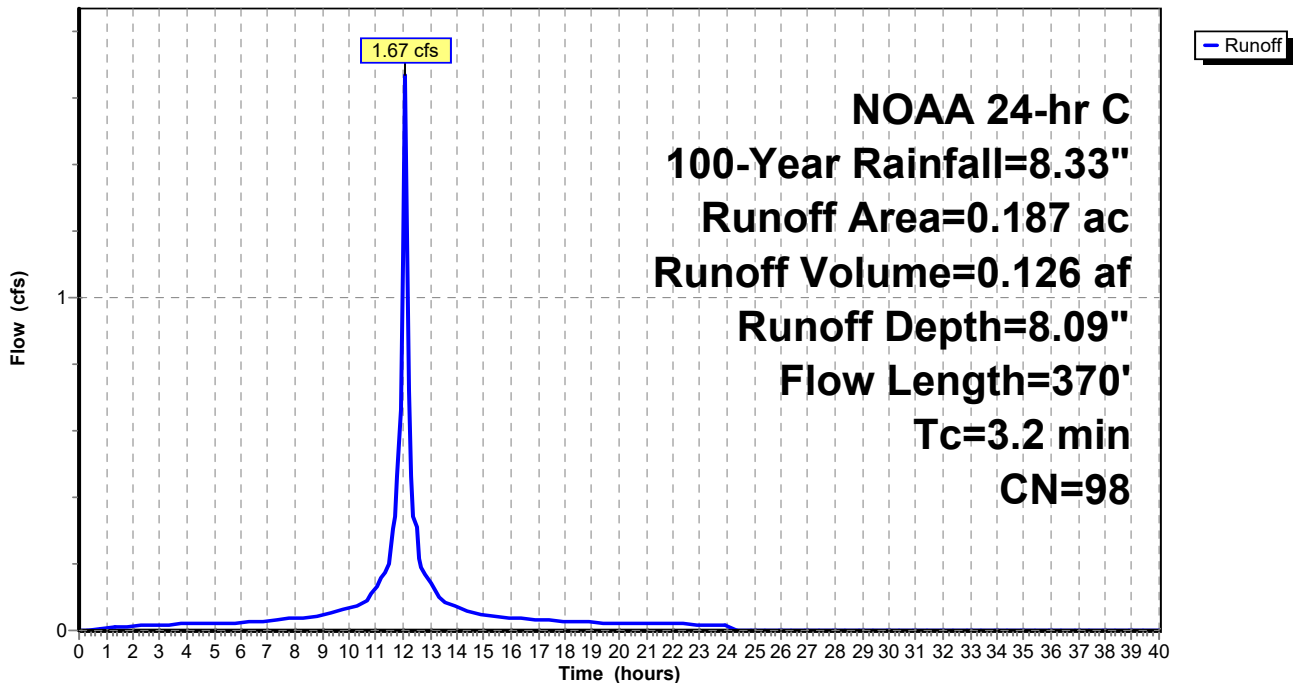
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
0.187	98	Paved parking, HSG D
0.187		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.06		Sheet Flow, F-G Smooth surfaces n= 0.011 P2= 3.31"
1.0	150	0.0150	2.49		Shallow Concentrated Flow, G-H Paved Kv= 20.3 fps
0.6	120	0.0030	3.26	5.75	Pipe Channel, H-I 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
3.2	370	Total			

Subcatchment 28S: PDA 3 - Impervious

Hydrograph



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Summary for Subcatchment 29S: PDA 1B - Pervious

Runoff = 8.78 cfs @ 12.09 hrs, Volume= 0.584 af, Depth= 5.94"

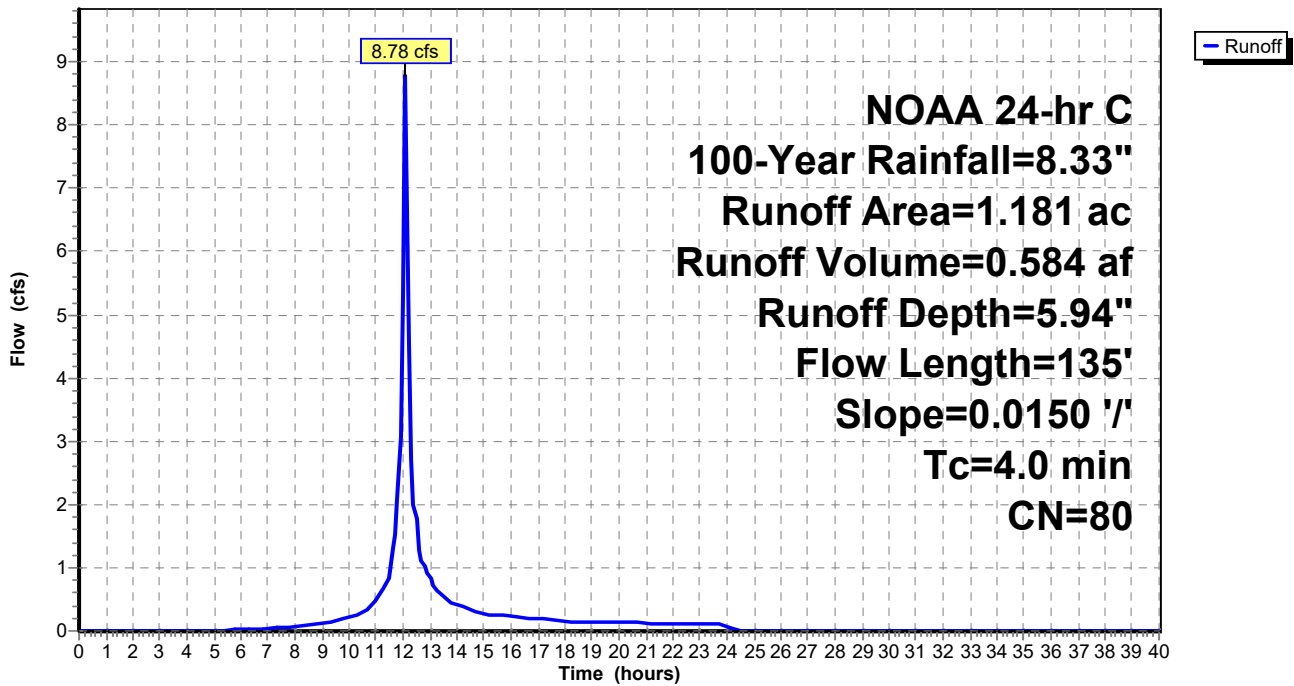
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
1.181	80	>75% Grass cover, Good, HSG D
1.181		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	18	0.0150	0.11		Sheet Flow, AD-AE Grass: Short n= 0.150 P2= 3.31"
1.1	82	0.0150	1.20		Sheet Flow, AE-AF Smooth surfaces n= 0.011 P2= 3.31"
0.2	35	0.0150	2.49		Shallow Concentrated Flow, AF-AC Paved Kv= 20.3 fps
4.0	135	Total			

Subcatchment 29S: PDA 1B - Pervious

Hydrograph



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Summary for Subcatchment 30S: PDA 1B - Impervious

Runoff = 13.24 cfs @ 12.07 hrs, Volume= 1.071 af, Depth= 8.09"

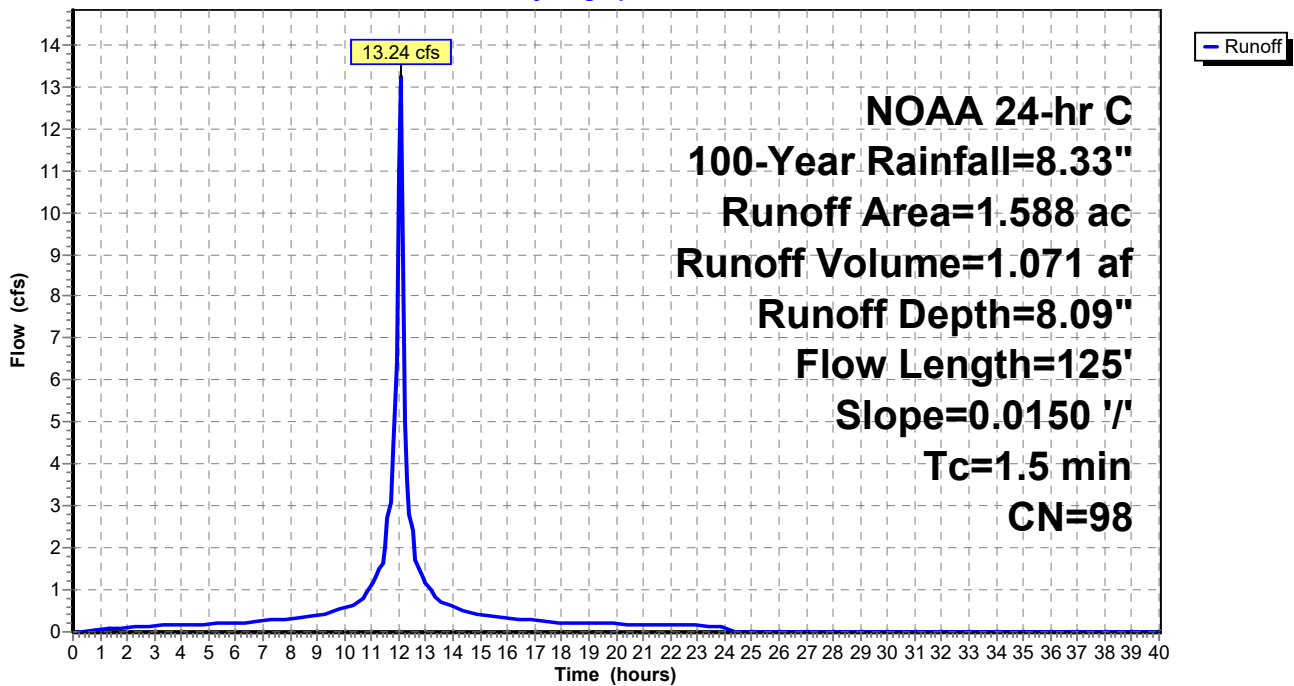
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
1.588	98	Paved parking, HSG C
1.588		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AA-AB Smooth surfaces n= 0.011 P2= 3.31"
0.2	25	0.0150	2.49		Shallow Concentrated Flow, AB-AC Paved Kv= 20.3 fps
1.5	125	Total			

Subcatchment 30S: PDA 1B - Impervious

Hydrograph



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Summary for Subcatchment 33S: PDA 1A - Pervious

Runoff = 17.00 cfs @ 12.26 hrs, Volume= 1.637 af, Depth= 5.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
1.768	80	>75% Grass cover, Good, HSG D
1.610	77	Woods, Good, HSG D
3.378	79	Weighted Average
3.378		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		Sheet Flow, AG-AH Grass: Short n= 0.150 P2= 3.31"
1.5	90	0.0200	0.99		Shallow Concentrated Flow, AH-AI Short Grass Pasture Kv= 7.0 fps
2.7	422	0.0025	2.63	3.23	Pipe Channel, AI-AJ 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
2.6	807	0.0050	5.09	16.00	Pipe Channel, AJ-X 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.3	117	0.0050	6.67	47.16	Pipe Channel, X-Y 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
16.8	1,581	Total			

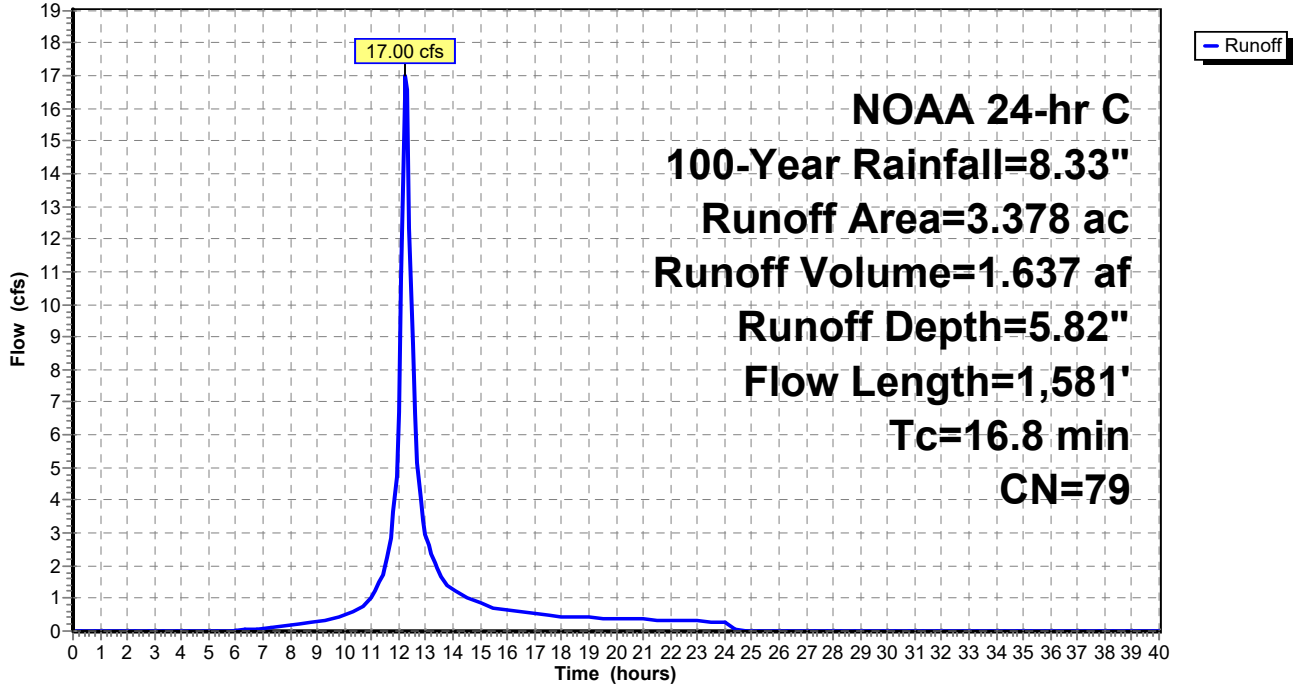
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Subcatchment 33S: PDA 1A - Pervious

Hydrograph



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Summary for Subcatchment 40S: PDA 1A - Impervious

Runoff = 78.18 cfs @ 12.10 hrs, Volume= 6.131 af, Depth= 8.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
9.094	98	Paved parking, HSG C
9.094		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AQ-AR Smooth surfaces n= 0.011 P2= 3.31"
0.6	90	0.0150	2.49		Shallow Concentrated Flow, AR-AS Paved Kv= 20.3 fps
0.1	181	0.3500	35.17	62.14	Pipe Channel, AS-Y (18 inch) 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
1.0	222	0.0025	3.60	11.31	Pipe Channel, AS-Y (24 inch - Section 1) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
1.0	247	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 2) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.5	134	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 3) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
4.6	1,019	Total			

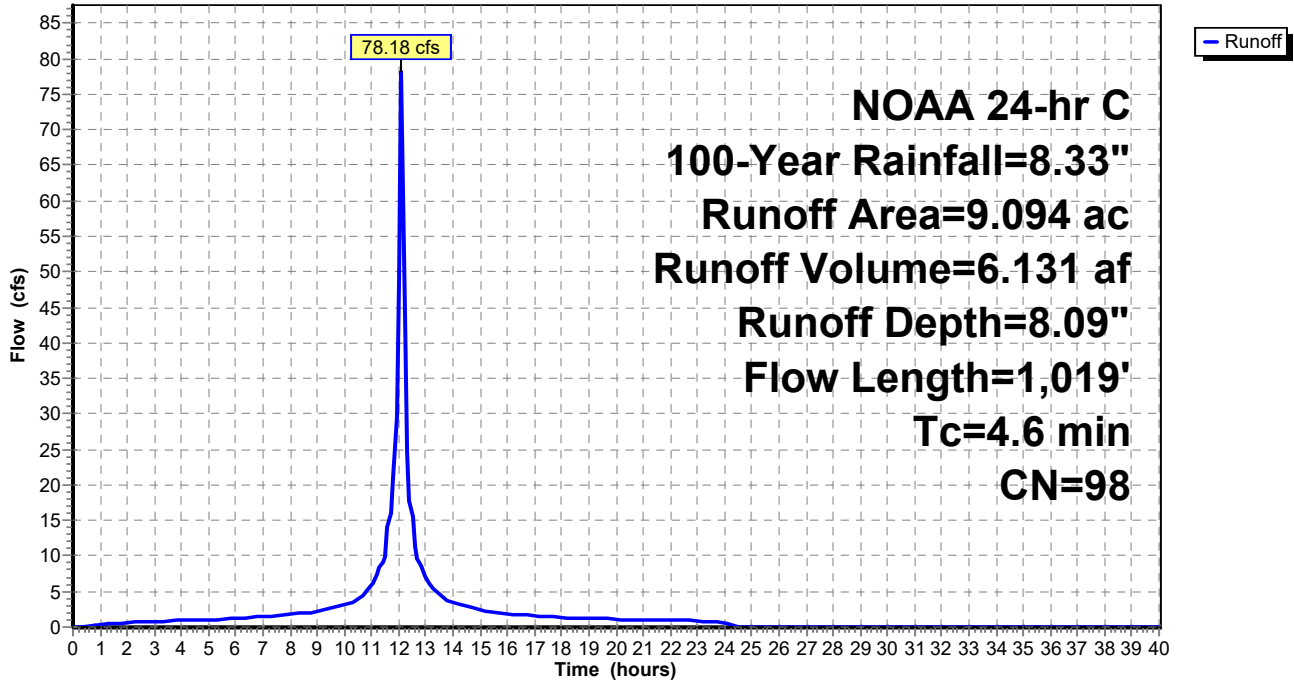
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Subcatchment 40S: PDA 1A - Impervious

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Summary for Subcatchment 46S: EDA 1 - Impervious

Runoff = 93.19 cfs @ 12.15 hrs, Volume= 8.652 af, Depth= 8.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
12.834	98	Paved parking, HSG C
12.834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	58	0.0010	0.38		Sheet Flow, V-W Smooth surfaces n= 0.011 P2= 3.31"
1.1	42	0.0040	0.62		Sheet Flow, W-X Smooth surfaces n= 0.011 P2= 3.31"
0.8	90	0.0080	1.82		Shallow Concentrated Flow, X-Y Paved Kv= 20.3 fps
0.8	175	0.0050	3.72	4.57	Pipe Channel, Y-Z 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
3.3	1,235	0.0075	6.24	19.59	Pipe Channel, Z-AA 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
8.6	1,600	Total			

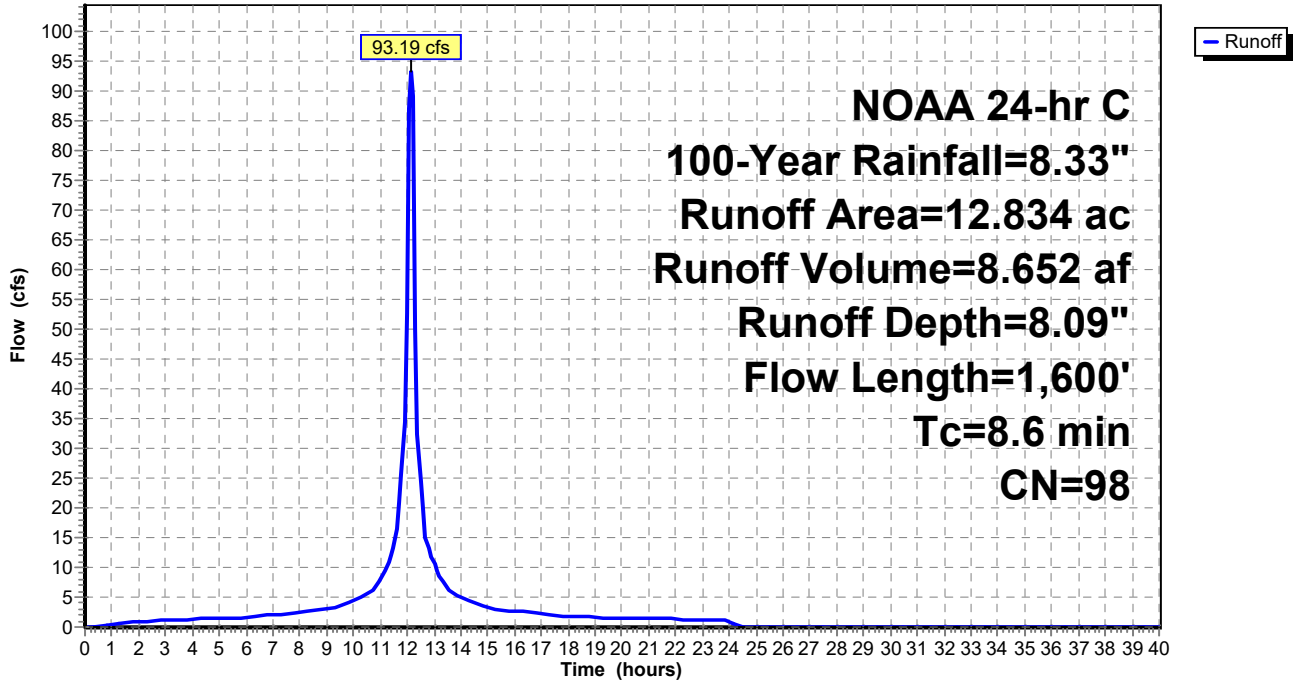
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Subcatchment 46S: EDA 1 - Impervious

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Summary for Pond 45P: Bioretention Basin

Inflow Area = 2.769 ac, 57.35% Impervious, Inflow Depth = 7.17" for 100-Year event
 Inflow = 21.88 cfs @ 12.08 hrs, Volume= 1.655 af
 Outflow = 12.78 cfs @ 12.19 hrs, Volume= 1.655 af, Atten= 42%, Lag= 6.4 min
 Primary = 12.78 cfs @ 12.19 hrs, Volume= 1.655 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 Peak Elev= 48.84' @ 12.19 hrs Surf.Area= 19,249 sf Storage= 15,050 cf

Plug-Flow detention time= 104.4 min calculated for 1.651 af (100% of inflow)
 Center-of-Mass det. time= 105.4 min (865.5 - 760.1)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	18,218 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	16,690	0	0
49.00	19,745	18,218	18,218

Device	Routing	Invert	Outlet Devices
#1	Primary	43.94'	18.0" Round Culvert L= 205.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 43.94' / 43.32' S= 0.0030 ' /' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	48.00'	1.000 in/hr Exfiltration X 0.50 over Surface area
#3	Device 1	48.35'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=12.76 cfs @ 12.19 hrs HW=48.83' (Free Discharge)

- 1=Culvert (Barrel Controls 12.76 cfs @ 7.22 fps)
- 2=Exfiltration (Passes < 0.22 cfs potential flow)
- 3=Orifice/Grate (Passes < 21.71 cfs potential flow)

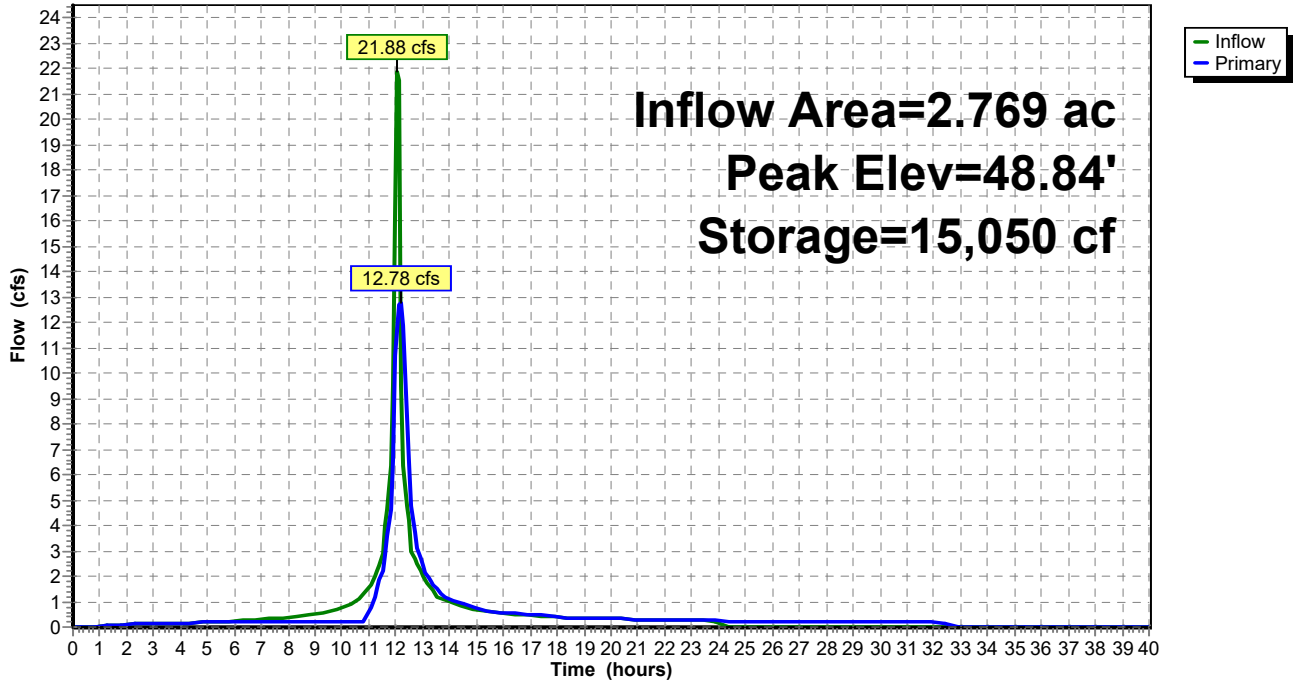
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Pond 45P: Bioretention Basin

Hydrograph



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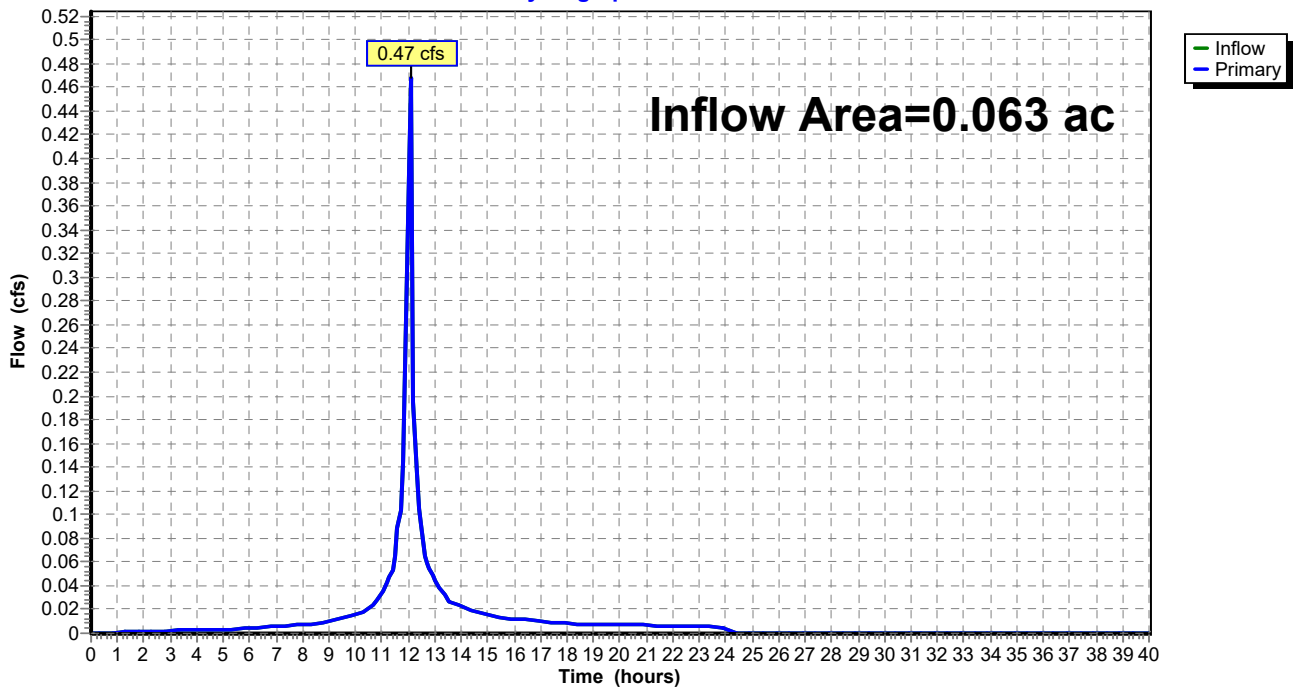
Summary for Link 4L: EDA 4

Inflow Area = 0.063 ac, 41.27% Impervious, Inflow Depth = 6.82" for 100-Year event
Inflow = 0.47 cfs @ 12.07 hrs, Volume= 0.036 af
Primary = 0.47 cfs @ 12.07 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 4L: EDA 4

Hydrograph



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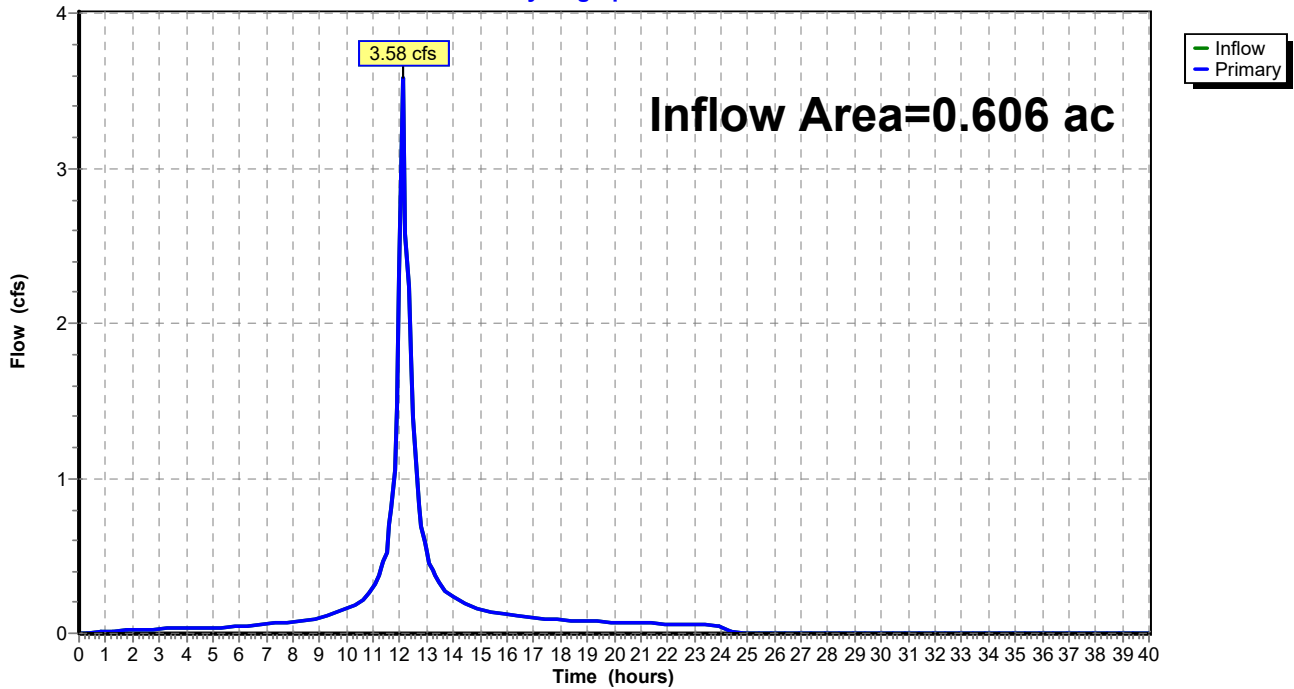
Summary for Link 7L: EDA 3

Inflow Area = 0.606 ac, 50.99% Impervious, Inflow Depth = 7.03" for 100-Year event
Inflow = 3.58 cfs @ 12.11 hrs, Volume= 0.355 af
Primary = 3.58 cfs @ 12.11 hrs, Volume= 0.355 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 7L: EDA 3

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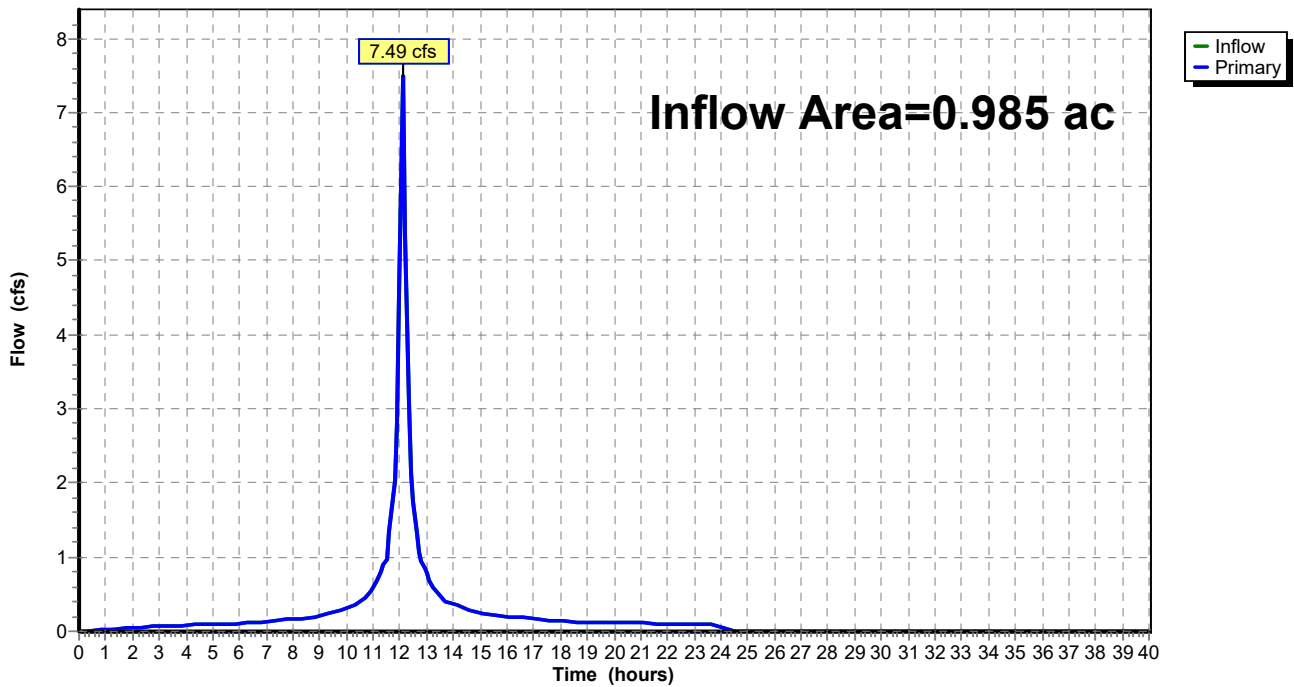
Summary for Link 10L: EDA 2

Inflow Area = 0.985 ac, 79.70% Impervious, Inflow Depth = 7.65" for 100-Year event
Inflow = 7.49 cfs @ 12.11 hrs, Volume= 0.628 af
Primary = 7.49 cfs @ 12.11 hrs, Volume= 0.628 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 10L: EDA 2

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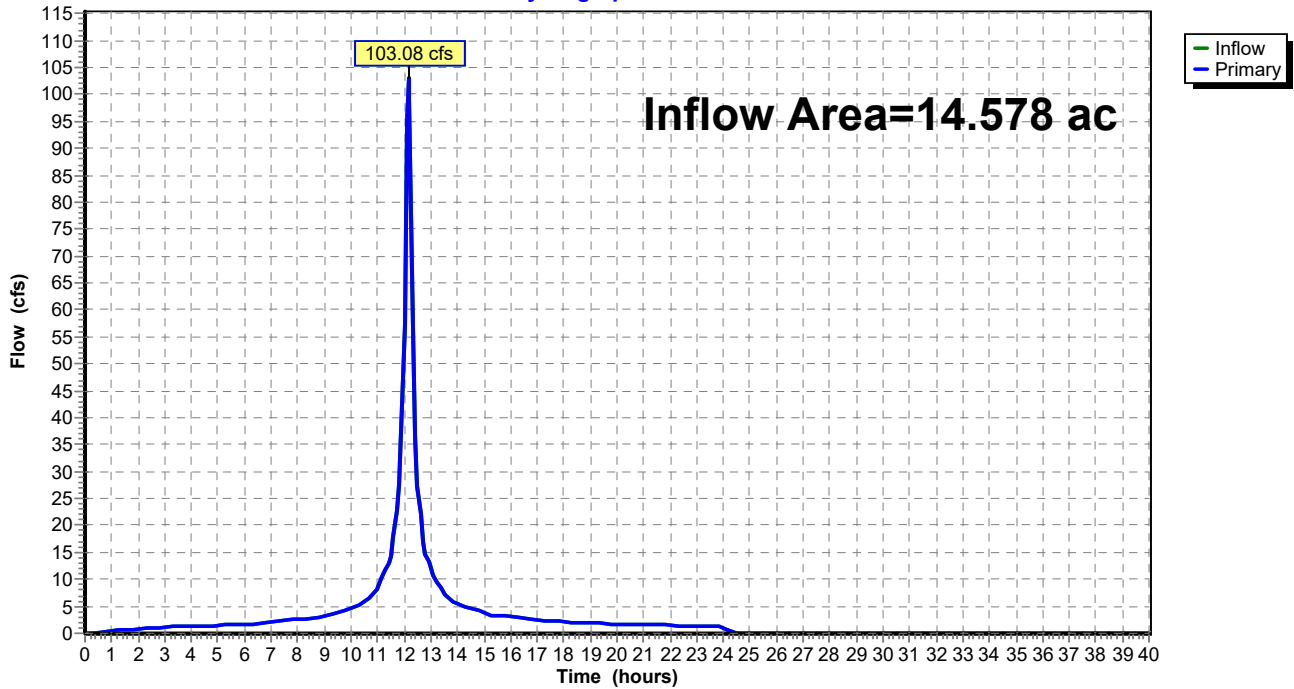
Summary for Link 13L: EDA 1

Inflow Area = 14.578 ac, 88.04% Impervious, Inflow Depth = 7.79" for 100-Year event
Inflow = 103.08 cfs @ 12.16 hrs, Volume= 9.463 af
Primary = 103.08 cfs @ 12.16 hrs, Volume= 9.463 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 13L: EDA 1

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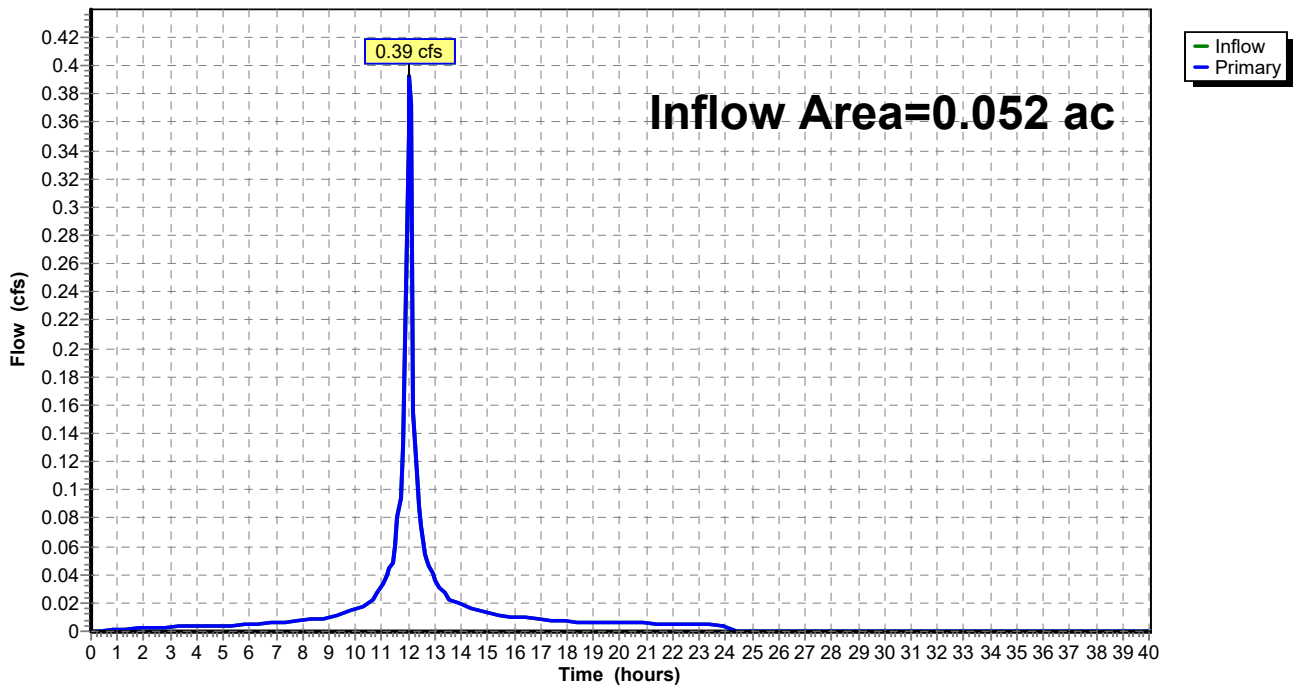
Summary for Link 24L: PDA 4

Inflow Area = 0.052 ac, 65.38% Impervious, Inflow Depth = 7.34" for 100-Year event
Inflow = 0.39 cfs @ 12.06 hrs, Volume= 0.032 af
Primary = 0.39 cfs @ 12.06 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 24L: PDA 4

Hydrograph



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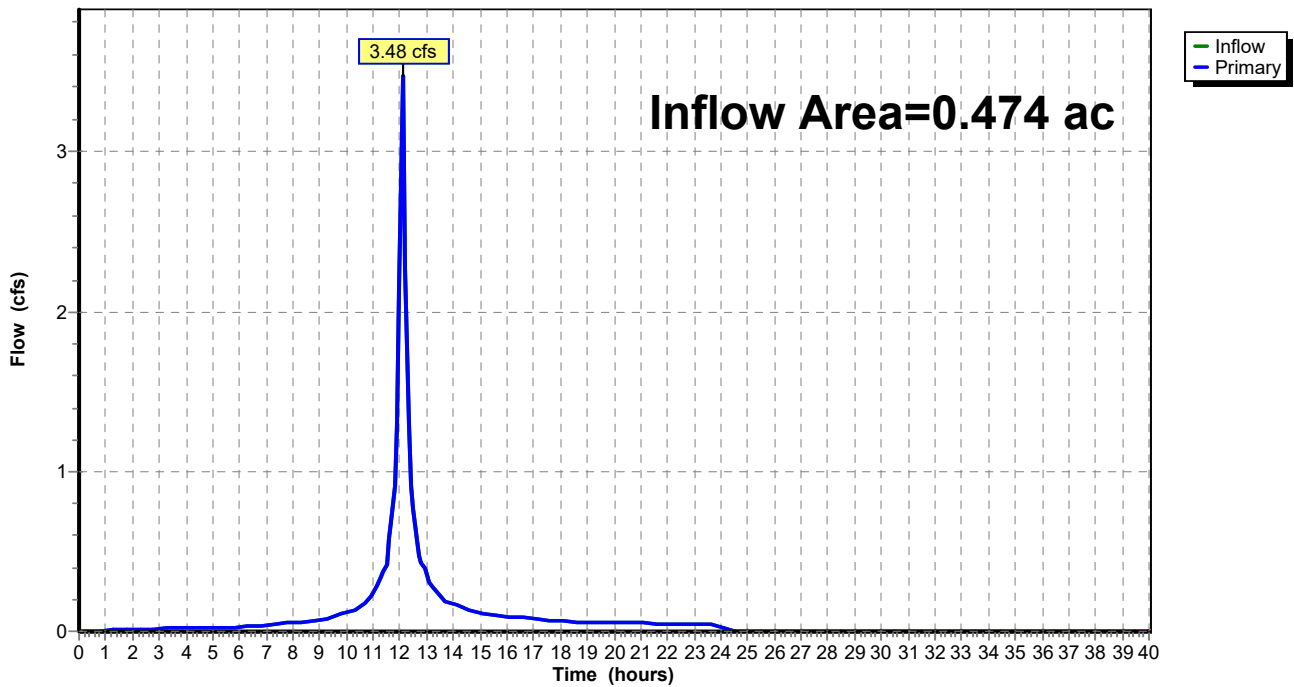
Summary for Link 25L: PDA 3

Inflow Area = 0.474 ac, 39.45% Impervious, Inflow Depth = 6.79" for 100-Year event
Inflow = 3.48 cfs @ 12.10 hrs, Volume= 0.268 af
Primary = 3.48 cfs @ 12.10 hrs, Volume= 0.268 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 25L: PDA 3

Hydrograph



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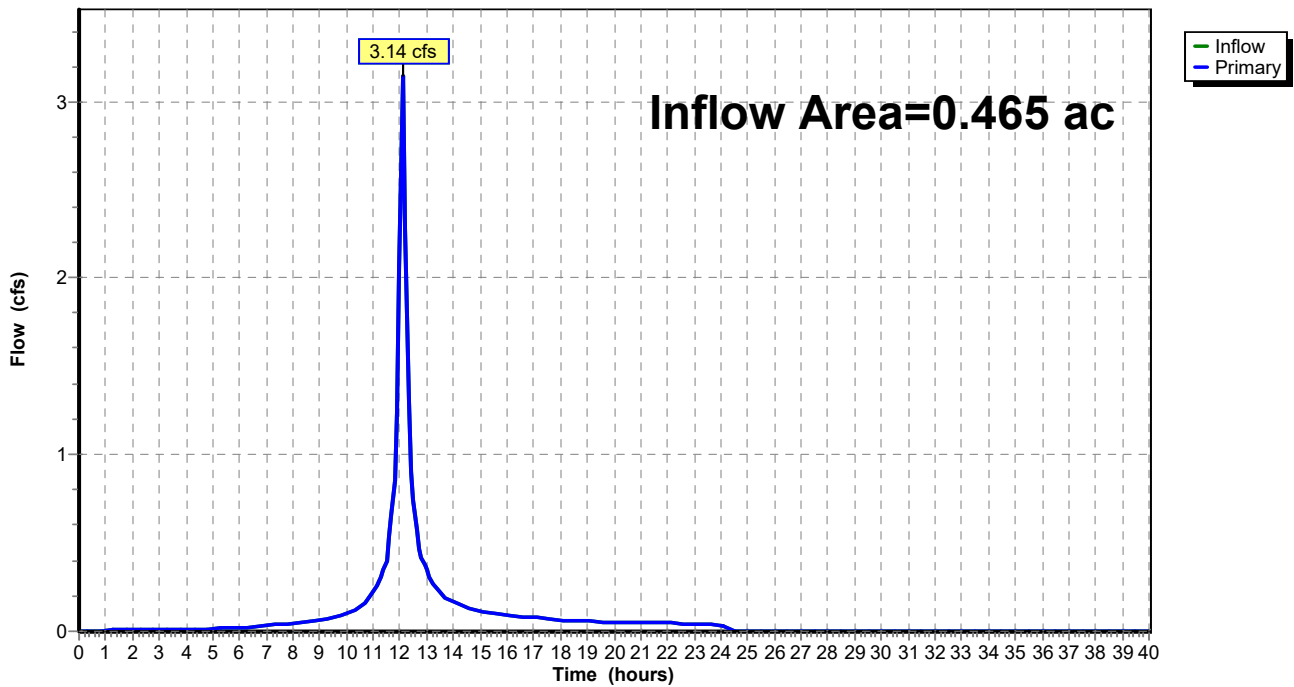
Summary for Link 26L: PDA 2

Inflow Area = 0.465 ac, 27.53% Impervious, Inflow Depth = 6.53" for 100-Year event
Inflow = 3.14 cfs @ 12.11 hrs, Volume= 0.253 af
Primary = 3.14 cfs @ 12.11 hrs, Volume= 0.253 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 26L: PDA 2

Hydrograph



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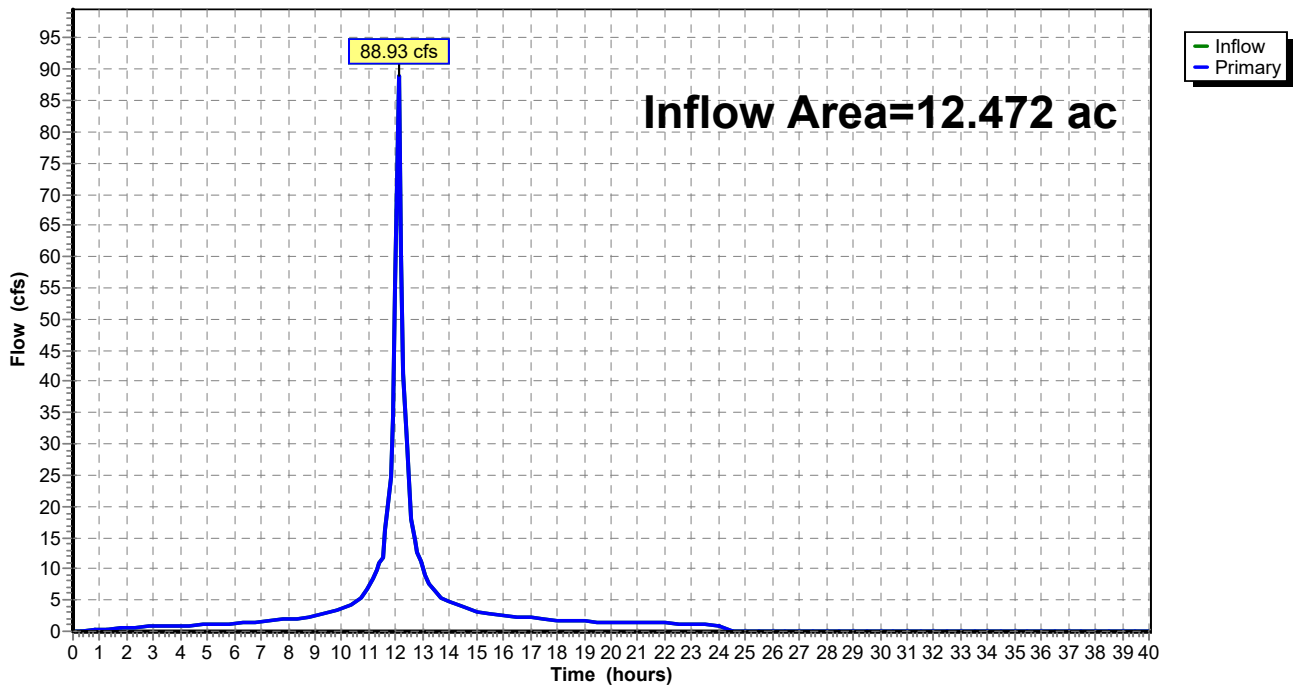
Summary for Link 35L: PDA 1A

Inflow Area = 12.472 ac, 72.92% Impervious, Inflow Depth = 7.47" for 100-Year event
Inflow = 88.93 cfs @ 12.10 hrs, Volume= 7.768 af
Primary = 88.93 cfs @ 12.10 hrs, Volume= 7.768 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 35L: PDA 1A

Hydrograph



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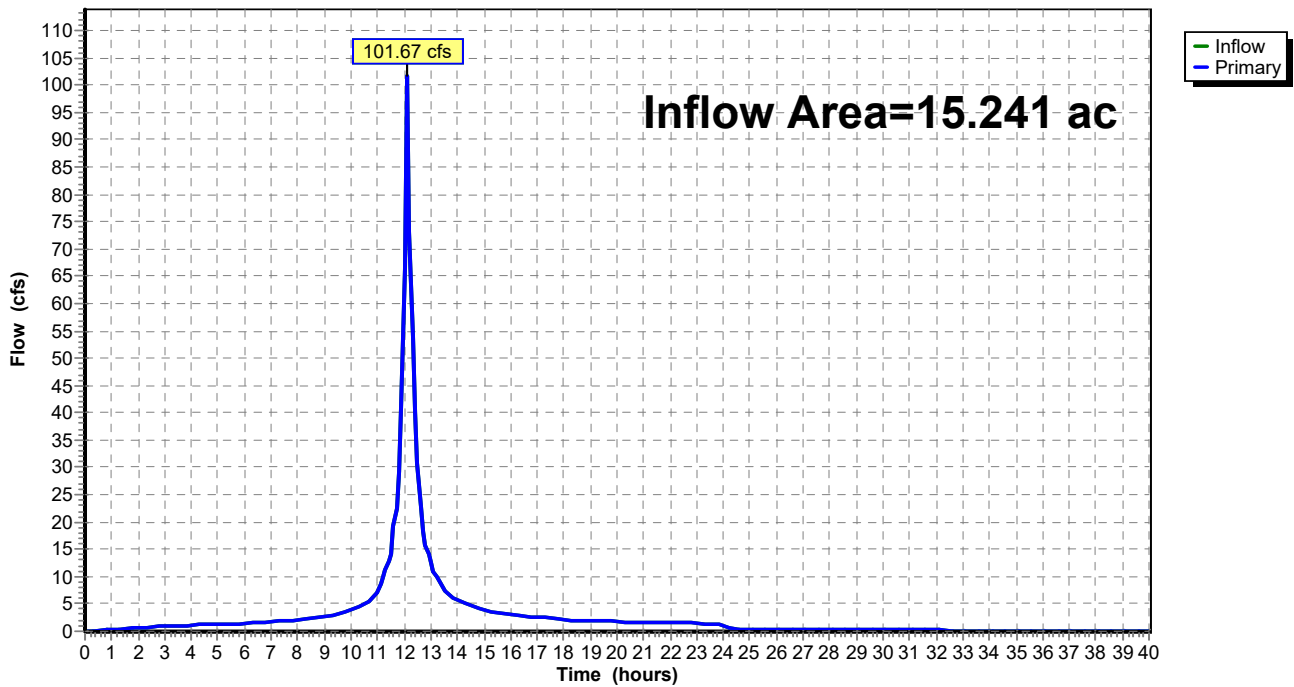
Summary for Link 44L: PDA 1

Inflow Area = 15.241 ac, 70.09% Impervious, Inflow Depth = 7.42" for 100-Year event
Inflow = 101.67 cfs @ 12.11 hrs, Volume= 9.423 af
Primary = 101.67 cfs @ 12.11 hrs, Volume= 9.423 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 44L: PDA 1

Hydrograph



B. DESIGN CALCULATIONS

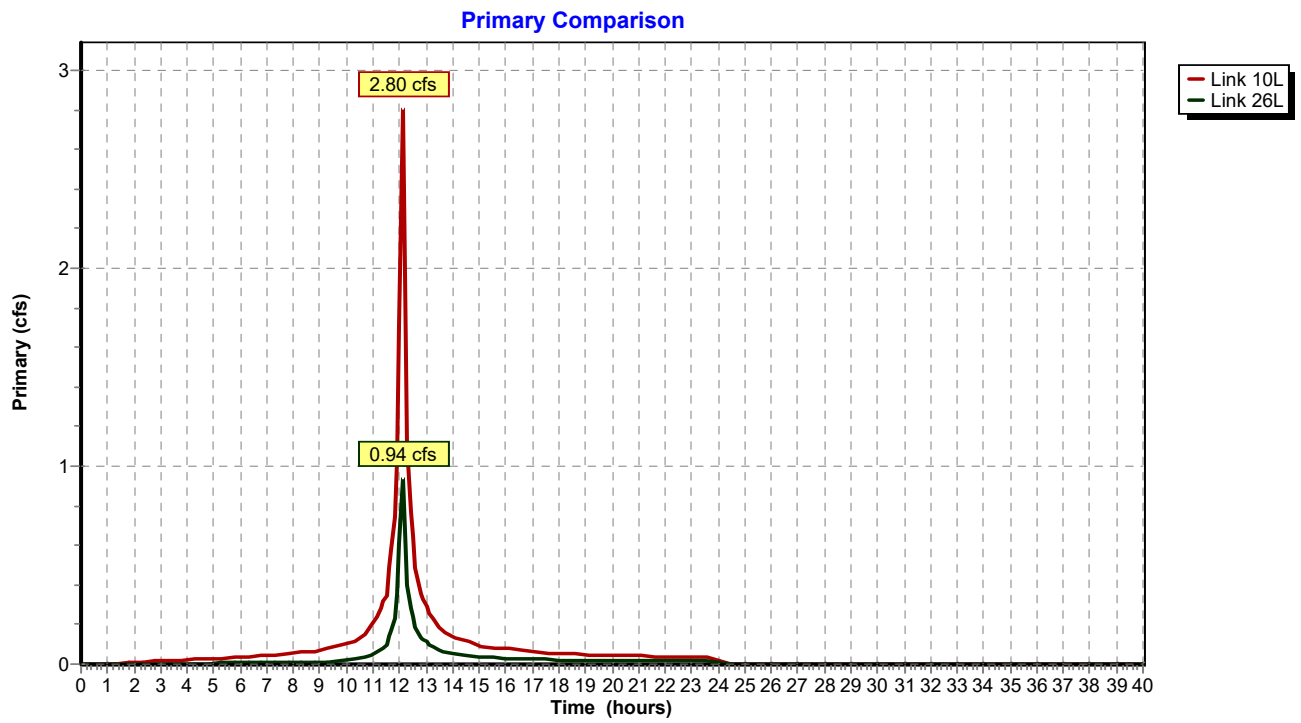
- ◆ **Drainage Area Comparison Hydrographs**
- ◆ **Basin Drain Time (WQ Storm Event)**
- ◆ **Basin Drain Time (100-Year Storm Event)**
- ◆ **Scour Hole Calculations**
- ◆ **Pipe Sizing**
- ◆ **Bioretention Basin Underdrain Pipe Sizing**
- ◆ **NJDEP Groundwater Recharge Worksheet**
- ◆ **DRCC NSPS Drainage Spreadsheet**
- ◆ **Water Quality Flow Calculations for MTDs**
- ◆ **Manufactured Treatment Device Certification**
- ◆ **Geotechnical Report**

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NOAA 24-hr C 2-Year Rainfall=3.31"

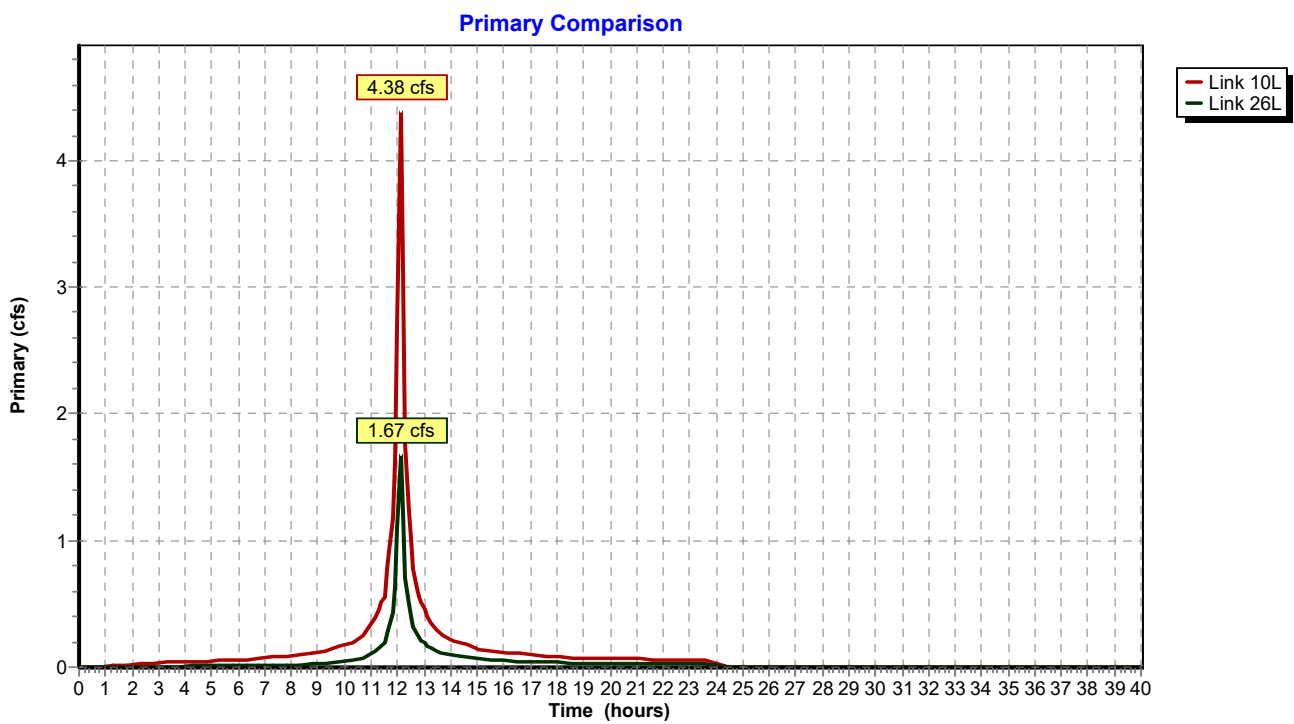


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NOAA 24-hr C 10-Year Rainfall=5.01"

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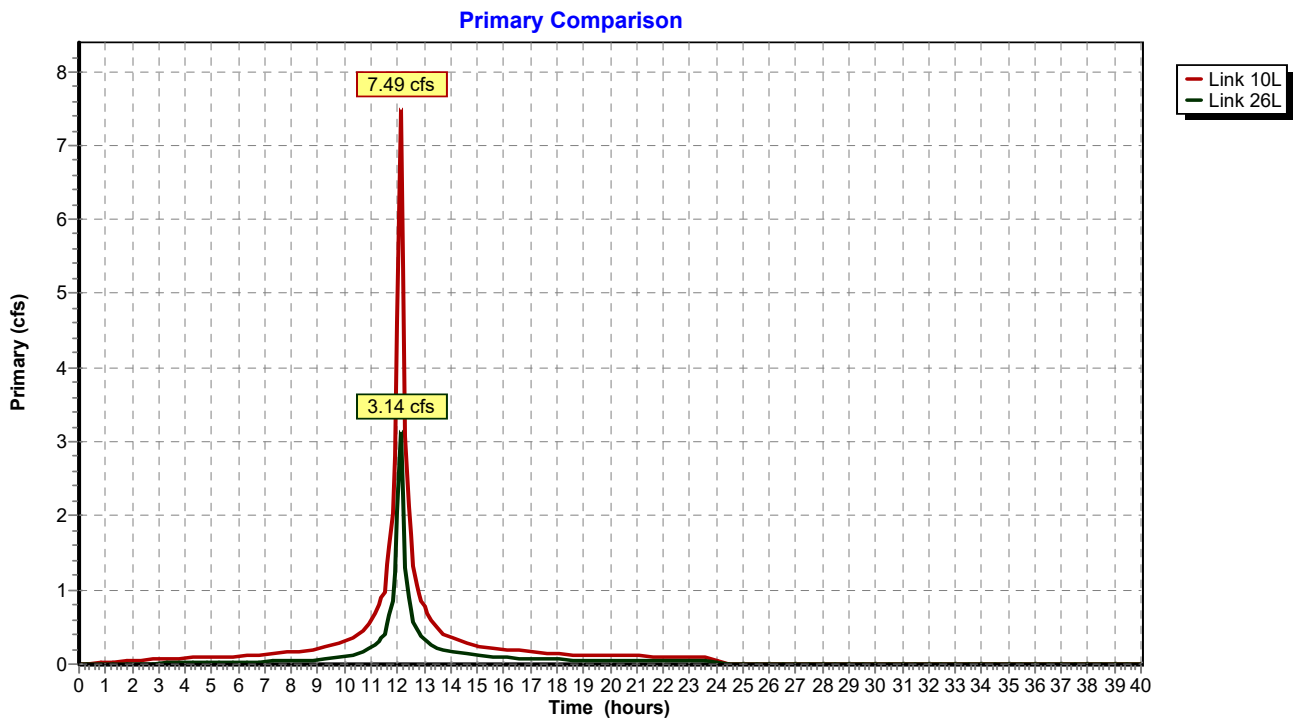


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NOAA 24-hr C 100-Year Rainfall=8.33"

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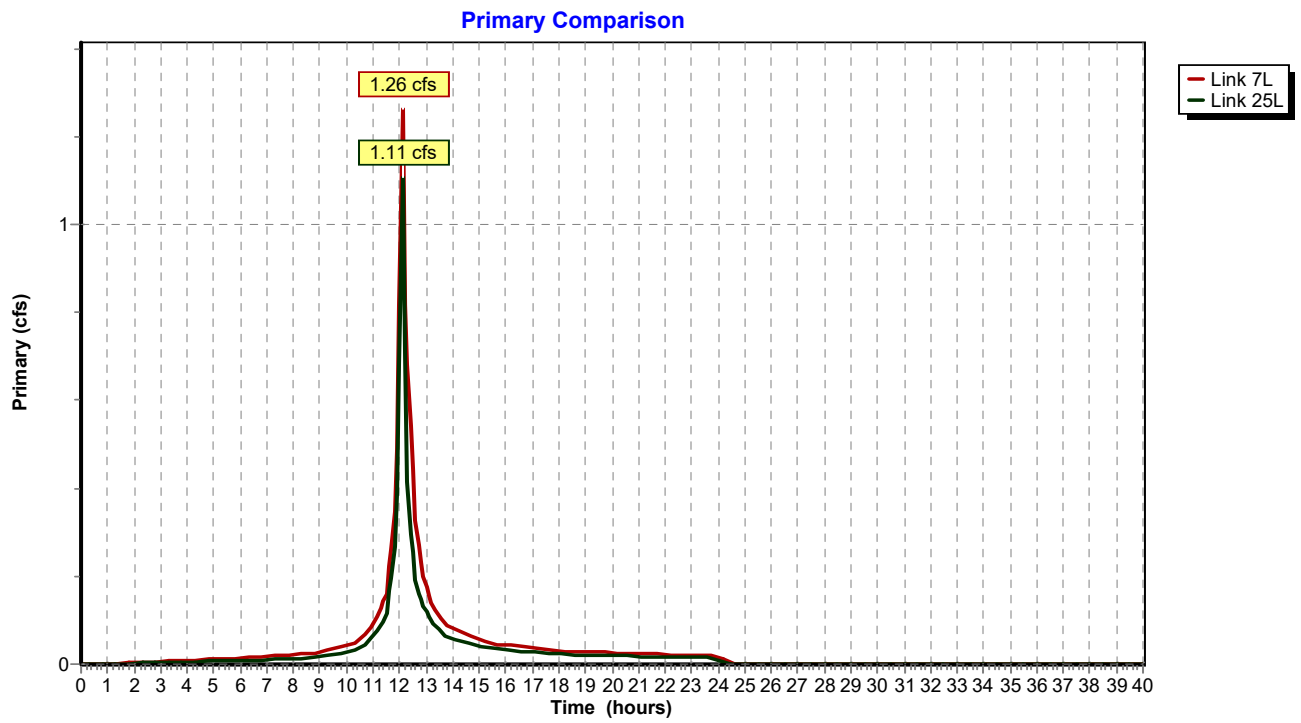


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NOAA 24-hr C 2-Year Rainfall=3.31"

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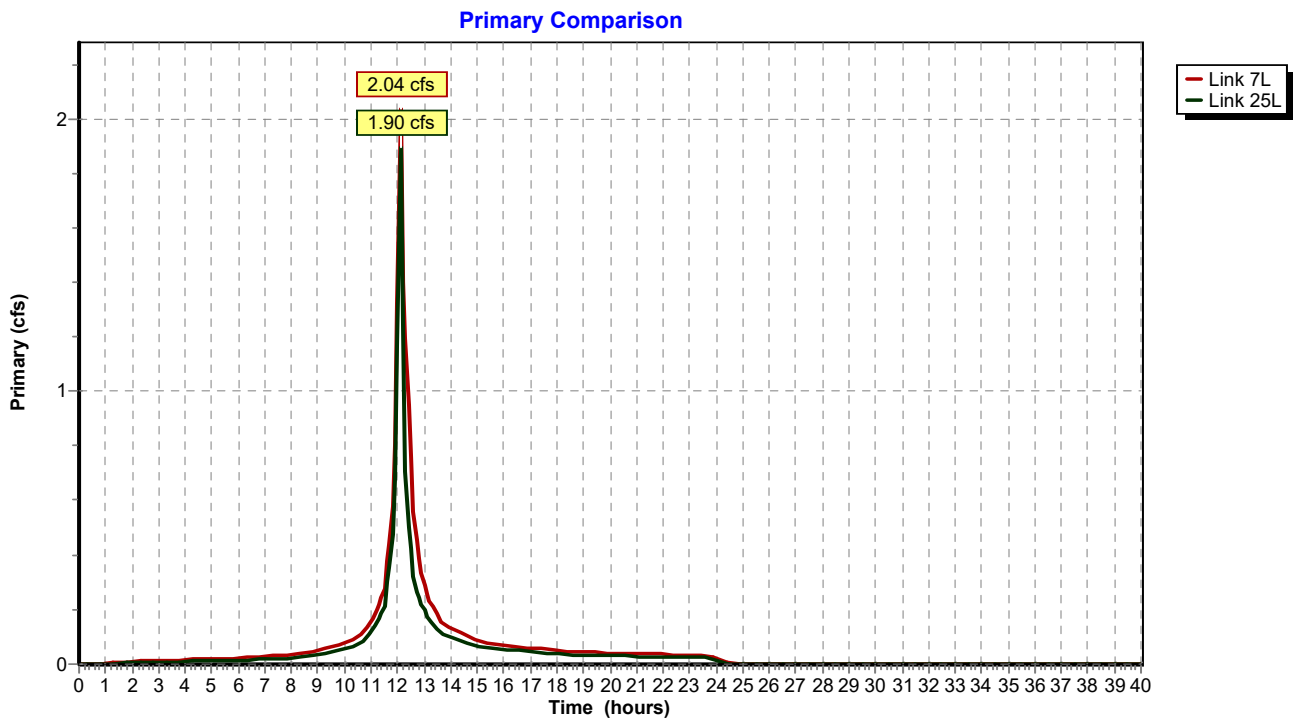


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NOAA 24-hr C 10-Year Rainfall=5.01"

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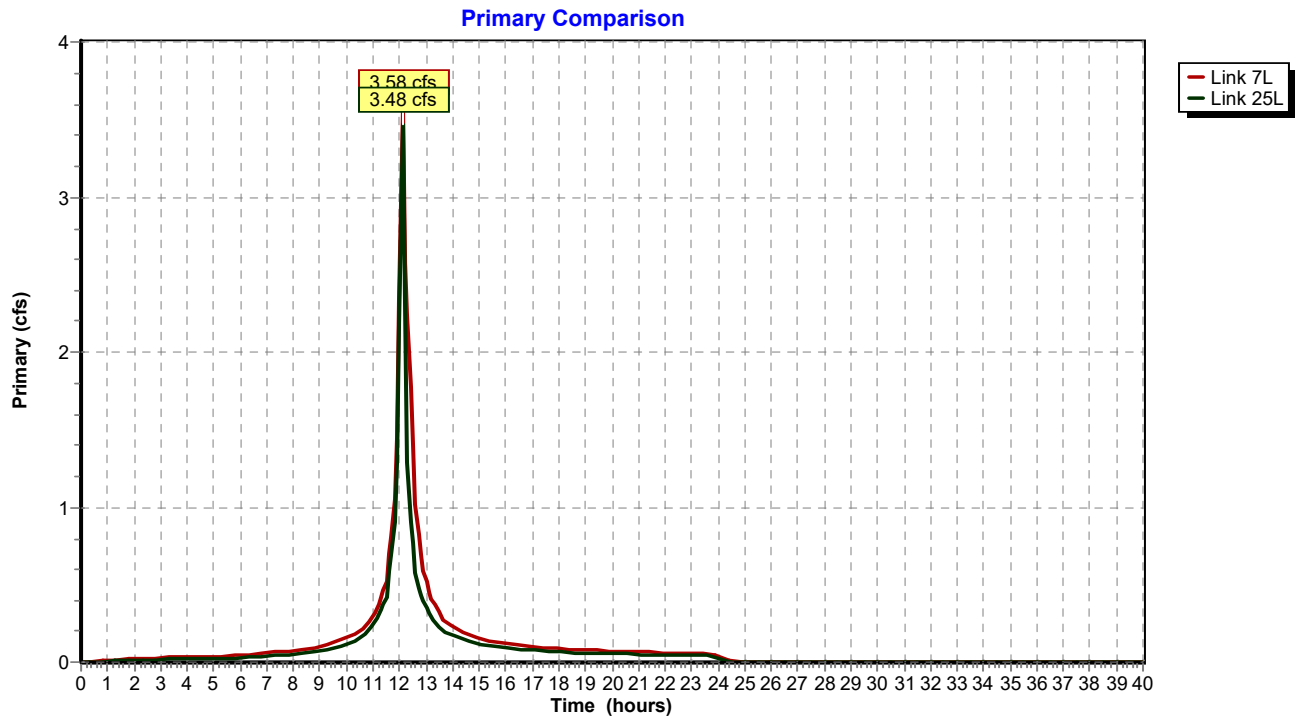


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NOAA 24-hr C 100-Year Rainfall=8.33"

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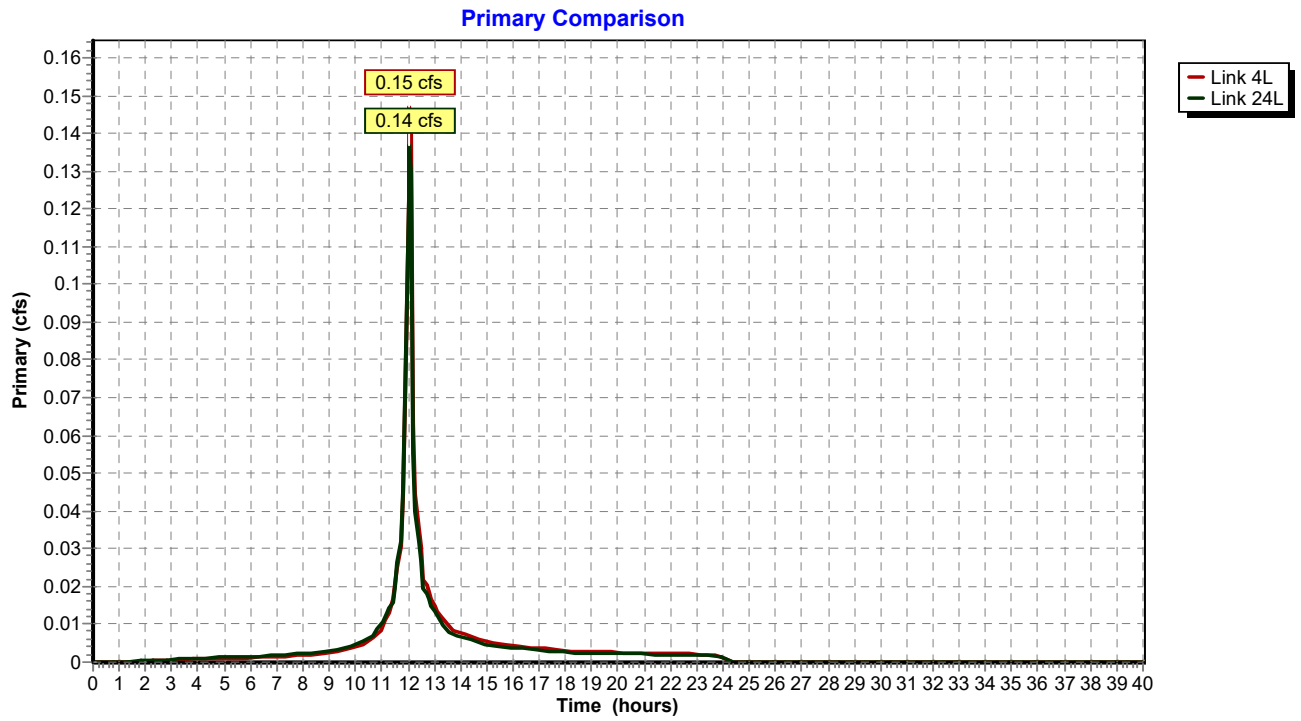


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NOAA 24-hr C 2-Year Rainfall=3.31"

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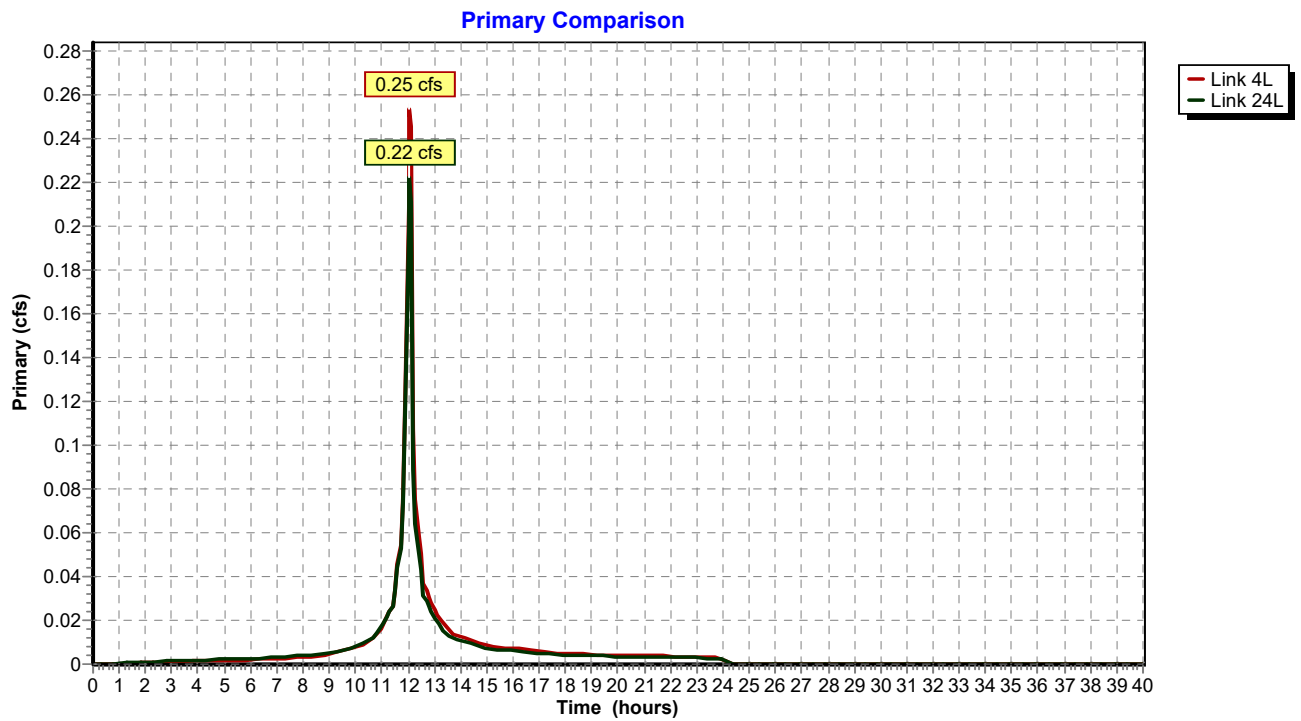


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NOAA 24-hr C 10-Year Rainfall=5.01"

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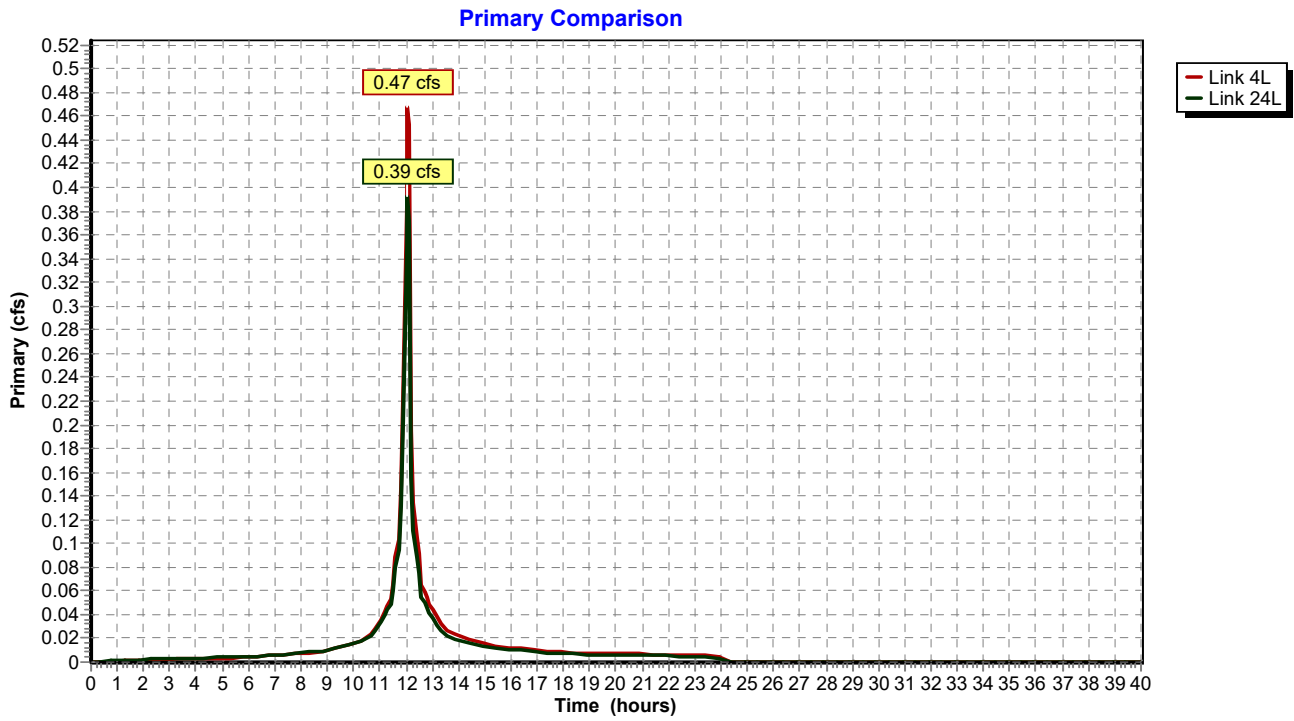


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NOAA 24-hr C 100-Year Rainfall=8.33"

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Page 1

Summary for Pond 45P: Bioretention Basin

Inflow Area = 2.769 ac, 57.35% Impervious, Inflow Depth = 7.17" for 100-Year event
 Inflow = 21.88 cfs @ 12.08 hrs, Volume= 1.655 af
 Outflow = 12.78 cfs @ 12.19 hrs, Volume= 1.655 af, Atten= 42%, Lag= 6.4 min
 Primary = 12.78 cfs @ 12.19 hrs, Volume= 1.655 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 Peak Elev= 48.84' @ 12.19 hrs Surf.Area= 19,249 sf Storage= 15,050 cf

Plug-Flow detention time= 104.4 min calculated for 1.651 af (100% of inflow)
 Center-of-Mass det. time= 105.4 min (865.5 - 760.1)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	18,218 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	16,690	0	0
49.00	19,745	18,218	18,218

Device	Routing	Invert	Outlet Devices
#1	Primary	43.94'	18.0" Round Culvert L= 205.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 43.94' / 43.32' S= 0.0030 ' S= 0.0030 ' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	48.00'	1.000 in/hr Exfiltration X 0.50 over Surface area
#3	Device 1	48.35'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=12.76 cfs @ 12.19 hrs HW=48.83' (Free Discharge)

- 1=Culvert (Barrel Controls 12.76 cfs @ 7.22 fps)
- 2=Exfiltration (Passes < 0.22 cfs potential flow)
- 3=Orifice/Grate (Passes < 21.71 cfs potential flow)

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Page 2

Hydrograph for Pond 45P: Bioretention Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	48.00	0.00
0.10	0.00	0	48.00	0.00
0.20	0.00	0	48.00	0.00
0.30	0.00	0	48.00	0.00
0.40	0.00	0	48.00	0.00
0.50	0.00	1	48.00	0.00
0.60	0.01	3	48.00	0.00
0.70	0.03	8	48.00	0.01
0.80	0.03	14	48.00	0.02
0.90	0.04	21	48.00	0.02
1.00	0.05	28	48.00	0.03
1.10	0.06	35	48.00	0.04
1.20	0.07	41	48.00	0.05
1.30	0.07	47	48.00	0.05
1.40	0.08	53	48.00	0.06
1.50	0.08	59	48.00	0.07
1.60	0.09	64	48.00	0.07
1.70	0.09	69	48.00	0.08
1.80	0.10	74	48.00	0.09
1.90	0.10	78	48.00	0.09
2.00	0.11	82	48.00	0.10
2.10	0.11	86	48.01	0.10
2.20	0.11	90	48.01	0.10
2.30	0.12	94	48.01	0.11
2.40	0.12	97	48.01	0.11
2.50	0.12	100	48.01	0.12
2.60	0.13	103	48.01	0.12
2.70	0.13	106	48.01	0.12
2.80	0.13	109	48.01	0.13
2.90	0.14	112	48.01	0.13
3.00	0.14	115	48.01	0.13
3.10	0.14	117	48.01	0.14
3.20	0.15	120	48.01	0.14
3.30	0.15	122	48.01	0.14
3.40	0.15	124	48.01	0.14
3.50	0.15	127	48.01	0.15
3.60	0.16	129	48.01	0.15
3.70	0.16	131	48.01	0.15
3.80	0.16	133	48.01	0.15
3.90	0.16	135	48.01	0.16
4.00	0.16	137	48.01	0.16
4.10	0.17	139	48.01	0.16
4.20	0.17	141	48.01	0.16
4.30	0.17	143	48.01	0.17
4.40	0.17	145	48.01	0.17
4.50	0.17	147	48.01	0.17
4.60	0.18	148	48.01	0.17
4.70	0.18	150	48.01	0.17
4.80	0.18	152	48.01	0.18
4.90	0.18	154	48.01	0.18
5.00	0.19	156	48.01	0.18
5.10	0.19	158	48.01	0.18

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Hydrograph for Pond 45P: Bioretention Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
5.20	0.19	161	48.01	0.19
5.30	0.20	163	48.01	0.19
5.40	0.20	166	48.01	0.19
5.50	0.20	169	48.01	0.19
5.60	0.21	173	48.01	0.19
5.70	0.21	179	48.01	0.19
5.80	0.21	185	48.01	0.19
5.90	0.22	193	48.01	0.19
6.00	0.22	202	48.01	0.19
6.10	0.23	213	48.01	0.19
6.20	0.24	226	48.01	0.19
6.30	0.24	243	48.01	0.19
6.40	0.25	262	48.02	0.19
6.50	0.26	283	48.02	0.19
6.60	0.27	308	48.02	0.19
6.70	0.27	335	48.02	0.19
6.80	0.28	365	48.02	0.19
6.90	0.29	398	48.02	0.19
7.00	0.30	434	48.03	0.19
7.10	0.31	473	48.03	0.19
7.20	0.31	515	48.03	0.19
7.30	0.32	560	48.03	0.19
7.40	0.33	608	48.04	0.19
7.50	0.34	658	48.04	0.19
7.60	0.35	712	48.04	0.19
7.70	0.36	769	48.05	0.19
7.80	0.37	829	48.05	0.19
7.90	0.38	892	48.05	0.20
8.00	0.38	958	48.06	0.20
8.10	0.39	1,028	48.06	0.20
8.20	0.40	1,100	48.07	0.20
8.30	0.41	1,176	48.07	0.20
8.40	0.42	1,255	48.07	0.20
8.50	0.43	1,337	48.08	0.20
8.60	0.44	1,422	48.08	0.20
8.70	0.45	1,511	48.09	0.20
8.80	0.46	1,603	48.10	0.20
8.90	0.47	1,698	48.10	0.20
9.00	0.48	1,797	48.11	0.20
9.10	0.51	1,904	48.11	0.20
9.20	0.54	2,021	48.12	0.20
9.30	0.57	2,148	48.13	0.20
9.40	0.59	2,285	48.14	0.20
9.50	0.62	2,433	48.14	0.20
9.60	0.65	2,592	48.15	0.20
9.70	0.68	2,761	48.16	0.20
9.80	0.72	2,942	48.17	0.20
9.90	0.75	3,133	48.18	0.20
10.00	0.78	3,336	48.20	0.20
10.10	0.81	3,550	48.21	0.20
10.20	0.84	3,775	48.22	0.20
10.30	0.87	4,012	48.24	0.20

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Hydrograph for Pond 45P: Bioretention Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
10.40	0.91	4,260	48.25	0.20
10.50	0.96	4,524	48.26	0.20
10.60	1.07	4,815	48.28	0.20
10.70	1.18	5,147	48.30	0.20
10.80	1.30	5,520	48.32	0.20
10.90	1.42	5,935	48.34	0.21
11.00	1.56	6,365	48.37	0.38
11.10	1.77	6,760	48.39	0.75
11.20	1.99	7,093	48.41	1.16
11.30	2.22	7,364	48.42	1.55
11.40	2.44	7,585	48.44	1.89
11.50	2.88	7,799	48.45	2.24
11.60	4.03	8,130	48.47	2.83
11.70	4.64	8,531	48.49	3.61
11.80	6.37	9,026	48.52	4.65
11.90	9.50	9,860	48.56	6.59
12.00	16.35	11,401	48.65	10.70
12.10	21.55	14,013	48.78	12.69
12.20	9.55	15,027	48.84	12.78
12.30	6.32	13,311	48.75	12.63
12.40	4.80	11,210	48.63	10.16
12.50	4.22	9,831	48.56	6.52
12.60	2.98	9,090	48.52	4.79
12.70	2.70	8,581	48.49	3.71
12.80	2.46	8,280	48.48	3.12
12.90	2.22	8,071	48.46	2.73
13.00	1.98	7,902	48.45	2.42
13.10	1.77	7,752	48.45	2.16
13.20	1.63	7,623	48.44	1.95
13.30	1.50	7,516	48.43	1.78
13.40	1.37	7,420	48.43	1.63
13.50	1.25	7,330	48.42	1.49
13.60	1.14	7,243	48.42	1.37
13.70	1.10	7,170	48.41	1.27
13.80	1.06	7,116	48.41	1.19
13.90	1.03	7,074	48.41	1.14
14.00	1.00	7,038	48.41	1.09
14.10	0.96	7,005	48.40	1.05
14.20	0.93	6,976	48.40	1.01
14.30	0.89	6,947	48.40	0.97
14.40	0.86	6,920	48.40	0.94
14.50	0.83	6,892	48.40	0.91
14.60	0.79	6,864	48.40	0.87
14.70	0.76	6,836	48.40	0.84
14.80	0.73	6,808	48.39	0.81
14.90	0.69	6,779	48.39	0.77
15.00	0.66	6,750	48.39	0.74
15.10	0.63	6,722	48.39	0.71
15.20	0.62	6,696	48.39	0.68
15.30	0.61	6,676	48.39	0.66
15.40	0.60	6,659	48.39	0.65
15.50	0.59	6,645	48.38	0.63

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Hydrograph for Pond 45P: Bioretention Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
15.60	0.59	6,633	48.38	0.62
15.70	0.58	6,621	48.38	0.61
15.80	0.57	6,611	48.38	0.60
15.90	0.56	6,601	48.38	0.59
16.00	0.55	6,591	48.38	0.58
16.10	0.54	6,582	48.38	0.57
16.20	0.53	6,573	48.38	0.56
16.30	0.52	6,564	48.38	0.55
16.40	0.51	6,555	48.38	0.54
16.50	0.50	6,546	48.38	0.53
16.60	0.50	6,536	48.38	0.52
16.70	0.49	6,527	48.38	0.52
16.80	0.48	6,517	48.38	0.51
16.90	0.47	6,507	48.38	0.50
17.00	0.46	6,497	48.38	0.49
17.10	0.45	6,487	48.38	0.48
17.20	0.44	6,477	48.38	0.47
17.30	0.43	6,466	48.37	0.46
17.40	0.43	6,456	48.37	0.45
17.50	0.42	6,446	48.37	0.44
17.60	0.41	6,436	48.37	0.44
17.70	0.40	6,426	48.37	0.43
17.80	0.39	6,415	48.37	0.42
17.90	0.38	6,405	48.37	0.41
18.00	0.37	6,395	48.37	0.40
18.10	0.36	6,385	48.37	0.39
18.20	0.36	6,375	48.37	0.39
18.30	0.36	6,367	48.37	0.38
18.40	0.36	6,360	48.37	0.37
18.50	0.35	6,354	48.37	0.37
18.60	0.35	6,348	48.37	0.37
18.70	0.35	6,343	48.37	0.36
18.80	0.35	6,339	48.37	0.36
18.90	0.35	6,334	48.37	0.36
19.00	0.34	6,330	48.37	0.35
19.10	0.34	6,326	48.37	0.35
19.20	0.34	6,322	48.37	0.35
19.30	0.34	6,318	48.37	0.35
19.40	0.33	6,315	48.37	0.34
19.50	0.33	6,311	48.37	0.34
19.60	0.33	6,308	48.37	0.34
19.70	0.33	6,304	48.37	0.34
19.80	0.33	6,301	48.37	0.34
19.90	0.32	6,298	48.37	0.33
20.00	0.32	6,295	48.36	0.33
20.10	0.32	6,291	48.36	0.33
20.20	0.32	6,288	48.36	0.33
20.30	0.31	6,284	48.36	0.32
20.40	0.31	6,281	48.36	0.32
20.50	0.31	6,277	48.36	0.32
20.60	0.31	6,274	48.36	0.32
20.70	0.31	6,271	48.36	0.31

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Hydrograph for Pond 45P: Bioretention Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
20.80	0.30	6,268	48.36	0.31
20.90	0.30	6,264	48.36	0.31
21.00	0.30	6,261	48.36	0.31
21.10	0.30	6,257	48.36	0.31
21.20	0.29	6,254	48.36	0.30
21.30	0.29	6,251	48.36	0.30
21.40	0.29	6,248	48.36	0.30
21.50	0.29	6,244	48.36	0.30
21.60	0.29	6,241	48.36	0.29
21.70	0.28	6,238	48.36	0.29
21.80	0.28	6,235	48.36	0.29
21.90	0.28	6,231	48.36	0.29
22.00	0.28	6,228	48.36	0.29
22.10	0.27	6,224	48.36	0.28
22.20	0.27	6,221	48.36	0.28
22.30	0.27	6,218	48.36	0.28
22.40	0.27	6,215	48.36	0.28
22.50	0.27	6,211	48.36	0.27
22.60	0.26	6,208	48.36	0.27
22.70	0.26	6,205	48.36	0.27
22.80	0.26	6,201	48.36	0.27
22.90	0.26	6,197	48.36	0.27
23.00	0.26	6,193	48.36	0.27
23.10	0.25	6,188	48.36	0.26
23.20	0.25	6,183	48.36	0.26
23.30	0.25	6,178	48.36	0.26
23.40	0.25	6,174	48.36	0.26
23.50	0.24	6,169	48.36	0.26
23.60	0.24	6,163	48.36	0.26
23.70	0.24	6,158	48.36	0.25
23.80	0.24	6,153	48.36	0.25
23.90	0.24	6,149	48.36	0.25
24.00	0.23	6,145	48.36	0.25
24.10	0.02	6,104	48.35	0.23
24.20	0.00	6,029	48.35	0.21
24.30	0.00	5,955	48.35	0.21
24.40	0.00	5,881	48.34	0.21
24.50	0.00	5,807	48.34	0.21
24.60	0.00	5,733	48.33	0.20
24.70	0.00	5,659	48.33	0.20
24.80	0.00	5,586	48.33	0.20
24.90	0.00	5,512	48.32	0.20
25.00	0.00	5,438	48.32	0.20
25.10	0.00	5,365	48.31	0.20
25.20	0.00	5,291	48.31	0.20
25.30	0.00	5,218	48.30	0.20
25.40	0.00	5,145	48.30	0.20
25.50	0.00	5,071	48.30	0.20
25.60	0.00	4,998	48.29	0.20
25.70	0.00	4,925	48.29	0.20
25.80	0.00	4,852	48.28	0.20
25.90	0.00	4,778	48.28	0.20

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Hydrograph for Pond 45P: Bioretention Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
26.00	0.00	4,705	48.28	0.20
26.10	0.00	4,632	48.27	0.20
26.20	0.00	4,559	48.27	0.20
26.30	0.00	4,486	48.26	0.20
26.40	0.00	4,414	48.26	0.20
26.50	0.00	4,341	48.25	0.20
26.60	0.00	4,268	48.25	0.20
26.70	0.00	4,195	48.25	0.20
26.80	0.00	4,123	48.24	0.20
26.90	0.00	4,050	48.24	0.20
27.00	0.00	3,978	48.23	0.20
27.10	0.00	3,905	48.23	0.20
27.20	0.00	3,833	48.23	0.20
27.30	0.00	3,760	48.22	0.20
27.40	0.00	3,688	48.22	0.20
27.50	0.00	3,616	48.21	0.20
27.60	0.00	3,543	48.21	0.20
27.70	0.00	3,471	48.20	0.20
27.80	0.00	3,399	48.20	0.20
27.90	0.00	3,327	48.20	0.20
28.00	0.00	3,255	48.19	0.20
28.10	0.00	3,183	48.19	0.20
28.20	0.00	3,111	48.18	0.20
28.30	0.00	3,039	48.18	0.20
28.40	0.00	2,968	48.18	0.20
28.50	0.00	2,896	48.17	0.20
28.60	0.00	2,824	48.17	0.20
28.70	0.00	2,753	48.16	0.20
28.80	0.00	2,681	48.16	0.20
28.90	0.00	2,609	48.15	0.20
29.00	0.00	2,538	48.15	0.20
29.10	0.00	2,467	48.15	0.20
29.20	0.00	2,395	48.14	0.20
29.30	0.00	2,324	48.14	0.20
29.40	0.00	2,253	48.13	0.20
29.50	0.00	2,181	48.13	0.20
29.60	0.00	2,110	48.13	0.20
29.70	0.00	2,039	48.12	0.20
29.80	0.00	1,968	48.12	0.20
29.90	0.00	1,897	48.11	0.20
30.00	0.00	1,826	48.11	0.20
30.10	0.00	1,755	48.10	0.20
30.20	0.00	1,684	48.10	0.20
30.30	0.00	1,614	48.10	0.20
30.40	0.00	1,543	48.09	0.20
30.50	0.00	1,472	48.09	0.20
30.60	0.00	1,402	48.08	0.20
30.70	0.00	1,331	48.08	0.20
30.80	0.00	1,260	48.08	0.20
30.90	0.00	1,190	48.07	0.20
31.00	0.00	1,120	48.07	0.20
31.10	0.00	1,049	48.06	0.20

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Hydrograph for Pond 45P: Bioretention Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
31.20	0.00	979	48.06	0.20
31.30	0.00	909	48.05	0.20
31.40	0.00	838	48.05	0.19
31.50	0.00	768	48.05	0.19
31.60	0.00	698	48.04	0.19
31.70	0.00	628	48.04	0.19
31.80	0.00	558	48.03	0.19
31.90	0.00	488	48.03	0.19
32.00	0.00	418	48.03	0.19
32.10	0.00	348	48.02	0.19
32.20	0.00	279	48.02	0.19
32.30	0.00	209	48.01	0.19
32.40	0.00	144	48.01	0.17
32.50	0.00	94	48.01	0.11
32.60	0.00	62	48.00	0.07
32.70	0.00	40	48.00	0.05
32.80	0.00	27	48.00	0.03
32.90	0.00	17	48.00	0.02
33.00	0.00	11	48.00	0.01
33.10	0.00	7	48.00	0.01
33.20	0.00	5	48.00	0.01
33.30	0.00	3	48.00	0.00
33.40	0.00	2	48.00	0.00
33.50	0.00	1	48.00	0.00
33.60	0.00	1	48.00	0.00
33.70	0.00	1	48.00	0.00
33.80	0.00	0	48.00	0.00
33.90	0.00	0	48.00	0.00
34.00	0.00	0	48.00	0.00
34.10	0.00	0	48.00	0.00
34.20	0.00	0	48.00	0.00
34.30	0.00	0	48.00	0.00
34.40	0.00	0	48.00	0.00
34.50	0.00	0	48.00	0.00
34.60	0.00	0	48.00	0.00
34.70	0.00	0	48.00	0.00
34.80	0.00	0	48.00	0.00
34.90	0.00	0	48.00	0.00
35.00	0.00	0	48.00	0.00
35.10	0.00	0	48.00	0.00
35.20	0.00	0	48.00	0.00
35.30	0.00	0	48.00	0.00
35.40	0.00	0	48.00	0.00
35.50	0.00	0	48.00	0.00
35.60	0.00	0	48.00	0.00
35.70	0.00	0	48.00	0.00
35.80	0.00	0	48.00	0.00
35.90	0.00	0	48.00	0.00
36.00	0.00	0	48.00	0.00
36.10	0.00	0	48.00	0.00
36.20	0.00	0	48.00	0.00
36.30	0.00	0	48.00	0.00

**BASIN DRAIN TIME FOR BIORETENTION BASIN 100-YEAR STORM
 33.80 - 12.20 = 21.30 HRS FROM PEAK < 72 HRS**

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Summary for Pond 45P: Bioretention Basin

Inflow Area = 2.769 ac, 57.35% Impervious, Inflow Depth = 0.67" for WQ Storm event
 Inflow = 4.89 cfs @ 1.03 hrs, Volume= 0.154 af
 Outflow = 0.20 cfs @ 1.93 hrs, Volume= 0.154 af, Atten= 96%, Lag= 53.5 min
 Primary = 0.20 cfs @ 1.93 hrs, Volume= 0.154 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 Peak Elev= 48.33' @ 1.93 hrs Surf.Area= 17,691 sf Storage= 5,632 cf

Plug-Flow detention time= 243.8 min calculated for 0.154 af (100% of inflow)
 Center-of-Mass det. time= 243.4 min (311.2 - 67.8)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	18,218 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	16,690	0	0
49.00	19,745	18,218	18,218

Device	Routing	Invert	Outlet Devices
#1	Primary	43.94'	18.0" Round Culvert L= 205.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 43.94' / 43.32' S= 0.0030 ' /' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	48.00'	1.000 in/hr Exfiltration X 0.50 over Surface area
#3	Device 1	48.35'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.20 cfs @ 1.93 hrs HW=48.33' (Free Discharge)

- ↑ 1=Culvert (Passes 0.20 cfs of 11.94 cfs potential flow)
- ↑ 2=Exfiltration (Exfiltration Controls 0.20 cfs)
- ↑ 3=Orifice/Grate (Controls 0.00 cfs)

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Hydrograph for Pond 45P: Bioretention Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	48.00	0.00
0.10	0.00	0	48.00	0.00
0.20	0.00	0	48.00	0.00
0.30	0.00	1	48.00	0.00
0.40	0.09	14	48.00	0.02
0.50	0.19	51	48.00	0.06
0.60	0.33	111	48.01	0.13
0.70	0.40	184	48.01	0.19
0.80	0.73	319	48.02	0.19
0.90	1.84	712	48.04	0.19
1.00	4.71	1,819	48.11	0.20
1.10	4.12	3,335	48.20	0.20
1.20	1.79	4,326	48.25	0.20
1.30	0.97	4,750	48.28	0.20
1.40	0.79	4,994	48.29	0.20
1.50	0.75	5,196	48.30	0.20
1.60	0.61	5,367	48.31	0.20
1.70	0.61	5,512	48.32	0.20
1.80	0.33	5,608	48.33	0.20
1.90	0.21	5,631	48.33	0.20
2.00	0.16	5,624	48.33	0.20
2.10	0.01	5,580	48.32	0.20
2.20	0.00	5,508	48.32	0.20
2.30	0.00	5,435	48.32	0.20
2.40	0.00	5,361	48.31	0.20
2.50	0.00	5,288	48.31	0.20
2.60	0.00	5,214	48.30	0.20
2.70	0.00	5,141	48.30	0.20
2.80	0.00	5,067	48.30	0.20
2.90	0.00	4,994	48.29	0.20
3.00	0.00	4,921	48.29	0.20
3.10	0.00	4,848	48.28	0.20
3.20	0.00	4,775	48.28	0.20
3.30	0.00	4,702	48.27	0.20
3.40	0.00	4,629	48.27	0.20
3.50	0.00	4,556	48.27	0.20
3.60	0.00	4,483	48.26	0.20
3.70	0.00	4,410	48.26	0.20
3.80	0.00	4,337	48.25	0.20
3.90	0.00	4,264	48.25	0.20
4.00	0.00	4,192	48.25	0.20
4.10	0.00	4,119	48.24	0.20
4.20	0.00	4,046	48.24	0.20
4.30	0.00	3,974	48.23	0.20
4.40	0.00	3,901	48.23	0.20
4.50	0.00	3,829	48.22	0.20
4.60	0.00	3,757	48.22	0.20
4.70	0.00	3,684	48.22	0.20
4.80	0.00	3,612	48.21	0.20
4.90	0.00	3,540	48.21	0.20
5.00	0.00	3,468	48.20	0.20
5.10	0.00	3,395	48.20	0.20

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Page 3

Hydrograph for Pond 45P: Bioretention Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
5.20	0.00	3,323	48.20	0.20
5.30	0.00	3,251	48.19	0.20
5.40	0.00	3,179	48.19	0.20
5.50	0.00	3,107	48.18	0.20
5.60	0.00	3,036	48.18	0.20
5.70	0.00	2,964	48.17	0.20
5.80	0.00	2,892	48.17	0.20
5.90	0.00	2,820	48.17	0.20
6.00	0.00	2,749	48.16	0.20
6.10	0.00	2,677	48.16	0.20
6.20	0.00	2,606	48.15	0.20
6.30	0.00	2,534	48.15	0.20
6.40	0.00	2,463	48.15	0.20
6.50	0.00	2,391	48.14	0.20
6.60	0.00	2,320	48.14	0.20
6.70	0.00	2,249	48.13	0.20
6.80	0.00	2,178	48.13	0.20
6.90	0.00	2,106	48.12	0.20
7.00	0.00	2,035	48.12	0.20
7.10	0.00	1,964	48.12	0.20
7.20	0.00	1,893	48.11	0.20
7.30	0.00	1,822	48.11	0.20
7.40	0.00	1,751	48.10	0.20
7.50	0.00	1,681	48.10	0.20
7.60	0.00	1,610	48.10	0.20
7.70	0.00	1,539	48.09	0.20
7.80	0.00	1,468	48.09	0.20
7.90	0.00	1,398	48.08	0.20
8.00	0.00	1,327	48.08	0.20
8.10	0.00	1,257	48.07	0.20
8.20	0.00	1,186	48.07	0.20
8.30	0.00	1,116	48.07	0.20
8.40	0.00	1,045	48.06	0.20
8.50	0.00	975	48.06	0.20
8.60	0.00	905	48.05	0.20
8.70	0.00	835	48.05	0.19
8.80	0.00	765	48.05	0.19
8.90	0.00	694	48.04	0.19
9.00	0.00	624	48.04	0.19
9.10	0.00	554	48.03	0.19
9.20	0.00	485	48.03	0.19
9.30	0.00	415	48.02	0.19
9.40	0.00	345	48.02	0.19
9.50	0.00	275	48.02	0.19
9.60	0.00	205	48.01	0.19
9.70	0.00	141	48.01	0.16
9.80	0.00	92	48.01	0.11
9.90	0.00	60	48.00	0.07
10.00	0.00	40	48.00	0.05
10.10	0.00	26	48.00	0.03
10.20	0.00	17	48.00	0.02
10.30	0.00	11	48.00	0.01

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Hydrograph for Pond 45P: Bioretention Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
10.40	0.00	7	48.00	0.01
10.50	0.00	5	48.00	0.01
10.60	0.00	3	48.00	0.00
10.70	0.00	2	48.00	0.00
10.80	0.00	1	48.00	0.00
10.90	0.00	1	48.00	0.00
11.00	0.00	1	48.00	0.00
11.10	0.00	0	48.00	0.00
11.20	0.00	0	48.00	0.00
11.30	0.00	0	48.00	0.00
11.40	0.00	0	48.00	0.00
11.50	0.00	0	48.00	0.00
11.60	0.00	0	48.00	0.00
11.70	0.00	0	48.00	0.00
11.80	0.00	0	48.00	0.00
11.90	0.00	0	48.00	0.00
12.00	0.00	0	48.00	0.00
12.10	0.00	0	48.00	0.00
12.20	0.00	0	48.00	0.00
12.30	0.00	0	48.00	0.00
12.40	0.00	0	48.00	0.00
12.50	0.00	0	48.00	0.00
12.60	0.00	0	48.00	0.00
12.70	0.00	0	48.00	0.00
12.80	0.00	0	48.00	0.00
12.90	0.00	0	48.00	0.00
13.00	0.00	0	48.00	0.00
13.10	0.00	0	48.00	0.00
13.20	0.00	0	48.00	0.00
13.30	0.00	0	48.00	0.00
13.40	0.00	0	48.00	0.00
13.50	0.00	0	48.00	0.00
13.60	0.00	0	48.00	0.00
13.70	0.00	0	48.00	0.00
13.80	0.00	0	48.00	0.00
13.90	0.00	0	48.00	0.00
14.00	0.00	0	48.00	0.00
14.10	0.00	0	48.00	0.00
14.20	0.00	0	48.00	0.00
14.30	0.00	0	48.00	0.00
14.40	0.00	0	48.00	0.00
14.50	0.00	0	48.00	0.00
14.60	0.00	0	48.00	0.00
14.70	0.00	0	48.00	0.00
14.80	0.00	0	48.00	0.00
14.90	0.00	0	48.00	0.00
15.00	0.00	0	48.00	0.00
15.10	0.00	0	48.00	0.00
15.20	0.00	0	48.00	0.00
15.30	0.00	0	48.00	0.00
15.40	0.00	0	48.00	0.00
15.50	0.00	0	48.00	0.00

BASIN DRAIN TIME FOR BIORETENTION BASIN WQ STORM
 11.10 - 1.90 = 9.20 HRS FROM PEAK < 72 HRS

Conduit Outlet Protection Calculations

Scour Hole # 1

Design Parameters:

Design Storm Flow for 25 Year, Q	10.48 cfs
Vertical Dimension of Outlet Pipe, D_o	24 in
Horizontal Dimension of Outlet Pipe, W_o	24 in
Tailwater Depth, TW^1	0.50 ft
Scour Hole Depth, y ($1/2 D_o$ or D_o)	12 in

Apron Dimension Calculations:

Minimum Bottom Width, $W_1 = 2W_o$	$W_1 = 4.00$ ft
Minimum Bottom Length, $L_1 = 3D_o$	$L_1 = 6.00$ ft
Minimum Top Width (max side slope of 3:1), W_2	$W_2 = 10.00$ ft
Minimum Top Length (max side slope of 3:1), L_2	$L_2 = 12.00$ ft

Rip Rap Stone Size Calculations:

Unit Discharge, $q = Q/D_o = 5.24$ cfs per foot

• **Case I: $y = 1/2 D_o$**

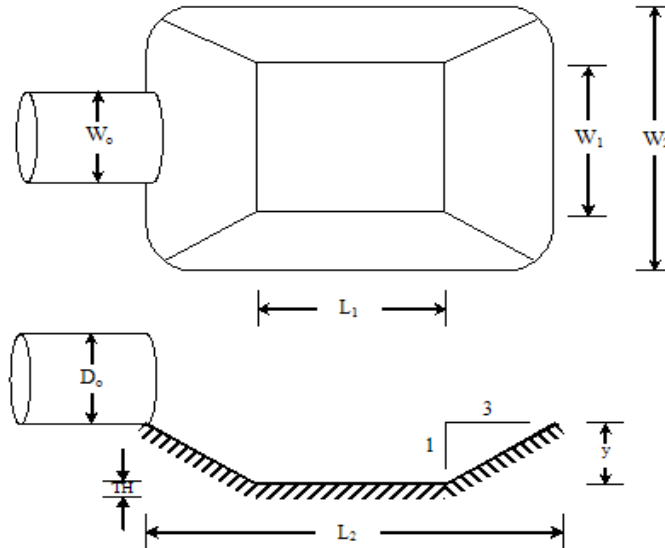
Median Stone, $d_{50} = \frac{0.0125 q^{1.33}}{TW} = 2.72$ in Therefore, use **$d_{50} = 6$ in**

Apron Thickness, $TH = 2 \times d_{50}$ with filter fabric **$TH = 12$ in**

• **Case II: $y = D_o$**

Median Stone, $d_{50} = \frac{0.0082 q^{1.33}}{TW} =$

Apron Thickness, $TH = 2 \times d_{50}$ with filter fabric



Notes:

1. The side slopes shall be 3:1 or flatter.
2. The bottom grade shall be 0.0% (level).
3. There shall be no overfall at the end of the apron or at the end of the culvert.
4. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50} . The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
5. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
6. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
7. Where the scour hole is to be placed within an existing or proposed waterway:
 - a. The scour hole sidewalls should be eliminated to maintain a smooth hydraulic line along the waterway bottom to avoid inviting turbulent flow from a sudden depression in the waterway.
 - b. If the flow in the waterway is greater than the flow from the proposed outlet, the rip-rap used to construct the scour hole should be sized based on the greater flow value according to the standard rip-rap.

Footnote:

1. Tailwater depth shall be the 2 year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.

Conduit Outlet Protection Calculations

Scour Hole # 2

Design Parameters:

Design Storm Flow for 25 Year, Q	58.64 cfs
Vertical Dimension of Outlet Pipe, D_o	36 in
Horizontal Dimension of Outlet Pipe, W_o	36 in
Tailwater Depth, TW^1	0.60 ft
Scour Hole Depth, y ($1/2 D_o$ or D_o)	18 in

Apron Dimension Calculations:

Minimum Bottom Width, $W_1 = 2W_o$	$W_1 = 6.00$ ft
Minimum Bottom Length, $L_1 = 3D_o$	$L_1 = 9.00$ ft
Minimum Top Width (max side slope of 3:1), W_2	$W_2 = 15.00$ ft
Minimum Top Length (max side slope of 3:1), L_2	$L_2 = 18.00$ ft

Rip Rap Stone Size Calculations:

Unit Discharge, $q = Q/D_o = 19.55$ cfs per foot

• **Case I: $y = 1/2 D_o$**

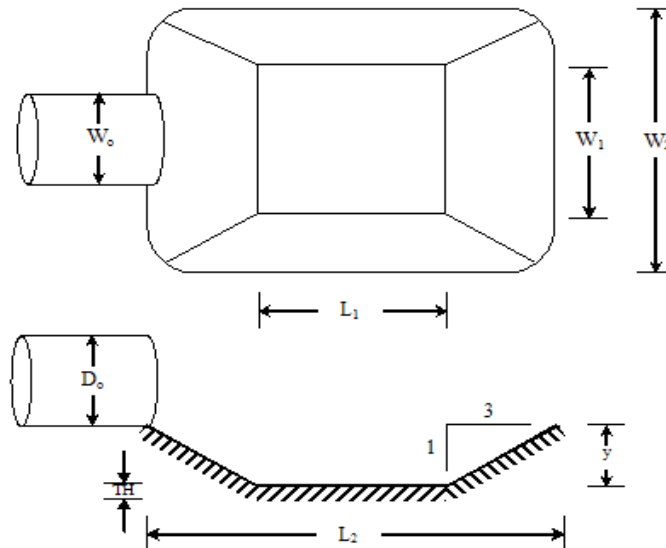
Median Stone, $d_{50} = \frac{0.0125 q^{1.33}}{TW} = 13.03$ in Therefore, use **$d_{50} = 14$ in**

Apron Thickness, $TH = 2 \times d_{50}$ with filter fabric **$TH = 28$ in**

• **Case II: $y = D_o$**

Median Stone, $d_{50} = \frac{0.0082 q^{1.33}}{TW} =$

Apron Thickness, $TH = 2 \times d_{50}$ with filter fabric



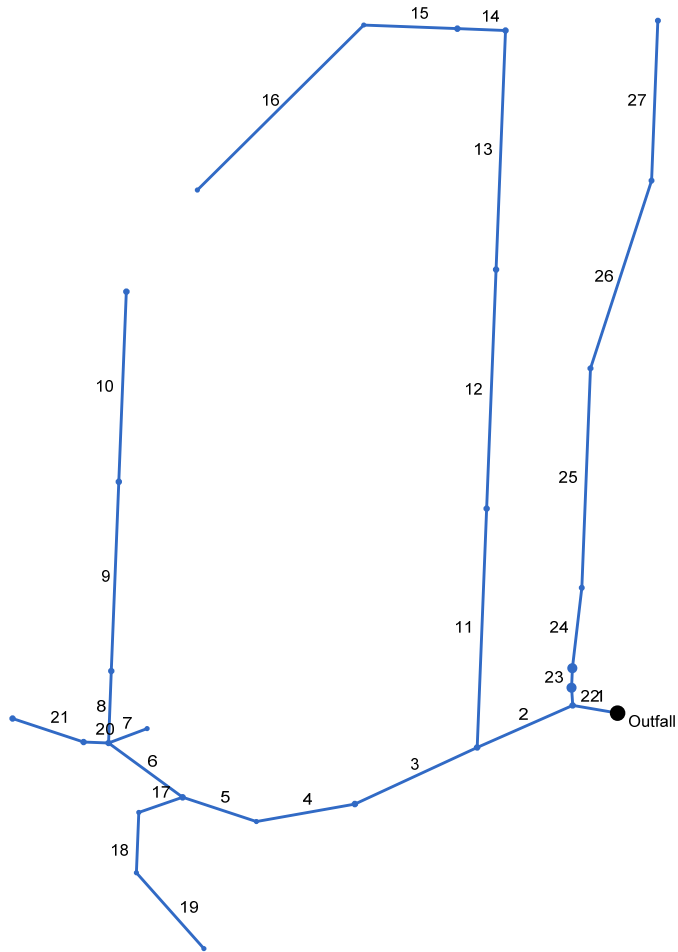
Notes:

1. The side slopes shall be 3:1 or flatter.
2. The bottom grade shall be 0.0% (level).
3. There shall be no overfall at the end of the apron or at the end of the culvert.
4. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50} . The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
5. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
6. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
7. Where the scour hole is to be placed within an existing or proposed waterway:
 - a. The scour hole sidewalls should be eliminated to maintain a smooth hydraulic line along the waterway bottom to avoid inviting turbulent flow from a sudden depression in the waterway.
 - b. If the flow in the waterway is greater than the flow from the proposed outlet, the rip-rap used to construct the scour hole should be sized based on the greater flow value according to the standard rip-rap.

Footnote:

1. Tailwater depth shall be the 2 year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.

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



Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	51.000	0.00	10.64	0.00	0.00	9.98	10.0	20.9	4.7	58.64	66.69	10.02	36	1.00	35.00	35.51	37.18	37.99	38.83	46.31	HW - 1
2	1	117.000	0.00	7.42	0.00	0.00	6.89	10.0	20.7	4.7	44.18	44.43	9.97	30	1.00	38.02	39.19	40.06	41.40	46.31	50.25	1 - 2
3	2	151.000	0.00	3.77	0.00	0.00	3.50	10.0	20.3	4.8	28.30	31.31	6.84	30	0.50	39.29	40.04	41.40	41.89	50.25	50.82	2 - 3
4	3	112.000	0.31	3.77	0.65	0.20	3.50	10.0	20.0	4.8	28.42	31.42	7.06	30	0.50	40.14	40.70	42.13	42.54	50.82	51.52	3 - 4
5	4	87.000	0.00	3.46	0.00	0.00	3.30	10.0	19.7	4.9	27.54	31.24	5.83	30	0.49	40.80	41.23	43.21	43.45	51.52	52.41	4 - 5
6	5	103.000	0.00	3.27	0.00	0.00	3.18	10.0	19.5	4.9	27.05	31.26	5.64	30	0.50	41.33	41.84	43.82	44.12	52.41	52.31	5 - 6
7	6	46.000	0.10	0.10	0.82	0.08	0.08	10.0	10.0	6.5	0.53	4.63	3.29	12	1.00	49.44	49.90	49.67	50.20	52.31	52.00	6 - 6A
8	6	81.000	0.00	3.05	0.00	0.00	3.02	10.0	11.2	6.2	30.28	31.22	6.17	30	0.49	41.94	42.34	44.64	45.01	52.31	51.98	6 - 7
9	8	213.000	0.00	3.05	0.00	0.00	3.02	10.0	10.6	6.3	19.15	20.84	7.38	24	0.50	45.62	46.69	47.13	48.26	51.98	51.91	7 - 8
10	9	214.000	3.05	3.05	0.99	3.02	3.02	10.0	10.0	6.5	19.52	20.69	7.34	24	0.50	46.69	47.75	48.26	49.34	51.91	51.47	8 - 9 (R1)
11	2	269.000	0.00	3.65	0.00	0.00	3.38	10.0	16.8	5.2	17.75	20.75	7.18	24	0.50	40.82	42.16	42.24	43.68	50.25	48.70	2 - 15
12	11	269.000	0.00	3.65	0.00	0.00	3.38	10.0	16.1	5.4	18.12	20.83	7.05	24	0.50	42.16	43.51	43.68	45.04	48.70	48.70	15 - 16
13	12	269.000	2.97	3.65	0.99	2.94	3.38	10.0	15.4	5.5	18.48	20.75	7.12	24	0.50	43.51	44.85	45.04	46.40	48.70	48.70	16 - 17(R2)
14	13	54.000	0.13	0.68	0.65	0.08	0.44	10.0	15.0	5.5	2.44	4.12	3.11	15	0.24	45.60	45.73	46.40	46.46	48.70	50.97	17 - 18
15	14	105.000	0.23	0.55	0.65	0.15	0.36	10.0	14.0	5.7	2.03	4.18	3.05	15	0.25	45.81	46.07	46.55	46.68	50.97	52.36	18 - 19
16	15	263.000	0.32	0.32	0.65	0.21	0.21	10.0	10.0	6.5	1.34	4.17	2.37	15	0.25	46.07	46.72	46.89	47.19	52.36	50.52	19 -21/21A
17	5	52.000	0.03	0.19	0.65	0.02	0.12	10.0	15.3	5.5	0.68	3.27	3.06	12	0.50	44.98	45.24	45.29	45.58	52.41	48.97	5 - 12
18	17	68.000	0.07	0.16	0.65	0.05	0.10	10.0	13.9	5.7	0.59	3.27	2.61	12	0.50	45.24	45.58	45.58	45.90	48.97	49.00	12 - 13
19	18	114.000	0.09	0.09	0.65	0.06	0.06	10.0	10.0	6.5	0.38	3.27	2.08	12	0.50	45.58	46.15	45.90	46.40	49.00	48.62	13 - 14
20	6	28.000	0.09	0.12	0.65	0.06	0.08	10.0	18.7	5.0	0.39	3.27	2.62	12	0.50	45.14	45.28	45.37	45.54	52.31	48.47	6 - 10
21	20	84.000	0.03	0.03	0.65	0.02	0.02	10.0	10.0	6.5	0.13	3.27	1.69	12	0.50	45.38	45.80	45.54	45.94	48.47	48.41	10 - 11
22	1	20.000	0.00	3.22	0.00	0.00	3.10	10.0	13.3	5.8	17.98	20.79	7.22	24	0.50	36.71	36.81	38.15	38.34	46.31	47.11	1 - MTD 1A

Project File: Storm Pipe Sizing - Main.stm

Number of lines: 27

Run Date: 1/18/2022

NOTES: Intensity = 182.59 / (Inlet time + 19.10) ^ 0.99; Return period = Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	22.000	0.00	3.22	0.00	0.00	3.10	10.0	13.3	5.8	18.01	20.79	7.22	24	0.50	38.64	38.75	40.08	40.28	47.11	46.95	MTD 1A - MTD 1B
24	23	91.000	0.76	3.22	0.98	0.74	3.10	10.0	13.0	5.9	18.16	20.68	7.22	24	0.49	40.58	41.03	42.03	42.56	46.95	45.82	MTD 1B - 22
25	24	247.000	0.74	2.46	0.99	0.73	2.35	10.0	12.1	6.0	14.19	17.45	5.87	24	0.35	41.03	41.90	42.56	43.26	45.82	45.82	22 -23
26	25	222.000	0.76	1.72	0.98	0.74	1.62	0.0	10.9	6.3	10.14	11.26	4.06	24	0.25	41.90	42.45	43.38	43.93	45.82	45.19	23 - 24
27	26	180.000	0.96	0.96	0.91	0.87	0.87	10.0	10.0	6.5	5.65	6.21	3.20	18	0.35	42.45	43.08	44.06	44.56	45.19	45.27	24 -25

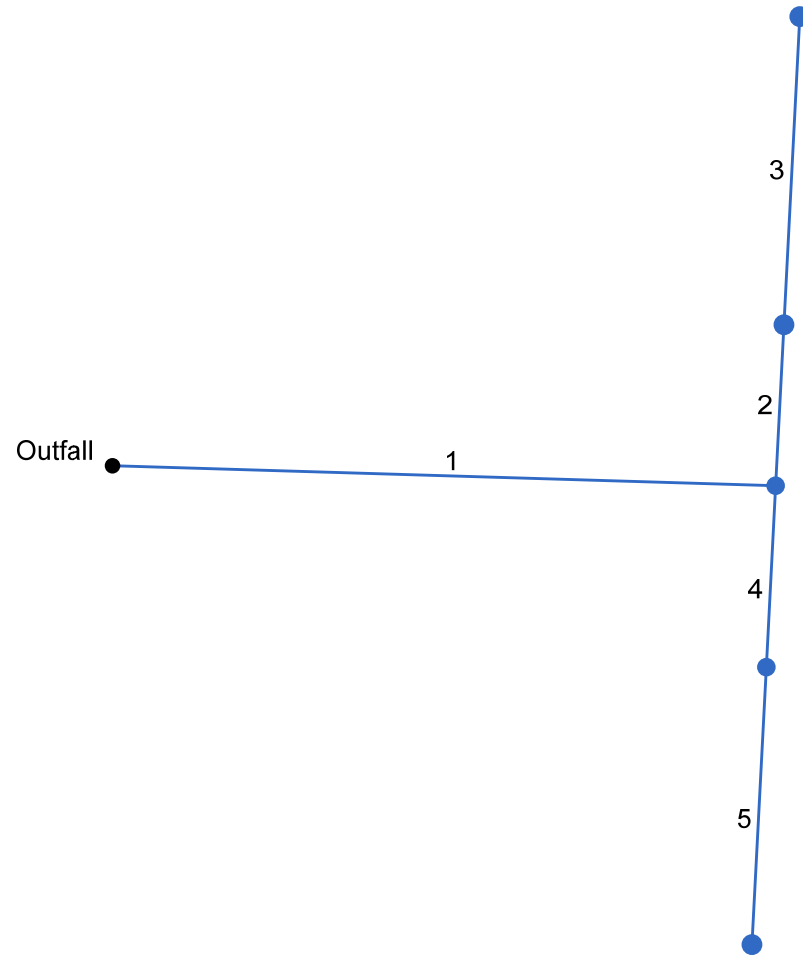
Project File: Storm Pipe Sizing - Main.stm

Number of lines: 27

Run Date: 1/18/2022

NOTES: Intensity = 182.59 / (Inlet time + 19.10) ^ 0.99; Return period = Yrs. 25 ; c = cir e = ellip b = box

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



Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	148.000	0.00	1.69	0.00	0.00	1.67	10.0	10.9	6.3	10.48	12.33	4.41	24	0.30	48.00	48.44	49.42	49.86	51.50	51.93	HW - MH 26
2	1	47.000	0.43	0.85	0.99	0.43	0.84	10.0	10.7	6.3	5.32	5.73	3.39	18	0.30	48.90	49.04	50.16	50.27	51.93	51.43	MH 26 -27
3	2	90.000	0.42	0.42	0.99	0.42	0.42	10.0	10.0	6.5	2.69	3.54	2.56	15	0.30	49.29	49.56	50.36	50.50	51.43	51.82	27-28
4	1	53.000	0.39	0.84	0.99	0.39	0.83	10.0	10.6	6.3	5.27	5.77	3.70	18	0.30	49.06	49.22	50.19	50.35	51.93	51.52	MH 26 - 29
5	4	81.000	0.45	0.45	0.99	0.45	0.45	10.0	10.0	6.5	2.88	3.51	2.55	15	0.30	49.31	49.55	50.45	50.59	51.52	51.80	29-30

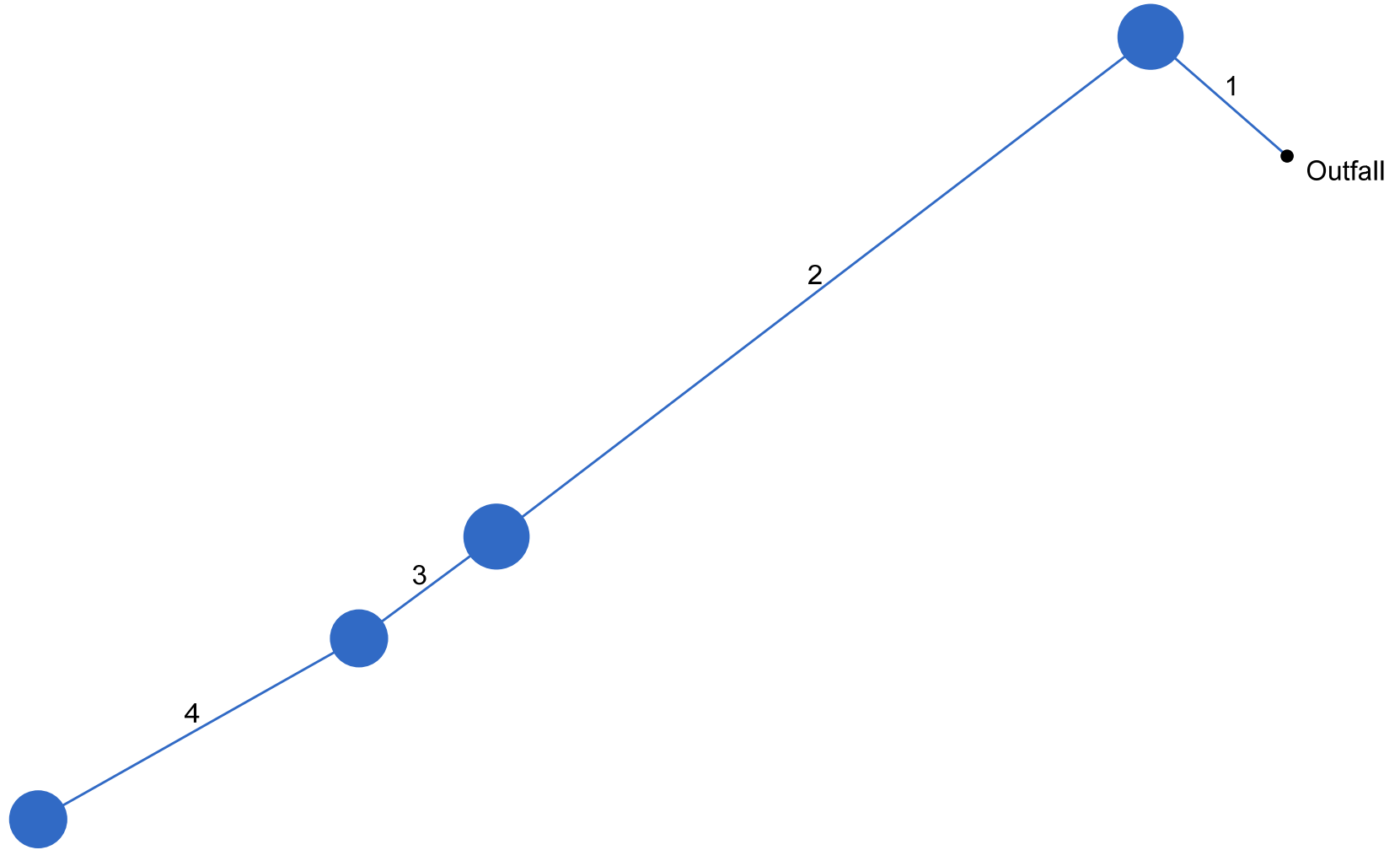
Project File: Storm Pipe Sizing - Parking.stm

Number of lines: 5

Run Date: 1/18/2022

NOTES: Intensity = 182.59 / (Inlet time + 19.10) ^ 0.99; Return period = Yrs. 25 ; c = cir e = ellip b = box

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



Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	13.000	0.00	0.23	0.00	0.00	0.20	10.0	11.9	6.1	1.21	4.39	3.06	15	0.46	43.70	43.76	44.15	44.21	48.89	49.26	ROW - MH 19a
2	1	58.000	0.00	0.23	0.00	0.00	0.20	10.0	10.9	6.3	1.25	4.57	2.69	15	0.50	43.76	44.05	44.35	44.49	49.26	49.76	MH 19 A - MTD 2
3	2	12.000	0.16	0.23	0.81	0.13	0.20	10.0	10.7	6.3	1.25	4.57	3.18	15	0.50	45.88	45.94	46.33	46.39	49.76	49.25	MTD 2 - 19
4	3	25.000	0.07	0.07	0.99	0.07	0.07	10.0	10.0	6.5	0.45	2.57	2.45	12	0.52	46.19	46.32	46.47	46.60	49.25	49.24	19 - 18

Project File: Storm Pipe Sizing - ROW.stm

Number of lines: 4

Run Date: 1/18/2022

NOTES: Intensity = 182.59 / (Inlet time + 19.10) ^ 0.99; Return period = Yrs. 25 ; c = cir e = ellip b = box

Bioretention Basin Underdrain Sizing

Requirement: The network of pipes for a bioretention basin with underdrains must have a conveyance rate at least twice the design permeability of the sand layer. Where the sand permeability is twice the design permeability of the soil bed.

Area of Infiltration: 14,855 SF (Largest Bioretention Basin Footprint on Site - Underdrain to be same size and slopes for all Bioretention Basins)

Design Permeability of Sand Layer = 1.0 in/hr (Permeability of Soil Bed = 1.0 in/hr., Design Permeability of Soil Bed = 0.50 in/hr)

Required Capacity of Underdrain System: $14,855 \text{ SF} * (1/12") * (1 \text{ hr} / 60 \text{ min}) * (1 \text{ min} / 60 \text{ sec}) * (2 * 1.0 \text{ in/hr}) = 0.69 \text{ cfs}$



Date: 1/12/2022
 Project: Lawrence
 Project No: J201029

Calculated By: ATK
 Checked By: AS

Bioretention Basin Underdrain Sizing

Manning's Equation

Design Parameters:

Pipe Diameter, D	12 in
Pipe Material	PVC
Slope, s	0.10 %
Flow Depth, y	FULL

Calculations:

Cross-Sectional Area, $A = D^2 / 8 [\theta - \sin(\theta)] =$	0.79 ft ²
Manning's Coefficient, n	0.010
Hydraulic Radius, R	0.25 ft
Angle, $\theta =$	6.28 radians
Wetted Perimeter, $P = \theta D / 2$	3.14 ft
Flow Depth, y	1.00 ft
Flow Top Width, $T = 2[y(D - y)]^{1/2}$	0.00 ft
Gravity Constant, g	32.174 ft/s ²
Froude Number, F	0.00

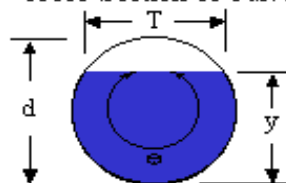
Subcritical Flow

• Flow & Velocity:

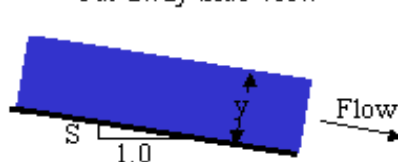
Flow, $Q_o = \frac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ **1.46 cfs**
0.95 MGD

Velocity, $V = Q/A$ **1.86 fps**

Cross-Section of Culvert



Cut-away Side View



$$Q = VA \quad V = \frac{k}{n} R^{2/3} s^{1/2} \quad R = \frac{A}{P} \quad A = \frac{d^2}{8} (\theta - \sin(\theta))$$

$$P = \frac{\theta d}{2} \quad y = \frac{d}{2} \left[1 - \cos\left(\frac{\theta}{2}\right) \right] \quad T = 2\sqrt{y(d-y)} \quad F = V \sqrt{\frac{T}{gA \cos(\tan^{-1} s)}}$$

12" PVC @ 0.10% Capacity = 1.46 cfs > 0.69 cfs required, therefore OKAY

New Jersey
Groundwater
Recharge
Spreadsheet
Version 2.0
November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
MERCER CO., LAWRENCE TWP	44.9	1.43

Project Name:	Lawrence Logistics Center
Description:	Proposed Warehouse Developme
Analysis Date:	01/12/202

Pre-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	13.954	Impervious areas	Udorthents	0.0	-
2	3.173	Open space	Udorthents	0.0	-
3	0				
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	17.1			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				0.0	-

Post-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	8.918	Impervious areas	Udorthents	0.0	-
2	8.209	Open space	Udorthents	0.0	-
3	0				
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	17.1			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				0.0	-

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

Annual Recharge Requirements Calculation ↓		0.0	-
% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	388,468
Post-Development Annual Recharge Deficit=	0	(cubic feet)	
Recharge Efficiency Parameters Calculations (area averages)			
RWC= 0.00	(in)	DRWC= 0.00	(in)
ERWC = 0.00	(in)	EDRWC= 0.00	(in)

NJDEP Nonstructural Strategies Points System (NSPS)

Version: January 31, 2006

Note: Input Values in Yellow Cells Only

Project:

Date:

User:

Notes:

Step 1 - Provide Basic Major Development Site Information

A. Specify Total Area in Acres of Development Site Described in Steps 2 and 3 = **Acres**

B. Specify by Percent the Various Planning Areas Located within the Development Site:

State Plan Planning Area:	PA-1	PA-2	PA-3	PA-4	PA-4B	PA-5	Total % Area
Percent of Each Planning Area within Site:	<input type="text" value="100.0%"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text" value="100.0%"/>

Note: See User's Guide for Equivalent Zones within Designated Centers and the NJ Meadowlands, Pinelands, and Highlands Districts

Step 2 - Describe Existing or Pre-Developed Site Conditions

A. Specify Existing Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers	0.0	0.0	0.0	1.9	1.9	37
2	Lawn and Open Space	0.0	0.0	0.0	0.7	0.7	7
3	Brush and Shrub	0.0	0.0	0.0	0.0	0.0	0
4	Meadow, Pasture, Grassland, or Range	0.0	0.0	0.0	0.0	0.0	0
5	Row Crop	0.0	0.0	0.0	0.0	0.0	0
6	Small Grain and Legumes	0.0	0.0	0.0	0.0	0.0	0
7	Woods - Indigenous	0.0	0.0	0.0	0.0	0.0	0
8	Woods - Planted	0.0	0.0	0.0	0.0	0.0	0
9	Woods and Grass Combination	0.0	0.0	0.0	0.4	0.4	5
10	Ponds, Lakes, and Other Open Water	0.0	0.0	0.0	0.2	0.2	3
11	Gravel and Dirt	0.0	0.0	0.0	0.0	0.0	0
12	Porous and Permeable Paving	0.0	0.0	0.0	0.0	0.0	0
13	Directly Connected Impervious	0.0	0.0	0.0	13.9	13.9	0
14	Unconnected Impervious with Small D/S Pervious	0.0	0.0	0.0	0.0	0.0	0
15	Unconnected Impervious with Large D/S Pervious	0.0	0.0	0.0	0.0	0.0	0
HSG Subtotals (Acres):		0.0	0.0	0.0	17.1		Total Area: 17.1
HSG Subtotals (%):		0.0%	0.0%	0.0%	100.0%		Total % Area: 100.0%
Points Subtotal:							52
Total Existing Site Points:							52

Step 3 - Describe Proposed or Post-Developed Site Conditions

A. Specify Proposed Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers	0.0	0.0	0.0	1.9	1.9	37
2	Lawn and Open Space	0.0	0.0	0.0	5.7	5.7	60
3	Brush and Shrub	0.0	0.0	0.0	0.0	0.0	0
4	Meadow, Pasture, Grassland, or Range	0.0	0.0	0.0	0.0	0.0	0
5	Row Crop	0.0	0.0	0.0	0.0	0.0	0
6	Small Grain and Legumes	0.0	0.0	0.0	0.0	0.0	0
7	Woods - Indigenous	0.0	0.0	0.0	0.0	0.0	0
8	Woods - Planted	0.0	0.0	0.0	0.0	0.0	0
9	Woods and Grass Combination	0.0	0.0	0.0	0.4	0.4	5
10	Ponds, Lakes, and Other Open Water	0.0	0.0	0.0	0.2	0.2	3
11	Gravel and Dirt	0.0	0.0	0.0	0.0	0.0	0
12	Porous and Permeable Paving	0.0	0.0	0.0	0.0	0.0	0
13	Directly Connected Impervious	0.0	0.0	0.0	8.9	8.9	0
14	Unconnected Impervious with Small D/S Pervious	0.0	0.0	0.0	0.0	0.0	0
15	Unconnected Impervious with Large D/S Pervious	0.0	0.0	0.0	0.0	0.0	0
HSG Subtotals (Acres):		0.0	0.0	0.0	17.1		Total Area: 17.1
HSG Subtotals (%):		0.0%	0.0%	0.0%	100.0%		Total % Area: 100.0%
Points Subtotal:							105

B. Compare Proposed Impervious Coverage with Maximum Allowable Impervious Coverage:

Total Directly Connected Impervious Coverage =	52%	% of Site
Total Unconnected Impervious Coverage with Small D/S Pervious =	0%	% of Site
Total Unconnected Impervious Coverage with Large D/S Pervious =	0%	% of Site
Total Site Impervious Coverage =	52%	% of Site
Effective Site Impervious Coverage =	52%	% of Site

Specify Source of Maximum Allowable Impervious Coverage: None (None or Table)

Points Subtotal: 0

C. Compare Proposed Site Disturbance with Maximum Allowable Site Disturbance:

Total Proposed Site Disturbance =	93%	% of Site
Maximum Allowable Site Disturbance by Municipal Ordinance =	100%	% of Site

Points Subtotal: 3

D. Describe Proposed Runoff Conveyance System:

Total Length of Runoff Conveyance System =	1120	Feet
Length of Vegetated Runoff Conveyance System =	0	Feet
% of Total Runoff Conveyance System That is Vegetated =	0%	

Points Subtotal: 0

E. Residential Lot Clustering:

Percent of Total Site Area that will be Clustered =	0%	% of Site
Minimum Standard Lot Size as Per Zoning (Note: 1/2 Acre or Greater) =	0.000	Acres
Maximum Proposed Cluster Lot Size (Note: 1/4 Acre or Less) =	0.000	Acres
Percent of Clustered Portion of Site to be Preserved as Vegetated Open Space =	0%	% of Clustered Site Portion

Points Subtotal: 0

F. Will the Following be Utilized to Minimize Soil Compaction?

Proposed Lawn Areas will be Graded with Lightweight Construction Equipment:
Percent of Proposed Lawn Areas to be Graded with Such Equipment:

No	(Yes or No)
0%	% of Lawn Areas

Points Subtotal: **0**

G. Are Any of the Following Stormwater Management Standards Met Using Only Nonstructural Strategies and Measures?

Groundwater Recharge Standards (NJAC 7:8-5.4-a-2):
Stormwater Runoff Quality Standards (NJAC 7:8-5.5):
Stormwater Runoff Quantity Standards (NJAC 7:8-5.4-a-3):

Yes	(Yes or No)
Yes	(Yes or No)
Yes	(Yes or No)

Points Subtotal: **42**

Note: If the Answers to All Three Questions at G Above are "Yes", Adequate Nonstructural Measures have been Utilized.

Total Proposed Site Points: 149

Ratio of Proposed to Existing Site Points: 286%

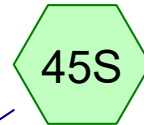
Required Site Points Ratio: 80%

Nonstructural Point System Results:

Proposed Nonstructural Measures are Adequate



PDA 1A (Partial - Truck Court Only) - Pervious (Truck Court Only)



PDA 1A (Partial - Truck Court Only) - Impervious (Truck Court Only)



MTD #1 (A&B)



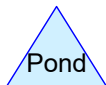
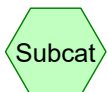
PDA 3 - Pervious



PDA 3 - Impervious



PDA 3 (MTD #2)



Routing Diagram for MTD Calculations

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MTD Calculations

Prepared by Bohler Engineering NJ, LLC

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Summary for Subcatchment 19S: PDA 3 - Pervious

Runoff = 0.12 cfs @ 1.19 hrs, Volume= 0.004 af, Depth= 0.17"

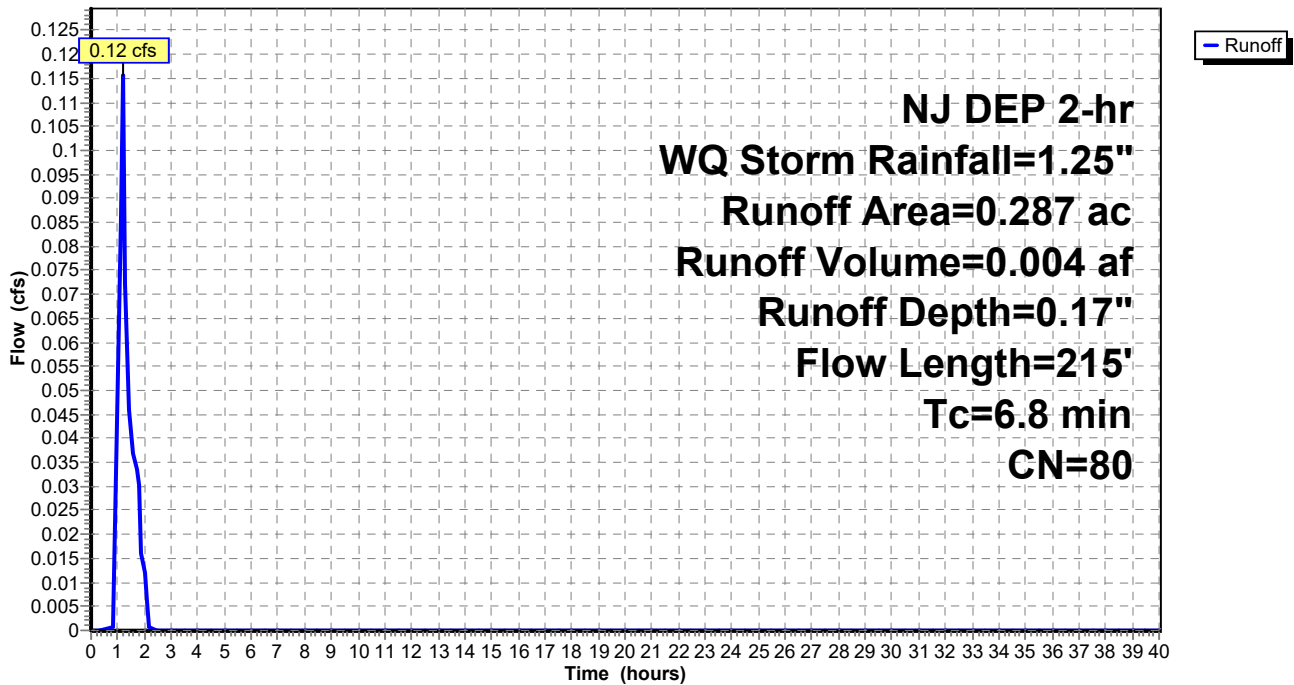
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.287	80	>75% Grass cover, Good, HSG D
0.287		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	45	0.0150	0.13		Sheet Flow, J-K Grass: Short n= 0.150 P2= 3.31"
0.6	75	0.0100	2.03		Shallow Concentrated Flow, K-L Paved Kv= 20.3 fps
0.5	95	0.0030	3.26	5.75	Pipe Channel, L-I 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
6.8	215	Total			

Subcatchment 19S: PDA 3 - Pervious

Hydrograph



MTD Calculations

Prepared by Bohler Engineering NJ, LLC

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Summary for Subcatchment 28S: PDA 3 - Impervious

Runoff = 0.53 cfs @ 1.06 hrs, Volume= 0.016 af, Depth= 1.03"

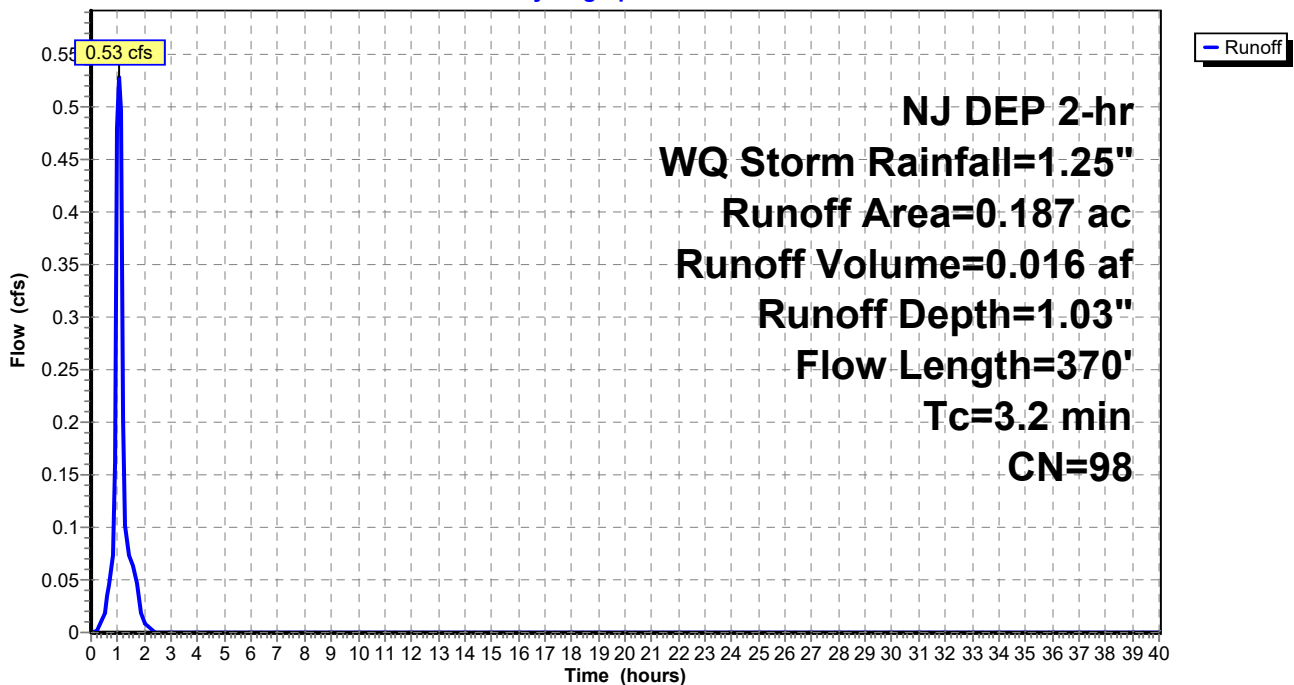
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.187	98	Paved parking, HSG D
0.187		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.06		Sheet Flow, F-G Smooth surfaces n= 0.011 P2= 3.31"
1.0	150	0.0150	2.49		Shallow Concentrated Flow, G-H Paved Kv= 20.3 fps
0.6	120	0.0030	3.26	5.75	Pipe Channel, H-I 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
3.2	370	Total			

Subcatchment 28S: PDA 3 - Impervious

Hydrograph



MTD Calculations

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Summary for Subcatchment 33S: PDA 1A (Partial - Truck Court Only) - Pervious (Truck Court Only)

Runoff = 0.10 cfs @ 1.23 hrs, Volume= 0.004 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
0.272	80	>75% Grass cover, Good, HSG D
0.272		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	90	0.0450	0.23		Sheet Flow, AT-AQ Grass: Short n= 0.150 P2= 3.31"
1.3	190	0.0150	2.49		Shallow Concentrated Flow, AH-AI Paved Kv= 20.3 fps
0.9	181	0.0035	3.52	6.21	Pipe Channel, AS-Y (PT. 1) 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
1.0	222	0.0025	3.60	11.31	Pipe Channel, AS-Y (PT. 2) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
1.0	247	0.0035	4.26	13.38	Pipe Channel, AS-Y (PT. 3) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.3	91	0.0050	5.09	16.00	Pipe Channel, AS-Y (PT. 4) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
10.9	1,021	Total			

MTD Calculations

Prepared by Bohler Engineering NJ, LLC

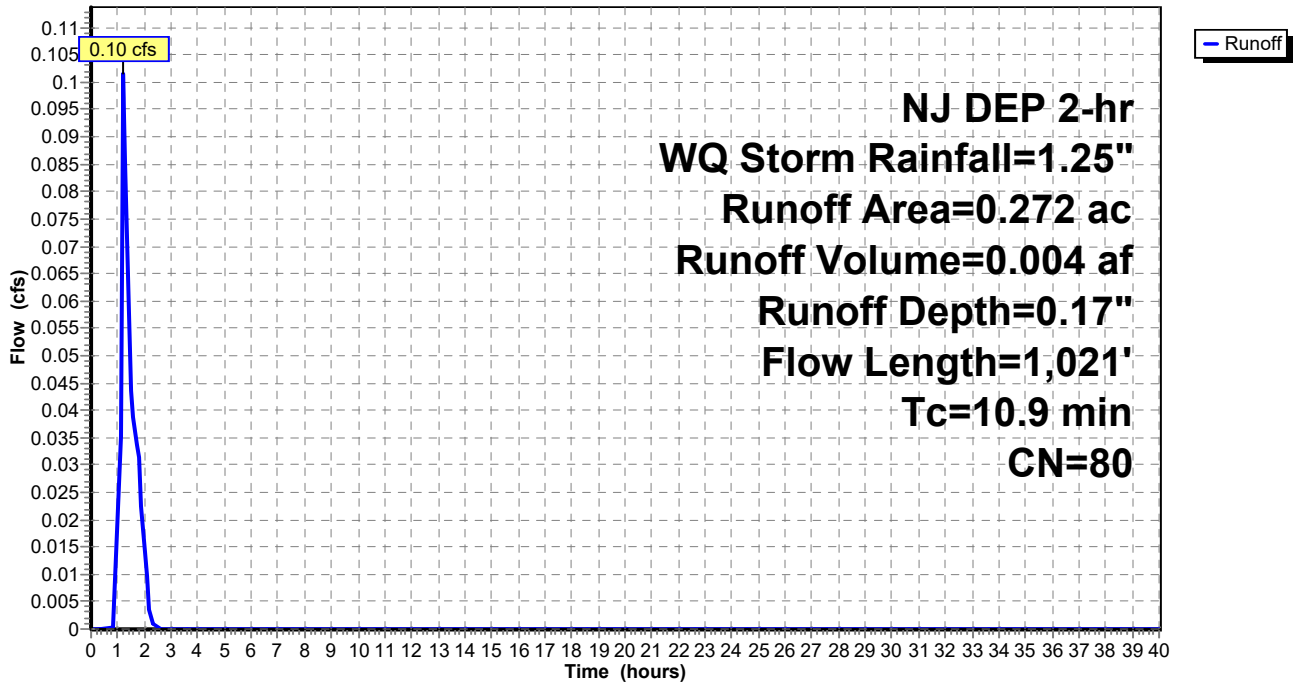
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WQ Flow Calculations for MTDs
NJ DEP 2-hr WQ Storm Rainfall=1.25"

Page 5

Subcatchment 33S: PDA 1A (Partial - Truck Court Only) - Pervious (Truck Court Only)

Hydrograph



MTD Calculations

Prepared by Bohler Engineering NJ, LLC

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Summary for Subcatchment 45S: PDA 1A (Partial - Truck Court Only) -Impervious (Truck Court Only)

Runoff = 8.37 cfs @ 1.09 hrs, Volume= 0.254 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Storm Rainfall=1.25"

Area (ac)	CN	Description
2.949	98	Paved parking, HSG D
2.949		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AT-AQ Smooth surfaces n= 0.011 P2= 3.31"
0.6	90	0.0150	2.49		Shallow Concentrated Flow, AH-AI Paved Kv= 20.3 fps
0.9	181	0.0035	3.52	6.21	Pipe Channel, AS-Y (PT. 1) 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
1.0	222	0.0025	3.60	11.31	Pipe Channel, AS-Y (PT. 2) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
1.0	247	0.0035	4.26	13.38	Pipe Channel, AS-Y (PT. 3) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.3	91	0.0050	5.09	16.00	Pipe Channel, AS-Y (PT. 4) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
5.1	931	Total			

MTD Calculations

Prepared by Bohler Engineering NJ, LLC

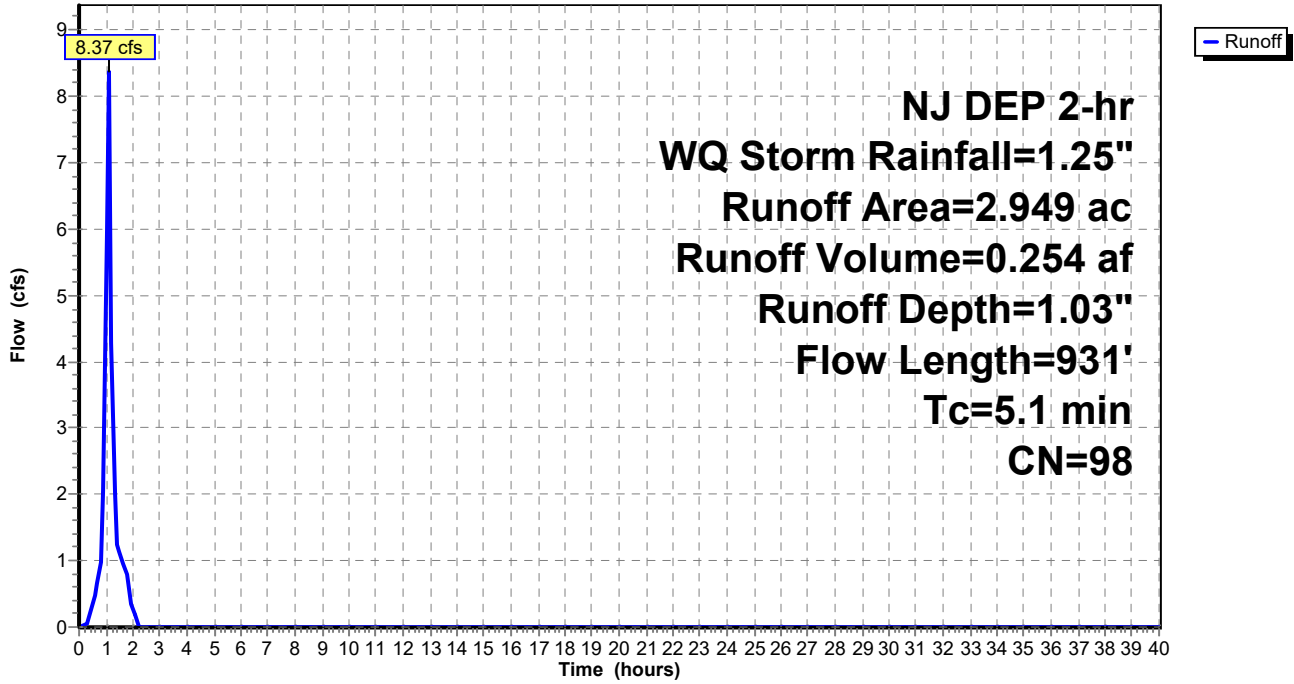
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WQ Flow Calculations for MTDs
NJ DEP 2-hr WQ Storm Rainfall=1.25"

Page 7

Subcatchment 45S: PDA 1A (Partial - Truck Court Only) -Impervious (Truck Court Only)

Hydrograph



MTD Calculations

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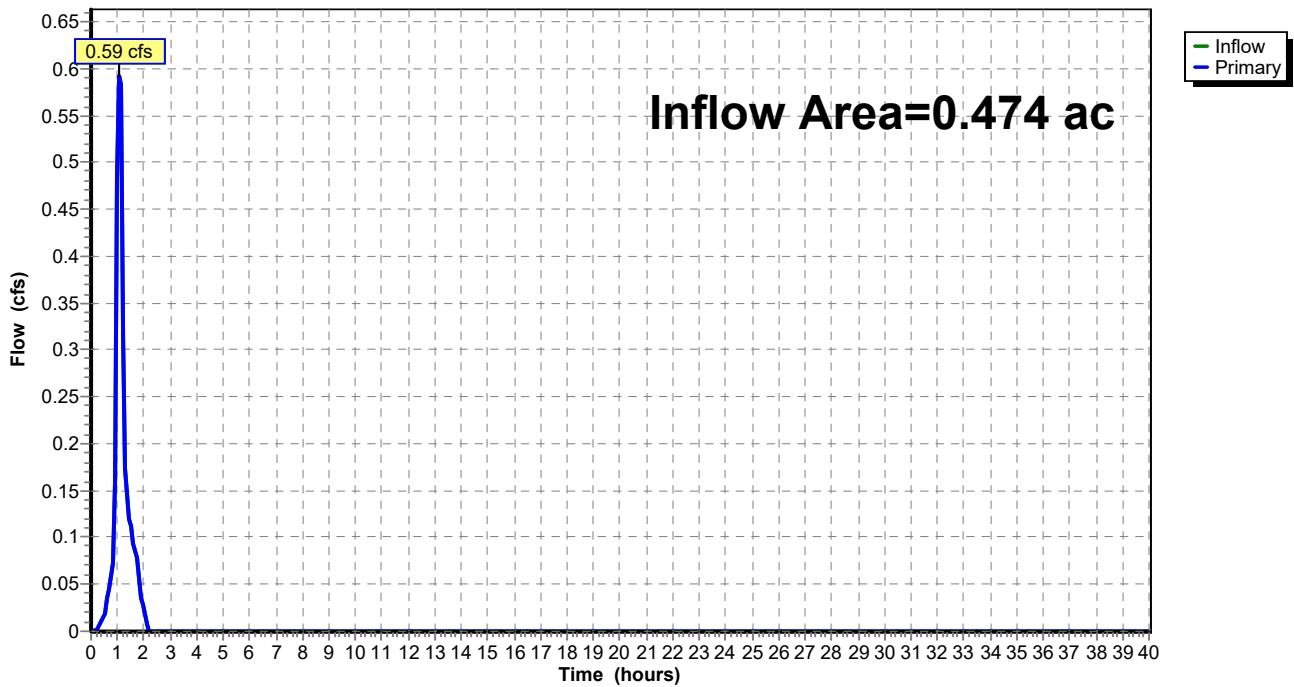
Summary for Link 25L: PDA 3 (MTD #2)

Inflow Area = 0.474 ac, 39.45% Impervious, Inflow Depth = 0.51" for WQ Storm event
Inflow = 0.59 cfs @ 1.08 hrs, Volume= 0.020 af
Primary = 0.59 cfs @ 1.08 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 25L: PDA 3 (MTD #2)

Hydrograph



MTD Calculations

Prepared by Bohler Engineering NJ, LLC

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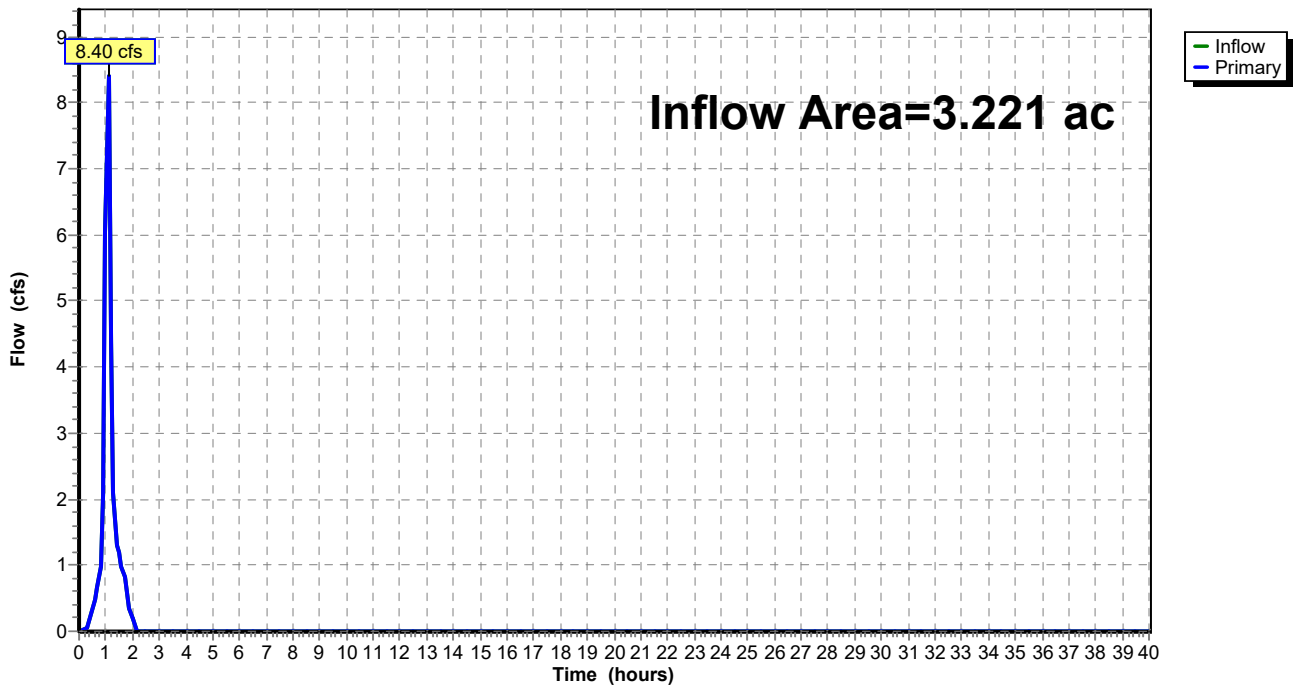
Summary for Link 35L: MTD #1 (A&B)

Inflow Area = 3.221 ac, 91.56% Impervious, Inflow Depth = 0.96" for WQ Storm event
Inflow = 8.40 cfs @ 1.09 hrs, Volume= 0.258 af
Primary = 8.40 cfs @ 1.09 hrs, Volume= 0.258 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs

Link 35L: MTD #1 (A&B)

Hydrograph



Lawrence Logistics Center (MTD #1)

Trenton, NJ

1/27/22

Information Provided by Engineer:

- Water quality flow rate = 8.40 cfs
- Impervious drainage area = 2.949 acres
- Pervious drainage area = 0.272 acres
- Required TSS removal rate = 80%
- Presiding agency = NJDEP

Information Determined by Contech:

- Attenuated water quality flow rate = 4.66 cfs

StormFilter Information and Cartridge Data:

The Stormwater Management StormFilter[®] is a passive, siphon-actuated, flow-through stormwater filtration system consisting of a precast concrete structure that houses rechargeable, media-filled filter cartridges. The StormFilter works by passing stormwater through the media-filled cartridges, which trap particulates and adsorb pollutants such as dissolved metals, nutrients, and hydrocarbons. **The StormFilter has received final certification from the NJDEP for 80% TSS removal as a stand-alone treatment system.**

- StormFilter cartridge filter media = Perlite
- StormFilter cartridge media height = 27 inches (nominal)
- StormFilter cartridge surface area = 10.61 square feet (nominal)
- StormFilter cartridge specific treatment flow rate = 2.12 gallons/minute per square foot (nominal)
- StormFilter cartridge treatment flow = 22.5 gpm
- **Hydraulic head required: 3.05 feet** (with 27 inch cartridge)
- Minimum physical drop between inlet and outlet pipe = 6 inches

Design Summary:

The StormFilter is sized based on the NJDEP certification, which lists an approved treatment flow rate and maximum impervious acreage limit per cartridge in Table 1. The number of cartridges required based on the impervious drainage area is compared with the number of cartridges required based on the treatment flow rate; the larger number of cartridges governs the sizing.

The StormFilter for this site was sized to provide **93 cartridges** in order to meet the hydraulic load requirement (calculations shown below). To house this number of cartridges, Contech Engineered Solutions recommends a Parallel System of (3) 8' x 20' precast Peak Diversion StormFilters.

$$N_{\text{cartridges hyd.load}} = \frac{Q_{\text{treat}} \times 449 \text{ gpm/cfs}}{Q_{\text{cartridge}}} = \frac{4.66 \text{ cfs} \times 449 \text{ gpm/cfs}}{22.5 \text{ gpm/cartridge}} = 92.99 \Rightarrow (93) \text{ 27" Cartridges}$$

$$N_{\text{cartridges mass load}} = \frac{\text{Area}_{\text{site}}}{\text{Max Area}_{\text{cartridge}}} = \frac{2.949 \text{ acre}}{0.136 \text{ acres/cartridge}} = 21.68 \Rightarrow (22) \text{ 27" Cartridges}$$



StormFilter Design Summary

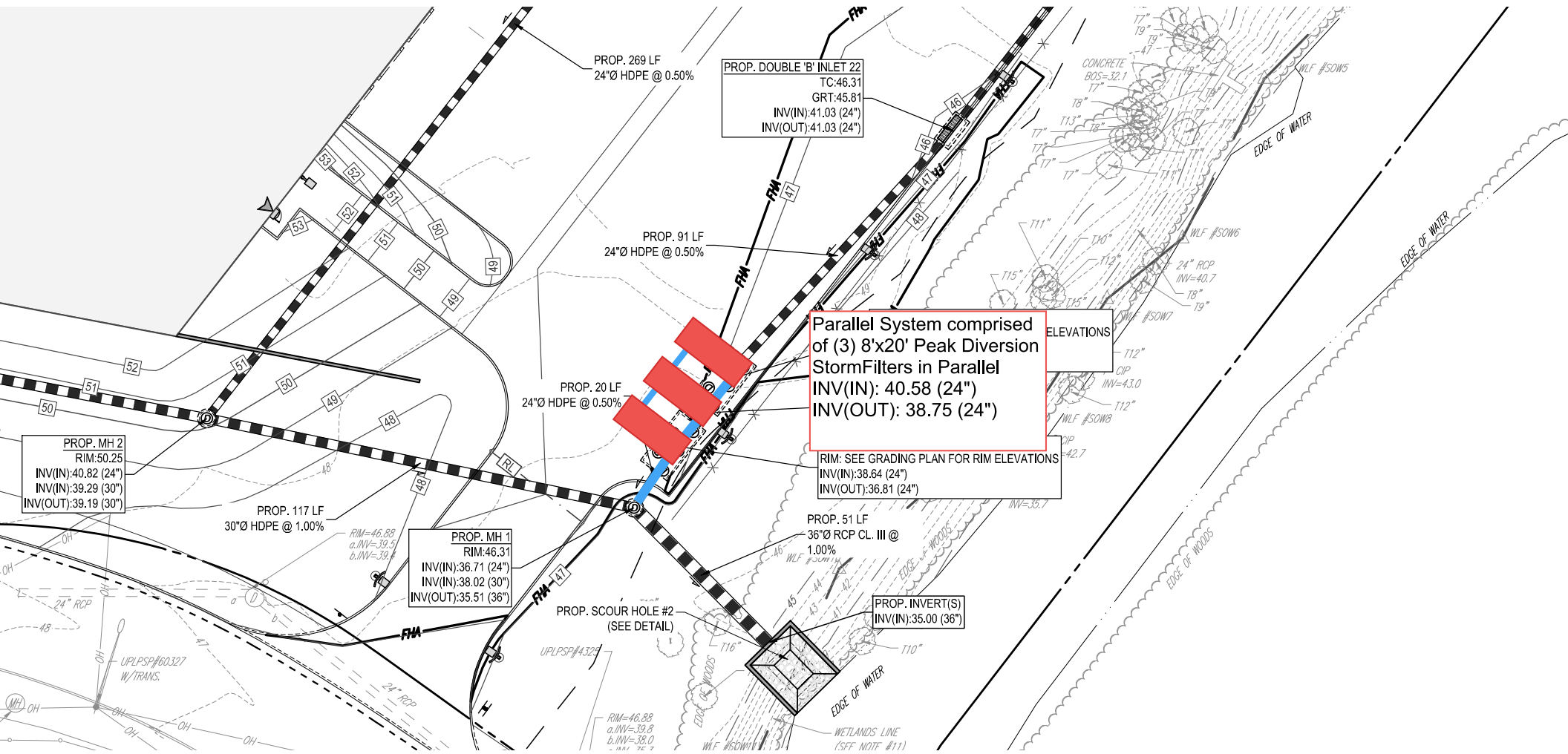
Maintenance:

Maintenance of Stormwater best management practices is required per the New Jersey Administrative Code 7:8-5.8. Recommendations for maintenance are included in chapters 8 & 9 of the New Jersey Stormwater Best Management Practices Manual. To comply with requirements, CONTECH offers a network of Preferred Service Providers that have the capability to perform all necessary inspections, compliance reporting and cleaning services. CONTECH recommends inspecting the system annually and maintaining the system at the recommendation of the annual inspection. Full maintenance is typically required every 24-36 months. Disposal of material should be handled in accordance with local regulations. Please contact CONTECH's Maintenance Department for all questions regarding maintenance at (503) 258-3157 or visit our website at www.conteches.com/maintenance.

Thank you for the opportunity to present this information to you and your client. If you have any questions, please call me at (443-457-1529).

Sincerely,

Taylor Murdock
Contech Engineered Solutions LLC



PROP. MH 2
RIM: 50.25
INV(IN): 40.82 (24")
INV(IN): 39.29 (30")
INV(OUT): 39.19 (30")

PROP. MH 1
RIM: 46.31
INV(IN): 36.71 (24")
INV(IN): 38.02 (30")
INV(OUT): 35.51 (36")

PROP. DOUBLE 'B' INLET 22
TC: 46.31
GRT: 45.81
INV(IN): 41.03 (24")
INV(OUT): 41.03 (24")

Parallel System comprised
of (3) 8'x20' Peak Diversion
Storm Filters in Parallel
INV(IN): 40.58 (24")
INV(OUT): 38.75 (24")

RIM: SEE GRADING PLAN FOR RIM ELEVATIONS
INV(IN): 38.64 (24")
INV(OUT): 36.81 (24")

PROP. INVERT(S)
INV(IN): 35.00 (36")

PROP. 269 LF
24"Ø HDPE @ 0.50%

PROP. 91 LF
24"Ø HDPE @ 0.50%

PROP. 20 LF
24"Ø HDPE @ 0.50%

PROP. 117 LF
30"Ø HDPE @ 1.00%

PROP. 51 LF
36"Ø RCP CL. III @
1.00%

PROP. SCOUR HOLE #2
(SEE DETAIL)

ELEVATIONS

EDGE OF WATER

EDGE OF WATER

EDGE OF WATER

WETLANDS LINE
(SFF NOTF #11)

CONCRETE
BOS=32.1

24" RCP
INV=40.7

24" RCP
INV=42.7

RIM=46.88
a. INV=39.8
b. INV=38.0

RIM=46.88
a. INV=39.5
b. INV=39.1

RIM=46.88
a. INV=39.8
b. INV=38.0

T12"

T12"

T12"

T12"

T12"

T12"

T12"

T12"

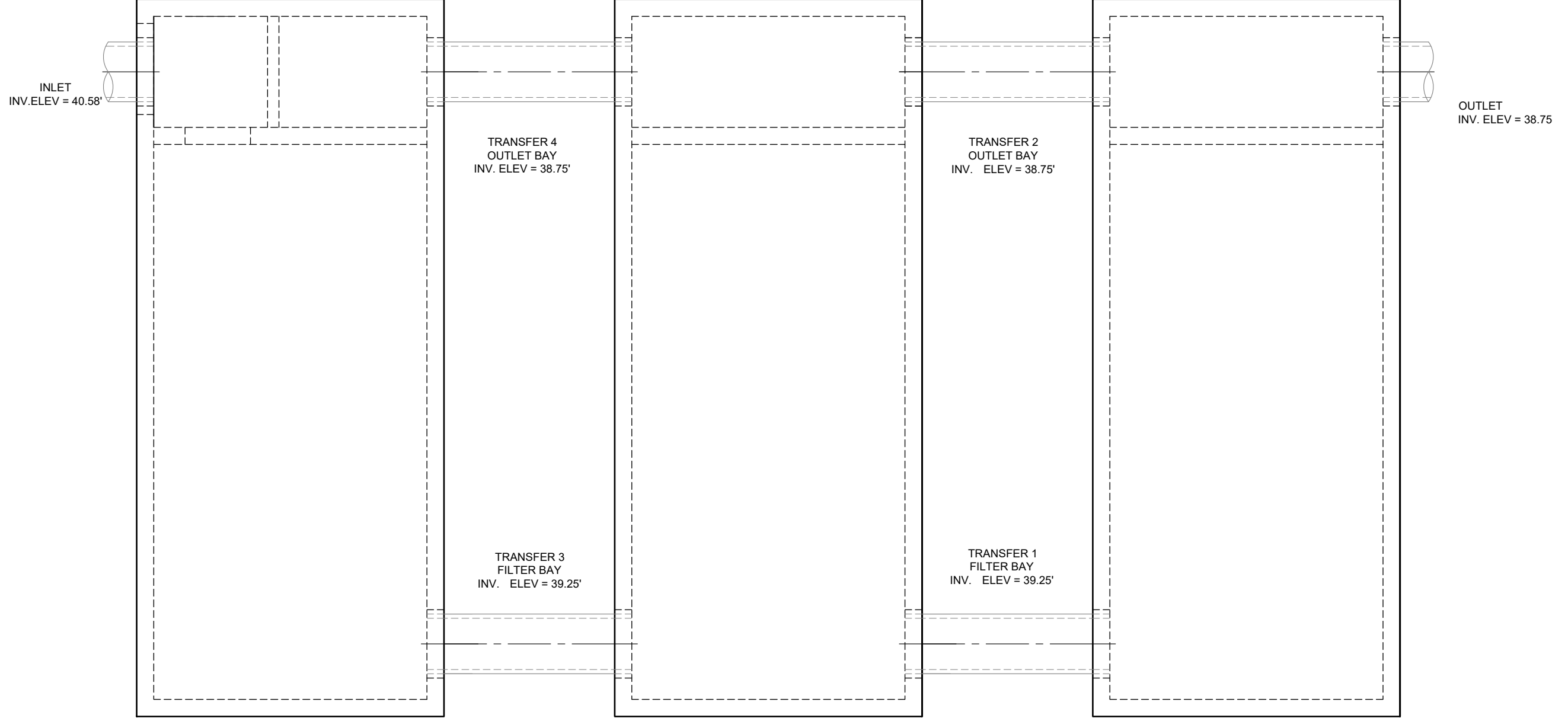
T12"

T12"

T12"

T12"

T12"



CONTECH
PROPOSAL
DRAWING

CONTECH
ENGINEERED SOLUTIONS LLC
www.conteches.com
5670 Greenwood Plaza Blvd., Suite 530, Greenwood Village, CO 80111
800-525-3889 720-587-2700 720-587-2851 FAX

StormFilter
The Stormwater Treatment
The Stormwater Treatment
This product has been authorized by the state of the following
for use in the following states: AR, CA, CO, CT, DE, FL, GA, IL, IN, MD, MI, MN, MO, NC, ND, OH, OK, PA, RI, SD, TN, TX, VA, WI, WY.

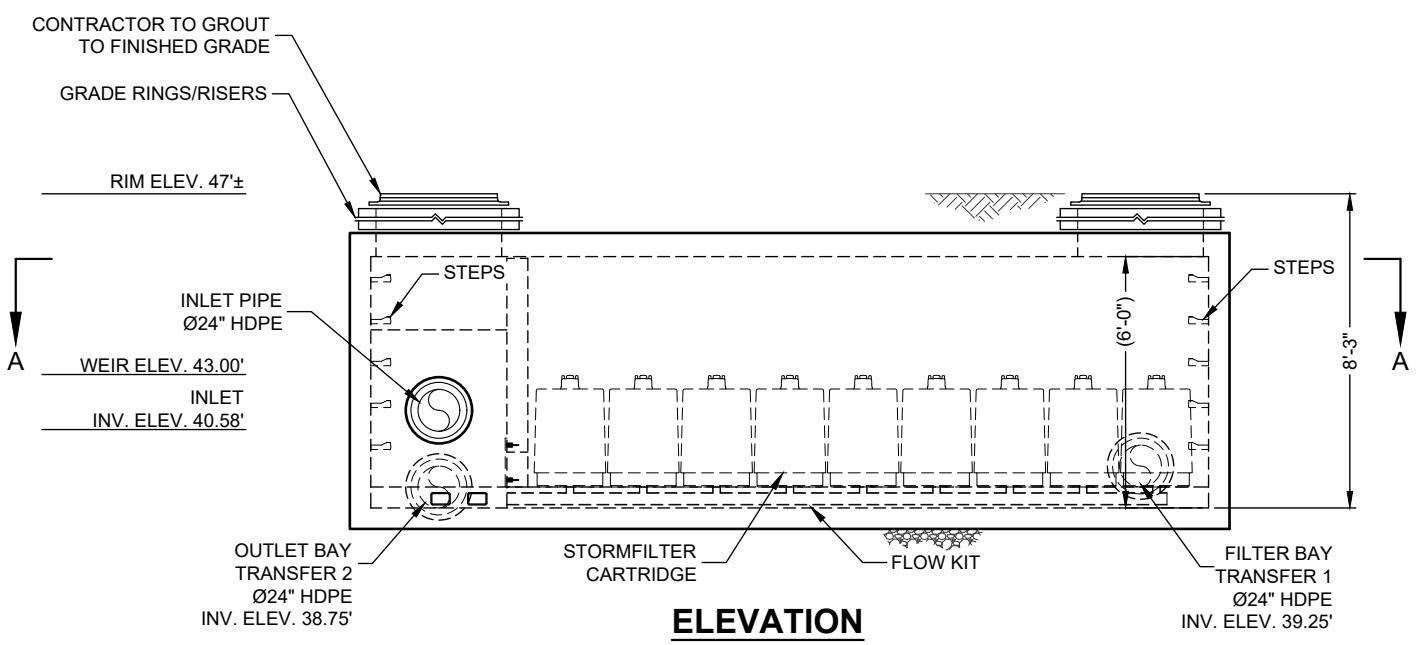
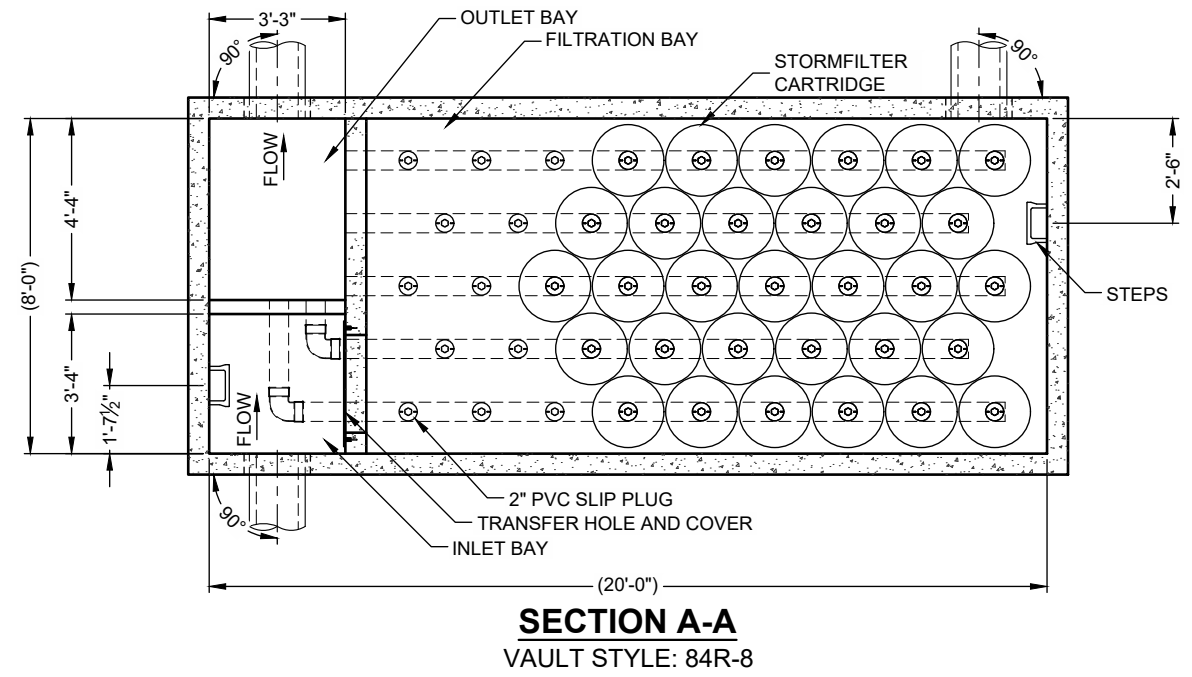
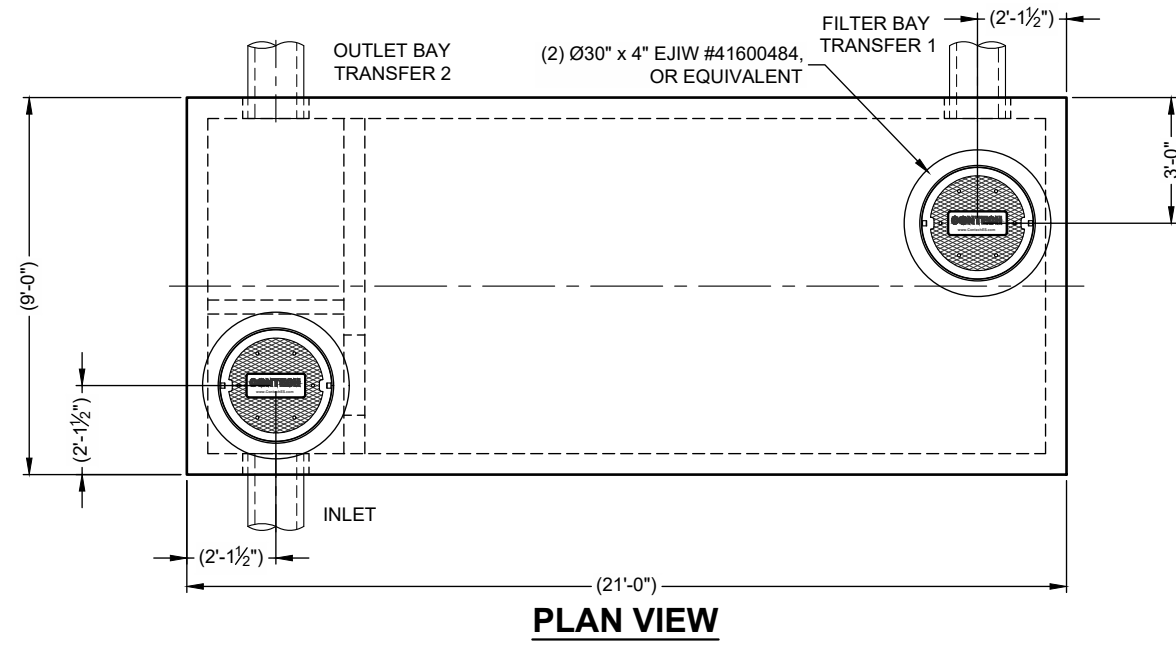
DATE:	
DESIGNED: TKM	DRAWN: TKM
CHECKED:	APPROVED:
PROJECT NUMBER: ---	
SHEET: SHEET_NOF 1	

PEAK DIVERSION STORMFILTER
PARALLEL VAULT LAYOUT

MARK	DATE	REVISION DESCRIPTION	BY

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I:\PSU\WGTWCRMF01\QUIKRETE.NET\IN\PROJECT\ACTIVE\700068\10-STORMFILTER\DRAWINGS\PROPOSAL\700068-10-SFPD0820-PRC-A.DWG 1/26/2022 5:08 PM



MATERIAL LIST - PROVIDED BY CONTECH

COUNT	DESCRIPTION	INSTALLED BY
31	27", PERLITE CARTRIDGE	CONTECH
43	RESTRICTOR DISK (GLD), 22.5 GPM	CONTECH
12	2" PVC SLIP PLUG	CONTECH
1	FLOW KIT (84R-8)	CONTECH
1	36" x 14" TRANSFER HOLE COVER	CONTECH
1	JOINT SEALANT	CONTRACTOR
2 PLCS	GRADE RINGS/RISERS	CONTRACTOR
2	Ø30" x 4" EJIW #41600484, OR EQUIVALENT FRAME AND COVER	CONTRACTOR
10	STEPS, P10CTS LANE LADDER, OR EQUIVALENT	CONTECH

PERFORMANCE SPECIFICATION
 FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7-INCHES.** FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **37 SECONDS.** SPECIFIC FLOW RATE SHALL BE **2 GPM/SF (MAXIMUM).** SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF OF MEDIA (MAXIMUM).**

GENERAL NOTES

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
- STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
- STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
- STORMFILTER STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING WITH ASTM C-857 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES

- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE (LIFTING CLUTCHES PROVIDED).
- CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL SECTIONS AND ASSEMBLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
- CONTRACTOR TO REMOVE THE TRANSFER HOLE COVER WHEN THE SYSTEM IS BROUGHT ONLINE.

STRUCTURE WEIGHT
 APPROXIMATE HEAVIEST PICK = T.B.D. LBS.

CONTECH
PROPOSAL
 DRAWING

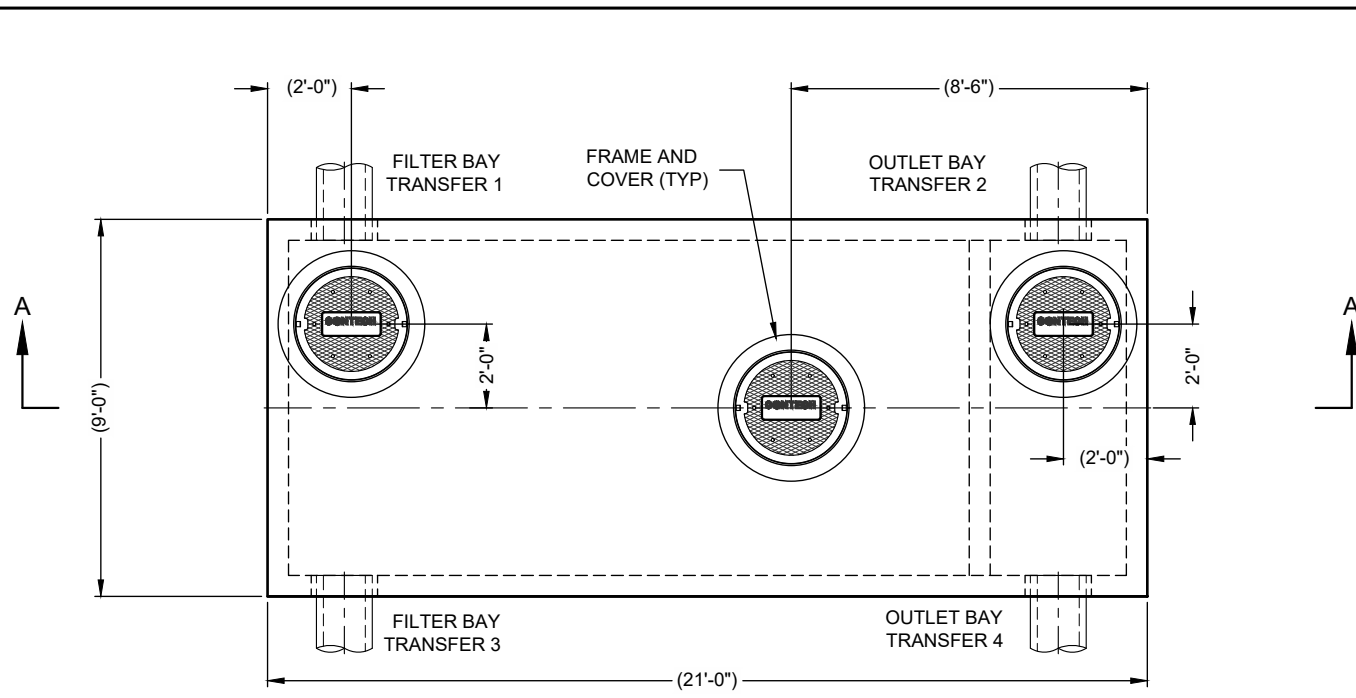
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NO.	REVISION DESCRIPTION	DATE	BY

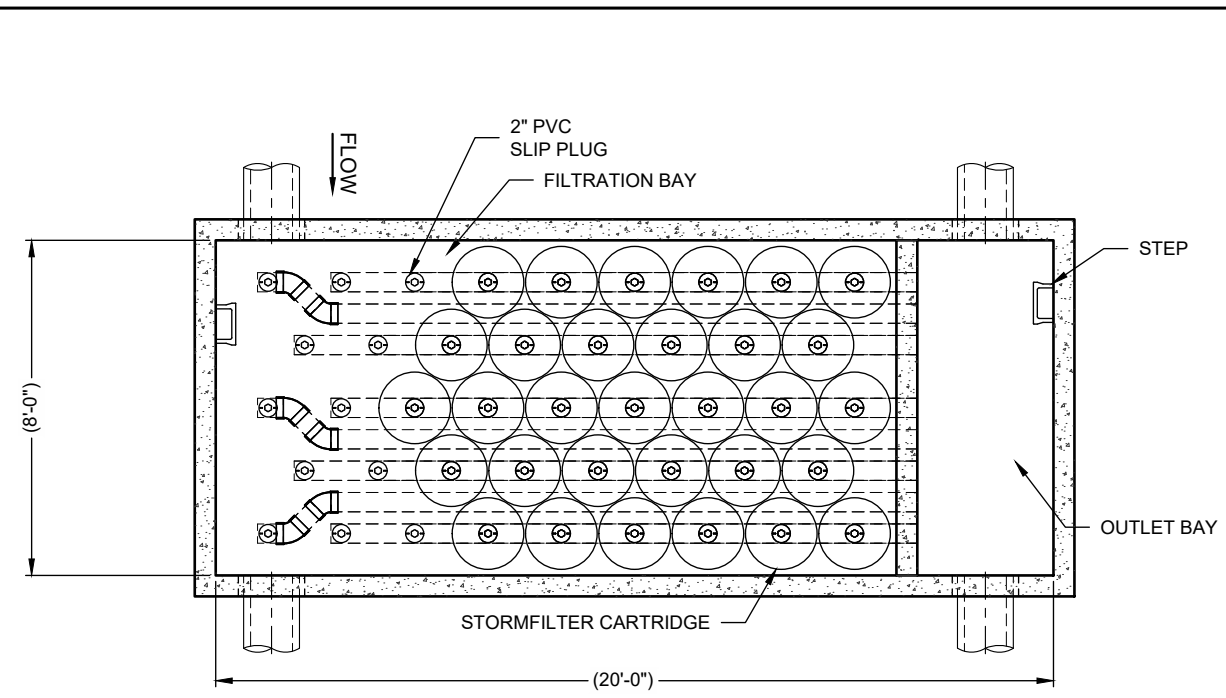
PEAK DIVERSION STORMFILTER
 SFPD0820 - 700068-10
LAWRENCE LOGISTICS CENTER
TRENTON, NJ
 for SYSTEM: MTD#1 VAULT A

CONTECH ENGINEERED SOLUTIONS LLC
 www.conteches.com
 11815 NE Glenn Widing Drive, Portland, OR 97220
 800-548-4687 503-240-3333 800-561-1271 FAX

DATE: 1/26/22	
DESIGNED: TKM	DRAWN: TKM
CHECKED:	APPROVED:
PROJECT NUMBER: 700068	
SHEET: 1 OF 1	



PLAN VIEW



SECTION B-B

VAULT STYLE: 14H## FULL HEIGHT BAFFLE WALL (NIB)

MATERIAL LIST- PROVIDED BY CONTECH

COUNT	DESCRIPTION	INSTALLED BY
31	27", 22.5 GPM, PERLITE CARTRIDGE (GLD)	CONTECH
12	2" PVC SLIP PLUG	CONTECH
1	FLOW KIT	CONTECH
3	Ø30" x 4" FRAME AND COVER	CONTRACTOR
1	JOINT SEALANT (BY PRECASTER)	CONTRACTOR
3 PLCS	GRADE RINGS/RISERS	CONTRACTOR

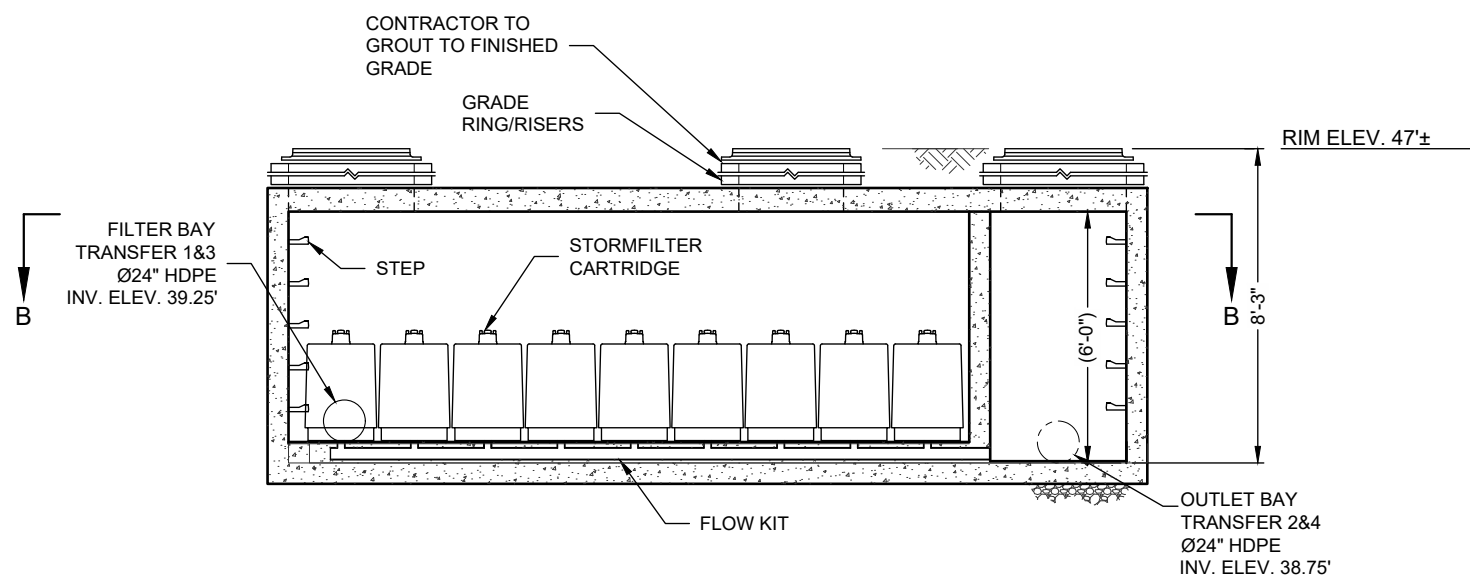
PERFORMANCE SPECIFICATION
 FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7-INCHES.** FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **38 SECONDS.**
 SPECIFIC FLOW RATE SHALL BE **2 GPM/SF (MAXIMUM).** SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF OF MEDIA (MAXIMUM).**

- GENERAL NOTES**
- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
 - FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
 - STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
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 - STORMFILTER STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-857 AND AASHTO LOAD FACTOR METHOD.

- INSTALLATION NOTES**
- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
 - CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE (LIFTING CLUTCHES PROVIDED).
 - CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL SECTIONS AND ASSEMBLE STRUCTURE.
 - CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
 - CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.

STRUCTURE WEIGHT
 APPROXIMATE HEAVIEST PICK = T.B.D. LBS.
 OF X PIECES.

CONTECH
PROPOSAL
 DRAWING



SECTION A-A

The design and information shown on this drawing is provided as a service to the project owner, engineer, architect, contractor, and other parties. It is the responsibility of the user to verify the accuracy of the information and to ensure that it is used in accordance with the intended purpose. The user agrees to hold the provider harmless from and against all claims, damages, and expenses, including reasonable attorneys' fees, arising from the use of this drawing, whether or not such claims, damages, and expenses are caused in whole or in part by the negligence of the provider. The provider expressly disclaims any liability or responsibility for such claims, damages, and expenses. If discrepancies between the supplied information and the actual field conditions are encountered, the user shall be responsible for resolving such discrepancies. The user shall be responsible for obtaining all necessary permits and approvals for the work shown on this drawing. The user shall be responsible for ensuring that the work is completed in accordance with the applicable codes and standards. The user shall be responsible for ensuring that the work is completed in a timely manner. The user shall be responsible for ensuring that the work is completed in a safe manner. The user shall be responsible for ensuring that the work is completed in a professional manner. The user shall be responsible for ensuring that the work is completed in a high-quality manner. The user shall be responsible for ensuring that the work is completed in a cost-effective manner. The user shall be responsible for ensuring that the work is completed in a sustainable manner. The user shall be responsible for ensuring that the work is completed in an ethical manner. The user shall be responsible for ensuring that the work is completed in a socially responsible manner. The user shall be responsible for ensuring that the work is completed in an environmentally responsible manner. The user shall be responsible for ensuring that the work is completed in a community responsible manner. The user shall be responsible for ensuring that the work is completed in a globally responsible manner. The user shall be responsible for ensuring that the work is completed in a humanely responsible manner. The user shall be responsible for ensuring that the work is completed in a justly responsible manner. The user shall be responsible for ensuring that the work is completed in a peacefully responsible manner. The user shall be responsible for ensuring that the work is completed in a responsibly responsible manner. The user shall be responsible for ensuring that the work is completed in a sustainably responsible manner. The user shall be responsible for ensuring that the work is completed in a responsibly responsible manner.

MARK	DATE	REVISION DESCRIPTION	BY

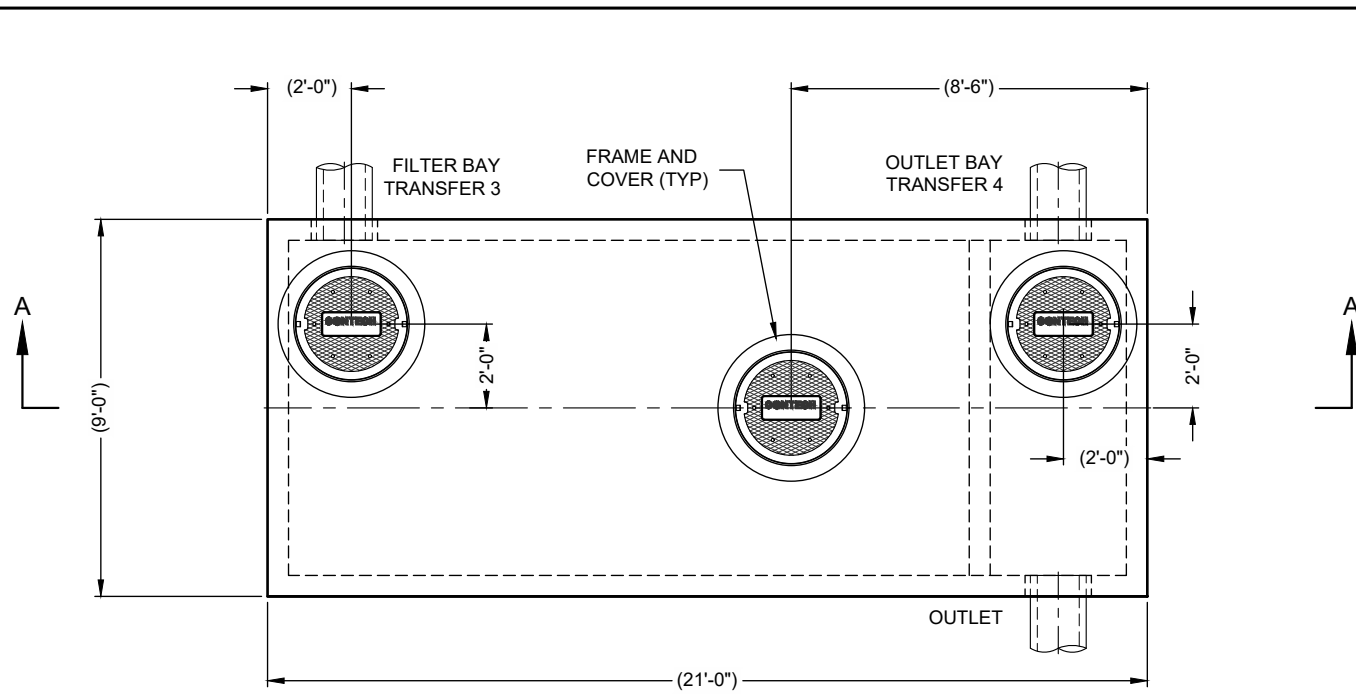
8' x 20' STORMFILTER - 700068-20
 LAWRENCE LOGISTICS CENTER
 TRENTON, NJ
 SITE DESIGNATION: MTD#1 VAULT
 B

CONTECH
 ENGINEERED SOLUTIONS LLC
www.conteches.com
 5660 Greenwood Plaza Blvd., Suite 455, Englewood, CO 80111
 800-526-3889 303-796-2233 303-796-2239 FAX

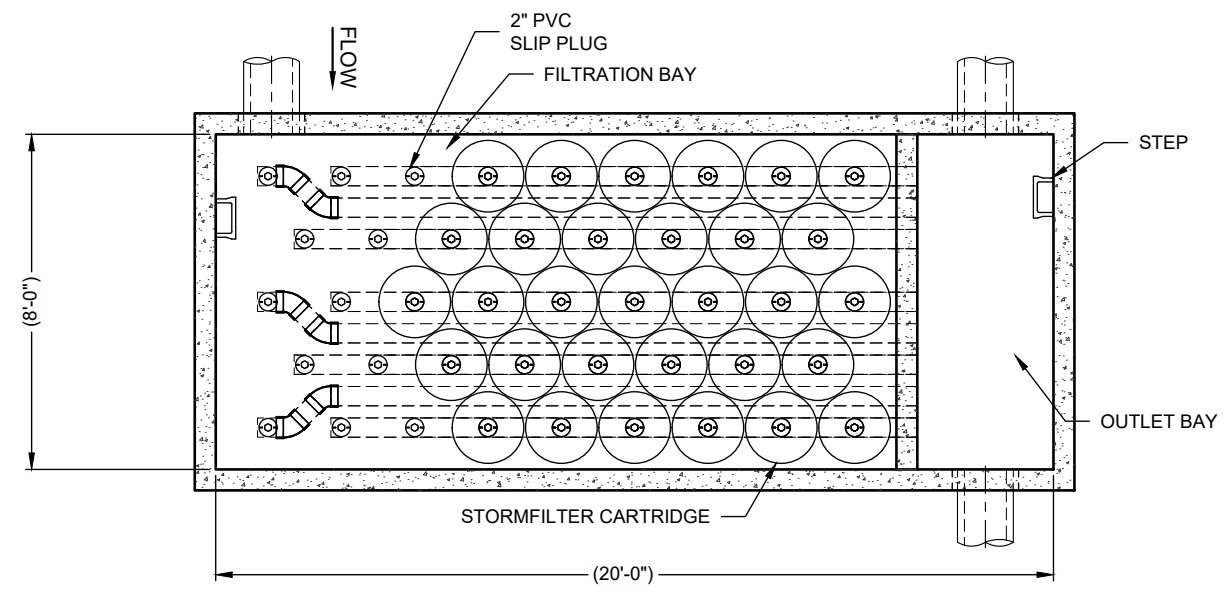
StormFilter
 THE INNOVATION IN WATER TREATMENT TECHNOLOGY OF THE FUTURE
 THE ONLY WATER TREATMENT TECHNOLOGY THAT IS 100% PATENTED

DATE:	1/26/22
DESIGNED:	TKM
DRAWN:	TKM
CHECKED:	APPROVED:
PROJECT NUMBER:	700068
SHEET:	1 OF 1

I:\PSU\WKT\WCRMF01-QUIKRETE-NET\MERLIN\PROJECT\ACTIVE\7000001\700068-10-STORMFILTER\DRAWINGS\PROPOSAL\700068-20-SF0820-PRO-A.DWG 1/26/2022 5:25 PM



PLAN VIEW



SECTION B-B

VAULT STYLE: 14H## FULL HEIGHT BAFFLE WALL (NIB)

MATERIAL LIST- PROVIDED BY CONTECH

COUNT	DESCRIPTION	INSTALLED BY
31	27", 22.5 GPM, PERLITE CARTRIDGE (GLD)	CONTECH
12	2" PVC SLIP PLUG	CONTECH
1	FLOW KIT	CONTECH
3	Ø30" x 4" FRAME AND COVER	CONTRACTOR
1	JOINT SEALANT (BY PRECASTER)	CONTRACTOR
3 PLCS	GRADE RINGS/RISERS	CONTRACTOR

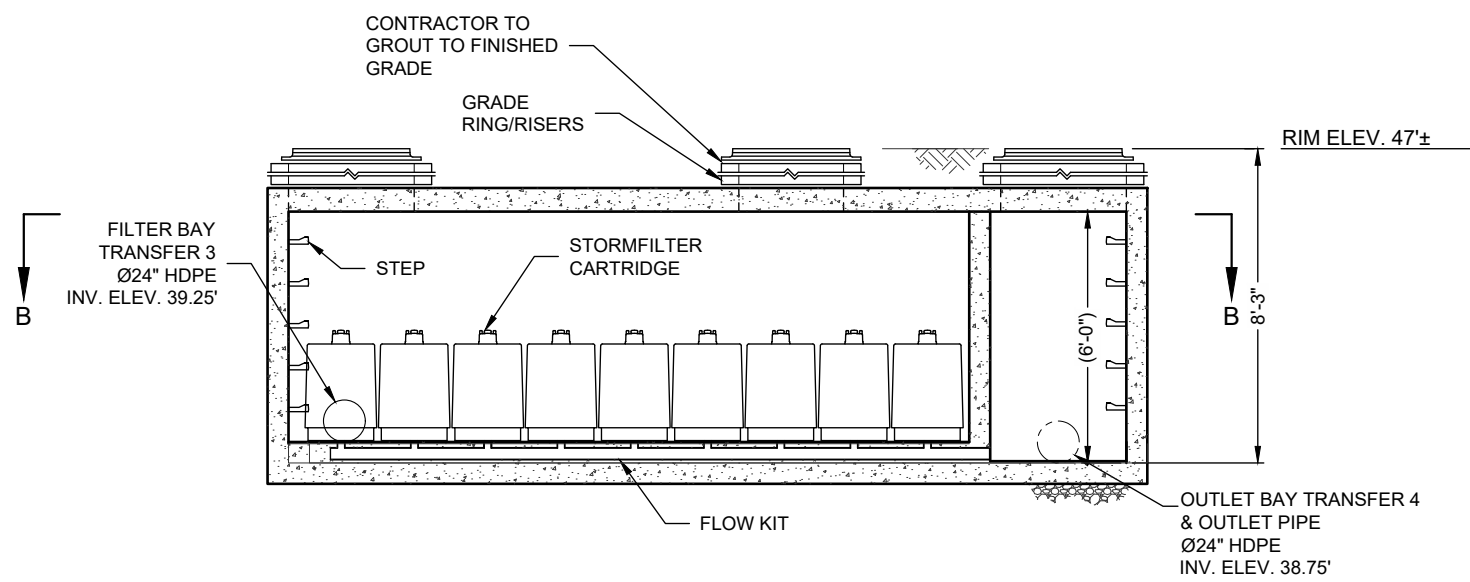
PERFORMANCE SPECIFICATION
 FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7-INCHES.** FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **38 SECONDS.**
 SPECIFIC FLOW RATE SHALL BE **2 GPM/SF (MAXIMUM).** SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF OF MEDIA (MAXIMUM).**

GENERAL NOTES
 1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
 2. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
 3. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
 4. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
 5. STORMFILTER STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-857 AND AASHT LOAD FACTOR METHOD.

INSTALLATION NOTES
 1. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
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 4. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
 5. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.

STRUCTURE WEIGHT
 APPROXIMATE HEAVIEST PICK = T.B.D. LBS.
 OF X PIECES.

CONTECH
PROPOSAL
 DRAWING



SECTION A-A

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NO.	DATE	REVISION DESCRIPTION	BY

8' x 20' STORMFILTER - 700068-30
 LAWRENCE LOGISTICS CENTER
 TRENTON, NJ
 SITE DESIGNATION: MTD#1 VAULT
 C

CONTECH
 ENGINEERED SOLUTIONS LLC
www.contechES.com
 5660 Greenwood Plaza Blvd., Suite 455, Englewood, CO 80111
 800-526-3989 303-796-2233 303-796-2239 FAX

DATE:	1/26/22
DESIGNED:	TKM
DRAWN:	TKM
CHECKED:	APPROVED:
PROJECT NUMBER:	700068
SHEET:	1 OF 1

Summary for Subcatchment 5S: DA 1

Runoff = 8.41 cfs @ 1.10 hrs, Volume= 11,125.448 cf, Depth= 0.95"

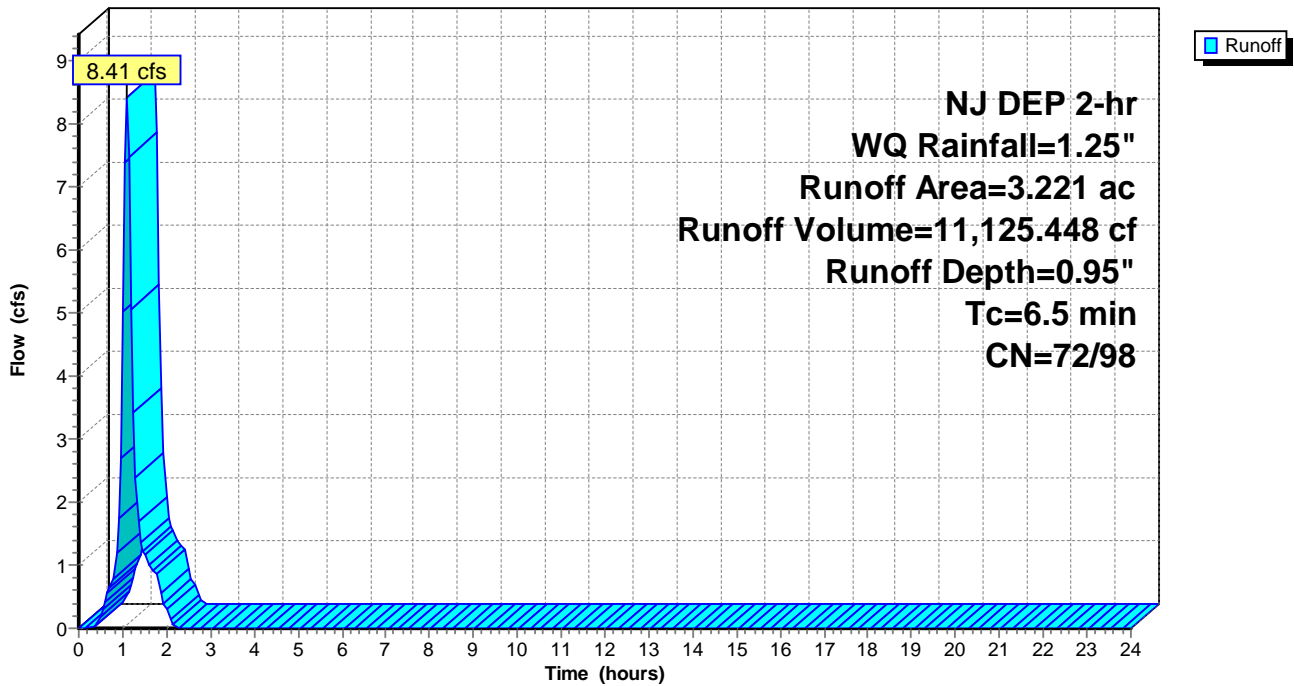
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
* 2.949	98	
* 0.272	72	
3.221	96	Weighted Average
0.272	72	8.44% Pervious Area
2.949	98	91.56% Impervious Area

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

Subcatchment 5S: DA 1

Hydrograph



Summary for Pond 12P: MTD#1 & Network

Inflow Area = 3.221 ac, 91.56% Impervious, Inflow Depth = 0.95" for WQ event
 Inflow = 8.41 cfs @ 1.10 hrs, Volume= 11,125.448 cf
 Outflow = 4.66 cfs @ 1.10 hrs, Volume= 11,070.332 cf, Atten= 45%, Lag= 0.0 min
 Primary = 4.66 cfs @ 1.10 hrs, Volume= 11,070.332 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 42.99' @ 1.21 hrs Surf.Area= 0.028 ac Storage= 2,408.762 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 6.0 min (76.8 - 70.8)

Volume	Invert	Avail.Storage	Storage Description
#1	39.25'	1,661.354 cf	17.38'W x 17.38'L x 5.50'H (3) Parallel SFPD0820 Equiv. Volume
#2	40.58'	285.885 cf	24.0" Round 24" HDPE L= 91.0' S= 0.0050 '/'
#3	41.03'	133.840 cf	8.00'W x 3.50'L x 4.78'H Dbl. B Inlet 22
#4	41.03'	775.973 cf	24.0" Round 24" HDPE L= 247.0' S= 0.0035 '/'
#5	41.90'	109.480 cf	8.00'W x 3.50'L x 3.91'H Dbl. B Inlet 23
#6	41.90'	697.434 cf	24.0" Round 24" HDPE L= 222.0' S= 0.0025 '/'
#7	42.45'	76.720 cf	8.00'W x 3.50'L x 2.74'H Dbl. B Inlet 24
		3,740.686 cf	Total Available Storage

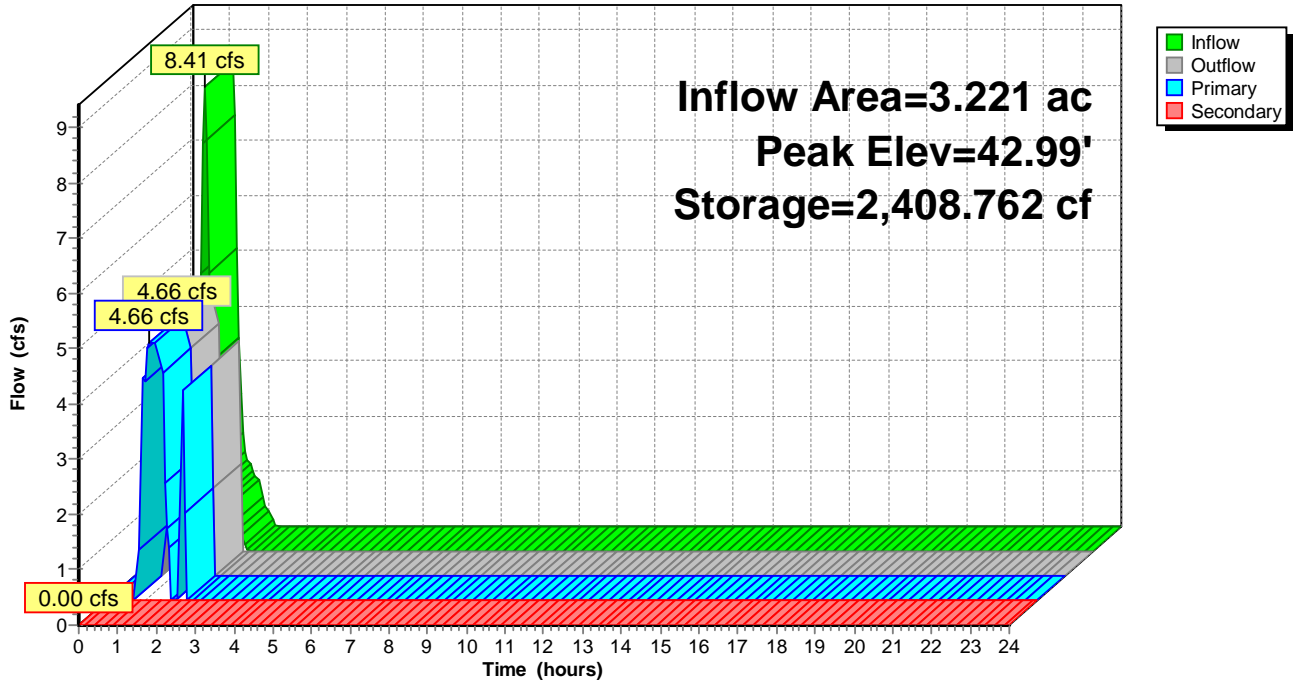
Device	Routing	Invert	Outlet Devices (Turned on 2 times)
#1	Primary	38.75'	24.0" Round 24" HDPE L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 38.75' / 38.64' S= 0.0048 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	41.50'	StormFilter 27 - 22.5gpm @ 27in X 93.00 Discharges@39.25' Turns Off<39.42'
#3	Secondary	43.00'	3.2' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=4.66 cfs @ 1.10 hrs HW=42.28' (Free Discharge)
 ↑**1=24" HDPE** (Passes 4.66 cfs of 24.08 cfs potential flow)
 ↑**2=StormFilter 27 - 22.5gpm @ 27in** (Pump Controls 4.66 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=39.25' (Free Discharge)
 ↑**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 12P: MTD#1 & Network

Hydrograph



Summary for Subcatchment 5S: DA 1

Runoff = 26.51 cfs @ 12.13 hrs, Volume= 90,162.332 cf, Depth> 7.71"

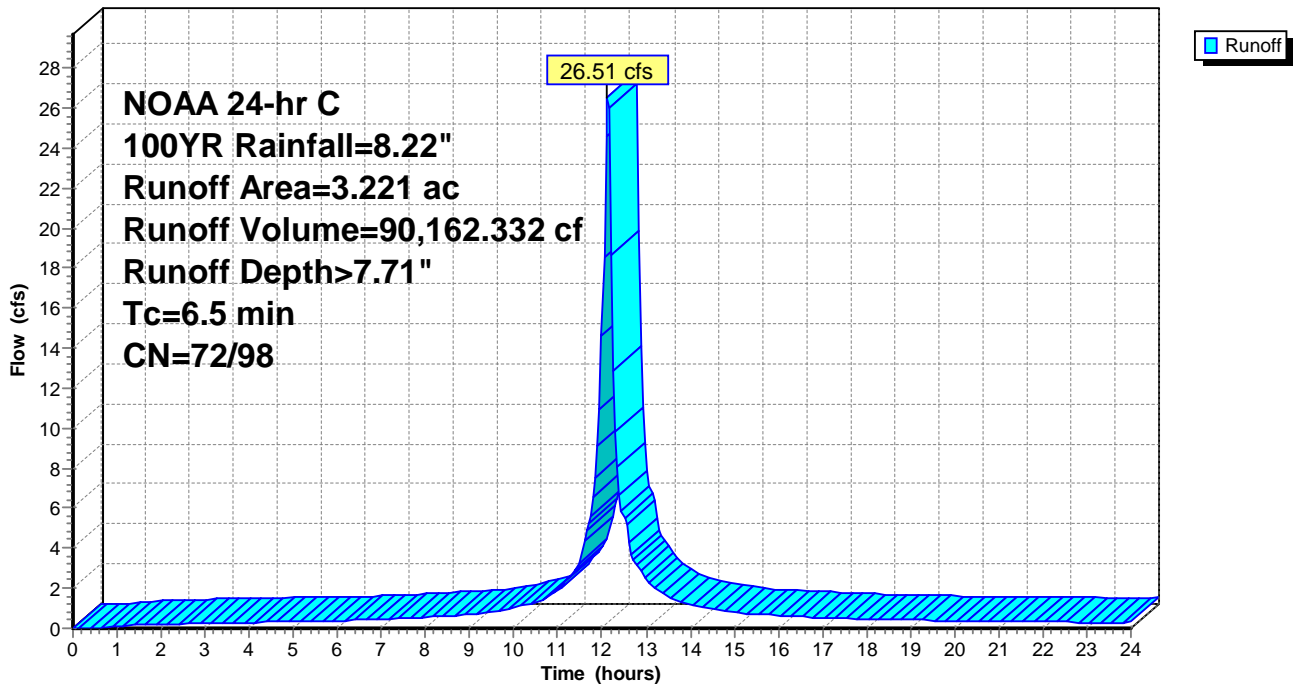
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 NOAA 24-hr C 100YR Rainfall=8.22"

Area (ac)	CN	Description
* 2.949	98	
* 0.272	72	
3.221	96	Weighted Average
0.272	72	8.44% Pervious Area
2.949	98	91.56% Impervious Area

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

Subcatchment 5S: DA 1

Hydrograph



Summary for Pond 12P: MTD#1 & Network

Inflow Area = 3.221 ac, 91.56% Impervious, Inflow Depth > 7.71" for 100YR event
 Inflow = 26.51 cfs @ 12.13 hrs, Volume= 90,162.332 cf
 Outflow = 26.50 cfs @ 12.14 hrs, Volume= 89,812.687 cf, Atten= 0%, Lag= 0.4 min
 Primary = 4.66 cfs @ 11.80 hrs, Volume= 70,473.840 cf
 Secondary = 21.83 cfs @ 12.14 hrs, Volume= 19,338.848 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 44.62' @ 12.14 hrs Surf.Area= 0.009 ac Storage= 3,617.958 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 4.5 min (750.1 - 745.6)

Volume	Invert	Avail.Storage	Storage Description
#1	39.25'	1,661.354 cf	17.38'W x 17.38'L x 5.50'H (3) Parallel SFPD0820 Equiv. Volume
#2	40.58'	285.885 cf	24.0" Round 24" HDPE L= 91.0' S= 0.0050 '/'
#3	41.03'	133.840 cf	8.00'W x 3.50'L x 4.78'H Dbl. B Inlet 22
#4	41.03'	775.973 cf	24.0" Round 24" HDPE L= 247.0' S= 0.0035 '/'
#5	41.90'	109.480 cf	8.00'W x 3.50'L x 3.91'H Dbl. B Inlet 23
#6	41.90'	697.434 cf	24.0" Round 24" HDPE L= 222.0' S= 0.0025 '/'
#7	42.45'	76.720 cf	8.00'W x 3.50'L x 2.74'H Dbl. B Inlet 24
		3,740.686 cf	Total Available Storage

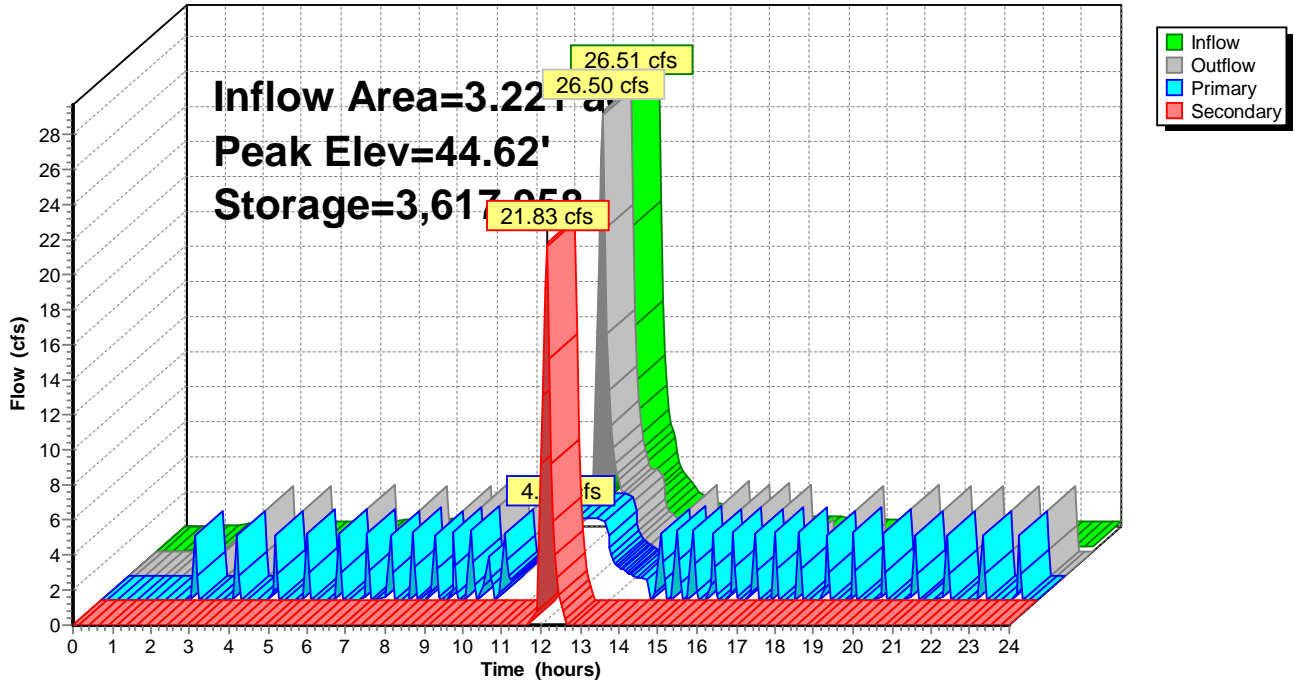
Device	Routing	Invert	Outlet Devices (Turned on 28 times)
#1	Primary	38.75'	24.0" Round 24" HDPE L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 38.75' / 38.64' S= 0.0048 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	41.50'	StormFilter 27 - 22.5gpm @ 27in X 93.00 Discharges@39.25' Turns Off<39.42'
#3	Secondary	43.00'	3.2' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=4.66 cfs @ 11.80 hrs HW=41.99' (Free Discharge)
 ↑**1=24" HDPE** (Passes 4.66 cfs of 21.90 cfs potential flow)
 ↑**2=StormFilter 27 - 22.5gpm @ 27in** (Pump Controls 4.66 cfs)

Secondary OutFlow Max=21.05 cfs @ 12.14 hrs HW=44.58' (Free Discharge)
 ↑**3=Broad-Crested Rectangular Weir** (Weir Controls 21.05 cfs @ 4.17 fps)

Pond 12P: MTD#1 & Network

Hydrograph





State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Nonpoint Pollution Control

Division of Water Quality

Mail Code 401-02B

Post Office Box 420

Trenton, New Jersey 08625-0420

609-633-7021 Fax: 609-777-0432

http://www.state.nj.us/dep/dwq/bnpc_home.htm

CHRIS CHRISTIE

Governor

KIM GUADAGNO

Lt. Governor

BOB MARTIN

Commissioner

December 14, 2016

Derek M. Berg
Director - Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Laboratory Certification
Stormwater Management StormFilter® (StormFilter) by Contech Engineered Solutions LLC
Off-line Installation

TSS Removal Rate 80%

Dear Mr. Berg:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions LLC has requested a Laboratory Certification for the StormFilter System.

This project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix for this device is published online at <http://www.njcat.org/verification-process/technology-verification-database.html>.

The NJDEP certifies the use of the StormFilter System by Contech Engineered Solutions LLC at a TSS removal rate of 80%, when designed, operated and maintained in accordance with the information provided in the Verification Appendix and subject to the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 2.12 gpm/sf of effective filtration treatment area.
2. The StormFilter System shall be installed using the same configuration as the unit tested by NJCAT, and sized in accordance with the criteria specified in item 6 below.
3. This device cannot be used in series with another MTD or a media filter (such as a sand filter), to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.
4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual which can be found on-line at www.njstormwater.org.
5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the StormFilter, which is attached to this document. However, it is recommended to review the maintenance website at <http://www.conteches.com/DesktopModules/Bring2mind/DMX/Download.aspx?EntryId=2813&PortalId=0&DownloadMethod=attachment> for any changes to the maintenance requirements.
6. Sizing Requirements:

The example below demonstrates the sizing procedure for a StormFilter System.

Example: A 0.25 acre impervious site is to be treated to 80% TSS removal using a StormFilter System. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs or 354.58 gpm.

The calculation of the minimum number of cartridges for use in the StormFilter System is based upon both the MTFR and the maximum inflow drainage area. It is necessary to calculate the required cartridges using both methods and to rely on the method that results in the highest minimum number of cartridges determined by the two methods.

Inflow Drainage Area Evaluation:

The drainage area to the StormFilter System in this example is 0.25 acres. Based upon the information in Table 1 below, the following minimum number of cartridges are required in a StormFilter System to treat the impervious area without exceeding the maximum drainage area:

1. Five (5) 12” cartridges,
2. Three (3) 18” cartridges, or
3. Two (2) 27” cartridges

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was determined based on the following:

time of concentration = 10 minutes
 $i=3.2$ in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
 $c=0.99$ (runoff coefficient for impervious)
 $Q=ciA=0.99 \times 3.2 \times 0.25 = 0.79$ cfs = 0.79×448.83 gpm = 354.58 gpm

Based on a flow rate of 354.58 gpm, the following minimum number of cartridges are required in a StormFilter System to treat the impervious area without exceeding the MTFR:

1. Thirty-six (36) 12” cartridges,
2. Twenty-four (24) 18” cartridges, or
3. Sixteen (16) 27” cartridges

The MTFR Evaluation results will be used since that method results in the higher minimum number of cartridges determined by the two methods.

The sizing table corresponding to the available system models are noted below:

TABLE 1 STORMFILTER CARTRIDGE HEIGHTS AND NEW JERSEY TREATMENT CAPACITIES

StormFilter Cartridge Heights and New Jersey Treatment Capacities				
StormFilter Cartridge Height	Filtration Surface Area (sq.ft)	MTFR¹ (GPM)	Mass Capture Capacity (lbs)	Maximum Allowable Inflow Area² (acres)
Low Drop (12")	4.71	10	36.3	0.061
18"	7.07	15	54.5	0.09
27"	10.61	22.5	81.8	0.136

Notes:

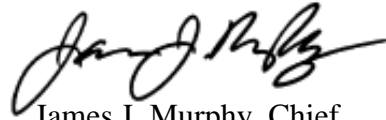
1. MTFR calculated based on 4.72×10^{-3} cfs/sf (2.12 gpm/sf) of effective filtration treatment area.
2. Based upon the equation found in the NJDEP Filter Protocol Maximum Inflow Drainage Area (acres) = weight of TSS before 10% loss in MTFR (lbs)/600 lbs/acre of drainage area annually.

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of

indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Shashi Nayak of my office at (609) 633-7021.

Sincerely,

A handwritten signature in black ink, appearing to read "James J. Murphy".

James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP - DLUR
Ravi Patraju, NJDEP - BES
Gabriel Mahon, NJDEP - BNPC
Shashi Nayak, NJDEP - BNPC

StormFilter Inspection and Maintenance Procedures



Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

1. Inspection

- Inspection of the vault interior to determine the need for maintenance.

2. Maintenance

- Cartridge replacement
- Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis, in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

The average maintenance lifecycle is approximately 1-5 years. Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

Regulatory requirements or a chemical spill can shift maintenance timing as well. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs..





Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct an inspection:

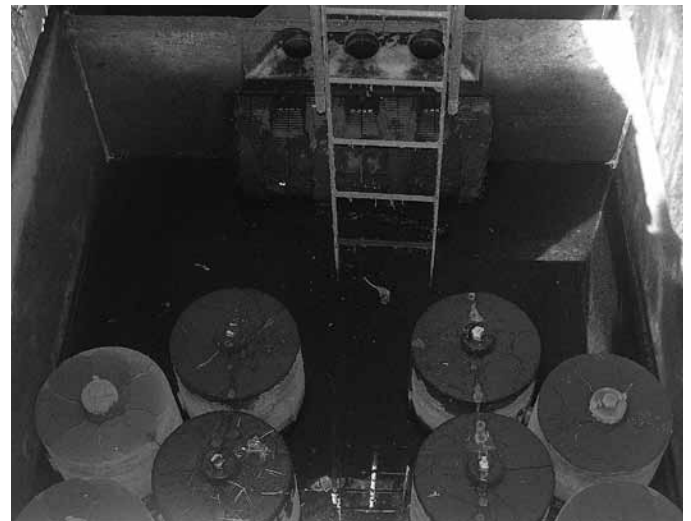
Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to whether or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)

1. Sediment loading on the vault floor.
 - a. If $>4"$ of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
 - a. If $>1/4"$ of accumulation, maintenance is required.
3. Submerged cartridges.
 - a. If $>4"$ of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
 - a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
 - a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
 - a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
 - a. If pronounced scum line (say $\geq 1/4"$ thick) is present above top cap, maintenance is required.



Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from Contech Engineered Solutions.

Warning: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

- A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact Contech Engineered Solutions for suggested attachment devices.

- B. Remove the used cartridges (up to 250 lbs. each) from the vault.



Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner.

- C. Set the used cartridge aside or load onto the hauling truck.
- D. Continue steps a through c until all cartridges have been removed.

Method 2:

- A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.
- B. Unscrew the cartridge cap.
- C. Remove the cartridge hood and float.
- D. At location under structure access, tip the cartridge on its side.
- E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.
- F. Set the empty, used cartridge aside or load onto the hauling truck.
- G. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used **empty** cartridges to Contech Engineered Solutions.

Related Maintenance Activities - Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.



Inspection Report

Date: Personnel:

Location: _____ System Size: _____

System Type: Vault Cast-In-Place Linear Catch Basin Manhole Other

Sediment Thickness in Forebay: _____ Date: _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Estimated Flow from Drainage Pipes (if available): _____

Cartridges Submerged: Yes No Depth of Standing Water: _____

StormFilter Maintenance Activities (check off if done and give description)

Trash and Debris Removal: _____

Minor Structural Repairs: _____

Drainage Area Report _____

Excessive Oil Loading: Yes No Source: _____

Sediment Accumulation on Pavement: Yes No Source: _____

Erosion of Landscaped Areas: Yes No Source: _____

Items Needing Further Work: _____

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault Cast-In-Place Linear Catch Basin Manhole Other

List Safety Procedures and Equipment Used: _____

System Observations

Months in Service: _____

Oil in Forebay (if present): Yes No

Sediment Depth in Forebay (if present): _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Drainage Area Report

Excessive Oil Loading: Yes No Source: _____

Sediment Accumulation on Pavement: Yes No Source: _____

Erosion of Landscaped Areas: Yes No Source: _____

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes No Details: _____

Replace Cartridges: Yes No Details: _____

Sediment Removed: Yes No Details: _____

Quantity of Sediment Removed (estimate?): _____

Minor Structural Repairs: Yes No Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes:



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800-338-1122

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Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other Contech division offerings, visit contech-cpi.com or call 800.338.1122.

Support

- Drawings and specifications are available at www.conteches.com.
- Site-specific design support is available from our engineers.

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Prepared for: Lawrence Logistics Center
Prepared by: Nick Burns, Hydro International
TSS Removal Required: 80%
Product: Up Flo Filter with 285r Ribbon Media

Product Brief

The Up Flo Filter is a passive, modular, proprietary filtration system that incorporates multiple elements of a treatment train into a single, small-footprint device. The Up Flo Filter uses a sedimentation sump and filtering system to treat stormwater runoff before it flows up through the filter ribbon membrane where final polishing via filtration occurs.

NJDEP Certification Letter

https://www.njstormwater.org/pdf/up_flo_filter_hydrointernational_certification_and_manual.pdf

Highlights of Certification Letter

Treatment flow rate per filter module: 15 gpm or 0.0334 cfs
Impervious drainage area per filter module: 0.014 ac

Design Information Provided by Engineer of Record

MTD #1

WQ inflow = 8.40 cfs
Total Impervious Area Tributary to the WQ Unit = 2.949 Acres

MTD #2

WQ inflow = 0.59 cfs
Total Impervious Area Tributary to the WQ Unit = 0.187 Acres

Design Sizing for MTRF and Drainage Area

The Up Flo Filters on this site are sized per the impervious drainage area and maximum water quality treatment flow rate. Both sizing methodologies are shown below for reference. The more conservative sizing will govern and is *highlighted.

MTD #1

WQ inflow = 8.40 cfs

Total Impervious Area Tributary to the WQ Unit = 2.949 Acres

*Cartridge Count Water Quality Flow Based = $8.40 \text{ cfs} / 0.0334 \text{ cfs per filter} = 252$ cartridges

Cartridge Count Drainage Area Based = $2.949 \text{ ac} / 0.014 \text{ ac/filter} = 211$ cartridges

252 filter cartridges would be housed in five 8'x18.5' precast concrete vaults

MTD #2

WQ inflow = 0.59 cfs

Total Impervious Area Tributary to the WQ Unit = 0.187 Acres

*Cartridge Count Water Quality Flow Based = $0.59 \text{ cfs} / 0.0334 \text{ cfs per filter} = 18$ cartridges

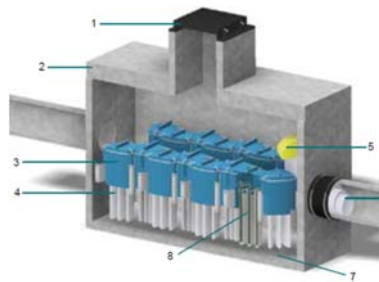
Cartridge Count Drainage Area Based = $0.187 \text{ ac} / 0.014 \text{ ac/filter} = 14$ cartridges

14 filter cartridges would be housed in one 6'x12' precast concrete vault

Maintenance

The center of the Up Flo Filter chamber has a wide, clear opening that allows for easy maintenance access. A vactor truck with hose can be dropped from the surface directly to the base of the sump to remove accumulated sediment, floatables and other captured pollutants. Hydro International recommends maintenance activity every 12 – 18 months and inspection as needed per the site conditions. Nobody maintains our systems better than we do. To ensure optimal, ongoing device performance, be sure to recommend Hydro International as a preferred service and maintenance provider to your clients.

Call **1 (800) 848-2706** to schedule an inspection and cleanout or learn more at hydro-int.com/service.



PROJECTION 

- COMMENTS:
1. STRUCTURE WALL AND SLAB THICKNESSES ARE NOT TO SCALE
 2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING THE STRUCTURE
 3. NOT FOR CONSTRUCTION CONTACT HYDRO FOR SITE SPECIFIC DRAWING
 4. NOT ALL SIZES AVAILABLE IN ALL AREAS
 5. SUMP DEPTH AVAILABLE IN 24" AND 36" DEPTHS

REVISION HISTORY			
REV	BY	DESCRIPTION	DATE
-		FIRST RELEASE	6/5/18

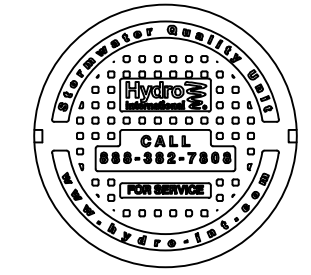
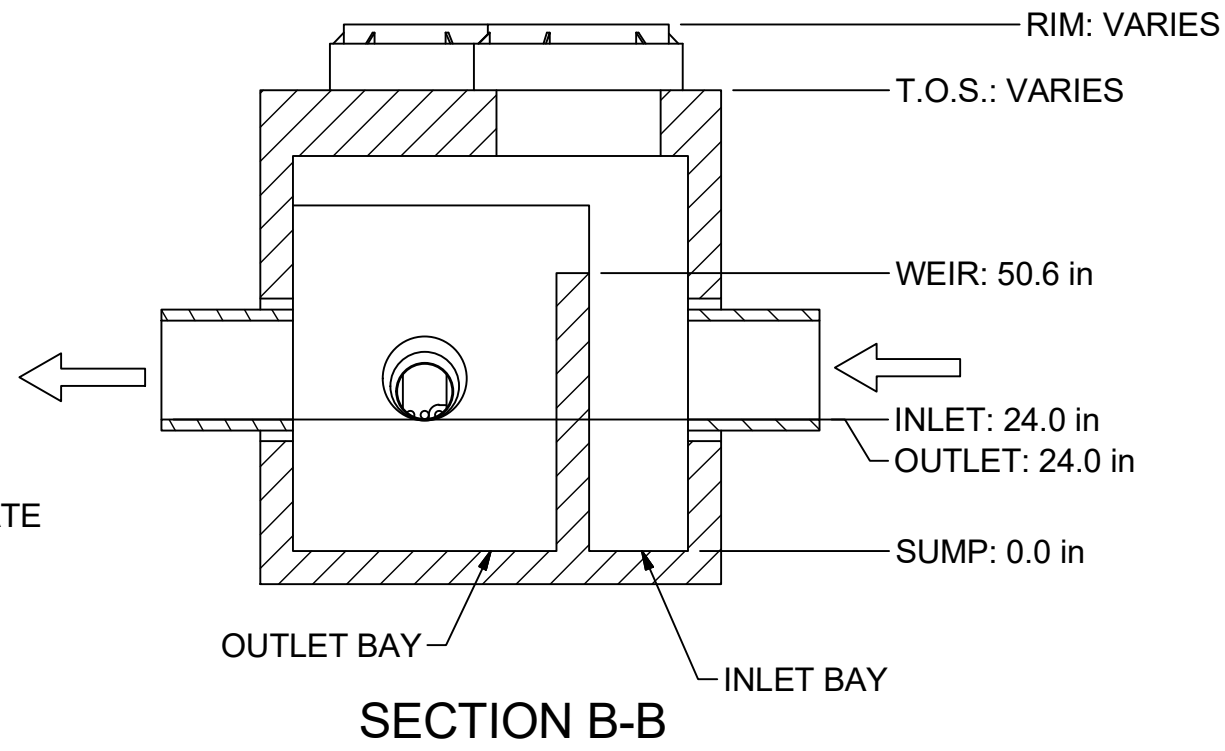
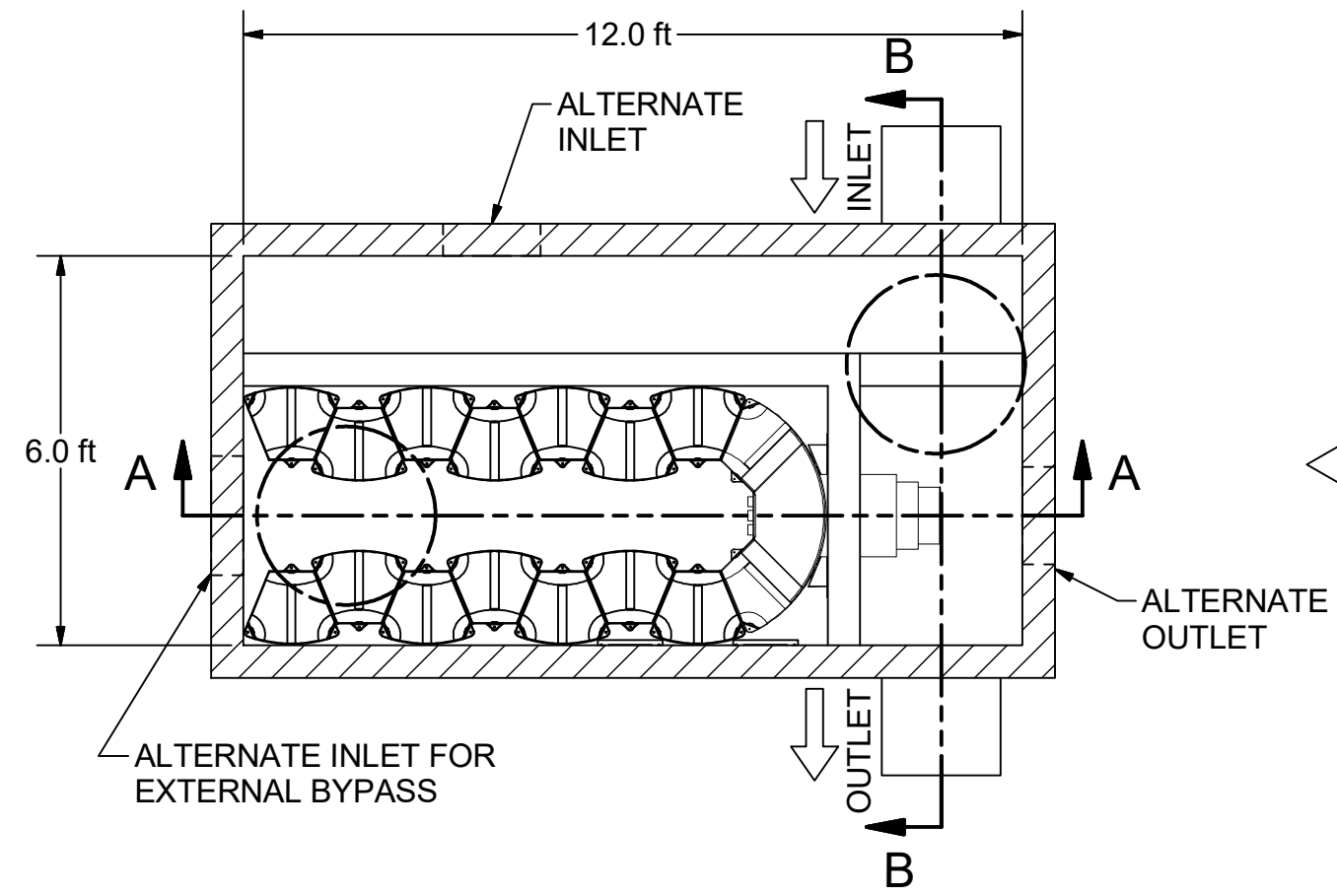
DATE: 6/5/2018 SCALE: 1:35

DRAWN BY: CV	CHECKED BY: JMC	APPROVED BY: KO
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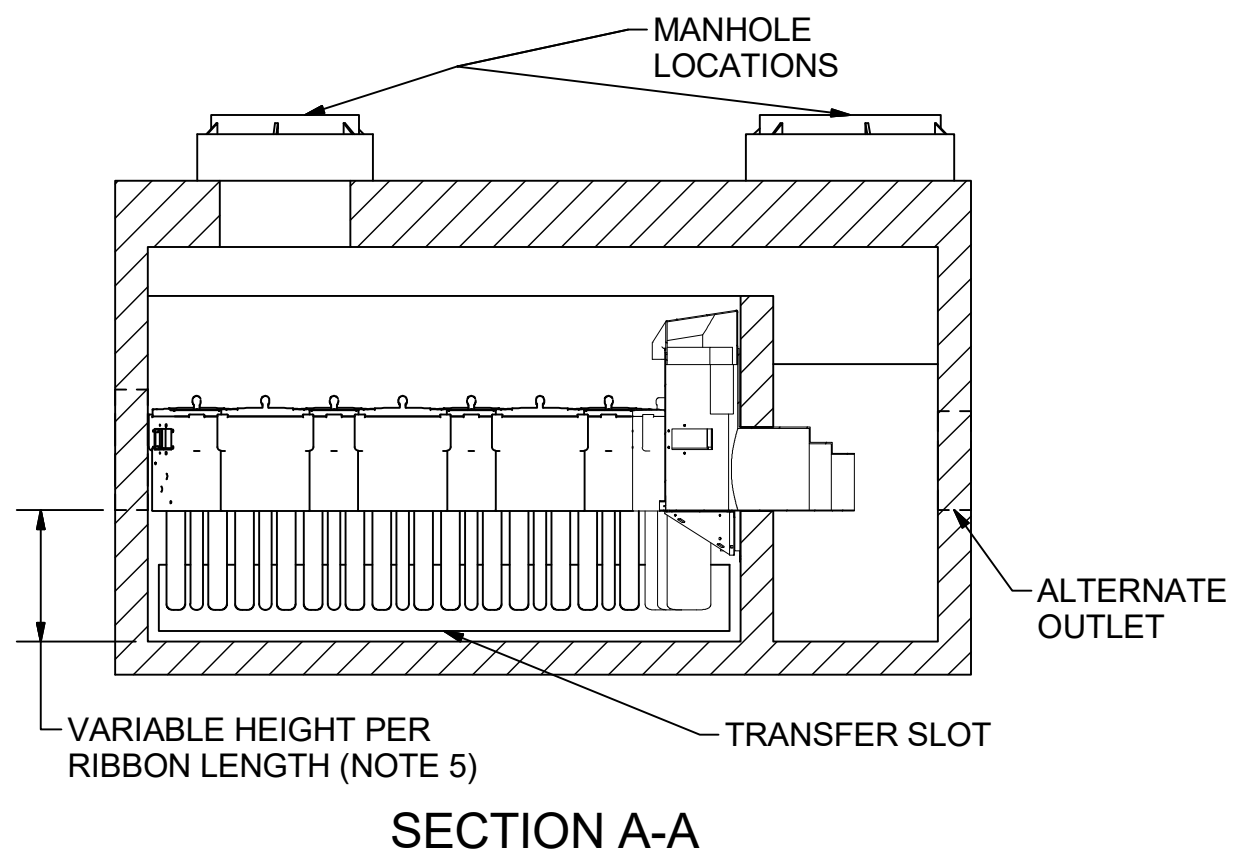
Title
UP-FLO FILTER
 6 ft x 12 ft
 13-16 MODULES



94 Hutchins Drive
 Portland, ME 04102
 Tel: +1 (207) 756-6200
 Fax: +1 (207) 756-6212
 hydro-int.com



- CAPACITIES:**
- Minimum performance: 80% removal. NJDEP - NJDEP Blend; NJCAT, Sil-Co-Sil 106 (d50 = 22 microns) at the peak treatment flow.
 - NJDEP peak treatment flow:
 - .033 CFS (15 GPM) per module (Ribbons)
 - .056 CFS (25 GPM) per module (CPZ)
 - Maximum number of modules per outlet module: 36
- ADDITIONAL DESIGN INFORMATION:**
- Normal operating W.S.E. is 26" above the outlet invert
 - Media Types Available: Ribbons, CPZ



ANY WARRANTY GIVEN BY HYDRO INTERNATIONAL WILL APPLY ONLY TO THOSE ITEMS SUPPLIED BY IT. ACCORDINGLY HYDRO INTERNATIONAL CANNOT ACCEPT ANY RESPONSIBILITY FOR ANY STRUCTURE, PLANT, OR EQUIPMENT, (OR THE PERFORMANCE THERE OF) DESIGNED, BUILT, MANUFACTURED, OR SUPPLIED BY ANY THIRD PARTY. HYDRO INTERNATIONAL HAVE A POLICY OF CONTINUOUS DEVELOPMENT AND RESERVE THE RIGHT TO AMEND THE SPECIFICATION. HYDRO INTERNATIONAL CANNOT ACCEPT LIABILITY FOR PERFORMANCE OF ITS EQUIPMENT, (OR ANY PART THEREOF), IF THE EQUIPMENT IS SUBJECT TO CONDITIONS OUTSIDE ANY DESIGN SPECIFICATION. HYDRO INTERNATIONAL OWNS THE COPYRIGHT OF THIS DRAWING, 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, WITHOUT PRIOR PERMISSION IN WRITING FROM HYDRO INTERNATIONAL.
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DO NOT SCALE DRAWING
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 TOLERANCES ARE:
 FRACTIONS ± 1/16
 DECIMALS:
 X.X ± .06
 X.XX ± .03
 X.XXX ± .015
 ANGLES: ± .5°

WEIGHT: N/A	MATERIAL:
NEXT ASSEMBLY: UP-FLOW FILTER-	
DRAWING NO.: UP-FLOW FILTER-6X12 GA	
SHEET SIZE: B	SHEET: 1 OF 1
Rev: -	



State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Nonpoint Pollution Control

Division of Water Quality

Mail Code 401-02B

Post Office Box 420

Trenton, New Jersey 08625-0420

609-633-7021 Fax: 609-777-0432

http://www.state.nj.us/dep/dwq/bnpc_home.htm

CHRIS CHRISTIE

Governor

KIM GUADAGNO

Lt. Governor

BOB MARTIN

Commissioner

January 11, 2017

David Scott, CPSWQ
General Manager
Hydro International
94 Hutchins Drive
Portland, ME 04102

Re: MTD Laboratory Certification
Up-Flo[®] Filter by Hydro International
Off-line Installation

TSS Removal Rate 80%

Dear Mr. Scott:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Hydro International has requested a Laboratory Certification for the Up-Flo[®] Filter System.

This project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix for this device is published online at <http://www.njcat.org/verification-process/technology-verification-database.html>.

The NJDEP certifies the use of the Up-Flo[®] Filter by Hydro International at a TSS removal rate of 80%, when designed, operated and maintained in accordance with the information provided in the Verification Appendix and subject to the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 1.264 gpm/sf of effective filtration treatment area.
2. The Up-Flo[®] Filter shall be installed using the same configuration as the unit verified by NJCAT, and sized in accordance with the criteria specified in item 6 below.
3. This device cannot be used in series with another MTD or a media filter (such as a sand filter), to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.
4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual which can be found on-line at www.njstormwater.org.
5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Up-Flo[®] Filter, which is attached to this document. However, it is recommended to review the maintenance website at http://www.hydro-int.com/sites/default/files/nj_uff_inspection_and_maintenance.pdf for any changes to the maintenance requirements.
6. Sizing Requirements:

The example below demonstrates the sizing procedure for an Up-Flo[®] Filter.

Example: A 0.25-acre impervious site is to be treated to 80% TSS removal using an Up-Flo[®] Filter. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs or 354.58 gpm.

The selection of configuration for use in the Up-Flo[®] Filter is based upon both the MTFR and the maximum inflow drainage area. It is necessary to select the configuration using both methods and to rely on the method that results in the larger configuration determined by the two methods.

Inflow Drainage Area Evaluation:

The drainage area to the Up-Flo[®] Filter in this example is 0.25 acres. Based upon the information in Table 1 below, the following minimum configuration is required in an Up-Flo[®] Filter to treat the impervious area without exceeding the maximum drainage area:

Model Size UFF-ZV-19-285R with MTRF of 285 gpm and Maximum Allowable Inflow
Drainage Area of 0.264 acre

Maximum Treatment Flow Rate (MTRF) Evaluation:

The site runoff (Q) was determined based on the following:

time of concentration = 10 minutes

i=3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)

c=0.99 (runoff coefficient for impervious)

$Q=ciA=0.99 \times 3.2 \times 0.25 = 0.79$ cfs = 0.79×448.83 gpm = 354.58 gpm

Based on a flow rate of 354.58 gpm, the following minimum configurations are required in an Up-Flo[®] Filter System to treat the impervious area without exceeding the MTRF:

Model Size UFF-ZV-38-285R with MTRF of 570 gpm and Maximum Allowable Inflow
Drainage Area of 0.528 acre

The MTRF Evaluation results will be used since that method results in the higher minimum configuration determined by the two methods.

The sizing table corresponding to the available system models are noted below:

Table 1 Up-Flo[®] Filter Configurations and NJDEP Sizing Table

Configuration	Model Size	Number of Filter Modules	Max. Filtration Rate ¹ (gpm)	Minimum Sedimentation Area ^{1,2} (sq.ft.)	Minimum Wet Volume ^{1,2} (cu.ft.)	Total Filtration Area ¹ (sq.ft.)	Total Mass Capture ¹ (lbs)	Maximum Allowable Inflow Area ¹ (Acres)
Manhole	UFF-MH-285R	6	90	12.57	31.30	71.22	50.0	0.083
Vault	UFF-ZV-19-285R	19	285	39.79	99.12	225.5	158	0.264
Vault	UFF-ZV-38-285R	38	570	79.59	198.2	451.1	317	0.528
Vault	UF-ZV-57-285R	57	855	119.4	297.4	676.6	475	0.792

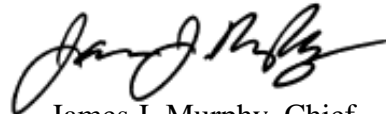
¹ Refer to Table A-1 of NJCAT Verification Report dated December 2016: UFF Design Specifications for the design parameters

² The precast structure housing the filter modules shall have at least the “Min. Sedimentation Area”

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Shashi Nayak of my office at (609) 633-7021.

Sincerely,

A handwritten signature in black ink, appearing to read "James J. Murphy". The signature is fluid and cursive, with a large initial "J" and "M".

James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP - DLUR
Ravi Patraju, NJDEP - BES
Gabriel Mahon, NJDEP - BNPC
Shashi Nayak, NJDEP – BNPC



Operation and Maintenance Manual

Up-Flo® Filter

Filtration System for Stormwater Treatment

Stormwater Solutions

94 Hutchins Drive
Portland, ME 04102

Tel: (207) 756-6200
Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

www.hydro-int.com



Overview & Product Description

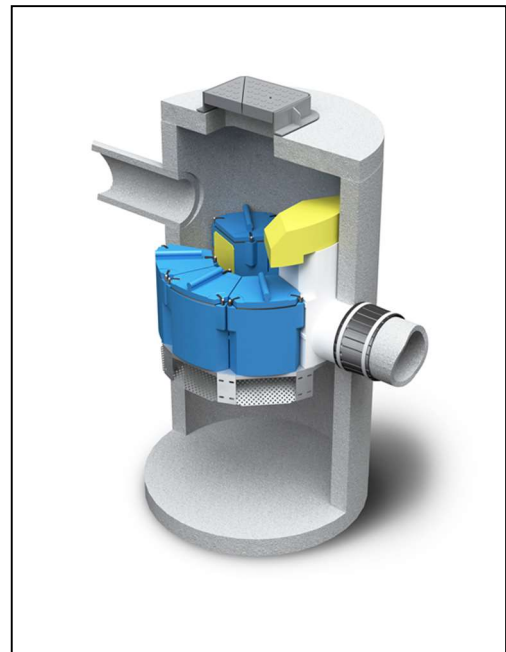
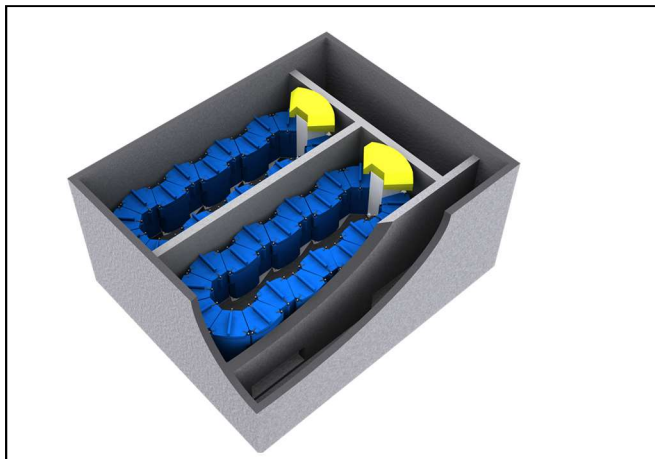
DON'T WANT TO GO IT ALONE? CALL HYDRO AND WE'LL TAKE CARE OF INSPECTION, REPLACEMENT MEDIA AND CLEANOUT.

CALL 1 (888) 382-7808 FOR A QUOTE

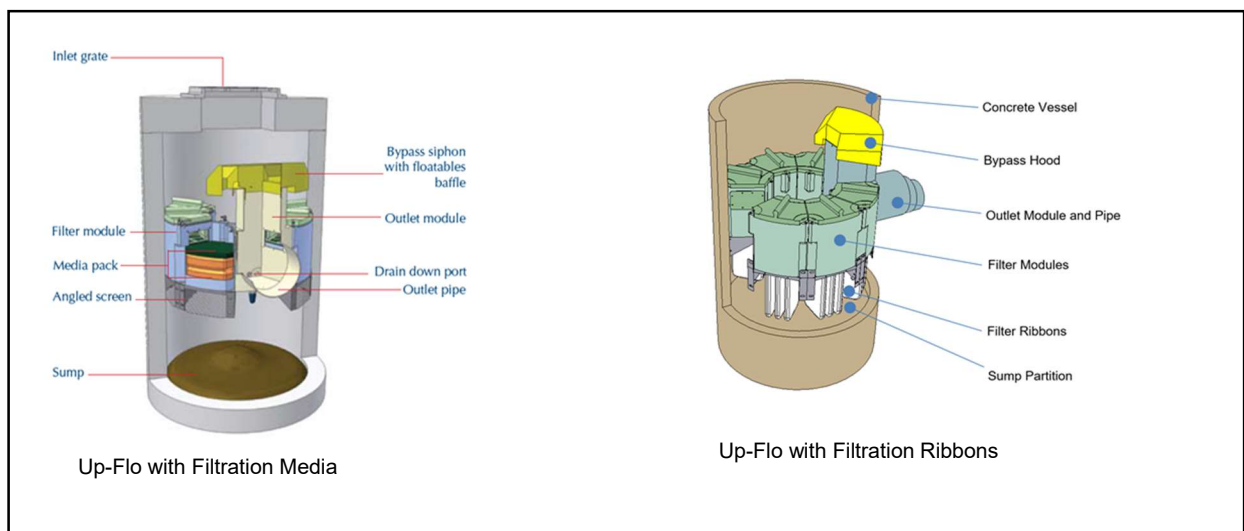
The Up-Flo® Filter is a modular high-rate stormwater filtration device designed to capture trash, oil, sediment and remove fine pollutants such as dissolved and particulate metals and nutrients from stormwater runoff. In general, a minimum of two inspections are required per year to monitor sediment and gross pollutant accumulations.

In order to sustain expected flow and removal rates for the Up-Flo® Filter, annual replacement of the Media Pack and removal of accumulated sediment from the sump is required. Depending on site use and pollutant characteristics, annual rainfall, design and functionality of the stormdrain conveyance system, annual replacement and clean out may be more or less often.

The Up-Flo Filter has modular components that connect together to form a ring of 1-6 Filter Modules or linearly to fit into rectangular precast structures with filter bays. Each filter bay can house 1-19 Filter Modules and precast structures can be constructed with multiple filter bays. Each Filter Module will have either a filtration Media Pack or filtration Ribbons.



It does not matter what type of media is used, the Filter Modules house the filtration medium and the precast structure is used to suspend the Filter Modules to provide a sedimentation sump. Stainless steel support frames are used to support the Filter Modules and attach them to the precast structure. An Outlet Module (with hood) is used to connect the Filter Modules to a discharge pipe and convey filtered water away from the treatment area. A Draindown Filter and screen are provided when filtration media is used but not with filtration Ribbons.



Maintenance activities can be categorized by those that can be performed from outside the Up-Flo® vessel and those that are performed inside the vessel. Maintenance performed from outside the vessel includes removal of floatables and oils that have accumulated on the water surface and removal of sediment from the sump. Maintenance performed inside the vessel includes removal and replacement of Media Packs (Filter Bags, flow Distribution Media and Draindown) or filtration Ribbons. A vactor truck is required for removal of oils, water, sediment, and to enter the vessel for performing inside maintenance. OSHA Confined Space Entry procedures need to be followed when entering the Up-Flo® vessel.

Inspection

The frequency of inspection and maintenance can be determined in the field after installation. Based on site characteristics such as contributing area, types of surfaces (e.g., paved and/or landscaped), site activities (e.g., short-term or long-term parking), and site maintenance (e.g., sanding and sweeping), inspection and maintenance should be conducted at intervals of no more than six months during the first year of operation. Typically, maintenance is recommended once per year thereafter.



By removing the manhole cover during a storm and monitoring the water level in the manhole or vault, site personnel can determine whether the filter is in bypass. A properly-sized filter that is in bypass during a storm that is producing runoff at, or below, the filter's design filtration rate needs maintenance. Otherwise, scheduled inspections will determine when one or more of the following maintenance thresholds have been reached:

- Sediment depth at sump storage capacity. Minimum 8" should separate the Draindown filter inlet from stored sediment in the sump or 6" should separate the bottom of the filtration Ribbons and sump floor. A simple probe, such as the Sludge-Judge®, can be used to determine the depth of the solids in the sump.
- Clogging of the Media Bags. Minimum filtration rate is generally reached when the Media Bags have accumulated approximately 20 lbs of sediment or when filtration Ribbons from one module have accumulated approximately 8 lbs. Determining the amount of accumulated sediment will be accomplished by removing both of the Media Bags from one of the Media Packs and weighing the bags separately or removing the filter Ribbon assembly as weighing. A spent Media Bag weighs approximately 50 lbs wet and a filter Ribbon assembly from one module weighs approximately 15 lbs spent .
- Draindown filter clogged. With modules supplied with filtration media, the Drain Down Filter is designed to lower the water level in the Up-Flo® vessel to an elevation below the bottom of the Filter Modules between storm events. If inspection one to two days after a storm event indicates otherwise, the Drain Down Filter has likely become clogged with sediment.
- Slime and debris covering the flow distribution media, angled screens or filtration Ribbons. After removal of the Media Bags or filtration Ribbons, the bottom flow distribution media should be removed and inspected to determine if it is coated with slime or debris. Similarly, the angled screen should be inspected for blockages and ragging.
- Oil forming a measureable thickness on the surface of the water. Since water in the Up-Flo® vessel drains down to an elevation below the bottom of the Filter Modules when the system is idle, the amount of accumulated oils must be minimized so that oils are not entrained into the Media Pack when stormwater begins to fill the vessel at the start of a storm event.
- Floatables completely covering the surface of the water. Similar to oils, the amount of accumulated floatables must be minimized to prevent trash and loose debris from becoming trapped on the angled screens when stormwater begins to fill the Up-Flo® vessel at the start of a storm event.



The site-specific solids loading rate in the sump and in the Media Packs will be determined during the first year of Up-Flo® Filter operation. Starting with a clean sump, the solids loading rate in the sump will be calculated by measuring the sediment depth in the sump and dividing the depth by the correlating interval of time since it was cleaned. Similarly, starting with fresh Media Bags or Ribbons, the solids loading rate in the Media Packs and Ribbons will be calculated by weighing the Media Bags or Ribbons and dividing the weights by the respective time interval since they were installed. The wet weight of the heaviest bag or Ribbon assembly from a single module will be used to determine the loading rate.

After completion of the first year of operation, the inspection and maintenance intervals for cleaning the sump and replacing Media Bags or Ribbons will be established to keep the solids loading within the respective limits of the sump and filter medium. Replacement of the Draindown Filter, replacement of flow Distribution Media, and removal of oils and floatables will occur at the same frequency unless the first year of operation indicates otherwise. Keeping to the established maintenance intervals will keep treatment flow rates at, or above, the design flow rate.

Maintenance

The access port located at the top of the manhole or vault provides access to the Up-Flo® vessel for maintenance personnel to enter the vessel and comfortably remove and replace Media Packs or Ribbon assemblies. The same access would be used for maintenance personnel working from the surface to net or skim debris and floatables or to vacuum out sediment, oil, and water. Unless the Up-Flo® Filter has been installed in a very shallow unit, it is necessary to have personnel with OSHA-confined space entry performing the maintenance that occurs inside the vessel.

Maintenance activities include inspection, floatables removal, oil removal, sediment removal, Media Pack and Ribbon assembly replacement, and Draindown Filter replacement. Filtration medium housed in the Filter Modules is easily accessed by loosening three latches used to secure the Filter Module Lid. Maintenance intervals are determined from monitoring the Up-Flo® Filter during its first year of operation. Depending on the site, some maintenance activities may have to be performed on a more frequent basis than others. In the case of floatables removal, a vacuum truck is not required. Otherwise, a vacuum truck is normally required for oil removal, removal of sediment from the sump, and to dewater the vessel for replacement of the Media Packs and Draindown Filter. All inspection and maintenance activities would be recorded in an Inspection and Maintenance Log.

Good housekeeping practices upstream of the Up-Flo® Filter can significantly extend Media Bag life. For example, sweeping paved surfaces, collecting leaves and grass trimmings, and protecting bare ground from the elements will reduce loading to the system. Media Packs should not be installed in the Filter Modules until construction activities are complete and site stabilization is effective.



Up-Flo Filter Inspection & Maintenance Logs

SITE REFERENCE NAME OR NUMBER FOR THIS UP-FLO® FILTER LOCATION:	
SITE NAME:	
SITE LOCATION:	
OWNER:	SITE CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

CONFIGURATION (CIRCLE ONE): MANHOLE VAULT SYSTEM

TOTAL NUMBER OF UP-FLO® FILTER MODULES: _____



UP-FLO® FILTER INSPECTION LOG

Site Name: _____ Owner Change since last inspection? Y N

Location: _____

Owner Name: _____

Address: _____ Phone Number: _____

Site Status: _____

Date: _____ Time: _____ Site conditions*: _____

**(Stable, Under Construction, Needing Maintenance, etc.)*

Inspection Frequency Key: A=annual; M=monthly; S=after major storms

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Adjacent area free of debris?	M			
Inlets and Outlets free of debris?	M			
Facility (internally) free of debris?	M			
Vegetation				
Surrounding area fully stabilized? (no evidence of eroding material into Up-Flo® Filter)	A			
Grass mowed?	M			
Water retention where required				
Water holding chamber(s) at normal pool?	A			
Evidence of erosion?	A			
Sediment Deposition				
Filtration Chamber free of sediments?	A			
Sedimentation sump not more than 50% full?	A			
Structural Components				
Any evidence of structural deterioration?	A			
Grates in good condition?	A			
Spalling or cracking of structural parts?	A			
Outlet/Overflow Spillway	A			
Other				
Noticeable odors?	A			
Any evidence of filter(s) clogging?	M			
Evidence of flow bypassing facility?	A			



Inspector Comments: _____

Overall Condition of Up-Flo® Filter**: Acceptable Unacceptable

**"Acceptable" would mean properly functioning; "unacceptable" would mean damaged or required further maintenance.

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed", list Maintenance actions and their completion dates below or on the Maintenance Log provided on page 15 of the Up-Flo® Filter Operation & Maintenance Manual:

Maintenance Action Needed	Due Date

The next routine inspection is schedule for approximately: (date) _____

Inspected by: (signature) _____

Inspected by: (printed) _____



UP-FLO® FILTER MAINTENANCE LOG

Site Name: _____ Owner Change since last inspection? Y N

Location: _____

Owner Name: _____

Address: _____ Phone Number: _____

Site Status: _____

Date: _____ Time: _____ Site conditions: _____
**(Stable, Under Construction, Needing Maintenance, etc.)*

Estimated volume of oil/floatable trash removed: _____

Sediment depth measured in sump prior to removal: _____

Number of Filter Modules fitted with new media packs: _____

Inspector Comments: _____

Overall Condition of Up-Flo® Filter: Acceptable Unacceptable

***"Acceptable" would mean properly functioning; "unacceptable" would mean damaged or required further maintenance.*

Maintained by: (signature) _____

Maintained by: (printed) _____

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BUILDING B, SUITE 101
MANASQUAN, NJ 08736
732.592.2101
whitestoneassoc.com

June 18, 2021

via email

BEECHLAWN PROPERTY MANAGEMENT LLC

51 Deforest Avenue
Summit, New Jersey 07901

Attention: Mr. Joseph Cioffi
Vice President, Property Management

**Regarding: PRELIMINARY GEOTECHNICAL INVESTIGATION &
STORMWATER MANAGEMENT AREA EVALUATION
PROPOSED WAREHOUSE REDEVELOPMENT
40 ENTERPRISE AVENUE
LAWRENCE TOWNSHIP, MERCER COUNTY, NEW JERSEY
WHITESTONE PROJECT NO.: GS2117967.000**

Dear Mr. Cioffi:

Whitestone Associates, Inc. (Whitestone) has completed a preliminary geotechnical investigation and stormwater management (SWM) area evaluation at the above referenced site. The results of the limited evaluation and preliminary recommendations presented below are based on the soil conditions disclosed from a limited number of subsurface tests conducted during Whitestone's field investigation. Recommendations for further investigation also are included herein.

The purpose of the preliminary subsurface soils investigation was to assess anticipated geologic features, shallow groundwater and/or rock, refusal depths, existing fill, and the potential feasibility of shallow foundations and/or expected earthwork requirements. While the scope of this preliminary investigation will not be sufficient to formulate detailed design recommendations and a more comprehensive geotechnical investigation ultimately will be required, this preliminary investigation may be used to assess potentially development impactive geotechnical issues to support preliminary studies regarding the feasibility of developing the property.

1.0 SUMMARY OF FINDINGS

In general, the subsurface conditions preliminarily indicate conditions suitable for shallow foundation design. The exploration indicated the presence of moderately to highly moisture-sensitive soils within portions of the site that will impact the planned construction. Based on past experience with similar soils, earthwork activities will require stringent soil moisture control efforts. Depending on the time of year of construction, site work should anticipate overexcavation of moisture sensitive soils in structural areas, using mechanical and/or chemical subgrade stabilization techniques, and exercising detailed attention to construction methods while maintaining strict moisture control. In addition, existing fill containing variable amounts of debris was encountered to a depth of up to three feet below ground surface (fbgs).

Other Office Locations:

WARREN, NJ
908.668.7777

CHALFONT, PA
215.712.2700

SOUTHBOROUGH, MA
508.485.0755

ROCKY HILL, CT
860.726.7889

PHILADELPHIA, PA
215.848.2323

Unsuitable portions of the existing fill containing deleterious debris, such as wood and cinders, will require overexcavation below proposed structural areas.

2.0 PROJECT DESCRIPTION

2.1 Site Location and Existing Conditions

The subject property located at 40 Enterprise Avenue in Lawrence Township, Mercer County, New Jersey currently houses multiple, vacant manufacturing and warehouse buildings with associated pavements, landscaping, and utilities. At the time of Whitestone's investigation, the existing structures were observed to be in fair to poor structural condition with multiple areas of surficial cracking. The existing pavements were observed to be in poor structural condition with multiple areas of variable and significant cracking.

2.2 Site Geology

The site is located within the Piedmont Physiographic Providence of New Jersey. Specifically, the subject site is underlain by medium- to coarse-grained Gabbro. The overburden materials at the site include Late Wisconsinan Glaciofluvial Deposits including sand and pebble to cobble gravel and minor silt. Overburden materials also include man-made fill associated with past and present development of the subject site.

2.3 Proposed Construction

Based on the undated *North Enterprise Concept Plan* provided by Avison Young, the proposed redevelopment is anticipated to include demolishing the existing site structures and constructing an approximately 233,000-square feet (maximum footprint) warehouse, loading dock area, truck trailer parking, pavements, landscaping, utilities and SWM facilities. The exact location(s) and size(s) of the SWM area(s) have not been provided. Whitestone anticipates that the proposed building will be a masonry- and steel-framed structure constructed with a ground-supported, concrete floor slab and no basement or crawl space. No new retaining walls, with the exception of the below-grade walls for the loading dock area, are anticipated for redevelopment.

Detailed grading or structural loading information have not been finalized at this time. Whitestone assumes the site will be redeveloped at or near existing site grades with maximum cut and fill on the order of one foot to two feet. Whitestone assumes the bottom elevations of the SWM area(s) will be approximately four feet below existing grades. Based on Whitestone's experience with similar structures, the maximum design loads are anticipated to be less than the following: column load - 150 kips, wall load - 2.0 kips/foot, and floor load - 150 pounds per square foot.

3.0 FIELD & LABORATORY WORK

3.1 Field Exploration

Field exploration at the project site was completed by means of five soil borings (identified as B-1 through B-5) conducted with a truck-mounted drill rig using hollow stem augers and split-spoon sampling techniques and five soil profile pits (identified as SPP-1 through SPP-4 and offset SPP-3A) with a track-mounted excavator. The borings were conducted within accessible portions of the proposed building

footprint and pavement areas to depths ranging from approximately five fbgs to 40 fbgs. The profile pits were conducted within anticipated locations of the proposed SWM facilities to depths ranging from approximately two fbgs (offset performed) to 12 fbgs. The subsurface tests were backfilled to the surface with excavated soils from the investigation and borings within existing paved areas were superficially restored with asphaltic pavement cold patch, as necessary. The locations of the subsurface tests are shown on the *Test Location Plan* included as Figure 1. *Records of Subsurface Exploration* are provided in Appendix A.

The subsurface tests were conducted in the presence of a Whitestone engineer who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The tests were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Soil borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D 1586. The SPT resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling the tests. Seasonal variations, temperature effects, man-made effects, and recent rainfall conditions may influence the levels of the groundwater, and the observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

3.2 *Laboratory Program*

Representative samples of a selected strata encountered were subjected to a laboratory program that included Atterberg limits determination (ASTM D-4318), moisture content determinations (ASTM D-2216) and washed gradation analyses (ASTM D-422) in order to conduct supplementary engineering soil classifications in general accordance with ASTM D-2487. The soil stratum tested was classified by the Unified Soil Classification System (USCS) and results of the laboratory testing are summarized in the following table. Quantitative test results are provided in Appendix B.

PHYSICAL/TEXTURAL ANALYSES SUMMARY							
Boring	Sample	Depth (fbgs)	% Passing No. 200 Sieve	Moisture Content (%)	Liquid Limit (%)	Plastic Index (%)	USCS Classification
B-1	S-3	5.0 - 7.0	6.5	20.3	NP	NP	SP-SM
B-2	S-2	3.0 - 5.0	30.4	14.9	22	6	SC-SM

Notes: NP = Non-Plastic

4.0 *SUBSURFACE CONDITIONS*

The subsurface soil conditions encountered within the subsurface tests consisted of the following generalized strata in order of increasing depth. *Records of Subsurface Exploration* are provided in Appendix A.

Surface Materials: The subsurface tests were conducted within either existing paved areas, gravel-covered areas, grass-covered areas, or encountered fill at the surface as detailed below. The tests within existing paved areas encountered approximately 1.5 inches to three inches of asphaltic concrete pavement at the surface underlain by approximately three inches to four inches of stone subbase materials. The tests within existing gravel-covered areas encountered approximately eight inches to 10 inches of gravel at the surface. The tests within existing grass-covered areas encountered approximately two inches of topsoil at the surface.

Existing Fill: At or beneath the surface cover, the majority of subsurface tests encountered existing fill that generally consisted of silty sand with variable amounts of debris. The debris encountered consisted of concrete, brick, metal, cinders, wood, and asphalt fragments. SPP-3 was terminated within the existing fill at a depth of approximately two fbgs due to an apparent concrete obstruction. Within the remaining tests, the existing fill, where encountered, extended to depths ranging from approximately two fbgs to three fbgs. SPT N-values within the existing fill ranged between 11 blows per foot (bpf) and refusal (refusal defined as greater than 50 blows per six inches of split-spoon sampler advancement).

Glacial Deposits: Underlying the surface cover and/or existing fill, the tests encountered natural glacial deposits generally consisting of silty sand (USCS: SM) with variable amounts of gravel, silty, clayey sand (USCS: SC-SM), poorly graded sand (USCS: SP and SP-SM) with variable amounts of sand and gravel, and/or sandy silt (USCS: ML). The majority of the tests were terminated within the glacial deposits at depths ranging from approximately five fbgs to 25 fbgs. Within boring B-2, the glacial deposits extended to a depth of approximately 28 fbgs. SPT N-values within coarse-grained portions of this stratum ranged between four bpf and refusal, generally indicating loose to very dense relative density and averaging approximately 18 bpf. A pocket penetrometer test within a fine-grained portion of this stratum resulted in an unconfined compressive strength of approximately 1.5 tons per square foot, generally indicating stiff consistency.

Residual Soils: Underlying the glacial deposits, boring B-2 encountered natural residual soils generally consisting of silty sand (USCS: SM). Within B-2, the residual soils extended to a depth of approximately 38 fbgs. SPT N-values within coarse-grained portions of this stratum ranged between 11 bpf and 22 bpf, generally indicating medium dense relative density and averaging approximately 16 bpf.

Weathered Rock: Beneath the residual soils, B-2 encountered highly weathered rock materials. The top of weathered rock was encountered at a depth of approximately 38 fbgs. B-2 was terminated within the weathered rock materials at a depth of approximately 40 fbgs. The SPT N-value within this stratum was 38 bpf.

Groundwater: Static groundwater was encountered within the majority of the tests at depths ranging from approximately five fbgs to seven fbgs. Seasonal variations, temperature effects, and recent rainfall conditions may influence the levels of the groundwater. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater level.

5.0 CONCLUSIONS AND PRELIMINARY RECOMMENDATIONS

The following discussion is based on the subsurface conditions encountered during Whitestone's limited subsurface investigation for the proposed redevelopment and is intended to provide general characteristics of the subsurface conditions for preliminary planning purposes and should not be utilized for final design of structural foundations, floor slabs, or pavements. These preliminary considerations and site

development options should be confirmed or revised upon development of the final project design concept and completion of a site-specific subsurface investigation and engineering analyses.

Foundations: Whitestone preliminarily anticipates that the structure may be supported on conventional spread and continuous wall footings designed to bear either within the suitable portions of the existing fill, underlying natural materials, and/or controlled structural fill materials that are properly evaluated, placed, compacted, and prepared in order to control their moisture content. Unsuitable existing fill containing deleterious debris should be overexcavated if encountered at or below proposed foundation bearing elevations and the resulting excavation should be restored with controlled structural backfill. Foundations bearing within the above materials may be preliminarily designed to impart a maximum allowable net bearing pressure in the range of 2,000 pounds per square foot (psf) to 4,000 psf, depending on final design column and wall loading, column spacing, settlement tolerances, and the final geotechnical investigation. Reuse of the existing fill for foundation support will be contingent upon supplemental evaluation, as recommended herein.

Floor Slabs and Pavements: Whitestone preliminarily anticipates that the properly evaluated, prepared and approved existing fill, natural site subgrade soils, and/or controlled structural imported fill will be suitable for support of the proposed floor slabs and pavements. At least limited overexcavation of existing fill may be required due to the variability that exists within existing fill, evidenced by the debris encountered. Subgrade stabilization and protection may also be necessary during wet conditions to obtain a stable surface. Subgrade stabilization may be achieved through the use of separation geotextiles, geogrids, and/or the addition of lime-cement to the subgrade.

On-Site Soil Reusability: Whitestone preliminarily anticipates that the majority of the existing fill and natural site soils situated above the groundwater table will be suitable for selective reuse as structural fill and/or backfill where free of debris and moisture contents are controlled within two percent of the optimum and the soils are placed during favorable weather conditions. Reuse of the existing fill will be contingent on careful inspection in the field by the owner's geotechnical engineer by visual observation and/or test pit excavations during construction as recommended herein. Soils located at or near the existing groundwater table will require extensive drying prior to reuse.

Based on the conditions disclosed by the subsurface exploration and the results of the laboratory test results, portions of the on-site soils contain an appreciable amount of fines and are not anticipated to be immediately suitable for reuse as structural fill and/or backfill due to high moisture content characteristics. Disturbance of these soils should be minimized. The on-site moisture sensitive soils, while stable and often hard when in a dry natural state, will degrade when wetted or disturbed. Whitestone anticipates that the sandy and/or less plastic site soils, where encountered, may be suitable for reuse as structural fill and/or backfill provided moisture contents are controlled within two percent of the optimum only during favorable weather conditions. Due to moisture sensitivity, use of portions of the on-site soils should expect mixing with a granular material, extensive moisture conditioning, and/or drying to facilitate their reuse, workability, and compaction in fill areas. These materials will become increasingly difficult to reuse and compact where wetted beyond the optimum moisture content. Materials that become exceedingly wet likely will require discing and aerating and extended time to dry during favorable weather.

Groundwater Control: Static groundwater was encountered at depths ranging from approximately five fbg to seven fbg. Additionally, perched/trapped groundwater may be encountered within the existing fill, at the existing fill/natural soil interface, and within fine-grained portions of the natural materials, especially following precipitation events. As such, construction phase dewatering of static and perched/trapped groundwater through the use of gravity fed sump pumps should be anticipated during

excavation activities for this site. Additionally, permanent groundwater control including perimeter drains for proposed foundations may be required, depending on final grades.

Supplemental Borings: A supplemental subsurface investigation designed to address site-specific conditions for proposed construction should be conducted following demolition of the existing site structures and the finalization of the design concept, grading, and general site layout. The final subsurface investigation and geotechnical evaluation should be conducted to obtain subsurface information across the site at more closely spaced intervals within the proposed building, pavements, and utility alignments, etc. Whitestone also recommends supplemental borings in accordance with the *International Building Code 2018, New Jersey Edition* as the proposed building will have a maximum height greater than 40 feet.

6.0 PRELIMINARY SWM AREA EVALUATION

General: Soil profile pits SPP-1 through SPP-4 and offset SPP-3A were conducted within accessible areas of the proposed SWM facilities. The soil profile pits within the SWM areas were terminated at depths ranging between approximately two fbgs to 12 fbgs.

Estimated Seasonal High Groundwater Levels: The methods used in determining the seasonal high groundwater level include evaluating the soil morphology within a test excavation and identifying irregular spots or blotches of different colors or minerals unlike that of the surrounding soil (mottles). A summary of the estimated seasonal high groundwater observations as well as infiltration test results are included in the following table.

INFILTRATION TEST SUMMARY				
Profile Pit #	ESHWG (fbgs)	USDA Classification @ Test	Infiltration Test	
			Depth (fbgs)	Rate (in/hour)
SPP-1	7.0	Loamy Sand	4.0	7.0
SPP-2	7.0	Loamy Sand	4.0	7.0
SPP-3A	7.0	Loamy Sand	4.0	7.0
SPP-4	7.0	Loamy Sand	4.0	7.0

Soil Infiltration Rates: In-situ infiltration tests were conducted within the proposed SWM areas at the soil profile pits. Infiltration testing was conducted using the single-ring infiltration test method per the *New Jersey Stormwater Best Practices Manual*. The tests resulted in an infiltration rate of approximately seven inches per hour. Infiltration test results are provided in Appendix C, Soil Profile Pit Logs are included in Appendix A.

7.0 CLOSING

Whitestone appreciates the opportunity to be of service to Beechlaw Property Management LLC. Please note that Whitestone has the capability to conduct the additional geotechnical engineering services recommended herein.

Please contact us at (908) 668-7777 with any questions or comments regarding this report.

Sincerely,

WHITESTONE ASSOCIATES, INC.



Mudar Khantamr, P.E.
Associate

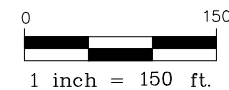
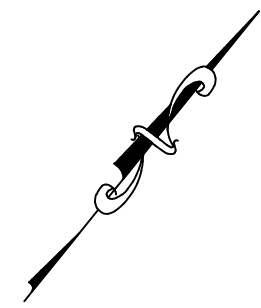
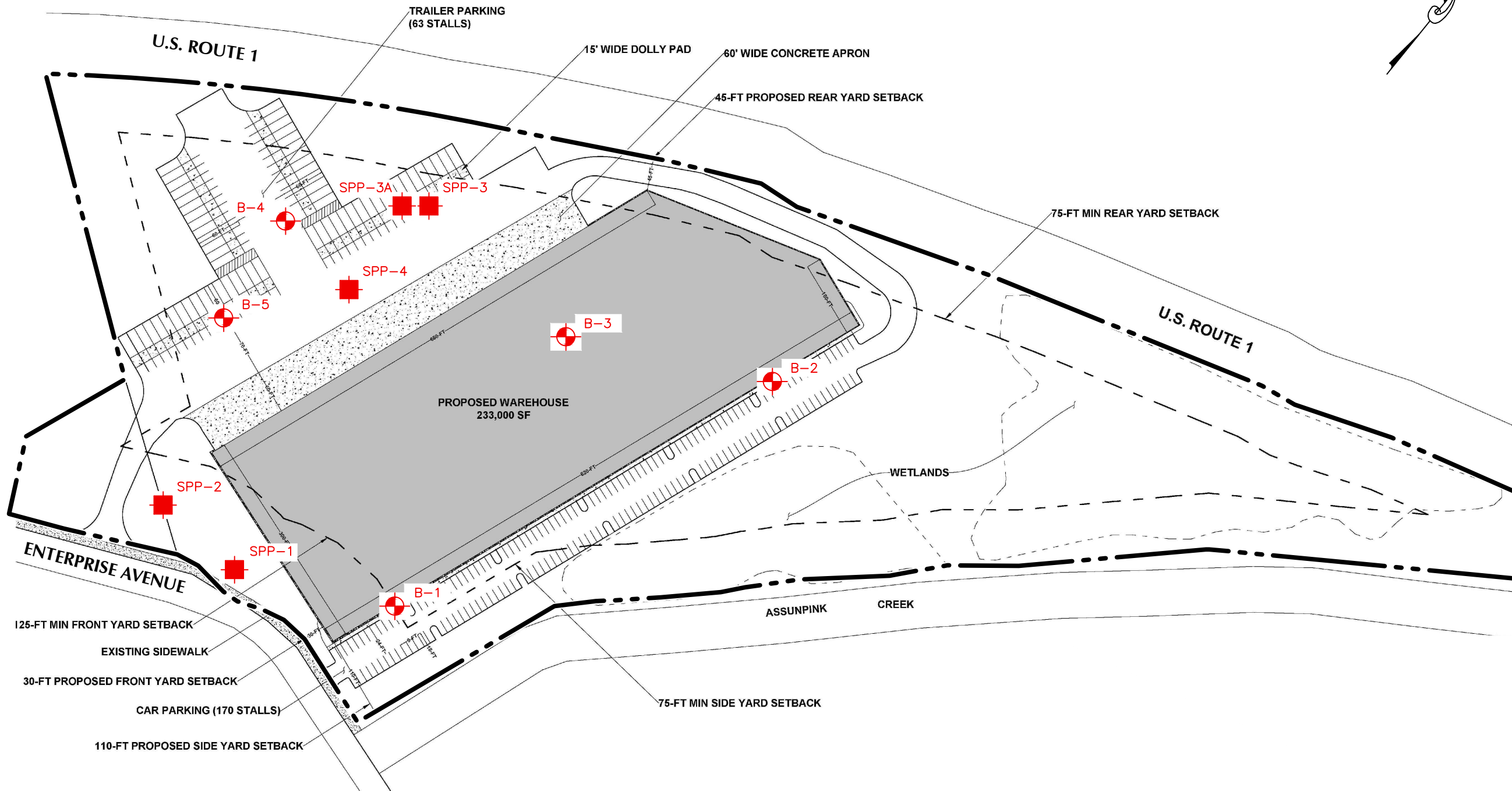


Laurence W. Keller, P.E.
Principal, Geotechnical Services

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Enclosures
Copy: Jonathan Fox, Beechlawn Property Management LLC
Lisa M. Lyng, LEED AP ID+C, Avison Young
Bradford A. Bohler, P.E., CRE, Bohler Engineering NJ, LLC
Timothy Aguilar, P.E., Bohler Engineering NJ, LLC

FIGURE 1
Test Location Plan

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LEGEND	
	SPP-1 SOIL PROFILE PIT
	B-1 BORING
	SUBJECT PROPERTY BOUNDARY
REFERENCE	
THIS PLAN IS BASED ON AN UNDATED NORTH ENTERPRISE CONCEPT PLAN PROVIDED BY AVISON YOUNG & ALL SITE LOCATIONS ARE APPROXIMATE.	

WHITESTONE ASSOCIATES, INC.

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



DRAWING TITLE: TEST LOCATION PLAN	
CLIENT: BEECHLAWN PROPERTY MANAGEMENT LLC	
PROJECT: PROPOSED WAREHOUSE REDEVELOPMENT 40 ENTERPRISE AVENUE LAWRENCE TOWNSHIP, MERCER COUNTY, NJ	
PROJECT #: GS2117967.000	
DESIGNED BY: GR	PROJ. MGR.: MK
DATE: 6/16/21	FIGURE: 1
SCALE: 1" = 150'	

APPENDIX A
Records of Subsurface Exploration

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Warehouse Redevelopment		WAI Project No.: GS2117967.000	
Location: 40 Enterprise Avenue; Lawrence Township, Mercer County, NJ		Client: Beechlawn Property Management LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>6/2/2021</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>25.0</u> feet bgs	Date Completed: <u>6/2/2021</u>	During: <u>7.0</u> --- ▼	At Completion: --- --- ▼
Proposed Location: <u>Building</u>	Logged By: MH	At Completion: <u>6.0</u> --- ▼	At Completion: --- --- ▼
Drill / Test Method: <u>HSA / SPT</u>	Contractor: JG	6 Hours: <u>6.0</u> --- ▼	24 Hours: --- --- ▼
	Equipment: CME-55		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	GRAVEL	8" Gravel Subbase	
1 - 3	S-1	X	4 - 4 - 4 - 5	20	8	0.7	GLACIAL DEPOSITS	Brown Sandy Silt, Moist, Stiff (ML)	Qu = 1.5 tsf
3 - 5	S-2	X	4 - 12 - 15 - 18	20	27	2.0		Brown Poorly Graded Sand with Silt and Gravel, Moist, Medium Dense (SP-SM)	Temporary Well Installed in B-1
5 - 7	S-3	X	12 - 13 - 13 - 15	20	26	5.0		As Above, Very Moist (SP-SM)	
7 - 9	S-4	X	7 - 6 - 6 - 6	20	12	7.0		Brown Poorly Graded Sand with Gravel, Wet, Medium Dense (SP)	
9 - 11	S-5	X	4 - 5 - 7 - 7	22	12	10.0		As Above (SP)	
13 - 15	S-6	X	4 - 4 - 4 - 4	22	8	15.0		As Above, Loose (SP)	
18 - 20	S-7	X	4 - 5 - 7 - 8	20	12	20.0		As Above, Medium Dense (SP)	
23 - 25	S-8	X	5 - 6 - 7 - 7	NR	13	25.0		No Recovery, Presumed As Above (SP)	
Boring Log B-1 Terminated at a Depth of 25.0 Feet Below Ground Surface									

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

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Warehouse Redevelopment		WAI Project No.: GS2117967.000	
Location: 40 Enterprise Avenue; Lawrence Township, Mercer County, NJ		Client: Beechlawn Property Management LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>6/2/2021</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>40.0</u> feet bgs	Date Completed: <u>6/2/2021</u>	During: <u>5.0</u> --- ▾	At Completion: <u>21.0</u> --- ▾
Proposed Location: <u>Building</u>	Logged By: <u>MH</u>	At Completion: <u>5.0</u> --- ▾	24 Hours: --- --- ▾
Drill / Test Method: <u>HSA / SPT</u>	Contractor: <u>JG</u>	24 Hours: --- --- ▾	24 Hours: --- --- ▾
	Equipment: <u>CME-55</u>		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	GRAVEL	10" Gravel Subbase	
1 - 1.3	S-1	X	50/3"	2	50/3"	0.8	FILL	Low Recovery, Presumed Fill	Gravel in Spoon tip
3 - 5	S-2	X	5 - 8 - 5 - 5	20	13	3.0	GLACIAL DEPOSITS	Brown Silty, Clayey Sand, Moist, Medium Dense (SC-SM)	LL = 22, PI = 6
5 - 7	S-3	X	3 - 2 - 2 - 2	NR	4	5.0		No Recovery, Presumed As Above (SC-SM)	Spoon Wet
7 - 9	S-4	X	4 - 4 - 10 - 15	20	14	7.0		Brown Silty Sand with Gravel, Wet, Medium Dense (SM)	
9 - 11	S-5	X	11 - 11 - 12 - 12	22	23	10.0		Brown Poorly Graded Sand with Gravel, Wet, Medium Dense (SP)	
13 - 15	S-6	X	6 - 6 - 6 - 7	20	12	15.0		As Above (SP)	More Gravel Content
18 - 20	S-7	X	5 - 5 - 5 - 6	20	10	20.0		As Above (SP)	
23 - 25	S-8	X	8 - 10 - 12 - 12	22	22	23.0		Brown Silty Sand with Gravel, Wet, Medium Dense (SM)	
						25.0			

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

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Warehouse Redevelopment		WAI Project No.: GS2117967.000	
Location: 40 Enterprise Avenue; Lawrence Township, Mercer County, NJ		Client: Beechlawn Property Management LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>6/2/2021</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>40.0</u> feet bgs	Date Completed: <u>6/2/2021</u>	During: <u>5.0</u> --- ▼	At Completion: <u>21.0</u> --- ▼
Proposed Location: <u>Building</u>	Logged By: MH	At Completion: <u>5.0</u> --- ▼	24 Hours: --- --- ▼
Drill / Test Method: <u>HSA / SPT</u>	Contractor: JG	24 Hours: --- --- ▼	24 Hours: --- --- ▼
	Equipment: CME-55		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						25.0	GLACIAL DEPOSITS		
28 - 30	S-9	X	5 - 5 - 6 - 6	20	11	28.0	RESIDUAL	Gray to Brown Micaceous Silty Sand, Wet, Medium Dense (SM)	Highly Weathered Rock
						30.0			
33 - 35	S-10	X	6 - 9 - 13 - 21	22	22	35.0		As Above (SM)	
						38.0			
38 - 40	S-11	X	10 - 16 - 22 - 31	22	38	40.0	WEATHERED ROCK	Gray to Brown Highly Weathered Rock, Wet, Dense (WR)	
								Boring Log B-2 Terminated at a Depth of 40.0 Feet Below Ground Surface	
						45.0			
						50.0			

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

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Warehouse Redevelopment		WAI Project No.: GS2117967.000	
Location: 40 Enterprise Avenue; Lawrence Township, Mercer County, NJ		Client: Beechlawn Property Management LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>6/2/2021</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>23.3</u> feet bgs	Date Completed: <u>6/2/2021</u>	During: <u>5.0</u> <u>---</u> ▼	At Completion: <u>---</u> <u>---</u> ▼
Proposed Location: <u>Building</u>	Logged By: <u>MH</u>	At Completion: <u>5.0</u> <u>---</u> ▼	At Completion: <u>---</u> <u>---</u> ▼
Drill / Test Method: <u>HSA / SPT</u>	Contractor: <u>JG</u>	24 Hours: <u>---</u> <u>---</u> ▼	24 Hours: <u>---</u> <u>---</u> ▼
	Equipment: <u>CME-55</u>		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	PAVEMENT	3" Asphalt, No Apparent Subbase	
						0.3	GLACIAL DEPOSITS		
1 - 3	S-1		2 - 2 - 3 - 4	16	5			Brown Silty Sand, Moist, Loose (SM)	
3 - 5	S-2		4 - 8 - 10 - 13	20	18			As Above, with Gravel, Medium Dense (SM)	
5 - 7	S-3		9 - 12 - 11 - 11	20	23	5.0		Brown Poorly Graded Sand with Gravel, Wet, Medium Dense (SP)	
7 - 9	S-4		8 - 8 - 7 - 8	20	15			As Above (SP)	
9 - 11	S-5		9 - 10 - 11 - 9	22	21	10.0		As Above (SP)	
13 - 15	S-6		5 - 5 - 6 - 7	19	11	15.0		As Above (SP)	
18 - 20	S-7		12 - 24 - 31 - 39	20	55	20.0		As Above, Very Dense (SP)	
23 - 23.3	S-8		50/3"	3	50/3"	23.3		As Above (SP)	
								Boring Log B-3 Terminated at a Depth of 23.3 Feet Below Ground Surface	
						25.0			

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

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Warehouse Redevelopment		WAI Project No.: GS2117967.000	
Location: 40 Enterprise Avenue; Lawrence Township, Mercer County, NJ		Client: Beechlawn Property Management LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>6/2/2021</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>5.0</u> feet bgs	Date Completed: <u>6/2/2021</u>	During: <u>NE</u> <u>---</u> ▼	At Completion: <u>---</u> <u>---</u> ▼
Proposed Location: <u>Pavement</u>	Logged By: <u>MH</u>	24 Hours: <u>---</u> <u>---</u> ▼	At Completion: <u>---</u> <u>---</u> ▼
Drill / Test Method: <u>HSA / SPT</u>	Contractor: <u>JG</u>	24 Hours: <u>---</u> <u>---</u> ▼	24 Hours: <u>---</u> <u>---</u> ▼
	Equipment: <u>CME-55</u>		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0			
						0.4	PAVEMENT FILL	1.5" Asphalt, 3" Stone Subbase	
1 - 3	S-1	X	10 - 16 - 9 - 4	12	25			Brown Silty Sand, Trace Debris, Moist (FILL)	Debris: Brick
3 - 5	S-2	X	4 - 6 - 7 - 10	18	13		GLACIAL DEPOSITS	Brown Silty Sand, Moist, Medium Dense (SM)	
						5.0		Boring Log B-4 Terminated at a Depth of 5.0 Feet Below Ground Surface	
						10.0			
						15.0			
						20.0			
						25.0			

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

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Warehouse Redevelopment		WAI Project No.: GS2117967.000	
Location: 40 Enterprise Avenue; Lawrence Township, Mercer County, NJ		Client: Beechlaw Property Management LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>6/2/2021</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>5.0</u> feet bgs	Date Completed: <u>6/2/2021</u>	During: <u>NE</u> <u>---</u> ▼	At Completion: <u>---</u> <u>---</u> ▼
Proposed Location: <u>Pavement</u>	Logged By: <u>MH</u>	24 Hours: <u>---</u> <u>---</u> ▼	At Completion: <u>---</u> <u>---</u> ▼
Drill / Test Method: <u>HSA / SPT</u>	Contractor: <u>JG</u>	24 Hours: <u>---</u> <u>---</u> ▼	24 Hours: <u>---</u> <u>---</u> ▼
	Equipment: <u>CME-55</u>		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0			
						0.5	PAVEMENT	2" Asphalt, 4" Stone Subbase	
							FILL		
1 - 3	S-1	X	2 - 2 - 9 - 11	16	11			Dark Brown Silty Sand, Trace Debris, Moist (FILL)	Debris: Wood
						3.0			
3 - 5	S-2	X	4 - 4 - 7 - 8	20	11		GLACIAL DEPOSITS	Brown Silty Sand, Moist, Medium Dense (SM)	
						5.0			
								Boring Log B-5 Terminated at a Depth of 5.0 Feet Below Ground Surface	
						10.0			
						15.0			
						20.0			
						25.0			

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

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Warehouse Redevelopment		WAI Project No.: GS2117967.000	
Location: 40 Enterprise Avenue; Lawrence Township, Mercer County, NJ		Client: Beechlawn Property Management LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>6/2/2021</u>	Water Depth Elevation (feet bgs) (feet)	Estimated Seasonal High Groundwater Depth Elevation (feet bgs) (feet)
Termination Depth: <u>12.0</u> feet bgs	Date Completed: <u>6/2/2021</u>		
Proposed Location: <u>SWM</u>	Logged By: <u>MH</u>	During: <u>7.0</u> <u>---</u> ▼	At Completion: <u>7.0</u> <u>---</u>
Excavating Method: <u>Test Pit Excavation</u>	Contractor: <u>TS</u>	At Completion: <u>7.0</u> <u>---</u> ▼	
Test Method: <u>Visual Observation</u>	Rig Type: <u>Komatsu</u>	24 Hours: <u>---</u> <u>---</u> ▼	

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 0.2	TOPSOIL	2" Topsoil	
			0.2 - 2	FILL	Dark Brown (7.5 YR 4/3) LOAM; Granular Structure; Moist; Friable; 5% Roots; No Mottling; Clear Boundary; Debris	Debris: Brick, Cinders & Asphalt
			2.0			
			2 - 4	GLACIAL DEPOSITS	Brown (7.5YR 4/4) LOAM; <5% Gravel; Single Grain Structure; Moist; Stiff; No Roots; No Mottling; Clear Boundary	
			4.0			
			4 - 12		Brown (7.5YR 4/4) LOAMY SAND; 10% Gravel; Moist; Granular Structure; Moist; Friable; No Roots; No Mottling; Clear Boundary	
			7.0			Wet @ 7.0 fbgs
			12.0			
			13.0			
			14.0			
			15.0			
Soil Profile Pit SPP-1 Terminated at a Depth of 12.0 Feet Below Ground Surface						

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Warehouse Redevelopment		WAI Project No.: GS2117967.000	
Location: 40 Enterprise Avenue; Lawrence Township, Mercer County, NJ		Client: Beechlawn Property Management LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>6/2/2021</u>	Water Depth Elevation (feet bgs) (feet)	Estimated Seasonal High Groundwater Depth Elevation (feet bgs) (feet)
Termination Depth: <u>12.0</u> feet bgs	Date Completed: <u>6/2/2021</u>		
Proposed Location: <u>SWM</u>	Logged By: <u>MH</u>	During: <u>7.0</u> <u>---</u> ▼	At Completion: <u>7.0</u> <u>---</u>
Excavating Method: <u>Test Pit Excavation</u>	Contractor: <u>TS</u>	At Completion: <u>7.0</u> <u>---</u> ▼	
Test Method: <u>Visual Observation</u>	Rig Type: <u>Komatsu</u>	24 Hours: <u>---</u> <u>---</u> ▼	

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 0.2	TOPSOIL	2" Topsoil	
			0.2 - 2	FILL	Dark Brown (7.5 YR 4/3) LOAM; Granular Structure; Moist; Friable; 5% Roots; No Mottling; Clear Boundary; Debris	Debris: Brick, Cinders & Asphalt
			2.0			
			2 - 4	GLACIAL DEPOSITS	Brown (7.5YR 4/4) LOAM; <5% Gravel; Single Grain Structure; Moist; Stiff; No Roots; No Mottling; Clear Boundary	
			4.0			
			4 - 12		Brown (7.5YR 4/4) LOAMY SAND; 10% Gravel; Moist; Granular Structure; Moist; Friable; No Roots; No Mottling; Clear Boundary	
			7.0			Wet @ 7.0 fbg
			12.0			
			13.0			
			14.0			
			15.0			
Soil Profile Pit SPP-2 Terminated at a Depth of 12.0 Feet Below Ground Surface						



RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: **SPP-3**

Page 1 of 1

Project: Proposed Warehouse Redevelopment		WAI Project No.: GS2117967.000	
Location: 40 Enterprise Avenue; Lawrence Township, Mercer County, NJ		Client: Beechlaw Property Management LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>6/2/2021</u>	Water Depth Elevation (feet bgs) (feet)	Estimated Seasonal High Groundwater Depth Elevation (feet bgs) (feet)
Termination Depth: <u>2.0</u> feet bgs	Date Completed: <u>6/2/2021</u>		
Proposed Location: <u>SWM</u>	Logged By: <u>MH</u>	During: <u>NE</u> <u>---</u> ▼	At Completion: <u>---</u> <u>---</u>
Excavating Method: <u>Test Pit Excavation</u>	Contractor: <u>TS</u>	At Completion: <u>---</u> <u>---</u> ▼	
Test Method: <u>Visual Observation</u>	Rig Type: <u>Komatsu</u>	24 Hours: <u>---</u> <u>---</u> ▼	

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0 0 - 2 1.0 2.0	FILL	Brown (7.5YR 4/4) SAND with Gravel; Granular Structure; Moist; Friable; No Roots; No Mottling; Debris	Debris: Concrete, Brick & Metal
			3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0		Soil Profile Pit SPP-3 Terminated at a Depth of 2.0 Feet Below Ground Surface Due to Bucket Refusal on Apparent Concrete Obstruction; Offset to SPP-3A	

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

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Warehouse Redevelopment		WAI Project No.: GS2117967.000	
Location: 40 Enterprise Avenue; Lawrence Township, Mercer County, NJ		Client: Beechlaw Property Management LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>6/2/2021</u>	Water Depth Elevation (feet bgs) (feet)	Estimated Seasonal High Groundwater Depth Elevation (feet bgs) (feet)
Termination Depth: <u>12.0</u> feet bgs	Date Completed: <u>6/2/2021</u>		
Proposed Location: <u>SWM</u>	Logged By: <u>MH</u>	During: <u>7.0</u> <u>---</u> ▼	At Completion: <u>7.0</u> <u>---</u>
Excavating Method: <u>Test Pit Excavation</u>	Contractor: <u>TS</u>	At Completion: <u>7.0</u> <u>---</u> ▼	
Test Method: <u>Visual Observation</u>	Rig Type: <u>Komatsu</u>	24 Hours: <u>---</u> <u>---</u> ▼	

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 2	FILL	Brown (7.5YR 4/4) SAND with Gravel; Granular Structure; Moist; Friable; No Roots; No Mottling; Debris	Debris: Concrete, Brick & Metal
			2.0			
			2 - 4	GLACIAL DEPOSITS	Brown (7.5YR 4/4) LOAM; <5% Gravel; Granular Structure; Moist; Friable; No Roots; No Mottling; Clear Boundary	
			4.0			
			4 - 12		Brown (7.5YR 4/4) LOAMY SAND; <10% Gravel; Granular Structure; Moist; Friable; No Roots; No Mottling	
			7.0			▼
						Wet @ 7.0 fbgs
			12.0			
			13.0			
			14.0			
			15.0			
					Soil Profile Pit SPP-3 Terminated at a Depth of 12.0 Feet Below Ground Surface	

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Warehouse Redevelopment		WAI Project No.: GS2117967.000	
Location: 40 Enterprise Avenue; Lawrence Township, Mercer County, NJ		Client: Beechlawn Property Management LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>6/2/2021</u>	Water Depth Elevation (feet bgs) (feet)	Estimated Seasonal High Groundwater Depth Elevation (feet bgs) (feet)
Termination Depth: <u>12.0</u> feet bgs	Date Completed: <u>6/2/2021</u>		
Proposed Location: <u>SWM</u>	Logged By: <u>MH</u>	During: <u>7.0</u> <u>---</u> ▼	At Completion: <u>7.0</u> <u>---</u>
Excavating Method: <u>Test Pit Excavation</u>	Contractor: <u>TS</u>	At Completion: <u>7.0</u> <u>---</u> ▼	
Test Method: <u>Visual Observation</u>	Rig Type: <u>Komatsu</u>	24 Hours: <u>---</u> <u>---</u> ▼	

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 2	FILL	Brown (7.5YR 4/4) SAND with Gravel; Granular Structure; Moist; Friable; No Roots; No Mottling; Debris	Debris: Concrete, Brick & Metal
			1.0			
			2.0			
			2 - 4	GLACIAL DEPOSITS	Brown (7.5YR 4/4) LOAM; <5% Gravel; Granular Structure; Moist; Friable; No Roots; No Mottling; Clear Boundary	
			3.0			
			4.0			
			4 - 12		Brown (7.5YR 4/4) LOAMY SAND; <10% Gravel; Granular Structure; Moist; Friable; No Roots; No Mottling	
			5.0			
			6.0			
			7.0			▼
			7.0			▼
			8.0			
			9.0			
			10.0			
			11.0			
			12.0			▼
			13.0		Soil Profile Pit SPP-4 Terminated at a Depth of 12.0 Feet Below Ground Surface	
			14.0			
			15.0			

Wet @ 7.0 fbgs



INFILTRATION TEST

Client: Beechlaw Property Management LLC
Project: Proposed Warehouse Redevelopment
Location: Lawrence, NJ
File No. GS2117967.000
Surf. Elev. Not Surveyed

Test Hole No.: SPP-1
Date: 6/2/2021
Weather: Partly Sunny, 80°
Field Engineer: MH
Test Depth Ft. | Elev.: 4.00 | NS

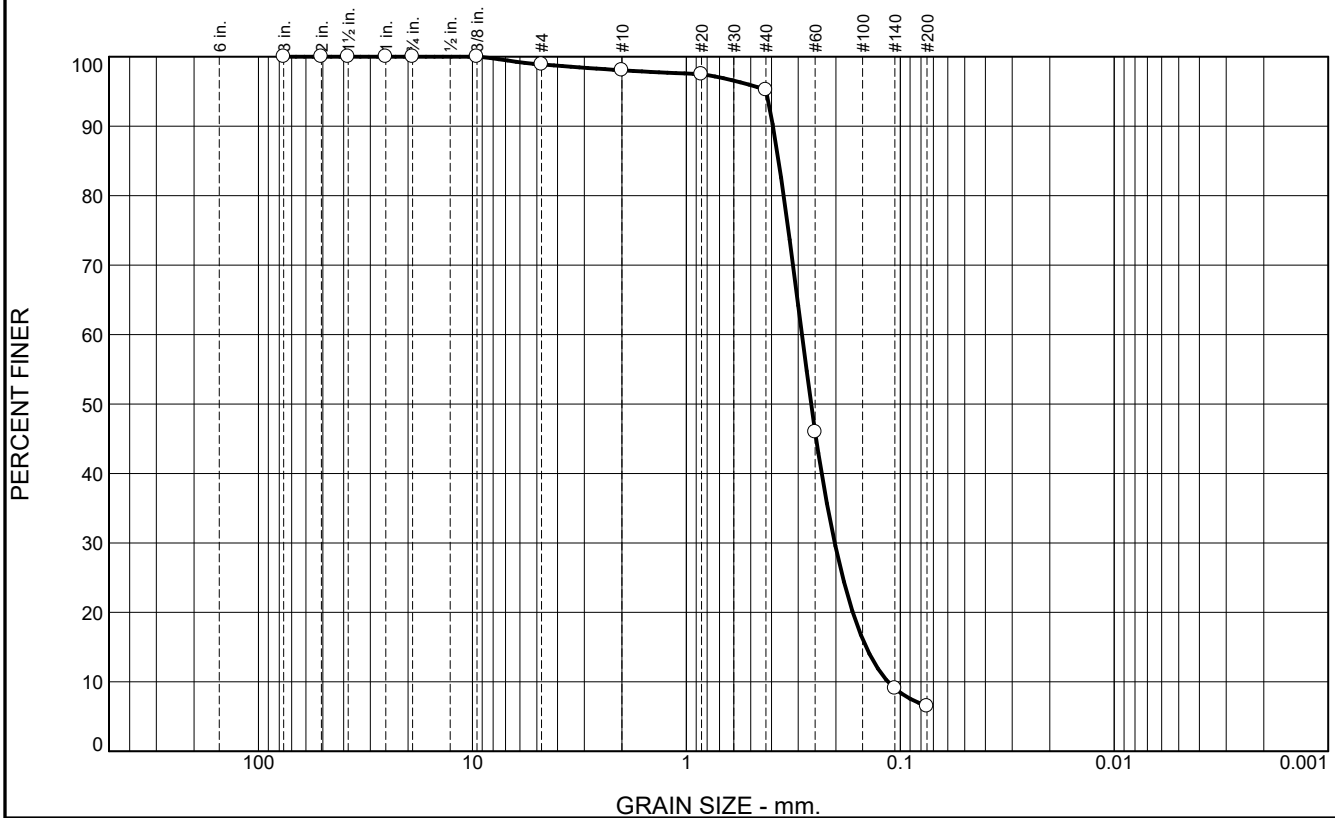
Reading No.	Time		Water Level Reading (inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/Hour)
	Start	Finish	Start	Finish			
PS	9:35	9:45	3.0	0.0	3.0	0.17	-
R-1	9:50	9:53	3.0	2.0	1.0	0.05	20.0
R-2	9:53	9:56	3.0	2.0	1.0	0.05	20.0
R-3	9:56	9:59	3.0	2.0	1.0	0.05	20.0
							K = 7.0 iph

NOTES: PS = Pre Soak; NS = Not Surveyed

APPENDIX B

Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.1	0.9	2.8	88.7	6.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	98.9		
#10	98.0		
#20	97.5		
#40	95.2		
#60	45.9		
#140	9.1		
#200	6.5		

Material Description
Poorly Graded Sand with Silt

Atterberg Limits
 PL= NP LL= NP PI= NP

Coefficients
 D₉₀= 0.3936 D₈₅= 0.3705 D₆₀= 0.2884
 D₅₀= 0.2611 D₃₀= 0.2026 D₁₅= 0.1445
 D₁₀= 0.1140 C_u= 2.53 C_c= 1.25

Classification
 USCS= SP-SM AASHTO= A-3

Remarks
 W_n = 20.3 %

* (no specification provided)

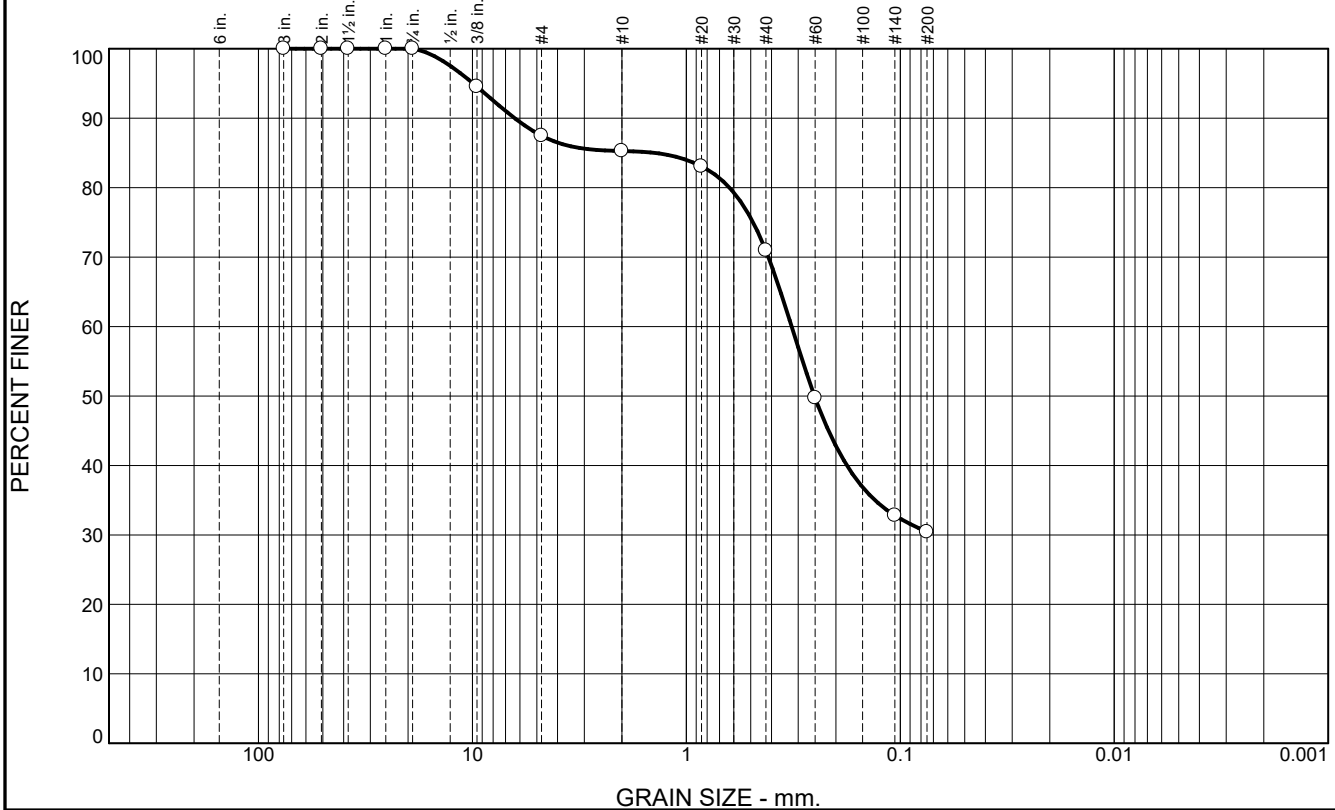
Source of Sample: B-1 Depth: 5.0' - 7.0'
 Sample Number: S-3

Date: 06/16/2021

**WHITESTONE
 ASSOCIATES, INC.
 Warren, New Jersey**

Client: Beechlawn Property Management LLC
Project: Proposed Warehouse Redevelopment
 40 Enterprise Avenue, Lawrence Township, Mercer County, NJ
Project No: GJ2117967.000 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.5	2.2	14.4	40.5	30.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.375	94.5		
#4	87.5		
#10	85.3		
#20	83.1		
#40	70.9		
#60	49.7		
#140	32.8		
#200	30.4		

Material Description

Silty, Clayey Sand

Atterberg Limits

PL= 16 LL= 22 PI= 6

Coefficients

D₉₀= 6.3444 D₈₅= 1.4109 D₆₀= 0.3221
D₅₀= 0.2520 D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Remarks

W_n = 14.9 %

* (no specification provided)

Source of Sample: B-2 Depth: 3.0' - 5.0'
Sample Number: S-2

Date: 06/16/2021

**WHITESTONE
ASSOCIATES, INC.
Warren, New Jersey**

Client: Beechlawn Property Management LLC
Project: Proposed Warehouse Redevelopment
40 Enterprise Avenue, Lawrence Township, Mercer County, NJ
Project No: GJ2117967.000 **Figure**

APPENDIX C
Supplemental Information
(USCS, Terms and Symbols)



UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
	MORE THAN 50% OF COARSE FRACTION <u>RETAINED</u> ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
		SAND AND SANDY SOILS	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	
	MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION <u>PASSING</u> NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
			SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS <u>LESS</u> THAN 50	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
LIQUID LIMITS <u>GREATER</u> THAN 50			SM	SILTY SANDS, SAND-SILT MIXTURES	
MORE THAN 50% OF MATERIAL IS <u>SMALLER</u> THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS <u>GREATER</u> THAN 50	SC	CLAYEY SANDS, SAND-CLAY MIXTURES	
HIGHLY ORGANIC SOILS			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*
Sand and/or Gravel

RELATIVE DENSITY

LOOSE..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*
Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

* VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.

Other Office Locations:

GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

- N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
 Qu: Unconfined compressive strength, TSF.
 Qp: Penetrometer value, unconfined compressive strength, TSF.
 Mc: Moisture content, %.
 LL: Liquid limit, %.
 PI: Plasticity index, %.
 δd: Natural dry density, PCF.
 ▽: Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

- NE: Not Encountered (Groundwater was not encountered).
 SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
 ST: Shelby Tube - 3" O.D., except where noted.
 AU: Auger Sample.
 OB: Diamond Bit.
 CB: Carbide Bit
 WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

<u>Term (Non-Cohesive Soils)</u>	<u>Standard Penetration Resistance</u>
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

<u>Term (Cohesive Soils)</u>	<u>Qu (TSF)</u>
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM NJ.docx

Other Office Locations:

CHALFONT, PA
215.712.2700

SOUTHBOROUGH, MA
508.485.0755

WETHERSFIELD, CT
860.726.7889

STERLING, VA
703.464.5858

EVERGREEN, CO
303.670.6905

C. Assunpink Creek Calculations

- **Assunpink Creek Stream States Data**
- **FEMA Channel Data and Tc Calculation**
- **Assunpink Creek Hydrograph Comparison**

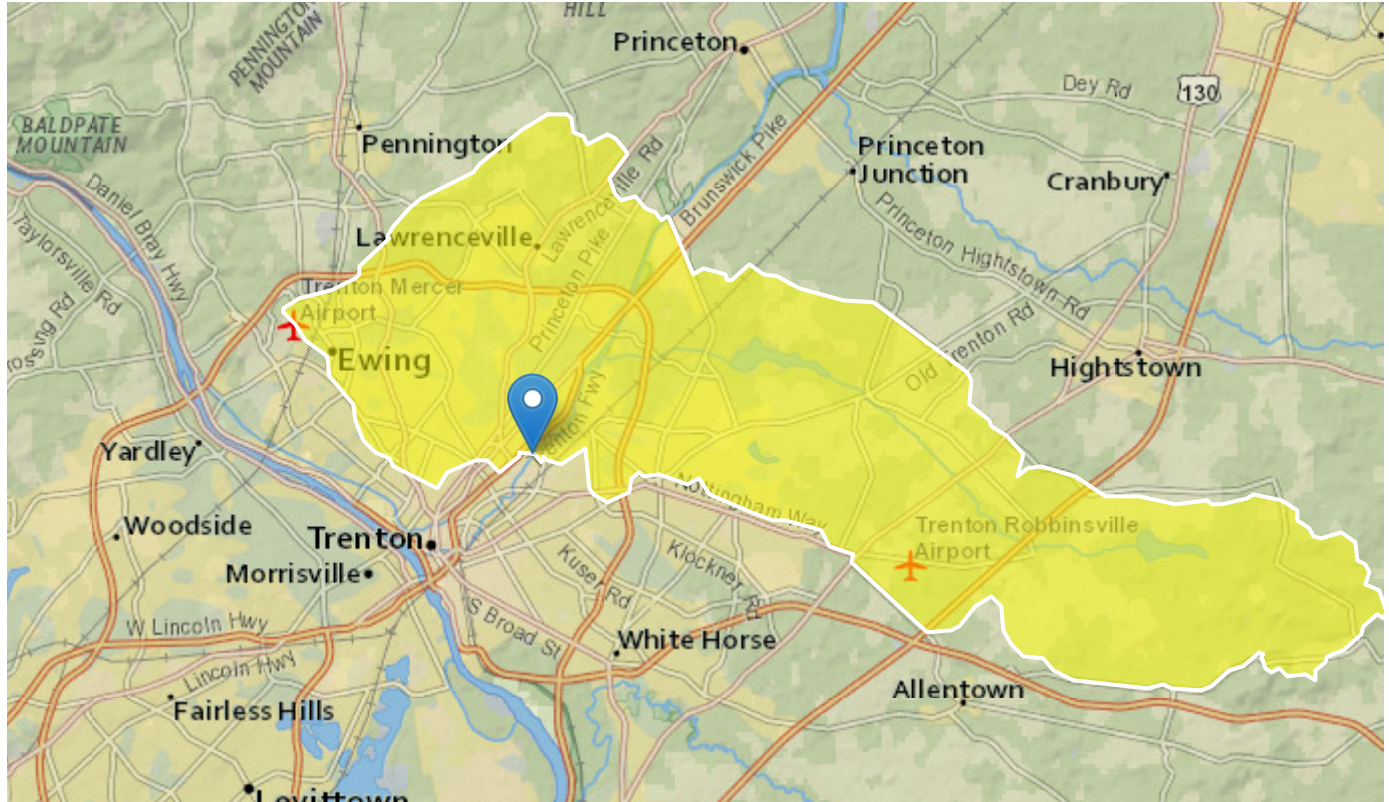
StreamStats Report

Region ID: NJ

Workspace ID: NJ20211220162048802000

Clicked Point (Latitude, Longitude): 40.24280, -74.73184

Time: 2021-12-20 11:21:08 -0500



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	79.2	square miles
FOREST	Percentage of area covered by forest	10.9	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	44.5	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	12.3	percent
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	26.9	percent

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Application Version: 4.6.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.1.2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
ASSUNPINK CREEK								
A	740	85	*	*	24.6	*	*	*
B	2,080	55	*	*	24.6	*	*	*
C	3,150	65	634	4.9	26.8	26.8	27.0	0.2
D	3,350	60	790	4.0	27.2	27.2	27.4	0.2
E	4,710	225	*	*	31.2	31.2	31.4	0.2
F	4,980	270	*	*	31.9	31.9	32.1	0.2
G	5,700	320	*	*	33.3	33.3	33.5	0.2
H	6,840	80/95 ²	*	*	35.4	35.4	35.6	0.2
I	7,620	90/195 ²	*	*	37.1	37.1	37.3	0.2
J	8,110	85	*	*	37.6	37.6	37.8	0.2
K	8,240	75	*	*	38.6	38.6	38.8	0.2
L	8,520	85	*	*	38.8	38.8	39.0	0.2
M	8,640	90	*	*	39.3	39.3	39.5	0.2
N	8,900	125/430 ²	*	*	40.0	40.0	40.2	0.2
O	9,620	850	*	*	40.6	40.6	40.8	0.2
P	10,710	110	1,505	2.6	42.5	42.5	42.7	0.2
Q	10,950	94	1,164	3.3	42.6	42.6	42.8	0.2
R	11,770	108	1,532	2.2	43.2	43.2	43.4	0.2
S	12,290	105	1,060	3.2	43.4	43.4	43.6	0.2
T	12,910	450	3,460	1.0	43.9	43.9	44.1	0.2

¹ Feet above the confluence with Delaware River

² Channel floodway/Railroad yard floodway

* Data not computed

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

**MERCER COUNTY, NJ
(ALL JURISDICTIONS)**

FLOODWAY DATA

ASSUNPINK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
ASSUNPINK CREEK (CONT.)								
U	13,910	140	1,590	2.1	44.1	44.1	44.3	0.2
V	16,120	120	1,480	2.3	45.6	45.6	45.8	0.2
W	17,870	180	1,890	1.9	46.7	46.7	46.9	0.2
X	19,395	170	1,580	2.2	47.0	47.0	47.2	0.2
Y	20,780	380	3,210	1.2	48.4	48.4	48.6	0.2
Z	22,880	700	3,890	0.5	48.7	48.7	48.9	0.2
AA	24,420	330	2,230	0.8	49.0	49.0	49.2	0.2
AB	27,170	860	4,790	0.4	49.3	49.3	49.5	0.2
AC	28,160	390	2,020	0.7	49.5	49.5	49.7	0.2
AD	32,570	610	1,890	0.4	50.2	50.2	50.4	0.2
AE	35,090	170	1,170	0.6	51.2	51.2	51.4	0.2
AF	35,390	130	300	2.5	51.4	51.4	51.6	0.2
AG	35,750	70	1,230	0.6	52.5	52.5	52.7	0.2
AH	36,200	70	260	2.7	52.8	52.8	53.0	0.2
AI	37,350	100	690	1.0	53.5	53.5	53.7	0.2
AJ	37,590	50	680	1.0	53.7	53.7	53.9	0.2
AK	39,790	130	320	2.2	55.6	55.6	55.8	0.2
AL	40,540	50	530	1.3	55.9	55.9	56.1	0.2
AM	40,850	75	190	3.7	56.3	56.3	56.5	0.2

Approx. Location of Discharge Point

¹ Feet above confluence with Delaware River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

MERCER COUNTY, NJ
(ALL JURISDICTIONS)

FLOODWAY DATA

ASSUNPINK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
ASSUNPINK CREEK (CONT.)								
AN	58,040	370	1,132	0.6	69.3	69.3	69.5	0.2
AO	59,040	424	850	0.7	70.2	70.2	70.4	0.2
AP	60,170	730	1,146	0.5	70.7	70.7	70.9	0.2
AQ	61,280	470	705	0.8	71.3	71.3	71.5	0.2
AR	63,120	290	658	0.8	71.9	71.9	72.1	0.2
AS	64,620	290	658	0.8	72.7	72.7	72.9	0.2
AT	66,370	290	797	0.7	73.5	73.5	73.7	0.2
AU	68,870	364	916	0.6	74.6	74.6	74.8	0.2
AV	70,100	127	507	1.1	75.4	75.4	75.6	0.2
AW	71,050	300	789	0.7	76.7	76.7	76.9	0.2
AX	80,310	480	2,393	0.5	87.0	87.0	87.2	0.2
AY	81,720	484	2,669	0.2	87.8	87.8	88.0	0.2
AZ	83,120	298	1,496	0.3	87.8	87.8	88.0	0.2
BA	83,970	181	872	0.5	87.9	87.9	88.1	0.2
BB	85,720	210	627	0.5	88.2	88.2	88.4	0.2

Upstream Limit of Watershed Area tributary to channel at discharge point

¹ Feet above confluence with Delaware River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

**MERCER COUNTY, NJ
(ALL JURISDICTIONS)**

FLOODWAY DATA

ASSUNPINK CREEK

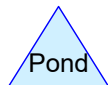
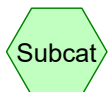
Assunpink Creek Time of Concentration
Upstream Limit to Location of Discharge Point

Section	Distance from Confluence of Delaware River		Section Distance		Velocity		Time	
BB	85720	Feet						
BA	83970	Feet	1750	Feet	0.5	Feet/Second	3500	seconds
AZ	83120	Feet	850	Feet	0.5	Feet/Second	1700	seconds
AY	81720	Feet	1400	Feet	0.3	Feet/Second	4667	seconds
AX	80310	Feet	1410	Feet	0.2	Feet/Second	7050	seconds
AW	71050	Feet	9260	Feet	0.5	Feet/Second	18520	seconds
AV	70100	Feet	950	Feet	0.7	Feet/Second	1357	seconds
AU	68870	Feet	1230	Feet	1.1	Feet/Second	1118	seconds
AT	66370	Feet	2500	Feet	0.6	Feet/Second	4167	seconds
AS	64620	Feet	1750	Feet	0.7	Feet/Second	2500	seconds
AR	63120	Feet	1500	Feet	0.8	Feet/Second	1875	seconds
AQ	61280	Feet	1840	Feet	0.8	Feet/Second	2300	seconds
AP	60170	Feet	1110	Feet	0.8	Feet/Second	1388	seconds
AO	59040	Feet	1130	Feet	0.5	Feet/Second	2260	seconds
AN	58040	Feet	1000	Feet	0.7	Feet/Second	1429	seconds
AM	40850	Feet	17190	Feet	0.6	Feet/Second	28650	seconds
AL	40540	Feet	310	Feet	3.7	Feet/Second	84	seconds
AK	39790	Feet	750	Feet	1.3	Feet/Second	577	seconds
AJ	37590	Feet	2200	Feet	2.2	Feet/Second	1000	seconds
AI	37350	Feet	240	Feet	1	Feet/Second	240	seconds
AH	36200	Feet	1150	Feet	1	Feet/Second	1150	seconds
AG	35750	Feet	450	Feet	2.7	Feet/Second	167	seconds
AF	35390	Feet	360	Feet	0.6	Feet/Second	600	seconds
AE	35090	Feet	300	Feet	2.5	Feet/Second	120	seconds
AD	32570	Feet	2520	Feet	0.6	Feet/Second	4200	seconds
AC	28160	Feet	4410	Feet	0.4	Feet/Second	11025	seconds
AB	27170	Feet	990	Feet	0.7	Feet/Second	1414	seconds
AA	24420	Feet	2750	Feet	0.4	Feet/Second	6875	seconds
Z	22880	Feet	1540	Feet	0.8	Feet/Second	1925	seconds
Y	20780	Feet	2100	Feet	0.5	Feet/Second	4200	seconds
X	19395	Feet	1385	Feet	1.2	Feet/Second	1154	seconds
W	17870	Feet	1525	Feet	2.2	Feet/Second	693	seconds
V	16120	Feet	1750	Feet	1.9	Feet/Second	921	seconds

Total 118825 Seconds
1980 Minutes
33 Hours



Upstream Assunpink Creek



ex-pr vs. Assunpink Creek

Prepared by Bohler Engineering NJ, LLC

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Summary for Subcatchment 47S: Upstream Assunpink Creek

Runoff = 2,347.45 cfs @ 37.41 hrs, Volume= 5,963.487 af, Depth= 1.93"

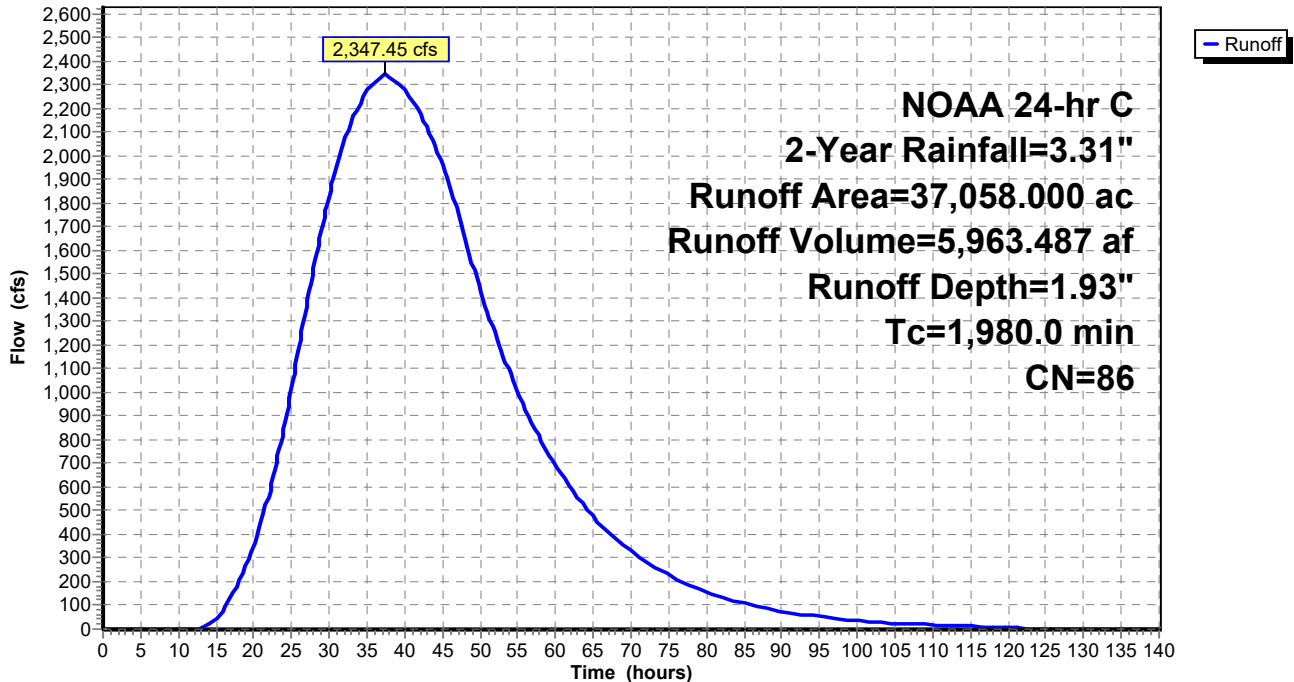
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
22,559.000	85	1/2 acre lots, 25% imp, HSG D
5,526.000	77	Woods, Good, HSG D
6,235.000	98	Paved parking, HSG D
2,738.000	80	>75% Grass cover, Good, HSG D
37,058.000	86	Weighted Average
25,183.250		67.96% Pervious Area
11,874.750		32.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1,980.0					Direct Entry, Estimated Tc

Subcatchment 47S: Upstream Assunpink Creek

Hydrograph



ex-pr vs. Assunpink Creek

Prepared by Bohler Engineering NJ, LLC

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Summary for Subcatchment 47S: Upstream Assunpink Creek

Runoff = 4,232.35 cfs @ 37.39 hrs, Volume= 10,735.511 af, Depth= 3.48"

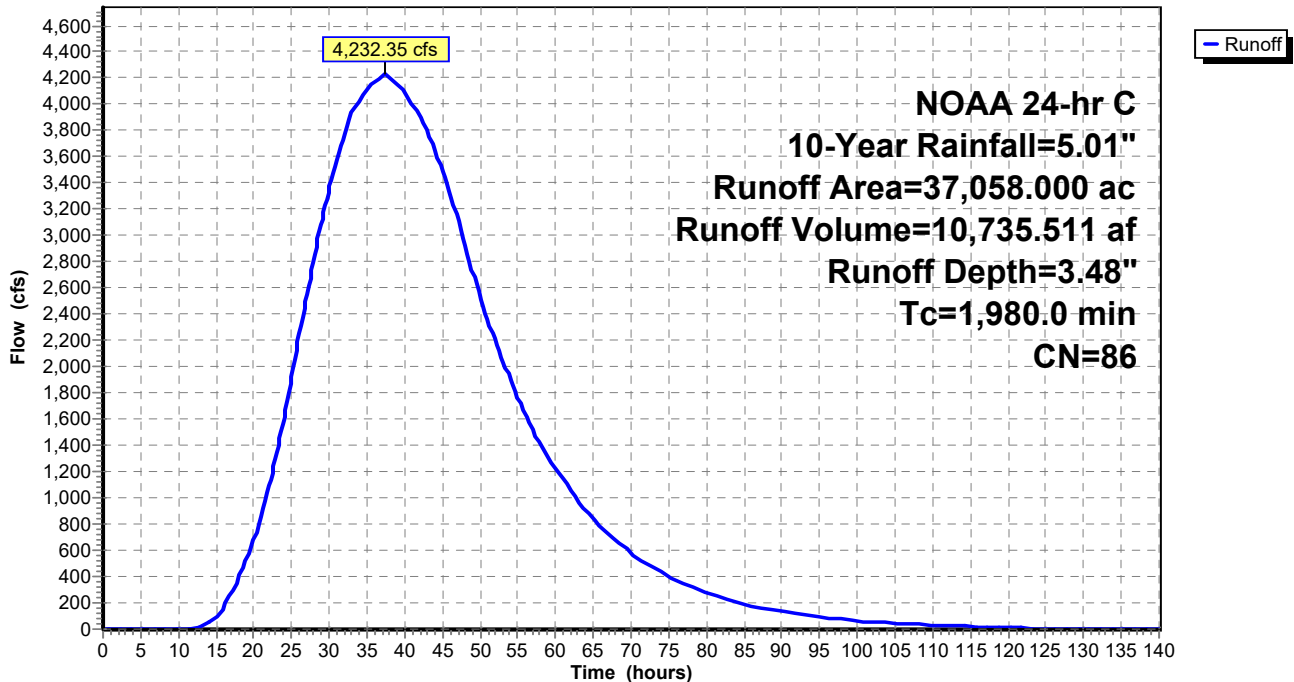
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
22,559.000	85	1/2 acre lots, 25% imp, HSG D
5,526.000	77	Woods, Good, HSG D
6,235.000	98	Paved parking, HSG D
2,738.000	80	>75% Grass cover, Good, HSG D
37,058.000	86	Weighted Average
25,183.250		67.96% Pervious Area
11,874.750		32.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1,980.0					Direct Entry, Estimated Tc

Subcatchment 47S: Upstream Assunpink Creek

Hydrograph



ex-pr vs. Assunpink Creek

Prepared by Bohler Engineering NJ, LLC

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Summary for Subcatchment 47S: Upstream Assunpink Creek

Runoff = 8,095.05 cfs @ 37.38 hrs, Volume= 20,541.359 af, Depth= 6.65"

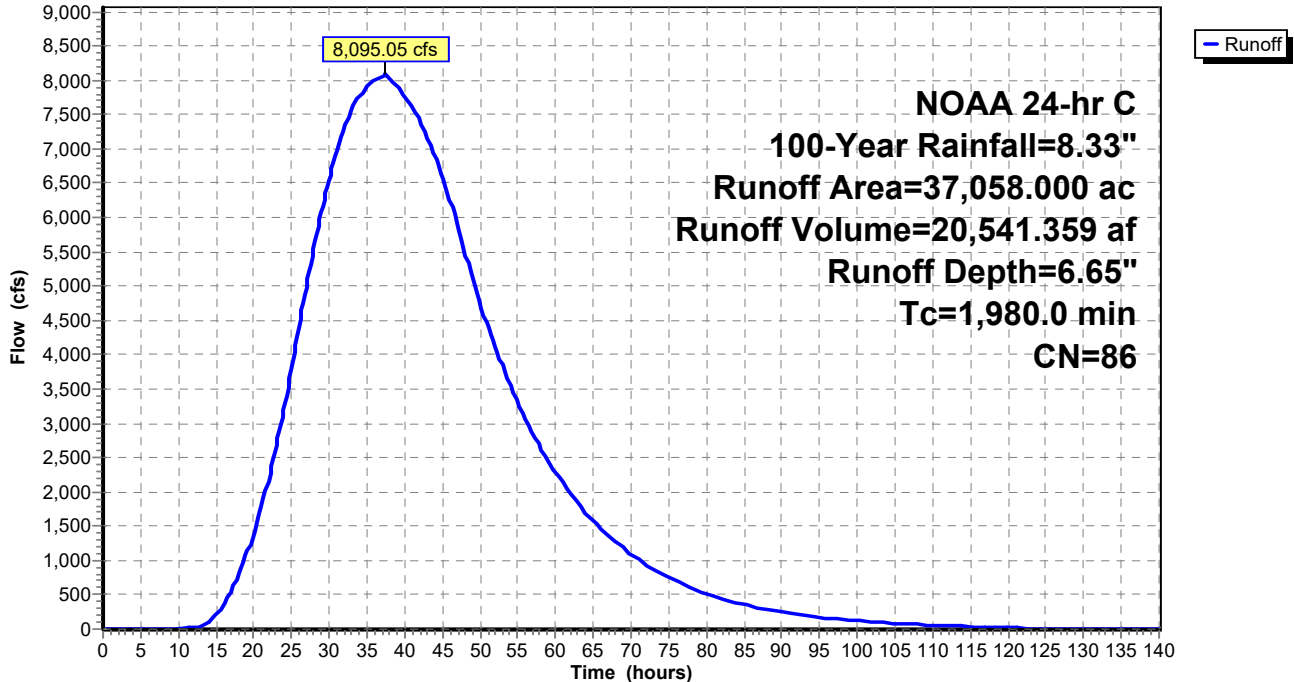
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year Rainfall=8.33"

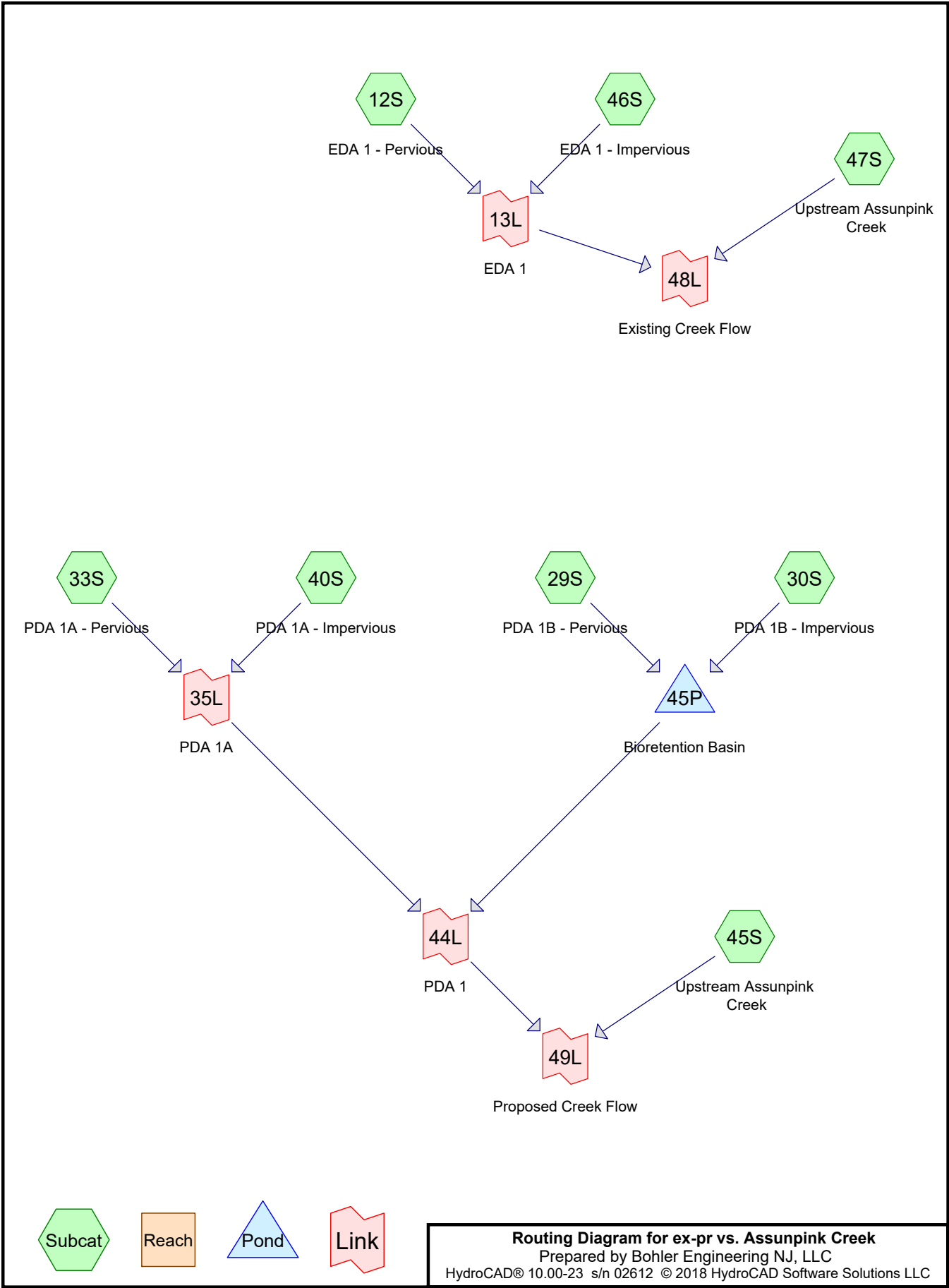
Area (ac)	CN	Description
22,559.000	85	1/2 acre lots, 25% imp, HSG D
5,526.000	77	Woods, Good, HSG D
6,235.000	98	Paved parking, HSG D
2,738.000	80	>75% Grass cover, Good, HSG D
37,058.000	86	Weighted Average
25,183.250		67.96% Pervious Area
11,874.750		32.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1,980.0					Direct Entry, Estimated Tc

Subcatchment 47S: Upstream Assunpink Creek

Hydrograph





ex-pr vs. Assunpink Creek

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Summary for Subcatchment 12S: EDA 1 - Pervious

Runoff = 2.36 cfs @ 12.19 hrs, Volume= 0.188 af, Depth= 1.29"

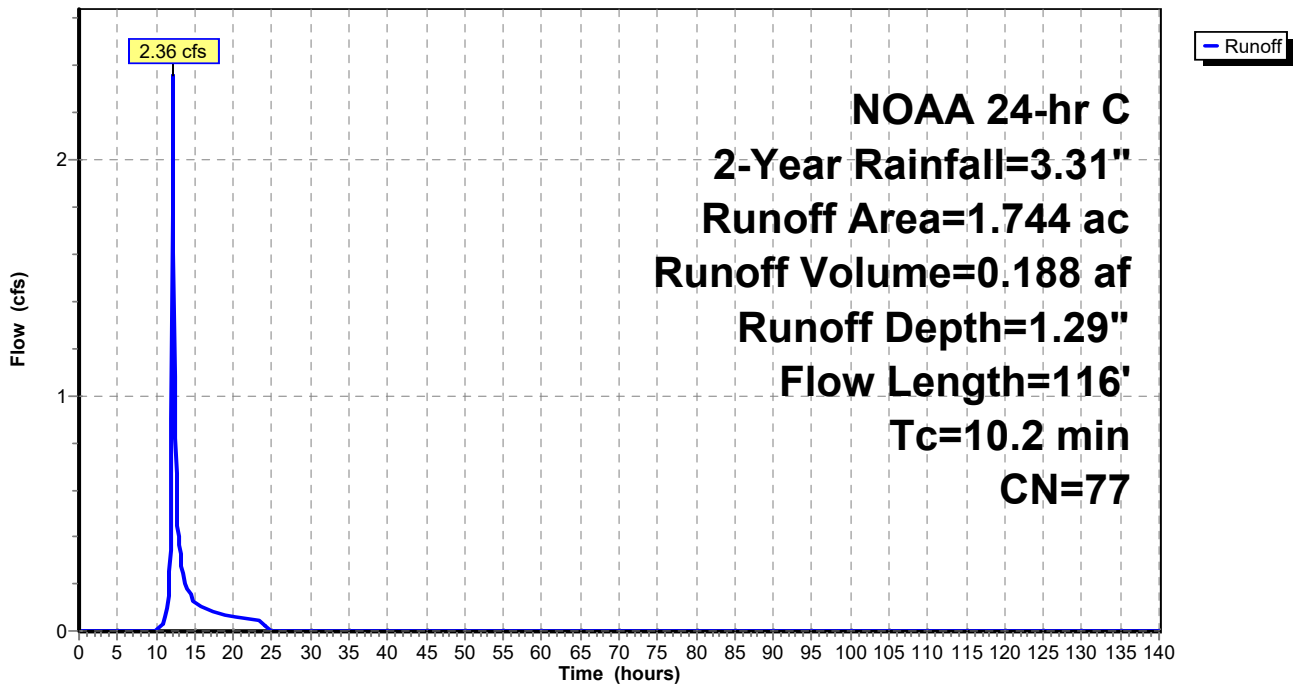
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
1.610	77	Woods, Good, HSG D
0.134	80	>75% Grass cover, Good, HSG D
1.744	77	Weighted Average
1.744		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	41	0.0250	0.07		Sheet Flow, R-S Woods: Light underbrush n= 0.400 P2= 3.31"
0.6	60	0.1170	1.71		Shallow Concentrated Flow, S-T Woodland Kv= 5.0 fps
0.1	15	0.2670	2.58		Shallow Concentrated Flow, T-U Woodland Kv= 5.0 fps
10.2	116	Total			

Subcatchment 12S: EDA 1 - Pervious

Hydrograph



ex-pr vs. Assunpink Creek

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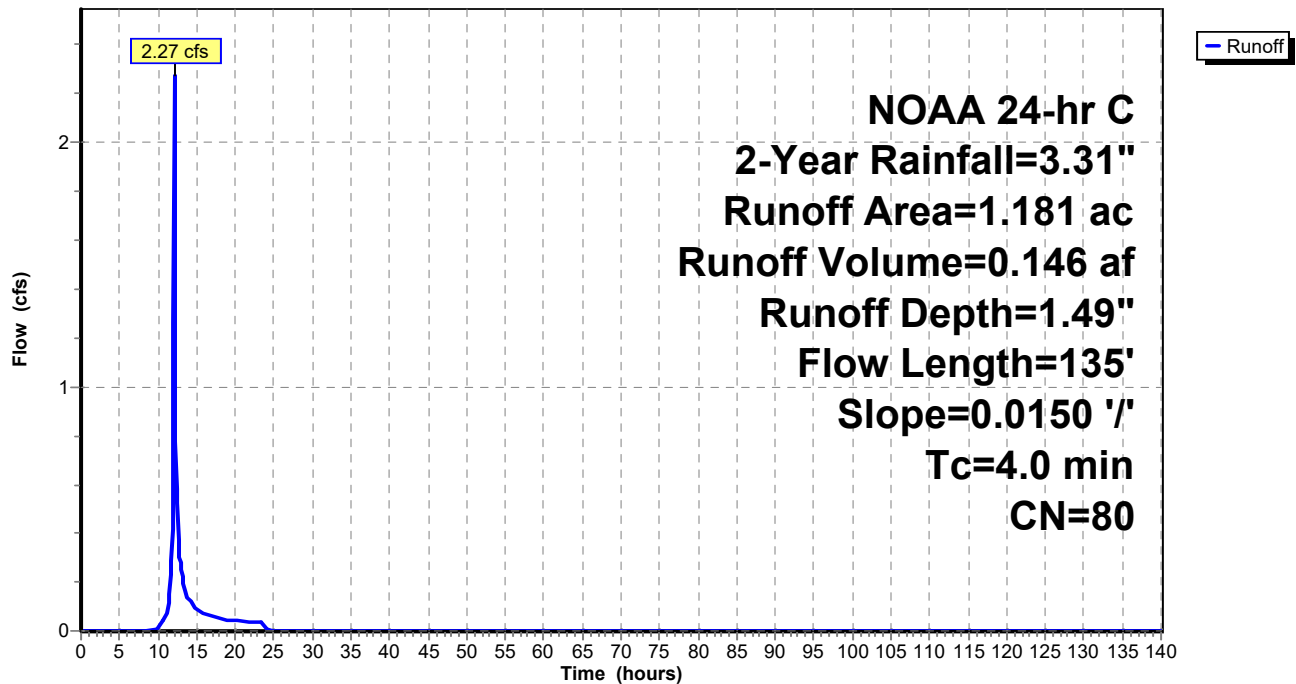
Summary for Subcatchment 29S: PDA 1B - Pervious

Runoff = 2.27 cfs @ 12.10 hrs, Volume= 0.146 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
1.181	80	>75% Grass cover, Good, HSG D
1.181		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	18	0.0150	0.11		Sheet Flow, AD-AE Grass: Short n= 0.150 P2= 3.31"
1.1	82	0.0150	1.20		Sheet Flow, AE-AF Smooth surfaces n= 0.011 P2= 3.31"
0.2	35	0.0150	2.49		Shallow Concentrated Flow, AF-AC Paved Kv= 20.3 fps
4.0	135	Total			

Subcatchment 29S: PDA 1B - Pervious**Hydrograph**

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Summary for Subcatchment 30S: PDA 1B - Impervious

Runoff = 5.21 cfs @ 12.07 hrs, Volume= 0.407 af, Depth= 3.08"

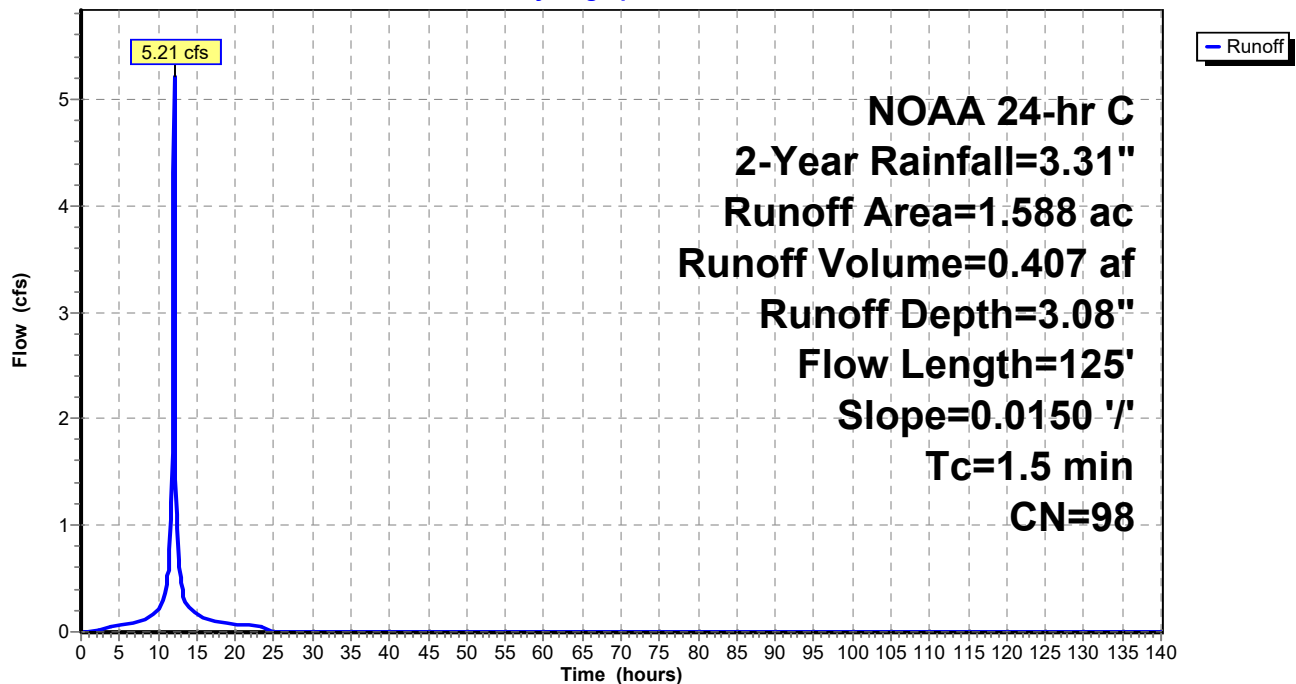
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
1.588	98	Paved parking, HSG C
1.588		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AA-AB Smooth surfaces n= 0.011 P2= 3.31"
0.2	25	0.0150	2.49		Shallow Concentrated Flow, AB-AC Paved Kv= 20.3 fps
1.5	125	Total			

Subcatchment 30S: PDA 1B - Impervious

Hydrograph



ex-pr vs. Assunpink Creek

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Summary for Subcatchment 33S: PDA 1A - Pervious

Runoff = 4.20 cfs @ 12.27 hrs, Volume= 0.400 af, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
1.768	80	>75% Grass cover, Good, HSG D
1.610	77	Woods, Good, HSG D
3.378	79	Weighted Average
3.378		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		Sheet Flow, AG-AH Grass: Short n= 0.150 P2= 3.31"
1.5	90	0.0200	0.99		Shallow Concentrated Flow, AH-AI Short Grass Pasture Kv= 7.0 fps
2.7	422	0.0025	2.63	3.23	Pipe Channel, AI-AJ 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
2.6	807	0.0050	5.09	16.00	Pipe Channel, AJ-X 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.3	117	0.0050	6.67	47.16	Pipe Channel, X-Y 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
16.8	1,581	Total			

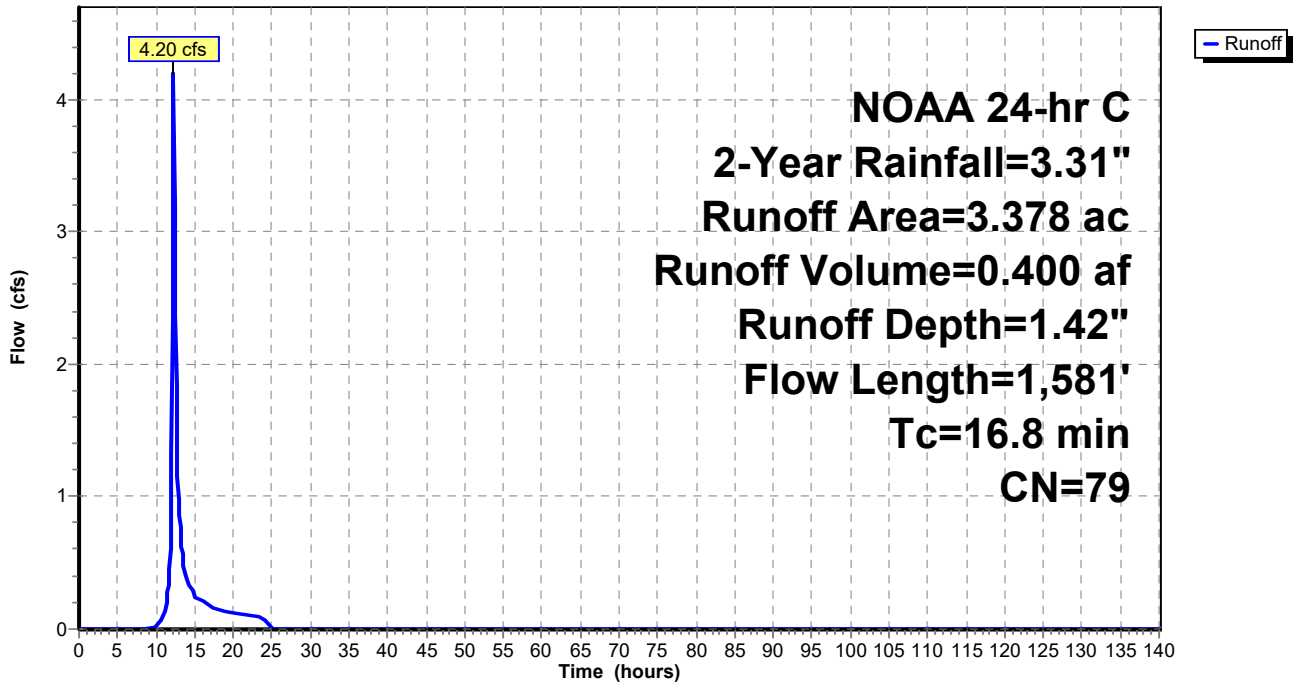
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Subcatchment 33S: PDA 1A - Pervious

Hydrograph



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Summary for Subcatchment 40S: PDA 1A - Impervious

Runoff = 30.75 cfs @ 12.10 hrs, Volume= 2.332 af, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
9.094	98	Paved parking, HSG C
9.094		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AQ-AR Smooth surfaces n= 0.011 P2= 3.31"
0.6	90	0.0150	2.49		Shallow Concentrated Flow, AR-AS Paved Kv= 20.3 fps
0.1	181	0.3500	35.17	62.14	Pipe Channel, AS-Y (18 inch) 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
1.0	222	0.0025	3.60	11.31	Pipe Channel, AS-Y (24 inch - Section 1) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
1.0	247	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 2) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.5	134	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 3) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
4.6	1,019	Total			

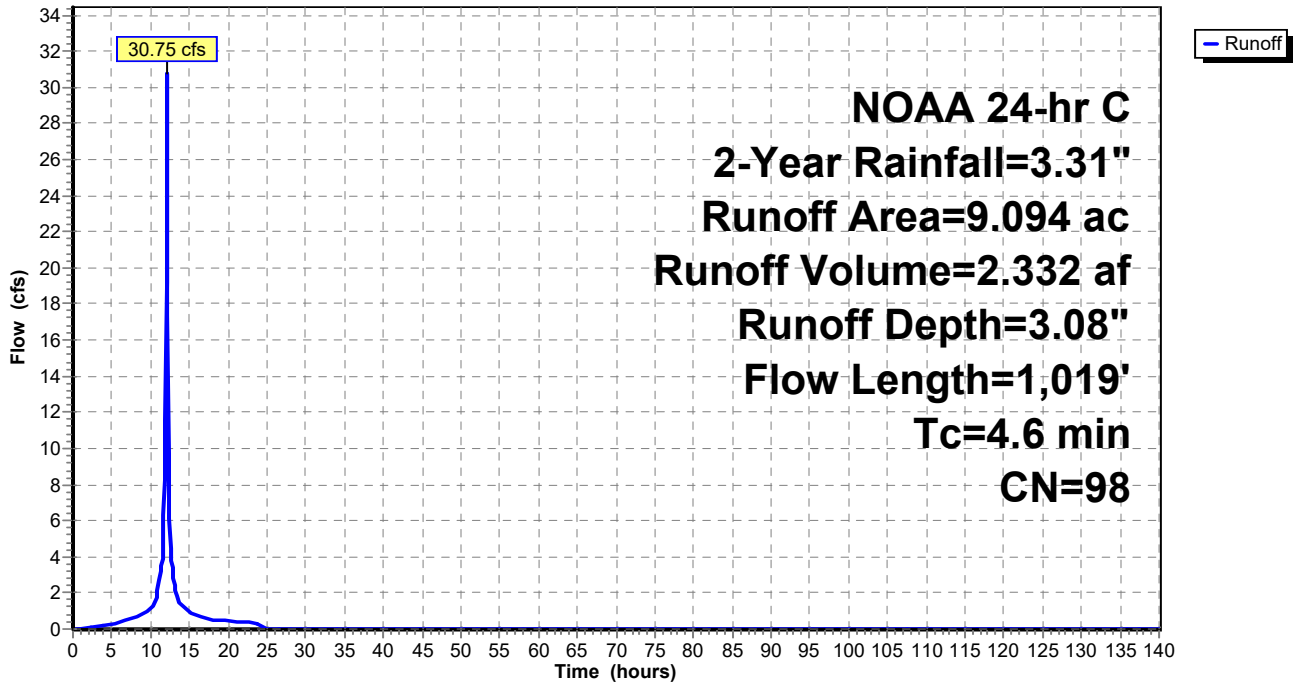
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Subcatchment 40S: PDA 1A - Impervious

Hydrograph



ex-pr vs. Assunpink Creek

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Summary for Subcatchment 45S: Upstream Assunpink Creek

Runoff = 2,347.45 cfs @ 37.41 hrs, Volume= 5,963.487 af, Depth= 1.93"

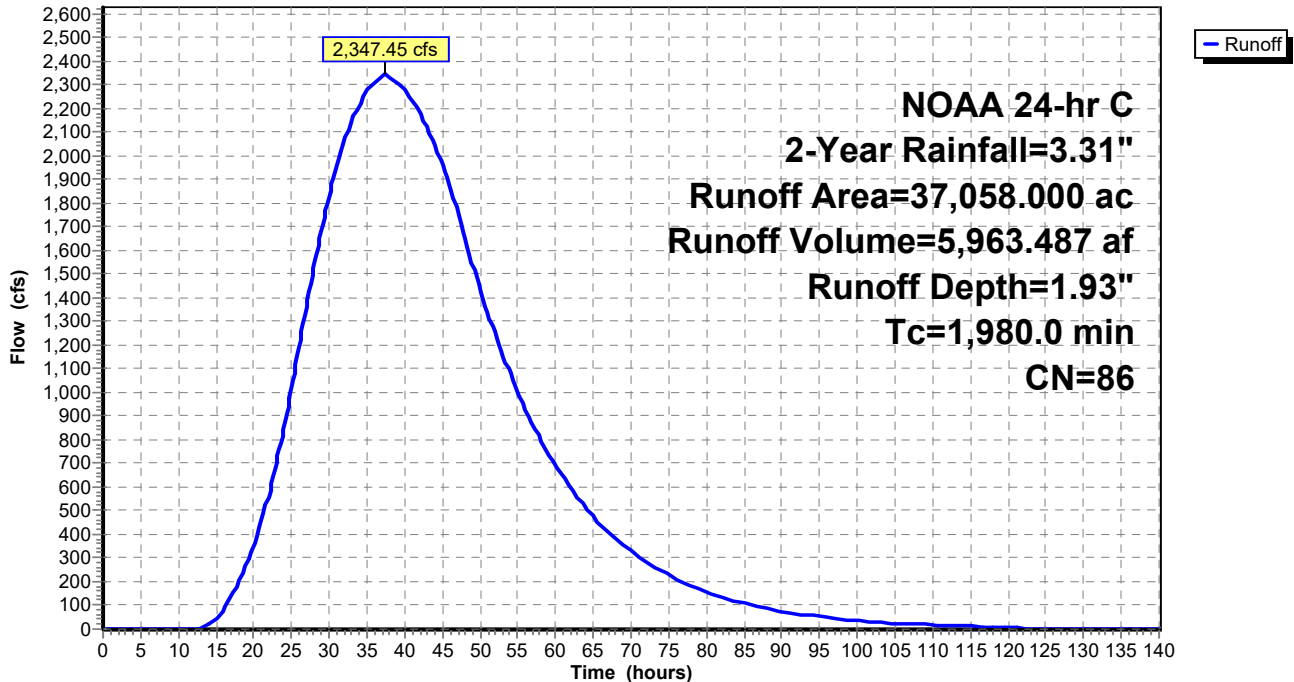
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
22,559.000	85	1/2 acre lots, 25% imp, HSG D
5,526.000	77	Woods, Good, HSG D
6,235.000	98	Paved parking, HSG D
2,738.000	80	>75% Grass cover, Good, HSG D
37,058.000	86	Weighted Average
25,183.250		67.96% Pervious Area
11,874.750		32.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1,980.0					Direct Entry, Estimated Tc

Subcatchment 45S: Upstream Assunpink Creek

Hydrograph



ex-pr vs. Assunpink Creek

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Summary for Subcatchment 46S: EDA 1 - Impervious

Runoff = 36.66 cfs @ 12.16 hrs, Volume= 3.291 af, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
12.834	98	Paved parking, HSG C
12.834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	58	0.0010	0.38		Sheet Flow, V-W Smooth surfaces n= 0.011 P2= 3.31"
1.1	42	0.0040	0.62		Sheet Flow, W-X Smooth surfaces n= 0.011 P2= 3.31"
0.8	90	0.0080	1.82		Shallow Concentrated Flow, X-Y Paved Kv= 20.3 fps
0.8	175	0.0050	3.72	4.57	Pipe Channel, Y-Z 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
3.3	1,235	0.0075	6.24	19.59	Pipe Channel, Z-AA 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
8.6	1,600	Total			

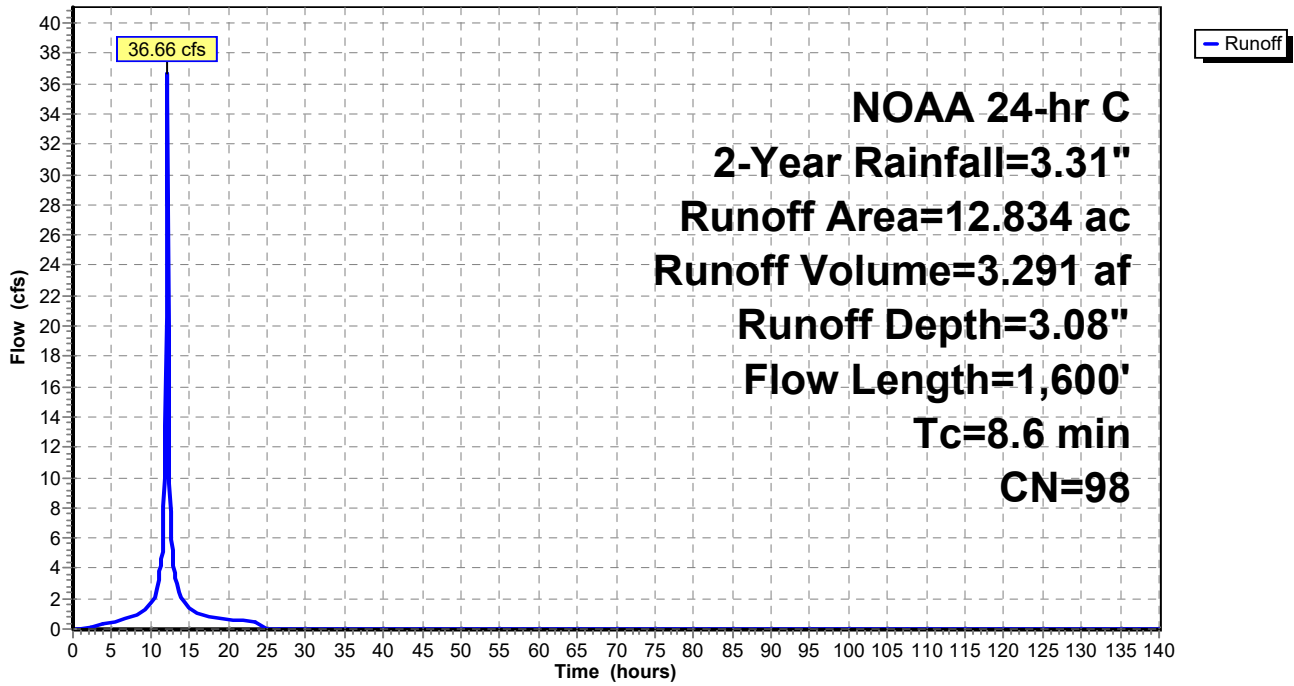
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Subcatchment 46S: EDA 1 - Impervious

Hydrograph



ex-pr vs. Assunpink Creek

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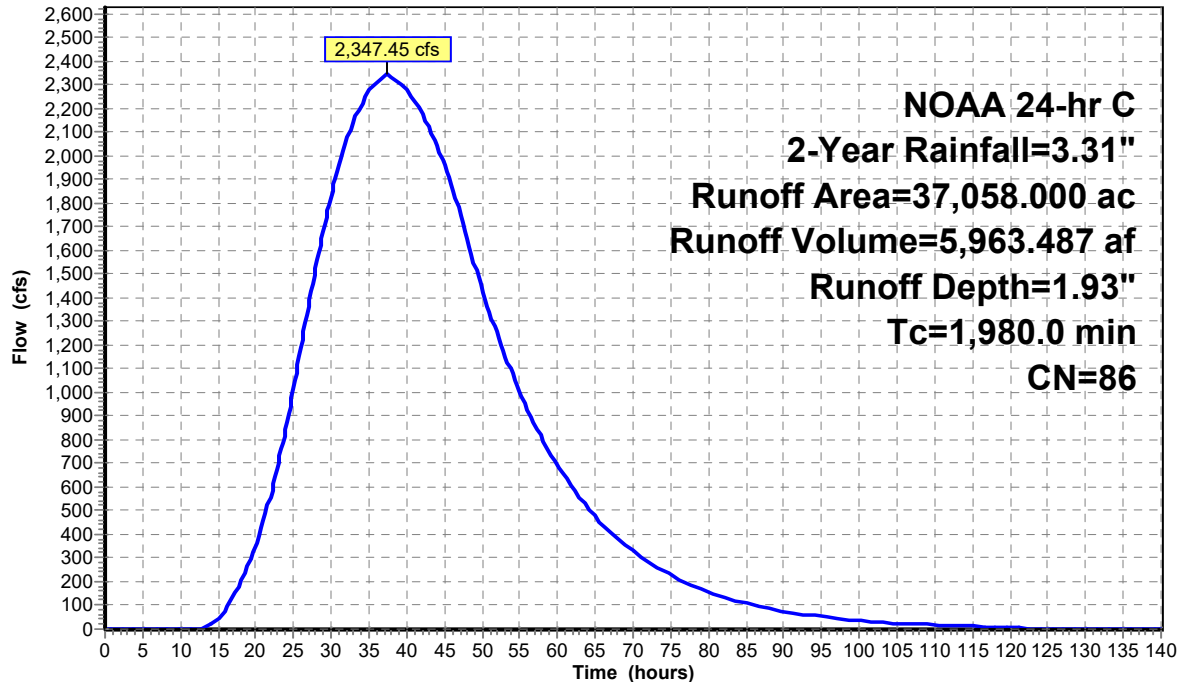
Summary for Subcatchment 47S: Upstream Assunpink Creek

Runoff = 2,347.45 cfs @ 37.41 hrs, Volume= 5,963.487 af, Depth= 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 2-Year Rainfall=3.31"

Area (ac)	CN	Description
22,559.000	85	1/2 acre lots, 25% imp, HSG D
5,526.000	77	Woods, Good, HSG D
6,235.000	98	Paved parking, HSG D
2,738.000	80	>75% Grass cover, Good, HSG D
37,058.000	86	Weighted Average
25,183.250		67.96% Pervious Area
11,874.750		32.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1,980.0					Direct Entry, Estimated Tc

Subcatchment 47S: Upstream Assunpink Creek**Hydrograph**

ex-pr vs. Assunpink Creek

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Summary for Pond 45P: Bioretention Basin

Inflow Area = 2.769 ac, 57.35% Impervious, Inflow Depth = 2.40" for 2-Year event
 Inflow = 7.42 cfs @ 12.08 hrs, Volume= 0.554 af
 Outflow = 3.30 cfs @ 12.24 hrs, Volume= 0.554 af, Atten= 56%, Lag= 9.6 min
 Primary = 3.30 cfs @ 12.24 hrs, Volume= 0.554 af

Routing by Stor-Ind method, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
 Peak Elev= 48.48' @ 12.24 hrs Surf.Area= 18,162 sf Storage= 8,394 cf

Plug-Flow detention time= 200.1 min calculated for 0.553 af (100% of inflow)
 Center-of-Mass det. time= 200.2 min (976.7 - 776.4)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	18,218 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	16,690	0	0
49.00	19,745	18,218	18,218

Device	Routing	Invert	Outlet Devices
#1	Primary	43.94'	18.0" Round Culvert L= 205.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 43.94' / 43.32' S= 0.0030 ' S Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	48.00'	1.000 in/hr Exfiltration X 0.50 over Surface area
#3	Device 1	48.35'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=3.06 cfs @ 12.24 hrs HW=48.47' (Free Discharge)

- ↑ **1=Culvert** (Passes 3.06 cfs of 12.18 cfs potential flow)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.21 cfs)
 ↑ **3=Orifice/Grate** (Weir Controls 2.85 cfs @ 1.15 fps)

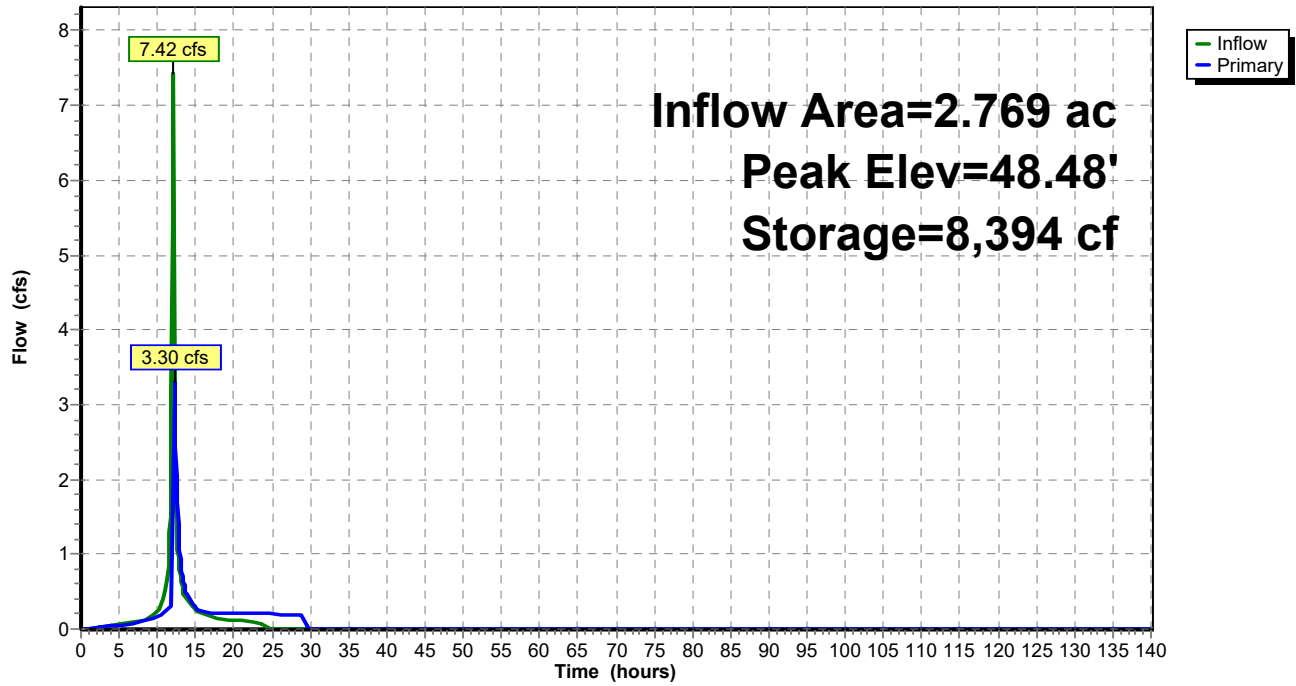
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Pond 45P: Bioretention Basin

Hydrograph



ex-pr vs. Assunpink Creek

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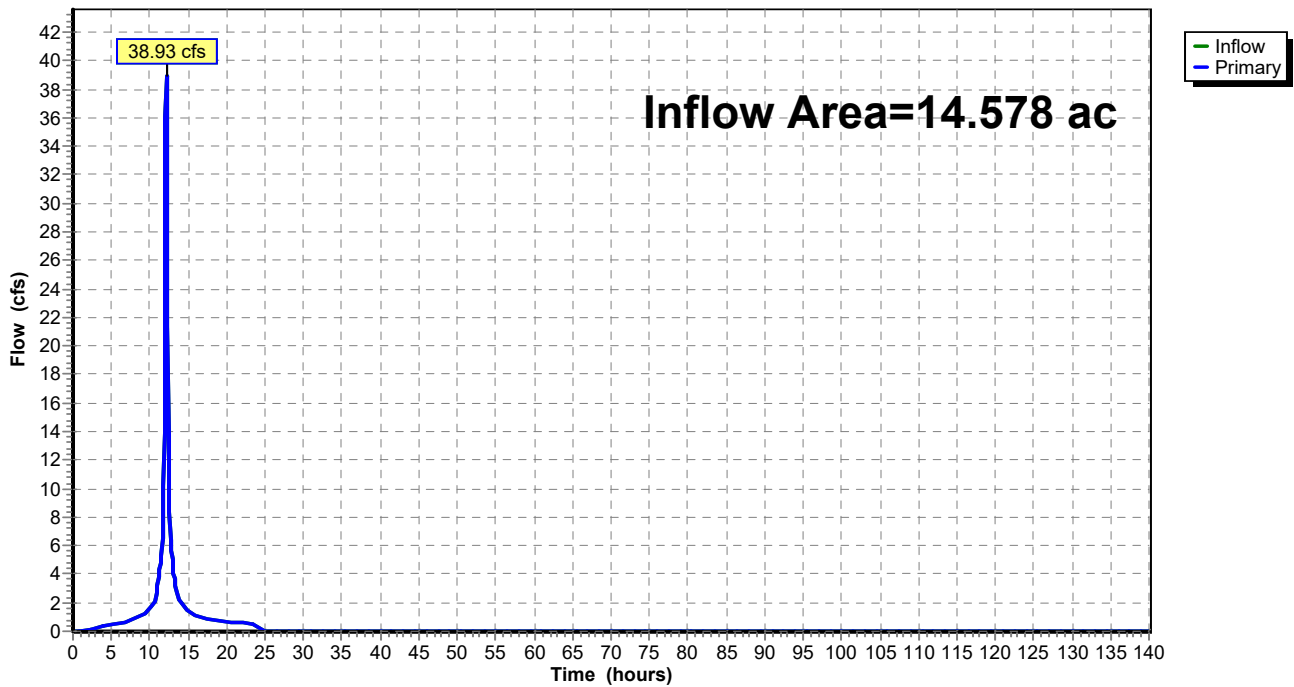
Summary for Link 13L: EDA 1

Inflow Area = 14.578 ac, 88.04% Impervious, Inflow Depth = 2.86" for 2-Year event
Inflow = 38.93 cfs @ 12.16 hrs, Volume= 3.479 af
Primary = 38.93 cfs @ 12.16 hrs, Volume= 3.479 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 13L: EDA 1

Hydrograph



ex-pr vs. Assunpink Creek

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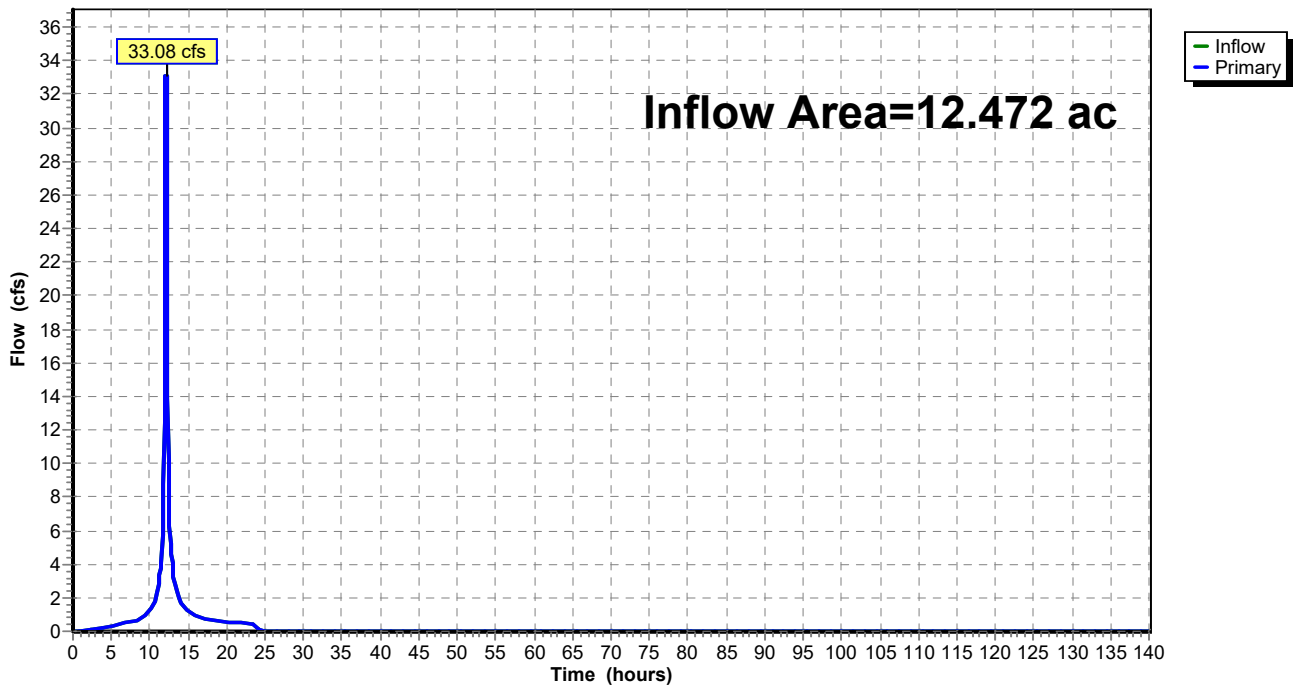
Summary for Link 35L: PDA 1A

Inflow Area = 12.472 ac, 72.92% Impervious, Inflow Depth = 2.63" for 2-Year event
Inflow = 33.08 cfs @ 12.10 hrs, Volume= 2.732 af
Primary = 33.08 cfs @ 12.10 hrs, Volume= 2.732 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 35L: PDA 1A

Hydrograph



ex-pr vs. Assunpink Creek

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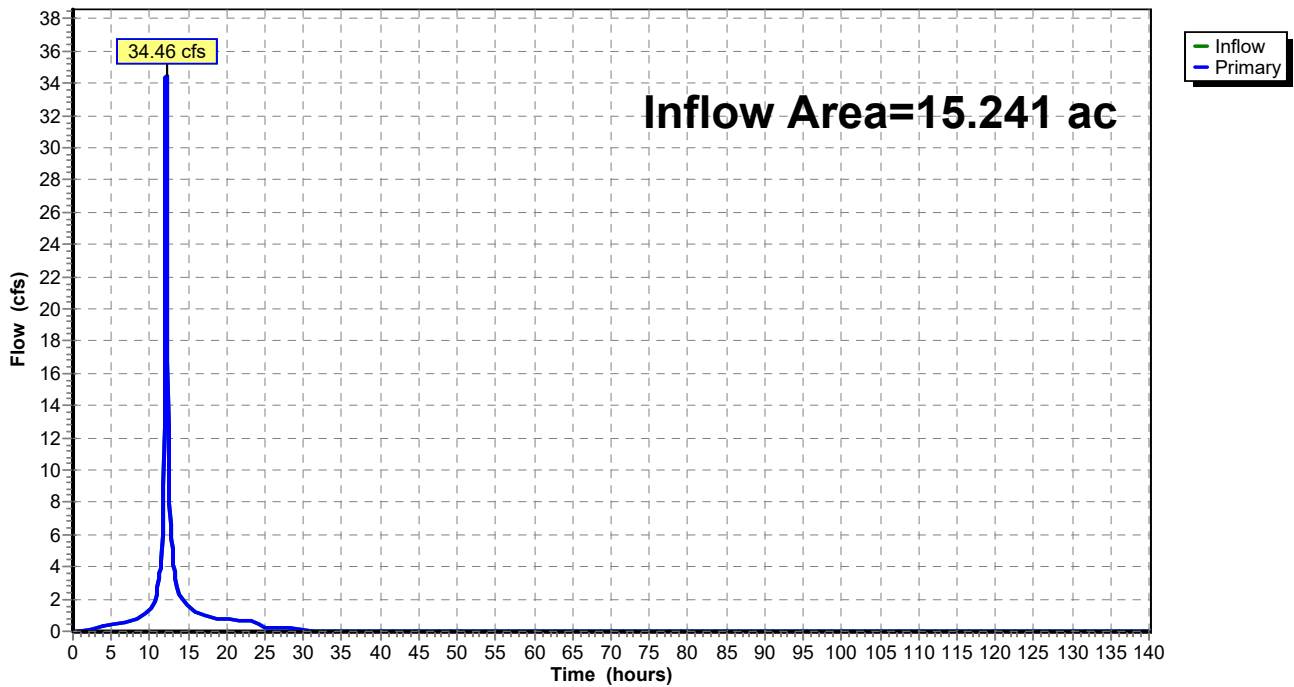
Summary for Link 44L: PDA 1

Inflow Area = 15.241 ac, 70.09% Impervious, Inflow Depth = 2.59" for 2-Year event
Inflow = 34.46 cfs @ 12.11 hrs, Volume= 3.285 af
Primary = 34.46 cfs @ 12.11 hrs, Volume= 3.285 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 44L: PDA 1

Hydrograph



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Summary for Link 48L: Existing Creek Flow

Inflow Area = 37,072.578 ac, 32.07% Impervious, Inflow Depth = 1.93" for 2-Year event

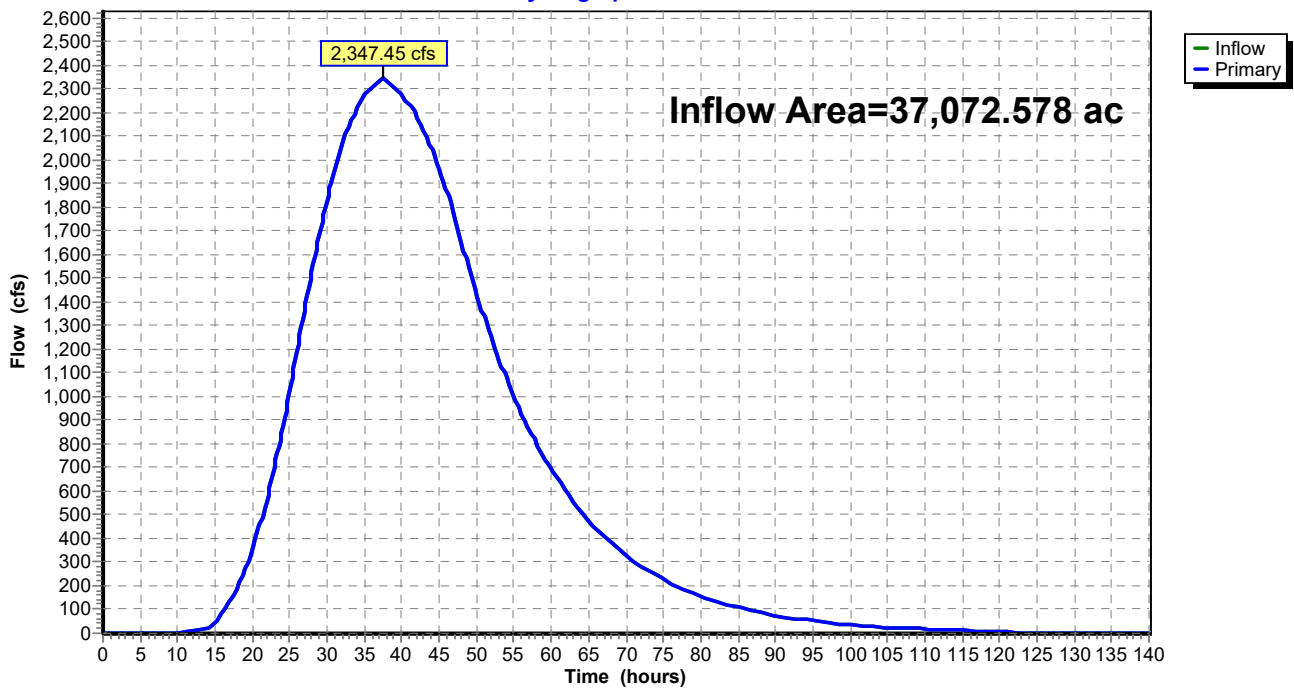
Inflow = 2,347.45 cfs @ 37.41 hrs, Volume= 5,966.965 af

Primary = 2,347.45 cfs @ 37.41 hrs, Volume= 5,966.965 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 48L: Existing Creek Flow

Hydrograph



ex-pr vs. Assunpink Creek

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Summary for Link 49L: Proposed Creek Flow

Inflow Area = 37,073.241 ac, 32.06% Impervious, Inflow Depth = 1.93" for 2-Year event

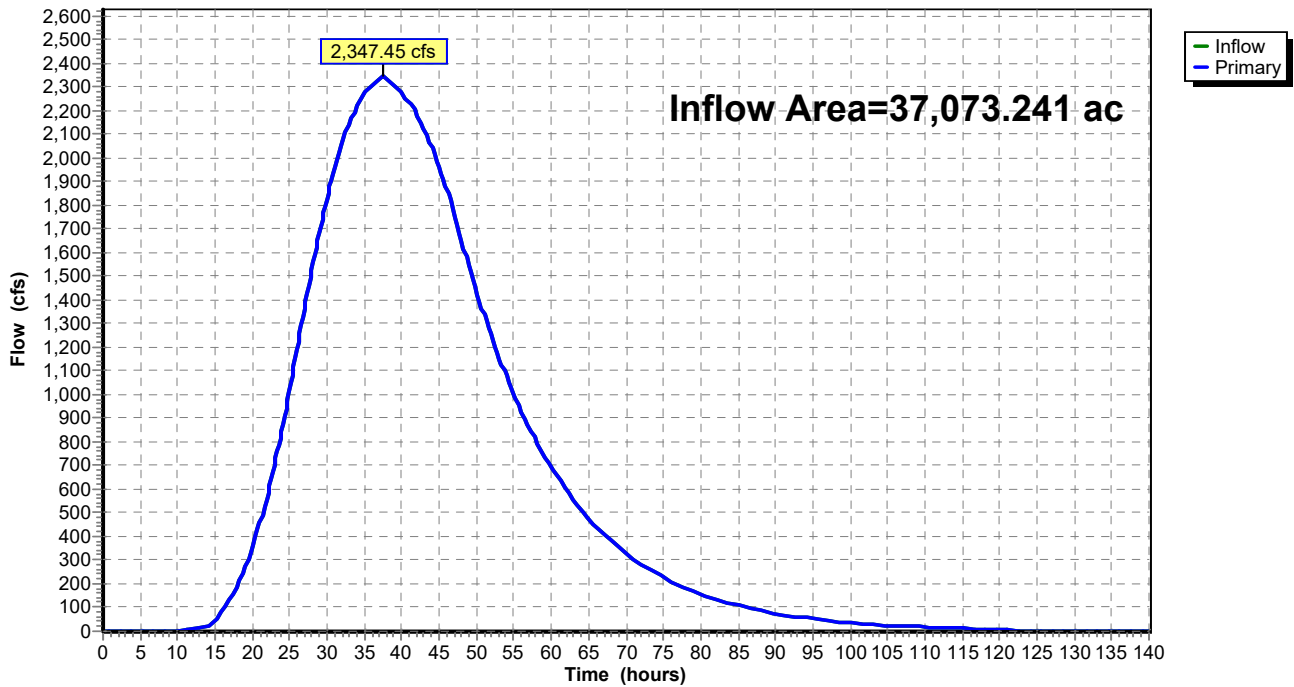
Inflow = 2,347.45 cfs @ 37.41 hrs, Volume= 5,966.772 af

Primary = 2,347.45 cfs @ 37.41 hrs, Volume= 5,966.772 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 49L: Proposed Creek Flow

Hydrograph



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Summary for Subcatchment 12S: EDA 1 - Pervious

Runoff = 4.85 cfs @ 12.19 hrs, Volume= 0.382 af, Depth= 2.63"

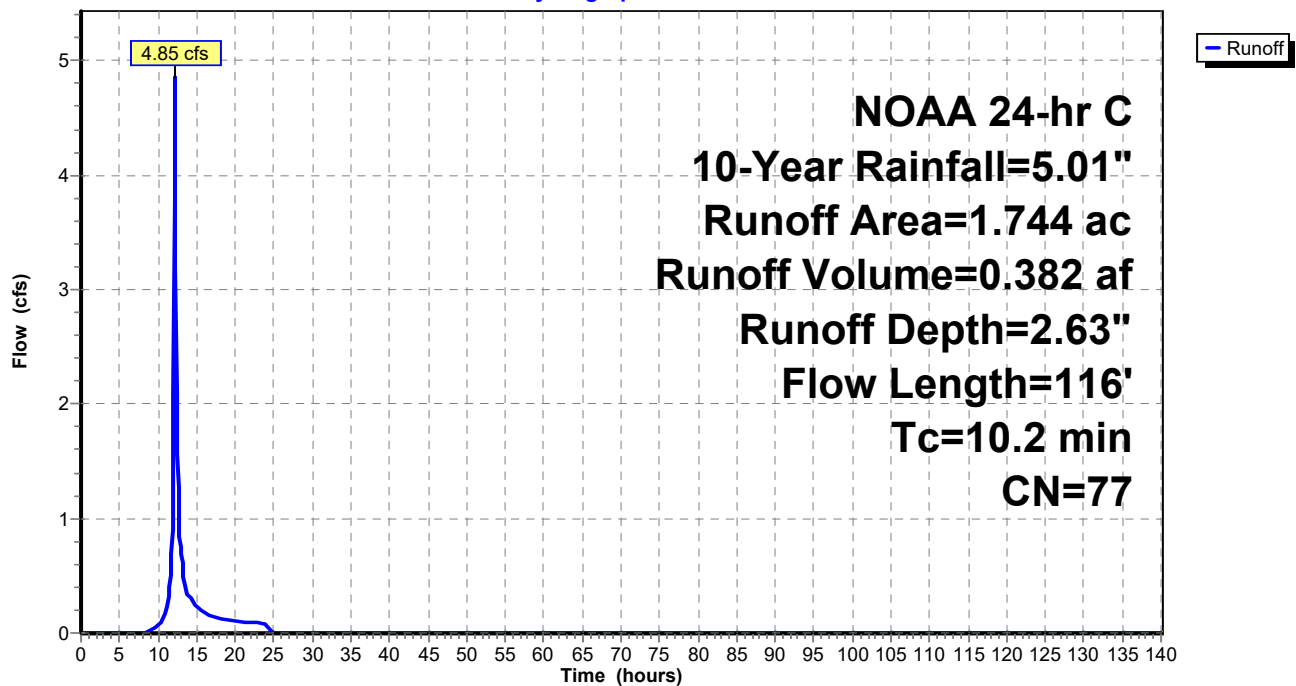
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
1.610	77	Woods, Good, HSG D
0.134	80	>75% Grass cover, Good, HSG D
1.744	77	Weighted Average
1.744		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	41	0.0250	0.07		Sheet Flow, R-S Woods: Light underbrush n= 0.400 P2= 3.31"
0.6	60	0.1170	1.71		Shallow Concentrated Flow, S-T Woodland Kv= 5.0 fps
0.1	15	0.2670	2.58		Shallow Concentrated Flow, T-U Woodland Kv= 5.0 fps
10.2	116	Total			

Subcatchment 12S: EDA 1 - Pervious

Hydrograph



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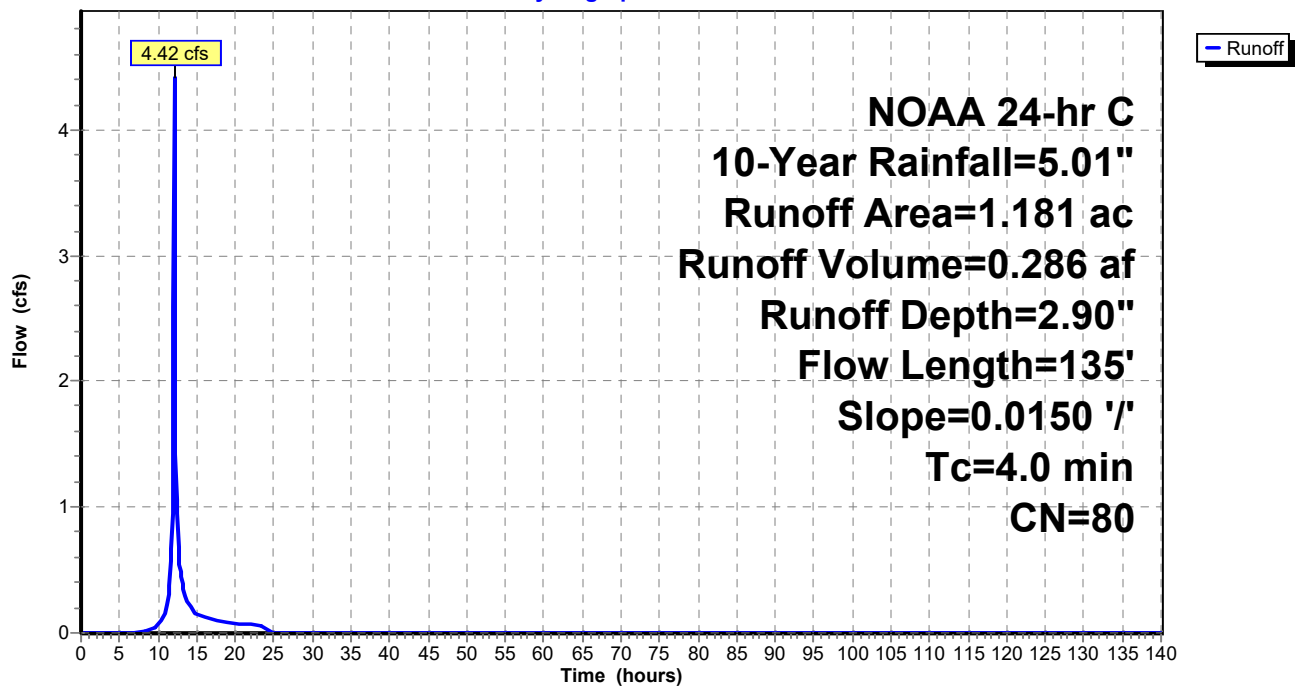
Summary for Subcatchment 29S: PDA 1B - Pervious

Runoff = 4.42 cfs @ 12.10 hrs, Volume= 0.286 af, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
1.181	80	>75% Grass cover, Good, HSG D
1.181		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	18	0.0150	0.11		Sheet Flow, AD-AE Grass: Short n= 0.150 P2= 3.31"
1.1	82	0.0150	1.20		Sheet Flow, AE-AF Smooth surfaces n= 0.011 P2= 3.31"
0.2	35	0.0150	2.49		Shallow Concentrated Flow, AF-AC Paved Kv= 20.3 fps
4.0	135	Total			

Subcatchment 29S: PDA 1B - Pervious**Hydrograph**

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Summary for Subcatchment 30S: PDA 1B - Impervious

Runoff = 7.94 cfs @ 12.07 hrs, Volume= 0.632 af, Depth= 4.77"

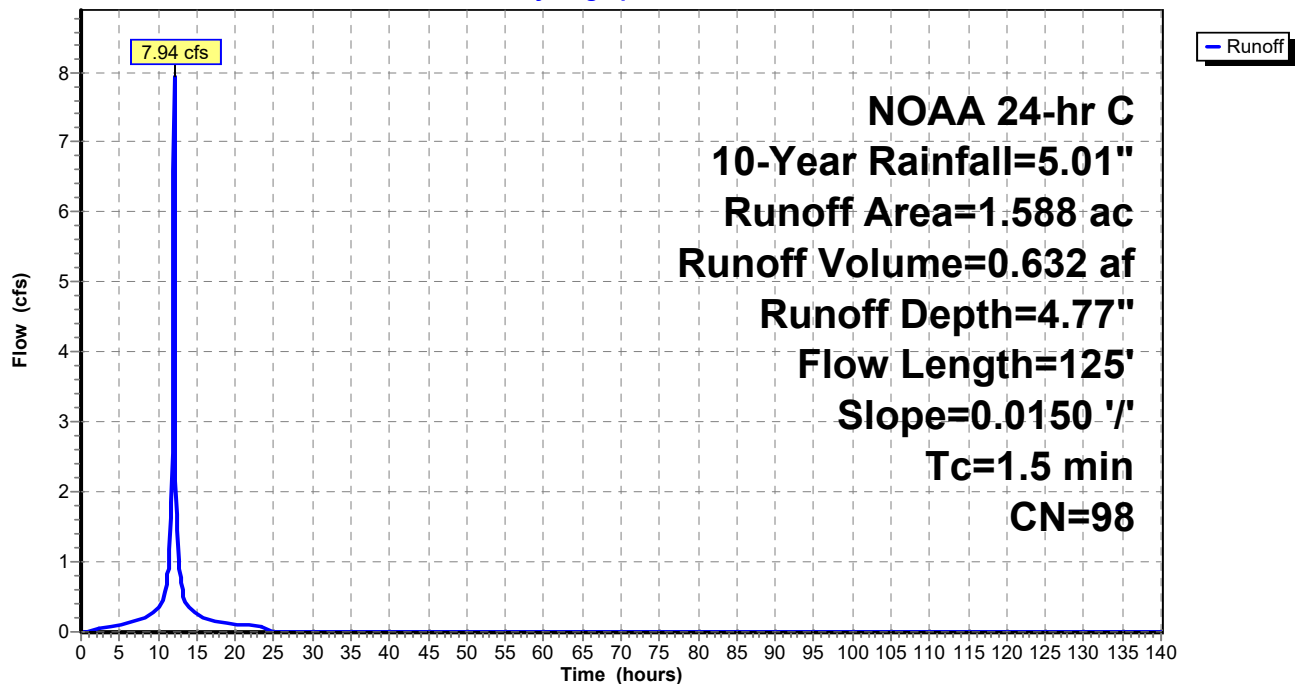
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
1.588	98	Paved parking, HSG C
1.588		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AA-AB Smooth surfaces n= 0.011 P2= 3.31"
0.2	25	0.0150	2.49		Shallow Concentrated Flow, AB-AC Paved Kv= 20.3 fps
1.5	125	Total			

Subcatchment 30S: PDA 1B - Impervious

Hydrograph



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Summary for Subcatchment 33S: PDA 1A - Pervious

Runoff = 8.36 cfs @ 12.26 hrs, Volume= 0.791 af, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
1.768	80	>75% Grass cover, Good, HSG D
1.610	77	Woods, Good, HSG D
3.378	79	Weighted Average
3.378		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		Sheet Flow, AG-AH Grass: Short n= 0.150 P2= 3.31"
1.5	90	0.0200	0.99		Shallow Concentrated Flow, AH-AI Short Grass Pasture Kv= 7.0 fps
2.7	422	0.0025	2.63	3.23	Pipe Channel, AI-AJ 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
2.6	807	0.0050	5.09	16.00	Pipe Channel, AJ-X 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.3	117	0.0050	6.67	47.16	Pipe Channel, X-Y 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
16.8	1,581	Total			

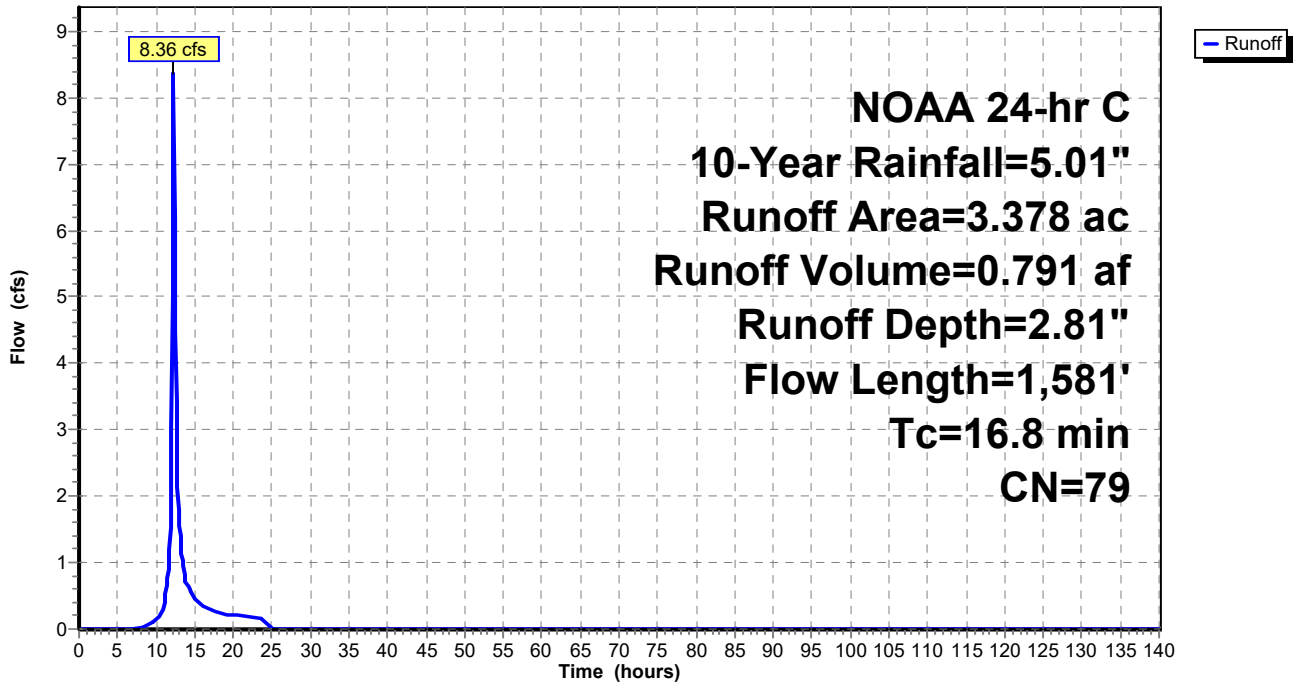
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Subcatchment 33S: PDA 1A - Pervious

Hydrograph



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Summary for Subcatchment 40S: PDA 1A - Impervious

Runoff = 46.86 cfs @ 12.10 hrs, Volume= 3.617 af, Depth= 4.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
9.094	98	Paved parking, HSG C
9.094		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AQ-AR Smooth surfaces n= 0.011 P2= 3.31"
0.6	90	0.0150	2.49		Shallow Concentrated Flow, AR-AS Paved Kv= 20.3 fps
0.1	181	0.3500	35.17	62.14	Pipe Channel, AS-Y (18 inch) 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
1.0	222	0.0025	3.60	11.31	Pipe Channel, AS-Y (24 inch - Section 1) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
1.0	247	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 2) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.5	134	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 3) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
4.6	1,019	Total			

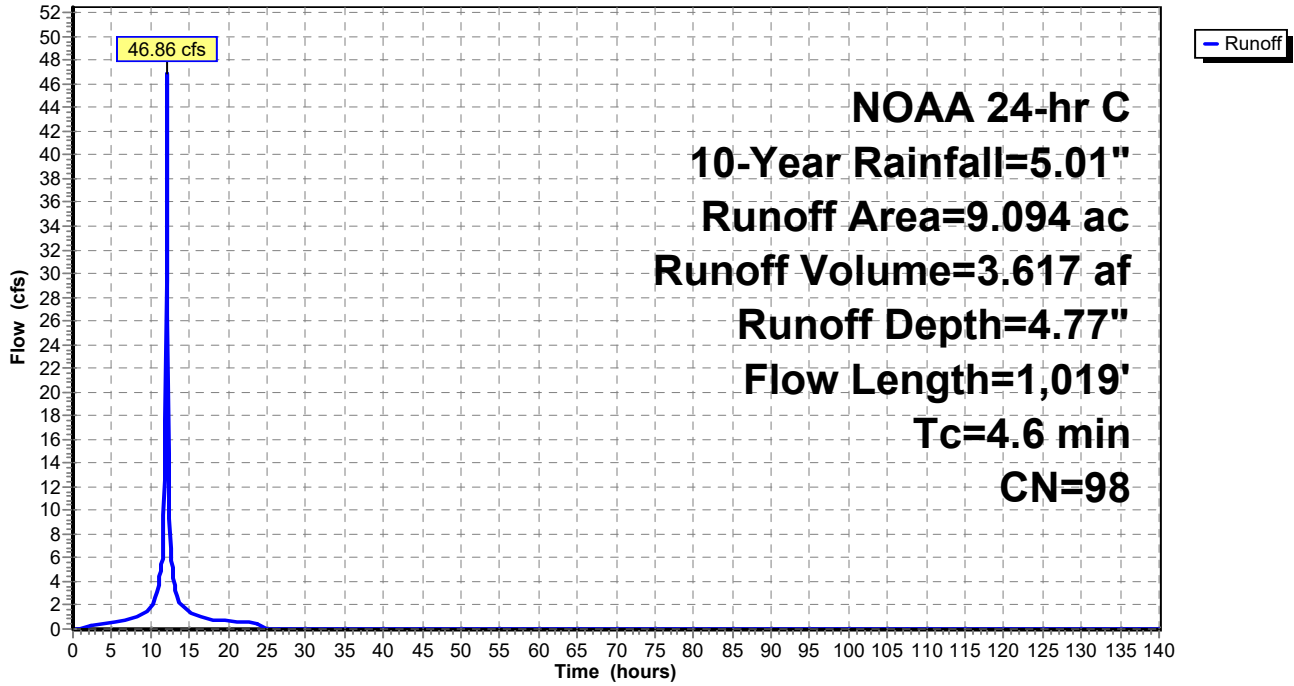
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Subcatchment 40S: PDA 1A - Impervious

Hydrograph



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Summary for Subcatchment 45S: Upstream Assunpink Creek

Runoff = 4,232.35 cfs @ 37.39 hrs, Volume= 10,735.511 af, Depth= 3.48"

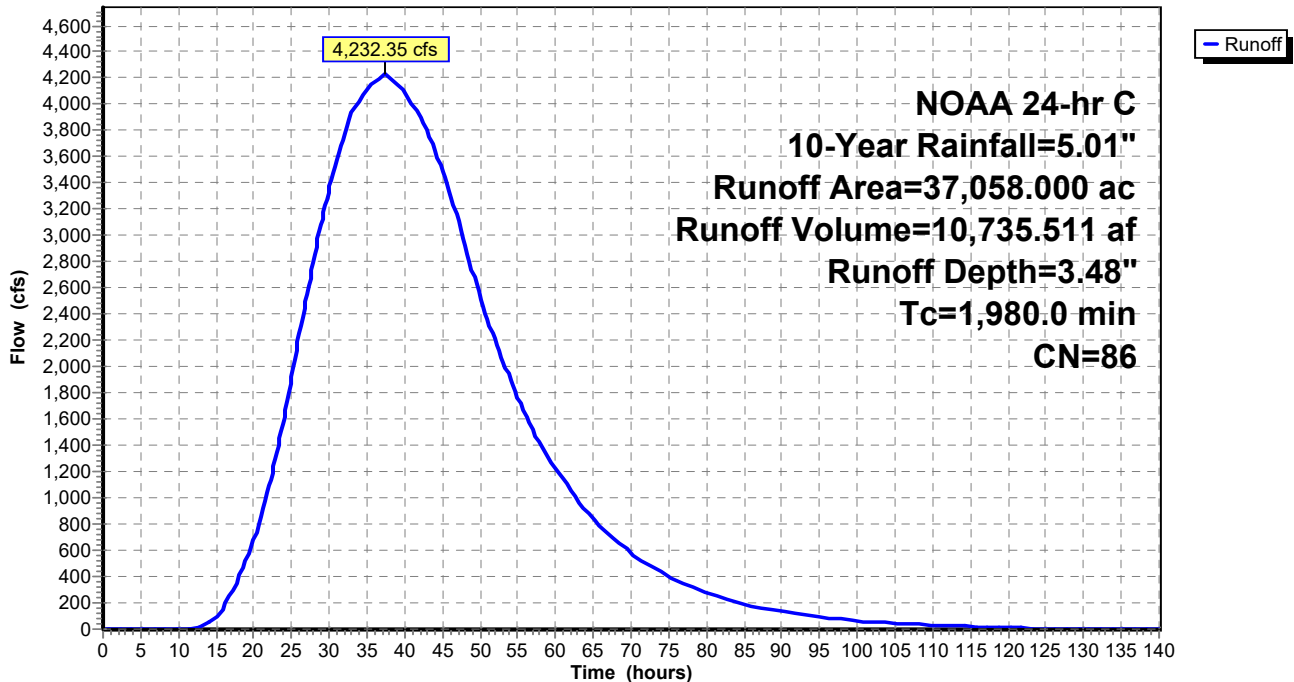
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
22,559.000	85	1/2 acre lots, 25% imp, HSG D
5,526.000	77	Woods, Good, HSG D
6,235.000	98	Paved parking, HSG D
2,738.000	80	>75% Grass cover, Good, HSG D
37,058.000	86	Weighted Average
25,183.250		67.96% Pervious Area
11,874.750		32.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1,980.0					Direct Entry, Estimated Tc

Subcatchment 45S: Upstream Assunpink Creek

Hydrograph



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Summary for Subcatchment 46S: EDA 1 - Impervious

Runoff = 55.85 cfs @ 12.16 hrs, Volume= 5.105 af, Depth= 4.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
12.834	98	Paved parking, HSG C
12.834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	58	0.0010	0.38		Sheet Flow, V-W Smooth surfaces n= 0.011 P2= 3.31"
1.1	42	0.0040	0.62		Sheet Flow, W-X Smooth surfaces n= 0.011 P2= 3.31"
0.8	90	0.0080	1.82		Shallow Concentrated Flow, X-Y Paved Kv= 20.3 fps
0.8	175	0.0050	3.72	4.57	Pipe Channel, Y-Z 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
3.3	1,235	0.0075	6.24	19.59	Pipe Channel, Z-AA 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
8.6	1,600	Total			

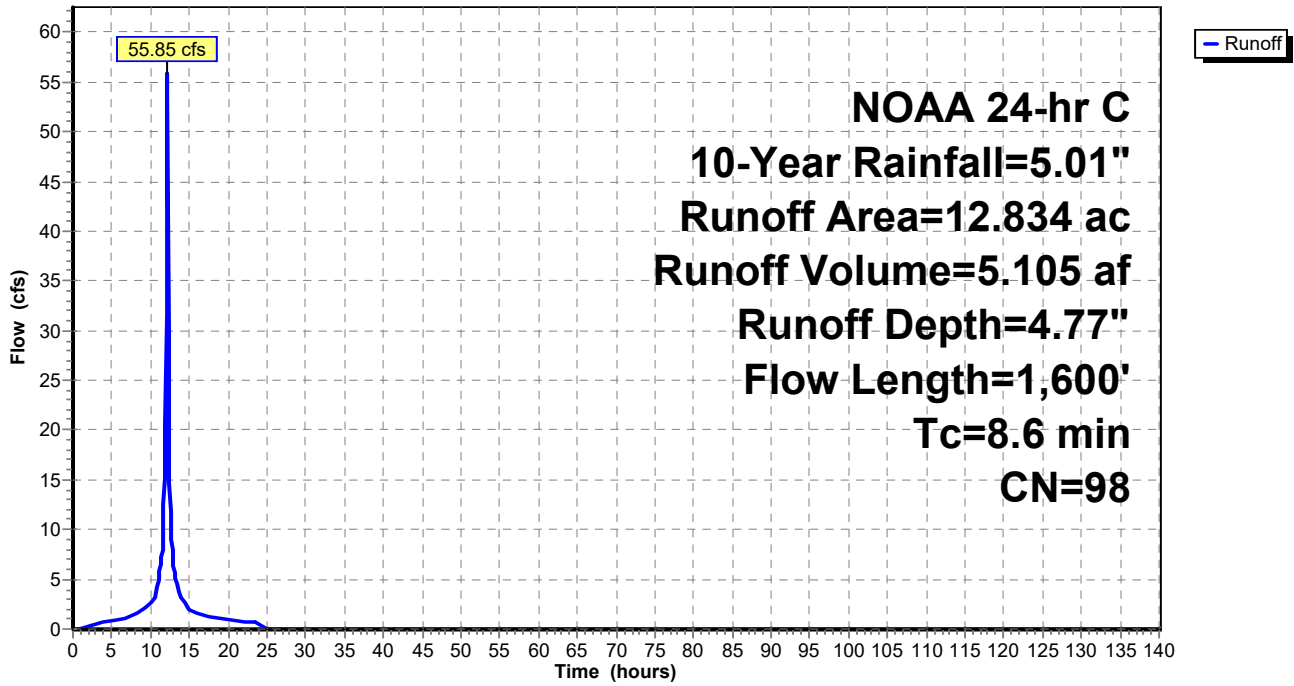
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Subcatchment 46S: EDA 1 - Impervious

Hydrograph



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Summary for Subcatchment 47S: Upstream Assunpink Creek

Runoff = 4,232.35 cfs @ 37.39 hrs, Volume= 10,735.511 af, Depth= 3.48"

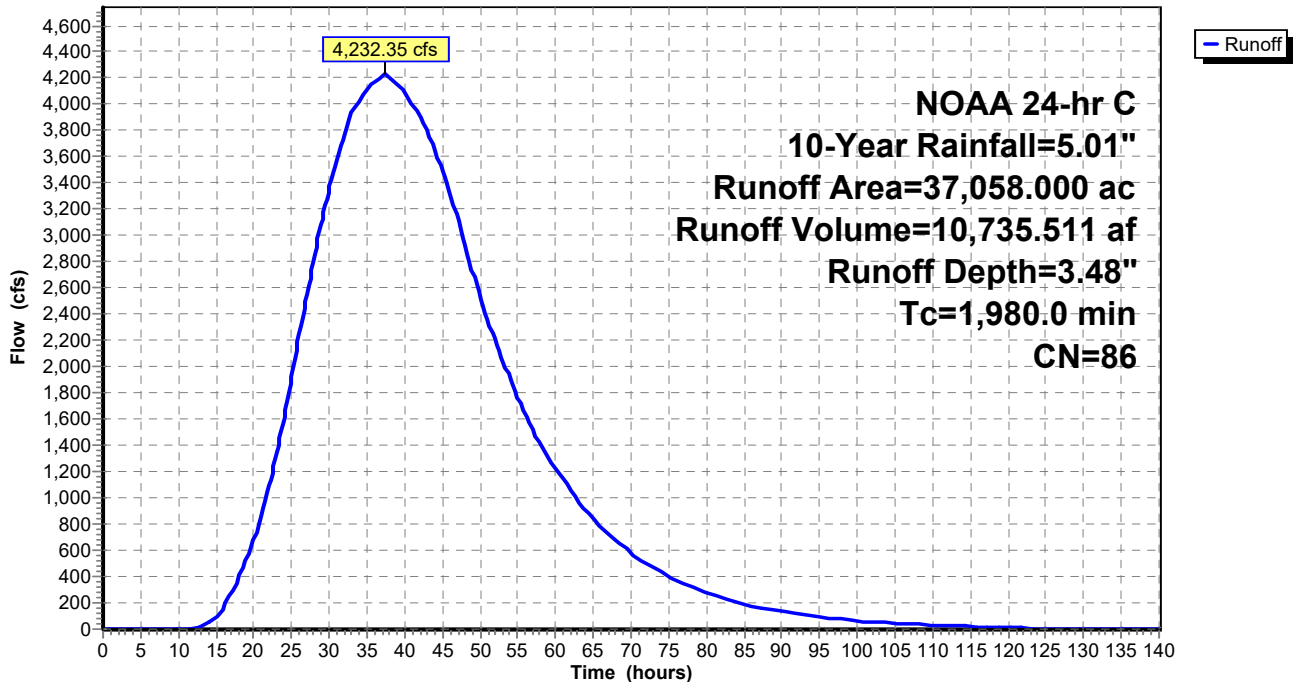
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
22,559.000	85	1/2 acre lots, 25% imp, HSG D
5,526.000	77	Woods, Good, HSG D
6,235.000	98	Paved parking, HSG D
2,738.000	80	>75% Grass cover, Good, HSG D
37,058.000	86	Weighted Average
25,183.250		67.96% Pervious Area
11,874.750		32.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1,980.0					Direct Entry, Estimated Tc

Subcatchment 47S: Upstream Assunpink Creek

Hydrograph



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Summary for Pond 45P: Bioretention Basin

Inflow Area = 2.769 ac, 57.35% Impervious, Inflow Depth = 3.97" for 10-Year event
 Inflow = 12.26 cfs @ 12.08 hrs, Volume= 0.917 af
 Outflow = 8.70 cfs @ 12.16 hrs, Volume= 0.917 af, Atten= 29%, Lag= 5.0 min
 Primary = 8.70 cfs @ 12.16 hrs, Volume= 0.917 af

Routing by Stor-Ind method, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
 Peak Elev= 48.61' @ 12.16 hrs Surf.Area= 18,543 sf Storage= 10,685 cf

Plug-Flow detention time= 154.3 min calculated for 0.917 af (100% of inflow)
 Center-of-Mass det. time= 154.5 min (923.6 - 769.0)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	18,218 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	16,690	0	0
49.00	19,745	18,218	18,218

Device	Routing	Invert	Outlet Devices
#1	Primary	43.94'	18.0" Round Culvert L= 205.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 43.94' / 43.32' S= 0.0030 ' S= 0.0030 ' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	48.00'	1.000 in/hr Exfiltration X 0.50 over Surface area
#3	Device 1	48.35'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=8.36 cfs @ 12.16 hrs HW=48.60' (Free Discharge)

- 1=Culvert (Passes 8.36 cfs of 12.39 cfs potential flow)
 2=Exfiltration (Exfiltration Controls 0.21 cfs)
 3=Orifice/Grate (Weir Controls 8.14 cfs @ 1.63 fps)

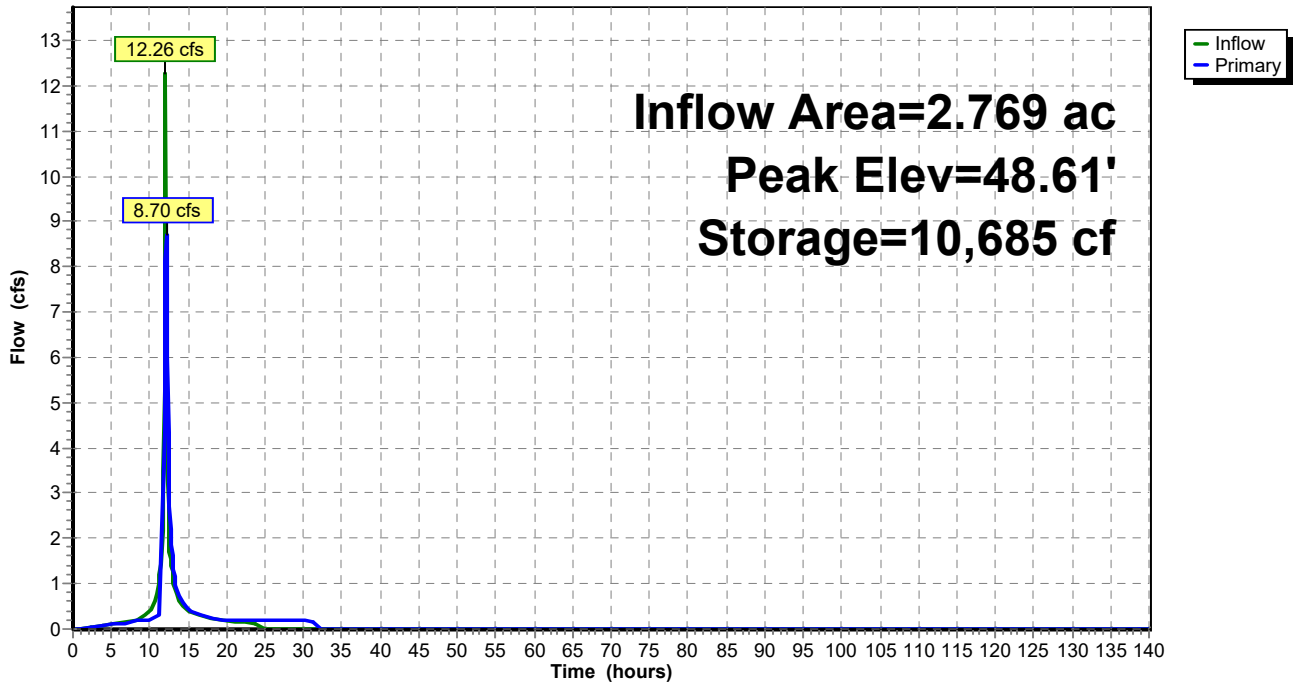
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Pond 45P: Bioretention Basin

Hydrograph



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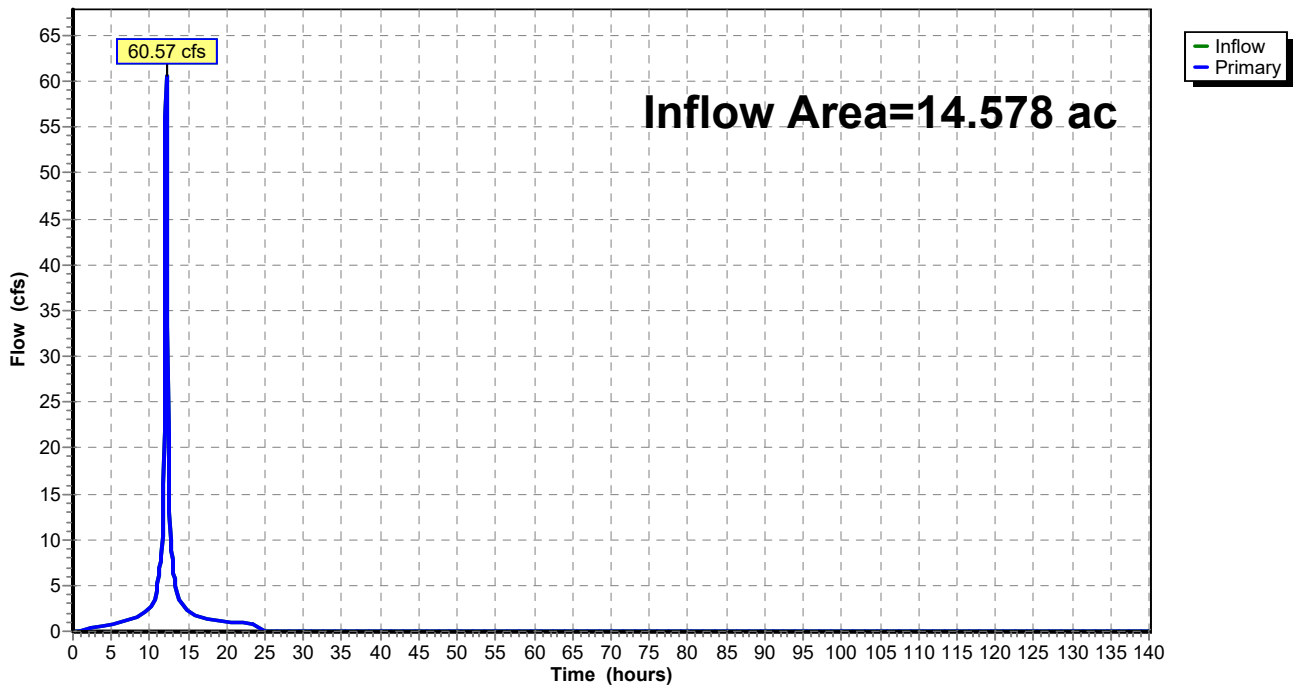
Summary for Link 13L: EDA 1

Inflow Area = 14.578 ac, 88.04% Impervious, Inflow Depth = 4.52" for 10-Year event
Inflow = 60.57 cfs @ 12.16 hrs, Volume= 5.487 af
Primary = 60.57 cfs @ 12.16 hrs, Volume= 5.487 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 13L: EDA 1

Hydrograph



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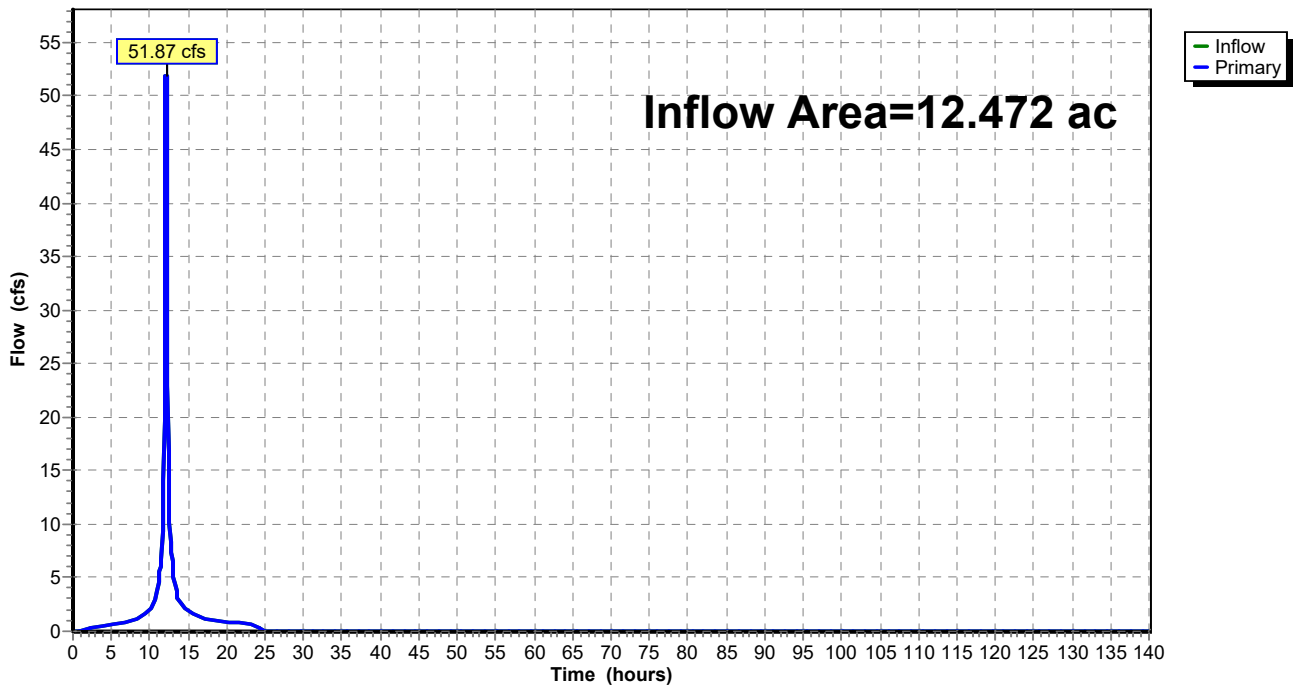
Summary for Link 35L: PDA 1A

Inflow Area = 12.472 ac, 72.92% Impervious, Inflow Depth = 4.24" for 10-Year event
Inflow = 51.87 cfs @ 12.10 hrs, Volume= 4.408 af
Primary = 51.87 cfs @ 12.10 hrs, Volume= 4.408 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 35L: PDA 1A

Hydrograph



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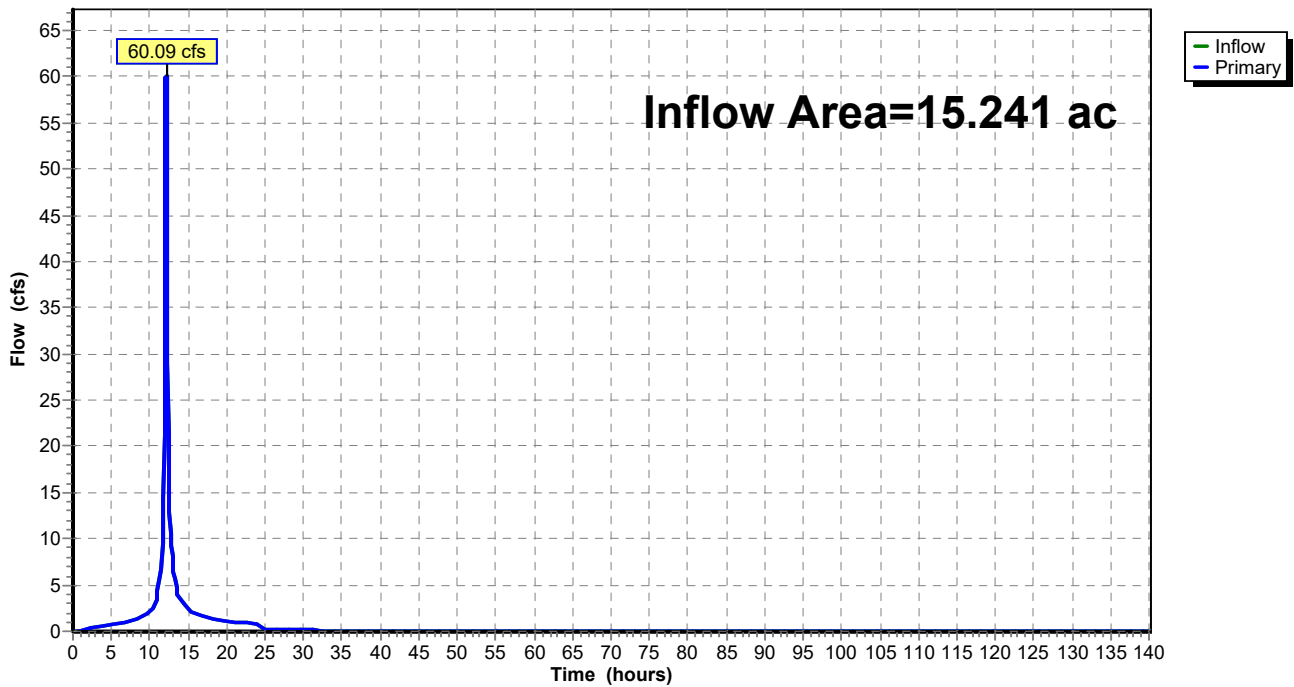
Summary for Link 44L: PDA 1

Inflow Area = 15.241 ac, 70.09% Impervious, Inflow Depth = 4.19" for 10-Year event
Inflow = 60.09 cfs @ 12.11 hrs, Volume= 5.326 af
Primary = 60.09 cfs @ 12.11 hrs, Volume= 5.326 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 44L: PDA 1

Hydrograph



ex-pr vs. Assunpink Creek

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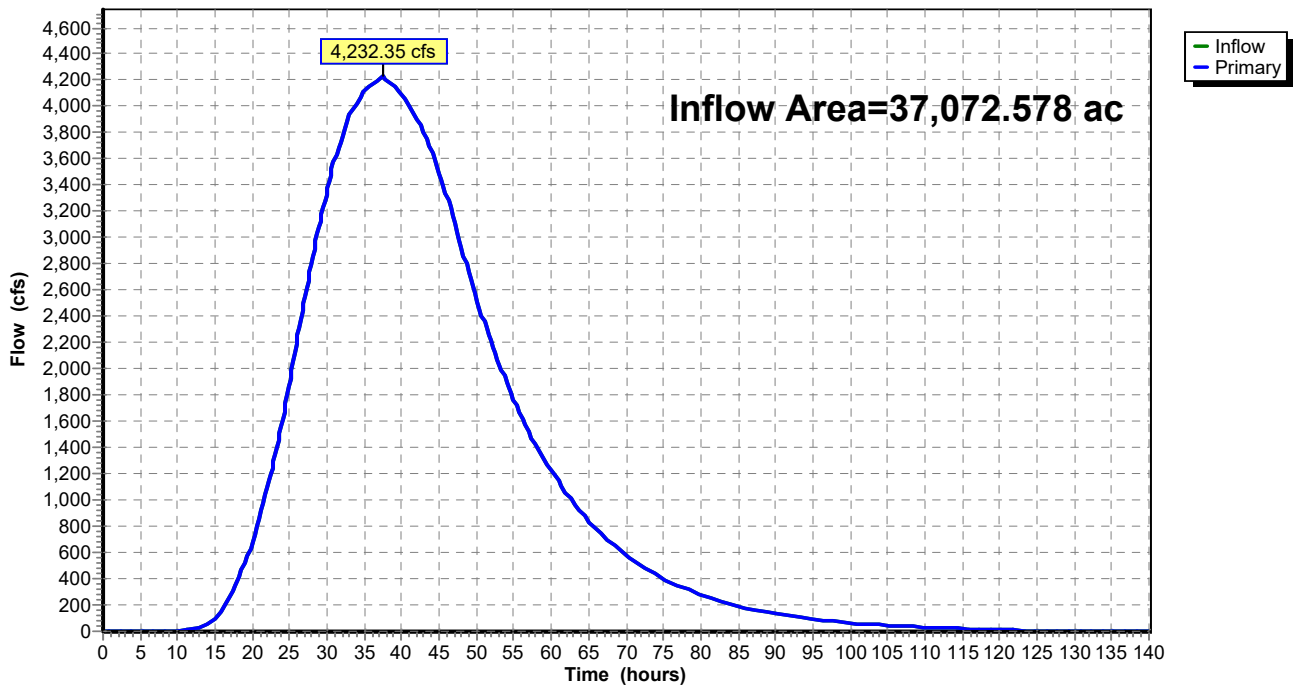
Summary for Link 48L: Existing Creek Flow

Inflow Area = 37,072.578 ac, 32.07% Impervious, Inflow Depth = 3.48" for 10-Year event
Inflow = 4,232.35 cfs @ 37.39 hrs, Volume= 10,740.999 af
Primary = 4,232.35 cfs @ 37.39 hrs, Volume= 10,740.999 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 48L: Existing Creek Flow

Hydrograph



ex-pr vs. Assunpink Creek

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Summary for Link 49L: Proposed Creek Flow

Inflow Area = 37,073.241 ac, 32.06% Impervious, Inflow Depth = 3.48" for 10-Year event

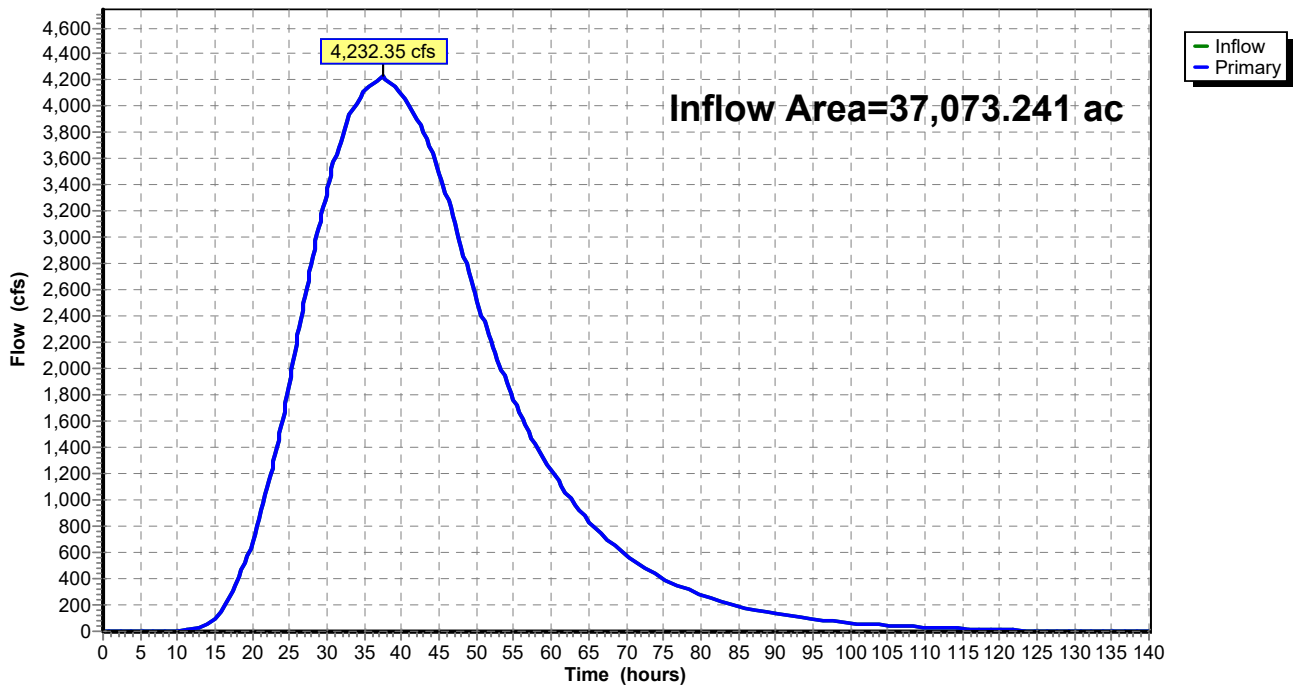
Inflow = 4,232.35 cfs @ 37.39 hrs, Volume= 10,740.837 af

Primary = 4,232.35 cfs @ 37.39 hrs, Volume= 10,740.837 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 49L: Proposed Creek Flow

Hydrograph



ex-pr vs. Assunpink Creek

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Summary for Subcatchment 12S: EDA 1 - Pervious

Runoff = 10.09 cfs @ 12.18 hrs, Volume= 0.811 af, Depth= 5.58"

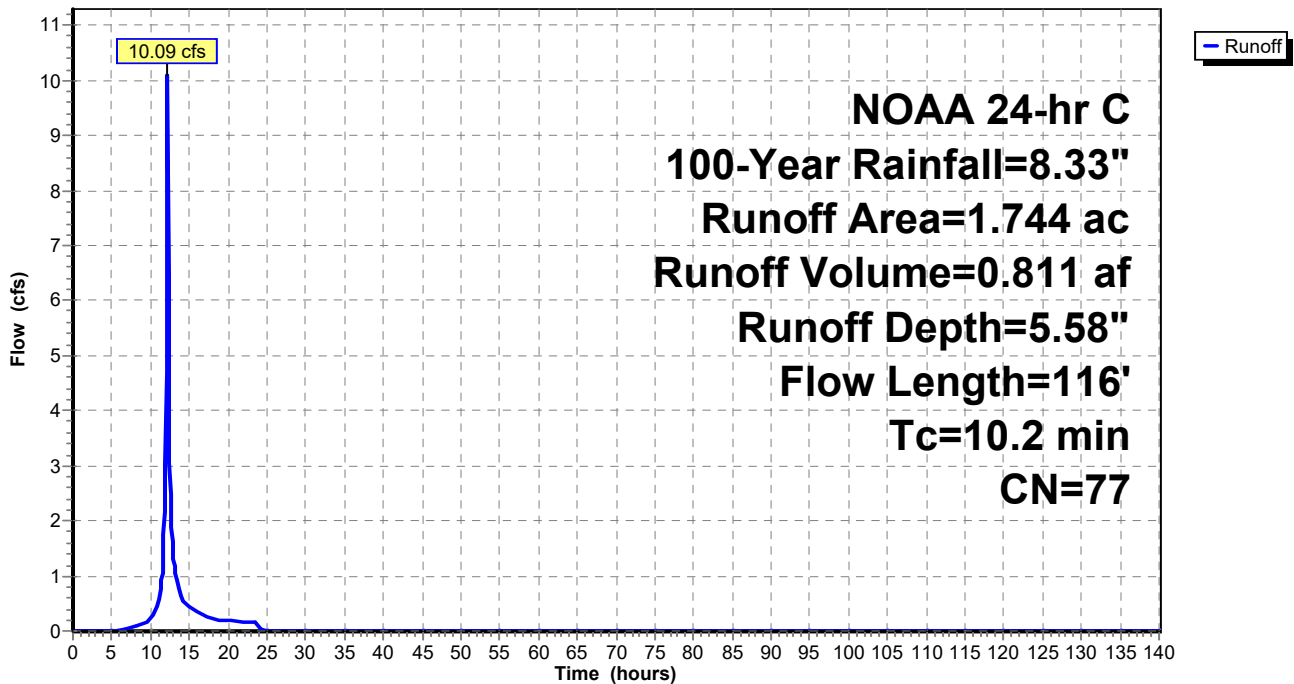
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
1.610	77	Woods, Good, HSG D
0.134	80	>75% Grass cover, Good, HSG D
1.744	77	Weighted Average
1.744		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	41	0.0250	0.07		Sheet Flow, R-S Woods: Light underbrush n= 0.400 P2= 3.31"
0.6	60	0.1170	1.71		Shallow Concentrated Flow, S-T Woodland Kv= 5.0 fps
0.1	15	0.2670	2.58		Shallow Concentrated Flow, T-U Woodland Kv= 5.0 fps
10.2	116	Total			

Subcatchment 12S: EDA 1 - Pervious

Hydrograph



ex-pr vs. Assunpink Creek

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Summary for Subcatchment 29S: PDA 1B - Pervious

Runoff = 8.78 cfs @ 12.09 hrs, Volume= 0.584 af, Depth= 5.94"

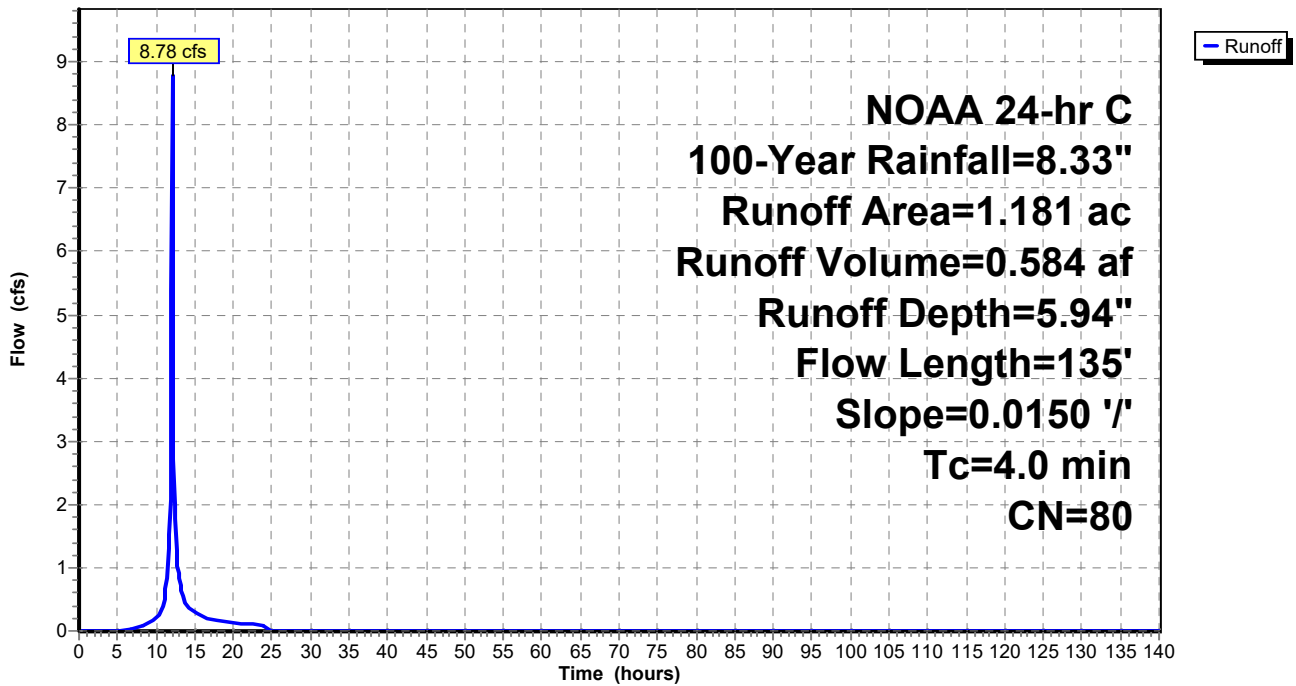
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
1.181	80	>75% Grass cover, Good, HSG D
1.181		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	18	0.0150	0.11		Sheet Flow, AD-AE Grass: Short n= 0.150 P2= 3.31"
1.1	82	0.0150	1.20		Sheet Flow, AE-AF Smooth surfaces n= 0.011 P2= 3.31"
0.2	35	0.0150	2.49		Shallow Concentrated Flow, AF-AC Paved Kv= 20.3 fps
4.0	135	Total			

Subcatchment 29S: PDA 1B - Pervious

Hydrograph



ex-pr vs. Assunpink Creek

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Summary for Subcatchment 30S: PDA 1B - Impervious

Runoff = 13.24 cfs @ 12.07 hrs, Volume= 1.071 af, Depth= 8.09"

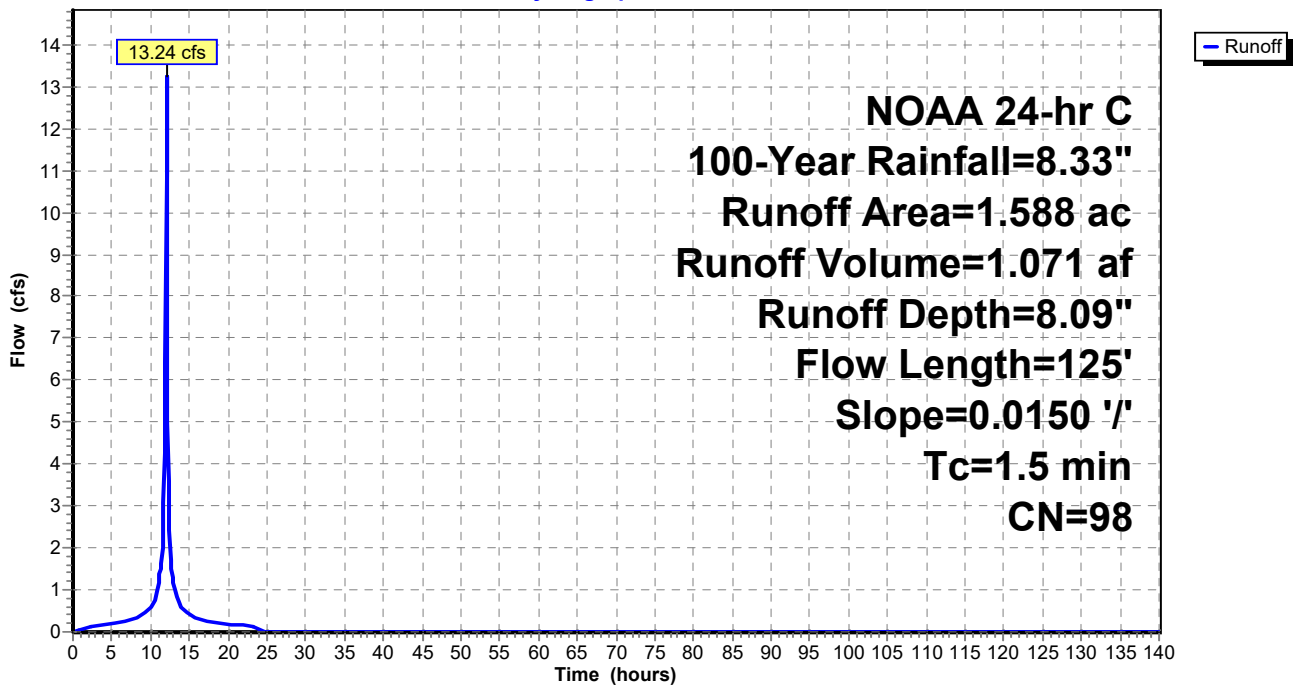
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
1.588	98	Paved parking, HSG C
1.588		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AA-AB Smooth surfaces n= 0.011 P2= 3.31"
0.2	25	0.0150	2.49		Shallow Concentrated Flow, AB-AC Paved Kv= 20.3 fps
1.5	125	Total			

Subcatchment 30S: PDA 1B - Impervious

Hydrograph



ex-pr vs. Assunpink Creek

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Summary for Subcatchment 33S: PDA 1A - Pervious

Runoff = 17.00 cfs @ 12.26 hrs, Volume= 1.637 af, Depth= 5.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
1.768	80	>75% Grass cover, Good, HSG D
1.610	77	Woods, Good, HSG D
3.378	79	Weighted Average
3.378		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		Sheet Flow, AG-AH Grass: Short n= 0.150 P2= 3.31"
1.5	90	0.0200	0.99		Shallow Concentrated Flow, AH-AI Short Grass Pasture Kv= 7.0 fps
2.7	422	0.0025	2.63	3.23	Pipe Channel, AI-AJ 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
2.6	807	0.0050	5.09	16.00	Pipe Channel, AJ-X 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.3	117	0.0050	6.67	47.16	Pipe Channel, X-Y 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
16.8	1,581	Total			

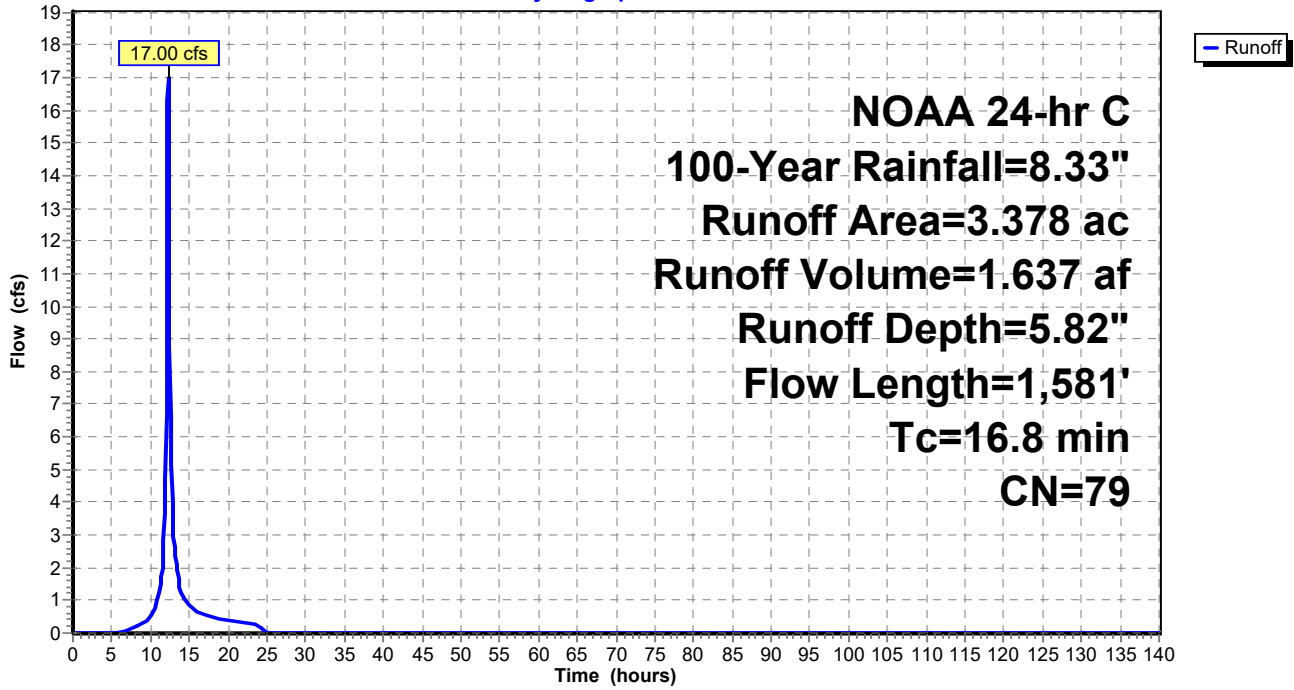
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Subcatchment 33S: PDA 1A - Pervious

Hydrograph



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Summary for Subcatchment 40S: PDA 1A - Impervious

Runoff = 78.18 cfs @ 12.10 hrs, Volume= 6.131 af, Depth= 8.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
9.094	98	Paved parking, HSG C
9.094		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.25		Sheet Flow, AQ-AR Smooth surfaces n= 0.011 P2= 3.31"
0.6	90	0.0150	2.49		Shallow Concentrated Flow, AR-AS Paved Kv= 20.3 fps
0.1	181	0.3500	35.17	62.14	Pipe Channel, AS-Y (18 inch) 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
1.0	222	0.0025	3.60	11.31	Pipe Channel, AS-Y (24 inch - Section 1) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
1.0	247	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 2) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.5	134	0.0035	4.26	13.38	Pipe Channel, AS-Y (24 inch - Section 3) 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.1	45	0.0050	7.39	71.14	Pipe Channel, Y-Z 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013 Concrete pipe, bends & connections
4.6	1,019	Total			

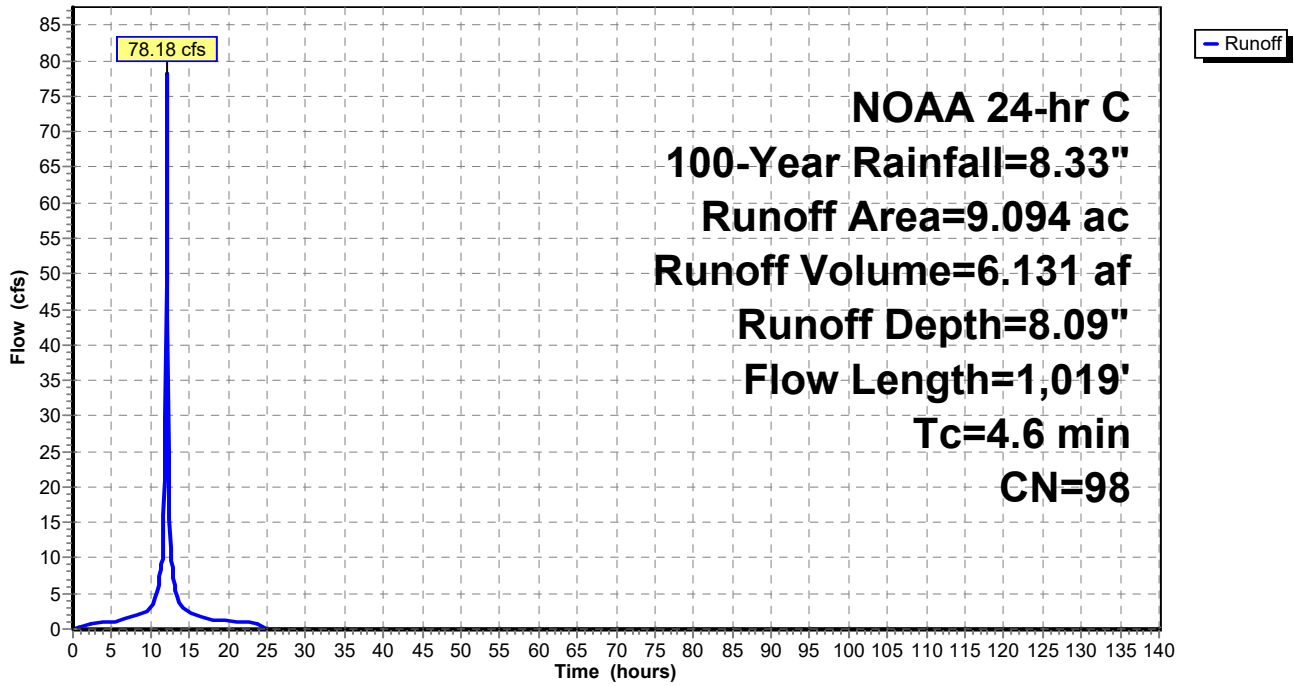
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Subcatchment 40S: PDA 1A - Impervious

Hydrograph



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Summary for Subcatchment 45S: Upstream Assunpink Creek

Runoff = 8,095.05 cfs @ 37.38 hrs, Volume= 20,541.359 af, Depth= 6.65"

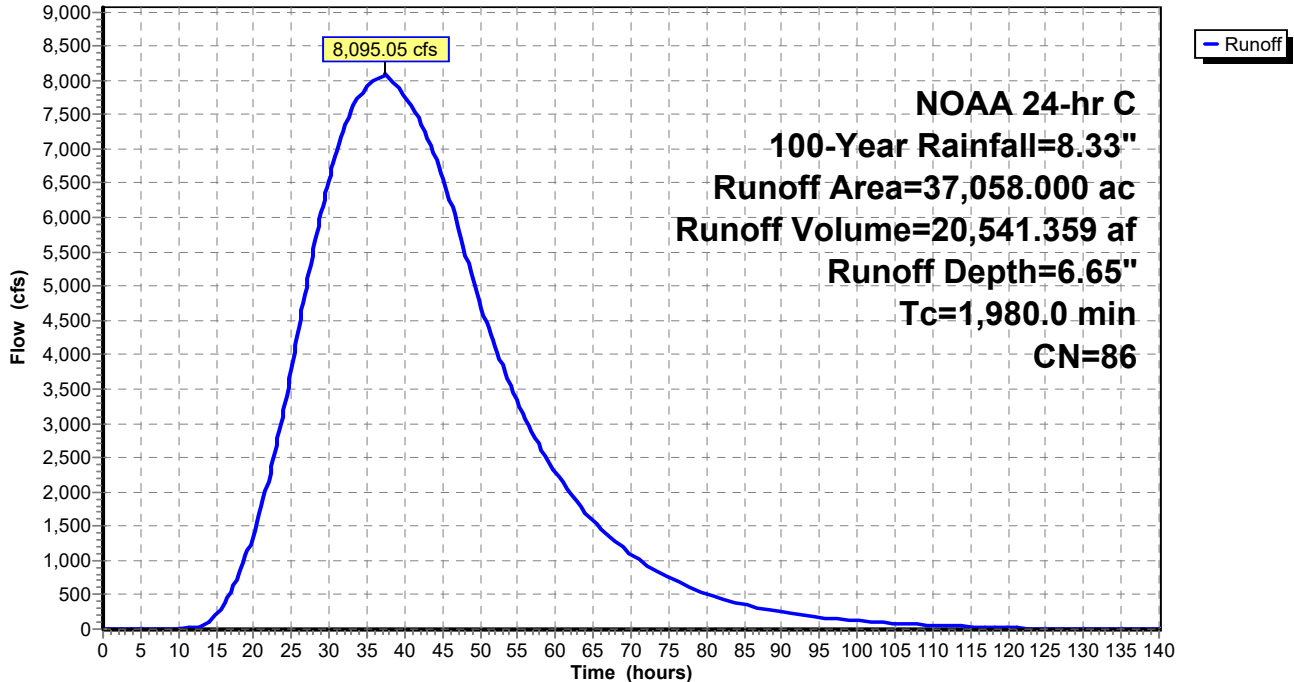
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
22,559.000	85	1/2 acre lots, 25% imp, HSG D
5,526.000	77	Woods, Good, HSG D
6,235.000	98	Paved parking, HSG D
2,738.000	80	>75% Grass cover, Good, HSG D
37,058.000	86	Weighted Average
25,183.250		67.96% Pervious Area
11,874.750		32.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1,980.0					Direct Entry, Estimated Tc

Subcatchment 45S: Upstream Assunpink Creek

Hydrograph



ex-pr vs. Assunpink Creek

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Summary for Subcatchment 46S: EDA 1 - Impervious

Runoff = 93.19 cfs @ 12.15 hrs, Volume= 8.652 af, Depth= 8.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
12.834	98	Paved parking, HSG C
12.834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	58	0.0010	0.38		Sheet Flow, V-W Smooth surfaces n= 0.011 P2= 3.31"
1.1	42	0.0040	0.62		Sheet Flow, W-X Smooth surfaces n= 0.011 P2= 3.31"
0.8	90	0.0080	1.82		Shallow Concentrated Flow, X-Y Paved Kv= 20.3 fps
0.8	175	0.0050	3.72	4.57	Pipe Channel, Y-Z 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
3.3	1,235	0.0075	6.24	19.59	Pipe Channel, Z-AA 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
8.6	1,600	Total			

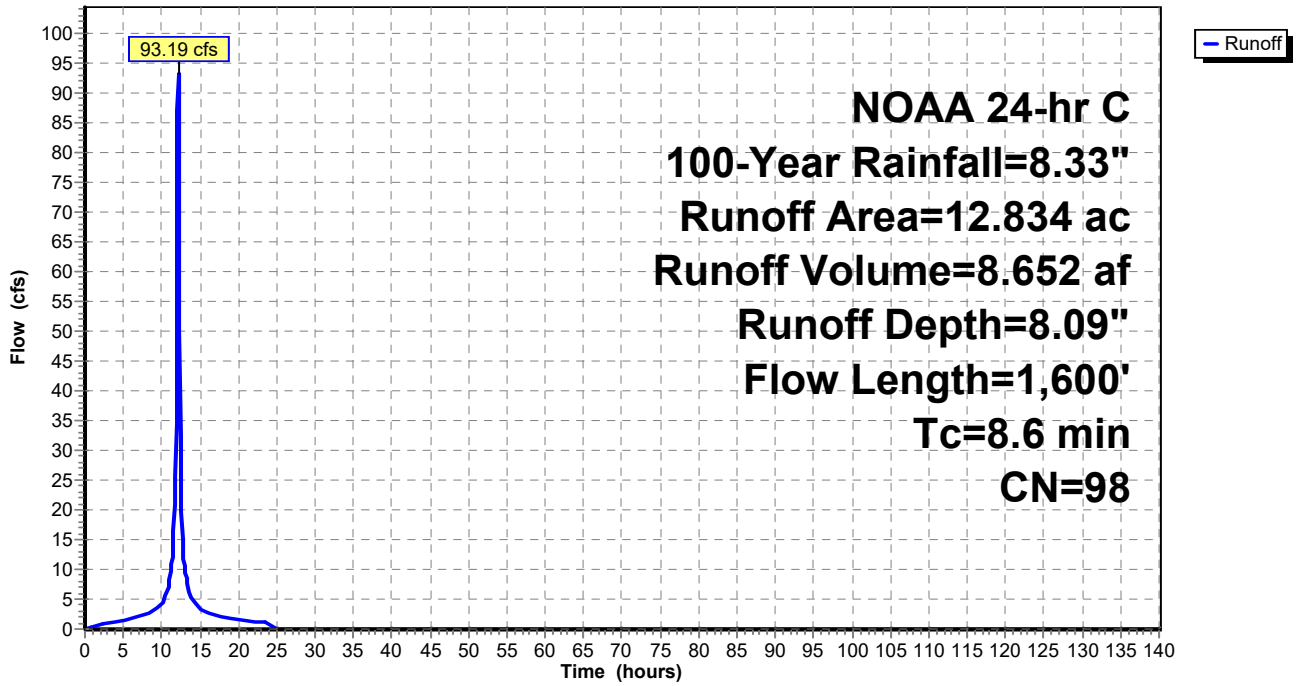
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Subcatchment 46S: EDA 1 - Impervious

Hydrograph



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Summary for Subcatchment 47S: Upstream Assunpink Creek

Runoff = 8,095.05 cfs @ 37.38 hrs, Volume= 20,541.359 af, Depth= 6.65"

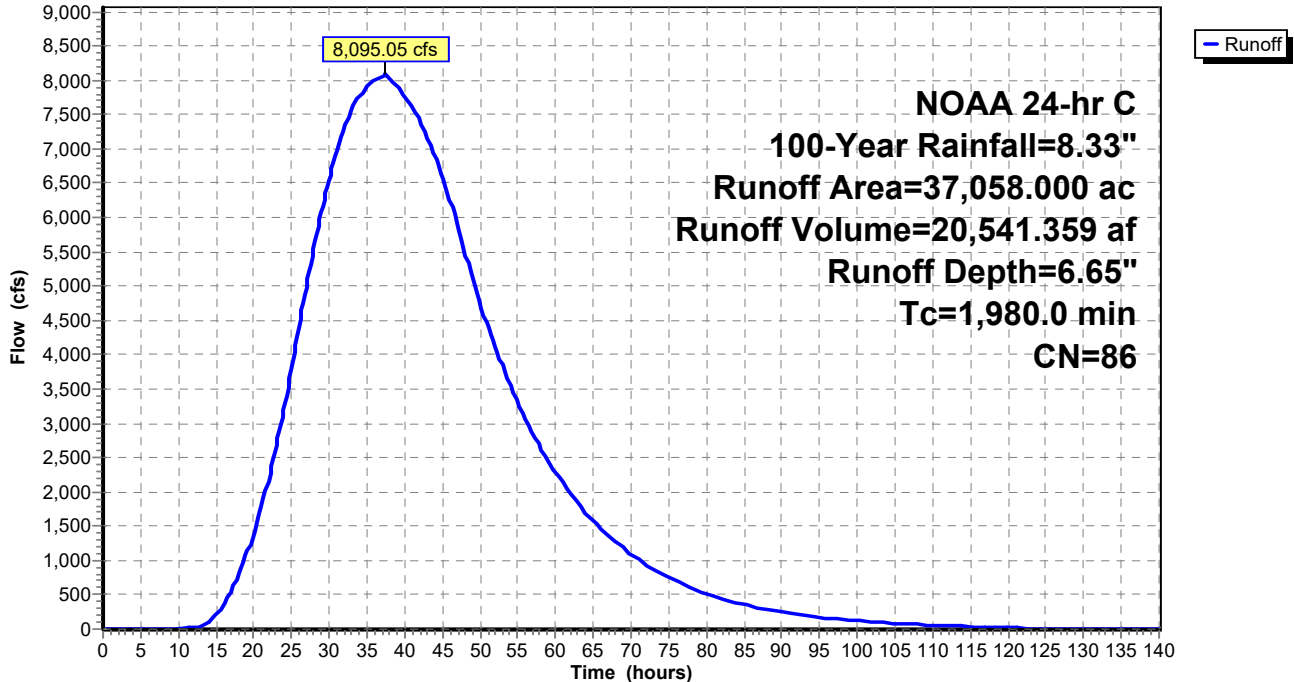
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year Rainfall=8.33"

Area (ac)	CN	Description
22,559.000	85	1/2 acre lots, 25% imp, HSG D
5,526.000	77	Woods, Good, HSG D
6,235.000	98	Paved parking, HSG D
2,738.000	80	>75% Grass cover, Good, HSG D
37,058.000	86	Weighted Average
25,183.250		67.96% Pervious Area
11,874.750		32.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1,980.0					Direct Entry, Estimated Tc

Subcatchment 47S: Upstream Assunpink Creek

Hydrograph



ex-pr vs. Assunpink Creek

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Summary for Pond 45P: Bioretention Basin

Inflow Area = 2.769 ac, 57.35% Impervious, Inflow Depth = 7.17" for 100-Year event
 Inflow = 21.88 cfs @ 12.08 hrs, Volume= 1.655 af
 Outflow = 12.78 cfs @ 12.19 hrs, Volume= 1.655 af, Atten= 42%, Lag= 6.4 min
 Primary = 12.78 cfs @ 12.19 hrs, Volume= 1.655 af

Routing by Stor-Ind method, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs
 Peak Elev= 48.84' @ 12.19 hrs Surf.Area= 19,249 sf Storage= 15,050 cf

Plug-Flow detention time= 105.1 min calculated for 1.654 af (100% of inflow)
 Center-of-Mass det. time= 105.4 min (865.5 - 760.1)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	18,218 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	16,690	0	0
49.00	19,745	18,218	18,218

Device	Routing	Invert	Outlet Devices
#1	Primary	43.94'	18.0" Round Culvert L= 205.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 43.94' / 43.32' S= 0.0030 ' S= 0.0030 ' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	48.00'	1.000 in/hr Exfiltration X 0.50 over Surface area
#3	Device 1	48.35'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=12.76 cfs @ 12.19 hrs HW=48.83' (Free Discharge)

- 1=Culvert (Barrel Controls 12.76 cfs @ 7.22 fps)
- 2=Exfiltration (Passes < 0.22 cfs potential flow)
- 3=Orifice/Grate (Passes < 21.71 cfs potential flow)

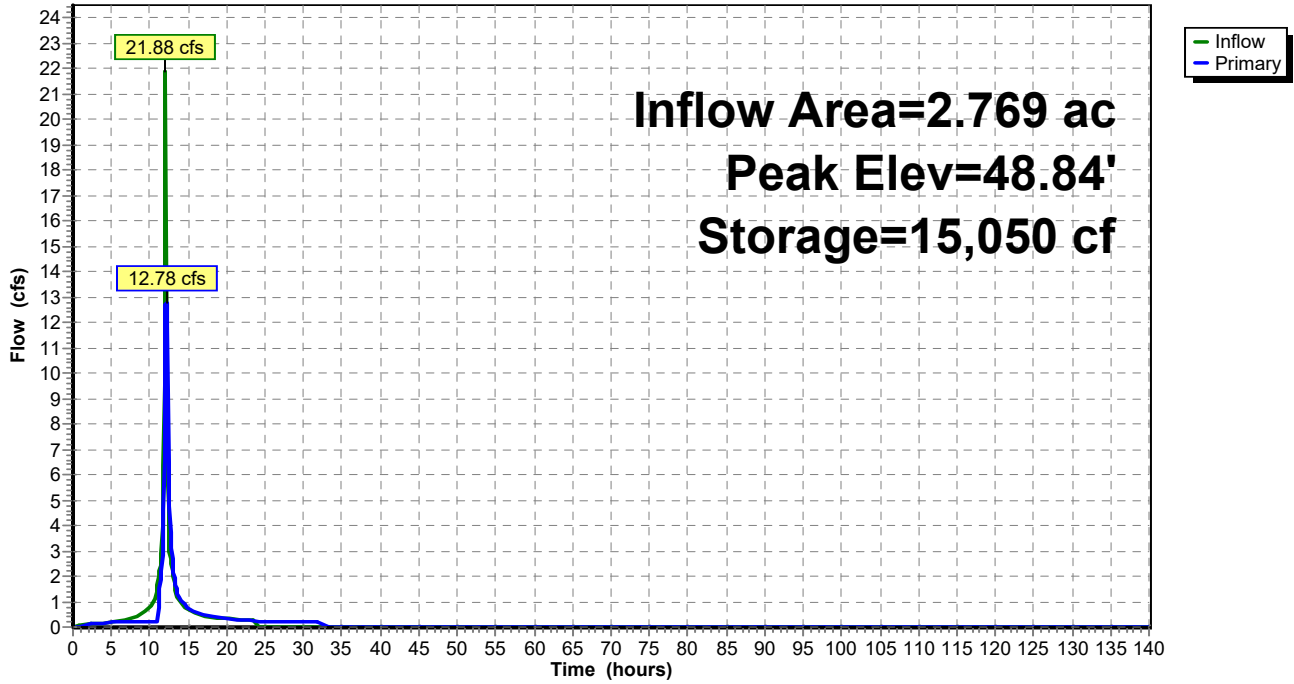
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Pond 45P: Bioretention Basin

Hydrograph



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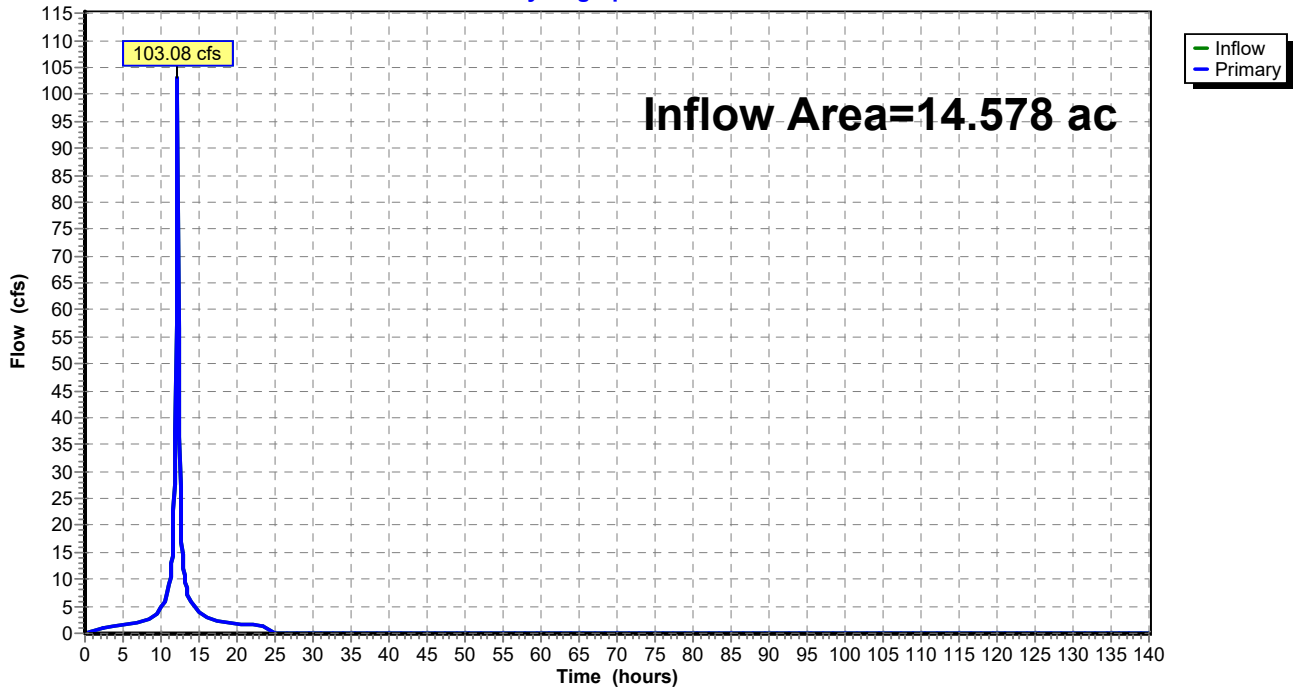
Summary for Link 13L: EDA 1

Inflow Area = 14.578 ac, 88.04% Impervious, Inflow Depth = 7.79" for 100-Year event
Inflow = 103.08 cfs @ 12.16 hrs, Volume= 9.463 af
Primary = 103.08 cfs @ 12.16 hrs, Volume= 9.463 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 13L: EDA 1

Hydrograph



ex-pr vs. Assunpink Creek

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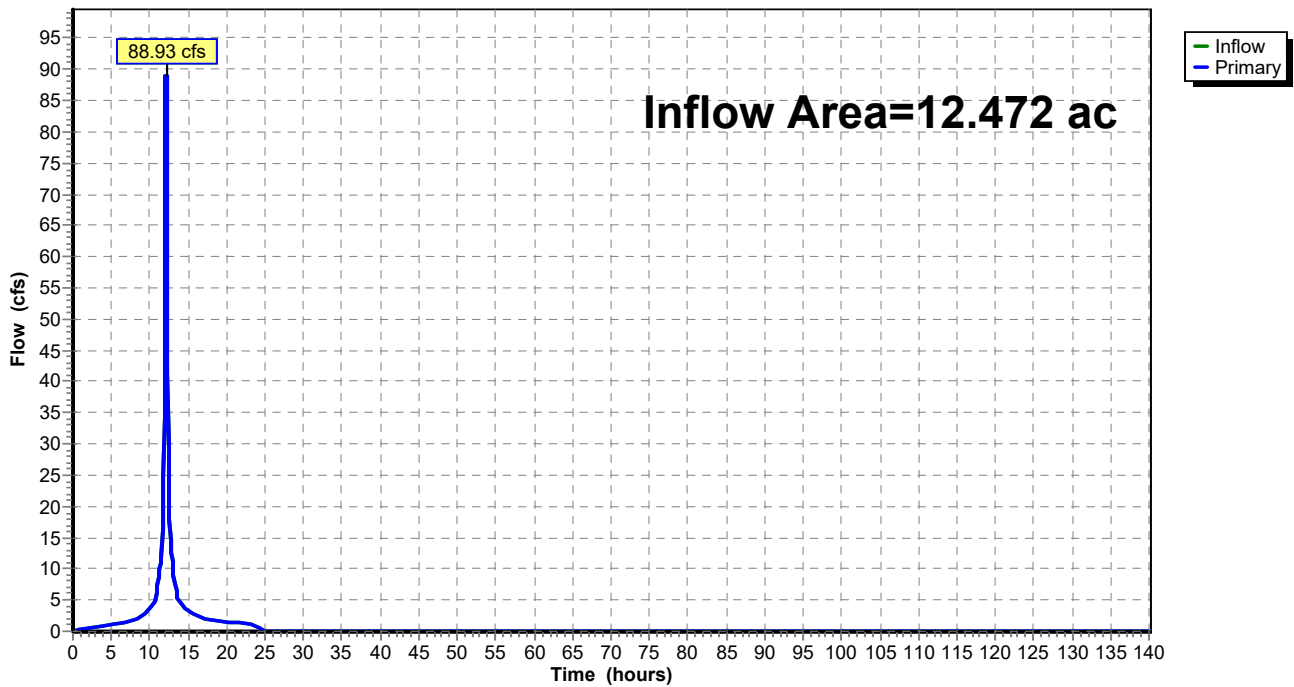
Summary for Link 35L: PDA 1A

Inflow Area = 12.472 ac, 72.92% Impervious, Inflow Depth = 7.47" for 100-Year event
Inflow = 88.93 cfs @ 12.10 hrs, Volume= 7.768 af
Primary = 88.93 cfs @ 12.10 hrs, Volume= 7.768 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 35L: PDA 1A

Hydrograph



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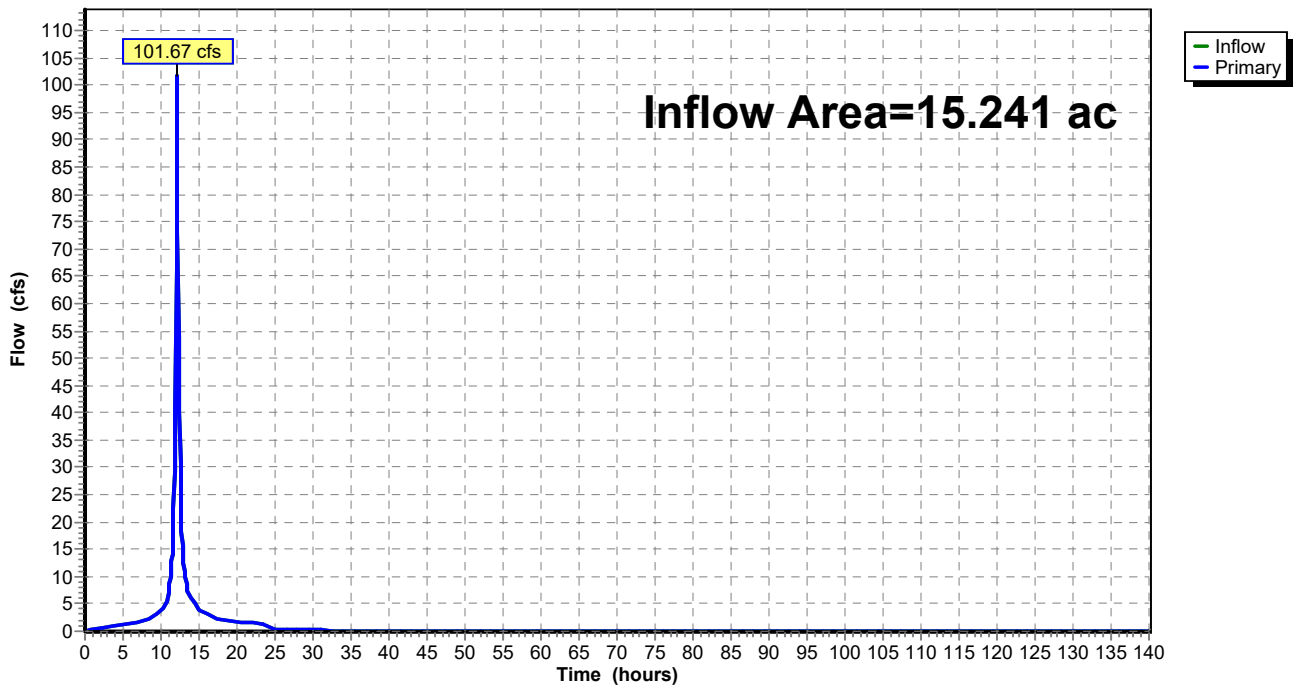
Summary for Link 44L: PDA 1

Inflow Area = 15.241 ac, 70.09% Impervious, Inflow Depth = 7.42" for 100-Year event
Inflow = 101.67 cfs @ 12.11 hrs, Volume= 9.423 af
Primary = 101.67 cfs @ 12.11 hrs, Volume= 9.423 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 44L: PDA 1

Hydrograph



ex-pr vs. Assunpink Creek

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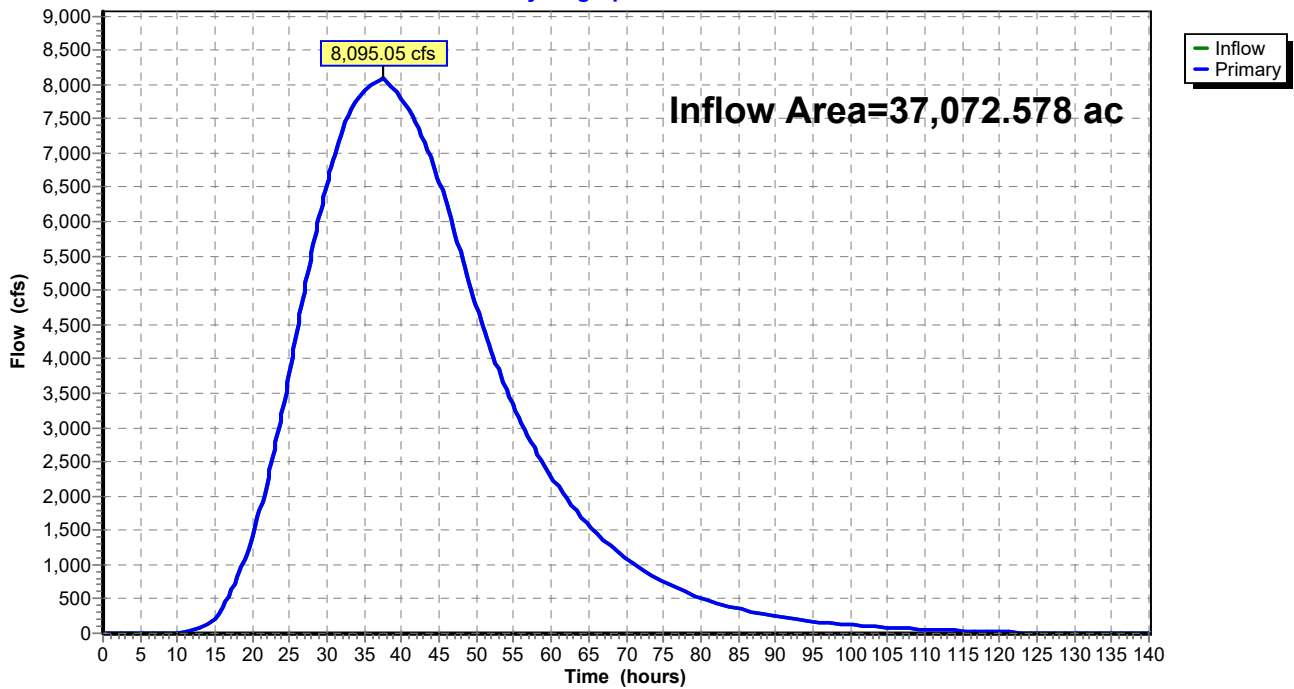
Summary for Link 48L: Existing Creek Flow

Inflow Area = 37,072.578 ac, 32.07% Impervious, Inflow Depth = 6.65" for 100-Year event
Inflow = 8,095.05 cfs @ 37.38 hrs, Volume= 20,550.821 af
Primary = 8,095.05 cfs @ 37.38 hrs, Volume= 20,550.821 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 48L: Existing Creek Flow

Hydrograph



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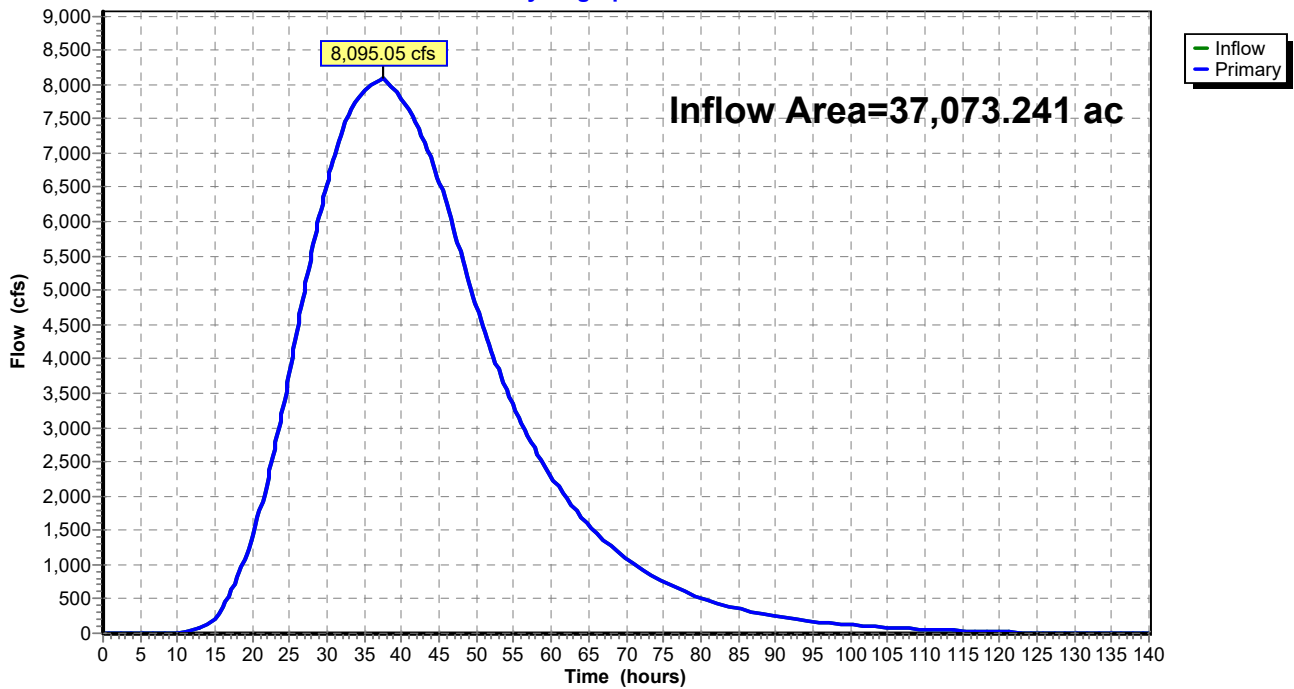
Summary for Link 49L: Proposed Creek Flow

Inflow Area = 37,073.241 ac, 32.06% Impervious, Inflow Depth = 6.65" for 100-Year event
Inflow = 8,095.05 cfs @ 37.38 hrs, Volume= 20,550.781 af
Primary = 8,095.05 cfs @ 37.38 hrs, Volume= 20,550.781 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-140.00 hrs, dt= 0.10 hrs

Link 49L: Proposed Creek Flow

Hydrograph

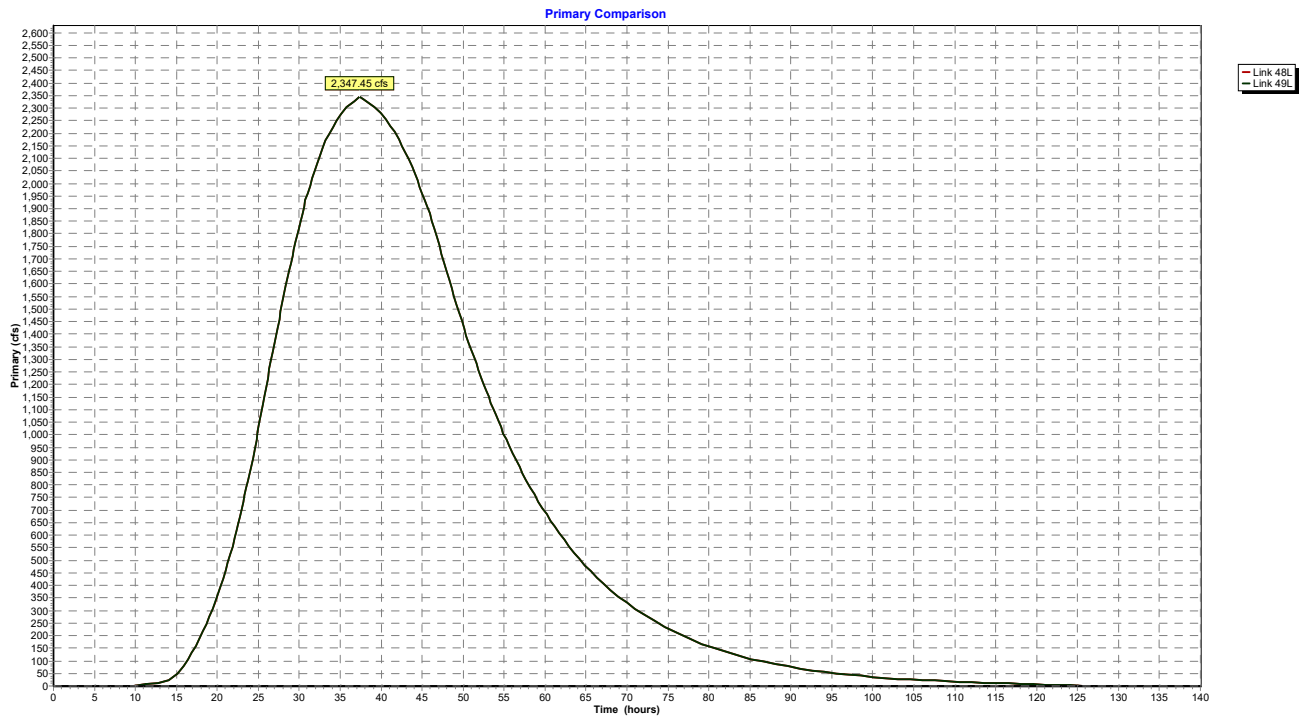


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NOAA 24-hr C 2-Year Rainfall=3.31"



LINK 48L - EXISTING CREEK FLOW
LINK 49L - PROPOSED CREEK FLOW

ex-pr vs. Assunpink Creek

NOAA 24-hr C 2-Year Rainfall=3.31"

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Primary Comparison

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
0.00	0.00	0.00	5.30	0.47	0.39	10.60	2.47	2.16
0.10	0.00	0.00	5.40	0.48	0.40	10.70	2.70	2.36
0.20	0.00	0.00	5.50	0.48	0.41	10.80	2.96	2.56
0.30	0.00	0.00	5.60	0.49	0.41	10.90	3.23	2.77
0.40	0.00	0.00	5.70	0.50	0.42	11.00	3.50	2.98
0.50	0.00	0.00	5.80	0.51	0.42	11.10	3.87	3.33
0.60	0.00	0.00	5.90	0.52	0.43	11.20	4.35	3.72
0.70	0.00	0.00	6.00	0.52	0.44	11.30	4.85	4.12
0.80	0.00	0.00	6.10	0.53	0.45	11.40	5.37	4.53
0.90	0.00	0.00	6.20	0.55	0.46	11.50	5.88	4.95
1.00	0.00	0.00	6.30	0.57	0.48	11.60	7.23	6.67
1.10	0.00	0.00	6.40	0.58	0.49	11.70	9.10	7.65
1.20	0.00	0.00	6.50	0.60	0.51	11.80	11.01	9.79
1.30	0.01	0.01	6.60	0.62	0.52	11.90	14.74	13.41
1.40	0.03	0.03	6.70	0.64	0.54	12.00	22.34	21.64
1.50	0.04	0.04	6.80	0.65	0.55	12.10	36.85	35.30
1.60	0.06	0.05	6.90	0.67	0.57	12.20	38.36	25.37
1.70	0.07	0.07	7.00	0.69	0.58	12.30	22.35	17.79
1.80	0.09	0.08	7.10	0.71	0.60	12.40	14.85	13.69
1.90	0.10	0.09	7.20	0.73	0.61	12.50	11.53	11.60
2.00	0.12	0.10	7.30	0.75	0.63	12.60	9.53	9.10
2.10	0.13	0.11	7.40	0.76	0.64	12.70	7.60	7.78
2.20	0.15	0.13	7.50	0.78	0.66	12.80	6.85	7.02
2.30	0.16	0.14	7.60	0.80	0.67	12.90	6.35	6.42
2.40	0.18	0.15	7.70	0.82	0.69	13.00	5.89	5.90
2.50	0.19	0.16	7.80	0.84	0.70	13.10	5.44	5.44
2.60	0.20	0.17	7.90	0.86	0.72	13.20	5.35	5.39
2.70	0.21	0.18	8.00	0.88	0.74	13.30	7.06	7.10
2.80	0.23	0.19	8.10	0.90	0.75	13.40	9.08	9.10
2.90	0.24	0.20	8.20	0.91	0.77	13.50	11.10	11.12
3.00	0.25	0.21	8.30	0.93	0.78	13.60	13.13	13.15
3.10	0.26	0.22	8.40	0.95	0.80	13.70	15.22	15.28
3.20	0.27	0.23	8.50	0.97	0.81	13.80	17.41	17.46
3.30	0.28	0.24	8.60	0.99	0.83	13.90	19.62	19.66
3.40	0.29	0.25	8.70	1.01	0.84	14.00	21.84	21.87
3.50	0.30	0.26	8.80	1.03	0.86	14.10	24.06	24.08
3.60	0.32	0.27	8.90	1.06	0.89	14.20	26.29	26.30
3.70	0.33	0.27	9.00	1.10	0.93	14.30	28.51	28.52
3.80	0.34	0.28	9.10	1.16	0.99	14.40	30.73	30.74
3.90	0.34	0.29	9.20	1.23	1.06	14.50	32.95	32.96
4.00	0.35	0.30	9.30	1.31	1.13	14.60	35.17	35.18
4.10	0.36	0.31	9.40	1.39	1.20	14.70	37.39	37.40
4.20	0.37	0.31	9.50	1.47	1.27	14.80	39.61	39.63
4.30	0.38	0.32	9.60	1.55	1.34	14.90	41.83	41.85
4.40	0.39	0.33	9.70	1.64	1.41	15.00	44.05	44.07
4.50	0.40	0.34	9.80	1.72	1.49	15.10	46.27	46.29
4.60	0.41	0.34	9.90	1.80	1.57	15.20	48.51	48.54
4.70	0.42	0.35	10.00	1.89	1.64	15.30	50.77	50.80
4.80	0.43	0.36	10.10	1.97	1.71	15.40	53.42	53.45
4.90	0.44	0.37	10.20	2.06	1.78	15.50	58.31	58.34
5.00	0.44	0.37	10.30	2.14	1.85	15.60	63.58	63.60
5.10	0.45	0.38	10.40	2.23	1.92	15.70	68.84	68.87
5.20	0.46	0.39	10.50	2.32	2.00	15.80	74.11	74.13

ex-pr vs. Assunpink Creek

NOAA 24-hr C 2-Year Rainfall=3.31"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
15.90	79.38	79.40	21.20	481.61	481.71	26.50	1,285.63	1,285.82
16.00	84.65	84.67	21.30	492.22	492.32	26.60	1,302.20	1,302.40
16.10	89.91	89.93	21.40	502.83	502.93	26.70	1,318.78	1,318.98
16.20	95.18	95.20	21.50	513.44	513.54	26.80	1,335.36	1,335.56
16.30	100.45	100.47	21.60	524.05	524.15	26.90	1,351.94	1,352.14
16.40	105.71	105.73	21.70	534.66	534.76	27.00	1,368.52	1,368.72
16.50	110.98	111.00	21.80	545.27	545.38	27.10	1,385.10	1,385.29
16.60	116.25	116.27	21.90	555.89	555.99	27.20	1,401.68	1,401.87
16.70	121.52	121.54	22.00	566.96	567.06	27.30	1,418.25	1,418.45
16.80	126.78	126.81	22.10	580.82	580.93	27.40	1,434.83	1,435.03
16.90	132.05	132.08	22.20	595.15	595.26	27.50	1,451.41	1,451.61
17.00	137.32	137.35	22.30	609.49	609.59	27.60	1,467.99	1,468.19
17.10	142.59	142.62	22.40	623.81	623.92	27.70	1,484.57	1,484.76
17.20	147.85	147.89	22.50	638.14	638.25	27.80	1,501.15	1,501.34
17.30	153.12	153.16	22.60	652.47	652.58	27.90	1,517.73	1,517.92
17.40	158.39	158.43	22.70	666.80	666.91	28.00	1,534.30	1,534.50
17.50	163.65	163.70	22.80	681.13	681.24	28.10	1,550.88	1,551.08
17.60	169.20	169.25	22.90	695.46	695.57	28.20	1,567.46	1,567.66
17.70	176.37	176.43	23.00	709.79	709.90	28.30	1,584.04	1,584.23
17.80	183.82	183.88	23.10	724.12	724.23	28.40	1,600.62	1,600.81
17.90	191.28	191.34	23.20	738.45	738.56	28.50	1,617.20	1,617.39
18.00	198.73	198.79	23.30	752.78	752.89	28.60	1,633.45	1,633.64
18.10	206.18	206.24	23.40	767.11	767.23	28.70	1,647.74	1,647.93
18.20	213.63	213.71	23.50	781.44	781.56	28.80	1,661.70	1,661.89
18.30	221.10	221.17	23.60	795.77	795.89	28.90	1,675.66	1,675.86
18.40	228.56	228.64	23.70	810.10	810.22	29.00	1,689.63	1,689.82
18.50	236.03	236.10	23.80	824.43	824.55	29.10	1,703.59	1,703.78
18.60	243.49	243.57	23.90	838.76	838.88	29.20	1,717.55	1,717.68
18.70	250.96	251.03	24.00	853.13	853.26	29.30	1,731.51	1,731.60
18.80	258.42	258.50	24.10	867.32	867.33	29.40	1,745.48	1,745.53
18.90	265.89	265.96	24.20	881.78	881.96	29.50	1,759.44	1,759.47
19.00	273.35	273.43	24.30	898.92	899.13	29.60	1,773.40	1,773.42
19.10	280.82	280.90	24.40	916.53	916.74	29.70	1,787.36	1,787.38
19.20	288.28	288.36	24.50	934.16	934.36	29.80	1,801.33	1,801.34
19.30	295.75	295.83	24.60	951.78	951.98	29.90	1,815.29	1,815.29
19.40	303.21	303.29	24.70	969.41	969.61	30.00	1,829.25	1,829.25
19.50	310.68	310.76	24.80	987.03	987.23	30.10	1,843.21	1,843.22
19.60	318.14	318.22	24.90	1,004.66	1,004.86	30.20	1,857.17	1,857.18
19.70	325.61	325.69	25.00	1,022.28	1,022.48	30.30	1,871.14	1,871.14
19.80	333.47	333.55	25.10	1,039.91	1,040.11	30.40	1,885.10	1,885.10
19.90	343.68	343.77	25.20	1,057.54	1,057.74	30.50	1,899.06	1,899.06
20.00	354.29	354.38	25.30	1,075.16	1,075.36	30.60	1,913.02	1,913.02
20.10	364.90	364.99	25.40	1,092.79	1,092.99	30.70	1,926.99	1,926.99
20.20	375.51	375.60	25.50	1,110.41	1,110.61	30.80	1,940.46	1,940.46
20.30	386.12	386.21	25.60	1,128.04	1,128.24	30.90	1,951.00	1,951.00
20.40	396.73	396.82	25.70	1,145.67	1,145.86	31.00	1,961.06	1,961.06
20.50	407.34	407.43	25.80	1,163.29	1,163.49	31.10	1,971.11	1,971.11
20.60	417.95	418.05	25.90	1,180.92	1,181.12	31.20	1,981.17	1,981.17
20.70	428.56	428.65	26.00	1,198.54	1,198.74	31.30	1,991.22	1,991.22
20.80	439.17	439.27	26.10	1,216.17	1,216.37	31.40	2,001.28	2,001.28
20.90	449.78	449.88	26.20	1,233.80	1,233.99	31.50	2,011.33	2,011.33
21.00	460.39	460.49	26.30	1,251.42	1,251.62	31.60	2,021.39	2,021.39
21.10	471.00	471.10	26.40	1,268.92	1,269.11	31.70	2,031.44	2,031.44

**END OF PROPOSED
STORMWATER RUNOFF
FOR PROPOSED SITE**

**NO CHANGE IN TIME TO
PEAK OR PEAK FLOW
WITHIN ASSUNPINK CREEK**

ex-pr vs. Assunpink Creek

NOAA 24-hr C 2-Year Rainfall=3.31"

Prepared by Bohler Engineering NJ, LLC

HydroCAD® 10.00-23 s/n 02612 © 2018 HydroCAD Software Solutions LLC

Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
31.80	2,041.50	2,041.50	37.10	2,339.59	2,339.59	42.40	2,160.07	2,160.07
31.90	2,051.55	2,051.55	37.20	2,342.42	2,342.42	42.50	2,153.22	2,153.22
32.00	2,061.61	2,061.61	37.30	2,345.26	2,345.26	42.60	2,146.37	2,146.37
32.10	2,071.66	2,071.66	37.40	2,347.44	2,347.44	42.70	2,139.52	2,139.52
32.20	2,081.72	2,081.72	37.50	2,345.68	2,345.68	42.80	2,132.67	2,132.67
32.30	2,091.77	2,091.77	37.60	2,343.26	2,343.26	42.90	2,125.82	2,125.82
32.40	2,101.83	2,101.83	37.70	2,340.85	2,340.85	43.00	2,118.97	2,118.97
32.50	2,111.88	2,111.88	37.80	2,338.43	2,338.43	43.10	2,112.13	2,112.13
32.60	2,121.93	2,121.93	37.90	2,336.01	2,336.01	43.20	2,105.28	2,105.28
32.70	2,131.99	2,131.99	38.00	2,333.59	2,333.59	43.30	2,098.43	2,098.43
32.80	2,142.04	2,142.04	38.10	2,331.17	2,331.17	43.40	2,091.58	2,091.58
32.90	2,152.10	2,152.10	38.20	2,328.76	2,328.76	43.50	2,084.73	2,084.73
33.00	2,161.60	2,161.60	38.30	2,326.34	2,326.34	43.60	2,077.88	2,077.88
33.10	2,167.77	2,167.77	38.40	2,323.92	2,323.92	43.70	2,071.03	2,071.03
33.20	2,173.38	2,173.38	38.50	2,321.50	2,321.50	43.80	2,064.18	2,064.18
33.30	2,179.00	2,179.00	38.60	2,319.08	2,319.08	43.90	2,057.33	2,057.33
33.40	2,184.61	2,184.61	38.70	2,316.66	2,316.66	44.00	2,050.22	2,050.22
33.50	2,190.22	2,190.22	38.80	2,314.25	2,314.25	44.10	2,041.54	2,041.54
33.60	2,195.84	2,195.84	38.90	2,311.83	2,311.83	44.20	2,032.59	2,032.59
33.70	2,201.45	2,201.45	39.00	2,309.41	2,309.41	44.30	2,023.64	2,023.64
33.80	2,207.06	2,207.06	39.10	2,306.99	2,306.99	44.40	2,014.69	2,014.69
33.90	2,212.68	2,212.68	39.20	2,304.57	2,304.57	44.50	2,005.75	2,005.75
34.00	2,218.29	2,218.29	39.30	2,302.16	2,302.16	44.60	1,996.80	1,996.80
34.10	2,223.91	2,223.91	39.40	2,299.74	2,299.74	44.70	1,987.85	1,987.85
34.20	2,229.52	2,229.52	39.50	2,297.32	2,297.32	44.80	1,978.90	1,978.90
34.30	2,235.13	2,235.13	39.60	2,294.67	2,294.67	44.90	1,969.96	1,969.96
34.40	2,240.75	2,240.75	39.70	2,290.64	2,290.64	45.00	1,961.01	1,961.01
34.50	2,246.36	2,246.36	39.80	2,286.38	2,286.38	45.10	1,952.06	1,952.06
34.60	2,251.98	2,251.98	39.90	2,282.12	2,282.12	45.20	1,943.11	1,943.11
34.70	2,257.59	2,257.59	40.00	2,277.86	2,277.86	45.30	1,934.17	1,934.17
34.80	2,263.20	2,263.20	40.10	2,273.60	2,273.60	45.40	1,925.22	1,925.22
34.90	2,268.82	2,268.82	40.20	2,269.34	2,269.34	45.50	1,916.27	1,916.27
35.00	2,274.43	2,274.43	40.30	2,265.08	2,265.08	45.60	1,907.32	1,907.32
35.10	2,280.05	2,280.05	40.40	2,260.82	2,260.82	45.70	1,898.38	1,898.38
35.20	2,285.31	2,285.31	40.50	2,256.55	2,256.55	45.80	1,889.43	1,889.43
35.30	2,288.50	2,288.50	40.60	2,252.29	2,252.29	45.90	1,880.48	1,880.48
35.40	2,291.34	2,291.34	40.70	2,248.03	2,248.03	46.00	1,871.54	1,871.54
35.50	2,294.17	2,294.17	40.80	2,243.77	2,243.77	46.10	1,862.59	1,862.59
35.60	2,297.01	2,297.01	40.90	2,239.51	2,239.51	46.20	1,853.34	1,853.34
35.70	2,299.85	2,299.85	41.00	2,235.25	2,235.25	46.30	1,842.29	1,842.29
35.80	2,302.69	2,302.69	41.10	2,230.99	2,230.99	46.40	1,830.93	1,830.93
35.90	2,305.53	2,305.53	41.20	2,226.73	2,226.73	46.50	1,819.58	1,819.58
36.00	2,308.37	2,308.37	41.30	2,222.47	2,222.47	46.60	1,808.22	1,808.22
36.10	2,311.20	2,311.20	41.40	2,218.21	2,218.21	46.70	1,796.87	1,796.87
36.20	2,314.04	2,314.04	41.50	2,213.95	2,213.95	46.80	1,785.51	1,785.51
36.30	2,316.88	2,316.88	41.60	2,209.69	2,209.69	46.90	1,774.16	1,774.16
36.40	2,319.72	2,319.72	41.70	2,205.42	2,205.42	47.00	1,762.80	1,762.80
36.50	2,322.56	2,322.56	41.80	2,200.84	2,200.84	47.10	1,751.45	1,751.45
36.60	2,325.39	2,325.39	41.90	2,194.31	2,194.31	47.20	1,740.09	1,740.09
36.70	2,328.23	2,328.23	42.00	2,187.47	2,187.47	47.30	1,728.74	1,728.74
36.80	2,331.07	2,331.07	42.10	2,180.62	2,180.62	47.40	1,717.38	1,717.38
36.90	2,333.91	2,333.91	42.20	2,173.77	2,173.77	47.50	1,706.03	1,706.03
37.00	2,336.75	2,336.75	42.30	2,166.92	2,166.92	47.60	1,694.67	1,694.67

THERE IS NO INCREASE, COMPARED TO THE PRE-CONSTRUCTION (EXISTING) CONDITION IN THE PEAK RUNOFF RATE OF STORMWATER LEAVING THE SITE AND THE INCREASE INCREASED VOLUME AND CHANGE IN TIMING FOR STORMWATER RUNOFF IS NOT EXPECTED TO INCREASED FLOOD DAMAGE AR OR DOWNSTREAM OF THE SITE.

ex-pr vs. Assunpink Creek

NOAA 24-hr C 2-Year Rainfall=3.31"

Prepared by Bohler Engineering NJ, LLC

HydroCAD® 10.00-23 s/n 02612 © 2018 HydroCAD Software Solutions LLC

Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
47.70	1,683.32	1,683.32	53.00	1,159.27	1,159.27	58.30	784.72	784.72
47.80	1,671.97	1,671.97	53.10	1,151.23	1,151.23	58.40	779.03	779.03
47.90	1,660.61	1,660.61	53.20	1,143.19	1,143.19	58.50	773.34	773.34
48.00	1,649.26	1,649.26	53.30	1,135.15	1,135.15	58.60	767.64	767.64
48.10	1,637.90	1,637.90	53.40	1,127.11	1,127.11	58.70	761.95	761.95
48.20	1,626.55	1,626.55	53.50	1,119.07	1,119.07	58.80	756.26	756.26
48.30	1,615.19	1,615.19	53.60	1,111.03	1,111.03	58.90	750.57	750.57
48.40	1,603.95	1,603.95	53.70	1,103.00	1,103.00	59.00	744.87	744.87
48.50	1,593.35	1,593.35	53.80	1,094.96	1,094.96	59.10	739.18	739.18
48.60	1,582.86	1,582.86	53.90	1,086.92	1,086.92	59.20	733.49	733.49
48.70	1,572.37	1,572.37	54.00	1,078.88	1,078.88	59.30	727.80	727.80
48.80	1,561.89	1,561.89	54.10	1,070.84	1,070.84	59.40	722.21	722.21
48.90	1,551.40	1,551.40	54.20	1,062.80	1,062.80	59.50	717.25	717.25
49.00	1,540.91	1,540.91	54.30	1,054.76	1,054.76	59.60	712.40	712.40
49.10	1,530.43	1,530.43	54.40	1,046.72	1,046.72	59.70	707.54	707.54
49.20	1,519.94	1,519.94	54.50	1,038.68	1,038.68	59.80	702.69	702.69
49.30	1,509.45	1,509.45	54.60	1,030.64	1,030.64	59.90	697.83	697.83
49.40	1,498.96	1,498.96	54.70	1,022.60	1,022.60	60.00	692.98	692.98
49.50	1,488.48	1,488.48	54.80	1,014.56	1,014.56	60.10	688.13	688.13
49.60	1,477.99	1,477.99	54.90	1,006.52	1,006.52	60.20	683.27	683.27
49.70	1,467.50	1,467.50	55.00	998.63	998.63	60.30	678.42	678.42
49.80	1,457.01	1,457.01	55.10	991.61	991.61	60.40	673.57	673.57
49.90	1,446.53	1,446.53	55.20	984.74	984.74	60.50	668.71	668.71
50.00	1,436.04	1,436.04	55.30	977.87	977.87	60.60	663.86	663.86
50.10	1,425.55	1,425.55	55.40	971.00	971.00	60.70	659.00	659.00
50.20	1,415.06	1,415.06	55.50	964.13	964.13	60.80	654.15	654.15
50.30	1,404.58	1,404.58	55.60	957.26	957.26	60.90	649.30	649.30
50.40	1,394.09	1,394.09	55.70	950.39	950.39	61.00	644.44	644.44
50.50	1,383.60	1,383.60	55.80	943.52	943.52	61.10	639.59	639.59
50.60	1,373.30	1,373.30	55.90	936.65	936.65	61.20	634.74	634.74
50.70	1,364.13	1,364.13	56.00	929.78	929.78	61.30	629.88	629.88
50.80	1,355.14	1,355.14	56.10	922.91	922.91	61.40	625.03	625.03
50.90	1,346.15	1,346.15	56.20	916.04	916.04	61.50	620.17	620.17
51.00	1,337.16	1,337.16	56.30	909.17	909.17	61.60	615.38	615.38
51.10	1,328.17	1,328.17	56.40	902.30	902.30	61.70	610.97	610.97
51.20	1,319.18	1,319.18	56.50	895.43	895.43	61.80	606.62	606.62
51.30	1,310.19	1,310.19	56.60	888.56	888.56	61.90	602.27	602.27
51.40	1,301.20	1,301.20	56.70	881.69	881.69	62.00	597.92	597.92
51.50	1,292.21	1,292.21	56.80	874.82	874.82	62.10	593.58	593.58
51.60	1,283.22	1,283.22	56.90	867.95	867.95	62.20	589.23	589.23
51.70	1,274.23	1,274.23	57.00	861.08	861.08	62.30	584.88	584.88
51.80	1,265.24	1,265.24	57.10	854.21	854.21	62.40	580.53	580.53
51.90	1,256.25	1,256.25	57.20	847.49	847.49	62.50	576.18	576.18
52.00	1,247.26	1,247.26	57.30	841.65	841.65	62.60	571.83	571.83
52.10	1,238.28	1,238.28	57.40	835.96	835.96	62.70	567.48	567.48
52.20	1,229.29	1,229.29	57.50	830.26	830.26	62.80	563.13	563.13
52.30	1,220.30	1,220.30	57.60	824.57	824.57	62.90	558.78	558.78
52.40	1,211.31	1,211.31	57.70	818.88	818.88	63.00	554.43	554.43
52.50	1,202.32	1,202.32	57.80	813.19	813.19	63.10	550.08	550.08
52.60	1,193.33	1,193.33	57.90	807.49	807.49	63.20	545.74	545.74
52.70	1,184.34	1,184.34	58.00	801.80	801.80	63.30	541.39	541.39
52.80	1,175.47	1,175.47	58.10	796.11	796.11	63.40	537.04	537.04
52.90	1,167.31	1,167.31	58.20	790.42	790.42	63.50	532.69	532.69

ex-pr vs. Assunpink Creek

NOAA 24-hr C 2-Year Rainfall=3.31"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
63.60	528.34	528.34	68.90	358.24	358.24	74.20	241.94	241.94
63.70	523.99	523.99	69.00	355.67	355.67	74.30	240.06	240.06
63.80	519.74	519.74	69.10	353.10	353.10	74.40	238.17	238.17
63.90	516.07	516.07	69.20	350.52	350.52	74.50	236.28	236.28
64.00	512.50	512.50	69.30	347.95	347.95	74.60	234.40	234.40
64.10	508.93	508.93	69.40	345.38	345.38	74.70	232.51	232.51
64.20	505.36	505.36	69.50	342.81	342.81	74.80	230.67	230.67
64.30	501.79	501.79	69.60	340.23	340.23	74.90	229.10	229.10
64.40	498.21	498.21	69.70	337.66	337.66	75.00	227.57	227.57
64.50	494.64	494.64	69.80	335.09	335.09	75.10	226.05	226.05
64.60	491.07	491.07	69.90	332.52	332.52	75.20	224.52	224.52
64.70	487.50	487.50	70.00	329.94	329.94	75.30	222.99	222.99
64.80	483.93	483.93	70.10	327.37	327.37	75.40	221.47	221.47
64.90	480.36	480.36	70.20	324.80	324.80	75.50	219.94	219.94
65.00	476.79	476.79	70.30	322.23	322.23	75.60	218.41	218.41
65.10	473.22	473.22	70.40	319.71	319.71	75.70	216.89	216.89
65.20	469.65	469.65	70.50	317.49	317.49	75.80	215.36	215.36
65.30	466.08	466.08	70.60	315.33	315.33	75.90	213.83	213.83
65.40	462.50	462.50	70.70	313.17	313.17	76.00	212.31	212.31
65.50	458.93	458.93	70.80	311.01	311.01	76.10	210.78	210.78
65.60	455.36	455.36	70.90	308.85	308.85	76.20	209.25	209.25
65.70	451.79	451.79	71.00	306.69	306.69	76.30	207.73	207.73
65.80	448.22	448.22	71.10	304.53	304.53	76.40	206.20	206.20
65.90	444.65	444.65	71.20	302.37	302.37	76.50	204.68	204.68
66.00	441.16	441.16	71.30	300.20	300.20	76.60	203.15	203.15
66.10	438.13	438.13	71.40	298.04	298.04	76.70	201.62	201.62
66.20	435.18	435.18	71.50	295.88	295.88	76.80	200.10	200.10
66.30	432.24	432.24	71.60	293.72	293.72	76.90	198.57	198.57
66.40	429.29	429.29	71.70	291.56	291.56	77.00	197.05	197.05
66.50	426.34	426.34	71.80	289.40	289.40	77.10	195.60	195.60
66.60	423.40	423.40	71.90	287.24	287.24	77.20	194.17	194.17
66.70	420.45	420.45	72.00	285.08	285.08	77.30	192.73	192.73
66.80	417.50	417.50	72.10	282.92	282.92	77.40	191.29	191.29
66.90	414.56	414.56	72.20	280.75	280.75	77.50	189.85	189.85
67.00	411.61	411.61	72.30	278.59	278.59	77.60	188.42	188.42
67.10	408.66	408.66	72.40	276.43	276.43	77.70	186.98	186.98
67.20	405.72	405.72	72.50	274.27	274.27	77.80	185.54	185.54
67.30	402.77	402.77	72.60	272.14	272.14	77.90	184.10	184.10
67.40	399.82	399.82	72.70	270.22	270.22	78.00	182.67	182.67
67.50	396.87	396.87	72.80	268.34	268.34	78.10	181.23	181.23
67.60	393.93	393.93	72.90	266.45	266.45	78.20	179.79	179.79
67.70	390.98	390.98	73.00	264.57	264.57	78.30	178.35	178.35
67.80	388.03	388.03	73.10	262.68	262.68	78.40	176.92	176.92
67.90	385.09	385.09	73.20	260.80	260.80	78.50	175.48	175.48
68.00	382.14	382.14	73.30	258.91	258.91	78.60	174.04	174.04
68.10	379.19	379.19	73.40	257.03	257.03	78.70	172.60	172.60
68.20	376.29	376.29	73.50	255.14	255.14	78.80	171.17	171.17
68.30	373.67	373.67	73.60	253.25	253.25	78.90	169.73	169.73
68.40	371.10	371.10	73.70	251.37	251.37	79.00	168.29	168.29
68.50	368.53	368.53	73.80	249.48	249.48	79.10	166.85	166.85
68.60	365.96	365.96	73.90	247.60	247.60	79.20	165.46	165.46
68.70	363.38	363.38	74.00	245.71	245.71	79.30	164.32	164.32
68.80	360.81	360.81	74.10	243.83	243.83	79.40	163.23	163.23

ex-pr vs. Assunpink Creek

NOAA 24-hr C 2-Year Rainfall=3.31"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
79.50	162.14	162.14	84.80	109.98	109.98	90.10	74.81	74.81
79.60	161.05	161.05	84.90	109.18	109.18	90.20	74.25	74.25
79.70	159.95	159.95	85.00	108.37	108.37	90.30	73.72	73.72
79.80	158.86	158.86	85.10	107.57	107.57	90.40	73.20	73.20
79.90	157.77	157.77	85.20	106.77	106.77	90.50	72.67	72.67
80.00	156.68	156.68	85.30	105.96	105.96	90.60	72.14	72.14
80.10	155.58	155.58	85.40	105.16	105.16	90.70	71.62	71.62
80.20	154.49	154.49	85.50	104.35	104.35	90.80	71.09	71.09
80.30	153.40	153.40	85.60	103.55	103.55	90.90	70.56	70.56
80.40	152.31	152.31	85.70	102.75	102.75	91.00	70.04	70.04
80.50	151.21	151.21	85.80	101.96	101.96	91.10	69.51	69.51
80.60	150.12	150.12	85.90	101.24	101.24	91.20	68.98	68.98
80.70	149.03	149.03	86.00	100.54	100.54	91.30	68.46	68.46
80.80	147.94	147.94	86.10	99.84	99.84	91.40	67.93	67.93
80.90	146.84	146.84	86.20	99.14	99.14	91.50	67.40	67.40
81.00	145.75	145.75	86.30	98.45	98.45	91.60	66.88	66.88
81.10	144.66	144.66	86.40	97.75	97.75	91.70	66.35	66.35
81.20	143.57	143.57	86.50	97.05	97.05	91.80	65.83	65.83
81.30	142.47	142.47	86.60	96.35	96.35	91.90	65.30	65.30
81.40	141.39	141.39	86.70	95.65	95.65	92.00	64.77	64.77
81.50	140.39	140.39	86.80	94.95	94.95	92.10	64.25	64.25
81.60	139.40	139.40	86.90	94.25	94.25	92.20	63.72	63.72
81.70	138.42	138.42	87.00	93.55	93.55	92.30	63.19	63.19
81.80	137.43	137.43	87.10	92.85	92.85	92.40	62.68	62.68
81.90	136.44	136.44	87.20	92.15	92.15	92.50	62.26	62.26
82.00	135.45	135.45	87.30	91.45	91.45	92.60	61.85	61.85
82.10	134.46	134.46	87.40	90.75	90.75	92.70	61.45	61.45
82.20	133.47	133.47	87.50	90.05	90.05	92.80	61.04	61.04
82.30	132.48	132.48	87.60	89.35	89.35	92.90	60.63	60.63
82.40	131.49	131.49	87.70	88.65	88.65	93.00	60.22	60.22
82.50	130.50	130.50	87.80	87.95	87.95	93.10	59.82	59.82
82.60	129.52	129.52	87.90	87.25	87.25	93.20	59.41	59.41
82.70	128.53	128.53	88.00	86.57	86.57	93.30	59.00	59.00
82.80	127.54	127.54	88.10	85.99	85.99	93.40	58.60	58.60
82.90	126.55	126.55	88.20	85.43	85.43	93.50	58.19	58.19
83.00	125.56	125.56	88.30	84.87	84.87	93.60	57.78	57.78
83.10	124.57	124.57	88.40	84.32	84.32	93.70	57.37	57.37
83.20	123.58	123.58	88.50	83.76	83.76	93.80	56.97	56.97
83.30	122.59	122.59	88.60	83.20	83.20	93.90	56.56	56.56
83.40	121.61	121.61	88.70	82.64	82.64	94.00	56.15	56.15
83.50	120.62	120.62	88.80	82.08	82.08	94.10	55.74	55.74
83.60	119.65	119.65	88.90	81.52	81.52	94.20	55.34	55.34
83.70	118.82	118.82	89.00	80.96	80.96	94.30	54.93	54.93
83.80	118.02	118.02	89.10	80.40	80.40	94.40	54.52	54.52
83.90	117.22	117.22	89.20	79.84	79.84	94.50	54.12	54.12
84.00	116.41	116.41	89.30	79.28	79.28	94.60	53.71	53.71
84.10	115.61	115.61	89.40	78.72	78.72	94.70	53.32	53.32
84.20	114.80	114.80	89.50	78.16	78.16	94.80	52.92	52.92
84.30	114.00	114.00	89.60	77.60	77.60	94.90	52.53	52.53
84.40	113.20	113.20	89.70	77.04	77.04	95.00	52.14	52.14
84.50	112.39	112.39	89.80	76.49	76.49	95.10	51.74	51.74
84.60	111.59	111.59	89.90	75.93	75.93	95.20	51.35	51.35
84.70	110.79	110.79	90.00	75.37	75.37	95.30	50.96	50.96

ex-pr vs. Assunpink Creek

NOAA 24-hr C 2-Year Rainfall=3.31"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
95.40	50.57	50.57	100.70	34.15	34.15	106.00	23.19	23.19
95.50	50.17	50.17	100.80	33.87	33.87	106.10	23.04	23.04
95.60	49.78	49.78	100.90	33.59	33.59	106.20	22.89	22.89
95.70	49.39	49.39	101.00	33.32	33.32	106.30	22.74	22.74
95.80	48.99	48.99	101.10	33.04	33.04	106.40	22.59	22.59
95.90	48.60	48.60	101.20	32.77	32.77	106.50	22.43	22.43
96.00	48.21	48.21	101.30	32.52	32.52	106.60	22.28	22.28
96.10	47.82	47.82	101.40	32.28	32.28	106.70	22.13	22.13
96.20	47.42	47.42	101.50	32.04	32.04	106.80	21.98	21.98
96.30	47.03	47.03	101.60	31.80	31.80	106.90	21.83	21.83
96.40	46.64	46.64	101.70	31.56	31.56	107.00	21.67	21.67
96.50	46.24	46.24	101.80	31.32	31.32	107.10	21.52	21.52
96.60	45.85	45.85	101.90	31.08	31.08	107.20	21.37	21.37
96.70	45.46	45.46	102.00	30.83	30.83	107.30	21.22	21.22
96.80	45.08	45.08	102.10	30.59	30.59	107.40	21.06	21.06
96.90	44.78	44.78	102.20	30.35	30.35	107.50	20.91	20.91
97.00	44.50	44.50	102.30	30.11	30.11	107.60	20.76	20.76
97.10	44.22	44.22	102.40	29.87	29.87	107.70	20.61	20.61
97.20	43.94	43.94	102.50	29.63	29.63	107.80	20.46	20.46
97.30	43.66	43.66	102.60	29.39	29.39	107.90	20.33	20.33
97.40	43.37	43.37	102.70	29.15	29.15	108.00	20.20	20.20
97.50	43.09	43.09	102.80	28.91	28.91	108.10	20.07	20.07
97.60	42.81	42.81	102.90	28.67	28.67	108.20	19.94	19.94
97.70	42.53	42.53	103.00	28.43	28.43	108.30	19.81	19.81
97.80	42.25	42.25	103.10	28.19	28.19	108.40	19.68	19.68
97.90	41.96	41.96	103.20	27.94	27.94	108.50	19.55	19.55
98.00	41.68	41.68	103.30	27.70	27.70	108.60	19.42	19.42
98.10	41.40	41.40	103.40	27.47	27.47	108.70	19.29	19.29
98.20	41.12	41.12	103.50	27.30	27.30	108.80	19.16	19.16
98.30	40.84	40.84	103.60	27.13	27.13	108.90	19.03	19.03
98.40	40.56	40.56	103.70	26.96	26.96	109.00	18.90	18.90
98.50	40.27	40.27	103.80	26.80	26.80	109.10	18.77	18.77
98.60	39.99	39.99	103.90	26.63	26.63	109.20	18.64	18.64
98.70	39.71	39.71	104.00	26.46	26.46	109.30	18.51	18.51
98.80	39.43	39.43	104.10	26.30	26.30	109.40	18.38	18.38
98.90	39.15	39.15	104.20	26.13	26.13	109.50	18.25	18.25
99.00	38.86	38.86	104.30	25.97	25.97	109.60	18.12	18.12
99.10	38.59	38.59	104.40	25.80	25.80	109.70	17.99	17.99
99.20	38.31	38.31	104.50	25.63	25.63	109.80	17.86	17.86
99.30	38.03	38.03	104.60	25.47	25.47	109.90	17.73	17.73
99.40	37.75	37.75	104.70	25.30	25.30	110.00	17.60	17.60
99.50	37.48	37.48	104.80	25.13	25.13	110.10	17.48	17.48
99.60	37.20	37.20	104.90	24.97	24.97	110.20	17.35	17.35
99.70	36.92	36.92	105.00	24.80	24.80	110.30	17.22	17.22
99.80	36.64	36.64	105.10	24.63	24.63	110.40	17.10	17.10
99.90	36.37	36.37	105.20	24.47	24.47	110.50	16.97	16.97
100.00	36.09	36.09	105.30	24.30	24.30	110.60	16.85	16.85
100.10	35.81	35.81	105.40	24.14	24.14	110.70	16.72	16.72
100.20	35.54	35.54	105.50	23.97	23.97	110.80	16.59	16.59
100.30	35.26	35.26	105.60	23.80	23.80	110.90	16.47	16.47
100.40	34.98	34.98	105.70	23.65	23.65	111.00	16.34	16.34
100.50	34.70	34.70	105.80	23.50	23.50	111.10	16.22	16.22
100.60	34.43	34.43	105.90	23.35	23.35	111.20	16.09	16.09

ex-pr vs. Assunpink Creek

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
111.30	15.96	15.96	116.60	9.75	9.75	121.90	3.85	3.85
111.40	15.84	15.84	116.70	9.64	9.64	122.00	3.74	3.74
111.50	15.71	15.71	116.80	9.53	9.53	122.10	3.63	3.63
111.60	15.59	15.59	116.90	9.41	9.41	122.20	3.52	3.52
111.70	15.46	15.46	117.00	9.30	9.30	122.30	3.41	3.41
111.80	15.33	15.33	117.10	9.19	9.19	122.40	3.30	3.30
111.90	15.21	15.21	117.20	9.08	9.08	122.50	3.18	3.18
112.00	15.08	15.08	117.30	8.97	8.97	122.60	3.07	3.07
112.10	14.96	14.96	117.40	8.86	8.86	122.70	2.96	2.96
112.20	14.83	14.83	117.50	8.74	8.74	122.80	2.85	2.85
112.30	14.71	14.71	117.60	8.63	8.63	122.90	2.74	2.74
112.40	14.60	14.60	117.70	8.52	8.52	123.00	2.63	2.63
112.50	14.48	14.48	117.80	8.41	8.41	123.10	2.52	2.52
112.60	14.37	14.37	117.90	8.30	8.30	123.20	2.42	2.42
112.70	14.25	14.25	118.00	8.19	8.19	123.30	2.37	2.37
112.80	14.14	14.14	118.10	8.07	8.07	123.40	2.33	2.33
112.90	14.02	14.02	118.20	7.96	7.96	123.50	2.30	2.30
113.00	13.91	13.91	118.30	7.85	7.85	123.60	2.26	2.26
113.10	13.79	13.79	118.40	7.74	7.74	123.70	2.22	2.22
113.20	13.68	13.68	118.50	7.63	7.63	123.80	2.19	2.19
113.30	13.56	13.56	118.60	7.52	7.52	123.90	2.15	2.15
113.40	13.44	13.44	118.70	7.40	7.40	124.00	2.11	2.11
113.50	13.33	13.33	118.80	7.29	7.29	124.10	2.08	2.08
113.60	13.21	13.21	118.90	7.18	7.18	124.20	2.04	2.04
113.70	13.10	13.10	119.00	7.07	7.07	124.30	2.00	2.00
113.80	12.98	12.98	119.10	6.96	6.96	124.40	1.97	1.97
113.90	12.87	12.87	119.20	6.85	6.85	124.50	1.93	1.93
114.00	12.75	12.75	119.30	6.74	6.74	124.60	1.89	1.89
114.10	12.64	12.64	119.40	6.63	6.63	124.70	1.86	1.86
114.20	12.52	12.52	119.50	6.52	6.52	124.80	1.82	1.82
114.30	12.41	12.41	119.60	6.40	6.40	124.90	1.78	1.78
114.40	12.29	12.29	119.70	6.29	6.29	125.00	1.75	1.75
114.50	12.17	12.17	119.80	6.18	6.18	125.10	1.71	1.71
114.60	12.06	12.06	119.90	6.07	6.07	125.20	1.67	1.67
114.70	11.94	11.94	120.00	5.96	5.96	125.30	1.64	1.64
114.80	11.83	11.83	120.10	5.85	5.85	125.40	1.60	1.60
114.90	11.71	11.71	120.20	5.74	5.74	125.50	1.56	1.56
115.00	11.60	11.60	120.30	5.63	5.63	125.60	1.53	1.53
115.10	11.48	11.48	120.40	5.52	5.52	125.70	1.49	1.49
115.20	11.37	11.37	120.50	5.41	5.41	125.80	1.45	1.45
115.30	11.25	11.25	120.60	5.29	5.29	125.90	1.42	1.42
115.40	11.14	11.14	120.70	5.18	5.18	126.00	1.38	1.38
115.50	11.02	11.02	120.80	5.07	5.07	126.10	1.34	1.34
115.60	10.90	10.90	120.90	4.96	4.96	126.20	1.31	1.31
115.70	10.79	10.79	121.00	4.85	4.85	126.30	1.27	1.27
115.80	10.67	10.67	121.10	4.74	4.74	126.40	1.23	1.23
115.90	10.56	10.56	121.20	4.63	4.63	126.50	1.20	1.20
116.00	10.44	10.44	121.30	4.52	4.52	126.60	1.16	1.16
116.10	10.33	10.33	121.40	4.41	4.41	126.70	1.12	1.12
116.20	10.21	10.21	121.50	4.29	4.29	126.80	1.09	1.09
116.30	10.10	10.10	121.60	4.18	4.18	126.90	1.05	1.05
116.40	9.98	9.98	121.70	4.07	4.07	127.00	1.01	1.01
116.50	9.87	9.87	121.80	3.96	3.96	127.10	0.98	0.98

ex-pr vs. Assunpink Creek

NOAA 24-hr C 2-Year Rainfall=3.31"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

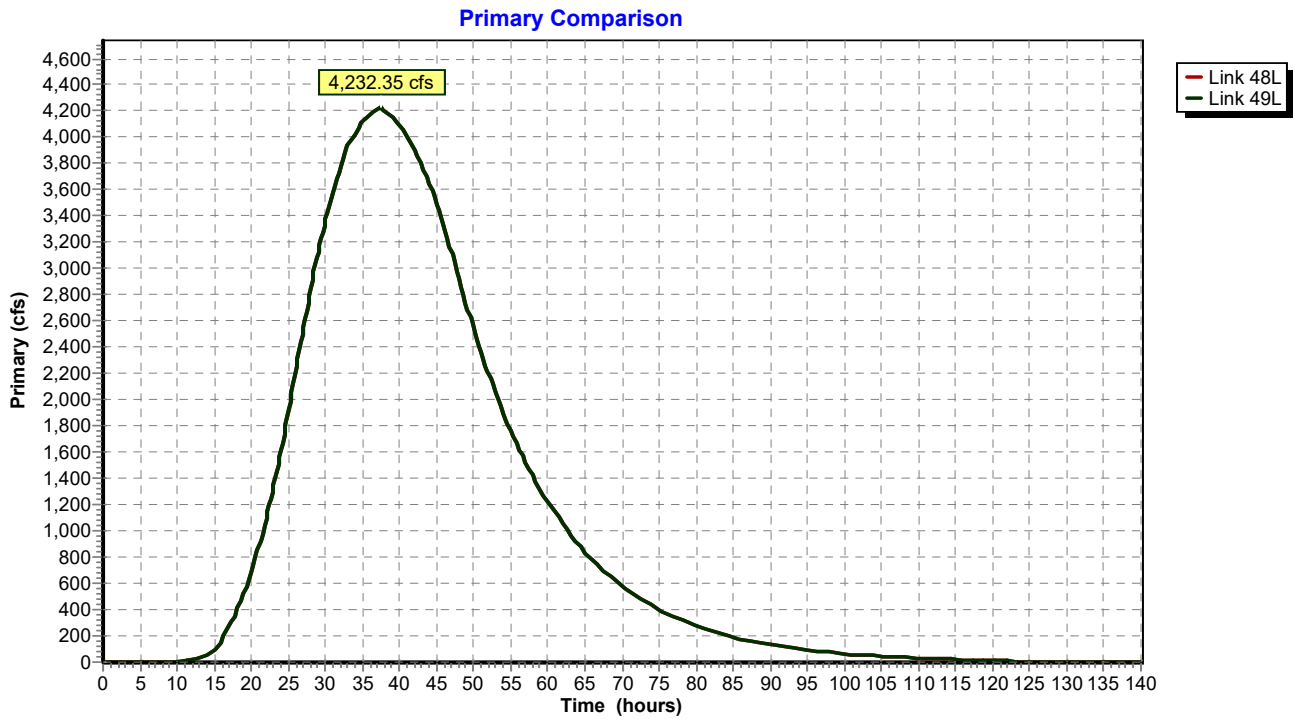
Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
127.20	0.94	0.94	132.50	0.15	0.15	137.80	0.00	0.00
127.30	0.91	0.91	132.60	0.14	0.14	137.90	0.00	0.00
127.40	0.87	0.87	132.70	0.14	0.14	138.00	0.00	0.00
127.50	0.83	0.83	132.80	0.14	0.14	138.10	0.00	0.00
127.60	0.80	0.80	132.90	0.13	0.13	138.20	0.00	0.00
127.70	0.78	0.78	133.00	0.13	0.13	138.30	0.00	0.00
127.80	0.77	0.77	133.10	0.12	0.12	138.40	0.00	0.00
127.90	0.75	0.75	133.20	0.12	0.12	138.50	0.00	0.00
128.00	0.74	0.74	133.30	0.12	0.12	138.60	0.00	0.00
128.10	0.72	0.72	133.40	0.11	0.11	138.70	0.00	0.00
128.20	0.71	0.71	133.50	0.11	0.11	138.80	0.00	0.00
128.30	0.70	0.70	133.60	0.11	0.11	138.90	0.00	0.00
128.40	0.68	0.68	133.70	0.10	0.10	139.00	0.00	0.00
128.50	0.67	0.67	133.80	0.10	0.10	139.10	0.00	0.00
128.60	0.65	0.65	133.90	0.09	0.09	139.20	0.00	0.00
128.70	0.64	0.64	134.00	0.09	0.09	139.30	0.00	0.00
128.80	0.62	0.62	134.10	0.09	0.09	139.40	0.00	0.00
128.90	0.61	0.61	134.20	0.08	0.08	139.50	0.00	0.00
129.00	0.60	0.60	134.30	0.08	0.08	139.60	0.00	0.00
129.10	0.58	0.58	134.40	0.08	0.08	139.70	0.00	0.00
129.20	0.57	0.57	134.50	0.07	0.07	139.80	0.00	0.00
129.30	0.55	0.55	134.60	0.07	0.07	139.90	0.00	0.00
129.40	0.54	0.54	134.70	0.06	0.06	140.00	0.00	0.00
129.50	0.52	0.52	134.80	0.06	0.06			
129.60	0.51	0.51	134.90	0.06	0.06			
129.70	0.50	0.50	135.00	0.05	0.05			
129.80	0.48	0.48	135.10	0.05	0.05			
129.90	0.47	0.47	135.20	0.05	0.05			
130.00	0.45	0.45	135.30	0.04	0.04			
130.10	0.44	0.44	135.40	0.04	0.04			
130.20	0.42	0.42	135.50	0.03	0.03			
130.30	0.41	0.41	135.60	0.03	0.03			
130.40	0.40	0.40	135.70	0.03	0.03			
130.50	0.38	0.38	135.80	0.02	0.02			
130.60	0.37	0.37	135.90	0.02	0.02			
130.70	0.35	0.35	136.00	0.02	0.02			
130.80	0.34	0.34	136.10	0.01	0.01			
130.90	0.32	0.32	136.20	0.01	0.01			
131.00	0.31	0.31	136.30	0.00	0.00			
131.10	0.29	0.29	136.40	0.00	0.00			
131.20	0.28	0.28	136.50	0.00	0.00			
131.30	0.27	0.27	136.60	0.00	0.00			
131.40	0.25	0.25	136.70	0.00	0.00			
131.50	0.24	0.24	136.80	0.00	0.00			
131.60	0.22	0.22	136.90	0.00	0.00			
131.70	0.21	0.21	137.00	0.00	0.00			
131.80	0.19	0.19	137.10	0.00	0.00			
131.90	0.18	0.18	137.20	0.00	0.00			
132.00	0.17	0.17	137.30	0.00	0.00			
132.10	0.16	0.16	137.40	0.00	0.00			
132.20	0.16	0.16	137.50	0.00	0.00			
132.30	0.15	0.15	137.60	0.00	0.00			
132.40	0.15	0.15	137.70	0.00	0.00			

ex-pr vs. Assunpink Creek

NOAA 24-hr C 10-Year Rainfall=5.01"

Prepared by Bohler Engineering NJ, LLC

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ex-pr vs. Assunpink Creek

NOAA 24-hr C 10-Year Rainfall=5.01"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
0.00	0.00	0.00	5.30	0.82	0.69	10.60	5.62	5.11
0.10	0.00	0.00	5.40	0.83	0.70	10.70	6.09	5.52
0.20	0.00	0.00	5.50	0.84	0.71	10.80	6.59	5.94
0.30	0.00	0.00	5.60	0.86	0.71	10.90	7.10	6.36
0.40	0.00	0.00	5.70	0.87	0.72	11.00	7.64	6.83
0.50	0.00	0.00	5.80	0.88	0.73	11.10	8.42	7.58
0.60	0.00	0.00	5.90	0.89	0.74	11.20	9.39	8.42
0.70	0.00	0.00	6.00	0.90	0.75	11.30	10.40	9.28
0.80	0.00	0.00	6.10	0.91	0.77	11.40	11.44	10.16
0.90	0.01	0.02	6.20	0.94	0.79	11.50	12.44	11.06
1.00	0.04	0.05	6.30	0.96	0.81	11.60	14.77	13.96
1.10	0.08	0.08	6.40	0.99	0.83	11.70	17.92	15.76
1.20	0.11	0.10	6.50	1.01	0.85	11.80	21.11	19.35
1.30	0.14	0.13	6.60	1.04	0.88	11.90	27.14	26.49
1.40	0.17	0.15	6.70	1.07	0.90	12.00	39.15	42.33
1.50	0.20	0.18	6.80	1.09	0.92	12.10	61.83	65.87
1.60	0.23	0.20	6.90	1.12	0.94	12.20	64.39	49.06
1.70	0.26	0.22	7.00	1.15	0.97	12.30	39.70	35.44
1.80	0.28	0.24	7.10	1.18	0.99	12.40	28.20	27.95
1.90	0.31	0.26	7.20	1.21	1.01	12.50	23.24	24.22
2.00	0.33	0.28	7.30	1.23	1.03	12.60	20.35	20.24
2.10	0.35	0.30	7.40	1.26	1.06	12.70	17.57	18.20
2.20	0.37	0.32	7.50	1.29	1.08	12.80	16.62	17.12
2.30	0.40	0.34	7.60	1.31	1.10	12.90	16.06	16.35
2.40	0.42	0.35	7.70	1.34	1.13	13.00	15.58	15.74
2.50	0.43	0.37	7.80	1.37	1.15	13.10	15.10	15.23
2.60	0.45	0.38	7.90	1.40	1.18	13.20	15.27	15.44
2.70	0.47	0.40	8.00	1.43	1.21	13.30	18.76	18.91
2.80	0.49	0.41	8.10	1.45	1.24	13.40	22.83	22.95
2.90	0.51	0.43	8.20	1.48	1.27	13.50	26.90	27.00
3.00	0.52	0.44	8.30	1.51	1.29	13.60	30.98	31.08
3.10	0.54	0.45	8.40	1.54	1.32	13.70	35.15	35.31
3.20	0.56	0.47	8.50	1.57	1.34	13.80	39.48	39.61
3.30	0.57	0.48	8.60	1.60	1.37	13.90	43.85	43.96
3.40	0.59	0.49	8.70	1.63	1.39	14.00	48.23	48.32
3.50	0.60	0.51	8.80	1.67	1.43	14.10	52.60	52.68
3.60	0.62	0.52	8.90	1.81	1.56	14.20	56.98	57.05
3.70	0.63	0.53	9.00	1.96	1.71	14.30	61.36	61.42
3.80	0.64	0.54	9.10	2.14	1.90	14.40	65.73	65.80
3.90	0.66	0.55	9.20	2.35	2.09	14.50	70.11	70.18
4.00	0.67	0.56	9.30	2.57	2.29	14.60	74.49	74.55
4.10	0.68	0.57	9.40	2.80	2.49	14.70	78.86	78.93
4.20	0.70	0.58	9.50	3.02	2.69	14.80	83.24	83.30
4.30	0.71	0.60	9.60	3.25	2.90	14.90	87.62	87.68
4.40	0.72	0.60	9.70	3.47	3.10	15.00	91.99	92.05
4.50	0.73	0.61	9.80	3.70	3.30	15.10	96.37	96.43
4.60	0.75	0.62	9.90	3.92	3.51	15.20	100.77	100.85
4.70	0.76	0.63	10.00	4.15	3.71	15.30	105.21	105.28
4.80	0.77	0.64	10.10	4.38	3.92	15.40	110.37	110.43
4.90	0.78	0.65	10.20	4.61	4.13	15.50	119.73	119.79
5.00	0.79	0.66	10.30	4.84	4.33	15.60	129.79	129.85
5.10	0.80	0.67	10.40	5.06	4.54	15.70	139.86	139.91
5.20	0.81	0.68	10.50	5.30	4.76	15.80	149.92	149.97

ex-pr vs. Assunpink Creek

NOAA 24-hr C 10-Year Rainfall=5.01"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
15.90	159.98	160.03	21.20	918.05	918.11	26.50	2,392.35	2,392.55
16.00	170.05	170.09	21.30	937.85	937.91	26.60	2,422.12	2,422.32
16.10	180.11	180.16	21.40	957.65	957.70	26.70	2,451.89	2,452.09
16.20	190.17	190.22	21.50	977.44	977.49	26.80	2,481.66	2,481.86
16.30	200.23	200.28	21.60	997.23	997.29	26.90	2,511.43	2,511.63
16.40	210.30	210.34	21.70	1,017.03	1,017.08	27.00	2,541.19	2,541.39
16.50	220.36	220.40	21.80	1,036.82	1,036.88	27.10	2,570.96	2,571.16
16.60	230.42	230.47	21.90	1,056.62	1,056.68	27.20	2,600.73	2,600.93
16.70	240.49	240.53	22.00	1,077.24	1,077.30	27.30	2,630.50	2,630.70
16.80	250.55	250.59	22.10	1,102.81	1,102.87	27.40	2,660.27	2,660.47
16.90	260.61	260.65	22.20	1,129.21	1,129.28	27.50	2,690.04	2,690.24
17.00	270.67	270.72	22.30	1,155.61	1,155.68	27.60	2,719.81	2,720.00
17.10	280.74	280.78	22.40	1,182.01	1,182.08	27.70	2,749.57	2,749.77
17.20	290.80	290.84	22.50	1,208.41	1,208.48	27.80	2,779.34	2,779.54
17.30	300.86	300.90	22.60	1,234.81	1,234.88	27.90	2,809.11	2,809.31
17.40	310.92	310.96	22.70	1,261.21	1,261.28	28.00	2,838.88	2,839.08
17.50	320.99	321.03	22.80	1,287.61	1,287.68	28.10	2,868.65	2,868.85
17.60	331.55	331.59	22.90	1,314.01	1,314.08	28.20	2,898.42	2,898.61
17.70	345.12	345.16	23.00	1,340.41	1,340.48	28.30	2,928.18	2,928.38
17.80	359.19	359.23	23.10	1,366.81	1,366.88	28.40	2,957.95	2,958.15
17.90	373.26	373.31	23.20	1,393.21	1,393.28	28.50	2,987.72	2,987.92
18.00	387.33	387.38	23.30	1,419.61	1,419.68	28.60	3,016.84	3,017.04
18.10	401.40	401.45	23.40	1,446.01	1,446.09	28.70	3,042.05	3,042.25
18.20	415.48	415.53	23.50	1,472.41	1,472.49	28.80	3,066.62	3,066.81
18.30	429.56	429.61	23.60	1,498.81	1,498.89	28.90	3,091.18	3,091.38
18.40	443.65	443.70	23.70	1,525.21	1,525.29	29.00	3,115.74	3,115.94
18.50	457.74	457.79	23.80	1,551.61	1,551.69	29.10	3,140.31	3,140.51
18.60	471.84	471.88	23.90	1,578.01	1,578.09	29.20	3,164.87	3,165.07
18.70	485.93	485.97	24.00	1,604.46	1,604.56	29.30	3,189.44	3,189.63
18.80	500.02	500.06	24.10	1,630.66	1,630.57	29.40	3,214.00	3,214.20
18.90	514.11	514.15	24.20	1,657.33	1,657.51	29.50	3,238.56	3,238.76
19.00	528.20	528.24	24.30	1,688.60	1,688.83	29.60	3,263.13	3,263.32
19.10	542.29	542.33	24.40	1,720.67	1,720.89	29.70	3,287.69	3,287.89
19.20	556.38	556.42	24.50	1,752.76	1,752.98	29.80	3,312.26	3,312.45
19.30	570.47	570.51	24.60	1,784.86	1,785.07	29.90	3,336.82	3,337.02
19.40	584.56	584.60	24.70	1,816.95	1,817.16	30.00	3,361.38	3,361.58
19.50	598.66	598.69	24.80	1,849.05	1,849.25	30.10	3,385.95	3,386.14
19.60	612.75	612.78	24.90	1,881.15	1,881.35	30.20	3,410.51	3,410.71
19.70	626.84	626.87	25.00	1,913.24	1,913.45	30.30	3,435.08	3,435.27
19.80	641.64	641.68	25.10	1,945.34	1,945.54	30.40	3,459.64	3,459.83
19.90	660.73	660.76	25.20	1,977.43	1,977.64	30.50	3,484.20	3,484.40
20.00	680.52	680.56	25.30	2,009.53	2,009.73	30.60	3,508.77	3,508.96
20.10	700.31	700.35	25.40	2,041.63	2,041.83	30.70	3,533.33	3,533.53
20.20	720.11	720.15	25.50	2,073.72	2,073.92	30.80	3,556.99	3,557.19
20.30	739.90	739.94	25.60	2,105.82	2,106.02	30.90	3,575.23	3,575.42
20.40	759.70	759.74	25.70	2,137.91	2,138.12	31.00	3,592.56	3,592.75
20.50	779.49	779.54	25.80	2,170.01	2,170.21	31.10	3,609.89	3,610.08
20.60	799.29	799.33	25.90	2,202.11	2,202.31	31.20	3,627.22	3,627.41
20.70	819.08	819.13	26.00	2,234.20	2,234.40	31.30	3,644.55	3,644.74
20.80	838.88	838.92	26.10	2,266.30	2,266.50	31.40	3,661.88	3,662.01
20.90	858.67	858.72	26.20	2,298.39	2,298.59	31.50	3,679.21	3,679.30
21.00	878.46	878.51	26.30	2,330.49	2,330.69	31.60	3,696.54	3,696.60
21.10	898.26	898.31	26.40	2,362.29	2,362.49	31.70	3,713.88	3,713.91

**END OF PROPOSED
STORMWATER RUNOFF
FOR PROPOSED SITE**

**NO CHANGE IN TIME TO
PEAK OR PEAK FLOW
WITHIN ASSUNPINK CREEK**

ex-pr vs. Assunpink Creek

NOAA 24-hr C 10-Year Rainfall=5.01"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
31.80	3,731.21	3,731.23	37.10	4,220.77	4,220.77	42.40	3,859.00	3,859.00
31.90	3,748.54	3,748.55	37.20	4,225.02	4,225.02	42.50	3,846.18	3,846.18
32.00	3,765.87	3,765.88	37.30	4,229.26	4,229.26	42.60	3,833.36	3,833.36
32.10	3,783.20	3,783.21	37.40	4,232.34	4,232.34	42.70	3,820.54	3,820.54
32.20	3,800.53	3,800.53	37.50	4,228.36	4,228.36	42.80	3,807.72	3,807.72
32.30	3,817.86	3,817.86	37.60	4,223.21	4,223.21	42.90	3,794.90	3,794.90
32.40	3,835.19	3,835.19	37.70	4,218.06	4,218.06	43.00	3,782.08	3,782.08
32.50	3,852.52	3,852.52	37.80	4,212.90	4,212.90	43.10	3,769.26	3,769.26
32.60	3,869.85	3,869.86	37.90	4,207.75	4,207.75	43.20	3,756.44	3,756.44
32.70	3,887.19	3,887.19	38.00	4,202.60	4,202.60	43.30	3,743.62	3,743.62
32.80	3,904.52	3,904.52	38.10	4,197.45	4,197.45	43.40	3,730.80	3,730.80
32.90	3,921.85	3,921.85	38.20	4,192.30	4,192.30	43.50	3,717.98	3,717.98
33.00	3,938.15	3,938.15	38.30	4,187.14	4,187.14	43.60	3,705.16	3,705.16
33.10	3,948.31	3,948.31	38.40	4,181.99	4,181.99	43.70	3,692.34	3,692.34
33.20	3,957.44	3,957.44	38.50	4,176.84	4,176.84	43.80	3,679.52	3,679.52
33.30	3,966.57	3,966.57	38.60	4,171.69	4,171.69	43.90	3,666.70	3,666.70
33.40	3,975.71	3,975.71	38.70	4,166.54	4,166.54	44.00	3,653.42	3,653.42
33.50	3,984.84	3,984.84	38.80	4,161.38	4,161.38	44.10	3,637.38	3,637.38
33.60	3,993.97	3,993.97	38.90	4,156.23	4,156.23	44.20	3,620.89	3,620.89
33.70	4,003.10	4,003.10	39.00	4,151.08	4,151.08	44.30	3,604.40	3,604.40
33.80	4,012.23	4,012.23	39.10	4,145.93	4,145.93	44.40	3,587.90	3,587.90
33.90	4,021.36	4,021.36	39.20	4,140.78	4,140.78	44.50	3,571.41	3,571.41
34.00	4,030.49	4,030.49	39.30	4,135.62	4,135.62	44.60	3,554.92	3,554.92
34.10	4,039.63	4,039.63	39.40	4,130.47	4,130.47	44.70	3,538.43	3,538.43
34.20	4,048.76	4,048.76	39.50	4,125.32	4,125.32	44.80	3,521.93	3,521.93
34.30	4,057.89	4,057.89	39.60	4,119.77	4,119.77	44.90	3,505.44	3,505.44
34.40	4,067.02	4,067.02	39.70	4,111.79	4,111.79	45.00	3,488.95	3,488.95
34.50	4,076.15	4,076.15	39.80	4,103.42	4,103.42	45.10	3,472.45	3,472.45
34.60	4,085.28	4,085.28	39.90	4,095.04	4,095.04	45.20	3,455.96	3,455.96
34.70	4,094.41	4,094.41	40.00	4,086.67	4,086.67	45.30	3,439.47	3,439.47
34.80	4,103.55	4,103.55	40.10	4,078.29	4,078.29	45.40	3,422.98	3,422.98
34.90	4,112.68	4,112.68	40.20	4,069.92	4,069.92	45.50	3,406.48	3,406.48
35.00	4,121.81	4,121.81	40.30	4,061.55	4,061.55	45.60	3,389.99	3,389.99
35.10	4,130.94	4,130.94	40.40	4,053.17	4,053.17	45.70	3,373.50	3,373.50
35.20	4,139.46	4,139.46	40.50	4,044.80	4,044.80	45.80	3,357.00	3,357.00
35.30	4,144.32	4,144.32	40.60	4,036.42	4,036.42	45.90	3,340.51	3,340.51
35.40	4,148.57	4,148.57	40.70	4,028.05	4,028.05	46.00	3,324.02	3,324.02
35.50	4,152.81	4,152.81	40.80	4,019.67	4,019.67	46.10	3,307.53	3,307.53
35.60	4,157.06	4,157.06	40.90	4,011.30	4,011.30	46.20	3,290.52	3,290.52
35.70	4,161.31	4,161.31	41.00	4,002.92	4,002.92	46.30	3,270.40	3,270.40
35.80	4,165.56	4,165.56	41.10	3,994.55	3,994.55	46.40	3,249.76	3,249.76
35.90	4,169.80	4,169.80	41.20	3,986.17	3,986.17	46.50	3,229.13	3,229.13
36.00	4,174.05	4,174.05	41.30	3,977.80	3,977.80	46.60	3,208.49	3,208.49
36.10	4,178.30	4,178.30	41.40	3,969.42	3,969.42	46.70	3,187.85	3,187.85
36.20	4,182.54	4,182.54	41.50	3,961.05	3,961.05	46.80	3,167.22	3,167.22
36.30	4,186.79	4,186.79	41.60	3,952.67	3,952.67	46.90	3,146.58	3,146.58
36.40	4,191.04	4,191.04	41.70	3,944.30	3,944.30	47.00	3,125.95	3,125.95
36.50	4,195.29	4,195.29	41.80	3,935.37	3,935.37	47.10	3,105.31	3,105.31
36.60	4,199.53	4,199.53	41.90	3,923.10	3,923.10	47.20	3,084.67	3,084.67
36.70	4,203.78	4,203.78	42.00	3,910.28	3,910.28	47.30	3,064.04	3,064.04
36.80	4,208.03	4,208.03	42.10	3,897.46	3,897.46	47.40	3,043.40	3,043.40
36.90	4,212.27	4,212.27	42.20	3,884.64	3,884.64	47.50	3,022.77	3,022.77
37.00	4,216.52	4,216.52	42.30	3,871.82	3,871.82	47.60	3,002.13	3,002.13

THERE IS NO INCREASE, COMPARED TO THE PRE-CONSTRUCTION (EXISTING) CONDITION IN THE PEAK RUNOFF RATE OF STORMWATER LEAVING THE SITE AND THE INCREASE INCREASED VOLUME AND CHANGE IN TIMING FOR STORMWATER RUNOFF IS NOT EXPECTED TO INCREASED FLOOD DAMAGE AR OR DOWNSTREAM OF THE SITE.

ex-pr vs. Assunpink Creek

NOAA 24-hr C 10-Year Rainfall=5.01"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
47.70	2,981.49	2,981.49	53.00	2,042.77	2,042.77	58.30	1,382.89	1,382.89
47.80	2,960.86	2,960.86	53.10	2,028.58	2,028.58	58.40	1,372.89	1,372.89
47.90	2,940.22	2,940.22	53.20	2,014.39	2,014.39	58.50	1,362.89	1,362.89
48.00	2,919.59	2,919.59	53.30	2,000.21	2,000.21	58.60	1,352.89	1,352.89
48.10	2,898.95	2,898.95	53.40	1,986.02	1,986.02	58.70	1,342.89	1,342.89
48.20	2,878.31	2,878.31	53.50	1,971.83	1,971.83	58.80	1,332.89	1,332.89
48.30	2,857.68	2,857.68	53.60	1,957.64	1,957.64	58.90	1,322.89	1,322.89
48.40	2,837.26	2,837.26	53.70	1,943.46	1,943.46	59.00	1,312.89	1,312.89
48.50	2,818.16	2,818.16	53.80	1,929.27	1,929.27	59.10	1,302.89	1,302.89
48.60	2,799.28	2,799.28	53.90	1,915.08	1,915.08	59.20	1,292.89	1,292.89
48.70	2,780.41	2,780.41	54.00	1,900.90	1,900.90	59.30	1,282.89	1,282.89
48.80	2,761.53	2,761.53	54.10	1,886.71	1,886.71	59.40	1,273.07	1,273.07
48.90	2,742.65	2,742.65	54.20	1,872.52	1,872.52	59.50	1,264.36	1,264.36
49.00	2,723.77	2,723.77	54.30	1,858.33	1,858.33	59.60	1,255.82	1,255.82
49.10	2,704.89	2,704.89	54.40	1,844.15	1,844.15	59.70	1,247.29	1,247.29
49.20	2,686.01	2,686.01	54.50	1,829.96	1,829.96	59.80	1,238.76	1,238.76
49.30	2,667.13	2,667.13	54.60	1,815.77	1,815.77	59.90	1,230.22	1,230.22
49.40	2,648.25	2,648.25	54.70	1,801.59	1,801.59	60.00	1,221.69	1,221.69
49.50	2,629.37	2,629.37	54.80	1,787.40	1,787.40	60.10	1,213.16	1,213.16
49.60	2,610.49	2,610.49	54.90	1,773.21	1,773.21	60.20	1,204.63	1,204.63
49.70	2,591.61	2,591.61	55.00	1,759.29	1,759.29	60.30	1,196.09	1,196.09
49.80	2,572.74	2,572.74	55.10	1,746.93	1,746.93	60.40	1,187.56	1,187.56
49.90	2,553.86	2,553.86	55.20	1,734.83	1,734.83	60.50	1,179.03	1,179.03
50.00	2,534.98	2,534.98	55.30	1,722.73	1,722.73	60.60	1,170.49	1,170.49
50.10	2,516.10	2,516.10	55.40	1,710.64	1,710.64	60.70	1,161.96	1,161.96
50.20	2,497.22	2,497.22	55.50	1,698.54	1,698.54	60.80	1,153.43	1,153.43
50.30	2,478.34	2,478.34	55.60	1,686.44	1,686.44	60.90	1,144.89	1,144.89
50.40	2,459.46	2,459.46	55.70	1,674.34	1,674.34	61.00	1,136.36	1,136.36
50.50	2,440.58	2,440.58	55.80	1,662.25	1,662.25	61.10	1,127.83	1,127.83
50.60	2,422.07	2,422.07	55.90	1,650.15	1,650.15	61.20	1,119.29	1,119.29
50.70	2,405.77	2,405.77	56.00	1,638.05	1,638.05	61.30	1,110.76	1,110.76
50.80	2,389.83	2,389.83	56.10	1,625.95	1,625.95	61.40	1,102.23	1,102.23
50.90	2,373.90	2,373.90	56.20	1,613.86	1,613.86	61.50	1,093.70	1,093.70
51.00	2,357.96	2,357.96	56.30	1,601.76	1,601.76	61.60	1,085.27	1,085.27
51.10	2,342.03	2,342.03	56.40	1,589.66	1,589.66	61.70	1,077.49	1,077.49
51.20	2,326.09	2,326.09	56.50	1,577.56	1,577.56	61.80	1,069.81	1,069.81
51.30	2,310.16	2,310.16	56.60	1,565.47	1,565.47	61.90	1,062.14	1,062.14
51.40	2,294.23	2,294.23	56.70	1,553.37	1,553.37	62.00	1,054.46	1,054.46
51.50	2,278.29	2,278.29	56.80	1,541.27	1,541.27	62.10	1,046.79	1,046.79
51.60	2,262.36	2,262.36	56.90	1,529.17	1,529.17	62.20	1,039.11	1,039.11
51.70	2,246.42	2,246.42	57.00	1,517.08	1,517.08	62.30	1,031.44	1,031.44
51.80	2,230.49	2,230.49	57.10	1,504.98	1,504.98	62.40	1,023.76	1,023.76
51.90	2,214.55	2,214.55	57.20	1,493.14	1,493.14	62.50	1,016.09	1,016.09
52.00	2,198.62	2,198.62	57.30	1,482.88	1,482.88	62.60	1,008.41	1,008.41
52.10	2,182.68	2,182.68	57.40	1,472.88	1,472.88	62.70	1,000.74	1,000.74
52.20	2,166.75	2,166.75	57.50	1,462.88	1,462.88	62.80	993.06	993.06
52.30	2,150.81	2,150.81	57.60	1,452.88	1,452.88	62.90	985.39	985.39
52.40	2,134.88	2,134.88	57.70	1,442.88	1,442.88	63.00	977.71	977.71
52.50	2,118.94	2,118.94	57.80	1,432.88	1,432.88	63.10	970.04	970.04
52.60	2,103.01	2,103.01	57.90	1,422.88	1,422.88	63.20	962.36	962.36
52.70	2,087.08	2,087.08	58.00	1,412.88	1,412.88	63.30	954.69	954.69
52.80	2,071.36	2,071.36	58.10	1,402.89	1,402.89	63.40	947.01	947.01
52.90	2,056.95	2,056.95	58.20	1,392.89	1,392.89	63.50	939.34	939.34

ex-pr vs. Assunpink Creek

NOAA 24-hr C 10-Year Rainfall=5.01"

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
63.60	931.66	931.66	68.90	631.68	631.68	74.20	426.51	426.51
63.70	923.98	923.98	69.00	627.14	627.14	74.30	423.18	423.18
63.80	916.48	916.48	69.10	622.60	622.60	74.40	419.85	419.85
63.90	910.00	910.00	69.20	618.06	618.06	74.50	416.52	416.52
64.00	903.70	903.70	69.30	613.52	613.52	74.60	413.19	413.19
64.10	897.39	897.39	69.40	608.99	608.99	74.70	409.86	409.86
64.20	891.08	891.08	69.50	604.45	604.45	74.80	406.61	406.61
64.30	884.77	884.77	69.60	599.91	599.91	74.90	403.84	403.84
64.40	878.47	878.47	69.70	595.37	595.37	75.00	401.16	401.16
64.50	872.16	872.16	69.80	590.83	590.83	75.10	398.47	398.47
64.60	865.85	865.85	69.90	586.30	586.30	75.20	395.78	395.78
64.70	859.55	859.55	70.00	581.76	581.76	75.30	393.09	393.09
64.80	853.24	853.24	70.10	577.22	577.22	75.40	390.41	390.41
64.90	846.93	846.93	70.20	572.68	572.68	75.50	387.72	387.72
65.00	840.62	840.62	70.30	568.14	568.14	75.60	385.03	385.03
65.10	834.32	834.32	70.40	563.70	563.70	75.70	382.34	382.34
65.20	828.01	828.01	70.50	559.80	559.80	75.80	379.66	379.66
65.30	821.70	821.70	70.60	555.99	555.99	75.90	376.97	376.97
65.40	815.40	815.40	70.70	552.18	552.18	76.00	374.28	374.28
65.50	809.09	809.09	70.80	548.37	548.37	76.10	371.59	371.59
65.60	802.78	802.78	70.90	544.56	544.56	76.20	368.91	368.91
65.70	796.47	796.47	71.00	540.75	540.75	76.30	366.22	366.22
65.80	790.17	790.17	71.10	536.94	536.94	76.40	363.53	363.53
65.90	783.86	783.86	71.20	533.13	533.13	76.50	360.84	360.84
66.00	777.69	777.69	71.30	529.32	529.32	76.60	358.16	358.16
66.10	772.37	772.37	71.40	525.50	525.50	76.70	355.47	355.47
66.20	767.18	767.18	71.50	521.69	521.69	76.80	352.78	352.78
66.30	761.99	761.99	71.60	517.88	517.88	76.90	350.09	350.09
66.40	756.81	756.81	71.70	514.07	514.07	77.00	347.42	347.42
66.50	751.62	751.62	71.80	510.26	510.26	77.10	344.87	344.87
66.60	746.43	746.43	71.90	506.45	506.45	77.20	342.33	342.33
66.70	741.24	741.24	72.00	502.64	502.64	77.30	339.79	339.79
66.80	736.06	736.06	72.10	498.83	498.83	77.40	337.25	337.25
66.90	730.87	730.87	72.20	495.02	495.02	77.50	334.71	334.71
67.00	725.68	725.68	72.30	491.21	491.21	77.60	332.17	332.17
67.10	720.50	720.50	72.40	487.40	487.40	77.70	329.63	329.63
67.20	715.31	715.31	72.50	483.59	483.59	77.80	327.09	327.09
67.30	710.12	710.12	72.60	479.84	479.84	77.90	324.55	324.55
67.40	704.94	704.94	72.70	476.45	476.45	78.00	322.01	322.01
67.50	699.75	699.75	72.80	473.12	473.12	78.10	319.47	319.47
67.60	694.56	694.56	72.90	469.80	469.80	78.20	316.93	316.93
67.70	689.38	689.38	73.00	466.47	466.47	78.30	314.39	314.39
67.80	684.19	684.19	73.10	463.14	463.14	78.40	311.86	311.86
67.90	679.00	679.00	73.20	459.81	459.81	78.50	309.32	309.32
68.00	673.82	673.82	73.30	456.48	456.48	78.60	306.78	306.78
68.10	668.63	668.63	73.40	453.15	453.15	78.70	304.24	304.24
68.20	663.52	663.52	73.50	449.82	449.82	78.80	301.70	301.70
68.30	658.90	658.90	73.60	446.49	446.49	78.90	299.16	299.16
68.40	654.37	654.37	73.70	443.16	443.16	79.00	296.62	296.62
68.50	649.83	649.83	73.80	439.83	439.83	79.10	294.08	294.08
68.60	645.29	645.29	73.90	436.50	436.50	79.20	291.62	291.62
68.70	640.75	640.75	74.00	433.17	433.17	79.30	289.61	289.61
68.80	636.21	636.21	74.10	429.84	429.84	79.40	287.69	287.69

ex-pr vs. Assunpink Creek

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
79.50	285.76	285.76	84.80	193.91	193.91	90.10	131.96	131.96
79.60	283.84	283.84	84.90	192.49	192.49	90.20	130.98	130.98
79.70	281.91	281.91	85.00	191.07	191.07	90.30	130.04	130.04
79.80	279.98	279.98	85.10	189.65	189.65	90.40	129.11	129.11
79.90	278.06	278.06	85.20	188.24	188.24	90.50	128.18	128.18
80.00	276.13	276.13	85.30	186.82	186.82	90.60	127.25	127.25
80.10	274.21	274.21	85.40	185.40	185.40	90.70	126.32	126.32
80.20	272.28	272.28	85.50	183.98	183.98	90.80	125.39	125.39
80.30	270.35	270.35	85.60	182.56	182.56	90.90	124.46	124.46
80.40	268.43	268.43	85.70	181.15	181.15	91.00	123.53	123.53
80.50	266.50	266.50	85.80	179.75	179.75	91.10	122.60	122.60
80.60	264.58	264.58	85.90	178.50	178.50	91.20	121.66	121.66
80.70	262.65	262.65	86.00	177.26	177.26	91.30	120.73	120.73
80.80	260.72	260.72	86.10	176.03	176.03	91.40	119.80	119.80
80.90	258.80	258.80	86.20	174.80	174.80	91.50	118.87	118.87
81.00	256.87	256.87	86.30	173.57	173.57	91.60	117.94	117.94
81.10	254.95	254.95	86.40	172.34	172.34	91.70	117.01	117.01
81.20	253.02	253.02	86.50	171.11	171.11	91.80	116.08	116.08
81.30	251.09	251.09	86.60	169.87	169.87	91.90	115.15	115.15
81.40	249.19	249.19	86.70	168.64	168.64	92.00	114.22	114.22
81.50	247.43	247.43	86.80	167.41	167.41	92.10	113.29	113.29
81.60	245.69	245.69	86.90	166.18	166.18	92.20	112.36	112.36
81.70	243.95	243.95	87.00	164.95	164.95	92.30	111.43	111.43
81.80	242.21	242.21	87.10	163.71	163.71	92.40	110.52	110.52
81.90	240.47	240.47	87.20	162.48	162.48	92.50	109.78	109.78
82.00	238.74	238.74	87.30	161.25	161.25	92.60	109.06	109.06
82.10	237.00	237.00	87.40	160.02	160.02	92.70	108.34	108.34
82.20	235.26	235.26	87.50	158.79	158.79	92.80	107.63	107.63
82.30	233.52	233.52	87.60	157.56	157.56	92.90	106.91	106.91
82.40	231.78	231.78	87.70	156.32	156.32	93.00	106.19	106.19
82.50	230.04	230.04	87.80	155.09	155.09	93.10	105.47	105.47
82.60	228.31	228.31	87.90	153.86	153.86	93.20	104.76	104.76
82.70	226.57	226.57	88.00	152.66	152.66	93.30	104.04	104.04
82.80	224.83	224.83	88.10	151.64	151.64	93.40	103.32	103.32
82.90	223.09	223.09	88.20	150.66	150.66	93.50	102.60	102.60
83.00	221.35	221.35	88.30	149.68	149.68	93.60	101.89	101.89
83.10	219.61	219.61	88.40	148.69	148.69	93.70	101.17	101.17
83.20	217.87	217.87	88.50	147.71	147.71	93.80	100.45	100.45
83.30	216.14	216.14	88.60	146.72	146.72	93.90	99.73	99.73
83.40	214.40	214.40	88.70	145.74	145.74	94.00	99.02	99.02
83.50	212.66	212.66	88.80	144.75	144.75	94.10	98.30	98.30
83.60	210.96	210.96	88.90	143.77	143.77	94.20	97.58	97.58
83.70	209.50	209.50	89.00	142.78	142.78	94.30	96.86	96.86
83.80	208.08	208.08	89.10	141.80	141.80	94.40	96.15	96.15
83.90	206.67	206.67	89.20	140.82	140.82	94.50	95.43	95.43
84.00	205.25	205.25	89.30	139.83	139.83	94.60	94.72	94.72
84.10	203.83	203.83	89.40	138.85	138.85	94.70	94.02	94.02
84.20	202.41	202.41	89.50	137.86	137.86	94.80	93.32	93.32
84.30	201.00	201.00	89.60	136.88	136.88	94.90	92.63	92.63
84.40	199.58	199.58	89.70	135.89	135.89	95.00	91.94	91.94
84.50	198.16	198.16	89.80	134.91	134.91	95.10	91.24	91.24
84.60	196.74	196.74	89.90	133.92	133.92	95.20	90.55	90.55
84.70	195.32	195.32	90.00	132.94	132.94	95.30	89.85	89.85

ex-pr vs. Assunpink Creek

NOAA 24-hr C 10-Year Rainfall=5.01"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
95.40	89.16	89.16	100.70	60.22	60.22	106.00	40.93	40.93
95.50	88.46	88.46	100.80	59.73	59.73	106.10	40.66	40.66
95.60	87.77	87.77	100.90	59.24	59.24	106.20	40.40	40.40
95.70	87.08	87.08	101.00	58.76	58.76	106.30	40.13	40.13
95.80	86.38	86.38	101.10	58.27	58.27	106.40	39.86	39.86
95.90	85.69	85.69	101.20	57.79	57.79	106.50	39.60	39.60
96.00	84.99	84.99	101.30	57.35	57.35	106.60	39.33	39.33
96.10	84.30	84.30	101.40	56.93	56.93	106.70	39.06	39.06
96.20	83.60	83.60	101.50	56.50	56.50	106.80	38.79	38.79
96.30	82.91	82.91	101.60	56.07	56.07	106.90	38.53	38.53
96.40	82.22	82.22	101.70	55.65	55.65	107.00	38.26	38.26
96.50	81.52	81.52	101.80	55.22	55.22	107.10	37.99	37.99
96.60	80.83	80.83	101.90	54.79	54.79	107.20	37.73	37.73
96.70	80.13	80.13	102.00	54.36	54.36	107.30	37.46	37.46
96.80	79.46	79.46	102.10	53.94	53.94	107.40	37.19	37.19
96.90	78.94	78.94	102.20	53.51	53.51	107.50	36.93	36.93
97.00	78.44	78.44	102.30	53.08	53.08	107.60	36.66	36.66
97.10	77.95	77.95	102.40	52.65	52.65	107.70	36.39	36.39
97.20	77.45	77.45	102.50	52.23	52.23	107.80	36.13	36.13
97.30	76.95	76.95	102.60	51.80	51.80	107.90	35.89	35.89
97.40	76.45	76.45	102.70	51.37	51.37	108.00	35.66	35.66
97.50	75.96	75.96	102.80	50.95	50.95	108.10	35.43	35.43
97.60	75.46	75.46	102.90	50.52	50.52	108.20	35.20	35.20
97.70	74.96	74.96	103.00	50.09	50.09	108.30	34.97	34.97
97.80	74.47	74.47	103.10	49.66	49.66	108.40	34.74	34.74
97.90	73.97	73.97	103.20	49.24	49.24	108.50	34.51	34.51
98.00	73.47	73.47	103.30	48.81	48.81	108.60	34.28	34.28
98.10	72.97	72.97	103.40	48.40	48.40	108.70	34.05	34.05
98.20	72.48	72.48	103.50	48.09	48.09	108.80	33.82	33.82
98.30	71.98	71.98	103.60	47.80	47.80	108.90	33.59	33.59
98.40	71.48	71.48	103.70	47.51	47.51	109.00	33.36	33.36
98.50	70.98	70.98	103.80	47.22	47.22	109.10	33.13	33.13
98.60	70.49	70.49	103.90	46.93	46.93	109.20	32.90	32.90
98.70	69.99	69.99	104.00	46.64	46.64	109.30	32.67	32.67
98.80	69.49	69.49	104.10	46.35	46.35	109.40	32.44	32.44
98.90	69.00	69.00	104.20	46.06	46.06	109.50	32.21	32.21
99.00	68.50	68.50	104.30	45.77	45.77	109.60	31.98	31.98
99.10	68.01	68.01	104.40	45.48	45.48	109.70	31.75	31.75
99.20	67.52	67.52	104.50	45.19	45.19	109.80	31.52	31.52
99.30	67.04	67.04	104.60	44.90	44.90	109.90	31.29	31.29
99.40	66.55	66.55	104.70	44.61	44.61	110.00	31.06	31.06
99.50	66.06	66.06	104.80	44.32	44.32	110.10	30.83	30.83
99.60	65.58	65.58	104.90	44.03	44.03	110.20	30.61	30.61
99.70	65.09	65.09	105.00	43.74	43.74	110.30	30.38	30.38
99.80	64.60	64.60	105.10	43.45	43.45	110.40	30.16	30.16
99.90	64.11	64.11	105.20	43.16	43.16	110.50	29.94	29.94
100.00	63.63	63.63	105.30	42.87	42.87	110.60	29.71	29.71
100.10	63.14	63.14	105.40	42.58	42.58	110.70	29.49	29.49
100.20	62.65	62.65	105.50	42.29	42.29	110.80	29.26	29.26
100.30	62.17	62.17	105.60	42.00	42.00	110.90	29.04	29.04
100.40	61.68	61.68	105.70	41.73	41.73	111.00	28.81	28.81
100.50	61.19	61.19	105.80	41.46	41.46	111.10	28.59	28.59
100.60	60.70	60.70	105.90	41.20	41.20	111.20	28.37	28.37

ex-pr vs. Assunpink Creek

NOAA 24-hr C 10-Year Rainfall=5.01"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
111.30	28.14	28.14	116.60	17.01	17.01	121.90	6.48	6.48
111.40	27.92	27.92	116.70	16.81	16.81	122.00	6.28	6.28
111.50	27.69	27.69	116.80	16.61	16.61	122.10	6.09	6.09
111.60	27.47	27.47	116.90	16.41	16.41	122.20	5.89	5.89
111.70	27.25	27.25	117.00	16.20	16.20	122.30	5.69	5.69
111.80	27.02	27.02	117.10	16.00	16.00	122.40	5.50	5.50
111.90	26.80	26.80	117.20	15.80	15.80	122.50	5.30	5.30
112.00	26.57	26.57	117.30	15.60	15.60	122.60	5.10	5.10
112.10	26.35	26.35	117.40	15.40	15.40	122.70	4.91	4.91
112.20	26.13	26.13	117.50	15.20	15.20	122.80	4.71	4.71
112.30	25.92	25.92	117.60	15.00	15.00	122.90	4.51	4.51
112.40	25.71	25.71	117.70	14.80	14.80	123.00	4.31	4.31
112.50	25.50	25.50	117.80	14.60	14.60	123.10	4.12	4.12
112.60	25.30	25.30	117.90	14.40	14.40	123.20	3.94	3.94
112.70	25.09	25.09	118.00	14.19	14.19	123.30	3.86	3.86
112.80	24.88	24.88	118.10	13.99	13.99	123.40	3.80	3.80
112.90	24.67	24.67	118.20	13.79	13.79	123.50	3.74	3.74
113.00	24.47	24.47	118.30	13.59	13.59	123.60	3.68	3.68
113.10	24.26	24.26	118.40	13.39	13.39	123.70	3.62	3.62
113.20	24.05	24.05	118.50	13.19	13.19	123.80	3.56	3.56
113.30	23.85	23.85	118.60	12.99	12.99	123.90	3.50	3.50
113.40	23.64	23.64	118.70	12.79	12.79	124.00	3.44	3.44
113.50	23.43	23.43	118.80	12.59	12.59	124.10	3.38	3.38
113.60	23.22	23.22	118.90	12.39	12.39	124.20	3.32	3.32
113.70	23.02	23.02	119.00	12.19	12.19	124.30	3.26	3.26
113.80	22.81	22.81	119.10	12.00	12.00	124.40	3.20	3.20
113.90	22.60	22.60	119.20	11.80	11.80	124.50	3.14	3.14
114.00	22.40	22.40	119.30	11.60	11.60	124.60	3.08	3.08
114.10	22.19	22.19	119.40	11.40	11.40	124.70	3.02	3.02
114.20	21.98	21.98	119.50	11.21	11.21	124.80	2.96	2.96
114.30	21.77	21.77	119.60	11.01	11.01	124.90	2.90	2.90
114.40	21.57	21.57	119.70	10.81	10.81	125.00	2.84	2.84
114.50	21.36	21.36	119.80	10.62	10.62	125.10	2.78	2.78
114.60	21.15	21.15	119.90	10.42	10.42	125.20	2.72	2.72
114.70	20.95	20.95	120.00	10.22	10.22	125.30	2.66	2.66
114.80	20.74	20.74	120.10	10.03	10.03	125.40	2.60	2.60
114.90	20.53	20.53	120.20	9.83	9.83	125.50	2.54	2.54
115.00	20.32	20.32	120.30	9.63	9.63	125.60	2.48	2.48
115.10	20.12	20.12	120.40	9.43	9.43	125.70	2.42	2.42
115.20	19.91	19.91	120.50	9.24	9.24	125.80	2.37	2.37
115.30	19.70	19.70	120.60	9.04	9.04	125.90	2.31	2.31
115.40	19.50	19.50	120.70	8.84	8.84	126.00	2.25	2.25
115.50	19.29	19.29	120.80	8.65	8.65	126.10	2.19	2.19
115.60	19.08	19.08	120.90	8.45	8.45	126.20	2.13	2.13
115.70	18.87	18.87	121.00	8.25	8.25	126.30	2.07	2.07
115.80	18.67	18.67	121.10	8.06	8.06	126.40	2.01	2.01
115.90	18.46	18.46	121.20	7.86	7.86	126.50	1.95	1.95
116.00	18.25	18.25	121.30	7.66	7.66	126.60	1.89	1.89
116.10	18.04	18.04	121.40	7.47	7.47	126.70	1.83	1.83
116.20	17.84	17.84	121.50	7.27	7.27	126.80	1.77	1.77
116.30	17.63	17.63	121.60	7.07	7.07	126.90	1.71	1.71
116.40	17.42	17.42	121.70	6.87	6.87	127.00	1.65	1.65
116.50	17.22	17.22	121.80	6.68	6.68	127.10	1.59	1.59

ex-pr vs. Assunpink Creek

NOAA 24-hr C 10-Year Rainfall=5.01"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

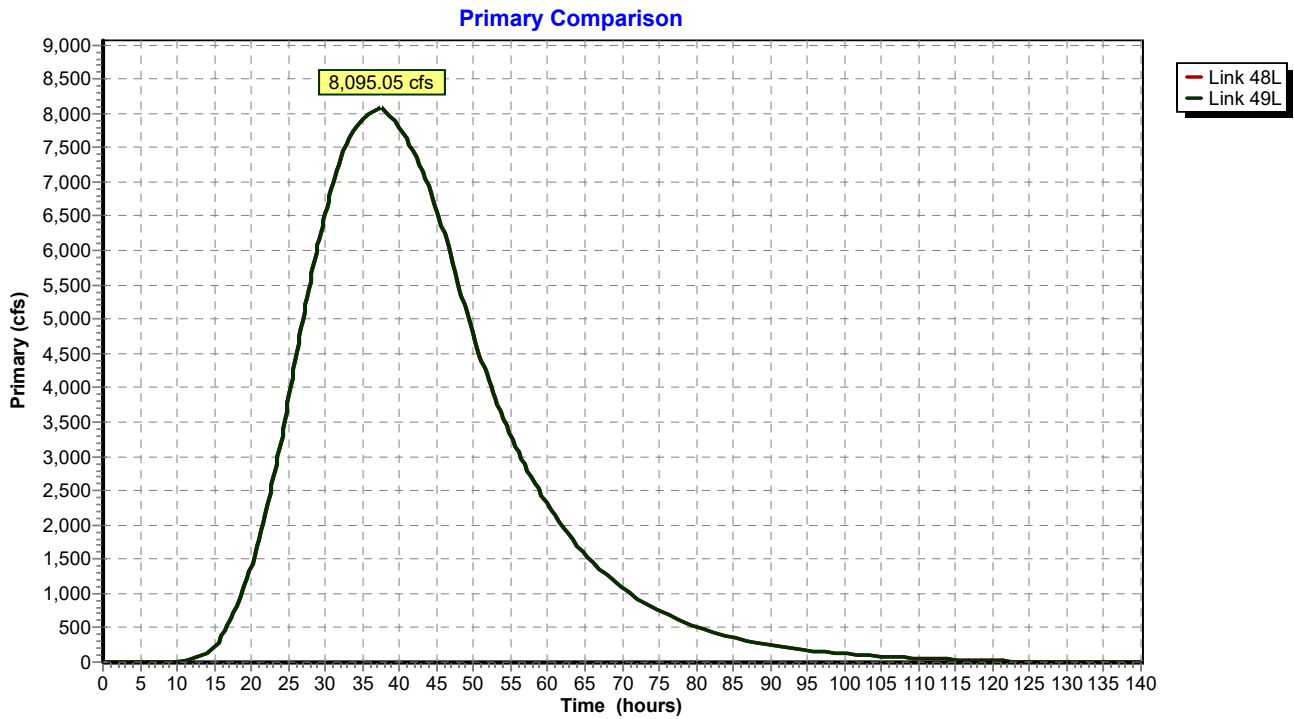
Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
127.20	1.53	1.53	132.50	0.24	0.24	137.80	0.00	0.00
127.30	1.47	1.47	132.60	0.23	0.23	137.90	0.00	0.00
127.40	1.41	1.41	132.70	0.23	0.23	138.00	0.00	0.00
127.50	1.35	1.35	132.80	0.22	0.22	138.10	0.00	0.00
127.60	1.29	1.29	132.90	0.21	0.21	138.20	0.00	0.00
127.70	1.26	1.26	133.00	0.21	0.21	138.30	0.00	0.00
127.80	1.24	1.24	133.10	0.20	0.20	138.40	0.00	0.00
127.90	1.22	1.22	133.20	0.20	0.20	138.50	0.00	0.00
128.00	1.20	1.20	133.30	0.19	0.19	138.60	0.00	0.00
128.10	1.17	1.17	133.40	0.18	0.18	138.70	0.00	0.00
128.20	1.15	1.15	133.50	0.18	0.18	138.80	0.00	0.00
128.30	1.13	1.13	133.60	0.17	0.17	138.90	0.00	0.00
128.40	1.10	1.10	133.70	0.16	0.16	139.00	0.00	0.00
128.50	1.08	1.08	133.80	0.16	0.16	139.10	0.00	0.00
128.60	1.06	1.06	133.90	0.15	0.15	139.20	0.00	0.00
128.70	1.03	1.03	134.00	0.15	0.15	139.30	0.00	0.00
128.80	1.01	1.01	134.10	0.14	0.14	139.40	0.00	0.00
128.90	0.99	0.99	134.20	0.13	0.13	139.50	0.00	0.00
129.00	0.96	0.96	134.30	0.13	0.13	139.60	0.00	0.00
129.10	0.94	0.94	134.40	0.12	0.12	139.70	0.00	0.00
129.20	0.92	0.92	134.50	0.12	0.12	139.80	0.00	0.00
129.30	0.89	0.89	134.60	0.11	0.11	139.90	0.00	0.00
129.40	0.87	0.87	134.70	0.10	0.10	140.00	0.00	0.00
129.50	0.85	0.85	134.80	0.10	0.10			
129.60	0.82	0.82	134.90	0.09	0.09			
129.70	0.80	0.80	135.00	0.09	0.09			
129.80	0.78	0.78	135.10	0.08	0.08			
129.90	0.76	0.76	135.20	0.07	0.07			
130.00	0.73	0.73	135.30	0.07	0.07			
130.10	0.71	0.71	135.40	0.06	0.06			
130.20	0.69	0.69	135.50	0.05	0.05			
130.30	0.66	0.66	135.60	0.05	0.05			
130.40	0.64	0.64	135.70	0.04	0.04			
130.50	0.62	0.62	135.80	0.04	0.04			
130.60	0.59	0.59	135.90	0.03	0.03			
130.70	0.57	0.57	136.00	0.02	0.02			
130.80	0.55	0.55	136.10	0.02	0.02			
130.90	0.52	0.52	136.20	0.01	0.01			
131.00	0.50	0.50	136.30	0.01	0.01			
131.10	0.48	0.48	136.40	0.00	0.00			
131.20	0.45	0.45	136.50	0.00	0.00			
131.30	0.43	0.43	136.60	0.00	0.00			
131.40	0.41	0.41	136.70	0.00	0.00			
131.50	0.38	0.38	136.80	0.00	0.00			
131.60	0.36	0.36	136.90	0.00	0.00			
131.70	0.34	0.34	137.00	0.00	0.00			
131.80	0.32	0.32	137.10	0.00	0.00			
131.90	0.29	0.29	137.20	0.00	0.00			
132.00	0.27	0.27	137.30	0.00	0.00			
132.10	0.26	0.26	137.40	0.00	0.00			
132.20	0.26	0.26	137.50	0.00	0.00			
132.30	0.25	0.25	137.60	0.00	0.00			
132.40	0.24	0.24	137.70	0.00	0.00			

ex-pr vs. Assunpink Creek

NOAA 24-hr C 100-Year Rainfall=8.33"

Prepared by Bohler Engineering NJ, LLC

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LINK 48L - EXISTING CREEK FLOW
LINK 49L - PROPOSED CREEK FLOW

ex-pr vs. Assunpink Creek

NOAA 24-hr C 100-Year Rainfall=8.33"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
0.00	0.00	0.00	5.30	1.67	1.42	10.60	16.76	15.90
0.10	0.00	0.00	5.40	1.70	1.46	10.70	17.88	16.93
0.20	0.00	0.00	5.50	1.73	1.49	10.80	19.06	17.99
0.30	0.00	0.00	5.60	1.76	1.52	10.90	20.27	19.06
0.40	0.00	0.00	5.70	1.79	1.55	11.00	21.56	20.41
0.50	0.00	0.01	5.80	1.82	1.58	11.10	23.55	22.74
0.60	0.04	0.06	5.90	1.86	1.61	11.20	25.91	25.32
0.70	0.11	0.13	6.00	1.89	1.64	11.30	28.35	27.90
0.80	0.20	0.19	6.10	1.93	1.69	11.40	30.82	30.47
0.90	0.27	0.25	6.20	1.99	1.74	11.50	33.24	33.09
1.00	0.34	0.30	6.30	2.05	1.79	11.60	37.91	39.32
1.10	0.41	0.36	6.40	2.12	1.85	11.70	44.02	43.95
1.20	0.47	0.40	6.50	2.18	1.90	11.80	50.15	51.88
1.30	0.52	0.45	6.60	2.25	1.96	11.90	61.11	64.54
1.40	0.57	0.49	6.70	2.33	2.03	12.00	82.22	91.43
1.50	0.62	0.53	6.80	2.41	2.10	12.10	121.34	127.71
1.60	0.67	0.57	6.90	2.50	2.18	12.20	126.36	100.54
1.70	0.71	0.60	7.00	2.59	2.26	12.30	85.05	82.32
1.80	0.75	0.63	7.10	2.68	2.34	12.40	66.12	69.90
1.90	0.79	0.67	7.20	2.76	2.42	12.50	58.34	61.70
2.00	0.83	0.70	7.30	2.85	2.49	12.60	54.13	54.80
2.10	0.86	0.72	7.40	2.93	2.57	12.70	50.13	51.66
2.20	0.89	0.75	7.50	3.02	2.65	12.80	49.21	50.34
2.30	0.92	0.78	7.60	3.11	2.73	12.90	48.97	49.67
2.40	0.95	0.80	7.70	3.19	2.81	13.00	48.85	49.31
2.50	0.98	0.82	7.80	3.28	2.88	13.10	48.75	49.11
2.60	1.01	0.84	7.90	3.37	2.97	13.20	49.89	50.31
2.70	1.03	0.87	8.00	3.46	3.05	13.30	57.52	57.88
2.80	1.06	0.89	8.10	3.55	3.12	13.40	66.26	66.56
2.90	1.09	0.91	8.20	3.63	3.21	13.50	75.01	75.27
3.00	1.11	0.93	8.30	3.72	3.28	13.60	83.77	84.02
3.10	1.13	0.94	8.40	3.81	3.36	13.70	92.70	93.03
3.20	1.15	0.96	8.50	3.90	3.45	13.80	101.88	102.17
3.30	1.17	0.98	8.60	3.99	3.53	13.90	111.14	111.38
3.40	1.19	1.00	8.70	4.08	3.61	14.00	120.40	120.62
3.50	1.22	1.02	8.80	4.23	3.75	14.10	129.67	129.87
3.60	1.24	1.03	8.90	4.74	4.26	14.20	138.94	139.13
3.70	1.25	1.05	9.00	5.33	4.85	14.30	148.21	148.38
3.80	1.27	1.06	9.10	5.96	5.48	14.40	157.47	157.64
3.90	1.29	1.08	9.20	6.64	6.14	14.50	166.74	166.91
4.00	1.31	1.09	9.30	7.35	6.82	14.60	176.01	176.17
4.10	1.32	1.11	9.40	8.05	7.48	14.70	185.27	185.43
4.20	1.34	1.12	9.50	8.76	8.16	14.80	194.54	194.70
4.30	1.36	1.14	9.60	9.47	8.84	14.90	203.81	203.96
4.40	1.38	1.15	9.70	10.18	9.51	15.00	213.08	213.22
4.50	1.41	1.18	9.80	10.88	10.18	15.10	222.35	222.49
4.60	1.44	1.21	9.90	11.60	10.87	15.20	231.66	231.82
4.70	1.47	1.24	10.00	12.31	11.54	15.30	241.03	241.19
4.80	1.51	1.27	10.10	13.02	12.22	15.40	251.81	251.96
4.90	1.54	1.30	10.20	13.73	12.91	15.50	270.88	271.01
5.00	1.57	1.33	10.30	14.45	13.59	15.60	291.32	291.45
5.10	1.60	1.36	10.40	15.16	14.27	15.70	311.77	311.88
5.20	1.63	1.39	10.50	15.88	14.97	15.80	332.21	332.32

ex-pr vs. Assunpink Creek

NOAA 24-hr C 100-Year Rainfall=8.33"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
15.90	352.66	352.77	21.20	1,872.15	1,872.21	26.50	4,729.19	4,729.39
16.00	373.10	373.21	21.30	1,911.39	1,911.45	26.60	4,785.59	4,785.79
16.10	393.55	393.66	21.40	1,950.63	1,950.69	26.70	4,841.98	4,842.18
16.20	413.99	414.10	21.50	1,989.87	1,989.93	26.80	4,898.38	4,898.58
16.30	434.44	434.54	21.60	2,029.11	2,029.17	26.90	4,954.77	4,954.98
16.40	454.88	454.98	21.70	2,068.35	2,068.41	27.00	5,011.17	5,011.37
16.50	475.32	475.42	21.80	2,107.60	2,107.66	27.10	5,067.57	5,067.77
16.60	495.77	495.87	21.90	2,146.84	2,146.89	27.20	5,123.96	5,124.16
16.70	516.22	516.32	22.00	2,187.60	2,187.66	27.30	5,180.36	5,180.56
16.80	536.66	536.76	22.10	2,237.52	2,237.58	27.40	5,236.75	5,236.96
16.90	557.10	557.20	22.20	2,288.97	2,289.03	27.50	5,293.15	5,293.35
17.00	577.55	577.65	22.30	2,340.42	2,340.47	27.60	5,349.55	5,349.75
17.10	598.00	598.09	22.40	2,391.86	2,391.91	27.70	5,405.94	5,406.14
17.20	618.44	618.53	22.50	2,443.30	2,443.36	27.80	5,462.34	5,462.54
17.30	638.88	638.97	22.60	2,494.75	2,494.81	27.90	5,518.73	5,518.93
17.40	659.32	659.42	22.70	2,546.20	2,546.25	28.00	5,575.13	5,575.33
17.50	679.77	679.86	22.80	2,597.64	2,597.70	28.10	5,631.53	5,631.73
17.60	701.20	701.28	22.90	2,649.08	2,649.14	28.20	5,687.92	5,688.12
17.70	728.49	728.58	23.00	2,700.53	2,700.59	28.30	5,744.32	5,744.52
17.80	756.76	756.85	23.10	2,751.98	2,752.03	28.40	5,800.71	5,800.91
17.90	785.03	785.12	23.20	2,803.42	2,803.48	28.50	5,857.11	5,857.31
18.00	813.30	813.39	23.30	2,854.87	2,854.92	28.60	5,912.16	5,912.36
18.10	841.58	841.66	23.40	2,906.32	2,906.38	28.70	5,959.13	5,959.33
18.20	869.86	869.95	23.50	2,957.76	2,957.82	28.80	6,004.75	6,004.95
18.30	898.16	898.25	23.60	3,009.21	3,009.26	28.90	6,050.37	6,050.57
18.40	926.47	926.55	23.70	3,060.65	3,060.71	29.00	6,095.99	6,096.19
18.50	954.78	954.85	23.80	3,112.10	3,112.15	29.10	6,141.61	6,141.81
18.60	983.08	983.16	23.90	3,163.54	3,163.61	29.20	6,187.23	6,187.43
18.70	1,011.39	1,011.47	24.00	3,215.08	3,215.16	29.30	6,232.85	6,233.05
18.80	1,039.70	1,039.77	24.10	3,266.19	3,266.27	29.40	6,278.47	6,278.67
18.90	1,068.01	1,068.08	24.20	3,318.17	3,318.24	29.50	6,324.09	6,324.29
19.00	1,096.32	1,096.39	24.30	3,378.34	3,378.41	29.60	6,369.71	6,369.91
19.10	1,124.62	1,124.69	24.40	3,439.95	3,440.02	29.70	6,415.33	6,415.53
19.20	1,152.93	1,153.00	24.50	3,501.58	3,501.65	29.80	6,460.95	6,461.15
19.30	1,181.24	1,181.31	24.60	3,563.23	3,563.30	29.90	6,506.57	6,506.77
19.40	1,209.55	1,209.61	24.70	3,624.87	3,624.94	30.00	6,552.19	6,552.39
19.50	1,237.85	1,237.92	24.80	3,686.51	3,686.58	30.10	6,597.81	6,598.01
19.60	1,266.16	1,266.23	24.90	3,748.15	3,748.22	30.20	6,643.43	6,643.63
19.70	1,294.47	1,294.54	25.00	3,809.80	3,809.87	30.30	6,689.05	6,689.25
19.80	1,324.15	1,324.22	25.10	3,871.44	3,871.51	30.40	6,734.67	6,734.87
19.90	1,362.02	1,362.09	25.20	3,933.08	3,933.15	30.50	6,780.29	6,780.49
20.00	1,401.26	1,401.33	25.30	3,994.72	3,994.79	30.60	6,825.91	6,826.11
20.10	1,440.50	1,440.57	25.40	4,056.37	4,056.44	30.70	6,871.53	6,871.73
20.20	1,479.74	1,479.81	25.50	4,118.01	4,118.08	30.80	6,915.40	6,915.60
20.30	1,518.98	1,519.05	25.60	4,179.65	4,179.72	30.90	6,948.74	6,948.94
20.40	1,558.22	1,558.29	25.70	4,241.30	4,241.37	31.00	6,980.32	6,980.52
20.50	1,597.46	1,597.53	25.80	4,302.94	4,303.01	31.10	7,011.90	7,012.10
20.60	1,636.71	1,636.77	25.90	4,364.58	4,364.65	31.20	7,043.48	7,043.68
20.70	1,675.95	1,676.01	26.00	4,426.22	4,426.29	31.30	7,075.07	7,075.26
20.80	1,715.19	1,715.25	26.10	4,487.87	4,487.94	31.40	7,106.65	7,106.84
20.90	1,754.43	1,754.49	26.20	4,549.51	4,549.58	31.50	7,138.23	7,138.42
21.00	1,793.67	1,793.73	26.30	4,611.15	4,611.22	31.60	7,169.81	7,170.01
21.10	1,832.91	1,832.97	26.40	4,672.14	4,672.21	31.70	7,201.39	7,201.59

**END OF PROPOSED
STORMWATER RUNOFF
FOR PROPOSED SITE**

**NO CHANGE IN TIME TO
PEAK OR PEAK FLOW
WITHIN ASSUNPINK CREEK**

ex-pr vs. Assunpink Creek

NOAA 24-hr C 100-Year Rainfall=8.33"

Prepared by Bohler Engineering NJ, LLC

HydroCAD® 10.00-23 s/n 02612 © 2018 HydroCAD Software Solutions LLC

Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
31.80	7,232.98	7,233.17	37.10	8,077.65	8,077.65	42.40	7,316.08	7,316.08
31.90	7,264.56	7,264.75	37.20	8,084.12	8,084.12	42.50	7,290.62	7,290.62
32.00	7,296.14	7,296.33	37.30	8,090.58	8,090.58	42.60	7,265.17	7,265.17
32.10	7,327.72	7,327.92	37.40	8,094.83	8,094.83	42.70	7,239.71	7,239.71
32.20	7,359.31	7,359.50	37.50	8,085.78	8,085.78	42.80	7,214.25	7,214.25
32.30	7,390.89	7,391.08	37.60	8,074.52	8,074.52	42.90	7,188.80	7,188.80
32.40	7,422.47	7,422.64	37.70	8,063.26	8,063.26	43.00	7,163.34	7,163.34
32.50	7,454.05	7,454.16	37.80	8,051.99	8,051.99	43.10	7,137.89	7,137.89
32.60	7,485.63	7,485.71	37.90	8,040.73	8,040.73	43.20	7,112.43	7,112.43
32.70	7,517.22	7,517.26	38.00	8,029.47	8,029.47	43.30	7,086.97	7,086.97
32.80	7,548.80	7,548.83	38.10	8,018.21	8,018.21	43.40	7,061.52	7,061.52
32.90	7,580.38	7,580.40	38.20	8,006.94	8,006.94	43.50	7,036.06	7,036.06
33.00	7,609.96	7,609.98	38.30	7,995.68	7,995.68	43.60	7,010.61	7,010.61
33.10	7,627.55	7,627.56	38.40	7,984.42	7,984.42	43.70	6,985.15	6,985.15
33.20	7,643.13	7,643.14	38.50	7,973.15	7,973.15	43.80	6,959.69	6,959.69
33.30	7,658.72	7,658.72	38.60	7,961.89	7,961.89	43.90	6,934.24	6,934.24
33.40	7,674.30	7,674.31	38.70	7,950.63	7,950.63	44.00	6,907.94	6,907.94
33.50	7,689.89	7,689.89	38.80	7,939.36	7,939.36	44.10	6,876.62	6,876.62
33.60	7,705.47	7,705.47	38.90	7,928.10	7,928.10	44.20	6,844.46	6,844.46
33.70	7,721.06	7,721.06	39.00	7,916.84	7,916.84	44.30	6,812.29	6,812.29
33.80	7,736.64	7,736.64	39.10	7,905.58	7,905.58	44.40	6,780.13	6,780.13
33.90	7,752.23	7,752.23	39.20	7,894.31	7,894.31	44.50	6,747.97	6,747.97
34.00	7,767.81	7,767.81	39.30	7,883.05	7,883.05	44.60	6,715.81	6,715.81
34.10	7,783.40	7,783.40	39.40	7,871.79	7,871.79	44.70	6,683.64	6,683.64
34.20	7,798.98	7,798.98	39.50	7,860.52	7,860.52	44.80	6,651.48	6,651.48
34.30	7,814.57	7,814.57	39.60	7,848.51	7,848.51	44.90	6,619.32	6,619.32
34.40	7,830.15	7,830.15	39.70	7,831.97	7,831.97	45.00	6,587.15	6,587.15
34.50	7,845.74	7,845.74	39.80	7,814.68	7,814.68	45.10	6,554.99	6,554.99
34.60	7,861.33	7,861.33	39.90	7,797.38	7,797.38	45.20	6,522.83	6,522.83
34.70	7,876.91	7,876.91	40.00	7,780.09	7,780.09	45.30	6,490.66	6,490.66
34.80	7,892.50	7,892.50	40.10	7,762.80	7,762.80	45.40	6,458.50	6,458.50
34.90	7,908.08	7,908.08	40.20	7,745.50	7,745.50	45.50	6,426.34	6,426.34
35.00	7,923.67	7,923.67	40.30	7,728.21	7,728.21	45.60	6,394.17	6,394.17
35.10	7,939.25	7,939.25	40.40	7,710.92	7,710.92	45.70	6,362.01	6,362.01
35.20	7,953.70	7,953.70	40.50	7,693.62	7,693.62	45.80	6,329.85	6,329.85
35.30	7,961.30	7,961.30	40.60	7,676.33	7,676.33	45.90	6,297.69	6,297.69
35.40	7,967.76	7,967.76	40.70	7,659.04	7,659.04	46.00	6,265.52	6,265.52
35.50	7,974.23	7,974.23	40.80	7,641.74	7,641.74	46.10	6,233.36	6,233.36
35.60	7,980.69	7,980.69	40.90	7,624.45	7,624.45	46.20	6,200.27	6,200.27
35.70	7,987.16	7,987.16	41.00	7,607.16	7,607.16	46.30	6,161.60	6,161.60
35.80	7,993.62	7,993.62	41.10	7,589.87	7,589.87	46.40	6,122.00	6,122.00
35.90	8,000.08	8,000.08	41.20	7,572.57	7,572.57	46.50	6,082.40	6,082.40
36.00	8,006.55	8,006.55	41.30	7,555.28	7,555.28	46.60	6,042.81	6,042.81
36.10	8,013.01	8,013.01	41.40	7,537.99	7,537.99	46.70	6,003.21	6,003.21
36.20	8,019.48	8,019.48	41.50	7,520.69	7,520.69	46.80	5,963.61	5,963.61
36.30	8,025.94	8,025.94	41.60	7,503.40	7,503.40	46.90	5,924.02	5,924.02
36.40	8,032.40	8,032.40	41.70	7,486.11	7,486.11	47.00	5,884.42	5,884.42
36.50	8,038.87	8,038.87	41.80	7,467.79	7,467.79	47.10	5,844.82	5,844.82
36.60	8,045.33	8,045.33	41.90	7,443.36	7,443.36	47.20	5,805.22	5,805.22
36.70	8,051.80	8,051.80	42.00	7,417.90	7,417.90	47.30	5,765.63	5,765.63
36.80	8,058.26	8,058.26	42.10	7,392.45	7,392.45	47.40	5,726.03	5,726.03
36.90	8,064.73	8,064.73	42.20	7,366.99	7,366.99	47.50	5,686.43	5,686.43
37.00	8,071.19	8,071.19	42.30	7,341.53	7,341.53	47.60	5,646.83	5,646.83

THERE IS NO INCREASE, COMPARED TO THE PRE-CONSTRUCTION (EXISTING) CONDITION IN THE PEAK RUNOFF RATE OF STORMWATER LEAVING THE SITE AND THE INCREASE INCREASED VOLUME AND CHANGE IN TIMING FOR STORMWATER RUNOFF IS NOT EXPECTED TO INCREASED FLOOD DAMAGE AR OR DOWNSTREAM OF THE SITE.

ex-pr vs. Assunpink Creek

NOAA 24-hr C 100-Year Rainfall=8.33"

Prepared by Bohler Engineering NJ, LLC

HydroCAD® 10.00-23 s/n 02612 © 2018 HydroCAD Software Solutions LLC

Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
47.70	5,607.24	5,607.24	53.00	3,826.24	3,826.24	58.30	2,590.75	2,590.75
47.80	5,567.64	5,567.64	53.10	3,799.65	3,799.65	58.40	2,572.06	2,572.06
47.90	5,528.04	5,528.04	53.20	3,773.06	3,773.06	58.50	2,553.36	2,553.36
48.00	5,488.44	5,488.44	53.30	3,746.47	3,746.47	58.60	2,534.66	2,534.66
48.10	5,448.85	5,448.85	53.40	3,719.89	3,719.89	58.70	2,515.97	2,515.97
48.20	5,409.25	5,409.25	53.50	3,693.30	3,693.30	58.80	2,497.27	2,497.27
48.30	5,369.65	5,369.65	53.60	3,666.71	3,666.71	58.90	2,478.57	2,478.57
48.40	5,330.51	5,330.51	53.70	3,640.12	3,640.12	59.00	2,459.87	2,459.87
48.50	5,294.10	5,294.10	53.80	3,613.54	3,613.54	59.10	2,441.18	2,441.18
48.60	5,258.15	5,258.15	53.90	3,586.95	3,586.95	59.20	2,422.48	2,422.48
48.70	5,222.20	5,222.20	54.00	3,560.36	3,560.36	59.30	2,403.78	2,403.78
48.80	5,186.25	5,186.25	54.10	3,533.77	3,533.77	59.40	2,385.43	2,385.43
48.90	5,150.30	5,150.30	54.20	3,507.19	3,507.19	59.50	2,369.12	2,369.12
49.00	5,114.35	5,114.35	54.30	3,480.60	3,480.60	59.60	2,353.16	2,353.16
49.10	5,078.40	5,078.40	54.40	3,454.01	3,454.01	59.70	2,337.20	2,337.20
49.20	5,042.45	5,042.45	54.50	3,427.42	3,427.42	59.80	2,321.24	2,321.24
49.30	5,006.50	5,006.50	54.60	3,400.83	3,400.83	59.90	2,305.28	2,305.28
49.40	4,970.55	4,970.55	54.70	3,374.25	3,374.25	60.00	2,289.31	2,289.31
49.50	4,934.60	4,934.60	54.80	3,347.66	3,347.66	60.10	2,273.35	2,273.35
49.60	4,898.65	4,898.65	54.90	3,321.07	3,321.07	60.20	2,257.39	2,257.39
49.70	4,862.70	4,862.70	55.00	3,294.98	3,294.98	60.30	2,241.43	2,241.43
49.80	4,826.75	4,826.75	55.10	3,271.84	3,271.84	60.40	2,225.47	2,225.47
49.90	4,790.80	4,790.80	55.20	3,249.21	3,249.21	60.50	2,209.51	2,209.51
50.00	4,754.85	4,754.85	55.30	3,226.57	3,226.57	60.60	2,193.54	2,193.54
50.10	4,718.90	4,718.90	55.40	3,203.93	3,203.93	60.70	2,177.58	2,177.58
50.20	4,682.95	4,682.95	55.50	3,181.29	3,181.29	60.80	2,161.62	2,161.62
50.30	4,647.00	4,647.00	55.60	3,158.65	3,158.65	60.90	2,145.66	2,145.66
50.40	4,611.05	4,611.05	55.70	3,136.01	3,136.01	61.00	2,129.70	2,129.70
50.50	4,575.10	4,575.10	55.80	3,113.37	3,113.37	61.10	2,113.73	2,113.73
50.60	4,539.89	4,539.89	55.90	3,090.73	3,090.73	61.20	2,097.77	2,097.77
50.70	4,509.16	4,509.16	56.00	3,068.09	3,068.09	61.30	2,081.81	2,081.81
50.80	4,479.17	4,479.17	56.10	3,045.45	3,045.45	61.40	2,065.85	2,065.85
50.90	4,449.18	4,449.18	56.20	3,022.81	3,022.81	61.50	2,049.89	2,049.89
51.00	4,419.20	4,419.20	56.30	3,000.17	3,000.17	61.60	2,034.12	2,034.12
51.10	4,389.21	4,389.21	56.40	2,977.54	2,977.54	61.70	2,019.54	2,019.54
51.20	4,359.22	4,359.22	56.50	2,954.90	2,954.90	61.80	2,005.15	2,005.15
51.30	4,329.23	4,329.23	56.60	2,932.26	2,932.26	61.90	1,990.77	1,990.77
51.40	4,299.24	4,299.24	56.70	2,909.62	2,909.62	62.00	1,976.38	1,976.38
51.50	4,269.26	4,269.26	56.80	2,886.98	2,886.98	62.10	1,962.00	1,962.00
51.60	4,239.27	4,239.27	56.90	2,864.34	2,864.34	62.20	1,947.61	1,947.61
51.70	4,209.28	4,209.28	57.00	2,841.70	2,841.70	62.30	1,933.22	1,933.22
51.80	4,179.29	4,179.29	57.10	2,819.06	2,819.06	62.40	1,918.84	1,918.84
51.90	4,149.30	4,149.30	57.20	2,796.91	2,796.91	62.50	1,904.45	1,904.45
52.00	4,119.32	4,119.32	57.30	2,777.72	2,777.72	62.60	1,890.07	1,890.07
52.10	4,089.33	4,089.33	57.40	2,759.03	2,759.03	62.70	1,875.68	1,875.68
52.20	4,059.34	4,059.34	57.50	2,740.33	2,740.33	62.80	1,861.30	1,861.30
52.30	4,029.35	4,029.35	57.60	2,721.63	2,721.63	62.90	1,846.91	1,846.91
52.40	3,999.36	3,999.36	57.70	2,702.94	2,702.94	63.00	1,832.53	1,832.53
52.50	3,969.38	3,969.38	57.80	2,684.24	2,684.24	63.10	1,818.14	1,818.14
52.60	3,939.39	3,939.39	57.90	2,665.54	2,665.54	63.20	1,803.75	1,803.75
52.70	3,909.40	3,909.40	58.00	2,646.85	2,646.85	63.30	1,789.37	1,789.37
52.80	3,879.84	3,879.84	58.10	2,628.15	2,628.15	63.40	1,774.98	1,774.98
52.90	3,852.83	3,852.83	58.20	2,609.45	2,609.45	63.50	1,760.60	1,760.60

ex-pr vs. Assunpink Creek

NOAA 24-hr C 100-Year Rainfall=8.33"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
63.60	1,746.21	1,746.21	68.90	1,183.88	1,183.88	74.20	799.18	799.18
63.70	1,731.83	1,731.83	69.00	1,175.37	1,175.37	74.30	792.92	792.92
63.80	1,717.76	1,717.76	69.10	1,166.86	1,166.86	74.40	786.67	786.67
63.90	1,705.60	1,705.60	69.20	1,158.35	1,158.35	74.50	780.42	780.42
64.00	1,693.77	1,693.77	69.30	1,149.84	1,149.84	74.60	774.17	774.17
64.10	1,681.93	1,681.93	69.40	1,141.33	1,141.33	74.70	767.92	767.92
64.20	1,670.10	1,670.10	69.50	1,132.82	1,132.82	74.80	761.82	761.82
64.30	1,658.26	1,658.26	69.60	1,124.31	1,124.31	74.90	756.64	756.64
64.40	1,646.42	1,646.42	69.70	1,115.80	1,115.80	75.00	751.61	751.61
64.50	1,634.59	1,634.59	69.80	1,107.29	1,107.29	75.10	746.58	746.58
64.60	1,622.75	1,622.75	69.90	1,098.78	1,098.78	75.20	741.55	741.55
64.70	1,610.91	1,610.91	70.00	1,090.27	1,090.27	75.30	736.52	736.52
64.80	1,599.08	1,599.08	70.10	1,081.76	1,081.76	75.40	731.49	731.49
64.90	1,587.24	1,587.24	70.20	1,073.25	1,073.25	75.50	726.45	726.45
65.00	1,575.41	1,575.41	70.30	1,064.74	1,064.74	75.60	721.42	721.42
65.10	1,563.57	1,563.57	70.40	1,056.40	1,056.40	75.70	716.39	716.39
65.20	1,551.73	1,551.73	70.50	1,049.09	1,049.09	75.80	711.36	711.36
65.30	1,539.90	1,539.90	70.60	1,041.95	1,041.95	75.90	706.33	706.33
65.40	1,528.06	1,528.06	70.70	1,034.82	1,034.82	76.00	701.30	701.30
65.50	1,516.22	1,516.22	70.80	1,027.68	1,027.68	76.10	696.27	696.27
65.60	1,504.39	1,504.39	70.90	1,020.54	1,020.54	76.20	691.24	691.24
65.70	1,492.55	1,492.55	71.00	1,013.40	1,013.40	76.30	686.21	686.21
65.80	1,480.72	1,480.72	71.10	1,006.26	1,006.26	76.40	681.18	681.18
65.90	1,468.88	1,468.88	71.20	999.13	999.13	76.50	676.15	676.15
66.00	1,457.31	1,457.31	71.30	991.99	991.99	76.60	671.12	671.12
66.10	1,447.34	1,447.34	71.40	984.85	984.85	76.70	666.09	666.09
66.20	1,437.63	1,437.63	71.50	977.71	977.71	76.80	661.06	661.06
66.30	1,427.92	1,427.92	71.60	970.57	970.57	76.90	656.03	656.03
66.40	1,418.21	1,418.21	71.70	963.44	963.44	77.00	651.03	651.03
66.50	1,408.50	1,408.50	71.80	956.30	956.30	77.10	646.23	646.23
66.60	1,398.79	1,398.79	71.90	949.16	949.16	77.20	641.47	641.47
66.70	1,389.08	1,389.08	72.00	942.02	942.02	77.30	636.71	636.71
66.80	1,379.37	1,379.37	72.10	934.88	934.88	77.40	631.95	631.95
66.90	1,369.67	1,369.67	72.20	927.75	927.75	77.50	627.18	627.18
67.00	1,359.96	1,359.96	72.30	920.61	920.61	77.60	622.42	622.42
67.10	1,350.25	1,350.25	72.40	913.47	913.47	77.70	617.66	617.66
67.20	1,340.54	1,340.54	72.50	906.33	906.33	77.80	612.90	612.90
67.30	1,330.83	1,330.83	72.60	899.30	899.30	77.90	608.13	608.13
67.40	1,321.12	1,321.12	72.70	892.94	892.94	78.00	603.37	603.37
67.50	1,311.41	1,311.41	72.80	886.69	886.69	78.10	598.61	598.61
67.60	1,301.70	1,301.70	72.90	880.44	880.44	78.20	593.85	593.85
67.70	1,292.00	1,292.00	73.00	874.19	874.19	78.30	589.08	589.08
67.80	1,282.29	1,282.29	73.10	867.94	867.94	78.40	584.32	584.32
67.90	1,272.58	1,272.58	73.20	861.69	861.69	78.50	579.56	579.56
68.00	1,262.87	1,262.87	73.30	855.44	855.44	78.60	574.79	574.79
68.10	1,253.16	1,253.16	73.40	849.18	849.18	78.70	570.03	570.03
68.20	1,243.60	1,243.60	73.50	842.93	842.93	78.80	565.27	565.27
68.30	1,234.94	1,234.94	73.60	836.68	836.68	78.90	560.51	560.51
68.40	1,226.43	1,226.43	73.70	830.43	830.43	79.00	555.74	555.74
68.50	1,217.92	1,217.92	73.80	824.18	824.18	79.10	550.98	550.98
68.60	1,209.41	1,209.41	73.90	817.93	817.93	79.20	546.36	546.36
68.70	1,200.90	1,200.90	74.00	811.68	811.68	79.30	542.61	542.61
68.80	1,192.39	1,192.39	74.10	805.43	805.43	79.40	539.00	539.00

ex-pr vs. Assunpink Creek

NOAA 24-hr C 100-Year Rainfall=8.33"

Prepared by Bohler Engineering NJ, LLC

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
79.50	535.39	535.39	84.80	363.41	363.41	90.10	247.39	247.39
79.60	531.78	531.78	84.90	360.76	360.76	90.20	245.56	245.56
79.70	528.17	528.17	85.00	358.10	358.10	90.30	243.80	243.80
79.80	524.56	524.56	85.10	355.44	355.44	90.40	242.05	242.05
79.90	520.95	520.95	85.20	352.79	352.79	90.50	240.30	240.30
80.00	517.34	517.34	85.30	350.13	350.13	90.60	238.55	238.55
80.10	513.73	513.73	85.40	347.47	347.47	90.70	236.80	236.80
80.20	510.12	510.12	85.50	344.82	344.82	90.80	235.05	235.05
80.30	506.51	506.51	85.60	342.16	342.16	90.90	233.30	233.30
80.40	502.90	502.90	85.70	339.50	339.50	91.00	231.56	231.56
80.50	499.29	499.29	85.80	336.89	336.89	91.10	229.81	229.81
80.60	495.68	495.68	85.90	334.54	334.54	91.20	228.06	228.06
80.70	492.07	492.07	86.00	332.23	332.23	91.30	226.31	226.31
80.80	488.46	488.46	86.10	329.92	329.92	91.40	224.56	224.56
80.90	484.84	484.84	86.20	327.62	327.62	91.50	222.81	222.81
81.00	481.23	481.23	86.30	325.31	325.31	91.60	221.06	221.06
81.10	477.62	477.62	86.40	323.00	323.00	91.70	219.31	219.31
81.20	474.01	474.01	86.50	320.69	320.69	91.80	217.57	217.57
81.30	470.40	470.40	86.60	318.39	318.39	91.90	215.82	215.82
81.40	466.84	466.84	86.70	316.08	316.08	92.00	214.07	214.07
81.50	463.54	463.54	86.80	313.77	313.77	92.10	212.32	212.32
81.60	460.29	460.29	86.90	311.46	311.46	92.20	210.57	210.57
81.70	457.04	457.04	87.00	309.16	309.16	92.30	208.82	208.82
81.80	453.79	453.79	87.10	306.85	306.85	92.40	207.12	207.12
81.90	450.54	450.54	87.20	304.54	304.54	92.50	205.73	205.73
82.00	447.29	447.29	87.30	302.23	302.23	92.60	204.39	204.39
82.10	444.04	444.04	87.40	299.93	299.93	92.70	203.04	203.04
82.20	440.79	440.79	87.50	297.62	297.62	92.80	201.70	201.70
82.30	437.54	437.54	87.60	295.31	295.31	92.90	200.36	200.36
82.40	434.29	434.29	87.70	293.00	293.00	93.00	199.01	199.01
82.50	431.04	431.04	87.80	290.70	290.70	93.10	197.67	197.67
82.60	427.79	427.79	87.90	288.39	288.39	93.20	196.33	196.33
82.70	424.54	424.54	88.00	286.14	286.14	93.30	194.98	194.98
82.80	421.29	421.29	88.10	284.24	284.24	93.40	193.64	193.64
82.90	418.04	418.04	88.20	282.39	282.39	93.50	192.30	192.30
83.00	414.79	414.79	88.30	280.55	280.55	93.60	190.95	190.95
83.10	411.54	411.54	88.40	278.71	278.71	93.70	189.61	189.61
83.20	408.29	408.29	88.50	276.87	276.87	93.80	188.27	188.27
83.30	405.04	405.04	88.60	275.02	275.02	93.90	186.92	186.92
83.40	401.79	401.79	88.70	273.18	273.18	94.00	185.58	185.58
83.50	398.54	398.54	88.80	271.34	271.34	94.10	184.24	184.24
83.60	395.37	395.37	88.90	269.50	269.50	94.20	182.89	182.89
83.70	392.63	392.63	89.00	267.65	267.65	94.30	181.55	181.55
83.80	389.98	389.98	89.10	265.81	265.81	94.40	180.21	180.21
83.90	387.32	387.32	89.20	263.97	263.97	94.50	178.86	178.86
84.00	384.67	384.67	89.30	262.13	262.13	94.60	177.53	177.53
84.10	382.01	382.01	89.40	260.28	260.28	94.70	176.22	176.22
84.20	379.35	379.35	89.50	258.44	258.44	94.80	174.91	174.91
84.30	376.70	376.70	89.60	256.60	256.60	94.90	173.61	173.61
84.40	374.04	374.04	89.70	254.76	254.76	95.00	172.31	172.31
84.50	371.38	371.38	89.80	252.91	252.91	95.10	171.01	171.01
84.60	368.73	368.73	89.90	251.07	251.07	95.20	169.70	169.70
84.70	366.07	366.07	90.00	249.23	249.23	95.30	168.40	168.40

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Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
95.40	167.10	167.10	100.70	112.87	112.87	106.00	76.77	76.77
95.50	165.80	165.80	100.80	111.96	111.96	106.10	76.27	76.27
95.60	164.49	164.49	100.90	111.05	111.05	106.20	75.77	75.77
95.70	163.19	163.19	101.00	110.14	110.14	106.30	75.28	75.28
95.80	161.89	161.89	101.10	109.24	109.24	106.40	74.78	74.78
95.90	160.59	160.59	101.20	108.34	108.34	106.50	74.28	74.28
96.00	159.28	159.28	101.30	107.52	107.52	106.60	73.78	73.78
96.10	157.98	157.98	101.40	106.72	106.72	106.70	73.28	73.28
96.20	156.68	156.68	101.50	105.92	105.92	106.80	72.78	72.78
96.30	155.38	155.38	101.60	105.11	105.11	106.90	72.28	72.28
96.40	154.07	154.07	101.70	104.31	104.31	107.00	71.78	71.78
96.50	152.77	152.77	101.80	103.51	103.51	107.10	71.28	71.28
96.60	151.47	151.47	101.90	102.70	102.70	107.20	70.78	70.78
96.70	150.17	150.17	102.00	101.90	101.90	107.30	70.28	70.28
96.80	148.91	148.91	102.10	101.10	101.10	107.40	69.78	69.78
96.90	147.93	147.93	102.20	100.29	100.29	107.50	69.28	69.28
97.00	146.99	146.99	102.30	99.49	99.49	107.60	68.78	68.78
97.10	146.06	146.06	102.40	98.69	98.69	107.70	68.28	68.28
97.20	145.12	145.12	102.50	97.88	97.88	107.80	67.79	67.79
97.30	144.19	144.19	102.60	97.08	97.08	107.90	67.34	67.34
97.40	143.25	143.25	102.70	96.28	96.28	108.00	66.91	66.91
97.50	142.32	142.32	102.80	95.47	95.47	108.10	66.47	66.47
97.60	141.39	141.39	102.90	94.67	94.67	108.20	66.04	66.04
97.70	140.45	140.45	103.00	93.86	93.86	108.30	65.60	65.60
97.80	139.52	139.52	103.10	93.06	93.06	108.40	65.17	65.17
97.90	138.58	138.58	103.20	92.26	92.26	108.50	64.73	64.73
98.00	137.65	137.65	103.30	91.45	91.45	108.60	64.30	64.30
98.10	136.71	136.71	103.40	90.68	90.68	108.70	63.86	63.86
98.20	135.78	135.78	103.50	90.11	90.11	108.80	63.43	63.43
98.30	134.84	134.84	103.60	89.57	89.57	108.90	62.99	62.99
98.40	133.91	133.91	103.70	89.03	89.03	109.00	62.55	62.55
98.50	132.97	132.97	103.80	88.49	88.49	109.10	62.12	62.12
98.60	132.04	132.04	103.90	87.95	87.95	109.20	61.68	61.68
98.70	131.10	131.10	104.00	87.41	87.41	109.30	61.25	61.25
98.80	130.17	130.17	104.10	86.87	86.87	109.40	60.81	60.81
98.90	129.24	129.24	104.20	86.33	86.33	109.50	60.38	60.38
99.00	128.30	128.30	104.30	85.79	85.79	109.60	59.94	59.94
99.10	127.39	127.39	104.40	85.25	85.25	109.70	59.51	59.51
99.20	126.49	126.49	104.50	84.71	84.71	109.80	59.07	59.07
99.30	125.58	125.58	104.60	84.17	84.17	109.90	58.63	58.63
99.40	124.67	124.67	104.70	83.63	83.63	110.00	58.20	58.20
99.50	123.76	123.76	104.80	83.09	83.09	110.10	57.77	57.77
99.60	122.85	122.85	104.90	82.55	82.55	110.20	57.35	57.35
99.70	121.95	121.95	105.00	82.01	82.01	110.30	56.92	56.92
99.80	121.04	121.04	105.10	81.47	81.47	110.40	56.50	56.50
99.90	120.13	120.13	105.20	80.93	80.93	110.50	56.08	56.08
100.00	119.22	119.22	105.30	80.39	80.39	110.60	55.65	55.65
100.10	118.31	118.31	105.40	79.85	79.85	110.70	55.23	55.23
100.20	117.41	117.41	105.50	79.31	79.31	110.80	54.80	54.80
100.30	116.50	116.50	105.60	78.78	78.78	110.90	54.38	54.38
100.40	115.59	115.59	105.70	78.27	78.27	111.00	53.95	53.95
100.50	114.68	114.68	105.80	77.77	77.77	111.10	53.53	53.53
100.60	113.77	113.77	105.90	77.27	77.27	111.20	53.10	53.10

ex-pr vs. Assunpink Creek

NOAA 24-hr C 100-Year Rainfall=8.33"

Prepared by Bohler Engineering NJ, LLC

HydroCAD® 10.00-23 s/n 02612 © 2018 HydroCAD Software Solutions LLC

Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
111.30	52.68	52.68	116.60	31.47	31.47	121.90	11.61	11.61
111.40	52.25	52.25	116.70	31.09	31.09	122.00	11.24	11.24
111.50	51.83	51.83	116.80	30.70	30.70	122.10	10.88	10.88
111.60	51.40	51.40	116.90	30.32	30.32	122.20	10.51	10.51
111.70	50.98	50.98	117.00	29.94	29.94	122.30	10.14	10.14
111.80	50.55	50.55	117.10	29.55	29.55	122.40	9.77	9.77
111.90	50.13	50.13	117.20	29.17	29.17	122.50	9.40	9.40
112.00	49.70	49.70	117.30	28.78	28.78	122.60	9.04	9.04
112.10	49.28	49.28	117.40	28.40	28.40	122.70	8.67	8.67
112.20	48.86	48.86	117.50	28.01	28.01	122.80	8.30	8.30
112.30	48.46	48.46	117.60	27.63	27.63	122.90	7.93	7.93
112.40	48.06	48.06	117.70	27.25	27.25	123.00	7.56	7.56
112.50	47.67	47.67	117.80	26.86	26.86	123.10	7.20	7.20
112.60	47.27	47.27	117.90	26.48	26.48	123.20	6.86	6.86
112.70	46.88	46.88	118.00	26.09	26.09	123.30	6.72	6.72
112.80	46.48	46.48	118.10	25.71	25.71	123.40	6.62	6.62
112.90	46.08	46.08	118.20	25.33	25.33	123.50	6.52	6.52
113.00	45.69	45.69	118.30	24.94	24.94	123.60	6.41	6.41
113.10	45.29	45.29	118.40	24.56	24.56	123.70	6.31	6.31
113.20	44.90	44.90	118.50	24.17	24.17	123.80	6.20	6.20
113.30	44.50	44.50	118.60	23.79	23.79	123.90	6.10	6.10
113.40	44.11	44.11	118.70	23.41	23.41	124.00	5.99	5.99
113.50	43.71	43.71	118.80	23.02	23.02	124.10	5.89	5.89
113.60	43.32	43.32	118.90	22.65	22.65	124.20	5.78	5.78
113.70	42.92	42.92	119.00	22.28	22.28	124.30	5.68	5.68
113.80	42.53	42.53	119.10	21.92	21.92	124.40	5.58	5.58
113.90	42.13	42.13	119.20	21.55	21.55	124.50	5.47	5.47
114.00	41.74	41.74	119.30	21.18	21.18	124.60	5.37	5.37
114.10	41.34	41.34	119.40	20.81	20.81	124.70	5.26	5.26
114.20	40.95	40.95	119.50	20.44	20.44	124.80	5.16	5.16
114.30	40.55	40.55	119.60	20.08	20.08	124.90	5.05	5.05
114.40	40.16	40.16	119.70	19.71	19.71	125.00	4.95	4.95
114.50	39.76	39.76	119.80	19.34	19.34	125.10	4.84	4.84
114.60	39.37	39.37	119.90	18.97	18.97	125.20	4.74	4.74
114.70	38.97	38.97	120.00	18.60	18.60	125.30	4.64	4.64
114.80	38.58	38.58	120.10	18.24	18.24	125.40	4.53	4.53
114.90	38.18	38.18	120.20	17.87	17.87	125.50	4.43	4.43
115.00	37.79	37.79	120.30	17.50	17.50	125.60	4.32	4.32
115.10	37.39	37.39	120.40	17.13	17.13	125.70	4.22	4.22
115.20	37.00	37.00	120.50	16.76	16.76	125.80	4.11	4.11
115.30	36.60	36.60	120.60	16.40	16.40	125.90	4.01	4.01
115.40	36.21	36.21	120.70	16.03	16.03	126.00	3.90	3.90
115.50	35.81	35.81	120.80	15.66	15.66	126.10	3.80	3.80
115.60	35.42	35.42	120.90	15.29	15.29	126.20	3.70	3.70
115.70	35.02	35.02	121.00	14.92	14.92	126.30	3.59	3.59
115.80	34.63	34.63	121.10	14.56	14.56	126.40	3.49	3.49
115.90	34.24	34.24	121.20	14.19	14.19	126.50	3.38	3.38
116.00	33.84	33.84	121.30	13.82	13.82	126.60	3.28	3.28
116.10	33.45	33.45	121.40	13.45	13.45	126.70	3.17	3.17
116.20	33.05	33.05	121.50	13.08	13.08	126.80	3.07	3.07
116.30	32.66	32.66	121.60	12.72	12.72	126.90	2.96	2.96
116.40	32.26	32.26	121.70	12.35	12.35	127.00	2.86	2.86
116.50	31.87	31.87	121.80	11.98	11.98	127.10	2.76	2.76

ex-pr vs. Assunpink Creek

NOAA 24-hr C 100-Year Rainfall=8.33"

Prepared by Bohler Engineering NJ, LLC

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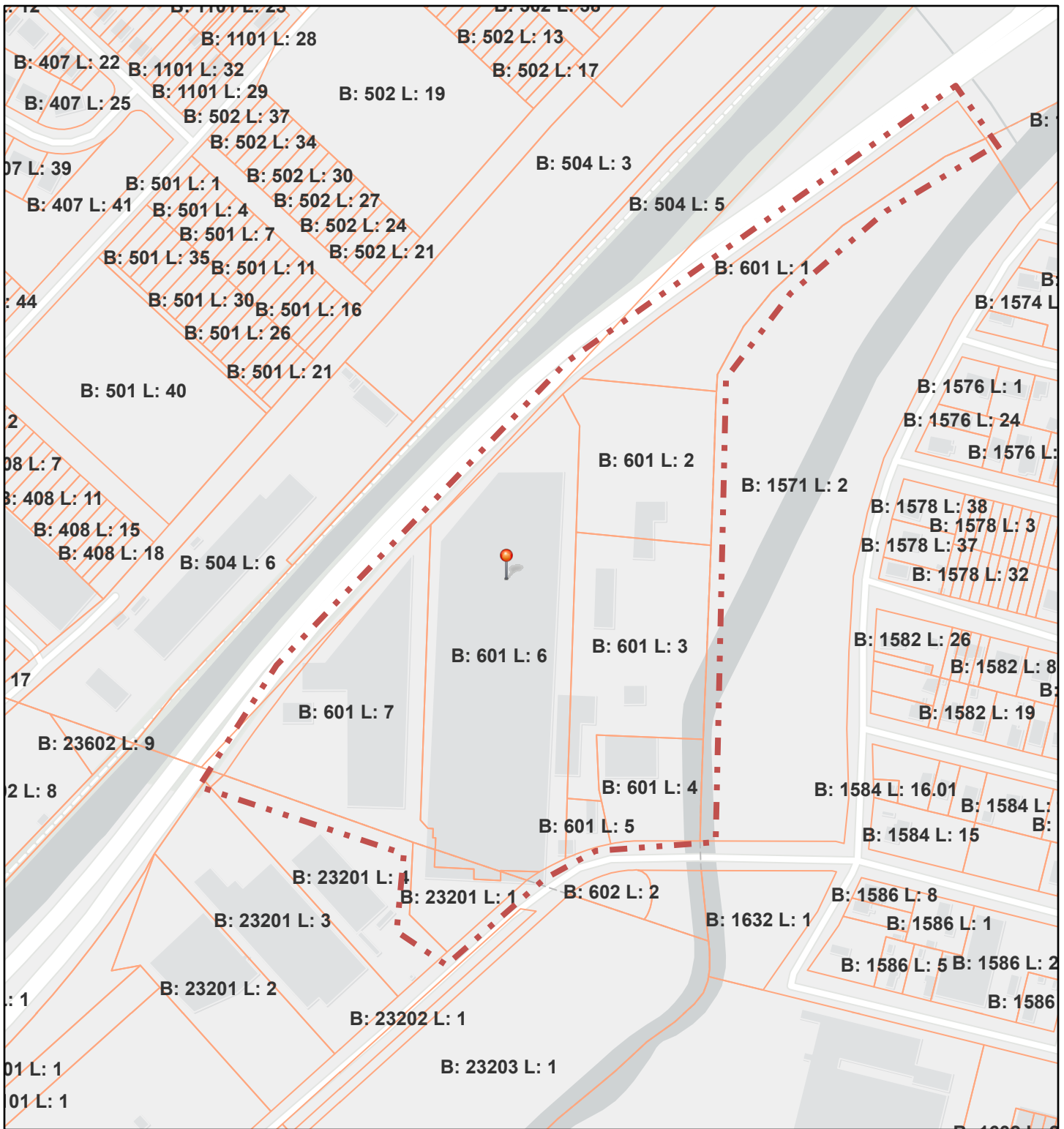
Primary Comparison (continued)

Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)	Time (hours)	Link 48L (cfs)	Link 49L (cfs)
127.20	2.65	2.65	132.50	0.41	0.41	137.80	0.00	0.00
127.30	2.55	2.55	132.60	0.40	0.40	137.90	0.00	0.00
127.40	2.44	2.44	132.70	0.39	0.39	138.00	0.00	0.00
127.50	2.34	2.34	132.80	0.38	0.38	138.10	0.00	0.00
127.60	2.24	2.24	132.90	0.37	0.37	138.20	0.00	0.00
127.70	2.19	2.19	133.00	0.36	0.36	138.30	0.00	0.00
127.80	2.15	2.15	133.10	0.35	0.35	138.40	0.00	0.00
127.90	2.11	2.11	133.20	0.34	0.34	138.50	0.00	0.00
128.00	2.07	2.07	133.30	0.33	0.33	138.60	0.00	0.00
128.10	2.03	2.03	133.40	0.32	0.32	138.70	0.00	0.00
128.20	1.99	1.99	133.50	0.31	0.31	138.80	0.00	0.00
128.30	1.95	1.95	133.60	0.30	0.30	138.90	0.00	0.00
128.40	1.91	1.91	133.70	0.29	0.29	139.00	0.00	0.00
128.50	1.87	1.87	133.80	0.27	0.27	139.10	0.00	0.00
128.60	1.83	1.83	133.90	0.26	0.26	139.20	0.00	0.00
128.70	1.79	1.79	134.00	0.25	0.25	139.30	0.00	0.00
128.80	1.75	1.75	134.10	0.24	0.24	139.40	0.00	0.00
128.90	1.71	1.71	134.20	0.23	0.23	139.50	0.00	0.00
129.00	1.67	1.67	134.30	0.22	0.22	139.60	0.00	0.00
129.10	1.63	1.63	134.40	0.21	0.21	139.70	0.00	0.00
129.20	1.59	1.59	134.50	0.20	0.20	139.80	0.00	0.00
129.30	1.55	1.55	134.60	0.19	0.19	139.90	0.00	0.00
129.40	1.51	1.51	134.70	0.18	0.18	140.00	0.00	0.00
129.50	1.47	1.47	134.80	0.17	0.17			
129.60	1.43	1.43	134.90	0.16	0.16			
129.70	1.39	1.39	135.00	0.15	0.15			
129.80	1.35	1.35	135.10	0.14	0.14			
129.90	1.31	1.31	135.20	0.13	0.13			
130.00	1.27	1.27	135.30	0.12	0.12			
130.10	1.23	1.23	135.40	0.11	0.11			
130.20	1.19	1.19	135.50	0.10	0.10			
130.30	1.15	1.15	135.60	0.08	0.08			
130.40	1.11	1.11	135.70	0.07	0.07			
130.50	1.07	1.07	135.80	0.06	0.06			
130.60	1.03	1.03	135.90	0.05	0.05			
130.70	0.99	0.99	136.00	0.04	0.04			
130.80	0.95	0.95	136.10	0.03	0.03			
130.90	0.91	0.91	136.20	0.02	0.02			
131.00	0.87	0.87	136.30	0.01	0.01			
131.10	0.83	0.83	136.40	0.00	0.00			
131.20	0.79	0.79	136.50	0.00	0.00			
131.30	0.75	0.75	136.60	0.00	0.00			
131.40	0.71	0.71	136.70	0.00	0.00			
131.50	0.67	0.67	136.80	0.00	0.00			
131.60	0.63	0.63	136.90	0.00	0.00			
131.70	0.59	0.59	137.00	0.00	0.00			
131.80	0.55	0.55	137.10	0.00	0.00			
131.90	0.51	0.51	137.20	0.00	0.00			
132.00	0.47	0.47	137.30	0.00	0.00			
132.10	0.45	0.45	137.40	0.00	0.00			
132.20	0.44	0.44	137.50	0.00	0.00			
132.30	0.43	0.43	137.60	0.00	0.00			
132.40	0.42	0.42	137.70	0.00	0.00			

D. MAPS

- ◆ **Tax Map**
- ◆ **Aerial Map**
- ◆ **Soil Map**
- ◆ **USGS Map**
- ◆ **FEMA FIRM Flood Map**
- ◆ **Drainage Area Maps**
 - **Existing Drainage Area Map**
 - **Proposed Drainage Area Map**
 - **Inlet Area Map**

Tax Map

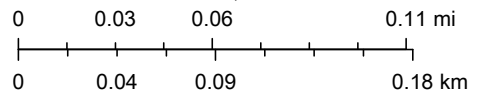


1/7/2022, 1:48:57 PM

1:4,514



Override 1



 Override 1

 County Boundaries

 Parcels Data (Block and Lot)

Esri Community Maps Contributors, Bucks County, PA, Mercer County, NJ, data.pa.gov, New Jersey Office of GIS, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA

New Jersey Department of Environmental Protection

Esri Community Maps Contributors, Bucks County, PA, Mercer County, NJ, data.pa.gov, New Jersey Office of GIS, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, INCREMENT P,

Aerial Map



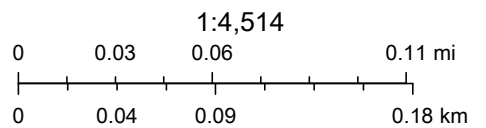
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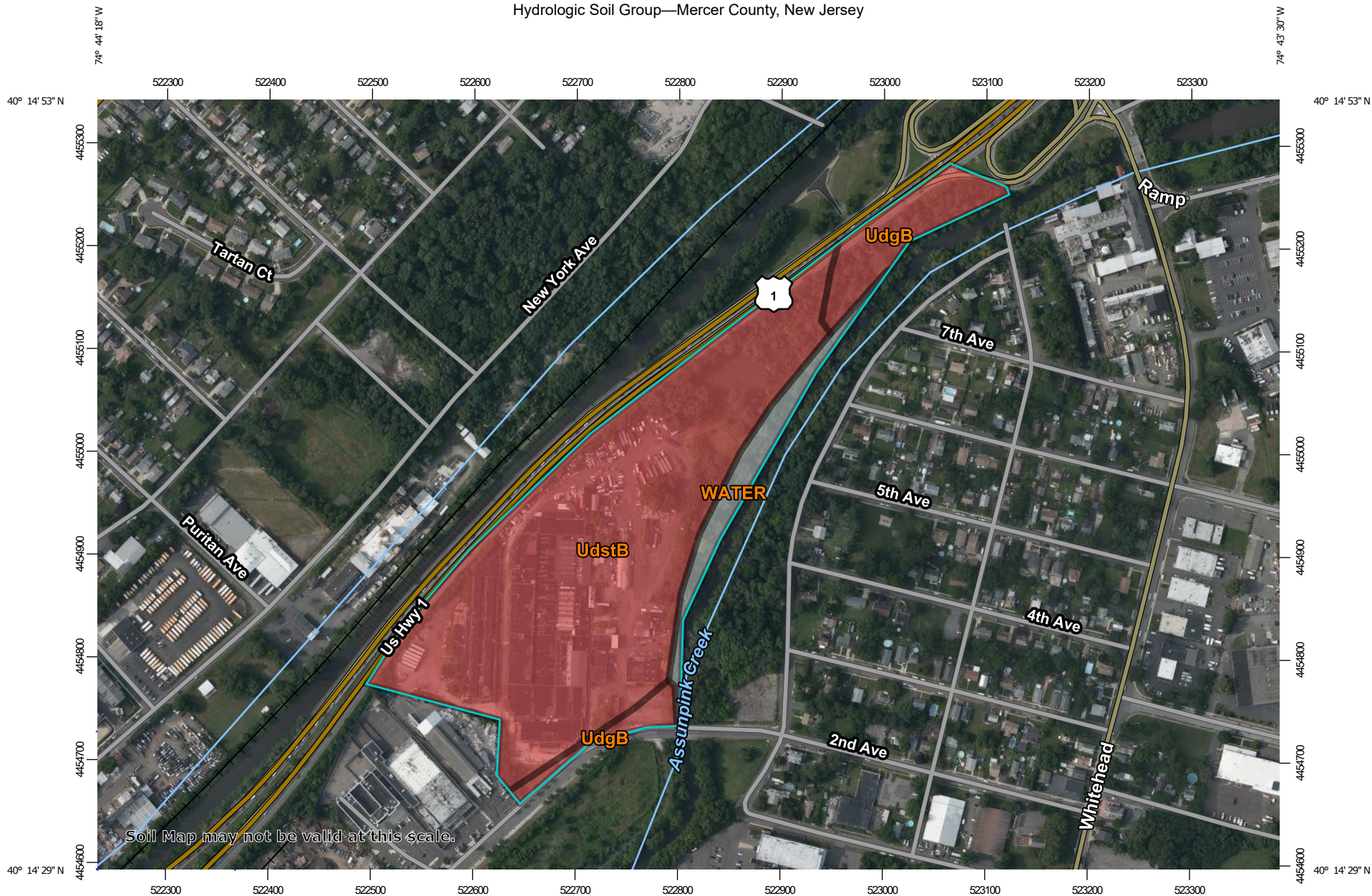


Override 1



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Hydrologic Soil Group—Mercer County, New Jersey



Map Scale: 1:5,280 if printed on A landscape (11" x 8.5") sheet.



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



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons





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

Soil Rating Lines

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

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Mercer County, New Jersey
 Survey Area Data: Version 17, Aug 31, 2021

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

Date(s) aerial images were photographed: May 2, 2019—Jul 9, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
UdgB	Udorthents, gravelly substratum, 0 to 8 percent slopes	D	3.0	11.9%
UdstB	Udorthents, stratified substratum, 0 to 8 percent slopes	D	20.6	81.1%
WATER	Water		1.8	7.0%
Totals for Area of Interest			25.5	100.0%

Description

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

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

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

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

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

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

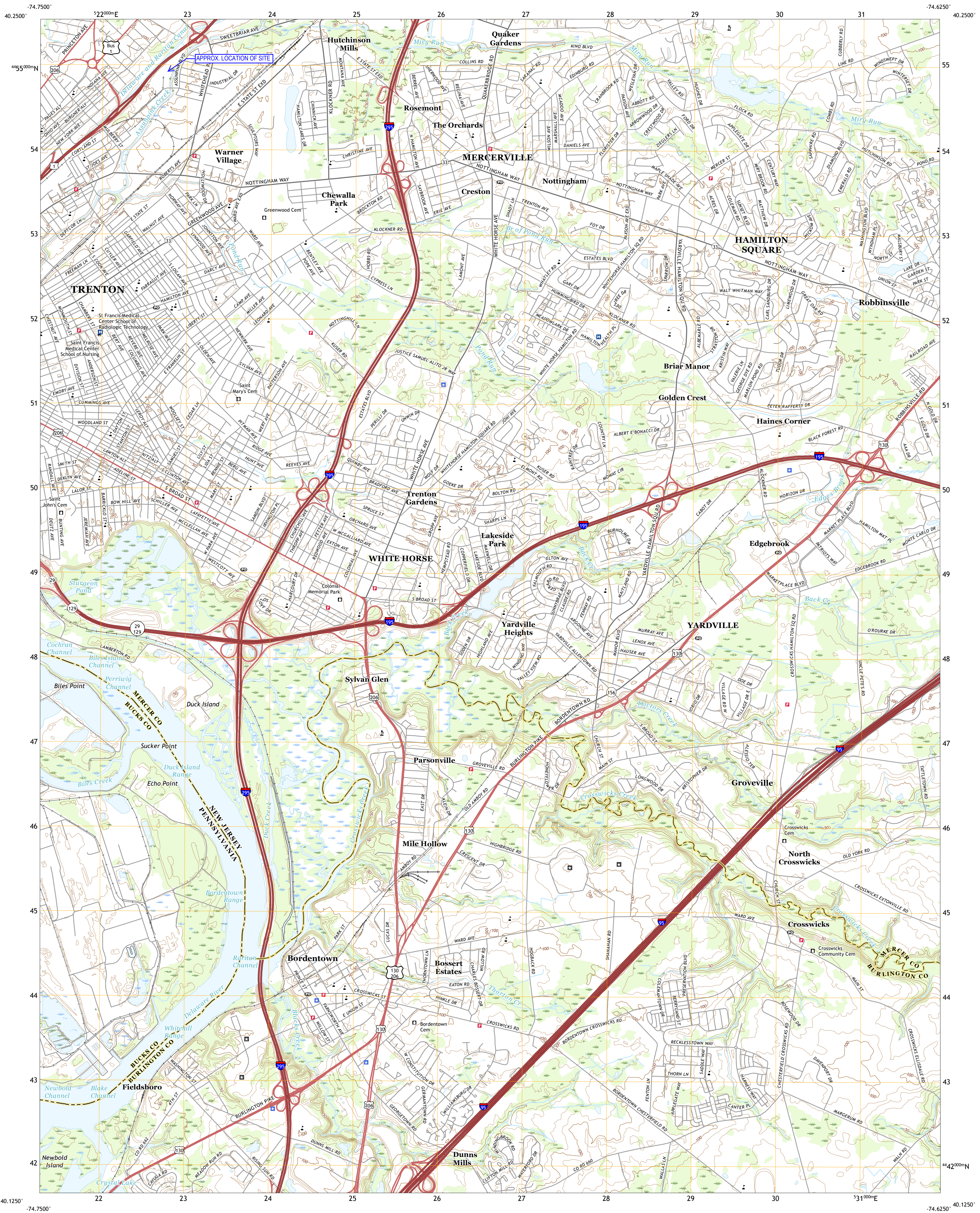
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

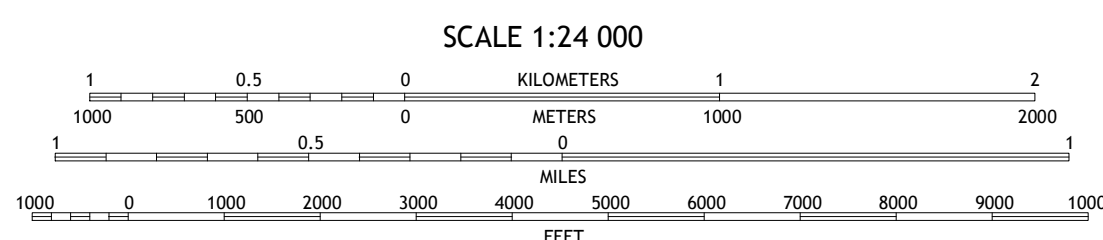
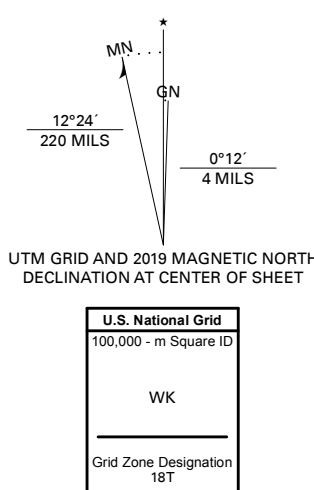
Tie-break Rule: Higher



Produced by the United States Geological Survey

North American Datum of 1983 (NAD83) World Geodetic System of 1984 (WGS84) Projection and 1 000-meter grid/Universal Transverse Mercator, Zone 18T This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery: NAIP, July 2015 - December 2017 Roads: U.S. Census Bureau, 2016 Names: GNS, 1979 - 2019 Hydrography: National Hydrography Dataset, 1989 - 2019 Contours: National Elevation Dataset, 2017 Boundaries: Multiple sources; see metadata file 2017 - 2018 Wetlands: FWS National Wetlands Inventory 2007 - 2013



ROAD CLASSIFICATION table with symbols for Expressway, Secondary Hwy, Ramp, Interstate Route, Local Connector, Local Road, 4WD, US Route, and State Route.

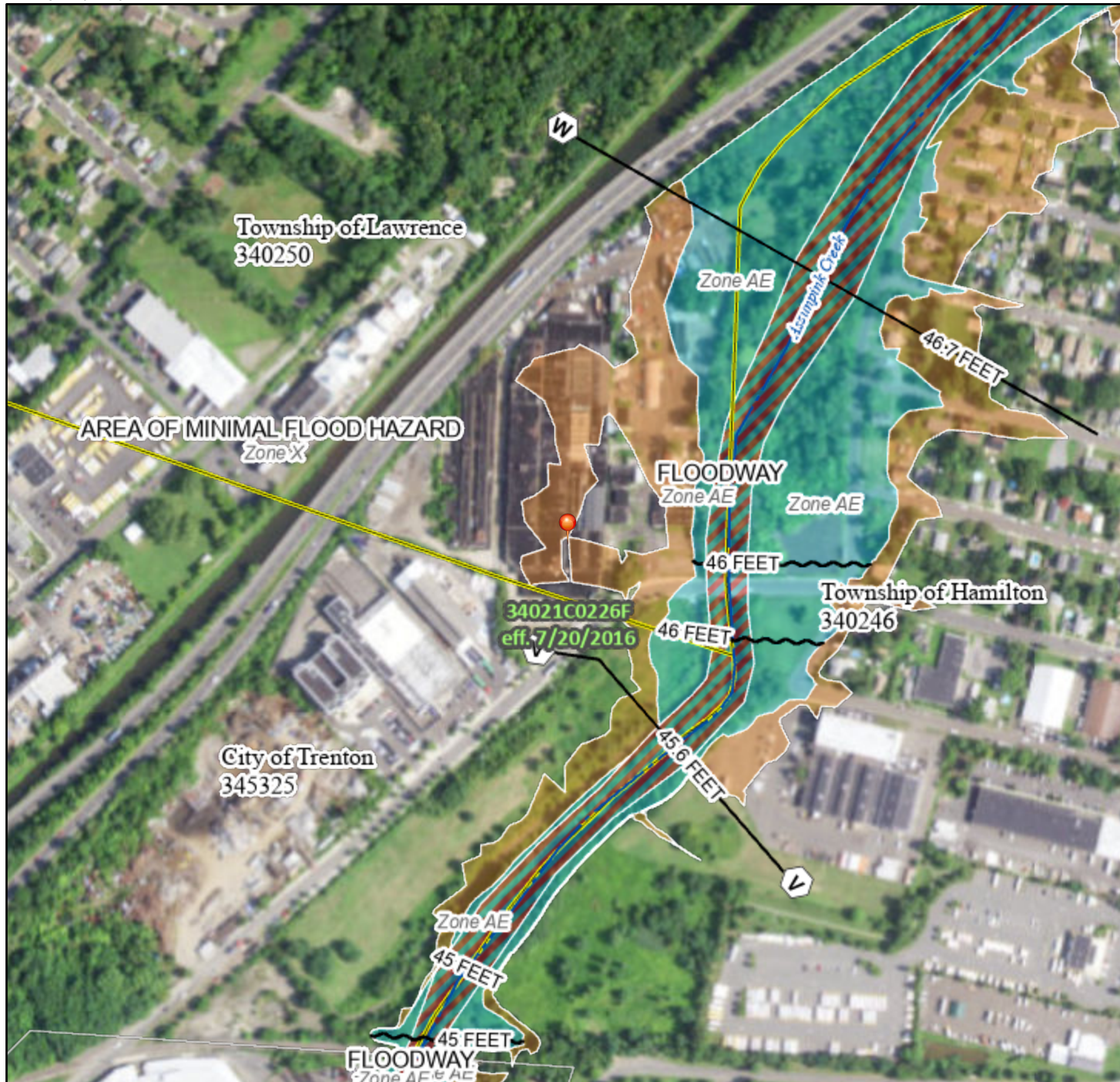
ADJOINING QUADRANGLES table with a 3x3 grid of numbers 1-9.



National Flood Hazard Layer FIRMMette



74°44'19"W 40°14'48"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
	Profile Baseline	
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped
		The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.



This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/7/2022 at 1:59 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.