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STORMWATER MANAGEMENT REPORT

Sellers Farm Road, MA01821

ASSESSORS MAP 24 PARCEL 1E,1G,1K

March 04, 2022

Submitted to:

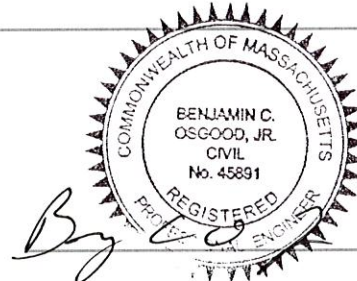
Town of Andover
Andover, MA 01821

Prepared for:

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III.

INTRODUCTION

In accordance with Massachusetts Stormwater Management Regulations and the Town of Andover Stormwater Management and Erosion Control Regulations, Ranger Engineering Group (Ranger) has prepared a comprehensive Stormwater Management Plan for submittal to the Town of Andover, MA planning board on behalf of LRC Builders, LLC (LRC) in support of an Application for a Modified Definitive Subdivision Plan with the planning board and Notice of Intent with the conservation commission for the construction of three (3) new dwellings on a new 382 foot road called Sellers Farm Road which ends in a cul-de-sac.

IV.

EXISTING CONDITIONS

The project site consists of 3 existing lots on an undeveloped road which intersects Highland Road and was approved in 2006. Lot 1 is located on assessor's map 24 lot 1E and is 0.89 acres. Lot 2 is located on assessor's map 24 lot 1G and is 1.10 acres. Lot 3 is located on assessor's map 24 lot 1K and is 0.70 acres. Portions of the drainage area are on assessors Map 24 Lot 1F, 1J, and 1H. (see Ranger Dwg. CS0201). The site is currently undeveloped and consists of grassland, forest, and wetlands. The parcel is bordered by residential properties, with undeveloped forest across Highland Road and a large wetland area to the southeast. A small wetland located on the northeast side of the site drains into the larger wetland to the southeast.

Generally, the topography is sloped away from Highland Road towards the wetland to the southeast. Stormwater sheet flows over the site towards the wetlands. Soils on the site are generally sandy loam on the upper areas of the site and saturated hydric soils in the wetlands.

V.

PROPOSED CONDITIONS

The Applicant proposes to construct a new 382 ft road ending in a cul-de-sac which will provide access to three new dwellings. Each dwelling has a garage and a bituminous concrete driveway. The new roadway will be 18' wide with asphalt berm constructed on each side. The cul-de sac will have a diameter of 96 feet. The dwellings will have water, electric, natural gas, and sewer service. The proposed utility services will be connected to the existing utility mains located in Highland Road.

A closed drainage system consisting of deep sump catch basins, manholes and piping will be constructed to collect stormwater runoff along Sellers Farm Road. Stormwater will be directed via the closed system and sheet flow over the site towards three open basin infiltration/detention ponds with sediment forebays. The treated stormwater is then discharged into the existing wetland.

VI.

STORMWATER DESIGN

The proposed stormwater system will maintain the same drainage patterns as under the pre-development conditions. Increases to peak rates of flow will be mitigated onsite to minimize or eliminate impacts to downstream areas. Stormwater presently flows to the south and east into the surrounding wetland areas.

Closed Drainage Systems

The closed drainage system consists of deep sump catch basins with 4' deep sumps and HDPE piping. Each deep sump catch basin is capable of handling a minimum of one years' worth of sediment. The system conforms to the town of Andover and Massachusetts stormwater regulations.

Stormwater Treatment

Three (3) open infiltration/detention basins are proposed to mitigate peak runoff rates and volumes, promote groundwater recharge, and to provide for water quality. Pond 1 collects water from the proposed road, the entirety of lot 3, and the driveway and front lawn of lot 1. Pond 2 collects water from the driveway and front lawn of lot 2. Pond 3 collects the remaining stormwater water from lot 2. Each pond has a sediment forebay which is designed to treat stormwater of sediment and nutrient loading flowing off impervious areas. Each pond is also sized appropriately to remove the remaining nutrient load. The stormwater system is designed to contain and mitigate the 2-year, 10-year, 25-year, and 100-year storm events.

Stormwater Infiltration

The system has been sized to provide both water quality treatment and recharge to satisfy the requirements of both Mass DEP Stormwater Management Standards 3 and 4. Each pond has a raised outlet so a minimum of 1" of runoff from impervious surfaces is infiltrated.

Wetland Resource Areas

The site contains wetlands resource areas that have been flagged and located on the project plans.

Flood Zone Classification

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Essex County, Massachusetts, Community Panel 25009C0238F, effective date July 3, 2012, the site and nearby properties are located within Zone X, which is defined as areas outside of the 500-year floodplains (see attached).

Estimated Habitat for Rare Wildlife and Rare Species

According to current *Massachusetts GIS Online Mapping Tool (Oliver)*, the site is not designated as an area for estimated habitat for rare wildlife or rare species.

Soil Classification

According to the Soil Survey of Essex County, Massachusetts, prepared by the US Department of Agriculture, Soil Conservation Service, underlying soils located within the site consist primarily of Paxton Fine Sandy Loam and Woodbridge Fine Sandy Loam (see Soils Map). Paxton and Woodbridge soils, are classified within SCS Hydrologic Soil Group C.

Table 1
Hydrologic Soil Group Ratings

Map Unit Symbol	Map Unit Name	Rating
305C	Paxton Fine Sandy Loam 8-15% slope	C
311B	Woodbridge Fine Sandy Loam 0 -8%	C

The on-site soils consist of series, described by NRCS, as follows:

Paxton: The Paxton series consists of moderately well drained loamy soils formed in lodgment till and are shallow to bedrock. They are nearly level to moderately steep soils on hills, drumlins, till plains, and ground moraines. Slope ranges from 0 to 25 percent

Woodbridge: The Woodbridge series consists of moderately well drained loamy soils formed in lodgment till and are very deep to bedrock. They are nearly level to moderately steep soils on hills, drumlins, till plains, and ground moraines. Slope ranges from 0 to 25 percent.

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.

Per the soil survey, the general characteristics of the four (4) hydrologic soil groups are 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 clay pan 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.

Subsurface Investigation

Test pits have been performed and are shown on CS0002 of the planset. Ground water was found between 17-48". Bedrock was found as approximately 32"-80" deep in areas. The soils were found to be consistent with a C soil type as indicated in the USGS soil survey report. Sufficient soils were found beneath the proposed detention/infiltration basin to allow for a conservative infiltration

Methodology

The comparative hydrologic analysis of pre-development conditions to post-development conditions was performed using the Soil Conservation Service, Technical Release 20 (TR-20). The 2, 10, 25, and 100-year storm events were modeled for a 24-hour, Type III storm using HydroCAD version 8.5. HydroCAD calculations for pre-and post-development conditions are include in the Appendices.

The following rainfall amounts were utilized for each design storm event.

2-year Frequency Storm:	3.18 inches per 24-hours
10-year Frequency Storm:	5.04 inches per 24-hours
25-year Frequency Storm:	6.20 inches per 24 hours
100-year Frequency Storm:	7.99 inches per 24-hours

Existing Watershed

The existing site does not contain any drainage systems. Stormwater runoff infiltrates onsite and sheet flows offsite to the southeastern wetlands. The existing catchment areas and drainage runoff flow patterns associated with the site are illustrated on the attached Pre-Development Watershed Plan (Dwg. CS9201). The drainage patterns will be maintained under post-development conditions.

For the purposes of the hydrologic analyses, the existing site has been delineated as two existing catchment areas which flow to two design points. Design Point 1 is located in Highland Road and Design point 2 is located in the wetland to the south east of the site.

The following Catchments flow to design point 1 in the pre-development condition***Catchment E1***

Catchment EX1 includes areas of the site which direct stormwater runoff primarily toward the existing road (Highland Road). The topography within the catchment is moderately sloped (approx. 4%-8%). The catchment has grassed lawn area and a small portion of abutting paved driveway.

Catchment E2

Catchment EX2 includes areas of the site which direct stormwater runoff primarily toward the wetland series A on the southeast side of the property (DP #2). The area includes undeveloped woods areas and grass lawn areas. Slopes are moderate (approx. 5%–20%). The topography within the proposed developed site is gently sloping (approx. 5%). A portion of EX2 flows into wetland series B which ultimately flows into Wetland series A.

Proposed Watershed

The proposed subdivision will include a closed drainage system which will collect and convey stormwater runoff into several detention basins. For the purposes of the analyses, the proposed site has been divided into eleven (11) sub-catchment areas. The proposed catchment areas are shown on the Post-Development Watershed Plan (Dwg. CS9301)

The following Catchments flow to Design Point 1 in the post-development condition

Catchment P1A/P1B

Catchment P1A and P1B includes flow from the proposed Sellers Farm Road and grassed shoulder. Runoff from these catchments flow to deep sump catch basins CB1 and CB2 respectively.

Catchment P2

Includes flow from 171 Highland Road. It consists primarily of lawn with a small portion of paved bit. Conc. Driveway. Stormwater sheet flows offsite and matches the predevelopment drainage conditions.

Catchment P3

Is located on lot 3 and consists of lot 3 roof area (R3), landscaped lawn and paved driveway. Stormwater is collected in the curb constructed along the southern edge of lot 3 driveway and conveyed into one of pond 1's sediment forebays.

Catchment P4A/P4B

Consists of the lower section and cul-de-sac of Sellers Farm Road. In addition, P4B collects stormwater from lot 1 driveway and front lawn. The stormwater is directed towards CB3 and CB4 respectively and ultimately discharged into Pond 1.

Catchment P5

Consists of pond 2, a small portion of Lot 1's lawn, and Lot 1 roof area (R1). Pond 2 is discharged into wetland series B after treatment.

Catchment P6

P6 consists of Lot 1's back yard grassed lawn, woodland, and wetland series B. the majority of P6 is unaltered from the predevelopment conditions.

Catchment P7

Catchment P7 consists of lot 3's grassed lawn, roof area (R3) and pond 3. A small portion of the Lot3 driveway is directed into Pond 3. Pond 3 is discharged into wetland series A.

Catchment P8

Consists of pond 1 and the two forebays. It collects water from the closed drainage system. Treated stormwater is discharged into wetland series A.

Catchment P9

Consists of Wetland Series A, woodland, and a small portion of the rear lawn of lot 3. The majority of P9 is unaltered from the pre-development conditions.

IX. SUMMARY OF PEAK DISCHARGE RATES AND VOLUMES

The estimation of flow rates and volumes were calculated utilizing *HydroCad* stormwater modeling software. The methodology is SCS TR-20, Type III, 24-hour rainfalls (2, 10, 25, & 100-year frequency storm events). Supporting calculations are included in the Appendix.

FLOW RATE TABLES

Point of Analysis	Storm	Pre-Development Rate (CFS)	Post-Development Rate (CFS)
DP #1 (Flow to Highland Rd)	2-year	0.43	0.33
	10-year	1.00	0.75
	25-Year	1.39	1.03
	100-year	2.01	1.48

Point of Analysis	Storm	Pre-Development Rate (CFS)	Post-Development Rate (CFS)
DP #2 (Back Property Line)	2-year	2.90	2.36
	10-year	7.84	6.85
	25-Year	11.32	10.64
	100-year	16.97	16.38

X. STORMWATER MANAGEMENT STANDARDS

The project has been designed to meet the *Mass DEP Stormwater Management Standards* outlined in the *Wetlands Protection Act Regulations*. The design also complies with the standards of the *Town of Andover Stormwater Management and Erosion Control*.

STORMWATER MANAGEMENT PRACTICES

The majority of the stormwater runoff from the developed site is routed through a closed drainage system into detention basins at the low points of the site. All three ponds are equipped with sediment forebays to pretreat stormwater and handle sediment load from impervious areas. Each pond has been designed as an infiltration/detention basin. Discharge from pond 1 and 3 is conveyed through an Outlet control structure to control flows.

Detention basin 2 is an infiltration/detention basin. This basin is sized to provide infiltration and treatment of runoff. The pond has an overflow weir which directs flow to the wetland in the 10, 25, and 100 year storm event

Each pond is sized appropriately for water quality and will successfully remove the required amount of nutrients.

CONFORMANCE WITH STANDARDS

Standard 1: No New Untreated Discharges – Met

There will be no new untreated outfalls proposed as part of this project; the stormwater management system is designed to provide a minimal level of water quality treatment for all discharges.

Standard 2: Peak Rate Attenuation – Met

There will be an increase to the impervious area associated with the redevelopment of this site. Pre- and post-development watershed analyses of the drainage systems were performed for the 2, 10, 25 and 100-year storms. A summary of peak discharge rates for the pre and post development conditions is presented in section IX and the full Hydrocad printouts are included in the Appendix to this report. The results of the analysis indicate that post-development peak discharge rates will not increase from the pre-development peak discharge rates for the design point in the analysis.

Standard 3: Recharge Volume– Met

At a minimum, Standard 3 requires that the post-development site provides at least as much recharge volume as the existing conditions. There will be an increase to the impervious areas of 28,322 square feet in the post development condition which is broken down as follows:

Paved Area = 21,848 square feet

Roof Areas = 6,474 square feet

There is a groundwater recharge requirement associated with this project under the Massachusetts Stormwater management act. Based upon the Type C soil, 0.25" over the area of impervious surface must be infiltrated. Under the Andover Stormwater management act, the requirement for TSS removal are considered met when 1" of run off from impervious surfaces is infiltrated.

$28,322 \text{ sf} \times (1"/12") = 2,360 \text{ cubic feet}$

To meet this requirement infiltration is provided by infiltration in the detention ponds.

Basin 1:

For the area flowing to detention basin 1 the total impervious pavement area is 19,523 square feet. The required infiltration for the area flowing to ponds 1 is calculated as follows:

$$19,523\text{sf} \times (1"/12") = \mathbf{1,626 \text{ CF}}$$

The total volume of infiltration available in detention basins 1 is = **1,822 cubic feet >1,626 CF**

Basin 2:

For the area flowing to detention basin 2 the total impervious pavement area is 5,449 square feet. The required infiltration for the area flowing to ponds 1 is calculated as follows:

$$5,449\text{sf} \times (1"/12") = \mathbf{454 \text{ CF}}$$

The total volume of infiltration available in detention basins 2 is = **511 cubic feet > 454 CF**

Basin 3:

For the area flowing to detention basin 3 the total impervious pavement area is 3,350 square feet. The required infiltration for the area flowing to ponds 1 is calculated as follows:

$$3,350 \text{ sf} \times (1"/12") = \mathbf{279 \text{ CF}}$$

The total volume of infiltration available in detention basins 1 is = **338 cubic feet > 279 CF**

The stormwater management act requires that no less than 65% of the impervious area flow to the infiltration systems for the project site. All impervious surfaces flow to infiltration system so an adjustment is not required.

72-Hour Drawdown Calculations

The drawdown time for the detention basin is determined with the following equation.

$$\text{Time (drawdown)} = \frac{\text{ReV}}{(\text{K}) \times \text{Area}}$$

Where, ReV = recharge Volume Provided
 K = Saturated Hydraulic Conductivity (Rawls Rate for HSG B soils)
 Area = Average Surface area of basin bottom

Three (3) soil samples were taken on site from Test Pit 6, 7 and 10 (see CS0201 and sieve analysis reports) and indicate that the underlying soil is a sandy loamy. The infiltration rate associated with a loamy sand is 1.02 inches per hour and is the rate used in the drawdown calculations below.

Detention Basin 1

The volume of stormwater stored will infiltrate through the bottom of the detention basin in time

$$\text{Time (drawdown)} = \frac{1,822\text{cf}}{(1.02\text{"/hr})/12 \times 2125 \text{ sf}} = 10 \text{ hours}$$

Detention Basin 2

The volume of stormwater stored will infiltrate through the bottom of the detention basin in time

$$\text{Time (drawdown)} = \frac{511\text{cf}}{(1.02\text{"/hr})/12 \times 616 \text{ sf}} = 9.75 \text{ hours}$$

Detention Basin 3

The volume of stormwater stored will infiltrate through the bottom of the detention basin in time

$$\text{Time (drawdown)} = \frac{338\text{cf}}{(1.02\text{"/hr})/12 \times 541 \text{ sf}} = 6.5 \text{ hours}$$

Standard 4: Water Quality – Met

According to Andover Stormwater regulations, the project is subject to a 90% TSS Removal Rate and a 60% Phosphorus removal rate requirement. The requirement is also considered met when one inch of water over the impervious area is retained. Water quality will be provided in three separate treatment trains as detailed below.

Detention Basin 1-3

Water quality will be provided using deep sump catch basins, sediment forebays, and a infiltration/detention basin. The water quality volume treated within this system will be as follows: The volume subject to treatment is the same volume which was calculated for Standard 3 above

Basin 1

= 1,822 cubic feet provided > 1626 CF required

Basin 2

= 511 cubic feet provided > 454 CF required

Basin 3

= 338 cubic feet provided > 279 CF required

The detention basin water quality treatment train includes deep sump catch basins, which provide a 25% TSS removal rate, sediment forebay which provides 25% TSS removal and the dry detention/infiltration basin which provides 80% TSS removal rate. The total TSS removal rate for this treatment chain is 85% which meets standard 4 of the Massachusetts stormwater regulations of 80% TSS removal. Additionally, Andover Stormwater Management Act requires 60% Total Phosphorous removal. Infiltration/detention Basins equipped with Sediment forebays remove 60-80% Total Phosphorus which meets the requirements.

Revised Universal Soil Loss Equation (RUSLE)

Annual Sediment Load per Catch Basin w/ 4' deep sump

Sediment load (CF/yr) = Paved Area (Ac) * 750 LB/Ac-storm / 90LB/CF * 10 storms/yr
Volume of 4' deep sump catch basin = $\pi * r * r * h = 3.14 \times 2\text{ft} \times 2\text{ft} \times 4\text{ft} = 50.25\text{ CF}$

CB1

Load = $0.034\text{ ac} * 750 * (1/90) * 10 = 2.83\text{ cf/yr}$

CB2

Load = $0.034\text{ ac} * 750 * (1/90) * 10 = 2.83\text{ cf/yr}$

CB3

Load = $0.12\text{ ac} * 750 * (1/90) * 10 = 10\text{ cf/yr}$

CB4

Load = $0.16\text{ ac} * 750 * (1/90) * 10 = 13.3\text{ cf/yr}$

Sediment Forebay Sizing

Required Volume = Impervious Area x (0.1"/12")

Pond 1:

Required Volume = $19,523\text{ SF} \times (0.1"/12") = 162\text{ CF}$

Provided Volume = 780 CF

Pond 2:

Required Volume = $5,449\text{ SF} \times (0.1"/12") = 45\text{ CF}$

Provided Volume = 71.5 CF

Pond 3:

Required Volume = $3,350\text{ SF} \times (0.1"/12") = 28\text{ CF}$

Provided Volume = 450 CF

Standard 5: LUHPPL's – Not applicable

Standard 6: Critical Areas _ Not Applicable

Standard 7: Redevelopment Projects Not Applicable

Standard 8: Erosion and Sediment Control – Met

Soil and erosion control shall be provided during construction by means of siltation fence, and/or compost filter tubes. Inlet protection will be installed on all drain inlets and a construction entrance will be used in areas where the pavement and building are being removed.

The Stormwater Pollution Prevention Plan (SWPPP) has been completed and included with this report. The Contractor will submit the SWPPP through the NPDES Notice system prior to any land disturbance.

Standard 9: Operation and Maintenance Plan – Met

The operation and maintenance plan for the post-construction BMP's on this project will be the responsibility of the Property Owner. The Operation and Maintenance Plan for the proposed drainage systems can be found in the Appendix.

Standard 10: Illicit Discharges – Met

There are no known or suspected illicit discharges to the proposed stormwater conveyance system.

In summary, this project meets Standards 1, 2,3, 4, 8, 9, and 10. Standards 5, 6, and 7 are not applicable to the project.

STORMWATER MANAGEMENT REPORT

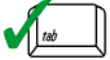
DEP STORMWATER CHECKLIST



Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

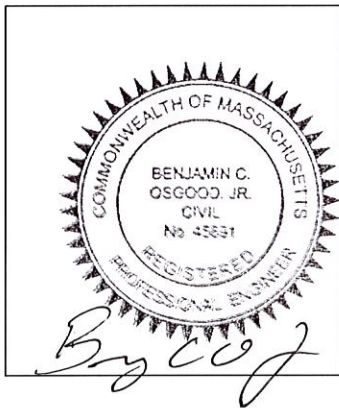
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



3-4-22
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe):

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does **not** cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

TSS REMOVAL CALCULATIONS

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Ponds P1, P2 and P3

B BMP ¹	C TSS Removal Rate ¹	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Infiltration Basin	0.80	0.75	0.60	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

Total TSS Removal = 85%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 196 Ballardvale Street, Wilmington, MA
Prepared By: BCO Jr.
Date: 3/2/2022

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
 1. From MassDEP Stormwater Handbook Vol. 1

Construction Period Erosion and Sedimentation Control Plan:

The BMP's associated with the construction phase this project will be owned by the Applicant's Contractor, which will be responsible for inspection, operation and maintenance. A more detailed SWPPP – per NPDES Phase 2 requirements – is to be kept on site, along with inspection logs. All details and plans required are included in the Site Plan set attached herewith.

1. The contractor is to install and maintain drainage facilities as shown on site plan prepared by Ranger Engineering Group, Inc. (Ranger), dated March 04, 2022.
2. Prior to commencement of construction the contractor shall file a notice of intent under the EPA NPDES construction permit.
3. Any dewatering requires coverage under the NPDES construction site dewatering general permit.
4. The contractor must install erosion control measures as shown on the plans and in the details prior to starting any other work on the site. Erosion control must be installed at every inlet structure (existing and proposed) and maintained for the duration of the project.
5. Erosion controls as shown on plans shall be inspected, repaired and/or maintained by the contractor daily and within 12 hours of each storm event.
6. Sediment deposits shall be removed when they reach a depth of 1/4 to 1/2 the height of the silt fence or sediment sock.
7. Sediment shall be contained within the construction site, away from drainage structures. Sediment reaching the public way shall be removed by street sweeping and not by flushing.
8. Stabilize slopes steeper than 3:1 (horizontal to vertical) with seed, secured geotextile fabric, or rock rip-rap as required to prevent erosion during construction.
9. Clean out catch basins, drain manholes and storm drain pipes after completion of construction.
10. Loam and seed all disturbed areas. Permanent seeding shall occur in the spring from late march through may and in late summer or early fall between August and October.
11. Dust shall be controlled at the site with mechanical water spraying as necessary and during extended dry periods.
12. Upon establishment of permanent vegetation over disturbed areas, remove and dispose of hay wattles and stakes.
13. It is the responsibility of the contractor to maintain and supplement the specified sedimentation controls as necessary to prevent sedimentation of off-site areas and/or any regulated resource areas. Failure by the contractor to control erosion, pollution and/or siltation shall be cause for the owner to employ outside assistance or to use his

own means to provide the necessary corrective measure. The cost of such assistance plus project engineering costs will be the contractor's responsibility.

14. In addition to those locations shown on this plan and on the grading and drainage plans, erosion controls shall be installed at the following locations: toe of slope of embankment construction, toe of temporary earthwork stockpiles. Stockpile side slopes shall not exceed 2:1.
15. Erosion and sedimentation control shall be installed and maintained in compliance with Massachusetts stormwater policy.

LONG TERM POLLUTION PREVENTION PLAN

It is the responsibility of the property owner to properly maintain the drainage systems and structures, including drain pipes. The current property owner will oversee long term maintenance of the stormwater system and will be responsible for compliance with the Long Term Pollution Prevention Plan upon completion of the construction.

Regular maintenance is to include the following:

1. **Cleaning of Debris from Stormwater Ponds**

Trash and debris shall be removed from the stormwater ponds monthly.

2. **Mowing Interior of Stormwater Ponds**

Grass slopes within and around stormwater ponds shall be mowed a minimum of twice per year to prevent the growth of woody vegetation

3. **Pavement Sweeping**

Pavement surfaces shall be swept a minimum of twice per year, preferably just after snow melt and late in the fall.

4. **Catch Basin Sumps, Drain Manhole and Outlet Control Structures**

Inspect quarterly for the evidence of structural damage, silt accumulation and improper function. Remove accumulated sediments and debris from catch basin sump when sump is more than 25% full, minimum annually just after snow melt.

5. **Drain Pipes**

Inspect annually for the evidence of structural damage, silt accumulation and improper function. Clean pipes when sediment occupies more than 20% of pipe diameter.

6. **Sediment Forebays**

Inspect quarterly for accumulation of silt and debris. Remove silt when deeper than 4".

7. **Dry Detention / Infiltration Ponds**

Inspect after every storm event for first few months of operation to ensure that the ponds are infiltrating properly. Thereafter inspect twice per year for evidence of structural damage, erosion, and sediment accumulation. Inspect outlet structure and rip rap protection for proper function and control of erosion. Mow the side slopes, remove trash, debris, and grass clippings a minimum of twice per year.

8. Graded Slopes and Rip Rap outlets

Inspect every spring for erosion. Repair any erosion by placing rip-rap or loam and seed. Nurtured freshly seeded areas to ensure proper germination and establishment of turf.

Inspections shall be performed by a qualified person with knowledge of stormwater structures and conveyance systems A report of inspections shall be submitted to the Town of Billerica on an annual basis within 30 days of the end of each calendar year.

The requirement and responsibility for the inspection and maintenance of the stormwater system will continue to any subsequent owners of the property.

Current Property Owner who will be responsible for the operation, maintenance, and emergency repairs of the stormwater system.

LRC Builders, LLC
475 Boston Road
Billerica, MA 01821

Inspection Costs

The annual costs of implementing the required inspections and maintenance outlined in the long-term pollution prevention plan are expected to be as follows:

- Quarterly inspections \$ 2,000
- Annual roadway sweeping \$ 1,500
- Removal of silt from stormwater treatment systems \$ 2,000
- Annual mowing of side slopes \$ 500
- Annual catch basin cleaning \$ 1,500

Public Safety

The stormwater management system is designed as a passive system and when maintained properly it should not pose any threat to public safety.

**ANNUAL LONG TERM POLLUTION PREVENTION PLAN
MAINTINANCE AND INSPECTION LOG**

This inspection log shall be maintained on site and completed as required during the calendar year when stormwater system maintenance and inspection is performed. General Maintenance items such as mowing and removal of debris from stormwater systems can be completed by persons employed by the property owner. Inspections of stormwater systems and piping should be performed by a person with knowledge of stormwater systems and is qualified to perform such inspections.

Plan Year _____

Cleaning of Debris from Stormwater Ponds

Trash and debris shall be removed from the stormwater ponds on a monthly basis

MONTH	DATE	PERFORMED BY	COMMENTS
JANUARY			
FEBRUARY			
MARCH			
APRIL			
MAY			
JUNE			
JULY			
AUGUST			
SEPTEMBER			
OCTOBER			
NOVEMBER			
DECEMBER			

Mowing Interior of Stormwater Ponds

Grass slopes within and around stormwater ponds shall be mowed a minimum of twice per year to prevent the growth of woody vegetation

DATE	PERFORMED BY	COMMENTS

Pavement Sweeping

Pavement surfaces shall be swept a minimum of twice per year, preferably just after snow melt and late in the fall.

DATE	PERFORMED BY	COMMENTS

Catch Basin Sumps, Drain Manhole and Outlet Control Structures

Inspect quarterly for the evidence of structural damage, silt accumulation and improper function. Remove accumulated sediments and debris from catch basin sump when sump is more than 25% full, minimum annually just after snow melt.

INSPECTION DATE	PERFORMED BY	COMMENTS

Drain Pipes

Inspect annually for the evidence of structural damage, silt accumulation and improper function. Clean pipes when sediment occupies more than 20% of pipe diameter.

INSPECTION DATE	PERFORMED BY	COMMENTS

Sediment Forebays

Inspect quarterly for accumulation of silt and debris. Remove silt when deeper than 4”.

INSPECTION DATE	PERFORMED BY	COMMENTS

Dry Detention / Infiltration Ponds

Inspect after every storm event for first few months of operation to ensure that the ponds are infiltrating properly. Thereafter inspect twice per year for evidence of structural damage, erosion, and sediment accumulation. Inspect outlet structure and rip rap protection for proper function and control of erosion. Mow the side slopes, remove trash, debris, and grass clippings a minimum of twice per year.

INSPECTION DATE	PERFORMED BY	COMMENTS

Graded Slopes and Rip Rap outlets

Inspect every spring for erosion. Repair any erosion by placing rip-rap or loam and seed. Nurtured freshly seeded areas to ensure proper germination and establishment of turf.

INSPECTION DATE	PERFORMED BY	COMMENTS

Corrective actions

In the area below describe any repairs made to the system during the current calendar year. Add additional sheets if necessary

DATE	NO.	REVISIONS	BY



APPENDICES

HYDROCAD CALCULATIONS

STORMWATER MANAGEMENT REPORT

PRE-DEVELOPMENT DRAINAGE



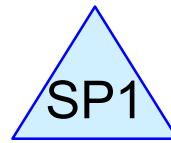
EX1 FLOW TO
HIGHLAND ROAD



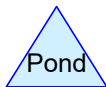
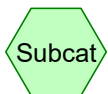
SUM POND STREET



EX2 DESIGN POINT
BACK PROPERTY
LINE



(new Pond)



SELLERS FARM PRE DEVELOPMENT

Prepared by Ranger Engineering Group, Inc..

Printed 3/2/2022

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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
55,440	74	>75% Grass cover, Good, HSG C (EX1, EX2)
1,415	98	Paved parking, HSG C (EX1)
105,163	70	Woods, Good, HSG C (EX1, EX2)
17,464	72	Woods/grass comb., Good, HSG C (EX2)
179,482	72	TOTAL AREA

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
179,482	HSG C	EX1, EX2
0	HSG D	
0	Other	
179,482		TOTAL AREA

SELLERS FARM PRE DEVELOPMENT

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	55,440	0	0	55,440	>75% Grass cover, Good
0	0	1,415	0	0	1,415	Paved parking
0	0	105,163	0	0	105,163	Woods, Good
0	0	17,464	0	0	17,464	Woods/grass comb., Good
0	0	179,482	0	0	179,482	TOTAL AREA



RANGER ENGINEERING GROUP, INC.

STORMWATER MANAGEMENT REPORT

PRE-DEVELOPMENT DRAINAGE

2 YEAR STORM

SELLERS FARM PRE DEVELOPMENT

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SELLERS FARM PRE 3-2-2022

Type III 24-hr 2 year Rainfall=3.18"

Printed 3/2/2022

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX1: EX1 FLOW TO

Runoff Area=14,525 sf 9.74% Impervious Runoff Depth>1.14"
Flow Length=205' Tc=5.0 min CN=76 Runoff=0.43 cfs 1,376 cf

Subcatchment EX2: EX2 DESIGN POINT

Runoff Area=164,957 sf 0.00% Impervious Runoff Depth>0.86"
Flow Length=406' Tc=11.2 min CN=71 Runoff=2.90 cfs 11,872 cf

Pond SP1: (new Pond)

Inflow=2.90 cfs 11,872 cf
Primary=2.90 cfs 11,872 cf

Pond SP2: SUM POND STREET

Inflow=0.43 cfs 1,376 cf
Primary=0.43 cfs 1,376 cf

Total Runoff Area = 179,482 sf Runoff Volume = 13,249 cf Average Runoff Depth = 0.89"
99.21% Pervious = 178,067 sf 0.79% Impervious = 1,415 sf

SELLERS FARM PRE DEVELOPMENT

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SELLERS FARM PRE 3-2-2022
Type III 24-hr 2 year Rainfall=3.18"

Printed 3/2/2022

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Summary for Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD

Runoff = 0.43 cfs @ 12.09 hrs, Volume= 1,376 cf, Depth> 1.14"

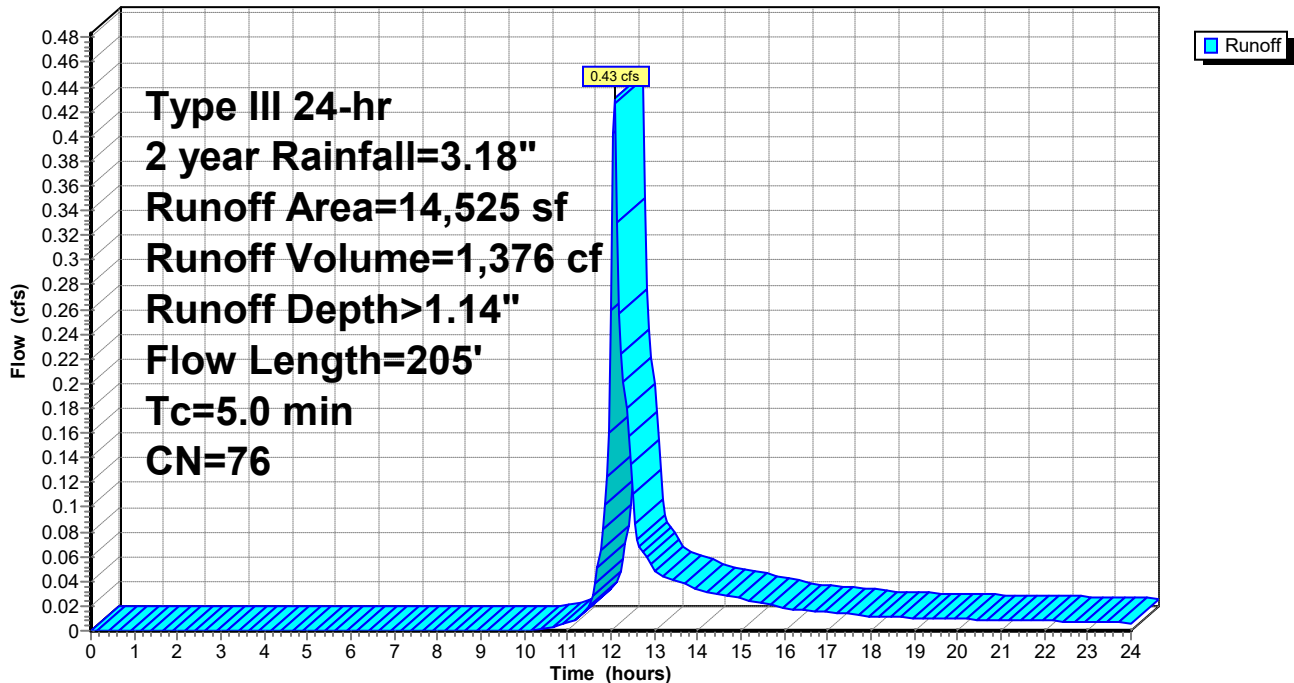
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
10,810	74	>75% Grass cover, Good, HSG C
2,300	70	Woods, Good, HSG C
14,525	76	Weighted Average
13,110		90.26% Pervious Area
1,415		9.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		Sheet Flow, FLOW OVER GRASS Grass: Short n= 0.150 P2= 3.12"
0.4	35	0.0420	1.43		Shallow Concentrated Flow, FLOW OVER GRASS Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		Shallow Concentrated Flow, FLOW ALONG DRIVEWAY Paved Kv= 20.3 fps
5.0	205	Total			

Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD

Hydrograph



SELLERS FARM PRE DEVELOPMENT

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SELLERS FARM PRE 3-2-2022
 Type III 24-hr 2 year Rainfall=3.18"

Printed 3/2/2022

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Summary for Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE

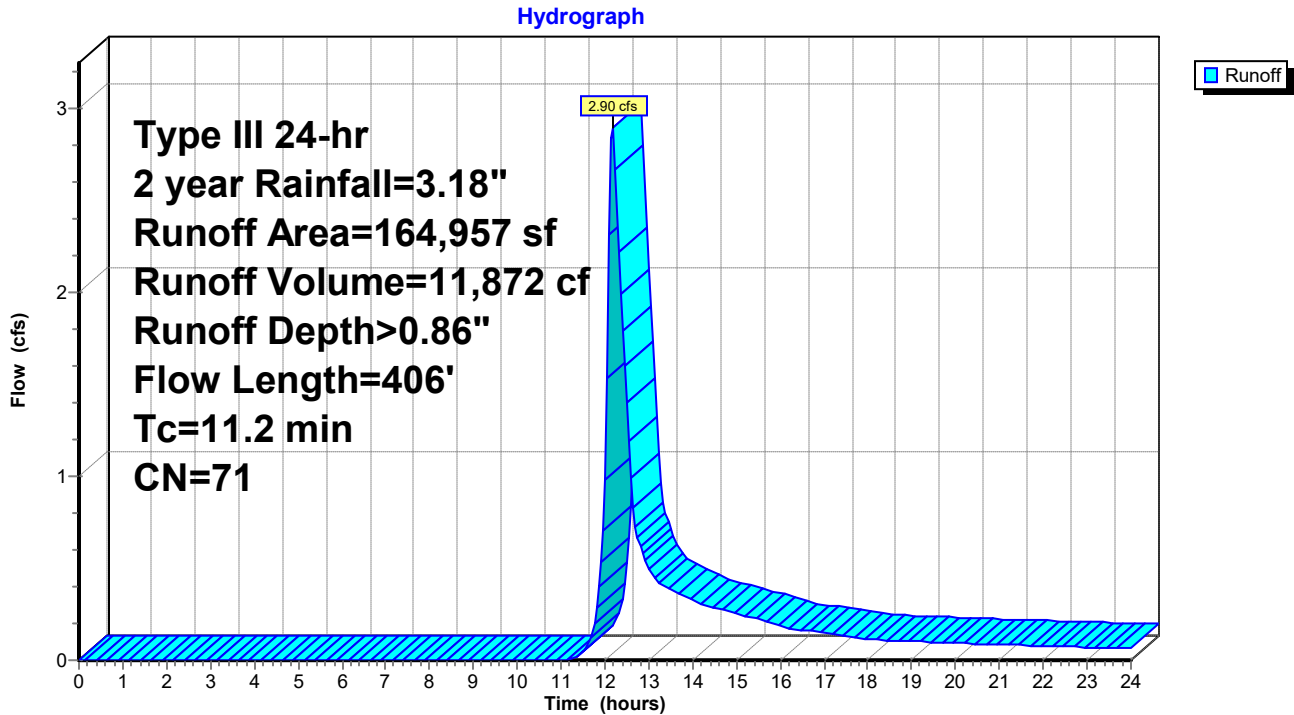
Runoff = 2.90 cfs @ 12.17 hrs, Volume= 11,872 cf, Depth> 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
44,630	74	>75% Grass cover, Good, HSG C
102,863	70	Woods, Good, HSG C
17,464	72	Woods/grass comb., Good, HSG C
164,957	71	Weighted Average
164,957		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		Sheet Flow, FLOW OVER GRASS Grass: Short n= 0.150 P2= 3.12"
3.7	246	0.0500	1.12		Shallow Concentrated Flow, FLOW IN WOODS Woodland Kv= 5.0 fps
3.5	110	0.0450	0.53		Shallow Concentrated Flow, FLOW IN WOODS Forest w/Heavy Litter Kv= 2.5 fps
11.2	406	Total			

Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE



SELLERS FARM PRE DEVELOPMENT

Prepared by Ranger Engineering Group, Inc..

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SELLERS FARM PRE 3-2-2022

Type III 24-hr 2 year Rainfall=3.18"

Printed 3/2/2022

Page 8

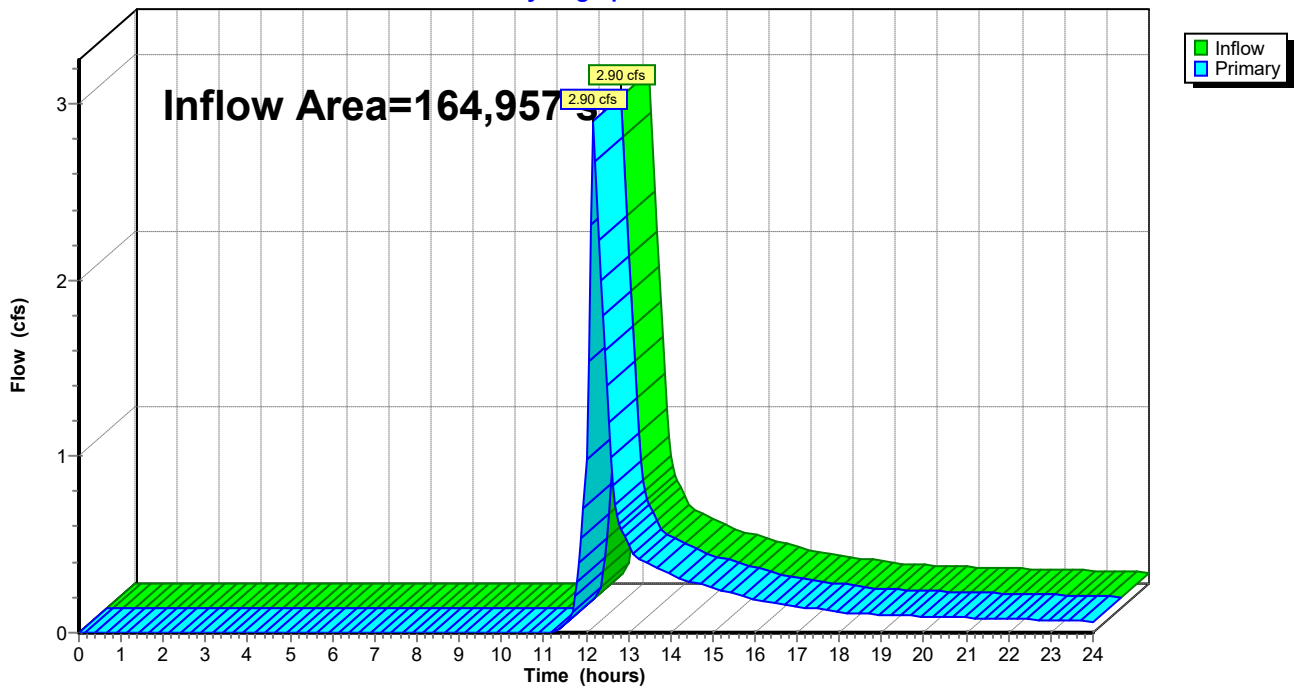
Summary for Pond SP1: (new Pond)

Inflow Area = 164,957 sf, 0.00% Impervious, Inflow Depth > 0.86" for 2 year event
Inflow = 2.90 cfs @ 12.17 hrs, Volume= 11,872 cf
Primary = 2.90 cfs @ 12.17 hrs, Volume= 11,872 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: (new Pond)

Hydrograph



SELLERS FARM PRE DEVELOPMENT

Prepared by Ranger Engineering Group, Inc..

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SELLERS FARM PRE 3-2-2022

Type III 24-hr 2 year Rainfall=3.18"

Printed 3/2/2022

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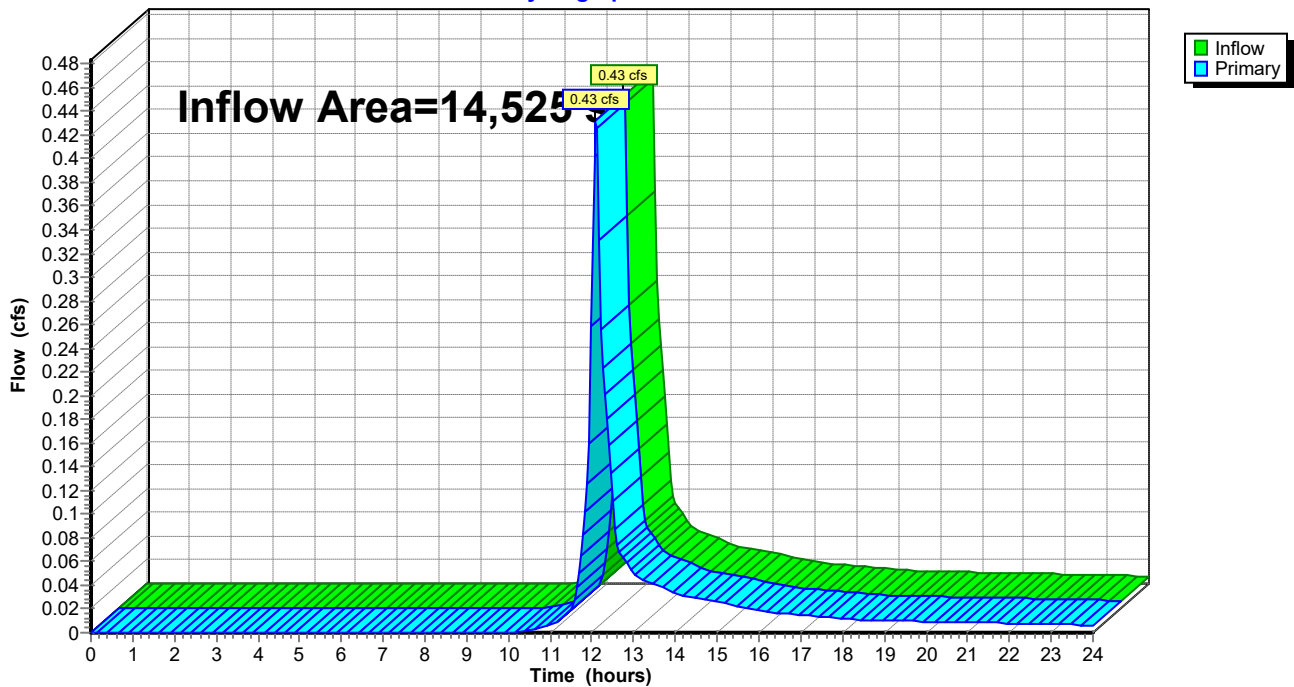
Summary for Pond SP2: SUM POND STREET

Inflow Area = 14,525 sf, 9.74% Impervious, Inflow Depth > 1.14" for 2 year event
Inflow = 0.43 cfs @ 12.09 hrs, Volume= 1,376 cf
Primary = 0.43 cfs @ 12.09 hrs, Volume= 1,376 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET

Hydrograph





RANGER ENGINEERING GROUP, INC.

STORMWATER MANAGEMENT REPORT

PRE-DEVELOPMENT DRAINAGE

10 YEAR STORM

SELLERS FARM PRE DEVELOPMENT

Prepared by Ranger Engineering Group, Inc..

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SELLERS FARM PRE 3-2-2022
Type III 24-hr 10 year Rainfall=5.04"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX1: EX1 FLOW TO

Runoff Area=14,525 sf 9.74% Impervious Runoff Depth>2.57"
Flow Length=205' Tc=5.0 min CN=76 Runoff=1.00 cfs 3,107 cf

Subcatchment EX2: EX2 DESIGN POINT

Runoff Area=164,957 sf 0.00% Impervious Runoff Depth>2.14"
Flow Length=406' Tc=11.2 min CN=71 Runoff=7.84 cfs 29,443 cf

Pond SP1: (new Pond)

Inflow=7.84 cfs 29,443 cf
Primary=7.84 cfs 29,443 cf

Pond SP2: SUM POND STREET

Inflow=1.00 cfs 3,107 cf
Primary=1.00 cfs 3,107 cf

Total Runoff Area = 179,482 sf Runoff Volume = 32,550 cf Average Runoff Depth = 2.18"
99.21% Pervious = 178,067 sf 0.79% Impervious = 1,415 sf

SELLERS FARM PRE DEVELOPMENT

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SELLERS FARM PRE 3-2-2022
 Type III 24-hr 10 year Rainfall=5.04"

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Summary for Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD

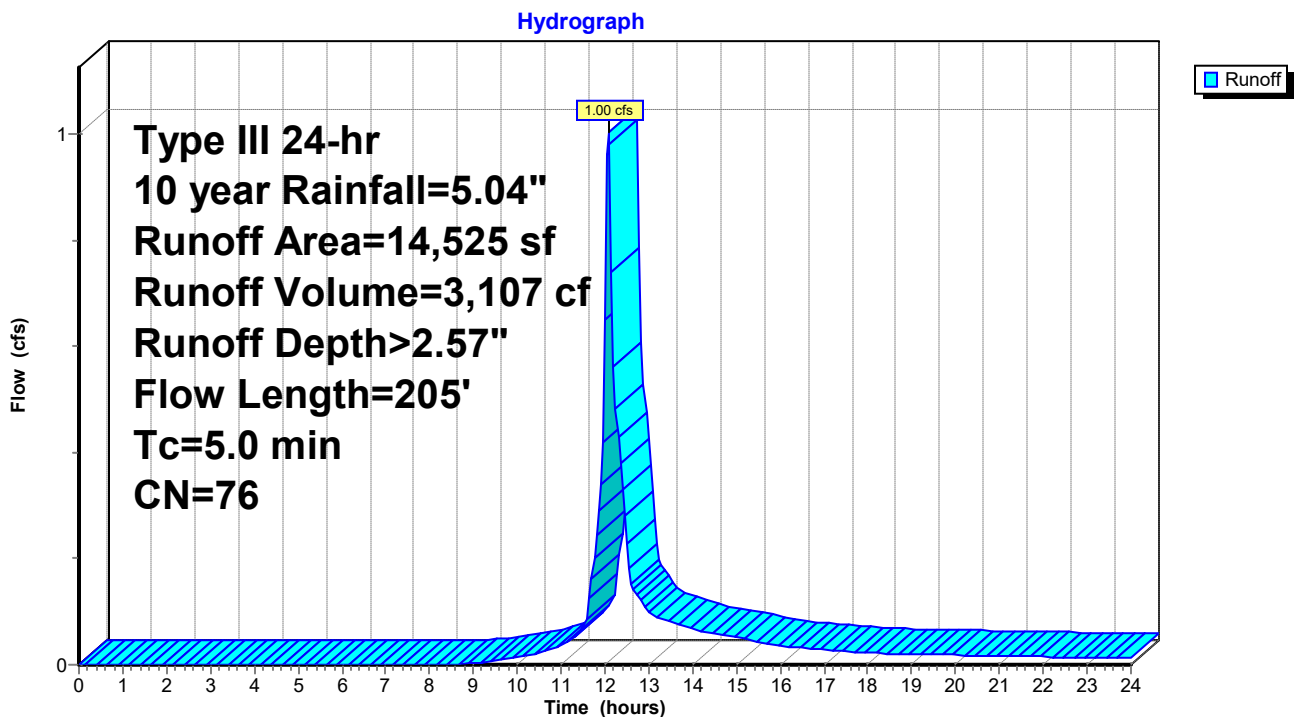
Runoff = 1.00 cfs @ 12.08 hrs, Volume= 3,107 cf, Depth> 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
10,810	74	>75% Grass cover, Good, HSG C
2,300	70	Woods, Good, HSG C
14,525	76	Weighted Average
13,110		90.26% Pervious Area
1,415		9.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		Sheet Flow, FLOW OVER GRASS Grass: Short n= 0.150 P2= 3.12"
0.4	35	0.0420	1.43		Shallow Concentrated Flow, FLOW OVER GRASS Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		Shallow Concentrated Flow, FLOW ALONG DRIVEWAY Paved Kv= 20.3 fps
5.0	205	Total			

Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD



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Type III 24-hr 10 year Rainfall=5.04"

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Summary for Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE

Runoff = 7.84 cfs @ 12.16 hrs, Volume= 29,443 cf, Depth> 2.14"

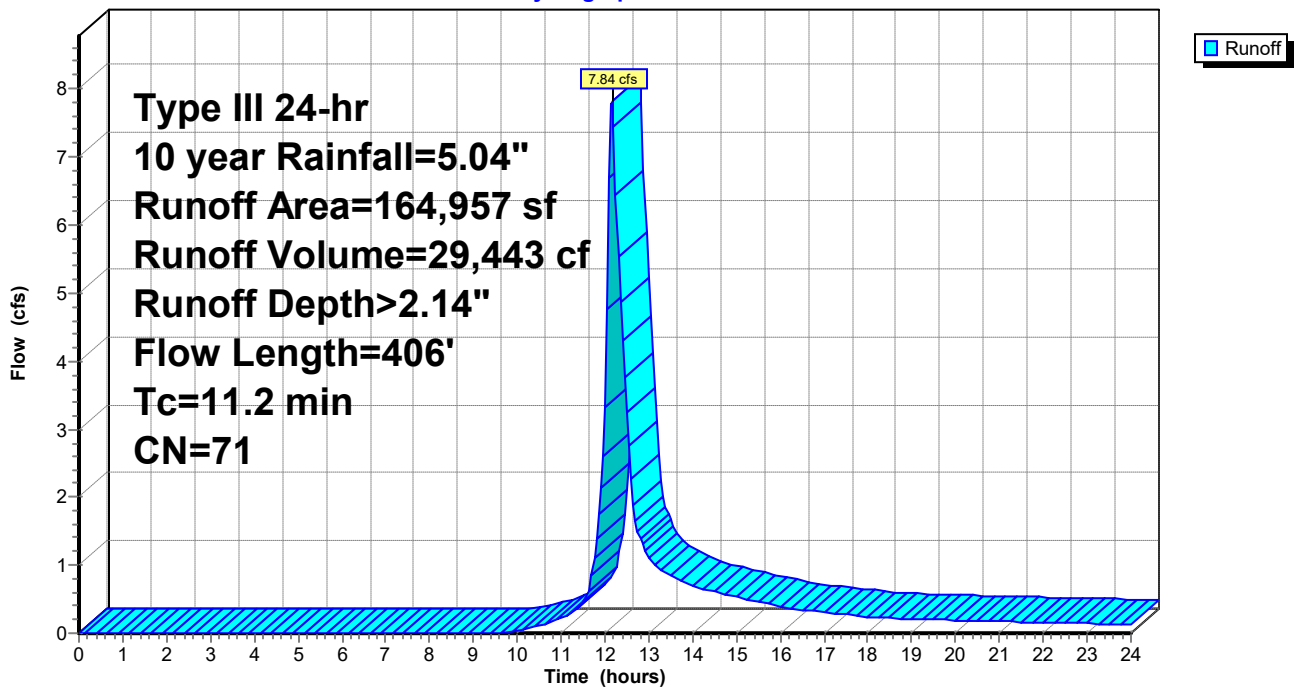
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
44,630	74	>75% Grass cover, Good, HSG C
102,863	70	Woods, Good, HSG C
17,464	72	Woods/grass comb., Good, HSG C
164,957	71	Weighted Average
164,957		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		Sheet Flow, FLOW OVER GRASS Grass: Short n= 0.150 P2= 3.12"
3.7	246	0.0500	1.12		Shallow Concentrated Flow, FLOW IN WOODS Woodland Kv= 5.0 fps
3.5	110	0.0450	0.53		Shallow Concentrated Flow, FLOW IN WOODS Forest w/Heavy Litter Kv= 2.5 fps
11.2	406	Total			

Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE

Hydrograph



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SELLERS FARM PRE 3-2-2022

Type III 24-hr 10 year Rainfall=5.04"

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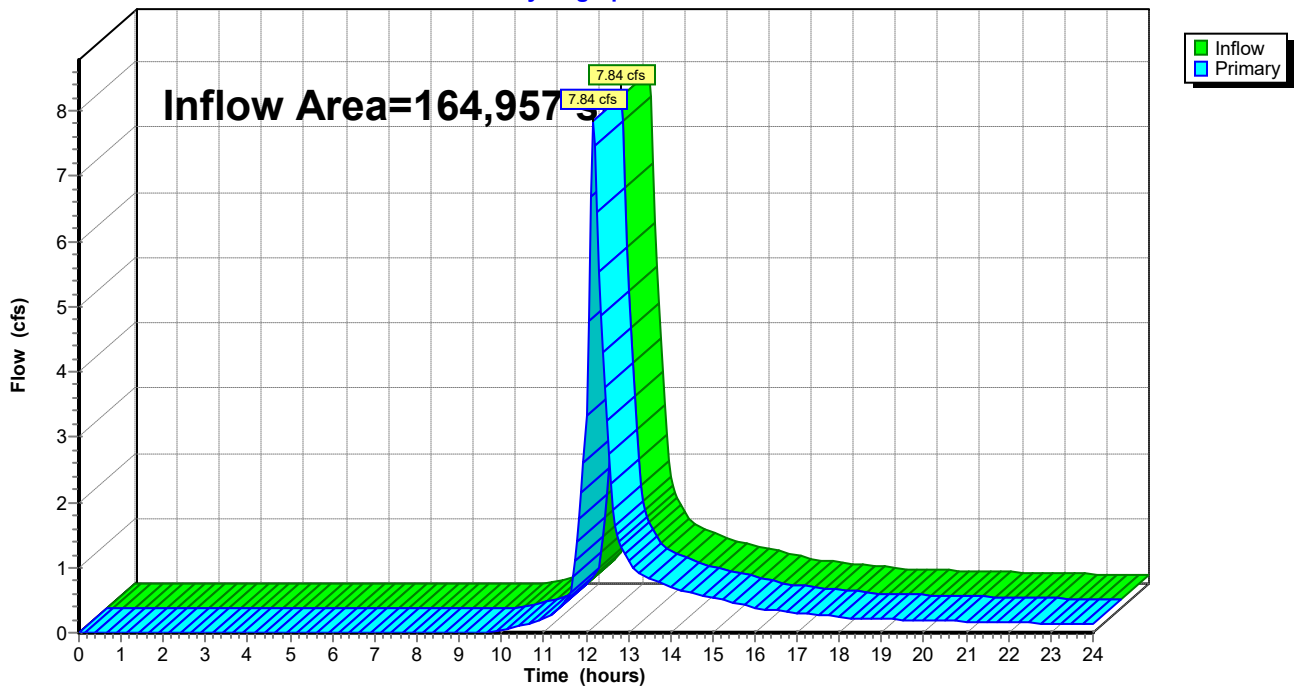
Summary for Pond SP1: (new Pond)

Inflow Area = 164,957 sf, 0.00% Impervious, Inflow Depth > 2.14" for 10 year event
Inflow = 7.84 cfs @ 12.16 hrs, Volume= 29,443 cf
Primary = 7.84 cfs @ 12.16 hrs, Volume= 29,443 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: (new Pond)

Hydrograph



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Type III 24-hr 10 year Rainfall=5.04"

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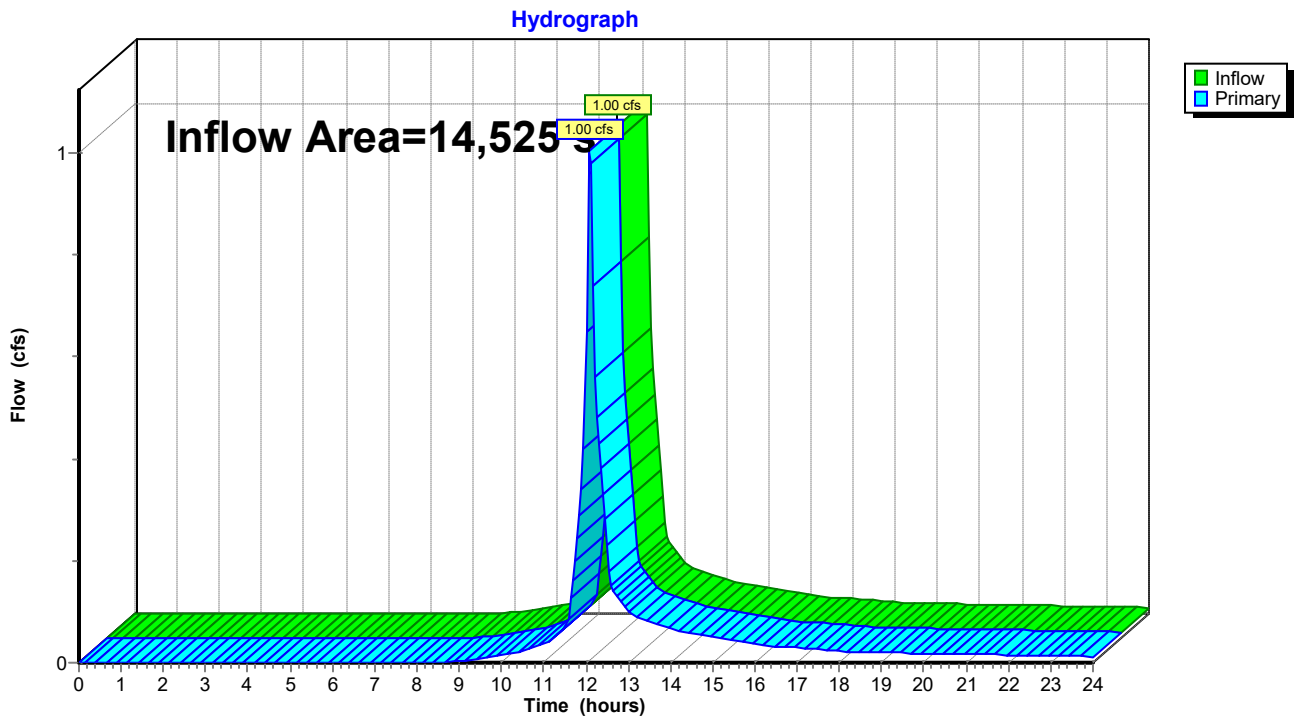
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Summary for Pond SP2: SUM POND STREET

Inflow Area = 14,525 sf, 9.74% Impervious, Inflow Depth > 2.57" for 10 year event
Inflow = 1.00 cfs @ 12.08 hrs, Volume= 3,107 cf
Primary = 1.00 cfs @ 12.08 hrs, Volume= 3,107 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET





RANGER ENGINEERING GROUP, INC.

STORMWATER MANAGEMENT REPORT

PRE-DEVELOPMENT DRAINAGE

25 YEAR STORM

SELLERS FARM PRE DEVELOPMENT

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SELLERS FARM PRE 3-2-2022
Type III 24-hr 25 year Rainfall=6.20"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX1: EX1 FLOW TO Runoff Area=14,525 sf 9.74% Impervious Runoff Depth>3.55"
Flow Length=205' Tc=5.0 min CN=76 Runoff=1.39 cfs 4,298 cf

Subcatchment EX2: EX2 DESIGN POINT Runoff Area=164,957 sf 0.00% Impervious Runoff Depth>3.05"
Flow Length=406' Tc=11.2 min CN=71 Runoff=11.32 cfs 41,986 cf

Pond SP1: (new Pond) Inflow=11.32 cfs 41,986 cf
Primary=11.32 cfs 41,986 cf

Pond SP2: SUM POND STREET Inflow=1.39 cfs 4,298 cf
Primary=1.39 cfs 4,298 cf

Total Runoff Area = 179,482 sf Runoff Volume = 46,284 cf Average Runoff Depth = 3.09"
99.21% Pervious = 178,067 sf 0.79% Impervious = 1,415 sf

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SELLERS FARM PRE 3-2-2022
 Type III 24-hr 25 year Rainfall=6.20"

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Summary for Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD

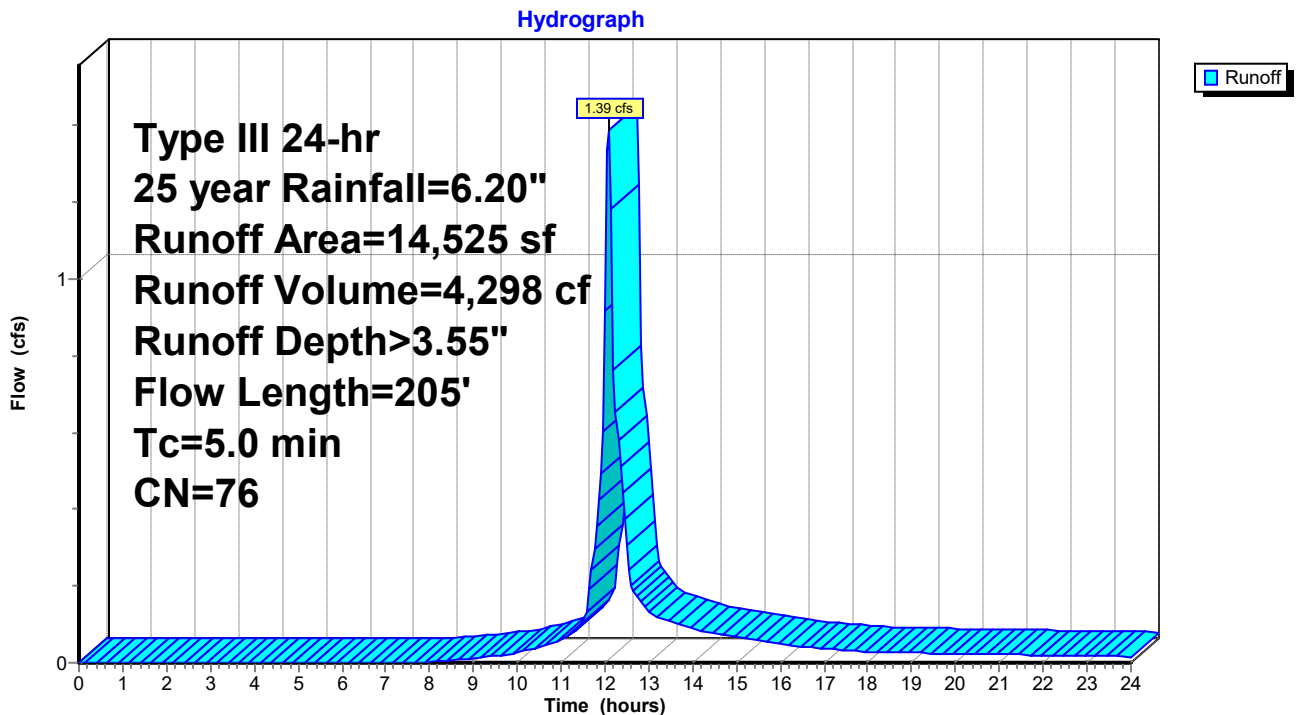
Runoff = 1.39 cfs @ 12.08 hrs, Volume= 4,298 cf, Depth> 3.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
10,810	74	>75% Grass cover, Good, HSG C
2,300	70	Woods, Good, HSG C
14,525	76	Weighted Average
13,110		90.26% Pervious Area
1,415		9.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		Sheet Flow, FLOW OVER GRASS Grass: Short n= 0.150 P2= 3.12"
0.4	35	0.0420	1.43		Shallow Concentrated Flow, FLOW OVER GRASS Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		Shallow Concentrated Flow, FLOW ALONG DRIVEWAY Paved Kv= 20.3 fps
5.0	205	Total			

Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD



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SELLERS FARM PRE 3-2-2022
 Type III 24-hr 25 year Rainfall=6.20"

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Summary for Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE

Runoff = 11.32 cfs @ 12.16 hrs, Volume= 41,986 cf, Depth> 3.05"

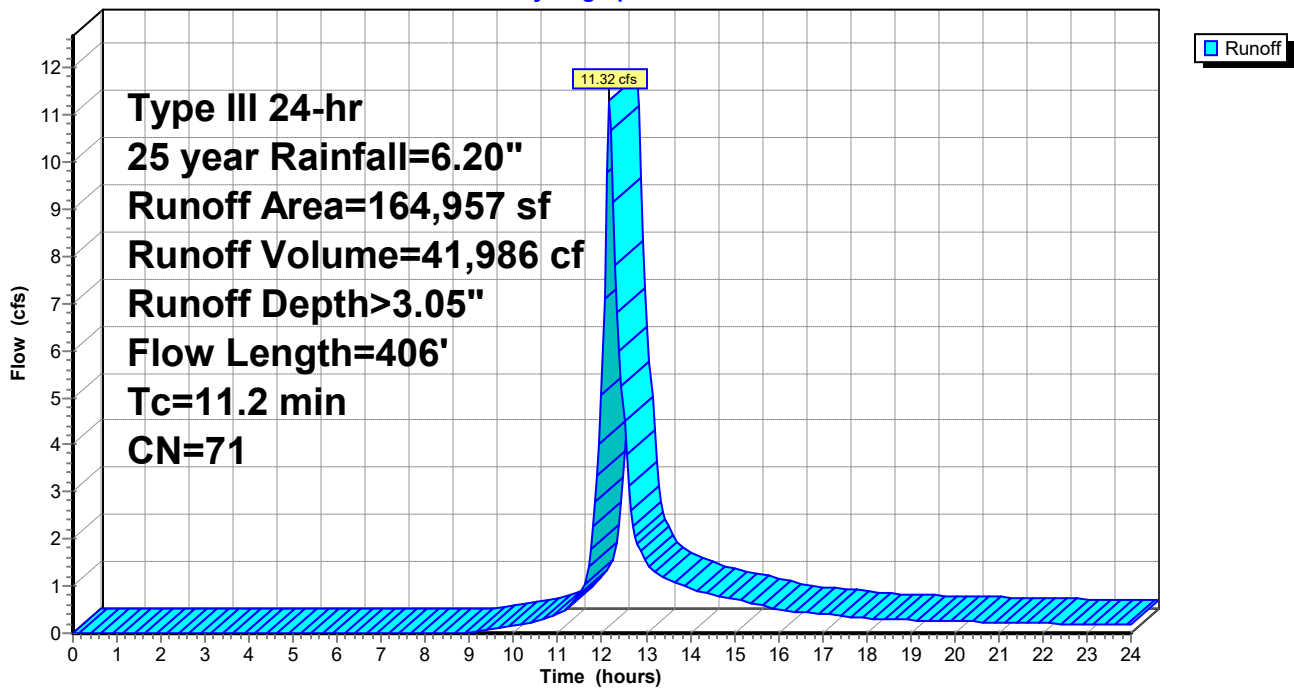
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
44,630	74	>75% Grass cover, Good, HSG C
102,863	70	Woods, Good, HSG C
17,464	72	Woods/grass comb., Good, HSG C
164,957	71	Weighted Average
164,957		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		Sheet Flow, FLOW OVER GRASS Grass: Short n= 0.150 P2= 3.12"
3.7	246	0.0500	1.12		Shallow Concentrated Flow, FLOW IN WOODS Woodland Kv= 5.0 fps
3.5	110	0.0450	0.53		Shallow Concentrated Flow, FLOW IN WOODS Forest w/Heavy Litter Kv= 2.5 fps
11.2	406	Total			

Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE

Hydrograph



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SELLERS FARM PRE 3-2-2022

Type III 24-hr 25 year Rainfall=6.20"

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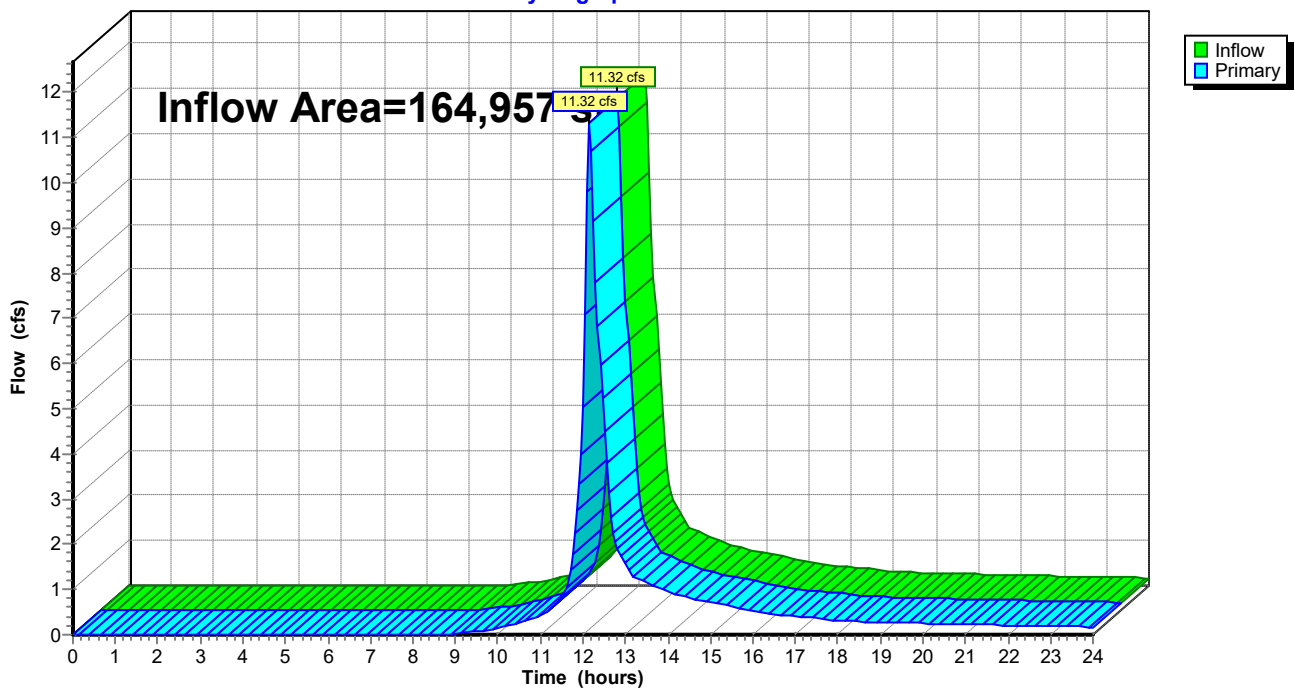
Summary for Pond SP1: (new Pond)

Inflow Area = 164,957 sf, 0.00% Impervious, Inflow Depth > 3.05" for 25 year event
Inflow = 11.32 cfs @ 12.16 hrs, Volume= 41,986 cf
Primary = 11.32 cfs @ 12.16 hrs, Volume= 41,986 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: (new Pond)

Hydrograph



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SELLERS FARM PRE 3-2-2022

Type III 24-hr 25 year Rainfall=6.20"

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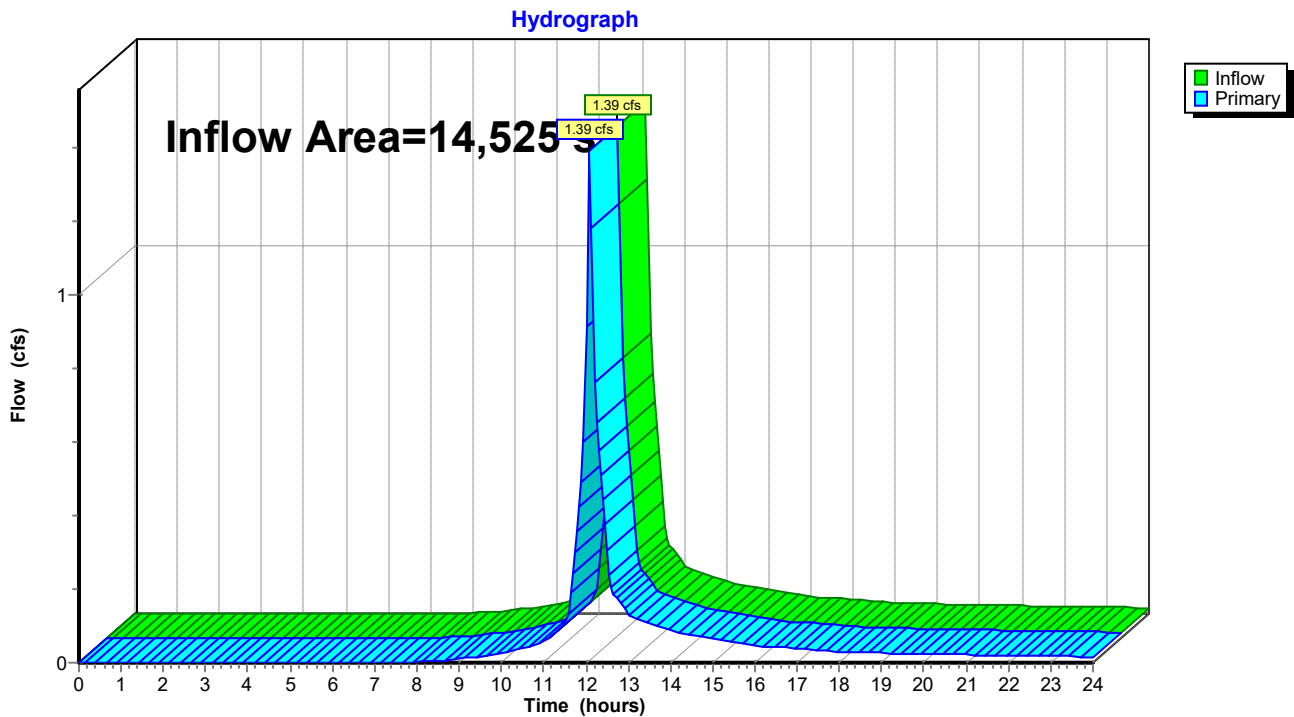
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Summary for Pond SP2: SUM POND STREET

Inflow Area = 14,525 sf, 9.74% Impervious, Inflow Depth > 3.55" for 25 year event
Inflow = 1.39 cfs @ 12.08 hrs, Volume= 4,298 cf
Primary = 1.39 cfs @ 12.08 hrs, Volume= 4,298 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET





RANGER ENGINEERING GROUP, INC.

STORMWATER MANAGEMENT REPORT

PRE-DEVELOPMENT DRAINAGE

100 YEAR STORM

SELLERS FARM PRE DEVELOPMENT

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SELLERS FARM PRE 3-2-2022
Type III 24-hr 100 Year Rainfall=7.99"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX1: EX1 FLOW TO

Runoff Area=14,525 sf 9.74% Impervious Runoff Depth>5.15"
Flow Length=205' Tc=5.0 min CN=76 Runoff=2.01 cfs 6,228 cf

Subcatchment EX2: EX2 DESIGN POINT

Runoff Area=164,957 sf 0.00% Impervious Runoff Depth>4.56"
Flow Length=406' Tc=11.2 min CN=71 Runoff=16.97 cfs 62,707 cf

Pond SP1: (new Pond)

Inflow=16.97 cfs 62,707 cf
Primary=16.97 cfs 62,707 cf

Pond SP2: SUM POND STREET

Inflow=2.01 cfs 6,228 cf
Primary=2.01 cfs 6,228 cf

Total Runoff Area = 179,482 sf Runoff Volume = 68,935 cf Average Runoff Depth = 4.61"
99.21% Pervious = 178,067 sf 0.79% Impervious = 1,415 sf

SELLERS FARM PRE DEVELOPMENT

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SELLERS FARM PRE 3-2-2022
Type III 24-hr 100 Year Rainfall=7.99"

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Summary for Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD

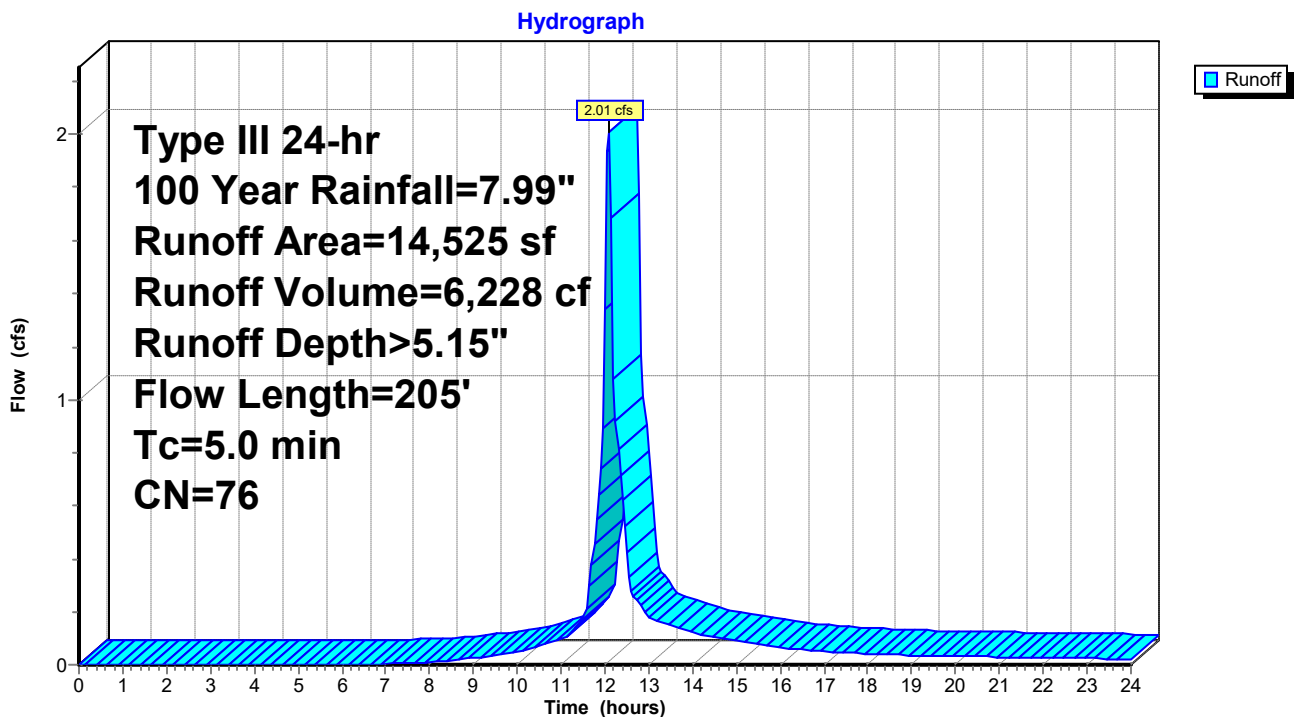
Runoff = 2.01 cfs @ 12.07 hrs, Volume= 6,228 cf, Depth> 5.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
10,810	74	>75% Grass cover, Good, HSG C
2,300	70	Woods, Good, HSG C
14,525	76	Weighted Average
13,110		90.26% Pervious Area
1,415		9.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		Sheet Flow, FLOW OVER GRASS Grass: Short n= 0.150 P2= 3.12"
0.4	35	0.0420	1.43		Shallow Concentrated Flow, FLOW OVER GRASS Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		Shallow Concentrated Flow, FLOW ALONG DRIVEWAY Paved Kv= 20.3 fps
5.0	205	Total			

Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD



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 Type III 24-hr 100 Year Rainfall=7.99"

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Summary for Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE

Runoff = 16.97 cfs @ 12.16 hrs, Volume= 62,707 cf, Depth> 4.56"

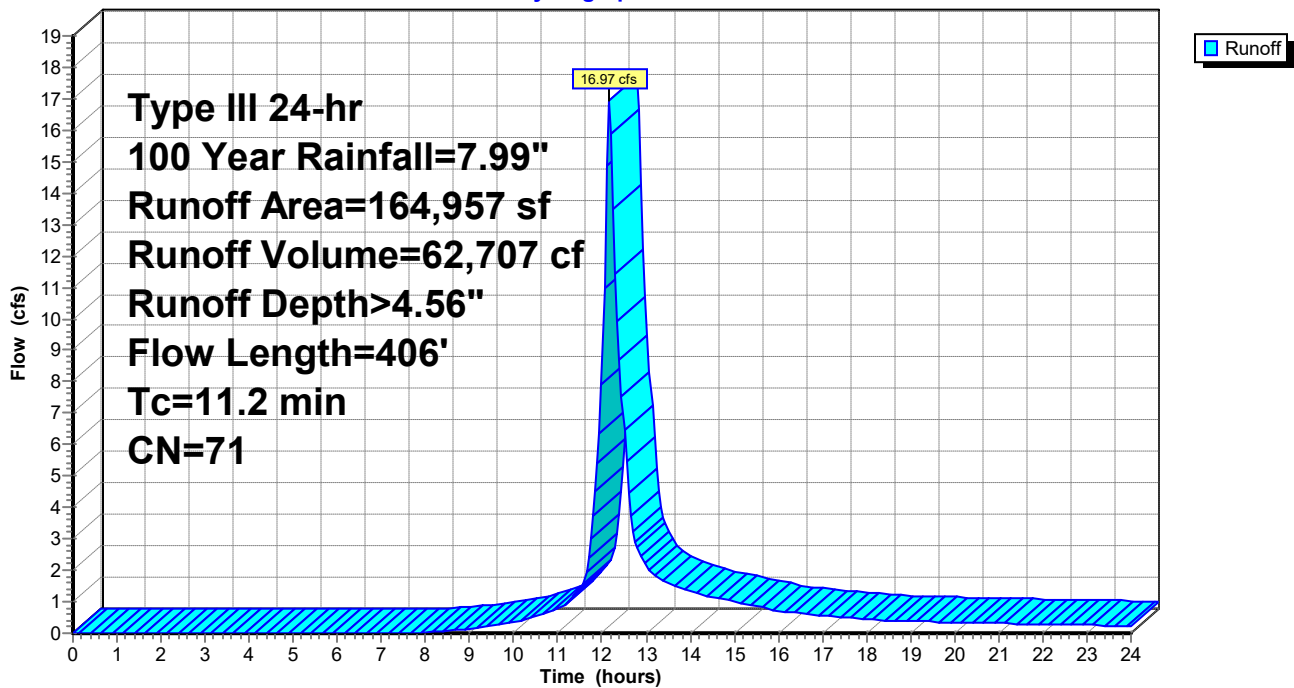
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
44,630	74	>75% Grass cover, Good, HSG C
102,863	70	Woods, Good, HSG C
17,464	72	Woods/grass comb., Good, HSG C
164,957	71	Weighted Average
164,957		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		Sheet Flow, FLOW OVER GRASS Grass: Short n= 0.150 P2= 3.12"
3.7	246	0.0500	1.12		Shallow Concentrated Flow, FLOW IN WOODS Woodland Kv= 5.0 fps
3.5	110	0.0450	0.53		Shallow Concentrated Flow, FLOW IN WOODS Forest w/Heavy Litter Kv= 2.5 fps
11.2	406	Total			

Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE

Hydrograph



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Type III 24-hr 100 Year Rainfall=7.99"

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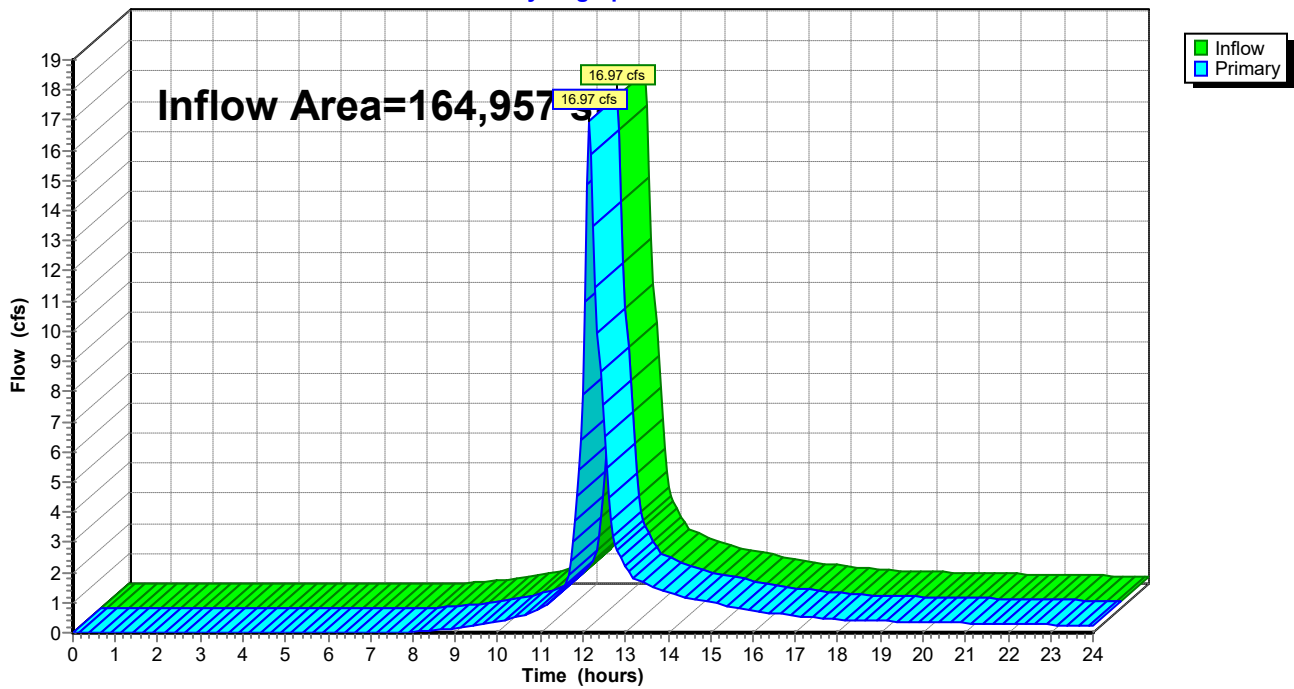
Summary for Pond SP1: (new Pond)

Inflow Area = 164,957 sf, 0.00% Impervious, Inflow Depth > 4.56" for 100 Year event
Inflow = 16.97 cfs @ 12.16 hrs, Volume= 62,707 cf
Primary = 16.97 cfs @ 12.16 hrs, Volume= 62,707 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: (new Pond)

Hydrograph



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Type III 24-hr 100 Year Rainfall=7.99"

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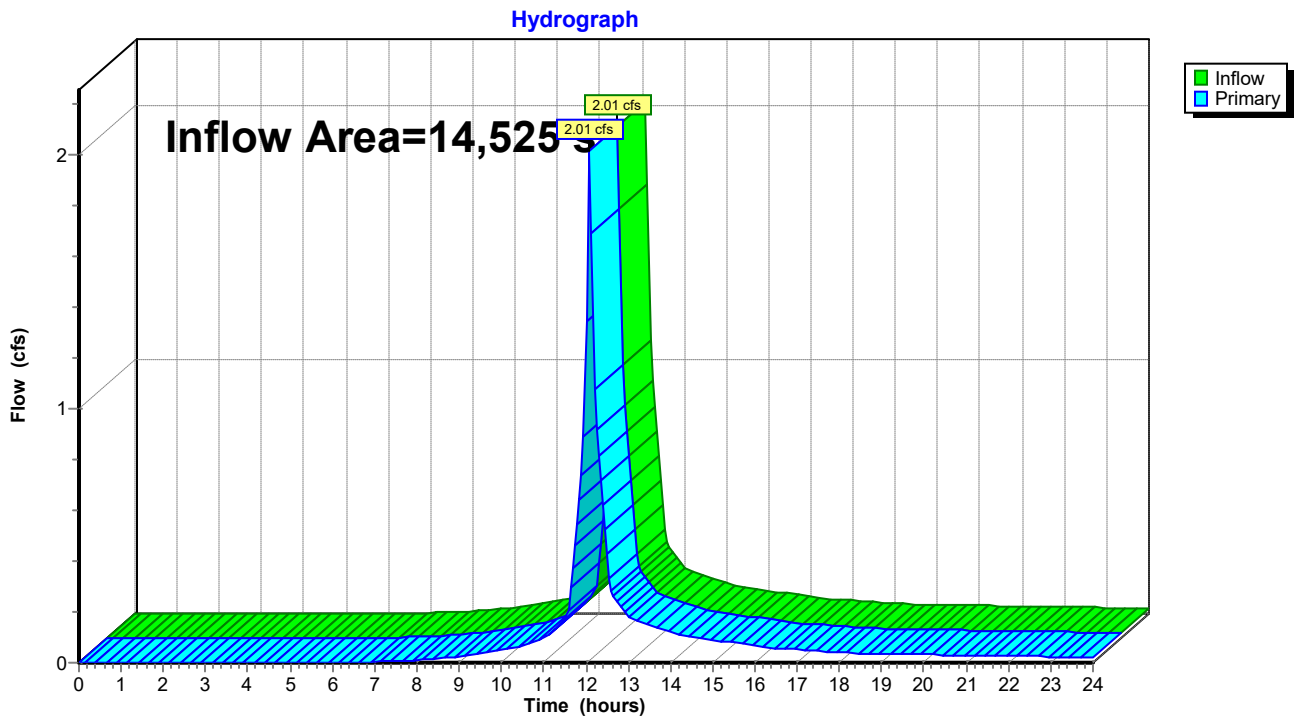
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Summary for Pond SP2: SUM POND STREET

Inflow Area = 14,525 sf, 9.74% Impervious, Inflow Depth > 5.15" for 100 Year event
Inflow = 2.01 cfs @ 12.07 hrs, Volume= 6,228 cf
Primary = 2.01 cfs @ 12.07 hrs, Volume= 6,228 cf, Atten= 0%, Lag= 0.0 min

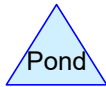
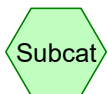
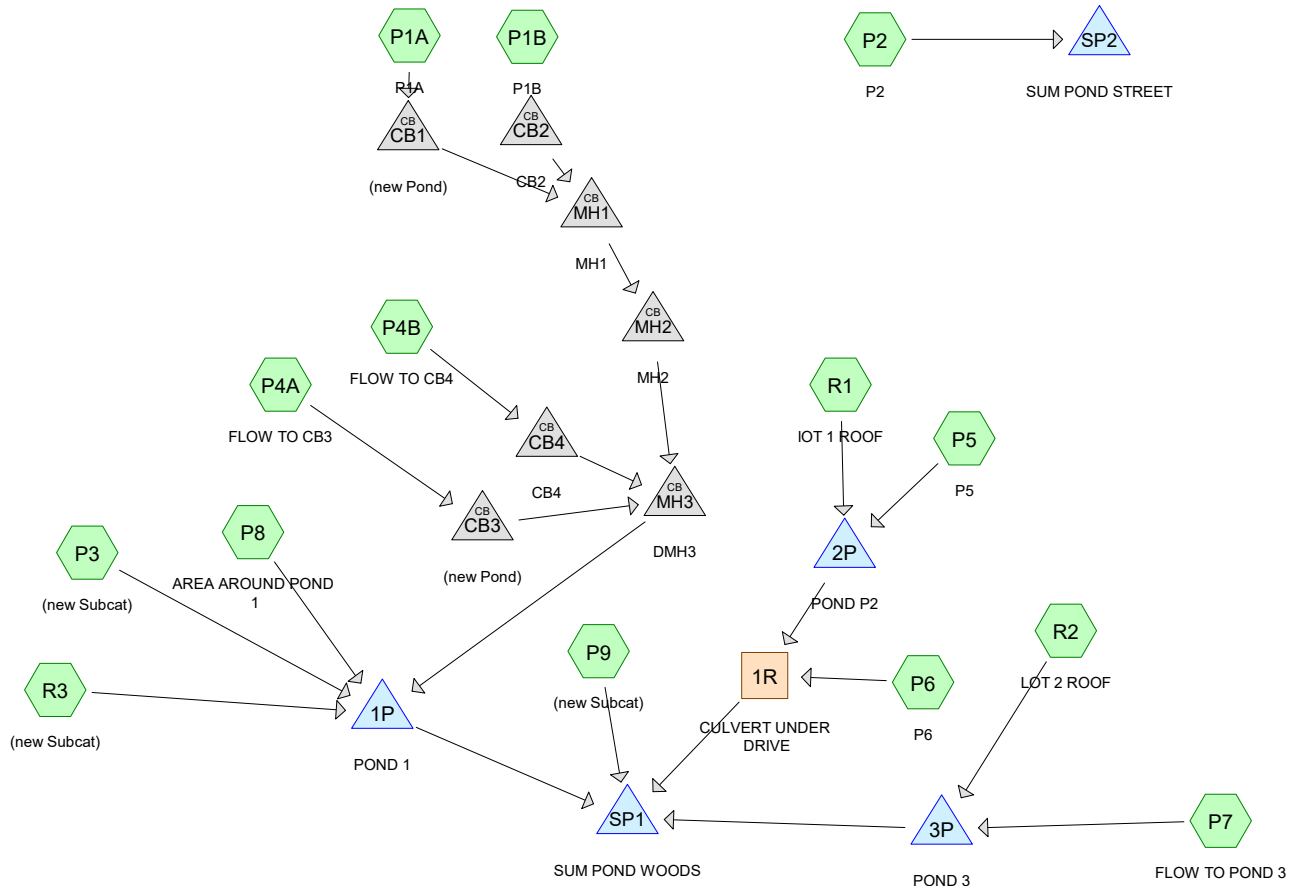
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET



STORMWATER MANAGEMENT REPORT

POST-DEVELOPMENT DRAINAGE



Routing Diagram for SELLERS FARM POST DEVELOPMENT
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SELLERS FARM POST DEVELOPMENT

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
99,919	74	>75% Grass cover, Good, HSG C (P1A, P2, P3, P4B, P5, P6, P7, P8, P9)
10,642	94	Fallow, bare soil, HSG D (P9)
490	89	Gravel roads, HSG C (P3, P4B)
23,263	98	Paved parking, HSG C (P1A, P1B, P2, P3, P4A, P4B, P5, P7)
6,599	98	Roofs, HSG C (P3, R1, R2, R3)
7,484	98	Water Surface, HSG C (P3, P5, P7, P8)
24,263	70	Woods, Good, HSG C (P9)
6,822	83	Woods, Poor, HSG D (P6)
179,482	80	TOTAL AREA

SELLERS FARM POST DEVELOPMENT

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
162,018	HSG C	P1A, P1B, P2, P3, P4A, P4B, P5, P6, P7, P8, P9, R1, R2, R3
17,464	HSG D	P6, P9
0	Other	
179,482		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	99,919	0	0	99,919	>75% Grass cover, Good
0	0	0	10,642	0	10,642	Fallow, bare soil
0	0	490	0	0	490	Gravel roads
0	0	23,263	0	0	23,263	Paved parking
0	0	6,599	0	0	6,599	Roofs
0	0	7,484	0	0	7,484	Water Surface
0	0	24,263	0	0	24,263	Woods, Good
0	0	0	6,822	0	6,822	Woods, Poor
0	0	162,018	17,464	0	179,482	TOTAL AREA

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1R	259.80	259.50	20.0	0.0150	0.012	12.0	0.0	0.0
2	1P	259.00	258.00	40.0	0.0250	0.012	12.0	0.0	0.0
3	3P	263.00	260.00	20.0	0.1500	0.013	12.0	0.0	0.0
4	CB1	261.90	261.80	10.0	0.0100	0.013	12.0	0.0	0.0
5	CB2	261.90	261.80	10.0	0.0100	0.013	12.0	0.0	0.0
6	CB3	260.50	260.00	10.0	0.0500	0.013	12.0	0.0	0.0
7	CB4	260.50	260.00	40.0	0.0125	0.013	12.0	0.0	0.0
8	MH1	261.70	260.60	215.0	0.0051	0.013	12.0	0.0	0.0
9	MH2	260.60	260.00	120.0	0.0050	0.013	12.0	0.0	0.0
10	MH3	259.75	259.00	30.0	0.0250	0.013	12.0	0.0	0.0



RANGER ENGINEERING GROUP, INC.

STORMWATER MANAGEMENT REPORT

POST-DEVELOPMENT DRAINAGE

2 YEAR STORM

SELLERS FARM POST DEVELOPMENT

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SELLERS FARM ROAD POST 3/2/22

Type III 24-hr 2 year Rainfall=3.18"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1A: P1A	Runoff Area=3,286 sf 45.25% Impervious Runoff Depth>1.74" Tc=6.0 min CN=85 Runoff=0.15 cfs 476 cf
Subcatchment P1B: P1B	Runoff Area=1,506 sf 100.00% Impervious Runoff Depth>2.95" Tc=6.0 min CN=98 Runoff=0.10 cfs 370 cf
Subcatchment P2: P2	Runoff Area=10,398 sf 13.61% Impervious Runoff Depth>1.20" Flow Length=205' Tc=4.9 min CN=77 Runoff=0.33 cfs 1,037 cf
Subcatchment P3: (new Subcat)	Runoff Area=11,734 sf 26.27% Impervious Runoff Depth>1.45" Flow Length=250' Tc=6.2 min CN=81 Runoff=0.45 cfs 1,420 cf
Subcatchment P4A: FLOW TO CB3	Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>2.95" Tc=6.0 min CN=98 Runoff=0.37 cfs 1,296 cf
Subcatchment P4B: FLOW TO CB4	Runoff Area=11,827 sf 59.86% Impervious Runoff Depth>2.06" Tc=6.0 min CN=89 Runoff=0.64 cfs 2,032 cf
Subcatchment P5: P5	Runoff Area=9,084 sf 51.11% Impervious Runoff Depth>1.82" Tc=6.0 min CN=86 Runoff=0.44 cfs 1,375 cf
Subcatchment P6: P6	Runoff Area=40,739 sf 0.00% Impervious Runoff Depth>1.14" Flow Length=300' Tc=7.3 min CN=76 Runoff=1.14 cfs 3,858 cf
Subcatchment P7: FLOW TO POND 3	Runoff Area=14,495 sf 16.87% Impervious Runoff Depth>1.25" Flow Length=180' Tc=14.4 min CN=78 Runoff=0.37 cfs 1,516 cf
Subcatchment P8: AREA AROUND POND 1	Runoff Area=6,584 sf 59.75% Impervious Runoff Depth>1.98" Tc=6.0 min CN=88 Runoff=0.34 cfs 1,085 cf
Subcatchment P9: (new Subcat)	Runoff Area=58,075 sf 0.00% Impervious Runoff Depth>1.13" Flow Length=350' Slope=0.0500 '/' Tc=13.1 min CN=76 Runoff=1.35 cfs 5,492 cf
Subcatchment R1: IOT 1 ROOF	Runoff Area=1,966 sf 100.00% Impervious Runoff Depth>2.95" Tc=6.0 min CN=98 Runoff=0.14 cfs 483 cf
Subcatchment R2: LOT 2 ROOF	Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>2.95" Tc=6.0 min CN=98 Runoff=0.16 cfs 553 cf
Subcatchment R3: (new Subcat)	Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>2.95" Tc=6.0 min CN=98 Runoff=0.16 cfs 553 cf
Reach 1R: CULVERT UNDER DRIVE	Avg. Flow Depth=0.23' Max Vel=4.05 fps Inflow=1.14 cfs 4,345 cf 12.0" Round Pipe x 2.00 n=0.012 L=20.0' S=0.0150 '/' Capacity=9.45 cfs Outflow=1.14 cfs 4,345 cf
Pond 1P: POND 1	Peak Elev=261.15' Storage=2,982 cf Inflow=2.09 cfs 6,860 cf Discarded=0.07 cfs 3,584 cf Primary=0.20 cfs 1,995 cf Outflow=0.28 cfs 5,579 cf

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Pond 2P: POND P2 Peak Elev=261.82' Storage=630 cf Inflow=0.57 cfs 1,857 cf
Discarded=0.02 cfs 1,080 cf Primary=0.23 cfs 487 cf Outflow=0.25 cfs 1,567 cf

Pond 3P: POND 3 Peak Elev=263.11' Storage=904 cf Inflow=0.46 cfs 2,069 cf
Discarded=0.03 cfs 1,214 cf Primary=0.05 cfs 335 cf Outflow=0.08 cfs 1,548 cf

Pond CB1: (new Pond) Peak Elev=262.11' Inflow=0.15 cfs 476 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Outflow=0.15 cfs 476 cf

Pond CB2: CB2 Peak Elev=0.00'
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Primary=0.00 cfs 0 cf

Pond CB3: (new Pond) Peak Elev=261.16' Inflow=0.37 cfs 1,296 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0500 '/' Outflow=0.37 cfs 1,296 cf

Pond CB4: CB4 Peak Elev=261.16' Inflow=0.64 cfs 2,032 cf
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=0.64 cfs 2,032 cf

Pond MH1: MH1 Peak Elev=261.92' Inflow=0.15 cfs 476 cf
12.0" Round Culvert n=0.013 L=215.0' S=0.0051 '/' Outflow=0.15 cfs 476 cf

Pond MH2: MH2 Peak Elev=261.16' Inflow=0.15 cfs 476 cf
12.0" Round Culvert n=0.013 L=120.0' S=0.0050 '/' Outflow=0.15 cfs 476 cf

Pond MH3: DMH3 Peak Elev=261.15' Inflow=1.15 cfs 3,804 cf
12.0" Round Culvert n=0.013 L=30.0' S=0.0250 '/' Outflow=1.15 cfs 3,802 cf

Pond SP1: SUM POND WOODS Inflow=2.36 cfs 12,166 cf
Primary=2.36 cfs 12,166 cf

Pond SP2: SUM POND STREET Inflow=0.33 cfs 1,037 cf
Primary=0.33 cfs 1,037 cf

Total Runoff Area = 179,482 sf Runoff Volume = 21,545 cf Average Runoff Depth = 1.44"
79.19% Pervious = 142,136 sf 20.81% Impervious = 37,346 sf

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Summary for Subcatchment P1A: P1A

Runoff = 0.15 cfs @ 12.09 hrs, Volume= 476 cf, Depth> 1.74"

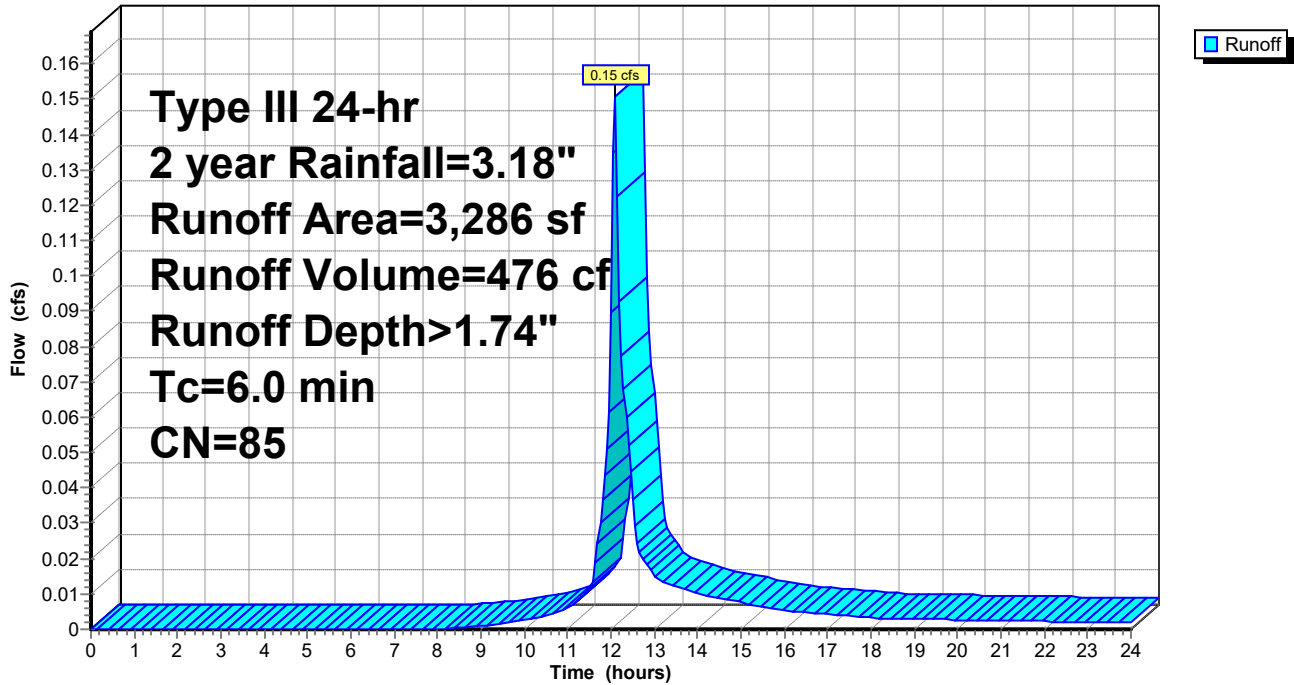
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
1,799	74	>75% Grass cover, Good, HSG C
1,487	98	Paved parking, HSG C
3,286	85	Weighted Average
1,799		54.75% Pervious Area
1,487		45.25% Impervious Area

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

Subcatchment P1A: P1A

Hydrograph



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Summary for Subcatchment P1B: P1B

Runoff = 0.10 cfs @ 12.09 hrs, Volume= 370 cf, Depth> 2.95"

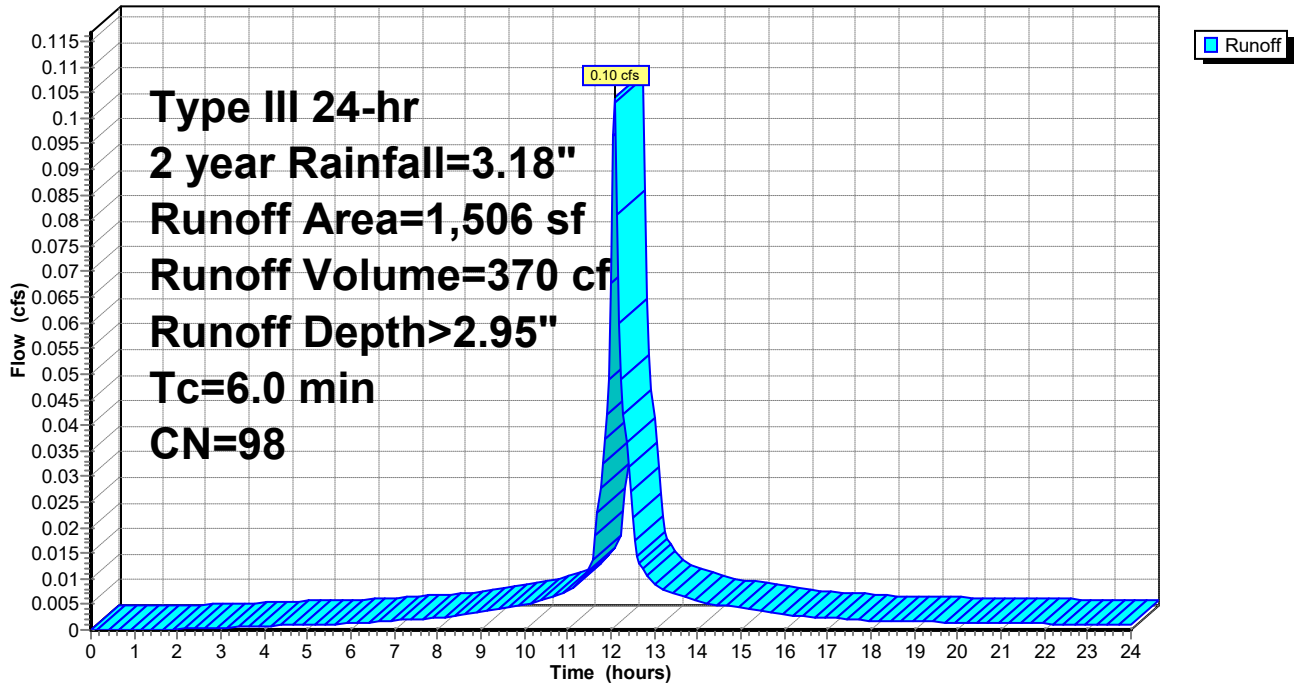
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
1,506	98	Paved parking, HSG C
1,506		100.00% Impervious Area

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

Subcatchment P1B: P1B

Hydrograph



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Type III 24-hr 2 year Rainfall=3.18"

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Summary for Subcatchment P2: P2

Runoff = 0.33 cfs @ 12.08 hrs, Volume= 1,037 cf, Depth> 1.20"

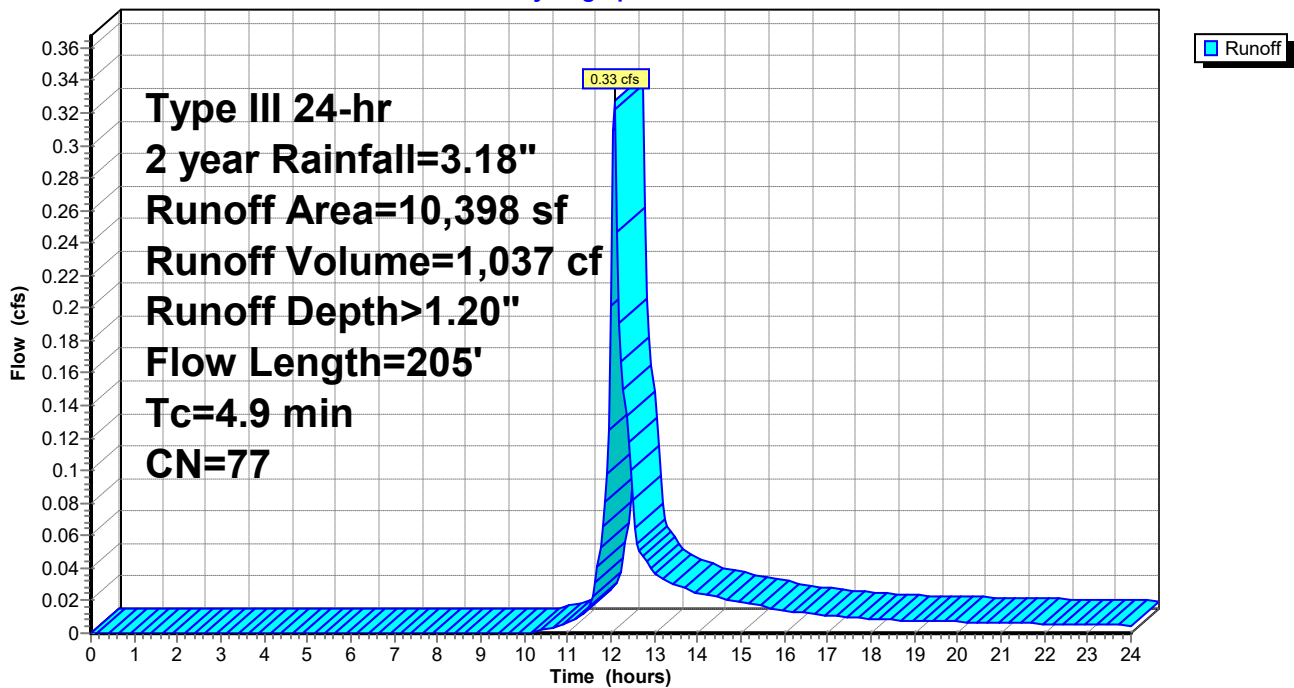
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
8,983	74	>75% Grass cover, Good, HSG C
10,398	77	Weighted Average
8,983		86.39% Pervious Area
1,415		13.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	50	0.0500	0.21		Sheet Flow, flow over grass Grass: Short n= 0.150 P2= 3.18"
0.4	35	0.0420	1.43		Shallow Concentrated Flow, flow over grass Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		Shallow Concentrated Flow, flow along driveway Paved Kv= 20.3 fps
4.9	205	Total			

Subcatchment P2: P2

Hydrograph



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Type III 24-hr 2 year Rainfall=3.18"

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Summary for Subcatchment P3: (new Subcat)

Runoff = 0.45 cfs @ 12.10 hrs, Volume= 1,420 cf, Depth> 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
8,359	74	>75% Grass cover, Good, HSG C
125	98	Roofs, HSG C
293	89	Gravel roads, HSG C
1,916	98	Paved parking, HSG C
1,041	98	Water Surface, HSG C
11,734	81	Weighted Average
8,652		73.73% Pervious Area
3,082		26.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		Sheet Flow, FLOW OVER GRASS Grass: Short n= 0.150 P2= 3.18"
1.3	120	0.0500	1.57		Shallow Concentrated Flow, FLOW OVER GRASS Short Grass Pasture Kv= 7.0 fps
0.6	80	0.0125	2.27		Shallow Concentrated Flow, FLOW OVER DRIVEWAY Paved Kv= 20.3 fps
6.2	250	Total			

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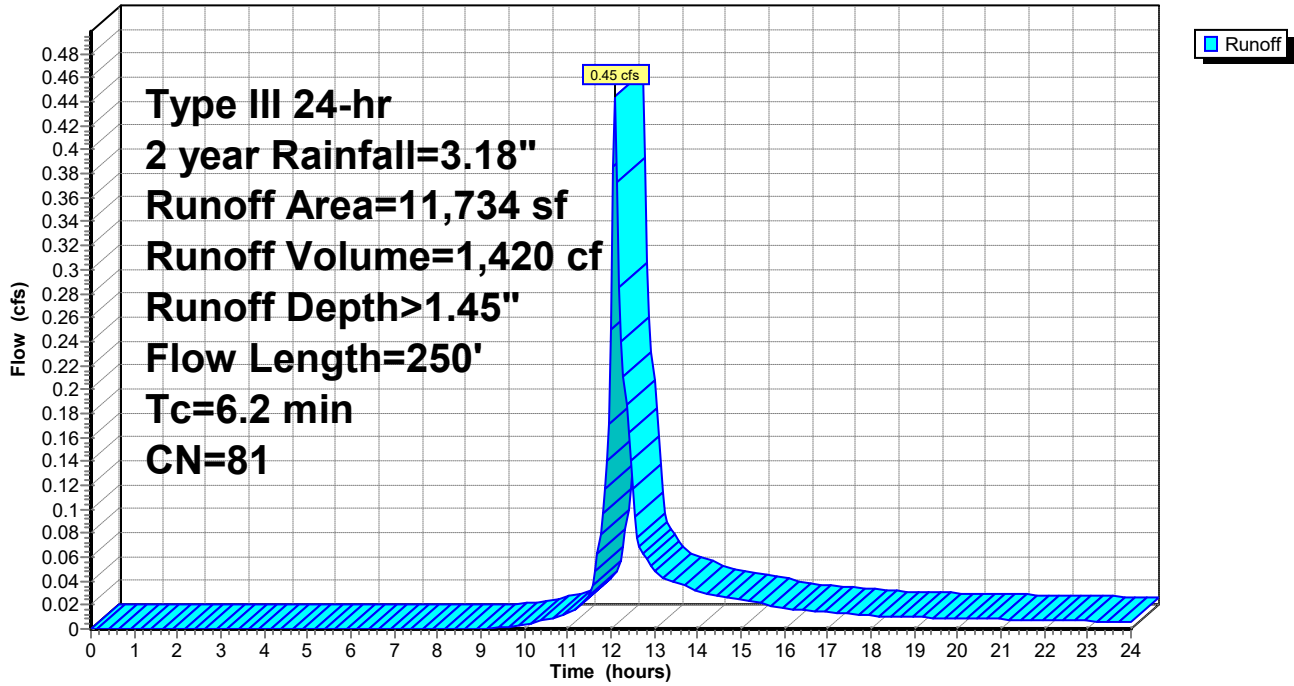
Type III 24-hr 2 year Rainfall=3.18"

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Subcatchment P3: (new Subcat)

Hydrograph



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Type III 24-hr 2 year Rainfall=3.18"

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Summary for Subcatchment P4A: FLOW TO CB3

Runoff = 0.37 cfs @ 12.09 hrs, Volume= 1,296 cf, Depth> 2.95"

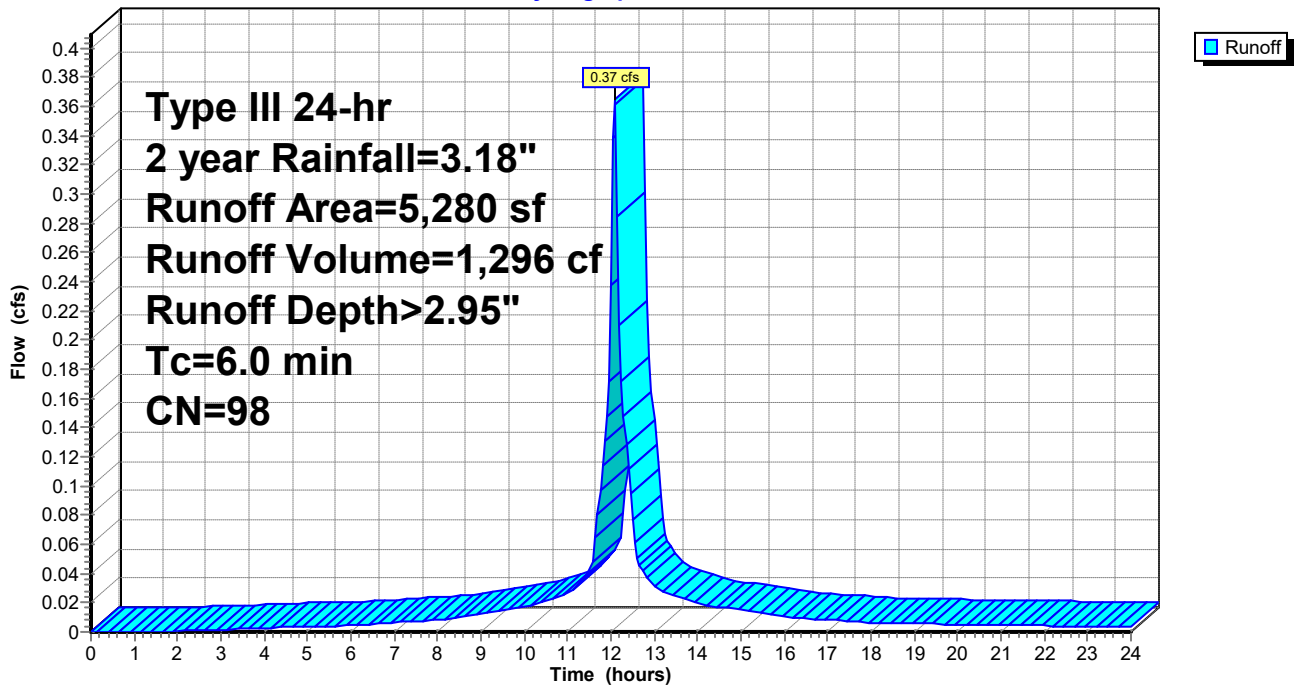
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
5,280	98	Paved parking, HSG C
5,280		100.00% Impervious Area

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

Subcatchment P4A: FLOW TO CB3

Hydrograph



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Type III 24-hr 2 year Rainfall=3.18"

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Summary for Subcatchment P4B: FLOW TO CB4

Runoff = 0.64 cfs @ 12.09 hrs, Volume= 2,032 cf, Depth> 2.06"

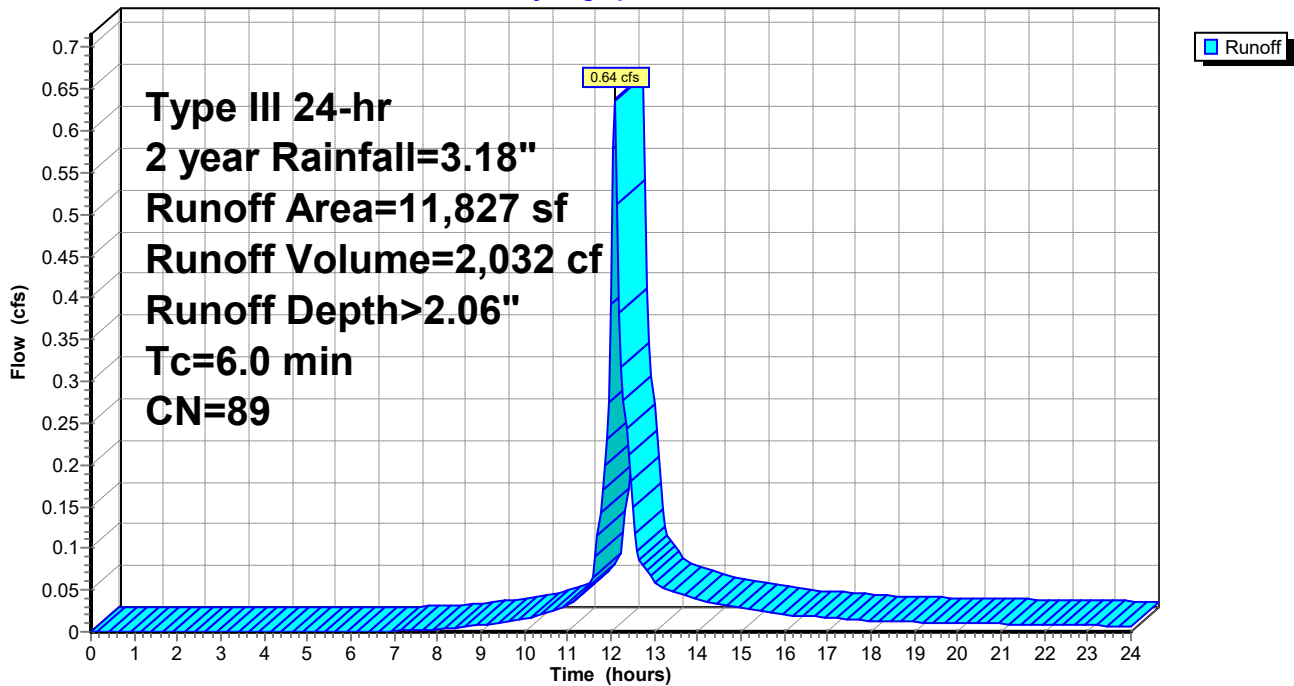
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
7,080	98	Paved parking, HSG C
4,550	74	>75% Grass cover, Good, HSG C
197	89	Gravel roads, HSG C
11,827	89	Weighted Average
4,747		40.14% Pervious Area
7,080		59.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW OVER PAVEMENT TO CB4

Subcatchment P4B: FLOW TO CB4

Hydrograph



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Type III 24-hr 2 year Rainfall=3.18"

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Summary for Subcatchment P5: P5

Runoff = 0.44 cfs @ 12.09 hrs, Volume= 1,375 cf, Depth> 1.82"

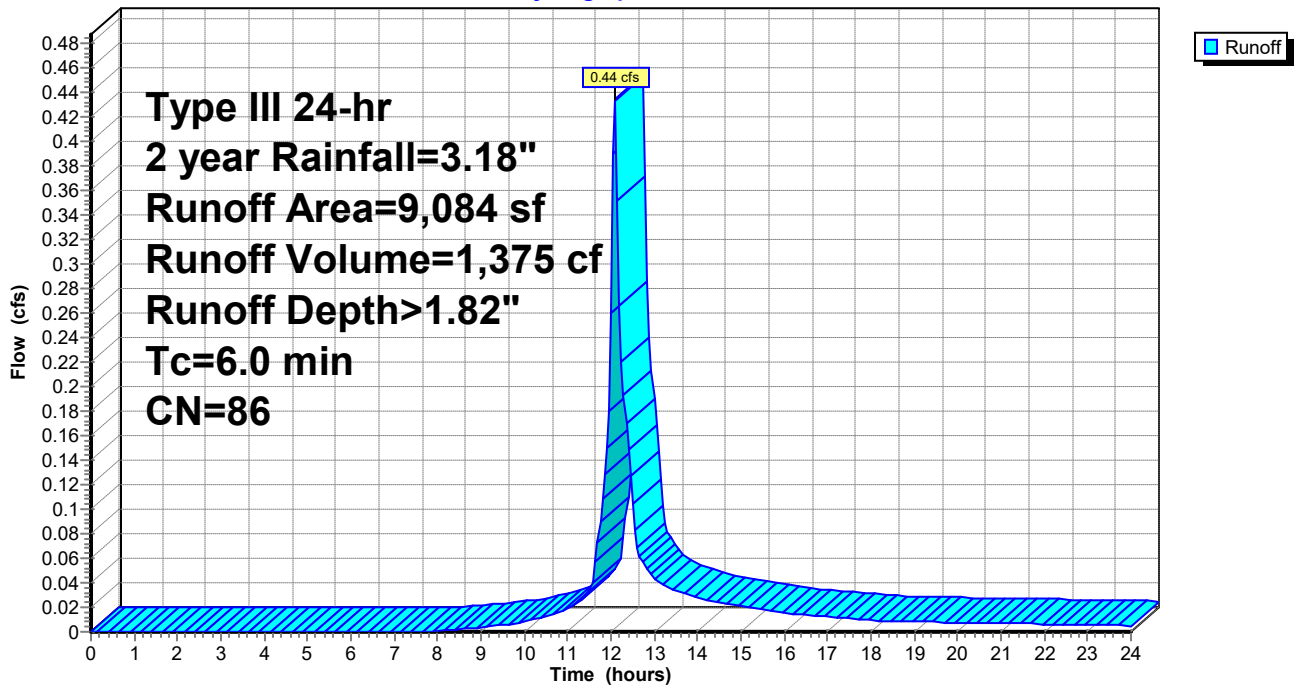
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
4,441	74	>75% Grass cover, Good, HSG C
1,160	98	Water Surface, HSG C
3,483	98	Paved parking, HSG C
9,084	86	Weighted Average
4,441		48.89% Pervious Area
4,643		51.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW TO POND P2

Subcatchment P5: P5

Hydrograph



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Type III 24-hr 2 year Rainfall=3.18"

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Summary for Subcatchment P6: P6

Runoff = 1.14 cfs @ 12.11 hrs, Volume= 3,858 cf, Depth> 1.14"

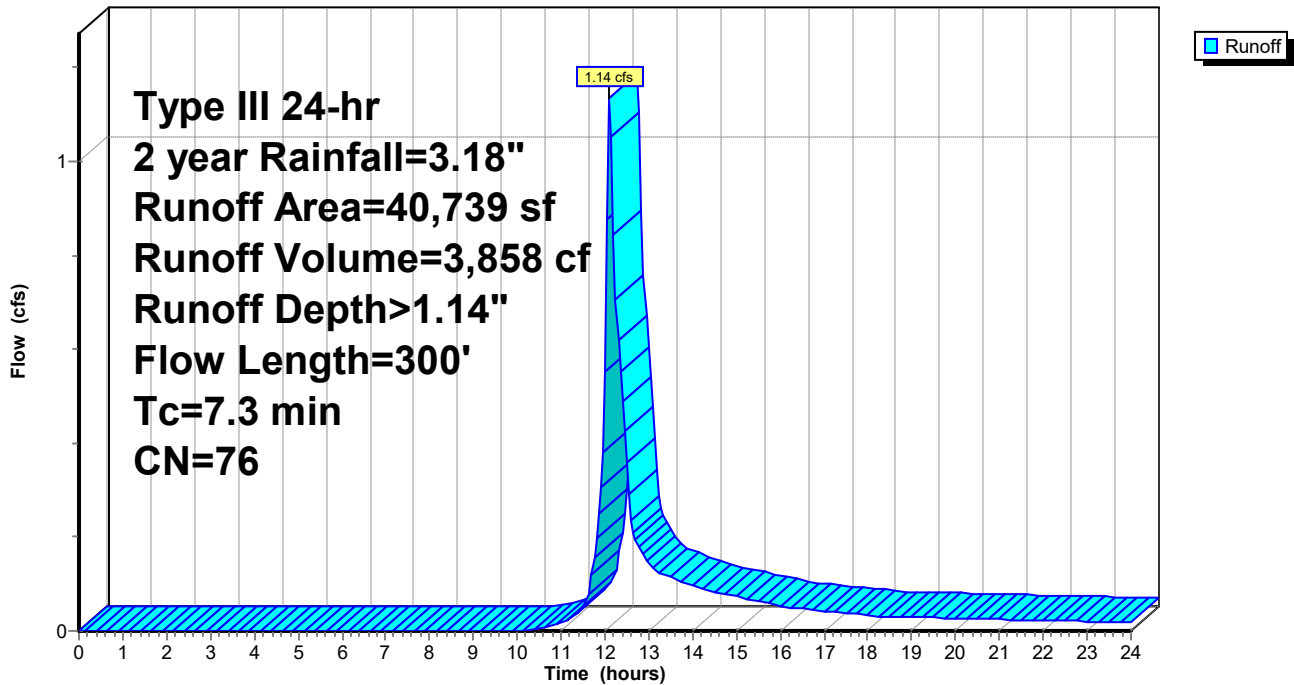
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
33,917	74	>75% Grass cover, Good, HSG C
6,822	83	Woods, Poor, HSG D
40,739	76	Weighted Average
40,739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	50	0.0500	0.21		Sheet Flow, flow over grass Grass: Short n= 0.150 P2= 3.18"
0.3	40	0.1000	2.21		Shallow Concentrated Flow, FLOW OVER GRASS Short Grass Pasture Kv= 7.0 fps
3.1	210	0.0500	1.12		Shallow Concentrated Flow, FLOW THROUGH WOODS Woodland Kv= 5.0 fps
7.3	300	Total			

Subcatchment P6: P6

Hydrograph



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Summary for Subcatchment P7: FLOW TO POND 3

Runoff = 0.37 cfs @ 12.21 hrs, Volume= 1,516 cf, Depth> 1.25"

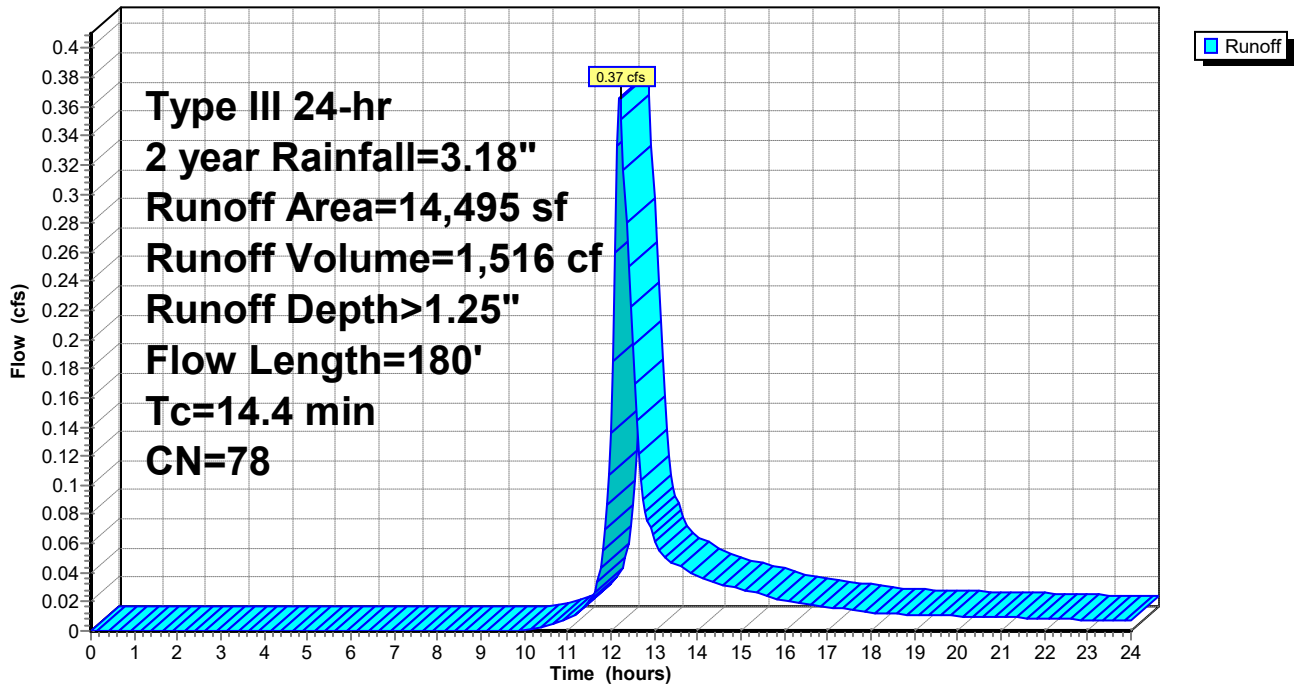
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
12,050	74	>75% Grass cover, Good, HSG C
1,096	98	Paved parking, HSG C
1,349	98	Water Surface, HSG C
14,495	78	Weighted Average
12,050		83.13% Pervious Area
2,445		16.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		Sheet Flow, FLOW IN WOODS Woods: Light underbrush n= 0.400 P2= 3.18"
2.0	130	0.0460	1.07		Shallow Concentrated Flow, FLOW THROUGH WOODS Woodland Kv= 5.0 fps
14.4	180	Total			

Subcatchment P7: FLOW TO POND 3

Hydrograph



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Summary for Subcatchment P8: AREA AROUND POND 1

Runoff = 0.34 cfs @ 12.09 hrs, Volume= 1,085 cf, Depth> 1.98"

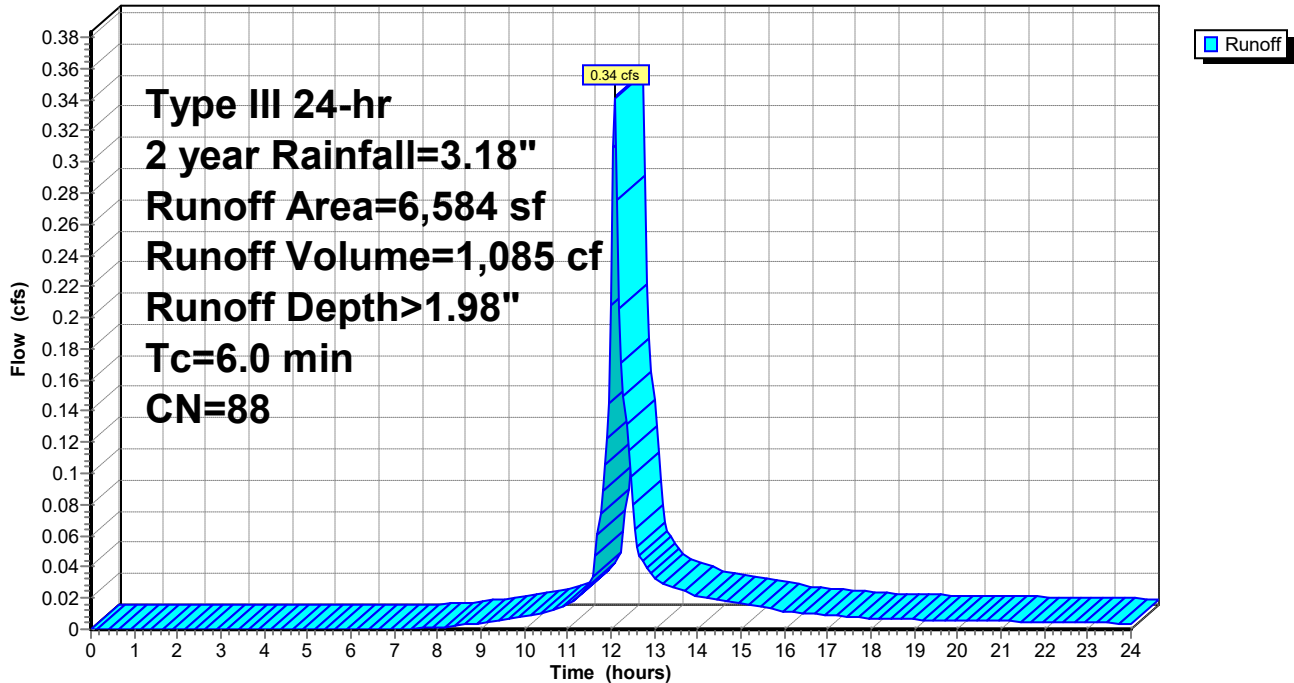
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
2,650	74	>75% Grass cover, Good, HSG C
3,934	98	Water Surface, HSG C
6,584	88	Weighted Average
2,650		40.25% Pervious Area
3,934		59.75% Impervious Area

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

Subcatchment P8: AREA AROUND POND 1

Hydrograph



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Summary for Subcatchment P9: (new Subcat)

Runoff = 1.35 cfs @ 12.20 hrs, Volume= 5,492 cf, Depth> 1.13"

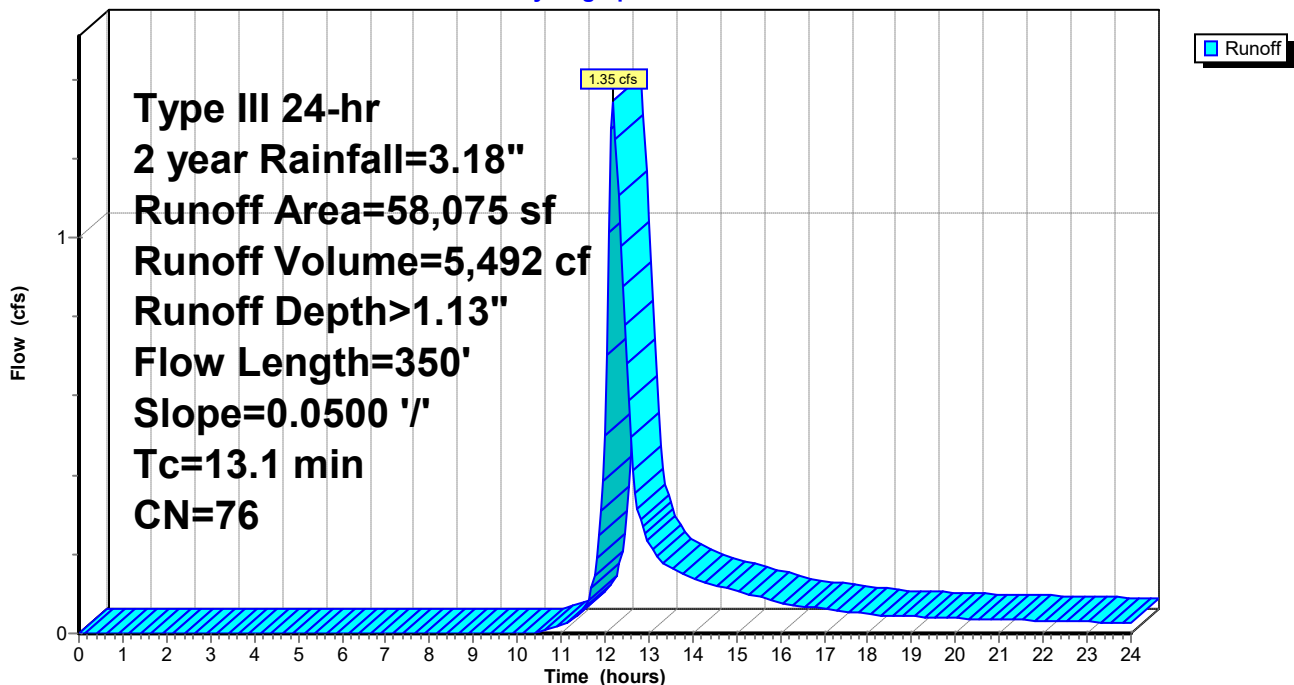
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
23,170	74	>75% Grass cover, Good, HSG C
24,263	70	Woods, Good, HSG C
10,642	94	Fallow, bare soil, HSG D
58,075	76	Weighted Average
58,075		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	50	0.0500	0.10		Sheet Flow, FLOW THROUGH WOODS Woods: Light underbrush n= 0.400 P2= 3.18"
4.5	300	0.0500	1.12		Shallow Concentrated Flow, FLOW THROUGH WOODS Woodland Kv= 5.0 fps
13.1	350	Total			

Subcatchment P9: (new Subcat)

Hydrograph



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Summary for Subcatchment R1: IOT 1 ROOF

Runoff = 0.14 cfs @ 12.09 hrs, Volume= 483 cf, Depth> 2.95"

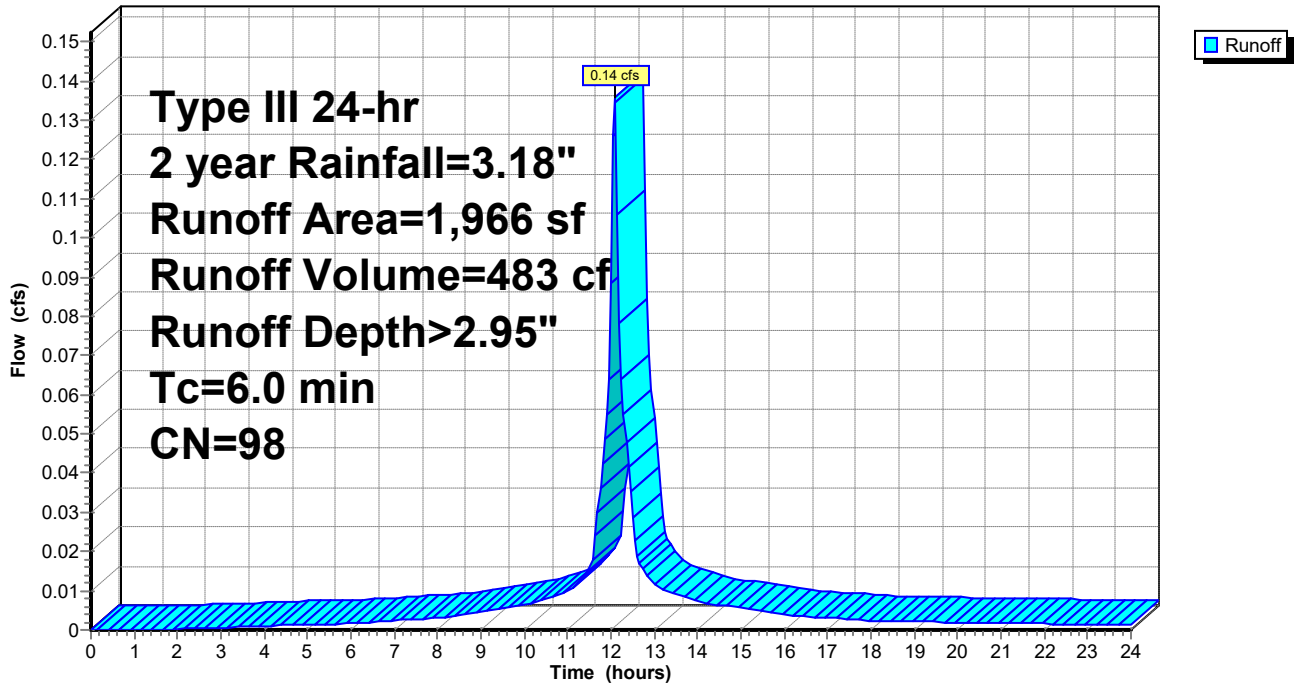
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
1,966	98	Roofs, HSG C
1,966		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW FROM ROOF TO POND

Subcatchment R1: IOT 1 ROOF

Hydrograph



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Summary for Subcatchment R2: LOT 2 ROOF

Runoff = 0.16 cfs @ 12.09 hrs, Volume= 553 cf, Depth> 2.95"

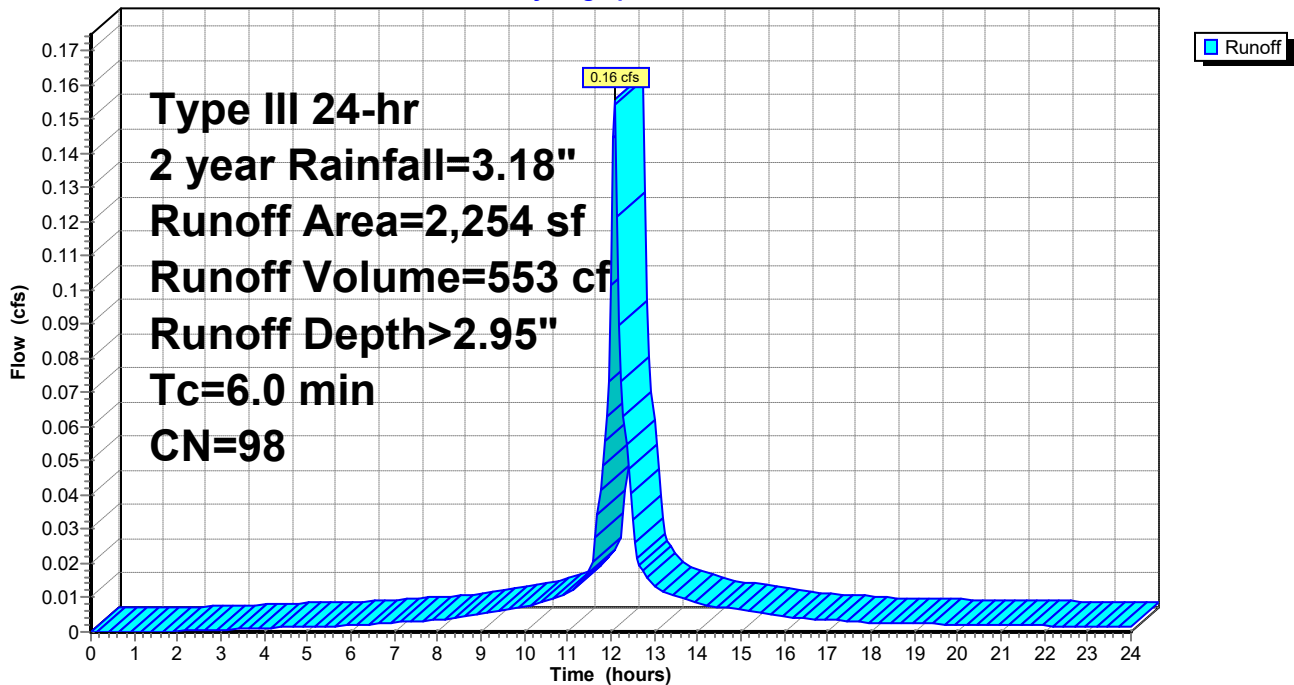
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW IN GUTTERS AND PIPES TO POND 3

Subcatchment R2: LOT 2 ROOF

Hydrograph



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Summary for Subcatchment R3: (new Subcat)

Runoff = 0.16 cfs @ 12.09 hrs, Volume= 553 cf, Depth> 2.95"

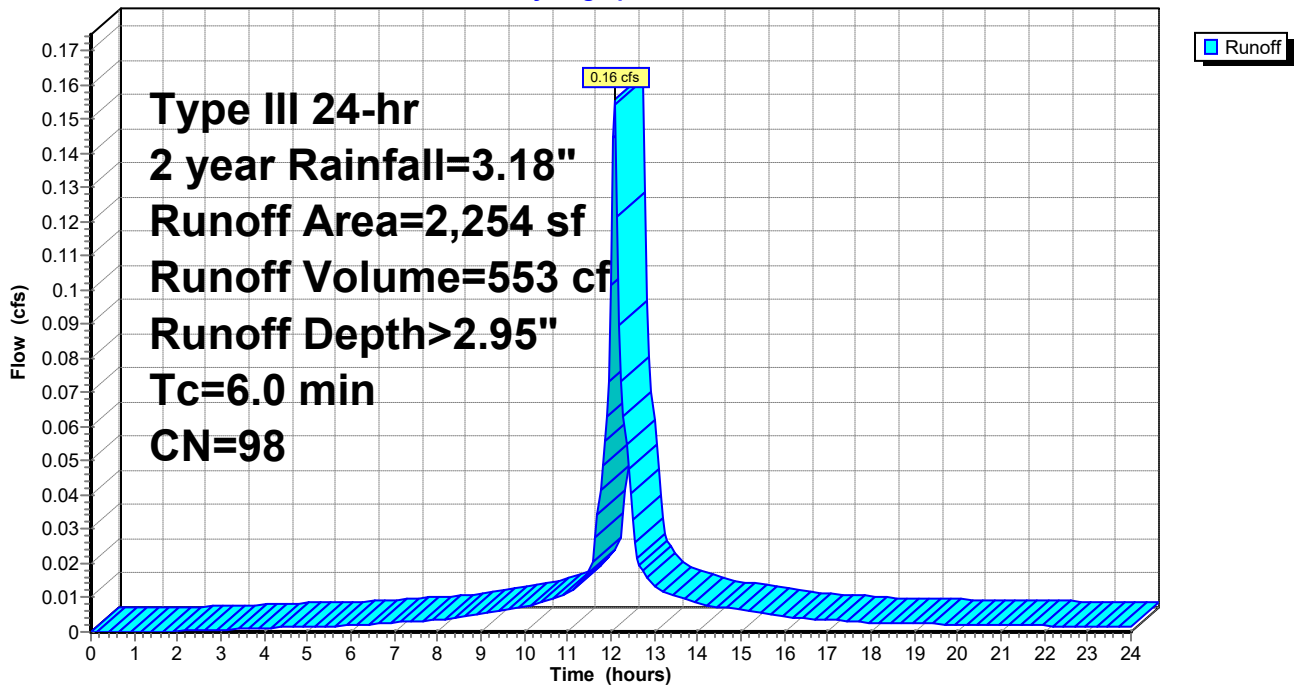
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.18"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW THROUGH GUTTERS TO POND

Subcatchment R3: (new Subcat)

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Summary for Reach 1R: CULVERT UNDER DRIVE

Inflow Area = 51,789 sf, 12.76% Impervious, Inflow Depth > 1.01" for 2 year event
Inflow = 1.14 cfs @ 12.11 hrs, Volume= 4,345 cf
Outflow = 1.14 cfs @ 12.11 hrs, Volume= 4,345 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.05 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 1.62 fps, Avg. Travel Time= 0.2 min

Peak Storage= 6 cf @ 12.11 hrs

Average Depth at Peak Storage= 0.23'

Bank-Full Depth= 1.00' Flow Area= 1.6 sf, Capacity= 9.45 cfs

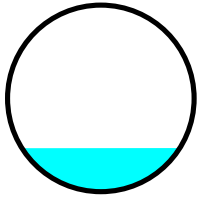
A factor of 2.00 has been applied to the storage and discharge capacity

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

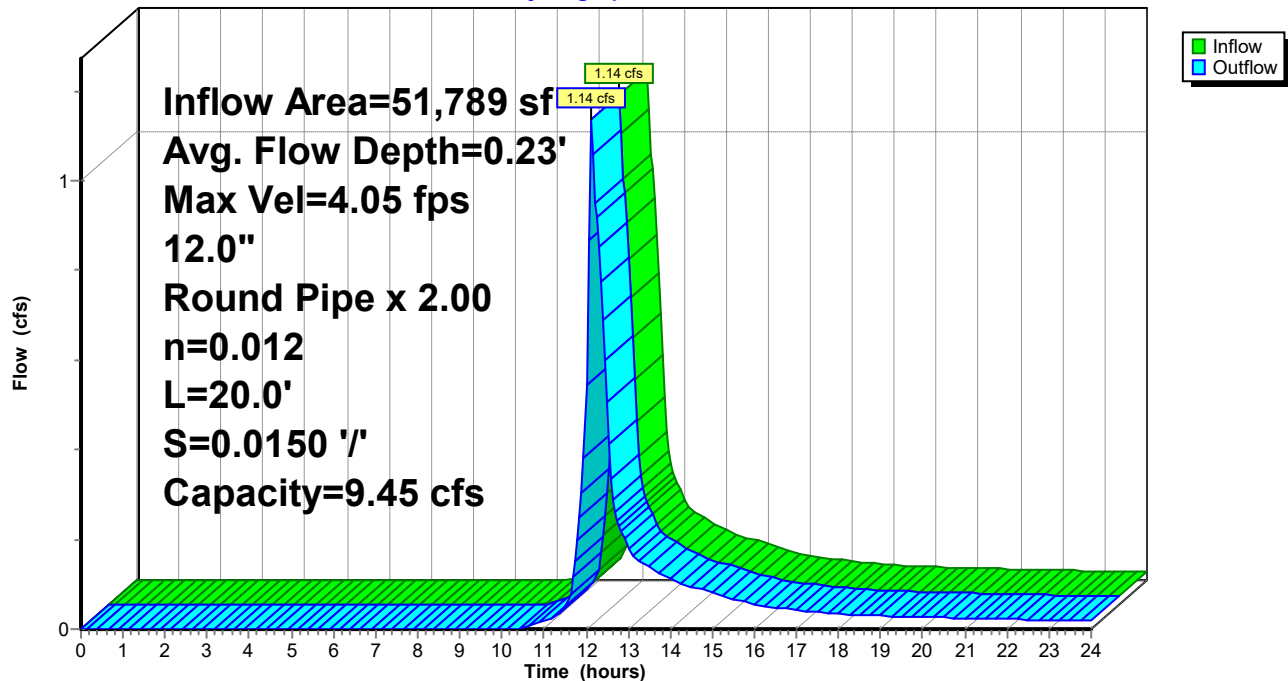
Length= 20.0' Slope= 0.0150 '/'

Inlet Invert= 259.80', Outlet Invert= 259.50'



Reach 1R: CULVERT UNDER DRIVE

Hydrograph



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Summary for Pond 1P: POND 1

Inflow Area = 40,965 sf, 56.43% Impervious, Inflow Depth > 2.01" for 2 year event
 Inflow = 2.09 cfs @ 12.09 hrs, Volume= 6,860 cf
 Outflow = 0.28 cfs @ 12.69 hrs, Volume= 5,579 cf, Atten= 87%, Lag= 35.9 min
 Discarded = 0.07 cfs @ 12.69 hrs, Volume= 3,584 cf
 Primary = 0.20 cfs @ 12.69 hrs, Volume= 1,995 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 261.15' @ 12.69 hrs Surf.Area= 3,068 sf Storage= 2,982 cf
 Flood Elev= 263.00' Surf.Area= 4,790 sf Storage= 10,193 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 118.9 min (922.5 - 803.6)

Volume	Invert	Avail.Storage	Storage Description			
#1	260.00'	10,193 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
260.00	2,125	260.0	0	0	2,125	
261.00	2,940	282.0	2,521	2,521	3,112	
262.00	3,825	308.0	3,373	5,894	4,368	
263.00	4,790	332.0	4,298	10,193	5,631	

Device	Routing	Invert	Outlet Devices	
#1	Primary	259.00'	12.0" Round Culvert L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.00' / 258.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf	
#2	Device 1	260.75'	4.0" Vert. Orifice/Grate C= 0.600	
#3	Device 1	261.75'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads	
#4	Discarded	260.00'	1.020 in/hr Exfiltration over Surface area	
#5	Primary	262.40'	5.0' long x 8.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74	

Discarded OutFlow Max=0.07 cfs @ 12.69 hrs HW=261.15' (Free Discharge)

↑ **4=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.20 cfs @ 12.69 hrs HW=261.15' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 0.20 cfs of 4.86 cfs potential flow)
 ↑ **2=Orifice/Grate** (Orifice Controls 0.20 cfs @ 2.34 fps)
 ↑ **3=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

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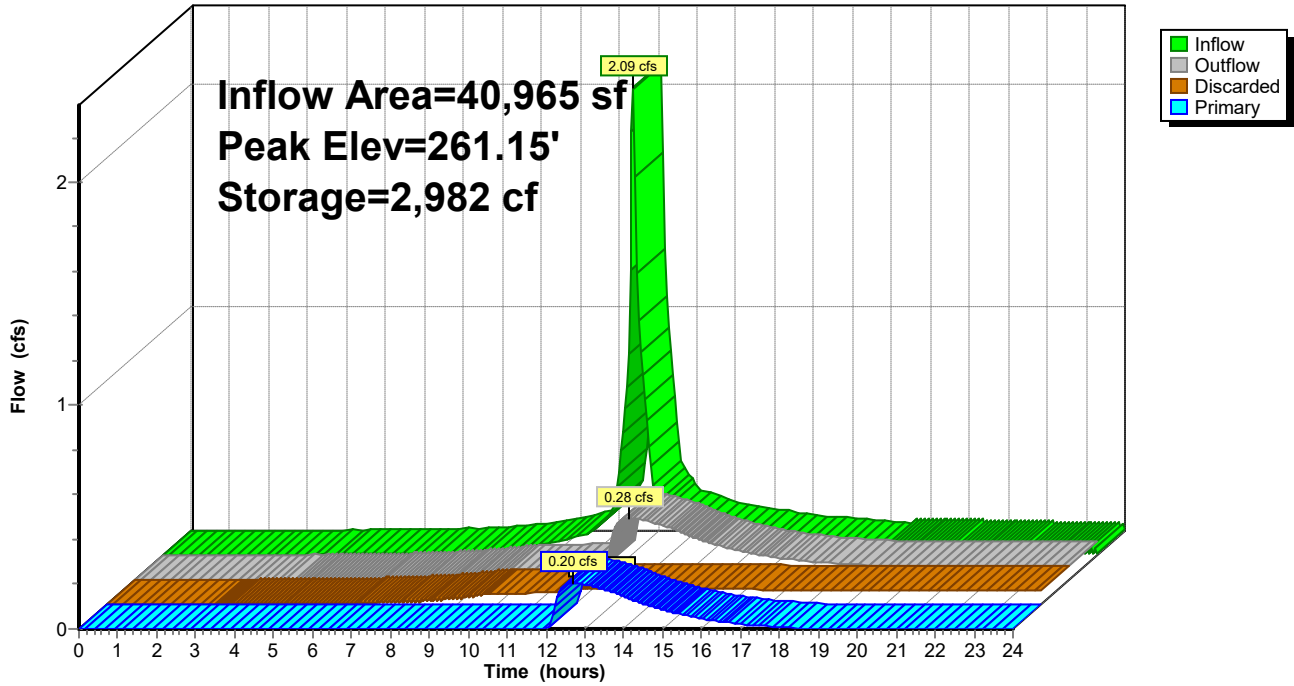
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Type III 24-hr 2 year Rainfall=3.18"

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Pond 1P: POND 1

Hydrograph



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Summary for Pond 2P: POND P2

Inflow Area = 11,050 sf, 59.81% Impervious, Inflow Depth > 2.02" for 2 year event
 Inflow = 0.57 cfs @ 12.09 hrs, Volume= 1,857 cf
 Outflow = 0.25 cfs @ 12.31 hrs, Volume= 1,567 cf, Atten= 55%, Lag= 12.9 min
 Discarded = 0.02 cfs @ 12.31 hrs, Volume= 1,080 cf
 Primary = 0.23 cfs @ 12.31 hrs, Volume= 487 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 261.82' @ 12.31 hrs Surf.Area= 925 sf Storage= 630 cf
 Flood Elev= 263.00' Surf.Area= 1,440 sf Storage= 2,014 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 110.4 min (915.4 - 805.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	261.00'	2,014 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
261.00	616	112.0	0	0	616	
262.00	1,000	139.0	800	800	1,170	
263.00	1,440	158.0	1,213	2,014	1,643	

Device	Routing	Invert	Outlet Devices												
#1	Discarded	261.00'	1.020 in/hr Exfiltration over Surface area												
#2	Primary	261.75'	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir												
			Head (feet)	0.20	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.00		
				2.50	3.00	3.50	4.00	4.50	5.00	5.50					
			Coef. (English)	2.34	2.50	2.70	2.68	2.68	2.66	2.65	2.65	2.65			
				2.65	2.67	2.66	2.68	2.70	2.74	2.79	2.88				

Discarded OutFlow Max=0.02 cfs @ 12.31 hrs HW=261.82' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.23 cfs @ 12.31 hrs HW=261.82' TW=260.00' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 0.23 cfs @ 0.63 fps)

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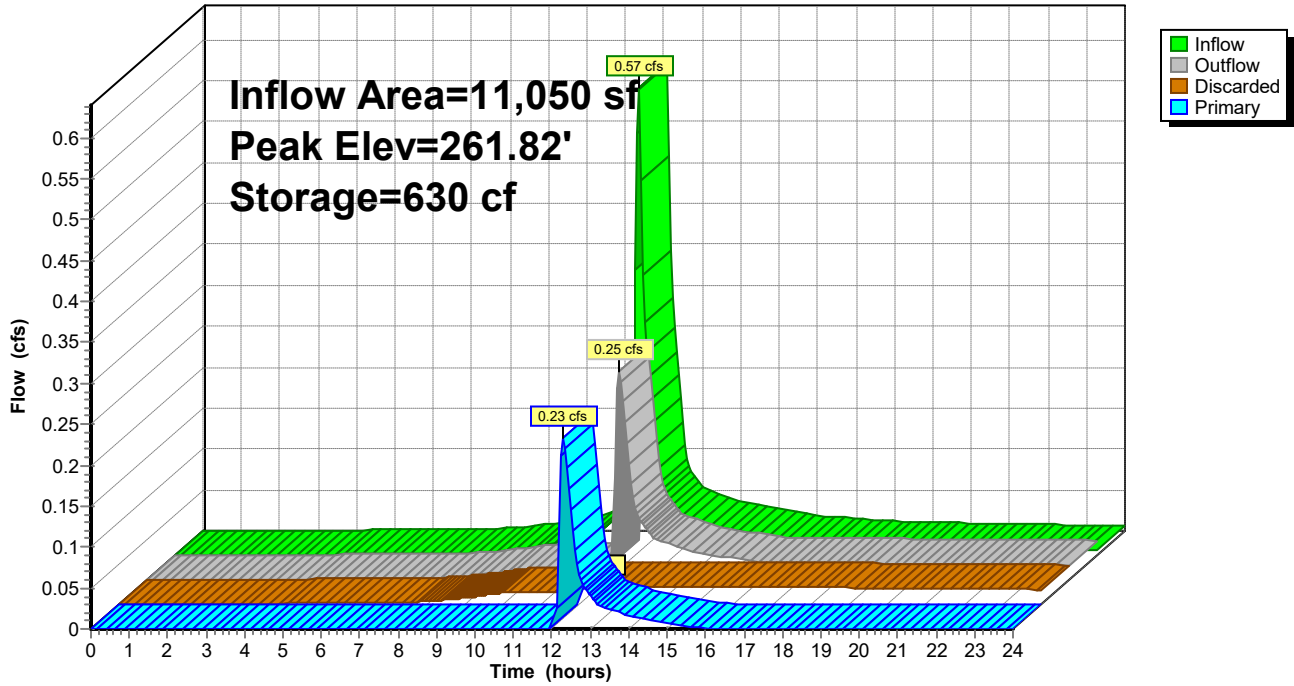
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Type III 24-hr 2 year Rainfall=3.18"

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Pond 2P: POND P2

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Summary for Pond 3P: POND 3

Inflow Area = 16,749 sf, 28.06% Impervious, Inflow Depth > 1.48" for 2 year event
 Inflow = 0.46 cfs @ 12.17 hrs, Volume= 2,069 cf
 Outflow = 0.08 cfs @ 12.97 hrs, Volume= 1,548 cf, Atten= 83%, Lag= 47.8 min
 Discarded = 0.03 cfs @ 12.97 hrs, Volume= 1,214 cf
 Primary = 0.05 cfs @ 12.97 hrs, Volume= 335 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 263.11' @ 12.97 hrs Surf.Area= 1,124 sf Storage= 904 cf
 Flood Elev= 265.00' Surf.Area= 2,460 sf Storage= 4,264 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 137.6 min (966.5 - 828.9)

Volume	Invert	Avail.Storage	Storage Description			
#1	262.00'	4,264 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
262.00	541	176.0	0	0	541	
264.00	1,745	219.0	2,172	2,172	1,949	
265.00	2,460	250.0	2,092	4,264	3,130	

Device	Routing	Invert	Outlet Devices		
#1	Primary	263.00'	12.0" Round Culvert L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 263.00' / 260.00' S= 0.1500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf		
#2	Discarded	262.00'	1.020 in/hr Exfiltration over Surface area		
#3	Device 1	263.00'	4.0" Vert. Orifice/Grate	C= 0.600	
#4	Device 1	262.50'	3.0" Vert. Orifice/Grate	C= 0.600	
#5	Device 1	264.00'	24.0" x 24.0" Horiz. Orifice/Grate	C= 0.600	Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 12.97 hrs HW=263.11' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.05 cfs @ 12.97 hrs HW=263.11' TW=0.00' (Dynamic Tailwater)
 ↳ **1=Culvert** (Inlet Controls 0.05 cfs @ 1.12 fps)
 ↳ **3=Orifice/Grate** (Passes < 0.03 cfs potential flow)
 ↳ **4=Orifice/Grate** (Passes < 0.08 cfs potential flow)
 ↳ **5=Orifice/Grate** (Controls 0.00 cfs)

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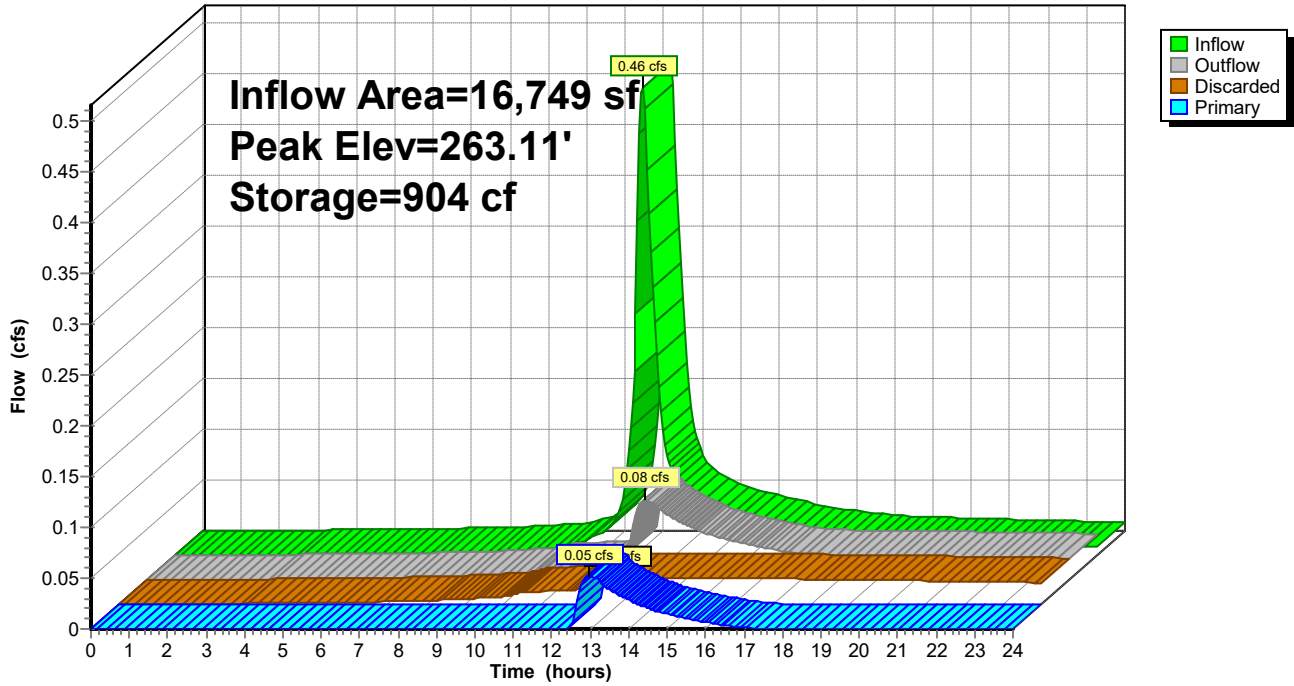
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Pond 3P: POND 3

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Summary for Pond CB1: (new Pond)

Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 1.74" for 2 year event
 Inflow = 0.15 cfs @ 12.09 hrs, Volume= 476 cf
 Outflow = 0.15 cfs @ 12.09 hrs, Volume= 476 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.15 cfs @ 12.09 hrs, Volume= 476 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.11' @ 12.09 hrs

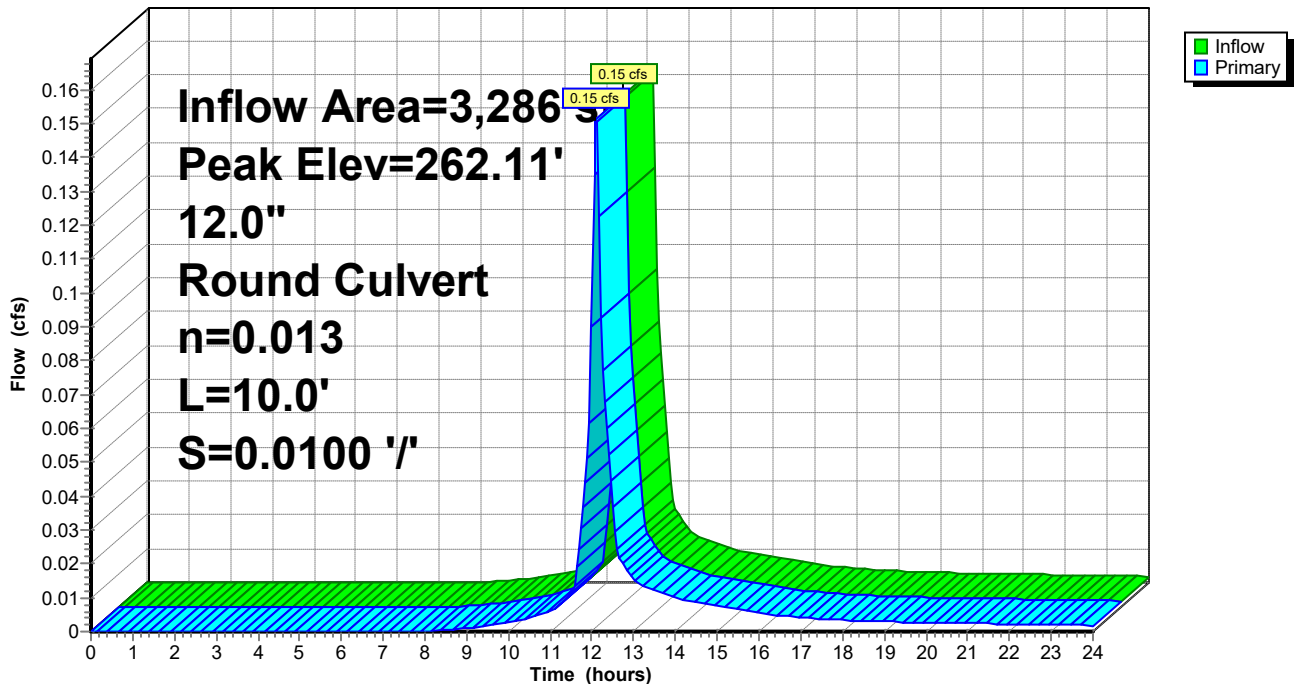
Flood Elev= 264.40'

Device #	Routing	Invert	Outlet Devices
#1	Primary	261.90'	12.0" Round Culvert L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.15 cfs @ 12.09 hrs HW=262.11' TW=261.92' (Dynamic Tailwater)
 ↑1=Culvert (Barrel Controls 0.15 cfs @ 1.92 fps)

Pond CB1: (new Pond)

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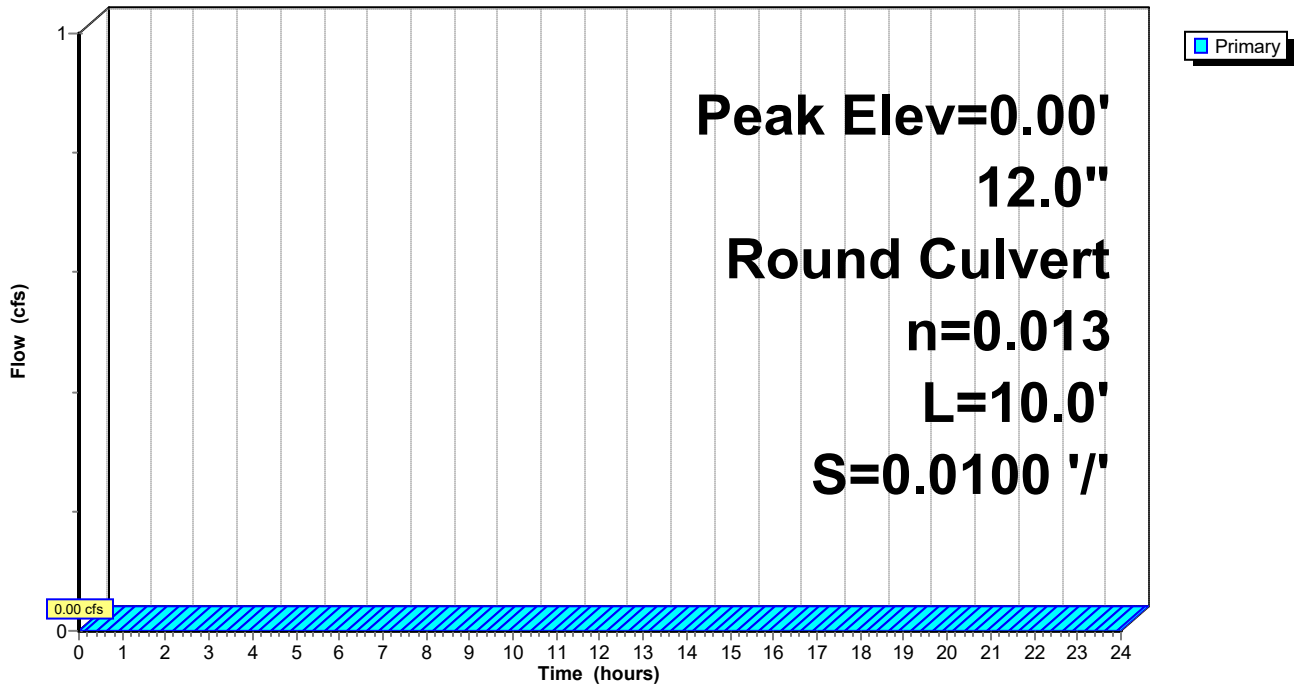
Summary for Pond CB2: CB2

Device	Routing	Invert	Outlet Devices
#1	Primary	261.90'	12.0" Round Culvert L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=261.70' (Dynamic Tailwater)
↑1=Culvert (Controls 0.00 cfs)

Pond CB2: CB2

Hydrograph



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Summary for Pond CB3: (new Pond)

Inflow Area = 5,280 sf, 100.00% Impervious, Inflow Depth > 2.95" for 2 year event
Inflow = 0.37 cfs @ 12.09 hrs, Volume= 1,296 cf
Outflow = 0.37 cfs @ 12.09 hrs, Volume= 1,296 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.37 cfs @ 12.09 hrs, Volume= 1,296 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 261.16' @ 12.79 hrs

Flood Elev= 263.50'

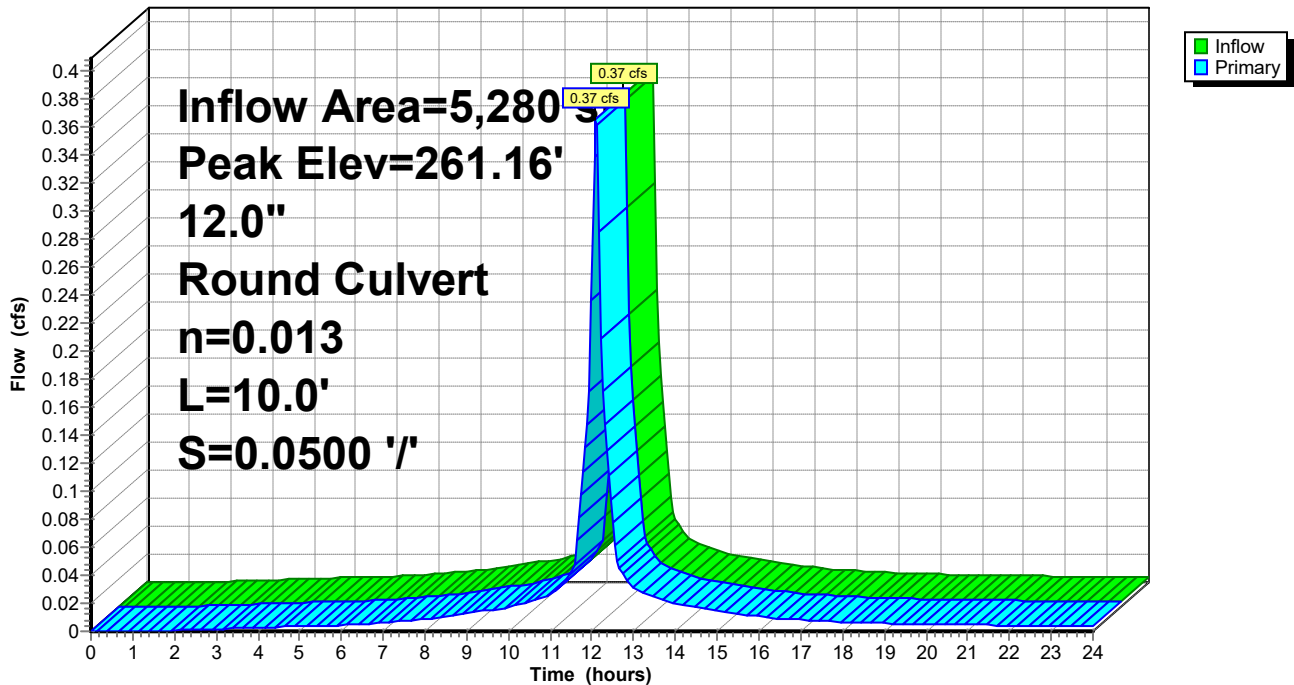
Device #	Routing	Invert	Outlet Devices
1	Primary	260.50'	12.0" Round Culvert L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0500 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.27 cfs @ 12.09 hrs HW=260.81' TW=260.68' (Dynamic Tailwater)

↑1=Culvert (Outlet Controls 0.27 cfs @ 1.97 fps)

Pond CB3: (new Pond)

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Summary for Pond CB4: CB4

Inflow Area = 11,827 sf, 59.86% Impervious, Inflow Depth > 2.06" for 2 year event
 Inflow = 0.64 cfs @ 12.09 hrs, Volume= 2,032 cf
 Outflow = 0.64 cfs @ 12.09 hrs, Volume= 2,032 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.64 cfs @ 12.09 hrs, Volume= 2,032 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 261.16' @ 12.78 hrs

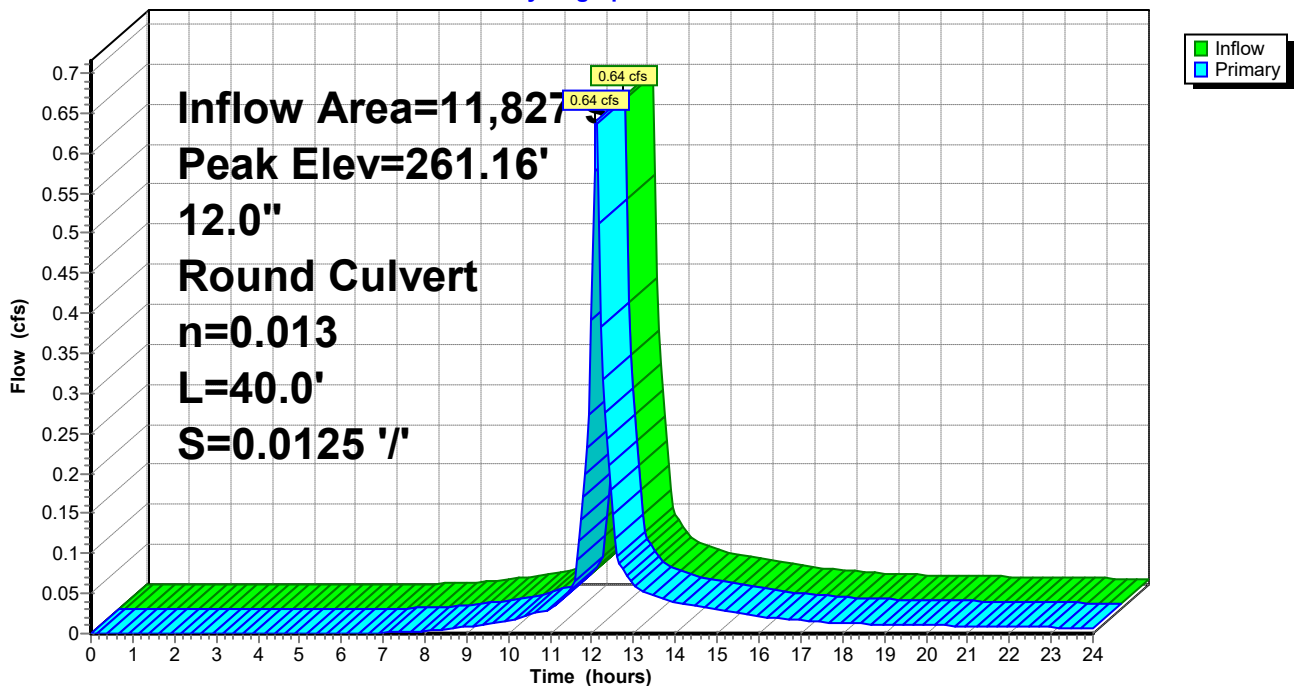
Flood Elev= 263.50'

Device #	Routing	Invert	Outlet Devices
#1	Primary	260.50'	12.0" Round Culvert L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.53 cfs @ 12.09 hrs HW=260.95' TW=260.69' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 0.53 cfs @ 2.27 fps)

Pond CB4: CB4

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Summary for Pond MH1: MH1

Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 1.74" for 2 year event
 Inflow = 0.15 cfs @ 12.09 hrs, Volume= 476 cf
 Outflow = 0.15 cfs @ 12.09 hrs, Volume= 476 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.15 cfs @ 12.09 hrs, Volume= 476 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 261.92' @ 12.10 hrs

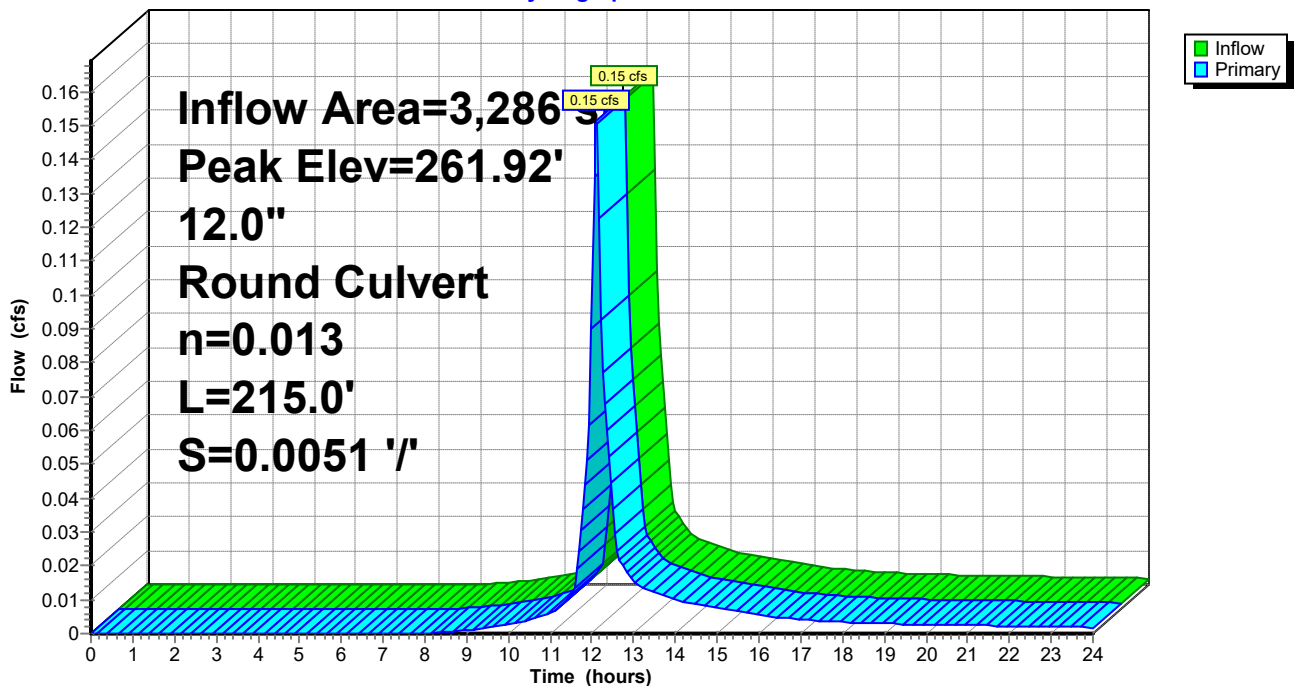
Flood Elev= 265.00'

Device #	Routing	Invert	Outlet Devices
#1	Primary	261.70'	12.0" Round Culvert L= 215.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.70' / 260.60' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.15 cfs @ 12.09 hrs HW=261.92' TW=260.87' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 0.15 cfs @ 1.69 fps)

Pond MH1: MH1

Hydrograph



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Summary for Pond MH2: MH2

Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 1.74" for 2 year event
 Inflow = 0.15 cfs @ 12.09 hrs, Volume= 476 cf
 Outflow = 0.15 cfs @ 12.09 hrs, Volume= 476 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.15 cfs @ 12.09 hrs, Volume= 476 cf

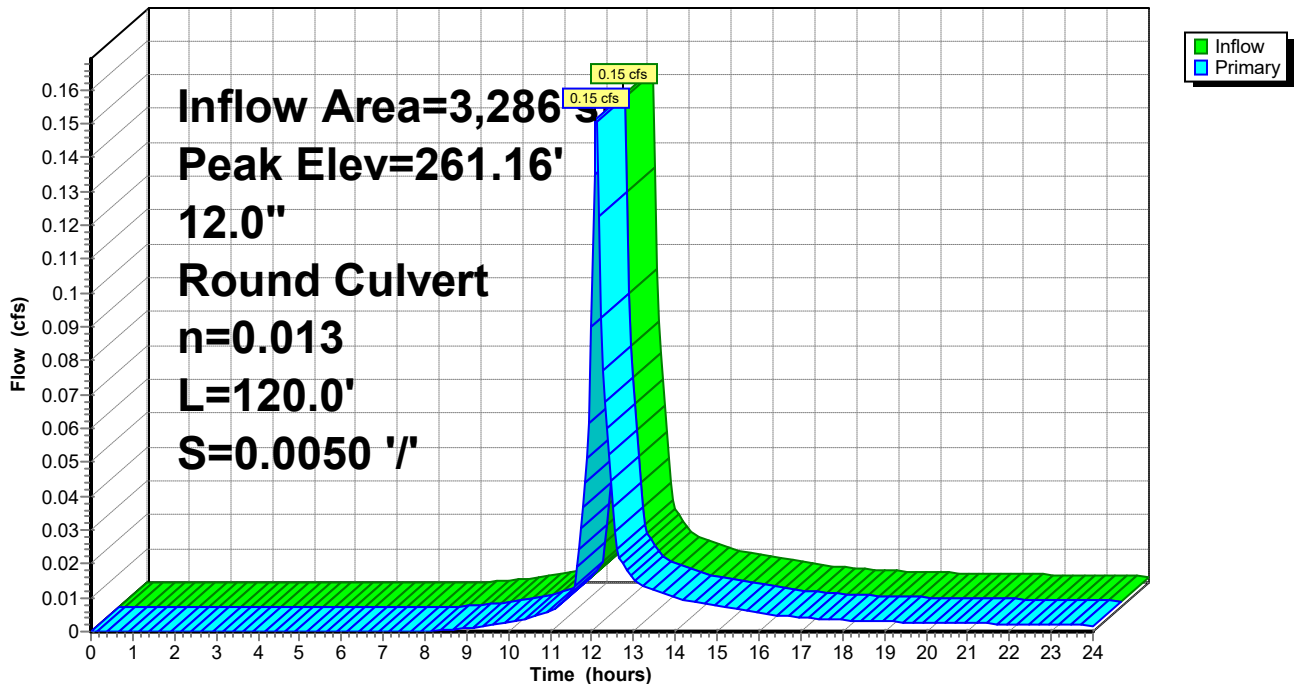
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 261.16' @ 12.79 hrs
 Flood Elev= 269.75'

Device #	Routing	Invert	Outlet Devices
#1	Primary	260.60'	12.0" Round Culvert L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.60' / 260.00' S= 0.0050 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.12 cfs @ 12.09 hrs HW=260.87' TW=260.69' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 0.12 cfs @ 1.03 fps)

Pond MH2: MH2

Hydrograph



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Summary for Pond MH3: DMH3

Inflow Area = 20,393 sf, 67.90% Impervious, Inflow Depth > 2.24" for 2 year event
Inflow = 1.15 cfs @ 12.09 hrs, Volume= 3,804 cf
Outflow = 1.15 cfs @ 12.09 hrs, Volume= 3,802 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.15 cfs @ 12.09 hrs, Volume= 3,802 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 261.15' @ 12.74 hrs

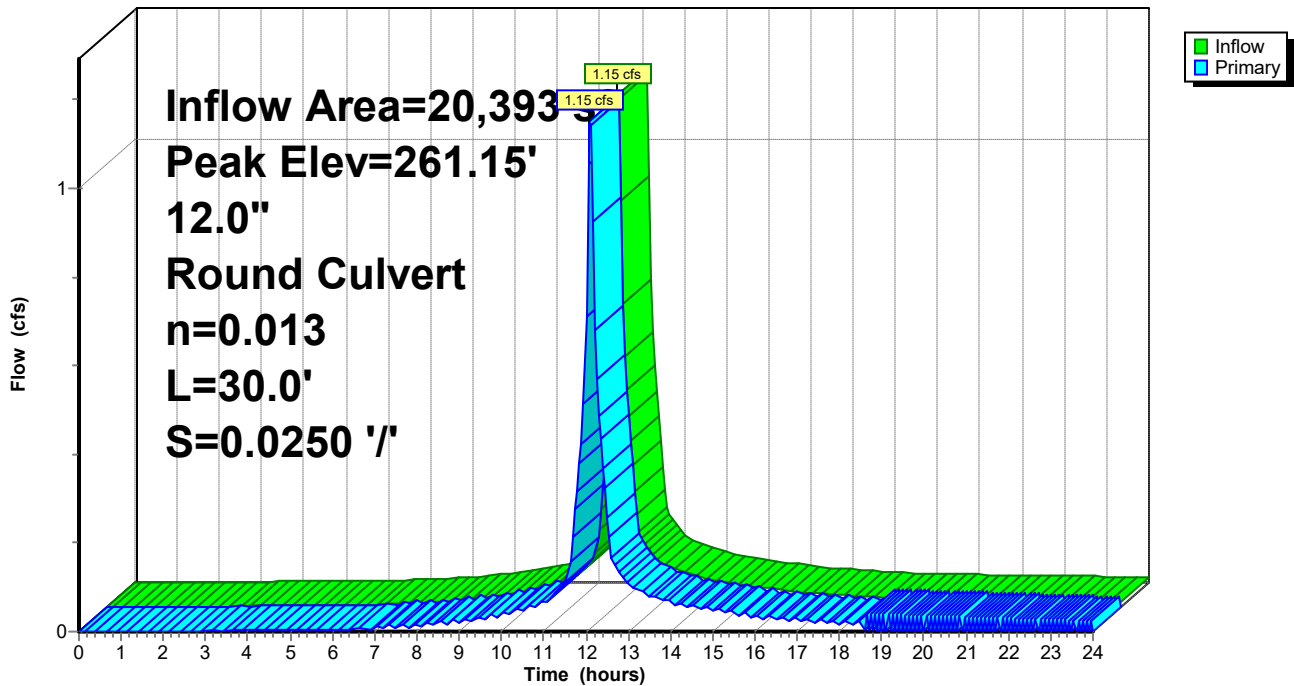
Flood Elev= 263.60'

Device #	Routing	Invert	Outlet Devices
1	Primary	259.75'	12.0" Round Culvert L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.75' / 259.00' S= 0.0250 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.14 cfs @ 12.09 hrs HW=260.68' TW=260.68' (Dynamic Tailwater)
↑1=Culvert (Outlet Controls 0.14 cfs @ 0.24 fps)

Pond MH3: DMH3

Hydrograph



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Type III 24-hr 2 year Rainfall=3.18"

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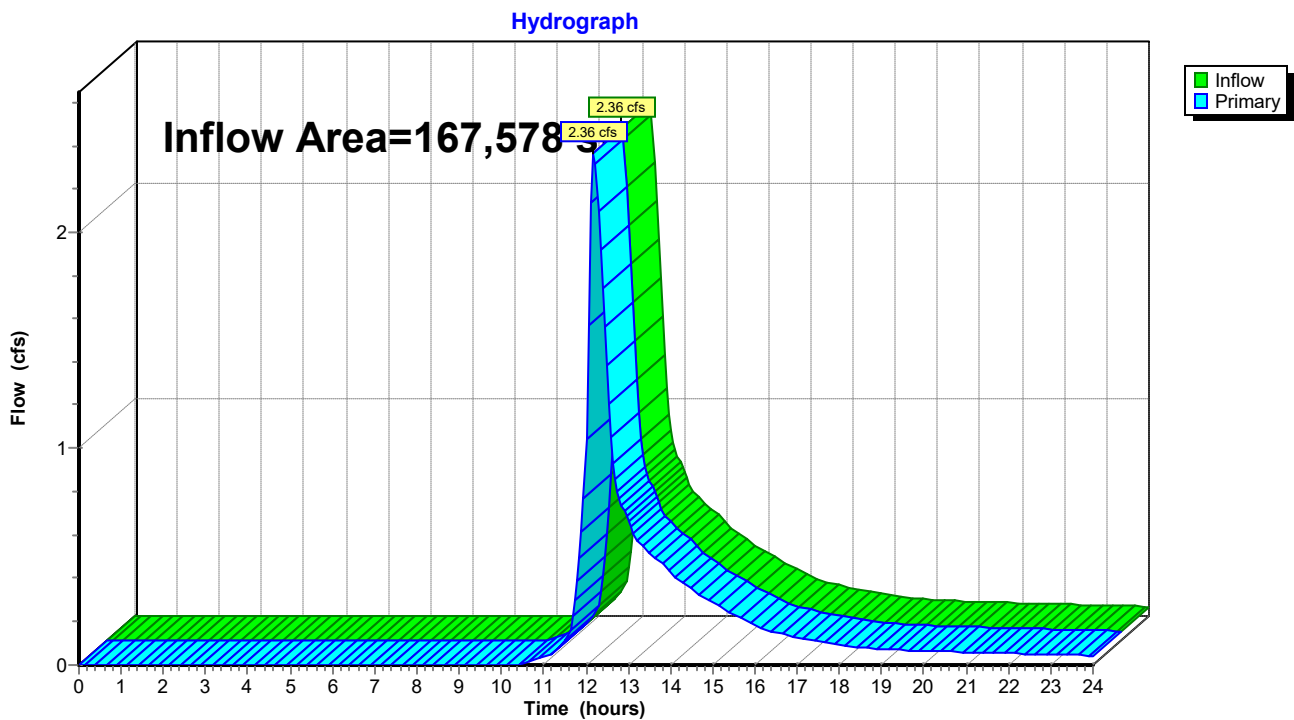
Summary for Pond SP1: SUM POND WOODS

DESIGN POINT AT REAR PROPERTY LINE

Inflow Area = 167,578 sf, 20.54% Impervious, Inflow Depth > 0.87" for 2 year event
Inflow = 2.36 cfs @ 12.18 hrs, Volume= 12,166 cf
Primary = 2.36 cfs @ 12.18 hrs, Volume= 12,166 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: SUM POND WOODS



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Type III 24-hr 2 year Rainfall=3.18"

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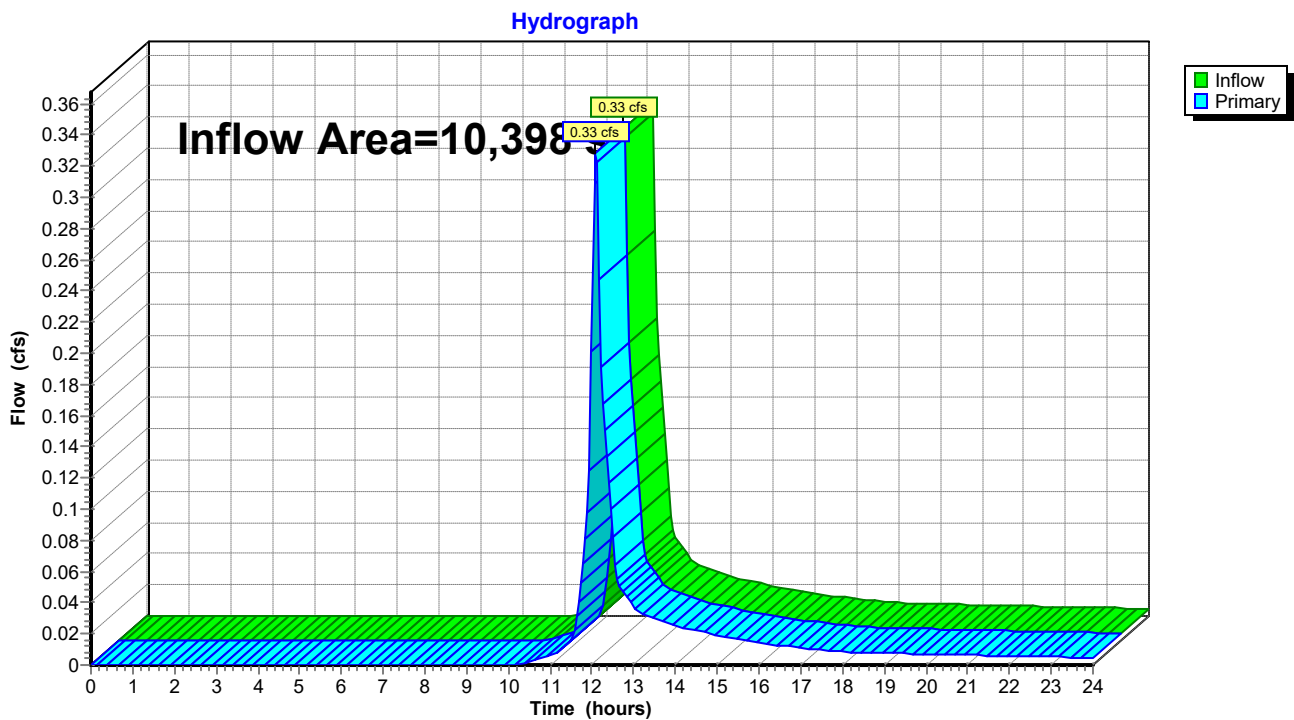
Summary for Pond SP2: SUM POND STREET

DESIGN POINT AT HIGHLAND ROAD

Inflow Area = 10,398 sf, 13.61% Impervious, Inflow Depth > 1.20" for 2 year event
Inflow = 0.33 cfs @ 12.08 hrs, Volume= 1,037 cf
Primary = 0.33 cfs @ 12.08 hrs, Volume= 1,037 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET





RANGER ENGINEERING GROUP, INC.

STORMWATER MANAGEMENT REPORT

POST-DEVELOPMENT DRAINAGE

10 YEAR STORM

SELLERS FARM POST DEVELOPMENT

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Type III 24-hr 10 year Rainfall=5.04"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1A: P1A	Runoff Area=3,286 sf 45.25% Impervious Runoff Depth>3.40" Tc=6.0 min CN=85 Runoff=0.29 cfs 932 cf
Subcatchment P1B: P1B	Runoff Area=1,506 sf 100.00% Impervious Runoff Depth>4.80" Tc=6.0 min CN=98 Runoff=0.17 cfs 602 cf
Subcatchment P2: P2	Runoff Area=10,398 sf 13.61% Impervious Runoff Depth>2.65" Flow Length=205' Tc=4.9 min CN=77 Runoff=0.75 cfs 2,300 cf
Subcatchment P3: (new Subcat)	Runoff Area=11,734 sf 26.27% Impervious Runoff Depth>3.02" Flow Length=250' Tc=6.2 min CN=81 Runoff=0.93 cfs 2,951 cf
Subcatchment P4A: FLOW TO CB3	Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>4.80" Tc=6.0 min CN=98 Runoff=0.58 cfs 2,112 cf
Subcatchment P4B: FLOW TO CB4	Runoff Area=11,827 sf 59.86% Impervious Runoff Depth>3.81" Tc=6.0 min CN=89 Runoff=1.15 cfs 3,753 cf
Subcatchment P5: P5	Runoff Area=9,084 sf 51.11% Impervious Runoff Depth>3.50" Tc=6.0 min CN=86 Runoff=0.83 cfs 2,651 cf
Subcatchment P6: P6	Runoff Area=40,739 sf 0.00% Impervious Runoff Depth>2.57" Flow Length=300' Tc=7.3 min CN=76 Runoff=2.66 cfs 8,709 cf
Subcatchment P7: FLOW TO POND 3	Runoff Area=14,495 sf 16.87% Impervious Runoff Depth>2.74" Flow Length=180' Tc=14.4 min CN=78 Runoff=0.82 cfs 3,308 cf
Subcatchment P8: AREA AROUND POND 1	Runoff Area=6,584 sf 59.75% Impervious Runoff Depth>3.70" Tc=6.0 min CN=88 Runoff=0.63 cfs 2,032 cf
Subcatchment P9: (new Subcat)	Runoff Area=58,075 sf 0.00% Impervious Runoff Depth>2.56" Flow Length=350' Slope=0.0500 '/' Tc=13.1 min CN=76 Runoff=3.16 cfs 12,400 cf
Subcatchment R1: IOT 1 ROOF	Runoff Area=1,966 sf 100.00% Impervious Runoff Depth>4.80" Tc=6.0 min CN=98 Runoff=0.22 cfs 786 cf
Subcatchment R2: LOT 2 ROOF	Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>4.80" Tc=6.0 min CN=98 Runoff=0.25 cfs 902 cf
Subcatchment R3: (new Subcat)	Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>4.80" Tc=6.0 min CN=98 Runoff=0.25 cfs 902 cf
Reach 1R: CULVERT UNDER DRIVE	Avg. Flow Depth=0.43' Max Vel=5.59 fps Inflow=3.59 cfs 10,489 cf 12.0" Round Pipe x 2.00 n=0.012 L=20.0' S=0.0150 '/' Capacity=9.45 cfs Outflow=3.59 cfs 10,489 cf
Pond 1P: POND 1	Peak Elev=261.89' Storage=5,464 cf Inflow=3.83 cfs 12,681 cf Discarded=0.09 cfs 4,190 cf Primary=0.93 cfs 6,749 cf Outflow=1.02 cfs 10,939 cf

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Type III 24-hr 10 year Rainfall=5.04"

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Pond 2P: POND P2 Peak Elev=261.94' Storage=738 cf Inflow=1.04 cfs 3,437 cf
Discarded=0.02 cfs 1,221 cf Primary=0.94 cfs 1,780 cf Outflow=0.97 cfs 3,001 cf

Pond 3P: POND 3 Peak Elev=263.52' Storage=1,425 cf Inflow=0.97 cfs 4,209 cf
Discarded=0.03 cfs 1,389 cf Primary=0.42 cfs 2,110 cf Outflow=0.45 cfs 3,499 cf

Pond CB1: (new Pond) Peak Elev=262.20' Inflow=0.29 cfs 932 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/ Outflow=0.29 cfs 932 cf

Pond CB2: CB2 Peak Elev=0.00'
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/ Primary=0.00 cfs 0 cf

Pond CB3: (new Pond) Peak Elev=261.90' Inflow=0.58 cfs 2,112 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0500 '/ Outflow=0.58 cfs 2,112 cf

Pond CB4: CB4 Peak Elev=261.90' Inflow=1.15 cfs 3,753 cf
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/ Outflow=1.15 cfs 3,753 cf

Pond MH1: MH1 Peak Elev=262.03' Inflow=0.29 cfs 932 cf
12.0" Round Culvert n=0.013 L=215.0' S=0.0051 '/ Outflow=0.29 cfs 932 cf

Pond MH2: MH2 Peak Elev=261.90' Inflow=0.29 cfs 932 cf
12.0" Round Culvert n=0.013 L=120.0' S=0.0050 '/ Outflow=0.29 cfs 932 cf

Pond MH3: DMH3 Peak Elev=261.90' Inflow=2.03 cfs 6,796 cf
12.0" Round Culvert n=0.013 L=30.0' S=0.0250 '/ Outflow=2.03 cfs 6,796 cf

Pond SP1: SUM POND WOODS Inflow=6.85 cfs 31,747 cf
Primary=6.85 cfs 31,747 cf

Pond SP2: SUM POND STREET Inflow=0.75 cfs 2,300 cf
Primary=0.75 cfs 2,300 cf

Total Runoff Area = 179,482 sf Runoff Volume = 44,340 cf Average Runoff Depth = 2.96"
79.19% Pervious = 142,136 sf 20.81% Impervious = 37,346 sf

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Type III 24-hr 10 year Rainfall=5.04"

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Summary for Subcatchment P1A: P1A

Runoff = 0.29 cfs @ 12.09 hrs, Volume= 932 cf, Depth> 3.40"

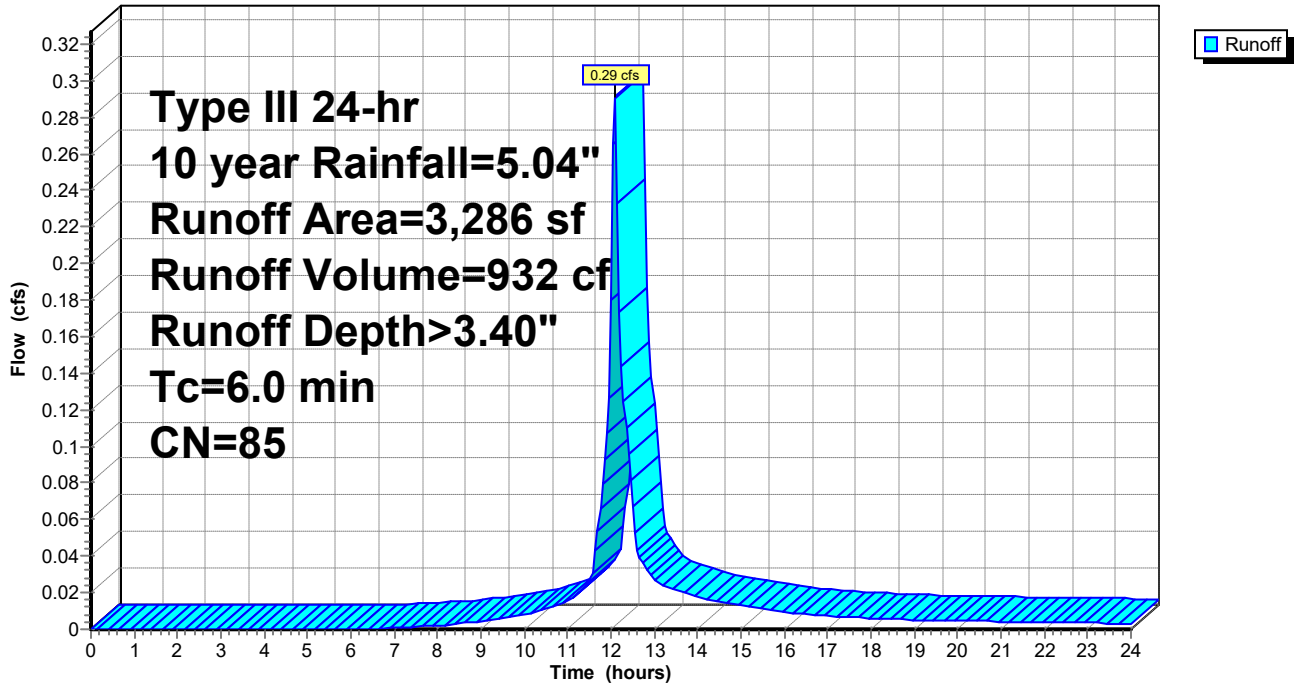
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
1,799	74	>75% Grass cover, Good, HSG C
1,487	98	Paved parking, HSG C
3,286	85	Weighted Average
1,799		54.75% Pervious Area
1,487		45.25% Impervious Area

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

Subcatchment P1A: P1A

Hydrograph



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Type III 24-hr 10 year Rainfall=5.04"

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Summary for Subcatchment P1B: P1B

Runoff = 0.17 cfs @ 12.09 hrs, Volume= 602 cf, Depth> 4.80"

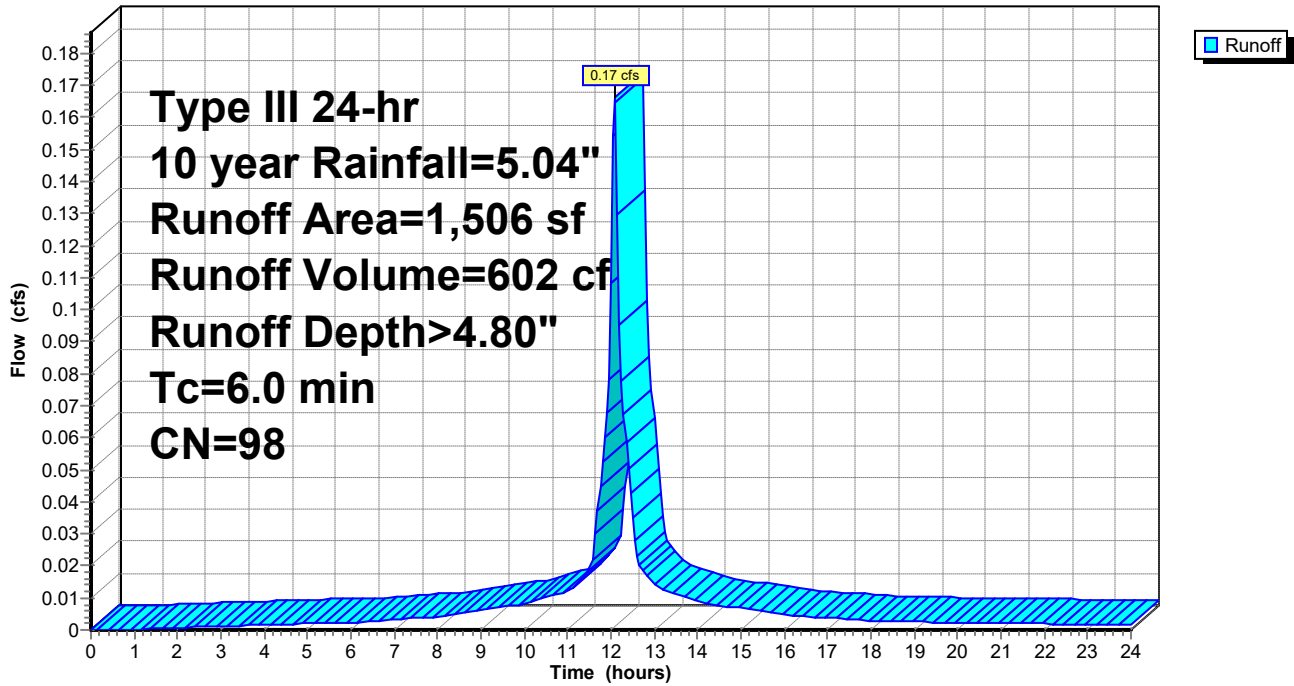
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
1,506	98	Paved parking, HSG C
1,506		100.00% Impervious Area

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

Subcatchment P1B: P1B

Hydrograph



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Type III 24-hr 10 year Rainfall=5.04"

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Summary for Subcatchment P2: P2

Runoff = 0.75 cfs @ 12.08 hrs, Volume= 2,300 cf, Depth> 2.65"

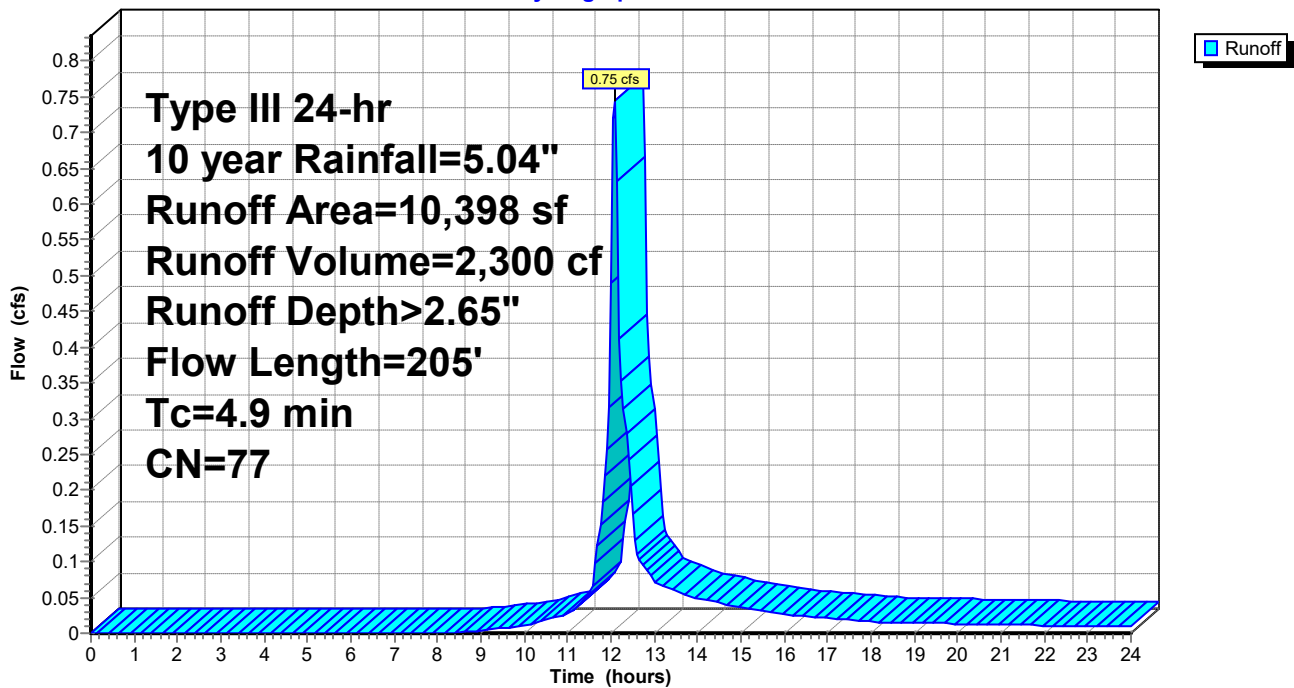
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
8,983	74	>75% Grass cover, Good, HSG C
10,398	77	Weighted Average
8,983		86.39% Pervious Area
1,415		13.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	50	0.0500	0.21		Sheet Flow, flow over grass Grass: Short n= 0.150 P2= 3.18"
0.4	35	0.0420	1.43		Shallow Concentrated Flow, flow over grass Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		Shallow Concentrated Flow, flow along driveway Paved Kv= 20.3 fps
4.9	205	Total			

Subcatchment P2: P2

Hydrograph



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Type III 24-hr 10 year Rainfall=5.04"

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Summary for Subcatchment P3: (new Subcat)

Runoff = 0.93 cfs @ 12.09 hrs, Volume= 2,951 cf, Depth> 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
8,359	74	>75% Grass cover, Good, HSG C
125	98	Roofs, HSG C
293	89	Gravel roads, HSG C
1,916	98	Paved parking, HSG C
1,041	98	Water Surface, HSG C
11,734	81	Weighted Average
8,652		73.73% Pervious Area
3,082		26.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		Sheet Flow, FLOW OVER GRASS Grass: Short n= 0.150 P2= 3.18"
1.3	120	0.0500	1.57		Shallow Concentrated Flow, FLOW OVER GRASS Short Grass Pasture Kv= 7.0 fps
0.6	80	0.0125	2.27		Shallow Concentrated Flow, FLOW OVER DRIVEWAY Paved Kv= 20.3 fps
6.2	250	Total			

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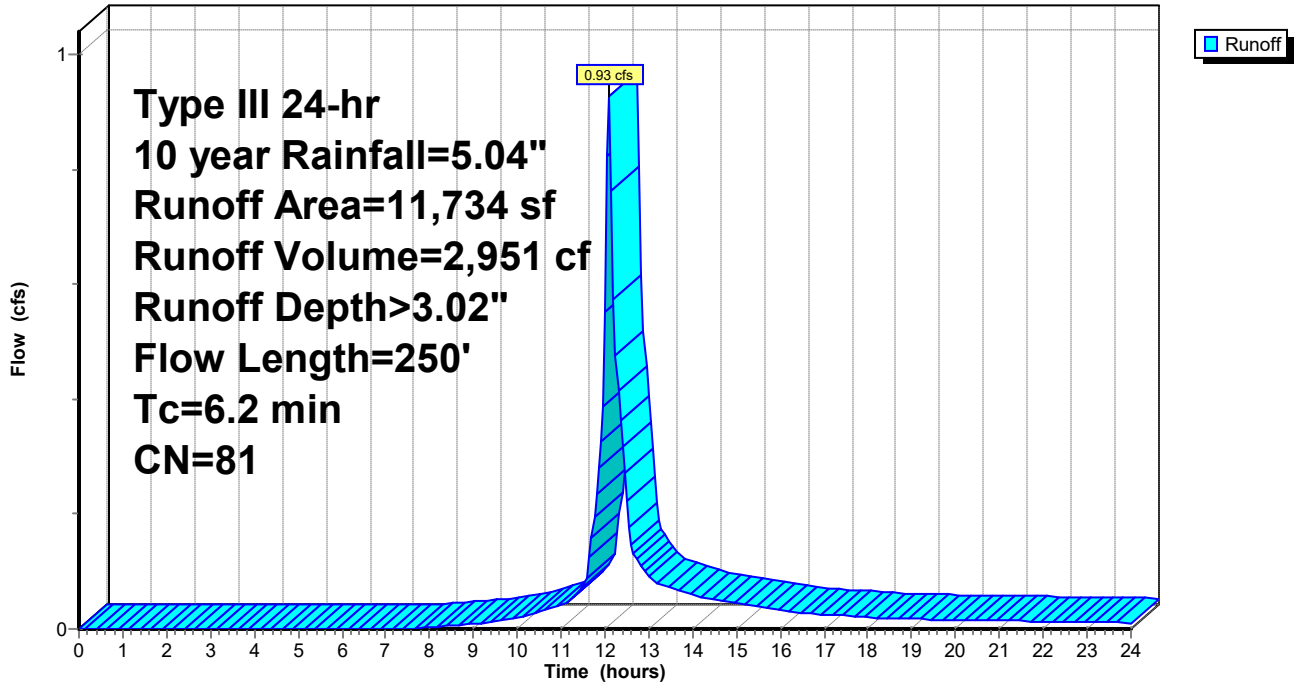
SELLERS FARM ROAD POST 3/2/22
Type III 24-hr 10 year Rainfall=5.04"

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Subcatchment P3: (new Subcat)

Hydrograph



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Type III 24-hr 10 year Rainfall=5.04"

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Summary for Subcatchment P4A: FLOW TO CB3

Runoff = 0.58 cfs @ 12.09 hrs, Volume= 2,112 cf, Depth> 4.80"

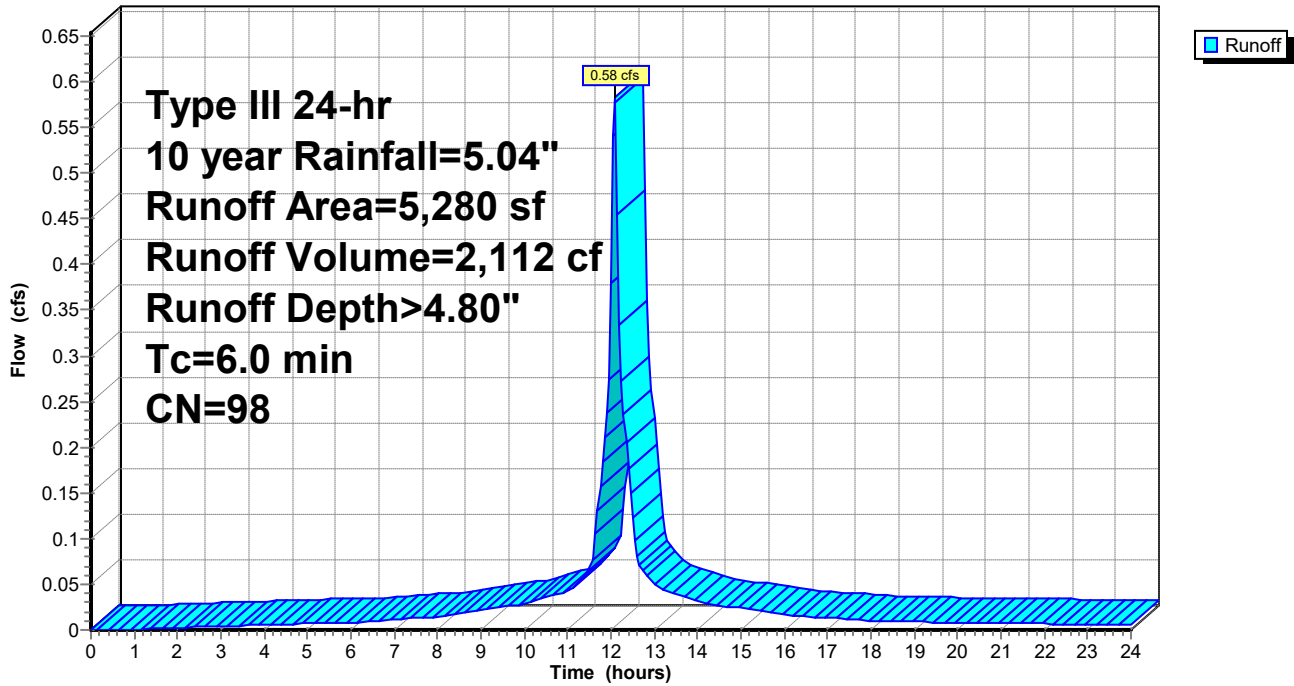
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
5,280	98	Paved parking, HSG C
5,280		100.00% Impervious Area

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

Subcatchment P4A: FLOW TO CB3

Hydrograph



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Type III 24-hr 10 year Rainfall=5.04"

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Summary for Subcatchment P4B: FLOW TO CB4

Runoff = 1.15 cfs @ 12.09 hrs, Volume= 3,753 cf, Depth> 3.81"

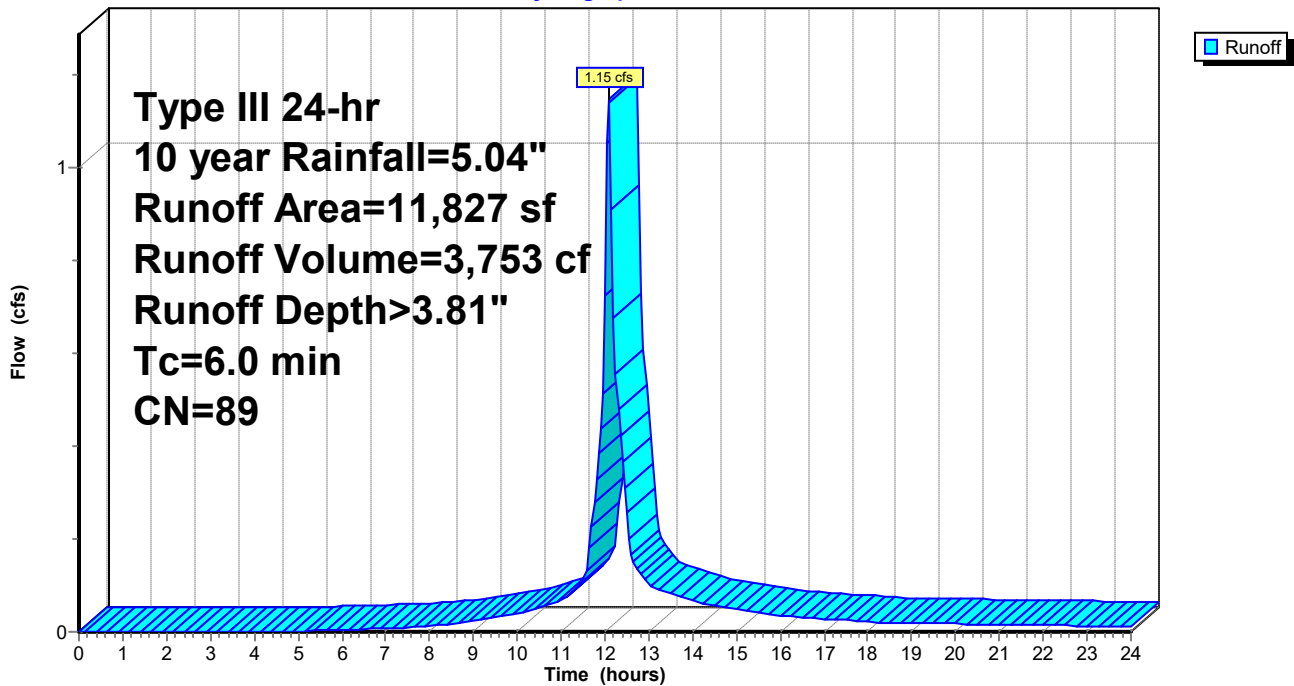
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
7,080	98	Paved parking, HSG C
4,550	74	>75% Grass cover, Good, HSG C
197	89	Gravel roads, HSG C
11,827	89	Weighted Average
4,747		40.14% Pervious Area
7,080		59.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW OVER PAVEMENT TO CB4

Subcatchment P4B: FLOW TO CB4

Hydrograph



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Type III 24-hr 10 year Rainfall=5.04"

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Summary for Subcatchment P5: P5

Runoff = 0.83 cfs @ 12.09 hrs, Volume= 2,651 cf, Depth> 3.50"

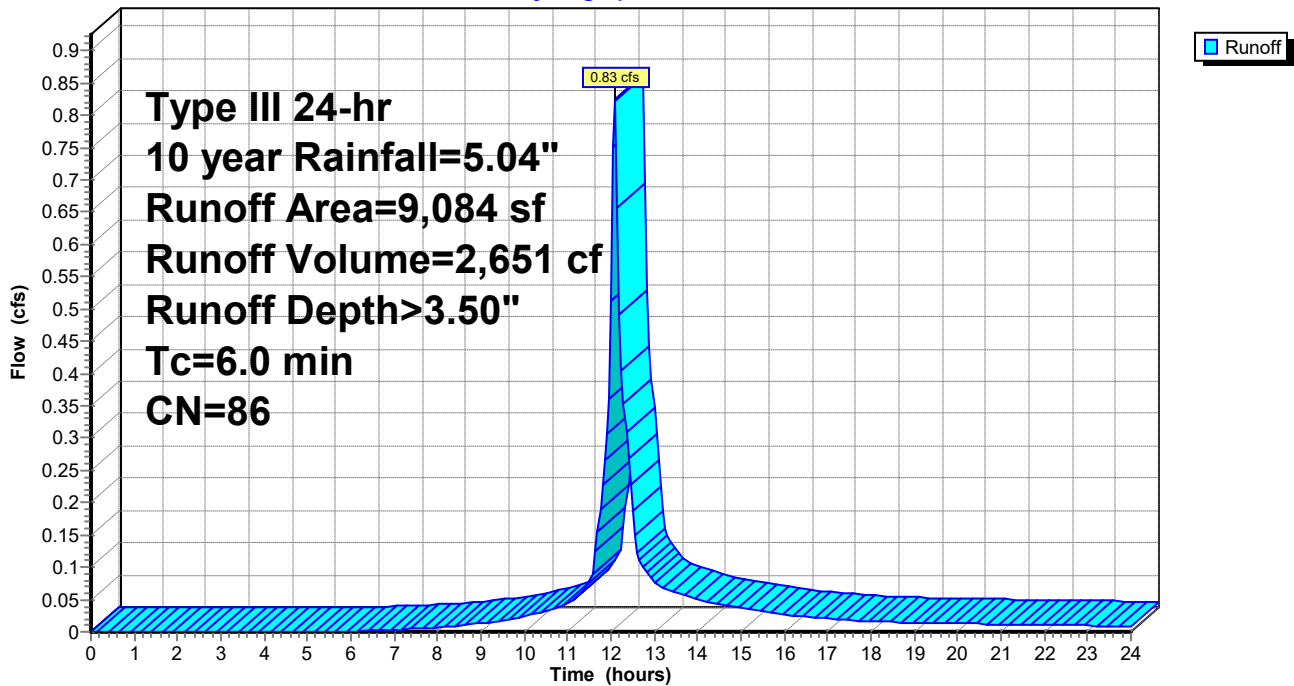
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
4,441	74	>75% Grass cover, Good, HSG C
1,160	98	Water Surface, HSG C
3,483	98	Paved parking, HSG C
9,084	86	Weighted Average
4,441		48.89% Pervious Area
4,643		51.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW TO POND P2

Subcatchment P5: P5

Hydrograph



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Type III 24-hr 10 year Rainfall=5.04"

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Summary for Subcatchment P6: P6

Runoff = 2.66 cfs @ 12.11 hrs, Volume= 8,709 cf, Depth> 2.57"

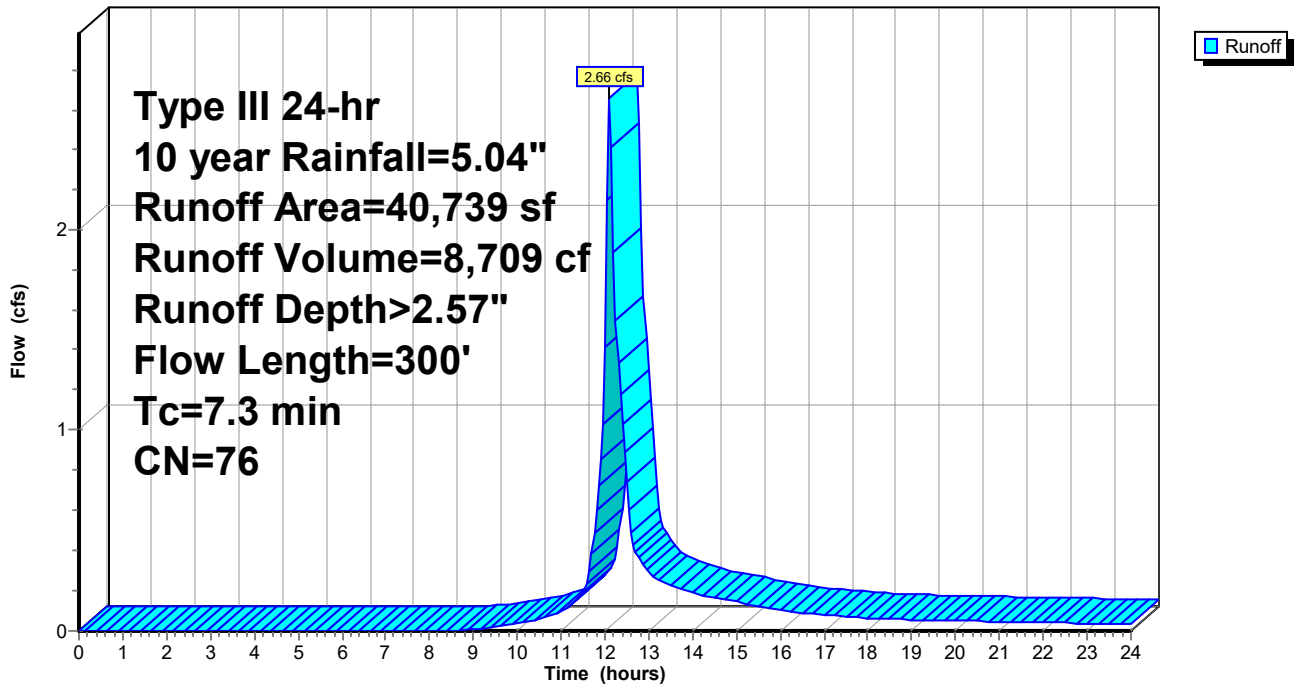
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
33,917	74	>75% Grass cover, Good, HSG C
6,822	83	Woods, Poor, HSG D
40,739	76	Weighted Average
40,739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	50	0.0500	0.21		Sheet Flow, flow over grass Grass: Short n= 0.150 P2= 3.18"
0.3	40	0.1000	2.21		Shallow Concentrated Flow, FLOW OVER GRASS Short Grass Pasture Kv= 7.0 fps
3.1	210	0.0500	1.12		Shallow Concentrated Flow, FLOW THROUGH WOODS Woodland Kv= 5.0 fps
7.3	300	Total			

Subcatchment P6: P6

Hydrograph



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Type III 24-hr 10 year Rainfall=5.04"

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Summary for Subcatchment P7: FLOW TO POND 3

Runoff = 0.82 cfs @ 12.20 hrs, Volume= 3,308 cf, Depth> 2.74"

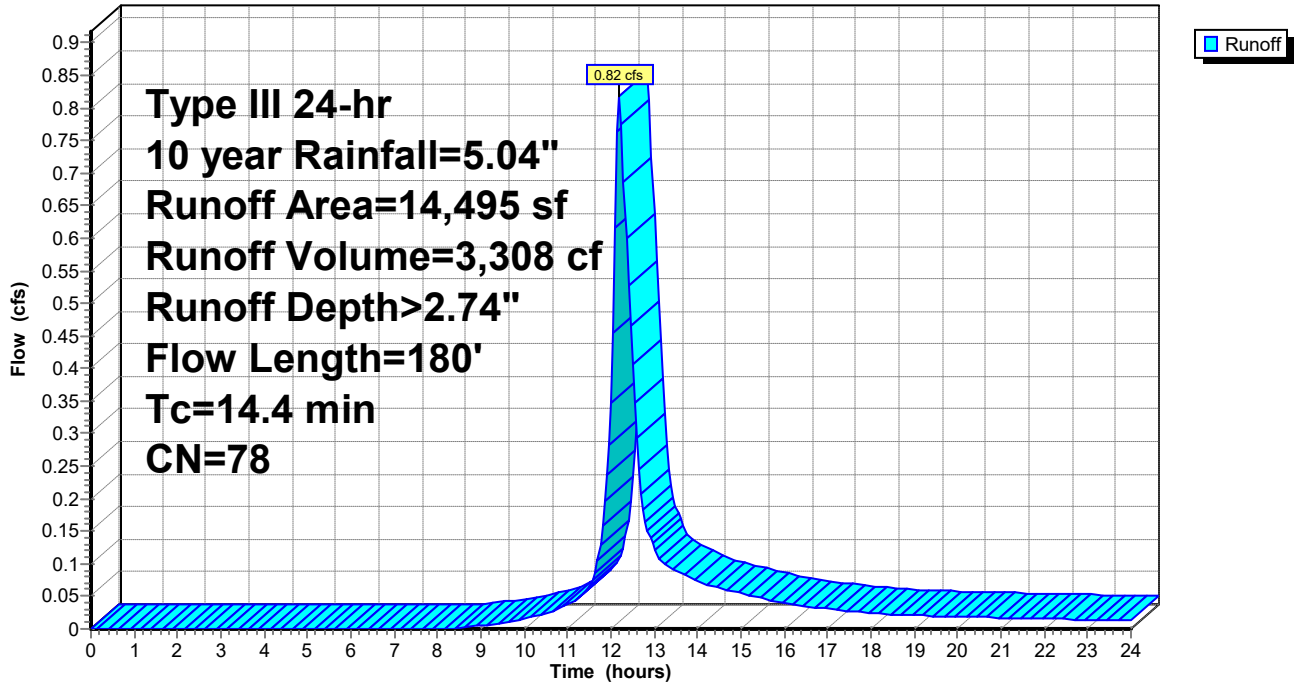
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
12,050	74	>75% Grass cover, Good, HSG C
1,096	98	Paved parking, HSG C
1,349	98	Water Surface, HSG C
14,495	78	Weighted Average
12,050		83.13% Pervious Area
2,445		16.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		Sheet Flow, FLOW IN WOODS
					Woods: Light underbrush n= 0.400 P2= 3.18"
2.0	130	0.0460	1.07		Shallow Concentrated Flow, FLOW THROUGH WOODS
					Woodland Kv= 5.0 fps
14.4	180	Total			

Subcatchment P7: FLOW TO POND 3

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Summary for Subcatchment P8: AREA AROUND POND 1

Runoff = 0.63 cfs @ 12.09 hrs, Volume= 2,032 cf, Depth> 3.70"

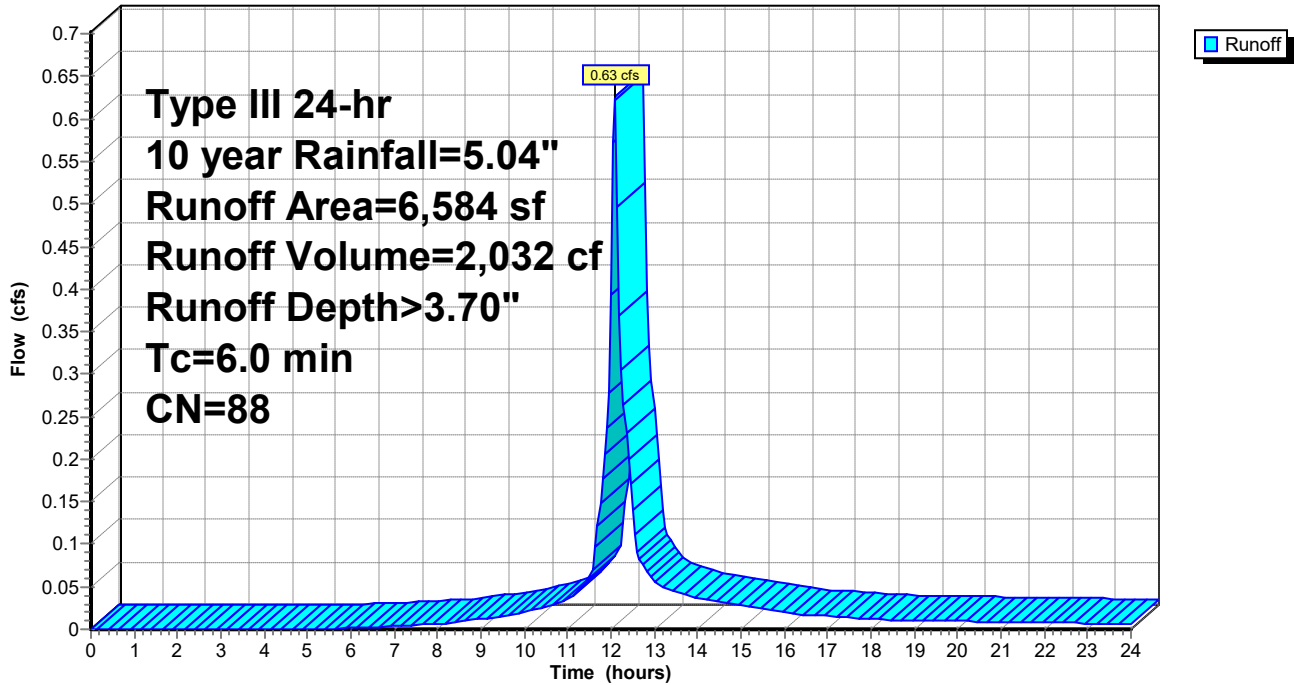
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
2,650	74	>75% Grass cover, Good, HSG C
3,934	98	Water Surface, HSG C
6,584	88	Weighted Average
2,650		40.25% Pervious Area
3,934		59.75% Impervious Area

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

Subcatchment P8: AREA AROUND POND 1

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Summary for Subcatchment P9: (new Subcat)

Runoff = 3.16 cfs @ 12.19 hrs, Volume= 12,400 cf, Depth> 2.56"

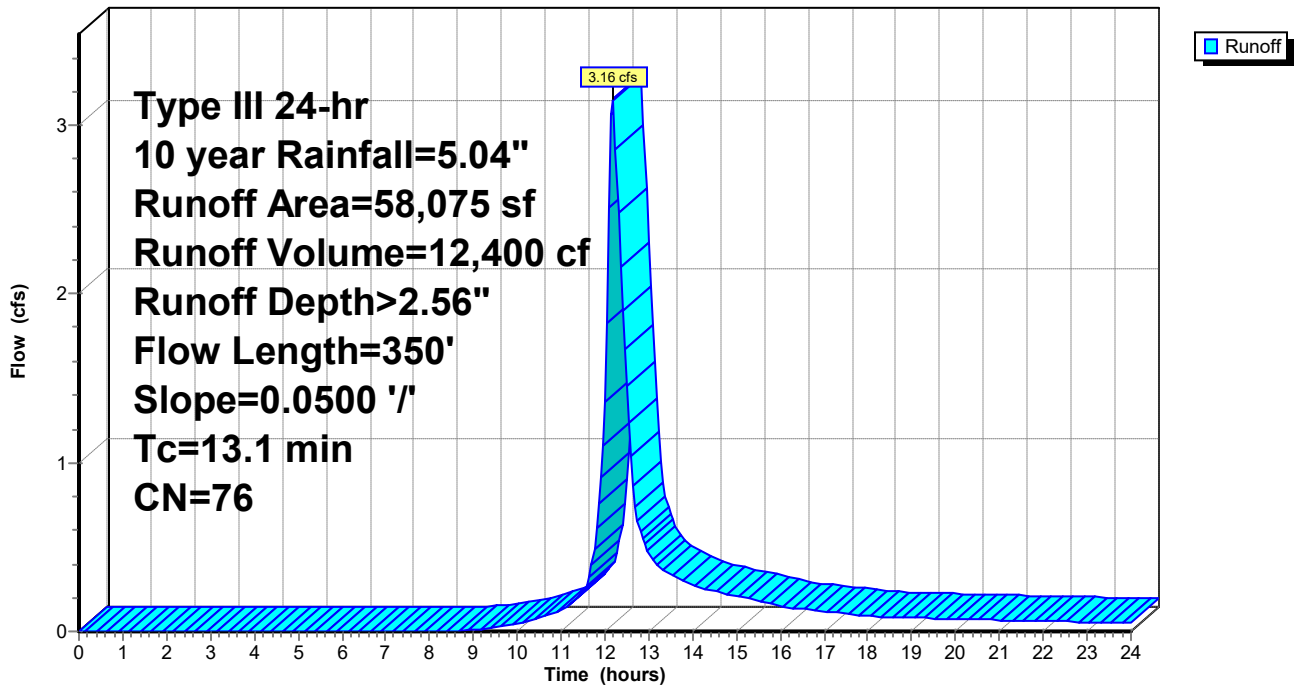
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
23,170	74	>75% Grass cover, Good, HSG C
24,263	70	Woods, Good, HSG C
10,642	94	Fallow, bare soil, HSG D
58,075	76	Weighted Average
58,075		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	50	0.0500	0.10		Sheet Flow, FLOW THROUGH WOODS Woods: Light underbrush n= 0.400 P2= 3.18"
4.5	300	0.0500	1.12		Shallow Concentrated Flow, FLOW THROUGH WOODS Woodland Kv= 5.0 fps
13.1	350	Total			

Subcatchment P9: (new Subcat)

Hydrograph



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Summary for Subcatchment R1: IOT 1 ROOF

Runoff = 0.22 cfs @ 12.09 hrs, Volume= 786 cf, Depth> 4.80"

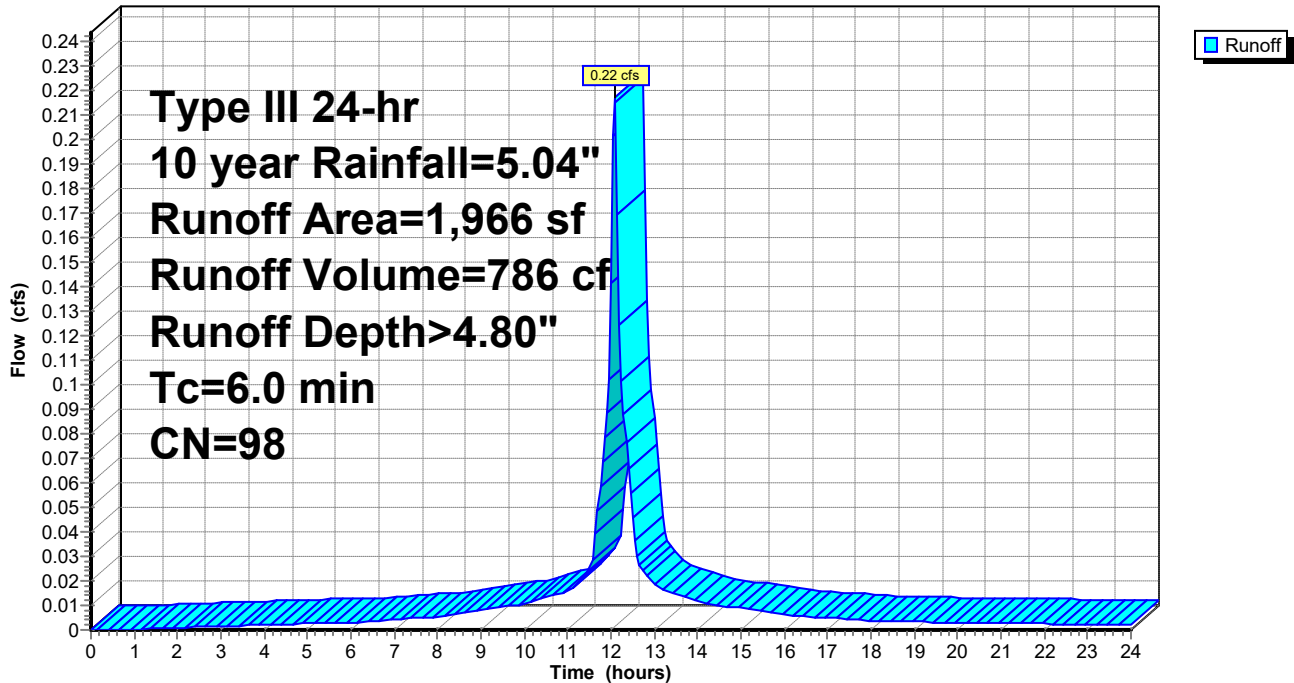
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
1,966	98	Roofs, HSG C
1,966		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW FROM ROOF TO POND

Subcatchment R1: IOT 1 ROOF

Hydrograph



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Summary for Subcatchment R2: LOT 2 ROOF

Runoff = 0.25 cfs @ 12.09 hrs, Volume= 902 cf, Depth> 4.80"

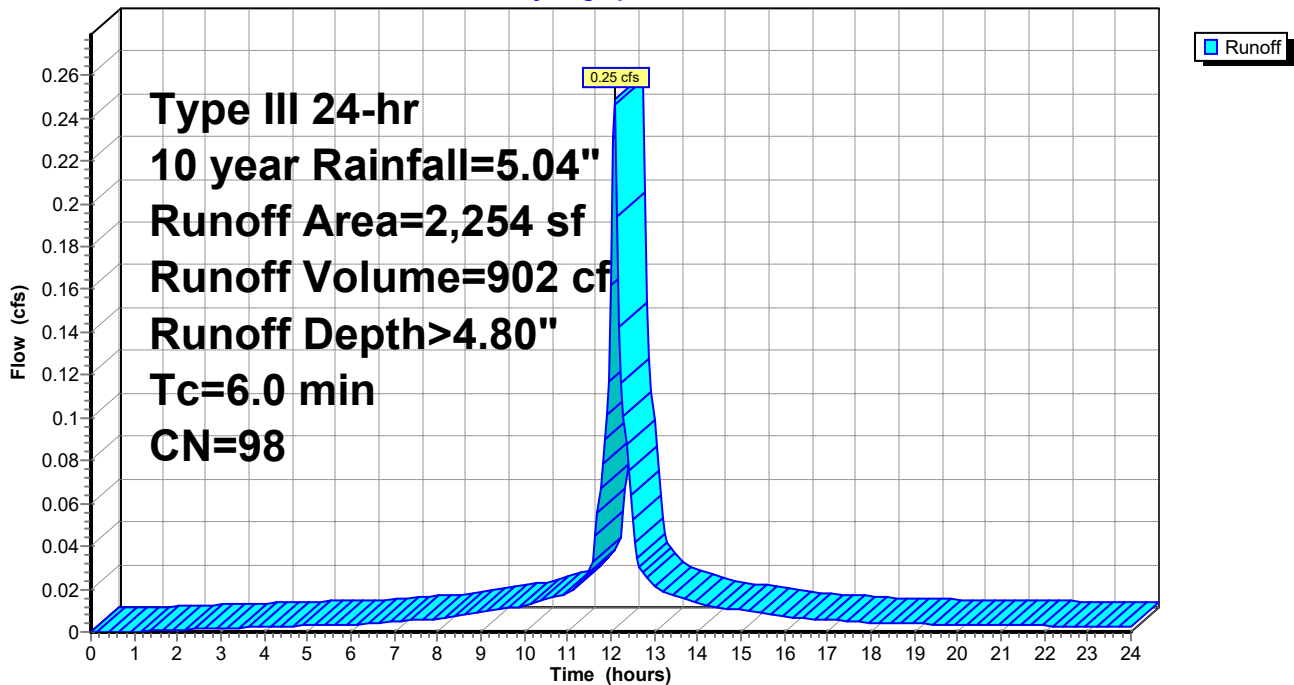
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW IN GUTTERS AND PIPES TO POND 3

Subcatchment R2: LOT 2 ROOF

Hydrograph



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Type III 24-hr 10 year Rainfall=5.04"

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Summary for Subcatchment R3: (new Subcat)

Runoff = 0.25 cfs @ 12.09 hrs, Volume= 902 cf, Depth> 4.80"

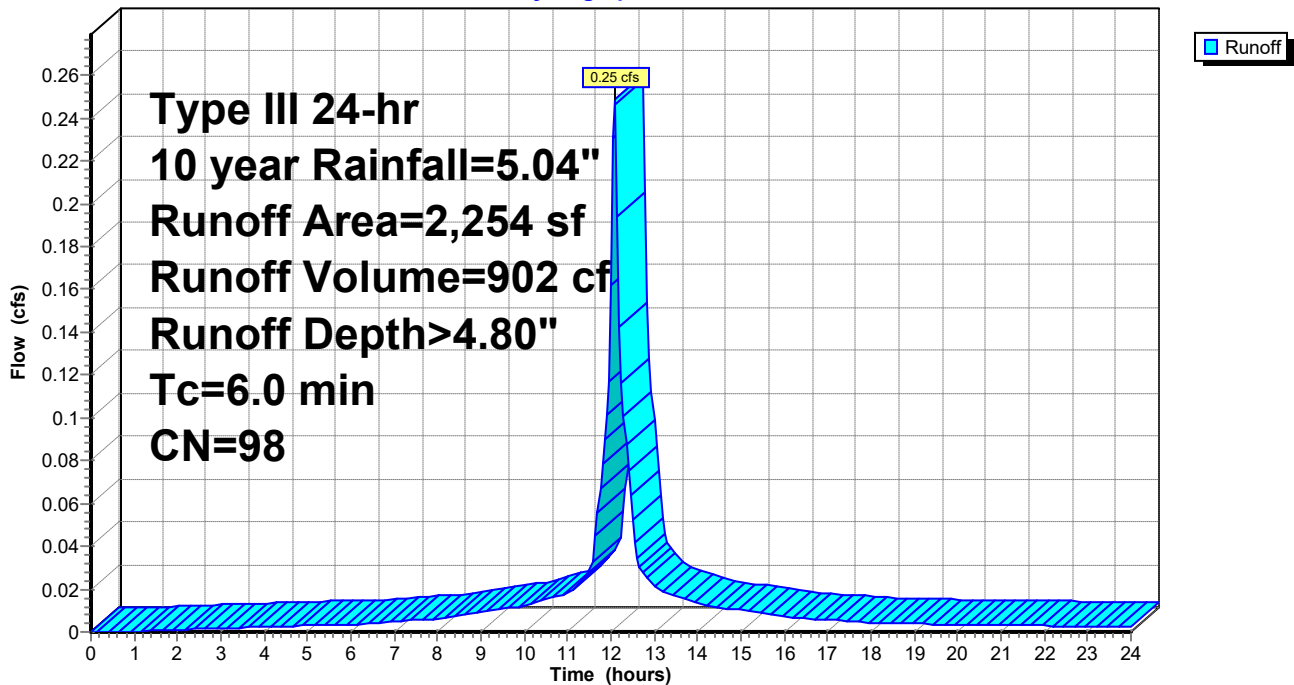
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.04"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW THROUGH GUTTERS TO POND

Subcatchment R3: (new Subcat)

Hydrograph



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Summary for Reach 1R: CULVERT UNDER DRIVE

Inflow Area = 51,789 sf, 12.76% Impervious, Inflow Depth > 2.43" for 10 year event
Inflow = 3.59 cfs @ 12.11 hrs, Volume= 10,489 cf
Outflow = 3.59 cfs @ 12.11 hrs, Volume= 10,489 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.59 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 1.96 fps, Avg. Travel Time= 0.2 min

Peak Storage= 13 cf @ 12.11 hrs

Average Depth at Peak Storage= 0.43'

Bank-Full Depth= 1.00' Flow Area= 1.6 sf, Capacity= 9.45 cfs

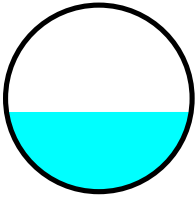
A factor of 2.00 has been applied to the storage and discharge capacity

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

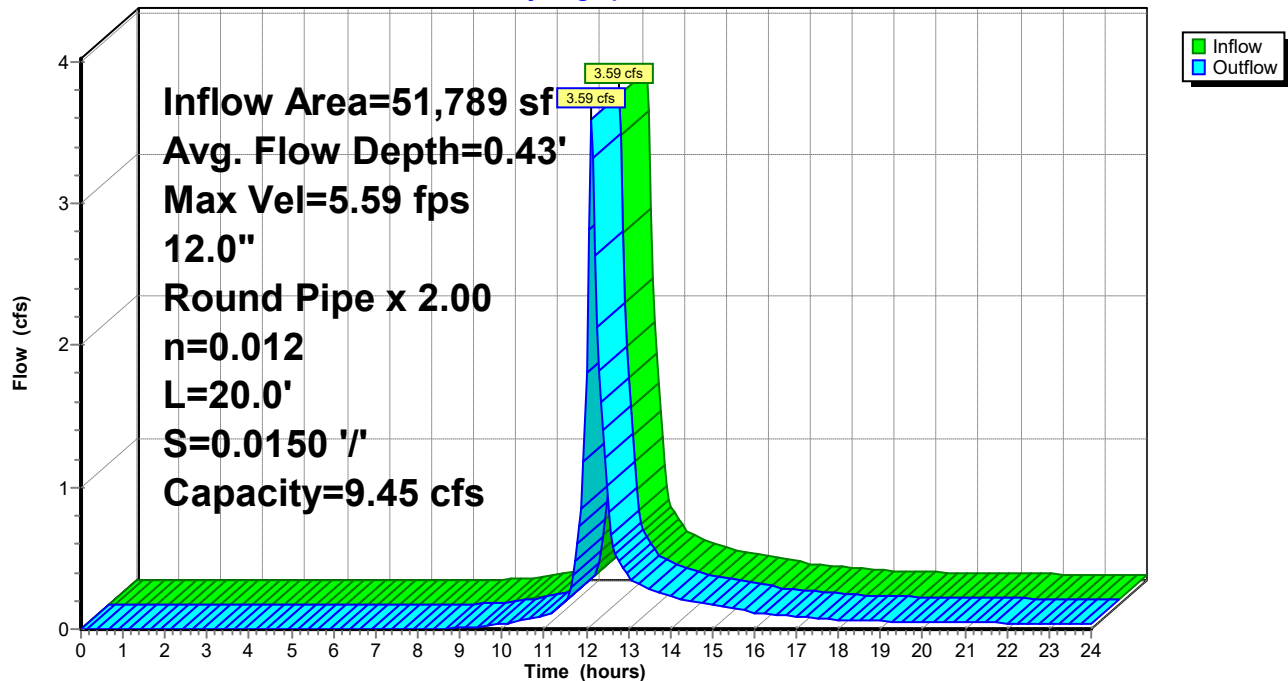
Length= 20.0' Slope= 0.0150 '/'

Inlet Invert= 259.80', Outlet Invert= 259.50'



Reach 1R: CULVERT UNDER DRIVE

Hydrograph



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Summary for Pond 1P: POND 1

Inflow Area = 40,965 sf, 56.43% Impervious, Inflow Depth > 3.71" for 10 year event
 Inflow = 3.83 cfs @ 12.09 hrs, Volume= 12,681 cf
 Outflow = 1.02 cfs @ 12.46 hrs, Volume= 10,939 cf, Atten= 74%, Lag= 22.3 min
 Discarded = 0.09 cfs @ 12.46 hrs, Volume= 4,190 cf
 Primary = 0.93 cfs @ 12.46 hrs, Volume= 6,749 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 261.89' @ 12.46 hrs Surf.Area= 3,718 sf Storage= 5,464 cf
 Flood Elev= 263.00' Surf.Area= 4,790 sf Storage= 10,193 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 93.6 min (883.6 - 790.0)

Volume	Invert	Avail.Storage	Storage Description			
#1	260.00'	10,193 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
260.00	2,125	260.0	0	0	2,125	
261.00	2,940	282.0	2,521	2,521	3,112	
262.00	3,825	308.0	3,373	5,894	4,368	
263.00	4,790	332.0	4,298	10,193	5,631	

Device	Routing	Invert	Outlet Devices	
#1	Primary	259.00'	12.0" Round Culvert L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.00' / 258.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf	
#2	Device 1	260.75'	4.0" Vert. Orifice/Grate C= 0.600	
#3	Device 1	261.75'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads	
#4	Discarded	260.00'	1.020 in/hr Exfiltration over Surface area	
#5	Primary	262.40'	5.0' long x 8.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74	

Discarded OutFlow Max=0.09 cfs @ 12.46 hrs HW=261.88' (Free Discharge)

↑4=Exfiltration (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.92 cfs @ 12.46 hrs HW=261.88' TW=0.00' (Dynamic Tailwater)

↑1=Culvert (Passes 0.92 cfs of 5.84 cfs potential flow)
 ↑2=Orifice/Grate (Orifice Controls 0.41 cfs @ 4.74 fps)
 ↑3=Orifice/Grate (Weir Controls 0.51 cfs @ 1.20 fps)
 ↑5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

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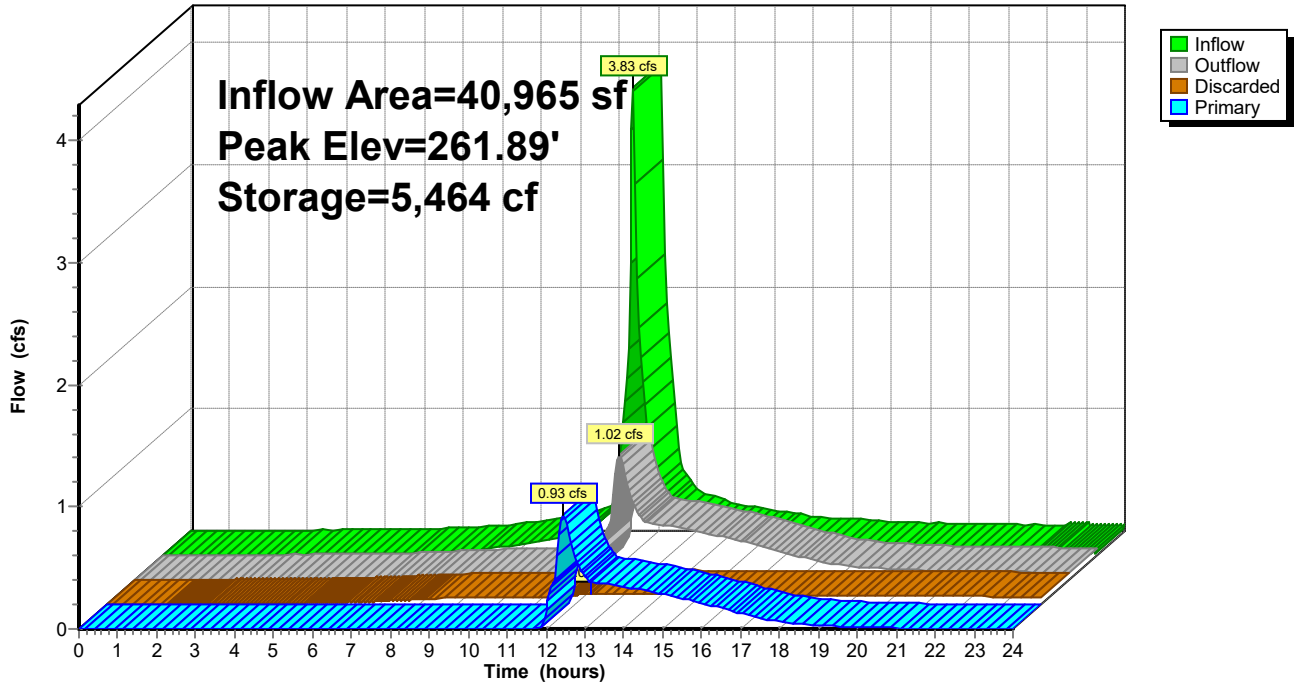
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Type III 24-hr 10 year Rainfall=5.04"

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Pond 1P: POND 1

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Summary for Pond 2P: POND P2

Inflow Area = 11,050 sf, 59.81% Impervious, Inflow Depth > 3.73" for 10 year event
 Inflow = 1.04 cfs @ 12.09 hrs, Volume= 3,437 cf
 Outflow = 0.97 cfs @ 12.12 hrs, Volume= 3,001 cf, Atten= 7%, Lag= 2.1 min
 Discarded = 0.02 cfs @ 12.12 hrs, Volume= 1,221 cf
 Primary = 0.94 cfs @ 12.12 hrs, Volume= 1,780 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 261.94' @ 12.12 hrs Surf.Area= 973 sf Storage= 738 cf
 Flood Elev= 263.00' Surf.Area= 1,440 sf Storage= 2,014 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 46.9 min (837.7 - 790.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	261.00'	2,014 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
261.00	616	112.0	0	0	616	
262.00	1,000	139.0	800	800	1,170	
263.00	1,440	158.0	1,213	2,014	1,643	

Device	Routing	Invert	Outlet Devices												
#1	Discarded	261.00'	1.020 in/hr Exfiltration over Surface area												
#2	Primary	261.75'	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir												
			Head (feet)	0.20	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.00		
				2.50	3.00	3.50	4.00	4.50	5.00	5.50					
			Coef. (English)	2.34	2.50	2.70	2.68	2.68	2.66	2.65	2.65	2.65			
				2.65	2.67	2.66	2.68	2.70	2.74	2.79	2.88				

Discarded OutFlow Max=0.02 cfs @ 12.12 hrs HW=261.93' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.91 cfs @ 12.12 hrs HW=261.93' TW=260.22' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 0.91 cfs @ 1.00 fps)

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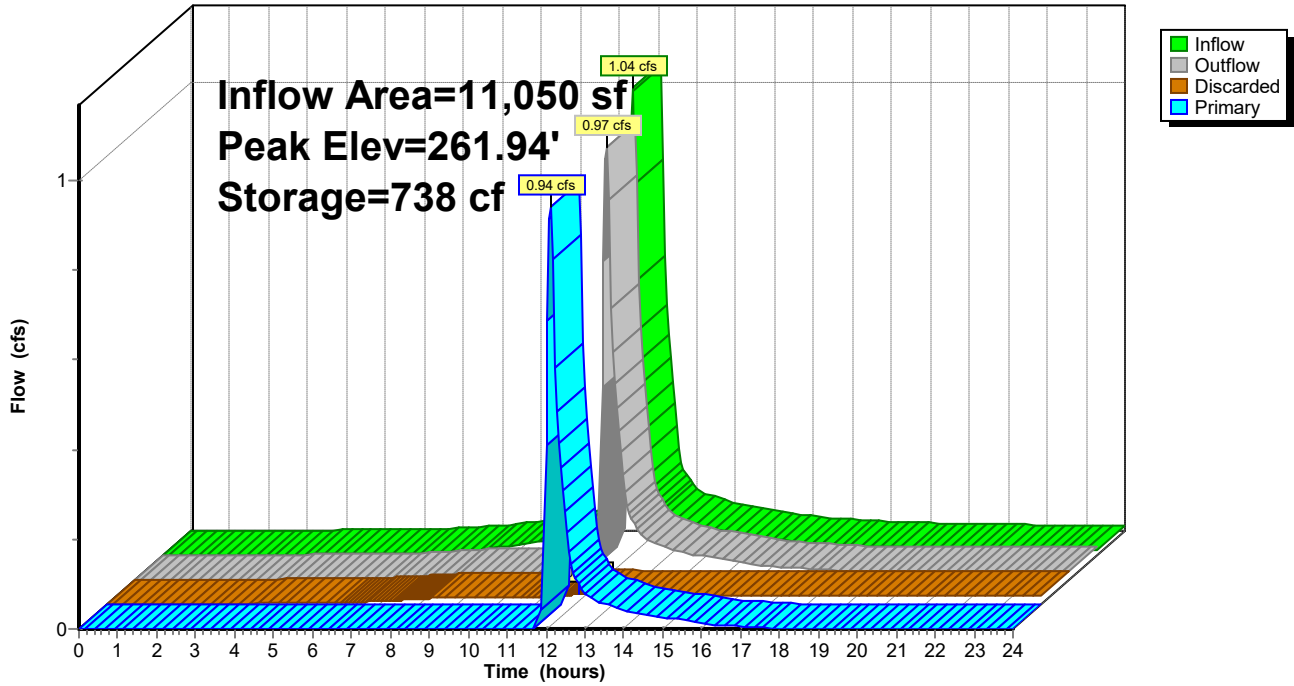
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Type III 24-hr 10 year Rainfall=5.04"

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Pond 2P: POND P2

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Summary for Pond 3P: POND 3

Inflow Area = 16,749 sf, 28.06% Impervious, Inflow Depth > 3.02" for 10 year event
 Inflow = 0.97 cfs @ 12.18 hrs, Volume= 4,209 cf
 Outflow = 0.45 cfs @ 12.50 hrs, Volume= 3,499 cf, Atten= 53%, Lag= 19.6 min
 Discarded = 0.03 cfs @ 12.50 hrs, Volume= 1,389 cf
 Primary = 0.42 cfs @ 12.50 hrs, Volume= 2,110 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 263.52' @ 12.50 hrs Surf.Area= 1,396 sf Storage= 1,425 cf
 Flood Elev= 265.00' Surf.Area= 2,460 sf Storage= 4,264 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 56.7 min (871.3 - 814.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	262.00'	4,264 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
262.00	541	176.0	0	0	541
264.00	1,745	219.0	2,172	2,172	1,949
265.00	2,460	250.0	2,092	4,264	3,130

Device	Routing	Invert	Outlet Devices	
#1	Primary	263.00'	12.0" Round Culvert L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 263.00' / 260.00' S= 0.1500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf	
#2	Discarded	262.00'	1.020 in/hr Exfiltration over Surface area	
#3	Device 1	263.00'	4.0" Vert. Orifice/Grate C= 0.600	
#4	Device 1	262.50'	3.0" Vert. Orifice/Grate C= 0.600	
#5	Device 1	264.00'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads	

Discarded OutFlow Max=0.03 cfs @ 12.50 hrs HW=263.52' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.42 cfs @ 12.50 hrs HW=263.52' TW=0.00' (Dynamic Tailwater)
 ↳ **1=Culvert** (Passes 0.42 cfs of 1.02 cfs potential flow)
 ↳ **3=Orifice/Grate** (Orifice Controls 0.25 cfs @ 2.87 fps)
 ↳ **4=Orifice/Grate** (Orifice Controls 0.17 cfs @ 3.48 fps)
 ↳ **5=Orifice/Grate** (Controls 0.00 cfs)

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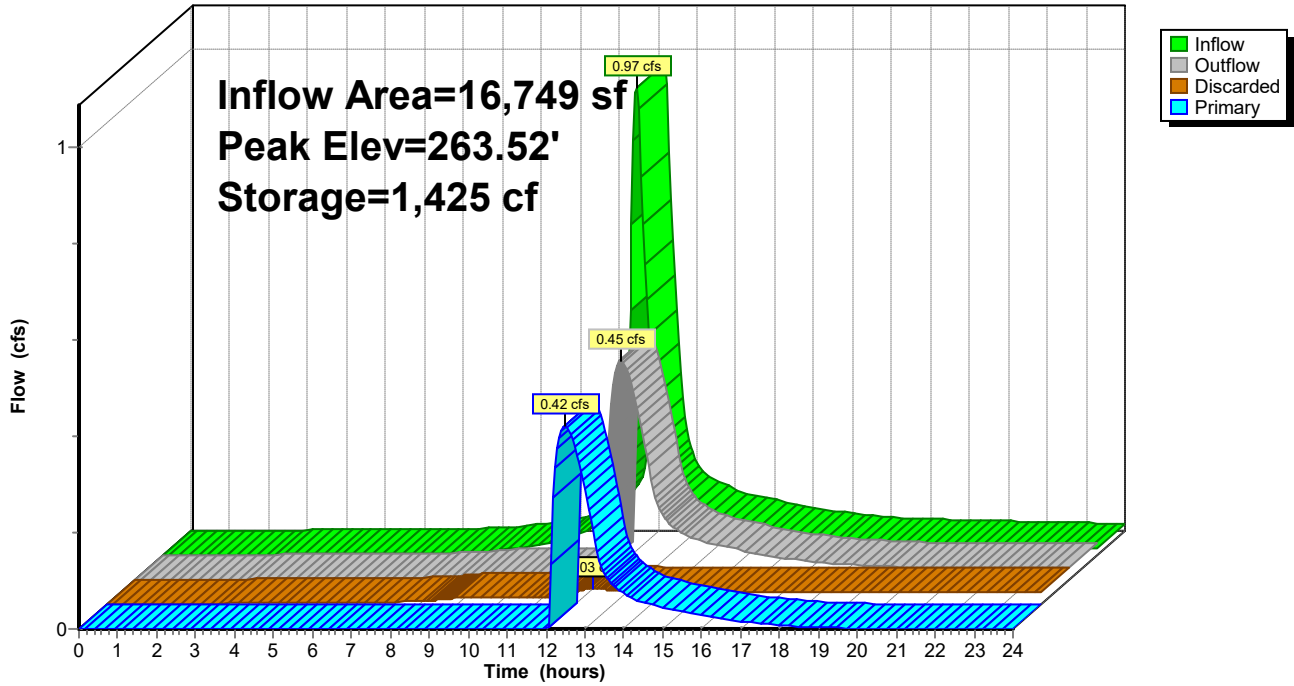
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Pond 3P: POND 3

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Summary for Pond CB1: (new Pond)

Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 3.40" for 10 year event
Inflow = 0.29 cfs @ 12.09 hrs, Volume= 932 cf
Outflow = 0.29 cfs @ 12.09 hrs, Volume= 932 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.09 hrs, Volume= 932 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.20' @ 12.09 hrs

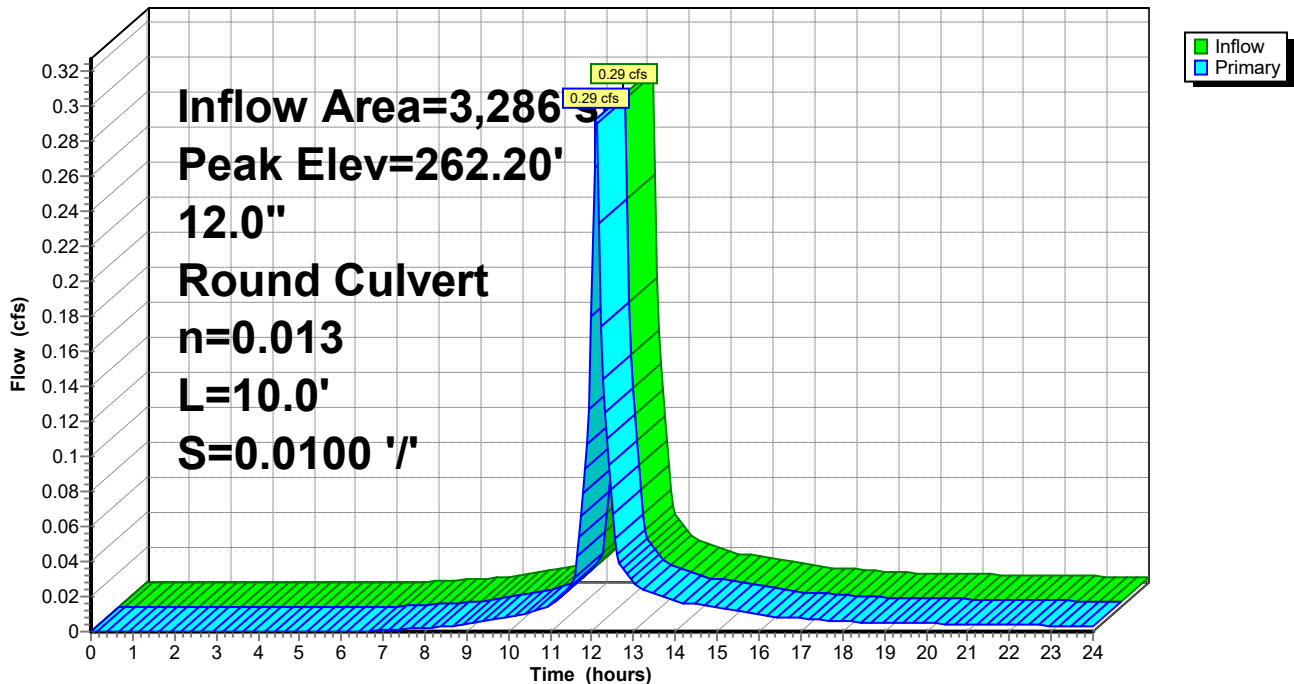
Flood Elev= 264.40'

Device #	Routing	Invert	Outlet Devices
#1	Primary	261.90'	12.0" Round Culvert L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.28 cfs @ 12.09 hrs HW=262.19' TW=262.02' (Dynamic Tailwater)
↑1=Culvert (Outlet Controls 0.28 cfs @ 2.20 fps)

Pond CB1: (new Pond)

Hydrograph



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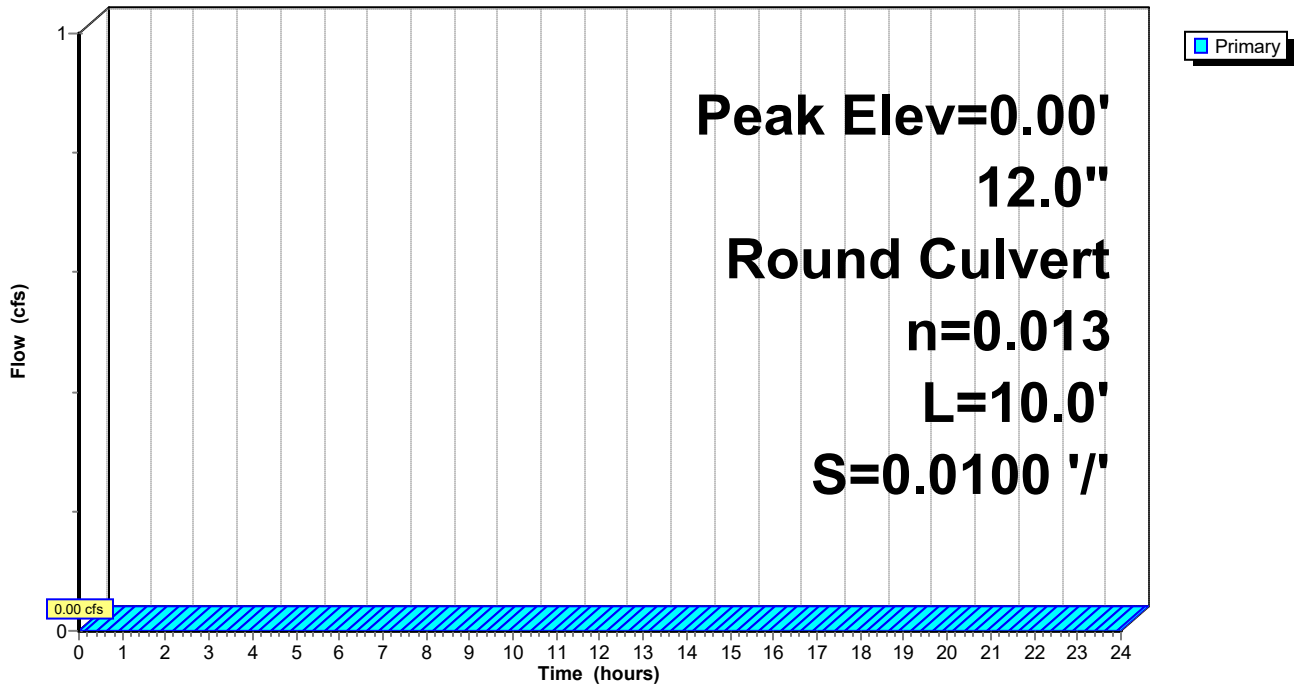
Summary for Pond CB2: CB2

Device	Routing	Invert	Outlet Devices
#1	Primary	261.90'	12.0" Round Culvert L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=261.70' (Dynamic Tailwater)
↑1=Culvert (Controls 0.00 cfs)

Pond CB2: CB2

Hydrograph



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Summary for Pond CB3: (new Pond)

Inflow Area = 5,280 sf, 100.00% Impervious, Inflow Depth > 4.80" for 10 year event
 Inflow = 0.58 cfs @ 12.09 hrs, Volume= 2,112 cf
 Outflow = 0.58 cfs @ 12.09 hrs, Volume= 2,112 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.58 cfs @ 12.09 hrs, Volume= 2,112 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 261.90' @ 12.53 hrs

Flood Elev= 263.50'

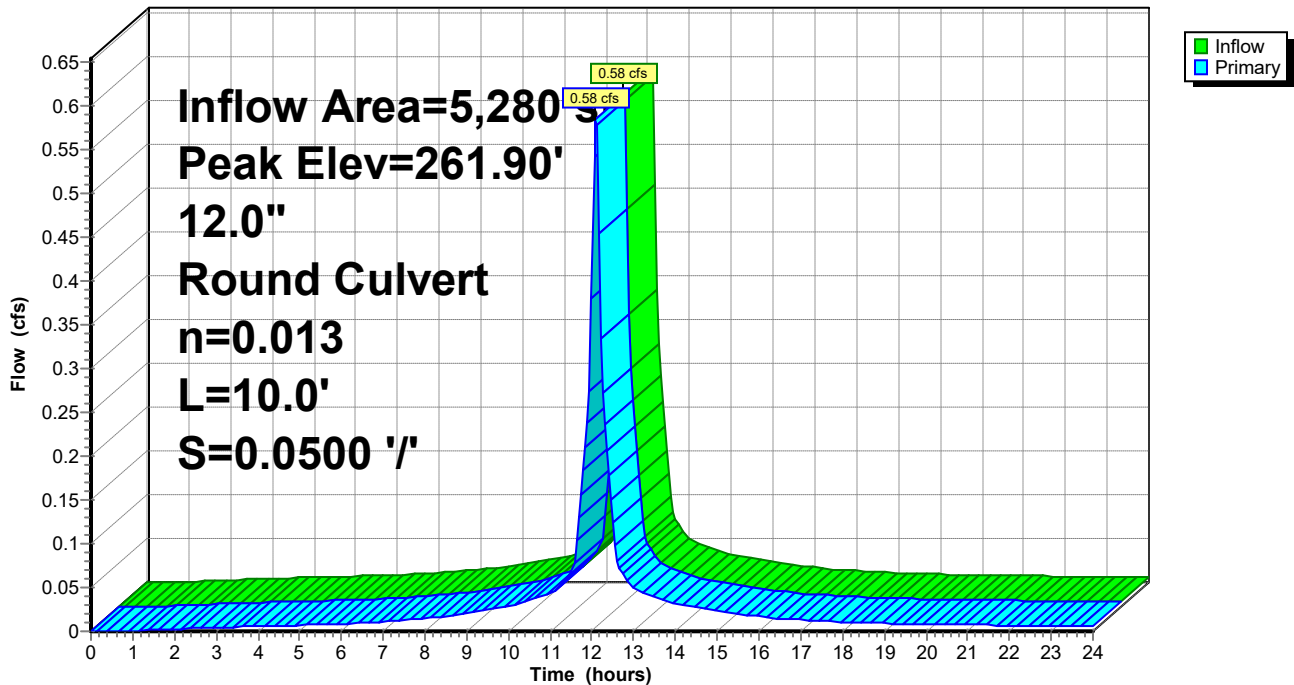
Device #	Routing	Invert	Outlet Devices
#1	Primary	260.50'	12.0" Round Culvert L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=261.28' TW=261.45' (Dynamic Tailwater)

↑1=Culvert (Controls 0.00 cfs)

Pond CB3: (new Pond)

Hydrograph



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Summary for Pond CB4: CB4

Inflow Area = 11,827 sf, 59.86% Impervious, Inflow Depth > 3.81" for 10 year event
Inflow = 1.15 cfs @ 12.09 hrs, Volume= 3,753 cf
Outflow = 1.15 cfs @ 12.09 hrs, Volume= 3,753 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.15 cfs @ 12.09 hrs, Volume= 3,753 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 261.90' @ 12.52 hrs

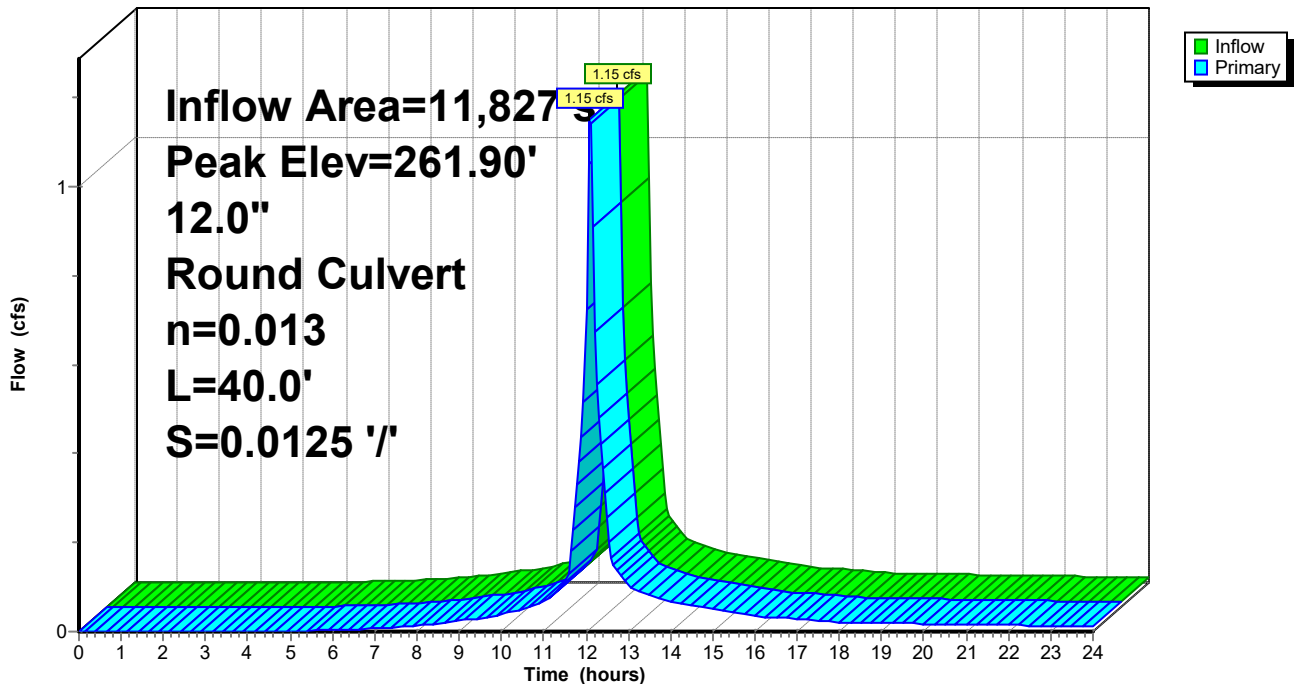
Flood Elev= 263.50'

Device #	Routing	Invert	Outlet Devices
1	Primary	260.50'	12.0" Round Culvert L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=261.41' TW=261.46' (Dynamic Tailwater)
↑1=Culvert (Controls 0.00 cfs)

Pond CB4: CB4

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Type III 24-hr 10 year Rainfall=5.04"

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Summary for Pond MH1: MH1

Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 3.40" for 10 year event
 Inflow = 0.29 cfs @ 12.09 hrs, Volume= 932 cf
 Outflow = 0.29 cfs @ 12.09 hrs, Volume= 932 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.29 cfs @ 12.09 hrs, Volume= 932 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.03' @ 12.11 hrs

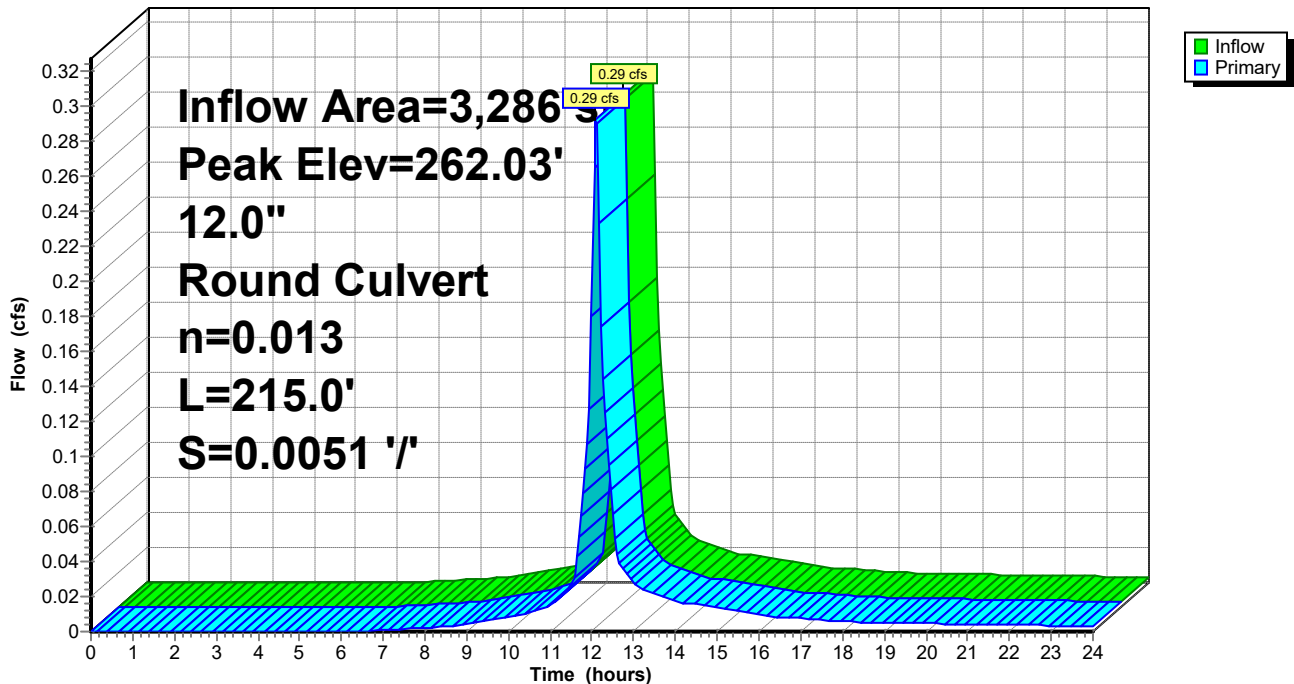
Flood Elev= 265.00'

Device #	Routing	Invert	Outlet Devices
#1	Primary	261.70'	12.0" Round Culvert L= 215.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.70' / 260.60' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.25 cfs @ 12.09 hrs HW=262.02' TW=261.30' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 0.25 cfs @ 1.73 fps)

Pond MH1: MH1

Hydrograph



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Summary for Pond MH2: MH2

Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 3.40" for 10 year event
Inflow = 0.29 cfs @ 12.09 hrs, Volume= 932 cf
Outflow = 0.29 cfs @ 12.09 hrs, Volume= 932 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.09 hrs, Volume= 932 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 261.90' @ 12.53 hrs

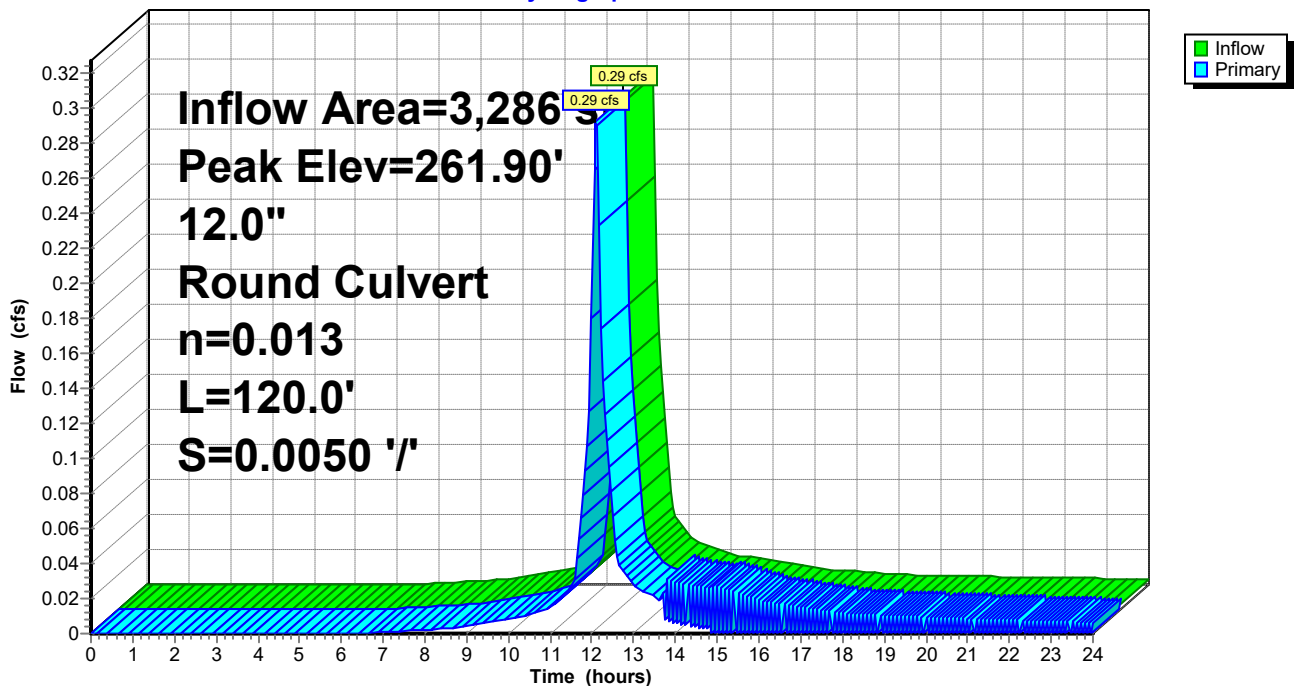
Flood Elev= 269.75'

Device #	Routing	Invert	Outlet Devices
#1	Primary	260.60'	12.0" Round Culvert L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.60' / 260.00' S= 0.0050 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=261.30' TW=261.47' (Dynamic Tailwater)
↑1=Culvert (Controls 0.00 cfs)

Pond MH2: MH2

Hydrograph



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Type III 24-hr 10 year Rainfall=5.04"

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Summary for Pond MH3: DMH3

Inflow Area = 20,393 sf, 67.90% Impervious, Inflow Depth > 4.00" for 10 year event
 Inflow = 2.03 cfs @ 12.09 hrs, Volume= 6,796 cf
 Outflow = 2.03 cfs @ 12.09 hrs, Volume= 6,796 cf, Atten= 0%, Lag= 0.0 min
 Primary = 2.03 cfs @ 12.09 hrs, Volume= 6,796 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 261.90' @ 12.48 hrs

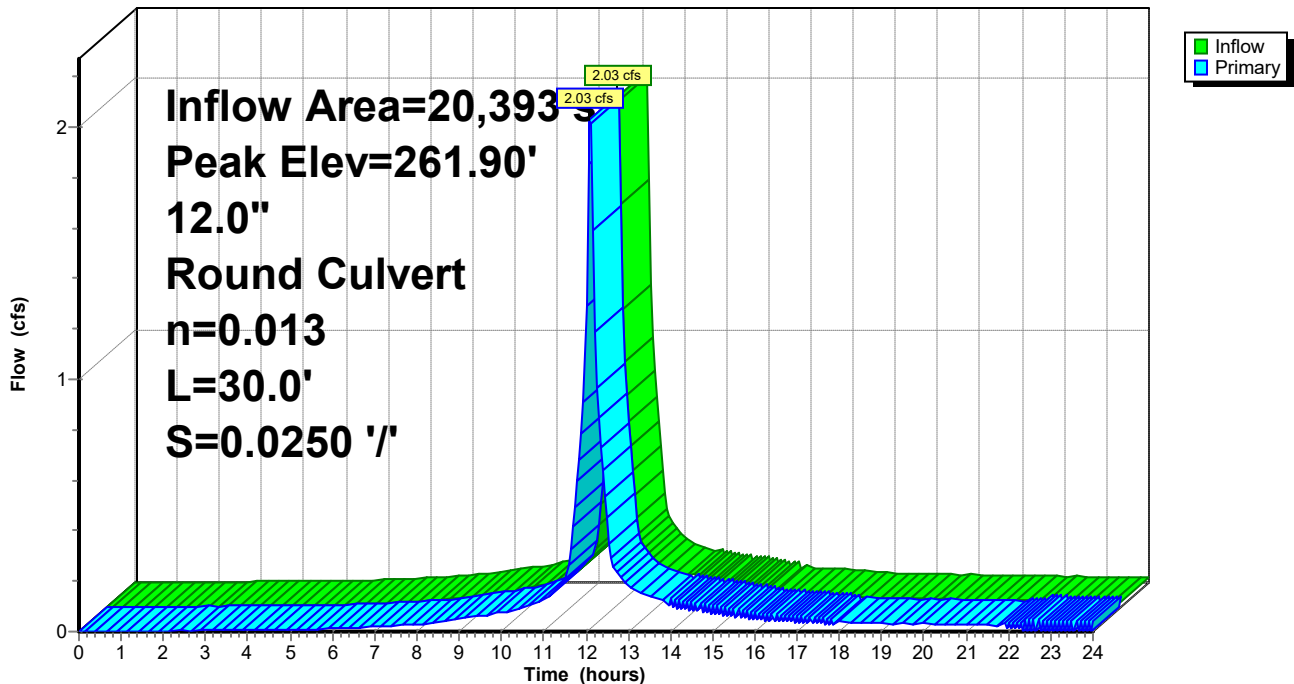
Flood Elev= 263.60'

Device #	Routing	Invert	Outlet Devices
#1	Primary	259.75'	12.0" Round Culvert L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.75' / 259.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.16 cfs @ 12.09 hrs HW=261.46' TW=261.36' (Dynamic Tailwater)
 ↑**1=Culvert** (Inlet Controls 1.16 cfs @ 1.48 fps)

Pond MH3: DMH3

Hydrograph



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Type III 24-hr 10 year Rainfall=5.04"

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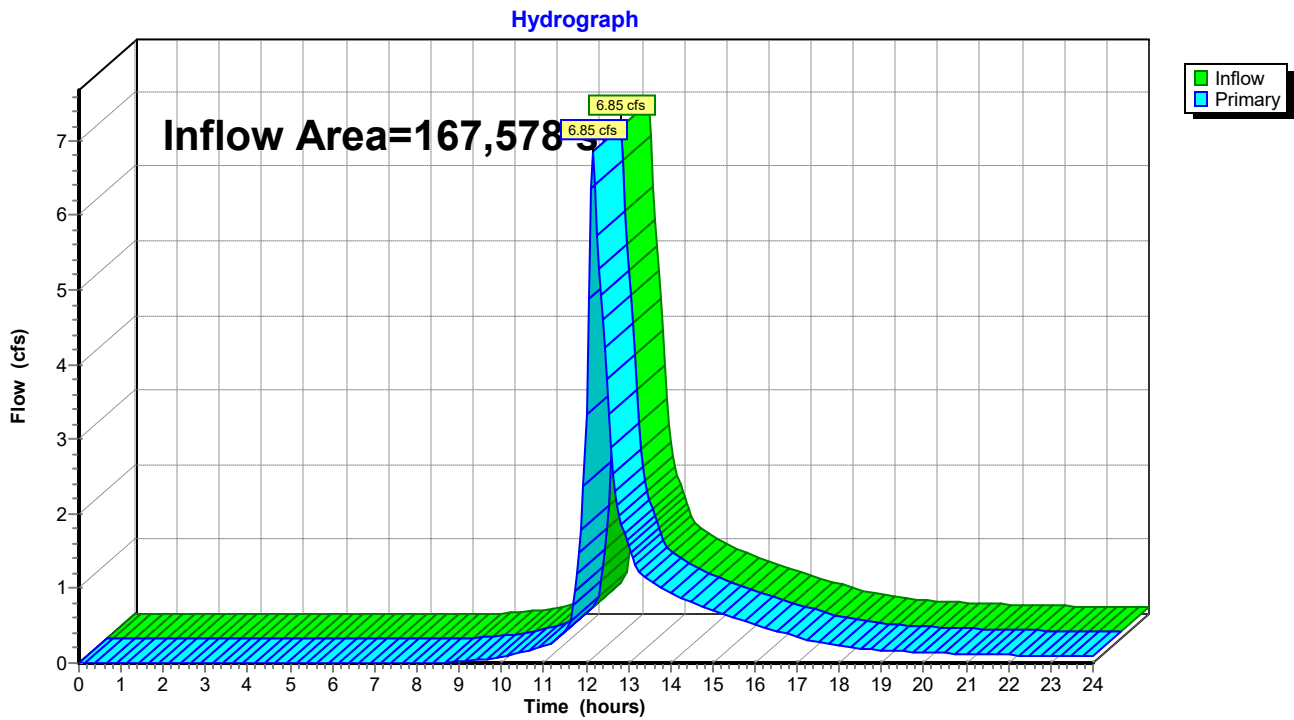
Summary for Pond SP1: SUM POND WOODS

DESIGN POINT AT REAR PROPERTY LINE

Inflow Area = 167,578 sf, 20.54% Impervious, Inflow Depth > 2.27" for 10 year event
Inflow = 6.85 cfs @ 12.15 hrs, Volume= 31,747 cf
Primary = 6.85 cfs @ 12.15 hrs, Volume= 31,747 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: SUM POND WOODS



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Type III 24-hr 10 year Rainfall=5.04"

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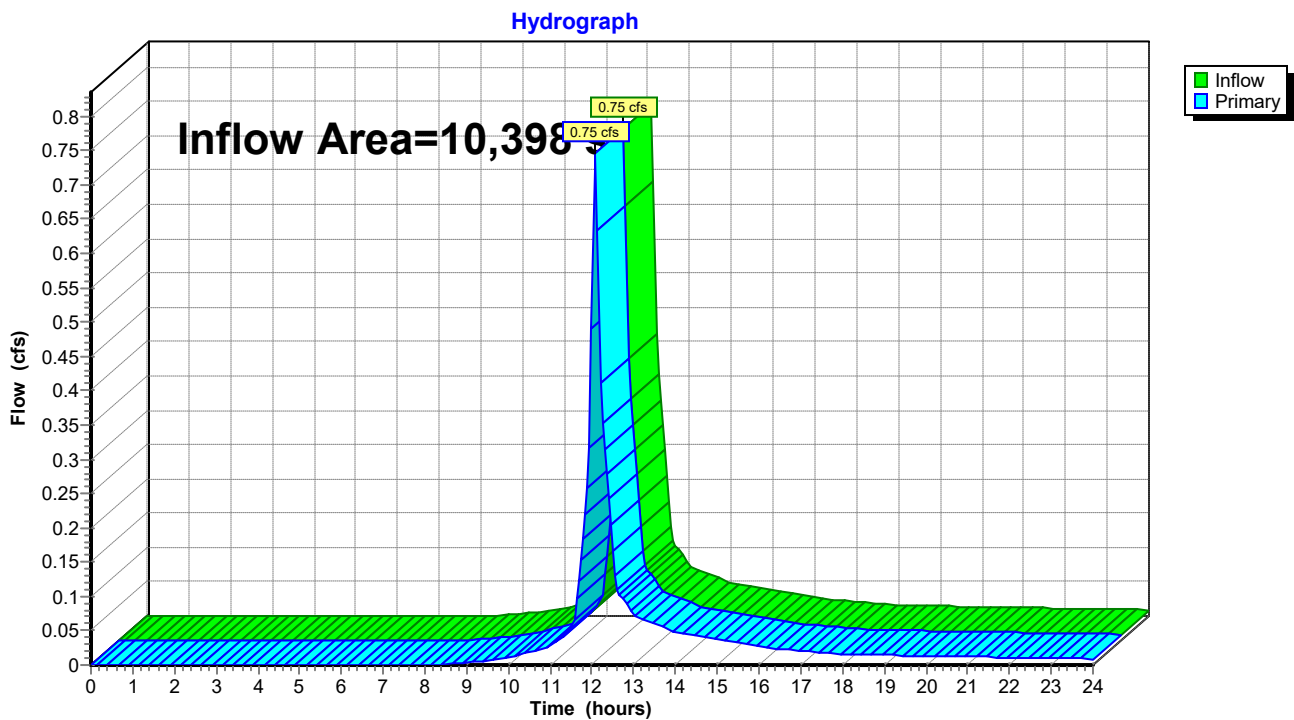
Summary for Pond SP2: SUM POND STREET

DESIGN POINT AT HIGHLAND ROAD

Inflow Area = 10,398 sf, 13.61% Impervious, Inflow Depth > 2.65" for 10 year event
Inflow = 0.75 cfs @ 12.08 hrs, Volume= 2,300 cf
Primary = 0.75 cfs @ 12.08 hrs, Volume= 2,300 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET





RANGER ENGINEERING GROUP, INC.

STORMWATER MANAGEMENT REPORT

POST-DEVELOPMENT DRAINAGE

25 YEAR STORM

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Type III 24-hr 25 year Rainfall=6.20"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1A: P1A	Runoff Area=3,286 sf 45.25% Impervious Runoff Depth>4.49" Tc=6.0 min CN=85 Runoff=0.38 cfs 1,229 cf
Subcatchment P1B: P1B	Runoff Area=1,506 sf 100.00% Impervious Runoff Depth>5.96" Tc=6.0 min CN=98 Runoff=0.21 cfs 748 cf
Subcatchment P2: P2	Runoff Area=10,398 sf 13.61% Impervious Runoff Depth>3.65" Flow Length=205' Tc=4.9 min CN=77 Runoff=1.03 cfs 3,164 cf
Subcatchment P3: (new Subcat)	Runoff Area=11,734 sf 26.27% Impervious Runoff Depth>4.06" Flow Length=250' Tc=6.2 min CN=81 Runoff=1.24 cfs 3,973 cf
Subcatchment P4A: FLOW TO CB3	Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>5.96" Tc=6.0 min CN=98 Runoff=0.72 cfs 2,622 cf
Subcatchment P4B: FLOW TO CB4	Runoff Area=11,827 sf 59.86% Impervious Runoff Depth>4.93" Tc=6.0 min CN=89 Runoff=1.47 cfs 4,855 cf
Subcatchment P5: P5	Runoff Area=9,084 sf 51.11% Impervious Runoff Depth>4.60" Tc=6.0 min CN=86 Runoff=1.07 cfs 3,479 cf
Subcatchment P6: P6	Runoff Area=40,739 sf 0.00% Impervious Runoff Depth>3.55" Flow Length=300' Tc=7.3 min CN=76 Runoff=3.68 cfs 12,049 cf
Subcatchment P7: FLOW TO POND 3	Runoff Area=14,495 sf 16.87% Impervious Runoff Depth>3.75" Flow Length=180' Tc=14.4 min CN=78 Runoff=1.12 cfs 4,526 cf
Subcatchment P8: AREA AROUND POND 1	Runoff Area=6,584 sf 59.75% Impervious Runoff Depth>4.82" Tc=6.0 min CN=88 Runoff=0.80 cfs 2,642 cf
Subcatchment P9: (new Subcat)	Runoff Area=58,075 sf 0.00% Impervious Runoff Depth>3.55" Flow Length=350' Slope=0.0500 '/' Tc=13.1 min CN=76 Runoff=4.38 cfs 17,157 cf
Subcatchment R1: IOT 1 ROOF	Runoff Area=1,966 sf 100.00% Impervious Runoff Depth>5.96" Tc=6.0 min CN=98 Runoff=0.27 cfs 976 cf
Subcatchment R2: LOT 2 ROOF	Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>5.96" Tc=6.0 min CN=98 Runoff=0.31 cfs 1,119 cf
Subcatchment R3: (new Subcat)	Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>5.96" Tc=6.0 min CN=98 Runoff=0.31 cfs 1,119 cf
Reach 1R: CULVERT UNDER DRIVE	Avg. Flow Depth=0.51' Max Vel=6.07 fps Inflow=4.91 cfs 14,715 cf 12.0" Round Pipe x 2.00 n=0.012 L=20.0' S=0.0150 '/' Capacity=9.45 cfs Outflow=4.91 cfs 14,714 cf
Pond 1P: POND 1	Peak Elev=262.06' Storage=6,114 cf Inflow=4.92 cfs 16,439 cf Discarded=0.09 cfs 4,450 cf Primary=2.20 cfs 10,108 cf Outflow=2.29 cfs 14,558 cf

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Type III 24-hr 25 year Rainfall=6.20"

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Pond 2P: POND P2 Peak Elev=261.97' Storage=773 cf Inflow=1.34 cfs 4,456 cf
Discarded=0.02 cfs 1,290 cf Primary=1.23 cfs 2,665 cf Outflow=1.26 cfs 3,956 cf

Pond 3P: POND 3 Peak Elev=263.83' Storage=1,885 cf Inflow=1.31 cfs 5,645 cf
Discarded=0.04 cfs 1,484 cf Primary=0.56 cfs 3,387 cf Outflow=0.60 cfs 4,871 cf

Pond CB1: (new Pond) Peak Elev=262.25' Inflow=0.38 cfs 1,229 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Outflow=0.38 cfs 1,229 cf

Pond CB2: CB2 Peak Elev=0.00'
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Primary=0.00 cfs 0 cf

Pond CB3: (new Pond) Peak Elev=262.15' Inflow=0.72 cfs 2,622 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0500 '/' Outflow=0.72 cfs 2,622 cf

Pond CB4: CB4 Peak Elev=262.16' Inflow=1.47 cfs 4,855 cf
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=1.47 cfs 4,855 cf

Pond MH1: MH1 Peak Elev=262.19' Inflow=0.38 cfs 1,229 cf
12.0" Round Culvert n=0.013 L=215.0' S=0.0051 '/' Outflow=0.38 cfs 1,229 cf

Pond MH2: MH2 Peak Elev=262.14' Inflow=0.38 cfs 1,229 cf
12.0" Round Culvert n=0.013 L=120.0' S=0.0050 '/' Outflow=0.38 cfs 1,229 cf

Pond MH3: DMH3 Peak Elev=262.14' Inflow=2.57 cfs 8,705 cf
12.0" Round Culvert n=0.013 L=30.0' S=0.0250 '/' Outflow=2.57 cfs 8,705 cf

Pond SP1: SUM POND WOODS Inflow=10.64 cfs 45,365 cf
Primary=10.64 cfs 45,365 cf

Pond SP2: SUM POND STREET Inflow=1.03 cfs 3,164 cf
Primary=1.03 cfs 3,164 cf

Total Runoff Area = 179,482 sf Runoff Volume = 59,658 cf Average Runoff Depth = 3.99"
79.19% Pervious = 142,136 sf 20.81% Impervious = 37,346 sf

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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Subcatchment P1A: P1A

Runoff = 0.38 cfs @ 12.09 hrs, Volume= 1,229 cf, Depth> 4.49"

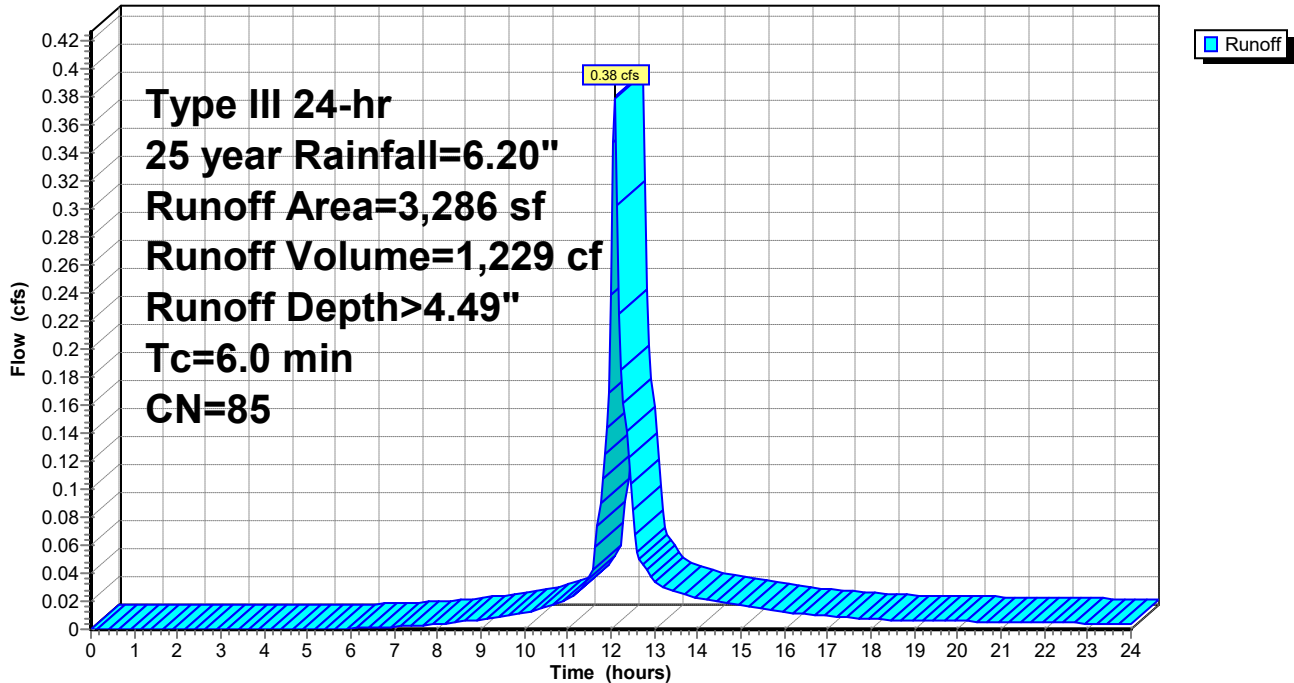
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
1,799	74	>75% Grass cover, Good, HSG C
1,487	98	Paved parking, HSG C
3,286	85	Weighted Average
1,799		54.75% Pervious Area
1,487		45.25% Impervious Area

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

Subcatchment P1A: P1A

Hydrograph



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Summary for Subcatchment P1B: P1B

Runoff = 0.21 cfs @ 12.09 hrs, Volume= 748 cf, Depth> 5.96"

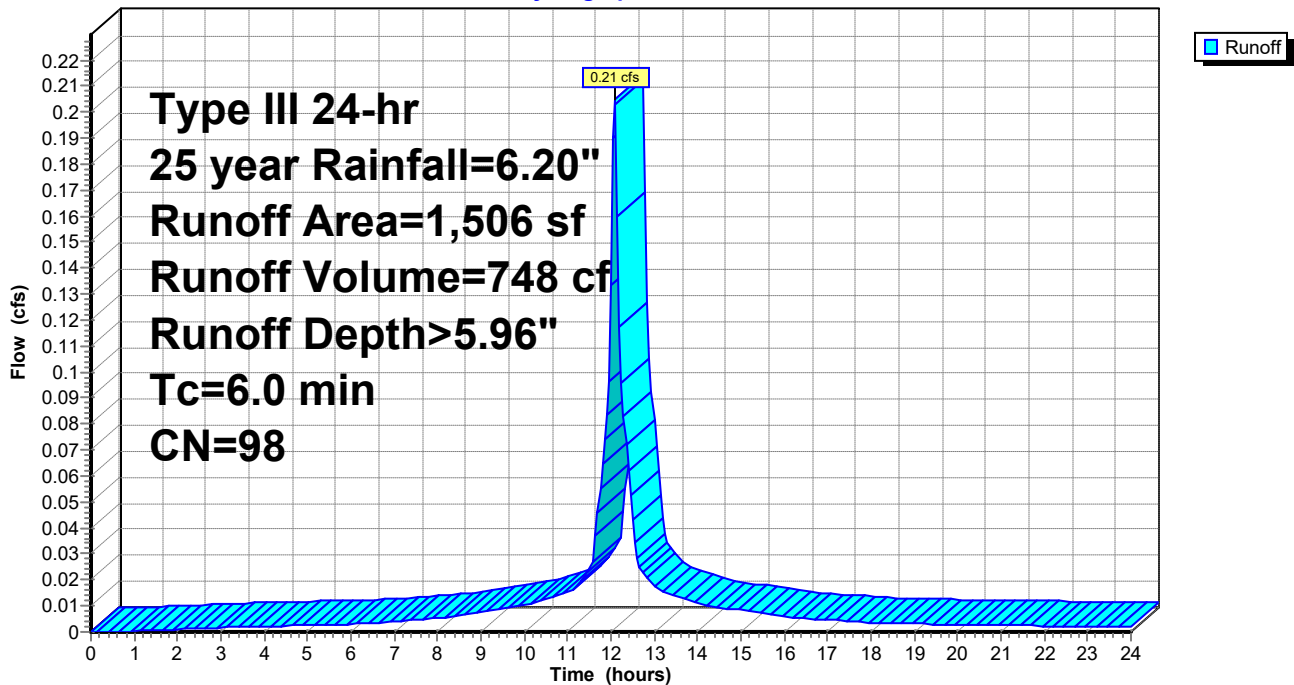
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
1,506	98	Paved parking, HSG C
1,506		100.00% Impervious Area

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

Subcatchment P1B: P1B

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Subcatchment P2: P2

Runoff = 1.03 cfs @ 12.07 hrs, Volume= 3,164 cf, Depth> 3.65"

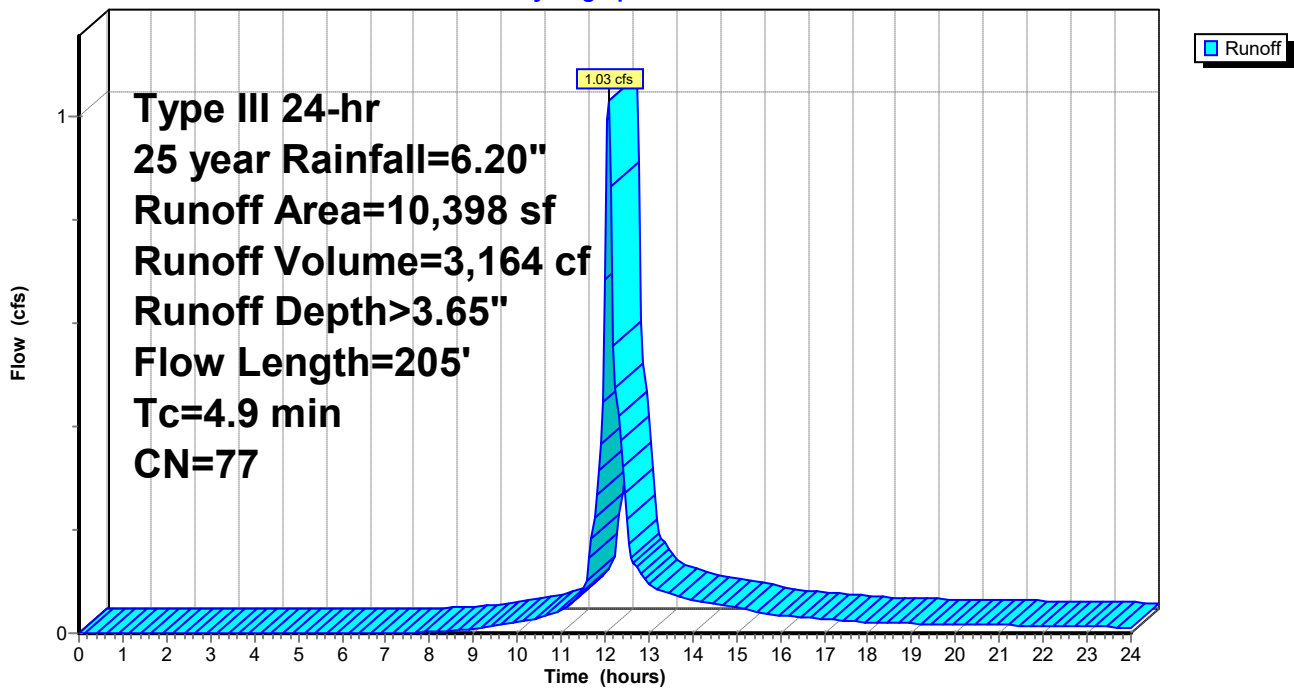
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
8,983	74	>75% Grass cover, Good, HSG C
10,398	77	Weighted Average
8,983		86.39% Pervious Area
1,415		13.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	50	0.0500	0.21		Sheet Flow, flow over grass Grass: Short n= 0.150 P2= 3.18"
0.4	35	0.0420	1.43		Shallow Concentrated Flow, flow over grass Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		Shallow Concentrated Flow, flow along driveway Paved Kv= 20.3 fps
4.9	205	Total			

Subcatchment P2: P2

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Subcatchment P3: (new Subcat)

Runoff = 1.24 cfs @ 12.09 hrs, Volume= 3,973 cf, Depth> 4.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
8,359	74	>75% Grass cover, Good, HSG C
125	98	Roofs, HSG C
293	89	Gravel roads, HSG C
1,916	98	Paved parking, HSG C
1,041	98	Water Surface, HSG C
11,734	81	Weighted Average
8,652		73.73% Pervious Area
3,082		26.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		Sheet Flow, FLOW OVER GRASS Grass: Short n= 0.150 P2= 3.18"
1.3	120	0.0500	1.57		Shallow Concentrated Flow, FLOW OVER GRASS Short Grass Pasture Kv= 7.0 fps
0.6	80	0.0125	2.27		Shallow Concentrated Flow, FLOW OVER DRIVEWAY Paved Kv= 20.3 fps
6.2	250	Total			

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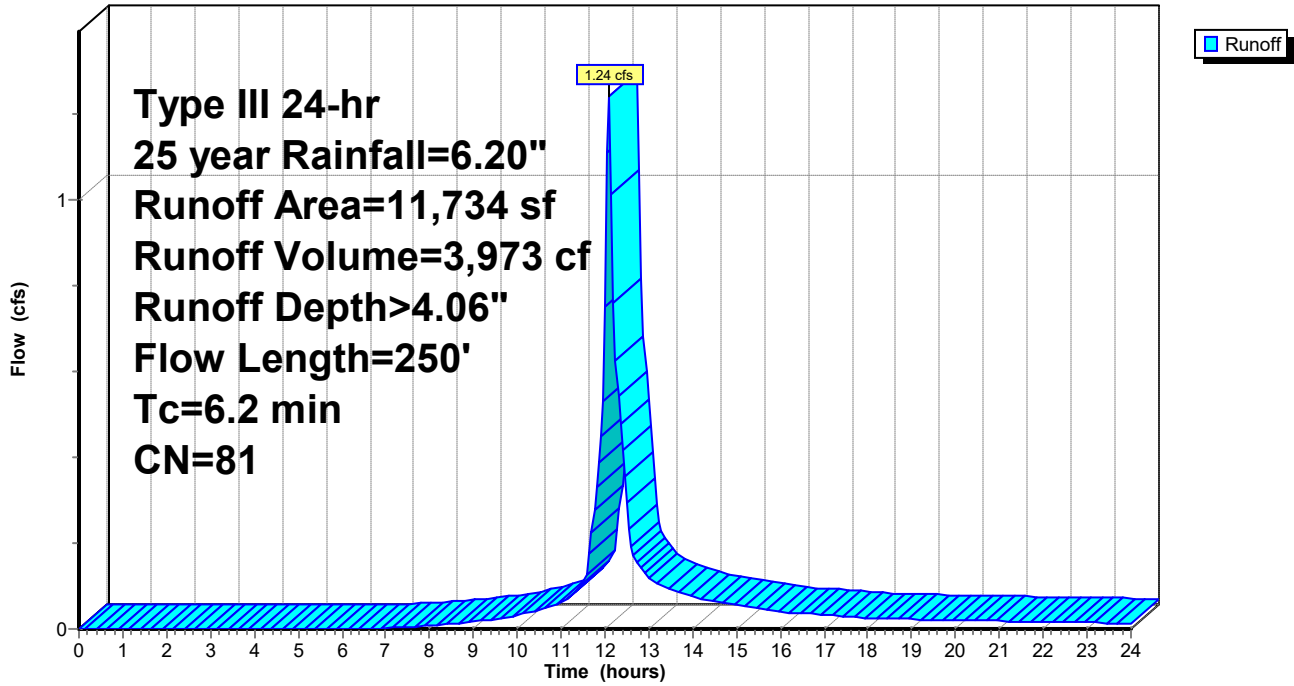
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Type III 24-hr 25 year Rainfall=6.20"

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Subcatchment P3: (new Subcat)

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Subcatchment P4A: FLOW TO CB3

Runoff = 0.72 cfs @ 12.09 hrs, Volume= 2,622 cf, Depth> 5.96"

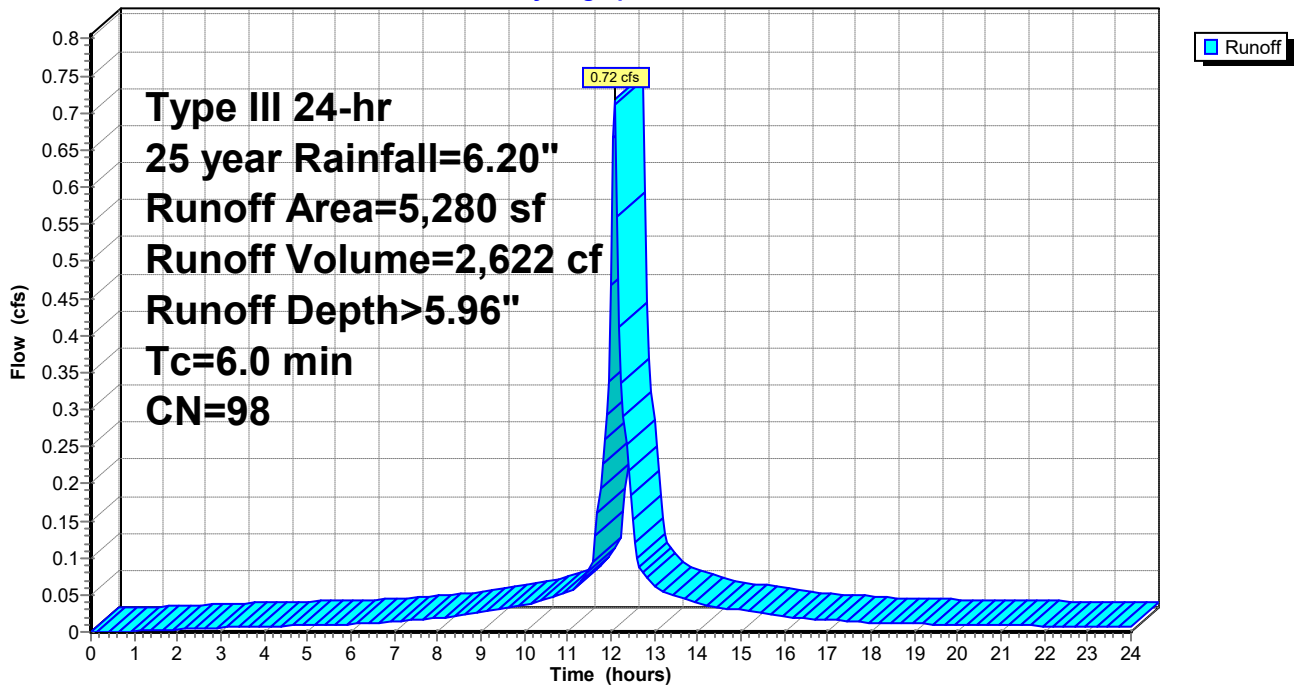
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
5,280	98	Paved parking, HSG C
5,280		100.00% Impervious Area

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

Subcatchment P4A: FLOW TO CB3

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Subcatchment P4B: FLOW TO CB4

Runoff = 1.47 cfs @ 12.09 hrs, Volume= 4,855 cf, Depth> 4.93"

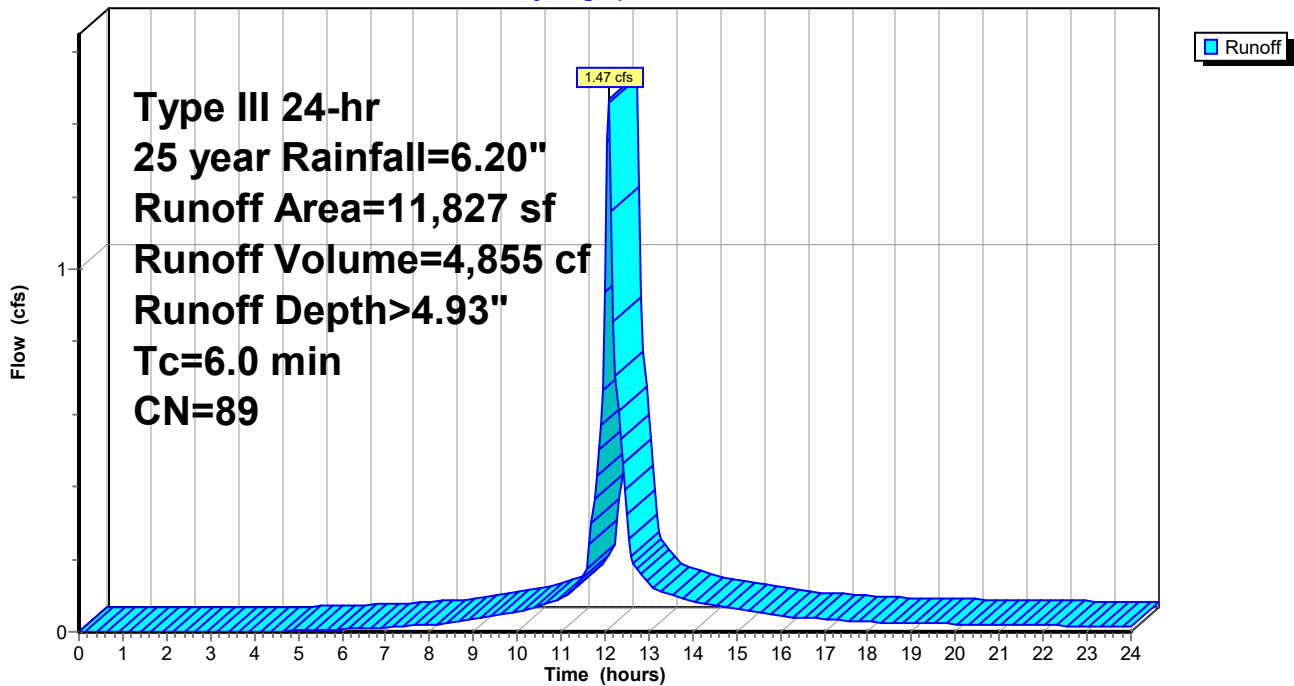
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
7,080	98	Paved parking, HSG C
4,550	74	>75% Grass cover, Good, HSG C
197	89	Gravel roads, HSG C
11,827	89	Weighted Average
4,747		40.14% Pervious Area
7,080		59.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW OVER PAVEMENT TO CB4

Subcatchment P4B: FLOW TO CB4

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Subcatchment P5: P5

Runoff = 1.07 cfs @ 12.09 hrs, Volume= 3,479 cf, Depth> 4.60"

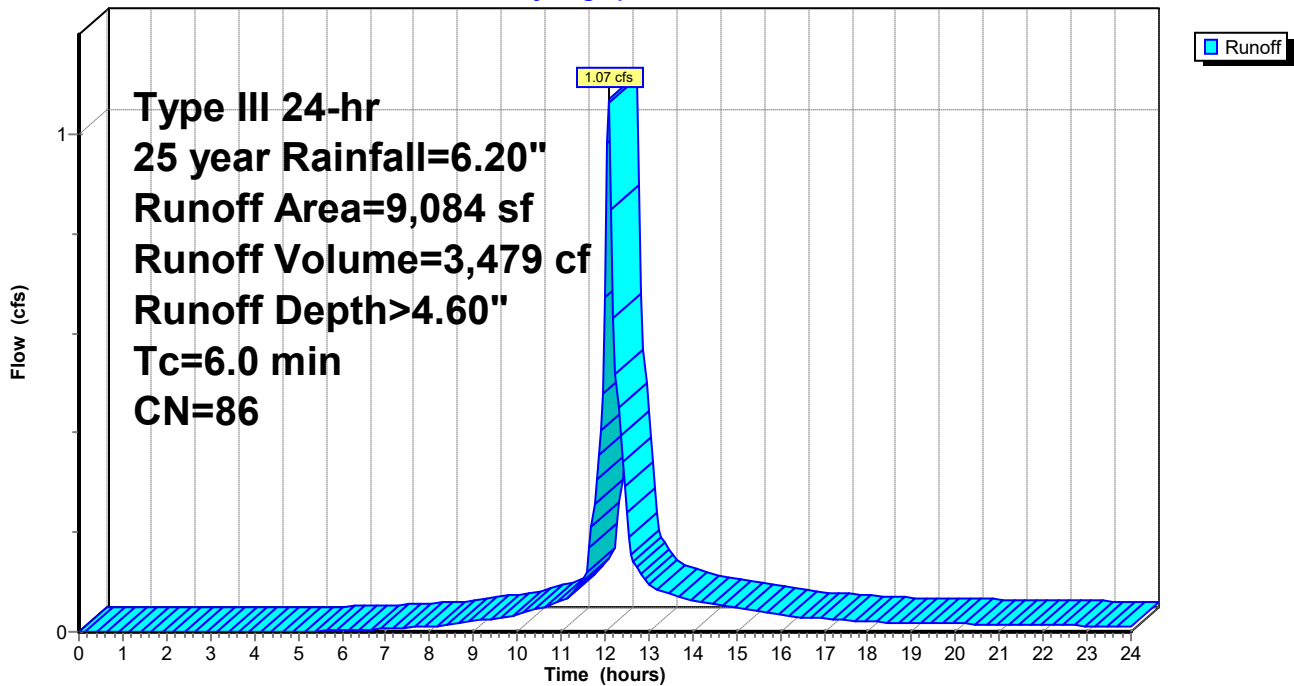
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
4,441	74	>75% Grass cover, Good, HSG C
1,160	98	Water Surface, HSG C
3,483	98	Paved parking, HSG C
9,084	86	Weighted Average
4,441		48.89% Pervious Area
4,643		51.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW TO POND P2

Subcatchment P5: P5

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Subcatchment P6: P6

Runoff = 3.68 cfs @ 12.11 hrs, Volume= 12,049 cf, Depth> 3.55"

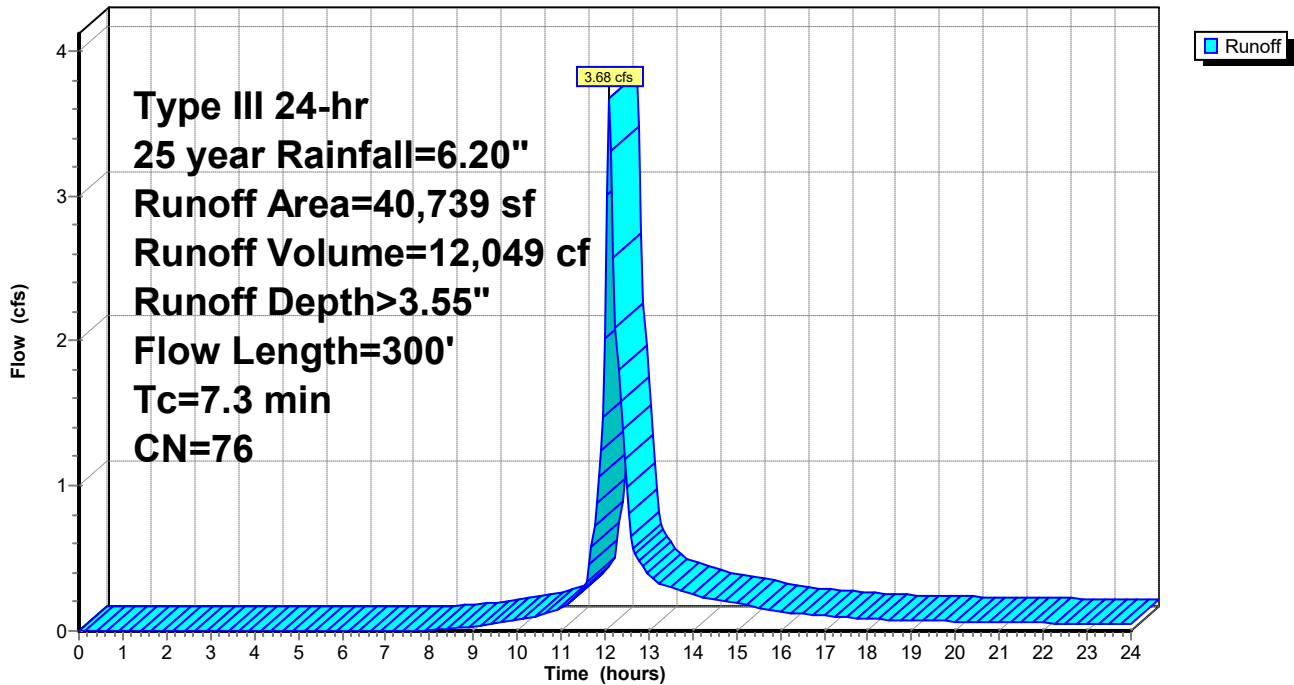
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
33,917	74	>75% Grass cover, Good, HSG C
6,822	83	Woods, Poor, HSG D
40,739	76	Weighted Average
40,739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	50	0.0500	0.21		Sheet Flow, flow over grass Grass: Short n= 0.150 P2= 3.18"
0.3	40	0.1000	2.21		Shallow Concentrated Flow, FLOW OVER GRASS Short Grass Pasture Kv= 7.0 fps
3.1	210	0.0500	1.12		Shallow Concentrated Flow, FLOW THROUGH WOODS Woodland Kv= 5.0 fps
7.3	300	Total			

Subcatchment P6: P6

Hydrograph



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Summary for Subcatchment P7: FLOW TO POND 3

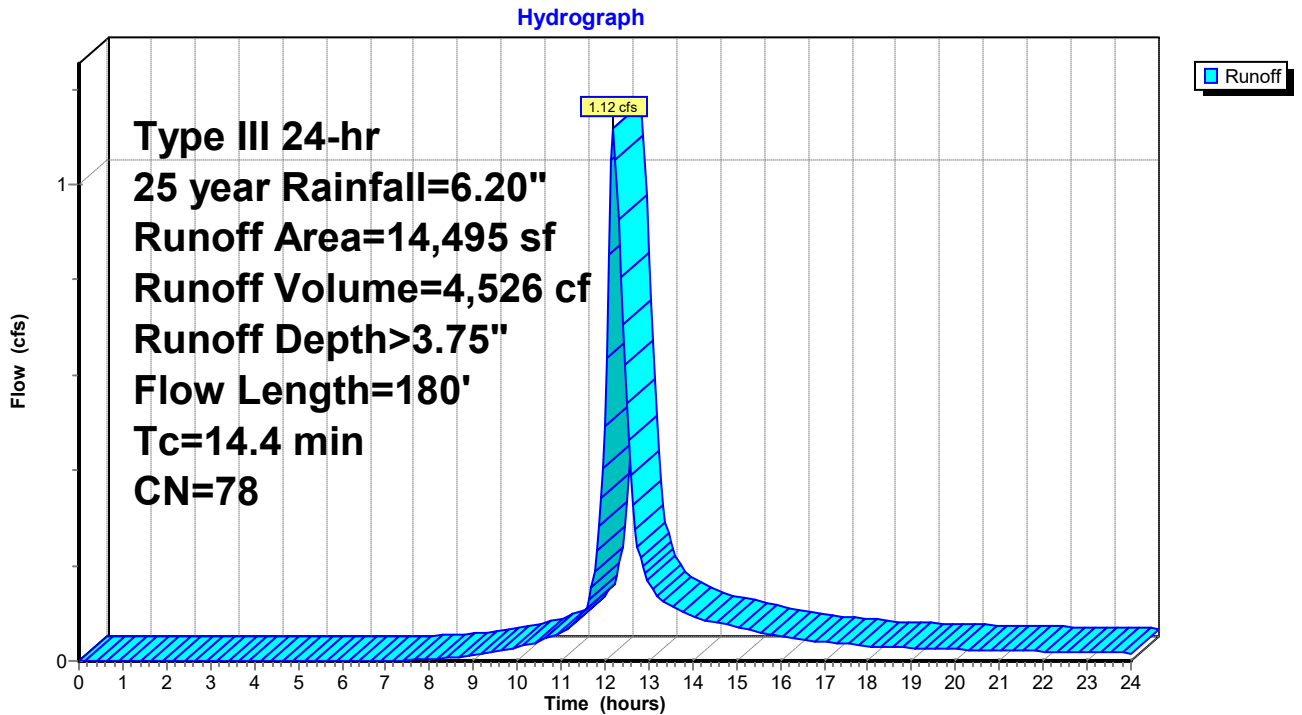
Runoff = 1.12 cfs @ 12.20 hrs, Volume= 4,526 cf, Depth> 3.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
12,050	74	>75% Grass cover, Good, HSG C
1,096	98	Paved parking, HSG C
1,349	98	Water Surface, HSG C
14,495	78	Weighted Average
12,050		83.13% Pervious Area
2,445		16.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		Sheet Flow, FLOW IN WOODS Woods: Light underbrush n= 0.400 P2= 3.18"
2.0	130	0.0460	1.07		Shallow Concentrated Flow, FLOW THROUGH WOODS Woodland Kv= 5.0 fps
14.4	180	Total			

Subcatchment P7: FLOW TO POND 3



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Subcatchment P8: AREA AROUND POND 1

Runoff = 0.80 cfs @ 12.09 hrs, Volume= 2,642 cf, Depth> 4.82"

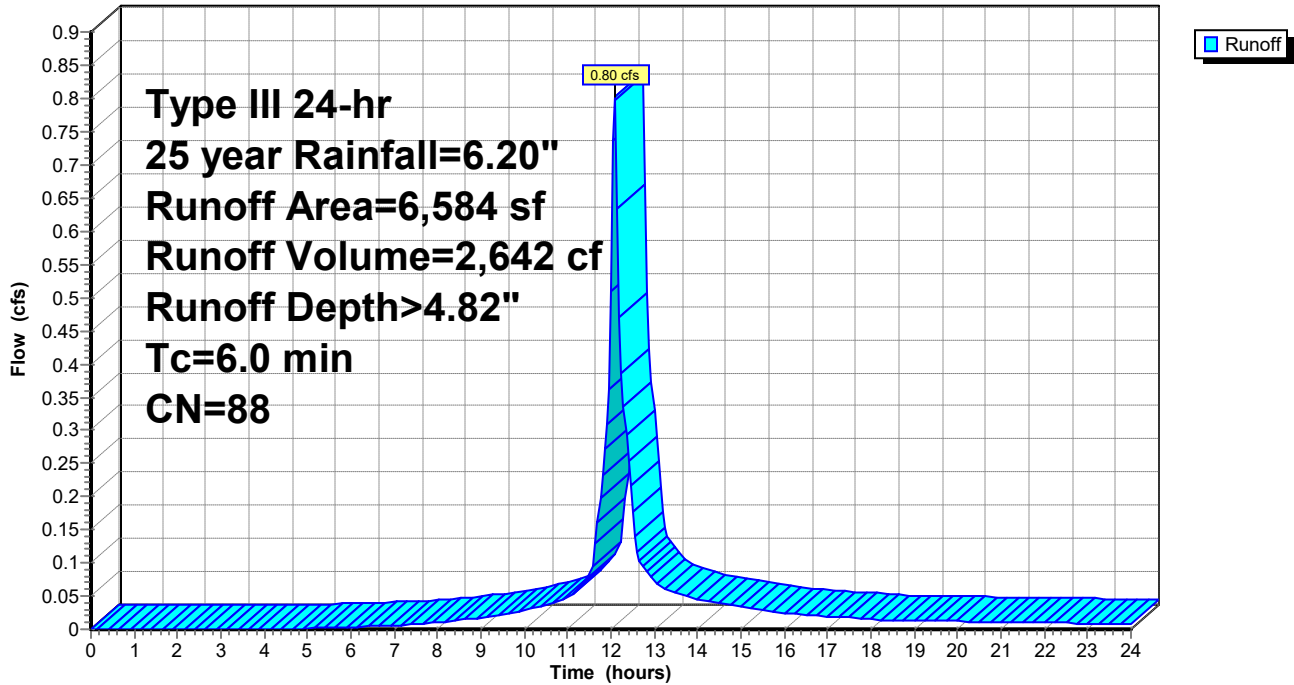
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
2,650	74	>75% Grass cover, Good, HSG C
3,934	98	Water Surface, HSG C
6,584	88	Weighted Average
2,650		40.25% Pervious Area
3,934		59.75% Impervious Area

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

Subcatchment P8: AREA AROUND POND 1

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Subcatchment P9: (new Subcat)

Runoff = 4.38 cfs @ 12.18 hrs, Volume= 17,157 cf, Depth> 3.55"

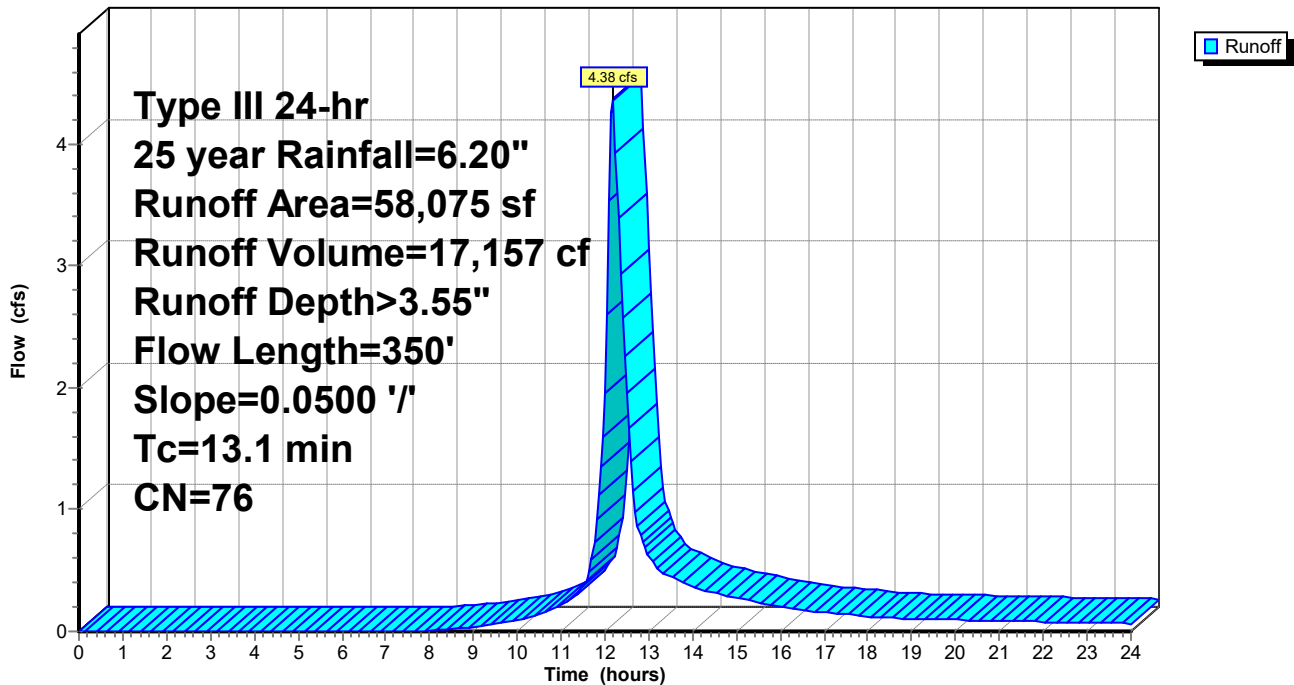
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
23,170	74	>75% Grass cover, Good, HSG C
24,263	70	Woods, Good, HSG C
10,642	94	Fallow, bare soil, HSG D
58,075	76	Weighted Average
58,075		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	50	0.0500	0.10		Sheet Flow, FLOW THROUGH WOODS Woods: Light underbrush n= 0.400 P2= 3.18"
4.5	300	0.0500	1.12		Shallow Concentrated Flow, FLOW THROUGH WOODS Woodland Kv= 5.0 fps
13.1	350	Total			

Subcatchment P9: (new Subcat)

Hydrograph



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Summary for Subcatchment R1: IOT 1 ROOF

Runoff = 0.27 cfs @ 12.09 hrs, Volume= 976 cf, Depth> 5.96"

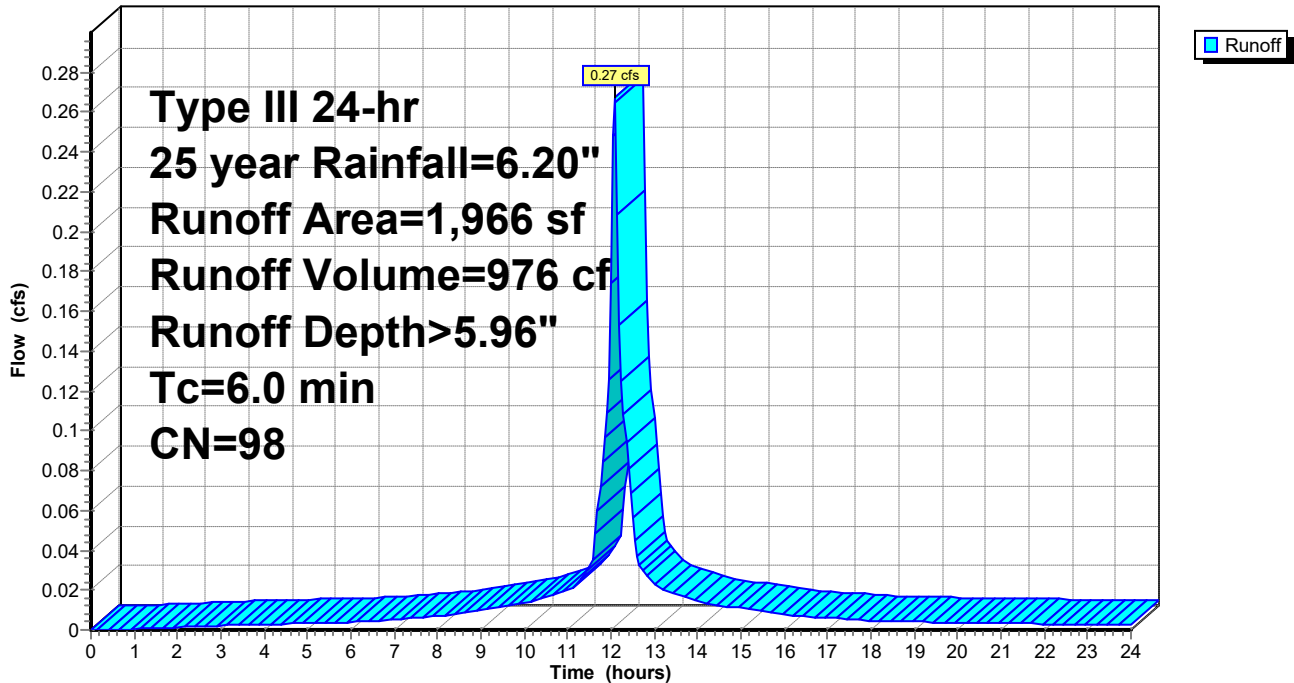
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
1,966	98	Roofs, HSG C
1,966		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW FROM ROOF TO POND

Subcatchment R1: IOT 1 ROOF

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Subcatchment R2: LOT 2 ROOF

Runoff = 0.31 cfs @ 12.09 hrs, Volume= 1,119 cf, Depth> 5.96"

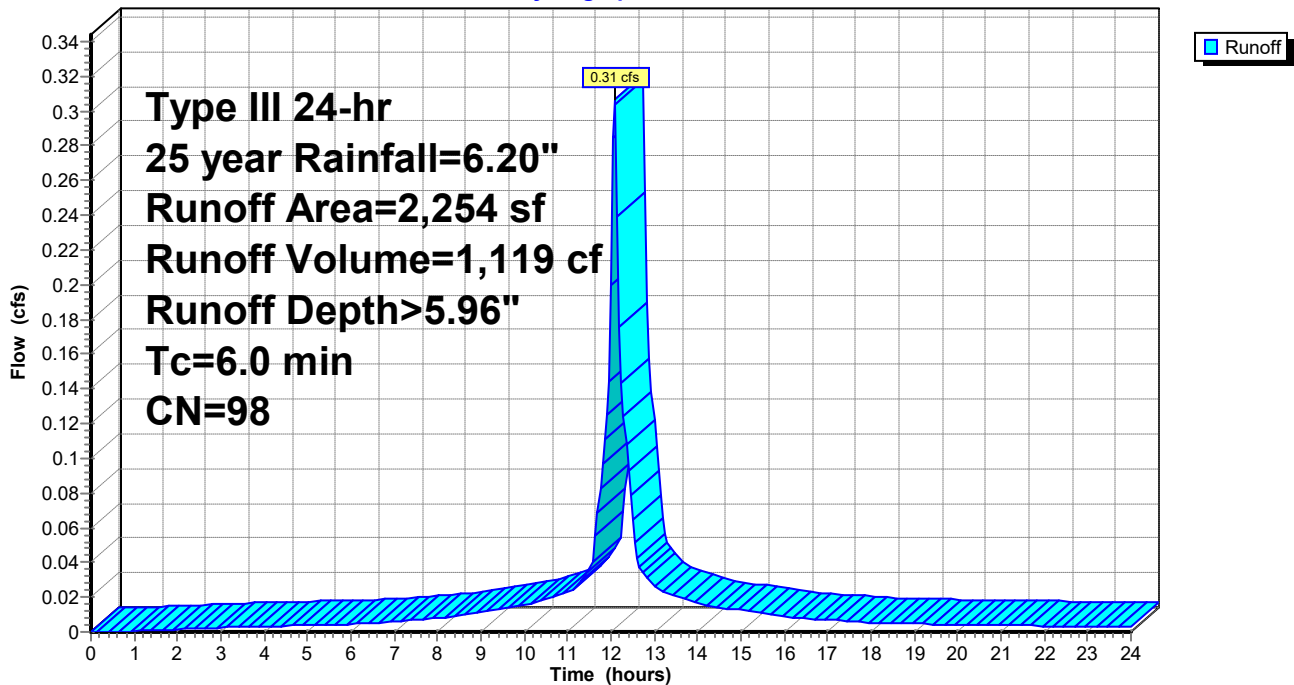
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW IN GUTTERS AND PIPES TO POND 3

Subcatchment R2: LOT 2 ROOF

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Subcatchment R3: (new Subcat)

Runoff = 0.31 cfs @ 12.09 hrs, Volume= 1,119 cf, Depth> 5.96"

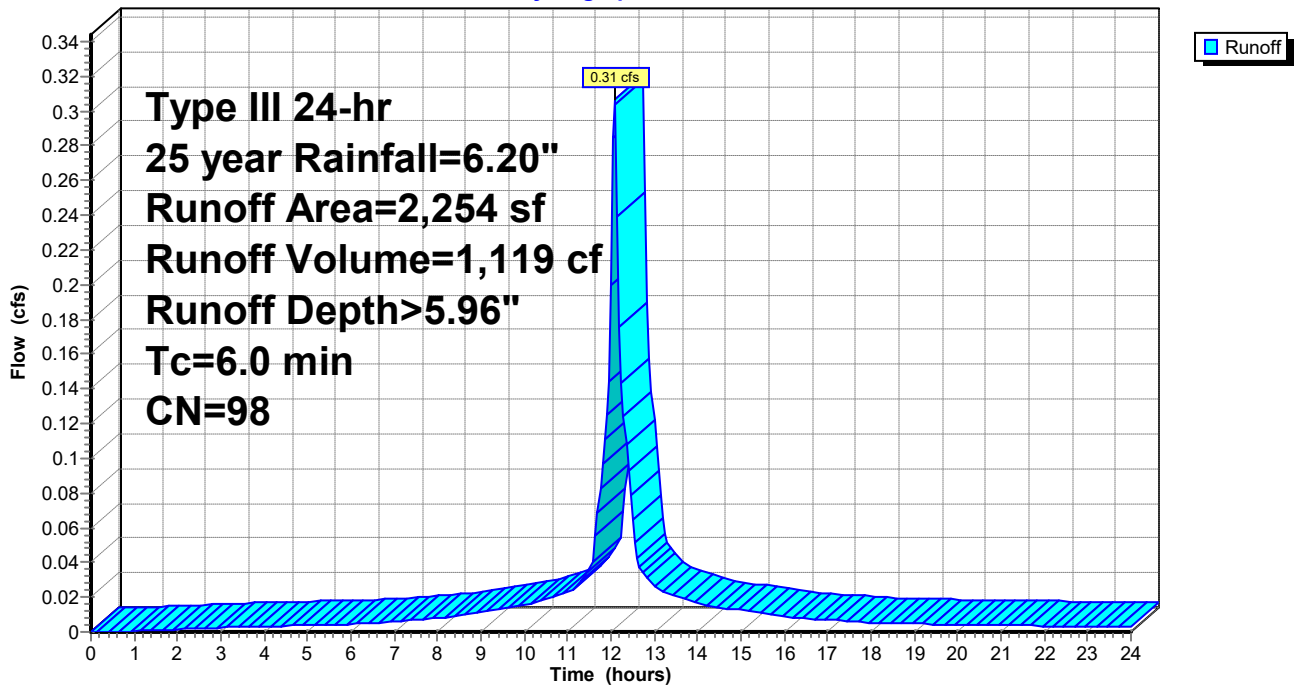
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW THROUGH GUTTERS TO POND

Subcatchment R3: (new Subcat)

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Reach 1R: CULVERT UNDER DRIVE

Inflow Area = 51,789 sf, 12.76% Impervious, Inflow Depth > 3.41" for 25 year event
Inflow = 4.91 cfs @ 12.11 hrs, Volume= 14,715 cf
Outflow = 4.91 cfs @ 12.11 hrs, Volume= 14,714 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.07 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.12 fps, Avg. Travel Time= 0.2 min

Peak Storage= 16 cf @ 12.11 hrs

Average Depth at Peak Storage= 0.51'

Bank-Full Depth= 1.00' Flow Area= 1.6 sf, Capacity= 9.45 cfs

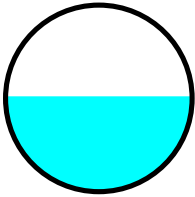
A factor of 2.00 has been applied to the storage and discharge capacity

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

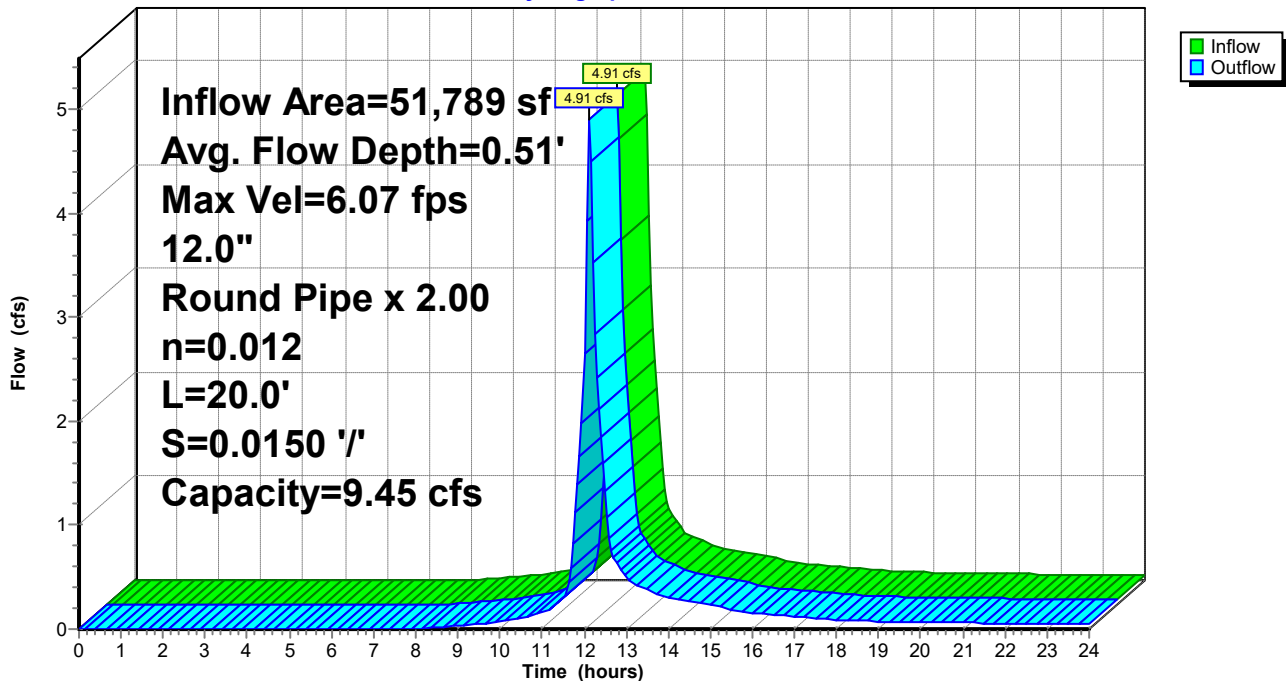
Length= 20.0' Slope= 0.0150 '/'

Inlet Invert= 259.80', Outlet Invert= 259.50'



Reach 1R: CULVERT UNDER DRIVE

Hydrograph



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Summary for Pond 1P: POND 1

Inflow Area = 40,965 sf, 56.43% Impervious, Inflow Depth > 4.82" for 25 year event
 Inflow = 4.92 cfs @ 12.09 hrs, Volume= 16,439 cf
 Outflow = 2.29 cfs @ 12.27 hrs, Volume= 14,558 cf, Atten= 53%, Lag= 10.9 min
 Discarded = 0.09 cfs @ 12.27 hrs, Volume= 4,450 cf
 Primary = 2.20 cfs @ 12.27 hrs, Volume= 10,108 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 262.06' @ 12.27 hrs Surf.Area= 3,877 sf Storage= 6,114 cf
 Flood Elev= 263.00' Surf.Area= 4,790 sf Storage= 10,193 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 79.5 min (863.6 - 784.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	260.00'	10,193 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
260.00	2,125	260.0	0	0	2,125	
261.00	2,940	282.0	2,521	2,521	3,112	
262.00	3,825	308.0	3,373	5,894	4,368	
263.00	4,790	332.0	4,298	10,193	5,631	

Device	Routing	Invert	Outlet Devices	
#1	Primary	259.00'	12.0" Round Culvert L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.00' / 258.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf	
#2	Device 1	260.75'	4.0" Vert. Orifice/Grate C= 0.600	
#3	Device 1	261.75'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads	
#4	Discarded	260.00'	1.020 in/hr Exfiltration over Surface area	
#5	Primary	262.40'	5.0' long x 8.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74	

Discarded OutFlow Max=0.09 cfs @ 12.27 hrs HW=262.05' (Free Discharge)
 ↳ **4=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=2.17 cfs @ 12.27 hrs HW=262.05' TW=0.00' (Dynamic Tailwater)
 ↳ **1=Culvert** (Passes 2.17 cfs of 6.04 cfs potential flow)
 ↳ **2=Orifice/Grate** (Orifice Controls 0.45 cfs @ 5.14 fps)
 ↳ **3=Orifice/Grate** (Weir Controls 1.72 cfs @ 1.80 fps)
 ↳ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

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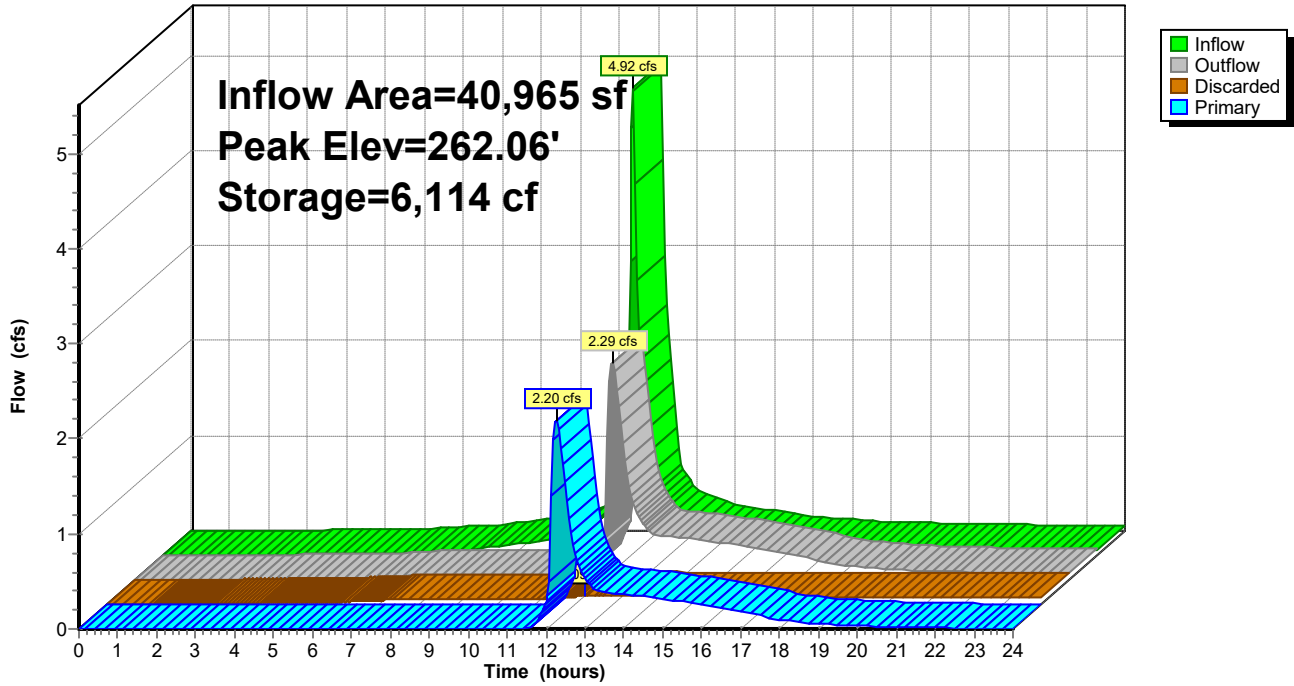
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Type III 24-hr 25 year Rainfall=6.20"

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Pond 1P: POND 1

Hydrograph



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Summary for Pond 2P: POND P2

Inflow Area = 11,050 sf, 59.81% Impervious, Inflow Depth > 4.84" for 25 year event
 Inflow = 1.34 cfs @ 12.09 hrs, Volume= 4,456 cf
 Outflow = 1.26 cfs @ 12.12 hrs, Volume= 3,956 cf, Atten= 6%, Lag= 1.8 min
 Discarded = 0.02 cfs @ 12.12 hrs, Volume= 1,290 cf
 Primary = 1.23 cfs @ 12.12 hrs, Volume= 2,665 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 261.97' @ 12.12 hrs Surf.Area= 988 sf Storage= 773 cf
 Flood Elev= 263.00' Surf.Area= 1,440 sf Storage= 2,014 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 32.7 min (817.4 - 784.7)

Volume	Invert	Avail.Storage	Storage Description			
#1	261.00'	2,014 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
261.00	616	112.0	0	0	616	
262.00	1,000	139.0	800	800	1,170	
263.00	1,440	158.0	1,213	2,014	1,643	

Device	Routing	Invert	Outlet Devices												
#1	Discarded	261.00'	1.020 in/hr Exfiltration over Surface area												
#2	Primary	261.75'	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir												
			Head (feet)	0.20	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.00		
				2.50	3.00	3.50	4.00	4.50	5.00	5.50					
			Coef. (English)	2.34	2.50	2.70	2.68	2.68	2.66	2.65	2.65	2.65			
				2.65	2.67	2.66	2.68	2.70	2.74	2.79	2.88				

Discarded OutFlow Max=0.02 cfs @ 12.12 hrs HW=261.97' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.20 cfs @ 12.12 hrs HW=261.97' TW=260.30' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 1.20 cfs @ 1.10 fps)

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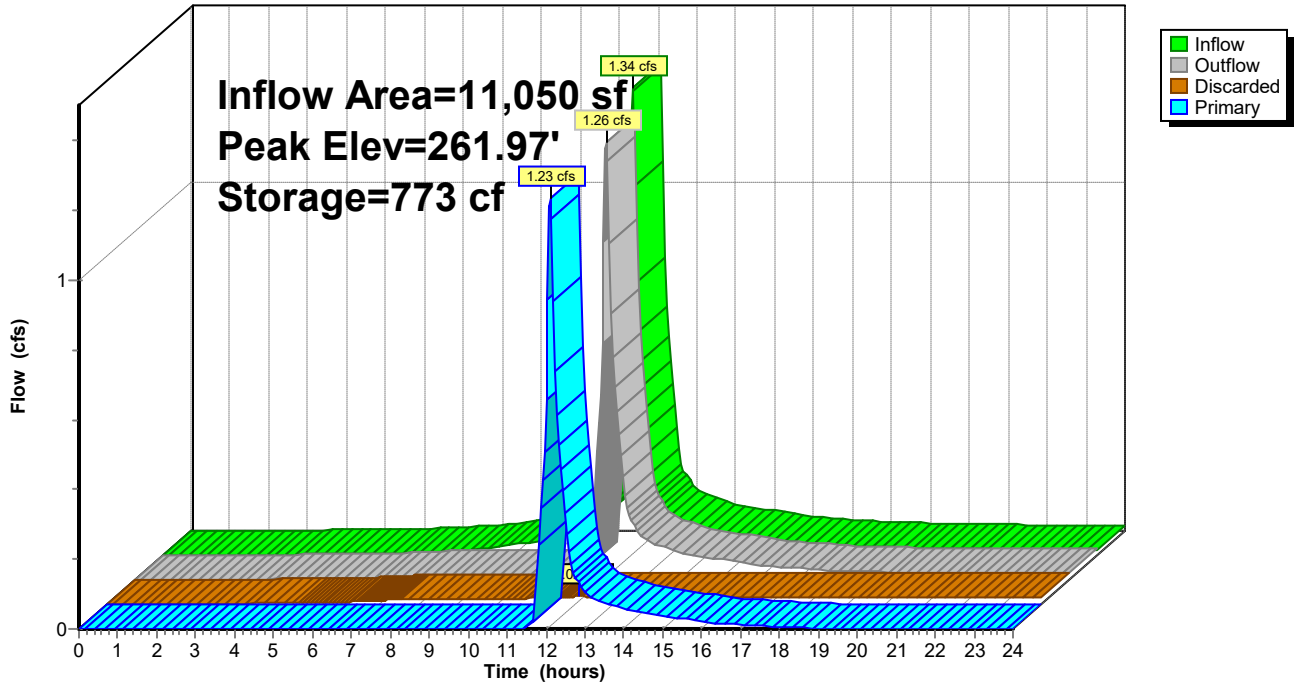
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Type III 24-hr 25 year Rainfall=6.20"

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Pond 2P: POND P2

Hydrograph



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Summary for Pond 3P: POND 3

Inflow Area = 16,749 sf, 28.06% Impervious, Inflow Depth > 4.04" for 25 year event
 Inflow = 1.31 cfs @ 12.18 hrs, Volume= 5,645 cf
 Outflow = 0.60 cfs @ 12.51 hrs, Volume= 4,871 cf, Atten= 54%, Lag= 19.7 min
 Discarded = 0.04 cfs @ 12.51 hrs, Volume= 1,484 cf
 Primary = 0.56 cfs @ 12.51 hrs, Volume= 3,387 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 263.83' @ 12.51 hrs Surf.Area= 1,615 sf Storage= 1,885 cf
 Flood Elev= 265.00' Surf.Area= 2,460 sf Storage= 4,264 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 45.8 min (854.0 - 808.2)

Volume	Invert	Avail.Storage	Storage Description			
#1	262.00'	4,264 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
262.00	541	176.0	0	0	541	
264.00	1,745	219.0	2,172	2,172	1,949	
265.00	2,460	250.0	2,092	4,264	3,130	

Device	Routing	Invert	Outlet Devices		
#1	Primary	263.00'	12.0" Round Culvert L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 263.00' / 260.00' S= 0.1500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf		
#2	Discarded	262.00'	1.020 in/hr Exfiltration over Surface area		
#3	Device 1	263.00'	4.0" Vert. Orifice/Grate	C= 0.600	
#4	Device 1	262.50'	3.0" Vert. Orifice/Grate	C= 0.600	
#5	Device 1	264.00'	24.0" x 24.0" Horiz. Orifice/Grate	C= 0.600	Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.51 hrs HW=263.83' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.56 cfs @ 12.51 hrs HW=263.83' TW=0.00' (Dynamic Tailwater)
 ↑ **1=Culvert** (Passes 0.56 cfs of 2.16 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 0.34 cfs @ 3.92 fps)
 ↑ **4=Orifice/Grate** (Orifice Controls 0.22 cfs @ 4.38 fps)
 ↑ **5=Orifice/Grate** (Controls 0.00 cfs)

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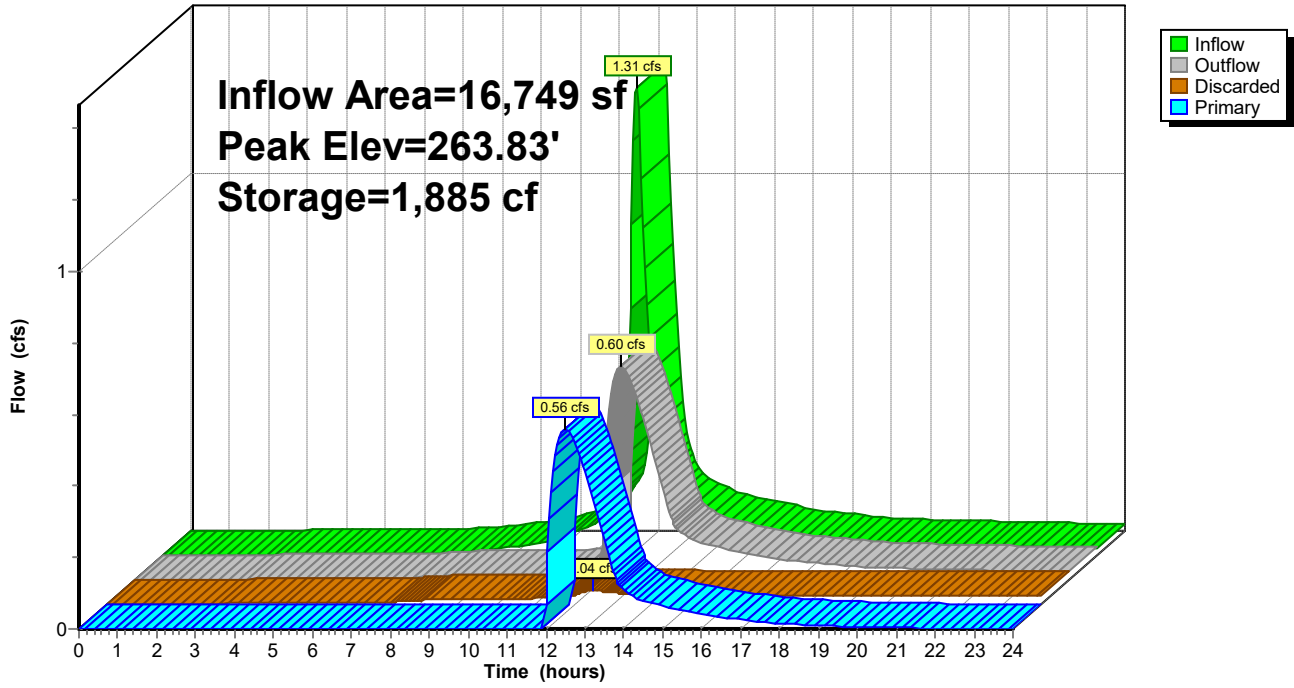
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Type III 24-hr 25 year Rainfall=6.20"

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Pond 3P: POND 3

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Summary for Pond CB1: (new Pond)

Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 4.49" for 25 year event
 Inflow = 0.38 cfs @ 12.09 hrs, Volume= 1,229 cf
 Outflow = 0.38 cfs @ 12.09 hrs, Volume= 1,229 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.38 cfs @ 12.09 hrs, Volume= 1,229 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.25' @ 12.11 hrs

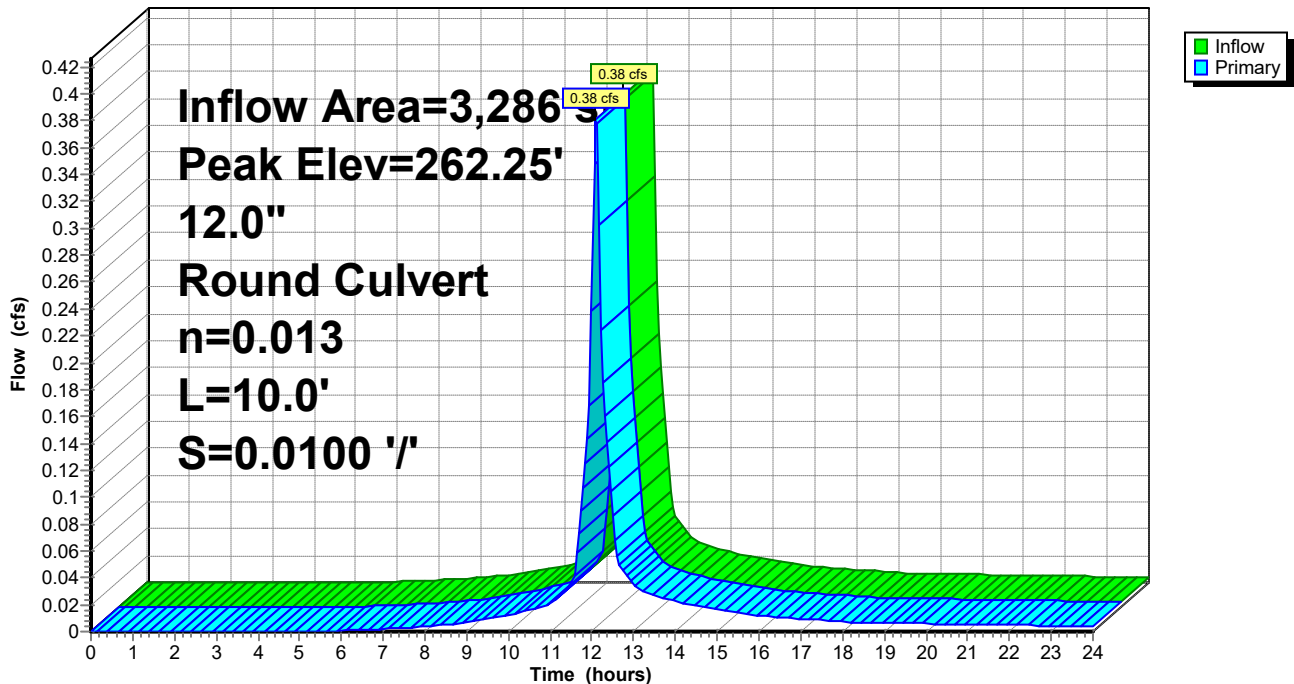
Flood Elev= 264.40'

Device #	Routing	Invert	Outlet Devices
1	Primary	261.90'	12.0" Round Culvert L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.33 cfs @ 12.09 hrs HW=262.24' TW=262.11' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 0.33 cfs @ 2.05 fps)

Pond CB1: (new Pond)

Hydrograph



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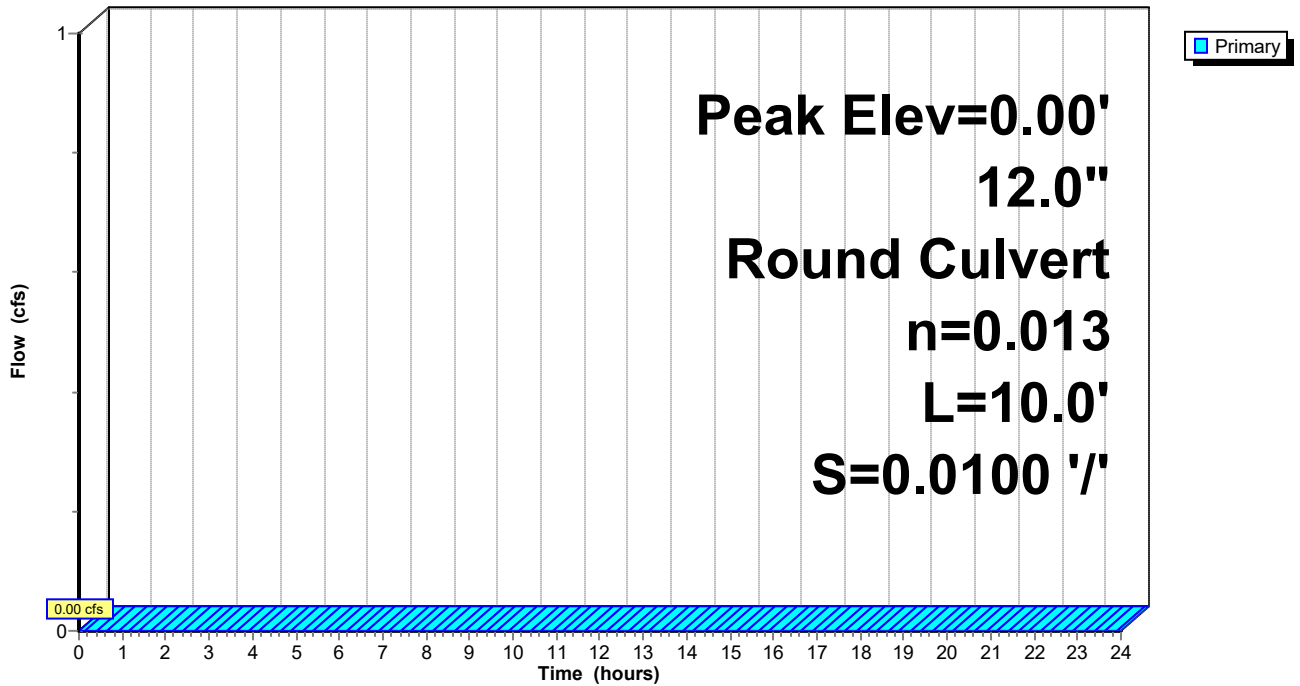
Summary for Pond CB2: CB2

Device	Routing	Invert	Outlet Devices
#1	Primary	261.90'	12.0" Round Culvert L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=261.70' (Dynamic Tailwater)
↑1=Culvert (Controls 0.00 cfs)

Pond CB2: CB2

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Pond CB3: (new Pond)

Inflow Area = 5,280 sf, 100.00% Impervious, Inflow Depth > 5.96" for 25 year event
 Inflow = 0.72 cfs @ 12.09 hrs, Volume= 2,622 cf
 Outflow = 0.72 cfs @ 12.09 hrs, Volume= 2,622 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.72 cfs @ 12.09 hrs, Volume= 2,622 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.15' @ 12.31 hrs

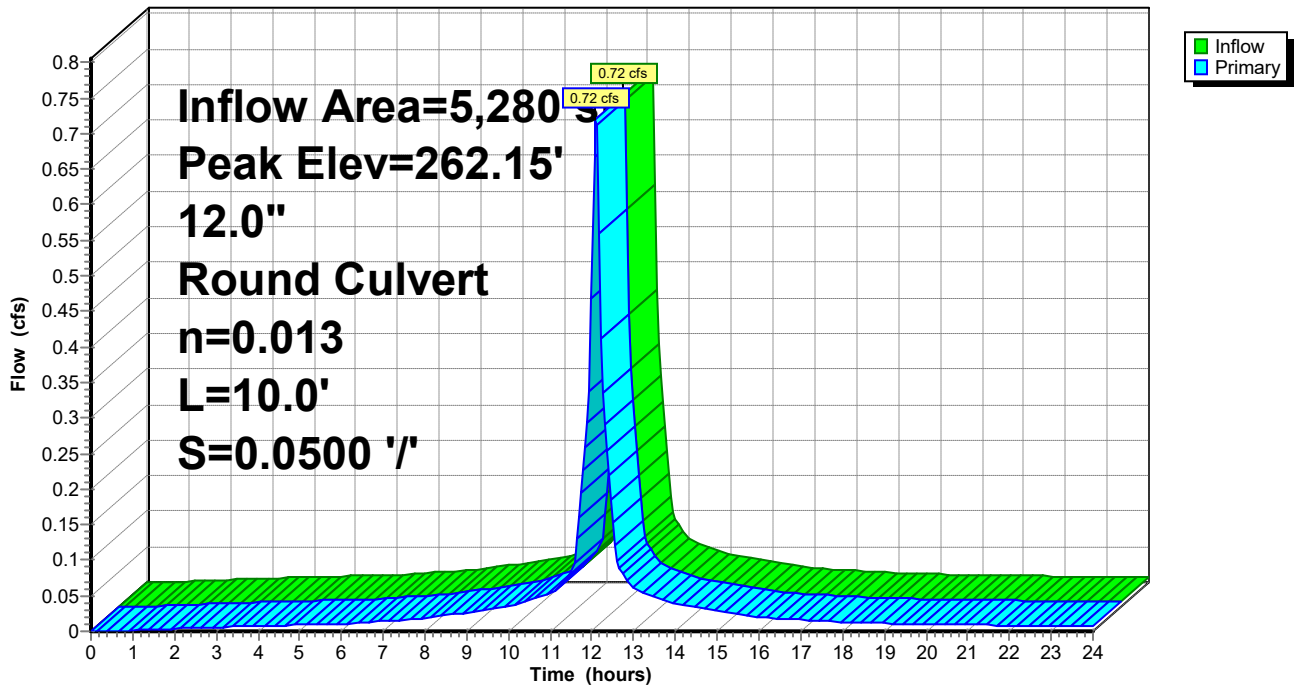
Flood Elev= 263.50'

Device #	Routing	Invert	Outlet Devices
#1	Primary	260.50'	12.0" Round Culvert L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0500 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=261.73' TW=261.97' (Dynamic Tailwater)
 ↑1=Culvert (Controls 0.00 cfs)

Pond CB3: (new Pond)

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Pond CB4: CB4

Inflow Area = 11,827 sf, 59.86% Impervious, Inflow Depth > 4.93" for 25 year event
Inflow = 1.47 cfs @ 12.09 hrs, Volume= 4,855 cf
Outflow = 1.47 cfs @ 12.09 hrs, Volume= 4,855 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.47 cfs @ 12.09 hrs, Volume= 4,855 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.16' @ 12.30 hrs

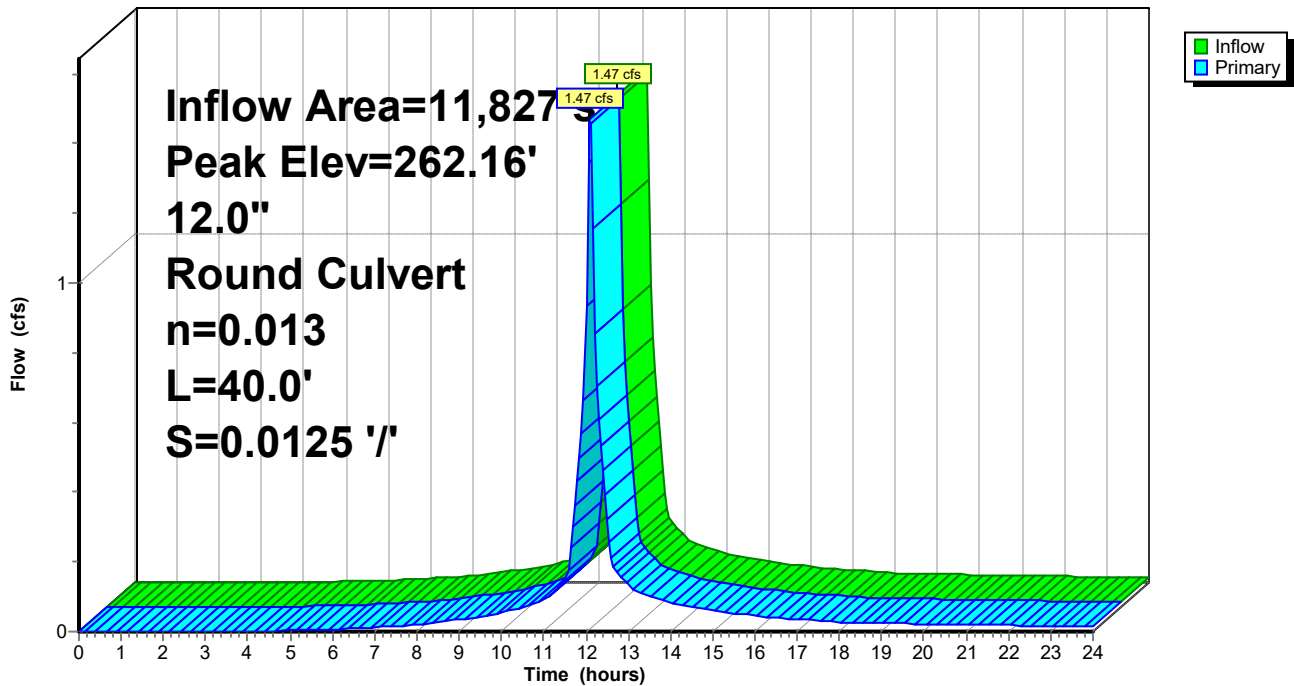
Flood Elev= 263.50'

Device #	Routing	Invert	Outlet Devices
1	Primary	260.50'	12.0" Round Culvert L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=261.86' TW=261.98' (Dynamic Tailwater)
↑1=Culvert (Controls 0.00 cfs)

Pond CB4: CB4

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Pond MH1: MH1

Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 4.49" for 25 year event
 Inflow = 0.38 cfs @ 12.09 hrs, Volume= 1,229 cf
 Outflow = 0.38 cfs @ 12.09 hrs, Volume= 1,229 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.38 cfs @ 12.09 hrs, Volume= 1,229 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.19' @ 12.34 hrs

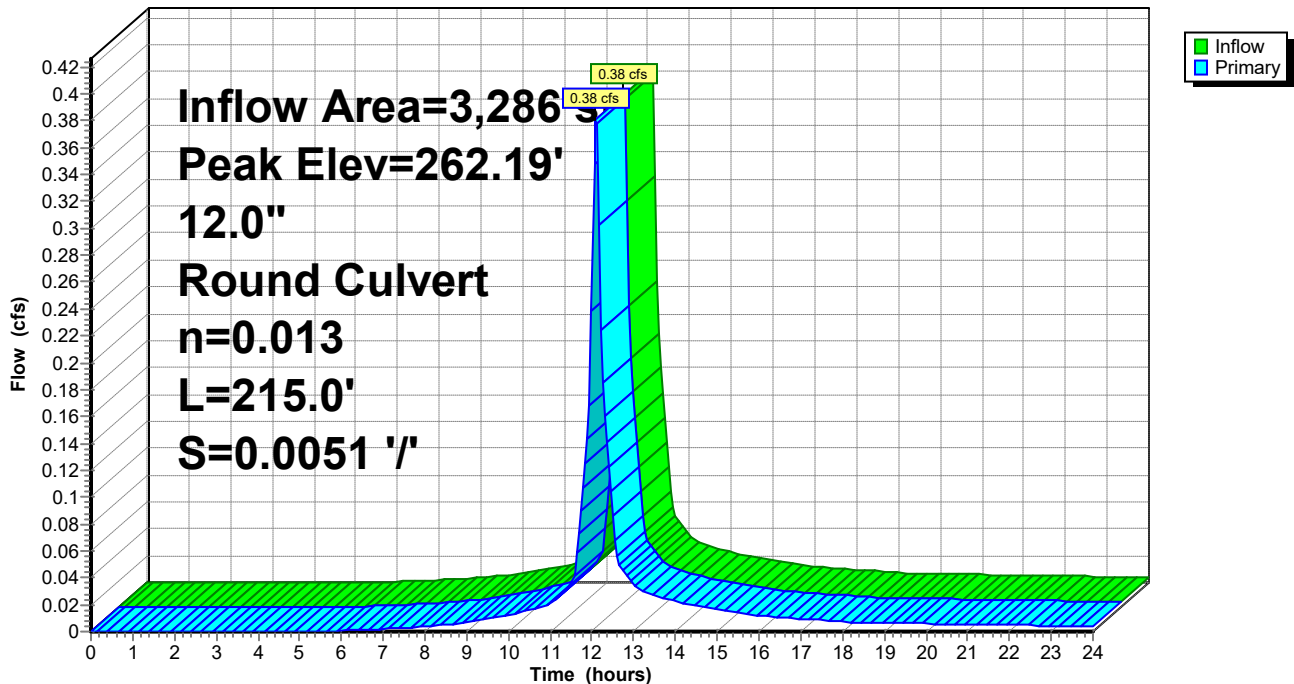
Flood Elev= 265.00'

Device #	Routing	Invert	Outlet Devices
1	Primary	261.70'	12.0" Round Culvert L= 215.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.70' / 260.60' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.28 cfs @ 12.09 hrs HW=262.11' TW=261.74' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 0.28 cfs @ 1.37 fps)

Pond MH1: MH1

Hydrograph



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Type III 24-hr 25 year Rainfall=6.20"

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Summary for Pond MH2: MH2

Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 4.49" for 25 year event
 Inflow = 0.38 cfs @ 12.09 hrs, Volume= 1,229 cf
 Outflow = 0.38 cfs @ 12.09 hrs, Volume= 1,229 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.38 cfs @ 12.09 hrs, Volume= 1,229 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.14' @ 12.31 hrs

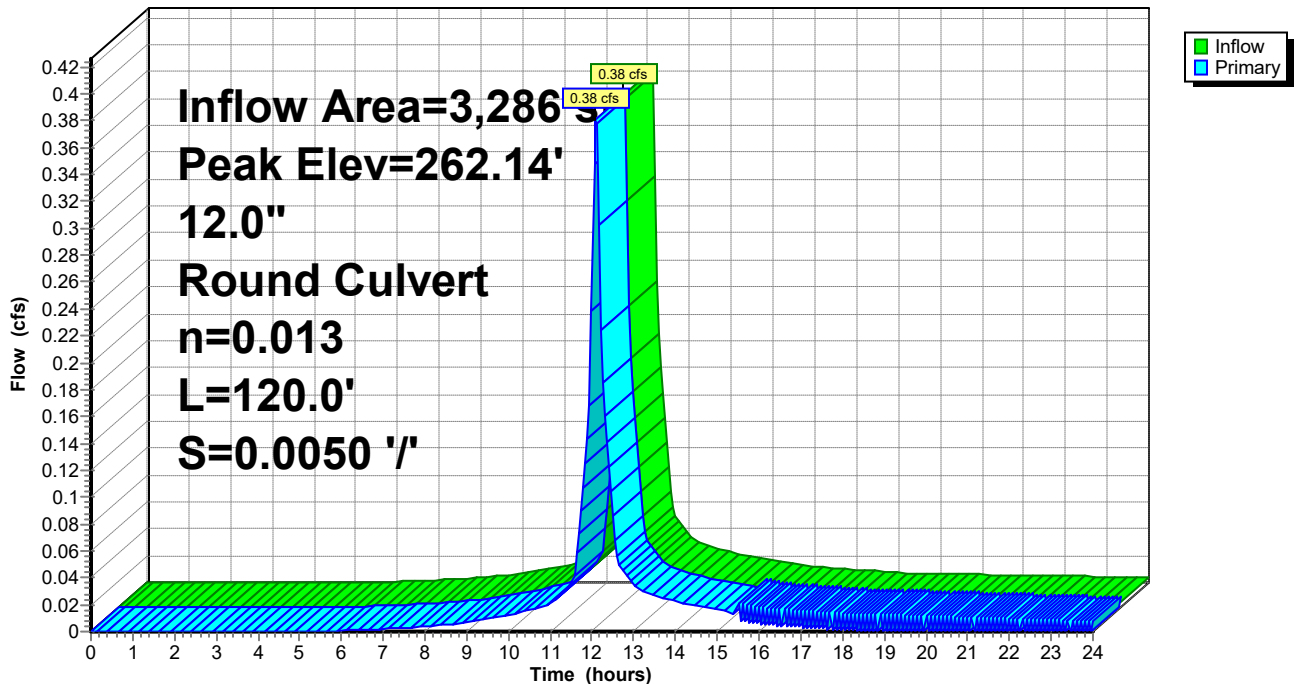
Flood Elev= 269.75'

Device #	Routing	Invert	Outlet Devices
1	Primary	260.60'	12.0" Round Culvert L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.60' / 260.00' S= 0.0050 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=261.74' TW=261.98' (Dynamic Tailwater)
 ↑1=Culvert (Controls 0.00 cfs)

Pond MH2: MH2

Hydrograph



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Summary for Pond MH3: DMH3

Inflow Area = 20,393 sf, 67.90% Impervious, Inflow Depth > 5.12" for 25 year event
Inflow = 2.57 cfs @ 12.09 hrs, Volume= 8,705 cf
Outflow = 2.57 cfs @ 12.09 hrs, Volume= 8,705 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.57 cfs @ 12.09 hrs, Volume= 8,705 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.14' @ 12.27 hrs

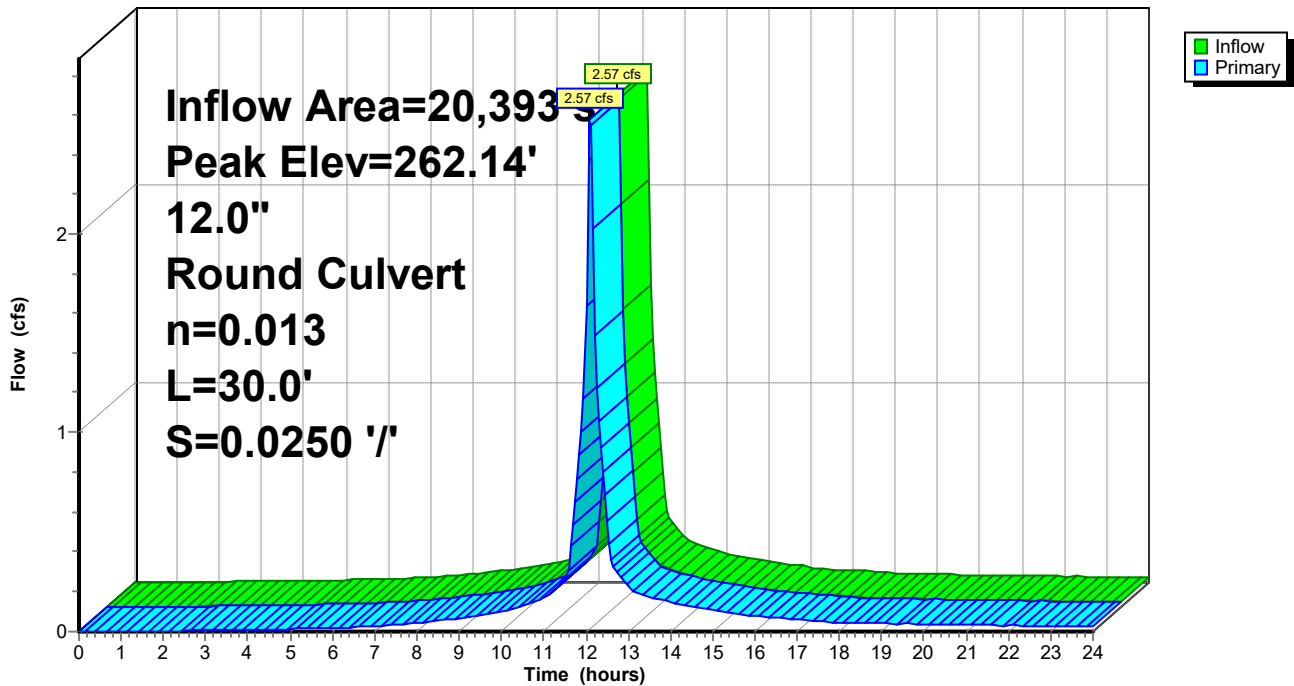
Flood Elev= 263.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	259.75'	12.0" Round Culvert L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.75' / 259.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.82 cfs @ 12.09 hrs HW=261.97' TW=261.74' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 1.82 cfs @ 2.32 fps)

Pond MH3: DMH3

Hydrograph



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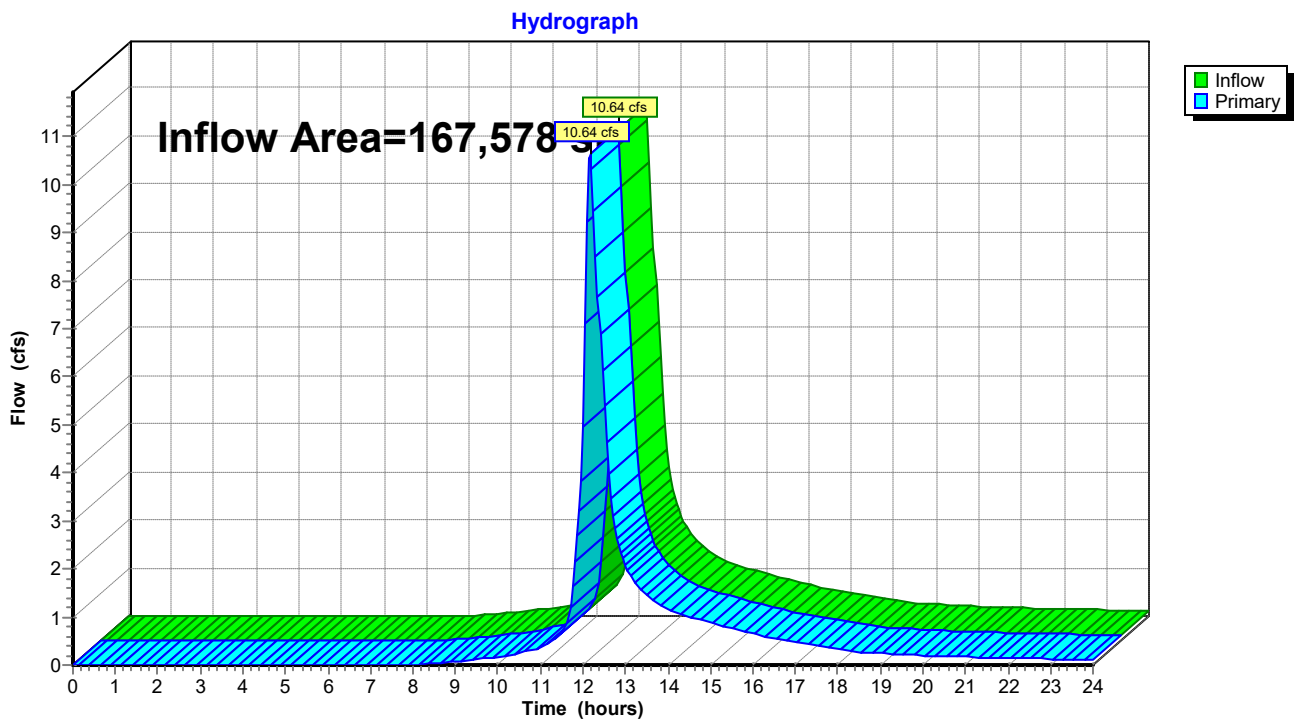
Summary for Pond SP1: SUM POND WOODS

DESIGN POINT AT REAR PROPERTY LINE

Inflow Area = 167,578 sf, 20.54% Impervious, Inflow Depth > 3.25" for 25 year event
Inflow = 10.64 cfs @ 12.17 hrs, Volume= 45,365 cf
Primary = 10.64 cfs @ 12.17 hrs, Volume= 45,365 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: SUM POND WOODS



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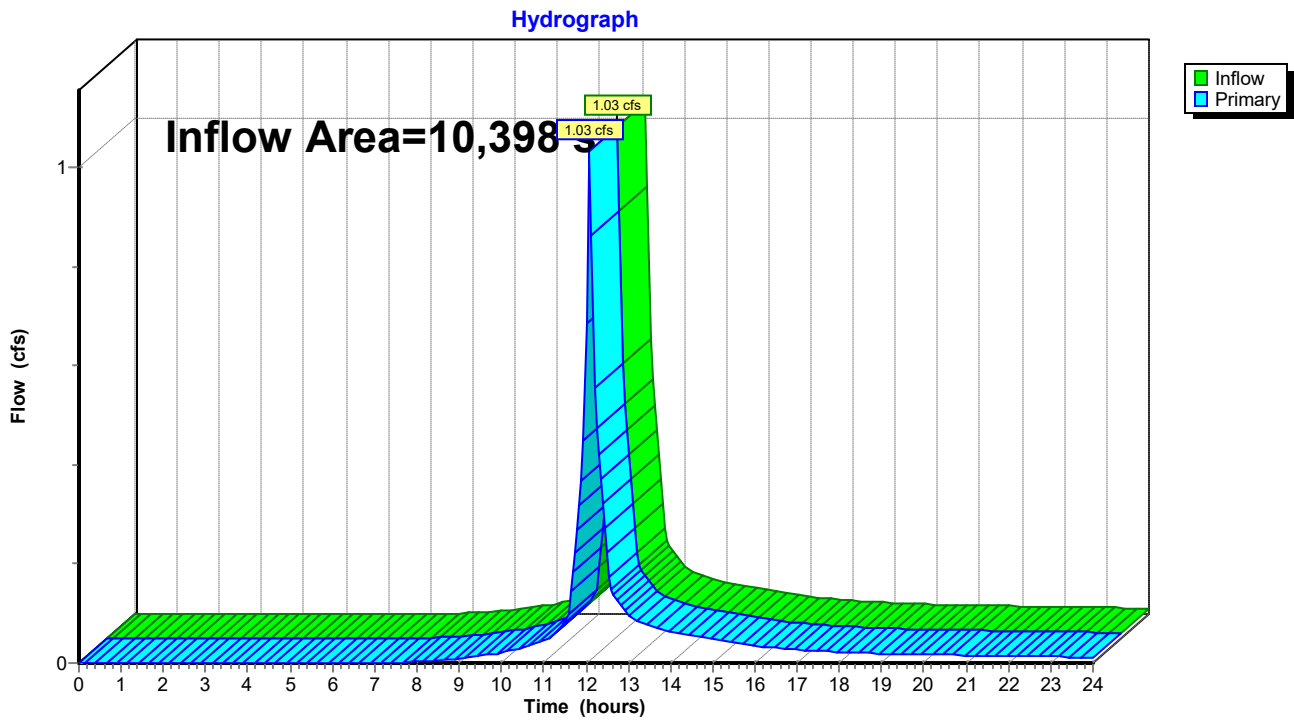
Summary for Pond SP2: SUM POND STREET

DESIGN POINT AT HIGHLAND ROAD

Inflow Area = 10,398 sf, 13.61% Impervious, Inflow Depth > 3.65" for 25 year event
Inflow = 1.03 cfs @ 12.07 hrs, Volume= 3,164 cf
Primary = 1.03 cfs @ 12.07 hrs, Volume= 3,164 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET





RANGER ENGINEERING GROUP, INC.

STORMWATER MANAGEMENT REPORT

POST-DEVELOPMENT DRAINAGE

100 YEAR STORM

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1A: P1A	Runoff Area=3,286 sf 45.25% Impervious Runoff Depth>6.20" Tc=6.0 min CN=85 Runoff=0.52 cfs 1,698 cf
Subcatchment P1B: P1B	Runoff Area=1,506 sf 100.00% Impervious Runoff Depth>7.75" Tc=6.0 min CN=98 Runoff=0.26 cfs 972 cf
Subcatchment P2: P2	Runoff Area=10,398 sf 13.61% Impervious Runoff Depth>5.26" Flow Length=205' Tc=4.9 min CN=77 Runoff=1.48 cfs 4,560 cf
Subcatchment P3: (new Subcat)	Runoff Area=11,734 sf 26.27% Impervious Runoff Depth>5.73" Flow Length=250' Tc=6.2 min CN=81 Runoff=1.73 cfs 5,601 cf
Subcatchment P4A: FLOW TO CB3	Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>7.75" Tc=6.0 min CN=98 Runoff=0.93 cfs 3,408 cf
Subcatchment P4B: FLOW TO CB4	Runoff Area=11,827 sf 59.86% Impervious Runoff Depth>6.67" Tc=6.0 min CN=89 Runoff=1.96 cfs 6,576 cf
Subcatchment P5: P5	Runoff Area=9,084 sf 51.11% Impervious Runoff Depth>6.32" Tc=6.0 min CN=86 Runoff=1.45 cfs 4,782 cf
Subcatchment P6: P6	Runoff Area=40,739 sf 0.00% Impervious Runoff Depth>5.14" Flow Length=300' Tc=7.3 min CN=76 Runoff=5.30 cfs 17,461 cf
Subcatchment P7: FLOW TO POND 3	Runoff Area=14,495 sf 16.87% Impervious Runoff Depth>5.37" Flow Length=180' Tc=14.4 min CN=78 Runoff=1.59 cfs 6,486 cf
Subcatchment P8: AREA AROUND POND 1	Runoff Area=6,584 sf 59.75% Impervious Runoff Depth>6.55" Tc=6.0 min CN=88 Runoff=1.08 cfs 3,596 cf
Subcatchment P9: (new Subcat)	Runoff Area=58,075 sf 0.00% Impervious Runoff Depth>5.14" Flow Length=350' Slope=0.0500 '/' Tc=13.1 min CN=76 Runoff=6.32 cfs 24,864 cf
Subcatchment R1: IOT 1 ROOF	Runoff Area=1,966 sf 100.00% Impervious Runoff Depth>7.75" Tc=6.0 min CN=98 Runoff=0.35 cfs 1,269 cf
Subcatchment R2: LOT 2 ROOF	Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>7.75" Tc=6.0 min CN=98 Runoff=0.40 cfs 1,455 cf
Subcatchment R3: (new Subcat)	Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>7.75" Tc=6.0 min CN=98 Runoff=0.40 cfs 1,455 cf
Reach 1R: CULVERT UNDER DRIVE	Avg. Flow Depth=0.64' Max Vel=6.58 fps Inflow=6.98 cfs 21,585 cf 12.0" Round Pipe x 2.00 n=0.012 L=20.0' S=0.0150 '/' Capacity=9.45 cfs Outflow=6.98 cfs 21,585 cf
Pond 1P: POND 1	Peak Elev=262.36' Storage=7,339 cf Inflow=6.60 cfs 22,334 cf Discarded=0.10 cfs 4,796 cf Primary=3.46 cfs 15,525 cf Outflow=3.56 cfs 20,320 cf

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Pond 2P: POND P2 Peak Elev=262.02' Storage=821 cf Inflow=1.79 cfs 6,051 cf
Discarded=0.02 cfs 1,375 cf Primary=1.68 cfs 4,124 cf Outflow=1.71 cfs 5,500 cf

Pond 3P: POND 3 Peak Elev=264.08' Storage=2,322 cf Inflow=1.84 cfs 7,940 cf
Discarded=0.04 cfs 1,611 cf Primary=1.30 cfs 5,518 cf Outflow=1.34 cfs 7,128 cf

Pond CB1: (new Pond) Peak Elev=262.86' Inflow=0.52 cfs 1,698 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/ Outflow=0.52 cfs 1,698 cf

Pond CB2: CB2 Peak Elev=0.00'
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/ Primary=0.00 cfs 0 cf

Pond CB3: (new Pond) Peak Elev=262.86' Inflow=0.93 cfs 3,408 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0500 '/ Outflow=0.93 cfs 3,408 cf

Pond CB4: CB4 Peak Elev=262.98' Inflow=1.96 cfs 6,576 cf
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/ Outflow=1.96 cfs 6,576 cf

Pond MH1: MH1 Peak Elev=262.86' Inflow=0.52 cfs 1,698 cf
12.0" Round Culvert n=0.013 L=215.0' S=0.0051 '/ Outflow=0.52 cfs 1,698 cf

Pond MH2: MH2 Peak Elev=262.84' Inflow=0.52 cfs 1,698 cf
12.0" Round Culvert n=0.013 L=120.0' S=0.0050 '/ Outflow=0.52 cfs 1,698 cf

Pond MH3: DMH3 Peak Elev=262.82' Inflow=3.40 cfs 11,682 cf
12.0" Round Culvert n=0.013 L=30.0' S=0.0250 '/ Outflow=3.40 cfs 11,682 cf

Pond SP1: SUM POND WOODS Inflow=16.38 cfs 67,491 cf
Primary=16.38 cfs 67,491 cf

Pond SP2: SUM POND STREET Inflow=1.48 cfs 4,560 cf
Primary=1.48 cfs 4,560 cf

Total Runoff Area = 179,482 sf Runoff Volume = 84,182 cf Average Runoff Depth = 5.63"
79.19% Pervious = 142,136 sf 20.81% Impervious = 37,346 sf

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Summary for Subcatchment P1A: P1A

Runoff = 0.52 cfs @ 12.09 hrs, Volume= 1,698 cf, Depth> 6.20"

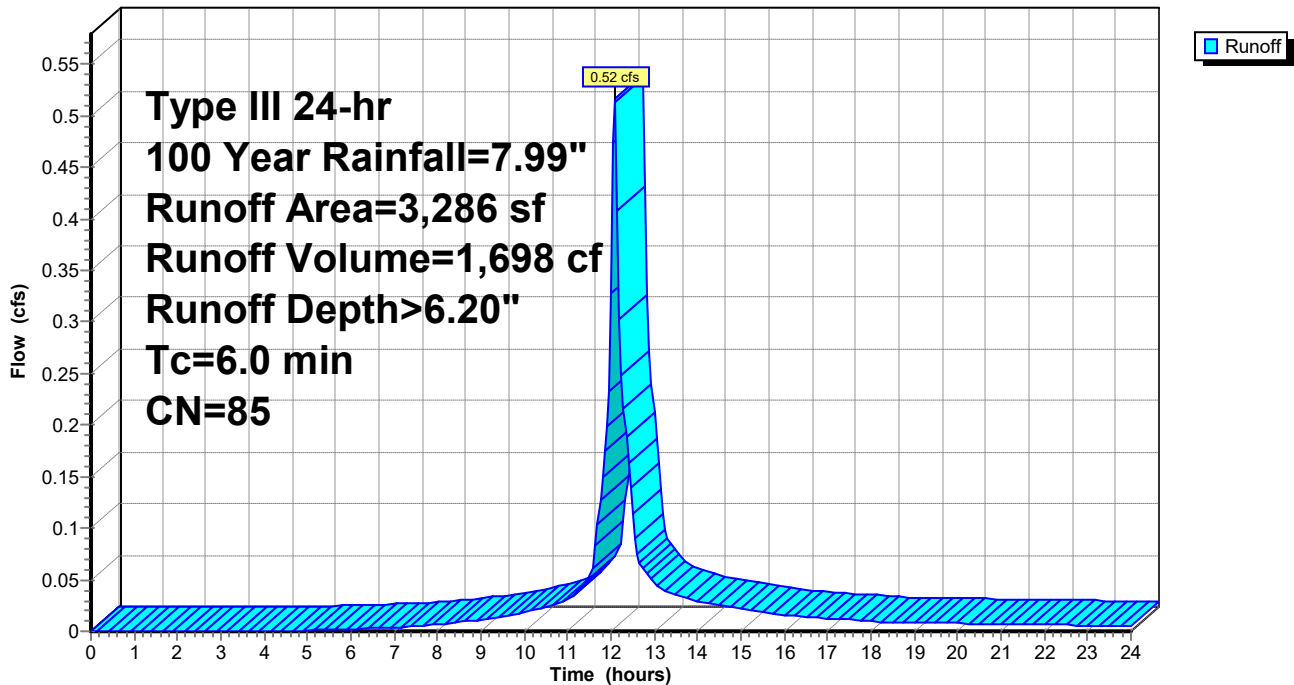
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
1,799	74	>75% Grass cover, Good, HSG C
1,487	98	Paved parking, HSG C
3,286	85	Weighted Average
1,799		54.75% Pervious Area
1,487		45.25% Impervious Area

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

Subcatchment P1A: P1A

Hydrograph



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Summary for Subcatchment P1B: P1B

Runoff = 0.26 cfs @ 12.09 hrs, Volume= 972 cf, Depth> 7.75"

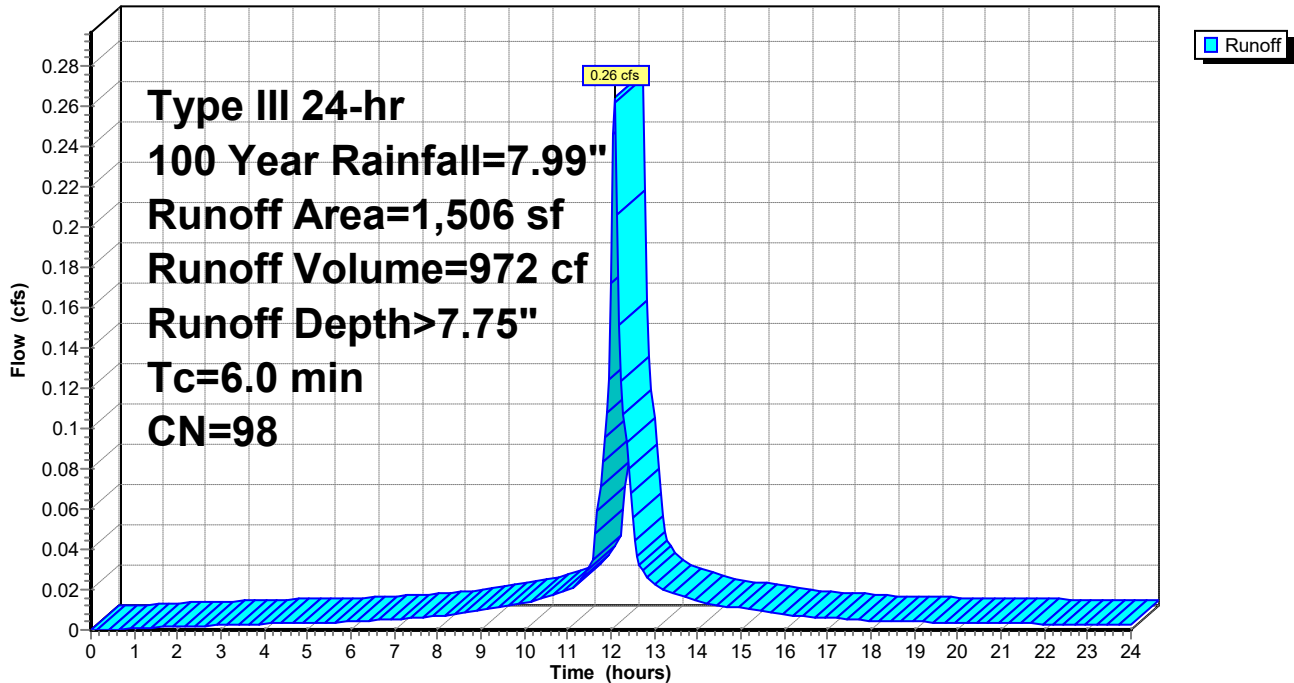
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
1,506	98	Paved parking, HSG C
1,506		100.00% Impervious Area

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

Subcatchment P1B: P1B

Hydrograph



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Summary for Subcatchment P2: P2

Runoff = 1.48 cfs @ 12.07 hrs, Volume= 4,560 cf, Depth> 5.26"

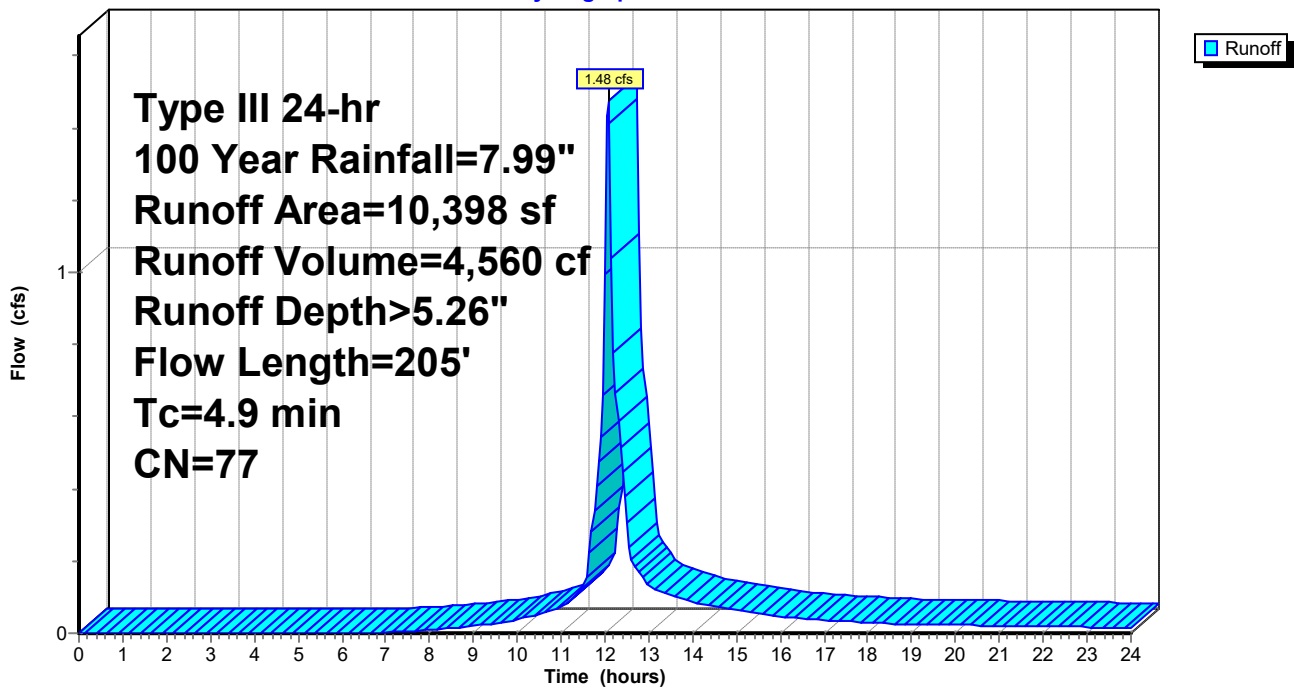
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
8,983	74	>75% Grass cover, Good, HSG C
10,398	77	Weighted Average
8,983		86.39% Pervious Area
1,415		13.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	50	0.0500	0.21		Sheet Flow, flow over grass Grass: Short n= 0.150 P2= 3.18"
0.4	35	0.0420	1.43		Shallow Concentrated Flow, flow over grass Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		Shallow Concentrated Flow, flow along driveway Paved Kv= 20.3 fps
4.9	205	Total			

Subcatchment P2: P2

Hydrograph



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Summary for Subcatchment P3: (new Subcat)

Runoff = 1.73 cfs @ 12.09 hrs, Volume= 5,601 cf, Depth> 5.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
8,359	74	>75% Grass cover, Good, HSG C
125	98	Roofs, HSG C
293	89	Gravel roads, HSG C
1,916	98	Paved parking, HSG C
1,041	98	Water Surface, HSG C
11,734	81	Weighted Average
8,652		73.73% Pervious Area
3,082		26.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		Sheet Flow, FLOW OVER GRASS Grass: Short n= 0.150 P2= 3.18"
1.3	120	0.0500	1.57		Shallow Concentrated Flow, FLOW OVER GRASS Short Grass Pasture Kv= 7.0 fps
0.6	80	0.0125	2.27		Shallow Concentrated Flow, FLOW OVER DRIVEWAY Paved Kv= 20.3 fps
6.2	250	Total			

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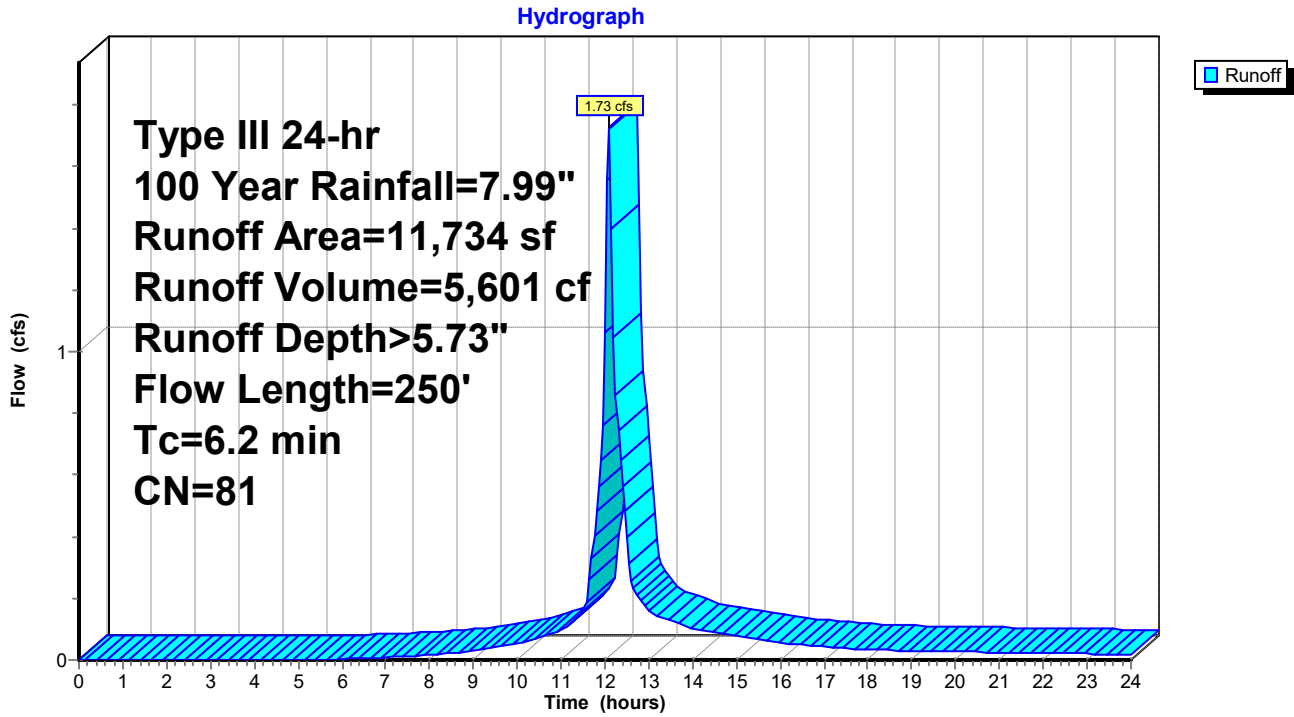
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Subcatchment P3: (new Subcat)



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Summary for Subcatchment P4A: FLOW TO CB3

Runoff = 0.93 cfs @ 12.09 hrs, Volume= 3,408 cf, Depth> 7.75"

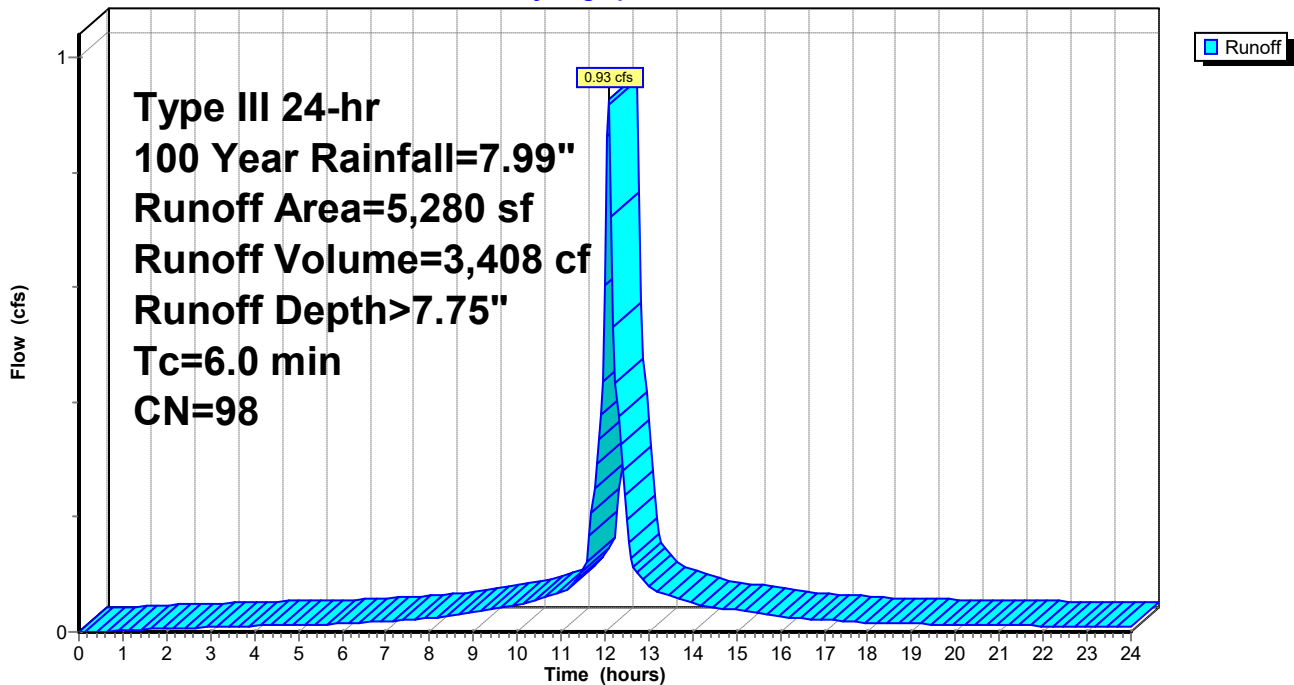
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
5,280	98	Paved parking, HSG C
5,280		100.00% Impervious Area

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

Subcatchment P4A: FLOW TO CB3

Hydrograph



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Summary for Subcatchment P4B: FLOW TO CB4

Runoff = 1.96 cfs @ 12.09 hrs, Volume= 6,576 cf, Depth> 6.67"

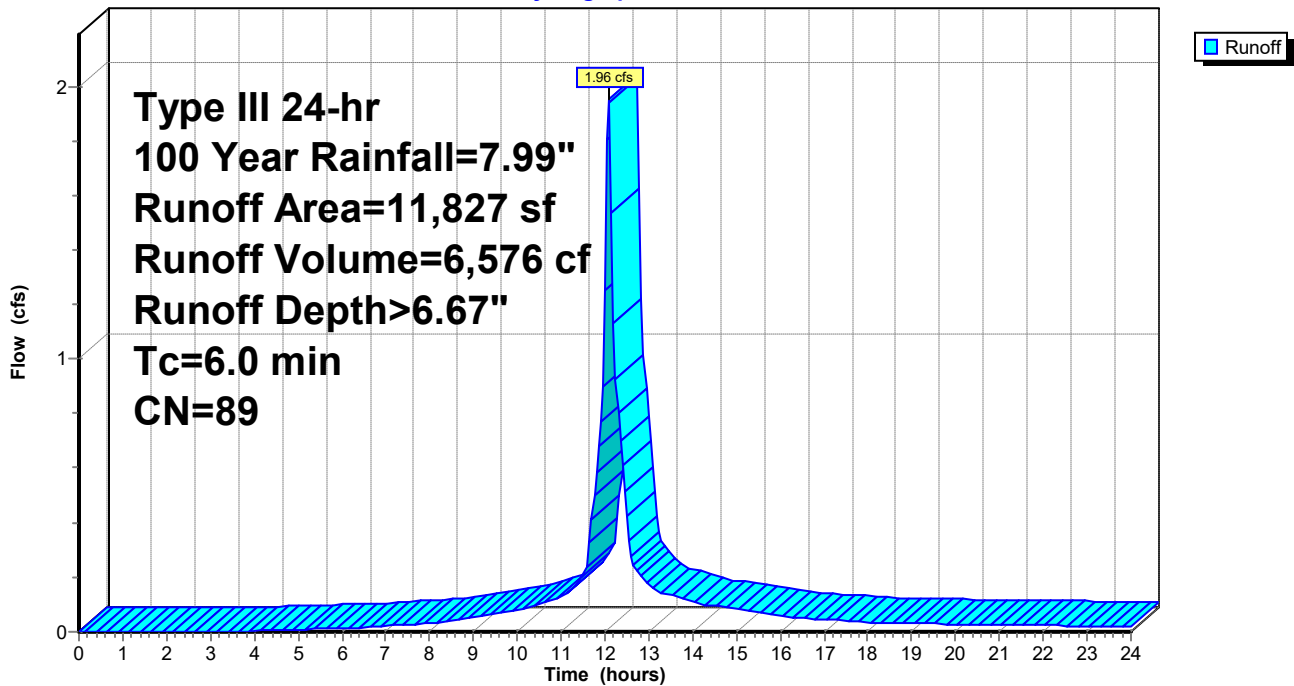
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
7,080	98	Paved parking, HSG C
4,550	74	>75% Grass cover, Good, HSG C
197	89	Gravel roads, HSG C
11,827	89	Weighted Average
4,747		40.14% Pervious Area
7,080		59.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW OVER PAVEMENT TO CB4

Subcatchment P4B: FLOW TO CB4

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Summary for Subcatchment P5: P5

Runoff = 1.45 cfs @ 12.09 hrs, Volume= 4,782 cf, Depth> 6.32"

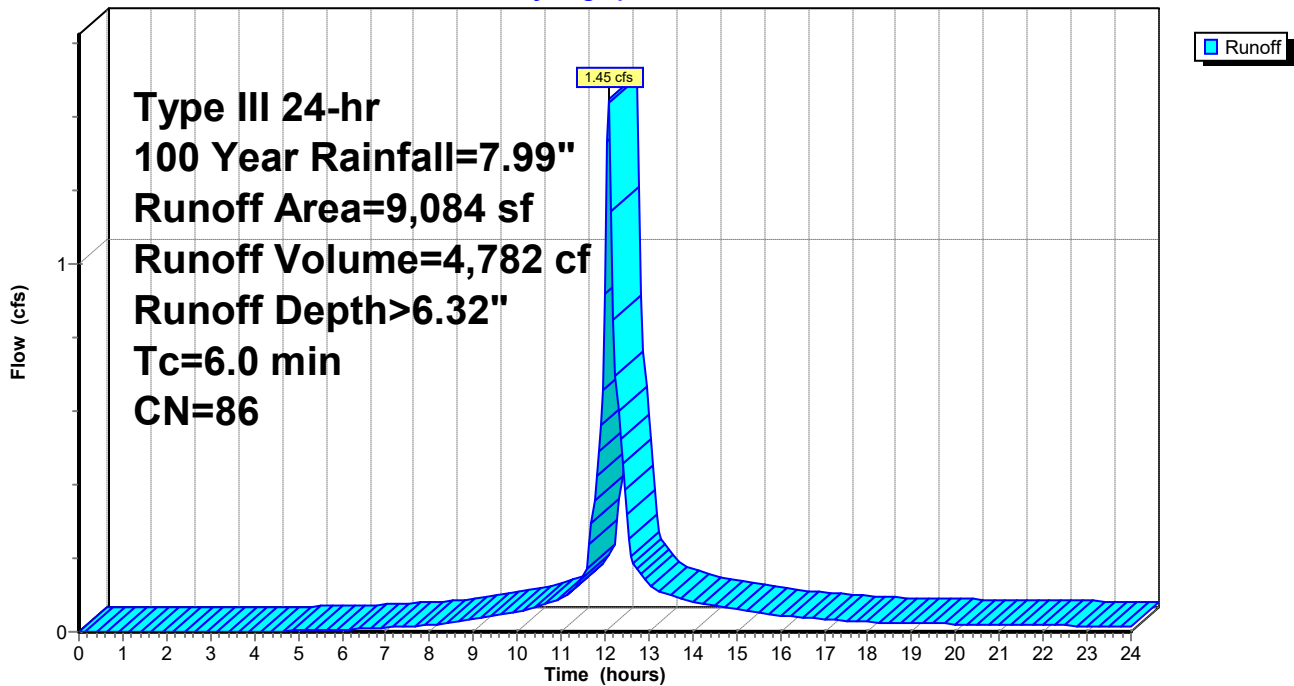
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
4,441	74	>75% Grass cover, Good, HSG C
1,160	98	Water Surface, HSG C
3,483	98	Paved parking, HSG C
9,084	86	Weighted Average
4,441		48.89% Pervious Area
4,643		51.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW TO POND P2

Subcatchment P5: P5

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Summary for Subcatchment P6: P6

Runoff = 5.30 cfs @ 12.11 hrs, Volume= 17,461 cf, Depth> 5.14"

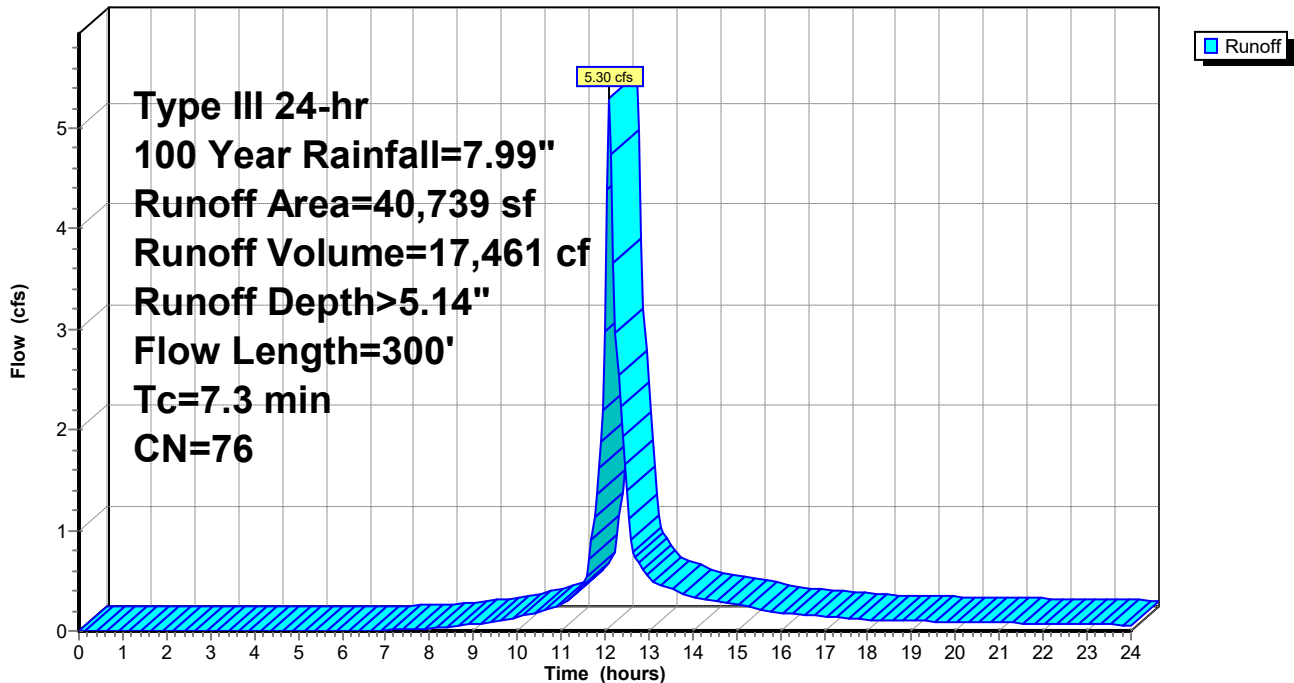
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
33,917	74	>75% Grass cover, Good, HSG C
6,822	83	Woods, Poor, HSG D
40,739	76	Weighted Average
40,739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	50	0.0500	0.21		Sheet Flow, flow over grass Grass: Short n= 0.150 P2= 3.18"
0.3	40	0.1000	2.21		Shallow Concentrated Flow, FLOW OVER GRASS Short Grass Pasture Kv= 7.0 fps
3.1	210	0.0500	1.12		Shallow Concentrated Flow, FLOW THROUGH WOODS Woodland Kv= 5.0 fps
7.3	300	Total			

Subcatchment P6: P6

Hydrograph



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Summary for Subcatchment P7: FLOW TO POND 3

Runoff = 1.59 cfs @ 12.20 hrs, Volume= 6,486 cf, Depth> 5.37"

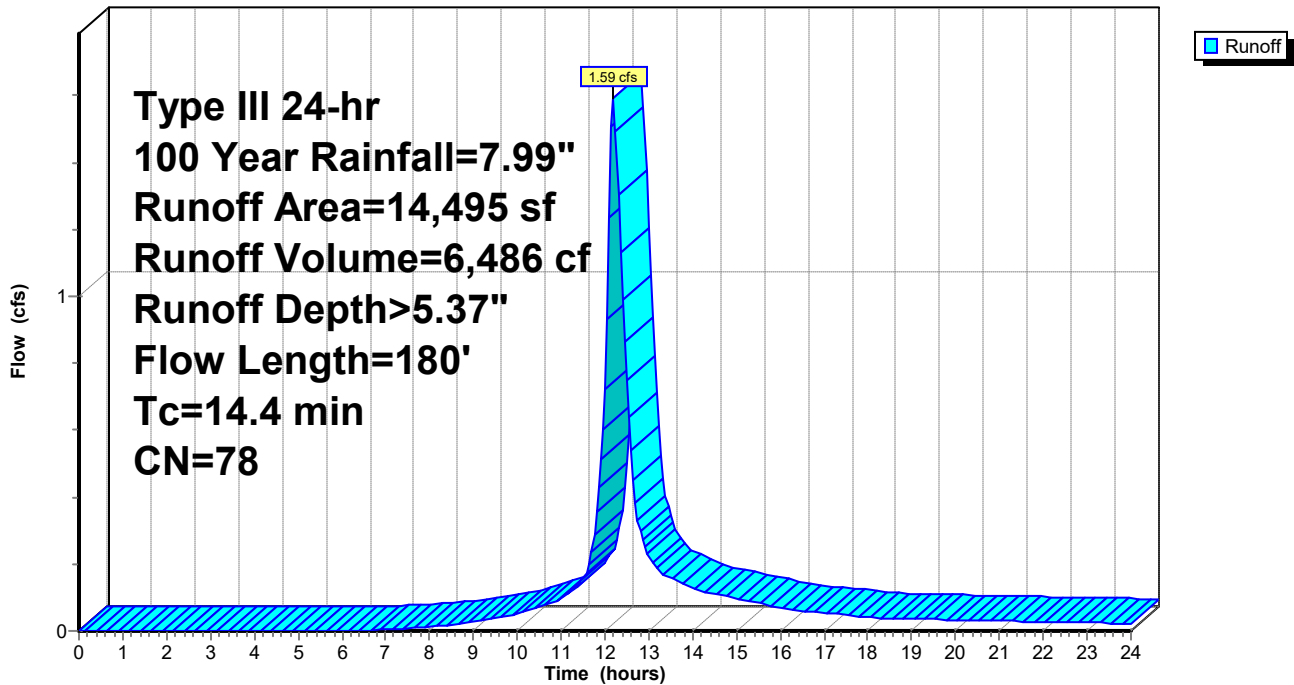
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
12,050	74	>75% Grass cover, Good, HSG C
1,096	98	Paved parking, HSG C
1,349	98	Water Surface, HSG C
14,495	78	Weighted Average
12,050		83.13% Pervious Area
2,445		16.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		Sheet Flow, FLOW IN WOODS Woods: Light underbrush n= 0.400 P2= 3.18"
2.0	130	0.0460	1.07		Shallow Concentrated Flow, FLOW THROUGH WOODS Woodland Kv= 5.0 fps
14.4	180	Total			

Subcatchment P7: FLOW TO POND 3

Hydrograph



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Summary for Subcatchment P8: AREA AROUND POND 1

Runoff = 1.08 cfs @ 12.09 hrs, Volume= 3,596 cf, Depth> 6.55"

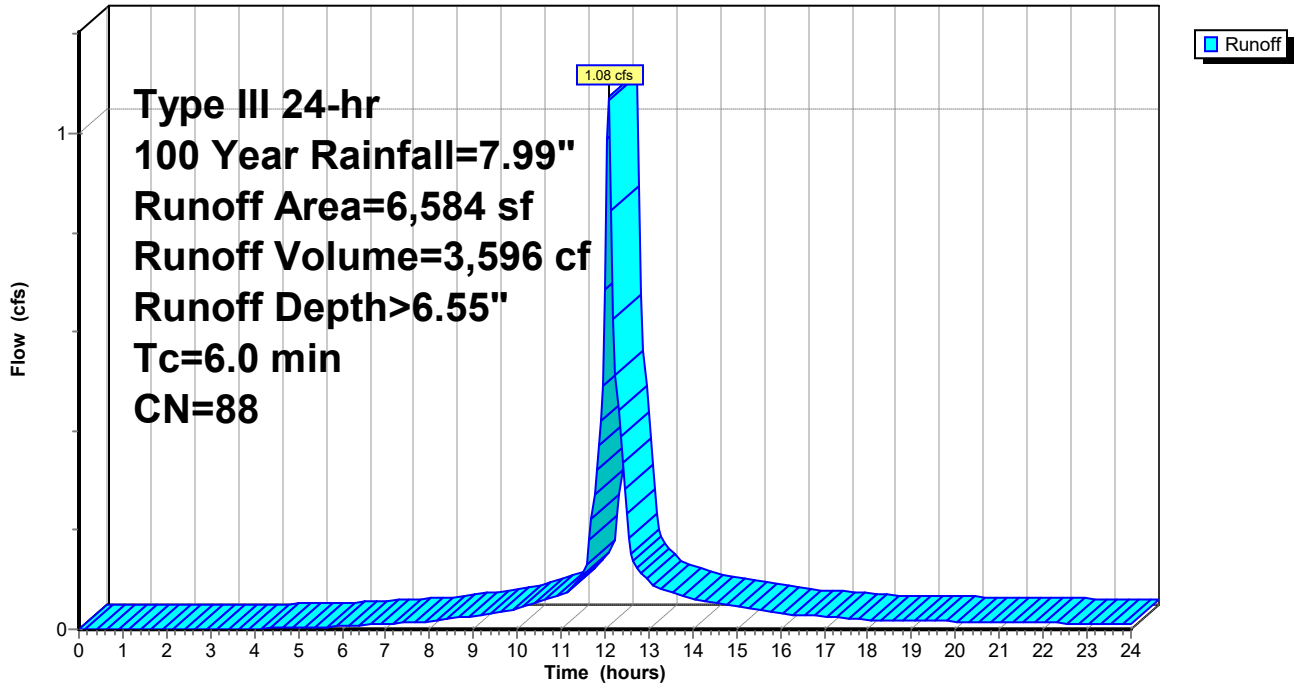
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
2,650	74	>75% Grass cover, Good, HSG C
3,934	98	Water Surface, HSG C
6,584	88	Weighted Average
2,650		40.25% Pervious Area
3,934		59.75% Impervious Area

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

Subcatchment P8: AREA AROUND POND 1

Hydrograph



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Summary for Subcatchment P9: (new Subcat)

Runoff = 6.32 cfs @ 12.18 hrs, Volume= 24,864 cf, Depth> 5.14"

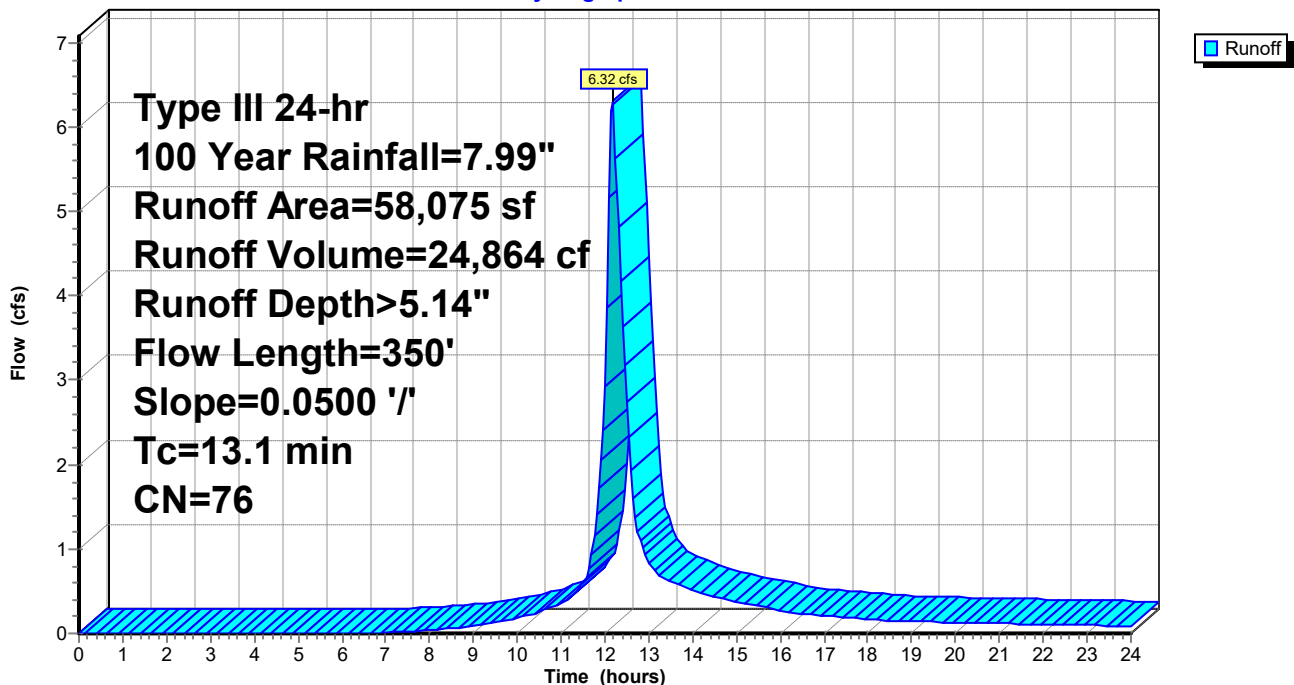
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
23,170	74	>75% Grass cover, Good, HSG C
24,263	70	Woods, Good, HSG C
10,642	94	Fallow, bare soil, HSG D
58,075	76	Weighted Average
58,075		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	50	0.0500	0.10		Sheet Flow, FLOW THROUGH WOODS Woods: Light underbrush n= 0.400 P2= 3.18"
4.5	300	0.0500	1.12		Shallow Concentrated Flow, FLOW THROUGH WOODS Woodland Kv= 5.0 fps
13.1	350	Total			

Subcatchment P9: (new Subcat)

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Summary for Subcatchment R1: IOT 1 ROOF

Runoff = 0.35 cfs @ 12.09 hrs, Volume= 1,269 cf, Depth> 7.75"

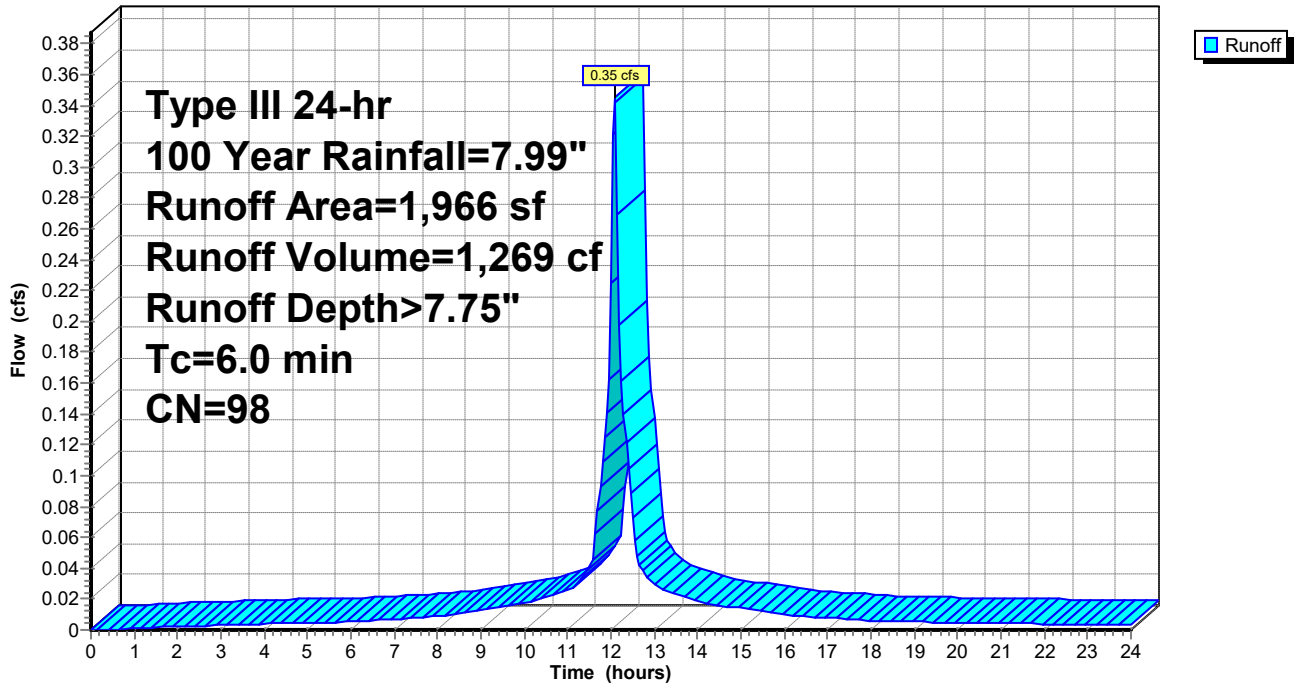
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
1,966	98	Roofs, HSG C
1,966		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW FROM ROOF TO POND

Subcatchment R1: IOT 1 ROOF

Hydrograph



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Summary for Subcatchment R2: LOT 2 ROOF

Runoff = 0.40 cfs @ 12.09 hrs, Volume= 1,455 cf, Depth> 7.75"

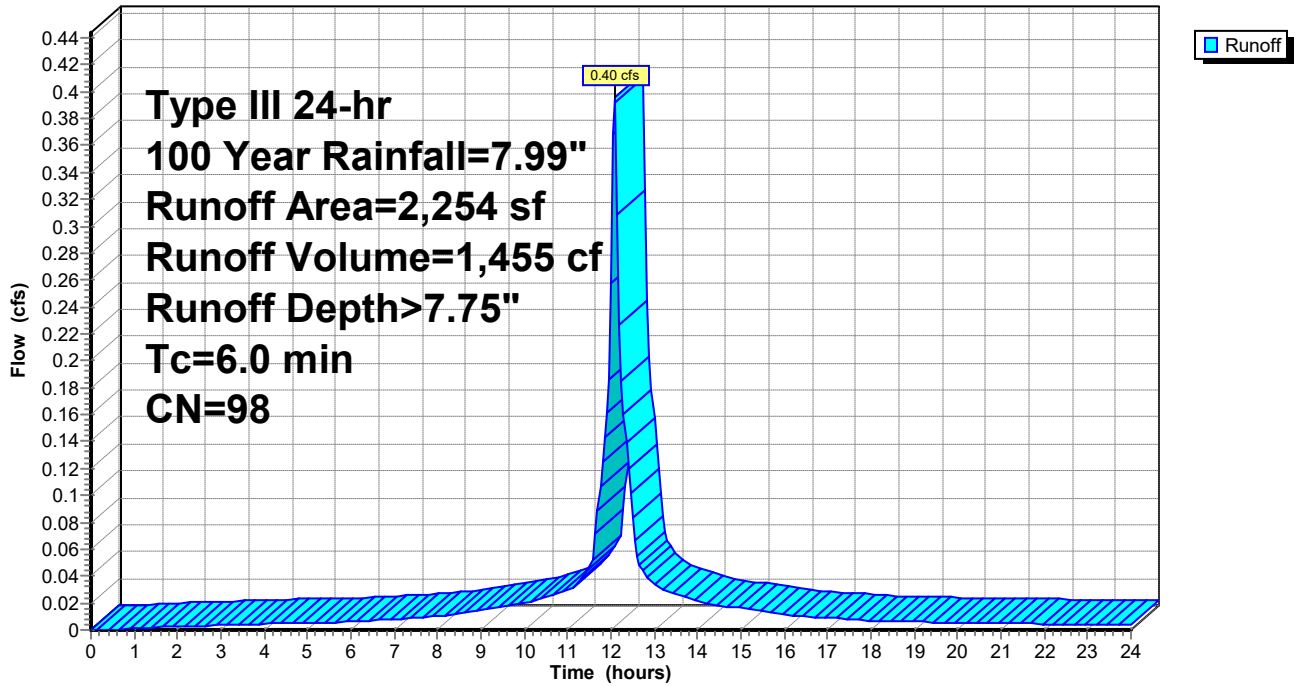
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW IN GUTTERS AND PIPES TO POND 3

Subcatchment R2: LOT 2 ROOF

Hydrograph



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Summary for Subcatchment R3: (new Subcat)

Runoff = 0.40 cfs @ 12.09 hrs, Volume= 1,455 cf, Depth> 7.75"

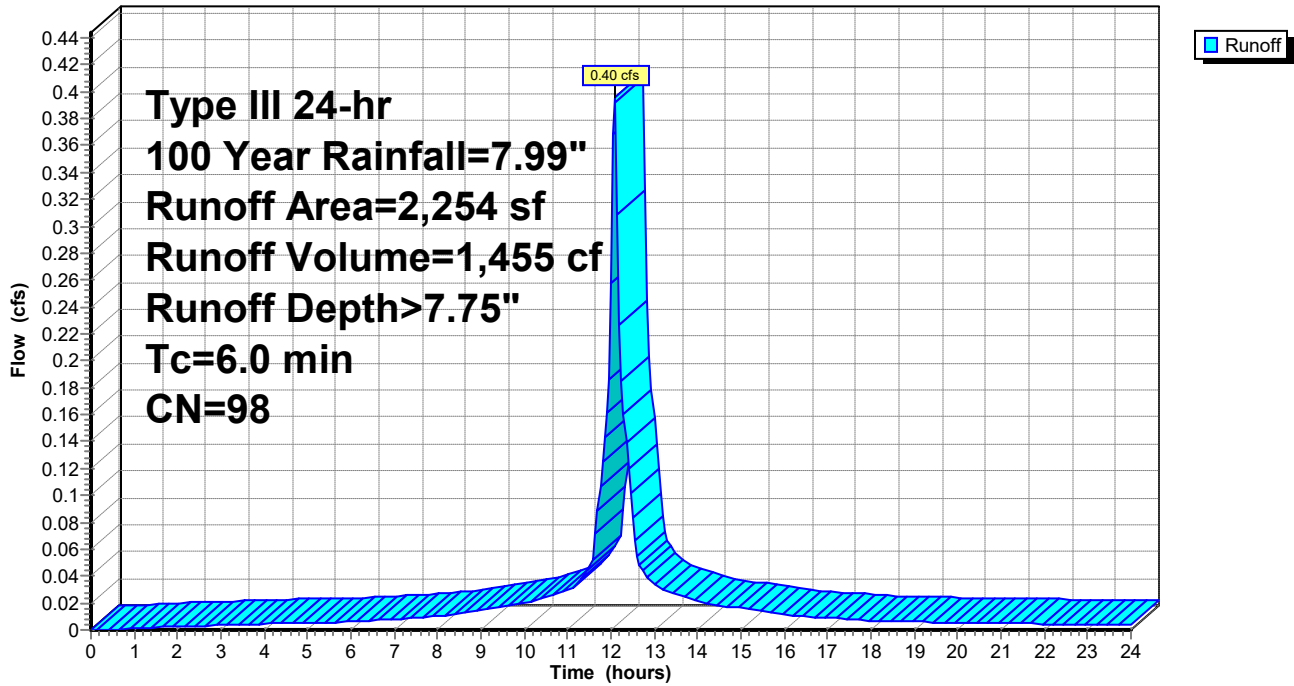
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100 Year Rainfall=7.99"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, FLOW THROUGH GUTTERS TO POND

Subcatchment R3: (new Subcat)

Hydrograph



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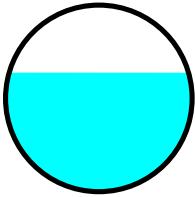
Summary for Reach 1R: CULVERT UNDER DRIVE

Inflow Area = 51,789 sf, 12.76% Impervious, Inflow Depth > 5.00" for 100 Year event
Inflow = 6.98 cfs @ 12.11 hrs, Volume= 21,585 cf
Outflow = 6.98 cfs @ 12.11 hrs, Volume= 21,585 cf, Atten= 0%, Lag= 0.0 min

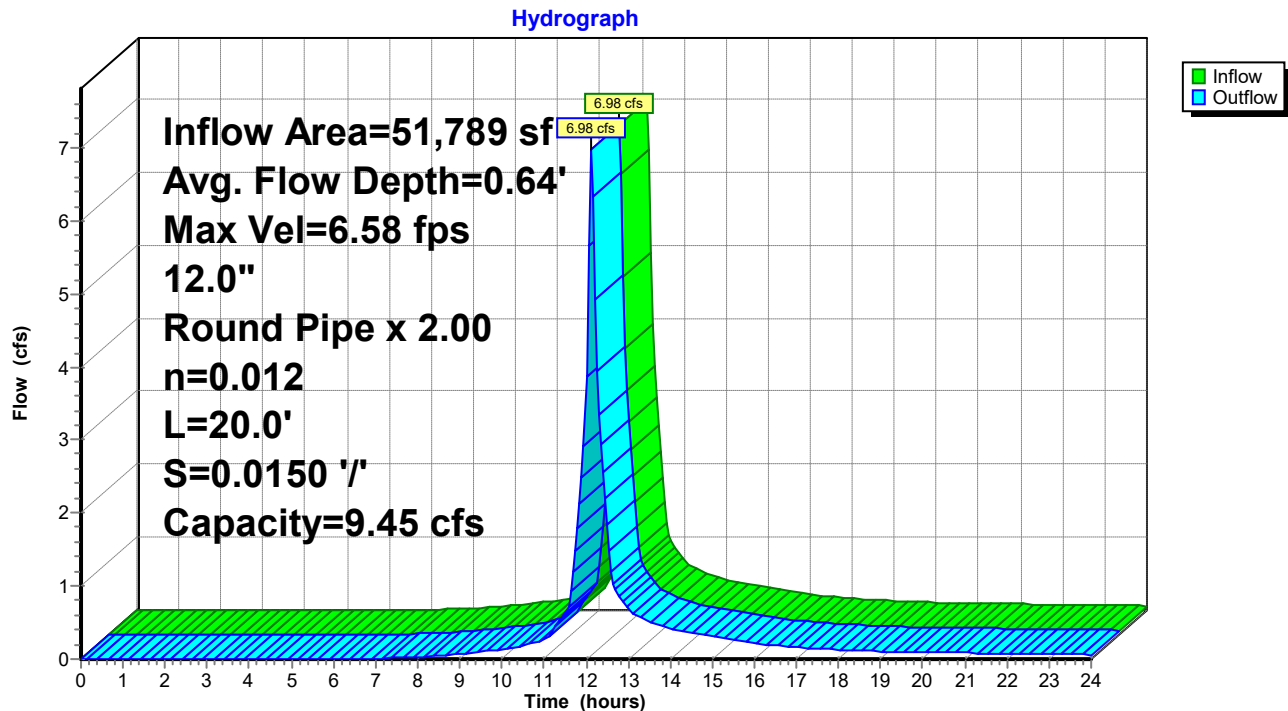
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.58 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.31 fps, Avg. Travel Time= 0.1 min

Peak Storage= 21 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 1.00' Flow Area= 1.6 sf, Capacity= 9.45 cfs

A factor of 2.00 has been applied to the storage and discharge capacity
12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 20.0' Slope= 0.0150 '/'
Inlet Invert= 259.80', Outlet Invert= 259.50'



Reach 1R: CULVERT UNDER DRIVE



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Summary for Pond 1P: POND 1

Inflow Area = 40,965 sf, 56.43% Impervious, Inflow Depth > 6.54" for 100 Year event
 Inflow = 6.60 cfs @ 12.09 hrs, Volume= 22,334 cf
 Outflow = 3.56 cfs @ 12.22 hrs, Volume= 20,320 cf, Atten= 46%, Lag= 8.1 min
 Discarded = 0.10 cfs @ 12.22 hrs, Volume= 4,796 cf
 Primary = 3.46 cfs @ 12.22 hrs, Volume= 15,525 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 262.36' @ 12.22 hrs Surf.Area= 4,162 sf Storage= 7,339 cf
 Flood Elev= 263.00' Surf.Area= 4,790 sf Storage= 10,193 cf

Plug-Flow detention time= 115.0 min calculated for 20,320 cf (91% of inflow)
 Center-of-Mass det. time= 69.6 min (846.7 - 777.2)

Volume	Invert	Avail.Storage	Storage Description			
#1	260.00'	10,193 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
260.00	2,125	260.0	0	0	2,125	
261.00	2,940	282.0	2,521	2,521	3,112	
262.00	3,825	308.0	3,373	5,894	4,368	
263.00	4,790	332.0	4,298	10,193	5,631	

Device	Routing	Invert	Outlet Devices	
#1	Primary	259.00'	12.0" Round Culvert L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.00' / 258.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf	
#2	Device 1	260.75'	4.0" Vert. Orifice/Grate C= 0.600	
#3	Device 1	261.75'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads	
#4	Discarded	260.00'	1.020 in/hr Exfiltration over Surface area	
#5	Primary	262.40'	5.0' long x 8.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74	

Discarded OutFlow Max=0.10 cfs @ 12.22 hrs HW=262.36' (Free Discharge)
 ↳ **4=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=3.45 cfs @ 12.22 hrs HW=262.36' TW=0.00' (Dynamic Tailwater)
 ↳ **1=Culvert** (Passes 3.45 cfs of 6.39 cfs potential flow)
 ↳ **2=Orifice/Grate** (Orifice Controls 0.50 cfs @ 5.78 fps)
 ↳ **3=Orifice/Grate** (Orifice Controls 2.94 cfs @ 3.75 fps)
 ↳ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

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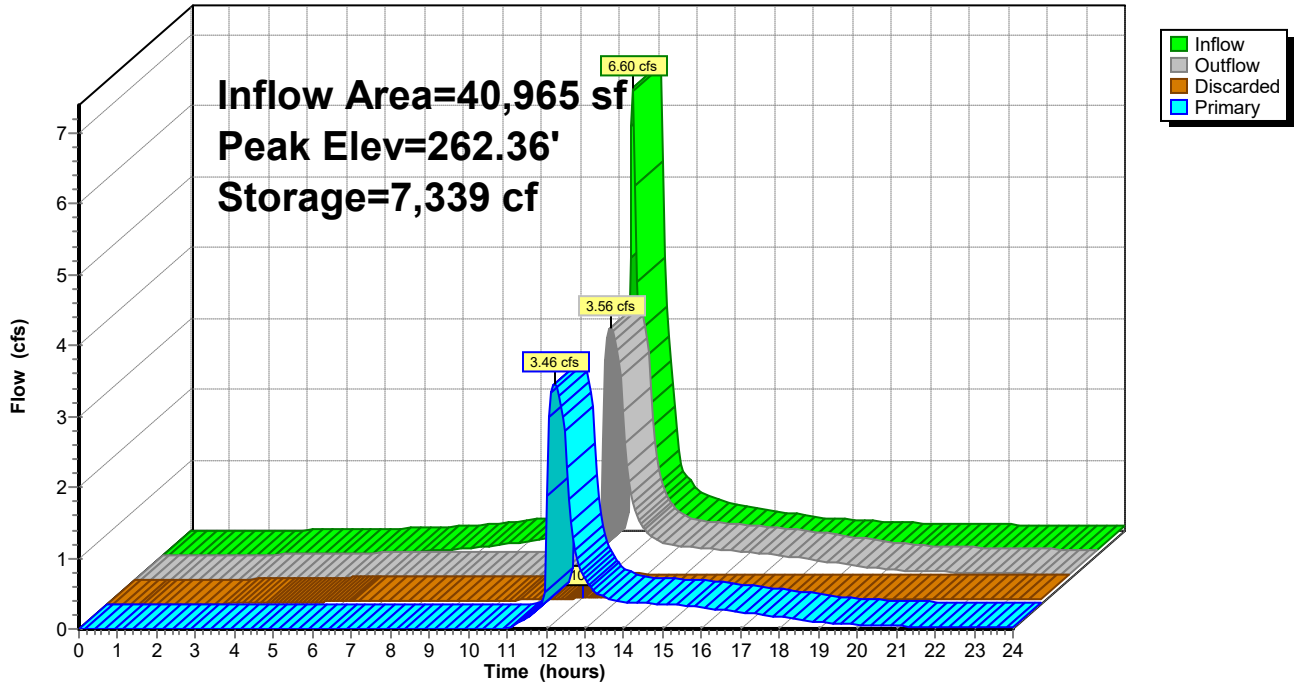
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Pond 1P: POND 1

Hydrograph



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Summary for Pond 2P: POND P2

Inflow Area = 11,050 sf, 59.81% Impervious, Inflow Depth > 6.57" for 100 Year event
 Inflow = 1.79 cfs @ 12.09 hrs, Volume= 6,051 cf
 Outflow = 1.71 cfs @ 12.12 hrs, Volume= 5,500 cf, Atten= 5%, Lag= 1.7 min
 Discarded = 0.02 cfs @ 12.12 hrs, Volume= 1,375 cf
 Primary = 1.68 cfs @ 12.12 hrs, Volume= 4,124 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 262.02' @ 12.12 hrs Surf.Area= 1,008 sf Storage= 821 cf
 Flood Elev= 263.00' Surf.Area= 1,440 sf Storage= 2,014 cf

Plug-Flow detention time= 69.7 min calculated for 5,500 cf (91% of inflow)
 Center-of-Mass det. time= 24.0 min (801.6 - 777.6)

Volume	Invert	Avail.Storage	Storage Description			
#1	261.00'	2,014 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
261.00	616	112.0	0	0	616	
262.00	1,000	139.0	800	800	1,170	
263.00	1,440	158.0	1,213	2,014	1,643	

Device	Routing	Invert	Outlet Devices												
#1	Discarded	261.00'	1.020 in/hr Exfiltration over Surface area												
#2	Primary	261.75'	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir												
			Head (feet)	0.20	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.00		
				2.50	3.00	3.50	4.00	4.50	5.00	5.50					
			Coef. (English)	2.34	2.50	2.70	2.68	2.68	2.66	2.65	2.65	2.65			
				2.65	2.67	2.66	2.68	2.70	2.74	2.79	2.88				

Discarded OutFlow Max=0.02 cfs @ 12.12 hrs HW=262.02' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.64 cfs @ 12.12 hrs HW=262.02' TW=260.43' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 1.64 cfs @ 1.23 fps)

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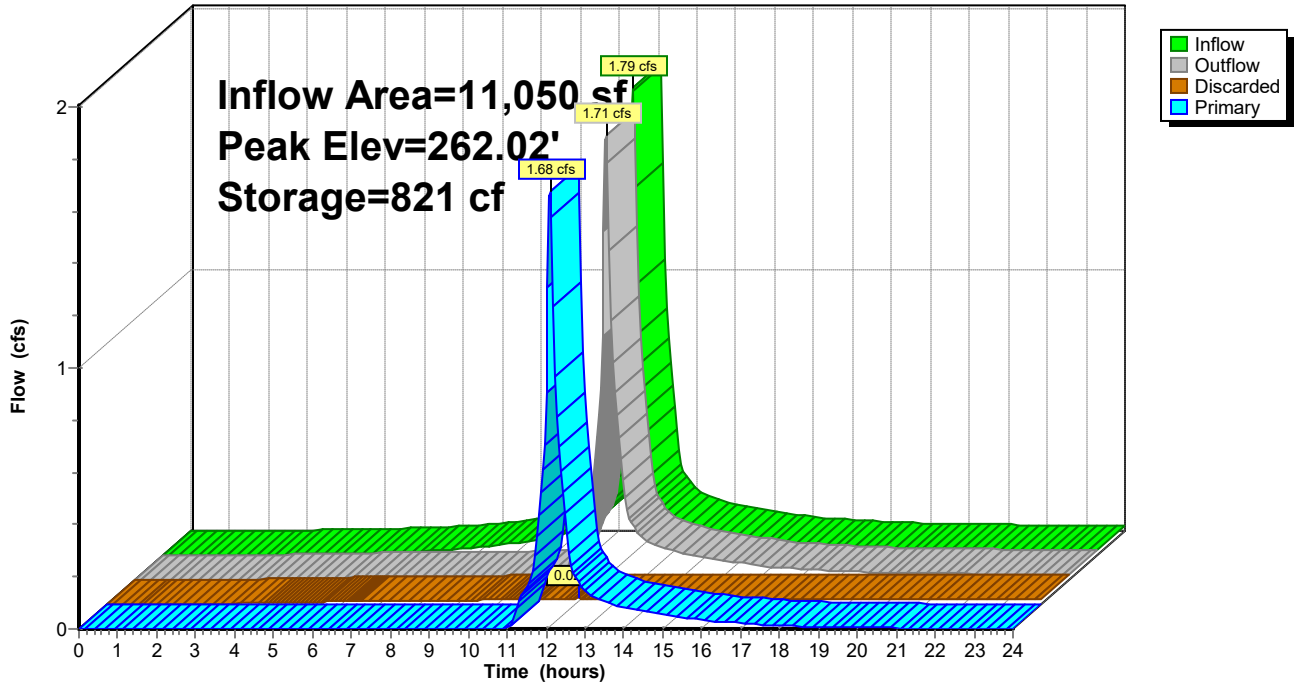
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Pond 2P: POND P2

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Summary for Pond 3P: POND 3

Inflow Area = 16,749 sf, 28.06% Impervious, Inflow Depth > 5.69" for 100 Year event
 Inflow = 1.84 cfs @ 12.18 hrs, Volume= 7,940 cf
 Outflow = 1.34 cfs @ 12.35 hrs, Volume= 7,128 cf, Atten= 27%, Lag= 10.1 min
 Discarded = 0.04 cfs @ 12.35 hrs, Volume= 1,611 cf
 Primary = 1.30 cfs @ 12.35 hrs, Volume= 5,518 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 264.08' @ 12.35 hrs Surf.Area= 1,801 sf Storage= 2,322 cf
 Flood Elev= 265.00' Surf.Area= 2,460 sf Storage= 4,264 cf

Plug-Flow detention time= 89.0 min calculated for 7,113 cf (90% of inflow)
 Center-of-Mass det. time= 40.3 min (840.8 - 800.5)

Volume	Invert	Avail.Storage	Storage Description			
#1	262.00'	4,264 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
262.00	541	176.0	0	0	541	
264.00	1,745	219.0	2,172	2,172	1,949	
265.00	2,460	250.0	2,092	4,264	3,130	

Device	Routing	Invert	Outlet Devices		
#1	Primary	263.00'	12.0" Round Culvert L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 263.00' / 260.00' S= 0.1500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf		
#2	Discarded	262.00'	1.020 in/hr Exfiltration over Surface area		
#3	Device 1	263.00'	4.0" Vert. Orifice/Grate	C= 0.600	
#4	Device 1	262.50'	3.0" Vert. Orifice/Grate	C= 0.600	
#5	Device 1	264.00'	24.0" x 24.0" Horiz. Orifice/Grate	C= 0.600	Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.35 hrs HW=264.08' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=1.29 cfs @ 12.35 hrs HW=264.08' TW=0.00' (Dynamic Tailwater)
 ↳ **1=Culvert** (Passes 1.29 cfs of 2.89 cfs potential flow)
 ↳ **3=Orifice/Grate** (Orifice Controls 0.40 cfs @ 4.61 fps)
 ↳ **4=Orifice/Grate** (Orifice Controls 0.25 cfs @ 5.01 fps)
 ↳ **5=Orifice/Grate** (Weir Controls 0.64 cfs @ 0.95 fps)

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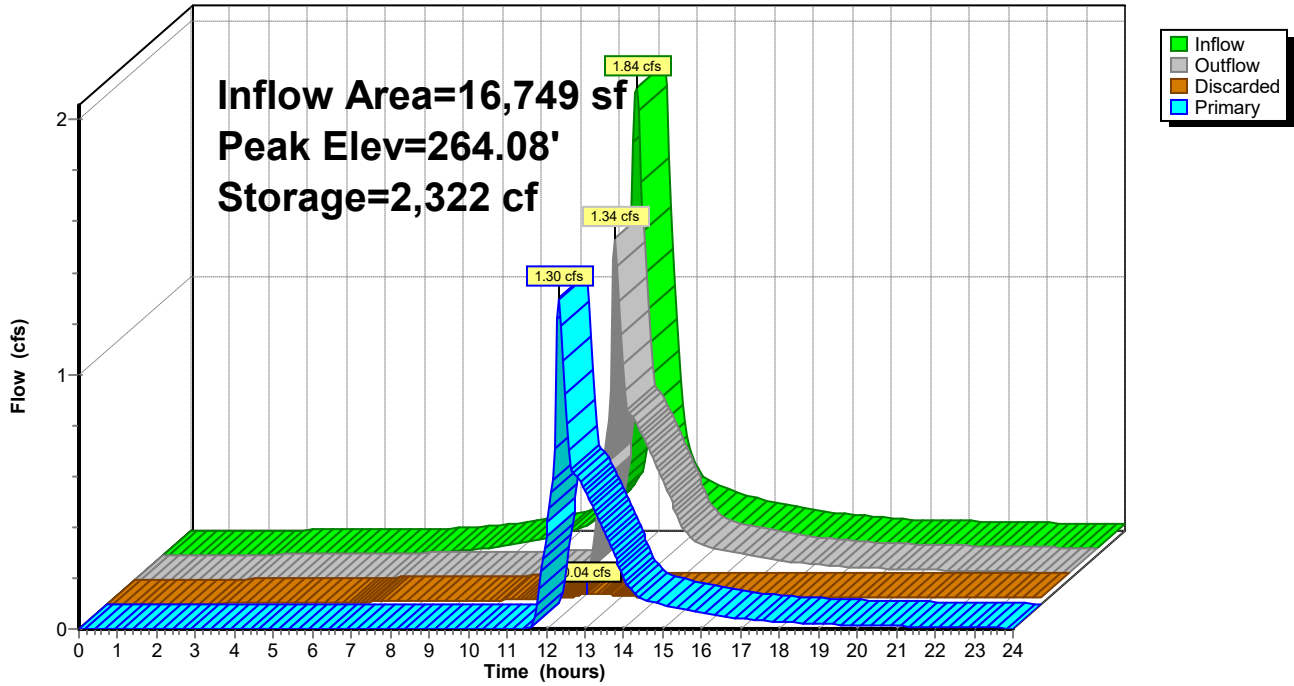
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Pond 3P: POND 3

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Summary for Pond CB1: (new Pond)

Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 6.20" for 100 Year event
 Inflow = 0.52 cfs @ 12.09 hrs, Volume= 1,698 cf
 Outflow = 0.52 cfs @ 12.09 hrs, Volume= 1,698 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.52 cfs @ 12.09 hrs, Volume= 1,698 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.86' @ 12.26 hrs

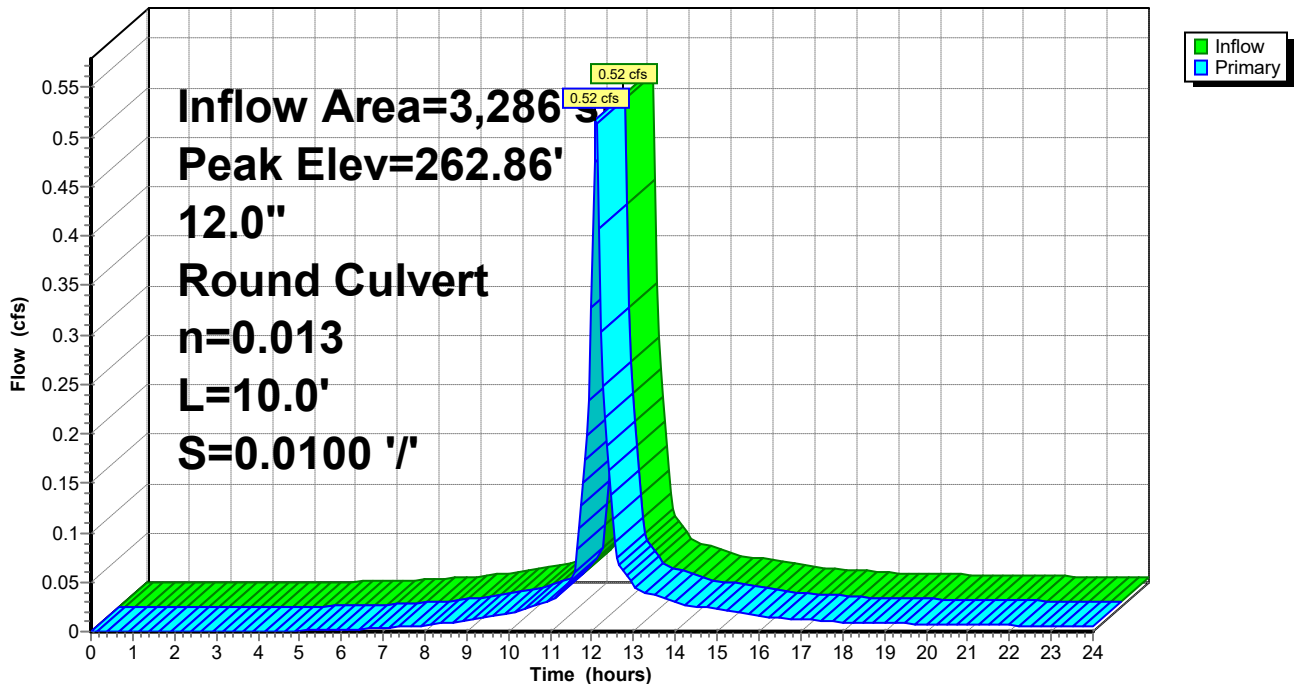
Flood Elev= 264.40'

Device #	Routing	Invert	Outlet Devices
#1	Primary	261.90'	12.0" Round Culvert L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.26 cfs @ 12.09 hrs HW=262.34' TW=262.30' (Dynamic Tailwater)
 ←1=Culvert (Outlet Controls 0.26 cfs @ 1.17 fps)

Pond CB1: (new Pond)

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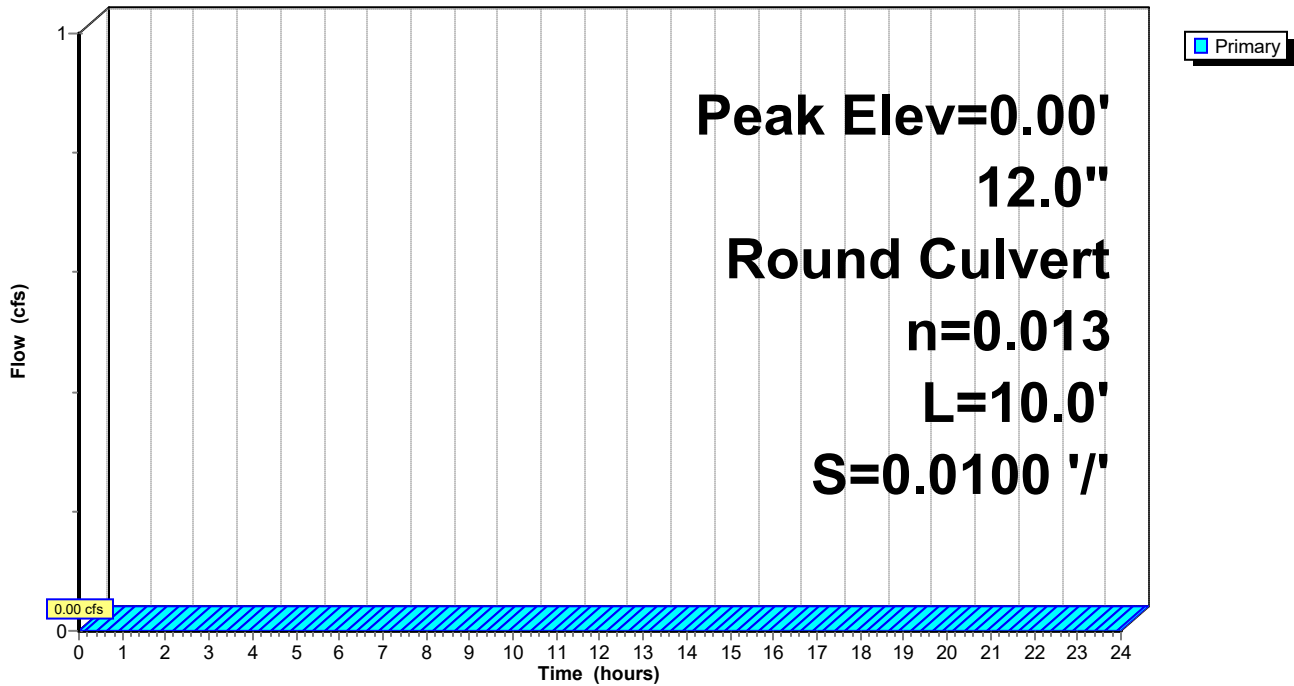
Summary for Pond CB2: CB2

Device	Routing	Invert	Outlet Devices
#1	Primary	261.90'	12.0" Round Culvert L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=261.70' (Dynamic Tailwater)
↑1=Culvert (Controls 0.00 cfs)

Pond CB2: CB2

Hydrograph



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Summary for Pond CB3: (new Pond)

Inflow Area = 5,280 sf, 100.00% Impervious, Inflow Depth > 7.75" for 100 Year event
Inflow = 0.93 cfs @ 12.09 hrs, Volume= 3,408 cf
Outflow = 0.93 cfs @ 12.09 hrs, Volume= 3,408 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.93 cfs @ 12.09 hrs, Volume= 3,408 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.86' @ 12.16 hrs

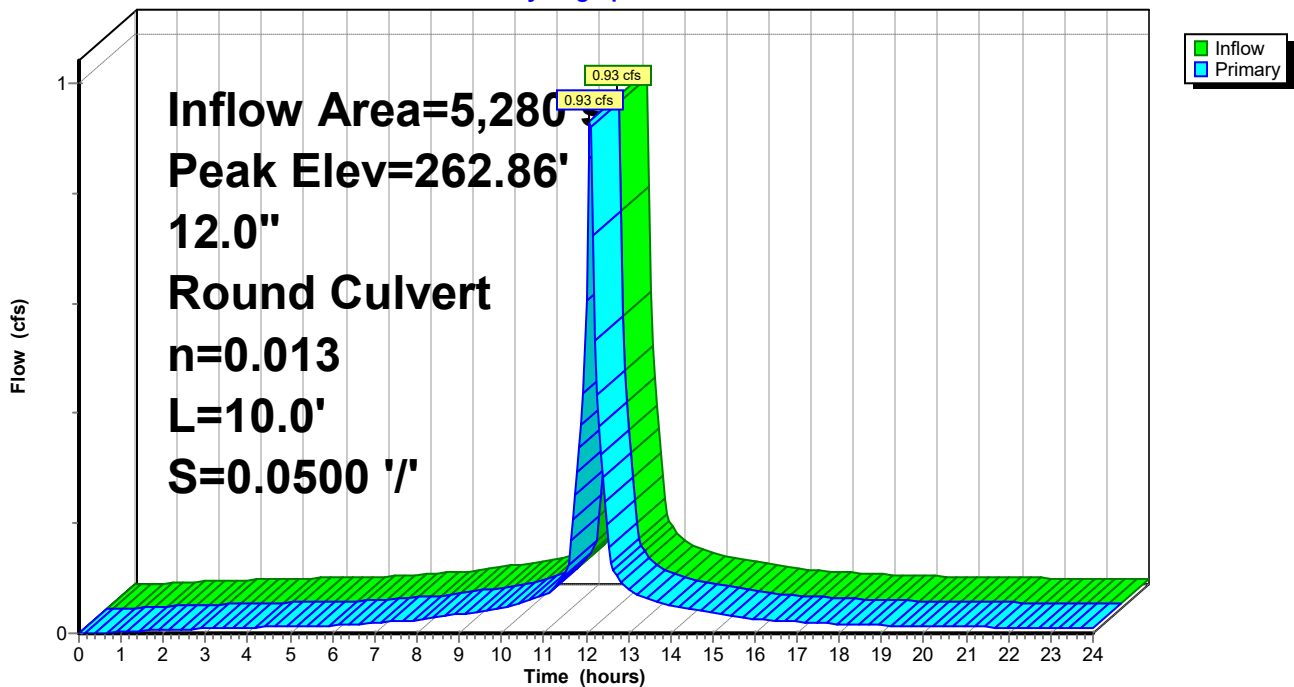
Flood Elev= 263.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.50'	12.0" Round Culvert L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0500 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=262.45' TW=262.74' (Dynamic Tailwater)
↑1=Culvert (Controls 0.00 cfs)

Pond CB3: (new Pond)

Hydrograph



SELLERS FARM POST DEVELOPMENT

Prepared by Ranger Engineering Group, Inc..

HydroCAD® 10.00-22 s/n 02248 © 2018 HydroCAD Software Solutions LLC

SELLERS FARM ROAD POST 3/2/22
Type III 24-hr 100 Year Rainfall=7.99"

Printed 3/2/2022

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Summary for Pond CB4: CB4

Inflow Area = 11,827 sf, 59.86% Impervious, Inflow Depth > 6.67" for 100 Year event
Inflow = 1.96 cfs @ 12.09 hrs, Volume= 6,576 cf
Outflow = 1.96 cfs @ 12.09 hrs, Volume= 6,576 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.96 cfs @ 12.09 hrs, Volume= 6,576 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.98' @ 12.15 hrs

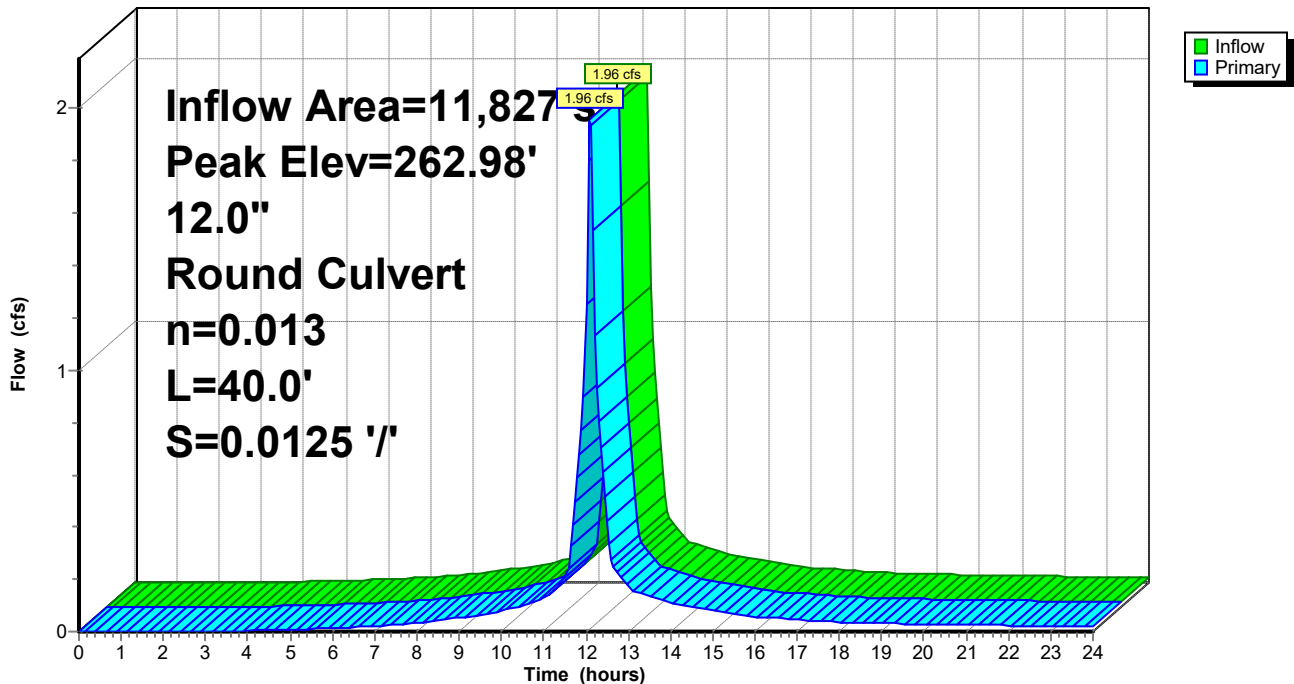
Flood Elev= 263.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.50'	12.0" Round Culvert L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=262.66' TW=262.74' (Dynamic Tailwater)
↑1=Culvert (Controls 0.00 cfs)

Pond CB4: CB4

Hydrograph



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Summary for Pond MH1: MH1

Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 6.20" for 100 Year event
Inflow = 0.52 cfs @ 12.09 hrs, Volume= 1,698 cf
Outflow = 0.52 cfs @ 12.09 hrs, Volume= 1,698 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.52 cfs @ 12.09 hrs, Volume= 1,698 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.86' @ 12.21 hrs

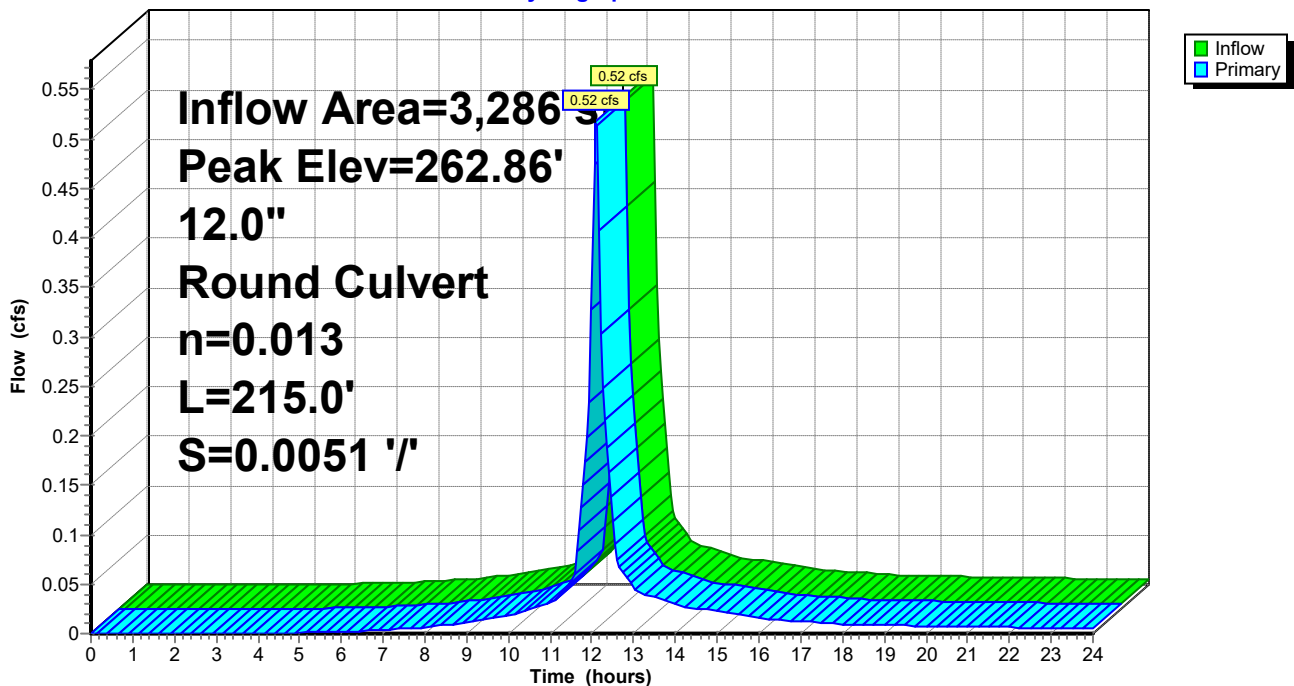
Flood Elev= 265.00'

Device #	Routing	Invert	Outlet Devices
#1	Primary	261.70'	12.0" Round Culvert L= 215.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.70' / 260.60' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=262.30' TW=262.45' (Dynamic Tailwater)
↑1=Culvert (Controls 0.00 cfs)

Pond MH1: MH1

Hydrograph



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SELLERS FARM ROAD POST 3/2/22
 Type III 24-hr 100 Year Rainfall=7.99"

Printed 3/2/2022

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Summary for Pond MH2: MH2

Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 6.20" for 100 Year event
 Inflow = 0.52 cfs @ 12.09 hrs, Volume= 1,698 cf
 Outflow = 0.52 cfs @ 12.09 hrs, Volume= 1,698 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.52 cfs @ 12.09 hrs, Volume= 1,698 cf

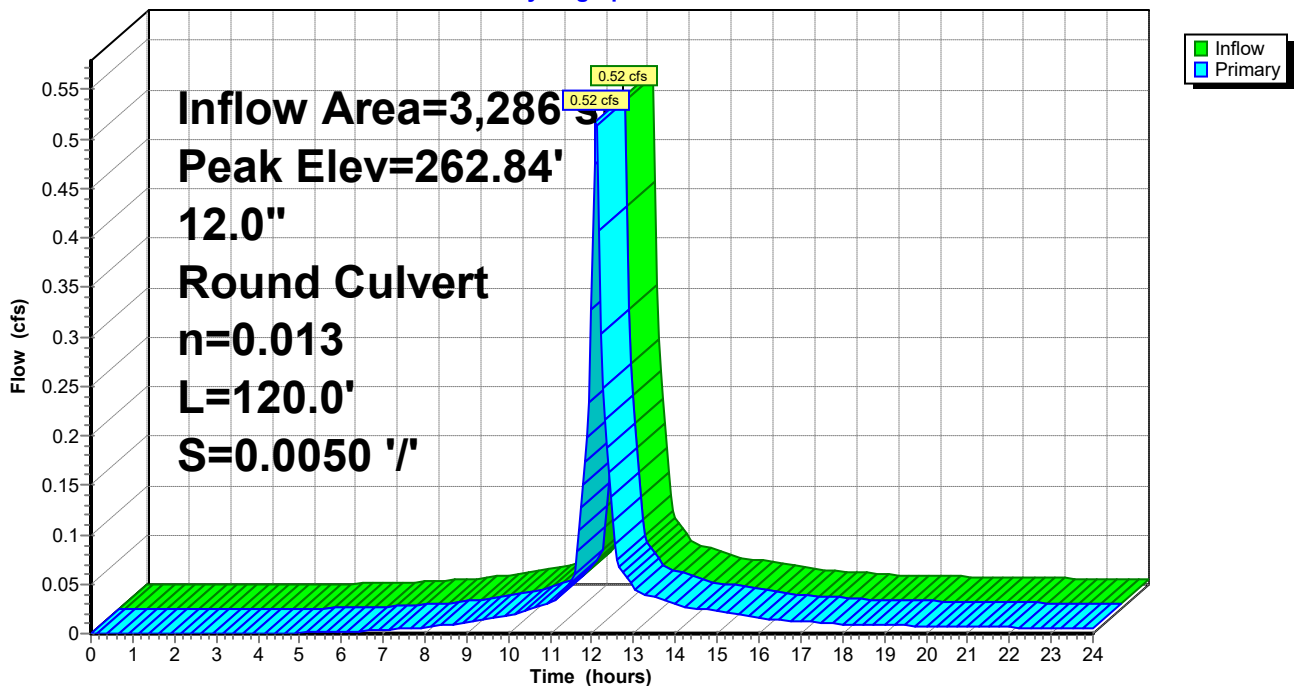
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 262.84' @ 12.16 hrs
 Flood Elev= 269.75'

Device #	Routing	Invert	Outlet Devices
#1	Primary	260.60'	12.0" Round Culvert L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.60' / 260.00' S= 0.0050 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=262.45' TW=262.75' (Dynamic Tailwater)
 ↑1=Culvert (Controls 0.00 cfs)

Pond MH2: MH2

Hydrograph



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SELLERS FARM ROAD POST 3/2/22
Type III 24-hr 100 Year Rainfall=7.99"

Printed 3/2/2022

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Summary for Pond MH3: DMH3

Inflow Area = 20,393 sf, 67.90% Impervious, Inflow Depth > 6.87" for 100 Year event
Inflow = 3.40 cfs @ 12.09 hrs, Volume= 11,682 cf
Outflow = 3.40 cfs @ 12.09 hrs, Volume= 11,682 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.40 cfs @ 12.09 hrs, Volume= 11,682 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 262.82' @ 12.11 hrs

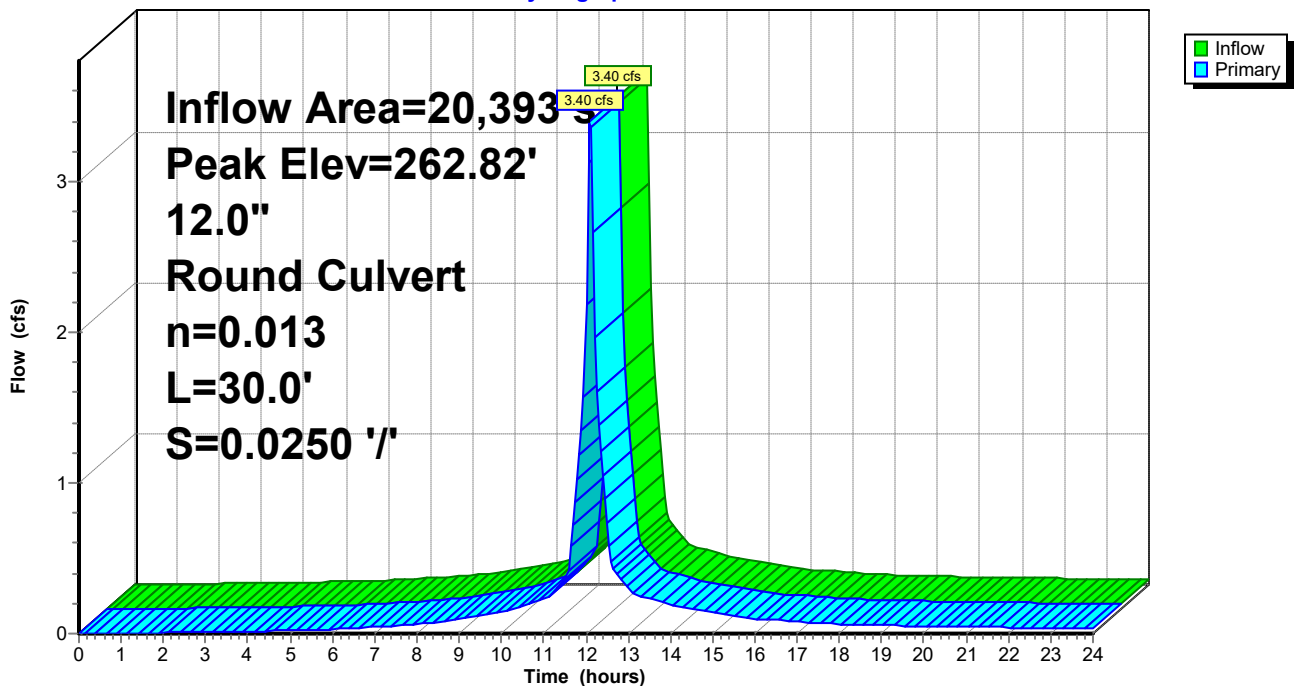
Flood Elev= 263.60'

Device #	Routing	Invert	Outlet Devices
1	Primary	259.75'	12.0" Round Culvert L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.75' / 259.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.91 cfs @ 12.09 hrs HW=262.74' TW=262.15' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 2.91 cfs @ 3.71 fps)

Pond MH3: DMH3

Hydrograph



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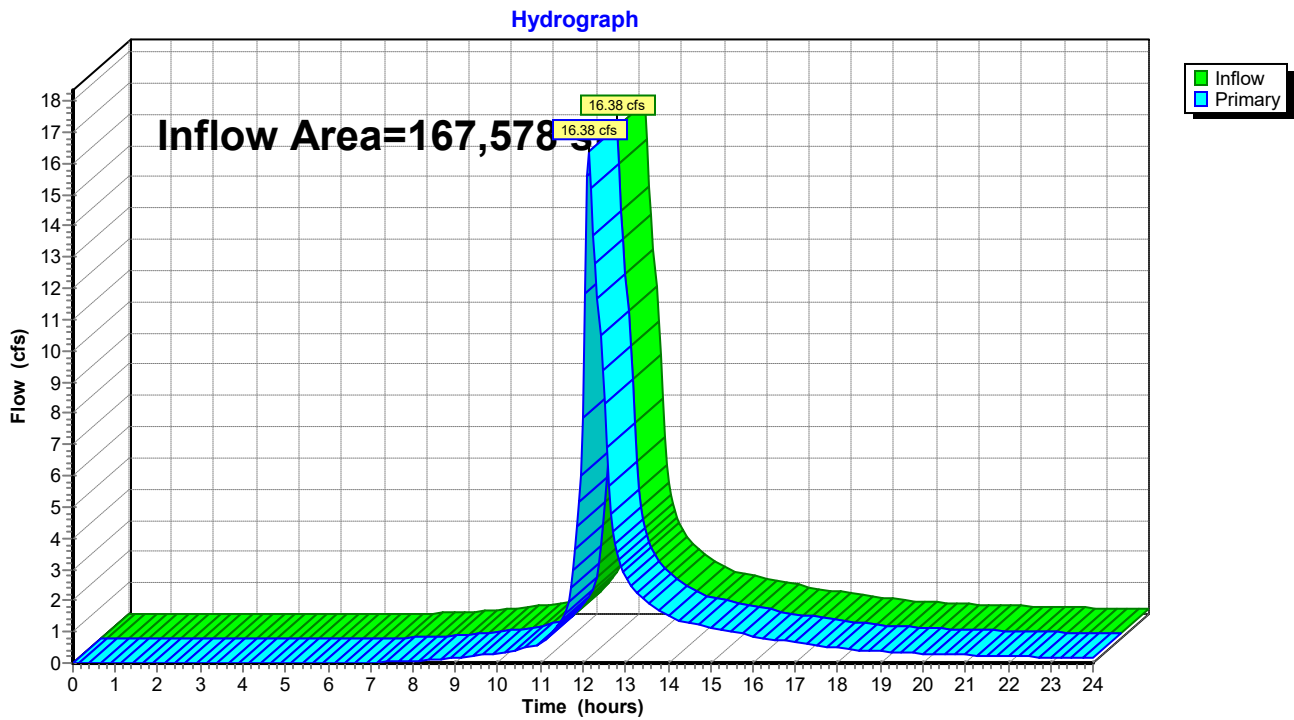
Summary for Pond SP1: SUM POND WOODS

DESIGN POINT AT REAR PROPERTY LINE

Inflow Area = 167,578 sf, 20.54% Impervious, Inflow Depth > 4.83" for 100 Year event
Inflow = 16.38 cfs @ 12.15 hrs, Volume= 67,491 cf
Primary = 16.38 cfs @ 12.15 hrs, Volume= 67,491 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: SUM POND WOODS



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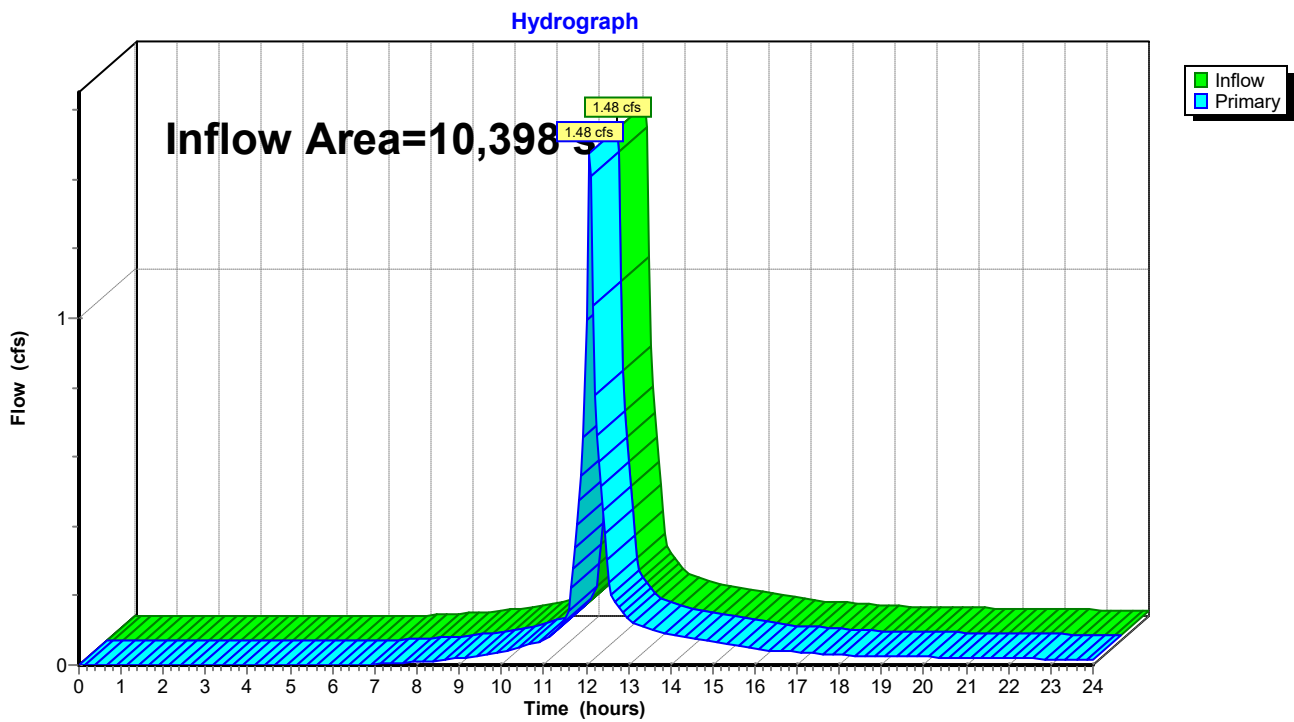
Summary for Pond SP2: SUM POND STREET

DESIGN POINT AT HIGHLAND ROAD

Inflow Area = 10,398 sf, 13.61% Impervious, Inflow Depth > 5.26" for 100 Year event
Inflow = 1.48 cfs @ 12.07 hrs, Volume= 4,560 cf
Primary = 1.48 cfs @ 12.07 hrs, Volume= 4,560 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET



USGS Precipitation Table



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.311 (0.244-0.384)	0.371 (0.291-0.460)	0.470 (0.367-0.585)	0.553 (0.429-0.690)	0.666 (0.500-0.870)	0.751 (0.553-1.00)	0.840 (0.599-1.16)	0.940 (0.634-1.33)	1.08 (0.702-1.59)	1.20 (0.760-1.80)
10-min	0.440 (0.345-0.545)	0.526 (0.412-0.652)	0.666 (0.520-0.827)	0.783 (0.608-0.979)	0.943 (0.708-1.23)	1.06 (0.782-1.42)	1.19 (0.849-1.65)	1.33 (0.899-1.89)	1.53 (0.995-2.25)	1.70 (1.08-2.55)
15-min	0.518 (0.406-0.641)	0.619 (0.485-0.767)	0.784 (0.612-0.975)	0.921 (0.715-1.15)	1.11 (0.833-1.45)	1.25 (0.921-1.67)	1.40 (0.999-1.94)	1.57 (1.06-2.22)	1.81 (1.17-2.65)	2.00 (1.27-3.00)
30-min	0.712 (0.559-0.881)	0.851 (0.667-1.05)	1.08 (0.843-1.34)	1.27 (0.984-1.59)	1.53 (1.15-2.00)	1.72 (1.27-2.30)	1.93 (1.38-2.67)	2.16 (1.46-3.06)	2.49 (1.61-3.66)	2.76 (1.75-4.14)
60-min	0.906 (0.711-1.12)	1.08 (0.849-1.34)	1.37 (1.07-1.71)	1.62 (1.25-2.02)	1.95 (1.46-2.54)	2.20 (1.61-2.93)	2.46 (1.75-3.41)	2.75 (1.86-3.90)	3.17 (2.06-4.66)	3.52 (2.23-5.28)
2-hr	1.17 (0.923-1.43)	1.41 (1.11-1.73)	1.80 (1.41-2.22)	2.12 (1.66-2.63)	2.57 (1.95-3.34)	2.90 (2.15-3.86)	3.25 (2.35-4.52)	3.68 (2.49-5.19)	4.33 (2.82-6.32)	4.88 (3.10-7.27)
3-hr	1.35 (1.07-1.65)	1.63 (1.30-2.00)	2.09 (1.66-2.57)	2.48 (1.95-3.06)	3.00 (2.29-3.91)	3.39 (2.54-4.52)	3.82 (2.78-5.31)	4.34 (2.94-6.10)	5.14 (3.35-7.48)	5.84 (3.71-8.66)
6-hr	1.72 (1.38-2.10)	2.10 (1.68-2.55)	2.70 (2.16-3.30)	3.21 (2.55-3.94)	3.91 (3.00-5.05)	4.42 (3.33-5.86)	4.98 (3.65-6.90)	5.68 (3.87-7.92)	6.77 (4.42-9.78)	7.71 (4.92-11.4)
12-hr	2.17 (1.75-2.62)	2.65 (2.14-3.20)	3.44 (2.77-4.17)	4.10 (3.27-5.00)	5.00 (3.87-6.42)	5.66 (4.29-7.46)	6.39 (4.71-8.79)	7.29 (4.99-10.1)	8.69 (5.70-12.5)	9.90 (6.34-14.5)
24-hr	2.56 (2.09-3.08)	3.18 (2.59-3.83)	4.20 (3.41-5.06)	5.04 (4.07-6.11)	6.20 (4.84-7.93)	7.05 (5.39-9.25)	7.99 (5.95-11.0)	9.17 (6.31-12.6)	11.0 (7.26-15.7)	12.7 (8.13-18.4)
2-day	2.88 (2.37-3.43)	3.65 (3.00-4.35)	4.91 (4.02-5.88)	5.95 (4.84-7.17)	7.39 (5.82-9.42)	8.44 (6.51-11.0)	9.61 (7.23-13.2)	11.1 (7.68-15.2)	13.6 (8.98-19.3)	15.8 (10.2-22.8)
3-day	3.16 (2.61-3.75)	3.98 (3.29-4.73)	5.34 (4.39-6.36)	6.46 (5.28-7.74)	8.00 (6.33-10.2)	9.12 (7.08-11.9)	10.4 (7.85-14.2)	12.0 (8.32-16.4)	14.7 (9.74-20.8)	17.1 (11.0-24.6)
4-day	3.43 (2.85-4.06)	4.28 (3.55-5.07)	5.67 (4.68-6.74)	6.83 (5.60-8.16)	8.42 (6.68-10.7)	9.57 (7.45-12.4)	10.9 (8.24-14.8)	12.6 (8.72-17.1)	15.4 (10.2-21.6)	17.8 (11.5-25.6)
7-day	4.18 (3.49-4.92)	5.06 (4.22-5.96)	6.49 (5.40-7.68)	7.69 (6.35-9.14)	9.33 (7.45-11.7)	10.5 (8.23-13.6)	11.9 (9.02-16.0)	13.6 (9.48-18.4)	16.5 (11.0-23.0)	19.0 (12.3-27.1)
10-day	4.85 (4.08-5.69)	5.75 (4.83-6.76)	7.23 (6.04-8.52)	8.46 (7.01-10.0)	10.1 (8.12-12.7)	11.4 (8.90-14.6)	12.7 (9.67-17.1)	14.5 (10.1-19.5)	17.3 (11.5-24.1)	19.8 (12.8-28.1)
20-day	6.76 (5.73-7.88)	7.76 (6.57-9.05)	9.39 (7.91-11.0)	10.7 (8.99-12.6)	12.6 (10.1-15.5)	14.0 (10.9-17.6)	15.5 (11.7-20.2)	17.2 (12.1-22.9)	19.7 (13.2-27.2)	21.8 (14.2-30.7)
30-day	8.36 (7.13-9.70)	9.44 (8.03-11.0)	11.2 (9.48-13.0)	12.6 (10.6-14.8)	14.7 (11.8-17.9)	16.2 (12.7-20.1)	17.7 (13.3-22.8)	19.4 (13.7-25.7)	21.7 (14.6-29.8)	23.5 (15.3-33.0)
45-day	10.4 (8.92-12.0)	11.6 (9.90-13.4)	13.5 (11.5-15.6)	15.0 (12.7-17.6)	17.2 (13.9-20.8)	18.9 (14.8-23.3)	20.6 (15.4-26.1)	22.2 (15.8-29.3)	24.3 (16.4-33.2)	25.8 (16.9-36.1)
60-day	12.2 (10.5-14.0)	13.4 (11.5-15.5)	15.4 (13.2-17.8)	17.1 (14.5-19.9)	19.4 (15.7-23.3)	21.1 (16.6-25.9)	22.9 (17.1-28.9)	24.5 (17.5-32.2)	26.5 (18.0-36.1)	27.9 (18.3-39.0)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

Particle Size Analysis - Comprehensive

Prepared For:

Benjamin Osgood
Ranger Engineering Group
13 Red Roof Lane, Suite 203
Salem, NH 03079

bosgood@rangereng.com
973-435-1324

Sample Information:

Sample ID: TP 10

Order Number: 58396

Lab Number: X220104-103

Received: 12/28/2021

Reported: 1/19/2022

<u>USDA Size Fraction</u>			<u>Percent of Whole Sample Passing</u>		
<u>Main Fractions</u>	<u>Size (mm)</u>	<u>Percent</u>	<u>Size (mm)</u>	<u>Sieve #</u>	<u>Whole Sample % of Sample Passing</u>
Sand	0.05-2.0	77.6	2.00	#10	65.6
Silt	0.002-0.05	16.6	1.00	#18	56.3
Clay	<0.002	5.8	0.50	#35	46.1
			0.25	#60	35.1
			0.10	#140	22.3
<u>Sand Fractions</u>	<u>Size (mm)</u>	<u>Percent</u>	0.053	#270	14.7
Very Coarse	1.0-2.0	14.3	0.02	20 um	9.6
Coarse	0.5-1.0	15.4	0.005	5 um	4.6
Medium	0.25-0.5	16.8	0.002	2 um	3.8
Fine	0.10-0.25	19.5			
Very Fine	0.05-0.10	11.6			
<u>Silt Fractions</u>	<u>Size (mm)</u>	<u>Percent</u>			
Coarse	0.02-0.05	7.7			
Medium	0.005-0.02	7.6			
Fine	0.002-0.005	1.3			

USDA Textural Class: gravelly loamy coarse sand

Gravel Content: (%) 34.4

Particle Size Analysis - Comprehensive

Prepared For:

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Salem, NH 03079

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973-435-1324

Sample Information:

Sample ID: TP 7

Order Number: 58396

Lab Number: X220104-102

Received: 12/28/2021

Reported: 1/19/2022

<u>USDA Size Fraction</u>			<u>Percent of Whole Sample Passing</u>		
<u>Main Fractions</u>	<u>Size (mm)</u>	<u>Percent</u>	<u>Size (mm)</u>	<u>Sieve #</u>	<u>Whole Sample % of Sample Passing</u>
Sand	0.05-2.0	63.6	2.00	#10	69.3
Silt	0.002-0.05	24.7	1.00	#18	63.5
Clay	<0.002	11.7	0.50	#35	56.3
			0.25	#60	46.8
			0.10	#140	33.6
<u>Sand Fractions</u>	<u>Size (mm)</u>	<u>Percent</u>	0.053	#270	25.2
Very Coarse	1.0-2.0	8.3	0.02	20 um	19.1
Coarse	0.5-1.0	10.4	0.005	5 um	11.2
Medium	0.25-0.5	13.7	0.002	2 um	8.1
Fine	0.10-0.25	19.1			
Very Fine	0.05-0.10	12.1			
<u>Silt Fractions</u>	<u>Size (mm)</u>	<u>Percent</u>			
Coarse	0.02-0.05	8.9			
Medium	0.005-0.02	11.3			
Fine	0.002-0.005	4.5			

USDA Textural Class: sandy loam

Gravel Content: (%) 30.7

Particle Size Analysis - Comprehensive

Prepared For:

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Salem, NH 03079

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973-435-1324

Sample Information:

Sample ID: TP 6

Order Number: 58396

Lab Number: X220104-101

Received: 12/28/2021

Reported: 1/19/2022

<u>USDA Size Fraction</u>			<u>Percent of Whole Sample Passing</u>		
<u>Main Fractions</u>	<u>Size (mm)</u>	<u>Percent</u>	<u>Size (mm)</u>	<u>Sieve #</u>	<u>Whole Sample % of Sample Passing</u>
Sand	0.05-2.0	68.6	2.00	#10	62.5
Silt	0.002-0.05	24.9	1.00	#18	56.3
Clay	<0.002	6.5	0.50	#35	48.6
			0.25	#60	39.4
			0.10	#140	28.1
			0.053	#270	19.6
<u>Sand Fractions</u>	<u>Size (mm)</u>	<u>Percent</u>	0.02	20 um	12.5
Very Coarse	1.0-2.0	9.9	0.005	5 um	5.4
Coarse	0.5-1.0	12.4	0.002	2 um	4.1
Medium	0.25-0.5	14.7			
Fine	0.10-0.25	18.0			
Very Fine	0.05-0.10	13.6			
<u>Silt Fractions</u>	<u>Size (mm)</u>	<u>Percent</u>			
Coarse	0.02-0.05	11.3			
Medium	0.005-0.02	11.4			
Fine	0.002-0.005	2.1			

USDA Textural Class: gravelly sandy loam

Gravel Content: (%) 37.5

MAPS

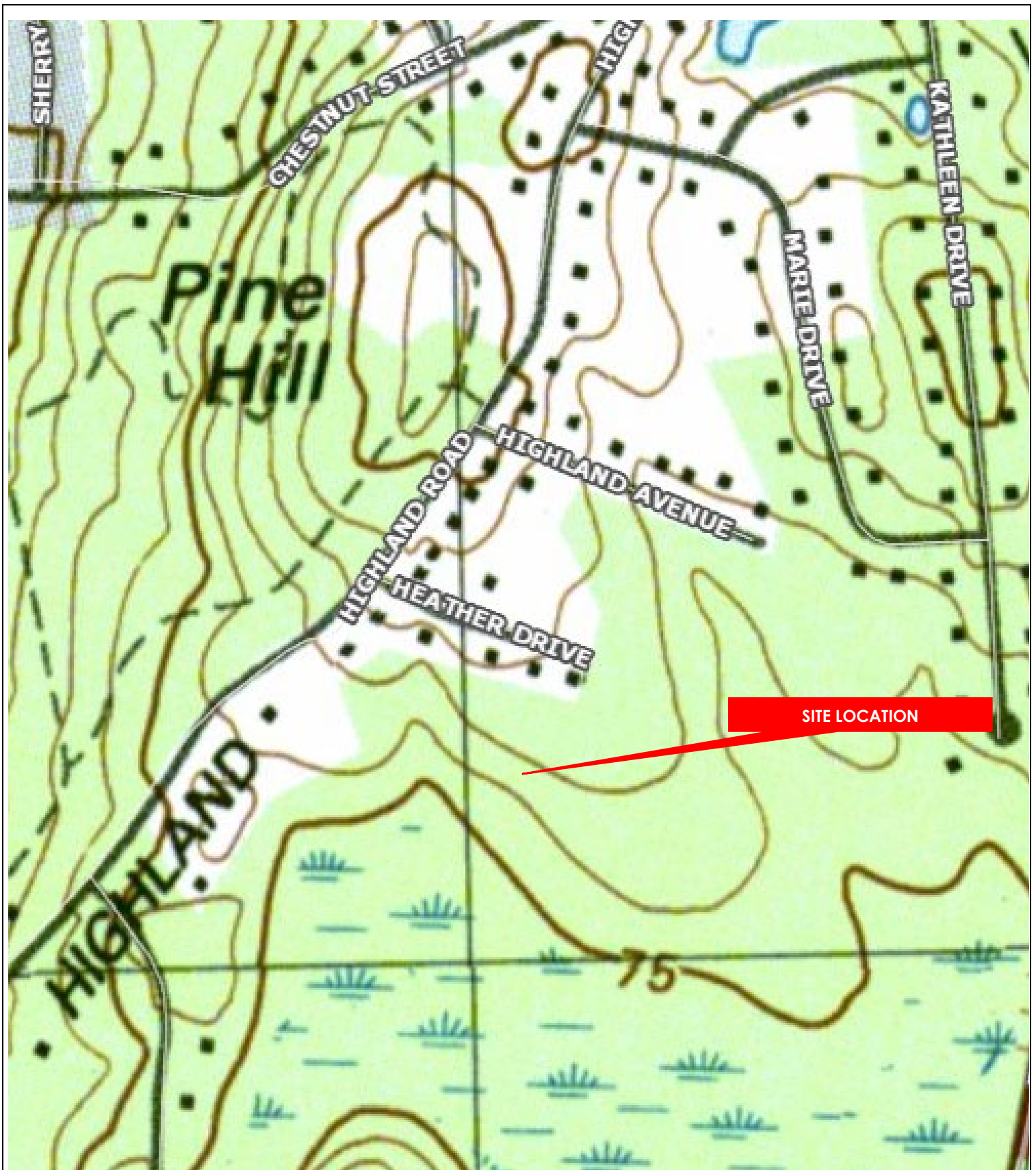
USGS LOCUS

SCS SOILS

FEMA

CS 9201 PRE-DEVELOPMENT DRAINAGE

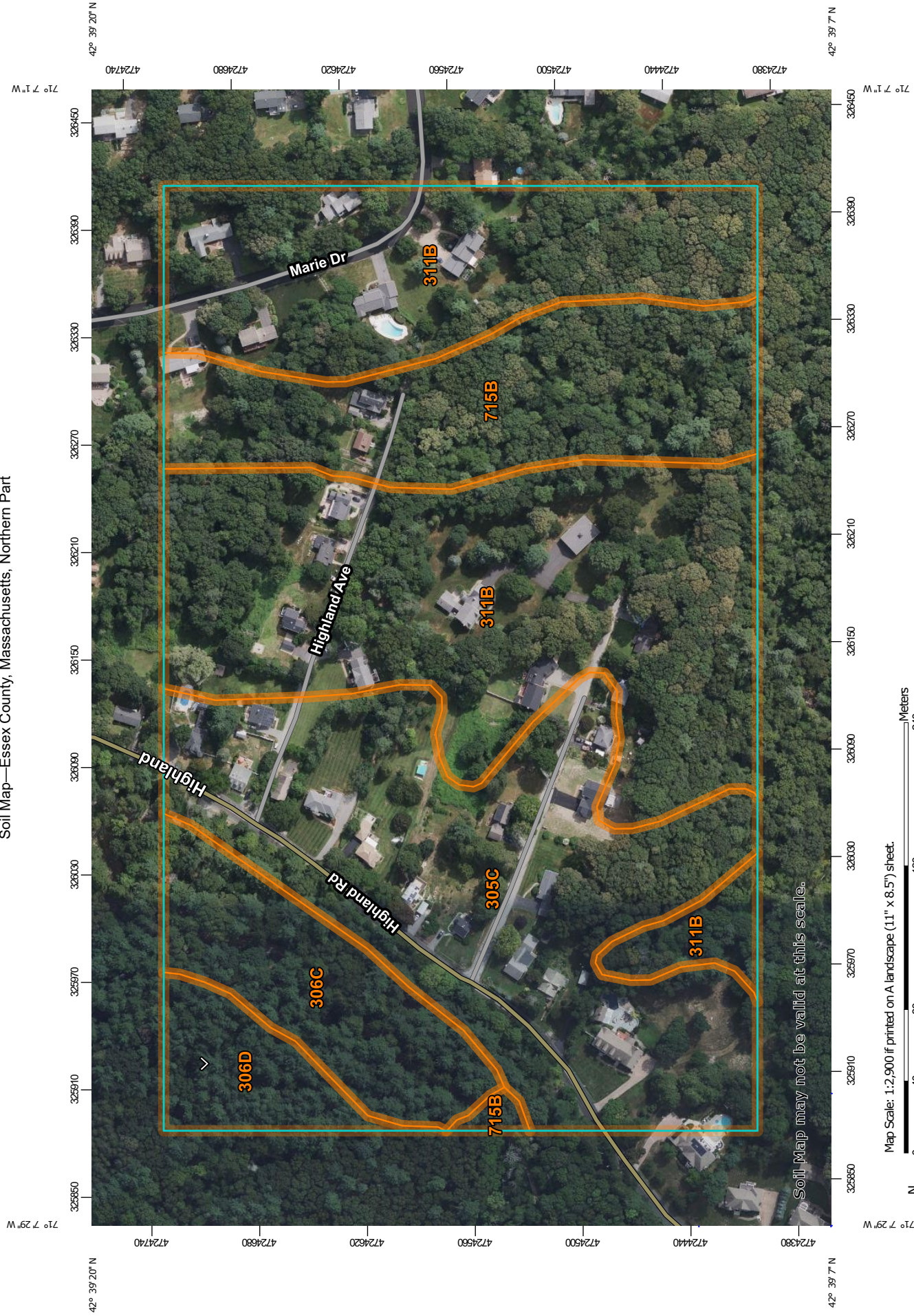
CS 9301 POST DEVELOPMENT DRAINAGE



Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs; USGS Topographic Quadrangle Images

**USGS MAP
SELLERS FARM RD ANDOVER, MA
MAP 24 LOTS 1K, 1J, 1H, 1G, 1E, 1F**

Soil Map—Essex County, Massachusetts, Northern Part



Soil Map may not be valid at this scale.

Map Scale: 1:2,900 if printed on A landscape (11" x 8.5") sheet.

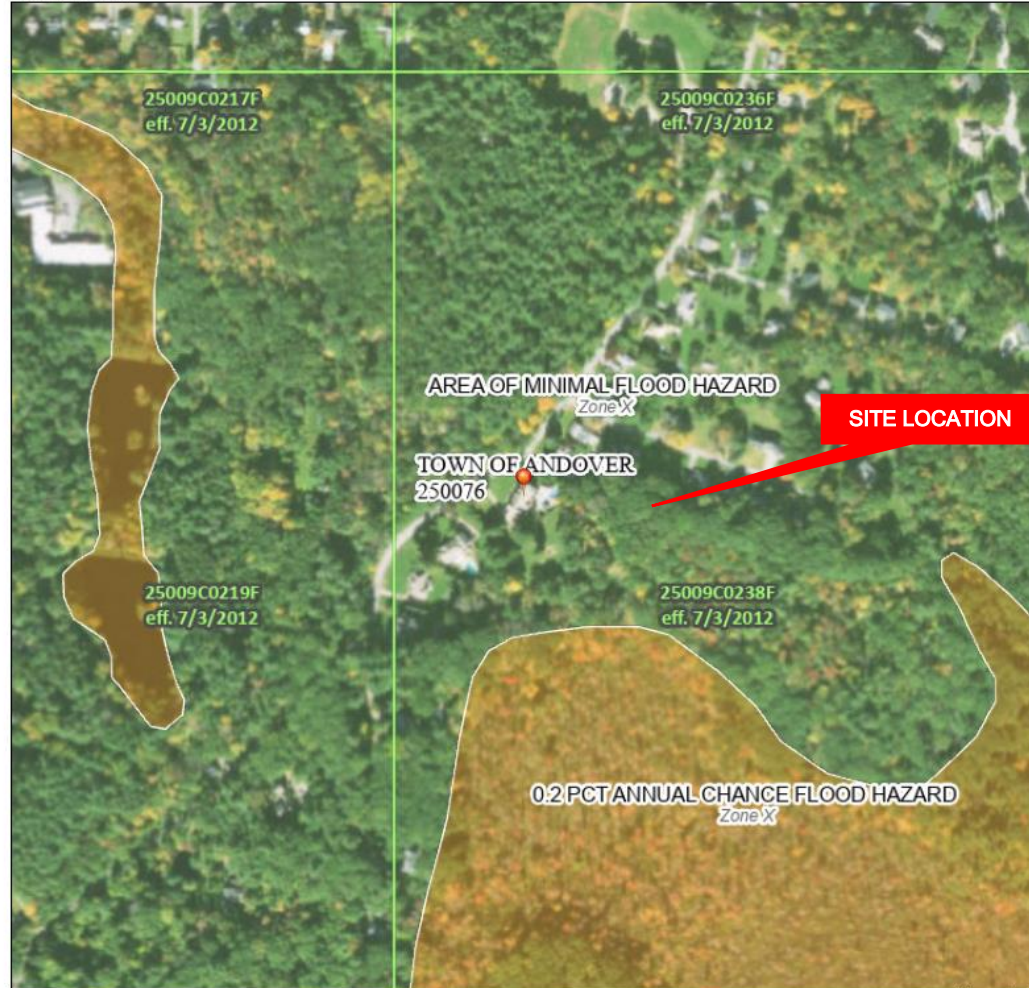


Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

National Flood Hazard Layer FIRMeTte



71°7'44"W 42°39'24"N



0 250 500 1,000 1,500 2,000 Feet 1:6,000
 Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		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 <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped

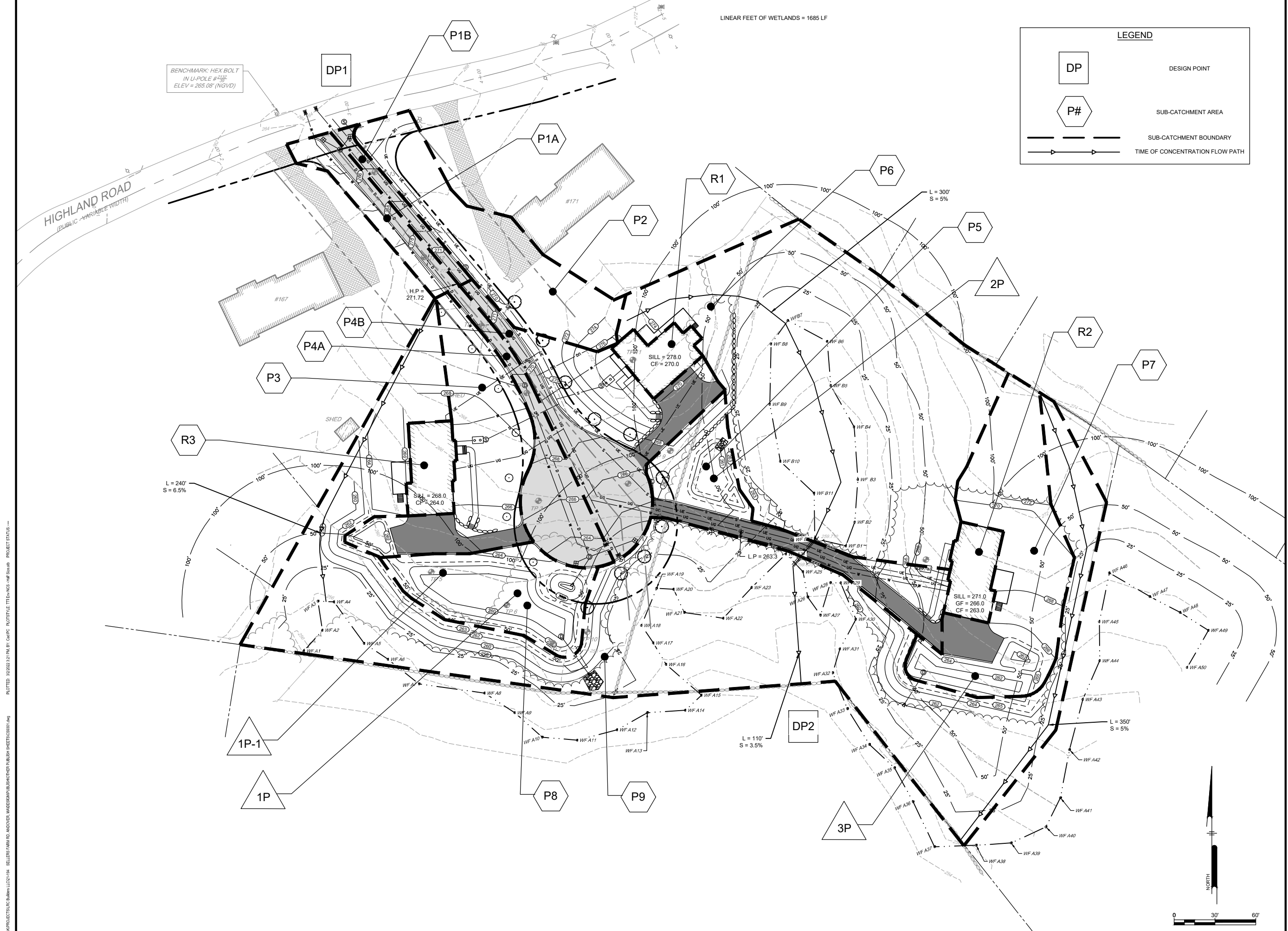
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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 2/21/2022 at 12:55 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 unmoderized areas cannot be used for regulatory purposes.

FEMA MAP SELLERS FARM RD ANDOVER MA MAP 24 LOTS 1K, 1J, 1H, 1G, 1E



Z:\PROJECTS\CS9301\Bldg\11001114 - SELLERS FARM RD AND OVER WAGES\DWG\SUBDIVISION\POST DEVELOPMENT SHEETS\CS9301.dwg
 PLOTTED: 10/22/2021 12:11 PM BY: C:\PC\PLT\STALE.TT\EN\NS - HMF\Bldg
 PROJECT STATUS: ---



MODIFIED DEFINITIVE SUBDIVISION
 SELLERS FARM ROAD
 ANDOVER, MASSACHUSETTS
POST DEVELOPMENT DRAINAGE PLAN
 PREPARED FOR
 LRC BUILDERS LLC
 475 BOSTON ROAD
 BILLERICA, MASSACHUSETTS 01821

NO.	DATE	REVISIONS	BY

PROJECT	21-194
DATE	2021-11-23
DRAWING SCALE	1" = 40'
DRAWN BY	DJO
APPROVED BY	BCO
CS9301	
SHEET	6 OF 9