

# Drainage Report

## Nichols College Townhouses Center Road, Dudley, MA

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*CHA Project Number: 076491.000*

***Prepared for:***  
***Nichols College***  
***121 Center Road***  
***Dudley, MA 01571***

***Prepared by:***



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***May 23, 2022***



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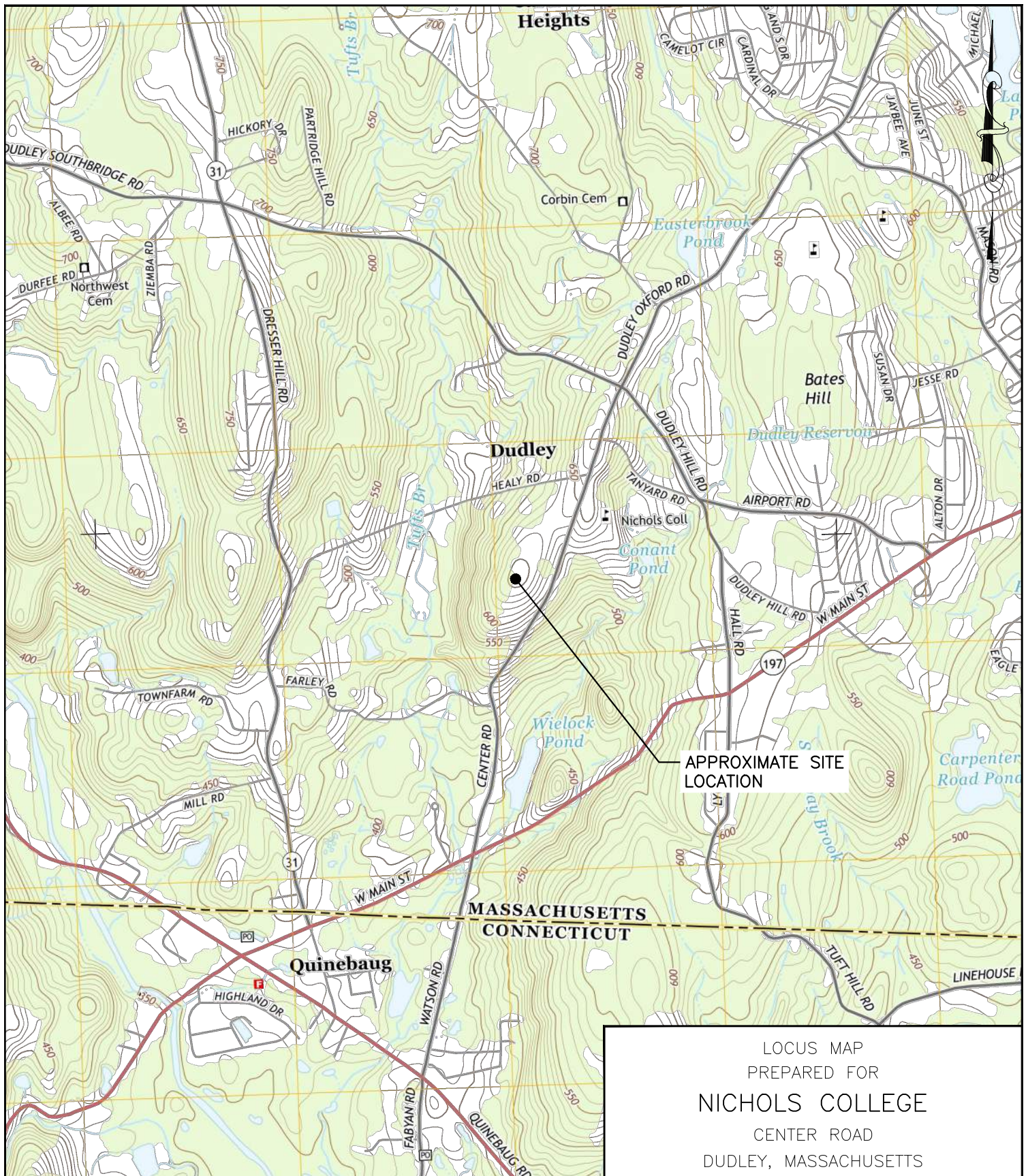
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## LOCUS & SUMMARY





LOCUS MAP  
PREPARED FOR  
**NICHOLS COLLEGE**  
CENTER ROAD  
DUDLEY, MASSACHUSETTS

USGS QUADRANGLE  
WEBSTER, MA  
2015

2000 1000 0 2000

GRAPHIC SCALE IN FEET

DATE: 05/22/2022

SCALE: 1" = 2000'

SHEET: 1 OF 1



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## SUMMARY

Nichols College proposes to construct two  $\pm 6,400$  square foot Townhouse style student residence buildings at the south end of their campus in Dudley. The proposed location is on the west side of Center Road, approximately 1,500-feet south of Healy Road. Storm flows from the existing site drain primarily to the East, to the existing Center Road Drainage System, and to the West towards Tufts Brook, along the center of the existing athletic field. Available USDA soils mapping (See Section G) indicates that soils in the proposed development area consist primarily of fine sandy loams with a hydrologic group of 'C'.

The proposed project will consist of two student residence buildings, underground utilities, associated parking and access driveways. Storm flows from the majority of the developed site will be collected by a series of catch basins and discharged through a hydrodynamic separator into a water quality basin on the east side of the site. This basin will discharge to the existing driveway drainage system which connects to the existing system in Center Road.

CHA utilized a computer model, HydroCAD®, to perform drainage calculations. The model used the Soil Conservation Service TR-20 method with NOAA 24-hour rainfall data to calculate the runoff. The design points for calculating the existing and proposed peak storm flows are the existing Drainage System in Center Road, the existing stormwater basin to the north, the western property line and the southern property line. Calculations for the 2, 10, 25, and 100-year storm events are provided. Peak storm flows for existing and proposed conditions are listed in Table 1-1.

**Table 1-1. Existing & Proposed Peak Storm Flows**

Storm Event	To Center RD		To Ex. Basin		To West		To South	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
2 Year Storm	7.7 cfs	7.4 cfs	5.9 cfs	5.7 cfs	6.1 cfs	5.0 cfs	0.5 cfs	0.5 cfs
10 Year Storm	15.6 cfs	14.0 cfs	10.0 cfs	9.2 cfs	14.8 cfs	12.6 cfs	1.2 cfs	1.2 cfs
25 Year Storm	20.7 cfs	18.1 cfs	12.5 cfs	11.5 cfs	20.8 cfs	17.9 cfs	1.7 cfs	1.7 cfs
100 Year Storm	28.8 cfs	24.3 cfs	16.4 cfs	14.8 cfs	30.6 cfs	26.6 cfs	2.5 cfs	2.5 cfs

Peak Flows to all Design Points will be reduced or maintained through the 100-year storm event.





**MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL  
PROTECTION CHECKLIST FOR STORMWATER REPORT**



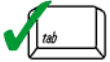




# Checklist for Stormwater Report

## 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.<sup>1</sup> 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 8<sup>2</sup>
- 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.

<sup>1</sup> 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.

<sup>2</sup> 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

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## 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.

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### 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

\_\_\_\_\_  
Signature and Date

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## 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

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## 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

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## 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 Field<sup>1</sup>
- ☐ 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.

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



# Checklist for Stormwater Report

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## 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

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## 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

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## 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

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## 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.



**WATER QUALITY VOLUME, RECHARGE VOLUME,  
& TSS REMOVAL CALCULATIONS**

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## Water Quality Flow

Project Name: Nichols Townhouses

Project # 076491

Date: May 22, 202

Following Guidelines From "Massachusetts Department of Environmental Protection Wetlands Program"

### Hydrodynamic Separator 1

#### Water Quality Volume

$$WQV = 1" (I) / 12$$

Where:

WQV = Water Quality Volume (ac-ft)

I = Impervious Area (ac)

Areas From  
AutoCAD

	SQ. FT	Acres
Impervious	24,320	0.558
Pervious	54,870	1.260
Total (A)	79,190	1.818

$$WQV \text{ REQUIRED} = 0.047 \text{ ac ft}$$
$$\mathbf{2,027 \text{ cf}}$$

#### Determine Unit Peak Discharge

$$I_a / P = \mathbf{0.034} \quad (1" \text{ Runoff})$$

#### Read Unit Peak Discharge From Figure 4

$$q_u = +/- \mathbf{795}$$

#### Water Quality Flow

APP B

$$WQF = (q_u) (A) (WQV)$$

Where:

$q_u$  = unit peak discharge (cfs/sqmi/in)

A = Drainage Area (sqmi)

WQV = Water Quality Volume (watershed inches)

$$WQF = \mathbf{0.7 \text{ cfs}}$$

Prepared By: PMP



## **Massachusetts Department of Environmental Protection Wetlands Program**

### **Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices**

Effective October 15, 2013, computations following the standardized method must be submitted with a Wetlands Notice of Intent (NOI) when a proprietary manufactured stormwater treatment device sized using a flow rate is proposed in connection with work proposed in a wetland resource area or associated buffer zone. The computational method will primarily affect the sizing of the proprietary manufactured stormwater treatment separators, and not other types of stormwater treatment practices that are volume based (such as extended detention basins) or proprietary stormwater treatment filters sized using the Water Quality Volume (WQV).

Stormwater Standard No. 4 requires structural stormwater management practices to be sized to capture the required WQV in accordance with the Massachusetts Stormwater Handbook (310 CMR 10.05(6)(k)(4) and 314 CMR 9.06(6)(a)(4)). Stormwater Standard No. 4 requires that the full WQV be captured and treated to remove 80% of the Total Suspended Solid (TSS) load.

Since manufactured proprietary stormwater separators are sized using discharge rates and not volume, MassDEP is requiring the standardized method described below be used to convert the required WQV to a discharge rate (Q). No other methods are allowed to convert the WQV to the Q rate. This will ensure that flow rate based manufactured proprietary stormwater treatment practices are sized consistently from manufacturer to manufacturer. This section contains the following: caveats for method use, method description, examples of how to use the method, and documentation describing how the method was derived. This method will be incorporated into the Massachusetts Stormwater Handbook.

The following caveats apply to use of the method:

- Device sized using the Q rate must only be used as pretreatment practice.
- Device sized using this method shall be designed to be “offline”, unless approved otherwise through written reciprocity granted by MassDEP to a final certification pursuant to the Technology Acceptance Reciprocity Partnership (TARP). This means the device must be sized at a minimum to fully treat the Q rate without any overflow, by-pass, surcharge of runoff, or scouring of sediments or oils previously trapped or entrained in the device.
- The computations described below must be provided in the Stormwater Report accompanying Wetlands Notice of Intent or application for 401 Water Quality Certification.
- MassDEP reserves ability to revise this method in the future as may be needed to reflect documented increases to precipitation intensity (Douglas 2011), updates to design intensity storms currently being considered by the National Weather Service or Northeast Climate Center (NECC)<sup>1</sup> to Technical Paper 40 (upon which this methodology is based), NRCS revisions to the WinTR55/TR20 methods,<sup>2</sup> or changes to the National Pollution Discharge Elimination System (NPDES) permits issued by EPA for Massachusetts.

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<sup>1</sup> On web, see precipitation intensities at <http://precip.net>

<sup>2</sup> On web, See MA-NRCS description at: [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs144p2\\_013763.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_013763.pdf)

## METHOD

1. Determine if the WQV is the first ½-inch or 1-inch of runoff. If WQV is the first ½ -inch, go to STEP 2. If WQV is the first 1-inch of runoff, go to STEP 7.

### FOR FIRST ½ INCH RUNOFF WQV

2. Use Curve Number (CN) 98 to represent the runoff potential for impervious surfaces (see Method Derivation section below for explanation regarding how CN 98 was obtained).

*Only use impervious surfaces for these computations. Runoff from pervious surfaces should not be included in the WQV computations for the Q rate. The WQV required by the Massachusetts Wetlands Protection (310 CMR 10.05(6)(k)(4)) and 401 Water Quality Certification (314 CMR 9.06(6)(a)(4)) regulations for Stormwater Standard No. 4 is based only on impervious surfaces.*

3. Compute the time of concentration (tc) using the methods described in TR-55 1986, Chapter 3.
4. Refer to Figure 1, Ia/P Curve = 0.058
5. Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc determined in STEP 3, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi<sup>2</sup>/watershed inches (csm/in).
6. Compute Q rate using the following equation:

$$Q_{0.5} = (qu)(A)(WQV)$$

Where:

$Q_{0.5}$  = flow rate associated with first ½ -inch of runoff

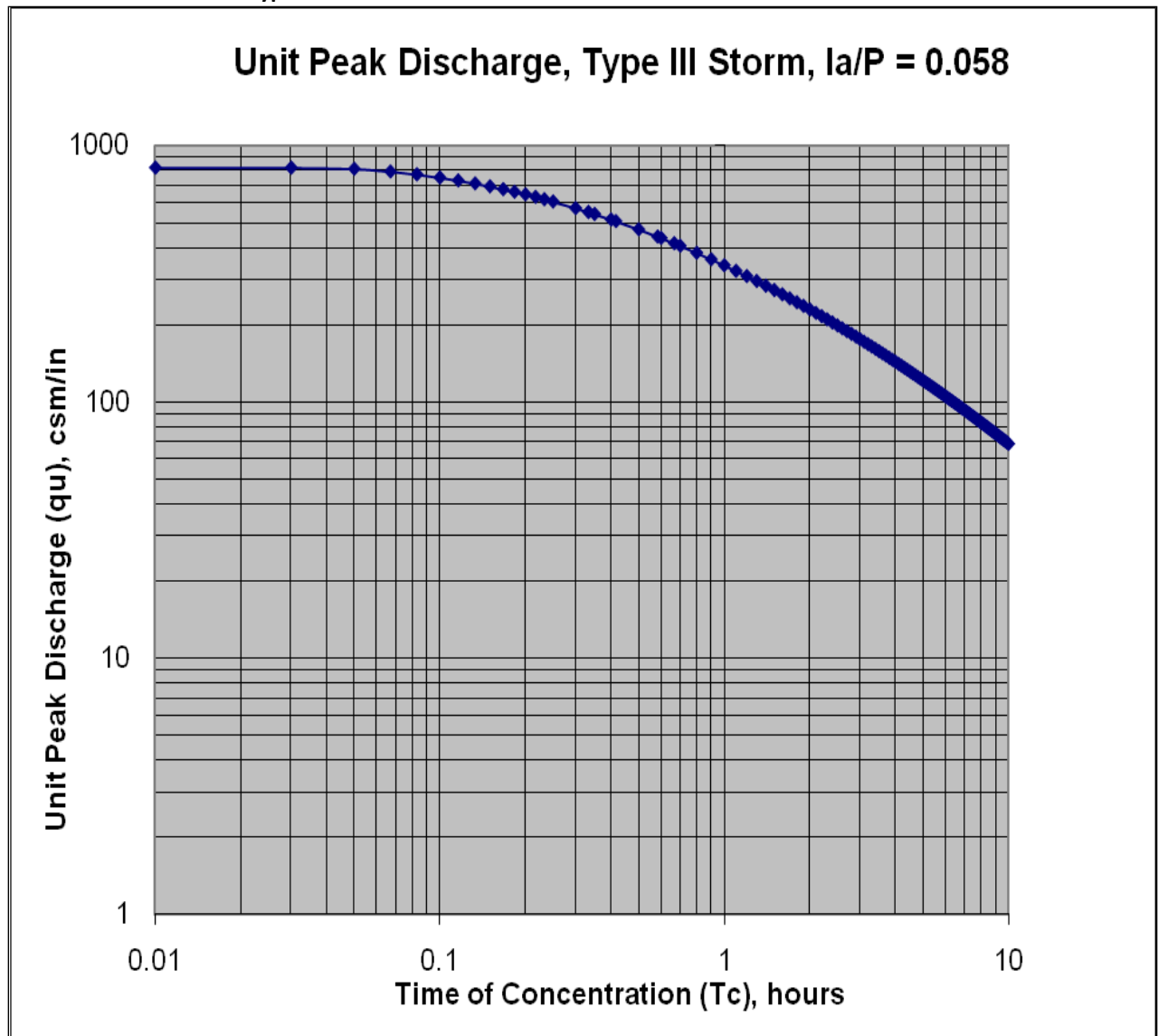
qu = the unit peak discharge, in csm/in.

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (½ -inch in this case)

See Example 1, page 8 applying use of the method to convert first ½ -inch WQV to minimum  $Q_{0.5}$  rate.

Figure 1: For First ½-inch Runoff, Ia/P Curve = 0.058, Relationship Between Unit Peak Discharge and Time of Concentration for NRCS Type III Storm Distribution.



**Figure 2: For First ½-inch of Runoff, Table of qu values for Ia/P Curve = 0.0.058, listed by tc, for Type III Storm Distribution**

<b>Tc (Hours)</b>	<b>qu (csm/in)</b>	<b>Tc (Hours)</b>	<b>qu (csm/in)</b>	<b>Tc (Hours)</b>	<b>qu (csm/in)</b>	<b>Tc (Hours)</b>	<b>qu (csm/in)</b>
0.01	821	1.8	246	5.3	116	8.8	77
0.03	821	1.9	238	5.4	115	8.9	76
0.05	813	2	230	5.5	113	9	76
0.067	794	2.1	223	5.6	112	9.1	75
0.083	773	2.2	217	5.7	110	9.2	74
0.1	752	2.3	211	5.8	109	9.3	74
0.116	733	2.4	205	5.9	107	9.4	73
0.133	713	2.5	200	6	106	9.5	72
0.15	694	2.6	194	6.1	104	9.6	72
0.167	677	2.7	190	6.2	103	9.7	71
0.183	662	2.8	185	6.3	102	9.8	70
0.2	646	2.9	181	6.4	100	9.9	70
0.217	632	3	176	6.5	99	10	69
0.233	619	3.1	173	6.6	98		
0.25	606	3.2	169	6.7	97		
0.3	572	3.3	165	6.8	96		
0.333	552	3.4	162	6.9	94		
0.35	542	3.5	158	7	93		
0.4	516	3.6	155	7.1	92		
0.416	508	3.7	152	7.2	91		
0.5	472	3.8	149	7.3	90		
0.583	443	3.9	147	7.4	89		
0.6	437	4	144	7.5	88		
0.667	417	4.1	141	7.6	87		
0.7	408	4.2	139	7.7	86		
0.8	383	4.3	136	7.8	85		
0.9	361	4.4	134	7.9	84		
1	342	4.5	132	8	84		
1.1	325	4.6	130	8.1	83		
1.2	311	4.7	128	8.2	82		
1.3	297	4.8	126	8.3	81		
1.4	285	4.9	124	8.4	80		
1.5	274	5	122	8.5	79		
1.6	264	5.1	120	8.6	79		
1.7	254	5.2	118	8.7	78		



### FOR FIRST 1-INCH RUNOFF WQV

7. Use Curve Number (CN) 98 to represent the runoff potential for impervious surfaces (see Method Derivation section below for explanation regarding how CN 98 was obtained).

*Only use impervious surfaces for these computations. Runoff from pervious surfaces should not be included in the WQV computations for peak WQF. The WQV required by the Massachusetts Wetlands Protection (310 CMR 10.05(6)(k)(4)) and 401 Water Quality Certification (314 CMR 9.06(6)(a)(4)) regulations for Stormwater Standard No. 4 is based only on impervious surfaces.*

8. Compute the time of concentration ( $t_c$ ) using the methods described in TR-55 1986, Chapter 3.
9. Refer to Ia/P Curve = 0.034 (Figure 3)
10. Determine unit peak discharge using Figure 3 or 4. Figure 4 is in tabular form so is preferred. Using the  $t_c$  determined in STEP 8, read the unit peak discharge ( $q_u$ ) from Figure 2 or from Table in Figure 4.  $q_u$  is expressed in the following units: cfs/mi<sup>2</sup>/watershed inches (csm/in).
11. Compute the water quality flow (WQF) using the following equation:

$$Q_1 = (q_u)(A)(WQV)$$

Where:

$Q_1$  = peak flow rate associated with first 1-inch of runoff

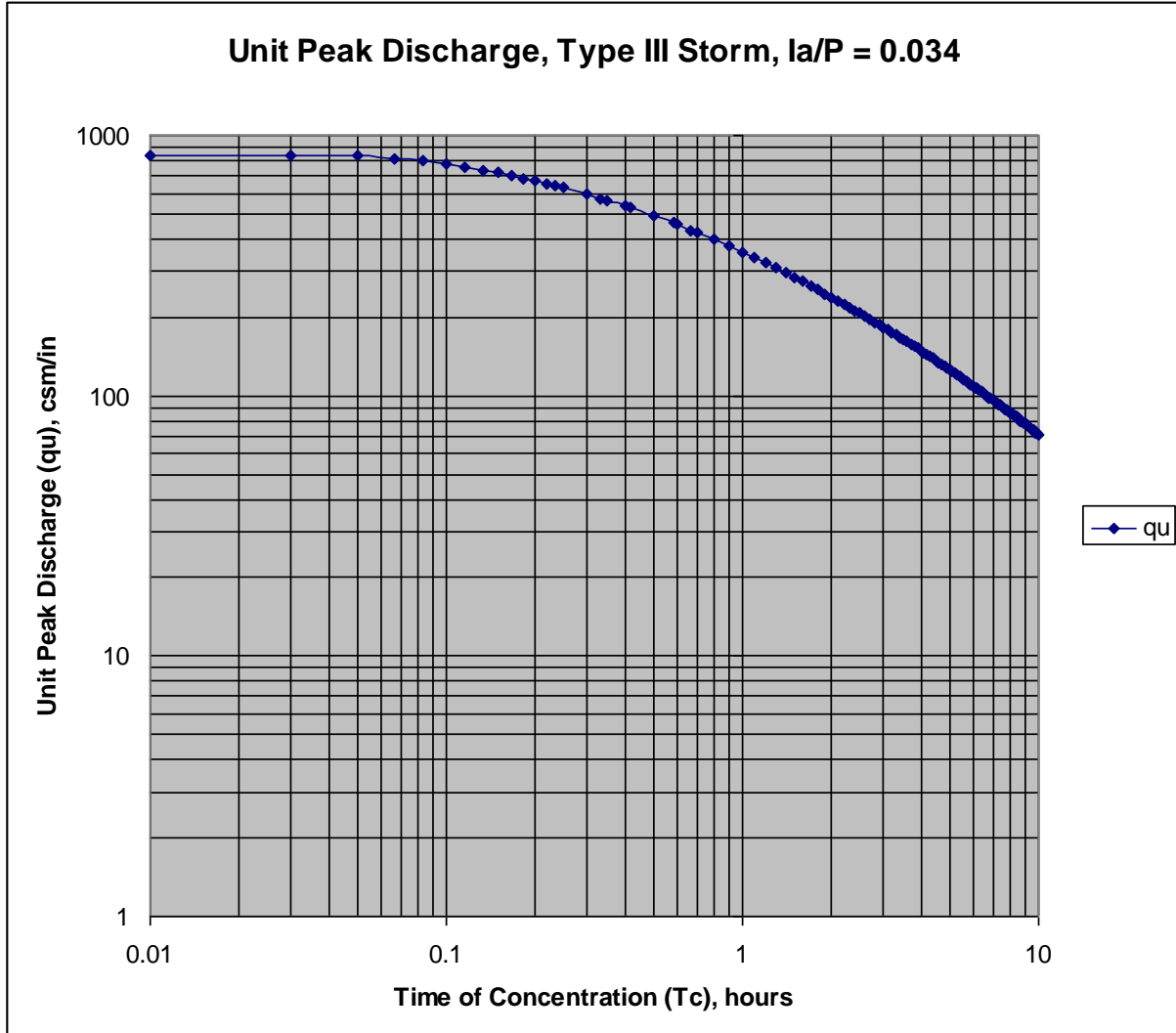
$q_u$  = the unit peak discharge, in csm/in.

$A$  = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (1.0-inches in this case)

See Example 2, page 8 applying use of the method to convert first 1-inch WQV to minimum  $Q_1$  rate.

Figure 3: For First 1-inch Runoff,  $I_a/P$  Curve = 0.034, Relationship Between Unit Peak Discharge and Time of Concentration for NRCS Type III Storm Distribution



**Figure 4: for First 1-inch Runoff, Table of qu values for Ia/P Curve = 0.034, listed by tc, for Type III Storm Distribution**

<b>Tc (Hours)</b>	<b>qu (csm/in)</b>	<b>Tc (Hours)</b>	<b>qu (csm/in)</b>	<b>Tc (Hours)</b>	<b>qu (csm/in)</b>
0.01	835	2.7	197	7.1	95
0.03	835	2.8	192	7.2	94
0.05	831	2.9	187	7.3	93
0.067	814	3	183	7.4	92
0.083	795	3.1	179	7.5	91
0.1	774	3.2	175	7.6	90
0.116	755	3.3	171	7.7	89
0.133	736	3.4	168	7.8	88
0.15	717	3.5	164	7.9	87
0.167	700	3.6	161	8	86
0.183	685	3.7	158	8.1	85
0.2	669	3.8	155	8.2	84
0.217	654	3.9	152	8.3	84
0.233	641	4	149	8.4	83
0.25	628	4.1	146	8.5	82
0.3	593	4.2	144	8.6	81
0.333	572	4.3	141	8.7	80
0.35	563	4.4	139	8.8	79
0.4	536	4.5	137	8.9	79
0.416	528	4.6	134	9	78
0.5	491	4.7	132	9.1	77
0.583	460	4.8	130	9.2	76
0.6	454	4.9	128	9.3	76
0.667	433	5	126	9.4	75
0.7	424	5.1	124	9.5	74
0.8	398	5.2	122	9.6	74
0.9	376	5.3	120	9.7	73
1	356	5.4	119	9.8	72
1.1	339	5.5	117	9.9	72
1.2	323	5.6	115	10	71
1.3	309	5.7	114		
1.4	296	5.8	112		
1.5	285	5.9	111		
1.6	274	6	109		
1.7	264	6.1	108		
1.8	255	6.2	106		
1.9	247	6.3	105		
2	239	6.4	104		
2.1	232	6.5	102		
2.2	225	6.6	101		
2.3	219	6.7	100		
2.4	213	6.8	99		
2.5	207	6.9	98		
2.6	202	7	96		

## Examples

*Example 1:* 2.28-acre asphalt parking lot (impervious surface), with time of concentration equal to 0.25 hours. The proposed parking lot drains to a wetland resource area, which is not a critical area, nor is the site located “near” a critical area. A proprietary separator is proposed to pretreat runoff to be directed to an Extended Detention Basin.

Because site does not drain to or located near a critical area, WQV = ½ -inch

$$1\text{-acre} = 0.0015625 \text{ mi}^2$$

Step 1: Use CN = 98 to represent the 2.28-acre impervious surface.

Step 2: Determine  $t_c$

$$t_c = 0.25 \text{ hours (given).}$$

Step 3: Determine  $q_u$  using Figure 2

With  $t_c = 0.25$  hours,  $q_u$  is determined to be 606 csm/inch using Table in Figure 2.

Step 4 (Final Step): Determine  $Q_{0.5}$

$$Q_{0.5} = (q_u)(A)(WQV)$$

$$Q_{0.5} = (606 \text{ csm/in})(2.28\text{-acre})(0.0015625 \text{ mi}^2/\text{acre})(\frac{1}{2}\text{-inch})$$

$$Q_{0.5} \approx 1.1 \text{ CFS}$$

*Example 2:* One-acre site composed entirely of impervious surfaces, with time of concentration equal to 6 minutes. The proposed impervious surfaces are to be drained to a stream located in Zone II of a public drinking water supply. A proprietary separator is proposed to pretreat runoff to be directed to an Infiltration Basin.

Because site drains to a critical area, WQV = 1-inch

$$1\text{-acre} = 0.0015625 \text{ mi}^2$$

Step 1: Use CN = 98 to represent the 1-acre impervious surface.

Step 2: Determine  $t_c$

$t_c = 6$  minutes (given).

Convert minutes to hours

$t_c = (6 \text{ minutes}) / (60 \text{ minutes/hr}) = 0.1 \text{ hours}$

Step 3: Determine  $q_u$  using Table in Figure 4

Using the  $t_c$  column, read down to find  $t_c = 0.1$  hours. Read to the right of  $t_c = 0.1$  hours to find the  $q_u$  value which is 774 csm/inch.

Alternatively, you may use Figure 3 ( $I_a/P$  curve = 0.034). Find  $t_c = 0.1$  hours, read up to the  $I_a/P$  curve, then follow intersecting line to the left to interpolate the  $q_u$  value. You'll note that using Figure 4 is quicker in so far as no interpolation is required. In cases where the  $t_c$  is not listed in Figure 4, you may need to use Figure 3. In such instances, Figure 4 may still assist you in bracketing the  $q_u$  values to interpolate.

Step 4 (Final Step): Determine  $Q_1$

$$Q_1 = (q_u)(A)(WQV)$$

$$Q_1 = (774 \text{ csm/in})(1\text{-acre})(0.0015625 \text{ mi}^2/\text{acre})(1\text{-inch})$$

$$Q_1 \approx 1.2 \text{ CFS}$$

If the conversion factor to convert acres to square miles is not included, the result will not be correct. As different units are used in the computations, double check your units to ensure the result is correct.

## **Method Derivation**

The Stormwater Advisory Committee convened to assist MassDEP with the 2008 stormwater revisions to the Wetlands and 401 Water Quality Certification regulations. The Advisory Committee tabled a method proposed at that time and asked its Proprietary BMP subcommittee to study the issue further. Subsequently, the Proprietary BMP subcommittee met from 2008 to 2011, examining multiple methods. Among the methods reviewed included the Rational Method used by New Jersey DEP, Ahlfeld et al 2004, Winkler et al 2001, Claytor and Scheuler 1996, Imbrium PCSWMM, and Bryant. The Ahlfeld and Winkler methods were funded by MassDEP through 319 funds and developed using Massachusetts precipitation data. The Claytor method is based on SCS TR-55 graphical methods. The PCSWMM method is a proprietary version of the EPA SWMM method, based on Mannings equation. The Bryant method was based on precipitation data compiled in the Ahlfeld and Winkler methods.

To assist in selecting a method, Rees and Schoen 2009 conducted third party review of the different approaches. Rees and Schoen found that the various methods produced different peak rate flows.

Differences were also found between peak flow rates in coastal and inland areas. With some methods, the precipitation intensity associated with the ½-inch water quality volume produced a greater flow rate than the 1-inch water quality volume. The study concluded that the Claytor and Schueler 1996 method was the most complete in attempting to transform the Water Quality Volume to a flow rate.

Subsequent to the study, flow rate results from the Claytor and Schueler method were adapted for use in Massachusetts using both the first ½ - inch and 1-inch Water Quality Volumes. Flow rates were found to bypass a portion of the Water Quality Volume for the both the first ½ -inch and 1-inch of runoff depending on drainage area and treatment device size. As bypassed runoff is not treated, the Proprietary BMP Subcommittee agreed on meeting held in March 2011 that practices sized using the flow conversion method must be restricted to pretreatment only and directed to stormwater treatment practices. The Proprietary BMP Subcommittee subsequently recommended the Claytor and Schueler 1996 method be used, as adapted for use in Massachusetts, to the Stormwater Advisory Committee in May 2011.

The Claytor and Schueler 1996 approach in part utilizes the U.S. Natural Resource and Conservation Service Technical Release 55 (TR-55) Graphical Peak Discharge Method (NRCS / SCS 1986), adapted for small storm hydrology (Pitt 1999). It was adapted for use in Massachusetts by determining the precipitation values that generate the first ½ -inch and 1-inch of runoff, using the NRCS / SCS 1986 equations as described below.

1. The Massachusetts Stormwater Standard No. 4 sets the required WQV equal to 0.5-inch or 1.0- inch, depending if the discharge is to or near a critical area, Land Use with Higher Potential Pollutant Load (LUHPPL), or soil with rapid infiltration rate.
2. The Claytor and Scheuler 1996 method requires a Curve Number (CN) be determined to represent the ability of a surface to effectively convey runoff. CN 98 was derived for impervious surfaces using small storm hydrology using the following equation (NRCS / SCS 1986). The precipitation depth associated with the first 1.0-inch of runoff is 1.2 watershed inches based on Figure 4 (NRCS 1986 Table 2-1) and Figure 5 (NRCS 1986 Figure 2-1). The precipitation depth associated with the first ½ - inch of runoff is 0.7 watershed inches.

½-inch WQV Derivation:

Solve for  $P_t$

$$CN = \frac{1000}{10 + 5P_t + 10Q_{WQV} - 10(Q_{WQV}^2 + 1.25Q_{WQV}P_t)^{0.5}}$$

Where:

CN = Runoff Curve Number = 98 for runoff impervious surfaces

$P_t$  = Precipitation depth

$Q_{WQV}$  = Runoff depth related to Water Quality Volume = 0.5 watershed inches

This equation produces the result  $P_t = 0.7$  inches, when CN = 98 and  $Q_{WQV} = 0.5$  inches.

### 1-inch WQV Derivation

$$CN = \frac{1000}{10 + 5P_t + 10Q_{WQV} - 10(Q_{WQV}^2 + 1.25Q_{WQV}P_t)^{0.5}}$$

Where:

CN = Runoff Curve Number = 98 for runoff from impervious surfaces

$P_t$  = Precipitation depth

$Q_{WQV}$  = Runoff depth related to Water Quality Volume = 1.0 watershed inches

This equation produces the result  $P_t = 1.2$  inches, when CN = 98 and  $Q_{WQV} = 1.0$  inches

3. Potential maximum retention (S) in inches was derived using the following equation (NRCS 1986):

½-inch WQV Derivation / 1-inch WQV Derivation (result same for both):

$$S = (1000/CN) - 10$$

This equation produces the result  $S = 0.204$  when the CN = 98

4. The initial abstraction (Ia) was derived using the following equation (NRCS 1986):

½-inch WQV Derivation / 1-inch WQV Derivation (result same for both):

$$Ia = 0.2S$$

This equation produces the result  $Ia = 0.041$ , when  $S = 0.204$

*Also See Figure 6 (NRCS 1986, Table 4-1), where  $Ia = 0.041$ , for CN = 98*

5. The Ia/P Ratio was derived using the following equation (NRCS 1986):

½-inch WQV Derivation

Solve for Ia/P Ratio using the following equation (NRCS 1986):

$$Ia/P \text{ Ratio} = Ia / P_t$$

Where:

$Ia = 0.041$  (for CN = 98)

$P_t = 0.7$  watershed inches

$$Ia/P \text{ Ratio} = 0.041 / 0.7 = 0.058$$

## 1-inch WQV Derivation

$$I_a/P \text{ Ratio} = I_a / P_t$$

Where:

$$I_a = 0.041 \text{ (for CN} = 98\text{)}$$

$$P_t = 1.2 \text{ watershed inches}$$

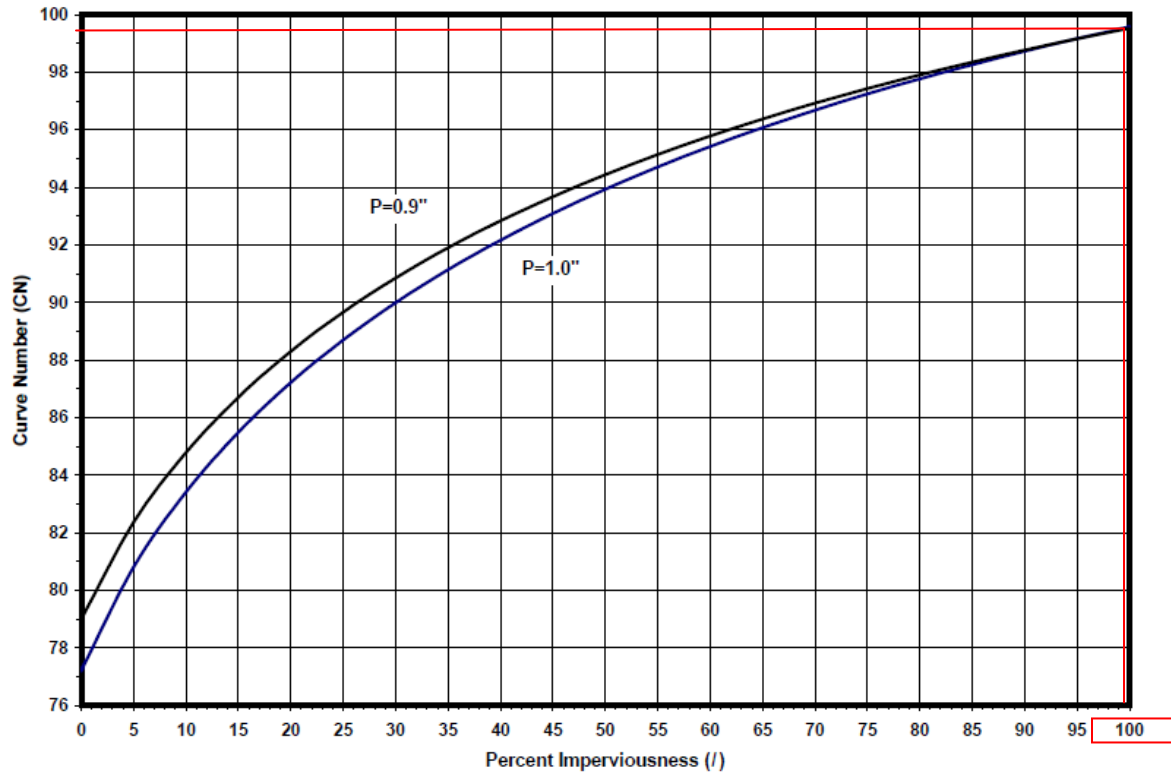
$$I_a/P \text{ Ratio} = 0.041 / 1.2 = 0.034$$

6. For the first ½ -inch runoff,  $I_a/P$  curve for 0.058 ratio (Figure 1) and corresponding table (Figure 2) were generated using coefficients  $C_0$ ,  $C_1$  and  $C_2$  derived from regression of coefficients published in Appendix F in NRCS / SCS TR-55 1986.
7. For the first 1-inch runoff,  $I_a/P$  curve for 0.034 ratio (Figure 3) and corresponding table (Figure 4) were generated using coefficients  $C_0$ ,  $C_1$  and  $C_2$  derived from regression of coefficients published in Appendix F in NRCS / SCS TR-55 1986.



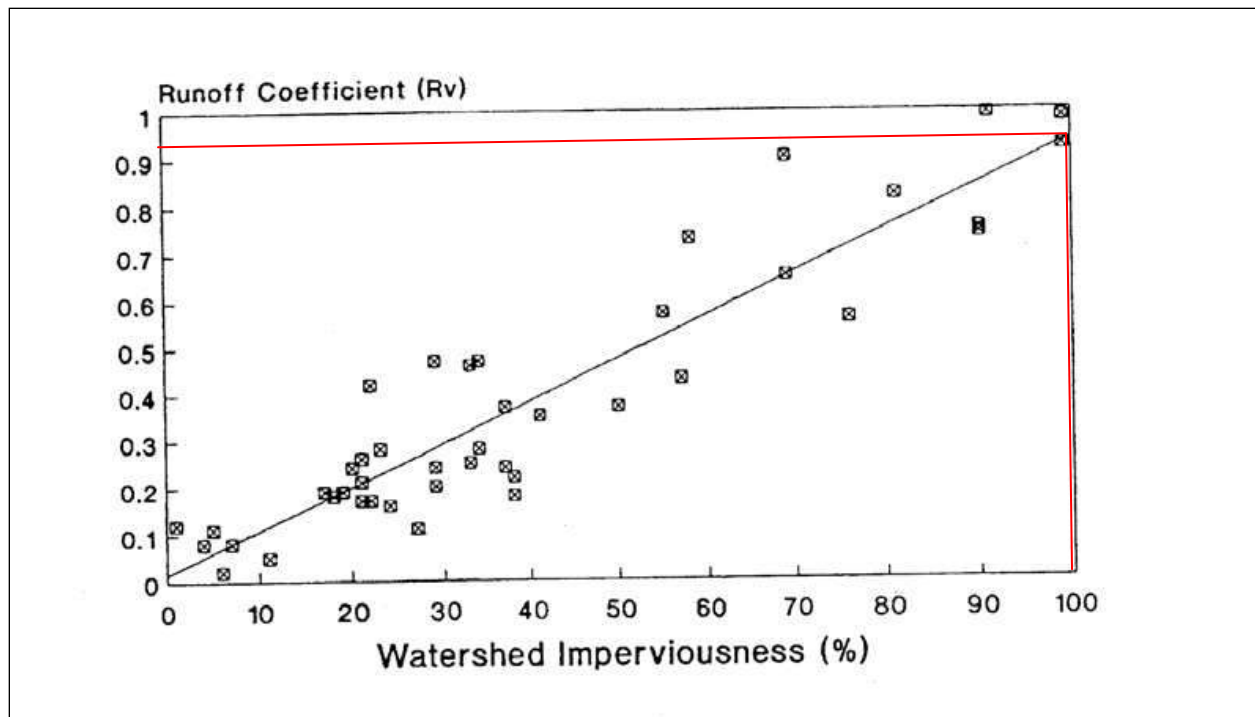
## Figures Used for Method Derivation

Figure D-10.1 Curve Number (CN) for Water Quality Storm  
- Rainfall (P) = 1.0" & 0.9"



Appendix D.10. Method for Computing Peak Discharge for Water Quality Storm

Figure 5: Graph Depicting CN to Percent Impervious Relationship by Precipitation Depth (MD 2000, Figure D-10.1). Note at 100% imperviousness, precipitation depths coincide, making corresponding Runoff CN greater than 98.



**Figure 6: Relationship Between Impervious Cover & Runoff Coefficient (Vermont 2002, from Schueler, 1987).**  
Note at 100% imperviousness, Rv is between 0.9 and 1, meaning that most of the precipitation effectively becomes runoff.

**Table 2-1** Runoff depth for selected CN's and rainfall amounts <sup>1/</sup>

Rainfall	Runoff depth for curve number of—												
	40	45	50	55	60	65	70	75	80	85	90	95	98
	inches												
1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.17	0.32	0.56	0.79
1.2	.00	.00	.00	.00	.00	.00	.03	.07	.15	.27	.46	.74	.99
1.4	.00	.00	.00	.00	.00	.02	.06	.13	.24	.39	.61	.92	1.18
1.6	.00	.00	.00	.00	.01	.05	.11	.20	.34	.52	.76	1.11	1.38
1.8	.00	.00	.00	.00	.03	.09	.17	.29	.44	.65	.93	1.29	1.58
2.0	.00	.00	.00	.02	.06	.14	.24	.38	.56	.80	1.09	1.48	1.77
2.5	.00	.00	.02	.08	.17	.30	.46	.65	.89	1.18	1.53	1.96	2.27
3.0	.00	.02	.09	.19	.33	.51	.71	.96	1.25	1.59	1.98	2.45	2.77
3.5	.02	.08	.20	.35	.53	.75	1.01	1.30	1.64	2.02	2.45	2.94	3.27
4.0	.06	.18	.33	.53	.76	1.03	1.33	1.67	2.04	2.46	2.92	3.43	3.77
4.5	.14	.30	.50	.74	1.02	1.33	1.67	2.05	2.46	2.91	3.40	3.92	4.26
5.0	.24	.44	.69	.98	1.30	1.65	2.04	2.45	2.89	3.37	3.88	4.42	4.76
6.0	.50	.80	1.14	1.52	1.92	2.35	2.81	3.28	3.78	4.30	4.85	5.41	5.76
7.0	.84	1.24	1.68	2.12	2.60	3.10	3.62	4.15	4.69	5.25	5.82	6.41	6.76
8.0	1.25	1.74	2.25	2.78	3.33	3.89	4.46	5.04	5.63	6.21	6.81	7.40	7.76
9.0	1.71	2.29	2.88	3.49	4.10	4.72	5.33	5.95	6.57	7.18	7.79	8.40	8.76
10.0	2.23	2.89	3.56	4.23	4.90	5.56	6.22	6.88	7.52	8.16	8.78	9.40	9.76
11.0	2.78	3.52	4.26	5.00	5.72	6.43	7.13	7.81	8.48	9.13	9.77	10.39	10.76
12.0	3.38	4.19	5.00	5.79	6.56	7.32	8.05	8.76	9.45	10.11	10.76	11.39	11.76
13.0	4.00	4.89	5.76	6.61	7.42	8.21	8.98	9.71	10.42	11.10	11.76	12.39	12.76
14.0	4.65	5.62	6.55	7.44	8.30	9.12	9.91	10.67	11.39	12.08	12.75	13.39	13.76
15.0	5.33	6.36	7.35	8.29	9.19	10.04	10.85	11.63	12.37	13.07	13.74	14.39	14.76

**Figure 7: Table Depicting Relationship Between Precipitation (P) and Direct Runoff (Q) by Curve Number (NRCS 1986, Table 2-1). 1.2 inches of precipitation effectively becomes 0.99-inch of runoff.**

Figure 2-1 Solution of runoff equation.

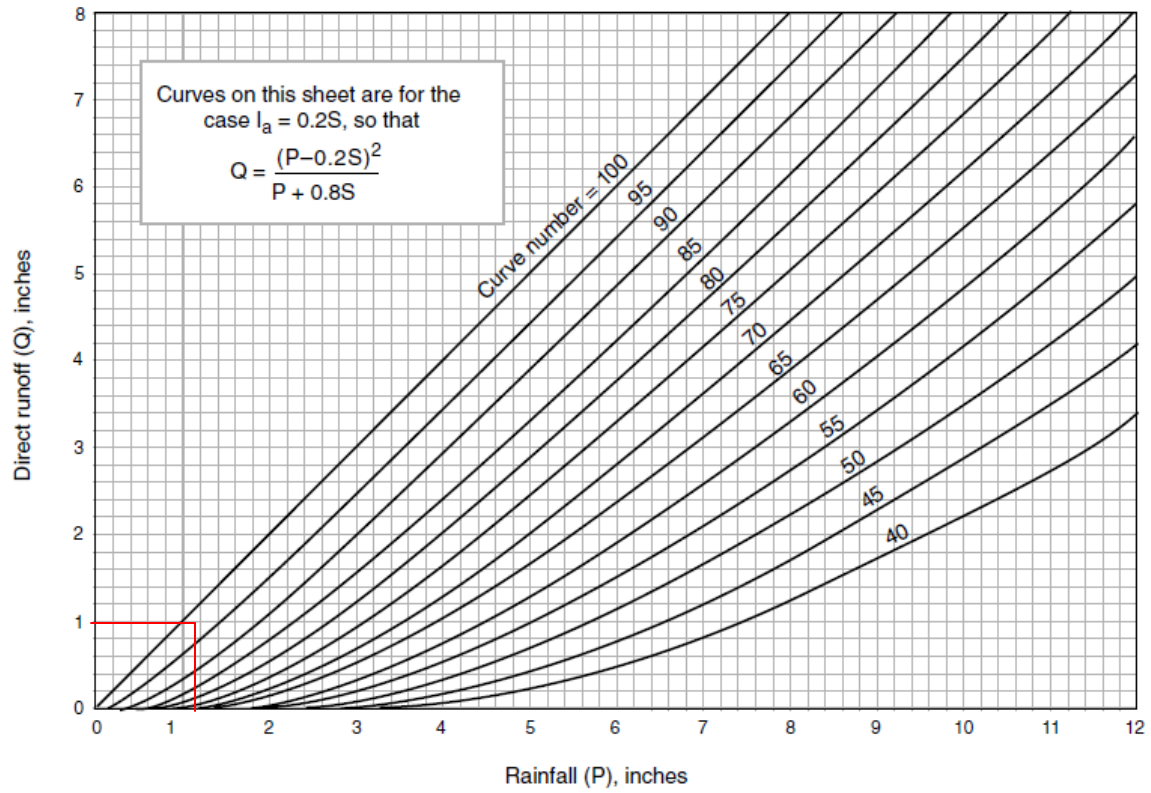


Figure 8: Graph Depicting Relationship Between Precipitation (P) and Direct Runoff (Q) by Curve Number (NRCS 1986, Figure 2-1). This indicates that for a CN 98 (representing impervious surfaces), 1.2 inches of precipitation effectively equals 1-inch of direct runoff.

**Table 4-1**  $I_a$  values for runoff curve numbers

Curve number	$I_a$ (in)	Curve number	$I_a$ (in)
40 .....	3.000	70 .....	0.857
41 .....	2.878	71 .....	0.817
42 .....	2.762	72 .....	0.778
43 .....	2.651	73 .....	0.740
44 .....	2.545	74 .....	0.703
45 .....	2.444	75 .....	0.667
46 .....	2.348	76 .....	0.632
47 .....	2.255	77 .....	0.597
48 .....	2.167	78 .....	0.564
49 .....	2.082	79 .....	0.532
50 .....	2.000	80 .....	0.500
51 .....	1.922	81 .....	0.469
52 .....	1.846	82 .....	0.439
53 .....	1.774	83 .....	0.410
54 .....	1.704	84 .....	0.381
55 .....	1.636	85 .....	0.353
56 .....	1.571	86 .....	0.326
57 .....	1.509	87 .....	0.299
58 .....	1.448	88 .....	0.273
59 .....	1.390	89 .....	0.247
60 .....	1.333	90 .....	0.222
61 .....	1.279	91 .....	0.198
62 .....	1.226	92 .....	0.174
63 .....	1.175	93 .....	0.151
64 .....	1.125	94 .....	0.128
65 .....	1.077	95 .....	0.105
66 .....	1.030	96 .....	0.083
67 .....	0.985	97 .....	0.062
68 .....	0.941	98 .....	0.041
69 .....	0.899		

Figure 9: Table Listing  $I_a$  by CN (NRCS 1986, Table 4-1). This indicates Initial Abstraction ( $I_a$ ) for CN 98 = 0.041

**Figure 4-1** Variation of  $I_a/P$  for P and CN

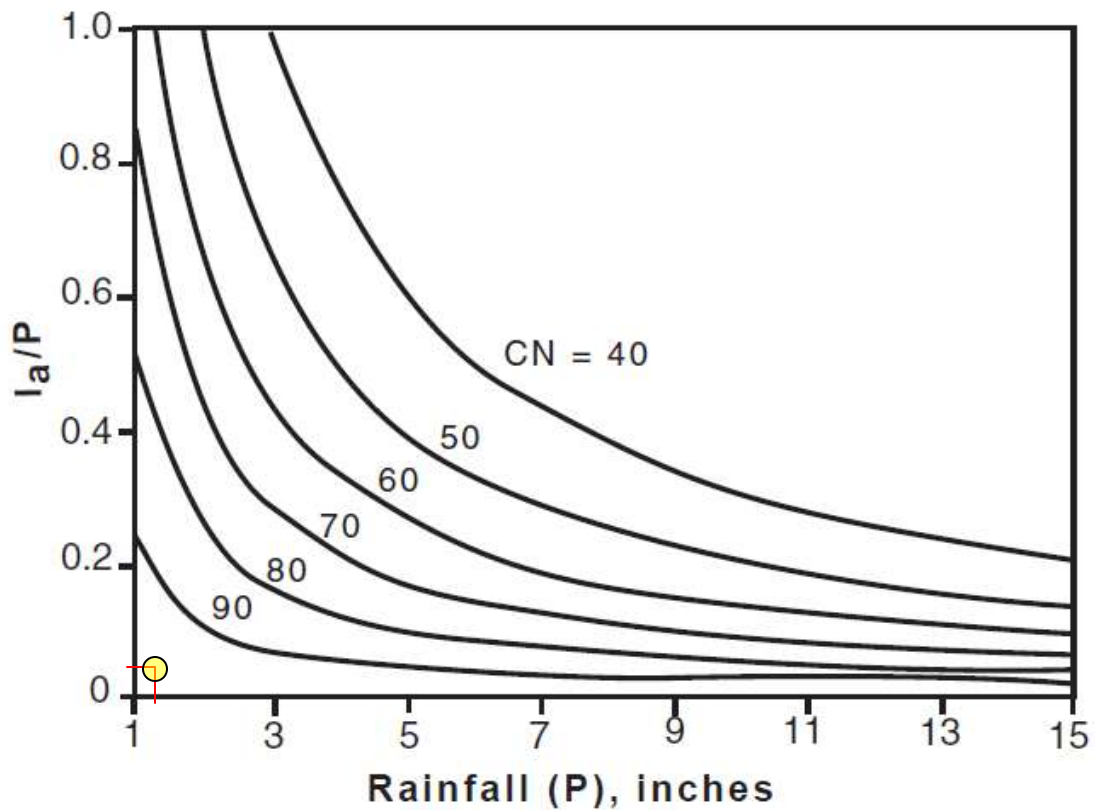
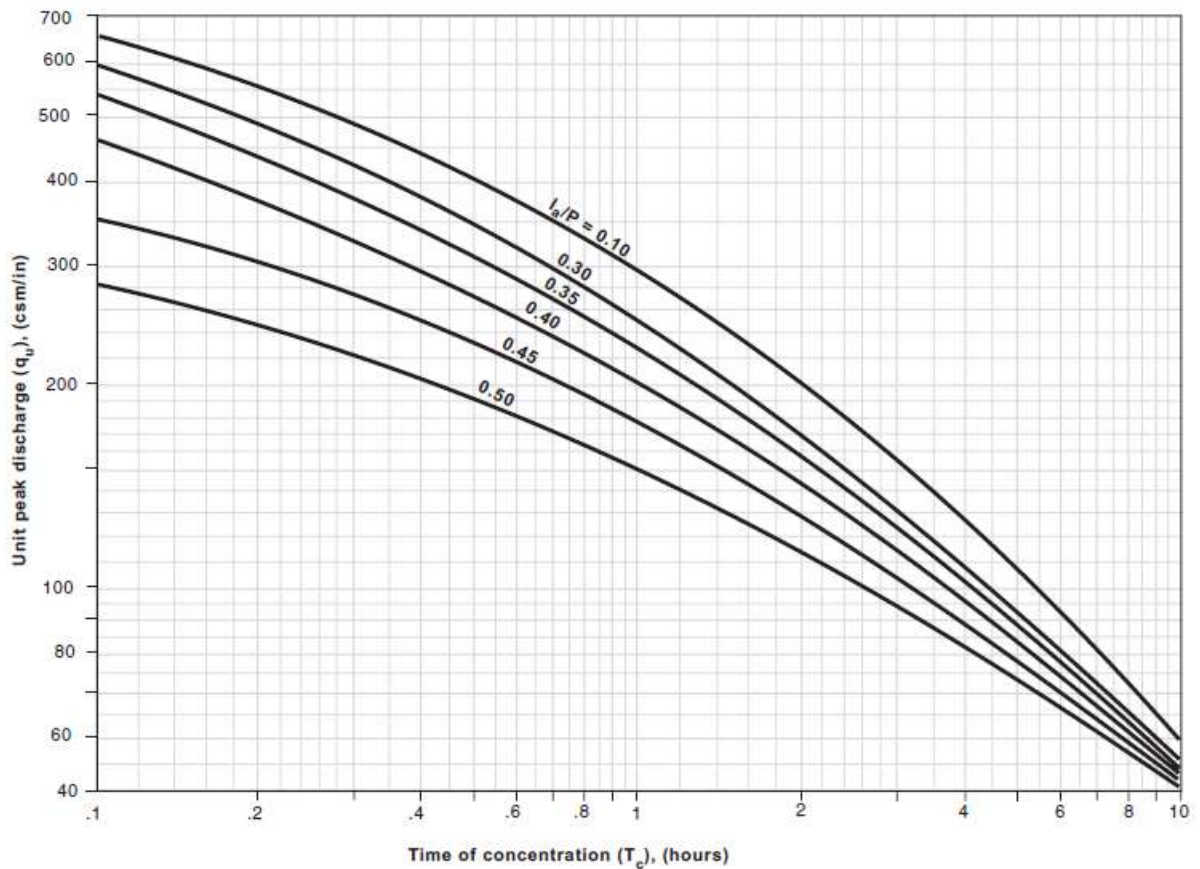


Figure 10: Graph Depicting  $I_a/P$  to Precipitation Relationship by CN (NRCS 1986, Figure 4-1).  $I_a/P$  ratio of 0.034 corresponding to 1.2 inches of precipitation added.  $I_a/P$  ratio determined for CN 98, using  $I_a = 0.041$ ,  $P = 1.2$

**Exhibit 4-III Unit peak discharge ( $q_u$ ) for NRCS (SCS) type III rainfall distribution**



**Figure 11: Relationship Between Time of Concentration and Unit Peak Discharge for  $I_a/P$  Ratios from 0.10 to 0.50 for NRCS Type III Storm Distribution (NRCS 1986, Exhibit 4-III). NRCS / SCS 1986 specifies Type III storm distribution (tropical influenced storms) for Massachusetts. See Figure 3 and 4 for  $I_a/P$  Ratio = 0.034**

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**CONTECH**<sup>®</sup>  
ENGINEERED SOLUTIONS

CDS<sup>®</sup>



Solutions  
Guide



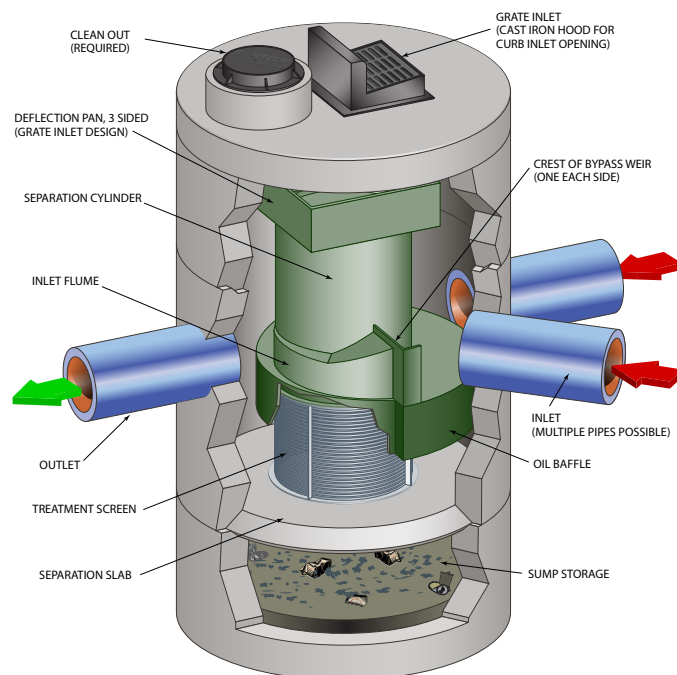
# Continuous Deflective Separation - CDS®



## Superior Stormwater Trash and Sediment Removal

The CDS is a swirl concentrator hybrid technology that uses continuous deflective separation – a combination of swirl concentration and indirect screening to screen, separate and trap debris, sediment, and hydrocarbons from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material debris 2.4 mm or larger, without binding. CDS retains all captured pollutants, even at high flow rates, and provides easy access for maintenance.

CDS is used to meet trash Total Maximum Daily Load (TMDL) requirements, for stormwater quality control, inlet and outlet pollution control, and as pretreatment for filtration, detention/infiltration, bioretention, rainwater harvesting systems, and a variety of green infrastructure practices.



Learn more about the CDS system at  
[www.ContechES.com/CDS](http://www.ContechES.com/CDS) ❖ ❖ ❖

## CDS® Approvals

CDS has been verified by some of the most stringent stormwater technology evaluation organizations in North America, including:

- Washington State Department of Ecology
- New Jersey Department of Environmental Protection
- Canadian Environmental Technology Verification (ETV)
- California Statewide Trash Amendments Full Capture System Certified\*



\* The CDS System has been certified by the California State Water Resources Control Board as a Full Capture System provided that it is sized to treat the peak flow rate from the region specific 1-year, 1-hour design storm, or the peak flow capacity of the corresponding storm drain, whichever is less.

## CDS® Features & Benefits

Feature	Benefit
1. Captures and retains 100% of floatables and neutrally buoyant debris 2.4 mm or larger	1. Superior pollutant removal
2. Self-cleaning screen	2. Ease of maintenance
3. Isolated storage sump eliminates scour potential	3. Excellent pollutant retention
4. Internal bypass	4. Eliminates the need for additional structures
5. Multiple pipe inlets and 90-180° angles	5. Design flexibility
6. Numerous regulatory approvals	6. Proven performance



# The CDS® Screen

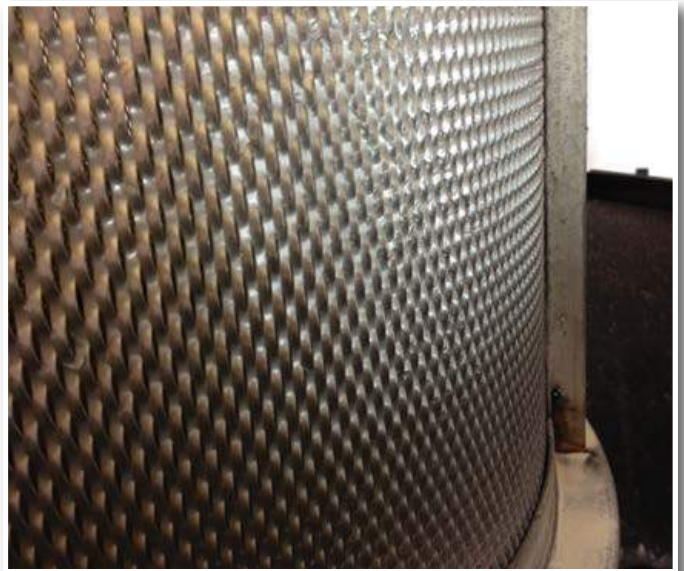
Traditional approaches to trash control typically involve “direct screening” that can easily become clogged, as trash is pinned to the screen as water passes through. Clogged screens can lead to flooding as water backs up.

The design of the CDS screen is fundamentally different. Flow is introduced to the screen face which is louvered so that it is smooth in the downstream direction. The effect created is called “Continuous Deflective Separation.” The power of the incoming flow is harnessed to continually shear debris off the screen and to direct trash and sediment toward the center of the separation cylinder.

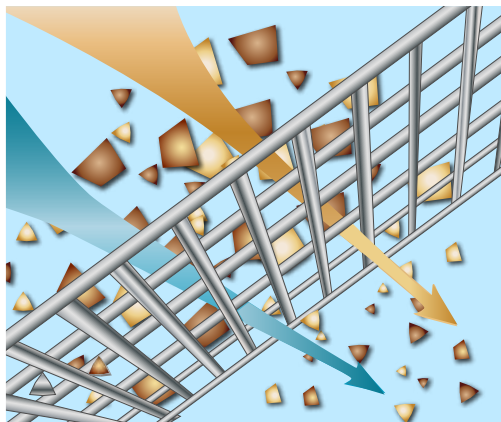
## Key Features:

### Self-Cleaning Screening Technology

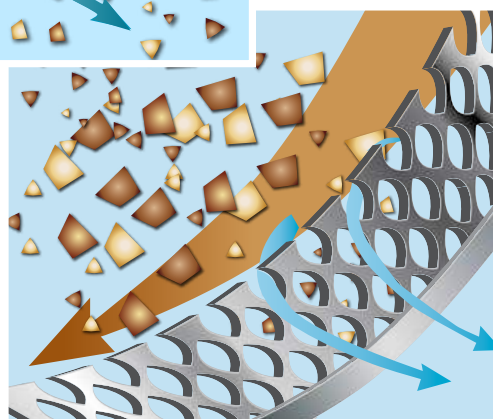
- CDS Screen captures neutrally buoyant materials missed by other separator systems.
- Screen is hydraulically designed to be self-cleaning.
- Runoff entering the separation cylinder must pass through the screen prior to discharge, eliminating potential for scouring previously captured trash at high flow rates.



## The CDS Screen — Self-Cleaning Screening Technology ❖ ❖ ❖



**Direct Screening** – particles that are larger than the aperture size of the screen can cause clogging, resulting in flooding if not maintained frequently.



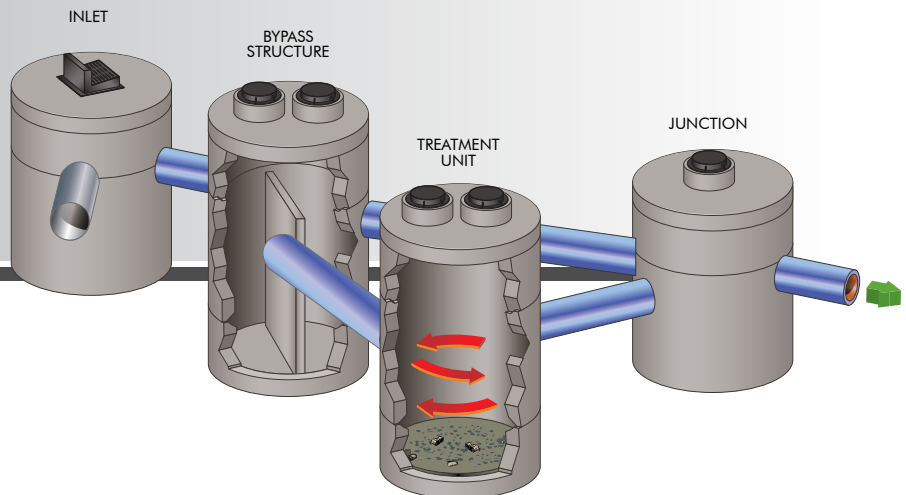
**Continuous Deflective Separation Indirect Screening** – water velocities within the swirl chamber continually shear debris off the screen to keep it clean.

# CDS® Configuration - One System that Can Do It All!

The CDS effectively treats stormwater runoff while reducing the number of structures on your site.

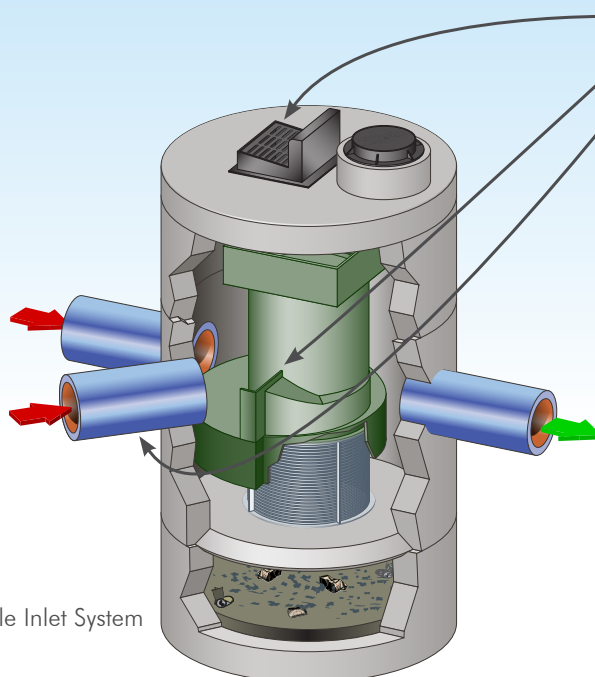
## WHY GO THROUGH ALL THIS?

### TRADITIONAL STORMWATER TREATMENT SITE DESIGN



## ONE SYSTEM CAN DO IT ALL!

- Inline, offline, grate inlet, and drop inlet configurations available
- Internal and external peak bypass options available



CDS® Multiple Inlet System



Save Time, Space, and Money with CDS®

- Grate inlet option available
- Internal bypass weir
- Accepts multiple inlets at a variety of angles
- Advanced hydrodynamic separator
- Captures and retains 100% of floatables and neutrally buoyant debris 2.4 mm or larger
- Indirect screening capability keeps screen from clogging
- Retention of all captured pollutants, even at high flows
- Performance verified by NJCAT, WA Ecology, and ETV Canada

# CDS® Applications

CDS is commonly used in the following stormwater applications:

- Stormwater quality control – trash, debris, sediment, and hydrocarbon removal
- Urban retrofit and redevelopment
- Inlet and outlet protection
- Pretreatment for filtration, detention/infiltration, bioretention, rainwater harvesting systems, and Low Impact Development designs.



CDS provides trash control.



CDS pretreats a bioswale.



CDS pretreats a rainwater harvesting cistern.



CDS standalone system removes trash and sediment.



# CDS® Models and Capacities

CDS MODEL		Treatment Flow Rates <sup>1</sup>			Estimated Maximum Peak Conveyance Flow <sup>3</sup> (cfs)/(L/s)	Minimum Sump Storage Capacity <sup>4</sup> (yd <sup>3</sup> )/(m <sup>3</sup> )	Minimum Oil Storage Capacity <sup>4</sup> (gal)/(L)
		75 microns (cfs)/(L/s)	125 microns <sup>2</sup> (cfs)/(L/s)	Trash & Debris (cfs)/(L/s)			
PRECAST	CDS2015-4	0.5 (14.2)	0.7 (19.8)	1.0 (28.3)	10 (283)	0.9 (0.7)	61 (232)
	CDS2015-5	0.5 (14.2)	0.7(19.8)	1.0 (28.3)	10 (283)	1.5 (1.1)	83 (313)
	CDS2020-5	0.7 (19.8)	1.1 (31.2)	1.5 (42.5)	14 (396)	1.5 (1.1)	99 (376)
	CDS2025-5	1.1 (31.2)	1.6 (45.3)	2.2 (62.3)	14 (396)	1.5 (1.1)	116 (439)
	CDS3020-6	1.4 (39.6)	2.0 (56.6)	2.8 (79.3)	20 (566)	2.1 (1.6)	184 (696)
	CDS3025-6	1.7 (48.1)	2.5 (70.8)	3.5 (99.2)	20 (566)	2.1 (1.6)	210 (795)
	CDS3030-6	2.0 (56.6)	3.0 (85.0)	4.2 (118.9)	20 (566)	2.1 (1.6)	236 (895)
	CDS3035-6	2.6 (73.6)	3.8 (106.2)	5.3 (150.0)	20 (566)	2.1 (1.6)	263 (994)
	CDS4030-8	3.1 (87.7)	4.5 (127.4)	6.3 (178.3)	30 (850)	5.6 (4.3)	426 (1612)
	CDS4040-8	4.1 (116.1)	6.0 (169.9)	8.4 (237.8)	30 (850)	5.6 (4.3)	520 (1970)
	CDS4045-8	5.1 (144.4)	7.5 (212.4)	10.5 (297.2)	30 (850)	5.6 (4.3)	568 (2149)
	CDS5640-10	6.1 (172.7)	9.0 (254.9)	12.6 (356.7)	50 (1416)	8.7 (6.7)	758 (2869)
	CDS5653-10	9.5 (268.9)	14.0 (396.5)	19.6 (554.8)	50 (1416)	8.7 (6.7)	965 (3652)
	CDS5668-10	12.9 (365.1)	19.0 (538.1)	26.6 (752.9)	50 (1416)	8.7 (6.7)	1172 (4435)
	CDS5678-10	17.0 (481.2)	25.0 (708.0)	35.0 (990.7)	50 (1416)	8.7 (6.7)	1309 (4956)
	CDS9280-12	27.2 (770.2)	40.0 (1132.7)	56.0 (1585.7)	Offline	16.8 (12.8)	N/A
	CDS9290-12	35.4 (1002.4)	52.0 (1472.5)	72 (2038.8)		16.8 (12.8)	
	CDS92100-12	42.8 (1212.0)	63.0 (1783.9)	88 (2491.9)		16.8 (12.8)	
CDS150134-22	100.7 (2851.5)	148.0 (4190.9)	270 (7645.6)	56.3 (43.0)			
CDS200164-26	183.6 (5199.0)	270.0 (7645.6)	378.0 (10703.8)	78.7 (60.2)			
CDS240160-32	204 (5776.6)	300.0 (8495.1)	420.0 (8495.1)	119.1 (91.1)			
Additional Cast-in-Place models available upon request.							
CAST-IN-PLACE							

1. Alternative PSD/D<sub>50</sub> sizing is available upon request.
2. 125 micron flows are based on the CDS Washington State Department of Ecology approval for 80% removal of a particle size distribution (PSD) having a mean particle size (D<sub>50</sub>) of 125 microns.
3. Estimated maximum peak conveyance flow is calculated using conservative values and may be exceeded on sites with lower inflow velocities and sufficient head over the weir.
4. Sump and oil capacities can be customized to meet site needs



# CDS® Maintenance

Systems vary in their maintenance needs, and the selection of a cost-effective and easy-to-access treatment system can mean a huge difference in maintenance expenses for years to come.

A CDS unit is designed to minimize maintenance and make it as easy and inexpensive as possible to keep our systems working properly.

## Inspection

Inspection is the key to effective maintenance. Pollutant deposition and transport may vary from year to year and site to site. Semi-annual inspections will help ensure that the system is cleaned out at the appropriate time. Inspections should be performed more frequently where site conditions may cause rapid accumulation of pollutants.



Most CDS units can easily be cleaned in 30 minutes.

## Recommendations for CDS Maintenance

The recommended cleanout of solids within the CDS unit's sump should occur at 75% of the sump capacity. Access to the CDS unit is typically achieved through two manhole access covers – one allows inspection and cleanout of the separation chamber and sump, and another allows inspection and cleanout of sediment captured and retained behind the screen. A vacuum truck is recommended for cleanout of the CDS unit and can be easily accomplished in less than 30 minutes for most installations.

## DYOHDS™ Tool

### Design Your Own Hydrodynamic Separator

#### Features

- Choose from three HDS technologies - CDS®, Vortechs® and VortSentry® HS
- Site specific questions ensure the selected unit will comply with site constraints
- Unit size based on selected mean particle size and targeted removal percentage
- Localized rainfall data allows for region specific designs
- PDF report includes detailed performance calculations, specification and standard drawing for the unit that was sized



 **DYO Project**  
design made easy.



 **Design Your Own (DYO) Hydrodynamic Separator**  
online at [www.ContechES.com/dyohds](http://www.ContechES.com/dyohds)

## Next Steps

### Learn more

See our CDS systems in action at [www.ContechES.com/videos](http://www.ContechES.com/videos)

### Connect with Us

We're here to make your job easier – and that includes being able to get in touch with us when you need to. [www.ContechES.com/localresources](http://www.ContechES.com/localresources)

### Start a Project

If you are ready to begin a project, visit us at [www.ContechES.com/startaproject](http://www.ContechES.com/startaproject)

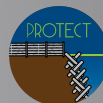
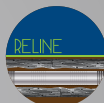
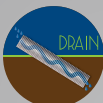
Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, retaining walls, sanitary sewer, stormwater, erosion control and soil stabilization products.

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266 related foreign patents or other patents pending.

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## COMPLETE SITE SOLUTIONS



#### Stormwater Solutions

Helping to satisfy stormwater management requirements on land development projects

- Stormwater Treatment
- Detention/Infiltration
- Rainwater Harvesting
- Biofiltration/Bioretenation

#### Pipe Solutions

Meeting project needs for durability, hydraulics, corrosion resistance, and stiffness

- Corrugated Metal Pipe (CMP)
- Steel Reinforced Polyethylene (SRPE)
- High Density Polyethylene (HDPE)
- Polyvinyl Chloride (PVC)

#### Structures Solutions

Providing innovative options and support for crossings, culverts, and bridges

- Plate, Precast & Truss bridges
- Hard Armor
- Retaining Walls
- Tunnel Liner Plate

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We print our brochures entirely on Forest Stewardship Council certified paper. FSC certification ensures that the paper in our brochures contain fiber from well-managed and responsibly harvested forests that meet strict environmental and socioeconomic standards.

FSC

## RECHARGE VOLUME

Project Name: Nichols Townhouses

Project # 076491

Date: May 22, 2022

Following Guidelines From "Massachusetts Stormwater Management Technical Handbook"

### Recharge Volume

$$Rv = F * \text{Impervious Area}$$

Where:

Rv = Required Recharge Volume

F = Target Depth Factor

Areas From  
AutoCAD

Hydrologic Soil Group	Recharge Factor	Acres
A	0.60	0.000
B	0.35	0.000
C	0.25	0.826
D	0.10	0.000

$$Rv \text{ REQUIRED} = 0.017 \text{ ac ft}$$

**750 cf**

### Available Storage

Volumes From  
HydroCAD

Water Quality Basin to Elev. 639.0 → 4,290 cu.ft.

Total Available Storage = **4,290** cu.ft.

$$4,290 \geq 750$$

### Drawdown

$$T = Rv / K (\text{Btm Area})$$

Where:

T = Time (hrs)

Rv = Required Recharge Volume

K = Saturated Hydraulic Conductivity

Table 2.3.3  
K=Rawls Rates  
for Type "C" Silt Loam

$$T = 4290 / (0.27 * (3553 / 12))$$

$$T = 53.7 \text{ hrs}$$

$$53.7 \leq 72$$

Prepared By: PMP



## 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: Nichols College

TSS Removal Calculation Worksheet	B	C	D	E	F
	BMP <sup>1</sup>	TSS Removal Rate <sup>1</sup>	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
	Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
	Oil Grit Separator	0.25	0.75	0.19	0.56
	Water Quality Swale - Dry	0.70	0.56	0.39	0.17
		0.00	0.17	0.00	0.17
		0.00	0.17	0.00	0.17

Total TSS Removal =

83%

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

Project: Townhouses

Prepared By: P.Parent

Date: 5/22/2022

\*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

Mass. Dept. of Environmental Protection



## **EXISTING CONDITIONS DRAINAGE CALCULATIONS**

---







Juster Pope Frazier, LLC  
Architects and Planners  
82 North Street  
Northampton, Massachusetts 01060  
413.586.1600

Clough Harbour Associates, LLP  
Civil Engineers  
101 East River Drive, 1st Floor  
East Hartford, CT 06108  
860.290.4100

NICHOLS COLLEGE

TOWNHOMES

CENTER ROAD, DUDLEY, MA 01571

REVISIONS			
NO.	DATE	BY	REMARKS

SET

PLANNING BOARD  
SUBMISSION

SHEET TITLE

EXISTING CONDITIONS  
DRAINAGE BASIN MAP

DATE MAY 25, 2022

SCALE 1" = 60'

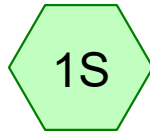
DRAWN BY PMP

CHECKED BY

SHEET NO.

C6.1





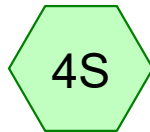
Existing to Center Road



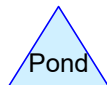
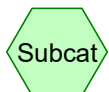
Existing to Northern  
Detention Basin



Existing to West



Existing to South





**076491 Nichols Townhouses**

Prepared by CHA Companies, Inc.

Printed 5/23/2022

HydroCAD® 10.00-25 s/n 01289 © 2019 HydroCAD Software Solutions LLC

Page 2

**Area Listing (selected nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
221,205	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S, 4S)
77,220	98	Paved (1S, 2S)
186,175	70	Woods, Good, HSG C (1S, 3S, 4S)
<b>484,600</b>	<b>76</b>	<b>TOTAL AREA</b>

**076491 Nichols Townhouses**

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Existing Conditions  
Type II 24-hr 2-yr Rainfall=3.29"

Printed 5/23/2022

Page 3

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

**Subcatchment1S: Existing to Center**      Runoff Area=142,880 sf   23.89% Impervious   Runoff Depth=1.40"  
Flow Length=205'   Tc=7.9 min   CN=79   Runoff=7.69 cfs   16,725 cf

**Subcatchment2S: Existing to Northern**      Runoff Area=63,790 sf   67.55% Impervious   Runoff Depth=2.25"  
Tc=5.0 min   CN=90   Runoff=5.87 cfs   11,972 cf

**Subcatchment3S: Existing to West**      Runoff Area=258,900 sf   0.00% Impervious   Runoff Depth=0.99"  
Flow Length=530'   Tc=20.1 min   CN=72   Runoff=6.05 cfs   21,272 cf

**Subcatchment4S: Existing to South**      Runoff Area=19,030 sf   0.00% Impervious   Runoff Depth=0.99"  
Flow Length=255'   Tc=16.0 min   CN=72   Runoff=0.51 cfs   1,564 cf

**Total Runoff Area = 484,600 sf   Runoff Volume = 51,532 cf   Average Runoff Depth = 1.28"**  
**84.07% Pervious = 407,380 sf   15.93% Impervious = 77,220 sf**

**076491 Nichols Townhouses**

Prepared by CHA Companies, Inc.

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Existing Conditions  
Type II 24-hr 2-yr Rainfall=3.29"

Printed 5/23/2022

Page 4

**Summary for Subcatchment 1S: Existing to Center Road**

Runoff = 7.69 cfs @ 12.00 hrs, Volume= 16,725 cf, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

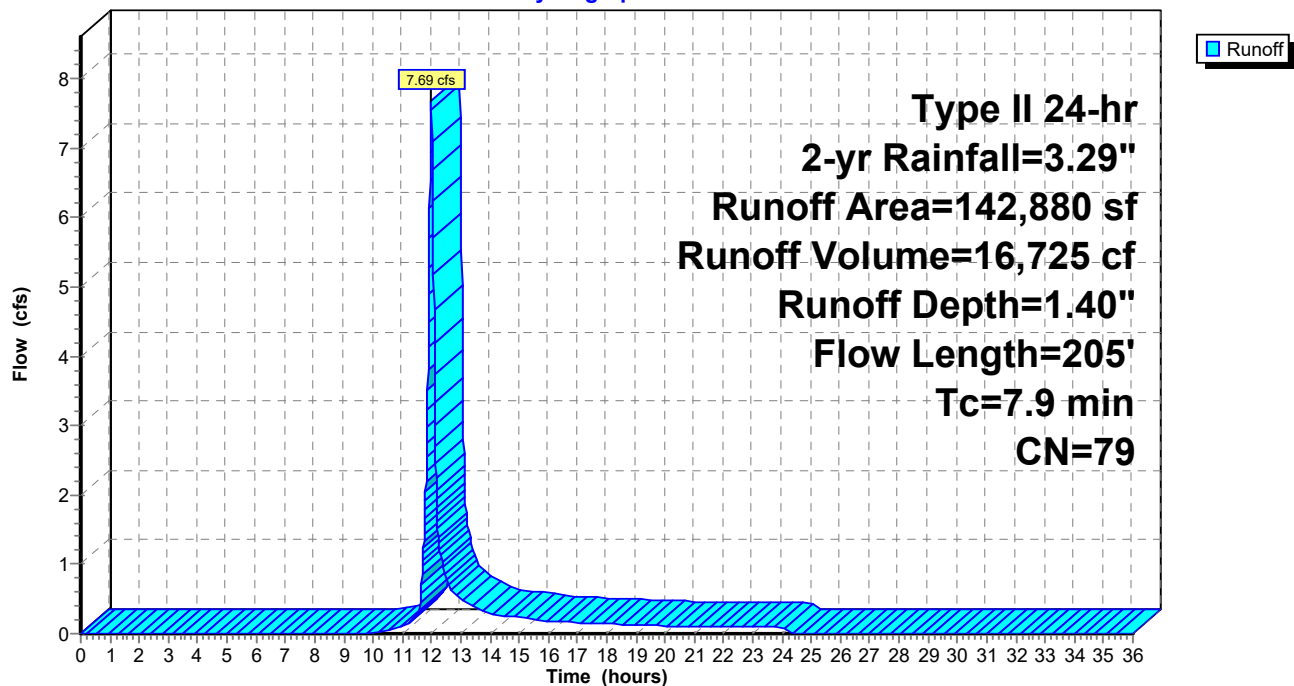
	Area (sf)	CN	Description
*	34,130	98	Paved
	88,835	74	>75% Grass cover, Good, HSG C
	19,915	70	Woods, Good, HSG C
	142,880	79	Weighted Average
	108,750		76.11% Pervious Area
	34,130		23.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	35	0.0060	0.09		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
1.1	170	0.1300	2.52		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
7.9	205	Total			

**Subcatchment 1S: Existing to Center Road**

Hydrograph



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Existing Conditions  
Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 2S: Existing to Northern Detention Basin**

Runoff = 5.87 cfs @ 11.96 hrs, Volume= 11,972 cf, Depth= 2.25"

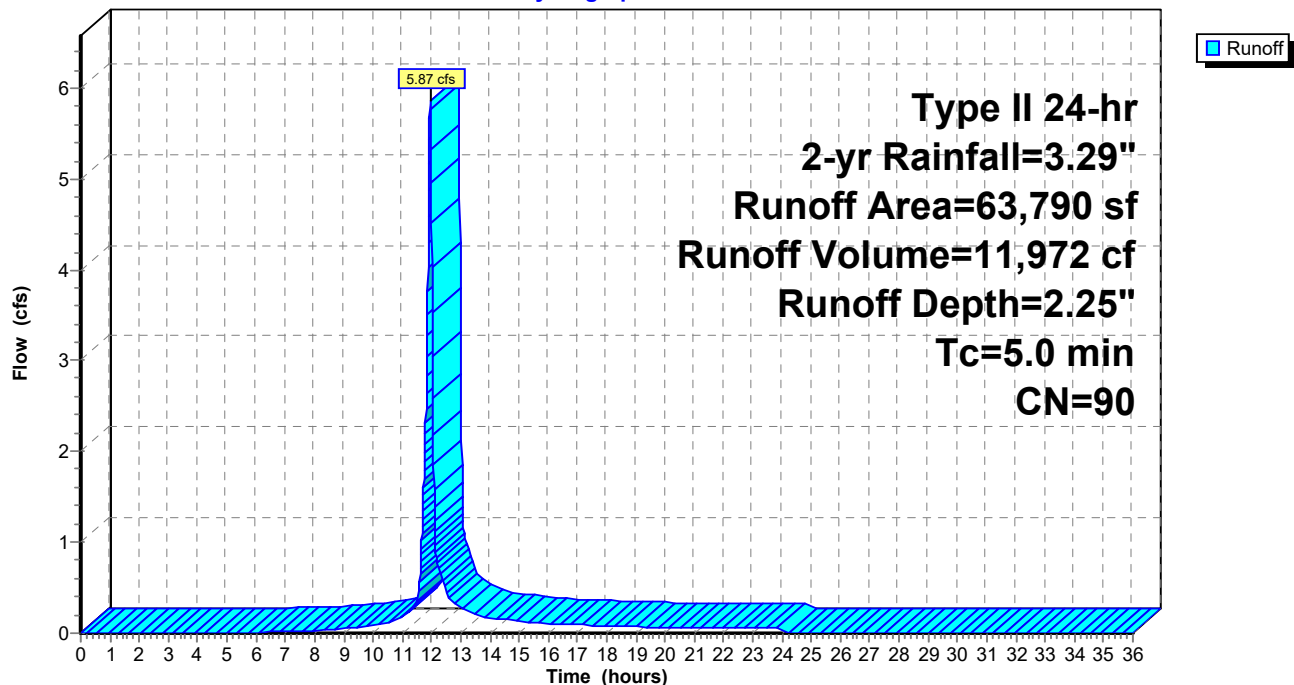
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	43,090	98	Paved
	20,700	74	>75% Grass cover, Good, HSG C
	63,790	90	Weighted Average
	20,700		32.45% Pervious Area
	43,090		67.55% Impervious Area

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

**Subcatchment 2S: Existing to Northern Detention Basin**

Hydrograph





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Existing Conditions  
Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 3S: Existing to West**

Runoff = 6.05 cfs @ 12.14 hrs, Volume= 21,272 cf, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

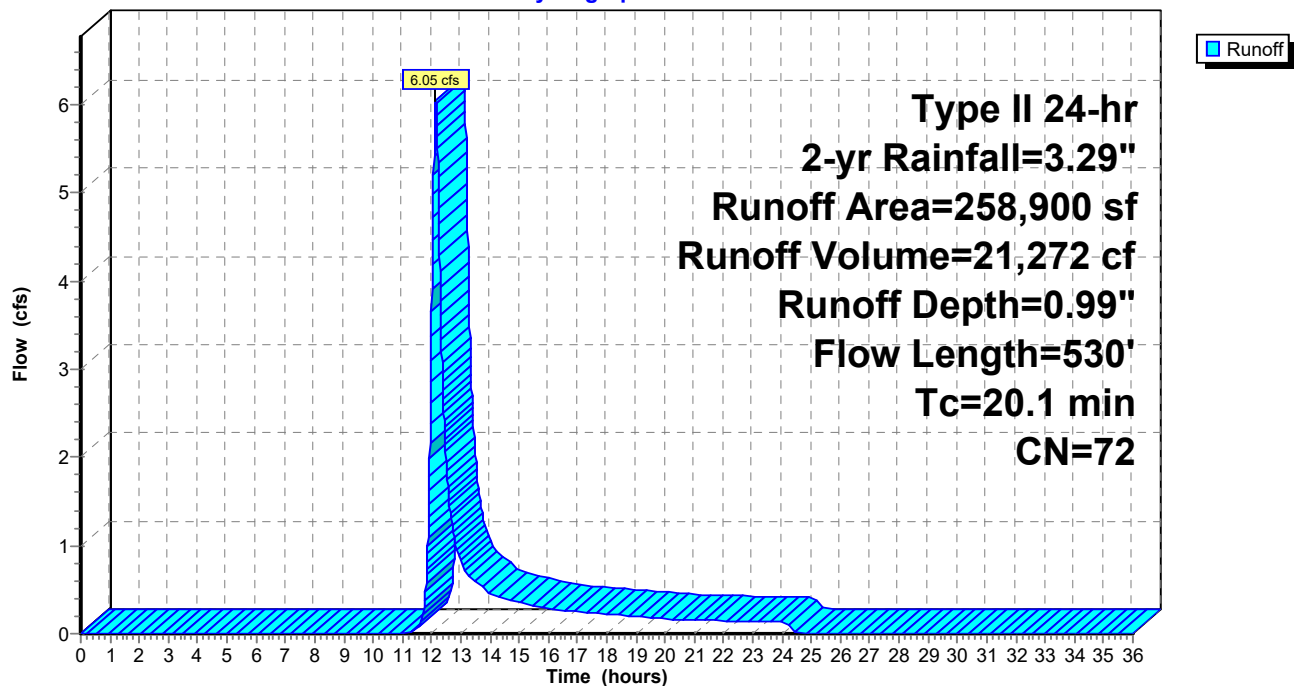
Area (sf)	CN	Description
101,210	74	>75% Grass cover, Good, HSG C
157,690	70	Woods, Good, HSG C
258,900	72	Weighted Average
258,900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
5.6	165	0.0050	0.49		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
2.1	290	0.1070	2.29		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
20.1	530	Total			

**Subcatchment 3S: Existing to West**

Hydrograph



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Existing Conditions  
Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 4S: Existing to South**

Runoff = 0.51 cfs @ 12.10 hrs, Volume= 1,564 cf, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

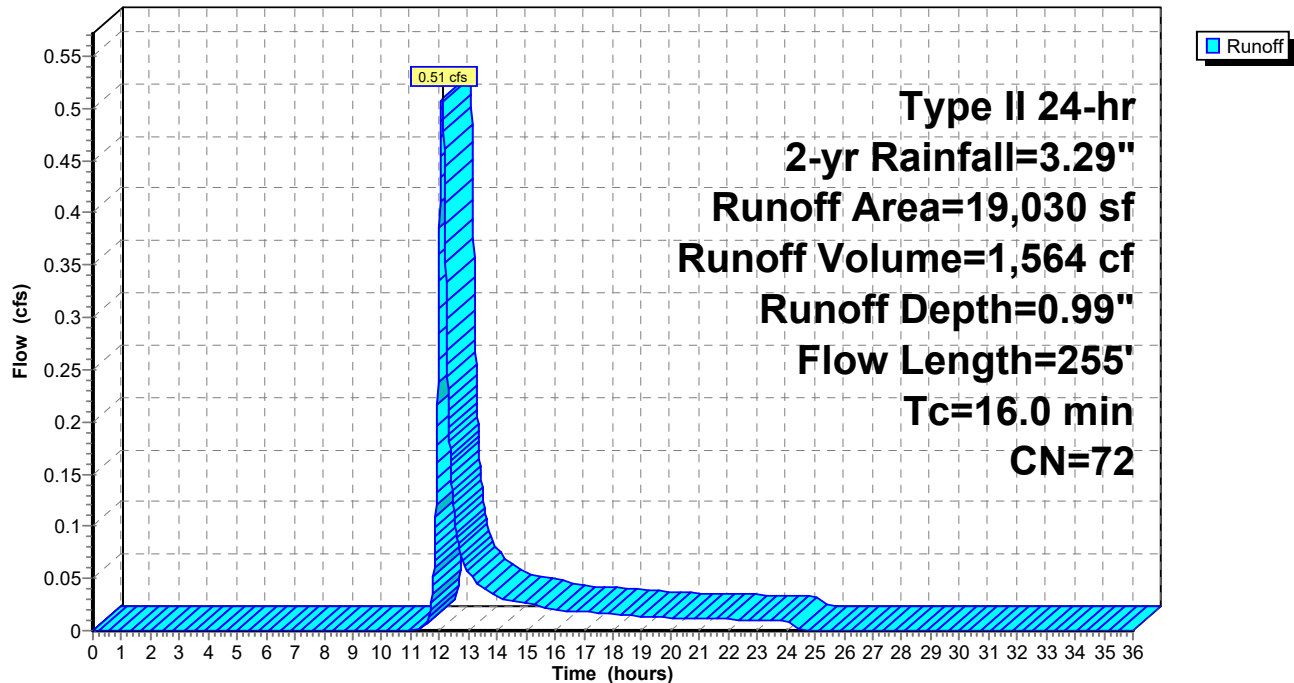
Area (sf)	CN	Description
10,460	74	>75% Grass cover, Good, HSG C
8,570	70	Woods, Good, HSG C
19,030	72	Weighted Average
19,030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
2.4	100	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.2	80	0.0250	1.11		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
16.0	255	Total			

**Subcatchment 4S: Existing to South**

Hydrograph



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Existing Conditions  
Type II 24-hr 10-yr Rainfall=5.08"

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

**Subcatchment1S: Existing to Center**      Runoff Area=142,880 sf   23.89% Impervious   Runoff Depth=2.87"  
Flow Length=205'   Tc=7.9 min   CN=79   Runoff=15.57 cfs   34,180 cf

**Subcatchment2S: Existing to Northern**      Runoff Area=63,790 sf   67.55% Impervious   Runoff Depth=3.95"  
Tc=5.0 min   CN=90   Runoff=9.95 cfs   21,016 cf

**Subcatchment3S: Existing to West**      Runoff Area=258,900 sf   0.00% Impervious   Runoff Depth=2.26"  
Flow Length=530'   Tc=20.1 min   CN=72   Runoff=14.78 cfs   48,752 cf

**Subcatchment4S: Existing to South**      Runoff Area=19,030 sf   0.00% Impervious   Runoff Depth=2.26"  
Flow Length=255'   Tc=16.0 min   CN=72   Runoff=1.23 cfs   3,583 cf

**Total Runoff Area = 484,600 sf   Runoff Volume = 107,532 cf   Average Runoff Depth = 2.66"**  
**84.07% Pervious = 407,380 sf   15.93% Impervious = 77,220 sf**

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Existing Conditions  
Type II 24-hr 10-yr Rainfall=5.08"

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**Summary for Subcatchment 1S: Existing to Center Road**

Runoff = 15.57 cfs @ 11.99 hrs, Volume= 34,180 cf, Depth= 2.87"

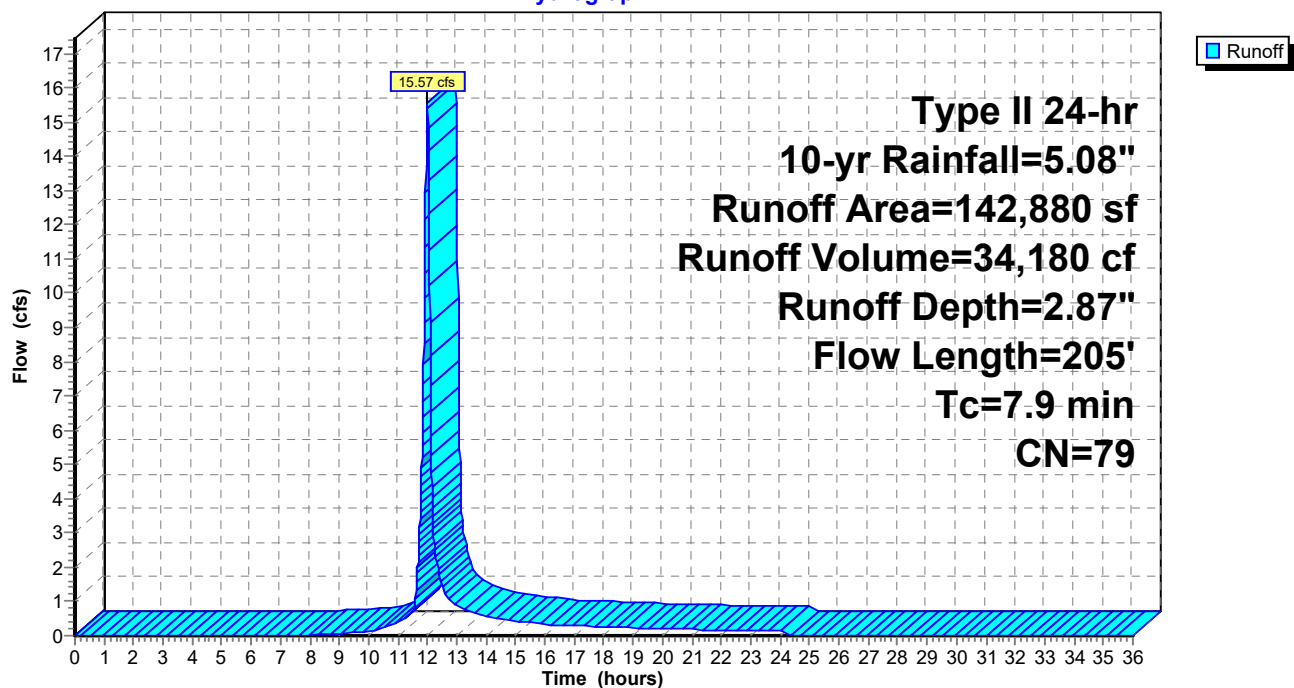
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	34,130	98	Paved
	88,835	74	>75% Grass cover, Good, HSG C
	19,915	70	Woods, Good, HSG C
	142,880	79	Weighted Average
	108,750		76.11% Pervious Area
	34,130		23.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	35	0.0060	0.09		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
1.1	170	0.1300	2.52		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
7.9	205	Total			

**Subcatchment 1S: Existing to Center Road**

Hydrograph



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Existing Conditions  
Type II 24-hr 10-yr Rainfall=5.08"

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**Summary for Subcatchment 2S: Existing to Northern Detention Basin**

Runoff = 9.95 cfs @ 11.96 hrs, Volume= 21,016 cf, Depth= 3.95"

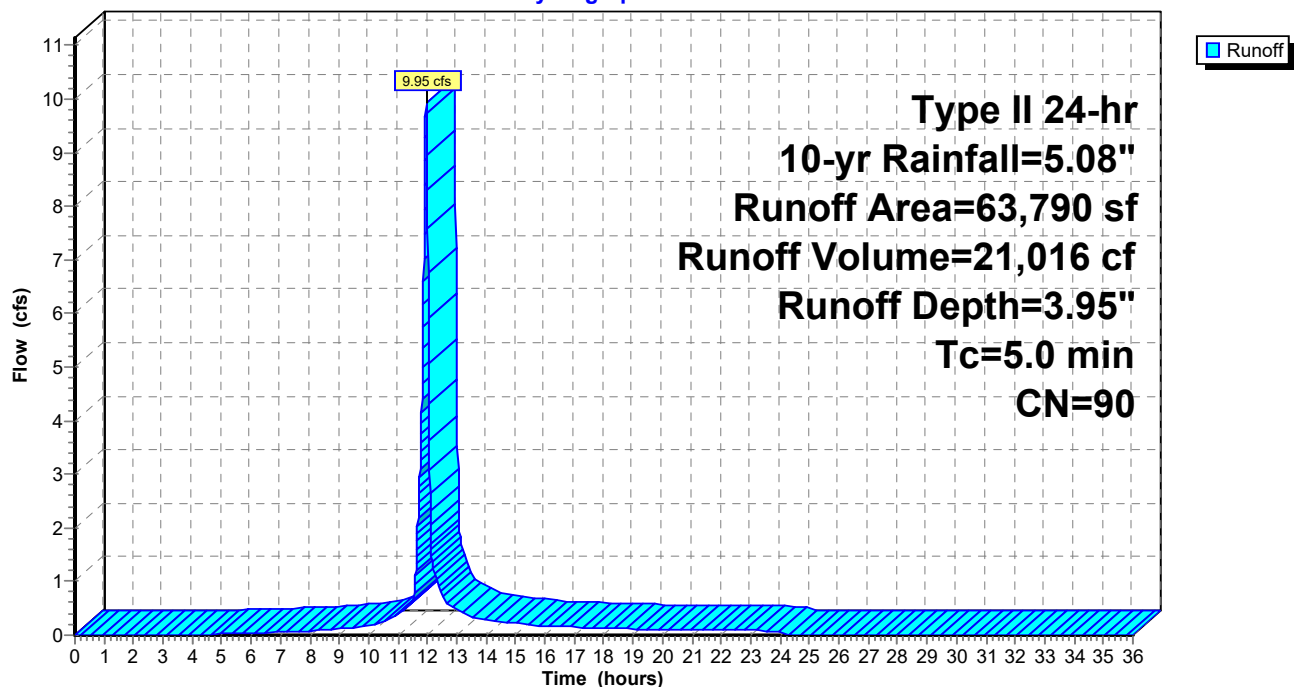
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	43,090	98	Paved
	20,700	74	>75% Grass cover, Good, HSG C
	63,790	90	Weighted Average
	20,700		32.45% Pervious Area
	43,090		67.55% Impervious Area

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

**Subcatchment 2S: Existing to Northern Detention Basin**

Hydrograph



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Existing Conditions  
Type II 24-hr 10-yr Rainfall=5.08"

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**Summary for Subcatchment 3S: Existing to West**

Runoff = 14.78 cfs @ 12.13 hrs, Volume= 48,752 cf, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

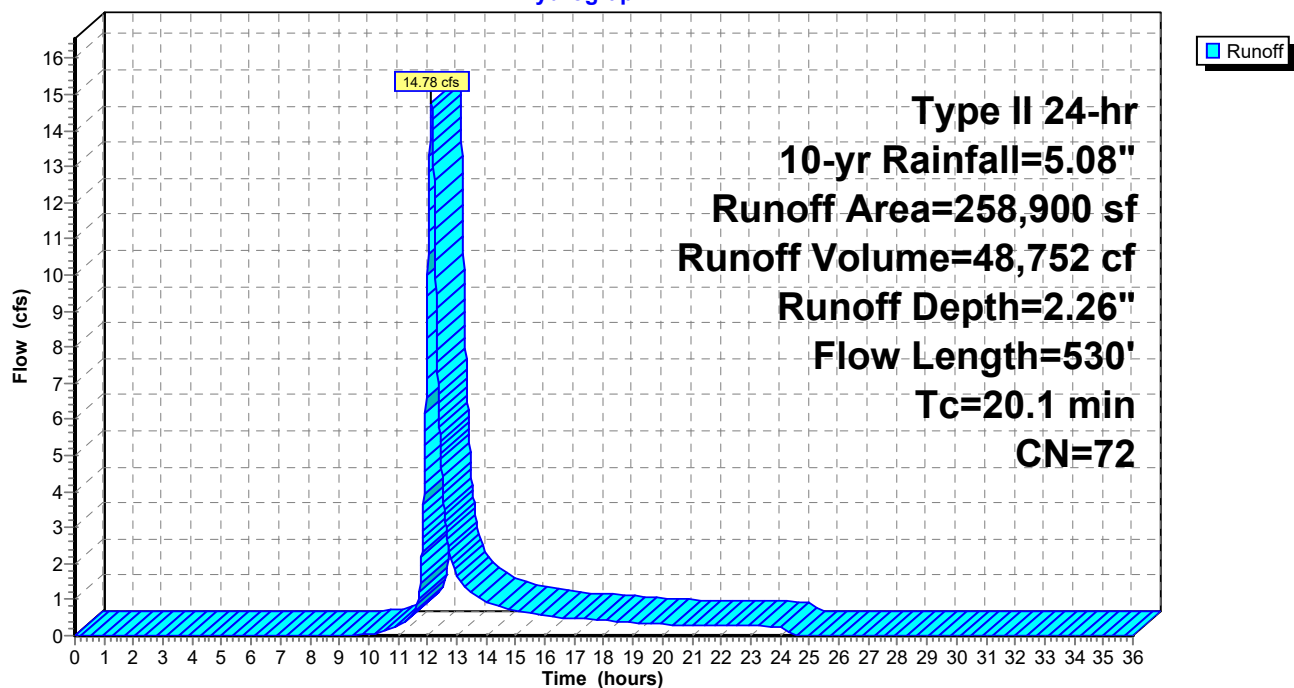
Area (sf)	CN	Description
101,210	74	>75% Grass cover, Good, HSG C
157,690	70	Woods, Good, HSG C
258,900	72	Weighted Average
258,900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
5.6	165	0.0050	0.49		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
2.1	290	0.1070	2.29		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
20.1	530	Total			

**Subcatchment 3S: Existing to West**

Hydrograph



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Existing Conditions  
Type II 24-hr 10-yr Rainfall=5.08"

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**Summary for Subcatchment 4S: Existing to South**

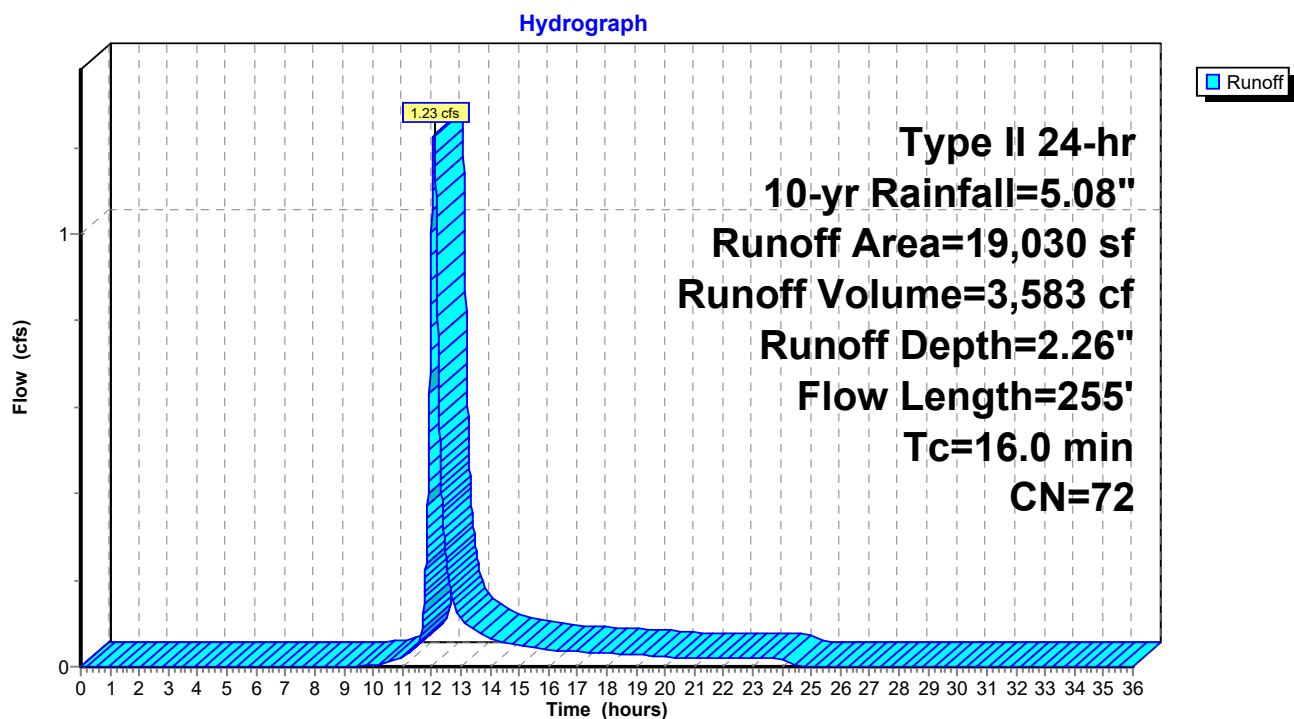
Runoff = 1.23 cfs @ 12.09 hrs, Volume= 3,583 cf, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

Area (sf)	CN	Description
10,460	74	>75% Grass cover, Good, HSG C
8,570	70	Woods, Good, HSG C
19,030	72	Weighted Average
19,030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
2.4	100	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.2	80	0.0250	1.11		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
16.0	255	Total			

**Subcatchment 4S: Existing to South**

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Existing Conditions  
Type II 24-hr 25-yr Rainfall=6.20"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Existing to Center**      Runoff Area=142,880 sf   23.89% Impervious   Runoff Depth=3.86"  
Flow Length=205'   Tc=7.9 min   CN=79   Runoff=20.72 cfs   45,945 cf

**Subcatchment2S: Existing to Northern**      Runoff Area=63,790 sf   67.55% Impervious   Runoff Depth=5.04"  
Tc=5.0 min   CN=90   Runoff=12.48 cfs   26,796 cf

**Subcatchment3S: Existing to West**      Runoff Area=258,900 sf   0.00% Impervious   Runoff Depth=3.16"  
Flow Length=530'   Tc=20.1 min   CN=72   Runoff=20.83 cfs   68,125 cf

**Subcatchment4S: Existing to South**      Runoff Area=19,030 sf   0.00% Impervious   Runoff Depth=3.16"  
Flow Length=255'   Tc=16.0 min   CN=72   Runoff=1.73 cfs   5,007 cf

**Total Runoff Area = 484,600 sf   Runoff Volume = 145,873 cf   Average Runoff Depth = 3.61"**  
**84.07% Pervious = 407,380 sf   15.93% Impervious = 77,220 sf**



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Existing Conditions  
Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 1S: Existing to Center Road**

Runoff = 20.72 cfs @ 11.99 hrs, Volume= 45,945 cf, Depth= 3.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

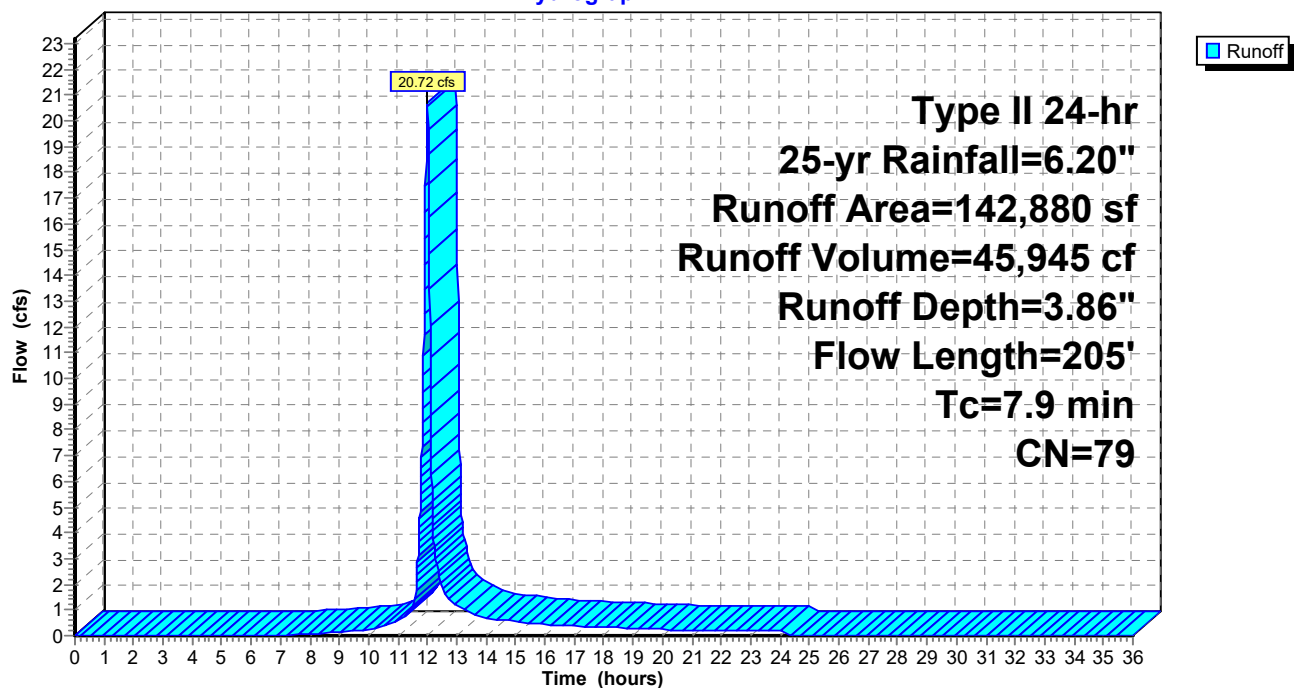
	Area (sf)	CN	Description
*	34,130	98	Paved
	88,835	74	>75% Grass cover, Good, HSG C
	19,915	70	Woods, Good, HSG C
	142,880	79	Weighted Average
	108,750		76.11% Pervious Area
	34,130		23.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	35	0.0060	0.09		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
1.1	170	0.1300	2.52		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
7.9	205	Total			

**Subcatchment 1S: Existing to Center Road**

Hydrograph



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Existing Conditions  
Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 2S: Existing to Northern Detention Basin**

Runoff = 12.48 cfs @ 11.96 hrs, Volume= 26,796 cf, Depth= 5.04"

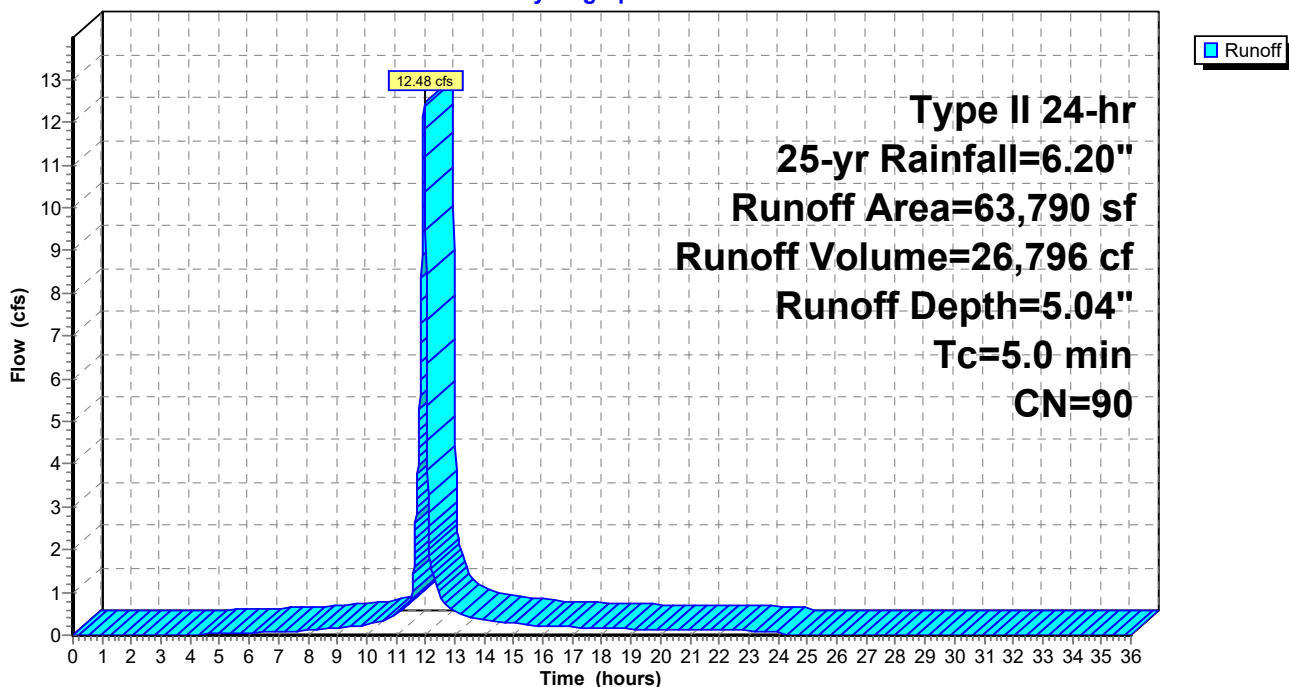
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	43,090	98	Paved
	20,700	74	>75% Grass cover, Good, HSG C
	63,790	90	Weighted Average
	20,700		32.45% Pervious Area
	43,090		67.55% Impervious Area

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

**Subcatchment 2S: Existing to Northern Detention Basin**

Hydrograph



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Existing Conditions  
Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 3S: Existing to West**

Runoff = 20.83 cfs @ 12.13 hrs, Volume= 68,125 cf, Depth= 3.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

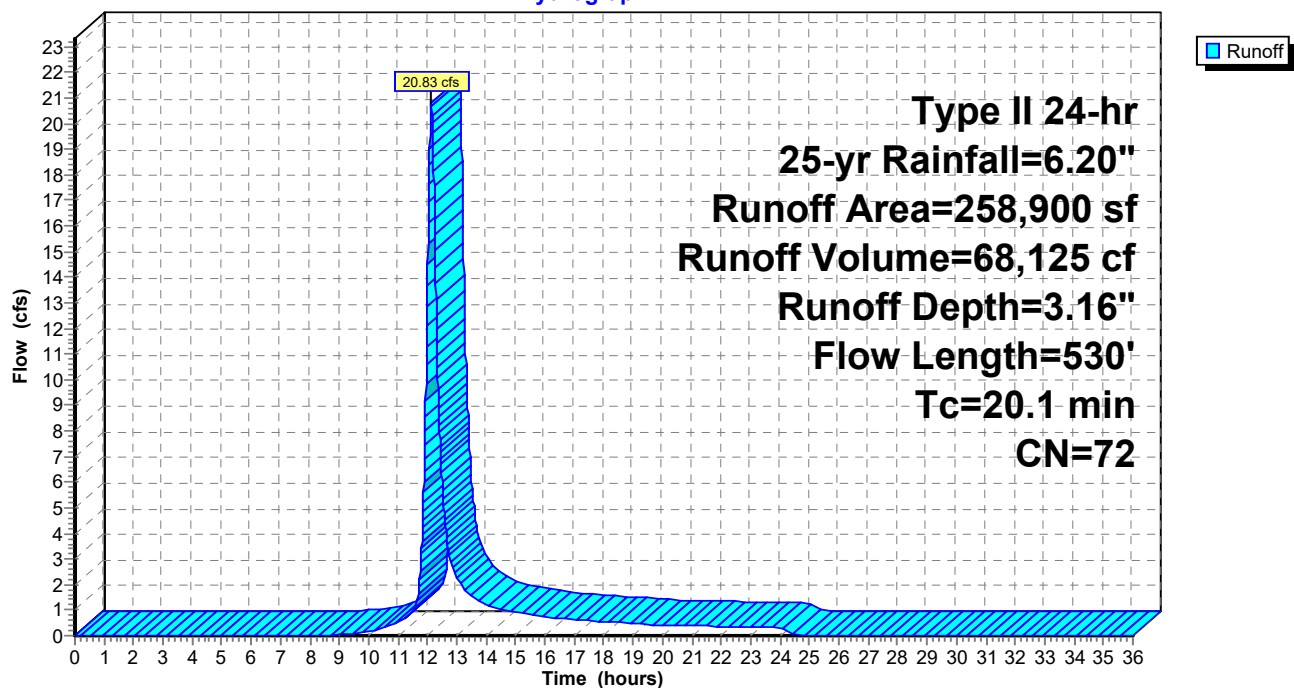
Area (sf)	CN	Description
101,210	74	>75% Grass cover, Good, HSG C
157,690	70	Woods, Good, HSG C
258,900	72	Weighted Average
258,900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
5.6	165	0.0050	0.49		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
2.1	290	0.1070	2.29		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
20.1	530	Total			

**Subcatchment 3S: Existing to West**

Hydrograph



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Existing Conditions  
Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 4S: Existing to South**

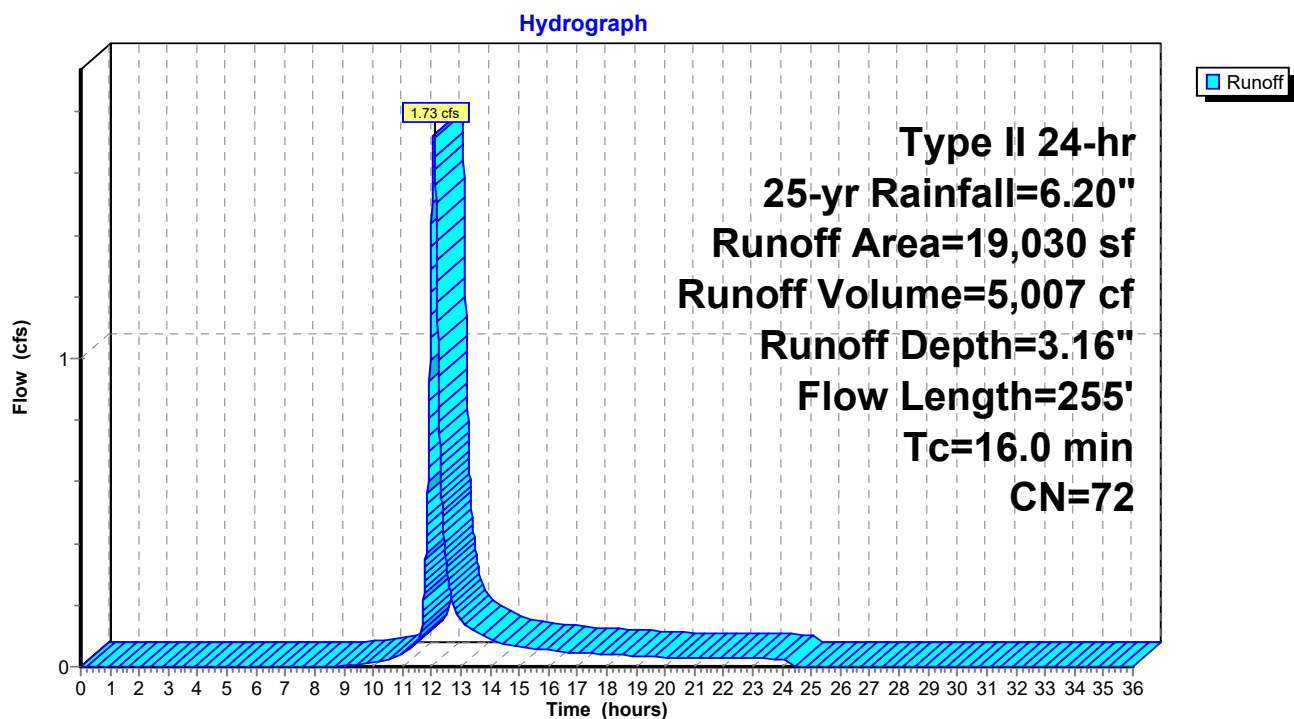
Runoff = 1.73 cfs @ 12.08 hrs, Volume= 5,007 cf, Depth= 3.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

Area (sf)	CN	Description
10,460	74	>75% Grass cover, Good, HSG C
8,570	70	Woods, Good, HSG C
19,030	72	Weighted Average
19,030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
2.4	100	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.2	80	0.0250	1.11		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
16.0	255	Total			

**Subcatchment 4S: Existing to South**

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Existing Conditions  
*Type II 24-hr 100-yr Rainfall=7.93"*

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

**Subcatchment1S: Existing to Center**      Runoff Area=142,880 sf   23.89% Impervious   Runoff Depth=5.44"  
Flow Length=205'   Tc=7.9 min   CN=79   Runoff=28.76 cfs   64,805 cf

**Subcatchment2S: Existing to Northern**      Runoff Area=63,790 sf   67.55% Impervious   Runoff Depth=6.74"  
Tc=5.0 min   CN=90   Runoff=16.35 cfs   35,811 cf

**Subcatchment3S: Existing to West**      Runoff Area=258,900 sf   0.00% Impervious   Runoff Depth=4.63"  
Flow Length=530'   Tc=20.1 min   CN=72   Runoff=30.60 cfs   99,959 cf

**Subcatchment4S: Existing to South**      Runoff Area=19,030 sf   0.00% Impervious   Runoff Depth=4.63"  
Flow Length=255'   Tc=16.0 min   CN=72   Runoff=2.54 cfs   7,347 cf

**Total Runoff Area = 484,600 sf   Runoff Volume = 207,922 cf   Average Runoff Depth = 5.15"**  
**84.07% Pervious = 407,380 sf   15.93% Impervious = 77,220 sf**

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Existing Conditions  
Type II 24-hr 100-yr Rainfall=7.93"

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**Summary for Subcatchment 1S: Existing to Center Road**

Runoff = 28.76 cfs @ 11.99 hrs, Volume= 64,805 cf, Depth= 5.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

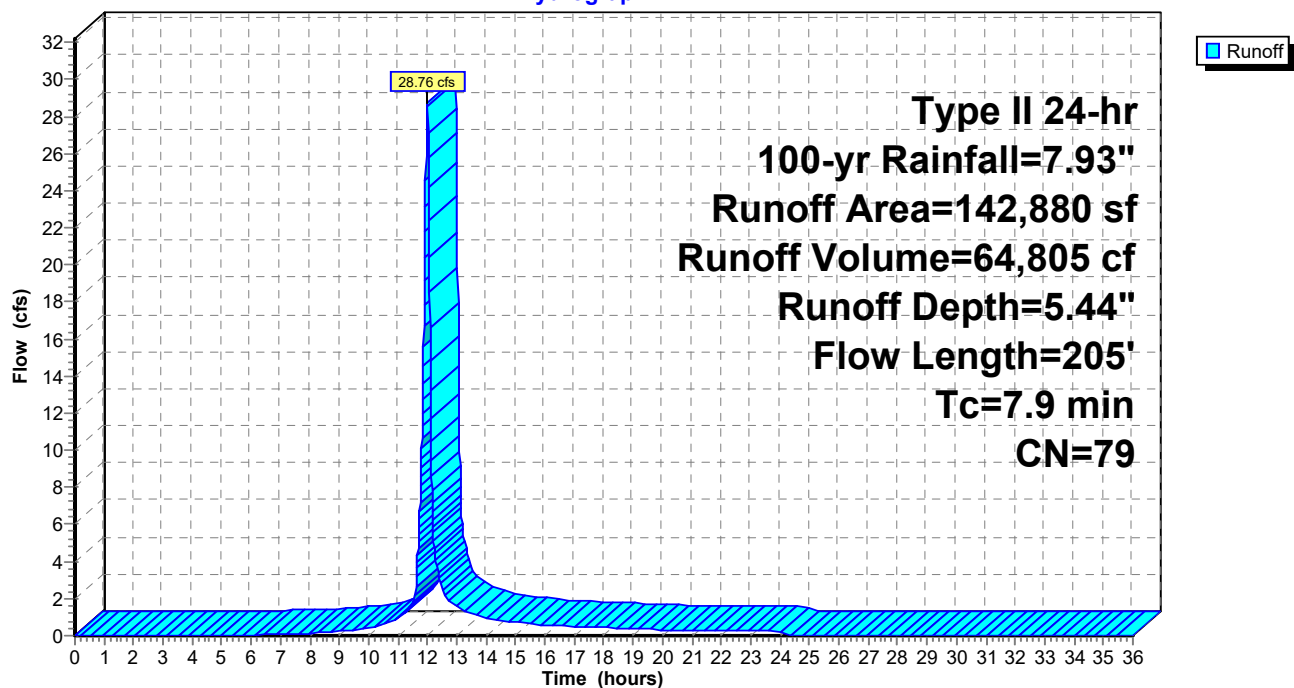
	Area (sf)	CN	Description
*	34,130	98	Paved
	88,835	74	>75% Grass cover, Good, HSG C
	19,915	70	Woods, Good, HSG C
	142,880	79	Weighted Average
	108,750		76.11% Pervious Area
	34,130		23.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	35	0.0060	0.09		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
1.1	170	0.1300	2.52		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
7.9	205	Total			

**Subcatchment 1S: Existing to Center Road**

Hydrograph



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Existing Conditions  
Type II 24-hr 100-yr Rainfall=7.93"

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**Summary for Subcatchment 2S: Existing to Northern Detention Basin**

Runoff = 16.35 cfs @ 11.96 hrs, Volume= 35,811 cf, Depth= 6.74"

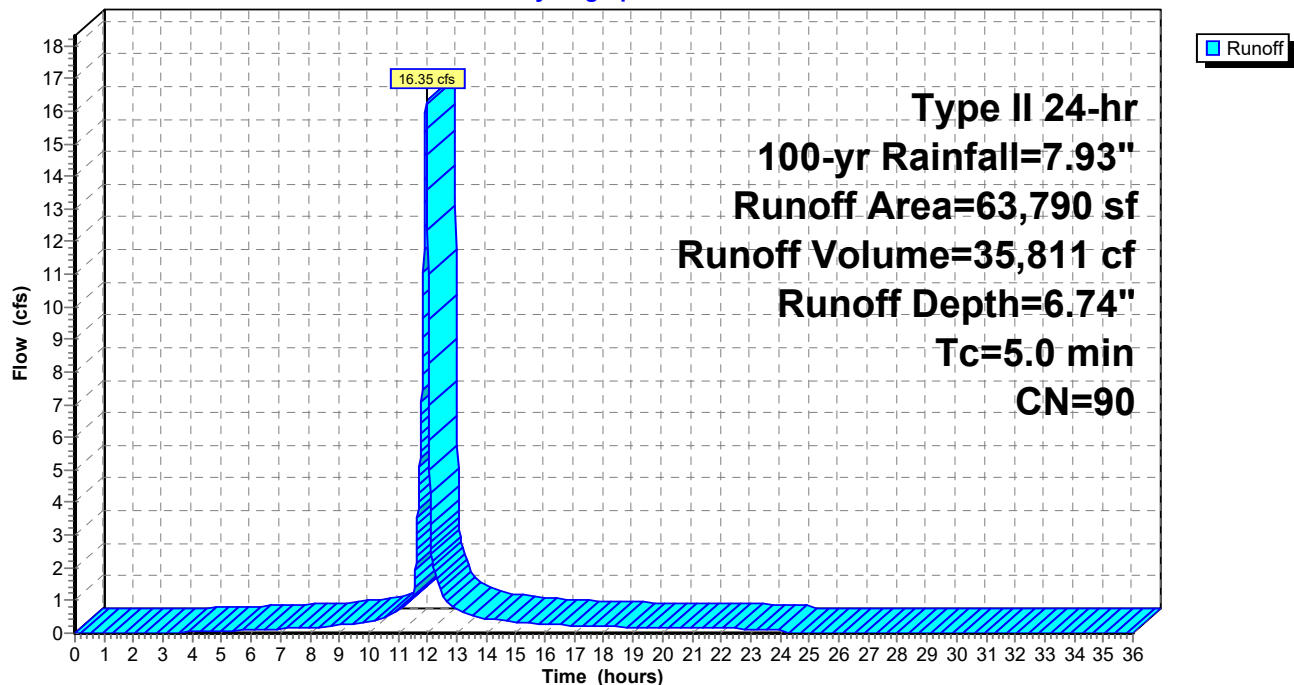
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	43,090	98	Paved
	20,700	74	>75% Grass cover, Good, HSG C
	63,790	90	Weighted Average
	20,700		32.45% Pervious Area
	43,090		67.55% Impervious Area

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

**Subcatchment 2S: Existing to Northern Detention Basin**

Hydrograph



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Existing Conditions  
Type II 24-hr 100-yr Rainfall=7.93"

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**Summary for Subcatchment 3S: Existing to West**

Runoff = 30.60 cfs @ 12.13 hrs, Volume= 99,959 cf, Depth= 4.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

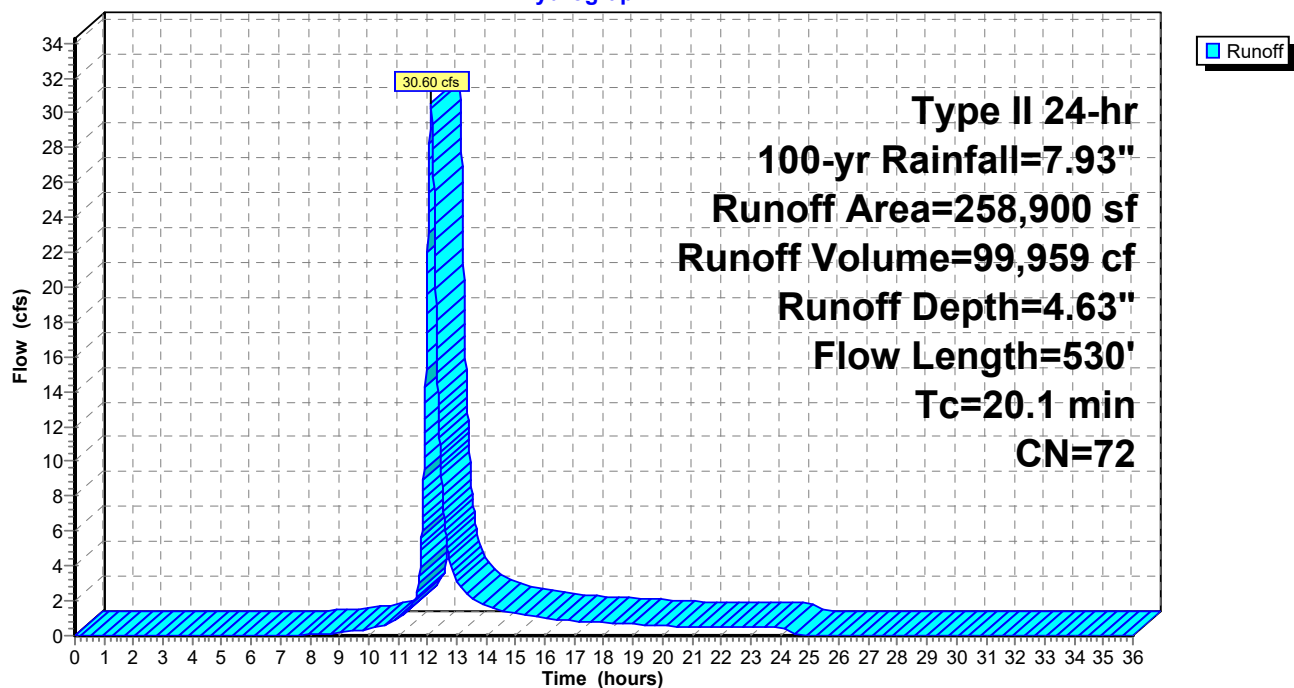
Area (sf)	CN	Description
101,210	74	>75% Grass cover, Good, HSG C
157,690	70	Woods, Good, HSG C
258,900	72	Weighted Average
258,900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
5.6	165	0.0050	0.49		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
2.1	290	0.1070	2.29		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
20.1	530	Total			

**Subcatchment 3S: Existing to West**

Hydrograph





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Existing Conditions  
Type II 24-hr 100-yr Rainfall=7.93"

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**Summary for Subcatchment 4S: Existing to South**

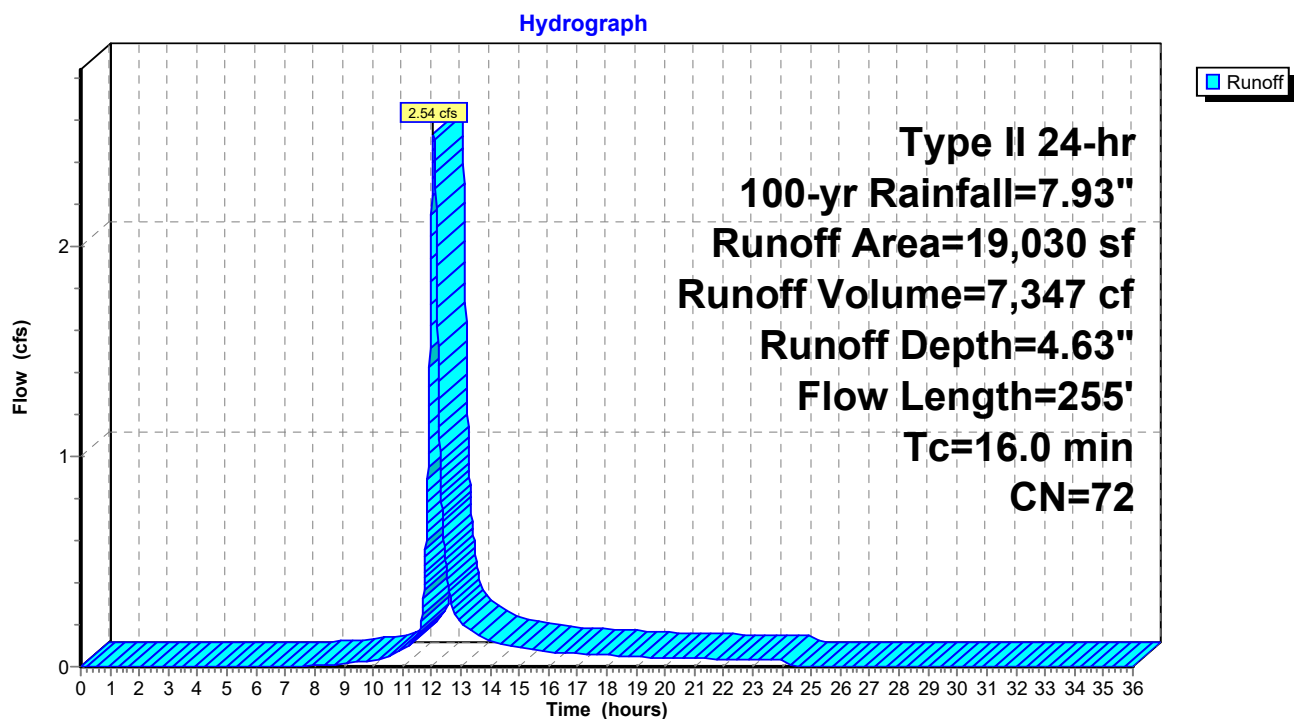
Runoff = 2.54 cfs @ 12.08 hrs, Volume= 7,347 cf, Depth= 4.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

Area (sf)	CN	Description
10,460	74	>75% Grass cover, Good, HSG C
8,570	70	Woods, Good, HSG C
19,030	72	Weighted Average
19,030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
2.4	100	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.2	80	0.0250	1.11		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
16.0	255	Total			

**Subcatchment 4S: Existing to South**

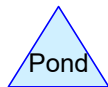
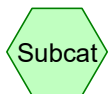
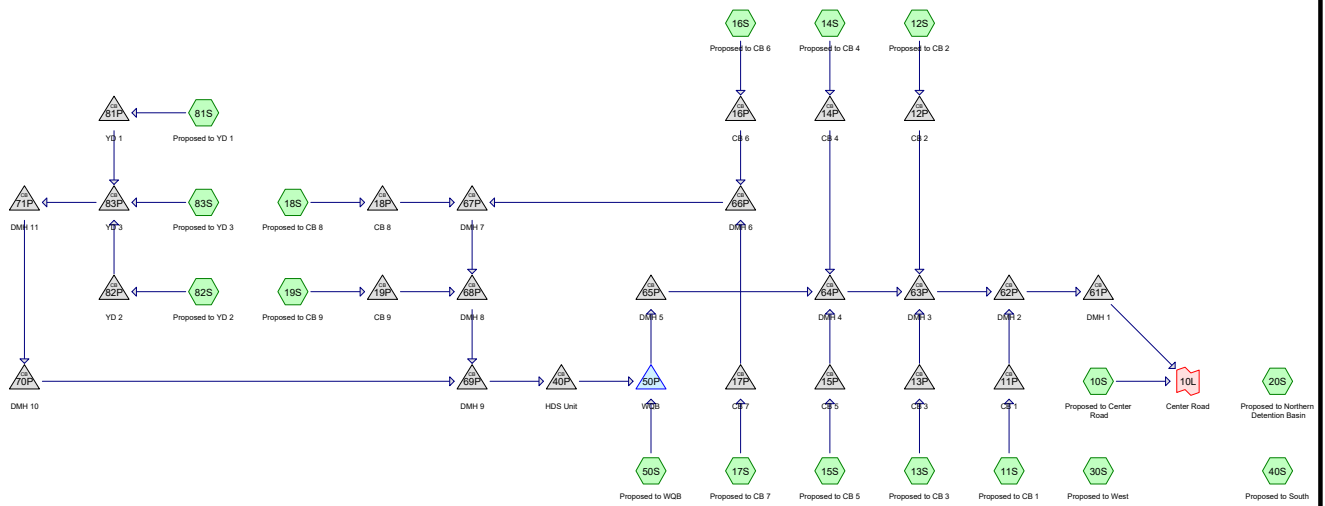


## **PROPOSED CONDITIONS DRAINAGE CALCULATIONS**









**Routing Diagram for 076491 Nichols Townhouses**  
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**Area Listing (selected nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
195,860	74	>75% Grass cover, Good, HSG C (10S, 11S, 12S, 14S, 16S, 17S, 18S, 19S, 20S, 30S, 40S, 50S, 83S)
106,780	98	Paved (10S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 18S, 19S, 20S, 30S, 81S, 82S, 83S)
6,400	98	Roof (81S, 82S)
175,560	70	Woods, Good, HSG C (10S, 30S, 40S)
<b>484,600</b>	<b>78</b>	<b>TOTAL AREA</b>

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Type II 24-hr 2-yr Rainfall=3.29"

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

<b>Subcatchment10S: Proposed to Center</b>	Runoff Area=83,930 sf 43.63% Impervious Runoff Depth=1.76" Tc=5.0 min CN=84 Runoff=6.25 cfs 12,296 cf
<b>Subcatchment11S: Proposed to CB 1</b>	Runoff Area=7,750 sf 41.81% Impervious Runoff Depth=1.76" Tc=5.0 min CN=84 Runoff=0.58 cfs 1,135 cf
<b>Subcatchment12S: Proposed to CB 2</b>	Runoff Area=4,140 sf 22.46% Impervious Runoff Depth=1.40" Tc=5.0 min CN=79 Runoff=0.25 cfs 485 cf
<b>Subcatchment13S: Proposed to CB 3</b>	Runoff Area=930 sf 100.00% Impervious Runoff Depth=3.06" Tc=5.0 min CN=98 Runoff=0.10 cfs 237 cf
<b>Subcatchment14S: Proposed to CB 4</b>	Runoff Area=2,000 sf 34.50% Impervious Runoff Depth=1.61" Tc=5.0 min CN=82 Runoff=0.14 cfs 268 cf
<b>Subcatchment15S: Proposed to CB 5</b>	Runoff Area=660 sf 100.00% Impervious Runoff Depth=3.06" Tc=5.0 min CN=98 Runoff=0.07 cfs 168 cf
<b>Subcatchment16S: Proposed to CB 6</b>	Runoff Area=5,850 sf 56.41% Impervious Runoff Depth=2.08" Tc=5.0 min CN=88 Runoff=0.50 cfs 1,013 cf
<b>Subcatchment17S: Proposed to CB 7</b>	Runoff Area=2,950 sf 74.92% Impervious Runoff Depth=2.44" Tc=5.0 min CN=92 Runoff=0.29 cfs 599 cf
<b>Subcatchment18S: Proposed to CB 8</b>	Runoff Area=3,330 sf 75.98% Impervious Runoff Depth=2.44" Tc=5.0 min CN=92 Runoff=0.33 cfs 676 cf
<b>Subcatchment19S: Proposed to CB 9</b>	Runoff Area=11,800 sf 50.17% Impervious Runoff Depth=1.91" Tc=5.0 min CN=86 Runoff=0.95 cfs 1,882 cf
<b>Subcatchment20S: Proposed to Northern</b>	Runoff Area=56,570 sf 79.49% Impervious Runoff Depth=2.53" Tc=5.0 min CN=93 Runoff=5.67 cfs 11,938 cf
<b>Subcatchment30S: Proposed to West</b>	Runoff Area=230,400 sf 0.36% Impervious Runoff Depth=0.93" Flow Length=530' Tc=20.1 min CN=71 Runoff=5.03 cfs 17,908 cf
<b>Subcatchment40S: Proposed to South</b>	Runoff Area=19,030 sf 0.00% Impervious Runoff Depth=0.99" Flow Length=255' Tc=16.0 min CN=72 Runoff=0.51 cfs 1,564 cf
<b>Subcatchment50S: Proposed to WQB</b>	Runoff Area=34,530 sf 0.00% Impervious Runoff Depth=1.10" Tc=5.0 min CN=74 Runoff=1.61 cfs 3,157 cf
<b>Subcatchment81S: Proposed to YD 1</b>	Runoff Area=4,470 sf 100.00% Impervious Runoff Depth=3.06" Tc=5.0 min CN=98 Runoff=0.49 cfs 1,139 cf
<b>Subcatchment82S: Proposed to YD 2</b>	Runoff Area=4,470 sf 100.00% Impervious Runoff Depth=3.06" Tc=5.0 min CN=98 Runoff=0.49 cfs 1,139 cf

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<b>Subcatchment83S: Proposed to YD 3</b>	Runoff Area=11,790 sf 12.04% Impervious Runoff Depth=1.28" Tc=5.0 min CN=77 Runoff=0.64 cfs 1,254 cf
<b>Pond 11P: CB 1</b>	Peak Elev=636.81' Inflow=0.58 cfs 1,135 cf 12.0" Round Culvert n=0.012 L=3.0' S=0.0333 '/' Outflow=0.58 cfs 1,135 cf
<b>Pond 12P: CB 2</b>	Peak Elev=639.24' Inflow=0.25 cfs 485 cf 12.0" Round Culvert n=0.012 L=15.0' S=0.0200 '/' Outflow=0.25 cfs 485 cf
<b>Pond 13P: CB 3</b>	Peak Elev=639.25' Inflow=0.10 cfs 237 cf 12.0" Round Culvert n=0.012 L=3.0' S=0.0333 '/' Outflow=0.10 cfs 237 cf
<b>Pond 14P: CB 4</b>	Peak Elev=643.68' Inflow=0.14 cfs 268 cf 12.0" Round Culvert n=0.012 L=15.0' S=0.0200 '/' Outflow=0.14 cfs 268 cf
<b>Pond 15P: CB 5</b>	Peak Elev=643.63' Inflow=0.07 cfs 168 cf 12.0" Round Culvert n=0.012 L=3.0' S=0.0333 '/' Outflow=0.07 cfs 168 cf
<b>Pond 16P: CB 6</b>	Peak Elev=650.38' Inflow=0.50 cfs 1,013 cf 12.0" Round Culvert n=0.012 L=15.0' S=0.0100 '/' Outflow=0.50 cfs 1,013 cf
<b>Pond 17P: CB 7</b>	Peak Elev=647.76' Inflow=0.29 cfs 599 cf 12.0" Round Culvert n=0.012 L=9.0' S=0.0222 '/' Outflow=0.29 cfs 599 cf
<b>Pond 18P: CB 8</b>	Peak Elev=650.58' Inflow=0.33 cfs 676 cf 12.0" Round Culvert n=0.012 L=6.0' S=0.0250 '/' Outflow=0.33 cfs 676 cf
<b>Pond 19P: CB 9</b>	Peak Elev=650.63' Inflow=0.95 cfs 1,882 cf 12.0" Round Culvert n=0.012 L=6.0' S=0.0250 '/' Outflow=0.95 cfs 1,882 cf
<b>Pond 40P: HDS Unit</b>	Peak Elev=642.42' Inflow=3.69 cfs 7,701 cf 15.0" Round Culvert n=0.012 L=46.0' S=0.0739 '/' Outflow=3.69 cfs 7,701 cf
<b>Pond 50P: WQB</b>	Peak Elev=639.41' Storage=6,531 cf Inflow=5.29 cfs 10,859 cf Outflow=0.21 cfs 6,480 cf
<b>Pond 61P: DMH 1</b>	Peak Elev=633.91' Inflow=1.14 cfs 8,774 cf 12.0" Round Culvert n=0.012 L=70.0' S=0.0679 '/' Outflow=1.14 cfs 8,774 cf
<b>Pond 62P: DMH 2</b>	Peak Elev=635.01' Inflow=1.14 cfs 8,774 cf 12.0" Round Culvert n=0.012 L=100.0' S=0.0100 '/' Outflow=1.14 cfs 8,774 cf
<b>Pond 63P: DMH 3</b>	Peak Elev=635.72' Inflow=0.56 cfs 7,639 cf 12.0" Round Culvert n=0.012 L=77.0' S=0.0104 '/' Outflow=0.56 cfs 7,639 cf
<b>Pond 64P: DMH 4</b>	Peak Elev=636.43' Inflow=0.22 cfs 6,917 cf 12.0" Round Culvert n=0.012 L=75.0' S=0.0100 '/' Outflow=0.22 cfs 6,917 cf
<b>Pond 65P: DMH 5</b>	Peak Elev=637.21' Inflow=0.21 cfs 6,480 cf 12.0" Round Culvert n=0.012 L=72.0' S=0.0097 '/' Outflow=0.21 cfs 6,480 cf

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**Pond 66P: DMH 6**

Peak Elev=647.62' Inflow=0.79 cfs 1,612 cf  
15.0" Round Culvert n=0.012 L=87.0' S=0.0103 '/' Outflow=0.79 cfs 1,612 cf

**Pond 67P: DMH 7**

Peak Elev=646.70' Inflow=1.12 cfs 2,288 cf  
15.0" Round Culvert n=0.012 L=68.0' S=0.0103 '/' Outflow=1.12 cfs 2,288 cf

**Pond 68P: DMH 8**

Peak Elev=646.14' Inflow=2.07 cfs 4,170 cf  
15.0" Round Culvert n=0.012 L=42.0' S=0.0095 '/' Outflow=2.07 cfs 4,170 cf

**Pond 69P: DMH 9**

Peak Elev=643.02' Inflow=3.69 cfs 7,701 cf  
15.0" Round Culvert n=0.012 L=8.0' S=0.0750 '/' Outflow=3.69 cfs 7,701 cf

**Pond 70P: DMH 10**

Peak Elev=648.89' Inflow=1.63 cfs 3,532 cf  
12.0" Round Culvert n=0.012 L=193.0' S=0.0166 '/' Outflow=1.63 cfs 3,532 cf

**Pond 71P: DMH 11**

Peak Elev=650.84' Inflow=1.63 cfs 3,532 cf  
12.0" Round Culvert n=0.012 L=112.0' S=0.0165 '/' Outflow=1.63 cfs 3,532 cf

**Pond 81P: YD 1**

Peak Elev=653.35' Inflow=0.49 cfs 1,139 cf  
12.0" Round Culvert n=0.012 L=46.0' S=0.0380 '/' Outflow=0.49 cfs 1,139 cf

**Pond 82P: YD 2**

Peak Elev=653.35' Inflow=0.49 cfs 1,139 cf  
12.0" Round Culvert n=0.012 L=46.0' S=0.0380 '/' Outflow=0.49 cfs 1,139 cf

**Pond 83P: YD 3**

Peak Elev=651.94' Inflow=1.63 cfs 3,532 cf  
12.0" Round Culvert n=0.012 L=60.0' S=0.0167 '/' Outflow=1.63 cfs 3,532 cf

**Link 10L: Center Road**

Inflow=7.39 cfs 21,069 cf  
Primary=7.39 cfs 21,069 cf

**Total Runoff Area = 484,600 sf Runoff Volume = 56,857 cf Average Runoff Depth = 1.41"**  
**76.64% Pervious = 371,420 sf 23.36% Impervious = 113,180 sf**

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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 10S: Proposed to Center Road**

Runoff = 6.25 cfs @ 11.96 hrs, Volume= 12,296 cf, Depth= 1.76"

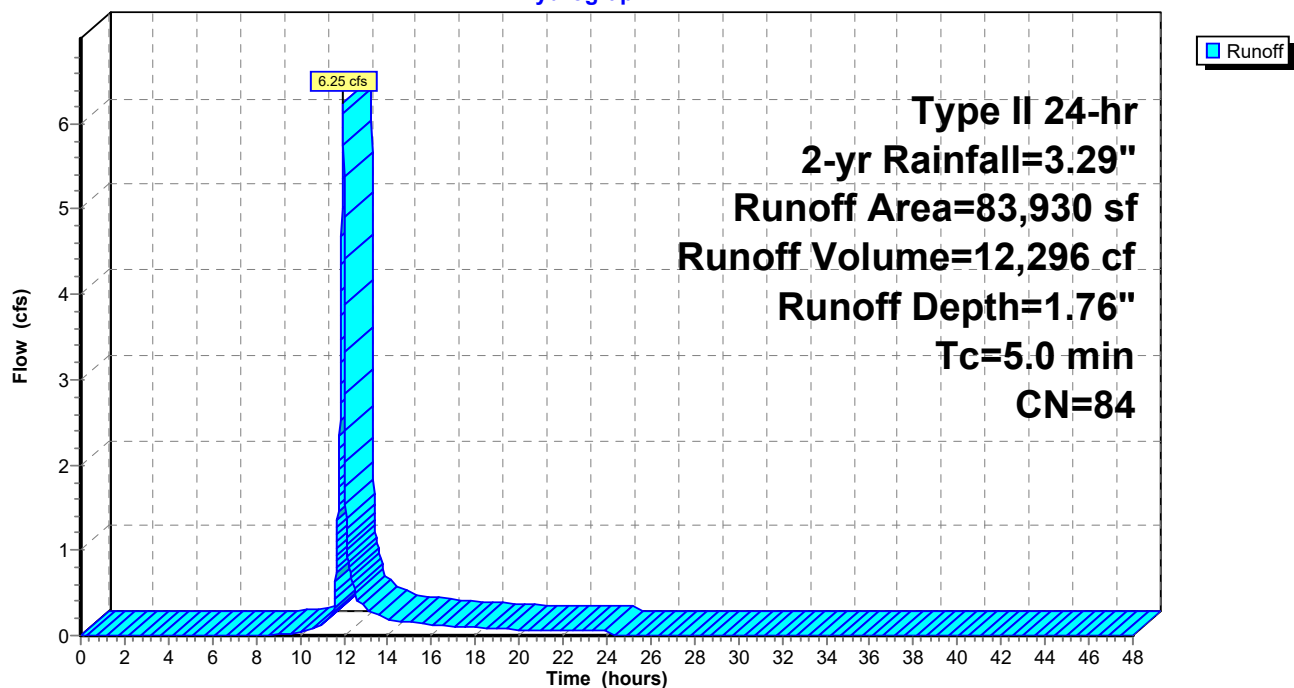
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	36,620	98	Paved
	38,010	74	>75% Grass cover, Good, HSG C
	9,300	70	Woods, Good, HSG C
	83,930	84	Weighted Average
	47,310		56.37% Pervious Area
	36,620		43.63% Impervious Area

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

**Subcatchment 10S: Proposed to Center Road**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 11S: Proposed to CB 1**

Runoff = 0.58 cfs @ 11.96 hrs, Volume= 1,135 cf, Depth= 1.76"

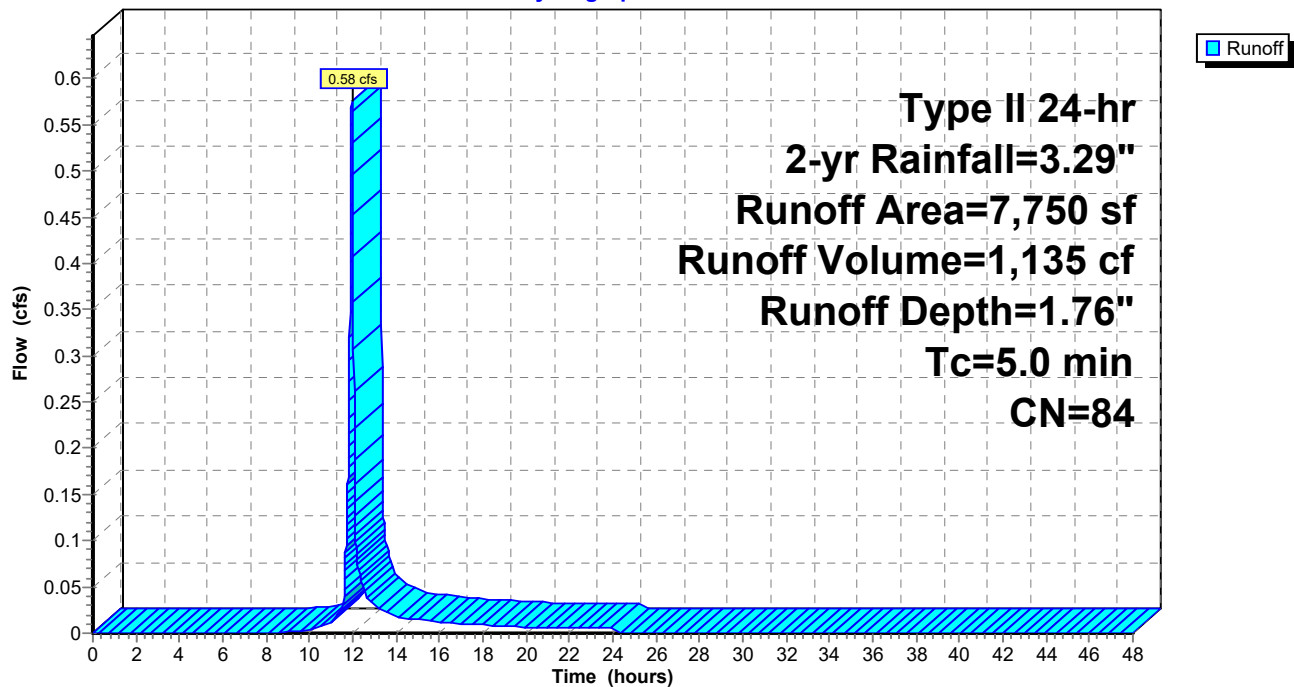
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	3,240	98	Paved
	4,510	74	>75% Grass cover, Good, HSG C
	7,750	84	Weighted Average
	4,510		58.19% Pervious Area
	3,240		41.81% Impervious Area

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

**Subcatchment 11S: Proposed to CB 1**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 12S: Proposed to CB 2**

Runoff = 0.25 cfs @ 11.96 hrs, Volume= 485 cf, Depth= 1.40"

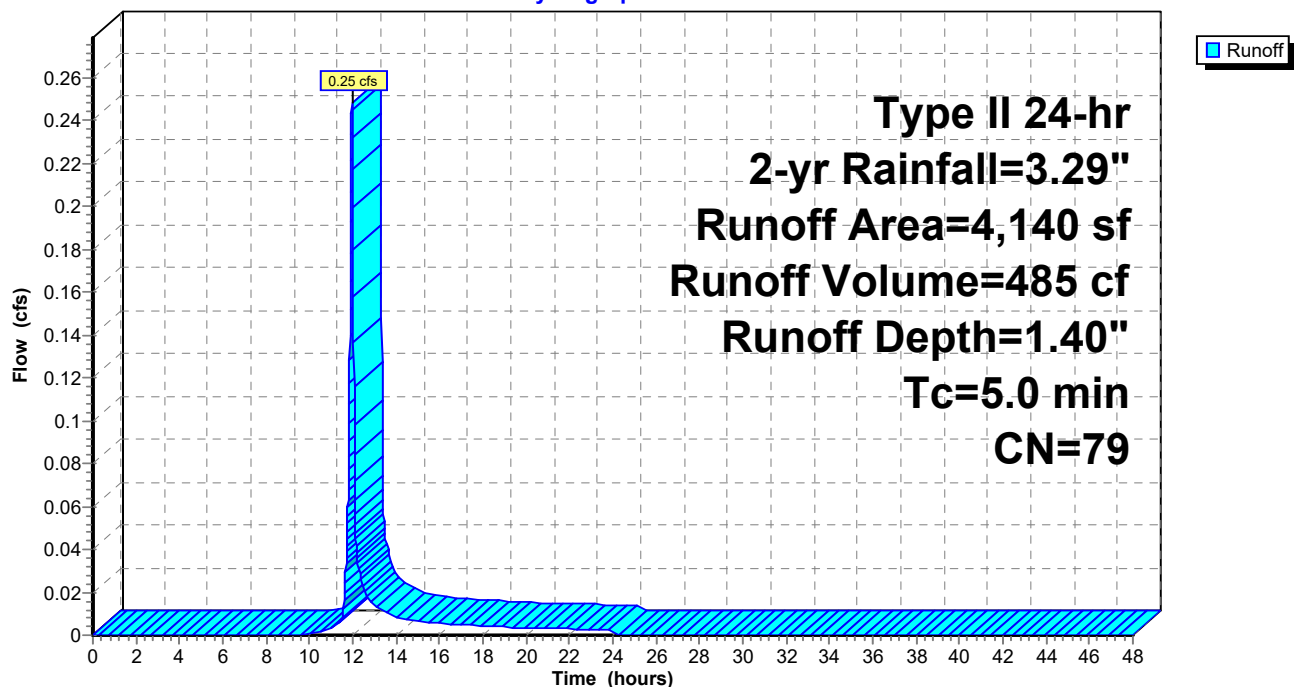
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	930	98	Paved
	3,210	74	>75% Grass cover, Good, HSG C
	4,140	79	Weighted Average
	3,210		77.54% Pervious Area
	930		22.46% Impervious Area

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

**Subcatchment 12S: Proposed to CB 2**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 13S: Proposed to CB 3**

Runoff = 0.10 cfs @ 11.96 hrs, Volume= 237 cf, Depth= 3.06"

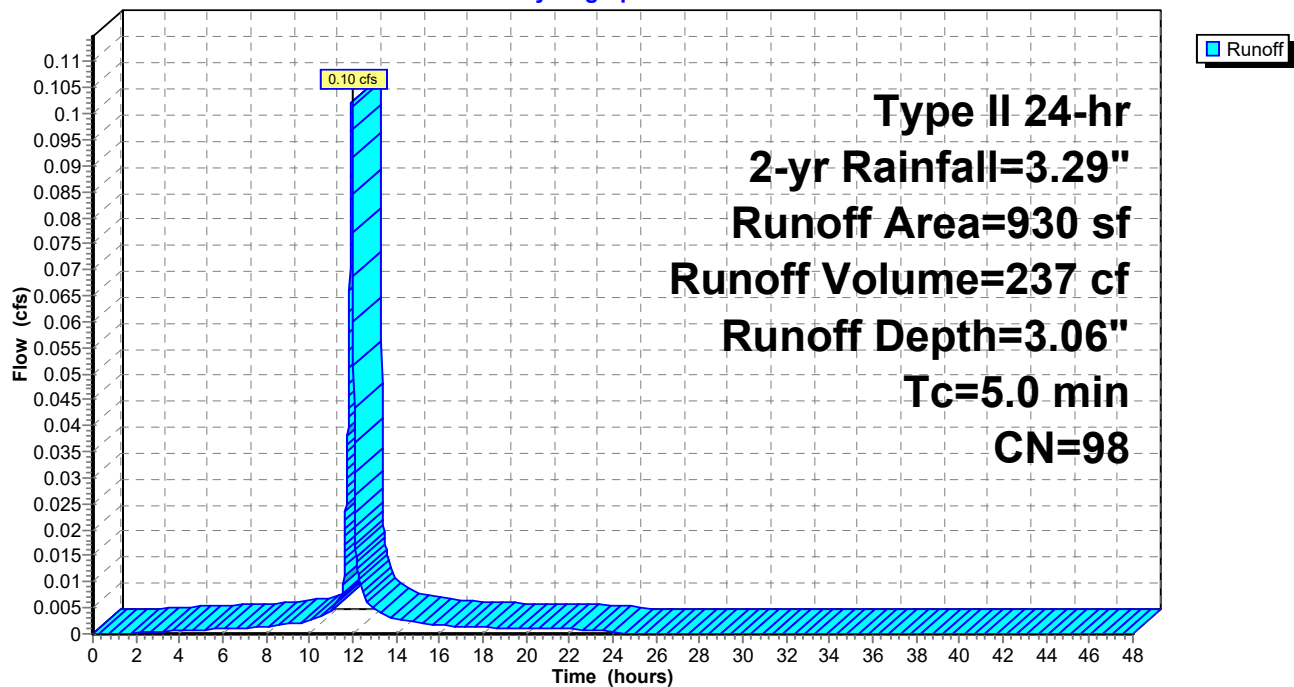
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	930	98	Paved
	930		100.00% Impervious Area

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

**Subcatchment 13S: Proposed to CB 3**

Hydrograph





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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 14S: Proposed to CB 4**

Runoff = 0.14 cfs @ 11.96 hrs, Volume= 268 cf, Depth= 1.61"

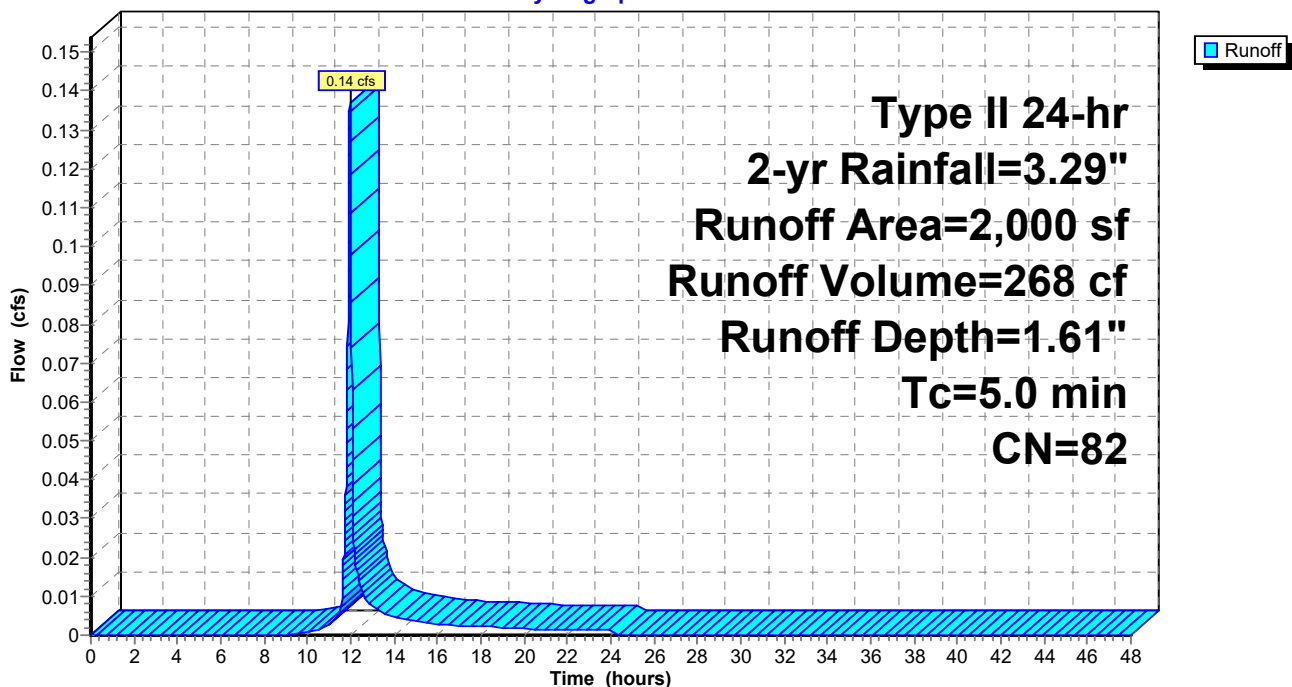
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	690	98	Paved
	1,310	74	>75% Grass cover, Good, HSG C
	2,000	82	Weighted Average
	1,310		65.50% Pervious Area
	690		34.50% Impervious Area

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

**Subcatchment 14S: Proposed to CB 4**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 15S: Proposed to CB 5**

Runoff = 0.07 cfs @ 11.96 hrs, Volume= 168 cf, Depth= 3.06"

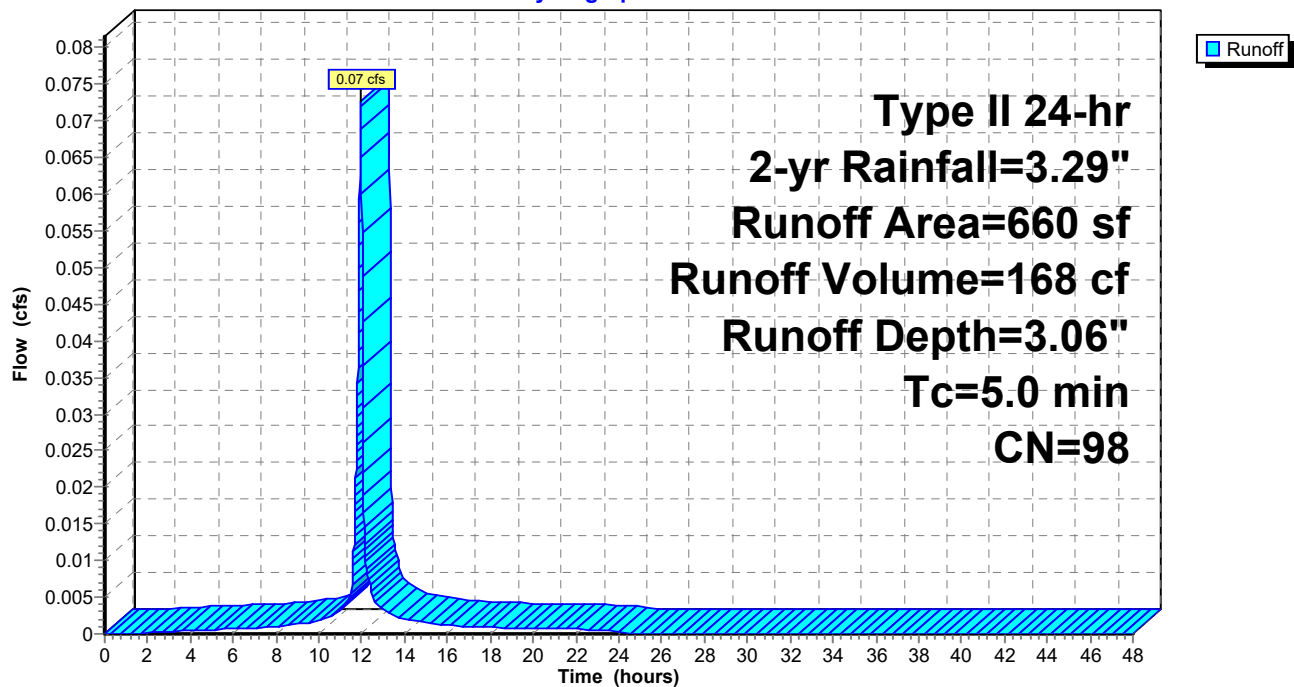
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	660	98	Paved
	660		100.00% Impervious Area

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

**Subcatchment 15S: Proposed to CB 5**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 16S: Proposed to CB 6**

Runoff = 0.50 cfs @ 11.96 hrs, Volume= 1,013 cf, Depth= 2.08"

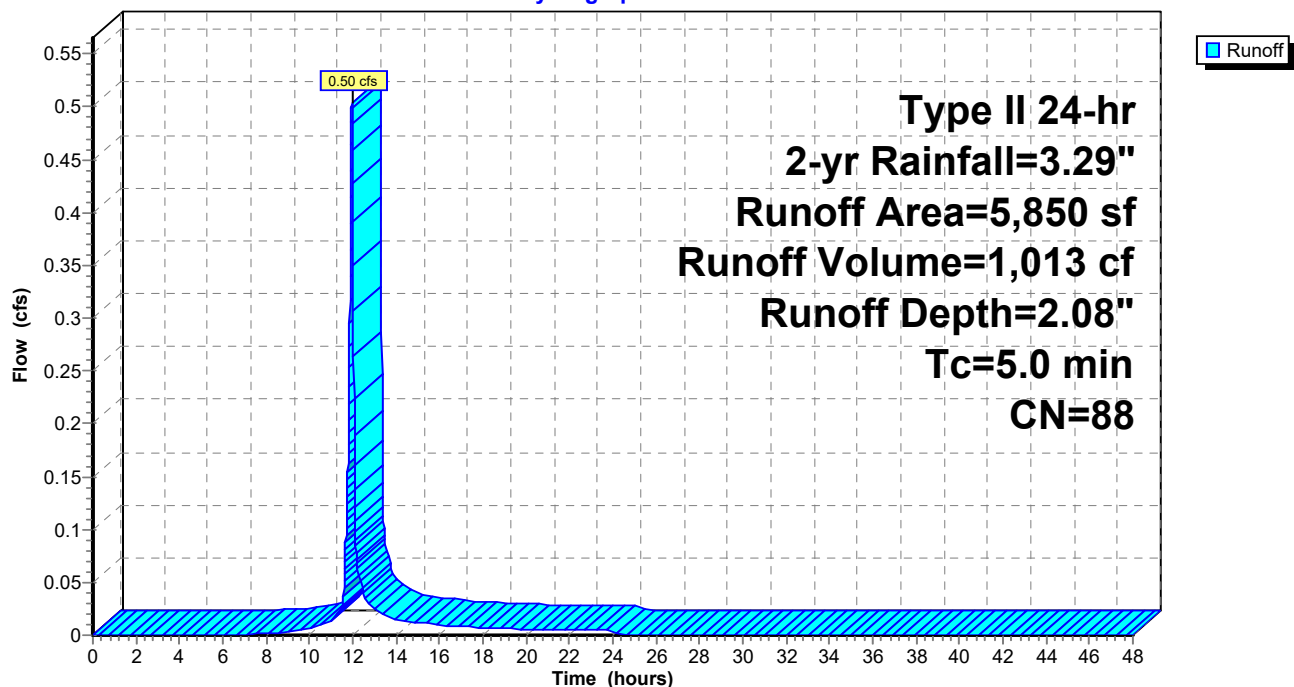
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	3,300	98	Paved
	2,550	74	>75% Grass cover, Good, HSG C
	5,850	88	Weighted Average
	2,550		43.59% Pervious Area
	3,300		56.41% Impervious Area

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

**Subcatchment 16S: Proposed to CB 6**

Hydrograph



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**Summary for Subcatchment 17S: Proposed to CB 7**

Runoff = 0.29 cfs @ 11.96 hrs, Volume= 599 cf, Depth= 2.44"

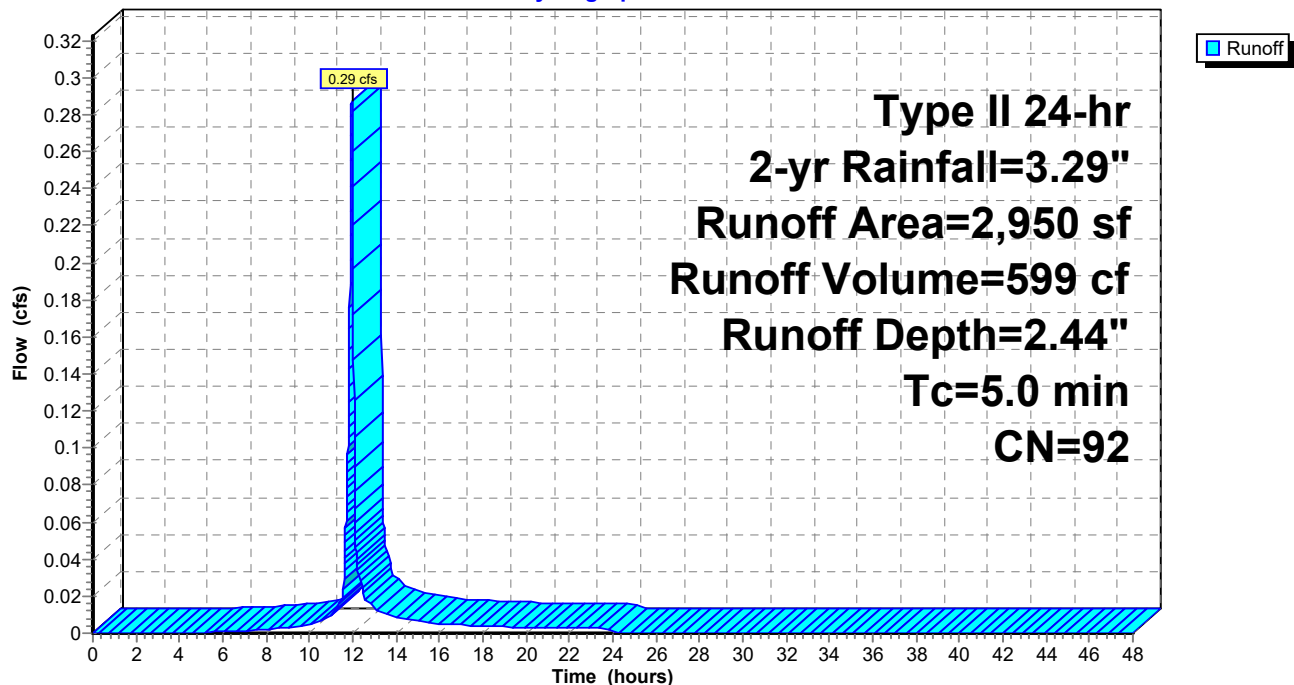
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	2,210	98	Paved
	740	74	>75% Grass cover, Good, HSG C
	2,950	92	Weighted Average
	740		25.08% Pervious Area
	2,210		74.92% Impervious Area

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

**Subcatchment 17S: Proposed to CB 7**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 18S: Proposed to CB 8**

Runoff = 0.33 cfs @ 11.96 hrs, Volume= 676 cf, Depth= 2.44"

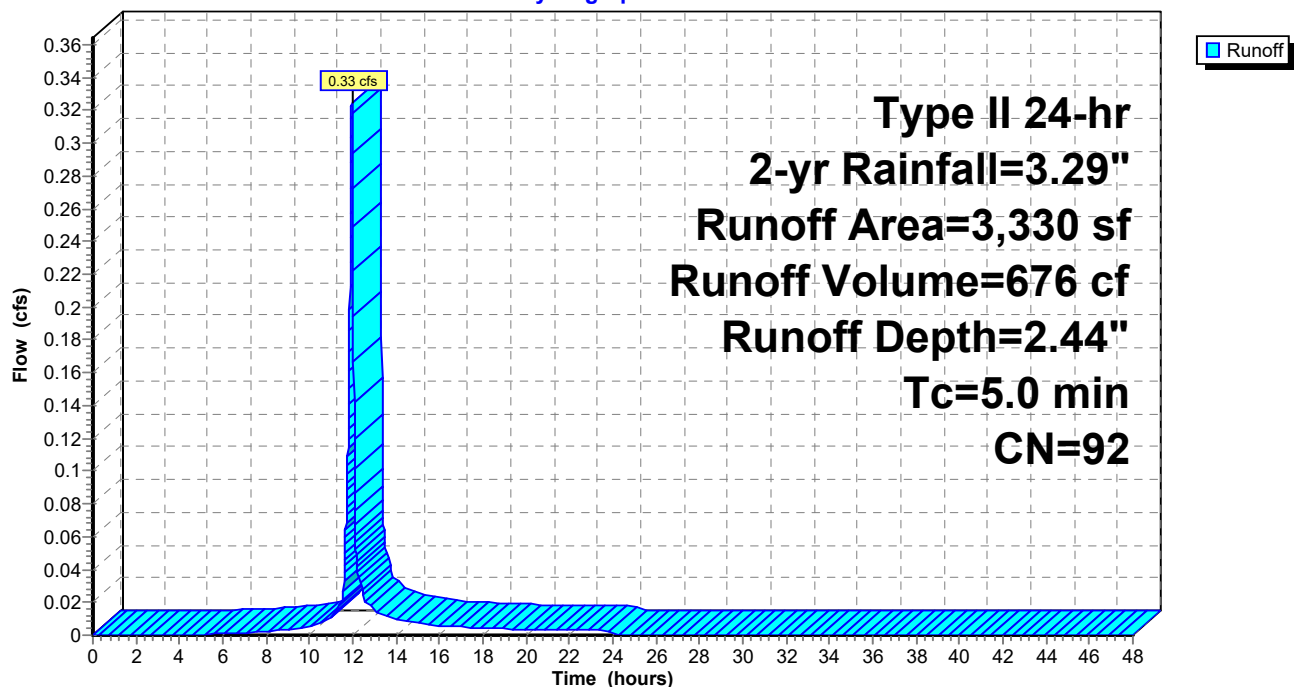
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	2,530	98	Paved
	800	74	>75% Grass cover, Good, HSG C
	3,330	92	Weighted Average
	800		24.02% Pervious Area
	2,530		75.98% Impervious Area

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

**Subcatchment 18S: Proposed to CB 8**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 19S: Proposed to CB 9**

Runoff = 0.95 cfs @ 11.96 hrs, Volume= 1,882 cf, Depth= 1.91"

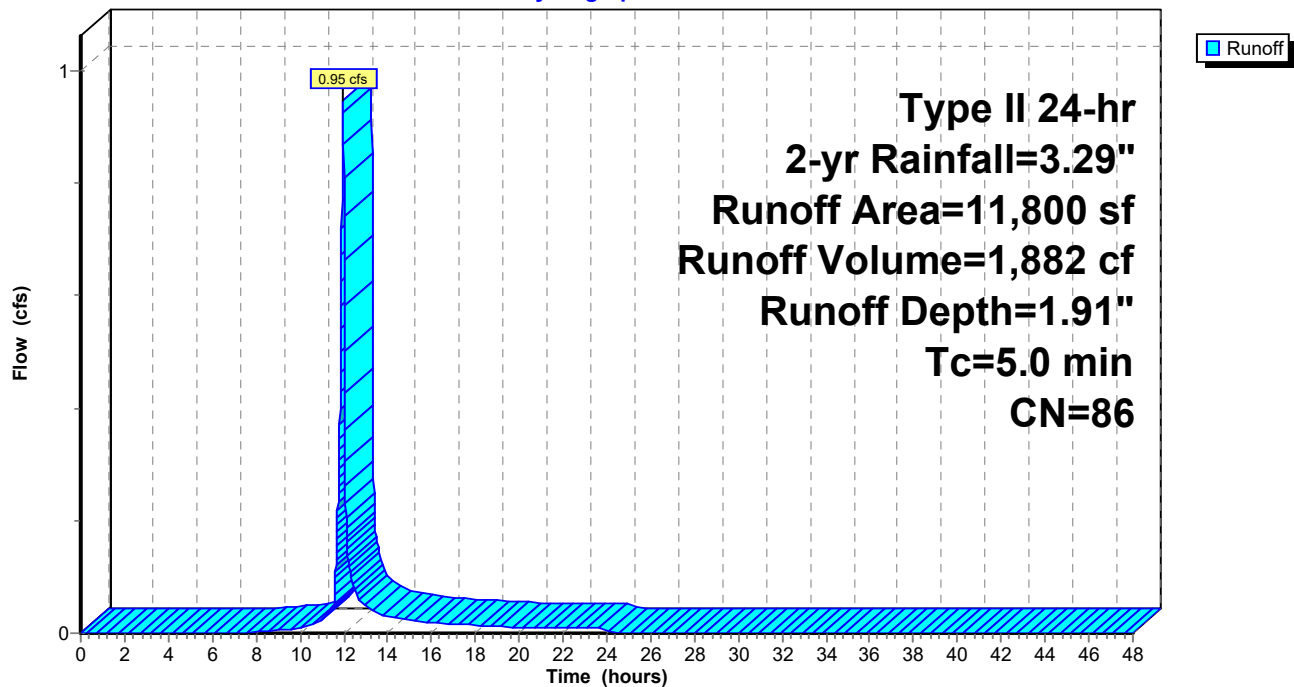
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	5,920	98	Paved
	5,880	74	>75% Grass cover, Good, HSG C
	11,800	86	Weighted Average
	5,880		49.83% Pervious Area
	5,920		50.17% Impervious Area

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

**Subcatchment 19S: Proposed to CB 9**

Hydrograph



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**Summary for Subcatchment 20S: Proposed to Northern Detention Basin**

Runoff = 5.67 cfs @ 11.96 hrs, Volume= 11,938 cf, Depth= 2.53"

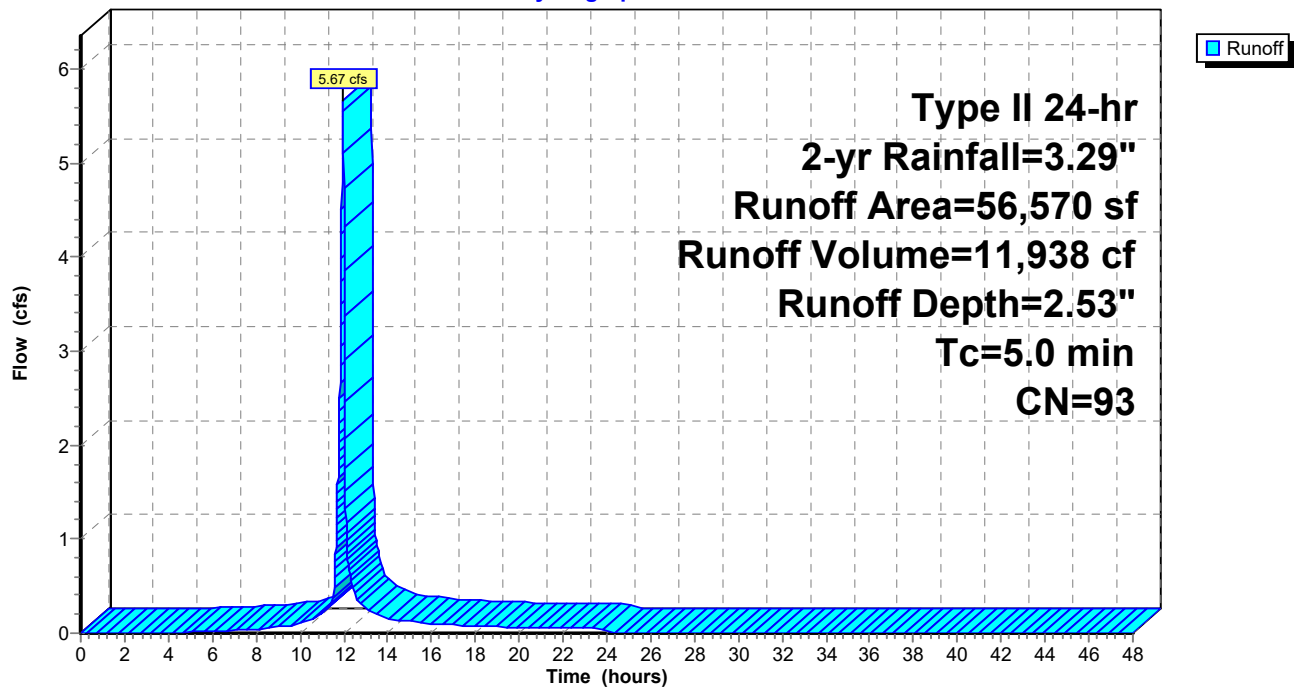
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	44,970	98	Paved
	11,600	74	>75% Grass cover, Good, HSG C
	56,570	93	Weighted Average
	11,600		20.51% Pervious Area
	44,970		79.49% Impervious Area

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

**Subcatchment 20S: Proposed to Northern Detention Basin**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 30S: Proposed to West**

Runoff = 5.03 cfs @ 12.15 hrs, Volume= 17,908 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

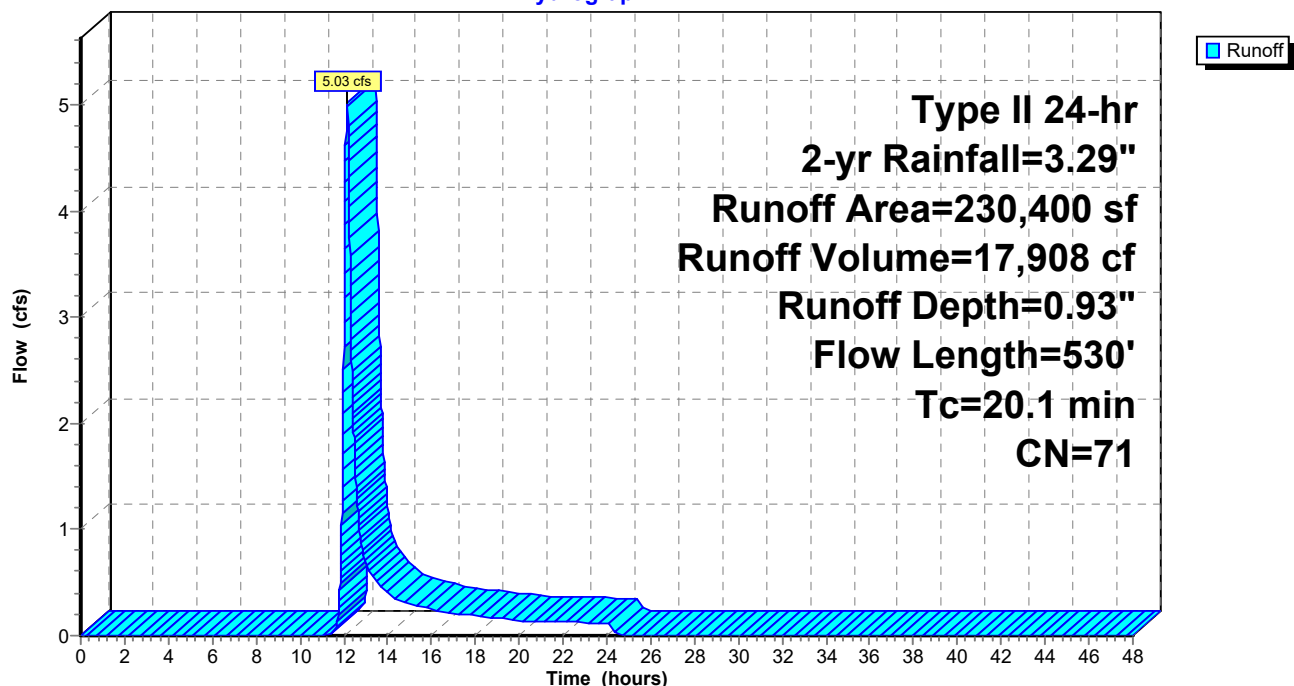
	Area (sf)	CN	Description
*	820	98	Paved
	71,890	74	>75% Grass cover, Good, HSG C
	157,690	70	Woods, Good, HSG C
	230,400	71	Weighted Average
	229,580		99.64% Pervious Area
	820		0.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
5.6	165	0.0050	0.49		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
2.1	290	0.1070	2.29		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
20.1	530	Total			

**Subcatchment 30S: Proposed to West**

Hydrograph





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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 40S: Proposed to South**

Runoff = 0.51 cfs @ 12.10 hrs, Volume= 1,564 cf, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

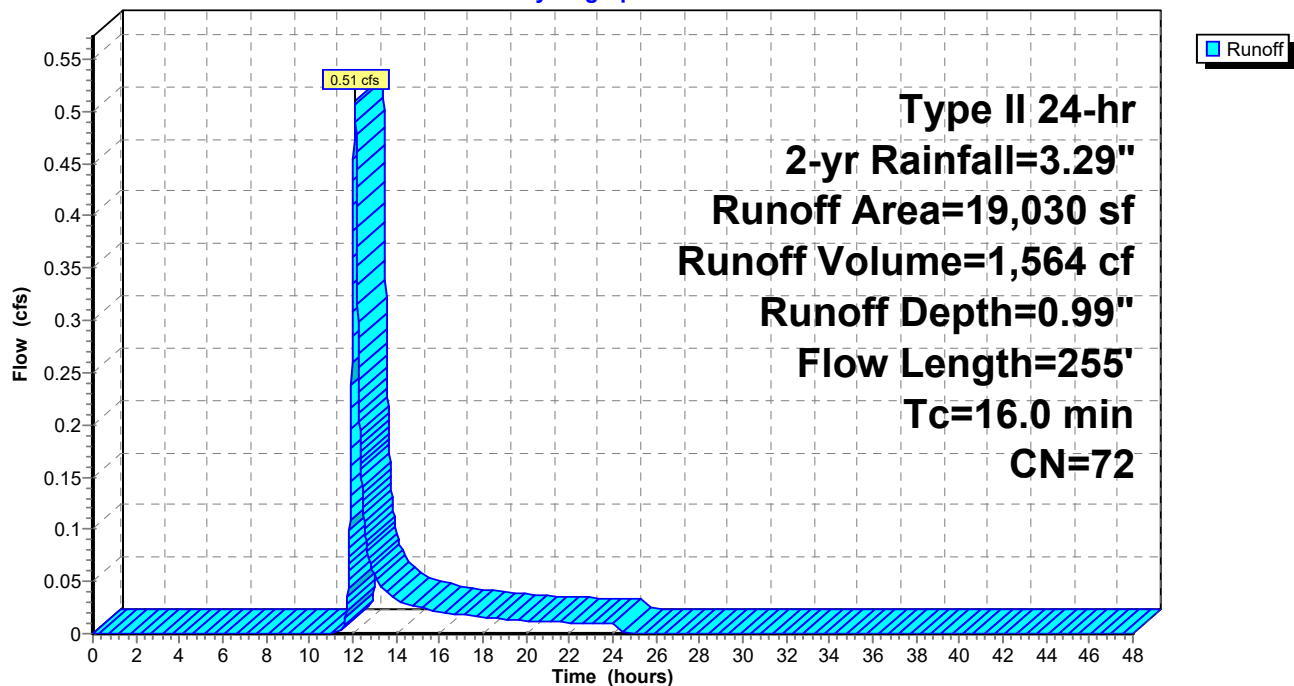
Area (sf)	CN	Description
10,460	74	>75% Grass cover, Good, HSG C
8,570	70	Woods, Good, HSG C
19,030	72	Weighted Average
19,030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
2.4	100	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.2	80	0.0250	1.11		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
16.0	255	Total			

**Subcatchment 40S: Proposed to South**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 50S: Proposed to WQB**

Runoff = 1.61 cfs @ 11.97 hrs, Volume= 3,157 cf, Depth= 1.10"

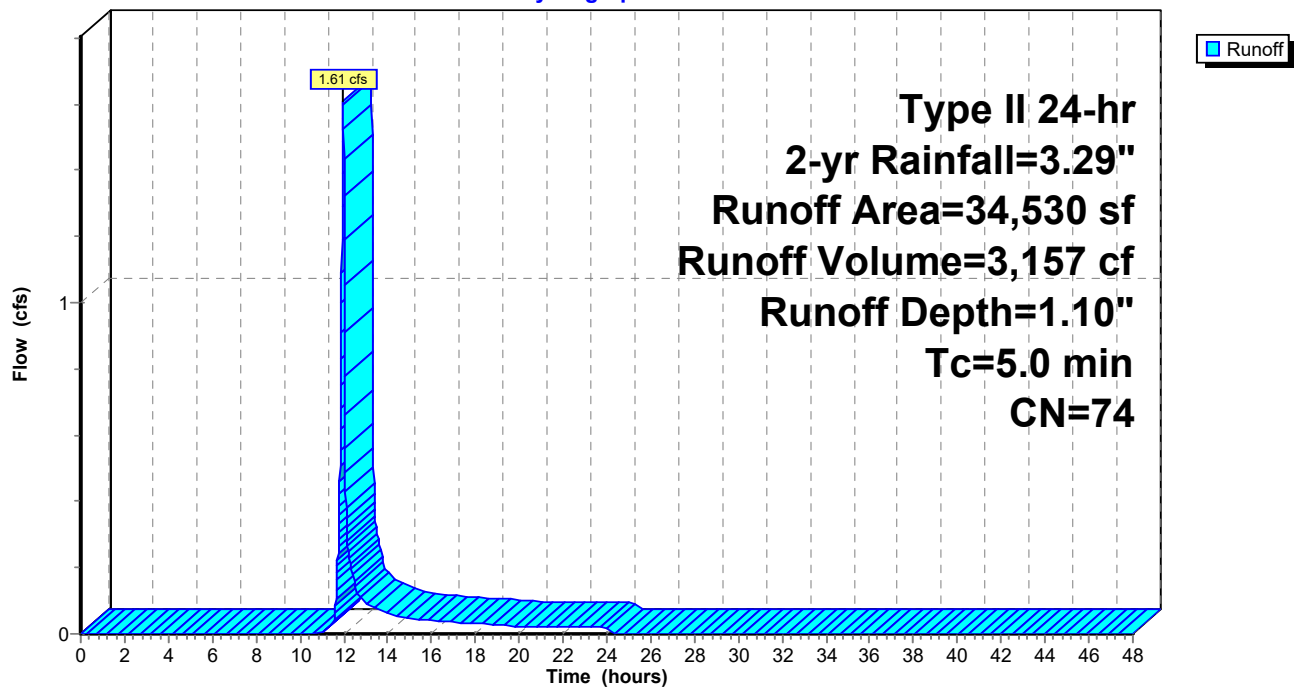
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

Area (sf)	CN	Description
34,530	74	>75% Grass cover, Good, HSG C
34,530		100.00% Pervious Area

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

**Subcatchment 50S: Proposed to WQB**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 81S: Proposed to YD 1**

Runoff = 0.49 cfs @ 11.96 hrs, Volume= 1,139 cf, Depth= 3.06"

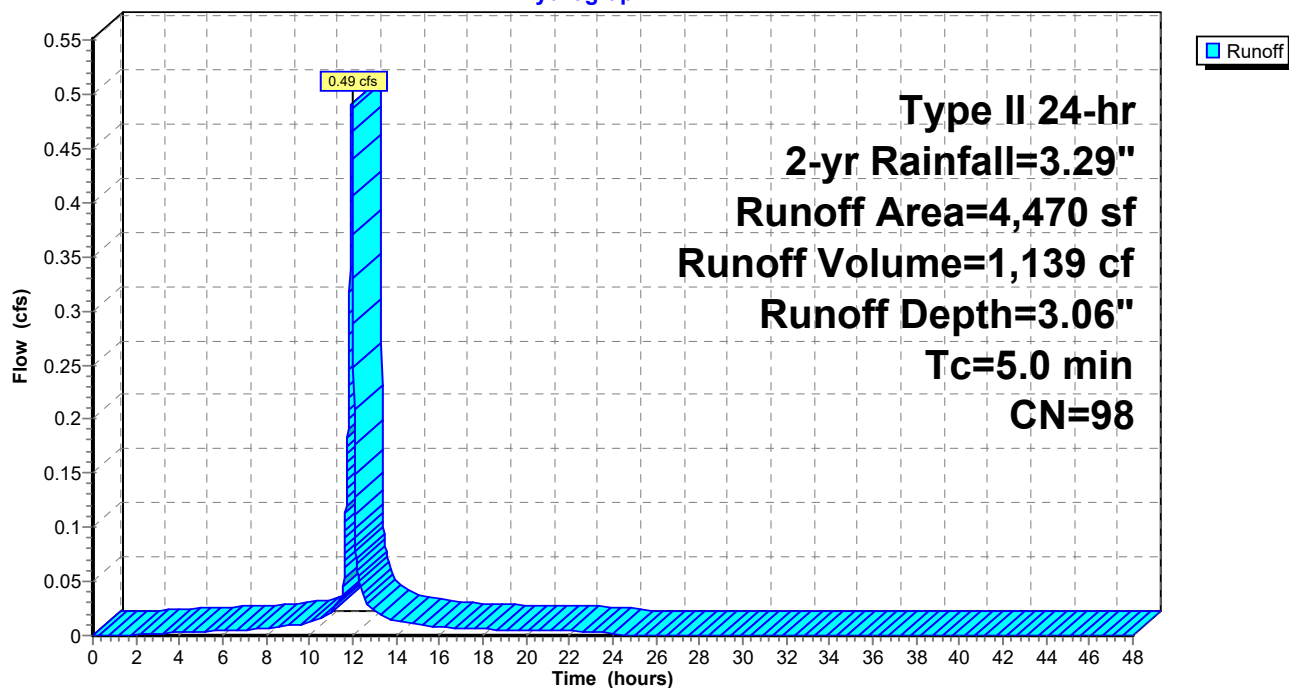
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	3,200	98	Roof
*	1,270	98	Paved
	4,470	98	Weighted Average
	4,470		100.00% Impervious Area

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

**Subcatchment 81S: Proposed to YD 1**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Subcatchment 82S: Proposed to YD 2**

Runoff = 0.49 cfs @ 11.96 hrs, Volume= 1,139 cf, Depth= 3.06"

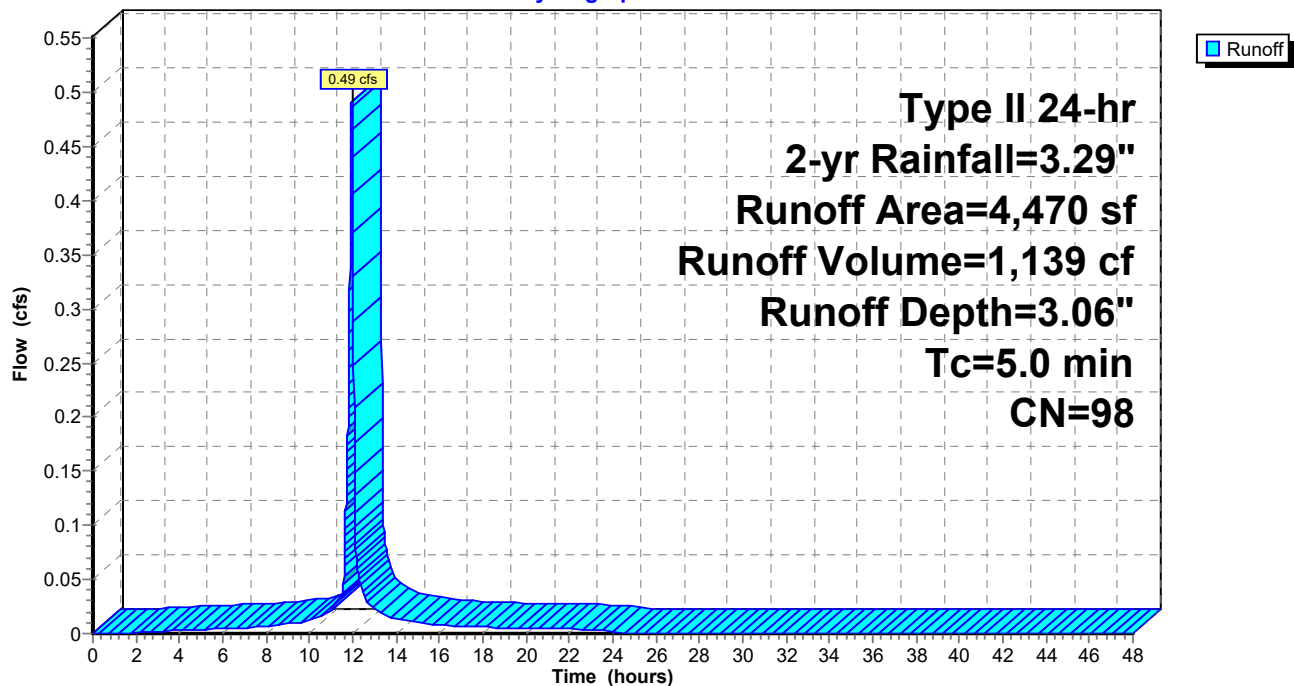
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	3,200	98	Roof
*	1,270	98	Paved
	4,470	98	Weighted Average
	4,470		100.00% Impervious Area

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

**Subcatchment 82S: Proposed to YD 2**

Hydrograph



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**Summary for Subcatchment 83S: Proposed to YD 3**

Runoff = 0.64 cfs @ 11.97 hrs, Volume= 1,254 cf, Depth= 1.28"

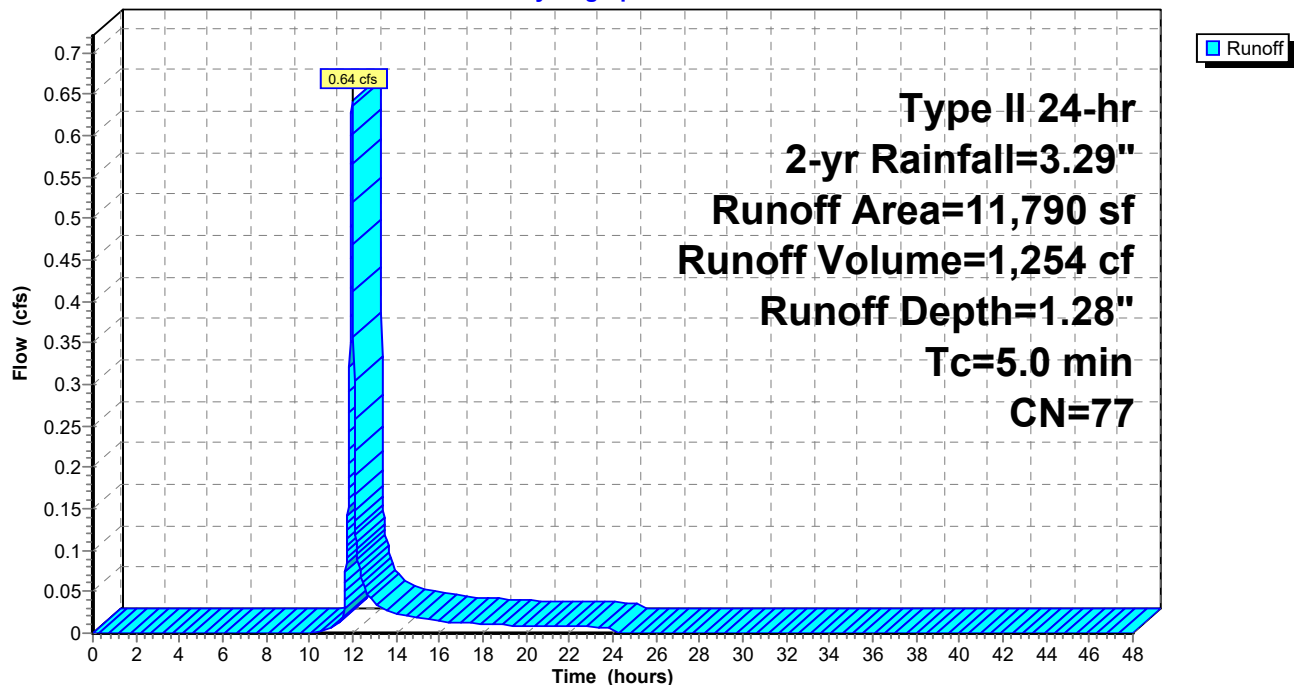
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-yr Rainfall=3.29"

	Area (sf)	CN	Description
*	1,420	98	Paved
	10,370	74	>75% Grass cover, Good, HSG C
	11,790	77	Weighted Average
	10,370		87.96% Pervious Area
	1,420		12.04% Impervious Area

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

**Subcatchment 83S: Proposed to YD 3**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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## Summary for Pond 11P: CB 1

Inflow Area = 7,750 sf, 41.81% Impervious, Inflow Depth = 1.76" for 2-yr event  
Inflow = 0.58 cfs @ 11.96 hrs, Volume= 1,135 cf  
Outflow = 0.58 cfs @ 11.96 hrs, Volume= 1,135 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.58 cfs @ 11.96 hrs, Volume= 1,135 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 636.81' @ 11.96 hrs

Flood Elev= 639.90'

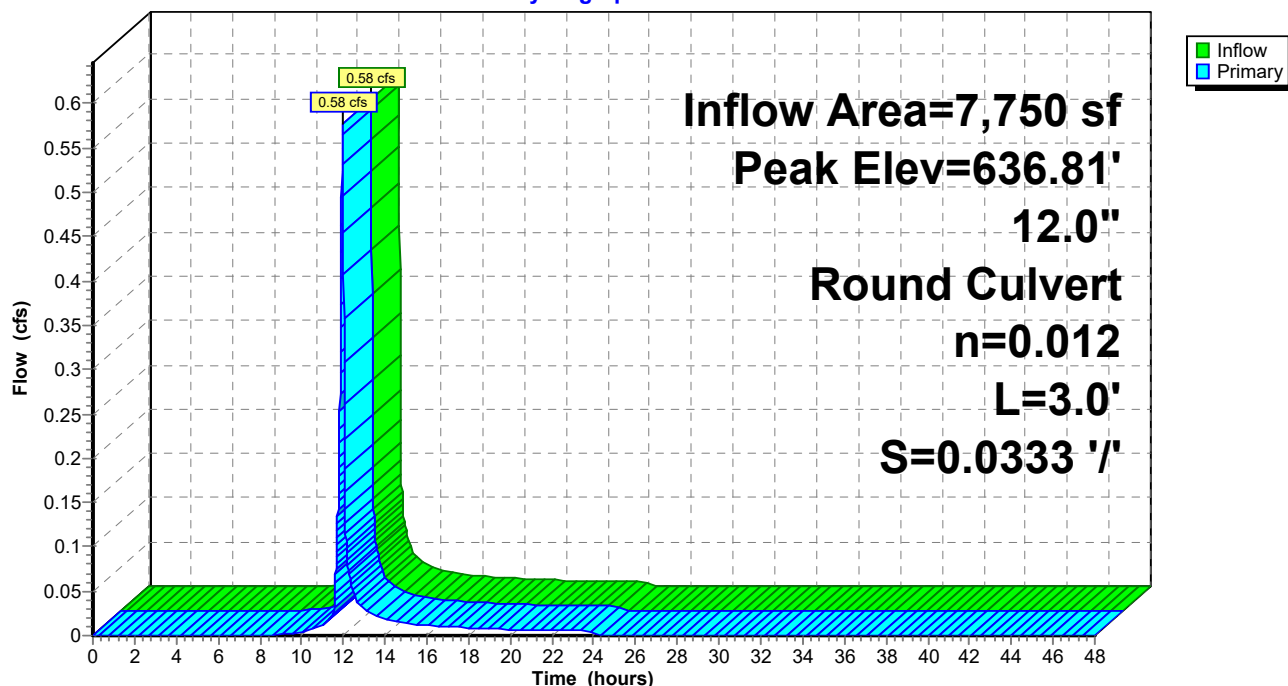
Device	Routing	Invert	Outlet Devices
#1	Primary	636.40'	<b>12.0" Round Culvert</b> L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 636.40' / 636.30' S= 0.0333 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.58 cfs @ 11.96 hrs HW=636.81' (Free Discharge)

↑1=Culvert (Barrel Controls 0.58 cfs @ 2.82 fps)

## Pond 11P: CB 1

Hydrograph



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## Summary for Pond 12P: CB 2

Inflow Area = 4,140 sf, 22.46% Impervious, Inflow Depth = 1.40" for 2-yr event  
Inflow = 0.25 cfs @ 11.96 hrs, Volume= 485 cf  
Outflow = 0.25 cfs @ 11.96 hrs, Volume= 485 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.25 cfs @ 11.96 hrs, Volume= 485 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 639.24' @ 11.96 hrs

Flood Elev= 642.50'

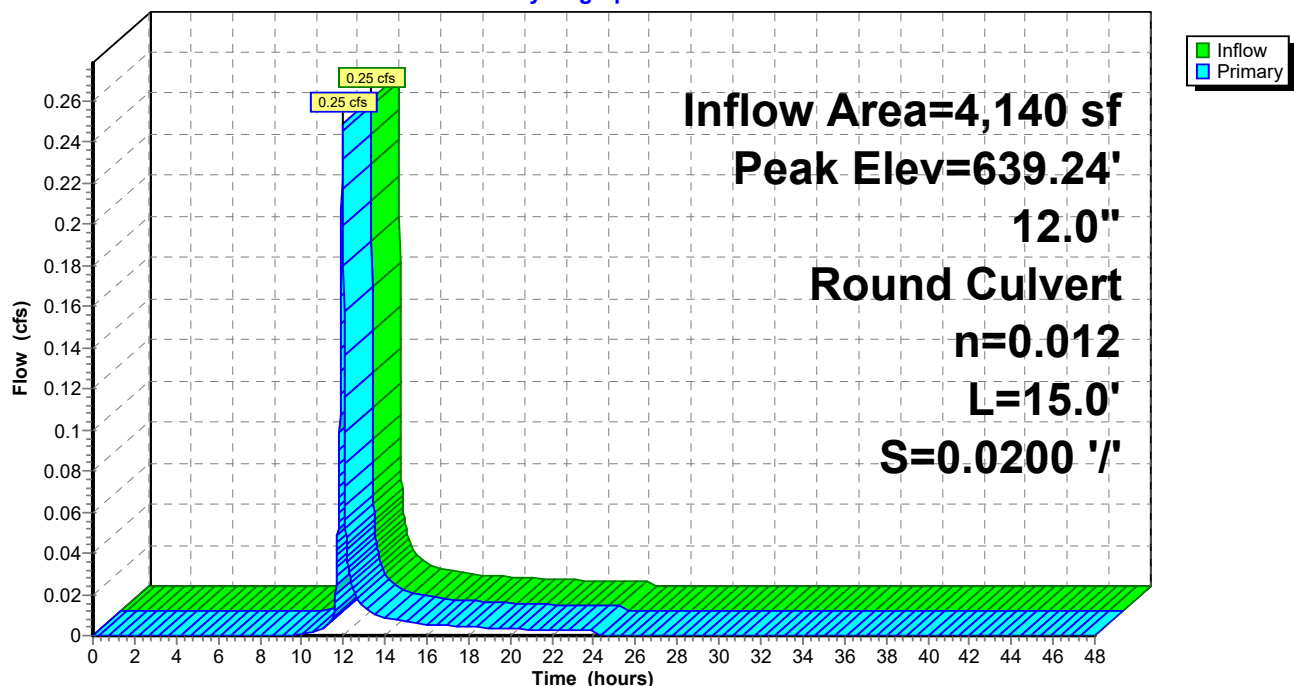
Device	Routing	Invert	Outlet Devices
#1	Primary	639.00'	<b>12.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 639.00' / 638.70' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.25 cfs @ 11.96 hrs HW=639.24' (Free Discharge)

↑1=Culvert (Inlet Controls 0.25 cfs @ 1.68 fps)

## Pond 12P: CB 2

Hydrograph



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## Summary for Pond 13P: CB 3

Inflow Area = 930 sf, 100.00% Impervious, Inflow Depth = 3.06" for 2-yr event  
Inflow = 0.10 cfs @ 11.96 hrs, Volume= 237 cf  
Outflow = 0.10 cfs @ 11.96 hrs, Volume= 237 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.10 cfs @ 11.96 hrs, Volume= 237 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 639.25' @ 11.96 hrs

Flood Elev= 642.60'

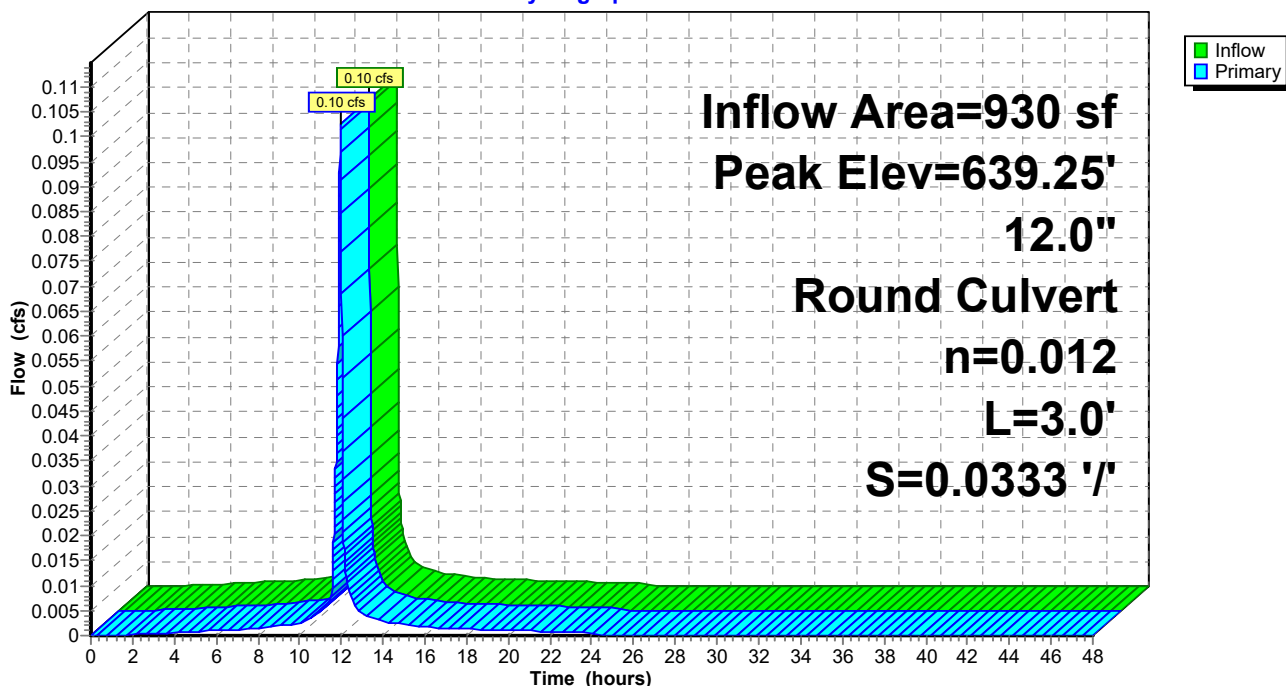
Device	Routing	Invert	Outlet Devices
#1	Primary	639.10'	<b>12.0" Round Culvert</b> L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 639.10' / 639.00' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.10 cfs @ 11.96 hrs HW=639.25' (Free Discharge)

↑1=Culvert (Inlet Controls 0.10 cfs @ 1.33 fps)

## Pond 13P: CB 3

Hydrograph





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## Summary for Pond 14P: CB 4

Inflow Area = 2,000 sf, 34.50% Impervious, Inflow Depth = 1.61" for 2-yr event  
Inflow = 0.14 cfs @ 11.96 hrs, Volume= 268 cf  
Outflow = 0.14 cfs @ 11.96 hrs, Volume= 268 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.14 cfs @ 11.96 hrs, Volume= 268 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 643.68' @ 11.96 hrs

Flood Elev= 647.00'

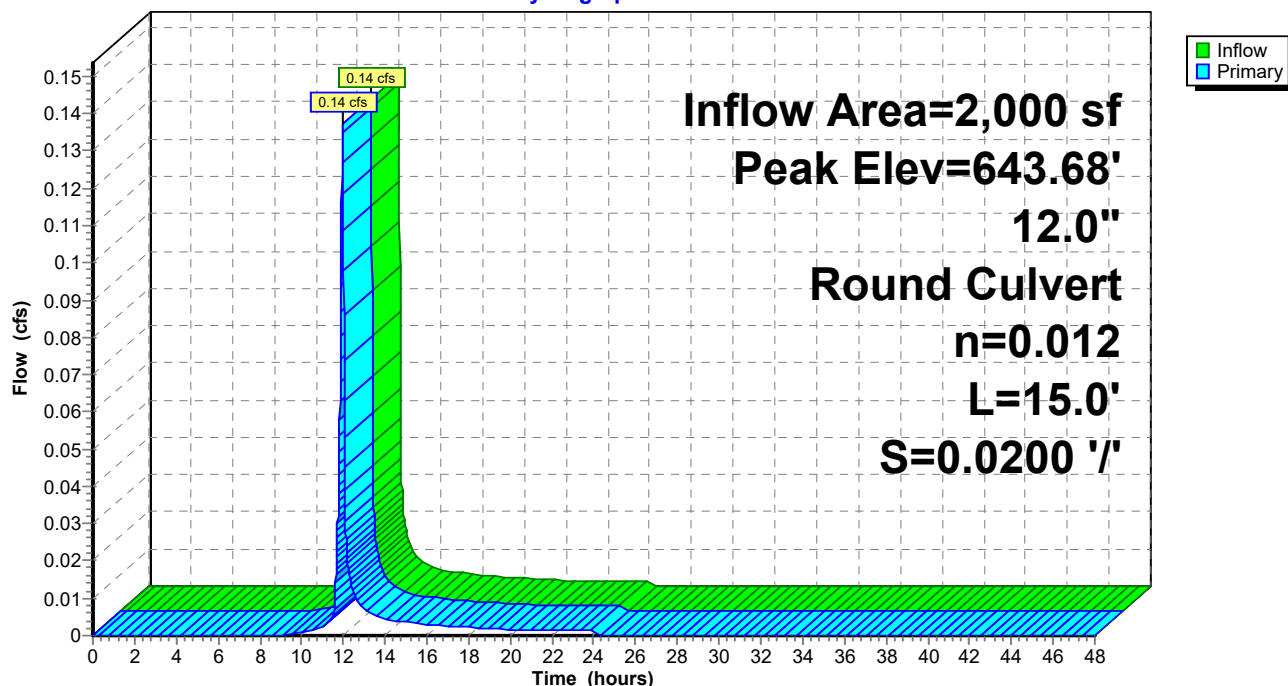
Device	Routing	Invert	Outlet Devices
#1	Primary	643.50'	<b>12.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 643.50' / 643.20' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.14 cfs @ 11.96 hrs HW=643.68' (Free Discharge)

↑1=Culvert (Inlet Controls 0.14 cfs @ 1.44 fps)

## Pond 14P: CB 4

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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## Summary for Pond 15P: CB 5

Inflow Area = 660 sf, 100.00% Impervious, Inflow Depth = 3.06" for 2-yr event  
Inflow = 0.07 cfs @ 11.96 hrs, Volume= 168 cf  
Outflow = 0.07 cfs @ 11.96 hrs, Volume= 168 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.07 cfs @ 11.96 hrs, Volume= 168 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 643.63' @ 11.96 hrs

Flood Elev= 647.00'

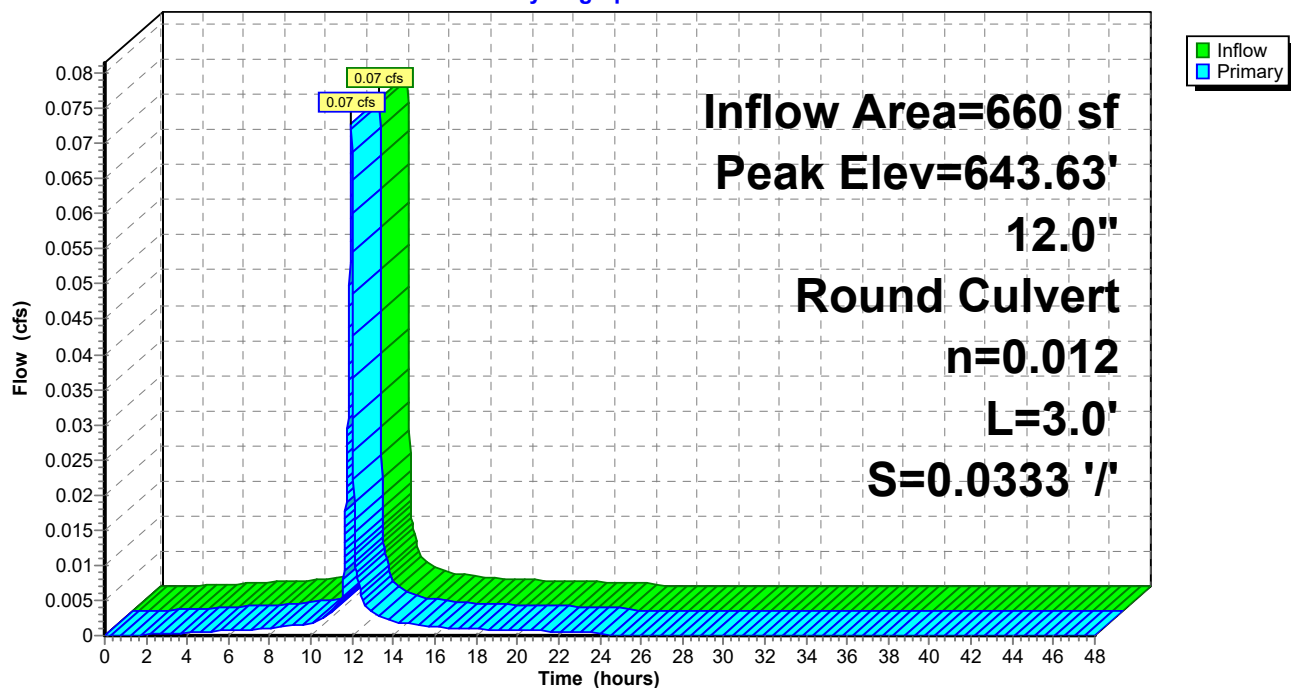
Device	Routing	Invert	Outlet Devices
#1	Primary	643.50'	<b>12.0" Round Culvert</b> L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 643.50' / 643.40' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.07 cfs @ 11.96 hrs HW=643.63' (Free Discharge)

↑1=Culvert (Inlet Controls 0.07 cfs @ 1.22 fps)

## Pond 15P: CB 5

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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## Summary for Pond 16P: CB 6

Inflow Area = 5,850 sf, 56.41% Impervious, Inflow Depth = 2.08" for 2-yr event  
Inflow = 0.50 cfs @ 11.96 hrs, Volume= 1,013 cf  
Outflow = 0.50 cfs @ 11.96 hrs, Volume= 1,013 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.50 cfs @ 11.96 hrs, Volume= 1,013 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 650.38' @ 11.96 hrs

Flood Elev= 651.00'

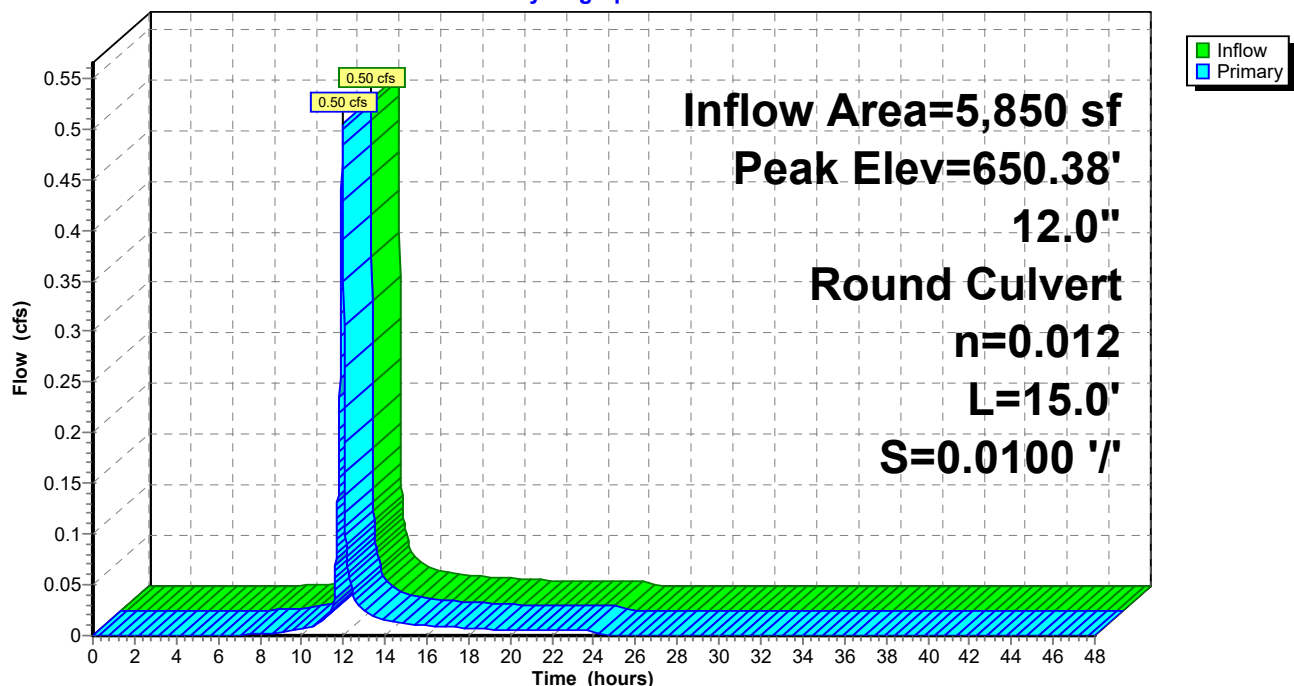
Device	Routing	Invert	Outlet Devices
#1	Primary	650.00'	<b>12.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.00' / 649.85' S= 0.0100 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.50 cfs @ 11.96 hrs HW=650.38' (Free Discharge)

↑1=Culvert (Barrel Controls 0.50 cfs @ 2.69 fps)

## Pond 16P: CB 6

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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## Summary for Pond 17P: CB 7

Inflow Area = 2,950 sf, 74.92% Impervious, Inflow Depth = 2.44" for 2-yr event  
Inflow = 0.29 cfs @ 11.96 hrs, Volume= 599 cf  
Outflow = 0.29 cfs @ 11.96 hrs, Volume= 599 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.29 cfs @ 11.96 hrs, Volume= 599 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 647.76' @ 11.96 hrs

Flood Elev= 651.00'

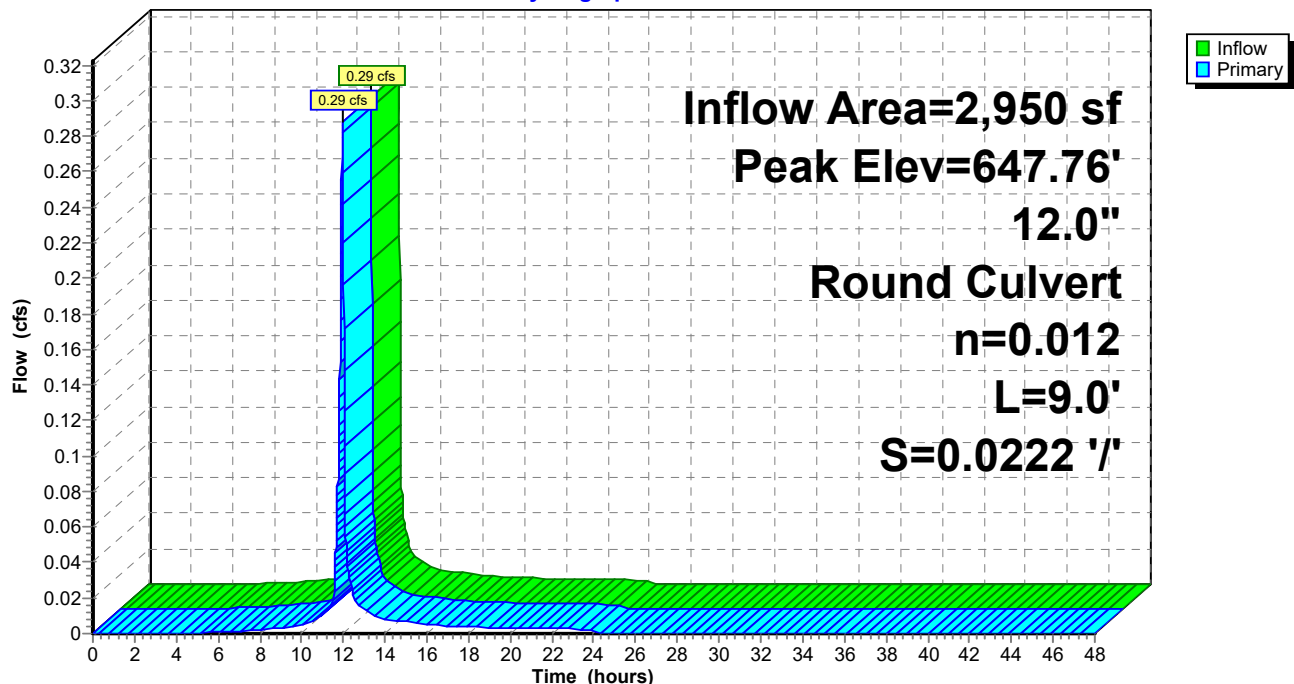
Device	Routing	Invert	Outlet Devices
#1	Primary	647.50'	<b>12.0" Round Culvert</b> L= 9.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 647.50' / 647.30' S= 0.0222 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.29 cfs @ 11.96 hrs HW=647.76' (Free Discharge)

↑1=Culvert (Inlet Controls 0.29 cfs @ 1.74 fps)

## Pond 17P: CB 7

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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## Summary for Pond 18P: CB 8

[58] Hint: Peaked 0.28' above defined flood level

Inflow Area = 3,330 sf, 75.98% Impervious, Inflow Depth = 2.44" for 2-yr event  
Inflow = 0.33 cfs @ 11.96 hrs, Volume= 676 cf  
Outflow = 0.33 cfs @ 11.96 hrs, Volume= 676 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.33 cfs @ 11.96 hrs, Volume= 676 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 650.58' @ 11.96 hrs

Flood Elev= 650.30'

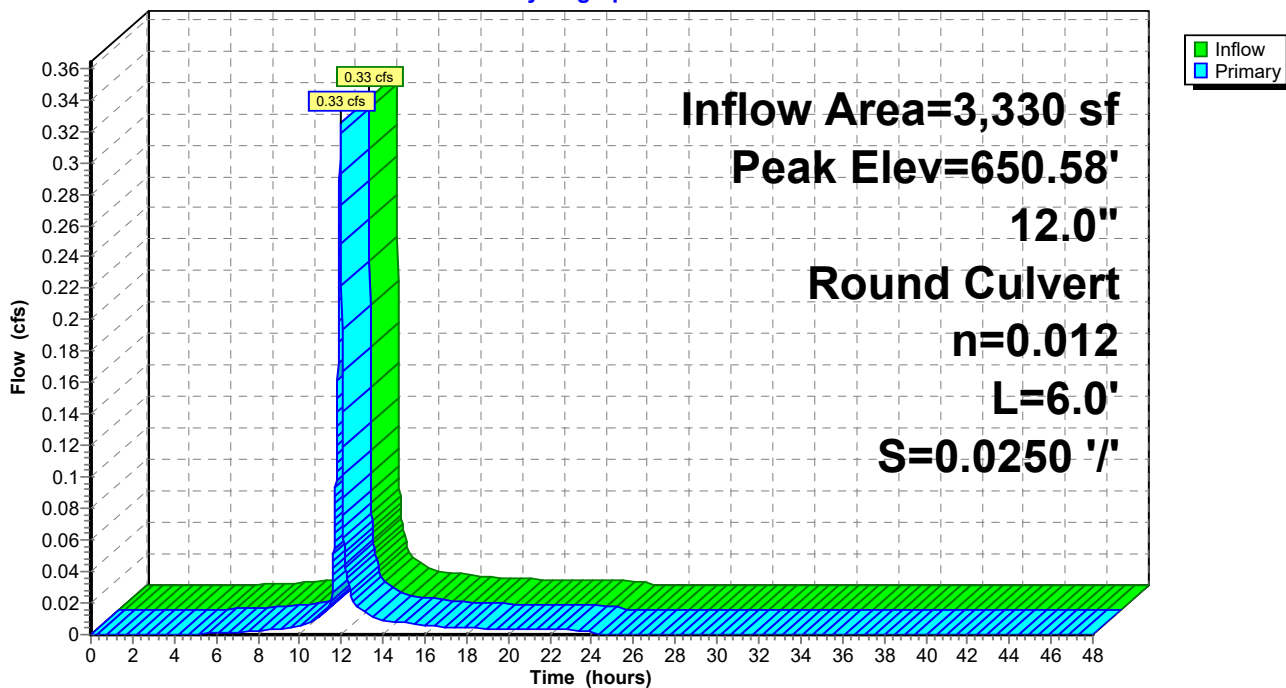
Device	Routing	Invert	Outlet Devices
#1	Primary	650.30'	<b>12.0" Round Culvert</b> L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.30' / 650.15' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.32 cfs @ 11.96 hrs HW=650.58' (Free Discharge)

↑1=Culvert (Inlet Controls 0.32 cfs @ 1.80 fps)

## Pond 18P: CB 8

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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**Summary for Pond 19P: CB 9**

Inflow Area = 11,800 sf, 50.17% Impervious, Inflow Depth = 1.91" for 2-yr event  
Inflow = 0.95 cfs @ 11.96 hrs, Volume= 1,882 cf  
Outflow = 0.95 cfs @ 11.96 hrs, Volume= 1,882 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.95 cfs @ 11.96 hrs, Volume= 1,882 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 650.63' @ 11.96 hrs

Flood Elev= 653.60'

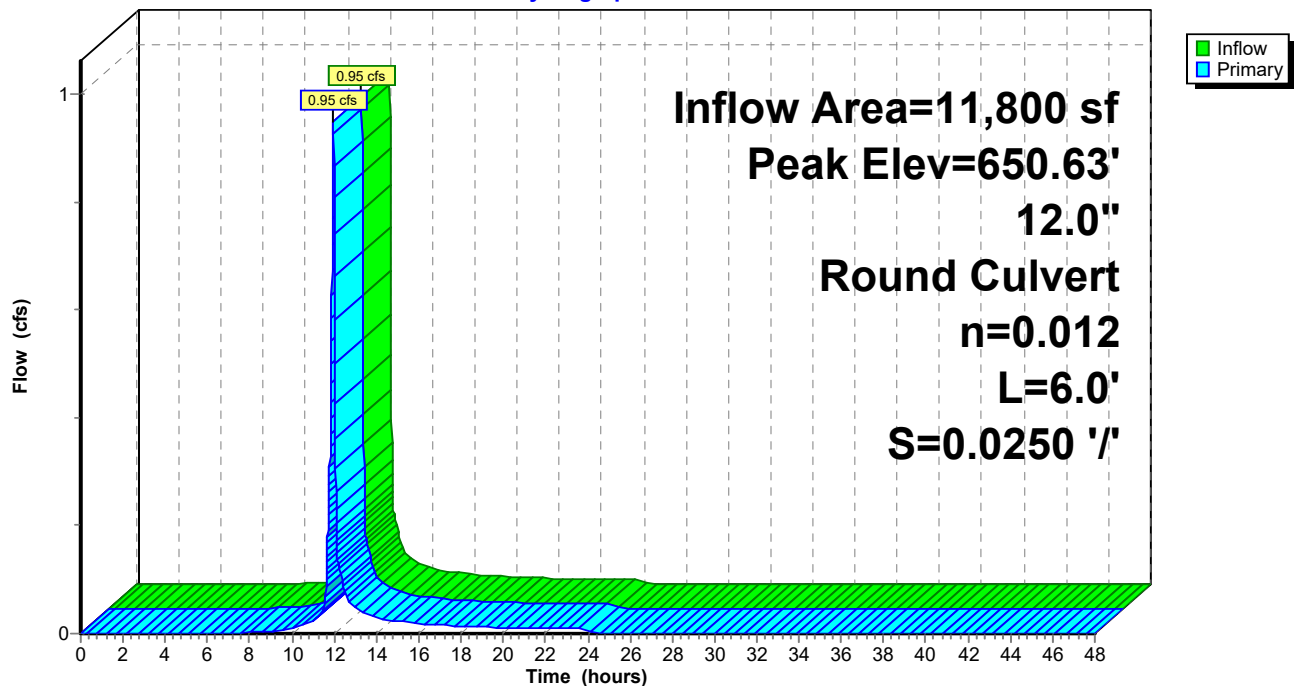
Device	Routing	Invert	Outlet Devices
#1	Primary	650.10'	<b>12.0" Round Culvert</b> L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.10' / 649.95' S= 0.0250 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.95 cfs @ 11.96 hrs HW=650.63' (Free Discharge)

↑1=Culvert (Barrel Controls 0.95 cfs @ 3.27 fps)

**Pond 19P: CB 9**

Hydrograph



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## Summary for Pond 40P: HDS Unit

[79] Warning: Submerged Pond 69P Primary device # 1 INLET by 0.42'

Inflow Area = 44,660 sf, 54.46% Impervious, Inflow Depth = 2.07" for 2-yr event  
Inflow = 3.69 cfs @ 11.96 hrs, Volume= 7,701 cf  
Outflow = 3.69 cfs @ 11.96 hrs, Volume= 7,701 cf, Atten= 0%, Lag= 0.0 min  
Primary = 3.69 cfs @ 11.96 hrs, Volume= 7,701 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 642.42' @ 11.96 hrs

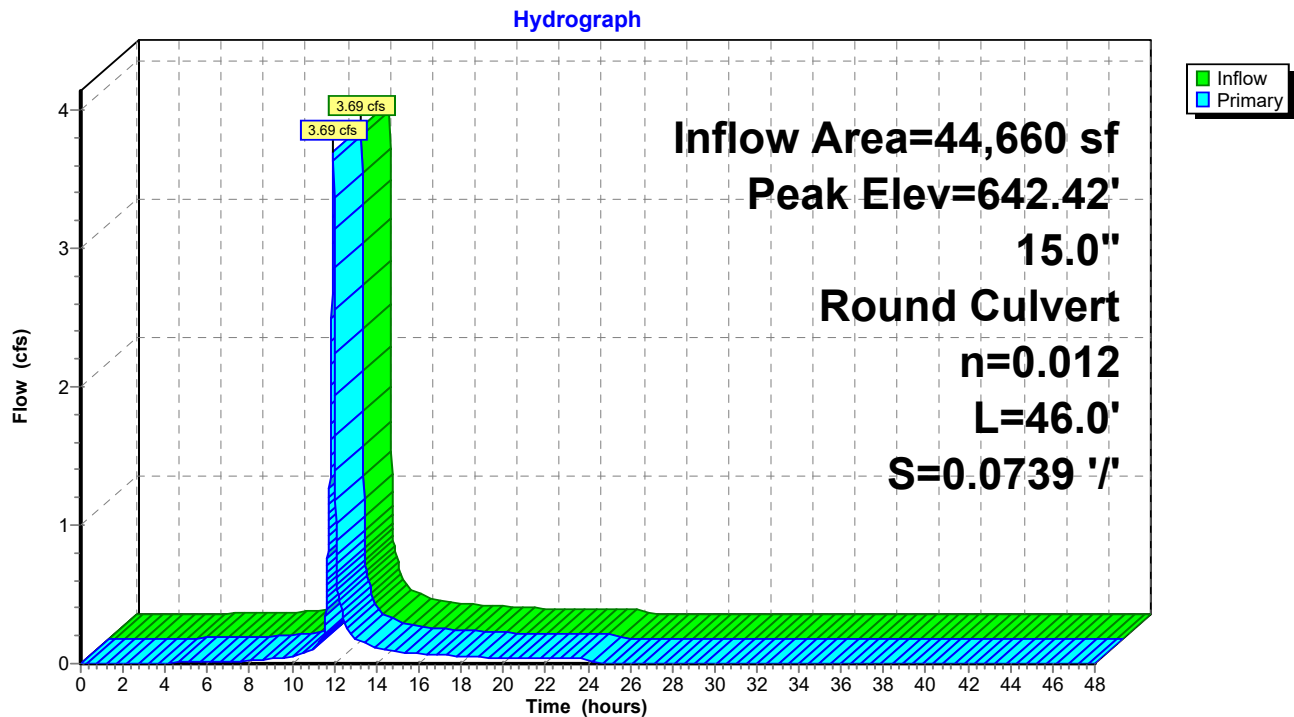
Flood Elev= 653.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	641.40'	<b>15.0" Round Culvert</b> L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 641.40' / 638.00' S= 0.0739 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=3.70 cfs @ 11.96 hrs HW=642.42' (Free Discharge)

↑1=Culvert (Inlet Controls 3.70 cfs @ 3.44 fps)

## Pond 40P: HDS Unit



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**Summary for Pond 50P: WQB**

[79] Warning: Submerged Pond 40P Primary device # 1 OUTLET by 1.41'

Inflow Area = 79,190 sf, 30.71% Impervious, Inflow Depth = 1.65" for 2-yr event  
 Inflow = 5.29 cfs @ 11.96 hrs, Volume= 10,859 cf  
 Outflow = 0.21 cfs @ 13.55 hrs, Volume= 6,480 cf, Atten= 96%, Lag= 95.4 min  
 Primary = 0.21 cfs @ 13.55 hrs, Volume= 6,480 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 639.41' @ 13.55 hrs Surf.Area= 5,779 sf Storage= 6,531 cf  
 Flood Elev= 644.00' Surf.Area= 14,157 sf Storage= 51,826 cf

Plug-Flow detention time= 398.1 min calculated for 6,480 cf (60% of inflow)  
 Center-of-Mass det. time= 279.3 min ( 1,093.8 - 814.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	638.00'	51,826 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
638.00	3,553	532.6	0	0	3,553
640.00	6,861	570.3	10,234	10,234	7,041
642.00	10,396	608.0	17,135	27,369	10,767
644.00	14,157	645.7	24,456	51,826	14,732

Device	Routing	Invert	Outlet Devices
#1	Primary	638.00'	<b>12.0" Round Culvert</b> L= 90.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 638.00' / 637.10' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	639.00'	<b>4.0" Vert. Orifice/Grate</b> C= 0.600
#3	Device 1	642.15'	<b>6.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.21 cfs @ 13.55 hrs HW=639.41' (Free Discharge)

↑ **1=Culvert** (Passes 0.21 cfs of 3.61 cfs potential flow)  
 ↑ **2=Orifice/Grate** (Orifice Controls 0.21 cfs @ 2.39 fps)  
 ↑ **3=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)



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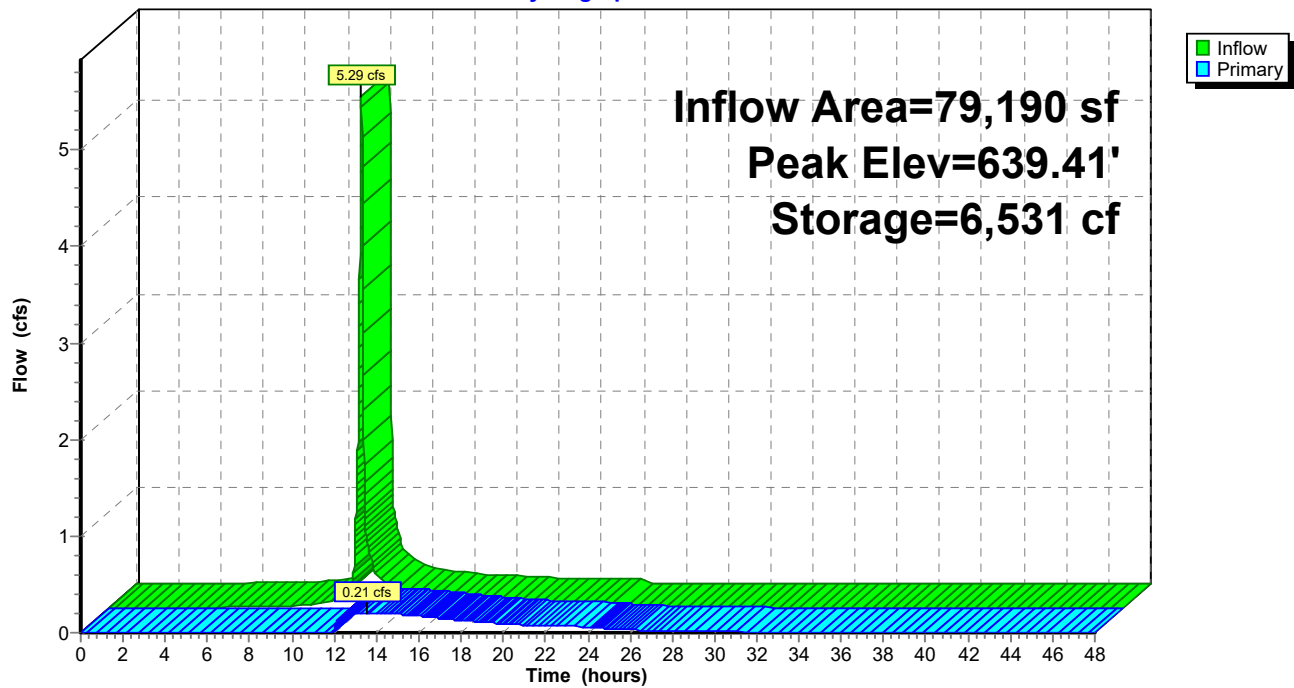
Proposed Conditions  
Type II 24-hr 2-yr Rainfall=3.29"

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## Pond 50P: WQB

### Hydrograph



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## Summary for Pond 61P: DMH 1

[79] Warning: Submerged Pond 62P Primary device # 1 OUTLET by 0.46'

Inflow Area = 94,670 sf, 32.50% Impervious, Inflow Depth > 1.11" for 2-yr event  
Inflow = 1.14 cfs @ 11.96 hrs, Volume= 8,774 cf  
Outflow = 1.14 cfs @ 11.96 hrs, Volume= 8,774 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.14 cfs @ 11.96 hrs, Volume= 8,774 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 633.91' @ 11.96 hrs

Flood Elev= 639.10'

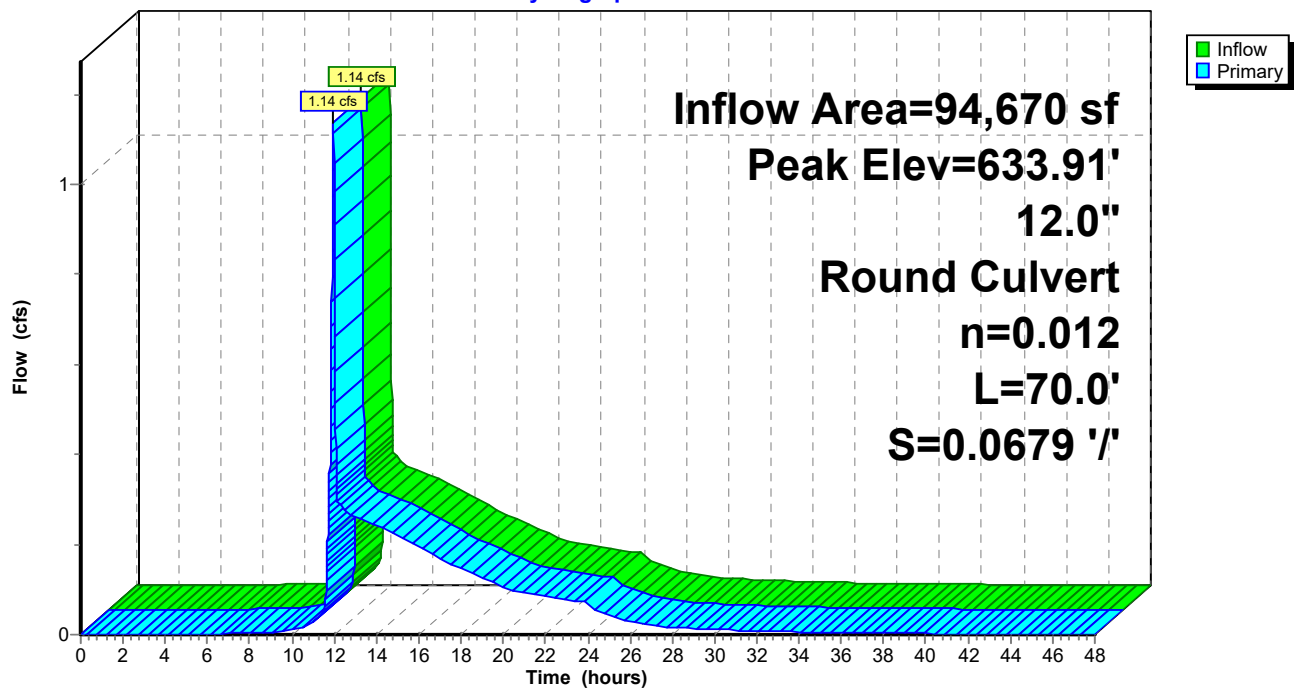
Device	Routing	Invert	Outlet Devices
#1	Primary	633.35'	<b>12.0" Round Culvert</b> L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 633.35' / 628.60' S= 0.0679 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.13 cfs @ 11.96 hrs HW=633.90' (Free Discharge)

↑1=Culvert (Inlet Controls 1.13 cfs @ 2.54 fps)

## Pond 61P: DMH 1

Hydrograph



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### Summary for Pond 62P: DMH 2

[79] Warning: Submerged Pond 63P Primary device # 1 OUTLET by 0.46'

Inflow Area = 94,670 sf, 32.50% Impervious, Inflow Depth > 1.11" for 2-yr event  
Inflow = 1.14 cfs @ 11.96 hrs, Volume= 8,774 cf  
Outflow = 1.14 cfs @ 11.96 hrs, Volume= 8,774 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.14 cfs @ 11.96 hrs, Volume= 8,774 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 635.01' @ 11.96 hrs

Flood Elev= 640.00'

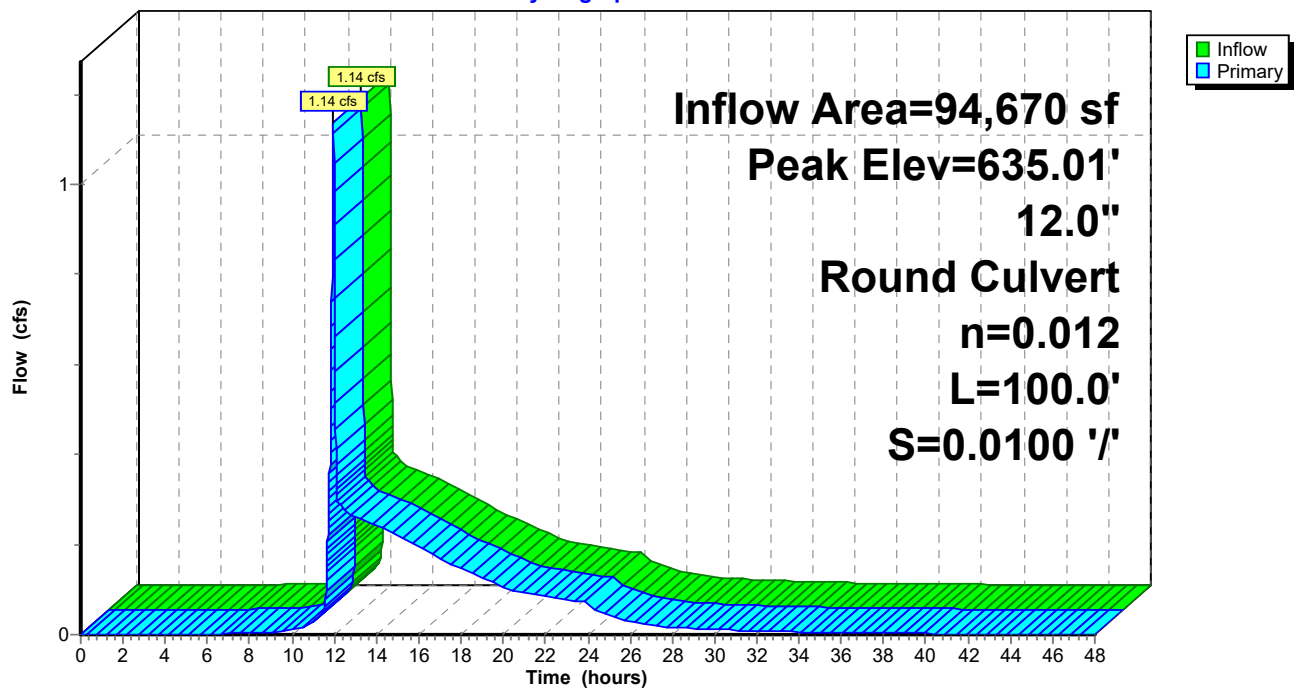
Device	Routing	Invert	Outlet Devices
#1	Primary	634.45'	<b>12.0" Round Culvert</b> L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 634.45' / 633.45' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.14 cfs @ 11.96 hrs HW=635.01' (Free Discharge)

↑1=Culvert (Inlet Controls 1.14 cfs @ 2.54 fps)

### Pond 62P: DMH 2

Hydrograph



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## Summary for Pond 63P: DMH 3

[79] Warning: Submerged Pond 64P Primary device # 1 OUTLET by 0.27'

Inflow Area = 86,920 sf, 31.67% Impervious, Inflow Depth > 1.05" for 2-yr event  
Inflow = 0.56 cfs @ 11.96 hrs, Volume= 7,639 cf  
Outflow = 0.56 cfs @ 11.96 hrs, Volume= 7,639 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.56 cfs @ 11.96 hrs, Volume= 7,639 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 635.72' @ 11.96 hrs

Flood Elev= 642.70'

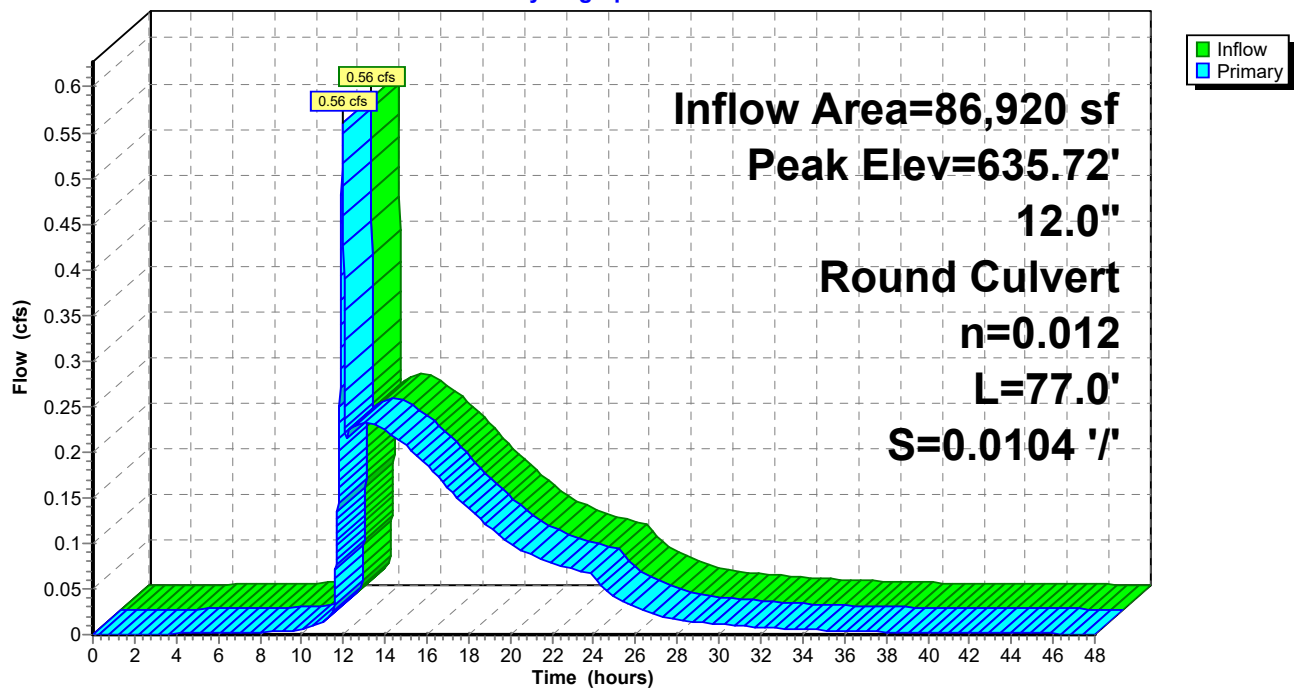
Device	Routing	Invert	Outlet Devices
#1	Primary	635.35'	<b>12.0" Round Culvert</b> L= 77.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 635.35' / 634.55' S= 0.0104 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.56 cfs @ 11.96 hrs HW=635.72' (Free Discharge)

↑1=Culvert (Inlet Controls 0.56 cfs @ 2.08 fps)

## Pond 63P: DMH 3

Hydrograph



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## Summary for Pond 64P: DMH 4

[79] Warning: Submerged Pond 65P Primary device # 1 OUTLET by 0.13'

Inflow Area = 81,850 sf, 31.36% Impervious, Inflow Depth > 1.01" for 2-yr event  
Inflow = 0.22 cfs @ 13.41 hrs, Volume= 6,917 cf  
Outflow = 0.22 cfs @ 13.41 hrs, Volume= 6,917 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.22 cfs @ 13.41 hrs, Volume= 6,917 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 636.43' @ 13.41 hrs

Flood Elev= 647.30'

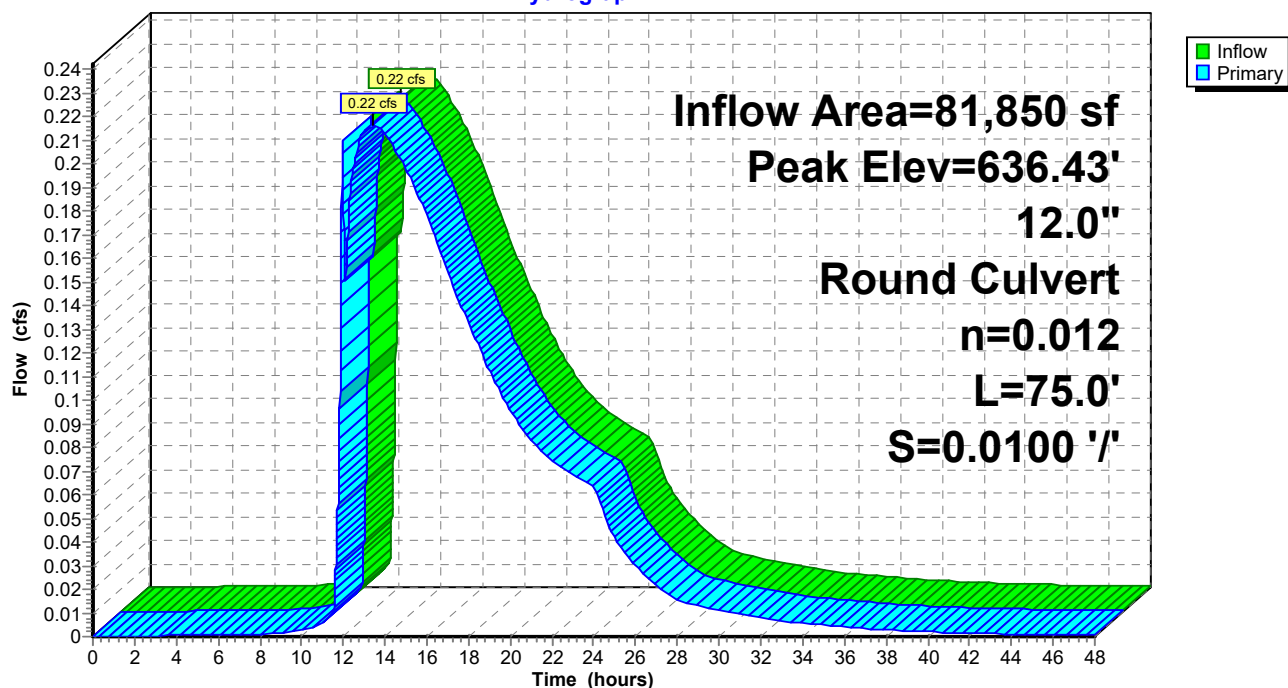
Device	Routing	Invert	Outlet Devices
#1	Primary	636.20'	<b>12.0" Round Culvert</b> L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 636.20' / 635.45' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.22 cfs @ 13.41 hrs HW=636.43' (Free Discharge)

↑1=Culvert (Inlet Controls 0.22 cfs @ 1.62 fps)

## Pond 64P: DMH 4

Hydrograph



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## Summary for Pond 65P: DMH 5

[79] Warning: Submerged Pond 50P Primary device # 1 OUTLET by 0.11'

Inflow Area = 79,190 sf, 30.71% Impervious, Inflow Depth > 0.98" for 2-yr event  
Inflow = 0.21 cfs @ 13.55 hrs, Volume= 6,480 cf  
Outflow = 0.21 cfs @ 13.55 hrs, Volume= 6,480 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.21 cfs @ 13.55 hrs, Volume= 6,480 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 637.21' @ 13.55 hrs

Flood Elev= 651.80'

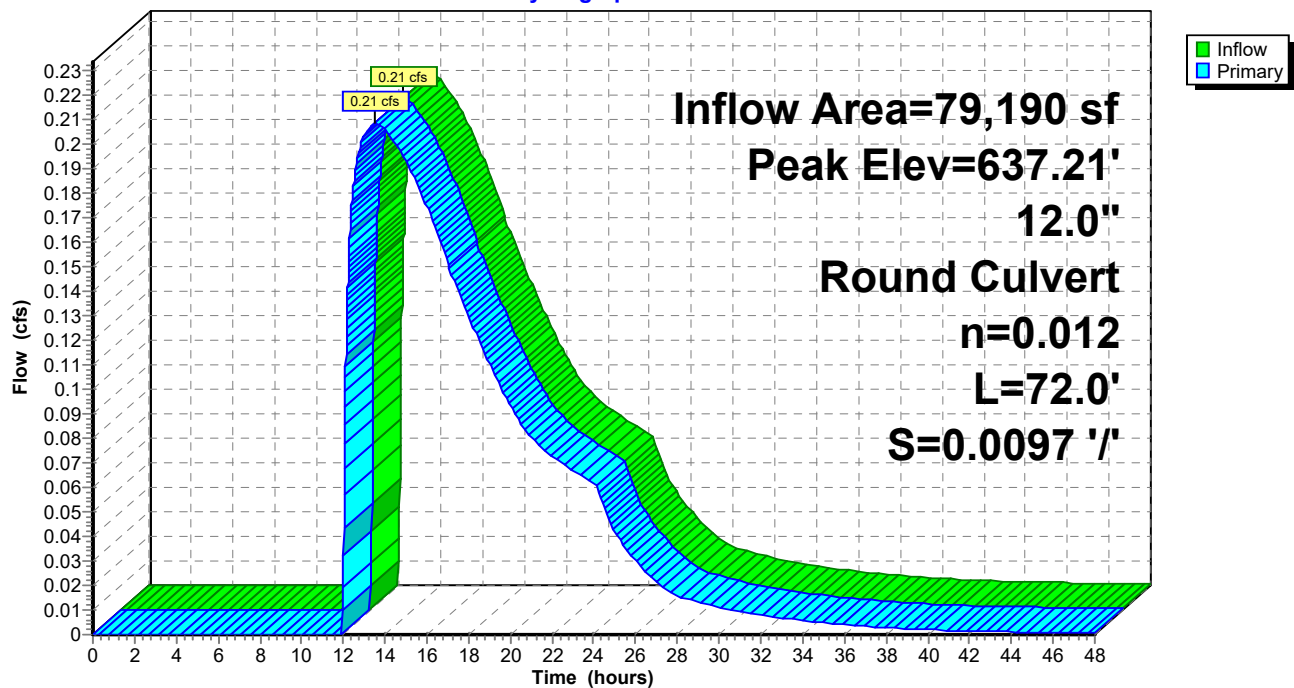
Device	Routing	Invert	Outlet Devices
#1	Primary	637.00'	<b>12.0" Round Culvert</b> L= 72.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 637.00' / 636.30' S= 0.0097 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.19 cfs @ 13.55 hrs HW=637.21' (Free Discharge)

↑1=Culvert (Inlet Controls 0.19 cfs @ 1.56 fps)

## Pond 65P: DMH 5

Hydrograph



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## Summary for Pond 66P: DMH 6

[79] Warning: Submerged Pond 17P Primary device # 1 INLET by 0.12'

Inflow Area = 8,800 sf, 62.61% Impervious, Inflow Depth = 2.20" for 2-yr event  
Inflow = 0.79 cfs @ 11.96 hrs, Volume= 1,612 cf  
Outflow = 0.79 cfs @ 11.96 hrs, Volume= 1,612 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.79 cfs @ 11.96 hrs, Volume= 1,612 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 647.62' @ 11.96 hrs

Flood Elev= 651.30'

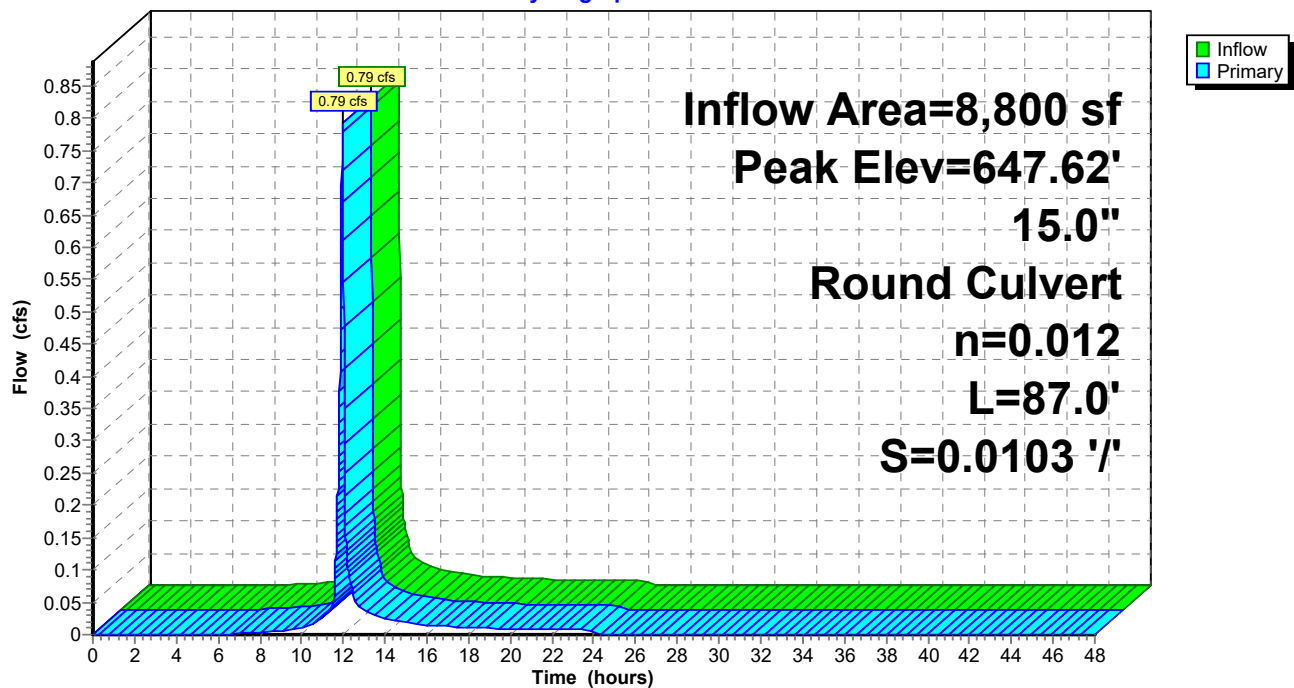
Device	Routing	Invert	Outlet Devices
#1	Primary	647.20'	<b>15.0" Round Culvert</b> L= 87.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 647.20' / 646.30' S= 0.0103 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=0.79 cfs @ 11.96 hrs HW=647.62' (Free Discharge)

↑1=Culvert (Inlet Controls 0.79 cfs @ 2.20 fps)

## Pond 66P: DMH 6

Hydrograph



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## Summary for Pond 67P: DMH 7

[79] Warning: Submerged Pond 66P Primary device # 1 OUTLET by 0.40'

Inflow Area = 12,130 sf, 66.28% Impervious, Inflow Depth = 2.26" for 2-yr event  
Inflow = 1.12 cfs @ 11.96 hrs, Volume= 2,288 cf  
Outflow = 1.12 cfs @ 11.96 hrs, Volume= 2,288 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.12 cfs @ 11.96 hrs, Volume= 2,288 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 646.70' @ 11.96 hrs

Flood Elev= 654.20'

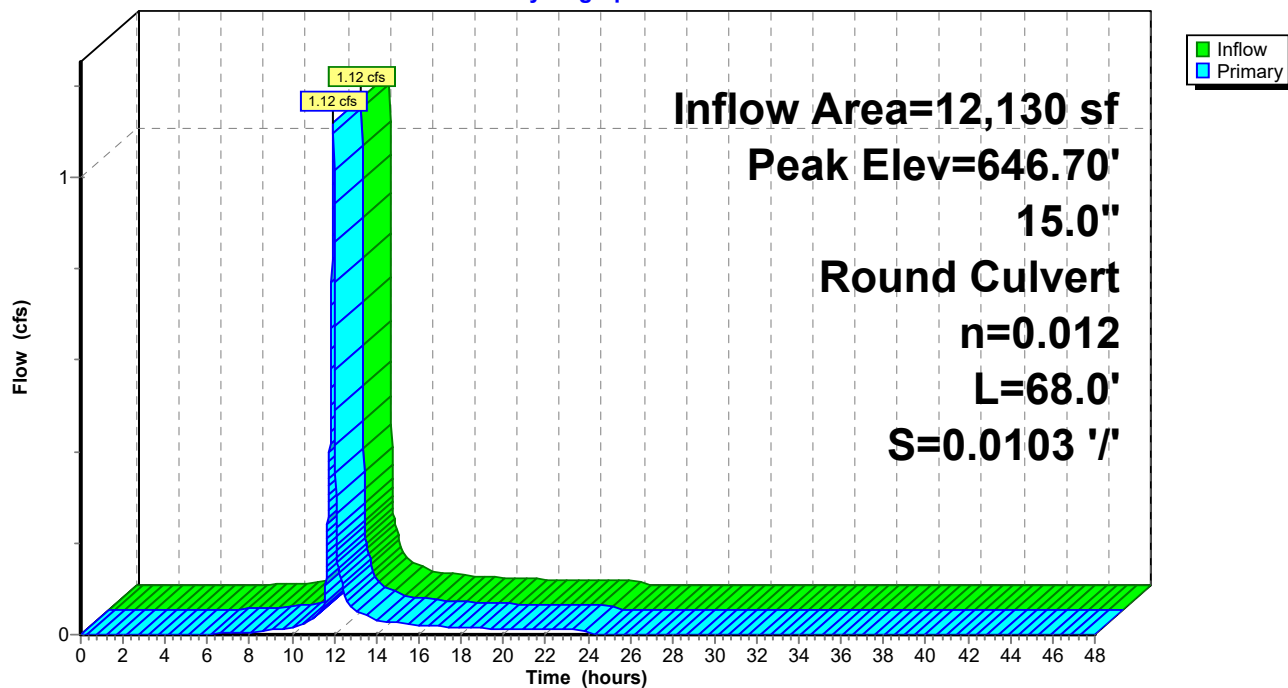
Device	Routing	Invert	Outlet Devices
#1	Primary	646.20'	<b>15.0" Round Culvert</b> L= 68.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 646.20' / 645.50' S= 0.0103 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=1.11 cfs @ 11.96 hrs HW=646.70' (Free Discharge)

↑1=Culvert (Inlet Controls 1.11 cfs @ 2.41 fps)

## Pond 67P: DMH 7

Hydrograph





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## Summary for Pond 68P: DMH 8

[79] Warning: Submerged Pond 67P Primary device # 1 OUTLET by 0.64'

Inflow Area = 23,930 sf, 58.34% Impervious, Inflow Depth = 2.09" for 2-yr event  
Inflow = 2.07 cfs @ 11.96 hrs, Volume= 4,170 cf  
Outflow = 2.07 cfs @ 11.96 hrs, Volume= 4,170 cf, Atten= 0%, Lag= 0.0 min  
Primary = 2.07 cfs @ 11.96 hrs, Volume= 4,170 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 646.14' @ 11.96 hrs

Flood Elev= 654.10'

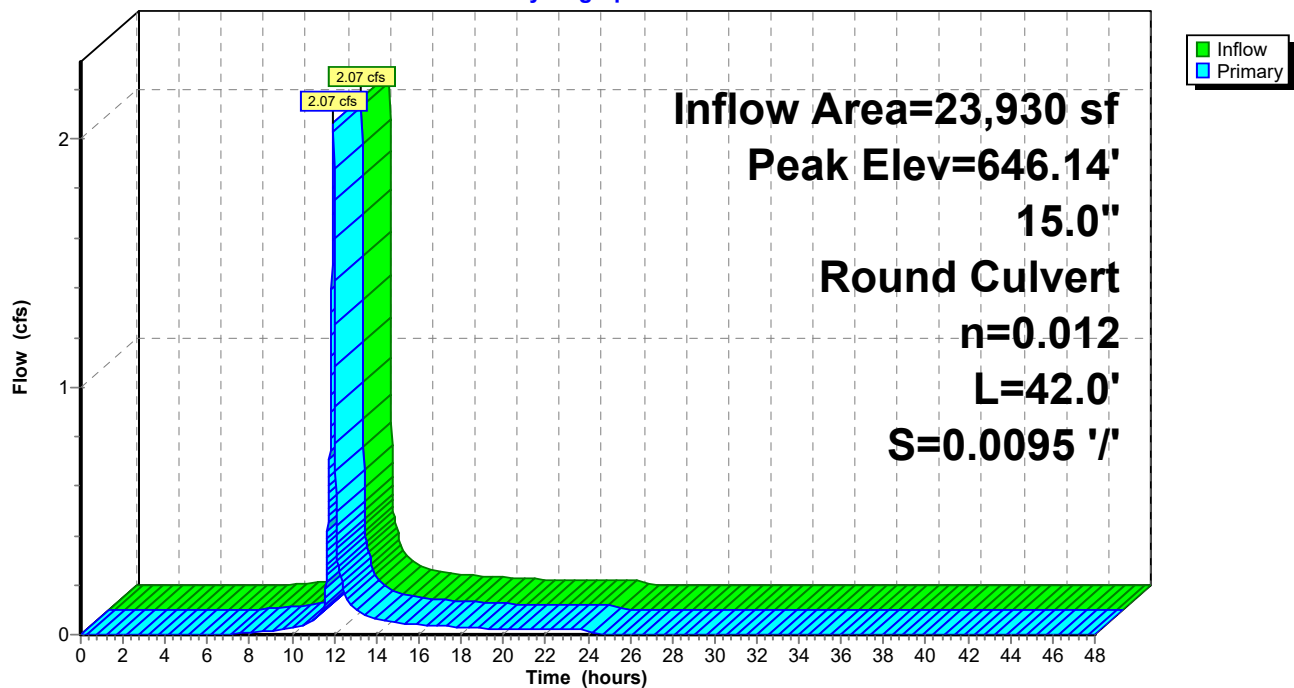
Device	Routing	Invert	Outlet Devices
#1	Primary	645.40'	<b>15.0" Round Culvert</b> L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 645.40' / 645.00' S= 0.0095 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=2.06 cfs @ 11.96 hrs HW=646.14' (Free Discharge)

↑1=Culvert (Barrel Controls 2.06 cfs @ 3.94 fps)

## Pond 68P: DMH 8

Hydrograph



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## Summary for Pond 69P: DMH 9

Inflow Area = 44,660 sf, 54.46% Impervious, Inflow Depth = 2.07" for 2-yr event  
Inflow = 3.69 cfs @ 11.96 hrs, Volume= 7,701 cf  
Outflow = 3.69 cfs @ 11.96 hrs, Volume= 7,701 cf, Atten= 0%, Lag= 0.0 min  
Primary = 3.69 cfs @ 11.96 hrs, Volume= 7,701 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 643.02' @ 11.96 hrs

Flood Elev= 654.20'

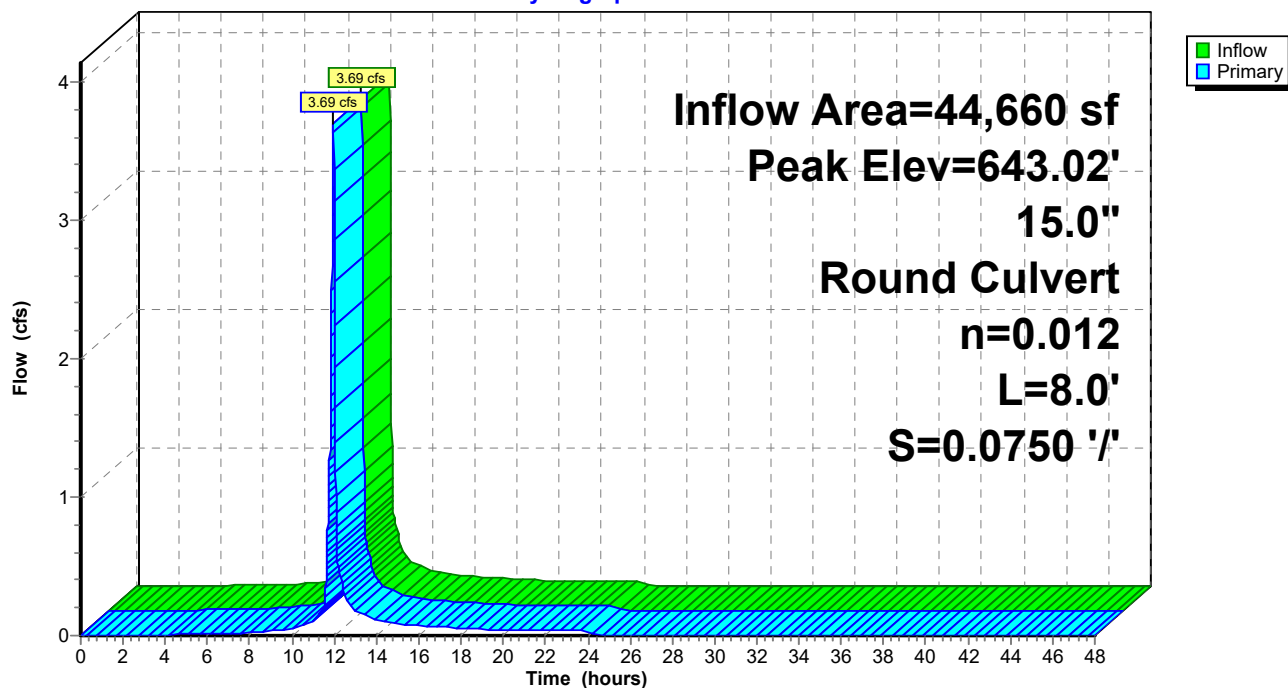
Device	Routing	Invert	Outlet Devices
#1	Primary	642.00'	<b>15.0" Round Culvert</b> L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 642.00' / 641.40' S= 0.0750 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=3.70 cfs @ 11.96 hrs HW=643.02' (Free Discharge)

↑1=Culvert (Inlet Controls 3.70 cfs @ 3.44 fps)

## Pond 69P: DMH 9

Hydrograph



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## Summary for Pond 70P: DMH 10

[79] Warning: Submerged Pond 71P Primary device # 1 OUTLET by 0.59'

Inflow Area = 20,730 sf, 49.98% Impervious, Inflow Depth = 2.04" for 2-yr event  
Inflow = 1.63 cfs @ 11.96 hrs, Volume= 3,532 cf  
Outflow = 1.63 cfs @ 11.96 hrs, Volume= 3,532 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.63 cfs @ 11.96 hrs, Volume= 3,532 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 648.89' @ 11.96 hrs

Flood Elev= 655.50'

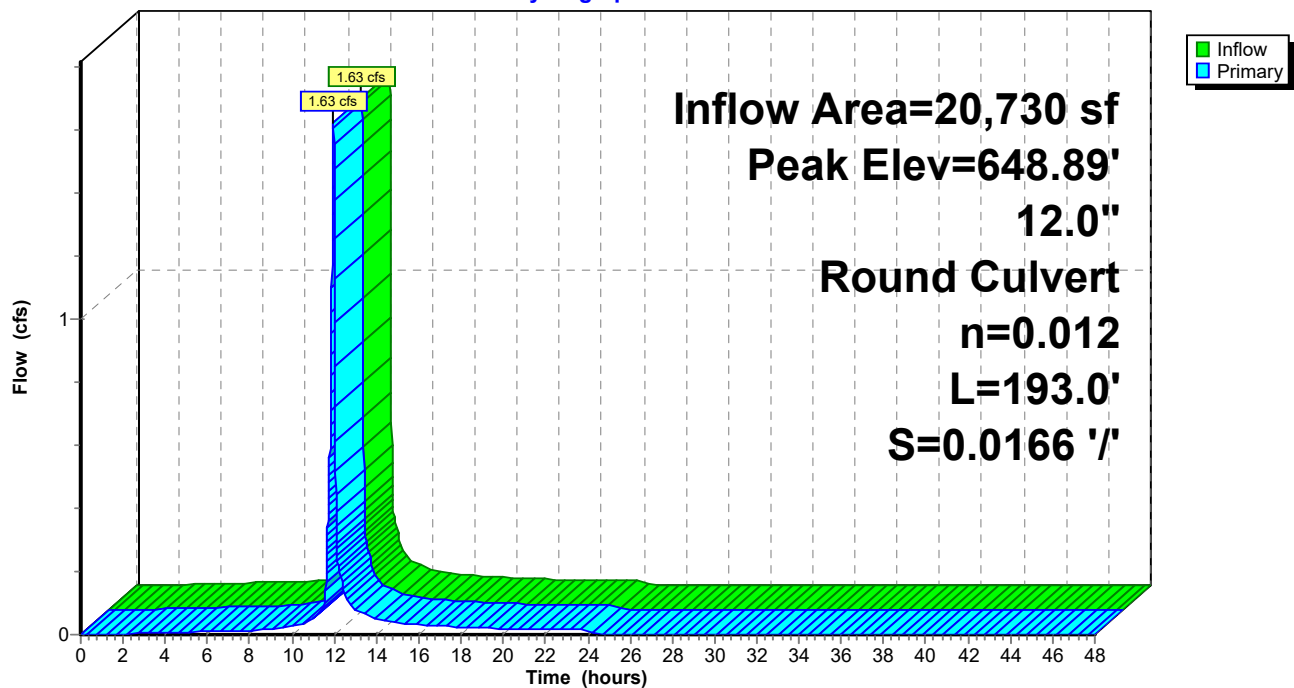
Device	Routing	Invert	Outlet Devices
#1	Primary	648.20'	<b>12.0" Round Culvert</b> L= 193.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 648.20' / 645.00' S= 0.0166 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.63 cfs @ 11.96 hrs HW=648.89' (Free Discharge)

↑1=Culvert (Inlet Controls 1.63 cfs @ 2.82 fps)

## Pond 70P: DMH 10

Hydrograph



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### Summary for Pond 71P: DMH 11

[79] Warning: Submerged Pond 83P Primary device # 1 OUTLET by 0.59'

Inflow Area = 20,730 sf, 49.98% Impervious, Inflow Depth = 2.04" for 2-yr event  
Inflow = 1.63 cfs @ 11.96 hrs, Volume= 3,532 cf  
Outflow = 1.63 cfs @ 11.96 hrs, Volume= 3,532 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.63 cfs @ 11.96 hrs, Volume= 3,532 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 650.84' @ 11.96 hrs

Flood Elev= 655.50'

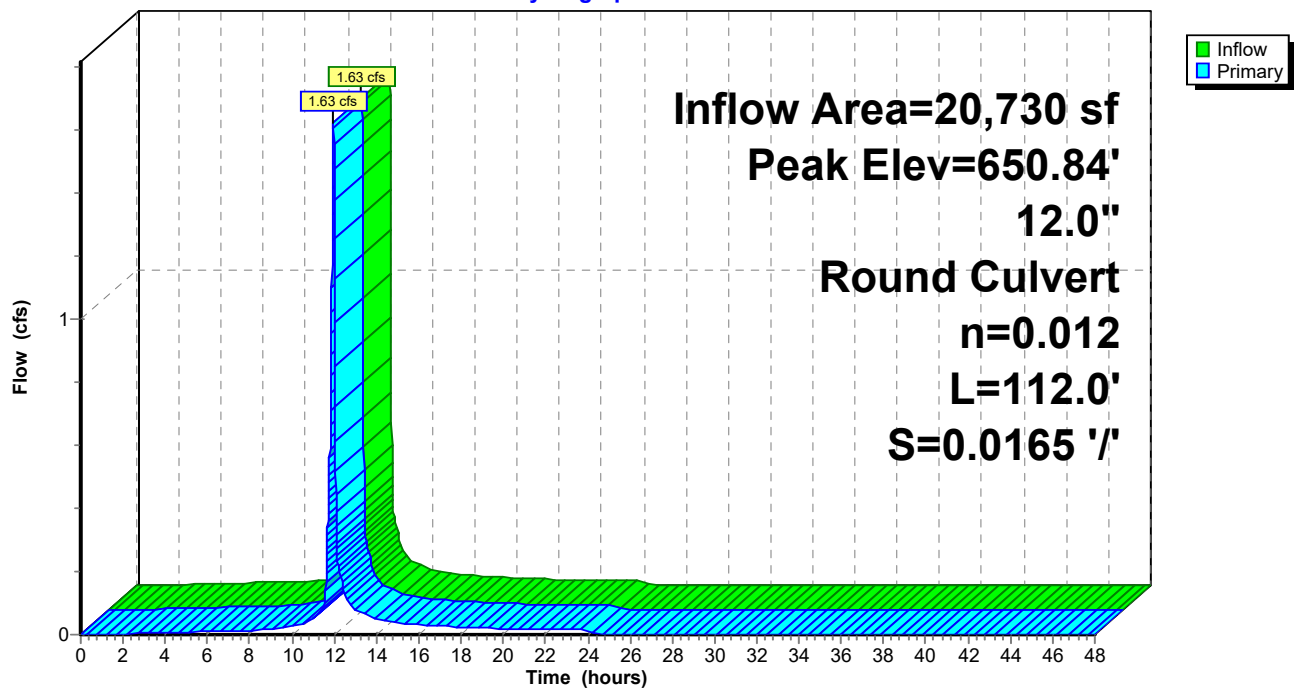
Device	Routing	Invert	Outlet Devices
#1	Primary	650.15'	<b>12.0" Round Culvert</b> L= 112.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.15' / 648.30' S= 0.0165 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.63 cfs @ 11.96 hrs HW=650.84' (Free Discharge)

↑1=Culvert (Inlet Controls 1.63 cfs @ 2.82 fps)

### Pond 71P: DMH 11

Hydrograph



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## Summary for Pond 81P: YD 1

Inflow Area = 4,470 sf, 100.00% Impervious, Inflow Depth = 3.06" for 2-yr event  
Inflow = 0.49 cfs @ 11.96 hrs, Volume= 1,139 cf  
Outflow = 0.49 cfs @ 11.96 hrs, Volume= 1,139 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.49 cfs @ 11.96 hrs, Volume= 1,139 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 653.35' @ 11.96 hrs

Flood Elev= 656.50'

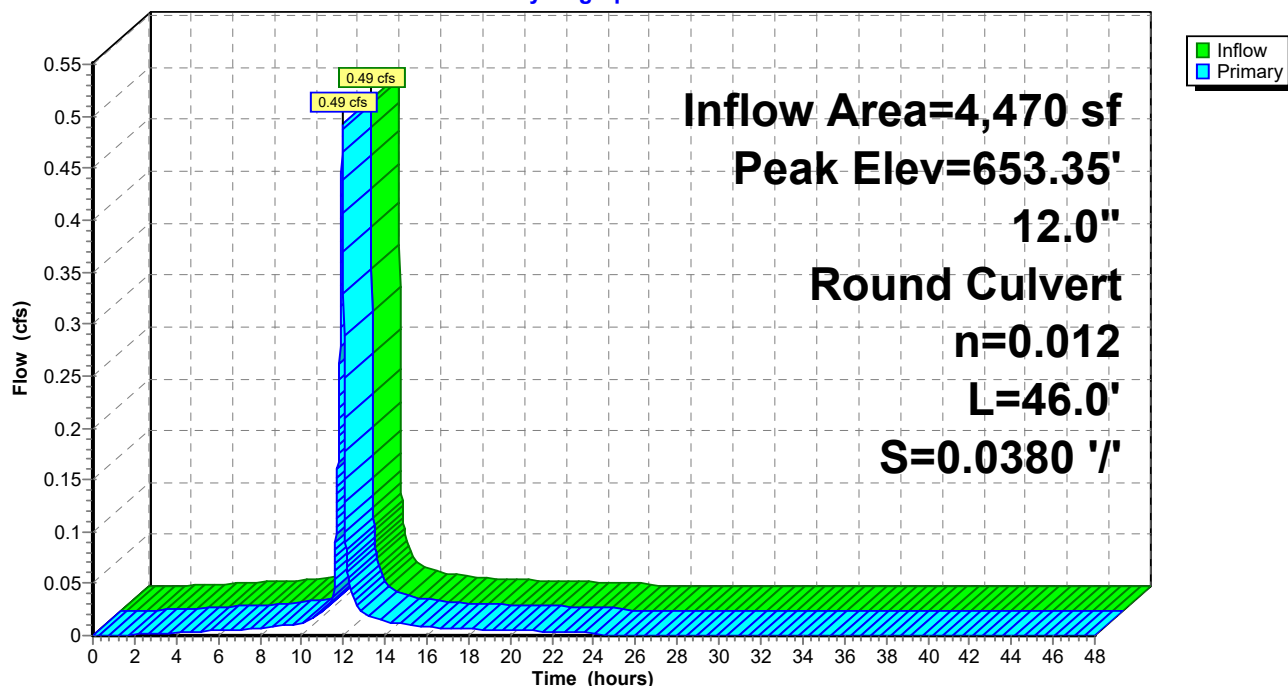
Device	Routing	Invert	Outlet Devices
#1	Primary	653.00'	<b>12.0" Round Culvert</b> L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 653.00' / 651.25' S= 0.0380 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.49 cfs @ 11.96 hrs HW=653.35' (Free Discharge)

↑1=Culvert (Inlet Controls 0.49 cfs @ 2.01 fps)

## Pond 81P: YD 1

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.29"

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## Summary for Pond 82P: YD 2

Inflow Area = 4,470 sf, 100.00% Impervious, Inflow Depth = 3.06" for 2-yr event  
Inflow = 0.49 cfs @ 11.96 hrs, Volume= 1,139 cf  
Outflow = 0.49 cfs @ 11.96 hrs, Volume= 1,139 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.49 cfs @ 11.96 hrs, Volume= 1,139 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 653.35' @ 11.96 hrs

Flood Elev= 656.50'

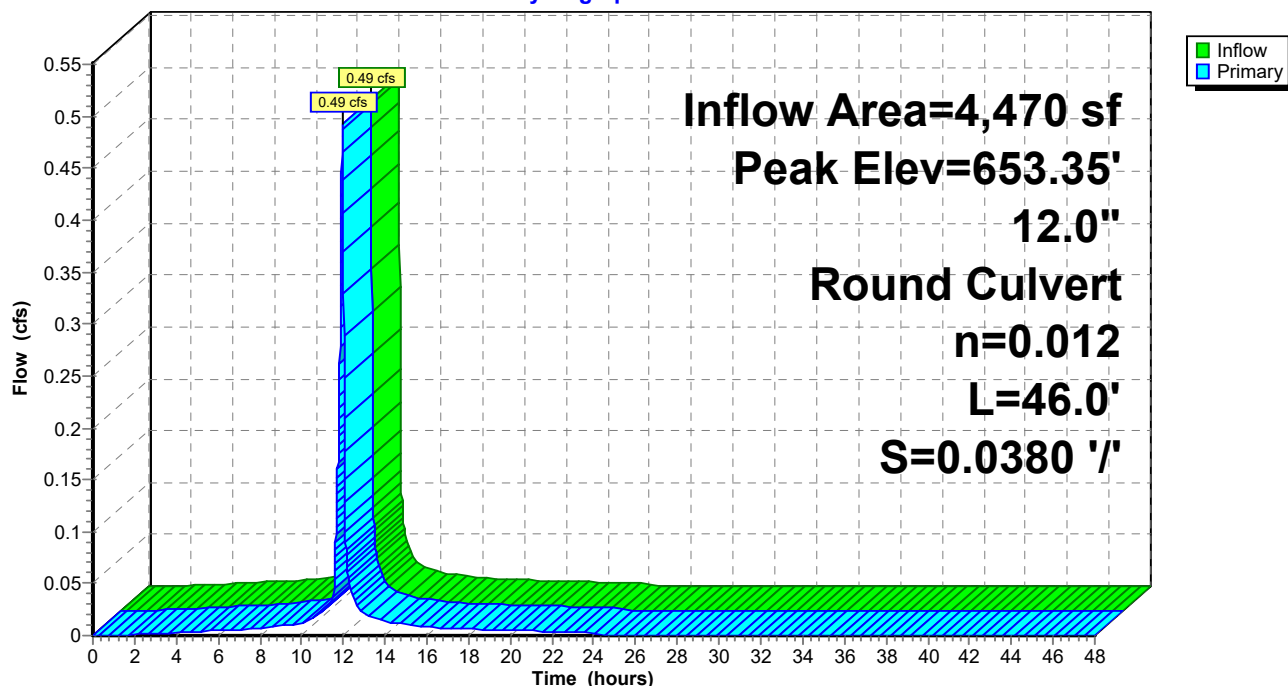
Device	Routing	Invert	Outlet Devices
#1	Primary	653.00'	<b>12.0" Round Culvert</b> L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 653.00' / 651.25' S= 0.0380 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.49 cfs @ 11.96 hrs HW=653.35' (Free Discharge)

↑1=Culvert (Inlet Controls 0.49 cfs @ 2.01 fps)

## Pond 82P: YD 2

Hydrograph



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## Summary for Pond 83P: YD 3

[79] Warning: Submerged Pond 81P Primary device # 1 OUTLET by 0.69'

[79] Warning: Submerged Pond 82P Primary device # 1 OUTLET by 0.69'

Inflow Area = 20,730 sf, 49.98% Impervious, Inflow Depth = 2.04" for 2-yr event  
Inflow = 1.63 cfs @ 11.96 hrs, Volume= 3,532 cf  
Outflow = 1.63 cfs @ 11.96 hrs, Volume= 3,532 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.63 cfs @ 11.96 hrs, Volume= 3,532 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 651.94' @ 11.96 hrs

Flood Elev= 654.75'

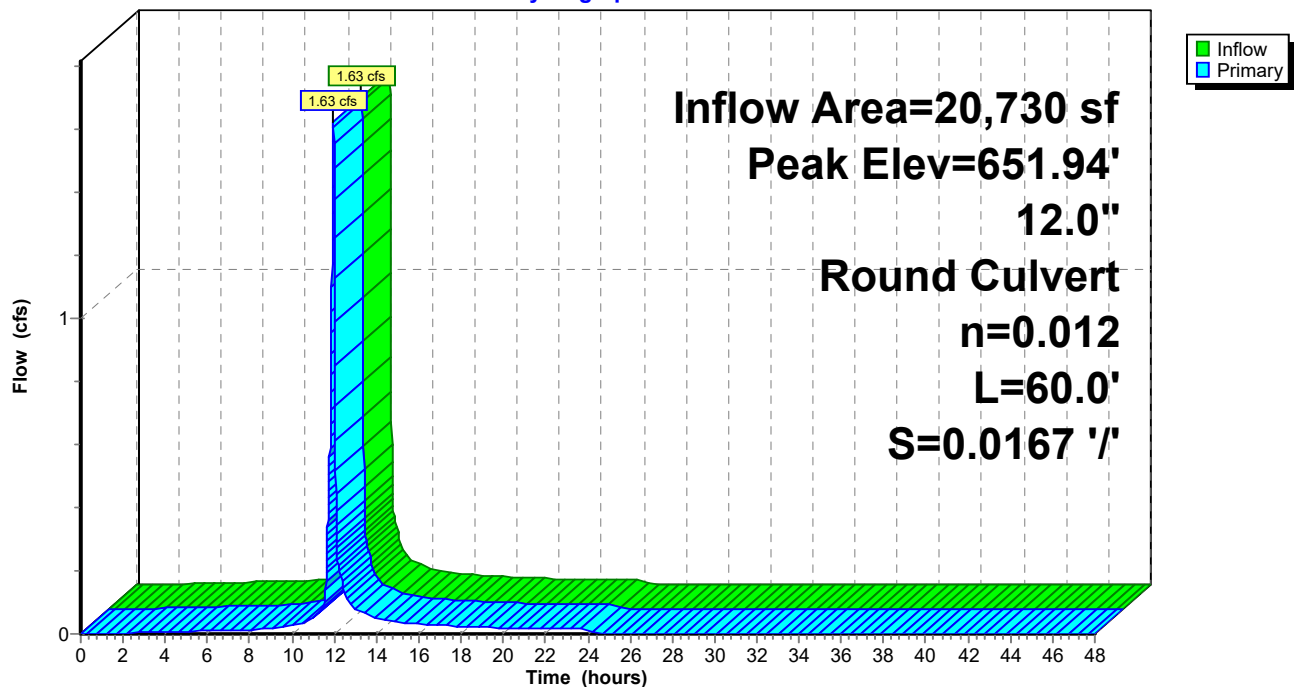
Device	Routing	Invert	Outlet Devices
#1	Primary	651.25'	<b>12.0" Round Culvert</b> L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 651.25' / 650.25' S= 0.0167 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.63 cfs @ 11.96 hrs HW=651.94' (Free Discharge)

↑1=Culvert (Inlet Controls 1.63 cfs @ 2.82 fps)

## Pond 83P: YD 3

Hydrograph



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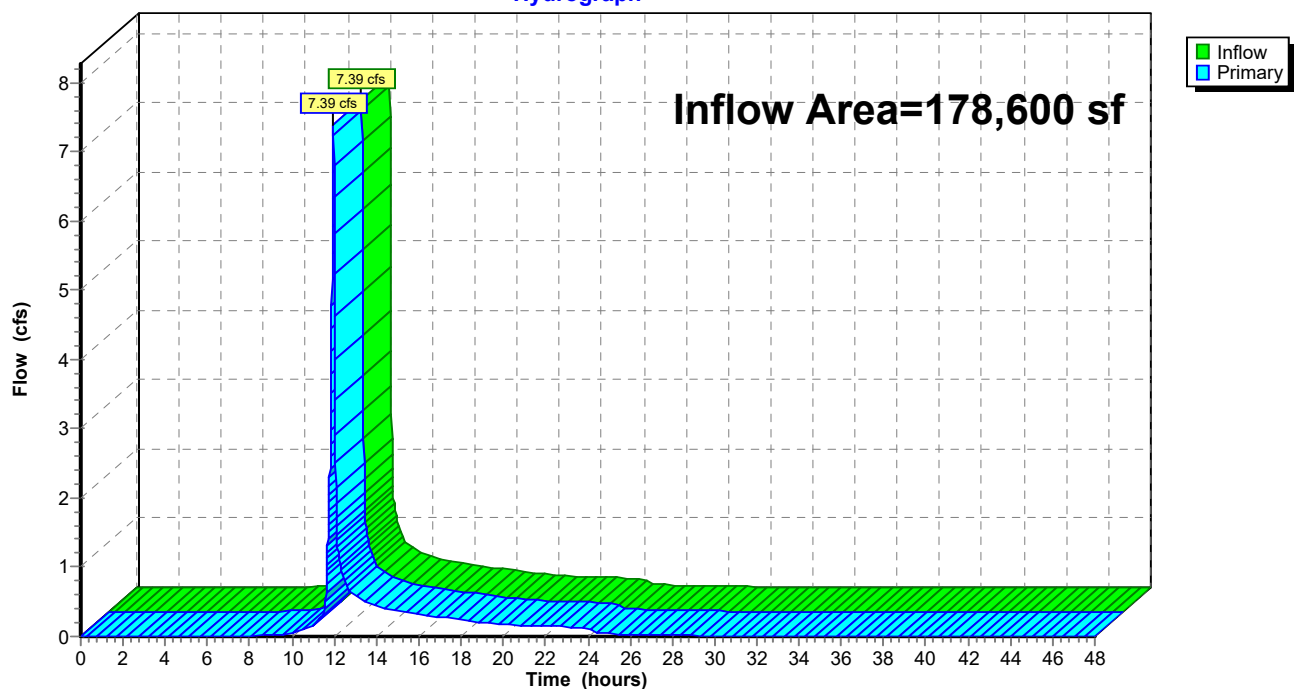
### Summary for Link 10L: Center Road

Inflow Area = 178,600 sf, 37.73% Impervious, Inflow Depth > 1.42" for 2-yr event  
Inflow = 7.39 cfs @ 11.96 hrs, Volume= 21,069 cf  
Primary = 7.39 cfs @ 11.96 hrs, Volume= 21,069 cf, Atten= 0%, Lag= 0.0 min

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

### Link 10L: Center Road

Hydrograph





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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

<b>Subcatchment10S: Proposed to Center</b>	Runoff Area=83,930 sf 43.63% Impervious Runoff Depth=3.34" Tc=5.0 min CN=84 Runoff=11.57 cfs 23,386 cf
<b>Subcatchment11S: Proposed to CB 1</b>	Runoff Area=7,750 sf 41.81% Impervious Runoff Depth=3.34" Tc=5.0 min CN=84 Runoff=1.07 cfs 2,159 cf
<b>Subcatchment12S: Proposed to CB 2</b>	Runoff Area=4,140 sf 22.46% Impervious Runoff Depth=2.87" Tc=5.0 min CN=79 Runoff=0.50 cfs 990 cf
<b>Subcatchment13S: Proposed to CB 3</b>	Runoff Area=930 sf 100.00% Impervious Runoff Depth=4.84" Tc=5.0 min CN=98 Runoff=0.16 cfs 375 cf
<b>Subcatchment14S: Proposed to CB 4</b>	Runoff Area=2,000 sf 34.50% Impervious Runoff Depth=3.15" Tc=5.0 min CN=82 Runoff=0.26 cfs 525 cf
<b>Subcatchment15S: Proposed to CB 5</b>	Runoff Area=660 sf 100.00% Impervious Runoff Depth=4.84" Tc=5.0 min CN=98 Runoff=0.11 cfs 266 cf
<b>Subcatchment16S: Proposed to CB 6</b>	Runoff Area=5,850 sf 56.41% Impervious Runoff Depth=3.74" Tc=5.0 min CN=88 Runoff=0.88 cfs 1,826 cf
<b>Subcatchment17S: Proposed to CB 7</b>	Runoff Area=2,950 sf 74.92% Impervious Runoff Depth=4.17" Tc=5.0 min CN=92 Runoff=0.48 cfs 1,024 cf
<b>Subcatchment18S: Proposed to CB 8</b>	Runoff Area=3,330 sf 75.98% Impervious Runoff Depth=4.17" Tc=5.0 min CN=92 Runoff=0.54 cfs 1,156 cf
<b>Subcatchment19S: Proposed to CB 9</b>	Runoff Area=11,800 sf 50.17% Impervious Runoff Depth=3.54" Tc=5.0 min CN=86 Runoff=1.70 cfs 3,483 cf
<b>Subcatchment20S: Proposed to Northern</b>	Runoff Area=56,570 sf 79.49% Impervious Runoff Depth=4.28" Tc=5.0 min CN=93 Runoff=9.24 cfs 20,160 cf
<b>Subcatchment30S: Proposed to West</b>	Runoff Area=230,400 sf 0.36% Impervious Runoff Depth=2.18" Flow Length=530' Tc=20.1 min CN=71 Runoff=12.63 cfs 41,801 cf
<b>Subcatchment40S: Proposed to South</b>	Runoff Area=19,030 sf 0.00% Impervious Runoff Depth=2.26" Flow Length=255' Tc=16.0 min CN=72 Runoff=1.23 cfs 3,583 cf
<b>Subcatchment50S: Proposed to WQB</b>	Runoff Area=34,530 sf 0.00% Impervious Runoff Depth=2.43" Tc=5.0 min CN=74 Runoff=3.58 cfs 6,987 cf
<b>Subcatchment81S: Proposed to YD 1</b>	Runoff Area=4,470 sf 100.00% Impervious Runoff Depth=4.84" Tc=5.0 min CN=98 Runoff=0.77 cfs 1,804 cf
<b>Subcatchment82S: Proposed to YD 2</b>	Runoff Area=4,470 sf 100.00% Impervious Runoff Depth=4.84" Tc=5.0 min CN=98 Runoff=0.77 cfs 1,804 cf

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<b>Subcatchment83S: Proposed to YD 3</b>	Runoff Area=11,790 sf 12.04% Impervious Runoff Depth=2.69" Tc=5.0 min CN=77 Runoff=1.34 cfs 2,643 cf
<b>Pond 11P: CB 1</b>	Peak Elev=636.99' Inflow=1.07 cfs 2,159 cf 12.0" Round Culvert n=0.012 L=3.0' S=0.0333 '/' Outflow=1.07 cfs 2,159 cf
<b>Pond 12P: CB 2</b>	Peak Elev=639.35' Inflow=0.50 cfs 990 cf 12.0" Round Culvert n=0.012 L=15.0' S=0.0200 '/' Outflow=0.50 cfs 990 cf
<b>Pond 13P: CB 3</b>	Peak Elev=639.29' Inflow=0.16 cfs 375 cf 12.0" Round Culvert n=0.012 L=3.0' S=0.0333 '/' Outflow=0.16 cfs 375 cf
<b>Pond 14P: CB 4</b>	Peak Elev=643.75' Inflow=0.26 cfs 525 cf 12.0" Round Culvert n=0.012 L=15.0' S=0.0200 '/' Outflow=0.26 cfs 525 cf
<b>Pond 15P: CB 5</b>	Peak Elev=643.66' Inflow=0.11 cfs 266 cf 12.0" Round Culvert n=0.012 L=3.0' S=0.0333 '/' Outflow=0.11 cfs 266 cf
<b>Pond 16P: CB 6</b>	Peak Elev=650.53' Inflow=0.88 cfs 1,826 cf 12.0" Round Culvert n=0.012 L=15.0' S=0.0100 '/' Outflow=0.88 cfs 1,826 cf
<b>Pond 17P: CB 7</b>	Peak Elev=647.84' Inflow=0.48 cfs 1,024 cf 12.0" Round Culvert n=0.012 L=9.0' S=0.0222 '/' Outflow=0.48 cfs 1,024 cf
<b>Pond 18P: CB 8</b>	Peak Elev=650.67' Inflow=0.54 cfs 1,156 cf 12.0" Round Culvert n=0.012 L=6.0' S=0.0250 '/' Outflow=0.54 cfs 1,156 cf
<b>Pond 19P: CB 9</b>	Peak Elev=650.86' Inflow=1.70 cfs 3,483 cf 12.0" Round Culvert n=0.012 L=6.0' S=0.0250 '/' Outflow=1.70 cfs 3,483 cf
<b>Pond 40P: HDS Unit</b>	Peak Elev=643.22' Inflow=6.47 cfs 13,740 cf 15.0" Round Culvert n=0.012 L=46.0' S=0.0739 '/' Outflow=6.47 cfs 13,740 cf
<b>Pond 50P: WQB</b>	Peak Elev=640.31' Storage=12,412 cf Inflow=10.04 cfs 20,728 cf Outflow=0.45 cfs 16,342 cf
<b>Pond 61P: DMH 1</b>	Peak Elev=634.25' Inflow=2.41 cfs 20,658 cf 12.0" Round Culvert n=0.012 L=70.0' S=0.0679 '/' Outflow=2.41 cfs 20,658 cf
<b>Pond 62P: DMH 2</b>	Peak Elev=635.35' Inflow=2.41 cfs 20,658 cf 12.0" Round Culvert n=0.012 L=100.0' S=0.0100 '/' Outflow=2.41 cfs 20,658 cf
<b>Pond 63P: DMH 3</b>	Peak Elev=635.96' Inflow=1.34 cfs 18,499 cf 12.0" Round Culvert n=0.012 L=77.0' S=0.0104 '/' Outflow=1.34 cfs 18,499 cf
<b>Pond 64P: DMH 4</b>	Peak Elev=636.62' Inflow=0.69 cfs 17,133 cf 12.0" Round Culvert n=0.012 L=75.0' S=0.0100 '/' Outflow=0.69 cfs 17,133 cf
<b>Pond 65P: DMH 5</b>	Peak Elev=637.33' Inflow=0.45 cfs 16,342 cf 12.0" Round Culvert n=0.012 L=72.0' S=0.0097 '/' Outflow=0.45 cfs 16,342 cf

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**Pond 66P: DMH 6**

Peak Elev=647.76' Inflow=1.35 cfs 2,850 cf  
15.0" Round Culvert n=0.012 L=87.0' S=0.0103 '/' Outflow=1.35 cfs 2,850 cf

**Pond 67P: DMH 7**

Peak Elev=646.87' Inflow=1.89 cfs 4,007 cf  
15.0" Round Culvert n=0.012 L=68.0' S=0.0103 '/' Outflow=1.89 cfs 4,007 cf

**Pond 68P: DMH 8**

Peak Elev=646.45' Inflow=3.59 cfs 7,489 cf  
15.0" Round Culvert n=0.012 L=42.0' S=0.0095 '/' Outflow=3.59 cfs 7,489 cf

**Pond 69P: DMH 9**

Peak Elev=643.82' Inflow=6.47 cfs 13,740 cf  
15.0" Round Culvert n=0.012 L=8.0' S=0.0750 '/' Outflow=6.47 cfs 13,740 cf

**Pond 70P: DMH 10**

Peak Elev=649.28' Inflow=2.87 cfs 6,251 cf  
12.0" Round Culvert n=0.012 L=193.0' S=0.0166 '/' Outflow=2.87 cfs 6,251 cf

**Pond 71P: DMH 11**

Peak Elev=651.23' Inflow=2.87 cfs 6,251 cf  
12.0" Round Culvert n=0.012 L=112.0' S=0.0165 '/' Outflow=2.87 cfs 6,251 cf

**Pond 81P: YD 1**

Peak Elev=653.44' Inflow=0.77 cfs 1,804 cf  
12.0" Round Culvert n=0.012 L=46.0' S=0.0380 '/' Outflow=0.77 cfs 1,804 cf

**Pond 82P: YD 2**

Peak Elev=653.44' Inflow=0.77 cfs 1,804 cf  
12.0" Round Culvert n=0.012 L=46.0' S=0.0380 '/' Outflow=0.77 cfs 1,804 cf

**Pond 83P: YD 3**

Peak Elev=652.33' Inflow=2.87 cfs 6,251 cf  
12.0" Round Culvert n=0.012 L=60.0' S=0.0167 '/' Outflow=2.87 cfs 6,251 cf

**Link 10L: Center Road**

Inflow=13.97 cfs 44,045 cf  
Primary=13.97 cfs 44,045 cf

**Total Runoff Area = 484,600 sf Runoff Volume = 113,975 cf Average Runoff Depth = 2.82"**  
**76.64% Pervious = 371,420 sf 23.36% Impervious = 113,180 sf**

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**Summary for Subcatchment 10S: Proposed to Center Road**

Runoff = 11.57 cfs @ 11.96 hrs, Volume= 23,386 cf, Depth= 3.34"

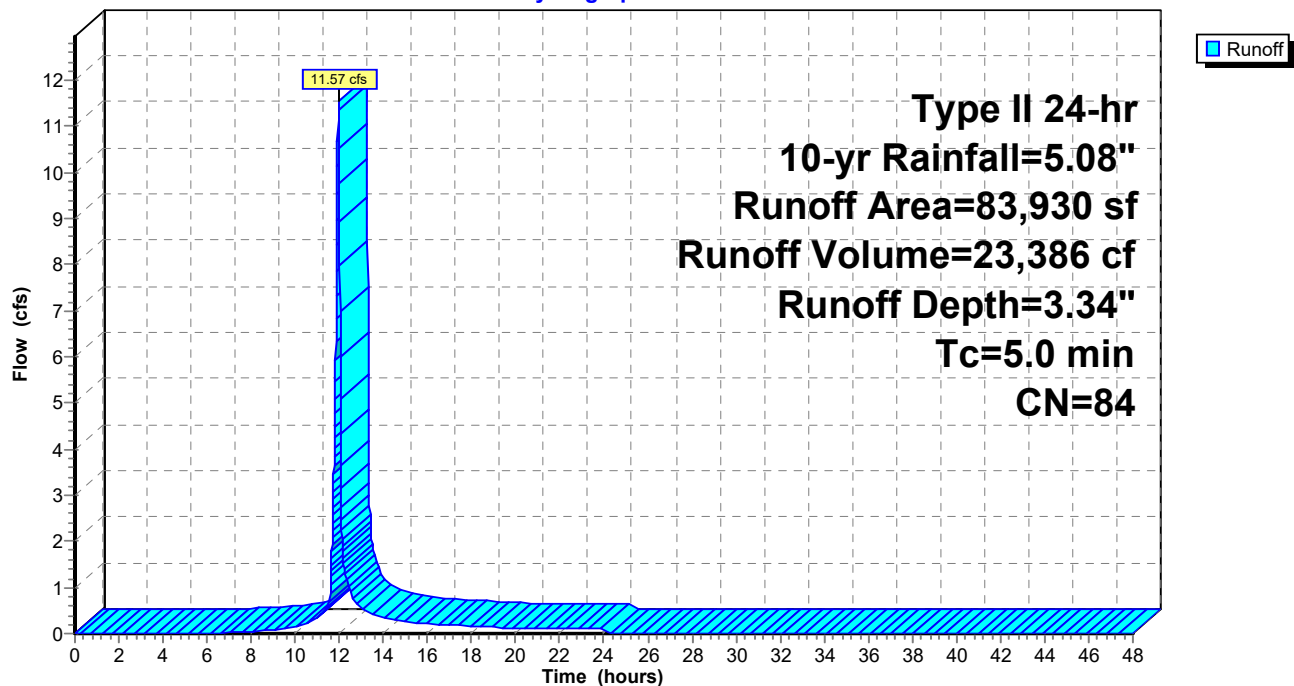
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	36,620	98	Paved
	38,010	74	>75% Grass cover, Good, HSG C
	9,300	70	Woods, Good, HSG C
	83,930	84	Weighted Average
	47,310		56.37% Pervious Area
	36,620		43.63% Impervious Area

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

**Subcatchment 10S: Proposed to Center Road**

Hydrograph



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**Summary for Subcatchment 11S: Proposed to CB 1**

Runoff = 1.07 cfs @ 11.96 hrs, Volume= 2,159 cf, Depth= 3.34"

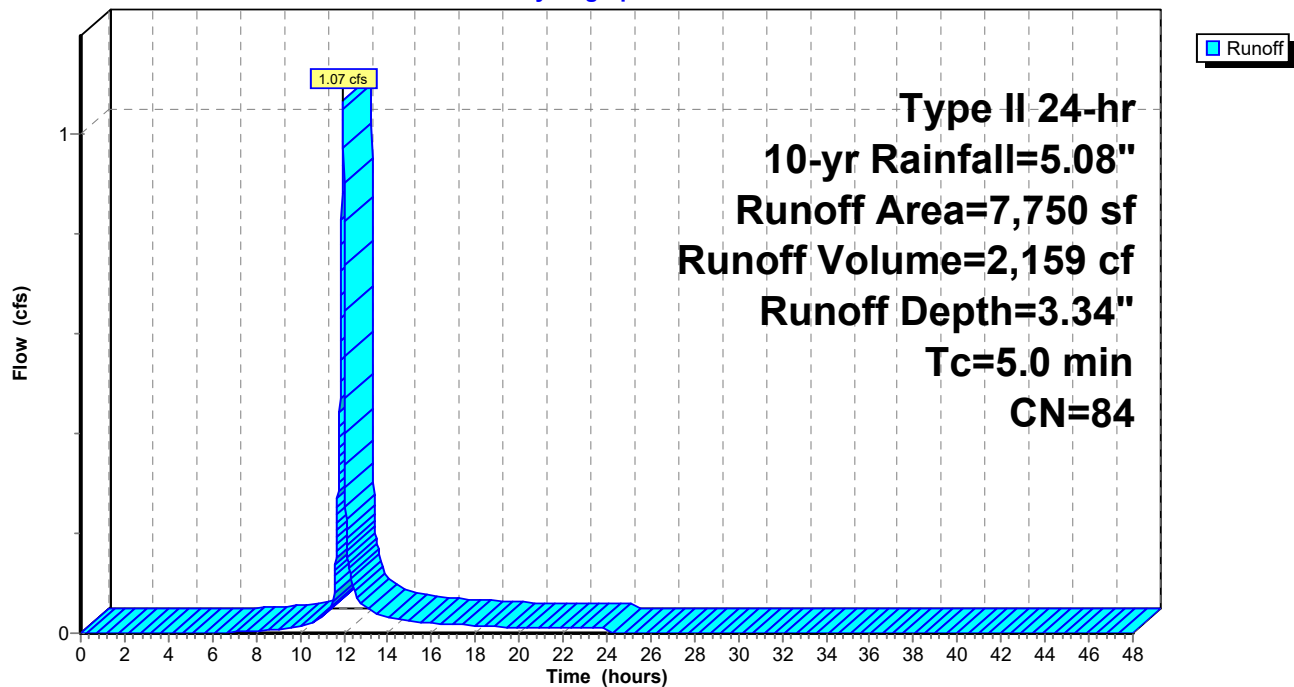
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	3,240	98	Paved
	4,510	74	>75% Grass cover, Good, HSG C
	7,750	84	Weighted Average
	4,510		58.19% Pervious Area
	3,240		41.81% Impervious Area

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

**Subcatchment 11S: Proposed to CB 1**

Hydrograph



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**Summary for Subcatchment 12S: Proposed to CB 2**

Runoff = 0.50 cfs @ 11.96 hrs, Volume= 990 cf, Depth= 2.87"

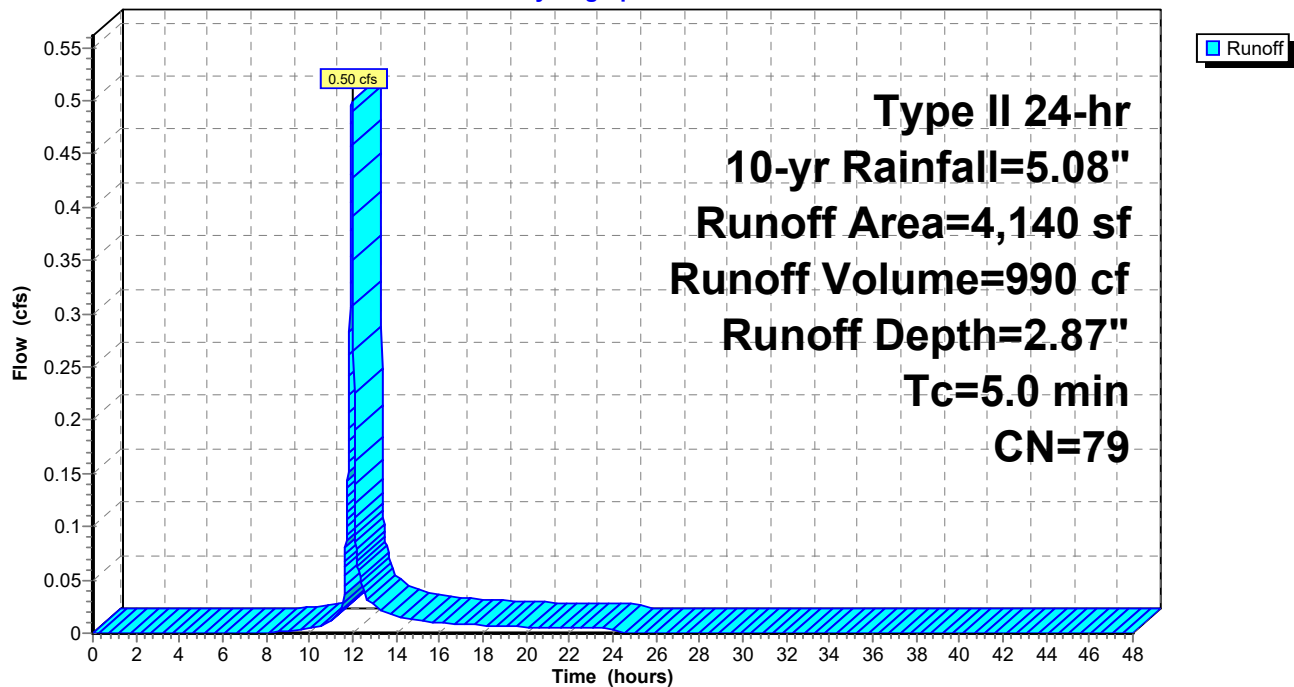
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	930	98	Paved
	3,210	74	>75% Grass cover, Good, HSG C
	4,140	79	Weighted Average
	3,210		77.54% Pervious Area
	930		22.46% Impervious Area

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

**Subcatchment 12S: Proposed to CB 2**

Hydrograph



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**Summary for Subcatchment 13S: Proposed to CB 3**

Runoff = 0.16 cfs @ 11.96 hrs, Volume= 375 cf, Depth= 4.84"

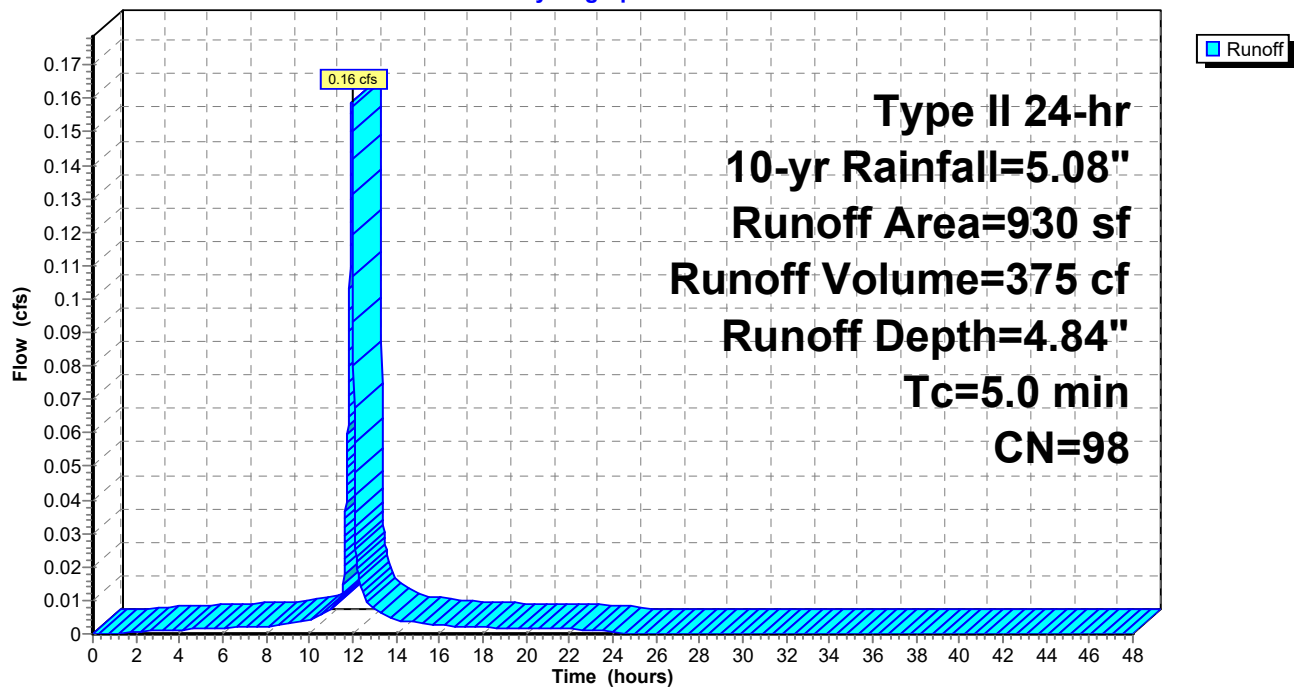
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	930	98	Paved
	930		100.00% Impervious Area

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

**Subcatchment 13S: Proposed to CB 3**

Hydrograph



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**Summary for Subcatchment 14S: Proposed to CB 4**

Runoff = 0.26 cfs @ 11.96 hrs, Volume= 525 cf, Depth= 3.15"

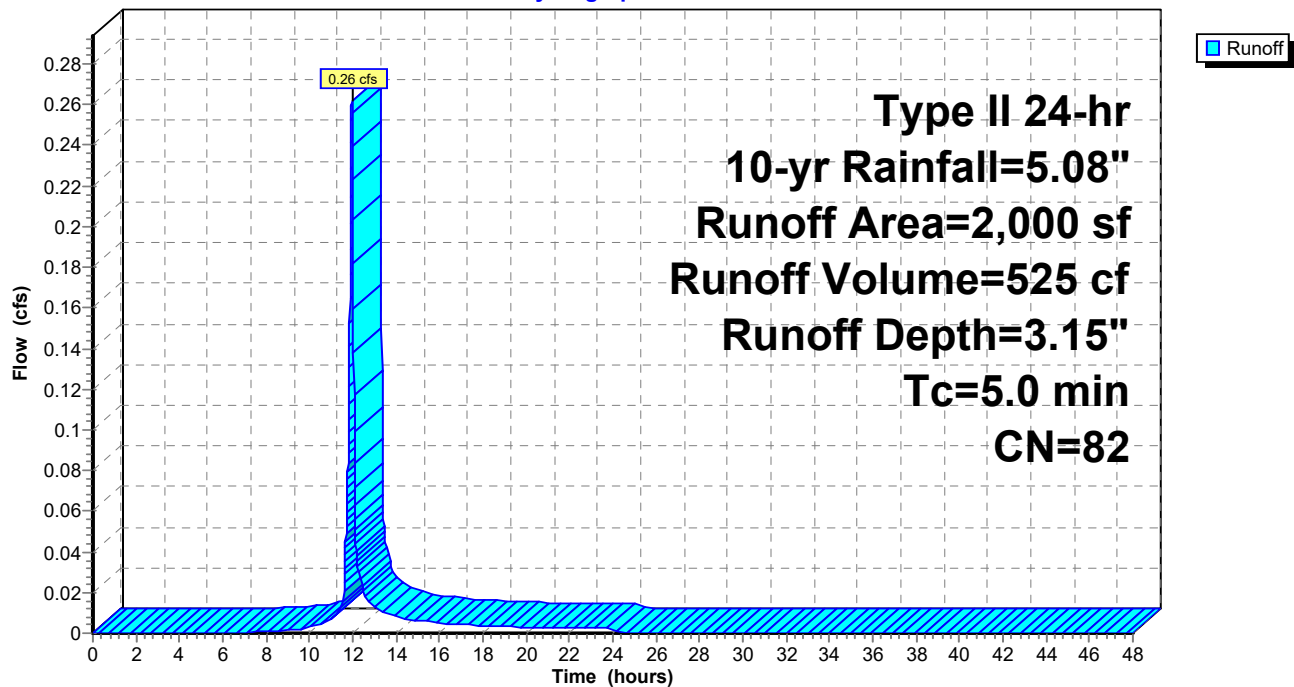
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	690	98	Paved
	1,310	74	>75% Grass cover, Good, HSG C
	2,000	82	Weighted Average
	1,310		65.50% Pervious Area
	690		34.50% Impervious Area

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

**Subcatchment 14S: Proposed to CB 4**

Hydrograph





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**Summary for Subcatchment 15S: Proposed to CB 5**

Runoff = 0.11 cfs @ 11.96 hrs, Volume= 266 cf, Depth= 4.84"

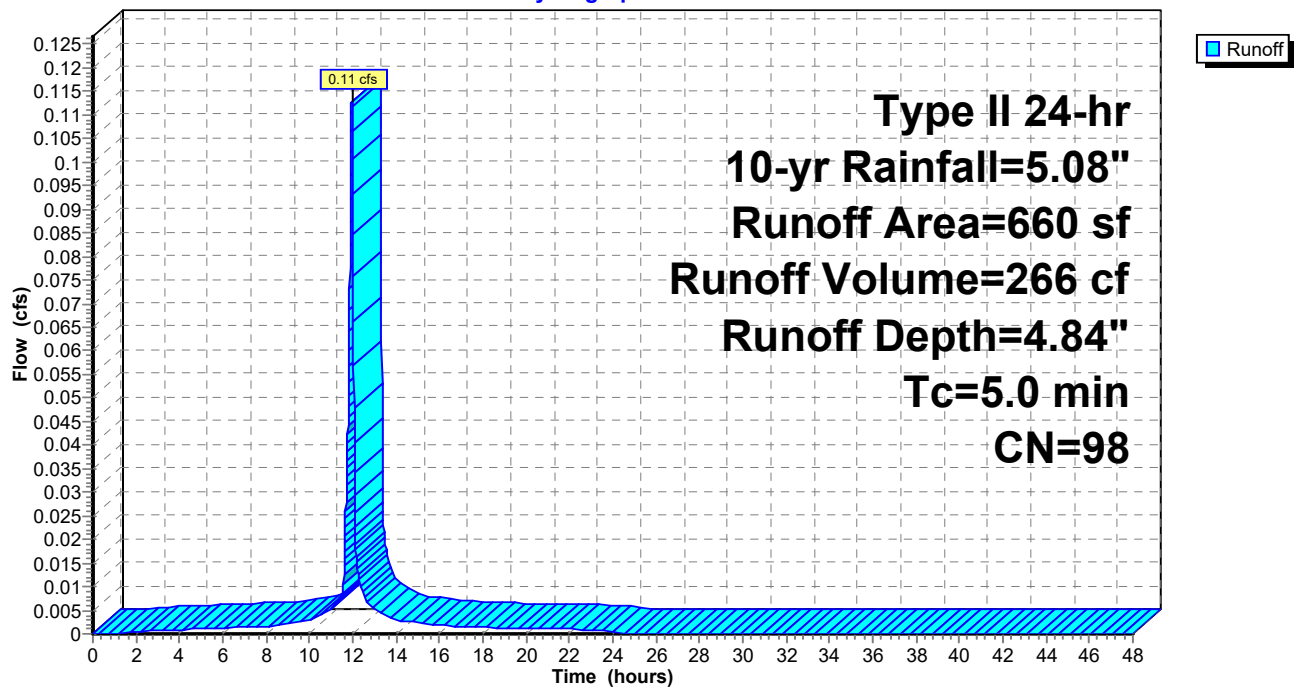
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	660	98	Paved
	660		100.00% Impervious Area

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

**Subcatchment 15S: Proposed to CB 5**

Hydrograph



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**Summary for Subcatchment 16S: Proposed to CB 6**

Runoff = 0.88 cfs @ 11.96 hrs, Volume= 1,826 cf, Depth= 3.74"

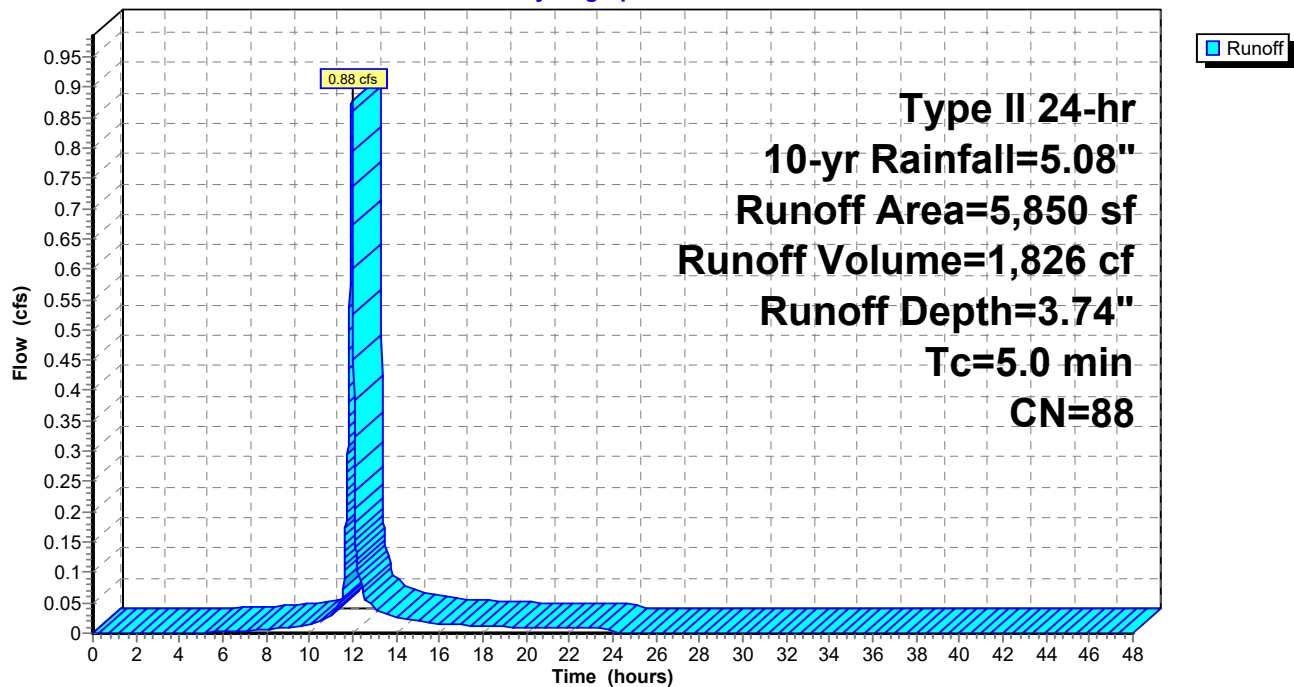
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	3,300	98	Paved
	2,550	74	>75% Grass cover, Good, HSG C
	5,850	88	Weighted Average
	2,550		43.59% Pervious Area
	3,300		56.41% Impervious Area

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

**Subcatchment 16S: Proposed to CB 6**

Hydrograph



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**Summary for Subcatchment 17S: Proposed to CB 7**

Runoff = 0.48 cfs @ 11.96 hrs, Volume= 1,024 cf, Depth= 4.17"

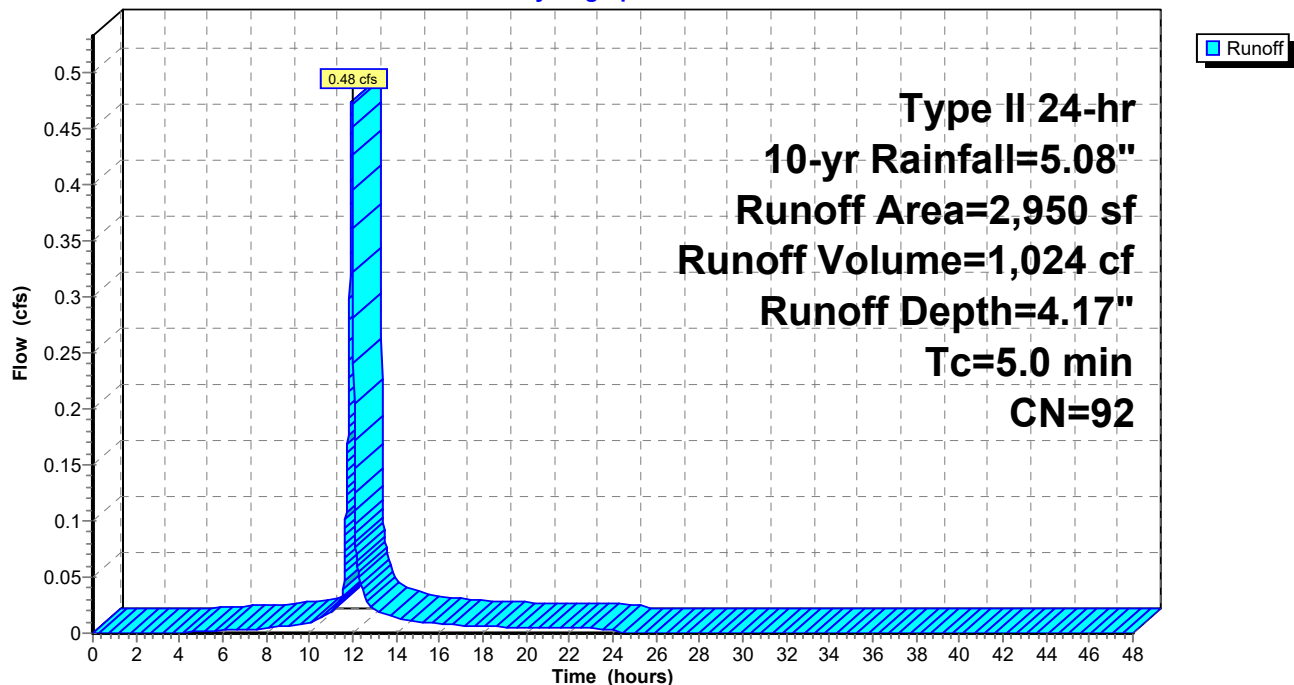
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	2,210	98	Paved
	740	74	>75% Grass cover, Good, HSG C
	2,950	92	Weighted Average
	740		25.08% Pervious Area
	2,210		74.92% Impervious Area

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

**Subcatchment 17S: Proposed to CB 7**

Hydrograph



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Type II 24-hr 10-yr Rainfall=5.08"

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**Summary for Subcatchment 18S: Proposed to CB 8**

Runoff = 0.54 cfs @ 11.96 hrs, Volume= 1,156 cf, Depth= 4.17"

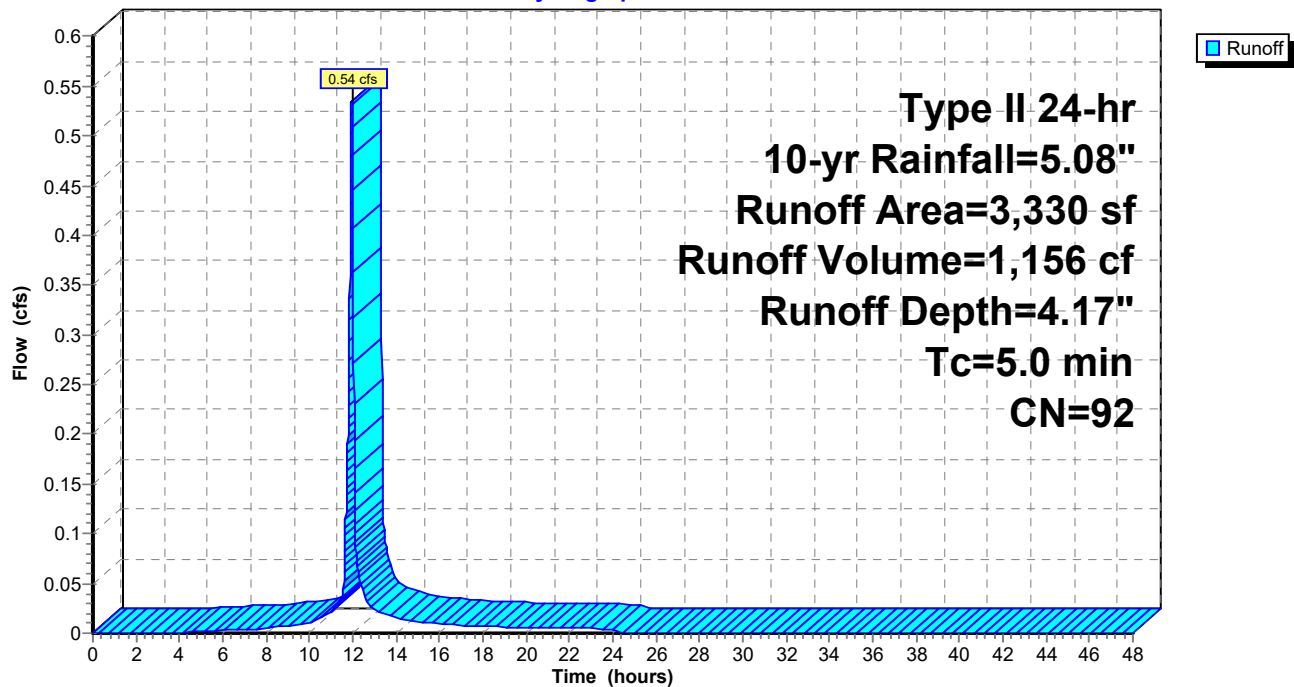
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	2,530	98	Paved
	800	74	>75% Grass cover, Good, HSG C
	3,330	92	Weighted Average
	800		24.02% Pervious Area
	2,530		75.98% Impervious Area

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

**Subcatchment 18S: Proposed to CB 8**

Hydrograph



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Type II 24-hr 10-yr Rainfall=5.08"

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**Summary for Subcatchment 19S: Proposed to CB 9**

Runoff = 1.70 cfs @ 11.96 hrs, Volume= 3,483 cf, Depth= 3.54"

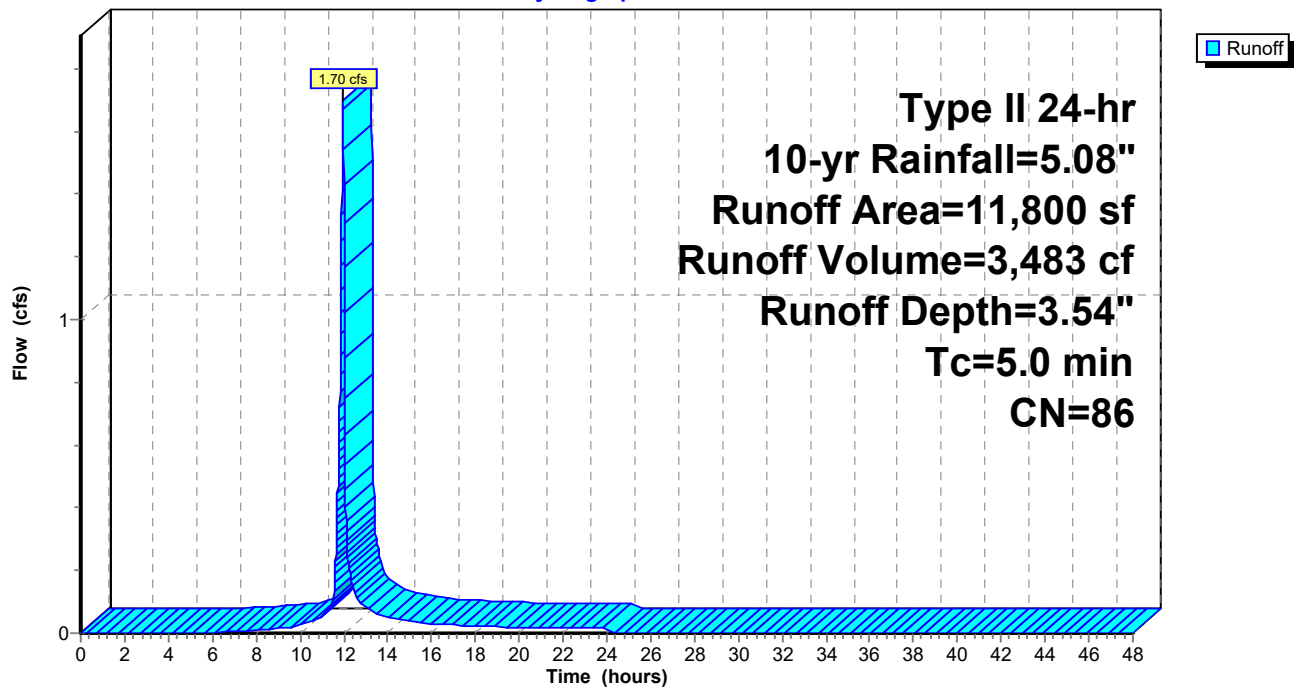
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	5,920	98	Paved
	5,880	74	>75% Grass cover, Good, HSG C
	11,800	86	Weighted Average
	5,880		49.83% Pervious Area
	5,920		50.17% Impervious Area

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

**Subcatchment 19S: Proposed to CB 9**

Hydrograph



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Type II 24-hr 10-yr Rainfall=5.08"

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**Summary for Subcatchment 20S: Proposed to Northern Detention Basin**

Runoff = 9.24 cfs @ 11.96 hrs, Volume= 20,160 cf, Depth= 4.28"

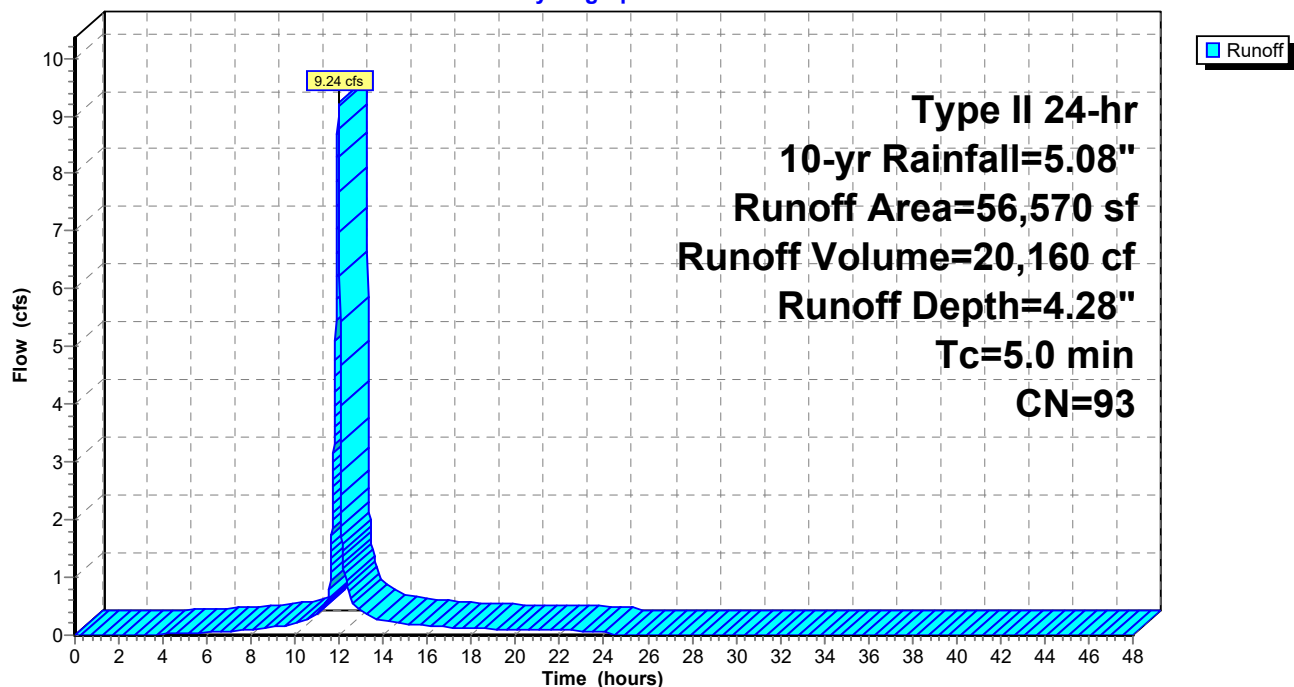
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	44,970	98	Paved
	11,600	74	>75% Grass cover, Good, HSG C
	56,570	93	Weighted Average
	11,600		20.51% Pervious Area
	44,970		79.49% Impervious Area

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

**Subcatchment 20S: Proposed to Northern Detention Basin**

Hydrograph



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Type II 24-hr 10-yr Rainfall=5.08"

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**Summary for Subcatchment 30S: Proposed to West**

Runoff = 12.63 cfs @ 12.13 hrs, Volume= 41,801 cf, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

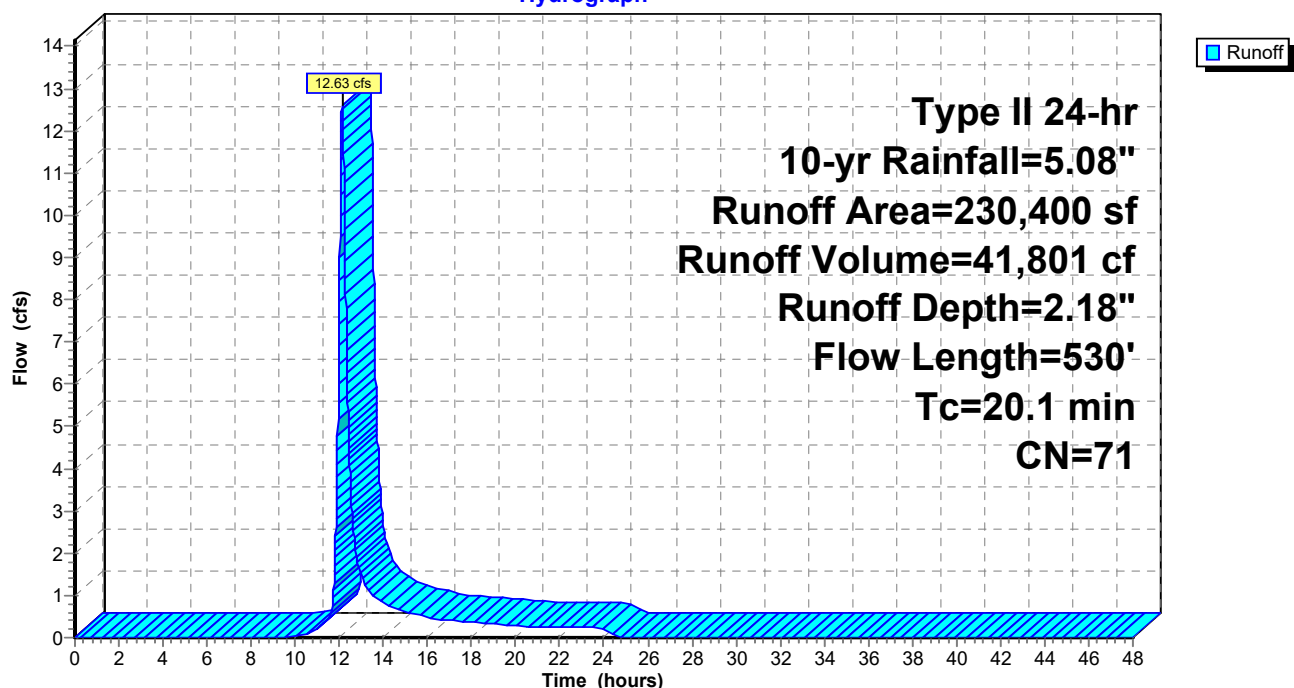
	Area (sf)	CN	Description
*	820	98	Paved
	71,890	74	>75% Grass cover, Good, HSG C
	157,690	70	Woods, Good, HSG C
	230,400	71	Weighted Average
	229,580		99.64% Pervious Area
	820		0.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
5.6	165	0.0050	0.49		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
2.1	290	0.1070	2.29		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
20.1	530	Total			

**Subcatchment 30S: Proposed to West**

Hydrograph



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Type II 24-hr 10-yr Rainfall=5.08"

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**Summary for Subcatchment 40S: Proposed to South**

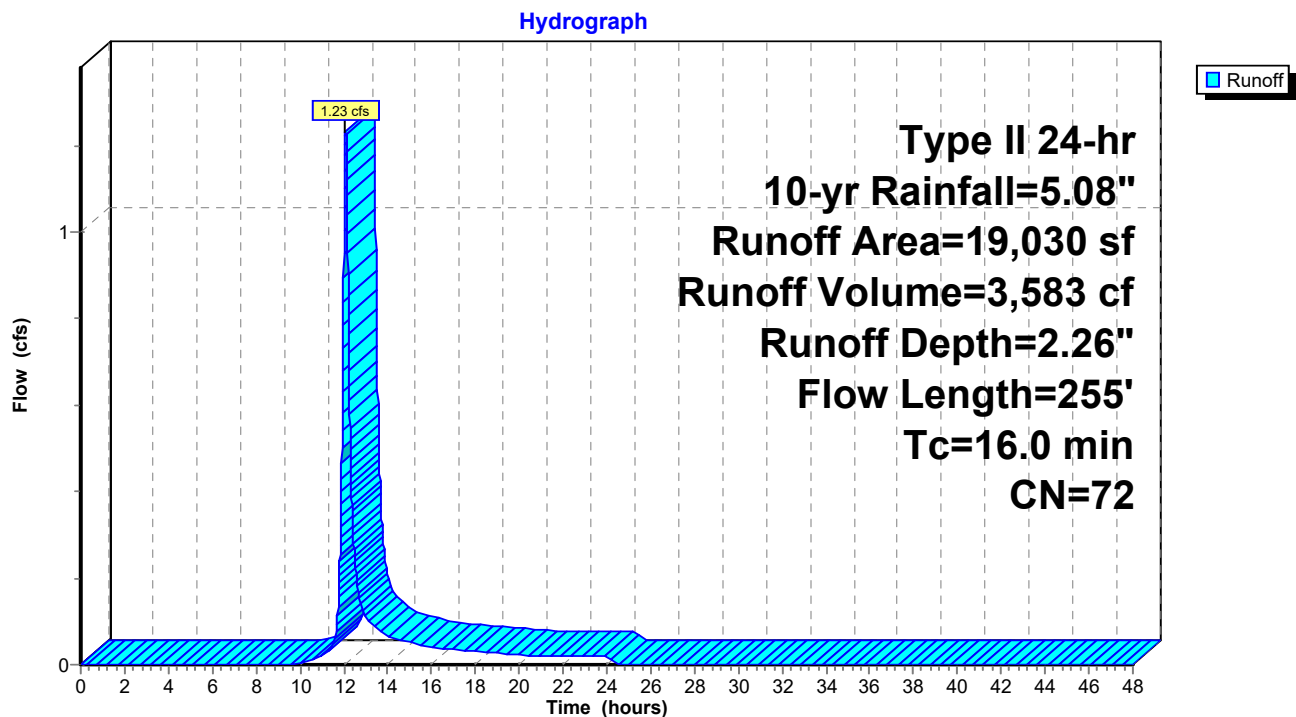
Runoff = 1.23 cfs @ 12.09 hrs, Volume= 3,583 cf, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

Area (sf)	CN	Description
10,460	74	>75% Grass cover, Good, HSG C
8,570	70	Woods, Good, HSG C
19,030	72	Weighted Average
19,030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
2.4	100	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.2	80	0.0250	1.11		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
16.0	255	Total			

**Subcatchment 40S: Proposed to South**



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Type II 24-hr 10-yr Rainfall=5.08"

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**Summary for Subcatchment 50S: Proposed to WQB**

Runoff = 3.58 cfs @ 11.96 hrs, Volume= 6,987 cf, Depth= 2.43"

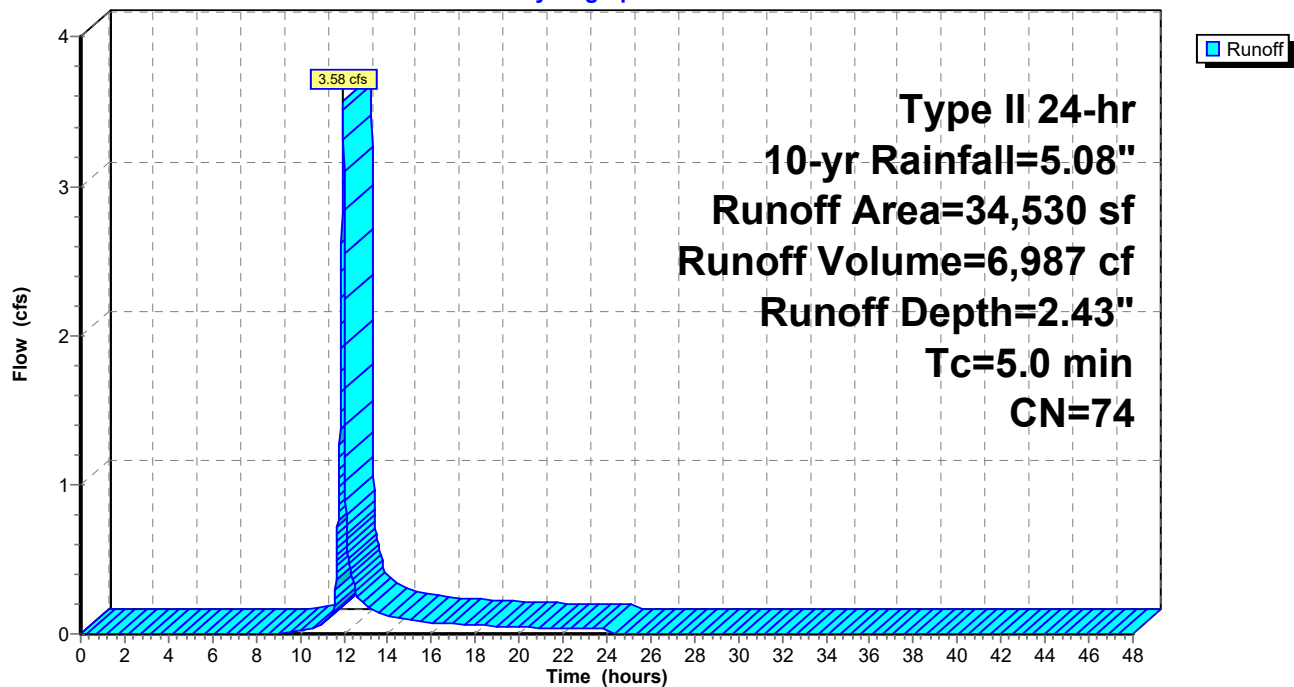
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

Area (sf)	CN	Description
34,530	74	>75% Grass cover, Good, HSG C
34,530		100.00% Pervious Area

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

**Subcatchment 50S: Proposed to WQB**

Hydrograph



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Type II 24-hr 10-yr Rainfall=5.08"

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**Summary for Subcatchment 81S: Proposed to YD 1**

Runoff = 0.77 cfs @ 11.96 hrs, Volume= 1,804 cf, Depth= 4.84"

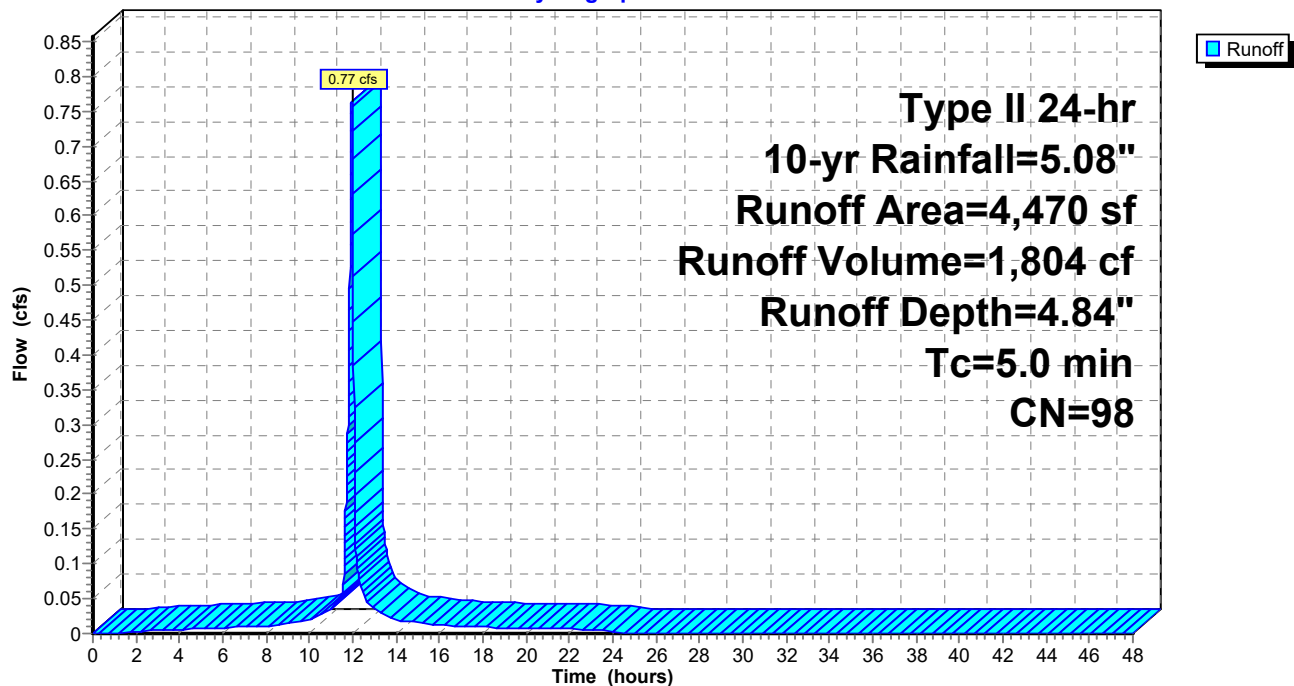
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	3,200	98	Roof
*	1,270	98	Paved
	4,470	98	Weighted Average
	4,470		100.00% Impervious Area

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

**Subcatchment 81S: Proposed to YD 1**

Hydrograph



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Type II 24-hr 10-yr Rainfall=5.08"

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**Summary for Subcatchment 82S: Proposed to YD 2**

Runoff = 0.77 cfs @ 11.96 hrs, Volume= 1,804 cf, Depth= 4.84"

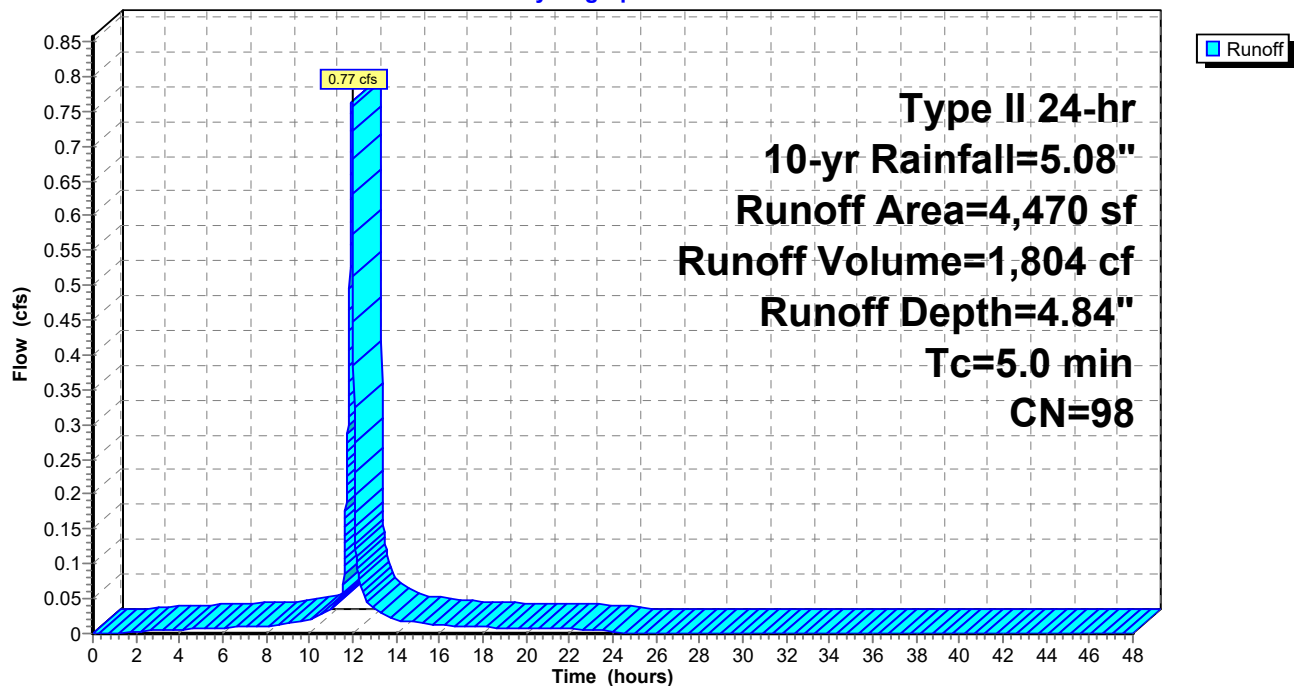
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	3,200	98	Roof
*	1,270	98	Paved
	4,470	98	Weighted Average
	4,470		100.00% Impervious Area

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

**Subcatchment 82S: Proposed to YD 2**

Hydrograph



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Type II 24-hr 10-yr Rainfall=5.08"

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**Summary for Subcatchment 83S: Proposed to YD 3**

Runoff = 1.34 cfs @ 11.96 hrs, Volume= 2,643 cf, Depth= 2.69"

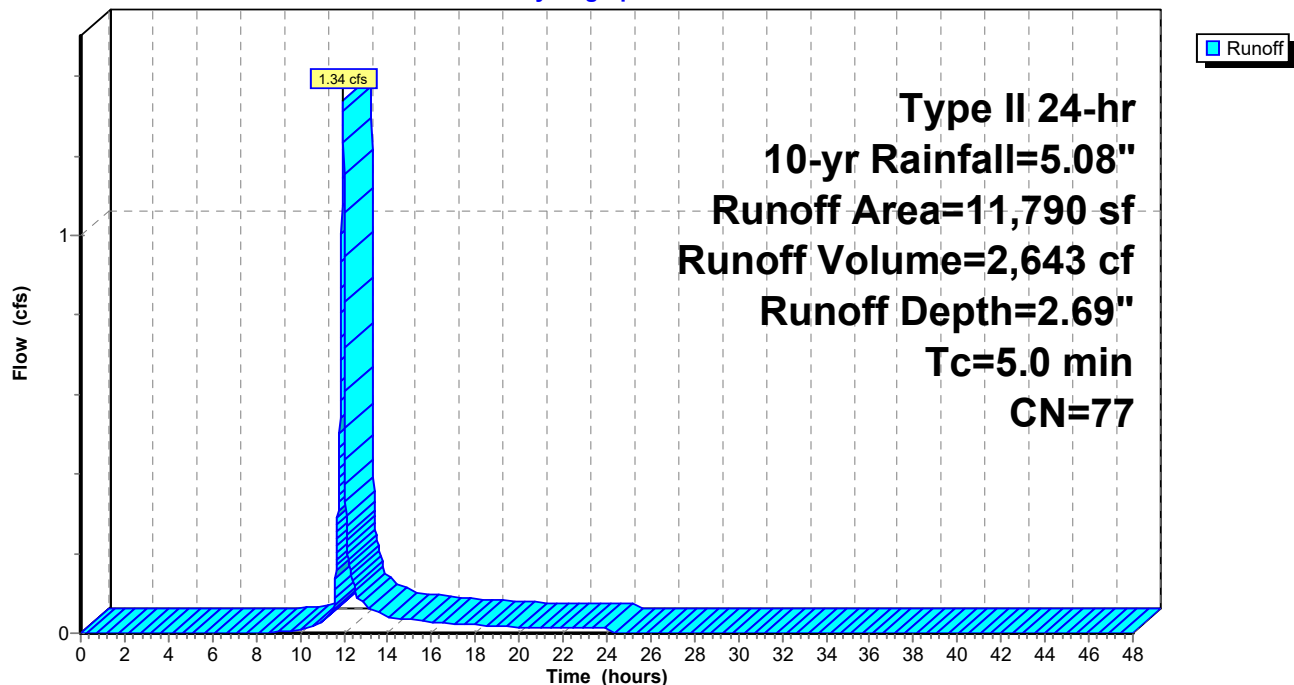
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-yr Rainfall=5.08"

	Area (sf)	CN	Description
*	1,420	98	Paved
	10,370	74	>75% Grass cover, Good, HSG C
	11,790	77	Weighted Average
	10,370		87.96% Pervious Area
	1,420		12.04% Impervious Area

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

**Subcatchment 83S: Proposed to YD 3**

Hydrograph



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## Summary for Pond 11P: CB 1

Inflow Area = 7,750 sf, 41.81% Impervious, Inflow Depth = 3.34" for 10-yr event  
Inflow = 1.07 cfs @ 11.96 hrs, Volume= 2,159 cf  
Outflow = 1.07 cfs @ 11.96 hrs, Volume= 2,159 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.07 cfs @ 11.96 hrs, Volume= 2,159 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 636.99' @ 11.96 hrs

Flood Elev= 639.90'

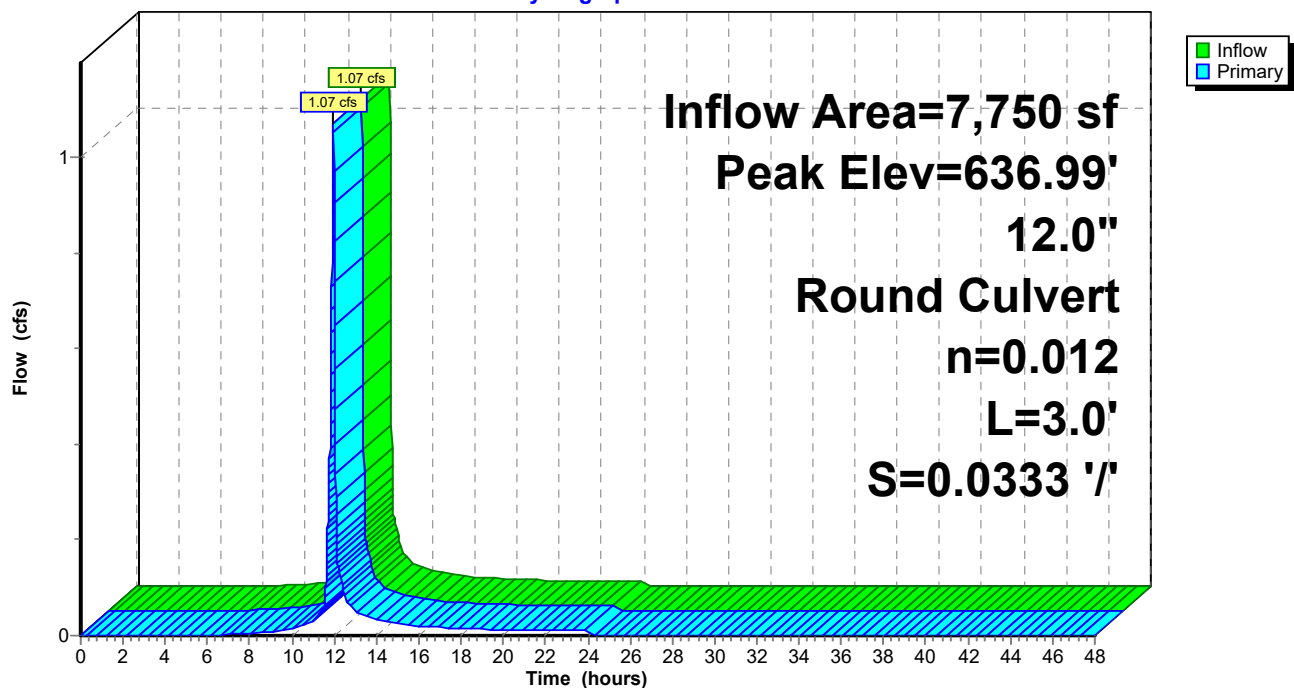
Device	Routing	Invert	Outlet Devices
#1	Primary	636.40'	<b>12.0" Round Culvert</b> L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 636.40' / 636.30' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.07 cfs @ 11.96 hrs HW=636.99' (Free Discharge)

↑1=Culvert (Barrel Controls 1.07 cfs @ 3.17 fps)

## Pond 11P: CB 1

Hydrograph



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## Summary for Pond 12P: CB 2

Inflow Area = 4,140 sf, 22.46% Impervious, Inflow Depth = 2.87" for 10-yr event  
Inflow = 0.50 cfs @ 11.96 hrs, Volume= 990 cf  
Outflow = 0.50 cfs @ 11.96 hrs, Volume= 990 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.50 cfs @ 11.96 hrs, Volume= 990 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 639.35' @ 11.96 hrs

Flood Elev= 642.50'

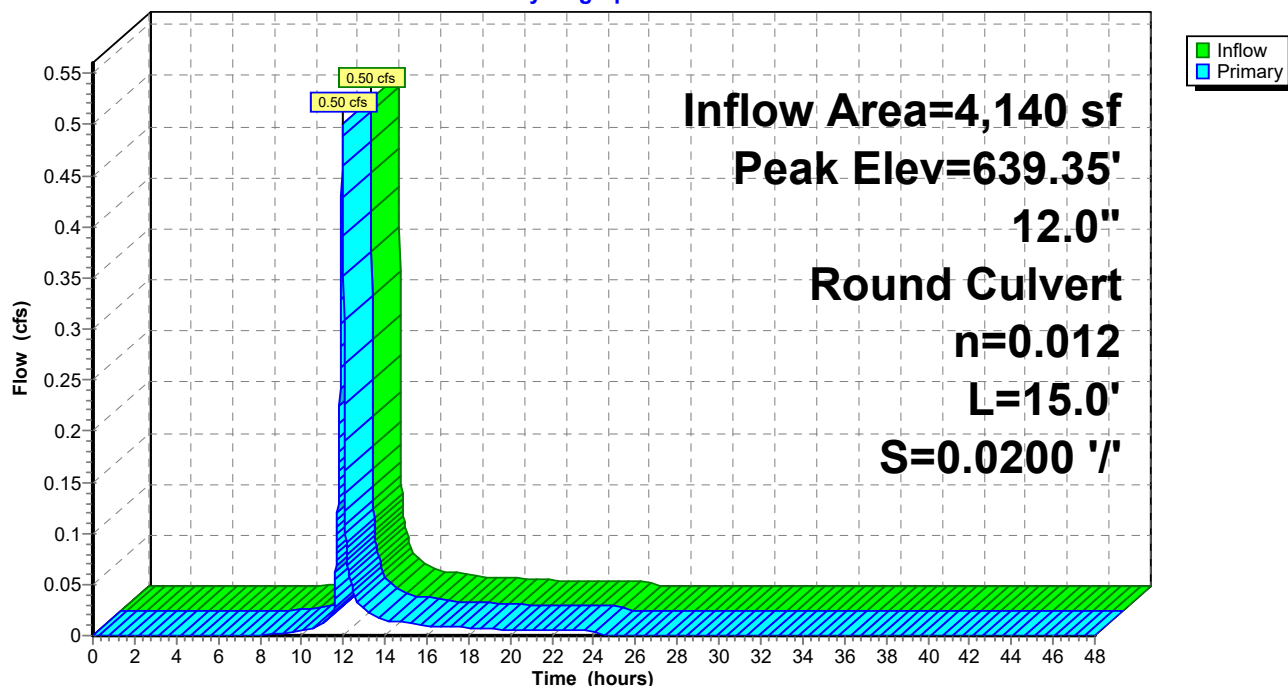
Device	Routing	Invert	Outlet Devices
#1	Primary	639.00'	<b>12.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 639.00' / 638.70' S= 0.0200 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.50 cfs @ 11.96 hrs HW=639.35' (Free Discharge)

↑1=Culvert (Inlet Controls 0.50 cfs @ 2.02 fps)

## Pond 12P: CB 2

Hydrograph



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## Summary for Pond 13P: CB 3

Inflow Area = 930 sf, 100.00% Impervious, Inflow Depth = 4.84" for 10-yr event  
Inflow = 0.16 cfs @ 11.96 hrs, Volume= 375 cf  
Outflow = 0.16 cfs @ 11.96 hrs, Volume= 375 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.16 cfs @ 11.96 hrs, Volume= 375 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 639.29' @ 11.96 hrs

Flood Elev= 642.60'

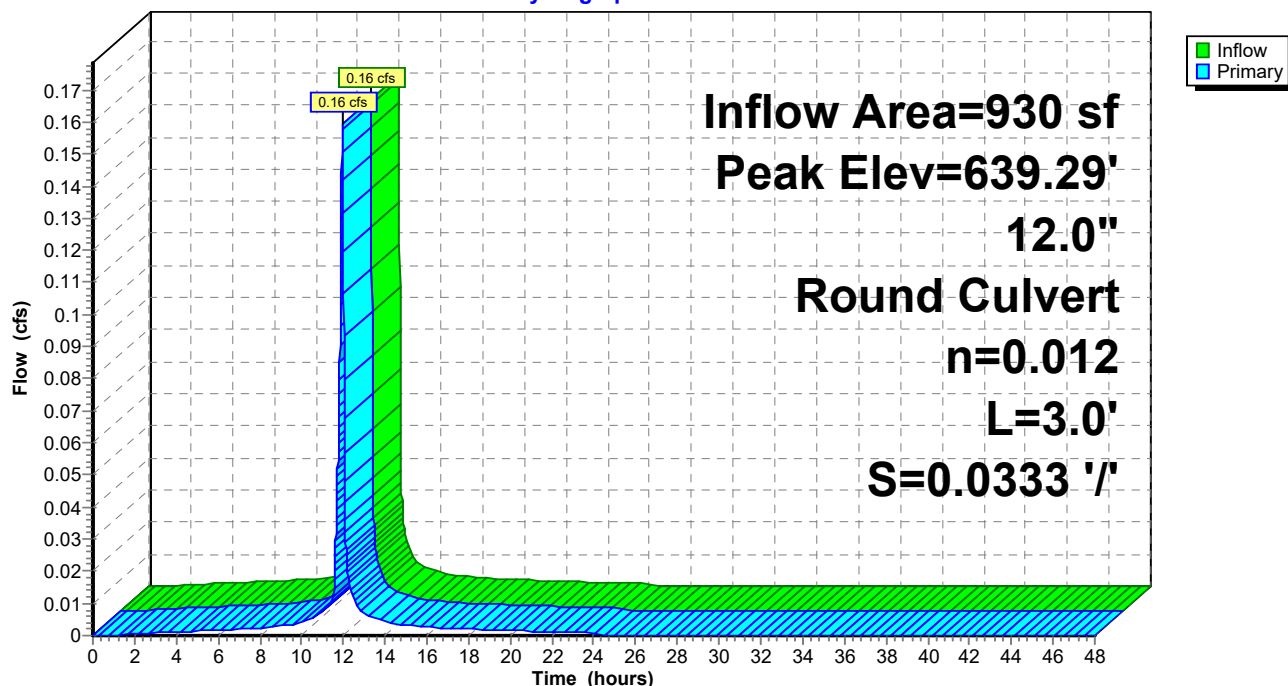
Device	Routing	Invert	Outlet Devices
#1	Primary	639.10'	<b>12.0" Round Culvert</b> L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 639.10' / 639.00' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.16 cfs @ 11.96 hrs HW=639.29' (Free Discharge)

↑1=Culvert (Inlet Controls 0.16 cfs @ 1.49 fps)

## Pond 13P: CB 3

Hydrograph



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## Summary for Pond 14P: CB 4

Inflow Area = 2,000 sf, 34.50% Impervious, Inflow Depth = 3.15" for 10-yr event  
Inflow = 0.26 cfs @ 11.96 hrs, Volume= 525 cf  
Outflow = 0.26 cfs @ 11.96 hrs, Volume= 525 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.26 cfs @ 11.96 hrs, Volume= 525 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 643.75' @ 11.96 hrs

Flood Elev= 647.00'

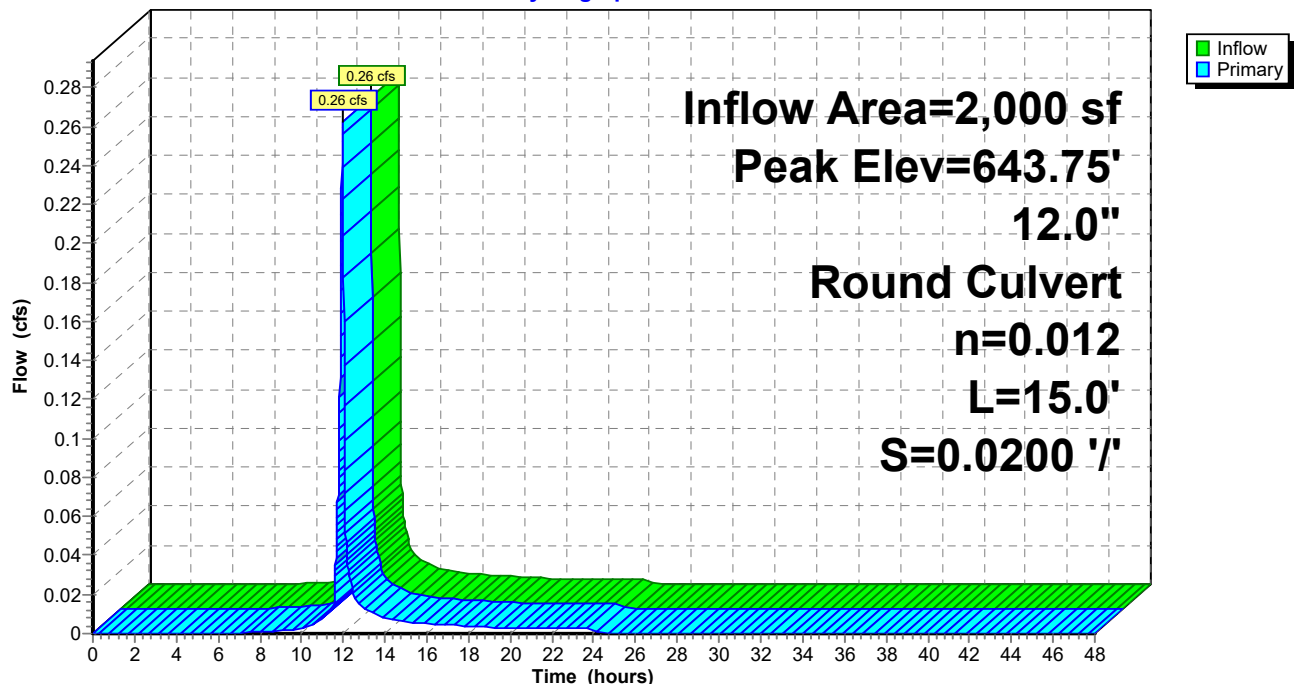
Device	Routing	Invert	Outlet Devices
#1	Primary	643.50'	<b>12.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 643.50' / 643.20' S= 0.0200 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.26 cfs @ 11.96 hrs HW=643.75' (Free Discharge)

↑1=Culvert (Inlet Controls 0.26 cfs @ 1.70 fps)

## Pond 14P: CB 4

Hydrograph





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## Summary for Pond 15P: CB 5

Inflow Area = 660 sf, 100.00% Impervious, Inflow Depth = 4.84" for 10-yr event  
Inflow = 0.11 cfs @ 11.96 hrs, Volume= 266 cf  
Outflow = 0.11 cfs @ 11.96 hrs, Volume= 266 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.11 cfs @ 11.96 hrs, Volume= 266 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 643.66' @ 11.96 hrs

Flood Elev= 647.00'

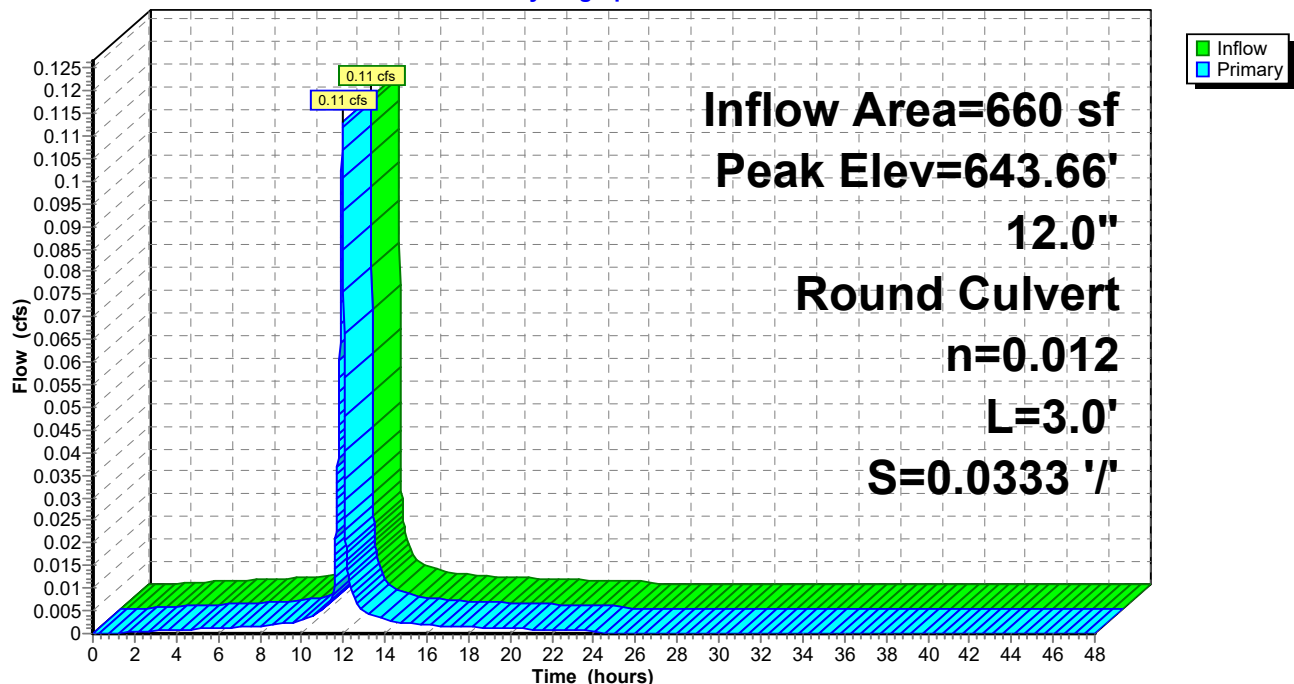
Device	Routing	Invert	Outlet Devices
#1	Primary	643.50'	<b>12.0" Round Culvert</b> L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 643.50' / 643.40' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.11 cfs @ 11.96 hrs HW=643.66' (Free Discharge)

↑1=Culvert (Inlet Controls 0.11 cfs @ 1.37 fps)

## Pond 15P: CB 5

Hydrograph



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## Summary for Pond 16P: CB 6

Inflow Area = 5,850 sf, 56.41% Impervious, Inflow Depth = 3.74" for 10-yr event  
Inflow = 0.88 cfs @ 11.96 hrs, Volume= 1,826 cf  
Outflow = 0.88 cfs @ 11.96 hrs, Volume= 1,826 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.88 cfs @ 11.96 hrs, Volume= 1,826 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 650.53' @ 11.96 hrs

Flood Elev= 651.00'

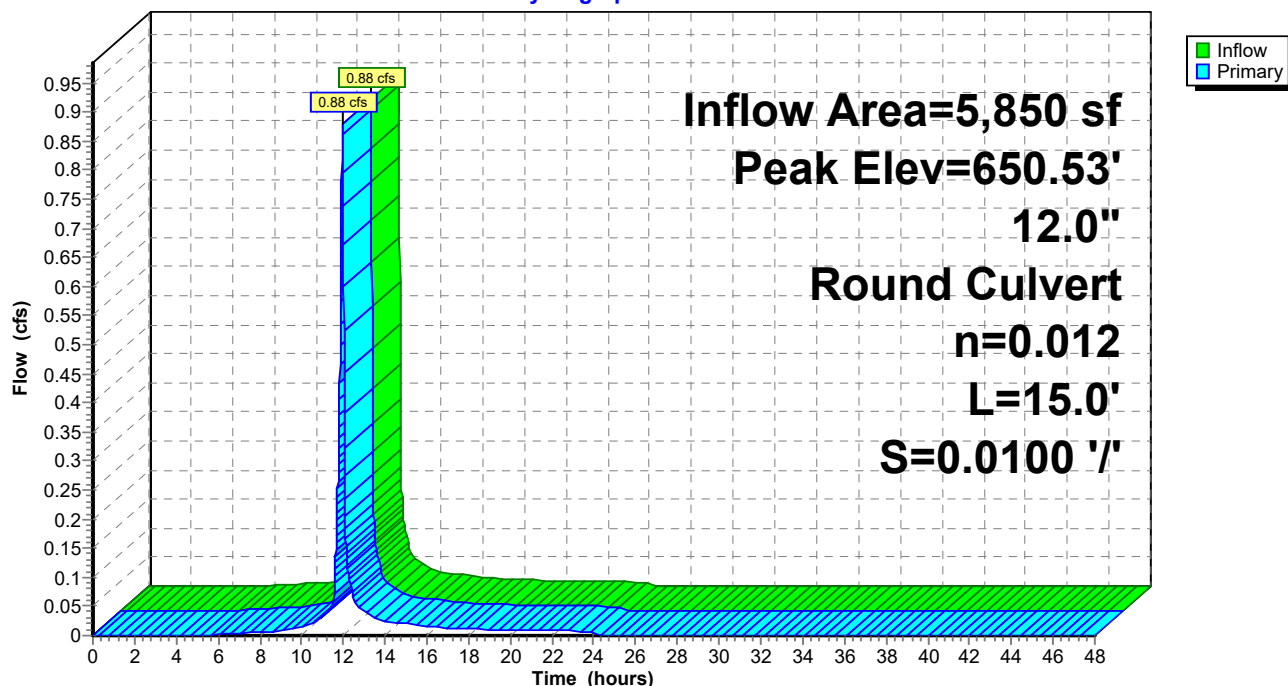
Device	Routing	Invert	Outlet Devices
#1	Primary	650.00'	<b>12.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.00' / 649.85' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.88 cfs @ 11.96 hrs HW=650.53' (Free Discharge)

↑1=Culvert (Barrel Controls 0.88 cfs @ 3.02 fps)

## Pond 16P: CB 6

Hydrograph



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## Summary for Pond 17P: CB 7

Inflow Area = 2,950 sf, 74.92% Impervious, Inflow Depth = 4.17" for 10-yr event  
Inflow = 0.48 cfs @ 11.96 hrs, Volume= 1,024 cf  
Outflow = 0.48 cfs @ 11.96 hrs, Volume= 1,024 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.48 cfs @ 11.96 hrs, Volume= 1,024 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 647.84' @ 11.96 hrs

Flood Elev= 651.00'

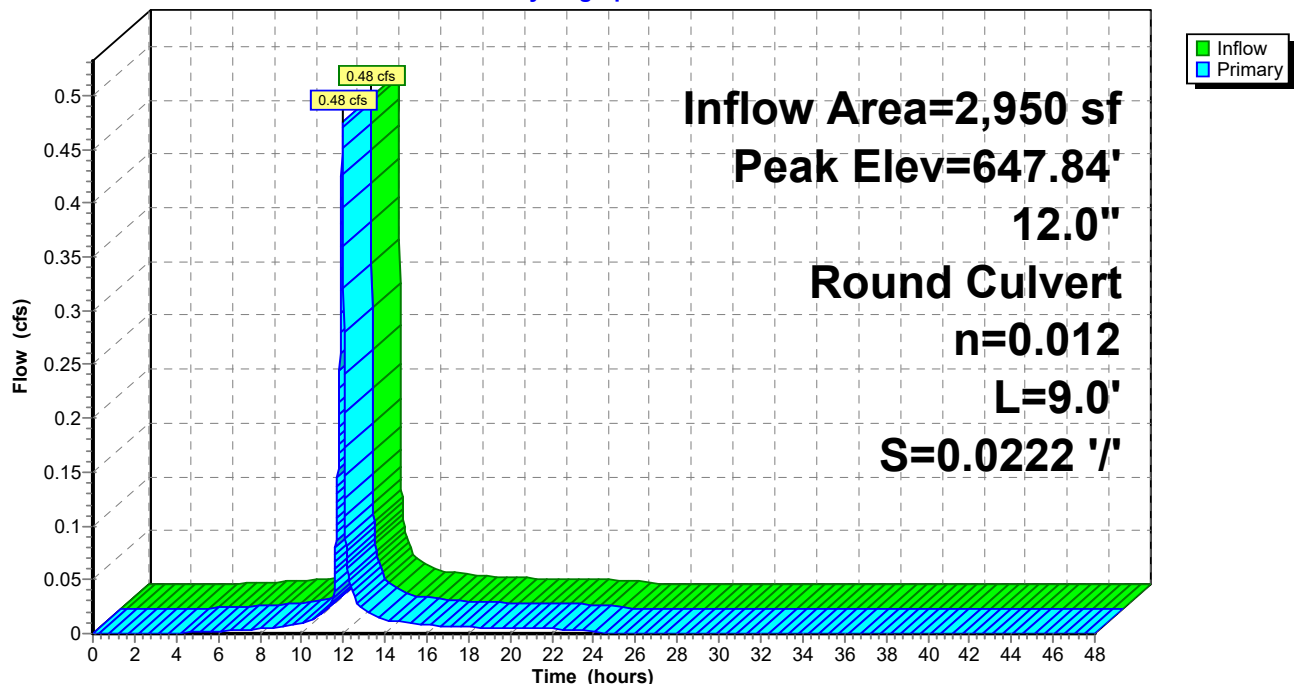
Device	Routing	Invert	Outlet Devices
#1	Primary	647.50'	<b>12.0" Round Culvert</b> L= 9.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 647.50' / 647.30' S= 0.0222 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.47 cfs @ 11.96 hrs HW=647.84' (Free Discharge)

↑1=Culvert (Inlet Controls 0.47 cfs @ 1.99 fps)

## Pond 17P: CB 7

Hydrograph



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## Summary for Pond 18P: CB 8

[58] Hint: Peaked 0.37' above defined flood level

Inflow Area = 3,330 sf, 75.98% Impervious, Inflow Depth = 4.17" for 10-yr event  
Inflow = 0.54 cfs @ 11.96 hrs, Volume= 1,156 cf  
Outflow = 0.54 cfs @ 11.96 hrs, Volume= 1,156 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.54 cfs @ 11.96 hrs, Volume= 1,156 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 650.67' @ 11.96 hrs

Flood Elev= 650.30'

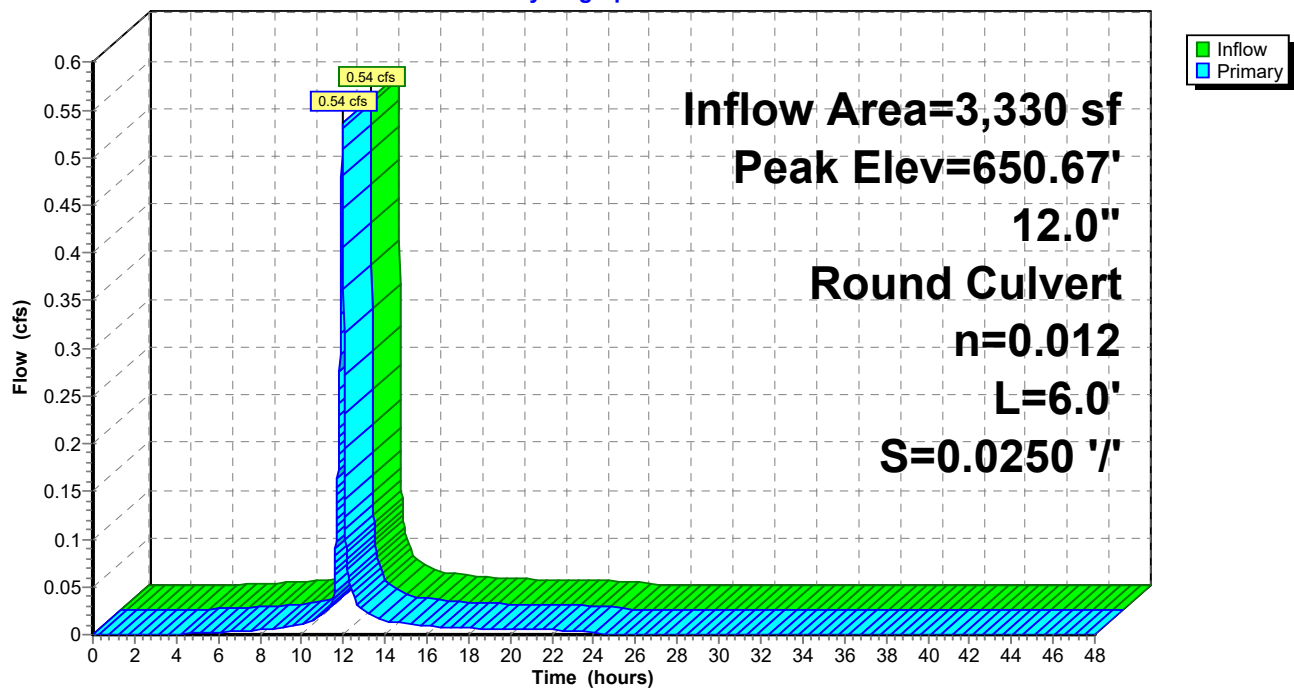
Device	Routing	Invert	Outlet Devices
#1	Primary	650.30'	<b>12.0" Round Culvert</b> L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.30' / 650.15' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.54 cfs @ 11.96 hrs HW=650.67' (Free Discharge)

↑1=Culvert (Barrel Controls 0.54 cfs @ 2.96 fps)

## Pond 18P: CB 8

Hydrograph



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**Summary for Pond 19P: CB 9**

Inflow Area = 11,800 sf, 50.17% Impervious, Inflow Depth = 3.54" for 10-yr event  
Inflow = 1.70 cfs @ 11.96 hrs, Volume= 3,483 cf  
Outflow = 1.70 cfs @ 11.96 hrs, Volume= 3,483 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.70 cfs @ 11.96 hrs, Volume= 3,483 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 650.86' @ 11.96 hrs

Flood Elev= 653.60'

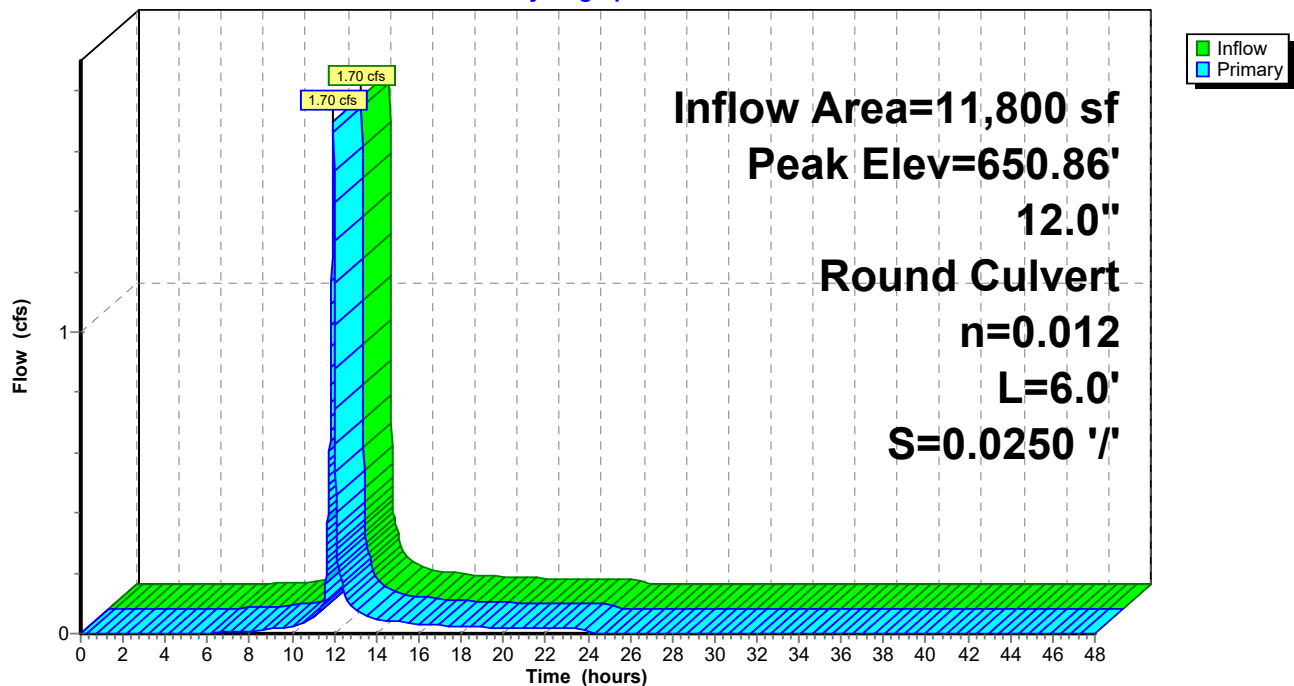
Device	Routing	Invert	Outlet Devices
#1	Primary	650.10'	<b>12.0" Round Culvert</b> L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.10' / 649.95' S= 0.0250 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.70 cfs @ 11.96 hrs HW=650.86' (Free Discharge)

↑1=Culvert (Barrel Controls 1.70 cfs @ 3.65 fps)

**Pond 19P: CB 9**

Hydrograph



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## Summary for Pond 40P: HDS Unit

[79] Warning: Submerged Pond 69P Primary device # 1 INLET by 1.22'

Inflow Area = 44,660 sf, 54.46% Impervious, Inflow Depth = 3.69" for 10-yr event  
Inflow = 6.47 cfs @ 11.96 hrs, Volume= 13,740 cf  
Outflow = 6.47 cfs @ 11.96 hrs, Volume= 13,740 cf, Atten= 0%, Lag= 0.0 min  
Primary = 6.47 cfs @ 11.96 hrs, Volume= 13,740 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 643.22' @ 11.96 hrs

Flood Elev= 653.50'

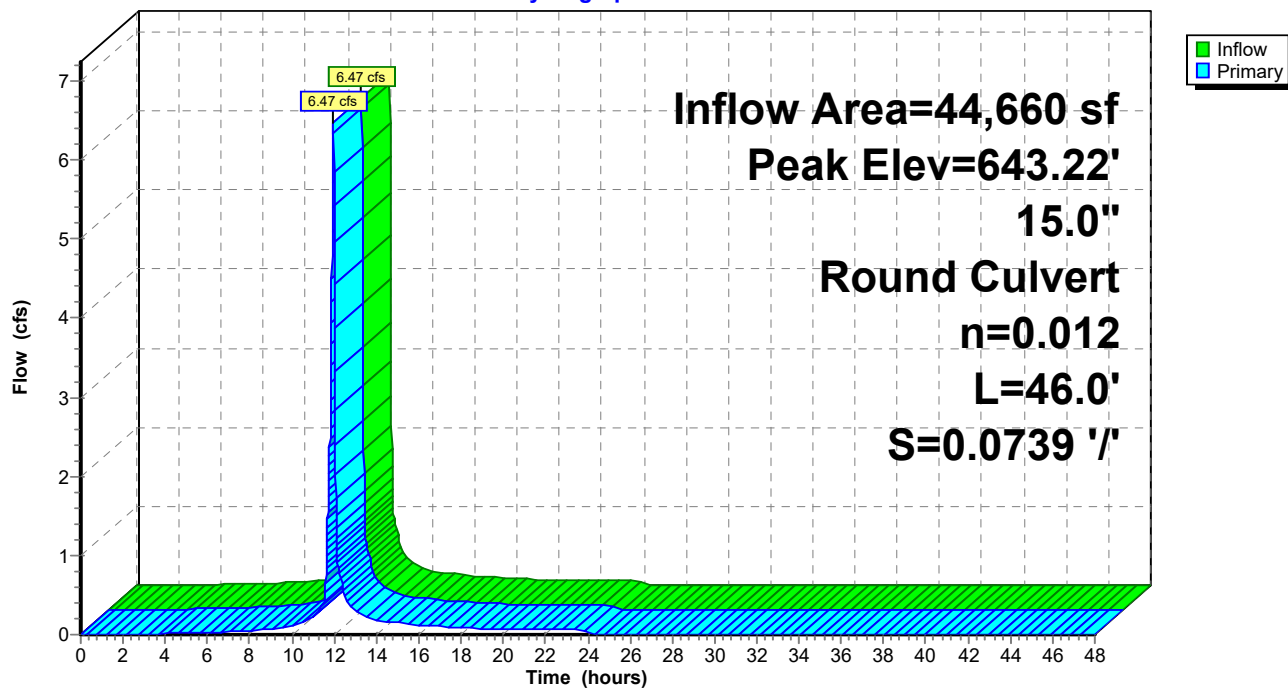
Device	Routing	Invert	Outlet Devices
#1	Primary	641.40'	<b>15.0" Round Culvert</b> L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 641.40' / 638.00' S= 0.0739 '/ Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=6.46 cfs @ 11.96 hrs HW=643.22' (Free Discharge)

↑1=Culvert (Inlet Controls 6.46 cfs @ 5.26 fps)

## Pond 40P: HDS Unit

Hydrograph



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**Summary for Pond 50P: WQB**

[79] Warning: Submerged Pond 40P Primary device # 1 OUTLET by 2.31'

Inflow Area = 79,190 sf, 30.71% Impervious, Inflow Depth = 3.14" for 10-yr event  
 Inflow = 10.04 cfs @ 11.96 hrs, Volume= 20,728 cf  
 Outflow = 0.45 cfs @ 13.17 hrs, Volume= 16,342 cf, Atten= 96%, Lag= 72.9 min  
 Primary = 0.45 cfs @ 13.17 hrs, Volume= 16,342 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 640.31' @ 13.17 hrs Surf.Area= 7,355 sf Storage= 12,412 cf  
 Flood Elev= 644.00' Surf.Area= 14,157 sf Storage= 51,826 cf

Plug-Flow detention time= 373.8 min calculated for 16,338 cf (79% of inflow)  
 Center-of-Mass det. time= 288.0 min ( 1,089.2 - 801.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	638.00'	51,826 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
638.00	3,553	532.6	0	0	3,553
640.00	6,861	570.3	10,234	10,234	7,041
642.00	10,396	608.0	17,135	27,369	10,767
644.00	14,157	645.7	24,456	51,826	14,732

Device	Routing	Invert	Outlet Devices
#1	Primary	638.00'	<b>12.0" Round Culvert</b> L= 90.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 638.00' / 637.10' S= 0.0100 ' / Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	639.00'	<b>4.0" Vert. Orifice/Grate</b> C= 0.600
#3	Device 1	642.15'	<b>6.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.45 cfs @ 13.17 hrs HW=640.31' (Free Discharge)

↑ **1=Culvert** (Passes 0.45 cfs of 4.74 cfs potential flow)  
 ↑ **2=Orifice/Grate** (Orifice Controls 0.45 cfs @ 5.14 fps)  
 ↑ **3=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

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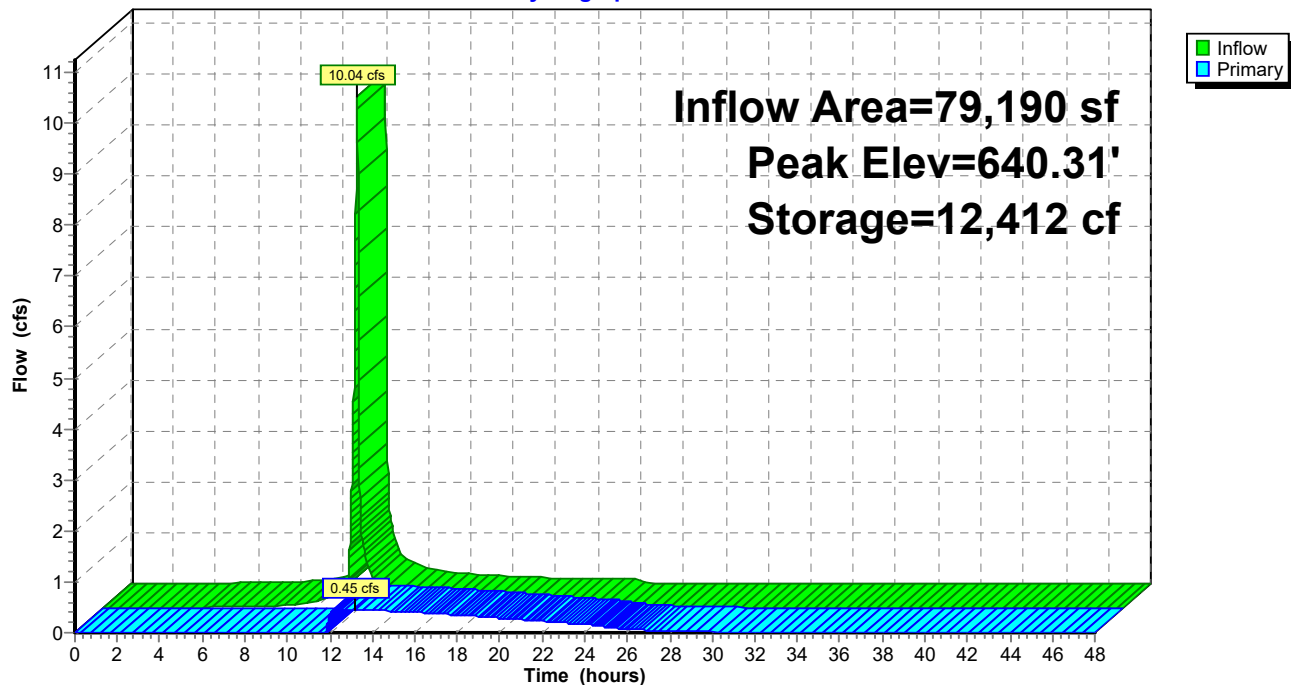
Type II 24-hr 10-yr Rainfall=5.08"

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## Pond 50P: WQB

Hydrograph





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## Summary for Pond 61P: DMH 1

[79] Warning: Submerged Pond 62P Primary device # 1 OUTLET by 0.80'

Inflow Area = 94,670 sf, 32.50% Impervious, Inflow Depth > 2.62" for 10-yr event  
Inflow = 2.41 cfs @ 11.96 hrs, Volume= 20,658 cf  
Outflow = 2.41 cfs @ 11.96 hrs, Volume= 20,658 cf, Atten= 0%, Lag= 0.0 min  
Primary = 2.41 cfs @ 11.96 hrs, Volume= 20,658 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 634.25' @ 11.96 hrs

Flood Elev= 639.10'

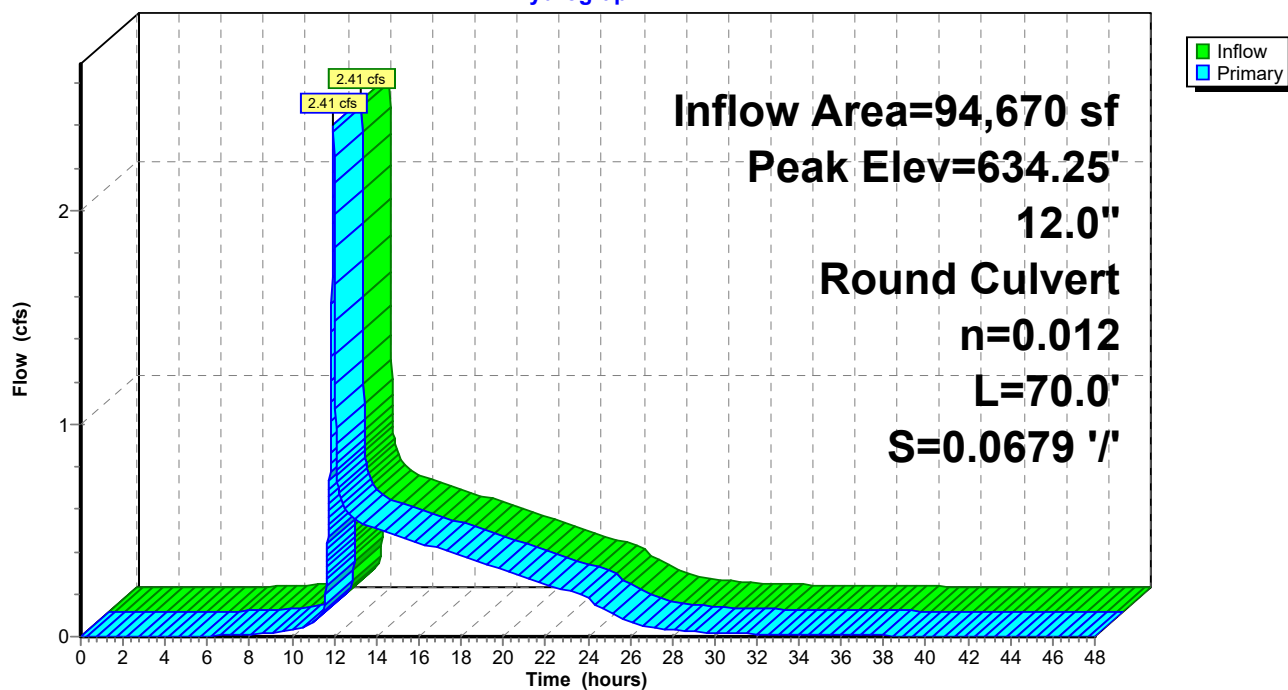
Device	Routing	Invert	Outlet Devices
#1	Primary	633.35'	<b>12.0" Round Culvert</b> L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 633.35' / 628.60' S= 0.0679 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.40 cfs @ 11.96 hrs HW=634.25' (Free Discharge)

↑1=Culvert (Inlet Controls 2.40 cfs @ 3.23 fps)

## Pond 61P: DMH 1

Hydrograph



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## Summary for Pond 62P: DMH 2

[79] Warning: Submerged Pond 63P Primary device # 1 OUTLET by 0.80'

Inflow Area = 94,670 sf, 32.50% Impervious, Inflow Depth > 2.62" for 10-yr event  
Inflow = 2.41 cfs @ 11.96 hrs, Volume= 20,658 cf  
Outflow = 2.41 cfs @ 11.96 hrs, Volume= 20,658 cf, Atten= 0%, Lag= 0.0 min  
Primary = 2.41 cfs @ 11.96 hrs, Volume= 20,658 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 635.35' @ 11.96 hrs

Flood Elev= 640.00'

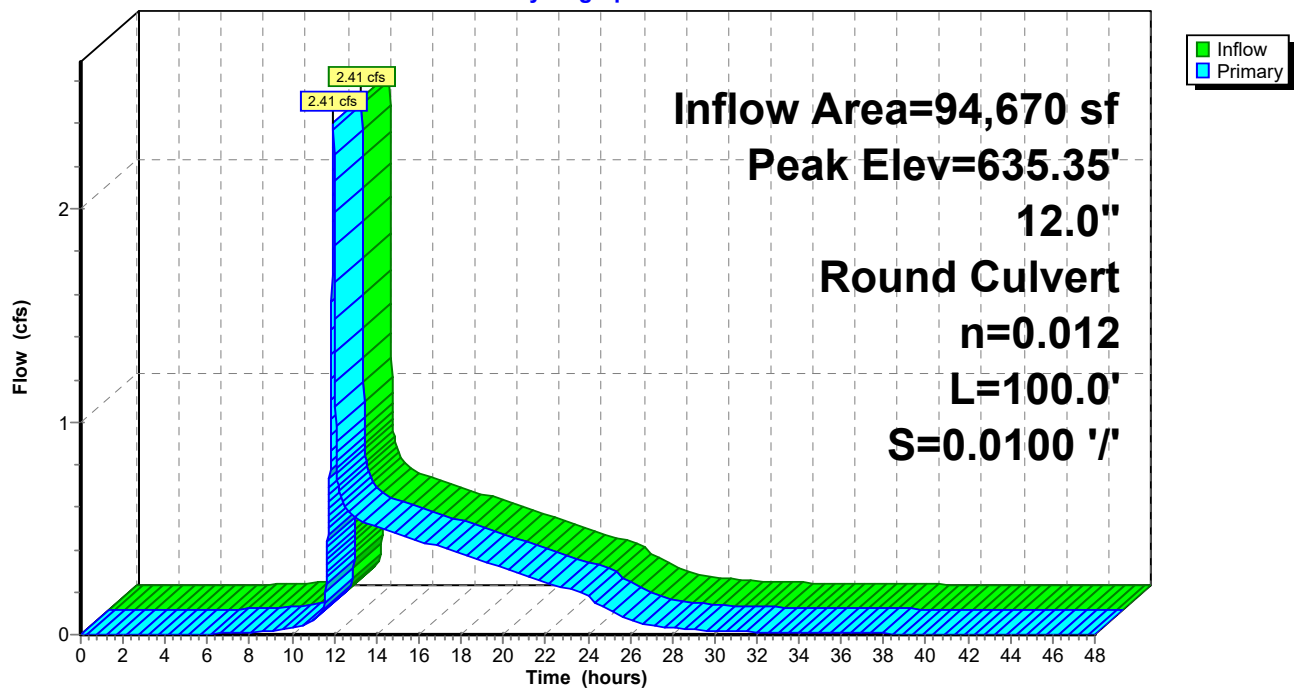
Device	Routing	Invert	Outlet Devices
#1	Primary	634.45'	<b>12.0" Round Culvert</b> L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 634.45' / 633.45' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.40 cfs @ 11.96 hrs HW=635.35' (Free Discharge)

↑1=Culvert (Inlet Controls 2.40 cfs @ 3.23 fps)

## Pond 62P: DMH 2

Hydrograph



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## Summary for Pond 63P: DMH 3

[79] Warning: Submerged Pond 64P Primary device # 1 OUTLET by 0.51'

Inflow Area = 86,920 sf, 31.67% Impervious, Inflow Depth > 2.55" for 10-yr event  
Inflow = 1.34 cfs @ 11.97 hrs, Volume= 18,499 cf  
Outflow = 1.34 cfs @ 11.97 hrs, Volume= 18,499 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.34 cfs @ 11.97 hrs, Volume= 18,499 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 635.96' @ 11.97 hrs

Flood Elev= 642.70'

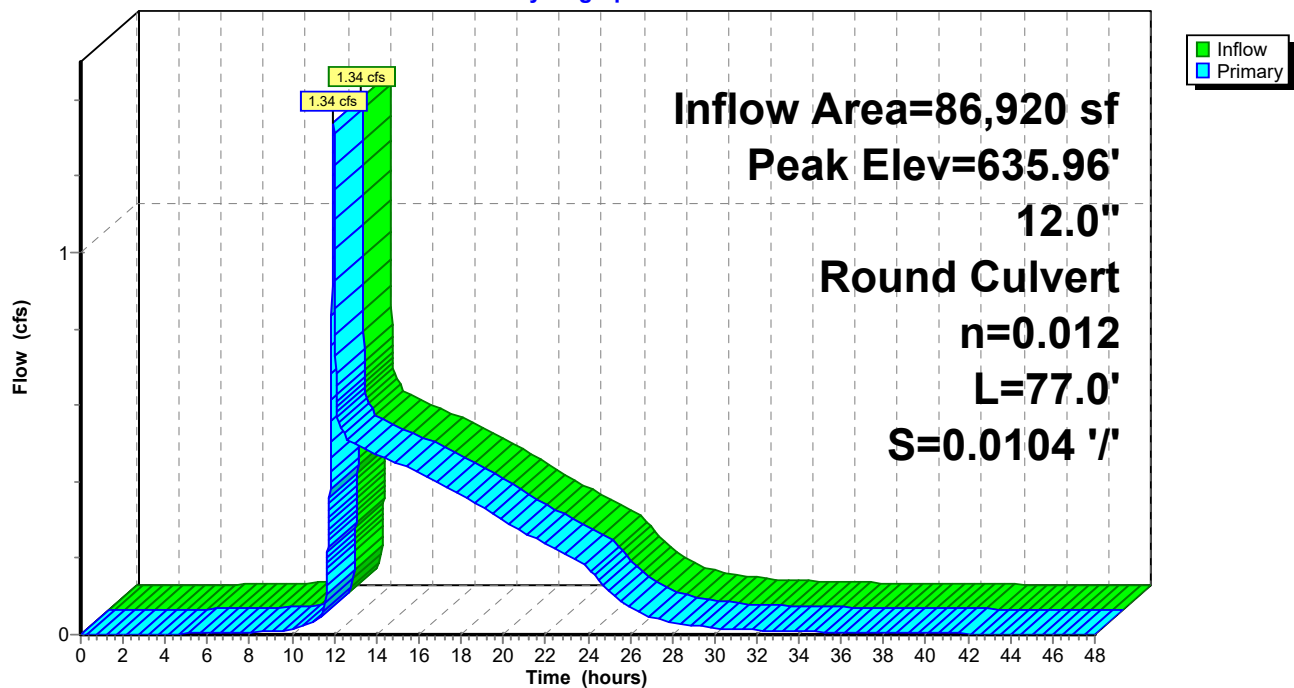
Device	Routing	Invert	Outlet Devices
#1	Primary	635.35'	<b>12.0" Round Culvert</b> L= 77.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 635.35' / 634.55' S= 0.0104 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.34 cfs @ 11.97 hrs HW=635.96' (Free Discharge)

↑1=Culvert (Inlet Controls 1.34 cfs @ 2.66 fps)

## Pond 63P: DMH 3

Hydrograph



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## Summary for Pond 64P: DMH 4

[79] Warning: Submerged Pond 65P Primary device # 1 OUTLET by 0.32'

Inflow Area = 81,850 sf, 31.36% Impervious, Inflow Depth > 2.51" for 10-yr event  
Inflow = 0.69 cfs @ 11.98 hrs, Volume= 17,133 cf  
Outflow = 0.69 cfs @ 11.98 hrs, Volume= 17,133 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.69 cfs @ 11.98 hrs, Volume= 17,133 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 636.62' @ 11.98 hrs

Flood Elev= 647.30'

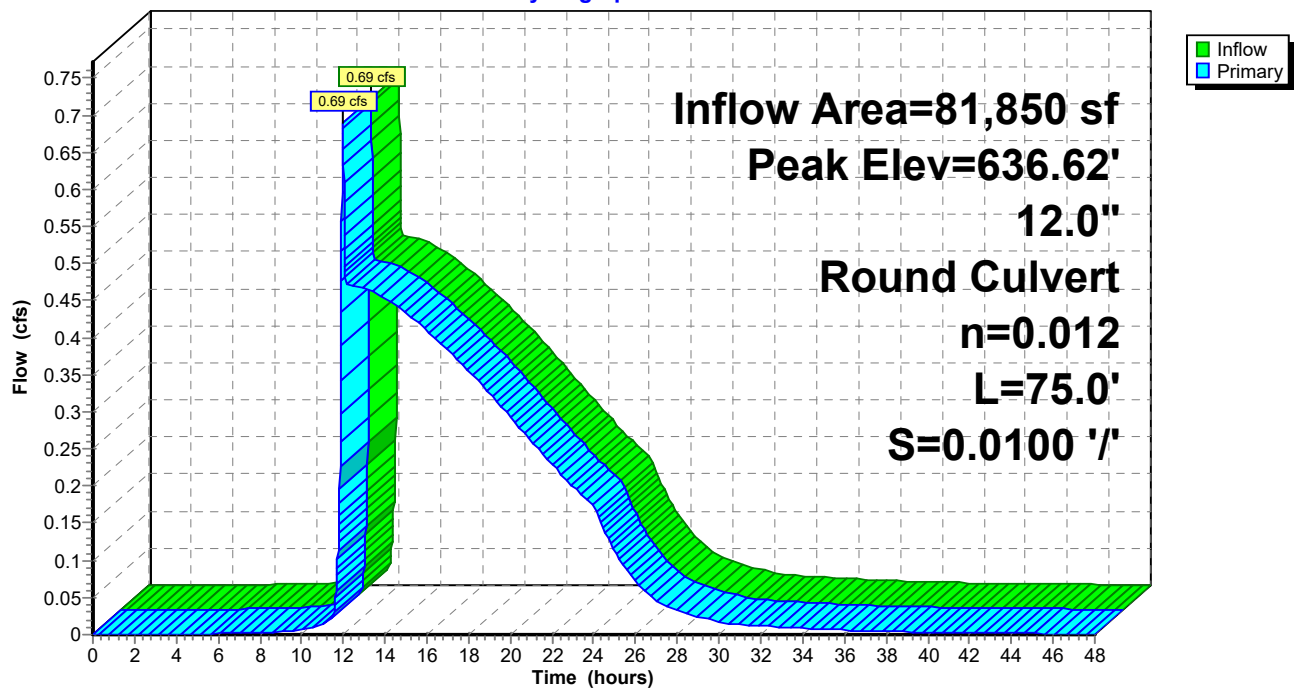
Device	Routing	Invert	Outlet Devices
#1	Primary	636.20'	<b>12.0" Round Culvert</b> L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 636.20' / 635.45' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.68 cfs @ 11.98 hrs HW=636.62' (Free Discharge)

↑1=Culvert (Inlet Controls 0.68 cfs @ 2.20 fps)

## Pond 64P: DMH 4

Hydrograph



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## Summary for Pond 65P: DMH 5

[79] Warning: Submerged Pond 50P Primary device # 1 OUTLET by 0.23'

Inflow Area = 79,190 sf, 30.71% Impervious, Inflow Depth > 2.48" for 10-yr event  
Inflow = 0.45 cfs @ 13.17 hrs, Volume= 16,342 cf  
Outflow = 0.45 cfs @ 13.17 hrs, Volume= 16,342 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.45 cfs @ 13.17 hrs, Volume= 16,342 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 637.33' @ 13.17 hrs

Flood Elev= 651.80'

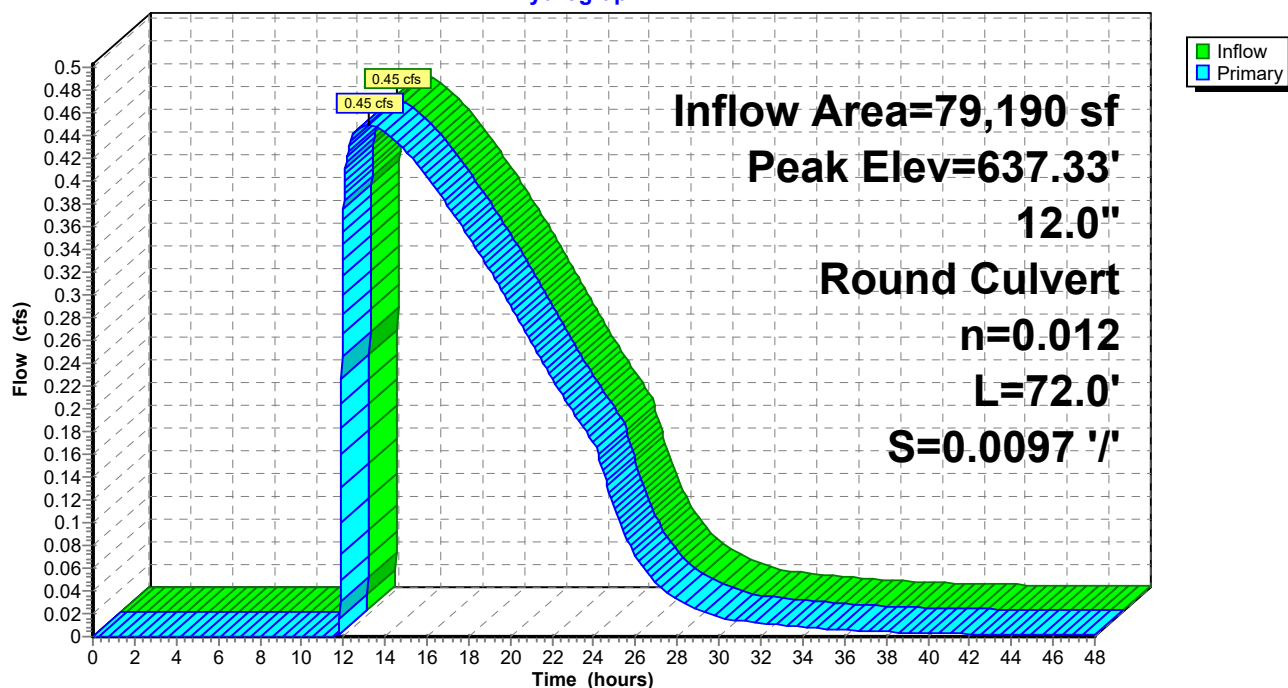
Device	Routing	Invert	Outlet Devices
#1	Primary	637.00'	<b>12.0" Round Culvert</b> L= 72.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 637.00' / 636.30' S= 0.0097 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.44 cfs @ 13.17 hrs HW=637.33' (Free Discharge)

↑1=Culvert (Inlet Controls 0.44 cfs @ 1.95 fps)

## Pond 65P: DMH 5

Hydrograph



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## Summary for Pond 66P: DMH 6

[79] Warning: Submerged Pond 17P Primary device # 1 INLET by 0.26'

Inflow Area = 8,800 sf, 62.61% Impervious, Inflow Depth = 3.89" for 10-yr event  
Inflow = 1.35 cfs @ 11.96 hrs, Volume= 2,850 cf  
Outflow = 1.35 cfs @ 11.96 hrs, Volume= 2,850 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.35 cfs @ 11.96 hrs, Volume= 2,850 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 647.76' @ 11.96 hrs

Flood Elev= 651.30'

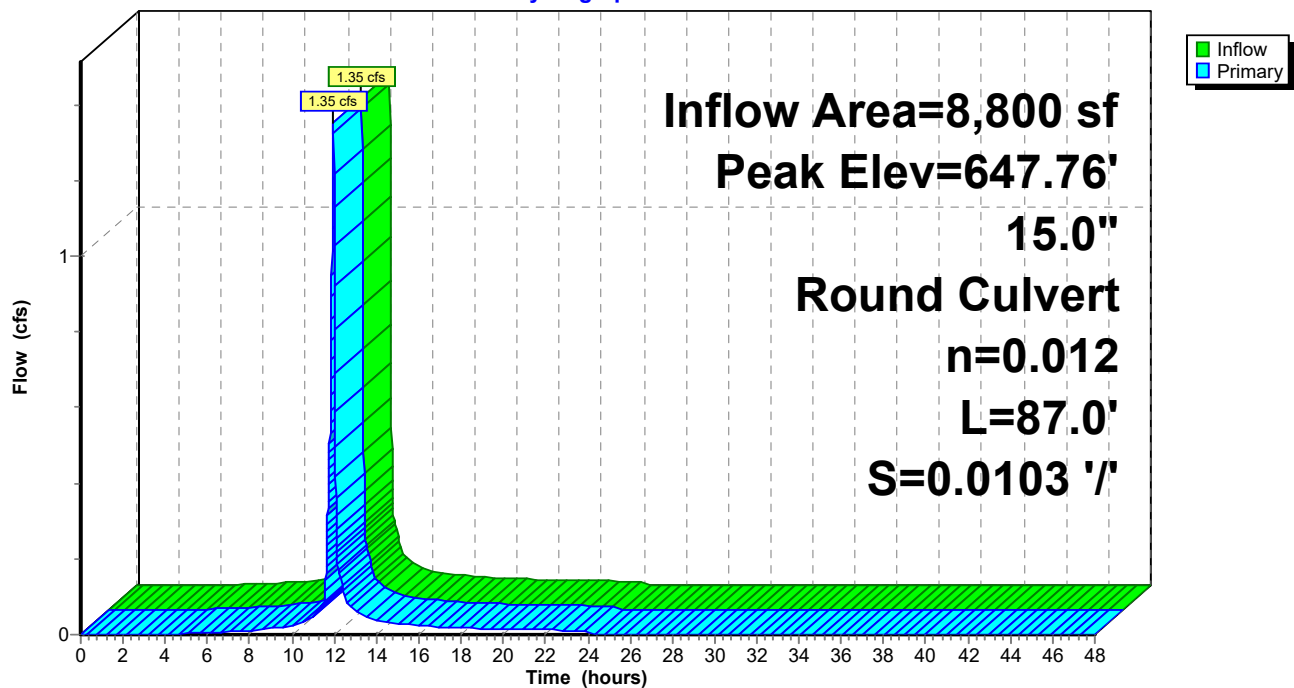
Device	Routing	Invert	Outlet Devices
#1	Primary	647.20'	<b>15.0" Round Culvert</b> L= 87.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 647.20' / 646.30' S= 0.0103 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=1.35 cfs @ 11.96 hrs HW=647.76' (Free Discharge)

↑1=Culvert (Inlet Controls 1.35 cfs @ 2.54 fps)

## Pond 66P: DMH 6

Hydrograph



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## Summary for Pond 67P: DMH 7

[79] Warning: Submerged Pond 66P Primary device # 1 OUTLET by 0.57'

Inflow Area = 12,130 sf, 66.28% Impervious, Inflow Depth = 3.96" for 10-yr event  
Inflow = 1.89 cfs @ 11.96 hrs, Volume= 4,007 cf  
Outflow = 1.89 cfs @ 11.96 hrs, Volume= 4,007 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.89 cfs @ 11.96 hrs, Volume= 4,007 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 646.87' @ 11.96 hrs

Flood Elev= 654.20'

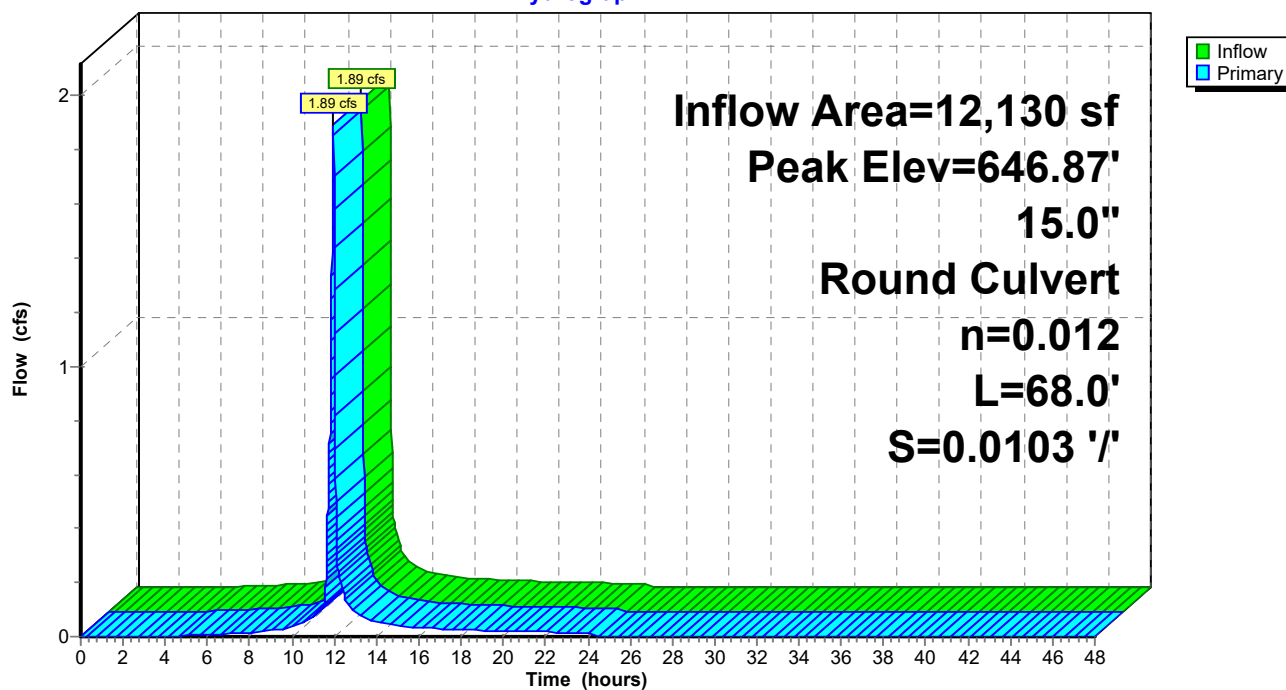
Device	Routing	Invert	Outlet Devices
#1	Primary	646.20'	<b>15.0" Round Culvert</b> L= 68.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 646.20' / 645.50' S= 0.0103 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=1.88 cfs @ 11.96 hrs HW=646.87' (Free Discharge)

↑1=Culvert (Inlet Controls 1.88 cfs @ 2.79 fps)

## Pond 67P: DMH 7

Hydrograph



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### Summary for Pond 68P: DMH 8

[79] Warning: Submerged Pond 67P Primary device # 1 INLET by 0.25'

Inflow Area = 23,930 sf, 58.34% Impervious, Inflow Depth = 3.76" for 10-yr event  
Inflow = 3.59 cfs @ 11.96 hrs, Volume= 7,489 cf  
Outflow = 3.59 cfs @ 11.96 hrs, Volume= 7,489 cf, Atten= 0%, Lag= 0.0 min  
Primary = 3.59 cfs @ 11.96 hrs, Volume= 7,489 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 646.45' @ 11.96 hrs

Flood Elev= 654.10'

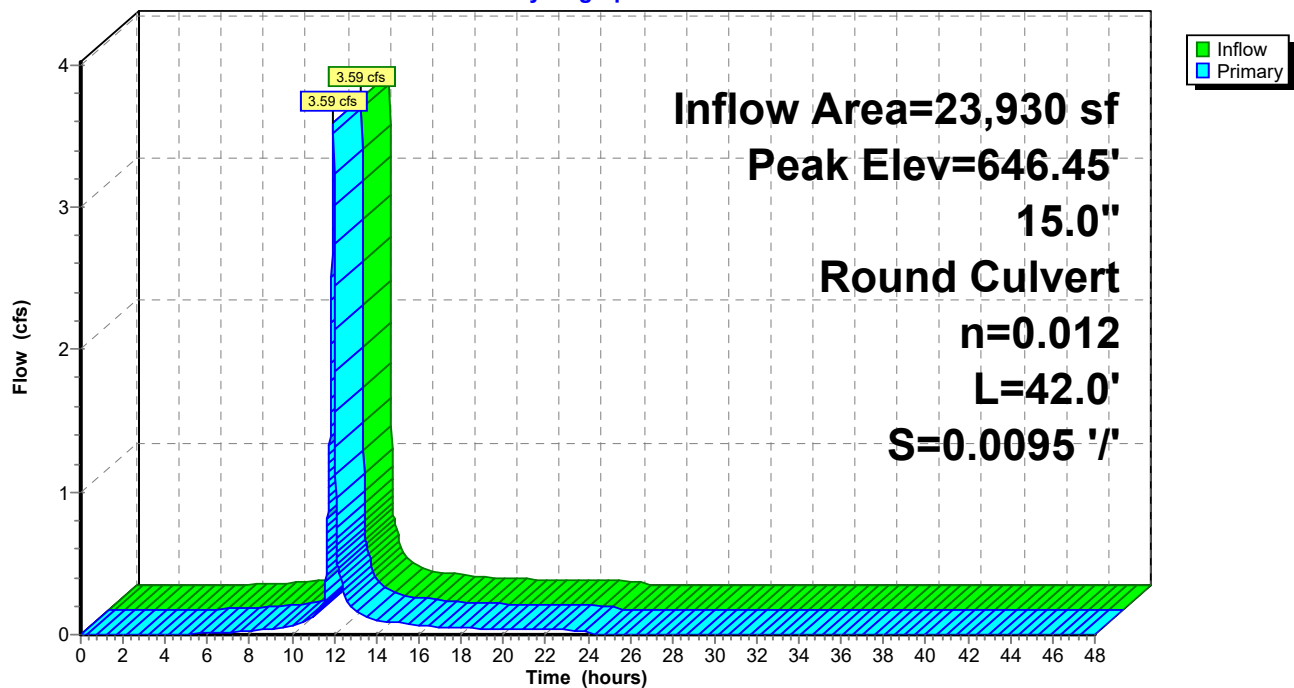
Device	Routing	Invert	Outlet Devices
#1	Primary	645.40'	<b>15.0" Round Culvert</b> L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 645.40' / 645.00' S= 0.0095 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=3.59 cfs @ 11.96 hrs HW=646.45' (Free Discharge)

↑1=Culvert (Barrel Controls 3.59 cfs @ 4.40 fps)

### Pond 68P: DMH 8

Hydrograph





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## Summary for Pond 69P: DMH 9

Inflow Area = 44,660 sf, 54.46% Impervious, Inflow Depth = 3.69" for 10-yr event  
Inflow = 6.47 cfs @ 11.96 hrs, Volume= 13,740 cf  
Outflow = 6.47 cfs @ 11.96 hrs, Volume= 13,740 cf, Atten= 0%, Lag= 0.0 min  
Primary = 6.47 cfs @ 11.96 hrs, Volume= 13,740 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 643.82' @ 11.96 hrs

Flood Elev= 654.20'

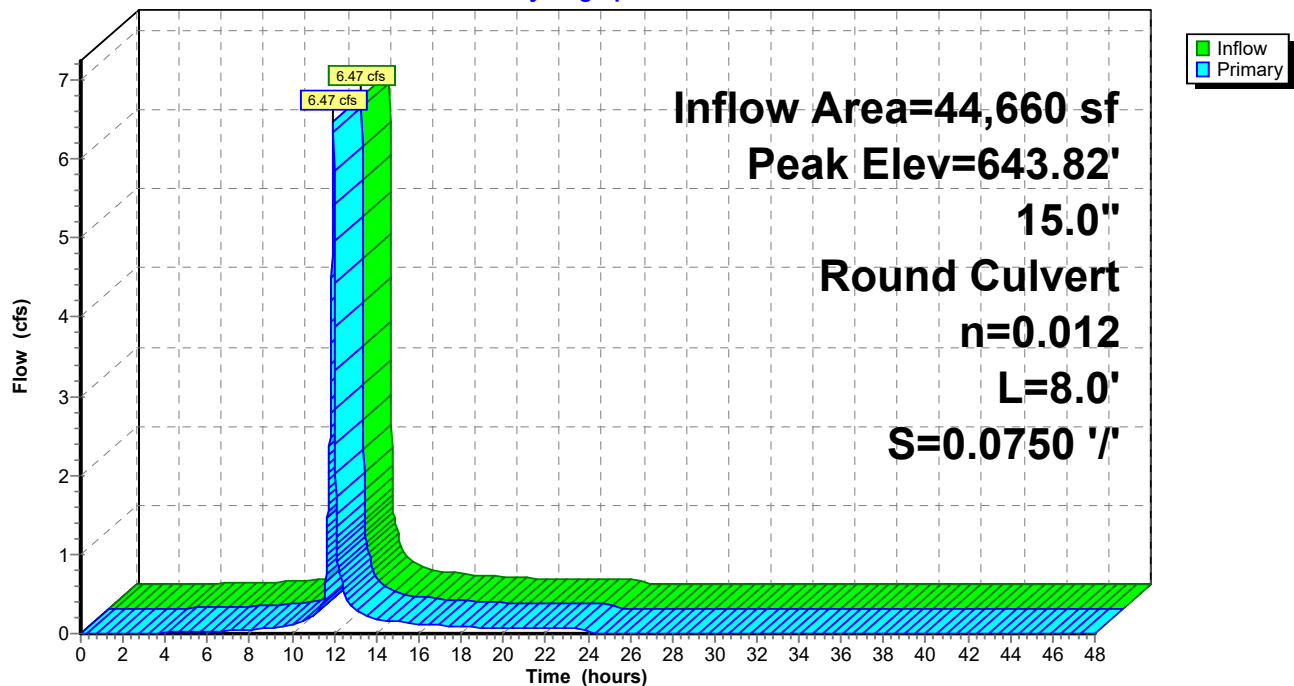
Device	Routing	Invert	Outlet Devices
#1	Primary	642.00'	<b>15.0" Round Culvert</b> L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 642.00' / 641.40' S= 0.0750 '/ Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=6.46 cfs @ 11.96 hrs HW=643.82' (Free Discharge)

↑1=Culvert (Inlet Controls 6.46 cfs @ 5.26 fps)

## Pond 69P: DMH 9

Hydrograph



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## Summary for Pond 70P: DMH 10

[79] Warning: Submerged Pond 71P Primary device # 1 OUTLET by 0.98'

Inflow Area = 20,730 sf, 49.98% Impervious, Inflow Depth = 3.62" for 10-yr event  
Inflow = 2.87 cfs @ 11.96 hrs, Volume= 6,251 cf  
Outflow = 2.87 cfs @ 11.96 hrs, Volume= 6,251 cf, Atten= 0%, Lag= 0.0 min  
Primary = 2.87 cfs @ 11.96 hrs, Volume= 6,251 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 649.28' @ 11.96 hrs

Flood Elev= 655.50'

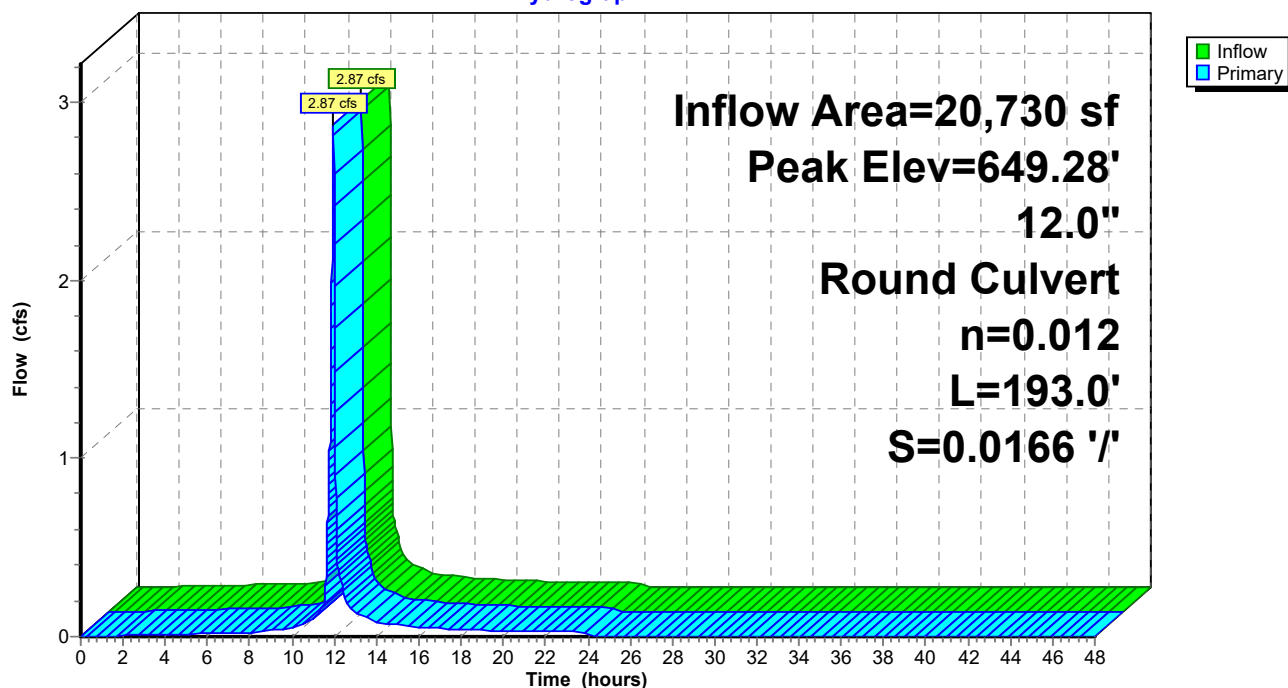
Device	Routing	Invert	Outlet Devices
#1	Primary	648.20'	<b>12.0" Round Culvert</b> L= 193.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 648.20' / 645.00' S= 0.0166 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.87 cfs @ 11.96 hrs HW=649.28' (Free Discharge)

↑1=Culvert (Inlet Controls 2.87 cfs @ 3.66 fps)

## Pond 70P: DMH 10

Hydrograph



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## Summary for Pond 71P: DMH 11

[79] Warning: Submerged Pond 83P Primary device # 1 OUTLET by 0.98'

Inflow Area = 20,730 sf, 49.98% Impervious, Inflow Depth = 3.62" for 10-yr event  
Inflow = 2.87 cfs @ 11.96 hrs, Volume= 6,251 cf  
Outflow = 2.87 cfs @ 11.96 hrs, Volume= 6,251 cf, Atten= 0%, Lag= 0.0 min  
Primary = 2.87 cfs @ 11.96 hrs, Volume= 6,251 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 651.23' @ 11.96 hrs

Flood Elev= 655.50'

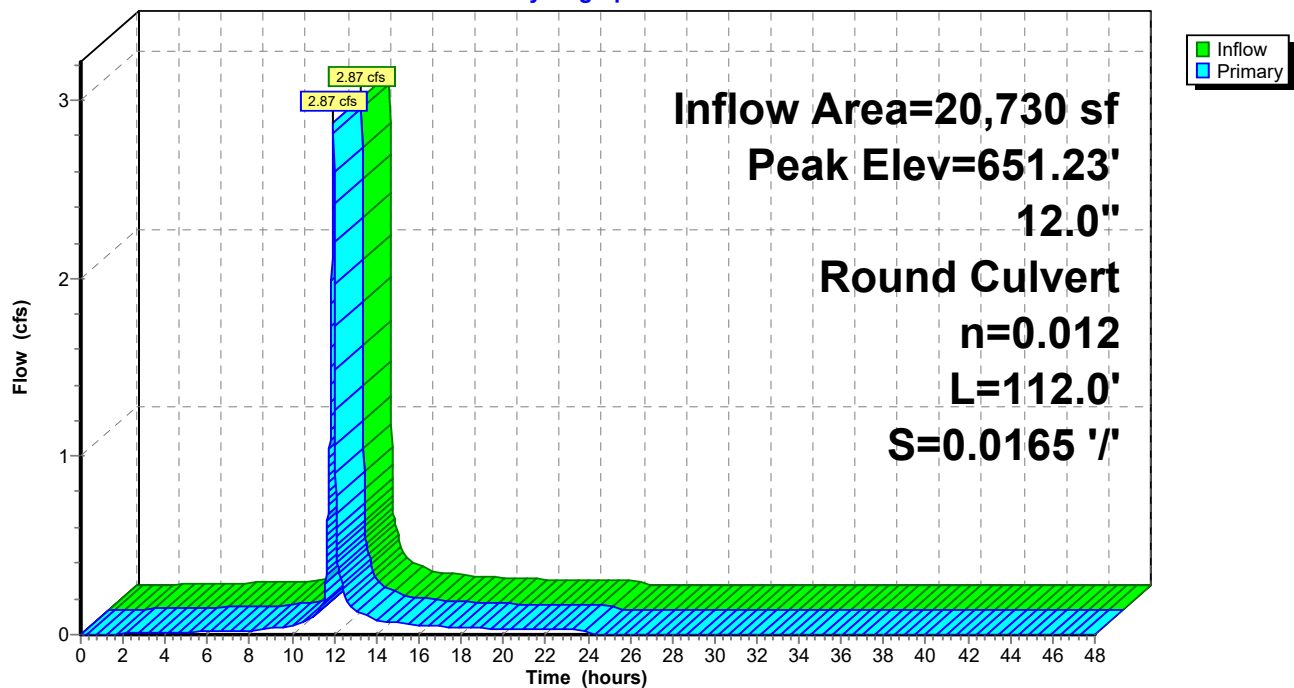
Device	Routing	Invert	Outlet Devices
#1	Primary	650.15'	<b>12.0" Round Culvert</b> L= 112.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.15' / 648.30' S= 0.0165 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.87 cfs @ 11.96 hrs HW=651.23' (Free Discharge)

↑1=Culvert (Inlet Controls 2.87 cfs @ 3.66 fps)

## Pond 71P: DMH 11

Hydrograph



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Type II 24-hr 10-yr Rainfall=5.08"

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## Summary for Pond 81P: YD 1

Inflow Area = 4,470 sf, 100.00% Impervious, Inflow Depth = 4.84" for 10-yr event  
Inflow = 0.77 cfs @ 11.96 hrs, Volume= 1,804 cf  
Outflow = 0.77 cfs @ 11.96 hrs, Volume= 1,804 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.77 cfs @ 11.96 hrs, Volume= 1,804 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 653.44' @ 11.96 hrs

Flood Elev= 656.50'

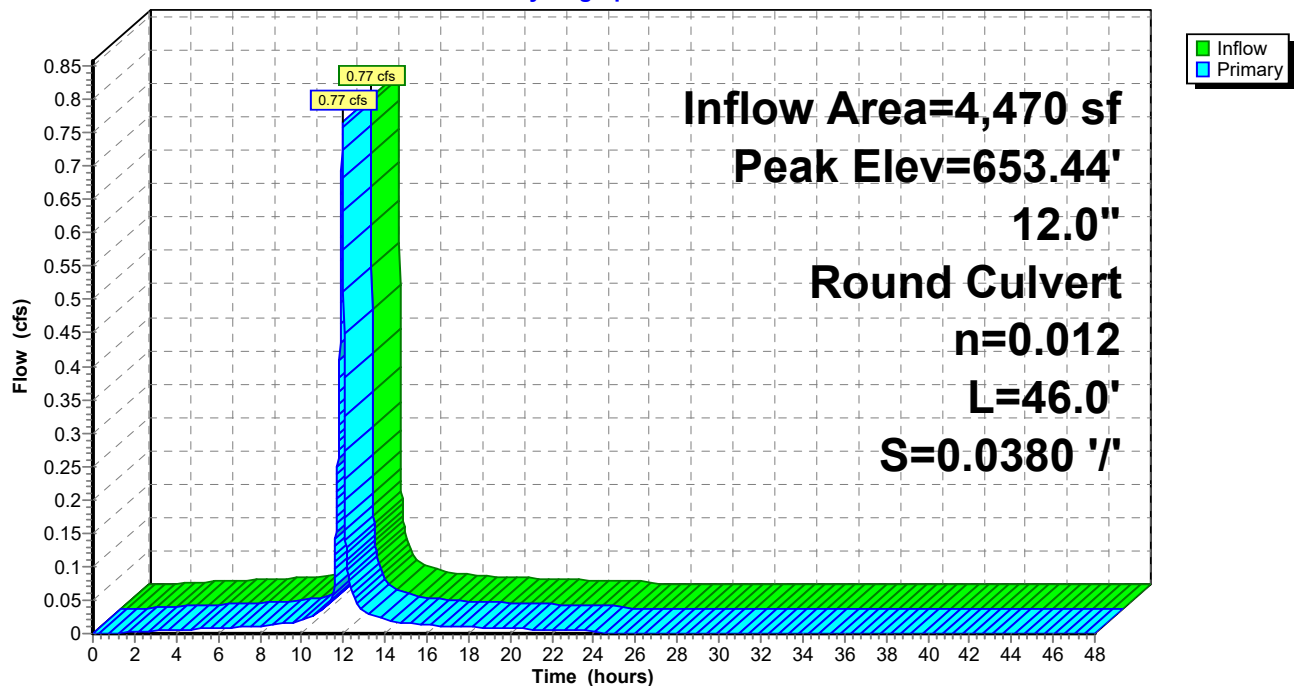
Device	Routing	Invert	Outlet Devices
#1	Primary	653.00'	<b>12.0" Round Culvert</b> L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 653.00' / 651.25' S= 0.0380 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.76 cfs @ 11.96 hrs HW=653.44' (Free Discharge)

↑1=Culvert (Inlet Controls 0.76 cfs @ 2.27 fps)

## Pond 81P: YD 1

Hydrograph



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## Summary for Pond 82P: YD 2

Inflow Area = 4,470 sf, 100.00% Impervious, Inflow Depth = 4.84" for 10-yr event  
Inflow = 0.77 cfs @ 11.96 hrs, Volume= 1,804 cf  
Outflow = 0.77 cfs @ 11.96 hrs, Volume= 1,804 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.77 cfs @ 11.96 hrs, Volume= 1,804 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 653.44' @ 11.96 hrs

Flood Elev= 656.50'

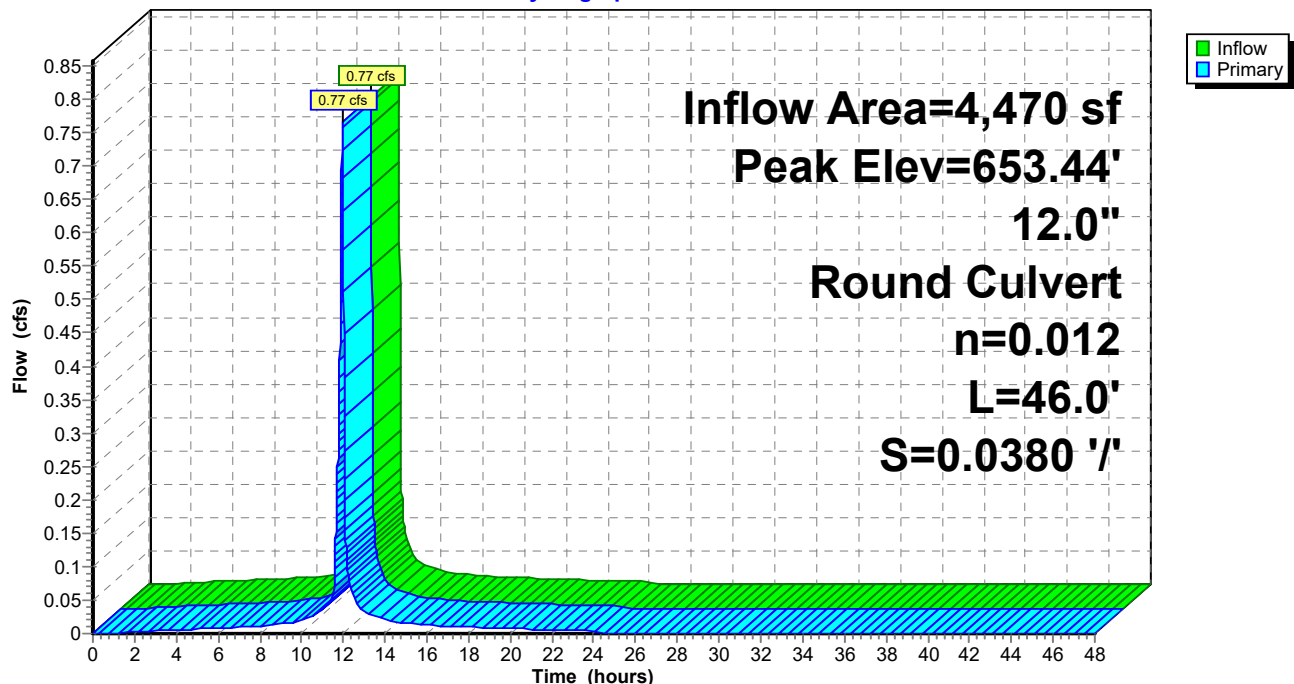
Device	Routing	Invert	Outlet Devices
#1	Primary	653.00'	<b>12.0" Round Culvert</b> L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 653.00' / 651.25' S= 0.0380 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.76 cfs @ 11.96 hrs HW=653.44' (Free Discharge)

↑1=Culvert (Inlet Controls 0.76 cfs @ 2.27 fps)

## Pond 82P: YD 2

Hydrograph



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## Summary for Pond 83P: YD 3

[79] Warning: Submerged Pond 81P Primary device # 1 OUTLET by 1.08'

[79] Warning: Submerged Pond 82P Primary device # 1 OUTLET by 1.08'

Inflow Area = 20,730 sf, 49.98% Impervious, Inflow Depth = 3.62" for 10-yr event  
Inflow = 2.87 cfs @ 11.96 hrs, Volume= 6,251 cf  
Outflow = 2.87 cfs @ 11.96 hrs, Volume= 6,251 cf, Atten= 0%, Lag= 0.0 min  
Primary = 2.87 cfs @ 11.96 hrs, Volume= 6,251 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 652.33' @ 11.96 hrs

Flood Elev= 654.75'

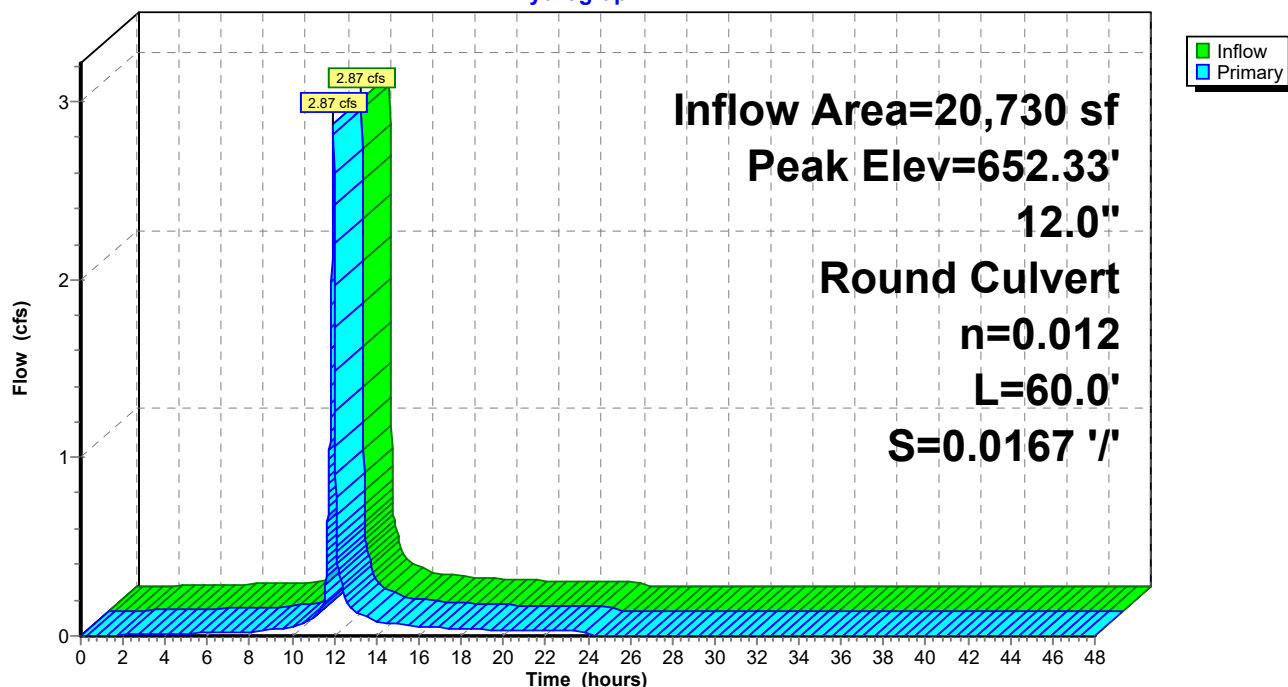
Device	Routing	Invert	Outlet Devices
#1	Primary	651.25'	<b>12.0" Round Culvert</b> L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 651.25' / 650.25' S= 0.0167 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.87 cfs @ 11.96 hrs HW=652.33' (Free Discharge)

↑1=Culvert (Inlet Controls 2.87 cfs @ 3.66 fps)

## Pond 83P: YD 3

Hydrograph



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Type II 24-hr 10-yr Rainfall=5.08"

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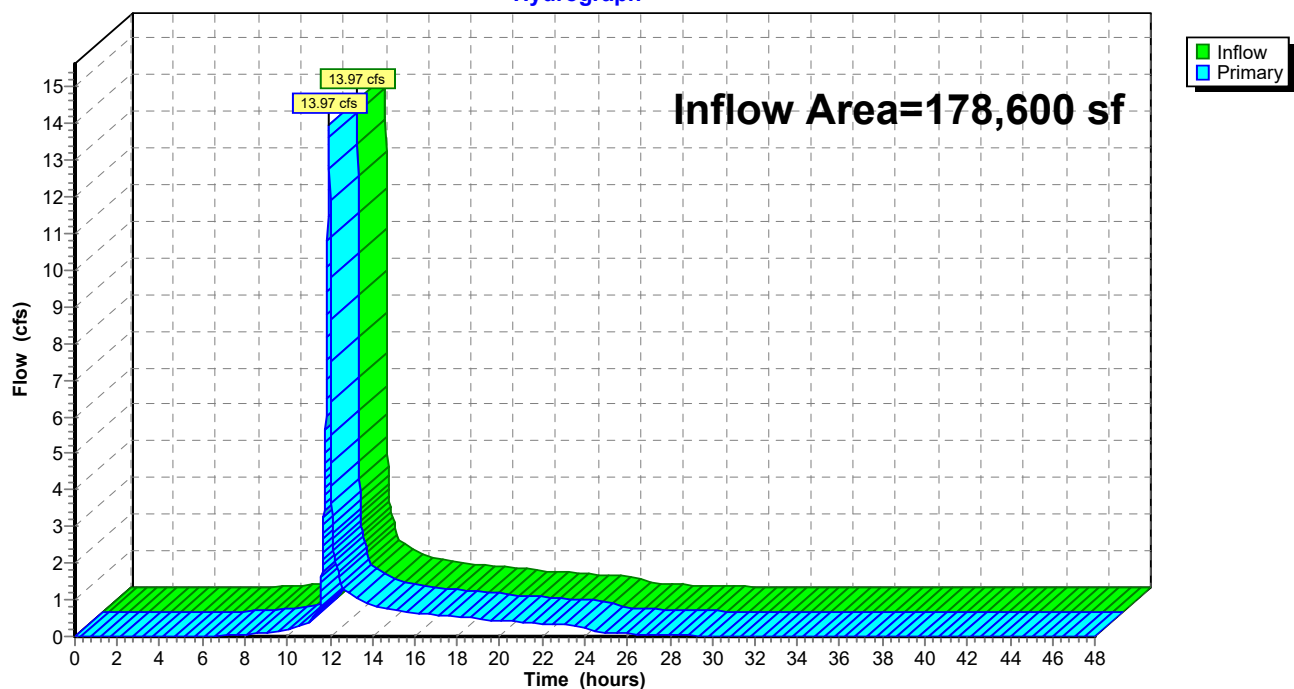
### Summary for Link 10L: Center Road

Inflow Area = 178,600 sf, 37.73% Impervious, Inflow Depth = 2.96" for 10-yr event  
Inflow = 13.97 cfs @ 11.96 hrs, Volume= 44,045 cf  
Primary = 13.97 cfs @ 11.96 hrs, Volume= 44,045 cf, Atten= 0%, Lag= 0.0 min

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

### Link 10L: Center Road

Hydrograph



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

<b>Subcatchment10S: Proposed to Center</b>	Runoff Area=83,930 sf 43.63% Impervious Runoff Depth=4.38" Tc=5.0 min CN=84 Runoff=14.93 cfs 30,663 cf
<b>Subcatchment11S: Proposed to CB 1</b>	Runoff Area=7,750 sf 41.81% Impervious Runoff Depth=4.38" Tc=5.0 min CN=84 Runoff=1.38 cfs 2,831 cf
<b>Subcatchment12S: Proposed to CB 2</b>	Runoff Area=4,140 sf 22.46% Impervious Runoff Depth=3.86" Tc=5.0 min CN=79 Runoff=0.66 cfs 1,331 cf
<b>Subcatchment13S: Proposed to CB 3</b>	Runoff Area=930 sf 100.00% Impervious Runoff Depth=5.96" Tc=5.0 min CN=98 Runoff=0.19 cfs 462 cf
<b>Subcatchment14S: Proposed to CB 4</b>	Runoff Area=2,000 sf 34.50% Impervious Runoff Depth=4.17" Tc=5.0 min CN=82 Runoff=0.34 cfs 695 cf
<b>Subcatchment15S: Proposed to CB 5</b>	Runoff Area=660 sf 100.00% Impervious Runoff Depth=5.96" Tc=5.0 min CN=98 Runoff=0.14 cfs 328 cf
<b>Subcatchment16S: Proposed to CB 6</b>	Runoff Area=5,850 sf 56.41% Impervious Runoff Depth=4.82" Tc=5.0 min CN=88 Runoff=1.11 cfs 2,349 cf
<b>Subcatchment17S: Proposed to CB 7</b>	Runoff Area=2,950 sf 74.92% Impervious Runoff Depth=5.27" Tc=5.0 min CN=92 Runoff=0.59 cfs 1,295 cf
<b>Subcatchment18S: Proposed to CB 8</b>	Runoff Area=3,330 sf 75.98% Impervious Runoff Depth=5.27" Tc=5.0 min CN=92 Runoff=0.67 cfs 1,461 cf
<b>Subcatchment19S: Proposed to CB 9</b>	Runoff Area=11,800 sf 50.17% Impervious Runoff Depth=4.60" Tc=5.0 min CN=86 Runoff=2.17 cfs 4,523 cf
<b>Subcatchment20S: Proposed to Northern</b>	Runoff Area=56,570 sf 79.49% Impervious Runoff Depth=5.38" Tc=5.0 min CN=93 Runoff=11.45 cfs 25,363 cf
<b>Subcatchment30S: Proposed to West</b>	Runoff Area=230,400 sf 0.36% Impervious Runoff Depth=3.06" Flow Length=530' Tc=20.1 min CN=71 Runoff=17.94 cfs 58,766 cf
<b>Subcatchment40S: Proposed to South</b>	Runoff Area=19,030 sf 0.00% Impervious Runoff Depth=3.16" Flow Length=255' Tc=16.0 min CN=72 Runoff=1.73 cfs 5,007 cf
<b>Subcatchment50S: Proposed to WQB</b>	Runoff Area=34,530 sf 0.00% Impervious Runoff Depth=3.35" Tc=5.0 min CN=74 Runoff=4.90 cfs 9,651 cf
<b>Subcatchment81S: Proposed to YD 1</b>	Runoff Area=4,470 sf 100.00% Impervious Runoff Depth=5.96" Tc=5.0 min CN=98 Runoff=0.94 cfs 2,221 cf
<b>Subcatchment82S: Proposed to YD 2</b>	Runoff Area=4,470 sf 100.00% Impervious Runoff Depth=5.96" Tc=5.0 min CN=98 Runoff=0.94 cfs 2,221 cf



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<b>Subcatchment83S: Proposed to YD 3</b>	Runoff Area=11,790 sf 12.04% Impervious Runoff Depth=3.65" Tc=5.0 min CN=77 Runoff=1.81 cfs 3,590 cf
<b>Pond 11P: CB 1</b>	Peak Elev=637.09' Inflow=1.38 cfs 2,831 cf 12.0" Round Culvert n=0.012 L=3.0' S=0.0333 ' ' Outflow=1.38 cfs 2,831 cf
<b>Pond 12P: CB 2</b>	Peak Elev=639.41' Inflow=0.66 cfs 1,331 cf 12.0" Round Culvert n=0.012 L=15.0' S=0.0200 ' ' Outflow=0.66 cfs 1,331 cf
<b>Pond 13P: CB 3</b>	Peak Elev=639.32' Inflow=0.19 cfs 462 cf 12.0" Round Culvert n=0.012 L=3.0' S=0.0333 ' ' Outflow=0.19 cfs 462 cf
<b>Pond 14P: CB 4</b>	Peak Elev=643.79' Inflow=0.34 cfs 695 cf 12.0" Round Culvert n=0.012 L=15.0' S=0.0200 ' ' Outflow=0.34 cfs 695 cf
<b>Pond 15P: CB 5</b>	Peak Elev=643.68' Inflow=0.14 cfs 328 cf 12.0" Round Culvert n=0.012 L=3.0' S=0.0333 ' ' Outflow=0.14 cfs 328 cf
<b>Pond 16P: CB 6</b>	Peak Elev=650.61' Inflow=1.11 cfs 2,349 cf 12.0" Round Culvert n=0.012 L=15.0' S=0.0100 ' ' Outflow=1.11 cfs 2,349 cf
<b>Pond 17P: CB 7</b>	Peak Elev=647.89' Inflow=0.59 cfs 1,295 cf 12.0" Round Culvert n=0.012 L=9.0' S=0.0222 ' ' Outflow=0.59 cfs 1,295 cf
<b>Pond 18P: CB 8</b>	Peak Elev=650.73' Inflow=0.67 cfs 1,461 cf 12.0" Round Culvert n=0.012 L=6.0' S=0.0250 ' ' Outflow=0.67 cfs 1,461 cf
<b>Pond 19P: CB 9</b>	Peak Elev=651.00' Inflow=2.17 cfs 4,523 cf 12.0" Round Culvert n=0.012 L=6.0' S=0.0250 ' ' Outflow=2.17 cfs 4,523 cf
<b>Pond 40P: HDS Unit</b>	Peak Elev=643.96' Inflow=8.22 cfs 17,660 cf 15.0" Round Culvert n=0.012 L=46.0' S=0.0739 ' ' Outflow=8.22 cfs 17,660 cf
<b>Pond 50P: WQB</b>	Peak Elev=640.86' Storage=16,741 cf Inflow=13.12 cfs 27,310 cf Outflow=0.55 cfs 22,917 cf
<b>Pond 61P: DMH 1</b>	Peak Elev=634.53' Inflow=3.13 cfs 28,565 cf 12.0" Round Culvert n=0.012 L=70.0' S=0.0679 ' ' Outflow=3.13 cfs 28,565 cf
<b>Pond 62P: DMH 2</b>	Peak Elev=635.63' Inflow=3.13 cfs 28,565 cf 12.0" Round Culvert n=0.012 L=100.0' S=0.0100 ' ' Outflow=3.13 cfs 28,565 cf
<b>Pond 63P: DMH 3</b>	Peak Elev=636.07' Inflow=1.75 cfs 25,733 cf 12.0" Round Culvert n=0.012 L=77.0' S=0.0104 ' ' Outflow=1.75 cfs 25,733 cf
<b>Pond 64P: DMH 4</b>	Peak Elev=636.68' Inflow=0.90 cfs 23,940 cf 12.0" Round Culvert n=0.012 L=75.0' S=0.0100 ' ' Outflow=0.90 cfs 23,940 cf
<b>Pond 65P: DMH 5</b>	Peak Elev=637.36' Inflow=0.55 cfs 22,917 cf 12.0" Round Culvert n=0.012 L=72.0' S=0.0097 ' ' Outflow=0.55 cfs 22,917 cf

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**Pond 66P: DMH 6**

Peak Elev=647.84' Inflow=1.70 cfs 3,644 cf  
15.0" Round Culvert n=0.012 L=87.0' S=0.0103 '/' Outflow=1.70 cfs 3,644 cf

**Pond 67P: DMH 7**

Peak Elev=646.97' Inflow=2.37 cfs 5,105 cf  
15.0" Round Culvert n=0.012 L=68.0' S=0.0103 '/' Outflow=2.37 cfs 5,105 cf

**Pond 68P: DMH 8**

Peak Elev=646.65' Inflow=4.54 cfs 9,628 cf  
15.0" Round Culvert n=0.012 L=42.0' S=0.0095 '/' Outflow=4.54 cfs 9,628 cf

**Pond 69P: DMH 9**

Peak Elev=644.56' Inflow=8.22 cfs 17,660 cf  
15.0" Round Culvert n=0.012 L=8.0' S=0.0750 '/' Outflow=8.22 cfs 17,660 cf

**Pond 70P: DMH 10**

Peak Elev=649.65' Inflow=3.68 cfs 8,032 cf  
12.0" Round Culvert n=0.012 L=193.0' S=0.0166 '/' Outflow=3.68 cfs 8,032 cf

**Pond 71P: DMH 11**

Peak Elev=651.60' Inflow=3.68 cfs 8,032 cf  
12.0" Round Culvert n=0.012 L=112.0' S=0.0165 '/' Outflow=3.68 cfs 8,032 cf

**Pond 81P: YD 1**

Peak Elev=653.50' Inflow=0.94 cfs 2,221 cf  
12.0" Round Culvert n=0.012 L=46.0' S=0.0380 '/' Outflow=0.94 cfs 2,221 cf

**Pond 82P: YD 2**

Peak Elev=653.50' Inflow=0.94 cfs 2,221 cf  
12.0" Round Culvert n=0.012 L=46.0' S=0.0380 '/' Outflow=0.94 cfs 2,221 cf

**Pond 83P: YD 3**

Peak Elev=652.70' Inflow=3.68 cfs 8,032 cf  
12.0" Round Culvert n=0.012 L=60.0' S=0.0167 '/' Outflow=3.68 cfs 8,032 cf

**Link 10L: Center Road**

Inflow=18.06 cfs 59,227 cf  
Primary=18.06 cfs 59,227 cf

**Total Runoff Area = 484,600 sf Runoff Volume = 152,757 cf Average Runoff Depth = 3.78"**  
**76.64% Pervious = 371,420 sf 23.36% Impervious = 113,180 sf**

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**Summary for Subcatchment 10S: Proposed to Center Road**

Runoff = 14.93 cfs @ 11.96 hrs, Volume= 30,663 cf, Depth= 4.38"

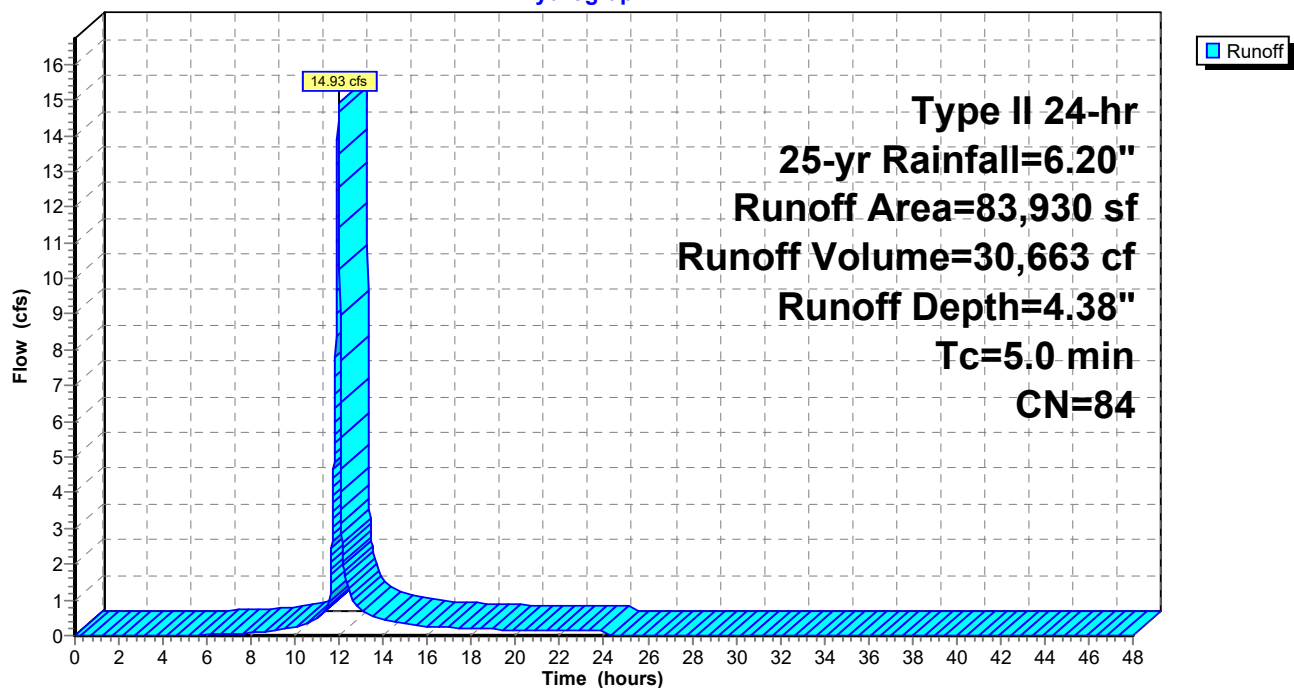
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	36,620	98	Paved
	38,010	74	>75% Grass cover, Good, HSG C
	9,300	70	Woods, Good, HSG C
	83,930	84	Weighted Average
	47,310		56.37% Pervious Area
	36,620		43.63% Impervious Area

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

**Subcatchment 10S: Proposed to Center Road**

Hydrograph



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**Summary for Subcatchment 11S: Proposed to CB 1**

Runoff = 1.38 cfs @ 11.96 hrs, Volume= 2,831 cf, Depth= 4.38"

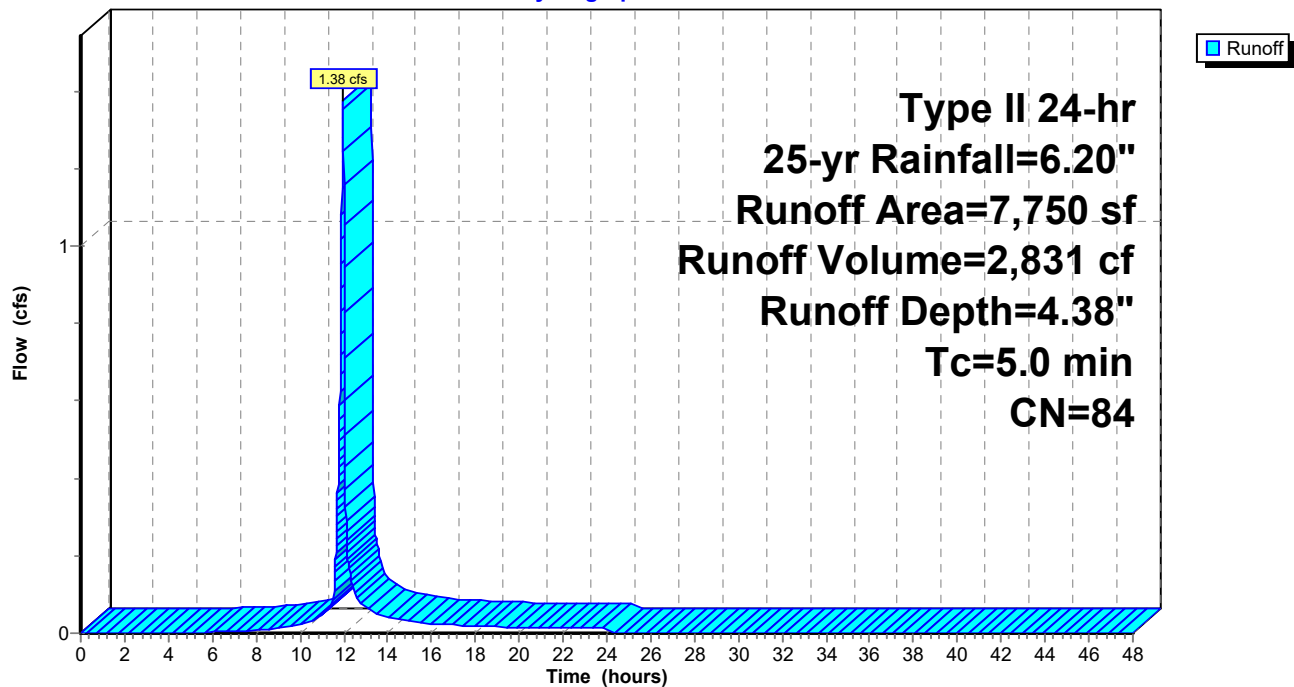
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	3,240	98	Paved
	4,510	74	>75% Grass cover, Good, HSG C
	7,750	84	Weighted Average
	4,510		58.19% Pervious Area
	3,240		41.81% Impervious Area

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

**Subcatchment 11S: Proposed to CB 1**

Hydrograph



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**Summary for Subcatchment 12S: Proposed to CB 2**

Runoff = 0.66 cfs @ 11.96 hrs, Volume= 1,331 cf, Depth= 3.86"

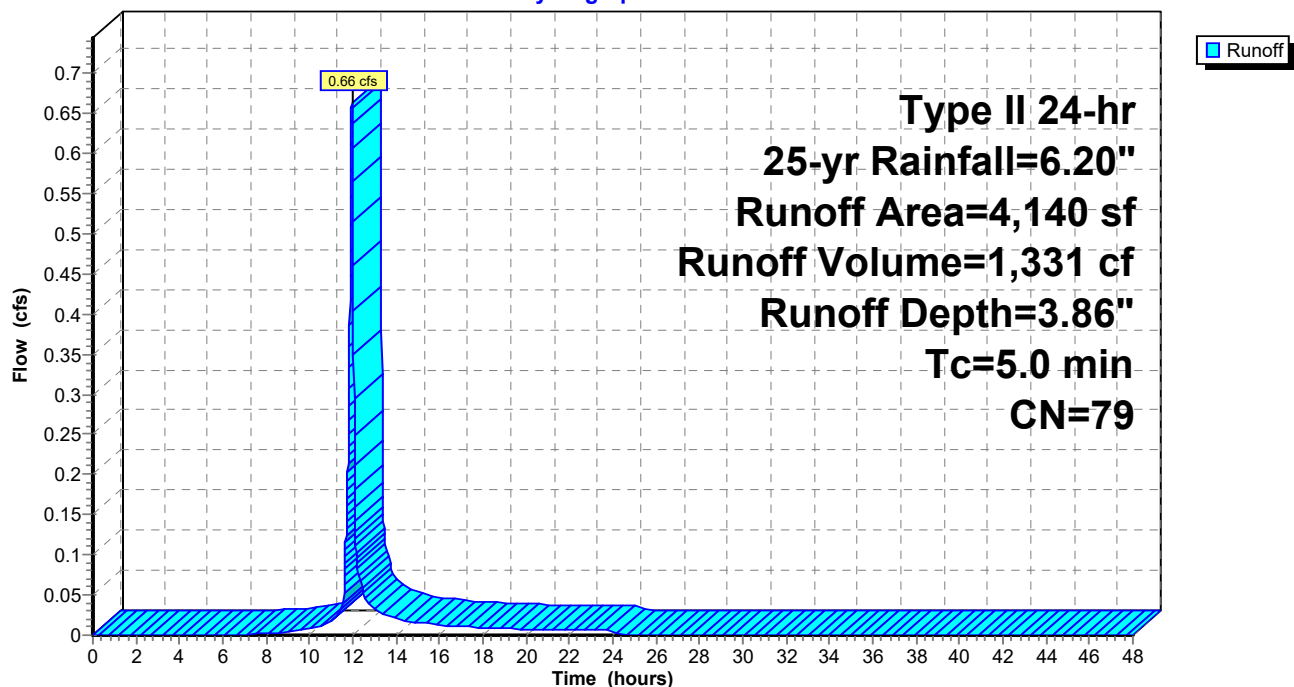
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	930	98	Paved
	3,210	74	>75% Grass cover, Good, HSG C
	4,140	79	Weighted Average
	3,210		77.54% Pervious Area
	930		22.46% Impervious Area

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

**Subcatchment 12S: Proposed to CB 2**

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 13S: Proposed to CB 3**

Runoff = 0.19 cfs @ 11.96 hrs, Volume= 462 cf, Depth= 5.96"

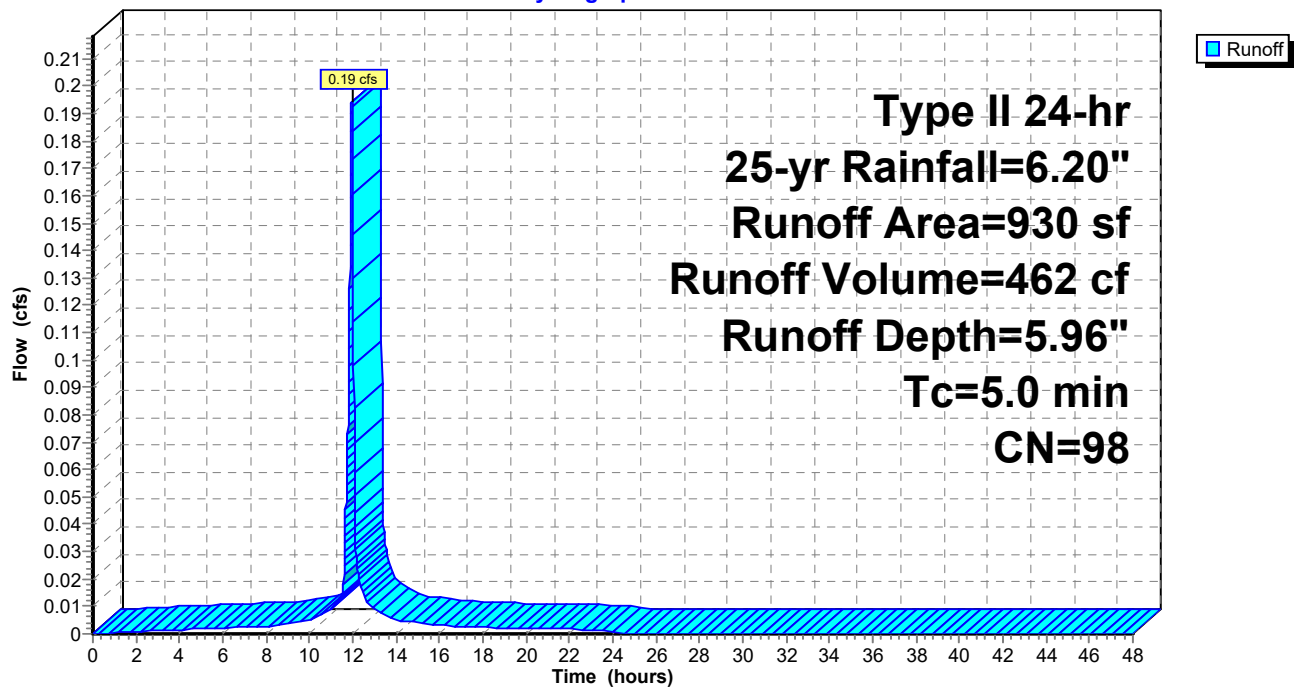
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	930	98	Paved
	930		100.00% Impervious Area

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

**Subcatchment 13S: Proposed to CB 3**

Hydrograph



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**Summary for Subcatchment 14S: Proposed to CB 4**

Runoff = 0.34 cfs @ 11.96 hrs, Volume= 695 cf, Depth= 4.17"

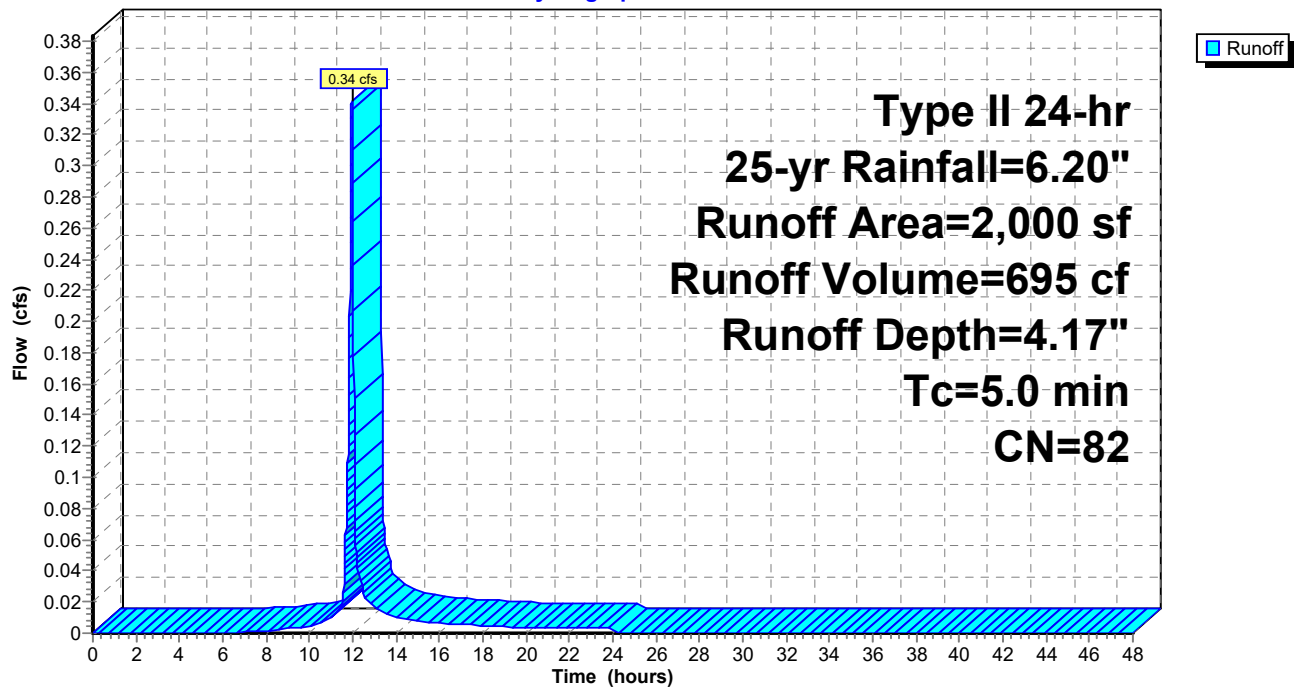
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	690	98	Paved
	1,310	74	>75% Grass cover, Good, HSG C
	2,000	82	Weighted Average
	1,310		65.50% Pervious Area
	690		34.50% Impervious Area

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

**Subcatchment 14S: Proposed to CB 4**

Hydrograph



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**Summary for Subcatchment 15S: Proposed to CB 5**

Runoff = 0.14 cfs @ 11.96 hrs, Volume= 328 cf, Depth= 5.96"

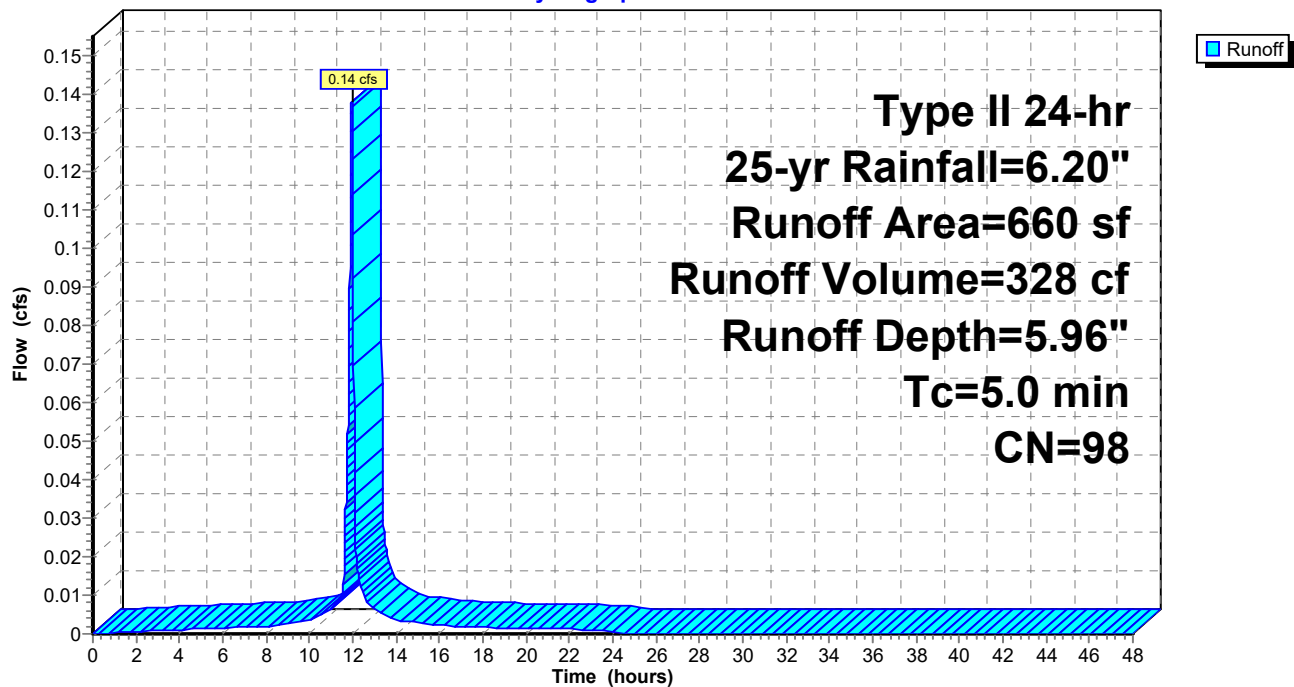
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	660	98	Paved
	660		100.00% Impervious Area

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

**Subcatchment 15S: Proposed to CB 5**

Hydrograph





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**Summary for Subcatchment 16S: Proposed to CB 6**

Runoff = 1.11 cfs @ 11.96 hrs, Volume= 2,349 cf, Depth= 4.82"

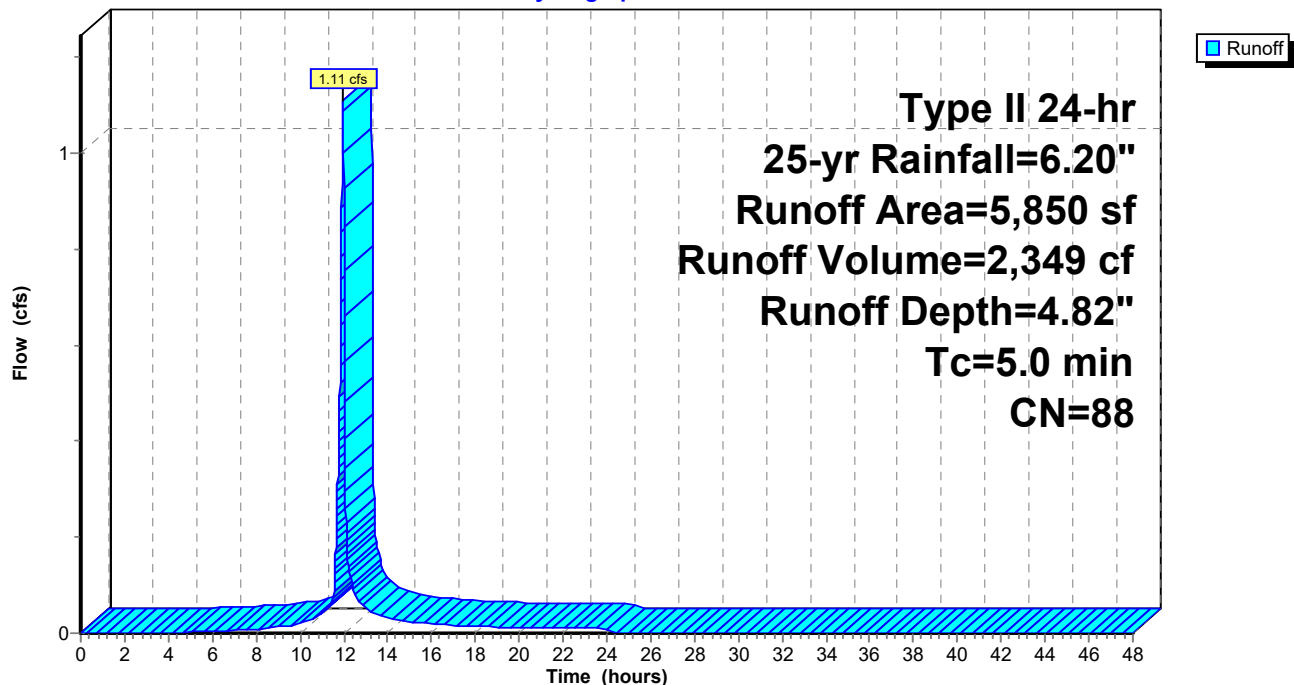
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	3,300	98	Paved
	2,550	74	>75% Grass cover, Good, HSG C
	5,850	88	Weighted Average
	2,550		43.59% Pervious Area
	3,300		56.41% Impervious Area

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

**Subcatchment 16S: Proposed to CB 6**

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 17S: Proposed to CB 7**

Runoff = 0.59 cfs @ 11.96 hrs, Volume= 1,295 cf, Depth= 5.27"

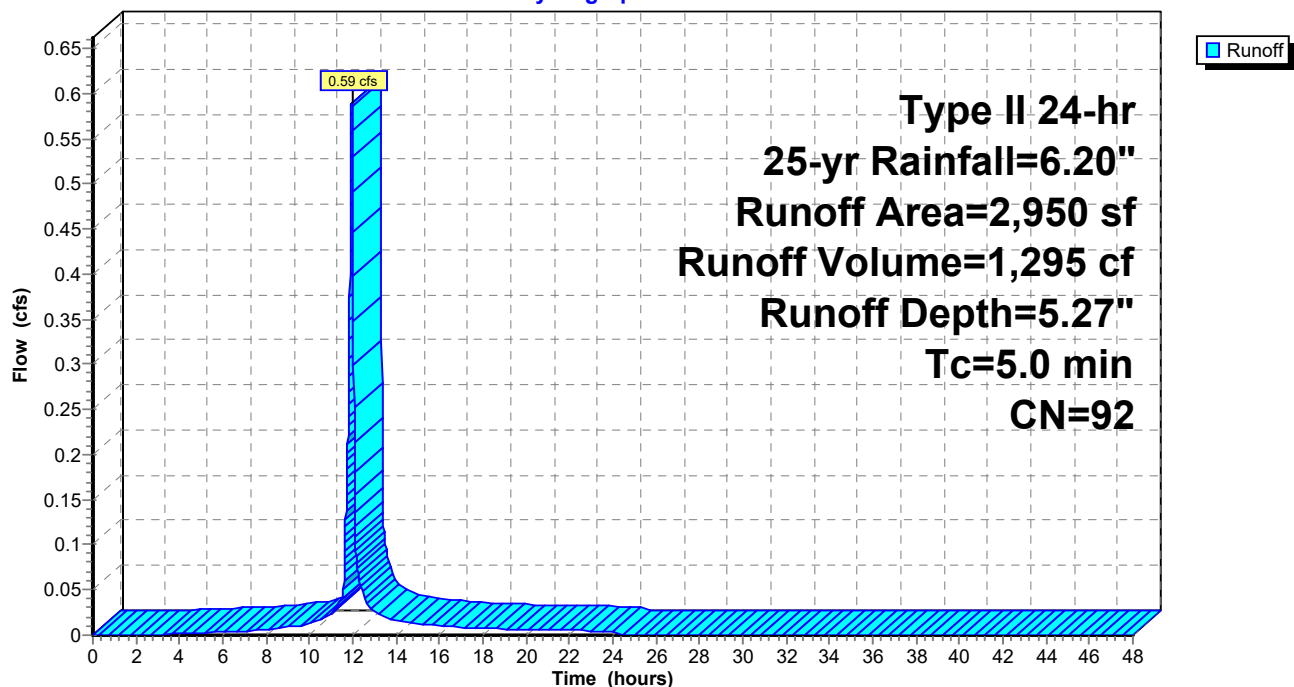
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	2,210	98	Paved
	740	74	>75% Grass cover, Good, HSG C
	2,950	92	Weighted Average
	740		25.08% Pervious Area
	2,210		74.92% Impervious Area

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

**Subcatchment 17S: Proposed to CB 7**

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 18S: Proposed to CB 8**

Runoff = 0.67 cfs @ 11.96 hrs, Volume= 1,461 cf, Depth= 5.27"

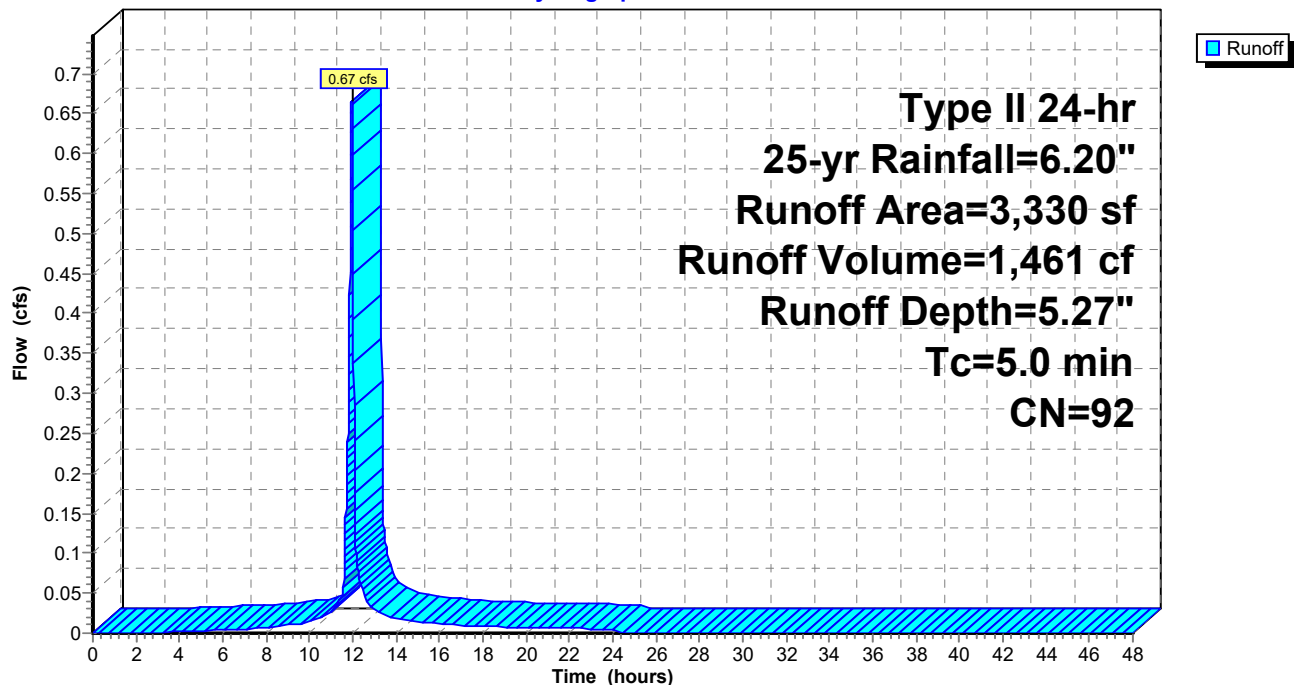
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	2,530	98	Paved
	800	74	>75% Grass cover, Good, HSG C
	3,330	92	Weighted Average
	800		24.02% Pervious Area
	2,530		75.98% Impervious Area

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

**Subcatchment 18S: Proposed to CB 8**

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 19S: Proposed to CB 9**

Runoff = 2.17 cfs @ 11.96 hrs, Volume= 4,523 cf, Depth= 4.60"

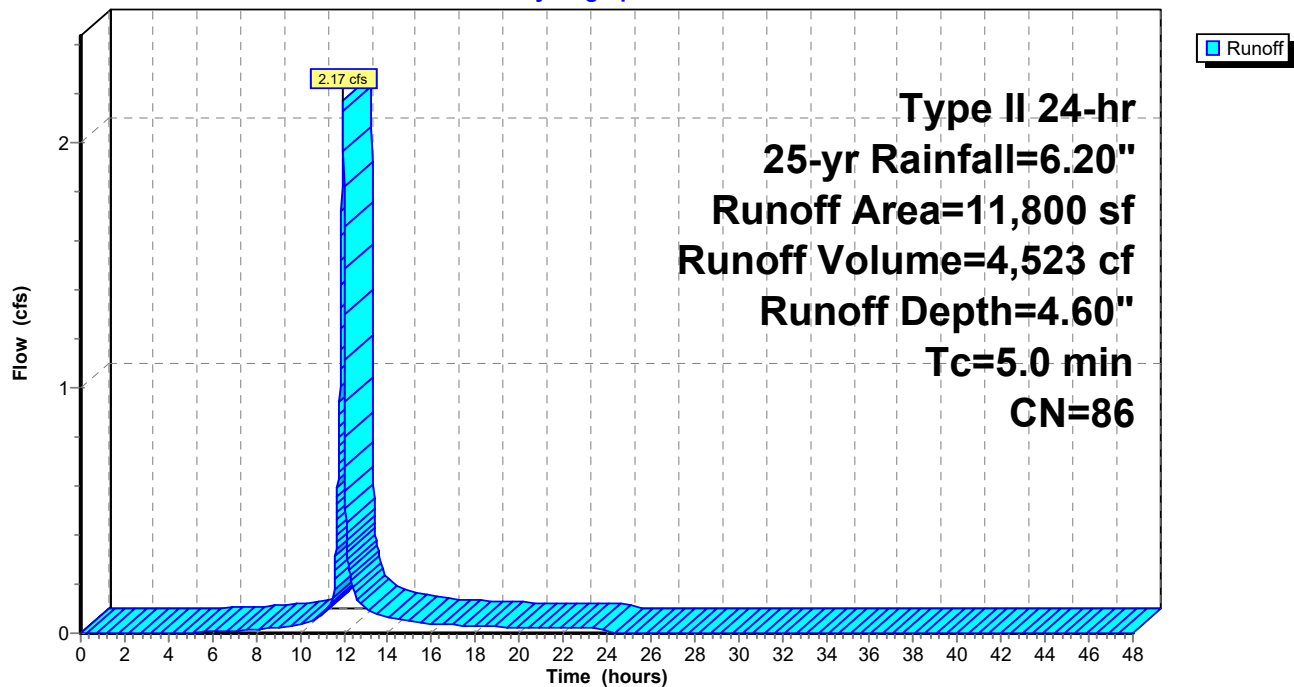
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	5,920	98	Paved
	5,880	74	>75% Grass cover, Good, HSG C
	11,800	86	Weighted Average
	5,880		49.83% Pervious Area
	5,920		50.17% Impervious Area

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

**Subcatchment 19S: Proposed to CB 9**

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 20S: Proposed to Northern Detention Basin**

Runoff = 11.45 cfs @ 11.96 hrs, Volume= 25,363 cf, Depth= 5.38"

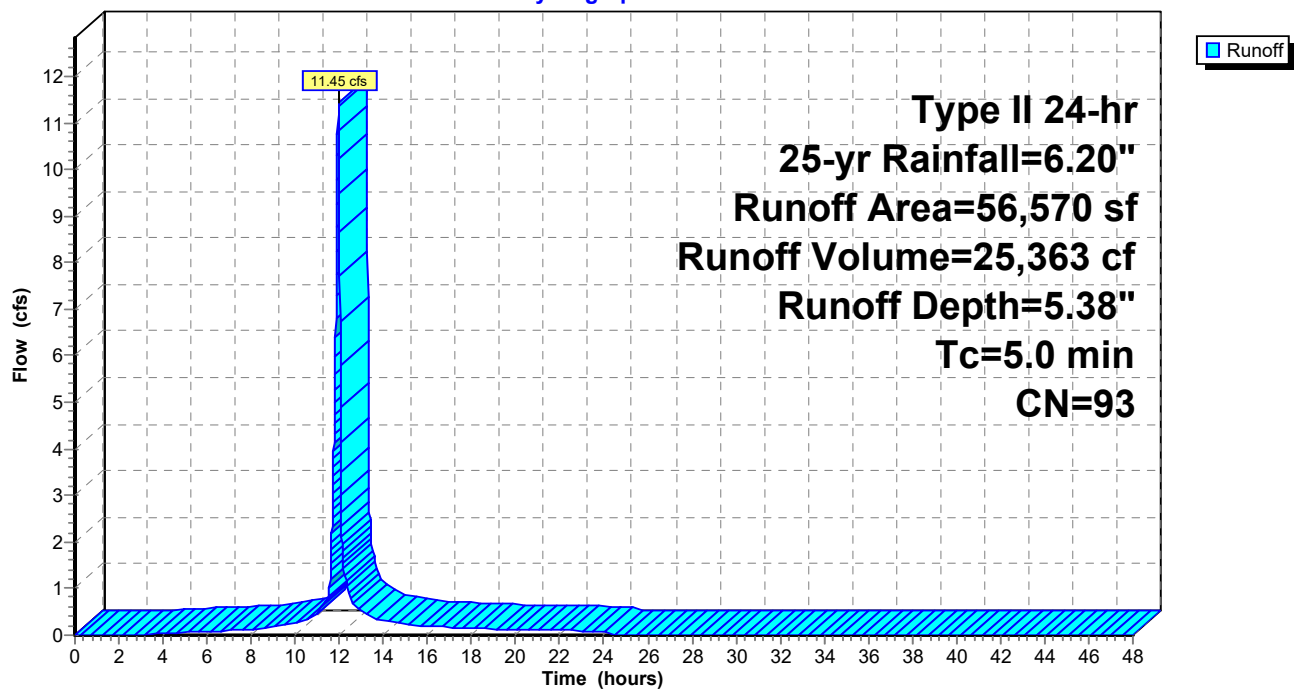
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	44,970	98	Paved
	11,600	74	>75% Grass cover, Good, HSG C
	56,570	93	Weighted Average
	11,600		20.51% Pervious Area
	44,970		79.49% Impervious Area

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

**Subcatchment 20S: Proposed to Northern Detention Basin**

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 30S: Proposed to West**

Runoff = 17.94 cfs @ 12.13 hrs, Volume= 58,766 cf, Depth= 3.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

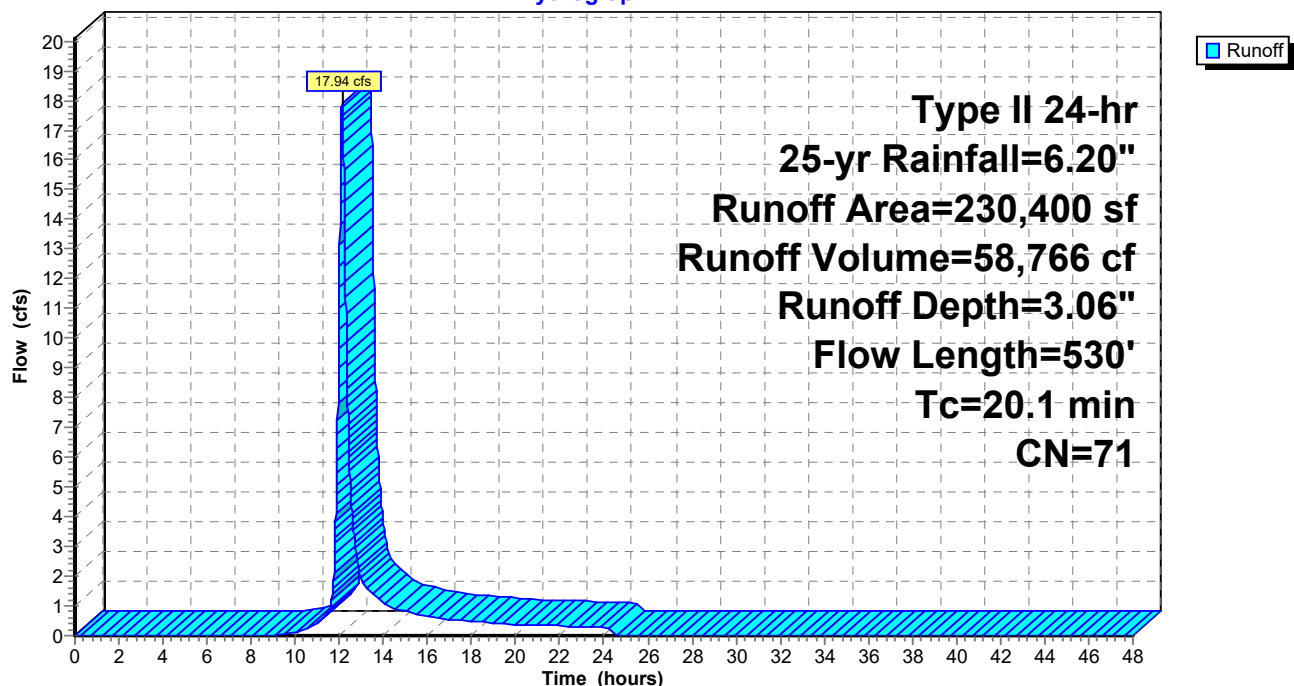
	Area (sf)	CN	Description
*	820	98	Paved
	71,890	74	>75% Grass cover, Good, HSG C
	157,690	70	Woods, Good, HSG C
	230,400	71	Weighted Average
	229,580		99.64% Pervious Area
	820		0.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
5.6	165	0.0050	0.49		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
2.1	290	0.1070	2.29		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
20.1	530	Total			

**Subcatchment 30S: Proposed to West**

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 40S: Proposed to South**

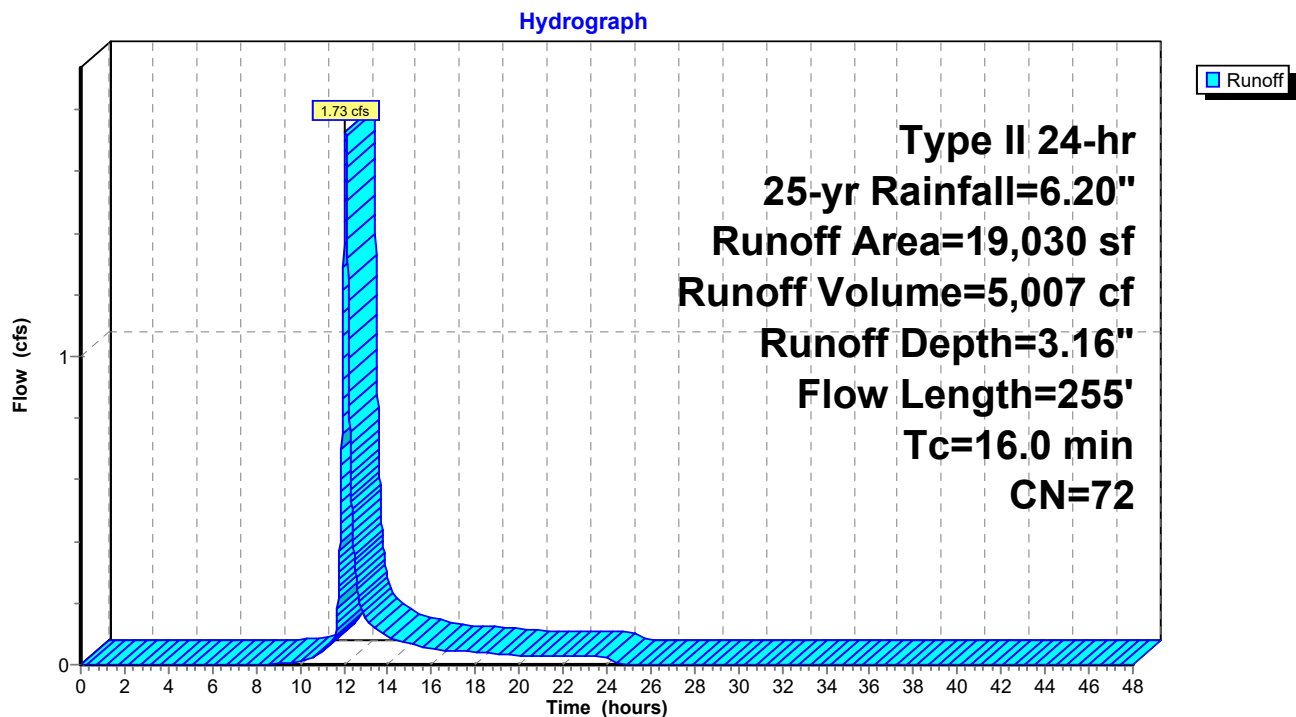
Runoff = 1.73 cfs @ 12.08 hrs, Volume= 5,007 cf, Depth= 3.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

Area (sf)	CN	Description
10,460	74	>75% Grass cover, Good, HSG C
8,570	70	Woods, Good, HSG C
19,030	72	Weighted Average
19,030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
2.4	100	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.2	80	0.0250	1.11		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
16.0	255	Total			

**Subcatchment 40S: Proposed to South**

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Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 50S: Proposed to WQB**

Runoff = 4.90 cfs @ 11.96 hrs, Volume= 9,651 cf, Depth= 3.35"

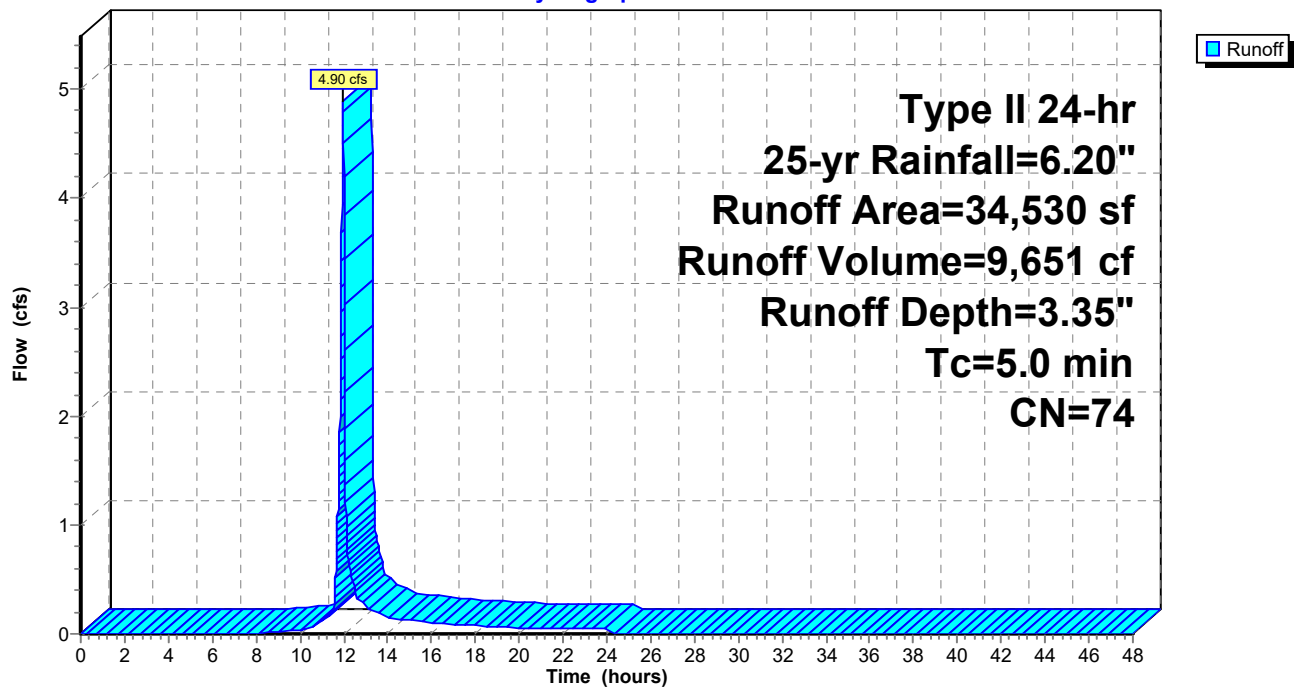
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

Area (sf)	CN	Description
34,530	74	>75% Grass cover, Good, HSG C
34,530		100.00% Pervious Area

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

**Subcatchment 50S: Proposed to WQB**

Hydrograph





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Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 81S: Proposed to YD 1**

Runoff = 0.94 cfs @ 11.96 hrs, Volume= 2,221 cf, Depth= 5.96"

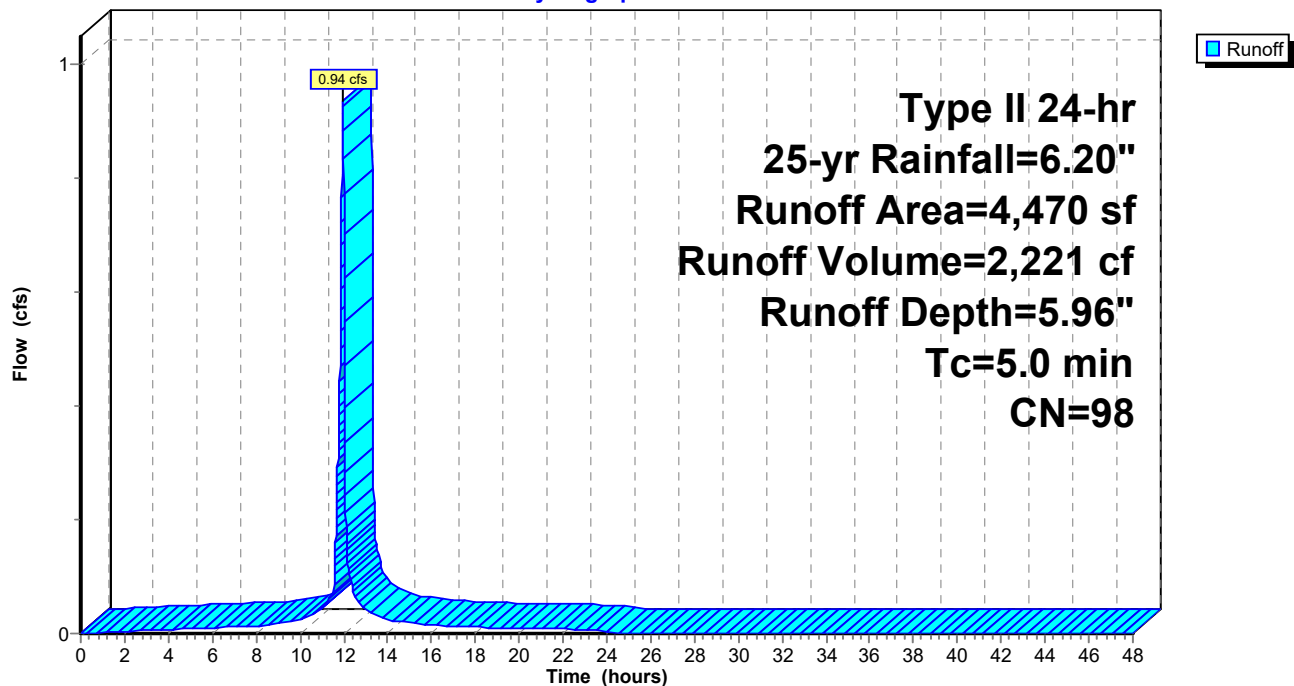
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	3,200	98	Roof
*	1,270	98	Paved
	4,470	98	Weighted Average
	4,470		100.00% Impervious Area

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

**Subcatchment 81S: Proposed to YD 1**

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 82S: Proposed to YD 2**

Runoff = 0.94 cfs @ 11.96 hrs, Volume= 2,221 cf, Depth= 5.96"

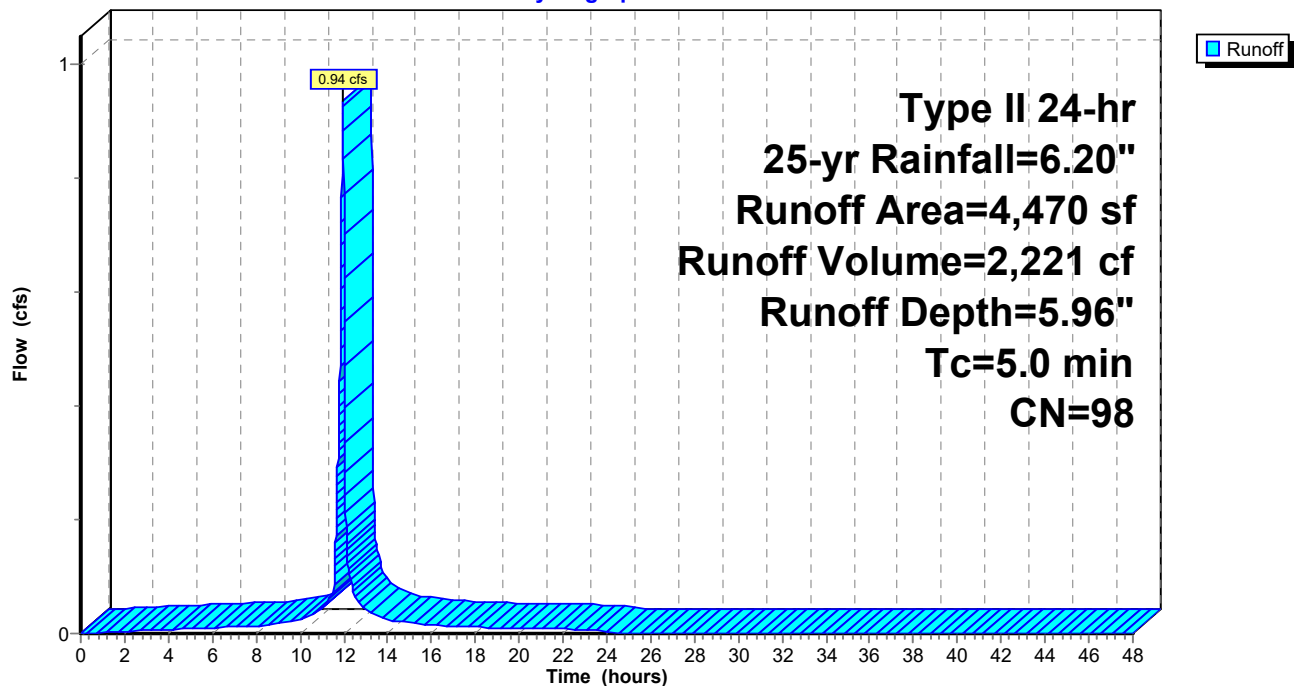
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	3,200	98	Roof
*	1,270	98	Paved
	4,470	98	Weighted Average
	4,470		100.00% Impervious Area

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

**Subcatchment 82S: Proposed to YD 2**

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Subcatchment 83S: Proposed to YD 3**

Runoff = 1.81 cfs @ 11.96 hrs, Volume= 3,590 cf, Depth= 3.65"

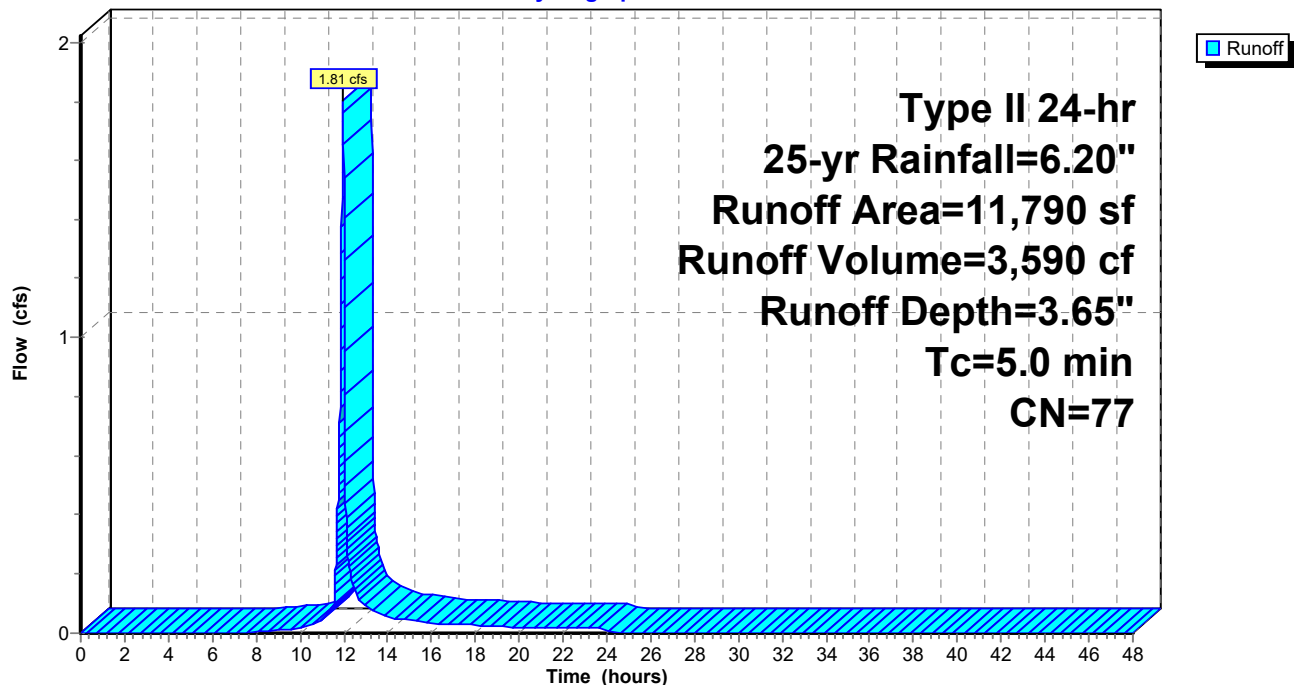
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 25-yr Rainfall=6.20"

	Area (sf)	CN	Description
*	1,420	98	Paved
	10,370	74	>75% Grass cover, Good, HSG C
	11,790	77	Weighted Average
	10,370		87.96% Pervious Area
	1,420		12.04% Impervious Area

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

**Subcatchment 83S: Proposed to YD 3**

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Pond 11P: CB 1**

Inflow Area = 7,750 sf, 41.81% Impervious, Inflow Depth = 4.38" for 25-yr event  
Inflow = 1.38 cfs @ 11.96 hrs, Volume= 2,831 cf  
Outflow = 1.38 cfs @ 11.96 hrs, Volume= 2,831 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.38 cfs @ 11.96 hrs, Volume= 2,831 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 637.09' @ 11.96 hrs

Flood Elev= 639.90'

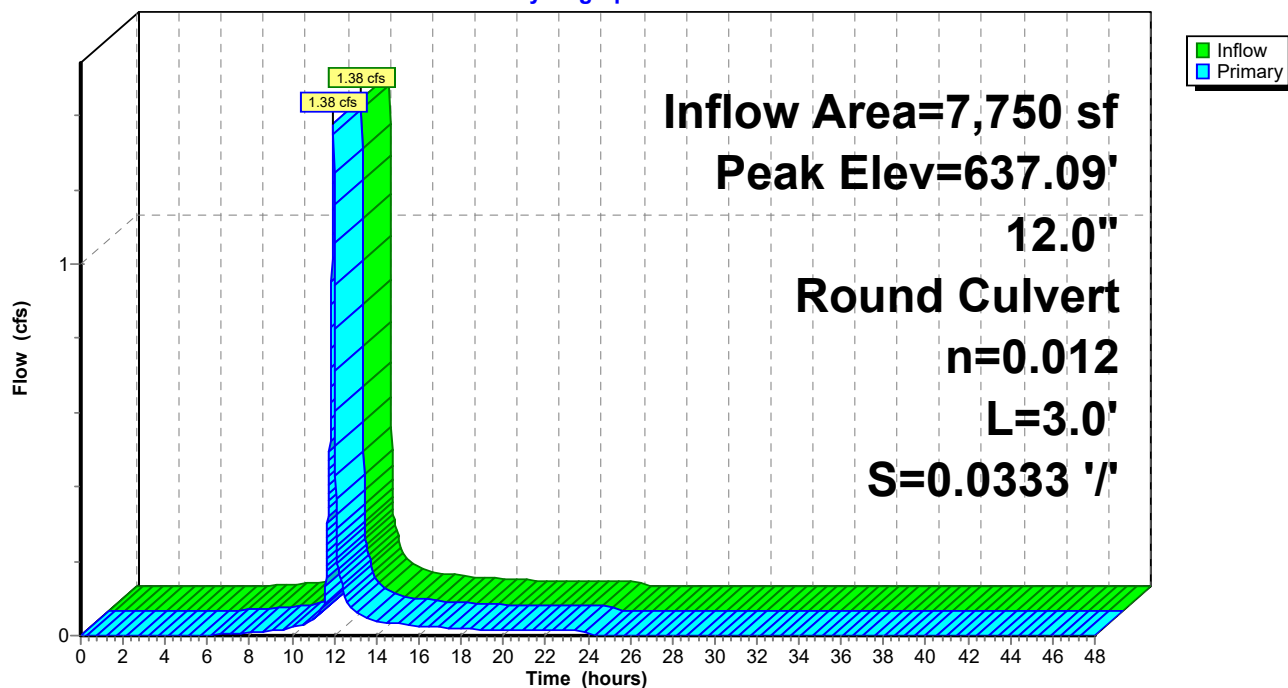
Device	Routing	Invert	Outlet Devices
#1	Primary	636.40'	<b>12.0" Round Culvert</b> L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 636.40' / 636.30' S= 0.0333 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.38 cfs @ 11.96 hrs HW=637.09' (Free Discharge)

↑1=Culvert (Barrel Controls 1.38 cfs @ 3.34 fps)

**Pond 11P: CB 1**

Hydrograph



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## Summary for Pond 12P: CB 2

Inflow Area = 4,140 sf, 22.46% Impervious, Inflow Depth = 3.86" for 25-yr event  
Inflow = 0.66 cfs @ 11.96 hrs, Volume= 1,331 cf  
Outflow = 0.66 cfs @ 11.96 hrs, Volume= 1,331 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.66 cfs @ 11.96 hrs, Volume= 1,331 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 639.41' @ 11.96 hrs

Flood Elev= 642.50'

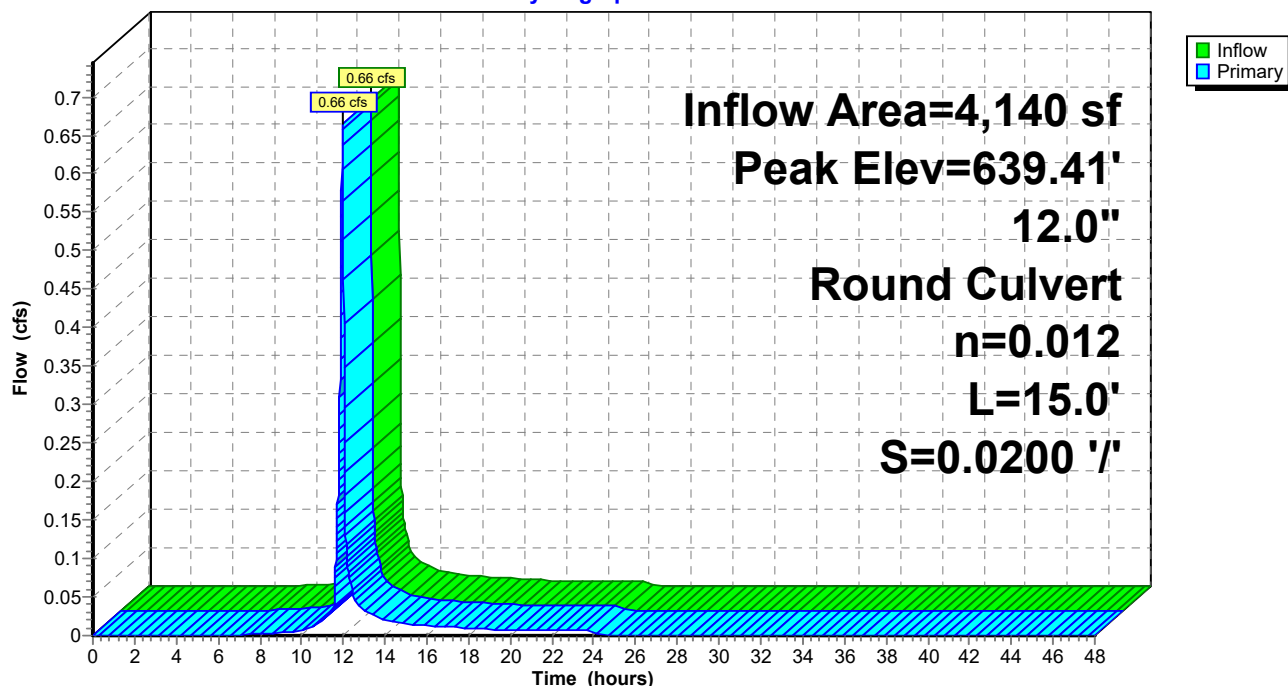
Device	Routing	Invert	Outlet Devices
#1	Primary	639.00'	<b>12.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 639.00' / 638.70' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.66 cfs @ 11.96 hrs HW=639.41' (Free Discharge)

↑1=Culvert (Inlet Controls 0.66 cfs @ 2.18 fps)

## Pond 12P: CB 2

Hydrograph



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## Summary for Pond 13P: CB 3

Inflow Area = 930 sf, 100.00% Impervious, Inflow Depth = 5.96" for 25-yr event  
Inflow = 0.19 cfs @ 11.96 hrs, Volume= 462 cf  
Outflow = 0.19 cfs @ 11.96 hrs, Volume= 462 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.19 cfs @ 11.96 hrs, Volume= 462 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 639.32' @ 11.96 hrs

Flood Elev= 642.60'

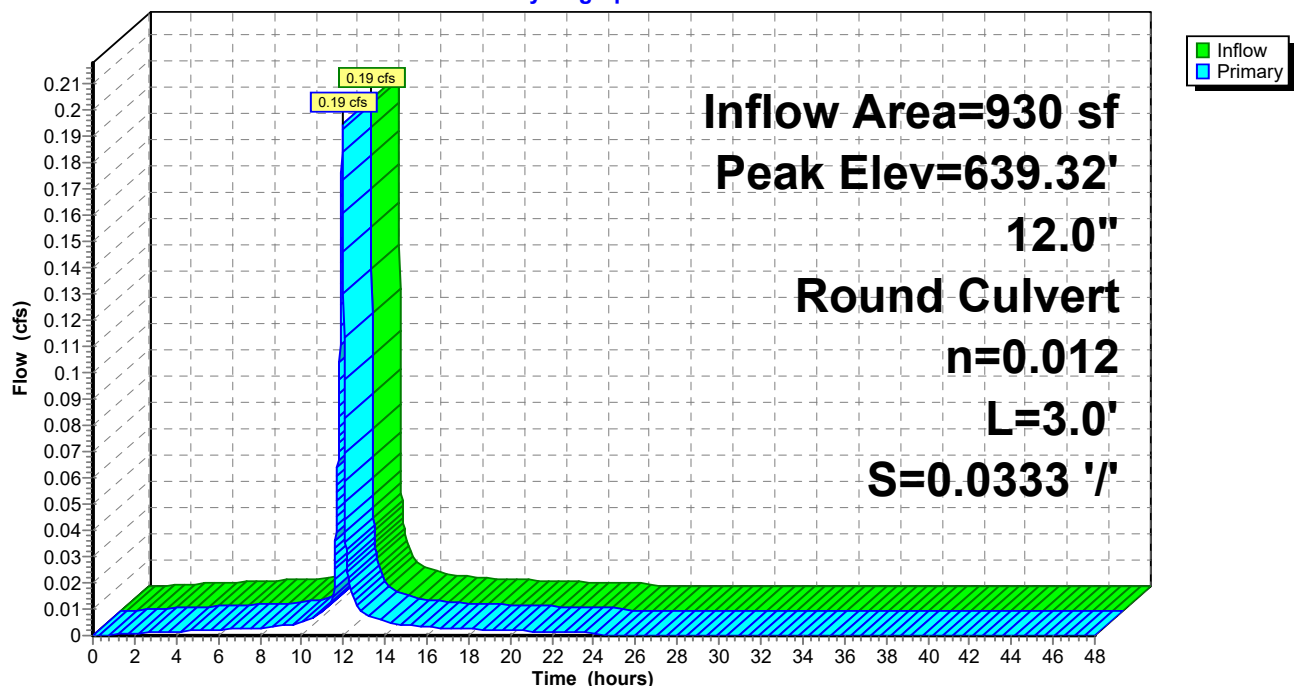
Device	Routing	Invert	Outlet Devices
#1	Primary	639.10'	<b>12.0" Round Culvert</b> L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 639.10' / 639.00' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.19 cfs @ 11.96 hrs HW=639.32' (Free Discharge)

↑1=Culvert (Barrel Controls 0.19 cfs @ 2.36 fps)

## Pond 13P: CB 3

Hydrograph



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## Summary for Pond 14P: CB 4

Inflow Area = 2,000 sf, 34.50% Impervious, Inflow Depth = 4.17" for 25-yr event  
Inflow = 0.34 cfs @ 11.96 hrs, Volume= 695 cf  
Outflow = 0.34 cfs @ 11.96 hrs, Volume= 695 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.34 cfs @ 11.96 hrs, Volume= 695 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 643.79' @ 11.96 hrs

Flood Elev= 647.00'

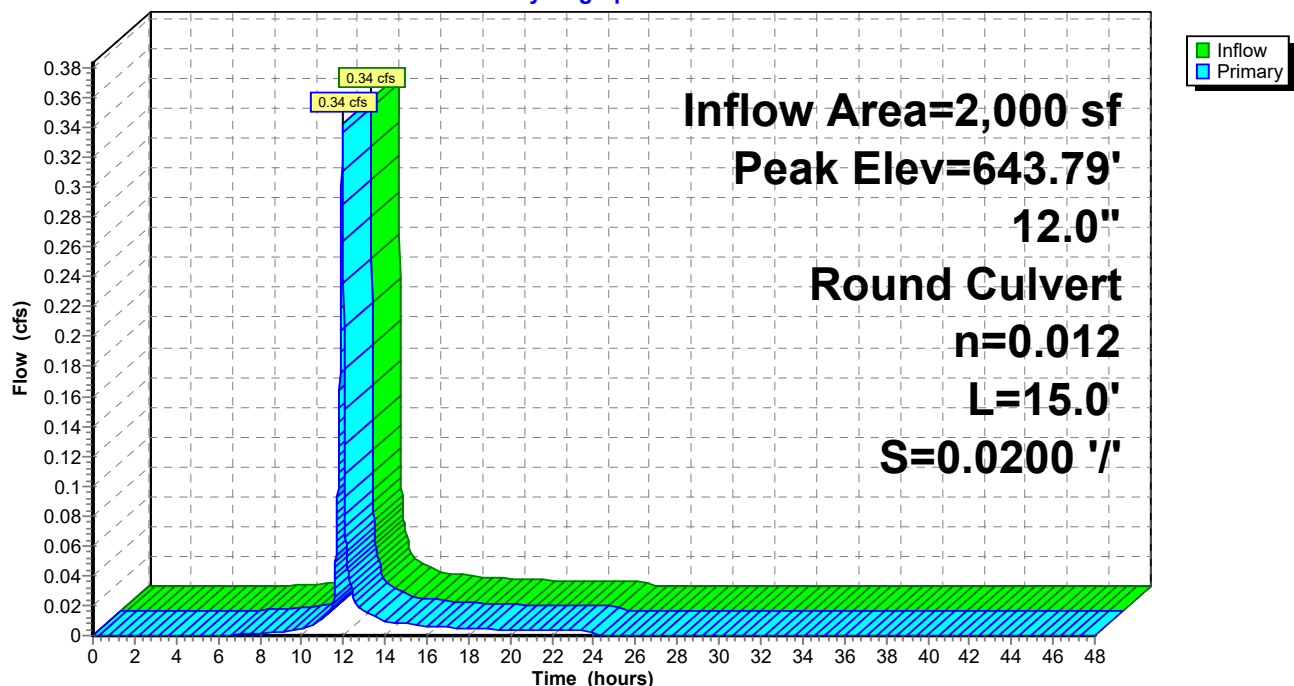
Device	Routing	Invert	Outlet Devices
#1	Primary	643.50'	<b>12.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 643.50' / 643.20' S= 0.0200 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.34 cfs @ 11.96 hrs HW=643.79' (Free Discharge)

↑1=Culvert (Inlet Controls 0.34 cfs @ 1.83 fps)

## Pond 14P: CB 4

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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## Summary for Pond 15P: CB 5

Inflow Area = 660 sf, 100.00% Impervious, Inflow Depth = 5.96" for 25-yr event  
Inflow = 0.14 cfs @ 11.96 hrs, Volume= 328 cf  
Outflow = 0.14 cfs @ 11.96 hrs, Volume= 328 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.14 cfs @ 11.96 hrs, Volume= 328 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 643.68' @ 11.96 hrs

Flood Elev= 647.00'

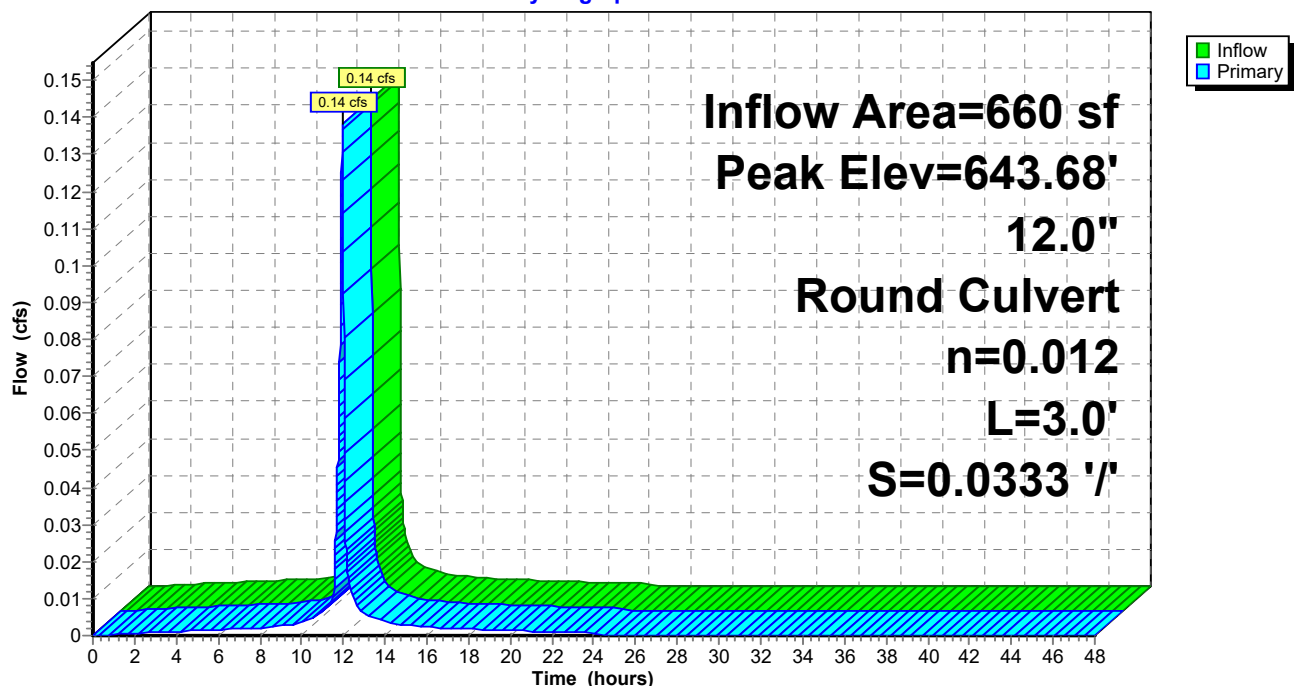
Device	Routing	Invert	Outlet Devices
#1	Primary	643.50'	<b>12.0" Round Culvert</b> L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 643.50' / 643.40' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.14 cfs @ 11.96 hrs HW=643.68' (Free Discharge)

↑1=Culvert (Inlet Controls 0.14 cfs @ 1.44 fps)

## Pond 15P: CB 5

Hydrograph





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Type II 24-hr 25-yr Rainfall=6.20"

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## Summary for Pond 16P: CB 6

Inflow Area = 5,850 sf, 56.41% Impervious, Inflow Depth = 4.82" for 25-yr event  
Inflow = 1.11 cfs @ 11.96 hrs, Volume= 2,349 cf  
Outflow = 1.11 cfs @ 11.96 hrs, Volume= 2,349 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.11 cfs @ 11.96 hrs, Volume= 2,349 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 650.61' @ 11.96 hrs

Flood Elev= 651.00'

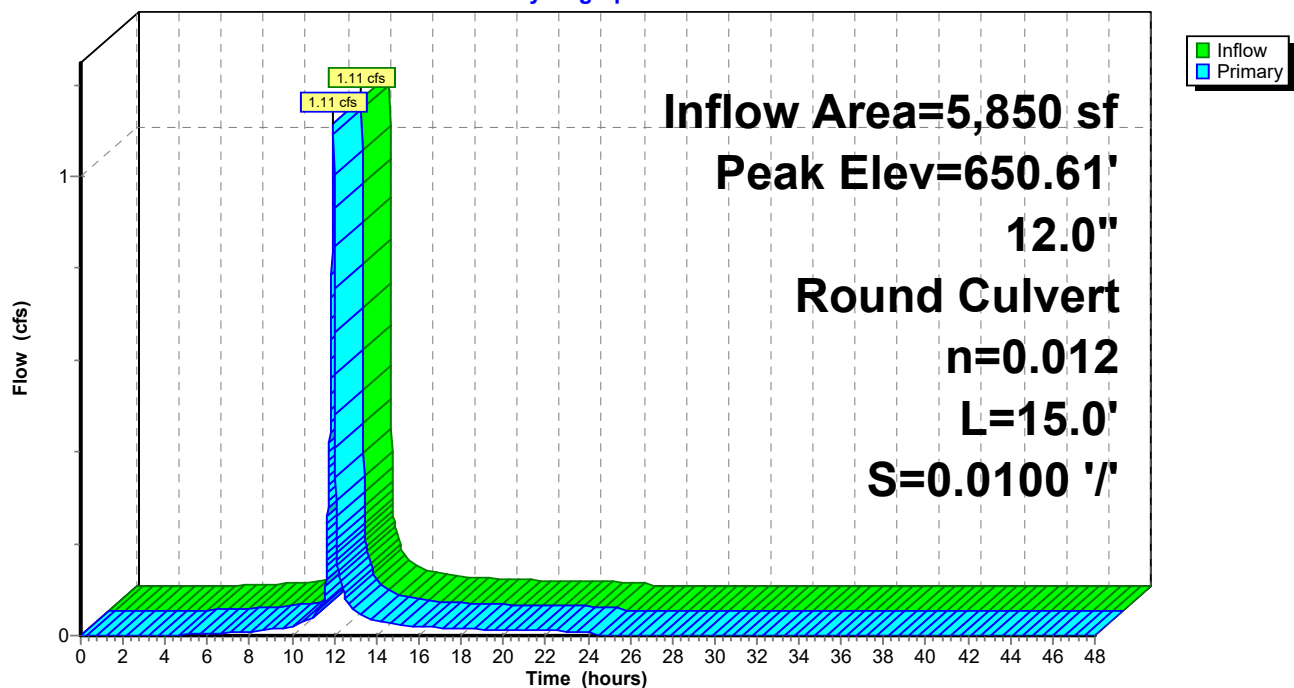
Device	Routing	Invert	Outlet Devices
#1	Primary	650.00'	<b>12.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.00' / 649.85' S= 0.0100 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.11 cfs @ 11.96 hrs HW=650.61' (Free Discharge)

↑1=Culvert (Barrel Controls 1.11 cfs @ 3.17 fps)

## Pond 16P: CB 6

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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## Summary for Pond 17P: CB 7

Inflow Area = 2,950 sf, 74.92% Impervious, Inflow Depth = 5.27" for 25-yr event  
Inflow = 0.59 cfs @ 11.96 hrs, Volume= 1,295 cf  
Outflow = 0.59 cfs @ 11.96 hrs, Volume= 1,295 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.59 cfs @ 11.96 hrs, Volume= 1,295 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 647.89' @ 11.96 hrs

Flood Elev= 651.00'

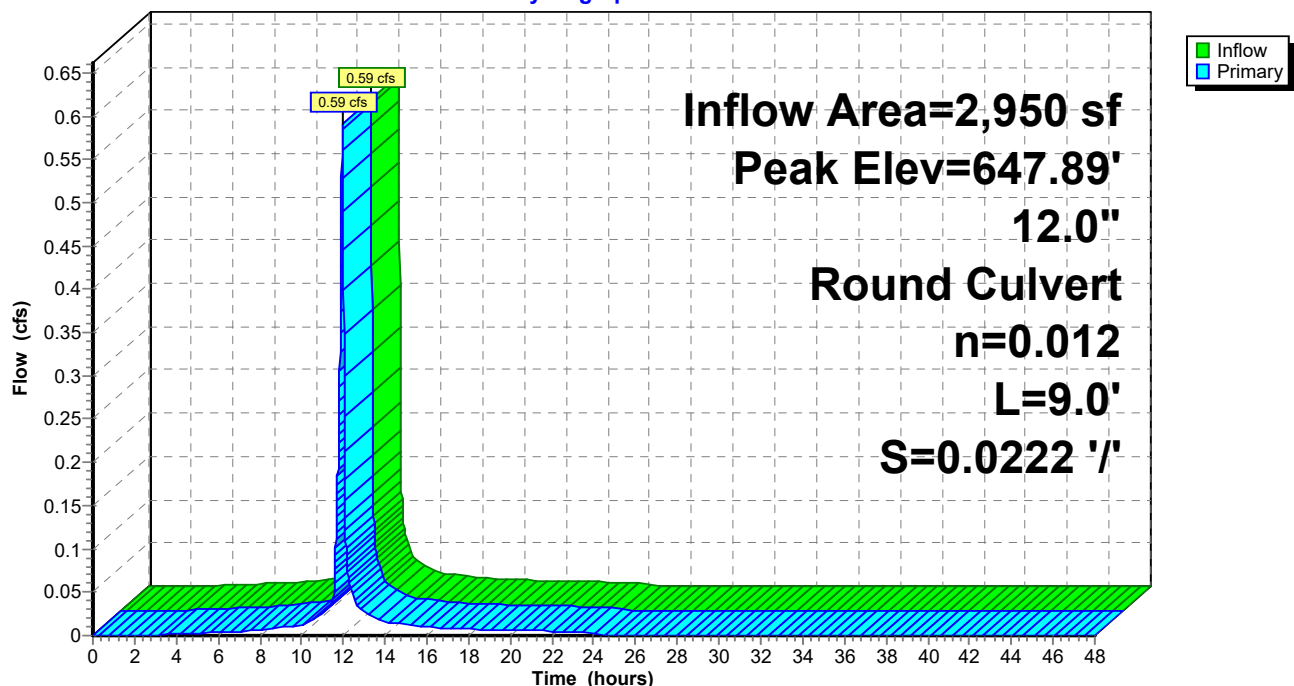
Device	Routing	Invert	Outlet Devices
#1	Primary	647.50'	<b>12.0" Round Culvert</b> L= 9.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 647.50' / 647.30' S= 0.0222 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.59 cfs @ 11.96 hrs HW=647.89' (Free Discharge)

↑1=Culvert (Inlet Controls 0.59 cfs @ 2.11 fps)

## Pond 17P: CB 7

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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## Summary for Pond 18P: CB 8

[58] Hint: Peaked 0.43' above defined flood level

Inflow Area = 3,330 sf, 75.98% Impervious, Inflow Depth = 5.27" for 25-yr event  
Inflow = 0.67 cfs @ 11.96 hrs, Volume= 1,461 cf  
Outflow = 0.67 cfs @ 11.96 hrs, Volume= 1,461 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.67 cfs @ 11.96 hrs, Volume= 1,461 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 650.73' @ 11.96 hrs

Flood Elev= 650.30'

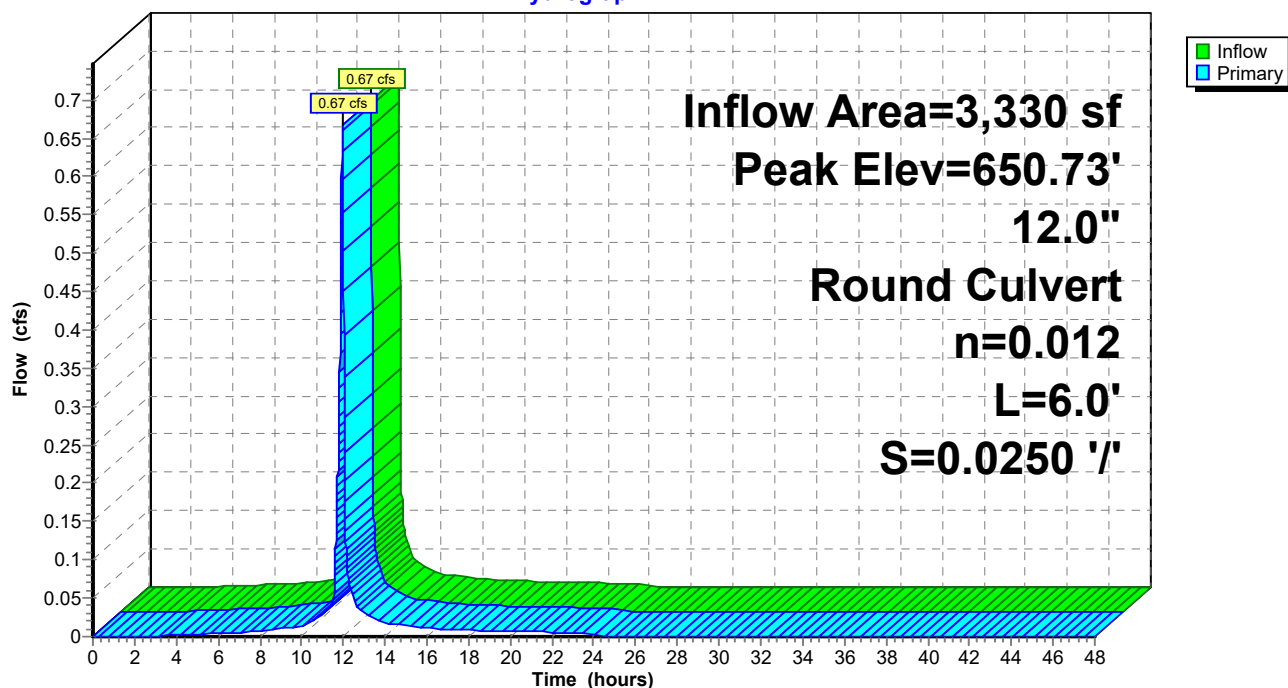
Device	Routing	Invert	Outlet Devices
#1	Primary	650.30'	<b>12.0" Round Culvert</b> L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.30' / 650.15' S= 0.0250 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.67 cfs @ 11.96 hrs HW=650.73' (Free Discharge)

↑1=Culvert (Barrel Controls 0.67 cfs @ 3.07 fps)

## Pond 18P: CB 8

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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## Summary for Pond 19P: CB 9

Inflow Area = 11,800 sf, 50.17% Impervious, Inflow Depth = 4.60" for 25-yr event  
Inflow = 2.17 cfs @ 11.96 hrs, Volume= 4,523 cf  
Outflow = 2.17 cfs @ 11.96 hrs, Volume= 4,523 cf, Atten= 0%, Lag= 0.0 min  
Primary = 2.17 cfs @ 11.96 hrs, Volume= 4,523 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 651.00' @ 11.96 hrs

Flood Elev= 653.60'

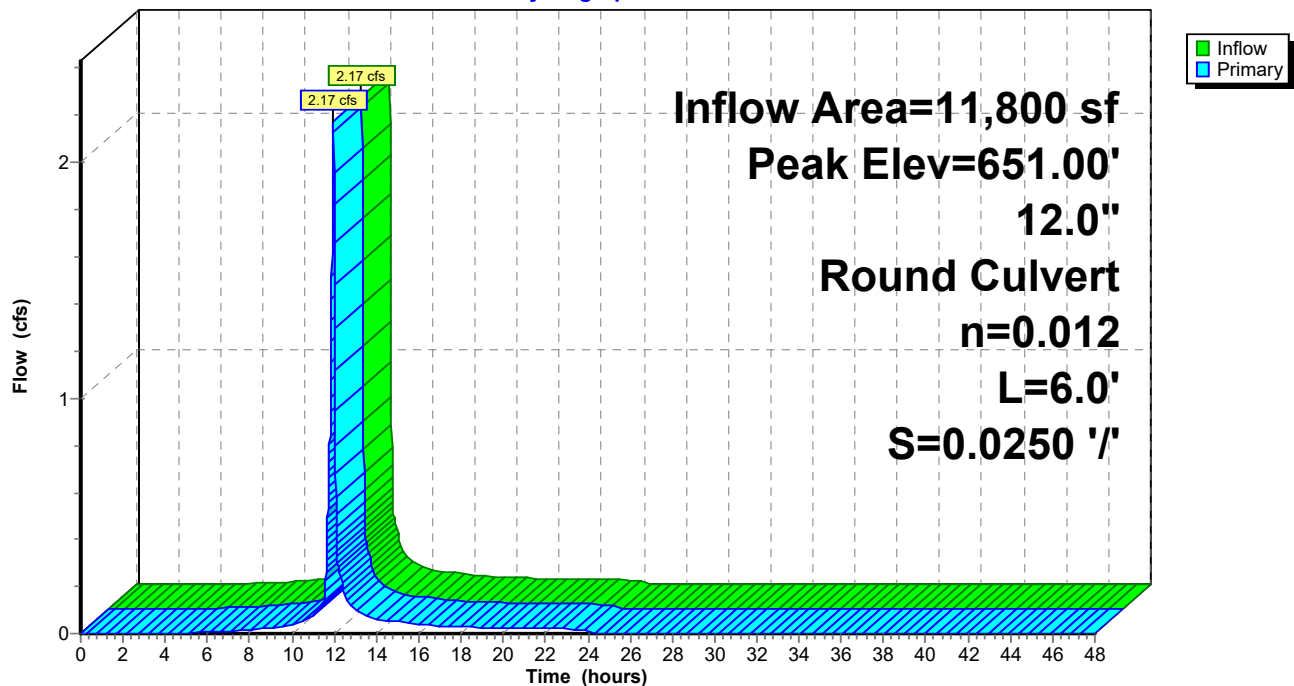
Device	Routing	Invert	Outlet Devices
#1	Primary	650.10'	<b>12.0" Round Culvert</b> L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.10' / 649.95' S= 0.0250 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.17 cfs @ 11.96 hrs HW=651.00' (Free Discharge)

↑1=Culvert (Barrel Controls 2.17 cfs @ 3.85 fps)

## Pond 19P: CB 9

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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## Summary for Pond 40P: HDS Unit

[79] Warning: Submerged Pond 69P Primary device # 1 INLET by 1.96'

Inflow Area = 44,660 sf, 54.46% Impervious, Inflow Depth = 4.75" for 25-yr event  
Inflow = 8.22 cfs @ 11.96 hrs, Volume= 17,660 cf  
Outflow = 8.22 cfs @ 11.96 hrs, Volume= 17,660 cf, Atten= 0%, Lag= 0.0 min  
Primary = 8.22 cfs @ 11.96 hrs, Volume= 17,660 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 643.96' @ 11.96 hrs

Flood Elev= 653.50'

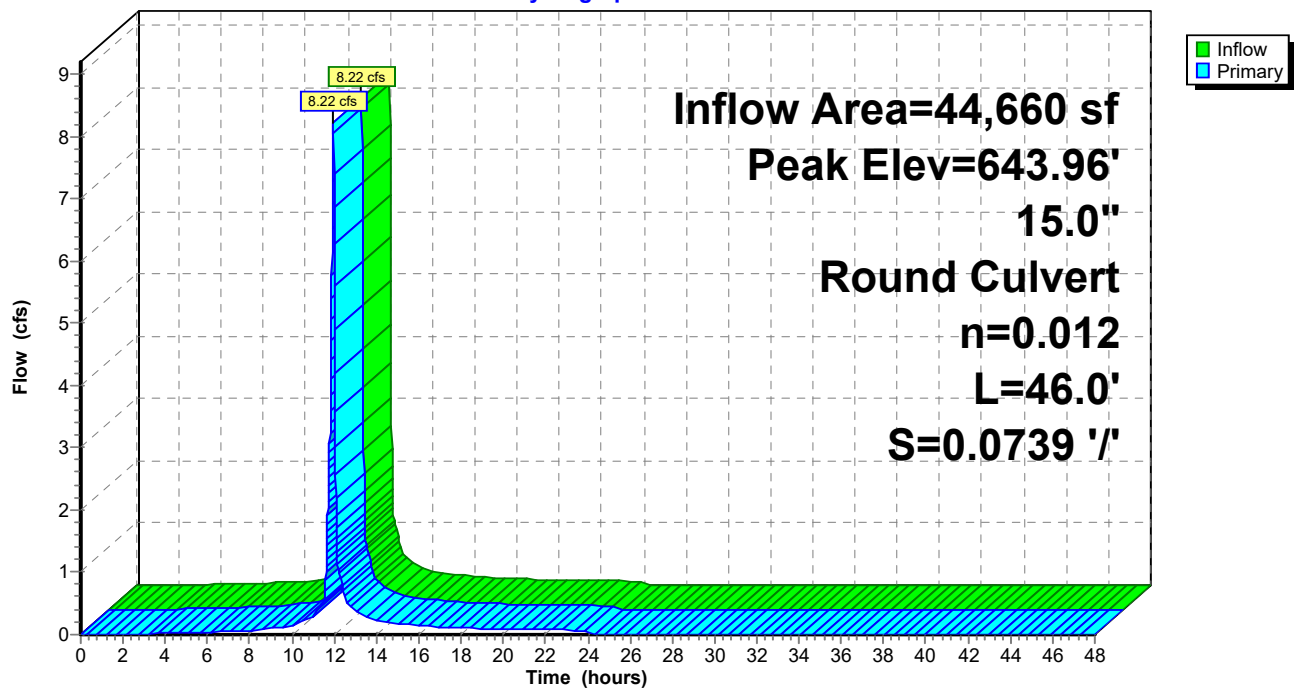
Device	Routing	Invert	Outlet Devices
#1	Primary	641.40'	<b>15.0" Round Culvert</b> L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 641.40' / 638.00' S= 0.0739 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=8.21 cfs @ 11.96 hrs HW=643.95' (Free Discharge)

↑1=Culvert (Inlet Controls 8.21 cfs @ 6.69 fps)

## Pond 40P: HDS Unit

### Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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**Summary for Pond 50P: WQB**

[79] Warning: Submerged Pond 40P Primary device # 1 OUTLET by 2.86'

Inflow Area = 79,190 sf, 30.71% Impervious, Inflow Depth = 4.14" for 25-yr event  
 Inflow = 13.12 cfs @ 11.96 hrs, Volume= 27,310 cf  
 Outflow = 0.55 cfs @ 13.27 hrs, Volume= 22,917 cf, Atten= 96%, Lag= 78.8 min  
 Primary = 0.55 cfs @ 13.27 hrs, Volume= 22,917 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 640.86' @ 13.27 hrs Surf.Area= 8,291 sf Storage= 16,741 cf  
 Flood Elev= 644.00' Surf.Area= 14,157 sf Storage= 51,826 cf

Plug-Flow detention time= 404.0 min calculated for 22,912 cf (84% of inflow)  
 Center-of-Mass det. time= 331.8 min ( 1,127.1 - 795.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	638.00'	51,826 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
638.00	3,553	532.6	0	0	3,553
640.00	6,861	570.3	10,234	10,234	7,041
642.00	10,396	608.0	17,135	27,369	10,767
644.00	14,157	645.7	24,456	51,826	14,732

Device	Routing	Invert	Outlet Devices
#1	Primary	638.00'	<b>12.0" Round Culvert</b> L= 90.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 638.00' / 637.10' S= 0.0100 ' / Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	639.00'	<b>4.0" Vert. Orifice/Grate</b> C= 0.600
#3	Device 1	642.15'	<b>6.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.55 cfs @ 13.27 hrs HW=640.86' (Free Discharge)

1=Culvert (Passes 0.55 cfs of 5.30 cfs potential flow)  
 2=Orifice/Grate (Orifice Controls 0.55 cfs @ 6.27 fps)  
 3=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

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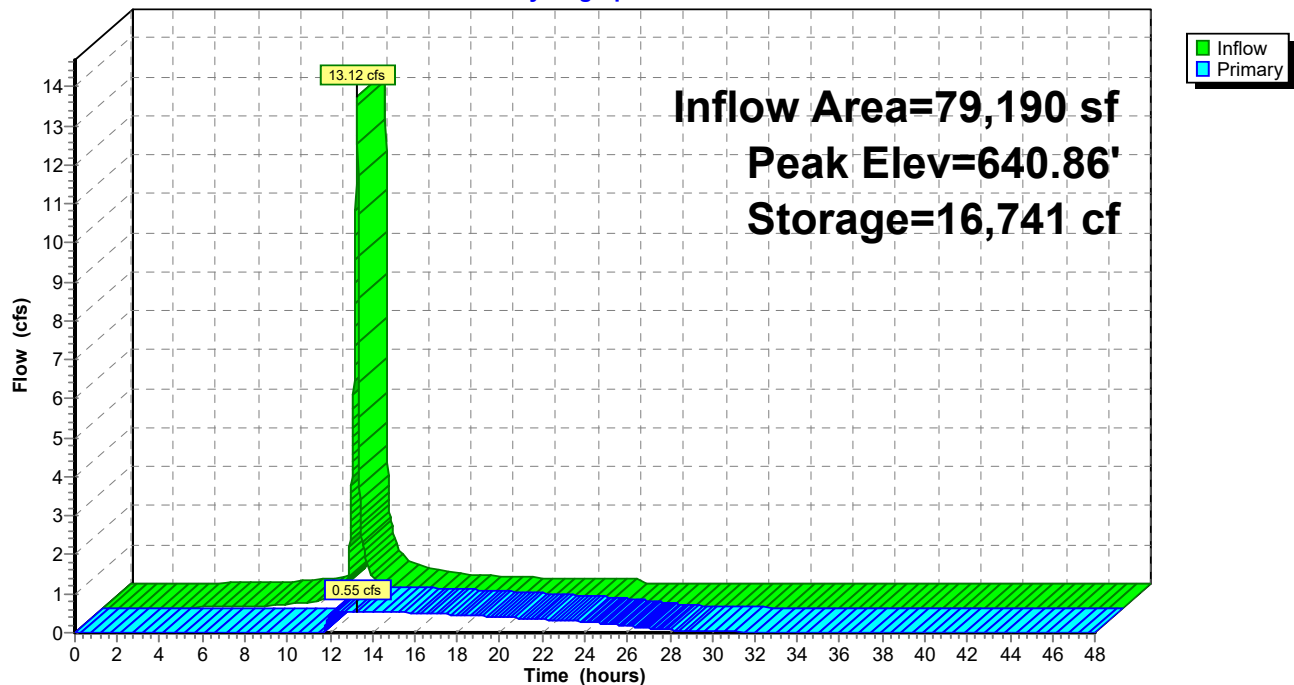
Type II 24-hr 25-yr Rainfall=6.20"

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## Pond 50P: WQB

### Hydrograph



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## Summary for Pond 61P: DMH 1

[79] Warning: Submerged Pond 62P Primary device # 1 INLET by 0.08'

Inflow Area = 94,670 sf, 32.50% Impervious, Inflow Depth > 3.62" for 25-yr event  
Inflow = 3.13 cfs @ 11.96 hrs, Volume= 28,565 cf  
Outflow = 3.13 cfs @ 11.96 hrs, Volume= 28,565 cf, Atten= 0%, Lag= 0.0 min  
Primary = 3.13 cfs @ 11.96 hrs, Volume= 28,565 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 634.53' @ 11.96 hrs

Flood Elev= 639.10'

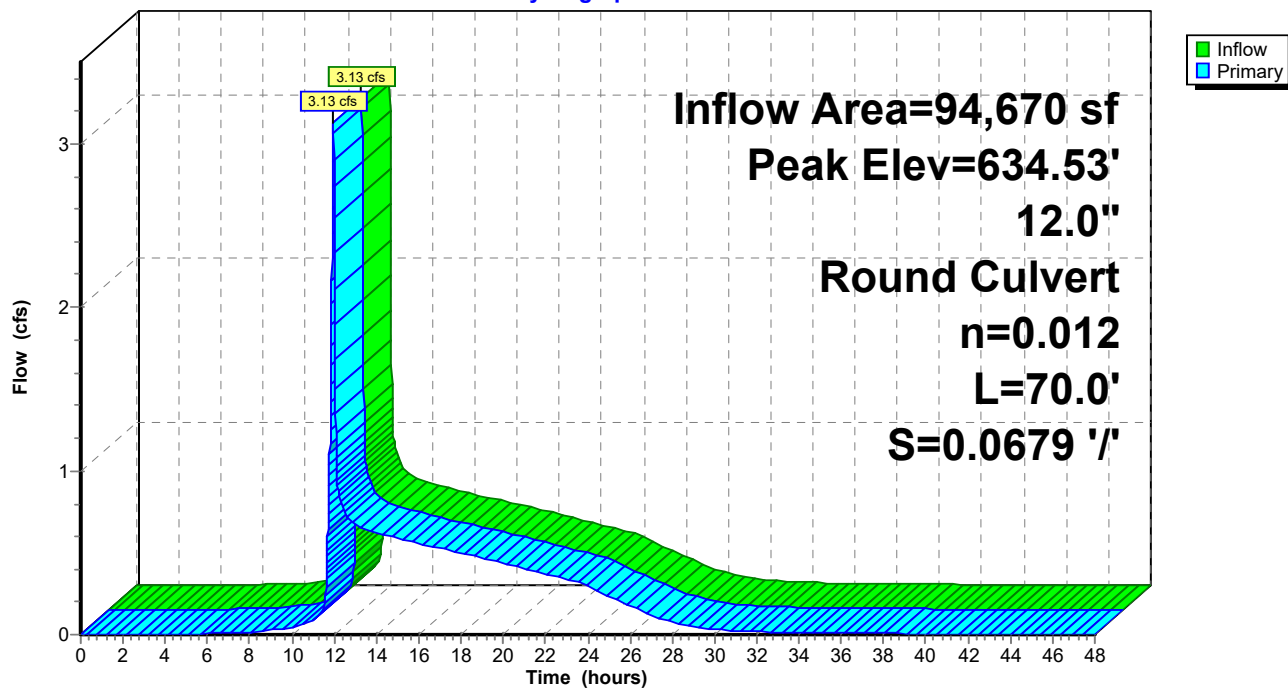
Device	Routing	Invert	Outlet Devices
#1	Primary	633.35'	<b>12.0" Round Culvert</b> L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 633.35' / 628.60' S= 0.0679 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.13 cfs @ 11.96 hrs HW=634.53' (Free Discharge)

↑1=Culvert (Inlet Controls 3.13 cfs @ 3.98 fps)

## Pond 61P: DMH 1

Hydrograph





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Type II 24-hr 25-yr Rainfall=6.20"

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## Summary for Pond 62P: DMH 2

[79] Warning: Submerged Pond 63P Primary device # 1 INLET by 0.28'

Inflow Area = 94,670 sf, 32.50% Impervious, Inflow Depth > 3.62" for 25-yr event  
Inflow = 3.13 cfs @ 11.96 hrs, Volume= 28,565 cf  
Outflow = 3.13 cfs @ 11.96 hrs, Volume= 28,565 cf, Atten= 0%, Lag= 0.0 min  
Primary = 3.13 cfs @ 11.96 hrs, Volume= 28,565 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 635.63' @ 11.96 hrs

Flood Elev= 640.00'

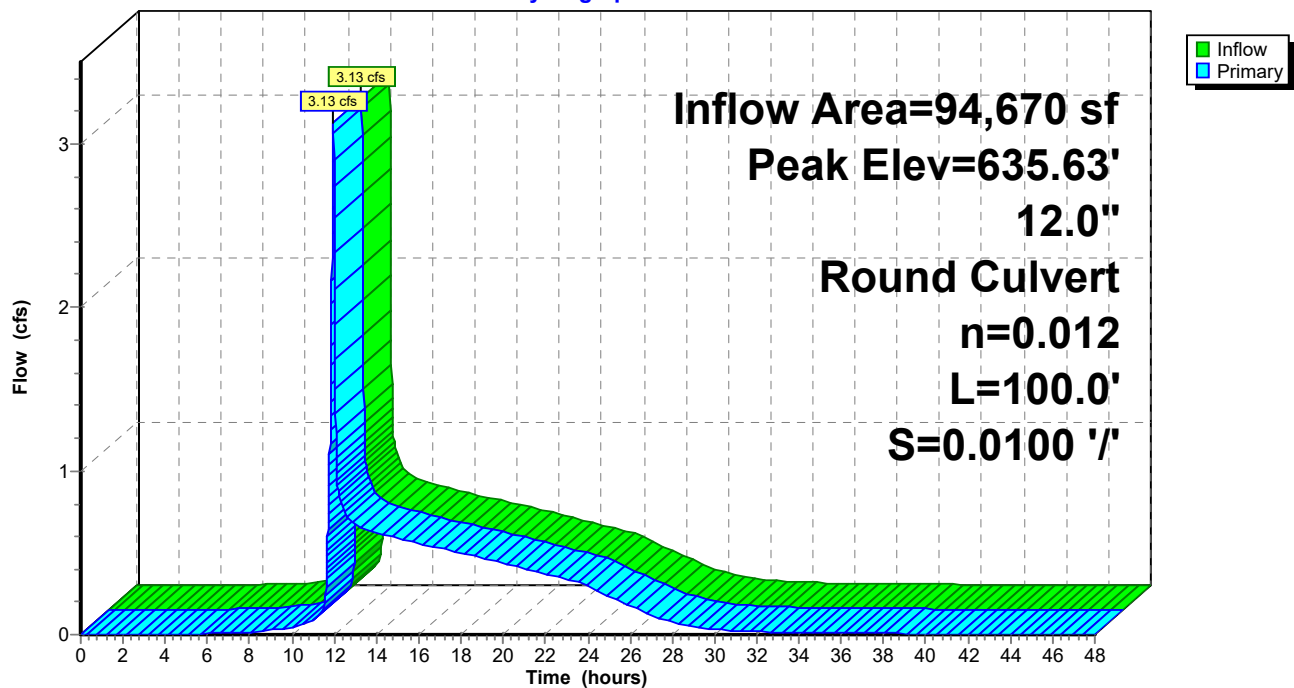
Device	Routing	Invert	Outlet Devices
#1	Primary	634.45'	<b>12.0" Round Culvert</b> L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 634.45' / 633.45' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.13 cfs @ 11.96 hrs HW=635.63' (Free Discharge)

↑1=Culvert (Inlet Controls 3.13 cfs @ 3.98 fps)

## Pond 62P: DMH 2

Hydrograph



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## Summary for Pond 63P: DMH 3

[79] Warning: Submerged Pond 64P Primary device # 1 OUTLET by 0.62'

Inflow Area = 86,920 sf, 31.67% Impervious, Inflow Depth > 3.55" for 25-yr event  
Inflow = 1.75 cfs @ 11.96 hrs, Volume= 25,733 cf  
Outflow = 1.75 cfs @ 11.96 hrs, Volume= 25,733 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.75 cfs @ 11.96 hrs, Volume= 25,733 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 636.07' @ 11.96 hrs

Flood Elev= 642.70'

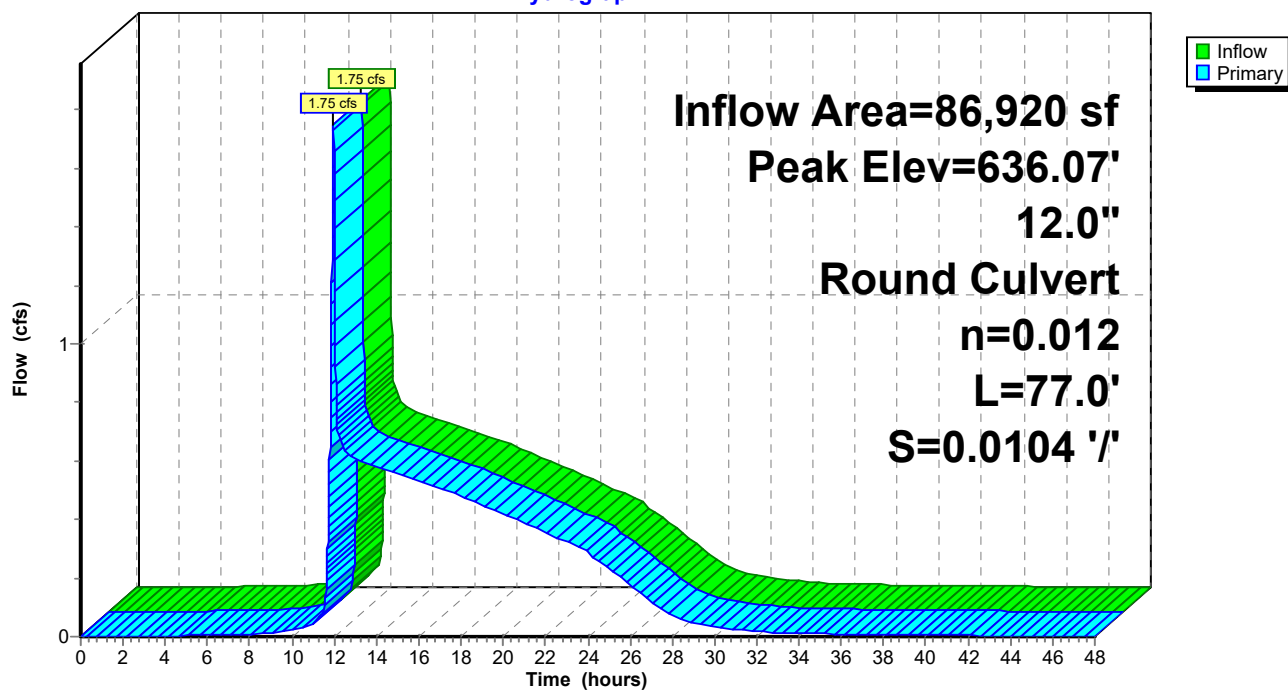
Device	Routing	Invert	Outlet Devices
#1	Primary	635.35'	<b>12.0" Round Culvert</b> L= 77.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 635.35' / 634.55' S= 0.0104 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.75 cfs @ 11.96 hrs HW=636.07' (Free Discharge)

↑1=Culvert (Inlet Controls 1.75 cfs @ 2.89 fps)

## Pond 63P: DMH 3

Hydrograph



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## Summary for Pond 64P: DMH 4

[79] Warning: Submerged Pond 65P Primary device # 1 OUTLET by 0.38'

Inflow Area = 81,850 sf, 31.36% Impervious, Inflow Depth > 3.51" for 25-yr event  
Inflow = 0.90 cfs @ 11.97 hrs, Volume= 23,940 cf  
Outflow = 0.90 cfs @ 11.97 hrs, Volume= 23,940 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.90 cfs @ 11.97 hrs, Volume= 23,940 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 636.68' @ 11.97 hrs

Flood Elev= 647.30'

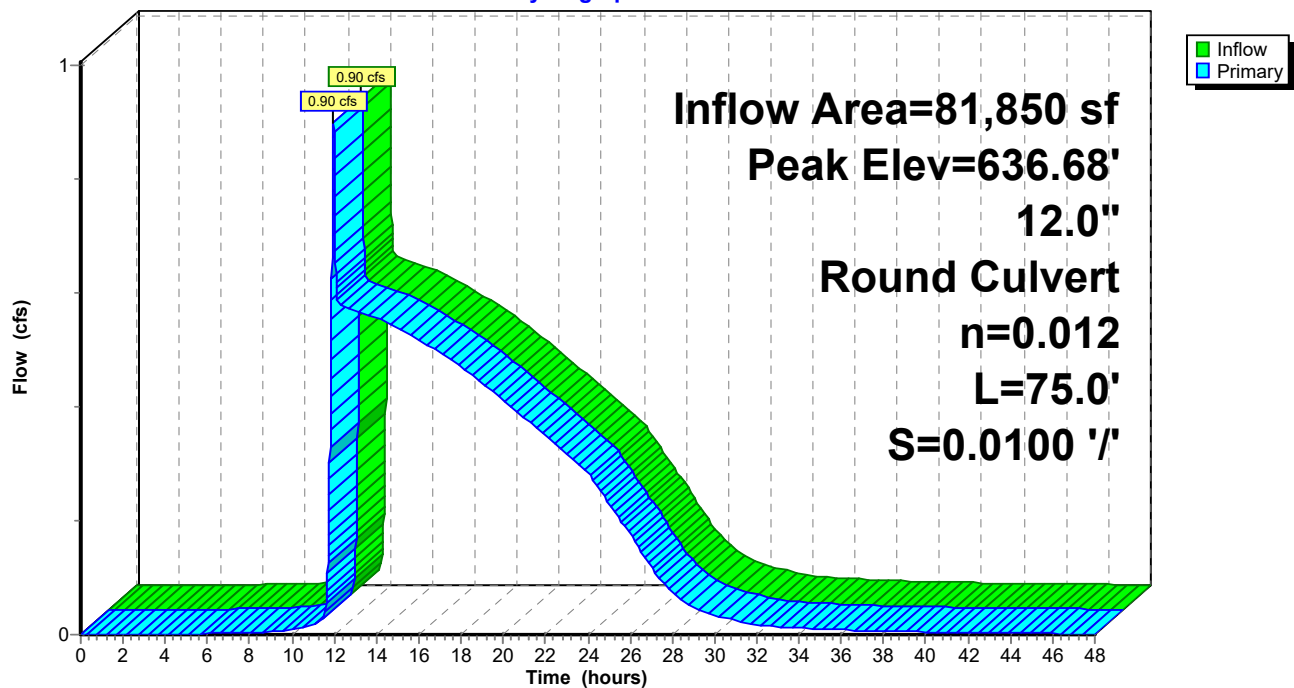
Device	Routing	Invert	Outlet Devices
#1	Primary	636.20'	<b>12.0" Round Culvert</b> L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 636.20' / 635.45' S= 0.0100 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.89 cfs @ 11.97 hrs HW=636.68' (Free Discharge)

↑1=Culvert (Inlet Controls 0.89 cfs @ 2.37 fps)

## Pond 64P: DMH 4

Hydrograph



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## Summary for Pond 65P: DMH 5

[79] Warning: Submerged Pond 50P Primary device # 1 OUTLET by 0.26'

Inflow Area = 79,190 sf, 30.71% Impervious, Inflow Depth > 3.47" for 25-yr event  
Inflow = 0.55 cfs @ 13.27 hrs, Volume= 22,917 cf  
Outflow = 0.55 cfs @ 13.27 hrs, Volume= 22,917 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.55 cfs @ 13.27 hrs, Volume= 22,917 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 637.36' @ 13.27 hrs

Flood Elev= 651.80'

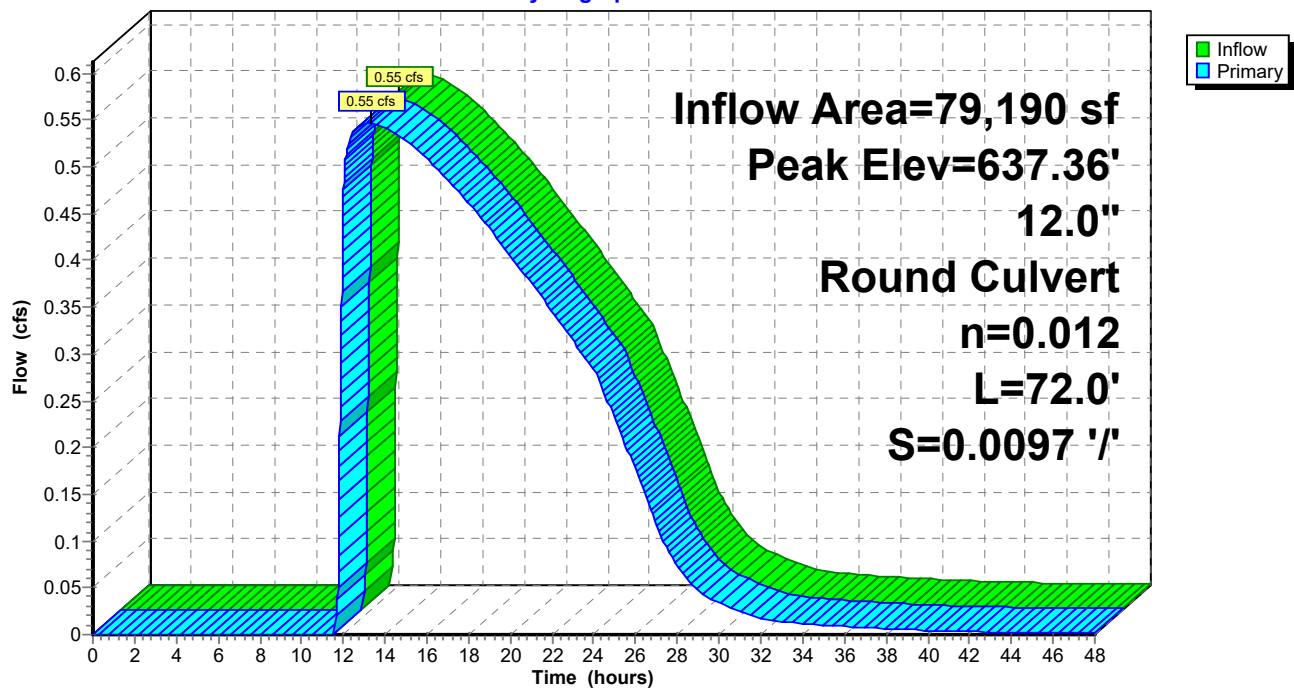
Device	Routing	Invert	Outlet Devices
#1	Primary	637.00'	<b>12.0" Round Culvert</b> L= 72.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 637.00' / 636.30' S= 0.0097 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.53 cfs @ 13.27 hrs HW=637.36' (Free Discharge)

↑1=Culvert (Inlet Controls 0.53 cfs @ 2.06 fps)

## Pond 65P: DMH 5

Hydrograph



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## Summary for Pond 66P: DMH 6

[79] Warning: Submerged Pond 17P Primary device # 1 INLET by 0.34'

Inflow Area = 8,800 sf, 62.61% Impervious, Inflow Depth = 4.97" for 25-yr event  
Inflow = 1.70 cfs @ 11.96 hrs, Volume= 3,644 cf  
Outflow = 1.70 cfs @ 11.96 hrs, Volume= 3,644 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.70 cfs @ 11.96 hrs, Volume= 3,644 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 647.84' @ 11.96 hrs

Flood Elev= 651.30'

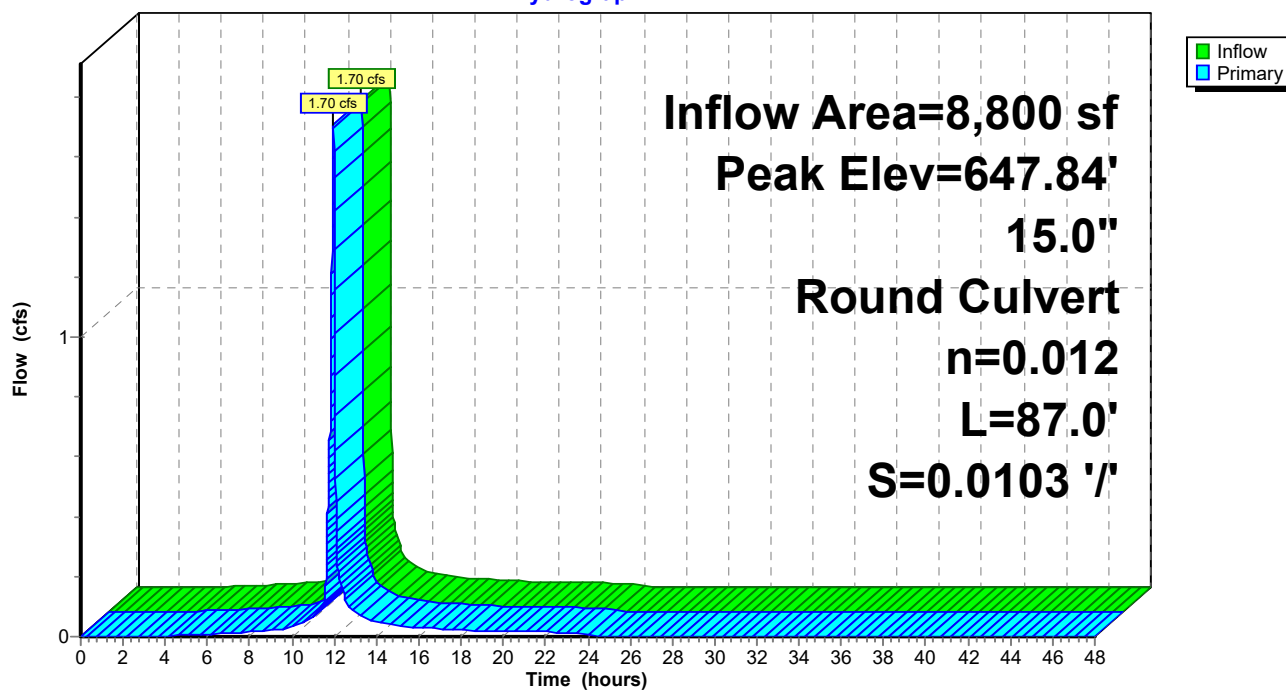
Device	Routing	Invert	Outlet Devices
#1	Primary	647.20'	<b>15.0" Round Culvert</b> L= 87.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 647.20' / 646.30' S= 0.0103 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=1.70 cfs @ 11.96 hrs HW=647.84' (Free Discharge)

↑1=Culvert (Inlet Controls 1.70 cfs @ 2.71 fps)

## Pond 66P: DMH 6

Hydrograph



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## Summary for Pond 67P: DMH 7

[79] Warning: Submerged Pond 66P Primary device # 1 OUTLET by 0.67'

Inflow Area = 12,130 sf, 66.28% Impervious, Inflow Depth = 5.05" for 25-yr event  
Inflow = 2.37 cfs @ 11.96 hrs, Volume= 5,105 cf  
Outflow = 2.37 cfs @ 11.96 hrs, Volume= 5,105 cf, Atten= 0%, Lag= 0.0 min  
Primary = 2.37 cfs @ 11.96 hrs, Volume= 5,105 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 646.97' @ 11.96 hrs

Flood Elev= 654.20'

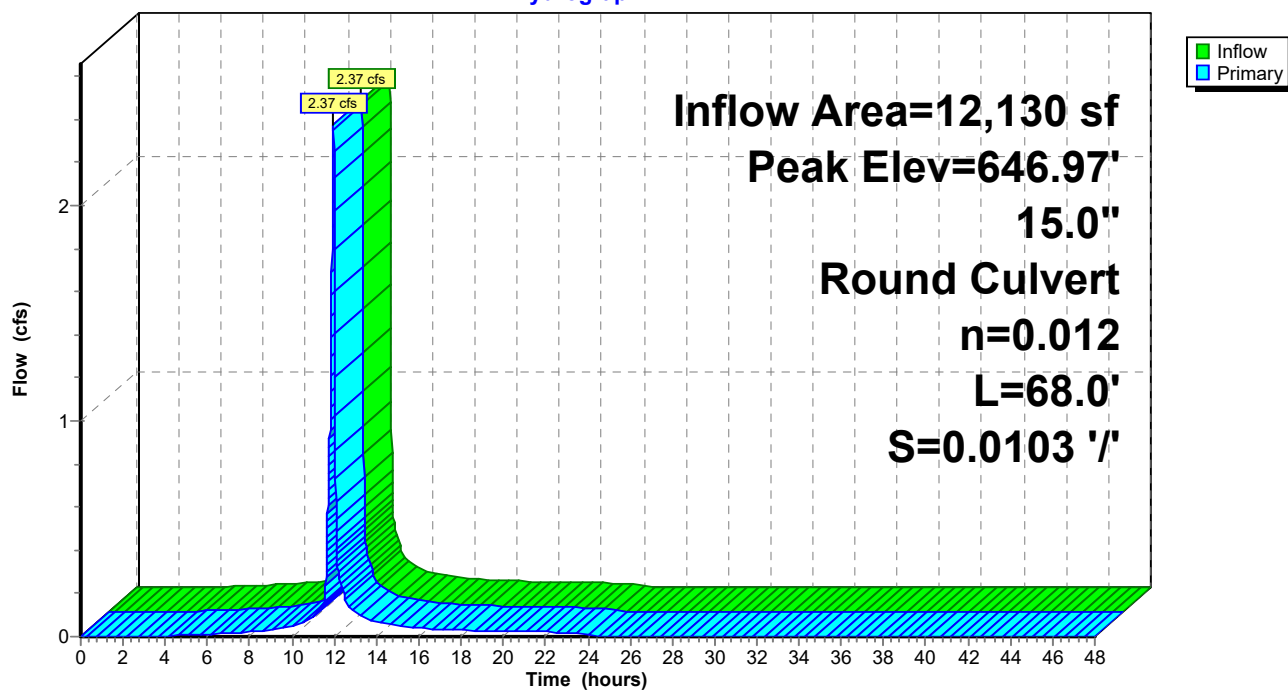
Device	Routing	Invert	Outlet Devices
#1	Primary	646.20'	<b>15.0" Round Culvert</b> L= 68.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 646.20' / 645.50' S= 0.0103 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=2.36 cfs @ 11.96 hrs HW=646.97' (Free Discharge)

↑1=Culvert (Inlet Controls 2.36 cfs @ 2.99 fps)

## Pond 67P: DMH 7

Hydrograph



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## Summary for Pond 68P: DMH 8

[79] Warning: Submerged Pond 67P Primary device # 1 INLET by 0.45'

Inflow Area = 23,930 sf, 58.34% Impervious, Inflow Depth = 4.83" for 25-yr event  
Inflow = 4.54 cfs @ 11.96 hrs, Volume= 9,628 cf  
Outflow = 4.54 cfs @ 11.96 hrs, Volume= 9,628 cf, Atten= 0%, Lag= 0.0 min  
Primary = 4.54 cfs @ 11.96 hrs, Volume= 9,628 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 646.65' @ 11.96 hrs

Flood Elev= 654.10'

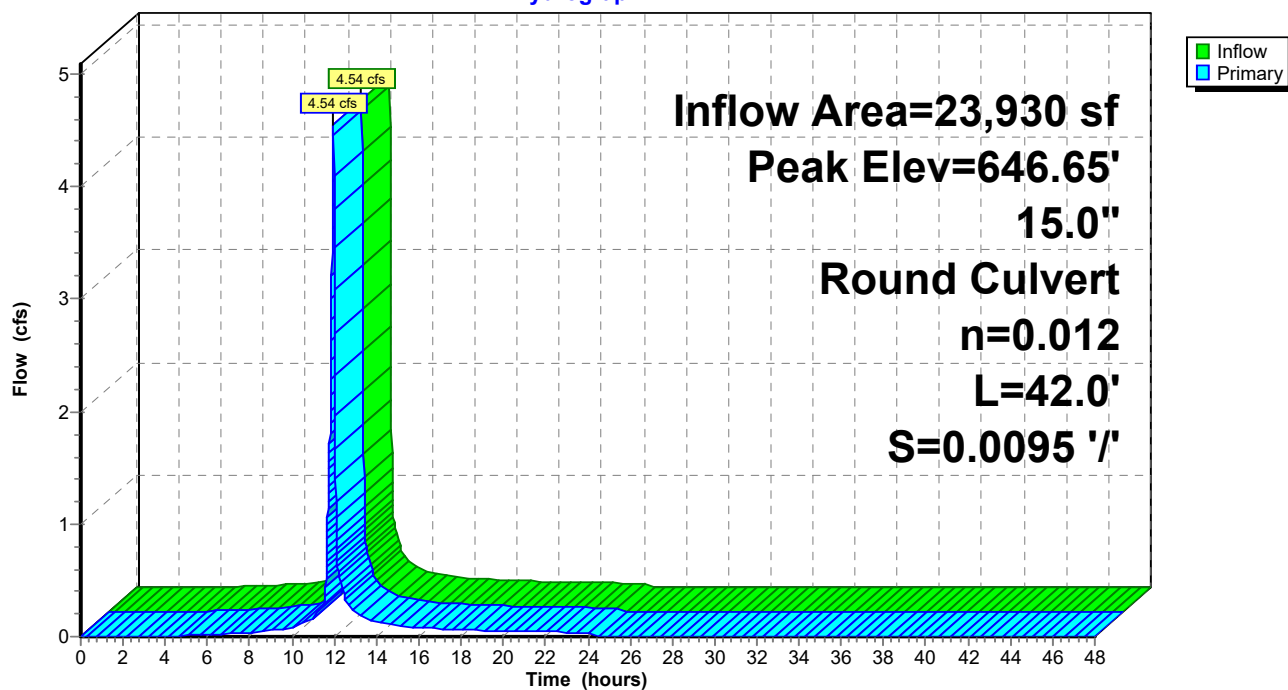
Device	Routing	Invert	Outlet Devices
#1	Primary	645.40'	<b>15.0" Round Culvert</b> L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 645.40' / 645.00' S= 0.0095 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=4.54 cfs @ 11.96 hrs HW=646.65' (Free Discharge)

↑1=Culvert (Barrel Controls 4.54 cfs @ 4.62 fps)

## Pond 68P: DMH 8

Hydrograph



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## Summary for Pond 69P: DMH 9

Inflow Area = 44,660 sf, 54.46% Impervious, Inflow Depth = 4.75" for 25-yr event  
Inflow = 8.22 cfs @ 11.96 hrs, Volume= 17,660 cf  
Outflow = 8.22 cfs @ 11.96 hrs, Volume= 17,660 cf, Atten= 0%, Lag= 0.0 min  
Primary = 8.22 cfs @ 11.96 hrs, Volume= 17,660 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 644.56' @ 11.96 hrs

Flood Elev= 654.20'

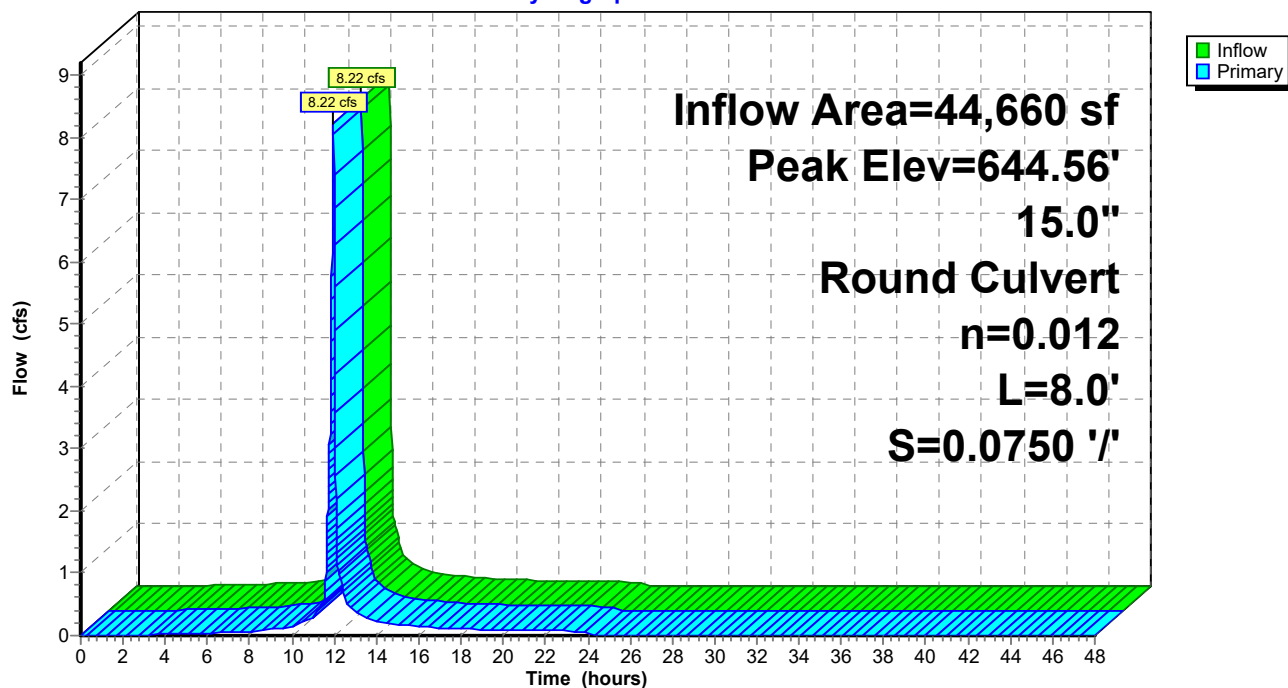
Device	Routing	Invert	Outlet Devices
#1	Primary	642.00'	<b>15.0" Round Culvert</b> L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 642.00' / 641.40' S= 0.0750 '/ Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=8.21 cfs @ 11.96 hrs HW=644.55' (Free Discharge)

↑1=Culvert (Inlet Controls 8.21 cfs @ 6.69 fps)

## Pond 69P: DMH 9

Hydrograph





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## Summary for Pond 70P: DMH 10

[79] Warning: Submerged Pond 71P Primary device # 1 OUTLET by 1.35'

Inflow Area = 20,730 sf, 49.98% Impervious, Inflow Depth = 4.65" for 25-yr event  
Inflow = 3.68 cfs @ 11.96 hrs, Volume= 8,032 cf  
Outflow = 3.68 cfs @ 11.96 hrs, Volume= 8,032 cf, Atten= 0%, Lag= 0.0 min  
Primary = 3.68 cfs @ 11.96 hrs, Volume= 8,032 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 649.65' @ 11.96 hrs

Flood Elev= 655.50'

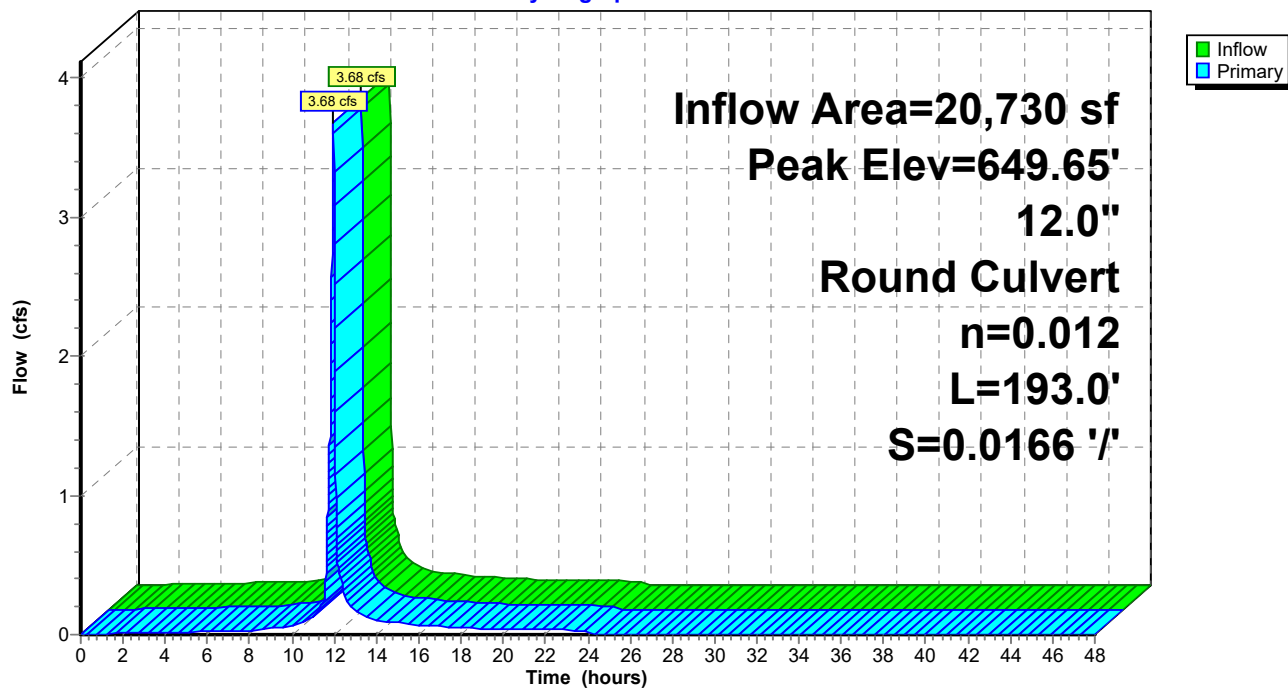
Device	Routing	Invert	Outlet Devices
#1	Primary	648.20'	<b>12.0" Round Culvert</b> L= 193.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 648.20' / 645.00' S= 0.0166 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.67 cfs @ 11.96 hrs HW=649.64' (Free Discharge)

↑1=Culvert (Inlet Controls 3.67 cfs @ 4.68 fps)

## Pond 70P: DMH 10

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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## Summary for Pond 71P: DMH 11

[79] Warning: Submerged Pond 83P Primary device # 1 INLET by 0.34'

Inflow Area = 20,730 sf, 49.98% Impervious, Inflow Depth = 4.65" for 25-yr event  
Inflow = 3.68 cfs @ 11.96 hrs, Volume= 8,032 cf  
Outflow = 3.68 cfs @ 11.96 hrs, Volume= 8,032 cf, Atten= 0%, Lag= 0.0 min  
Primary = 3.68 cfs @ 11.96 hrs, Volume= 8,032 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 651.60' @ 11.96 hrs

Flood Elev= 655.50'

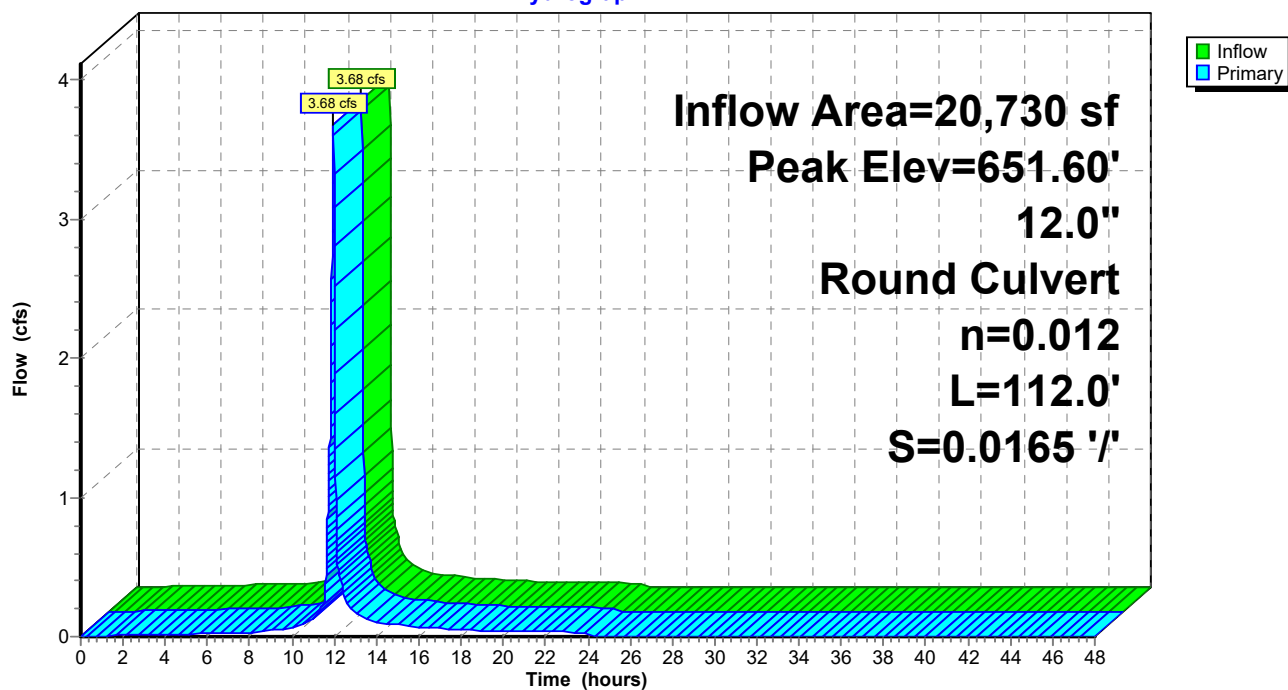
Device	Routing	Invert	Outlet Devices
#1	Primary	650.15'	<b>12.0" Round Culvert</b> L= 112.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.15' / 648.30' S= 0.0165 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.67 cfs @ 11.96 hrs HW=651.59' (Free Discharge)

↑1=Culvert (Inlet Controls 3.67 cfs @ 4.67 fps)

## Pond 71P: DMH 11

### Hydrograph



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## Summary for Pond 81P: YD 1

Inflow Area = 4,470 sf, 100.00% Impervious, Inflow Depth = 5.96" for 25-yr event  
Inflow = 0.94 cfs @ 11.96 hrs, Volume= 2,221 cf  
Outflow = 0.94 cfs @ 11.96 hrs, Volume= 2,221 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.94 cfs @ 11.96 hrs, Volume= 2,221 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 653.50' @ 11.96 hrs

Flood Elev= 656.50'

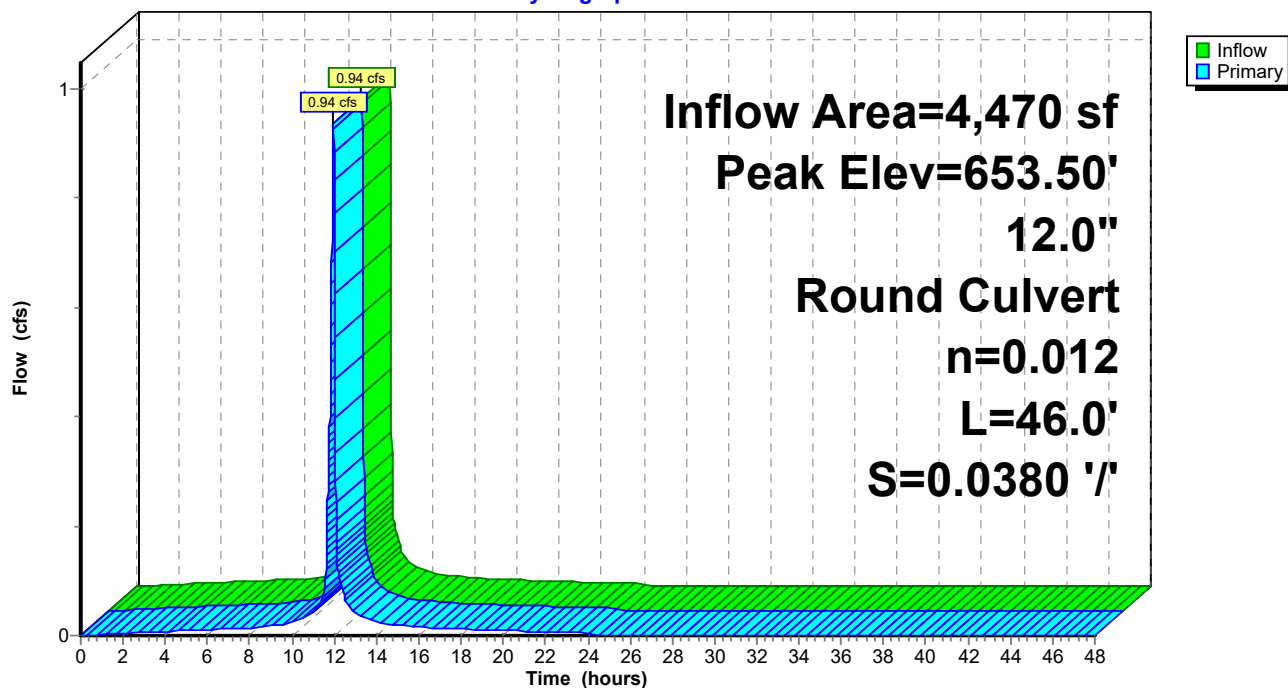
Device	Routing	Invert	Outlet Devices
#1	Primary	653.00'	<b>12.0" Round Culvert</b> L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 653.00' / 651.25' S= 0.0380 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.93 cfs @ 11.96 hrs HW=653.50' (Free Discharge)

↑1=Culvert (Inlet Controls 0.93 cfs @ 2.40 fps)

## Pond 81P: YD 1

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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## Summary for Pond 82P: YD 2

Inflow Area = 4,470 sf, 100.00% Impervious, Inflow Depth = 5.96" for 25-yr event  
Inflow = 0.94 cfs @ 11.96 hrs, Volume= 2,221 cf  
Outflow = 0.94 cfs @ 11.96 hrs, Volume= 2,221 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.94 cfs @ 11.96 hrs, Volume= 2,221 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 653.50' @ 11.96 hrs

Flood Elev= 656.50'

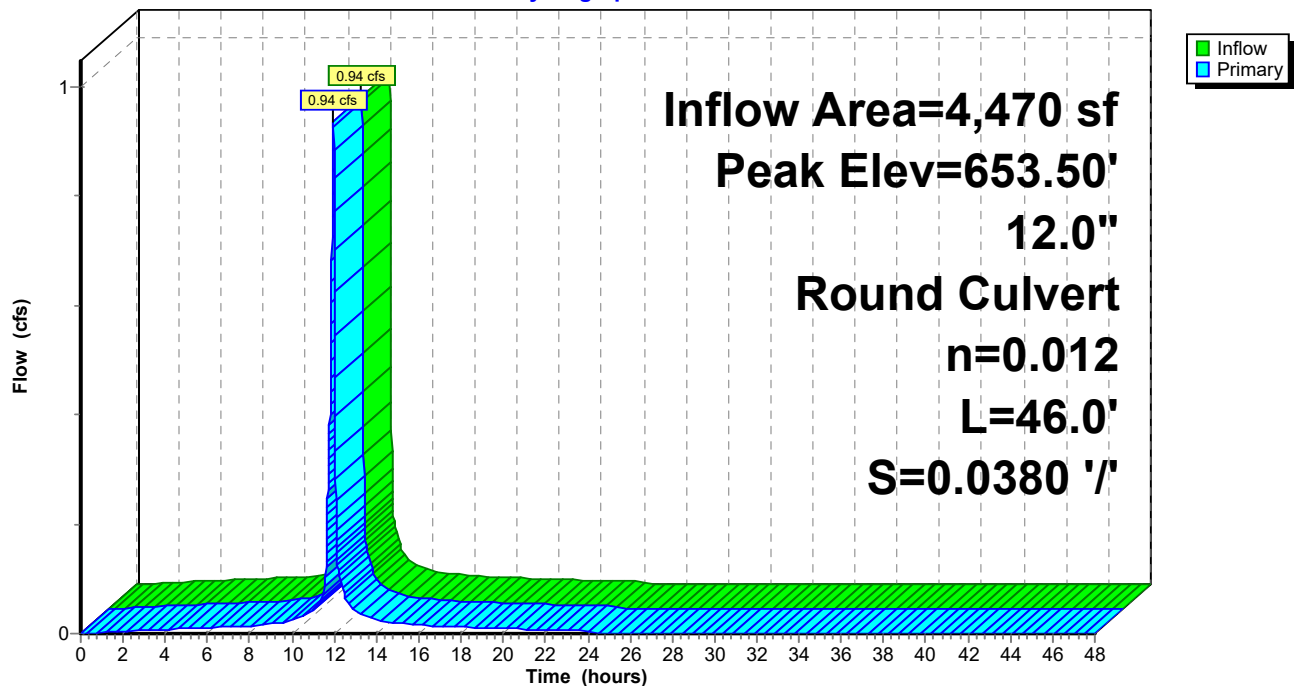
Device	Routing	Invert	Outlet Devices
#1	Primary	653.00'	<b>12.0" Round Culvert</b> L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 653.00' / 651.25' S= 0.0380 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.93 cfs @ 11.96 hrs HW=653.50' (Free Discharge)

↑1=Culvert (Inlet Controls 0.93 cfs @ 2.40 fps)

## Pond 82P: YD 2

Hydrograph



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## Summary for Pond 83P: YD 3

[79] Warning: Submerged Pond 81P Primary device # 1 OUTLET by 1.44'

[79] Warning: Submerged Pond 82P Primary device # 1 OUTLET by 1.44'

Inflow Area = 20,730 sf, 49.98% Impervious, Inflow Depth = 4.65" for 25-yr event  
Inflow = 3.68 cfs @ 11.96 hrs, Volume= 8,032 cf  
Outflow = 3.68 cfs @ 11.96 hrs, Volume= 8,032 cf, Atten= 0%, Lag= 0.0 min  
Primary = 3.68 cfs @ 11.96 hrs, Volume= 8,032 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 652.70' @ 11.96 hrs

Flood Elev= 654.75'

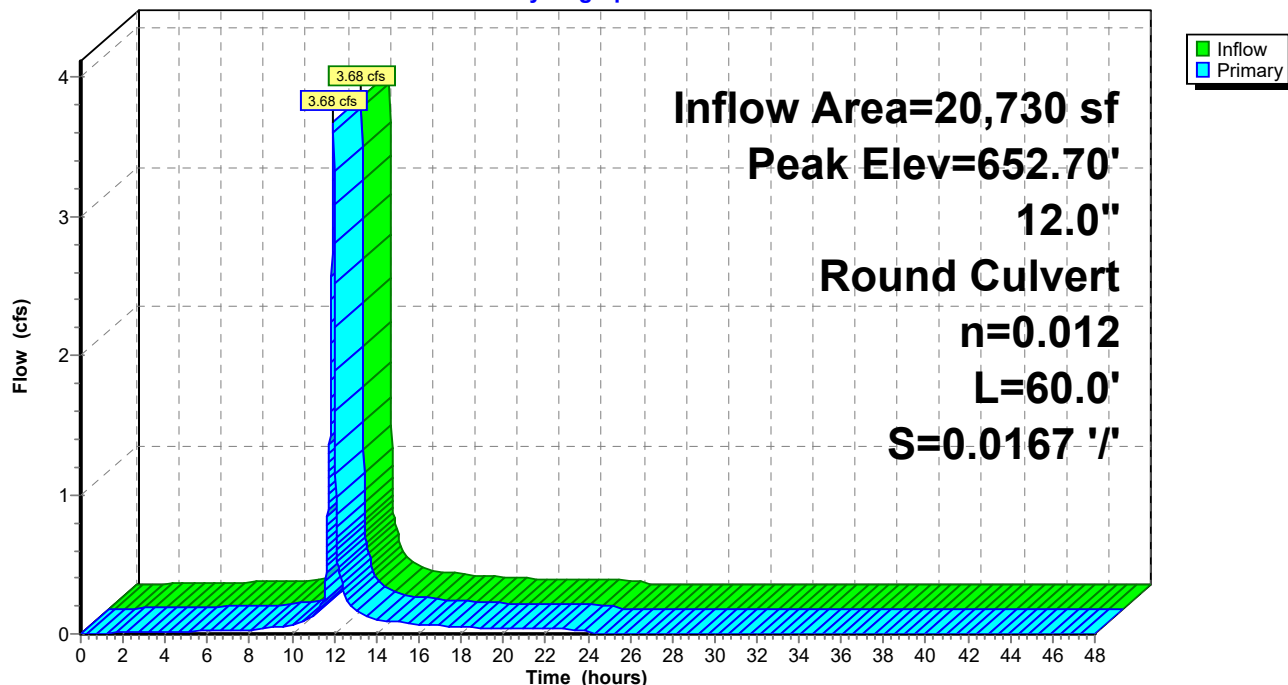
Device	Routing	Invert	Outlet Devices
#1	Primary	651.25'	<b>12.0" Round Culvert</b> L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 651.25' / 650.25' S= 0.0167 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.67 cfs @ 11.96 hrs HW=652.69' (Free Discharge)

↑1=Culvert (Inlet Controls 3.67 cfs @ 4.68 fps)

## Pond 83P: YD 3

Hydrograph



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Type II 24-hr 25-yr Rainfall=6.20"

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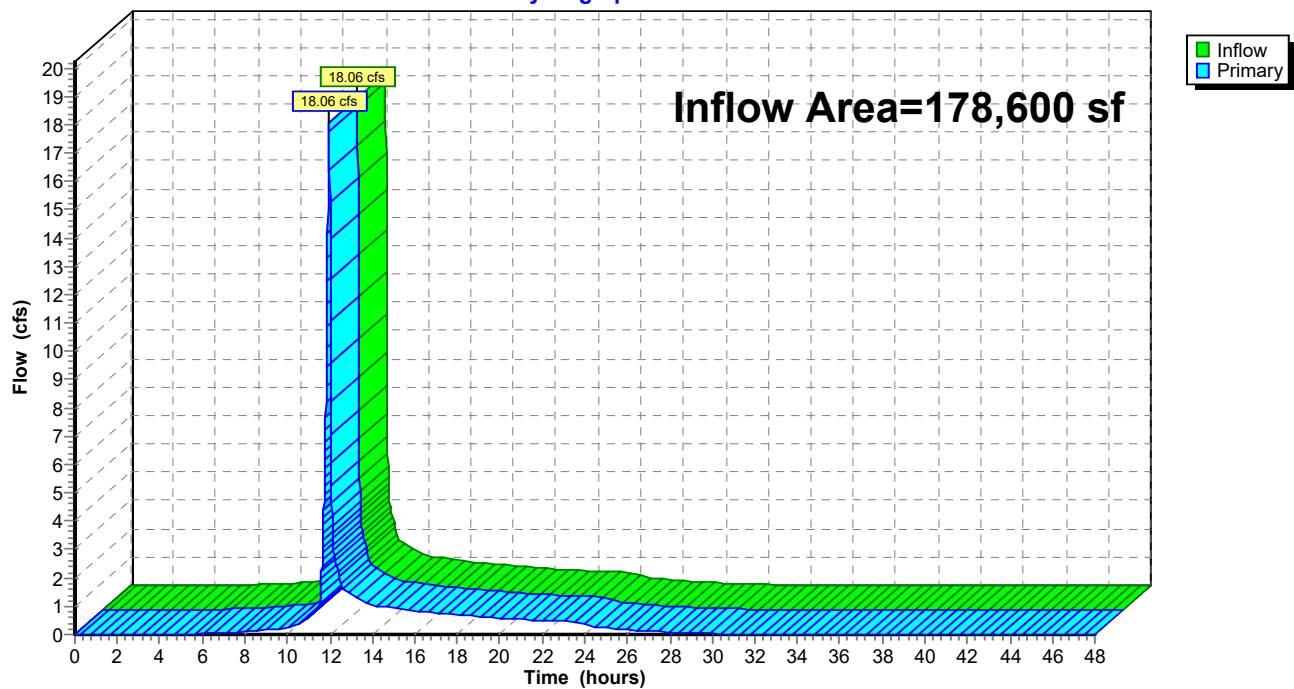
### Summary for Link 10L: Center Road

Inflow Area = 178,600 sf, 37.73% Impervious, Inflow Depth = 3.98" for 25-yr event  
Inflow = 18.06 cfs @ 11.96 hrs, Volume= 59,227 cf  
Primary = 18.06 cfs @ 11.96 hrs, Volume= 59,227 cf, Atten= 0%, Lag= 0.0 min

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

### Link 10L: Center Road

Hydrograph



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

<b>Subcatchment10S: Proposed to Center</b>	Runoff Area=83,930 sf 43.63% Impervious Runoff Depth=6.03" Tc=5.0 min CN=84 Runoff=20.12 cfs 42,161 cf
<b>Subcatchment11S: Proposed to CB 1</b>	Runoff Area=7,750 sf 41.81% Impervious Runoff Depth=6.03" Tc=5.0 min CN=84 Runoff=1.86 cfs 3,893 cf
<b>Subcatchment12S: Proposed to CB 2</b>	Runoff Area=4,140 sf 22.46% Impervious Runoff Depth=5.44" Tc=5.0 min CN=79 Runoff=0.92 cfs 1,878 cf
<b>Subcatchment13S: Proposed to CB 3</b>	Runoff Area=930 sf 100.00% Impervious Runoff Depth=7.69" Tc=5.0 min CN=98 Runoff=0.25 cfs 596 cf
<b>Subcatchment14S: Proposed to CB 4</b>	Runoff Area=2,000 sf 34.50% Impervious Runoff Depth=5.79" Tc=5.0 min CN=82 Runoff=0.47 cfs 966 cf
<b>Subcatchment15S: Proposed to CB 5</b>	Runoff Area=660 sf 100.00% Impervious Runoff Depth=7.69" Tc=5.0 min CN=98 Runoff=0.18 cfs 423 cf
<b>Subcatchment16S: Proposed to CB 6</b>	Runoff Area=5,850 sf 56.41% Impervious Runoff Depth=6.50" Tc=5.0 min CN=88 Runoff=1.47 cfs 3,169 cf
<b>Subcatchment17S: Proposed to CB 7</b>	Runoff Area=2,950 sf 74.92% Impervious Runoff Depth=6.97" Tc=5.0 min CN=92 Runoff=0.77 cfs 1,714 cf
<b>Subcatchment18S: Proposed to CB 8</b>	Runoff Area=3,330 sf 75.98% Impervious Runoff Depth=6.97" Tc=5.0 min CN=92 Runoff=0.87 cfs 1,935 cf
<b>Subcatchment19S: Proposed to CB 9</b>	Runoff Area=11,800 sf 50.17% Impervious Runoff Depth=6.26" Tc=5.0 min CN=86 Runoff=2.90 cfs 6,159 cf
<b>Subcatchment20S: Proposed to Northern</b>	Runoff Area=56,570 sf 79.49% Impervious Runoff Depth=7.09" Tc=5.0 min CN=93 Runoff=14.84 cfs 33,438 cf
<b>Subcatchment30S: Proposed to West</b>	Runoff Area=230,400 sf 0.36% Impervious Runoff Depth=4.52" Flow Length=530' Tc=20.1 min CN=71 Runoff=26.57 cfs 86,755 cf
<b>Subcatchment40S: Proposed to South</b>	Runoff Area=19,030 sf 0.00% Impervious Runoff Depth=4.63" Flow Length=255' Tc=16.0 min CN=72 Runoff=2.54 cfs 7,347 cf
<b>Subcatchment50S: Proposed to WQB</b>	Runoff Area=34,530 sf 0.00% Impervious Runoff Depth=4.86" Tc=5.0 min CN=74 Runoff=7.00 cfs 13,994 cf
<b>Subcatchment81S: Proposed to YD 1</b>	Runoff Area=4,470 sf 100.00% Impervious Runoff Depth=7.69" Tc=5.0 min CN=98 Runoff=1.20 cfs 2,865 cf
<b>Subcatchment82S: Proposed to YD 2</b>	Runoff Area=4,470 sf 100.00% Impervious Runoff Depth=7.69" Tc=5.0 min CN=98 Runoff=1.20 cfs 2,865 cf

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<b>Subcatchment83S: Proposed to YD 3</b>	Runoff Area=11,790 sf 12.04% Impervious Runoff Depth=5.21" Tc=5.0 min CN=77 Runoff=2.53 cfs 5,119 cf
<b>Pond 11P: CB 1</b>	Peak Elev=637.24' Inflow=1.86 cfs 3,893 cf 12.0" Round Culvert n=0.012 L=3.0' S=0.0333 '/' Outflow=1.86 cfs 3,893 cf
<b>Pond 12P: CB 2</b>	Peak Elev=639.49' Inflow=0.92 cfs 1,878 cf 12.0" Round Culvert n=0.012 L=15.0' S=0.0200 '/' Outflow=0.92 cfs 1,878 cf
<b>Pond 13P: CB 3</b>	Peak Elev=639.35' Inflow=0.25 cfs 596 cf 12.0" Round Culvert n=0.012 L=3.0' S=0.0333 '/' Outflow=0.25 cfs 596 cf
<b>Pond 14P: CB 4</b>	Peak Elev=643.84' Inflow=0.47 cfs 966 cf 12.0" Round Culvert n=0.012 L=15.0' S=0.0200 '/' Outflow=0.47 cfs 966 cf
<b>Pond 15P: CB 5</b>	Peak Elev=643.70' Inflow=0.18 cfs 423 cf 12.0" Round Culvert n=0.012 L=3.0' S=0.0333 '/' Outflow=0.18 cfs 423 cf
<b>Pond 16P: CB 6</b>	Peak Elev=650.72' Inflow=1.47 cfs 3,169 cf 12.0" Round Culvert n=0.012 L=15.0' S=0.0100 '/' Outflow=1.47 cfs 3,169 cf
<b>Pond 17P: CB 7</b>	Peak Elev=647.95' Inflow=0.77 cfs 1,714 cf 12.0" Round Culvert n=0.012 L=9.0' S=0.0222 '/' Outflow=0.77 cfs 1,714 cf
<b>Pond 18P: CB 8</b>	Peak Elev=650.80' Inflow=0.87 cfs 1,935 cf 12.0" Round Culvert n=0.012 L=6.0' S=0.0250 '/' Outflow=0.87 cfs 1,935 cf
<b>Pond 19P: CB 9</b>	Peak Elev=651.22' Inflow=2.90 cfs 6,159 cf 12.0" Round Culvert n=0.012 L=6.0' S=0.0250 '/' Outflow=2.90 cfs 6,159 cf
<b>Pond 40P: HDS Unit</b>	Peak Elev=645.45' Inflow=10.94 cfs 23,826 cf 15.0" Round Culvert n=0.012 L=46.0' S=0.0739 '/' Outflow=10.94 cfs 23,826 cf
<b>Pond 50P: WQB</b>	Peak Elev=641.65' Storage=23,857 cf Inflow=17.93 cfs 37,819 cf Outflow=0.66 cfs 33,408 cf
<b>Pond 61P: DMH 1</b>	Peak Elev=635.08' Inflow=4.20 cfs 41,163 cf 12.0" Round Culvert n=0.012 L=70.0' S=0.0679 '/' Outflow=4.20 cfs 41,163 cf
<b>Pond 62P: DMH 2</b>	Peak Elev=636.30' Inflow=4.20 cfs 41,163 cf 12.0" Round Culvert n=0.012 L=100.0' S=0.0100 '/' Outflow=4.20 cfs 41,163 cf
<b>Pond 63P: DMH 3</b>	Peak Elev=636.23' Inflow=2.34 cfs 37,270 cf 12.0" Round Culvert n=0.012 L=77.0' S=0.0104 '/' Outflow=2.34 cfs 37,270 cf
<b>Pond 64P: DMH 4</b>	Peak Elev=636.77' Inflow=1.18 cfs 34,797 cf 12.0" Round Culvert n=0.012 L=75.0' S=0.0100 '/' Outflow=1.18 cfs 34,797 cf
<b>Pond 65P: DMH 5</b>	Peak Elev=637.41' Inflow=0.66 cfs 33,408 cf 12.0" Round Culvert n=0.012 L=72.0' S=0.0097 '/' Outflow=0.66 cfs 33,408 cf



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**Pond 66P: DMH 6**

Peak Elev=647.94' Inflow=2.24 cfs 4,883 cf  
15.0" Round Culvert n=0.012 L=87.0' S=0.0103 ' ' Outflow=2.24 cfs 4,883 cf

**Pond 67P: DMH 7**

Peak Elev=647.11' Inflow=3.11 cfs 6,818 cf  
15.0" Round Culvert n=0.012 L=68.0' S=0.0103 ' ' Outflow=3.11 cfs 6,818 cf

**Pond 68P: DMH 8**

Peak Elev=647.11' Inflow=6.01 cfs 12,978 cf  
15.0" Round Culvert n=0.012 L=42.0' S=0.0095 ' ' Outflow=6.01 cfs 12,978 cf

**Pond 69P: DMH 9**

Peak Elev=646.05' Inflow=10.94 cfs 23,826 cf  
15.0" Round Culvert n=0.012 L=8.0' S=0.0750 ' ' Outflow=10.94 cfs 23,826 cf

**Pond 70P: DMH 10**

Peak Elev=650.40' Inflow=4.93 cfs 10,848 cf  
12.0" Round Culvert n=0.012 L=193.0' S=0.0166 ' ' Outflow=4.93 cfs 10,848 cf

**Pond 71P: DMH 11**

Peak Elev=652.35' Inflow=4.93 cfs 10,848 cf  
12.0" Round Culvert n=0.012 L=112.0' S=0.0165 ' ' Outflow=4.93 cfs 10,848 cf

**Pond 81P: YD 1**

Peak Elev=653.57' Inflow=1.20 cfs 2,865 cf  
12.0" Round Culvert n=0.012 L=46.0' S=0.0380 ' ' Outflow=1.20 cfs 2,865 cf

**Pond 82P: YD 2**

Peak Elev=653.57' Inflow=1.20 cfs 2,865 cf  
12.0" Round Culvert n=0.012 L=46.0' S=0.0380 ' ' Outflow=1.20 cfs 2,865 cf

**Pond 83P: YD 3**

Peak Elev=653.45' Inflow=4.93 cfs 10,848 cf  
12.0" Round Culvert n=0.012 L=60.0' S=0.0167 ' ' Outflow=4.93 cfs 10,848 cf

**Link 10L: Center Road**

Inflow=24.31 cfs 83,325 cf  
Primary=24.31 cfs 83,325 cf

**Total Runoff Area = 484,600 sf Runoff Volume = 215,277 cf Average Runoff Depth = 5.33"**  
**76.64% Pervious = 371,420 sf 23.36% Impervious = 113,180 sf**

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**Summary for Subcatchment 10S: Proposed to Center Road**

Runoff = 20.12 cfs @ 11.96 hrs, Volume= 42,161 cf, Depth= 6.03"

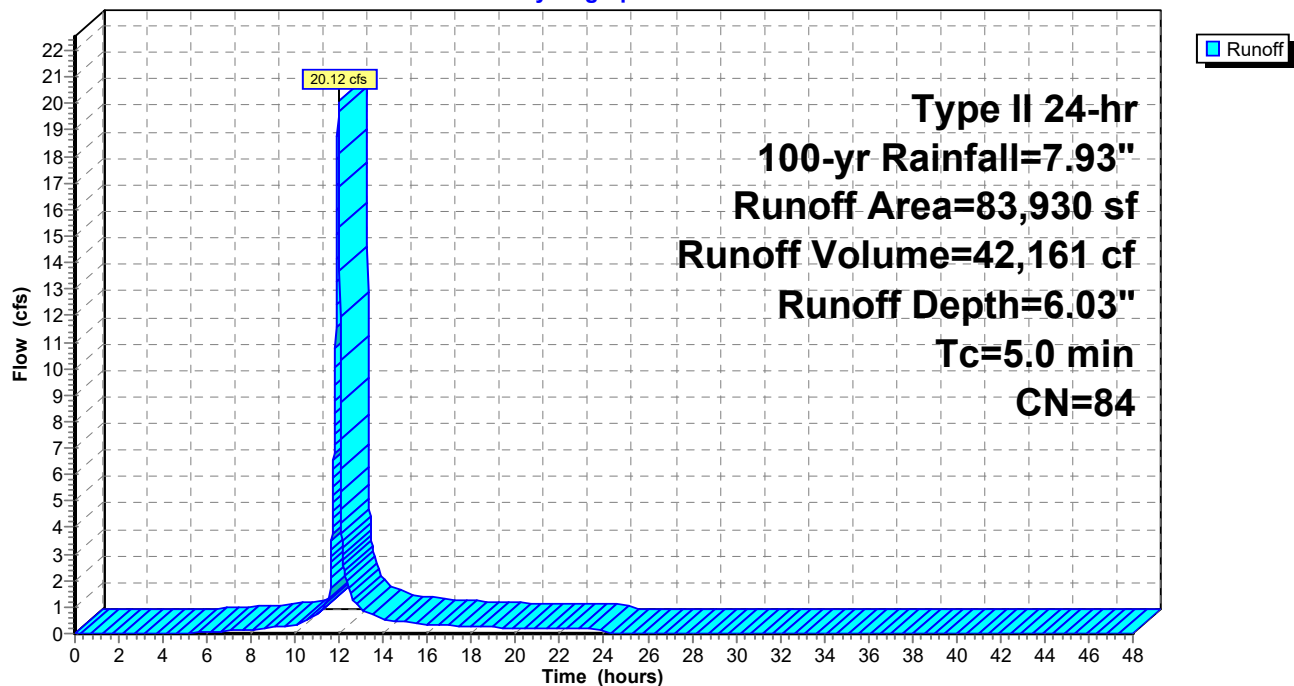
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	36,620	98	Paved
	38,010	74	>75% Grass cover, Good, HSG C
	9,300	70	Woods, Good, HSG C
	83,930	84	Weighted Average
	47,310		56.37% Pervious Area
	36,620		43.63% Impervious Area

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

**Subcatchment 10S: Proposed to Center Road**

Hydrograph



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**Summary for Subcatchment 11S: Proposed to CB 1**

Runoff = 1.86 cfs @ 11.96 hrs, Volume= 3,893 cf, Depth= 6.03"

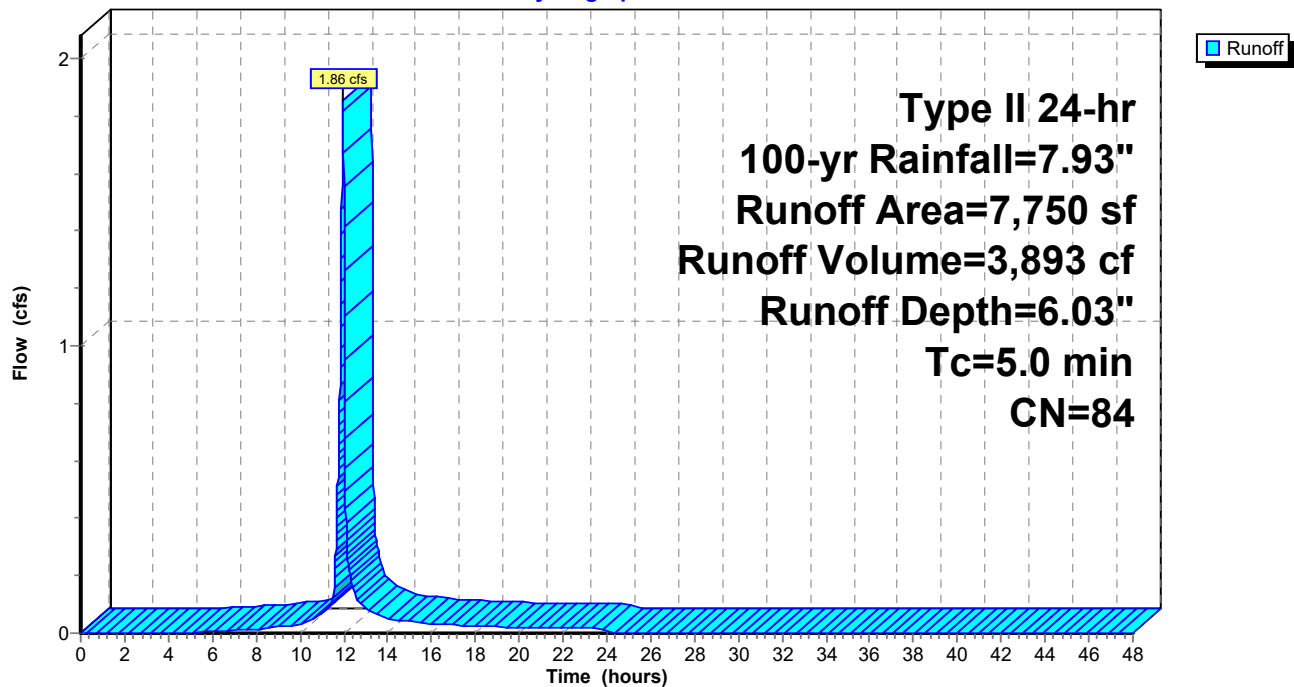
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	3,240	98	Paved
	4,510	74	>75% Grass cover, Good, HSG C
	7,750	84	Weighted Average
	4,510		58.19% Pervious Area
	3,240		41.81% Impervious Area

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

**Subcatchment 11S: Proposed to CB 1**

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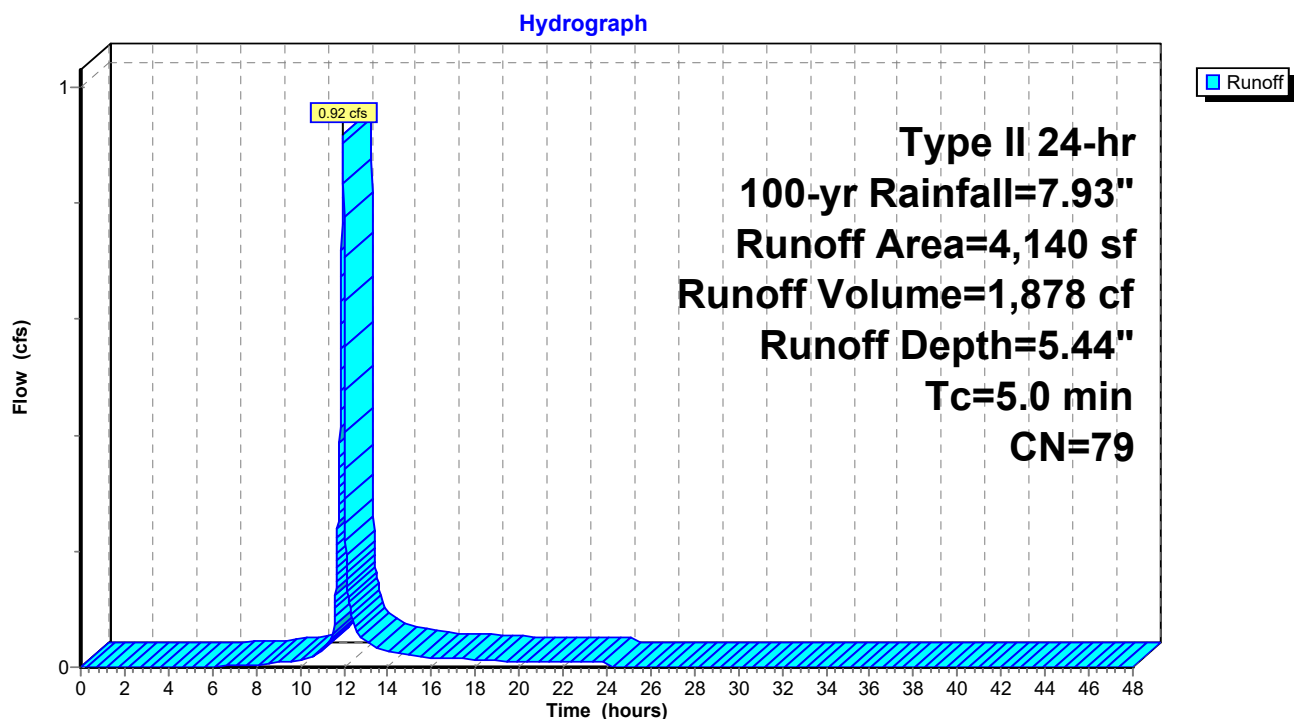
**Summary for Subcatchment 12S: Proposed to CB 2**

Runoff = 0.92 cfs @ 11.96 hrs, Volume= 1,878 cf, Depth= 5.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	930	98	Paved
	3,210	74	>75% Grass cover, Good, HSG C
	4,140	79	Weighted Average
	3,210		77.54% Pervious Area
	930		22.46% Impervious Area

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

**Subcatchment 12S: Proposed to CB 2**

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**Summary for Subcatchment 13S: Proposed to CB 3**

Runoff = 0.25 cfs @ 11.96 hrs, Volume= 596 cf, Depth= 7.69"

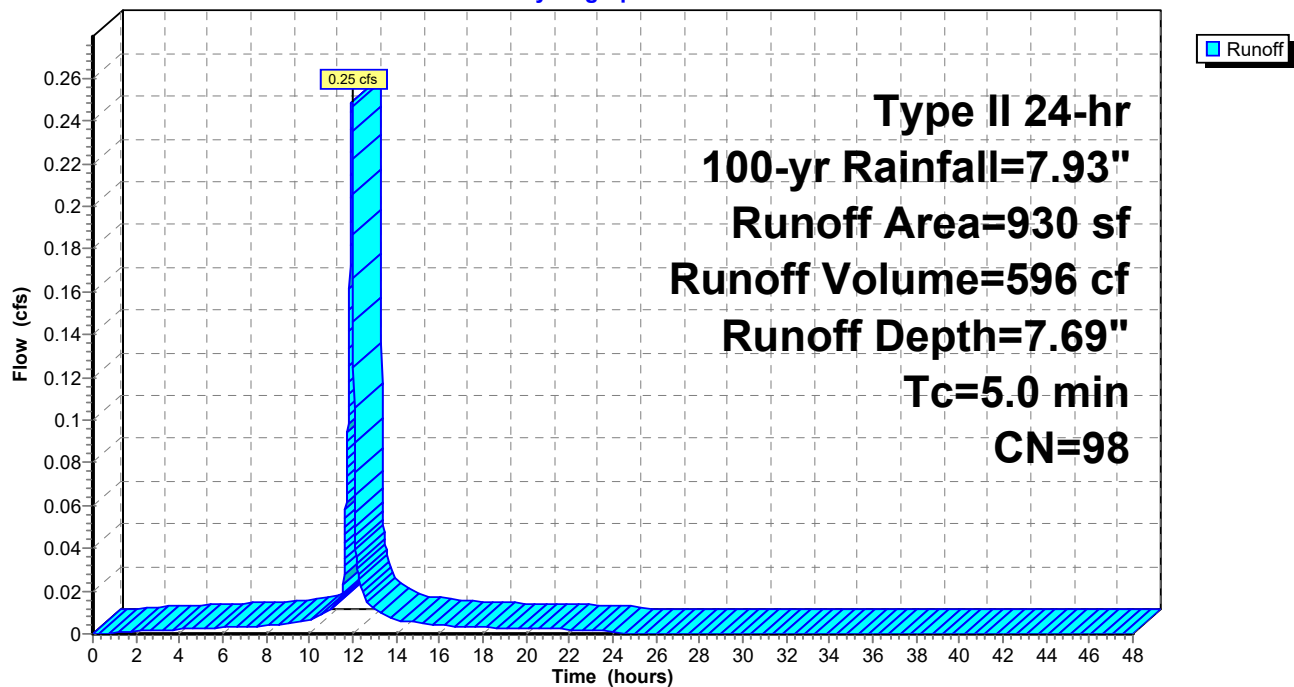
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	930	98	Paved
	930		100.00% Impervious Area

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

**Subcatchment 13S: Proposed to CB 3**

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**Summary for Subcatchment 14S: Proposed to CB 4**

Runoff = 0.47 cfs @ 11.96 hrs, Volume= 966 cf, Depth= 5.79"

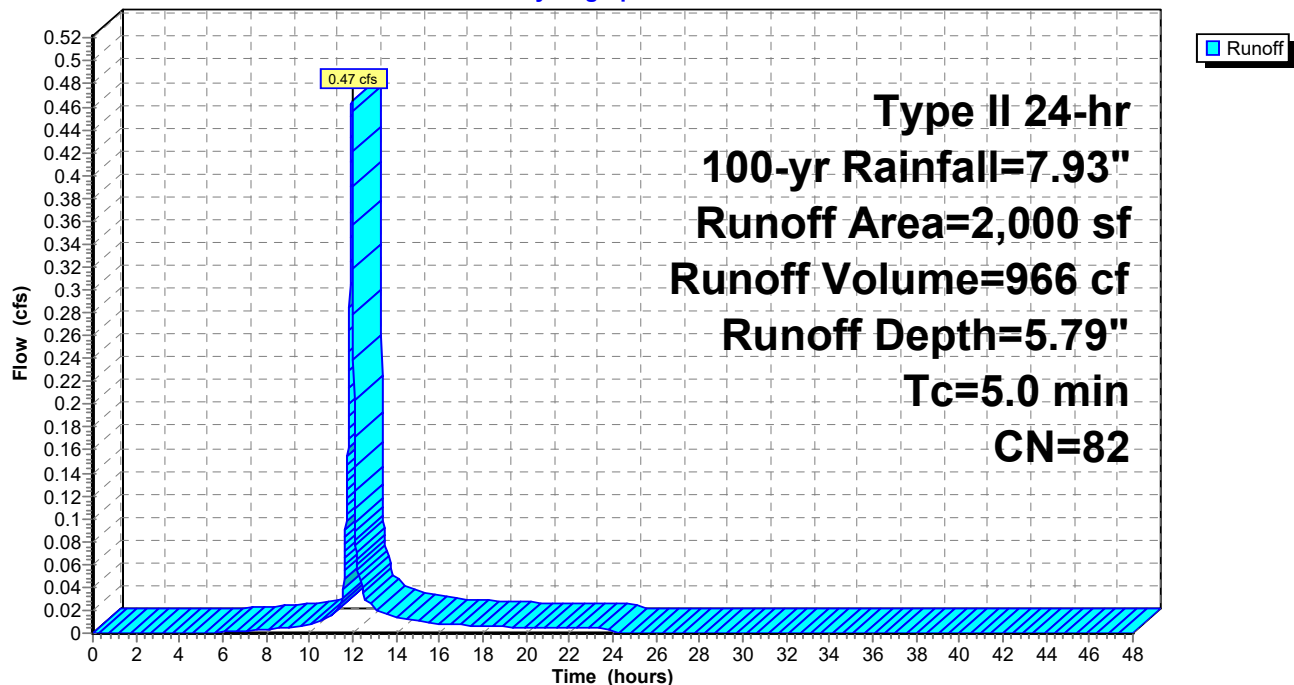
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	690	98	Paved
	1,310	74	>75% Grass cover, Good, HSG C
	2,000	82	Weighted Average
	1,310		65.50% Pervious Area
	690		34.50% Impervious Area

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

**Subcatchment 14S: Proposed to CB 4**

Hydrograph



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Type II 24-hr 100-yr Rainfall=7.93"

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**Summary for Subcatchment 15S: Proposed to CB 5**

Runoff = 0.18 cfs @ 11.96 hrs, Volume= 423 cf, Depth= 7.69"

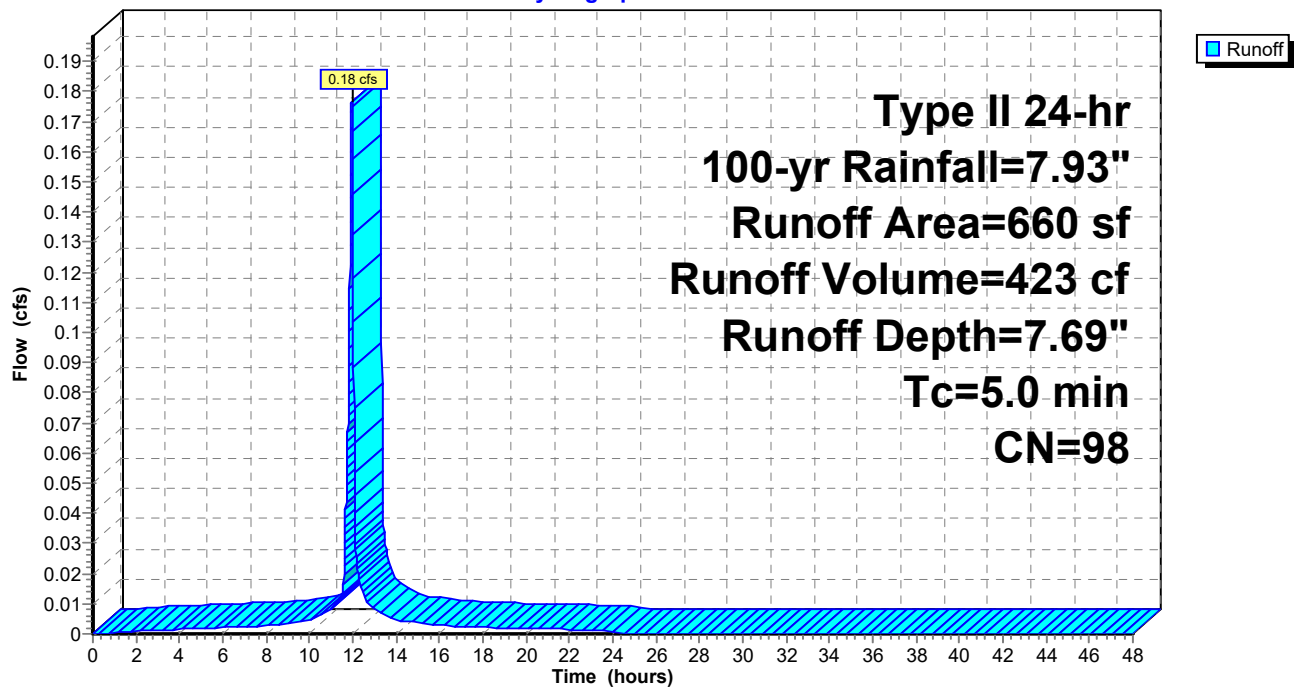
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	660	98	Paved
	660		100.00% Impervious Area

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

**Subcatchment 15S: Proposed to CB 5**

Hydrograph



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**Summary for Subcatchment 16S: Proposed to CB 6**

Runoff = 1.47 cfs @ 11.96 hrs, Volume= 3,169 cf, Depth= 6.50"

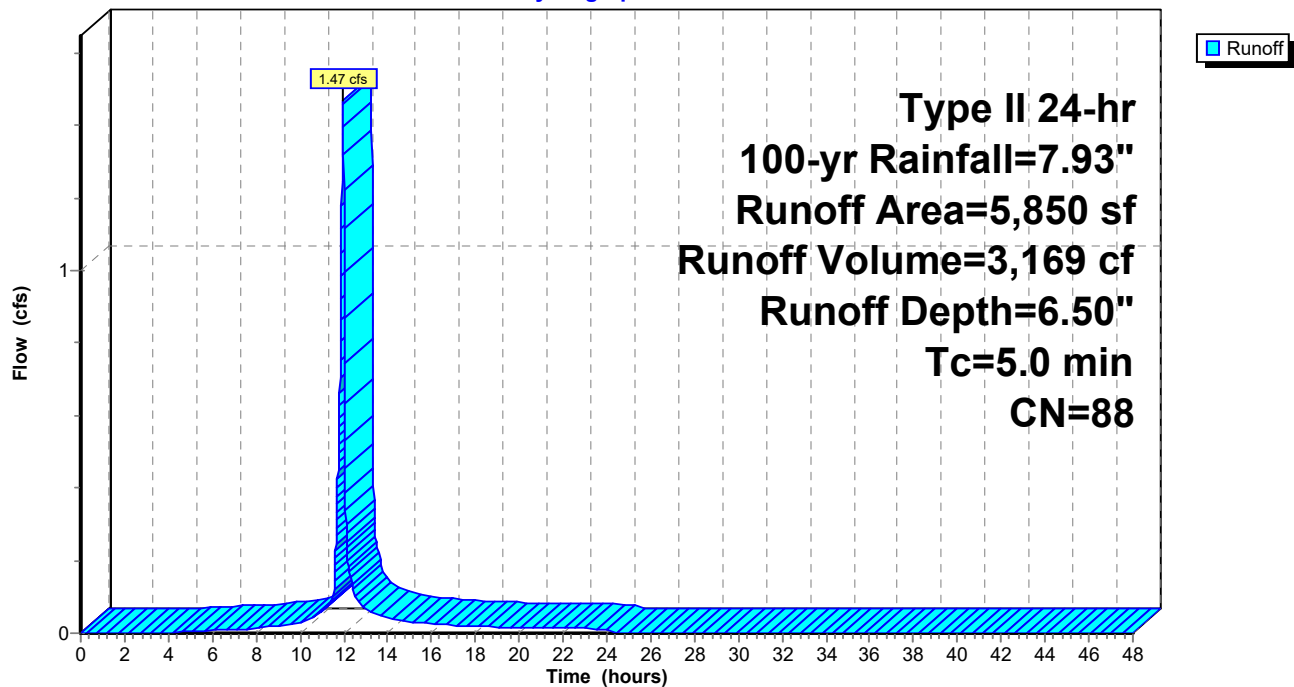
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	3,300	98	Paved
	2,550	74	>75% Grass cover, Good, HSG C
	5,850	88	Weighted Average
	2,550		43.59% Pervious Area
	3,300		56.41% Impervious Area

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

**Subcatchment 16S: Proposed to CB 6**

Hydrograph





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**Summary for Subcatchment 17S: Proposed to CB 7**

Runoff = 0.77 cfs @ 11.96 hrs, Volume= 1,714 cf, Depth= 6.97"

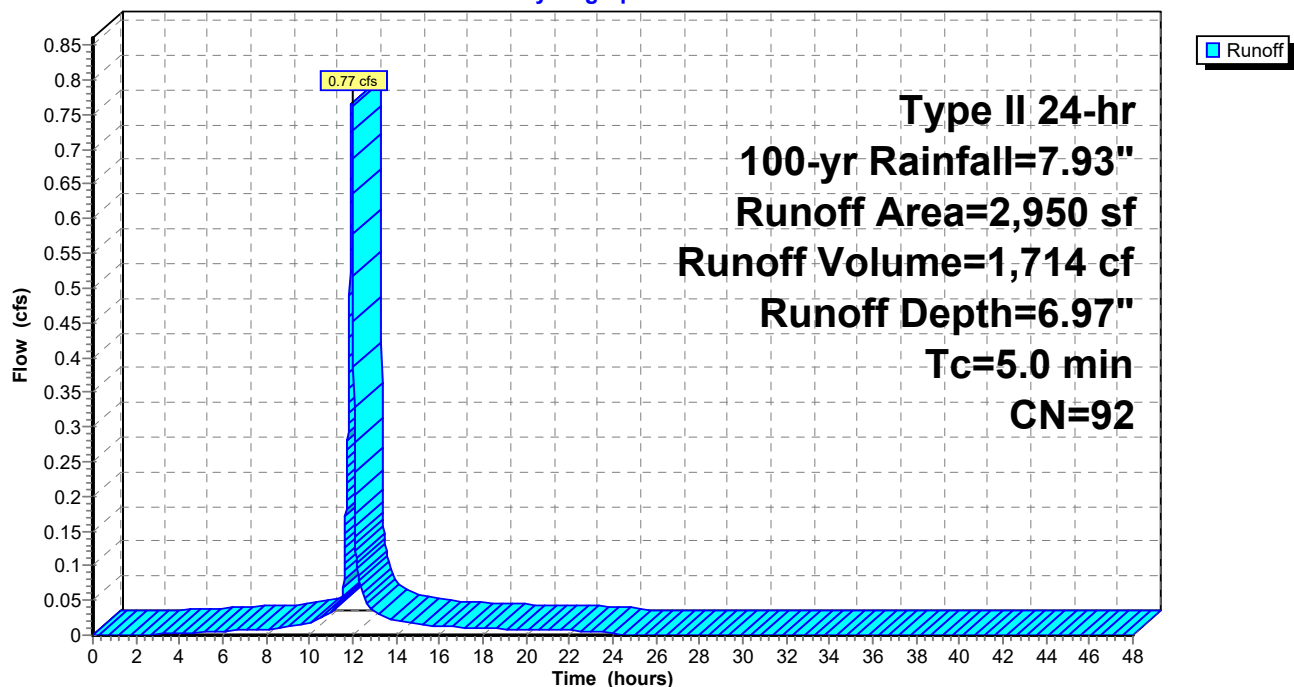
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	2,210	98	Paved
	740	74	>75% Grass cover, Good, HSG C
	2,950	92	Weighted Average
	740		25.08% Pervious Area
	2,210		74.92% Impervious Area

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

**Subcatchment 17S: Proposed to CB 7**

Hydrograph



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Type II 24-hr 100-yr Rainfall=7.93"

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**Summary for Subcatchment 18S: Proposed to CB 8**

Runoff = 0.87 cfs @ 11.96 hrs, Volume= 1,935 cf, Depth= 6.97"

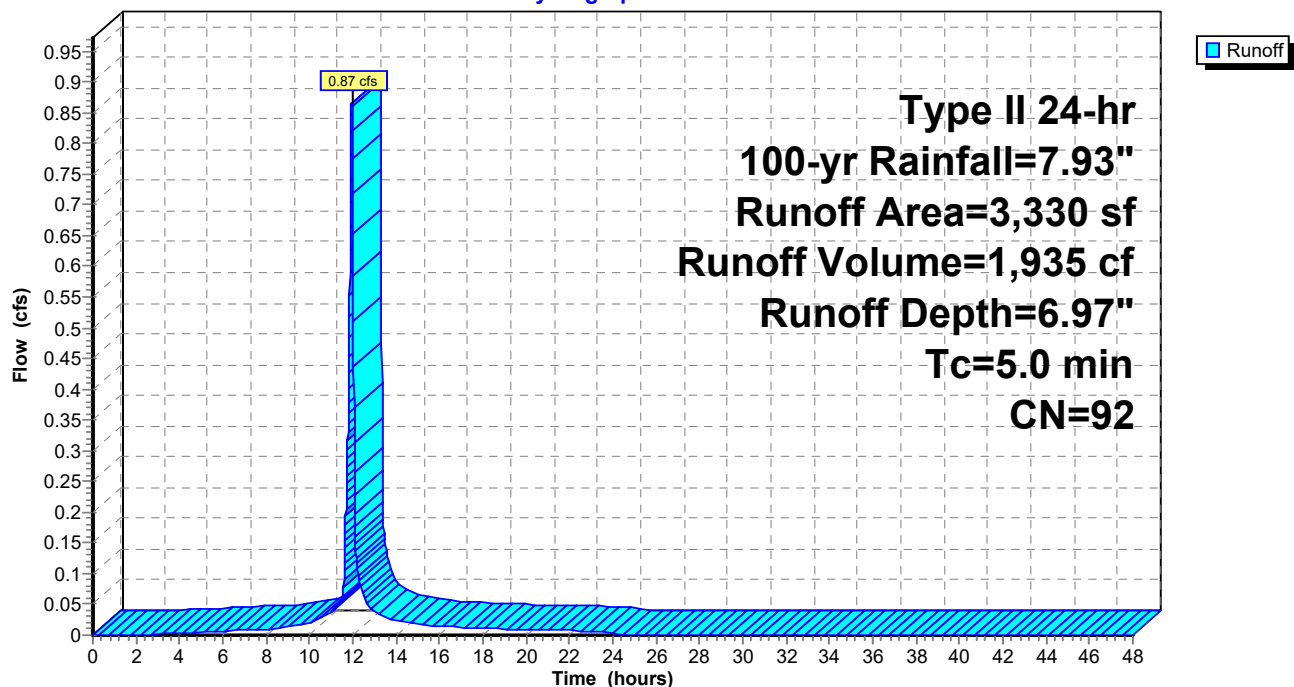
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	2,530	98	Paved
	800	74	>75% Grass cover, Good, HSG C
	3,330	92	Weighted Average
	800		24.02% Pervious Area
	2,530		75.98% Impervious Area

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

**Subcatchment 18S: Proposed to CB 8**

Hydrograph



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**Summary for Subcatchment 19S: Proposed to CB 9**

Runoff = 2.90 cfs @ 11.96 hrs, Volume= 6,159 cf, Depth= 6.26"

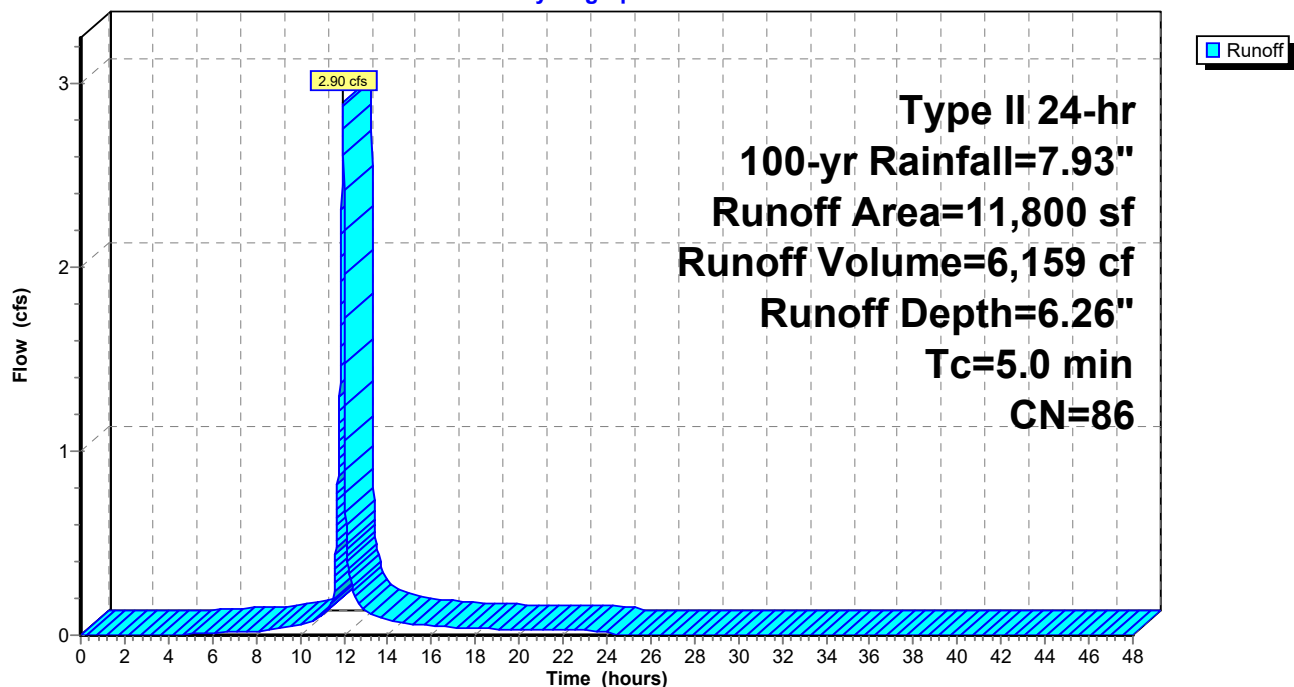
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	5,920	98	Paved
	5,880	74	>75% Grass cover, Good, HSG C
	11,800	86	Weighted Average
	5,880		49.83% Pervious Area
	5,920		50.17% Impervious Area

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

**Subcatchment 19S: Proposed to CB 9**

Hydrograph



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**Summary for Subcatchment 20S: Proposed to Northern Detention Basin**

Runoff = 14.84 cfs @ 11.96 hrs, Volume= 33,438 cf, Depth= 7.09"

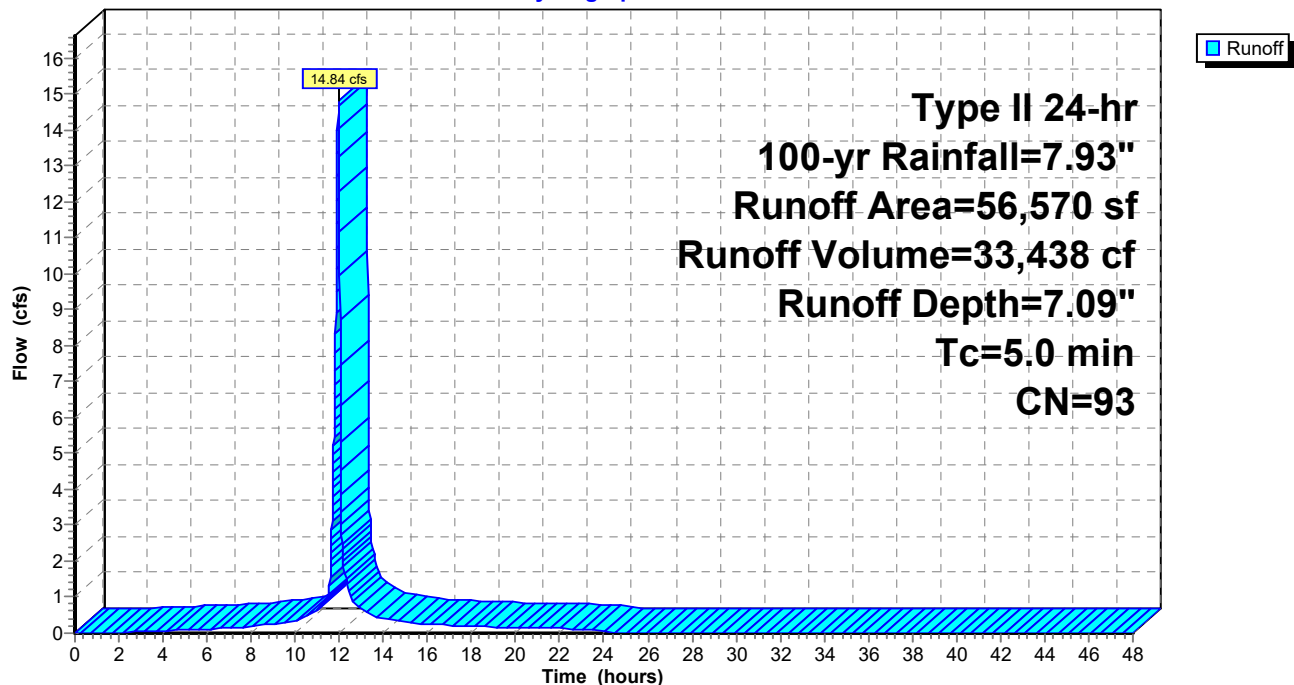
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	44,970	98	Paved
	11,600	74	>75% Grass cover, Good, HSG C
	56,570	93	Weighted Average
	11,600		20.51% Pervious Area
	44,970		79.49% Impervious Area

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

**Subcatchment 20S: Proposed to Northern Detention Basin**

Hydrograph



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Type II 24-hr 100-yr Rainfall=7.93"

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**Summary for Subcatchment 30S: Proposed to West**

Runoff = 26.57 cfs @ 12.13 hrs, Volume= 86,755 cf, Depth= 4.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

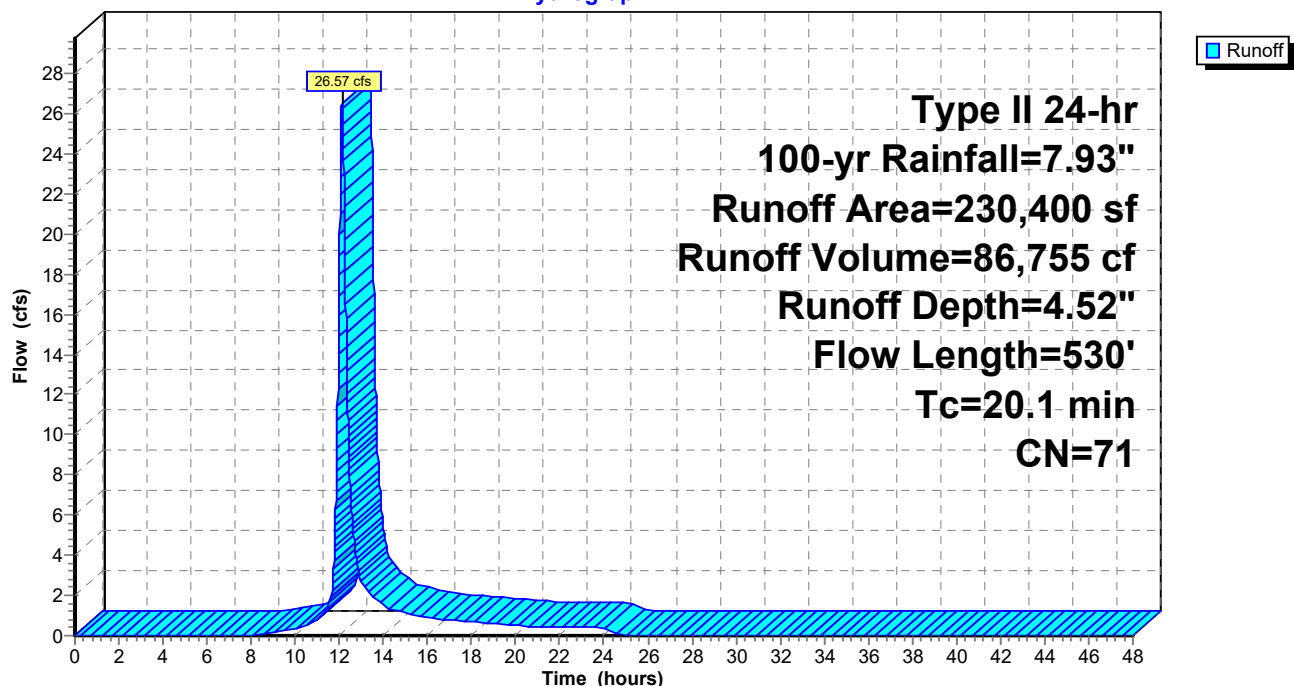
	Area (sf)	CN	Description
*	820	98	Paved
	71,890	74	>75% Grass cover, Good, HSG C
	157,690	70	Woods, Good, HSG C
	230,400	71	Weighted Average
	229,580		99.64% Pervious Area
	820		0.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
5.6	165	0.0050	0.49		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
2.1	290	0.1070	2.29		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
20.1	530	Total			

**Subcatchment 30S: Proposed to West**

Hydrograph



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Type II 24-hr 100-yr Rainfall=7.93"

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**Summary for Subcatchment 40S: Proposed to South**

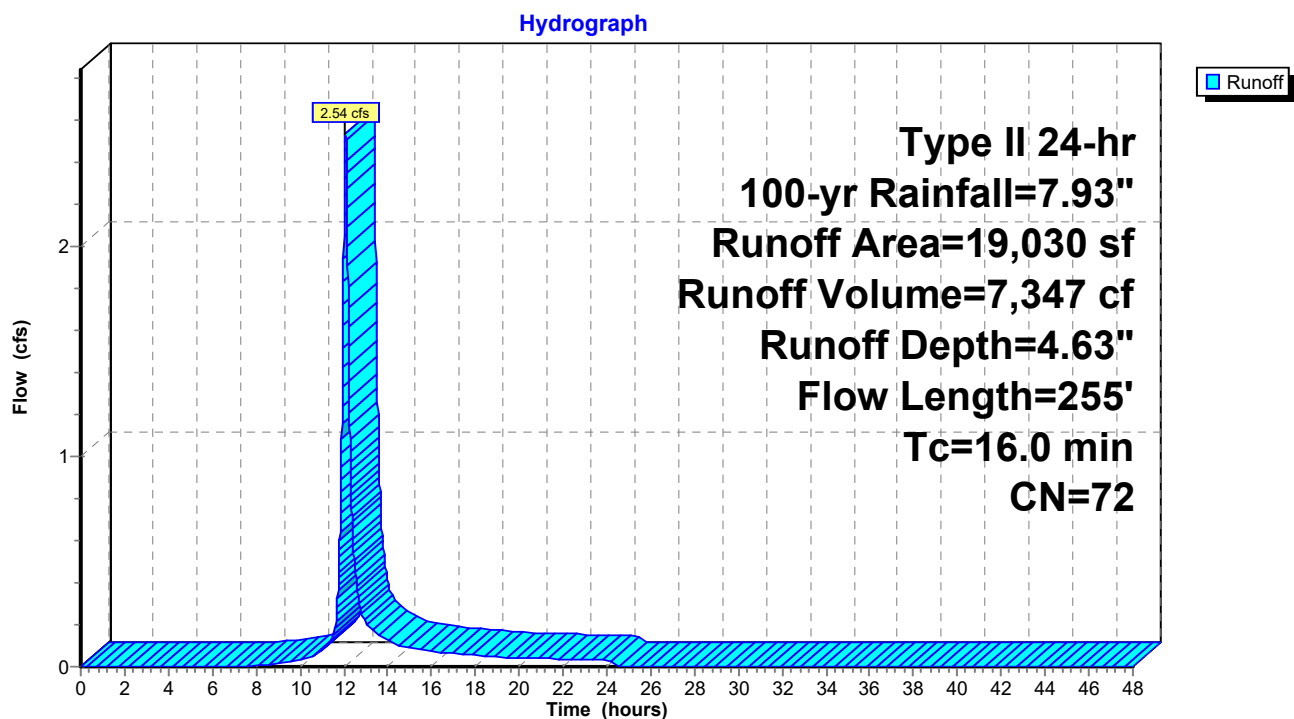
Runoff = 2.54 cfs @ 12.08 hrs, Volume= 7,347 cf, Depth= 4.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

Area (sf)	CN	Description
10,460	74	>75% Grass cover, Good, HSG C
8,570	70	Woods, Good, HSG C
19,030	72	Weighted Average
19,030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	75	0.0060	0.10		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.29"
2.4	100	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.2	80	0.0250	1.11		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
16.0	255	Total			

**Subcatchment 40S: Proposed to South**

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**Summary for Subcatchment 50S: Proposed to WQB**

Runoff = 7.00 cfs @ 11.96 hrs, Volume= 13,994 cf, Depth= 4.86"

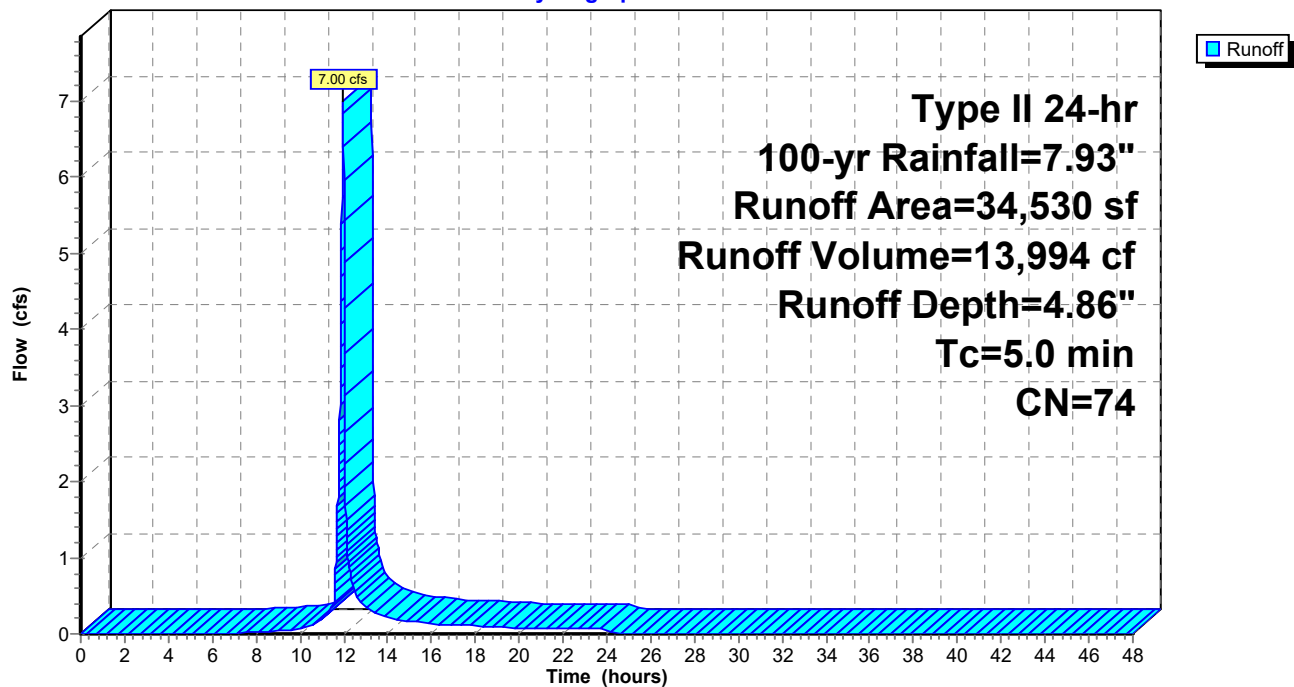
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

Area (sf)	CN	Description
34,530	74	>75% Grass cover, Good, HSG C
34,530		100.00% Pervious Area

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

**Subcatchment 50S: Proposed to WQB**

Hydrograph



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**Summary for Subcatchment 81S: Proposed to YD 1**

Runoff = 1.20 cfs @ 11.96 hrs, Volume= 2,865 cf, Depth= 7.69"

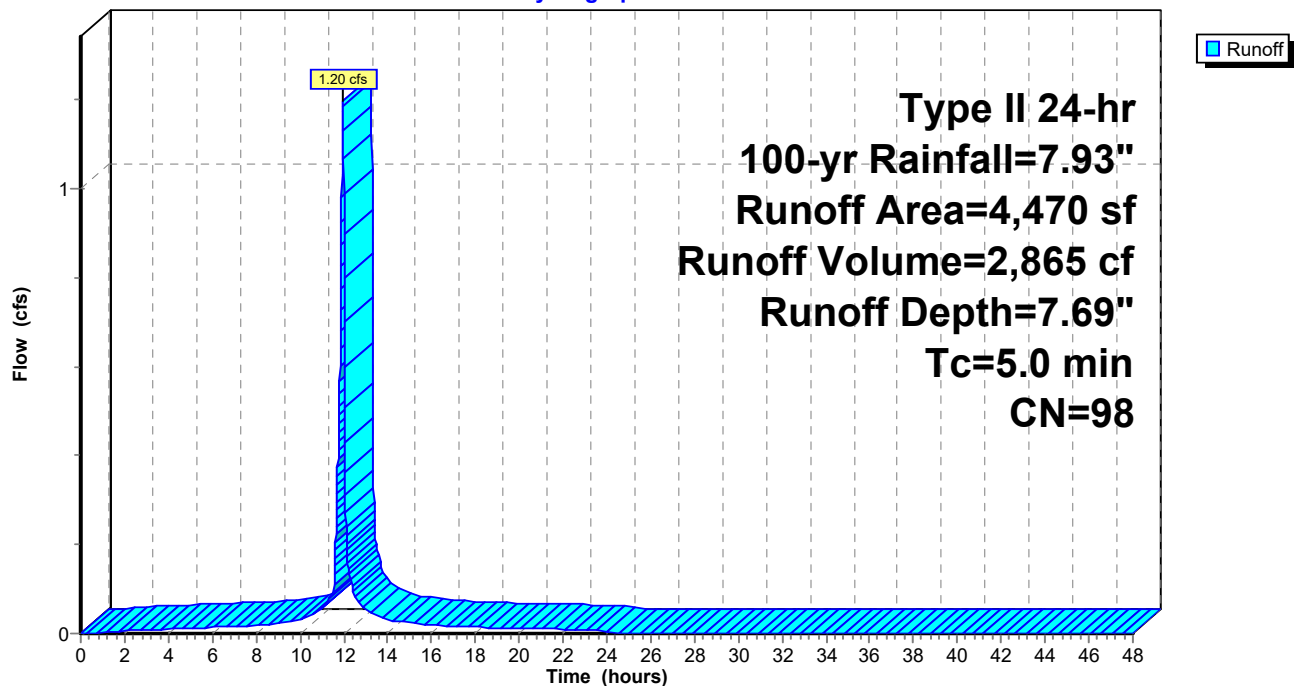
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	3,200	98	Roof
*	1,270	98	Paved
	4,470	98	Weighted Average
	4,470		100.00% Impervious Area

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

**Subcatchment 81S: Proposed to YD 1**

Hydrograph





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**Summary for Subcatchment 82S: Proposed to YD 2**

Runoff = 1.20 cfs @ 11.96 hrs, Volume= 2,865 cf, Depth= 7.69"

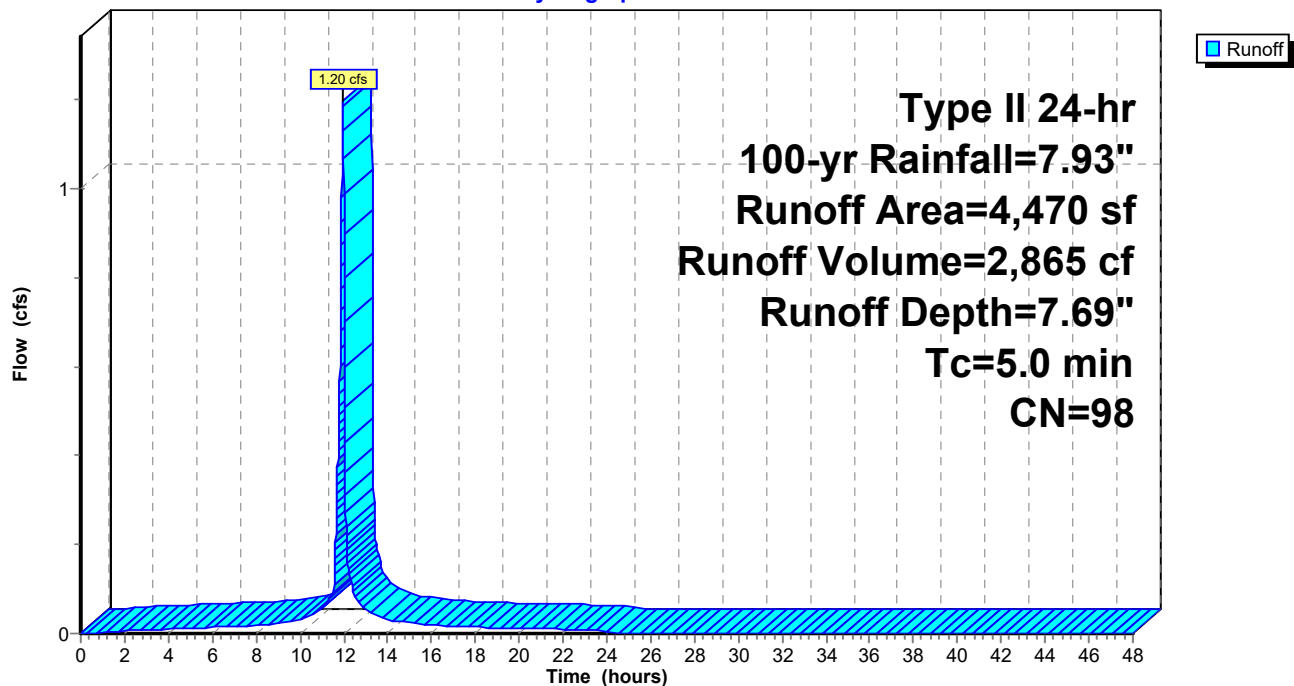
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	3,200	98	Roof
*	1,270	98	Paved
	4,470	98	Weighted Average
	4,470		100.00% Impervious Area

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

**Subcatchment 82S: Proposed to YD 2**

Hydrograph



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**Summary for Subcatchment 83S: Proposed to YD 3**

Runoff = 2.53 cfs @ 11.96 hrs, Volume= 5,119 cf, Depth= 5.21"

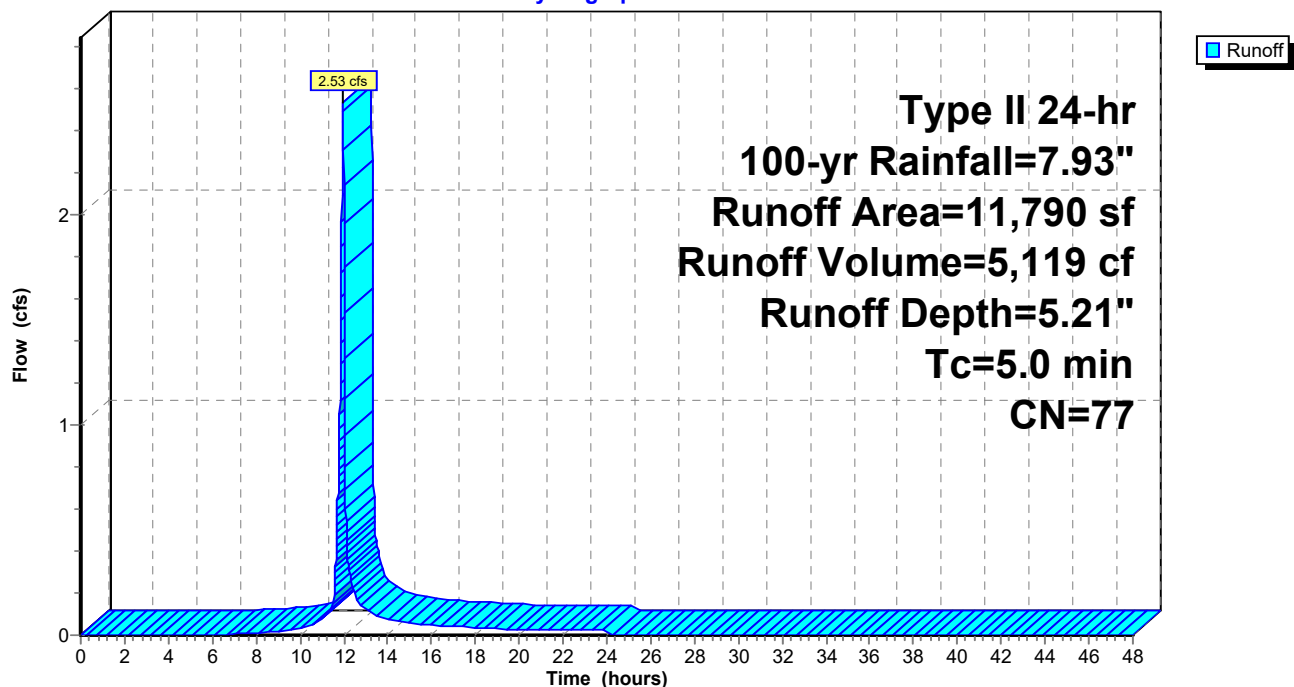
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-yr Rainfall=7.93"

	Area (sf)	CN	Description
*	1,420	98	Paved
	10,370	74	>75% Grass cover, Good, HSG C
	11,790	77	Weighted Average
	10,370		87.96% Pervious Area
	1,420		12.04% Impervious Area

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

**Subcatchment 83S: Proposed to YD 3**

Hydrograph



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**Summary for Pond 11P: CB 1**

Inflow Area = 7,750 sf, 41.81% Impervious, Inflow Depth = 6.03" for 100-yr event  
Inflow = 1.86 cfs @ 11.96 hrs, Volume= 3,893 cf  
Outflow = 1.86 cfs @ 11.96 hrs, Volume= 3,893 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.86 cfs @ 11.96 hrs, Volume= 3,893 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 637.24' @ 11.96 hrs

Flood Elev= 639.90'

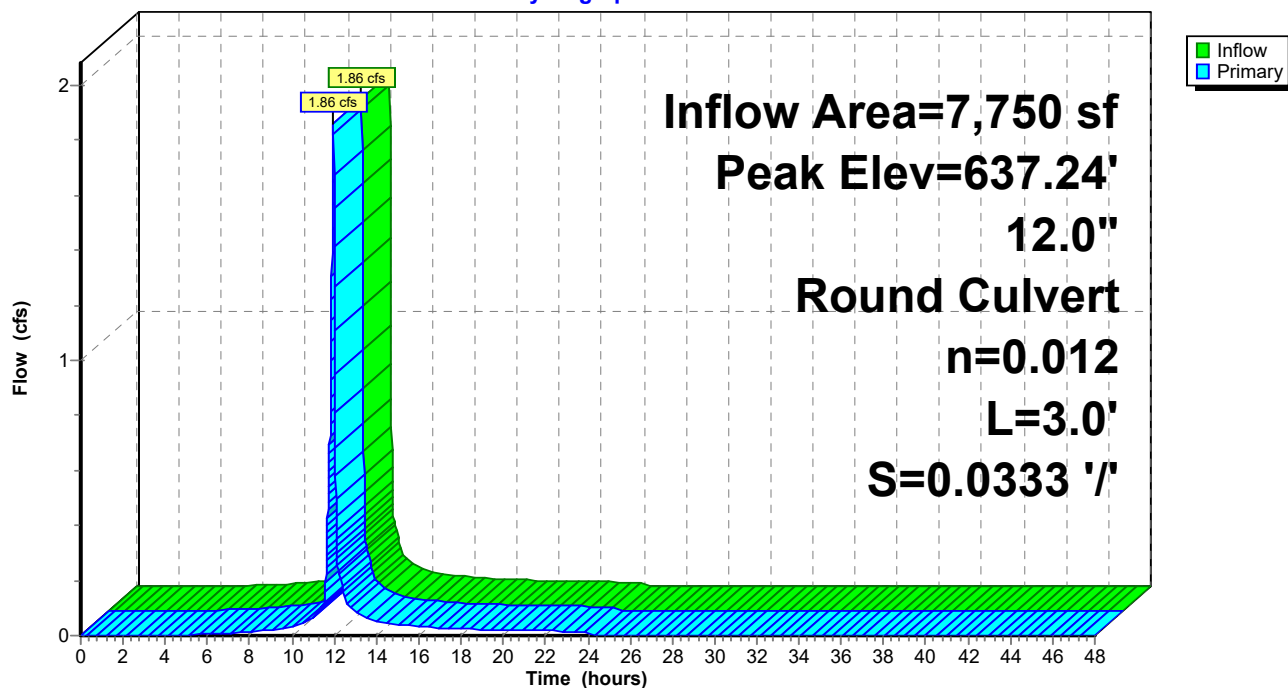
Device	Routing	Invert	Outlet Devices
#1	Primary	636.40'	<b>12.0" Round Culvert</b> L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 636.40' / 636.30' S= 0.0333 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.85 cfs @ 11.96 hrs HW=637.24' (Free Discharge)

1=Culvert (Barrel Controls 1.85 cfs @ 3.57 fps)

**Pond 11P: CB 1**

Hydrograph



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**Summary for Pond 12P: CB 2**

Inflow Area = 4,140 sf, 22.46% Impervious, Inflow Depth = 5.44" for 100-yr event  
Inflow = 0.92 cfs @ 11.96 hrs, Volume= 1,878 cf  
Outflow = 0.92 cfs @ 11.96 hrs, Volume= 1,878 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.92 cfs @ 11.96 hrs, Volume= 1,878 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 639.49' @ 11.96 hrs

Flood Elev= 642.50'

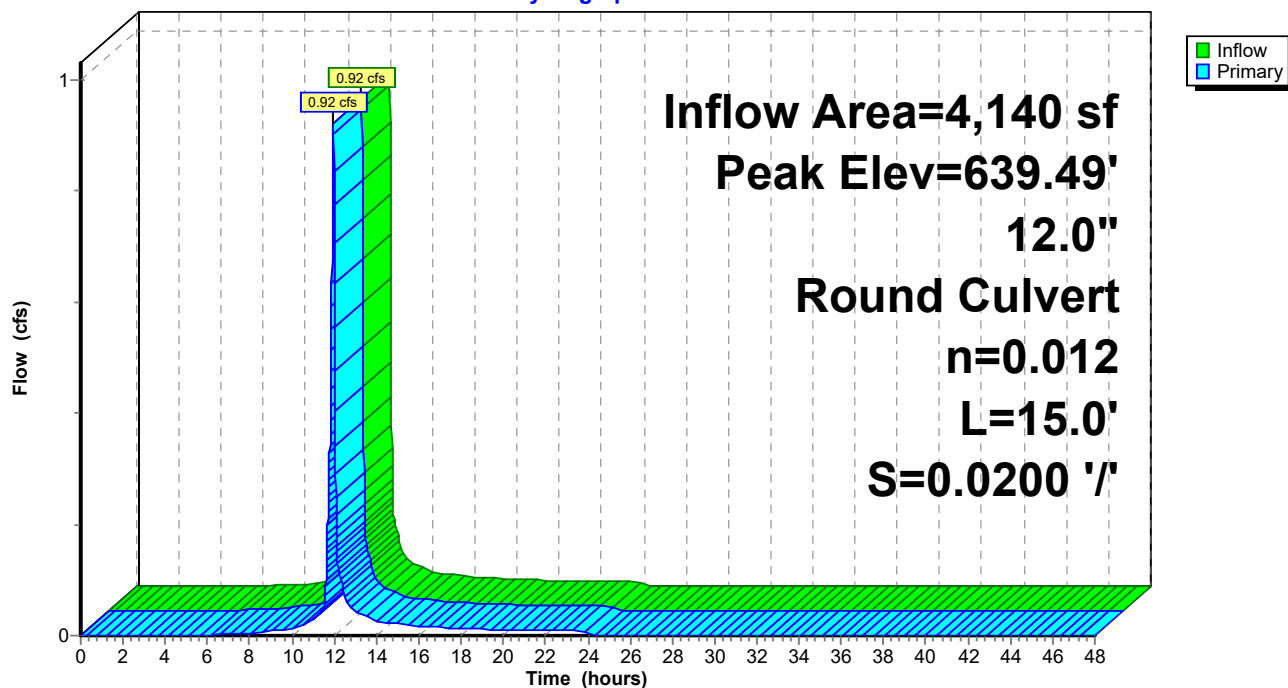
Device	Routing	Invert	Outlet Devices
#1	Primary	639.00'	<b>12.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 639.00' / 638.70' S= 0.0200 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.92 cfs @ 11.96 hrs HW=639.49' (Free Discharge)

↑1=Culvert (Inlet Controls 0.92 cfs @ 2.39 fps)

**Pond 12P: CB 2**

Hydrograph



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## Summary for Pond 13P: CB 3

Inflow Area = 930 sf, 100.00% Impervious, Inflow Depth = 7.69" for 100-yr event  
Inflow = 0.25 cfs @ 11.96 hrs, Volume= 596 cf  
Outflow = 0.25 cfs @ 11.96 hrs, Volume= 596 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.25 cfs @ 11.96 hrs, Volume= 596 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 639.35' @ 11.96 hrs

Flood Elev= 642.60'

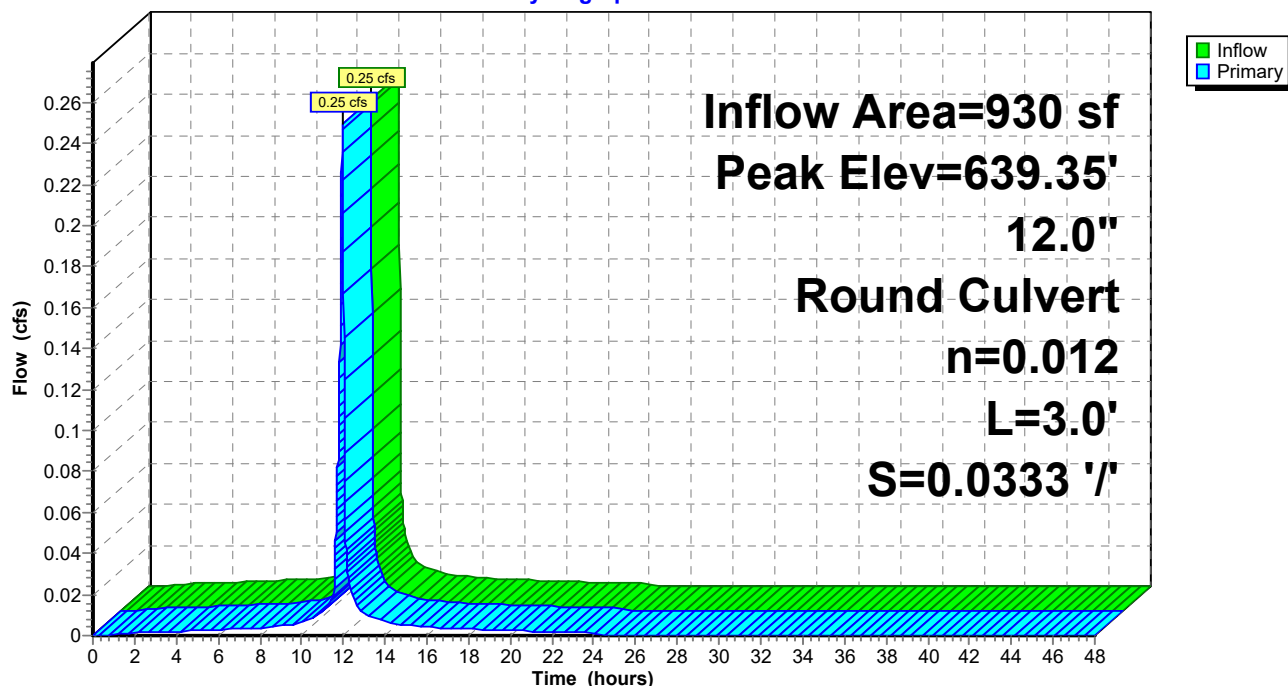
Device	Routing	Invert	Outlet Devices
#1	Primary	639.10'	<b>12.0" Round Culvert</b> L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 639.10' / 639.00' S= 0.0333 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.25 cfs @ 11.96 hrs HW=639.35' (Free Discharge)

↑1=Culvert (Barrel Controls 0.25 cfs @ 2.46 fps)

## Pond 13P: CB 3

Hydrograph



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## Summary for Pond 14P: CB 4

Inflow Area = 2,000 sf, 34.50% Impervious, Inflow Depth = 5.79" for 100-yr event  
Inflow = 0.47 cfs @ 11.96 hrs, Volume= 966 cf  
Outflow = 0.47 cfs @ 11.96 hrs, Volume= 966 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.47 cfs @ 11.96 hrs, Volume= 966 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 643.84' @ 11.96 hrs

Flood Elev= 647.00'

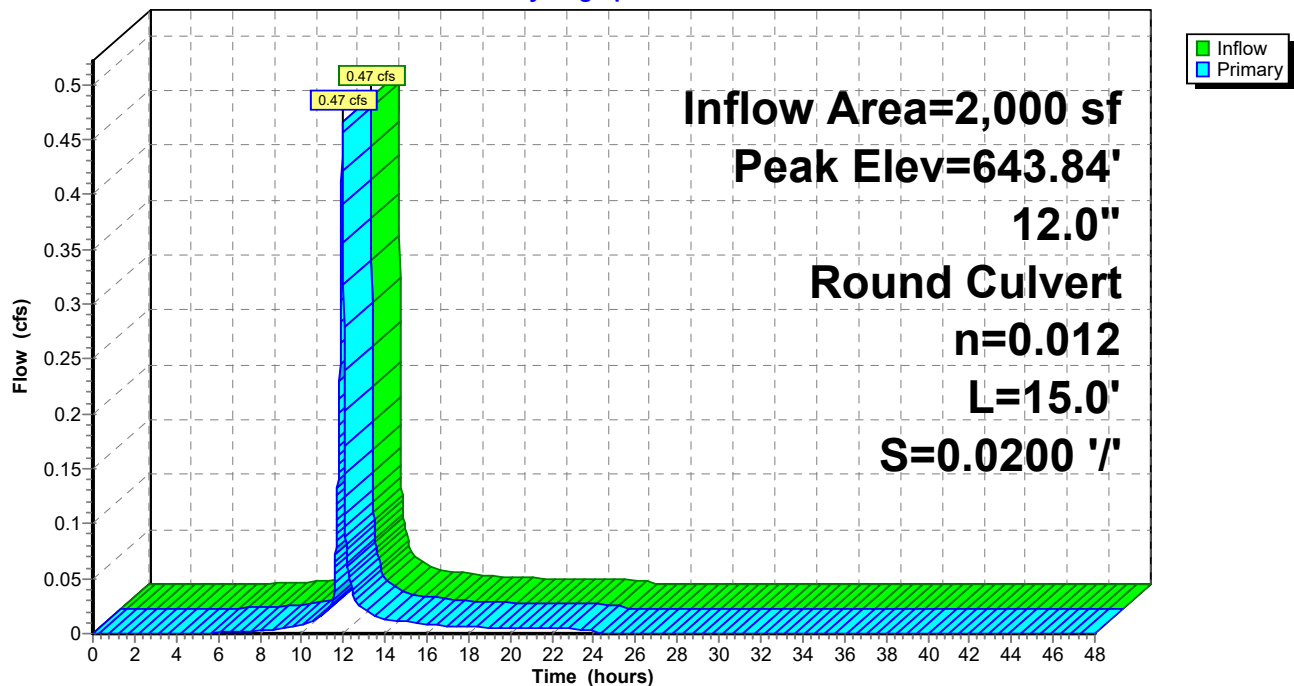
Device	Routing	Invert	Outlet Devices
#1	Primary	643.50'	<b>12.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 643.50' / 643.20' S= 0.0200 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.46 cfs @ 11.96 hrs HW=643.84' (Free Discharge)

↑1=Culvert (Inlet Controls 0.46 cfs @ 1.98 fps)

## Pond 14P: CB 4

Hydrograph



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## Summary for Pond 15P: CB 5

Inflow Area = 660 sf, 100.00% Impervious, Inflow Depth = 7.69" for 100-yr event  
Inflow = 0.18 cfs @ 11.96 hrs, Volume= 423 cf  
Outflow = 0.18 cfs @ 11.96 hrs, Volume= 423 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.18 cfs @ 11.96 hrs, Volume= 423 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 643.70' @ 11.96 hrs

Flood Elev= 647.00'

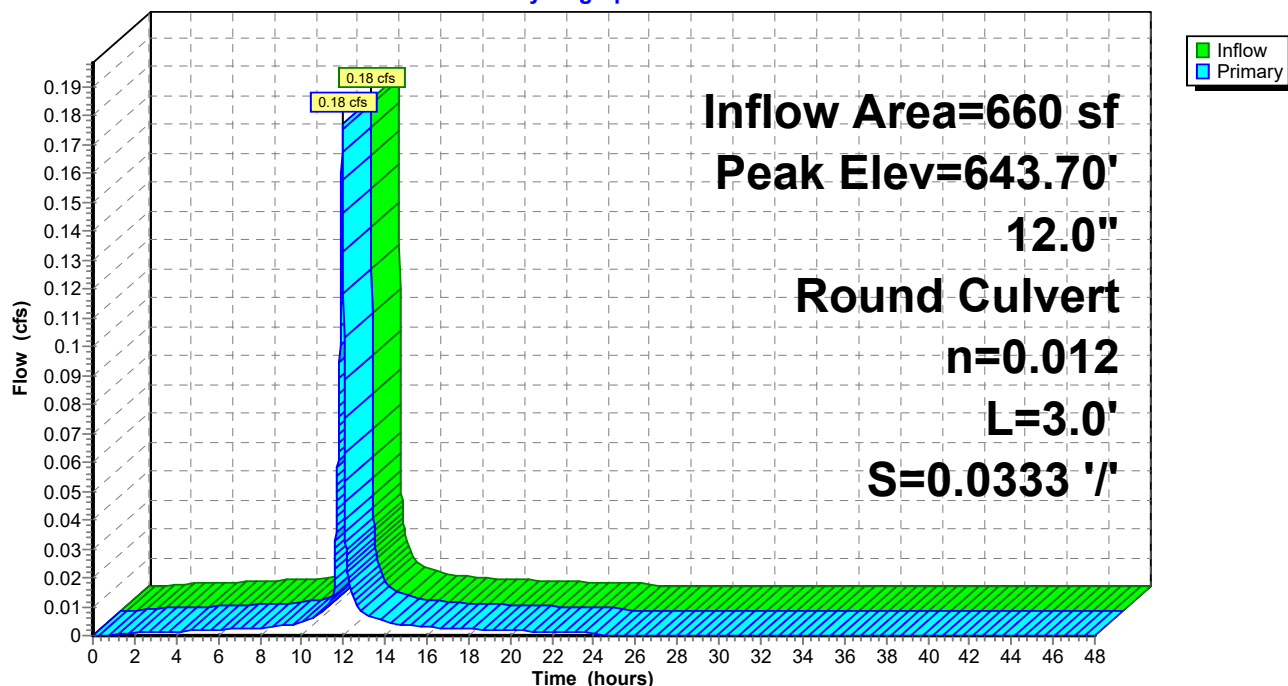
Device	Routing	Invert	Outlet Devices
#1	Primary	643.50'	<b>12.0" Round Culvert</b> L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 643.50' / 643.40' S= 0.0333 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.18 cfs @ 11.96 hrs HW=643.70' (Free Discharge)

↑1=Culvert (Inlet Controls 0.18 cfs @ 1.54 fps)

## Pond 15P: CB 5

Hydrograph



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**Summary for Pond 16P: CB 6**

Inflow Area = 5,850 sf, 56.41% Impervious, Inflow Depth = 6.50" for 100-yr event  
Inflow = 1.47 cfs @ 11.96 hrs, Volume= 3,169 cf  
Outflow = 1.47 cfs @ 11.96 hrs, Volume= 3,169 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.47 cfs @ 11.96 hrs, Volume= 3,169 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 650.72' @ 11.96 hrs

Flood Elev= 651.00'

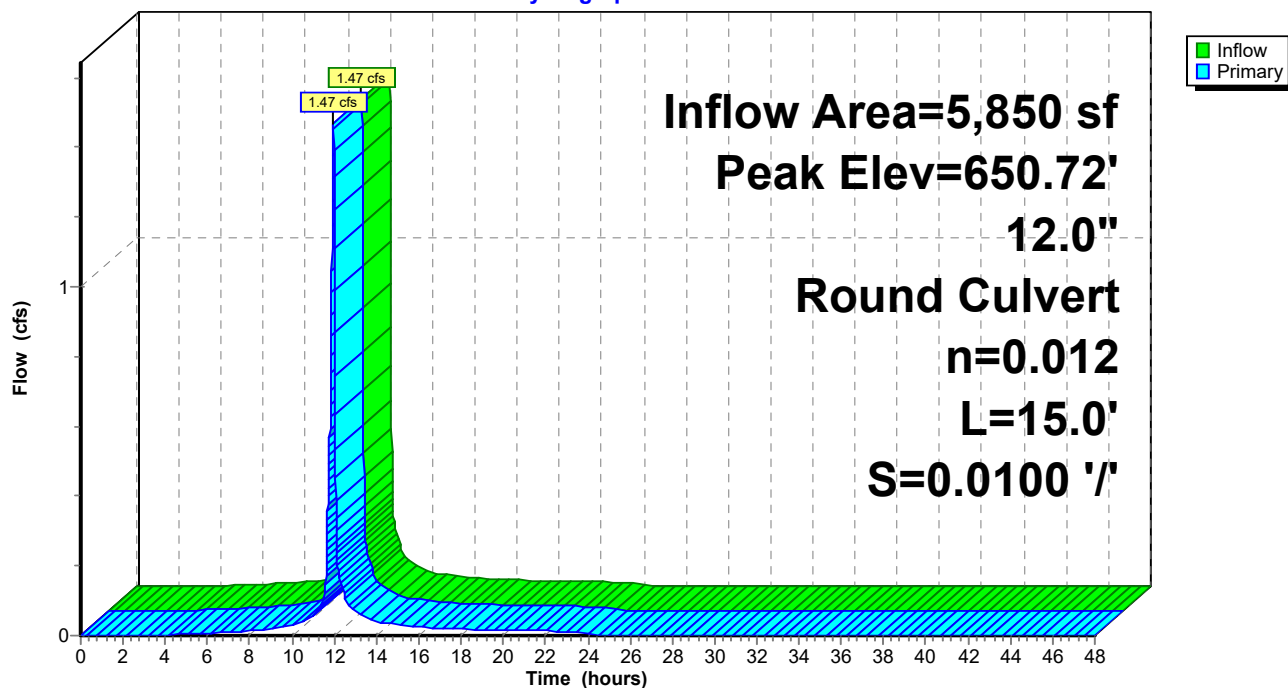
Device	Routing	Invert	Outlet Devices
#1	Primary	650.00'	<b>12.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.00' / 649.85' S= 0.0100 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.47 cfs @ 11.96 hrs HW=650.72' (Free Discharge)

↑1=Culvert (Barrel Controls 1.47 cfs @ 3.37 fps)

**Pond 16P: CB 6**

Hydrograph





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## Summary for Pond 17P: CB 7

Inflow Area = 2,950 sf, 74.92% Impervious, Inflow Depth = 6.97" for 100-yr event  
Inflow = 0.77 cfs @ 11.96 hrs, Volume= 1,714 cf  
Outflow = 0.77 cfs @ 11.96 hrs, Volume= 1,714 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.77 cfs @ 11.96 hrs, Volume= 1,714 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 647.95' @ 11.96 hrs

Flood Elev= 651.00'

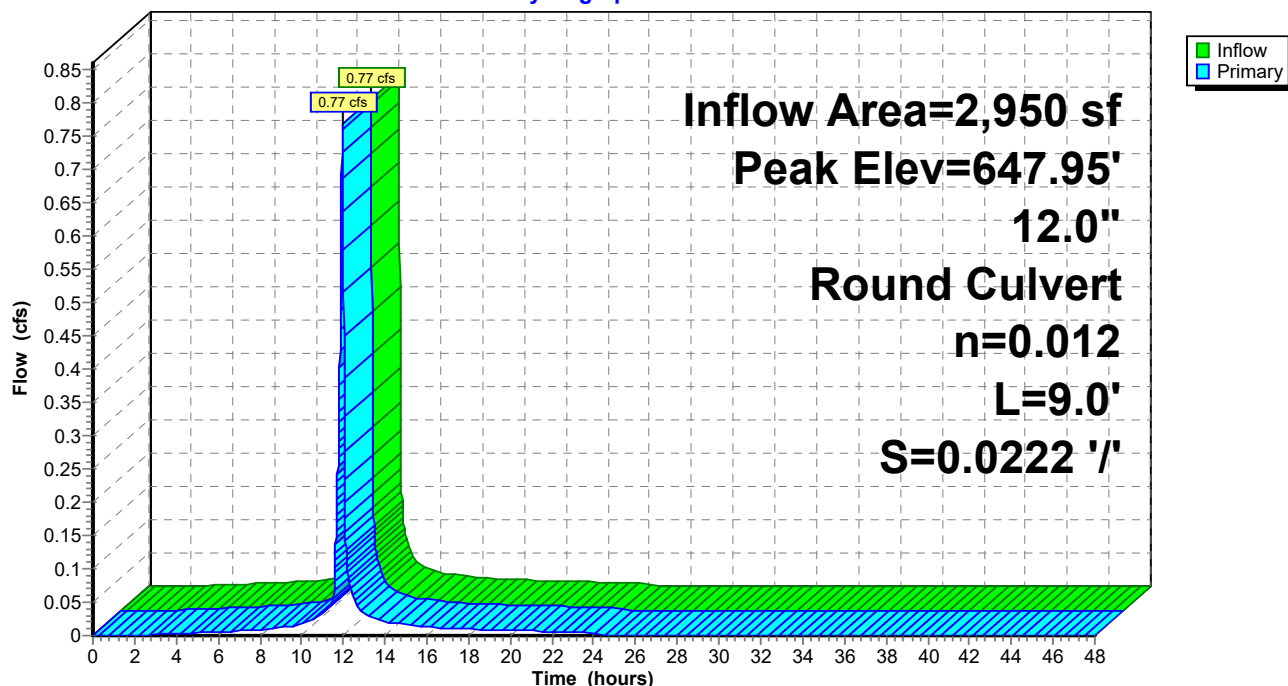
Device	Routing	Invert	Outlet Devices
#1	Primary	647.50'	<b>12.0" Round Culvert</b> L= 9.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 647.50' / 647.30' S= 0.0222 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.77 cfs @ 11.96 hrs HW=647.95' (Free Discharge)

↑1=Culvert (Barrel Controls 0.77 cfs @ 3.30 fps)

## Pond 17P: CB 7

Hydrograph



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## Summary for Pond 18P: CB 8

[58] Hint: Peaked 0.50' above defined flood level

Inflow Area = 3,330 sf, 75.98% Impervious, Inflow Depth = 6.97" for 100-yr event  
Inflow = 0.87 cfs @ 11.96 hrs, Volume= 1,935 cf  
Outflow = 0.87 cfs @ 11.96 hrs, Volume= 1,935 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.87 cfs @ 11.96 hrs, Volume= 1,935 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 650.80' @ 11.96 hrs

Flood Elev= 650.30'

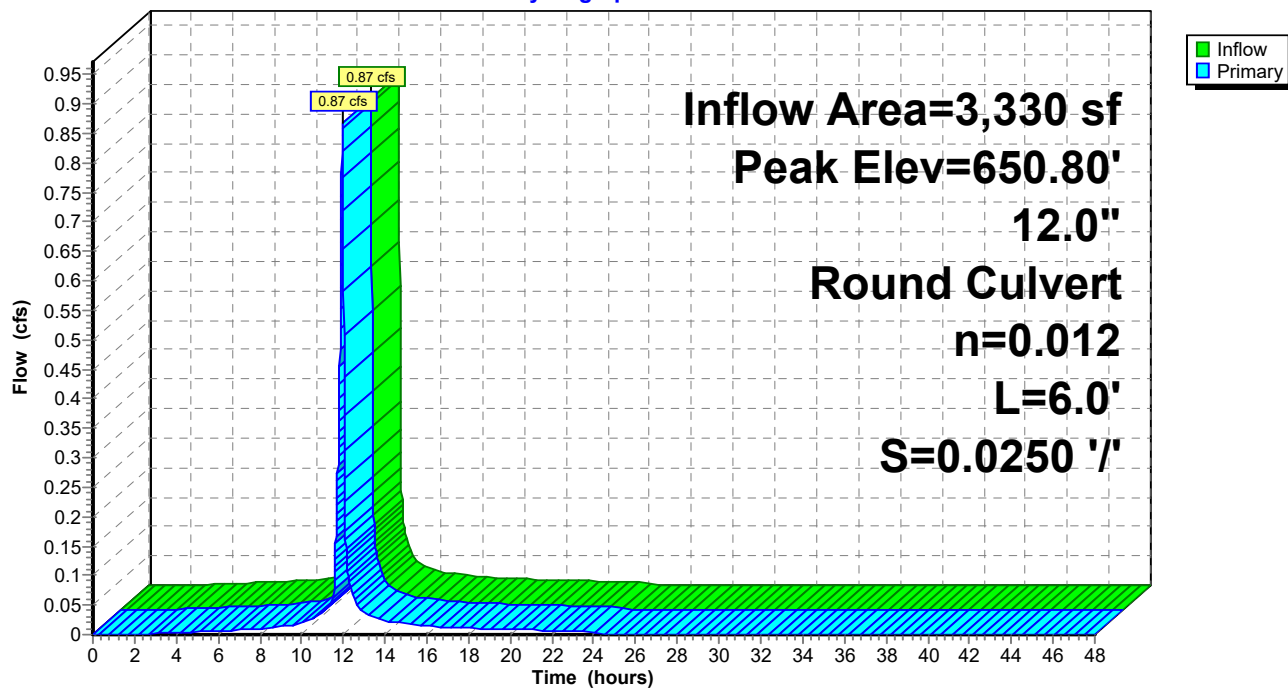
Device	Routing	Invert	Outlet Devices
#1	Primary	650.30'	<b>12.0" Round Culvert</b> L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.30' / 650.15' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.87 cfs @ 11.96 hrs HW=650.80' (Free Discharge)

↑1=Culvert (Barrel Controls 0.87 cfs @ 3.22 fps)

## Pond 18P: CB 8

Hydrograph



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## Summary for Pond 19P: CB 9

Inflow Area = 11,800 sf, 50.17% Impervious, Inflow Depth = 6.26" for 100-yr event  
Inflow = 2.90 cfs @ 11.96 hrs, Volume= 6,159 cf  
Outflow = 2.90 cfs @ 11.96 hrs, Volume= 6,159 cf, Atten= 0%, Lag= 0.0 min  
Primary = 2.90 cfs @ 11.96 hrs, Volume= 6,159 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 651.22' @ 11.96 hrs

Flood Elev= 653.60'

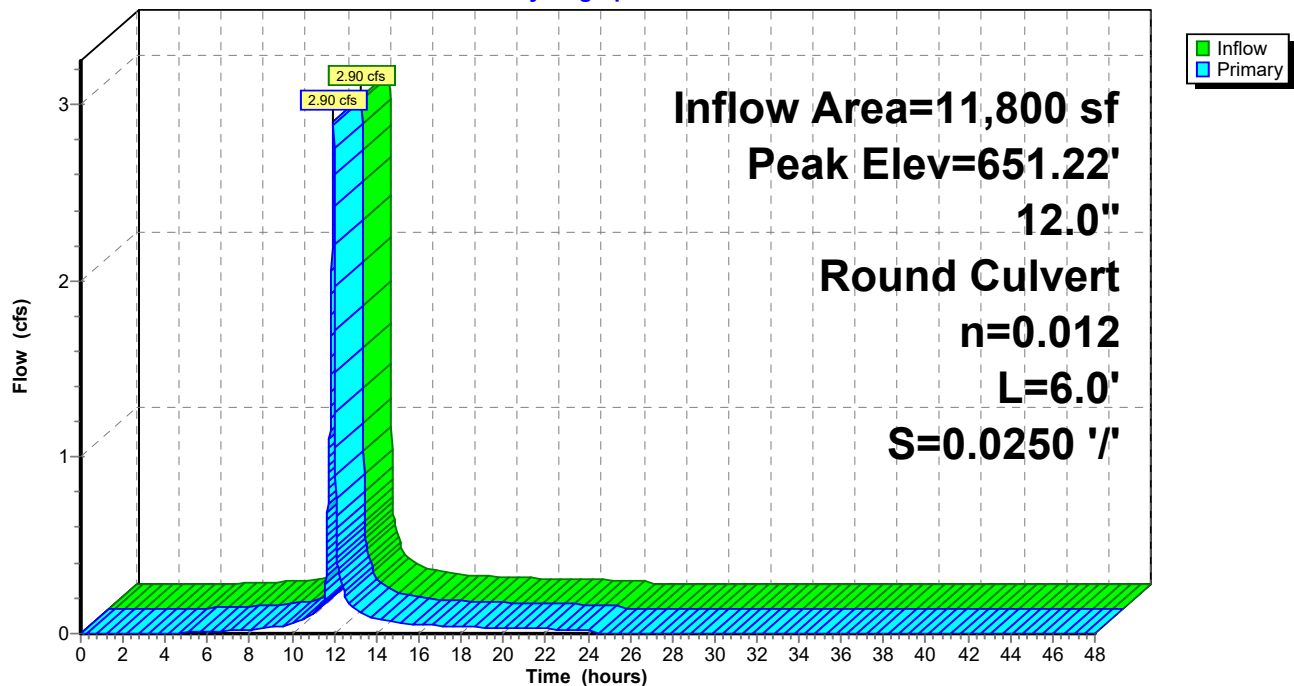
Device	Routing	Invert	Outlet Devices
#1	Primary	650.10'	<b>12.0" Round Culvert</b> L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.10' / 649.95' S= 0.0250 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.89 cfs @ 11.96 hrs HW=651.22' (Free Discharge)

↑1=Culvert (Barrel Controls 2.89 cfs @ 4.12 fps)

## Pond 19P: CB 9

Hydrograph



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## Summary for Pond 40P: HDS Unit

[79] Warning: Submerged Pond 69P Primary device # 1 INLET by 3.45'

Inflow Area = 44,660 sf, 54.46% Impervious, Inflow Depth = 6.40" for 100-yr event  
Inflow = 10.94 cfs @ 11.96 hrs, Volume= 23,826 cf  
Outflow = 10.94 cfs @ 11.96 hrs, Volume= 23,826 cf, Atten= 0%, Lag= 0.0 min  
Primary = 10.94 cfs @ 11.96 hrs, Volume= 23,826 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 645.45' @ 11.96 hrs

Flood Elev= 653.50'

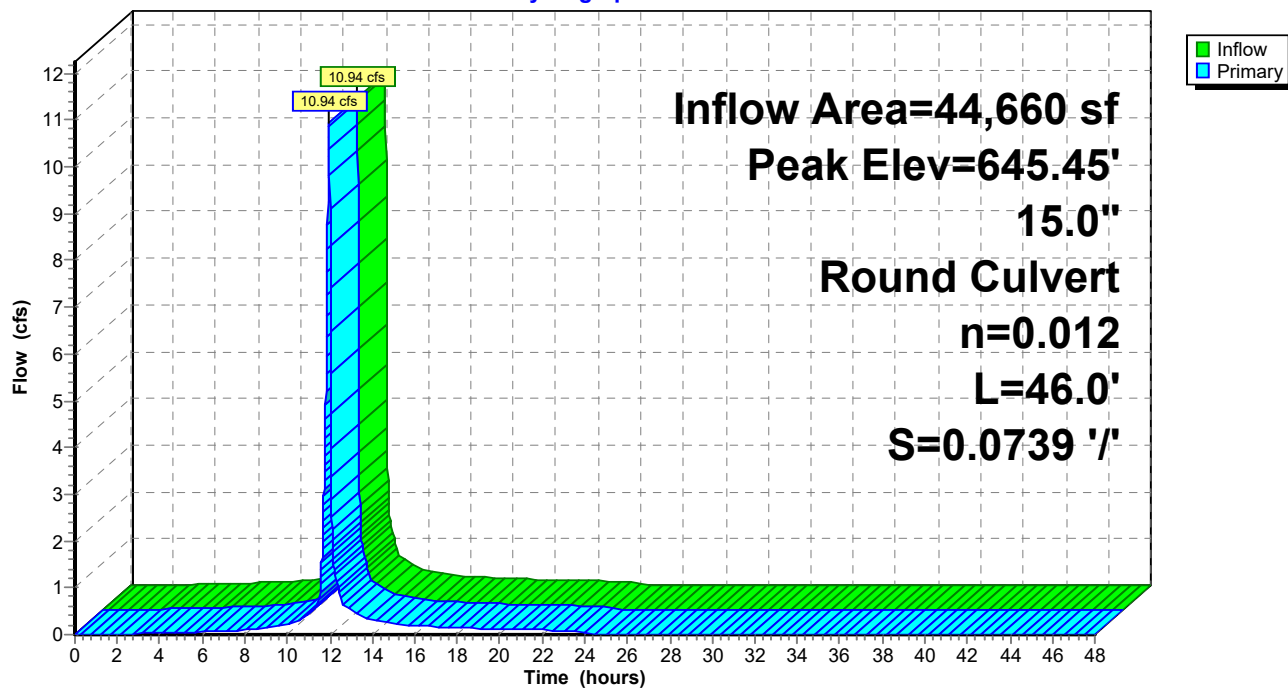
Device	Routing	Invert	Outlet Devices
#1	Primary	641.40'	<b>15.0" Round Culvert</b> L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 641.40' / 638.00' S= 0.0739 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=10.91 cfs @ 11.96 hrs HW=645.44' (Free Discharge)

↑1=Culvert (Inlet Controls 10.91 cfs @ 8.89 fps)

## Pond 40P: HDS Unit

Hydrograph



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**Summary for Pond 50P: WQB**

[79] Warning: Submerged Pond 40P Primary device # 1 INLET by 0.25'

Inflow Area = 79,190 sf, 30.71% Impervious, Inflow Depth = 5.73" for 100-yr event  
 Inflow = 17.93 cfs @ 11.96 hrs, Volume= 37,819 cf  
 Outflow = 0.66 cfs @ 13.46 hrs, Volume= 33,408 cf, Atten= 96%, Lag= 90.2 min  
 Primary = 0.66 cfs @ 13.46 hrs, Volume= 33,408 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 641.65' @ 13.46 hrs Surf.Area= 9,726 sf Storage= 23,857 cf  
 Flood Elev= 644.00' Surf.Area= 14,157 sf Storage= 51,826 cf

Plug-Flow detention time= 460.4 min calculated for 33,401 cf (88% of inflow)  
 Center-of-Mass det. time= 402.8 min ( 1,190.7 - 788.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	638.00'	51,826 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
638.00	3,553	532.6	0	0	3,553
640.00	6,861	570.3	10,234	10,234	7,041
642.00	10,396	608.0	17,135	27,369	10,767
644.00	14,157	645.7	24,456	51,826	14,732

Device	Routing	Invert	Outlet Devices
#1	Primary	638.00'	<b>12.0" Round Culvert</b> L= 90.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 638.00' / 637.10' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	639.00'	<b>4.0" Vert. Orifice/Grate</b> C= 0.600
#3	Device 1	642.15'	<b>6.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.66 cfs @ 13.46 hrs HW=641.65' (Free Discharge)

1=Culvert (Passes 0.66 cfs of 6.01 cfs potential flow)  
 2=Orifice/Grate (Orifice Controls 0.66 cfs @ 7.59 fps)  
 3=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

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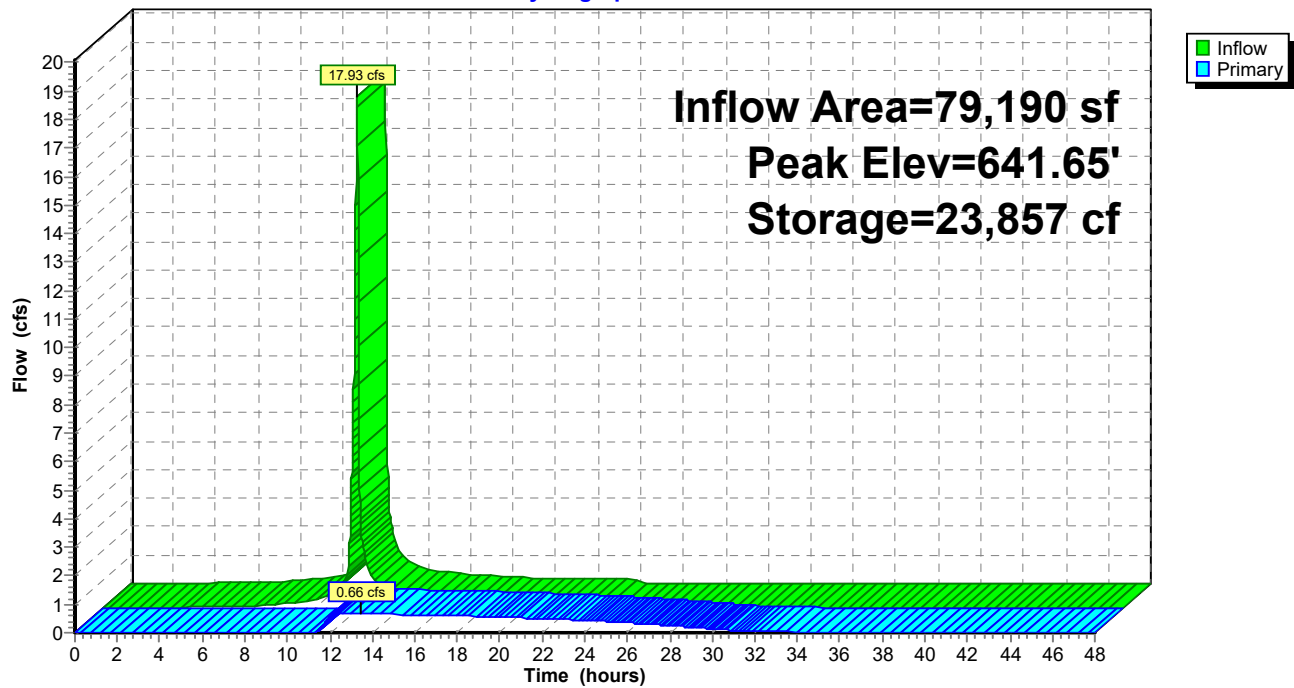
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## Pond 50P: WQB

Hydrograph



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## Summary for Pond 61P: DMH 1

[79] Warning: Submerged Pond 62P Primary device # 1 INLET by 0.63'

Inflow Area = 94,670 sf, 32.50% Impervious, Inflow Depth > 5.22" for 100-yr event  
Inflow = 4.20 cfs @ 11.96 hrs, Volume= 41,163 cf  
Outflow = 4.20 cfs @ 11.96 hrs, Volume= 41,163 cf, Atten= 0%, Lag= 0.0 min  
Primary = 4.20 cfs @ 11.96 hrs, Volume= 41,163 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 635.08' @ 11.96 hrs

Flood Elev= 639.10'

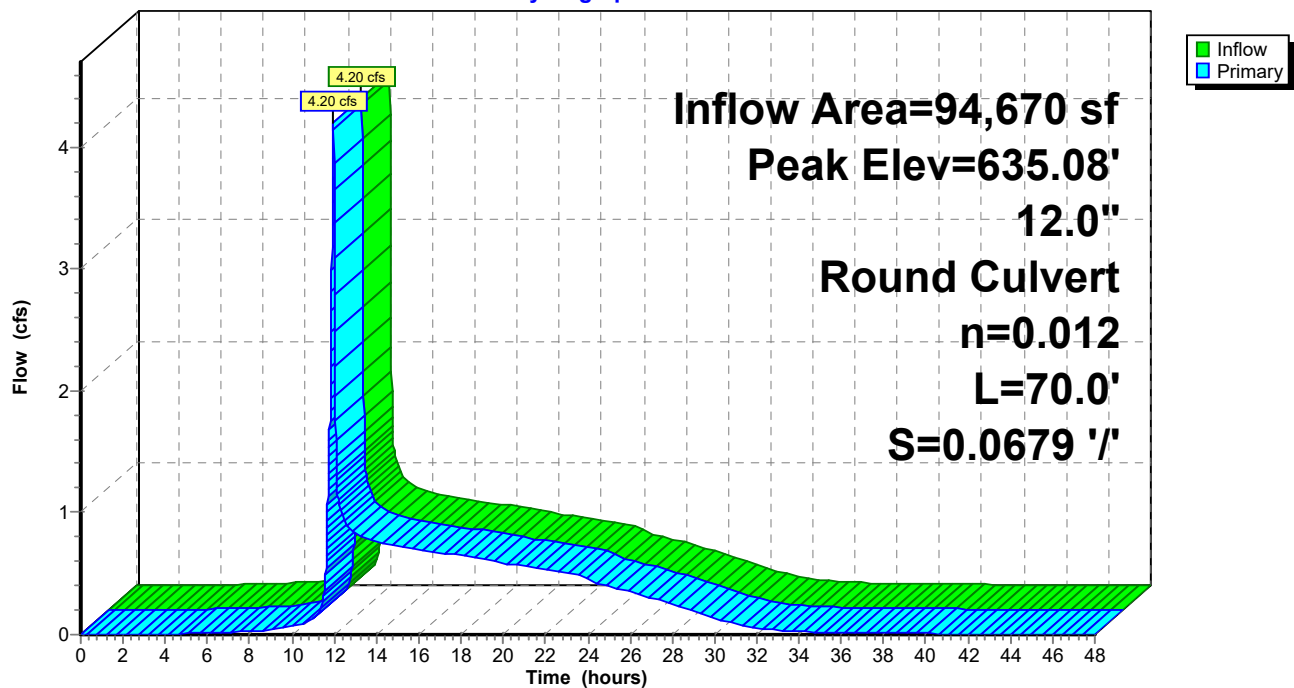
Device	Routing	Invert	Outlet Devices
#1	Primary	633.35'	<b>12.0" Round Culvert</b> L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 633.35' / 628.60' S= 0.0679 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=4.20 cfs @ 11.96 hrs HW=635.08' (Free Discharge)

↑1=Culvert (Inlet Controls 4.20 cfs @ 5.34 fps)

## Pond 61P: DMH 1

Hydrograph



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## Summary for Pond 62P: DMH 2

[81] Warning: Exceeded Pond 63P by 0.07' @ 11.96 hrs

Inflow Area = 94,670 sf, 32.50% Impervious, Inflow Depth > 5.22" for 100-yr event  
Inflow = 4.20 cfs @ 11.96 hrs, Volume= 41,163 cf  
Outflow = 4.20 cfs @ 11.96 hrs, Volume= 41,163 cf, Atten= 0%, Lag= 0.0 min  
Primary = 4.20 cfs @ 11.96 hrs, Volume= 41,163 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 636.30' @ 11.96 hrs

Flood Elev= 640.00'

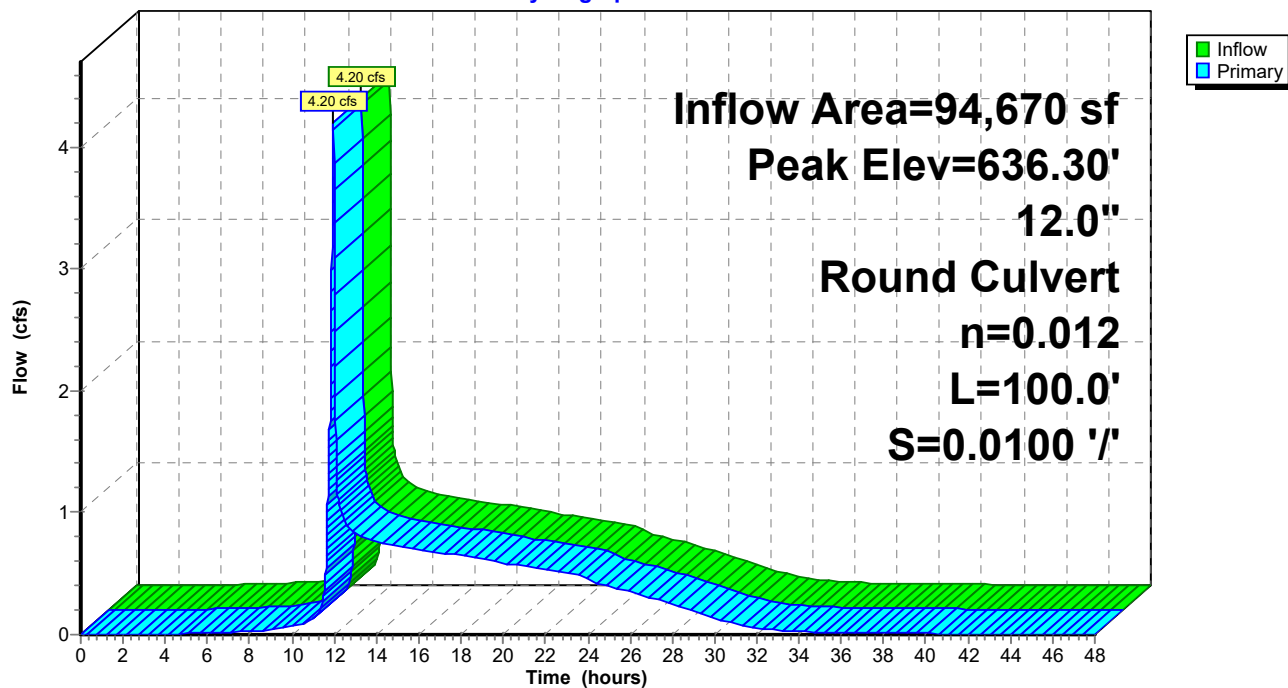
Device	Routing	Invert	Outlet Devices
#1	Primary	634.45'	<b>12.0" Round Culvert</b> L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 634.45' / 633.45' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=4.20 cfs @ 11.96 hrs HW=636.30' (Free Discharge)

↑1=Culvert (Barrel Controls 4.20 cfs @ 5.34 fps)

## Pond 62P: DMH 2

Hydrograph





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## Summary for Pond 63P: DMH 3

[79] Warning: Submerged Pond 64P Primary device # 1 INLET by 0.03'

Inflow Area = 86,920 sf, 31.67% Impervious, Inflow Depth > 5.15" for 100-yr event  
Inflow = 2.34 cfs @ 11.96 hrs, Volume= 37,270 cf  
Outflow = 2.34 cfs @ 11.96 hrs, Volume= 37,270 cf, Atten= 0%, Lag= 0.0 min  
Primary = 2.34 cfs @ 11.96 hrs, Volume= 37,270 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 636.23' @ 11.96 hrs

Flood Elev= 642.70'

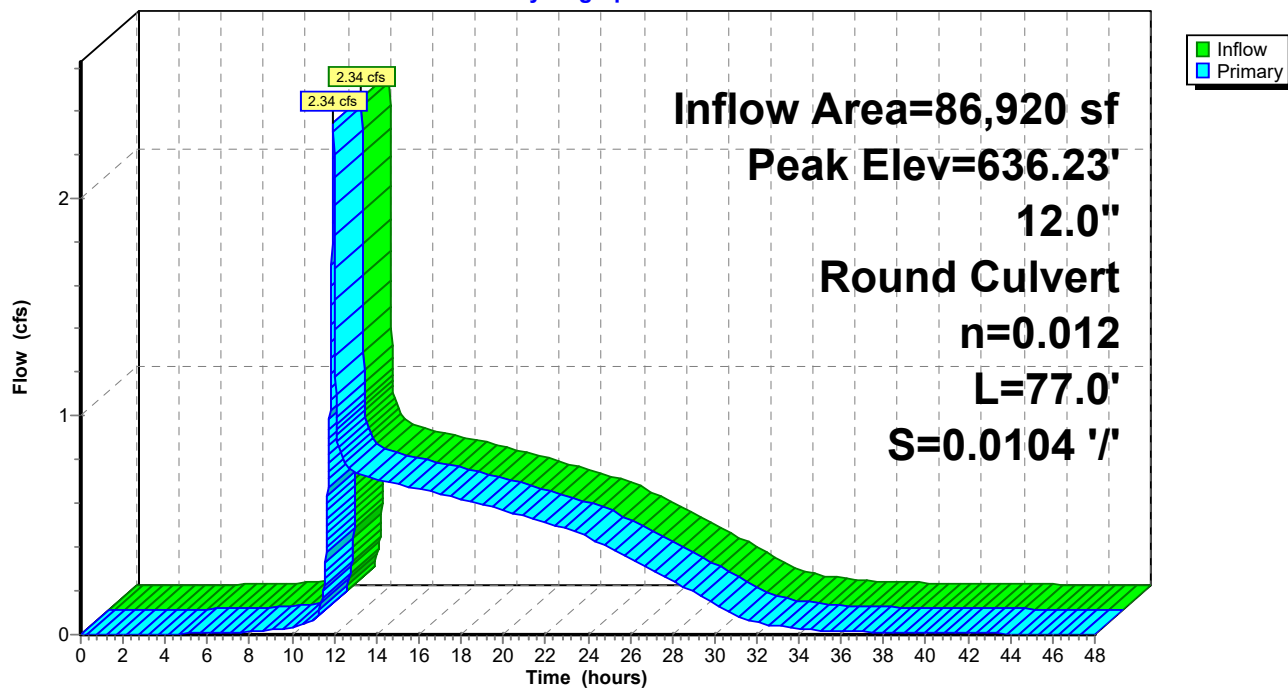
Device	Routing	Invert	Outlet Devices
#1	Primary	635.35'	<b>12.0" Round Culvert</b> L= 77.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 635.35' / 634.55' S= 0.0104 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.34 cfs @ 11.96 hrs HW=636.23' (Free Discharge)

↑1=Culvert (Inlet Controls 2.34 cfs @ 3.19 fps)

## Pond 63P: DMH 3

Hydrograph



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## Summary for Pond 64P: DMH 4

[79] Warning: Submerged Pond 65P Primary device # 1 OUTLET by 0.47'

Inflow Area = 81,850 sf, 31.36% Impervious, Inflow Depth > 5.10" for 100-yr event  
Inflow = 1.18 cfs @ 11.97 hrs, Volume= 34,797 cf  
Outflow = 1.18 cfs @ 11.97 hrs, Volume= 34,797 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.18 cfs @ 11.97 hrs, Volume= 34,797 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 636.77' @ 11.97 hrs

Flood Elev= 647.30'

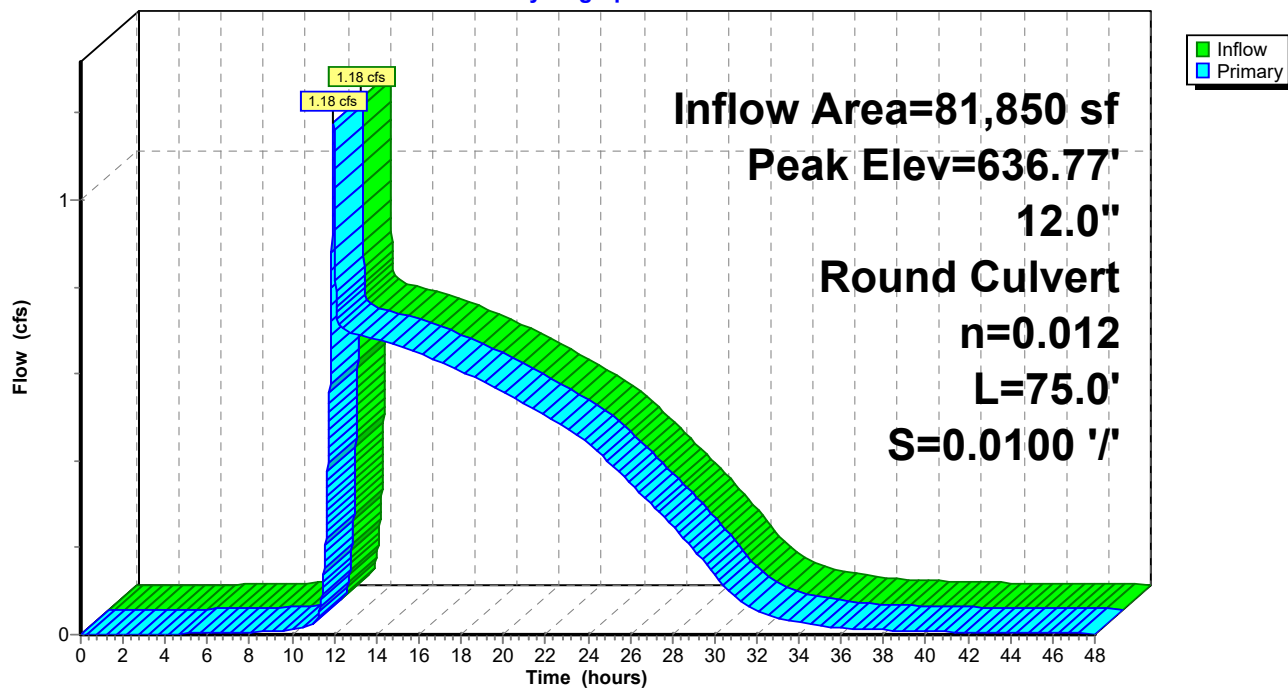
Device	Routing	Invert	Outlet Devices
#1	Primary	636.20'	<b>12.0" Round Culvert</b> L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 636.20' / 635.45' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.17 cfs @ 11.97 hrs HW=636.77' (Free Discharge)

↑1=Culvert (Inlet Controls 1.17 cfs @ 2.56 fps)

## Pond 64P: DMH 4

Hydrograph



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## Summary for Pond 65P: DMH 5

[79] Warning: Submerged Pond 50P Primary device # 1 OUTLET by 0.31'

Inflow Area = 79,190 sf, 30.71% Impervious, Inflow Depth > 5.06" for 100-yr event  
Inflow = 0.66 cfs @ 13.46 hrs, Volume= 33,408 cf  
Outflow = 0.66 cfs @ 13.46 hrs, Volume= 33,408 cf, Atten= 0%, Lag= 0.0 min  
Primary = 0.66 cfs @ 13.46 hrs, Volume= 33,408 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 637.41' @ 13.46 hrs

Flood Elev= 651.80'

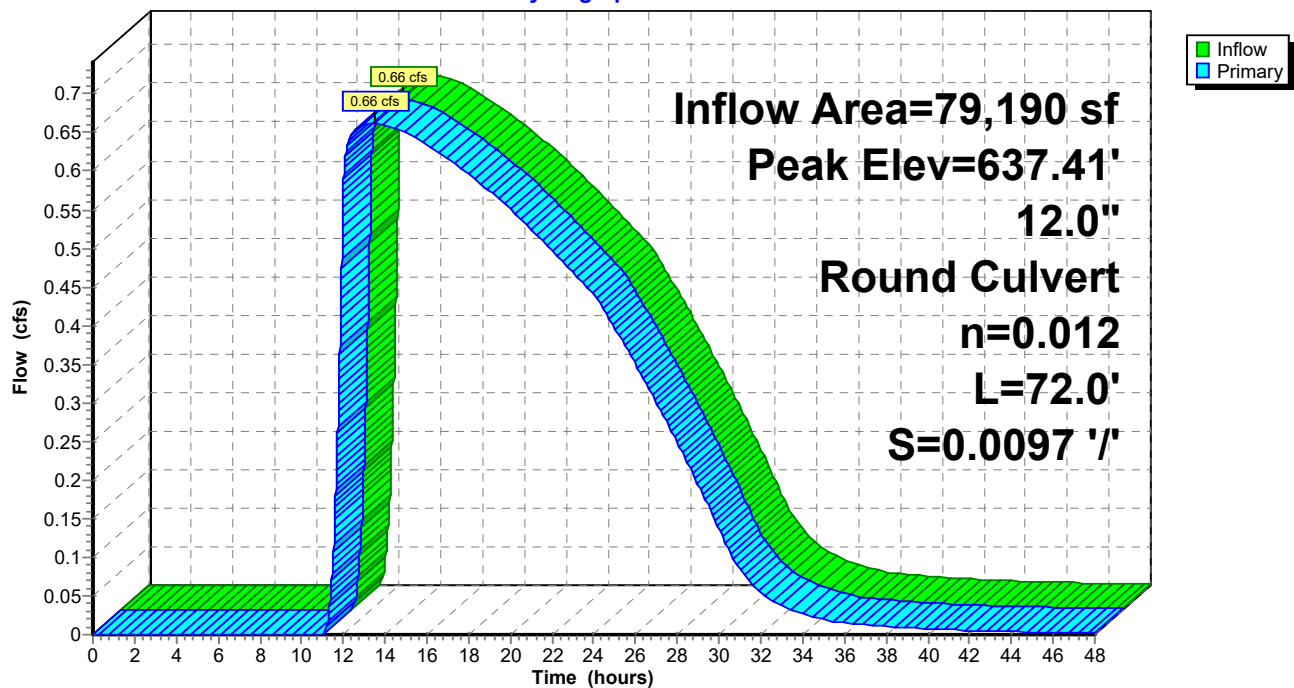
Device	Routing	Invert	Outlet Devices
#1	Primary	637.00'	<b>12.0" Round Culvert</b> L= 72.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 637.00' / 636.30' S= 0.0097 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.65 cfs @ 13.46 hrs HW=637.41' (Free Discharge)

↑1=Culvert (Inlet Controls 0.65 cfs @ 2.17 fps)

## Pond 65P: DMH 5

### Hydrograph



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## Summary for Pond 66P: DMH 6

[79] Warning: Submerged Pond 17P Primary device # 1 INLET by 0.44'

Inflow Area = 8,800 sf, 62.61% Impervious, Inflow Depth = 6.66" for 100-yr event  
Inflow = 2.24 cfs @ 11.96 hrs, Volume= 4,883 cf  
Outflow = 2.24 cfs @ 11.96 hrs, Volume= 4,883 cf, Atten= 0%, Lag= 0.0 min  
Primary = 2.24 cfs @ 11.96 hrs, Volume= 4,883 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 647.94' @ 11.96 hrs

Flood Elev= 651.30'

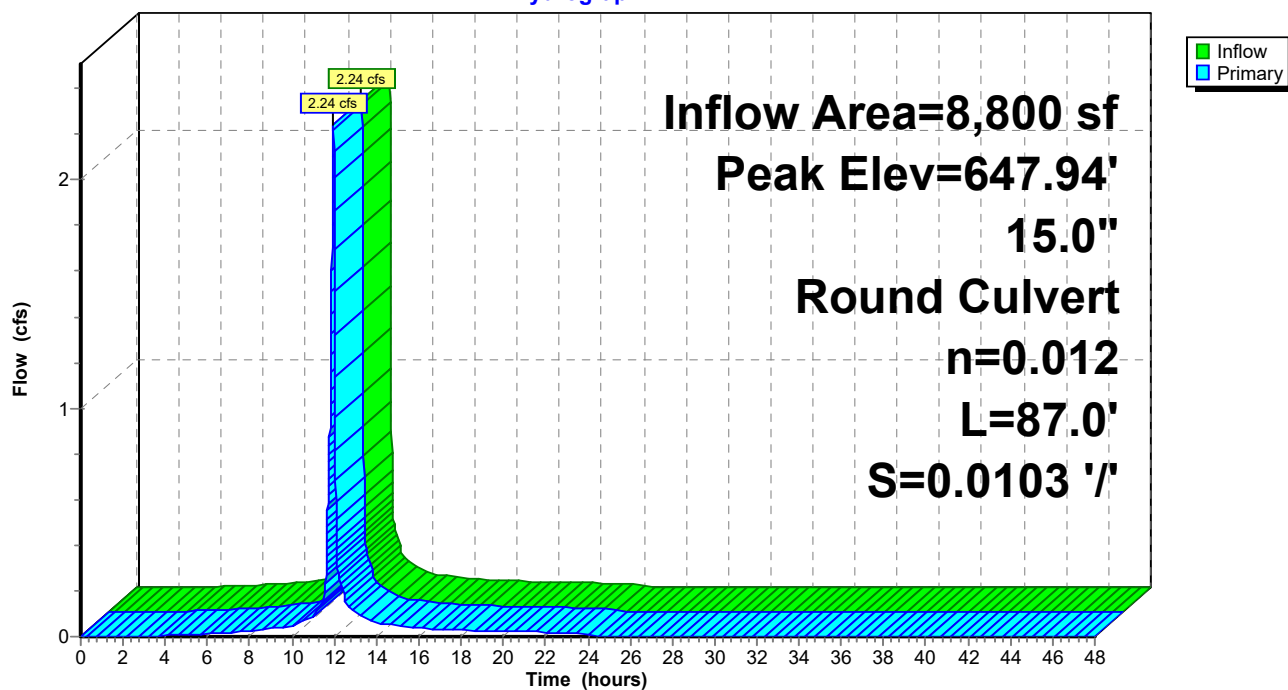
Device	Routing	Invert	Outlet Devices
#1	Primary	647.20'	<b>15.0" Round Culvert</b> L= 87.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 647.20' / 646.30' S= 0.0103 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=2.23 cfs @ 11.96 hrs HW=647.94' (Free Discharge)

↑1=Culvert (Inlet Controls 2.23 cfs @ 2.94 fps)

## Pond 66P: DMH 6

Hydrograph



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## Summary for Pond 67P: DMH 7

[79] Warning: Submerged Pond 66P Primary device # 1 OUTLET by 0.81'

Inflow Area = 12,130 sf, 66.28% Impervious, Inflow Depth = 6.75" for 100-yr event  
Inflow = 3.11 cfs @ 11.96 hrs, Volume= 6,818 cf  
Outflow = 3.11 cfs @ 11.96 hrs, Volume= 6,818 cf, Atten= 0%, Lag= 0.0 min  
Primary = 3.11 cfs @ 11.96 hrs, Volume= 6,818 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 647.11' @ 11.96 hrs

Flood Elev= 654.20'

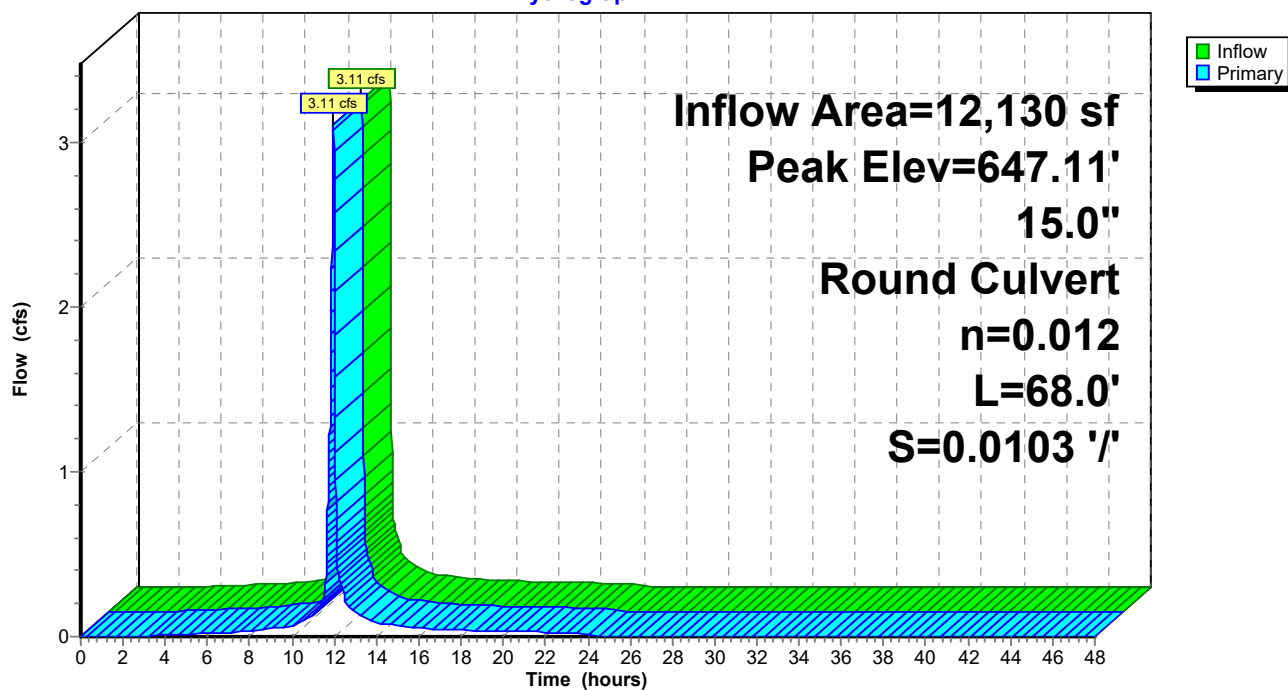
Device	Routing	Invert	Outlet Devices
#1	Primary	646.20'	<b>15.0" Round Culvert</b> L= 68.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 646.20' / 645.50' S= 0.0103 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=3.10 cfs @ 11.96 hrs HW=647.11' (Free Discharge)

↑1=Culvert (Inlet Controls 3.10 cfs @ 3.24 fps)

## Pond 67P: DMH 7

Hydrograph



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## Summary for Pond 68P: DMH 8

[79] Warning: Submerged Pond 67P Primary device # 1 INLET by 0.90'

Inflow Area = 23,930 sf, 58.34% Impervious, Inflow Depth = 6.51" for 100-yr event  
Inflow = 6.01 cfs @ 11.96 hrs, Volume= 12,978 cf  
Outflow = 6.01 cfs @ 11.96 hrs, Volume= 12,978 cf, Atten= 0%, Lag= 0.0 min  
Primary = 6.01 cfs @ 11.96 hrs, Volume= 12,978 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 647.11' @ 11.96 hrs

Flood Elev= 654.10'

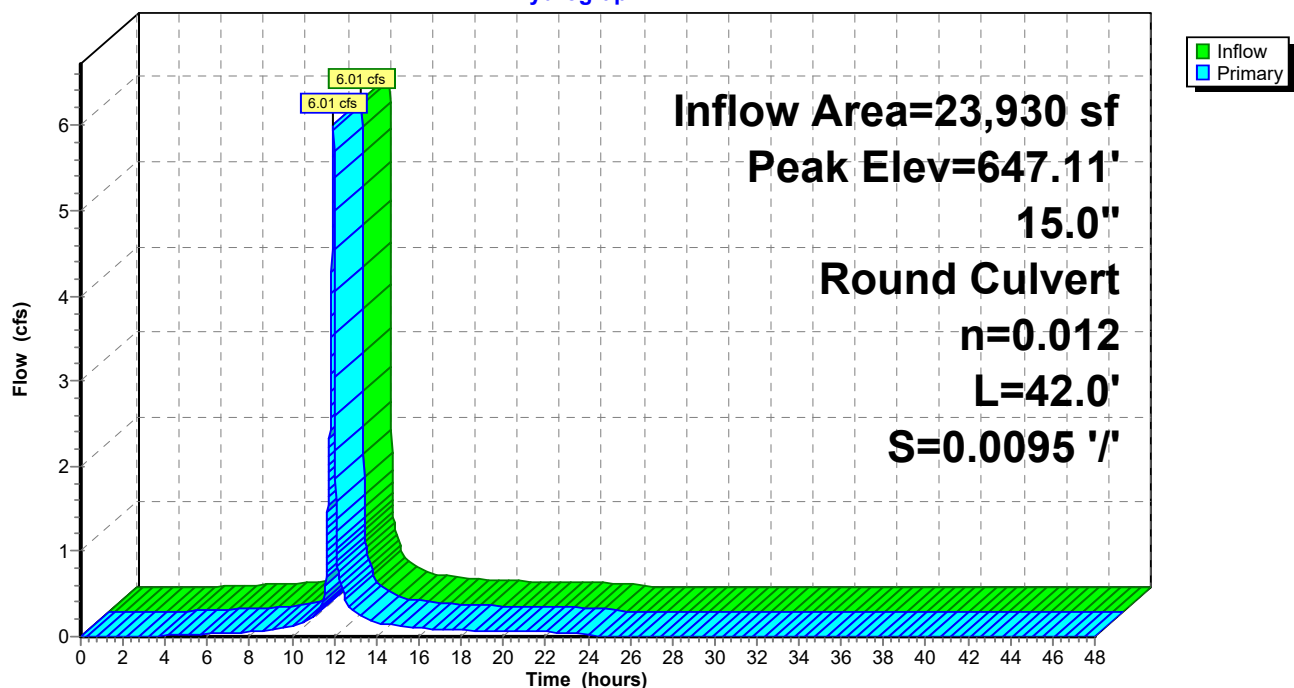
Device	Routing	Invert	Outlet Devices
#1	Primary	645.40'	<b>15.0" Round Culvert</b> L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 645.40' / 645.00' S= 0.0095 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=5.95 cfs @ 11.96 hrs HW=647.10' (Free Discharge)

↑1=Culvert (Barrel Controls 5.95 cfs @ 4.85 fps)

## Pond 68P: DMH 8

Hydrograph



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### Summary for Pond 69P: DMH 9

[79] Warning: Submerged Pond 68P Primary device # 1 INLET by 0.65'

[79] Warning: Submerged Pond 70P Primary device # 1 OUTLET by 1.05'

Inflow Area = 44,660 sf, 54.46% Impervious, Inflow Depth = 6.40" for 100-yr event  
Inflow = 10.94 cfs @ 11.96 hrs, Volume= 23,826 cf  
Outflow = 10.94 cfs @ 11.96 hrs, Volume= 23,826 cf, Atten= 0%, Lag= 0.0 min  
Primary = 10.94 cfs @ 11.96 hrs, Volume= 23,826 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 646.05' @ 11.96 hrs

Flood Elev= 654.20'

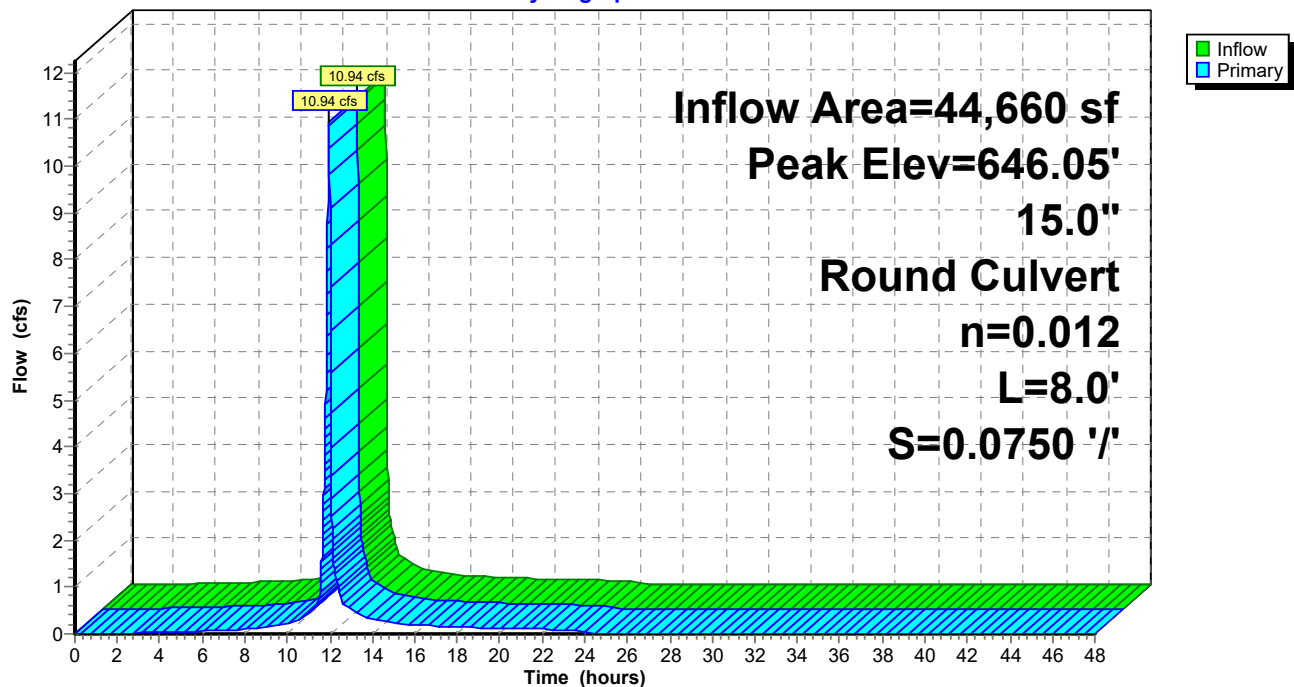
Device	Routing	Invert	Outlet Devices
#1	Primary	642.00'	<b>15.0" Round Culvert</b> L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 642.00' / 641.40' S= 0.0750 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

**Primary OutFlow** Max=10.91 cfs @ 11.96 hrs HW=646.04' (Free Discharge)

↑1=Culvert (Inlet Controls 10.91 cfs @ 8.89 fps)

### Pond 69P: DMH 9

Hydrograph



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Proposed Conditions  
Type II 24-hr 100-yr Rainfall=7.93"

Printed 5/23/2022

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## Summary for Pond 70P: DMH 10

[79] Warning: Submerged Pond 71P Primary device # 1 INLET by 0.25'

Inflow Area = 20,730 sf, 49.98% Impervious, Inflow Depth = 6.28" for 100-yr event  
Inflow = 4.93 cfs @ 11.96 hrs, Volume= 10,848 cf  
Outflow = 4.93 cfs @ 11.96 hrs, Volume= 10,848 cf, Atten= 0%, Lag= 0.0 min  
Primary = 4.93 cfs @ 11.96 hrs, Volume= 10,848 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 650.40' @ 11.96 hrs

Flood Elev= 655.50'

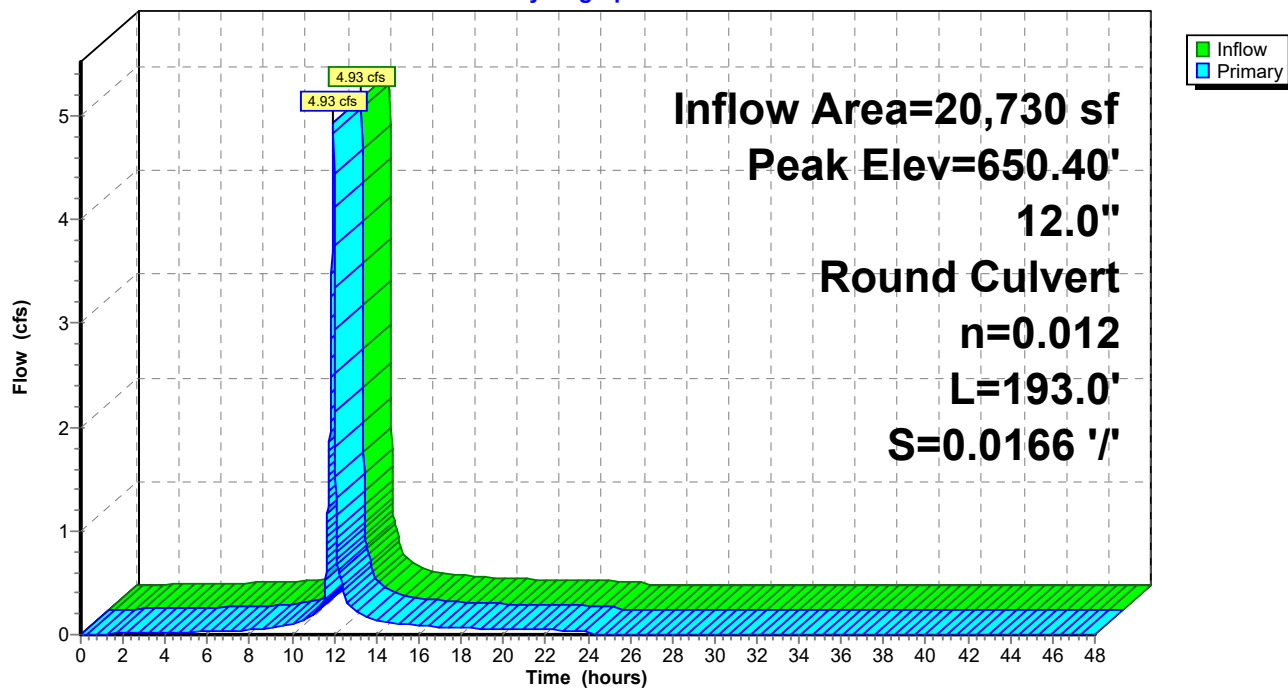
Device	Routing	Invert	Outlet Devices
#1	Primary	648.20'	<b>12.0" Round Culvert</b> L= 193.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 648.20' / 645.00' S= 0.0166 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=4.92 cfs @ 11.96 hrs HW=650.39' (Free Discharge)

↑1=Culvert (Inlet Controls 4.92 cfs @ 6.27 fps)

## Pond 70P: DMH 10

### Hydrograph





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## Summary for Pond 71P: DMH 11

[79] Warning: Submerged Pond 83P Primary device # 1 INLET by 1.10'

Inflow Area = 20,730 sf, 49.98% Impervious, Inflow Depth = 6.28" for 100-yr event  
Inflow = 4.93 cfs @ 11.96 hrs, Volume= 10,848 cf  
Outflow = 4.93 cfs @ 11.96 hrs, Volume= 10,848 cf, Atten= 0%, Lag= 0.0 min  
Primary = 4.93 cfs @ 11.96 hrs, Volume= 10,848 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 652.35' @ 11.96 hrs

Flood Elev= 655.50'

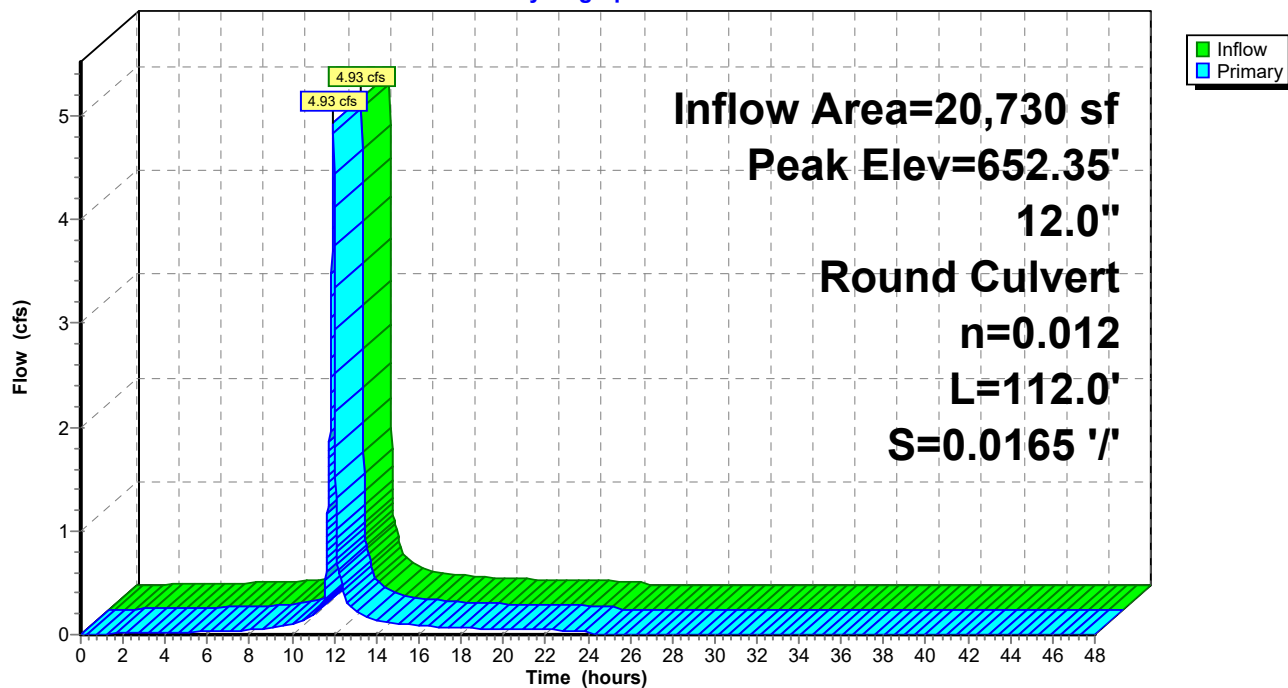
Device	Routing	Invert	Outlet Devices
#1	Primary	650.15'	<b>12.0" Round Culvert</b> L= 112.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 650.15' / 648.30' S= 0.0165 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=4.92 cfs @ 11.96 hrs HW=652.34' (Free Discharge)

↑1=Culvert (Inlet Controls 4.92 cfs @ 6.27 fps)

## Pond 71P: DMH 11

### Hydrograph



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## Summary for Pond 81P: YD 1

Inflow Area = 4,470 sf, 100.00% Impervious, Inflow Depth = 7.69" for 100-yr event  
Inflow = 1.20 cfs @ 11.96 hrs, Volume= 2,865 cf  
Outflow = 1.20 cfs @ 11.96 hrs, Volume= 2,865 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.20 cfs @ 11.96 hrs, Volume= 2,865 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 653.57' @ 11.96 hrs

Flood Elev= 656.50'

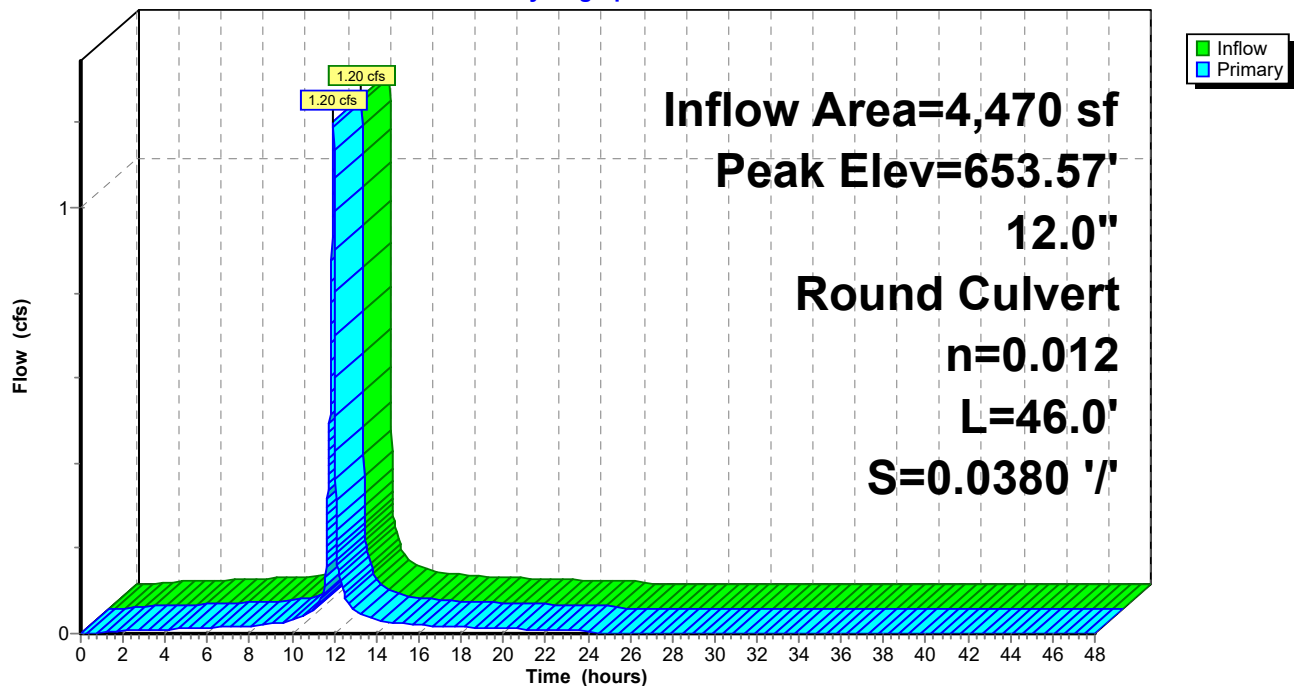
Device	Routing	Invert	Outlet Devices
#1	Primary	653.00'	<b>12.0" Round Culvert</b> L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 653.00' / 651.25' S= 0.0380 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.20 cfs @ 11.96 hrs HW=653.57' (Free Discharge)

↑1=Culvert (Inlet Controls 1.20 cfs @ 2.57 fps)

## Pond 81P: YD 1

Hydrograph



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Type II 24-hr 100-yr Rainfall=7.93"

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## Summary for Pond 82P: YD 2

Inflow Area = 4,470 sf, 100.00% Impervious, Inflow Depth = 7.69" for 100-yr event  
Inflow = 1.20 cfs @ 11.96 hrs, Volume= 2,865 cf  
Outflow = 1.20 cfs @ 11.96 hrs, Volume= 2,865 cf, Atten= 0%, Lag= 0.0 min  
Primary = 1.20 cfs @ 11.96 hrs, Volume= 2,865 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 653.57' @ 11.96 hrs

Flood Elev= 656.50'

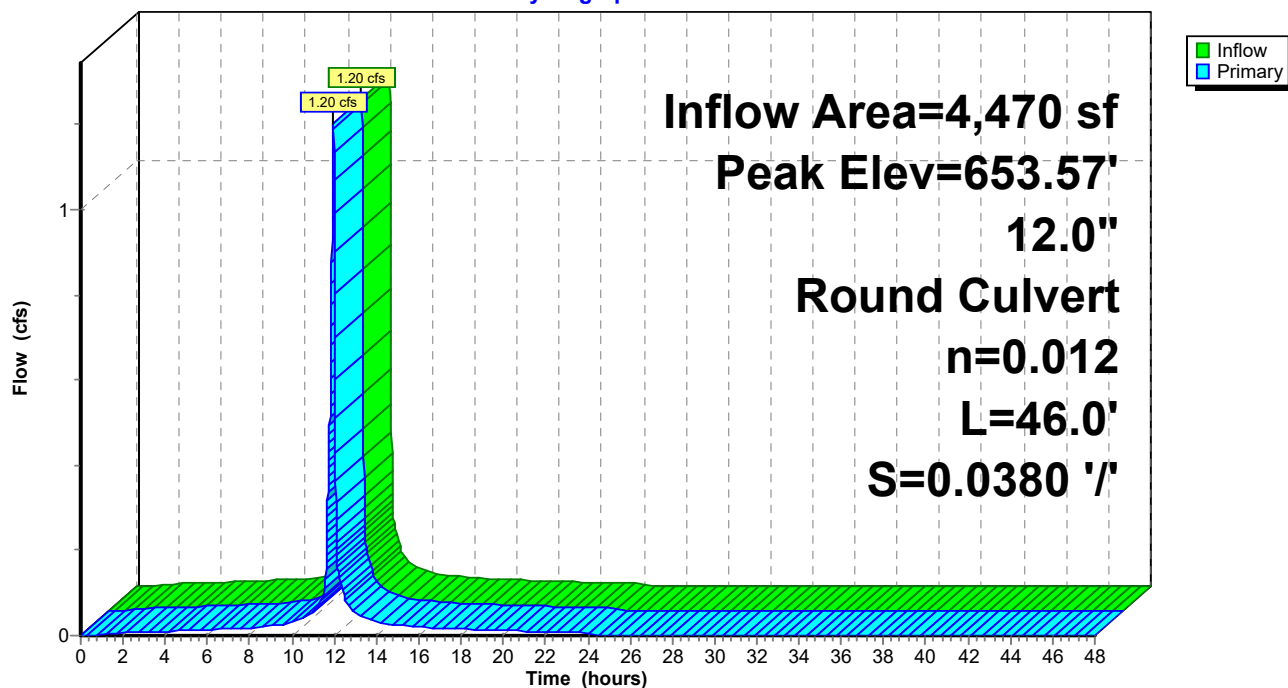
Device	Routing	Invert	Outlet Devices
#1	Primary	653.00'	<b>12.0" Round Culvert</b> L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 653.00' / 651.25' S= 0.0380 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.20 cfs @ 11.96 hrs HW=653.57' (Free Discharge)

↑1=Culvert (Inlet Controls 1.20 cfs @ 2.57 fps)

## Pond 82P: YD 2

Hydrograph



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Type II 24-hr 100-yr Rainfall=7.93"

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## Summary for Pond 83P: YD 3

[79] Warning: Submerged Pond 81P Primary device # 1 INLET by 0.45'

[79] Warning: Submerged Pond 82P Primary device # 1 INLET by 0.45'

Inflow Area = 20,730 sf, 49.98% Impervious, Inflow Depth = 6.28" for 100-yr event  
Inflow = 4.93 cfs @ 11.96 hrs, Volume= 10,848 cf  
Outflow = 4.93 cfs @ 11.96 hrs, Volume= 10,848 cf, Atten= 0%, Lag= 0.0 min  
Primary = 4.93 cfs @ 11.96 hrs, Volume= 10,848 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 653.45' @ 11.96 hrs

Flood Elev= 654.75'

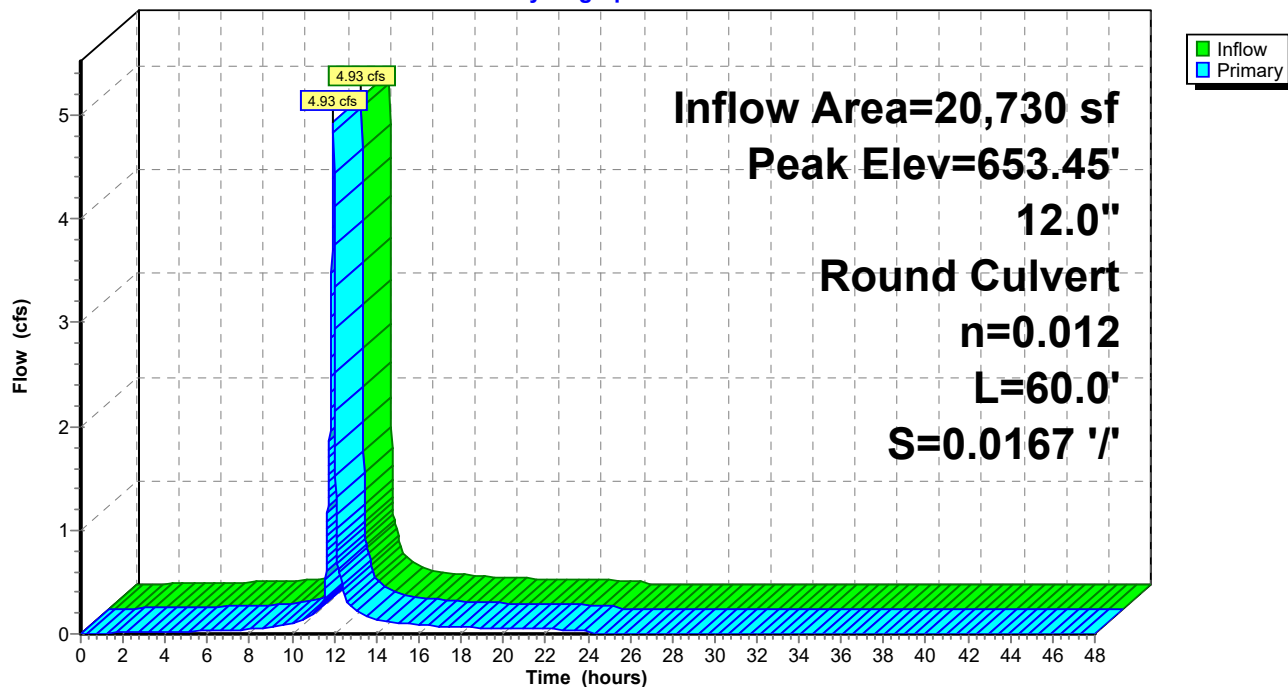
Device	Routing	Invert	Outlet Devices
#1	Primary	651.25'	<b>12.0" Round Culvert</b> L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 651.25' / 650.25' S= 0.0167 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

**Primary OutFlow** Max=4.92 cfs @ 11.96 hrs HW=653.44' (Free Discharge)

↑1=Culvert (Inlet Controls 4.92 cfs @ 6.27 fps)

## Pond 83P: YD 3

Hydrograph



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Proposed Conditions  
Type II 24-hr 100-yr Rainfall=7.93"

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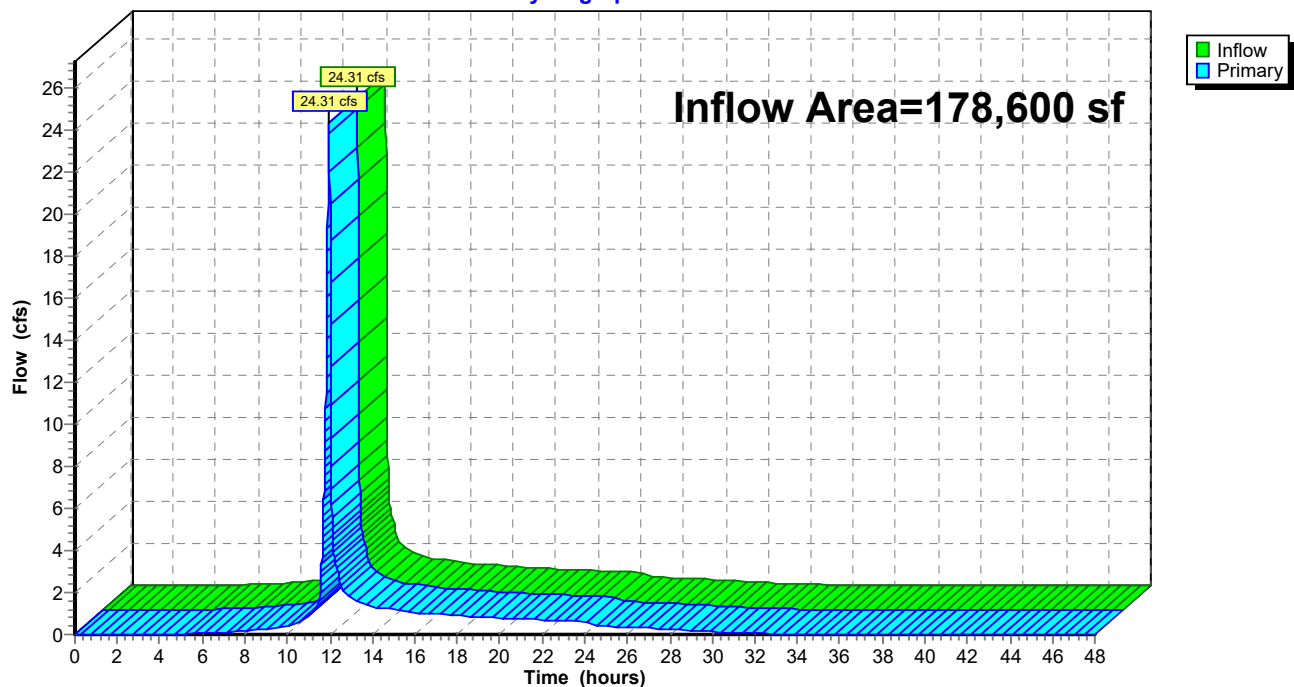
### Summary for Link 10L: Center Road

Inflow Area = 178,600 sf, 37.73% Impervious, Inflow Depth = 5.60" for 100-yr event  
Inflow = 24.31 cfs @ 11.96 hrs, Volume= 83,325 cf  
Primary = 24.31 cfs @ 11.96 hrs, Volume= 83,325 cf, Atten= 0%, Lag= 0.0 min

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

### Link 10L: Center Road

Hydrograph





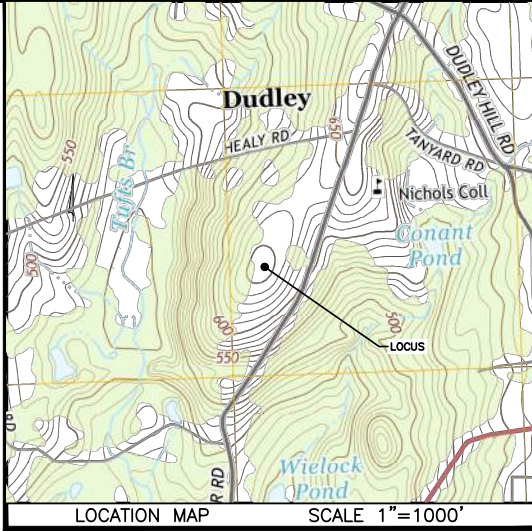
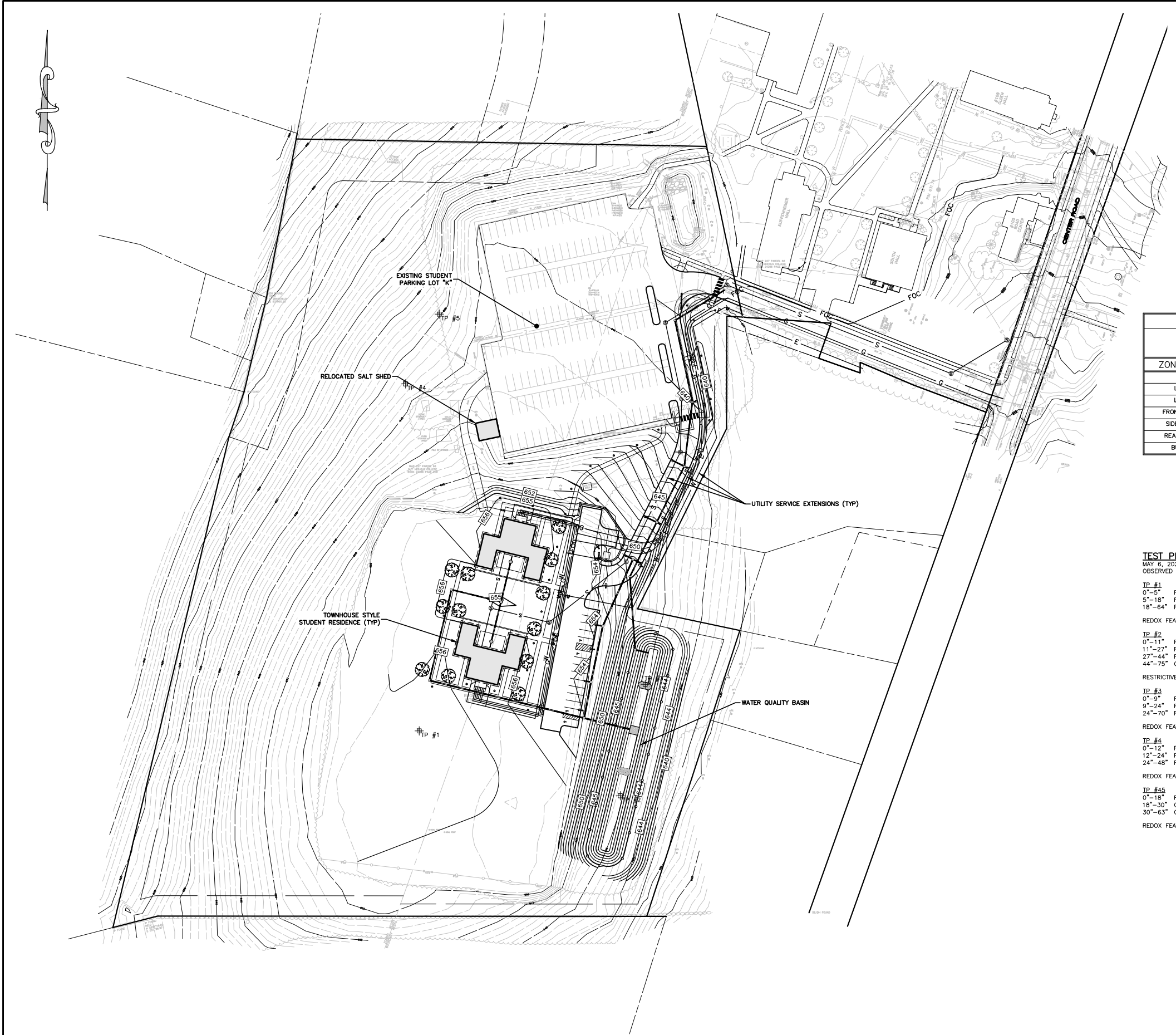
## **DESIGN PLANS**

(Includes Construction Period Pollution Prevention Plan, Erosion & Sedimentation Control Plan,  
and Post Construction Operation & Maintenance Plan)

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DIMENSIONAL REQUIREMENTS		
RESIDENTIAL 15/RESIDENTIAL 87		
ZONING CRITERIA	REQUIRED	PROVIDED
LOT AREA	15,000 SF / 87,000 SF	>1,000,000 SF
LOT FRONTAGE	100' / 150'	>1000'
LOT COVERAGE	30% / 20%	±20%
FRONT YARD SETBACK	30' / 40'	>100'
SIDE YARD SETBACK	15' / 25'	±120'
REAR YARD SETBACK	20' / 25'	±330'
BUILDING HEIGHT	35'	35'

**TEST PITS**  
MAY 6, 2022  
OBSERVED BY P. PARENT (CHA)

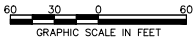
**TP #1**  
0"-5" FINE SANDY LOAM WITH GRAVEL 7.5YR ¾  
5"-18" FINE SANDY LOAM WITH GRAVEL 7.5YR ¾  
18"-64" FINE SANDY LOAM WITH GRAVEL & COBBLES 10YR ¾  
REDOX FEATURES OBSERVED AT 18"

**TP #2**  
0"-11" FINE SANDY LOAM 7.5YR ¾  
11"-27" FINE SANDY LOAM 10YR ¾  
27"-44" FINE SANDY LOAM 10YR ¾  
44"-75" COMPACT LOAMY SAND 10YR ¾  
RESTRICTIVE LAYER AT 44"

**TP #3**  
0"-9" FINE SANDY LOAM 7.5YR ¾  
9"-24" FINE SANDY LOAM 10YR ¾  
24"-70" FINE SANDY LOAM WITH GRAVEL & COBBLES 2.5YR ¾  
REDOX FEATURES OBSERVED AT 38"

**TP #4**  
0"-12" FINE SANDY LOAM 7.5YR ¾  
12"-24" FINE SANDY LOAM 7.5YR ¾  
24"-48" FINE SANDY LOAM WITH GRAVEL & COBBLES 7.5YR ¾  
REDOX FEATURES OBSERVED AT 24"

**TP #4.5**  
0"-18" FINE SANDY LOAM 7.5YR ¾  
18"-30" COMPACT FINE SANDY LOAM WITH GRAVEL 7.5YR ¾  
30"-63" COMPACT FINE SANDY LOAM WITH GRAVEL 10YR ¾  
REDOX FEATURES OBSERVED AT 18"



APPROVED BY THE  
PLANNING BOARD

Juster Pope Frazier, LLC  
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Northampton, Massachusetts 01060  
413.586.1600

Clough Harbour Associates, LLP  
Civil Engineers  
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East Hartford, CT 06108  
860.290.4100

NICHOLS COLLEGE

TOWNHOMES

CENTER ROAD, DUDLEY, MA 01571

REVISIONS

NO.	DATE	BY	REMARKS

SET

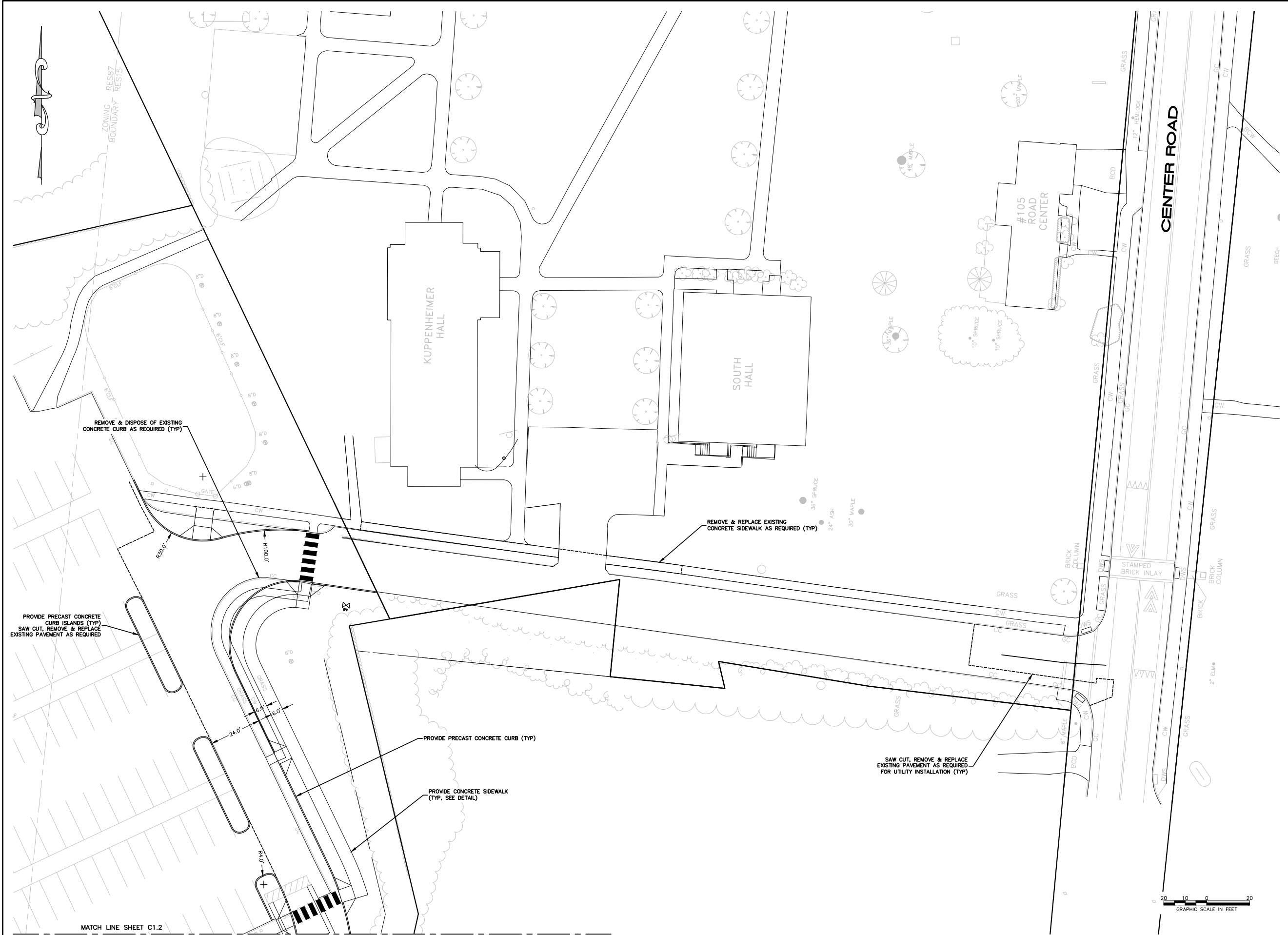
PLANNING BOARD  
SUBMISSION

SHEET TITLE

OVERALL SITE PLAN

DATE	MAY 25, 2022
SCALE	1" = 60'
DRAWN BY	PMP
CHECKED BY	
SHEET NO.	C1.0





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REVISIONS				
NO.	DATE	BY	REMARKS	

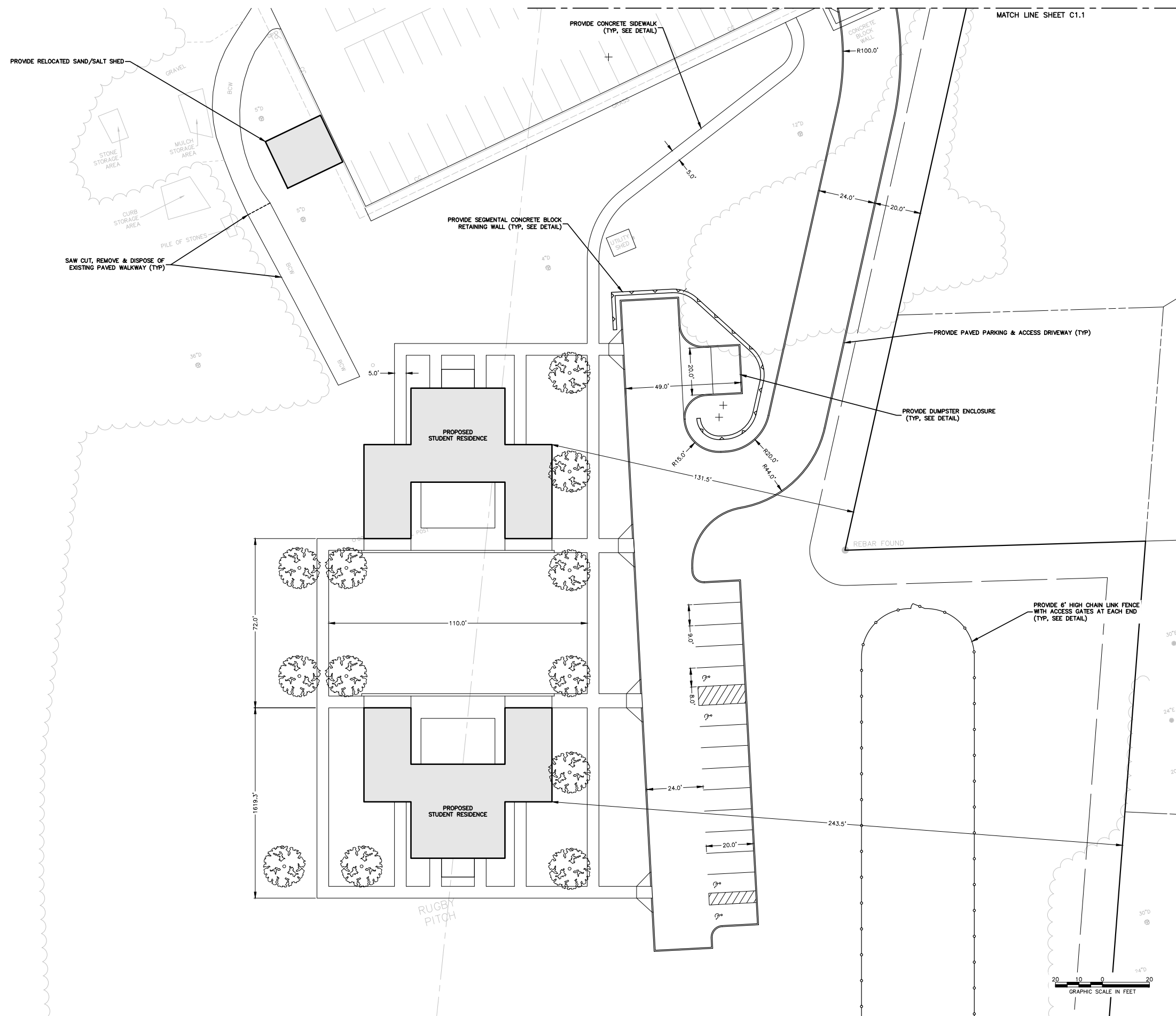
SET  
  
PLANNING BOARD  
SUBMISSION

SHEET TITLE  
  
SITE LAYOUT PLAN

DATE	MAY 25, 2022
SCALE	1" = 20'
DRAWN BY	PMP
CHECKED BY	
SHEET NO.	

C1.1





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[illegible]

SET

## PLANNING BOARD SUBMISSION

SHEET TITLE

## SITE LAYOUT PLAN

DATE	MAY 25, 2022
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SCALE 1" = 20'

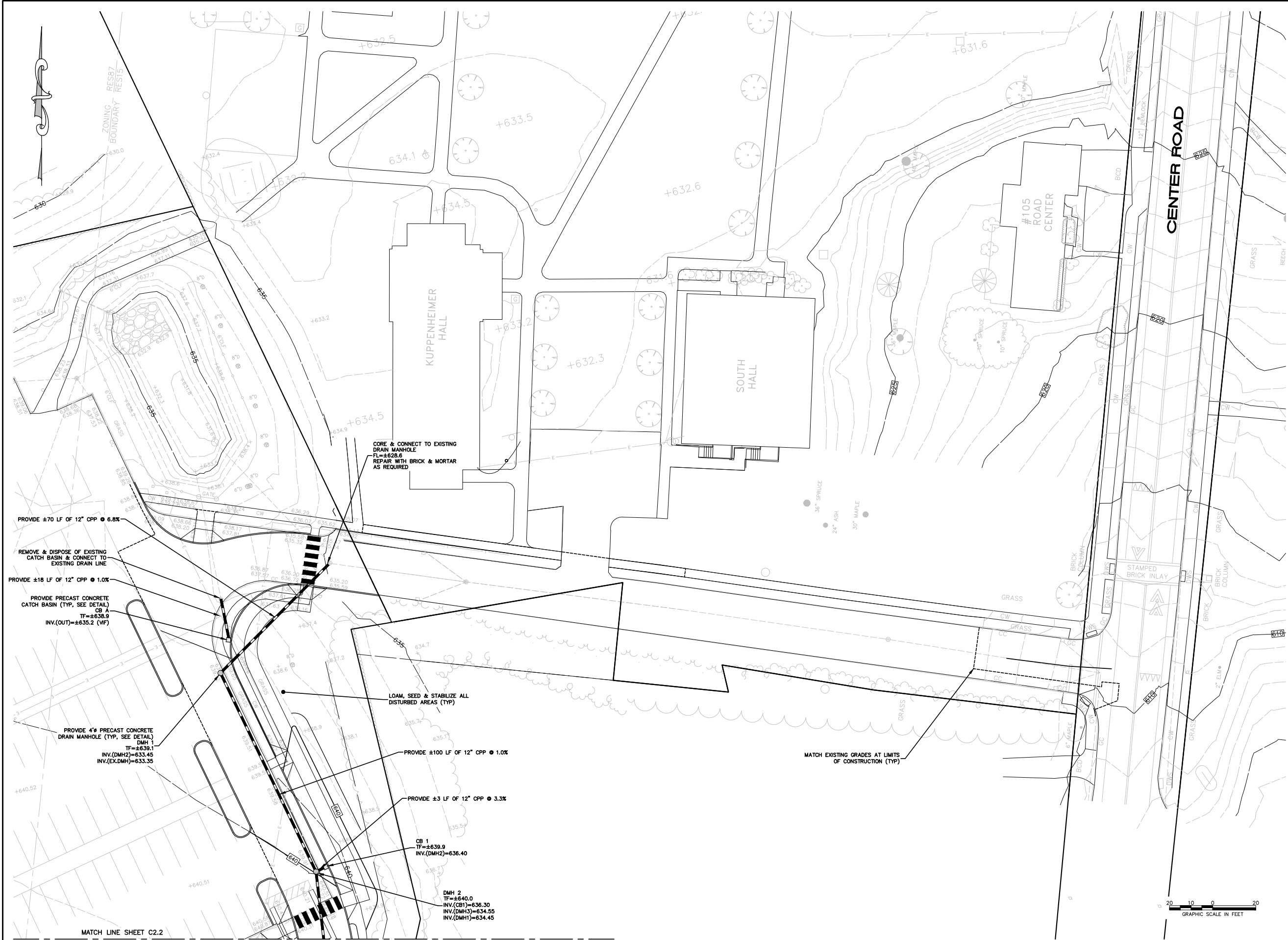
DRAWN BY PMP

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SHEET NO.

C1.2





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SUBMISSION

SHEET TITLE

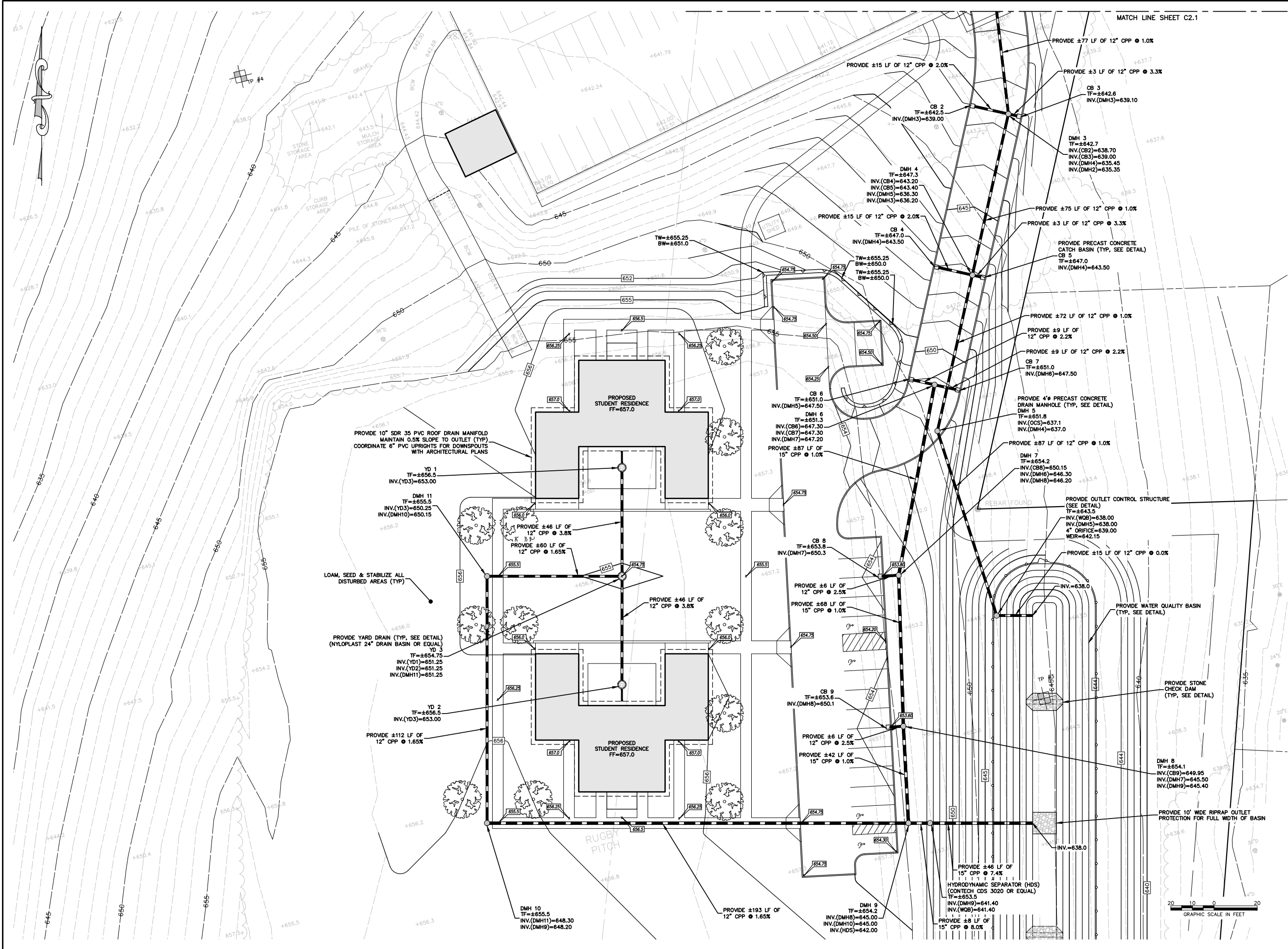
SITE GRADING &  
DRAINAGE PLAN

DATE	MAY 25, 2022
SCALE	1" = 20'
DRAWN BY	PMP
CHECKED BY	
SHEET NO.	

C2.1







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SHEET TITLE

SITE GRADING &  
DRAINAGE PLAN

DATE MAY 25, 2022

SCALE 1" = 20'

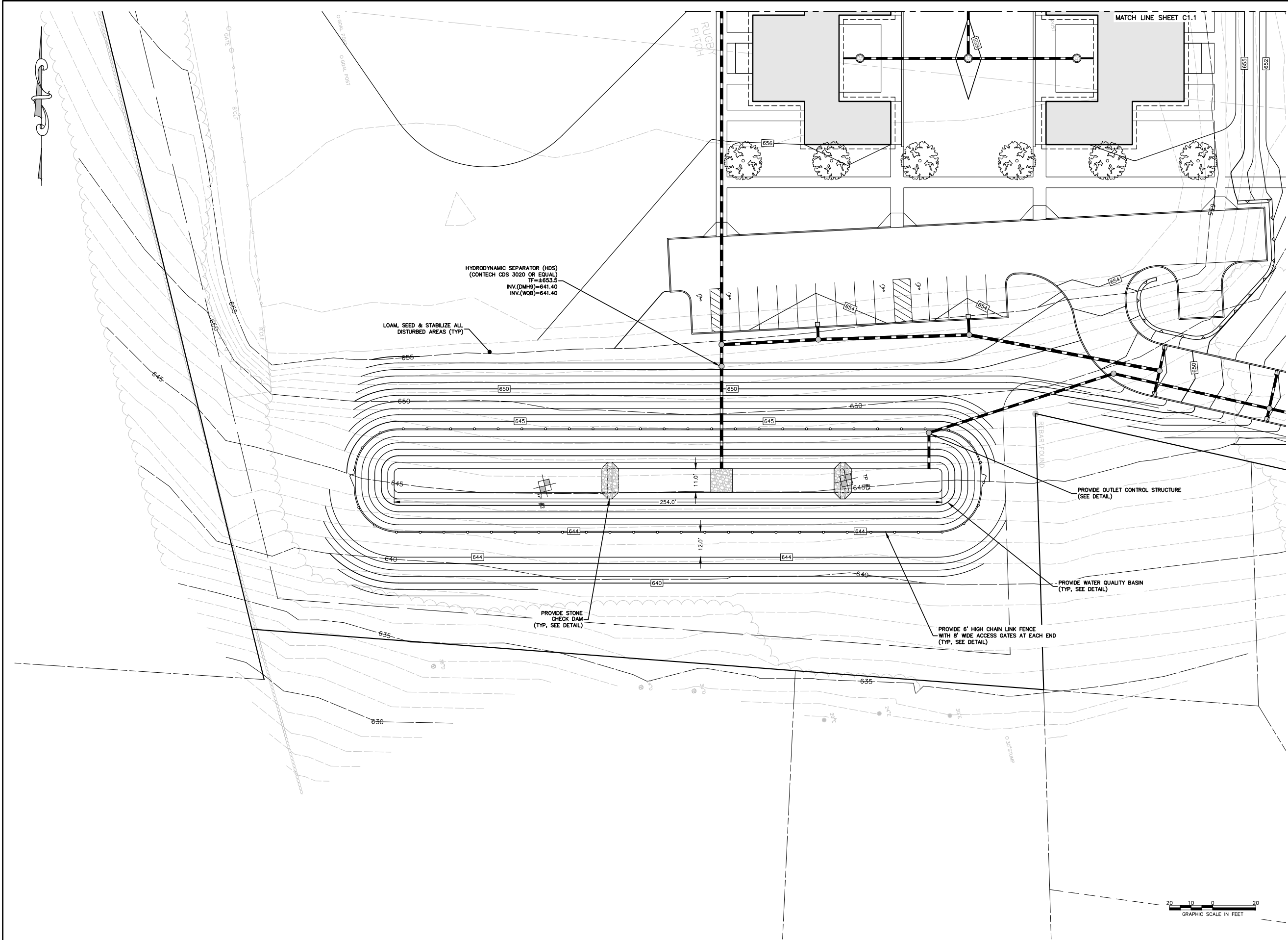
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SHEET NO.

C2.2





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SUBMISSION

SHEET TITLE

SITE GRADING &  
DRAINAGE PLAN

DATE MAY 25, 2022

SCALE 1" = 20'

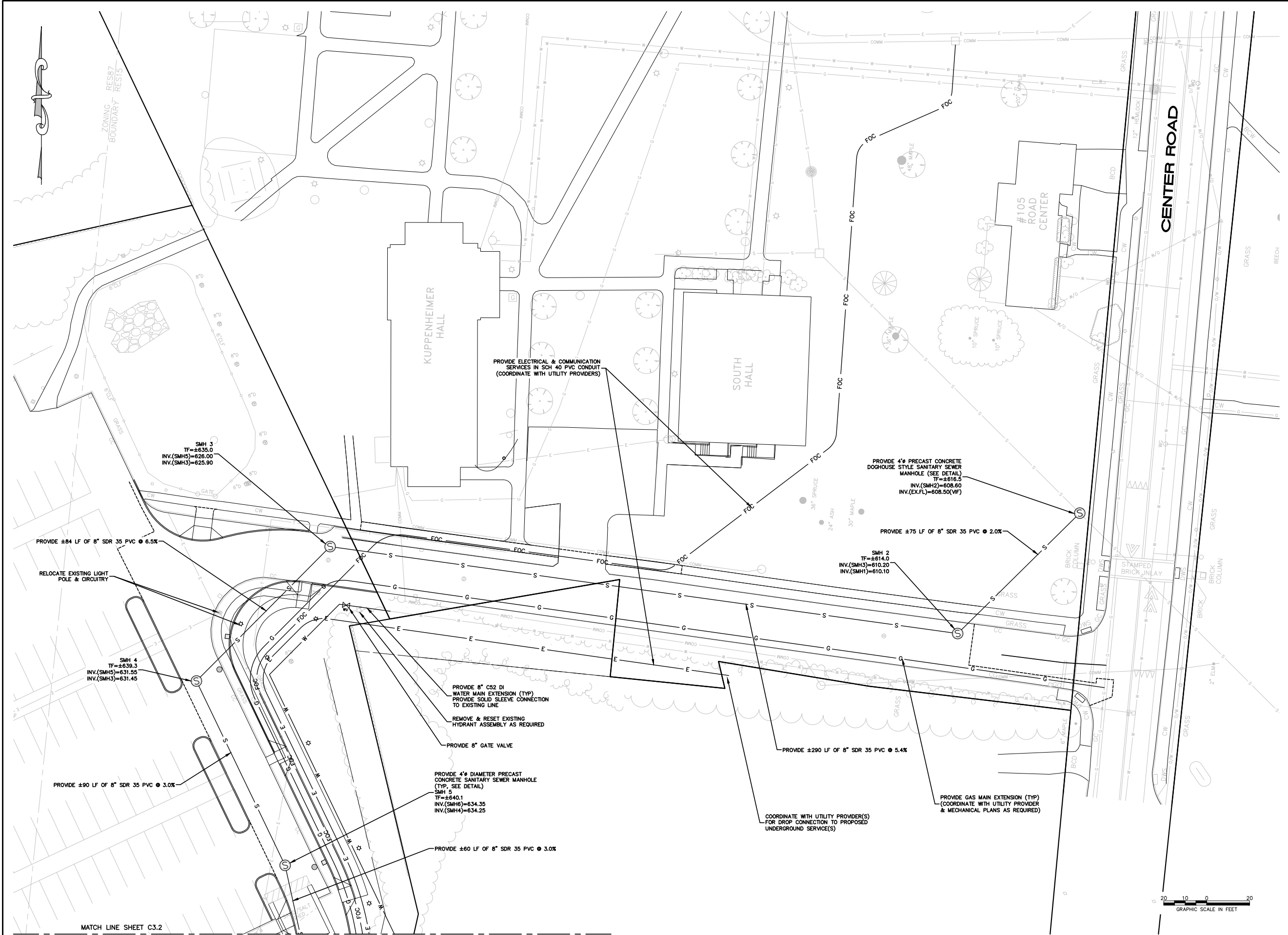
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C2.3





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NO.	DATE	BY	REMARKS

SET

PLANNING BOARD  
SUBMISSION

SHEET TITLE

SITE UTILITY PLAN

DATE MAY 25, 2022

SCALE 1" = 20'

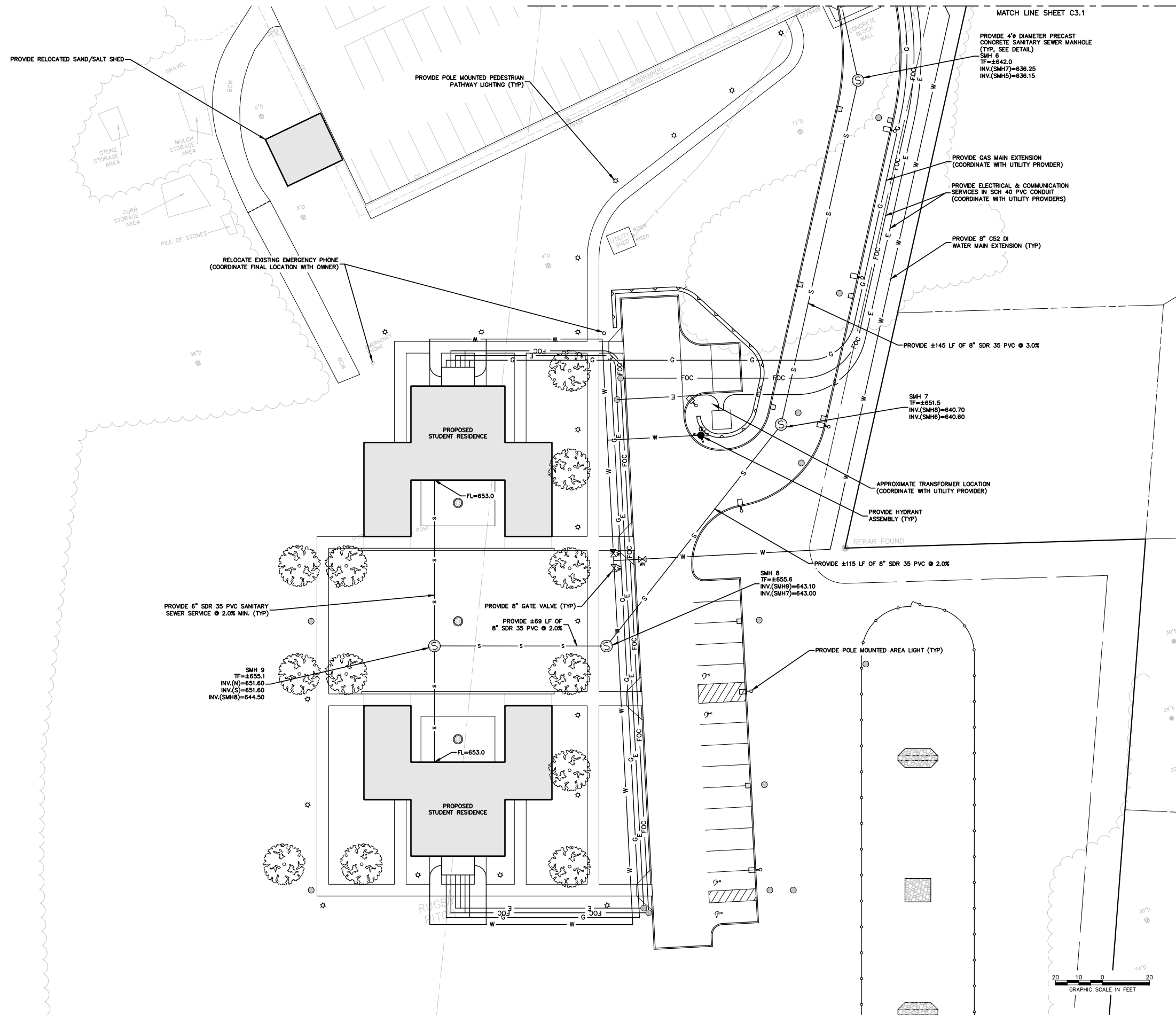
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SHEET NO.

C3.1





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SHEET TITLE

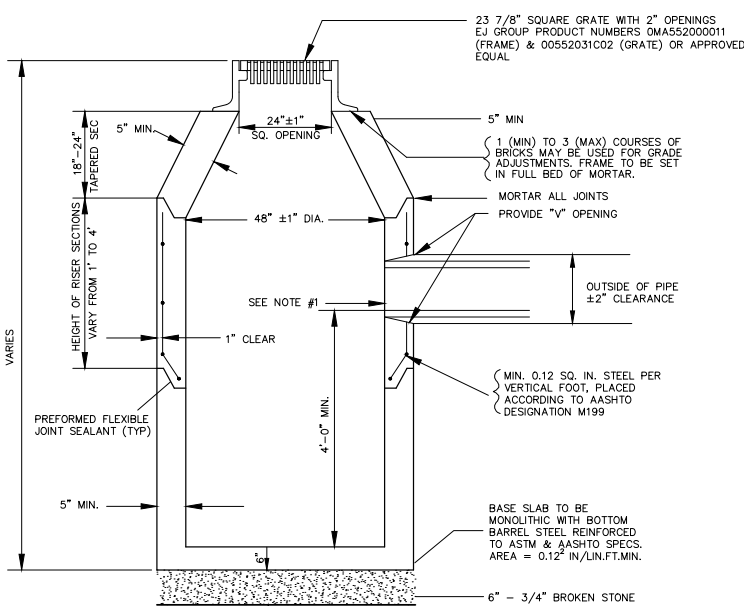
## SITE UTILITY PLAN

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CHECKED BY	
SHEET NO.	

C3.2

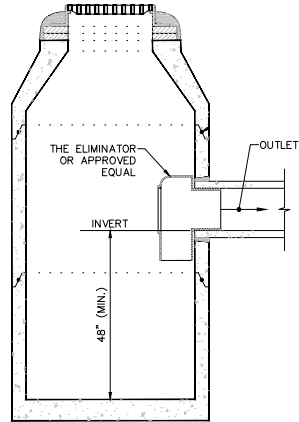




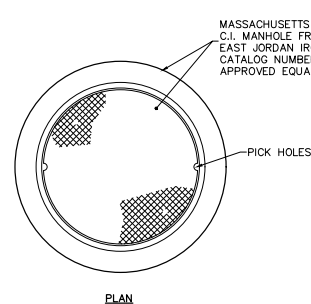


**PRECAST CONCRETE CATCH BASIN**  
NOT TO SCALE

- NOTES:
- FACE OF PIPE SHALL BE FLUSH OR NOT TO PROJECT MORE THAN 4" FROM FACE OF WALL ALONG CENTERLINE OF PIPE.
  - FOR DESCRIPTION, MATERIALS, AND CONSTRUCTION METHODS SEE MASSDOT "STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES" AND CONSTRUCTION STANDARDS AND THE CONTRACT DOCUMENT SPECIFICATIONS.
  - MINIMUM DEPTH OF SUMP TO BE 4'.
  - WHEN A CURB INLET IS INSTALLED, THE OPENING IS TO BE 24" ± 1" X 27" ± 1".
  - ALL CATCH BASINS SHALL INCLUDE A CATCH BASIN HOOD FOR THE OUTLET PIPE.
  - CATCH BASIN AND ALL APPURTENANCES SHALL MEET H-20 LOADING.



**CATCH BASIN HOOD**  
NOT TO SCALE

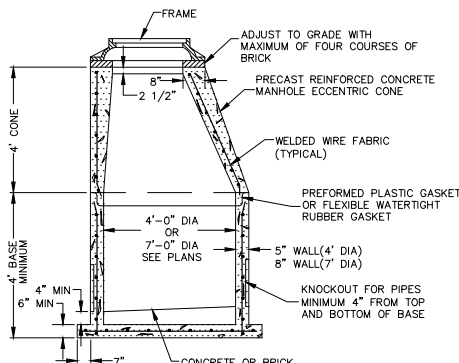


**STANDARD FRAME AND COVER**  
NTS

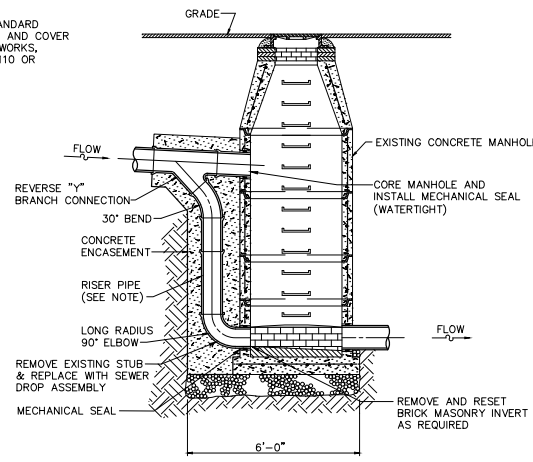
NOTE: CONTRACTOR SHALL SUBMIT  
SHOP DRAWINGS OF FRAME AND  
COVER SHOWING CASTING FOR  
APPROVAL

DRAINAGE MANHOLE SHALL HAVE  
"DRAINAGE" OR "STORM" IMPRINTED  
ON COVER

SEWER MANHOLE SHALL HAVE  
"SEWER" IMPRINTED ON COVER

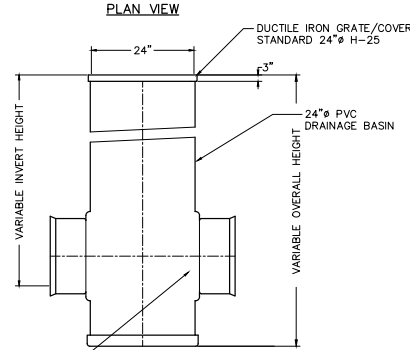
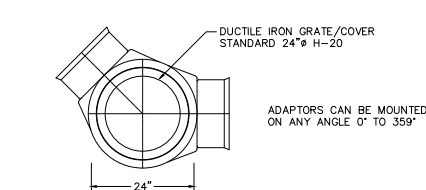


**DRAINAGE MANHOLE  
CROSS SECTION**  
NOT TO SCALE



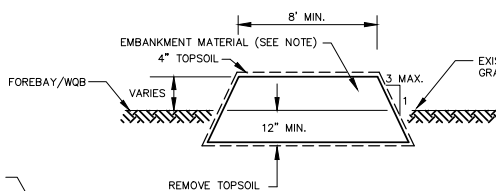
NOTE: USE 8" RISER PIPE AND BENDS FOR INCOMING  
SEWER OF 12" OR LESS. FOR INCOMING SEWER  
LARGER THAN 12", THE RISER PIPE AND BENDS  
SHALL BE 10"

**DROP MANHOLE CROSS SECTION**  
NOT TO SCALE



**NYLOPLAST 24" DRAIN BASIN (YARD DRAIN)**  
NTS

NOTE: PROVIDE POURED IN PLACE CONCRETE RING UNDER  
GRATE AS REQUIRED BY MANUFACTURER.

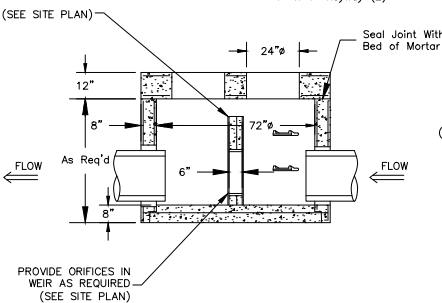
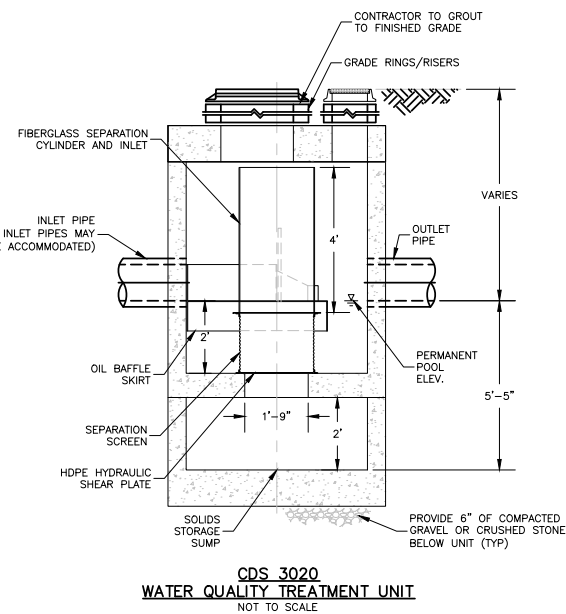
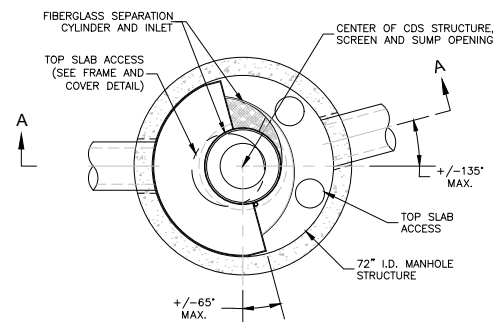
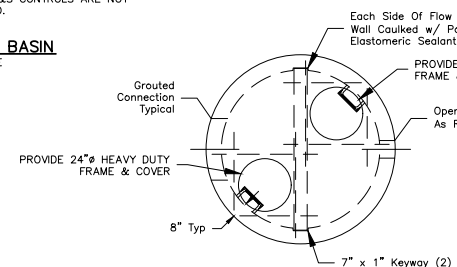


NOTE: EMBANKMENT MATERIAL SHALL CONTAIN AT LEAST 15%  
PASSING THE #200 SIEVE AND NOT MORE THAN 50% PASSING  
THE #200 SIEVE. NO STONES LARGER THAN 6 INCHES SHALL  
BE ALLOWED WITHIN THE COMPACTED EMBANKMENT. WITHIN  
TWO FEET OF ANY STRUCTURE, THE MAXIMUM SIZE SHALL BE  
3 INCHES. CONSTRUCTION SHALL NOT TAKE PLACE DURING  
COLD PERIODS WHERE TEMPERATURES ARE CONSISTENTLY  
LOWER THAN 40 DEGREES FAHRENHEIT. EMBANKMENT  
MATERIAL TO BE COMPACTED IN LIFTS TO 95% MAXIMUM DRY  
DENSITY.

**EARTH BERM DETAIL**  
NTS

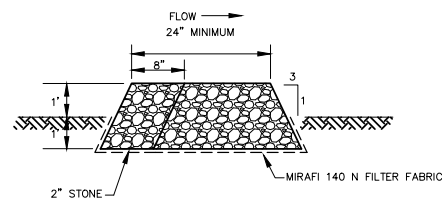
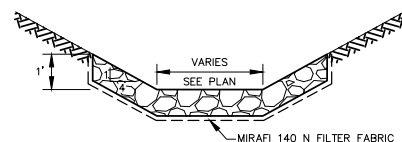
- NOTES:
- SAND/TOPSOIL/COMPOST MIXTURE SHALL NOT BE COMPACTED AND THE  
ENTIRE WATER QUALITY BASIN SHALL BE PROTECTED FROM HEAVY  
EQUIPMENT TRAFFIC THROUGHOUT CONSTRUCTION.
  - THE CONTRACTOR SHALL BE LIABLE FOR THE REPLACEMENT OF THE  
SAND/TOPSOIL/COMPOST MIXTURE IF EAS CONTROLS ARE NOT  
INSTALLED & MAINTAINED AS INDICATED.

**WATER QUALITY BASIN**  
NOT TO SCALE



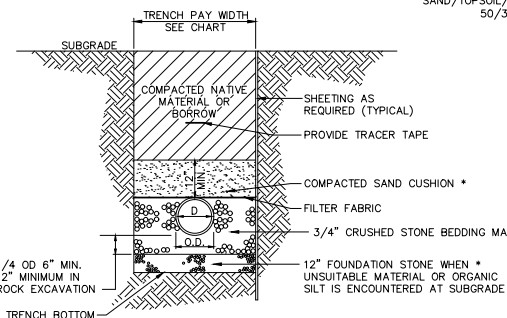
**OUTLET CONTROL DEVICE**  
NOT TO SCALE

- NOTES:
- MANHOLE SECTIONS TO BE MANUFACTURED TO ASTM  
C-478 SPECIFICATIONS.
  - REINFORCING SHOWN FOR SCHEMATIC ONLY. STRUCTURE  
MUST BE DESIGNED TO MEET H-20 LOADING  
REQUIREMENTS.
  - CONTRACTOR TO SEAL BETWEEN PRECAST WALL & BASE  
W/BUTYL ROPE.



NOTE: KEY ENDS INTO EXISTING GRADE

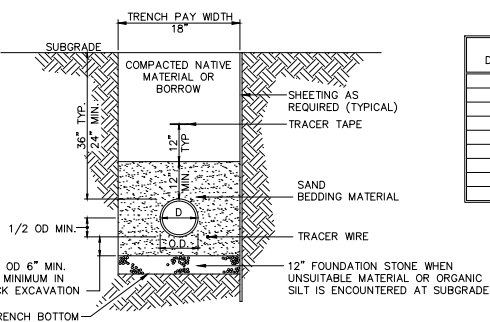
PIPE DIAMETER	MAXIMUM TRENCH WIDTH
≤ 6"	2'-6"
8"	3'-0"
10"	3'-0"
12"	3'-0"
15"	3'-3"
18"	3'-6"
21"	4'-0"
24"	4'-6"
30"	5'-0"
60"	8'-0"



**TRENCH SECTION FOR SANITARY SEWER & STORM DRAINS**  
NOT TO SCALE

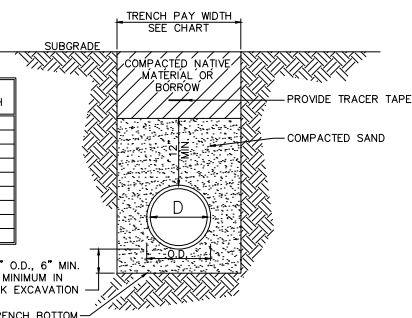
NOTE:  
BACKFILL MATERIAL TO BE PLACED IN 12" MAXIMUM LIFTS  
& COMPACTED TO 95% MAXIMUM DRY DENSITY  
(AS DETERMINED BY THE MODIFIED PROCTOR METHOD)

\* PROVIDE NATIVE MATERIAL WITHIN 50' OF SEPTIC SYSTEM LEACHING FIELDS



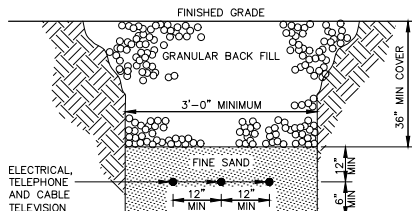
**TRENCH SECTION FOR GAS LINES**  
NOT TO SCALE

PIPE DIAMETER	MAXIMUM TRENCH WIDTH
≤ 6"	2'-6"
8"	3'-0"
10"	3'-0"
12"	3'-0"
15"	3'-3"
18"	3'-6"
21"	4'-0"
24"	4'-6"
30"	5'-0"



**TRENCH SECTION FOR TYPICAL WATER TRENCH**  
NOT TO SCALE

NOTE:  
BACKFILL MATERIAL TO BE PLACED IN 12" MAXIMUM LIFTS  
& COMPACTED TO 95% MAXIMUM DRY DENSITY  
(AS DETERMINED BY THE MODIFIED PROCTOR METHOD)



**BURIED CABLE TRENCH  
CROSS SECTION**  
NOT TO SCALE

Juster Pope Frazier, LLC  
Architects and Planners  
82 North Street  
Northampton, Massachusetts 01060  
413.586.1600

Clough Harbour Associates, LLP  
Civil Engineers  
101 East River Drive, 1st Floor  
East Hartford, CT 06108  
860.290.4100

NICHOLS COLLEGE

TOWNHOMES

CENTER ROAD, DUDLEY, MA 01571

REVISIONS

NO. DATE BY REMARKS

SET

PLANNING BOARD  
SUBMISSION

SHEET TITLE

CONSTRUCTION  
DETAILS

DATE MAY 25, 2022

SCALE AS NOTED

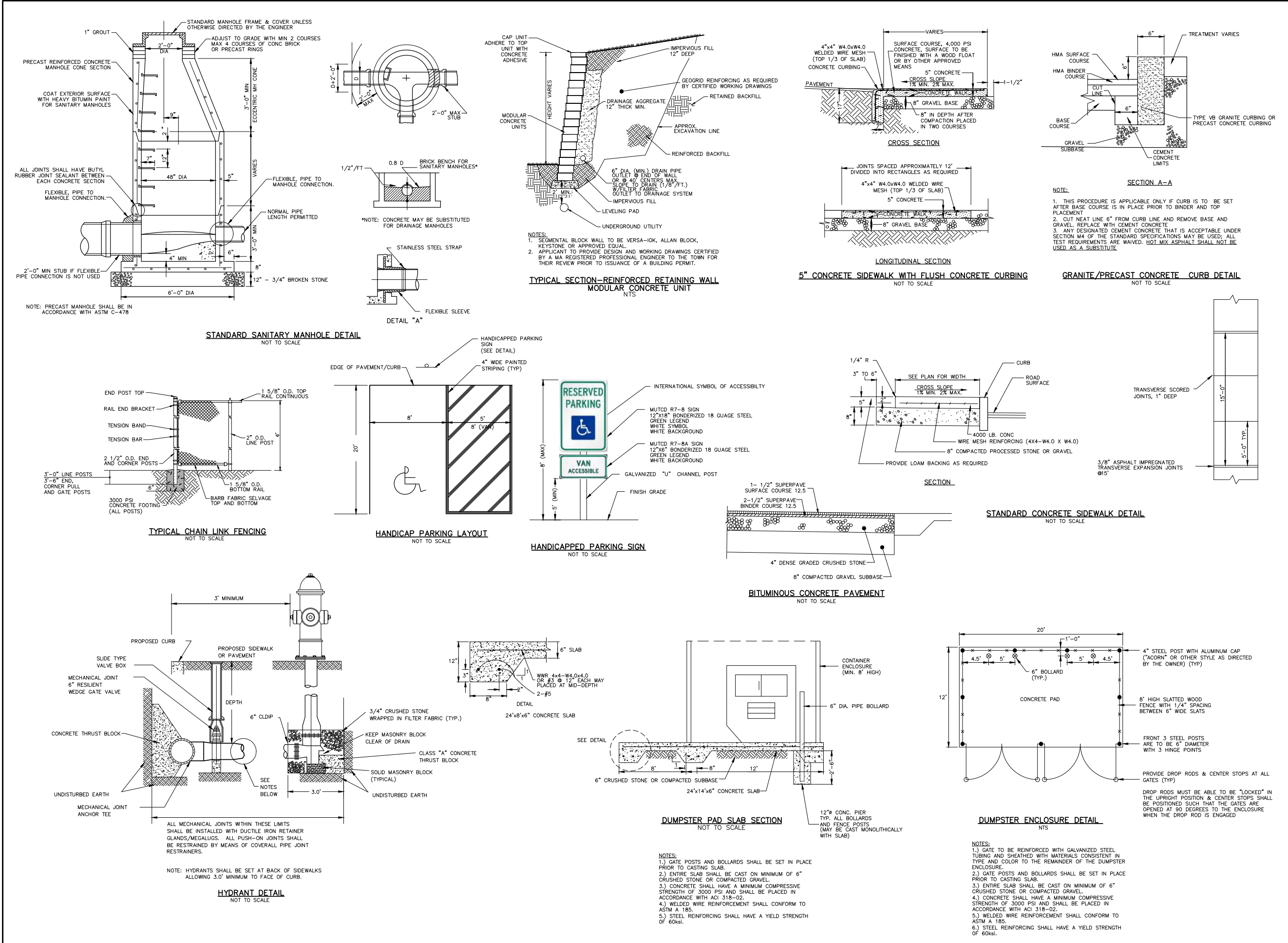
DRAWN BY PMP

CHECKED BY

SHEET NO.

C4.1





Juster Pope Frazier, LLC  
Architects and Planners  
82 North Street  
Northampton, Massachusetts 01060  
413.586.1600

Clough Harbour Associates, LLP  
Civil Engineers  
101 East River Drive, 1st Floor  
East Hartford, CT 06108  
860.290.4100

NICHOLS COLLEGE

TOWNHOMES

CENTER ROAD, DUDLEY, MA 01571

REVISIONS				
NO.	DATE	BY	REMARKS	

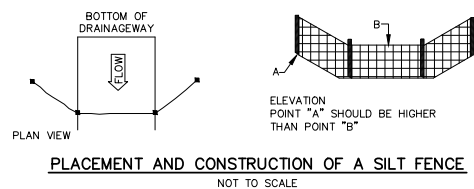
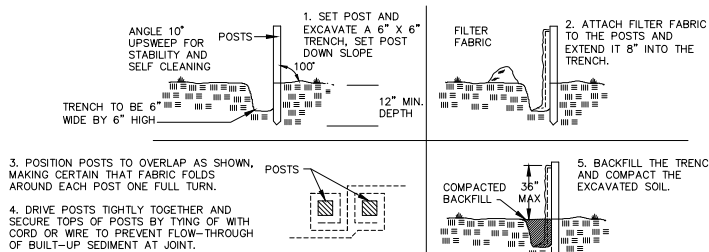
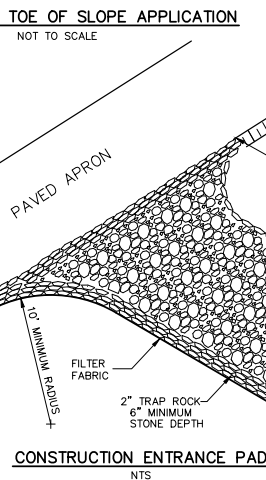
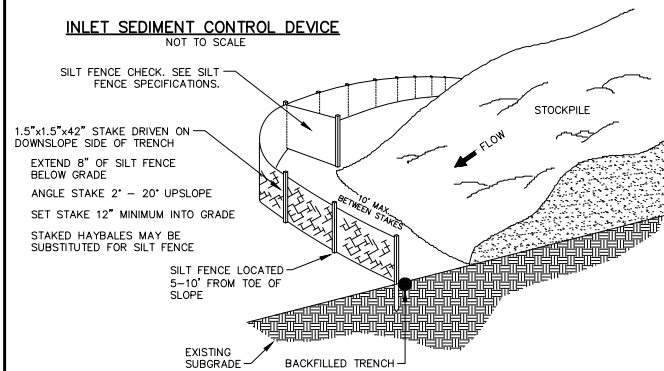
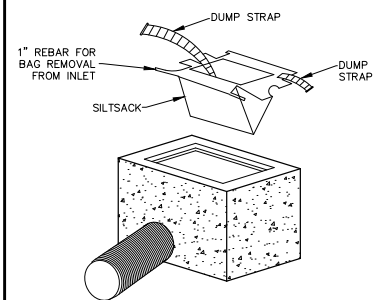
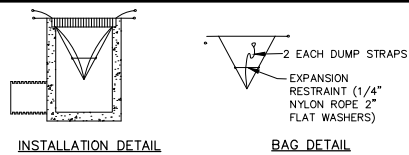
SET  
PLANNING BOARD  
SUBMISSION

SHEET TITLE  
CONSTRUCTION  
DETAILS

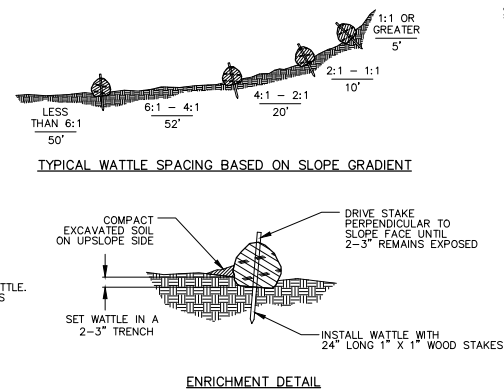
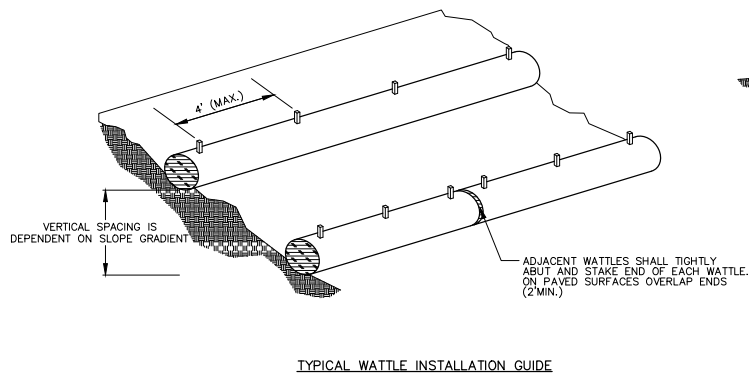
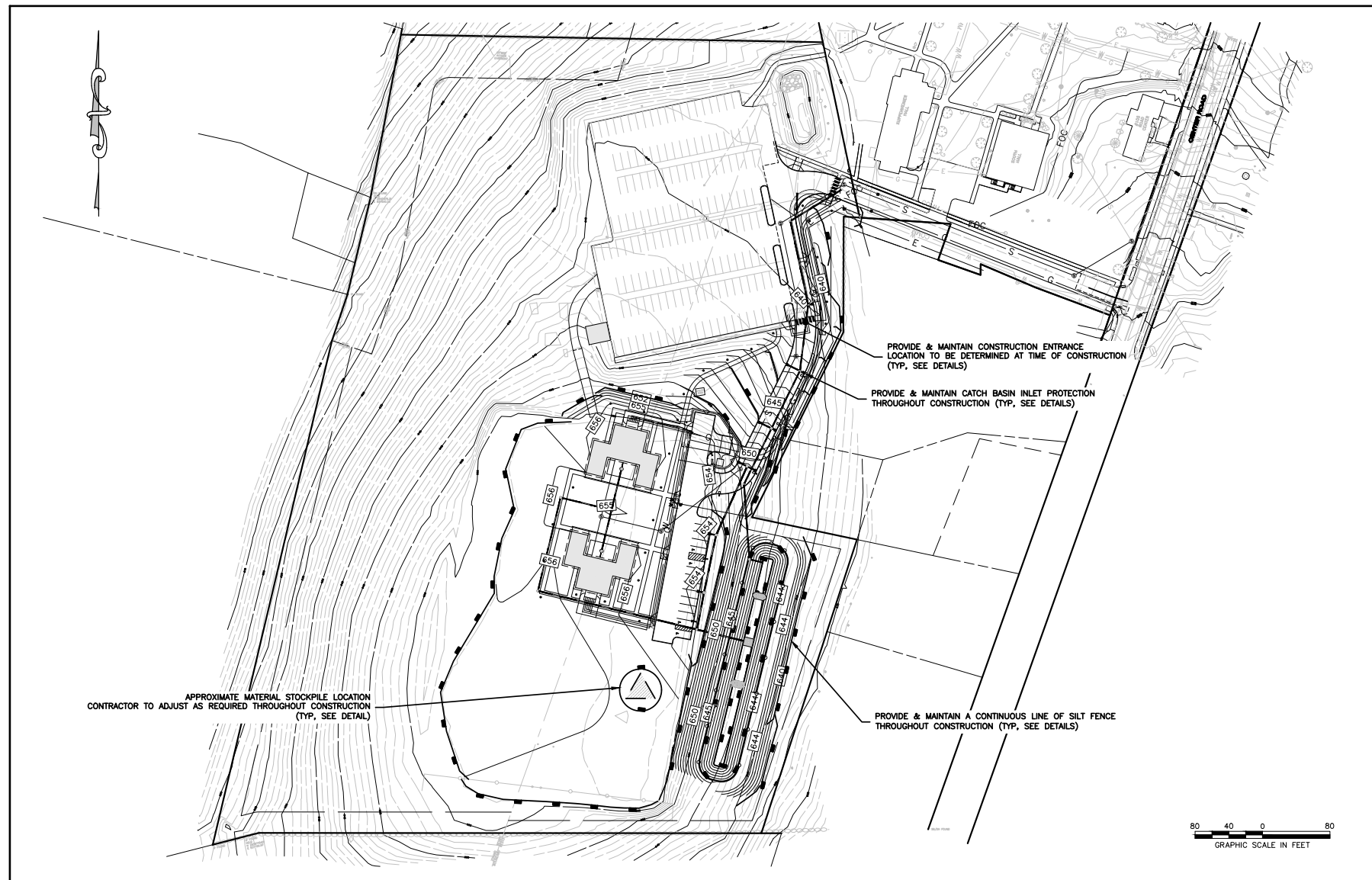
DATE	MAY 25, 2022
SCALE	AS NOTED
DRAWN BY	PMP
CHECKED BY	
SHEET NO.	

C4.2





## EROSION AND SEDIMENTATION CONTROL DETAILS



### STRAW WATTLE NOTES:

- BEGIN AT THE LOCATION WHERE THE WATTLE IS TO BE INSTALLED BY EXCAVATING A 2-3" DEEP BY 9" WIDE TRENCH ALONG THE CONTOUR OF THE SLOPE. EXCAVATED SOIL SHOULD BE PLACED UP-SLOPE FROM THE ANCHOR TRENCH.
- PLACE THE WATTLE IN THE TRENCH SO THAT IT CONTOURS TO THE SOIL SURFACE. COMPACT THE SOIL FROM THE EXCAVATED TRENCH AGAINST THE WATTLE ON THE UPHILL SIDE. ADJACENT WATTLES SHOULD TIGHTLY ABUT.
- SECURE THE WATTLE WITH 24" LONG STAKES EVERY 3-4' WITH A STAKE ON EACH END. STAKES SHOULD BE DRIVEN THROUGH THE MIDDLE OF THE WATTLES LEAVING 2-3" OF STAKE EXTENDING ABOVE. THE WATTLE STAKES SHOULD BE DRIVEN PERPENDICULAR TO THE SLOPE FACE.
- SECURE WATTLES PLACED ON PAVED SURFACES WITH SANDBAGS SPACED AT AN INTERVAL SUFFICIENT TO PREVENT MOVEMENT OF WATTLE AND TO ENSURE THAT ENDS OF ADJACENT WATTLES REMAIN TIGHTLY ABUTTED.

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NICHOLS COLLEGE

TOWNHOMES

CENTER ROAD, DUDLEY, MA 01571

### REVISIONS

NO.	DATE	BY	REMARKS

SET

PLANNING BOARD  
SUBMISSION

SHEET TITLE

EROSION & SEDIMENT  
CONTROL PLAN

DATE MAY 25, 2022

SCALE AS NOTED

DRAWN BY PMP

CHECKED BY

SHEET NO.

C5.1









## SOILS MAPPING

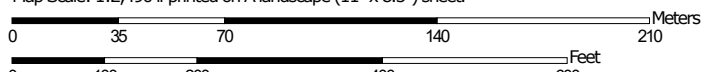


# Soil Map—Worcester County, Massachusetts, Southern Part



Soil Map may not be valid at this scale.

Map Scale: 1:2,490 if printed on A landscape (11" x 8.5") sheet.



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



**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

5/5/2022  
Page 1 of 3



## MAP LEGEND

### Area of Interest (AOI)

Area of Interest (AOI)

### Soils



Soil Map Unit Polygons



Soil Map Unit Lines



Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Worcester County, Massachusetts, Southern Part

Survey Area Data: Version 14, Sep 3, 2021

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

Date(s) aerial images were photographed: May 18, 2019—Jul 9, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
305B	Paxton fine sandy loam, 3 to 8 percent slopes	11.3	65.6%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	3.3	19.3%
305D	Paxton fine sandy loam, 15 to 25 percent slopes	2.6	15.1%
<b>Totals for Area of Interest</b>		<b>17.2</b>	<b>100.0%</b>

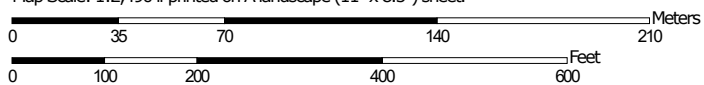


# Hydrologic Soil Group—Worcester County, Massachusetts, Southern Part



Soil Map may not be valid at this scale.

Map Scale: 1:2,490 if printed on A landscape (11" x 8.5") sheet.



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



**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

5/5/2022  
Page 1 of 4





## MAP LEGEND

### Area of Interest (AOI)









Area of Interest (AOI)

### Soils

#### Soil Rating Polygons





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

#### Soil Rating Lines

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

#### Soil Rating Points




-  A
-  A/D
-  B
-  B/D

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


### Water Features

-  Streams and Canals

### Transportation

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

### Background

-  Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Worcester County, Massachusetts, Southern Part

Survey Area Data: Version 14, Sep 3, 2021

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

Date(s) aerial images were photographed: May 18, 2019—Jul 9, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	11.3	65.6%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	C	3.3	19.3%
305D	Paxton fine sandy loam, 15 to 25 percent slopes	C	2.6	15.1%
<b>Totals for Area of Interest</b>			<b>17.2</b>	<b>100.0%</b>

## Description

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

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

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

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

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

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

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

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher



## HYDROLOGIC DATA





NOAA Atlas 14, Volume 10, Version 3  
Location name: Dudley, Massachusetts, USA\*  
Latitude: 42.0417°, Longitude: -71.9342°  
Elevation: 640.33 ft\*\*  
\* source: ESRI Maps  
\*\* source: USGS



## POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

### PF tabular

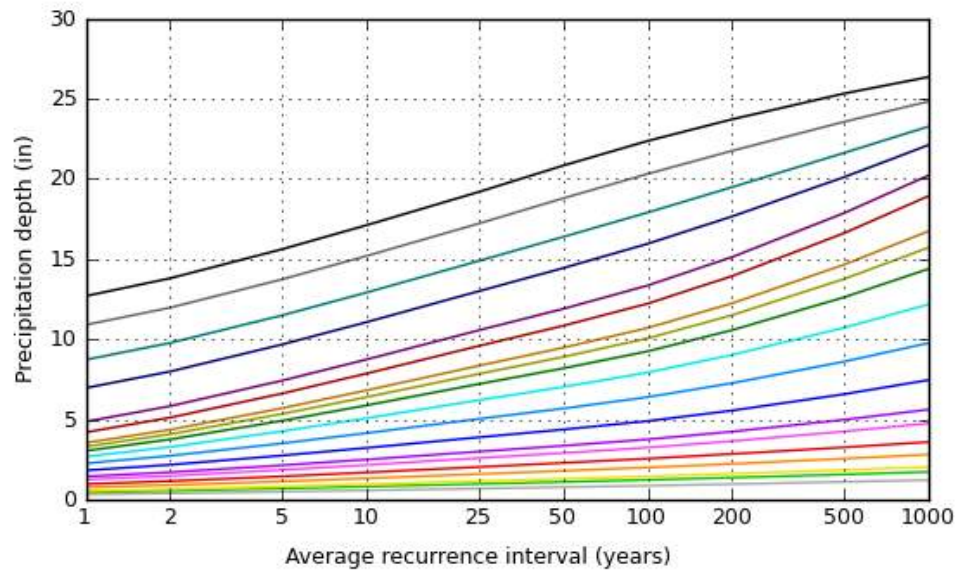
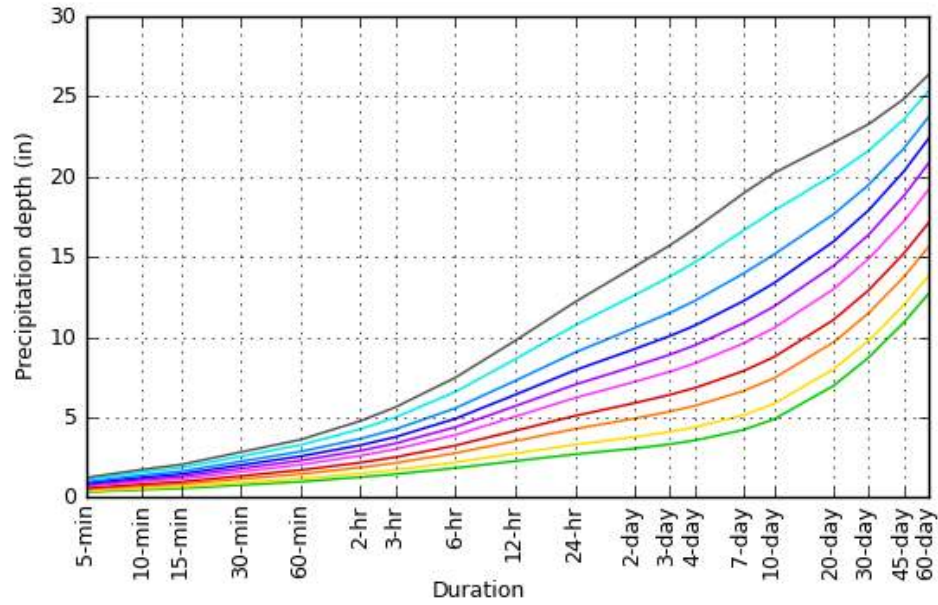
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.333 (0.262-0.419)	0.395 (0.310-0.497)	0.496 (0.388-0.626)	0.580 (0.451-0.736)	0.695 (0.522-0.924)	0.782 (0.575-1.06)	0.872 (0.621-1.23)	0.971 (0.657-1.41)	1.11 (0.721-1.68)	1.23 (0.775-1.89)
10-min	0.472 (0.371-0.593)	0.560 (0.440-0.703)	0.703 (0.550-0.886)	0.821 (0.639-1.04)	0.984 (0.740-1.31)	1.11 (0.814-1.51)	1.24 (0.880-1.75)	1.38 (0.930-2.00)	1.58 (1.02-2.38)	1.74 (1.10-2.68)
15-min	0.556 (0.437-0.698)	0.658 (0.517-0.828)	0.826 (0.646-1.04)	0.966 (0.751-1.23)	1.16 (0.870-1.54)	1.30 (0.958-1.77)	1.45 (1.03-2.06)	1.62 (1.09-2.36)	1.85 (1.20-2.80)	2.04 (1.29-3.16)
30-min	0.766 (0.603-0.962)	0.908 (0.713-1.14)	1.14 (0.892-1.44)	1.33 (1.04-1.69)	1.60 (1.20-2.13)	1.80 (1.32-2.45)	2.01 (1.43-2.84)	2.24 (1.51-3.25)	2.56 (1.66-3.87)	2.82 (1.78-4.36)
60-min	0.977 (0.768-1.23)	1.16 (0.910-1.46)	1.45 (1.14-1.83)	1.70 (1.32-2.16)	2.04 (1.53-2.71)	2.30 (1.69-3.12)	2.56 (1.82-3.62)	2.85 (1.93-4.15)	3.27 (2.12-4.94)	3.60 (2.28-5.56)
2-hr	1.26 (0.995-1.57)	1.49 (1.18-1.85)	1.86 (1.47-2.33)	2.17 (1.70-2.73)	2.59 (1.97-3.44)	2.91 (2.16-3.96)	3.25 (2.35-4.61)	3.65 (2.48-5.28)	4.25 (2.77-6.39)	4.76 (3.02-7.32)
3-hr	1.45 (1.15-1.80)	1.71 (1.36-2.13)	2.15 (1.70-2.68)	2.50 (1.97-3.15)	3.00 (2.29-3.97)	3.37 (2.52-4.57)	3.76 (2.74-5.34)	4.25 (2.88-6.12)	4.99 (3.25-7.47)	5.62 (3.58-8.60)
6-hr	1.83 (1.46-2.25)	2.18 (1.74-2.69)	2.75 (2.20-3.41)	3.23 (2.56-4.03)	3.89 (2.99-5.12)	4.37 (3.29-5.91)	4.90 (3.59-6.94)	5.56 (3.79-7.96)	6.58 (4.30-9.79)	7.46 (4.76-11.3)
12-hr	2.26 (1.83-2.77)	2.74 (2.21-3.36)	3.51 (2.82-4.32)	4.15 (3.32-5.15)	5.04 (3.89-6.58)	5.69 (4.30-7.63)	6.40 (4.71-8.98)	7.27 (4.98-10.3)	8.61 (5.65-12.7)	9.77 (6.25-14.7)
24-hr	2.68 (2.18-3.27)	3.29 (2.67-4.00)	4.27 (3.45-5.22)	5.08 (4.09-6.25)	6.20 (4.82-8.05)	7.03 (5.35-9.37)	7.93 (5.87-11.1)	9.03 (6.21-12.8)	10.7 (7.06-15.7)	12.2 (7.82-18.2)
2-day	3.05 (2.50-3.68)	3.76 (3.08-4.55)	4.92 (4.01-5.97)	5.89 (4.77-7.19)	7.21 (5.65-9.31)	8.19 (6.28-10.8)	9.26 (6.89-12.8)	10.6 (7.30-14.8)	12.6 (8.34-18.4)	14.4 (9.27-21.4)
3-day	3.31 (2.73-3.98)	4.09 (3.36-4.92)	5.35 (4.38-6.47)	6.40 (5.21-7.78)	7.84 (6.16-10.1)	8.90 (6.85-11.8)	10.1 (7.53-13.9)	11.5 (7.97-16.1)	13.8 (9.11-20.0)	15.7 (10.1-23.3)
4-day	3.55 (2.93-4.25)	4.37 (3.60-5.24)	5.71 (4.69-6.88)	6.82 (5.57-8.27)	8.35 (6.59-10.7)	9.48 (7.31-12.5)	10.7 (8.03-14.8)	12.3 (8.49-17.1)	14.7 (9.72-21.2)	16.7 (10.8-24.7)
7-day	4.20 (3.49-5.01)	5.12 (4.25-6.11)	6.62 (5.48-7.94)	7.87 (6.46-9.49)	9.58 (7.60-12.2)	10.8 (8.41-14.2)	12.2 (9.20-16.8)	13.9 (9.70-19.3)	16.6 (11.1-23.9)	18.9 (12.3-27.8)
10-day	4.87 (4.06-5.78)	5.84 (4.87-6.94)	7.43 (6.17-8.87)	8.74 (7.21-10.5)	10.6 (8.39-13.4)	11.9 (9.24-15.5)	13.4 (10.0-18.2)	15.1 (10.6-20.9)	17.9 (11.9-25.6)	20.2 (13.1-29.6)
20-day	6.97 (5.86-8.22)	8.00 (6.72-9.44)	9.68 (8.10-11.5)	11.1 (9.20-13.2)	13.0 (10.4-16.2)	14.4 (11.2-18.5)	16.0 (11.9-21.2)	17.7 (12.4-24.1)	20.1 (13.5-28.5)	22.1 (14.4-32.1)
30-day	8.73 (7.38-10.3)	9.78 (8.26-11.5)	11.5 (9.66-13.6)	12.9 (10.8-15.4)	14.9 (11.9-18.4)	16.4 (12.8-20.7)	17.9 (13.4-23.5)	19.5 (13.8-26.5)	21.6 (14.5-30.5)	23.3 (15.2-33.6)
45-day	10.9 (9.26-12.8)	12.0 (10.2-14.0)	13.7 (11.6-16.2)	15.2 (12.7-18.0)	17.2 (13.8-21.1)	18.8 (14.6-23.5)	20.3 (15.1-26.3)	21.8 (15.4-29.4)	23.6 (15.9-33.1)	24.8 (16.2-35.8)
60-day	12.7 (10.8-14.8)	13.8 (11.8-16.1)	15.6 (13.2-18.3)	17.1 (14.4-20.2)	19.2 (15.4-23.4)	20.8 (16.3-25.9)	22.4 (16.6-28.7)	23.7 (16.9-31.9)	25.3 (17.1-35.4)	26.4 (17.2-37.8)
<sup>1</sup> 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

## PDS-based depth-duration-frequency (DDF) curves

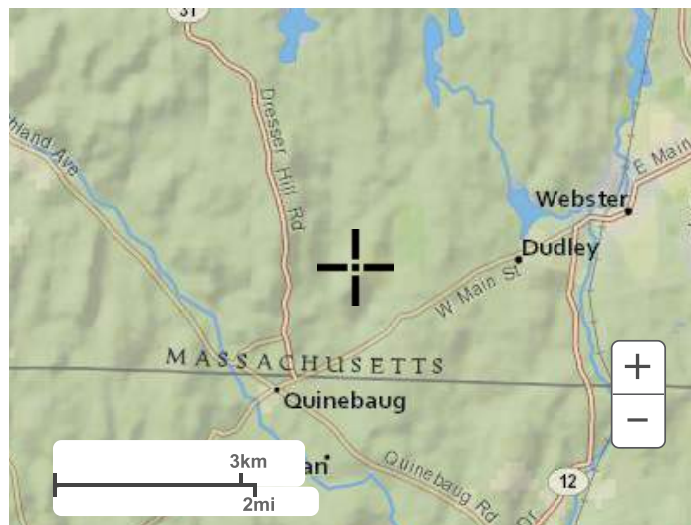
Latitude: 42.0417°, Longitude: -71.9342°



## Maps & aerials

Small scale terrain





Large scale terrain



Large scale map



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NOAA Atlas 14, Volume 10, Version 3  
Location name: Dudley, Massachusetts, USA\*  
Latitude: 42.0417°, Longitude: -71.9342°  
Elevation: 640.33 ft\*\*  
\* source: ESRI Maps  
\*\* source: USGS



## POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

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### PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.00 (3.14-5.03)	4.74 (3.72-5.96)	5.95 (4.66-7.51)	6.96 (5.41-8.83)	8.34 (6.26-11.1)	9.38 (6.90-12.8)	10.5 (7.45-14.8)	11.7 (7.88-17.0)	13.3 (8.65-20.2)	14.7 (9.30-22.7)
10-min	2.83 (2.23-3.56)	3.36 (2.64-4.22)	4.22 (3.30-5.32)	4.93 (3.83-6.25)	5.90 (4.44-7.85)	6.65 (4.88-9.04)	7.42 (5.28-10.5)	8.26 (5.58-12.0)	9.45 (6.14-14.3)	10.4 (6.59-16.1)
15-min	2.22 (1.75-2.79)	2.63 (2.07-3.31)	3.30 (2.58-4.17)	3.86 (3.00-4.90)	4.63 (3.48-6.16)	5.21 (3.83-7.09)	5.82 (4.14-8.22)	6.48 (4.38-9.42)	7.41 (4.81-11.2)	8.16 (5.17-12.6)
30-min	1.53 (1.21-1.92)	1.82 (1.43-2.28)	2.28 (1.78-2.88)	2.67 (2.07-3.39)	3.20 (2.40-4.25)	3.60 (2.65-4.89)	4.01 (2.86-5.68)	4.47 (3.02-6.51)	5.12 (3.32-7.74)	5.64 (3.57-8.72)
60-min	0.977 (0.768-1.23)	1.16 (0.910-1.46)	1.45 (1.14-1.83)	1.70 (1.32-2.16)	2.04 (1.53-2.71)	2.30 (1.69-3.12)	2.56 (1.82-3.62)	2.85 (1.93-4.15)	3.27 (2.12-4.94)	3.60 (2.28-5.56)
2-hr	0.628 (0.498-0.784)	0.742 (0.588-0.926)	0.929 (0.732-1.16)	1.08 (0.849-1.37)	1.30 (0.984-1.72)	1.46 (1.08-1.98)	1.63 (1.17-2.31)	1.83 (1.24-2.64)	2.13 (1.38-3.20)	2.38 (1.51-3.66)
3-hr	0.482 (0.383-0.598)	0.570 (0.453-0.709)	0.714 (0.565-0.891)	0.834 (0.656-1.05)	0.999 (0.762-1.32)	1.12 (0.837-1.52)	1.25 (0.911-1.78)	1.41 (0.960-2.04)	1.66 (1.08-2.49)	1.87 (1.19-2.86)
6-hr	0.305 (0.244-0.376)	0.364 (0.291-0.449)	0.460 (0.367-0.570)	0.540 (0.428-0.673)	0.649 (0.499-0.855)	0.730 (0.550-0.986)	0.819 (0.600-1.16)	0.929 (0.633-1.33)	1.10 (0.718-1.63)	1.25 (0.795-1.89)
12-hr	0.188 (0.152-0.230)	0.227 (0.183-0.279)	0.291 (0.234-0.359)	0.345 (0.275-0.427)	0.418 (0.323-0.546)	0.472 (0.357-0.633)	0.531 (0.391-0.746)	0.603 (0.413-0.858)	0.715 (0.469-1.06)	0.811 (0.519-1.22)
24-hr	0.112 (0.091-0.136)	0.137 (0.111-0.167)	0.178 (0.144-0.217)	0.212 (0.170-0.260)	0.258 (0.201-0.336)	0.293 (0.223-0.390)	0.330 (0.244-0.461)	0.376 (0.259-0.532)	0.447 (0.294-0.655)	0.508 (0.326-0.760)
2-day	0.064 (0.052-0.077)	0.078 (0.064-0.095)	0.103 (0.084-0.124)	0.123 (0.099-0.150)	0.150 (0.118-0.194)	0.171 (0.131-0.226)	0.193 (0.144-0.268)	0.220 (0.152-0.309)	0.263 (0.174-0.383)	0.300 (0.193-0.446)
3-day	0.046 (0.038-0.055)	0.057 (0.047-0.068)	0.074 (0.061-0.090)	0.089 (0.072-0.108)	0.109 (0.086-0.140)	0.124 (0.095-0.163)	0.140 (0.105-0.193)	0.160 (0.111-0.223)	0.191 (0.127-0.277)	0.218 (0.141-0.323)
4-day	0.037 (0.031-0.044)	0.045 (0.038-0.055)	0.059 (0.049-0.072)	0.071 (0.058-0.086)	0.087 (0.069-0.112)	0.099 (0.076-0.130)	0.112 (0.084-0.154)	0.128 (0.088-0.178)	0.153 (0.101-0.221)	0.174 (0.113-0.258)
7-day	0.025 (0.021-0.030)	0.030 (0.025-0.036)	0.039 (0.033-0.047)	0.047 (0.038-0.056)	0.057 (0.045-0.073)	0.065 (0.050-0.084)	0.073 (0.055-0.100)	0.083 (0.058-0.115)	0.099 (0.066-0.142)	0.113 (0.073-0.165)
10-day	0.020 (0.017-0.024)	0.024 (0.020-0.029)	0.031 (0.026-0.037)	0.036 (0.030-0.044)	0.044 (0.035-0.056)	0.050 (0.039-0.064)	0.056 (0.042-0.076)	0.063 (0.044-0.087)	0.074 (0.050-0.107)	0.084 (0.055-0.123)
20-day	0.015 (0.012-0.017)	0.017 (0.014-0.020)	0.020 (0.017-0.024)	0.023 (0.019-0.028)	0.027 (0.022-0.034)	0.030 (0.023-0.038)	0.033 (0.025-0.044)	0.037 (0.026-0.050)	0.042 (0.028-0.059)	0.046 (0.030-0.067)
30-day	0.012 (0.010-0.014)	0.014 (0.011-0.016)	0.016 (0.013-0.019)	0.018 (0.015-0.021)	0.021 (0.017-0.026)	0.023 (0.018-0.029)	0.025 (0.019-0.033)	0.027 (0.019-0.037)	0.030 (0.020-0.042)	0.032 (0.021-0.047)
45-day	0.010 (0.009-0.012)	0.011 (0.009-0.013)	0.013 (0.011-0.015)	0.014 (0.012-0.017)	0.016 (0.013-0.020)	0.017 (0.014-0.022)	0.019 (0.014-0.024)	0.020 (0.014-0.027)	0.022 (0.015-0.031)	0.023 (0.015-0.033)
60-day	0.009 (0.008-0.010)	0.010 (0.008-0.011)	0.011 (0.009-0.013)	0.012 (0.010-0.014)	0.013 (0.011-0.016)	0.014 (0.011-0.018)	0.016 (0.012-0.020)	0.016 (0.012-0.022)	0.018 (0.012-0.025)	0.018 (0.012-0.026)

<sup>1</sup> 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.

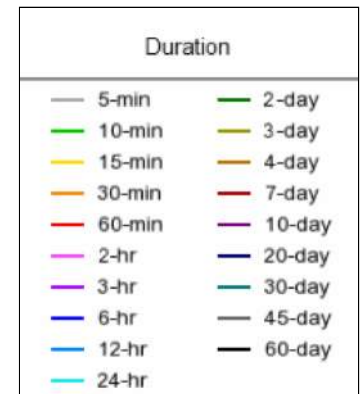
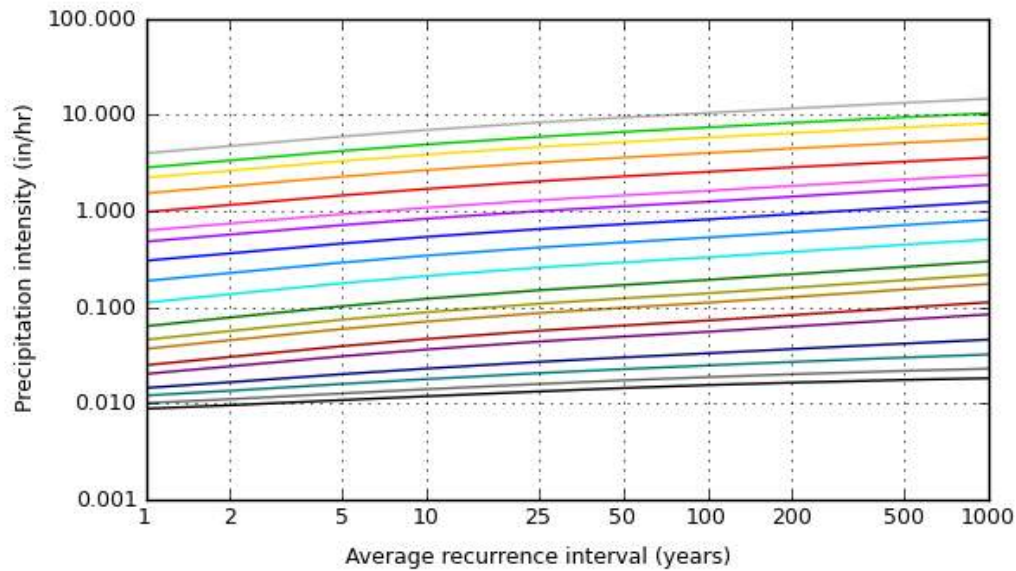
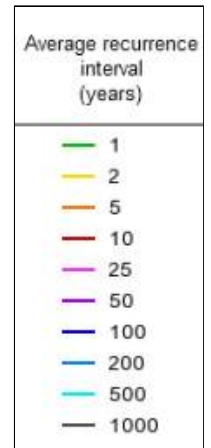
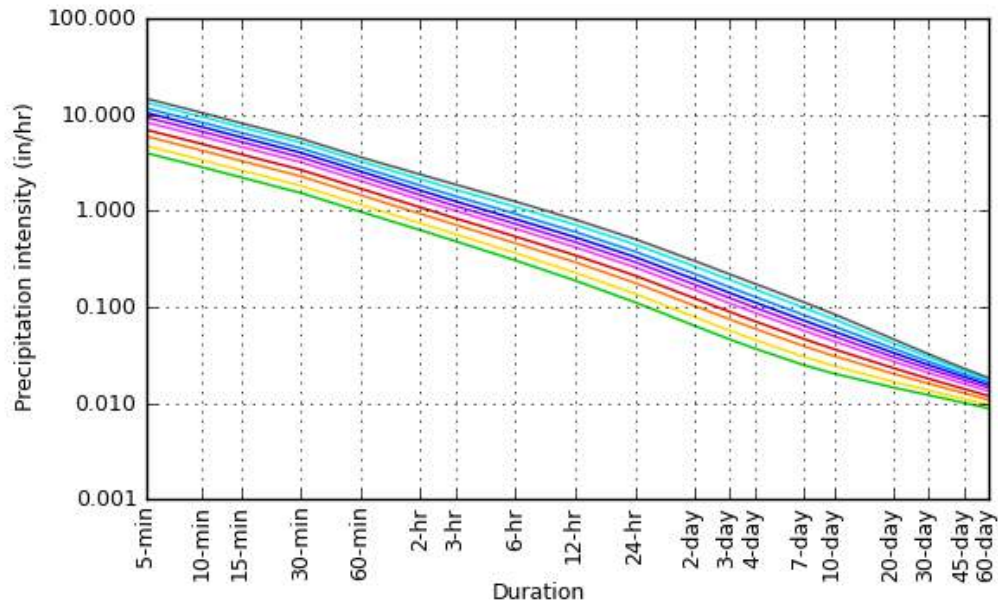
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### PF graphical

## PDS-based intensity-duration-frequency (IDF) curves

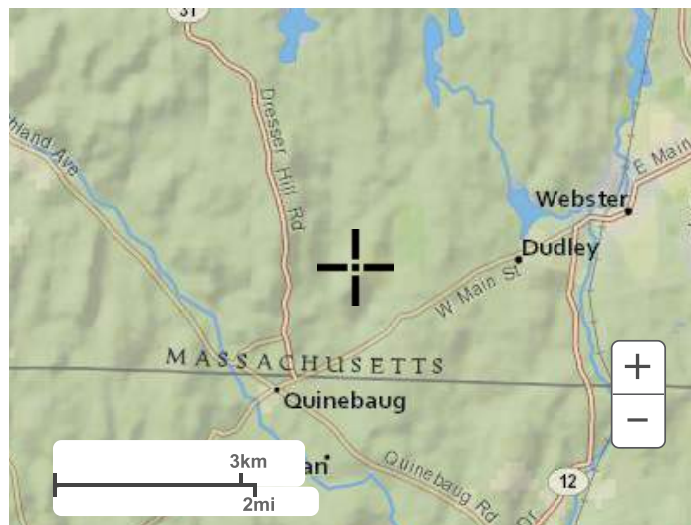
Latitude: 42.0417°, Longitude: -71.9342°



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