MILLENNIUM ENGINEERING, INC.

Land Surveyors and Civil Engineers

STORMWATER MANAGEMENT REPORT

FOR THE

PROPOSED SITE IMPROVEMENTS

AT

80 HAVERHILL ROAD
AMESBURY, MA

PREPARED FOR:

80 HAVERHILL ROAD, LLC
80 HAVERHILL ROAD
AMESBURY, MA

DATE: NOVEMBER 8, 2024

Massachusetts:

62 Elm Street-
Salisbury, MA 01952
Phone: 978-463-8980

New Hampshire:

13 Hampton Road
Exeter, NH 03833
Phone: 603-778-0528

Table of Contents

Stormwater Management Report
80 Haverhill Road Amesbury, MA

I. **Introduction**

II. **Stormwater Management Checklist**

III. **Hydrologic Analysis**

IV. **Stormwater Recharge Calculations**

V. **TSS Removal Calculations**

VI. **Water Quality Calculations**

VII. **Soils Analysis**

VIII. **Long Term Pollution Prevention Plan and Operations and Maintenance Plan**

IX. **Appendix**

- a. **Existing Conditions HydroCAD Report**
- b. **Proposed Conditions HydroCAD Report**
- c. **Watershed Maps**

I. Introduction

Introduction

The subject parcel is described as Tax Map 85, Lot 59 on the City of Amesbury, MA Assessor's Map. The project parcel is 23,332 S.F. in size. Elevations on the site range from 125.00' at the existing dwelling to 119.00' at the southwest end of the site. These elevations are based upon 1988 NAV datum.

The proposed improvements at 80 Haverhill Road include the rehabilitation of the existing historical building and addition off the rear of the building to create 8 total dwelling units. The project will consist of rehabbing the historical building, the construction of the addition off the rear of the building and the construction of a new residential driveway with all associated utilities.

The proposed stormwater management system for the project includes catch basins, proprietary separators and subsurface infiltration structures. The catch basins and Contech CDS units will remove suspended solids prior to discharging to the infiltration areas. The infiltration areas will provide stormwater recharge to the groundwater and mitigate peak runoff rates to ensure the post-development runoff rates will be less than or equal to the pre-development rates. Roof drywells are also proposed to recharge roof runoff to the groundwater.

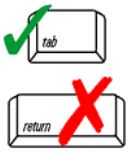
II. Stormwater Management Checklist

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

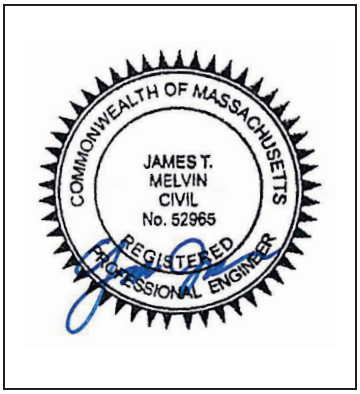
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☒ Other (describe): Subsurface infiltration chambers, Contech CDS unit

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

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

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

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

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☒ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

III. Hydrologic Analysis

Existing Site Characteristics

In general, the property is irregular in shape and fronts Haverhill Road. The entire property is upland with no resource areas located on-site. An existing Multi-family dwelling with associated barn, driveway, parking, patio, decks and utilities is located on-site. See the accompanying plan for a more detailed description of the existing site conditions and topography.

The lot consists of two soil groups: Deerfield loamy fine sand, 256A (Hydrologic Soil Group A); and Canton fine sandy loam, 420B (Hydrologic Soil Group B). 16 test pits were performed onsite in August 2024. The test pits indicated loamy sand material present throughout most of the site. See Appendix E for the NRCS soil map.

Proposed Site Features

The Applicant proposes to rehab the existing dwelling to create 8 residential units. Access to the property will remain nearly the same via Haverhill Road. A new 18' wide driveway will be constructed with adequate parking provided for the 8 units. Underground electrical and telecommunications service will also be provided. Sewer and water services are proposed to be connected to the City of Amesbury's 24" sewer main and 12" water main located in the Haverhill Road Right of Way.

In order to address stormwater management regulations, catch basins, Contech Water Quality Units, subsurface infiltration areas, and roof drywells are proposed to treat, store, and infiltrate runoff.

WATERSHED ANALYSIS AND METHODOLOGY

The stormwater runoff management system was analyzed using the storm events of the 2-year, 10-year and 100-year frequency. The analysis was performed using HydroCAD, version 10.00. Using USDA NRCS TR-20 and TR-55 methods of estimating runoff, the program uses the measured characteristics of the site and computes runoff produced by simulated rainfall events. The results are then used to design runoff control structures.

Existing drainage area boundaries were developed using an onsite topographic survey performed by Millennium Engineering, Inc. Proposed site development boundaries were developed from proposed grades and ground cover designed to minimize site storm water management structure requirements.

Hydrologic soil groups and curve numbers were estimated for existing and proposed developed conditions using available NRCS Soil Maps, current vegetation, and terrain.

DRAINAGE ANALYSIS

The purpose of the drainage analysis is two-fold. The first is to analyze and quantify the pre-development runoff flows through the site. The second purpose is to evaluate the impact of the proposed development on drainage patterns and flows, both within and outside the site, and to design a stormwater management system to adequately convey post-development runoff.

The design of the stormwater management system has the following goals:

1.) Minimize or eliminate erosion and sedimentation during construction as well as after development.

2.) To ensure that post-development flows do not have an adverse effect on downstream drainage structures and landowners.

3.) To design a stormwater and treatment system which will carry the surface runoff and satisfy goals one and two.

To determine the hydrological effect of the proposed development on the watershed, the existing conditions must first be analyzed.

WATERSHED DESCRIPTION: EXISTING CONDITIONS

Depending on the soil classification, type of ground cover present and the direction of the flow of runoff, the existing site is divided into watershed areas. Watershed area E1 consists of the front of the site and drains off to the north towards Haverhill Road. Area E2 consists of the western portion of the site that flows towards directly west to the abutting property. Area E3 consists of a smaller portion at the south east corner of the site that flows south to the abutting property. See the attached plans (Watersheds and HydroCad Data, sheet 1 of 2) for the watershed area boundaries and the pre-development time of concentration flow paths.

WATERSHED ANALYSIS: EXISTING CONDITIONS

The existing conditions were modeled using the tabular hydrograph method with a Type III synthetic storm distribution for the 2, 10 and 100-year storm recurrence intervals. Runoff hydrographs were produced to estimate existing peak discharge.

Flows for the three storm simulations are as follows:

Existing (Pre-development) Peak Runoff Rates (c.f.s.)

Subcatchment	Size (Acres)	2 Yr Storm	10 Yr Storm	25 Yr Storm	100 Yr Storm
E1	0.18	0.12	0.34	0.55	1.03
E2	0.32	0.01	0.15	0.40	1.05
E3	0.12	0.07	0.22	0.35	0.67

The pre-development drainage calculations can be found in Appendix A.

WATERSHED DESCRIPTION: POST-DEVELOPMENT CONDITIONS

To determine the post development runoff, new watersheds, runoff curve numbers and times of concentration were generated reflecting the changes in the topography and surface cover. The post-development watersheds are shown on the attached plans (Watersheds and HydroCad Data, sheet 2 of 2). Watershed area P1 consists of the lawn, and some roof areas at the front of the lot abutting Haverhill Road. The runoff flows directly over land towards Haverhill Road. Watershed Area P2 consist of the western portion of the site containing roof and lawn surfaces and flows directly offsite to the west. Watershed area P3 is located at the southern most part of the site containing grass area and runs off directly to the southern abutter. Watershed areas P4A and P4B consist of portions of the proposed driveways, and some lawn area. These areas are directed into catch basins #3 and #4, into the Contech water quality unit #2, into subsurface infiltration system #2 and recharged into the ground. Watershed areas P5A and P5B consist of portions of the proposed paved driveway to the north of the site. These areas are directed into catch basins #1 and #2, into the Contech water quality unit#1, and into subsurface infiltration system #1 and recharged into the ground. Lastly, sub-catchment P6 contains roof area from the proposed barn addition. The runoff is collected roof gutters/down spouts and piped to subsurface infiltration system #3.

WATERSHED ANALYSIS: POST-DEVELOPMENT CONDITIONS

The proposed developed conditions were modeled using the tabular hydrograph method with a Type III synthetic storm distribution for the 2, 10 and 100-year storm recurrence intervals. Runoff hydrographs were produced to estimate the post-development peak discharge.

Flows for the three storm simulations are as follows:

Post-Developed Peak Runoff Rates (c.f.s.)

Subcatchment	Size (Acres)	2 Yr Storm	10 Yr Storm	25 Yr Storm	100 Yr Storm
Total P1	0.11	0.00	0.02	0.08	0.27
Total P2	0.20	0.01	0.13	0.30	0.72
Total P3	0.02	0.00	0.00	0.00	0.02

The post-development drainage calculations can be found in Appendix B.

**Sub-catchments P4A, P4B, P5A, P5B and P6 are not included in this table because they drainage to subsurface infiltration systems in which the flow is recharged into the ground and the runoff is 0cfs.*

IV. Stormwater Recharge Calculations

Stormwater Recharge Calculations

Calculations were performed to ensure that the proposed project will comply with the groundwater recharge requirements of the Mass **DEP** Stormwater Management Standards. The required recharge volume was calculated as follows:

The Required Recharge Volume equals a depth of runoff corresponding to the soil type times the impervious areas located on site.

Rv = Fx Impervious area Where:

Rv = Required Recharge Volume, expressed in cubic feet

F = Target Depth Factor associated with each Hydrologic Soil

Group Impervious Area = pavement and rooftop area on site

For the proposed project:

Required Recharge volume, Rv (A soil) = F * impervious area
= 0.6 in * 13,632 s.f.
= 663 c.f.

Total Required Recharge Volume = 663 c.f.

Total Recharge provided = 3,072 c.f.
Subsurface Inf. #1= 557 c.f.
Subsurface Inf. #2= 1,690 c.f.
Subsurface Inf. #3= 825 c.f.

Adjusted Required Recharge Volume

Since only a portion of the new impervious areas are to be directed into the infiltration BMP, it is necessary to calculate an Adjusted Required Recharge Volume:

1. The Required Recharge Volume = 663 cubic feet
2. The total proposed impervious area is 13,632 s.f.
3. The proposed impervious area draining to all infiltration areas is 11,212 s.f.
4. The ratio of total site impervious area to impervious are draining to the infiltration BMP is 13,632 / 11,212= 1.21
5. The Adjusted Required Recharge Volume = 1.21 x 663 cubic feet = 803 cubic feet.

Stormwater recharge will be accomplished on the site through the infiltration areas to be constructed.

Total Recharge provided = 3,072 c.f.

Drawdown Calculation

Subsurface Infiltration #1

$$\text{Drawdown Time} = \frac{Rv}{(K)\,(\text{Bottom Area})}$$

Rv=Storage Volume= 557 c.f.
K=Saturated Hydraulic Conductivity=2.41 in./hr
Bottom Area=281 s.f.

$$\text{Drawdown Time} = \frac{557 \text{ c.f.}}{(2.41 \text{ in/hr})(1\text{ft}/12\text{in})(281 \text{ s.f.})}$$

Drawdown Time = 9.87 hours

Subsurface infiltration #2

Drawdown Time = $\frac{Rv}{(K)\ (Bottom\ Area)}$

Rv=Storage Volume= 1,690 c.f.
K=Saturated Hydraulic Conductivity=2.41 in./hr
Bottom Area=1,494 s.f.

Drawdown Time = $\frac{1,690\ c.f.}{(2.41\ in/hr)(1ft/12in)(1,494\ s.f.)}$

Drawdown Time = 5.63 hours

Subsurface infiltration #3

Drawdown Time = $\frac{Rv}{(K)\ (Bottom\ Area)}$

Rv=Storage Volume= 825 c.f.
K=Saturated Hydraulic Conductivity=2.41 in./hr
Bottom Area= 505 s.f.

Drawdown Time = $\frac{825\ c.f.}{(2.41\ in/hr)(1ft/12in)(505\ s.f.)}$

Drawdown Time = 8.13 hours

V. TSS Removal Calculations

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

80 HAVERHILL ROAD
AMESBURY, MA

Area	**0.05 ac**	Unit Site Designation	**CDS #1**
Weighted C	**0.9**	Rainfall Station #	**67**
t_c	**5 min**		
CDS Model	**1515-3**	CDS Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.08	41.0%	41.0%	0.00	0.00	39.8
0.16	23.9%	64.9%	0.01	0.01	23.1
0.24	11.5%	76.5%	0.01	0.01	11.1
0.32	7.4%	83.9%	0.01	0.01	7.1
0.40	4.4%	88.3%	0.02	0.02	4.3
0.48	2.9%	91.2%	0.02	0.02	2.8
0.56	1.8%	93.0%	0.02	0.02	1.7
0.64	1.2%	94.2%	0.03	0.03	1.1
0.72	1.6%	95.8%	0.03	0.03	1.5
0.80	0.8%	96.6%	0.03	0.03	0.8
1.00	0.6%	97.1%	0.04	0.04	0.5
1.40	1.4%	98.6%	0.06	0.06	1.3
1.80	0.9%	99.5%	0.07	0.07	0.8
2.20	0.5%	100.0%	0.09	0.09	0.5
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					96.5
				Removal Efficiency Adjustment[2] =	0.0%
				Predicted % Annual Rainfall Treated =	100.0%
				Predicted Net Annual Load Removal Efficiency =	**96.5%**

1 - Based on 7 years of data from NCDC station #3276, Groveland, Essex County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

80 HAVERHILL ROAD
AMESBURY, MA

Area	**0.14 ac**	Unit Site Designation	**CDS #2**
Weighted C	**0.9**	Rainfall Station #	**67**
t_c	**5 min**		
CDS Model	**1515-3**	CDS Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.08	41.0%	41.0%	0.01	0.01	39.6
0.16	23.9%	64.9%	0.02	0.02	22.9
0.24	11.5%	76.5%	0.03	0.03	11.0
0.32	7.4%	83.9%	0.04	0.04	7.0
0.40	4.4%	88.3%	0.05	0.05	4.2
0.48	2.9%	91.2%	0.06	0.06	2.7
0.56	1.8%	93.0%	0.07	0.07	1.6
0.64	1.2%	94.2%	0.08	0.08	1.1
0.72	1.6%	95.8%	0.09	0.09	1.5
0.80	0.8%	96.6%	0.10	0.10	0.7
1.00	0.6%	97.1%	0.12	0.12	0.5
1.40	1.4%	98.6%	0.17	0.17	1.2
1.80	0.9%	99.5%	0.22	0.22	0.7
2.20	0.5%	100.0%	0.27	0.27	0.4
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					95.2
				Removal Efficiency Adjustment[2] =	0.0%
				Predicted % Annual Rainfall Treated =	100.0%
				Predicted Net Annual Load Removal Efficiency =	**95.2%**

1 - Based on 7 years of data from NCDC station #3276, Groveland, Essex County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

VI. Water Quality Calculations

Water Quality Calculations

The Massachusetts DEP requires water quality calculations based on 1 inch of runoff for the total impervious area associated with the proposed development. The following calculation identifies the water quality volume required.

Infiltration Area #1

Total Impervious Area contributing to Infiltration Area 1 = 1,968 s.f.
1,968 s.f. * 1" / 12 (to convert to ft) = **164 c.f. of runoff to be treated for water quality.**

Infiltration Area #2

Total Impervious Area contributing to Infiltration Area 2 = 4,186 s.f.
4,186 s.f. * 1" / 12 (to convert to ft) = **349 c.f. of runoff to be treated for water quality.**

** The required WQV is obtained through the CDS unit (see supporting documents)*

Project: 80 Haverhill Road
Location: Amesbury, MA
Prepared For: Millennium Engineering

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Compute Q Rate using the following equation:

$$Q = (qu)\ (A)\ (WQV)$$

where:

Q = flow rate associated with first 1" 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 (1" in this case)

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	WQV (in)	qu (csm/in.)	Q (cfs)
CDS #1	0.05	0.0000719	5.0	0.083	1.00	795.00	0.06
CDS #2	0.14	0.0002141	5.0	0.083	1.00	795.00	0.17

VII. Soils Analysis

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Essex County, Massachusetts, Northern Part

October 23, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface..... 2
How Soil Surveys Are Made.....5
Soil Map..... 8
Soil Map.....9
Legend.....10
Map Unit Legend..... 11
Map Unit Descriptions.....11
Essex County, Massachusetts, Northern Part..... 13
256A—Deerfield loamy fine sand, 0 to 3 percent slopes..... 13
420B—Canton fine sandy loam, 3 to 8 percent slopes..... 14
References.....17

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:474 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 5 10 20 30

Feet
0 20 40 80 120

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

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 1:15,800.

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: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 20, Aug 27, 2024

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	0.7	93.8%
420B	Canton fine sandy loam, 3 to 8 percent slopes	0.0	6.2%
Totals for Area of Interest		**0.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Essex County, Massachusetts, Northern Part

256A—Deerfield loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2xfg8
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Deerfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Deerfield

Setting

Landform: Outwash terraces, outwash deltas, outwash plains, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

Ap - 0 to 9 inches: loamy fine sand
Bw - 9 to 25 inches: loamy fine sand
BC - 25 to 33 inches: fine sand
Cg - 33 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: About 15 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 11.0
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 7 percent
Landform: Outwash terraces, kame terraces, outwash deltas, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Wareham

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury

Percent of map unit: 2 percent
Landform: Outwash plains, kame terraces, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent
Landform: Kame terraces, outwash plains, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Hydric soil rating: No

420B—Canton fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w81b
Elevation: 0 to 1,180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Canton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hills, moraines, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: gravelly fine sandy loam
2C - 26 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 10 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk

Percent of map unit: 5 percent
Landform: Moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton

Percent of map unit: 4 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 1 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

SOIL SUITABILITY ASSESSMENT REPORT

COMMONWEALTH OF MASSACHUSETTS

AMESBURY, MASSACHUSETTS

SOIL EVALUATION FOR ON-SITE STORMWATER DRAINAGE CONTROL

SITE INFORMATION

August 05, 2024

Street Address: 80 Haverhill Road Town: Amesbury State: Massachusetts Zip Code: 01913 County: Essex

Land Use: Residential Latitude: ~42° 50' 31.90" N Longitude: ~70° 57' 03.70" W

PUBLISHED SOIL DATA AND MAP UNIT DESCRIPTION

Physiographic Division: Appalachian Highlands Physio. Province: New England Physio. Section: Seaboard lowland section

Soil survey area: Essex County, Massachusetts, Northern Part Series name: 256A Deerfield LS, 0-3% slopes

Order: Entisol Suborder: Psamments Family: Mixed, mesic, Aquic Udipsamments

Soil moisture regime: Udic Soil temperature regime: Mesic Runoff class: Negligible Hydric soil rating: No

Soil hydric or upland? Upland Average depth to water table: About 15"- 37" Depth to restrictive feature: > 80"

Frequency of flooding: None Frequency of ponding: None Available water capacity: Moderate (~6.5")

Drainage Class: Moderately well drained Hydrologic Soil Group: A Ksat: Moderately high to very high (1.42 – 99.90 in/hr)

Ecological site: Moist sandy Outwash

WETLAND AREA & USGS WELL MEASUREMENTS

National Wetland Inventory Map: NA Wetlands Conservancy Program: NA Bordering vegetative wetland: NA

Current Water Resource Condition (USGS): Well Site # 424841071004101- MA-HLW 23 Haverhill, MA.,

Well depth: 15.10 feet Land surface altitude: 100.00 feet above NGVD29 Latitude: ~42°48'41.8" N Longitude: ~71°00'41.7"

Most recent data value: 13.47' on 08/05/24 (depth to water level in feet below land surface)

SURFICIAL GEOLOGY:

Geologic parent material: Glaciofluvial sandy deposits Geomorphic component: Outwash terrace

Slope aspect: Level Landform position (2D): Flat Landform position (3D): Tread

Slope gradient: ~00-03% Down slope shape: Convex Across slope shape: Linear Slope complexity: Simple

Bedrock outcropping in vicinity: None observed Glacial erratics in vicinity: None observed

Bedrock Type: Eliot Formation: Phyllite and calcareous phyllite. Consists of gray to green phyllite, calcareous quartzite, quartz-mica schist, and well-bedded calc-silicate.

TP24-1 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: August 05, 2024 Weather: Clear, 75º-80º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 03% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-1

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 89"	^C	Sandy Loam fill mixture	10YR 4/1 dark gray	none observed	Friable; moderate-grade fine to medium blocky structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine-to-medium roots; non-sticky; non-plastic; poorly graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 89" Seasonal High Groundwater Table: ___ Apparent water: ___

TP24-1 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table:___ (below land surface)

Kind: _____

Shape: _____ Location: _____

Hardness: _____ Boundary: _____ Abundance: _____ Size: _____ Contrast: _____

Concentration color: _____ Reduction color: _____ Moisture state: Dry

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: ____ inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 0.00'

Depth of naturally occurring pervious material in TP24-1 Upper boundary: 00"
Lower boundary: 00"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848* — June 1998

Evaluator & license number Certification — Date of Soil Evaluator Certification

Unofficial soils for drainage — 08/05/24

Amesbury Town Witness — Date of soil testing

TP24-2 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: August 05, 2024 Weather: Clear, 75º-80º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 03% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-2

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00” → 40”	^C	Sandy Loam fill mixture	10YR 4/4 dark yellowish brown	none observed	Friable; moderate-grade fine to medium blocky structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine-to-medium roots; non-sticky; non-plastic; poorly graded; abrupt wavy boundary.
40” → 95”	2C	Loamy Fine Sand gravelly	2.5Y 6/3 light yellowish brown	none observed	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; approximately 20-25% sub-angular to sub-rounded gravel and 10% sub-rounded to angular cobble content of mixed lithology; non-sticky; non-plastic; well graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 95” Seasonal High Groundwater Table: ___ Apparent water: ___

TP24-2 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table:___ (below land surface)

Kind: _____

Shape: _____ Location: _____

Hardness: _____ Boundary: _____ Abundance: _____ Size: _____ Contrast: _____

Concentration color: _____ Reduction color: _____ Moisture state: Dry

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: ____ inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 4.58'

Depth of naturally occurring pervious material in TP24-2 Upper boundary: 40"
Lower boundary: 95"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848* — June 1998

Evaluator & license number Certification — Date of Soil Evaluator Certification

Unofficial soils for drainage — 08/05/24

Amesbury Town Witness — Date of soil testing

TP24-3 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: August 05, 2024 Weather: Clear, 75º-80º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 03% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-3

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 93"	^C	Sandy Loam fill mixture	10YR 4/4 dark yellowish brown	none observed	Friable; moderate-grade fine to medium blocky structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine-to-medium roots; non-sticky; non-plastic; poorly graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 93" Seasonal High Groundwater Table: ___ Apparent water: ___

TP24-3 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table:___ (below land surface)

Kind: _____

Shape: _____ Location: _____

Hardness: _____ Boundary: _____ Abundance: _____ Size: _____ Contrast: _____

Concentration color: _____ Reduction color: _____ Moisture state: Dry

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: ____ inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 0.00'

Depth of naturally occurring pervious material in TP24-3 Upper boundary: 00"
Lower boundary: 00"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848*	June 1998
Evaluator & license number Certification	Date of Soil Evaluator Certification
Unofficial soils for drainage	08/05/24
Amesbury Town Witness	Date of soil testing

TP24-4 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: August 05, 2024 Weather: Clear, 75º-80º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 03% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^+ feet Drainage way: 50^+ feet Drinking water well: 100^+ feet Abutting septic system: 50^+ feet

Wetlands: 50^+ feet Public water supply reservoir: 400^+ feet Tributary to reservoir: 200^+ feet

SOIL PROFILE ► TP24-4

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 08"	A	Sandy Loam fine	10YR 3/2 very dark brown	none observed	Very friable; moderate-grade fine to medium granular structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine roots; clear wavy boundary.
08" → 85"	$_2$C	Loamy Fine Sand gravelly	2.5Y 6/3 light yellowish brown	none observed	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; approximately 20-25% sub-angular to sub-rounded gravel and 10% sub-rounded to angular cobble content of mixed lithology; non-sticky; non-plastic; well graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 85" Seasonal High Groundwater Table: ___ Apparent water: ___

TP24-4 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table:___ (below land surface)

Kind: _____

Shape: _____ Location: _____

Hardness: _____ Boundary: _____ Abundance: _____ Size: _____ Contrast: _____

Concentration color: _____ Reduction color: _____ Moisture state: Dry

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: ____ inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 6.42'

Depth of naturally occurring pervious material in TP24-4 Upper boundary: 08"
Lower boundary: 85"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848* — June 1998

Evaluator & license number Certification — Date of Soil Evaluator Certification

Unofficial soils for drainage — 08/05/24

Amesbury Town Witness — Date of soil testing

TP24-5 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: August 05, 2024 Weather: Clear, 75º-80º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 03% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-5

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 08"	A	Sandy Loam fine	10YR 3/2 very dark brown	none observed	Very friable; moderate-grade fine to medium granular structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine roots; clear wavy boundary.
08" → 92"	$_{2}$C	Loamy Fine Sand gravelly	2.5Y 6/3 light yellowish brown	none observed	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; approximately 20-25% sub-angular to sub-rounded gravel and 10% sub-rounded to angular cobble content of mixed lithology; non-sticky; non-plastic; well graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 92" Seasonal High Groundwater Table: ___ Apparent water: ___

TP24-5 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table:___ (below land surface)

Kind: _____

Shape: _____ Location: _____

Hardness: _____ Boundary: _____ Abundance: _____ Size: _____ Contrast: _____

Concentration color: _____ Reduction color: _____ Moisture state: Dry

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: ____ inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 7.00'

Depth of naturally occurring pervious material in TP24-5 Upper boundary: 08"
Lower boundary: 92"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848* — June 1998

Evaluator & license number Certification — Date of Soil Evaluator Certification

Unofficial soils for drainage — 08/05/24

Amesbury Town Witness — Date of soil testing

TP24-6 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: August 05, 2024 Weather: Clear, 75º-80º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 03% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-6

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00” → 07”	A	Sandy Loam fine	10YR 3/2 very dark brown	none observed	Very friable; moderate-grade fine to medium granular structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine roots; clear wavy boundary.
07” → 95”	$_{2}$C	Loamy Fine Sand gravelly	2.5Y 6/3 light yellowish brown	none observed	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; approximately 20-25% sub-angular to sub-rounded gravel and 10% sub-rounded to angular cobble content of mixed lithology; non-sticky; non-plastic; well graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 95” Seasonal High Groundwater Table: ___ Apparent water: ___

TP24-6 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table:___ (below land surface)

Kind: _____

Shape: _____ Location: _____

Hardness: _____ Boundary: _____ Abundance: _____ Size: _____ Contrast: _____

Concentration color: _____ Reduction color: _____ Moisture state: Dry

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: ____ inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 7.33'

Depth of naturally occurring pervious material in TP24-6 Upper boundary: 07"
Lower boundary: 95"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848* — June 1998

Evaluator & license number Certification — Date of Soil Evaluator Certification

Unofficial soils for drainage — 08/05/24

Amesbury Town Witness — Date of soil testing

TP24-7 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: August 05, 2024 Weather: Clear, 75º-80º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 03% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-7

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 26"	^C	Sandy Loam fill mixture	10YR 4/4 dark yellowish brown	none observed	Friable; moderate-grade fine to medium blocky structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine-to-medium roots; non-sticky; non-plastic; poorly graded; abrupt wavy boundary.
26" → 85"	2C	Loamy Fine Sand gravelly	2.5Y 6/3 light yellowish brown	none observed	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; approximately 20-25% sub-angular to sub-rounded gravel and 10% sub-rounded to angular cobble content of mixed lithology; non-sticky; non-plastic; well graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 85" Seasonal High Groundwater Table: ___ Apparent water: ___

TP24-7 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table:___ (below land surface)

Kind: _____

Shape: _____ Location: _____

Hardness: _____ Boundary: _____ Abundance: _____ Size: _____ Contrast: _____

Concentration color: _____ Reduction color: _____ Moisture state: Dry

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: ____ inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 4.92'

Depth of naturally occurring pervious material in TP24-7 Upper boundary: 26"
Lower boundary: 85"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848*	June 1998
Evaluator & license number Certification	Date of Soil Evaluator Certification
Unofficial soils for drainage	08/05/24
Amesbury Town Witness	Date of soil testing

TP24-8 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: August 05, 2024 Weather: Clear, 75º-80º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 03% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^+ feet Drainage way: 50^+ feet Drinking water well: 100^+ feet Abutting septic system: 50^+ feet

Wetlands: 50^+ feet Public water supply reservoir: 400^+ feet Tributary to reservoir: 200^+ feet

SOIL PROFILE ► TP24-8

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 21"	$_{\wedge}$C	Sandy Loam fill mixture	10YR 4/4 dark yellowish brown	none observed	Friable; moderate-grade fine to medium blocky structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine-to-medium roots; non-sticky; non-plastic; poorly graded; abrupt wavy boundary.
21" → 78"	$_2$C	Loamy Fine Sand	2.5Y 6/8 olive yellow	none observed	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; free of clasts; non-sticky; non-plastic; well graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 78" Seasonal High Groundwater Table: ___ Apparent water: ___

TP24-8 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table:___ (below land surface)

Kind: _____

Shape: _____ Location: _____

Hardness: _____ Boundary: _____ Abundance: _____ Size: _____ Contrast: _____

Concentration color: _____ Reduction color: _____ Moisture state: Dry

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: ____ inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 4.75'

Depth of naturally occurring pervious material in TP24-8 Upper boundary: 21"
Lower boundary: 78"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848*	June 1998
Evaluator & license number Certification	Date of Soil Evaluator Certification
Unofficial soils for drainage	08/05/24
Amesbury Town Witness	Date of soil testing

TP24-9 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: August 05, 2024 Weather: Clear, 75º-80º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 03% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-9

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 28"	^C	Sandy Loam fill mixture	10YR 4/4 dark yellowish brown	none observed	Friable; moderate-grade fine to medium blocky structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine-to-medium roots; non-sticky; non-plastic; poorly graded; abrupt wavy boundary.
28" → 82"	2C	Loamy Fine Sand	2.5Y 6/8 olive yellow	none observed	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; approximately 05-10% sub-angular to sub-rounded gravel and 05% sub-rounded to angular cobble content of mixed lithology; non-sticky; non-plastic; poorly graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 82" Seasonal High Groundwater Table: ___ Apparent water: ___

TP24-9 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table:___ (below land surface)

Kind: _____

Shape: _____ Location: _____

Hardness: _____ Boundary: _____ Abundance: _____ Size: _____ Contrast: _____

Concentration color: _____ Reduction color: _____ Moisture state: Dry

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: ____ inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 4.50'

Depth of naturally occurring pervious material in TP24-9 Upper boundary: 28"
Lower boundary: 82"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848*	June 1998
Evaluator & license number Certification	Date of Soil Evaluator Certification
Unofficial soils for drainage	08/05/24
Amesbury Town Witness	Date of soil testing

TP24-10 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: August 05, 2024 Weather: Clear, 75º-80º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 03% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-10

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00” → 10”	A	Sandy Loam fine	10YR 3/2 very dark brown	none observed	Very friable; moderate-grade fine to medium granular structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine roots; clear wavy boundary.
10” → 14”	B_w	Sandy Loam	10YR 4/6 dark yellowish brown	none observed	Very friable; massive structure; non-cohesive; fine-grained mineral content; damp; non-sticky; non-plastic; few roots; approximately 3-5% sub-angular to sub-rounded gravel content of mixed lithology; clear wavy boundary.
14” → 80”	$_2C$	Loamy Fine Sand gravelly	2.5Y 6/3 light yellowish brown	none observed	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; approximately 05-10% sub-angular to sub-rounded gravel and 05% sub-rounded to angular cobble content of mixed lithology; non-sticky; non-plastic; poorly graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 80” Seasonal High Groundwater Table: ___ Apparent water: ___

TP24-10 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table:___ (below land surface)

Kind: _____

Shape: _____ Location: _____

Hardness: _____ Boundary: _____ Abundance: _____ Size: _____ Contrast: _____

Concentration color: _____ Reduction color: _____ Moisture state: Dry

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: ____ inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 5.83'

Depth of naturally occurring pervious material in TP24-10 Upper boundary: 10"
Lower boundary: 80"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848*	June 1998
Evaluator & license number Certification	Date of Soil Evaluator Certification
Unofficial soils for drainage	08/05/24
Amesbury Town Witness	Date of soil testing

TP24-11 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: September 30, 2024 Weather: Clear, 65º-70º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 02% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-11

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 13"	^C	Sandy Loam fill mixture	10YR 4/2 dark grayish brown	none observed	Friable; moderate-grade fine to medium blocky structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine-to-medium roots; non-sticky; non-plastic; poorly graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.
13" → 129"	$_{2}$C	Loamy Fine Sand gravelly	2.5Y 6/3 light yellowish brown	101" (c,2,p) 5YR 5/8 10YR 7/1	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; approximately 05-10% sub-angular to sub-rounded gravel and 05% sub-rounded to angular cobble content of mixed lithology; non-sticky; non-plastic; poorly graded; redoximorphic features observed at 101"; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 129" Seasonal High Groundwater Table: 101" Apparent water: >129

TP24-11 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 101" (below land surface)

Kind: Iron concentrations; non-cemented iron masses surrounded by reduction halos

Shape: Amorphous/ spherical Location: In 2C matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: 10YR 7/1 light gray Moisture state: Dry matrix

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 101" inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 9.66'

Depth of naturally occurring pervious material in TP24-11 Upper boundary: 13"
Lower boundary: 129"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848*	June 1998
Evaluator & license number Certification	Date of Soil Evaluator Certification
Unofficial soils for drainage	09/30/24
Amesbury Town Witness	Date of soil testing

TP24-12 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: September 30, 2024 Weather: Clear, 65º-70º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 02% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-12

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 15"	^C	Sandy Loam fill mixture	10YR 4/2 dark grayish brown	none observed	Friable; moderate-grade fine to medium blocky structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine-to-medium roots; non-sticky; non-plastic; poorly graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.
15" → 127"	$_2$C	Loamy Fine Sand gravelly	2.5Y 6/3 light yellowish brown	100" (c,2,p) 5YR 5/8 10YR 7/1	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; approximately 05-10% sub-angular to sub-rounded gravel and 05% sub-rounded to angular cobble content of mixed lithology; non-sticky; non-plastic; poorly graded; redoximorphic features observed at 100"; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 127" Seasonal High Groundwater Table: 100" Apparent water: >127

TP24-12 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 100" (below land surface)

Kind: Iron concentrations; non-cemented iron masses surrounded by reduction halos

Shape: Amorphous/ spherical Location: In 2C matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: 10YR 7/1 light gray Moisture state: Dry matrix

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: ____ inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 9.66'

Depth of naturally occurring pervious material in TP24-12 Upper boundary: 13"
Lower boundary: 129"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848*	June 1998
Evaluator & license number Certification	Date of Soil Evaluator Certification
Unofficial soils for drainage	09/30/24
Amesbury Town Witness	Date of soil testing

TP24-13 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: September 30, 2024 Weather: Clear, 65º-70º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 02% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-13

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 16"	^C	Sandy Loam fill mixture	10YR 4/2 dark grayish brown	none observed	Friable; moderate-grade fine to medium blocky structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine-to-medium roots; non-sticky; non-plastic; poorly graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.
16" → 127"	$_{2}$C	Loamy Fine Sand gravelly	2.5Y 6/3 light yellowish brown	110" (c,2,p) 5YR 5/8 10YR 7/1	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; approximately 05-10% sub-angular to sub-rounded gravel and 05% sub-rounded to angular cobble content of mixed lithology; non-sticky; non-plastic; poorly graded; redoximorphic features observed at 110"; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 127" Seasonal High Groundwater Table: 110" Apparent water: >127

TP24-13 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 100" (below land surface)

Kind: Iron concentrations; non-cemented iron masses surrounded by reduction halos

Shape: Amorphous/ spherical Location: In 2C matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: 10YR 7/1 light gray Moisture state: Dry matrix

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: ____ inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 9.66'

Depth of naturally occurring pervious material in TP24-13 Upper boundary: 13"
Lower boundary: 129"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848*	June 1998
Evaluator & license number Certification	Date of Soil Evaluator Certification
Unofficial soils for drainage	09/30/24
Amesbury Town Witness	Date of soil testing

TP24-14 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: September 30, 2024 Weather: Clear, 65º-70º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 01% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-14

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 20"	^C	Sandy Loam fill mixture	10YR 4/2 dark grayish brown	none observed	Friable; moderate-grade fine to medium blocky structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine-to-medium roots; non-sticky; non-plastic; poorly graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.
20" → 127"	$_{2}$C	Loamy Fine Sand gravelly	2.5Y 6/3 light yellowish brown	90" (c,2,p) 5YR 5/8 10YR 7/1	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; approximately 05-10% sub-angular to sub-rounded gravel and 05% sub-rounded to angular cobble content of mixed lithology; non-sticky; non-plastic; poorly graded; redoximorphic features observed at 90"; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 127" Seasonal High Groundwater Table: 90" Apparent water: >127

TP24-14 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 90" (below land surface)

Kind: Iron concentrations; non-cemented iron masses surrounded by reduction halos

Shape: Amorphous/ spherical Location: In 2C matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: 10YR 7/1 light gray Moisture state: Dry matrix

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 90" inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 8.92'

Depth of naturally occurring pervious material in TP24-14 Upper boundary: 20"
Lower boundary: 127"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848*	June 1998
Evaluator & license number Certification	Date of Soil Evaluator Certification
Unofficial soils for drainage	09/30/24
Amesbury Town Witness	Date of soil testing

TP24-15 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: September 30, 2024 Weather: Clear, 65º-70º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 01% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-15

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 20"	^C	Sandy Loam fill mixture	10YR 4/2 dark grayish brown	none observed	Friable; moderate-grade fine to medium blocky structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine-to-medium roots; non-sticky; non-plastic; poorly graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.
20" → 127"	$_{2}$C	Loamy Fine Sand gravelly	2.5Y 6/3 light yellowish brown	92" (c,2,p) 5YR 5/8 10YR 7/1	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; approximately 05-10% sub-angular to sub-rounded gravel and 05% sub-rounded to angular cobble content of mixed lithology; non-sticky; non-plastic; poorly graded; redoximorphic features observed at 92"; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 127" Seasonal High Groundwater Table: 92" Apparent water: >127

TP24-15 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 92" (below land surface)

Kind: Iron concentrations; non-cemented iron masses surrounded by reduction halos

Shape: Amorphous/ spherical Location: In 2C matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: 10YR 7/1 light gray Moisture state: Dry matrix

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 90" inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 8.92'

Depth of naturally occurring pervious material in TP24-15 Upper boundary: 20"
Lower boundary: 127"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848*	June 1998
Evaluator & license number Certification	Date of Soil Evaluator Certification
Unofficial soils for drainage	09/30/24
Amesbury Town Witness	Date of soil testing

TP24-16 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

Date: September 30, 2024 Weather: Clear, 65º-70º F, still and dry.

Landscape: Upland Landform: Outwash terrace Position on landscape: Tread

Slope aspect: Level Slope (%): 00 – 01% Slope complexity: Simple Land Cover: Grass lawn

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

SOIL PROFILE ► TP24-16

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 28"	^C	Sandy Loam fill mixture	10YR 4/2 dark grayish brown	none observed	Friable; moderate-grade fine to medium blocky structure; somewhat cohesive; fine grained mineral content; dry matrix; non-sticky; non-plastic; free of clasts; common fine-to-medium roots; non-sticky; non-plastic; poorly graded; no redoximorphic features observed; no apparent water observed; no bedrock refusal at test hole depth.
28" → 124"	$_{2}$C	Loamy Fine Sand gravelly	2.5Y 6/3 light yellowish brown	90" (c,2,p) 5YR 5/8 10YR 7/1	Loose; single grained/ structureless; unstable; non-cohesive; stratified; medium-to-fine grained mineral content; slightly damp matrix; non-sticky; non-plastic; no observed indications of a seasonal high-water table; approximately 05-10% sub-angular to sub-rounded gravel and 05% sub-rounded to angular cobble content of mixed lithology; non-sticky; non-plastic; poorly graded; redoximorphic features observed at 90"; no apparent water observed; no bedrock refusal at test hole depth.

Depth to bedrock: > 127" Seasonal High Groundwater Table: 90" Apparent water: >127

TP24-16 DEEP OBSERVATION HOLE

80 Haverhill Road, Amesbury, Massachusetts

ESTIMATED SEASONAL GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 90" (below land surface)

Kind: Iron concentrations; non-cemented iron masses surrounded by reduction halos

Shape: Amorphous/ spherical Location: In 2C matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: 10YR 7/1 light gray Moisture state: Dry matrix

DEPTH TO PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: ____ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: dry

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 90" inches below grade

Observed water weeping from side of deep hole: ____ inches below grade

Observed depth to stabilized phreatic water: ____ inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 8.00'

Depth of naturally occurring pervious material in TP24-16 Upper boundary: 28"
Lower boundary: 124"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *License #1848*	June 1998
Evaluator & license number Certification	Date of Soil Evaluator Certification
Unofficial soils for drainage	09/30/24
Amesbury Town Witness	Date of soil testing

VIII. Long Term Pollution Prevention and Operations and Maintenance Plan

This long-term Stormwater Management System Operations and Maintenance (O&M) Plan, filed with the City of Amesbury, shall be implemented for the proposed development at 80 Haverhill road to ensure that the stormwater management system functions as designed. The Owner holds the primary responsibility for overseeing and implementing the O&M Plan and assigning a Property Manager who will be responsible for the proper operation and maintenance of the stormwater structures. In case of transfer of property ownership, future property owners shall be notified of the presence of the stormwater management system and the requirements for proper implementation of the O&M Plan. Included in the manual is a Stormwater Management O&M Plan identifying the key components of the stormwater system and a log for tracking inspections and maintenance.

The stormwater management system protects and enhances the stormwater runoff water quality through the removal of sediment and pollutants, and source control significantly reduces the amount of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular vacuuming and litter removal, and prohibitions on the use of pesticides.

The purpose of the Stormwater Operations and Maintenance (O&M) plan is to ensure inspection of the system, removal of accumulated sediments, oils, and debris, and implementation of corrective action and record keeping activities.

The ongoing responsibility is the Owner, its successors and assigns. Adequate maintenance is defined in this document as good working condition.

Contact information is provided below:

Responsibility for Operations and Maintenance
80 Haverhill Road, LLC
80 Haverhill Road
Amesbury, MA

Illicit Discharge Compliance Statement

I, _____, verify that all illicit discharges to the stormwater management system are prohibited and no illicit discharges exist on the site.

EROSION AND SEDIMENT CONTROL BMPs

Minimize Disturbed Area and Protect Natural Features and Soil

Topsoil

Topsoil stripped from the immediate construction area can be temporarily stockpiled on site providing that the perimeter of the stockpiles is properly staked with silt fence at the toe of slope. The stockpiles shall be in areas that will not interfere with construction and at least 15 feet away from areas of concentrated flows or pavement. The area shall be inspected weekly for erosion and immediately after storm events. Areas on or around the stockpile that have eroded shall be stabilized immediately with erosion controls.

Stabilize Soils

Temporary Stabilization

- All vegetated areas which do not exhibit a minimum of 85% vegetative growth by Oct. 15th, or which are disturbed after Oct. 15th, shall be stabilized by seeding and installing erosion control blankets on slopes greater than 3:1, and seeding and placing 3 to 4 tons of mulch per acre, secured with anchored netting, elsewhere. The placement of erosion control blankets or mulch and netting shall not occur over accumulated snow or on frozen ground and shall be completed in advance of thaw or spring melt events.
- All ditches or swales which do not exhibit a minimum of 85% vegetative growth by Oct. 15th, or which are disturbed after Oct. 15th, shall be stabilized with stone or erosion control blankets appropriate for the design flow conditions.
- After November 15th, incomplete road surfaces, where work has stopped for the winter season, shall be protected with a minimum of 3 inches of crushed gravel.

Protect Slopes

Geotextile erosion control blankets shall be used to provide stabilization for slopes exceeding 3:1. Prepare soil before installing erosion control blanket, including any necessary application of lime, fertilizer, and seed. Begin at the top of the slope by anchoring the blanket in a 6" deep x 6" wide trench with approximately 12" extended beyond the upslope portion of the trench. Anchor the blanket with a row of staples/stakes approximately 12" apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to compacted soil and fold remaining 12" portion of back over seed and compacted soil. Secure over compacted soil with a row of staples/stakes spaced approximately 12" apart across the width of the blanket. Roll erosion control blanket either down or horizontally across the slope. Blanket will unroll with appropriate side against the soil surface. All blankets must be securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staple pattern guide. When using the dot system, staples/stakes should be placed through each of the colored dots corresponding to the appropriate staple pattern. The edges of parallel blankets must be stapled with approximately

2"-5" overlap. Consecutive blankets spliced down the slope must be placed end over end (shingle style) with an approximate 3" overlap. Staple through overlapped area, approximately 12" apart across entire blanket's width. In loose soil conditions, the use of staple or stake lengths greater than 6" may be necessary to properly anchor the blanket.

Establish Perimeter Controls and Sediment Barriers

Silt fence shall be installed along the edge of the limit of work. The silt fence shall be installed before construction begins. Wooden posts shall be doubled and coupled at filter cloth seams. Filter cloth shall be fastened securely to support netting with ties spaced every 24" at top, midsection, and bottom. When two sections of filter cloth adjoin each other, they shall be overlapped by 6 inches, folded and stapled. Silt fence shall be removed upon completion of the project and stabilization of all soil.

Maintenance:
1. Silt fence shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any repairs that are required shall be made immediately.
2. If the fabric on the silt fence shall decompose or become ineffective during the expected life of the fence, the fabric shall be replaced promptly.
3. Sediment deposits shall be inspected after every storm event. The deposits shall be removed when they reach approximately one-half the height of the barrier.
4. Sediment deposits that are removed or left in place after the fabric has been removed shall be graded to conform with the existing topography and vegetated.

Establish Stabilized Construction Entrance

A stabilized construction entrance shall be installed before construction begins on the site. The stone anti-tracking pad shall remain in place until the subgrade of pavement is installed.

1. Stone shall be 1-2" stone, reclaimed stone, or recycled concrete equivalent.
2. The length of the stabilized entrance shall not be less than 50'.
3. The thickness of the stone for the stabilized entrance shall not be less than 6".
4. Geotextile filter cloth shall be placed over the entire area prior to placing the stone.
5. All surface water that is flowing to or diverted toward the construction entrance shall be piped beneath the entrance. If piping is impractical, a berm with 5:1 slope that can be crossed by vehicles may be substituted for the pipe.
6. The entrance shall be maintained in a condition that will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top-dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spilled, washed, or tracked onto public rights-of-way must be removed promptly.
7. Wheels shall be cleaned to remove mud prior to entrance onto public rights-of way. When washing is required, it shall be done on an area stabilized with stone which drains into an approved sediment trapping device.

Catch Basin Inlet Protection

Inlet protection devices intercept and/or filter sediment before it can be transported from a site into the storm drain system and discharged into a lake, river, stream, wetland, or other waterbody. These devices also keep sediment from filling or clogging storm drain pipes, ditches, and downgradient sediment traps or ponds. A siltsack or approved equal shall be used for catch basin inlet protection. It should be inspected weekly. When the restraint cord is no longer visible, siltsack is full and shall be emptied.

<u>POST-CONSTRUCTION BMPs</u>

Snow and Snow Melt Management

Proper management of snow and snow melt, snow removal and storage, use of deicing compounds, and other practices can minimize major runoff and pollutant loading impacts. Snow will be stored in areas adjacent to the edge of the roadway. Use of alternative deicing compounds, such as calcium chloride and calcium magnesium acetate, will be investigated for use. Professional services will be used for snow management.

Deep Sump/Hooded Catch Basins

Deep sump/hooded catch basins are incorporated in the proposed development's stormwater management plan as pre-treatment for the proposed drainage system. The sump provides for settlement of suspended solids and a hood is provided to remove floatables and trapped hydrocarbons. It is not anticipated that the proposed roadway will become an area of high sediment loading. The sump should be inspected and cleaned at least four times per year; the more frequent the cleaning, the less likely sediment will be resuspended and subsequently discharged. Catch basin sediments and debris shall be disposed of at an approved DEP landfill. The owner shall be responsible for the catch basin cleaning operations.

Infiltration Chamber

Infiltration chambers are incorporated into the site design for infiltration. The chambers shall be inspected after every major storm event in the first 4 months after construction to ensure proper function. Inspection ports shall be utilized for access and assessment. After the four-month period, the chambers shall be inspected a minimum of twice per year. Any grit or sediment found within the chambers impacting infiltration shall be removed by manual or mechanical methods, such as a vacuum truck. The Condominium Association will be responsible for proper maintenance of the subsurface systems.

CDS System

A CDS2015-4 is incorporated into the site design for treatment for the proposed underground infiltration system. At a minimum, the unit shall be inspected twice per year (spring and fall). The CDS unit should be vacuum cleaned when the level of sediment has reached 75% of capacity in the isolated sump. Sediments and debris shall be disposed of at an approved DEP landfill. The owner shall be responsible for the CDS cleaning operations.

FINAL STABILIZATION

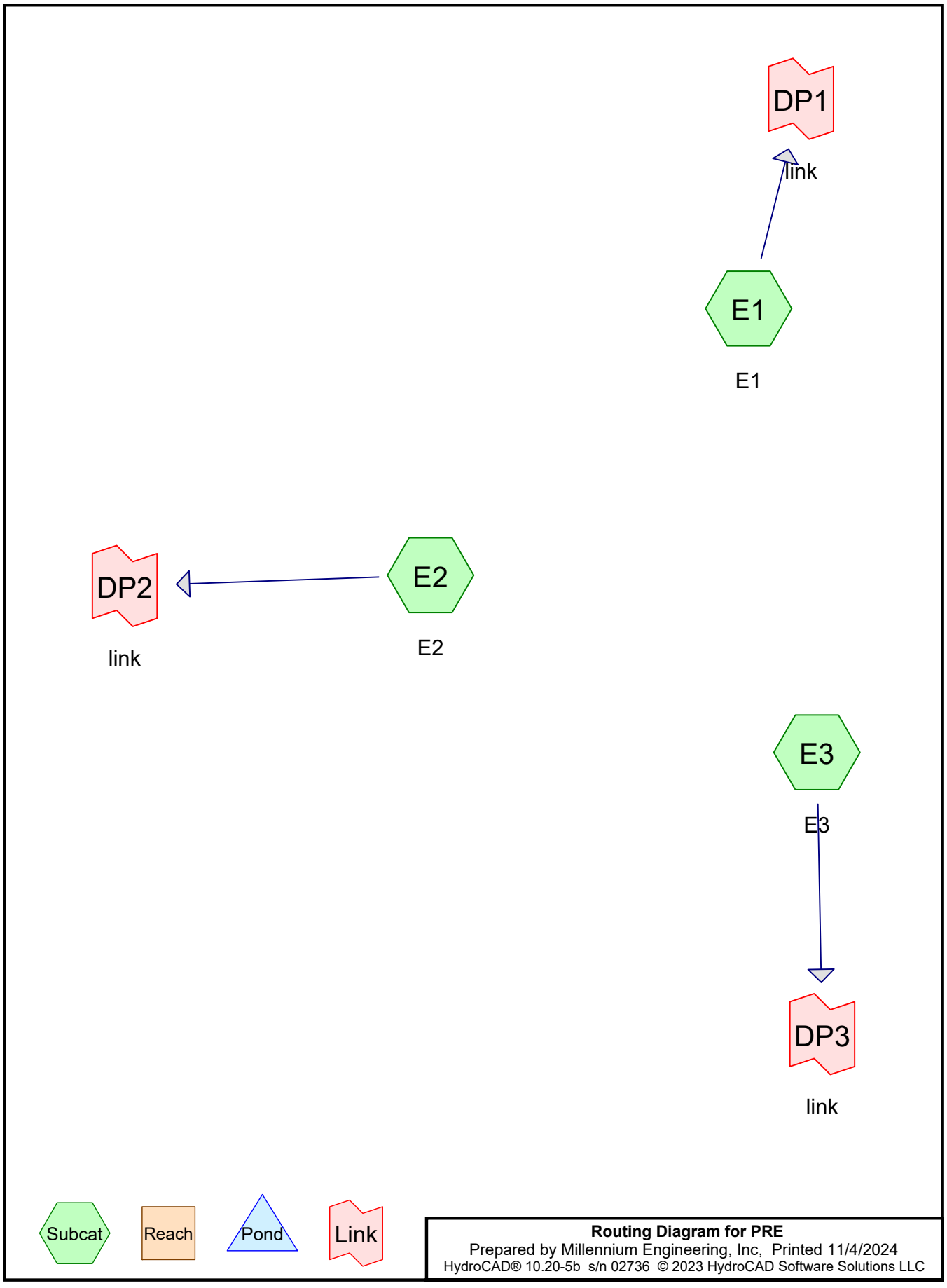
Permanent Seeding

Loam and hydroseed any disturbed surfaces after the final design grades have been achieved. A minimum of 6" of loam shall be installed. Seed mix shall be a maximum of 10% rye grass and a minimum of 90% permanent bluegrass and/or fescue. Lime shall be applied at a rate of 2 tons/acre.

Construction debris, trash and temporary BMPs (including silt fences, material storage areas, and inlet protection) will also be removed and any areas disturbed during removal will be seeded immediately.

IIX. **Appendix**

a. Existing Conditions HydroCAD Report



Routing Diagram for PRE

Prepared by Millennium Engineering, Inc, Printed 11/4/2024

HydroCAD® 10.20-5b s/n 02736 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.15	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.83	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.16	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.94	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
16,801	39	>75% Grass cover, Good, HSG A (E1, E2, E3)
6,845	96	Gravel surface, HSG A (E1, E2, E3)
523	98	Roofs, HSG A (E3)
3,164	98	Unconnected roofs, HSG A (E1, E2)
27,333	**61**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
27,333	HSG A	E1, E2, E3
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
27,333		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
16,801	0	0	0	0	16,801	>75% Grass cover, Good	
6,845	0	0	0	0	6,845	Gravel surface	
523	0	0	0	0	523	Roofs	
3,164	0	0	0	0	3,164	Unconnected roofs	
27,333	**0**	**0**	**0**	**0**	**27,333**	**TOTAL AREA**	

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

Subcatchment E1: E1 Runoff Area=7,976 sf 12.02% Impervious Runoff Depth>0.66"
Tc=6.0 min UI Adjusted CN=67 Runoff=0.12 cfs 439 cf

Subcatchment E2: E2 Runoff Area=14,039 sf 15.71% Impervious Runoff Depth>0.14"
Tc=6.0 min UI Adjusted CN=51 Runoff=0.01 cfs 162 cf

Subcatchment E3: E3 Runoff Area=5,318 sf 9.83% Impervious Runoff Depth>0.62"
Tc=6.0 min CN=66 Runoff=0.07 cfs 273 cf

Link DP1: link Inflow=0.12 cfs 439 cf
Primary=0.12 cfs 439 cf

Link DP2: link Inflow=0.01 cfs 162 cf
Primary=0.01 cfs 162 cf

Link DP3: link Inflow=0.07 cfs 273 cf
Primary=0.07 cfs 273 cf

Total Runoff Area = 27,333 sf Runoff Volume = 875 cf Average Runoff Depth = 0.38"
86.51% Pervious = 23,646 sf 13.49% Impervious = 3,687 sf

Summary for Subcatchment E1: E1

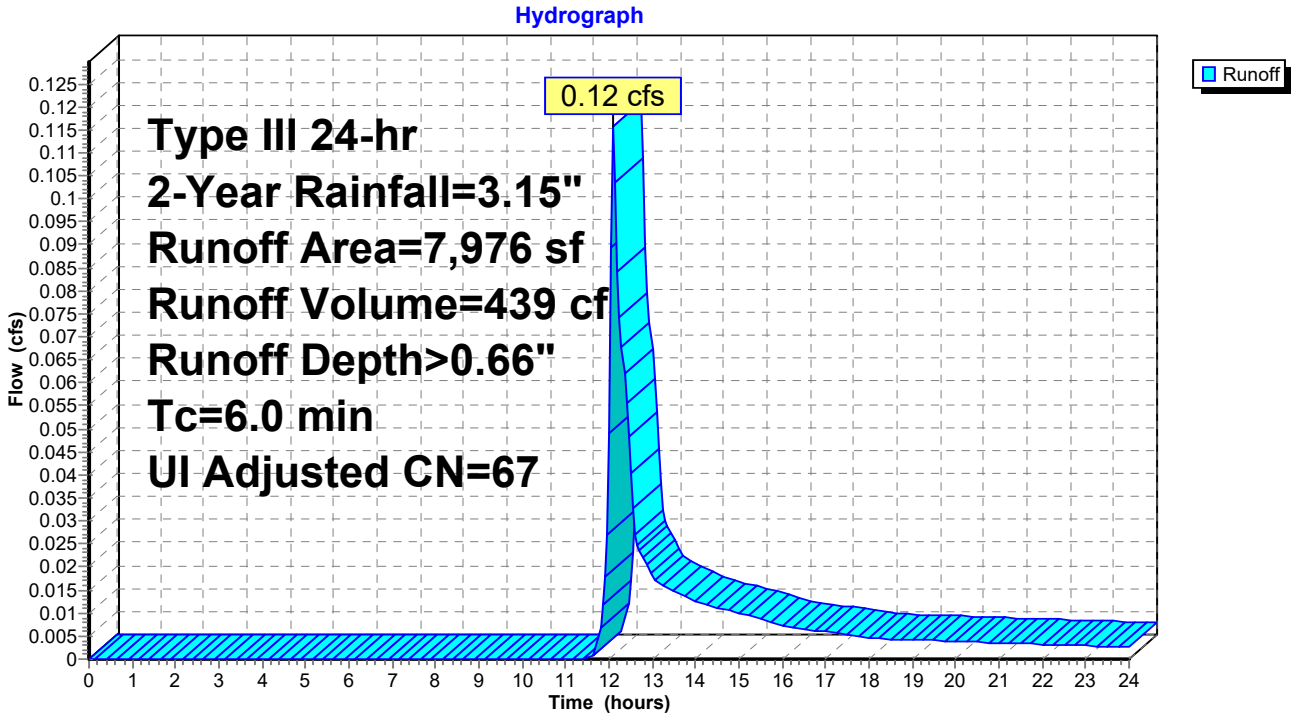
Runoff = 0.12 cfs @ 12.11 hrs, Volume= 439 cf, Depth> 0.66"
Routed to Link DP1 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Adj	Description
959	98		Unconnected roofs, HSG A
3,180	96		Gravel surface, HSG A
3,837	39		>75% Grass cover, Good, HSG A
7,976	69	67	Weighted Average, UI Adjusted
7,017			87.98% Pervious Area
959			12.02% Impervious Area
959			100.00% Unconnected

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

Subcatchment E1: E1



Summary for Subcatchment E2: E2

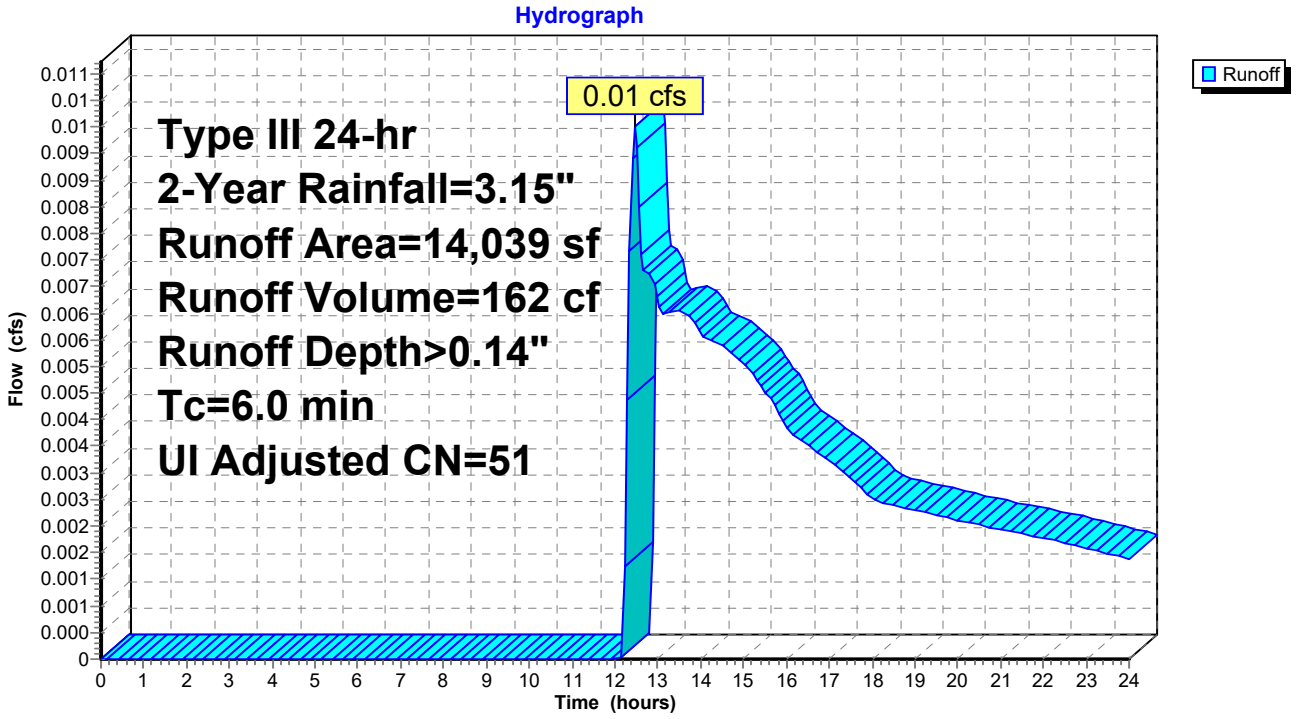
Runoff = 0.01 cfs @ 12.45 hrs, Volume= 162 cf, Depth> 0.14"
Routed to Link DP2 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Adj	Description
2,205	98		Unconnected roofs, HSG A
1,666	96		Gravel surface, HSG A
10,168	39		>75% Grass cover, Good, HSG A
14,039	55	51	Weighted Average, UI Adjusted
11,834			84.29% Pervious Area
2,205			15.71% Impervious Area
2,205			100.00% Unconnected

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

Subcatchment E2: E2



Summary for Subcatchment E3: E3

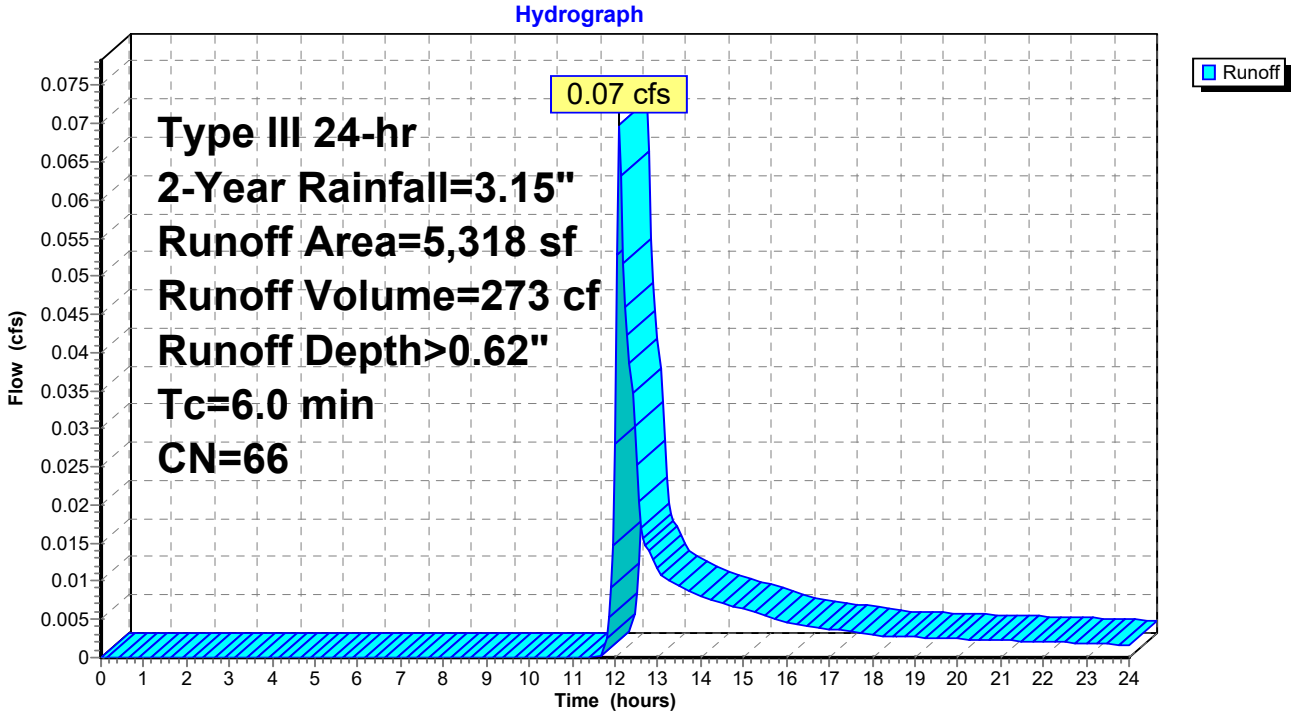
Runoff = 0.07 cfs @ 12.11 hrs, Volume= 273 cf, Depth> 0.62"
Routed to Link DP3 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
523	98	Roofs, HSG A
1,999	96	Gravel surface, HSG A
2,796	39	>75% Grass cover, Good, HSG A
5,318	66	Weighted Average
4,795		90.17% Pervious Area
523		9.83% Impervious Area

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

Subcatchment E3: E3

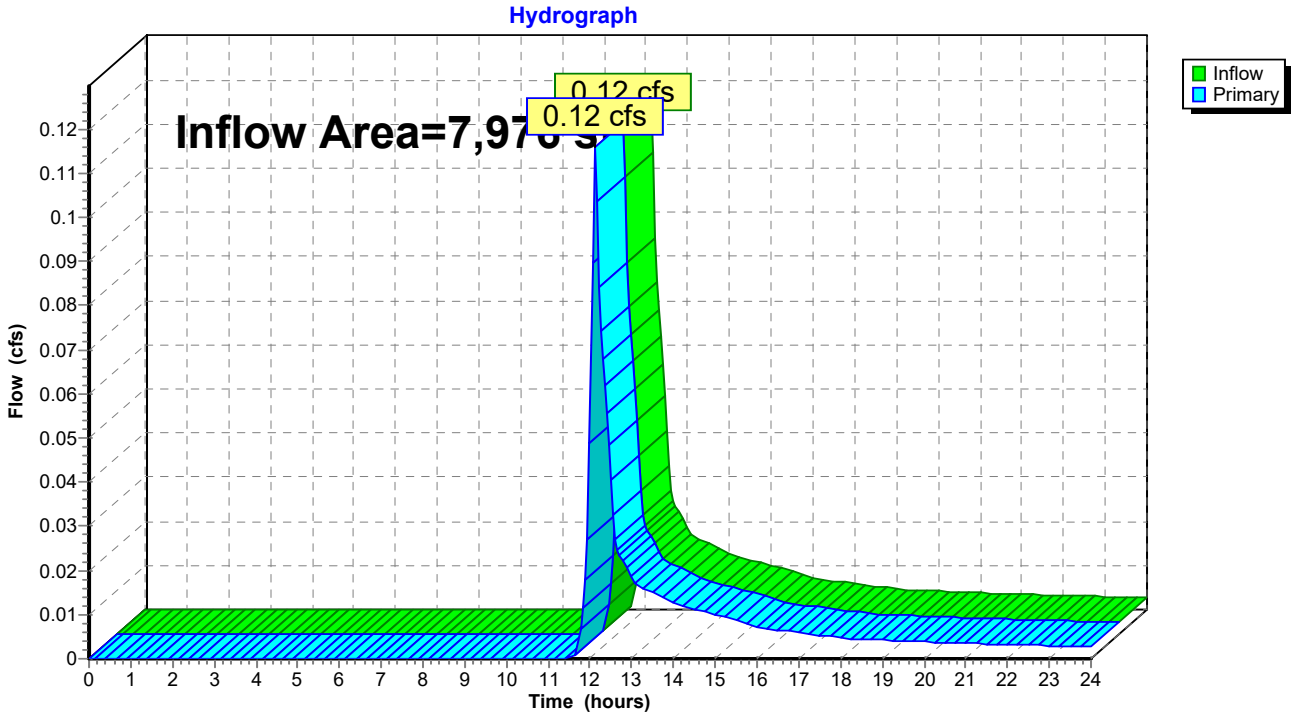


Summary for Link DP1: link

Inflow Area = 7,976 sf, 12.02% Impervious, Inflow Depth > 0.66" for 2-Year event
Inflow = 0.12 cfs @ 12.11 hrs, Volume= 439 cf
Primary = 0.12 cfs @ 12.11 hrs, Volume= 439 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP1: link

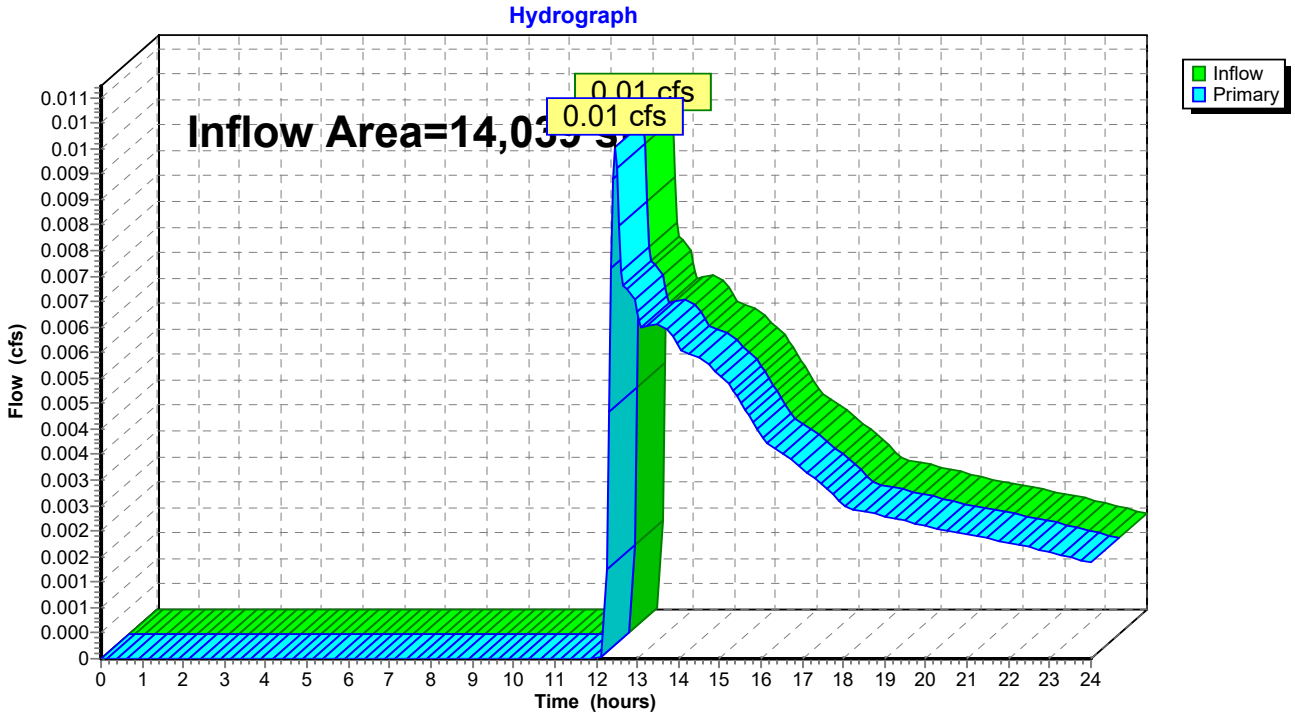


Summary for Link DP2: link

Inflow Area = 14,039 sf, 15.71% Impervious, Inflow Depth > 0.14" for 2-Year event
Inflow = 0.01 cfs @ 12.45 hrs, Volume= 162 cf
Primary = 0.01 cfs @ 12.45 hrs, Volume= 162 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP2: link

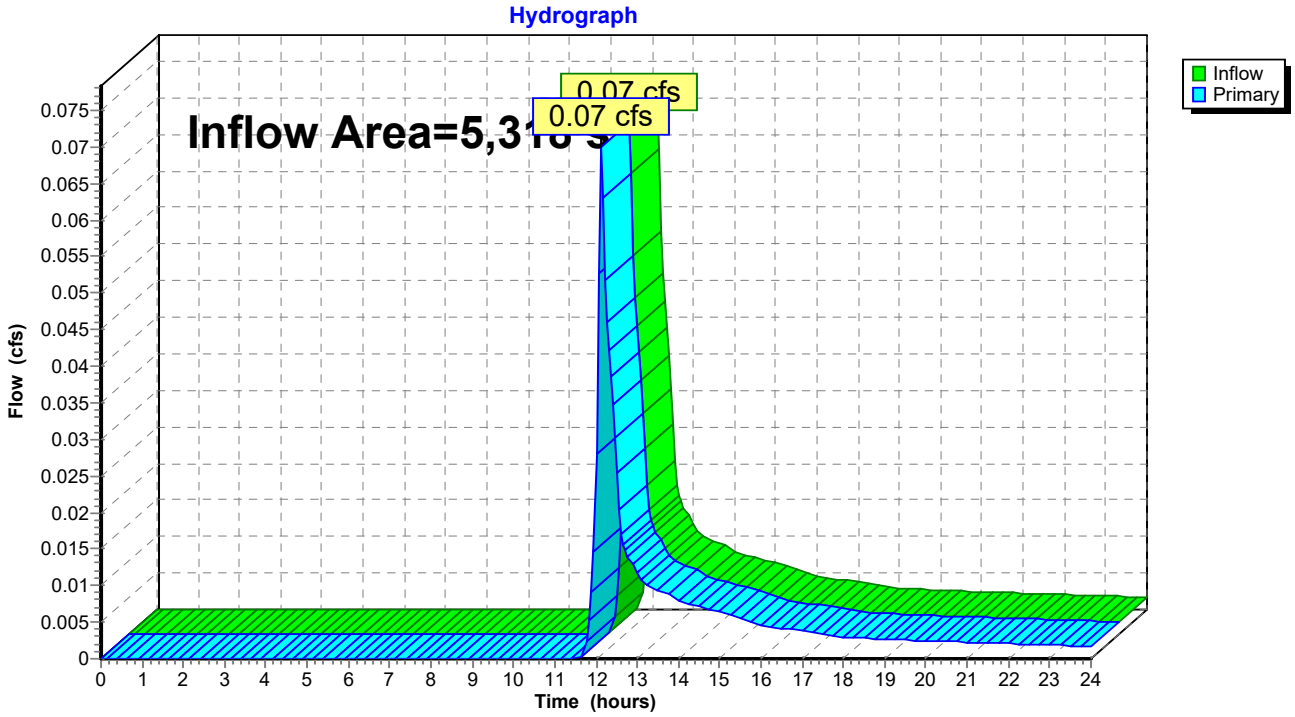


Summary for Link DP3: link

Inflow Area = 5,318 sf, 9.83% Impervious, Inflow Depth > 0.62" for 2-Year event
Inflow = 0.07 cfs @ 12.11 hrs, Volume= 273 cf
Primary = 0.07 cfs @ 12.11 hrs, Volume= 273 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP3: link



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

Subcatchment E1: E1 Runoff Area=7,976 sf 12.02% Impervious Runoff Depth>1.68"
Tc=6.0 min UI Adjusted CN=67 Runoff=0.34 cfs 1,119 cf

Subcatchment E2: E2 Runoff Area=14,039 sf 15.71% Impervious Runoff Depth>0.67"
Tc=6.0 min UI Adjusted CN=51 Runoff=0.15 cfs 789 cf

Subcatchment E3: E3 Runoff Area=5,318 sf 9.83% Impervious Runoff Depth>1.61"
Tc=6.0 min CN=66 Runoff=0.22 cfs 714 cf

Link DP1: link Inflow=0.34 cfs 1,119 cf
Primary=0.34 cfs 1,119 cf

Link DP2: link Inflow=0.15 cfs 789 cf
Primary=0.15 cfs 789 cf

Link DP3: link Inflow=0.22 cfs 714 cf
Primary=0.22 cfs 714 cf

Total Runoff Area = 27,333 sf Runoff Volume = 2,622 cf Average Runoff Depth = 1.15"
86.51% Pervious = 23,646 sf 13.49% Impervious = 3,687 sf

Summary for Subcatchment E1: E1

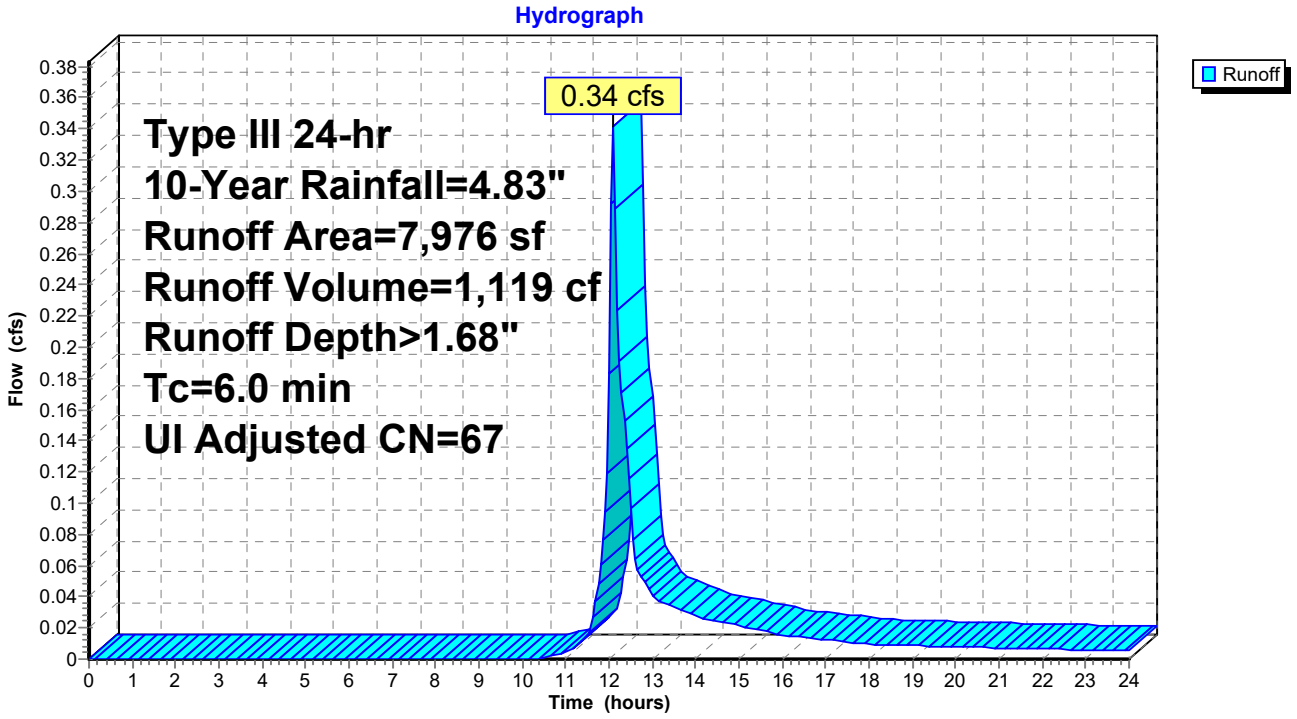
Runoff = 0.34 cfs @ 12.10 hrs, Volume= 1,119 cf, Depth> 1.68"
Routed to Link DP1 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Adj	Description
959	98		Unconnected roofs, HSG A
3,180	96		Gravel surface, HSG A
3,837	39		>75% Grass cover, Good, HSG A
7,976	69	67	Weighted Average, UI Adjusted
7,017			87.98% Pervious Area
959			12.02% Impervious Area
959			100.00% Unconnected

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

Subcatchment E1: E1



Summary for Subcatchment E2: E2

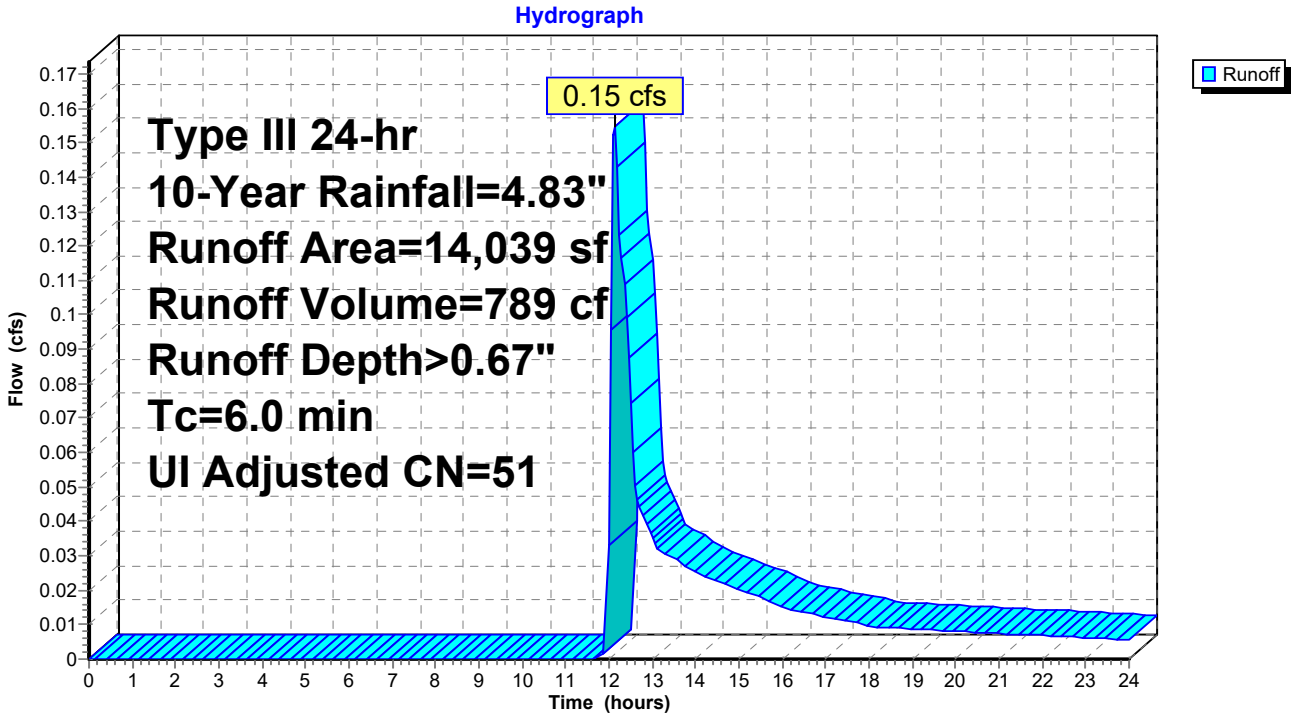
Runoff = 0.15 cfs @ 12.13 hrs, Volume= 789 cf, Depth> 0.67"
Routed to Link DP2 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Adj	Description
2,205	98		Unconnected roofs, HSG A
1,666	96		Gravel surface, HSG A
10,168	39		>75% Grass cover, Good, HSG A
14,039	55	51	Weighted Average, UI Adjusted
11,834			84.29% Pervious Area
2,205			15.71% Impervious Area
2,205			100.00% Unconnected

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

Subcatchment E2: E2



Summary for Subcatchment E3: E3

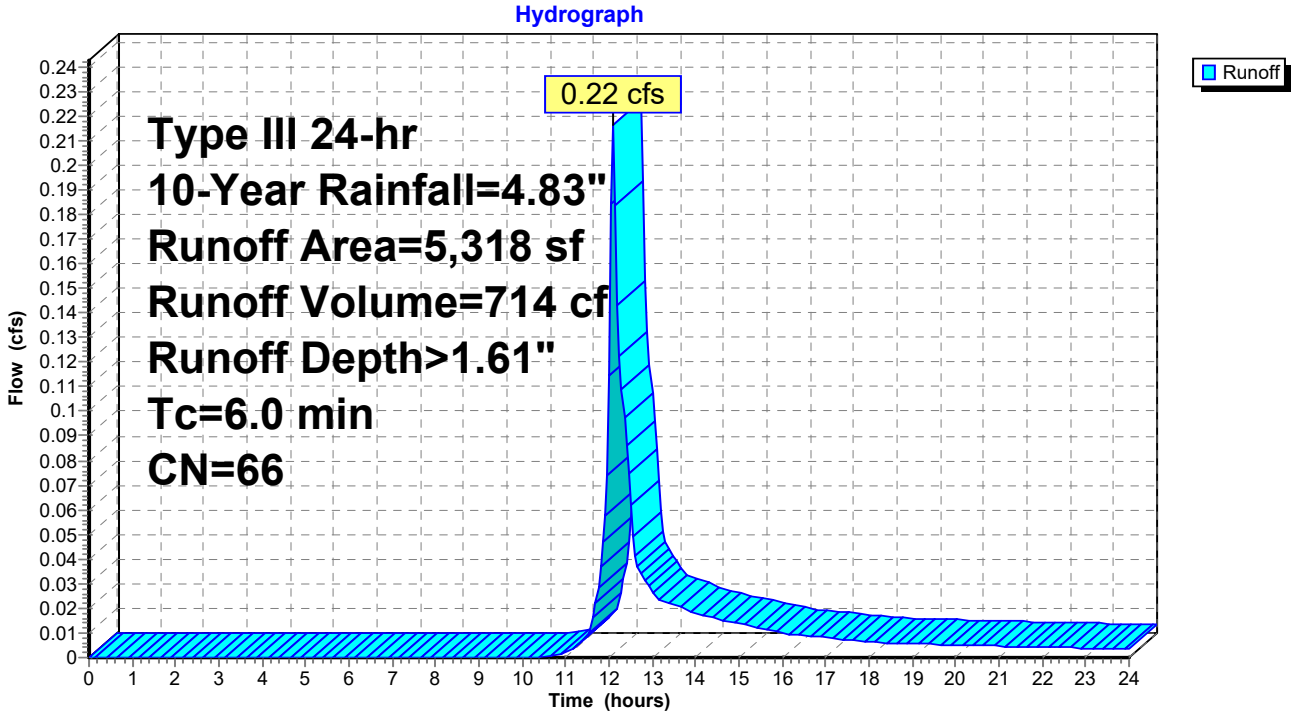
Runoff = 0.22 cfs @ 12.10 hrs, Volume= 714 cf, Depth> 1.61"
Routed to Link DP3 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
523	98	Roofs, HSG A
1,999	96	Gravel surface, HSG A
2,796	39	>75% Grass cover, Good, HSG A
5,318	66	Weighted Average
4,795		90.17% Pervious Area
523		9.83% Impervious Area

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

Subcatchment E3: E3

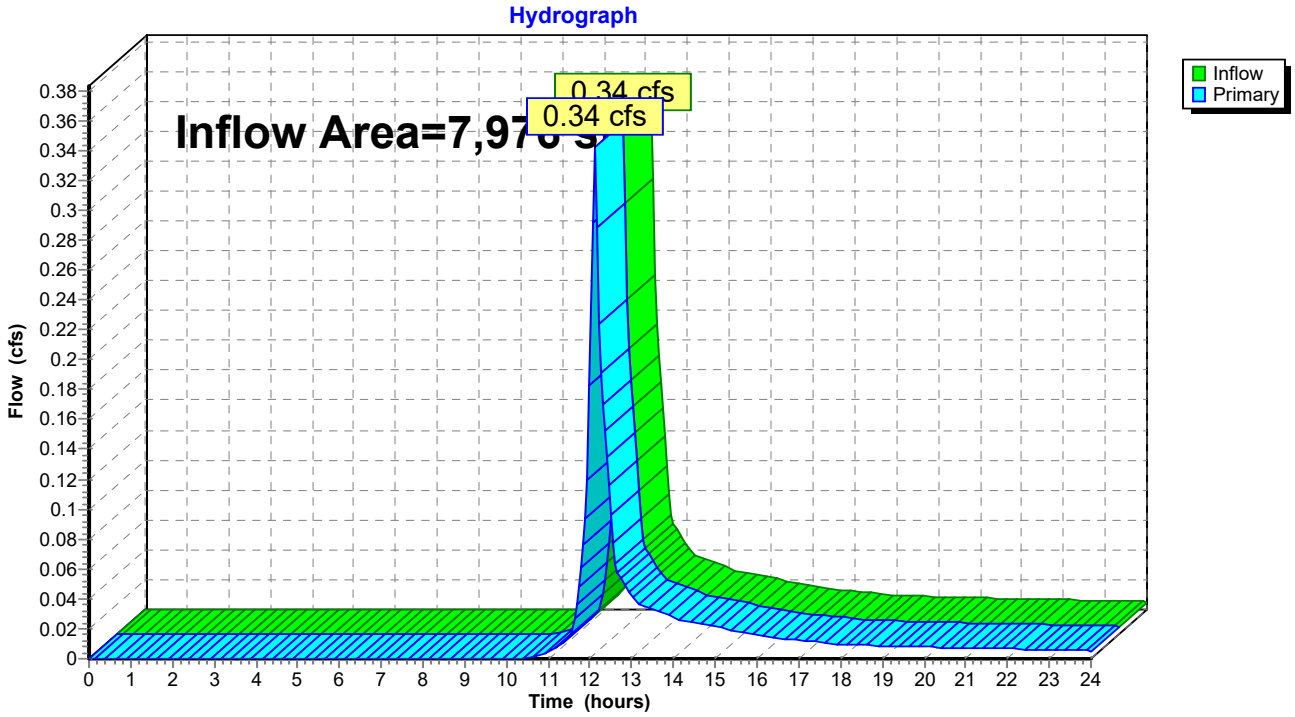


Summary for Link DP1: link

Inflow Area = 7,976 sf, 12.02% Impervious, Inflow Depth > 1.68" for 10-Year event
Inflow = 0.34 cfs @ 12.10 hrs, Volume= 1,119 cf
Primary = 0.34 cfs @ 12.10 hrs, Volume= 1,119 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP1: link

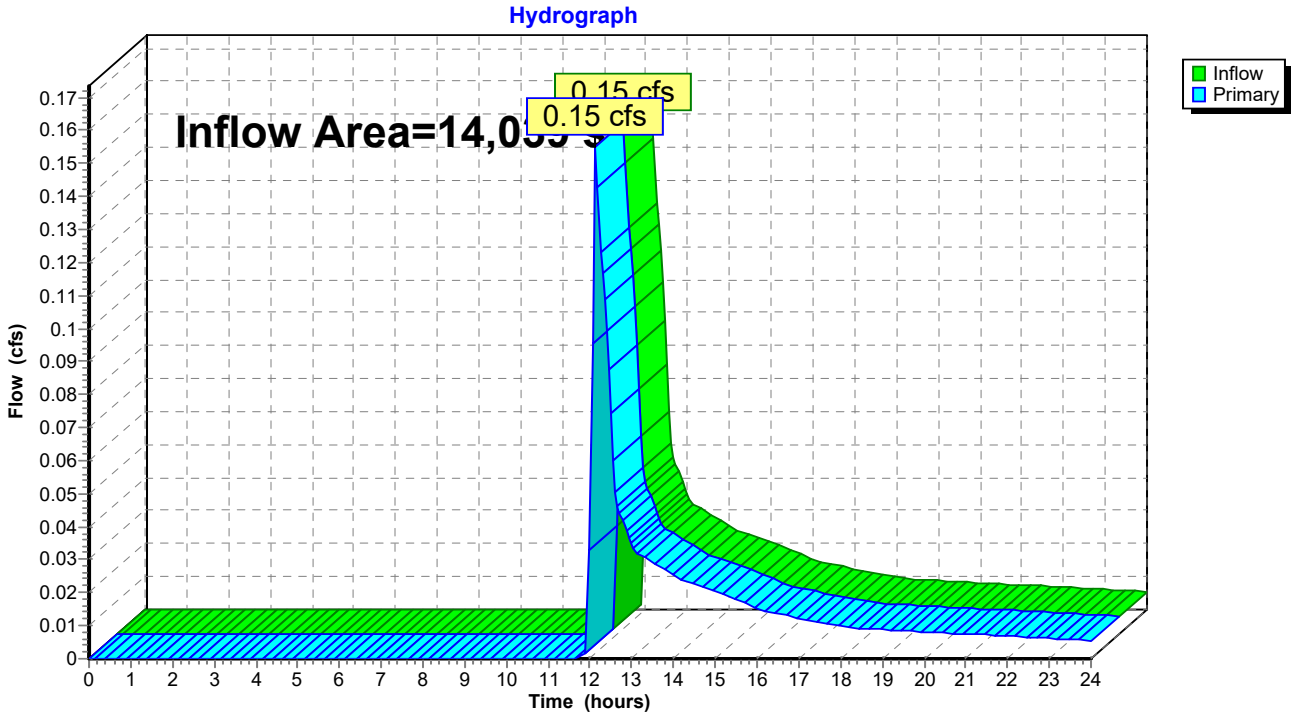


Summary for Link DP2: link

Inflow Area = 14,039 sf, 15.71% Impervious, Inflow Depth > 0.67" for 10-Year event
Inflow = 0.15 cfs @ 12.13 hrs, Volume= 789 cf
Primary = 0.15 cfs @ 12.13 hrs, Volume= 789 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP2: link

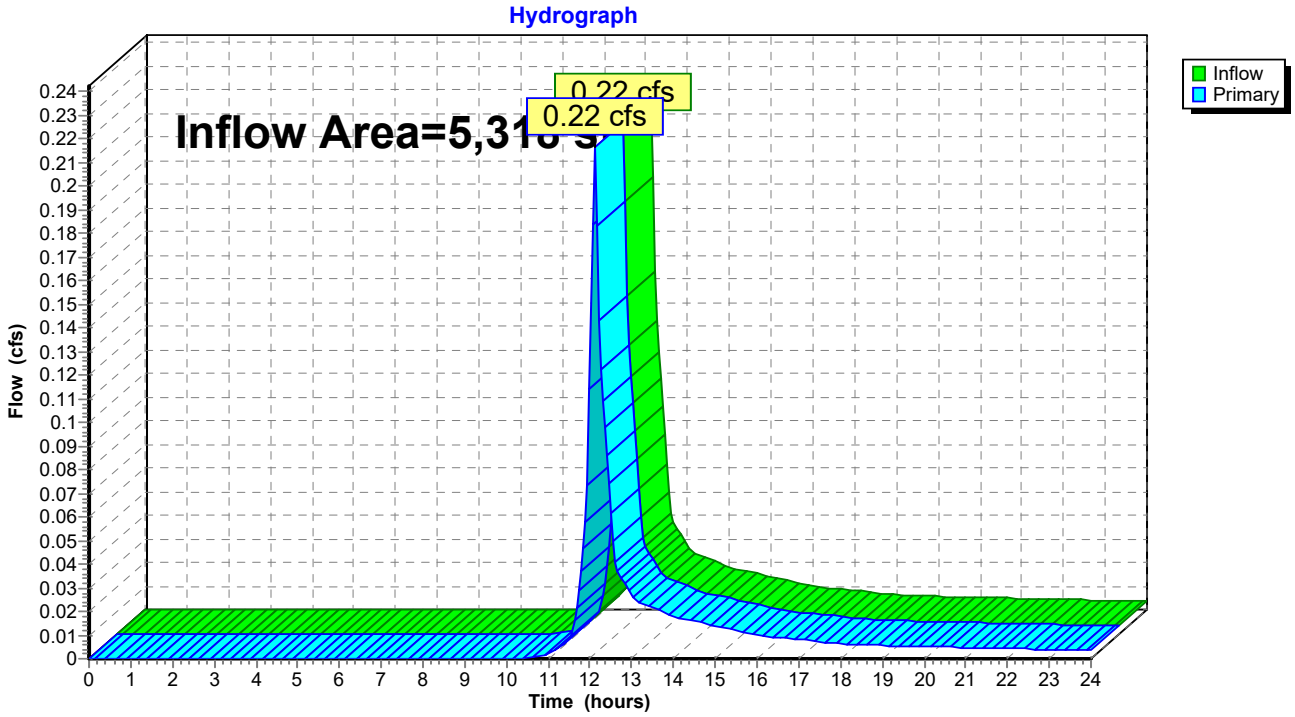


Summary for Link DP3: link

Inflow Area = 5,318 sf, 9.83% Impervious, Inflow Depth > 1.61" for 10-Year event
Inflow = 0.22 cfs @ 12.10 hrs, Volume= 714 cf
Primary = 0.22 cfs @ 12.10 hrs, Volume= 714 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP3: link



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

Subcatchment E1: E1 Runoff Area=7,976 sf 12.02% Impervious Runoff Depth>2.65"
Tc=6.0 min UI Adjusted CN=67 Runoff=0.55 cfs 1,760 cf

Subcatchment E2: E2 Runoff Area=14,039 sf 15.71% Impervious Runoff Depth>1.30"
Tc=6.0 min UI Adjusted CN=51 Runoff=0.40 cfs 1,516 cf

Subcatchment E3: E3 Runoff Area=5,318 sf 9.83% Impervious Runoff Depth>2.56"
Tc=6.0 min CN=66 Runoff=0.35 cfs 1,133 cf

Link DP1: link Inflow=0.55 cfs 1,760 cf
Primary=0.55 cfs 1,760 cf

Link DP2: link Inflow=0.40 cfs 1,516 cf
Primary=0.40 cfs 1,516 cf

Link DP3: link Inflow=0.35 cfs 1,133 cf
Primary=0.35 cfs 1,133 cf

Total Runoff Area = 27,333 sf Runoff Volume = 4,409 cf Average Runoff Depth = 1.94"
86.51% Pervious = 23,646 sf 13.49% Impervious = 3,687 sf

Summary for Subcatchment E1: E1

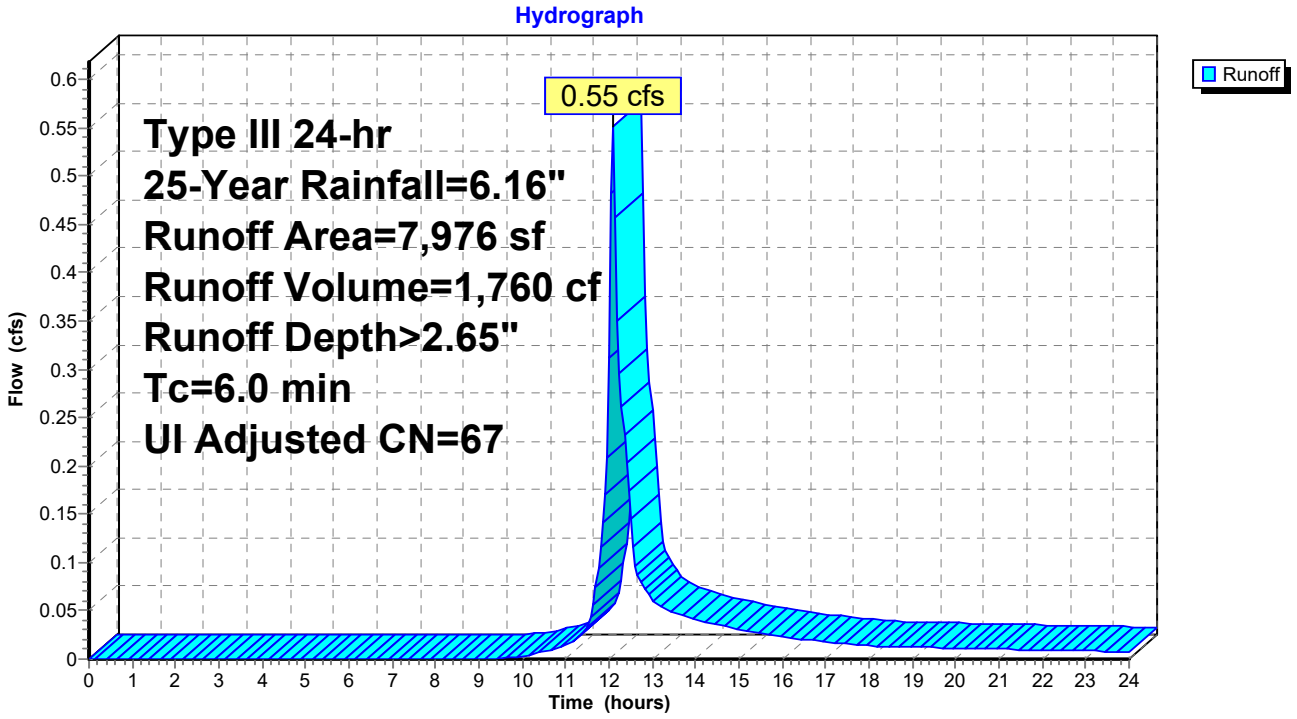
Runoff = 0.55 cfs @ 12.10 hrs, Volume= 1,760 cf, Depth> 2.65"
Routed to Link DP1 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Adj	Description
959	98		Unconnected roofs, HSG A
3,180	96		Gravel surface, HSG A
3,837	39		>75% Grass cover, Good, HSG A
7,976	69	67	Weighted Average, UI Adjusted
7,017			87.98% Pervious Area
959			12.02% Impervious Area
959			100.00% Unconnected

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

Subcatchment E1: E1



Summary for Subcatchment E2: E2

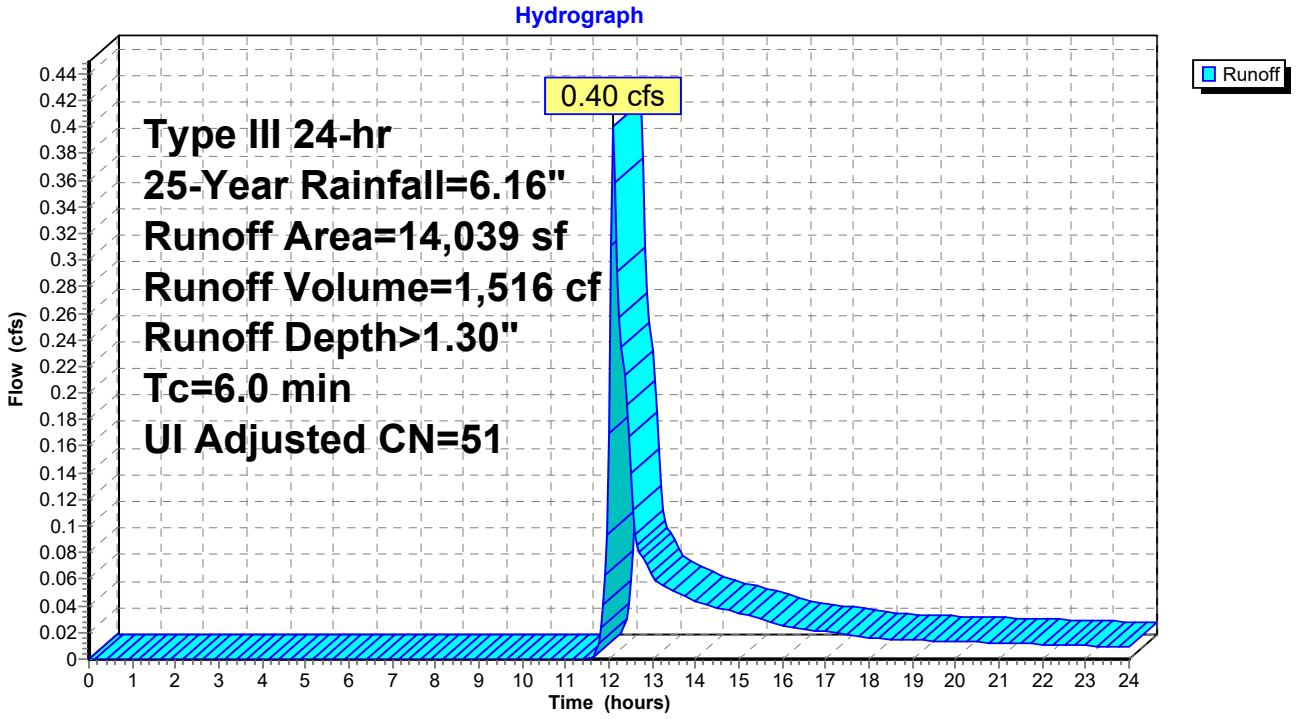
Runoff = 0.40 cfs @ 12.11 hrs, Volume= 1,516 cf, Depth> 1.30"
Routed to Link DP2 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Adj	Description
2,205	98		Unconnected roofs, HSG A
1,666	96		Gravel surface, HSG A
10,168	39		>75% Grass cover, Good, HSG A
14,039	55	51	Weighted Average, UI Adjusted
11,834			84.29% Pervious Area
2,205			15.71% Impervious Area
2,205			100.00% Unconnected

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

Subcatchment E2: E2



Summary for Subcatchment E3: E3

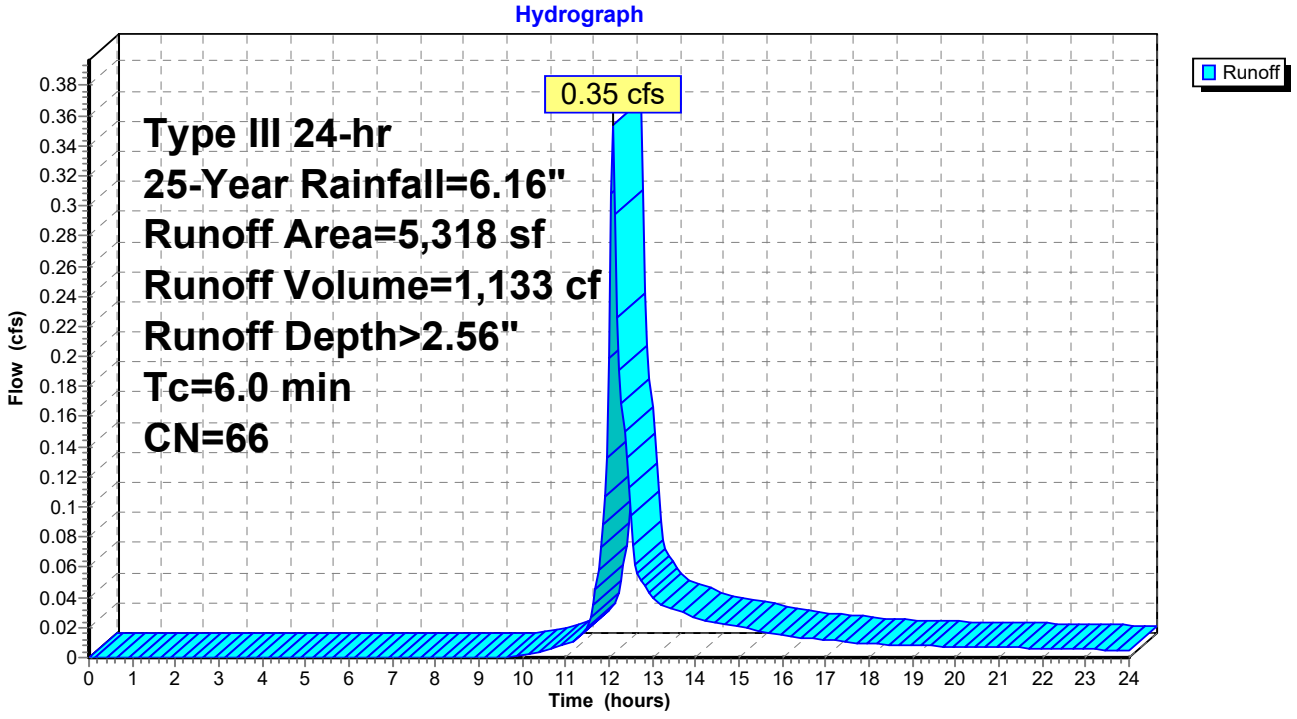
Runoff = 0.35 cfs @ 12.10 hrs, Volume= 1,133 cf, Depth> 2.56"
Routed to Link DP3 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
523	98	Roofs, HSG A
1,999	96	Gravel surface, HSG A
2,796	39	>75% Grass cover, Good, HSG A
5,318	66	Weighted Average
4,795		90.17% Pervious Area
523		9.83% Impervious Area

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

Subcatchment E3: E3

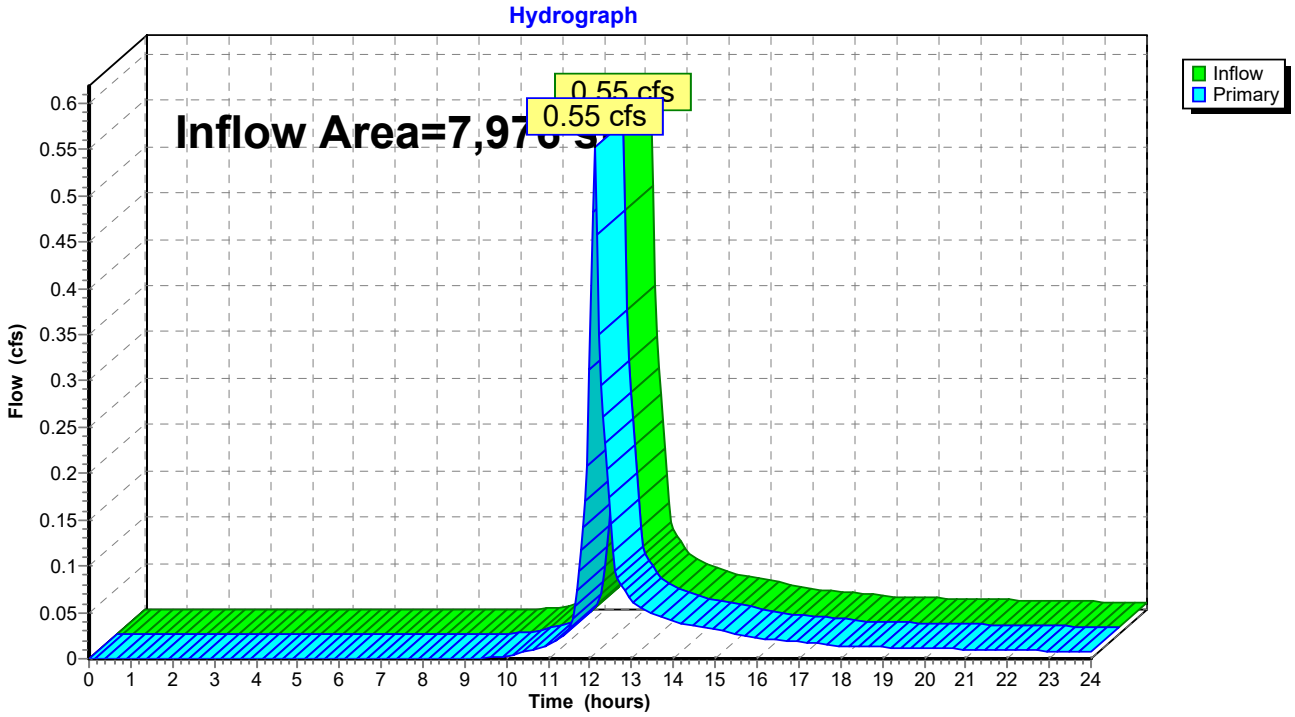


Summary for Link DP1: link

Inflow Area = 7,976 sf, 12.02% Impervious, Inflow Depth > 2.65" for 25-Year event
Inflow = 0.55 cfs @ 12.10 hrs, Volume= 1,760 cf
Primary = 0.55 cfs @ 12.10 hrs, Volume= 1,760 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP1: link

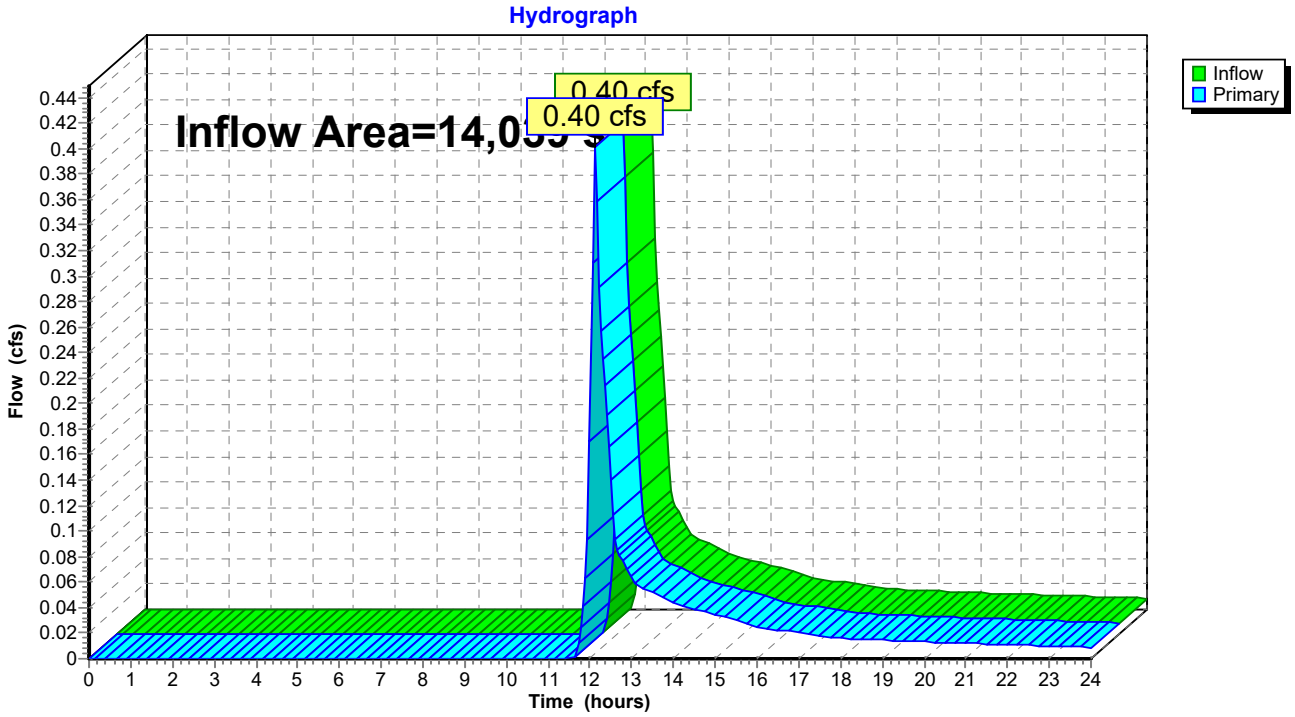


Summary for Link DP2: link

Inflow Area = 14,039 sf, 15.71% Impervious, Inflow Depth > 1.30" for 25-Year event
Inflow = 0.40 cfs @ 12.11 hrs, Volume= 1,516 cf
Primary = 0.40 cfs @ 12.11 hrs, Volume= 1,516 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP2: link

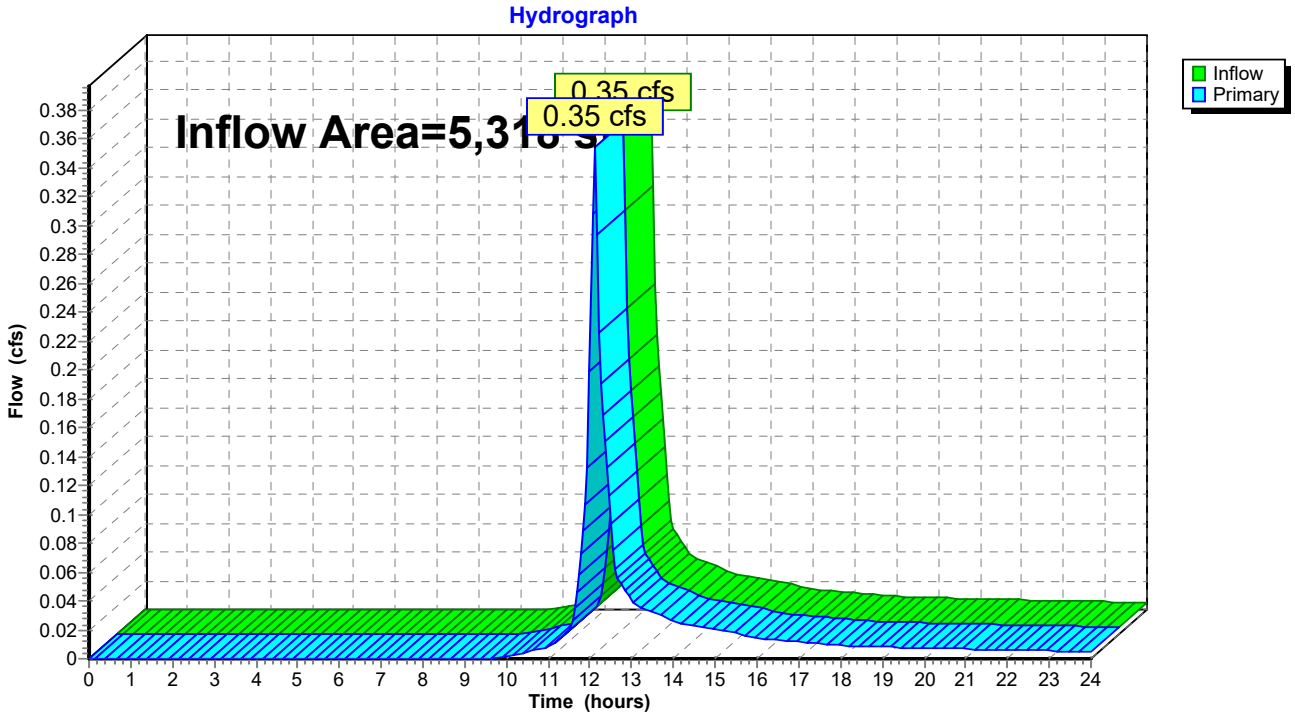


Summary for Link DP3: link

Inflow Area = 5,318 sf, 9.83% Impervious, Inflow Depth > 2.56" for 25-Year event
Inflow = 0.35 cfs @ 12.10 hrs, Volume= 1,133 cf
Primary = 0.35 cfs @ 12.10 hrs, Volume= 1,133 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP3: link



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

Subcatchment E1: E1 Runoff Area=7,976 sf 12.02% Impervious Runoff Depth>4.91"
Tc=6.0 min UI Adjusted CN=67 Runoff=1.03 cfs 3,263 cf

Subcatchment E2: E2 Runoff Area=14,039 sf 15.71% Impervious Runoff Depth>2.96"
Tc=6.0 min UI Adjusted CN=51 Runoff=1.05 cfs 3,462 cf

Subcatchment E3: E3 Runoff Area=5,318 sf 9.83% Impervious Runoff Depth>4.79"
Tc=6.0 min CN=66 Runoff=0.67 cfs 2,121 cf

Link DP1: link Inflow=1.03 cfs 3,263 cf
Primary=1.03 cfs 3,263 cf

Link DP2: link Inflow=1.05 cfs 3,462 cf
Primary=1.05 cfs 3,462 cf

Link DP3: link Inflow=0.67 cfs 2,121 cf
Primary=0.67 cfs 2,121 cf

Total Runoff Area = 27,333 sf Runoff Volume = 8,845 cf Average Runoff Depth = 3.88"
86.51% Pervious = 23,646 sf 13.49% Impervious = 3,687 sf

Summary for Subcatchment E1: E1

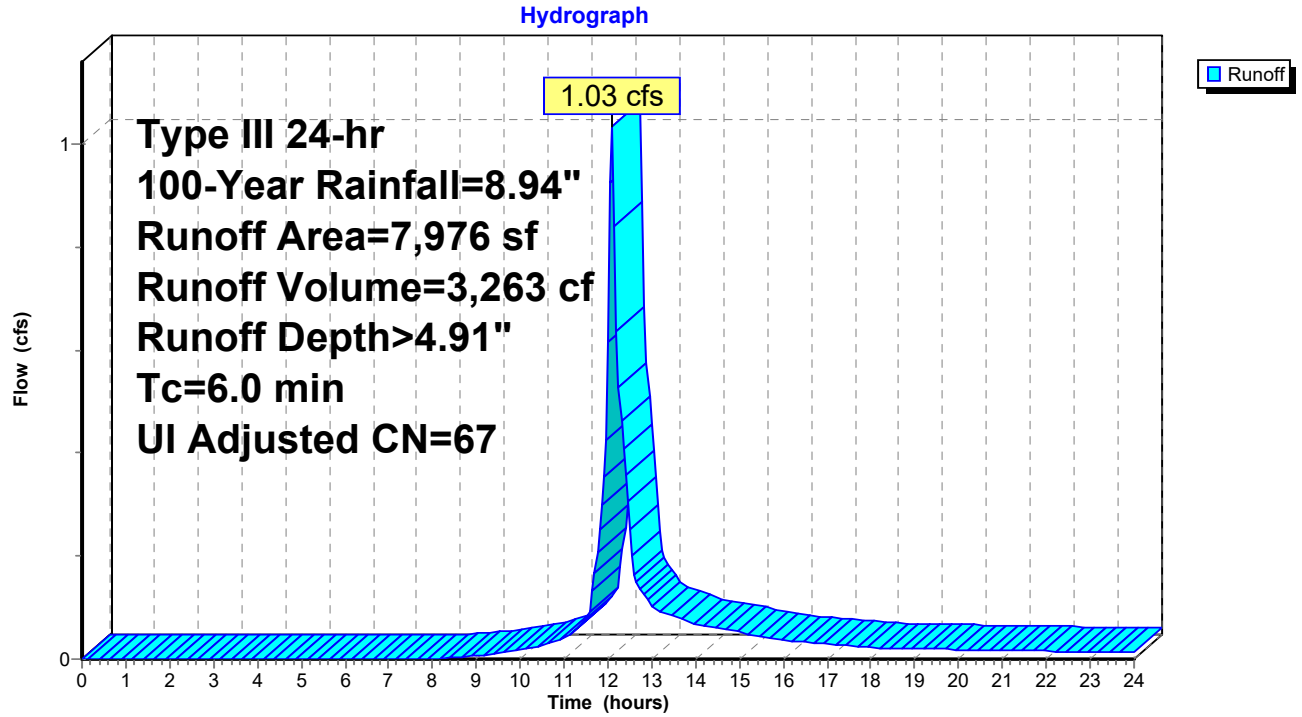
Runoff = 1.03 cfs @ 12.09 hrs, Volume= 3,263 cf, Depth> 4.91"
Routed to Link DP1 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Adj	Description
959	98		Unconnected roofs, HSG A
3,180	96		Gravel surface, HSG A
3,837	39		>75% Grass cover, Good, HSG A
7,976	69	67	Weighted Average, UI Adjusted
7,017			87.98% Pervious Area
959			12.02% Impervious Area
959			100.00% Unconnected

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

Subcatchment E1: E1



Summary for Subcatchment E2: E2

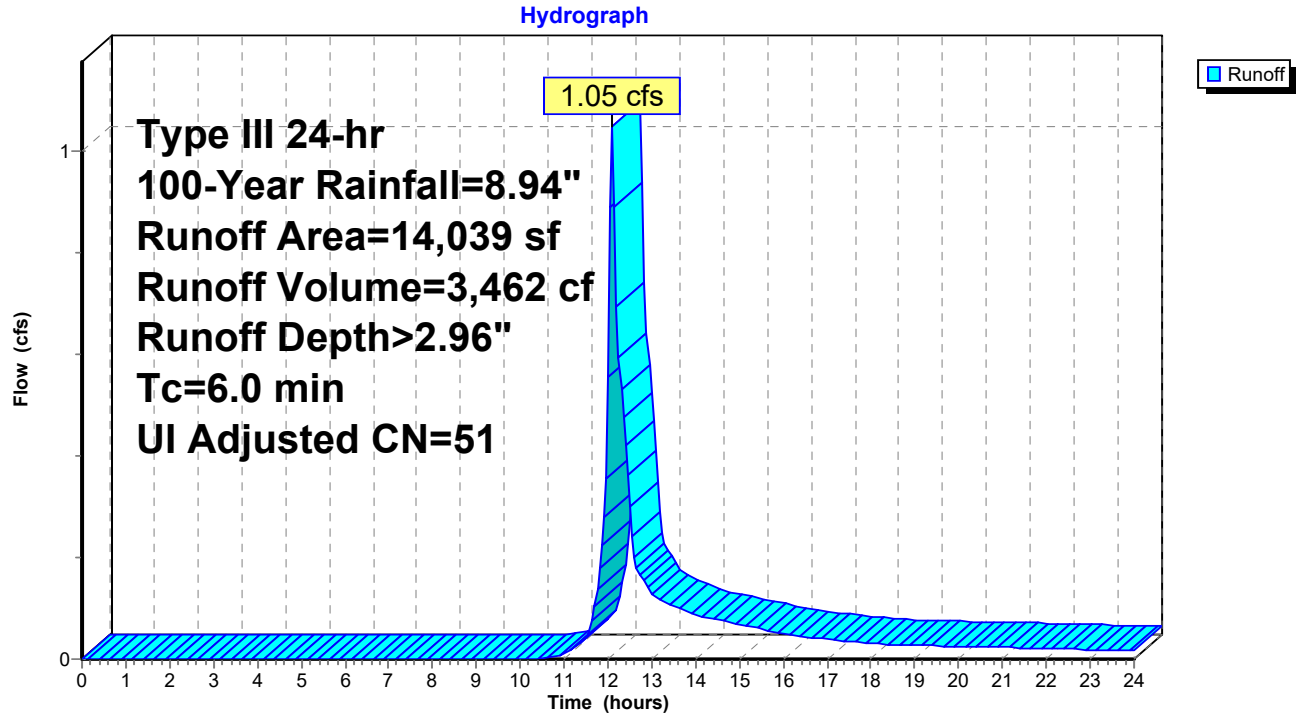
Runoff = 1.05 cfs @ 12.10 hrs, Volume= 3,462 cf, Depth> 2.96"
Routed to Link DP2 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Adj	Description
2,205	98		Unconnected roofs, HSG A
1,666	96		Gravel surface, HSG A
10,168	39		>75% Grass cover, Good, HSG A
14,039	55	51	Weighted Average, UI Adjusted
11,834			84.29% Pervious Area
2,205			15.71% Impervious Area
2,205			100.00% Unconnected

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

Subcatchment E2: E2



Summary for Subcatchment E3: E3

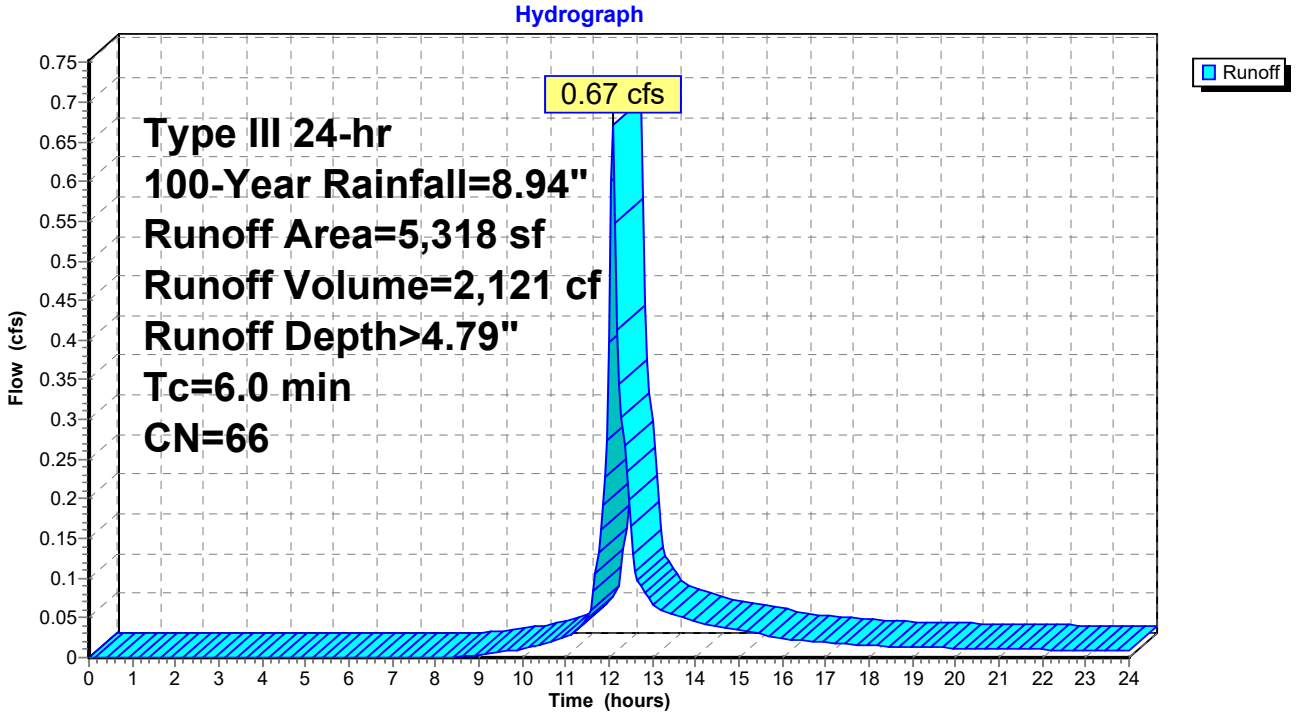
Runoff = 0.67 cfs @ 12.09 hrs, Volume= 2,121 cf, Depth> 4.79"
Routed to Link DP3 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
523	98	Roofs, HSG A
1,999	96	Gravel surface, HSG A
2,796	39	>75% Grass cover, Good, HSG A
5,318	66	Weighted Average
4,795		90.17% Pervious Area
523		9.83% Impervious Area

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

Subcatchment E3: E3

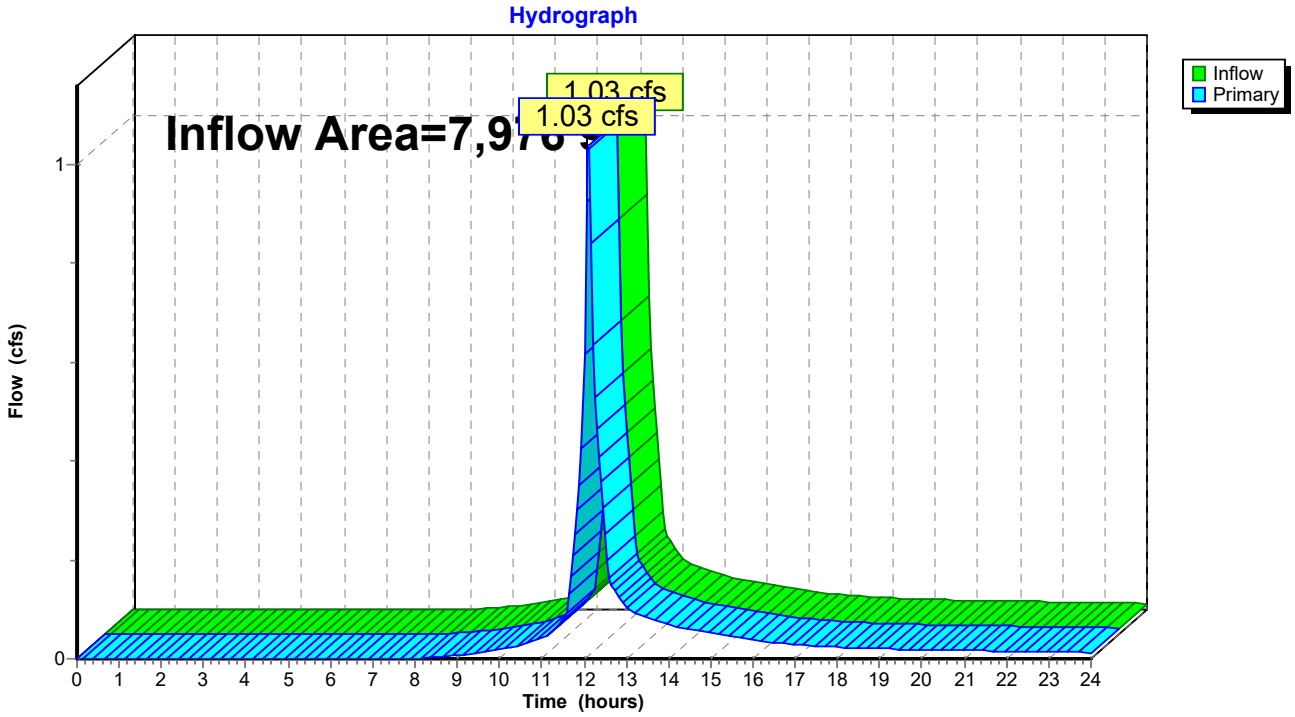


Summary for Link DP1: link

Inflow Area = 7,976 sf, 12.02% Impervious, Inflow Depth > 4.91" for 100-Year event
Inflow = 1.03 cfs @ 12.09 hrs, Volume= 3,263 cf
Primary = 1.03 cfs @ 12.09 hrs, Volume= 3,263 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP1: link

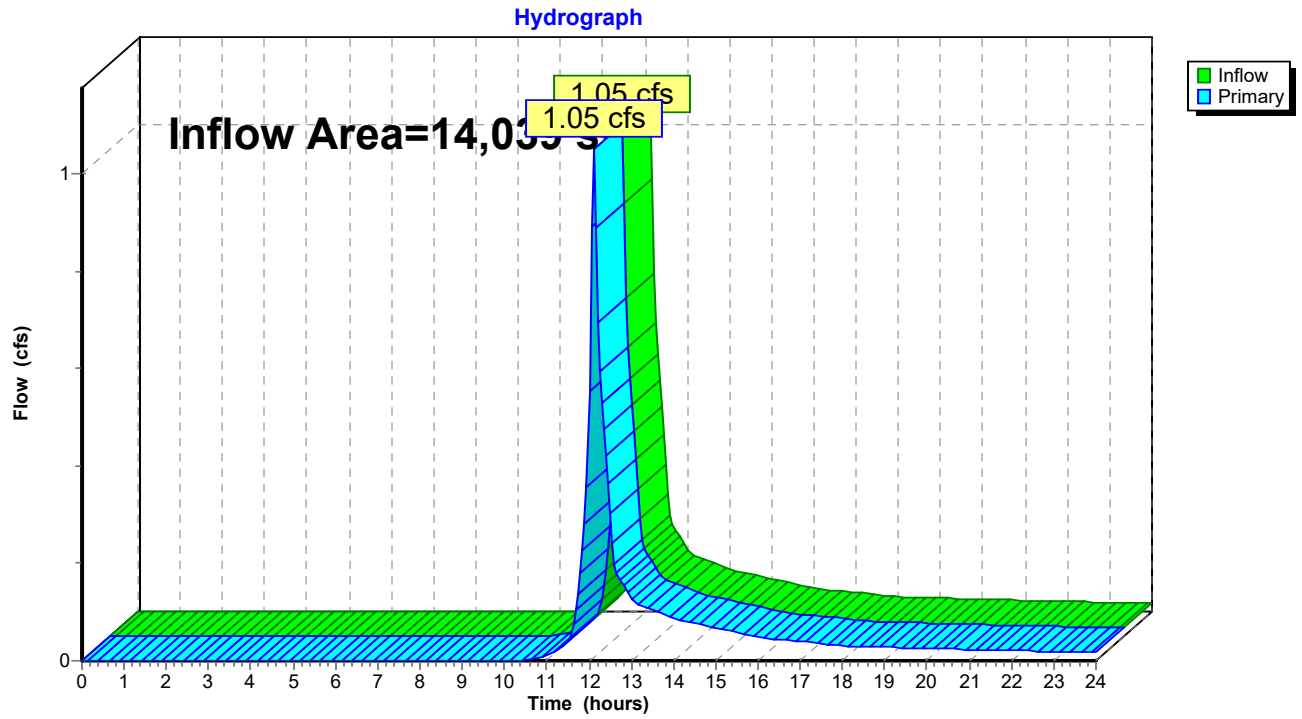


Summary for Link DP2: link

Inflow Area = 14,039 sf, 15.71% Impervious, Inflow Depth > 2.96" for 100-Year event
Inflow = 1.05 cfs @ 12.10 hrs, Volume= 3,462 cf
Primary = 1.05 cfs @ 12.10 hrs, Volume= 3,462 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP2: link



Summary for Link DP3: link

Inflow Area = 5,318 sf, 9.83% Impervious, Inflow Depth > 4.79" for 100-Year event
Inflow = 0.67 cfs @ 12.09 hrs, Volume= 2,121 cf
Primary = 0.67 cfs @ 12.09 hrs, Volume= 2,121 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP3: link

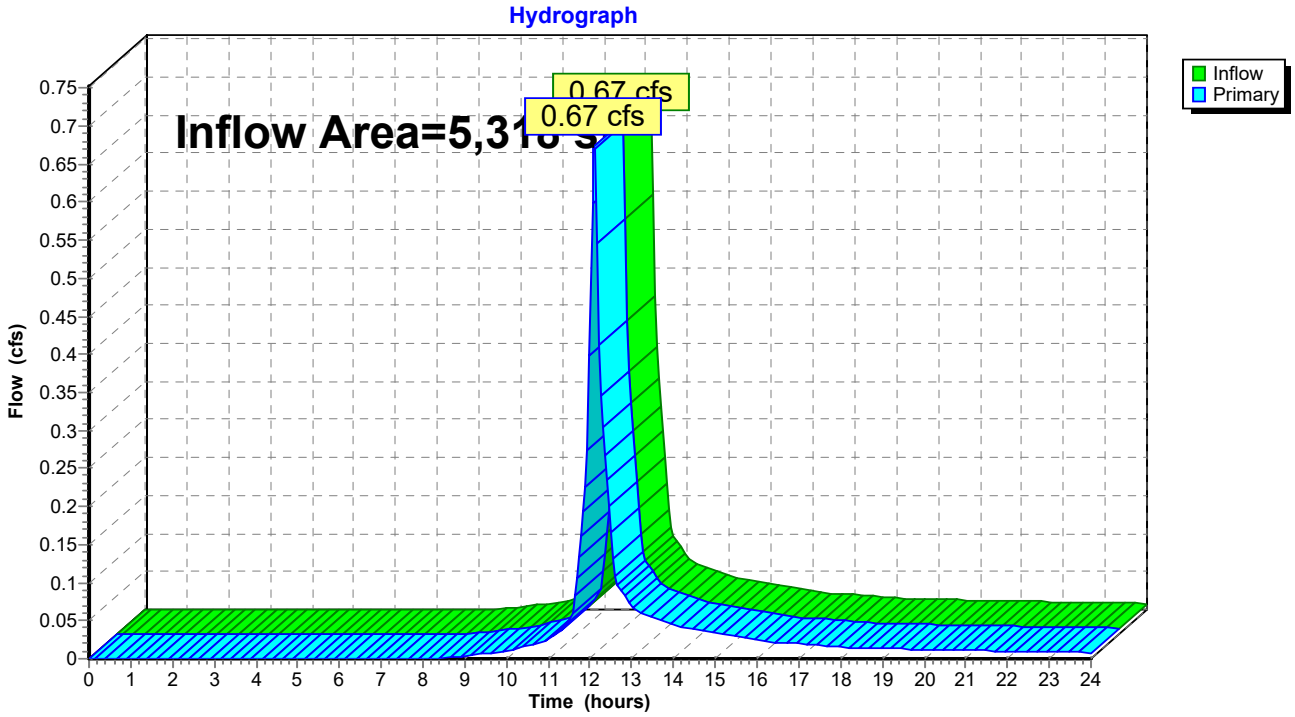


TABLE OF CONTENTS

Project Reports
1 Routing Diagram
2 Rainfall Events Listing (selected events)
3 Area Listing (all nodes)
4 Soil Listing (all nodes)
5 Ground Covers (all nodes)

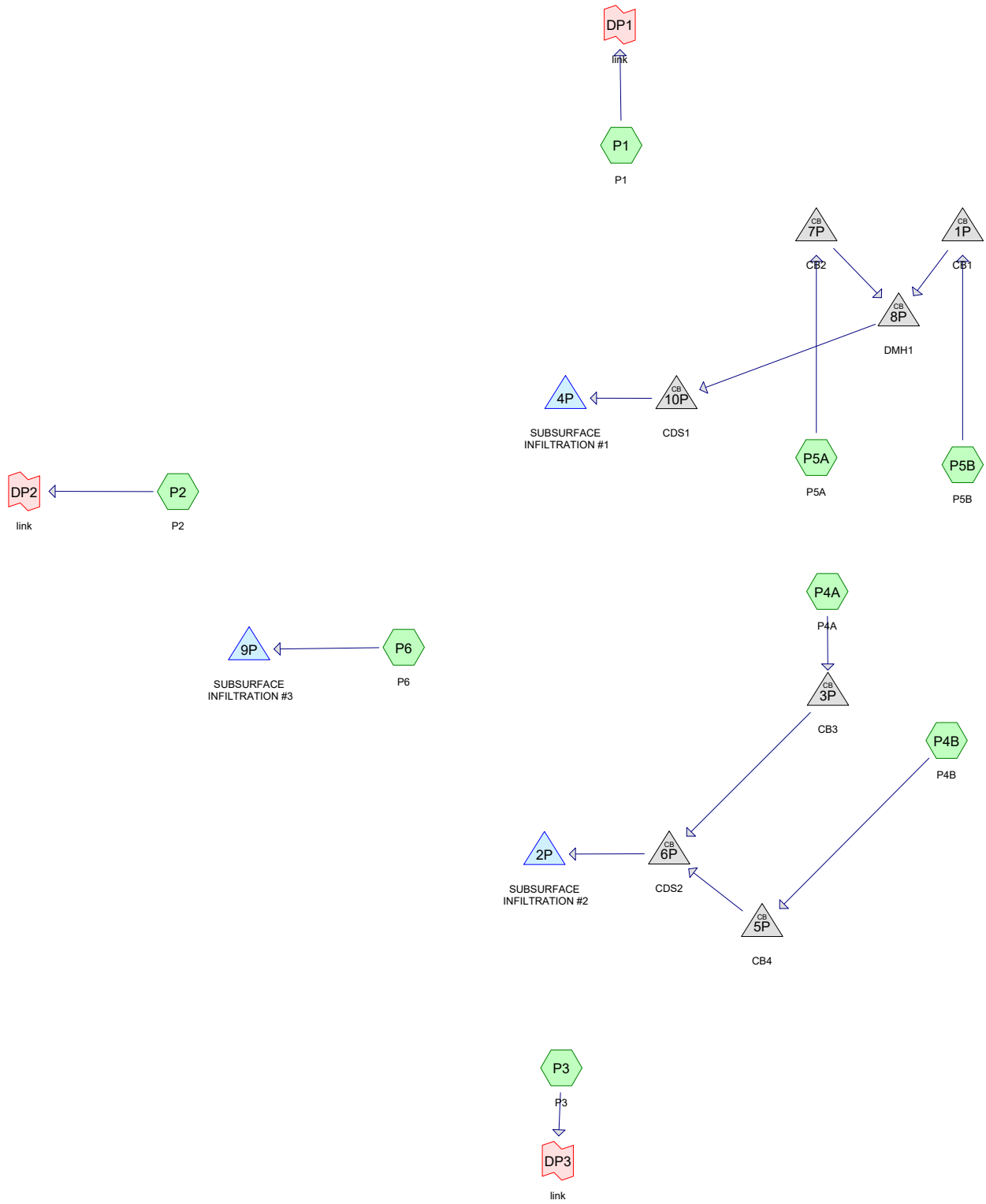
2-Year Event
6 Node Listing
7 Subcat E1: E1
8 Subcat E2: E2
9 Subcat E3: E3
10 Link DP1: link
11 Link DP2: link
12 Link DP3: link

10-Year Event
13 Node Listing
14 Subcat E1: E1
15 Subcat E2: E2
16 Subcat E3: E3
17 Link DP1: link
18 Link DP2: link
19 Link DP3: link

25-Year Event
20 Node Listing
21 Subcat E1: E1
22 Subcat E2: E2
23 Subcat E3: E3
24 Link DP1: link
25 Link DP2: link
26 Link DP3: link

100-Year Event
27 Node Listing
28 Subcat E1: E1
29 Subcat E2: E2
30 Subcat E3: E3
31 Link DP1: link
32 Link DP2: link
33 Link DP3: link

b. Proposed Conditions HydroCAD Report



Routing Diagram for POST

Prepared by Millennium Engineering, Inc, Printed 11/4/2024

HydroCAD® 10.20-5b s/n 02736 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.15	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.83	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.16	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.94	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
13,706	39	>75% Grass cover, Good, HSG A (P1, P2, P3, P4A, P4B)
7,879	98	Paved parking, HSG A (P4A, P4B, P5A, P5B)
5,769	98	Roofs, HSG A (P1, P2, P6)
27,354	**68**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
27,354	HSG A	P1, P2, P3, P4A, P4B, P5A, P5B, P6
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
27,354		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
13,706	0	0	0	0	13,706	>75% Grass cover, Good	
7,879	0	0	0	0	7,879	Paved parking	
5,769	0	0	0	0	5,769	Roofs	
27,354	**0**	**0**	**0**	**0**	**27,354**	**TOTAL AREA**	

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

Subcatchment P1: P1 Runoff Area=4,785 sf 11.64% Impervious Runoff Depth>0.05"
Tc=6.0 min CN=46 Runoff=0.00 cfs 20 cf

Subcatchment P2: P2 Runoff Area=8,858 sf 24.43% Impervious Runoff Depth>0.18"
Tc=6.0 min CN=53 Runoff=0.01 cfs 136 cf

Subcatchment P3: P3 Runoff Area=764 sf 0.00% Impervious Runoff Depth>0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment P4A: P4A Runoff Area=2,010 sf 85.82% Impervious Runoff Depth>2.12"
Tc=6.0 min CN=90 Runoff=0.11 cfs 355 cf

Subcatchment P4B: P4B Runoff Area=5,921 sf 70.70% Impervious Runoff Depth>1.43"
Tc=6.0 min CN=81 Runoff=0.22 cfs 705 cf

Subcatchment P5A: P5A Runoff Area=1,227 sf 100.00% Impervious Runoff Depth>2.92"
Tc=6.0 min CN=98 Runoff=0.08 cfs 298 cf

Subcatchment P5B: P5B Runoff Area=741 sf 100.00% Impervious Runoff Depth>2.92"
Tc=6.0 min CN=98 Runoff=0.05 cfs 180 cf

Subcatchment P6: P6 Runoff Area=3,048 sf 100.00% Impervious Runoff Depth>2.92"
Tc=6.0 min CN=98 Runoff=0.21 cfs 741 cf

Pond 1P: CB1 Peak Elev=119.29' Inflow=0.05 cfs 180 cf
12.0" Round Culvert n=0.013 L=7.5' S=0.0053 '/' Outflow=0.05 cfs 180 cf

Pond 2P: SUBSURFACE INFILTRATION #2 Peak Elev=114.36' Storage=214 cf Inflow=0.33 cfs 1,060 cf
Outflow=0.10 cfs 1,059 cf

Pond 3P: CB3 Peak Elev=115.06' Inflow=0.11 cfs 355 cf
12.0" Round Culvert n=0.013 L=30.5' S=0.0052 '/' Outflow=0.11 cfs 355 cf

Pond 4P: SUBSURFACE INFILTRATION #1 Peak Elev=119.09' Storage=138 cf Inflow=0.13 cfs 478 cf
Outflow=0.02 cfs 478 cf

Pond 5P: CB4 Peak Elev=115.11' Inflow=0.22 cfs 705 cf
8.0" Round Culvert n=0.013 L=14.5' S=0.0055 '/' Outflow=0.22 cfs 705 cf

Pond 6P: CDS2 Peak Elev=115.02' Inflow=0.33 cfs 1,060 cf
12.0" Round Culvert n=0.013 L=3.0' S=0.0333 '/' Outflow=0.33 cfs 1,060 cf

Pond 7P: CB2 Peak Elev=119.33' Inflow=0.08 cfs 298 cf
12.0" Round Culvert n=0.013 L=7.5' S=0.0053 '/' Outflow=0.08 cfs 298 cf

Pond 8P: DMH1 Peak Elev=119.23' Inflow=0.13 cfs 478 cf
12.0" Round Culvert n=0.013 L=22.0' S=0.0050 '/' Outflow=0.13 cfs 478 cf

Pond 9P: SUBSURFACE INFILTRATION #3 Peak Elev=115.25' Storage=201 cf Inflow=0.21 cfs 741 cf
Outflow=0.04 cfs 740 cf

Pond 10P: CDS1 Peak Elev=119.01' Inflow=0.13 cfs 478 cf
12.0" Round Culvert n=0.013 L=12.0' S=0.0083 '/' Outflow=0.13 cfs 478 cf

Link DP1: link Inflow=0.00 cfs 20 cf
Primary=0.00 cfs 20 cf

Link DP2: link Inflow=0.01 cfs 136 cf
Primary=0.01 cfs 136 cf

Link DP3: link Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 27,354 sf Runoff Volume = 2,435 cf Average Runoff Depth = 1.07"
50.11% Pervious = 13,706 sf 49.89% Impervious = 13,648 sf

Summary for Subcatchment P1: P1

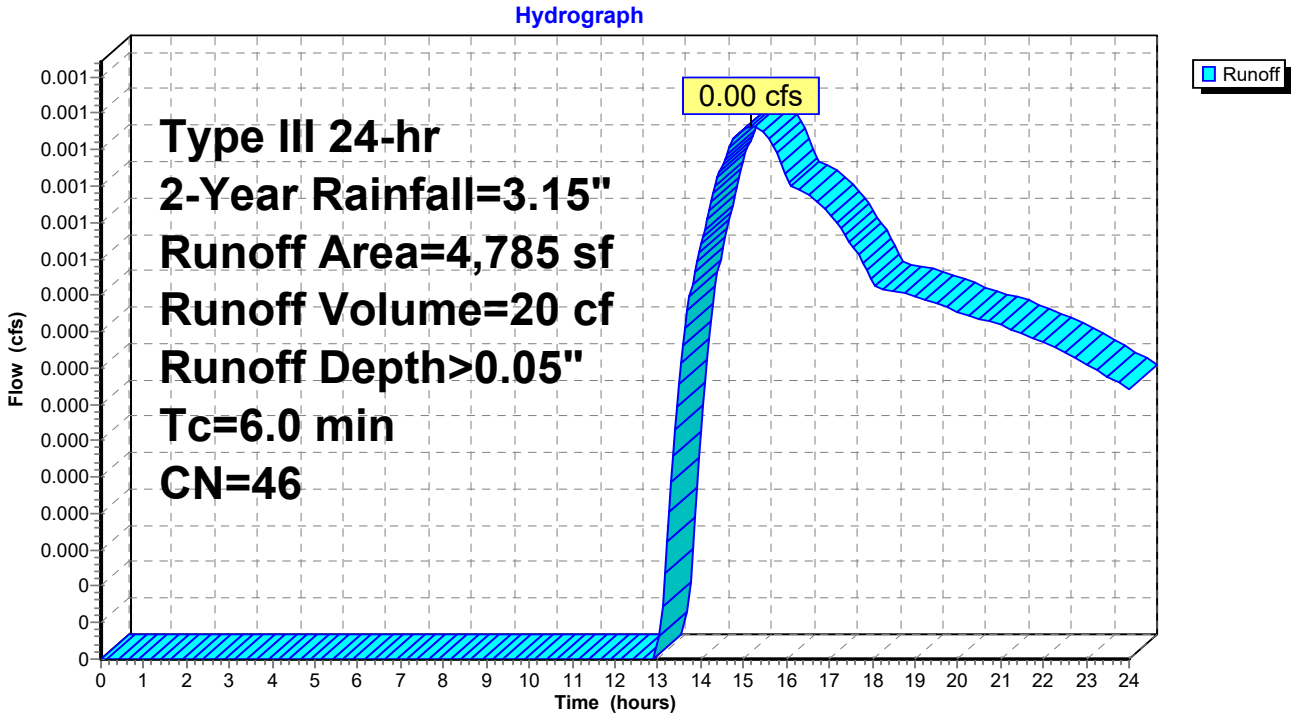
Runoff = 0.00 cfs @ 15.17 hrs, Volume= 20 cf, Depth> 0.05"
Routed to Link DP1 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
557	98	Roofs, HSG A
4,228	39	>75% Grass cover, Good, HSG A
4,785	46	Weighted Average
4,228		88.36% Pervious Area
557		11.64% Impervious Area

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

Subcatchment P1: P1



Summary for Subcatchment P2: P2

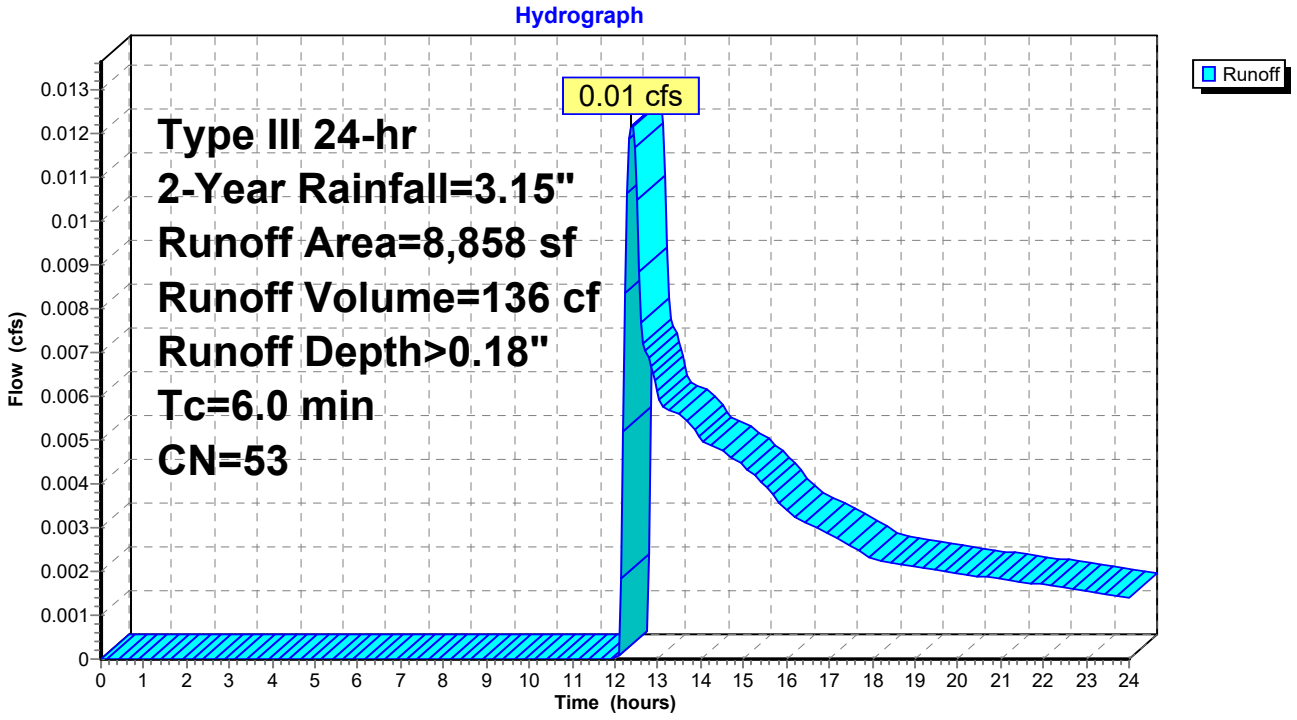
Runoff = 0.01 cfs @ 12.39 hrs, Volume= 136 cf, Depth> 0.18"
Routed to Link DP2 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
2,164	98	Roofs, HSG A
6,694	39	>75% Grass cover, Good, HSG A
8,858	53	Weighted Average
6,694		75.57% Pervious Area
2,164		24.43% Impervious Area

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

Subcatchment P2: P2



Summary for Subcatchment P3: P3

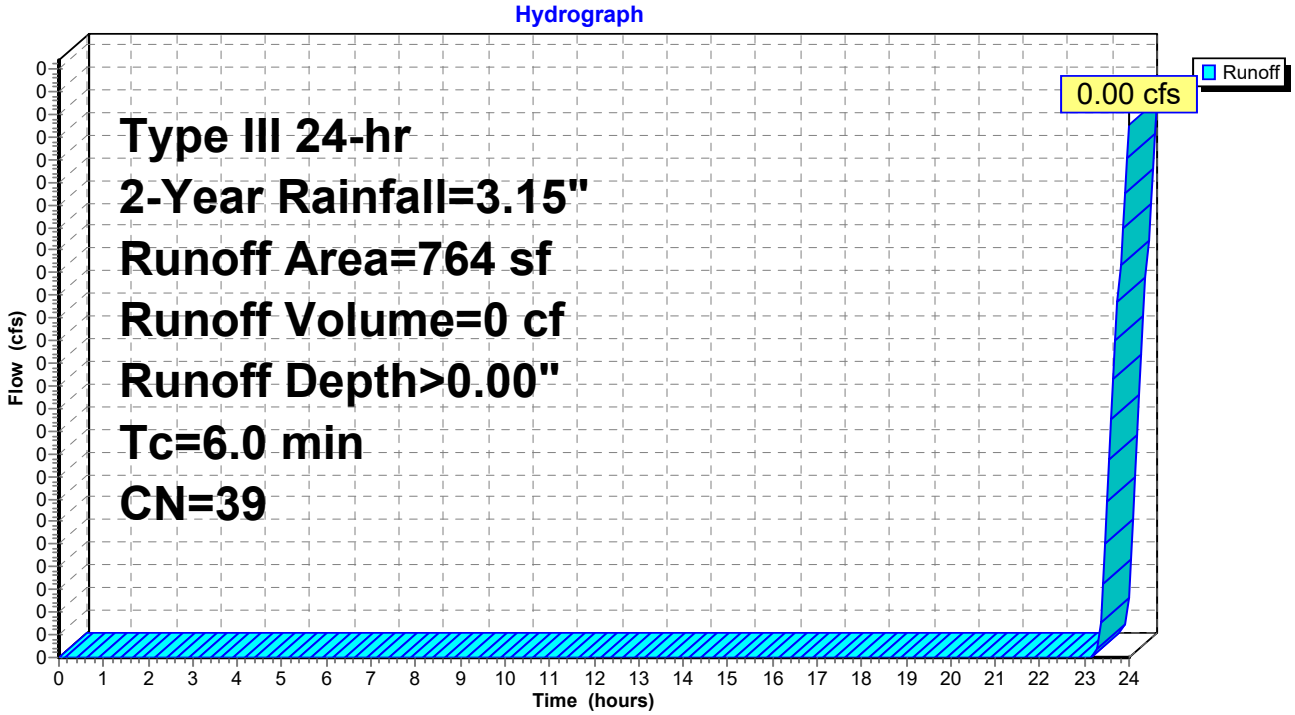
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0 cf, Depth> 0.00"
Routed to Link DP3 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
764	39	>75% Grass cover, Good, HSG A
764		100.00% Pervious Area

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

Subcatchment P3: P3



Summary for Subcatchment P4A: P4A

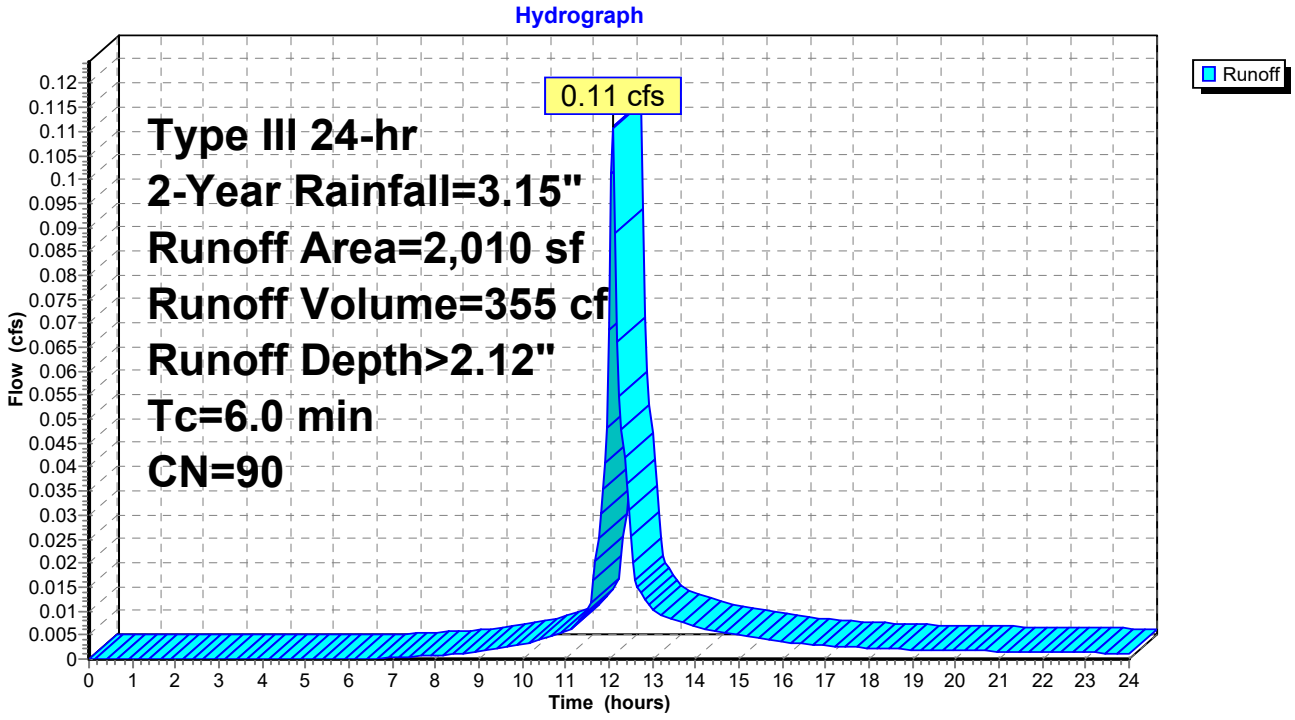
Runoff = 0.11 cfs @ 12.09 hrs, Volume= 355 cf, Depth> 2.12"
Routed to Pond 3P : CB3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
285	39	>75% Grass cover, Good, HSG A
1,725	98	Paved parking, HSG A
2,010	90	Weighted Average
285		14.18% Pervious Area
1,725		85.82% Impervious Area

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

Subcatchment P4A: P4A



Summary for Subcatchment P4B: P4B

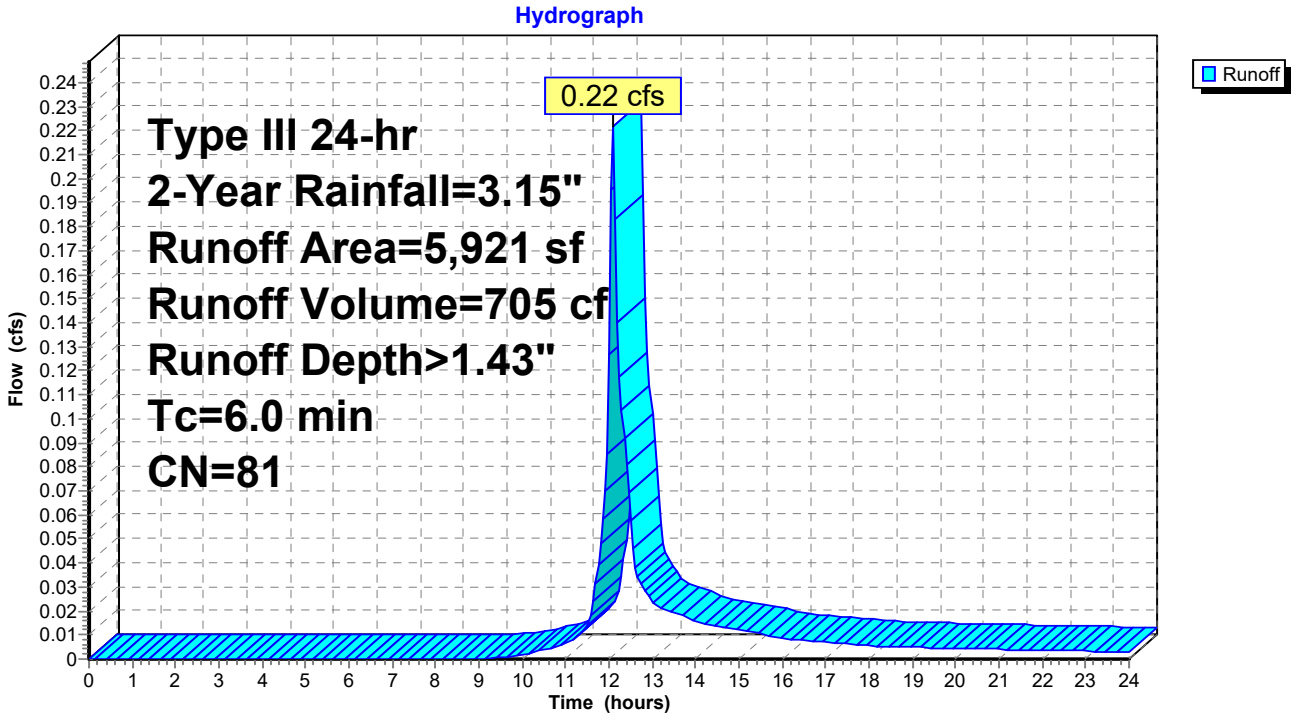
Runoff = 0.22 cfs @ 12.10 hrs, Volume= 705 cf, Depth> 1.43"
Routed to Pond 5P : CB4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
1,735	39	>75% Grass cover, Good, HSG A
4,186	98	Paved parking, HSG A
5,921	81	Weighted Average
1,735		29.30% Pervious Area
4,186		70.70% Impervious Area

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

Subcatchment P4B: P4B



Summary for Subcatchment P5A: P5A

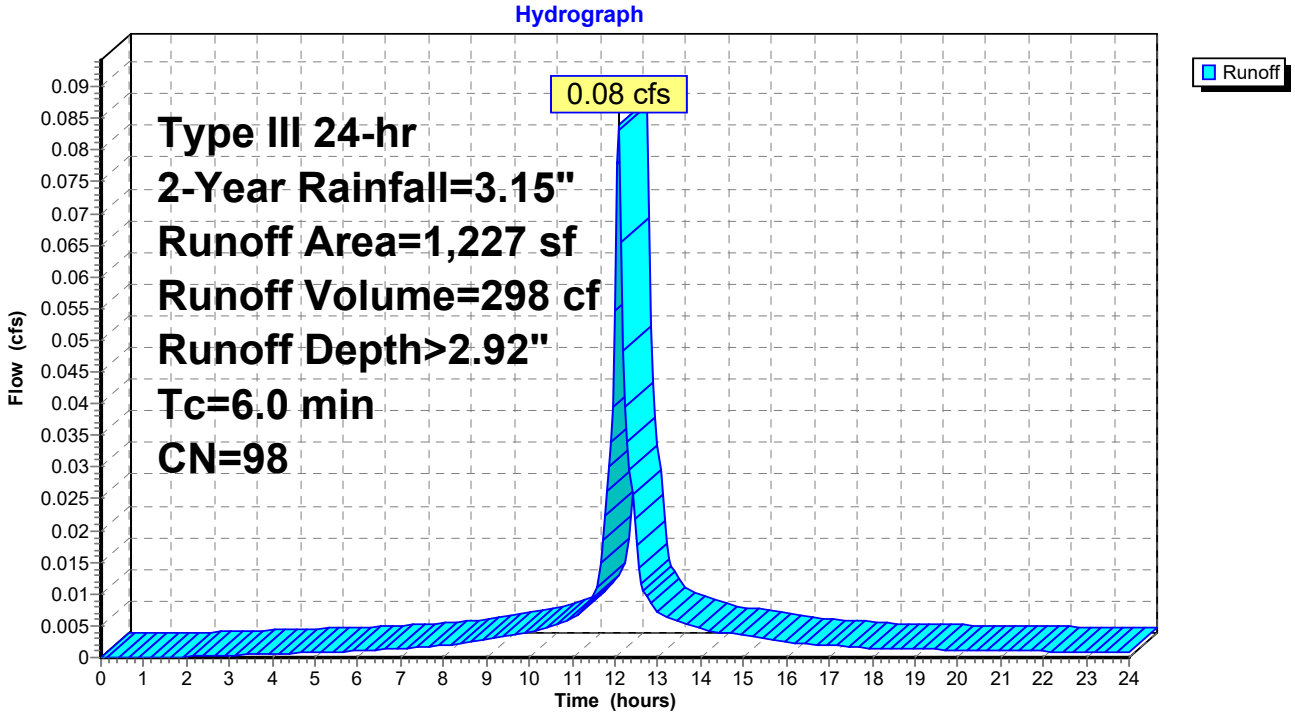
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 298 cf, Depth> 2.92"
Routed to Pond 7P : CB2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
1,227	98	Paved parking, HSG A
1,227		100.00% Impervious Area

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

Subcatchment P5A: P5A



Summary for Subcatchment P5B: P5B

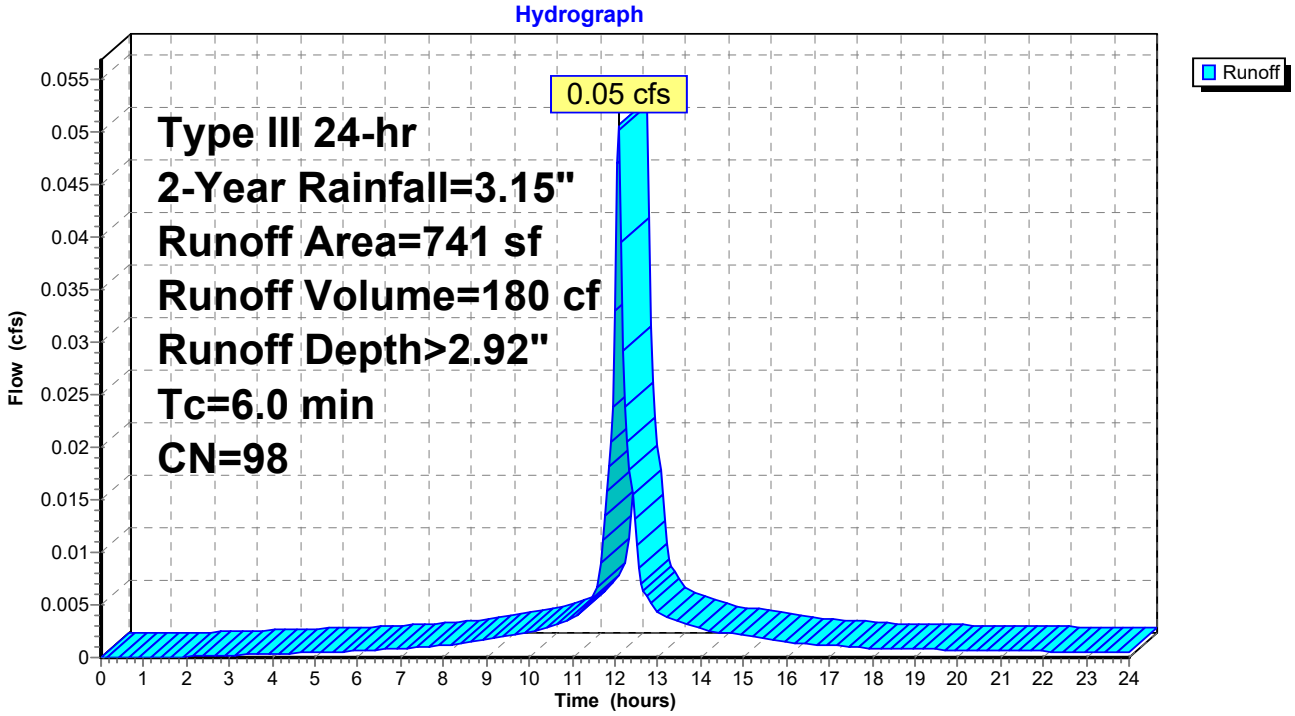
Runoff = 0.05 cfs @ 12.09 hrs, Volume= 180 cf, Depth> 2.92"
Routed to Pond 1P : CB1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
741	98	Paved parking, HSG A
741		100.00% Impervious Area

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

Subcatchment P5B: P5B



Summary for Subcatchment P6: P6

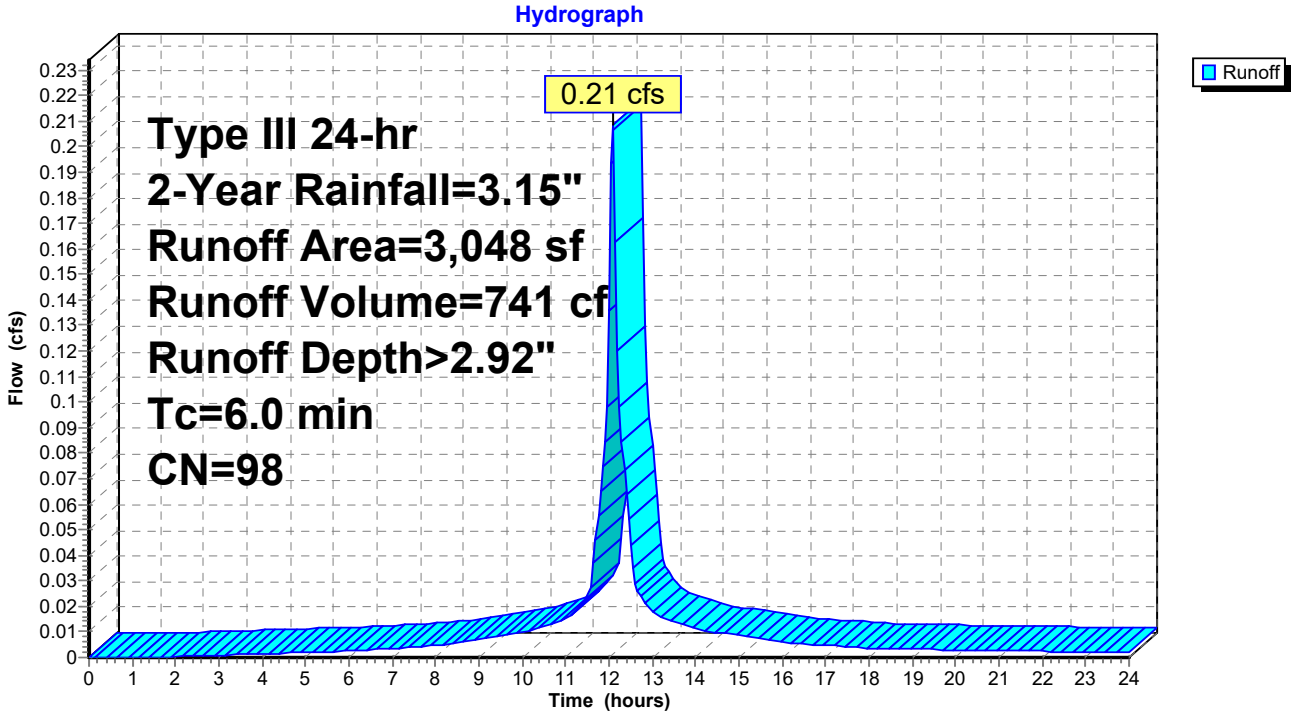
Runoff = 0.21 cfs @ 12.09 hrs, Volume= 741 cf, Depth> 2.92"
Routed to Pond 9P : SUBSURFACE INFILTRATION #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
3,048	98	Roofs, HSG A
3,048		100.00% Impervious Area

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

Subcatchment P6: P6



Summary for Pond 1P: CB1

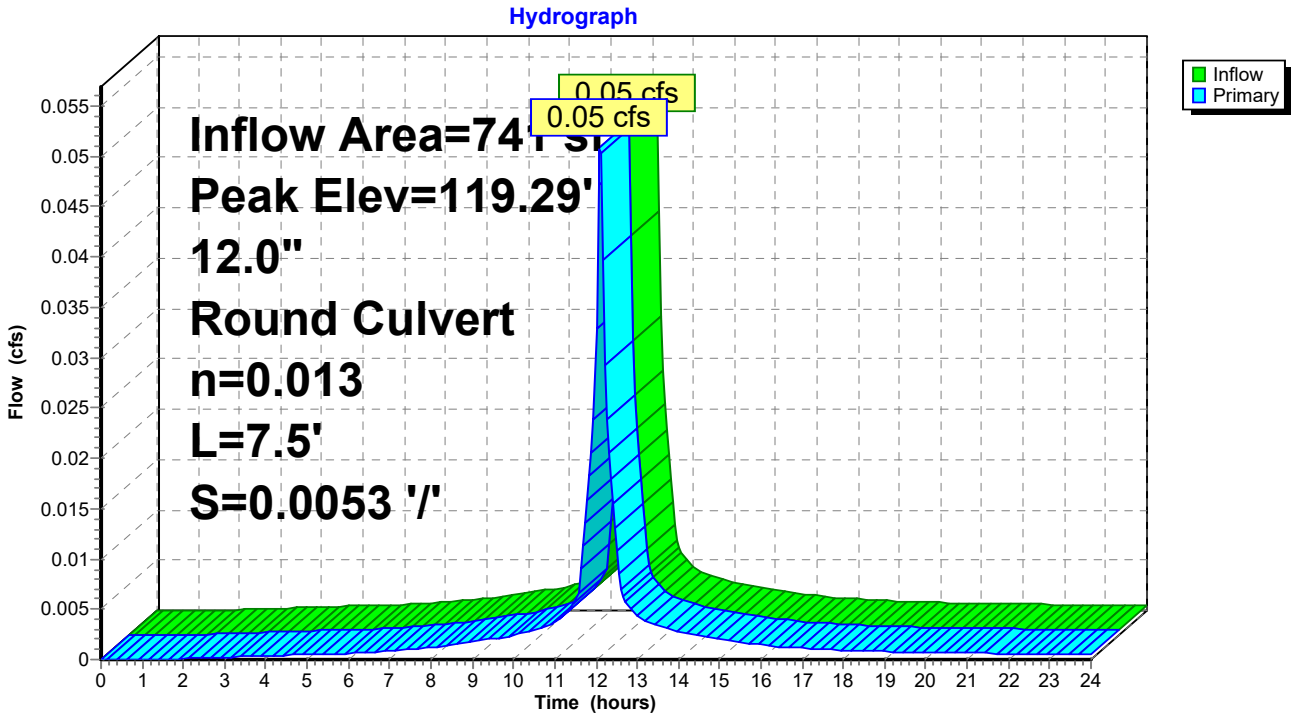
Inflow Area = 741 sf,100.00% Impervious, Inflow Depth > 2.92" for 2-Year event
Inflow = 0.05 cfs @ 12.09 hrs, Volume= 180 cf
Outflow = 0.05 cfs @ 12.09 hrs, Volume= 180 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.05 cfs @ 12.09 hrs, Volume= 180 cf
Routed to Pond 8P : DMH1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.29' @ 12.09 hrs
Flood Elev= 122.15'

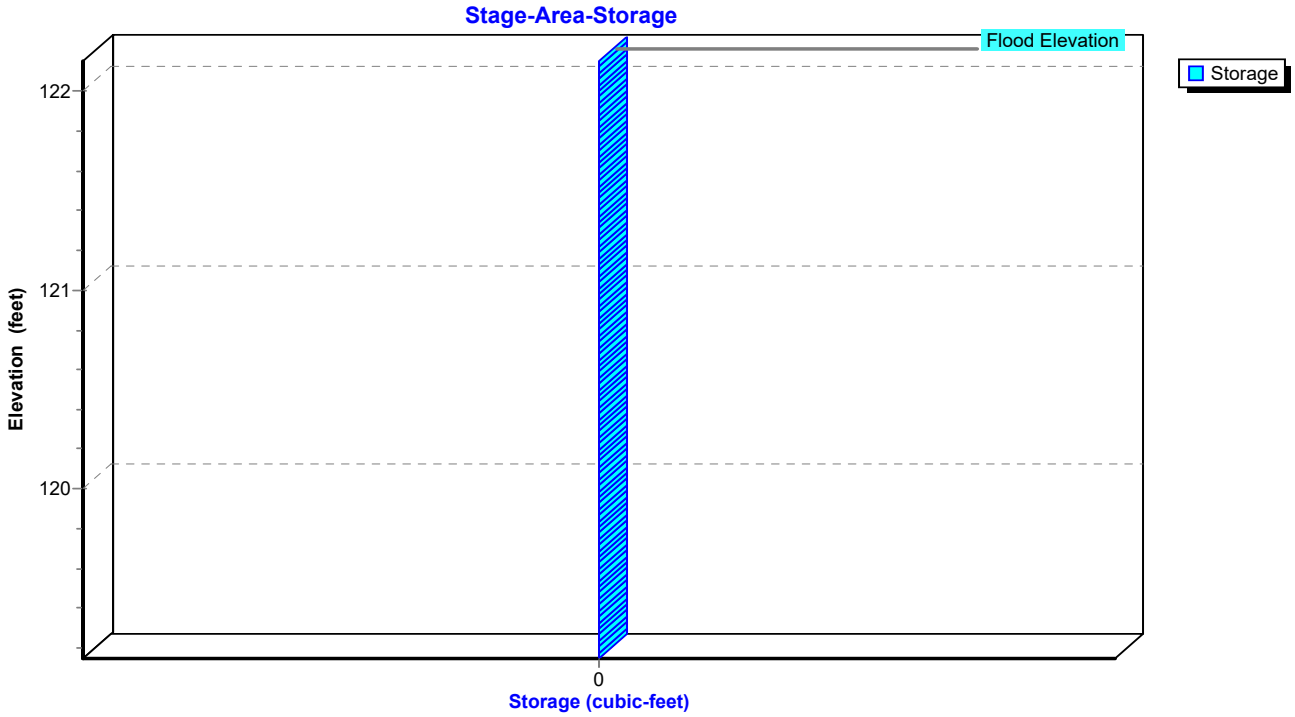
Device	Routing	Invert	Outlet Devices
#1	Primary	119.15'	**12.0" Round Culvert** L= 7.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.15' / 119.11' S= 0.0053 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.05 cfs @ 12.09 hrs HW=119.28' (Free Discharge)
1=Culvert (Barrel Controls 0.05 cfs @ 1.19 fps)

Pond 1P: CB1



Pond 1P: CB1


Stage-Area-Storage
Flood Elevation
Storage
122
121
120
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 1P: CB1

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
119.15	**0**	120.21	0	121.27	0
119.17	0	120.23	0	121.29	0
119.19	0	120.25	0	121.31	0
119.21	0	120.27	0	121.33	0
119.23	0	120.29	0	121.35	0
119.25	0	120.31	0	121.37	0
119.27	0	120.33	0	121.39	0
119.29	0	120.35	0	121.41	0
119.31	0	120.37	0	121.43	0
119.33	0	120.39	0	121.45	0
119.35	0	120.41	0	121.47	0
119.37	0	120.43	0	121.49	0
119.39	0	120.45	0	121.51	0
119.41	0	120.47	0	121.53	0
119.43	0	120.49	0	121.55	0
119.45	0	120.51	0	121.57	0
119.47	0	120.53	0	121.59	0
119.49	0	120.55	0	121.61	0
119.51	0	120.57	0	121.63	0
119.53	0	120.59	0	121.65	0
119.55	0	120.61	0	121.67	0
119.57	0	120.63	0	121.69	0
119.59	0	120.65	0	121.71	0
119.61	0	120.67	0	121.73	0
119.63	0	120.69	0	121.75	0
119.65	0	120.71	0	121.77	0
119.67	0	120.73	0	121.79	0
119.69	0	120.75	0	121.81	0
119.71	0	120.77	0	121.83	0
119.73	0	120.79	0	121.85	0
119.75	0	120.81	0	121.87	0
119.77	0	120.83	0	121.89	0
119.79	0	120.85	0	121.91	0
119.81	0	120.87	0	121.93	0
119.83	0	120.89	0	121.95	0
119.85	0	120.91	0	121.97	0
119.87	0	120.93	0	121.99	0
119.89	0	120.95	0	122.01	0
119.91	0	120.97	0	122.03	0
119.93	0	120.99	0	122.05	0
119.95	0	121.01	0	122.07	0
119.97	0	121.03	0	122.09	0
119.99	0	121.05	0	122.11	0
120.01	0	121.07	0	122.13	0
120.03	0	121.09	0	122.15	0
120.05	0	121.11	0		
120.07	0	121.13	0		
120.09	0	121.15	0		
120.11	0	121.17	0		
120.13	0	121.19	0		
120.15	0	121.21	0		
120.17	0	121.23	0		
120.19	0	121.25	0		

Summary for Pond 2P: SUBSURFACE INFILTRATION #2

Inflow Area = 7,931 sf, 74.53% Impervious, Inflow Depth > 1.60" for 2-Year event
Inflow = 0.33 cfs @ 12.09 hrs, Volume= 1,060 cf
Outflow = 0.10 cfs @ 12.46 hrs, Volume= 1,059 cf, Atten= 70%, Lag= 21.7 min
Primary = 0.10 cfs @ 12.46 hrs, Volume= 1,059 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 114.36' @ 12.46 hrs Surf.Area= 1,494 sf Storage= 214 cf

Plug-Flow detention time= 13.2 min calculated for 1,059 cf (100% of inflow)
Center-of-Mass det. time= 12.8 min (841.6 - 828.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.00'	1,064 cf	**28.17'W x 53.04'L x 2.33'H Field A** 3,486 cf Overall - 826 cf Embedded = 2,660 cf x 40.0% Voids
#2A	114.50'	826 cf	**ADS_StormTech SC-310 +Cap** x 56 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 56 Chambers in 8 Rows
		1,890 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	114.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 112.00'

Primary OutFlow Max=0.10 cfs @ 12.46 hrs HW=114.36' (Free Discharge)
1=Exfiltration (Controls 0.10 cfs)

Pond 2P: SUBSURFACE INFILTRATION #2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

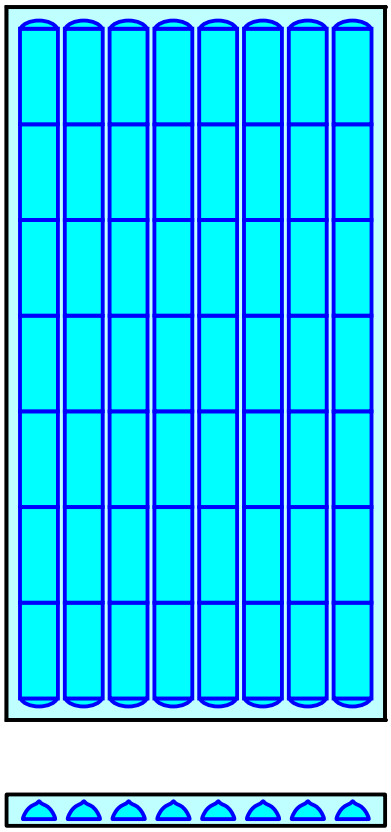
7 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 51.04' Row Length +12.0" End Stone x 2 = 53.04' Base Length
8 Rows x 34.0" Wide + 6.0" Spacing x 7 + 12.0" Side Stone x 2 = 28.17' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

56 Chambers x 14.7 cf = 825.5 cf Chamber Storage

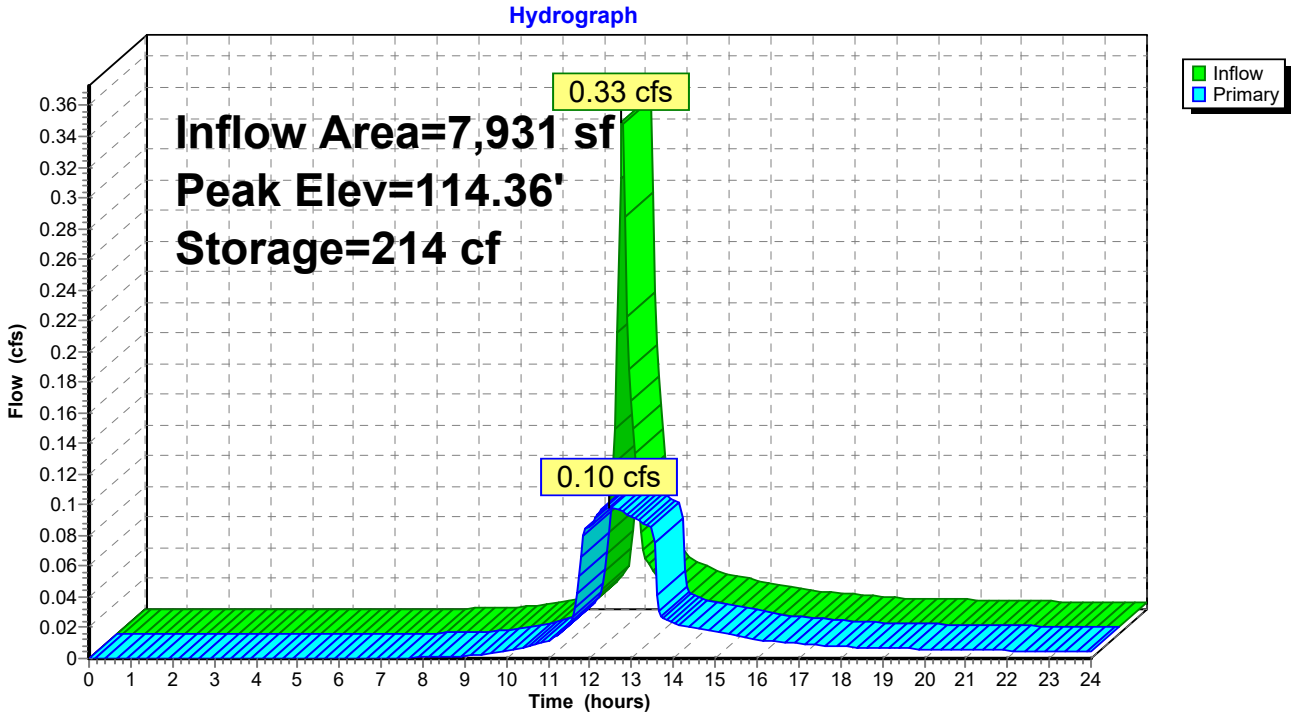
3,485.9 cf Field - 825.5 cf Chambers = 2,660.4 cf Stone x 40.0% Voids = 1,064.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,889.7 cf = 0.043 af
Overall Storage Efficiency = 54.2%
Overall System Size = 53.04' x 28.17' x 2.33'

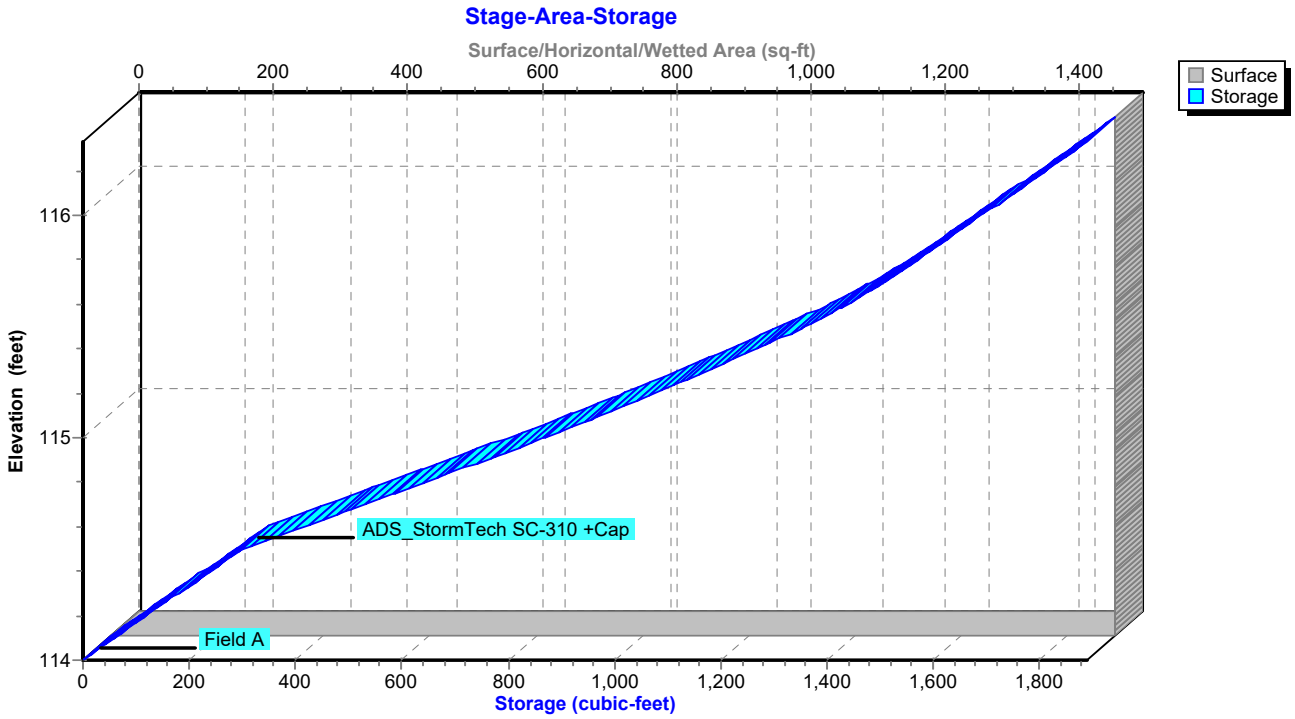
56 Chambers
129.1 cy Field
98.5 cy Stone



Pond 2P: SUBSURFACE INFILTRATION #2



Pond 2P: SUBSURFACE INFILTRATION #2



Stage-Area-Storage for Pond 2P: SUBSURFACE INFILTRATION #2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
114.00	**1,494**	0
114.05	1,494	30
114.10	1,494	60
114.15	1,494	90
114.20	1,494	120
114.25	1,494	149
114.30	1,494	179
114.35	1,494	209
114.40	1,494	239
114.45	1,494	269
114.50	1,494	299
114.55	1,494	357
114.60	1,494	416
114.65	1,494	474
114.70	1,494	532
114.75	1,494	589
114.80	1,494	646
114.85	1,494	702
114.90	1,494	757
114.95	1,494	812
115.00	1,494	866
115.05	1,494	920
115.10	1,494	973
115.15	1,494	1,024
115.20	1,494	1,075
115.25	1,494	1,125
115.30	1,494	1,174
115.35	1,494	1,222
115.40	1,494	1,268
115.45	1,494	1,313
115.50	1,494	1,357
115.55	1,494	1,398
115.60	1,494	1,436
115.65	1,494	1,473
115.70	1,494	1,507
115.75	1,494	1,539
115.80	1,494	1,571
115.85	1,494	1,601
115.90	1,494	1,631
115.95	1,494	1,661
116.00	1,494	1,690
116.05	1,494	1,720
116.10	1,494	1,750
116.15	1,494	1,780
116.20	1,494	1,810
116.25	1,494	1,840
116.30	1,494	**1,870**

Summary for Pond 3P: CB3

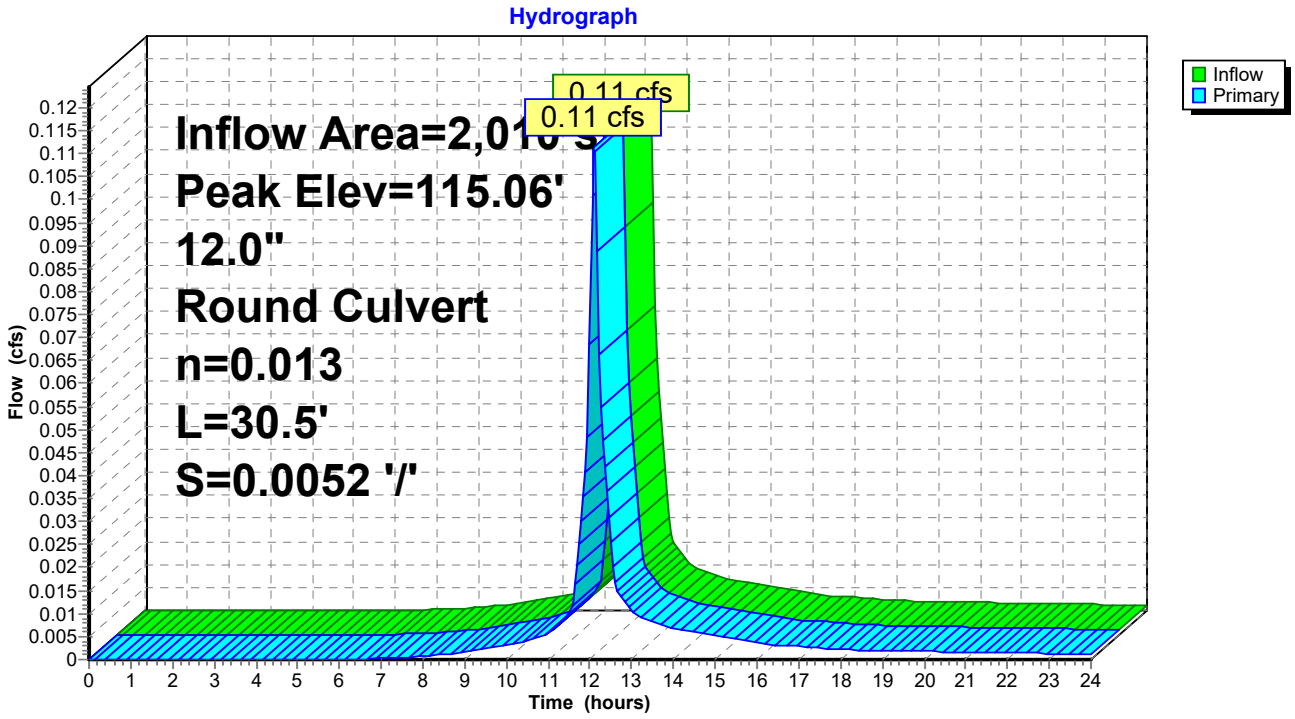
Inflow Area = 2,010 sf, 85.82% Impervious, Inflow Depth > 2.12" for 2-Year event
Inflow = 0.11 cfs @ 12.09 hrs, Volume= 355 cf
Outflow = 0.11 cfs @ 12.09 hrs, Volume= 355 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.11 cfs @ 12.09 hrs, Volume= 355 cf
Routed to Pond 6P : CDS2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.06' @ 12.09 hrs
Flood Elev= 118.00'

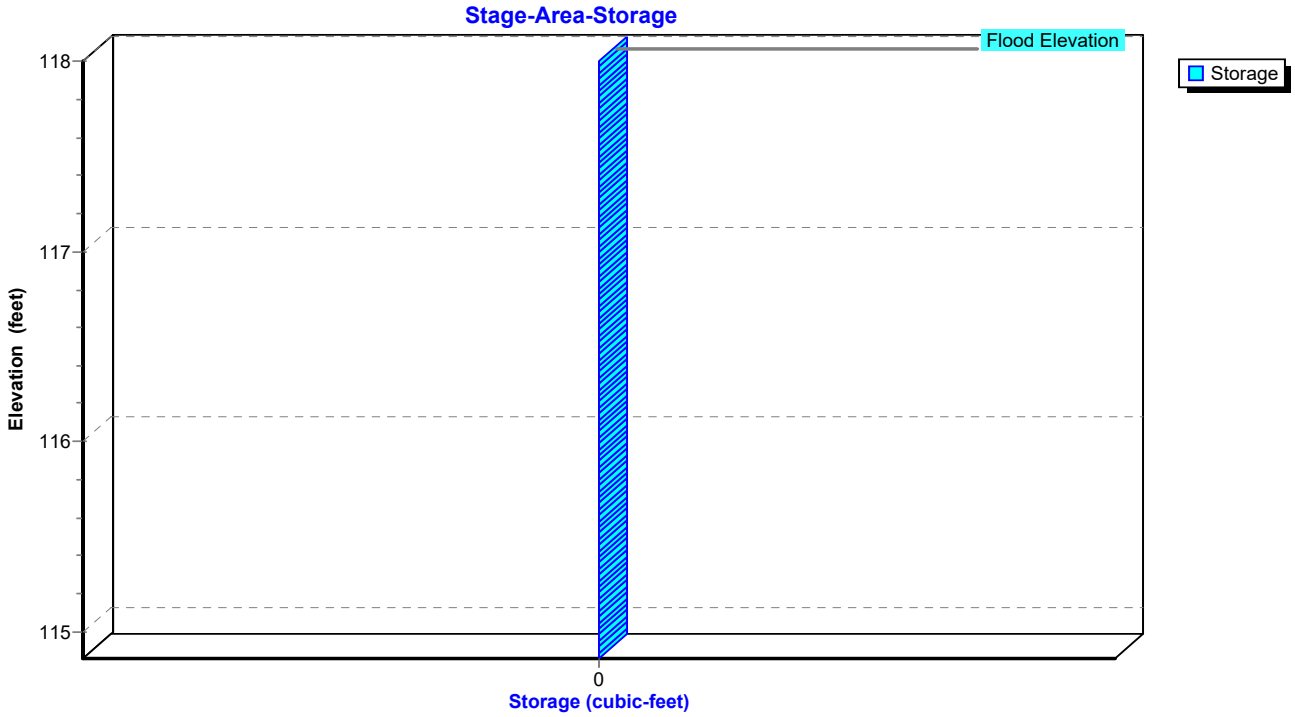
Device	Routing	Invert	Outlet Devices
#1	Primary	114.86'	**12.0" Round Culvert** L= 30.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 114.86' / 114.70' S= 0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.11 cfs @ 12.09 hrs HW=115.05' (Free Discharge)
1=Culvert (Barrel Controls 0.11 cfs @ 1.54 fps)

Pond 3P: CB3



Pond 3P: CB3


Stage-Area-Storage
Flood Elevation
Storage
118
117
116
115
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 3P: CB3

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
114.86	**0**	115.92	0	116.98	0
114.88	0	115.94	0	117.00	0
114.90	0	115.96	0	117.02	0
114.92	0	115.98	0	117.04	0
114.94	0	116.00	0	117.06	0
114.96	0	116.02	0	117.08	0
114.98	0	116.04	0	117.10	0
115.00	0	116.06	0	117.12	0
115.02	0	116.08	0	117.14	0
115.04	0	116.10	0	117.16	0
115.06	0	116.12	0	117.18	0
115.08	0	116.14	0	117.20	0
115.10	0	116.16	0	117.22	0
115.12	0	116.18	0	117.24	0
115.14	0	116.20	0	117.26	0
115.16	0	116.22	0	117.28	0
115.18	0	116.24	0	117.30	0
115.20	0	116.26	0	117.32	0
115.22	0	116.28	0	117.34	0
115.24	0	116.30	0	117.36	0
115.26	0	116.32	0	117.38	0
115.28	0	116.34	0	117.40	0
115.30	0	116.36	0	117.42	0
115.32	0	116.38	0	117.44	0
115.34	0	116.40	0	117.46	0
115.36	0	116.42	0	117.48	0
115.38	0	116.44	0	117.50	0
115.40	0	116.46	0	117.52	0
115.42	0	116.48	0	117.54	0
115.44	0	116.50	0	117.56	0
115.46	0	116.52	0	117.58	0
115.48	0	116.54	0	117.60	0
115.50	0	116.56	0	117.62	0
115.52	0	116.58	0	117.64	0
115.54	0	116.60	0	117.66	0
115.56	0	116.62	0	117.68	0
115.58	0	116.64	0	117.70	0
115.60	0	116.66	0	117.72	0
115.62	0	116.68	0	117.74	0
115.64	0	116.70	0	117.76	0
115.66	0	116.72	0	117.78	0
115.68	0	116.74	0	117.80	0
115.70	0	116.76	0	117.82	0
115.72	0	116.78	0	117.84	0
115.74	0	116.80	0	117.86	0
115.76	0	116.82	0	117.88	0
115.78	0	116.84	0	117.90	0
115.80	0	116.86	0	117.92	0
115.82	0	116.88	0	117.94	0
115.84	0	116.90	0	117.96	0
115.86	0	116.92	0	117.98	0
115.88	0	116.94	0	118.00	0
115.90	0	116.96	0		

Summary for Pond 4P: SUBSURFACE INFILTRATION #1

Inflow Area = 1,968 sf,100.00% Impervious, Inflow Depth > 2.92" for 2-Year event
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 478 cf
Outflow = 0.02 cfs @ 12.56 hrs, Volume= 478 cf, Atten= 83%, Lag= 28.1 min
Primary = 0.02 cfs @ 12.56 hrs, Volume= 478 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.09' @ 12.56 hrs Surf.Area= 281 sf Storage= 138 cf

Plug-Flow detention time= 40.0 min calculated for 477 cf (100% of inflow)
Center-of-Mass det. time= 39.5 min (795.8 - 756.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	118.20'	277 cf	**15.75'W x 17.86'L x 3.50'H Field A** 984 cf Overall - 292 cf Embedded = 693 cf x 40.0% Voids
#2A	118.70'	292 cf	**ADS_StormTech SC-740 b +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 6 Chambers in 3 Rows Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf
		569 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	118.20'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 116.16'

Primary OutFlow Max=0.02 cfs @ 12.56 hrs HW=119.09' (Free Discharge)
↑**1=Exfiltration** (Controls 0.02 cfs)

Pond 4P: SUBSURFACE INFILTRATION #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 b +Cap (ADS StormTech® SC-740 with cap storage)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

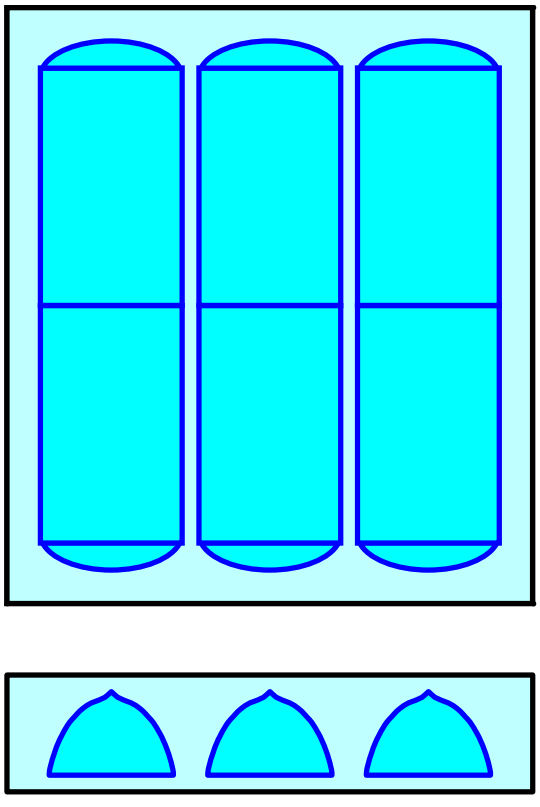
2 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 15.86' Row Length +12.0" End Stone x 2 = 17.86' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

6 Chambers x 45.9 cf + 2.7 cf Cap Volume x 2 x 3 Rows = 291.6 cf Chamber Storage

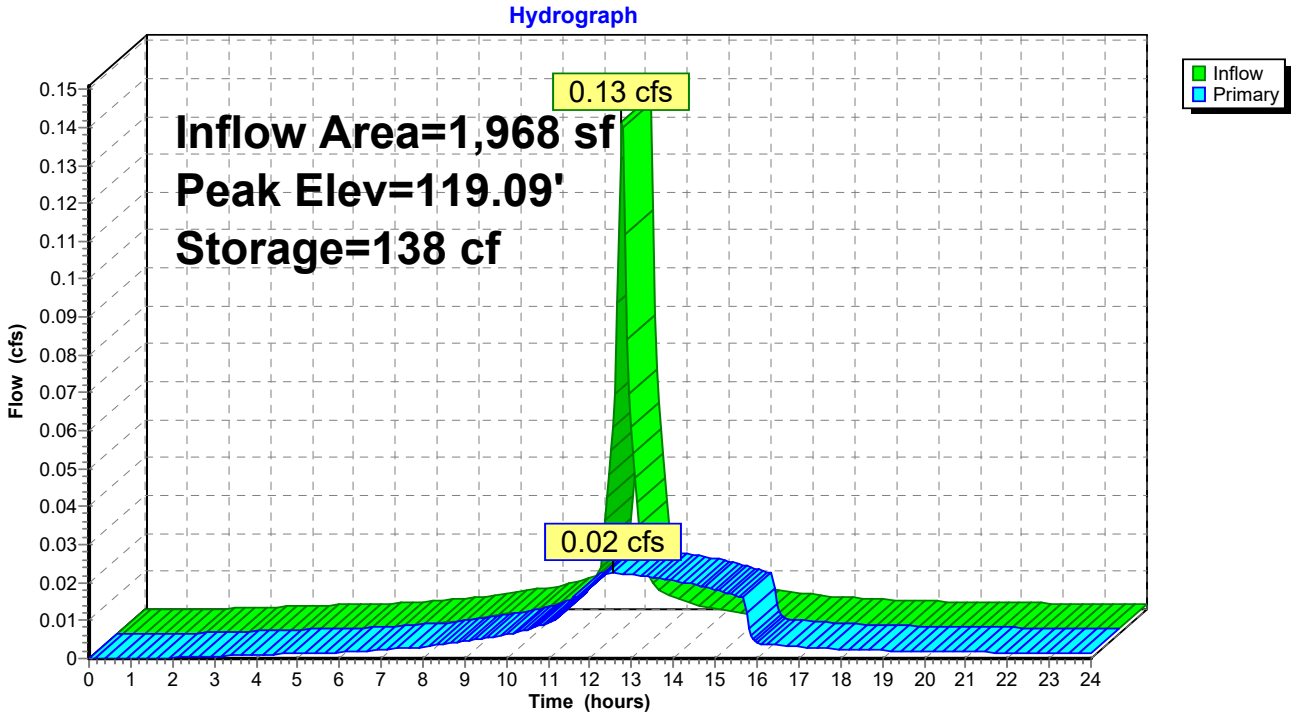
984.3 cf Field - 291.6 cf Chambers = 692.8 cf Stone x 40.0% Voids = 277.1 cf Stone Storage

Chamber Storage + Stone Storage = 568.7 cf = 0.013 af
Overall Storage Efficiency = 57.8%
Overall System Size = 17.86' x 15.75' x 3.50'

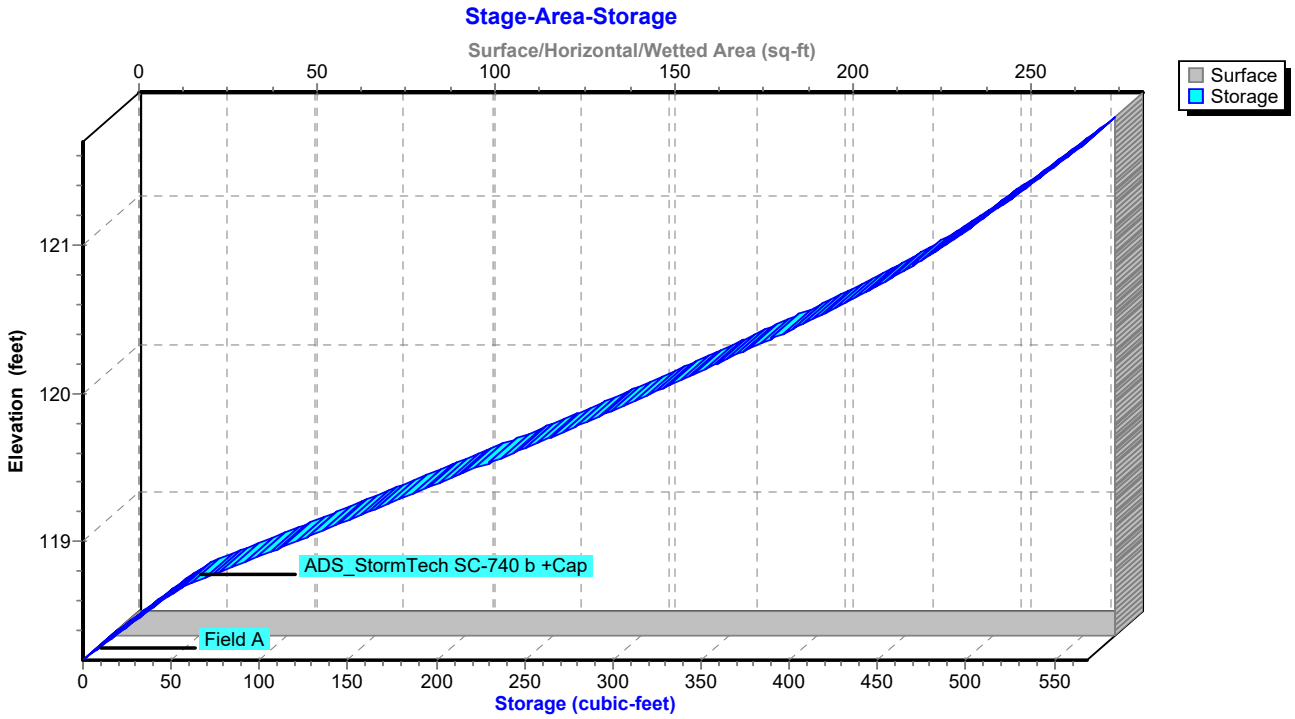
6 Chambers
36.5 cy Field
25.7 cy Stone



Pond 4P: SUBSURFACE INFILTRATION #1



Pond 4P: SUBSURFACE INFILTRATION #1



Stage-Area-Storage for Pond 4P: SUBSURFACE INFILTRATION #1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
118.20	**281**	0
118.25	281	6
118.30	281	11
118.35	281	17
118.40	281	22
118.45	281	28
118.50	281	34
118.55	281	39
118.60	281	45
118.65	281	51
118.70	281	56
118.75	281	67
118.80	281	78
118.85	281	88
118.90	281	99
118.95	281	109
119.00	281	120
119.05	281	131
119.10	281	141
119.15	281	151
119.20	281	162
119.25	281	172
119.30	281	183
119.35	281	193
119.40	281	203
119.45	281	213
119.50	281	223
119.55	281	234
119.60	281	244
119.65	281	254
119.70	281	264
119.75	281	273
119.80	281	283
119.85	281	293
119.90	281	303
119.95	281	312
120.00	281	322
120.05	281	331
120.10	281	341
120.15	281	350
120.20	281	359
120.25	281	368
120.30	281	377
120.35	281	386
120.40	281	395
120.45	281	404
120.50	281	412
120.55	281	421
120.60	281	429
120.65	281	437
120.70	281	445
120.75	281	453
120.80	281	461
120.85	281	468
120.90	281	475
120.95	281	482
121.00	281	489
121.05	281	495
121.10	281	501
121.15	281	507
121.20	281	512
121.25	281	518
121.30	281	524
121.35	281	529
121.40	281	535
121.45	281	541
121.50	281	546
121.55	281	552
121.60	281	557
121.65	281	563
121.70	281	**569**

Summary for Pond 5P: CB4

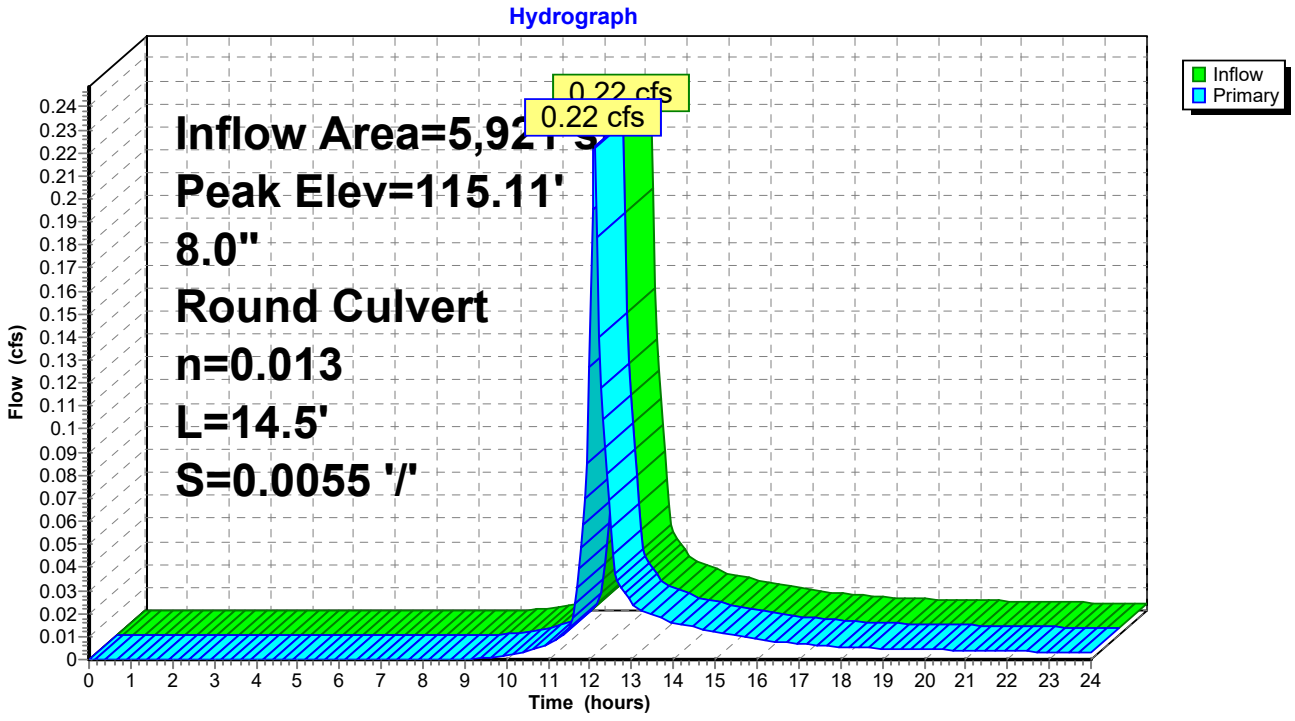
Inflow Area = 5,921 sf, 70.70% Impervious, Inflow Depth > 1.43" for 2-Year event
Inflow = 0.22 cfs @ 12.10 hrs, Volume= 705 cf
Outflow = 0.22 cfs @ 12.10 hrs, Volume= 705 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.22 cfs @ 12.10 hrs, Volume= 705 cf
Routed to Pond 6P : CDS2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.11' @ 12.10 hrs
Flood Elev= 117.40'

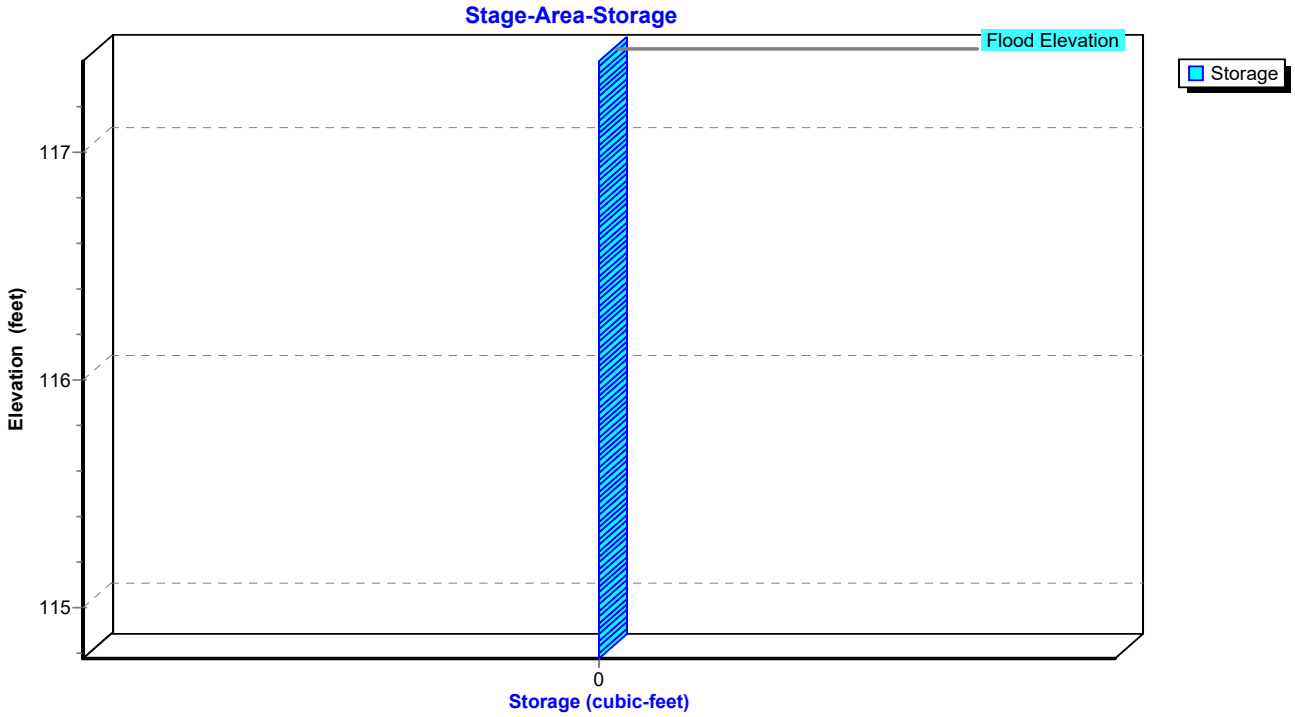
Device	Routing	Invert	Outlet Devices
#1	Primary	114.78'	**8.0" Round Culvert** L= 14.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 114.78' / 114.70' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.22 cfs @ 12.10 hrs HW=115.11' (Free Discharge)
1=Culvert (Barrel Controls 0.22 cfs @ 1.88 fps)

Pond 5P: CB4



Pond 5P: CB4


Stage-Area-Storage
Flood Elevation
Storage
117
116
115
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 5P: CB4

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
114.78	**0**	115.84	0	116.90	0
114.80	0	115.86	0	116.92	0
114.82	0	115.88	0	116.94	0
114.84	0	115.90	0	116.96	0
114.86	0	115.92	0	116.98	0
114.88	0	115.94	0	117.00	0
114.90	0	115.96	0	117.02	0
114.92	0	115.98	0	117.04	0
114.94	0	116.00	0	117.06	0
114.96	0	116.02	0	117.08	0
114.98	0	116.04	0	117.10	0
115.00	0	116.06	0	117.12	0
115.02	0	116.08	0	117.14	0
115.04	0	116.10	0	117.16	0
115.06	0	116.12	0	117.18	0
115.08	0	116.14	0	117.20	0
115.10	0	116.16	0	117.22	0
115.12	0	116.18	0	117.24	0
115.14	0	116.20	0	117.26	0
115.16	0	116.22	0	117.28	0
115.18	0	116.24	0	117.30	0
115.20	0	116.26	0	117.32	0
115.22	0	116.28	0	117.34	0
115.24	0	116.30	0	117.36	0
115.26	0	116.32	0	117.38	0
115.28	0	116.34	0	117.40	0
115.30	0	116.36	0		
115.32	0	116.38	0		
115.34	0	116.40	0		
115.36	0	116.42	0		
115.38	0	116.44	0		
115.40	0	116.46	0		
115.42	0	116.48	0		
115.44	0	116.50	0		
115.46	0	116.52	0		
115.48	0	116.54	0		
115.50	0	116.56	0		
115.52	0	116.58	0		
115.54	0	116.60	0		
115.56	0	116.62	0		
115.58	0	116.64	0		
115.60	0	116.66	0		
115.62	0	116.68	0		
115.64	0	116.70	0		
115.66	0	116.72	0		
115.68	0	116.74	0		
115.70	0	116.76	0		
115.72	0	116.78	0		
115.74	0	116.80	0		
115.76	0	116.82	0		
115.78	0	116.84	0		
115.80	0	116.86	0		
115.82	0	116.88	0		

Summary for Pond 6P: CDS2

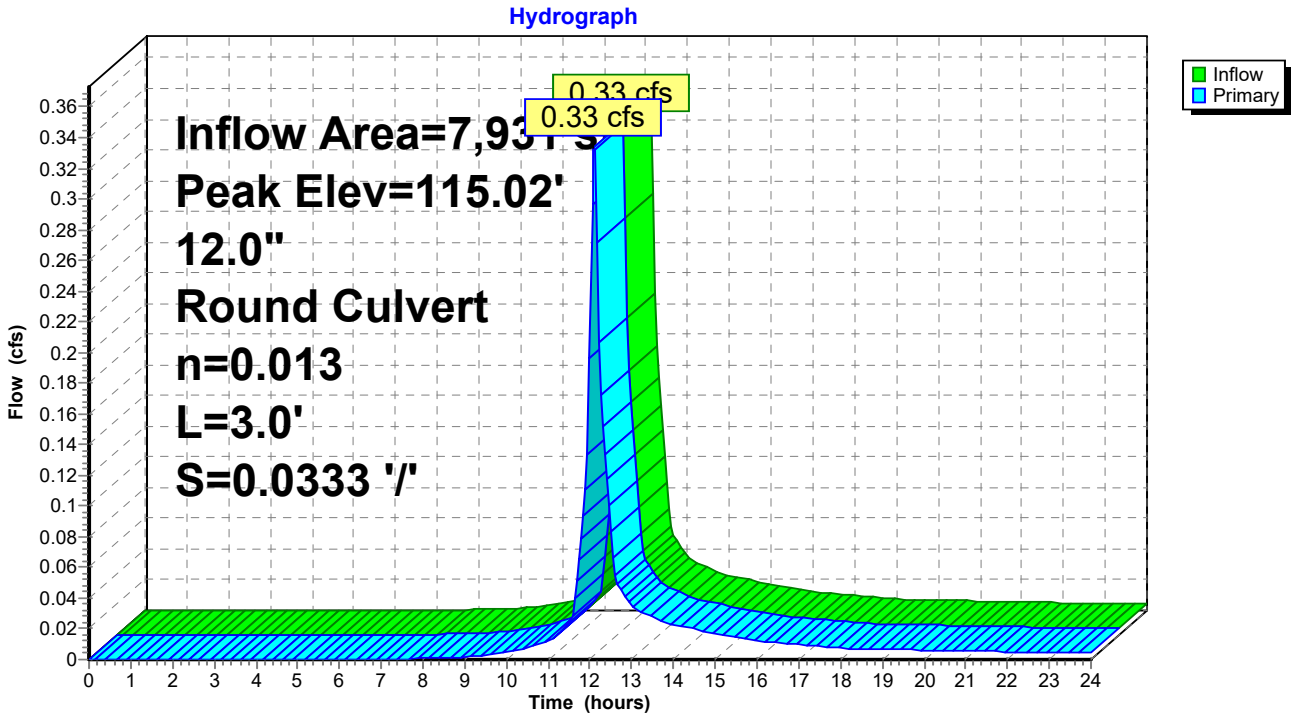
Inflow Area = 7,931 sf, 74.53% Impervious, Inflow Depth > 1.60" for 2-Year event
Inflow = 0.33 cfs @ 12.09 hrs, Volume= 1,060 cf
Outflow = 0.33 cfs @ 12.09 hrs, Volume= 1,060 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.33 cfs @ 12.09 hrs, Volume= 1,060 cf
Routed to Pond 2P : SUBSURFACE INFILTRATION #2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.02' @ 12.09 hrs
Flood Elev= 118.00'

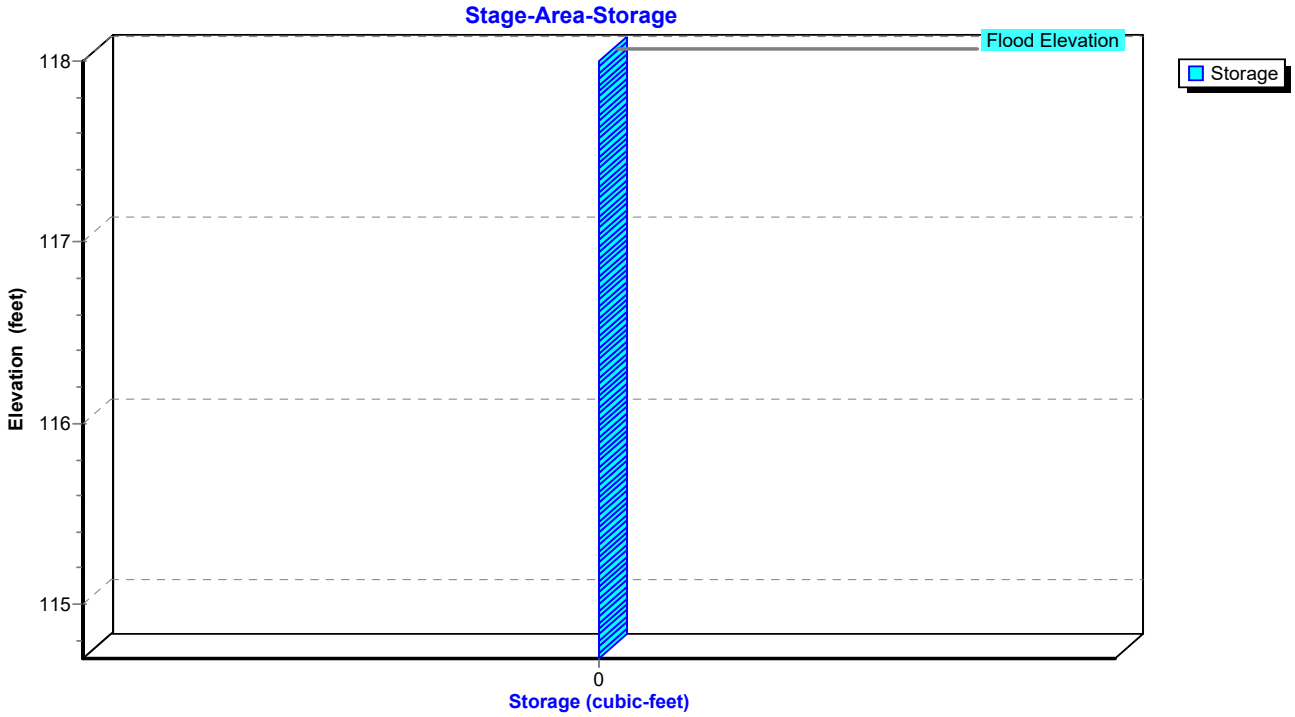
Device	Routing	Invert	Outlet Devices
#1	Primary	114.70'	**12.0" Round Culvert** L= 3.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 114.70' / 114.60' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.33 cfs @ 12.09 hrs HW=115.02' (Free Discharge)
1=Culvert (Inlet Controls 0.33 cfs @ 1.52 fps)

Pond 6P: CDS2



Pond 6P: CDS2


Stage-Area-Storage
Flood Elevation
Storage
118
117
116
115
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 6P: CDS2

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
114.70	**0**	117.35	0
114.75	0	117.40	0
114.80	0	117.45	0
114.85	0	117.50	0
114.90	0	117.55	0
114.95	0	117.60	0
115.00	0	117.65	0
115.05	0	117.70	0
115.10	0	117.75	0
115.15	0	117.80	0
115.20	0	117.85	0
115.25	0	117.90	0
115.30	0	117.95	0
115.35	0	118.00	0
115.40	0		
115.45	0		
115.50	0		
115.55	0		
115.60	0		
115.65	0		
115.70	0		
115.75	0		
115.80	0		
115.85	0		
115.90	0		
115.95	0		
116.00	0		
116.05	0		
116.10	0		
116.15	0		
116.20	0		
116.25	0		
116.30	0		
116.35	0		
116.40	0		
116.45	0		
116.50	0		
116.55	0		
116.60	0		
116.65	0		
116.70	0		
116.75	0		
116.80	0		
116.85	0		
116.90	0		
116.95	0		
117.00	0		
117.05	0		
117.10	0		
117.15	0		
117.20	0		
117.25	0		
117.30	0		

Summary for Pond 7P: CB2

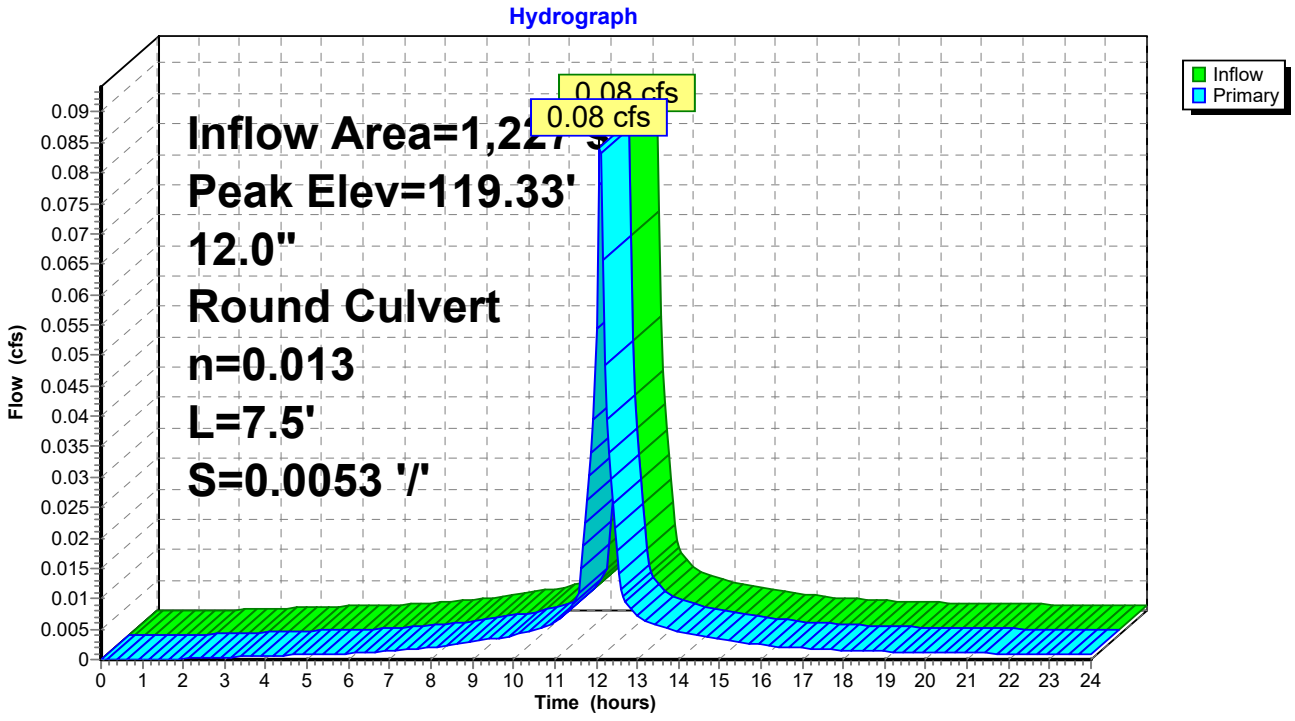
Inflow Area = 1,227 sf,100.00% Impervious, Inflow Depth > 2.92" for 2-Year event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 298 cf
Outflow = 0.08 cfs @ 12.09 hrs, Volume= 298 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.08 cfs @ 12.09 hrs, Volume= 298 cf
Routed to Pond 8P : DMH1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.33' @ 12.09 hrs
Flood Elev= 122.15'

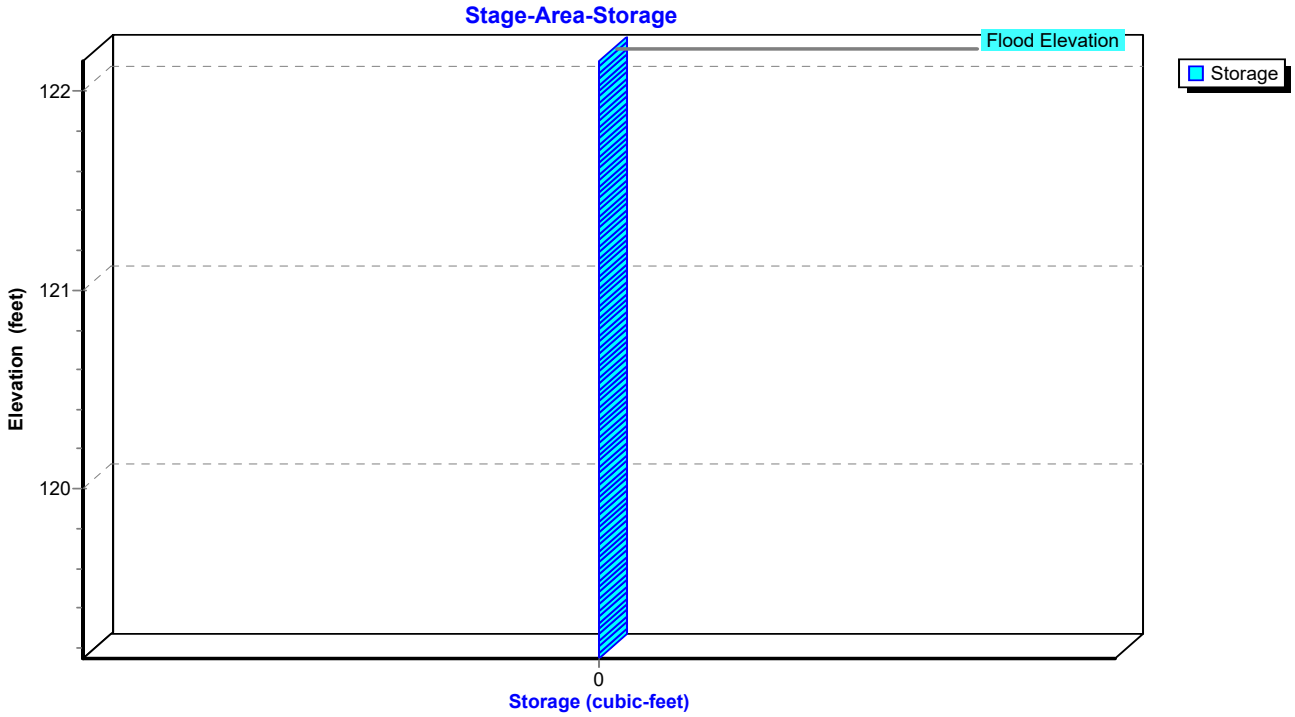
Device	Routing	Invert	Outlet Devices
#1	Primary	119.15'	**12.0" Round Culvert** L= 7.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.15' / 119.11' S= 0.0053 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.08 cfs @ 12.09 hrs HW=119.32' (Free Discharge)
1=Culvert (Barrel Controls 0.08 cfs @ 1.35 fps)

Pond 7P: CB2



Pond 7P: CB2


Stage-Area-Storage
Flood Elevation
Storage
122
121
120
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 7P: CB2

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
119.15	**0**	120.21	0	121.27	0
119.17	0	120.23	0	121.29	0
119.19	0	120.25	0	121.31	0
119.21	0	120.27	0	121.33	0
119.23	0	120.29	0	121.35	0
119.25	0	120.31	0	121.37	0
119.27	0	120.33	0	121.39	0
119.29	0	120.35	0	121.41	0
119.31	0	120.37	0	121.43	0
119.33	0	120.39	0	121.45	0
119.35	0	120.41	0	121.47	0
119.37	0	120.43	0	121.49	0
119.39	0	120.45	0	121.51	0
119.41	0	120.47	0	121.53	0
119.43	0	120.49	0	121.55	0
119.45	0	120.51	0	121.57	0
119.47	0	120.53	0	121.59	0
119.49	0	120.55	0	121.61	0
119.51	0	120.57	0	121.63	0
119.53	0	120.59	0	121.65	0
119.55	0	120.61	0	121.67	0
119.57	0	120.63	0	121.69	0
119.59	0	120.65	0	121.71	0
119.61	0	120.67	0	121.73	0
119.63	0	120.69	0	121.75	0
119.65	0	120.71	0	121.77	0
119.67	0	120.73	0	121.79	0
119.69	0	120.75	0	121.81	0
119.71	0	120.77	0	121.83	0
119.73	0	120.79	0	121.85	0
119.75	0	120.81	0	121.87	0
119.77	0	120.83	0	121.89	0
119.79	0	120.85	0	121.91	0
119.81	0	120.87	0	121.93	0
119.83	0	120.89	0	121.95	0
119.85	0	120.91	0	121.97	0
119.87	0	120.93	0	121.99	0
119.89	0	120.95	0	122.01	0
119.91	0	120.97	0	122.03	0
119.93	0	120.99	0	122.05	0
119.95	0	121.01	0	122.07	0
119.97	0	121.03	0	122.09	0
119.99	0	121.05	0	122.11	0
120.01	0	121.07	0	122.13	0
120.03	0	121.09	0	122.15	0
120.05	0	121.11	0		
120.07	0	121.13	0		
120.09	0	121.15	0		
120.11	0	121.17	0		
120.13	0	121.19	0		
120.15	0	121.21	0		
120.17	0	121.23	0		
120.19	0	121.25	0		

Summary for Pond 8P: DMH1

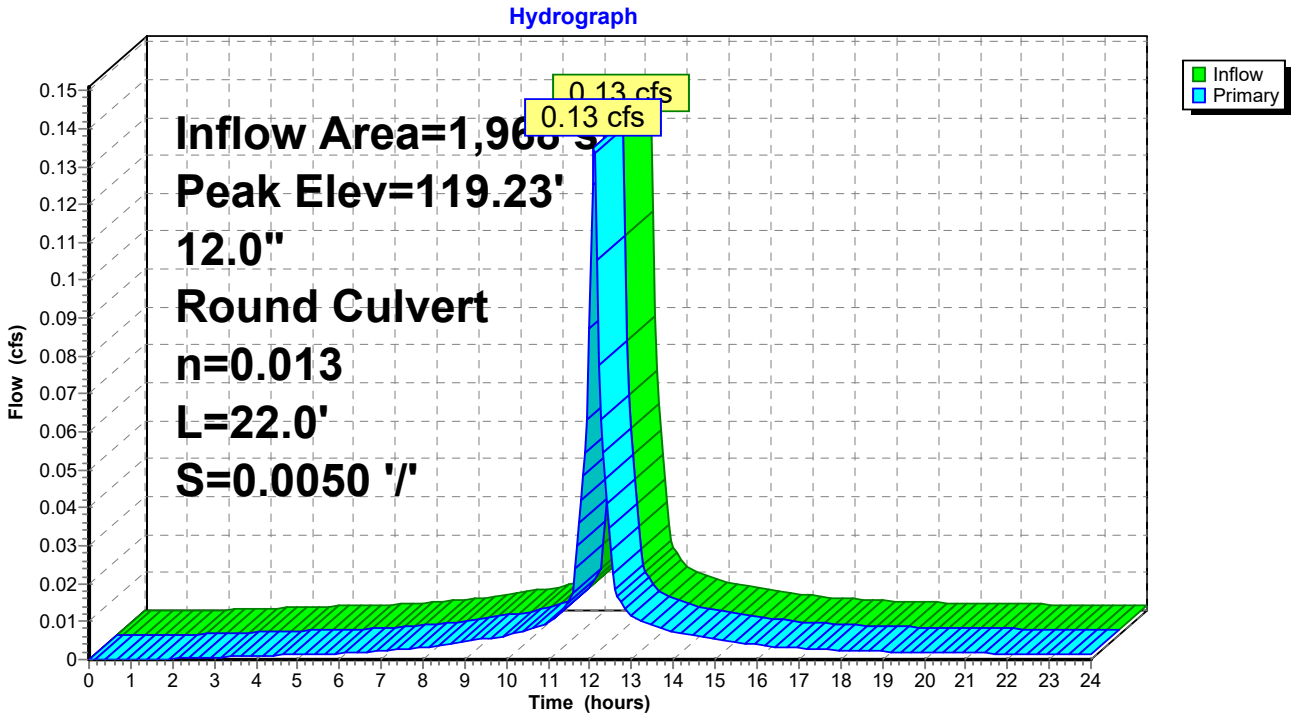
Inflow Area = 1,968 sf,100.00% Impervious, Inflow Depth > 2.92" for 2-Year event
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 478 cf
Outflow = 0.13 cfs @ 12.09 hrs, Volume= 478 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.13 cfs @ 12.09 hrs, Volume= 478 cf
Routed to Pond 10P : CDS1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.23' @ 12.09 hrs
Flood Elev= 122.50'

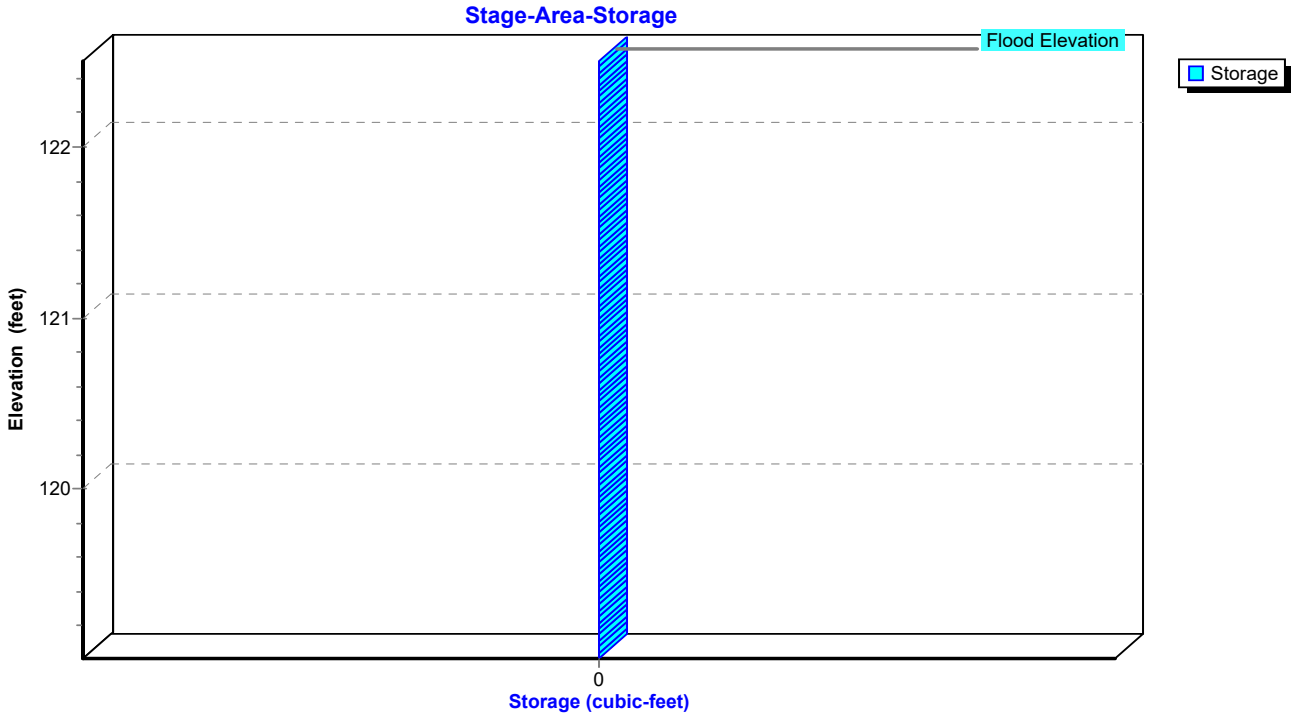
Device	Routing	Invert	Outlet Devices
#1	Primary	119.01'	**12.0" Round Culvert** L= 22.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.01' / 118.90' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 12.09 hrs HW=119.23' (Free Discharge)
1=Culvert (Barrel Controls 0.13 cfs @ 1.58 fps)

Pond 8P: DMH1



Pond 8P: DMH1


Stage-Area-Storage
Flood Elevation
Storage
122
121
120
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 8P: DMH1

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
119.01	**0**	121.66	0
119.06	0	121.71	0
119.11	0	121.76	0
119.16	0	121.81	0
119.21	0	121.86	0
119.26	0	121.91	0
119.31	0	121.96	0
119.36	0	122.01	0
119.41	0	122.06	0
119.46	0	122.11	0
119.51	0	122.16	0
119.56	0	122.21	0
119.61	0	122.26	0
119.66	0	122.31	0
119.71	0	122.36	0
119.76	0	122.41	0
119.81	0	122.46	0
119.86	0		
119.91	0		
119.96	0		
120.01	0		
120.06	0		
120.11	0		
120.16	0		
120.21	0		
120.26	0		
120.31	0		
120.36	0		
120.41	0		
120.46	0		
120.51	0		
120.56	0		
120.61	0		
120.66	0		
120.71	0		
120.76	0		
120.81	0		
120.86	0		
120.91	0		
120.96	0		
121.01	0		
121.06	0		
121.11	0		
121.16	0		
121.21	0		
121.26	0		
121.31	0		
121.36	0		
121.41	0		
121.46	0		
121.51	0		
121.56	0		
121.61	0		

Summary for Pond 9P: SUBSURFACE INFILTRATION #3

Inflow Area = 3,048 sf,100.00% Impervious, Inflow Depth > 2.92" for 2-Year event
Inflow = 0.21 cfs @ 12.09 hrs, Volume= 741 cf
Outflow = 0.04 cfs @ 12.53 hrs, Volume= 740 cf, Atten= 81%, Lag= 26.6 min
Discarded = 0.04 cfs @ 12.53 hrs, Volume= 740 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.25' @ 12.53 hrs Surf.Area= 506 sf Storage= 201 cf

Plug-Flow detention time= 32.3 min calculated for 739 cf (100% of inflow)
Center-of-Mass det. time= 31.8 min (788.2 - 756.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.50'	481 cf	**15.75'W x 32.10'L x 3.50'H Field A** 1,769 cf Overall - 567 cf Embedded = 1,202 cf x 40.0% Voids
#2A	115.00'	567 cf	**ADS_StormTech SC-740 b +Cap** x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 3 Rows Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf
		1,048 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	114.50'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 112.50'

Discarded OutFlow Max=0.04 cfs @ 12.53 hrs HW=115.25' (Free Discharge)
↑**1=Exfiltration** (Controls 0.04 cfs)

Pond 9P: SUBSURFACE INFILTRATION #3 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 b +Cap (ADS StormTech® SC-740 with cap storage)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

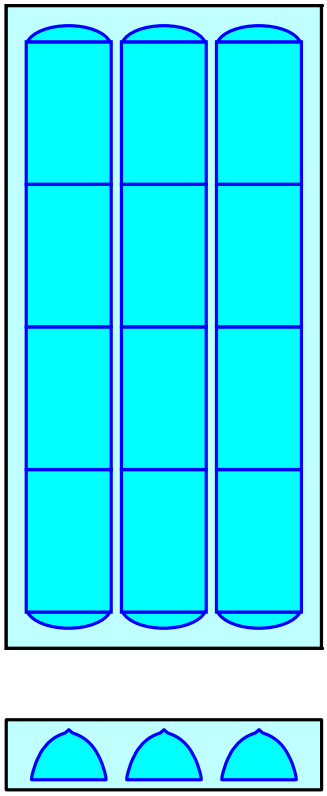
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

12 Chambers x 45.9 cf + 2.7 cf Cap Volume x 2 x 3 Rows = 567.2 cf Chamber Storage

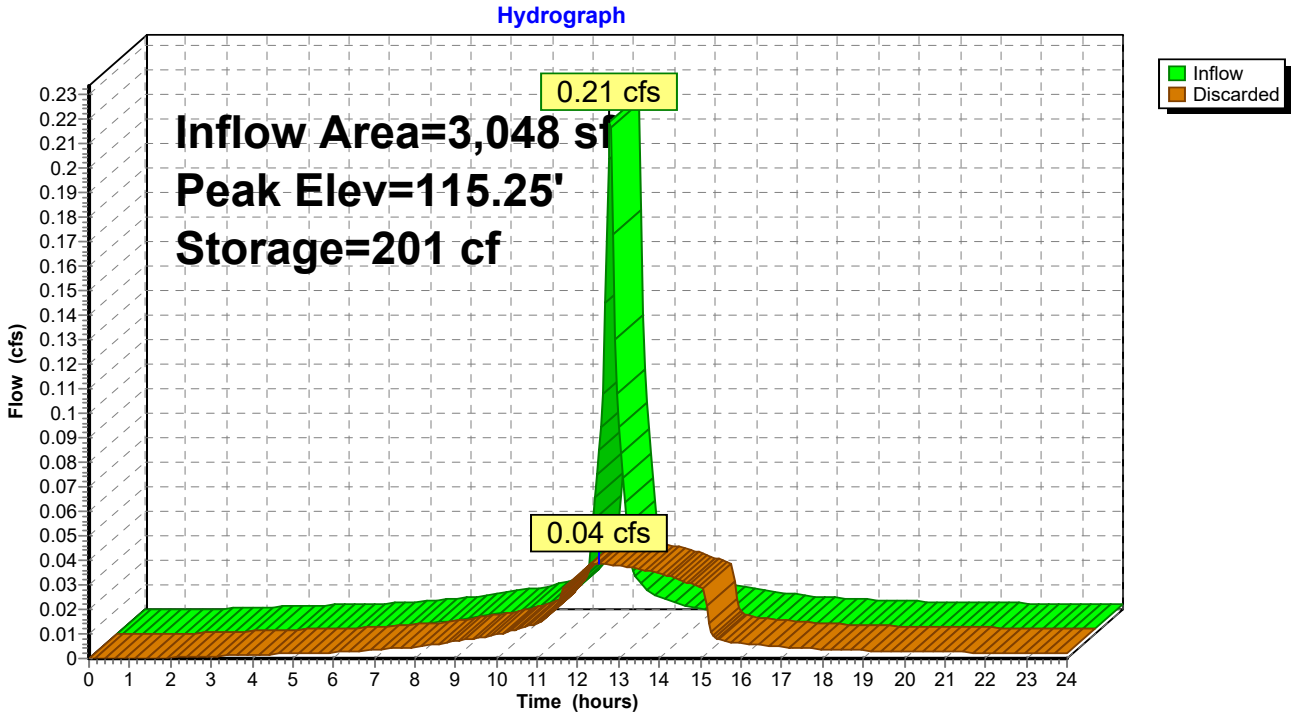
1,769.3 cf Field - 567.2 cf Chambers = 1,202.1 cf Stone x 40.0% Voids = 480.8 cf Stone Storage

Chamber Storage + Stone Storage = 1,048.1 cf = 0.024 af
Overall Storage Efficiency = 59.2%
Overall System Size = 32.10' x 15.75' x 3.50'

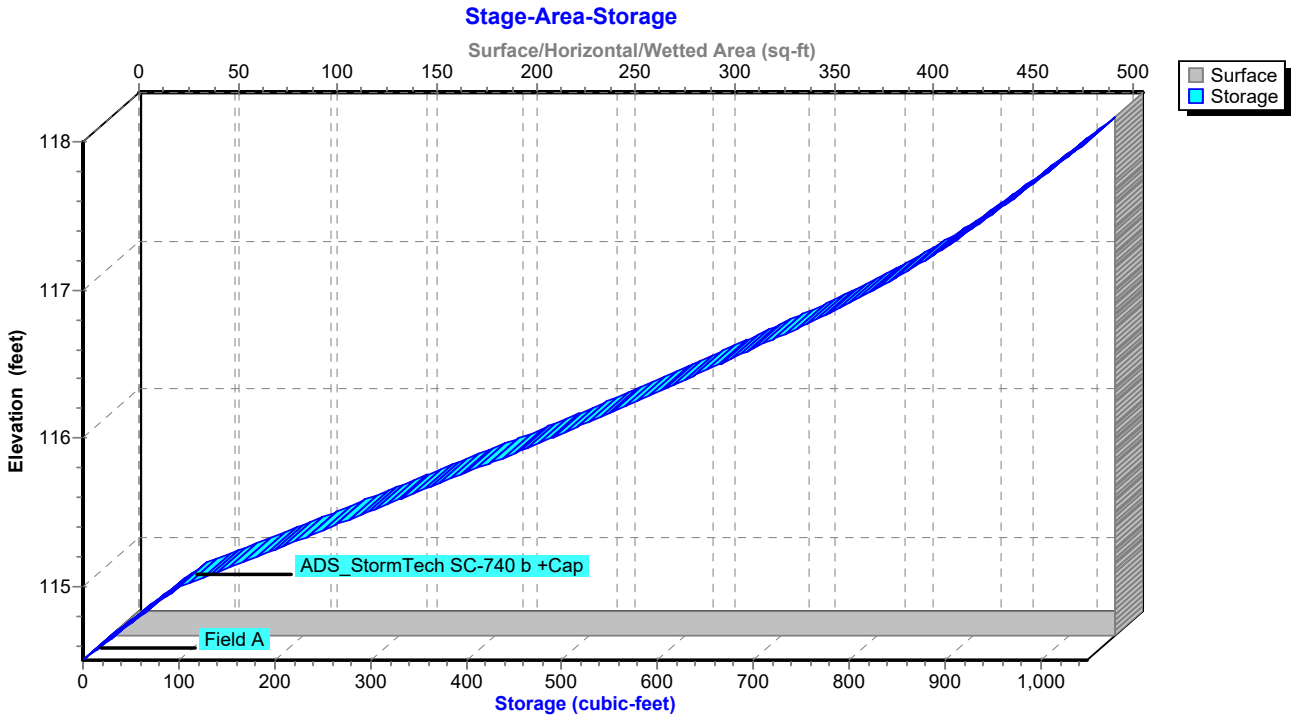
12 Chambers
65.5 cy Field
44.5 cy Stone



Pond 9P: SUBSURFACE INFILTRATION #3



Pond 9P: SUBSURFACE INFILTRATION #3



Stage-Area-Storage for Pond 9P: SUBSURFACE INFILTRATION #3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
114.50	**506**	0
114.55	506	10
114.60	506	20
114.65	506	30
114.70	506	40
114.75	506	51
114.80	506	61
114.85	506	71
114.90	506	81
114.95	506	91
115.00	506	101
115.05	506	121
115.10	506	141
115.15	506	161
115.20	506	181
115.25	506	200
115.30	506	220
115.35	506	240
115.40	506	259
115.45	506	279
115.50	506	298
115.55	506	318
115.60	506	337
115.65	506	356
115.70	506	375
115.75	506	394
115.80	506	413
115.85	506	432
115.90	506	451
115.95	506	469
116.00	506	488
116.05	506	506
116.10	506	524
116.15	506	543
116.20	506	561
116.25	506	578
116.30	506	596
116.35	506	614
116.40	506	631
116.45	506	648
116.50	506	665
116.55	506	682
116.60	506	699
116.65	506	716
116.70	506	732
116.75	506	748
116.80	506	764
116.85	506	779
116.90	506	795
116.95	506	810
117.00	506	825
117.05	506	839
117.10	506	853
117.15	506	867
117.20	506	880
117.25	506	892
117.30	506	904
117.35	506	915
117.40	506	926
117.45	506	937
117.50	506	947
117.55	506	957
117.60	506	967
117.65	506	977
117.70	506	987
117.75	506	998
117.80	506	1,008
117.85	506	1,018
117.90	506	1,028
117.95	506	1,038
118.00	506	**1,048**

Summary for Pond 10P: CDS1

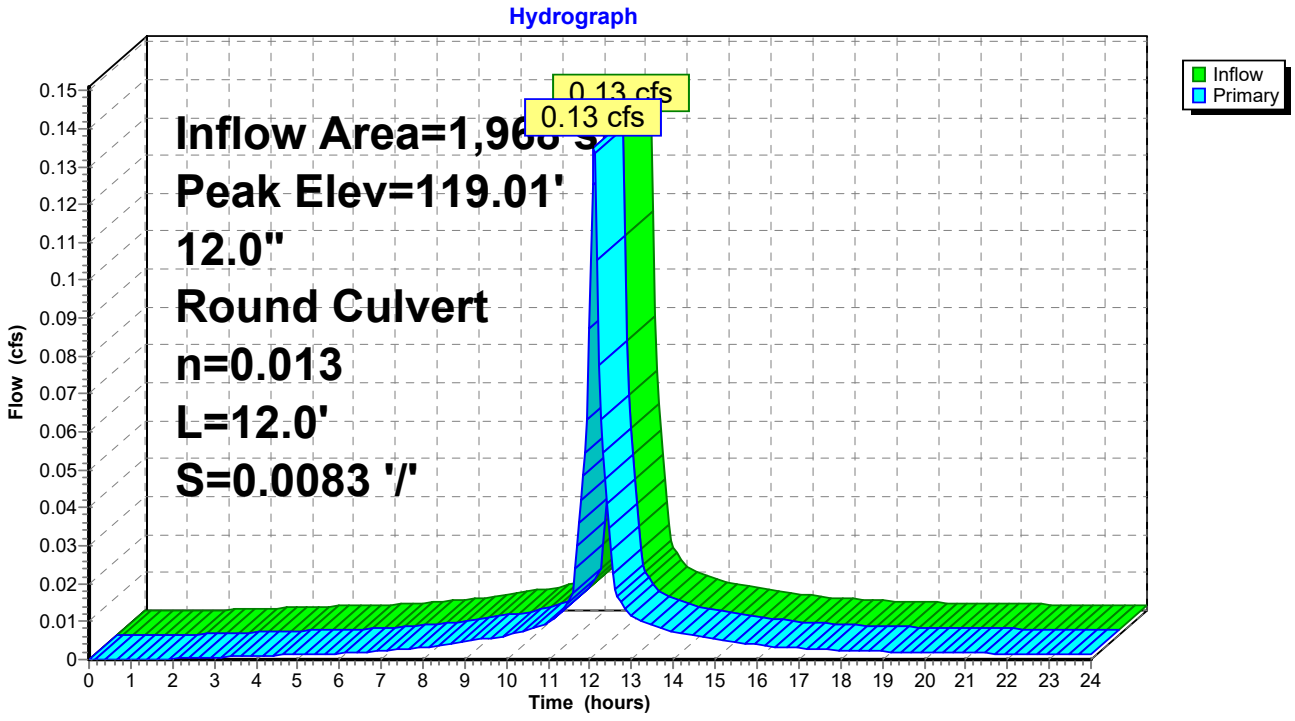
Inflow Area = 1,968 sf,100.00% Impervious, Inflow Depth > 2.92" for 2-Year event
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 478 cf
Outflow = 0.13 cfs @ 12.09 hrs, Volume= 478 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.13 cfs @ 12.09 hrs, Volume= 478 cf
Routed to Pond 4P : SUBSURFACE INFILTRATION #1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.01' @ 12.09 hrs
Flood Elev= 122.50'

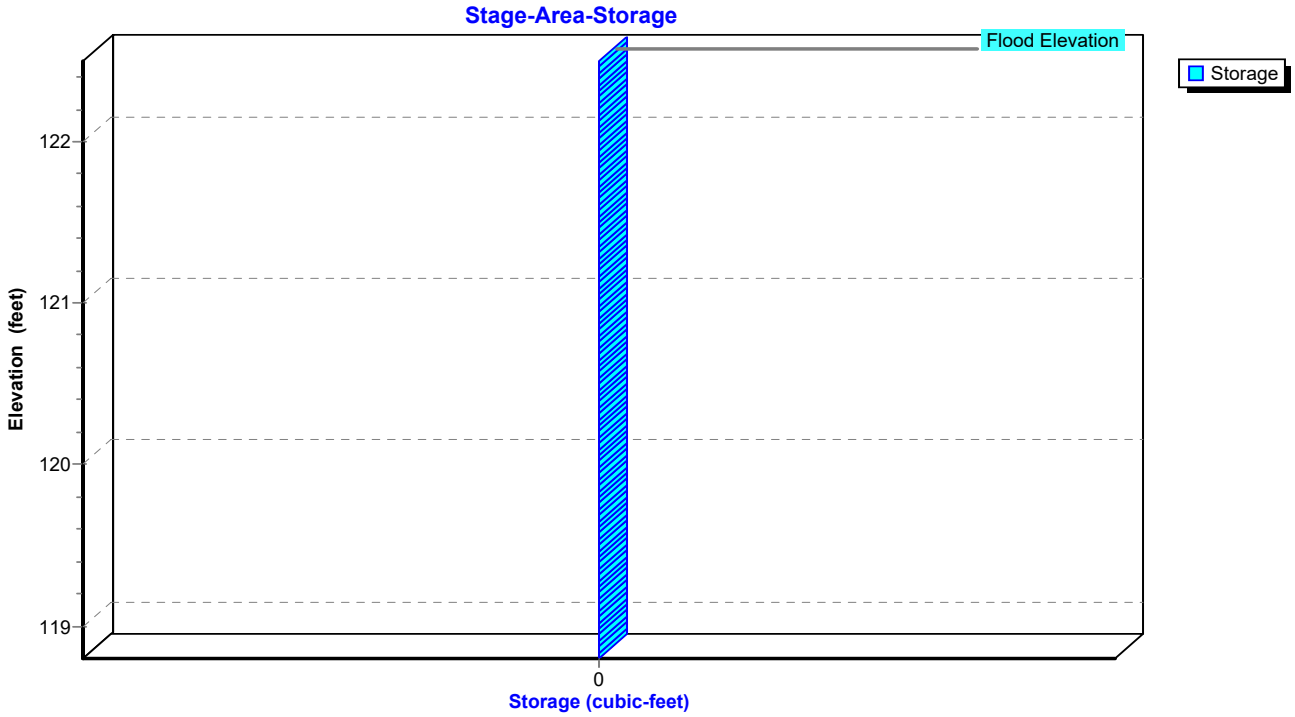
Device	Routing	Invert	Outlet Devices
#1	Primary	118.80'	**12.0" Round Culvert** L= 12.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.80' / 118.70' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 12.09 hrs HW=119.00' (Free Discharge)
1=Culvert (Barrel Controls 0.13 cfs @ 1.72 fps)

Pond 10P: CDS1



Pond 10P: CDS1



Stage-Area-Storage for Pond 10P: CDS1

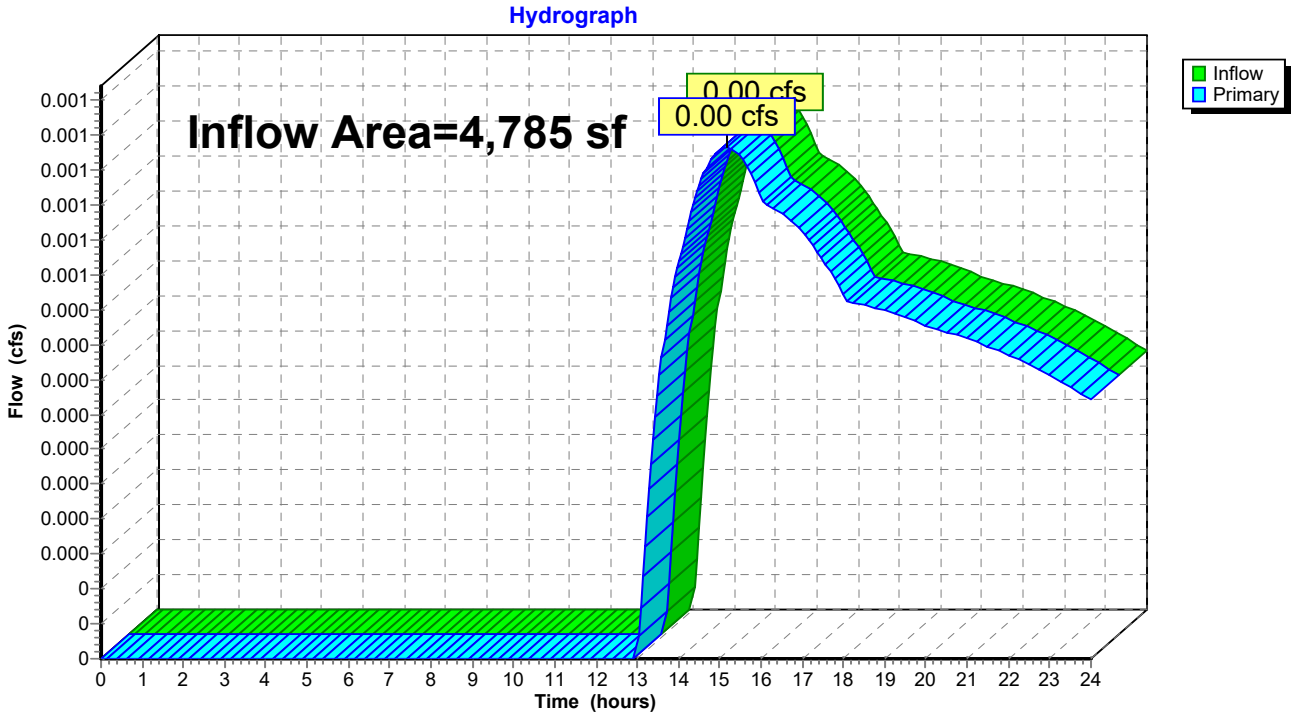
Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
118.80	**0**	121.45	0
118.85	0	121.50	0
118.90	0	121.55	0
118.95	0	121.60	0
119.00	0	121.65	0
119.05	0	121.70	0
119.10	0	121.75	0
119.15	0	121.80	0
119.20	0	121.85	0
119.25	0	121.90	0
119.30	0	121.95	0
119.35	0	122.00	0
119.40	0	122.05	0
119.45	0	122.10	0
119.50	0	122.15	0
119.55	0	122.20	0
119.60	0	122.25	0
119.65	0	122.30	0
119.70	0	122.35	0
119.75	0	122.40	0
119.80	0	122.45	0
119.85	0	122.50	0
119.90	0		
119.95	0		
120.00	0		
120.05	0		
120.10	0		
120.15	0		
120.20	0		
120.25	0		
120.30	0		
120.35	0		
120.40	0		
120.45	0		
120.50	0		
120.55	0		
120.60	0		
120.65	0		
120.70	0		
120.75	0		
120.80	0		
120.85	0		
120.90	0		
120.95	0		
121.00	0		
121.05	0		
121.10	0		
121.15	0		
121.20	0		
121.25	0		
121.30	0		
121.35	0		
121.40	0		

Summary for Link DP1: link

Inflow Area = 4,785 sf, 11.64% Impervious, Inflow Depth > 0.05" for 2-Year event
Inflow = 0.00 cfs @ 15.17 hrs, Volume= 20 cf
Primary = 0.00 cfs @ 15.17 hrs, Volume= 20 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP1: link

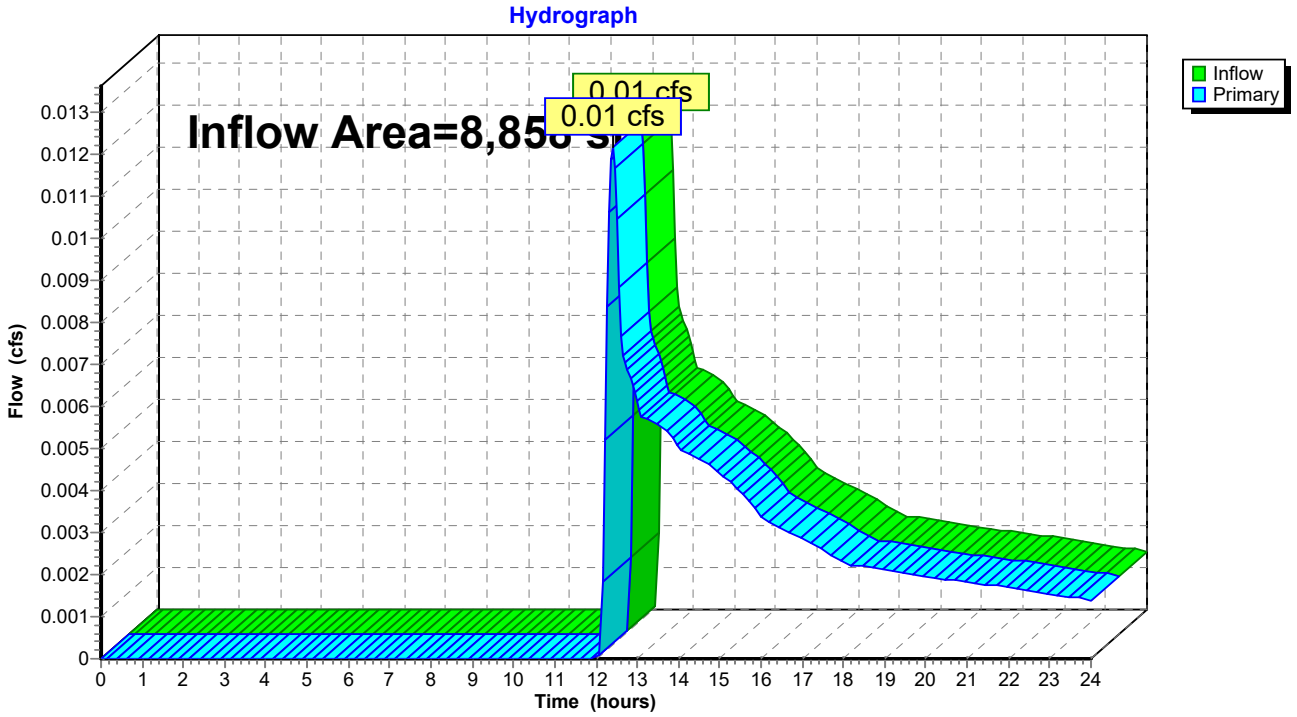


Summary for Link DP2: link

Inflow Area = 8,858 sf, 24.43% Impervious, Inflow Depth > 0.18" for 2-Year event
Inflow = 0.01 cfs @ 12.39 hrs, Volume= 136 cf
Primary = 0.01 cfs @ 12.39 hrs, Volume= 136 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP2: link

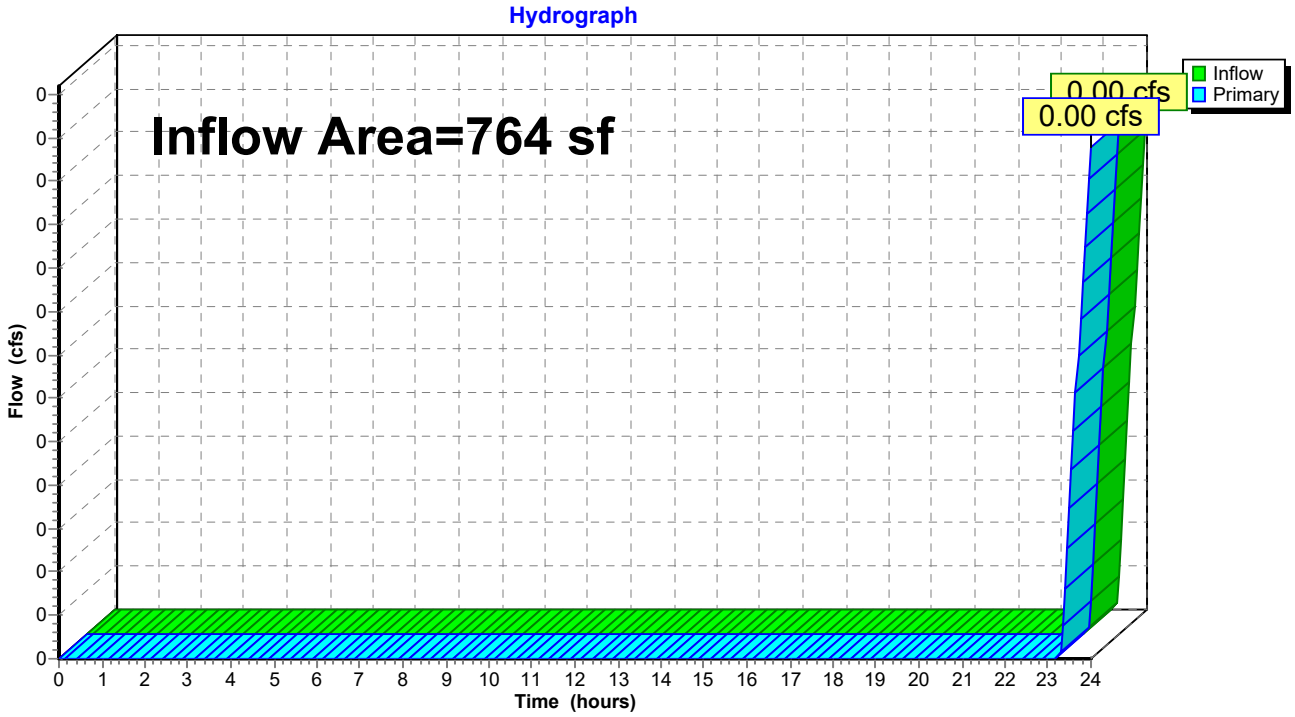


Summary for Link DP3: link

Inflow Area = 764 sf, 0.00% Impervious, Inflow Depth > 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 24.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP3: link



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

Subcatchment P1: P1 Runoff Area=4,785 sf 11.64% Impervious Runoff Depth>0.43"
Tc=6.0 min CN=46 Runoff=0.02 cfs 172 cf

Subcatchment P2: P2 Runoff Area=8,858 sf 24.43% Impervious Runoff Depth>0.78"
Tc=6.0 min CN=53 Runoff=0.13 cfs 577 cf

Subcatchment P3: P3 Runoff Area=764 sf 0.00% Impervious Runoff Depth>0.17"
Tc=6.0 min CN=39 Runoff=0.00 cfs 11 cf

Subcatchment P4A: P4A Runoff Area=2,010 sf 85.82% Impervious Runoff Depth>3.71"
Tc=6.0 min CN=90 Runoff=0.19 cfs 621 cf

Subcatchment P4B: P4B Runoff Area=5,921 sf 70.70% Impervious Runoff Depth>2.83"
Tc=6.0 min CN=81 Runoff=0.44 cfs 1,398 cf

Subcatchment P5A: P5A Runoff Area=1,227 sf 100.00% Impervious Runoff Depth>4.59"
Tc=6.0 min CN=98 Runoff=0.13 cfs 469 cf

Subcatchment P5B: P5B Runoff Area=741 sf 100.00% Impervious Runoff Depth>4.59"
Tc=6.0 min CN=98 Runoff=0.08 cfs 283 cf

Subcatchment P6: P6 Runoff Area=3,048 sf 100.00% Impervious Runoff Depth>4.59"
Tc=6.0 min CN=98 Runoff=0.32 cfs 1,166 cf

Pond 1P: CB1 Peak Elev=119.32' Inflow=0.08 cfs 283 cf
12.0" Round Culvert n=0.013 L=7.5' S=0.0053 '/' Outflow=0.08 cfs 283 cf

Pond 2P: SUBSURFACE INFILTRATION #2 Peak Elev=114.76' Storage=597 cf Inflow=0.63 cfs 2,019 cf
Outflow=0.11 cfs 2,018 cf

Pond 3P: CB3 Peak Elev=115.12' Inflow=0.19 cfs 621 cf
12.0" Round Culvert n=0.013 L=30.5' S=0.0052 '/' Outflow=0.19 cfs 621 cf

Pond 4P: SUBSURFACE INFILTRATION #1 Peak Elev=119.63' Storage=250 cf Inflow=0.21 cfs 753 cf
Outflow=0.03 cfs 752 cf

Pond 5P: CB4 Peak Elev=115.27' Inflow=0.44 cfs 1,398 cf
8.0" Round Culvert n=0.013 L=14.5' S=0.0055 '/' Outflow=0.44 cfs 1,398 cf

Pond 6P: CDS2 Peak Elev=115.16' Inflow=0.63 cfs 2,019 cf
12.0" Round Culvert n=0.013 L=3.0' S=0.0333 '/' Outflow=0.63 cfs 2,019 cf

Pond 7P: CB2 Peak Elev=119.37' Inflow=0.13 cfs 469 cf
12.0" Round Culvert n=0.013 L=7.5' S=0.0053 '/' Outflow=0.13 cfs 469 cf

Pond 8P: DMH1 Peak Elev=119.29' Inflow=0.21 cfs 753 cf
12.0" Round Culvert n=0.013 L=22.0' S=0.0050 '/' Outflow=0.21 cfs 753 cf

Pond 9P: SUBSURFACE INFILTRATION #3 Peak Elev=115.68' Storage=368 cf Inflow=0.32 cfs 1,166 cf
Outflow=0.04 cfs 1,165 cf

Pond 10P: CDS1 Peak Elev=119.06' Inflow=0.21 cfs 753 cf
12.0" Round Culvert n=0.013 L=12.0' S=0.0083 '/' Outflow=0.21 cfs 753 cf

Link DP1: link Inflow=0.02 cfs 172 cf
Primary=0.02 cfs 172 cf

Link DP2: link Inflow=0.13 cfs 577 cf
Primary=0.13 cfs 577 cf

Link DP3: link Inflow=0.00 cfs 11 cf
Primary=0.00 cfs 11 cf

Total Runoff Area = 27,354 sf Runoff Volume = 4,699 cf Average Runoff Depth = 2.06"
50.11% Pervious = 13,706 sf 49.89% Impervious = 13,648 sf

Summary for Subcatchment P1: P1

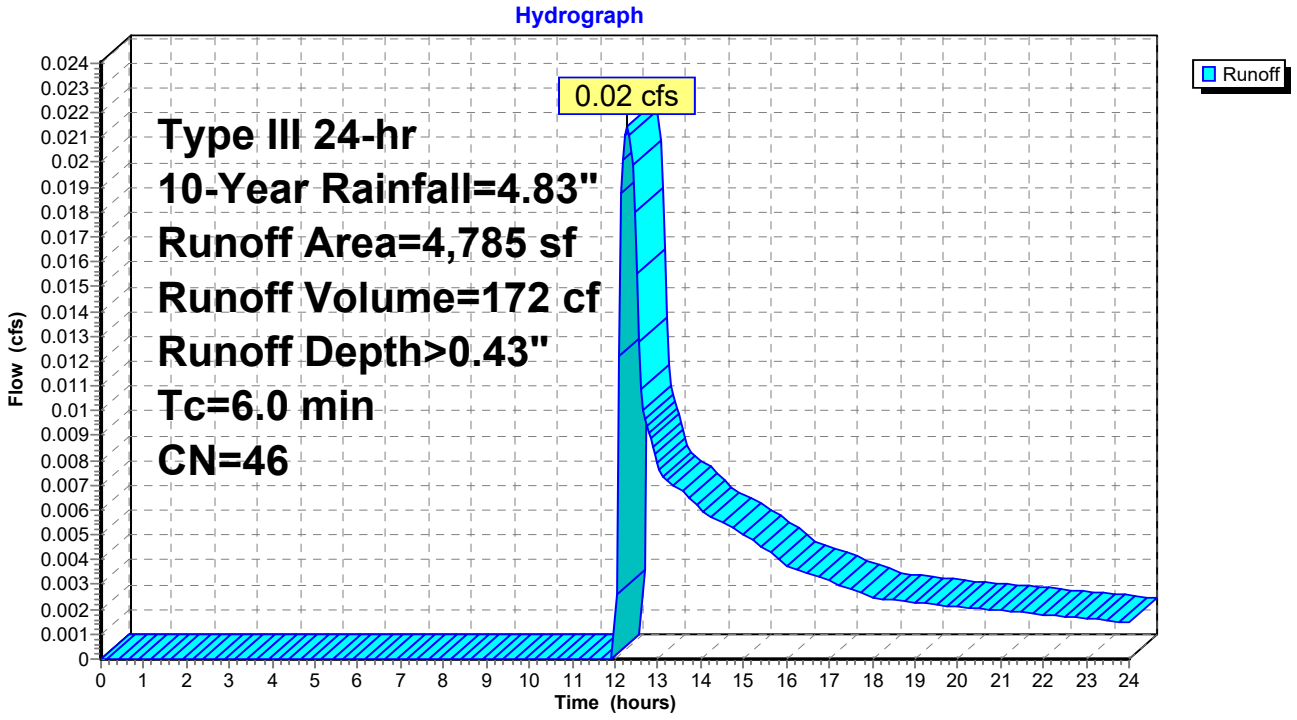
Runoff = 0.02 cfs @ 12.30 hrs, Volume= 172 cf, Depth> 0.43"
Routed to Link DP1 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
557	98	Roofs, HSG A
4,228	39	>75% Grass cover, Good, HSG A
4,785	46	Weighted Average
4,228		88.36% Pervious Area
557		11.64% Impervious Area

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

Subcatchment P1: P1



Summary for Subcatchment P2: P2

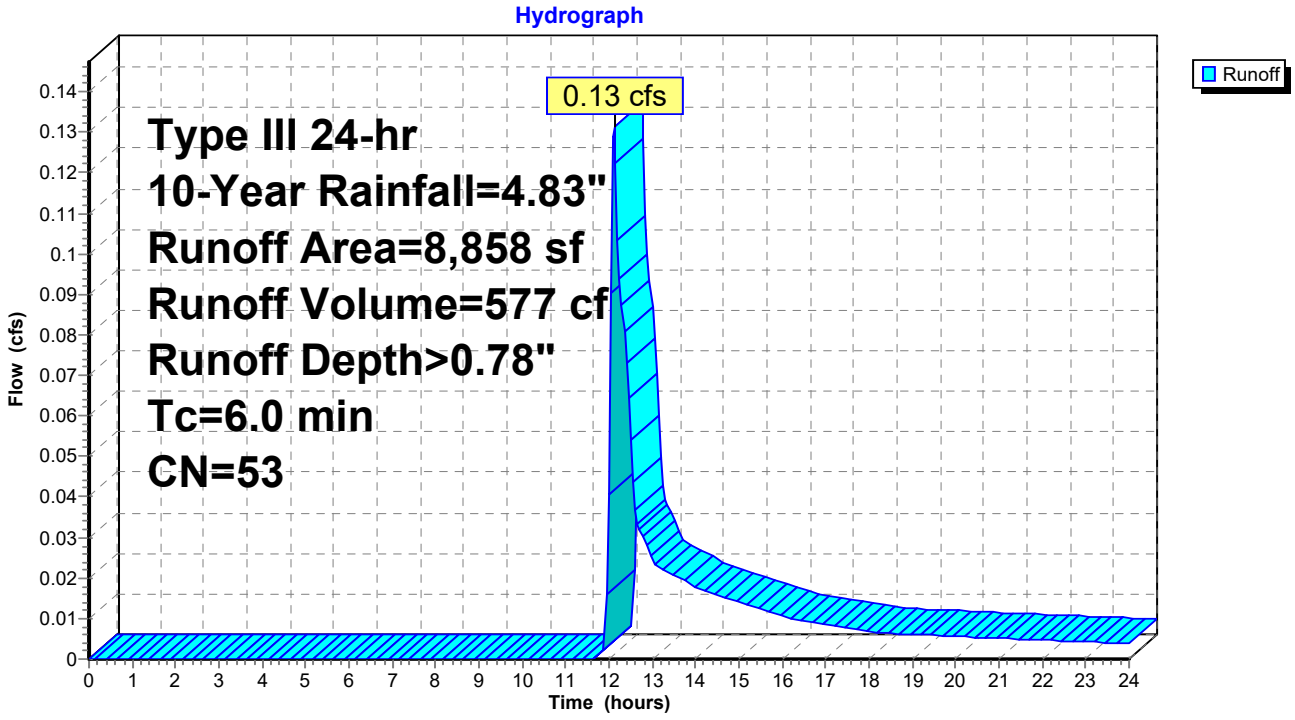
Runoff = 0.13 cfs @ 12.12 hrs, Volume= 577 cf, Depth> 0.78"
Routed to Link DP2 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
2,164	98	Roofs, HSG A
6,694	39	>75% Grass cover, Good, HSG A
8,858	53	Weighted Average
6,694		75.57% Pervious Area
2,164		24.43% Impervious Area

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

Subcatchment P2: P2



Summary for Subcatchment P3: P3

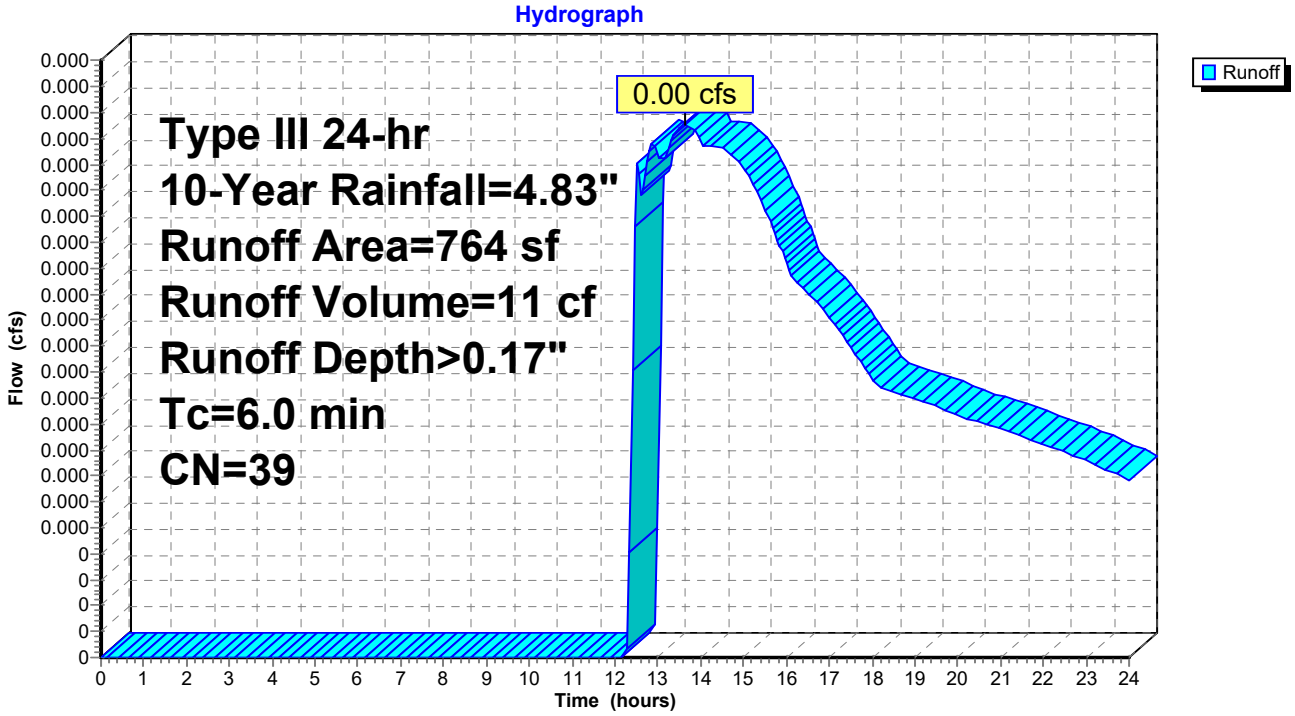
Runoff = 0.00 cfs @ 13.65 hrs, Volume= 11 cf, Depth> 0.17"
Routed to Link DP3 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
764	39	>75% Grass cover, Good, HSG A
764		100.00% Pervious Area

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

Subcatchment P3: P3



Summary for Subcatchment P4A: P4A

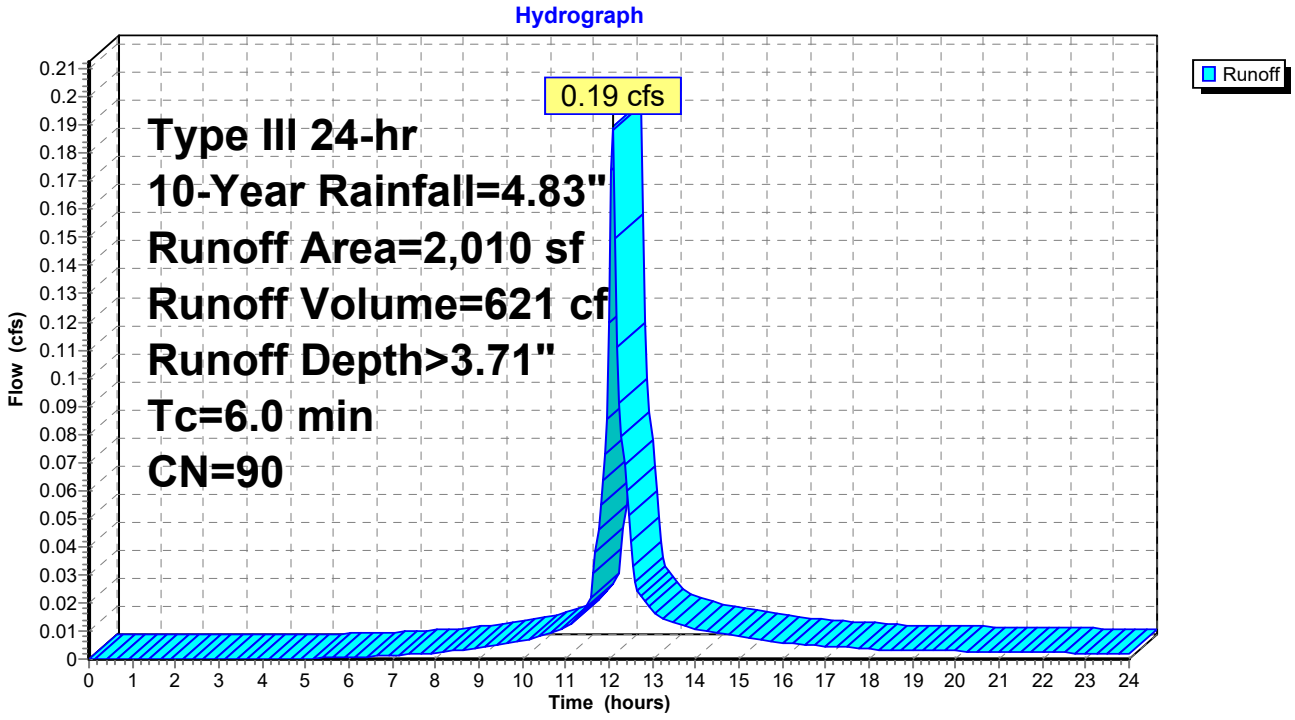
Runoff = 0.19 cfs @ 12.09 hrs, Volume= 621 cf, Depth> 3.71"
Routed to Pond 3P : CB3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
285	39	>75% Grass cover, Good, HSG A
1,725	98	Paved parking, HSG A
2,010	90	Weighted Average
285		14.18% Pervious Area
1,725		85.82% Impervious Area

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

Subcatchment P4A: P4A



Summary for Subcatchment P4B: P4B

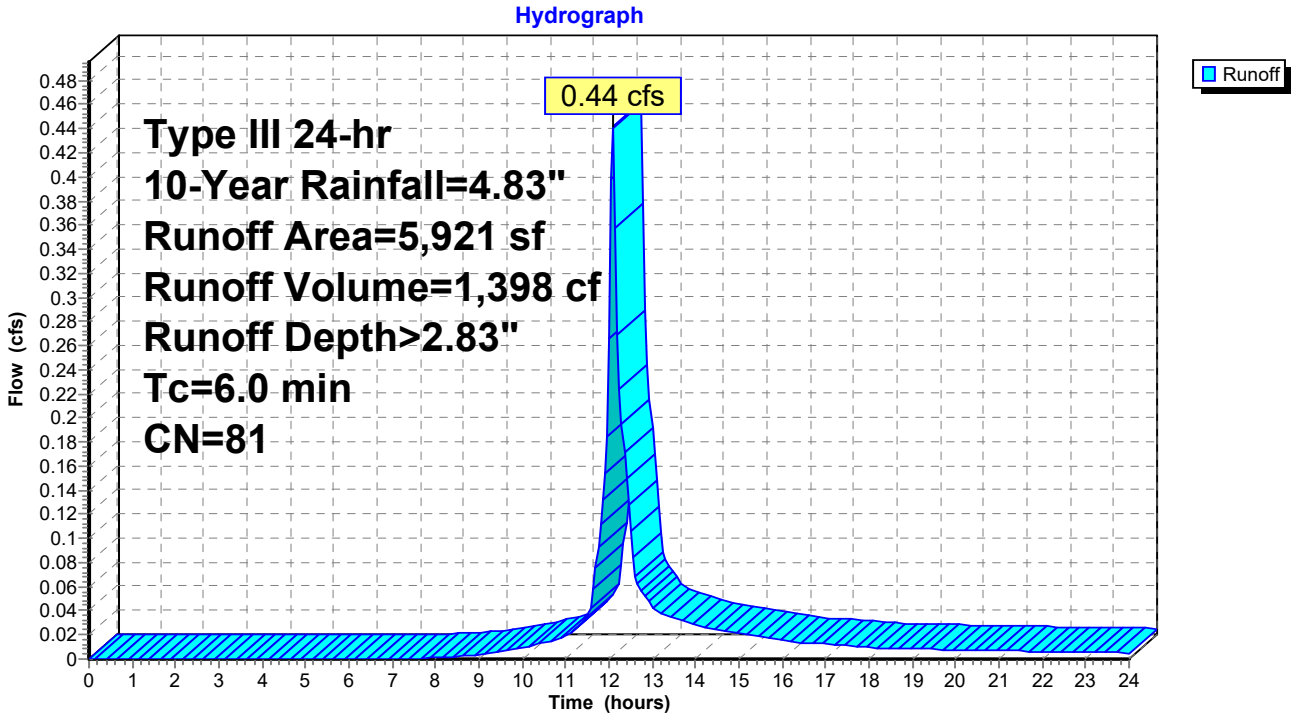
Runoff = 0.44 cfs @ 12.09 hrs, Volume= 1,398 cf, Depth> 2.83"
Routed to Pond 5P : CB4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
1,735	39	>75% Grass cover, Good, HSG A
4,186	98	Paved parking, HSG A
5,921	81	Weighted Average
1,735		29.30% Pervious Area
4,186		70.70% Impervious Area

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

Subcatchment P4B: P4B



Summary for Subcatchment P5A: P5A

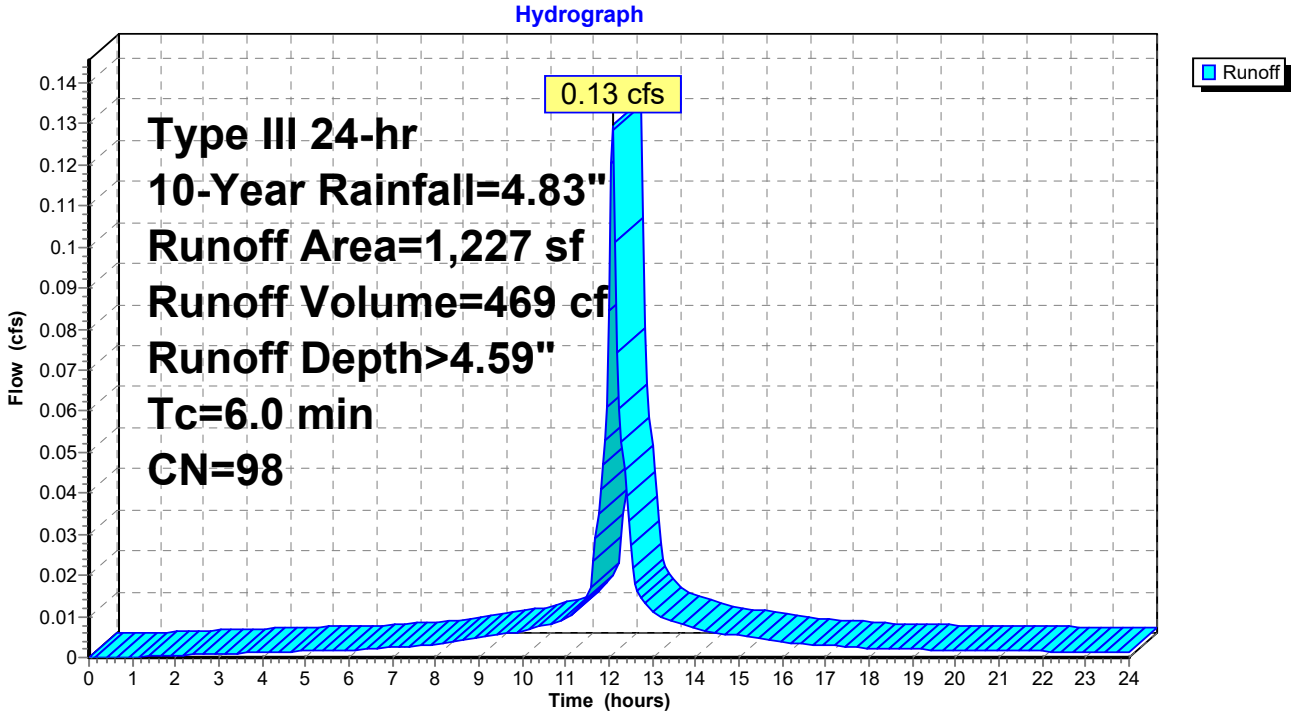
Runoff = 0.13 cfs @ 12.09 hrs, Volume= 469 cf, Depth> 4.59"
Routed to Pond 7P : CB2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
1,227	98	Paved parking, HSG A
1,227		100.00% Impervious Area

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

Subcatchment P5A: P5A



Summary for Subcatchment P5B: P5B

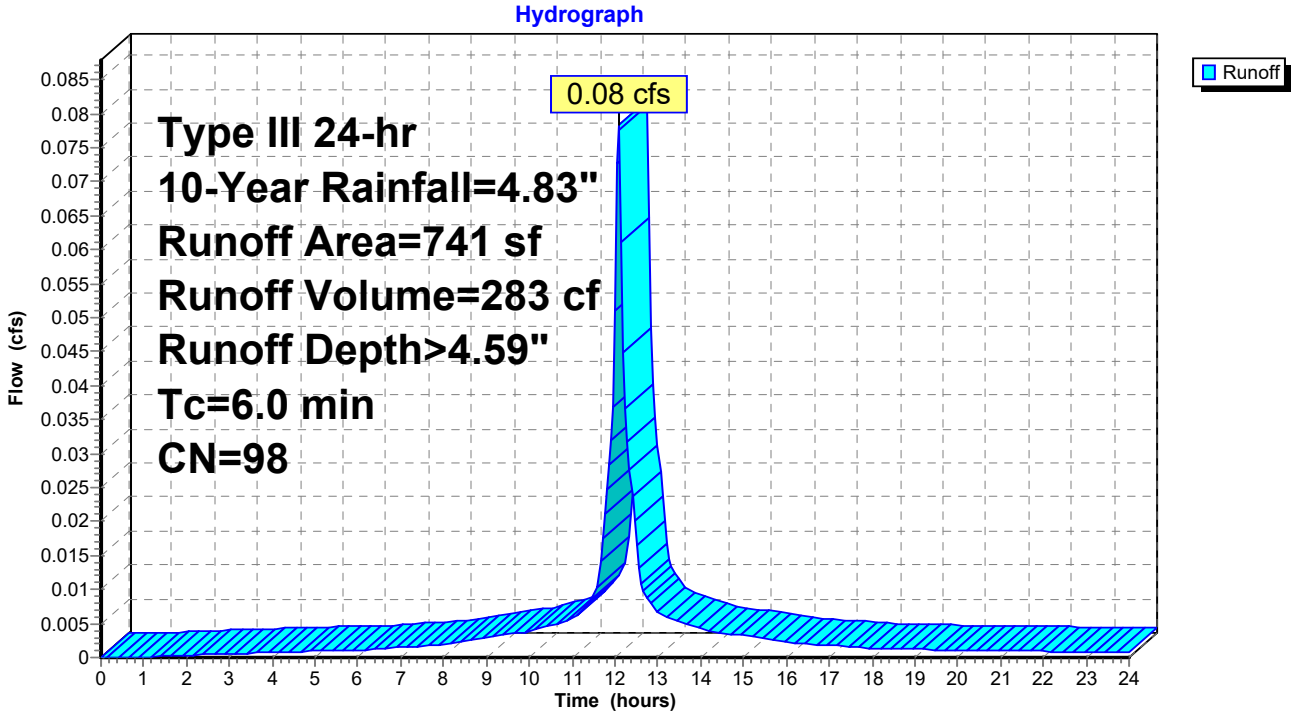
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 283 cf, Depth> 4.59"
Routed to Pond 1P : CB1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
741	98	Paved parking, HSG A
741		100.00% Impervious Area

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

Subcatchment P5B: P5B



Summary for Subcatchment P6: P6

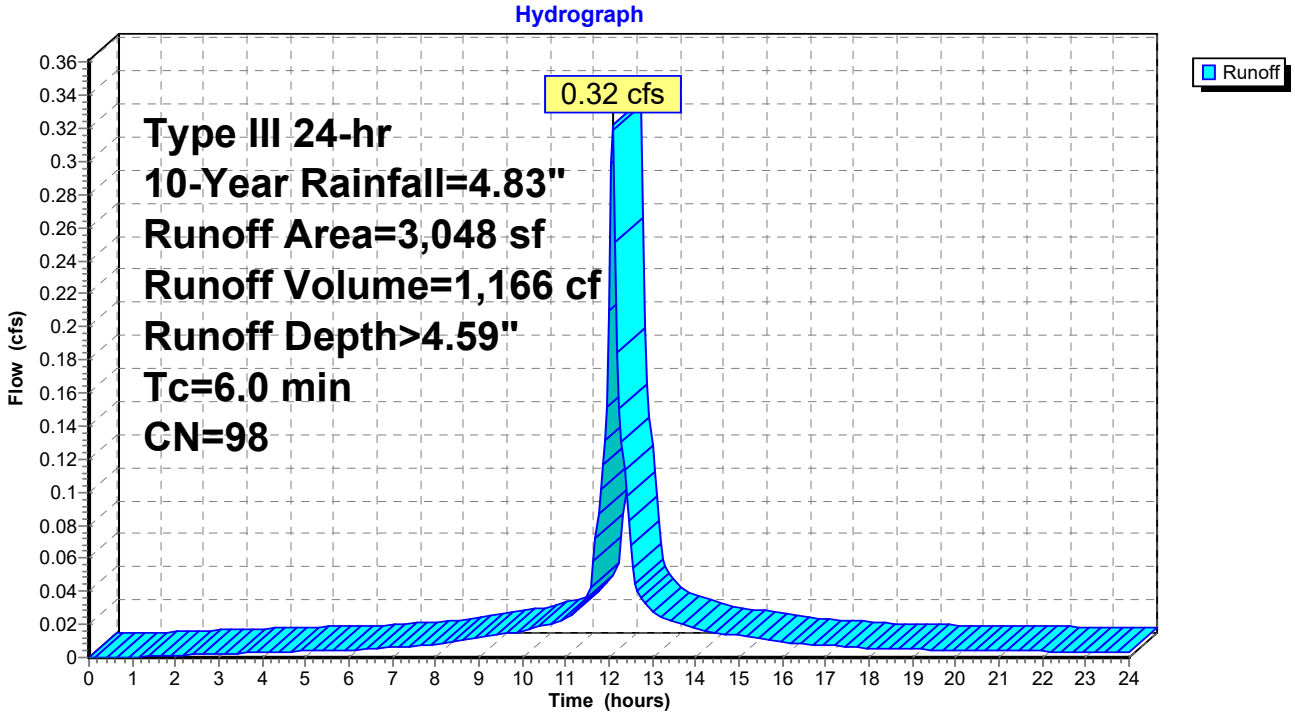
Runoff = 0.32 cfs @ 12.09 hrs, Volume= 1,166 cf, Depth> 4.59"
Routed to Pond 9P : SUBSURFACE INFILTRATION #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
3,048	98	Roofs, HSG A
3,048		100.00% Impervious Area

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

Subcatchment P6: P6



Summary for Pond 1P: CB1

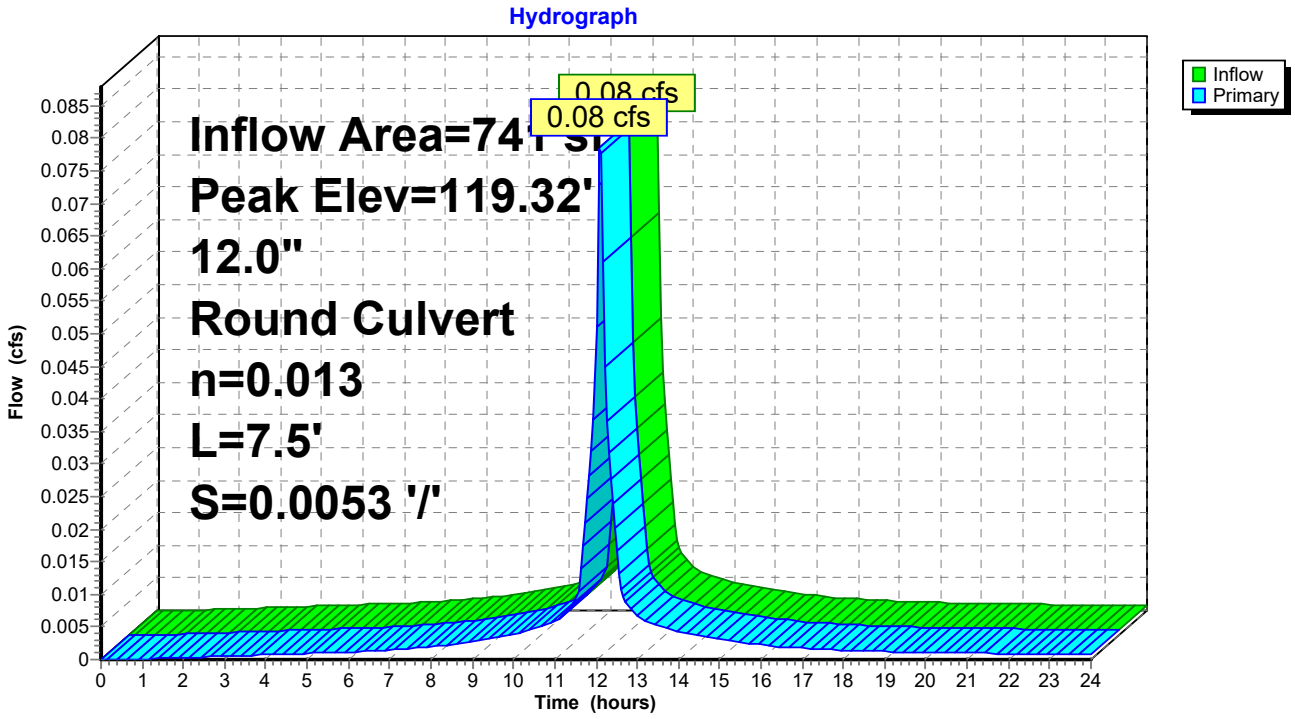
Inflow Area = 741 sf,100.00% Impervious, Inflow Depth > 4.59" for 10-Year event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 283 cf
Outflow = 0.08 cfs @ 12.09 hrs, Volume= 283 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.08 cfs @ 12.09 hrs, Volume= 283 cf
Routed to Pond 8P : DMH1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.32' @ 12.09 hrs
Flood Elev= 122.15'

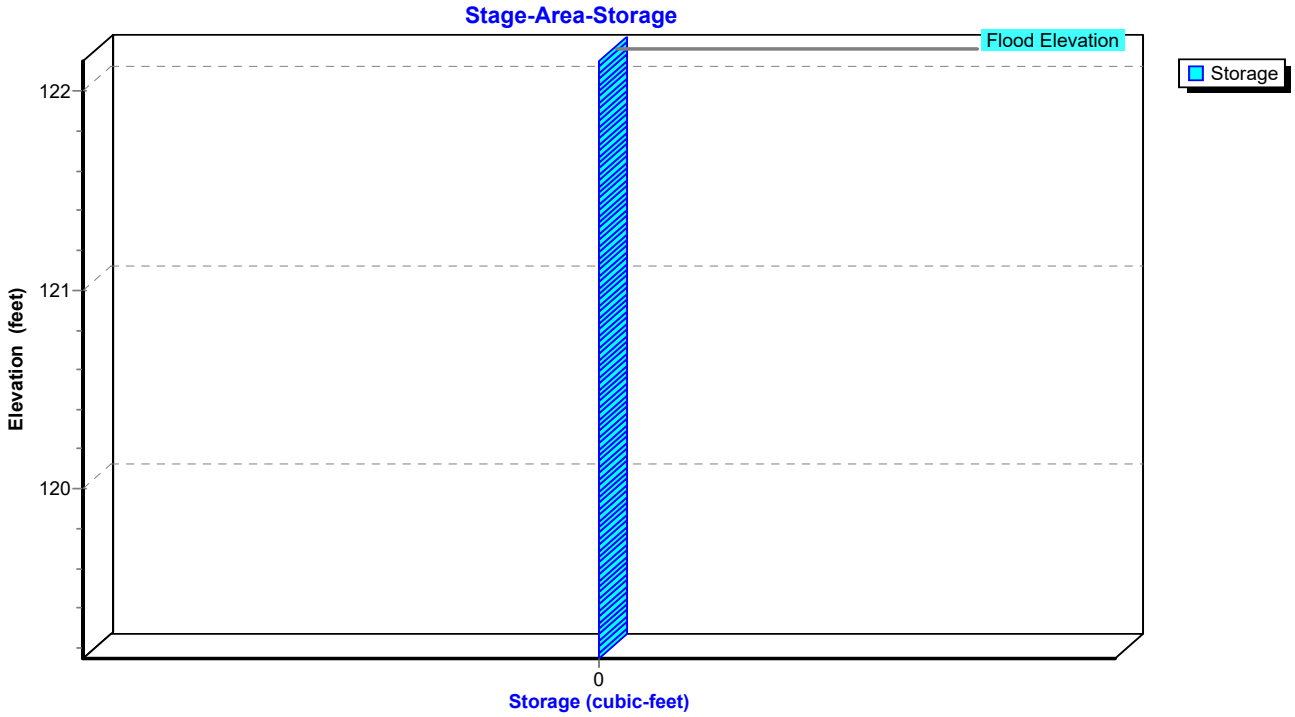
Device	Routing	Invert	Outlet Devices
#1	Primary	119.15'	**12.0" Round Culvert** L= 7.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.15' / 119.11' S= 0.0053 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.08 cfs @ 12.09 hrs HW=119.32' (Free Discharge)
1=Culvert (Barrel Controls 0.08 cfs @ 1.33 fps)

Pond 1P: CB1



Pond 1P: CB1


Stage-Area-Storage
Flood Elevation
Storage
122
121
120
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 1P: CB1

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
119.15	**0**	120.21	0	121.27	0
119.17	0	120.23	0	121.29	0
119.19	0	120.25	0	121.31	0
119.21	0	120.27	0	121.33	0
119.23	0	120.29	0	121.35	0
119.25	0	120.31	0	121.37	0
119.27	0	120.33	0	121.39	0
119.29	0	120.35	0	121.41	0
119.31	0	120.37	0	121.43	0
119.33	0	120.39	0	121.45	0
119.35	0	120.41	0	121.47	0
119.37	0	120.43	0	121.49	0
119.39	0	120.45	0	121.51	0
119.41	0	120.47	0	121.53	0
119.43	0	120.49	0	121.55	0
119.45	0	120.51	0	121.57	0
119.47	0	120.53	0	121.59	0
119.49	0	120.55	0	121.61	0
119.51	0	120.57	0	121.63	0
119.53	0	120.59	0	121.65	0
119.55	0	120.61	0	121.67	0
119.57	0	120.63	0	121.69	0
119.59	0	120.65	0	121.71	0
119.61	0	120.67	0	121.73	0
119.63	0	120.69	0	121.75	0
119.65	0	120.71	0	121.77	0
119.67	0	120.73	0	121.79	0
119.69	0	120.75	0	121.81	0
119.71	0	120.77	0	121.83	0
119.73	0	120.79	0	121.85	0
119.75	0	120.81	0	121.87	0
119.77	0	120.83	0	121.89	0
119.79	0	120.85	0	121.91	0
119.81	0	120.87	0	121.93	0
119.83	0	120.89	0	121.95	0
119.85	0	120.91	0	121.97	0
119.87	0	120.93	0	121.99	0
119.89	0	120.95	0	122.01	0
119.91	0	120.97	0	122.03	0
119.93	0	120.99	0	122.05	0
119.95	0	121.01	0	122.07	0
119.97	0	121.03	0	122.09	0
119.99	0	121.05	0	122.11	0
120.01	0	121.07	0	122.13	0
120.03	0	121.09	0	122.15	0
120.05	0	121.11	0		
120.07	0	121.13	0		
120.09	0	121.15	0		
120.11	0	121.17	0		
120.13	0	121.19	0		
120.15	0	121.21	0		
120.17	0	121.23	0		
120.19	0	121.25	0		

Summary for Pond 2P: SUBSURFACE INFILTRATION #2

Inflow Area = 7,931 sf, 74.53% Impervious, Inflow Depth > 3.06" for 10-Year event
Inflow = 0.63 cfs @ 12.09 hrs, Volume= 2,019 cf
Outflow = 0.11 cfs @ 12.56 hrs, Volume= 2,018 cf, Atten= 82%, Lag= 28.1 min
Primary = 0.11 cfs @ 12.56 hrs, Volume= 2,018 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 114.76' @ 12.56 hrs Surf.Area= 1,494 sf Storage= 597 cf

Plug-Flow detention time= 36.3 min calculated for 2,014 cf (100% of inflow)
Center-of-Mass det. time= 35.9 min (847.1 - 811.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.00'	1,064 cf	**28.17'W x 53.04'L x 2.33'H Field A** 3,486 cf Overall - 826 cf Embedded = 2,660 cf x 40.0% Voids
#2A	114.50'	826 cf	**ADS_StormTech SC-310 +Cap** x 56 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 56 Chambers in 8 Rows
		1,890 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	114.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 112.00'

Primary OutFlow Max=0.11 cfs @ 12.56 hrs HW=114.76' (Free Discharge)
1=Exfiltration (Controls 0.11 cfs)

Pond 2P: SUBSURFACE INFILTRATION #2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

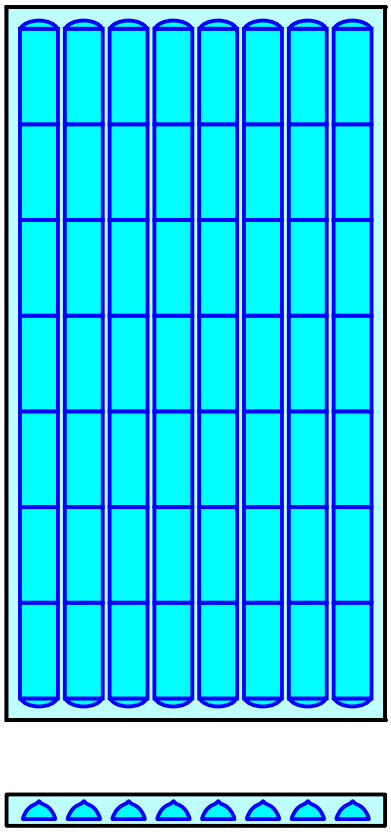
7 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 51.04' Row Length +12.0" End Stone x 2 = 53.04' Base Length
8 Rows x 34.0" Wide + 6.0" Spacing x 7 + 12.0" Side Stone x 2 = 28.17' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

56 Chambers x 14.7 cf = 825.5 cf Chamber Storage

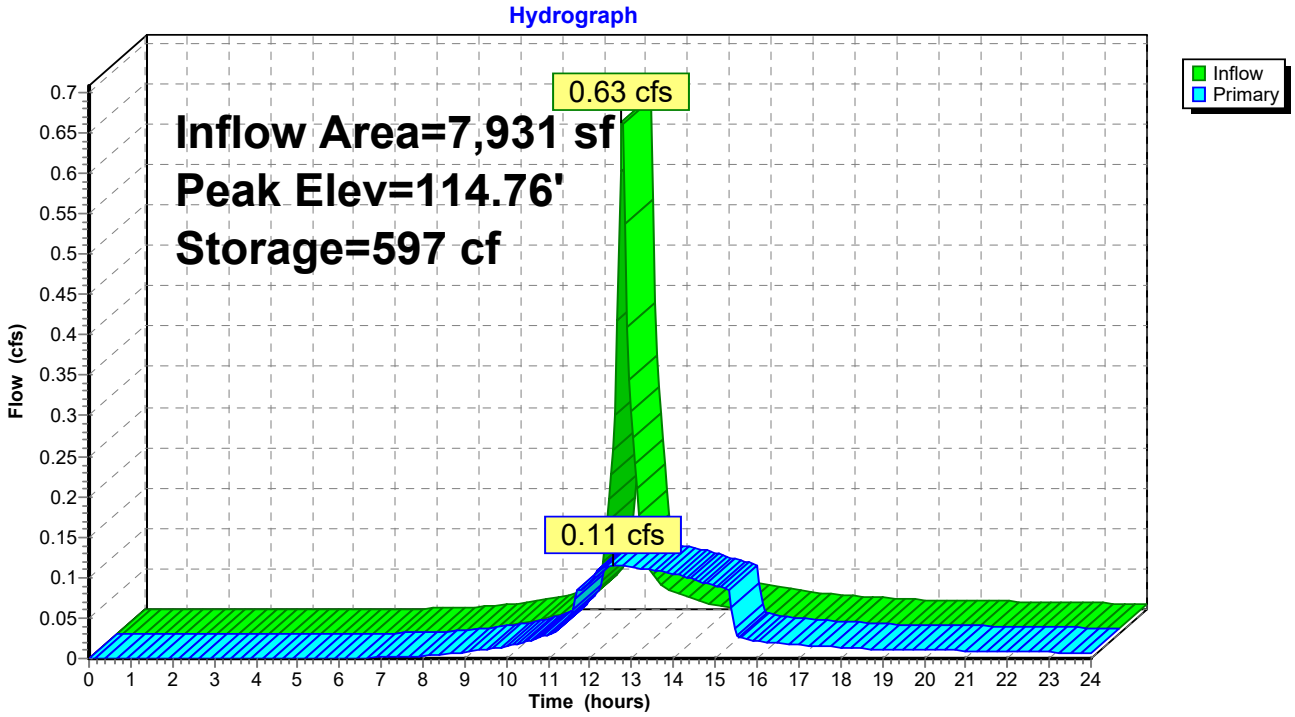
3,485.9 cf Field - 825.5 cf Chambers = 2,660.4 cf Stone x 40.0% Voids = 1,064.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,889.7 cf = 0.043 af
Overall Storage Efficiency = 54.2%
Overall System Size = 53.04' x 28.17' x 2.33'

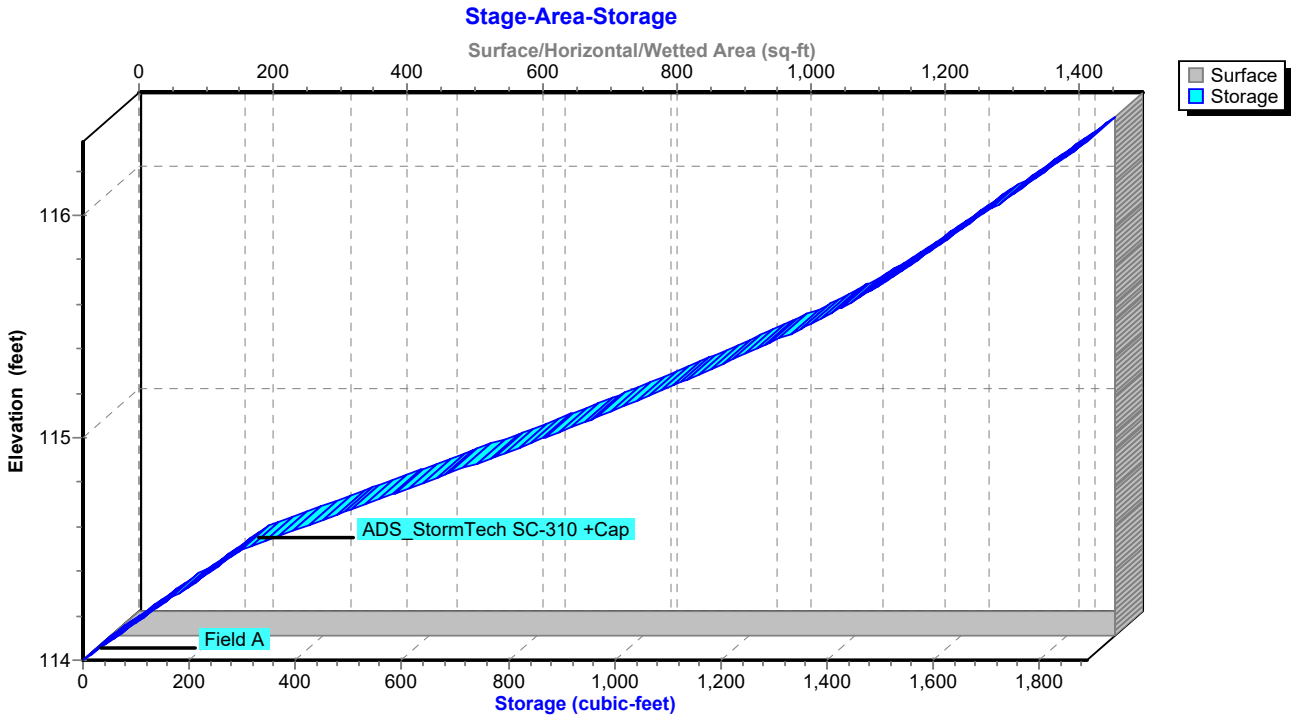
56 Chambers
129.1 cy Field
98.5 cy Stone



Pond 2P: SUBSURFACE INFILTRATION #2



Pond 2P: SUBSURFACE INFILTRATION #2



Stage-Area-Storage for Pond 2P: SUBSURFACE INFILTRATION #2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
114.00	**1,494**	0
114.05	1,494	30
114.10	1,494	60
114.15	1,494	90
114.20	1,494	120
114.25	1,494	149
114.30	1,494	179
114.35	1,494	209
114.40	1,494	239
114.45	1,494	269
114.50	1,494	299
114.55	1,494	357
114.60	1,494	416
114.65	1,494	474
114.70	1,494	532
114.75	1,494	589
114.80	1,494	646
114.85	1,494	702
114.90	1,494	757
114.95	1,494	812
115.00	1,494	866
115.05	1,494	920
115.10	1,494	973
115.15	1,494	1,024
115.20	1,494	1,075
115.25	1,494	1,125
115.30	1,494	1,174
115.35	1,494	1,222
115.40	1,494	1,268
115.45	1,494	1,313
115.50	1,494	1,357
115.55	1,494	1,398
115.60	1,494	1,436
115.65	1,494	1,473
115.70	1,494	1,507
115.75	1,494	1,539
115.80	1,494	1,571
115.85	1,494	1,601
115.90	1,494	1,631
115.95	1,494	1,661
116.00	1,494	1,690
116.05	1,494	1,720
116.10	1,494	1,750
116.15	1,494	1,780
116.20	1,494	1,810
116.25	1,494	1,840
116.30	1,494	**1,870**

Summary for Pond 3P: CB3

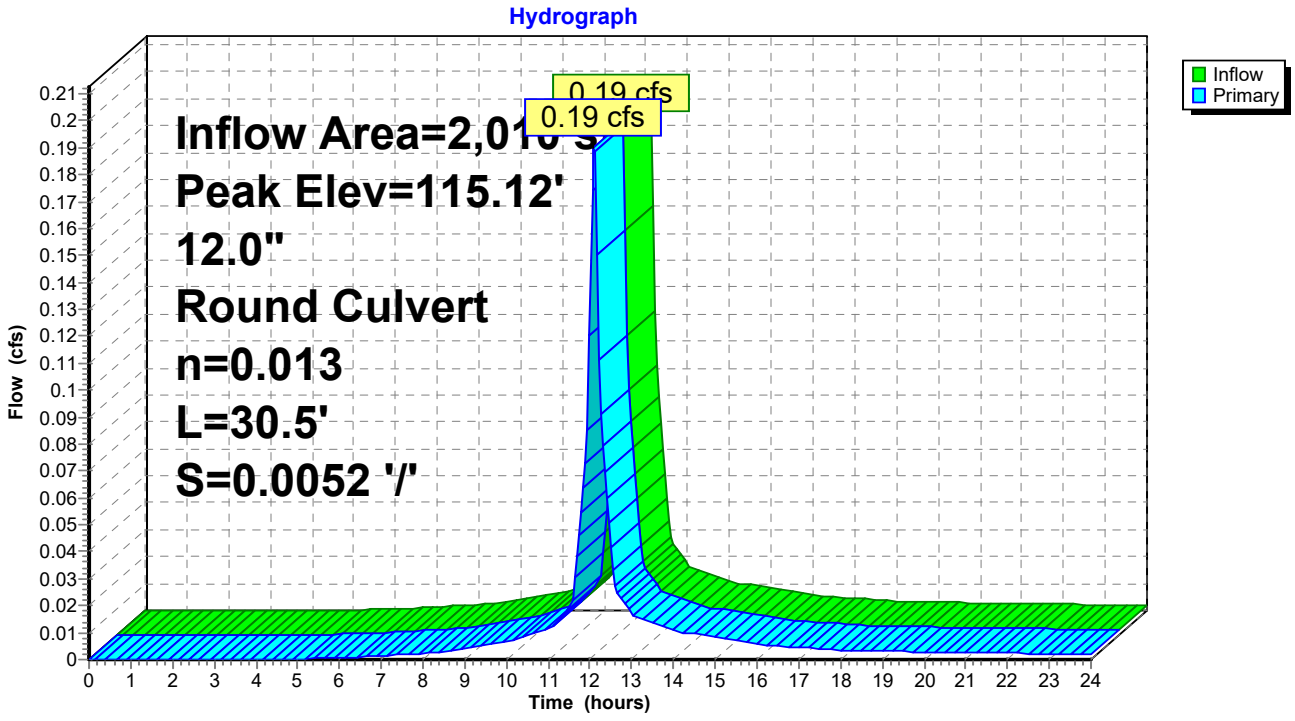
Inflow Area = 2,010 sf, 85.82% Impervious, Inflow Depth > 3.71" for 10-Year event
Inflow = 0.19 cfs @ 12.09 hrs, Volume= 621 cf
Outflow = 0.19 cfs @ 12.09 hrs, Volume= 621 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.19 cfs @ 12.09 hrs, Volume= 621 cf
Routed to Pond 6P : CDS2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.12' @ 12.09 hrs
Flood Elev= 118.00'

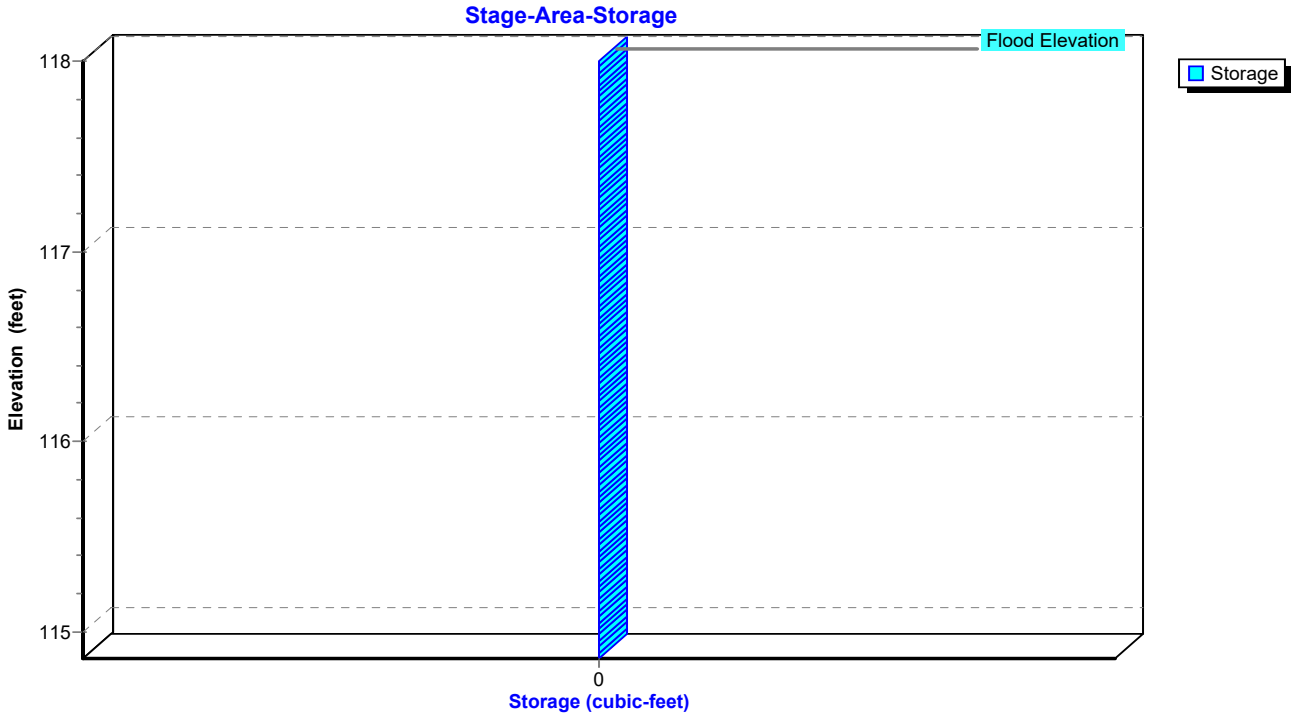
Device	Routing	Invert	Outlet Devices
#1	Primary	114.86'	**12.0" Round Culvert** L= 30.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 114.86' / 114.70' S= 0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.18 cfs @ 12.09 hrs HW=115.11' (Free Discharge)
1=Culvert (Barrel Controls 0.18 cfs @ 1.77 fps)

Pond 3P: CB3



Pond 3P: CB3


Stage-Area-Storage
Flood Elevation
Storage
118
117
116
115
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 3P: CB3

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
114.86	**0**	115.92	0	116.98	0
114.88	0	115.94	0	117.00	0
114.90	0	115.96	0	117.02	0
114.92	0	115.98	0	117.04	0
114.94	0	116.00	0	117.06	0
114.96	0	116.02	0	117.08	0
114.98	0	116.04	0	117.10	0
115.00	0	116.06	0	117.12	0
115.02	0	116.08	0	117.14	0
115.04	0	116.10	0	117.16	0
115.06	0	116.12	0	117.18	0
115.08	0	116.14	0	117.20	0
115.10	0	116.16	0	117.22	0
115.12	0	116.18	0	117.24	0
115.14	0	116.20	0	117.26	0
115.16	0	116.22	0	117.28	0
115.18	0	116.24	0	117.30	0
115.20	0	116.26	0	117.32	0
115.22	0	116.28	0	117.34	0
115.24	0	116.30	0	117.36	0
115.26	0	116.32	0	117.38	0
115.28	0	116.34	0	117.40	0
115.30	0	116.36	0	117.42	0
115.32	0	116.38	0	117.44	0
115.34	0	116.40	0	117.46	0
115.36	0	116.42	0	117.48	0
115.38	0	116.44	0	117.50	0
115.40	0	116.46	0	117.52	0
115.42	0	116.48	0	117.54	0
115.44	0	116.50	0	117.56	0
115.46	0	116.52	0	117.58	0
115.48	0	116.54	0	117.60	0
115.50	0	116.56	0	117.62	0
115.52	0	116.58	0	117.64	0
115.54	0	116.60	0	117.66	0
115.56	0	116.62	0	117.68	0
115.58	0	116.64	0	117.70	0
115.60	0	116.66	0	117.72	0
115.62	0	116.68	0	117.74	0
115.64	0	116.70	0	117.76	0
115.66	0	116.72	0	117.78	0
115.68	0	116.74	0	117.80	0
115.70	0	116.76	0	117.82	0
115.72	0	116.78	0	117.84	0
115.74	0	116.80	0	117.86	0
115.76	0	116.82	0	117.88	0
115.78	0	116.84	0	117.90	0
115.80	0	116.86	0	117.92	0
115.82	0	116.88	0	117.94	0
115.84	0	116.90	0	117.96	0
115.86	0	116.92	0	117.98	0
115.88	0	116.94	0	118.00	0
115.90	0	116.96	0		

Summary for Pond 4P: SUBSURFACE INFILTRATION #1

Inflow Area = 1,968 sf,100.00% Impervious, Inflow Depth > 4.59" for 10-Year event
Inflow = 0.21 cfs @ 12.09 hrs, Volume= 753 cf
Outflow = 0.03 cfs @ 12.63 hrs, Volume= 752 cf, Atten= 87%, Lag= 32.9 min
Primary = 0.03 cfs @ 12.63 hrs, Volume= 752 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.63' @ 12.63 hrs Surf.Area= 281 sf Storage= 250 cf

Plug-Flow detention time= 69.1 min calculated for 752 cf (100% of inflow)
Center-of-Mass det. time= 68.7 min (816.8 - 748.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	118.20'	277 cf	**15.75'W x 17.86'L x 3.50'H Field A** 984 cf Overall - 292 cf Embedded = 693 cf x 40.0% Voids
#2A	118.70'	292 cf	**ADS_StormTech SC-740 b +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 6 Chambers in 3 Rows Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf
		569 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	118.20'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 116.16'

Primary OutFlow Max=0.03 cfs @ 12.63 hrs HW=119.63' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.03 cfs)

Pond 4P: SUBSURFACE INFILTRATION #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 b +Cap (ADS StormTech® SC-740 with cap storage)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

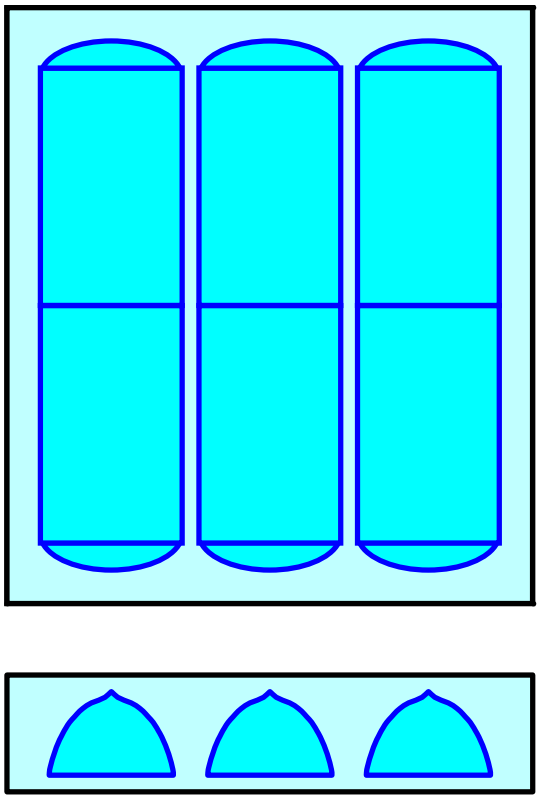
2 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 15.86' Row Length +12.0" End Stone x 2 = 17.86' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

6 Chambers x 45.9 cf + 2.7 cf Cap Volume x 2 x 3 Rows = 291.6 cf Chamber Storage

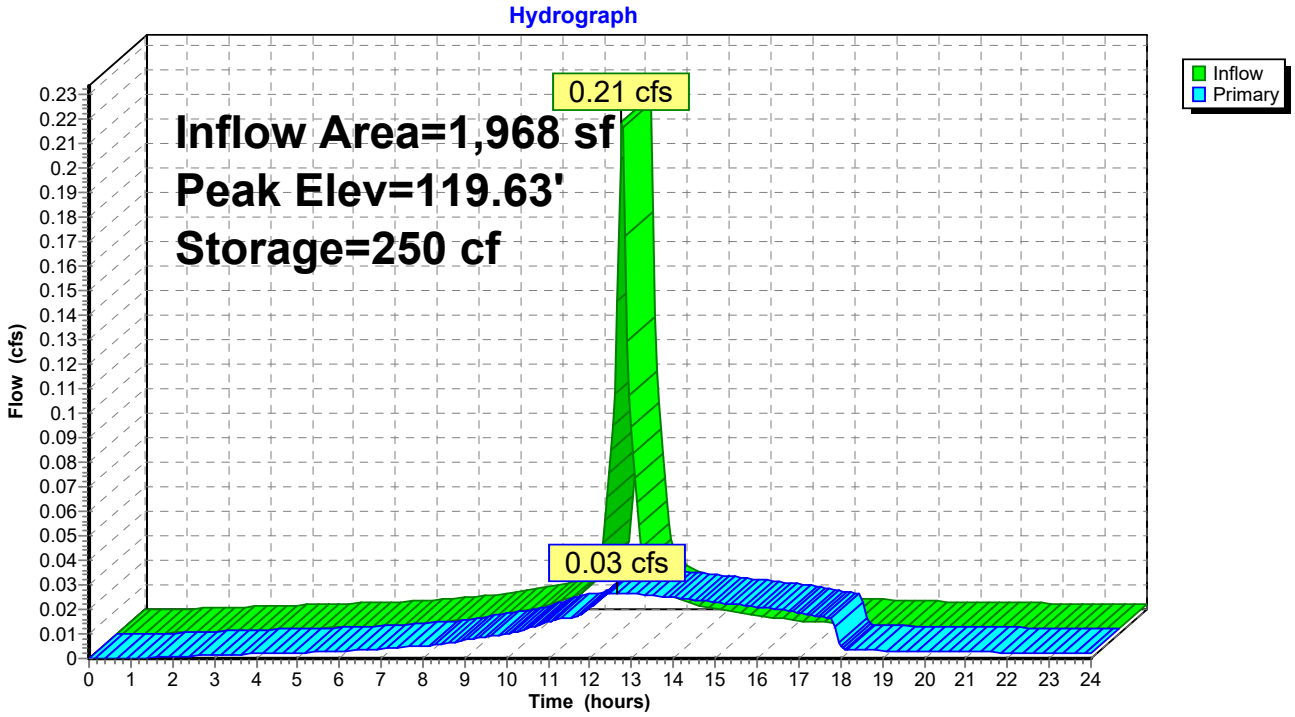
984.3 cf Field - 291.6 cf Chambers = 692.8 cf Stone x 40.0% Voids = 277.1 cf Stone Storage

Chamber Storage + Stone Storage = 568.7 cf = 0.013 af
Overall Storage Efficiency = 57.8%
Overall System Size = 17.86' x 15.75' x 3.50'

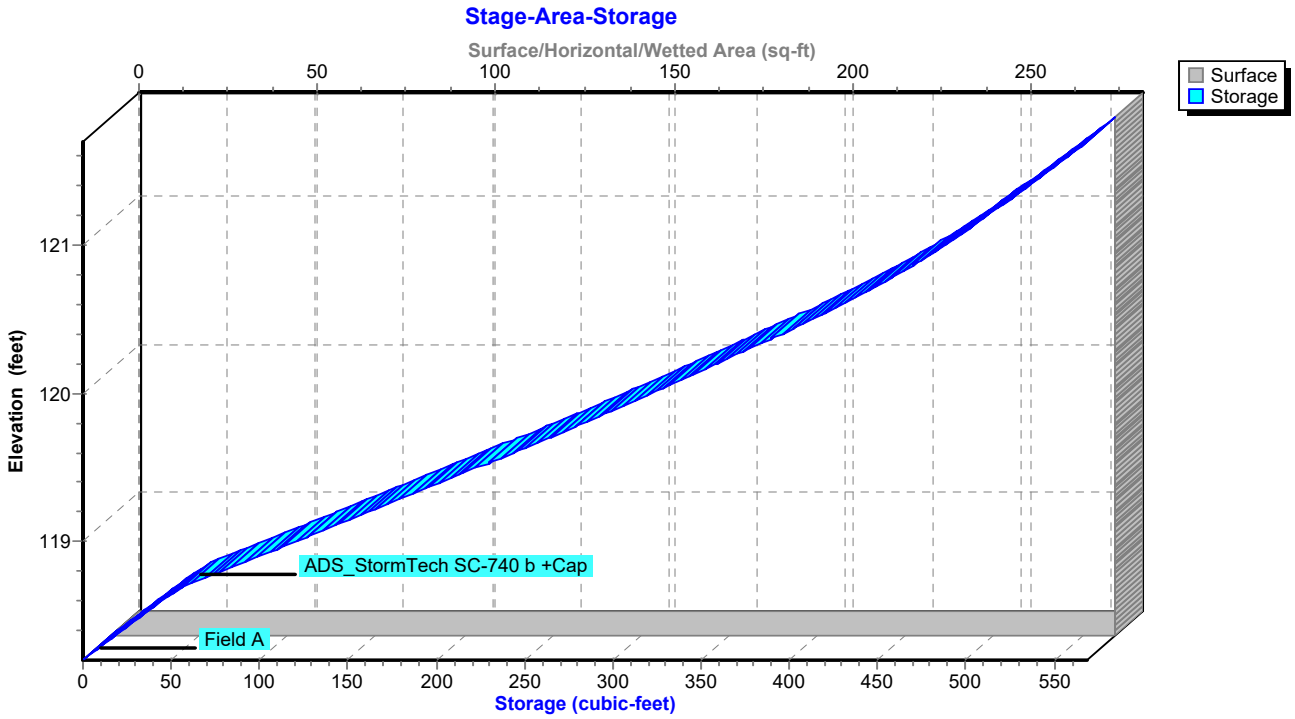
6 Chambers
36.5 cy Field
25.7 cy Stone



Pond 4P: SUBSURFACE INFILTRATION #1



Pond 4P: SUBSURFACE INFILTRATION #1



Stage-Area-Storage for Pond 4P: SUBSURFACE INFILTRATION #1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
118.20	**281**	0
118.25	281	6
118.30	281	11
118.35	281	17
118.40	281	22
118.45	281	28
118.50	281	34
118.55	281	39
118.60	281	45
118.65	281	51
118.70	281	56
118.75	281	67
118.80	281	78
118.85	281	88
118.90	281	99
118.95	281	109
119.00	281	120
119.05	281	131
119.10	281	141
119.15	281	151
119.20	281	162
119.25	281	172
119.30	281	183
119.35	281	193
119.40	281	203
119.45	281	213
119.50	281	223
119.55	281	234
119.60	281	244
119.65	281	254
119.70	281	264
119.75	281	273
119.80	281	283
119.85	281	293
119.90	281	303
119.95	281	312
120.00	281	322
120.05	281	331
120.10	281	341
120.15	281	350
120.20	281	359
120.25	281	368
120.30	281	377
120.35	281	386
120.40	281	395
120.45	281	404
120.50	281	412
120.55	281	421
120.60	281	429
120.65	281	437
120.70	281	445
120.75	281	453
120.80	281	461
120.85	281	468
120.90	281	475
120.95	281	482
121.00	281	489
121.05	281	495
121.10	281	501
121.15	281	507
121.20	281	512
121.25	281	518
121.30	281	524
121.35	281	529
121.40	281	535
121.45	281	541
121.50	281	546
121.55	281	552
121.60	281	557
121.65	281	563
121.70	281	**569**

Summary for Pond 5P: CB4

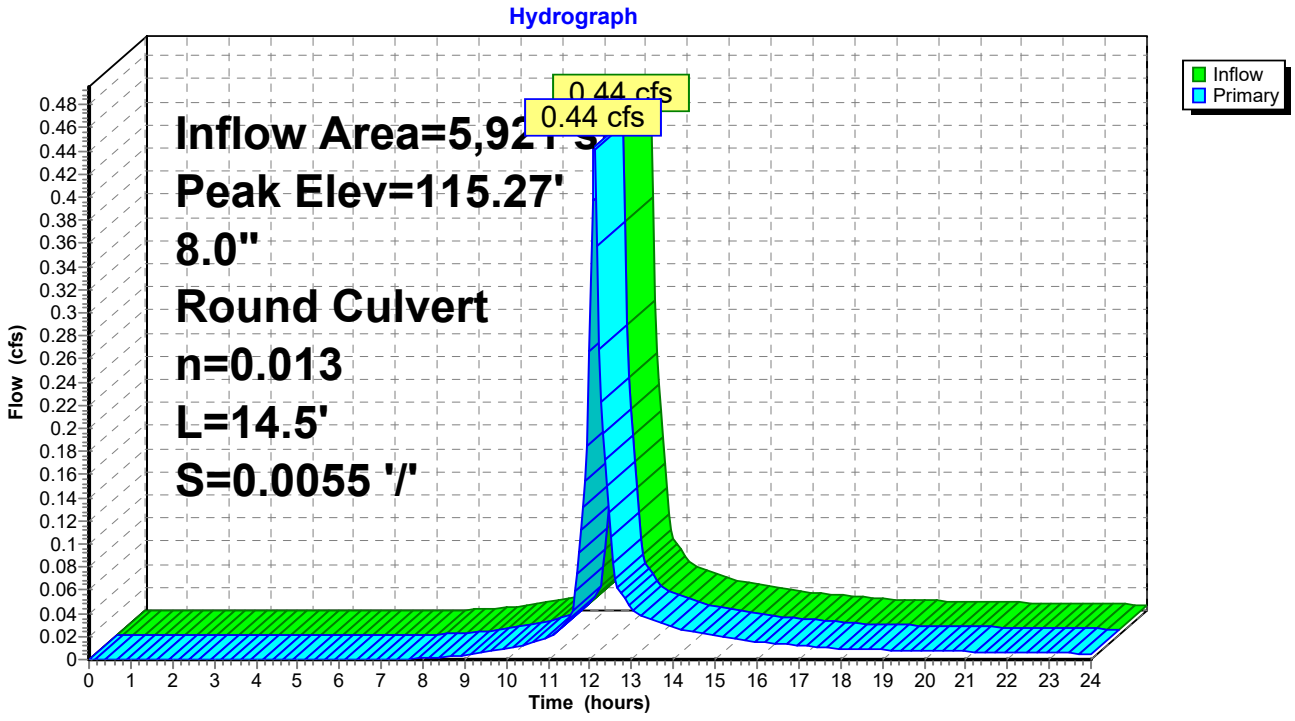
Inflow Area = 5,921 sf, 70.70% Impervious, Inflow Depth > 2.83" for 10-Year event
Inflow = 0.44 cfs @ 12.09 hrs, Volume= 1,398 cf
Outflow = 0.44 cfs @ 12.09 hrs, Volume= 1,398 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.44 cfs @ 12.09 hrs, Volume= 1,398 cf
Routed to Pond 6P : CDS2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.27' @ 12.09 hrs
Flood Elev= 117.40'

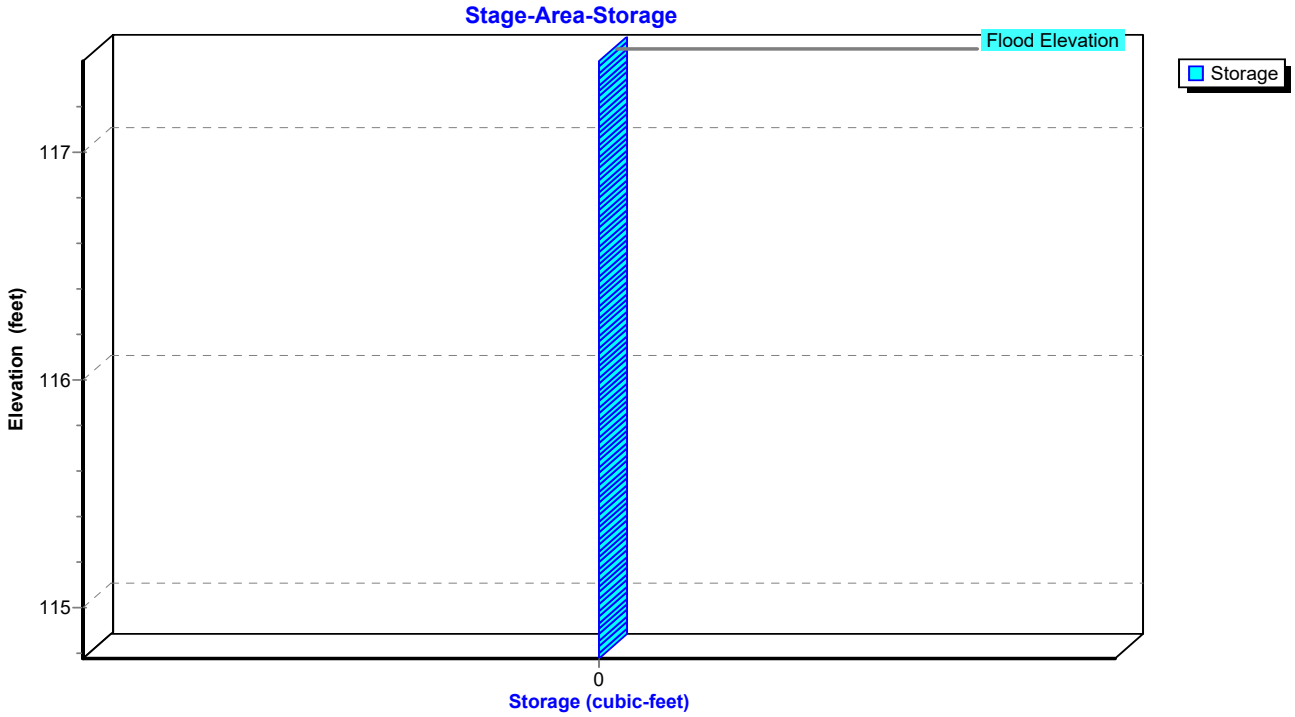
Device	Routing	Invert	Outlet Devices
#1	Primary	114.78'	**8.0" Round Culvert** L= 14.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 114.78' / 114.70' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.43 cfs @ 12.09 hrs HW=115.27' (Free Discharge)
1=Culvert (Barrel Controls 0.43 cfs @ 2.22 fps)

Pond 5P: CB4



Pond 5P: CB4


Stage-Area-Storage
Flood Elevation
Storage
117
116
115
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 5P: CB4

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
114.78	**0**	115.84	0	116.90	0
114.80	0	115.86	0	116.92	0
114.82	0	115.88	0	116.94	0
114.84	0	115.90	0	116.96	0
114.86	0	115.92	0	116.98	0
114.88	0	115.94	0	117.00	0
114.90	0	115.96	0	117.02	0
114.92	0	115.98	0	117.04	0
114.94	0	116.00	0	117.06	0
114.96	0	116.02	0	117.08	0
114.98	0	116.04	0	117.10	0
115.00	0	116.06	0	117.12	0
115.02	0	116.08	0	117.14	0
115.04	0	116.10	0	117.16	0
115.06	0	116.12	0	117.18	0
115.08	0	116.14	0	117.20	0
115.10	0	116.16	0	117.22	0
115.12	0	116.18	0	117.24	0
115.14	0	116.20	0	117.26	0
115.16	0	116.22	0	117.28	0
115.18	0	116.24	0	117.30	0
115.20	0	116.26	0	117.32	0
115.22	0	116.28	0	117.34	0
115.24	0	116.30	0	117.36	0
115.26	0	116.32	0	117.38	0
115.28	0	116.34	0	117.40	0
115.30	0	116.36	0		
115.32	0	116.38	0		
115.34	0	116.40	0		
115.36	0	116.42	0		
115.38	0	116.44	0		
115.40	0	116.46	0		
115.42	0	116.48	0		
115.44	0	116.50	0		
115.46	0	116.52	0		
115.48	0	116.54	0		
115.50	0	116.56	0		
115.52	0	116.58	0		
115.54	0	116.60	0		
115.56	0	116.62	0		
115.58	0	116.64	0		
115.60	0	116.66	0		
115.62	0	116.68	0		
115.64	0	116.70	0		
115.66	0	116.72	0		
115.68	0	116.74	0		
115.70	0	116.76	0		
115.72	0	116.78	0		
115.74	0	116.80	0		
115.76	0	116.82	0		
115.78	0	116.84	0		
115.80	0	116.86	0		
115.82	0	116.88	0		

Summary for Pond 6P: CDS2

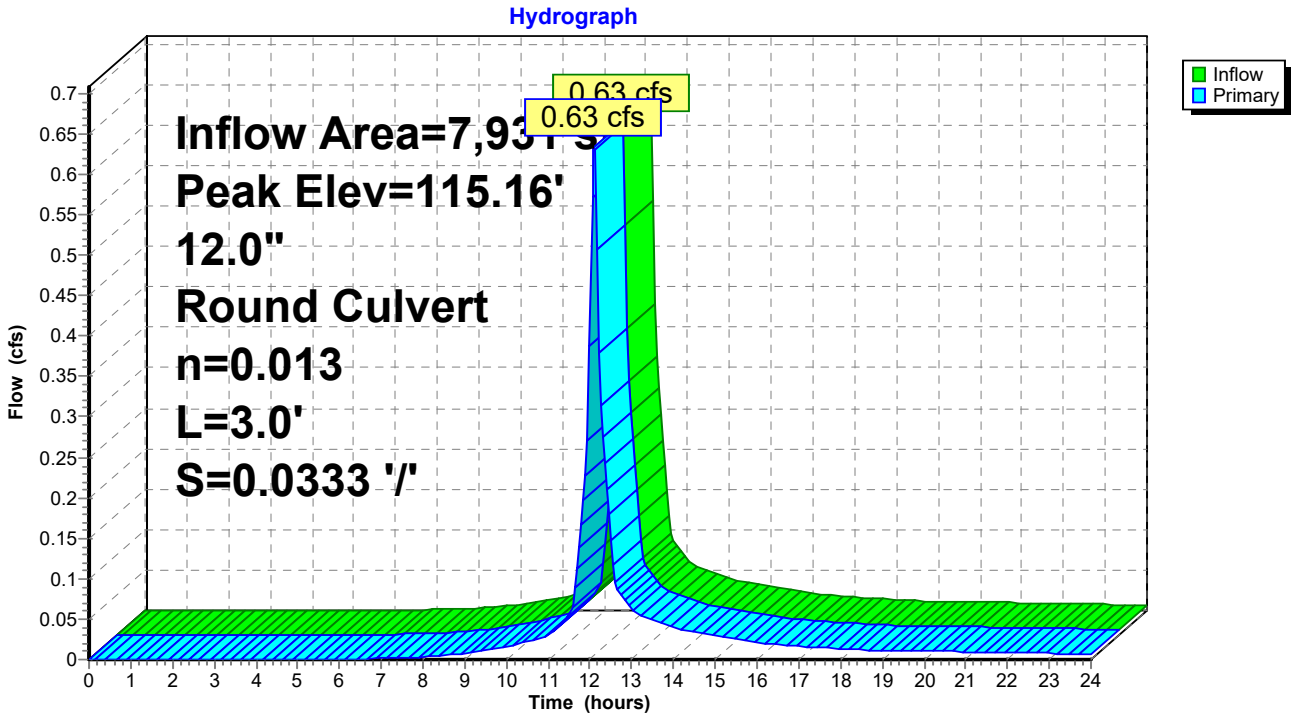
Inflow Area = 7,931 sf, 74.53% Impervious, Inflow Depth > 3.06" for 10-Year event
Inflow = 0.63 cfs @ 12.09 hrs, Volume= 2,019 cf
Outflow = 0.63 cfs @ 12.09 hrs, Volume= 2,019 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.63 cfs @ 12.09 hrs, Volume= 2,019 cf
Routed to Pond 2P : SUBSURFACE INFILTRATION #2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.16' @ 12.09 hrs
Flood Elev= 118.00'

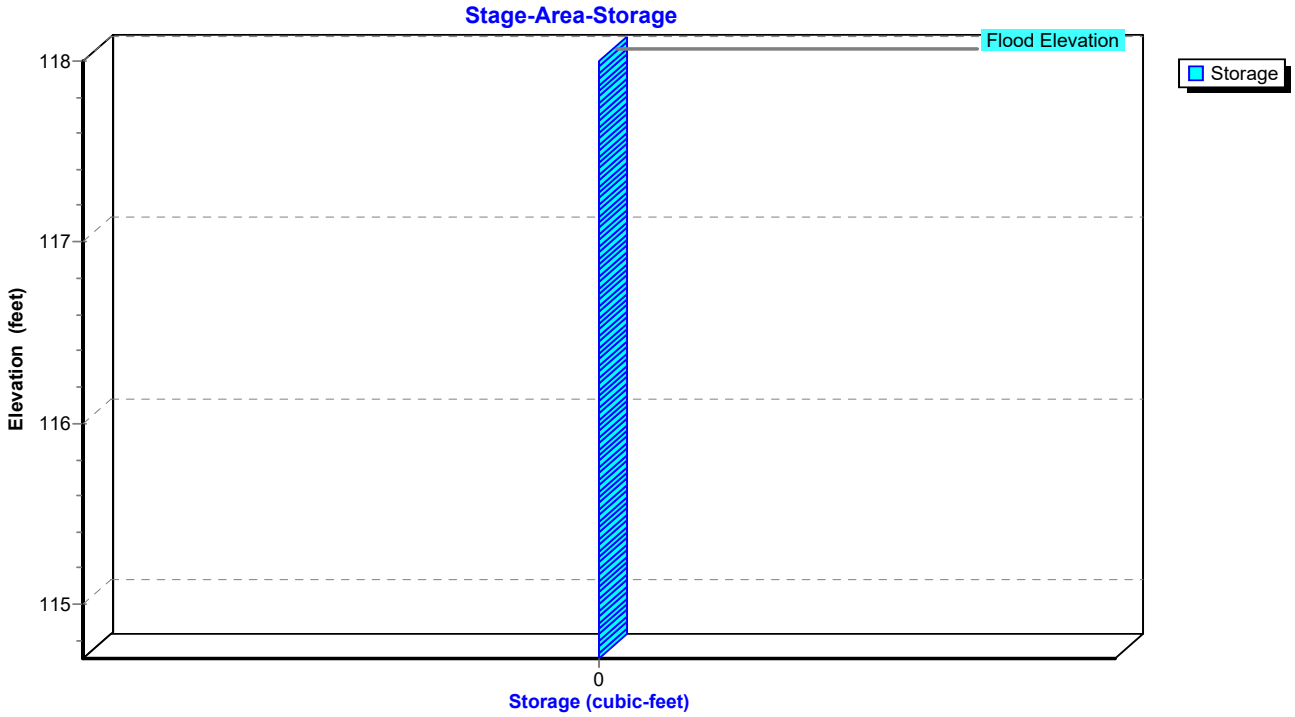
Device	Routing	Invert	Outlet Devices
#1	Primary	114.70'	**12.0" Round Culvert** L= 3.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 114.70' / 114.60' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.62 cfs @ 12.09 hrs HW=115.16' (Free Discharge)
1=Culvert (Barrel Controls 0.62 cfs @ 2.60 fps)

Pond 6P: CDS2



Pond 6P: CDS2


Stage-Area-Storage
Flood Elevation
Storage
118
117
116
115
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 6P: CDS2

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
114.70	**0**	117.35	0
114.75	0	117.40	0
114.80	0	117.45	0
114.85	0	117.50	0
114.90	0	117.55	0
114.95	0	117.60	0
115.00	0	117.65	0
115.05	0	117.70	0
115.10	0	117.75	0
115.15	0	117.80	0
115.20	0	117.85	0
115.25	0	117.90	0
115.30	0	117.95	0
115.35	0	118.00	0
115.40	0		
115.45	0		
115.50	0		
115.55	0		
115.60	0		
115.65	0		
115.70	0		
115.75	0		
115.80	0		
115.85	0		
115.90	0		
115.95	0		
116.00	0		
116.05	0		
116.10	0		
116.15	0		
116.20	0		
116.25	0		
116.30	0		
116.35	0		
116.40	0		
116.45	0		
116.50	0		
116.55	0		
116.60	0		
116.65	0		
116.70	0		
116.75	0		
116.80	0		
116.85	0		
116.90	0		
116.95	0		
117.00	0		
117.05	0		
117.10	0		
117.15	0		
117.20	0		
117.25	0		
117.30	0		

Summary for Pond 7P: CB2

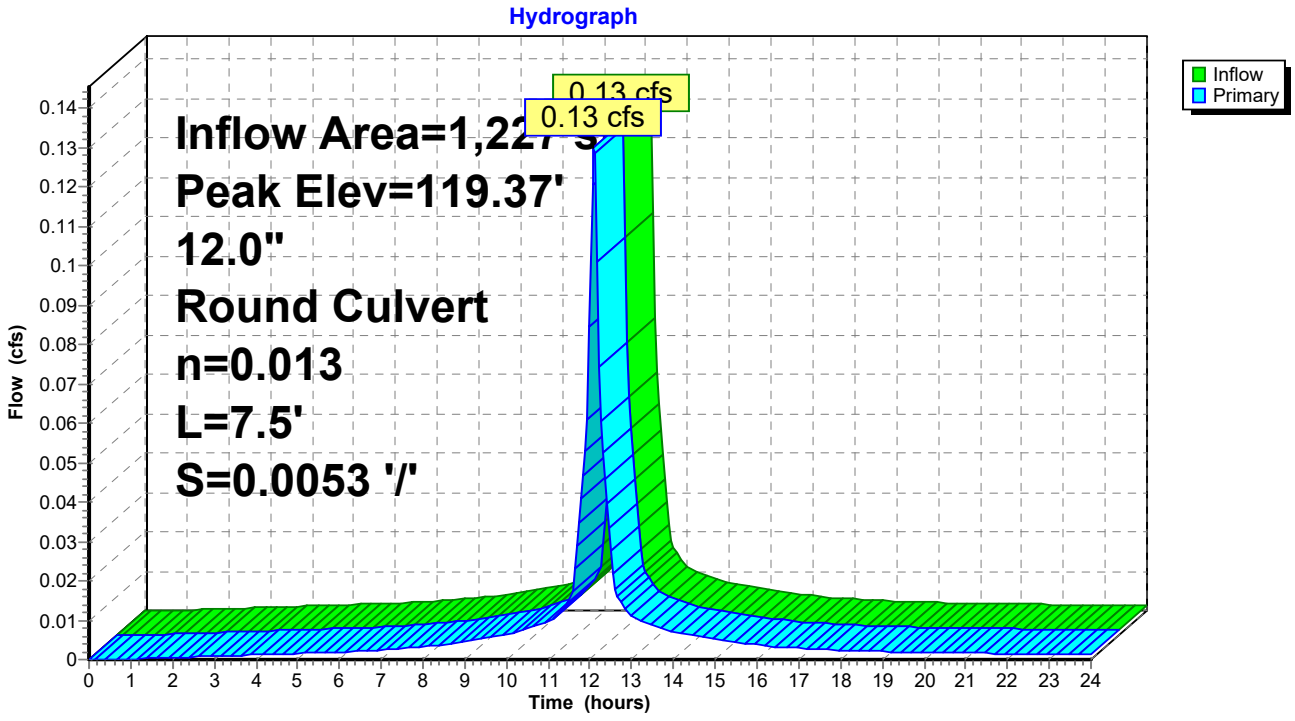
Inflow Area = 1,227 sf,100.00% Impervious, Inflow Depth > 4.59" for 10-Year event
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 469 cf
Outflow = 0.13 cfs @ 12.09 hrs, Volume= 469 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.13 cfs @ 12.09 hrs, Volume= 469 cf
Routed to Pond 8P : DMH1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.37' @ 12.09 hrs
Flood Elev= 122.15'

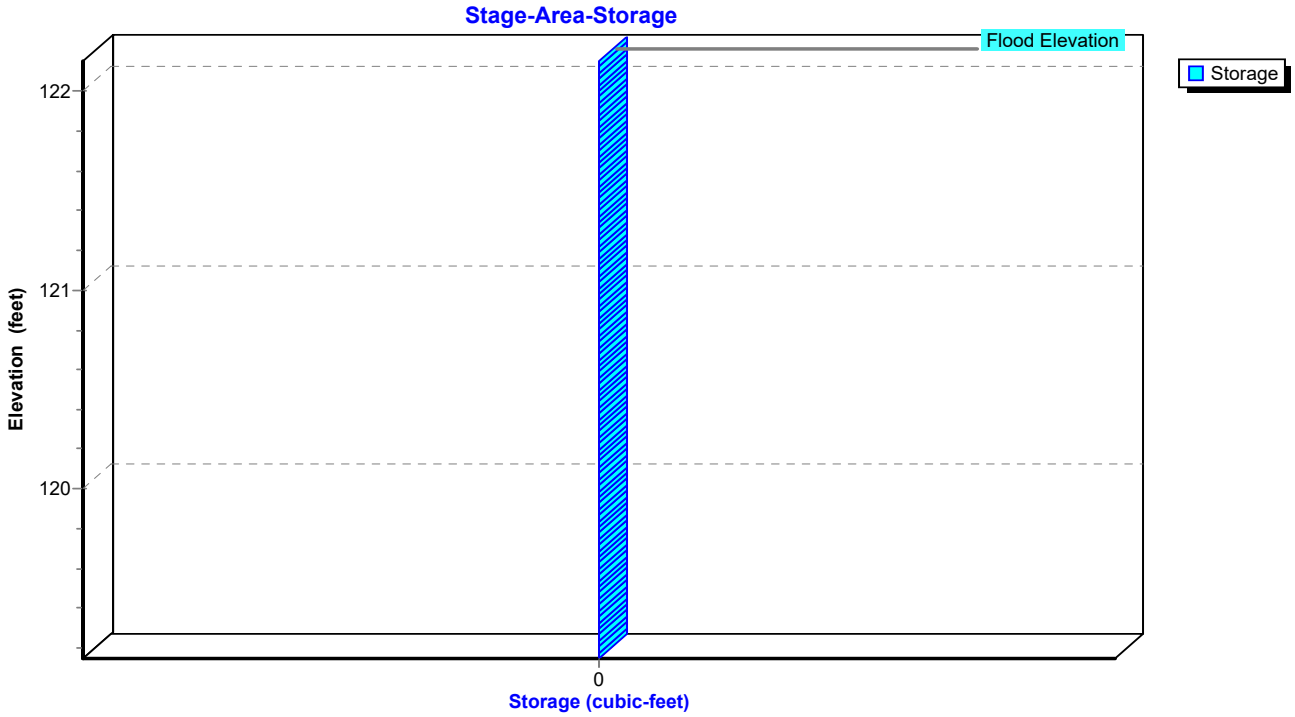
Device	Routing	Invert	Outlet Devices
#1	Primary	119.15'	**12.0" Round Culvert** L= 7.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.15' / 119.11' S= 0.0053 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 12.09 hrs HW=119.37' (Free Discharge)
1=Culvert (Barrel Controls 0.13 cfs @ 1.50 fps)

Pond 7P: CB2



Pond 7P: CB2


Stage-Area-Storage
Flood Elevation
Storage
122
121
120
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 7P: CB2

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
119.15	**0**	120.21	0	121.27	0
119.17	0	120.23	0	121.29	0
119.19	0	120.25	0	121.31	0
119.21	0	120.27	0	121.33	0
119.23	0	120.29	0	121.35	0
119.25	0	120.31	0	121.37	0
119.27	0	120.33	0	121.39	0
119.29	0	120.35	0	121.41	0
119.31	0	120.37	0	121.43	0
119.33	0	120.39	0	121.45	0
119.35	0	120.41	0	121.47	0
119.37	0	120.43	0	121.49	0
119.39	0	120.45	0	121.51	0
119.41	0	120.47	0	121.53	0
119.43	0	120.49	0	121.55	0
119.45	0	120.51	0	121.57	0
119.47	0	120.53	0	121.59	0
119.49	0	120.55	0	121.61	0
119.51	0	120.57	0	121.63	0
119.53	0	120.59	0	121.65	0
119.55	0	120.61	0	121.67	0
119.57	0	120.63	0	121.69	0
119.59	0	120.65	0	121.71	0
119.61	0	120.67	0	121.73	0
119.63	0	120.69	0	121.75	0
119.65	0	120.71	0	121.77	0
119.67	0	120.73	0	121.79	0
119.69	0	120.75	0	121.81	0
119.71	0	120.77	0	121.83	0
119.73	0	120.79	0	121.85	0
119.75	0	120.81	0	121.87	0
119.77	0	120.83	0	121.89	0
119.79	0	120.85	0	121.91	0
119.81	0	120.87	0	121.93	0
119.83	0	120.89	0	121.95	0
119.85	0	120.91	0	121.97	0
119.87	0	120.93	0	121.99	0
119.89	0	120.95	0	122.01	0
119.91	0	120.97	0	122.03	0
119.93	0	120.99	0	122.05	0
119.95	0	121.01	0	122.07	0
119.97	0	121.03	0	122.09	0
119.99	0	121.05	0	122.11	0
120.01	0	121.07	0	122.13	0
120.03	0	121.09	0	122.15	0
120.05	0	121.11	0		
120.07	0	121.13	0		
120.09	0	121.15	0		
120.11	0	121.17	0		
120.13	0	121.19	0		
120.15	0	121.21	0		
120.17	0	121.23	0		
120.19	0	121.25	0		

Summary for Pond 8P: DMH1

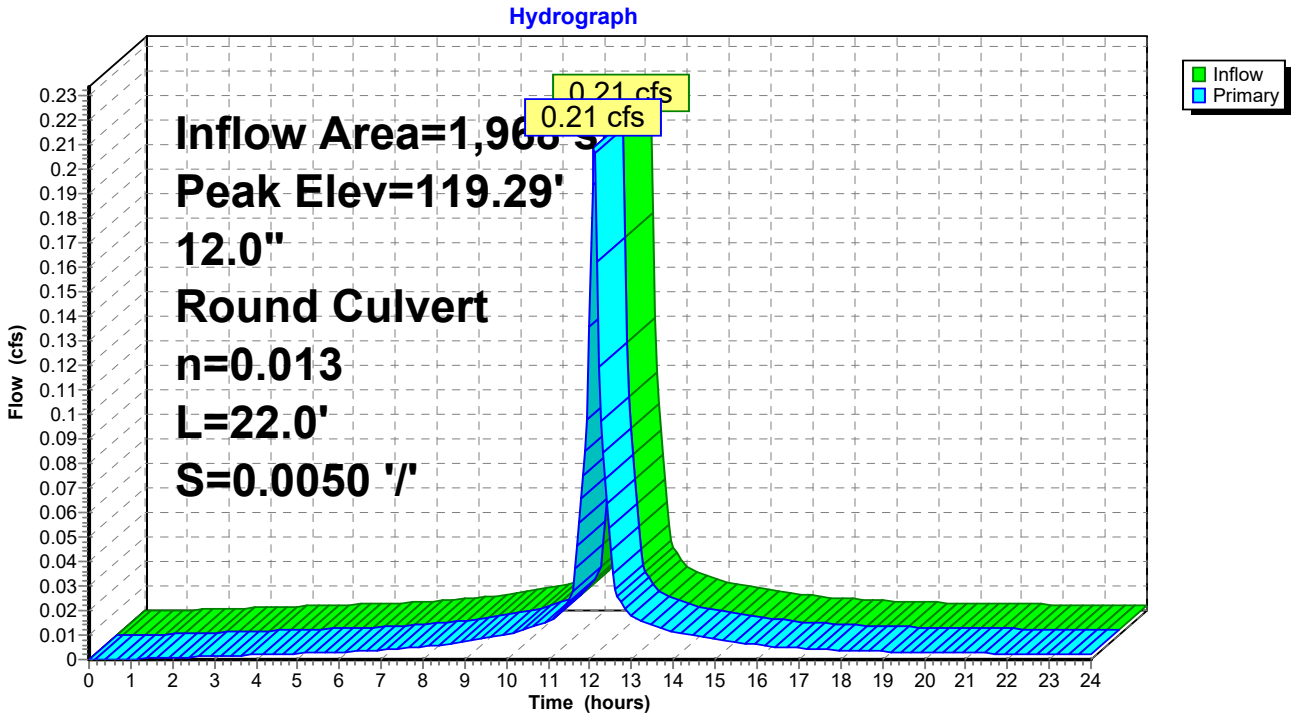
Inflow Area = 1,968 sf,100.00% Impervious, Inflow Depth > 4.59" for 10-Year event
Inflow = 0.21 cfs @ 12.09 hrs, Volume= 753 cf
Outflow = 0.21 cfs @ 12.09 hrs, Volume= 753 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.21 cfs @ 12.09 hrs, Volume= 753 cf
Routed to Pond 10P : CDS1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.29' @ 12.09 hrs
Flood Elev= 122.50'

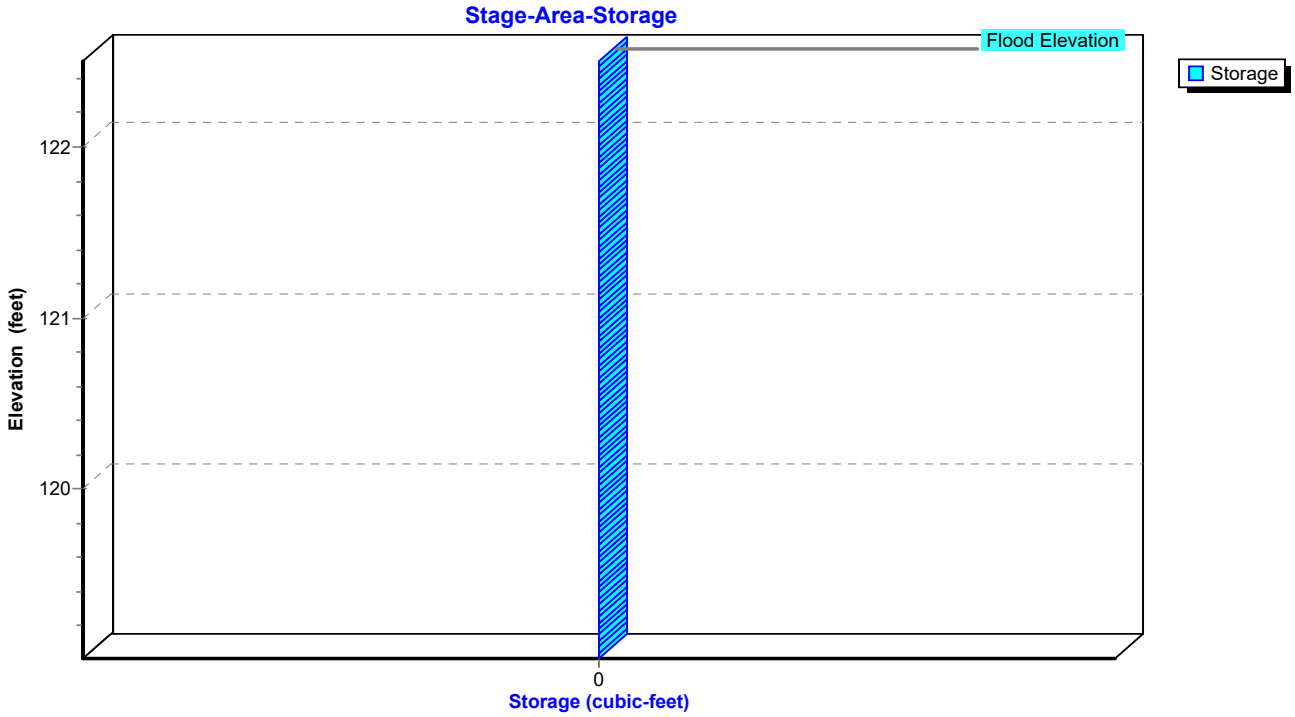
Device	Routing	Invert	Outlet Devices
#1	Primary	119.01'	**12.0" Round Culvert** L= 22.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.01' / 118.90' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.20 cfs @ 12.09 hrs HW=119.28' (Free Discharge)
1=Culvert (Barrel Controls 0.20 cfs @ 1.76 fps)

Pond 8P: DMH1



Pond 8P: DMH1


Stage-Area-Storage
Flood Elevation
Storage
122
121
120
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 8P: DMH1

Elevation (feet)	Storage (cubic-feet)
119.01	**0**
119.06	0
119.11	0
119.16	0
119.21	0
119.26	0
119.31	0
119.36	0
119.41	0
119.46	0
119.51	0
119.56	0
119.61	0
119.66	0
119.71	0
119.76	0
119.81	0
119.86	0
119.91	0
119.96	0
120.01	0
120.06	0
120.11	0
120.16	0
120.21	0
120.26	0
120.31	0
120.36	0
120.41	0
120.46	0
120.51	0
120.56	0
120.61	0
120.66	0
120.71	0
120.76	0
120.81	0
120.86	0
120.91	0
120.96	0
121.01	0
121.06	0
121.11	0
121.16	0
121.21	0
121.26	0
121.31	0
121.36	0
121.41	0
121.46	0
121.51	0
121.56	0
121.61	0
121.66	0
121.71	0
121.76	0
121.81	0
121.86	0
121.91	0
121.96	0
122.01	0
122.06	0
122.11	0
122.16	0
122.21	0
122.26	0
122.31	0
122.36	0
122.41	0
122.46	0

Summary for Pond 9P: SUBSURFACE INFILTRATION #3

Inflow Area = 3,048 sf,100.00% Impervious, Inflow Depth > 4.59" for 10-Year event
Inflow = 0.32 cfs @ 12.09 hrs, Volume= 1,166 cf
Outflow = 0.04 cfs @ 12.60 hrs, Volume= 1,165 cf, Atten= 86%, Lag= 31.1 min
Discarded = 0.04 cfs @ 12.60 hrs, Volume= 1,165 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.68' @ 12.60 hrs Surf.Area= 506 sf Storage= 368 cf

Plug-Flow detention time= 57.5 min calculated for 1,163 cf (100% of inflow)
Center-of-Mass det. time= 57.0 min (805.2 - 748.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.50'	481 cf	**15.75'W x 32.10'L x 3.50'H Field A** 1,769 cf Overall - 567 cf Embedded = 1,202 cf x 40.0% Voids
#2A	115.00'	567 cf	**ADS_StormTech SC-740 b +Cap** x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 3 Rows Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf
		1,048 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	114.50'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 112.50'

Discarded OutFlow Max=0.04 cfs @ 12.60 hrs HW=115.68' (Free Discharge)
↑**1=Exfiltration** (Controls 0.04 cfs)

Pond 9P: SUBSURFACE INFILTRATION #3 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 b +Cap (ADS StormTech® SC-740 with cap storage)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

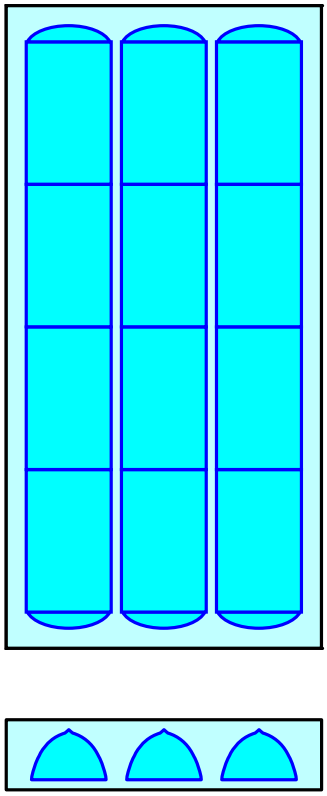
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

12 Chambers x 45.9 cf + 2.7 cf Cap Volume x 2 x 3 Rows = 567.2 cf Chamber Storage

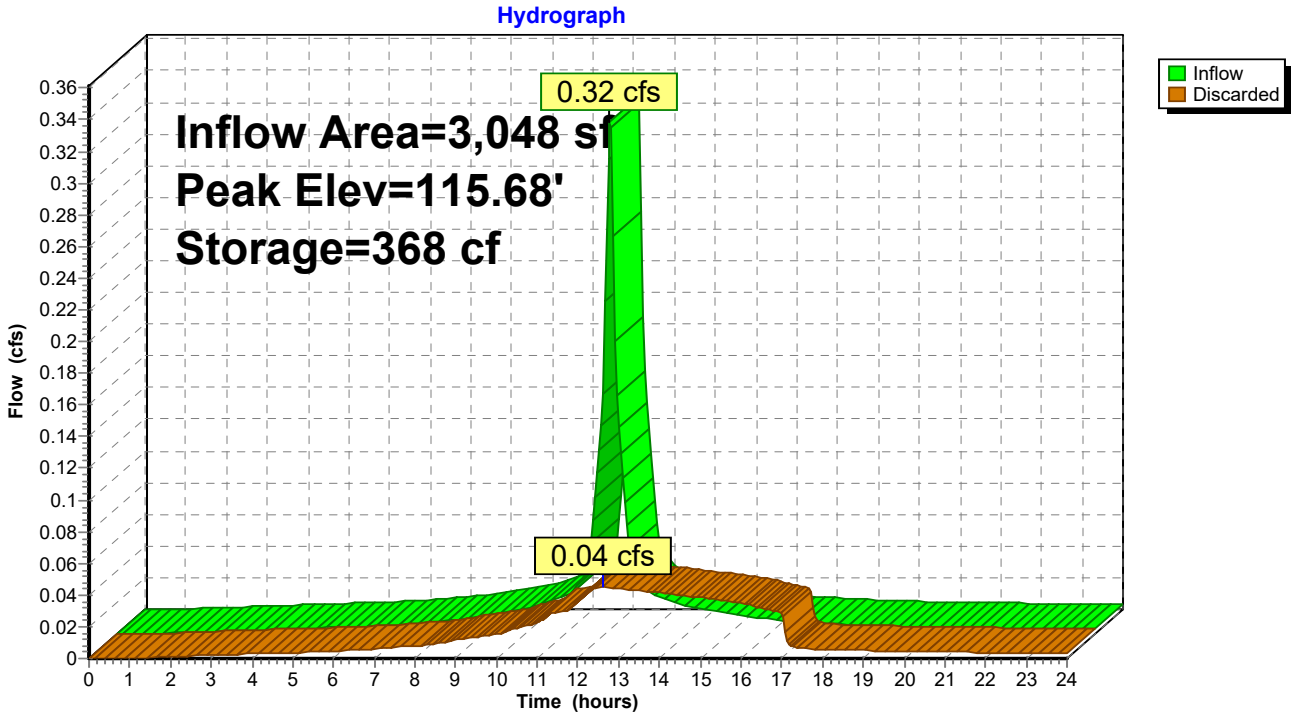
1,769.3 cf Field - 567.2 cf Chambers = 1,202.1 cf Stone x 40.0% Voids = 480.8 cf Stone Storage

Chamber Storage + Stone Storage = 1,048.1 cf = 0.024 af
Overall Storage Efficiency = 59.2%
Overall System Size = 32.10' x 15.75' x 3.50'

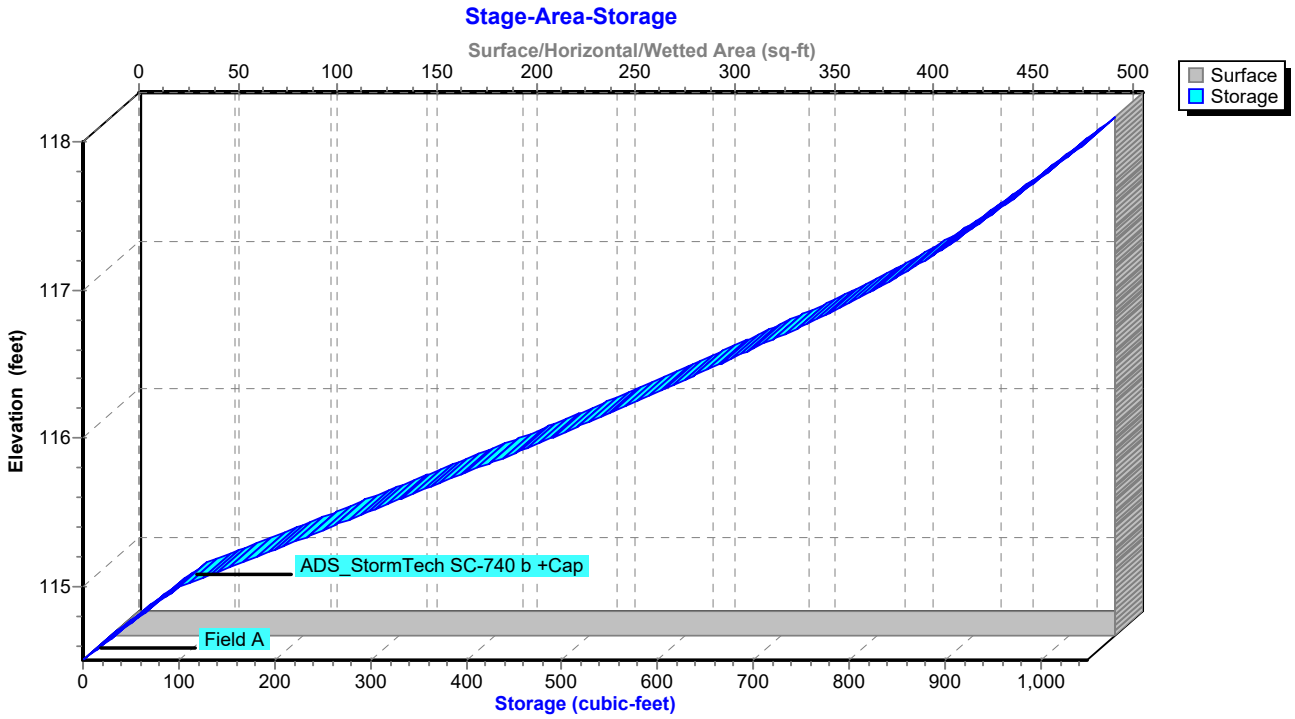
12 Chambers
65.5 cy Field
44.5 cy Stone



Pond 9P: SUBSURFACE INFILTRATION #3



Pond 9P: SUBSURFACE INFILTRATION #3



Stage-Area-Storage for Pond 9P: SUBSURFACE INFILTRATION #3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
114.50	**506**	0
114.55	506	10
114.60	506	20
114.65	506	30
114.70	506	40
114.75	506	51
114.80	506	61
114.85	506	71
114.90	506	81
114.95	506	91
115.00	506	101
115.05	506	121
115.10	506	141
115.15	506	161
115.20	506	181
115.25	506	200
115.30	506	220
115.35	506	240
115.40	506	259
115.45	506	279
115.50	506	298
115.55	506	318
115.60	506	337
115.65	506	356
115.70	506	375
115.75	506	394
115.80	506	413
115.85	506	432
115.90	506	451
115.95	506	469
116.00	506	488
116.05	506	506
116.10	506	524
116.15	506	543
116.20	506	561
116.25	506	578
116.30	506	596
116.35	506	614
116.40	506	631
116.45	506	648
116.50	506	665
116.55	506	682
116.60	506	699
116.65	506	716
116.70	506	732
116.75	506	748
116.80	506	764
116.85	506	779
116.90	506	795
116.95	506	810
117.00	506	825
117.05	506	839
117.10	506	853
117.15	506	867
117.20	506	880
117.25	506	892
117.30	506	904
117.35	506	915
117.40	506	926
117.45	506	937
117.50	506	947
117.55	506	957
117.60	506	967
117.65	506	977
117.70	506	987
117.75	506	998
117.80	506	1,008
117.85	506	1,018
117.90	506	1,028
117.95	506	1,038
118.00	506	**1,048**

Summary for Pond 10P: CDS1

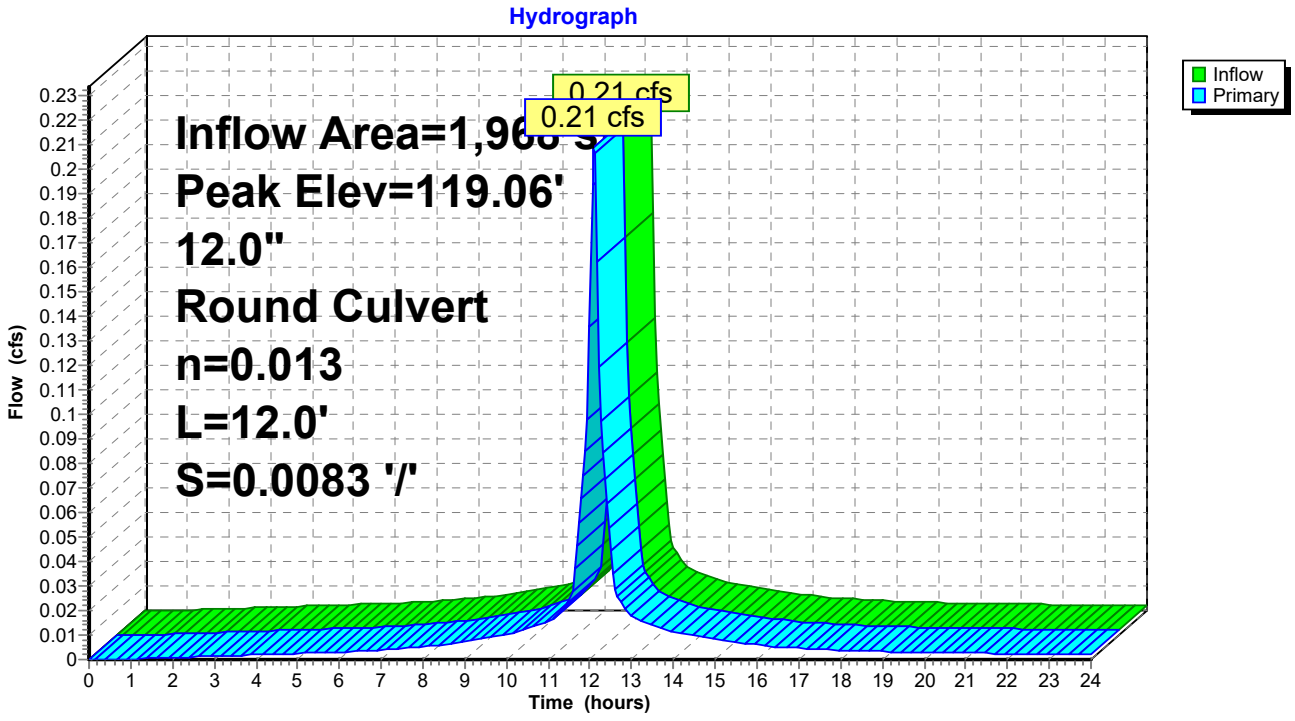
Inflow Area = 1,968 sf,100.00% Impervious, Inflow Depth > 4.59" for 10-Year event
Inflow = 0.21 cfs @ 12.09 hrs, Volume= 753 cf
Outflow = 0.21 cfs @ 12.09 hrs, Volume= 753 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.21 cfs @ 12.09 hrs, Volume= 753 cf
Routed to Pond 4P : SUBSURFACE INFILTRATION #1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.06' @ 12.09 hrs
Flood Elev= 122.50'

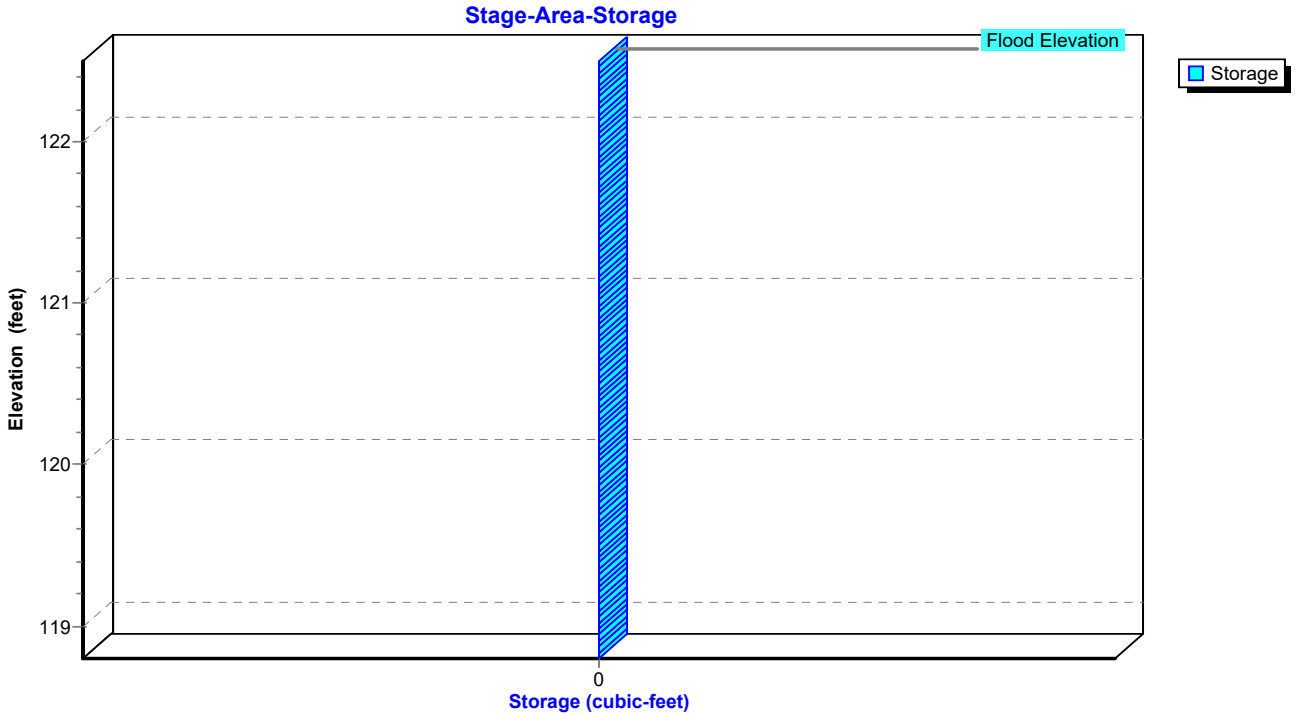
Device	Routing	Invert	Outlet Devices
#1	Primary	118.80'	**12.0" Round Culvert** L= 12.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.80' / 118.70' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.20 cfs @ 12.09 hrs HW=119.06' (Free Discharge)
1=Culvert (Barrel Controls 0.20 cfs @ 1.90 fps)

Pond 10P: CDS1



Pond 10P: CDS1



Stage-Area-Storage for Pond 10P: CDS1

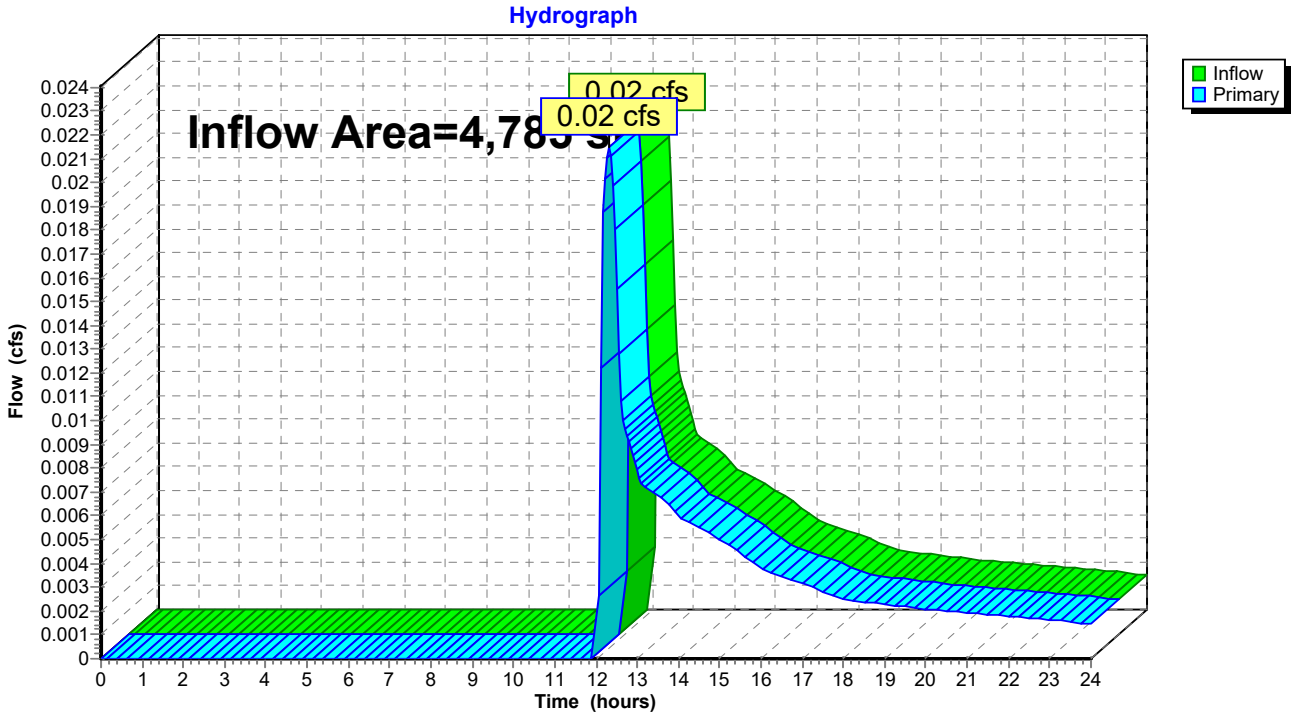
Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
118.80	**0**	121.45	0
118.85	0	121.50	0
118.90	0	121.55	0
118.95	0	121.60	0
119.00	0	121.65	0
119.05	0	121.70	0
119.10	0	121.75	0
119.15	0	121.80	0
119.20	0	121.85	0
119.25	0	121.90	0
119.30	0	121.95	0
119.35	0	122.00	0
119.40	0	122.05	0
119.45	0	122.10	0
119.50	0	122.15	0
119.55	0	122.20	0
119.60	0	122.25	0
119.65	0	122.30	0
119.70	0	122.35	0
119.75	0	122.40	0
119.80	0	122.45	0
119.85	0	122.50	0
119.90	0		
119.95	0		
120.00	0		
120.05	0		
120.10	0		
120.15	0		
120.20	0		
120.25	0		
120.30	0		
120.35	0		
120.40	0		
120.45	0		
120.50	0		
120.55	0		
120.60	0		
120.65	0		
120.70	0		
120.75	0		
120.80	0		
120.85	0		
120.90	0		
120.95	0		
121.00	0		
121.05	0		
121.10	0		
121.15	0		
121.20	0		
121.25	0		
121.30	0		
121.35	0		
121.40	0		

Summary for Link DP1: link

Inflow Area = 4,785 sf, 11.64% Impervious, Inflow Depth > 0.43" for 10-Year event
Inflow = 0.02 cfs @ 12.30 hrs, Volume= 172 cf
Primary = 0.02 cfs @ 12.30 hrs, Volume= 172 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP1: link

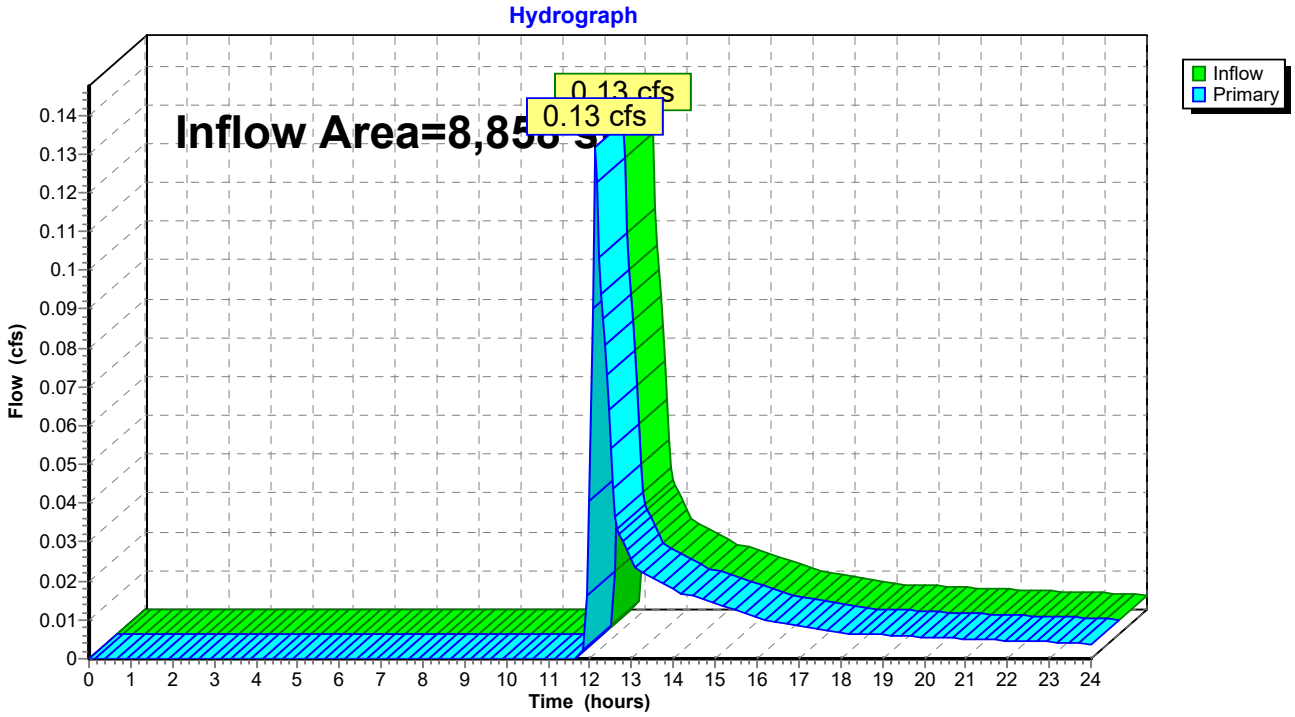


Summary for Link DP2: link

Inflow Area = 8,858 sf, 24.43% Impervious, Inflow Depth > 0.78" for 10-Year event
Inflow = 0.13 cfs @ 12.12 hrs, Volume= 577 cf
Primary = 0.13 cfs @ 12.12 hrs, Volume= 577 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP2: link

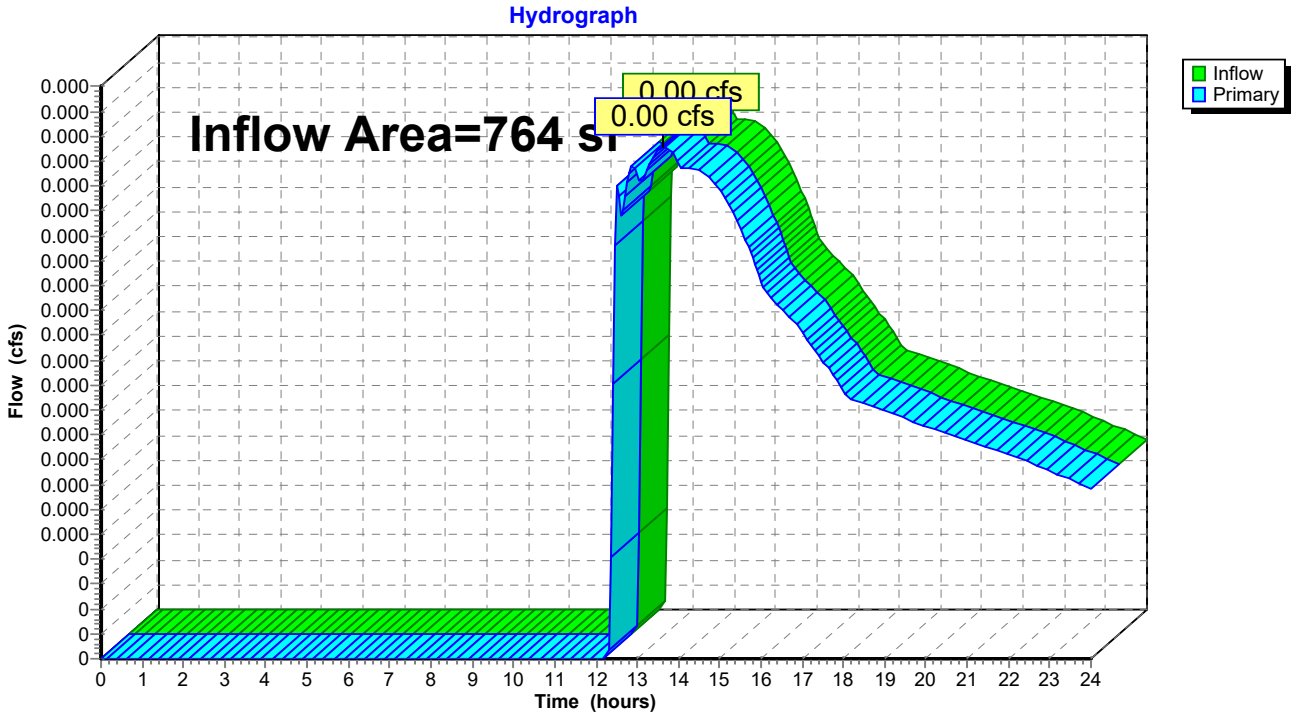


Summary for Link DP3: link

Inflow Area = 764 sf, 0.00% Impervious, Inflow Depth > 0.17" for 10-Year event
Inflow = 0.00 cfs @ 13.65 hrs, Volume= 11 cf
Primary = 0.00 cfs @ 13.65 hrs, Volume= 11 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP3: link



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

Subcatchment P1: P1 Runoff Area=4,785 sf 11.64% Impervious Runoff Depth>0.93"
Tc=6.0 min CN=46 Runoff=0.08 cfs 372 cf

Subcatchment P2: P2 Runoff Area=8,858 sf 24.43% Impervious Runoff Depth>1.45"
Tc=6.0 min CN=53 Runoff=0.30 cfs 1,070 cf

Subcatchment P3: P3 Runoff Area=764 sf 0.00% Impervious Runoff Depth>0.49"
Tc=6.0 min CN=39 Runoff=0.00 cfs 31 cf

Subcatchment P4A: P4A Runoff Area=2,010 sf 85.82% Impervious Runoff Depth>5.00"
Tc=6.0 min CN=90 Runoff=0.25 cfs 837 cf

Subcatchment P4B: P4B Runoff Area=5,921 sf 70.70% Impervious Runoff Depth>4.03"
Tc=6.0 min CN=81 Runoff=0.62 cfs 1,987 cf

Subcatchment P5A: P5A Runoff Area=1,227 sf 100.00% Impervious Runoff Depth>5.92"
Tc=6.0 min CN=98 Runoff=0.17 cfs 605 cf

Subcatchment P5B: P5B Runoff Area=741 sf 100.00% Impervious Runoff Depth>5.92"
Tc=6.0 min CN=98 Runoff=0.10 cfs 365 cf

Subcatchment P6: P6 Runoff Area=3,048 sf 100.00% Impervious Runoff Depth>5.92"
Tc=6.0 min CN=98 Runoff=0.41 cfs 1,503 cf

Pond 1P: CB1 Peak Elev=119.34' Inflow=0.10 cfs 365 cf
12.0" Round Culvert n=0.013 L=7.5' S=0.0053 '/' Outflow=0.10 cfs 365 cf

Pond 2P: SUBSURFACE INFILTRATION #2 Peak Elev=115.07' Storage=938 cf Inflow=0.88 cfs 2,824 cf
Outflow=0.13 cfs 2,822 cf

Pond 3P: CB3 Peak Elev=115.16' Inflow=0.25 cfs 837 cf
12.0" Round Culvert n=0.013 L=30.5' S=0.0052 '/' Outflow=0.25 cfs 837 cf

Pond 4P: SUBSURFACE INFILTRATION #1 Peak Elev=120.12' Storage=345 cf Inflow=0.27 cfs 971 cf
Outflow=0.03 cfs 970 cf

Pond 5P: CB4 Peak Elev=115.39' Inflow=0.62 cfs 1,987 cf
8.0" Round Culvert n=0.013 L=14.5' S=0.0055 '/' Outflow=0.62 cfs 1,987 cf

Pond 6P: CDS2 Peak Elev=115.26' Inflow=0.88 cfs 2,824 cf
12.0" Round Culvert n=0.013 L=3.0' S=0.0333 '/' Outflow=0.88 cfs 2,824 cf

Pond 7P: CB2 Peak Elev=119.40' Inflow=0.17 cfs 605 cf
12.0" Round Culvert n=0.013 L=7.5' S=0.0053 '/' Outflow=0.17 cfs 605 cf

Pond 8P: DMH1 Peak Elev=119.32' Inflow=0.27 cfs 971 cf
12.0" Round Culvert n=0.013 L=22.0' S=0.0050 '/' Outflow=0.27 cfs 971 cf

Pond 9P: SUBSURFACE INFILTRATION #3 Peak Elev=116.06' Storage=510 cf Inflow=0.41 cfs 1,503 cf
Outflow=0.05 cfs 1,502 cf

Pond 10P: CDS1 Peak Elev=119.10' Inflow=0.27 cfs 971 cf
12.0" Round Culvert n=0.013 L=12.0' S=0.0083 '/' Outflow=0.27 cfs 971 cf

Link DP1: link Inflow=0.08 cfs 372 cf
Primary=0.08 cfs 372 cf

Link DP2: link Inflow=0.30 cfs 1,070 cf
Primary=0.30 cfs 1,070 cf

Link DP3: link Inflow=0.00 cfs 31 cf
Primary=0.00 cfs 31 cf

Total Runoff Area = 27,354 sf Runoff Volume = 6,771 cf Average Runoff Depth = 2.97"
50.11% Pervious = 13,706 sf 49.89% Impervious = 13,648 sf

Summary for Subcatchment P1: P1

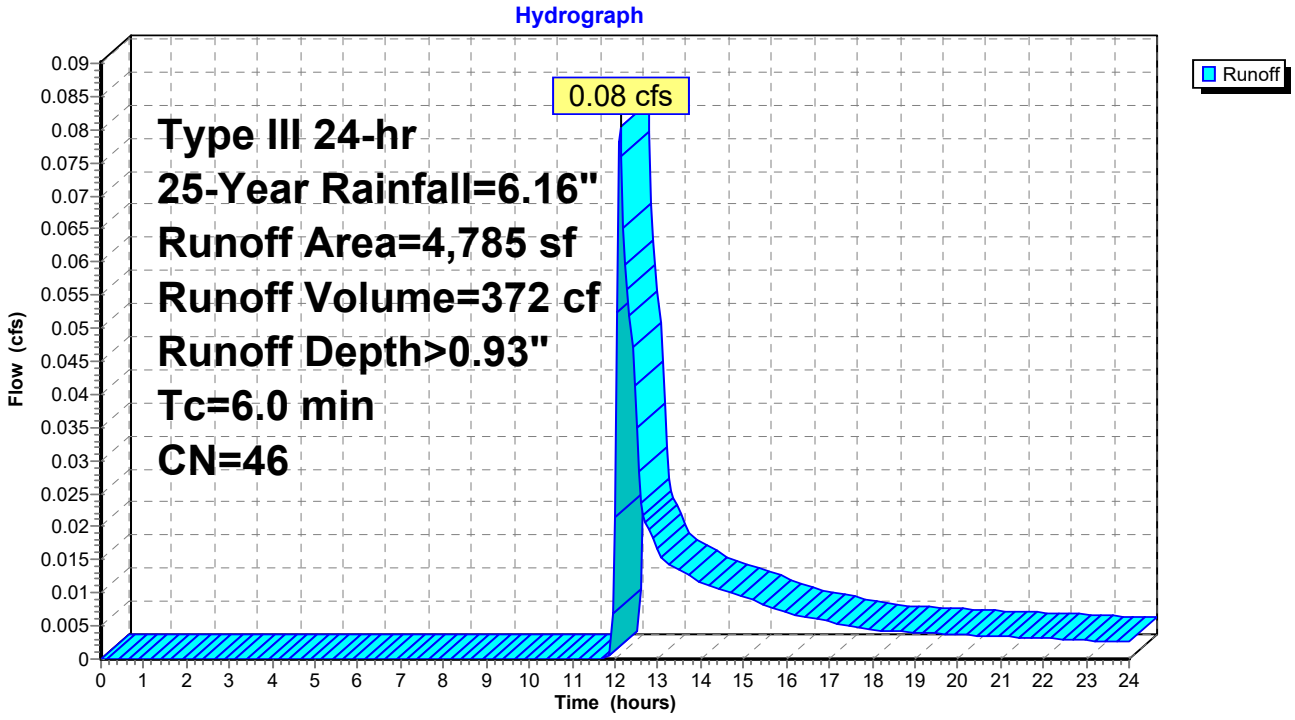
Runoff = 0.08 cfs @ 12.12 hrs, Volume= 372 cf, Depth> 0.93"
Routed to Link DP1 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
557	98	Roofs, HSG A
4,228	39	>75% Grass cover, Good, HSG A
4,785	46	Weighted Average
4,228		88.36% Pervious Area
557		11.64% Impervious Area

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

Subcatchment P1: P1



Summary for Subcatchment P2: P2

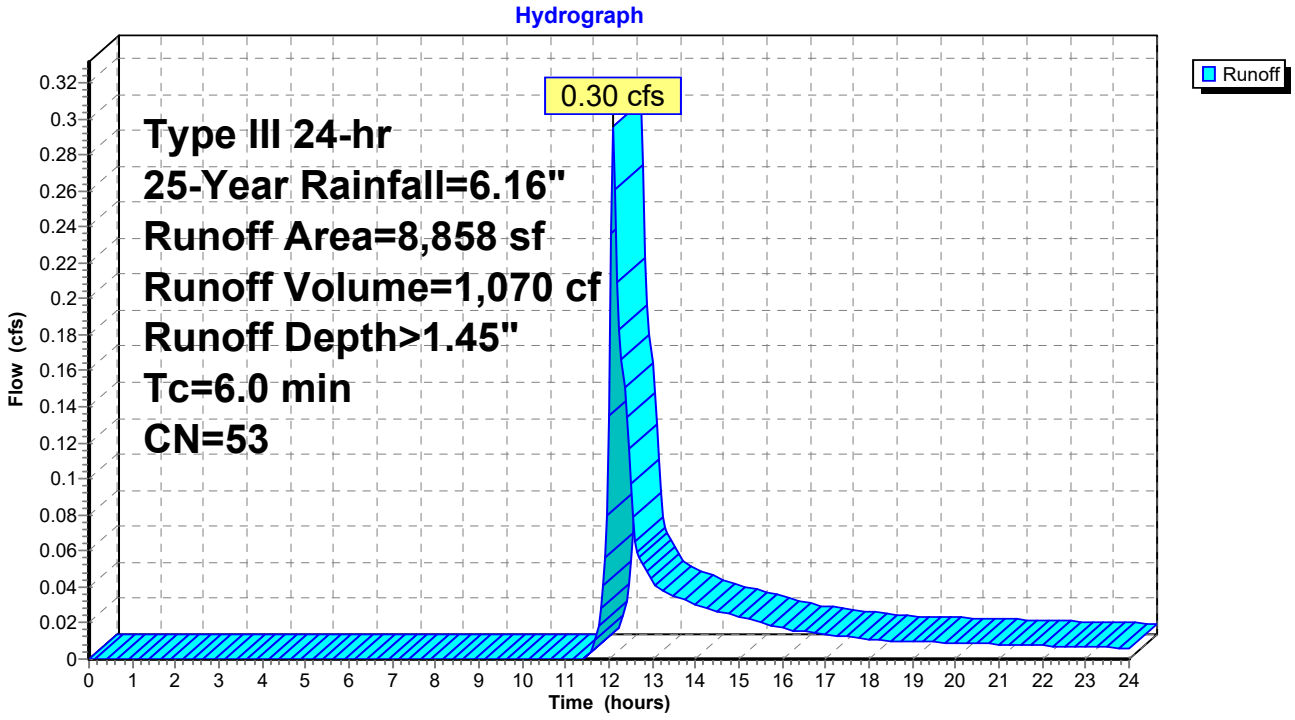
Runoff = 0.30 cfs @ 12.11 hrs, Volume= 1,070 cf, Depth> 1.45"
Routed to Link DP2 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
2,164	98	Roofs, HSG A
6,694	39	>75% Grass cover, Good, HSG A
8,858	53	Weighted Average
6,694		75.57% Pervious Area
2,164		24.43% Impervious Area

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

Subcatchment P2: P2



Summary for Subcatchment P3: P3

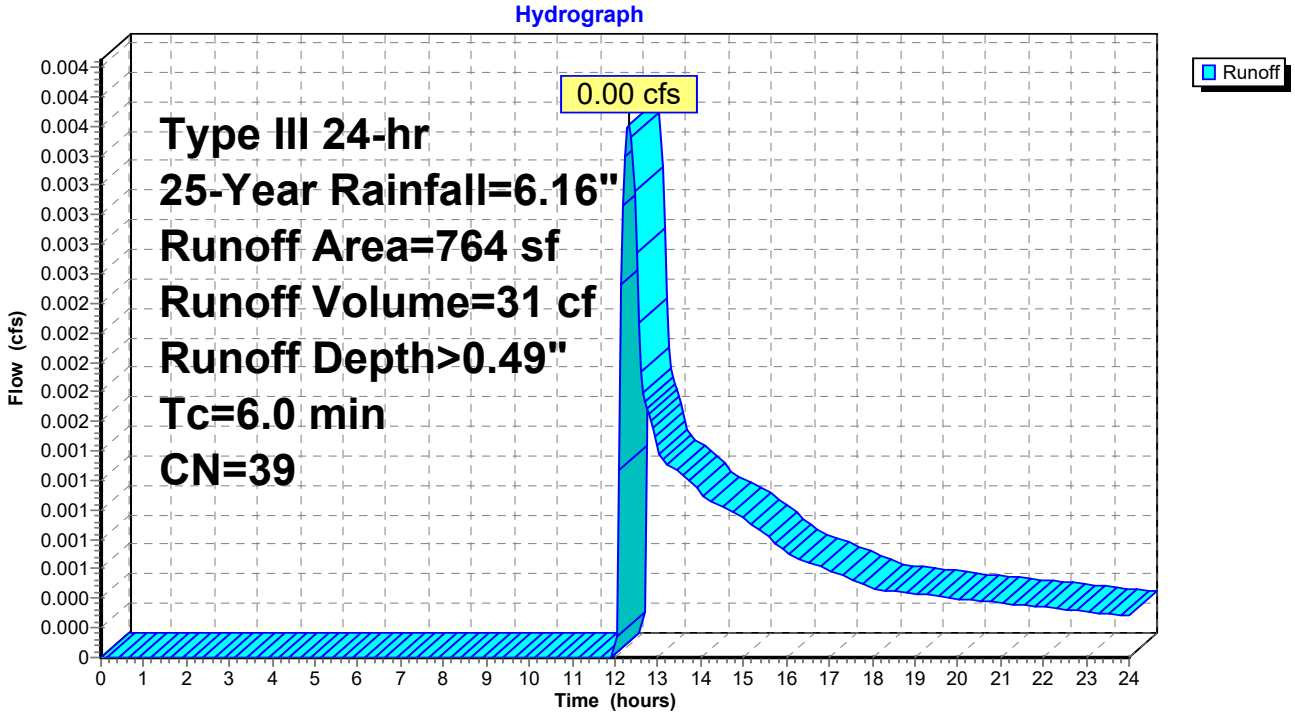
Runoff = 0.00 cfs @ 12.33 hrs, Volume= 31 cf, Depth> 0.49"
Routed to Link DP3 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
764	39	>75% Grass cover, Good, HSG A
764		100.00% Pervious Area

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

Subcatchment P3: P3



Summary for Subcatchment P4A: P4A

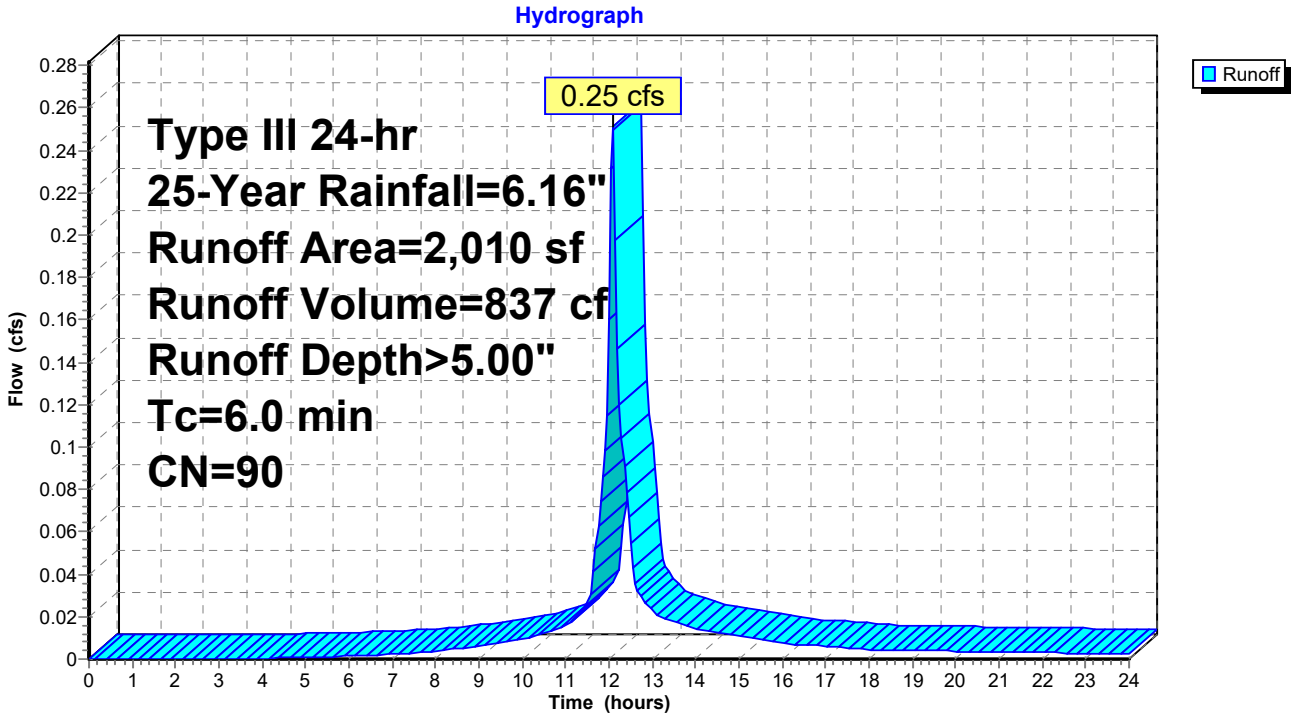
Runoff = 0.25 cfs @ 12.09 hrs, Volume= 837 cf, Depth> 5.00"
Routed to Pond 3P : CB3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
285	39	>75% Grass cover, Good, HSG A
1,725	98	Paved parking, HSG A
2,010	90	Weighted Average
285		14.18% Pervious Area
1,725		85.82% Impervious Area

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

Subcatchment P4A: P4A



Summary for Subcatchment P4B: P4B

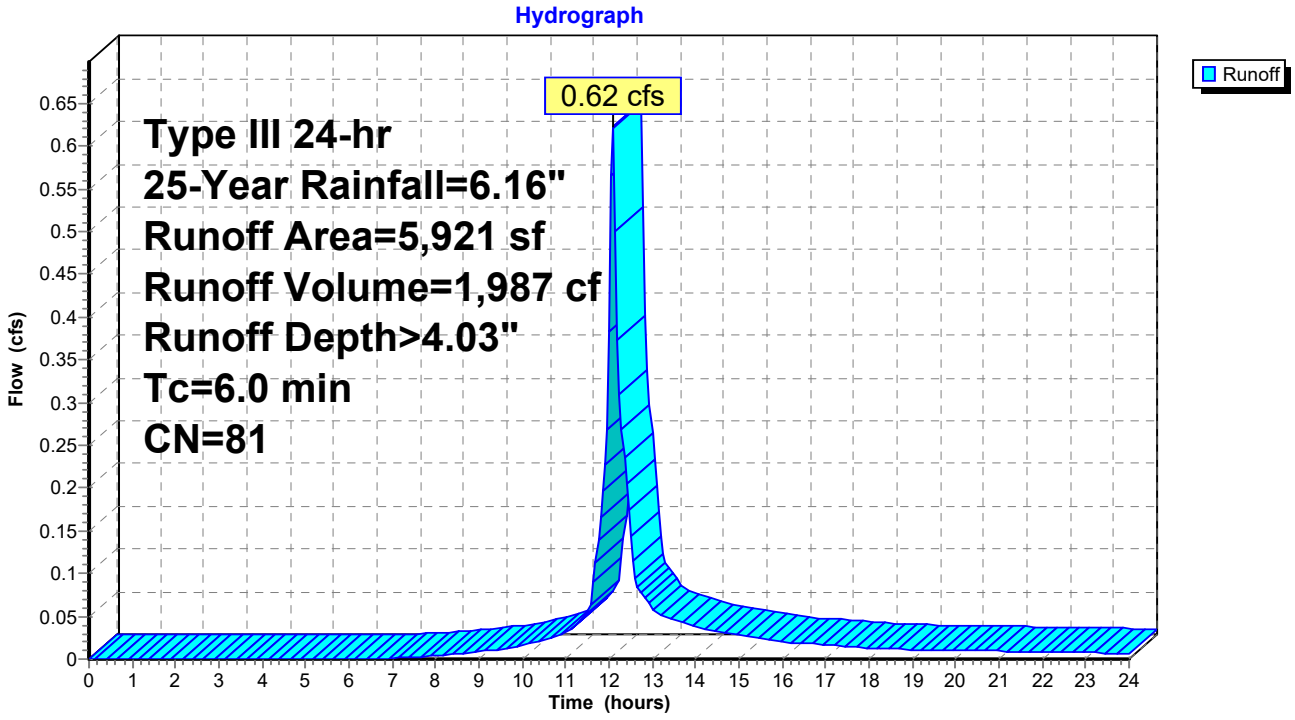
Runoff = 0.62 cfs @ 12.09 hrs, Volume= 1,987 cf, Depth> 4.03"
Routed to Pond 5P : CB4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
1,735	39	>75% Grass cover, Good, HSG A
4,186	98	Paved parking, HSG A
5,921	81	Weighted Average
1,735		29.30% Pervious Area
4,186		70.70% Impervious Area

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

Subcatchment P4B: P4B



Summary for Subcatchment P5A: P5A

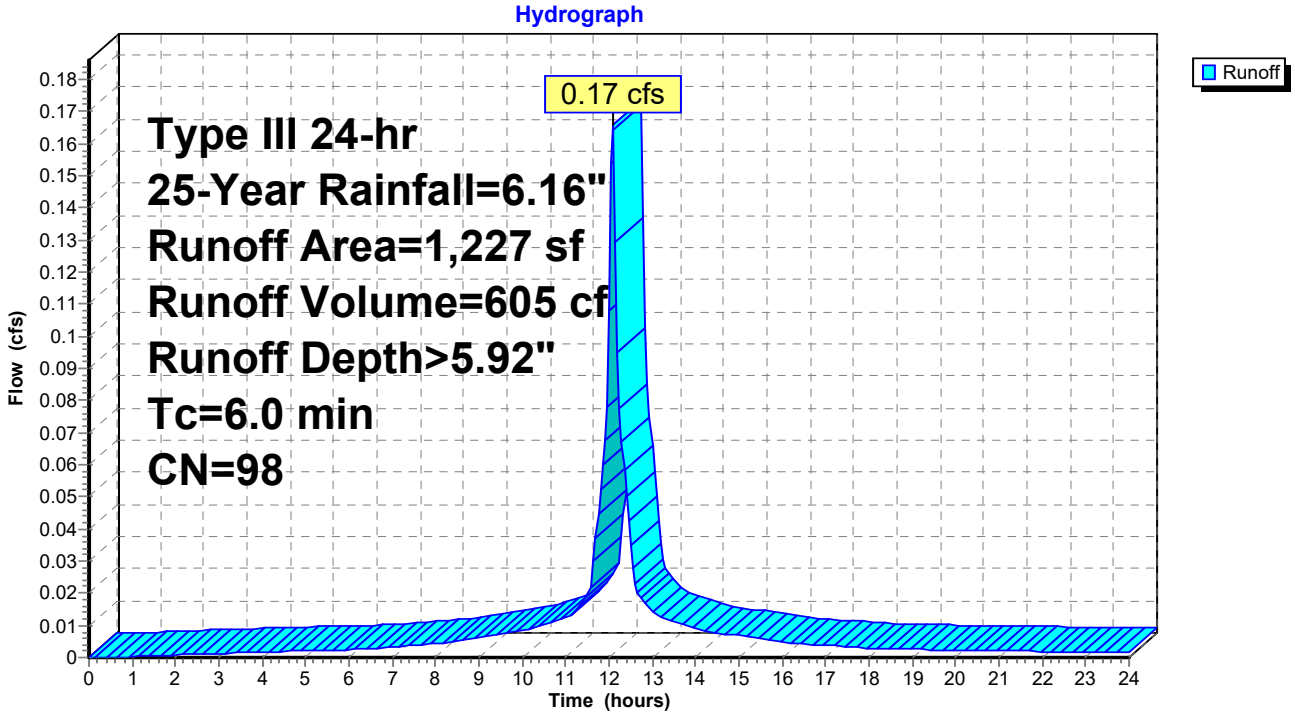
Runoff = 0.17 cfs @ 12.09 hrs, Volume= 605 cf, Depth> 5.92"
Routed to Pond 7P : CB2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
1,227	98	Paved parking, HSG A
1,227		100.00% Impervious Area

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

Subcatchment P5A: P5A



Summary for Subcatchment P5B: P5B

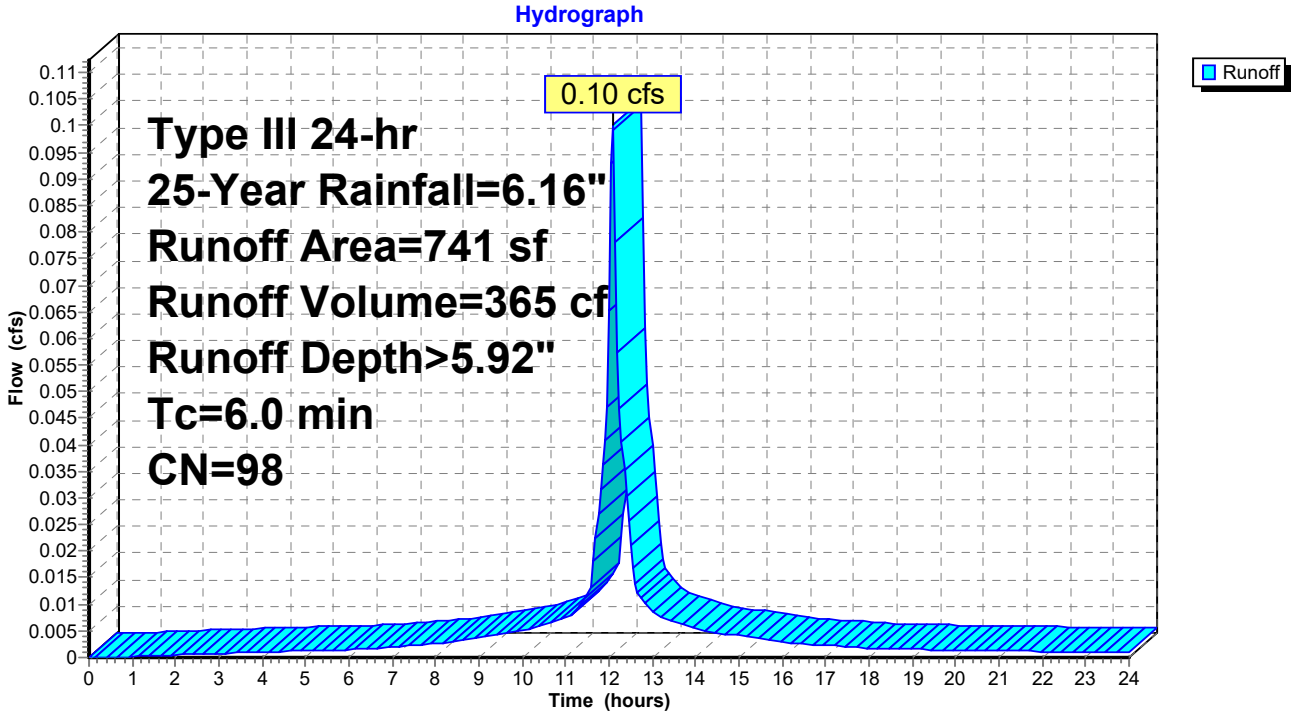
Runoff = 0.10 cfs @ 12.09 hrs, Volume= 365 cf, Depth> 5.92"
Routed to Pond 1P : CB1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
741	98	Paved parking, HSG A
741		100.00% Impervious Area

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

Subcatchment P5B: P5B



Summary for Subcatchment P6: P6

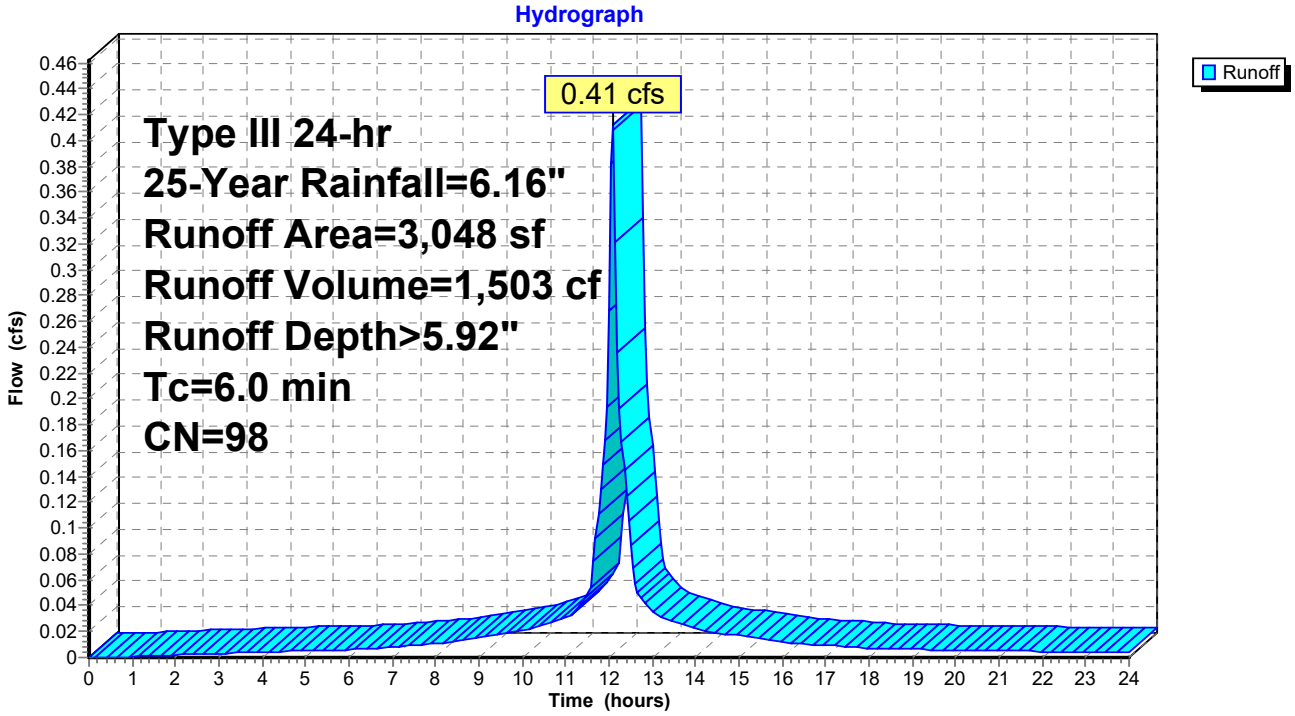
Runoff = 0.41 cfs @ 12.09 hrs, Volume= 1,503 cf, Depth> 5.92"
Routed to Pond 9P : SUBSURFACE INFILTRATION #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
3,048	98	Roofs, HSG A
3,048		100.00% Impervious Area

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

Subcatchment P6: P6



Summary for Pond 1P: CB1

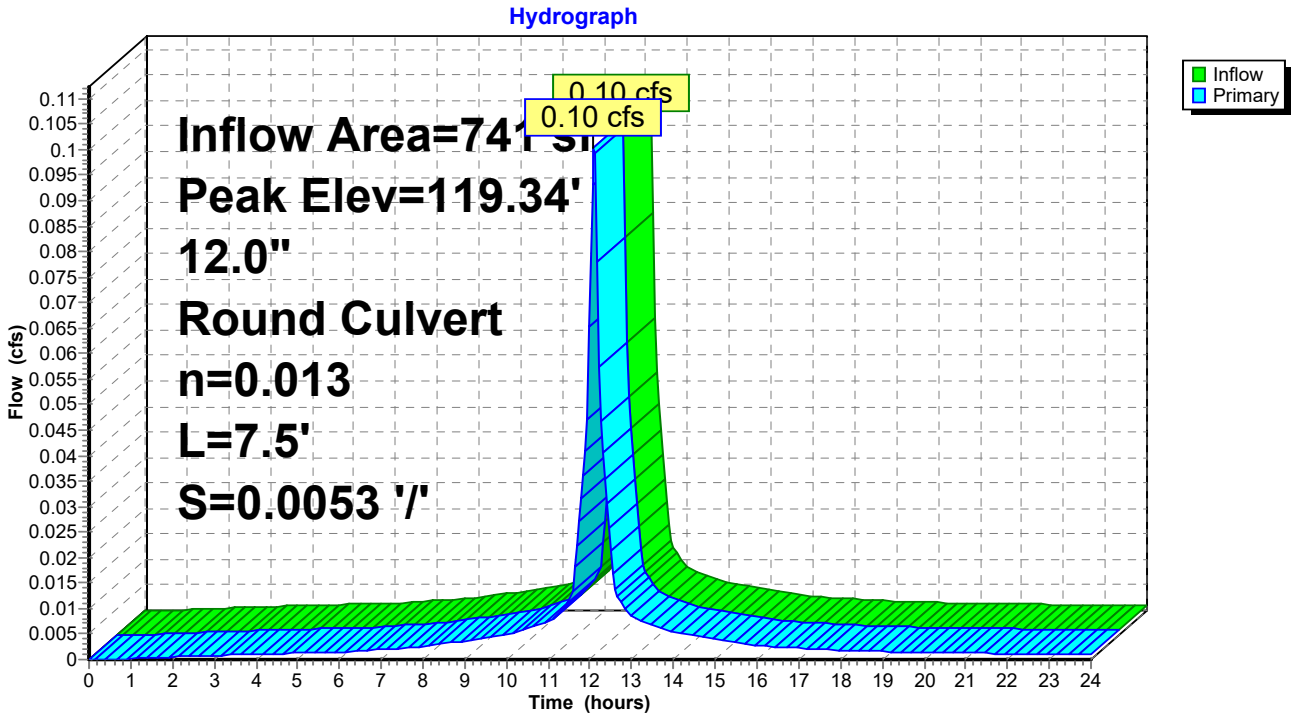
Inflow Area = 741 sf,100.00% Impervious, Inflow Depth > 5.92" for 25-Year event
Inflow = 0.10 cfs @ 12.09 hrs, Volume= 365 cf
Outflow = 0.10 cfs @ 12.09 hrs, Volume= 365 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.10 cfs @ 12.09 hrs, Volume= 365 cf
Routed to Pond 8P : DMH1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.34' @ 12.09 hrs
Flood Elev= 122.15'

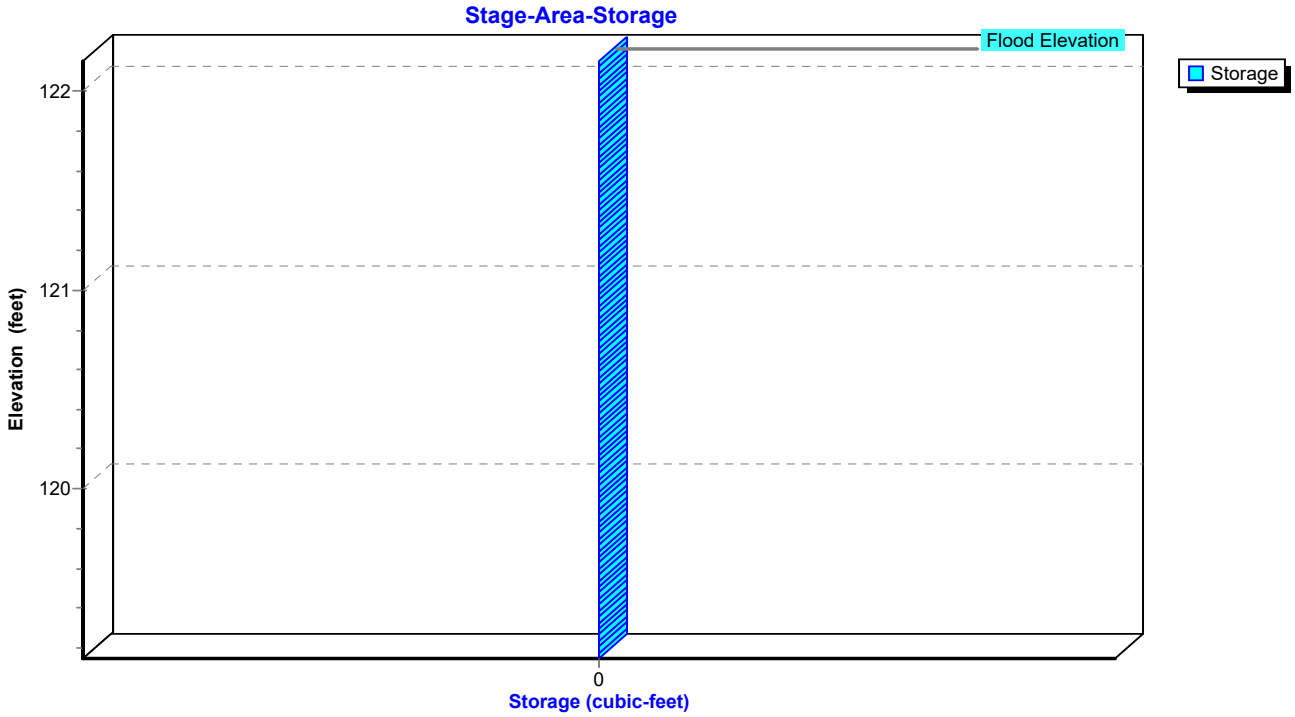
Device	Routing	Invert	Outlet Devices
#1	Primary	119.15'	**12.0" Round Culvert** L= 7.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.15' / 119.11' S= 0.0053 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.10 cfs @ 12.09 hrs HW=119.34' (Free Discharge)
1=Culvert (Barrel Controls 0.10 cfs @ 1.41 fps)

Pond 1P: CB1



Pond 1P: CB1


Stage-Area-Storage
Flood Elevation
Storage
122
121
120
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 1P: CB1

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
119.15	**0**	120.21	0	121.27	0
119.17	0	120.23	0	121.29	0
119.19	0	120.25	0	121.31	0
119.21	0	120.27	0	121.33	0
119.23	0	120.29	0	121.35	0
119.25	0	120.31	0	121.37	0
119.27	0	120.33	0	121.39	0
119.29	0	120.35	0	121.41	0
119.31	0	120.37	0	121.43	0
119.33	0	120.39	0	121.45	0
119.35	0	120.41	0	121.47	0
119.37	0	120.43	0	121.49	0
119.39	0	120.45	0	121.51	0
119.41	0	120.47	0	121.53	0
119.43	0	120.49	0	121.55	0
119.45	0	120.51	0	121.57	0
119.47	0	120.53	0	121.59	0
119.49	0	120.55	0	121.61	0
119.51	0	120.57	0	121.63	0
119.53	0	120.59	0	121.65	0
119.55	0	120.61	0	121.67	0
119.57	0	120.63	0	121.69	0
119.59	0	120.65	0	121.71	0
119.61	0	120.67	0	121.73	0
119.63	0	120.69	0	121.75	0
119.65	0	120.71	0	121.77	0
119.67	0	120.73	0	121.79	0
119.69	0	120.75	0	121.81	0
119.71	0	120.77	0	121.83	0
119.73	0	120.79	0	121.85	0
119.75	0	120.81	0	121.87	0
119.77	0	120.83	0	121.89	0
119.79	0	120.85	0	121.91	0
119.81	0	120.87	0	121.93	0
119.83	0	120.89	0	121.95	0
119.85	0	120.91	0	121.97	0
119.87	0	120.93	0	121.99	0
119.89	0	120.95	0	122.01	0
119.91	0	120.97	0	122.03	0
119.93	0	120.99	0	122.05	0
119.95	0	121.01	0	122.07	0
119.97	0	121.03	0	122.09	0
119.99	0	121.05	0	122.11	0
120.01	0	121.07	0	122.13	0
120.03	0	121.09	0	122.15	0
120.05	0	121.11	0		
120.07	0	121.13	0		
120.09	0	121.15	0		
120.11	0	121.17	0		
120.13	0	121.19	0		
120.15	0	121.21	0		
120.17	0	121.23	0		
120.19	0	121.25	0		

Summary for Pond 2P: SUBSURFACE INFILTRATION #2

Inflow Area = 7,931 sf, 74.53% Impervious, Inflow Depth > 4.27" for 25-Year event
Inflow = 0.88 cfs @ 12.09 hrs, Volume= 2,824 cf
Outflow = 0.13 cfs @ 12.61 hrs, Volume= 2,822 cf, Atten= 85%, Lag= 31.4 min
Primary = 0.13 cfs @ 12.61 hrs, Volume= 2,822 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.07' @ 12.61 hrs Surf.Area= 1,494 sf Storage= 938 cf

Plug-Flow detention time= 56.4 min calculated for 2,822 cf (100% of inflow)
Center-of-Mass det. time= 56.1 min (858.2 - 802.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.00'	1,064 cf	**28.17'W x 53.04'L x 2.33'H Field A** 3,486 cf Overall - 826 cf Embedded = 2,660 cf x 40.0% Voids
#2A	114.50'	826 cf	**ADS_StormTech SC-310 +Cap** x 56 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 56 Chambers in 8 Rows
		1,890 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	114.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 112.00'

Primary OutFlow Max=0.13 cfs @ 12.61 hrs HW=115.07' (Free Discharge)
1=Exfiltration (Controls 0.13 cfs)

Pond 2P: SUBSURFACE INFILTRATION #2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

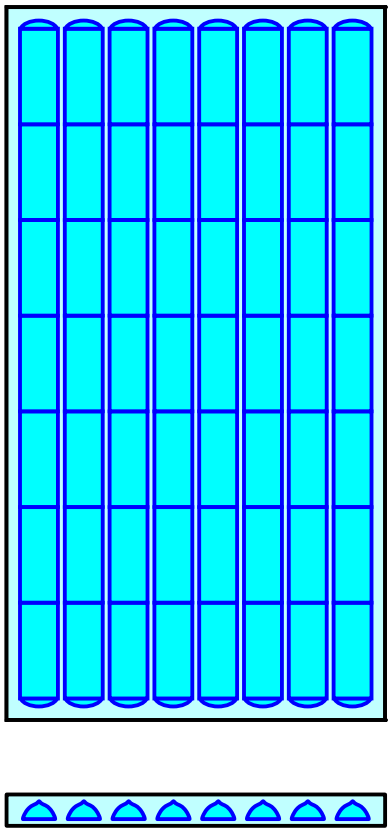
7 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 51.04' Row Length +12.0" End Stone x 2 = 53.04' Base Length
8 Rows x 34.0" Wide + 6.0" Spacing x 7 + 12.0" Side Stone x 2 = 28.17' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

56 Chambers x 14.7 cf = 825.5 cf Chamber Storage

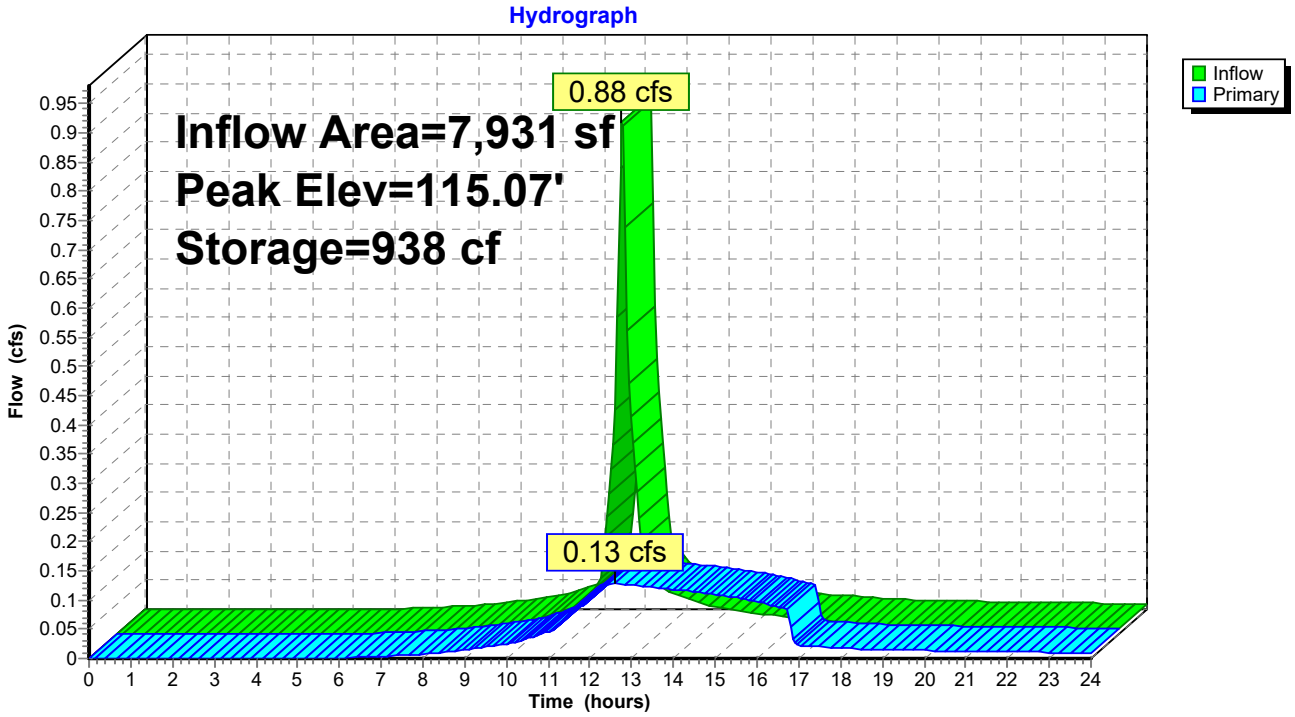
3,485.9 cf Field - 825.5 cf Chambers = 2,660.4 cf Stone x 40.0% Voids = 1,064.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,889.7 cf = 0.043 af
Overall Storage Efficiency = 54.2%
Overall System Size = 53.04' x 28.17' x 2.33'

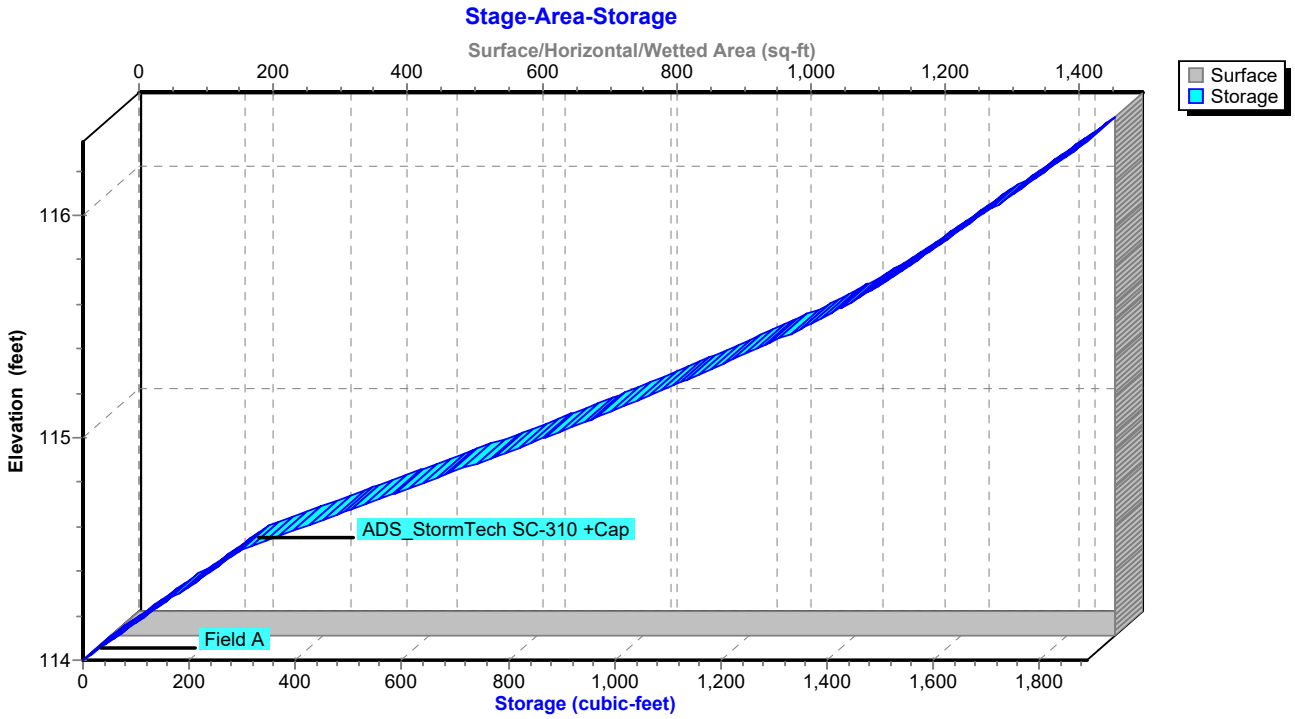
56 Chambers
129.1 cy Field
98.5 cy Stone



Pond 2P: SUBSURFACE INFILTRATION #2



Pond 2P: SUBSURFACE INFILTRATION #2



Stage-Area-Storage for Pond 2P: SUBSURFACE INFILTRATION #2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
114.00	**1,494**	0
114.05	1,494	30
114.10	1,494	60
114.15	1,494	90
114.20	1,494	120
114.25	1,494	149
114.30	1,494	179
114.35	1,494	209
114.40	1,494	239
114.45	1,494	269
114.50	1,494	299
114.55	1,494	357
114.60	1,494	416
114.65	1,494	474
114.70	1,494	532
114.75	1,494	589
114.80	1,494	646
114.85	1,494	702
114.90	1,494	757
114.95	1,494	812
115.00	1,494	866
115.05	1,494	920
115.10	1,494	973
115.15	1,494	1,024
115.20	1,494	1,075
115.25	1,494	1,125
115.30	1,494	1,174
115.35	1,494	1,222
115.40	1,494	1,268
115.45	1,494	1,313
115.50	1,494	1,357
115.55	1,494	1,398
115.60	1,494	1,436
115.65	1,494	1,473
115.70	1,494	1,507
115.75	1,494	1,539
115.80	1,494	1,571
115.85	1,494	1,601
115.90	1,494	1,631
115.95	1,494	1,661
116.00	1,494	1,690
116.05	1,494	1,720
116.10	1,494	1,750
116.15	1,494	1,780
116.20	1,494	1,810
116.25	1,494	1,840
116.30	1,494	**1,870**

Summary for Pond 3P: CB3

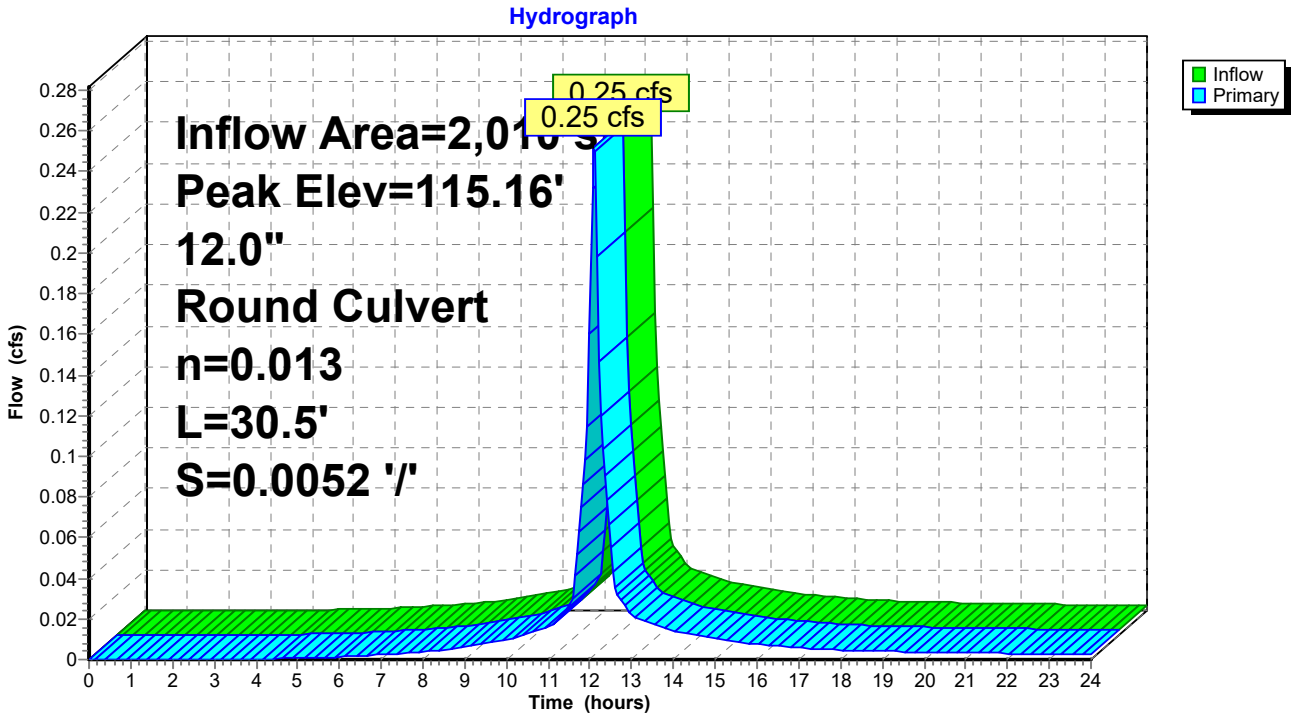
Inflow Area = 2,010 sf, 85.82% Impervious, Inflow Depth > 5.00" for 25-Year event
Inflow = 0.25 cfs @ 12.09 hrs, Volume= 837 cf
Outflow = 0.25 cfs @ 12.09 hrs, Volume= 837 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.25 cfs @ 12.09 hrs, Volume= 837 cf
Routed to Pond 6P : CDS2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.16' @ 12.09 hrs
Flood Elev= 118.00'

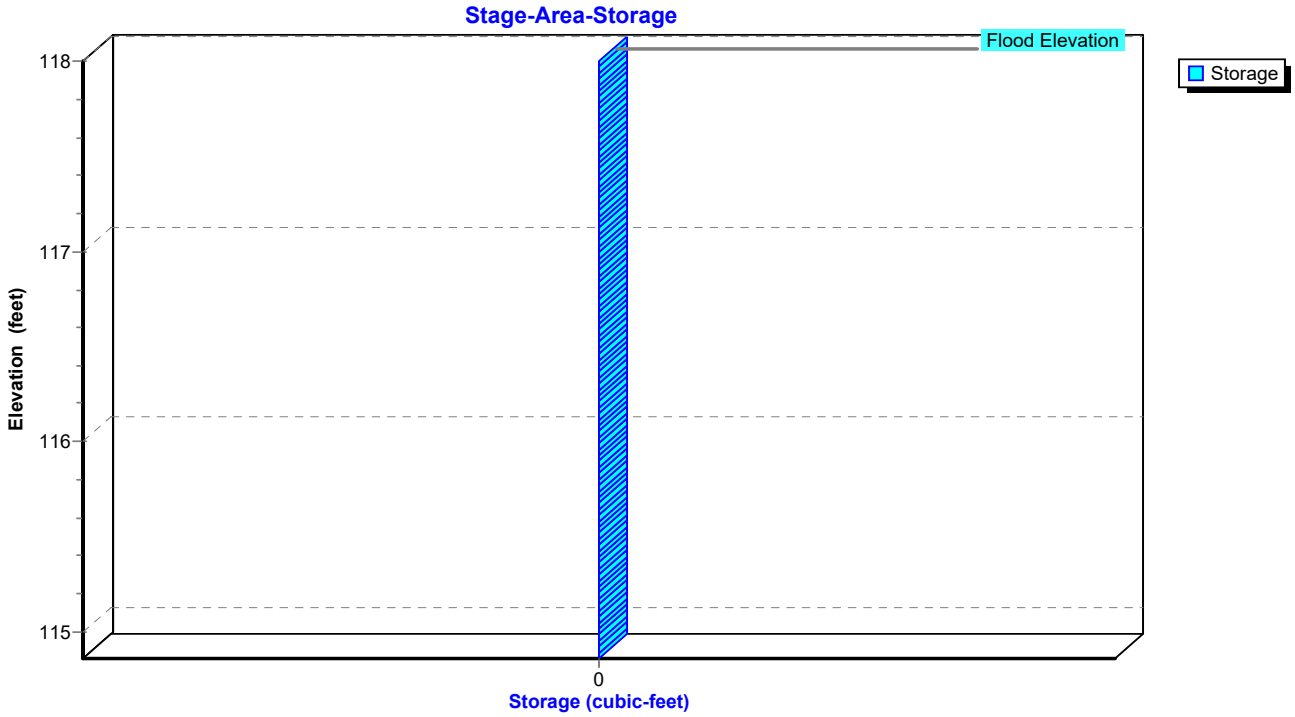
Device	Routing	Invert	Outlet Devices
#1	Primary	114.86'	**12.0" Round Culvert** L= 30.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 114.86' / 114.70' S= 0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.24 cfs @ 12.09 hrs HW=115.15' (Free Discharge)
1=Culvert (Barrel Controls 0.24 cfs @ 1.90 fps)

Pond 3P: CB3



Pond 3P: CB3


Stage-Area-Storage
Flood Elevation
Storage
118
117
116
115
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 3P: CB3

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
114.86	**0**	115.92	0	116.98	0
114.88	0	115.94	0	117.00	0
114.90	0	115.96	0	117.02	0
114.92	0	115.98	0	117.04	0
114.94	0	116.00	0	117.06	0
114.96	0	116.02	0	117.08	0
114.98	0	116.04	0	117.10	0
115.00	0	116.06	0	117.12	0
115.02	0	116.08	0	117.14	0
115.04	0	116.10	0	117.16	0
115.06	0	116.12	0	117.18	0
115.08	0	116.14	0	117.20	0
115.10	0	116.16	0	117.22	0
115.12	0	116.18	0	117.24	0
115.14	0	116.20	0	117.26	0
115.16	0	116.22	0	117.28	0
115.18	0	116.24	0	117.30	0
115.20	0	116.26	0	117.32	0
115.22	0	116.28	0	117.34	0
115.24	0	116.30	0	117.36	0
115.26	0	116.32	0	117.38	0
115.28	0	116.34	0	117.40	0
115.30	0	116.36	0	117.42	0
115.32	0	116.38	0	117.44	0
115.34	0	116.40	0	117.46	0
115.36	0	116.42	0	117.48	0
115.38	0	116.44	0	117.50	0
115.40	0	116.46	0	117.52	0
115.42	0	116.48	0	117.54	0
115.44	0	116.50	0	117.56	0
115.46	0	116.52	0	117.58	0
115.48	0	116.54	0	117.60	0
115.50	0	116.56	0	117.62	0
115.52	0	116.58	0	117.64	0
115.54	0	116.60	0	117.66	0
115.56	0	116.62	0	117.68	0
115.58	0	116.64	0	117.70	0
115.60	0	116.66	0	117.72	0
115.62	0	116.68	0	117.74	0
115.64	0	116.70	0	117.76	0
115.66	0	116.72	0	117.78	0
115.68	0	116.74	0	117.80	0
115.70	0	116.76	0	117.82	0
115.72	0	116.78	0	117.84	0
115.74	0	116.80	0	117.86	0
115.76	0	116.82	0	117.88	0
115.78	0	116.84	0	117.90	0
115.80	0	116.86	0	117.92	0
115.82	0	116.88	0	117.94	0
115.84	0	116.90	0	117.96	0
115.86	0	116.92	0	117.98	0
115.88	0	116.94	0	118.00	0
115.90	0	116.96	0		

Summary for Pond 4P: SUBSURFACE INFILTRATION #1

Inflow Area = 1,968 sf,100.00% Impervious, Inflow Depth > 5.92" for 25-Year event
Inflow = 0.27 cfs @ 12.09 hrs, Volume= 971 cf
Outflow = 0.03 cfs @ 12.71 hrs, Volume= 970 cf, Atten= 89%, Lag= 37.6 min
Primary = 0.03 cfs @ 12.71 hrs, Volume= 970 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 120.12' @ 12.71 hrs Surf.Area= 281 sf Storage= 345 cf

Plug-Flow detention time= 90.9 min calculated for 968 cf (100% of inflow)
Center-of-Mass det. time= 90.3 min (834.7 - 744.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	118.20'	277 cf	**15.75'W x 17.86'L x 3.50'H Field A** 984 cf Overall - 292 cf Embedded = 693 cf x 40.0% Voids
#2A	118.70'	292 cf	**ADS_StormTech SC-740 b +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 6 Chambers in 3 Rows Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf
		569 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	118.20'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 116.16'

Primary OutFlow Max=0.03 cfs @ 12.71 hrs HW=120.12' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.03 cfs)

Pond 4P: SUBSURFACE INFILTRATION #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 b +Cap (ADS StormTech® SC-740 with cap storage)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

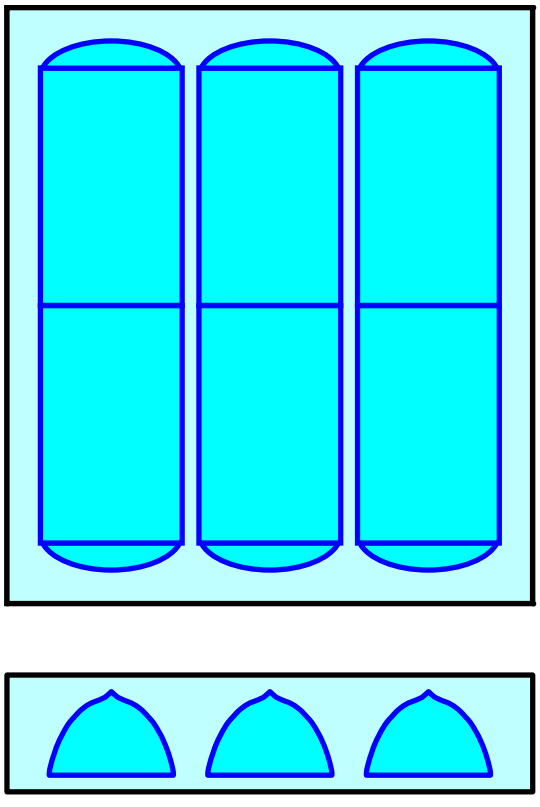
2 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 15.86' Row Length +12.0" End Stone x 2 = 17.86' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

6 Chambers x 45.9 cf + 2.7 cf Cap Volume x 2 x 3 Rows = 291.6 cf Chamber Storage

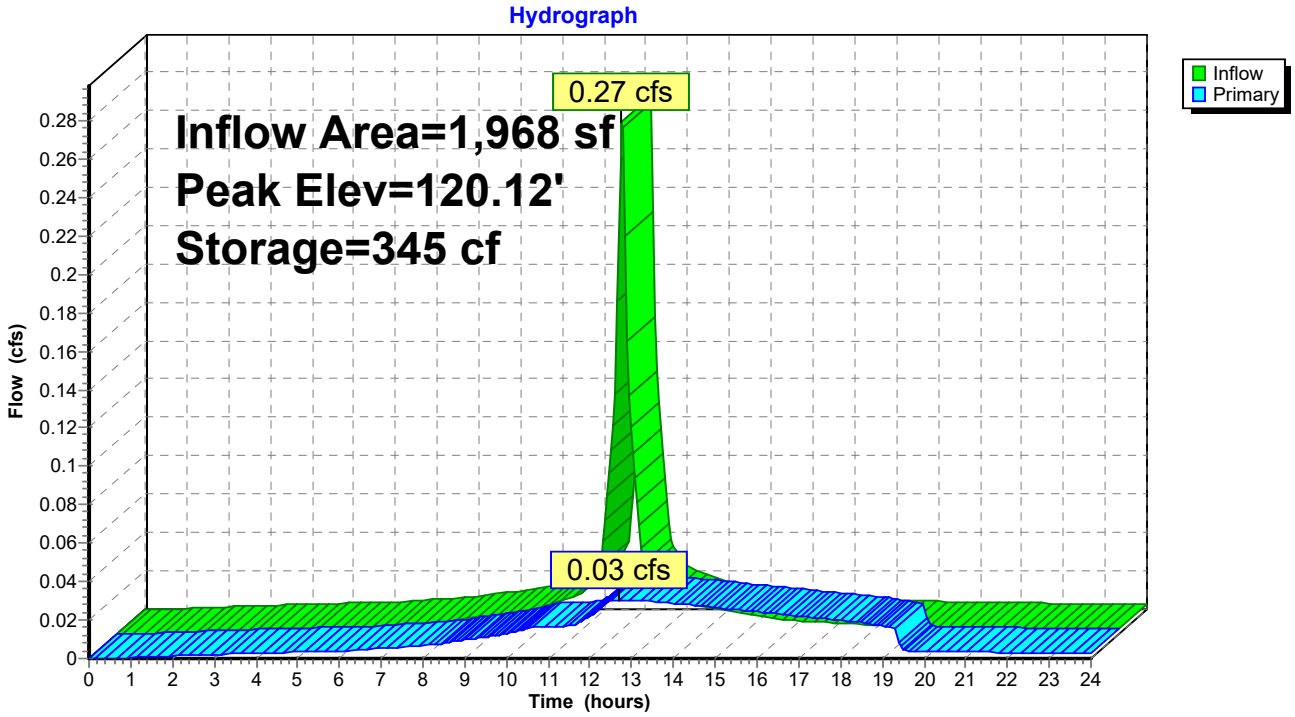
984.3 cf Field - 291.6 cf Chambers = 692.8 cf Stone x 40.0% Voids = 277.1 cf Stone Storage

Chamber Storage + Stone Storage = 568.7 cf = 0.013 af
Overall Storage Efficiency = 57.8%
Overall System Size = 17.86' x 15.75' x 3.50'

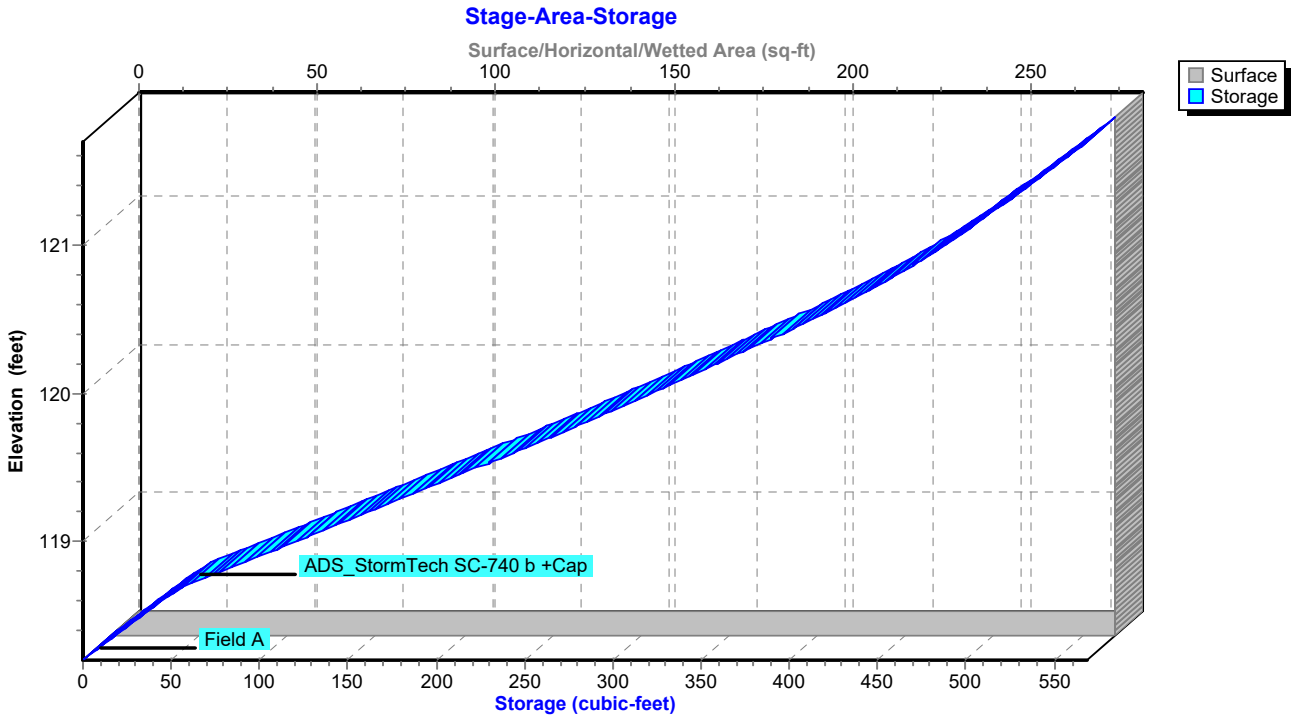
6 Chambers
36.5 cy Field
25.7 cy Stone



Pond 4P: SUBSURFACE INFILTRATION #1



Pond 4P: SUBSURFACE INFILTRATION #1



Stage-Area-Storage for Pond 4P: SUBSURFACE INFILTRATION #1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
118.20	**281**	0
118.25	281	6
118.30	281	11
118.35	281	17
118.40	281	22
118.45	281	28
118.50	281	34
118.55	281	39
118.60	281	45
118.65	281	51
118.70	281	56
118.75	281	67
118.80	281	78
118.85	281	88
118.90	281	99
118.95	281	109
119.00	281	120
119.05	281	131
119.10	281	141
119.15	281	151
119.20	281	162
119.25	281	172
119.30	281	183
119.35	281	193
119.40	281	203
119.45	281	213
119.50	281	223
119.55	281	234
119.60	281	244
119.65	281	254
119.70	281	264
119.75	281	273
119.80	281	283
119.85	281	293
119.90	281	303
119.95	281	312
120.00	281	322
120.05	281	331
120.10	281	341
120.15	281	350
120.20	281	359
120.25	281	368
120.30	281	377
120.35	281	386
120.40	281	395
120.45	281	404
120.50	281	412
120.55	281	421
120.60	281	429
120.65	281	437
120.70	281	445
120.75	281	453
120.80	281	461
120.85	281	468
120.90	281	475
120.95	281	482
121.00	281	489
121.05	281	495
121.10	281	501
121.15	281	507
121.20	281	512
121.25	281	518
121.30	281	524
121.35	281	529
121.40	281	535
121.45	281	541
121.50	281	546
121.55	281	552
121.60	281	557
121.65	281	563
121.70	281	**569**

Summary for Pond 5P: CB4

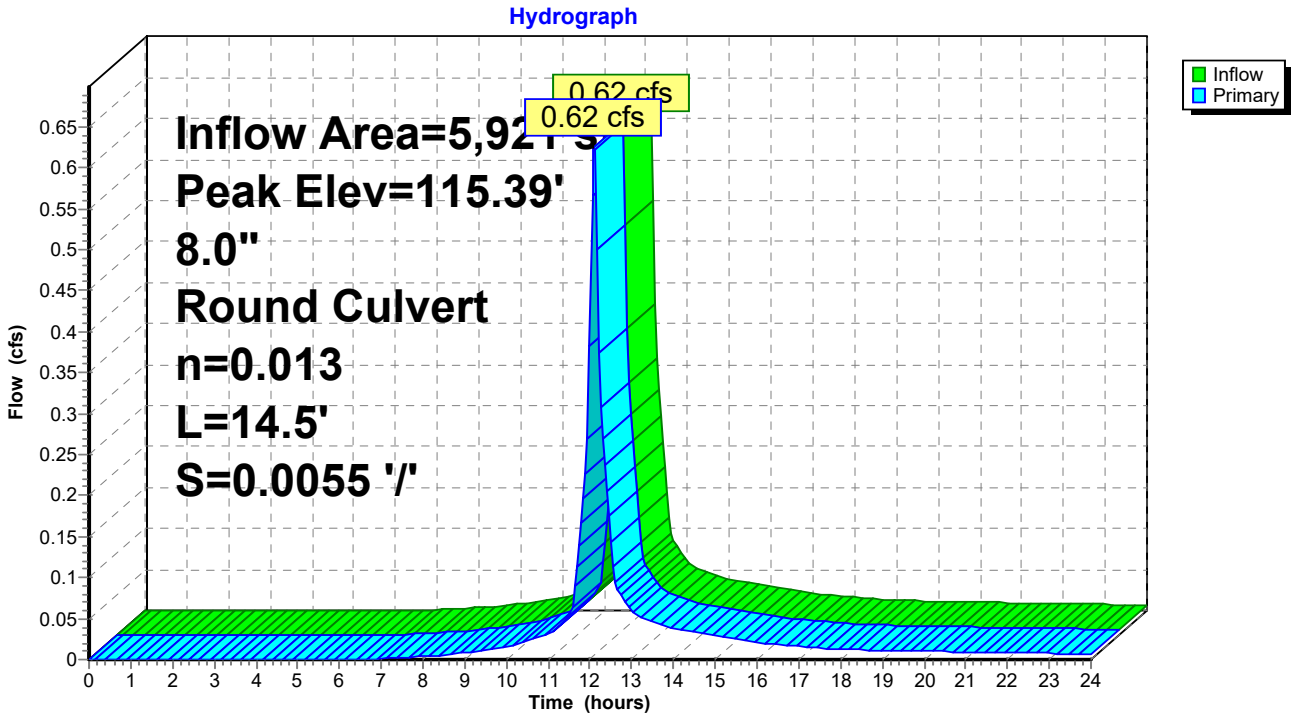
Inflow Area = 5,921 sf, 70.70% Impervious, Inflow Depth > 4.03" for 25-Year event
Inflow = 0.62 cfs @ 12.09 hrs, Volume= 1,987 cf
Outflow = 0.62 cfs @ 12.09 hrs, Volume= 1,987 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.62 cfs @ 12.09 hrs, Volume= 1,987 cf
Routed to Pond 6P : CDS2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.39' @ 12.09 hrs
Flood Elev= 117.40'

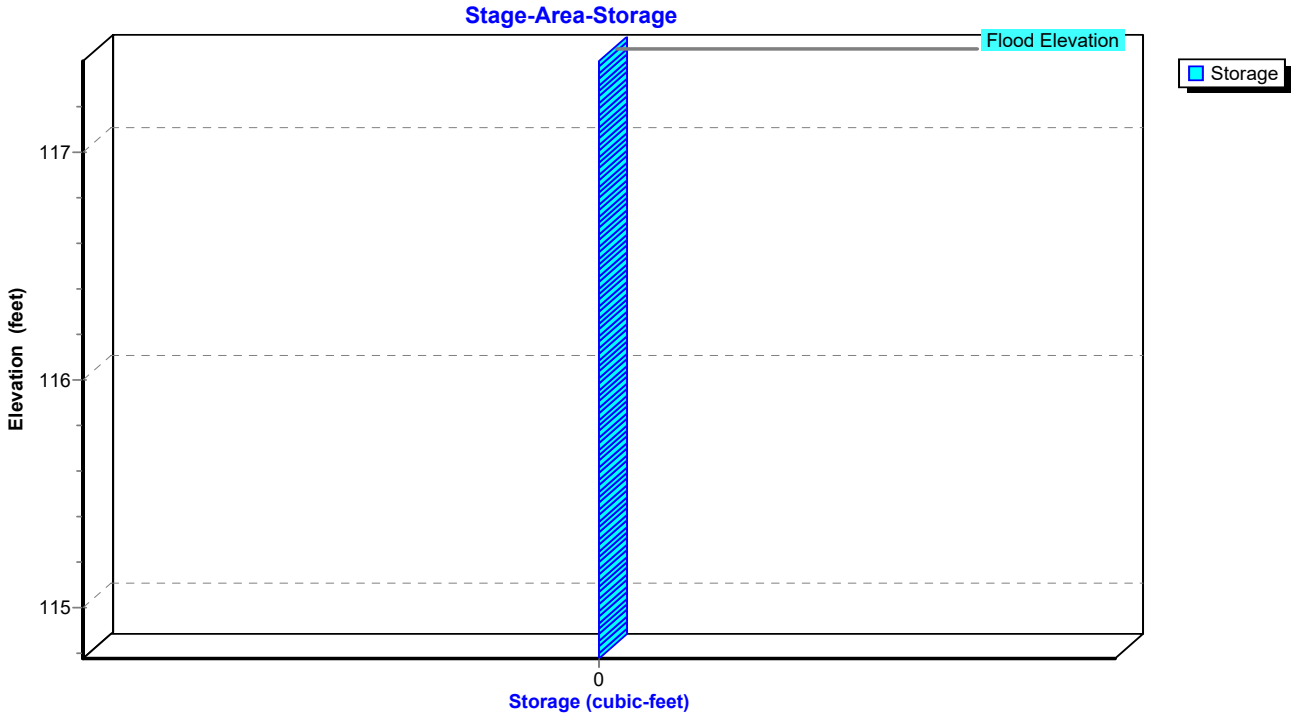
Device	Routing	Invert	Outlet Devices
#1	Primary	114.78'	**8.0" Round Culvert** L= 14.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 114.78' / 114.70' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.61 cfs @ 12.09 hrs HW=115.38' (Free Discharge)
1=Culvert (Barrel Controls 0.61 cfs @ 2.42 fps)

Pond 5P: CB4



Pond 5P: CB4


Stage-Area-Storage
Flood Elevation
Storage
117
116
115
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 5P: CB4

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
114.78	**0**	115.84	0	116.90	0
114.80	0	115.86	0	116.92	0
114.82	0	115.88	0	116.94	0
114.84	0	115.90	0	116.96	0
114.86	0	115.92	0	116.98	0
114.88	0	115.94	0	117.00	0
114.90	0	115.96	0	117.02	0
114.92	0	115.98	0	117.04	0
114.94	0	116.00	0	117.06	0
114.96	0	116.02	0	117.08	0
114.98	0	116.04	0	117.10	0
115.00	0	116.06	0	117.12	0
115.02	0	116.08	0	117.14	0
115.04	0	116.10	0	117.16	0
115.06	0	116.12	0	117.18	0
115.08	0	116.14	0	117.20	0
115.10	0	116.16	0	117.22	0
115.12	0	116.18	0	117.24	0
115.14	0	116.20	0	117.26	0
115.16	0	116.22	0	117.28	0
115.18	0	116.24	0	117.30	0
115.20	0	116.26	0	117.32	0
115.22	0	116.28	0	117.34	0
115.24	0	116.30	0	117.36	0
115.26	0	116.32	0	117.38	0
115.28	0	116.34	0	117.40	0
115.30	0	116.36	0		
115.32	0	116.38	0		
115.34	0	116.40	0		
115.36	0	116.42	0		
115.38	0	116.44	0		
115.40	0	116.46	0		
115.42	0	116.48	0		
115.44	0	116.50	0		
115.46	0	116.52	0		
115.48	0	116.54	0		
115.50	0	116.56	0		
115.52	0	116.58	0		
115.54	0	116.60	0		
115.56	0	116.62	0		
115.58	0	116.64	0		
115.60	0	116.66	0		
115.62	0	116.68	0		
115.64	0	116.70	0		
115.66	0	116.72	0		
115.68	0	116.74	0		
115.70	0	116.76	0		
115.72	0	116.78	0		
115.74	0	116.80	0		
115.76	0	116.82	0		
115.78	0	116.84	0		
115.80	0	116.86	0		
115.82	0	116.88	0		

Summary for Pond 6P: CDS2

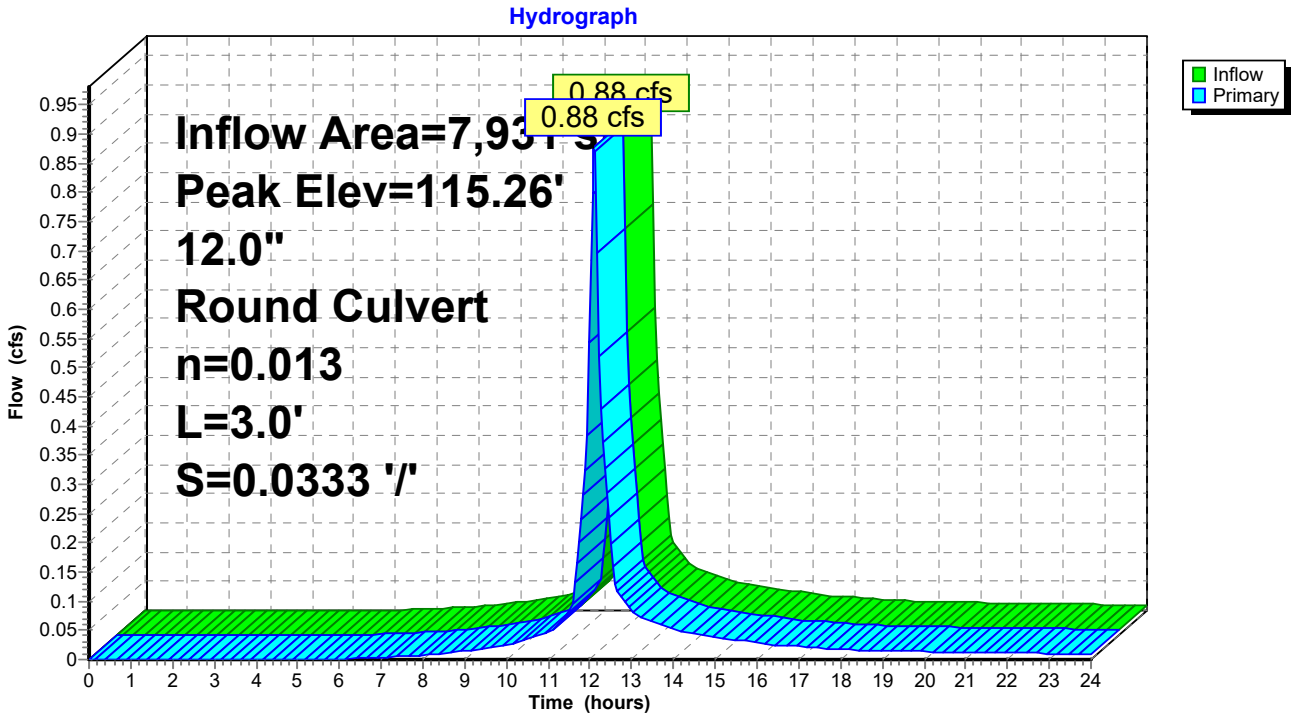
Inflow Area = 7,931 sf, 74.53% Impervious, Inflow Depth > 4.27" for 25-Year event
Inflow = 0.88 cfs @ 12.09 hrs, Volume= 2,824 cf
Outflow = 0.88 cfs @ 12.09 hrs, Volume= 2,824 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.88 cfs @ 12.09 hrs, Volume= 2,824 cf
Routed to Pond 2P : SUBSURFACE INFILTRATION #2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.26' @ 12.09 hrs
Flood Elev= 118.00'

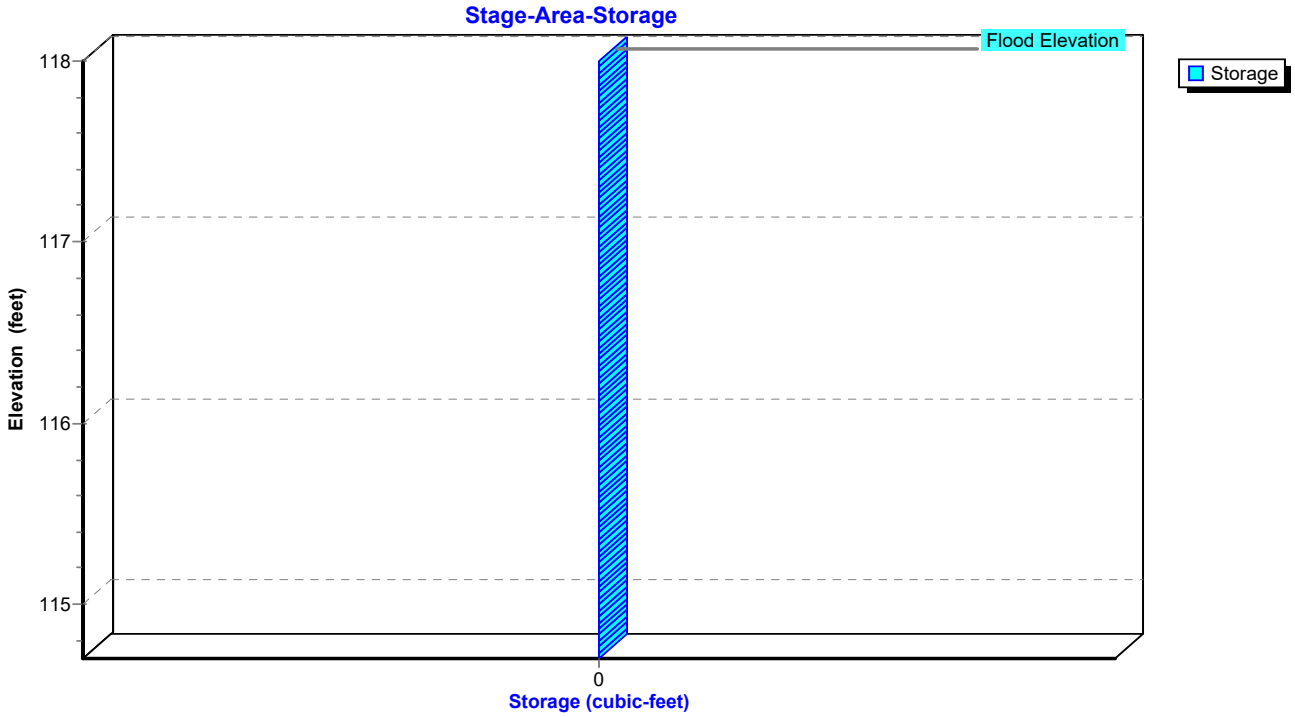
Device	Routing	Invert	Outlet Devices
#1	Primary	114.70'	**12.0" Round Culvert** L= 3.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 114.70' / 114.60' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.86 cfs @ 12.09 hrs HW=115.26' (Free Discharge)
1=Culvert (Barrel Controls 0.86 cfs @ 2.77 fps)

Pond 6P: CDS2



Pond 6P: CDS2


Stage-Area-Storage
Flood Elevation
Storage
118
117
116
115
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 6P: CDS2

Elevation (feet)	Storage (cubic-feet)
114.70	**0**
114.75	0
114.80	0
114.85	0
114.90	0
114.95	0
115.00	0
115.05	0
115.10	0
115.15	0
115.20	0
115.25	0
115.30	0
115.35	0
115.40	0
115.45	0
115.50	0
115.55	0
115.60	0
115.65	0
115.70	0
115.75	0
115.80	0
115.85	0
115.90	0
115.95	0
116.00	0
116.05	0
116.10	0
116.15	0
116.20	0
116.25	0
116.30	0
116.35	0
116.40	0
116.45	0
116.50	0
116.55	0
116.60	0
116.65	0
116.70	0
116.75	0
116.80	0
116.85	0
116.90	0
116.95	0
117.00	0
117.05	0
117.10	0
117.15	0
117.20	0
117.25	0
117.30	0
117.35	0
117.40	0
117.45	0
117.50	0
117.55	0
117.60	0
117.65	0
117.70	0
117.75	0
117.80	0
117.85	0
117.90	0
117.95	0
118.00	0

Summary for Pond 7P: CB2

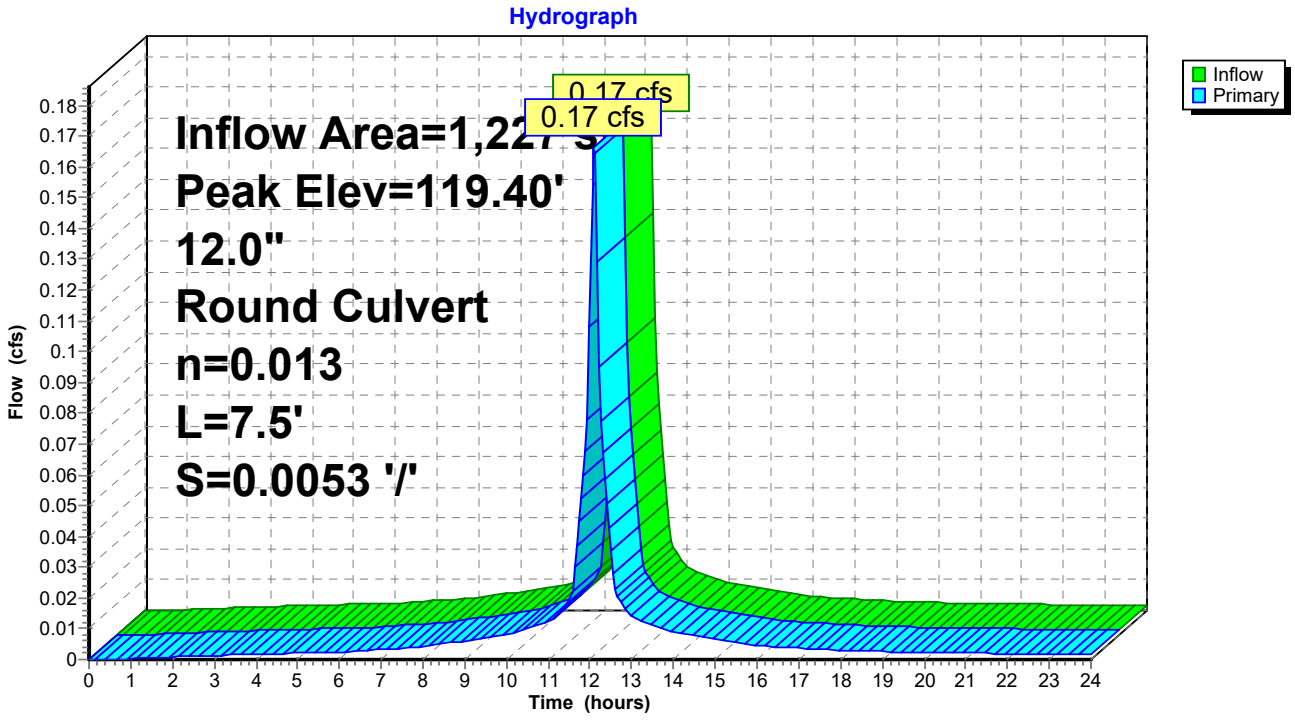
Inflow Area = 1,227 sf,100.00% Impervious, Inflow Depth > 5.92" for 25-Year event
Inflow = 0.17 cfs @ 12.09 hrs, Volume= 605 cf
Outflow = 0.17 cfs @ 12.09 hrs, Volume= 605 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.17 cfs @ 12.09 hrs, Volume= 605 cf
Routed to Pond 8P : DMH1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.40' @ 12.09 hrs
Flood Elev= 122.15'

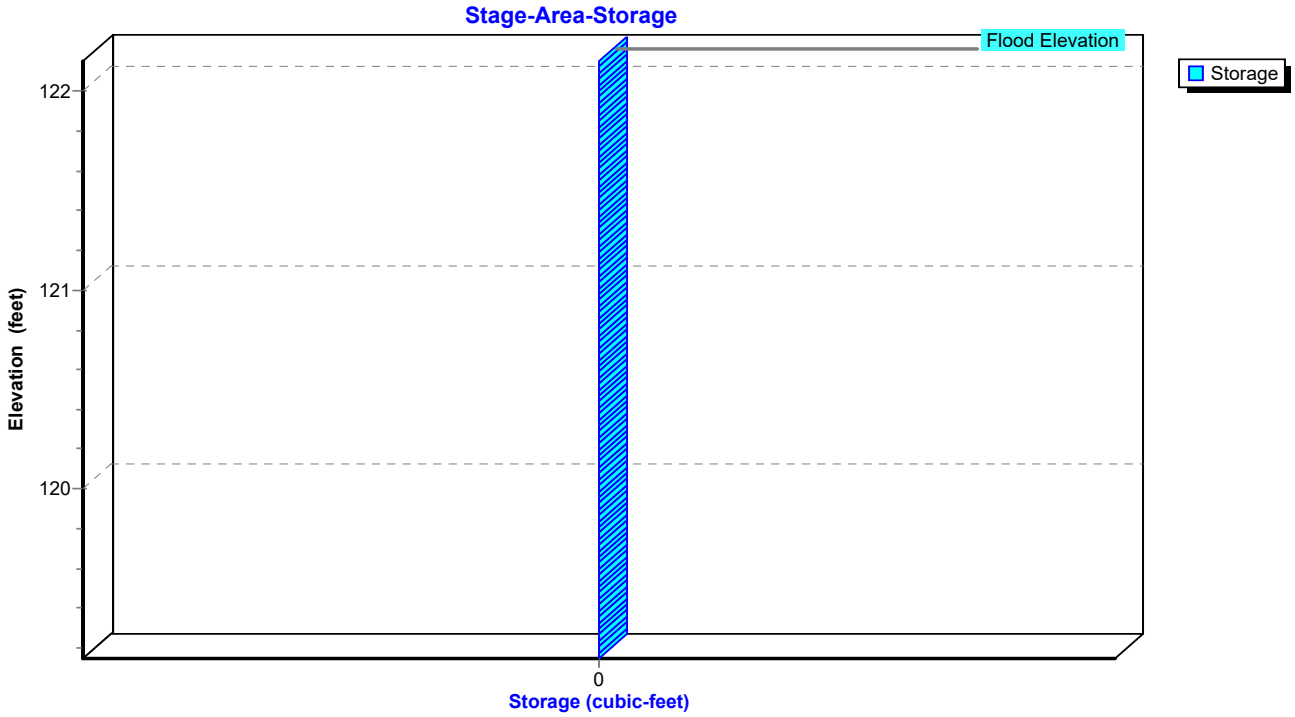
Device	Routing	Invert	Outlet Devices
#1	Primary	119.15'	**12.0" Round Culvert** L= 7.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.15' / 119.11' S= 0.0053 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.16 cfs @ 12.09 hrs HW=119.40' (Free Discharge)
1=Culvert (Barrel Controls 0.16 cfs @ 1.60 fps)

Pond 7P: CB2



Pond 7P: CB2


Stage-Area-Storage
Flood Elevation
Storage
122
121
120
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 7P: CB2

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
119.15	**0**	120.21	0	121.27	0
119.17	0	120.23	0	121.29	0
119.19	0	120.25	0	121.31	0
119.21	0	120.27	0	121.33	0
119.23	0	120.29	0	121.35	0
119.25	0	120.31	0	121.37	0
119.27	0	120.33	0	121.39	0
119.29	0	120.35	0	121.41	0
119.31	0	120.37	0	121.43	0
119.33	0	120.39	0	121.45	0
119.35	0	120.41	0	121.47	0
119.37	0	120.43	0	121.49	0
119.39	0	120.45	0	121.51	0
119.41	0	120.47	0	121.53	0
119.43	0	120.49	0	121.55	0
119.45	0	120.51	0	121.57	0
119.47	0	120.53	0	121.59	0
119.49	0	120.55	0	121.61	0
119.51	0	120.57	0	121.63	0
119.53	0	120.59	0	121.65	0
119.55	0	120.61	0	121.67	0
119.57	0	120.63	0	121.69	0
119.59	0	120.65	0	121.71	0
119.61	0	120.67	0	121.73	0
119.63	0	120.69	0	121.75	0
119.65	0	120.71	0	121.77	0
119.67	0	120.73	0	121.79	0
119.69	0	120.75	0	121.81	0
119.71	0	120.77	0	121.83	0
119.73	0	120.79	0	121.85	0
119.75	0	120.81	0	121.87	0
119.77	0	120.83	0	121.89	0
119.79	0	120.85	0	121.91	0
119.81	0	120.87	0	121.93	0
119.83	0	120.89	0	121.95	0
119.85	0	120.91	0	121.97	0
119.87	0	120.93	0	121.99	0
119.89	0	120.95	0	122.01	0
119.91	0	120.97	0	122.03	0
119.93	0	120.99	0	122.05	0
119.95	0	121.01	0	122.07	0
119.97	0	121.03	0	122.09	0
119.99	0	121.05	0	122.11	0
120.01	0	121.07	0	122.13	0
120.03	0	121.09	0	122.15	0
120.05	0	121.11	0		
120.07	0	121.13	0		
120.09	0	121.15	0		
120.11	0	121.17	0		
120.13	0	121.19	0		
120.15	0	121.21	0		
120.17	0	121.23	0		
120.19	0	121.25	0		

Summary for Pond 8P: DMH1

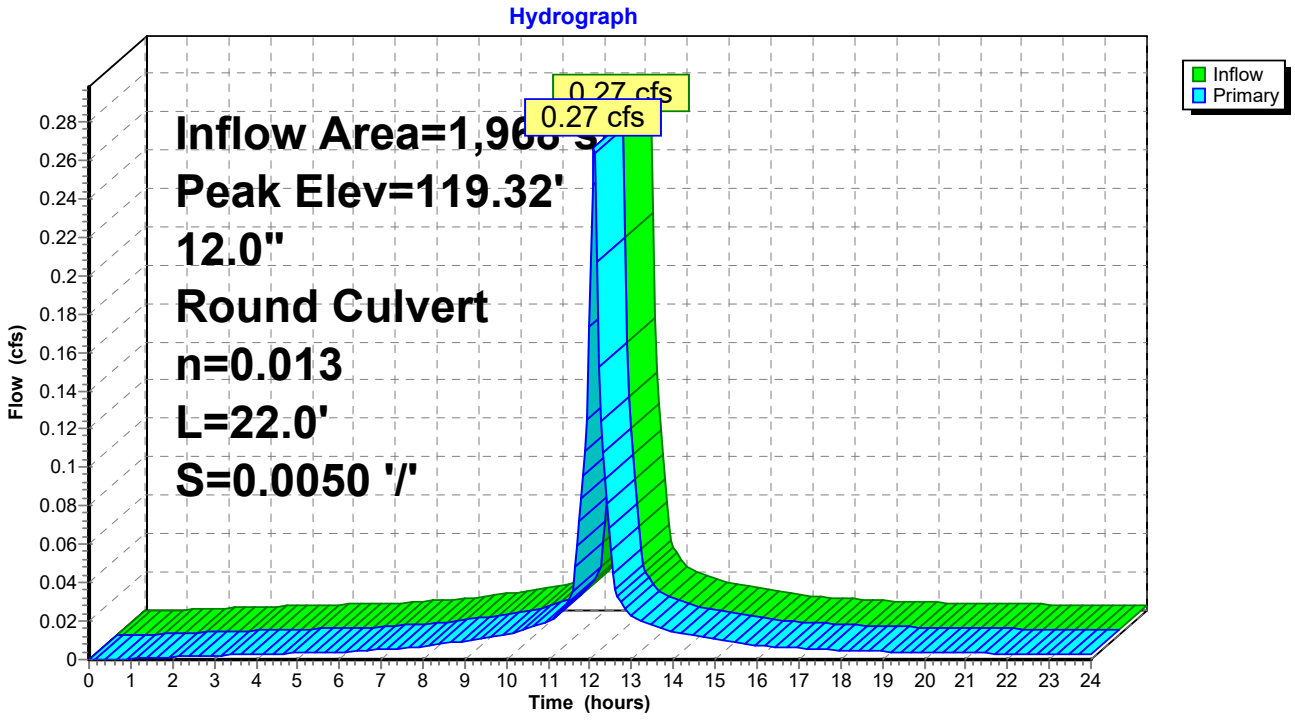
Inflow Area = 1,968 sf,100.00% Impervious, Inflow Depth > 5.92" for 25-Year event
Inflow = 0.27 cfs @ 12.09 hrs, Volume= 971 cf
Outflow = 0.27 cfs @ 12.09 hrs, Volume= 971 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.09 hrs, Volume= 971 cf
Routed to Pond 10P : CDS1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.32' @ 12.09 hrs
Flood Elev= 122.50'

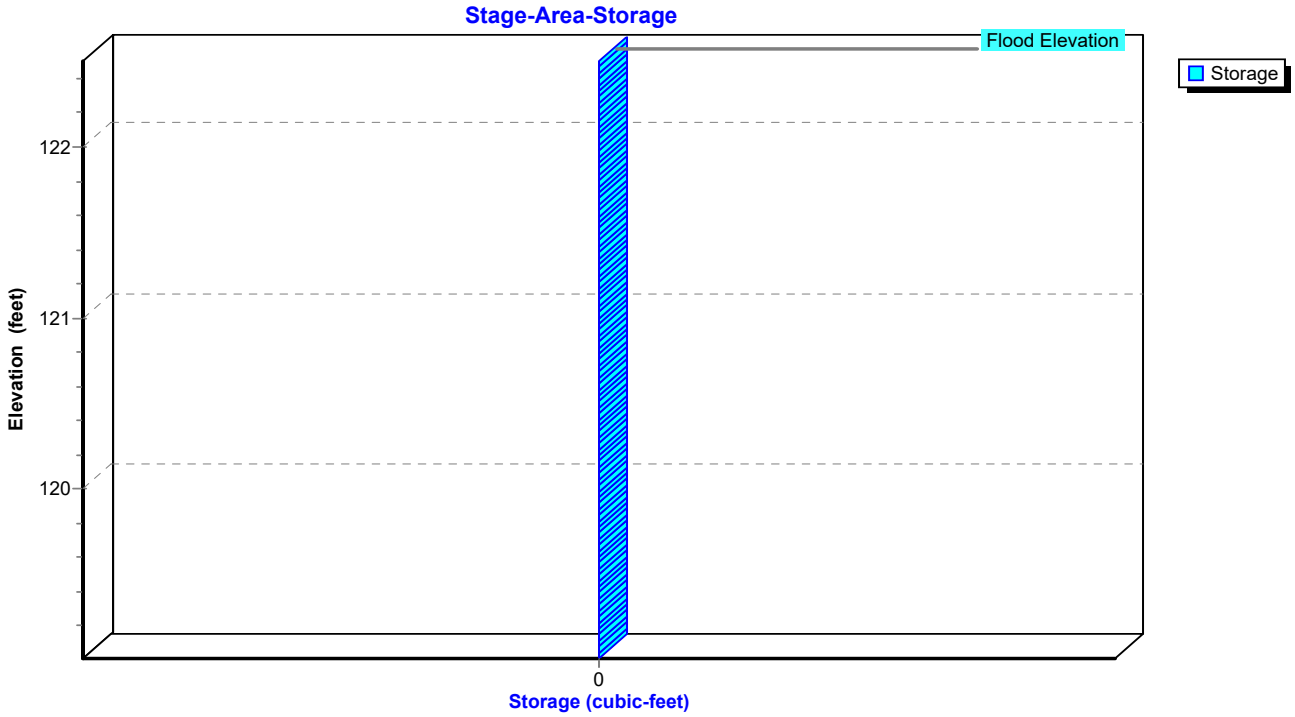
Device	Routing	Invert	Outlet Devices
#1	Primary	119.01'	**12.0" Round Culvert** L= 22.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.01' / 118.90' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.26 cfs @ 12.09 hrs HW=119.32' (Free Discharge)
1=Culvert (Barrel Controls 0.26 cfs @ 1.87 fps)

Pond 8P: DMH1



Pond 8P: DMH1


Stage-Area-Storage
Flood Elevation
Storage
122
121
120
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 8P: DMH1

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
119.01	**0**	121.66	0
119.06	0	121.71	0
119.11	0	121.76	0
119.16	0	121.81	0
119.21	0	121.86	0
119.26	0	121.91	0
119.31	0	121.96	0
119.36	0	122.01	0
119.41	0	122.06	0
119.46	0	122.11	0
119.51	0	122.16	0
119.56	0	122.21	0
119.61	0	122.26	0
119.66	0	122.31	0
119.71	0	122.36	0
119.76	0	122.41	0
119.81	0	122.46	0
119.86	0		
119.91	0		
119.96	0		
120.01	0		
120.06	0		
120.11	0		
120.16	0		
120.21	0		
120.26	0		
120.31	0		
120.36	0		
120.41	0		
120.46	0		
120.51	0		
120.56	0		
120.61	0		
120.66	0		
120.71	0		
120.76	0		
120.81	0		
120.86	0		
120.91	0		
120.96	0		
121.01	0		
121.06	0		
121.11	0		
121.16	0		
121.21	0		
121.26	0		
121.31	0		
121.36	0		
121.41	0		
121.46	0		
121.51	0		
121.56	0		
121.61	0		

Summary for Pond 9P: SUBSURFACE INFILTRATION #3

Inflow Area = 3,048 sf,100.00% Impervious, Inflow Depth > 5.92" for 25-Year event
Inflow = 0.41 cfs @ 12.09 hrs, Volume= 1,503 cf
Outflow = 0.05 cfs @ 12.66 hrs, Volume= 1,502 cf, Atten= 88%, Lag= 34.7 min
Discarded = 0.05 cfs @ 12.66 hrs, Volume= 1,502 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 116.06' @ 12.66 hrs Surf.Area= 506 sf Storage= 510 cf

Plug-Flow detention time= 76.9 min calculated for 1,502 cf (100% of inflow)
Center-of-Mass det. time= 76.5 min (820.8 - 744.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.50'	481 cf	**15.75'W x 32.10'L x 3.50'H Field A** 1,769 cf Overall - 567 cf Embedded = 1,202 cf x 40.0% Voids
#2A	115.00'	567 cf	**ADS_StormTech SC-740 b +Cap** x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 3 Rows Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf
		1,048 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	114.50'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 112.50'

Discarded OutFlow Max=0.05 cfs @ 12.66 hrs HW=116.06' (Free Discharge)
↑**1=Exfiltration** (Controls 0.05 cfs)

Pond 9P: SUBSURFACE INFILTRATION #3 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 b +Cap (ADS StormTech® SC-740 with cap storage)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

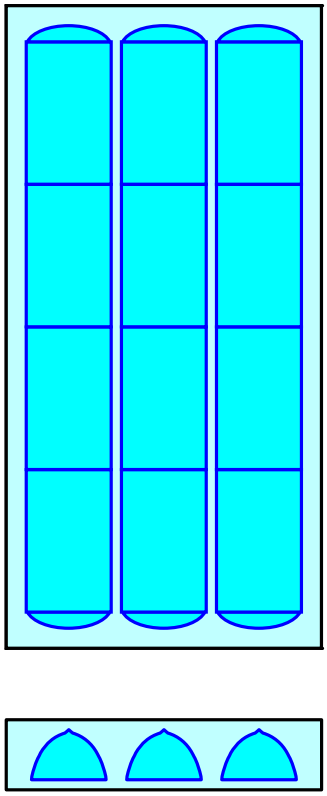
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

12 Chambers x 45.9 cf + 2.7 cf Cap Volume x 2 x 3 Rows = 567.2 cf Chamber Storage

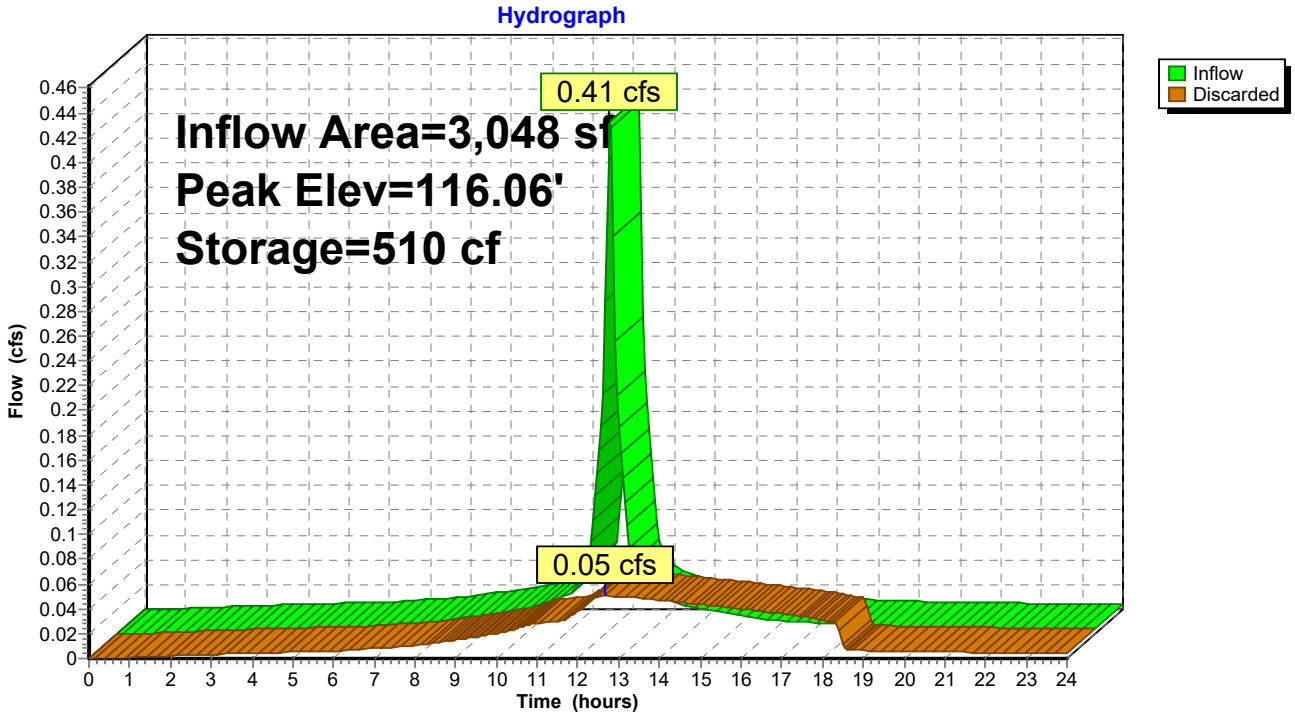
1,769.3 cf Field - 567.2 cf Chambers = 1,202.1 cf Stone x 40.0% Voids = 480.8 cf Stone Storage

Chamber Storage + Stone Storage = 1,048.1 cf = 0.024 af
Overall Storage Efficiency = 59.2%
Overall System Size = 32.10' x 15.75' x 3.50'

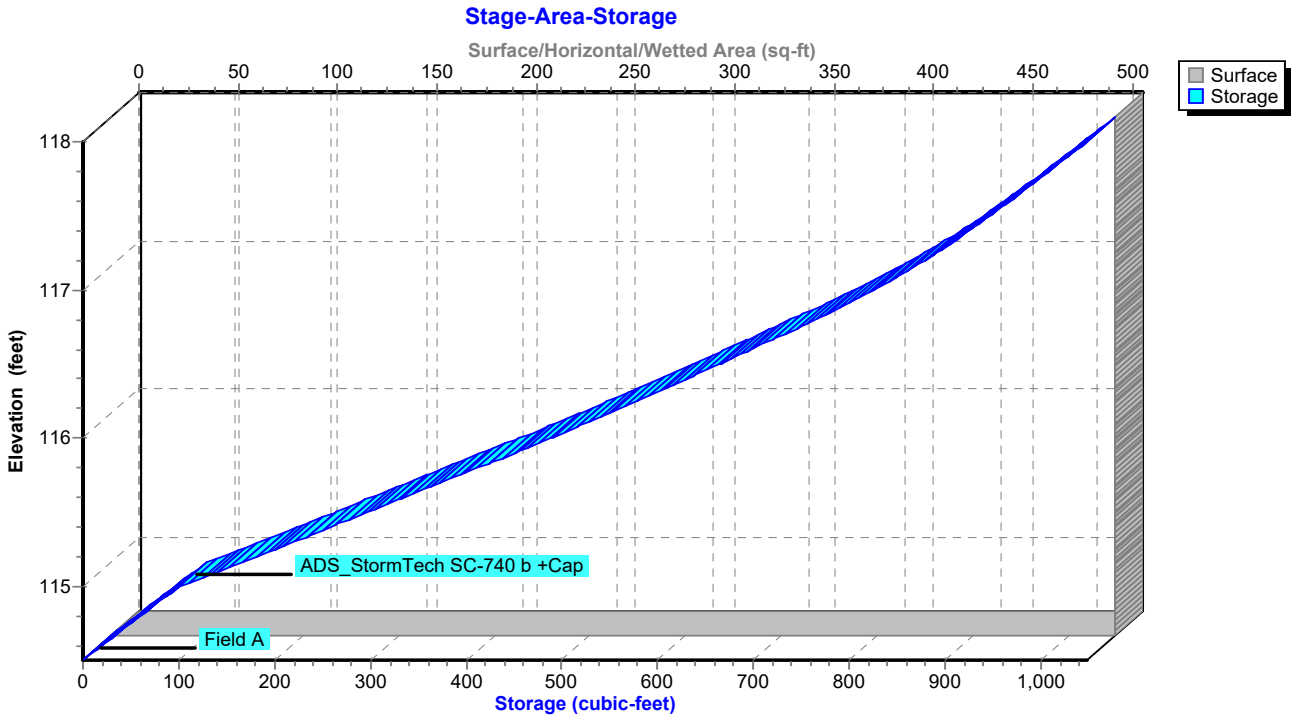
12 Chambers
65.5 cy Field
44.5 cy Stone



Pond 9P: SUBSURFACE INFILTRATION #3



Pond 9P: SUBSURFACE INFILTRATION #3



Stage-Area-Storage for Pond 9P: SUBSURFACE INFILTRATION #3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
114.50	**506**	0
114.55	506	10
114.60	506	20
114.65	506	30
114.70	506	40
114.75	506	51
114.80	506	61
114.85	506	71
114.90	506	81
114.95	506	91
115.00	506	101
115.05	506	121
115.10	506	141
115.15	506	161
115.20	506	181
115.25	506	200
115.30	506	220
115.35	506	240
115.40	506	259
115.45	506	279
115.50	506	298
115.55	506	318
115.60	506	337
115.65	506	356
115.70	506	375
115.75	506	394
115.80	506	413
115.85	506	432
115.90	506	451
115.95	506	469
116.00	506	488
116.05	506	506
116.10	506	524
116.15	506	543
116.20	506	561
116.25	506	578
116.30	506	596
116.35	506	614
116.40	506	631
116.45	506	648
116.50	506	665
116.55	506	682
116.60	506	699
116.65	506	716
116.70	506	732
116.75	506	748
116.80	506	764
116.85	506	779
116.90	506	795
116.95	506	810
117.00	506	825
117.05	506	839
117.10	506	853
117.15	506	867
117.20	506	880
117.25	506	892
117.30	506	904
117.35	506	915
117.40	506	926
117.45	506	937
117.50	506	947
117.55	506	957
117.60	506	967
117.65	506	977
117.70	506	987
117.75	506	998
117.80	506	1,008
117.85	506	1,018
117.90	506	1,028
117.95	506	1,038
118.00	506	**1,048**

Summary for Pond 10P: CDS1

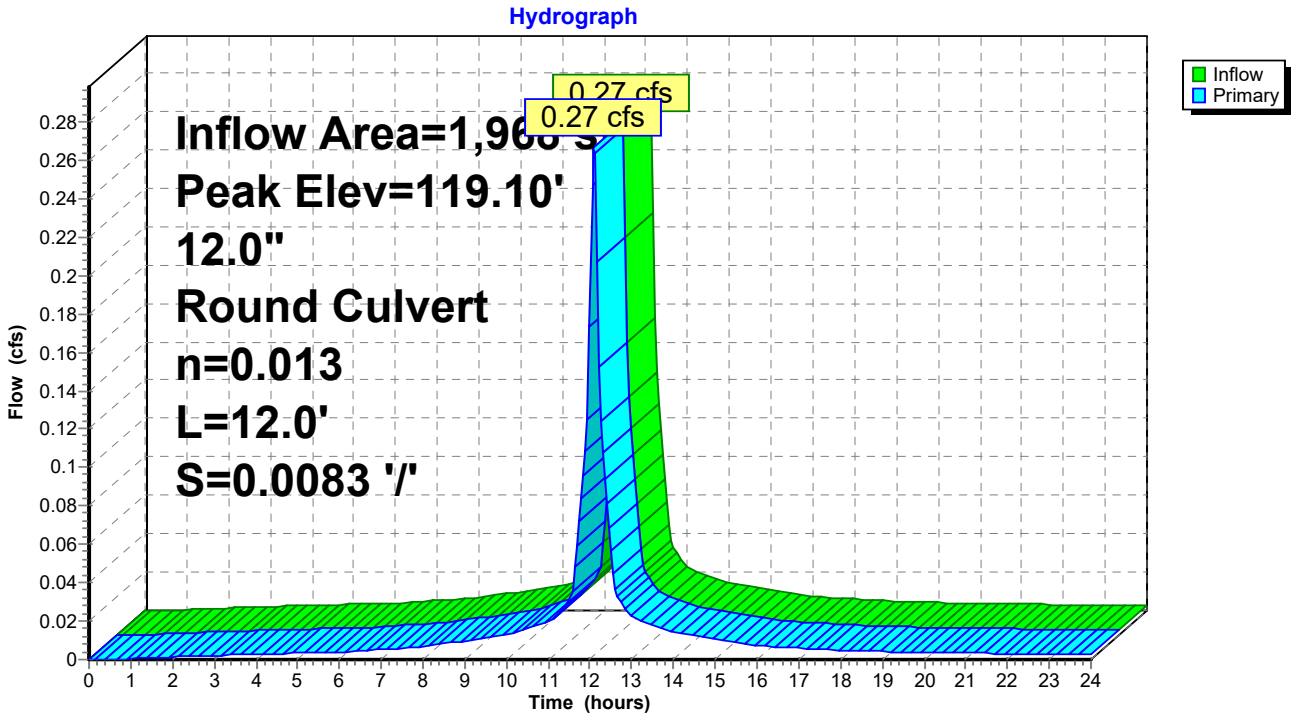
Inflow Area = 1,968 sf,100.00% Impervious, Inflow Depth > 5.92" for 25-Year event
Inflow = 0.27 cfs @ 12.09 hrs, Volume= 971 cf
Outflow = 0.27 cfs @ 12.09 hrs, Volume= 971 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.09 hrs, Volume= 971 cf
Routed to Pond 4P : SUBSURFACE INFILTRATION #1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.10' @ 12.09 hrs
Flood Elev= 122.50'

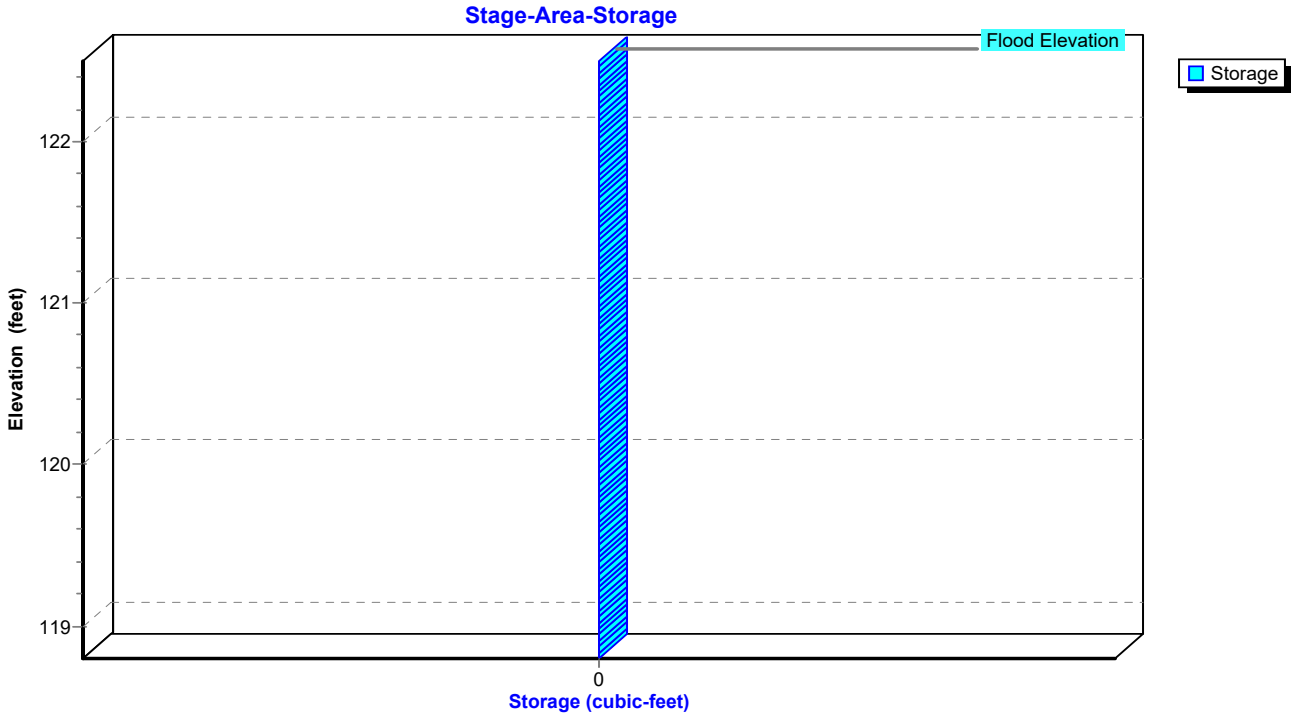
Device	Routing	Invert	Outlet Devices
#1	Primary	118.80'	**12.0" Round Culvert** L= 12.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.80' / 118.70' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.26 cfs @ 12.09 hrs HW=119.09' (Free Discharge)
1=Culvert (Barrel Controls 0.26 cfs @ 2.00 fps)

Pond 10P: CDS1



Pond 10P: CDS1



Stage-Area-Storage for Pond 10P: CDS1

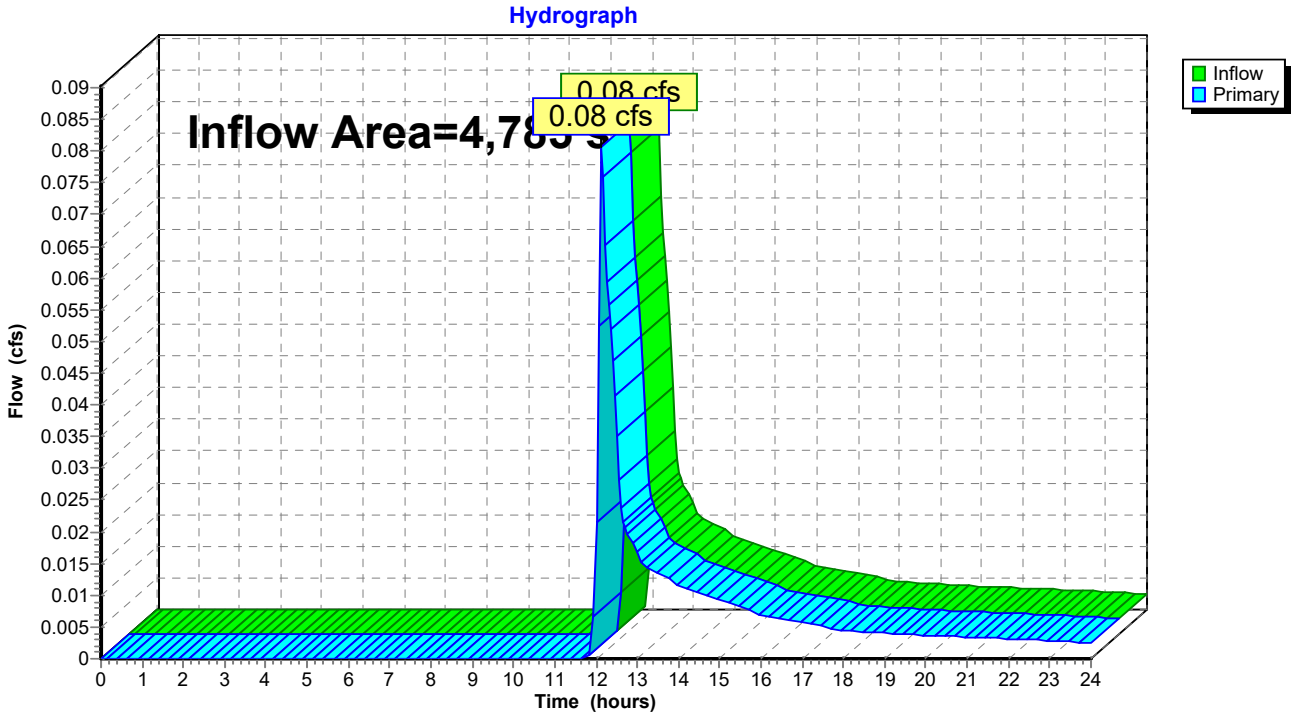
Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
118.80	**0**	121.45	0
118.85	0	121.50	0
118.90	0	121.55	0
118.95	0	121.60	0
119.00	0	121.65	0
119.05	0	121.70	0
119.10	0	121.75	0
119.15	0	121.80	0
119.20	0	121.85	0
119.25	0	121.90	0
119.30	0	121.95	0
119.35	0	122.00	0
119.40	0	122.05	0
119.45	0	122.10	0
119.50	0	122.15	0
119.55	0	122.20	0
119.60	0	122.25	0
119.65	0	122.30	0
119.70	0	122.35	0
119.75	0	122.40	0
119.80	0	122.45	0
119.85	0	122.50	0
119.90	0		
119.95	0		
120.00	0		
120.05	0		
120.10	0		
120.15	0		
120.20	0		
120.25	0		
120.30	0		
120.35	0		
120.40	0		
120.45	0		
120.50	0		
120.55	0		
120.60	0		
120.65	0		
120.70	0		
120.75	0		
120.80	0		
120.85	0		
120.90	0		
120.95	0		
121.00	0		
121.05	0		
121.10	0		
121.15	0		
121.20	0		
121.25	0		
121.30	0		
121.35	0		
121.40	0		

Summary for Link DP1: link

Inflow Area = 4,785 sf, 11.64% Impervious, Inflow Depth > 0.93" for 25-Year event
Inflow = 0.08 cfs @ 12.12 hrs, Volume= 372 cf
Primary = 0.08 cfs @ 12.12 hrs, Volume= 372 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP1: link

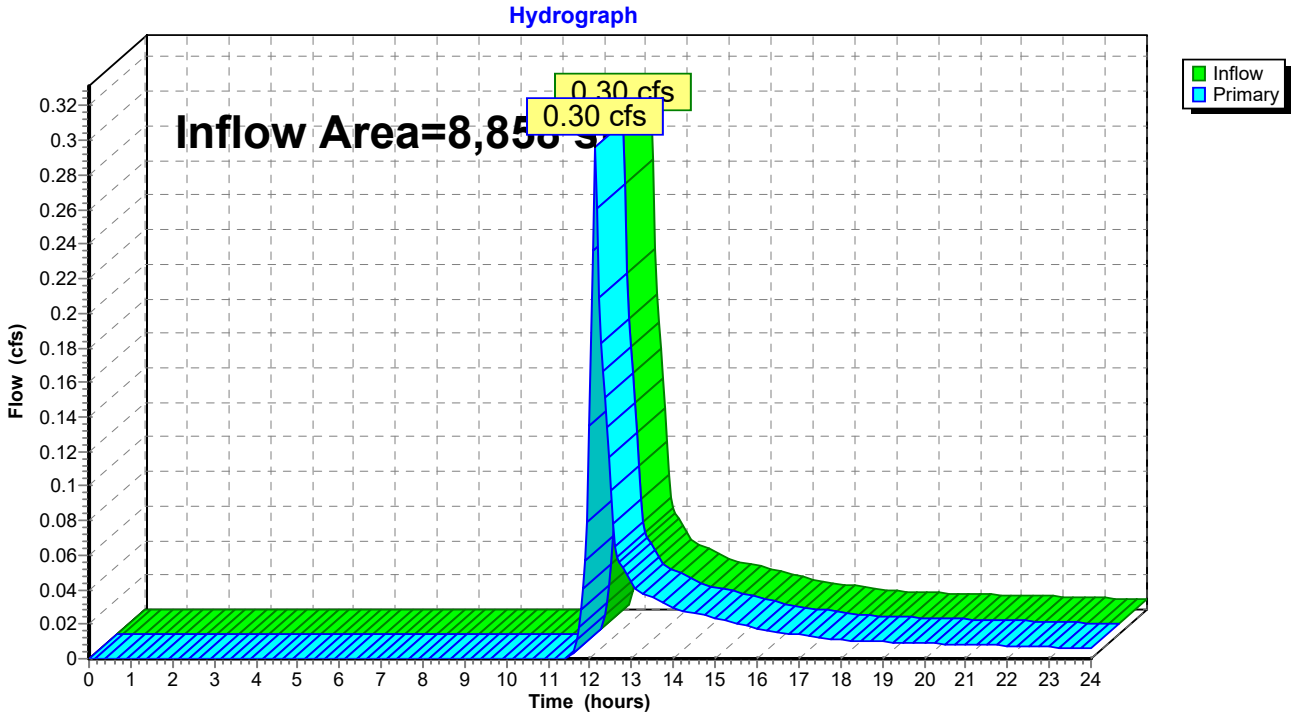


Summary for Link DP2: link

Inflow Area = 8,858 sf, 24.43% Impervious, Inflow Depth > 1.45" for 25-Year event
Inflow = 0.30 cfs @ 12.11 hrs, Volume= 1,070 cf
Primary = 0.30 cfs @ 12.11 hrs, Volume= 1,070 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP2: link

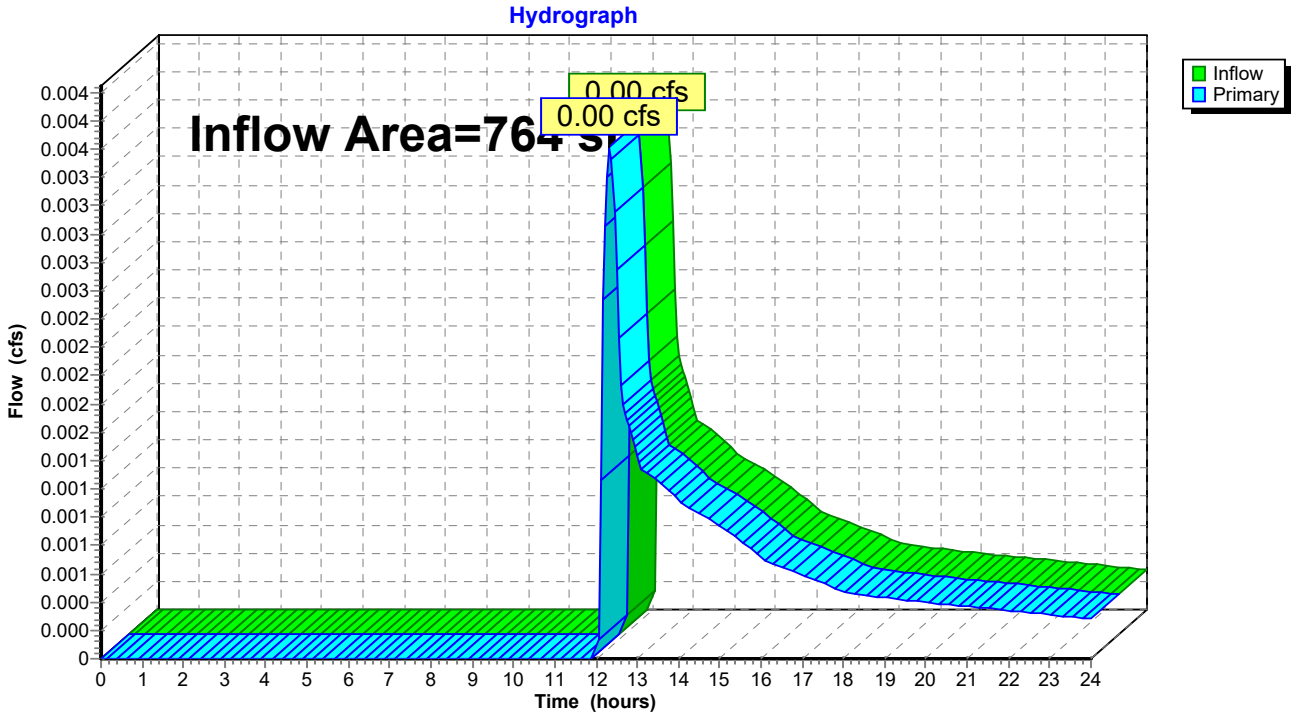


Summary for Link DP3: link

Inflow Area = 764 sf, 0.00% Impervious, Inflow Depth > 0.49" for 25-Year event
Inflow = 0.00 cfs @ 12.33 hrs, Volume= 31 cf
Primary = 0.00 cfs @ 12.33 hrs, Volume= 31 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP3: link



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

Subcatchment P1: P1 Runoff Area=4,785 sf 11.64% Impervious Runoff Depth>2.37"
Tc=6.0 min CN=46 Runoff=0.27 cfs 944 cf

Subcatchment P2: P2 Runoff Area=8,858 sf 24.43% Impervious Runoff Depth>3.20"
Tc=6.0 min CN=53 Runoff=0.72 cfs 2,362 cf

Subcatchment P3: P3 Runoff Area=764 sf 0.00% Impervious Runoff Depth>1.57"
Tc=6.0 min CN=39 Runoff=0.02 cfs 100 cf

Subcatchment P4A: P4A Runoff Area=2,010 sf 85.82% Impervious Runoff Depth>7.73"
Tc=6.0 min CN=90 Runoff=0.38 cfs 1,294 cf

Subcatchment P4B: P4B Runoff Area=5,921 sf 70.70% Impervious Runoff Depth>6.63"
Tc=6.0 min CN=81 Runoff=1.01 cfs 3,271 cf

Subcatchment P5A: P5A Runoff Area=1,227 sf 100.00% Impervious Runoff Depth>8.69"
Tc=6.0 min CN=98 Runoff=0.24 cfs 889 cf

Subcatchment P5B: P5B Runoff Area=741 sf 100.00% Impervious Runoff Depth>8.69"
Tc=6.0 min CN=98 Runoff=0.15 cfs 537 cf

Subcatchment P6: P6 Runoff Area=3,048 sf 100.00% Impervious Runoff Depth>8.69"
Tc=6.0 min CN=98 Runoff=0.60 cfs 2,208 cf

Pond 1P: CB1 Peak Elev=119.39' Inflow=0.15 cfs 537 cf
12.0" Round Culvert n=0.013 L=7.5' S=0.0053 '/' Outflow=0.15 cfs 537 cf

Pond 2P: SUBSURFACE INFILTRATION #2 Peak Elev=116.03' Storage=1,707 cf Inflow=1.39 cfs 4,565 cf
Outflow=0.17 cfs 4,563 cf

Pond 3P: CB3 Peak Elev=115.23' Inflow=0.38 cfs 1,294 cf
12.0" Round Culvert n=0.013 L=30.5' S=0.0052 '/' Outflow=0.38 cfs 1,294 cf

Pond 4P: SUBSURFACE INFILTRATION #1 Peak Elev=121.58' Storage=555 cf Inflow=0.39 cfs 1,426 cf
Outflow=0.04 cfs 1,425 cf

Pond 5P: CB4 Peak Elev=115.71' Inflow=1.01 cfs 3,271 cf
8.0" Round Culvert n=0.013 L=14.5' S=0.0055 '/' Outflow=1.01 cfs 3,271 cf

Pond 6P: CDS2 Peak Elev=115.45' Inflow=1.39 cfs 4,565 cf
12.0" Round Culvert n=0.013 L=3.0' S=0.0333 '/' Outflow=1.39 cfs 4,565 cf

Pond 7P: CB2 Peak Elev=119.46' Inflow=0.24 cfs 889 cf
12.0" Round Culvert n=0.013 L=7.5' S=0.0053 '/' Outflow=0.24 cfs 889 cf

Pond 8P: DMH1 Peak Elev=119.39' Inflow=0.39 cfs 1,426 cf
12.0" Round Culvert n=0.013 L=22.0' S=0.0050 '/' Outflow=0.39 cfs 1,426 cf

Pond 9P: SUBSURFACE INFILTRATION #3 Peak Elev=117.02' Storage=831 cf Inflow=0.60 cfs 2,208 cf
Outflow=0.06 cfs 2,207 cf

Pond 10P: CDS1 Peak Elev=119.17' Inflow=0.39 cfs 1,426 cf
12.0" Round Culvert n=0.013 L=12.0' S=0.0083 '/' Outflow=0.39 cfs 1,426 cf

Link DP1: link Inflow=0.27 cfs 944 cf
Primary=0.27 cfs 944 cf

Link DP2: link Inflow=0.72 cfs 2,362 cf
Primary=0.72 cfs 2,362 cf

Link DP3: link Inflow=0.02 cfs 100 cf
Primary=0.02 cfs 100 cf

Total Runoff Area = 27,354 sf Runoff Volume = 11,605 cf Average Runoff Depth = 5.09"
50.11% Pervious = 13,706 sf 49.89% Impervious = 13,648 sf

Summary for Subcatchment P1: P1

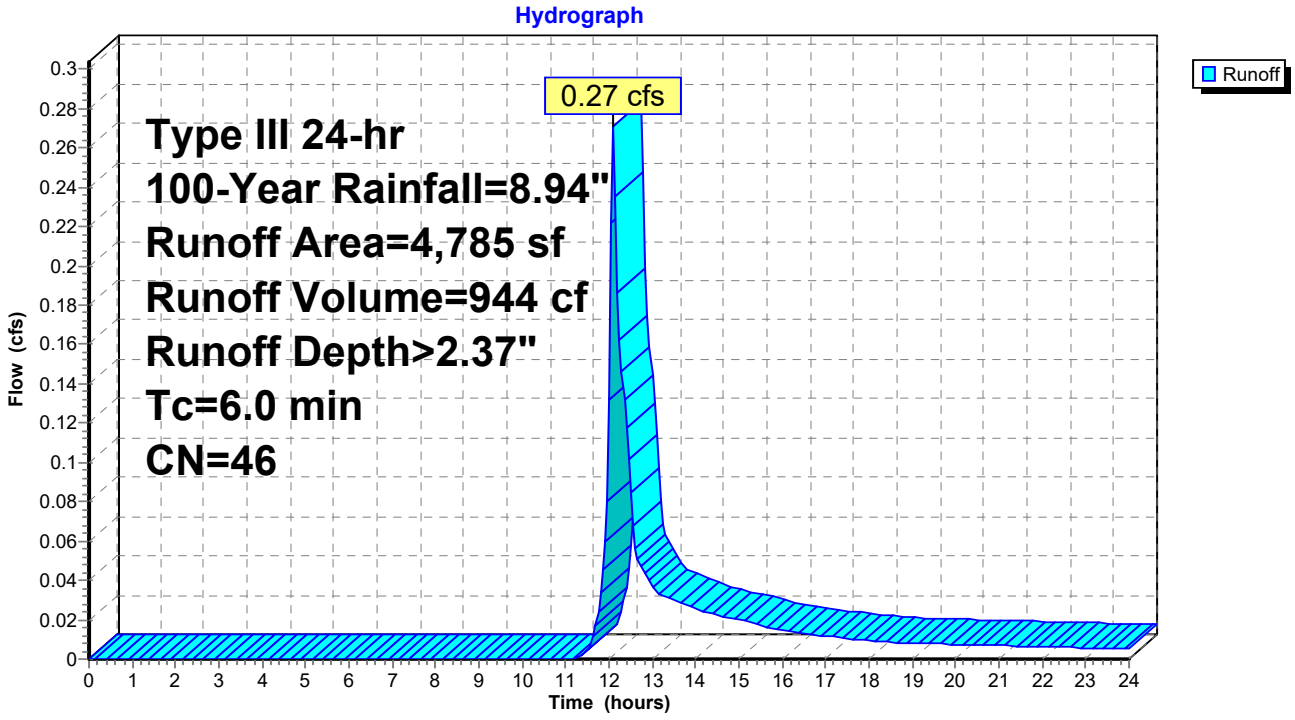
Runoff = 0.27 cfs @ 12.10 hrs, Volume= 944 cf, Depth> 2.37"
Routed to Link DP1 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
557	98	Roofs, HSG A
4,228	39	>75% Grass cover, Good, HSG A
4,785	46	Weighted Average
4,228		88.36% Pervious Area
557		11.64% Impervious Area

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

Subcatchment P1: P1



Summary for Subcatchment P2: P2

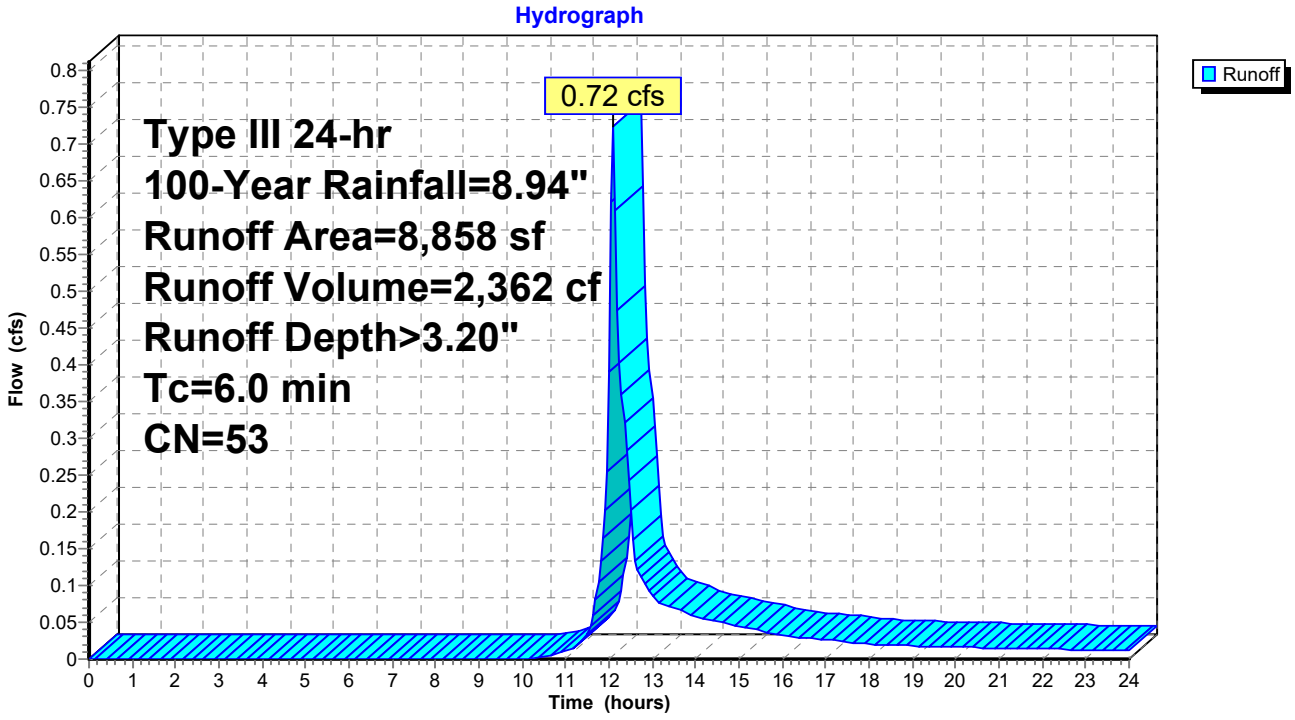
Runoff = 0.72 cfs @ 12.10 hrs, Volume= 2,362 cf, Depth> 3.20"
Routed to Link DP2 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
2,164	98	Roofs, HSG A
6,694	39	>75% Grass cover, Good, HSG A
8,858	53	Weighted Average
6,694		75.57% Pervious Area
2,164		24.43% Impervious Area

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

Subcatchment P2: P2



Summary for Subcatchment P3: P3

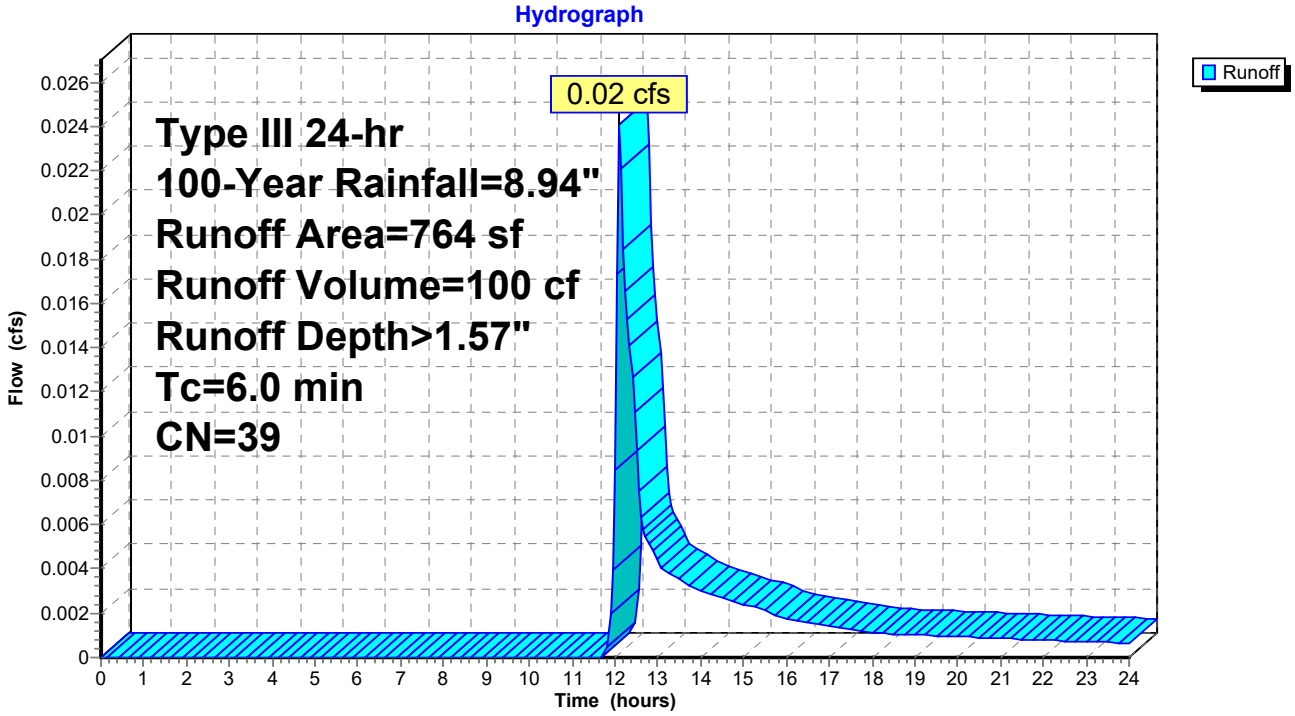
Runoff = 0.02 cfs @ 12.11 hrs, Volume= 100 cf, Depth> 1.57"
Routed to Link DP3 : link

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
764	39	>75% Grass cover, Good, HSG A
764		100.00% Pervious Area

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

Subcatchment P3: P3



Summary for Subcatchment P4A: P4A

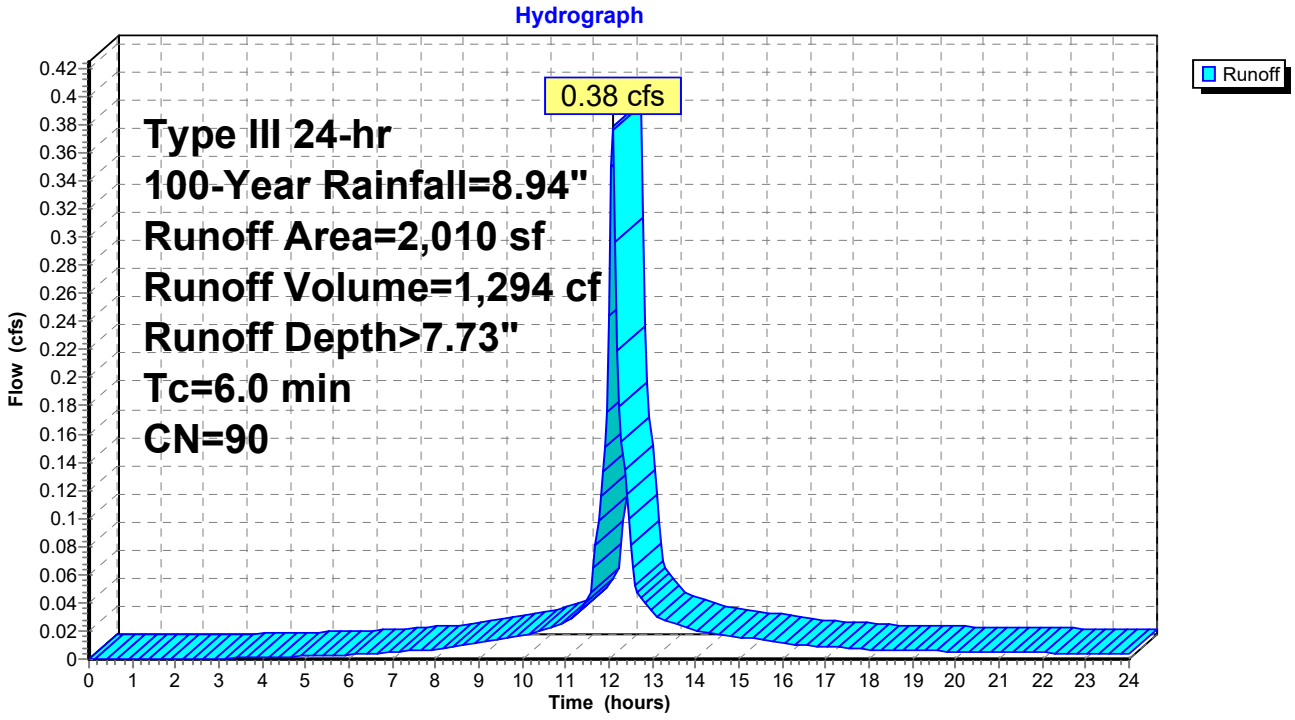
Runoff = 0.38 cfs @ 12.09 hrs, Volume= 1,294 cf, Depth> 7.73"
Routed to Pond 3P : CB3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
285	39	>75% Grass cover, Good, HSG A
1,725	98	Paved parking, HSG A
2,010	90	Weighted Average
285		14.18% Pervious Area
1,725		85.82% Impervious Area

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

Subcatchment P4A: P4A



Summary for Subcatchment P4B: P4B

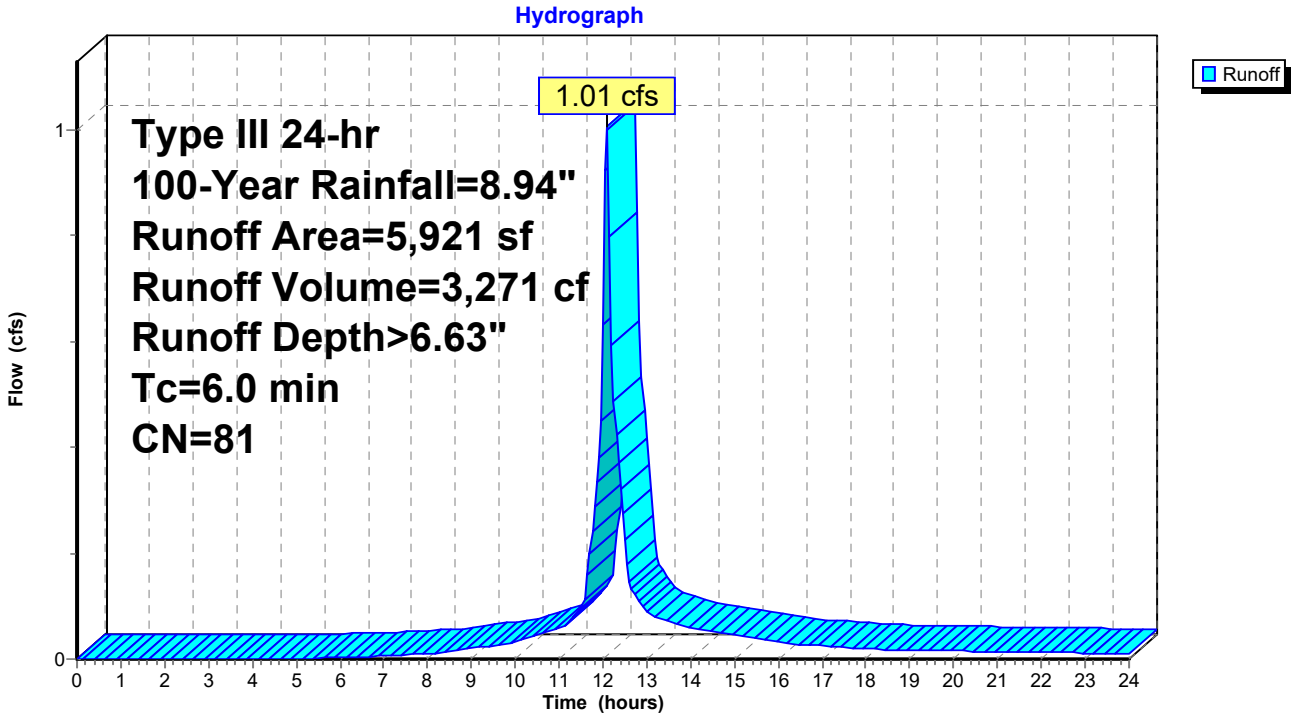
Runoff = 1.01 cfs @ 12.09 hrs, Volume= 3,271 cf, Depth> 6.63"
Routed to Pond 5P : CB4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
1,735	39	>75% Grass cover, Good, HSG A
4,186	98	Paved parking, HSG A
5,921	81	Weighted Average
1,735		29.30% Pervious Area
4,186		70.70% Impervious Area

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

Subcatchment P4B: P4B



Summary for Subcatchment P5A: P5A

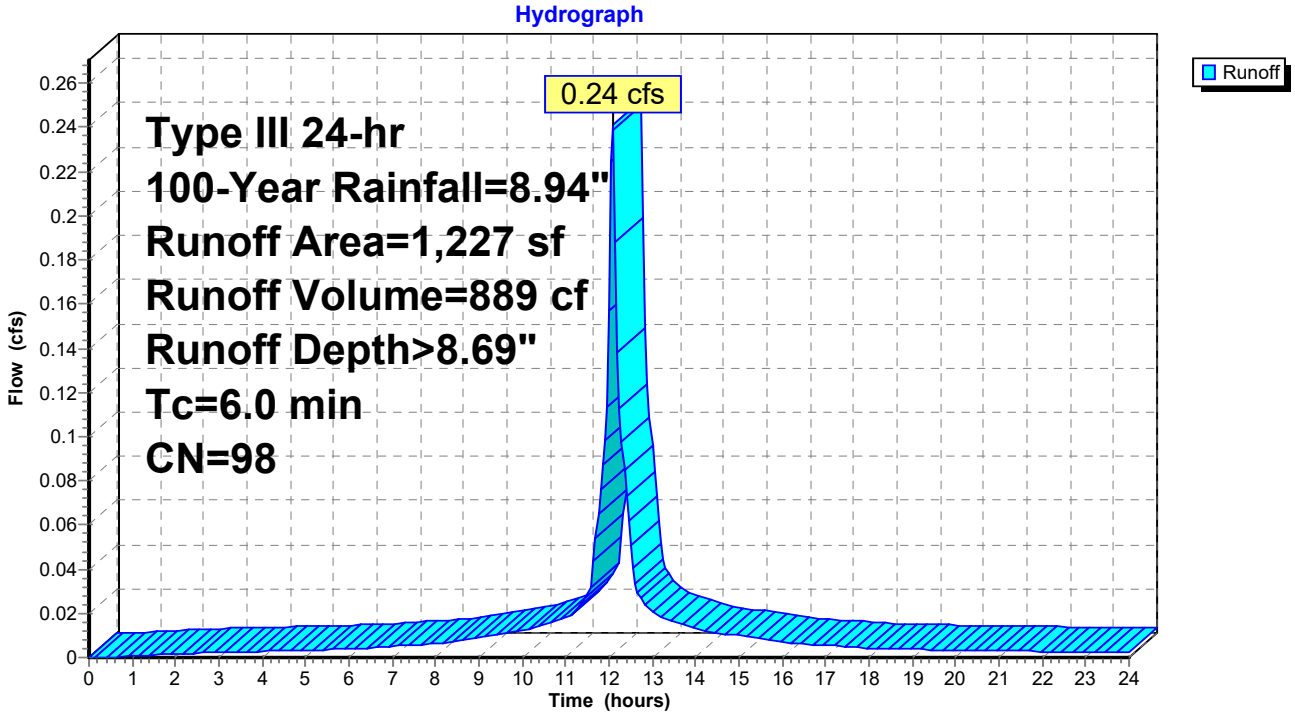
Runoff = 0.24 cfs @ 12.09 hrs, Volume= 889 cf, Depth> 8.69"
Routed to Pond 7P : CB2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
1,227	98	Paved parking, HSG A
1,227		100.00% Impervious Area

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

Subcatchment P5A: P5A



Summary for Subcatchment P5B: P5B

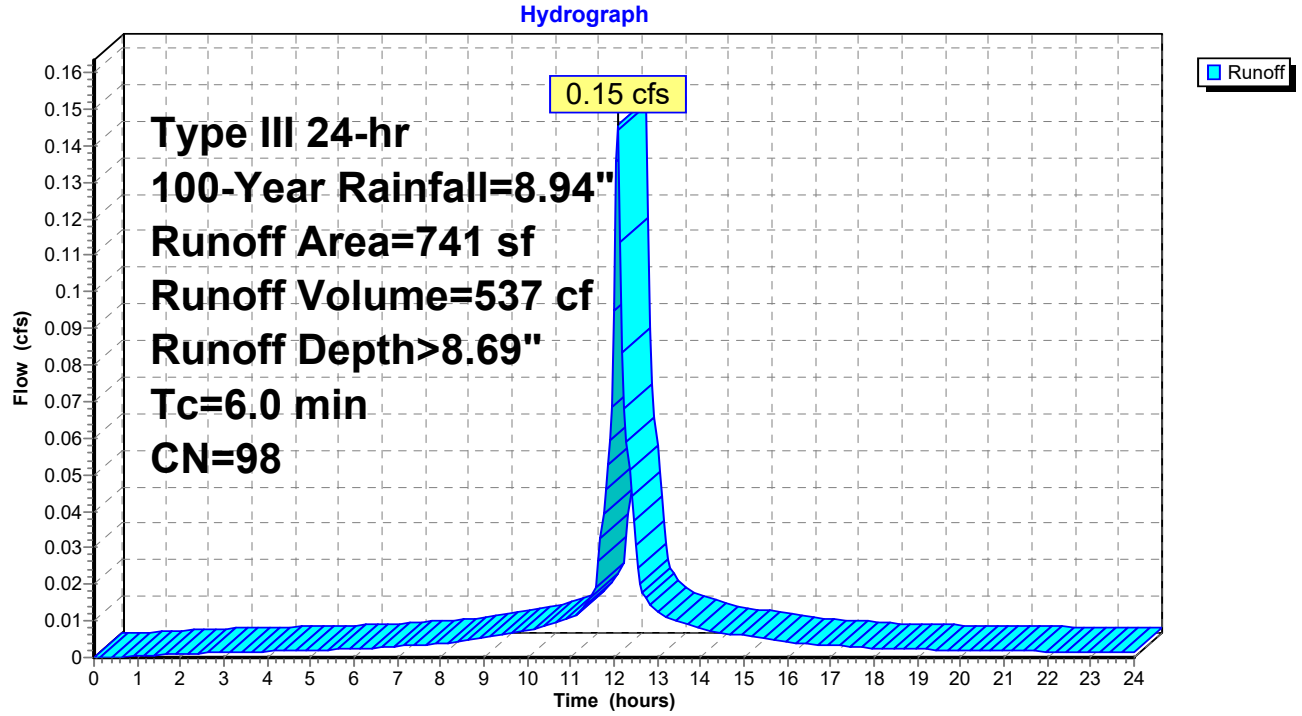
Runoff = 0.15 cfs @ 12.09 hrs, Volume= 537 cf, Depth> 8.69"
Routed to Pond 1P : CB1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
741	98	Paved parking, HSG A
741		100.00% Impervious Area

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

Subcatchment P5B: P5B



Summary for Subcatchment P6: P6

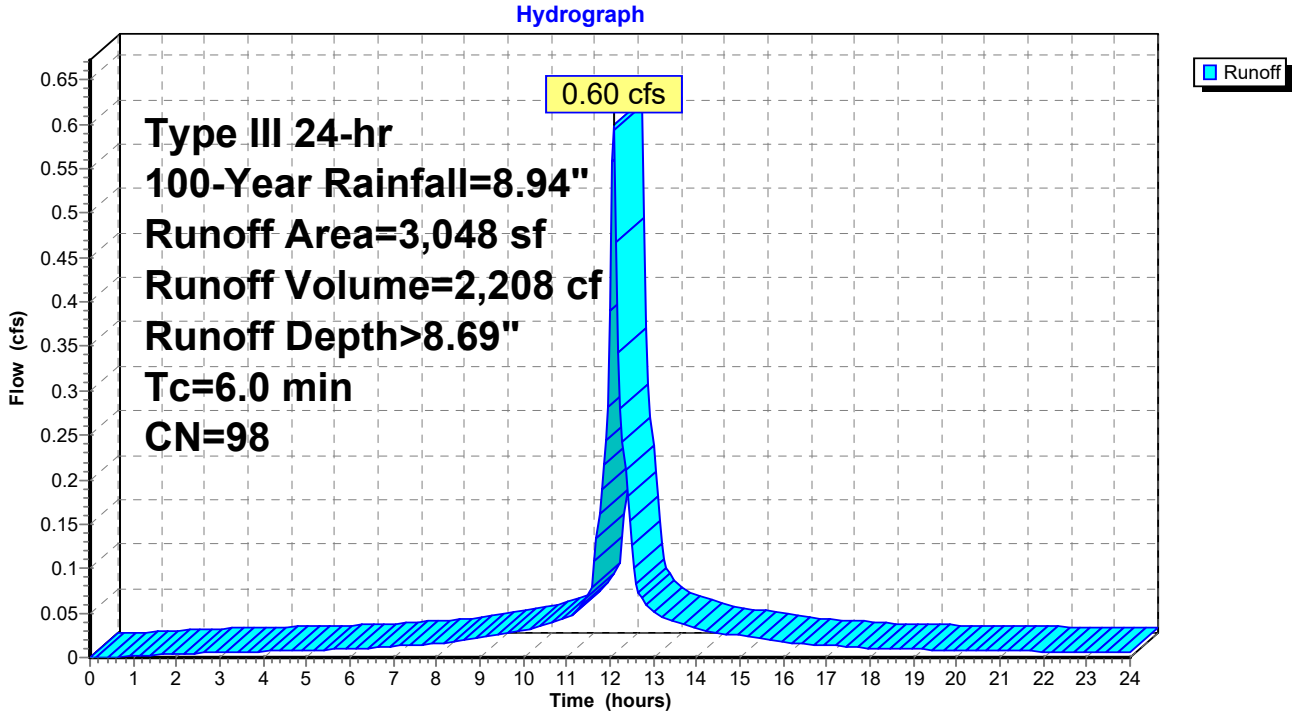
Runoff = 0.60 cfs @ 12.09 hrs, Volume= 2,208 cf, Depth> 8.69"
Routed to Pond 9P : SUBSURFACE INFILTRATION #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
3,048	98	Roofs, HSG A
3,048		100.00% Impervious Area

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

Subcatchment P6: P6



Summary for Pond 1P: CB1

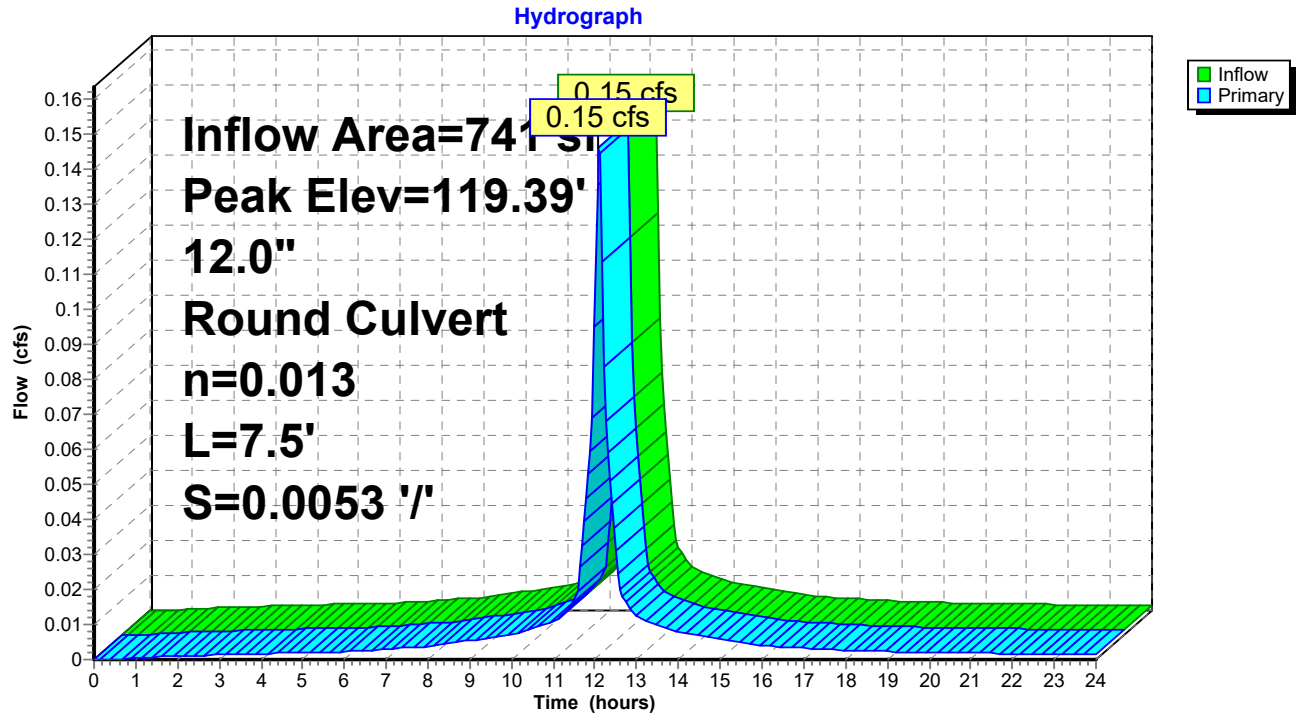
Inflow Area = 741 sf,100.00% Impervious, Inflow Depth > 8.69" for 100-Year event
Inflow = 0.15 cfs @ 12.09 hrs, Volume= 537 cf
Outflow = 0.15 cfs @ 12.09 hrs, Volume= 537 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.15 cfs @ 12.09 hrs, Volume= 537 cf
Routed to Pond 8P : DMH1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.39' @ 12.09 hrs
Flood Elev= 122.15'

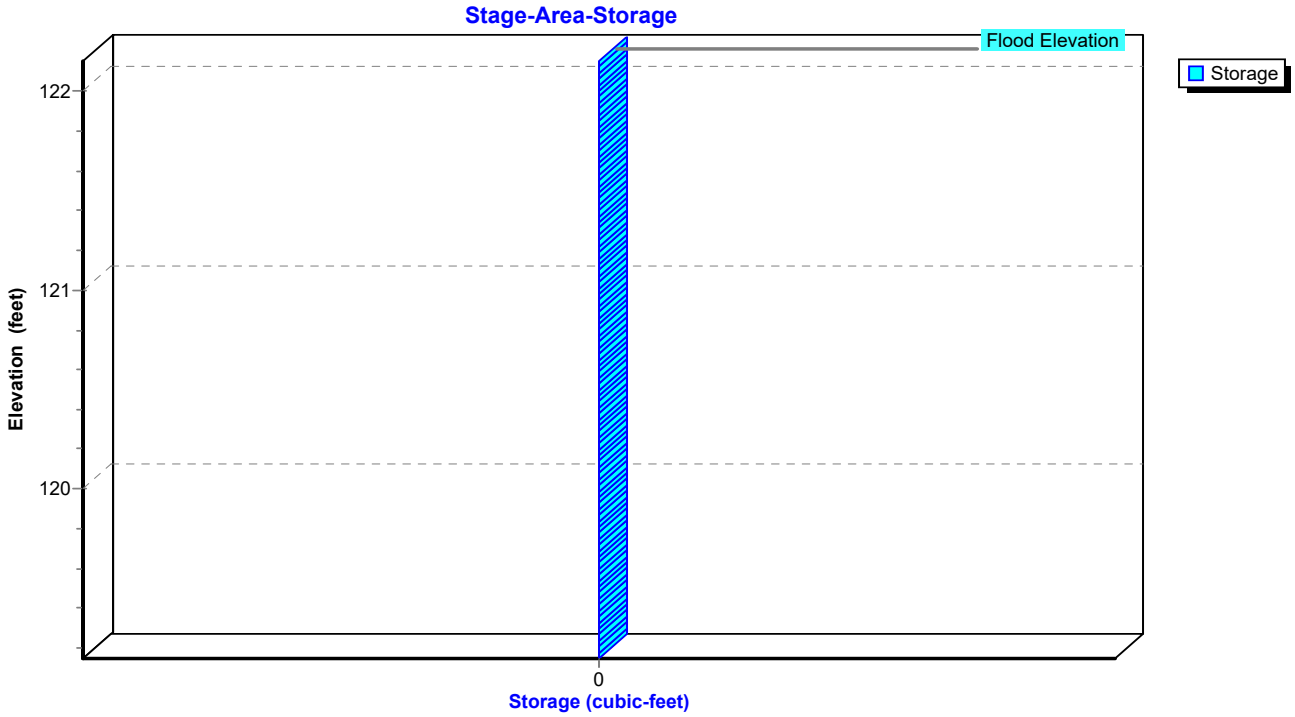
Device	Routing	Invert	Outlet Devices
#1	Primary	119.15'	**12.0" Round Culvert** L= 7.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.15' / 119.11' S= 0.0053 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.14 cfs @ 12.09 hrs HW=119.38' (Free Discharge)
1=Culvert (Barrel Controls 0.14 cfs @ 1.55 fps)

Pond 1P: CB1



Pond 1P: CB1


Stage-Area-Storage
Flood Elevation
Storage
122
121
120
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 1P: CB1

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
119.15	**0**	120.21	0	121.27	0
119.17	0	120.23	0	121.29	0
119.19	0	120.25	0	121.31	0
119.21	0	120.27	0	121.33	0
119.23	0	120.29	0	121.35	0
119.25	0	120.31	0	121.37	0
119.27	0	120.33	0	121.39	0
119.29	0	120.35	0	121.41	0
119.31	0	120.37	0	121.43	0
119.33	0	120.39	0	121.45	0
119.35	0	120.41	0	121.47	0
119.37	0	120.43	0	121.49	0
119.39	0	120.45	0	121.51	0
119.41	0	120.47	0	121.53	0
119.43	0	120.49	0	121.55	0
119.45	0	120.51	0	121.57	0
119.47	0	120.53	0	121.59	0
119.49	0	120.55	0	121.61	0
119.51	0	120.57	0	121.63	0
119.53	0	120.59	0	121.65	0
119.55	0	120.61	0	121.67	0
119.57	0	120.63	0	121.69	0
119.59	0	120.65	0	121.71	0
119.61	0	120.67	0	121.73	0
119.63	0	120.69	0	121.75	0
119.65	0	120.71	0	121.77	0
119.67	0	120.73	0	121.79	0
119.69	0	120.75	0	121.81	0
119.71	0	120.77	0	121.83	0
119.73	0	120.79	0	121.85	0
119.75	0	120.81	0	121.87	0
119.77	0	120.83	0	121.89	0
119.79	0	120.85	0	121.91	0
119.81	0	120.87	0	121.93	0
119.83	0	120.89	0	121.95	0
119.85	0	120.91	0	121.97	0
119.87	0	120.93	0	121.99	0
119.89	0	120.95	0	122.01	0
119.91	0	120.97	0	122.03	0
119.93	0	120.99	0	122.05	0
119.95	0	121.01	0	122.07	0
119.97	0	121.03	0	122.09	0
119.99	0	121.05	0	122.11	0
120.01	0	121.07	0	122.13	0
120.03	0	121.09	0	122.15	0
120.05	0	121.11	0		
120.07	0	121.13	0		
120.09	0	121.15	0		
120.11	0	121.17	0		
120.13	0	121.19	0		
120.15	0	121.21	0		
120.17	0	121.23	0		
120.19	0	121.25	0		

Summary for Pond 2P: SUBSURFACE INFILTRATION #2

Inflow Area = 7,931 sf, 74.53% Impervious, Inflow Depth > 6.91" for 100-Year event
Inflow = 1.39 cfs @ 12.09 hrs, Volume= 4,565 cf
Outflow = 0.17 cfs @ 12.71 hrs, Volume= 4,563 cf, Atten= 88%, Lag= 37.2 min
Primary = 0.17 cfs @ 12.71 hrs, Volume= 4,563 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 116.03' @ 12.71 hrs Surf.Area= 1,494 sf Storage= 1,707 cf

Plug-Flow detention time= 92.1 min calculated for 4,563 cf (100% of inflow)
Center-of-Mass det. time= 91.8 min (881.0 - 789.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.00'	1,064 cf	**28.17'W x 53.04'L x 2.33'H Field A** 3,486 cf Overall - 826 cf Embedded = 2,660 cf x 40.0% Voids
#2A	114.50'	826 cf	**ADS_StormTech SC-310 +Cap** x 56 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 56 Chambers in 8 Rows
		1,890 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	114.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 112.00'

Primary OutFlow Max=0.17 cfs @ 12.71 hrs HW=116.03' (Free Discharge)
1=Exfiltration (Controls 0.17 cfs)

Pond 2P: SUBSURFACE INFILTRATION #2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

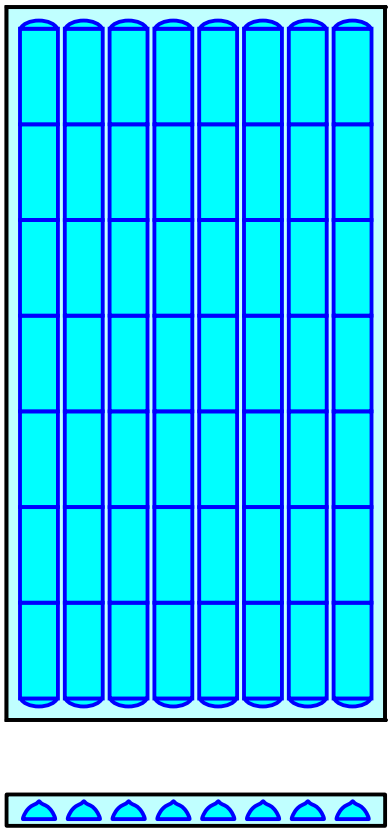
7 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 51.04' Row Length +12.0" End Stone x 2 = 53.04' Base Length
8 Rows x 34.0" Wide + 6.0" Spacing x 7 + 12.0" Side Stone x 2 = 28.17' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

56 Chambers x 14.7 cf = 825.5 cf Chamber Storage

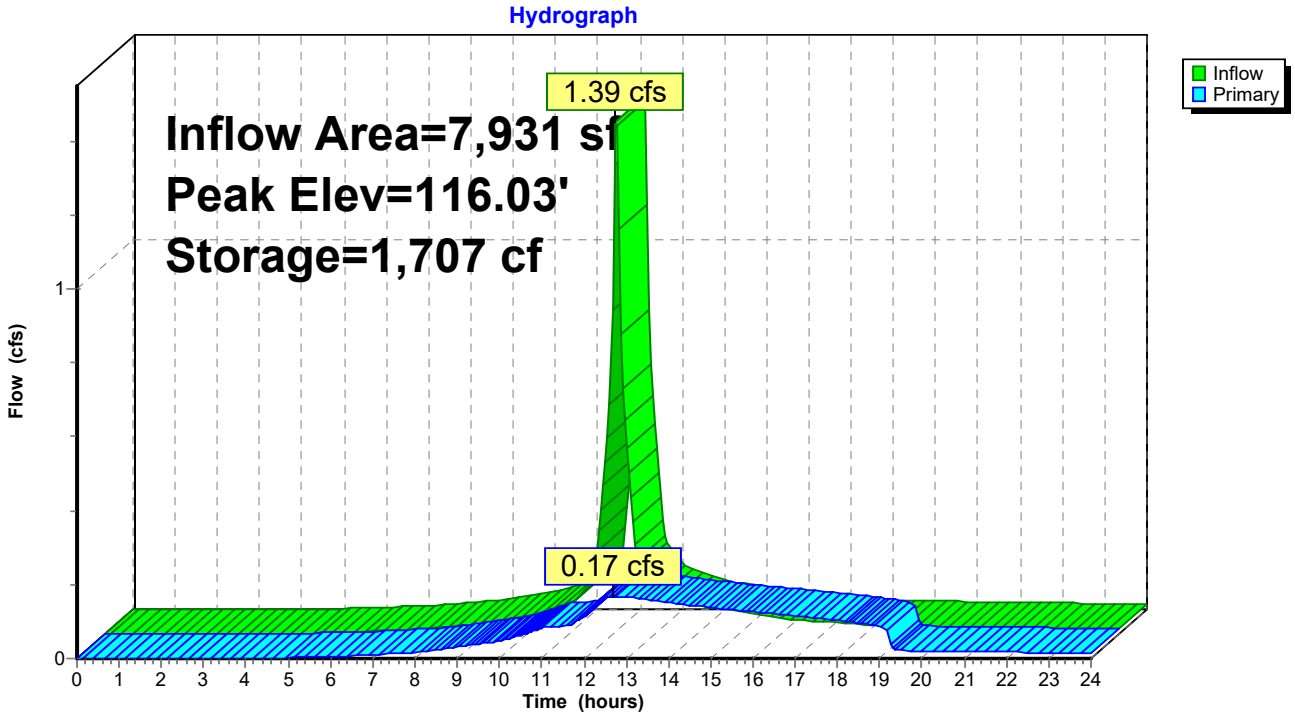
3,485.9 cf Field - 825.5 cf Chambers = 2,660.4 cf Stone x 40.0% Voids = 1,064.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,889.7 cf = 0.043 af
Overall Storage Efficiency = 54.2%
Overall System Size = 53.04' x 28.17' x 2.33'

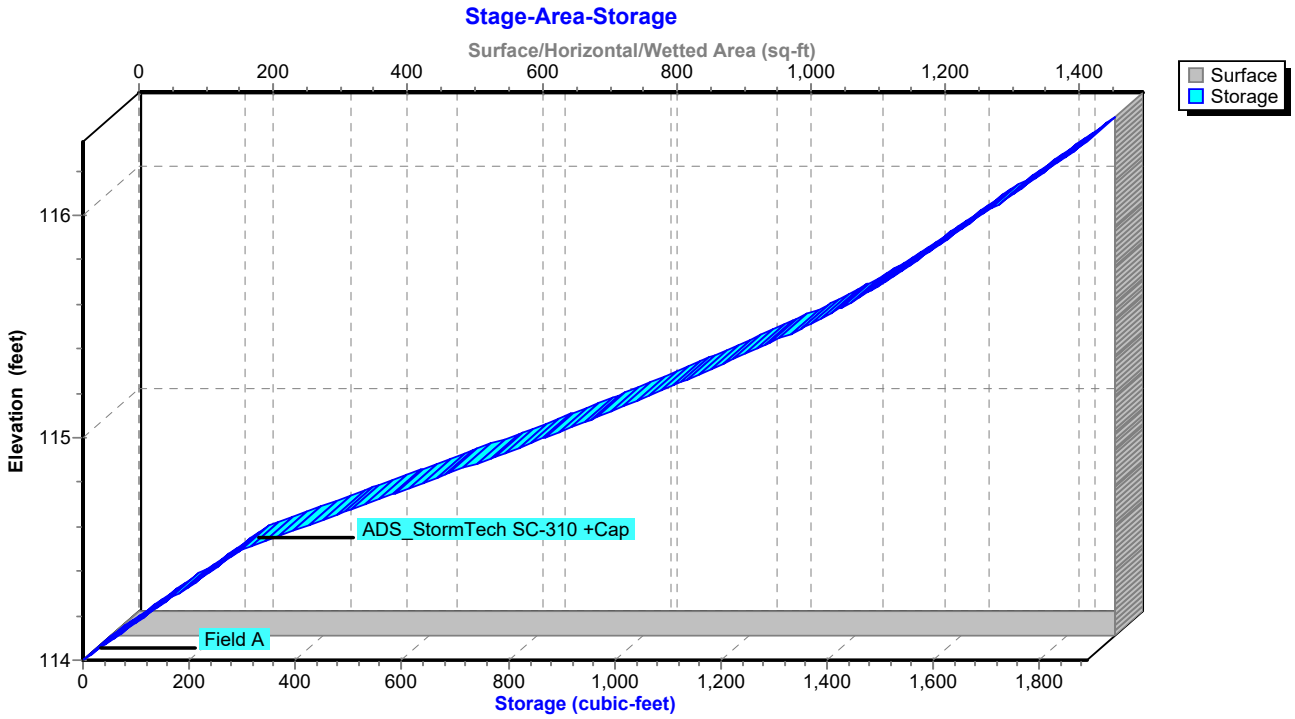
56 Chambers
129.1 cy Field
98.5 cy Stone



Pond 2P: SUBSURFACE INFILTRATION #2



Pond 2P: SUBSURFACE INFILTRATION #2



Stage-Area-Storage for Pond 2P: SUBSURFACE INFILTRATION #2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
114.00	**1,494**	0
114.05	1,494	30
114.10	1,494	60
114.15	1,494	90
114.20	1,494	120
114.25	1,494	149
114.30	1,494	179
114.35	1,494	209
114.40	1,494	239
114.45	1,494	269
114.50	1,494	299
114.55	1,494	357
114.60	1,494	416
114.65	1,494	474
114.70	1,494	532
114.75	1,494	589
114.80	1,494	646
114.85	1,494	702
114.90	1,494	757
114.95	1,494	812
115.00	1,494	866
115.05	1,494	920
115.10	1,494	973
115.15	1,494	1,024
115.20	1,494	1,075
115.25	1,494	1,125
115.30	1,494	1,174
115.35	1,494	1,222
115.40	1,494	1,268
115.45	1,494	1,313
115.50	1,494	1,357
115.55	1,494	1,398
115.60	1,494	1,436
115.65	1,494	1,473
115.70	1,494	1,507
115.75	1,494	1,539
115.80	1,494	1,571
115.85	1,494	1,601
115.90	1,494	1,631
115.95	1,494	1,661
116.00	1,494	1,690
116.05	1,494	1,720
116.10	1,494	1,750
116.15	1,494	1,780
116.20	1,494	1,810
116.25	1,494	1,840
116.30	1,494	**1,870**

Summary for Pond 3P: CB3

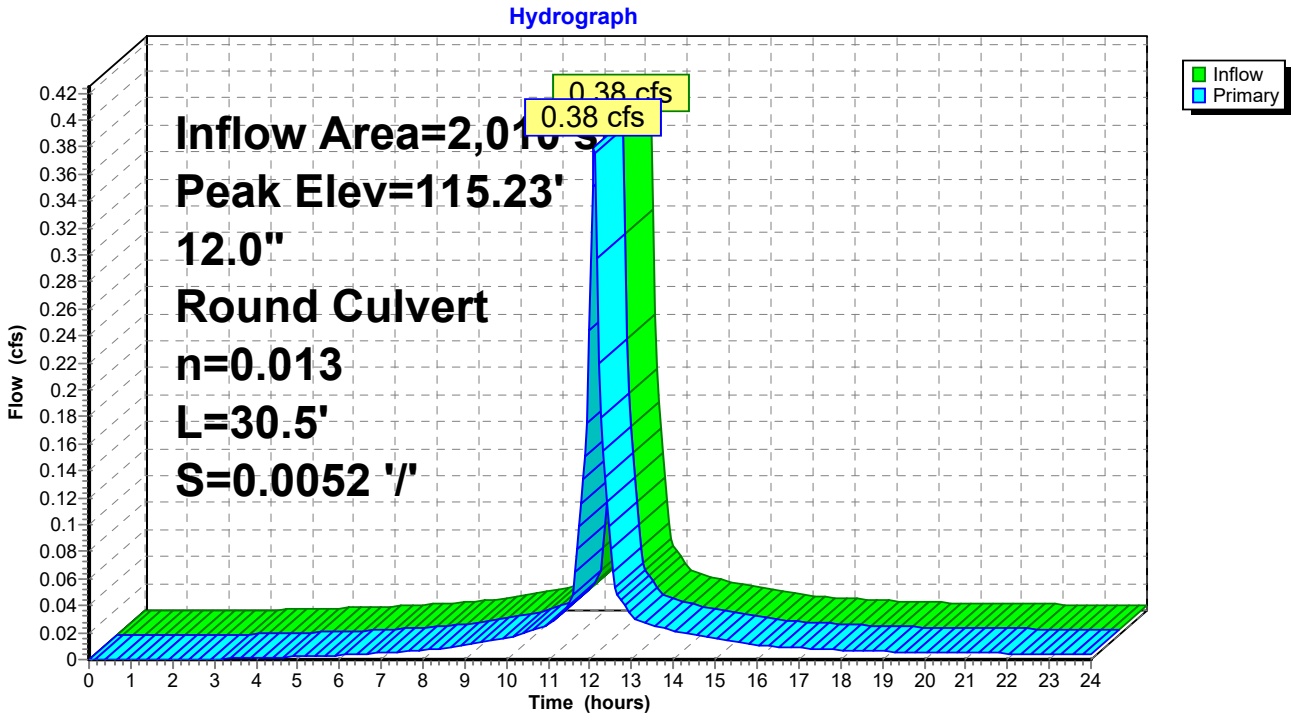
Inflow Area = 2,010 sf, 85.82% Impervious, Inflow Depth > 7.73" for 100-Year event
Inflow = 0.38 cfs @ 12.09 hrs, Volume= 1,294 cf
Outflow = 0.38 cfs @ 12.09 hrs, Volume= 1,294 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.38 cfs @ 12.09 hrs, Volume= 1,294 cf
Routed to Pond 6P : CDS2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.23' @ 12.09 hrs
Flood Elev= 118.00'

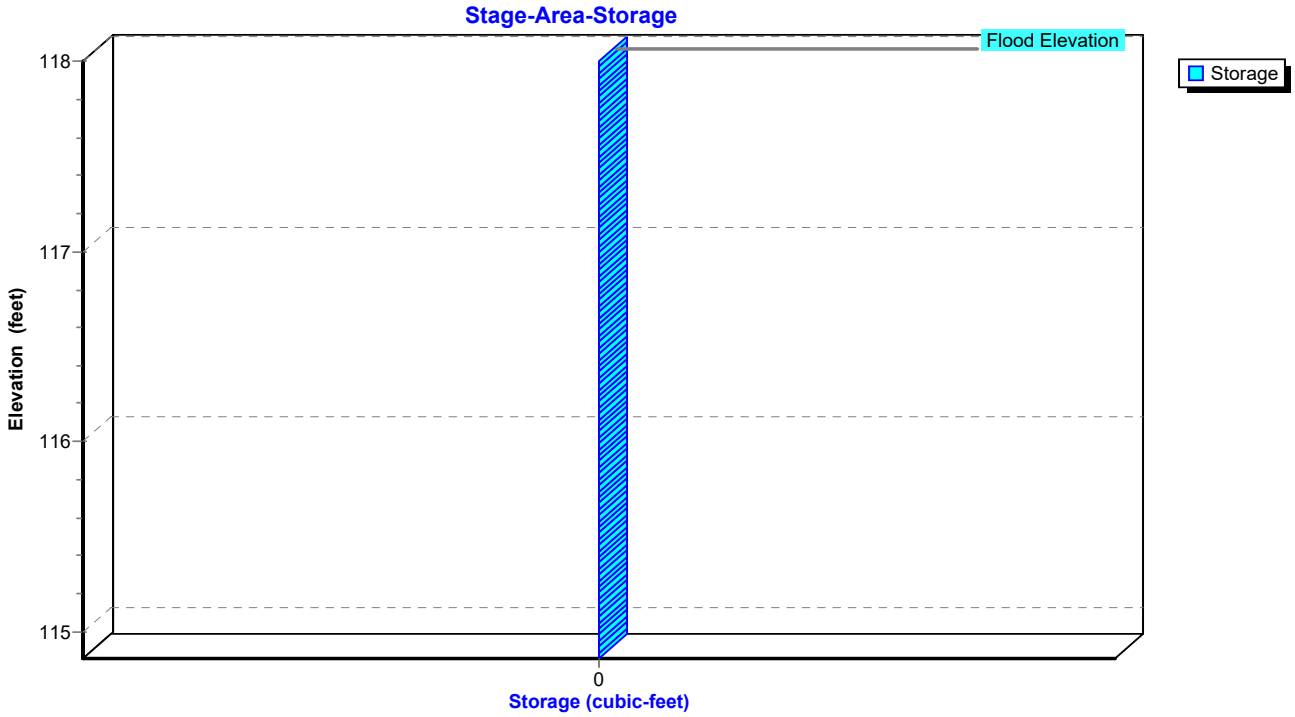
Device	Routing	Invert	Outlet Devices
#1	Primary	114.86'	**12.0" Round Culvert** L= 30.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 114.86' / 114.70' S= 0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.37 cfs @ 12.09 hrs HW=115.23' (Free Discharge)
1=Culvert (Barrel Controls 0.37 cfs @ 2.11 fps)

Pond 3P: CB3



Pond 3P: CB3


Stage-Area-Storage
Flood Elevation
Storage
118
117
116
115
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 3P: CB3

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
114.86	**0**	115.92	0	116.98	0
114.88	0	115.94	0	117.00	0
114.90	0	115.96	0	117.02	0
114.92	0	115.98	0	117.04	0
114.94	0	116.00	0	117.06	0
114.96	0	116.02	0	117.08	0
114.98	0	116.04	0	117.10	0
115.00	0	116.06	0	117.12	0
115.02	0	116.08	0	117.14	0
115.04	0	116.10	0	117.16	0
115.06	0	116.12	0	117.18	0
115.08	0	116.14	0	117.20	0
115.10	0	116.16	0	117.22	0
115.12	0	116.18	0	117.24	0
115.14	0	116.20	0	117.26	0
115.16	0	116.22	0	117.28	0
115.18	0	116.24	0	117.30	0
115.20	0	116.26	0	117.32	0
115.22	0	116.28	0	117.34	0
115.24	0	116.30	0	117.36	0
115.26	0	116.32	0	117.38	0
115.28	0	116.34	0	117.40	0
115.30	0	116.36	0	117.42	0
115.32	0	116.38	0	117.44	0
115.34	0	116.40	0	117.46	0
115.36	0	116.42	0	117.48	0
115.38	0	116.44	0	117.50	0
115.40	0	116.46	0	117.52	0
115.42	0	116.48	0	117.54	0
115.44	0	116.50	0	117.56	0
115.46	0	116.52	0	117.58	0
115.48	0	116.54	0	117.60	0
115.50	0	116.56	0	117.62	0
115.52	0	116.58	0	117.64	0
115.54	0	116.60	0	117.66	0
115.56	0	116.62	0	117.68	0
115.58	0	116.64	0	117.70	0
115.60	0	116.66	0	117.72	0
115.62	0	116.68	0	117.74	0
115.64	0	116.70	0	117.76	0
115.66	0	116.72	0	117.78	0
115.68	0	116.74	0	117.80	0
115.70	0	116.76	0	117.82	0
115.72	0	116.78	0	117.84	0
115.74	0	116.80	0	117.86	0
115.76	0	116.82	0	117.88	0
115.78	0	116.84	0	117.90	0
115.80	0	116.86	0	117.92	0
115.82	0	116.88	0	117.94	0
115.84	0	116.90	0	117.96	0
115.86	0	116.92	0	117.98	0
115.88	0	116.94	0	118.00	0
115.90	0	116.96	0		

Summary for Pond 4P: SUBSURFACE INFILTRATION #1

Inflow Area = 1,968 sf,100.00% Impervious, Inflow Depth > 8.69" for 100-Year event
Inflow = 0.39 cfs @ 12.09 hrs, Volume= 1,426 cf
Outflow = 0.04 cfs @ 12.77 hrs, Volume= 1,425 cf, Atten= 89%, Lag= 41.2 min
Primary = 0.04 cfs @ 12.77 hrs, Volume= 1,425 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 121.58' @ 12.77 hrs Surf.Area= 281 sf Storage= 555 cf

Plug-Flow detention time= 127.1 min calculated for 1,422 cf (100% of inflow)
Center-of-Mass det. time= 126.4 min (865.9 - 739.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	118.20'	277 cf	**15.75'W x 17.86'L x 3.50'H Field A** 984 cf Overall - 292 cf Embedded = 693 cf x 40.0% Voids
#2A	118.70'	292 cf	**ADS_StormTech SC-740 b +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 6 Chambers in 3 Rows Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf
		569 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	118.20'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 116.16'

Primary OutFlow Max=0.04 cfs @ 12.77 hrs HW=121.58' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.04 cfs)

Pond 4P: SUBSURFACE INFILTRATION #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 b +Cap (ADS StormTech® SC-740 with cap storage)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

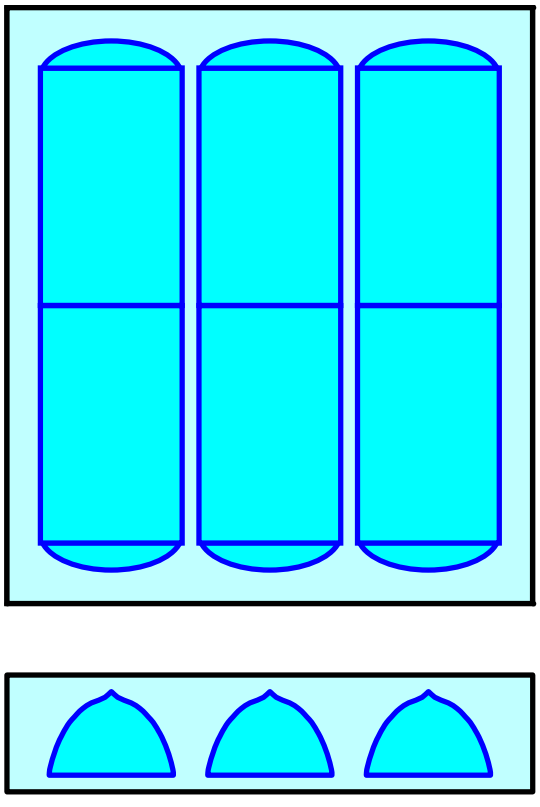
2 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 15.86' Row Length +12.0" End Stone x 2 = 17.86' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

6 Chambers x 45.9 cf + 2.7 cf Cap Volume x 2 x 3 Rows = 291.6 cf Chamber Storage

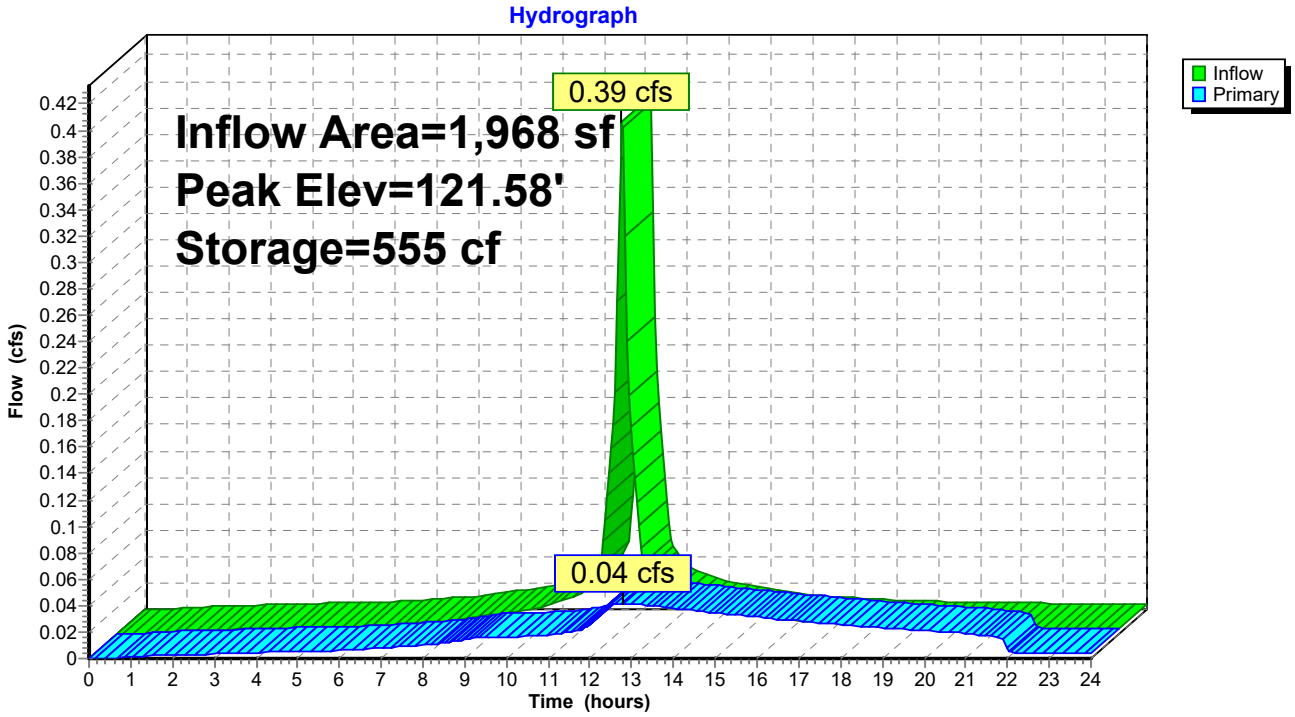
984.3 cf Field - 291.6 cf Chambers = 692.8 cf Stone x 40.0% Voids = 277.1 cf Stone Storage

Chamber Storage + Stone Storage = 568.7 cf = 0.013 af
Overall Storage Efficiency = 57.8%
Overall System Size = 17.86' x 15.75' x 3.50'

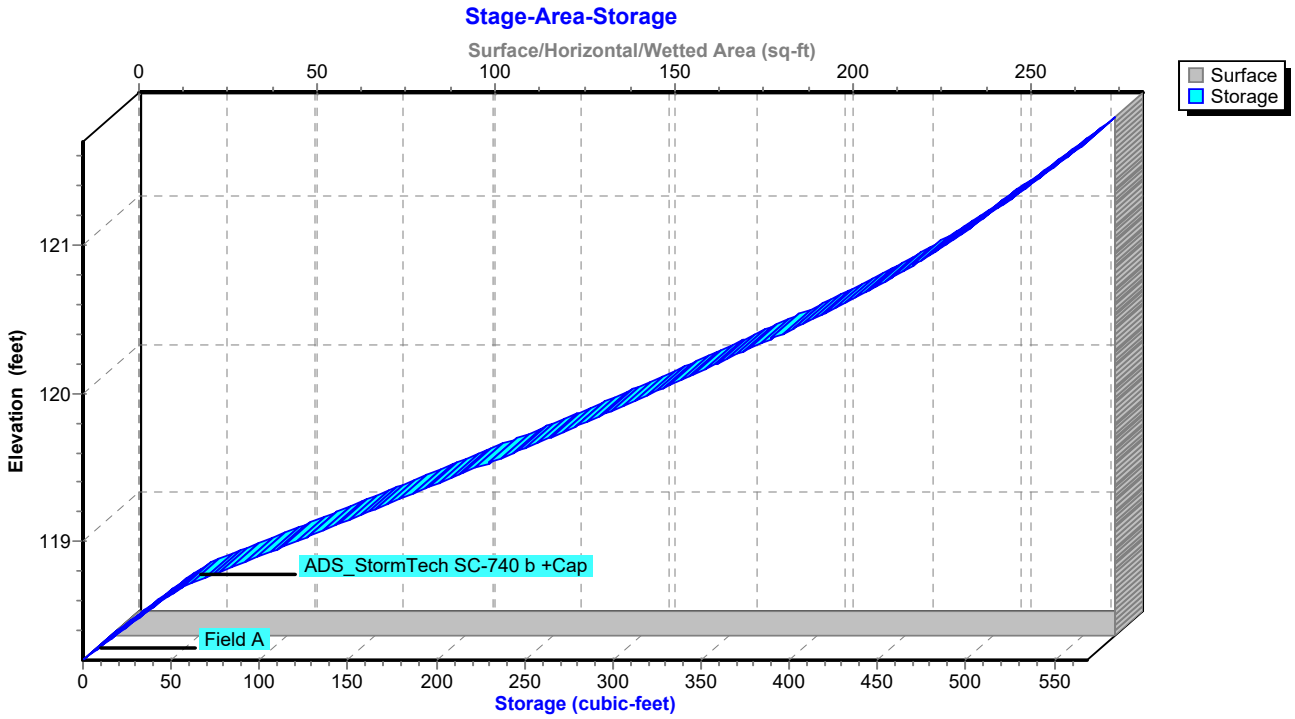
6 Chambers
36.5 cy Field
25.7 cy Stone



Pond 4P: SUBSURFACE INFILTRATION #1



Pond 4P: SUBSURFACE INFILTRATION #1



Stage-Area-Storage for Pond 4P: SUBSURFACE INFILTRATION #1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
118.20	**281**	0
118.25	281	6
118.30	281	11
118.35	281	17
118.40	281	22
118.45	281	28
118.50	281	34
118.55	281	39
118.60	281	45
118.65	281	51
118.70	281	56
118.75	281	67
118.80	281	78
118.85	281	88
118.90	281	99
118.95	281	109
119.00	281	120
119.05	281	131
119.10	281	141
119.15	281	151
119.20	281	162
119.25	281	172
119.30	281	183
119.35	281	193
119.40	281	203
119.45	281	213
119.50	281	223
119.55	281	234
119.60	281	244
119.65	281	254
119.70	281	264
119.75	281	273
119.80	281	283
119.85	281	293
119.90	281	303
119.95	281	312
120.00	281	322
120.05	281	331
120.10	281	341
120.15	281	350
120.20	281	359
120.25	281	368
120.30	281	377
120.35	281	386
120.40	281	395
120.45	281	404
120.50	281	412
120.55	281	421
120.60	281	429
120.65	281	437
120.70	281	445
120.75	281	453
120.80	281	461
120.85	281	468
120.90	281	475
120.95	281	482
121.00	281	489
121.05	281	495
121.10	281	501
121.15	281	507
121.20	281	512
121.25	281	518
121.30	281	524
121.35	281	529
121.40	281	535
121.45	281	541
121.50	281	546
121.55	281	552
121.60	281	557
121.65	281	563
121.70	281	**569**

Summary for Pond 5P: CB4

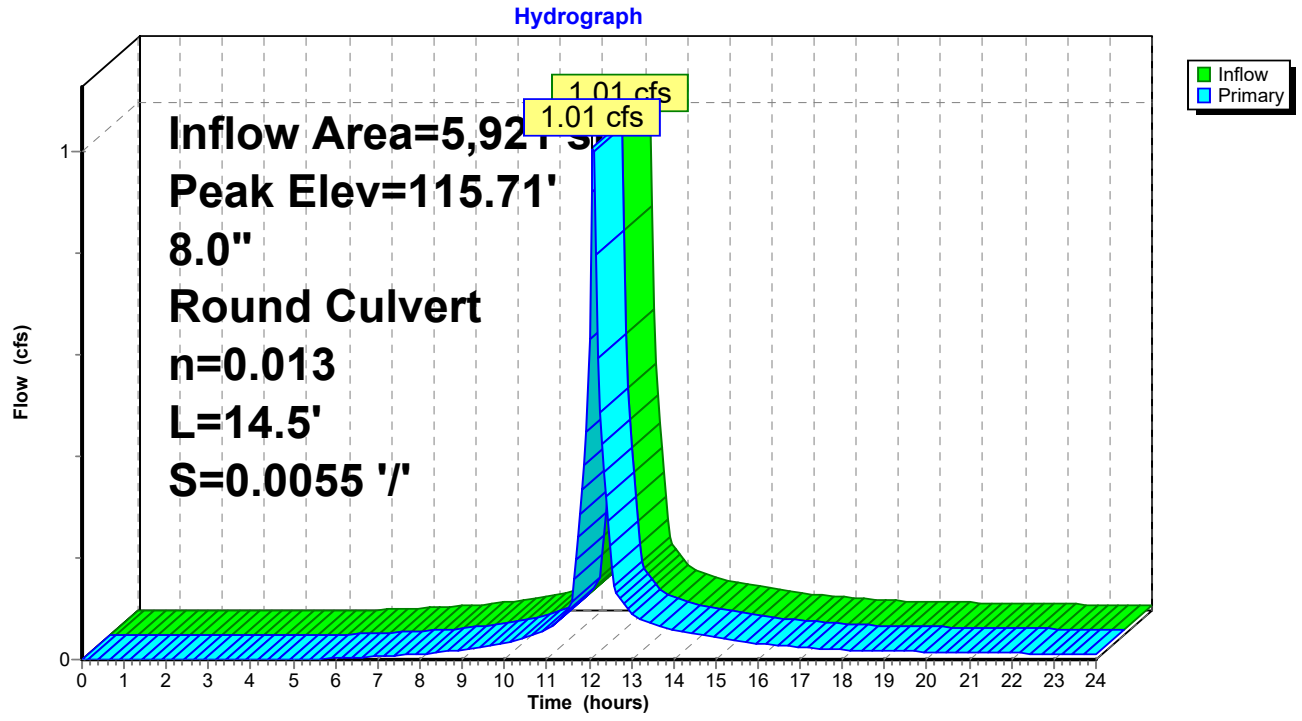
Inflow Area = 5,921 sf, 70.70% Impervious, Inflow Depth > 6.63" for 100-Year event
Inflow = 1.01 cfs @ 12.09 hrs, Volume= 3,271 cf
Outflow = 1.01 cfs @ 12.09 hrs, Volume= 3,271 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.01 cfs @ 12.09 hrs, Volume= 3,271 cf
Routed to Pond 6P : CDS2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.71' @ 12.09 hrs
Flood Elev= 117.40'

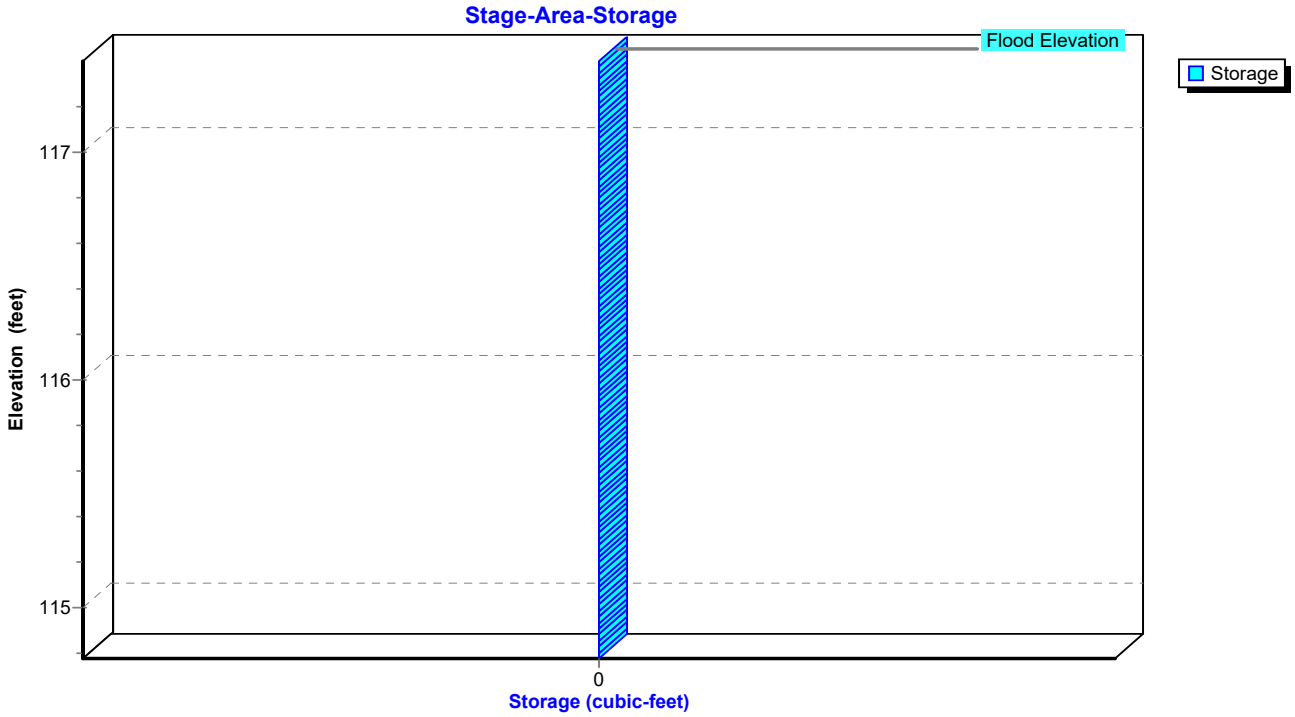
Device	Routing	Invert	Outlet Devices
#1	Primary	114.78'	**8.0" Round Culvert** L= 14.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 114.78' / 114.70' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.97 cfs @ 12.09 hrs HW=115.69' (Free Discharge)
1=Culvert (Barrel Controls 0.97 cfs @ 2.78 fps)

Pond 5P: CB4



Pond 5P: CB4


Stage-Area-Storage
Flood Elevation
Storage
117
116
115
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 5P: CB4

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
114.78	**0**	115.84	0	116.90	0
114.80	0	115.86	0	116.92	0
114.82	0	115.88	0	116.94	0
114.84	0	115.90	0	116.96	0
114.86	0	115.92	0	116.98	0
114.88	0	115.94	0	117.00	0
114.90	0	115.96	0	117.02	0
114.92	0	115.98	0	117.04	0
114.94	0	116.00	0	117.06	0
114.96	0	116.02	0	117.08	0
114.98	0	116.04	0	117.10	0
115.00	0	116.06	0	117.12	0
115.02	0	116.08	0	117.14	0
115.04	0	116.10	0	117.16	0
115.06	0	116.12	0	117.18	0
115.08	0	116.14	0	117.20	0
115.10	0	116.16	0	117.22	0
115.12	0	116.18	0	117.24	0
115.14	0	116.20	0	117.26	0
115.16	0	116.22	0	117.28	0
115.18	0	116.24	0	117.30	0
115.20	0	116.26	0	117.32	0
115.22	0	116.28	0	117.34	0
115.24	0	116.30	0	117.36	0
115.26	0	116.32	0	117.38	0
115.28	0	116.34	0	117.40	0
115.30	0	116.36	0		
115.32	0	116.38	0		
115.34	0	116.40	0		
115.36	0	116.42	0		
115.38	0	116.44	0		
115.40	0	116.46	0		
115.42	0	116.48	0		
115.44	0	116.50	0		
115.46	0	116.52	0		
115.48	0	116.54	0		
115.50	0	116.56	0		
115.52	0	116.58	0		
115.54	0	116.60	0		
115.56	0	116.62	0		
115.58	0	116.64	0		
115.60	0	116.66	0		
115.62	0	116.68	0		
115.64	0	116.70	0		
115.66	0	116.72	0		
115.68	0	116.74	0		
115.70	0	116.76	0		
115.72	0	116.78	0		
115.74	0	116.80	0		
115.76	0	116.82	0		
115.78	0	116.84	0		
115.80	0	116.86	0		
115.82	0	116.88	0		

Summary for Pond 6P: CDS2

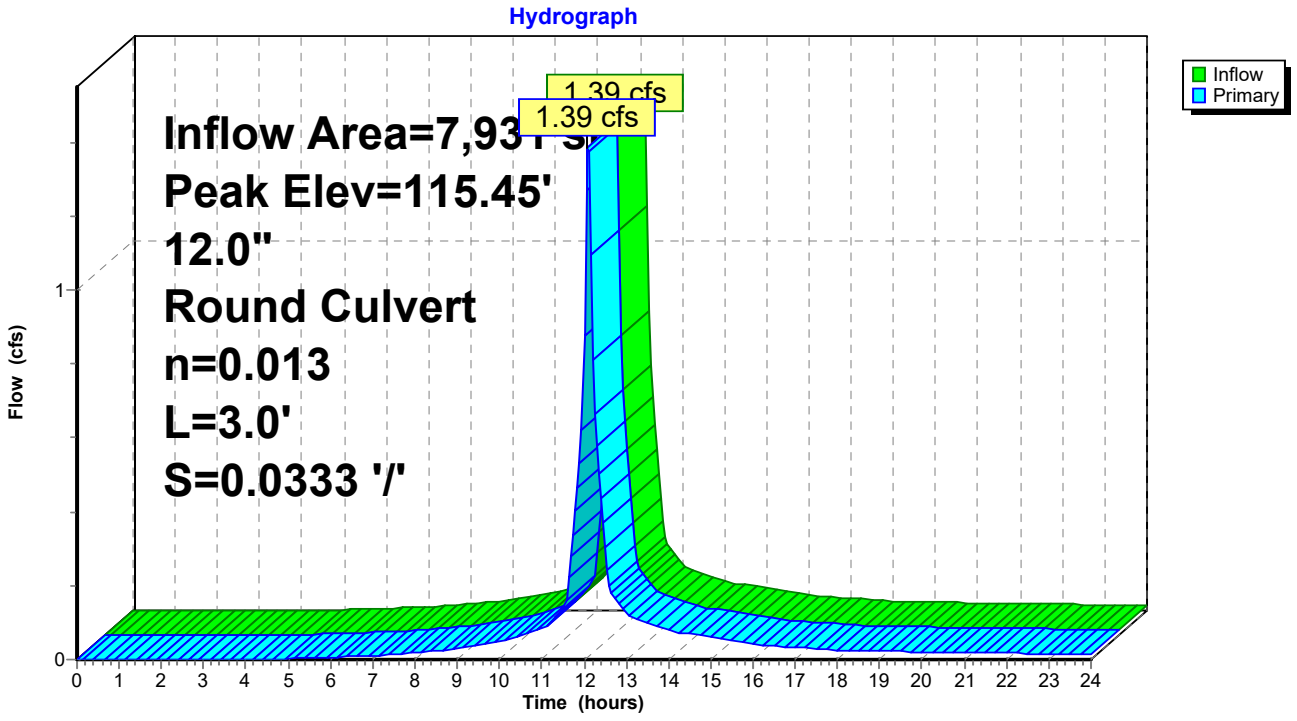
Inflow Area = 7,931 sf, 74.53% Impervious, Inflow Depth > 6.91" for 100-Year event
Inflow = 1.39 cfs @ 12.09 hrs, Volume= 4,565 cf
Outflow = 1.39 cfs @ 12.09 hrs, Volume= 4,565 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.39 cfs @ 12.09 hrs, Volume= 4,565 cf
Routed to Pond 2P : SUBSURFACE INFILTRATION #2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 115.45' @ 12.09 hrs
Flood Elev= 118.00'

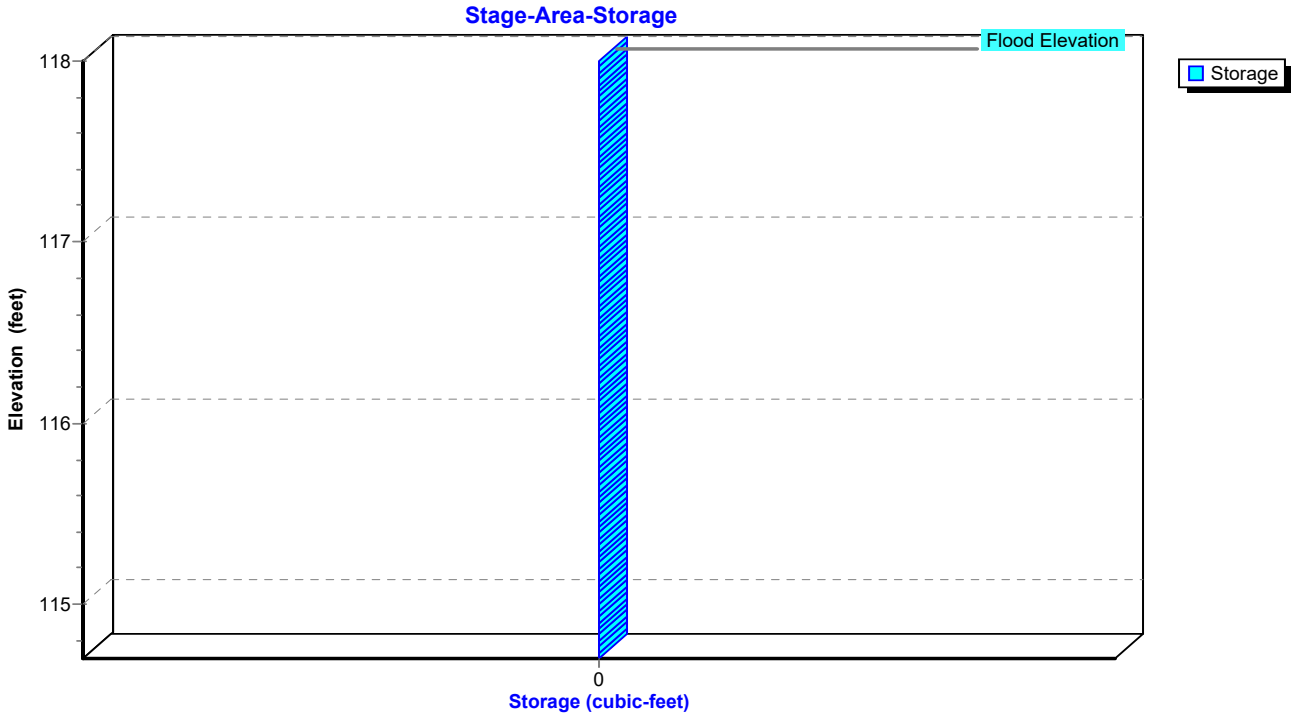
Device	Routing	Invert	Outlet Devices
#1	Primary	114.70'	**12.0" Round Culvert** L= 3.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 114.70' / 114.60' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.35 cfs @ 12.09 hrs HW=115.44' (Free Discharge)
1=Culvert (Barrel Controls 1.35 cfs @ 3.04 fps)

Pond 6P: CDS2



Pond 6P: CDS2


Stage-Area-Storage
Flood Elevation
Storage
118
117
116
115
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 6P: CDS2

Elevation (feet)	Storage (cubic-feet)
114.70	**0**
114.75	0
114.80	0
114.85	0
114.90	0
114.95	0
115.00	0
115.05	0
115.10	0
115.15	0
115.20	0
115.25	0
115.30	0
115.35	0
115.40	0
115.45	0
115.50	0
115.55	0
115.60	0
115.65	0
115.70	0
115.75	0
115.80	0
115.85	0
115.90	0
115.95	0
116.00	0
116.05	0
116.10	0
116.15	0
116.20	0
116.25	0
116.30	0
116.35	0
116.40	0
116.45	0
116.50	0
116.55	0
116.60	0
116.65	0
116.70	0
116.75	0
116.80	0
116.85	0
116.90	0
116.95	0
117.00	0
117.05	0
117.10	0
117.15	0
117.20	0
117.25	0
117.30	0
117.35	0
117.40	0
117.45	0
117.50	0
117.55	0
117.60	0
117.65	0
117.70	0
117.75	0
117.80	0
117.85	0
117.90	0
117.95	0
118.00	0

Summary for Pond 7P: CB2

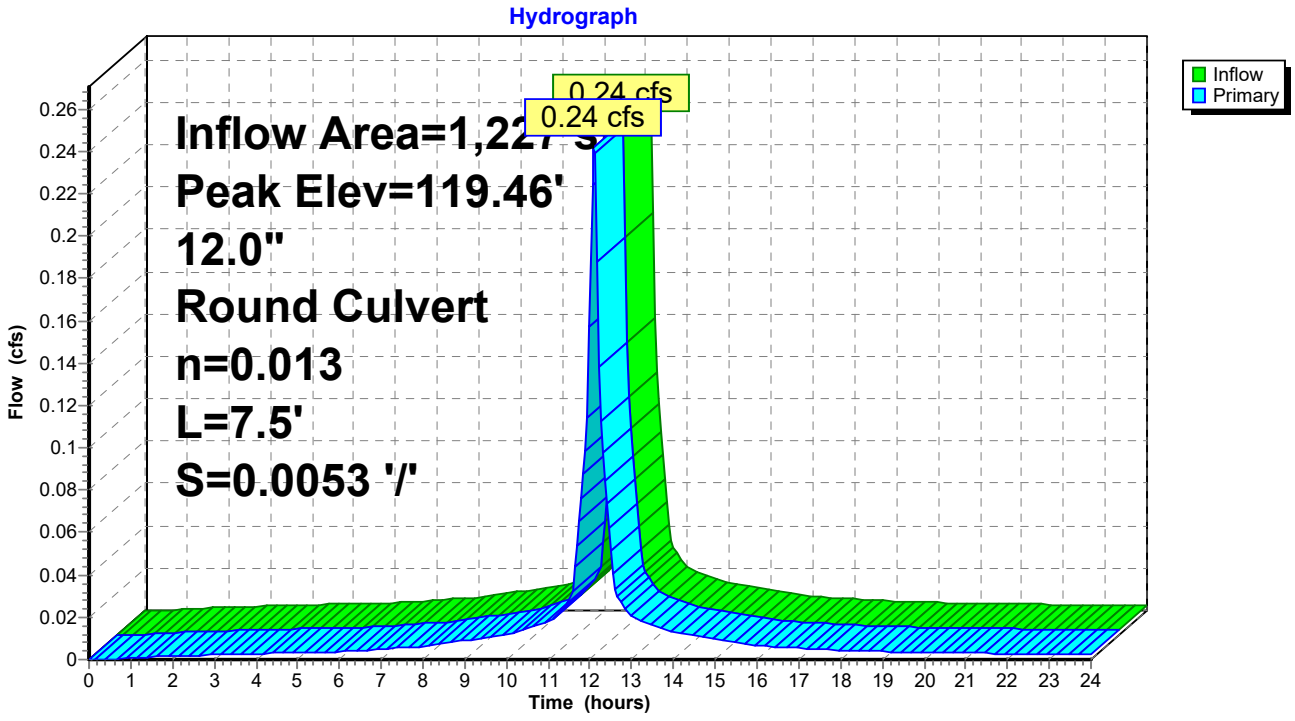
Inflow Area = 1,227 sf,100.00% Impervious, Inflow Depth > 8.69" for 100-Year event
Inflow = 0.24 cfs @ 12.09 hrs, Volume= 889 cf
Outflow = 0.24 cfs @ 12.09 hrs, Volume= 889 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 12.09 hrs, Volume= 889 cf
Routed to Pond 8P : DMH1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.46' @ 12.09 hrs
Flood Elev= 122.15'

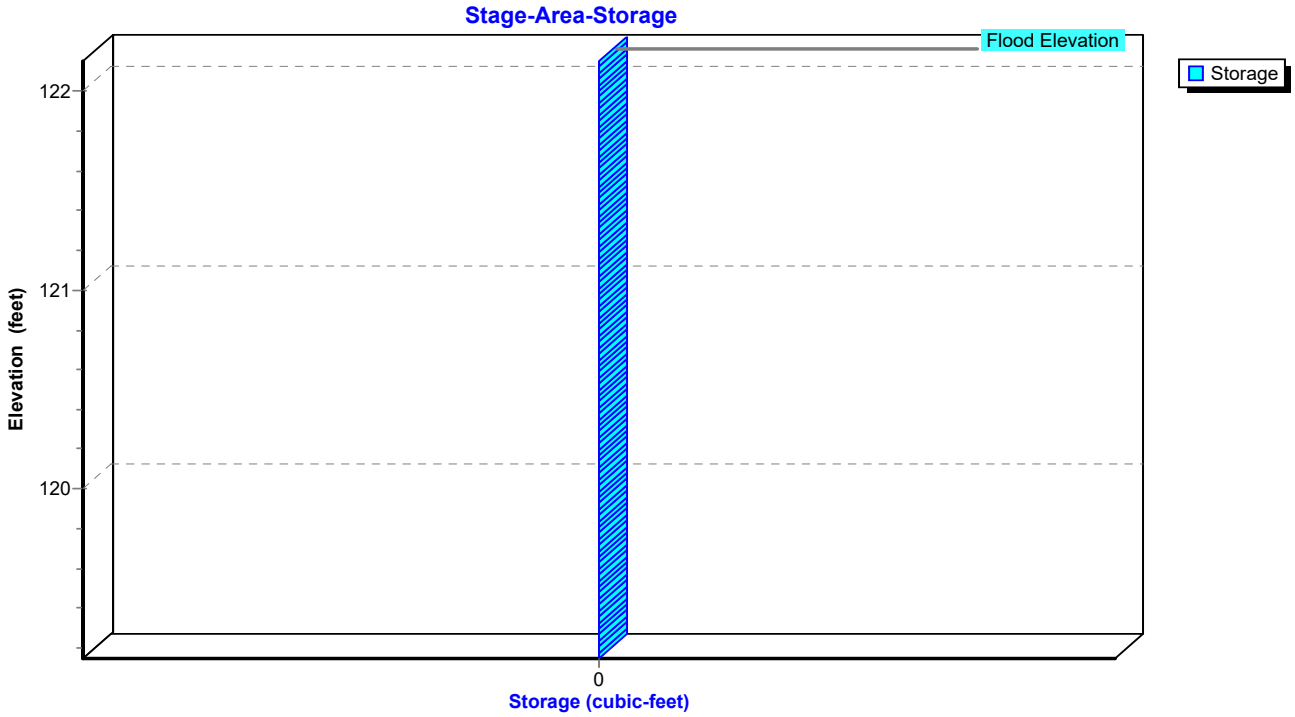
Device	Routing	Invert	Outlet Devices
#1	Primary	119.15'	**12.0" Round Culvert** L= 7.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.15' / 119.11' S= 0.0053 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.23 cfs @ 12.09 hrs HW=119.45' (Free Discharge)
1=Culvert (Barrel Controls 0.23 cfs @ 1.75 fps)

Pond 7P: CB2



Pond 7P: CB2


Stage-Area-Storage
Flood Elevation
Storage
122
121
120
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 7P: CB2

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
119.15	**0**	120.21	0	121.27	0
119.17	0	120.23	0	121.29	0
119.19	0	120.25	0	121.31	0
119.21	0	120.27	0	121.33	0
119.23	0	120.29	0	121.35	0
119.25	0	120.31	0	121.37	0
119.27	0	120.33	0	121.39	0
119.29	0	120.35	0	121.41	0
119.31	0	120.37	0	121.43	0
119.33	0	120.39	0	121.45	0
119.35	0	120.41	0	121.47	0
119.37	0	120.43	0	121.49	0
119.39	0	120.45	0	121.51	0
119.41	0	120.47	0	121.53	0
119.43	0	120.49	0	121.55	0
119.45	0	120.51	0	121.57	0
119.47	0	120.53	0	121.59	0
119.49	0	120.55	0	121.61	0
119.51	0	120.57	0	121.63	0
119.53	0	120.59	0	121.65	0
119.55	0	120.61	0	121.67	0
119.57	0	120.63	0	121.69	0
119.59	0	120.65	0	121.71	0
119.61	0	120.67	0	121.73	0
119.63	0	120.69	0	121.75	0
119.65	0	120.71	0	121.77	0
119.67	0	120.73	0	121.79	0
119.69	0	120.75	0	121.81	0
119.71	0	120.77	0	121.83	0
119.73	0	120.79	0	121.85	0
119.75	0	120.81	0	121.87	0
119.77	0	120.83	0	121.89	0
119.79	0	120.85	0	121.91	0
119.81	0	120.87	0	121.93	0
119.83	0	120.89	0	121.95	0
119.85	0	120.91	0	121.97	0
119.87	0	120.93	0	121.99	0
119.89	0	120.95	0	122.01	0
119.91	0	120.97	0	122.03	0
119.93	0	120.99	0	122.05	0
119.95	0	121.01	0	122.07	0
119.97	0	121.03	0	122.09	0
119.99	0	121.05	0	122.11	0
120.01	0	121.07	0	122.13	0
120.03	0	121.09	0	122.15	0
120.05	0	121.11	0		
120.07	0	121.13	0		
120.09	0	121.15	0		
120.11	0	121.17	0		
120.13	0	121.19	0		
120.15	0	121.21	0		
120.17	0	121.23	0		
120.19	0	121.25	0		

Summary for Pond 8P: DMH1

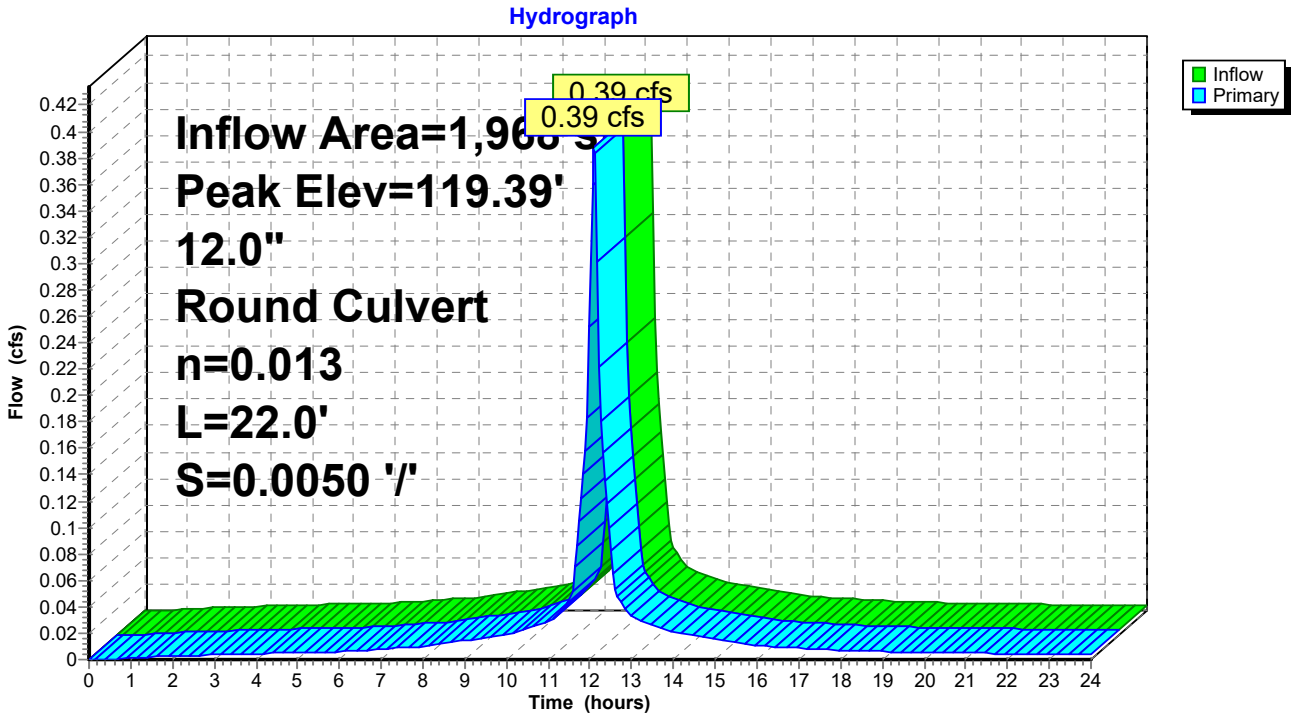
Inflow Area = 1,968 sf,100.00% Impervious, Inflow Depth > 8.69" for 100-Year event
Inflow = 0.39 cfs @ 12.09 hrs, Volume= 1,426 cf
Outflow = 0.39 cfs @ 12.09 hrs, Volume= 1,426 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.39 cfs @ 12.09 hrs, Volume= 1,426 cf
Routed to Pond 10P : CDS1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.39' @ 12.09 hrs
Flood Elev= 122.50'

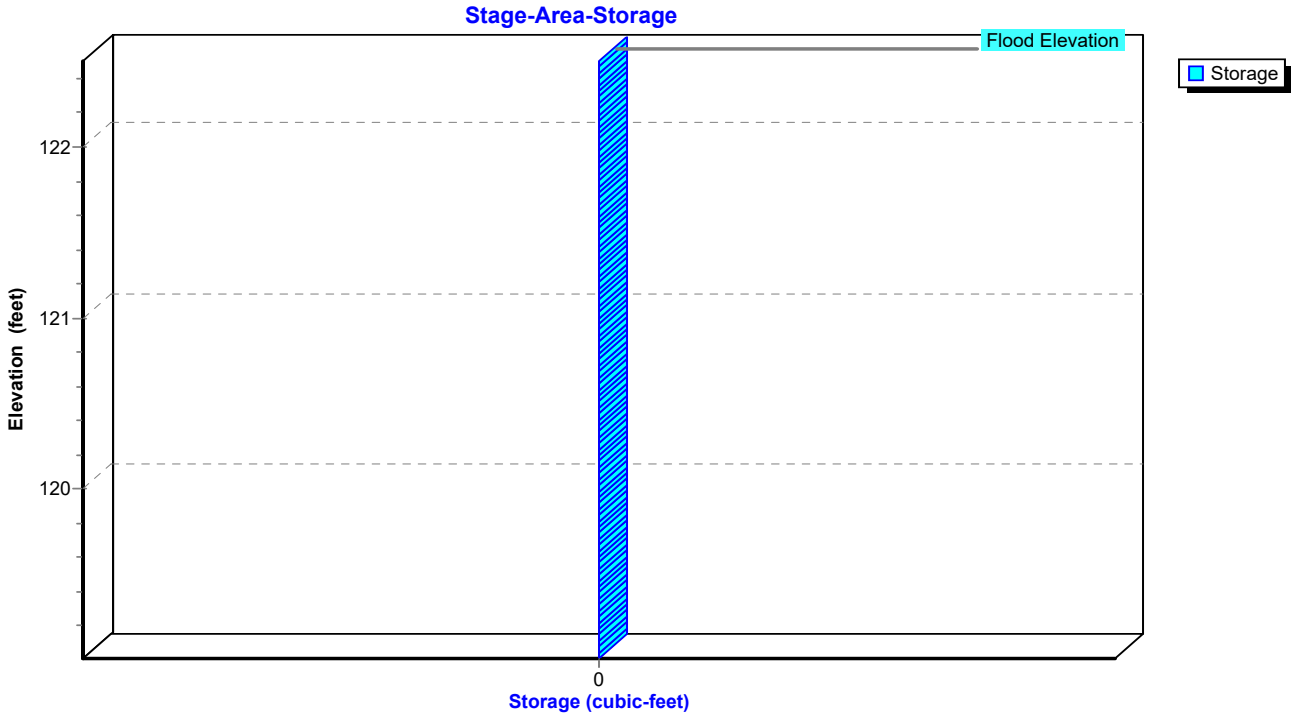
Device	Routing	Invert	Outlet Devices
#1	Primary	119.01'	**12.0" Round Culvert** L= 22.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.01' / 118.90' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.38 cfs @ 12.09 hrs HW=119.39' (Free Discharge)
1=Culvert (Barrel Controls 0.38 cfs @ 2.05 fps)

Pond 8P: DMH1



Pond 8P: DMH1


Stage-Area-Storage
Flood Elevation
Storage
122
121
120
Elevation (feet)
0
Storage (cubic-feet)

Stage-Area-Storage for Pond 8P: DMH1

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
119.01	**0**	121.66	0
119.06	0	121.71	0
119.11	0	121.76	0
119.16	0	121.81	0
119.21	0	121.86	0
119.26	0	121.91	0
119.31	0	121.96	0
119.36	0	122.01	0
119.41	0	122.06	0
119.46	0	122.11	0
119.51	0	122.16	0
119.56	0	122.21	0
119.61	0	122.26	0
119.66	0	122.31	0
119.71	0	122.36	0
119.76	0	122.41	0
119.81	0	122.46	0
119.86	0		
119.91	0		
119.96	0		
120.01	0		
120.06	0		
120.11	0		
120.16	0		
120.21	0		
120.26	0		
120.31	0		
120.36	0		
120.41	0		
120.46	0		
120.51	0		
120.56	0		
120.61	0		
120.66	0		
120.71	0		
120.76	0		
120.81	0		
120.86	0		
120.91	0		
120.96	0		
121.01	0		
121.06	0		
121.11	0		
121.16	0		
121.21	0		
121.26	0		
121.31	0		
121.36	0		
121.41	0		
121.46	0		
121.51	0		
121.56	0		
121.61	0		

Summary for Pond 9P: SUBSURFACE INFILTRATION #3

Inflow Area = 3,048 sf,100.00% Impervious, Inflow Depth > 8.69" for 100-Year event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 2,208 cf
Outflow = 0.06 cfs @ 12.79 hrs, Volume= 2,207 cf, Atten= 89%, Lag= 42.1 min
Discarded = 0.06 cfs @ 12.79 hrs, Volume= 2,207 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 117.02' @ 12.79 hrs Surf.Area= 506 sf Storage= 831 cf

Plug-Flow detention time= 113.5 min calculated for 2,202 cf (100% of inflow)
Center-of-Mass det. time= 112.8 min (852.3 - 739.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.50'	481 cf	**15.75'W x 32.10'L x 3.50'H Field A** 1,769 cf Overall - 567 cf Embedded = 1,202 cf x 40.0% Voids
#2A	115.00'	567 cf	**ADS_StormTech SC-740 b +Cap** x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 3 Rows Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf
		1,048 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	114.50'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 112.50'

Discarded OutFlow Max=0.06 cfs @ 12.79 hrs HW=117.02' (Free Discharge)
↑**1=Exfiltration** (Controls 0.06 cfs)

Pond 9P: SUBSURFACE INFILTRATION #3 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 b +Cap (ADS StormTech® SC-740 with cap storage)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Cap Storage= 2.7 cf x 2 x 3 rows = 15.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

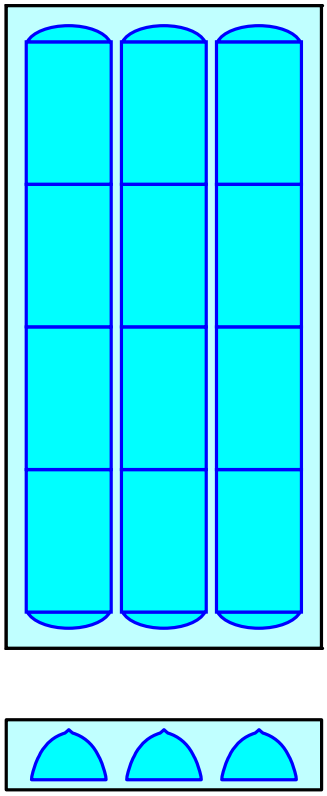
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

12 Chambers x 45.9 cf + 2.7 cf Cap Volume x 2 x 3 Rows = 567.2 cf Chamber Storage

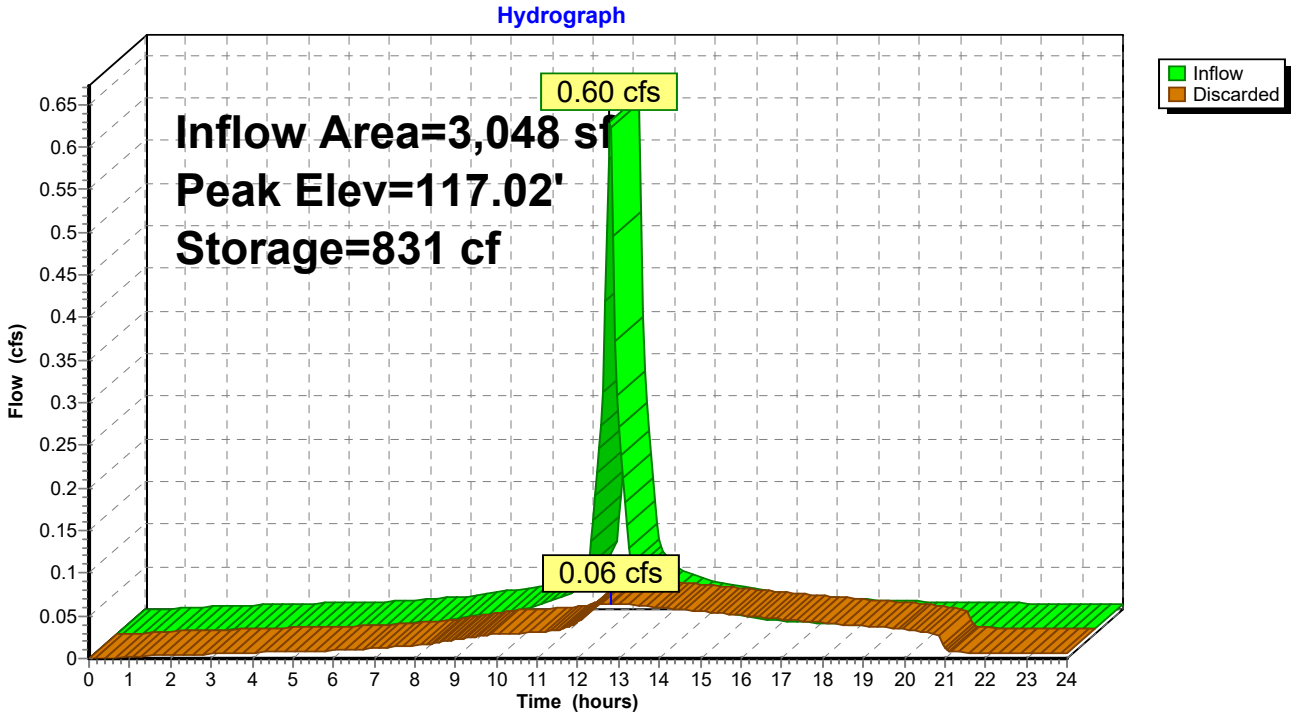
1,769.3 cf Field - 567.2 cf Chambers = 1,202.1 cf Stone x 40.0% Voids = 480.8 cf Stone Storage

Chamber Storage + Stone Storage = 1,048.1 cf = 0.024 af
Overall Storage Efficiency = 59.2%
Overall System Size = 32.10' x 15.75' x 3.50'

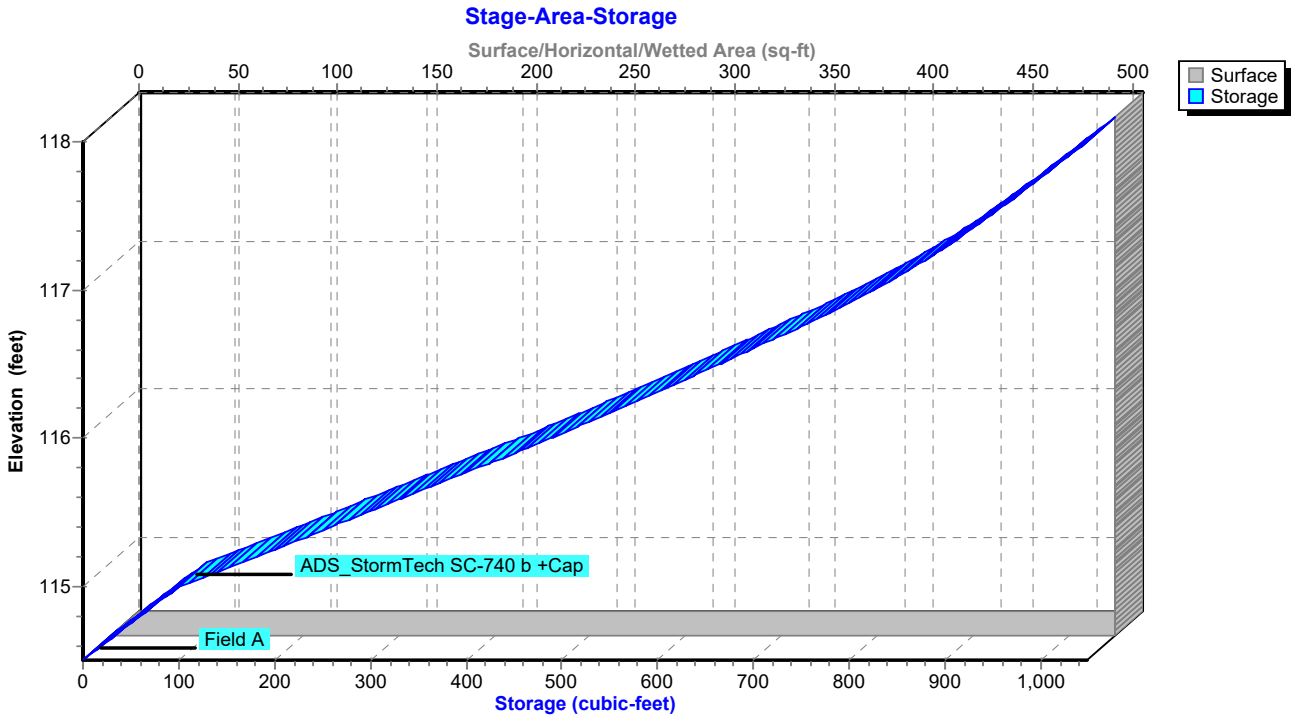
12 Chambers
65.5 cy Field
44.5 cy Stone



Pond 9P: SUBSURFACE INFILTRATION #3



Pond 9P: SUBSURFACE INFILTRATION #3



Stage-Area-Storage for Pond 9P: SUBSURFACE INFILTRATION #3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
114.50	**506**	0
114.55	506	10
114.60	506	20
114.65	506	30
114.70	506	40
114.75	506	51
114.80	506	61
114.85	506	71
114.90	506	81
114.95	506	91
115.00	506	101
115.05	506	121
115.10	506	141
115.15	506	161
115.20	506	181
115.25	506	200
115.30	506	220
115.35	506	240
115.40	506	259
115.45	506	279
115.50	506	298
115.55	506	318
115.60	506	337
115.65	506	356
115.70	506	375
115.75	506	394
115.80	506	413
115.85	506	432
115.90	506	451
115.95	506	469
116.00	506	488
116.05	506	506
116.10	506	524
116.15	506	543
116.20	506	561
116.25	506	578
116.30	506	596
116.35	506	614
116.40	506	631
116.45	506	648
116.50	506	665
116.55	506	682
116.60	506	699
116.65	506	716
116.70	506	732
116.75	506	748
116.80	506	764
116.85	506	779
116.90	506	795
116.95	506	810
117.00	506	825
117.05	506	839
117.10	506	853
117.15	506	867
117.20	506	880
117.25	506	892
117.30	506	904
117.35	506	915
117.40	506	926
117.45	506	937
117.50	506	947
117.55	506	957
117.60	506	967
117.65	506	977
117.70	506	987
117.75	506	998
117.80	506	1,008
117.85	506	1,018
117.90	506	1,028
117.95	506	1,038
118.00	506	**1,048**

Summary for Pond 10P: CDS1

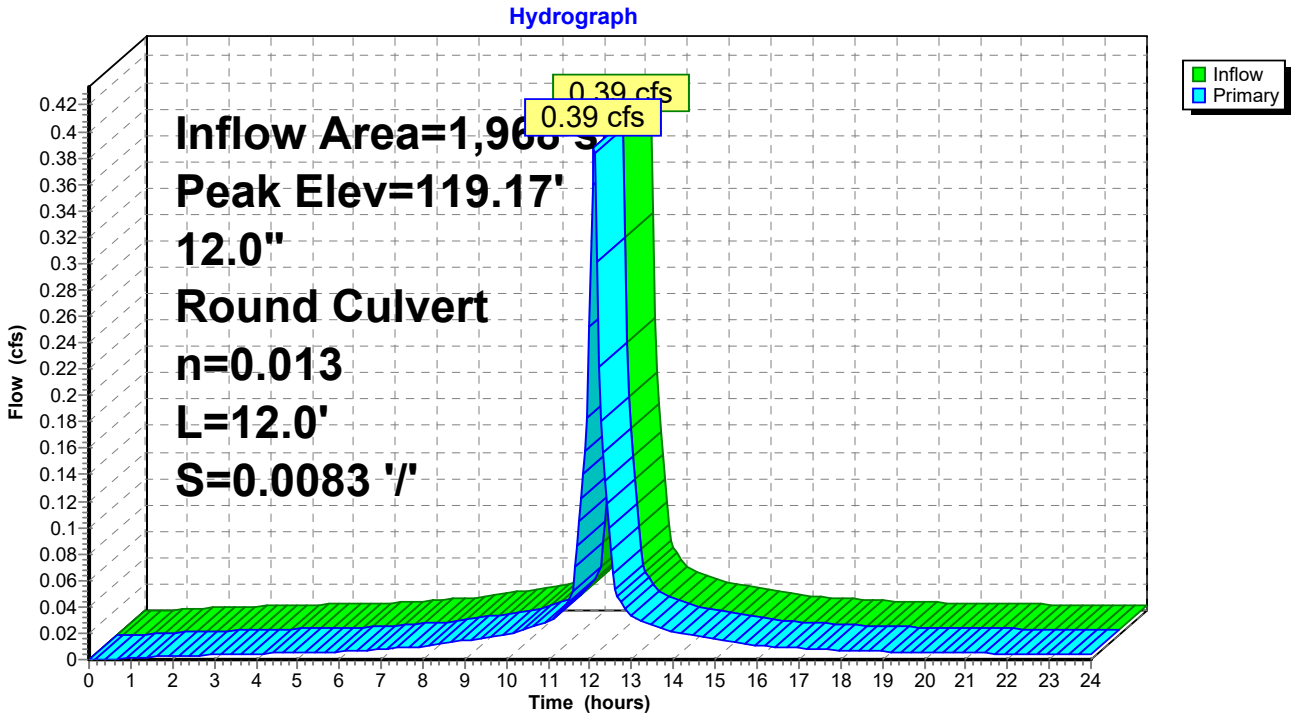
Inflow Area = 1,968 sf,100.00% Impervious, Inflow Depth > 8.69" for 100-Year event
Inflow = 0.39 cfs @ 12.09 hrs, Volume= 1,426 cf
Outflow = 0.39 cfs @ 12.09 hrs, Volume= 1,426 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.39 cfs @ 12.09 hrs, Volume= 1,426 cf
Routed to Pond 4P : SUBSURFACE INFILTRATION #1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.17' @ 12.09 hrs
Flood Elev= 122.50'

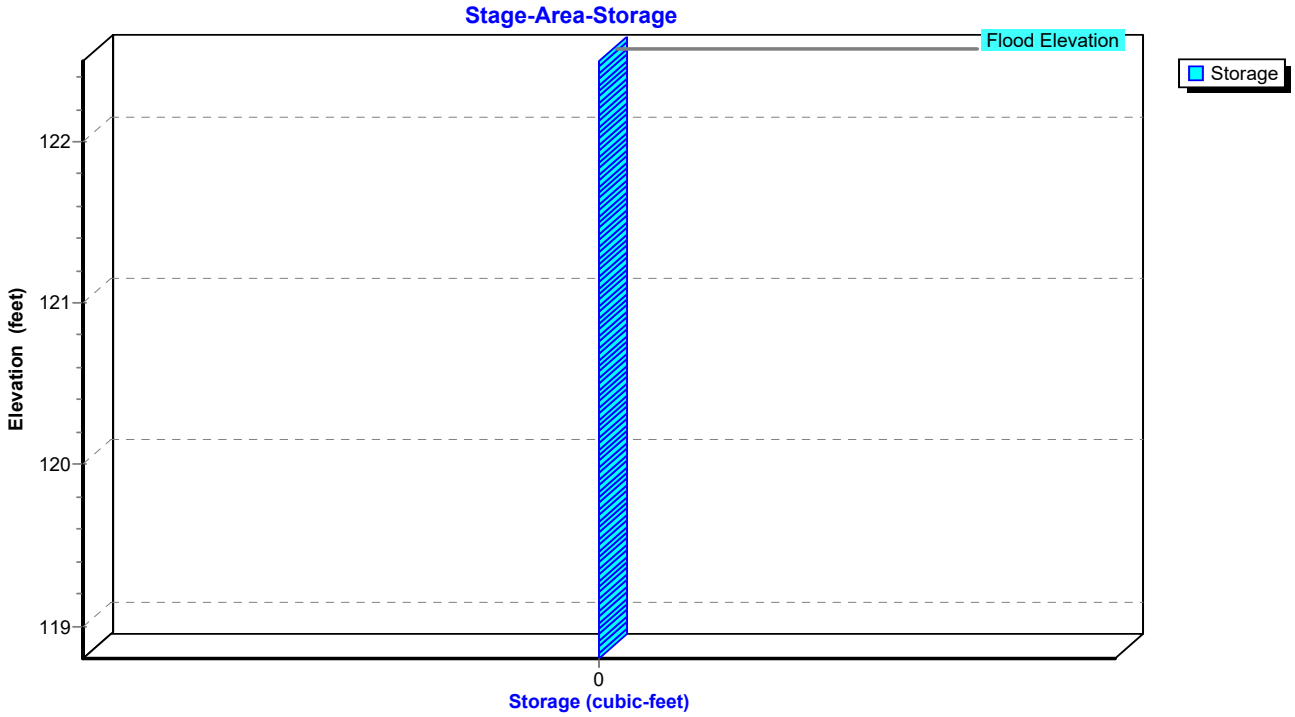
Device	Routing	Invert	Outlet Devices
#1	Primary	118.80'	**12.0" Round Culvert** L= 12.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.80' / 118.70' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.38 cfs @ 12.09 hrs HW=119.16' (Free Discharge)
1=Culvert (Barrel Controls 0.38 cfs @ 2.18 fps)

Pond 10P: CDS1



Pond 10P: CDS1



Stage-Area-Storage for Pond 10P: CDS1

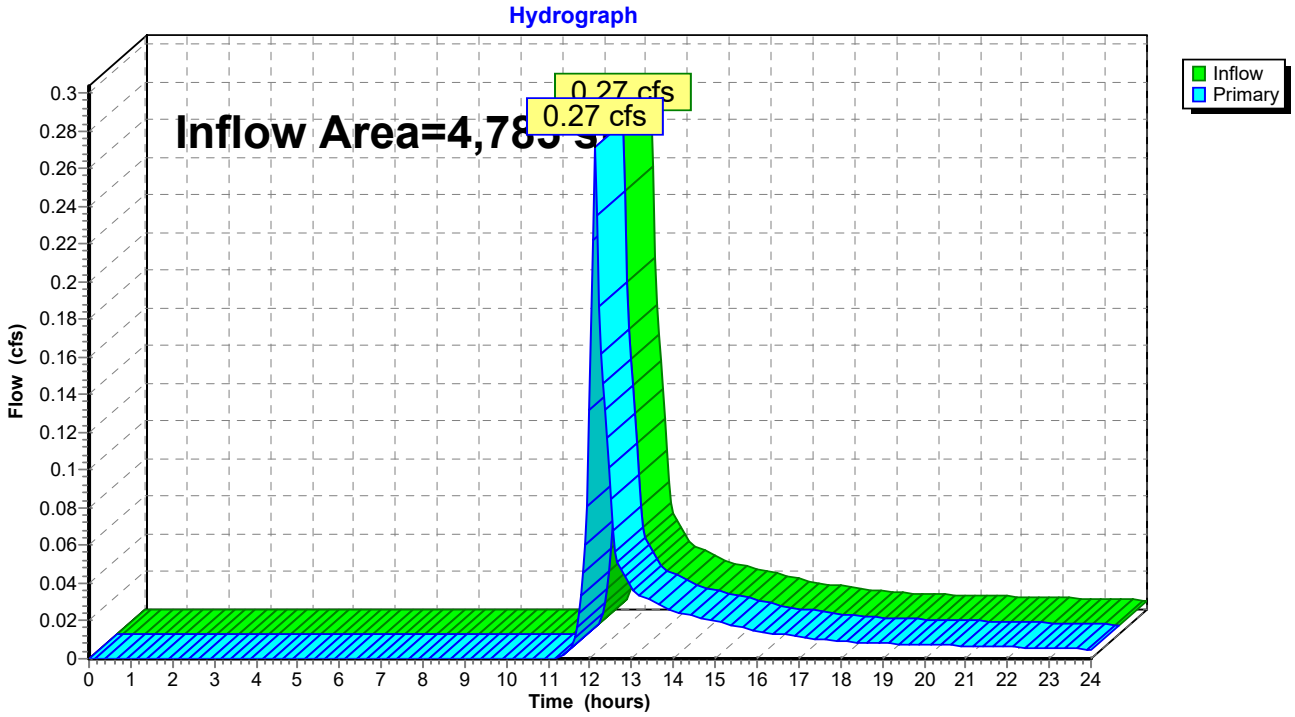
Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
118.80	**0**	121.45	0
118.85	0	121.50	0
118.90	0	121.55	0
118.95	0	121.60	0
119.00	0	121.65	0
119.05	0	121.70	0
119.10	0	121.75	0
119.15	0	121.80	0
119.20	0	121.85	0
119.25	0	121.90	0
119.30	0	121.95	0
119.35	0	122.00	0
119.40	0	122.05	0
119.45	0	122.10	0
119.50	0	122.15	0
119.55	0	122.20	0
119.60	0	122.25	0
119.65	0	122.30	0
119.70	0	122.35	0
119.75	0	122.40	0
119.80	0	122.45	0
119.85	0	122.50	0
119.90	0		
119.95	0		
120.00	0		
120.05	0		
120.10	0		
120.15	0		
120.20	0		
120.25	0		
120.30	0		
120.35	0		
120.40	0		
120.45	0		
120.50	0		
120.55	0		
120.60	0		
120.65	0		
120.70	0		
120.75	0		
120.80	0		
120.85	0		
120.90	0		
120.95	0		
121.00	0		
121.05	0		
121.10	0		
121.15	0		
121.20	0		
121.25	0		
121.30	0		
121.35	0		
121.40	0		

Summary for Link DP1: link

Inflow Area = 4,785 sf, 11.64% Impervious, Inflow Depth > 2.37" for 100-Year event
Inflow = 0.27 cfs @ 12.10 hrs, Volume= 944 cf
Primary = 0.27 cfs @ 12.10 hrs, Volume= 944 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP1: link

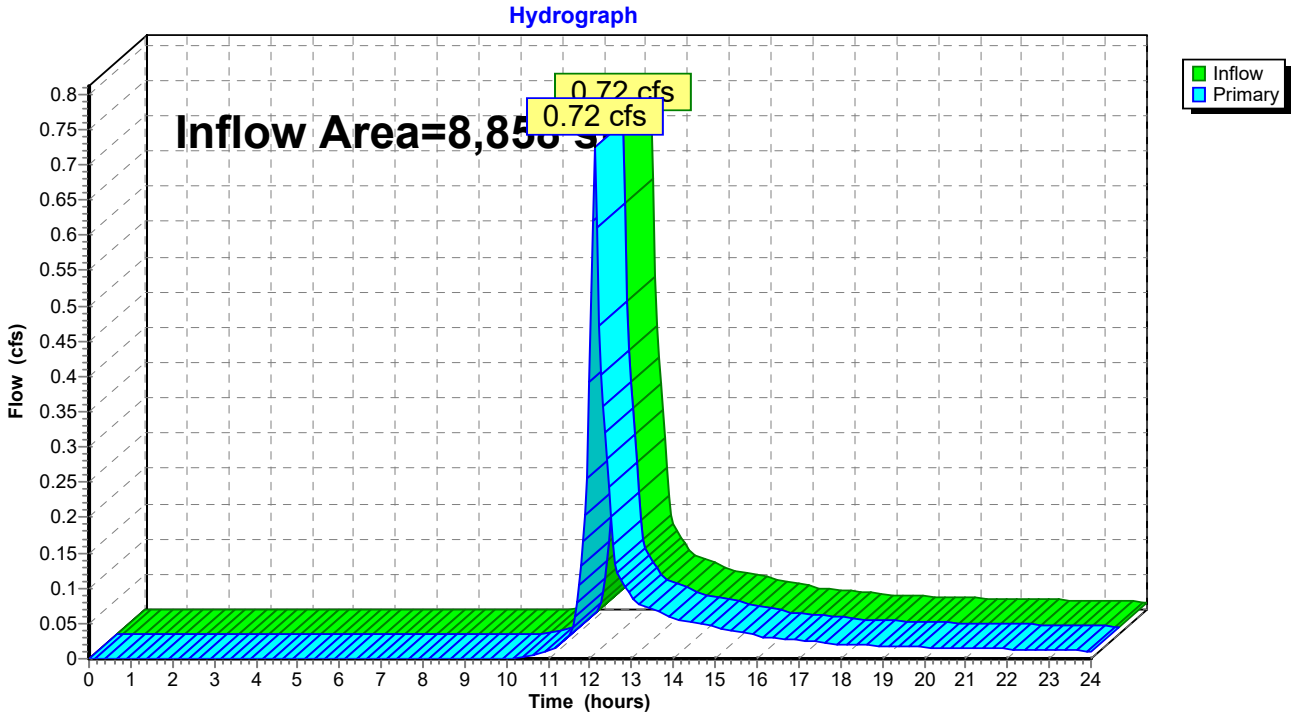


Summary for Link DP2: link

Inflow Area = 8,858 sf, 24.43% Impervious, Inflow Depth > 3.20" for 100-Year event
Inflow = 0.72 cfs @ 12.10 hrs, Volume= 2,362 cf
Primary = 0.72 cfs @ 12.10 hrs, Volume= 2,362 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP2: link



Summary for Link DP3: link

Inflow Area = 764 sf, 0.00% Impervious, Inflow Depth > 1.57" for 100-Year event
Inflow = 0.02 cfs @ 12.11 hrs, Volume= 100 cf
Primary = 0.02 cfs @ 12.11 hrs, Volume= 100 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP3: link

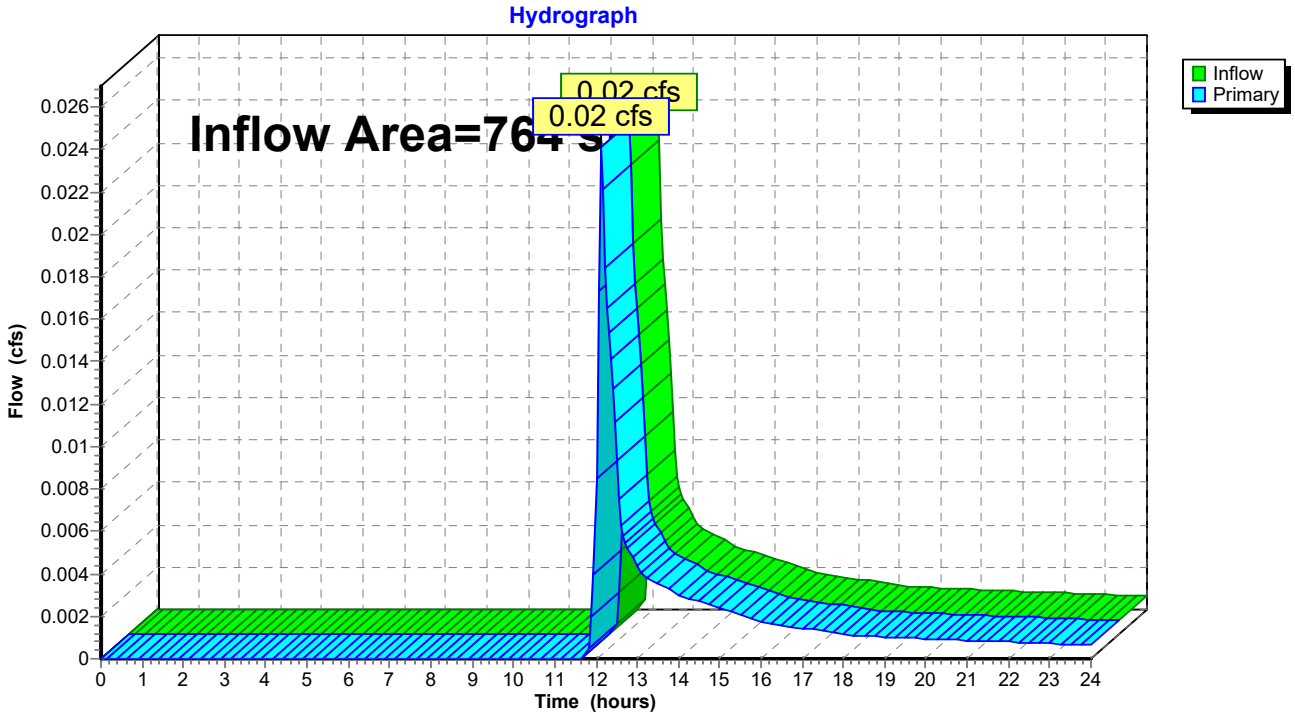


TABLE OF CONTENTS

Project Reports
1 Routing Diagram
2 Rainfall Events Listing (selected events)
3 Area Listing (all nodes)
4 Soil Listing (all nodes)
5 Ground Covers (all nodes)

2-Year Event
6 Node Listing
8 Subcat P1: P1
9 Subcat P2: P2
10 Subcat P3: P3
11 Subcat P4A: P4A
12 Subcat P4B: P4B
13 Subcat P5A: P5A
14 Subcat P5B: P5B
15 Subcat P6: P6
16 Pond 1P: CB1
19 Pond 2P: SUBSURFACE INFILTRATION #2
23 Pond 3P: CB3
26 Pond 4P: SUBSURFACE INFILTRATION #1
30 Pond 5P: CB4
33 Pond 6P: CDS2
36 Pond 7P: CB2
39 Pond 8P: DMH1
42 Pond 9P: SUBSURFACE INFILTRATION #3
46 Pond 10P: CDS1
49 Link DP1: link
50 Link DP2: link
51 Link DP3: link

10-Year Event
52 Node Listing
54 Subcat P1: P1
55 Subcat P2: P2
56 Subcat P3: P3
57 Subcat P4A: P4A
58 Subcat P4B: P4B
59 Subcat P5A: P5A
60 Subcat P5B: P5B
61 Subcat P6: P6
62 Pond 1P: CB1
65 Pond 2P: SUBSURFACE INFILTRATION #2
69 Pond 3P: CB3
72 Pond 4P: SUBSURFACE INFILTRATION #1
76 Pond 5P: CB4

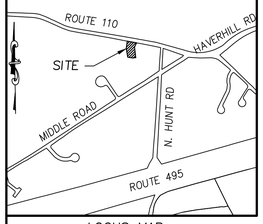
79 Pond 6P: CDS2
82 Pond 7P: CB2
85 Pond 8P: DMH1
88 Pond 9P: SUBSURFACE INFILTRATION #3
92 Pond 10P: CDS1
95 Link DP1: link
96 Link DP2: link
97 Link DP3: link

25-Year Event
98 Node Listing
100 Subcat P1: P1
101 Subcat P2: P2
102 Subcat P3: P3
103 Subcat P4A: P4A
104 Subcat P4B: P4B
105 Subcat P5A: P5A
106 Subcat P5B: P5B
107 Subcat P6: P6
108 Pond 1P: CB1
111 Pond 2P: SUBSURFACE INFILTRATION #2
115 Pond 3P: CB3
118 Pond 4P: SUBSURFACE INFILTRATION #1
122 Pond 5P: CB4
125 Pond 6P: CDS2
128 Pond 7P: CB2
131 Pond 8P: DMH1
134 Pond 9P: SUBSURFACE INFILTRATION #3
138 Pond 10P: CDS1
141 Link DP1: link
142 Link DP2: link
143 Link DP3: link

100-Year Event
144 Node Listing
146 Subcat P1: P1
147 Subcat P2: P2
148 Subcat P3: P3
149 Subcat P4A: P4A
150 Subcat P4B: P4B
151 Subcat P5A: P5A
152 Subcat P5B: P5B
153 Subcat P6: P6
154 Pond 1P: CB1
157 Pond 2P: SUBSURFACE INFILTRATION #2
161 Pond 3P: CB3
164 Pond 4P: SUBSURFACE INFILTRATION #1
168 Pond 5P: CB4

171 Pond 6P: CDS2
174 Pond 7P: CB2
177 Pond 8P: DMH1
180 Pond 9P: SUBSURFACE INFILTRATION #3
184 Pond 10P: CDS1
187 Link DP1: link
188 Link DP2: link
189 Link DP3: link

c. Watershed Maps



LOCUS MAP
1"=1000'

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20'

PREPARED FOR

80 HAVERHILL ROAD, LLC
80 HAVERHILL ROAD
AMESBURY, MA

NO.	DATE	DESCRIPTION	BY

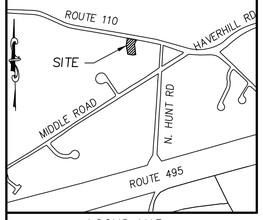
MILLENNIUM ENGINEERING, INC.
ENGINEERING AND LAND SURVEYING
62 ELM ST. SALISBURY, MA 01952 (978) 463-8980
13 HAMPTON RD. EXETER, NH 03833 (603) 778-0528

SCALE: 1"=20' | CALC. BY: S.R.C.
DATE: NOV. 8, 2024 | CHKD. BY: E.W.B.
PROJECT: M234276

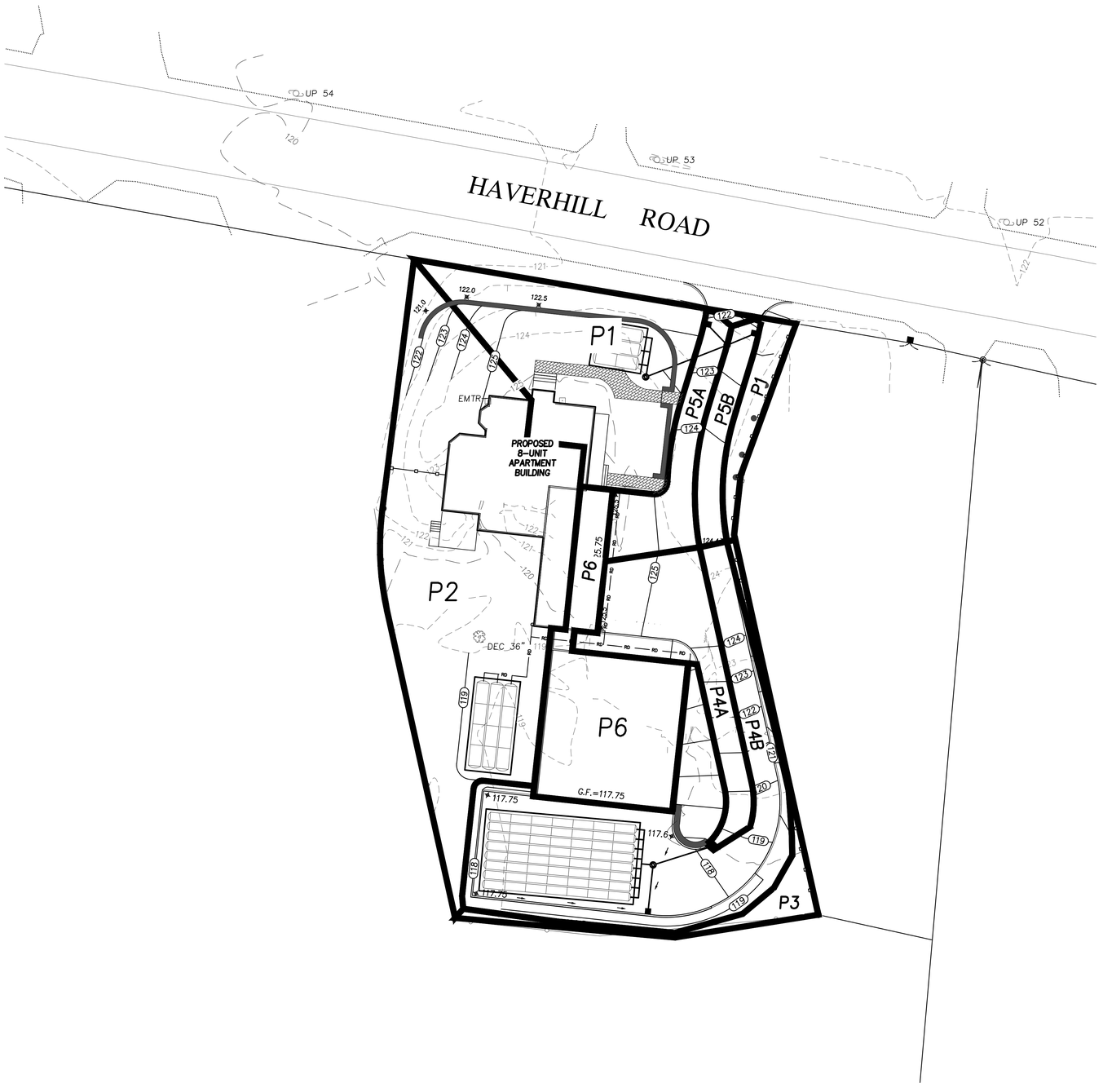
SITE PLAN
IN
AMESBURY, MA
AT
80 HAVERHILL ROAD

PRE-DEVELOPMENT WATERSHED MAP

SHEET: 1 OF 2



LOCUS MAP
1"=1000'



GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20'

PREPARED FOR

80 HAVERHILL ROAD, LLC
80 HAVERHILL ROAD
AMESBURY, MA

NO.	DATE	DESCRIPTION	BY

MEI
MILLENNIUM ENGINEERING, INC.
ENGINEERING AND LAND SURVEYING
62 ELM ST. SALISBURY, MA 01952 (978) 463-8980
13 HAMPTON RD. EXETER, NH 03833 (603) 778-0528

SCALE: 1"=20' | CALC. BY: S.R.C.
DATE: NOV. 8, 2024 | CHKD. BY: E.W.B.
PROJECT: M234276

SITE PLAN
IN
AMESBURY, MA
AT
80 HAVERHILL ROAD

POST-DEVELOPMENT WATERSHED MAP