# EXISTING GRADE, INC.

Land Surveyors - Civil Engineers

# *Storm Water Drainage Report*

*for*

## *0 & 31 Chapel Street*

## *Proposed Commercial Site Development*

*Leicester, Massachusetts*

Prepared for:

Armory Street, LLC
P.O. Box 682
Northborough, Massachusetts 01532

Prepared by:

Existing Grade, Inc.
62 Riedell Road
Douglas, Massachusetts 01516

January 25, 2021

EGI Project No. 1946


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# *1. Introduction*

## Project Summary

The proponent, Armory Street, LLC, proposes to construct two (2) new commercial structures on the current property located at 0 & 31 Chapel Street, Leicester MA. The proposed project will include the selective clearing and grubbing of development areas, removal of existing structure and onsite treatment units, the construction of two commercial structures, each to be serviced by Town water and sewer, and proposed bituminous parking areas. Onsite storm water management infrastructures will be inclusive of Cultec® stormwater infiltration devices to manage and infiltrate each structure's roof runoff as well as gravel filtration trenches prior to pavement runoff entering a proposed detention basin for each lot. The proposed project will be conducted per the Massachusetts Department of Environmental Protection requirements, Local Town and State bylaws, as well as using best management practices.

The project site is comprised of two parcels, recorded as parcel A4 and A3 on Assessor's map 21C and appears to lie within the Business (B) zoning district based upon a review of the most recent Town of Leicester Zoning Map. The parcels are partially located within the FEMA Flood Zone A (undetermined elevation) based upon a review of FIRM Map 25027C0782E, Panel 782 of 1075; last revised July 04, 2011. Currently there is overhead electric telephone/cable to service the property as well as municipal water and sewer within Chapel Street.

The property's address is recorded as 0 & 31 Chapel Street, Leicester MA and abuts Chapel Street to the East with privately owned land to the North, West, and South. Kettle Brook flows southward along the western property line with one delineated wetland system and river front area as shown on the site plans. Access to the site is proposed via a parking lot along the eastern property line from Chapel Street. Due to the size of the existing lots, the two parking lots are proposed to be interconnected to ensure adequate vehicular access. The existing site is comprised of a mix of wooded areas, dirt/gravel parking turnout areas, and an existing structure with historic settling basin.

The Worcester County Soil Survey, issued by the US Department of Agriculture was referenced to determine the type and hydrologic group of the soils located on the property. The property is comprised of mostly hydrologic soil group B type soils, Canton fine sandy loams, as was confirmed via soil testing conducted by Existing Grade, Inc in December of 2020.

## Pre- and Post-Development Analysis

The pre- and post-development conditions were analyzed utilizing Hydrocad, a storm water modeling program, to model the hydrologic impacts of the proposed development on adjacent

properties. The modeling program is based upon Soil Conservation Service's (SCS) Technical Release 55 (TR-55) and TR-20, programs to estimate the runoff and peak rates for small watersheds. As part of this analysis, two (2) separate models; one for the pre-development conditions, and one for post-development conditions were created and one point of comparison, or Design Point, was analyzed. The Design Point as well as the Watershed areas and associated time of concentration paths (Tc), are shown on the pre and post-development watershed plans, which are located in an appendix to this report.

The pre- and post development conditions were analyzed for the 2, 10, 25 and 100-year Type III 24-Hour storm events. The rainfall intensities used for each storm event were taken from the latest Atlas-14 rainfall data provided by the online NOAA Precipitation Data Server for Cherry Valley, Massachusetts

| ***Storm Event*** | ***Intensity (24-hr Duration (in)*** |
|---|---|
| 2-year | 3.14 |
| 10-year | 4.87 |
| 25-year | 5.95 |
| 100-year | 7.62 |

The Worcester County Soil Survey, issued by the US Department of Agriculture was referenced to determine the type and hydrologic group of the soils located on the property, as shown in Appendix C to this report.

## *2. Compliance with Storm Water Management Standards*

**Standard 1: No New Untreated Discharges**

The development is designed so that no new storm water conveyances do not discharge *untreated* pavement runoff into or cause erosion to wetland resource areas.

**Standard 2: Peak Rate Attenuation**

Pre- and Post Development storm water analysis calculations were performed for the 2, 10, 25 and 100-year Type III 24-Hour storm events and a comparison of the peak rates at the Design Point for each storm event, under pre- and post-development conditions are summarized in the table below:

| | ***Design Point*** | |
|---|---|---|
| ***Storm Event*** | ***Pre-Development*** | ***Post-Development*** |
| 2-year | 0.73 cfs | 0.61 cfs |
| 10-year | 1.28 cfs | 1.12 cfs |
| 25-year | 2.89 cfs | 2.45 cfs |
| 100-year | 2.89 cfs | 2.43 cfs |

As shown in the tables above, the peak rates of storm water runoff generated under post-development conditions will be equal or less than the peak rates generated under pre-development conditions as required for Massachusetts Stormwater Management Standards.

Complete runoff calculations for the 2, 10, 25 and 100-year Type III 24-Hour storm events including cover, soils types and time of concentration paths for the pre-development conditions and post-development conditions are provided in Appendices A and B, respectively.

**Standard 3: Groundwater Recharge**

The groundwater recharge volume will be maximized for the development and will be achieved through the proposed detention basins and subsurface infiltration. Refer to Appendix C for all Groundwater Recharge Calculations.

**Standard 4: Water Quality**

The storm water management system was designed with treatment trains consisting of Cultec® infiltration units as well as detention basins to facilitate the maximum extent practical removal of Total Suspended Solids (TSS). The Total Suspended Solids (TSS) removal calculations are provided in Appendix C.

**Standard 5: Land Uses with higher Potential Pollutant Loads (LUHPPLs)**

The proposed development is not a LUHPPL and therefore Standard 5 is not applicable.

**Standard 6: Critical Areas**

The proposed development does not discharge to a critical area and therefore Standard 6 is not applicable.

**Standard 7: Redevelopment and Other Projects Subject to the Standards Only to the Maximum Extent Practicable**

The proposed development is not a redevelopment and therefore Standard 7 is not applicable.

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

A Construction Period Pollution Prevention, including an Erosion and Sedimentation Control Plan, is provided in Appendix D.

**Standard 9: Operation and Maintenance Plan**

The Operation and Maintenance Plan is provided in Appendix E.

**Standard 10: Prohibition of Illicit Discharges**

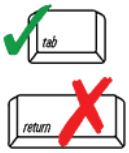
There are no illicit discharges anticipated for the proposed development however measures to prevent illicit discharges will be included within the Long-Term Pollution Prevention Plan. Also, as required, an Illicit Discharge Compliance Statement will be submitted prior to the discharge of any storm water to the post-construction storm water Best Management Practices (BMPs).

**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.

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[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.

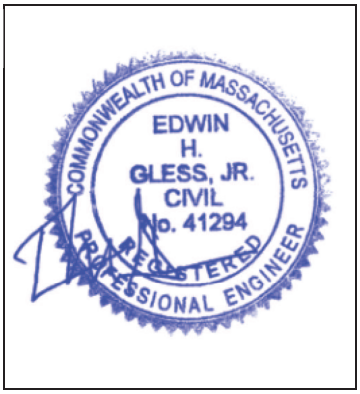
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that 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




Edwin Gless 01/25/2021

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): Gravel Filtration Trench

**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.

***APPENDIX A***


# EXISTING (PRE-DEV)

Subcat Reach Pond Link

**Routing Diagram for 1946_PRE-DEV**
Prepared by {enter your company name here}, Printed 1/25/2021

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 0.032 | 96 | Gravel surface, HSG B (E1) |
| 0.023 | 98 | Roofs, HSG B (E1) |
| 0.014 | 98 | Water Surface, HSG B (E1) |
| 0.589 | 65 | Woods/grass comb., Fair, HSG B (E1) |
| **0.657** | **68** | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (acres) | HSG-B (acres) | HSG-C (acres) | HSG-D (acres) | Other (acres) | Total (acres) | Ground Cover | Subcatchment Numbers |
|---|---|---|---|---|---|---|---|
| 0.000 | 0.032 | 0.000 | 0.000 | 0.000 | 0.032 | Gravel surface | E1 |
| 0.000 | 0.023 | 0.000 | 0.000 | 0.000 | 0.023 | Roofs | E1 |
| 0.000 | 0.014 | 0.000 | 0.000 | 0.000 | 0.014 | Water Surface | E1 |
| 0.000 | 0.589 | 0.000 | 0.000 | 0.000 | 0.589 | Woods/grass comb., Fair | E1 |
| **0.000** | **0.657** | **0.000** | **0.000** | **0.000** | **0.657** | **TOTAL AREA** | |

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: EXISTING(PRE-DEV)** Runoff Area=28,629 sf 5.50% Impervious Runoff Depth>0.62"
Flow Length=168' Tc=6.8 min CN=68 Runoff=0.73 cfs 0.034 af

**Total Runoff Area = 0.657 ac Runoff Volume = 0.034 af Average Runoff Depth = 0.62"**
**94.50% Pervious = 0.621 ac 5.50% Impervious = 0.036 ac**

## Summary for Subcatchment E1: EXISTING (PRE-DEV)

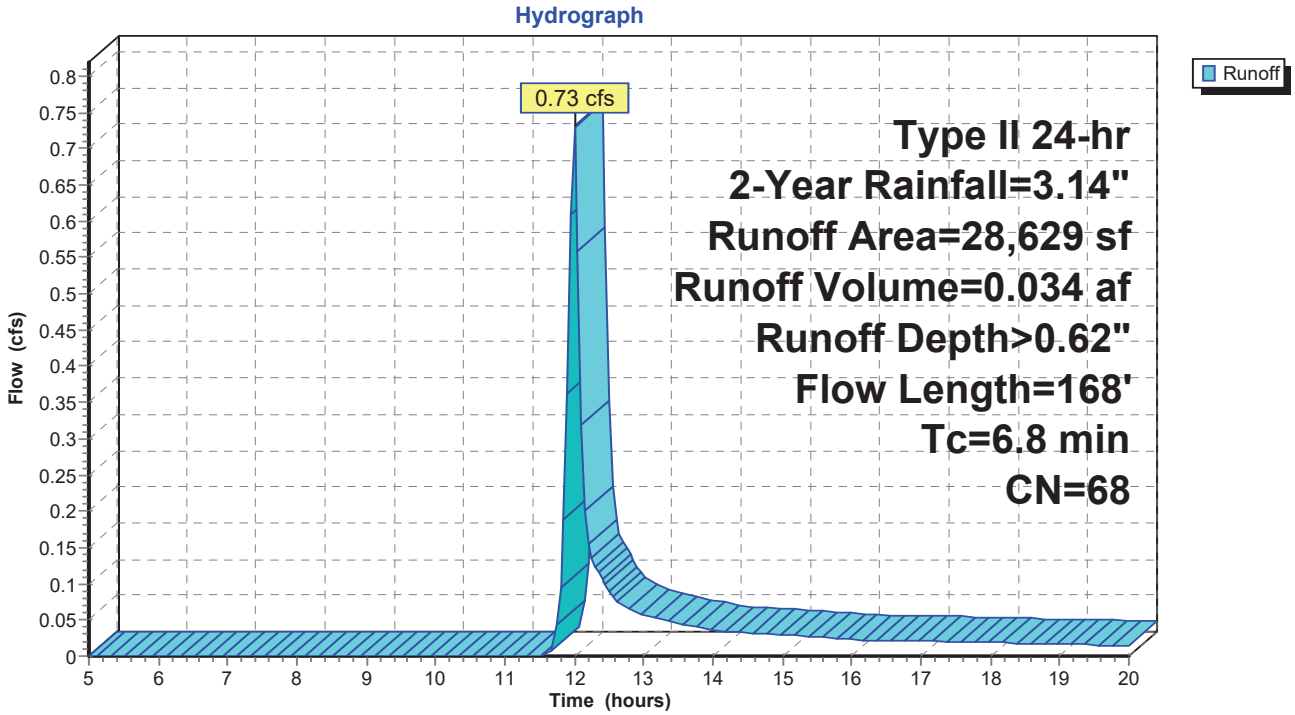
Runoff = 0.73 cfs @ 12.00 hrs, Volume= 0.034 af, Depth> 0.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.14"

| Area (sf) | CN | Description |
|---|---|---|
| 985 | 98 | Roofs, HSG B |
| 591 | 98 | Water Surface, HSG B |
| 1,390 | 96 | Gravel surface, HSG B |
| 25,663 | 65 | Woods/grass comb., Fair, HSG B |
| 28,629 | 68 | Weighted Average |
| 27,053 | | 94.50% Pervious Area |
| 1,576 | | 5.50% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.3 | 50 | 0.1100 | 0.13 | | **Sheet Flow, SHEET** Woods: Light underbrush n= 0.400 P2= 3.14" |
| 0.5 | 118 | 0.0720 | 4.32 | | **Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps |
| 6.8 | 168 | Total | | | |

## Subcatchment E1: EXISTING (PRE-DEV)



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: EXISTING(PRE-DEV)** Runoff Area=28,629 sf 5.50% Impervious Runoff Depth>1.64"
Flow Length=168' Tc=6.8 min CN=68 Runoff=1.28 cfs 0.090 af

**Total Runoff Area = 0.657 ac Runoff Volume = 0.090 af Average Runoff Depth = 1.64"**
**94.50% Pervious = 0.621 ac 5.50% Impervious = 0.036 ac**

## Summary for Subcatchment E1: EXISTING (PRE-DEV)

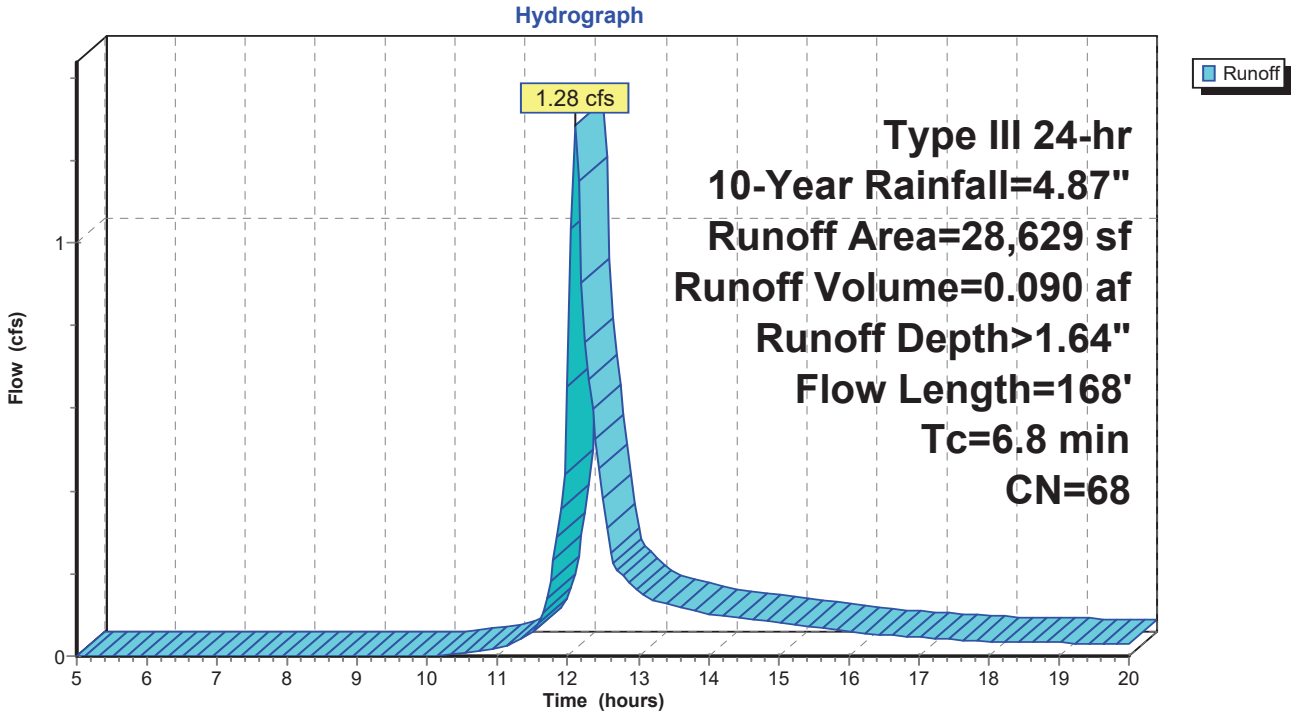
Runoff = 1.28 cfs @ 12.11 hrs, Volume= 0.090 af, Depth> 1.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.87"

| Area (sf) | CN | Description |
|---|---|---|
| 985 | 98 | Roofs, HSG B |
| 591 | 98 | Water Surface, HSG B |
| 1,390 | 96 | Gravel surface, HSG B |
| 25,663 | 65 | Woods/grass comb., Fair, HSG B |
| 28,629 | 68 | Weighted Average |
| 27,053 | | 94.50% Pervious Area |
| 1,576 | | 5.50% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.3 | 50 | 0.1100 | 0.13 | | **Sheet Flow, SHEET** Woods: Light underbrush n= 0.400 P2= 3.14" |
| 0.5 | 118 | 0.0720 | 4.32 | | **Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps |
| 6.8 | 168 | Total | | | |

## Subcatchment E1: EXISTING (PRE-DEV)



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: EXISTING(PRE-DEV)** Runoff Area=28,629 sf 5.50% Impervious Runoff Depth>2.36"
Flow Length=168' Tc=6.8 min CN=68 Runoff=2.89 cfs 0.129 af

**Total Runoff Area = 0.657 ac Runoff Volume = 0.129 af Average Runoff Depth = 2.36"**
**94.50% Pervious = 0.621 ac 5.50% Impervious = 0.036 ac**

## Summary for Subcatchment E1: EXISTING (PRE-DEV)

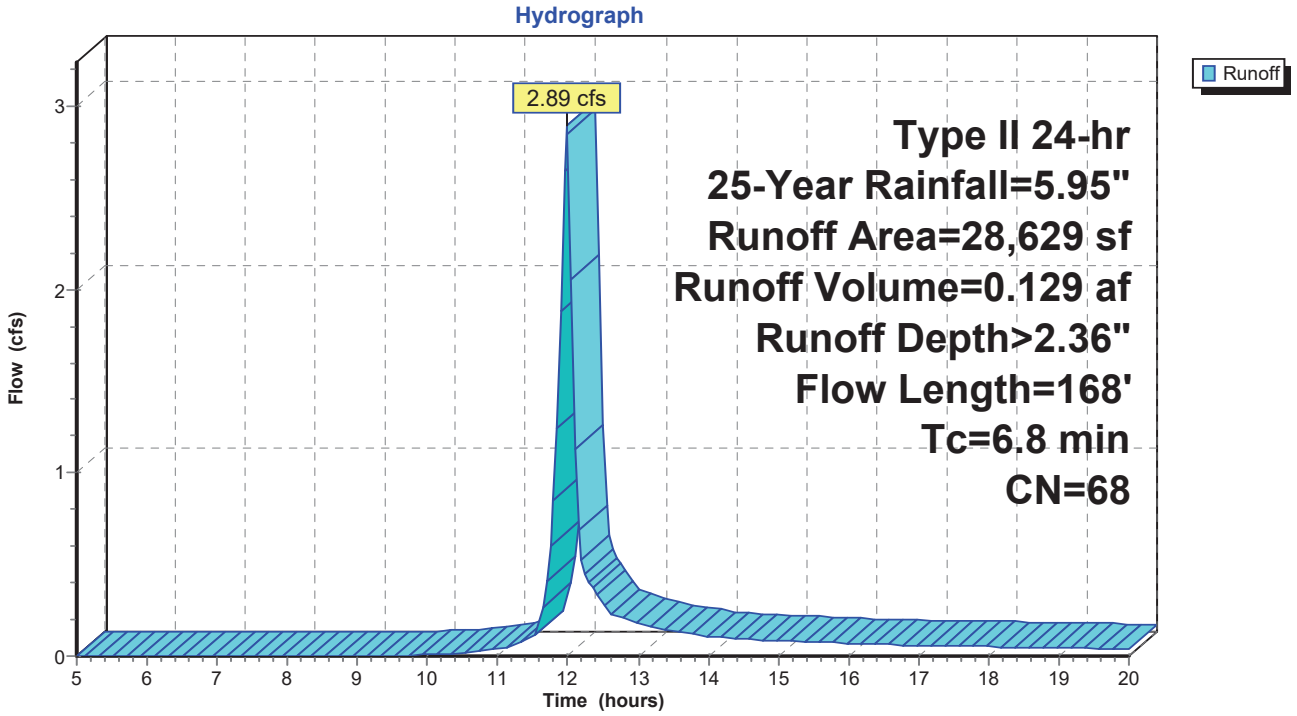
Runoff = 2.89 cfs @ 11.99 hrs, Volume= 0.129 af, Depth> 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=5.95"

| Area (sf) | CN | Description |
|---|---|---|
| 985 | 98 | Roofs, HSG B |
| 591 | 98 | Water Surface, HSG B |
| 1,390 | 96 | Gravel surface, HSG B |
| 25,663 | 65 | Woods/grass comb., Fair, HSG B |
| 28,629 | 68 | Weighted Average |
| 27,053 | | 94.50% Pervious Area |
| 1,576 | | 5.50% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.3 | 50 | 0.1100 | 0.13 | | **Sheet Flow, SHEET** Woods: Light underbrush n= 0.400 P2= 3.14" |
| 0.5 | 118 | 0.0720 | 4.32 | | **Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps |
| 6.8 | 168 | Total | | | |

## Subcatchment E1: EXISTING (PRE-DEV)



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: EXISTING(PRE-DEV)** Runoff Area=28,629 sf 5.50% Impervious Runoff Depth>3.64"
Flow Length=168' Tc=6.8 min CN=68 Runoff=2.89 cfs 0.199 af

**Total Runoff Area = 0.657 ac Runoff Volume = 0.199 af Average Runoff Depth = 3.64"**
**94.50% Pervious = 0.621 ac 5.50% Impervious = 0.036 ac**

## Summary for Subcatchment E1: EXISTING (PRE-DEV)

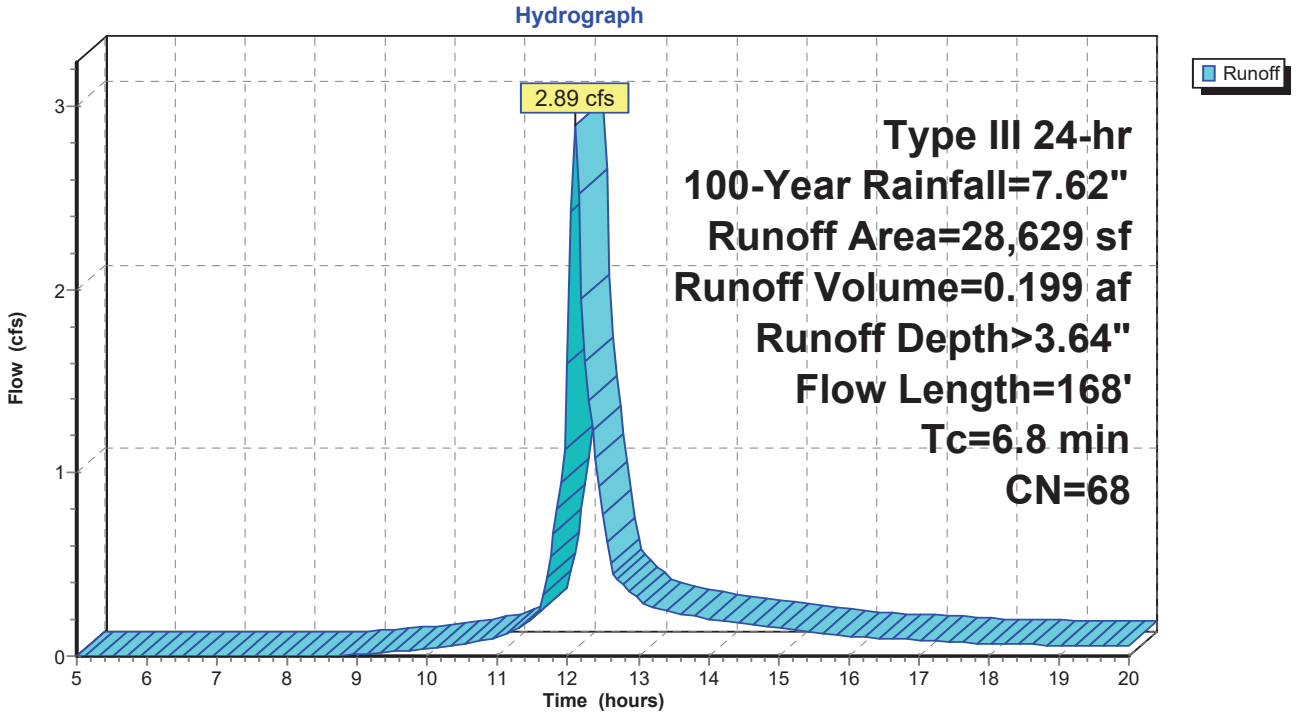
Runoff = 2.89 cfs @ 12.10 hrs, Volume= 0.199 af, Depth> 3.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.62"

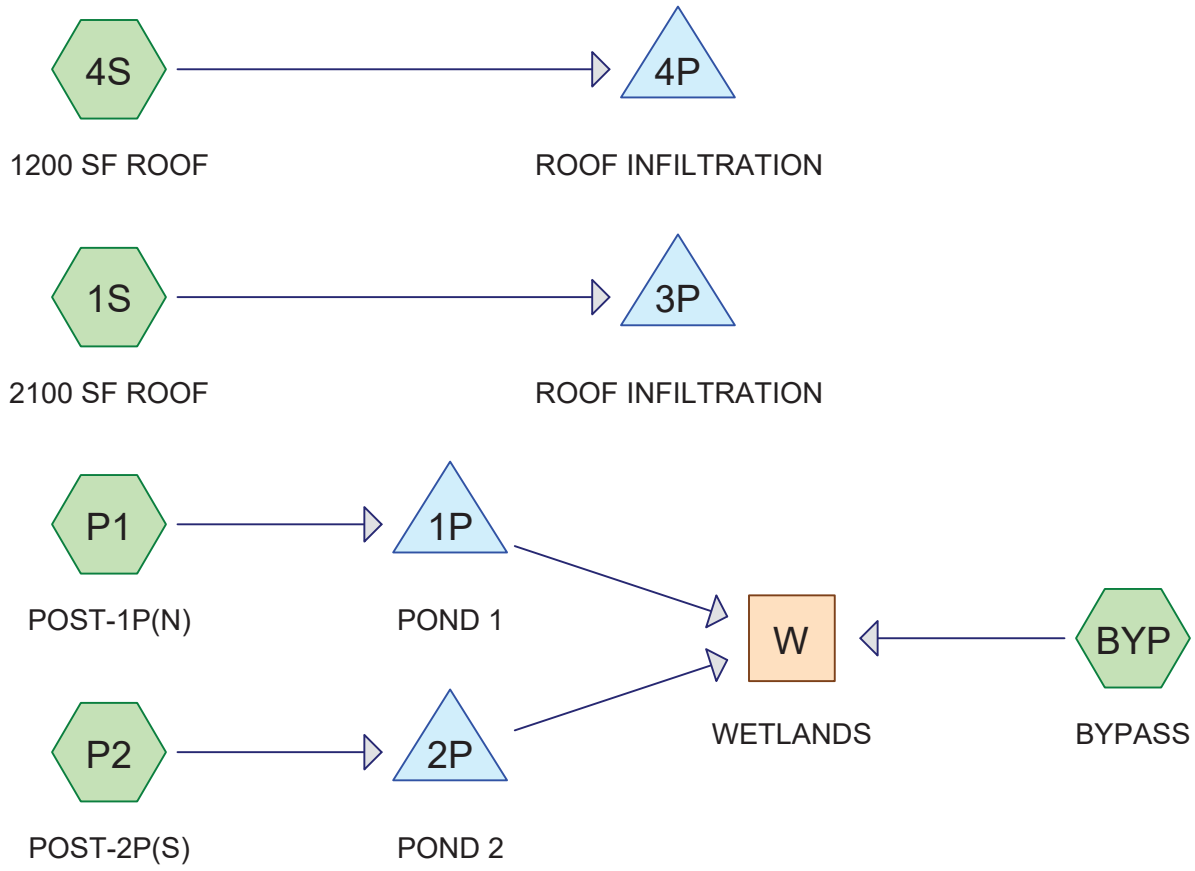
| Area (sf) | CN | Description |
|---|---|---|
| 985 | 98 | Roofs, HSG B |
| 591 | 98 | Water Surface, HSG B |
| 1,390 | 96 | Gravel surface, HSG B |
| 25,663 | 65 | Woods/grass comb., Fair, HSG B |
| 28,629 | 68 | Weighted Average |
| 27,053 | | 94.50% Pervious Area |
| 1,576 | | 5.50% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.3 | 50 | 0.1100 | 0.13 | | **Sheet Flow, SHEET** Woods: Light underbrush n= 0.400 P2= 3.14" |
| 0.5 | 118 | 0.0720 | 4.32 | | **Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps |
| 6.8 | 168 | Total | | | |

## Subcatchment E1: EXISTING (PRE-DEV)



***APPENDIX B***




Subcat Reach Pond Link

**Routing Diagram for 1946_POST-DEV**
Prepared by {enter your company name here}, Printed 1/25/2021

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 0.083 | 61 | >75% Grass cover, Good, HSG B (P1, P2) |
| 0.146 | 98 | Paved parking, HSG B (P1, P2) |
| 0.076 | 98 | Roofs, HSG B (1S, 4S) |
| 0.039 | 98 | Water Surface, HSG B (P1, P2) |
| 0.313 | 60 | Woods, Fair, HSG B (BYP) |
| **0.657** | **75** | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (acres) | HSG-B (acres) | HSG-C (acres) | HSG-D (acres) | Other (acres) | Total (acres) | Ground Cover | Subcatchment Numbers |
|---|---|---|---|---|---|---|---|
| 0.000 | 0.083 | 0.000 | 0.000 | 0.000 | 0.083 | >75% Grass cover, Good | P1, P2 |
| 0.000 | 0.146 | 0.000 | 0.000 | 0.000 | 0.146 | Paved parking | P1, P2 |
| 0.000 | 0.076 | 0.000 | 0.000 | 0.000 | 0.076 | Roofs | 1S, 4S |
| 0.000 | 0.039 | 0.000 | 0.000 | 0.000 | 0.039 | Water Surface | P1, P2 |
| 0.000 | 0.313 | 0.000 | 0.000 | 0.000 | 0.313 | Woods, Fair | BYP |
| **0.000** | **0.657** | **0.000** | **0.000** | **0.000** | **0.657** | **TOTAL AREA** | |

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 1S: 2100 SF ROOF** Runoff Area=2,100 sf 100.00% Impervious Runoff Depth>2.69"
Tc=6.0 min CN=98 Runoff=0.21 cfs 0.011 af

**Subcatchment 4S: 1200 SF ROOF** Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>2.69"
Tc=6.0 min CN=98 Runoff=0.12 cfs 0.006 af

**Subcatchment BYP: BYPASS** Runoff Area=13,628 sf 0.00% Impervious Runoff Depth>0.33"
Flow Length=114' Tc=8.2 min CN=60 Runoff=0.13 cfs 0.009 af

**Subcatchment P1: POST-1P(N)** Runoff Area=5,001 sf 61.03% Impervious Runoff Depth>1.51"
Tc=6.0 min CN=84 Runoff=0.32 cfs 0.014 af

**Subcatchment P2: POST-2P(S)** Runoff Area=6,700 sf 75.10% Impervious Runoff Depth>1.89"
Tc=0.0 min CN=89 Runoff=0.62 cfs 0.024 af

**Reach W: WETLANDS** Inflow=0.61 cfs 0.028 af
Outflow=0.61 cfs 0.028 af

**Pond 1P: POND 1** Peak Elev=749.71' Storage=119 cf Inflow=0.32 cfs 0.014 af
Discarded=0.01 cfs 0.004 af Primary=0.28 cfs 0.010 af Outflow=0.29 cfs 0.013 af

**Pond 2P: POND 2** Peak Elev=747.90' Storage=426 cf Inflow=0.62 cfs 0.024 af
Discarded=0.02 cfs 0.011 af Primary=0.21 cfs 0.010 af Outflow=0.22 cfs 0.021 af

**Pond 3P: ROOF INFILTRATION** Peak Elev=746.77' Storage=0.005 af Inflow=0.21 cfs 0.011 af
Outflow=0.02 cfs 0.011 af

**Pond 4P: ROOF INFILTRATION** Peak Elev=747.83' Storage=0.003 af Inflow=0.12 cfs 0.006 af
Outflow=0.01 cfs 0.006 af

**Total Runoff Area = 0.657 ac Runoff Volume = 0.064 af Average Runoff Depth = 1.17"**
**60.24% Pervious = 0.396 ac 39.76% Impervious = 0.261 ac**

## Summary for Subcatchment 1S: 2100 SF ROOF

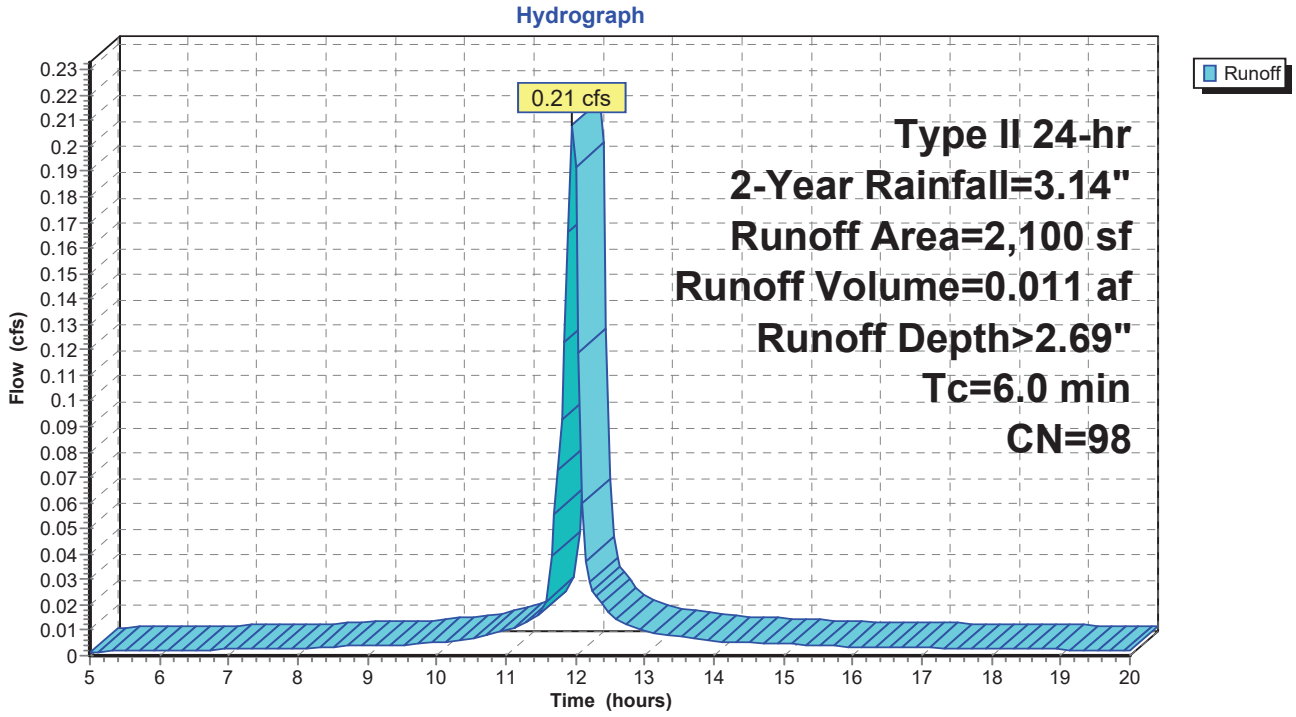
Runoff = 0.21 cfs @ 11.96 hrs, Volume= 0.011 af, Depth> 2.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.14"

| Area (sf) | CN | Description |
|---|---|---|
| 2,100 | 98 | Roofs, HSG B |
| 2,100 | | 100.00% Impervious Area |

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

## Subcatchment 1S: 2100 SF ROOF



## Summary for Subcatchment 4S: 1200 SF ROOF

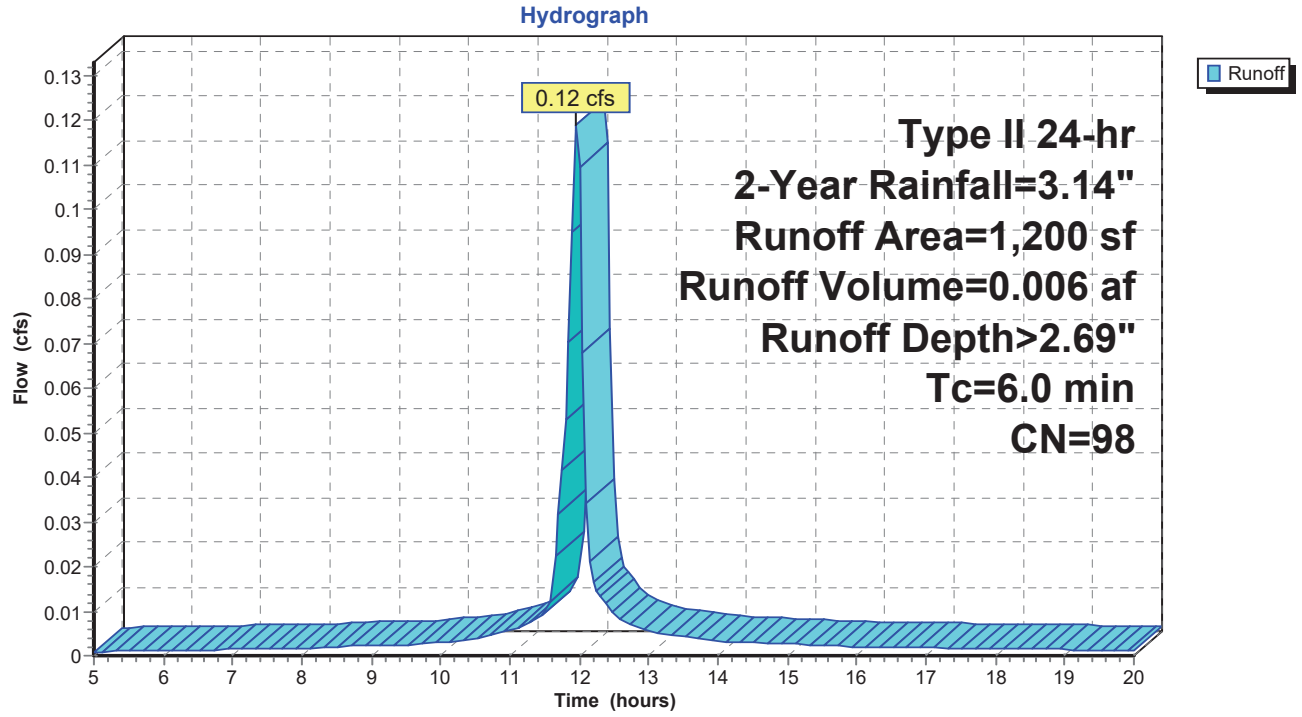
Runoff = 0.12 cfs @ 11.96 hrs, Volume= 0.006 af, Depth> 2.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.14"

| Area (sf) | CN | Description |
|---|---|---|
| 1,200 | 98 | Roofs, HSG B |
| 1,200 | | 100.00% Impervious Area |

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

## Subcatchment 4S: 1200 SF ROOF



## Summary for Subcatchment BYP: BYPASS

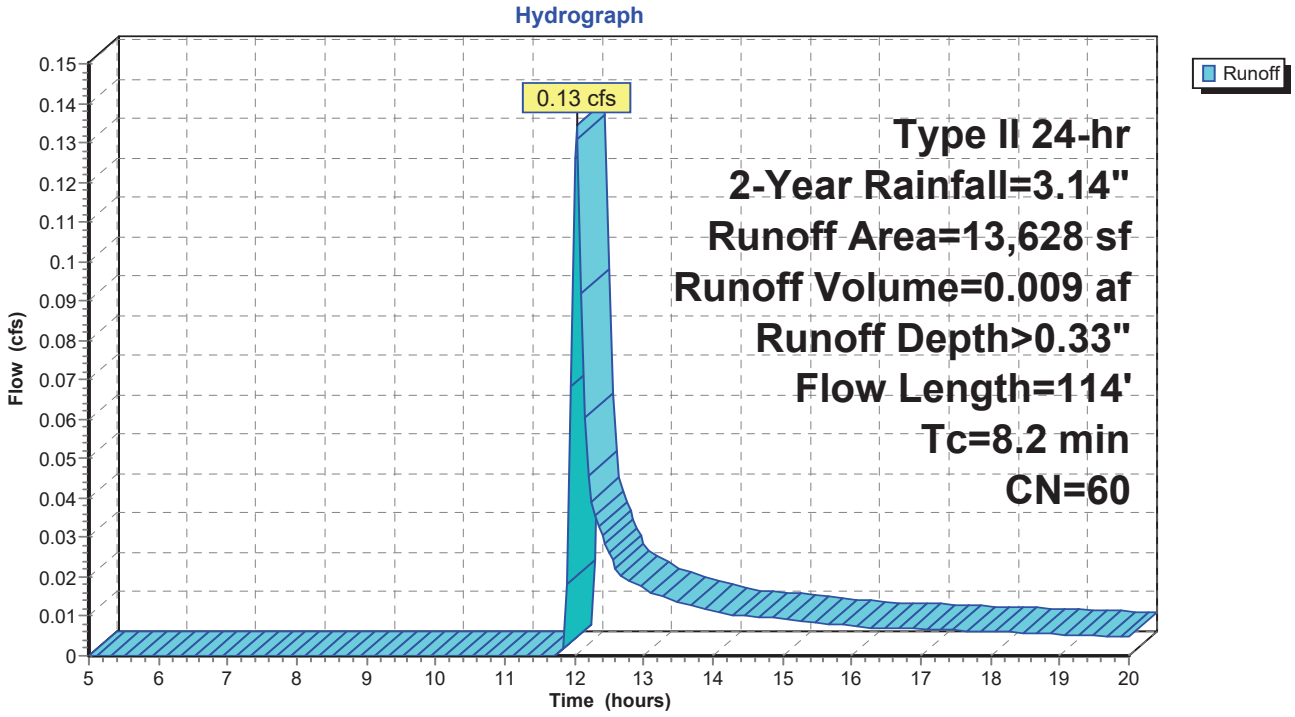
Runoff = 0.13 cfs @ 12.03 hrs, Volume= 0.009 af, Depth> 0.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.14"

| Area (sf) | CN | Description |
|---|---|---|
| 13,628 | 60 | Woods, Fair, HSG B |
| 13,628 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.0 | 50 | 0.0220 | 0.10 | | **Sheet Flow, SHEET** Grass: Dense n= 0.240 P2= 3.14" |
| 0.2 | 64 | 0.0960 | 4.99 | | **Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps |
| 8.2 | 114 | Total | | | |

## Subcatchment BYP: BYPASS



## Summary for Subcatchment P1: POST-1P(N)

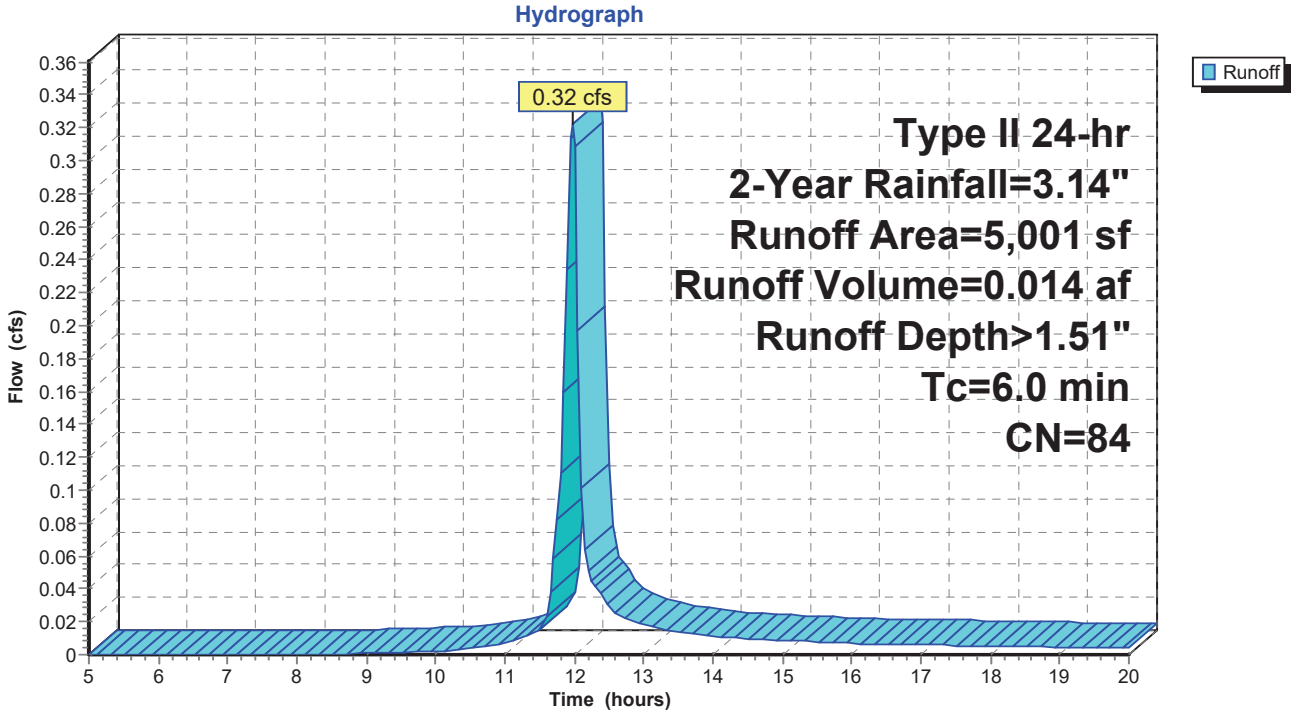
Runoff = 0.32 cfs @ 11.97 hrs, Volume= 0.014 af, Depth> 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.14"

| Area (sf) | CN | Description |
|---|---|---|
| 2,390 | 98 | Paved parking, HSG B |
| 662 | 98 | Water Surface, HSG B |
| 1,949 | 61 | >75% Grass cover, Good, HSG B |
| 5,001 | 84 | Weighted Average |
| 1,949 | | 38.97% Pervious Area |
| 3,052 | | 61.03% Impervious Area |

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

### Subcatchment P1: POST-1P(N)



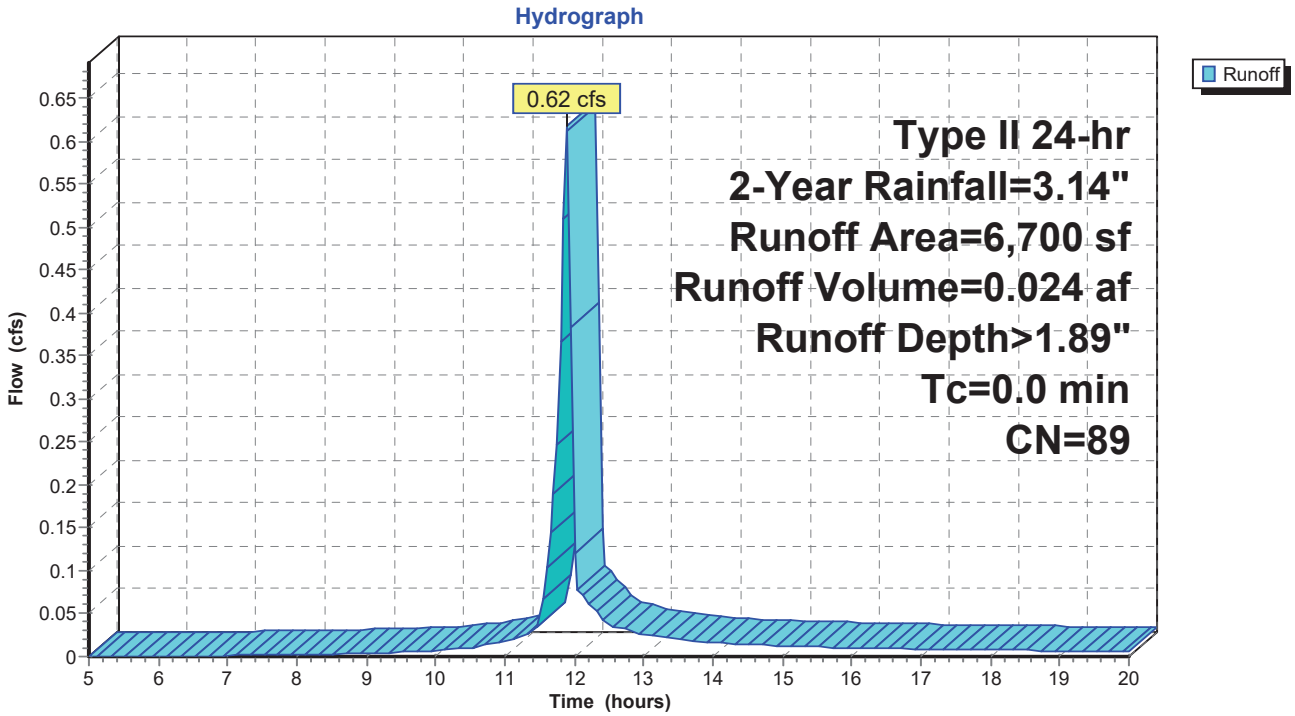
## Summary for Subcatchment P2: POST-2P(S)

Runoff = 0.62 cfs @ 11.89 hrs, Volume= 0.024 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.14"

| Area (sf) | CN | Description |
|---|---|---|
| 3,977 | 98 | Paved parking, HSG B |
| 1,055 | 98 | Water Surface, HSG B |
| 1,668 | 61 | >75% Grass cover, Good, HSG B |
| 6,700 | 89 | Weighted Average |
| 1,668 | | 24.90% Pervious Area |
| 5,032 | | 75.10% Impervious Area |

## Subcatchment P2: POST-2P(S)

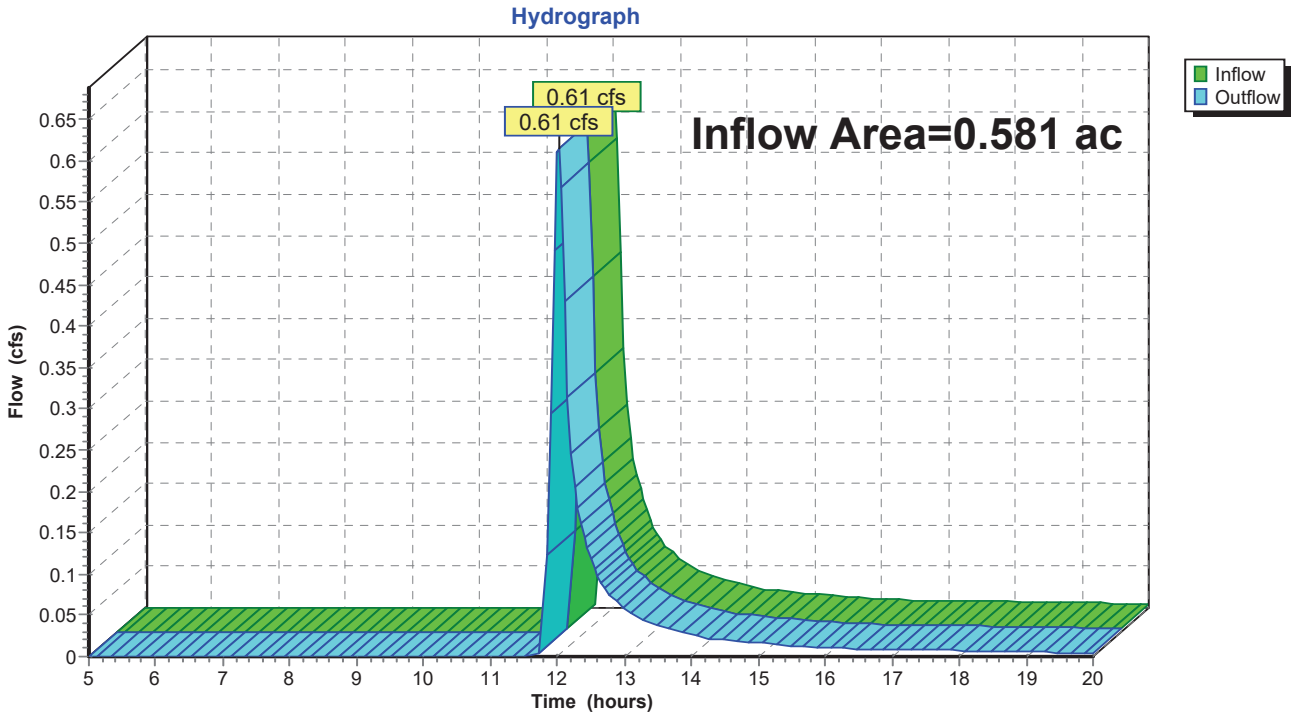


## Summary for Reach W: WETLANDS

Inflow Area = 0.581 ac, 31.92% Impervious, Inflow Depth > 0.58" for 2-Year event
Inflow = 0.61 cfs @ 12.01 hrs, Volume= 0.028 af
Outflow = 0.61 cfs @ 12.01 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

## Reach W: WETLANDS



## Summary for Pond 1P: POND 1

Inflow Area = 0.115 ac, 61.03% Impervious, Inflow Depth > 1.51" for 2-Year event
Inflow = 0.32 cfs @ 11.97 hrs, Volume= 0.014 af
Outflow = 0.29 cfs @ 12.01 hrs, Volume= 0.013 af, Atten= 11%, Lag= 2.3 min
Discarded = 0.01 cfs @ 12.01 hrs, Volume= 0.004 af
Primary = 0.28 cfs @ 12.01 hrs, Volume= 0.010 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 749.71' @ 12.01 hrs Surf.Area= 237 sf Storage= 119 cf

Plug-Flow detention time=45.0 min calculated for 0.013 af (91% of inflow)
Center-of-Mass det. time=14.6 min ( 800.3 - 785.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 749.00' | 665 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

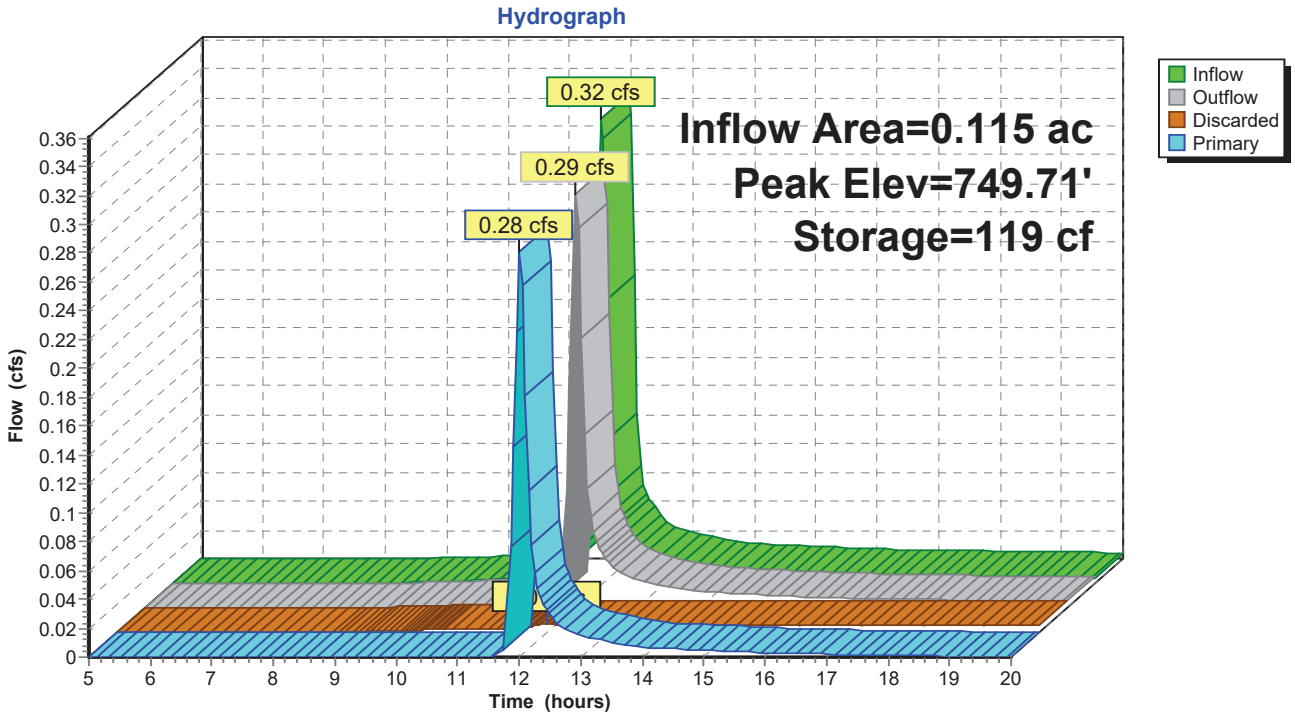
| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 749.00 | 108 | 50.7 | 0 | 0 | 108 |
| 750.00 | 305 | 76.5 | 198 | 198 | 377 |
| 750.50 | 456 | 132.9 | 189 | 387 | 1,318 |
| 751.00 | 662 | 142.3 | 278 | 665 | 1,535 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 749.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 744.00' |
| #2 | Primary | 749.40' | **Custom Weir/Orifice, Cv= 2.62 (C= 3.28)**<br>Head (feet) 0.00 0.50 0.50 1.00<br>Width (feet) 0.50 0.50 0.75 0.75 |

**Discarded OutFlow** Max=0.01 cfs @ 12.01 hrs HW=749.70' (Free Discharge)
↑—**1=Exfiltration** ( Controls 0.01 cfs)

**Primary OutFlow** Max=0.27 cfs @ 12.01 hrs HW=749.70' (Free Discharge)
↑—**2=Custom Weir/Orifice** (Weir Controls 0.27 cfs @ 1.81 fps)

## Pond 1P: POND 1



## Summary for Pond 2P: POND 2

Inflow Area = 0.154 ac, 75.10% Impervious, Inflow Depth > 1.89" for 2-Year event
Inflow = 0.62 cfs @ 11.89 hrs, Volume= 0.024 af
Outflow = 0.22 cfs @ 11.99 hrs, Volume= 0.021 af, Atten= 64%, Lag= 5.8 min
Discarded = 0.02 cfs @ 11.99 hrs, Volume= 0.011 af
Primary = 0.21 cfs @ 11.99 hrs, Volume= 0.010 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 747.90' @ 11.99 hrs Surf.Area= 626 sf Storage= 426 cf

Plug-Flow detention time=94.4 min calculated for 0.021 af (86% of inflow)
Center-of-Mass det. time=51.7 min ( 818.0 - 766.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 747.00' | 1,343 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

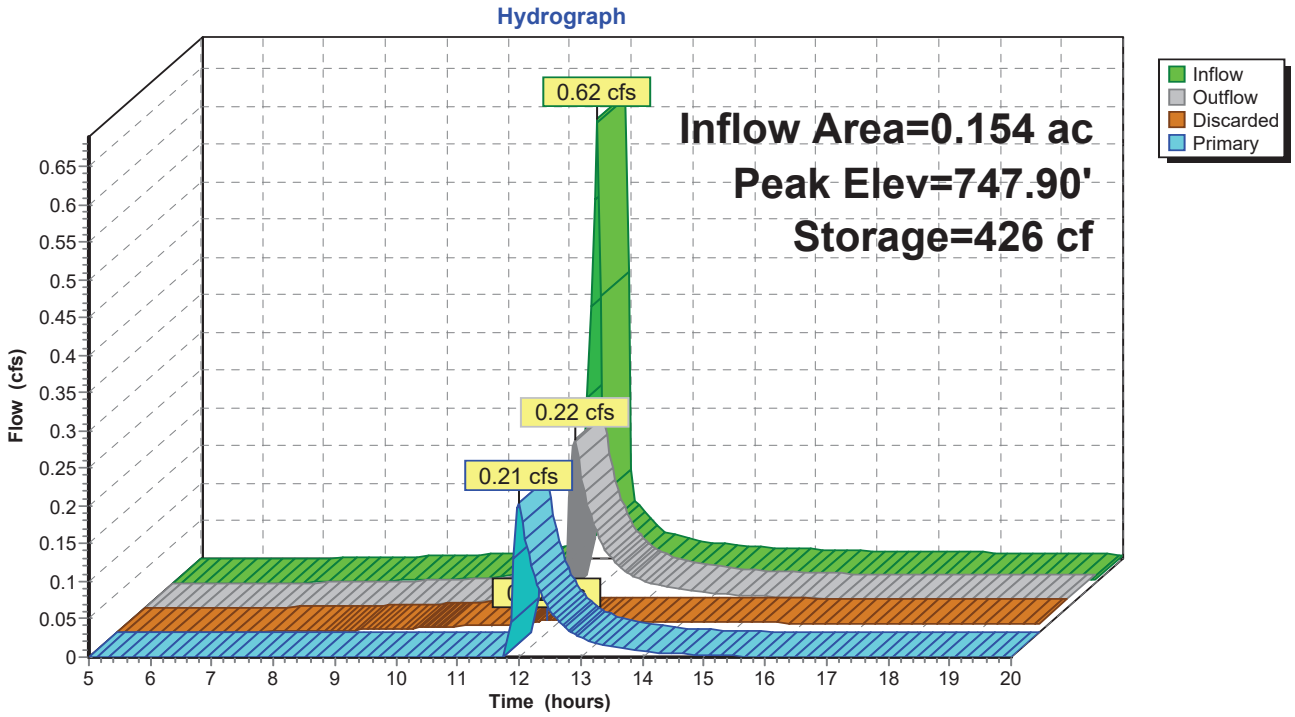
| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 747.00 | 336 | 96.8 | 0 | 0 | 336 |
| 748.00 | 665 | 120.2 | 491 | 491 | 754 |
| 749.00 | 1,054 | 139.0 | 852 | 1,343 | 1,163 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 747.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 743.21' |
| #2 | Primary | 747.50' | **Custom Weir/Orifice, Cv= 2.62 (C= 3.28)**<br>Head (feet) 0.00 0.50 0.50 1.00<br>Width (feet) 0.25 0.25 1.00 1.00 |

**Discarded OutFlow** Max=0.02 cfs @ 11.99 hrs HW=747.89' (Free Discharge)
↑—**1=Exfiltration** ( Controls 0.02 cfs)

**Primary OutFlow** Max=0.20 cfs @ 11.99 hrs HW=747.89' (Free Discharge)
↑—**2=Custom Weir/Orifice** (Weir Controls 0.20 cfs @ 2.06 fps)

## Pond 2P: POND 2



## Summary for Pond 3P: ROOF INFILTRATION

Inflow Area = 0.048 ac, 100.00% Impervious, Inflow Depth > 2.69" for 2-Year event
Inflow = 0.21 cfs @ 11.96 hrs, Volume= 0.011 af
Outflow = 0.02 cfs @ 12.51 hrs, Volume= 0.011 af, Atten= 92%, Lag= 32.9 min
Discarded = 0.02 cfs @ 12.51 hrs, Volume= 0.011 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 746.77' @ 12.51 hrs Surf.Area= 0.011 ac Storage= 0.005 af

Plug-Flow detention time=99.9 min calculated for 0.011 af (99% of inflow)
Center-of-Mass det. time=98.4 min ( 831.8 - 733.4 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 746.00' | 0.008 af | **11.25'W x 43.75'L x 2.54'H Field A**<br>0.029 af Overall - 0.008 af Embedded = 0.021 af x 40.0% Voids |
| #2A | 746.50' | 0.008 af | **Cultec R-150XLHD** x 12 Inside #1<br>Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf<br>Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap<br>Row Length Adjustment= +0.75' x 2.65 sf x 3 rows |
| | | 0.016 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 746.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 743.98' |

**Discarded OutFlow** Max=0.02 cfs @ 12.51 hrs HW=746.77' (Free Discharge)
↑**1=Exfiltration** ( Controls 0.02 cfs)

## Pond 3P: ROOF INFILTRATION - Chamber Wizard Field A

**ChamberModel = CultecR-150XLHD(CultecRecharger®150XLHD)**
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 3 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

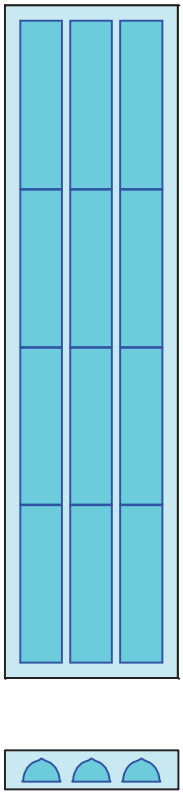
4 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 41.75' Row Length +12.0" End Stone x 2 = 43.75' Base Length
3 Rows x 33.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 11.25' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

12 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 3 Rows = 331.8 cf Chamber Storage

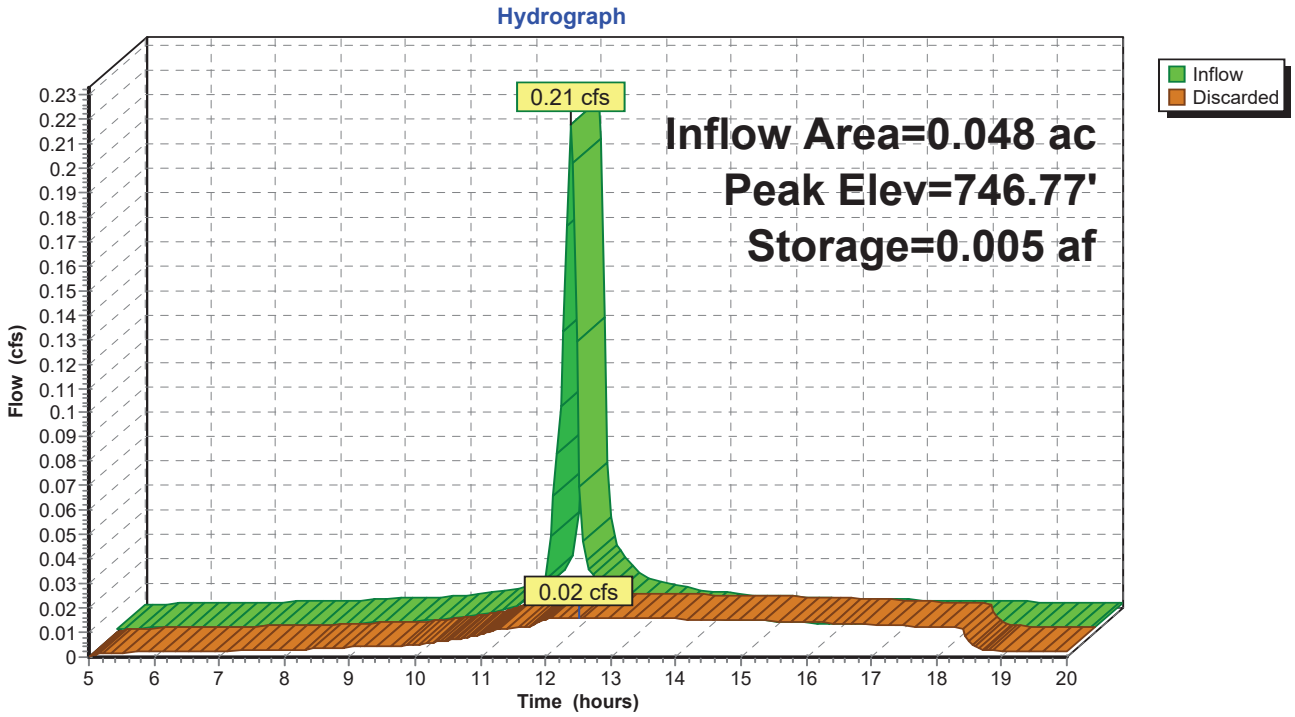
1,251.0 cf Field - 331.8 cf Chambers = 919.2 cf Stone x 40.0% Voids = 367.7 cf Stone Storage

Chamber Storage + Stone Storage = 699.5 cf = 0.016 af
Overall Storage Efficiency = 55.9%
Overall System Size = 43.75' x 11.25' x 2.54'

12 Chambers
46.3 cy Field
34.0 cy Stone



## Pond 3P: ROOF INFILTRATION



## Summary for Pond 4P: ROOF INFILTRATION

Inflow Area = 0.028 ac, 100.00% Impervious, Inflow Depth > 2.69" for 2-Year event
Inflow = 0.12 cfs @ 11.96 hrs, Volume= 0.006 af
Outflow = 0.01 cfs @ 12.58 hrs, Volume= 0.006 af, Atten= 93%, Lag= 36.8 min
Discarded = 0.01 cfs @ 12.58 hrs, Volume= 0.006 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 747.83' @ 12.58 hrs Surf.Area= 0.006 ac Storage= 0.003 af

Plug-Flow detention time=118.2 min calculated for 0.006 af (100% of inflow)
Center-of-Mass det. time=117.1 min ( 850.4 - 733.4 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 747.00' | 0.005 af | **8.00'W x 33.50'L x 2.54'H Field A**<br>0.016 af Overall - 0.004 af Embedded = 0.012 af x 40.0% Voids |
| #2A | 747.50' | 0.004 af | **Cultec R-150XLHD** x 6 Inside #1<br>Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf<br>Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap<br>Row Length Adjustment= +0.75' x 2.65 sf x 2 rows |
| | | 0.009 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 747.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 744.00' |

**Discarded OutFlow** Max=0.01 cfs @ 12.58 hrs HW=747.83' (Free Discharge)
↑**1=Exfiltration** ( Controls 0.01 cfs)

## Pond 4P: ROOF INFILTRATION - Chamber Wizard Field A

**ChamberModel = CultecR-150XLHD(CultecRecharger®150XLHD)**
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 2 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

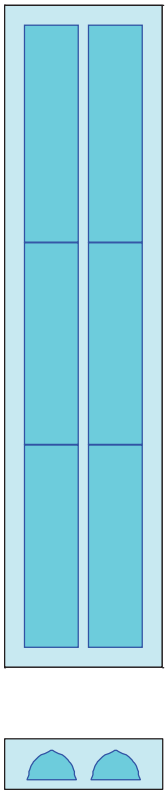
3 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 31.50' Row Length +12.0" End Stone x 2 = 33.50' Base Length
2 Rows x 33.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 8.00' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

6 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 2 Rows = 166.9 cf Chamber Storage

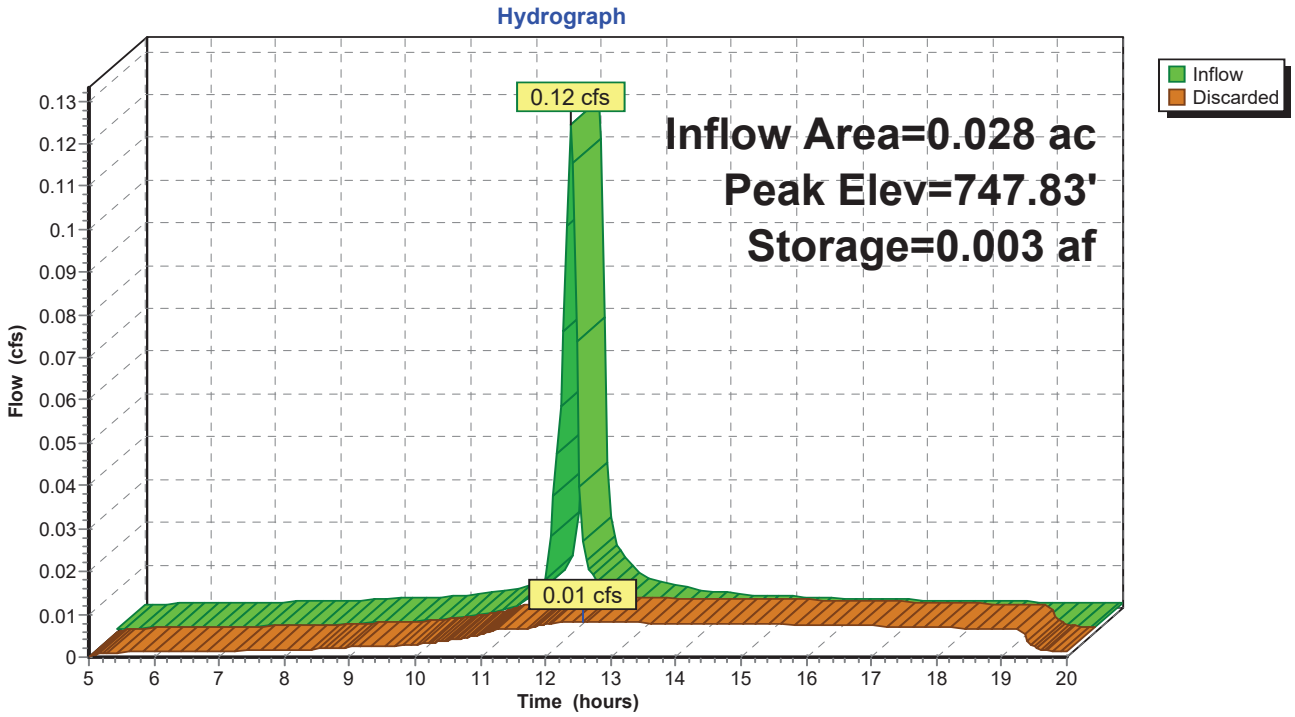
681.2 cf Field - 166.9 cf Chambers = 514.3 cf Stone x 40.0% Voids = 205.7 cf Stone Storage

Chamber Storage + Stone Storage = 372.6 cf = 0.009 af
Overall Storage Efficiency = 54.7%
Overall System Size = 33.50' x 8.00' x 2.54'

6 Chambers
25.2 cy Field
19.0 cy Stone



## Pond 4P: ROOF INFILTRATION



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 1S: 2100 SF ROOF** Runoff Area=2,100 sf 100.00% Impervious Runoff Depth>4.30"
Tc=6.0 min CN=98 Runoff=0.22 cfs 0.017 af

**Subcatchment 4S: 1200 SF ROOF** Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>4.30"
Tc=6.0 min CN=98 Runoff=0.13 cfs 0.010 af

**Subcatchment BYP: BYPASS** Runoff Area=13,628 sf 0.00% Impervious Runoff Depth>1.10"
Flow Length=114' Tc=8.2 min CN=60 Runoff=0.36 cfs 0.029 af

**Subcatchment P1: POST-1P(N)** Runoff Area=5,001 sf 61.03% Impervious Runoff Depth>2.96"
Tc=6.0 min CN=84 Runoff=0.41 cfs 0.028 af

**Subcatchment P2: POST-2P(S)** Runoff Area=6,700 sf 75.10% Impervious Runoff Depth>3.45"
Tc=0.0 min CN=89 Runoff=0.73 cfs 0.044 af

**Reach W: WETLANDS** Inflow=1.12 cfs 0.078 af
Outflow=1.12 cfs 0.078 af

**Pond 1P: POND 1** Peak Elev=749.77' Storage=133 cf Inflow=0.41 cfs 0.028 af
Discarded=0.01 cfs 0.004 af Primary=0.36 cfs 0.023 af Outflow=0.37 cfs 0.027 af

**Pond 2P: POND 2** Peak Elev=748.07' Storage=541 cf Inflow=0.73 cfs 0.044 af
Discarded=0.02 cfs 0.013 af Primary=0.41 cfs 0.027 af Outflow=0.42 cfs 0.040 af

**Pond 3P: ROOF INFILTRATION** Peak Elev=747.11' Storage=0.007 af Inflow=0.22 cfs 0.017 af
Outflow=0.02 cfs 0.015 af

**Pond 4P: ROOF INFILTRATION** Peak Elev=748.23' Storage=0.004 af Inflow=0.13 cfs 0.010 af
Outflow=0.01 cfs 0.008 af

**Total Runoff Area = 0.657 ac Runoff Volume = 0.128 af Average Runoff Depth = 2.35"**
**60.24% Pervious = 0.396 ac 39.76% Impervious = 0.261 ac**

## Summary for Subcatchment 1S: 2100 SF ROOF

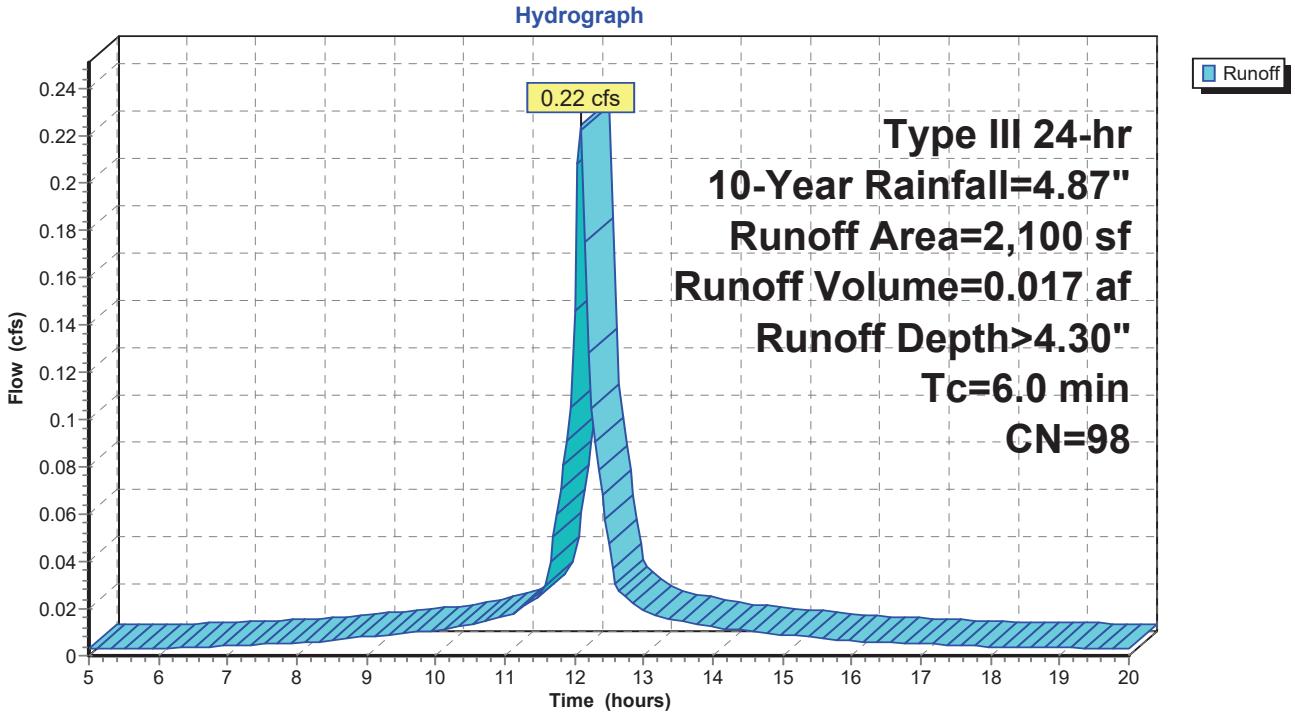
Runoff = 0.22 cfs @ 12.09 hrs, Volume= 0.017 af, Depth> 4.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.87"

| Area (sf) | CN | Description |
|---|---|---|
| 2,100 | 98 | Roofs, HSG B |
| 2,100 | | 100.00% Impervious Area |

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

## Subcatchment 1S: 2100 SF ROOF



## Summary for Subcatchment 4S: 1200 SF ROOF

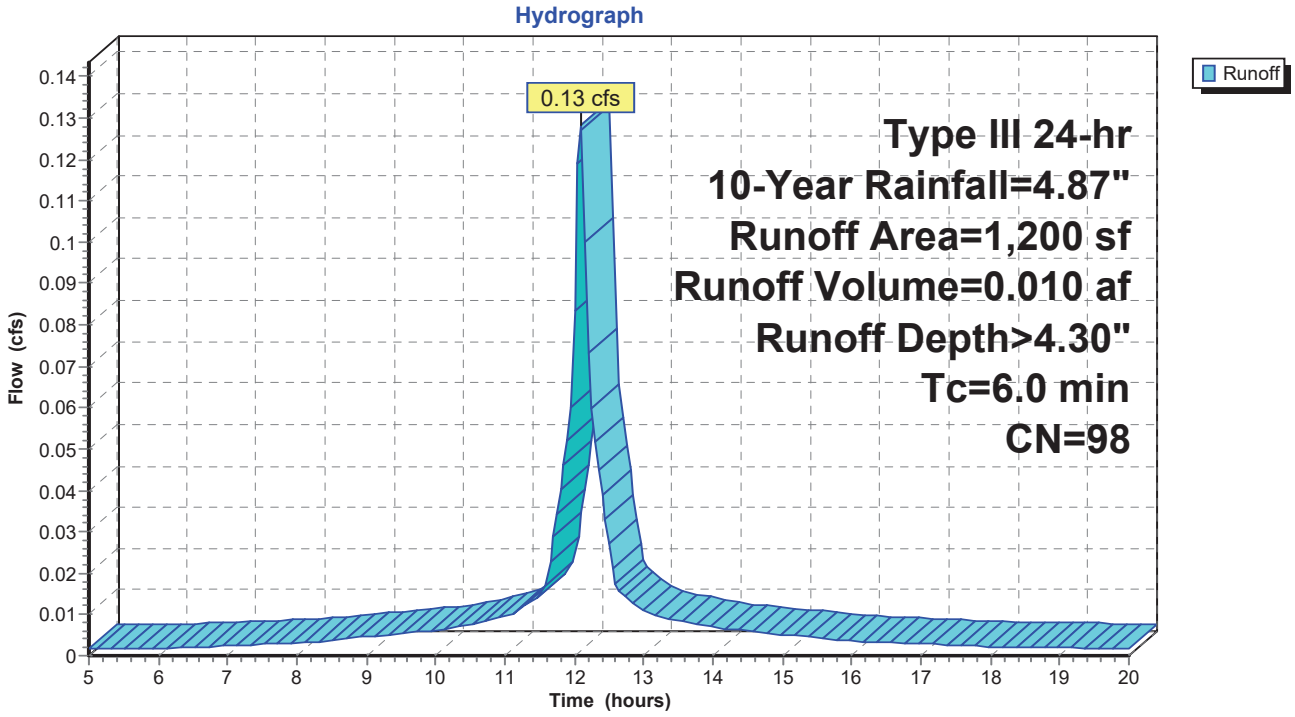
Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.010 af, Depth> 4.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.87"

| Area (sf) | CN | Description |
|---|---|---|
| 1,200 | 98 | Roofs, HSG B |
| 1,200 | | 100.00% Impervious Area |

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

## Subcatchment 4S: 1200 SF ROOF



## Summary for Subcatchment BYP: BYPASS

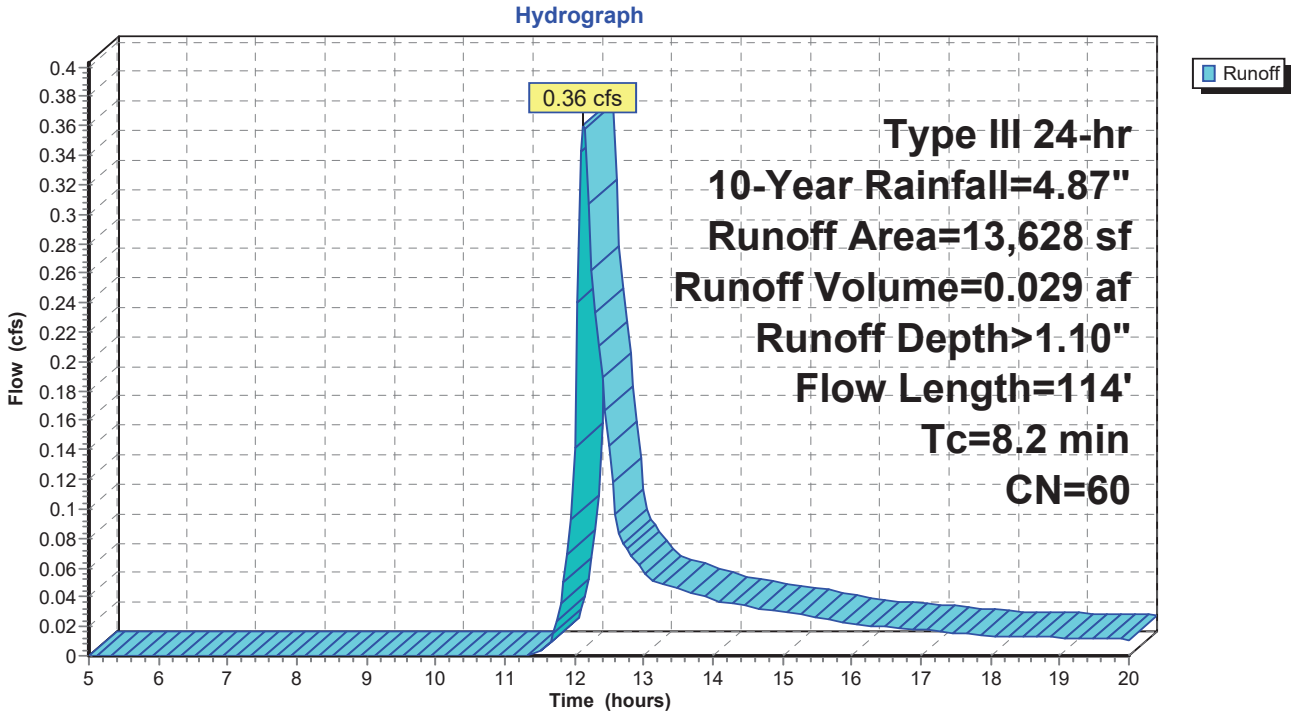
Runoff = 0.36 cfs @ 12.14 hrs, Volume= 0.029 af, Depth> 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.87"

| Area (sf) | CN | Description |
|---|---|---|
| 13,628 | 60 | Woods, Fair, HSG B |
| 13,628 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.0 | 50 | 0.0220 | 0.10 | | **Sheet Flow, SHEET** Grass: Dense n= 0.240 P2= 3.14" |
| 0.2 | 64 | 0.0960 | 4.99 | | **Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps |
| 8.2 | 114 | Total | | | |

## Subcatchment BYP: BYPASS



## Summary for Subcatchment P1: POST-1P(N)

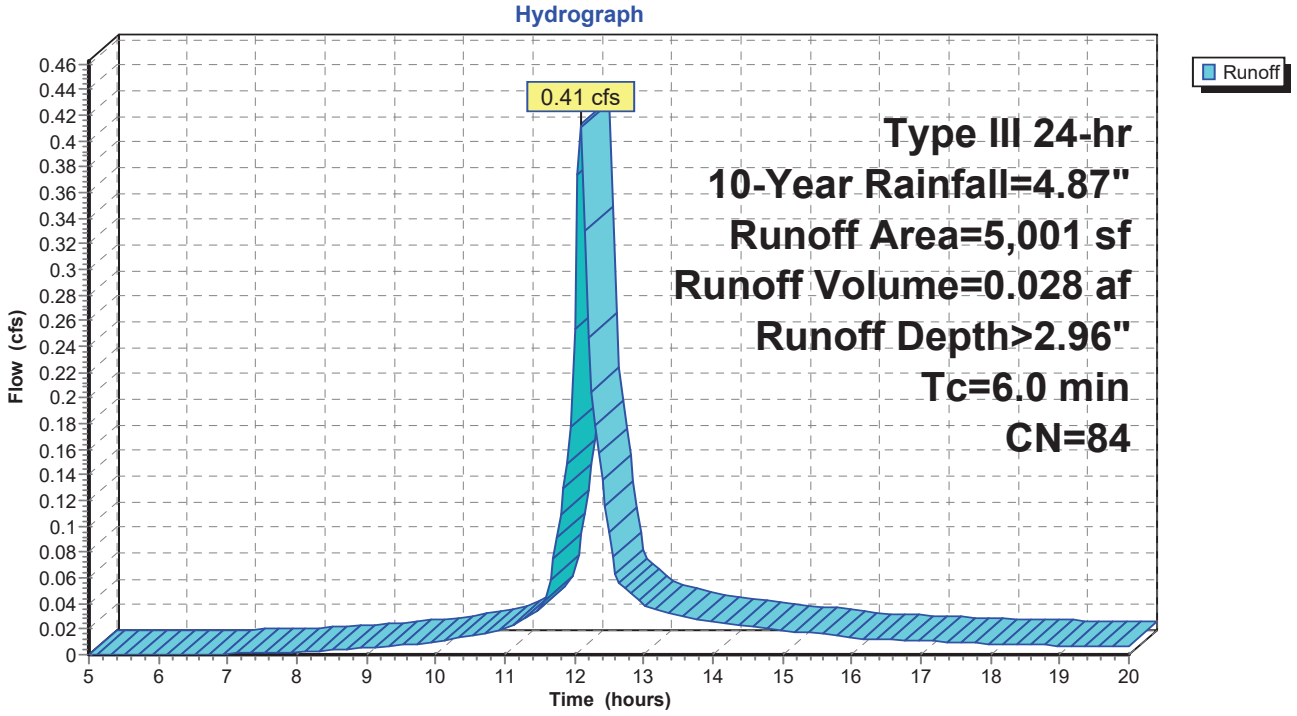
Runoff = 0.41 cfs @ 12.09 hrs, Volume= 0.028 af, Depth> 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.87"

| Area (sf) | CN | Description |
|---|---|---|
| 2,390 | 98 | Paved parking, HSG B |
| 662 | 98 | Water Surface, HSG B |
| 1,949 | 61 | >75% Grass cover, Good, HSG B |
| 5,001 | 84 | Weighted Average |
| 1,949 | | 38.97% Pervious Area |
| 3,052 | | 61.03% Impervious Area |

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

### Subcatchment P1: POST-1P(N)



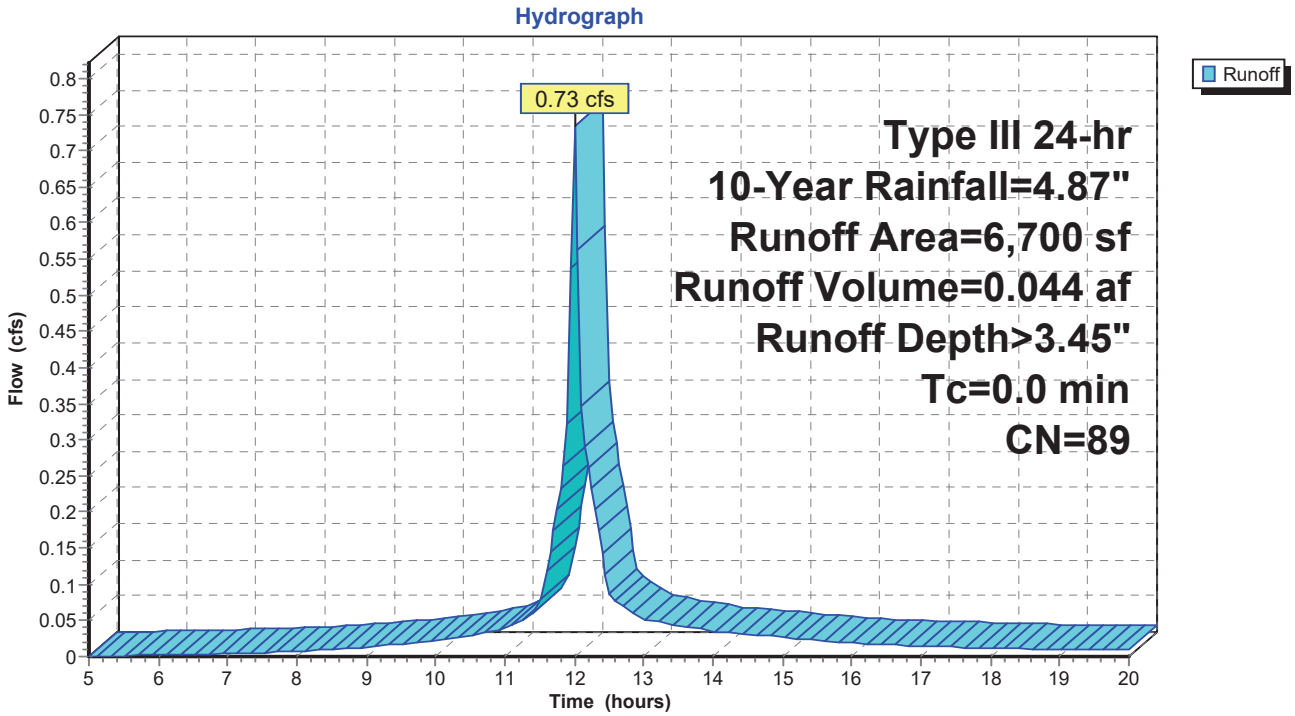
## Summary for Subcatchment P2: POST-2P(S)

Runoff = 0.73 cfs @ 12.00 hrs, Volume= 0.044 af, Depth> 3.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.87"

| Area (sf) | CN | Description |
|---|---|---|
| 3,977 | 98 | Paved parking, HSG B |
| 1,055 | 98 | Water Surface, HSG B |
| 1,668 | 61 | >75% Grass cover, Good, HSG B |
| 6,700 | 89 | Weighted Average |
| 1,668 | | 24.90% Pervious Area |
| 5,032 | | 75.10% Impervious Area |

## Subcatchment P2: POST-2P(S)

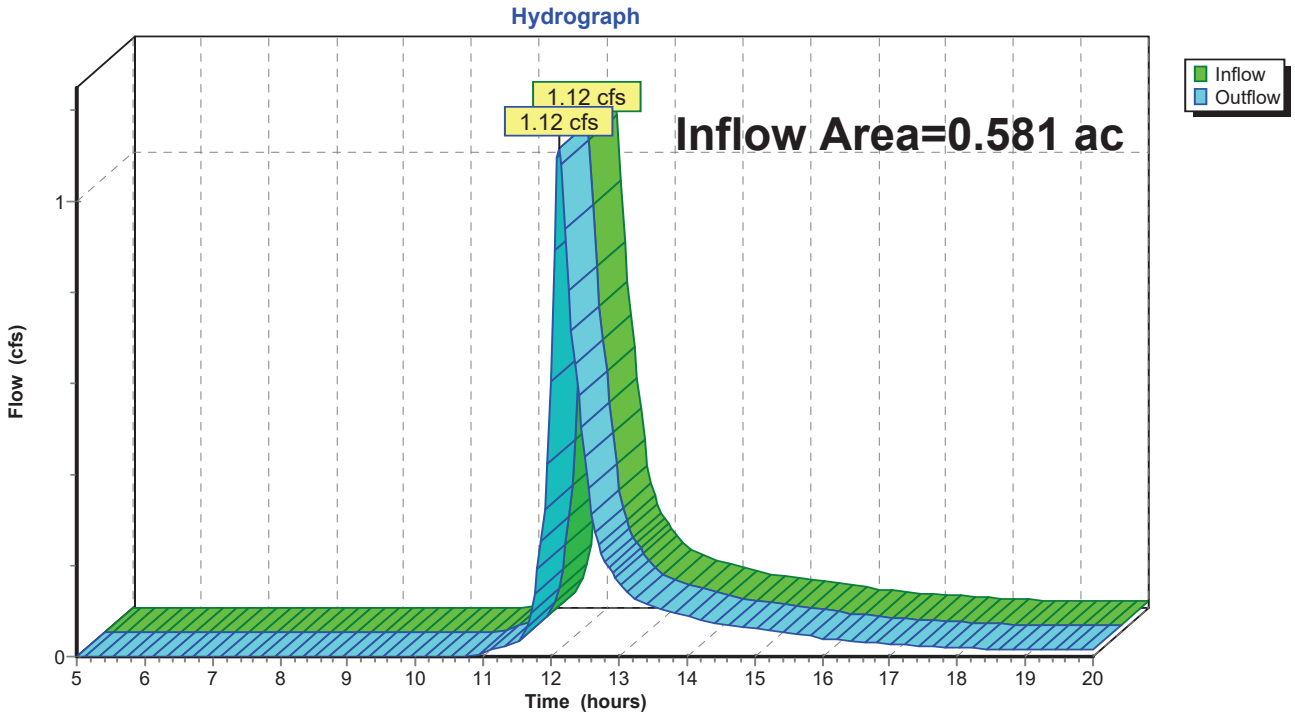


## Summary for Reach W: WETLANDS

Inflow Area = 0.581 ac, 31.92% Impervious, Inflow Depth > 1.61" for 10-Year event
Inflow = 1.12 cfs @ 12.12 hrs, Volume= 0.078 af
Outflow = 1.12 cfs @ 12.12 hrs, Volume= 0.078 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Reach W: WETLANDS



## Summary for Pond 1P: POND 1

Inflow Area = 0.115 ac, 61.03% Impervious, Inflow Depth > 2.96" for 10-Year event
Inflow = 0.41 cfs @ 12.09 hrs, Volume= 0.028 af
Outflow = 0.37 cfs @ 12.13 hrs, Volume= 0.027 af, Atten= 10%, Lag= 2.6 min
Discarded = 0.01 cfs @ 12.13 hrs, Volume= 0.004 af
Primary = 0.36 cfs @ 12.13 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 749.77' @ 12.13 hrs Surf.Area= 250 sf Storage= 133 cf

Plug-Flow detention time=30.2 min calculated for 0.027 af (95% of inflow)
Center-of-Mass det. time=12.7 min ( 791.2 - 778.5 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 749.00' | 665 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

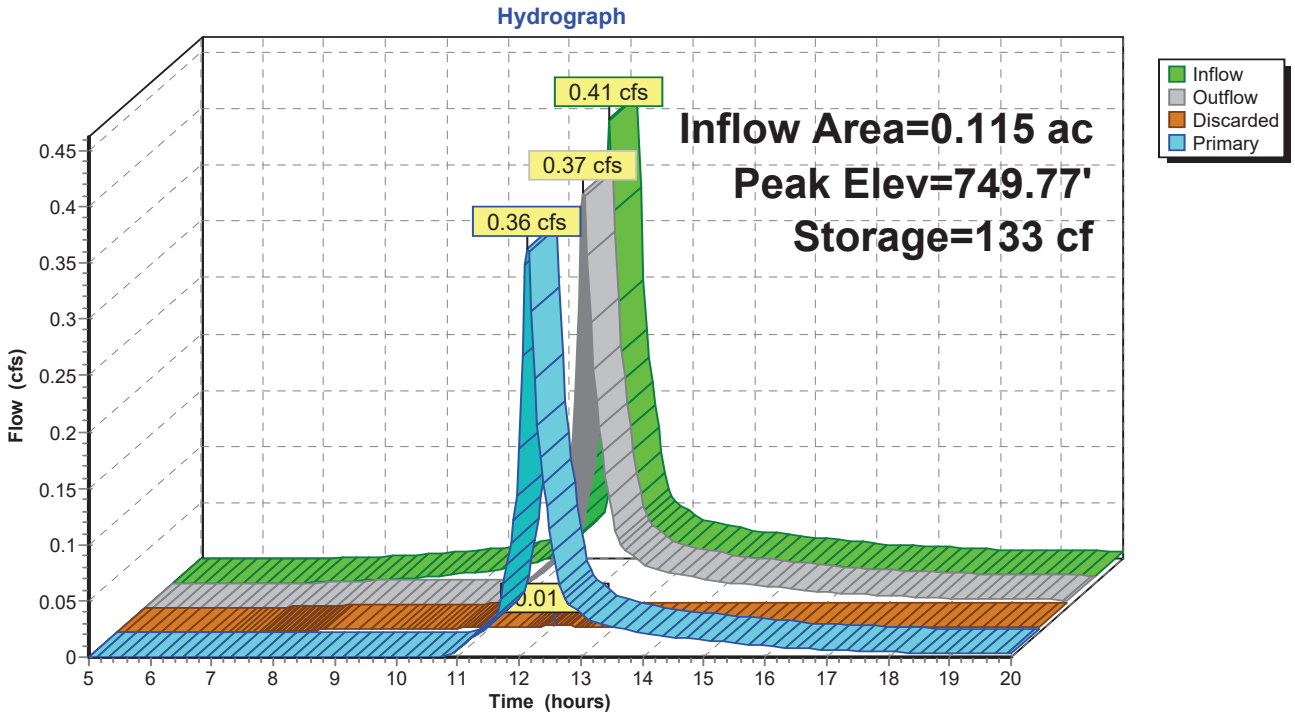
| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 749.00 | 108 | 50.7 | 0 | 0 | 108 |
| 750.00 | 305 | 76.5 | 198 | 198 | 377 |
| 750.50 | 456 | 132.9 | 189 | 387 | 1,318 |
| 751.00 | 662 | 142.3 | 278 | 665 | 1,535 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 749.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 744.00' |
| #2 | Primary | 749.40' | **Custom Weir/Orifice, Cv= 2.62 (C= 3.28)**<br>Head (feet) 0.00 0.50 0.50 1.00<br>Width (feet) 0.50 0.50 0.75 0.75 |

**Discarded OutFlow** Max=0.01 cfs @ 12.13 hrs HW=749.76' (Free Discharge)
↑—**1=Exfiltration** ( Controls 0.01 cfs)

**Primary OutFlow** Max=0.36 cfs @ 12.13 hrs HW=749.76' (Free Discharge)
↑—**2=Custom Weir/Orifice** (Weir Controls 0.36 cfs @ 1.97 fps)

## Pond 1P: POND 1



## Summary for Pond 2P: POND 2

Inflow Area = 0.154 ac, 75.10% Impervious, Inflow Depth > 3.45" for 10-Year event
Inflow = 0.73 cfs @ 12.00 hrs, Volume= 0.044 af
Outflow = 0.42 cfs @ 12.09 hrs, Volume= 0.040 af, Atten= 42%, Lag= 5.4 min
Discarded = 0.02 cfs @ 12.09 hrs, Volume= 0.013 af
Primary = 0.41 cfs @ 12.09 hrs, Volume= 0.027 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 748.07' @ 12.09 hrs Surf.Area= 691 sf Storage= 541 cf

Plug-Flow detention time=66.0 min calculated for 0.040 af (90% of inflow)
Center-of-Mass det. time=32.6 min ( 792.4 - 759.8 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 747.00' | 1,343 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

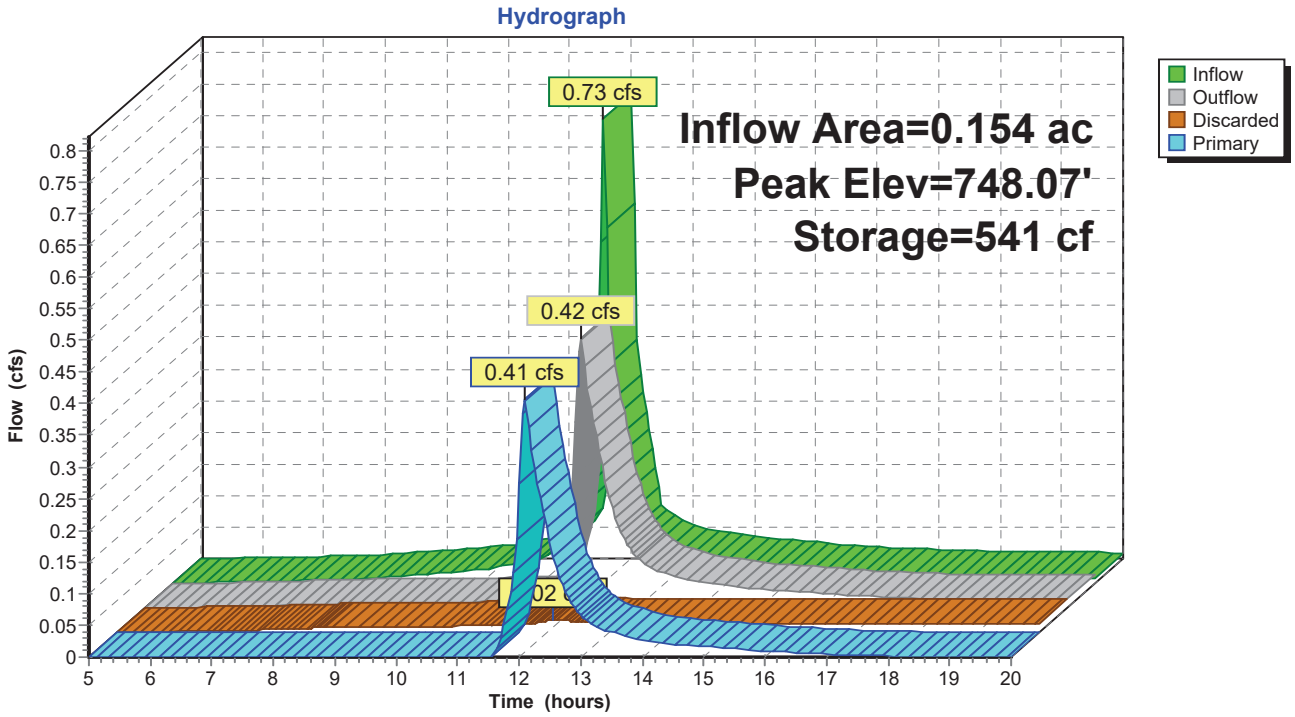
| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 747.00 | 336 | 96.8 | 0 | 0 | 336 |
| 748.00 | 665 | 120.2 | 491 | 491 | 754 |
| 749.00 | 1,054 | 139.0 | 852 | 1,343 | 1,163 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 747.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 743.21' |
| #2 | Primary | 747.50' | **Custom Weir/Orifice, Cv= 2.62 (C= 3.28)**<br>Head (feet) 0.00 0.50 0.50 1.00<br>Width (feet) 0.25 0.25 1.00 1.00 |

**Discarded OutFlow** Max=0.02 cfs @ 12.09 hrs HW=748.07' (Free Discharge)
↑—**1=Exfiltration** ( Controls 0.02 cfs)

**Primary OutFlow** Max=0.40 cfs @ 12.09 hrs HW=748.07' (Free Discharge)
↑—**2=Custom Weir/Orifice** (Weir Controls 0.40 cfs @ 2.04 fps)

## Pond 2P: POND 2



## Summary for Pond 3P: ROOF INFILTRATION

Inflow Area = 0.048 ac, 100.00% Impervious, Inflow Depth > 4.30" for 10-Year event
Inflow = 0.22 cfs @ 12.09 hrs, Volume= 0.017 af
Outflow = 0.02 cfs @ 13.06 hrs, Volume= 0.015 af, Atten= 92%, Lag= 58.6 min
Discarded = 0.02 cfs @ 13.06 hrs, Volume= 0.015 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 747.11' @ 13.06 hrs Surf.Area= 0.011 ac Storage= 0.007 af

Plug-Flow detention time= 150.7 min calculated for 0.015 af (88% of inflow)
Center-of-Mass det. time= 111.5 min ( 846.7 - 735.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 746.00' | 0.008 af | **11.25'W x 43.75'L x 2.54'H Field A**<br>0.029 af Overall - 0.008 af Embedded = 0.021 af x 40.0% Voids |
| #2A | 746.50' | 0.008 af | **Cultec R-150XLHD** x 12 Inside #1<br>Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf<br>Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap<br>Row Length Adjustment= +0.75' x 2.65 sf x 3 rows |
| | | 0.016 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 746.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 743.98' |

**Discarded OutFlow** Max=0.02 cfs @ 13.06 hrs HW=747.11' (Free Discharge)
↑**1=Exfiltration** ( Controls 0.02 cfs)

## Pond 3P: ROOF INFILTRATION - Chamber Wizard Field A

**ChamberModel = CultecR-150XLHD(CultecRecharger®150XLHD)**
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 3 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

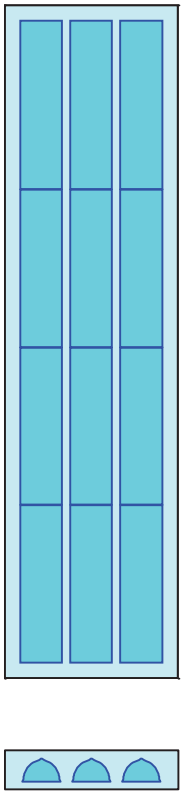
4 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 41.75' Row Length +12.0" End Stone x 2 = 43.75' Base Length
3 Rows x 33.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 11.25' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

12 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 3 Rows = 331.8 cf Chamber Storage

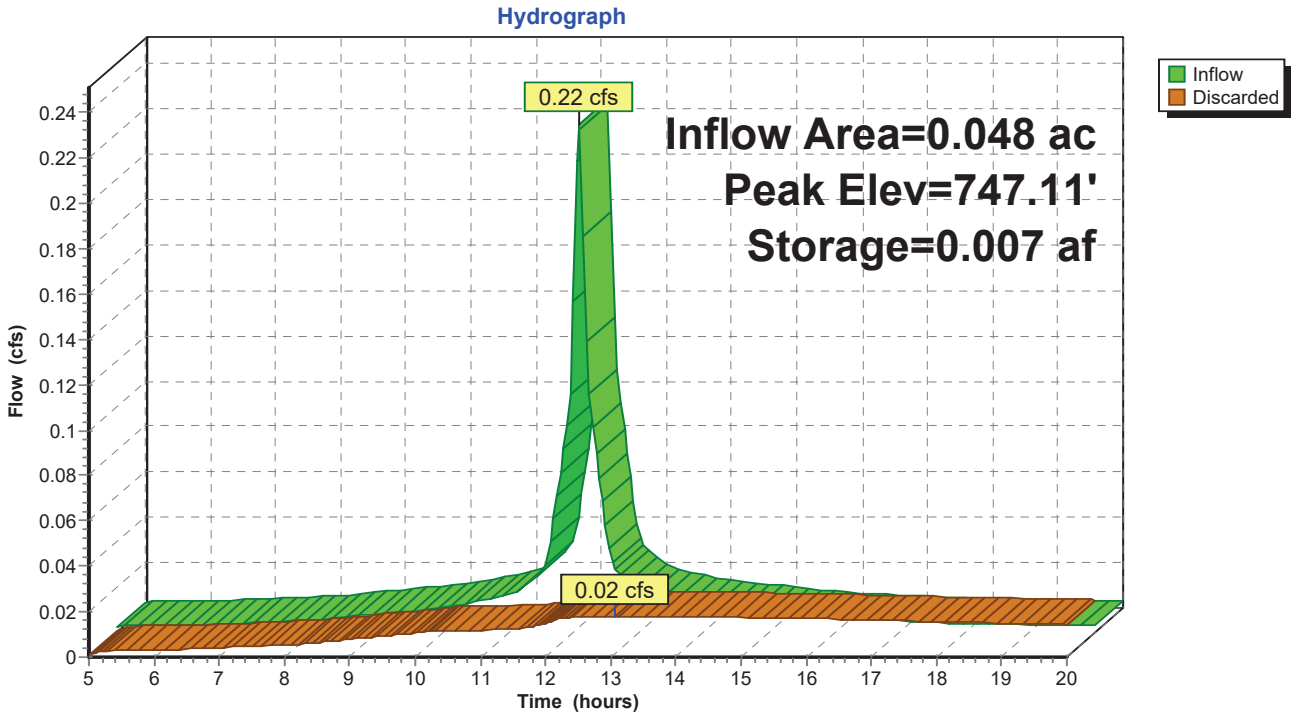
1,251.0 cf Field - 331.8 cf Chambers = 919.2 cf Stone x 40.0% Voids = 367.7 cf Stone Storage

Chamber Storage + Stone Storage = 699.5 cf = 0.016 af
Overall Storage Efficiency = 55.9%
Overall System Size = 43.75' x 11.25' x 2.54'

12 Chambers
46.3 cy Field
34.0 cy Stone



## Pond 3P: ROOF INFILTRATION



## Summary for Pond 4P: ROOF INFILTRATION

Inflow Area = 0.028 ac, 100.00% Impervious, Inflow Depth > 4.30" for 10-Year event
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 0.010 af
Outflow = 0.01 cfs @ 13.38 hrs, Volume= 0.008 af, Atten= 93%, Lag= 77.6 min
Discarded = 0.01 cfs @ 13.38 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 748.23' @ 13.38 hrs Surf.Area= 0.006 ac Storage= 0.004 af

Plug-Flow detention time= 160.2 min calculated for 0.008 af (81% of inflow)
Center-of-Mass det. time= 106.2 min ( 841.5 - 735.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 747.00' | 0.005 af | **8.00'W x 33.50'L x 2.54'H Field A**<br>0.016 af Overall - 0.004 af Embedded = 0.012 af x 40.0% Voids |
| #2A | 747.50' | 0.004 af | **Cultec R-150XLHD** x 6 Inside #1<br>Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf<br>Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap<br>Row Length Adjustment= +0.75' x 2.65 sf x 2 rows |
| | | 0.009 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 747.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 744.00' |

**Discarded OutFlow** Max=0.01 cfs @ 13.38 hrs HW=748.23' (Free Discharge)
↑**1=Exfiltration** ( Controls 0.01 cfs)

## Pond 4P: ROOF INFILTRATION - Chamber Wizard Field A

**ChamberModel = CultecR-150XLHD(CultecRecharger®150XLHD)**
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 2 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

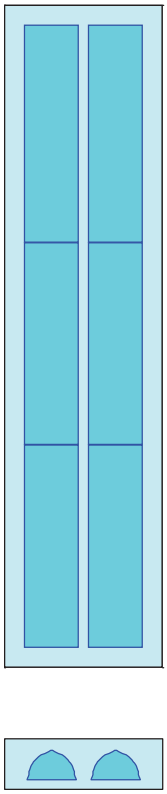
3 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 31.50' Row Length +12.0" End Stone x 2 = 33.50' Base Length
2 Rows x 33.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 8.00' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

6 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 2 Rows = 166.9 cf Chamber Storage

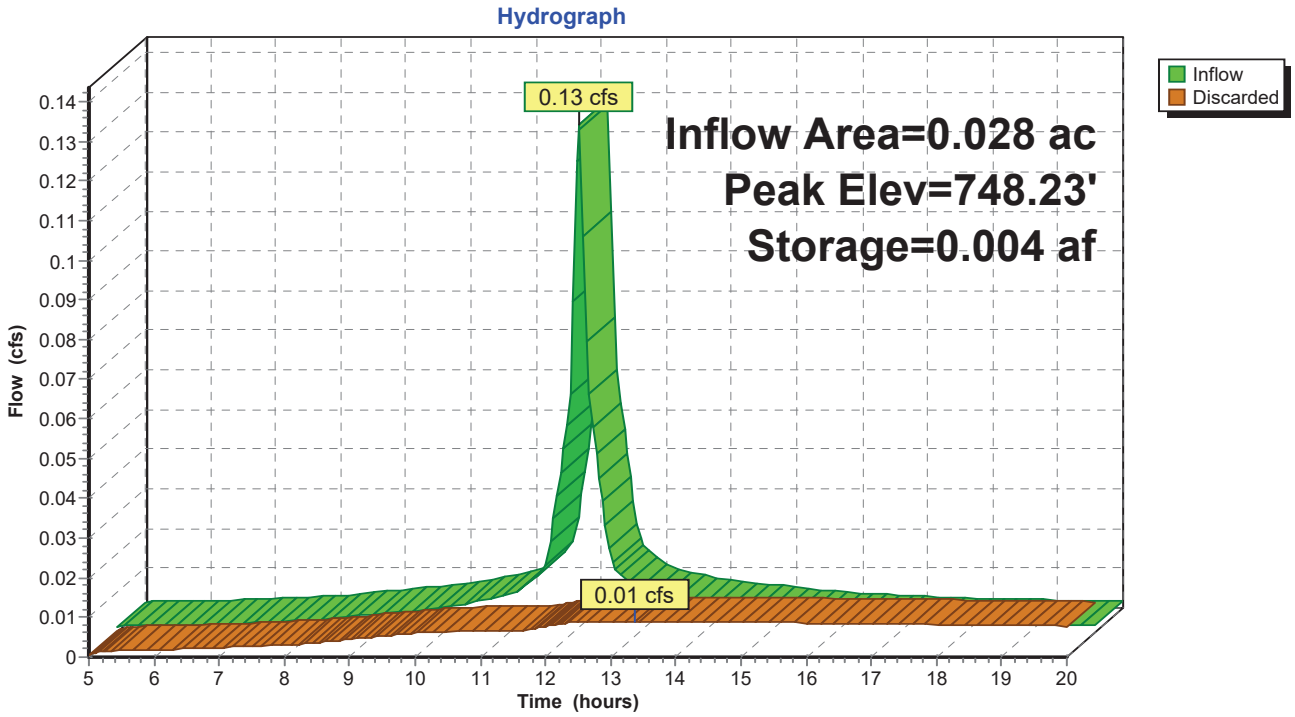
681.2 cf Field - 166.9 cf Chambers = 514.3 cf Stone x 40.0% Voids = 205.7 cf Stone Storage

Chamber Storage + Stone Storage = 372.6 cf = 0.009 af
Overall Storage Efficiency = 54.7%
Overall System Size = 33.50' x 8.00' x 2.54'

6 Chambers
25.2 cy Field
19.0 cy Stone



## Pond 4P: ROOF INFILTRATION



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: 2100 SF ROOF** Runoff Area=2,100 sf 100.00% Impervious Runoff Depth>5.22"
Tc=6.0 min CN=98 Runoff=0.40 cfs 0.021 af

**Subcatchment4S: 1200 SF ROOF** Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>5.22"
Tc=6.0 min CN=98 Runoff=0.23 cfs 0.012 af

**SubcatchmentBYP: BYPASS** Runoff Area=13,628 sf 0.00% Impervious Runoff Depth>1.70"
Flow Length=114' Tc=8.2 min CN=60 Runoff=0.94 cfs 0.044 af

**SubcatchmentP1: POST-1P(N)** Runoff Area=5,001 sf 61.03% Impervious Runoff Depth>3.88"
Tc=6.0 min CN=84 Runoff=0.79 cfs 0.037 af

**SubcatchmentP2: POST-2P(S)** Runoff Area=6,700 sf 75.10% Impervious Runoff Depth>4.40"
Tc=0.0 min CN=89 Runoff=1.35 cfs 0.056 af

**ReachW: WETLANDS** Inflow=2.45 cfs 0.113 af
Outflow=2.45 cfs 0.113 af

**Pond1P: POND1** Peak Elev=749.97' Storage=190 cf Inflow=0.79 cfs 0.037 af
Discarded=0.01 cfs 0.005 af Primary=0.72 cfs 0.031 af Outflow=0.73 cfs 0.036 af

**Pond2P: POND2** Peak Elev=748.30' Storage=708 cf Inflow=1.35 cfs 0.056 af
Discarded=0.02 cfs 0.014 af Primary=0.99 cfs 0.038 af Outflow=1.02 cfs 0.052 af

**Pond3P: ROOF INFILTRATION** Peak Elev=747.48' Storage=0.010 af Inflow=0.40 cfs 0.021 af
Outflow=0.02 cfs 0.017 af

**Pond4P: ROOF INFILTRATION** Peak Elev=748.65' Storage=0.006 af Inflow=0.23 cfs 0.012 af
Outflow=0.01 cfs 0.009 af

**Total Runoff Area = 0.657 ac Runoff Volume = 0.171 af Average Runoff Depth = 3.12"**
**60.24% Pervious = 0.396 ac 39.76% Impervious = 0.261 ac**

## Summary for Subcatchment 1S: 2100 SF ROOF

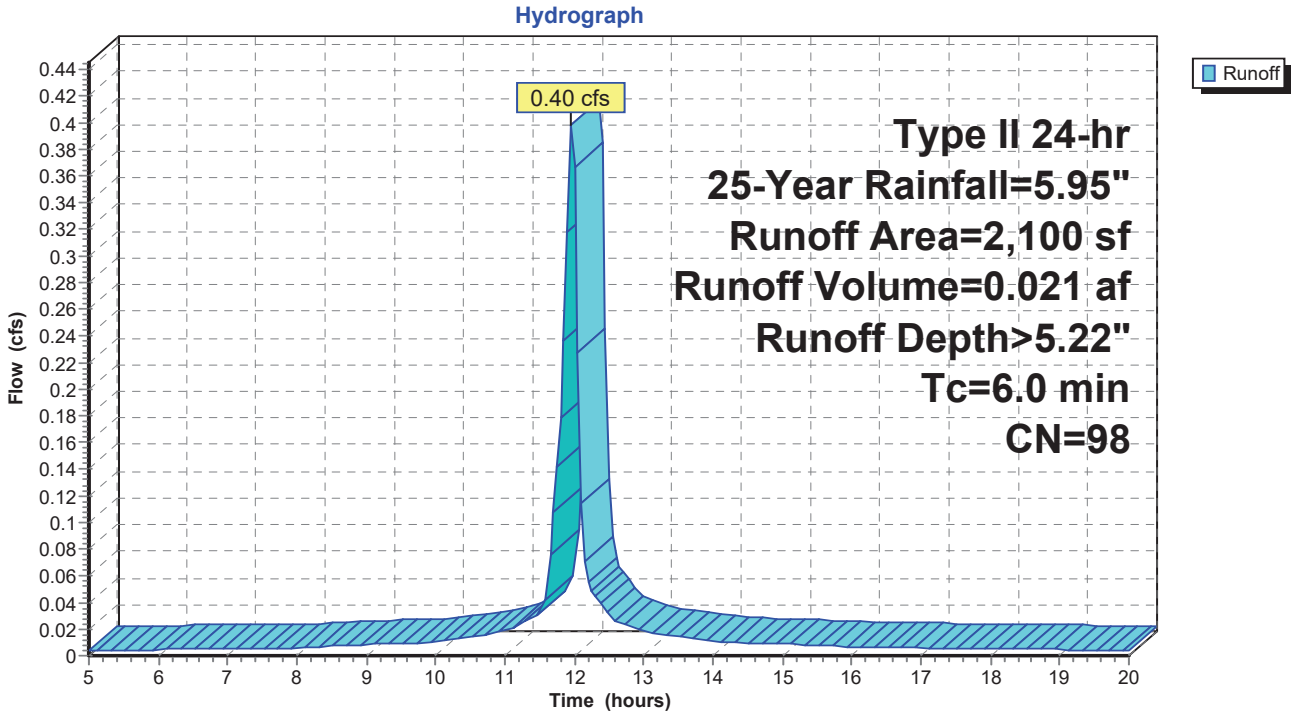
Runoff = 0.40 cfs @ 11.96 hrs, Volume= 0.021 af, Depth> 5.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=5.95"

| Area (sf) | CN | Description |
|---|---|---|
| 2,100 | 98 | Roofs, HSG B |
| 2,100 | | 100.00% Impervious Area |

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

## Subcatchment 1S: 2100 SF ROOF



## Summary for Subcatchment 4S: 1200 SF ROOF

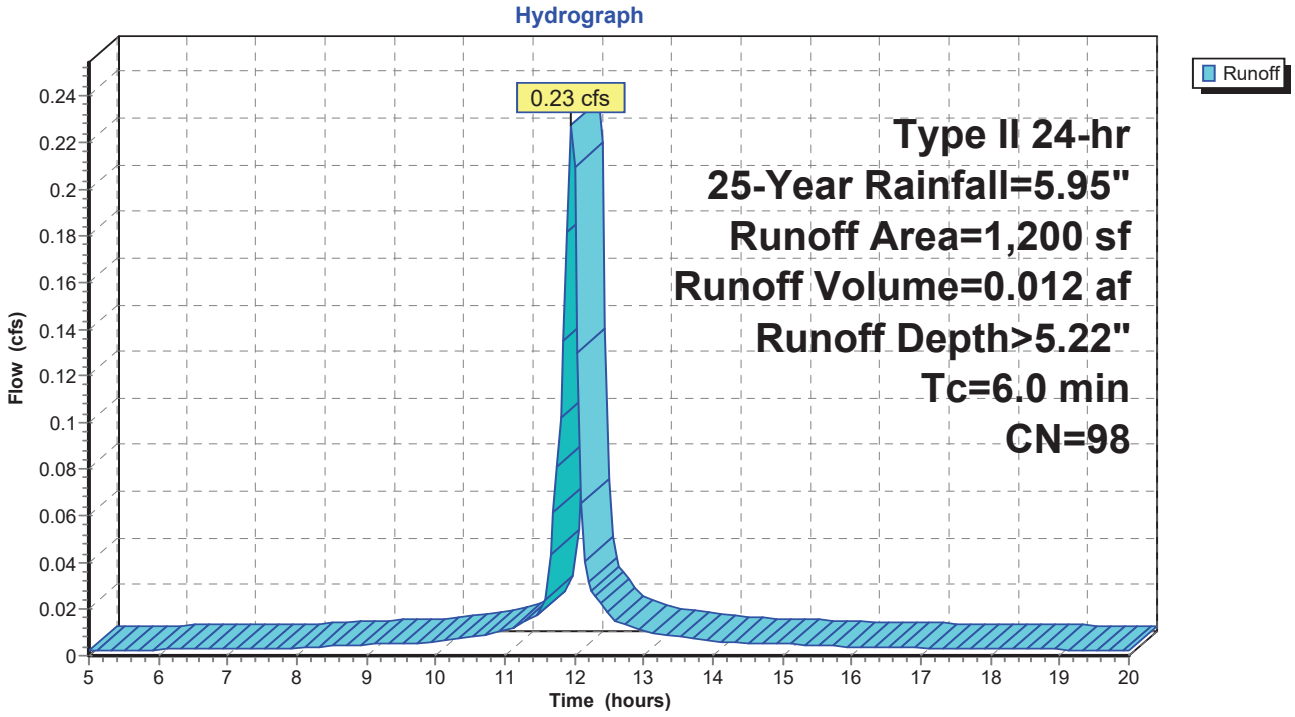
Runoff = 0.23 cfs @ 11.96 hrs, Volume= 0.012 af, Depth> 5.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=5.95"

| Area (sf) | CN | Description |
|---|---|---|
| 1,200 | 98 | Roofs, HSG B |
| 1,200 | | 100.00% Impervious Area |

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

## Subcatchment 4S: 1200 SF ROOF



## Summary for Subcatchment BYP: BYPASS

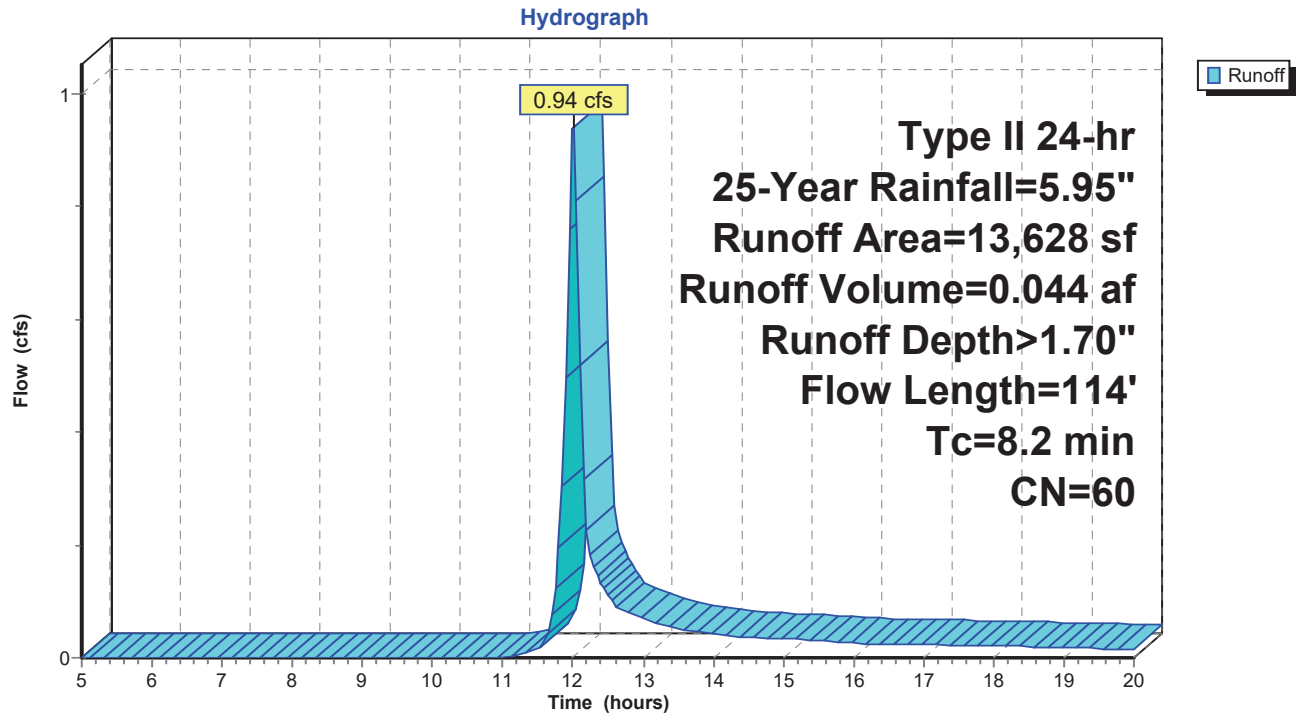
Runoff = 0.94 cfs @ 12.00 hrs, Volume= 0.044 af, Depth> 1.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=5.95"

| Area (sf) | CN | Description |
|---|---|---|
| 13,628 | 60 | Woods, Fair, HSG B |
| 13,628 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.0 | 50 | 0.0220 | 0.10 | | **Sheet Flow, SHEET** Grass: Dense n= 0.240 P2= 3.14" |
| 0.2 | 64 | 0.0960 | 4.99 | | **Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps |
| 8.2 | 114 | Total | | | |

## Subcatchment BYP: BYPASS



## Summary for Subcatchment P1: POST-1P(N)

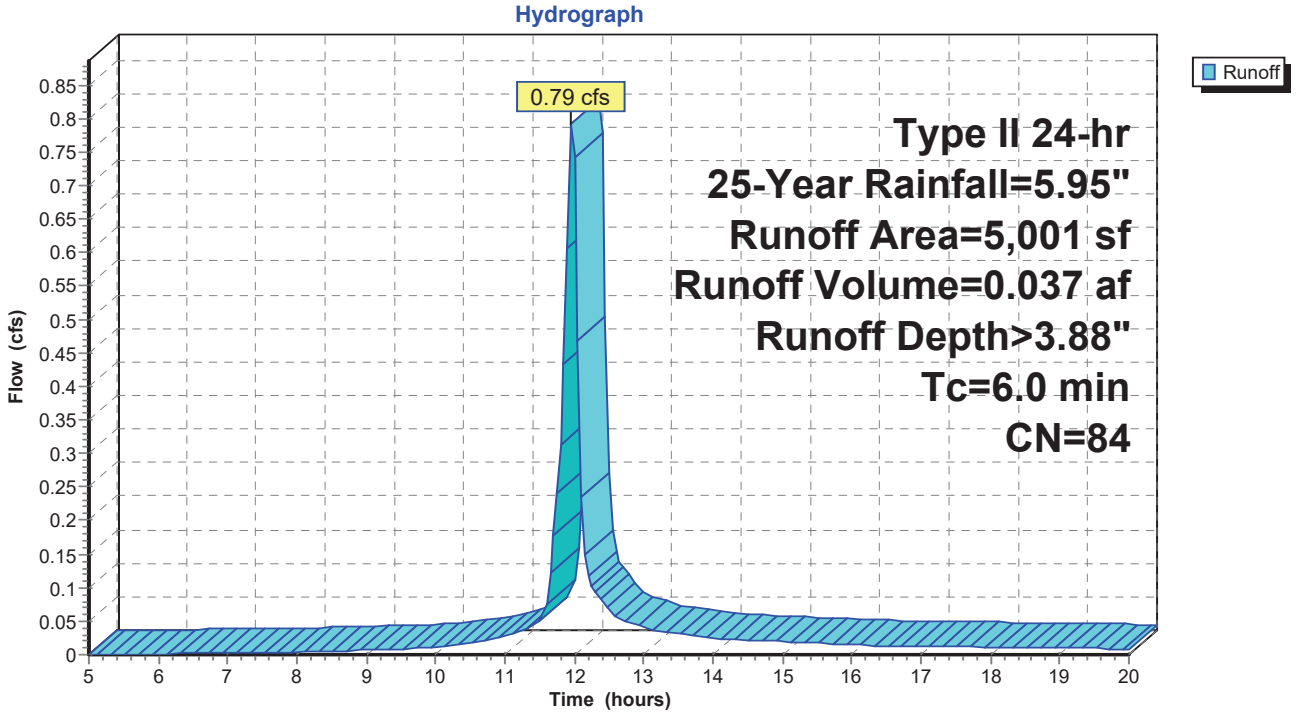
Runoff = 0.79 cfs @ 11.97 hrs, Volume= 0.037 af, Depth> 3.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=5.95"

| Area (sf) | CN | Description |
|---|---|---|
| 2,390 | 98 | Paved parking, HSG B |
| 662 | 98 | Water Surface, HSG B |
| 1,949 | 61 | >75% Grass cover, Good, HSG B |
| 5,001 | 84 | Weighted Average |
| 1,949 | | 38.97% Pervious Area |
| 3,052 | | 61.03% Impervious Area |

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

### Subcatchment P1: POST-1P(N)



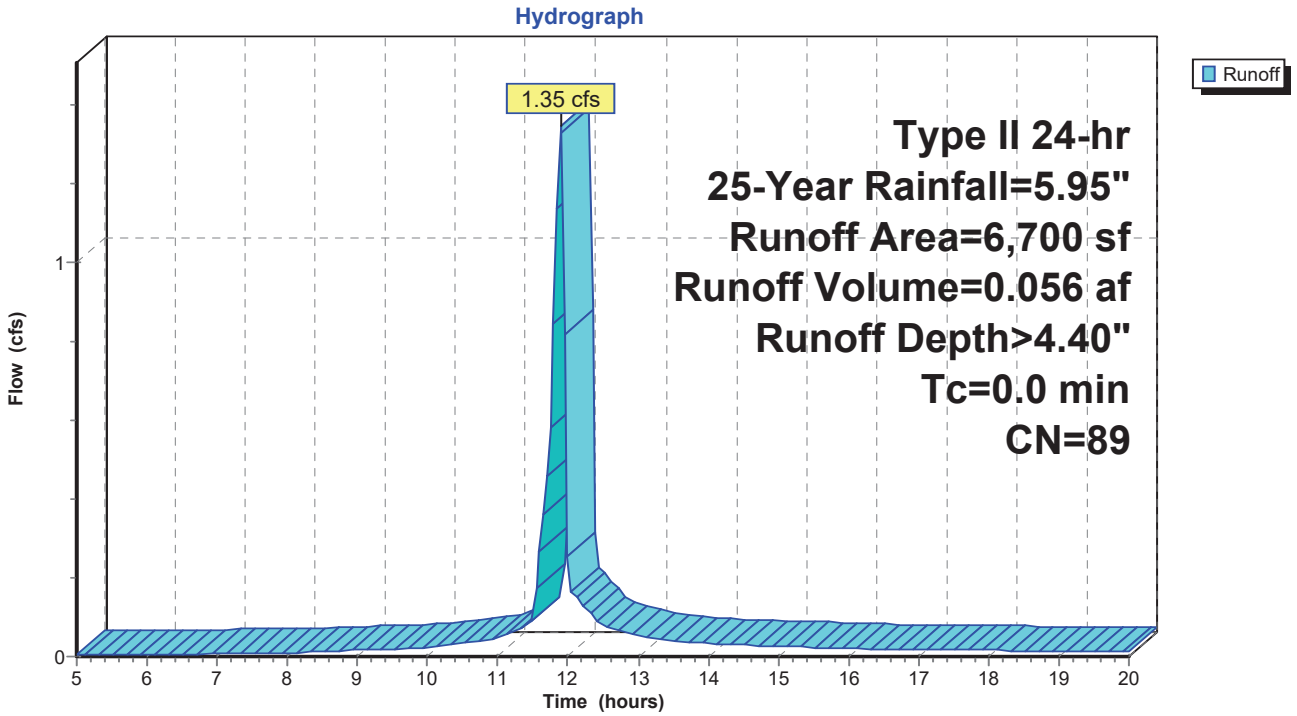
## Summary for Subcatchment P2: POST-2P(S)

Runoff = 1.35 cfs @ 11.89 hrs, Volume= 0.056 af, Depth> 4.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=5.95"

| Area (sf) | CN | Description |
|---|---|---|
| 3,977 | 98 | Paved parking, HSG B |
| 1,055 | 98 | Water Surface, HSG B |
| 1,668 | 61 | >75% Grass cover, Good, HSG B |
| 6,700 | 89 | Weighted Average |
| 1,668 | | 24.90% Pervious Area |
| 5,032 | | 75.10% Impervious Area |

## Subcatchment P2: POST-2P(S)

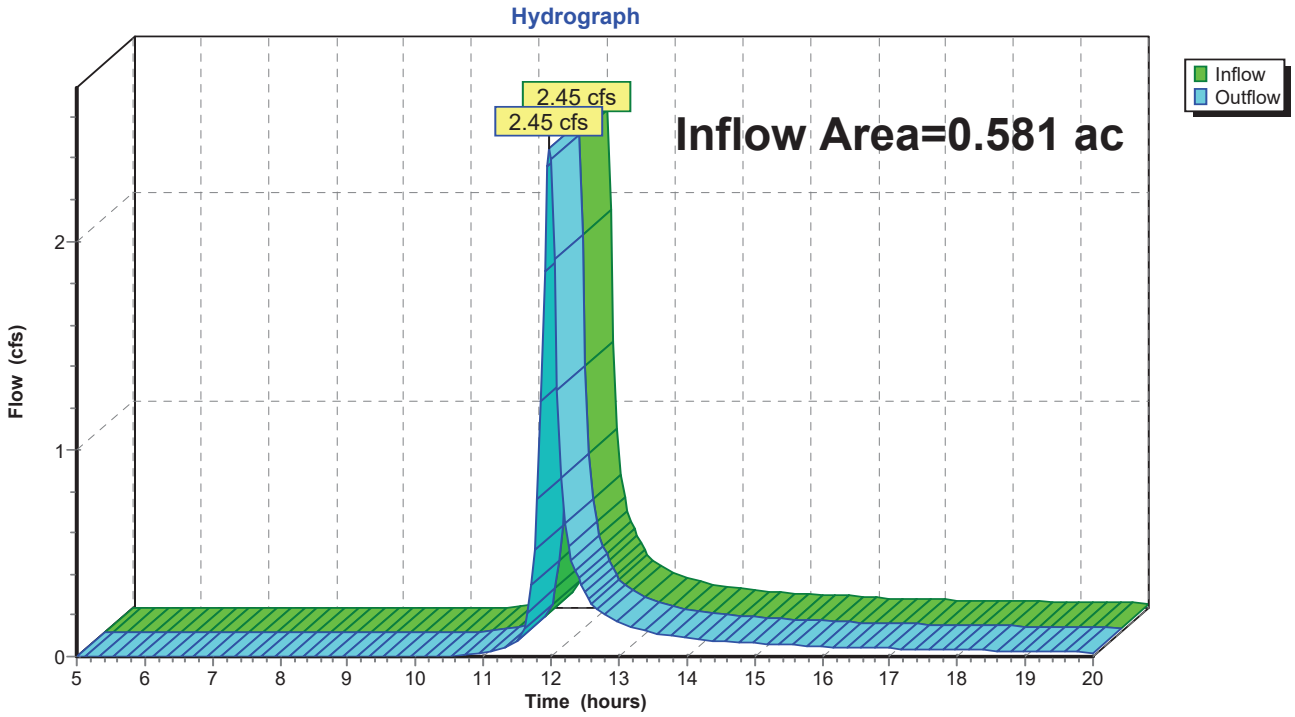


## Summary for Reach W: WETLANDS

Inflow Area = 0.581 ac, 31.92% Impervious, Inflow Depth > 2.33" for 25-Year event
Inflow = 2.45 cfs @ 11.98 hrs, Volume= 0.113 af
Outflow = 2.45 cfs @ 11.98 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

## Reach W: WETLANDS



## Summary for Pond 1P: POND 1

Inflow Area = 0.115 ac, 61.03% Impervious, Inflow Depth > 3.88" for 25-Year event
Inflow = 0.79 cfs @ 11.97 hrs, Volume= 0.037 af
Outflow = 0.73 cfs @ 12.00 hrs, Volume= 0.036 af, Atten= 7%, Lag= 2.0 min
Discarded = 0.01 cfs @ 12.00 hrs, Volume= 0.005 af
Primary = 0.72 cfs @ 12.00 hrs, Volume= 0.031 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 749.97' @ 12.00 hrs Surf.Area= 298 sf Storage= 190 cf

Plug-Flow detention time=25.1 min calculated for 0.036 af (96% of inflow)
Center-of-Mass det. time=10.7 min ( 775.1 - 764.4 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 749.00' | 665 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

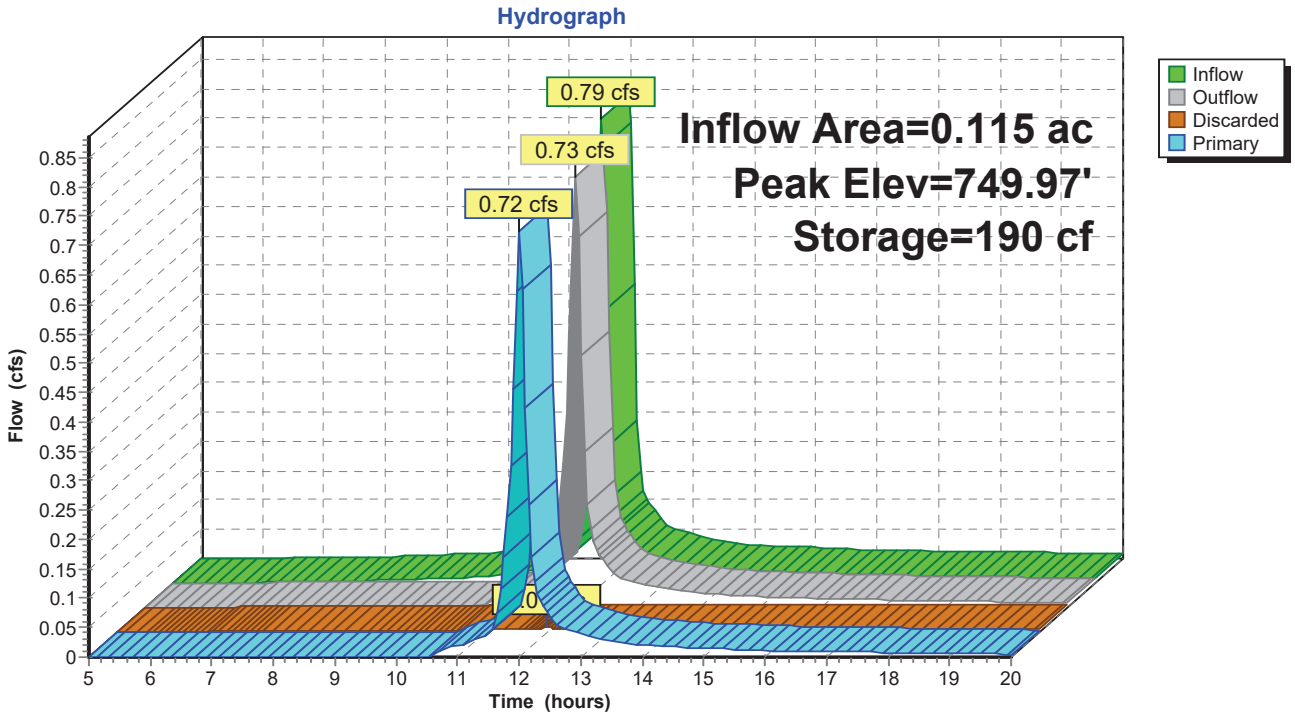
| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 749.00 | 108 | 50.7 | 0 | 0 | 108 |
| 750.00 | 305 | 76.5 | 198 | 198 | 377 |
| 750.50 | 456 | 132.9 | 189 | 387 | 1,318 |
| 751.00 | 662 | 142.3 | 278 | 665 | 1,535 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 749.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 744.00' |
| #2 | Primary | 749.40' | **Custom Weir/Orifice, Cv= 2.62 (C= 3.28)**<br>Head (feet) 0.00 0.50 0.50 1.00<br>Width (feet) 0.50 0.50 0.75 0.75 |

**Discarded OutFlow** Max=0.01 cfs @ 12.00 hrs HW=749.97' (Free Discharge)
↑—**1=Exfiltration** ( Controls 0.01 cfs)

**Primary OutFlow** Max=0.72 cfs @ 12.00 hrs HW=749.97' (Free Discharge)
↑—**2=Custom Weir/Orifice** (Weir Controls 0.72 cfs @ 2.38 fps)

## Pond 1P: POND 1



## Summary for Pond 2P: POND 2

Inflow Area = 0.154 ac, 75.10% Impervious, Inflow Depth > 4.40" for 25-Year event
Inflow = 1.35 cfs @ 11.89 hrs, Volume= 0.056 af
Outflow = 1.02 cfs @ 11.94 hrs, Volume= 0.052 af, Atten= 25%, Lag= 2.9 min
Discarded = 0.02 cfs @ 11.94 hrs, Volume= 0.014 af
Primary = 0.99 cfs @ 11.94 hrs, Volume= 0.038 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 748.30' @ 11.94 hrs Surf.Area= 773 sf Storage= 708 cf

Plug-Flow detention time=55.5 min calculated for 0.051 af (91% of inflow)
Center-of-Mass det. time=25.2 min ( 772.6 - 747.4 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 747.00' | 1,343 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

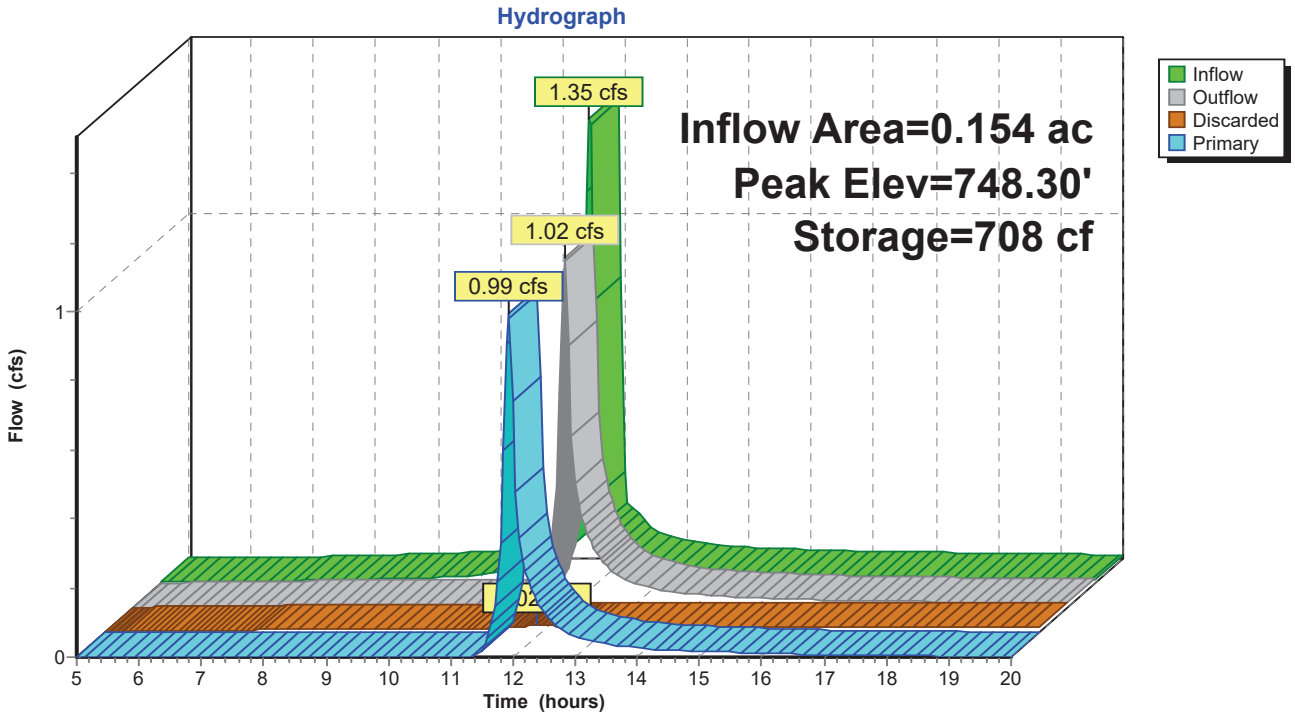
| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 747.00 | 336 | 96.8 | 0 | 0 | 336 |
| 748.00 | 665 | 120.2 | 491 | 491 | 754 |
| 749.00 | 1,054 | 139.0 | 852 | 1,343 | 1,163 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 747.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 743.21' |
| #2 | Primary | 747.50' | **Custom Weir/Orifice, Cv= 2.62 (C= 3.28)**<br>Head (feet) 0.00 0.50 0.50 1.00<br>Width (feet) 0.25 0.25 1.00 1.00 |

**Discarded OutFlow** Max=0.02 cfs @ 11.94 hrs HW=748.29' (Free Discharge)
↑—**1=Exfiltration** ( Controls 0.02 cfs)

**Primary OutFlow** Max=0.96 cfs @ 11.94 hrs HW=748.29' (Free Discharge)
↑—**2=Custom Weir/Orifice** (Weir Controls 0.96 cfs @ 2.31 fps)

## Pond 2P: POND 2



## Summary for Pond 3P: ROOF INFILTRATION

Inflow Area = 0.048 ac, 100.00% Impervious, Inflow Depth > 5.22" for 25-Year event
Inflow = 0.40 cfs @ 11.96 hrs, Volume= 0.021 af
Outflow = 0.02 cfs @ 12.92 hrs, Volume= 0.017 af, Atten= 95%, Lag= 57.8 min
Discarded = 0.02 cfs @ 12.92 hrs, Volume= 0.017 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 747.48' @ 12.92 hrs Surf.Area= 0.011 ac Storage= 0.010 af

Plug-Flow detention time= 169.8 min calculated for 0.017 af (79% of inflow)
Center-of-Mass det. time= 115.2 min ( 844.4 - 729.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 746.00' | 0.008 af | **11.25'W x 43.75'L x 2.54'H Field A**<br>0.029 af Overall - 0.008 af Embedded = 0.021 af x 40.0% Voids |
| #2A | 746.50' | 0.008 af | **Cultec R-150XLHD** x 12 Inside #1<br>Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf<br>Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap<br>Row Length Adjustment= +0.75' x 2.65 sf x 3 rows |
| | | 0.016 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 746.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 743.98' |

**Discarded OutFlow** Max=0.02 cfs @ 12.92 hrs HW=747.48' (Free Discharge)
↑**1=Exfiltration** ( Controls 0.02 cfs)

## Pond 3P: ROOF INFILTRATION - Chamber Wizard Field A

**ChamberModel = CultecR-150XLHD(CultecRecharger®150XLHD)**
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 3 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

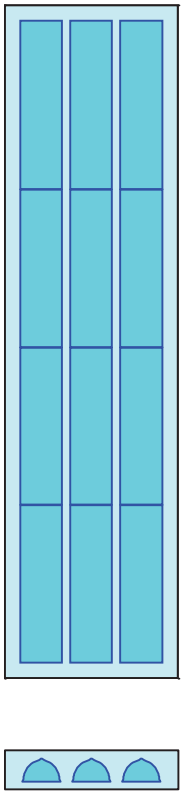
4 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 41.75' Row Length +12.0" End Stone x 2 = 43.75' Base Length
3 Rows x 33.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 11.25' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

12 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 3 Rows = 331.8 cf Chamber Storage

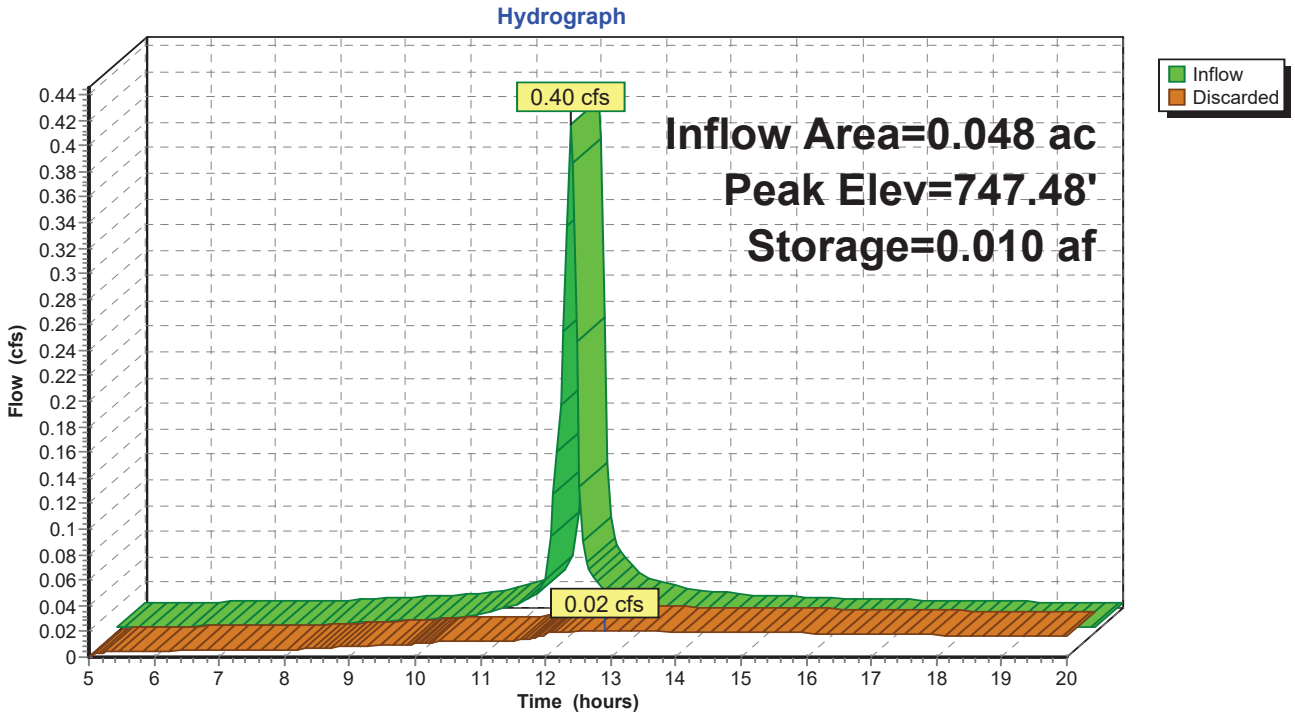
1,251.0 cf Field - 331.8 cf Chambers = 919.2 cf Stone x 40.0% Voids = 367.7 cf Stone Storage

Chamber Storage + Stone Storage = 699.5 cf = 0.016 af
Overall Storage Efficiency = 55.9%
Overall System Size = 43.75' x 11.25' x 2.54'

12 Chambers
46.3 cy Field
34.0 cy Stone



## Pond 3P: ROOF INFILTRATION



## Summary for Pond 4P: ROOF INFILTRATION

Inflow Area = 0.028 ac, 100.00% Impervious, Inflow Depth > 5.22" for 25-Year event
Inflow = 0.23 cfs @ 11.96 hrs, Volume= 0.012 af
Outflow = 0.01 cfs @ 13.15 hrs, Volume= 0.009 af, Atten= 96%, Lag= 71.5 min
Discarded = 0.01 cfs @ 13.15 hrs, Volume= 0.009 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 748.65' @ 13.15 hrs Surf.Area= 0.006 ac Storage= 0.006 af

Plug-Flow detention time= 173.4 min calculated for 0.009 af (72% of inflow)
Center-of-Mass det. time= 108.9 min ( 838.2 - 729.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 747.00' | 0.005 af | **8.00'W x 33.50'L x 2.54'H Field A**<br>0.016 af Overall - 0.004 af Embedded = 0.012 af x 40.0% Voids |
| #2A | 747.50' | 0.004 af | **Cultec R-150XLHD** x 6 Inside #1<br>Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf<br>Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap<br>Row Length Adjustment= +0.75' x 2.65 sf x 2 rows |
| | | 0.009 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 747.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 744.00' |

**Discarded OutFlow** Max=0.01 cfs @ 13.15 hrs HW=748.65' (Free Discharge)
↑**1=Exfiltration** ( Controls 0.01 cfs)

## Pond 4P: ROOF INFILTRATION - Chamber Wizard Field A

**ChamberModel = CultecR-150XLHD(CultecRecharger®150XLHD)**
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 2 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

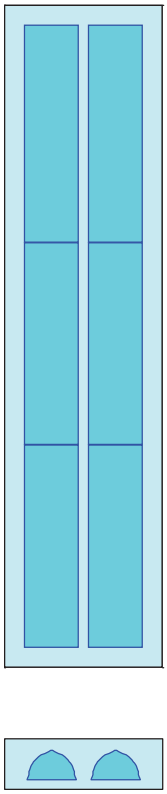
3 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 31.50' Row Length +12.0" End Stone x 2 = 33.50' Base Length
2 Rows x 33.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 8.00' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

6 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 2 Rows = 166.9 cf Chamber Storage

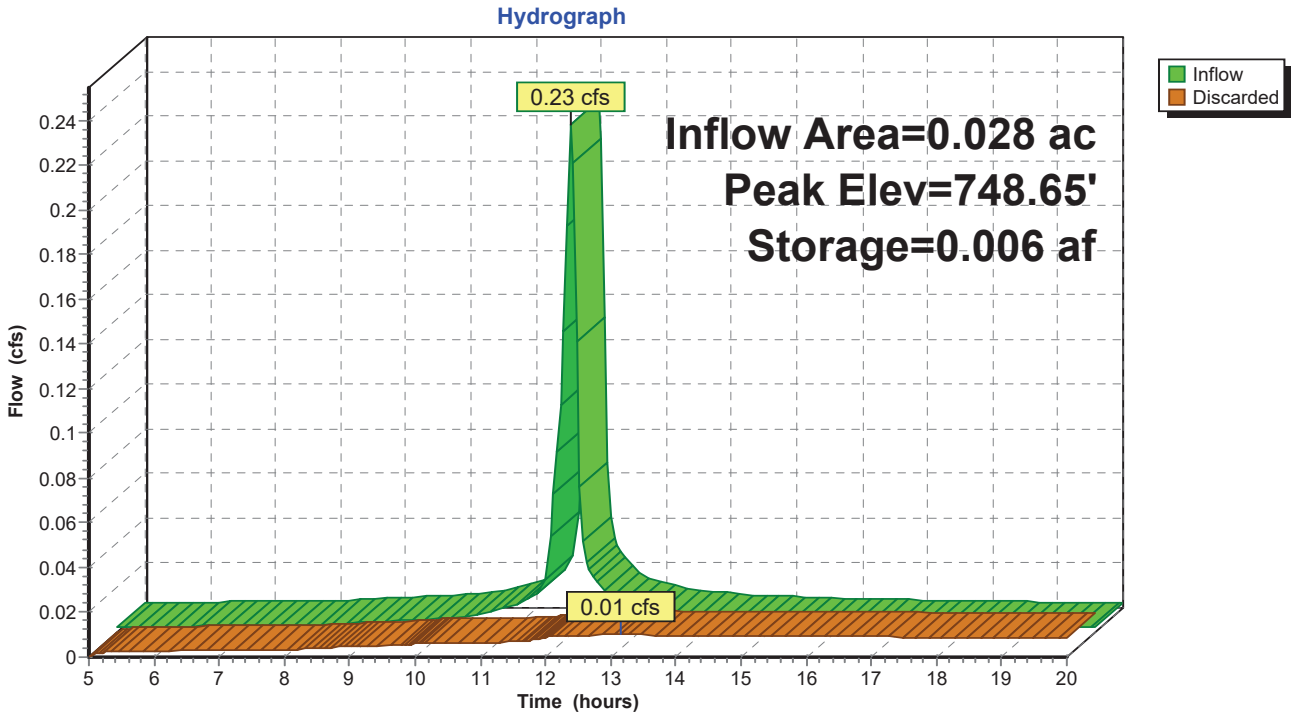
681.2 cf Field - 166.9 cf Chambers = 514.3 cf Stone x 40.0% Voids = 205.7 cf Stone Storage

Chamber Storage + Stone Storage = 372.6 cf = 0.009 af
Overall Storage Efficiency = 54.7%
Overall System Size = 33.50' x 8.00' x 2.54'

6 Chambers
25.2 cy Field
19.0 cy Stone



## Pond 4P: ROOF INFILTRATION



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 1S: 2100 SF ROOF** Runoff Area=2,100 sf 100.00% Impervious Runoff Depth>6.80"
Tc=6.0 min CN=98 Runoff=0.35 cfs 0.027 af

**Subcatchment 4S: 1200 SF ROOF** Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>6.80"
Tc=6.0 min CN=98 Runoff=0.20 cfs 0.016 af

**Subcatchment BYP: BYPASS** Runoff Area=13,628 sf 0.00% Impervious Runoff Depth>2.81"
Flow Length=114' Tc=8.2 min CN=60 Runoff=1.00 cfs 0.073 af

**Subcatchment P1: POST-1P(N)** Runoff Area=5,001 sf 61.03% Impervious Runoff Depth>5.41"
Tc=6.0 min CN=84 Runoff=0.73 cfs 0.052 af

**Subcatchment P2: POST-2P(S)** Runoff Area=6,700 sf 75.10% Impervious Runoff Depth>5.97"
Tc=0.0 min CN=89 Runoff=1.23 cfs 0.077 af

**Reach W: WETLANDS** Inflow=2.43 cfs 0.175 af
Outflow=2.43 cfs 0.175 af

**Pond 1P: POND 1** Peak Elev=749.94' Storage=181 cf Inflow=0.73 cfs 0.052 af
Discarded=0.01 cfs 0.005 af Primary=0.66 cfs 0.045 af Outflow=0.66 cfs 0.050 af

**Pond 2P: POND 2** Peak Elev=748.27' Storage=686 cf Inflow=1.23 cfs 0.077 af
Discarded=0.02 cfs 0.015 af Primary=0.91 cfs 0.056 af Outflow=0.93 cfs 0.072 af

**Pond 3P: ROOF INFILTRATION** Peak Elev=747.99' Storage=0.014 af Inflow=0.35 cfs 0.027 af
Outflow=0.02 cfs 0.020 af

**Pond 4P: ROOF INFILTRATION** Peak Elev=749.38' Storage=0.008 af Inflow=0.20 cfs 0.016 af
Outflow=0.01 cfs 0.010 af

**Total Runoff Area = 0.657 ac Runoff Volume = 0.244 af Average Runoff Depth = 4.46"**
**60.24% Pervious = 0.396 ac 39.76% Impervious = 0.261 ac**

## Summary for Subcatchment 1S: 2100 SF ROOF

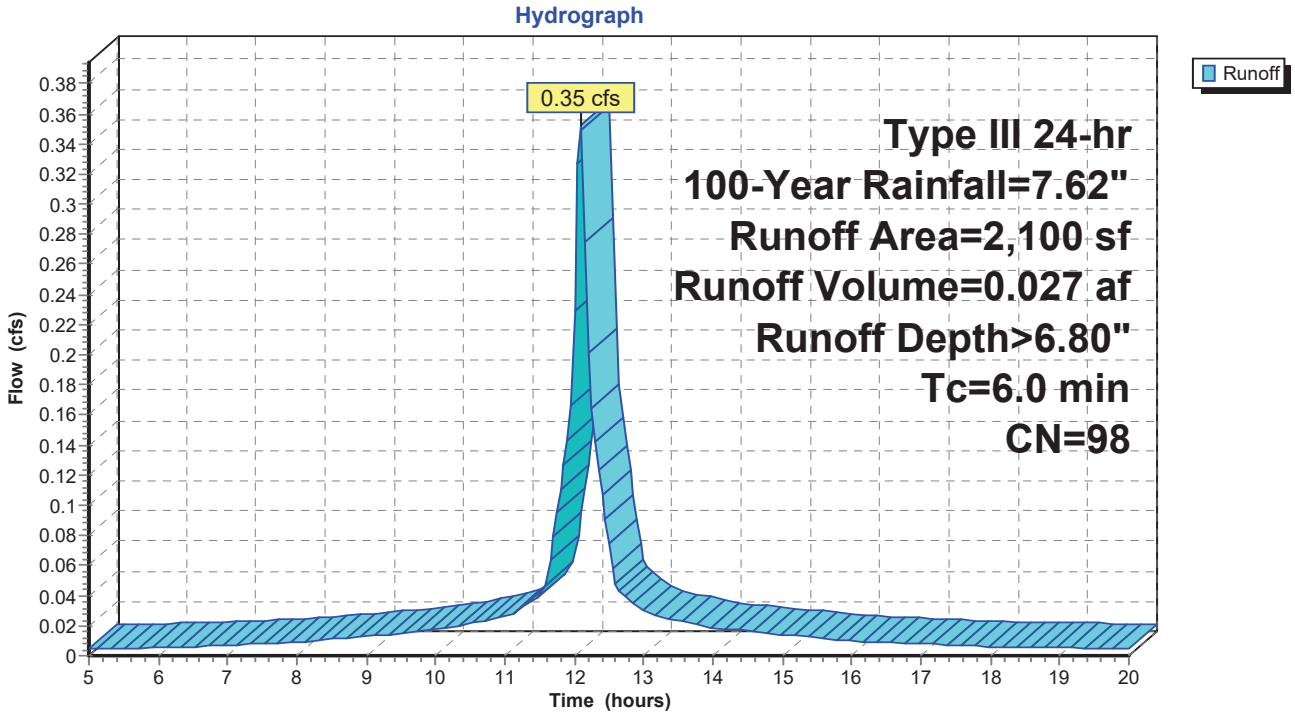
Runoff = 0.35 cfs @ 12.09 hrs, Volume= 0.027 af, Depth> 6.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.62"

| Area (sf) | CN | Description |
|---|---|---|
| 2,100 | 98 | Roofs, HSG B |
| 2,100 | | 100.00% Impervious Area |

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

### Subcatchment 1S: 2100 SF ROOF



## Summary for Subcatchment 4S: 1200 SF ROOF

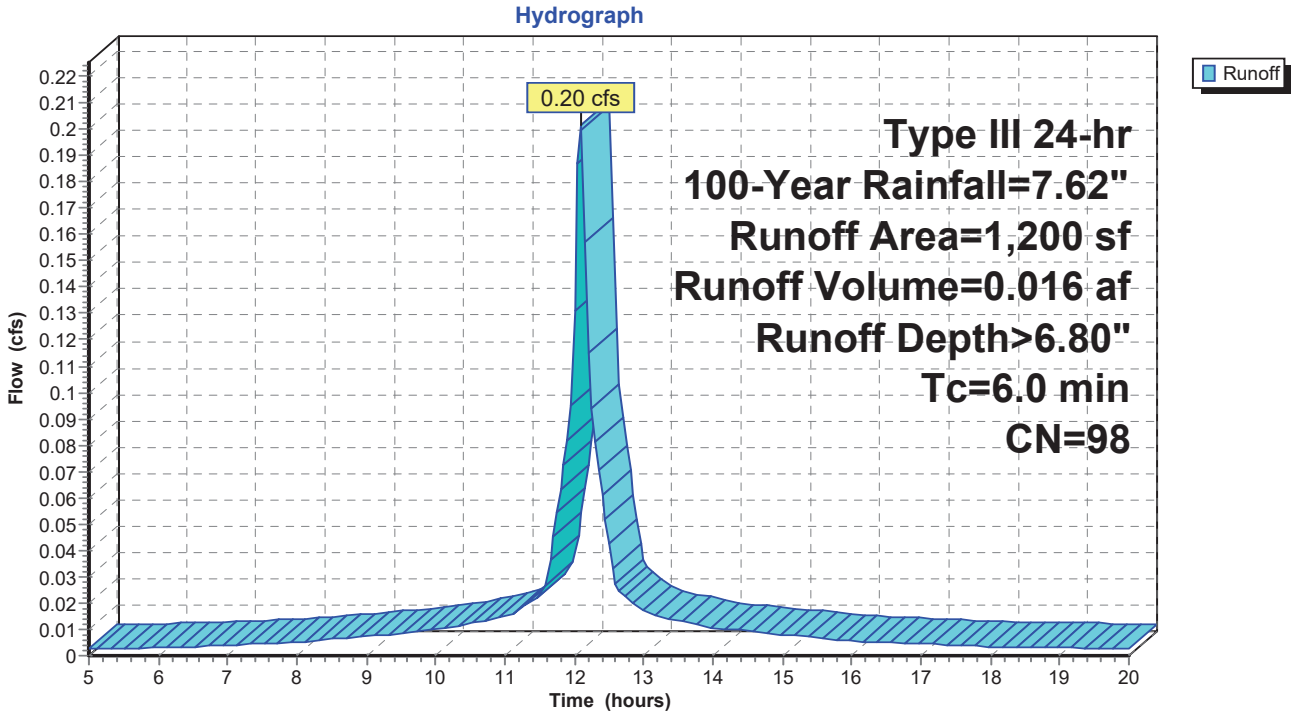
Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.016 af, Depth> 6.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.62"

| Area (sf) | CN | Description |
|---|---|---|
| 1,200 | 98 | Roofs, HSG B |
| 1,200 | | 100.00% Impervious Area |

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

## Subcatchment 4S: 1200 SF ROOF



## Summary for Subcatchment BYP: BYPASS

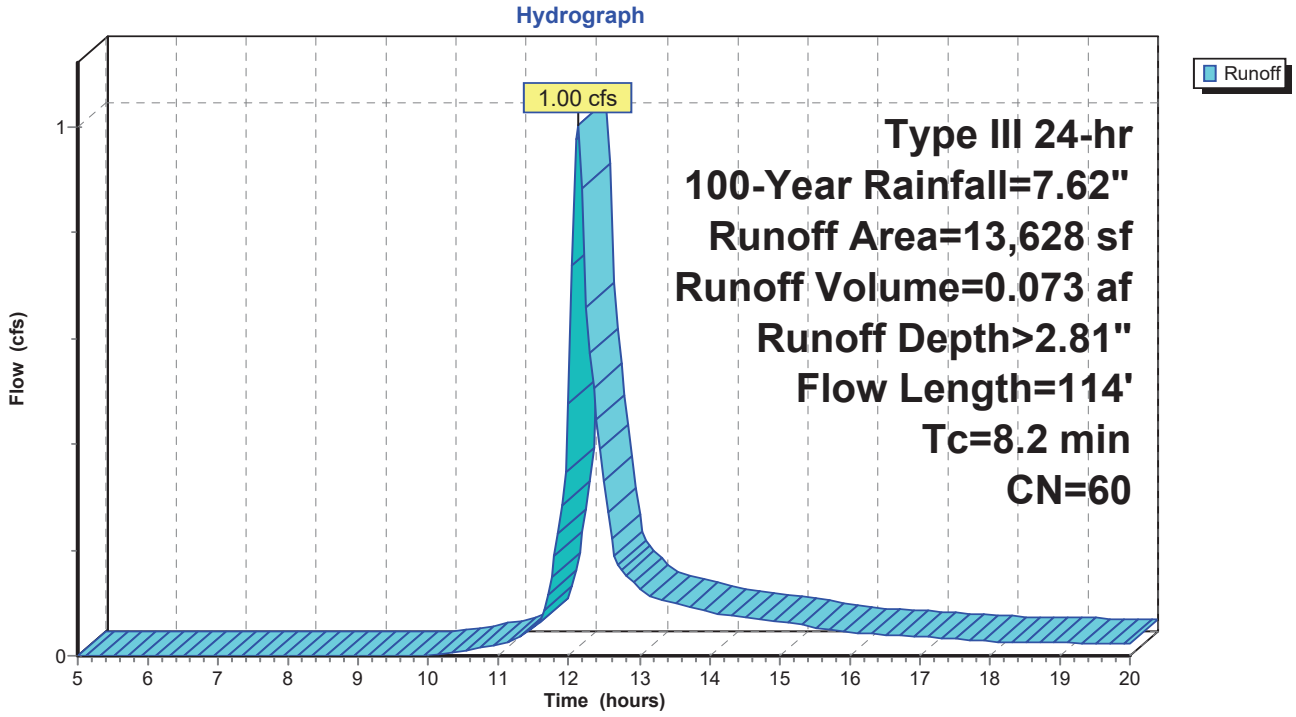
Runoff = 1.00 cfs @ 12.12 hrs, Volume= 0.073 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.62"

| Area (sf) | CN | Description |
|---|---|---|
| 13,628 | 60 | Woods, Fair, HSG B |
| 13,628 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.0 | 50 | 0.0220 | 0.10 | | **Sheet Flow, SHEET** Grass: Dense n= 0.240 P2= 3.14" |
| 0.2 | 64 | 0.0960 | 4.99 | | **Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps |
| 8.2 | 114 | Total | | | |

## Subcatchment BYP: BYPASS



## Summary for Subcatchment P1: POST-1P(N)

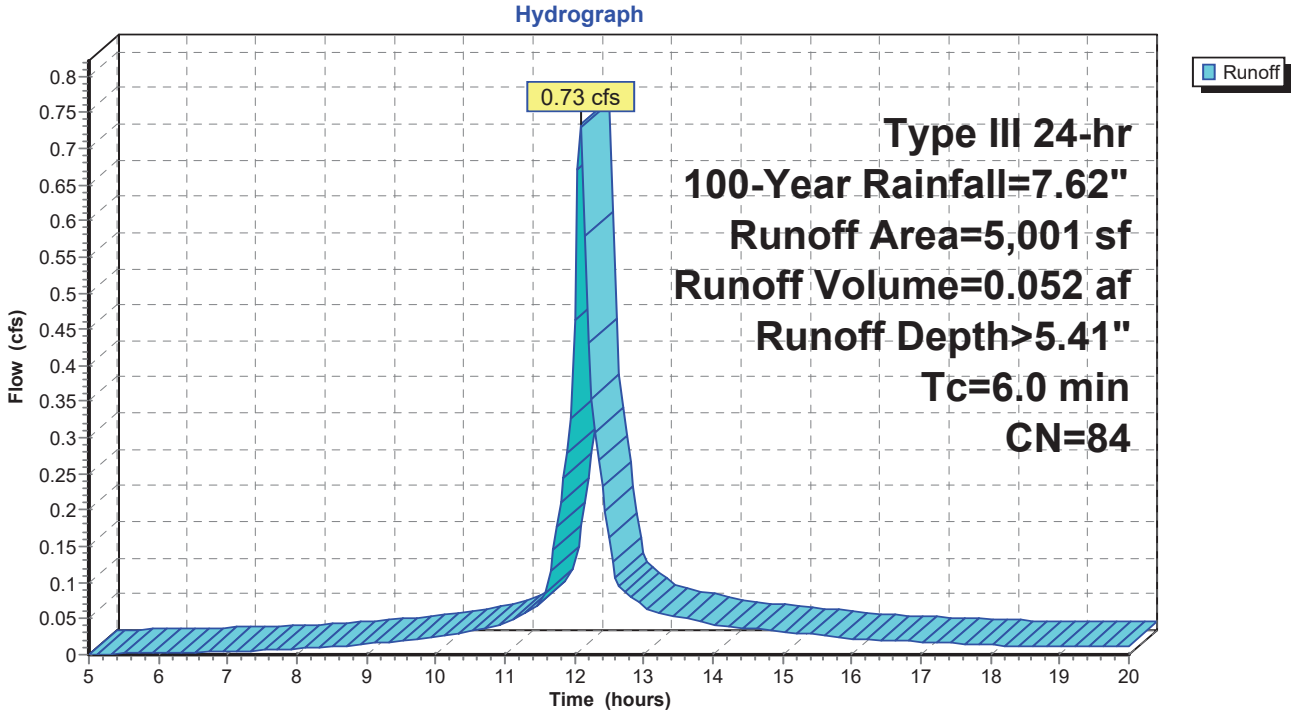
Runoff = 0.73 cfs @ 12.09 hrs, Volume= 0.052 af, Depth> 5.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.62"

| Area (sf) | CN | Description |
|---|---|---|
| 2,390 | 98 | Paved parking, HSG B |
| 662 | 98 | Water Surface, HSG B |
| 1,949 | 61 | >75% Grass cover, Good, HSG B |
| 5,001 | 84 | Weighted Average |
| 1,949 | | 38.97% Pervious Area |
| 3,052 | | 61.03% Impervious Area |

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

### Subcatchment P1: POST-1P(N)



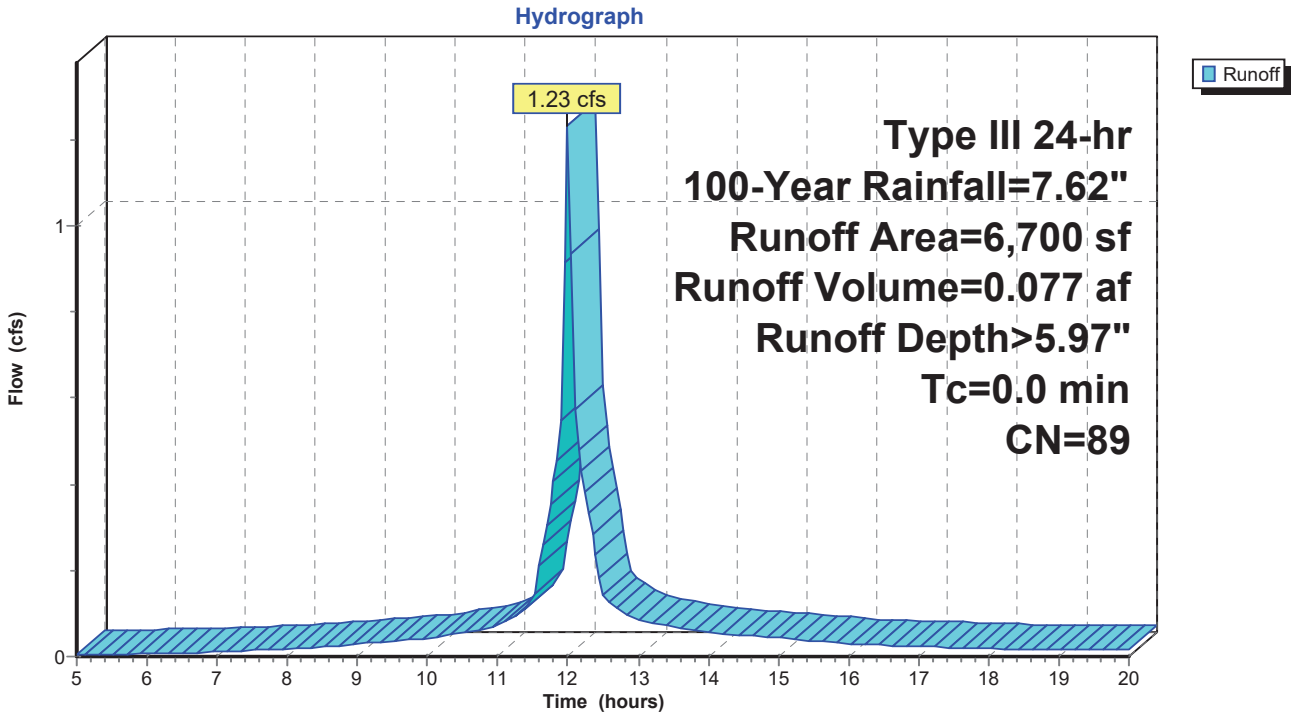
## Summary for Subcatchment P2: POST-2P(S)

Runoff = 1.23 cfs @ 12.00 hrs, Volume= 0.077 af, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.62"

| Area (sf) | CN | Description |
|---|---|---|
| 3,977 | 98 | Paved parking, HSG B |
| 1,055 | 98 | Water Surface, HSG B |
| 1,668 | 61 | >75% Grass cover, Good, HSG B |
| 6,700 | 89 | Weighted Average |
| 1,668 | | 24.90% Pervious Area |
| 5,032 | | 75.10% Impervious Area |

## Subcatchment P2: POST-2P(S)

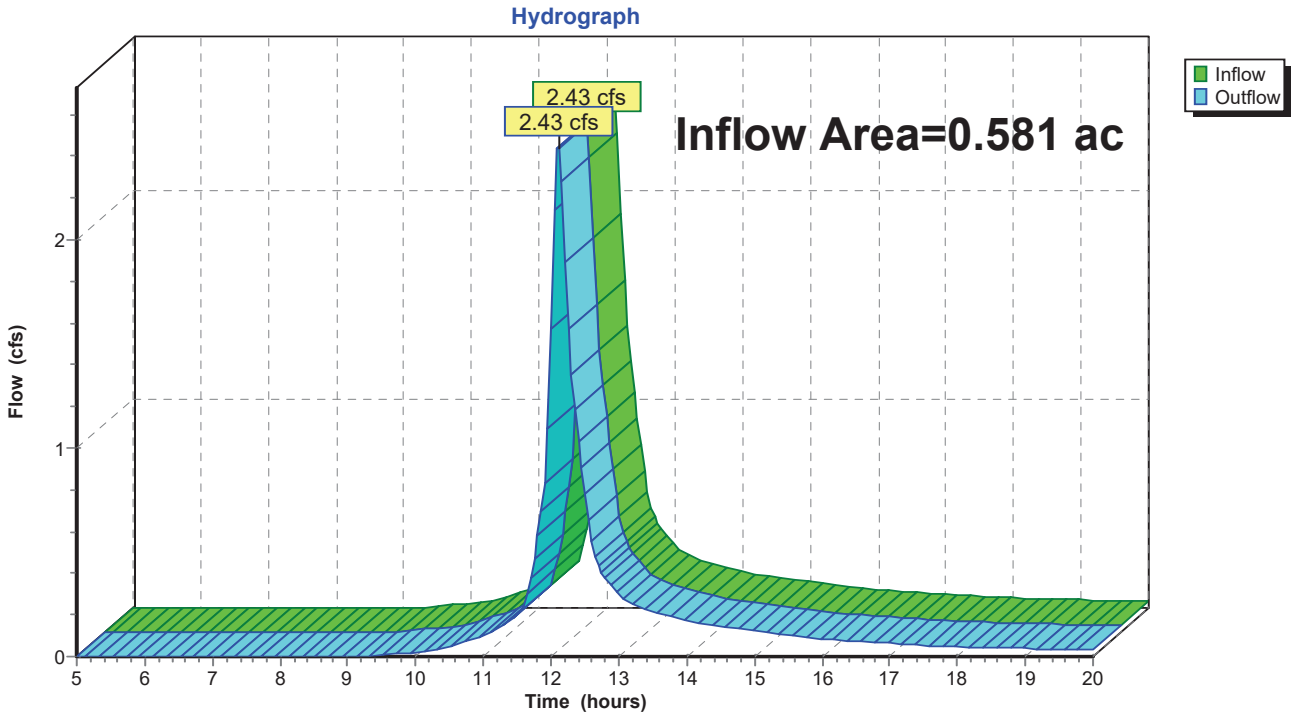


## Summary for Reach W: WETLANDS

Inflow Area = 0.581 ac, 31.92% Impervious, Inflow Depth > 3.61" for 100-Year event
Inflow = 2.43 cfs @ 12.11 hrs, Volume= 0.175 af
Outflow = 2.43 cfs @ 12.11 hrs, Volume= 0.175 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Reach W: WETLANDS



## Summary for Pond 1P: POND 1

Inflow Area = 0.115 ac, 61.03% Impervious, Inflow Depth > 5.41" for 100-Year event
Inflow = 0.73 cfs @ 12.09 hrs, Volume= 0.052 af
Outflow = 0.66 cfs @ 12.13 hrs, Volume= 0.050 af, Atten= 9%, Lag= 2.3 min
Discarded = 0.01 cfs @ 12.13 hrs, Volume= 0.005 af
Primary = 0.66 cfs @ 12.13 hrs, Volume= 0.045 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 749.94' @ 12.13 hrs Surf.Area= 291 sf Storage= 181 cf

Plug-Flow detention time=21.2 min calculated for 0.050 af (97% of inflow)
Center-of-Mass det. time=10.5 min ( 774.7 - 764.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 749.00' | 665 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

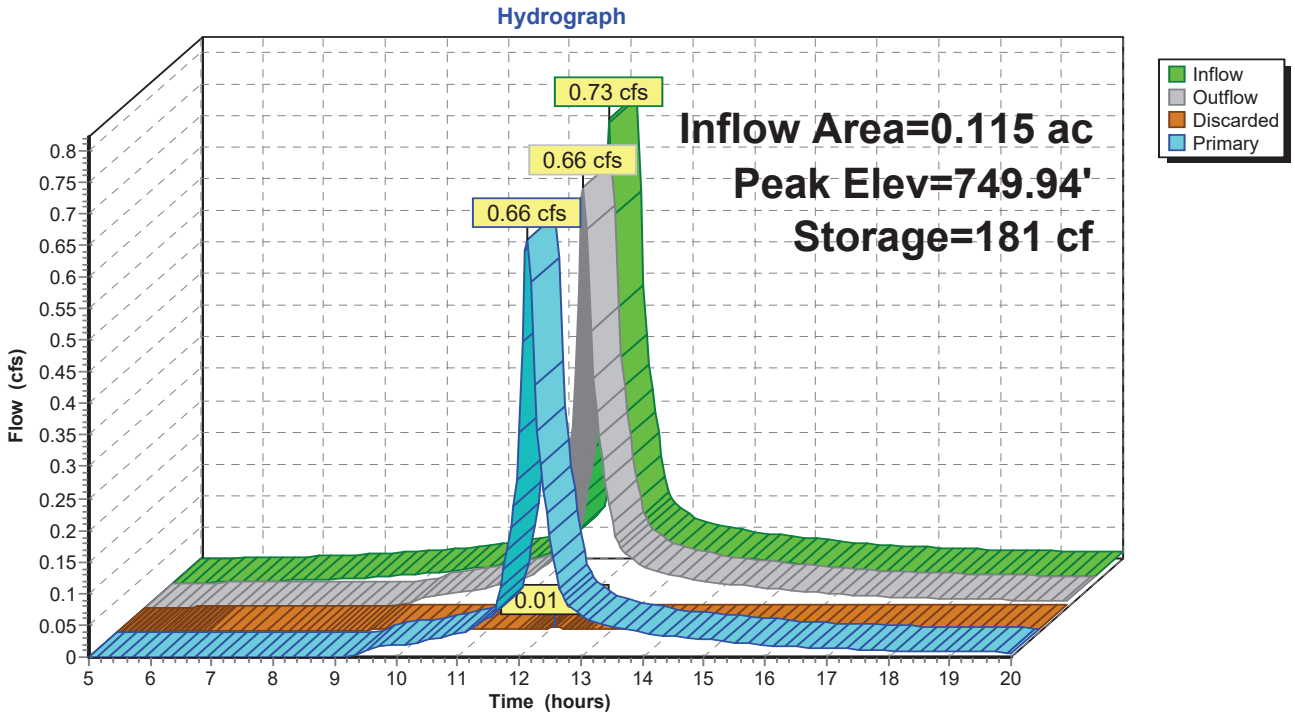
| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 749.00 | 108 | 50.7 | 0 | 0 | 108 |
| 750.00 | 305 | 76.5 | 198 | 198 | 377 |
| 750.50 | 456 | 132.9 | 189 | 387 | 1,318 |
| 751.00 | 662 | 142.3 | 278 | 665 | 1,535 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 749.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 744.00' |
| #2 | Primary | 749.40' | **Custom Weir/Orifice, Cv= 2.62 (C= 3.28)**<br>Head (feet) 0.00 0.50 0.50 1.00<br>Width (feet) 0.50 0.50 0.75 0.75 |

**Discarded OutFlow** Max=0.01 cfs @ 12.13 hrs HW=749.93' (Free Discharge)
↑—**1=Exfiltration** ( Controls 0.01 cfs)

**Primary OutFlow** Max=0.64 cfs @ 12.13 hrs HW=749.93' (Free Discharge)
↑—**2=Custom Weir/Orifice** (Weir Controls 0.64 cfs @ 2.34 fps)

## Pond 1P: POND 1



## Summary for Pond 2P: POND 2

Inflow Area = 0.154 ac, 75.10% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 1.23 cfs @ 12.00 hrs, Volume= 0.077 af
Outflow = 0.93 cfs @ 12.06 hrs, Volume= 0.072 af, Atten= 24%, Lag= 3.4 min
Discarded = 0.02 cfs @ 12.06 hrs, Volume= 0.015 af
Primary = 0.91 cfs @ 12.06 hrs, Volume= 0.056 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 748.27' @ 12.06 hrs Surf.Area= 763 sf Storage= 686 cf

Plug-Flow detention time=50.6 min calculated for 0.071 af (93% of inflow)
Center-of-Mass det. time=26.8 min ( 775.2 - 748.4 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 747.00' | 1,343 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

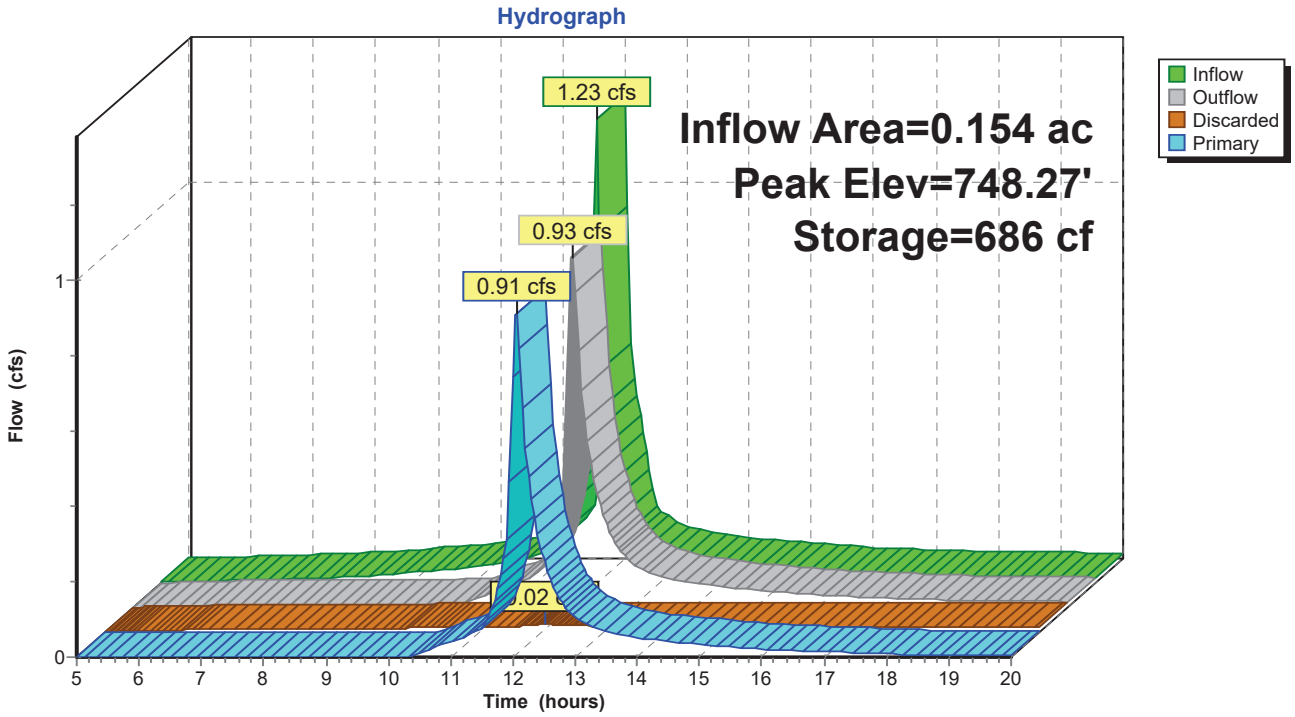
| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 747.00 | 336 | 96.8 | 0 | 0 | 336 |
| 748.00 | 665 | 120.2 | 491 | 491 | 754 |
| 749.00 | 1,054 | 139.0 | 852 | 1,343 | 1,163 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 747.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 743.21' |
| #2 | Primary | 747.50' | **Custom Weir/Orifice, Cv= 2.62 (C= 3.28)**<br>Head (feet) 0.00 0.50 0.50 1.00<br>Width (feet) 0.25 0.25 1.00 1.00 |

**Discarded OutFlow** Max=0.02 cfs @ 12.06 hrs HW=748.27' (Free Discharge)
↑—**1=Exfiltration** ( Controls 0.02 cfs)

**Primary OutFlow** Max=0.89 cfs @ 12.06 hrs HW=748.27' (Free Discharge)
↑—**2=Custom Weir/Orifice** (Weir Controls 0.89 cfs @ 2.27 fps)

## Pond 2P: POND 2



## Summary for Pond 3P: ROOF INFILTRATION

Inflow Area = 0.048 ac, 100.00% Impervious, Inflow Depth > 6.80" for 100-Year event
Inflow = 0.35 cfs @ 12.09 hrs, Volume= 0.027 af
Outflow = 0.02 cfs @ 13.54 hrs, Volume= 0.020 af, Atten= 93%, Lag= 87.0 min
Discarded = 0.02 cfs @ 13.54 hrs, Volume= 0.020 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 747.99' @ 13.54 hrs Surf.Area= 0.011 ac Storage= 0.014 af

Plug-Flow detention time= 171.1 min calculated for 0.019 af (71% of inflow)
Center-of-Mass det. time= 105.0 min ( 838.3 - 733.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 746.00' | 0.008 af | **11.25'W x 43.75'L x 2.54'H Field A**<br>0.029 af Overall - 0.008 af Embedded = 0.021 af x 40.0% Voids |
| #2A | 746.50' | 0.008 af | **Cultec R-150XLHD** x 12 Inside #1<br>Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf<br>Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap<br>Row Length Adjustment= +0.75' x 2.65 sf x 3 rows |
| | | 0.016 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 746.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 743.98' |

**Discarded OutFlow** Max=0.02 cfs @ 13.54 hrs HW=747.99' (Free Discharge)
↑**1=Exfiltration** ( Controls 0.02 cfs)

## Pond 3P: ROOF INFILTRATION - Chamber Wizard Field A

**ChamberModel = CultecR-150XLHD(CultecRecharger®150XLHD)**
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 3 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

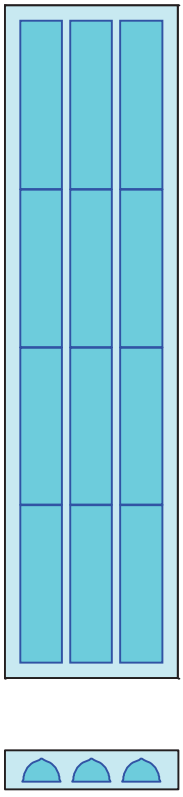
4 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 41.75' Row Length +12.0" End Stone x 2 = 43.75' Base Length
3 Rows x 33.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 11.25' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

12 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 3 Rows = 331.8 cf Chamber Storage

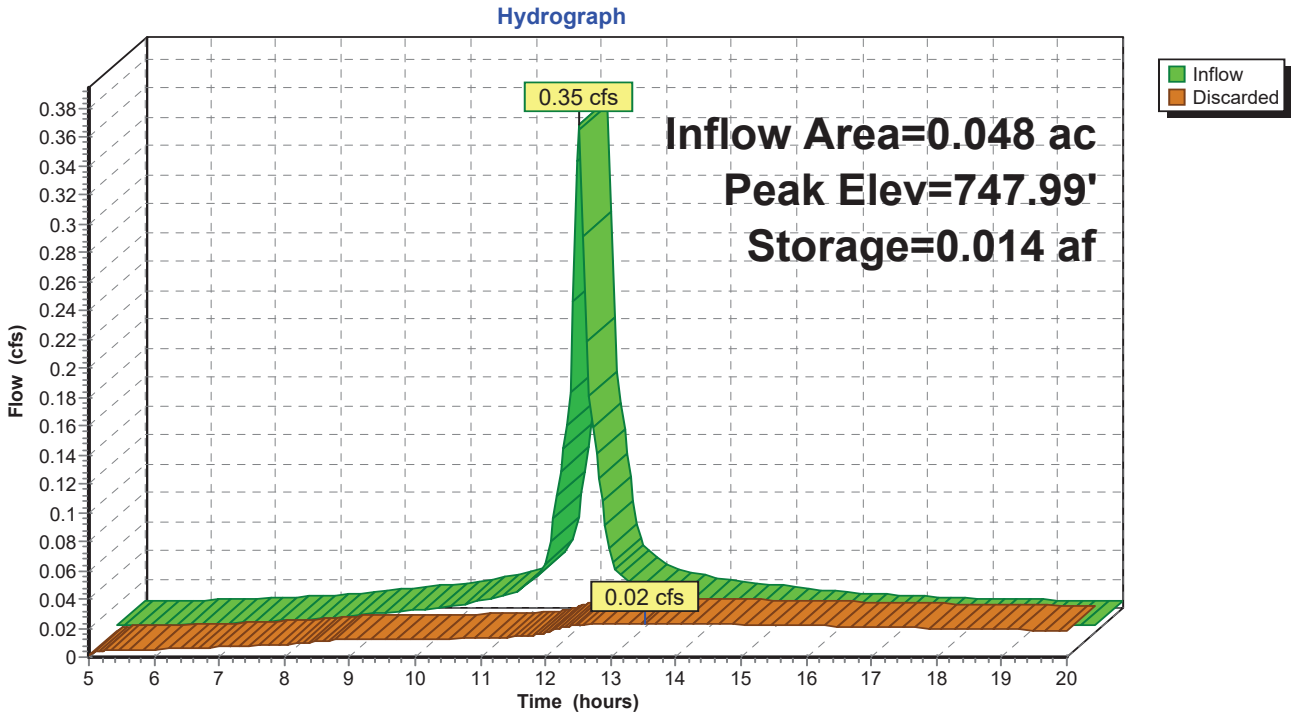
1,251.0 cf Field - 331.8 cf Chambers = 919.2 cf Stone x 40.0% Voids = 367.7 cf Stone Storage

Chamber Storage + Stone Storage = 699.5 cf = 0.016 af
Overall Storage Efficiency = 55.9%
Overall System Size = 43.75' x 11.25' x 2.54'

12 Chambers
46.3 cy Field
34.0 cy Stone



## Pond 3P: ROOF INFILTRATION



## Summary for Pond 4P: ROOF INFILTRATION

Inflow Area = 0.028 ac, 100.00% Impervious, Inflow Depth > 6.80" for 100-Year event
Inflow = 0.20 cfs @ 12.09 hrs, Volume= 0.016 af
Outflow = 0.01 cfs @ 13.90 hrs, Volume= 0.010 af, Atten= 94%, Lag= 108.8 min
Discarded = 0.01 cfs @ 13.90 hrs, Volume= 0.010 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 749.38' @ 13.90 hrs Surf.Area= 0.006 ac Storage= 0.008 af

Plug-Flow detention time=173.3 min calculated for 0.010 af (64% of inflow)
Center-of-Mass det. time=98.5 min ( 831.7 - 733.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 747.00' | 0.005 af | **8.00'W x 33.50'L x 2.54'H Field A**<br>0.016 af Overall - 0.004 af Embedded = 0.012 af x 40.0% Voids |
| #2A | 747.50' | 0.004 af | **Cultec R-150XLHD** x 6 Inside #1<br>Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf<br>Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap<br>Row Length Adjustment= +0.75' x 2.65 sf x 2 rows |
| | | 0.009 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 747.00' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 744.00' |

**Discarded OutFlow** Max=0.01 cfs @ 13.90 hrs HW=749.38' (Free Discharge)
↑**1=Exfiltration** ( Controls 0.01 cfs)

## Pond 4P: ROOF INFILTRATION - Chamber Wizard Field A

**ChamberModel = CultecR-150XLHD(CultecRecharger®150XLHD)**
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 2 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

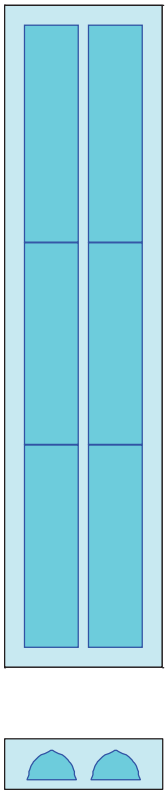
3 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 31.50' Row Length +12.0" End Stone x 2 = 33.50' Base Length
2 Rows x 33.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 8.00' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

6 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 2 Rows = 166.9 cf Chamber Storage

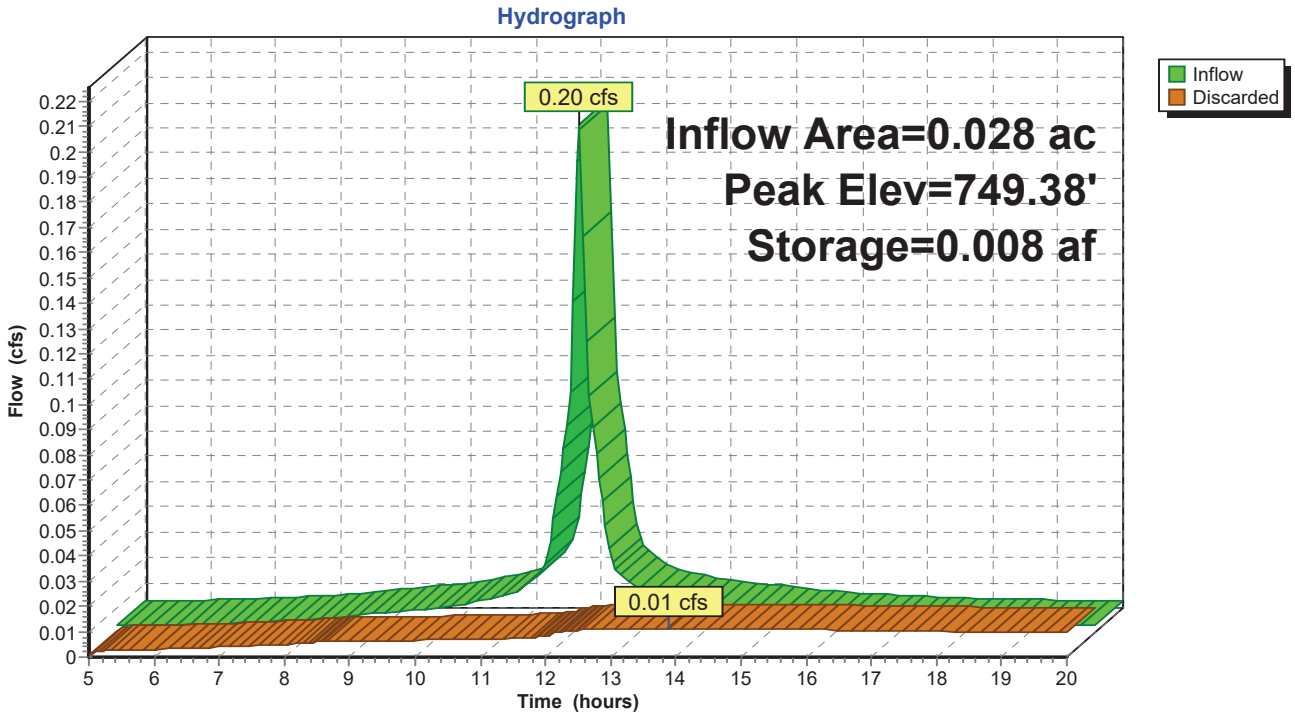
681.2 cf Field - 166.9 cf Chambers = 514.3 cf Stone x 40.0% Voids = 205.7 cf Stone Storage

Chamber Storage + Stone Storage = 372.6 cf = 0.009 af
Overall Storage Efficiency = 54.7%
Overall System Size = 33.50' x 8.00' x 2.54'

6 Chambers
25.2 cy Field
19.0 cy Stone



## Pond 4P: ROOF INFILTRATION



# ***APPENDIX C***

# ***APPENDIX C***

# Stormwater Recharge Volume Calculations

**Subcatchment 4P (1,200 SF Roof)**

Area Impervious = $A_I$= 1,200 sf (0.03 ac)
All development within HSG B (0.35 inches of runoff)
$Re_{Vol}$= 0.35" x $A_I$= 0.35" x 1ft/12" x 1,200 sf= 35 cf
$Re_{V\ Req'd}$=**35 cf**
Recharge Volume Provided = **373 cf (Cultec System)**
**$Re_V$ 373 cf > $Re_{V\ Req's}$ 35 cf : OK**

**Subcatchment 3P (2,100 SF Roof)**

Area Impervious = $A_I$= 2,100 sf (0.05 ac)
All development within HSG B (0.35 inches of runoff)
$Re_{Vol}$= 0.35" x $A_I$= 0.35" x 1ft/12" x 2,100 sf= 61 cf
$Re_{V\ Req'd}$=**61 cf**
Recharge Volume Provided = **700 cf (Cultec System)**
**$Re_V$ 700 cf > $Re_{V\ Req's}$ 61 cf : OK**

**Subcatchment 1P (Pond 1)**

Area Impervious = $A_I$= 2,390 sf (0.05 ac)
All development within HSG B (0.35 inches of runoff)
$Re_{Vol}$= 0.35" x $A_I$= 0.35" x 1ft/12" x 2,390 sf= 70 cf
$Re_{V\ Req'd}$=**70 cf**
Recharge Volume Provided = **181 cf (Pond 1)**
**$Re_V$ 181 cf > $Re_{V\ Req's}$ 70 cf : OK**

**Subcatchment 2P (Pond 2)**

Area Impervious = $A_I$= 3,977 sf (0.09 ac)
All development within HSG B (0.35 inches of runoff)
$Re_{Vol}$= 0.35" x $A_I$= 0.35" x 1ft/12" x 3,977 sf= 116 cf
$Re_{V\ Req'd}$=**116 cf**
Recharge Volume Provided = **686 cf (Pond 2)**
**$Re_V$ 686 cf > $Re_{V\ Req's}$ 116 cf : OK**

# Water Quality Volume Calculations

**Subcatchment 4P (1,200 SF Roof)**

Area Impervious = $A_I$= 1,200 sf (0.03 ac)

WQV=0.5" x $A_I$= 0.5" x 1ft/12" x 1,200 sf= 50 cf

$WQV_{Req'd}$=**50 cf**

Water Quality Volume Provided = **373 cf (Cultec System)**

**$WQV_{PROVIDE}$ 373 cf > $WQV_{Req'd}$ 50 cf : OK**

**Subcatchment 3P (2,100 SF Roof)**

Area Impervious = $A_I$= 2,100 sf (0.05 ac)

WQV=0.5" x $A_I$= 0.5" x 1ft/12" x 2,100 sf= 88 cf

$WQV_{Req'd}$=**88 cf**

Water Quality Volume Provided = **700 cf (Cultec System)**

**$WQV_{PROVIDE}$ 700 cf > $WQV_{Req'd}$ 88 cf : OK**

**Subcatchment 1P (Pond 1)**

Area Impervious = $A_I$= 2,390 sf (0.05 ac)

WQV=0.5" x $A_I$= 0.5" x 1ft/12" x 2,390 sf= 100 cf

$WQV_{Req'd}$=**100 cf**

Water Quality Volume Provided = **181 cf (Pond 1)**

**$WQV_{PROVIDE}$ 181 cf > $WQV_{Req'd}$ 100 cf : OK**

**Subcatchment 2P (Pond 2)**

Area Impervious = $A_I$= 3,977 sf (0.09 ac)

WQV=0.5" x $A_I$= 0.5" x 1ft/12" x 3,977 sf= 166 cf

$WQV_{Req'd}$=**166 cf**

Water Quality Volume Provided = **686 cf (Pond 2)**

**$WQV_{PROVIDE}$ 686 cf > $WQV_{Req'd}$ 116 cf : OK**

INSTRUCTIONS:

*Version 1, Automated: Mar. 4, 2008*

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

Location: 0 & 31 Chapel Street, Leicester - ROOF RECHARGE

## TSS Removal Calculation Worksheet

| B<br>BMP[1] | C<br>TSS Removal Rate[1] | D<br>Starting TSS Load* | E<br>Amount Removed (C*D) | F<br>Remaining Load (D-E) |
|---|---|---|---|---|
| **Subsurface Infiltration Structure** | **0.80** | **1.00** | **0.80** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |

**Total TSS Removal =** **80%**

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

Project: 1946

Prepared By: Zachary Gless

Date: 1/25/2021

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

*Version 1, Automated: Mar. 4, 2008*

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

Location: 0 & 31 Chapel Street, Leicester - PONDS

## TSS Removal Calculation Worksheet

| B<br>BMP[1] | C<br>TSS Removal Rate[1] | D<br>Starting TSS Load* | E<br>Amount Removed (C*D) | F<br>Remaining Load (D-E) |
|---|---|---|---|---|
| Infiltration Basin | 0.80 | 1.00 | 0.80 | 0.20 |
| | 0.00 | 0.20 | 0.00 | 0.20 |
| | 0.00 | 0.20 | 0.00 | 0.20 |
| | 0.00 | 0.20 | 0.00 | 0.20 |
| | 0.00 | 0.20 | 0.00 | 0.20 |

**Total TSS Removal =** 80%

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

Project: 1946

Prepared By: Zachary Gless

Date: 1/25/2021

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

# Pond Drawdown Calculations

## Subcatchment P1 → Pond 1

Area Impervious (HSG B = 0.35") $A_I$= 2,390 sf (0.05 ac)

Paved Parking/Roads: 0.05 Acres
**TOTAL: 0.05 Acres**

All development within HSG B = 0.35"

$R_V$= 0.35" x $A_I$= 0.35" x 1ft/12" x 2,390 sf= **70 cf**

$$Time_{drawdown} = \frac{Rv}{(K)(Trench\ \ Bottom\ \ Area)(n)}$$

$Time_{Drawdown}$ = (70 cf)/[(0.17 in/hr)(1'/12")(108 sf)] = ***45.75 hours*** **< 72 hours**

## Subcatchment P2 → Pond 2

Area Impervious (HSG B = 0.35") $A_I$= 3,977 sf (0.09 ac)

Paved Parking/Roads: 0.09 Acres
**TOTAL: 0.09 Acres**

$Re_{Vol\ (HSG\ C)}$ = 0.35" x $A_I$= 0.35" x 1ft/12" x 3,977 sf= **116 cf**

$$Time_{drawdown} = \frac{Rv}{(K)(Trench\ \ Bottom\ \ Area)(n)}$$

$Time_{Drawdown}$ = (116 cf)/[(0.17 in/hr)(1'/12")(336 sf)] = ***24.37 hours*** **< 72 hours**


Map Scale: 1:1,960 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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 Rating Polygons**
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Soil Rating Lines**
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Soil Rating Points**
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 13, Jun 11, 2020

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

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Hydrologic Soil Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 305C | Paxton fine sandy loam, 8 to 15 percent slopes | C | 1.2 | 6.4% |
| 305D | Paxton fine sandy loam, 15 to 25 percent slopes | C | 9.1 | 49.7% |
| 307C | Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony | C | 0.9 | 4.9% |
| 420B | Canton fine sandy loam, 3 to 8 percent slopes | B | 7.1 | 39.0% |
| **Totals for Area of Interest** | | | **18.3** | **100.0%** |

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

**NOAA Atlas 14, Volume 10, Version 3**
**Location name: Cherry Valley, Massachusetts, USA***
**Latitude: 42.2416°, Longitude: -71.8836°**
**Elevation: 753.7 ft****
* source: ESRI Maps
** source: USGS

## POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

# PF tabular

**PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]**

| Duration | Average recurrence interval (years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | 0.339 (0.275-0.414) | 0.399 (0.322-0.487) | 0.496 (0.400-0.609) | 0.576 (0.461-0.711) | 0.686 (0.528-0.891) | 0.770 (0.577-1.03) | 0.857 (0.618-1.19) | 0.950 (0.648-1.37) | 1.08 (0.704-1.62) | 1.18 (0.749-1.82) |
| 10-min | 0.481 (0.389-0.586) | 0.565 (0.457-0.689) | 0.702 (0.565-0.861) | 0.816 (0.653-1.01) | 0.972 (0.747-1.26) | 1.09 (0.818-1.45) | 1.21 (0.876-1.69) | 1.35 (0.917-1.94) | 1.53 (0.996-2.30) | 1.68 (1.06-2.58) |
| 15-min | 0.566 (0.458-0.690) | 0.664 (0.537-0.811) | 0.825 (0.664-1.01) | 0.959 (0.768-1.18) | 1.14 (0.879-1.49) | 1.28 (0.962-1.71) | 1.43 (1.03-1.98) | 1.58 (1.08-2.28) | 1.80 (1.17-2.70) | 1.97 (1.25-3.04) |
| 30-min | 0.772 (0.625-0.942) | 0.907 (0.734-1.11) | 1.13 (0.908-1.38) | 1.31 (1.05-1.62) | 1.57 (1.20-2.03) | 1.76 (1.32-2.34) | 1.95 (1.41-2.71) | 2.17 (1.48-3.12) | 2.46 (1.61-3.70) | 2.70 (1.71-4.16) |
| 60-min | 0.979 (0.793-1.19) | 1.15 (0.931-1.41) | 1.43 (1.15-1.76) | 1.67 (1.33-2.06) | 1.99 (1.53-2.58) | 2.23 (1.67-2.97) | 2.48 (1.79-3.45) | 2.75 (1.88-3.96) | 3.13 (2.04-4.70) | 3.43 (2.17-5.28) |
| 2-hr | 1.25 (1.02-1.51) | 1.48 (1.20-1.79) | 1.85 (1.50-2.25) | 2.16 (1.74-2.65) | 2.58 (2.00-3.34) | 2.90 (2.19-3.86) | 3.24 (2.36-4.51) | 3.63 (2.48-5.19) | 4.20 (2.74-6.26) | 4.67 (2.97-7.15) |
| 3-hr | 1.43 (1.17-1.72) | 1.70 (1.39-2.05) | 2.13 (1.74-2.59) | 2.50 (2.02-3.05) | 3.00 (2.34-3.88) | 3.37 (2.57-4.48) | 3.77 (2.77-5.26) | 4.25 (2.91-6.06) | 4.96 (3.24-7.38) | 5.56 (3.54-8.47) |
| 6-hr | 1.77 (1.46-2.12) | 2.13 (1.75-2.55) | 2.71 (2.22-3.27) | 3.20 (2.60-3.88) | 3.86 (3.03-4.97) | 4.35 (3.33-5.76) | 4.89 (3.62-6.79) | 5.53 (3.80-7.85) | 6.52 (4.28-9.64) | 7.36 (4.70-11.1) |
| 12-hr | 2.16 (1.79-2.57) | 2.63 (2.17-3.13) | 3.39 (2.80-4.06) | 4.02 (3.29-4.85) | 4.89 (3.86-6.26) | 5.54 (4.26-7.29) | 6.24 (4.64-8.62) | 7.08 (4.89-9.98) | 8.37 (5.51-12.3) | 9.48 (6.07-14.3) |
| 24-hr | 2.56 (2.13-3.02) | 3.14 (2.62-3.71) | 4.08 (3.39-4.86) | 4.87 (4.02-5.83) | 5.95 (4.72-7.56) | 6.75 (5.23-8.83) | 7.62 (5.70-10.5) | 8.68 (6.01-12.1) | 10.3 (6.80-15.0) | 11.7 (7.50-17.4) |
| 2-day | 2.95 (2.48-3.46) | 3.62 (3.04-4.26) | 4.73 (3.96-5.59) | 5.66 (4.70-6.73) | 6.92 (5.53-8.75) | 7.86 (6.12-10.2) | 8.88 (6.69-12.2) | 10.1 (7.05-14.1) | 12.1 (8.01-17.5) | 13.8 (8.87-20.4) |
| 3-day | 3.21 (2.71-3.76) | 3.95 (3.33-4.62) | 5.15 (4.32-6.06) | 6.14 (5.12-7.28) | 7.52 (6.02-9.46) | 8.53 (6.67-11.1) | 9.63 (7.29-13.1) | 11.0 (7.67-15.2) | 13.1 (8.72-19.0) | 15.0 (9.66-22.1) |
| 4-day | 3.45 (2.92-4.02) | 4.22 (3.57-4.93) | 5.49 (4.62-6.44) | 6.54 (5.46-7.72) | 7.98 (6.41-10.0) | 9.05 (7.09-11.7) | 10.2 (7.74-13.9) | 11.7 (8.14-16.1) | 13.9 (9.24-20.0) | 15.8 (10.2-23.3) |
| 7-day | 4.11 (3.50-4.77) | 4.96 (4.22-5.76) | 6.35 (5.38-7.41) | 7.50 (6.31-8.81) | 9.09 (7.33-11.3) | 10.3 (8.07-13.2) | 11.5 (8.75-15.5) | 13.1 (9.17-18.0) | 15.5 (10.3-22.1) | 17.5 (11.3-25.7) |
| 10-day | 4.78 (4.08-5.52) | 5.67 (4.84-6.56) | 7.12 (6.05-8.28) | 8.33 (7.03-9.75) | 9.99 (8.08-12.4) | 11.2 (8.84-14.3) | 12.6 (9.52-16.8) | 14.1 (9.94-19.3) | 16.5 (11.0-23.5) | 18.5 (12.0-27.0) |
| 20-day | 6.84 (5.89-7.85) | 7.79 (6.70-8.95) | 9.34 (7.99-10.8) | 10.6 (9.02-12.3) | 12.4 (10.1-15.1) | 13.7 (10.8-17.2) | 15.1 (11.4-19.7) | 16.6 (11.8-22.5) | 18.7 (12.6-26.4) | 20.4 (13.2-29.5) |
| 30-day | 8.58 (7.42-9.80) | 9.55 (8.24-10.9) | 11.1 (9.57-12.8) | 12.5 (10.6-14.4) | 14.3 (11.6-17.3) | 15.7 (12.4-19.4) | 17.1 (12.8-22.0) | 18.5 (13.1-24.9) | 20.3 (13.7-28.6) | 21.7 (14.1-31.3) |
| 45-day | 10.7 (9.31-12.2) | 11.7 (10.2-13.4) | 13.4 (11.5-15.3) | 14.7 (12.6-17.0) | 16.6 (13.6-20.0) | 18.1 (14.3-22.2) | 19.5 (14.7-24.8) | 20.8 (14.9-27.9) | 22.4 (15.2-31.3) | 23.5 (15.3-33.8) |
| 60-day | 12.5 (10.9-14.2) | 13.6 (11.8-15.4) | 15.2 (13.2-17.4) | 16.7 (14.3-19.1) | 18.6 (15.2-22.2) | 20.1 (15.9-24.6) | 21.6 (16.2-27.3) | 22.8 (16.3-30.4) | 24.3 (16.5-33.8) | 25.2 (16.6-36.1) |

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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# PF graphical

***APPENDIX D***

# *Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan*

*for*

## *0 & 31 Chapel Street*
## *Proposed Commercial Site Development*

*Leicester, Massachusetts*

Prepared for:

Armory Street, LLC
P.O. Box 682
Northborough, Massachusetts 01532

Prepared by:

Existing Grade, Inc.
62 Riedell Road
Douglas, Massachusetts 01516

January 25, 2021

EGI Project No. 1946

# TABLE OF CONTENTS

## *1. Introduction*

The erosion and sediment produced by the construction of the proposed development will be controlled on the property utilizing Erosion and Sedimentation Control Best Management Practices (BMPs). These practices are shown in detail on the Proposed Site Plans prepared by Existing Grade, Inc. These plans shall be hereinafter referred to as the "Site Plans".

The party responsible for the implementation, routine inspections and maintenance of the Erosion and Sedimentation Control BMPs shall be the Owner:

**Armory Street, LLC**
Northborough, Massachusetts

## *2. Project Narrative*

The proponent, Armory Street, LLC, proposes to construct two (2) new commercial structures on the current property located at 0 & 31 Chapel Street, Leicester MA. The proposed project will include the selective clearing and grubbing of development areas, removal of existing structure and onsite treatment units, the construction of two commercial structures, each to be serviced by Town water and sewer, and proposed bituminous parking areas. Onsite storm water management infrastructures will be inclusive of Cultec® stormwater infiltration devices to manage and infiltrate each structure's roof runoff as well as gravel filtration trenches prior to pavement runoff entering a proposed detention basin for each lot. The proposed project will be conducted per the Massachusetts Department of Environmental Protection requirements, Local Town and State bylaws, as well as using best management practices.

The project site is comprised of two parcels, recorded as parcel A4 and A3 on Assessor's map 21C and appears to lie within the Business (B) zoning district based upon a review of the most recent Town of Leicester Zoning Map. The parcels are partially located within the FEMA Flood Zone A (undetermined elevation) based upon a review of FIRM Map 25027C0782E, Panel 782 of 1075; last revised July 04, 2011. Currently there is overhead electric telephone/cable to service the property as well as municipal water and sewer within Chapel Street.

The property's address is recorded as 0 & 31 Chapel Street, Leicester MA and abuts Chapel Street to the East with privately owned land to the North, West, and South. Kettle Brook flows southward along the western property line with one delineated wetland system and river front area as shown on the site plans. Access to the site is proposed via a parking lot along the eastern property line from Chapel Street. Due to the size of the existing lots, the two parking lots are proposed to be interconnected to ensure adequate vehicular access. The existing site is comprised of a mix of wooded areas, dirt/gravel parking turnout areas, and an existing structure with historic settling basin.

The Worcester County Soil Survey, issued by the US Department of Agriculture was referenced to determine the type and hydrologic group of the soils located on the property. The property is comprised of mostly hydrologic soil group B type soils, Canton fine sandy loams, as was confirmed via soil testing conducted by Existing Grade, Inc in December of 2020.

## *3. Erosion and Sedimentation Control Best Management Practices (BMPs)*

### A. Sediment Fence/Straw Wattle Barrier Controls

A sediment fence/straw wattle barrier combination will be constructed along disturbed downward slopes, along the limit of work boundary and other locations as shown on the Site Plans. The sediment fence portion will be up gradient of the straw wattle. This control BMP shall be installed prior to any disturbance on the property.

Specifications

Sediment fence shall be Amoco woven polypropylene 1198 or approved equivalent.

Installation Requirements

1. Straw wattle shall be installed as directed by the owner's representative in accordance to manufacturer's Installation Guidelines, Staking Pattern Guide, and CAD details. The extent of straw wattle shall be as shown on the project drawings.

2. Straw wattle should be installed to intercept water flow and collect sediment on site. They may be placed over bare soil or on top of erosion control blankets. Straw wattles are typically installed in a 2 inch trench with the ends of the wattle facing upstream.

3. They shall be secured to the subgrade by wood stakes every four lineal feet across the length of the straw wattle. The stakes shall be driven through the center of the straw wattle only and driven into the ground a minimum of 24 inches.

4. Straw wattle installed in a swale or channel bottom shall allow the installation to continue up the slopes three feet above the anticipated high water mark and perpendicular to the flow of water.

5. The sediment fence shall be installed up gradient of the hay bale in accordance with the detail as shown on the Site Plans.

6. Spacing of straw wattle shall be such that the elevation of the bottom of the straw wattle upstream will be equal to the elevation of the top of the straw wattle downstream.

7. Straw wattle shall remain in place until fully established vegetation and root systems are present.

8. The sediment fence shall be installed to the up gradient side of the support net in a continuous length with a minimum of twelve (12) inches of the fence placed along the bottom and down gradient face of the trench. Break joints in the sediment fence shall be overlapped in accordance with the detail as shown on the Site Plans with care taken to avoid break joints in low points along the barrier line.

9. The sediment fence/straw wattle barrier shall be entrench and backfilled. The trench should be excavated to a width of the proposed straw wattle width plus six (6) inches and to a depth between four (4) to six (6) inches. After the installation of the barrier, the barrier shall be backfilled with the down gradient fill conforming to the existing ground level and the up gradient fill built up a minimum of four (4) inches against the barrier.

10. The barriers should be removed when they have served their usefulness, but not before all upslope areas have been permanently stabilized and permission to remove the barrier has been approved by the Town of Auburn Conservation Commission.

Inspection and Maintenance

1. The sediment fence/straw wattle barrier shall be inspected weekly and after every rainfall event of one (1) inch or greater and at least daily during prolonged storm events.

2. Inspect the barrier system for any signs of down gradient erosion or breakout, sediment fence tears, depth of sediment and integrity of the barrier anchor system. All deficiencies shall be repaired or replaced immediately or over burden of sediment shall be removed.

3. The sediment deposits shall be removed after every storm event to reduce pressure on the barrier system and to provide adequate storage volume for the next storm event. Care shall be taken to avoid undermining the barrier system during removal operations.

## B. Construction Entrance

A stabilized construction entrance shall be installed at the proposed development entrance off of the existing parking lot. The construction entrance shall be installed immediately after any clearing/grubbing operations and all cut/fill activities, required to provide access to the proposed site, has been completed. The purpose of the construction entrance is to keep mud

and sediment from being tracked off of the construction site and into the existing parking lot. The construction entrance shall be constructed in accordance with the detail and shown on the Site Plans.

Specifications

Filter fabric shall be Mirafi 140 N or approved equivalent.
Stone shall be in accordance with the Massachusetts Highway Department Specifications.

Installation Requirements

1. Grade construction entrance to produce positive drainage toward temporary sedimentation controls on the property.

2. Stone for the construction entrance shall consist of two (2) to four (4) inch stone fill placed on the graded base.

3. The minimal length of the construction entrance should extend onto the site a minimum of fifty (50) feet and should have a width equal to the full width of the proposed roadway or twenty (20) feet, whichever is greater.

4. Place filter fabric shall be between the stone fill and the earth surface below to reduce the migration of soil particles from the underlying soil into the stone and vice versa.

Inspection and Maintenance

1. The construction entrance and sediment disposal area shall be inspected weekly and after every rainfall event of one (1) inch or greater.

2. Mud and sediment, tracked or washed onto public roads, shall be immediately removed by sweeping.

3. Provide periodic topdressing with additional stone to maintain the entrance in a condition that will prevent tracking or flowing of sediment onto public roads.

## C. Temporary Sediment Basins

The Contractor shall construct temporary sediment basins where required to filter out sediment from stormwater until the permanent drainage system is functioning properly.

The temporary sediment basins shall be lined with sediment fence/straw wattle barrier controls. All stormwater runoff from disturbed areas shall be directed toward the temporary sediment basins prior to discharging from the site.

Installation Requirements

1. The sediment basins should be located as close to the sediment source as possible.

2. The sediment basins shall have a minimum length to width ratio of 2:1 and shall have minimum side slopes of 3:1.

3. The bottom of the sediment basin shall be lined with gravel/stone.

4. The sediment basin shall have a minimum storage volume of 3,600 cubic feet for each acre of disturbed drainage area.

Inspection and Maintenance

1. The sediment basins shall be inspected weekly and after every rainfall event of one (1) inch or greater.

2. Inspect the sediment basin for and settlement, seepage and erosion damage. All deficiencies shall be repaired or replaced immediately.

3. Remove and properly dispose of sediment when it accumulates to one-half (½) of the basin design volume. All trash and other debris shall be removed from the sediment basin on weekly basis.

4. Remove and replace gravel/stone when sediment basin does not drain properly.

## D. Temporary Drainage Swales

The Contractor shall construct temporary drainage swales to transport stormwater runoff from the disturbed areas of the site to the temporary sediment basins. Check dams shall be utilized along the temporary drainage swales.

Installation Requirements

1. The temporary drainage swales cross-section shall be constructed with a top width between two (2) to four (4) feet and a minimum height of one and on-half (1½) feet. The side slopes of the swale shall be between 2:1 and 4:1.

2. The maximum channel grade shall be one and on-half (1½) percent and shall have a positive grade to the outlet.

3. The stormwater runoff shall outlet through check dams and into temporary sediment basins.

Inspection and Maintenance

1. The temporary drainage swales shall be inspected weekly and after every rainfall event of one (1) inch or greater.

2. Inspect the drainage swales for construction induced damage, settlement and erosion damage. All deficiencies shall be repaired or replaced immediately.

3. Remove and properly dispose of sediment when it accumulates into the flow area. All trash and other debris shall be removed from the drainage swale on weekly basis.

**E. Temporary Check Dam**

The Contractor shall install temporary check dams along the temporary drainage swales to lower the runoff velocities of stormwater flows to reduce erosion and promoting the settlement of sediments.

Installation Requirements

1. Check dams shall be constructed of anchored hay bales or other approved means with a small sump located immediately upstream of the check dam.

2. The hay bales shall be either wire or nylon bound or string-tied. String-tied bales shall be installed so that the bindings are orientated around the sides, rather than along the tops and bottoms, to prevent the deterioration of the bindings.

3. Each hay bale shall be anchored with a minimum of two (2) wood stakes or steel rebar with the first anchor driven toward the previously laid hay bale to force bales together. The anchors shall be driven deep enough into the ground to securely anchor the bales or to a minimum of eighteen (18) inches.

4. All gaps between hay bales shall be filled by wedging with straw, to prevent water from escaping between the bales, and should be done with care in order not to separate the hay bales.

5. The maximum spacing between check dams shall be that the toe of the up gradient dam is at the same elevation as the top of the down gradient dam.

Inspection and Maintenance

1. The check dams shall be inspected weekly and after every rainfall event of one (1) inch or greater.

2. Inspect the check dams for damage and erosion damage. All deficiencies shall be repaired or replaced immediately.

3. Remove and properly dispose of sediment when it accumulates to a depth of one-half the dam height. All trash and other debris shall be removed from the check dam sump on weekly basis.

**F. Drainage System Inlet Protection**

The Contractor shall install Siltsack or approved equivalent at catch basin grate locations to allow the drainage system to be utilized before final site stabilized as long as the infiltration basin is constructed and stabilized.

Specifications

Siltsack by ACF Environmental, Inc.

Installation Requirements

1. Siltsack should be installed at all catch basin grate locations in accordance with the manufacturer recommendations and specifications.

Inspection and Maintenance

1. Siltsacks shall be inspected weekly and after every rainfall event of one (1) inch or greater.

2. Inspect the siltsack for damage. All deficiencies shall be repaired or replaced immediately.

3. Remove and properly dispose of sediment when it accumulates to a depth of one-half the siltsack storage volume.

## *4. Construction Sequencing Plan*

Anticipated Construction Schedule

1. Demarcate the proposed limit of work as well as trees and other buffer zone areas for protection.

2. Hold a pre-construction meeting a minimum of one (1) week prior to the start of construction.

3. Notify Dig-Safe to demarcate all underground utilities prior to start of construction.

4. Install sediment fence/straw wattle barrier at locations indicated on the Site Plans.

5. Construct all temporary drainage swales to collect and divert stormwater runoff from undisturbed areas of the site to bypass construction area.

6. Clear and construct temporary construction entrance.

7. Clear and grub all areas associated with the construction of the development.

8. Excavate topsoil and subsoil from cut areas, install erosion control barriers and stockpile soil on site. Consideration should be given to locating soil stockpiles on the up gradient side of disturbed areas, where possible, to act as temporary diversions.

9. Fill areas in twelve (12) inch lifts and compact to 95% standard proctor. Install slope protection or retaining walls with reinforcement, where required.

10. Rough grade the site.

11. Construct temporary drainage swales with check dams along the sides of the proposed roadway as well as all temporary sediment basins.

12. Construct fine grading of roadway.

13. Install closed drainage system and other utilities. Install Siltsack or approved equivalent at all catch basin grate locations.

14. Complete final grading of roadway with gravel sub base. Add additional erosion control measures as necessary.

15. Place the bituminous concrete binder course on roadways and sidewalk areas and permanently vegetate and landscape including the installation of trees. All slopes greater than 3:1 shall be stabilized with jute mesh.

16. Place final wearing surface of both the roadway and sidewalk.

17. After site is stabilized, remove all temporary measures and install permanent vegetation on all disturbed areas

***APPENDIX E***

# ***POST-CONSTRUCTION STORM WATER OPERATIONS AND MAINTENANCE PLAN***

## ***GENERAL NOTES***

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER INSPECTION AND MAINTENANCE OF ALL STORMWATER AND EROSION CONTROL FACILITIES UNTIL THE PROJECT CONSTRUCTION IS COMPLETED. THE CONTRACTOR SHALL CLEAN ALL COMPONENTS OF THE STORM WATER MANAGEMENT SYSTEM AND SWEEP ALL PAVED AREAS AT THE COMPLETION OF CONSTRUCTION, IMMEDIATELY PRIOR TO TURNING OVER OPERATION AND MAINTENANCE RESPONSIBILITY TO THE OWNER.

2. UPON COMPLETION OF CONSTRUCTION, THE OPERATION AND MAINTENANCE OF ALL COMPONENTS OF THE STORMWATER MANAGEMENT SYSTEM WILL BE THE RESPONSIBILITY OF THE OWNER:

   **Armory Street, LLC**
   Northborough, Massachusetts

3. DISPOSAL OF ACCUMULATED SEDIMENT AND HYDROCARBONS TO BE IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL GUIDELINES AND REGULATIONS.

## ***EROSION CONTROL BMPs***

DETENTION SYSTEMS:

INSPECT AFTER EVERY MAJOR STORM EVENT (1" OR GREATER) DURING CONSTRUCTION AND FOR TWELVE (12) MONTHS AFTER CONSTRUCTION TO ENSURE PROPER STABILIZATION AND FUNCTION. THEREAFTER, INSPECT AT LEAST TWICE PER YEAR DURING WET WEATHER TO ENSURE THE SYSTEM IS DRAINING PROPERLY. CHECK FOR ACCUMULATION OF SEDIMENT AND PONDING WATER. IF PONDING WATER IS VISIBLE INSIDE THE SYSTEM FOR SEVERAL DAYS AFTER A STORM EVENT, NOTIFY THE ENGINEER FOR POSSIBLE REMEDIAL MEASURES. REMOVE SEDIMENT AS NECESSARY DURING CONSTRUCTION, WHILE THE SYSTEM IS DRY, AND AT LEAST ONCE EVERY FIVE YEARS AFTER CONSTRUCTION.

CULTEC UNIT:

A. QUARTERLY INSPECTIONS DURING THE FIRST YEAR OF INSTALLATION AND ANNUALLY THEREAFTER.
B. REMOVE DEBRIS AND SEDIMENT THROUGH THE INSPECTION RISER PIPE
C. IF APPLICABLE, REMOVE ANY ACCUMULATED SLUDGE FROM THE BOTTOM OF THE UNIT USING A VACUUM TRUCK.