



STORMWATER REPORT

**ALL STATES MATERIAL GROUP (ASMG)
HAUL IMPROVEMENTS & NEW PAD SITE
FRANKLIN COUNTY, MASSACHUSETTS**

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SUBMISSION

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STORMWATER REPORT
ASMG Haul Road Improvements & New Pad Site

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STORMWATER MANAGEMENT CHECKLIST



Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

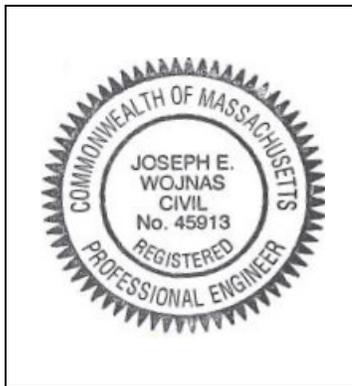
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



11/15/2022

Signature and Date

Checklist

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

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



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

Standard 3: Recharge

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

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

Standard 4: Water Quality

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

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



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

Standard 6: Critical Areas

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



Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 9: Operation and Maintenance Plan

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

Standard 10: Prohibition of Illicit Discharges

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

APPENDIX A – PROJECT DESCRIPTION

1.0 INTRODUCTION

The purpose of this report is to provide an analysis and summary of the existing and proposed stormwater management system associated with the proposed road redevelopment of the Haul Road referred to as Lenny Lane in the center of the All States Materials Group property located in Deerfield, Massachusetts. The proposed improvements include redevelopment of Lenny Lane to a Mine Safety and Health Administration (MSHA) compliant haul road with an improved stormwater management system. Proposed improvement also includes new BMP's for outfalls DSN-007 and DSN-008 and proposed culvert crossing for the unnamed stream (tributary to Deerfield River). The proposed stormwater management system and proposed site improvements are intended to be in full compliance with the State and Town regulations.

The overall project site is approximately 212-acres utilized as a rock quarry and aggregate processing plant (by Trew Stone, LLC), operates two hot mix asphalt plants (by Warner Brothers, LLC), and operates an above ground storage tank farm (by All States Asphalt, LLC).

The existing project drainage area is approximately 175 acres comprised of the following areas:

- 160.43+/- acres (Drainage Area 1),
- 7.50+/- acres (Drainage Area 2),
- 0.63+/- acres (Drainage Area 3),
- 0.09+/- acres (Drainage Area 4),
- 6.35+/- acres (Drainage Area 5)

The site is located approximately 1,200-feet south of River Road and 3,300-feet east of Massachusetts Route 10 and within the Deerfield Commercial zone. Existing site access is from River Road via existing private gravel roads. The site is bounded to the north and west by MassDOT rail serving Amtrak and Pan Am Southern, bounded to the east by River Road, and bounded to the south by residential/agricultural zone properties. See **Appendix B** for an Abutter's Map and list of Abutters within 300 ft of the site property lines.

The existing haul road (Lenny Lane) consist of a gravel surface and varies in width from approximately 22-feet to 34-feet wide. The existing haul road has an overall slope down grade from east to west with elevations varying from approximately 187 feet to 350 feet. The site consists of the intersection of 2 gravel roads, 2 small ponds, drainage pipes and culverts, and the majority being woods. There are no existing open storage areas for waste disposal. Two (2) 36-inch to 24-inch diameter culverts, adjacent to DSN-007 & DSN-008, convey the unnamed stream beneath the haul road. Two wetlands were identified adjacent to the site outside the limit of disturbance. The wetlands are at a higher existing and elevation to the proposed site work and will be protected and undisturbed. See **Appendix B** for an aerial image of the existing site.

The proposed site is approximately 175 acres comprised of the following areas:

- 151.84+/- acres (Drainage Area 1),
- 7.50+/- acres (Drainage Area 2),
- 0.98+/- acres (Drainage Area 3),
- 14.95+/- acres (Drainage Area 4),
- 0.53+/- acres (Drainage Area 5)

Proposed site improvements of the existing haul road to a MSHA compliant haul road include 2680 feet of roadway being widened, 170 feet of roadway being regraded, a 60-ft x 100-ft gravel

pad in the corner of Mathers Way and Lenny Lane, stormwater basins, drainage swales, drainage culverts, and minor landscaping. There are no proposed open storage areas for waste disposal. The site demolition that will occur includes the removal of two (2) detention ponds (Pond 7P, Pond 11P), three (3) catch basins, several culverts, removal of trees and shrubs, and clearing and grubbing within the limits of work. Permitted discharge point (DSN-001) will remain. Permitting discharge points (DSN-006, DSN-007, and DSN-008) will be removed during construction and the exact location would be established with updates to the NPDES permit.

Per the FEMA Flood Insurance Rate Map the site resides outside of any FEMA designated flood areas. See **Appendix C** to view the FEMA floodplain per FIRMette 2501150011B.

The Stormwater Report is submitted to document compliance with the Stormwater Management Standards as shown in the Massachusetts Stormwater Handbook (MSH) and in compliance with the Stormwater Regulations for the Town of Deerfield (SRTD).

2.0 STORMWATER MANAGEMENT STANDARDS

2.1 Standard 1: No New Untreated Discharges

There are no new drainage outfalls associated with the stormwater management system improvements. Permitted discharge point (DSN-001) to remain.

The stormwater management system best management practices (BMP's) includes two bioretention basins (90% TSS removal rate), sediment forebay (25% TSS removal rate) and deep-sump and hooded catch basins (25% TSS removal rate) for the system.

2.2 Standard 2: Peak Rate Attenuation

The stormwater management system is designed so that the hydrologic characteristics of post-development run-off from the site will mimic pre-development patterns and intensities for a 2-year, 10-year and 100-year 24-hour storm event.

Analysis Methodology

The hydrologic analysis to determine peak stormwater discharge rates was performed using the HydroCAD stormwater modeling system computer program developed by HydroCAD Software Solutions, LLC. Hydrographs for each watershed were developed using the SCS Synthetic Unit Hydrograph Method TR-20 with a Type III rainfall distribution, Antecedent Moisture Condition II, and rainfall depths per the Massachusetts Stormwater Handbook for Franklin County for the calculation of peak flow rates and are listed in **Table 1**. The drainage areas, or subcatchments as labeled by the program, are depicted by hexagons on the attached drainage diagrams. Storage areas, or pond nodes, are depicted by triangles. Pre-Development and Post-Development HydroCAD calculations output, including runoff curve numbers and time of concentrations, can be found in **Appendix F**.

Table 1 – Rainfall Data from Rainfall Frequency Atlas of the United States (Atlas 14)
24-hour Rainfall by Deerfield Massachusetts

Storm Event Frequency	Inches / 24-hour
2-year	2.94
10-year	4.48
100-year	6.93

Curve number (CN) is used to quantify the portion of rainfall which results in runoff. CN was estimated based on soil and land use data for the project area. Soil data were obtained from the Natural Resources Conservation Service (NRCS) Web Soil Survey for Franklin County, Massachusetts (Date: 9/12/2019). Land use data were obtained from the State of Massachusetts GIS data service (Date: 2016). Existing land use consists of industrial, pastureland, woods, brush, and wetlands and surface waters.

The time of concentration (Tc) is the travel time it takes storm water to travel from the most remote point in the watershed to the point of interest (also known as the design point). Storm water runoff travels through the watershed as sheet flow, shallow concentrated flow, and open channel flow depending on the site topography. The time of concentration was calculated within HydroCAD. The site was modeled using a Manning's number based on surface description, land slope and a maximum length of 100 feet for sheet flow. The shallow concentrated flow was modeled using a velocity factor based on surface description, land slope and flow length. The minimum time of concentration is 5 minutes.

Pre-Development Conditions

Pre-development stormwater management for the project consists of three (3) detention ponds (Pond 1P, Pond 7P, Pond 11P), two (2) catch basins, several culverts, and four (4) permitted discharge points (DSN-001, DSN-006, DSN-007, DSN-008). Runoff from the project area has the potential to discharge to the existing stream, both upstream and downstream of the existing road. The road crossing culverts (two 36-inch to 24-inch CMPs) were modeled as 30-in CMPs for the purposes of hydrologic and hydraulic modeling. Runoff discharging to the upstream section (S1) of the existing stream is monitored via outfalls DSN-007 and DSN-008. Runoff discharging to the downstream section (S2) of the existing stream is monitored via outfalls DSN-001 and DSN-006. The point of analysis used to evaluate pre-development flows is in existing stream section S2.

The total pre-development project watershed area is 175.00 acres and is approximately 2.7% impervious. The project watershed is subdivided into five (5) basins, labeled DA-1 through DA-5. DA-1 represents mostly undisturbed areas that drain directly to S1. DA-2 represents a north-south section of the existing road and additional onsite areas that drain to Pond 1P. DA-3 represents an east-west section of the existing road, which drains to catch basins that discharge to outfall DSN-007 before discharging to S1. DA-4 represents the small area draining directly to Pond 7P. Pond 1P discharges via culverts to both DSN-001 and Pond 7P. For the purposes of this analysis, all discharge from Pond 1P is routed to Pond 7P and the portion discharging to DSN-001 was ignored. The primary discharge from Pond 7P is via culverts under the existing road to DSN-008 and then to S1. Additional discharge from Pond 7P occurs via an emergency spillway to S2. No permitted outfall is associated with this spillway. All runoff routed to S1 ultimately drains under the existing road via two (2) culverts into S2. DA-5 represents undisturbed areas and a north-south section of the existing road that drains to Pond 11P, which discharges via outfall DSN-006 to S2.

Refer to the Pre-Development Hydrology Map (Figure ED-1) in **Appendix D** for detailed drainage areas, time of concentration flow paths, flow directions, stormwater management features, and topography in the pre-development condition. See **Appendix F** for detailed inputs and results of the Pre-Development HydroCAD Model. See **Appendix J** for details inputs and results of the Pre-Development HY-8 model.

Post-Development Conditions

The post-development condition is similar to the pre-development condition, with modifications to basins and stormwater management features due to the proposed haul road and pad. Post-development stormwater management for the project consists of one (1) detention pond (Pond 1P), three (3) stormwater basins (Stormwater Basins 1 and 2 and a stormwater pretreatment basin), two (2) catch basins, three (3) control structures, several culverts, several swales. As part of this Project, two stormwater detention ponds (Pond 7P and 11P), three catch basins, associated drainage pipe, and three discharge points (DSN-006, 007, and 008) will be removed during construction and the exact location would be established with updates to the NPDES permit. Pond 1P remains. Multiple culverts and catch basins are either abandoned, replaced, or rerouted to accommodate the proposed haul road. Multiple swales are added to convey runoff from the proposed haul road. Runoff from the project area has the potential to discharge similar to the pre-development condition (to the existing stream, both upstream and downstream of the haul road). Runoff discharging to the upstream section (S1) of the existing stream is monitored via outfalls DSN-007 and DSN-008. Runoff discharging to the downstream section (S2) of the existing stream is monitored via outfalls DSN-001 and DSN-006. The point of analysis used is the same as the pre-development condition.

The total post-development project watershed area is 175.83 acres and is approximately 2.8% impervious. The project watershed is subdivided into six (6) basins, which are modified versions of the pre-development basins. DA-1 is slightly reduced in area, but still represents mostly undisturbed areas that drain directly to the S1. This area discharges through the proposed crossing culvert and into S2. DA-2 represents a north-south section of the proposed road and additional onsite areas that drain to Pond 1P, which discharges to Stormwater Basin 1 and then to S1 via DSN-001. DA-3 represents an east-west section of the proposed road, which drains to catch basins that discharge to the Stormwater Basin 1 and then DSN-001. DA-4 from the pre-development condition is eliminated in the post-development condition due to expansion of the east-west road section. DA-5 from the pre-development condition is subdivided into three (3) post-development basins. DA-5a represents the majority of the basin and includes undisturbed areas and a north-south section of the existing road that drains to a stormwater pretreatment basin and then to Stormwater Basin 2. DA-5b represents that area that drains directly to Stormwater Basin 2, which discharges to a swale and ultimately to DSN-006. DA-5c represents the remaining area that drains directly to swale and offsite to S2.

Refer to the Post-Development Hydrology Map (Figure PD-1) in **Appendix D** for detailed drainage areas, time of concentration flow paths, stormwater management features, and topography in the post-development condition. See **Appendix F** for detailed inputs and results of the Post-Development HydroCAD Model. See **Appendix J** for details inputs and results of the Post-Development HY-8 model.

Table 2 - Comparison of Pre-Development and Post-Development Peak Runoff Rates

System: Point of Analysis

	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{100yr} (cfs)
Pre- Development	34.33	102.43	273.50
Post- Development	34.84	114.21	275.23
Delta =	+0.51	+11.78	+1.73

The change in peak runoff from pre- to post-development can be attributed to the proposed haul road (wider and higher elevation than existing road), the proposed crossing (two 30 in CPP culverts replaced by one 84 in CMP culvert), and the rerouting of flows to accommodate the proposed haul road. Runoff for the 2-year, 24-hour storm is slightly higher in the post-development condition. The proposed haul road and crossing have little to no impact on this storm event. Runoff for the 10-year, 24-hour storm is higher in the post-development condition. This is because the proposed crossing (84 in CMP) is sized appropriately; the culvert conveys the 10-year storm without retaining water upstream of the culvert. The existing crossing (two 30 in CPPs) is undersized for the 10-year storm, which results in more water being retained upstream of the crossing and therefore a lower discharge rate from the culverts. Runoff from the 100-year, 24-hour storm is slightly higher in the post-development condition. This can also be attributed to the proposed crossing being sized appropriately, but little to no impact occurs for this storm. In the pre-development condition, the 100-year storm results in overflow of the existing road. Road overflow is eliminated in the post-development condition.

Hydraulic Analysis

The culvert capacities for the existing crossing (two 30 in CPP culverts) and proposed crossing (one 84 in CMP culvert) were analyzed using HY-8. Minimum, design, and maximum flows needed to be conveyed by the crossing were the 2-, 10-, and 100-year, 24-hour storms, respectively. Peak discharge for each storm was obtained from the HydroCAD analysis. For each condition, the capacity of the culvert(s) was evaluated based on upstream and downstream stages. The post-development condition has slightly higher upstream stage for the 2-year storm and lower upstream peak stage for the 10- and 100-year storms. For the 10-year storm, upstream stage is below the top of culvert elevation in the post-development condition, indicating that the proposed crossing is sized appropriately. In the pre-development condition the 10-year storm results in upstream stage several feet above the top of culvert elevation, indicating the existing crossing is undersized. For the 100-year storm, upstream stage results in discharge over the existing road in the pre-development condition. Road discharge is eliminated in the post-development condition, which is another indication that the proposed crossing is sized appropriately. The stages downstream of the crossing are lower in the pre-development condition for all storms. Results indicate that the proposed crossing is appropriately sized and will not have an adverse impact on flows or stages upstream or downstream of the crossing.

Refer to **Appendix J** for detailed inputs and results of the pre- and post-development HY-8 culvert analyses.

2.3 Standard 3: Recharge

The required recharge volume equals the recharge volume multiplied by the total impervious area within the NRCS Hydrologic Group that is impervious. For this project, the post-development net increase impervious area is 0 sf, as the existing and proposed roads are pervious gravel material. The annual recharge from the post-development site will match the pre-development conditions based on soil type.

2.4 Standard 4: Water Quality

Stormwater quality control will be achieved through a program of Best Management Practices (BMPs). The proposed development is designed to achieve a minimum of 80% total suspended solids (TSS) removal in accordance with the MA DEP Stormwater Management Standards.

Effective stormwater management practices include good housekeeping, storing materials under cover, routine inspections, and maintenance of stormwater BMPs during and after construction. MassDEP assigns a maximum 90% TSS removal rate of a bioretention basin. The majority of the surface water for the haul road will sheet flow thru the surface aggregate stone layer, directed to two (2) deep-sump hooded catch basins, at the stream crossing, to a sediment forebay of the bioretention basin.

There is a portion of the proposed haul road that will be directed to conveyance vegetated swales with stone check dams at regular intervals along the swale. The conveyance vegetated swales are directed towards a pretreatment basin prior to a bioretention basin. A small portion of the haul road area is considered 'de minimus' per the Stormwater Management Regulations. Capturing runoff from this area is not possible due to topographic constraints.

For the project site discharges, the required water quality volume (WQV) equals 1/2 inch of runoff times the total impervious area of the post-development site. For this project, the post-development net increase impervious area is 0 sf, as the existing and proposed roads are pervious gravel material. However, WQV calculations were performed on stormwater sub area (haul road) to demonstrate the bioretention basin(s) are designed to accommodate the WQV. See **Appendix E** and **Appendix F** (F3 Post-Development BMP) for all detention and water quality calculations.

2.5 Standard 5: Land Uses with Higher Potential Pollutant Loads

In accordance with the Stormwater Management Standards, the proposed development use is not considered a Land Use with Higher Potential Pollutant Loads. Therefore, this standard does not apply to the project.

2.6 Standard 6: Critical Area

The project area is not located within or near an Area of Critical Environmental Concern. According to the Massachusetts Department of Environmental Protection (MassDEP), the Project area is not located within an Outstanding Resource Water area and is not designed as a Wellhead Protection Area.

2.7 Standard 7: Redevelopment and Other Projects Subject to the Standards only to the Maximum Extent Practicable

An Erosion and Sedimentation Control Plan has been provided in **Appendix E**.

An Illicit Discharge Compliance Statement has been provided in **Appendix I**.

The project meets all standards for redevelopment to the maximum extent practicable. Proposed stormwater controls result in a reduction in the annual pollutant loads from the site while treat the water quality volume.

2.8 Standard 8: Construction Period Pollution Prevention and Erosion and Sediment Control

The NPDES Construction General Permit requires a s Stormwater Pollution Prevention Plan (SWPPP) to be prepared for any project resulting in over 1-acre of disturbed land. The proposed project limits of disturbance are approximately 8.9-acres of land. Therefore, a SWPPP will be prepared by the owner for this project.

2.9 Standard 9: Operation and Maintenance Plan

An Operation & Maintenance Plan has been provided in **Appendix H**.

2.10 Standard 10: Illicit Discharges

An illicit discharge statement has been provided in **Appendix I**.

3.0 CONCLUSION

The proposed drainage patterns mimic the existing drainage patterns and conforms to the MassDEP Stormwater Management Regulations. The implementation of Best Management Practices including multiple bioretention basins, sediment forebays and deep-sump catch basins will minimize Total Suspended Solids (TSS) and other pollutants based on permit benchmark concentration levels to the maximum extents practicable.

APPENDIX B – EXISTING CONDITIONS

B1: Aerial Map

B2: Abutters List

B3: Abutters Maps

B1: AERIAL MAP



Parcel Number	GIS Number	Cama Number	Property Address	Owner Name	Co-Owner Name	Owner Address	Owner Address 2	Owner City	Owner State	Owner Zip
20-13	20-13	20-13	736 GREENFIELD RD	GAGNON SCOTT		127 BENT NAIL DR		SHELburne FALLS	MA	01370
20-14	20-14	20-14	OFF GREENFIELD RD	GAGNON SCOTT		127 BENT NAIL DR		SHELburne FALLS	MA	01370
20-15	20-15	20-15	734 GREENFIELD RD	CAMPBELL MARY SUE +	ADAMS EMERY	734 GREENFIELD RD		DEERFIELD	MA	01342
20-18	20-18	20-18	724 GREENFIELD RD	LAMORE WILLIAM R		724 GREENFIELD RD		DEERFIELD	MA	01342
20-2	20-2	20-2	705 GREENFIELD RD	PENFIELD ROBERT G + MARK R		308 COUNTRY CLUB RD		GREENFIELD	MA	01301
20-20	20-20	20-20	GREENFIELD RD	LAMORE WILLIAM R		724 GREENFIELD RD		DEERFIELD	MA	01342
22-1	22-1	22-1	RIVER RD	BYRNE JAMES J + BENJAMIN L		86 RIVER ST		GREENFIELD	MA	01301
22-12	22-12	22-12	RIVER RD	SMITH BARBARA F		784 RIVER RD		DEERFIELD	MA	01342
22-13	22-13	22-13	791 RIVER RD	SCHAEFER AMIE L		791 RIVER RD		DEERFIELD	MA	01342
22-14	22-14	22-14	795 RIVER RD	GILBERT NATHAN JAMES		1558 MAIN ST APT 2		WORCESTER	MA	01603
22-15	22-15	22-15	797 RIVER RD	ZAMOJSKI BRIAN		797 RIVER RD		DEERFIELD	MA	01342
22-16	22-16	22-16	RIVER RD	ZAMOJSKI BRIAN		797 RIVER RD		DEERFIELD	MA	01342
22-19	22-19	22-19	RIVER RD	CLARK LEWIS B	C/O DANNY ABBOTT	10 LAUREL LN		MONTAGUE	MA	01351
22-2	22-2	22-2	769 RIVER RD	BYRNES JAMES J JR		86 RIVER ST		GREENFIELD	MA	01301
22-20	22-20	22-20	803 RIVER RD	ABBOTT DANNY L + PHYLLIS R		10 LAUREL LN		MONTAGUE	MA	01351
22-21	22-21	22-21	799 RIVER RD	CLARK CHARLES L + SHIRLEY I		801 RIVER RD		DEERFIELD	MA	01342
22-22	22-22	22-22	801 RIVER RD	CLARK CHARLES L + SHIRLEY I		801 RIVER RD		DEERFIELD	MA	01342
22-24	22-24	22-24	796 RIVER RD	CANEDY RUSSELL R		796 RIVER RD		DEERFIELD	MA	01342
22-25	22-25	22-25	RIVER RD	HARTSHORN CHRISTOPHER C		790 RIVER RD		DEERFIELD	MA	01342
22-26	22-26	22-26	790 RIVER RD	HARTSHORN CHRISTOPHER C		790 RIVER RD		DEERFIELD	MA	01342
22-27	22-27	22-27	RIVER RD	SMITH ARTHUR H + BARBARA F		784 RIVER RD		DEERFIELD	MA	01342
22-28	22-28	22-28	784 RIVER RD	SMITH BARBARA F		784 RIVER RD		DEERFIELD	MA	01342
22-29	22-29	22-29	778 RIVER RD	BLANCHARD BRUCE E		778 RIVER RD		DEERFIELD	MA	01342
22-3	22-3	22-3	769 RIVER RD	BYRNES JAMES J JR		86 RIVER ST		GREENFIELD	MA	01301
22-4	22-4	22-4	769 RIVER RD	BYRNES JAMES J JR		86 RIVER ST		GREENFIELD	MA	01301
22-7	22-7	22-7	767 RIVER RD	BYRNE JAMES J + BENJAMIN L		86 RIVER ST		GREENFIELD	MA	01301
23-1	23-1	23-1	RIVER RD	BYRNE JAMES J JR + BENJAMIN L		767 RIVER RD		DEERFIELD	MA	01342
24-10	24-10	24-10	757 RIVER RD	CHAGNON JANET A +	ROMANKO DARRELL	757 RIVER RD		DEERFIELD	MA	01342
24-11	24-11	24-11	RIVER RD	LAVIGNE DANA M		754 RIVER RD		DEERFIELD	MA	01342
24-12	24-12	24-12	754 RIVER RD	LAVIGNE DANA M		754 RIVER RD		DEERFIELD	MA	01342
24-13	24-13	24-13	752 RIVER RD	AGAPOV ANDREY N + GALINA		55 ORCHARD ST		GREENFIELD	MA	01301
24-14	24-14	24-14	RIVER RD	WESTERN MASS ELECTRIC CO	PROPERTY TAX UNIT	PO BOX 270		HARTFORD	CT	06141
24-15	24-15	24-15	736 RIVER RD	ARMSTRONG-BUSHEY ELISABETH S		736 RIVER RD		DEERFIELD	MA	01342
24-16	24-16	24-16	MCCLELLAND FARM RD	FREDERICK L THOMPSON LIV TRUST	THOMPSON FREDERICK L TRUSTEE	38 MCCLELLAND FARM ROAD		DEERFIELD	MA	01342
24-4	24-4	24-4	RIVER RD	FRANKLIN COUNTY LEAGUE OF	SPORTSMEN'S CLUB INC	PO BOX 716		TURNERS FALLS	MA	01376-0716
24-5	24-5	24-5	725 RIVER RD	ELLIOT MARTHA P		725 RIVER RD		DEERFIELD	MA	01342
24-6	24-6	24-6	729 RIVER RD	ROWE MELISSA A		729 RIVER RD		DEERFIELD	MA	01342
24-7	24-7	24-7	RIVER RD	FRANKLIN COUNTY LEAGUE OF	SPORTSMEN'S CLUB INC	PO BOX 716		TURNERS FALLS	MA	01376-0716
24-9	24-9	24-9	753 RIVER RD	ROBINSON JUDITH ELLEN +	CROWHURST-ROBINSON ZOE M	160 3RD ST		POINT REYES STATION	CA	94956

25-1	25-1	25-1	721 RIVER RD	FRANKLIN CO SPORTSMENS CLUB IN		PO BOX 716		TURNERS FALLS	MA	01376-0716
25-2	25-2	25-2	OFF RIVER RD	BYRNE JAMES J JR + BENJAMIN L		767 RIVER RD		DEERFIELD	MA	01342
26-2	26-2	26-2	KEETS RD	DEERFIELD ACADEMY TRUSTEES OF		PO BOX 87		DEERFIELD	MA	01342
26-3	26-3	26-3	KEETS RD	WT LAND LLC		PO BOX 91		SUNDERLAND	MA	01375
27-10	27-10	27-10	KEETS RD	MALTBY DANIEL L		30 KEETS RD		DEERFIELD	MA	01342
27-11	27-11	27-11	35 KEETS RD	ARNOLD WENDY + KENNETH D		35 KEETS RD		DEERFIELD	MA	01342
27-12	27-12	27-12	39 KEETS RD	CHARLES SALZBERG REV TRUST	SALZBERG CHARLES TRUSTEE	PO BOX 121		ERVING	MA	01344
27-14	27-14	27-14	KEETS RD	WT LAND LLC		PO BOX 91		SUNDERLAND	MA	01375
27-16	27-16	27-16	KEETS RD	DELTA SAND AND GRAVEL INC		PO BOX 395		SUNDERLAND	MA	01375
27-5	27-5	27-5	GREENFIELD RD	YAZWINSKI EDWARD J+ CHESTER T	FRANK S YAZWINSKI III NOM TRST	109 OLD MAIN ST, BOX 296		DEERFIELD	MA	01342
27-9	27-9	27-9	OFF KEETS RD	MALTBY DANIEL L		17 KEETS RD		DEERFIELD	MA	01342
41-5	41-5	41-5	OFF JINGLE HILL RD	DEERFIELD ACADEMY TRUSTEES OF		PO BOX 87		DEERFIELD	MA	01342
42-1	42-1	42-1	103 KEETS RD	WOOLMAN HILL INC		107 KEETS RD		DEERFIELD	MA	01342
42-2	42-2	42-2	JINGLE HILL RD	ALLEN CHASE FOUNDATION	EAGLEBROOK SCHOOL	PO BOX 7		DEERFIELD	MA	01342
42-7	42-7	42-7	JINGLE HILL RD	ALLEN CHASE FOUNDATION	EAGLEBROOK SCHOOL	PO BOX 7		DEERFIELD	MA	01342
7-10	7-10	7-10	RIVER RD	HAYES KARA M		823 RIVER RD		DEERFIELD	MA	01342
7-11	7-11	7-11	RIVER RD	HAYES KARA M		823 RIVER RD		DEERFIELD	MA	01342
7-12	7-12	7-12	825 RIVER RD	RUDNICKI WALTER J + SUSAN J		825 RIVER RD		DEERFIELD	MA	01342
7-13	7-13	7-13	RIVER RD	RUDNICKI WALTER JR + SUSAN		825 RIVER RD		DEERFIELD	MA	01342
7-4	7-4	7-4	16 RAILROAD	COMMONWEALTH OF MASS		TEN PARK PLAZA		BOSTON	MA	02108
7-5	7-5	7-5	100 RAILROAD	PAN AM SOUTHERN LLC		1700 IRON HORSE PARK		N BILLERICA	MA	01862-1692
7-6	7-6	7-6	854 RIVER RD	MITCHELL THOMAS F		93 LEONARD RD		SHUTESBURY	MA	01072
7-7	7-7	7-7	RIVER RD	WELCOME LAWRENCE G +	BARBARA A	860 RIVER RD		DEERFIELD	MA	01342
7-8	7-8	7-8	RIVER RD	KONVELSKI JAMES + JANE		PO BOX 117		S DEERFIELD	MA	01373
7-9	7-9	7-9	823 RIVER RD	HAYES KARA M		823 RIVER RD		DEERFIELD	MA	01342
8-12	8-12	8-12	860 RIVER RD	WELCOME LAWRENCE JR +	WELCOME BARBARA A	860 RIVER RD		DEERFIELD	MA	01342
8-2	8-2	8-2	RIVER RD	WT LAND LLC		PO BOX 91		SUNDERLAND	MA	01375
8-3	8-3	8-3	RIVER RD	WT LAND LLC		PO BOX 91		SUNDERLAND	MA	01375
8-4	8-4	8-4	RIVER RD	PAN AM SOUTHERN LLC		1700 IRON HORSE PARK		N BILLERICA	MA	01862-1692
8-6	8-6	8-6	RIVER RD	DELTA SAND AND GRAVEL INC		PO BOX 395		SUNDERLAND	MA	01375
8-7	8-7	8-7	RIVER RD	DELTA SAND AND GRAVEL INC		PO BOX 395		SUNDERLAND	MA	01375
9-3	9-3	9-3	RIVER RD	WT LAND LLC		PO BOX 91		SUNDERLAND	MA	01375
9-4	9-4	9-4	RIVER RD	DOUG LLC aka DOUG AUTOMOTIVE	C/O RYAN DOUGLAS JAMES	28 VLADISH AVE		TURNERS FALLS	MA	01376
9-5	9-5	9-5	941 RIVER RD	DOUG LLC aka DOUG AUTOMOTIVE	C/O RYAN DOUGLAS JAMES	28 VLADISH AVE		TURNERS FALLS	MA	01376
9-6	9-6	9-6	951 RIVER RD	DOUG LLC aka DOUG AUTOMOTIVE	C/O RYAN DOUGLAS JAMES	28 VLADISH AVE		TURNERS FALLS	MA	01376
9-7	9-7	9-7	RIVER RD	DOUG LLC aka DOUG AUTOMOTIVE	C/O RYAN DOUGLAS JAMES	28 VLADISH AVE		TURNERS FALLS	MA	01376
9-8	9-8	9-8	RIVER RD	WT LAND LLC		PO BOX 91		SUNDERLAND	MA	01375



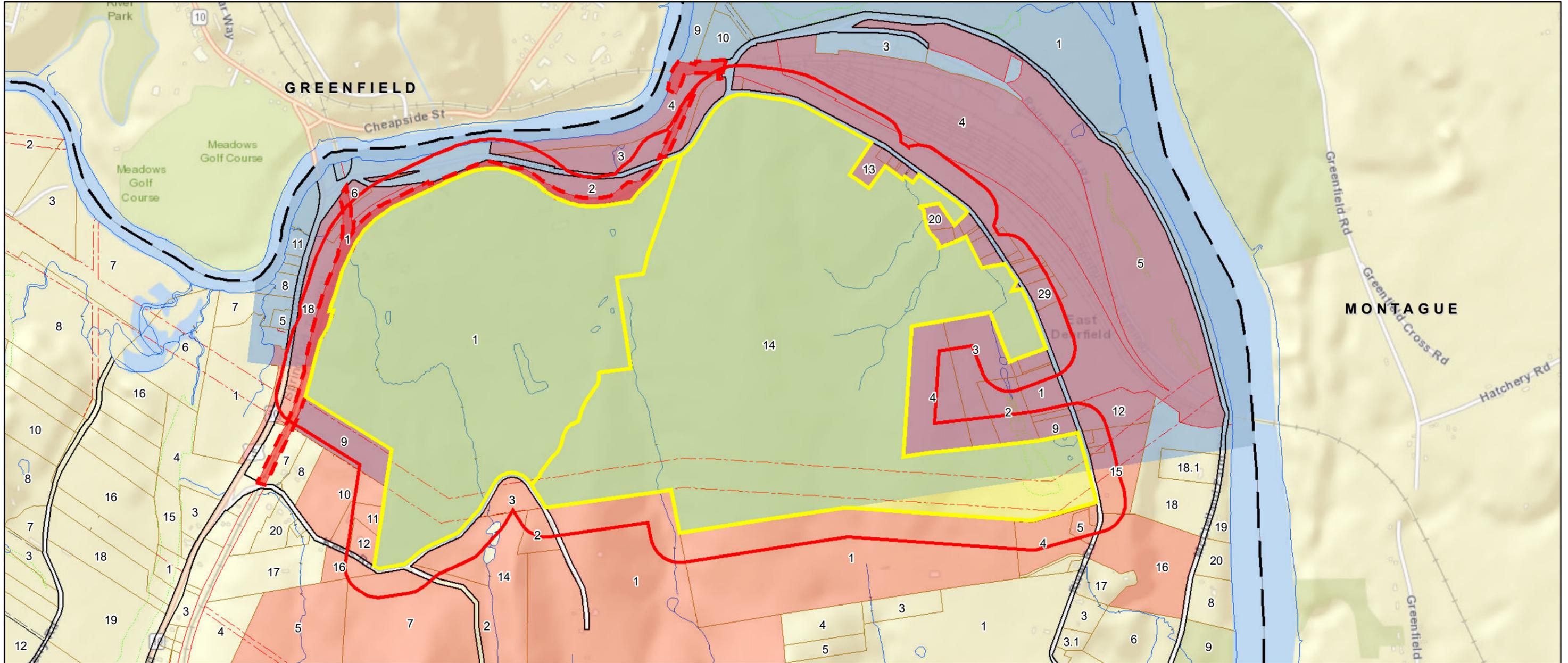
February 5, 2022

Deerfield, MA

1 inch = 1000 Feet



www.cai-tech.com



Large Scale	Railroad	Property Hook
CAI Town Line	Private Road ROW	Property TIC
PWater	Right of Way	Wetland
Private Road	Utility	WaterLines
Property Line	Utility	Commercial
Public Road	PropNotPar	Residential/Agricultural

Data shown on this map is provided for planning and informational purposes only. The municipality and CAI Technologies are not responsible for any use for other purposes or misuse or misrepresentation of this map.



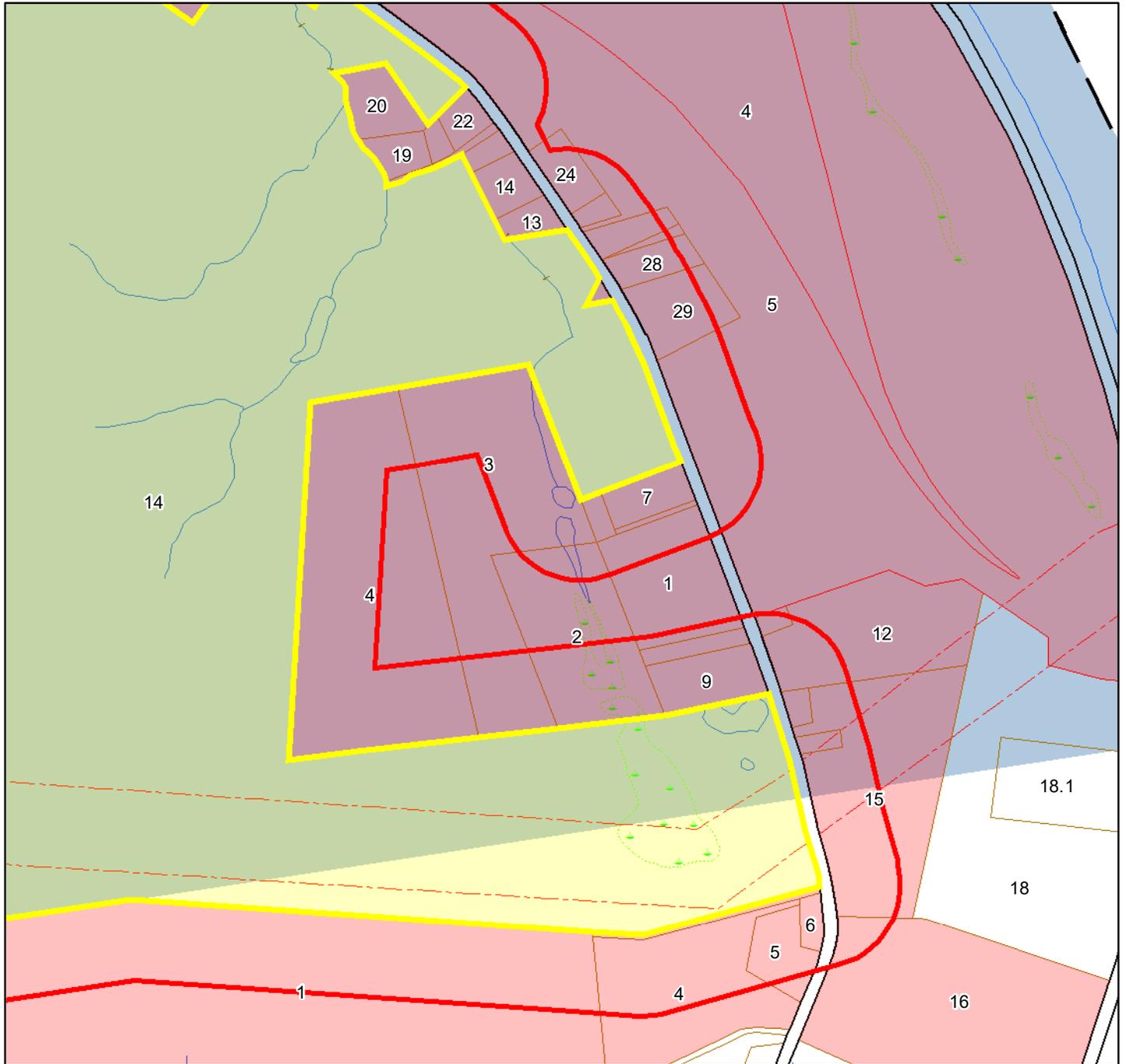
Deerfield, MA



February 5, 2022

1 inch = 554 Feet

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Large Scale	Public Road	Wetland	Residential/Agricultural
CAI Town Line	Railroad	WaterLines	
PWater	Utility	Wet Areas	
Property Line	Property Hook	Commercial	

Data shown on this map is provided for planning and informational purposes only. The municipality and CAI Technologies are not responsible for any use for other purposes or misuse or misrepresentation of this map.



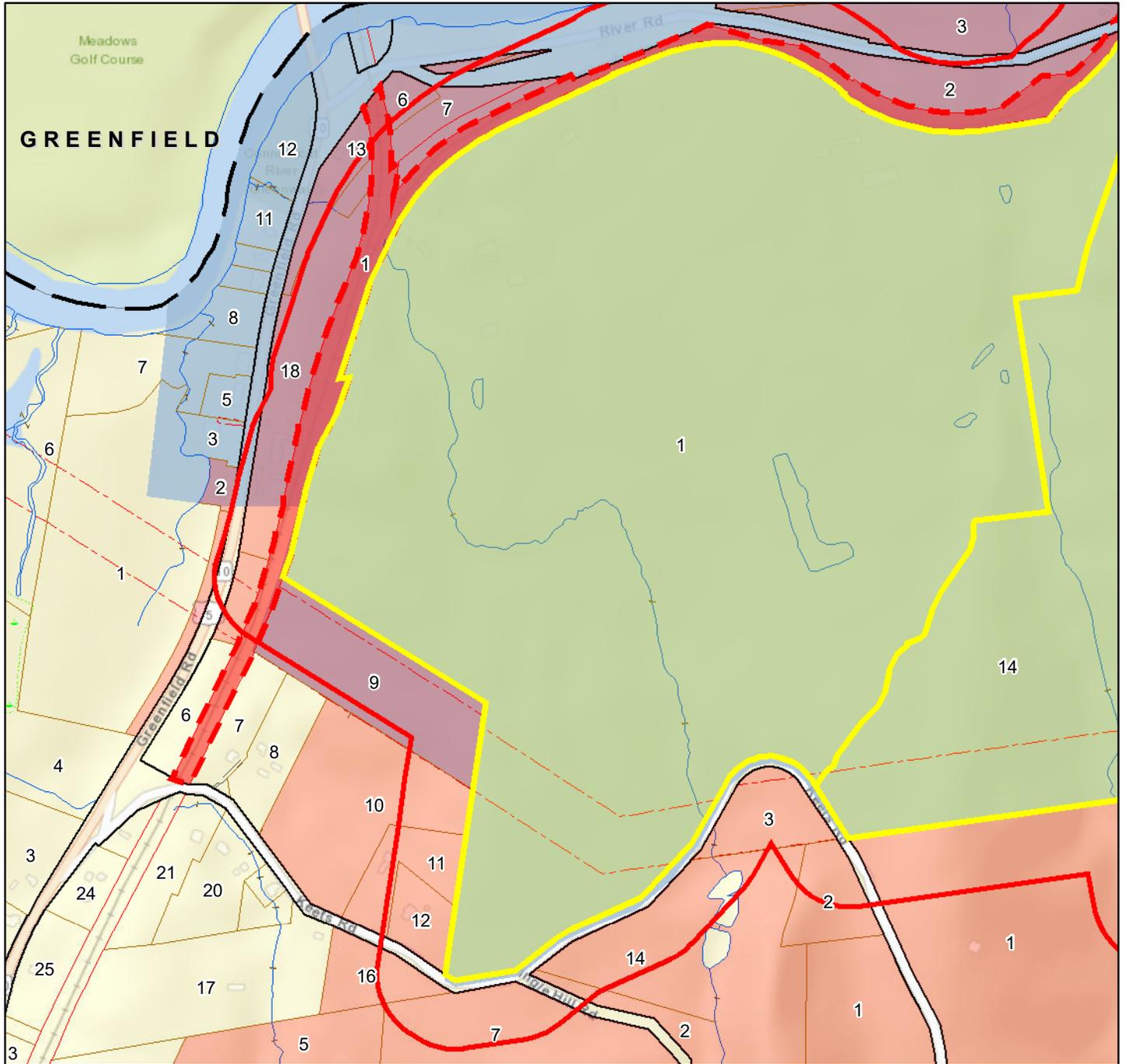
Deerfield, MA



February 5, 2022

1 inch = 650 Feet

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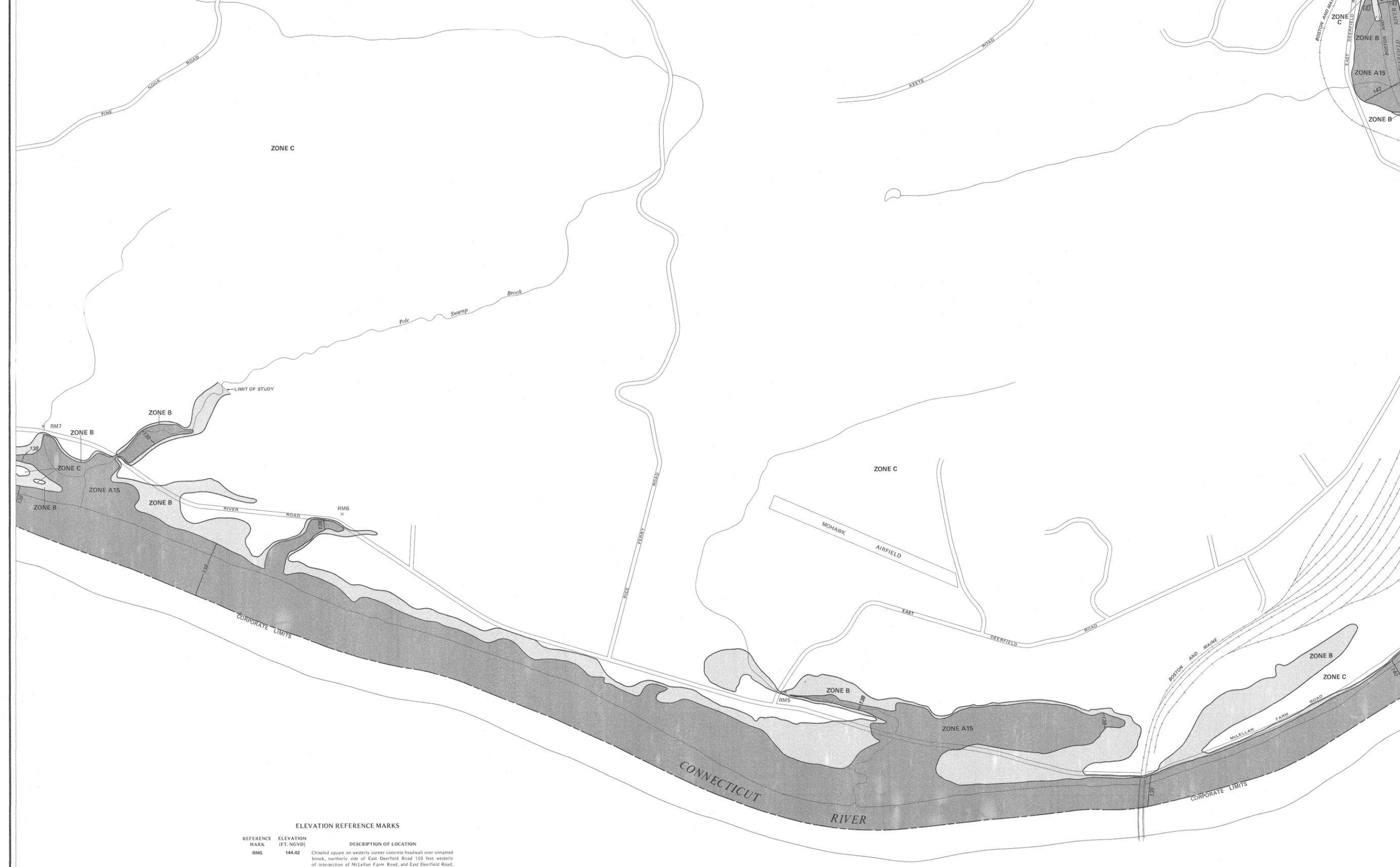
Large Scale	Public Road	Property Hook	Wet Areas
CAI Town Line	Railroad	Property TIC	Commercial
PWater	Right of Way	Wetland	Residential/Agricultural
Property Line	Utility	WaterLines	

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APPENDIX C – SUPPORT DOCUMENTS

C1: Federal Insurance Rate Map: FIRMette 250115 001 B

C2: USDA NRCS Hydrologic Soil Group



100-Year Flood Boundary
 Zone Designations* With Date of Identification
 e.g., 12/2/74
 100-Year Flood Boundary
 500-Year Flood Boundary
 Base Flood Elevation Line With Elevation In Feet**
 Base Flood Elevation In Feet Where Uniform Within Zone**
 Elevation Reference Mark
 River Mile
 **Referenced to the National Geodetic Vertical Datum of 1929

ZONE B
 ZONE A1 DATE
 ZONE A5 DATE
 ZONE B
 513
 (EL 987)
 RM7 X
 M1.5

- *EXPLANATION OF ZONE DESIGNATIONS**
- | ZONE | EXPLANATION |
|--------|--|
| A | Areas of 100-year flood; base flood elevations and flood hazard factors not determined. |
| A0 | Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined. |
| AH | Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined. |
| A1-A30 | Areas of 100-year flood; base flood elevations and flood hazard factors determined. |
| A99 | Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined. |
| B | Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading) |
| C | Areas of minimal flooding. (No shading) |
| D | Areas of undetermined, but possible, flood hazards. |
| V | Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined. |
| VI-V30 | Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined. |

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
 SEPTEMBER 13, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
 JULY 30, 1976

FLOOD INSURANCE RATE MAP EFFECTIVE DATE:
 JULY 2, 1980

FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620, or (800) 424-8872.



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM5	144.42	Chiseled square on westerly corner concrete headwall over unnamed brook, northerly side of East Deerfield Road 150 feet westerly of intersection of McLellan Farm Road, and East Deerfield Road, 40 feet northwesterly of pole no. 108/118. Established by Moore Survey and Mapping Company.
RM6	137.99	Chiseled square on stone (part of stone and mortar header) on the westerly side of River Road, 4500 feet southerly of intersection with McLellan Farm Road, 150 feet southerly of pole no. 138/148, 15 feet westerly of centerline. Established by Moore Survey and Mapping Company.
RM7	144.97	Chiseled square on southwesterly inside corner of stone and mortar header (not wing) on the westerly side of River Road, 3500 feet northerly of intersection with Keith Cross Road, 75 feet southerly of pole no. 159/23/170, 20 feet westerly of centerline. Established by Moore Survey and Mapping Company.

NATIONAL FLOOD INSURANCE PROGRAM

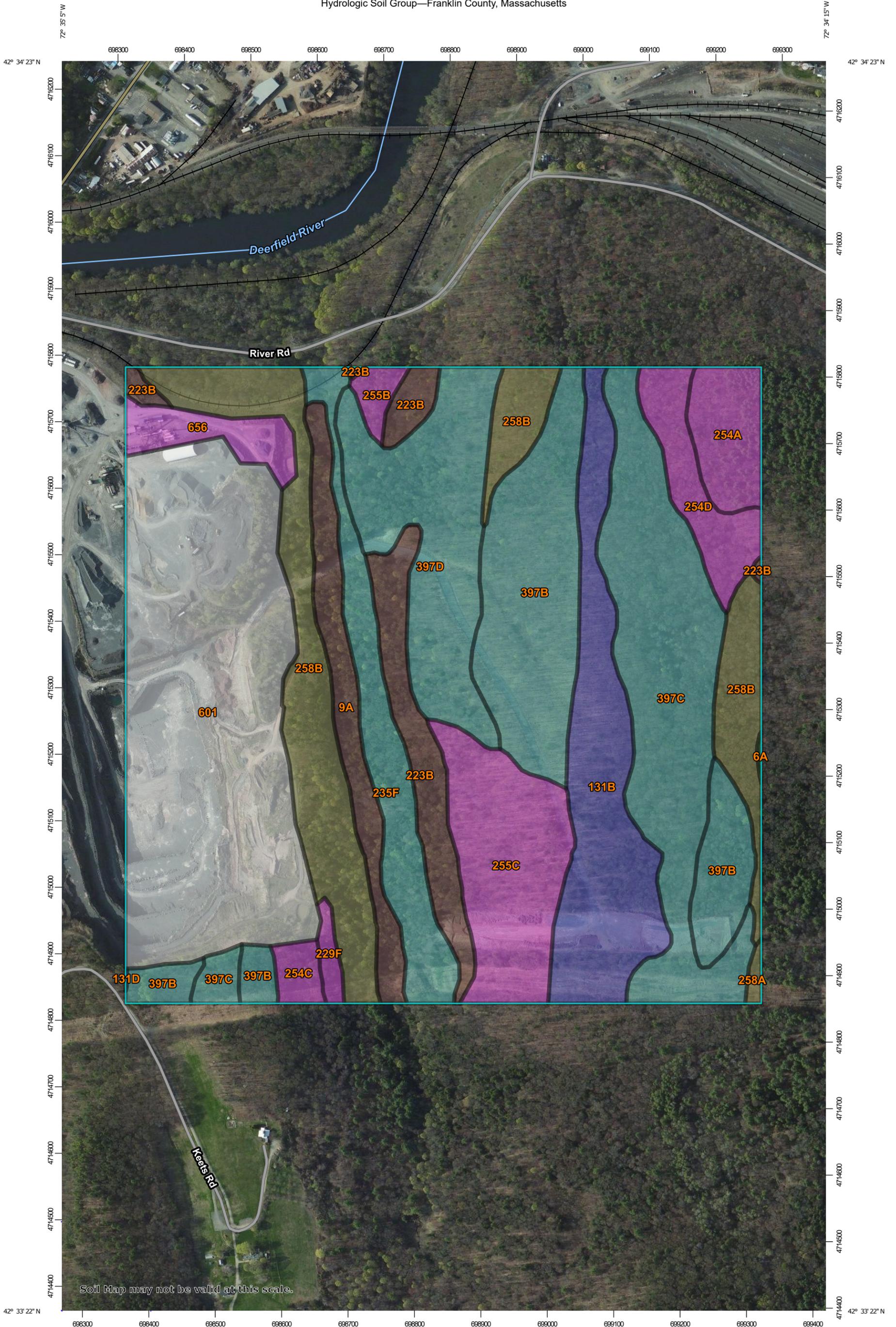
FIRM
 FLOOD INSURANCE RATE MAP

TOWN OF
DEERFIELD,
 MASSACHUSETTS
 FRANKLIN COUNTY

PANEL 11 OF 12
 (SEE MAP INDEX FOR PANELS NOT PRINTED)

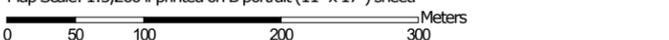
COMMUNITY-PANEL NUMBER
 250115 0011 B

EFFECTIVE DATE:
 JULY 2, 1980



Soil Map may not be valid at this scale.

Map Scale: 1:5,260 if printed on B portrait (11" x 17") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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: Franklin County, Massachusetts
 Survey Area Data: Version 16, Sep 2, 2021

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

Date(s) aerial images were photographed: Apr 9, 2011—May 12, 2011

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
6A	Scarboro mucky sandy loam, 0 to 2 percent slopes	A/D	0.1	0.0%
9A	Birdsall mucky silt loam, 0 to 2 percent slopes	B/D	8.2	3.6%
131B	Yalesville-Holyoke complex, 3 to 8 percent slopes, rocky	B	19.3	8.5%
131D	Yalesville-Holyoke complex, 15 to 25 percent slopes, rocky	B	0.0	0.0%
223B	Scio silt loam, 3 to 8 percent slopes	B/D	10.1	4.5%
229F	Windsor and Merrimac soils, 25 to 60 percent slopes	A	1.0	0.4%
235F	Poocham silt loam, 25 to 60 percent slopes	C	11.5	5.0%
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	A	5.3	2.3%
254C	Merrimac fine sandy loam, 8 to 15 percent slopes	A	1.6	0.7%
254D	Merrimac fine sandy loam, 15 to 25 percent slopes	A	6.0	2.6%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	1.3	0.6%
255C	Windsor loamy sand, 8 to 15 percent slopes	A	14.4	6.3%
258A	Amostown fine sandy loam, 0 to 3 percent slopes	C/D	0.4	0.2%
258B	Amostown fine sandy loam, 3 to 8 percent slopes	C/D	25.7	11.3%
397B	Wethersfield very fine sandy loam, 3 to 8 percent slopes	C	25.3	11.1%
397C	Wethersfield very fine sandy loam, 8 to 15 percent slopes	C	27.3	12.0%
397D	Wethersfield very fine sandy loam, 15 to 25 percent slopes	C	18.5	8.2%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
601	Pits, quarry		47.1	20.7%
656	Udorthents-Urban land complex	A	4.0	1.8%
Totals for Area of Interest			227.0	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

APPENDIX D – HYDROLOGY MAPS

D1: Pre-Development Hydrology Map (ED-1)

D2: Post-Development Hydrology Map (PD-1)

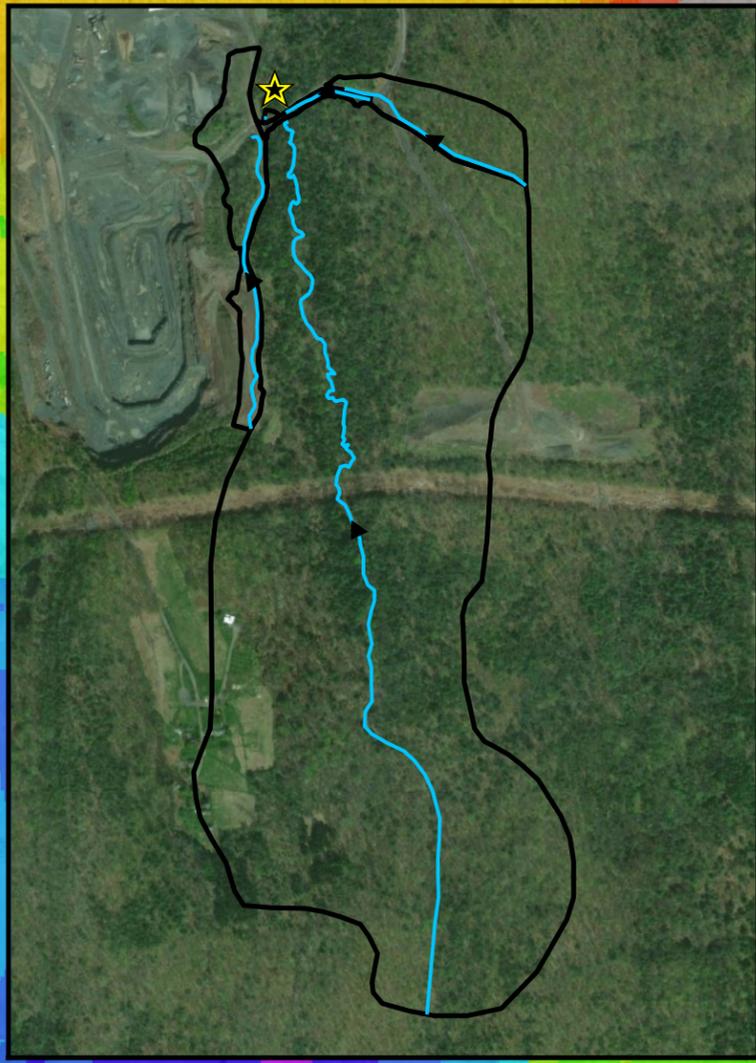
D3: Post-Development Hydrology (PD-1)

Source: Imagery was obtained from ESRI Basemap (Vivid Maxar, 5/6/2019). Existing topography derived from USGS LiDAR point cloud (LPC) for MA (2018). Vertical Datum: NAVD88.

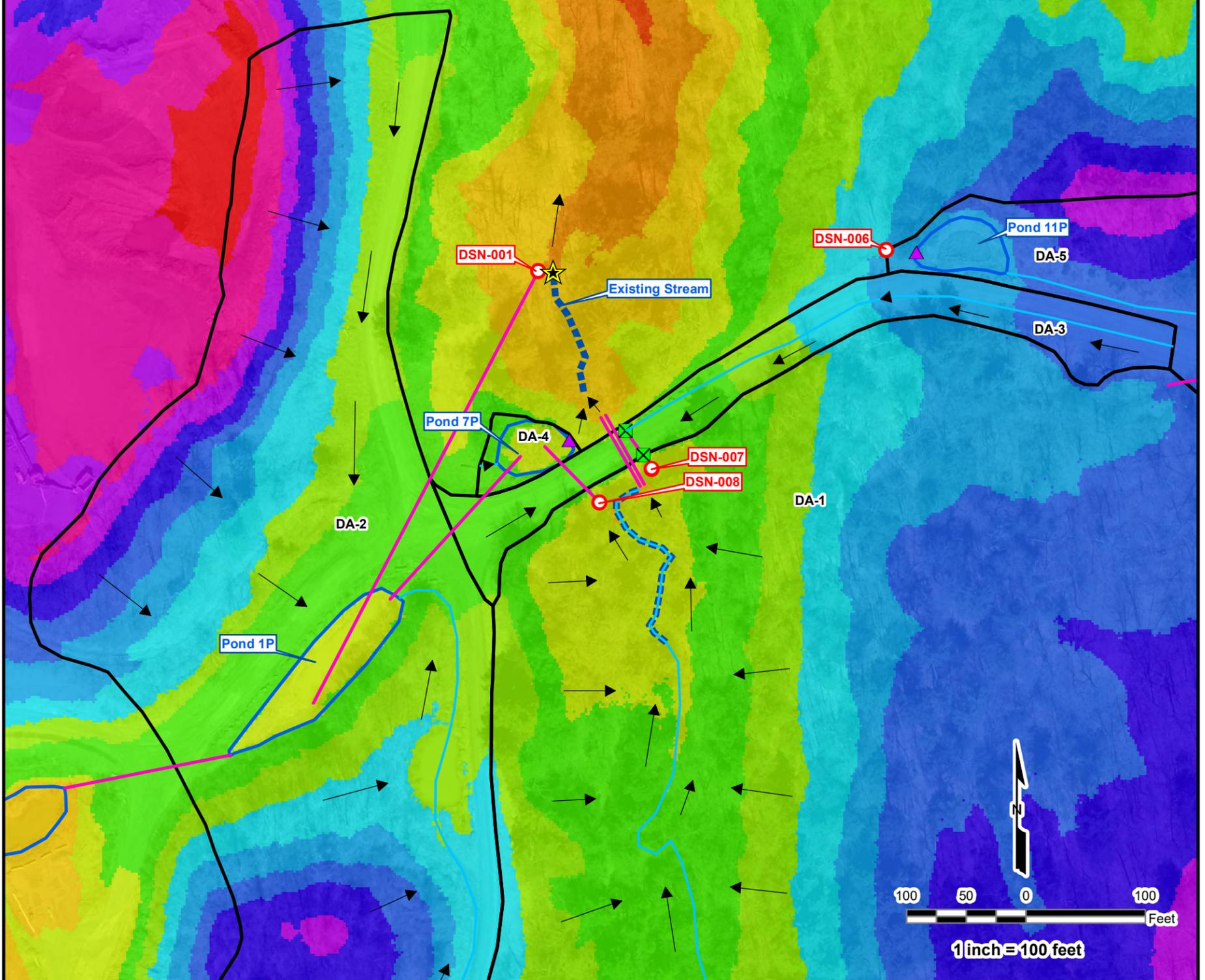
- Legend**
- ★ Point of Analysis
 - ▭ Pre-Development Basin
 - ▶ Pre-Development Time of Concentration Flow Path
 - ➔ Pre-Development Flow Direction
 - Existing Outfall
 - ✕ Existing Catch Basin
 - ▲ Existing Spillway
 - Existing Culvert
 - ▬ Existing Stream
 - ▭ Existing Detention Pond

Existing Topography (ft-NAVD) (USGS, 2018)	
191-200	191-200
201-210	201-210
211-220	211-220
221-230	221-230
231-240	231-240
241-250	241-250
251-260	251-260
261-270	261-270
271-280	271-280
130-140	
141-150	
151-160	
161-170	
171-180	
181-190	

PRE-DEVELOPMENT BASIN RUNOFF PARAMETERS			
Basin ID	AREA (AC.)	CN	TIME OF CONCENTRATION, Tc (MIN)
DA-1	160.43	65	48
DA-2	7.50	84	7
DA-3	0.63	93	5
DA-4	0.09	96	5
DA-5	6.35	74	23



OVERALL DRAINAGE MAP
SCALE: 1"=1000'



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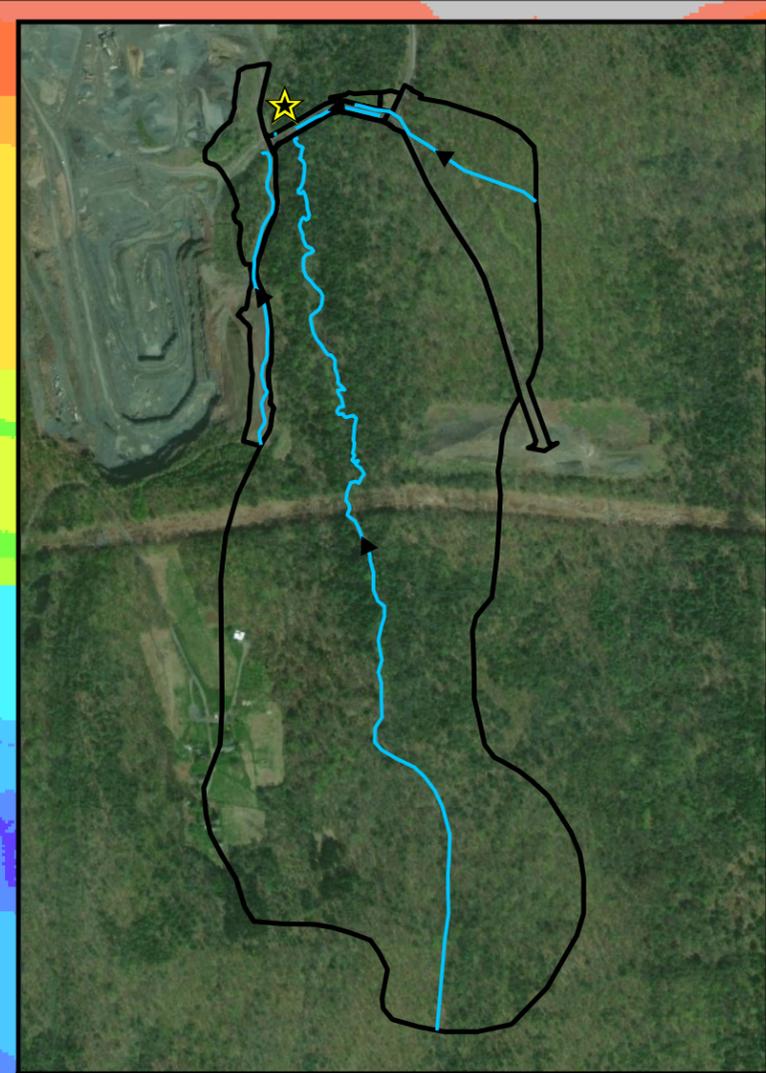
PROJECT NO. 20221383.001A
 DRAWN: 11/9/2022
 DRAWN BY: NCD
 CHECKED BY: KEV
 FILE NAME: ASMG Drain Exist.mxd

Pre-Development Hydrology Map

All States Materials Group
 901 River Road

FIGURE
ED-1

Source: Imagery was obtained from ESRI Basemap (Vivid Maxar, 5/6/2019). Existing topography derived from USGS LiDAR point cloud (LPC) for MA (2018). Vertical Datum: NAVD88.



OVERALL DRAINAGE MAP
SCALE: 1"=1000'

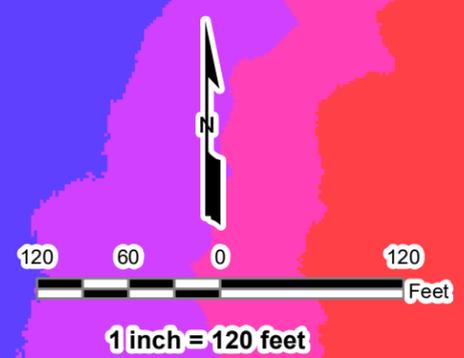
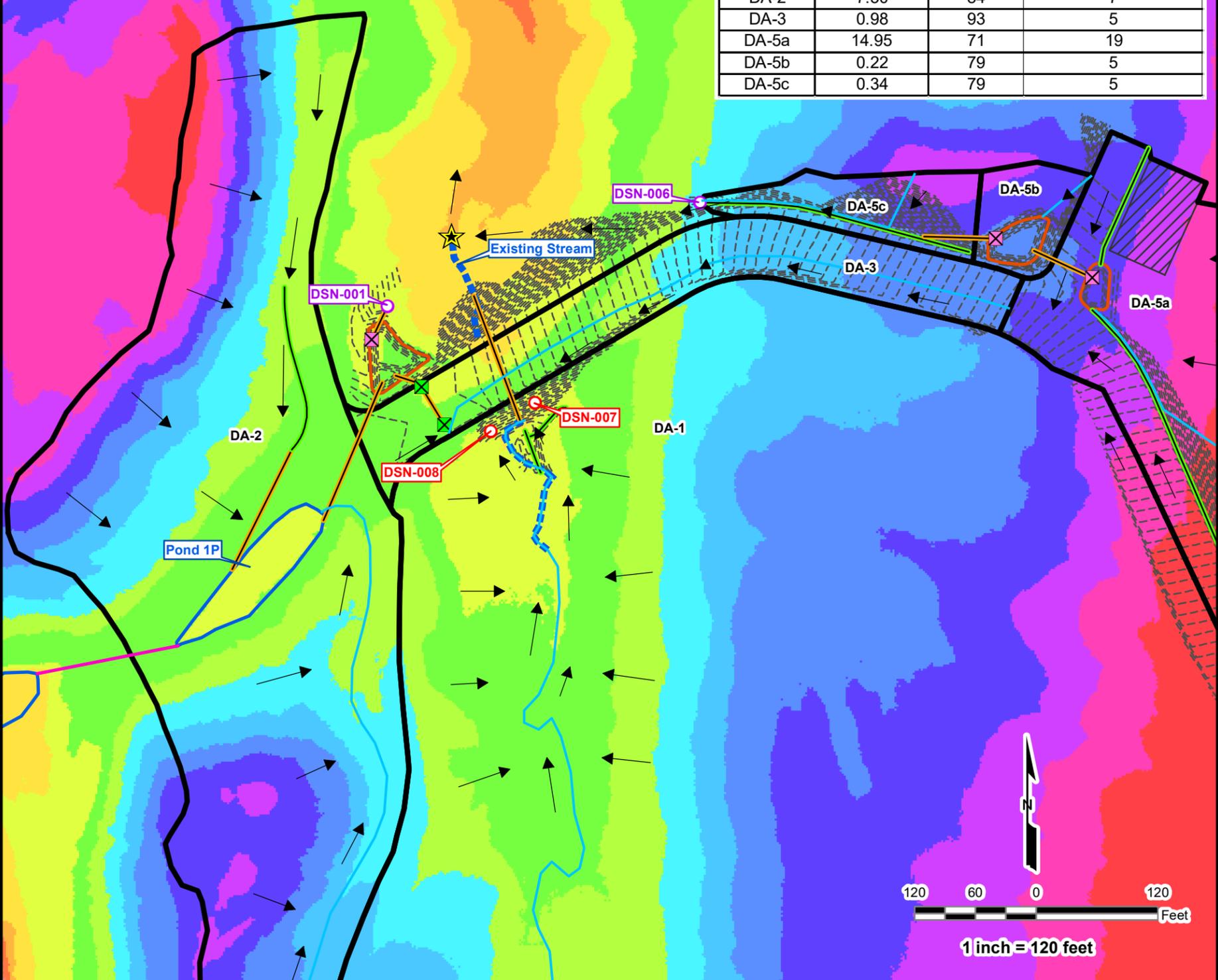
- Legend**
- ★ Point of Analysis
 - ▭ Post-Development Basin
 - ➔ Post-Development Time of Concentration Flow Path
 - ➔ Post-Development Flow Direction
 - Proposed Contours
 - Existing Outfall
 - Proposed Outfall
 - ✕ Proposed Catch Basin
 - ✕ Proposed Outlet Structure
 - Existing Culvert
 - Proposed Culvert
 - Proposed Swale
 - ▭ Existing Detention Pond
 - ▭ Proposed Stormwater Basin
 - ▨ Proposed Pad

Existing Topography (ft-NAVD) (USGS, 2018)

191-200	201-210	211-220	221-230
231-240	241-250	251-260	261-270
271-280			

POST-DEVELOPMENT BASIN RUNOFF PARAMETERS

Basin ID	AREA (AC.)	CN	TIME OF CONCENTRATION, T _c (MIN)
DA-1	151.84	65	48
DA-2	7.50	84	7
DA-3	0.98	93	5
DA-5a	14.95	71	19
DA-5b	0.22	79	5
DA-5c	0.34	79	5



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PROJECT NO. 20221383.001A
 DRAWN: 11/9/2022
 DRAWN BY: NCD
 CHECKED BY: KEV
 FILE NAME: ASMG Drain Prop.mxd

Post-Development Hydrology Map

All States Materials Group
 901 River Road

FIGURE
PD-1

APPENDIX E – STORMWATER COMPUTATIONS

E0: Rainfall Data

E1: TSS Removal Calculation Worksheet

E2: Temporary Sediment Traps

E3: Conveyance Swale Design & Lining

E4: Storm Drainage Culverts

E5: Water Quality Volume

Rainfall Data

PROJECT NAME: All State Material Group

NOAA STATION LOCATION: Deerfield, Massachusetts

NOAA FREQUENCY ESTIMATES (INCHES) AVERAGE RECURRENCE INTERVAL (YEARS)

	1	2	5	10	25	50	100	200	500
DURATION									
5-MIN	0.314	0.368	0.455	0.528	0.627	0.703	0.781	0.863	0.974
10-MIN	0.445	0.521	0.645	0.747	0.888	0.996	1.11	1.22	1.38
15-MIN	0.524	0.613	0.758	0.879	1.05	1.17	1.3	1.44	1.62
30-MIN	0.731	0.855	1.06	1.23	1.46	1.64	1.82	2.01	2.27
60-MIN	0.938	1.1	1.36	1.58	1.87	2.1	2.33	2.58	2.91
2-HR	1.19	1.39	1.73	2.01	2.4	2.69	2.99	3.32	3.78
3-HR	1.35	1.59	1.99	2.31	2.76	3.1	3.45	3.85	4.41
6-HR	1.68	1.99	2.5	2.93	3.52	3.95	4.42	4.96	5.75
12-HR	2.05	2.46	3.13	3.68	4.44	5.01	5.62	6.35	7.44
24-HR	2.42	2.94	3.78	4.48	5.44	6.16	6.93	7.88	9.35

NOAA INTENSITY ESTIMATES (INCHES/HOUR) AVERAGE RECURRENCE INTERVAL (YEARS)

	1	2	5	10	25	50	100	200	500
DURATION									
5-MIN	3.77	4.42	5.46	6.34	7.52	8.44	9.37	10.4	11.7
10-MIN	2.67	3.13	3.87	4.48	5.33	5.98	6.64	7.33	8.27
15-MIN	2.1	2.45	3.03	3.52	4.18	4.69	5.2	5.75	6.49
30-MIN	1.46	1.71	2.12	2.45	2.92	3.27	3.64	4.02	4.54
60-MIN	0.938	1.1	1.36	1.58	1.87	2.1	2.33	2.58	2.91
2-HR	0.593	0.696	0.865	1.01	1.2	1.35	1.5	1.66	1.89
3-HR	0.45	0.53	0.661	0.77	0.919	1.03	1.15	1.28	1.47
6-HR	0.28	0.332	0.418	0.489	0.587	0.66	0.738	0.828	0.959
12-HR	0.17	0.204	0.26	0.306	0.369	0.416	0.466	0.527	0.618
24-HR	0.101	0.122	0.158	0.187	0.227	0.256	0.289	0.328	0.389

[NOAA Precipitation Frequency Data Server \(PFDS\)](#)



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	0.314 (0.249-0.391)	0.368 (0.290-0.458)	0.455 (0.358-0.570)	0.528 (0.413-0.664)	0.627 (0.473-0.819)	0.703 (0.519-0.936)	0.781 (0.555-1.07)	0.863 (0.584-1.22)	0.974 (0.632-1.42)	1.06 (0.671-1.58)
10-min	0.445 (0.352-0.554)	0.521 (0.412-0.649)	0.645 (0.507-0.806)	0.747 (0.585-0.940)	0.888 (0.670-1.16)	0.996 (0.734-1.33)	1.11 (0.787-1.52)	1.22 (0.828-1.73)	1.38 (0.896-2.02)	1.50 (0.950-2.24)
15-min	0.524 (0.414-0.652)	0.613 (0.484-0.764)	0.758 (0.597-0.949)	0.879 (0.688-1.11)	1.05 (0.788-1.37)	1.17 (0.863-1.56)	1.30 (0.925-1.79)	1.44 (0.973-2.03)	1.62 (1.05-2.37)	1.77 (1.12-2.64)
30-min	0.731 (0.578-0.910)	0.855 (0.676-1.07)	1.06 (0.833-1.32)	1.23 (0.960-1.54)	1.46 (1.10-1.91)	1.64 (1.21-2.18)	1.82 (1.29-2.50)	2.01 (1.36-2.84)	2.27 (1.47-3.32)	2.47 (1.56-3.69)
60-min	0.938 (0.742-1.17)	1.10 (0.867-1.37)	1.36 (1.07-1.70)	1.58 (1.23-1.98)	1.87 (1.41-2.45)	2.10 (1.55-2.80)	2.33 (1.66-3.21)	2.58 (1.75-3.65)	2.91 (1.89-4.26)	3.18 (2.01-4.74)
2-hr	1.19 (0.944-1.47)	1.39 (1.11-1.73)	1.73 (1.37-2.15)	2.01 (1.58-2.51)	2.40 (1.82-3.12)	2.69 (2.00-3.57)	2.99 (2.15-4.10)	3.32 (2.26-4.67)	3.78 (2.47-5.50)	4.15 (2.64-6.16)
3-hr	1.35 (1.08-1.67)	1.59 (1.27-1.96)	1.99 (1.58-2.46)	2.31 (1.83-2.88)	2.76 (2.11-3.58)	3.10 (2.31-4.10)	3.45 (2.49-4.73)	3.85 (2.62-5.39)	4.41 (2.88-6.39)	4.87 (3.10-7.19)
6-hr	1.68 (1.35-2.05)	1.99 (1.60-2.44)	2.50 (2.00-3.08)	2.93 (2.33-3.62)	3.52 (2.70-4.54)	3.95 (2.97-5.21)	4.42 (3.22-6.04)	4.96 (3.39-6.90)	5.75 (3.76-8.27)	6.40 (4.08-9.39)
12-hr	2.05 (1.66-2.50)	2.46 (1.99-3.00)	3.13 (2.52-3.82)	3.68 (2.95-4.52)	4.44 (3.44-5.71)	5.01 (3.79-6.58)	5.62 (4.13-7.68)	6.35 (4.35-8.78)	7.44 (4.89-10.6)	8.37 (5.36-12.2)
24-hr	2.42 (1.98-2.93)	2.94 (2.39-3.55)	3.78 (3.07-4.59)	4.48 (3.61-5.46)	5.44 (4.24-6.97)	6.16 (4.70-8.06)	6.93 (5.13-9.45)	7.88 (5.42-10.8)	9.35 (6.16-13.3)	10.6 (6.81-15.4)
2-day	2.77 (2.27-3.32)	3.39 (2.78-4.08)	4.42 (3.61-5.33)	5.27 (4.28-6.39)	6.45 (5.06-8.21)	7.31 (5.62-9.53)	8.25 (6.17-11.2)	9.45 (6.53-12.9)	11.3 (7.49-16.0)	13.0 (8.36-18.7)
3-day	3.02 (2.49-3.61)	3.72 (3.06-4.45)	4.85 (3.98-5.82)	5.79 (4.72-6.99)	7.09 (5.59-9.00)	8.04 (6.20-10.5)	9.09 (6.83-12.4)	10.4 (7.22-14.2)	12.6 (8.32-17.7)	14.5 (9.33-20.7)
4-day	3.25 (2.69-3.87)	3.99 (3.30-4.76)	5.20 (4.28-6.23)	6.21 (5.07-7.47)	7.59 (6.00-9.61)	8.60 (6.65-11.2)	9.72 (7.32-13.2)	11.2 (7.73-15.1)	13.5 (8.92-18.9)	15.5 (10.0-22.1)
7-day	3.89 (3.24-4.61)	4.71 (3.92-5.59)	6.05 (5.01-7.20)	7.17 (5.89-8.57)	8.70 (6.90-10.9)	9.82 (7.62-12.6)	11.1 (8.34-14.9)	12.6 (8.78-17.0)	15.1 (10.0-21.0)	17.2 (11.2-24.5)
10-day	4.54 (3.79-5.36)	5.40 (4.50-6.38)	6.80 (5.65-8.07)	7.97 (6.57-9.50)	9.57 (7.61-12.0)	10.8 (8.35-13.7)	12.0 (9.06-16.0)	13.6 (9.51-18.3)	16.1 (10.7-22.3)	18.2 (11.8-25.7)
20-day	6.56 (5.51-7.69)	7.47 (6.27-8.76)	8.95 (7.48-10.5)	10.2 (8.45-12.1)	11.9 (9.47-14.6)	13.2 (10.2-16.5)	14.5 (10.8-18.8)	16.0 (11.2-21.3)	18.1 (12.1-24.9)	19.8 (12.9-27.9)
30-day	8.24 (6.95-9.62)	9.18 (7.74-10.7)	10.7 (9.00-12.6)	12.0 (10.0-14.2)	13.8 (11.0-16.8)	15.1 (11.8-18.8)	16.5 (12.3-21.2)	17.9 (12.6-23.7)	19.8 (13.3-27.1)	21.3 (13.9-29.8)
45-day	10.3 (8.72-12.0)	11.3 (9.56-13.2)	12.9 (10.9-15.1)	14.3 (12.0-16.8)	16.2 (13.0-19.6)	17.7 (13.8-21.8)	19.1 (14.2-24.3)	20.5 (14.5-27.0)	22.3 (15.0-30.3)	23.5 (15.4-32.8)
60-day	12.0 (10.2-13.9)	13.1 (11.1-15.2)	14.8 (12.5-17.3)	16.3 (13.7-19.1)	18.3 (14.7-22.1)	19.9 (15.5-24.4)	21.4 (16.0-27.0)	22.8 (16.2-30.0)	24.6 (16.6-33.4)	25.8 (16.9-35.9)

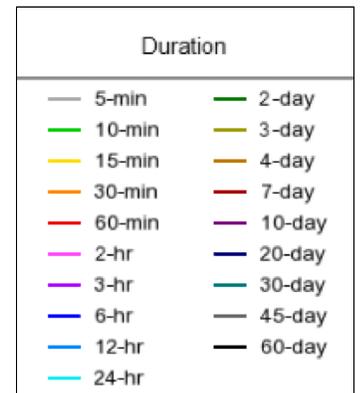
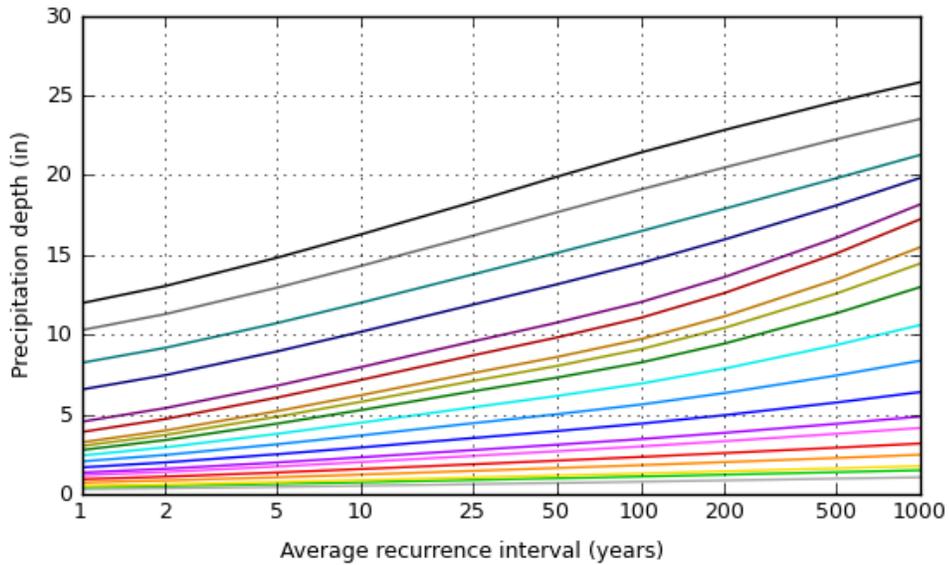
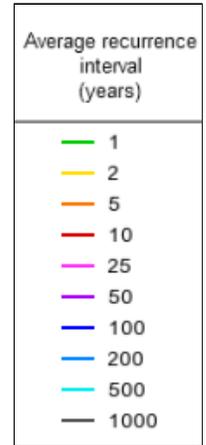
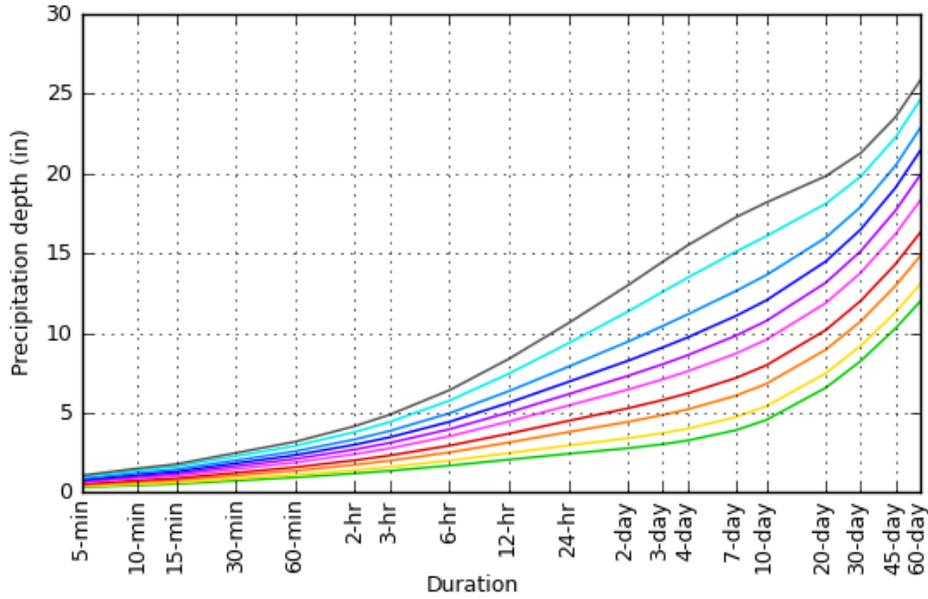
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average 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

PDS-based depth-duration-frequency (DDF) curves

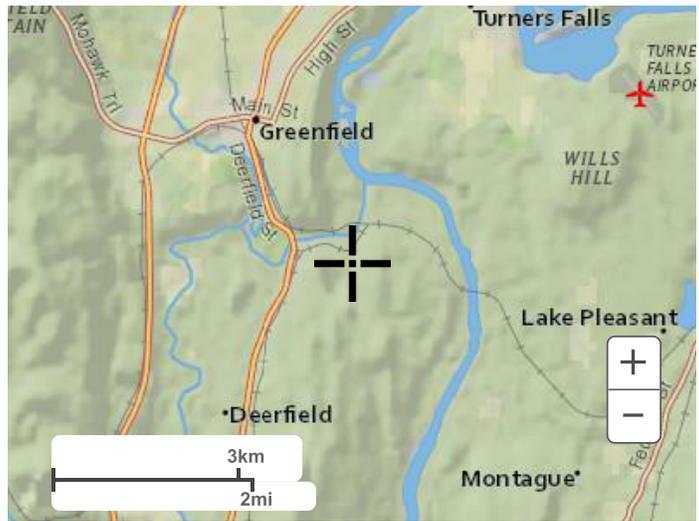
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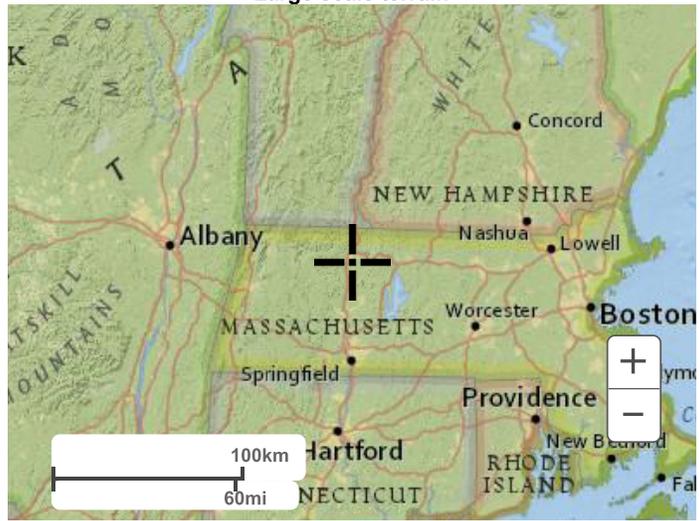
[Back to Top](#)

Maps & aerials

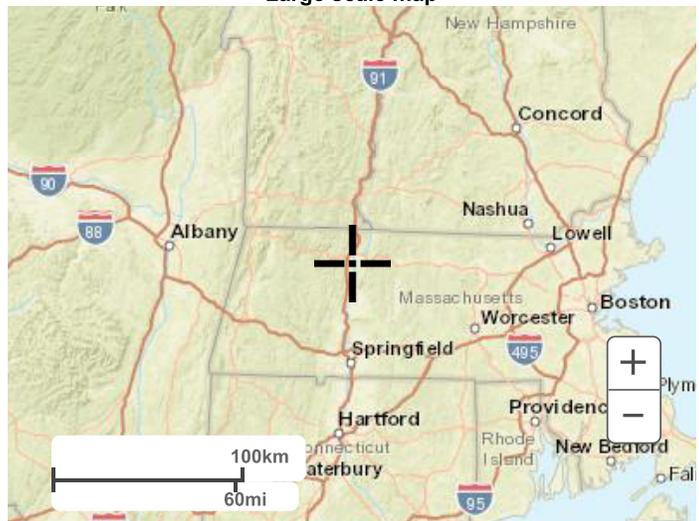
Small scale terrain



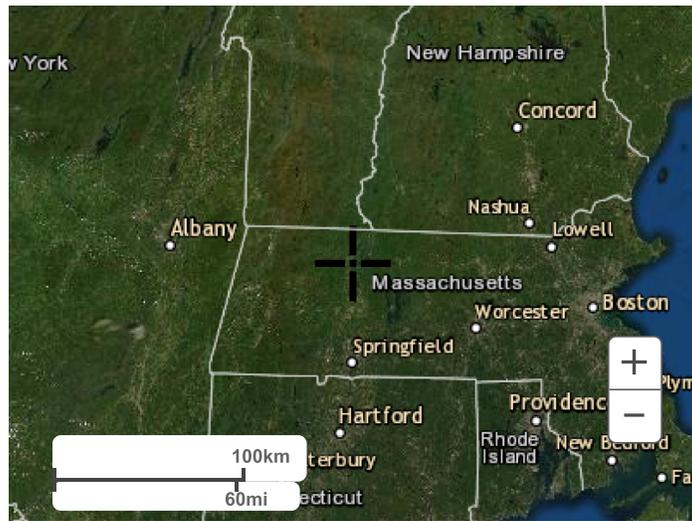
Large scale terrain



Large scale map



Large scale aerial



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1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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INSTRUCTIONS:

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

Version 1, Automated: Mar. 4, 2008

Location: Stormwater Mngt. Bioretention Basin No. 1

	B	C	D	E	F
	BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
TSS Removal Calculation Worksheet	Sediment Forebay	0.25	1.00	0.25	0.75
	Bioretention Area	0.90	0.75	0.68	0.08
	Deep Sump and Hooded Catch Basin	0.25	0.08	0.02	0.06
		0.00	0.06	0.00	0.06
		0.00	0.06	0.00	0.06

Total TSS Removal =

94%

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

Project: All State Material Group
 Prepared By: K. Violette
 Date: 11/9/2022

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

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

INSTRUCTIONS:

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

Version 1, Automated: Mar. 4, 2008

Location: Stormwater Mngt. Bioretention Basin No. 2

	B	C	D	E	F
	BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
TSS Removal Calculation Worksheet	Sediment Forebay	0.25	1.00	0.25	0.75
	Bioretention Area	0.90	0.75	0.68	0.08
	Deep Sump and Hooded Catch Basin	0.25	0.08	0.02	0.06
		0.00	0.06	0.00	0.06
		0.00	0.06	0.00	0.06

Total TSS Removal =

94%

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

Project: All State Material Group
 Prepared By: K. Violette
 Date: 11/9/2022

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

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

Temporary Sediment Traps

**DESIGN
STORM:**

10

SEDIMENT TRAP SUMMARY										
DESIGN										
TRAP NUMBER	DRAINAGE AREA (DA) (sf)	DRAINAGE AREA (DA) (acres)	REQUIRED VOLUME (1800 CF per acre of DA) (cf)	DEPTH* (ft)	WATER SURFACE LENGTH** (ft)	WATER SURFACE WIDTH** (ft)	BASIN BOTTOM LENGTH (ft)	BASIN BOTTOM WIDTH (ft)	VOLUME PROVIDED (cf)	MEETS REQUIRED VOLUME
TST-1	65786	1.51	2,718	See Erosion & Sedimentation Control Plans					4,960	Yes
TST-2	93268	2.14	3,854						4,885	Yes

*Depth is from basin bottom to water surface elevation, 2-ft minimum

**Minimum L/W Ratio = 2:1

Volume Provide: see HydroCAD calculations

Conveyance Swale Design and Lining

DESIGN
STORM:

10

CONVEYANCE SWALE DESIGN AND LINING																							
SWALES NAME	DRAINAGE AREA (sq. ft.)	DRAINAGE AREA (acres)	tc TIME OF CONC. (min)	RUNOFF COEFFICIENT, C	I INTENSITY (10-Yr) (in/hr)	Q (10-Yr) (cfs)	TOTAL RUNOFF, Q (cfs)	CHANNEL SLOPE (ft/ft)	CHANNEL SECTION	BOTTOM WIDTH (ft)	LEFT SIDE SLOPE, Z:1 (ft)	RIGHT SIDE SLOPE, Z:1 (ft)	CHANNEL DEPTH, D (ft)	LENGTH (ft)	UPPER INVERT (ft)	LOWER INVERT (ft)	NORMAL DEPTH (10-Yr) (ft)	FREEBOARD (10-Yr) (ft)	SHEAR STRESS (lb/ft2)	VELOCITY (fps)	n VALUE	TEMPORARY LINER	PERMANENT LINER
Conveyance Swale #1 (Riprap)	29,200	0.67	10.0	0.17	4.48	0.52	0.52	0.058	TRAPEZOIDAL	1.00	2.00	2.00	2.00	170	201.80	192.00	0.23	1.77	0.83	1.56	0.069	RIPRAP	RIPRAP
Conveyance Swale #2 (Riprap)	13,353	0.31	10.0	0.15	4.48	0.21	14.47	0.081	TRAPEZOIDAL	2.00	2.00	2.00	2.00	272	234.00	212.00	0.90	1.10	4.54	4.21	0.069	RIPRAP	RIPRAP
Conveyance Swale #3 (Riprap)	78,873	1.81	10.0	0.21	4.48	1.71	1.71	0.040	TRAPEZOIDAL	2.00	2.00	2.00	2.00	125	248.00	243.00	0.35	1.65	0.87	1.79	0.069	RIPRAP	RIPRAP
Conveyance Swale #4 (Vegetated)	550,536	12.64	10.0	0.28	4.48	15.67	15.67	0.066	TRAPEZOIDAL	2.00	2.00	2.00	2.00	1,593	349.60	244.00	0.55	1.45	2.28	9.16	0.022	NORTH AMERICAN GREEN SC150	NORTH AMERICAN GREEN SC150
Conveyance Swale #5 (Vegetated)	23,269	0.53	5.0	0.86	6.34	2.90	2.90	0.036	TRAPEZOIDAL	2.00	2.00	2.00	2.00	342	349.60	337.40	0.26	1.74	0.58	4.47	0.022	NORTH AMERICAN GREEN SC150	NORTH AMERICAN GREEN SC150

* Normal depth from FlowMaster

* Velocity from FlowMaster

Inputs

Design Storm = 10-year

* Normal depth for 10-yr storm

Bentley FlowMaster V8i

Swale Calculation Summary

SWALE #1

Worksheet : Swale #1_10yr (riprap)

Uniform Flow **Gradually Varied Flow** Messages

Solve For: **Normal Depth** Friction Method: **Manning Formula**

Roughness Coefficient:	0.069		Flow Area:	0.33	ft ²
Channel Slope:	0.05800	ft/ft	Wetted Perimeter:	2.02	ft
Normal Depth:	0.23	ft	Hydraulic Radius:	0.16	ft
Left Side Slope:	2.00	ft/ft (H:V)	Top Width:	1.91	ft
Right Side Slope:	2.00	ft/ft (H:V)	Critical Depth:	0.18	ft
Bottom Width:	1.00	ft	Critical Slope:	0.14188	ft/ft
Discharge:	0.52	ft ³ /s	Velocity:	1.56	ft/s
			Velocity Head:	0.04	ft
			Specific Energy:	0.27	ft
			Froude Number:	0.66	
			Flow Type:	Subcritical	

Calculation Successful.

SWALE #2

Worksheet : Swale #2_10yr (riprap)

Uniform Flow **Gradually Varied Flow** Messages

Solve For: **Normal Depth** Friction Method: **Manning Formula**

Roughness Coefficient:	0.069		Flow Area:	3.44	ft ²
Channel Slope:	0.08100	ft/ft	Wetted Perimeter:	6.04	ft
Normal Depth:	0.90	ft	Hydraulic Radius:	0.57	ft
Left Side Slope:	2.00	ft/ft (H:V)	Top Width:	5.61	ft
Right Side Slope:	2.00	ft/ft (H:V)	Critical Depth:	0.88	ft
Bottom Width:	2.00	ft	Critical Slope:	0.09069	ft/ft
Discharge:	14.47	ft ³ /s	Velocity:	4.21	ft/s
			Velocity Head:	0.28	ft
			Specific Energy:	1.18	ft
			Froude Number:	0.95	
			Flow Type:	Subcritical	

Calculation Successful.

SWALE #3

Worksheet : Swale #3_10yr (riprap)

Uniform Flow **Gradually Varied Flow** Messages

Solve For: **Normal Depth** Friction Method: **Manning Formula**

Roughness Coefficient:	0.069		Flow Area:	0.96	ft ²
Channel Slope:	0.04000	ft/ft	Wetted Perimeter:	3.58	ft
Normal Depth:	0.35	ft	Hydraulic Radius:	0.27	ft
Left Side Slope:	2.00	ft/ft (H:V)	Top Width:	3.41	ft
Right Side Slope:	2.00	ft/ft (H:V)	Critical Depth:	0.26	ft
Bottom Width:	2.00	ft	Critical Slope:	0.12215	ft/ft
Discharge:	1.71	ft ³ /s	Velocity:	1.79	ft/s
			Velocity Head:	0.05	ft
			Specific Energy:	0.40	ft
			Froude Number:	0.60	
			Flow Type:	Subcritical	

Calculation Successful.

SWALE #4

Worksheet : Swale #4_10yr (veg mat)

Uniform Flow **Gradually Varied Flow** Messages

Solve For: **Normal Depth** Friction Method: **Manning Formula**

Roughness Coefficient:	0.022		Flow Area:	1.71	ft ²
Channel Slope:	0.06600	ft/ft	Wetted Perimeter:	4.47	ft
Normal Depth:	0.55	ft	Hydraulic Radius:	0.38	ft
Left Side Slope:	2.00	ft/ft (H:V)	Top Width:	4.21	ft
Right Side Slope:	2.00	ft/ft (H:V)	Critical Depth:	0.92	ft
Bottom Width:	2.00	ft	Critical Slope:	0.00913	ft/ft
Discharge:	15.67	ft ³ /s	Velocity:	9.16	ft/s
			Velocity Head:	1.30	ft
			Specific Energy:	1.85	ft
			Froude Number:	2.53	
			Flow Type:	Supercritical	

Calculation Successful.

SWALE #5

Worksheet : Swale #5_10yr (veg mat)

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Normal Depth Friction Method: Manning Formula

Roughness Coefficient:	0.022		Flow Area:	0.65	ft ²
Channel Slope:	0.03600	ft/ft	Wetted Perimeter:	3.15	ft
Normal Depth:	0.26	ft	Hydraulic Radius:	0.21	ft
Left Side Slope:	2.00	ft/ft (H:V)	Top Width:	3.03	ft
Right Side Slope:	2.00	ft/ft (H:V)	Critical Depth:	0.36	ft
Bottom Width:	2.00	ft	Critical Slope:	0.01147	ft/ft
Discharge:	2.90	ft ³ /s	Velocity:	4.47	ft/s
			Velocity Head:	0.31	ft
			Specific Energy:	0.57	ft
			Froude Number:	1.70	
			Flow Type:	Supercritical	

Calculation Successful.

Storm Drainage Culverts

DESIGN STORM: 10

		STORM DRAINAGE COMPUTATIONS														
		10-YEAR														
LOCATION	CULVERT ID	DRAINAGE AREA (ac)	tc TIME OF CONC. (min)	RUNOFF COEFFICIENT, C	I INTENSITY (10-Yr) (in/hr)	Q (10-Yr) (cfs)	Q TOTAL FLOW (cfs)	SLOPE (ft/ft)	Dtheo (in)	SIZE (in)	Vfull (ft/sec)	LENGTH (ft)	UPPER INVERT (ft)	LOWER INVERT (ft)	TOP EL (ft)	PIPE MATERIAL
Before Sta. 10+00	CULVERT 1	0.67	5.0	0.18	6.34	0.77	0.77	0.015	31.2	12	0.1	130.00	192.00	190.00	193.60	RCP
Sta. 10+00	CULVERT 2	note 1	-	-	-	13.37	13.37	0.025	82.9	24	0.2	150.00	190.00	186.25	198.00	CPP
Basin No. 1	CULVERT 3a	0.13	5.0	0.91	6.34	0.75	0.75	0.008	34.9	24	0.1	51.00	187.00	186.60	193.30	CPP
Basin No. 1	CULVERT 3b	1.17	5.0	0.91	6.34	6.77	7.51	0.010	76.8	24	0.1	26.00	186.50	186.25	190.00	CPP
Sta. 11+75	CULVERT 4	see HY-8 results			-	-	-	0.054	-	84	0.5	132.00	177.80	170.70	195.60	CMP
Basin No. 2	CULVERT 5	14.45	30.0	0.27	2.45	9.56	9.56	0.034	69.0	24	0.2	66.00	235.50	233.25	245.00	CPP
Basin No. 2	CULVERT 6	note 2	-	-	-	8.70	8.70	0.005	95.4	24	0.1	72.00	230.00	229.64	243.60	CMP

Notes

1. from HydroCAD report, existing from Pond 1P, 10-year
2. from HydroCAD report, BMP

Storm Drainage Culverts

C-VALUE ASSUMPTIONS		
% WOODED ESTIMATE	% LAWN ESTIMATE	% IMPERVIOUS ESTIMATE
96	0	4
0	5	95
0	5	95
0	5	95
0	5	95
85	0	15
0	5	95

*Weighted averaged using C=0.20 (Lawns), C=0.15 (Woods) and C=0.95 (Impervious)

Culvert Report

Culvert #1

Invert Elev Dn (ft)	=	190.00
Pipe Length (ft)	=	130.00
Slope (%)	=	1.54
Invert Elev Up (ft)	=	192.00
Rise (in)	=	12.0
Shape	=	Circular
Span (in)	=	12.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

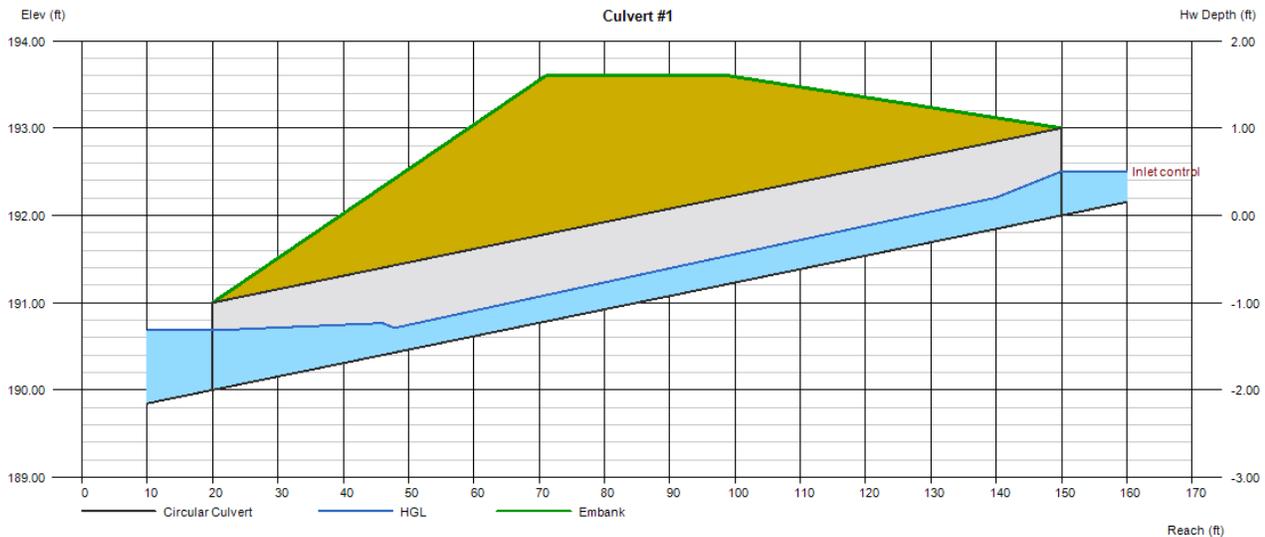
Top Elevation (ft)	=	193.60
Top Width (ft)	=	28.00
Crest Width (ft)	=	28.00

Calculations

Qmin (cfs)	=	0.77
Qmax (cfs)	=	0.77
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	0.77
Qpipe (cfs)	=	0.77
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	1.35
Veloc Up (ft/s)	=	2.96
HGL Dn (ft)	=	190.68
HGL Up (ft)	=	192.37
Hw Elev (ft)	=	192.50
Hw/D (ft)	=	0.50
Flow Regime	=	Inlet Control



Culvert Report

Culvert #2

Invert Elev Dn (ft)	=	186.25
Pipe Length (ft)	=	150.00
Slope (%)	=	2.50
Invert Elev Up (ft)	=	190.00
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.010
Culvert Type	=	Circular Culvert
Culvert Entrance	=	Smooth tapered inlet throat
Coeff. K,M,c,Y,k	=	0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

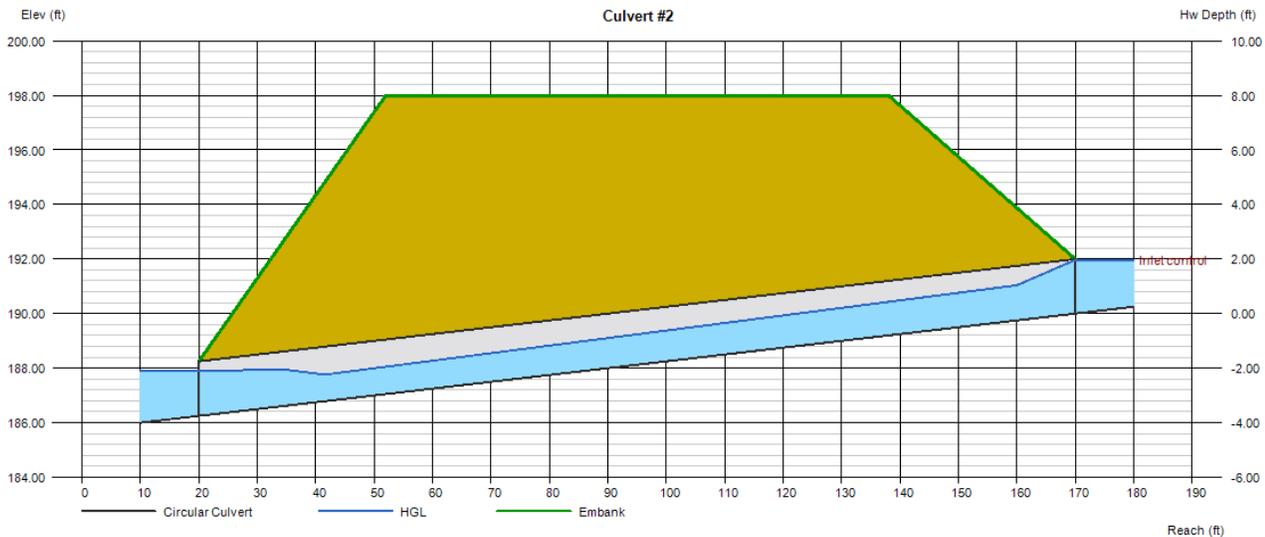
Top Elevation (ft)	=	198.00
Top Width (ft)	=	86.00
Crest Width (ft)	=	86.00

Calculations

Qmin (cfs)	=	13.37
Qmax (cfs)	=	13.37
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	13.37
Qpipe (cfs)	=	13.37
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.80
Veloc Up (ft/s)	=	6.10
HGL Dn (ft)	=	187.91
HGL Up (ft)	=	191.32
Hw Elev (ft)	=	191.97
Hw/D (ft)	=	0.98
Flow Regime	=	Inlet Control



Culvert Report

Culvert #3a

Invert Elev Dn (ft)	= 186.60
Pipe Length (ft)	= 51.00
Slope (%)	= 0.78
Invert Elev Up (ft)	= 187.00
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.010
Culvert Type	= Circular Culvert
Culvert Entrance	= Smooth tapered inlet throat
Coeff. K,M,c,Y,k	= 0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

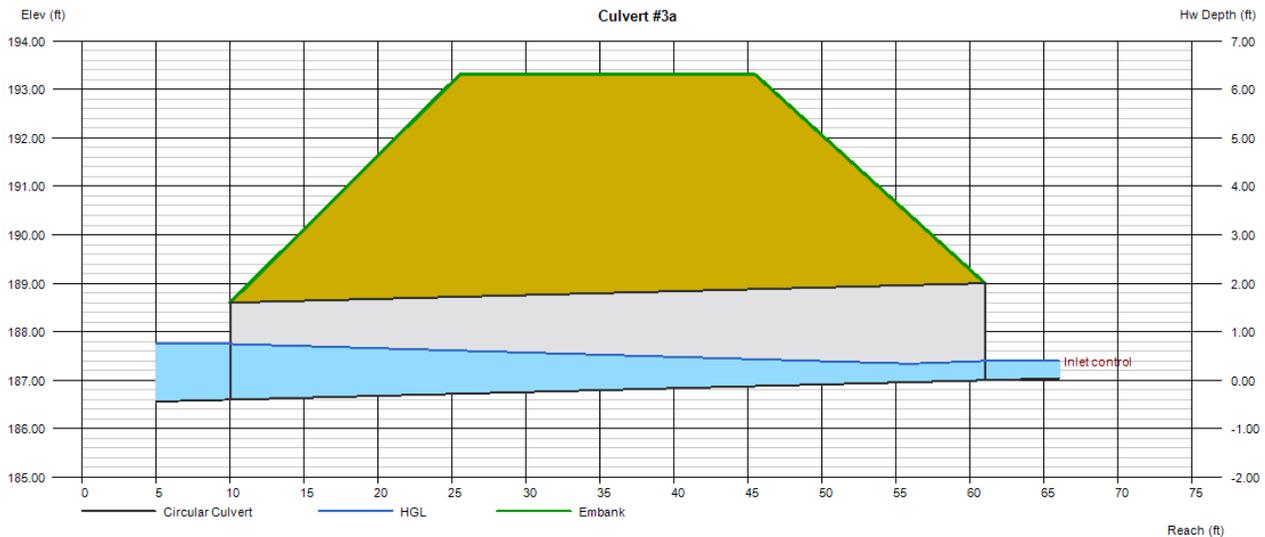
Top Elevation (ft)	= 193.30
Top Width (ft)	= 20.00
Crest Width (ft)	= 20.00

Calculations

Qmin (cfs)	= 0.75
Qmax (cfs)	= 0.75
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 0.75
Qpipe (cfs)	= 0.75
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 0.40
Veloc Up (ft/s)	= 2.57
HGL Dn (ft)	= 187.75
HGL Up (ft)	= 187.30
Hw Elev (ft)	= 187.40
Hw/D (ft)	= 0.20
Flow Regime	= Inlet Control



Culvert Report

Culvert #3b

Invert Elev Dn (ft)	= 186.25
Pipe Length (ft)	= 39.00
Slope (%)	= 0.64
Invert Elev Up (ft)	= 186.50
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.010
Culvert Type	= Circular Culvert
Culvert Entrance	= Smooth tapered inlet throat
Coeff. K,M,c,Y,k	= 0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

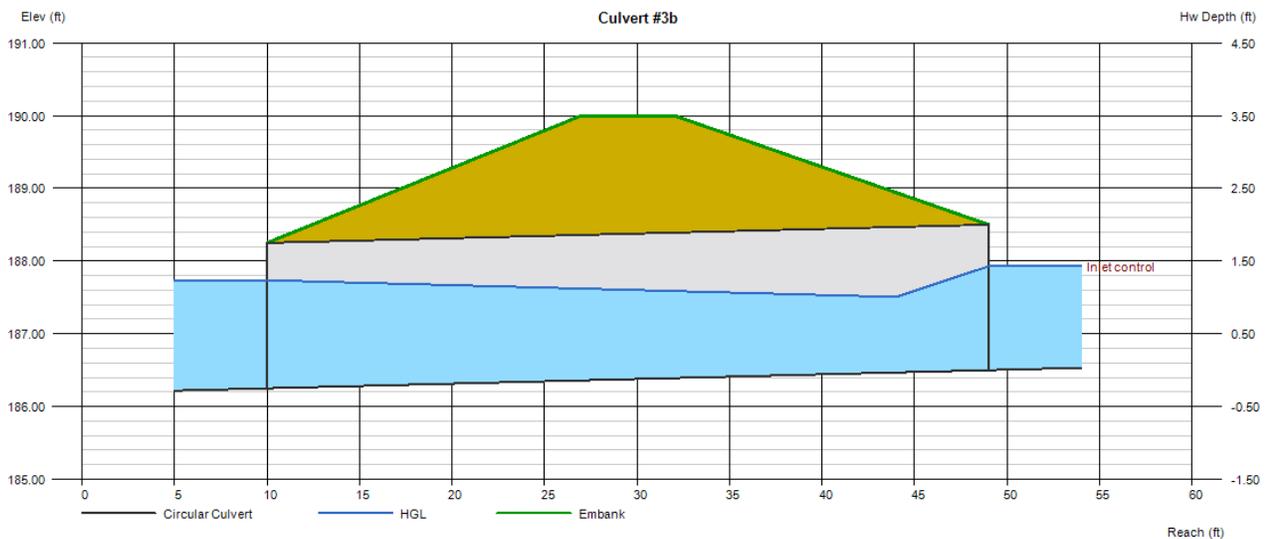
Top Elevation (ft)	= 190.00
Top Width (ft)	= 5.00
Crest Width (ft)	= 5.00

Calculations

Qmin (cfs)	= 7.51
Qmax (cfs)	= 7.51
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 7.51
Qpipe (cfs)	= 7.51
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 3.00
Veloc Up (ft/s)	= 4.95
HGL Dn (ft)	= 187.74
HGL Up (ft)	= 187.47
Hw Elev (ft)	= 187.93
Hw/D (ft)	= 0.71
Flow Regime	= Inlet Control



Culvert Report

Culvert #5

Invert Elev Dn (ft)	=	233.25
Pipe Length (ft)	=	66.00
Slope (%)	=	3.41
Invert Elev Up (ft)	=	235.50
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.010
Culvert Type	=	Circular Culvert
Culvert Entrance	=	Smooth tapered inlet throat
Coeff. K,M,c,Y,k	=	0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

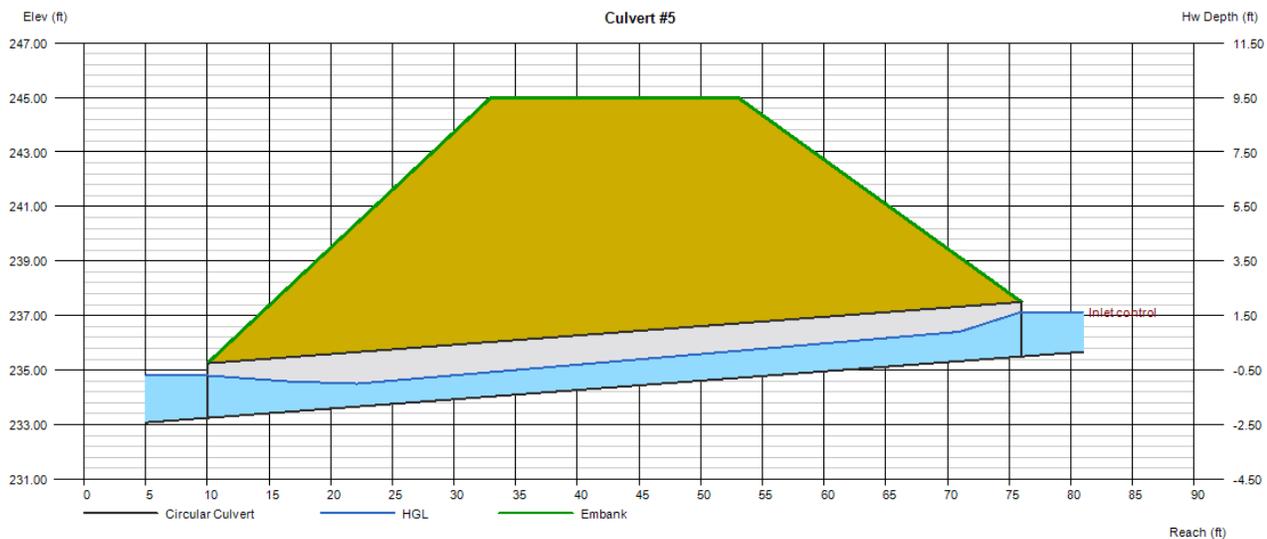
Top Elevation (ft)	=	245.00
Top Width (ft)	=	20.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	9.56
Qmax (cfs)	=	9.56
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	9.56
Qpipe (cfs)	=	9.56
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.65
Veloc Up (ft/s)	=	5.37
HGL Dn (ft)	=	234.80
HGL Up (ft)	=	236.60
Hw Elev (ft)	=	237.13
Hw/D (ft)	=	0.82
Flow Regime	=	Inlet Control



Culvert Report

Culvert #6

Invert Elev Dn (ft)	= 229.64
Pipe Length (ft)	= 72.00
Slope (%)	= 0.50
Invert Elev Up (ft)	= 230.00
Rise (in)	= 15.0
Shape	= Circular
Span (in)	= 15.0
No. Barrels	= 1
n-Value	= 0.023
Culvert Type	= Circular Culvert
Culvert Entrance	= Smooth tapered inlet throat
Coeff. K,M,c,Y,k	= 0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

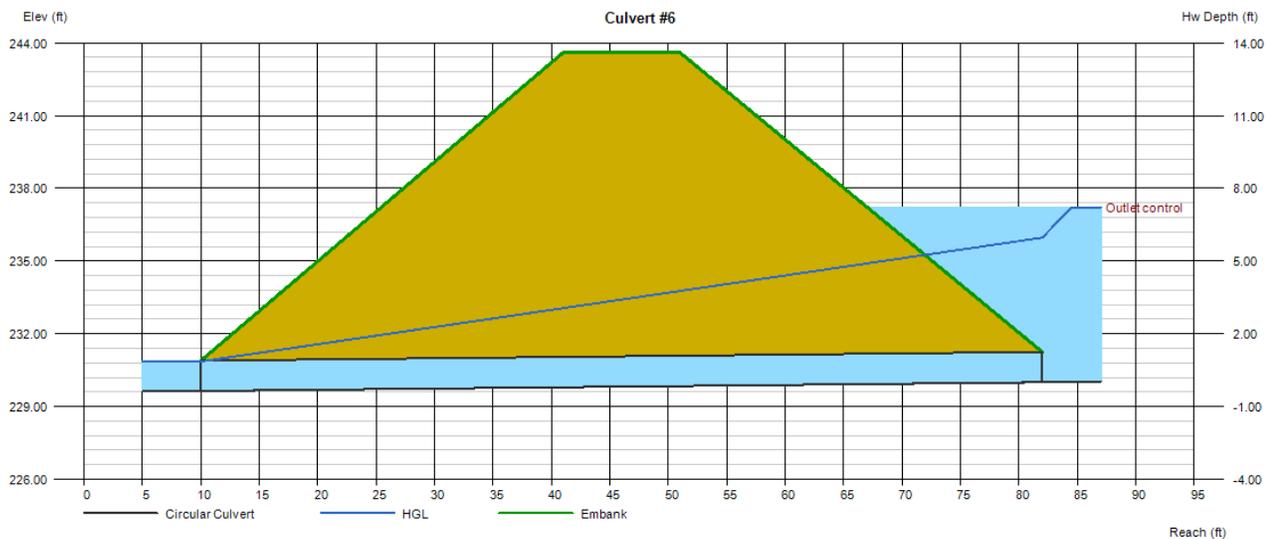
Top Elevation (ft)	= 243.60
Top Width (ft)	= 10.00
Crest Width (ft)	= 10.00

Calculations

Qmin (cfs)	= 10.00
Qmax (cfs)	= 10.00
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 10.00
Qpipe (cfs)	= 10.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 8.21
Veloc Up (ft/s)	= 8.15
HGL Dn (ft)	= 230.86
HGL Up (ft)	= 235.97
Hw Elev (ft)	= 237.20
Hw/D (ft)	= 5.76
Flow Regime	= Outlet Control



STANDARD 4: WATER QUALITY VOLUME

Reference: Massachusetts Stormwater Handbook, Chapter 1, Standard 4

Required Water Quality Volume (WQV)

0.5 inch of runoff

TSS REMOVAL CALCULATION

Description	Drainage Area	Impervious Area		WQV	Available Basin Storage (elev = top of grate)	% TSS Removal
	(sf)	(sf)	(acres)	(cf)	(cf)	(%)
Stormwater Management Basin No. 1 (Bioretention Basin)	65,786	61,506	1.4	2,563	3,273	90%
Stormwater Management Basin No. 2 (Bioretention Basin)	657,251	93,268	2.1	3,886	4,514	90%

Ref: HydroCAD

WQV

Equation: $WQV = \text{Imp. Area} \times \text{inches} \times 1\text{-ft}/12\text{-in}$
 $D = \text{Depth of Water in Structure (in)}$
 $IR = \text{Infiltration Rate}^* \text{ (in/hr)}$

Notes:

1. Refer to the attached TSS Removal Calculation Worksheet for % TSS removal

APPENDIX F – DRAINAGE CALCULATIONS (HYDROCAD)

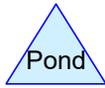
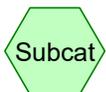
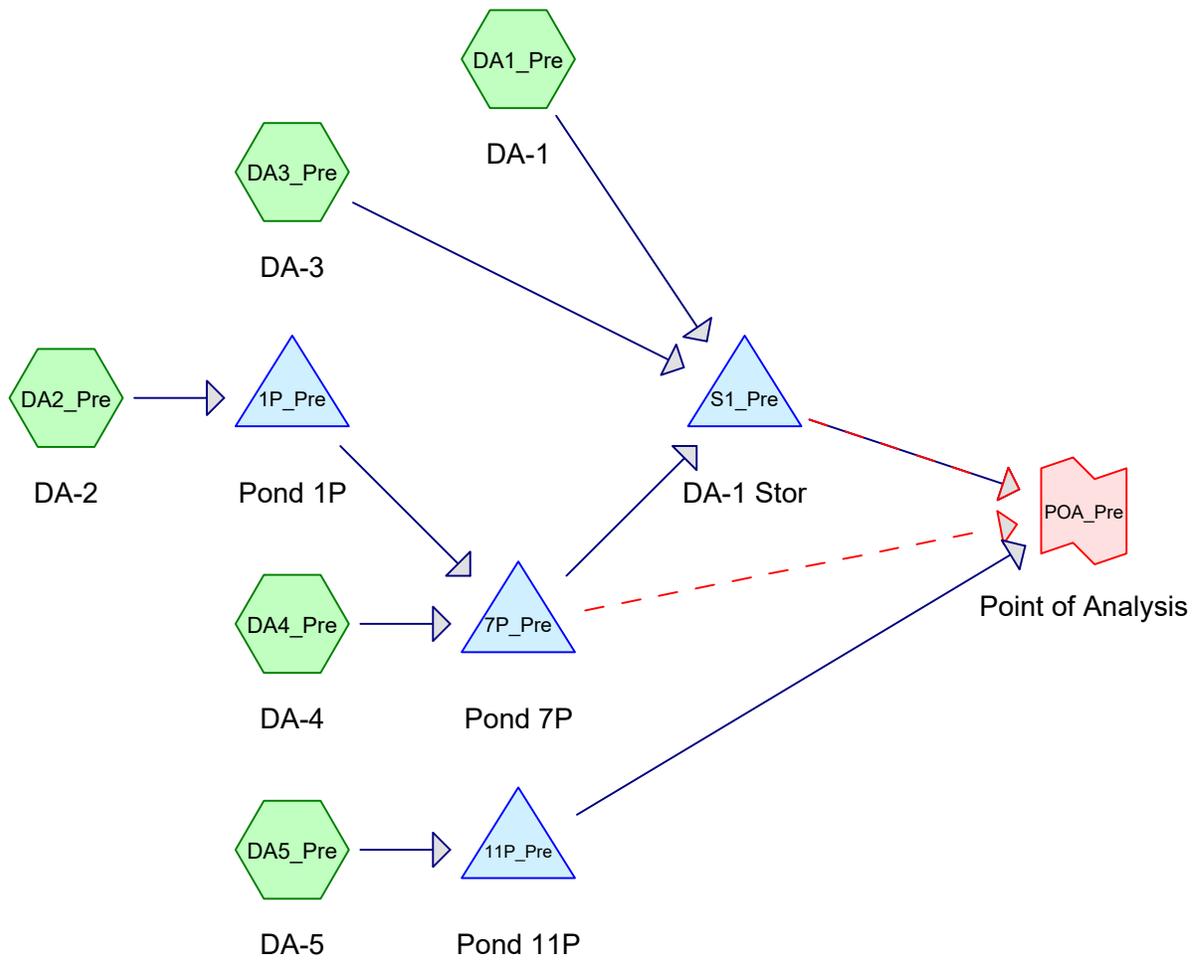
F1: Pre-Development Hydrology

F2: Post-Development Hydrology

F3: Post-Development BMP

F4: Erosion & Sedimentation Control (Temporary Sediment Traps)

PRE-DEVELOPMENT



Routing Diagram for ASMG_221383_Hydrology
Prepared by {enter your company name here}, Printed 11/11/2022
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ASMG_221383_Hydrology

Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Prepared by {enter your company name here}

Printed 11/11/2022

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Page 2

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

SubcatchmentDA1_Pre: DA-1 Runoff Area=160.430 ac 2.51% Impervious Runoff Depth=0.48"
 Flow Length=5,870' Tc=47.5 min CN=65 Runoff=30.15 cfs 6.403 af

SubcatchmentDA2_Pre: DA-2 Runoff Area=7.500 ac 16.69% Impervious Runoff Depth=1.47"
 Flow Length=1,705' Slope=0.0711 '/' Tc=7.0 min CN=84 Runoff=12.43 cfs 0.917 af

SubcatchmentDA3_Pre: DA-3 Runoff Area=0.630 ac 72.00% Impervious Runoff Depth=2.20"
 Tc=5.0 min CN=93 Runoff=1.64 cfs 0.115 af

SubcatchmentDA4_Pre: DA-4 Runoff Area=0.090 ac 87.56% Impervious Runoff Depth=2.49"
 Tc=5.0 min CN=96 Runoff=0.26 cfs 0.019 af

SubcatchmentDA5_Pre: DA-5 Runoff Area=6.350 ac 3.74% Impervious Runoff Depth=0.87"
 Flow Length=1,153' Slope=0.1040 '/' Tc=22.5 min CN=74 Runoff=3.83 cfs 0.461 af

Pond 1P_Pre: Pond 1P Peak Elev=188.25' Storage=4,861 cf Inflow=12.43 cfs 0.917 af
 Outflow=8.62 cfs 0.908 af

Pond 7P_Pre: Pond 7P Peak Elev=184.23' Storage=199 cf Inflow=8.75 cfs 0.926 af
 Primary=8.71 cfs 0.926 af Secondary=0.00 cfs 0.000 af Outflow=8.71 cfs 0.926 af

Pond 11P_Pre: Pond 11P Peak Elev=224.26' Storage=262 cf Inflow=3.83 cfs 0.461 af
 Outflow=3.83 cfs 0.461 af

Pond S1_Pre: DA-1 Stor Peak Elev=179.67' Storage=186 cf Inflow=32.49 cfs 7.444 af
 Primary=32.48 cfs 7.444 af Secondary=0.00 cfs 0.000 af Outflow=32.48 cfs 7.444 af

Link POA_Pre: Point of Analysis Inflow=34.33 cfs 7.905 af
 Primary=34.33 cfs 7.905 af

Total Runoff Area = 175.000 ac Runoff Volume = 7.914 af Average Runoff Depth = 0.54"
96.55% Pervious = 168.954 ac 3.45% Impervious = 6.046 ac

Summary for Subcatchment DA1_Pre: DA-1

Runoff = 30.15 cfs @ 12.82 hrs, Volume= 6.403 af, Depth= 0.48"

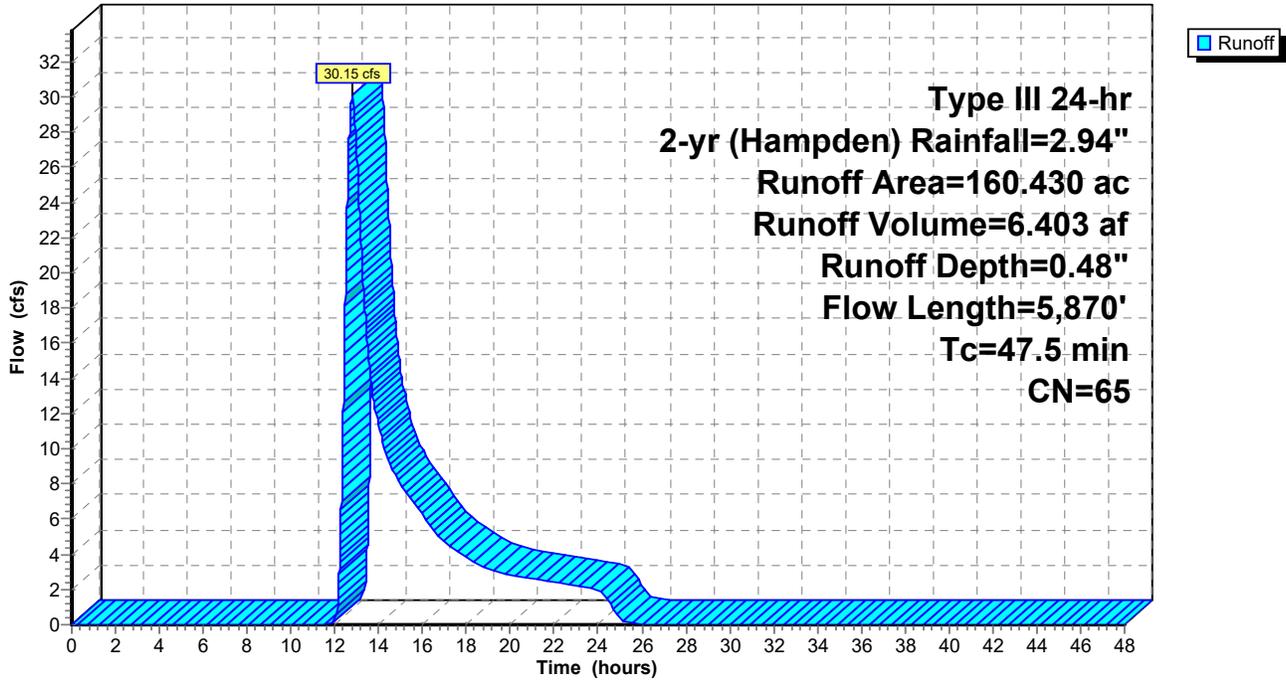
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (ac)	CN	Description
0.580	35	Brush, Fair, HSG A
0.450	70	Brush, Fair, HSG C
0.460	77	Brush, Fair, HSG D
2.450	93	Urban industrial, 72% imp, HSG D
2.480	49	Pasture/grassland/range, Fair, HSG A
0.660	69	Pasture/grassland/range, Fair, HSG B
5.930	79	Pasture/grassland/range, Fair, HSG C
1.220	84	Pasture/grassland/range, Fair, HSG D
* 2.260	98	Wetland
30.690	36	Woods, Fair, HSG A
29.080	60	Woods, Fair, HSG B
45.970	73	Woods, Fair, HSG C
38.200	79	Woods, Fair, HSG D
160.430	65	Weighted Average
156.406		97.49% Pervious Area
4.024		2.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0581	0.11		Sheet Flow, Sheet-Woods
					Woods: Light underbrush n= 0.400 P2= 2.94"
24.9	1,800	0.0581	1.21		Shallow Concentrated Flow, SCF-Woods
					Woodland Kv= 5.0 fps
8.0	3,970	0.0200	8.31	199.43	Parabolic Channel,
					W=18.00' D=2.00' Area=24.0 sf Perim=18.6' n= 0.030
47.5	5,870	Total			

Subcatchment DA1_Pre: DA-1

Hydrograph



Summary for Subcatchment DA2_Pre: DA-2

Runoff = 12.43 cfs @ 12.10 hrs, Volume= 0.917 af, Depth= 1.47"

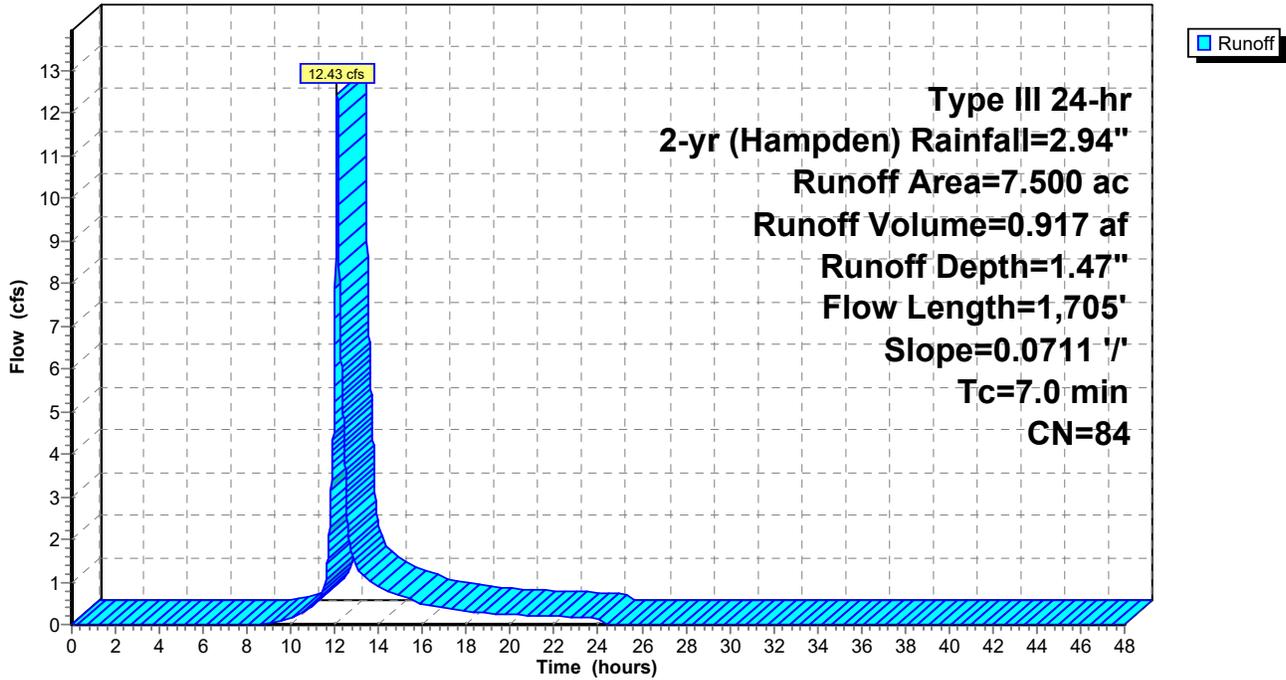
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (ac)	CN	Description
1.530	93	Urban industrial, 72% imp, HSG D
2.080	84	Pasture/grassland/range, Fair, HSG D
0.150	98	Water Surface, HSG D
3.740	79	Woods, Fair, HSG D
7.500	84	Weighted Average
6.248		83.31% Pervious Area
1.252		16.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0711	2.19		Sheet Flow, Sheet-Rd Smooth surfaces n= 0.011 P2= 2.94"
6.2	1,605	0.0711	4.29		Shallow Concentrated Flow, SCF-Rd Unpaved Kv= 16.1 fps
7.0	1,705	Total			

Subcatchment DA2_Pre: DA-2

Hydrograph



Summary for Subcatchment DA3_Pre: DA-3

Runoff = 1.64 cfs @ 12.07 hrs, Volume= 0.115 af, Depth= 2.20"

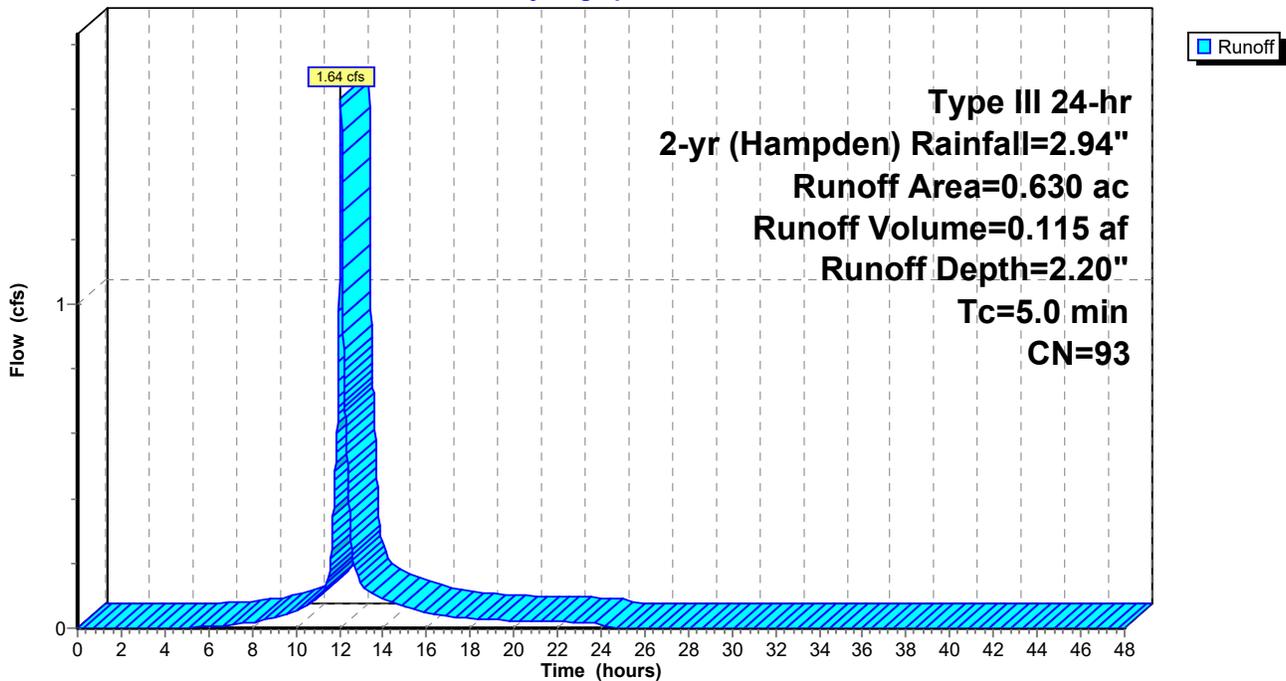
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (ac)	CN	Description
0.630	93	Urban industrial, 72% imp, HSG D
0.176		28.00% Pervious Area
0.454		72.00% Impervious Area

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

Subcatchment DA3_Pre: DA-3

Hydrograph



Summary for Subcatchment DA4_Pre: DA-4

Runoff = 0.26 cfs @ 12.07 hrs, Volume= 0.019 af, Depth= 2.49"

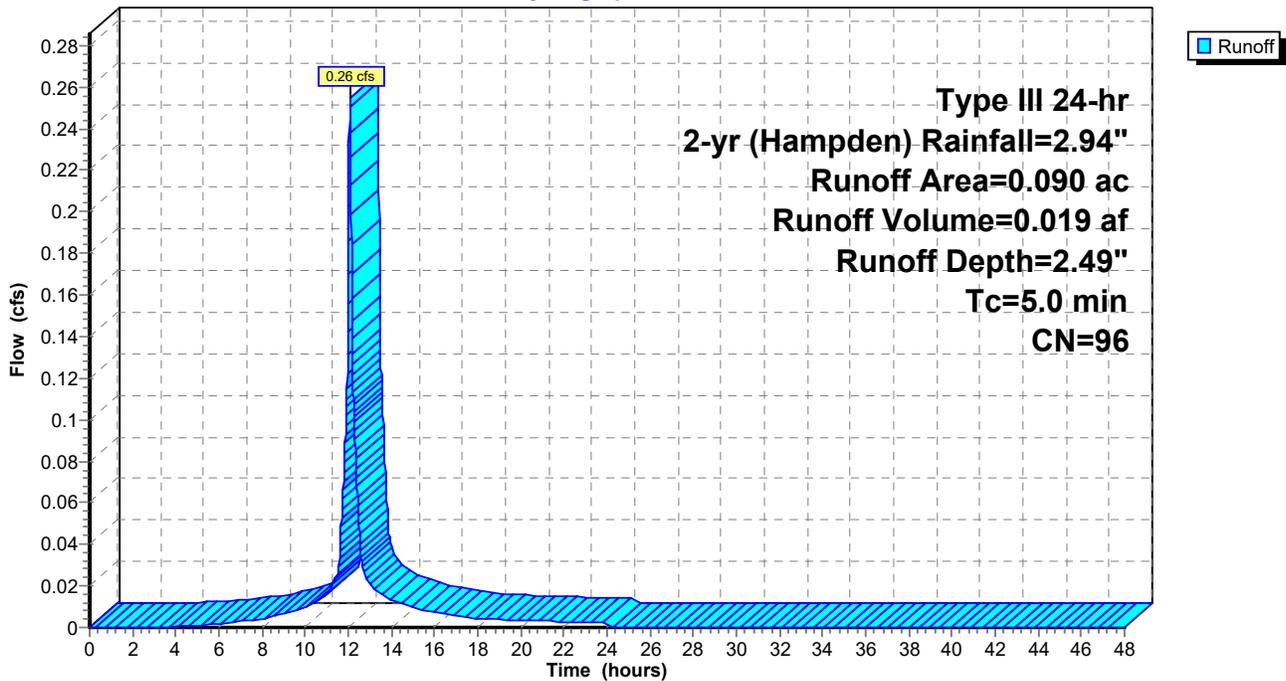
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (ac)	CN	Description
0.040	93	Urban industrial, 72% imp, HSG D
0.050	98	Water Surface, HSG D
0.090	96	Weighted Average
0.011		12.44% Pervious Area
0.079		87.56% Impervious Area

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

Subcatchment DA4_Pre: DA-4

Hydrograph



Summary for Subcatchment DA5_Pre: DA-5

Runoff = 3.83 cfs @ 12.34 hrs, Volume= 0.461 af, Depth= 0.87"

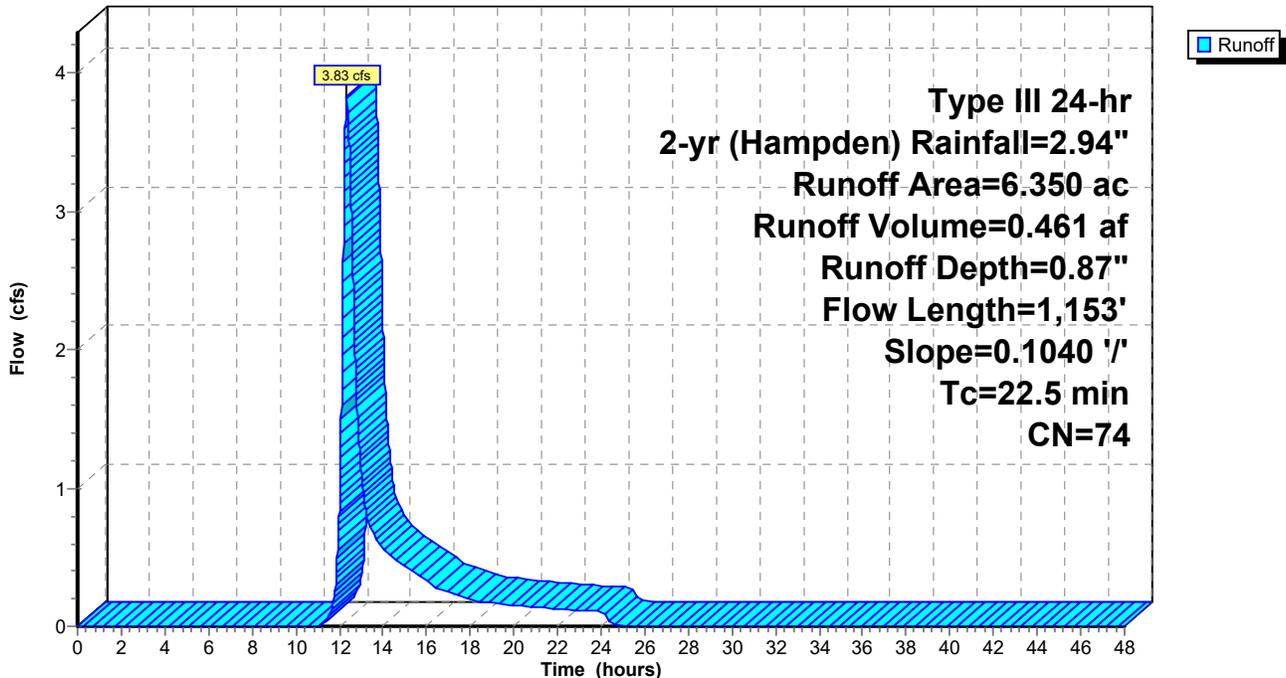
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (ac)	CN	Description
0.270	91	Urban industrial, 72% imp, HSG C
0.060	93	Urban industrial, 72% imp, HSG D
0.280	79	Pasture/grassland/range, Fair, HSG C
0.050	84	Pasture/grassland/range, Fair, HSG D
0.180	60	Woods, Fair, HSG B
5.350	73	Woods, Fair, HSG C
0.160	79	Woods, Fair, HSG D
6.350	74	Weighted Average
6.112		96.26% Pervious Area
0.238		3.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.1040	0.14		Sheet Flow, Sheet-Woods
					Woods: Light underbrush n= 0.400 P2= 2.94"
10.9	1,053	0.1040	1.61		Shallow Concentrated Flow, SCF-Woods
					Woodland Kv= 5.0 fps
22.5	1,153	Total			

Subcatchment DA5_Pre: DA-5

Hydrograph



Summary for Pond 1P_Pre: Pond 1P

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 7.500 ac, 16.69% Impervious, Inflow Depth = 1.47" for 2-yr (Hampden) event
 Inflow = 12.43 cfs @ 12.10 hrs, Volume= 0.917 af
 Outflow = 8.62 cfs @ 12.20 hrs, Volume= 0.908 af, Atten= 31%, Lag= 5.5 min
 Primary = 8.62 cfs @ 12.20 hrs, Volume= 0.908 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 188.25' @ 12.20 hrs Surf.Area= 4,157 sf Storage= 4,861 cf

Plug-Flow detention time= 22.7 min calculated for 0.908 af (99% of inflow)
 Center-of-Mass det. time= 16.5 min (851.0 - 834.4)

Volume	Invert	Avail.Storage	Storage Description
#1	186.00'	51,062 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.00	0	0	0
188.00	3,866	3,866	3,866
189.00	5,039	4,453	8,319
190.00	6,026	5,533	13,851
191.00	7,099	6,563	20,414
192.00	8,299	7,699	28,113
194.00	14,650	22,949	51,062

Device	Routing	Invert	Outlet Devices
#1	Primary	186.65'	15.0" Round 15" CPP 1 L= 161.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 186.65' / 183.17' S= 0.0215 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#2	Primary	186.88'	15.0" Round 15" CPP 2 L= 162.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 186.88' / 182.88' S= 0.0247 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

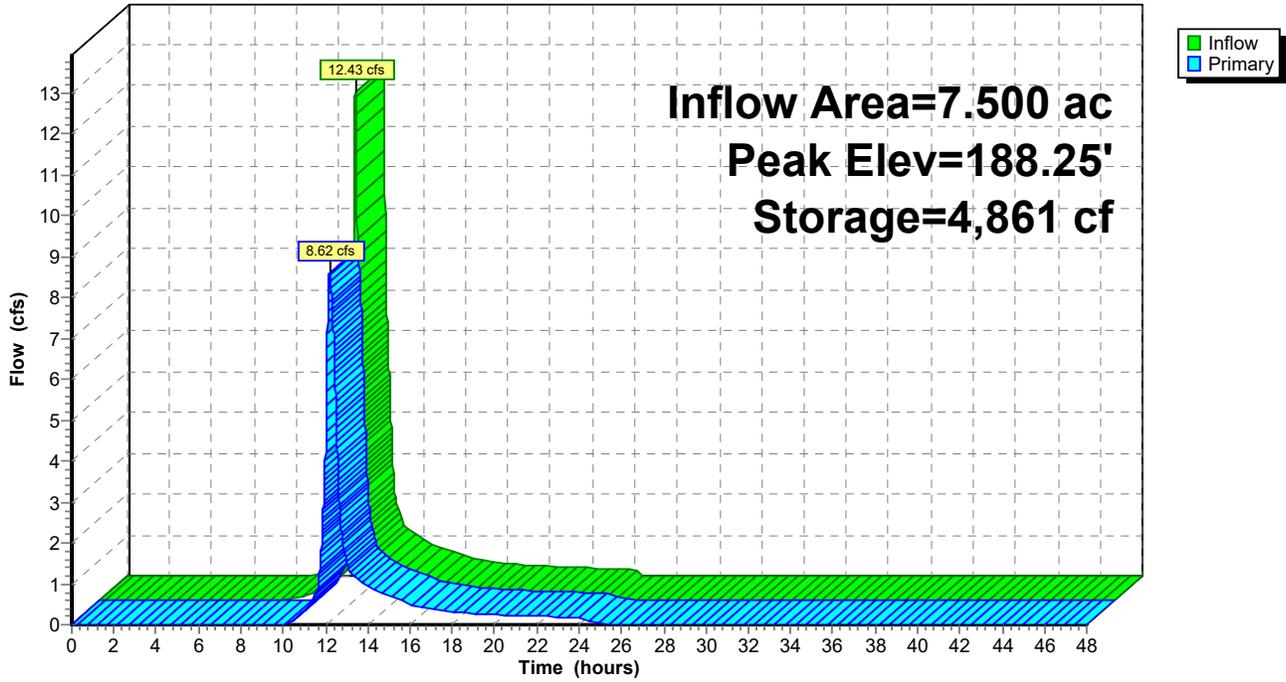
Primary OutFlow Max=8.62 cfs @ 12.20 hrs HW=188.25' (Free Discharge)

1=15" CPP 1 (Inlet Controls 4.60 cfs @ 3.75 fps)

2=15" CPP 2 (Inlet Controls 4.02 cfs @ 3.28 fps)

Pond 1P_Pre: Pond 1P

Hydrograph



Summary for Pond 7P_Pre: Pond 7P

Stage-area for elev 182 assumed based on culvert inverts.

Stage-area for elev 183-190 from civil survey.

[79] Warning: Submerged Pond 1P_Pre Primary device # 1 OUTLET by 1.06'

[79] Warning: Submerged Pond 1P_Pre Primary device # 2 OUTLET by 1.35'

Inflow Area = 7.590 ac, 17.53% Impervious, Inflow Depth = 1.46" for 2-yr (Hampden) event
 Inflow = 8.75 cfs @ 12.19 hrs, Volume= 0.926 af
 Outflow = 8.71 cfs @ 12.21 hrs, Volume= 0.926 af, Atten= 0%, Lag= 1.3 min
 Primary = 8.71 cfs @ 12.21 hrs, Volume= 0.926 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 184.23' @ 12.21 hrs Surf.Area= 300 sf Storage= 199 cf

Plug-Flow detention time= 0.4 min calculated for 0.926 af (100% of inflow)
 Center-of-Mass det. time= 0.2 min (849.7 - 849.4)

Volume	Invert	Avail.Storage	Storage Description
#1	182.00'	5,536 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
182.00	0	0	0
183.00	13	7	7
184.00	247	130	137
185.00	479	363	500
186.00	682	581	1,080
187.00	920	801	1,881
188.00	1,114	1,017	2,898
189.00	1,312	1,213	4,111
190.00	1,538	1,425	5,536

Device	Routing	Invert	Outlet Devices
#1	Primary	182.74'	12.0" Round 12" RCP 1 L= 69.5' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 182.74' / 181.83' S= 0.0131 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Primary	182.84'	12.0" Round 12" RCP 1 L= 65.8' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 182.84' / 181.60' S= 0.0188 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#3	Secondary	186.00'	Emergency Spillway, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 3.00 4.00 Width (feet) 4.26 9.60 15.15 20.50 31.66

Primary OutFlow Max=8.71 cfs @ 12.21 hrs HW=184.23' (Free Discharge)

1=12" RCP 1 (Barrel Controls 4.26 cfs @ 5.42 fps)

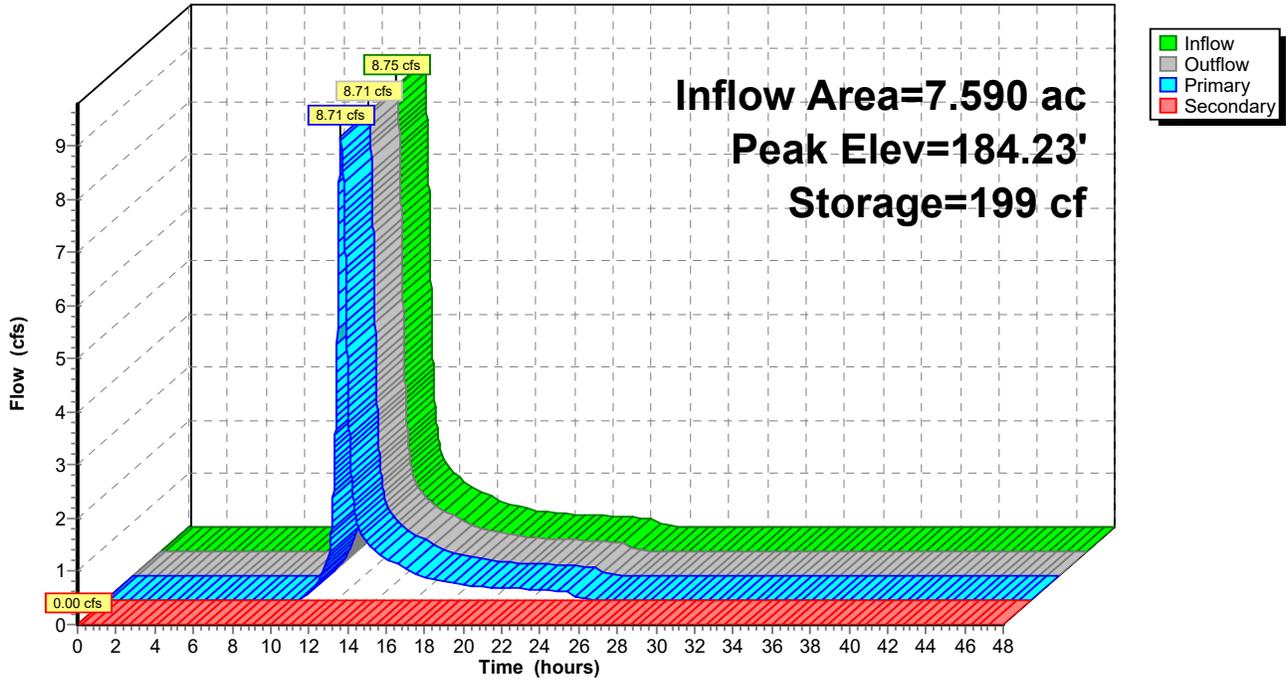
2=12" RCP 1 (Inlet Controls 4.45 cfs @ 5.67 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=182.00' (Free Discharge)

3=Emergency Spillway (Controls 0.00 cfs)

Pond 7P_Pre: Pond 7P

Hydrograph



Summary for Pond 11P_Pre: Pond 11P

Stage-area for elev 182 assumed based on culvert inverts.

Stage-area for elev 183-190 from civil survey.

Inflow Area = 6.350 ac, 3.74% Impervious, Inflow Depth = 0.87" for 2-yr (Hampden) event
 Inflow = 3.83 cfs @ 12.34 hrs, Volume= 0.461 af
 Outflow = 3.83 cfs @ 12.36 hrs, Volume= 0.461 af, Atten= 0%, Lag= 0.9 min
 Primary = 3.83 cfs @ 12.36 hrs, Volume= 0.461 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 224.26' @ 12.36 hrs Surf.Area= 1,096 sf Storage= 262 cf

Plug-Flow detention time= 2.1 min calculated for 0.460 af (100% of inflow)
 Center-of-Mass det. time= 2.1 min (885.0 - 882.9)

Volume	Invert	Avail.Storage	Storage Description
#1	224.00'	3,026 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

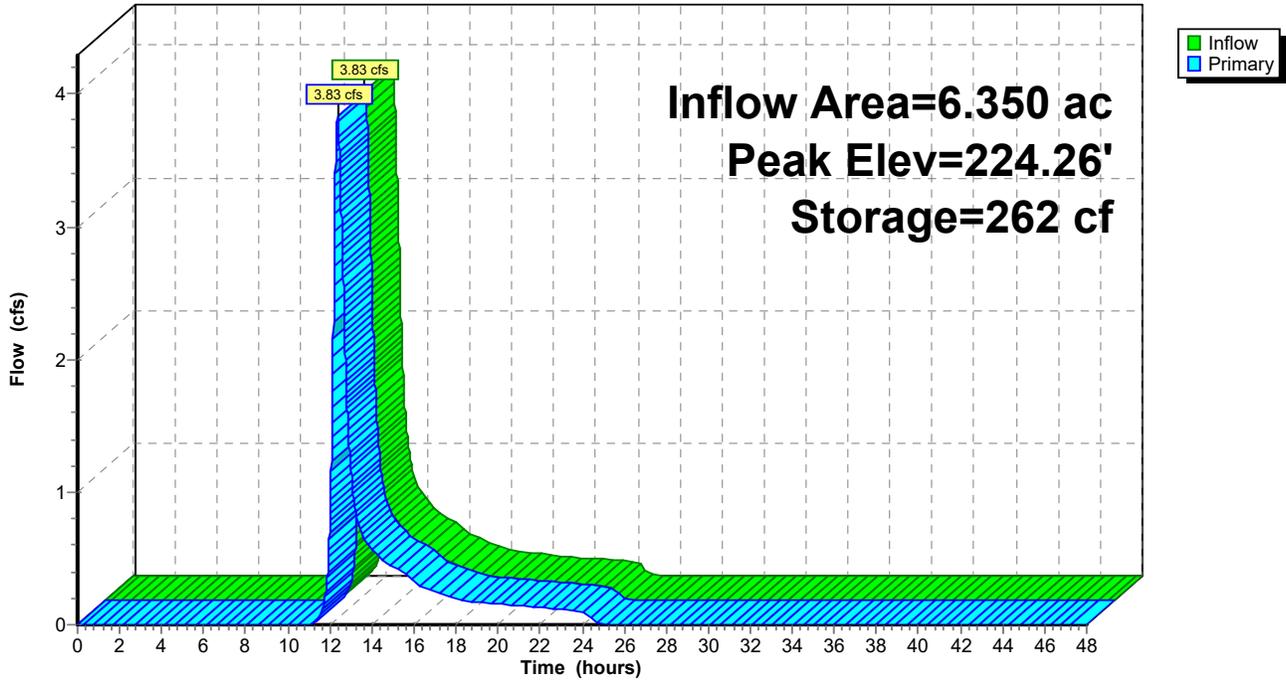
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
224.00	953	0	0
225.00	1,513	1,233	1,233
226.00	2,072	1,793	3,026

Device	Routing	Invert	Outlet Devices
#1	Primary	224.00'	Emergency Spillway, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 Width (feet) 8.00 18.00 26.00

Primary OutFlow Max=3.83 cfs @ 12.36 hrs HW=224.26' (Free Discharge)
 ↑1=**Emergency Spillway** (Weir Controls 3.83 cfs @ 1.61 fps)

Pond 11P_Pre: Pond 11P

Hydrograph



Summary for Pond S1_Pre: DA-1 Stor

Stage-area for elev 177 assumed based on culvert inverts.

Stage-area for elev 182-185 from civil survey.

Stage-area for elev 186-194 from KLF surface.

Inflow Area = 168.650 ac, 3.44% Impervious, Inflow Depth = 0.53" for 2-yr (Hampden) event
 Inflow = 32.49 cfs @ 12.77 hrs, Volume= 7.444 af
 Outflow = 32.48 cfs @ 12.78 hrs, Volume= 7.444 af, Atten= 0%, Lag= 0.3 min
 Primary = 32.48 cfs @ 12.78 hrs, Volume= 7.444 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 179.67' @ 12.78 hrs Surf.Area= 332 sf Storage= 186 cf

Plug-Flow detention time= 0.1 min calculated for 7.443 af (100% of inflow)
 Center-of-Mass det. time= 0.1 min (929.0 - 928.9)

Volume	Invert	Avail.Storage	Storage Description
#1	177.00'	237,211 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
177.00	0	0	0	0
178.00	21	7	7	23
179.00	83	49	56	89
180.00	512	267	323	522
181.00	1,306	879	1,201	1,323
182.00	2,393	1,822	3,023	2,420
183.00	4,058	3,189	6,213	4,097
184.00	5,691	4,852	11,064	5,748
185.00	8,000	6,813	17,877	8,076
186.00	10,421	9,184	27,061	10,521
188.00	16,620	26,801	53,862	16,773
190.00	26,218	42,475	96,337	26,427
192.00	34,530	60,558	156,894	34,830
194.00	46,063	80,317	237,211	46,450

Device	Routing	Invert	Outlet Devices
#1	Primary	177.50'	30.0" Round 30" CPP 1 L= 66.6' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 177.50' / 175.36' S= 0.0321 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 4.91 sf
#2	Primary	177.80'	30.0" Round 30" CPP 2 L= 66.4' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 177.80' / 175.50' S= 0.0346 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 4.91 sf
#3	Secondary	191.00'	Emergency Spillway, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 3.00 Width (feet) 38.32 93.77 128.55 162.52

Primary OutFlow Max=32.49 cfs @ 12.78 hrs HW=179.67' (Free Discharge)

1=30" CPP 1 (Inlet Controls 17.97 cfs @ 3.96 fps)

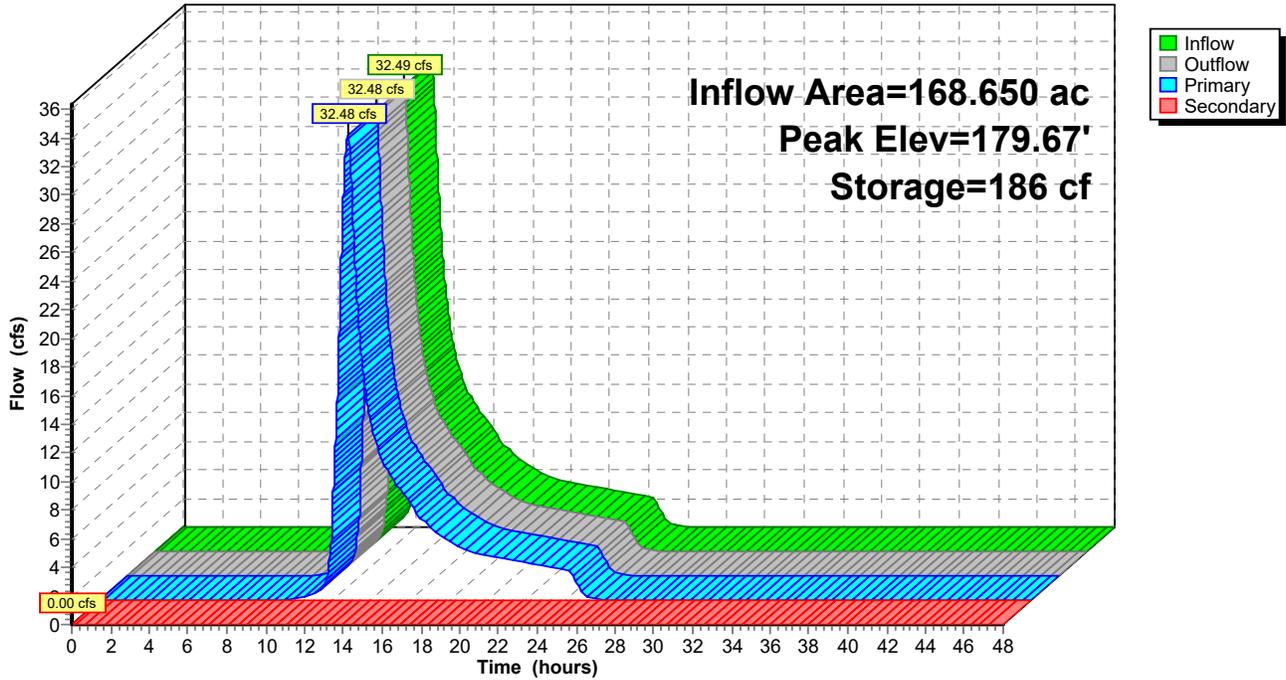
2=30" CPP 2 (Inlet Controls 14.53 cfs @ 3.68 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=177.00' (Free Discharge)

3=Emergency Spillway (Controls 0.00 cfs)

Pond S1_Pre: DA-1 Stor

Hydrograph



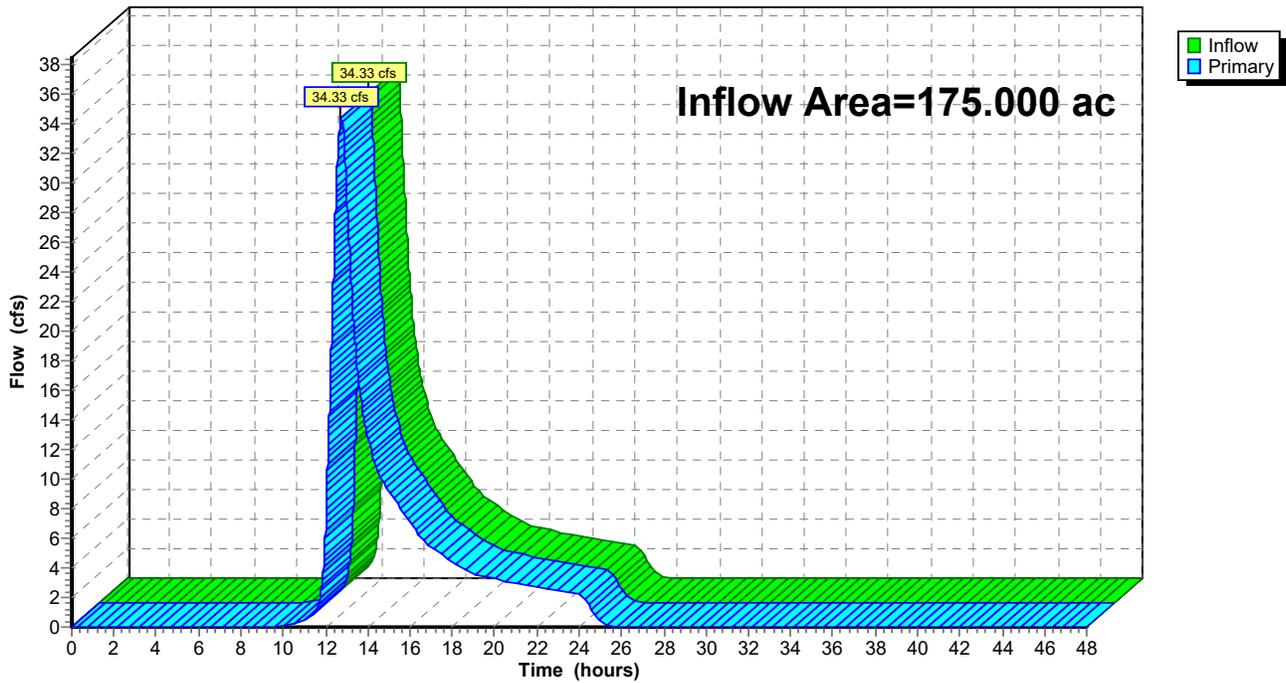
Summary for Link POA_Pre: Point of Analysis

Inflow Area = 175.000 ac, 3.45% Impervious, Inflow Depth = 0.54" for 2-yr (Hampden) event
Inflow = 34.33 cfs @ 12.73 hrs, Volume= 7.905 af
Primary = 34.33 cfs @ 12.73 hrs, Volume= 7.905 af, Atten= 0%, Lag= 0.0 min

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

Link POA_Pre: Point of Analysis

Hydrograph



ASMG_221383_Hydrology

Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Prepared by {enter your company name here}

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

SubcatchmentDA1_Pre: DA-1 Runoff Area=160.430 ac 2.51% Impervious Runoff Depth=1.32"
 Flow Length=5,870' Tc=47.5 min CN=65 Runoff=103.03 cfs 17.619 af

SubcatchmentDA2_Pre: DA-2 Runoff Area=7.500 ac 16.69% Impervious Runoff Depth=2.80"
 Flow Length=1,705' Slope=0.0711 '/' Tc=7.0 min CN=84 Runoff=23.68 cfs 1.749 af

SubcatchmentDA3_Pre: DA-3 Runoff Area=0.630 ac 72.00% Impervious Runoff Depth=3.69"
 Tc=5.0 min CN=93 Runoff=2.67 cfs 0.194 af

SubcatchmentDA4_Pre: DA-4 Runoff Area=0.090 ac 87.56% Impervious Runoff Depth=4.02"
 Tc=5.0 min CN=96 Runoff=0.40 cfs 0.030 af

SubcatchmentDA5_Pre: DA-5 Runoff Area=6.350 ac 3.74% Impervious Runoff Depth=1.96"
 Flow Length=1,153' Slope=0.1040 '/' Tc=22.5 min CN=74 Runoff=9.22 cfs 1.036 af

Pond 1P_Pre: Pond 1P Peak Elev=189.45' Storage=10,664 cf Inflow=23.68 cfs 1.749 af
 Outflow=13.37 cfs 1.740 af

Pond 7P_Pre: Pond 7P Peak Elev=186.01' Storage=1,084 cf Inflow=13.55 cfs 1.770 af
 Primary=13.18 cfs 1.770 af Secondary=0.02 cfs 0.000 af Outflow=13.21 cfs 1.770 af

Pond 11P_Pre: Pond 11P Peak Elev=224.44' Storage=469 cf Inflow=9.22 cfs 1.036 af
 Outflow=9.21 cfs 1.036 af

Pond S1_Pre: DA-1 Stor Peak Elev=185.98' Storage=26,804 cf Inflow=110.94 cfs 19.582 af
 Primary=99.26 cfs 19.582 af Secondary=0.00 cfs 0.000 af Outflow=99.26 cfs 19.582 af

Link POA_Pre: Point of Analysis Inflow=102.43 cfs 20.618 af
 Primary=102.43 cfs 20.618 af

Total Runoff Area = 175.000 ac Runoff Volume = 20.627 af Average Runoff Depth = 1.41"
96.55% Pervious = 168.954 ac 3.45% Impervious = 6.046 ac

Summary for Subcatchment DA1_Pre: DA-1

Runoff = 103.03 cfs @ 12.72 hrs, Volume= 17.619 af, Depth= 1.32"

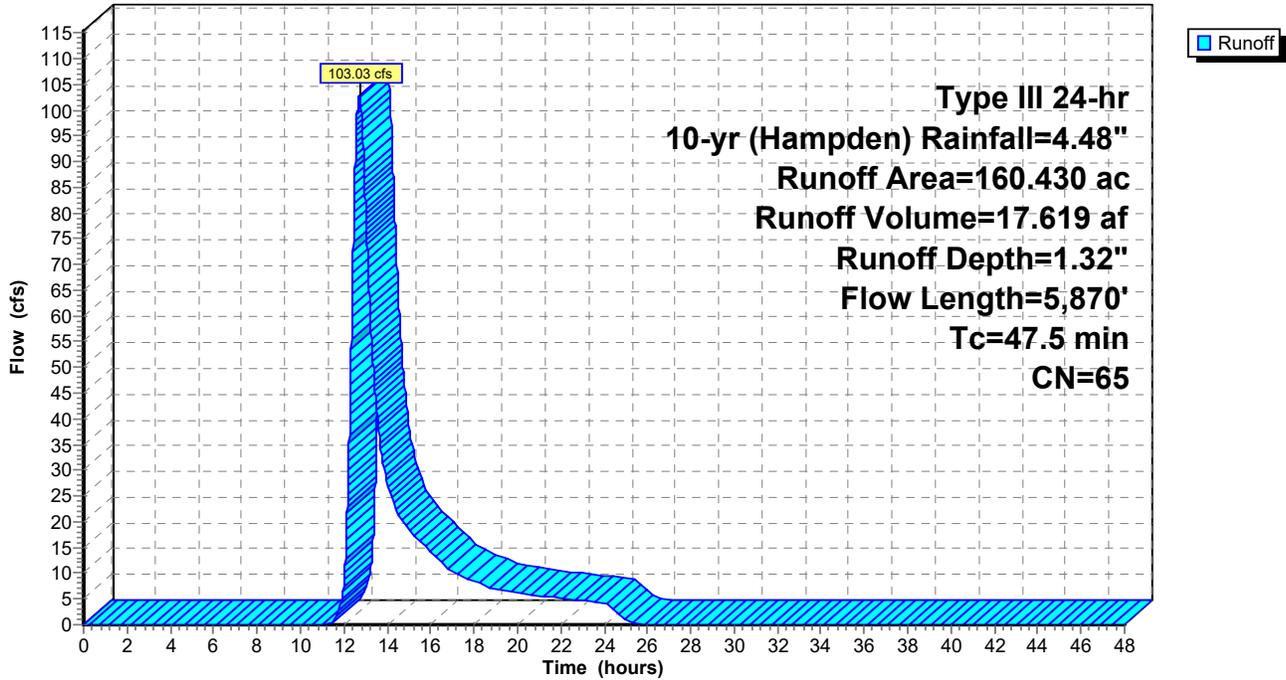
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (ac)	CN	Description
0.580	35	Brush, Fair, HSG A
0.450	70	Brush, Fair, HSG C
0.460	77	Brush, Fair, HSG D
2.450	93	Urban industrial, 72% imp, HSG D
2.480	49	Pasture/grassland/range, Fair, HSG A
0.660	69	Pasture/grassland/range, Fair, HSG B
5.930	79	Pasture/grassland/range, Fair, HSG C
1.220	84	Pasture/grassland/range, Fair, HSG D
* 2.260	98	Wetland
30.690	36	Woods, Fair, HSG A
29.080	60	Woods, Fair, HSG B
45.970	73	Woods, Fair, HSG C
38.200	79	Woods, Fair, HSG D
160.430	65	Weighted Average
156.406		97.49% Pervious Area
4.024		2.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0581	0.11		Sheet Flow, Sheet-Woods Woods: Light underbrush n= 0.400 P2= 2.94"
24.9	1,800	0.0581	1.21		Shallow Concentrated Flow, SCF-Woods Woodland Kv= 5.0 fps
8.0	3,970	0.0200	8.31	199.43	Parabolic Channel, W=18.00' D=2.00' Area=24.0 sf Perim=18.6' n= 0.030
47.5	5,870	Total			

Subcatchment DA1_Pre: DA-1

Hydrograph



Summary for Subcatchment DA2_Pre: DA-2

Runoff = 23.68 cfs @ 12.10 hrs, Volume= 1.749 af, Depth= 2.80"

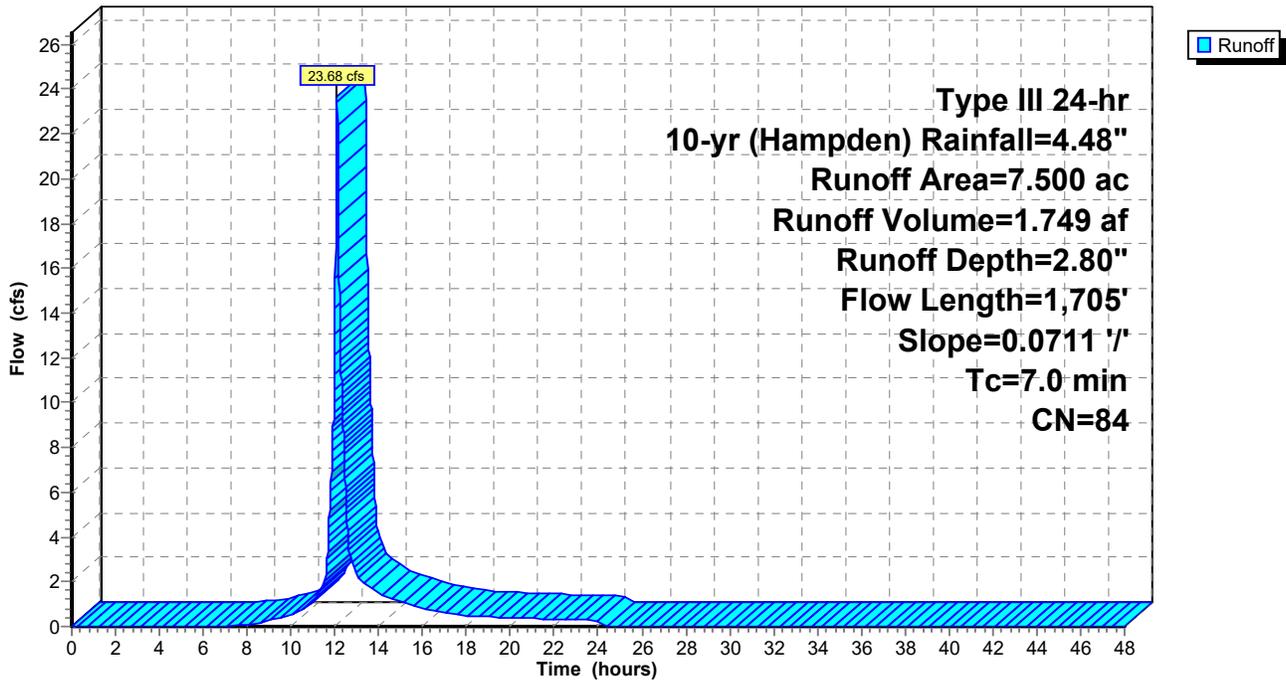
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (ac)	CN	Description
1.530	93	Urban industrial, 72% imp, HSG D
2.080	84	Pasture/grassland/range, Fair, HSG D
0.150	98	Water Surface, HSG D
3.740	79	Woods, Fair, HSG D
7.500	84	Weighted Average
6.248		83.31% Pervious Area
1.252		16.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0711	2.19		Sheet Flow, Sheet-Rd Smooth surfaces n= 0.011 P2= 2.94"
6.2	1,605	0.0711	4.29		Shallow Concentrated Flow, SCF-Rd Unpaved Kv= 16.1 fps
7.0	1,705	Total			

Subcatchment DA2_Pre: DA-2

Hydrograph



Summary for Subcatchment DA3_Pre: DA-3

Runoff = 2.67 cfs @ 12.07 hrs, Volume= 0.194 af, Depth= 3.69"

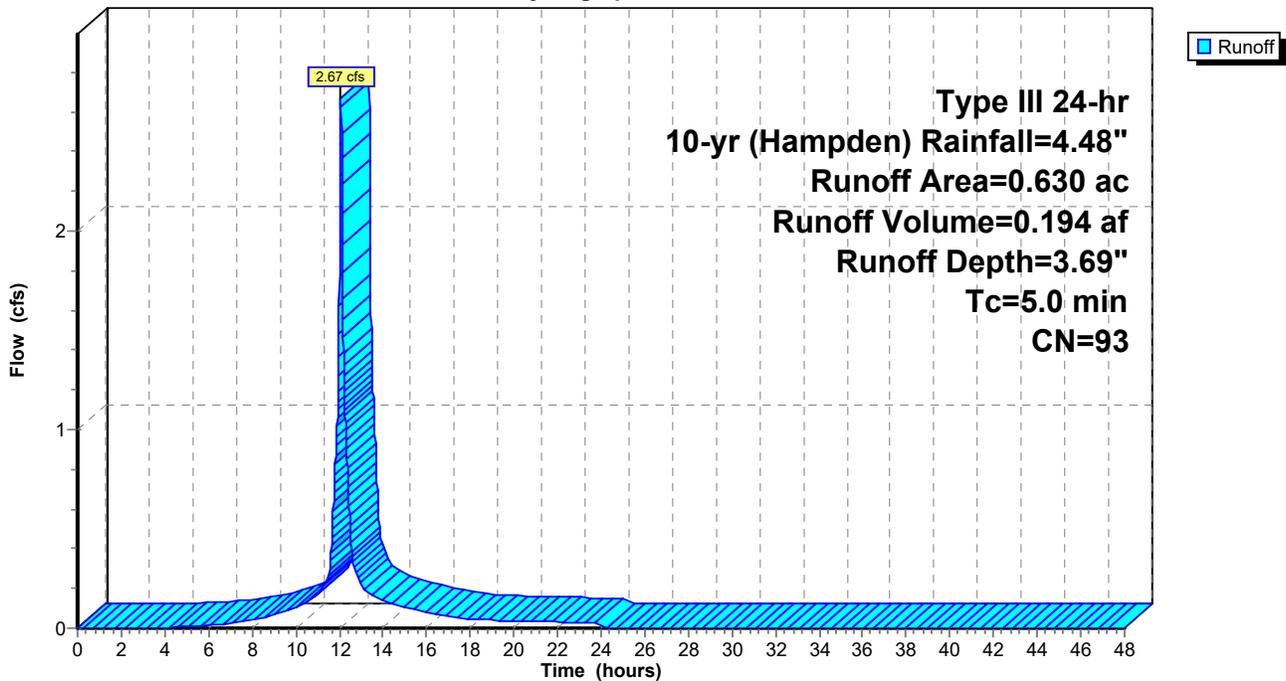
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (ac)	CN	Description
0.630	93	Urban industrial, 72% imp, HSG D
0.176		28.00% Pervious Area
0.454		72.00% Impervious Area

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

Subcatchment DA3_Pre: DA-3

Hydrograph



Summary for Subcatchment DA4_Pre: DA-4

Runoff = 0.40 cfs @ 12.07 hrs, Volume= 0.030 af, Depth= 4.02"

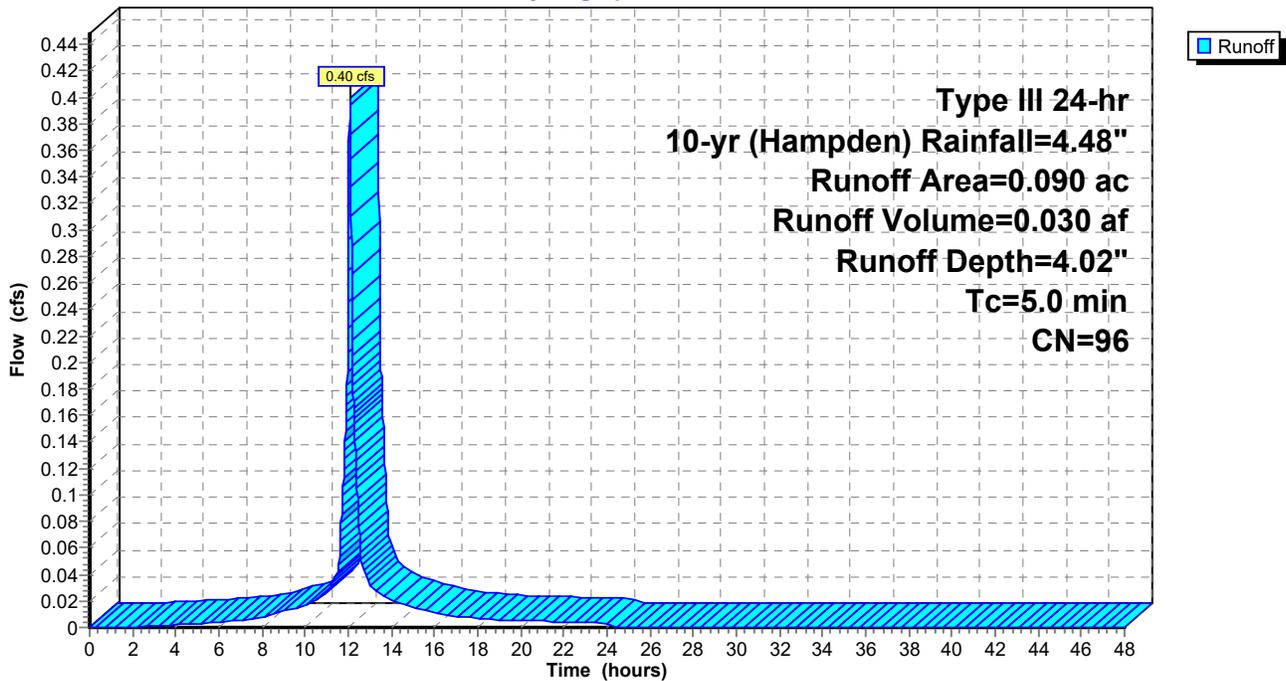
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (ac)	CN	Description
0.040	93	Urban industrial, 72% imp, HSG D
0.050	98	Water Surface, HSG D
0.090	96	Weighted Average
0.011		12.44% Pervious Area
0.079		87.56% Impervious Area

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

Subcatchment DA4_Pre: DA-4

Hydrograph



Summary for Subcatchment DA5_Pre: DA-5

Runoff = 9.22 cfs @ 12.32 hrs, Volume= 1.036 af, Depth= 1.96"

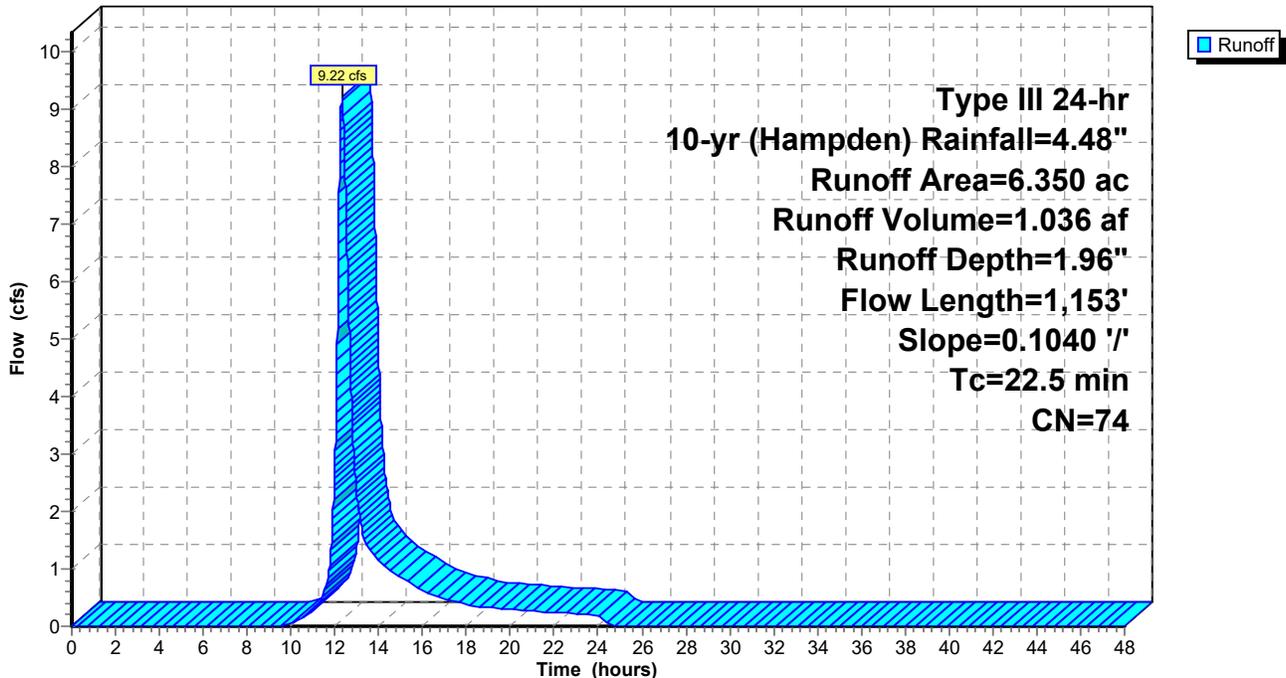
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (ac)	CN	Description
0.270	91	Urban industrial, 72% imp, HSG C
0.060	93	Urban industrial, 72% imp, HSG D
0.280	79	Pasture/grassland/range, Fair, HSG C
0.050	84	Pasture/grassland/range, Fair, HSG D
0.180	60	Woods, Fair, HSG B
5.350	73	Woods, Fair, HSG C
0.160	79	Woods, Fair, HSG D
6.350	74	Weighted Average
6.112		96.26% Pervious Area
0.238		3.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.1040	0.14		Sheet Flow, Sheet-Woods
10.9	1,053	0.1040	1.61		Woods: Light underbrush n= 0.400 P2= 2.94" Shallow Concentrated Flow, SCF-Woods
22.5	1,153	Total			Woodland Kv= 5.0 fps

Subcatchment DA5_Pre: DA-5

Hydrograph



Summary for Pond 1P_Pre: Pond 1P

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 7.500 ac, 16.69% Impervious, Inflow Depth = 2.80" for 10-yr (Hampden) event
 Inflow = 23.68 cfs @ 12.10 hrs, Volume= 1.749 af
 Outflow = 13.37 cfs @ 12.24 hrs, Volume= 1.740 af, Atten= 44%, Lag= 8.1 min
 Primary = 13.37 cfs @ 12.24 hrs, Volume= 1.740 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 189.45' @ 12.24 hrs Surf.Area= 5,479 sf Storage= 10,664 cf

Plug-Flow detention time= 17.9 min calculated for 1.740 af (99% of inflow)
 Center-of-Mass det. time= 14.5 min (830.4 - 815.9)

Volume	Invert	Avail.Storage	Storage Description
#1	186.00'	51,062 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.00	0	0	0
188.00	3,866	3,866	3,866
189.00	5,039	4,453	8,319
190.00	6,026	5,533	13,851
191.00	7,099	6,563	20,414
192.00	8,299	7,699	28,113
194.00	14,650	22,949	51,062

Device	Routing	Invert	Outlet Devices
#1	Primary	186.65'	15.0" Round 15" CPP 1 L= 161.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 186.65' / 183.17' S= 0.0215 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#2	Primary	186.88'	15.0" Round 15" CPP 2 L= 162.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 186.88' / 182.88' S= 0.0247 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

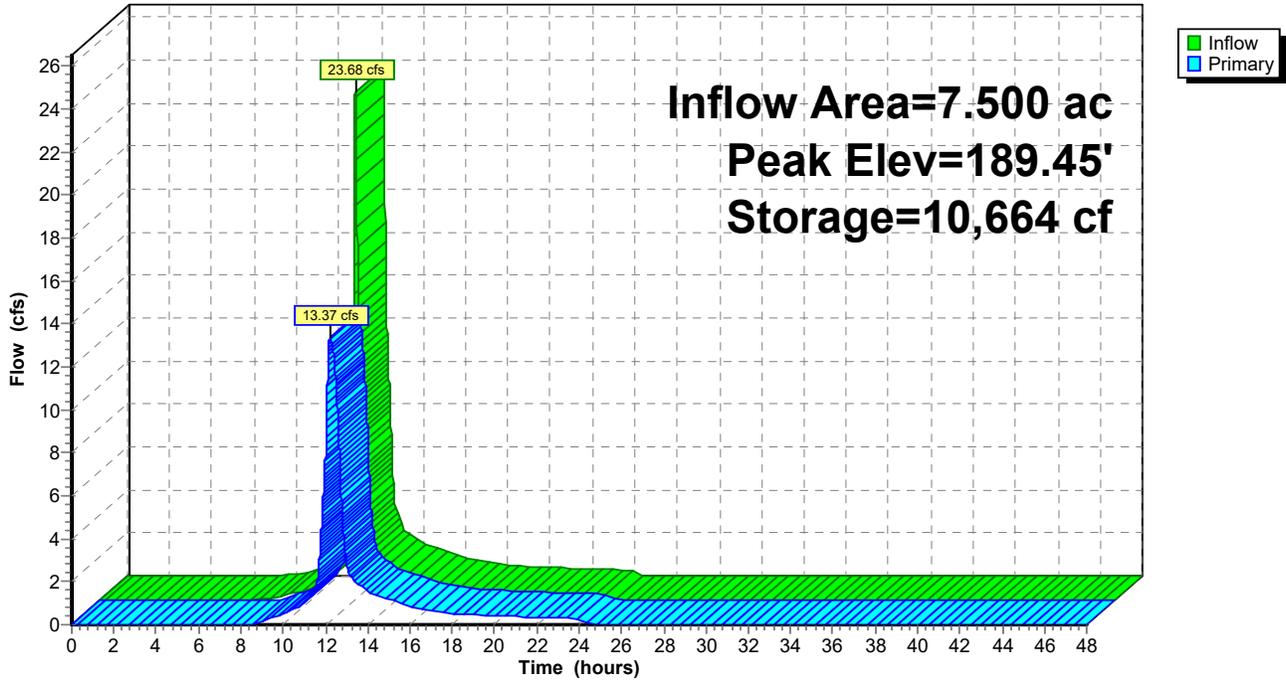
Primary OutFlow Max=13.37 cfs @ 12.24 hrs HW=189.45' (Free Discharge)

1=15" CPP 1 (Inlet Controls 6.87 cfs @ 5.60 fps)

2=15" CPP 2 (Inlet Controls 6.50 cfs @ 5.30 fps)

Pond 1P_Pre: Pond 1P

Hydrograph



Summary for Pond 7P_Pre: Pond 7P

Stage-area for elev 182 assumed based on culvert inverts.

Stage-area for elev 183-190 from civil survey.

[79] Warning: Submerged Pond 1P_Pre Primary device # 1 OUTLET by 2.84'

[79] Warning: Submerged Pond 1P_Pre Primary device # 2 OUTLET by 3.13'

Inflow Area = 7.590 ac, 17.53% Impervious, Inflow Depth = 2.80" for 10-yr (Hampden) event
 Inflow = 13.55 cfs @ 12.23 hrs, Volume= 1.770 af
 Outflow = 13.21 cfs @ 12.32 hrs, Volume= 1.770 af, Atten= 3%, Lag= 5.6 min
 Primary = 13.18 cfs @ 12.32 hrs, Volume= 1.770 af
 Secondary = 0.02 cfs @ 12.32 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 186.01' @ 12.32 hrs Surf.Area= 683 sf Storage= 1,084 cf

Plug-Flow detention time= 0.5 min calculated for 1.769 af (100% of inflow)
 Center-of-Mass det. time= 0.5 min (829.7 - 829.3)

Volume	Invert	Avail.Storage	Storage Description
#1	182.00'	5,536 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
182.00	0	0	0
183.00	13	7	7
184.00	247	130	137
185.00	479	363	500
186.00	682	581	1,080
187.00	920	801	1,881
188.00	1,114	1,017	2,898
189.00	1,312	1,213	4,111
190.00	1,538	1,425	5,536

Device	Routing	Invert	Outlet Devices
#1	Primary	182.74'	12.0" Round 12" RCP 1 L= 69.5' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 182.74' / 181.83' S= 0.0131 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Primary	182.84'	12.0" Round 12" RCP 1 L= 65.8' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 182.84' / 181.60' S= 0.0188 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#3	Secondary	186.00'	Emergency Spillway, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 3.00 4.00 Width (feet) 4.26 9.60 15.15 20.50 31.66

Primary OutFlow Max=13.18 cfs @ 12.32 hrs HW=186.01' (Free Discharge)

1=12" RCP 1 (Barrel Controls 6.42 cfs @ 8.18 fps)

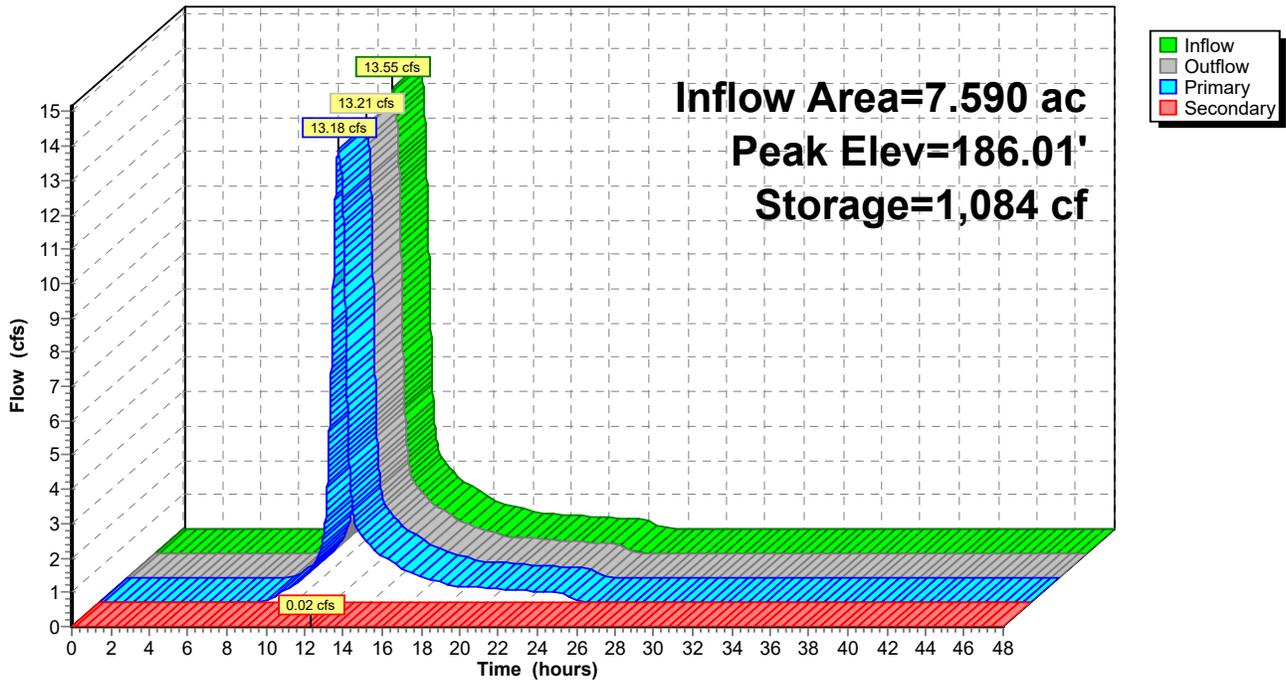
2=12" RCP 1 (Barrel Controls 6.76 cfs @ 8.61 fps)

Secondary OutFlow Max=0.01 cfs @ 12.32 hrs HW=186.01' (Free Discharge)

3=Emergency Spillway (Weir Controls 0.01 cfs @ 0.24 fps)

Pond 7P_Pre: Pond 7P

Hydrograph



Summary for Pond 11P_Pre: Pond 11P

Stage-area for elev 182 assumed based on culvert inverts.

Stage-area for elev 183-190 from civil survey.

Inflow Area = 6.350 ac, 3.74% Impervious, Inflow Depth = 1.96" for 10-yr (Hampden) event
 Inflow = 9.22 cfs @ 12.32 hrs, Volume= 1.036 af
 Outflow = 9.21 cfs @ 12.33 hrs, Volume= 1.036 af, Atten= 0%, Lag= 0.5 min
 Primary = 9.21 cfs @ 12.33 hrs, Volume= 1.036 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 224.44' @ 12.33 hrs Surf.Area= 1,197 sf Storage= 469 cf

Plug-Flow detention time= 1.6 min calculated for 1.036 af (100% of inflow)
 Center-of-Mass det. time= 1.6 min (859.9 - 858.3)

Volume	Invert	Avail.Storage	Storage Description
#1	224.00'	3,026 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

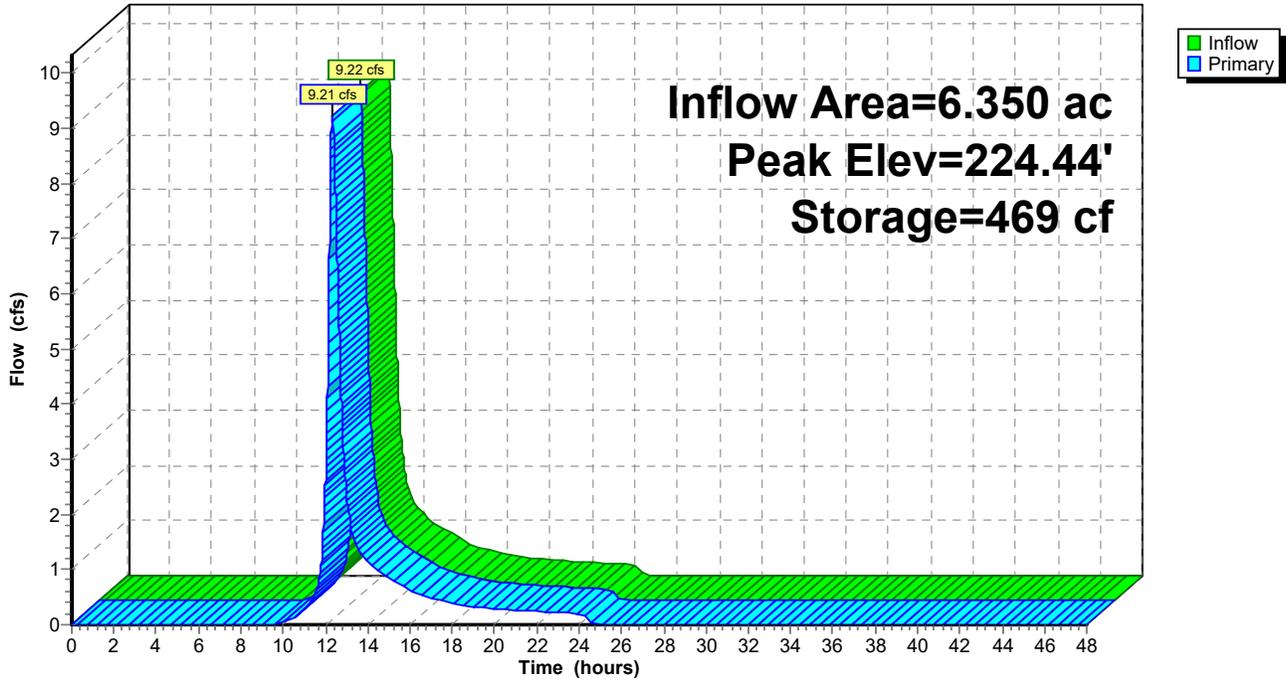
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
224.00	953	0	0
225.00	1,513	1,233	1,233
226.00	2,072	1,793	3,026

Device	Routing	Invert	Outlet Devices
#1	Primary	224.00'	Emergency Spillway, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 Width (feet) 8.00 18.00 26.00

Primary OutFlow Max=9.21 cfs @ 12.33 hrs HW=224.44' (Free Discharge)
 ↑1=**Emergency Spillway** (Weir Controls 9.21 cfs @ 2.07 fps)

Pond 11P_Pre: Pond 11P

Hydrograph



Summary for Pond S1_Pre: DA-1 Stor

Stage-area for elev 177 assumed based on culvert inverts.

Stage-area for elev 182-185 from civil survey.

Stage-area for elev 186-194 from KLF surface.

[81] Warning: Exceeded Pond 7P_Pre by 2.51' @ 12.90 hrs

Inflow Area = 168.650 ac, 3.44% Impervious, Inflow Depth = 1.39" for 10-yr (Hampden) event
 Inflow = 110.94 cfs @ 12.67 hrs, Volume= 19.582 af
 Outflow = 99.26 cfs @ 12.87 hrs, Volume= 19.582 af, Atten= 11%, Lag= 11.9 min
 Primary = 99.26 cfs @ 12.87 hrs, Volume= 19.582 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 185.98' @ 12.87 hrs Surf.Area= 10,357 sf Storage= 26,804 cf

Plug-Flow detention time= 1.2 min calculated for 19.578 af (100% of inflow)
 Center-of-Mass det. time= 1.2 min (899.5 - 898.3)

Volume	Invert	Avail.Storage	Storage Description
#1	177.00'	237,211 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
177.00	0	0	0	0
178.00	21	7	7	23
179.00	83	49	56	89
180.00	512	267	323	522
181.00	1,306	879	1,201	1,323
182.00	2,393	1,822	3,023	2,420
183.00	4,058	3,189	6,213	4,097
184.00	5,691	4,852	11,064	5,748
185.00	8,000	6,813	17,877	8,076
186.00	10,421	9,184	27,061	10,521
188.00	16,620	26,801	53,862	16,773
190.00	26,218	42,475	96,337	26,427
192.00	34,530	60,558	156,894	34,830
194.00	46,063	80,317	237,211	46,450

Device	Routing	Invert	Outlet Devices
#1	Primary	177.50'	30.0" Round 30" CPP 1 L= 66.6' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 177.50' / 175.36' S= 0.0321 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 4.91 sf
#2	Primary	177.80'	30.0" Round 30" CPP 2 L= 66.4' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 177.80' / 175.50' S= 0.0346 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 4.91 sf
#3	Secondary	191.00'	Emergency Spillway, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 3.00

Width (feet) 38.32 93.77 128.55 162.52

Primary OutFlow Max=99.26 cfs @ 12.87 hrs HW=185.97' (Free Discharge)

1=30" CPP 1 (Inlet Controls 50.16 cfs @ 10.22 fps)

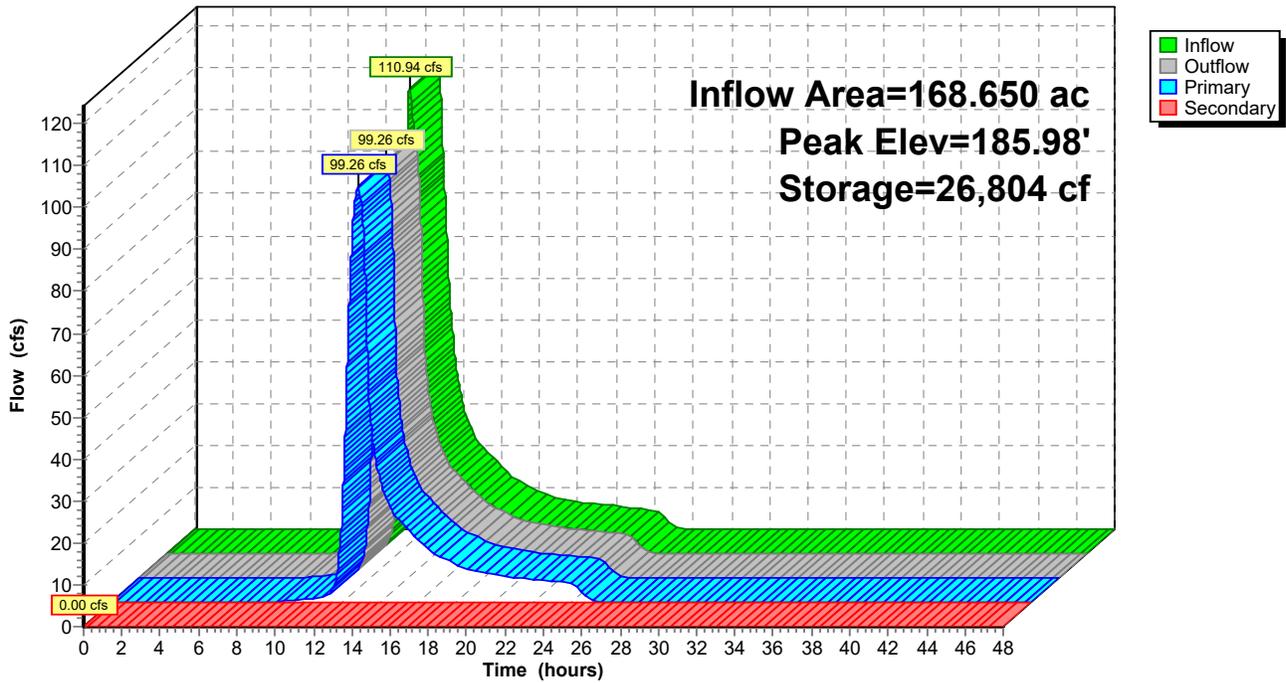
2=30" CPP 2 (Inlet Controls 49.10 cfs @ 10.00 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=177.00' (Free Discharge)

3=Emergency Spillway (Controls 0.00 cfs)

Pond S1_Pre: DA-1 Stor

Hydrograph



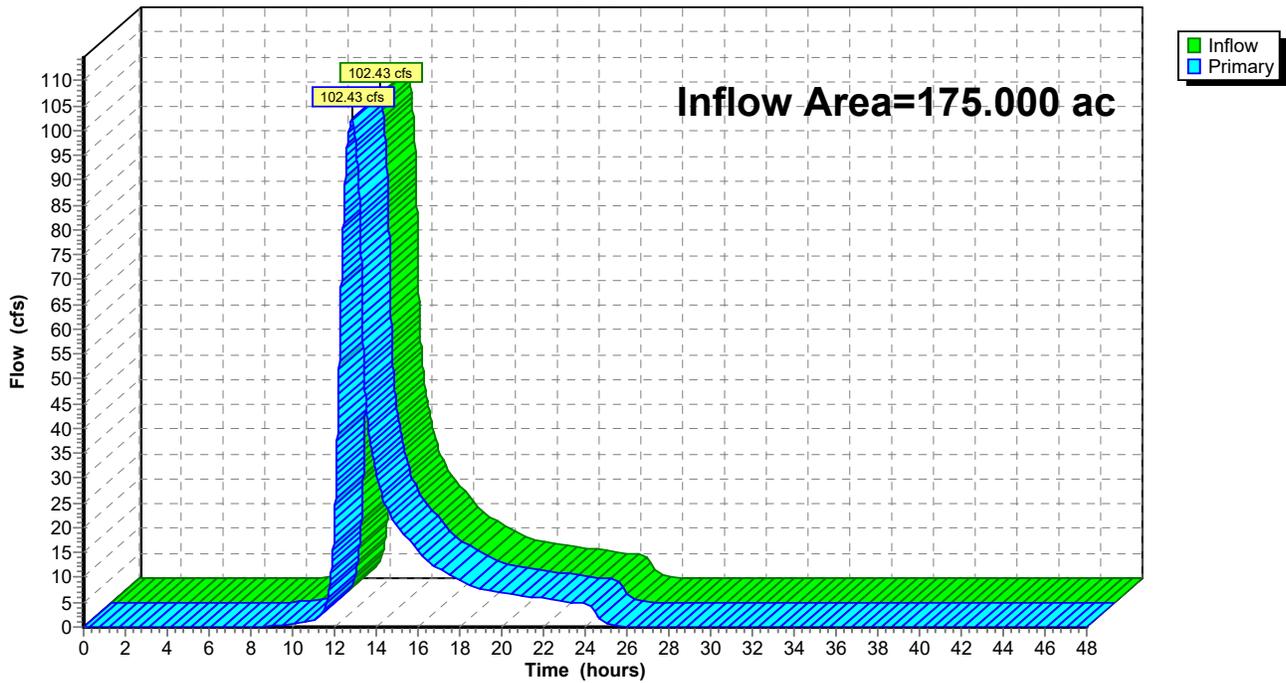
Summary for Link POA_Pre: Point of Analysis

Inflow Area = 175.000 ac, 3.45% Impervious, Inflow Depth = 1.41" for 10-yr (Hampden) event
Inflow = 102.43 cfs @ 12.84 hrs, Volume= 20.618 af
Primary = 102.43 cfs @ 12.84 hrs, Volume= 20.618 af, Atten= 0%, Lag= 0.0 min

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

Link POA_Pre: Point of Analysis

Hydrograph



ASMG_221383_Hydrology

Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Prepared by {enter your company name here}

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

SubcatchmentDA1_Pre: DA-1 Runoff Area=160.430 ac 2.51% Impervious Runoff Depth=3.05"
 Flow Length=5,870' Tc=47.5 min CN=65 Runoff=254.08 cfs 40.756 af

SubcatchmentDA2_Pre: DA-2 Runoff Area=7.500 ac 16.69% Impervious Runoff Depth=5.07"
 Flow Length=1,705' Slope=0.0711 '/' Tc=7.0 min CN=84 Runoff=42.12 cfs 3.171 af

SubcatchmentDA3_Pre: DA-3 Runoff Area=0.630 ac 72.00% Impervious Runoff Depth=6.10"
 Tc=5.0 min CN=93 Runoff=4.30 cfs 0.320 af

SubcatchmentDA4_Pre: DA-4 Runoff Area=0.090 ac 87.56% Impervious Runoff Depth=6.45"
 Tc=5.0 min CN=96 Runoff=0.63 cfs 0.048 af

SubcatchmentDA5_Pre: DA-5 Runoff Area=6.350 ac 3.74% Impervious Runoff Depth=3.98"
 Flow Length=1,153' Slope=0.1040 '/' Tc=22.5 min CN=74 Runoff=19.02 cfs 2.107 af

Pond 1P_Pre: Pond 1P Peak Elev=191.47' Storage=23,900 cf Inflow=42.12 cfs 3.171 af
 Outflow=18.85 cfs 3.162 af

Pond 7P_Pre: Pond 7P Peak Elev=186.44' Storage=1,405 cf Inflow=19.08 cfs 3.210 af
 Primary=14.03 cfs 2.998 af Secondary=5.05 cfs 0.212 af Outflow=19.08 cfs 3.210 af

Pond 11P_Pre: Pond 11P Peak Elev=224.67' Storage=759 cf Inflow=19.02 cfs 2.107 af
 Outflow=19.01 cfs 2.107 af

Pond S1_Pre: DA-1 Stor Peak Elev=191.80' Storage=149,914 cf Inflow=268.26 cfs 44.075 af
 Primary=134.01 cfs 39.575 af Secondary=130.09 cfs 4.500 af Outflow=264.10 cfs 44.075 af

Link POA_Pre: Point of Analysis Inflow=273.50 cfs 46.393 af
 Primary=273.50 cfs 46.393 af

Total Runoff Area = 175.000 ac Runoff Volume = 46.403 af Average Runoff Depth = 3.18"
96.55% Pervious = 168.954 ac 3.45% Impervious = 6.046 ac

Summary for Subcatchment DA1_Pre: DA-1

Runoff = 254.08 cfs @ 12.67 hrs, Volume= 40.756 af, Depth= 3.05"

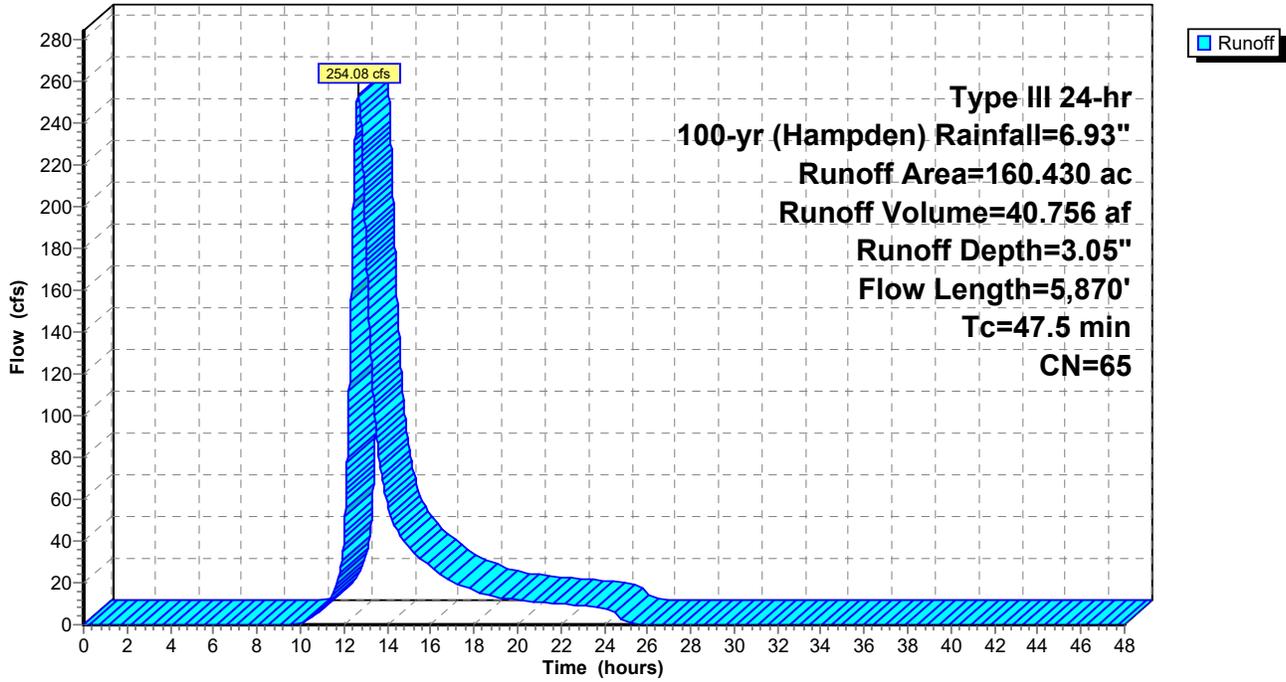
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (ac)	CN	Description
0.580	35	Brush, Fair, HSG A
0.450	70	Brush, Fair, HSG C
0.460	77	Brush, Fair, HSG D
2.450	93	Urban industrial, 72% imp, HSG D
2.480	49	Pasture/grassland/range, Fair, HSG A
0.660	69	Pasture/grassland/range, Fair, HSG B
5.930	79	Pasture/grassland/range, Fair, HSG C
1.220	84	Pasture/grassland/range, Fair, HSG D
* 2.260	98	Wetland
30.690	36	Woods, Fair, HSG A
29.080	60	Woods, Fair, HSG B
45.970	73	Woods, Fair, HSG C
38.200	79	Woods, Fair, HSG D
160.430	65	Weighted Average
156.406		97.49% Pervious Area
4.024		2.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0581	0.11		Sheet Flow, Sheet-Woods Woods: Light underbrush n= 0.400 P2= 2.94"
24.9	1,800	0.0581	1.21		Shallow Concentrated Flow, SCF-Woods Woodland Kv= 5.0 fps
8.0	3,970	0.0200	8.31	199.43	Parabolic Channel, W=18.00' D=2.00' Area=24.0 sf Perim=18.6' n= 0.030
47.5	5,870	Total			

Subcatchment DA1_Pre: DA-1

Hydrograph



Summary for Subcatchment DA2_Pre: DA-2

Runoff = 42.12 cfs @ 12.10 hrs, Volume= 3.171 af, Depth= 5.07"

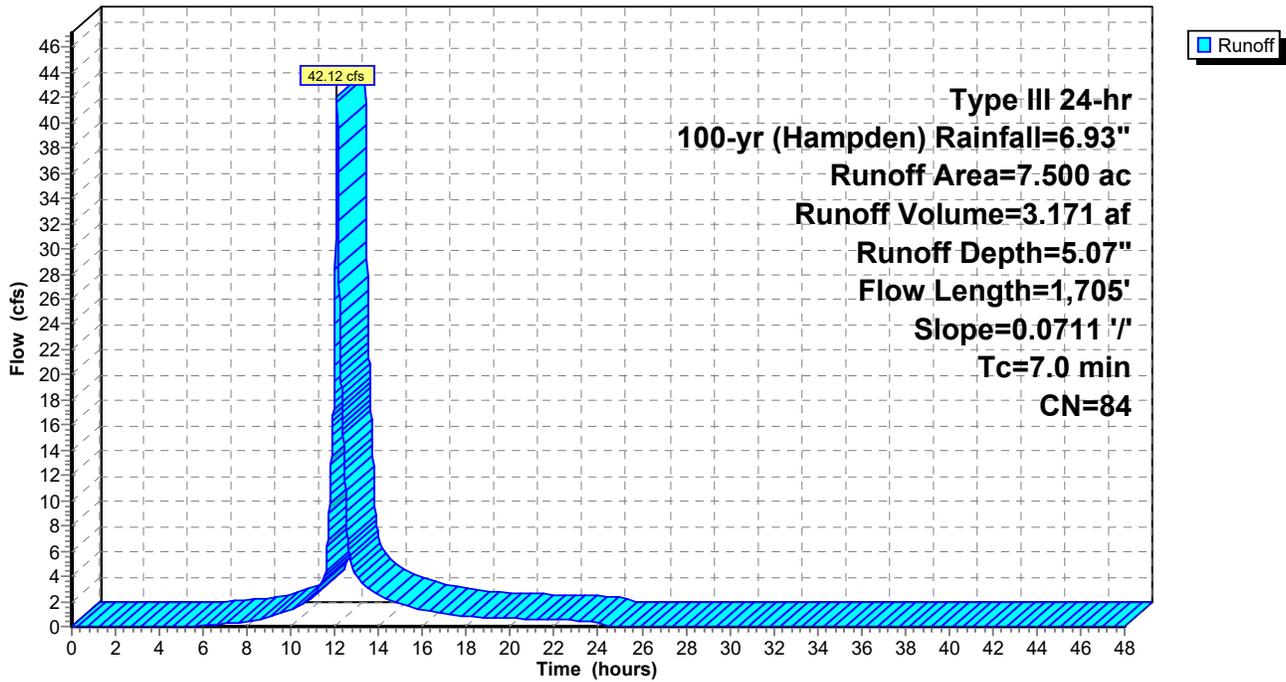
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (ac)	CN	Description
1.530	93	Urban industrial, 72% imp, HSG D
2.080	84	Pasture/grassland/range, Fair, HSG D
0.150	98	Water Surface, HSG D
3.740	79	Woods, Fair, HSG D
7.500	84	Weighted Average
6.248		83.31% Pervious Area
1.252		16.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0711	2.19		Sheet Flow, Sheet-Rd Smooth surfaces n= 0.011 P2= 2.94"
6.2	1,605	0.0711	4.29		Shallow Concentrated Flow, SCF-Rd Unpaved Kv= 16.1 fps
7.0	1,705	Total			

Subcatchment DA2_Pre: DA-2

Hydrograph



Summary for Subcatchment DA3_Pre: DA-3

Runoff = 4.30 cfs @ 12.07 hrs, Volume= 0.320 af, Depth= 6.10"

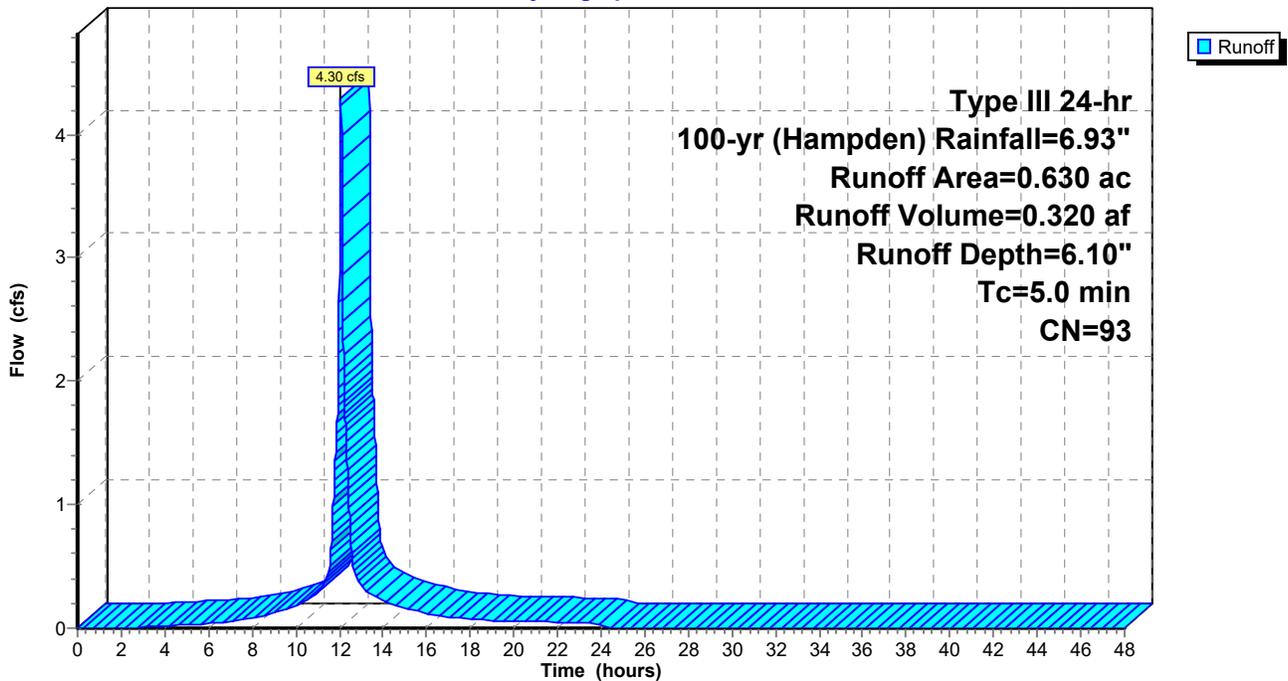
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (ac)	CN	Description
0.630	93	Urban industrial, 72% imp, HSG D
0.176		28.00% Pervious Area
0.454		72.00% Impervious Area

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

Subcatchment DA3_Pre: DA-3

Hydrograph



Summary for Subcatchment DA4_Pre: DA-4

Runoff = 0.63 cfs @ 12.07 hrs, Volume= 0.048 af, Depth= 6.45"

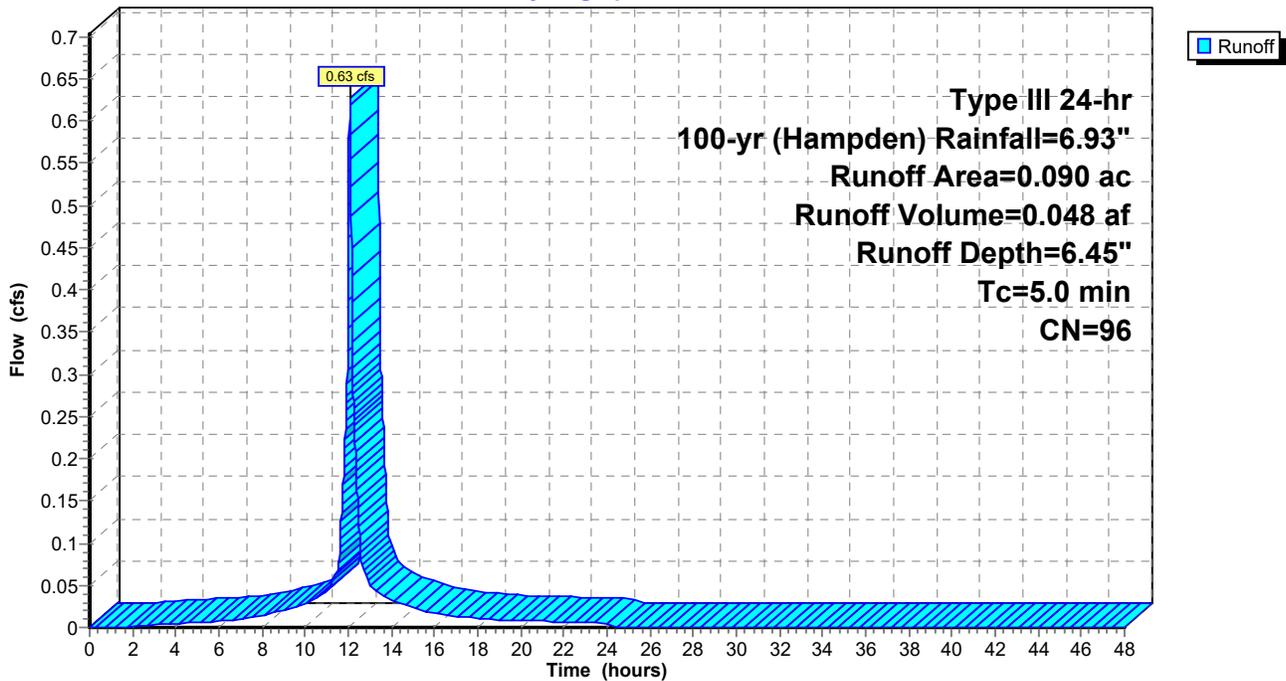
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (ac)	CN	Description
0.040	93	Urban industrial, 72% imp, HSG D
0.050	98	Water Surface, HSG D
0.090	96	Weighted Average
0.011		12.44% Pervious Area
0.079		87.56% Impervious Area

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

Subcatchment DA4_Pre: DA-4

Hydrograph



Summary for Subcatchment DA5_Pre: DA-5

Runoff = 19.02 cfs @ 12.32 hrs, Volume= 2.107 af, Depth= 3.98"

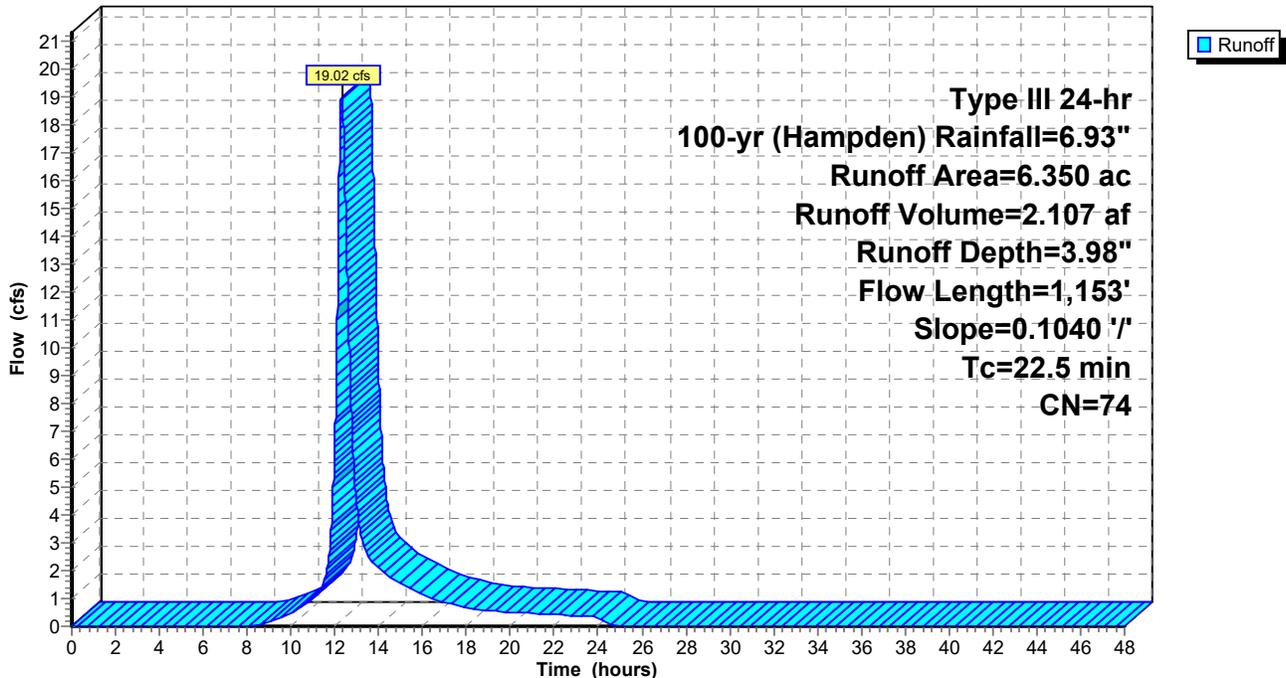
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (ac)	CN	Description
0.270	91	Urban industrial, 72% imp, HSG C
0.060	93	Urban industrial, 72% imp, HSG D
0.280	79	Pasture/grassland/range, Fair, HSG C
0.050	84	Pasture/grassland/range, Fair, HSG D
0.180	60	Woods, Fair, HSG B
5.350	73	Woods, Fair, HSG C
0.160	79	Woods, Fair, HSG D
6.350	74	Weighted Average
6.112		96.26% Pervious Area
0.238		3.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.1040	0.14		Sheet Flow, Sheet-Woods
10.9	1,053	0.1040	1.61		Woods: Light underbrush n= 0.400 P2= 2.94" Shallow Concentrated Flow, SCF-Woods
22.5	1,153	Total			Woodland Kv= 5.0 fps

Subcatchment DA5_Pre: DA-5

Hydrograph



Summary for Pond 1P_Pre: Pond 1P

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 7.500 ac, 16.69% Impervious, Inflow Depth = 5.07" for 100-yr (Hampden) event
 Inflow = 42.12 cfs @ 12.10 hrs, Volume= 3.171 af
 Outflow = 18.85 cfs @ 12.30 hrs, Volume= 3.162 af, Atten= 55%, Lag= 12.1 min
 Primary = 18.85 cfs @ 12.30 hrs, Volume= 3.162 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 191.47' @ 12.30 hrs Surf.Area= 7,666 sf Storage= 23,900 cf

Plug-Flow detention time= 17.0 min calculated for 3.161 af (100% of inflow)
 Center-of-Mass det. time= 15.1 min (814.2 - 799.1)

Volume	Invert	Avail.Storage	Storage Description
#1	186.00'	51,062 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.00	0	0	0
188.00	3,866	3,866	3,866
189.00	5,039	4,453	8,319
190.00	6,026	5,533	13,851
191.00	7,099	6,563	20,414
192.00	8,299	7,699	28,113
194.00	14,650	22,949	51,062

Device	Routing	Invert	Outlet Devices
#1	Primary	186.65'	15.0" Round 15" CPP 1 L= 161.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 186.65' / 183.17' S= 0.0215 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#2	Primary	186.88'	15.0" Round 15" CPP 2 L= 162.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 186.88' / 182.88' S= 0.0247 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

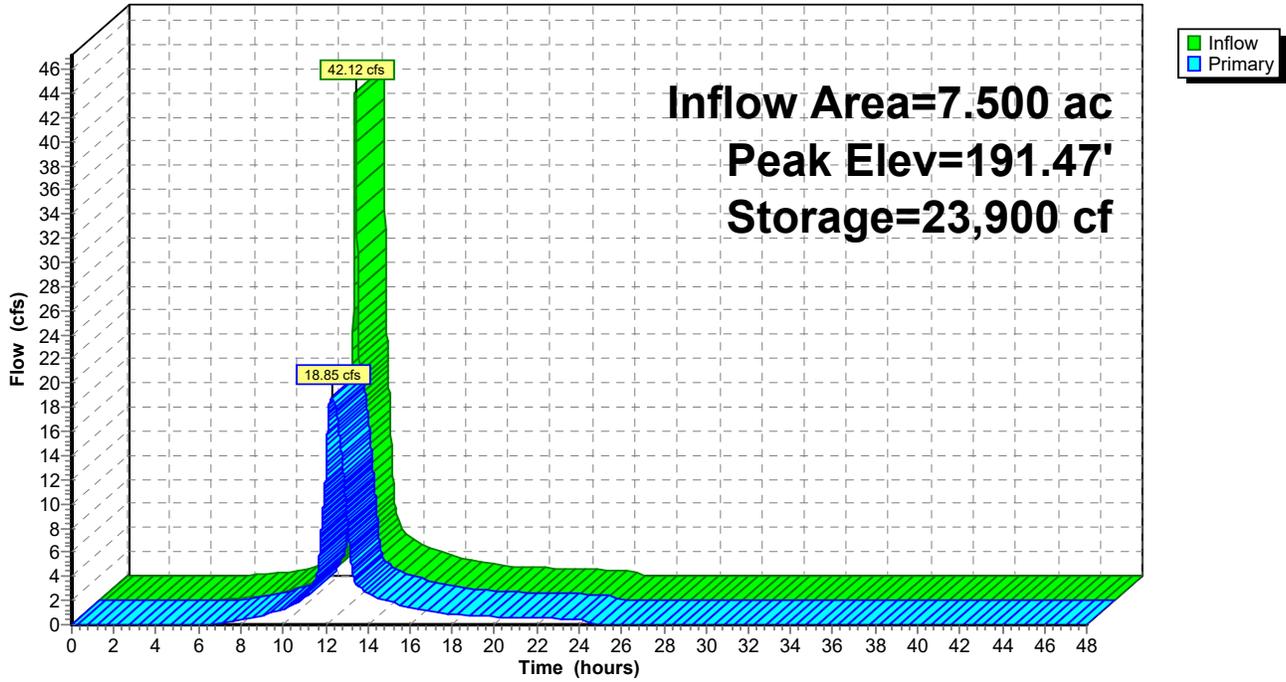
Primary OutFlow Max=18.85 cfs @ 12.30 hrs HW=191.47' (Free Discharge)

1=15" CPP 1 (Inlet Controls 9.56 cfs @ 7.79 fps)

2=15" CPP 2 (Inlet Controls 9.29 cfs @ 7.57 fps)

Pond 1P_Pre: Pond 1P

Hydrograph



Summary for Pond 7P_Pre: Pond 7P

Stage-area for elev 182 assumed based on culvert inverts.

Stage-area for elev 183-190 from civil survey.

[79] Warning: Submerged Pond 1P_Pre Primary device # 1 OUTLET by 3.27'

[79] Warning: Submerged Pond 1P_Pre Primary device # 2 OUTLET by 3.56'

Inflow Area = 7.590 ac, 17.53% Impervious, Inflow Depth = 5.08" for 100-yr (Hampden) event
 Inflow = 19.08 cfs @ 12.29 hrs, Volume= 3.210 af
 Outflow = 19.08 cfs @ 12.30 hrs, Volume= 3.210 af, Atten= 0%, Lag= 0.7 min
 Primary = 14.03 cfs @ 12.30 hrs, Volume= 2.998 af
 Secondary = 5.05 cfs @ 12.30 hrs, Volume= 0.212 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 186.44' @ 12.30 hrs Surf.Area= 787 sf Storage= 1,405 cf

Plug-Flow detention time= 0.8 min calculated for 3.210 af (100% of inflow)
 Center-of-Mass det. time= 0.6 min (814.0 - 813.3)

Volume	Invert	Avail.Storage	Storage Description
#1	182.00'	5,536 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
182.00	0	0	0
183.00	13	7	7
184.00	247	130	137
185.00	479	363	500
186.00	682	581	1,080
187.00	920	801	1,881
188.00	1,114	1,017	2,898
189.00	1,312	1,213	4,111
190.00	1,538	1,425	5,536

Device	Routing	Invert	Outlet Devices
#1	Primary	182.74'	12.0" Round 12" RCP 1 L= 69.5' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 182.74' / 181.83' S= 0.0131 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Primary	182.84'	12.0" Round 12" RCP 1 L= 65.8' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 182.84' / 181.60' S= 0.0188 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#3	Secondary	186.00'	Emergency Spillway, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 3.00 4.00 Width (feet) 4.26 9.60 15.15 20.50 31.66

Primary OutFlow Max=14.03 cfs @ 12.30 hrs HW=186.44' (Free Discharge)

1=12" RCP 1 (Barrel Controls 6.85 cfs @ 8.72 fps)

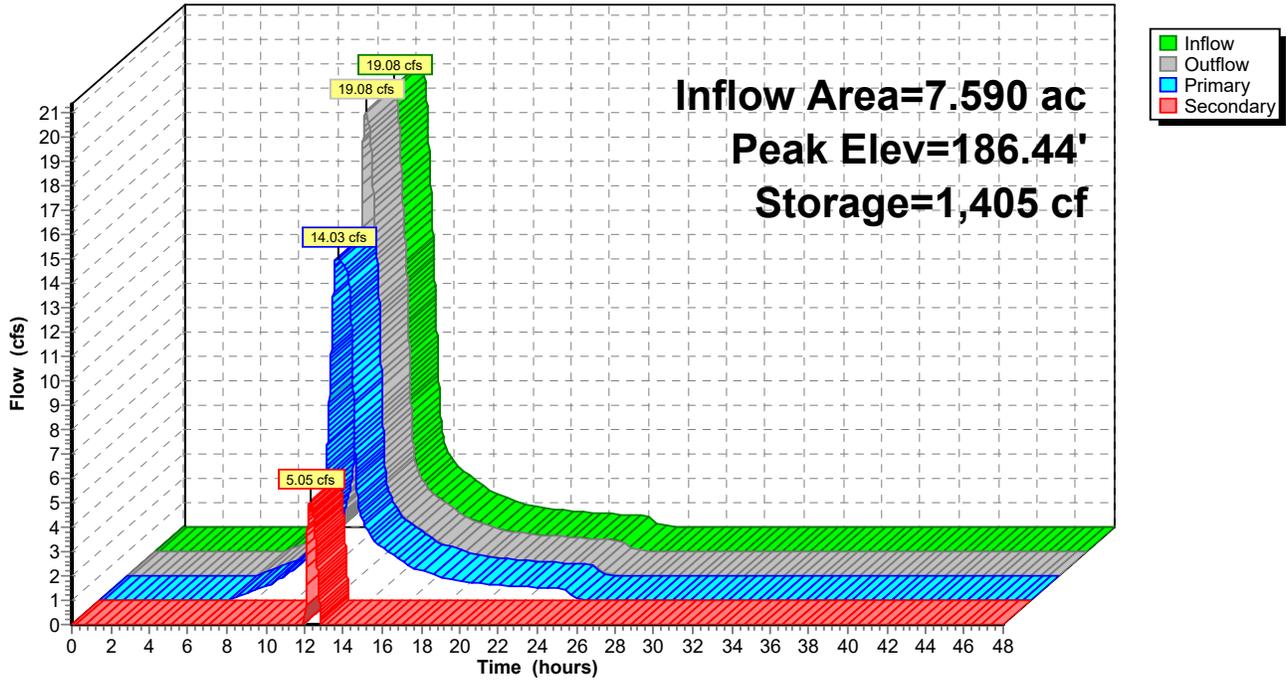
2=12" RCP 1 (Barrel Controls 7.18 cfs @ 9.14 fps)

Secondary OutFlow Max=5.02 cfs @ 12.30 hrs HW=186.44' (Free Discharge)

3=Emergency Spillway (Weir Controls 5.02 cfs @ 2.08 fps)

Pond 7P_Pre: Pond 7P

Hydrograph



Summary for Pond 11P_Pre: Pond 11P

Stage-area for elev 182 assumed based on culvert inverts.

Stage-area for elev 183-190 from civil survey.

Inflow Area = 6.350 ac, 3.74% Impervious, Inflow Depth = 3.98" for 100-yr (Hampden) event
 Inflow = 19.02 cfs @ 12.32 hrs, Volume= 2.107 af
 Outflow = 19.01 cfs @ 12.32 hrs, Volume= 2.107 af, Atten= 0%, Lag= 0.3 min
 Primary = 19.01 cfs @ 12.32 hrs, Volume= 2.107 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 224.67' @ 12.32 hrs Surf.Area= 1,326 sf Storage= 759 cf

Plug-Flow detention time= 1.3 min calculated for 2.107 af (100% of inflow)
 Center-of-Mass det. time= 1.3 min (839.0 - 837.7)

Volume	Invert	Avail.Storage	Storage Description
#1	224.00'	3,026 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

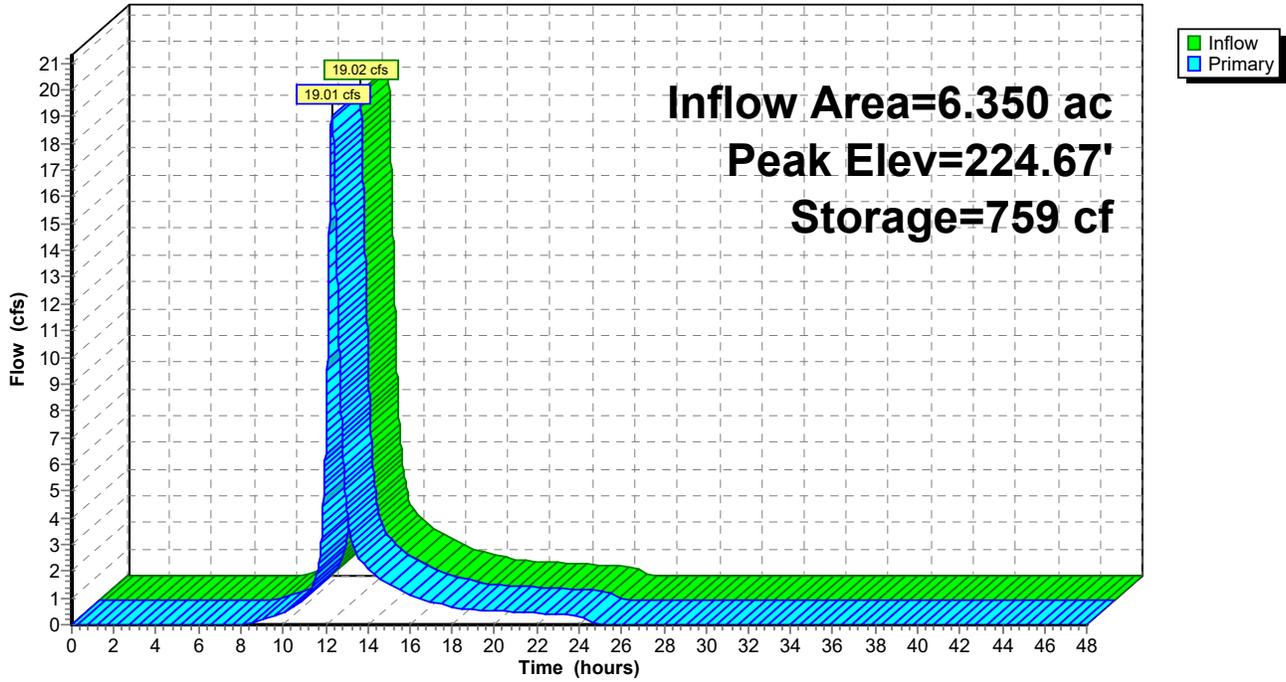
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
224.00	953	0	0
225.00	1,513	1,233	1,233
226.00	2,072	1,793	3,026

Device	Routing	Invert	Outlet Devices
#1	Primary	224.00'	Emergency Spillway, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 Width (feet) 8.00 18.00 26.00

Primary OutFlow Max=19.00 cfs @ 12.32 hrs HW=224.67' (Free Discharge)
 ↑1=**Emergency Spillway** (Weir Controls 19.00 cfs @ 2.52 fps)

Pond 11P_Pre: Pond 11P

Hydrograph



Summary for Pond S1_Pre: DA-1 Stor

Stage-area for elev 177 assumed based on culvert inverts.

Stage-area for elev 182-185 from civil survey.

Stage-area for elev 186-194 from KLF surface.

[81] Warning: Exceeded Pond 7P_Pre by 7.67' @ 13.23 hrs

Inflow Area = 168.650 ac, 3.44% Impervious, Inflow Depth = 3.14" for 100-yr (Hampden) event
 Inflow = 268.26 cfs @ 12.67 hrs, Volume= 44.075 af
 Outflow = 264.10 cfs @ 12.74 hrs, Volume= 44.075 af, Atten= 2%, Lag= 4.4 min
 Primary = 134.01 cfs @ 12.74 hrs, Volume= 39.575 af
 Secondary = 130.09 cfs @ 12.74 hrs, Volume= 4.500 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 191.80' @ 12.74 hrs Surf.Area= 33,626 sf Storage= 149,914 cf

Plug-Flow detention time= 6.0 min calculated for 44.066 af (100% of inflow)
 Center-of-Mass det. time= 6.0 min (881.9 - 875.9)

Volume	Invert	Avail.Storage	Storage Description
#1	177.00'	237,211 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
177.00	0	0	0	0
178.00	21	7	7	23
179.00	83	49	56	89
180.00	512	267	323	522
181.00	1,306	879	1,201	1,323
182.00	2,393	1,822	3,023	2,420
183.00	4,058	3,189	6,213	4,097
184.00	5,691	4,852	11,064	5,748
185.00	8,000	6,813	17,877	8,076
186.00	10,421	9,184	27,061	10,521
188.00	16,620	26,801	53,862	16,773
190.00	26,218	42,475	96,337	26,427
192.00	34,530	60,558	156,894	34,830
194.00	46,063	80,317	237,211	46,450

Device	Routing	Invert	Outlet Devices
#1	Primary	177.50'	30.0" Round 30" CPP 1 L= 66.6' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 177.50' / 175.36' S= 0.0321 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 4.91 sf
#2	Primary	177.80'	30.0" Round 30" CPP 2 L= 66.4' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 177.80' / 175.50' S= 0.0346 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 4.91 sf
#3	Secondary	191.00'	Emergency Spillway, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 3.00

Width (feet) 38.32 93.77 128.55 162.52

Primary OutFlow Max=134.01 cfs @ 12.74 hrs HW=191.80' (Free Discharge)

1=30" CPP 1 (Inlet Controls 67.39 cfs @ 13.73 fps)

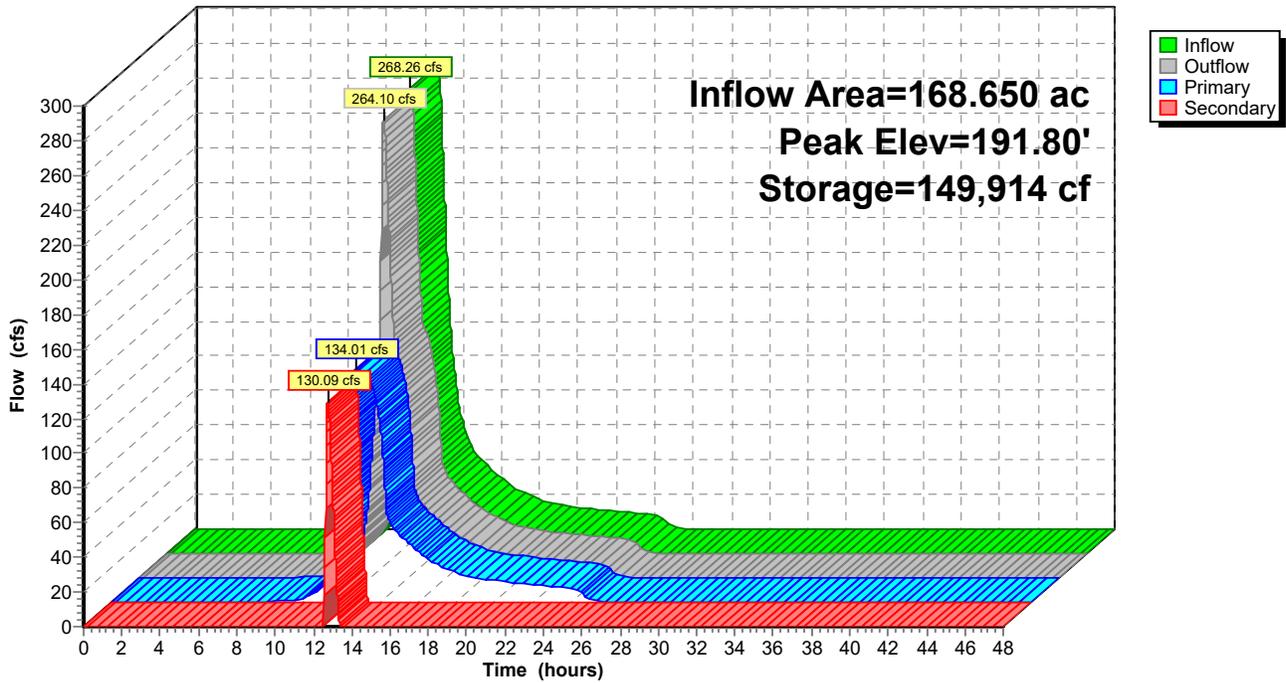
2=30" CPP 2 (Inlet Controls 66.61 cfs @ 13.57 fps)

Secondary OutFlow Max=129.89 cfs @ 12.74 hrs HW=191.80' (Free Discharge)

3=Emergency Spillway (Weir Controls 129.89 cfs @ 2.71 fps)

Pond S1_Pre: DA-1 Stor

Hydrograph



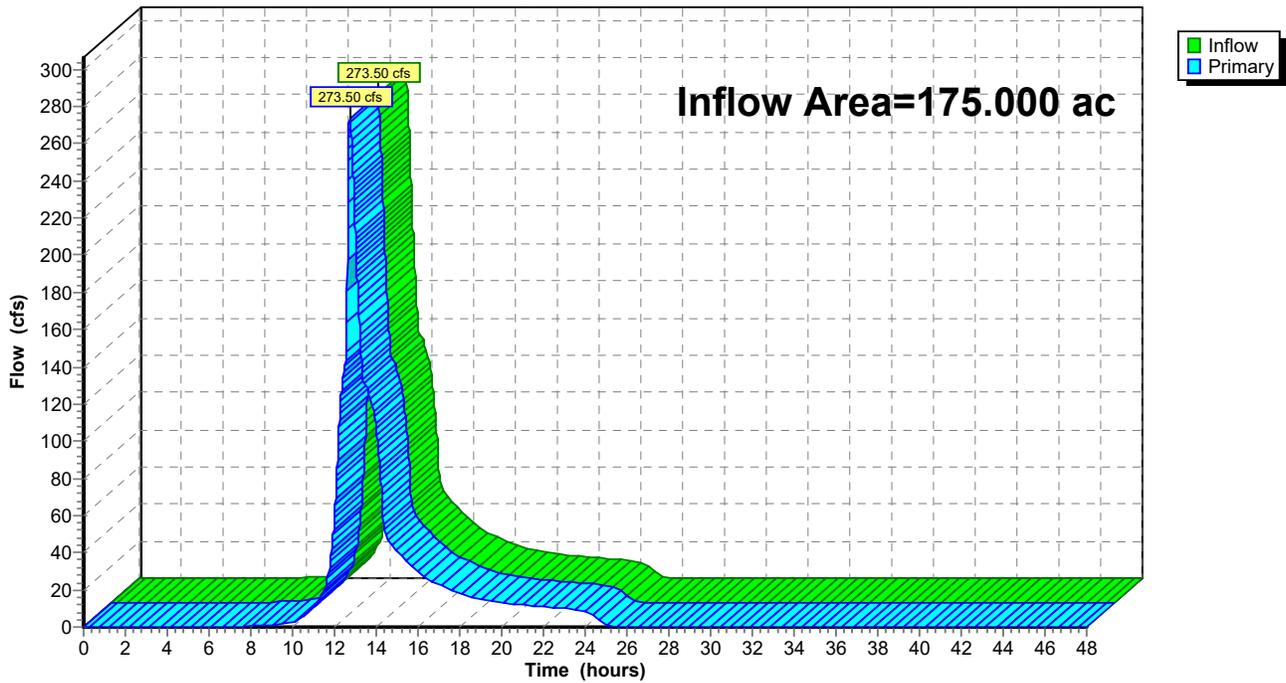
Summary for Link POA_Pre: Point of Analysis

Inflow Area = 175.000 ac, 3.45% Impervious, Inflow Depth = 3.18" for 100-yr (Hampden) event
Inflow = 273.50 cfs @ 12.74 hrs, Volume= 46.393 af
Primary = 273.50 cfs @ 12.74 hrs, Volume= 46.393 af, Atten= 0%, Lag= 0.0 min

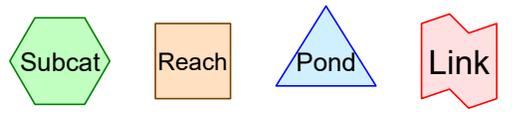
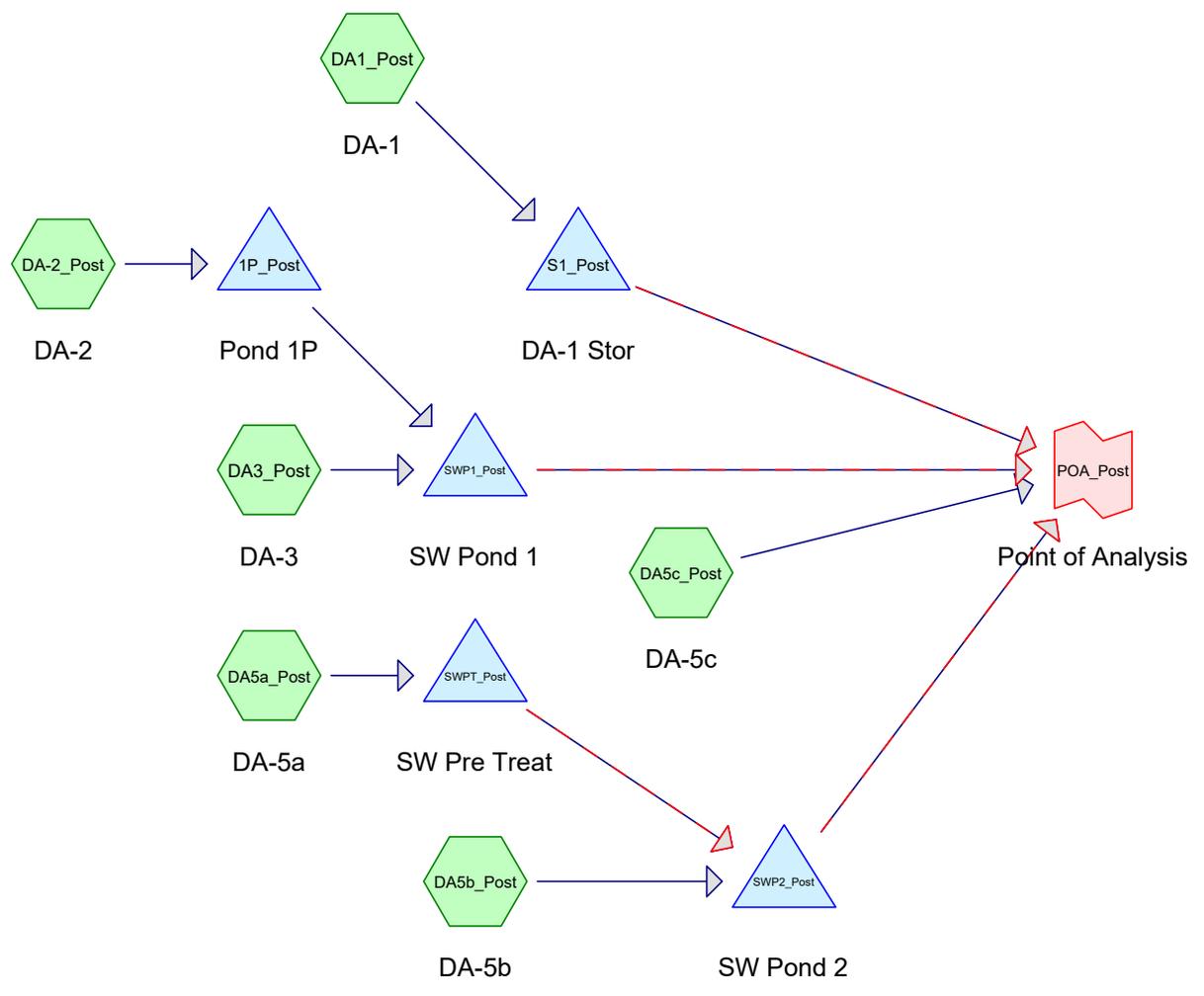
Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link POA_Pre: Point of Analysis

Hydrograph



POST-DEVELOPMENT



ASMG_221383_Hydrology

Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Prepared by {enter your company name here}

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Page 2

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

SubcatchmentDA-2_Post: DA-2 Runoff Area=7.500 ac 16.69% Impervious Runoff Depth=1.47"
 Flow Length=1,705' Slope=0.0711 '/' Tc=7.0 min CN=84 Runoff=12.43 cfs 0.917 af

SubcatchmentDA1_Post: DA-1 Runoff Area=151.840 ac 2.58% Impervious Runoff Depth=0.48"
 Flow Length=5,870' Tc=47.5 min CN=65 Runoff=28.53 cfs 6.060 af

SubcatchmentDA3_Post: DA-3 Runoff Area=0.980 ac 72.00% Impervious Runoff Depth=2.20"
 Tc=5.0 min CN=93 Runoff=2.55 cfs 0.179 af

SubcatchmentDA5a_Post: DA-5a Runoff Area=14.950 ac 2.75% Impervious Runoff Depth=0.73"
 Flow Length=890' Tc=19.0 min CN=71 Runoff=7.65 cfs 0.905 af

SubcatchmentDA5b_Post: DA-5b Runoff Area=0.220 ac 0.00% Impervious Runoff Depth=1.14"
 Tc=5.0 min CN=79 Runoff=0.30 cfs 0.021 af

SubcatchmentDA5c_Post: DA-5c Runoff Area=0.220 ac 0.00% Impervious Runoff Depth=1.14"
 Tc=5.0 min CN=79 Runoff=0.30 cfs 0.021 af

Pond 1P_Post: Pond 1P Peak Elev=190.78' Storage=18,846 cf Inflow=12.43 cfs 0.917 af
 24.0" Round Culvert n=0.012 L=150.0' S=0.0250 '/' Outflow=2.67 cfs 0.599 af

Pond S1_Post: DA-1 Stor Peak Elev=180.11' Storage=59 cf Inflow=28.53 cfs 6.060 af
 Primary=28.53 cfs 6.060 af Secondary=0.00 cfs 0.000 af Outflow=28.53 cfs 6.060 af

Pond SWP1_Post: SW Pond 1 Peak Elev=188.88' Storage=3,858 cf Inflow=3.10 cfs 0.778 af
 Primary=3.05 cfs 0.706 af Secondary=0.00 cfs 0.000 af Outflow=3.05 cfs 0.706 af

Pond SWP2_Post: SW Pond 2 Peak Elev=237.11' Storage=5,647 cf Inflow=7.77 cfs 0.915 af
 Primary=6.16 cfs 0.792 af Secondary=1.27 cfs 0.020 af Outflow=7.42 cfs 0.812 af

Pond SWPT_Post: SW Pre Treat Peak Elev=242.71' Storage=917 cf Inflow=7.65 cfs 0.905 af
 Primary=7.64 cfs 0.894 af Secondary=0.00 cfs 0.000 af Outflow=7.64 cfs 0.894 af

Link POA_Post: Point of Analysis Inflow=34.84 cfs 7.599 af
 Primary=34.84 cfs 7.599 af

Total Runoff Area = 175.710 ac Runoff Volume = 8.103 af Average Runoff Depth = 0.55"
96.42% Pervious = 169.419 ac 3.58% Impervious = 6.291 ac

Summary for Subcatchment DA-2_Post: DA-2

Runoff = 12.43 cfs @ 12.10 hrs, Volume= 0.917 af, Depth= 1.47"

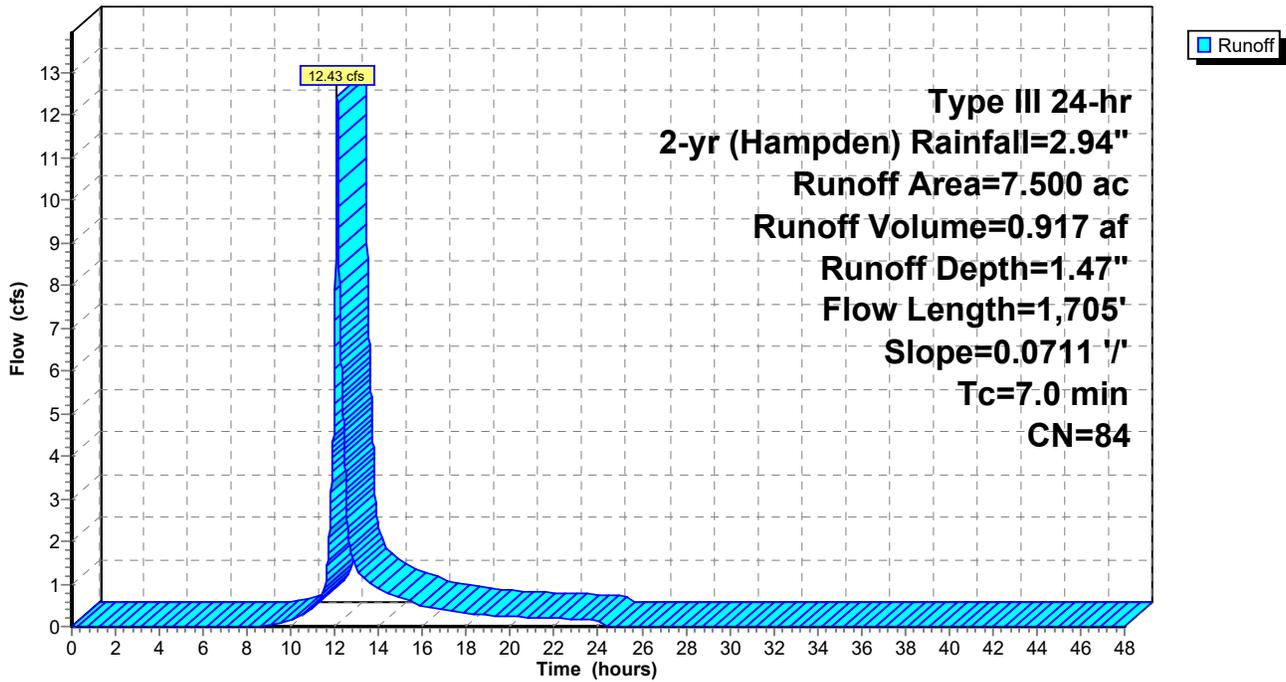
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (ac)	CN	Description
1.530	93	Urban industrial, 72% imp, HSG D
2.080	84	Pasture/grassland/range, Fair, HSG D
0.150	98	Water Surface, HSG D
3.740	79	Woods, Fair, HSG D
7.500	84	Weighted Average
6.248		83.31% Pervious Area
1.252		16.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0711	2.19		Sheet Flow, Sheet-Rd Smooth surfaces n= 0.011 P2= 2.94"
6.2	1,605	0.0711	4.29		Shallow Concentrated Flow, SCF-Rd Unpaved Kv= 16.1 fps
7.0	1,705	Total			

Subcatchment DA-2_Post: DA-2

Hydrograph



Summary for Subcatchment DA1_Post: DA-1

Runoff = 28.53 cfs @ 12.82 hrs, Volume= 6.060 af, Depth= 0.48"

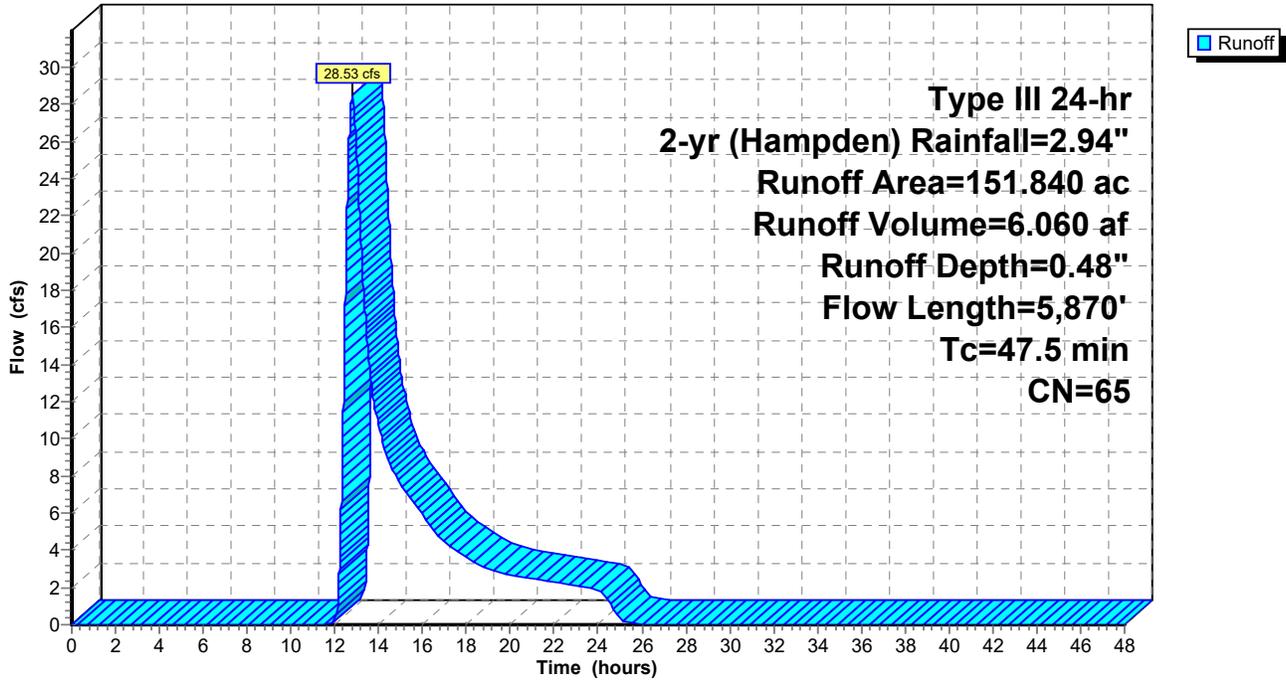
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (ac)	CN	Description
0.580	35	Brush, Fair, HSG A
0.450	70	Brush, Fair, HSG C
0.460	77	Brush, Fair, HSG D
0.960	81	Urban industrial, 72% imp, HSG A
1.110	88	Urban industrial, 72% imp, HSG B
0.240	93	Urban industrial, 72% imp, HSG D
2.240	49	Pasture/grassland/range, Fair, HSG A
0.660	69	Pasture/grassland/range, Fair, HSG B
5.730	79	Pasture/grassland/range, Fair, HSG C
1.220	84	Pasture/grassland/range, Fair, HSG D
* 0.170	98	Wetland
* 0.030	98	Wetland
* 2.060	98	Wetland
30.430	36	Woods, Fair, HSG A
27.020	60	Woods, Fair, HSG B
40.240	73	Woods, Fair, HSG C
38.240	79	Woods, Fair, HSG D
151.840	65	Weighted Average
147.917		97.42% Pervious Area
3.923		2.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0581	0.11		Sheet Flow, Sheet-Woods
					Woods: Light underbrush n= 0.400 P2= 2.94"
24.9	1,800	0.0581	1.21		Shallow Concentrated Flow, SCF-Woods
					Woodland Kv= 5.0 fps
8.0	3,970	0.0200	8.31	199.43	Parabolic Channel,
					W=18.00' D=2.00' Area=24.0 sf Perim=18.6' n= 0.030
47.5	5,870	Total			

Subcatchment DA1_Post: DA-1

Hydrograph



Summary for Subcatchment DA3_Post: DA-3

Runoff = 2.55 cfs @ 12.07 hrs, Volume= 0.179 af, Depth= 2.20"

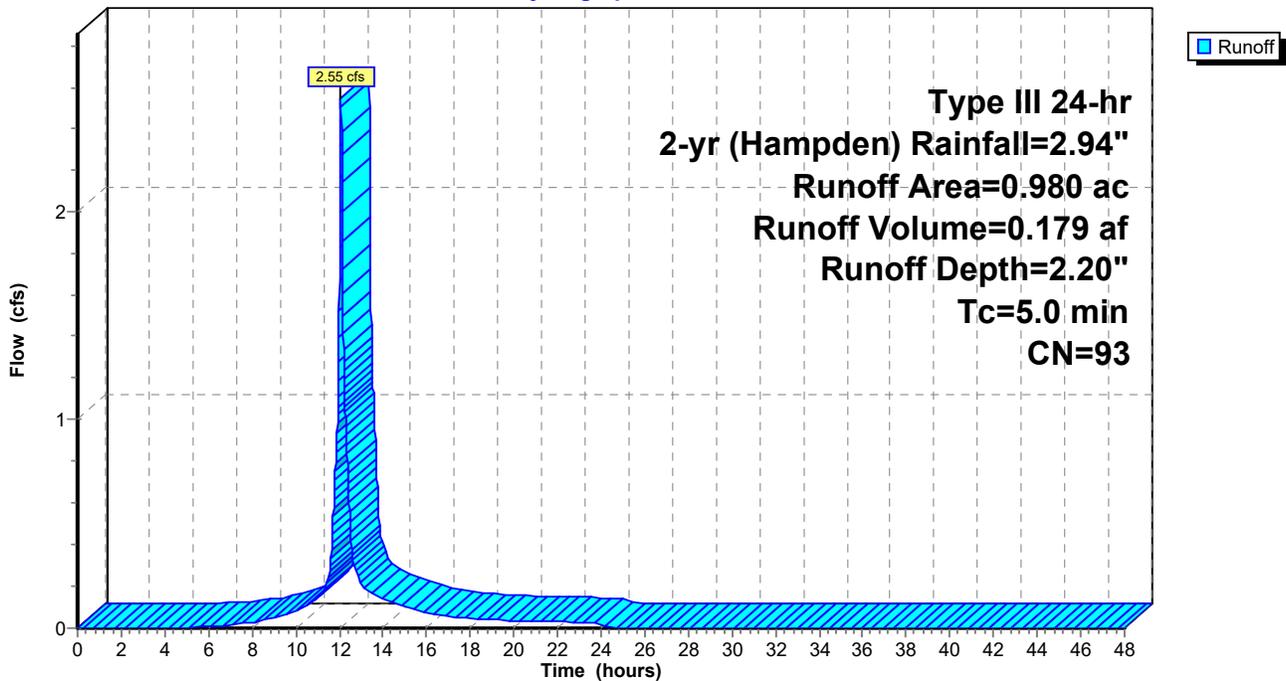
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (ac)	CN	Description
0.980	93	Urban industrial, 72% imp, HSG D
0.274		28.00% Pervious Area
0.706		72.00% Impervious Area

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

Subcatchment DA3_Post: DA-3

Hydrograph



Summary for Subcatchment DA5a_Post: DA-5a

Runoff = 7.65 cfs @ 12.30 hrs, Volume= 0.905 af, Depth= 0.73"

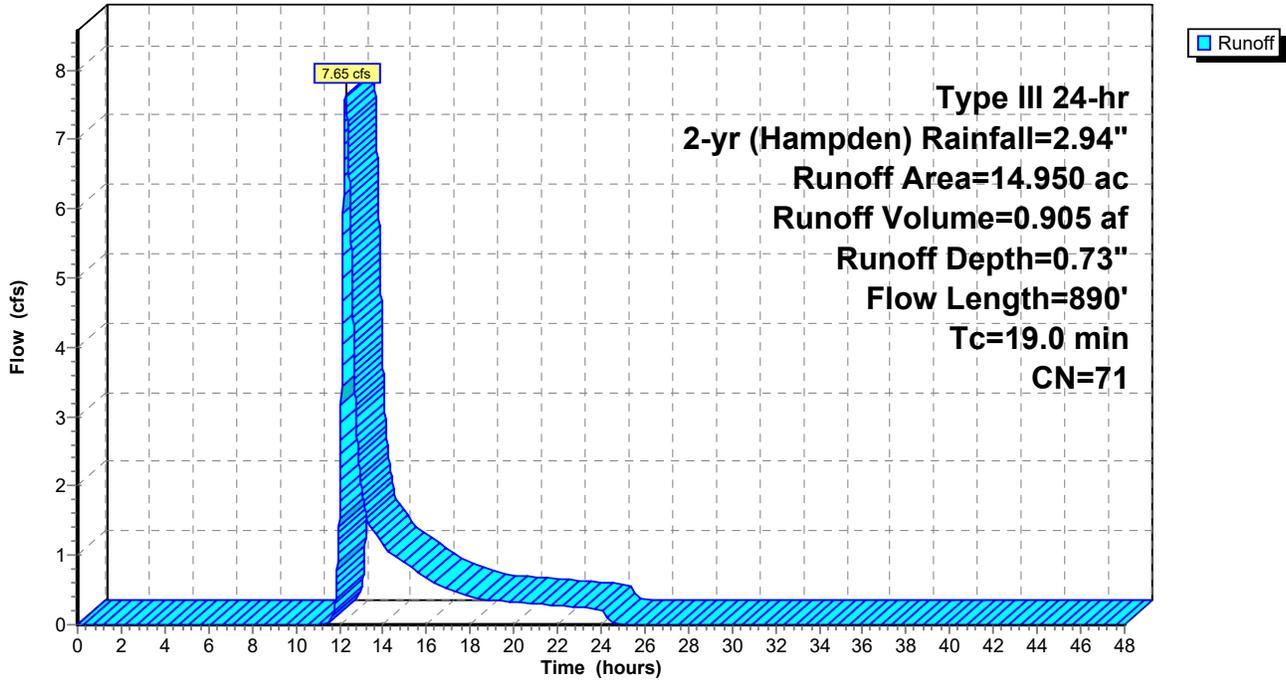
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (ac)	CN	Description
0.060	81	Urban industrial, 72% imp, HSG A
0.190	88	Urban industrial, 72% imp, HSG B
0.320	91	Urban industrial, 72% imp, HSG C
0.240	49	Pasture/grassland/range, Fair, HSG A
0.250	69	Pasture/grassland/range, Fair, HSG B
0.310	79	Pasture/grassland/range, Fair, HSG C
0.270	36	Woods, Fair, HSG A
2.340	60	Woods, Fair, HSG B
10.970	73	Woods, Fair, HSG C
14.950	71	Weighted Average
14.540		97.25% Pervious Area
0.410		2.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.1040	0.14		Sheet Flow, Sheet-Woods Woods: Light underbrush n= 0.400 P2= 2.94"
6.9	665	0.1040	1.61		Shallow Concentrated Flow, SCF-Woods Woodland Kv= 5.0 fps
0.5	125	0.0800	4.24		Shallow Concentrated Flow, SCF-Grassed swale Grassed Waterway Kv= 15.0 fps
19.0	890	Total			

Subcatchment DA5a_Post: DA-5a

Hydrograph



Summary for Subcatchment DA5b_Post: DA-5b

Runoff = 0.30 cfs @ 12.08 hrs, Volume= 0.021 af, Depth= 1.14"

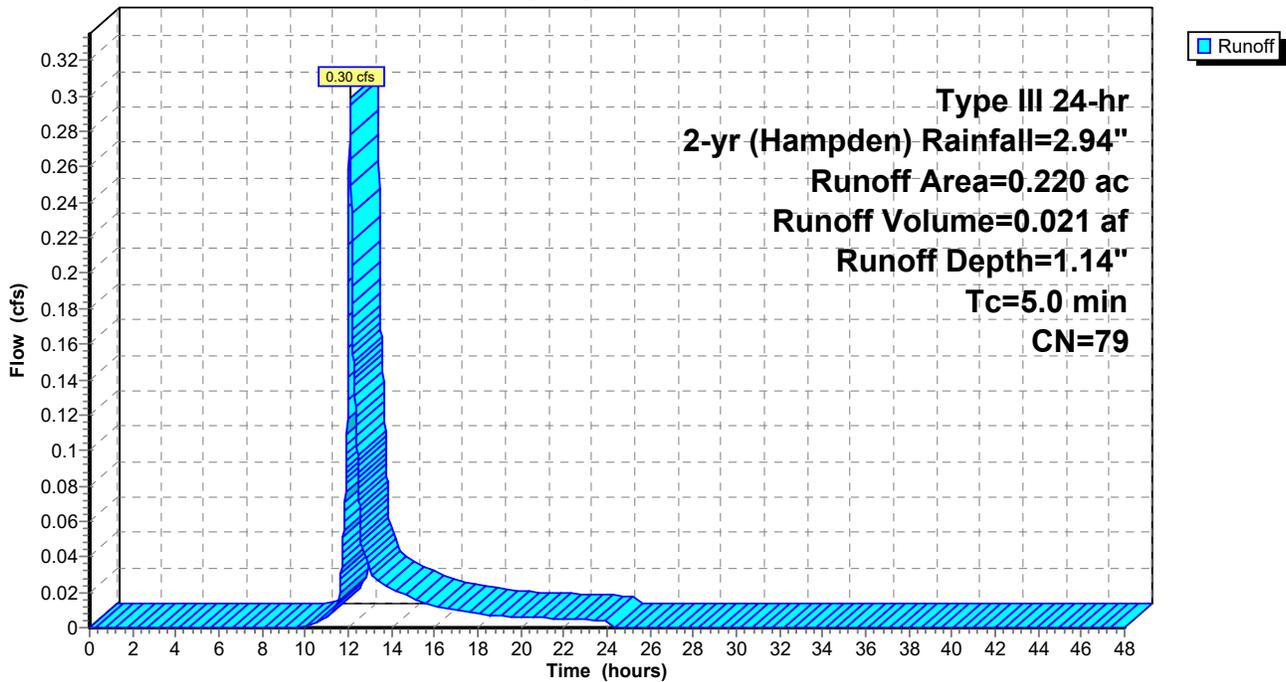
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (ac)	CN	Description
* 0.220	79	
0.220		100.00% Pervious Area

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

Subcatchment DA5b_Post: DA-5b

Hydrograph



Summary for Subcatchment DA5c_Post: DA-5c

Runoff = 0.30 cfs @ 12.08 hrs, Volume= 0.021 af, Depth= 1.14"

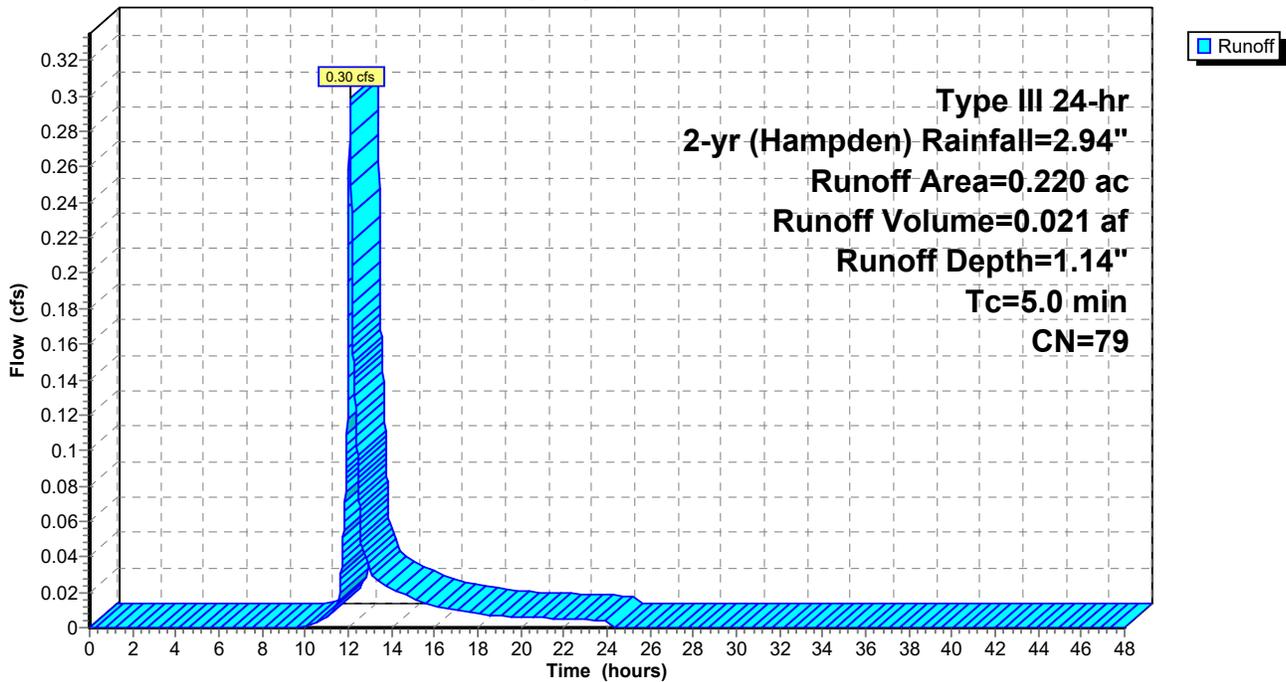
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (ac)	CN	Description
* 0.220	79	
0.220		100.00% Pervious Area

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

Subcatchment DA5c_Post: DA-5c

Hydrograph



Summary for Pond 1P_Post: Pond 1P

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 7.500 ac, 16.69% Impervious, Inflow Depth = 1.47" for 2-yr (Hampden) event
 Inflow = 12.43 cfs @ 12.10 hrs, Volume= 0.917 af
 Outflow = 2.67 cfs @ 12.55 hrs, Volume= 0.599 af, Atten= 79%, Lag= 27.0 min
 Primary = 2.67 cfs @ 12.55 hrs, Volume= 0.599 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 190.78' @ 12.55 hrs Surf.Area= 6,858 sf Storage= 18,846 cf

Plug-Flow detention time= 235.5 min calculated for 0.599 af (65% of inflow)
 Center-of-Mass det. time= 130.9 min (965.3 - 834.4)

Volume	Invert	Avail.Storage	Storage Description
#1	186.00'	51,062 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

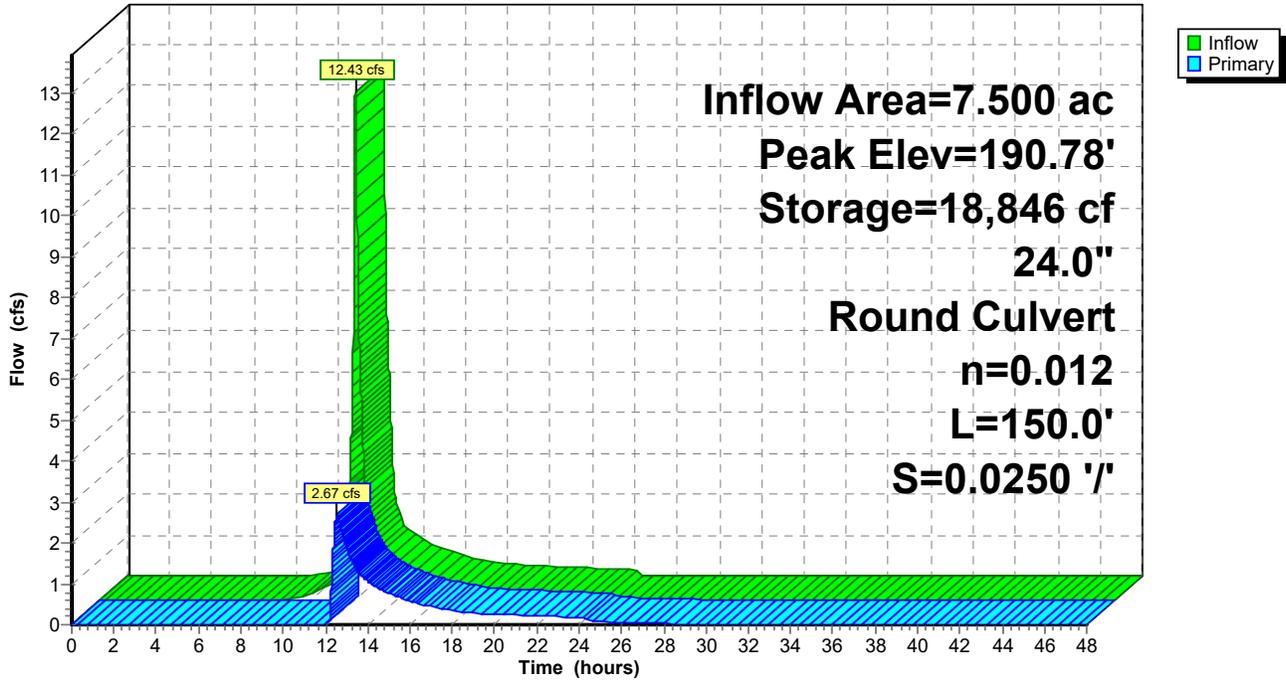
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.00	0	0	0
188.00	3,866	3,866	3,866
189.00	5,039	4,453	8,319
190.00	6,026	5,533	13,851
191.00	7,099	6,563	20,414
192.00	8,299	7,699	28,113
194.00	14,650	22,949	51,062

Device	Routing	Invert	Outlet Devices
#1	Primary	190.00'	24.0" Round 24" CPP L= 150.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 190.00' / 186.25' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=2.66 cfs @ 12.55 hrs HW=190.78' (Free Discharge)
 ↳ **1=24" CPP** (Inlet Controls 2.66 cfs @ 2.37 fps)

Pond 1P_Post: Pond 1P

Hydrograph



Summary for Pond S1_Post: DA-1 Stor

Stage-area for elev 177 assumed based on culvert inverts.

Stage-area for elev 182-185 from civil survey.

Stage-area for elev 186-194 from KLF surface.

Inflow Area = 151.840 ac, 2.58% Impervious, Inflow Depth = 0.48" for 2-yr (Hampden) event
 Inflow = 28.53 cfs @ 12.82 hrs, Volume= 6.060 af
 Outflow = 28.53 cfs @ 12.82 hrs, Volume= 6.060 af, Atten= 0%, Lag= 0.0 min
 Primary = 28.53 cfs @ 12.82 hrs, Volume= 6.060 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 180.11' @ 12.82 hrs Surf.Area= 580 sf Storage= 59 cf

Plug-Flow detention time= 0.0 min calculated for 6.059 af (100% of inflow)
 Center-of-Mass det. time= 0.0 min (942.8 - 942.8)

Volume	Invert	Avail.Storage	Storage Description
#1	180.00'	236,888 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
180.00	512	0	0	512
181.00	1,306	879	879	1,313
182.00	2,393	1,822	2,701	2,410
183.00	4,058	3,189	5,890	4,087
184.00	5,691	4,852	10,741	5,739
185.00	8,000	6,813	17,554	8,066
186.00	10,421	9,184	26,738	10,511
188.00	16,620	26,801	53,539	16,764
190.00	26,218	42,475	96,014	26,417
192.00	34,530	60,558	156,572	34,820
194.00	46,063	80,317	236,888	46,440

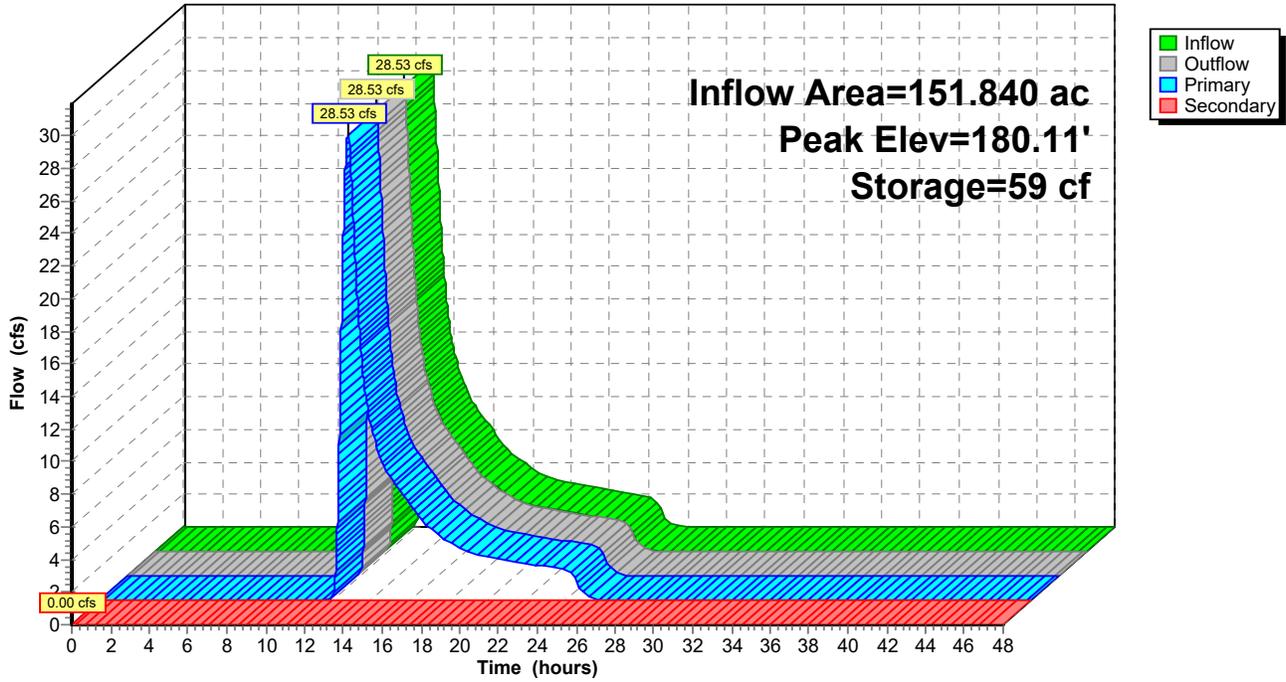
Device	Routing	Invert	Outlet Devices
#1	Primary	177.80'	84.0" Round 84" CMP L= 132.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 177.80' / 170.70' S= 0.0538 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 38.48 sf
#2	Secondary	195.00'	Road overflow, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 3.00 Width (feet) 38.32 93.77 128.55 162.52

Primary OutFlow Max=45.15 cfs @ 12.82 hrs HW=180.11' (Free Discharge)
 ↳1=84" CMP (Inlet Controls 45.15 cfs @ 4.08 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=180.00' (Free Discharge)
 ↳2=Road overflow (Controls 0.00 cfs)

Pond S1_Post: DA-1 Stor

Hydrograph



Summary for Pond SWP1_Post: SW Pond 1

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

[79] Warning: Submerged Pond 1P_Post Primary device # 1 OUTLET by 2.63'

Inflow Area = 8.480 ac, 23.08% Impervious, Inflow Depth = 1.10" for 2-yr (Hampden) event
 Inflow = 3.10 cfs @ 12.50 hrs, Volume= 0.778 af
 Outflow = 3.05 cfs @ 12.55 hrs, Volume= 0.706 af, Atten= 2%, Lag= 3.0 min
 Primary = 3.05 cfs @ 12.55 hrs, Volume= 0.706 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 188.88' @ 12.55 hrs Surf.Area= 1,933 sf Storage= 3,858 cf

Plug-Flow detention time= 87.3 min calculated for 0.706 af (91% of inflow)
 Center-of-Mass det. time= 32.2 min (958.2 - 926.0)

Volume	Invert	Avail.Storage	Storage Description
#1	186.00'	6,240 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.00	777	0	0
187.00	1,157	967	967
188.00	1,549	1,353	2,320
189.00	1,984	1,767	4,087
190.00	2,323	2,154	6,240

Device	Routing	Invert	Outlet Devices
#1	Device 2	188.50'	48.0" W x 24.0" H Vert. Orifice/Grate C= 0.600
#2	Primary	183.00'	15.0" Round 15" CPP L= 37.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 183.00' / 182.63' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#3	Secondary	189.00'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 Width (feet) 10.00 12.00

Primary OutFlow Max=3.05 cfs @ 12.55 hrs HW=188.88' (Free Discharge)

↑ **2=15" CPP** (Passes 3.05 cfs of 10.70 cfs potential flow)

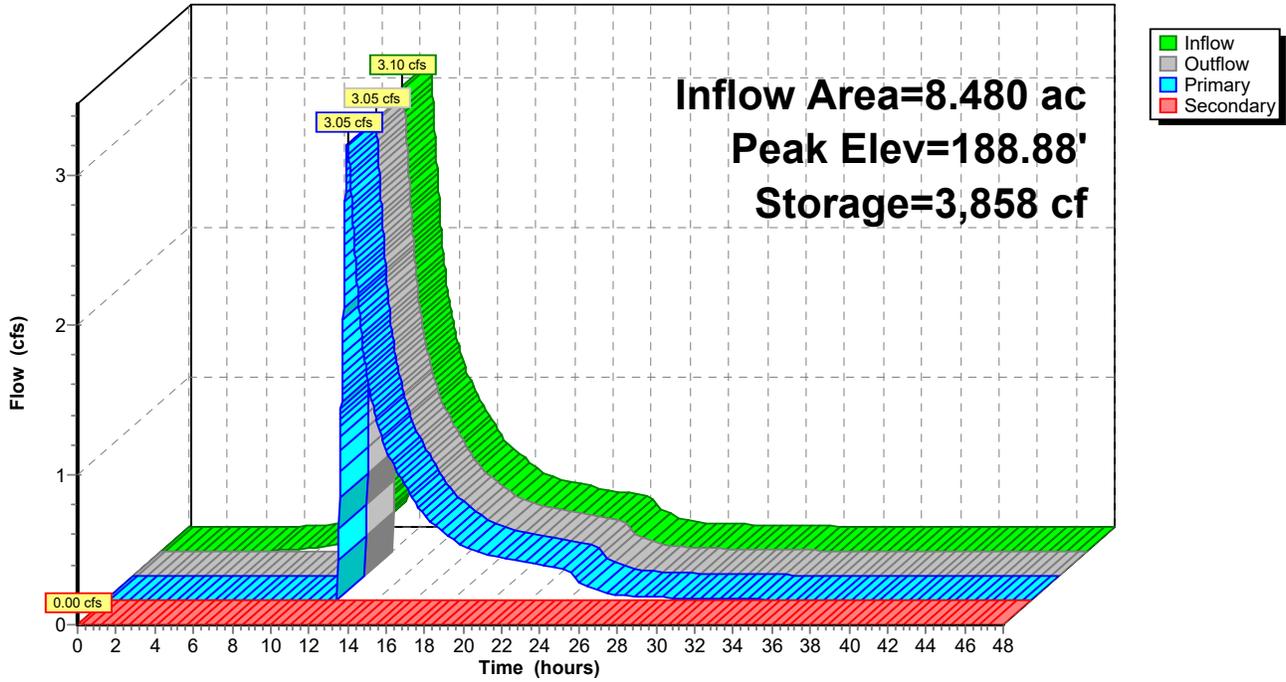
↑ **1=Orifice/Grate** (Orifice Controls 3.05 cfs @ 1.99 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=186.00' (Free Discharge)

↑ **3=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond SWP1_Post: SW Pond 1

Hydrograph



Summary for Pond SWP2_Post: SW Pond 2

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

[79] Warning: Submerged Pond SWPT_Post Primary device # 2 INLET by 1.61'

Inflow Area = 15.170 ac, 2.71% Impervious, Inflow Depth = 0.72" for 2-yr (Hampden) event
 Inflow = 7.77 cfs @ 12.31 hrs, Volume= 0.915 af
 Outflow = 7.42 cfs @ 12.38 hrs, Volume= 0.812 af, Atten= 4%, Lag= 4.0 min
 Primary = 6.16 cfs @ 12.38 hrs, Volume= 0.792 af
 Secondary = 1.27 cfs @ 12.38 hrs, Volume= 0.020 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 237.11' @ 12.38 hrs Surf.Area= 2,020 sf Storage= 5,647 cf

Plug-Flow detention time= 79.6 min calculated for 0.812 af (89% of inflow)
 Center-of-Mass det. time= 26.1 min (919.5 - 893.4)

Volume	Invert	Avail.Storage	Storage Description
#1	233.00'	7,583 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
233.00	799	0	0
234.00	1,054	927	927
235.00	1,335	1,195	2,121
236.00	1,644	1,490	3,611
237.00	1,980	1,812	5,423
238.00	2,340	2,160	7,583

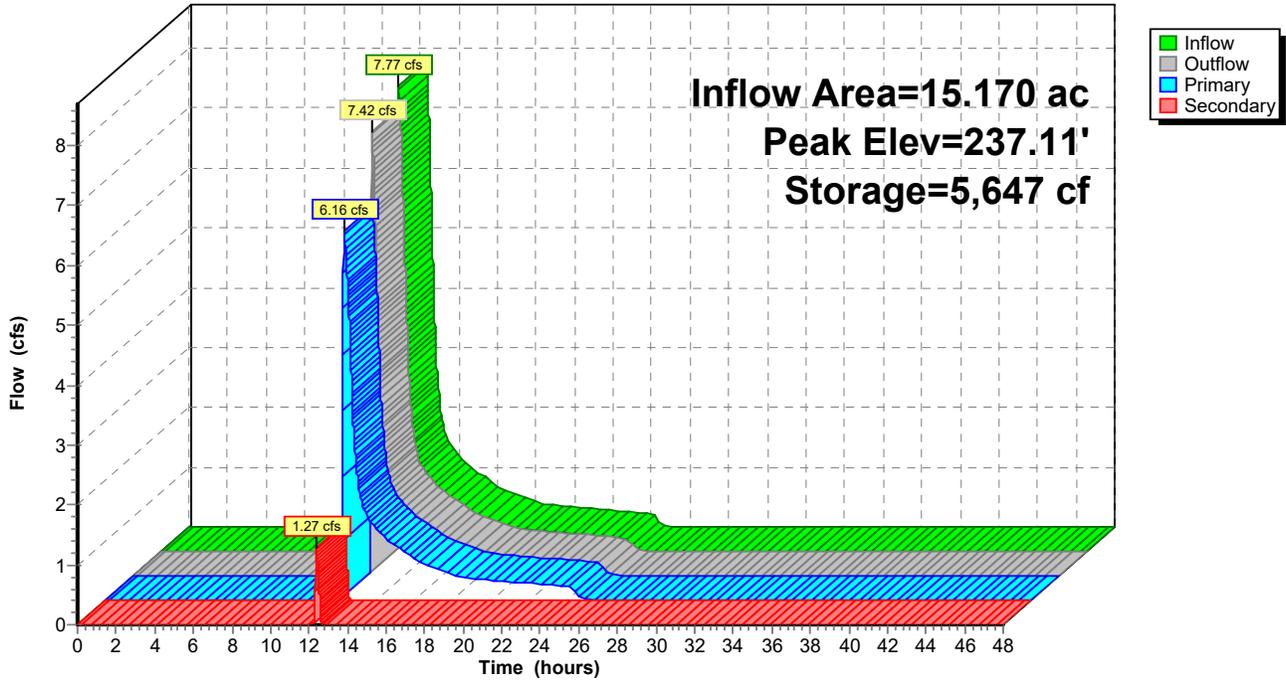
Device	Routing	Invert	Outlet Devices
#1	Device 2	236.50'	48.0" W x 24.0" H Vert. Orifice/Grate C= 0.600
#2	Primary	230.00'	15.0" Round 15" CPP L= 72.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 230.00' / 229.64' S= 0.0050 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#3	Secondary	237.00'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 Width (feet) 10.00 12.00

Primary OutFlow Max=6.15 cfs @ 12.38 hrs HW=237.11' (Free Discharge)
 ↑ **2=15" CPP** (Passes 6.15 cfs of 11.88 cfs potential flow)
 ↑ **1=Orifice/Grate** (Orifice Controls 6.15 cfs @ 2.51 fps)

Secondary OutFlow Max=1.24 cfs @ 12.38 hrs HW=237.11' (Free Discharge)
 ↑ **3=Custom Weir/Orifice** (Weir Controls 1.24 cfs @ 1.09 fps)

Pond SWP2_Post: SW Pond 2

Hydrograph



Summary for Pond SWPT_Post: SW Pre Treat

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 14.950 ac, 2.75% Impervious, Inflow Depth = 0.73" for 2-yr (Hampden) event
 Inflow = 7.65 cfs @ 12.30 hrs, Volume= 0.905 af
 Outflow = 7.64 cfs @ 12.31 hrs, Volume= 0.894 af, Atten= 0%, Lag= 0.6 min
 Primary = 7.64 cfs @ 12.31 hrs, Volume= 0.894 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 242.71' @ 12.31 hrs Surf.Area= 701 sf Storage= 917 cf

Plug-Flow detention time= 10.5 min calculated for 0.894 af (99% of inflow)
 Center-of-Mass det. time= 3.8 min (894.4 - 890.6)

Volume	Invert	Avail.Storage	Storage Description
#1	241.00'	2,033 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
241.00	383	0	0
242.00	559	471	471
243.00	760	660	1,131
244.00	1,045	903	2,033

Device	Routing	Invert	Outlet Devices
#1	Device 2	242.00'	48.0" W x 24.0" H Vert. Orifice/Grate C= 0.600
#2	Primary	235.50'	24.0" Round 24" CPP L= 66.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.50' / 234.84' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#3	Secondary	244.00'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 Width (feet) 100.00 100.00

Primary OutFlow Max=7.63 cfs @ 12.31 hrs HW=242.71' (Free Discharge)

↑ **2=24" CPP** (Passes 7.63 cfs of 29.75 cfs potential flow)

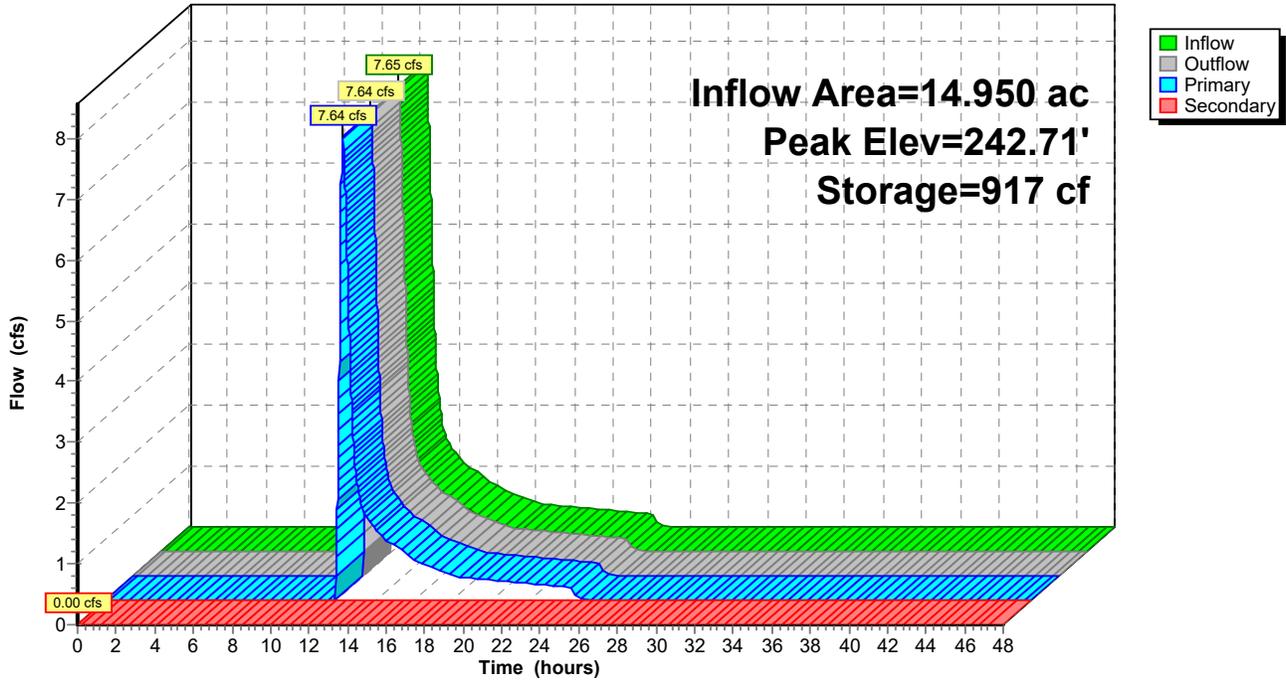
↑ **1=Orifice/Grate** (Orifice Controls 7.63 cfs @ 2.70 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=241.00' (Free Discharge)

↑ **3=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond SWPT_Post: SW Pre Treat

Hydrograph



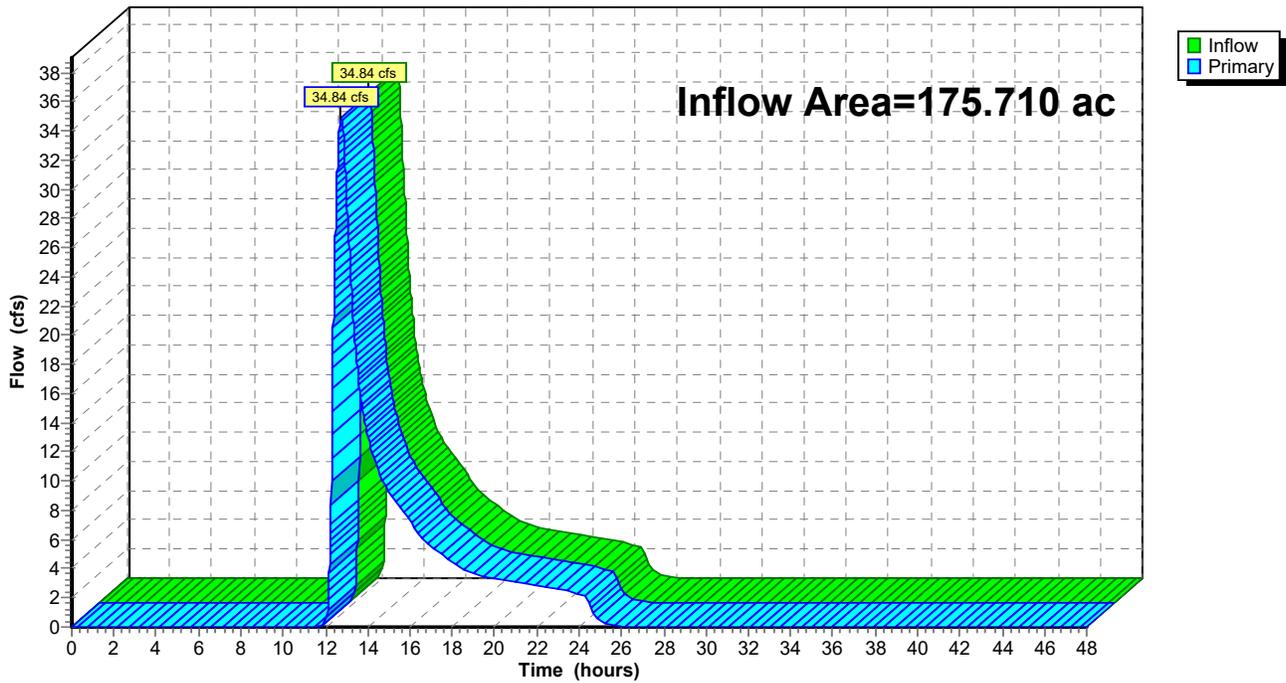
Summary for Link POA_Post: Point of Analysis

Inflow Area = 175.710 ac, 3.58% Impervious, Inflow Depth = 0.52" for 2-yr (Hampden) event
Inflow = 34.84 cfs @ 12.73 hrs, Volume= 7.599 af
Primary = 34.84 cfs @ 12.73 hrs, Volume= 7.599 af, Atten= 0%, Lag= 0.0 min

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

Link POA_Post: Point of Analysis

Hydrograph



ASMG_221383_Hydrology

Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Prepared by {enter your company name here}

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

SubcatchmentDA-2_Post:DA-2 Runoff Area=7.500 ac 16.69% Impervious Runoff Depth=2.80"
 Flow Length=1,705' Slope=0.0711 '/' Tc=7.0 min CN=84 Runoff=23.68 cfs 1.749 af

SubcatchmentDA1_Post:DA-1 Runoff Area=151.840 ac 2.58% Impervious Runoff Depth=1.32"
 Flow Length=5,870' Tc=47.5 min CN=65 Runoff=97.52 cfs 16.675 af

SubcatchmentDA3_Post:DA-3 Runoff Area=0.980 ac 72.00% Impervious Runoff Depth=3.69"
 Tc=5.0 min CN=93 Runoff=4.16 cfs 0.301 af

SubcatchmentDA5a_Post:DA-5a Runoff Area=14.950 ac 2.75% Impervious Runoff Depth=1.73"
 Flow Length=890' Tc=19.0 min CN=71 Runoff=20.30 cfs 2.158 af

SubcatchmentDA5b_Post:DA-5b Runoff Area=0.220 ac 0.00% Impervious Runoff Depth=2.36"
 Tc=5.0 min CN=79 Runoff=0.63 cfs 0.043 af

SubcatchmentDA5c_Post:DA-5c Runoff Area=0.220 ac 0.00% Impervious Runoff Depth=2.36"
 Tc=5.0 min CN=79 Runoff=0.63 cfs 0.043 af

Pond 1P_Post: Pond 1P Peak Elev=191.91' Storage=27,406 cf Inflow=23.68 cfs 1.749 af
 24.0" Round Culvert n=0.012 L=150.0' S=0.0250 '/' Outflow=11.51 cfs 1.431 af

Pond S1_Post: DA-1 Stor Peak Elev=181.31' Storage=1,334 cf Inflow=97.52 cfs 16.675 af
 Primary=97.42 cfs 16.675 af Secondary=0.00 cfs 0.000 af Outflow=97.42 cfs 16.675 af

Pond SWP1_Post: SW Pond 1 Peak Elev=189.27' Storage=4,626 cf Inflow=13.21 cfs 1.732 af
 Primary=8.61 cfs 1.470 af Secondary=4.59 cfs 0.190 af Outflow=13.20 cfs 1.660 af

Pond SWP2_Post: SW Pond 2 Peak Elev=237.42' Storage=6,282 cf Inflow=20.52 cfs 2.190 af
 Primary=11.30 cfs 1.755 af Secondary=9.17 cfs 0.333 af Outflow=20.47 cfs 2.087 af

Pond SWPT_Post: SW Pre Treat Peak Elev=243.35' Storage=1,418 cf Inflow=20.30 cfs 2.158 af
 Primary=20.25 cfs 2.147 af Secondary=0.00 cfs 0.000 af Outflow=20.25 cfs 2.147 af

Link POA_Post: Point of Analysis Inflow=114.21 cfs 20.466 af
 Primary=114.21 cfs 20.466 af

Total Runoff Area = 175.710 ac Runoff Volume = 20.970 af Average Runoff Depth = 1.43"
96.42% Pervious = 169.419 ac 3.58% Impervious = 6.291 ac

Summary for Subcatchment DA-2_Post: DA-2

Runoff = 23.68 cfs @ 12.10 hrs, Volume= 1.749 af, Depth= 2.80"

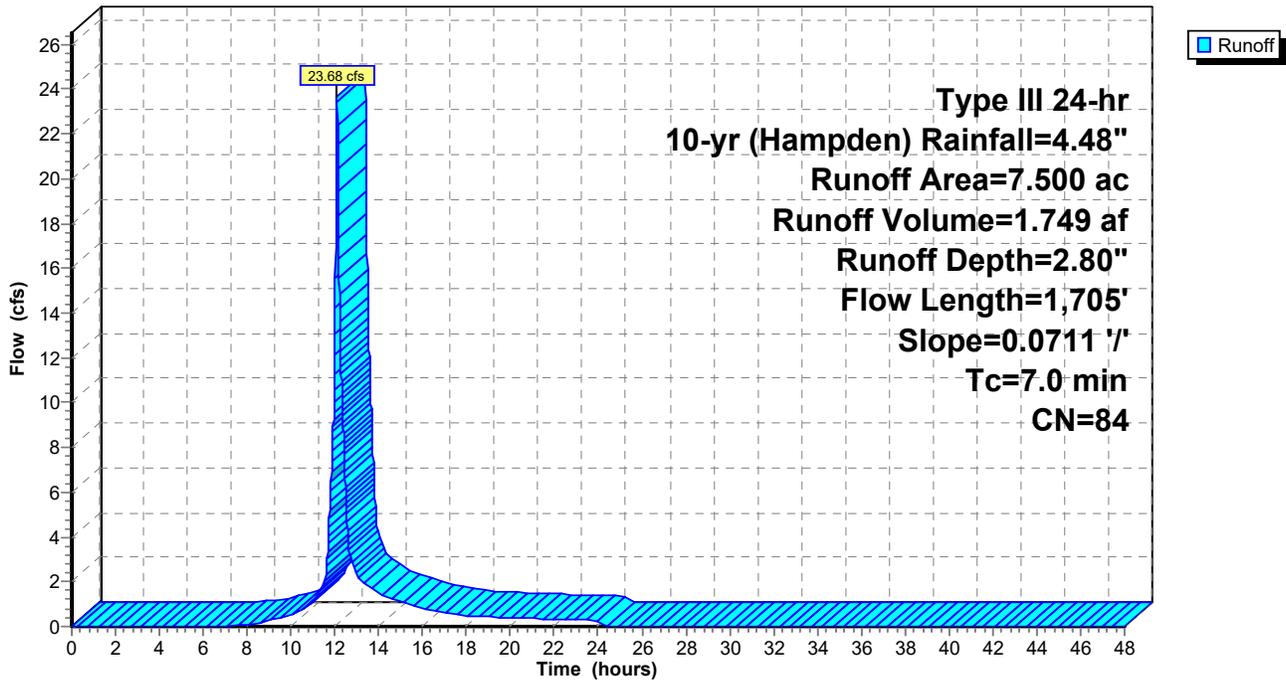
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (ac)	CN	Description
1.530	93	Urban industrial, 72% imp, HSG D
2.080	84	Pasture/grassland/range, Fair, HSG D
0.150	98	Water Surface, HSG D
3.740	79	Woods, Fair, HSG D
7.500	84	Weighted Average
6.248		83.31% Pervious Area
1.252		16.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0711	2.19		Sheet Flow, Sheet-Rd Smooth surfaces n= 0.011 P2= 2.94"
6.2	1,605	0.0711	4.29		Shallow Concentrated Flow, SCF-Rd Unpaved Kv= 16.1 fps
7.0	1,705	Total			

Subcatchment DA-2_Post: DA-2

Hydrograph



Summary for Subcatchment DA1_Post: DA-1

Runoff = 97.52 cfs @ 12.72 hrs, Volume= 16.675 af, Depth= 1.32"

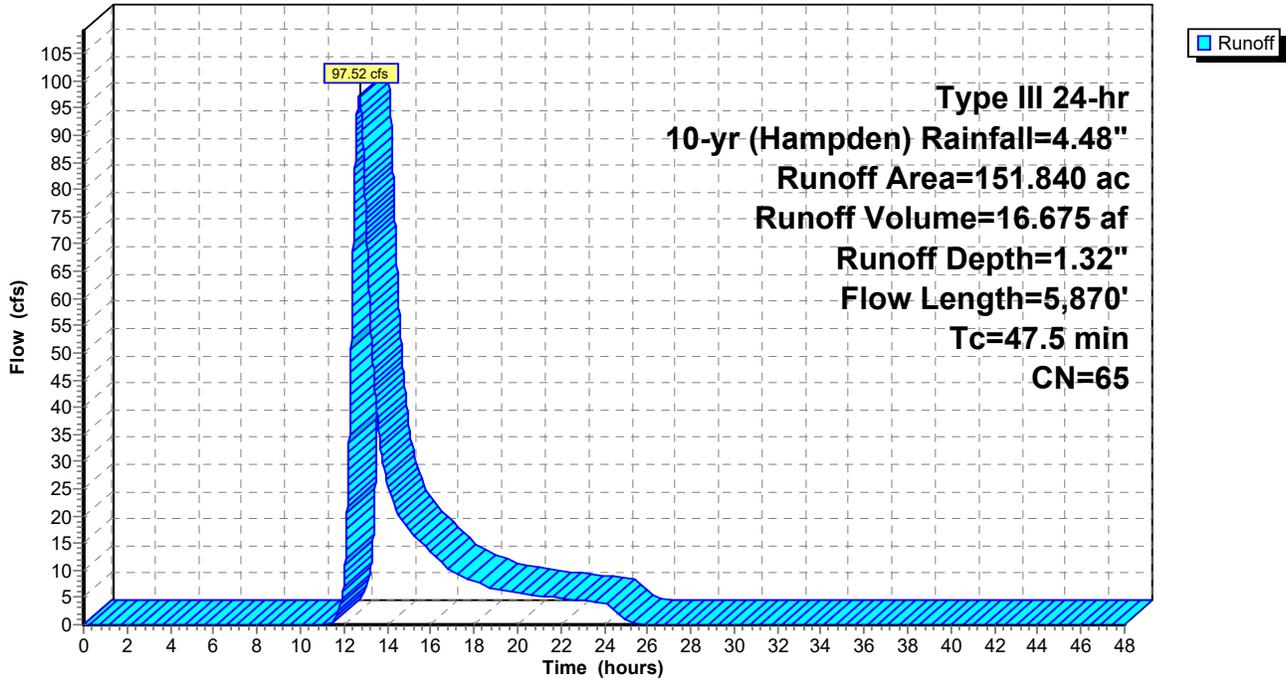
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (ac)	CN	Description
0.580	35	Brush, Fair, HSG A
0.450	70	Brush, Fair, HSG C
0.460	77	Brush, Fair, HSG D
0.960	81	Urban industrial, 72% imp, HSG A
1.110	88	Urban industrial, 72% imp, HSG B
0.240	93	Urban industrial, 72% imp, HSG D
2.240	49	Pasture/grassland/range, Fair, HSG A
0.660	69	Pasture/grassland/range, Fair, HSG B
5.730	79	Pasture/grassland/range, Fair, HSG C
1.220	84	Pasture/grassland/range, Fair, HSG D
* 0.170	98	Wetland
* 0.030	98	Wetland
* 2.060	98	Wetland
30.430	36	Woods, Fair, HSG A
27.020	60	Woods, Fair, HSG B
40.240	73	Woods, Fair, HSG C
38.240	79	Woods, Fair, HSG D
151.840	65	Weighted Average
147.917		97.42% Pervious Area
3.923		2.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0581	0.11		Sheet Flow, Sheet-Woods
					Woods: Light underbrush n= 0.400 P2= 2.94"
24.9	1,800	0.0581	1.21		Shallow Concentrated Flow, SCF-Woods
					Woodland Kv= 5.0 fps
8.0	3,970	0.0200	8.31	199.43	Parabolic Channel,
					W=18.00' D=2.00' Area=24.0 sf Perim=18.6' n= 0.030
47.5	5,870	Total			

Subcatchment DA1_Post: DA-1

Hydrograph



Summary for Subcatchment DA3_Post: DA-3

Runoff = 4.16 cfs @ 12.07 hrs, Volume= 0.301 af, Depth= 3.69"

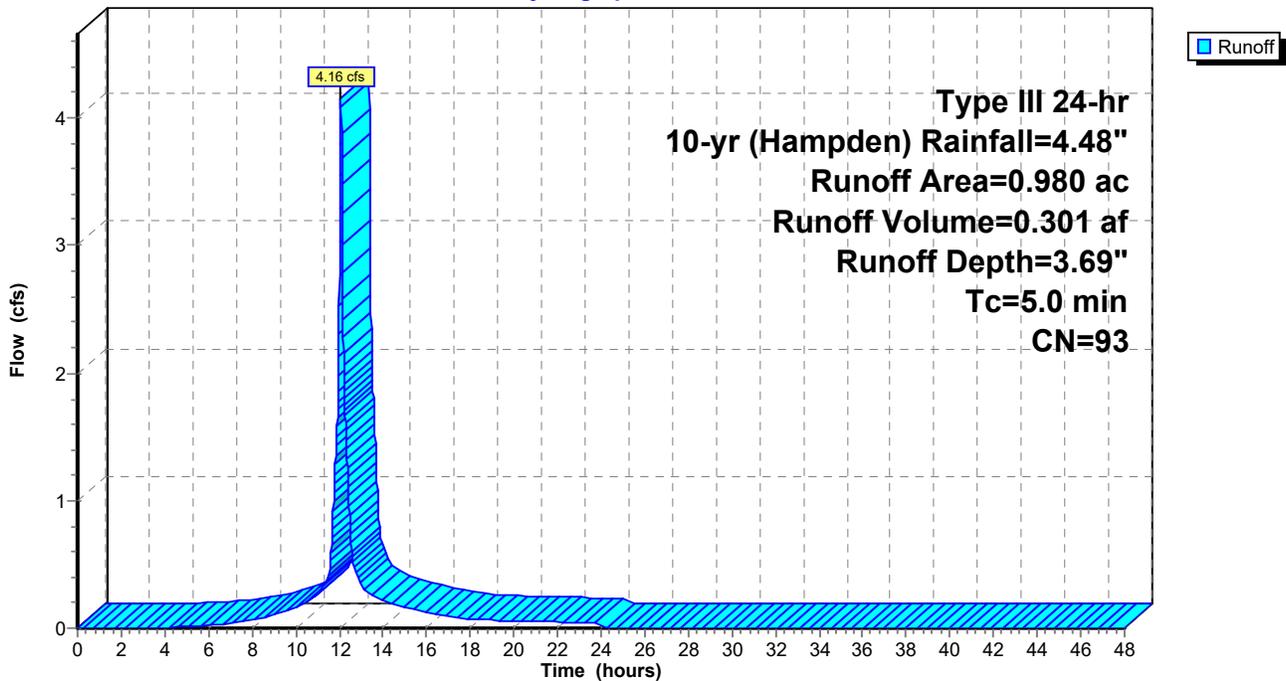
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (ac)	CN	Description
0.980	93	Urban industrial, 72% imp, HSG D
0.274		28.00% Pervious Area
0.706		72.00% Impervious Area

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

Subcatchment DA3_Post: DA-3

Hydrograph



Summary for Subcatchment DA5a_Post: DA-5a

Runoff = 20.30 cfs @ 12.27 hrs, Volume= 2.158 af, Depth= 1.73"

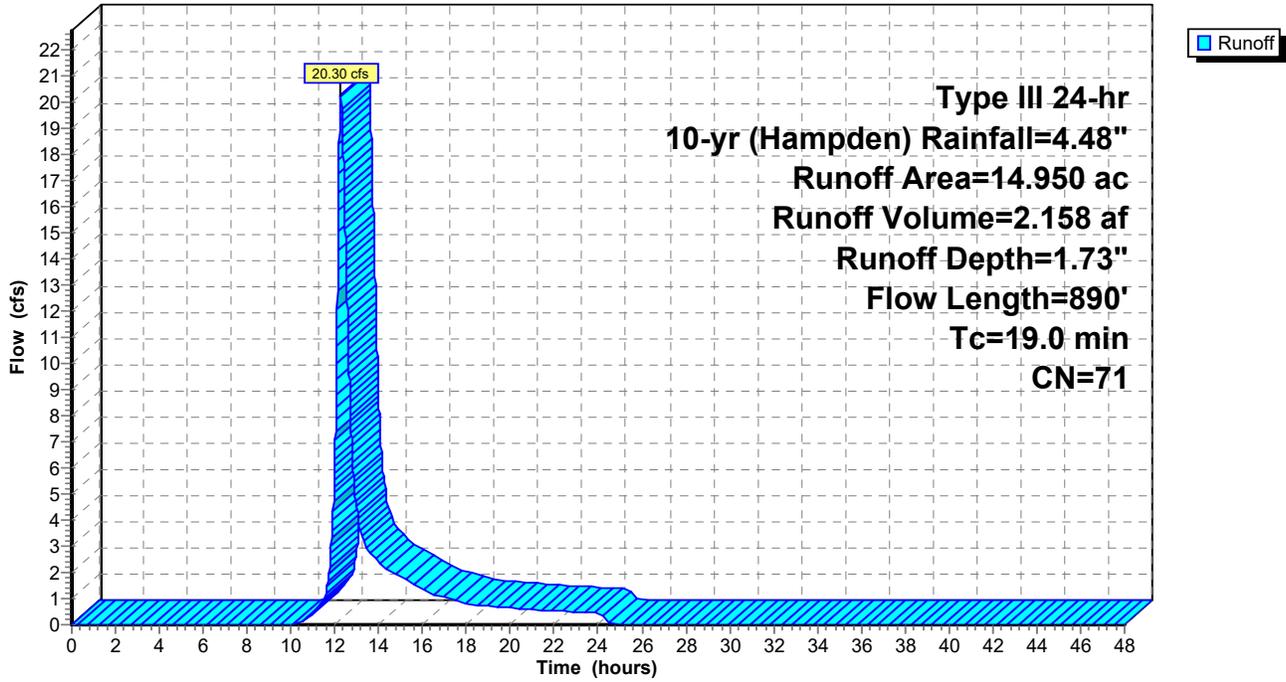
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (ac)	CN	Description
0.060	81	Urban industrial, 72% imp, HSG A
0.190	88	Urban industrial, 72% imp, HSG B
0.320	91	Urban industrial, 72% imp, HSG C
0.240	49	Pasture/grassland/range, Fair, HSG A
0.250	69	Pasture/grassland/range, Fair, HSG B
0.310	79	Pasture/grassland/range, Fair, HSG C
0.270	36	Woods, Fair, HSG A
2.340	60	Woods, Fair, HSG B
10.970	73	Woods, Fair, HSG C
14.950	71	Weighted Average
14.540		97.25% Pervious Area
0.410		2.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.1040	0.14		Sheet Flow, Sheet-Woods Woods: Light underbrush n= 0.400 P2= 2.94"
6.9	665	0.1040	1.61		Shallow Concentrated Flow, SCF-Woods Woodland Kv= 5.0 fps
0.5	125	0.0800	4.24		Shallow Concentrated Flow, SCF-Grassed swale Grassed Waterway Kv= 15.0 fps
19.0	890	Total			

Subcatchment DA5a_Post: DA-5a

Hydrograph



Summary for Subcatchment DA5b_Post: DA-5b

Runoff = 0.63 cfs @ 12.08 hrs, Volume= 0.043 af, Depth= 2.36"

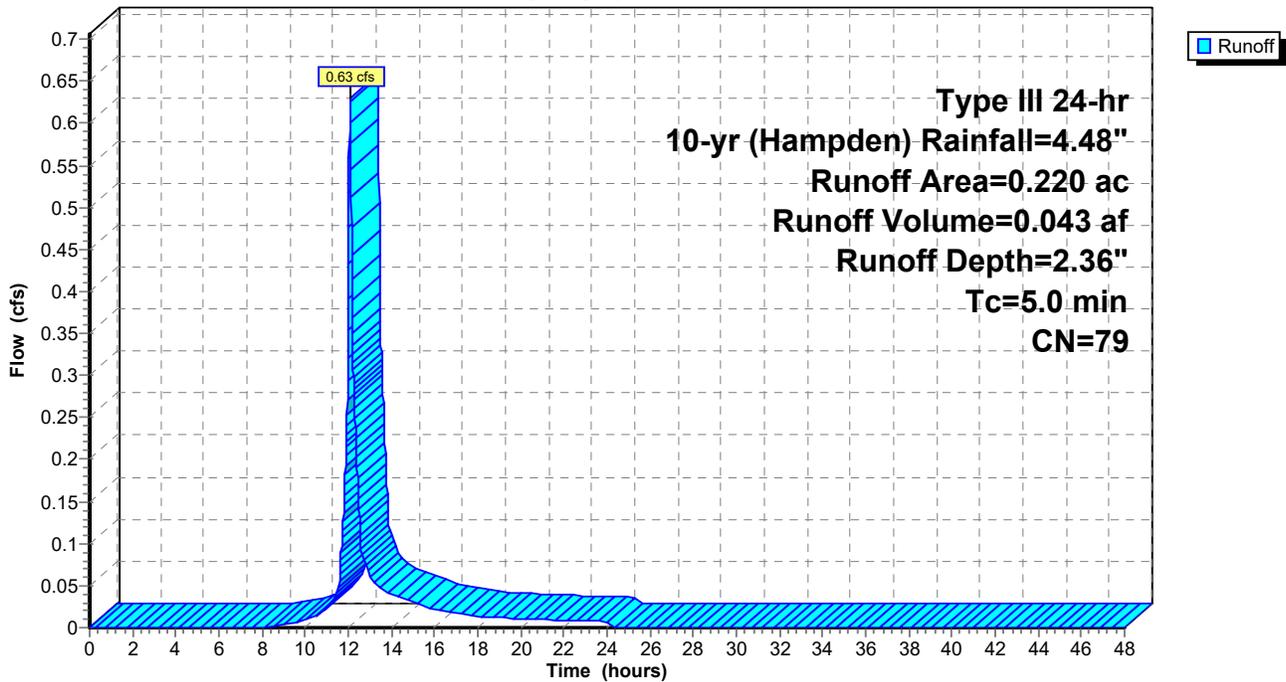
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (ac)	CN	Description
* 0.220	79	
0.220		100.00% Pervious Area

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

Subcatchment DA5b_Post: DA-5b

Hydrograph



Summary for Subcatchment DA5c_Post: DA-5c

Runoff = 0.63 cfs @ 12.08 hrs, Volume= 0.043 af, Depth= 2.36"

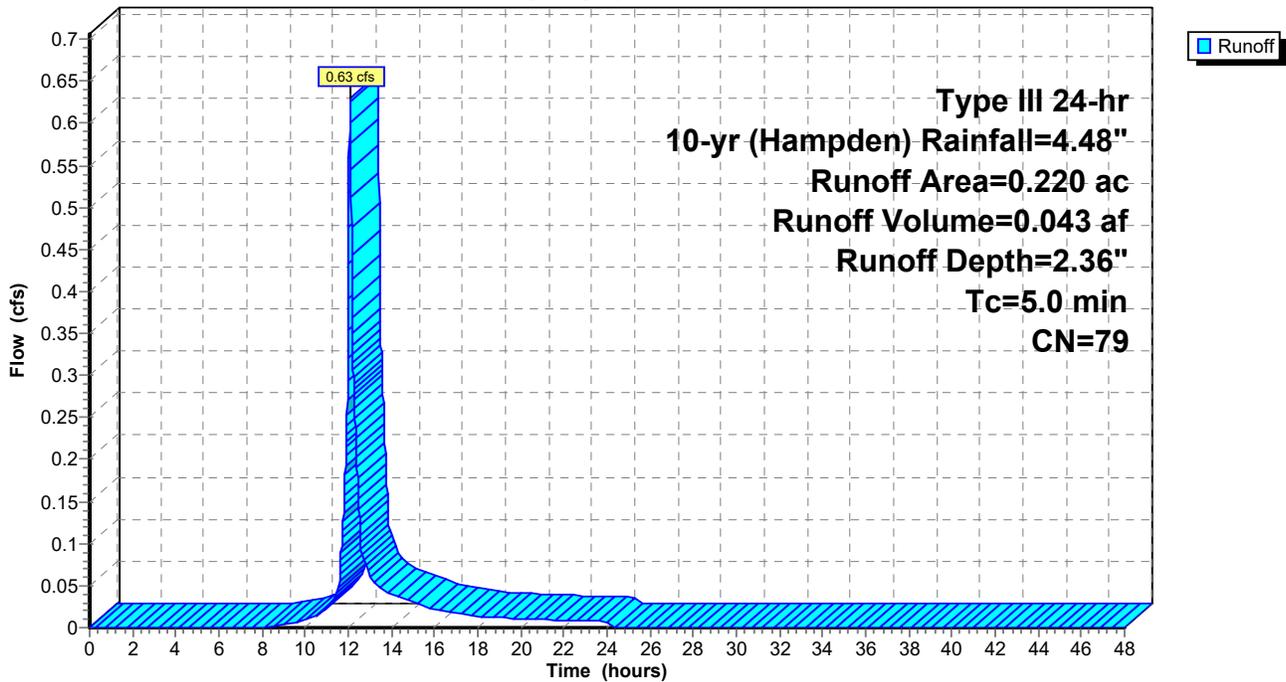
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (ac)	CN	Description
* 0.220	79	
0.220		100.00% Pervious Area

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

Subcatchment DA5c_Post: DA-5c

Hydrograph



Summary for Pond 1P_Post: Pond 1P

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 7.500 ac, 16.69% Impervious, Inflow Depth = 2.80" for 10-yr (Hampden) event
 Inflow = 23.68 cfs @ 12.10 hrs, Volume= 1.749 af
 Outflow = 11.51 cfs @ 12.28 hrs, Volume= 1.431 af, Atten= 51%, Lag= 11.0 min
 Primary = 11.51 cfs @ 12.28 hrs, Volume= 1.431 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 191.91' @ 12.28 hrs Surf.Area= 8,196 sf Storage= 27,406 cf

Plug-Flow detention time= 147.3 min calculated for 1.431 af (82% of inflow)
 Center-of-Mass det. time= 74.7 min (890.5 - 815.9)

Volume	Invert	Avail.Storage	Storage Description
#1	186.00'	51,062 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

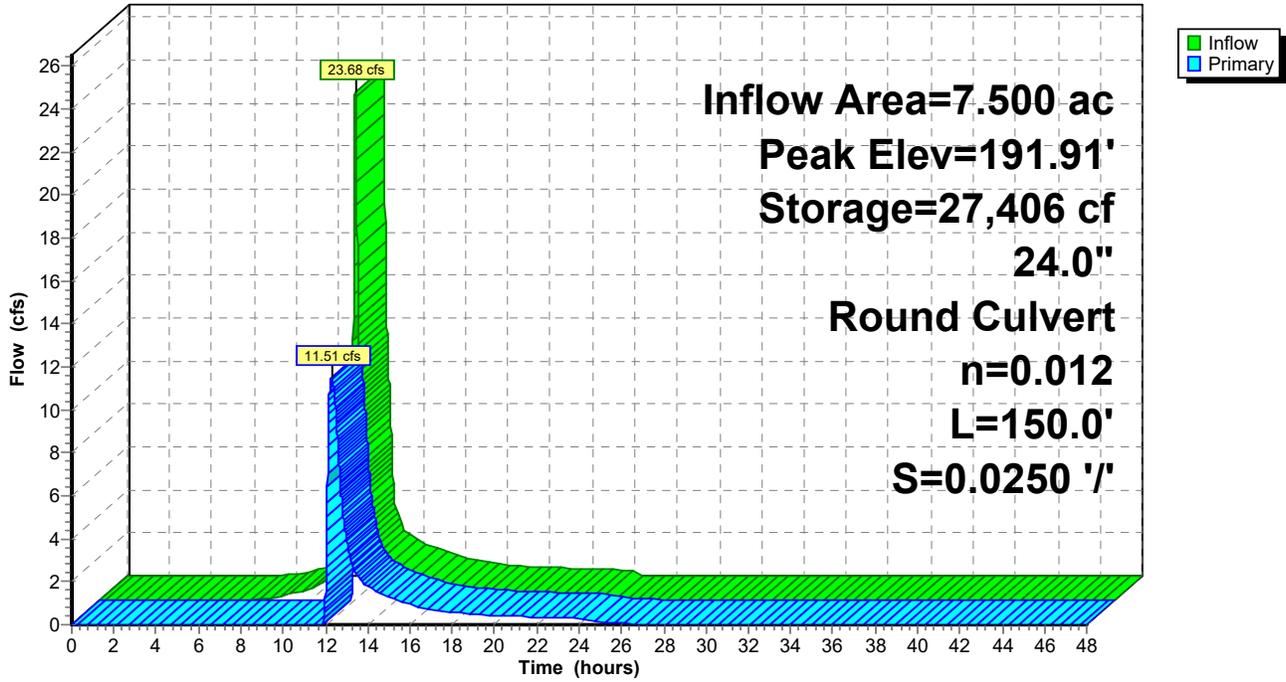
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.00	0	0	0
188.00	3,866	3,866	3,866
189.00	5,039	4,453	8,319
190.00	6,026	5,533	13,851
191.00	7,099	6,563	20,414
192.00	8,299	7,699	28,113
194.00	14,650	22,949	51,062

Device	Routing	Invert	Outlet Devices
#1	Primary	190.00'	24.0" Round 24" CPP L= 150.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 190.00' / 186.25' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=11.51 cfs @ 12.28 hrs HW=191.91' (Free Discharge)
 ↑1=24" CPP (Inlet Controls 11.51 cfs @ 3.72 fps)

Pond 1P_Post: Pond 1P

Hydrograph



Summary for Pond S1_Post: DA-1 Stor

Stage-area for elev 177 assumed based on culvert inverts.

Stage-area for elev 182-185 from civil survey.

Stage-area for elev 186-194 from KLF surface.

Inflow Area = 151.840 ac, 2.58% Impervious, Inflow Depth = 1.32" for 10-yr (Hampden) event
 Inflow = 97.52 cfs @ 12.72 hrs, Volume= 16.675 af
 Outflow = 97.42 cfs @ 12.73 hrs, Volume= 16.675 af, Atten= 0%, Lag= 0.4 min
 Primary = 97.42 cfs @ 12.73 hrs, Volume= 16.675 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 181.31' @ 12.73 hrs Surf.Area= 1,611 sf Storage= 1,334 cf

Plug-Flow detention time= 0.1 min calculated for 16.672 af (100% of inflow)
 Center-of-Mass det. time= 0.1 min (906.6 - 906.5)

Volume	Invert	Avail.Storage	Storage Description
#1	180.00'	236,888 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
180.00	512	0	0	512
181.00	1,306	879	879	1,313
182.00	2,393	1,822	2,701	2,410
183.00	4,058	3,189	5,890	4,087
184.00	5,691	4,852	10,741	5,739
185.00	8,000	6,813	17,554	8,066
186.00	10,421	9,184	26,738	10,511
188.00	16,620	26,801	53,539	16,764
190.00	26,218	42,475	96,014	26,417
192.00	34,530	60,558	156,572	34,820
194.00	46,063	80,317	236,888	46,440

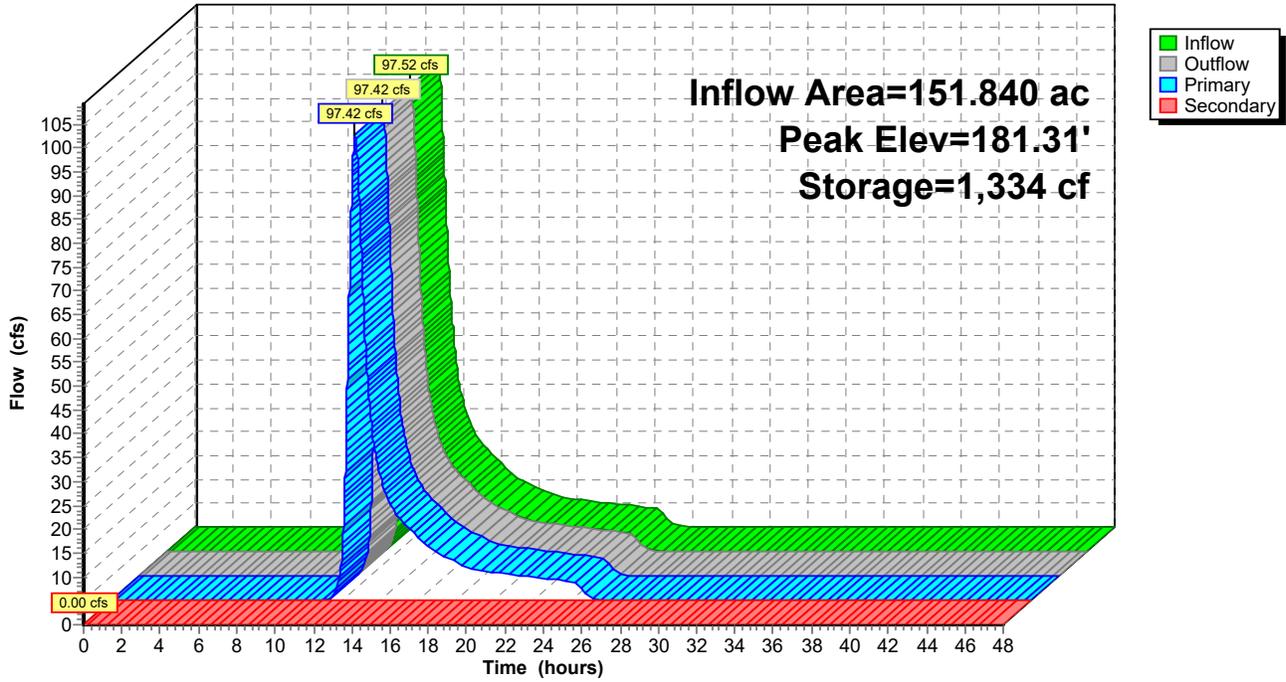
Device	Routing	Invert	Outlet Devices
#1	Primary	177.80'	84.0" Round 84" CMP L= 132.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 177.80' / 170.70' S= 0.0538 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 38.48 sf
#2	Secondary	195.00'	Road overflow, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 3.00 Width (feet) 38.32 93.77 128.55 162.52

Primary OutFlow Max=97.37 cfs @ 12.73 hrs HW=181.31' (Free Discharge)
 ↑1=84" CMP (Inlet Controls 97.37 cfs @ 5.04 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=180.00' (Free Discharge)
 ↑2=Road overflow (Controls 0.00 cfs)

Pond S1_Post: DA-1 Stor

Hydrograph



Summary for Pond SWP1_Post: SW Pond 1

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

[79] Warning: Submerged Pond 1P_Post Primary device # 1 OUTLET by 3.02'

Inflow Area = 8.480 ac, 23.08% Impervious, Inflow Depth = 2.45" for 10-yr (Hampden) event
 Inflow = 13.21 cfs @ 12.24 hrs, Volume= 1.732 af
 Outflow = 13.20 cfs @ 12.25 hrs, Volume= 1.660 af, Atten= 0%, Lag= 0.9 min
 Primary = 8.61 cfs @ 12.25 hrs, Volume= 1.470 af
 Secondary = 4.59 cfs @ 12.25 hrs, Volume= 0.190 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 189.27' @ 12.25 hrs Surf.Area= 2,074 sf Storage= 4,626 cf

Plug-Flow detention time= 43.1 min calculated for 1.660 af (96% of inflow)
 Center-of-Mass det. time= 15.6 min (887.1 - 871.4)

Volume	Invert	Avail.Storage	Storage Description
#1	186.00'	6,240 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.00	777	0	0
187.00	1,157	967	967
188.00	1,549	1,353	2,320
189.00	1,984	1,767	4,087
190.00	2,323	2,154	6,240

Device	Routing	Invert	Outlet Devices
#1	Device 2	188.50'	48.0" W x 24.0" H Vert. Orifice/Grate C= 0.600
#2	Primary	183.00'	15.0" Round 15" CPP L= 37.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 183.00' / 182.63' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#3	Secondary	189.00'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 Width (feet) 10.00 12.00

Primary OutFlow Max=8.60 cfs @ 12.25 hrs HW=189.27' (Free Discharge)

↑ **2=15" CPP** (Passes 8.60 cfs of 11.08 cfs potential flow)

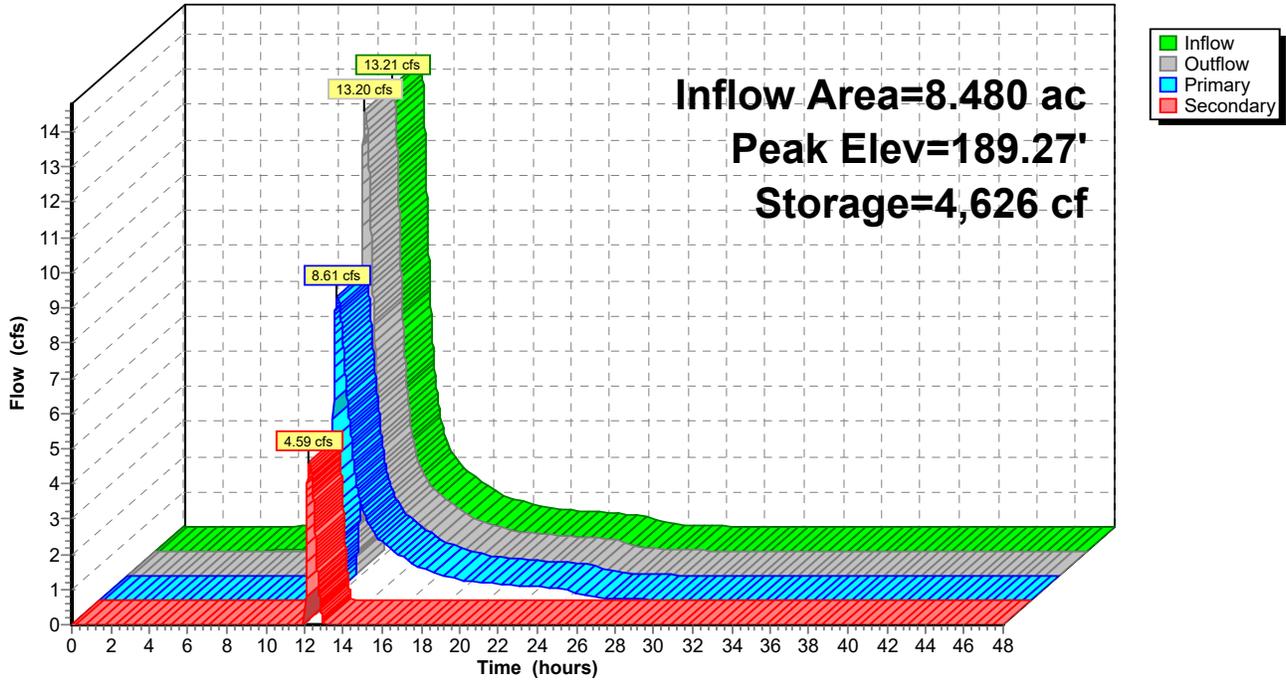
↑ **1=Orifice/Grate** (Orifice Controls 8.60 cfs @ 2.81 fps)

Secondary OutFlow Max=4.58 cfs @ 12.25 hrs HW=189.27' (Free Discharge)

↑ **3=Custom Weir/Orifice** (Weir Controls 4.58 cfs @ 1.68 fps)

Pond SWP1_Post: SW Pond 1

Hydrograph



Summary for Pond SWP2_Post: SW Pond 2

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

[79] Warning: Submerged Pond SWPT_Post Primary device # 2 INLET by 1.92'

Inflow Area = 15.170 ac, 2.71% Impervious, Inflow Depth = 1.73" for 10-yr (Hampden) event
 Inflow = 20.52 cfs @ 12.28 hrs, Volume= 2.190 af
 Outflow = 20.47 cfs @ 12.30 hrs, Volume= 2.087 af, Atten= 0%, Lag= 0.8 min
 Primary = 11.30 cfs @ 12.30 hrs, Volume= 1.755 af
 Secondary = 9.17 cfs @ 12.30 hrs, Volume= 0.333 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 237.42' @ 12.30 hrs Surf.Area= 2,131 sf Storage= 6,282 cf

Plug-Flow detention time= 37.2 min calculated for 2.087 af (95% of inflow)
 Center-of-Mass det. time= 11.9 min (876.7 - 864.8)

Volume	Invert	Avail.Storage	Storage Description
#1	233.00'	7,583 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
233.00	799	0	0
234.00	1,054	927	927
235.00	1,335	1,195	2,121
236.00	1,644	1,490	3,611
237.00	1,980	1,812	5,423
238.00	2,340	2,160	7,583

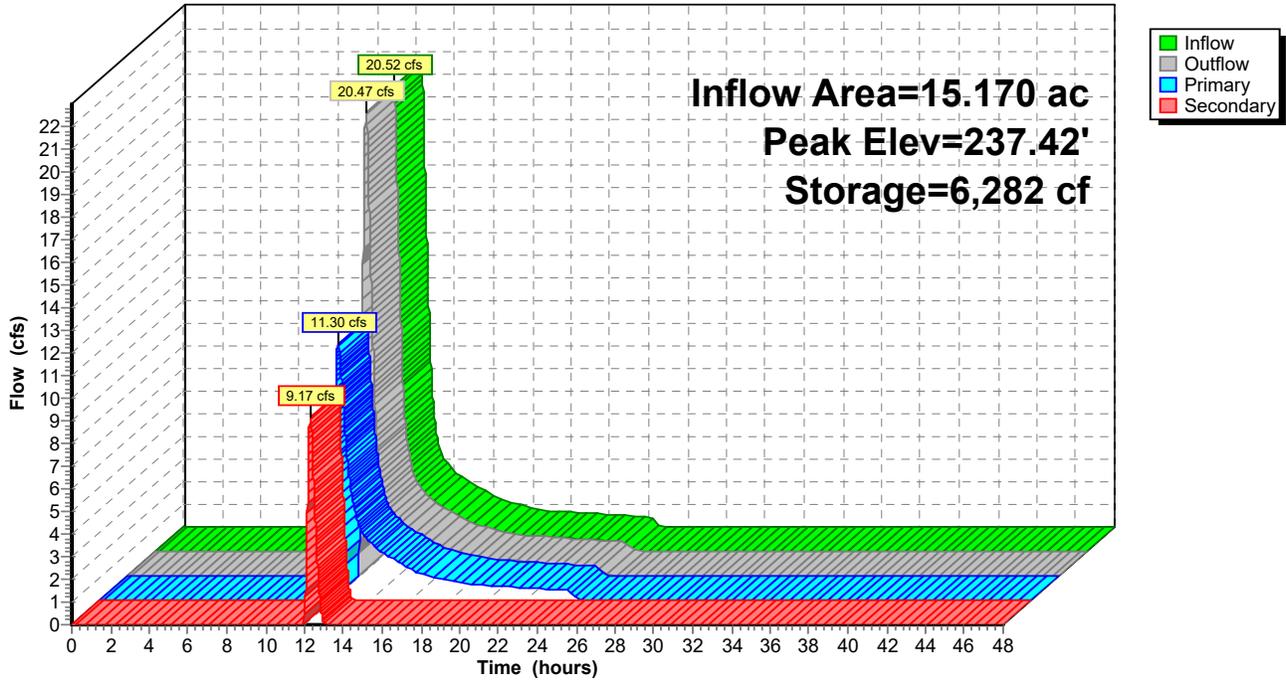
Device	Routing	Invert	Outlet Devices
#1	Device 2	236.50'	48.0" W x 24.0" H Vert. Orifice/Grate C= 0.600
#2	Primary	230.00'	15.0" Round 15" CPP L= 72.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 230.00' / 229.64' S= 0.0050 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#3	Secondary	237.00'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 Width (feet) 10.00 12.00

Primary OutFlow Max=11.30 cfs @ 12.30 hrs HW=237.42' (Free Discharge)
 ↑ **2=15" CPP** (Passes 11.30 cfs of 12.16 cfs potential flow)
 ↑ **1=Orifice/Grate** (Orifice Controls 11.30 cfs @ 3.08 fps)

Secondary OutFlow Max=9.15 cfs @ 12.30 hrs HW=237.42' (Free Discharge)
 ↑ **3=Custom Weir/Orifice** (Weir Controls 9.15 cfs @ 2.10 fps)

Pond SWP2_Post: SW Pond 2

Hydrograph



Summary for Pond SWPT_Post: SW Pre Treat

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 14.950 ac, 2.75% Impervious, Inflow Depth = 1.73" for 10-yr (Hampden) event
 Inflow = 20.30 cfs @ 12.27 hrs, Volume= 2.158 af
 Outflow = 20.25 cfs @ 12.28 hrs, Volume= 2.147 af, Atten= 0%, Lag= 0.7 min
 Primary = 20.25 cfs @ 12.28 hrs, Volume= 2.147 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 243.35' @ 12.28 hrs Surf.Area= 861 sf Storage= 1,418 cf

Plug-Flow detention time= 5.3 min calculated for 2.146 af (99% of inflow)
 Center-of-Mass det. time= 2.4 min (865.5 - 863.1)

Volume	Invert	Avail.Storage	Storage Description
#1	241.00'	2,033 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
241.00	383	0	0
242.00	559	471	471
243.00	760	660	1,131
244.00	1,045	903	2,033

Device	Routing	Invert	Outlet Devices
#1	Device 2	242.00'	48.0" W x 24.0" H Vert. Orifice/Grate C= 0.600
#2	Primary	235.50'	24.0" Round 24" CPP L= 66.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.50' / 234.84' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#3	Secondary	244.00'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 Width (feet) 100.00 100.00

Primary OutFlow Max=20.24 cfs @ 12.28 hrs HW=243.35' (Free Discharge)

↑ **2=24" CPP** (Passes 20.24 cfs of 31.27 cfs potential flow)

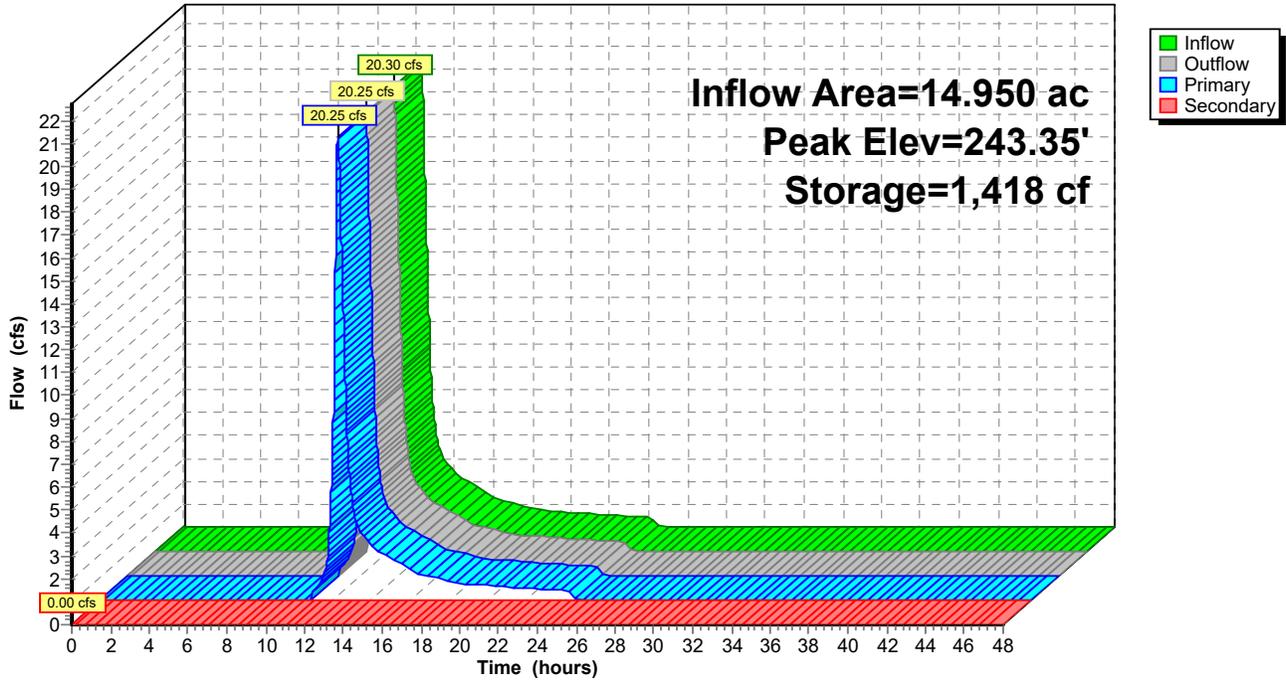
↑ **1=Orifice/Grate** (Orifice Controls 20.24 cfs @ 3.74 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=241.00' (Free Discharge)

↑ **3=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond SWPT_Post: SW Pre Treat

Hydrograph



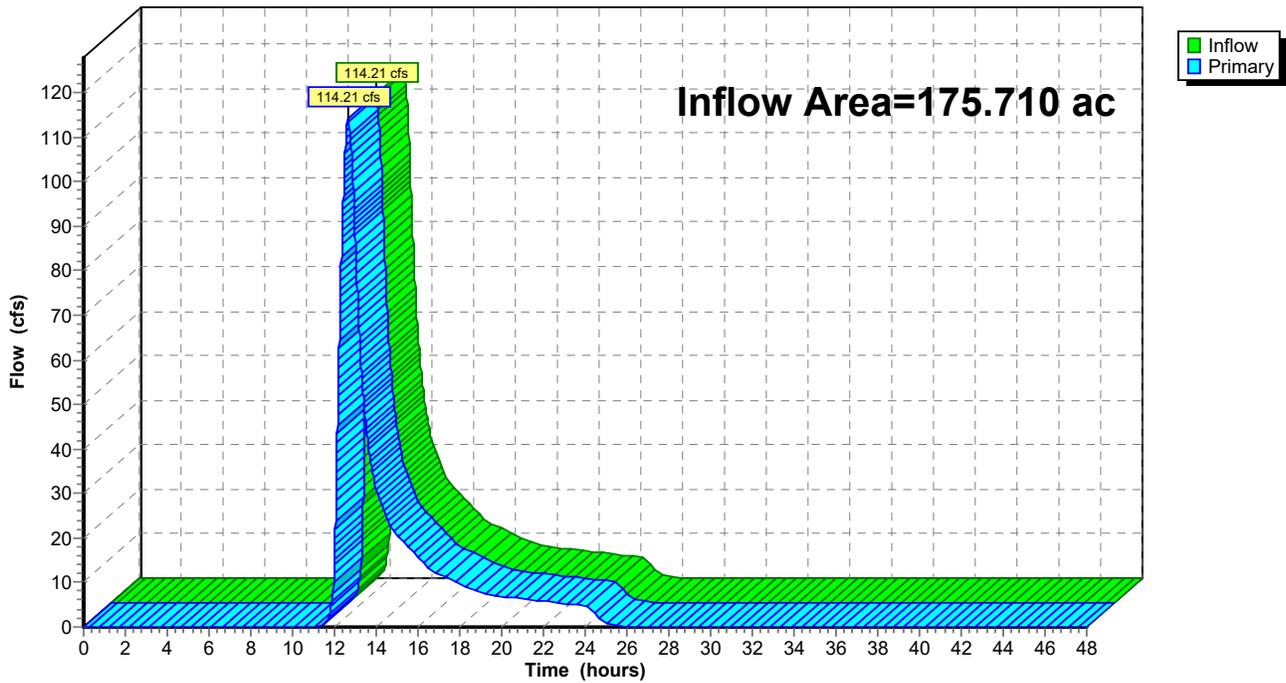
Summary for Link POA_Post: Point of Analysis

Inflow Area = 175.710 ac, 3.58% Impervious, Inflow Depth = 1.40" for 10-yr (Hampden) event
Inflow = 114.21 cfs @ 12.64 hrs, Volume= 20.466 af
Primary = 114.21 cfs @ 12.64 hrs, Volume= 20.466 af, Atten= 0%, Lag= 0.0 min

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

Link POA_Post: Point of Analysis

Hydrograph



ASMG_221383_Hydrology

Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Prepared by {enter your company name here}

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

SubcatchmentDA-2_Post:DA-2 Runoff Area=7.500 ac 16.69% Impervious Runoff Depth=5.07"
 Flow Length=1,705' Slope=0.0711 '/' Tc=7.0 min CN=84 Runoff=42.12 cfs 3.171 af

SubcatchmentDA1_Post:DA-1 Runoff Area=151.840 ac 2.58% Impervious Runoff Depth=3.05"
 Flow Length=5,870' Tc=47.5 min CN=65 Runoff=240.48 cfs 38.574 af

SubcatchmentDA3_Post:DA-3 Runoff Area=0.980 ac 72.00% Impervious Runoff Depth=6.10"
 Tc=5.0 min CN=93 Runoff=6.68 cfs 0.498 af

SubcatchmentDA5a_Post:DA-5a Runoff Area=14.950 ac 2.75% Impervious Runoff Depth=3.66"
 Flow Length=890' Tc=19.0 min CN=71 Runoff=44.22 cfs 4.565 af

SubcatchmentDA5b_Post:DA-5b Runoff Area=0.220 ac 0.00% Impervious Runoff Depth=4.52"
 Tc=5.0 min CN=79 Runoff=1.20 cfs 0.083 af

SubcatchmentDA5c_Post:DA-5c Runoff Area=0.220 ac 0.00% Impervious Runoff Depth=4.52"
 Tc=5.0 min CN=79 Runoff=1.20 cfs 0.083 af

Pond 1P_Post: Pond 1P Peak Elev=193.41' Storage=43,002 cf Inflow=42.12 cfs 3.171 af
 24.0" Round Culvert n=0.012 L=150.0' S=0.0250 '/' Outflow=18.55 cfs 2.853 af

Pond S1_Post: DA-1 Stor Peak Elev=183.97' Storage=10,560 cf Inflow=240.48 cfs 38.574 af
 Primary=239.68 cfs 38.574 af Secondary=0.00 cfs 0.000 af Outflow=239.68 cfs 38.574 af

Pond SWP1_Post: SW Pond 1 Peak Elev=189.46' Storage=5,037 cf Inflow=21.99 cfs 3.351 af
 Primary=11.27 cfs 2.562 af Secondary=10.63 cfs 0.717 af Outflow=21.89 cfs 3.279 af

Pond SWP2_Post: SW Pond 2 Peak Elev=237.94' Storage=7,438 cf Inflow=47.52 cfs 4.638 af
 Primary=12.62 cfs 3.211 af Secondary=31.99 cfs 1.324 af Outflow=44.61 cfs 4.535 af

Pond SWPT_Post: SW Pre Treat Peak Elev=244.12' Storage=2,033 cf Inflow=44.22 cfs 4.565 af
 Primary=32.97 cfs 4.381 af Secondary=14.05 cfs 0.174 af Outflow=47.02 cfs 4.555 af

Link POA_Post: Point of Analysis Inflow=275.23 cfs 46.471 af
 Primary=275.23 cfs 46.471 af

Total Runoff Area = 175.710 ac Runoff Volume = 46.975 af Average Runoff Depth = 3.21"
96.42% Pervious = 169.419 ac 3.58% Impervious = 6.291 ac

Summary for Subcatchment DA-2_Post: DA-2

Runoff = 42.12 cfs @ 12.10 hrs, Volume= 3.171 af, Depth= 5.07"

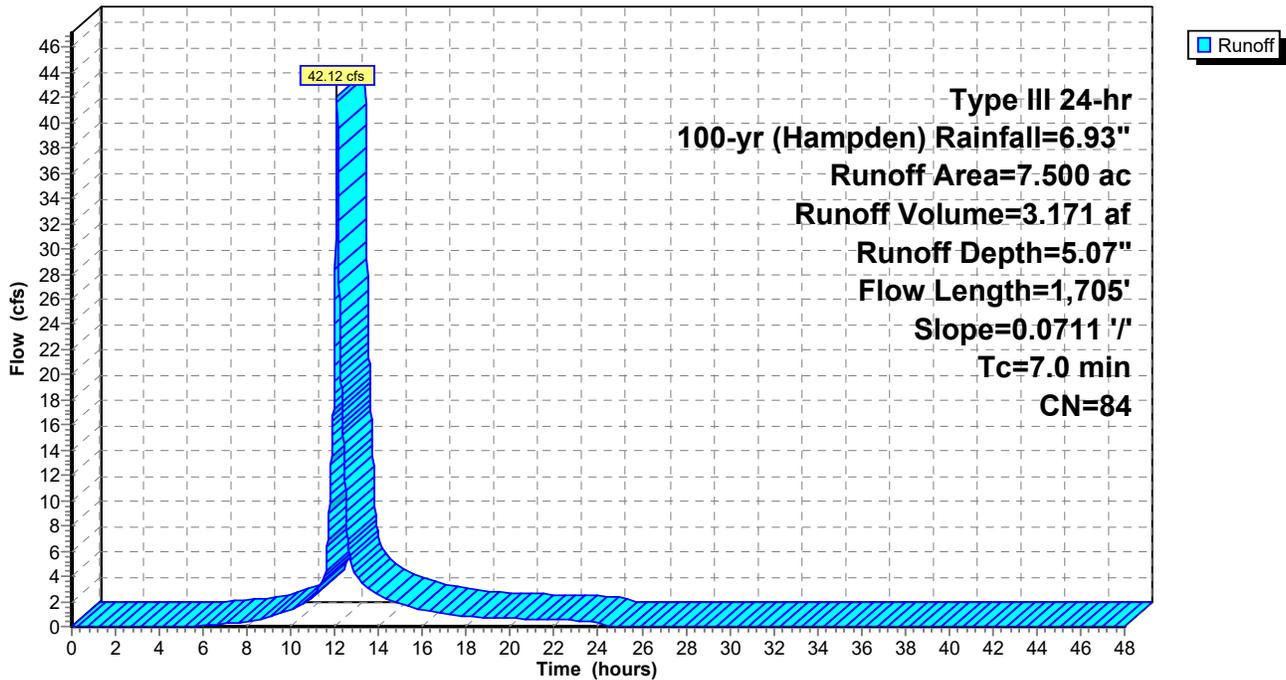
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (ac)	CN	Description
1.530	93	Urban industrial, 72% imp, HSG D
2.080	84	Pasture/grassland/range, Fair, HSG D
0.150	98	Water Surface, HSG D
3.740	79	Woods, Fair, HSG D
7.500	84	Weighted Average
6.248		83.31% Pervious Area
1.252		16.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0711	2.19		Sheet Flow, Sheet-Rd Smooth surfaces n= 0.011 P2= 2.94"
6.2	1,605	0.0711	4.29		Shallow Concentrated Flow, SCF-Rd Unpaved Kv= 16.1 fps
7.0	1,705	Total			

Subcatchment DA-2_Post: DA-2

Hydrograph



Summary for Subcatchment DA1_Post: DA-1

Runoff = 240.48 cfs @ 12.67 hrs, Volume= 38.574 af, Depth= 3.05"

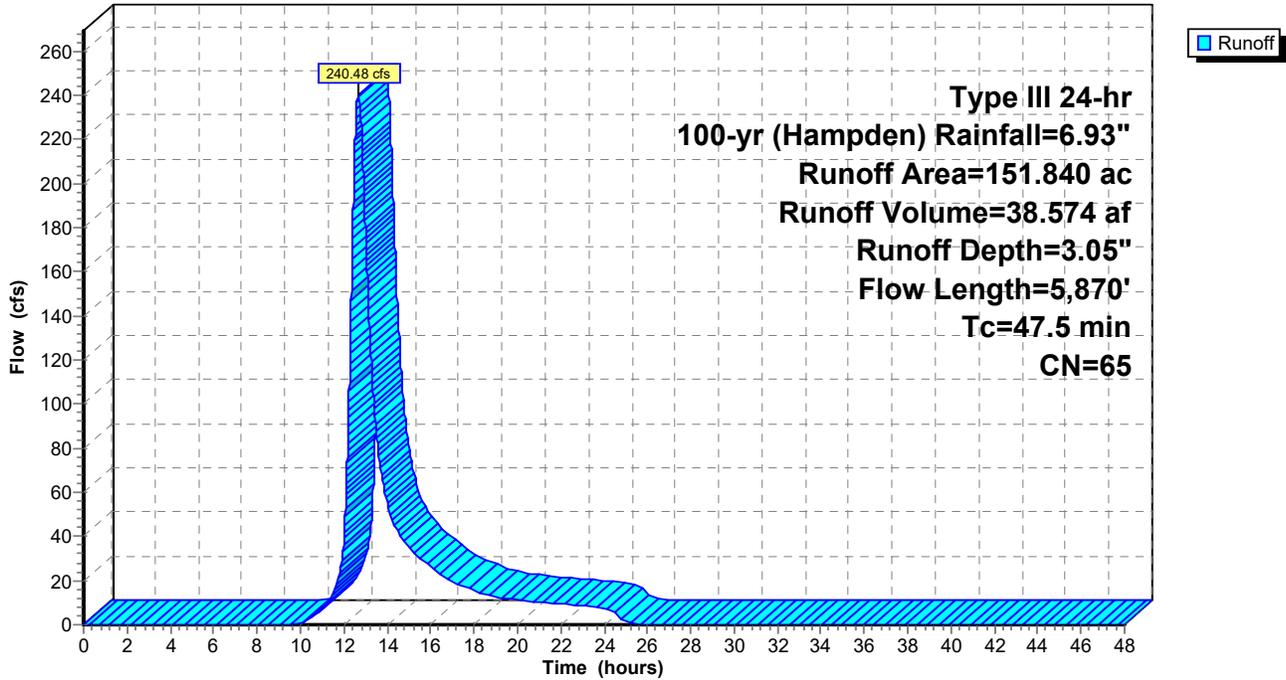
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (ac)	CN	Description
0.580	35	Brush, Fair, HSG A
0.450	70	Brush, Fair, HSG C
0.460	77	Brush, Fair, HSG D
0.960	81	Urban industrial, 72% imp, HSG A
1.110	88	Urban industrial, 72% imp, HSG B
0.240	93	Urban industrial, 72% imp, HSG D
2.240	49	Pasture/grassland/range, Fair, HSG A
0.660	69	Pasture/grassland/range, Fair, HSG B
5.730	79	Pasture/grassland/range, Fair, HSG C
1.220	84	Pasture/grassland/range, Fair, HSG D
* 0.170	98	Wetland
* 0.030	98	Wetland
* 2.060	98	Wetland
30.430	36	Woods, Fair, HSG A
27.020	60	Woods, Fair, HSG B
40.240	73	Woods, Fair, HSG C
38.240	79	Woods, Fair, HSG D
151.840	65	Weighted Average
147.917		97.42% Pervious Area
3.923		2.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0581	0.11		Sheet Flow, Sheet-Woods
					Woods: Light underbrush n= 0.400 P2= 2.94"
24.9	1,800	0.0581	1.21		Shallow Concentrated Flow, SCF-Woods
					Woodland Kv= 5.0 fps
8.0	3,970	0.0200	8.31	199.43	Parabolic Channel,
					W=18.00' D=2.00' Area=24.0 sf Perim=18.6' n= 0.030
47.5	5,870	Total			

Subcatchment DA1_Post: DA-1

Hydrograph



Summary for Subcatchment DA3_Post: DA-3

Runoff = 6.68 cfs @ 12.07 hrs, Volume= 0.498 af, Depth= 6.10"

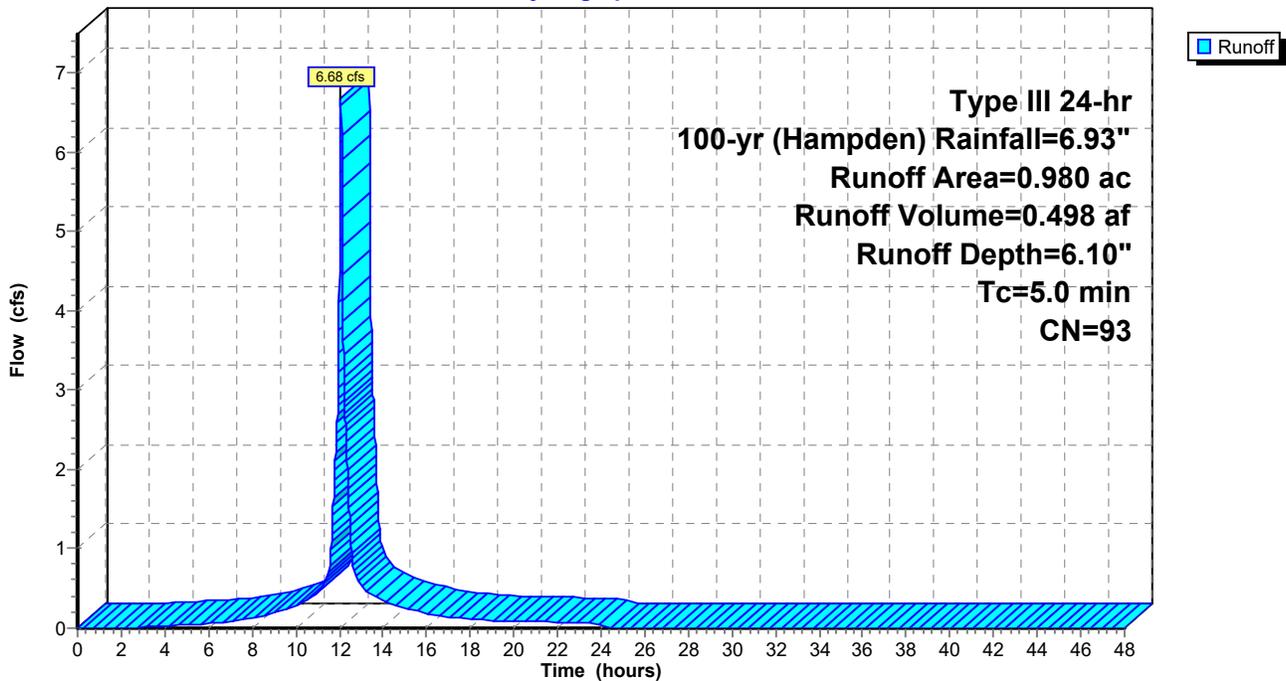
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (ac)	CN	Description
0.980	93	Urban industrial, 72% imp, HSG D
0.274		28.00% Pervious Area
0.706		72.00% Impervious Area

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

Subcatchment DA3_Post: DA-3

Hydrograph



Summary for Subcatchment DA5a_Post: DA-5a

Runoff = 44.22 cfs @ 12.26 hrs, Volume= 4.565 af, Depth= 3.66"

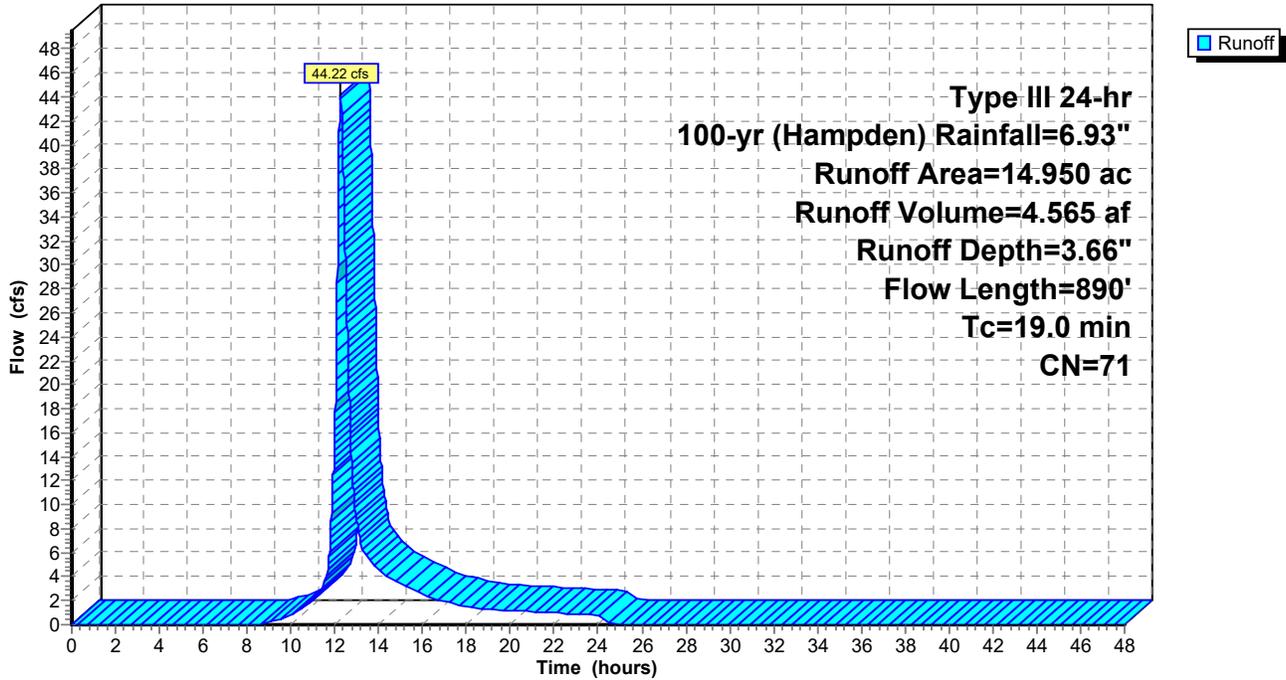
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (ac)	CN	Description
0.060	81	Urban industrial, 72% imp, HSG A
0.190	88	Urban industrial, 72% imp, HSG B
0.320	91	Urban industrial, 72% imp, HSG C
0.240	49	Pasture/grassland/range, Fair, HSG A
0.250	69	Pasture/grassland/range, Fair, HSG B
0.310	79	Pasture/grassland/range, Fair, HSG C
0.270	36	Woods, Fair, HSG A
2.340	60	Woods, Fair, HSG B
10.970	73	Woods, Fair, HSG C
14.950	71	Weighted Average
14.540		97.25% Pervious Area
0.410		2.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.1040	0.14		Sheet Flow, Sheet-Woods Woods: Light underbrush n= 0.400 P2= 2.94"
6.9	665	0.1040	1.61		Shallow Concentrated Flow, SCF-Woods Woodland Kv= 5.0 fps
0.5	125	0.0800	4.24		Shallow Concentrated Flow, SCF-Grassed swale Grassed Waterway Kv= 15.0 fps
19.0	890	Total			

Subcatchment DA5a_Post: DA-5a

Hydrograph



Summary for Subcatchment DA5b_Post: DA-5b

Runoff = 1.20 cfs @ 12.07 hrs, Volume= 0.083 af, Depth= 4.52"

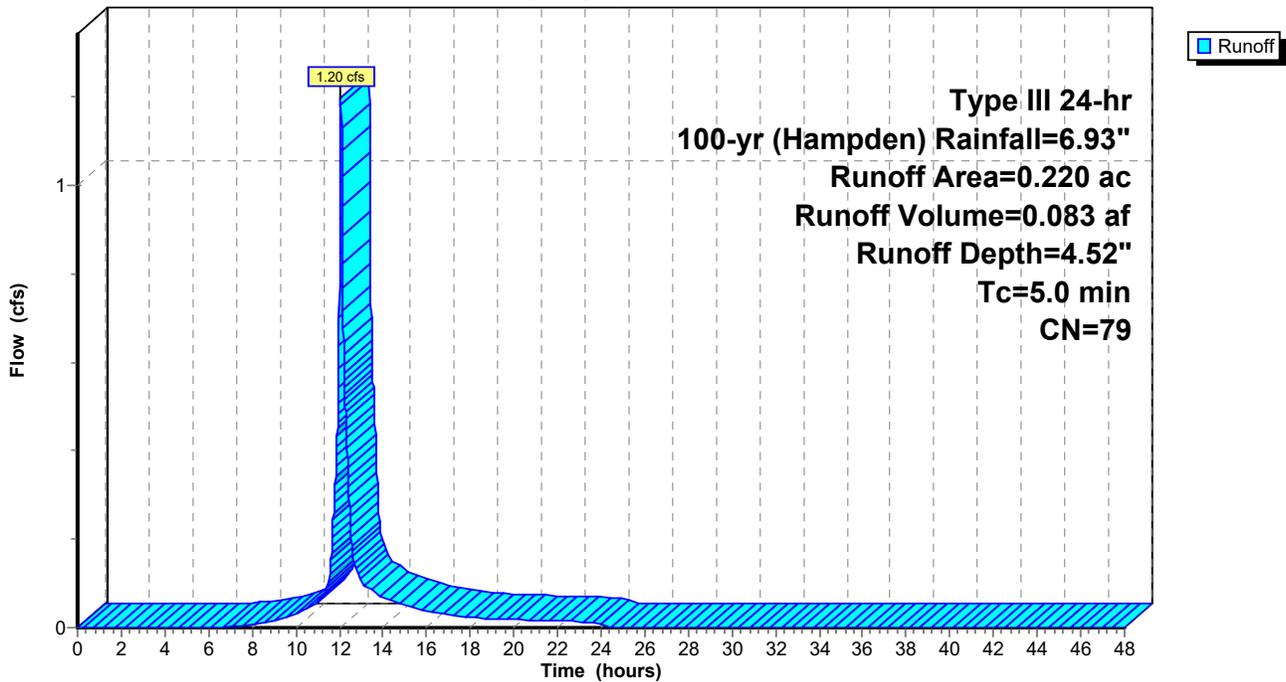
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (ac)	CN	Description
* 0.220	79	
0.220		100.00% Pervious Area

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

Subcatchment DA5b_Post: DA-5b

Hydrograph



Summary for Subcatchment DA5c_Post: DA-5c

Runoff = 1.20 cfs @ 12.07 hrs, Volume= 0.083 af, Depth= 4.52"

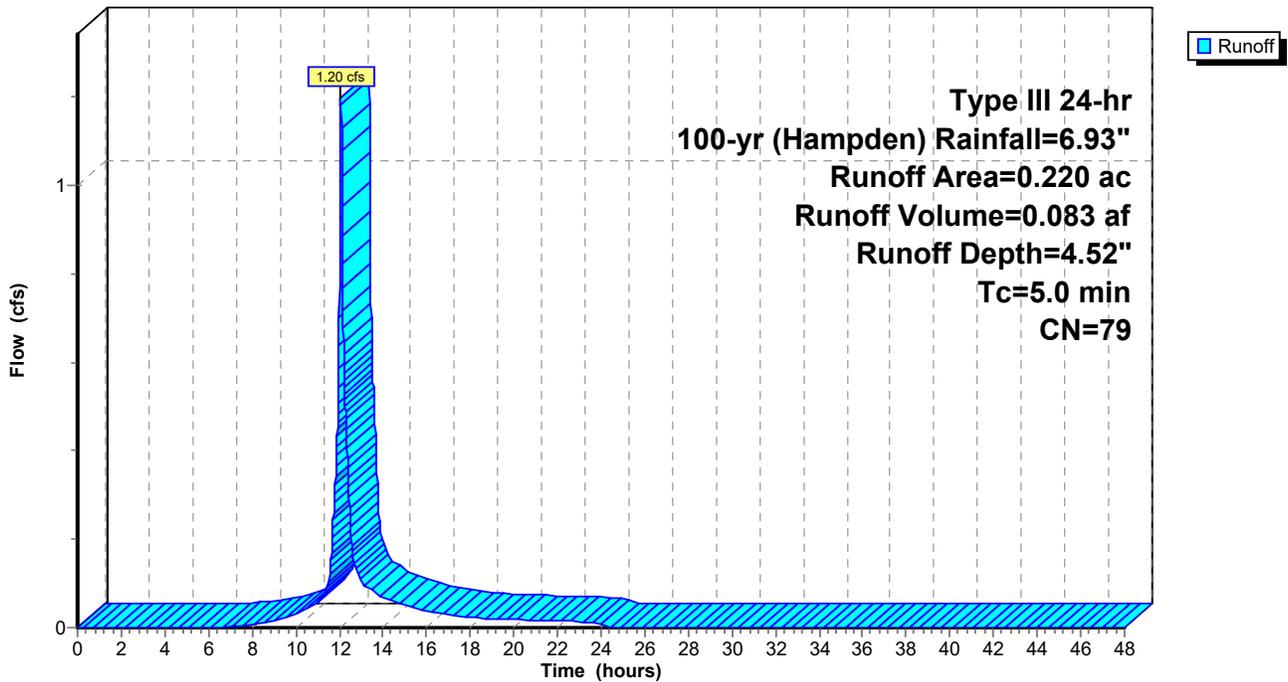
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (ac)	CN	Description
* 0.220	79	
0.220		100.00% Pervious Area

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

Subcatchment DA5c_Post: DA-5c

Hydrograph



Summary for Pond 1P_Post: Pond 1P

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 7.500 ac, 16.69% Impervious, Inflow Depth = 5.07" for 100-yr (Hampden) event
 Inflow = 42.12 cfs @ 12.10 hrs, Volume= 3.171 af
 Outflow = 18.55 cfs @ 12.31 hrs, Volume= 2.853 af, Atten= 56%, Lag= 12.5 min
 Primary = 18.55 cfs @ 12.31 hrs, Volume= 2.853 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 193.41' @ 12.31 hrs Surf.Area= 12,784 sf Storage= 43,002 cf

Plug-Flow detention time= 106.8 min calculated for 2.853 af (90% of inflow)
 Center-of-Mass det. time= 58.1 min (857.2 - 799.1)

Volume	Invert	Avail.Storage	Storage Description
#1	186.00'	51,062 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

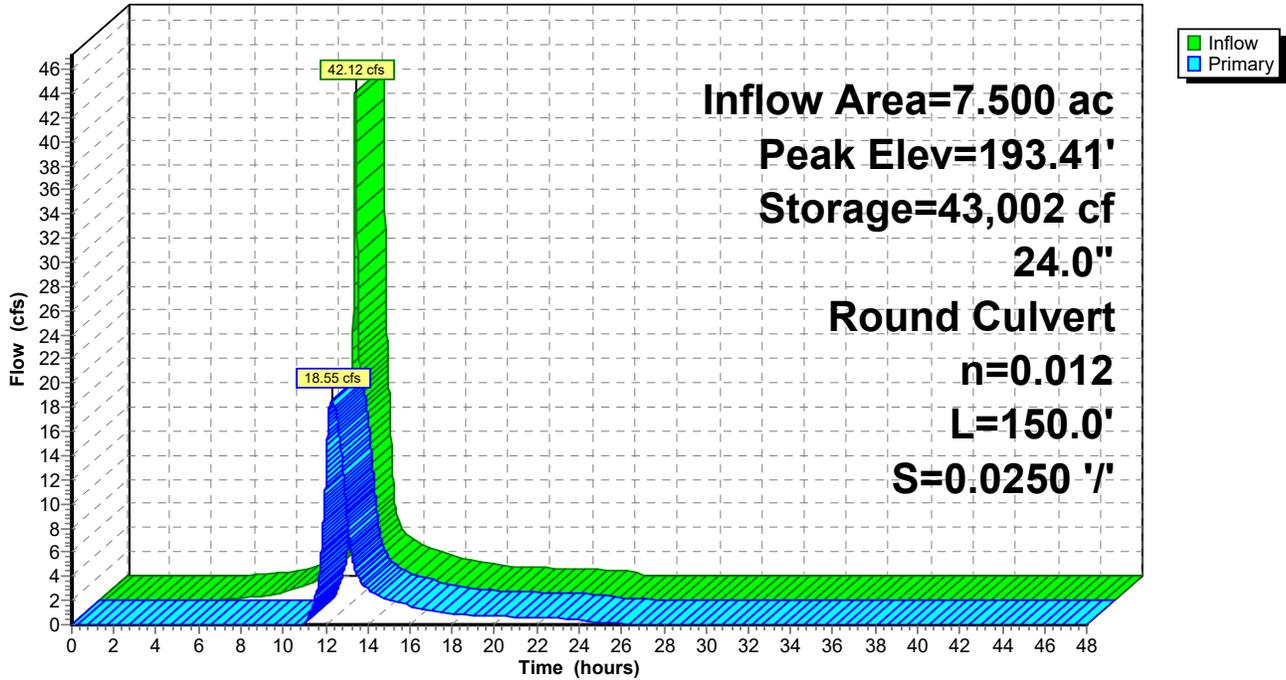
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.00	0	0	0
188.00	3,866	3,866	3,866
189.00	5,039	4,453	8,319
190.00	6,026	5,533	13,851
191.00	7,099	6,563	20,414
192.00	8,299	7,699	28,113
194.00	14,650	22,949	51,062

Device	Routing	Invert	Outlet Devices
#1	Primary	190.00'	24.0" Round 24" CPP L= 150.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 190.00' / 186.25' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=18.55 cfs @ 12.31 hrs HW=193.41' (Free Discharge)
 ↑1=24" CPP (Inlet Controls 18.55 cfs @ 5.90 fps)

Pond 1P_Post: Pond 1P

Hydrograph



Summary for Pond S1_Post: DA-1 Stor

Stage-area for elev 177 assumed based on culvert inverts.

Stage-area for elev 182-185 from civil survey.

Stage-area for elev 186-194 from KLF surface.

Inflow Area = 151.840 ac, 2.58% Impervious, Inflow Depth = 3.05" for 100-yr (Hampden) event
 Inflow = 240.48 cfs @ 12.67 hrs, Volume= 38.574 af
 Outflow = 239.68 cfs @ 12.71 hrs, Volume= 38.574 af, Atten= 0%, Lag= 2.3 min
 Primary = 239.68 cfs @ 12.71 hrs, Volume= 38.574 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 183.97' @ 12.71 hrs Surf.Area= 5,634 sf Storage= 10,560 cf

Plug-Flow detention time= 0.3 min calculated for 38.566 af (100% of inflow)
 Center-of-Mass det. time= 0.3 min (881.2 - 881.0)

Volume	Invert	Avail.Storage	Storage Description
#1	180.00'	236,888 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
180.00	512	0	0	512
181.00	1,306	879	879	1,313
182.00	2,393	1,822	2,701	2,410
183.00	4,058	3,189	5,890	4,087
184.00	5,691	4,852	10,741	5,739
185.00	8,000	6,813	17,554	8,066
186.00	10,421	9,184	26,738	10,511
188.00	16,620	26,801	53,539	16,764
190.00	26,218	42,475	96,014	26,417
192.00	34,530	60,558	156,572	34,820
194.00	46,063	80,317	236,888	46,440

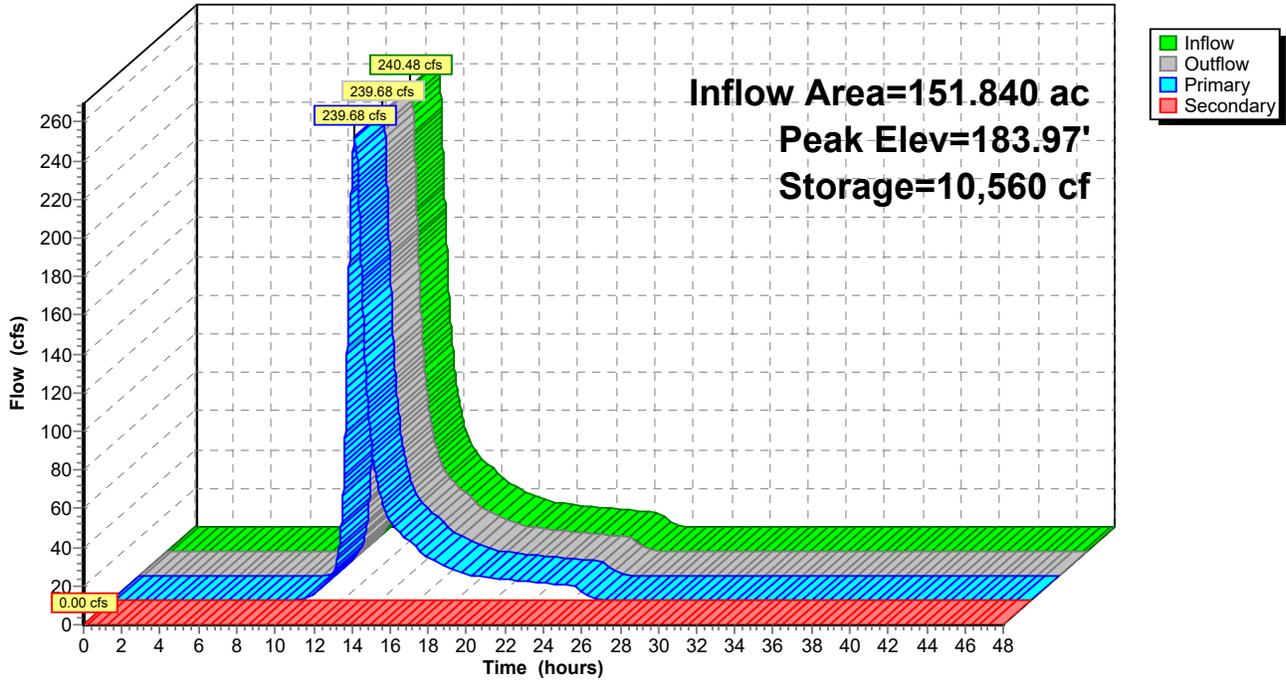
Device	Routing	Invert	Outlet Devices
#1	Primary	177.80'	84.0" Round 84" CMP L= 132.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 177.80' / 170.70' S= 0.0538 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 38.48 sf
#2	Secondary	195.00'	Road overflow, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 3.00 Width (feet) 38.32 93.77 128.55 162.52

Primary OutFlow Max=239.68 cfs @ 12.71 hrs HW=183.97' (Free Discharge)
 ↳1=84" CMP (Inlet Controls 239.68 cfs @ 6.68 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=180.00' (Free Discharge)
 ↳2=Road overflow (Controls 0.00 cfs)

Pond S1_Post: DA-1 Stor

Hydrograph



Summary for Pond SWP1_Post: SW Pond 1

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

[79] Warning: Submerged Pond 1P_Post Primary device # 1 OUTLET by 3.21'

Inflow Area = 8.480 ac, 23.08% Impervious, Inflow Depth = 4.74" for 100-yr (Hampden) event
 Inflow = 21.99 cfs @ 12.12 hrs, Volume= 3.351 af
 Outflow = 21.89 cfs @ 12.14 hrs, Volume= 3.279 af, Atten= 0%, Lag= 1.2 min
 Primary = 11.27 cfs @ 12.14 hrs, Volume= 2.562 af
 Secondary = 10.63 cfs @ 12.14 hrs, Volume= 0.717 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 189.46' @ 12.14 hrs Surf.Area= 2,140 sf Storage= 5,037 cf

Plug-Flow detention time= 25.3 min calculated for 3.278 af (98% of inflow)
 Center-of-Mass det. time= 10.5 min (854.4 - 843.9)

Volume	Invert	Avail.Storage	Storage Description
#1	186.00'	6,240 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.00	777	0	0
187.00	1,157	967	967
188.00	1,549	1,353	2,320
189.00	1,984	1,767	4,087
190.00	2,323	2,154	6,240

Device	Routing	Invert	Outlet Devices
#1	Device 2	188.50'	48.0" W x 24.0" H Vert. Orifice/Grate C= 0.600
#2	Primary	183.00'	15.0" Round 15" CPP L= 37.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 183.00' / 182.63' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#3	Secondary	189.00'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 Width (feet) 10.00 12.00

Primary OutFlow Max=11.27 cfs @ 12.14 hrs HW=189.46' (Free Discharge)

↑ **2=15" CPP** (Inlet Controls 11.27 cfs @ 9.18 fps)

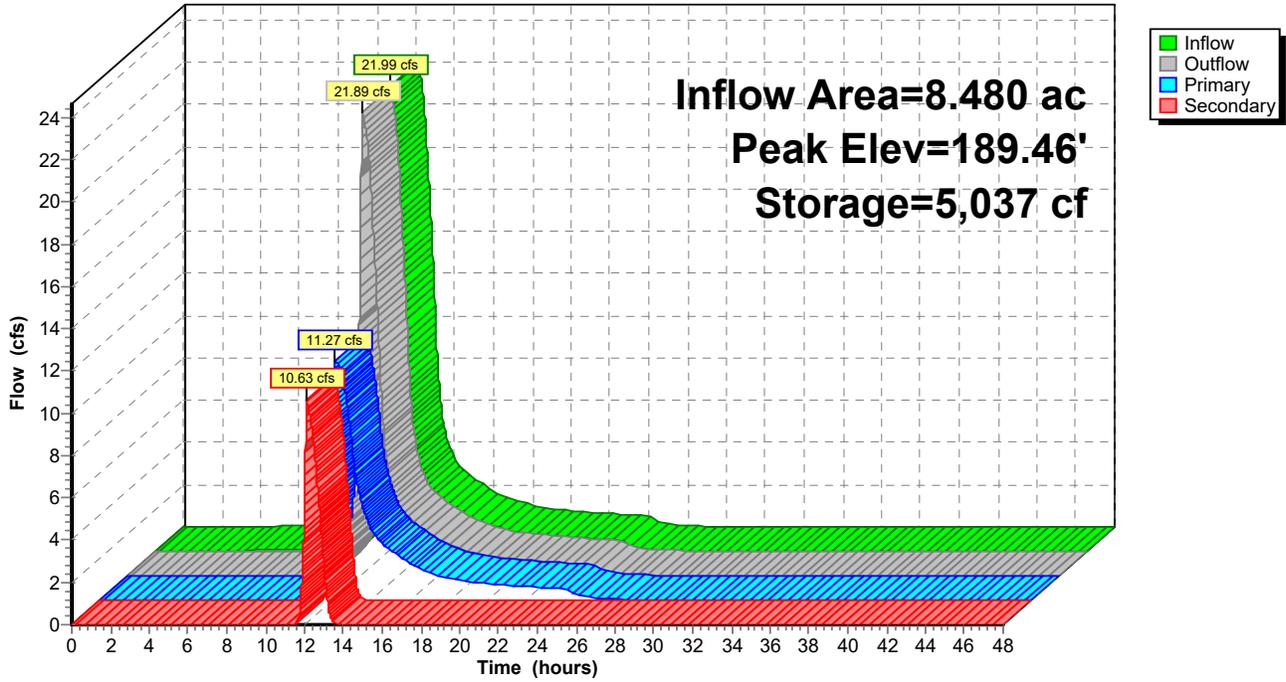
↑ **1=Orifice/Grate** (Passes 11.27 cfs of 12.09 cfs potential flow)

Secondary OutFlow Max=10.62 cfs @ 12.14 hrs HW=189.46' (Free Discharge)

↑ **3=Custom Weir/Orifice** (Weir Controls 10.62 cfs @ 2.20 fps)

Pond SWP1_Post: SW Pond 1

Hydrograph



Summary for Pond SWP2_Post: SW Pond 2

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

[79] Warning: Submerged Pond SWPT_Post Primary device # 2 INLET by 2.44'

Inflow Area = 15.170 ac, 2.71% Impervious, Inflow Depth = 3.67" for 100-yr (Hampden) event
 Inflow = 47.52 cfs @ 12.27 hrs, Volume= 4.638 af
 Outflow = 44.61 cfs @ 12.27 hrs, Volume= 4.535 af, Atten= 6%, Lag= 0.3 min
 Primary = 12.62 cfs @ 12.27 hrs, Volume= 3.211 af
 Secondary = 31.99 cfs @ 12.27 hrs, Volume= 1.324 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 237.94' @ 12.27 hrs Surf.Area= 2,318 sf Storage= 7,438 cf

Plug-Flow detention time= 21.1 min calculated for 4.535 af (98% of inflow)
 Center-of-Mass det. time= 8.1 min (850.4 - 842.3)

Volume	Invert	Avail.Storage	Storage Description
#1	233.00'	7,583 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
233.00	799	0	0
234.00	1,054	927	927
235.00	1,335	1,195	2,121
236.00	1,644	1,490	3,611
237.00	1,980	1,812	5,423
238.00	2,340	2,160	7,583

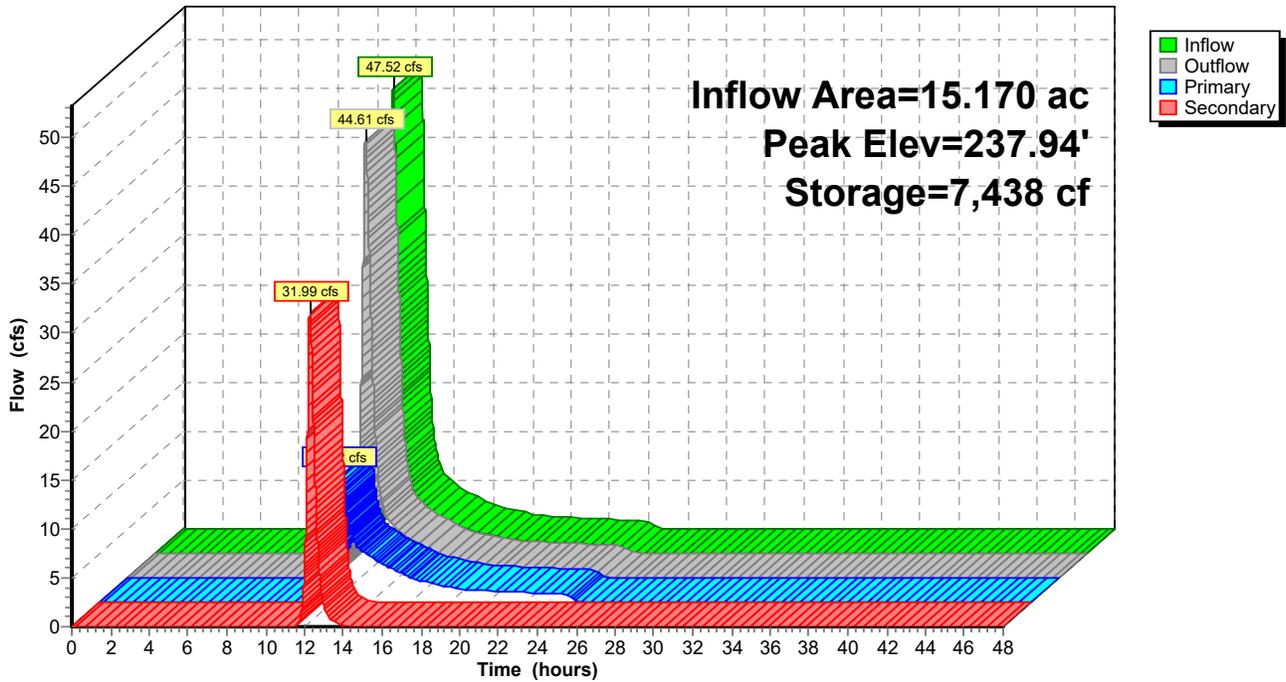
Device	Routing	Invert	Outlet Devices
#1	Device 2	236.50'	48.0" W x 24.0" H Vert. Orifice/Grate C= 0.600
#2	Primary	230.00'	15.0" Round 15" CPP L= 72.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 230.00' / 229.64' S= 0.0050 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#3	Secondary	237.00'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 Width (feet) 10.00 12.00

Primary OutFlow Max=12.61 cfs @ 12.27 hrs HW=237.94' (Free Discharge)
 ↳ **2=15" CPP** (Inlet Controls 12.61 cfs @ 10.28 fps)
 ↳ ↳ **1=Orifice/Grate** (Passes 12.61 cfs of 22.13 cfs potential flow)

Secondary OutFlow Max=31.97 cfs @ 12.27 hrs HW=237.94' (Free Discharge)
 ↳ **3=Custom Weir/Orifice** (Weir Controls 31.97 cfs @ 3.12 fps)

Pond SWP2_Post: SW Pond 2

Hydrograph



Summary for Pond SWPT_Post: SW Pre Treat

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

[93] Warning: Storage range exceeded by 0.12'

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=11)

Inflow Area = 14.950 ac, 2.75% Impervious, Inflow Depth = 3.66" for 100-yr (Hampden) event
 Inflow = 44.22 cfs @ 12.26 hrs, Volume= 4.565 af
 Outflow = 47.02 cfs @ 12.27 hrs, Volume= 4.555 af, Atten= 0%, Lag= 0.3 min
 Primary = 32.97 cfs @ 12.27 hrs, Volume= 4.381 af
 Secondary = 14.05 cfs @ 12.27 hrs, Volume= 0.174 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 244.12' @ 12.27 hrs Surf.Area= 1,045 sf Storage= 2,033 cf

Plug-Flow detention time= 3.2 min calculated for 4.554 af (100% of inflow)
 Center-of-Mass det. time= 1.8 min (842.9 - 841.2)

Volume	Invert	Avail.Storage	Storage Description
#1	241.00'	2,033 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
241.00	383	0	0
242.00	559	471	471
243.00	760	660	1,131
244.00	1,045	903	2,033

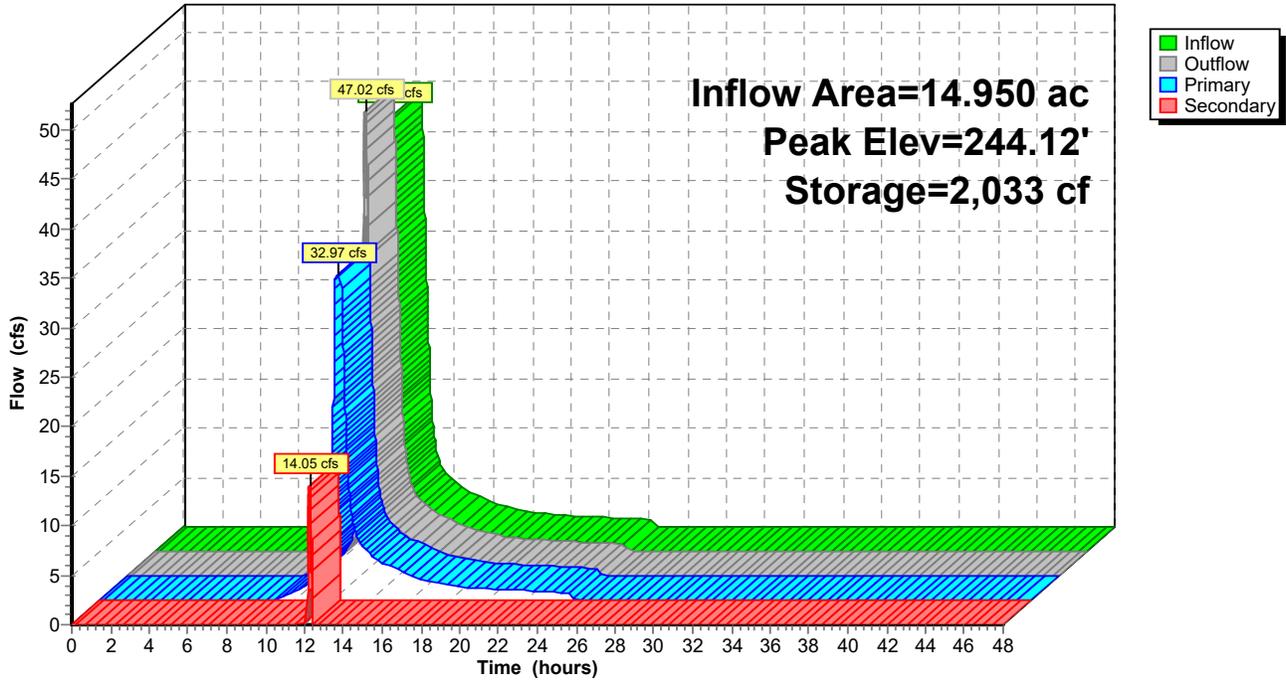
Device	Routing	Invert	Outlet Devices
#1	Device 2	242.00'	48.0" W x 24.0" H Vert. Orifice/Grate C= 0.600
#2	Primary	235.50'	24.0" Round 24" CPP L= 66.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.50' / 234.84' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#3	Secondary	244.00'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 Width (feet) 100.00 100.00

Primary OutFlow Max=32.97 cfs @ 12.27 hrs HW=244.12' (Free Discharge)
 ↑ **2=24" CPP** (Inlet Controls 32.97 cfs @ 10.49 fps)
 ↑ **1=Orifice/Grate** (Passes 32.97 cfs of 39.14 cfs potential flow)

Secondary OutFlow Max=13.96 cfs @ 12.27 hrs HW=244.12' (Free Discharge)
 ↑ **3=Custom Weir/Orifice** (Weir Controls 13.96 cfs @ 1.14 fps)

Pond SWPT_Post: SW Pre Treat

Hydrograph



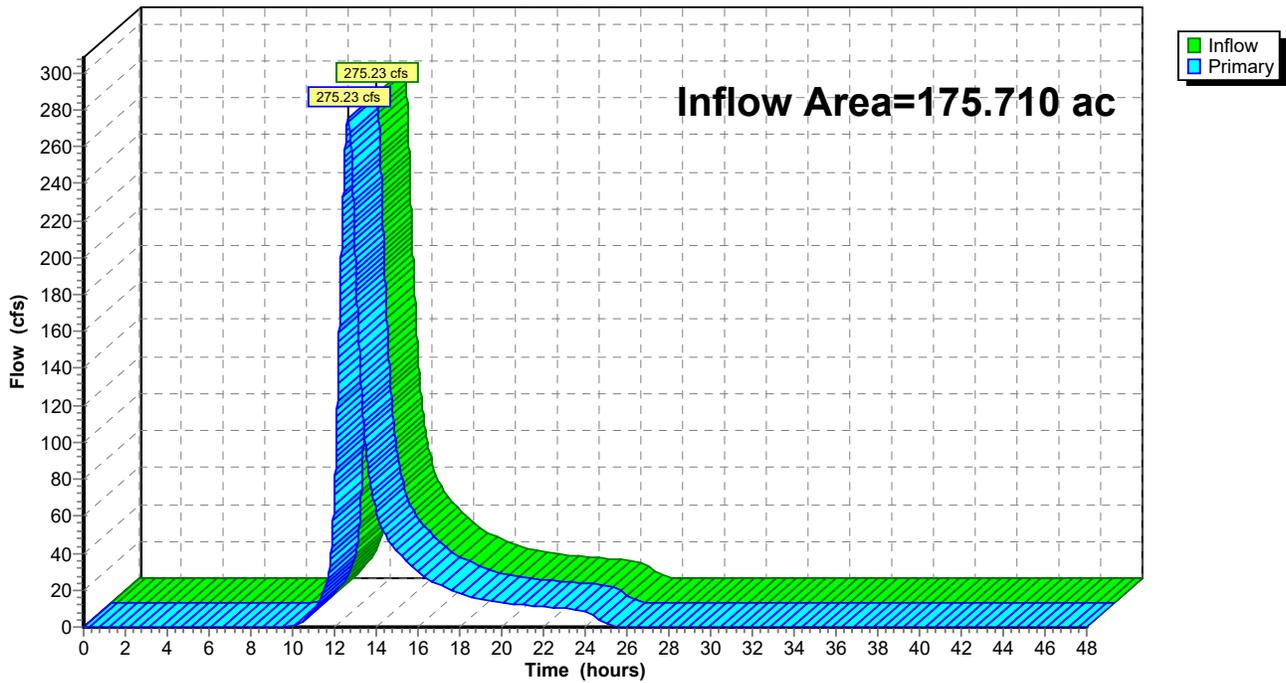
Summary for Link POA_Post: Point of Analysis

Inflow Area = 175.710 ac, 3.58% Impervious, Inflow Depth = 3.17" for 100-yr (Hampden) event
Inflow = 275.23 cfs @ 12.65 hrs, Volume= 46.471 af
Primary = 275.23 cfs @ 12.65 hrs, Volume= 46.471 af, Atten= 0%, Lag= 0.0 min

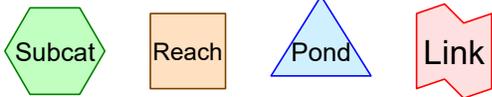
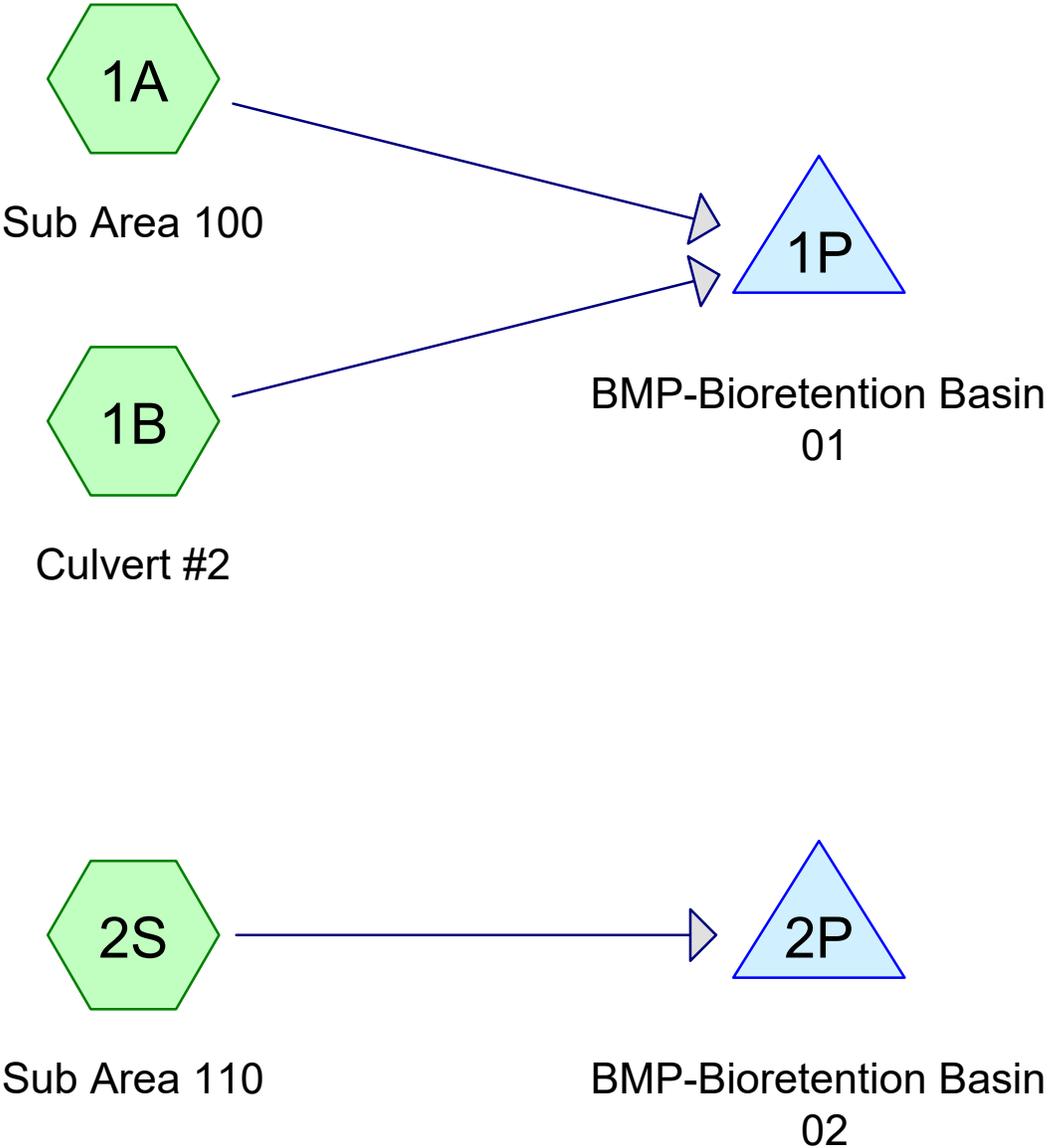
Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link POA_Post: Point of Analysis

Hydrograph



POST-DEVELOPMENT



Summary for Subcatchment 1A: Sub Area 100

Runoff = 2.15 cfs @ 12.14 hrs, Volume= 0.176 af, Depth= 1.40"

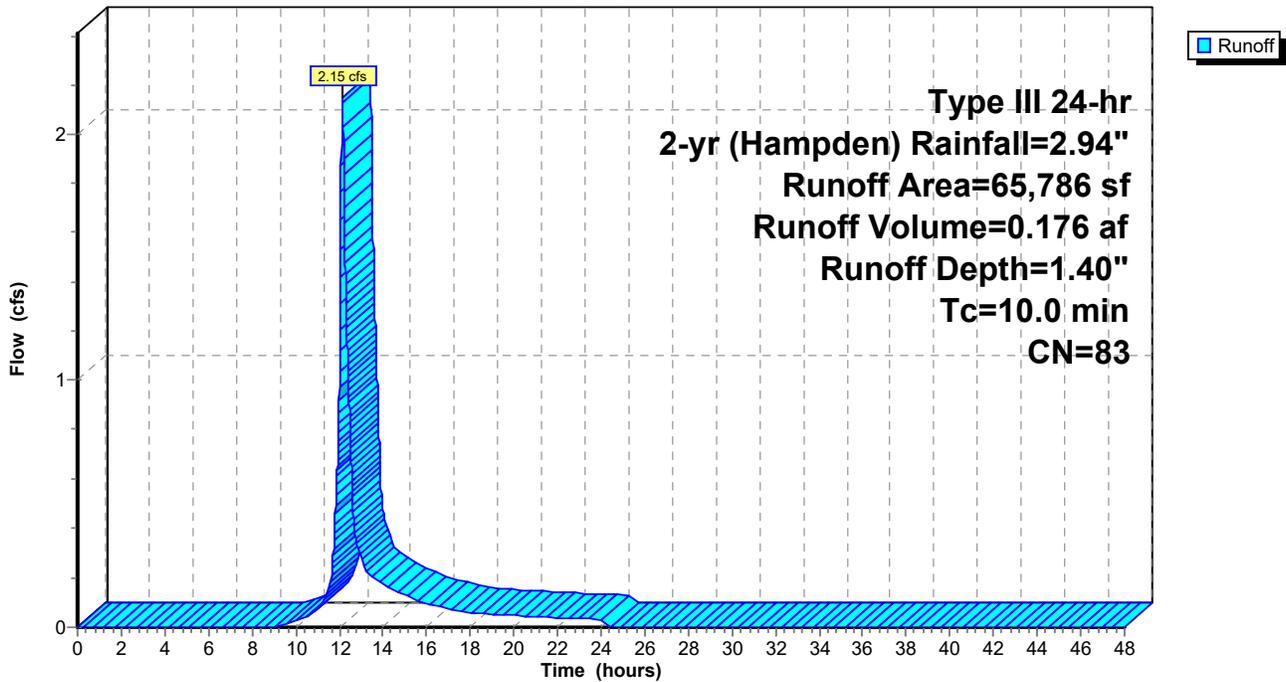
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (sf)	CN	Description
61,506	85	Gravel roads, HSG B
4,280	60	Woods, Fair, HSG B
65,786	83	Weighted Average
65,786		100.00% Pervious Area

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

Subcatchment 1A: Sub Area 100

Hydrograph



Summary for Subcatchment 1B: Culvert #2

Runoff = 7.10 cfs @ 12.08 hrs, Volume= 0.487 af, Depth= 1.54"

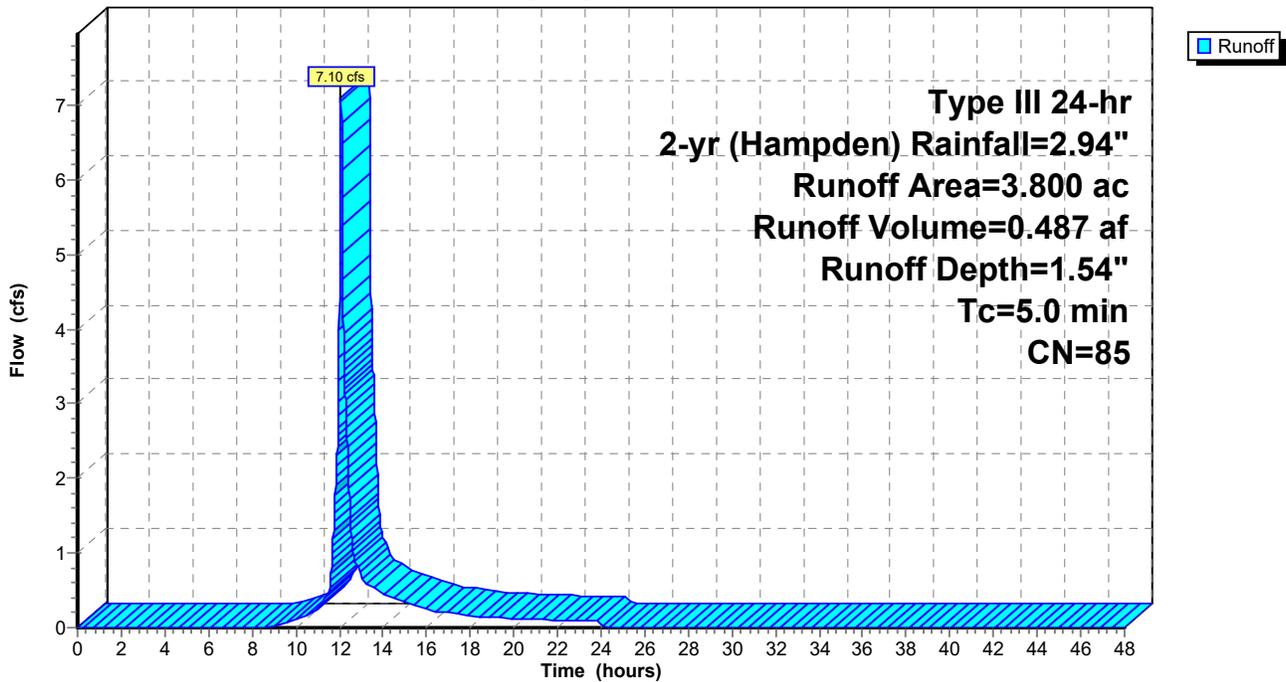
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (ac)	CN	Description
3.800	85	Gravel roads, HSG B
3.800		100.00% Pervious Area

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

Subcatchment 1B: Culvert #2

Hydrograph



Summary for Subcatchment 2S: Sub Area 110

Runoff = 3.24 cfs @ 12.53 hrs, Volume= 0.557 af, Depth= 0.44"

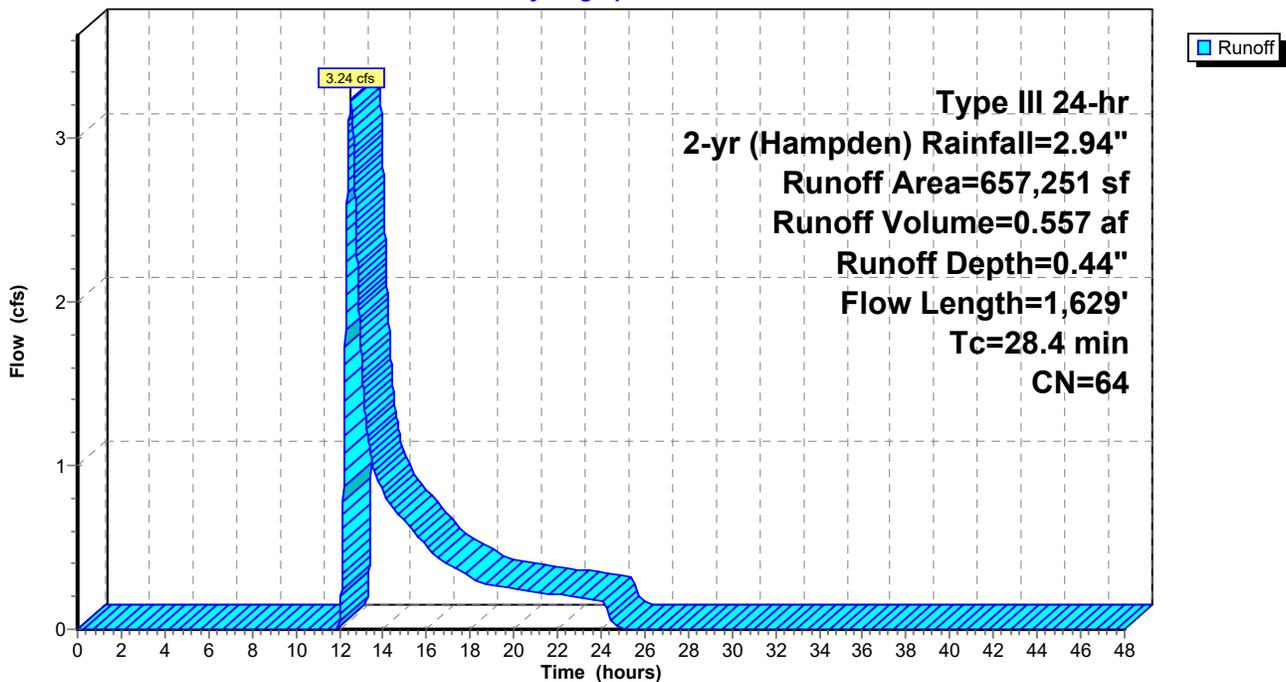
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr (Hampden) Rainfall=2.94"

Area (sf)	CN	Description
93,268	85	Gravel roads, HSG B
563,983	60	Woods, Fair, HSG B
657,251	64	Weighted Average
657,251		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	36	0.0700	0.06		Sheet Flow, 1-Woods Woods: Dense underbrush n= 0.800 P2= 2.94"
3.0	1,593	0.0660	8.76	105.15	Channel Flow, PR Swale 4 (Veg) Area= 12.0 sf Perim= 21.0' r= 0.57' n= 0.030 Earth, grassed & winding
15.0					Direct Entry, Stone Check Dams
28.4	1,629	Total			

Subcatchment 2S: Sub Area 110

Hydrograph



Summary for Pond 1P: BMP-Bioretention Basin 01

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 5.310 ac, 0.00% Impervious, Inflow Depth = 1.50" for 2-yr (Hampden) event
 Inflow = 8.87 cfs @ 12.08 hrs, Volume= 0.663 af
 Outflow = 5.72 cfs @ 12.20 hrs, Volume= 0.663 af, Atten= 36%, Lag= 7.0 min
 Discarded = 0.04 cfs @ 12.20 hrs, Volume= 0.007 af
 Primary = 5.67 cfs @ 12.20 hrs, Volume= 0.657 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 188.68' @ 12.20 hrs Surf.Area= 1,844 sf Storage= 3,542 cf

Plug-Flow detention time= 5.2 min calculated for 0.663 af (100% of inflow)
 Center-of-Mass det. time= 5.2 min (837.3 - 832.1)

Volume	Invert	Avail.Storage	Storage Description
#1	186.00'	6,259 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.00	888	0	0
187.00	1,170	1,029	1,029
188.00	1,550	1,360	2,389
189.00	1,983	1,767	4,156
190.00	2,223	2,103	6,259

Device	Routing	Invert	Outlet Devices
#1	Primary	183.00'	15.0" Round 15" Culvert L= 37.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 183.00' / 182.60' S= 0.0108 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	189.00'	10.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Device 1	188.50'	24.0" x 36.0" Horiz. Overflow CB 24"x36" Horz. Grate C= 0.600 Limited to weir flow at low heads
#4	Discarded	186.00'	1.000 in/hr Exfiltration over Surface area
#5	Device 1	183.20'	6.0" Round Underdrain X 2.00 L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 183.20' / 183.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.04 cfs @ 12.20 hrs HW=188.68' (Free Discharge)

4=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=5.67 cfs @ 12.20 hrs HW=188.68' (Free Discharge)

1=15" Culvert (Passes 5.67 cfs of 10.49 cfs potential flow)

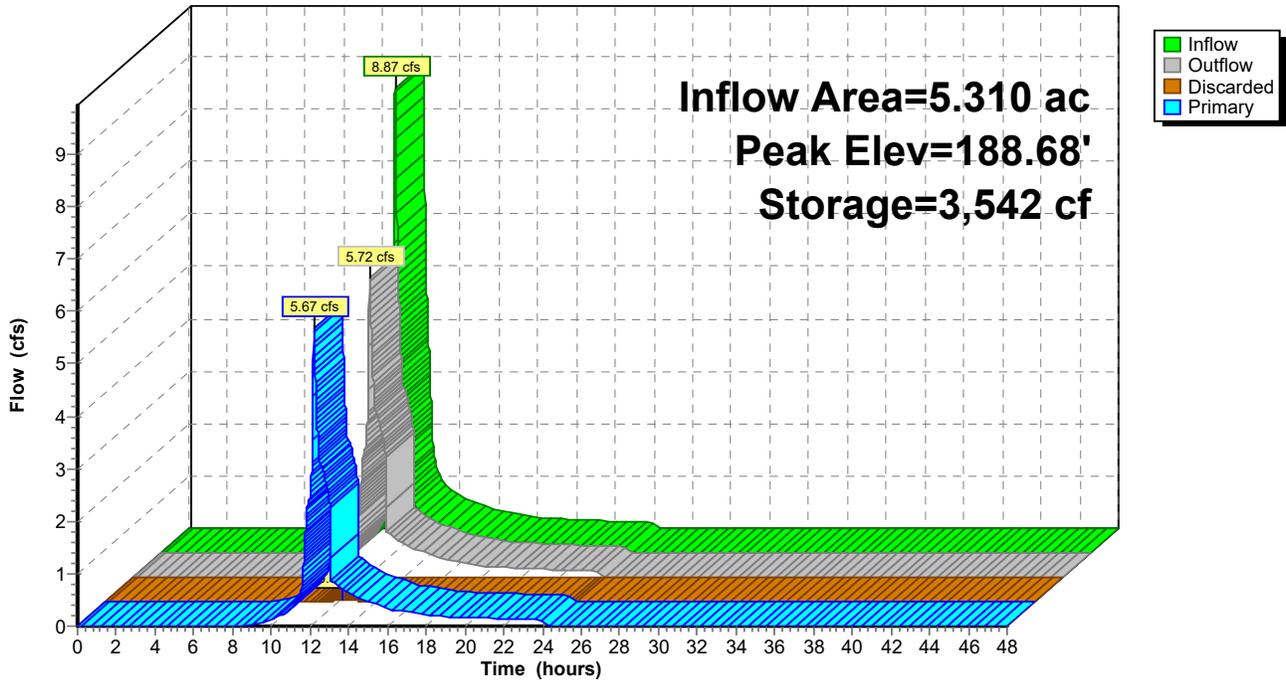
3=Overflow CB 24"x36" Horz. Grate (Weir Controls 2.48 cfs @ 1.38 fps)

5=Underdrain (Barrel Controls 3.19 cfs @ 8.12 fps)

2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: BMP-Bioretention Basin 01

Hydrograph



Summary for Pond 2P: BMP-Bioretenention Basin 02

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 15.088 ac, 0.00% Impervious, Inflow Depth = 0.44" for 2-yr (Hampden) event
 Inflow = 3.24 cfs @ 12.53 hrs, Volume= 0.557 af
 Outflow = 2.71 cfs @ 12.72 hrs, Volume= 0.557 af, Atten= 16%, Lag= 11.6 min
 Discarded = 0.02 cfs @ 12.72 hrs, Volume= 0.004 af
 Primary = 2.69 cfs @ 12.72 hrs, Volume= 0.552 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 233.69' @ 12.72 hrs Surf.Area= 975 sf Storage= 614 cf

Plug-Flow detention time= 0.8 min calculated for 0.557 af (100% of inflow)
 Center-of-Mass det. time= 0.8 min (931.0 - 930.1)

Volume	Invert	Avail.Storage	Storage Description
#1	233.00'	7,579 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
233.00	798	0	0
234.00	1,053	926	926
235.00	1,334	1,194	2,119
236.00	1,644	1,489	3,608
237.00	1,979	1,812	5,420
238.00	2,340	2,160	7,579

Device	Routing	Invert	Outlet Devices
#1	Primary	230.00'	15.0" Round 15" Culvert L= 72.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 230.00' / 229.64' S= 0.0050 '/ Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.23 sf
#2	Primary	237.00'	10.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Device 1	236.50'	24.0" x 36.0" Horiz. Overflow CB 24"x36" Horz. Grate C= 0.600 Limited to weir flow at low heads
#4	Discarded	233.00'	1.000 in/hr Exfiltration over Surface area
#5	Device 1	230.20'	6.0" Round Underdrain X 2.00 L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 230.20' / 230.00' S= 0.0050 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.02 cfs @ 12.72 hrs HW=233.69' (Free Discharge)

4=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.69 cfs @ 12.72 hrs HW=233.69' (Free Discharge)

1=15" Culvert (Passes 2.69 cfs of 5.79 cfs potential flow)

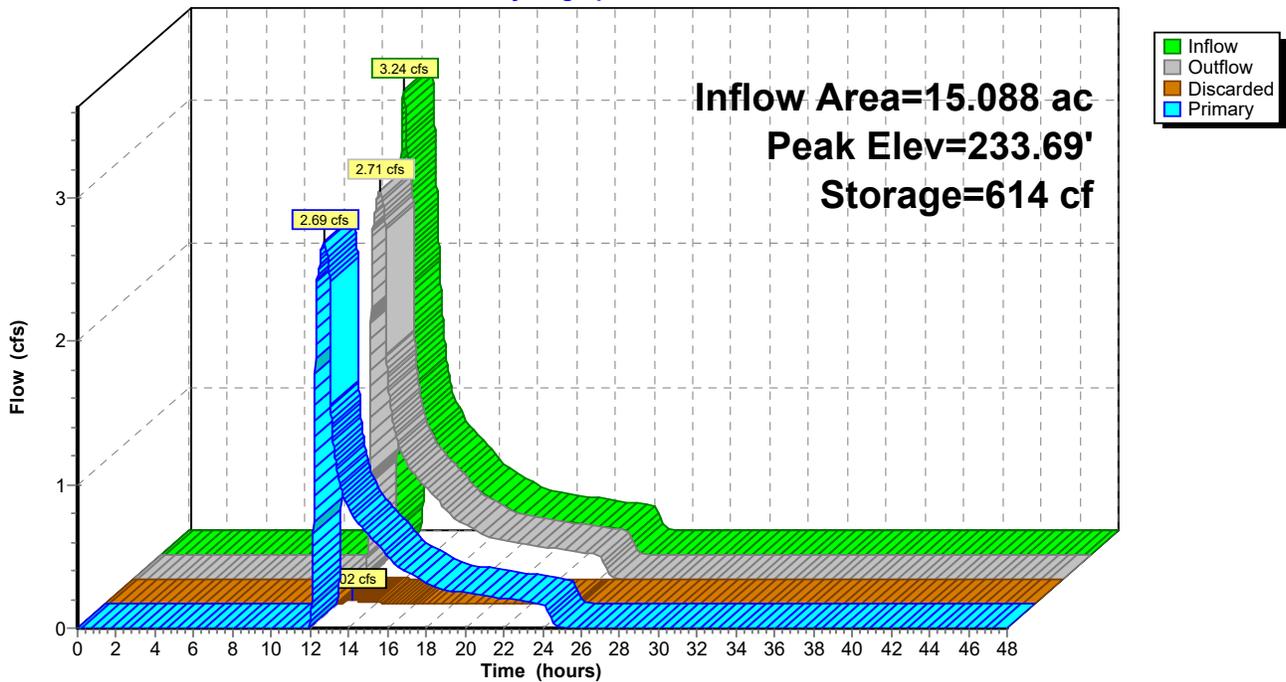
3=Overflow CB 24"x36" Horz. Grate (Controls 0.00 cfs)

5=Underdrain (Inlet Controls 2.69 cfs @ 6.84 fps)

2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: BMP-Bioretenention Basin 02

Hydrograph



Summary for Subcatchment 1A: Sub Area 100

Runoff = 4.18 cfs @ 12.14 hrs, Volume= 0.341 af, Depth= 2.71"

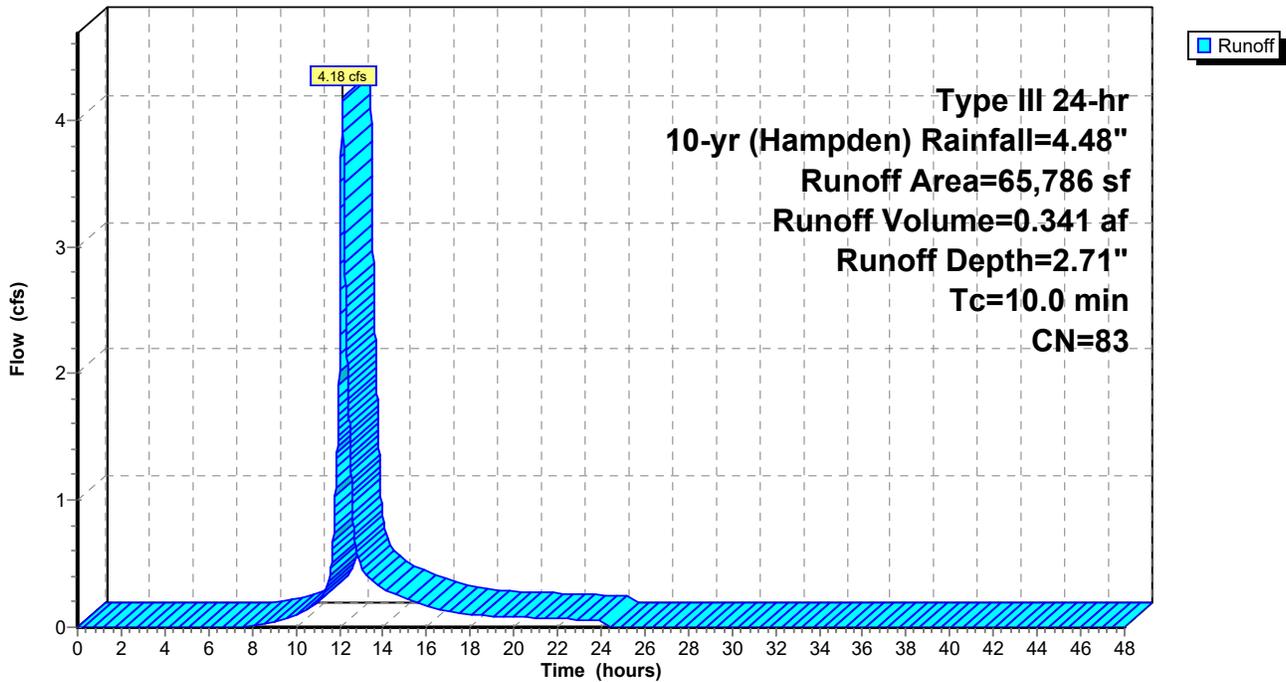
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (sf)	CN	Description
61,506	85	Gravel roads, HSG B
4,280	60	Woods, Fair, HSG B
65,786	83	Weighted Average
65,786		100.00% Pervious Area

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

Subcatchment 1A: Sub Area 100

Hydrograph



Summary for Subcatchment 1B: Culvert #2

Runoff = 13.27 cfs @ 12.07 hrs, Volume= 0.915 af, Depth= 2.89"

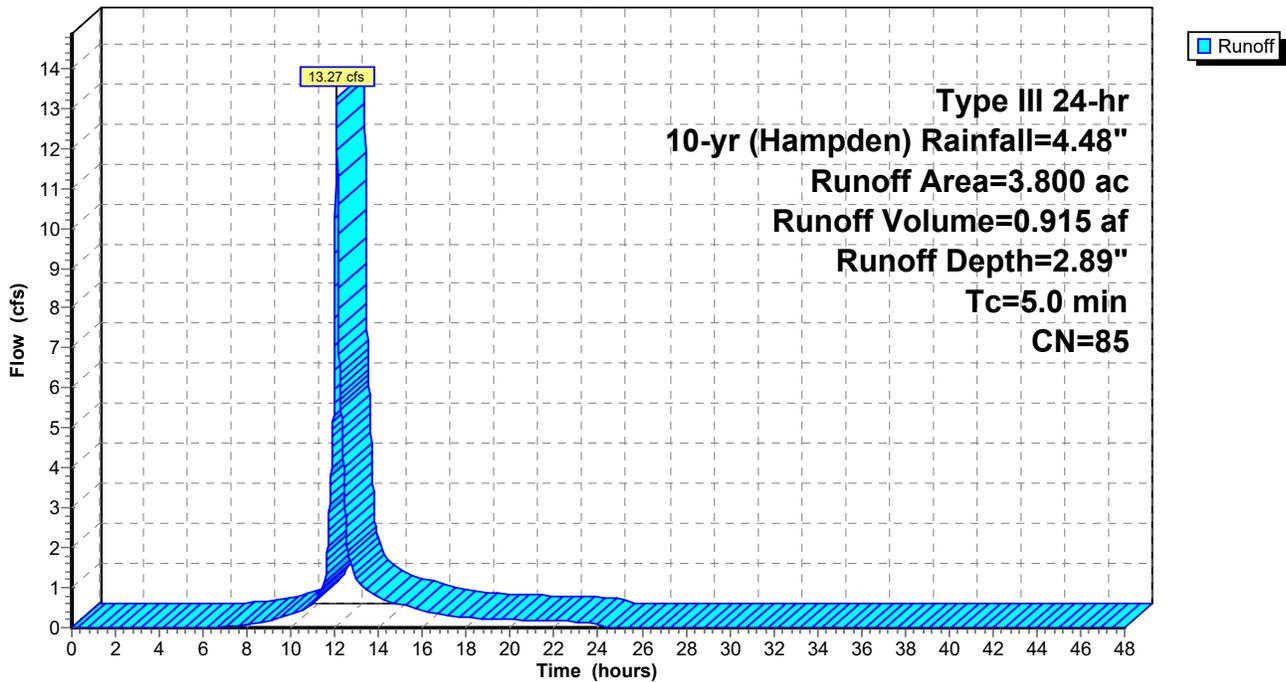
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (ac)	CN	Description
3.800	85	Gravel roads, HSG B
3.800		100.00% Pervious Area

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

Subcatchment 1B: Culvert #2

Hydrograph



Summary for Subcatchment 2S: Sub Area 110

Runoff = 11.73 cfs @ 12.44 hrs, Volume= 1.576 af, Depth= 1.25"

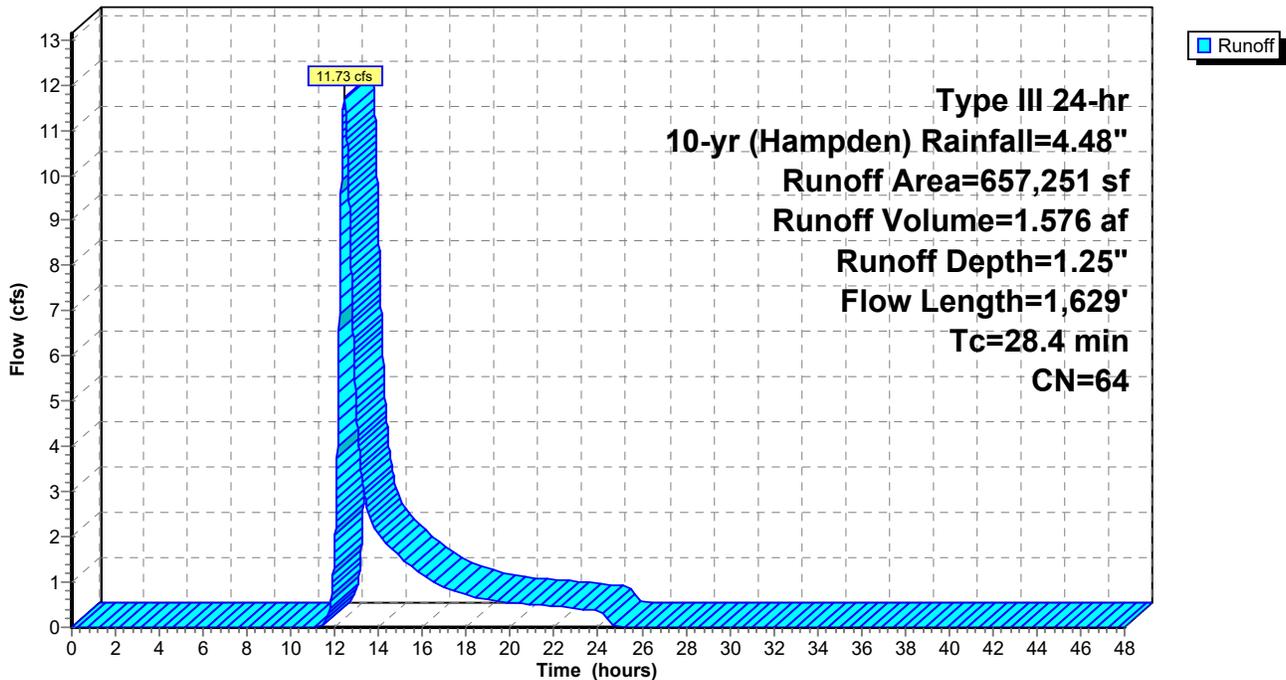
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (sf)	CN	Description
93,268	85	Gravel roads, HSG B
563,983	60	Woods, Fair, HSG B
657,251	64	Weighted Average
657,251		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	36	0.0700	0.06		Sheet Flow, 1-Woods Woods: Dense underbrush n= 0.800 P2= 2.94"
3.0	1,593	0.0660	8.76	105.15	Channel Flow, PR Swale 4 (Veg) Area= 12.0 sf Perim= 21.0' r= 0.57' n= 0.030 Earth, grassed & winding
15.0					Direct Entry, Stone Check Dams
28.4	1,629	Total			

Subcatchment 2S: Sub Area 110

Hydrograph



Summary for Pond 1P: BMP-Bioretenention Basin 01

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 5.310 ac, 0.00% Impervious, Inflow Depth = 2.84" for 10-yr (Hampden) event
 Inflow = 16.75 cfs @ 12.08 hrs, Volume= 1.256 af
 Outflow = 15.56 cfs @ 12.12 hrs, Volume= 1.256 af, Atten= 7%, Lag= 2.2 min
 Discarded = 0.05 cfs @ 12.12 hrs, Volume= 0.010 af
 Primary = 15.51 cfs @ 12.12 hrs, Volume= 1.246 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 189.32' @ 12.12 hrs Surf.Area= 2,059 sf Storage= 4,793 cf

Plug-Flow detention time= 4.7 min calculated for 1.256 af (100% of inflow)
 Center-of-Mass det. time= 4.7 min (818.5 - 813.9)

Volume	Invert	Avail.Storage	Storage Description
#1	186.00'	6,259 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.00	888	0	0
187.00	1,170	1,029	1,029
188.00	1,550	1,360	2,389
189.00	1,983	1,767	4,156
190.00	2,223	2,103	6,259

Device	Routing	Invert	Outlet Devices
#1	Primary	183.00'	15.0" Round 15" Culvert L= 37.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 183.00' / 182.60' S= 0.0108 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	189.00'	10.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Device 1	188.50'	24.0" x 36.0" Horiz. Overflow CB 24"x36" Horz. Grate C= 0.600 Limited to weir flow at low heads
#4	Discarded	186.00'	1.000 in/hr Exfiltration over Surface area
#5	Device 1	183.20'	6.0" Round Underdrain X 2.00 L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 183.20' / 183.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.05 cfs @ 12.12 hrs HW=189.31' (Free Discharge)

4=Exfiltration (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=15.49 cfs @ 12.12 hrs HW=189.31' (Free Discharge)

1=15" Culvert (Inlet Controls 11.13 cfs @ 9.07 fps)

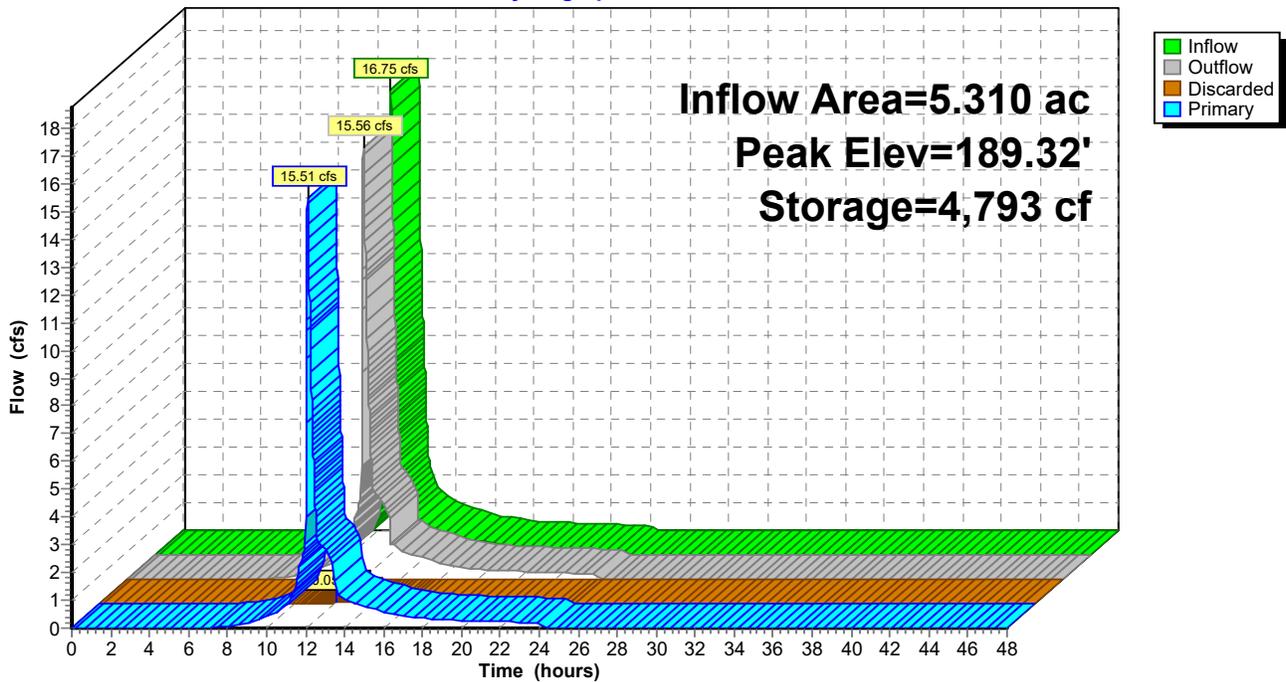
3=Overflow CB 24"x36" Horz. Grate (Passes < 24.04 cfs potential flow)

5=Underdrain (Passes < 3.38 cfs potential flow)

2=Broad-Crested Rectangular Weir (Weir Controls 4.36 cfs @ 1.39 fps)

Pond 1P: BMP-Bioretenention Basin 01

Hydrograph



Summary for Pond 2P: BMP-Bioretenion Basin 02

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 15.088 ac, 0.00% Impervious, Inflow Depth = 1.25" for 10-yr (Hampden) event
 Inflow = 11.73 cfs @ 12.44 hrs, Volume= 1.576 af
 Outflow = 11.23 cfs @ 12.53 hrs, Volume= 1.576 af, Atten= 4%, Lag= 5.1 min
 Discarded = 0.05 cfs @ 12.53 hrs, Volume= 0.012 af
 Primary = 11.18 cfs @ 12.53 hrs, Volume= 1.564 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 237.22' @ 12.53 hrs Surf.Area= 2,058 sf Storage= 5,863 cf

Plug-Flow detention time= 7.0 min calculated for 1.576 af (100% of inflow)
 Center-of-Mass det. time= 7.0 min (898.8 - 891.8)

Volume	Invert	Avail.Storage	Storage Description
#1	233.00'	7,579 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
233.00	798	0	0
234.00	1,053	926	926
235.00	1,334	1,194	2,119
236.00	1,644	1,489	3,608
237.00	1,979	1,812	5,420
238.00	2,340	2,160	7,579

Device	Routing	Invert	Outlet Devices
#1	Primary	230.00'	15.0" Round 15" Culvert L= 72.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 230.00' / 229.64' S= 0.0050 '/ Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.23 sf
#2	Primary	237.00'	10.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Device 1	236.50'	24.0" x 36.0" Horiz. Overflow CB 24"x36" Horiz. Grate C= 0.600 Limited to weir flow at low heads
#4	Discarded	233.00'	1.000 in/hr Exfiltration over Surface area
#5	Device 1	230.20'	6.0" Round Underdrain X 2.00 L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 230.20' / 230.00' S= 0.0050 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.05 cfs @ 12.53 hrs HW=237.22' (Free Discharge)

↳ 4=Exfiltration (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=11.16 cfs @ 12.53 hrs HW=237.22' (Free Discharge)

↳ 1=15" Culvert (Barrel Controls 8.70 cfs @ 7.09 fps)

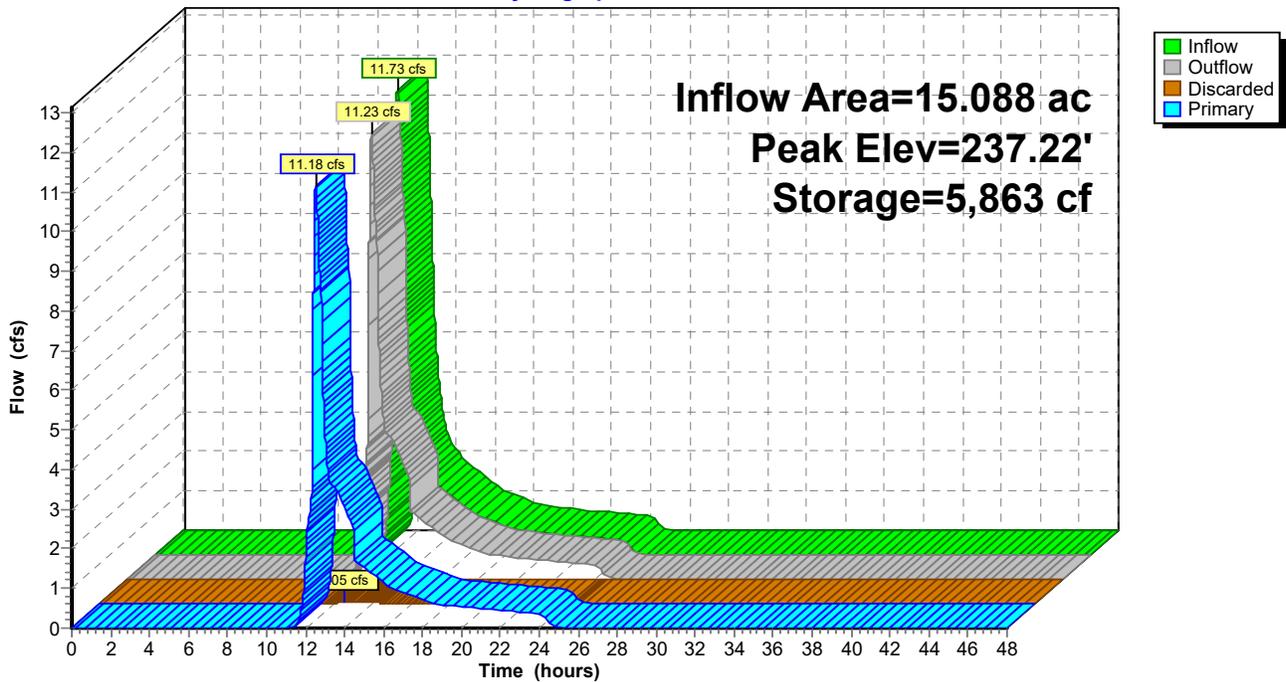
↳ 3=Overflow CB 24"x36" Horz. Grate (Passes < 19.96 cfs potential flow)

↳ 5=Underdrain (Passes < 3.88 cfs potential flow)

↳ 2=Broad-Crested Rectangular Weir (Weir Controls 2.46 cfs @ 1.12 fps)

Pond 2P: BMP-Bioretenention Basin 02

Hydrograph



Summary for Subcatchment 1A: Sub Area 100

Runoff = 7.55 cfs @ 12.14 hrs, Volume= 0.624 af, Depth= 4.96"

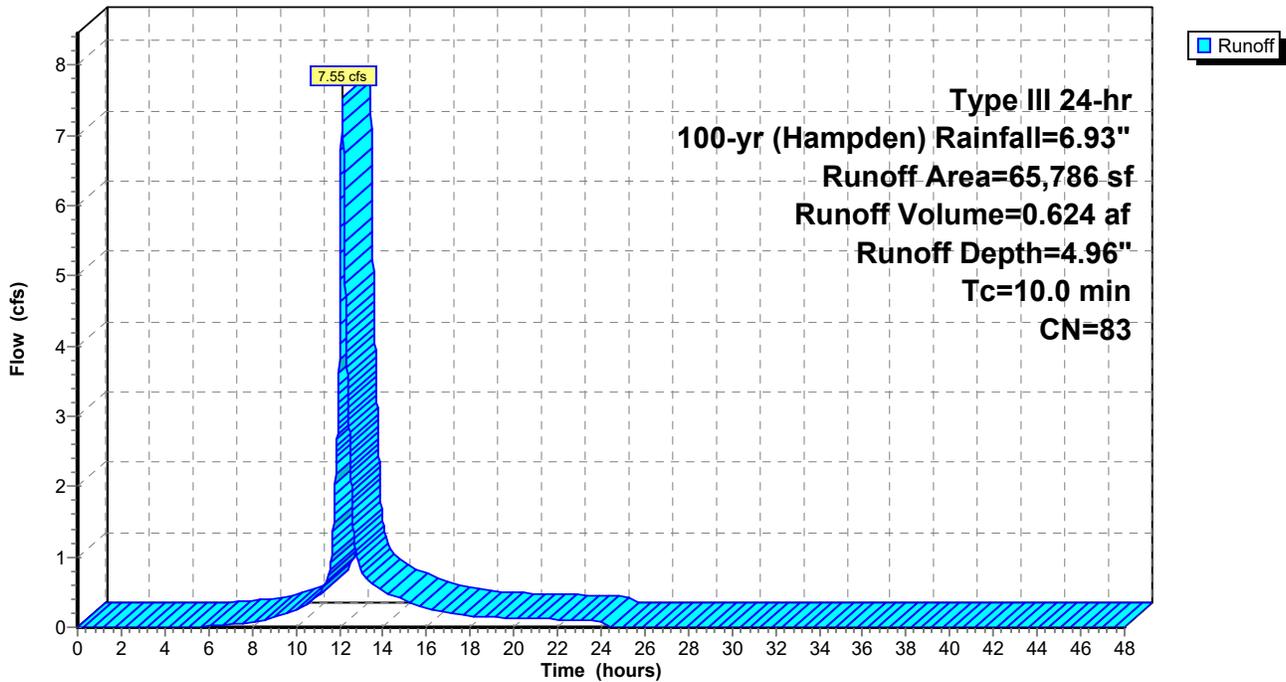
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (sf)	CN	Description
61,506	85	Gravel roads, HSG B
4,280	60	Woods, Fair, HSG B
65,786	83	Weighted Average
65,786		100.00% Pervious Area

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

Subcatchment 1A: Sub Area 100

Hydrograph



Summary for Subcatchment 1B: Culvert #2

Runoff = 23.29 cfs @ 12.07 hrs, Volume= 1.642 af, Depth= 5.19"

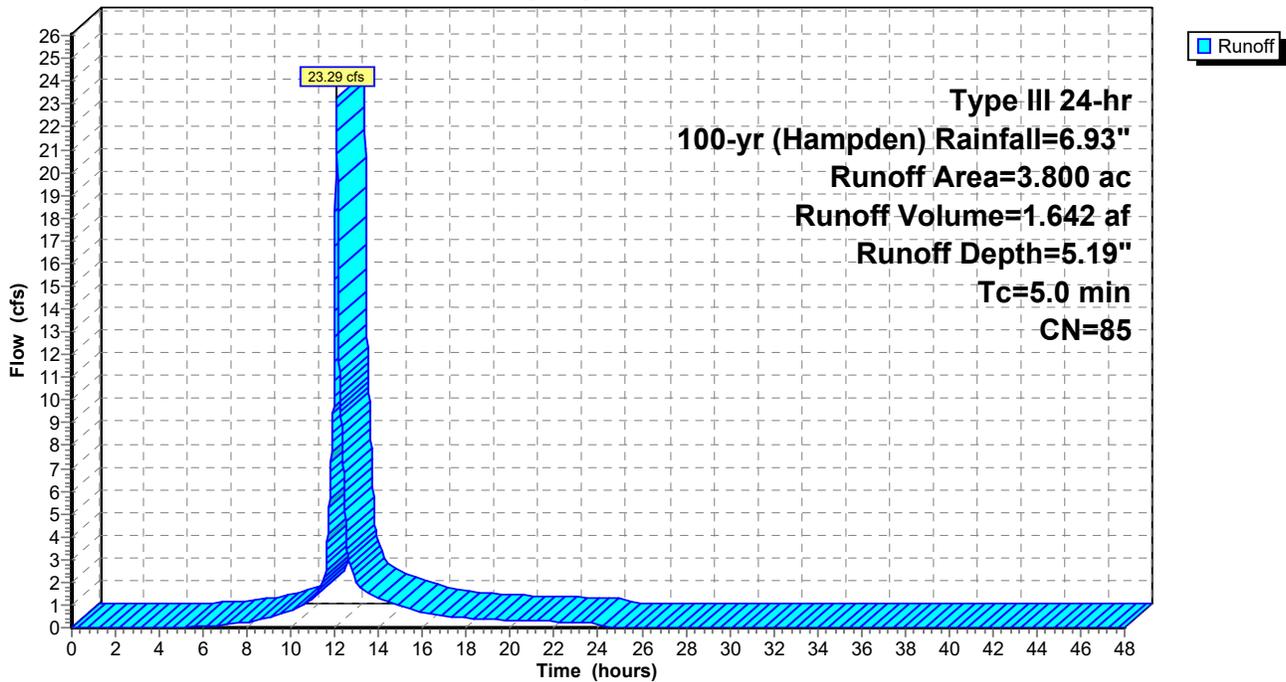
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (ac)	CN	Description
3.800	85	Gravel roads, HSG B
3.800		100.00% Pervious Area

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

Subcatchment 1B: Culvert #2

Hydrograph



Summary for Subcatchment 2S: Sub Area 110

Runoff = 29.77 cfs @ 12.40 hrs, Volume= 3.707 af, Depth= 2.95"

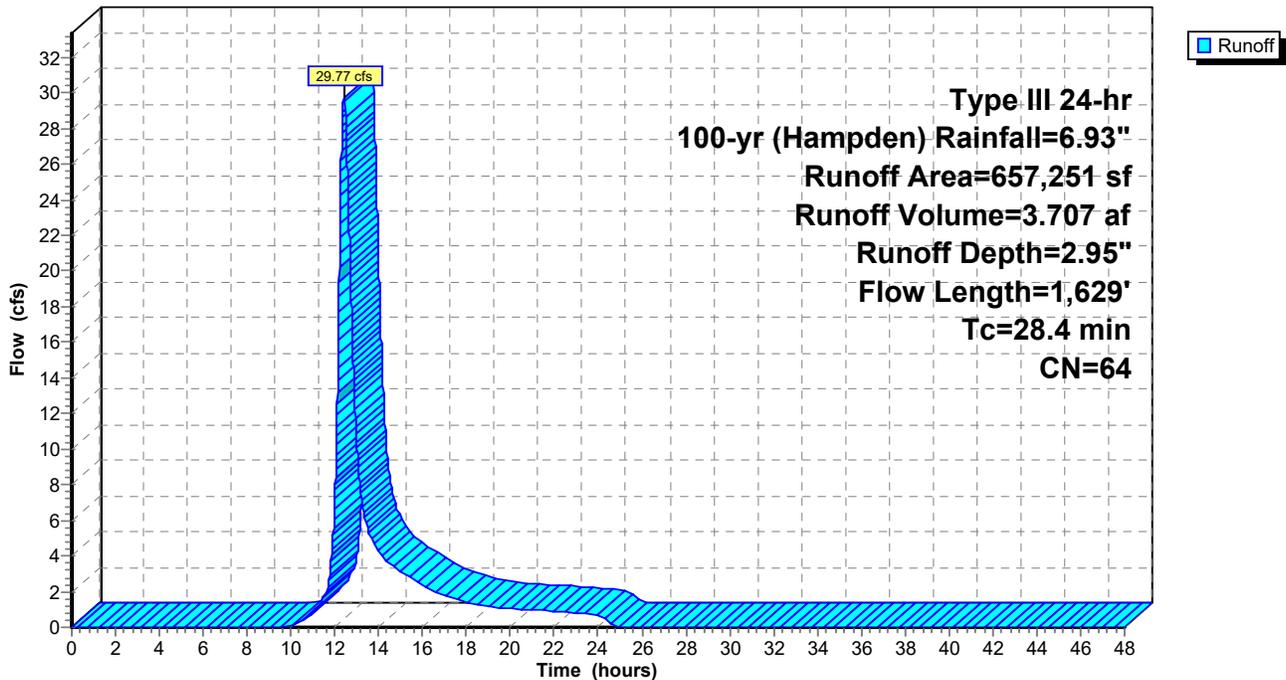
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr (Hampden) Rainfall=6.93"

Area (sf)	CN	Description
93,268	85	Gravel roads, HSG B
563,983	60	Woods, Fair, HSG B
657,251	64	Weighted Average
657,251		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	36	0.0700	0.06		Sheet Flow, 1-Woods Woods: Dense underbrush n= 0.800 P2= 2.94"
3.0	1,593	0.0660	8.76	105.15	Channel Flow, PR Swale 4 (Veg) Area= 12.0 sf Perim= 21.0' r= 0.57' n= 0.030 Earth, grassed & winding
15.0					Direct Entry, Stone Check Dams
28.4	1,629	Total			

Subcatchment 2S: Sub Area 110

Hydrograph



Summary for Pond 1P: BMP-Bioretention Basin 01

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 5.310 ac, 0.00% Impervious, Inflow Depth = 5.12" for 100-yr (Hampden) event
 Inflow = 29.61 cfs @ 12.08 hrs, Volume= 2.267 af
 Outflow = 29.01 cfs @ 12.10 hrs, Volume= 2.267 af, Atten= 2%, Lag= 1.1 min
 Discarded = 0.05 cfs @ 12.10 hrs, Volume= 0.016 af
 Primary = 28.96 cfs @ 12.10 hrs, Volume= 2.250 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 189.75' @ 12.10 hrs Surf.Area= 2,163 sf Storage= 5,710 cf

Plug-Flow detention time= 4.5 min calculated for 2.266 af (100% of inflow)
 Center-of-Mass det. time= 4.5 min (801.8 - 797.3)

Volume	Invert	Avail.Storage	Storage Description
#1	186.00'	6,259 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
186.00	888	0	0
187.00	1,170	1,029	1,029
188.00	1,550	1,360	2,389
189.00	1,983	1,767	4,156
190.00	2,223	2,103	6,259

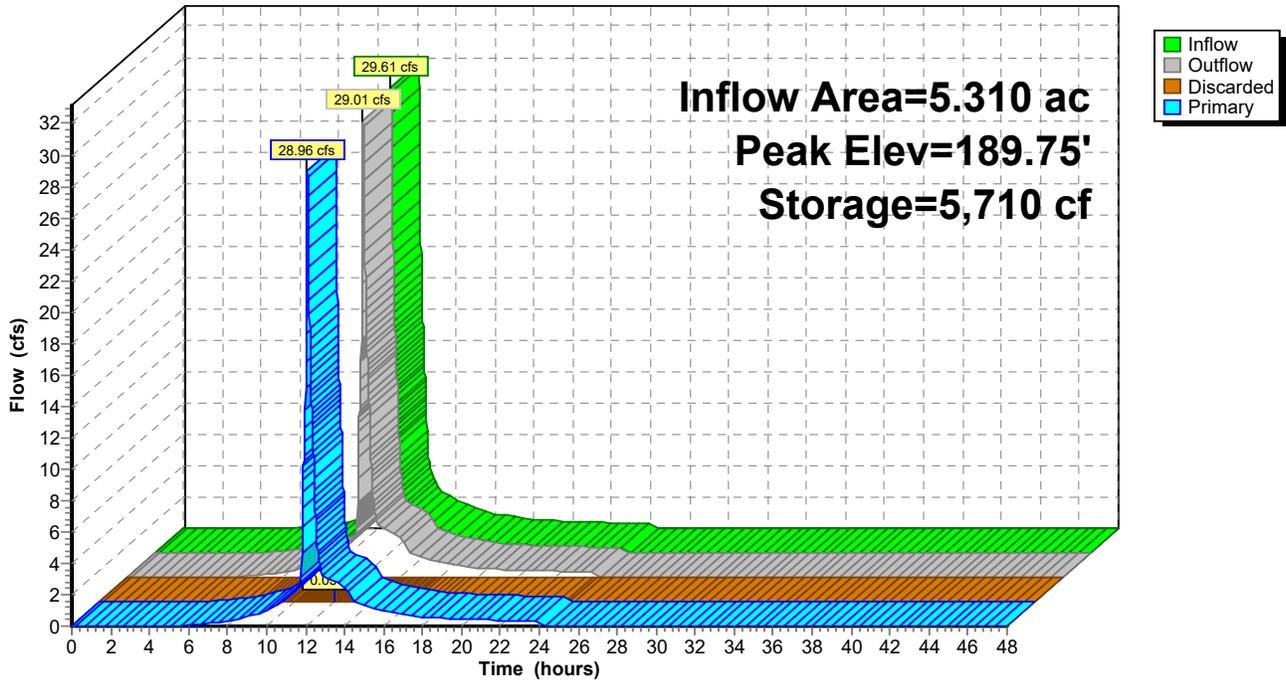
Device	Routing	Invert	Outlet Devices
#1	Primary	183.00'	15.0" Round 15" Culvert L= 37.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 183.00' / 182.60' S= 0.0108 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	189.00'	10.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Device 1	188.50'	24.0" x 36.0" Horiz. Overflow CB 24"x36" Horz. Grate C= 0.600 Limited to weir flow at low heads
#4	Discarded	186.00'	1.000 in/hr Exfiltration over Surface area
#5	Device 1	183.20'	6.0" Round Underdrain X 2.00 L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 183.20' / 183.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.05 cfs @ 12.10 hrs HW=189.75' (Free Discharge)
4=Exfiltration (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=28.94 cfs @ 12.10 hrs HW=189.75' (Free Discharge)
1=15" Culvert (Inlet Controls 11.54 cfs @ 9.41 fps)
3=Overflow CB 24"x36" Horz. Grate (Passes < 32.29 cfs potential flow)
5=Underdrain (Passes < 3.50 cfs potential flow)
2=Broad-Crested Rectangular Weir (Weir Controls 17.39 cfs @ 2.32 fps)

Pond 1P: BMP-Bioretenention Basin 01

Hydrograph



Summary for Pond 2P: BMP-Bioretenion Basin 02

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 15.088 ac, 0.00% Impervious, Inflow Depth = 2.95" for 100-yr (Hampden) event
 Inflow = 29.77 cfs @ 12.40 hrs, Volume= 3.707 af
 Outflow = 29.67 cfs @ 12.43 hrs, Volume= 3.707 af, Atten= 0%, Lag= 1.4 min
 Discarded = 0.05 cfs @ 12.43 hrs, Volume= 0.022 af
 Primary = 29.62 cfs @ 12.43 hrs, Volume= 3.685 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 237.84' @ 12.43 hrs Surf.Area= 2,281 sf Storage= 7,202 cf

Plug-Flow detention time= 7.1 min calculated for 3.706 af (100% of inflow)
 Center-of-Mass det. time= 7.1 min (872.6 - 865.5)

Volume	Invert	Avail.Storage	Storage Description
#1	233.00'	7,579 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
233.00	798	0	0
234.00	1,053	926	926
235.00	1,334	1,194	2,119
236.00	1,644	1,489	3,608
237.00	1,979	1,812	5,420
238.00	2,340	2,160	7,579

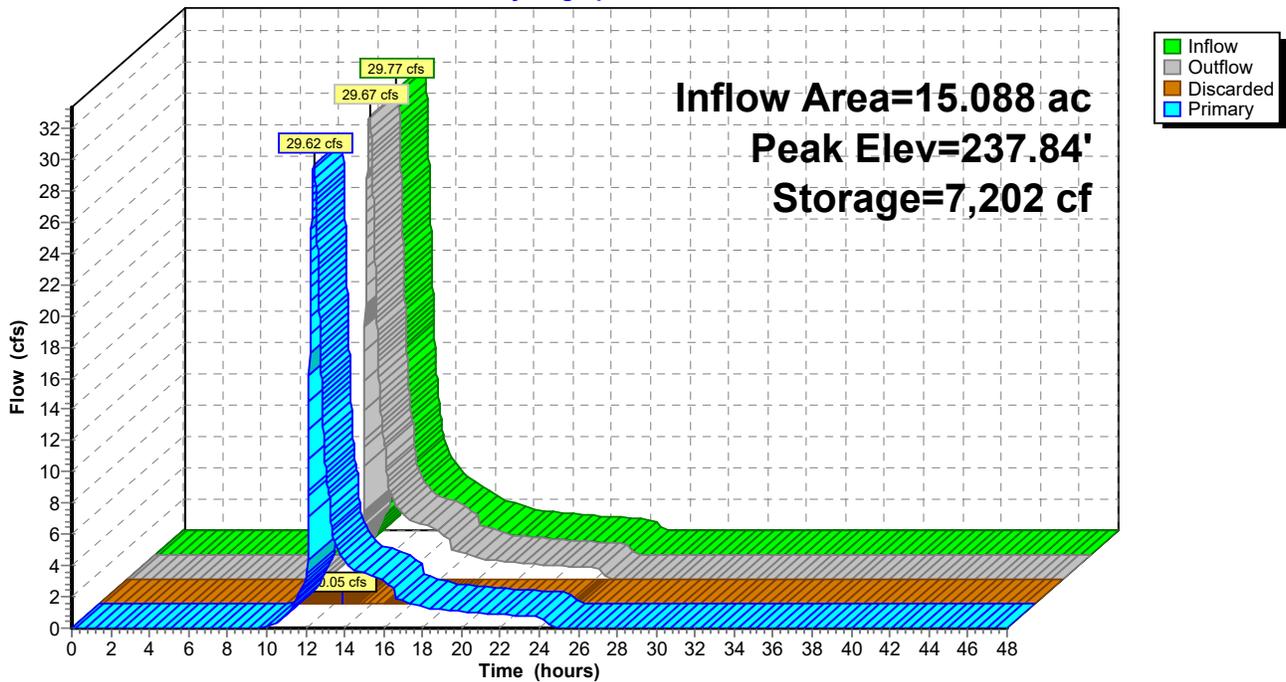
Device	Routing	Invert	Outlet Devices
#1	Primary	230.00'	15.0" Round 15" Culvert L= 72.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 230.00' / 229.64' S= 0.0050 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.23 sf
#2	Primary	237.00'	10.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Device 1	236.50'	24.0" x 36.0" Horiz. Overflow CB 24"x36" Horz. Grate C= 0.600 Limited to weir flow at low heads
#4	Discarded	233.00'	1.000 in/hr Exfiltration over Surface area
#5	Device 1	230.20'	6.0" Round Underdrain X 2.00 L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 230.20' / 230.00' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.05 cfs @ 12.43 hrs HW=237.84' (Free Discharge)
4=Exfiltration (Exfiltration Controls 0.05 cfs)

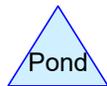
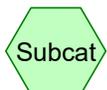
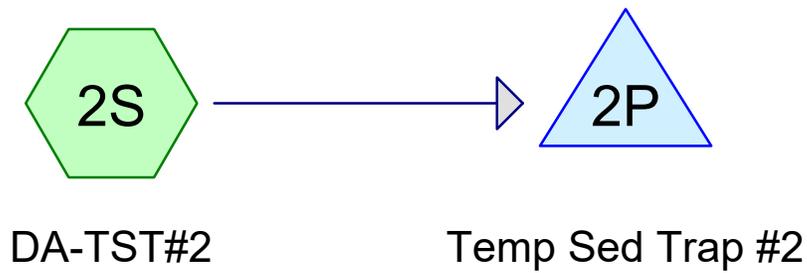
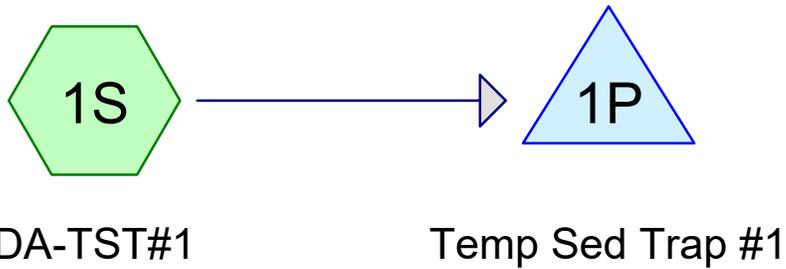
Primary OutFlow Max=29.61 cfs @ 12.43 hrs HW=237.84' (Free Discharge)
1=15" Culvert (Barrel Controls 9.11 cfs @ 7.43 fps)
3=Overflow CB 24"x36" Horz. Grate (Passes < 33.40 cfs potential flow)
5=Underdrain (Passes < 4.06 cfs potential flow)
2=Broad-Crested Rectangular Weir (Weir Controls 20.50 cfs @ 2.45 fps)

Pond 2P: BMP-Bioretenention Basin 02

Hydrograph



EROSION & SEDIMENTATION CONTROL



Summary for Subcatchment 1S: DA-TST#1

Runoff = 4.18 cfs @ 12.14 hrs, Volume= 0.341 af, Depth= 2.71"

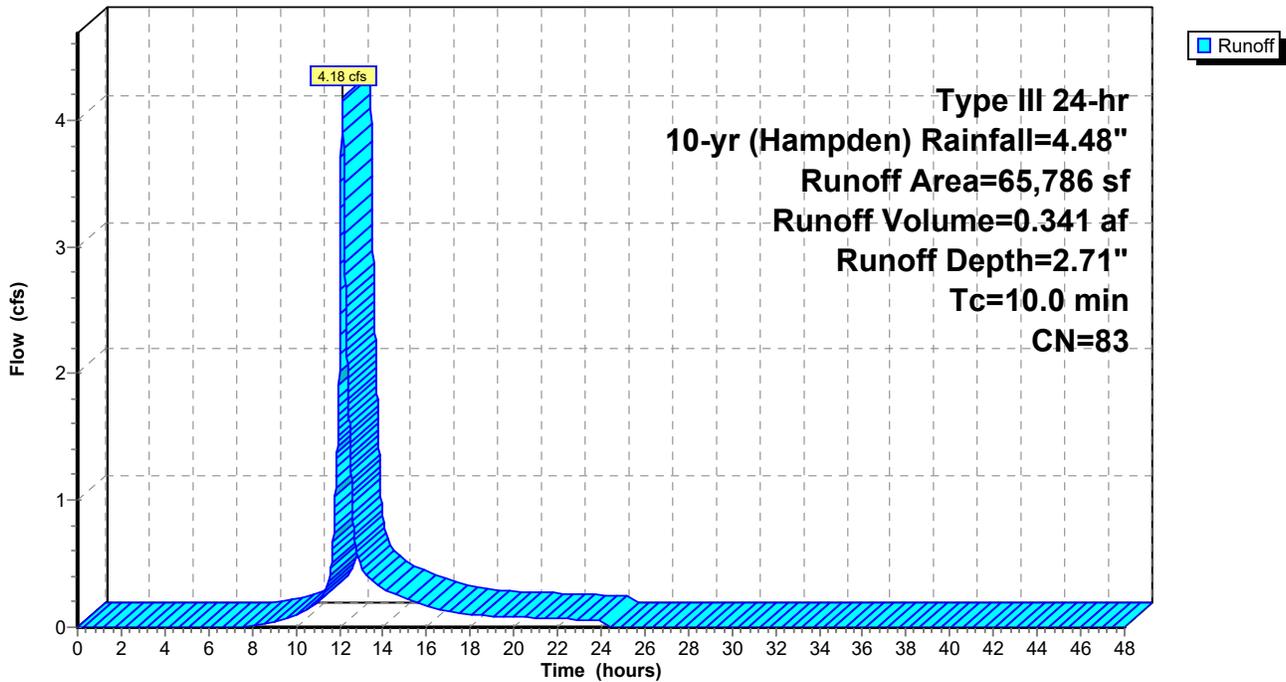
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (sf)	CN	Description
4,280	60	Woods, Fair, HSG B
61,506	85	Gravel roads, HSG B
65,786	83	Weighted Average
65,786		100.00% Pervious Area

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

Subcatchment 1S: DA-TST#1

Hydrograph



Summary for Subcatchment 2S: DA-TST#2

Runoff = 4.08 cfs @ 12.41 hrs, Volume= 0.516 af, Depth= 2.89"

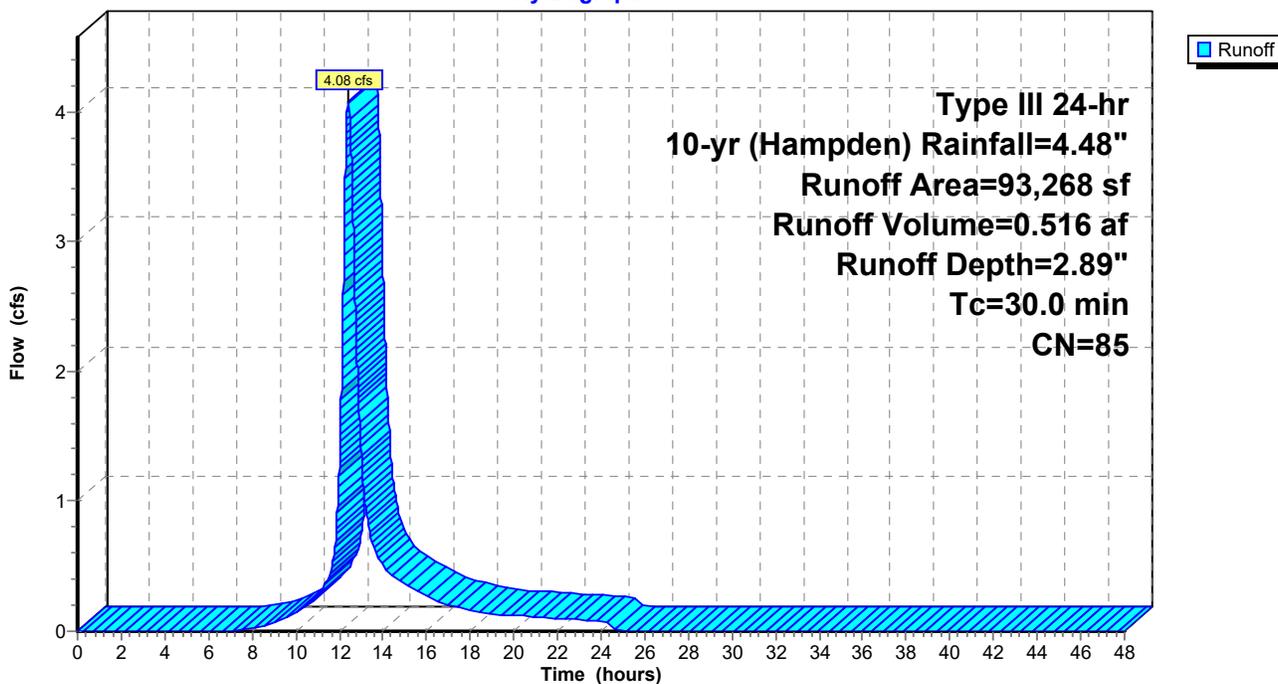
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr (Hampden) Rainfall=4.48"

Area (sf)	CN	Description
87,268	85	Gravel roads, HSG B
6,000	85	Gravel roads, HSG B
93,268	85	Weighted Average
93,268		100.00% Pervious Area

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

Subcatchment 2S: DA-TST#2

Hydrograph



Summary for Pond 1P: Temp Sed Trap #1

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 1.510 ac, 0.00% Impervious, Inflow Depth = 2.71" for 10-yr (Hampden) event
 Inflow = 4.18 cfs @ 12.14 hrs, Volume= 0.341 af
 Outflow = 2.49 cfs @ 12.30 hrs, Volume= 0.227 af, Atten= 41%, Lag= 9.9 min
 Primary = 2.49 cfs @ 12.30 hrs, Volume= 0.227 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 189.40' @ 12.30 hrs Surf.Area= 2,107 sf Storage= 5,770 cf

Plug-Flow detention time= 174.5 min calculated for 0.227 af (67% of inflow)
 Center-of-Mass det. time= 74.8 min (896.5 - 821.7)

Volume	Invert	Avail.Storage	Storage Description
#1	185.00'	7,100 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

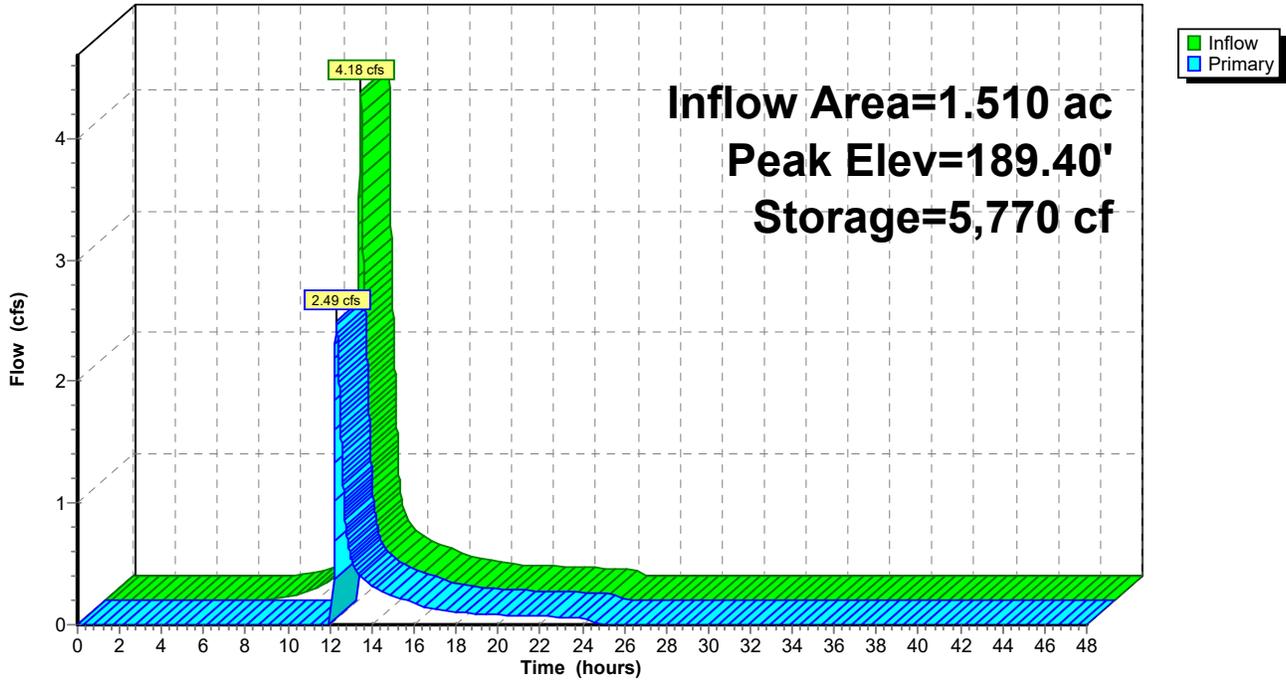
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
185.00	587	0	0
186.00	902	745	745
188.00	1,548	2,450	3,195
189.00	1,983	1,766	4,960
190.00	2,297	2,140	7,100

Device	Routing	Invert	Outlet Devices
#1	Primary	189.00'	4.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=2.49 cfs @ 12.30 hrs HW=189.40' (Free Discharge)
 ↳ **1=Broad-Crested Rectangular Weir**(Weir Controls 2.49 cfs @ 1.57 fps)

Pond 1P: Temp Sed Trap #1

Hydrograph



Summary for Pond 2P: Temp Sed Trap #2

Stage-area for elev 186 assumed based on culvert inverts.

Stage-area for elev 188-192 from civil survey.

Stage-area for elev 194 from KLF surface.

Inflow Area = 2.141 ac, 0.00% Impervious, Inflow Depth = 2.89" for 10-yr (Hampden) event
 Inflow = 4.08 cfs @ 12.41 hrs, Volume= 0.516 af
 Outflow = 3.98 cfs @ 12.47 hrs, Volume= 0.404 af, Atten= 2%, Lag= 3.6 min
 Primary = 3.98 cfs @ 12.47 hrs, Volume= 0.404 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 244.52' @ 12.47 hrs Surf.Area= 1,998 sf Storage= 5,884 cf

Plug-Flow detention time= 130.5 min calculated for 0.404 af (78% of inflow)
 Center-of-Mass det. time= 50.2 min (884.3 - 834.1)

Volume	Invert	Avail.Storage	Storage Description
#1	240.00'	6,875 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

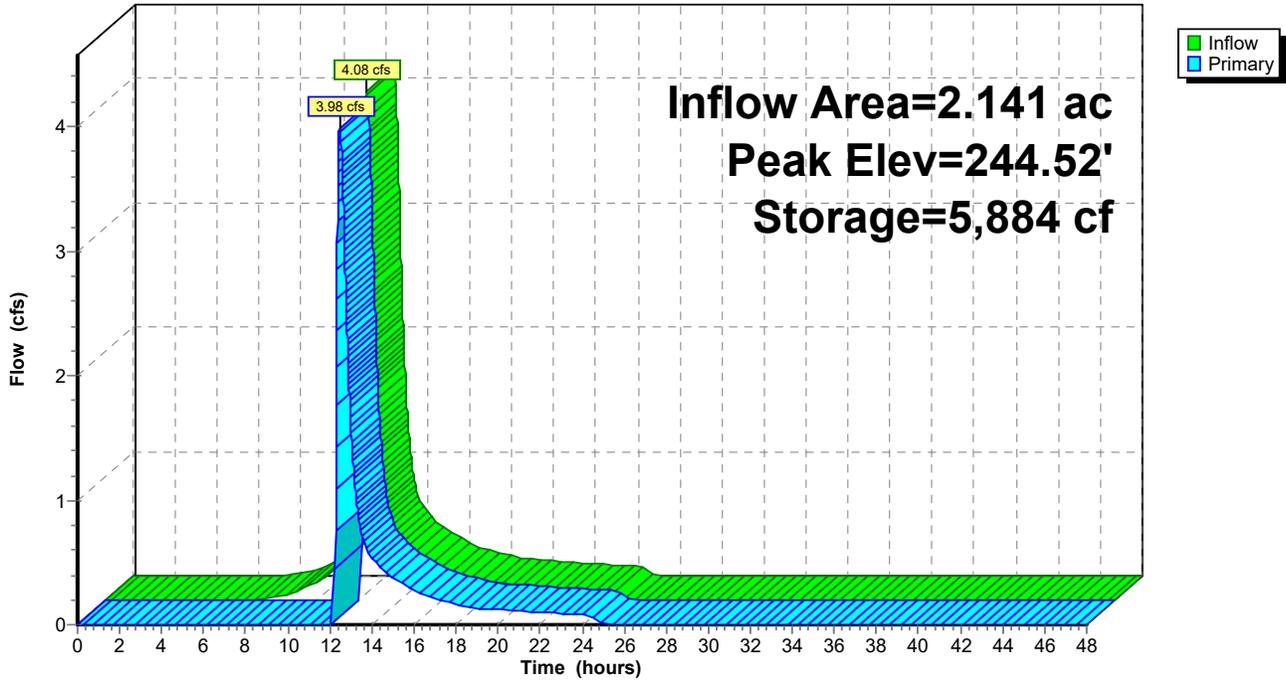
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
240.00	655	0	0
243.00	1,497	3,228	3,228
244.00	1,817	1,657	4,885
245.00	2,162	1,990	6,875

Device	Routing	Invert	Outlet Devices
#1	Primary	244.00'	4.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=3.98 cfs @ 12.47 hrs HW=244.52' (Free Discharge)
 ↳ **1=Broad-Crested Rectangular Weir**(Weir Controls 3.98 cfs @ 1.90 fps)

Pond 2P: Temp Sed Trap #2

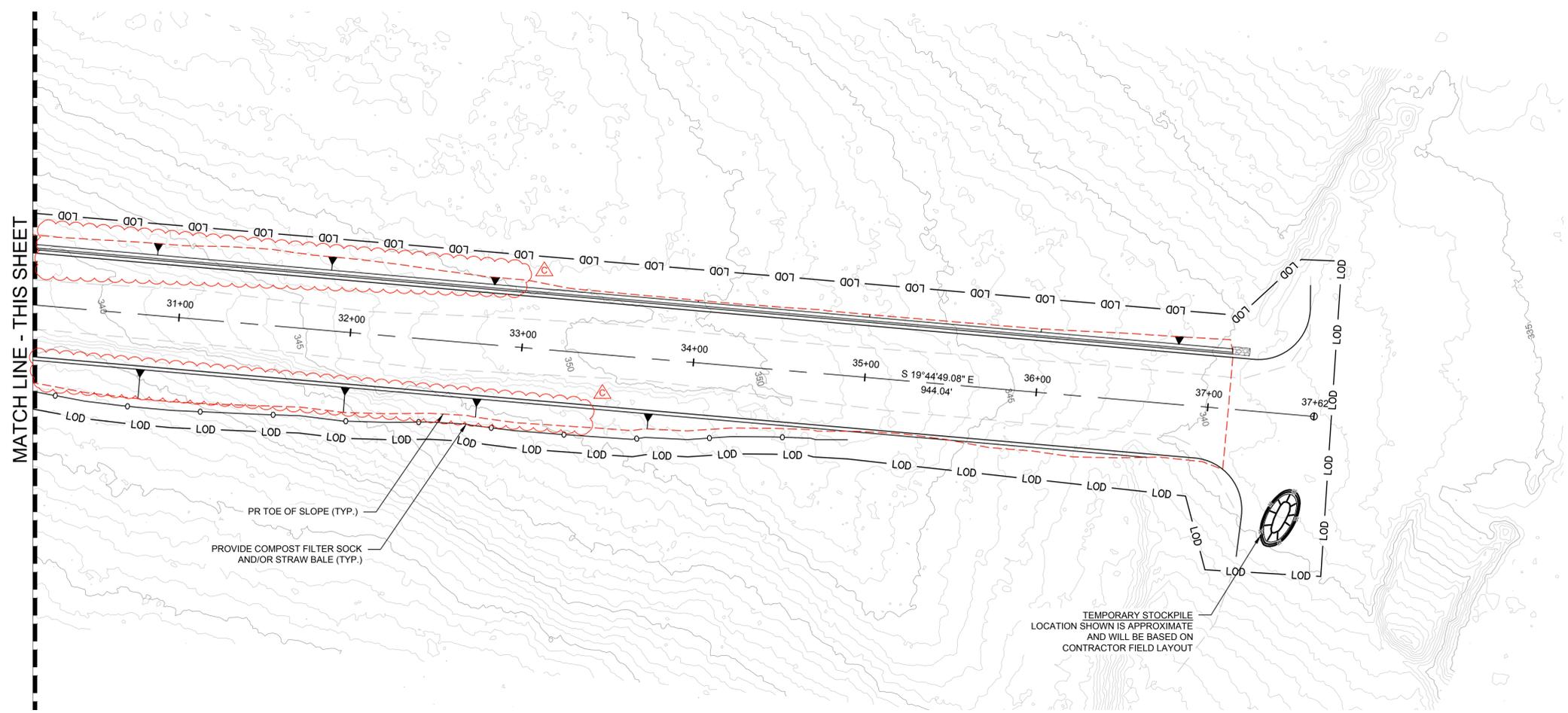
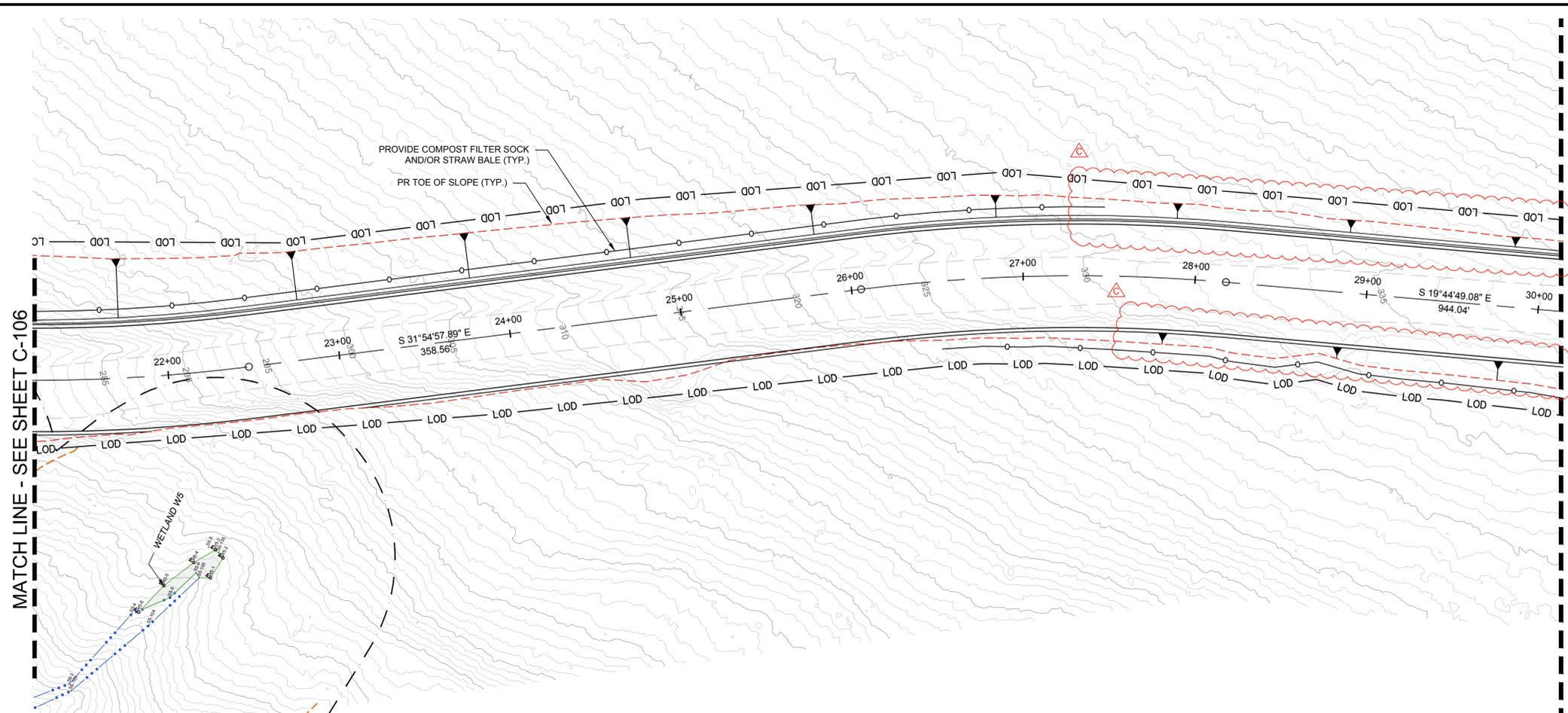
Hydrograph



APPENDIX G – EROSION AND SEDIMENTATION CONTROL PLAN

EROSION CONTROL LEGEND

- LOD — PROPOSED LIMIT OF DISTURBANCE
- - - PROPOSED GRADING LIMITS
- TEMPORARY COMPOST FILTER SOCK
- ⇒⇒⇒⇒ TEMPORARY DIVERSION DITCH
- TEMPORARY SILT SACK AT CATCH BASINS
- - - TEMPORARY ESC CONTOUR MINOR
- - - TEMPORARY ESC CONTOUR MAJOR
- ▨ TEMPORARY SEDIMENT TRAP
- ▩ EROSION CONTROL MATTING
- ⊗ TEMPORARY STOCKPILE AREA



REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE
A	ISSUED FOR PERMITTING	KRV	AGB	4/29/2022
B	ISSUED FOR PERMITTING	KRV	SH	10/25/2022
△	ISSUED FOR PERMITTING	KRV	SH	11/9/2022

ISSUED FOR PERMITTING

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

SCALE: 1" = 40' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

ISSUE FOR PERMIT (IFP) PLANS

ASMG HAUL ROAD DESIGN
901 RIVER ROAD
FRANKLIN COUNTY, MASSACHUSETTS

All States Materials Group

ALL STATES MATERIALS GROUP
901 RIVER ROAD
DEERFIELD, MA 01342

EROSION AND SEDIMENTATION CONTROL PLAN

PROJECT NO.	20221383.001A
ISSUE DATE	11/09/2022
CURRENT REVISION	C
DESIGNED BY	KRV
DRAWN BY	KRV
CHECKED BY	SH
APPROVED BY	JW

CAD FILE: C:\pwworking\kleinfelder\proj\2022\1383_Erosion Control Plan.dwg LAYOUT: C-107 PLOTTED: 11/09/2022 10:11 AM BY: kurt.veldete

APPENDIX H – OPERATION AND MAINTENANCE PLAN

OPERATIONS AND MAINTENANCE (O&M) PLAN

System Owner: All States Material Group

Party Responsible for O&M: Following construction the system owner is responsible for the following items listed below.

The stormwater management system has been designed to provide stormwater treatment as a high priority so that the run-off from the site does not negatively impact the water quality of the receiving existing drainage system. In order to maintain the efficiency of this system proper operating and maintenance procedures must be followed. This document provides guidance for performing that maintenance.

Table 1 - Summary of Stormwater System Operation & Maintenance Task

Bioretention Basin Maintenance	
Activity	Frequency
In the first three years after construction, inspect the bioretention basin.	Twice a year during both the growing and non-growing seasons.
During inspections, record and map the following information: <ul style="list-style-type: none">• The types and distribution of the wet basin plantings• The presence and distribution of plant species• The presence and distribution of invasive species (invasives must be removed)• Indications that other species are replacing the planted wet basin planting species• Percentage of standing water that is unvegetated• The maximum elevation and the vegetative condition• Accumulation of sediment in the forebay	

Sediment Forebay Maintenance	
Activity	Frequency
Sediment should be trapped and removed by the forebay or other type of basin before it reaches the wetland. Sediment forebay should be cleaned.	Once a year.

Deep Sump Catch Basin Maintenance	
Activity	Frequency
Inspect units	Four times per year.
Clean units	Four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

Conveyance Swale	
Activity	Frequency
Inspect swales to make sure vegetation is adequate and for signs of rilling and gullyng. Repair and rills and gullies. Replace dead vegetation.	The first few months after construction and twice a year thereafter.
Mow	As necessary. Grass height shall not exceed 6 inches.
Remove sediment and debris manually	At least once a year.
Reseed	As necessary. Use of road salt or other deicers during the winter will necessitate yearly reseeding in the spring.
Inspect for trash, debris, and sediment. Remove accumulated sediment by hand, with a flat-bottom shovel, or by similar means.	At least once a year.

APPENDIX I – ILLICIT DISCHARGE COMPLIANCE STATEMENT

ILLCIT DISCHARGE COMPLIANT STATEMENT

Responsibility:

The Owner is responsible for ultimate compliance with all provisions of the Massachusetts Stormwater Management Policy, the USEPA NPDES Construction General Permit and responsible for identifying and eliminating illicit discharge (as defined by the USEPA).

Owner Name: All States Material Group

Address: 901 River Road, Deerfield, Massachusetts, 01342

Tel. Number: Project Manager Daniel J. Hartman, PE at 413-712-0759

Engineer's Compliance Statement:

To the best of my knowledge, the attached plans, computations and specifications meet the requirements of Standard 10 of the Massachusetts Stormwater Handbook regarding illicit discharges to the stormwater management system and that no detectable illicit discharges exist on the site. All documents and attachments were prepared under my direction and qualified personnel properly gathered and evaluated the information submitted, to the best of my knowledge.

Included with this statement are site plans, drawn to scale, that identify the location of systems for conveying stormwater on the site and shown that these systems do not allow the entry of any illicit discharges into the stormwater management system.

APPENDIX J – HY-8 CULVERT ANALYSIS REPORT

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 32.49 cfs

Design Flow: 110.94 cfs

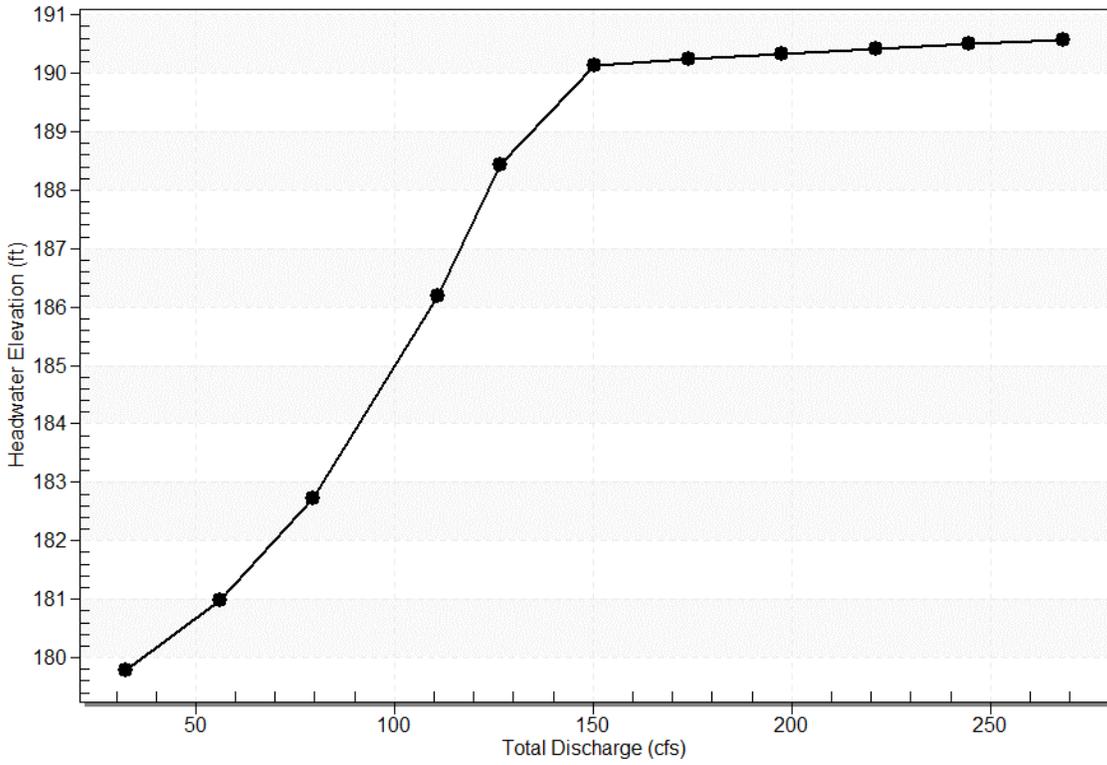
Maximum Flow: 268.26 cfs

Table 1 - Summary of Culvert Flows at Crossing: EXIST CROSSING

Headwater Elevation (ft)	Total Discharge (cfs)	30 in CMP 1 Discharge (cfs)	30 in CMP 2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
179.79	32.49	14.61	17.88	0.00	5
180.99	56.07	26.80	29.28	0.00	4
182.73	79.64	38.99	40.66	0.00	5
186.20	110.94	54.91	56.04	0.00	6
188.43	126.80	62.91	63.89	0.00	5
190.12	150.38	68.34	69.12	12.69	11
190.24	173.95	68.71	69.46	35.62	6
190.34	197.53	69.00	69.72	58.69	5
190.42	221.11	69.25	69.95	81.71	4
190.49	244.68	69.48	70.16	104.94	4
190.56	268.26	69.68	70.35	127.83	3
190.00	136.73	67.96	68.77	0.00	Overtopping

Rating Curve Plot for Crossing: EXIST CROSSING

Total Rating Curve
Crossing: EXIST CROSSING



Culvert Data: 30 in CMP 1

Table 2 - Culvert Summary Table: 30 in CMP 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
32.49 cfs	14.61 cfs	179.79	1.99	0.0*	1-S2n	1.03	1.29	1.03	0.63	7.71	4.22
56.07 cfs	26.80 cfs	180.99	3.19	1.306	5-S2n	1.46	1.76	1.46	0.86	8.98	5.10
79.64 cfs	38.99 cfs	182.73	4.93	3.899	5-S2n	1.93	2.11	1.93	1.06	9.60	5.74
110.94 cfs	54.91 cfs	186.20	8.40	7.860	7-M2c	2.50	2.35	2.35	1.28	11.46	6.39
126.80 cfs	62.91 cfs	188.43	10.63	10.339	7-M2c	2.50	2.26	2.26	1.38	13.49	6.67
150.38 cfs	68.34 cfs	190.12	12.32	12.169	6-FFc	2.50	2.50	2.50	1.52	13.92	7.04
173.95 cfs	68.71 cfs	190.24	12.44	12.299	6-FFc	2.50	2.50	2.50	1.65	14.00	7.37
197.53 cfs	69.00 cfs	190.34	12.54	12.401	6-FFc	2.50	2.50	2.50	1.77	14.06	7.66
221.11 cfs	69.25 cfs	190.42	12.62	12.489	6-FFc	2.50	2.50	2.50	1.89	14.11	7.93
244.68 cfs	69.48 cfs	190.49	12.69	12.570	6-FFc	2.50	2.50	2.50	2.00	14.15	8.18
268.26 cfs	69.68 cfs	190.56	12.76	12.645	6-FFc	2.50	2.50	2.50	2.10	14.20	8.40

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 177.80 ft,

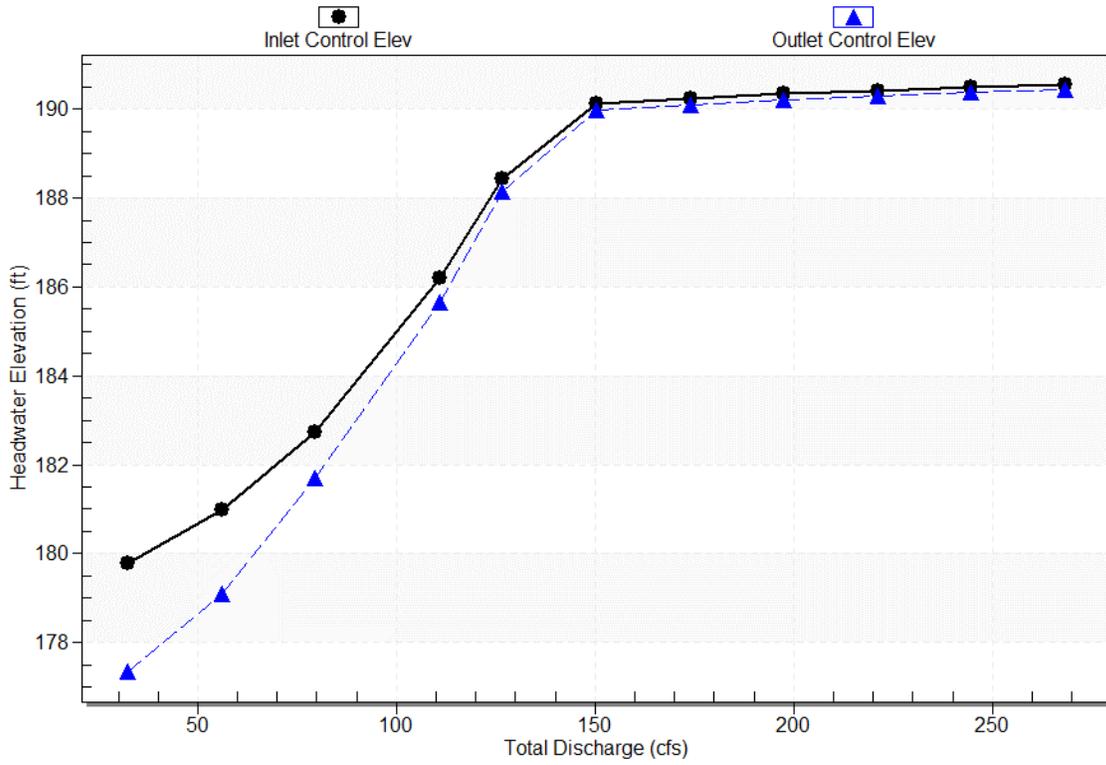
Outlet Elevation (invert): 175.50 ft

Culvert Length: 66.44 ft,

Culvert Slope: 0.0346

Culvert Performance Curve Plot: 30 in CMP 1

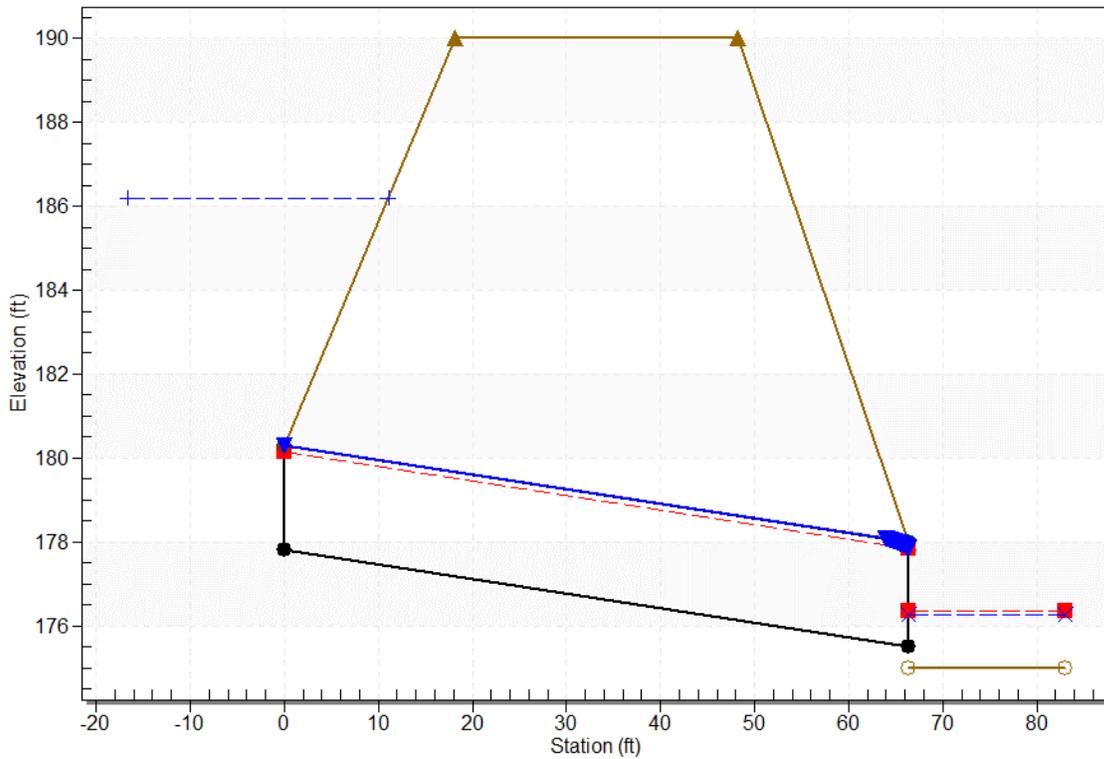
Performance Curve
Culvert: 30 in CMP 1



Water Surface Profile Plot for Culvert: 30 in CMP 1

Crossing - EXIST CROSSING, Design Discharge - 110.9 cfs

Culvert - 30 in CMP 1, Culvert Discharge - 54.9 cfs



Site Data - 30 in CMP 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 177.80 ft

Outlet Station: 66.40 ft

Outlet Elevation: 175.50 ft

Number of Barrels: 1

Culvert Data Summary - 30 in CMP 1

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting (Ke=0.9)

Inlet Depression: None

Culvert Data: 30 in CMP 2

Table 3 - Culvert Summary Table: 30 in CMP 2

	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
32.49 cfs	17.88 cfs	179.79	2.29	0.112	1-S2n	1.17	1.43	1.17	0.63	7.91	4.22
56.07 cfs	29.28 cfs	180.99	3.49	1.905	5-S2n	1.59	1.84	1.59	0.86	8.88	5.10
79.64 cfs	40.66 cfs	182.73	5.23	4.424	5-S2n	2.10	2.14	2.10	1.06	9.26	5.74
110.94 cfs	56.04 cfs	186.20	8.70	8.360	7-M2c	2.50	2.36	2.36	1.28	11.66	6.39
126.80 cfs	63.89 cfs	188.43	10.93	10.835	7-M2c	2.50	2.18	2.18	1.38	14.08	6.67
150.38 cfs	69.12 cfs	190.12	12.58	12.623	6-FFc	2.50	2.50	2.50	1.52	14.08	7.04
173.95 cfs	69.46 cfs	190.24	12.69	12.743	6-FFc	2.50	2.50	2.50	1.65	14.15	7.37
197.53 cfs	69.72 cfs	190.34	12.78	12.837	6-FFc	2.50	2.50	2.50	1.77	14.20	7.66
221.11 cfs	69.95 cfs	190.42	12.86	12.919	6-FFc	2.50	2.50	2.50	1.89	14.25	7.93
244.68 cfs	70.16 cfs	190.49	12.93	12.994	6-FFc	2.50	2.50	2.50	2.00	14.29	8.18
268.26 cfs	70.35 cfs	190.56	12.99	13.063	6-FFc	2.50	2.50	2.50	2.10	14.33	8.40

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 177.50 ft,

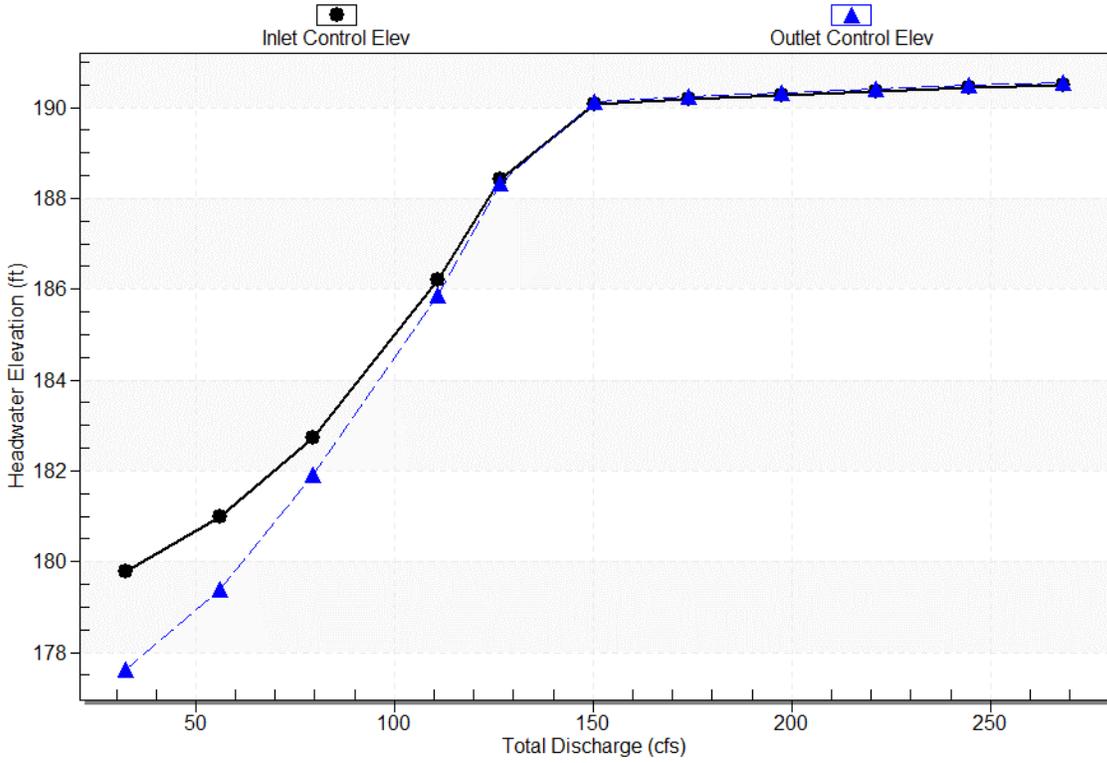
Outlet Elevation (invert): 175.36 ft

Culvert Length: 66.63 ft,

Culvert Slope: 0.0321

Culvert Performance Curve Plot: 30 in CMP 2

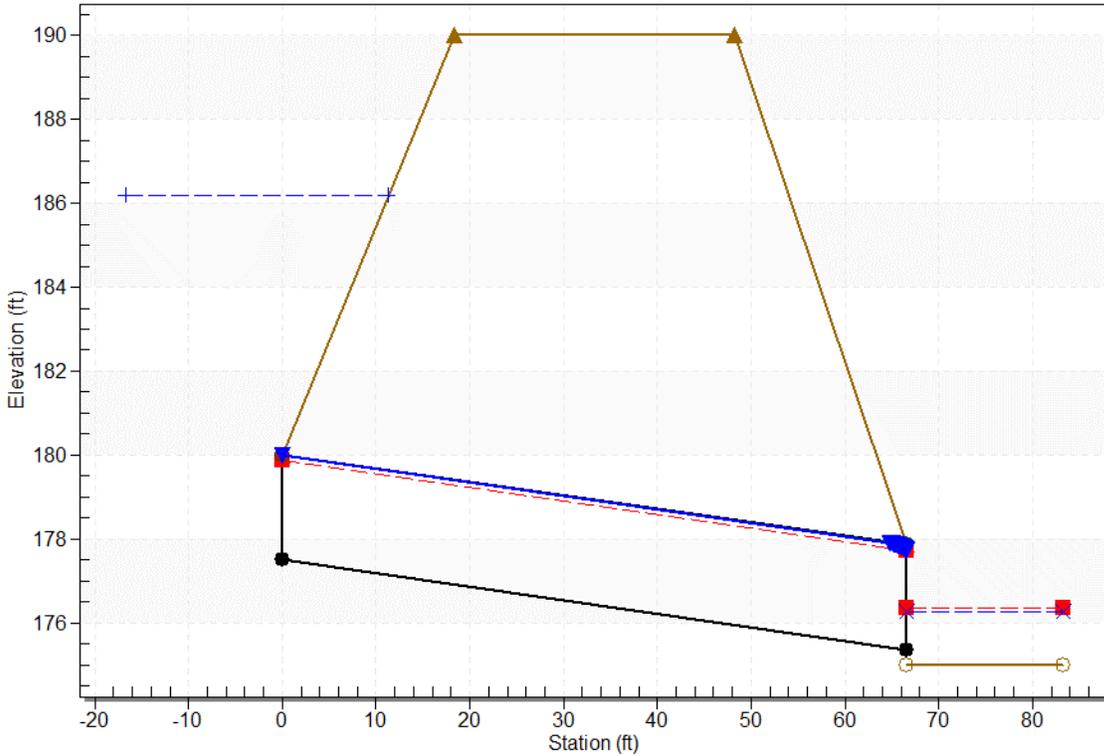
Performance Curve
Culvert: 30 in CMP 2



Water Surface Profile Plot for Culvert: 30 in CMP 2

Crossing - EXIST CROSSING, Design Discharge - 110.9 cfs

Culvert - 30 in CMP 2, Culvert Discharge - 56.0 cfs



Site Data - 30 in CMP 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 177.50 ft

Outlet Station: 66.60 ft

Outlet Elevation: 175.36 ft

Number of Barrels: 1

Culvert Data Summary - 30 in CMP 2

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Tailwater Data for Crossing: EXIST CROSSING

Table 4 - Downstream Channel Rating Curve (Crossing: EXIST CROSSING)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
32.49	175.63	0.63	4.22	1.72	0.99
56.07	175.86	0.86	5.10	2.37	1.03
79.64	176.06	1.06	5.74	2.91	1.06
110.94	176.28	1.28	6.39	3.51	1.09
126.80	176.38	1.38	6.67	3.79	1.10
150.38	176.52	1.52	7.04	4.18	1.11
173.95	176.65	1.65	7.37	4.53	1.12
197.53	176.77	1.77	7.66	4.87	1.13
221.11	176.89	1.89	7.93	5.18	1.14
244.68	177.00	2.00	8.18	5.48	1.15
268.26	177.10	2.10	8.40	5.77	1.15

Tailwater Channel Data - EXIST CROSSING

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 11.00 ft

Side Slope (H:V): 2.00 (:1)

Channel Slope: 0.0440

Channel Manning's n: 0.0500

Channel Invert Elevation: 175.00 ft

Roadway Data for Crossing: EXIST CROSSING

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 190.00 ft

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 28.53 cfs

Design Flow: 97.52 cfs

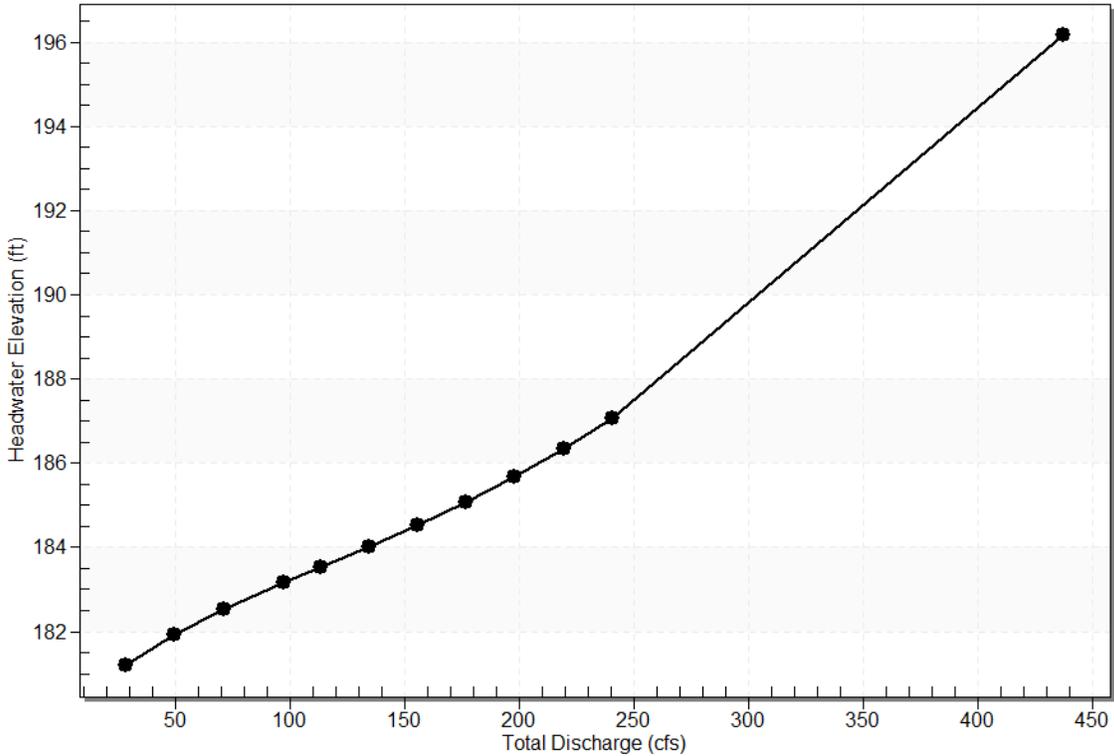
Maximum Flow: 240.48 cfs

Table 1 - Summary of Culvert Flows at Crossing: PROP CROSSING

Headwater Elevation (ft)	Total Discharge (cfs)	84 in CMP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
181.21	28.53	28.53	0.00	1
181.93	49.73	49.73	0.00	1
182.53	70.92	70.92	0.00	1
183.18	97.52	97.52	0.00	1
183.54	113.31	113.31	0.00	1
184.03	134.50	134.50	0.00	1
184.53	155.70	155.70	0.00	1
185.07	176.90	176.90	0.00	1
185.67	198.09	198.09	0.00	1
186.33	219.28	219.28	0.00	1
187.06	240.48	240.48	0.00	1
196.00	415.18	415.18	0.00	Overtopping

Rating Curve Plot for Crossing: PROP CROSSING

Total Rating Curve Crossing: PROP CROSSING



Culvert Data: 84 in CMP

Table 2 - Culvert Summary Table: 84 in CMP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
28.53 cfs	28.53 cfs	181.21	1.41	0.0*	1-S2n	0.81	0.85	0.81	0.58	5.33	4.03
49.73 cfs	49.73 cfs	181.93	2.13	0.0*	1-S2n	1.16	1.21	1.16	0.81	6.43	4.90
70.92 cfs	70.92 cfs	182.53	2.73	0.0*	1-S2n	1.46	1.53	1.46	0.99	7.22	5.52
97.52 cfs	97.52 cfs	183.18	3.38	0.0*	1-S2n	1.78	1.87	1.78	1.19	8.10	6.13
113.31 cfs	113.31 cfs	183.54	3.74	0.0*	1-S2n	1.95	2.06	1.95	1.30	8.56	6.43
134.50 cfs	134.50 cfs	184.03	4.23	0.0*	1-S2n	2.17	2.30	2.17	1.43	9.11	6.80
155.70 cfs	155.70 cfs	184.53	4.73	0.0*	1-S2n	2.38	2.52	2.38	1.55	9.60	7.12
176.90 cfs	176.90 cfs	185.07	5.27	0.0*	5-S2n	2.59	2.73	2.59	1.67	10.05	7.40
198.09 cfs	198.09 cfs	185.67	5.87	0.686	5-S2n	2.80	2.93	2.80	1.78	10.45	7.67
219.28 cfs	219.28 cfs	186.33	6.53	1.814	5-S2n	3.00	3.12	3.00	1.88	10.82	7.91
240.48 cfs	240.48 cfs	187.06	7.26	2.997	5-S2n	3.21	3.30	3.21	1.98	11.16	8.13

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 179.80 ft,

Outlet Elevation (invert): 172.70 ft

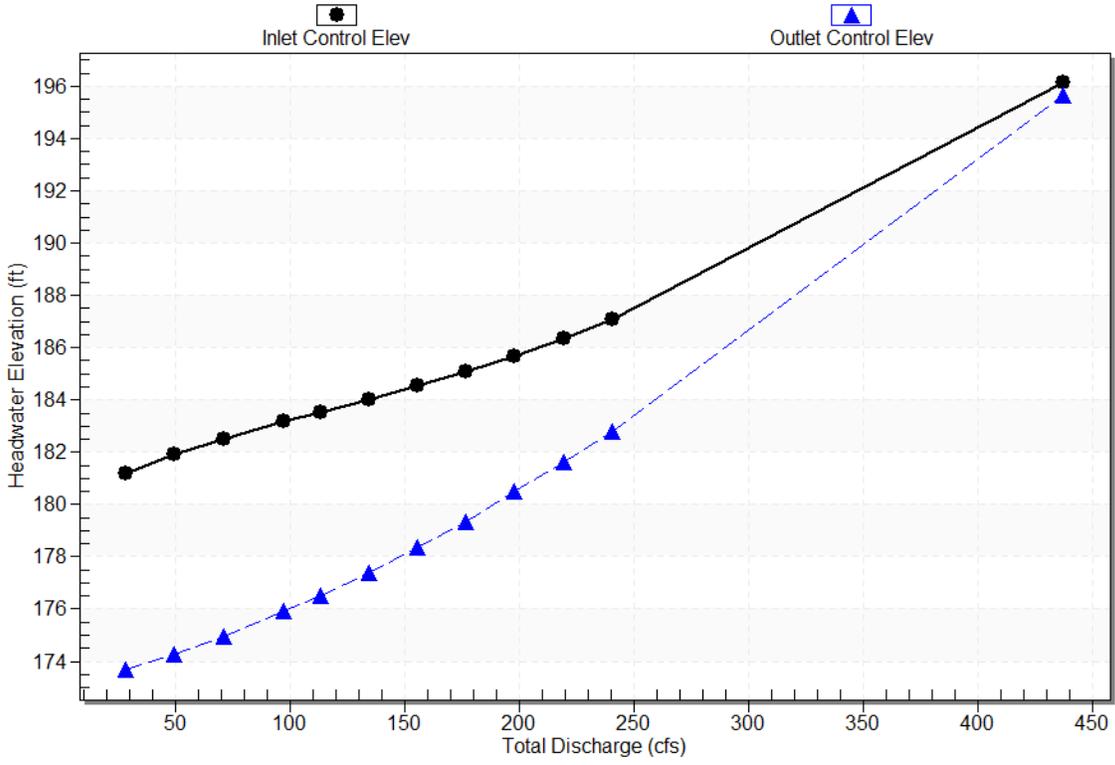
Culvert Length: 132.19 ft,

Culvert Slope: 0.0538

Culvert Performance Curve Plot: 84 in CMP

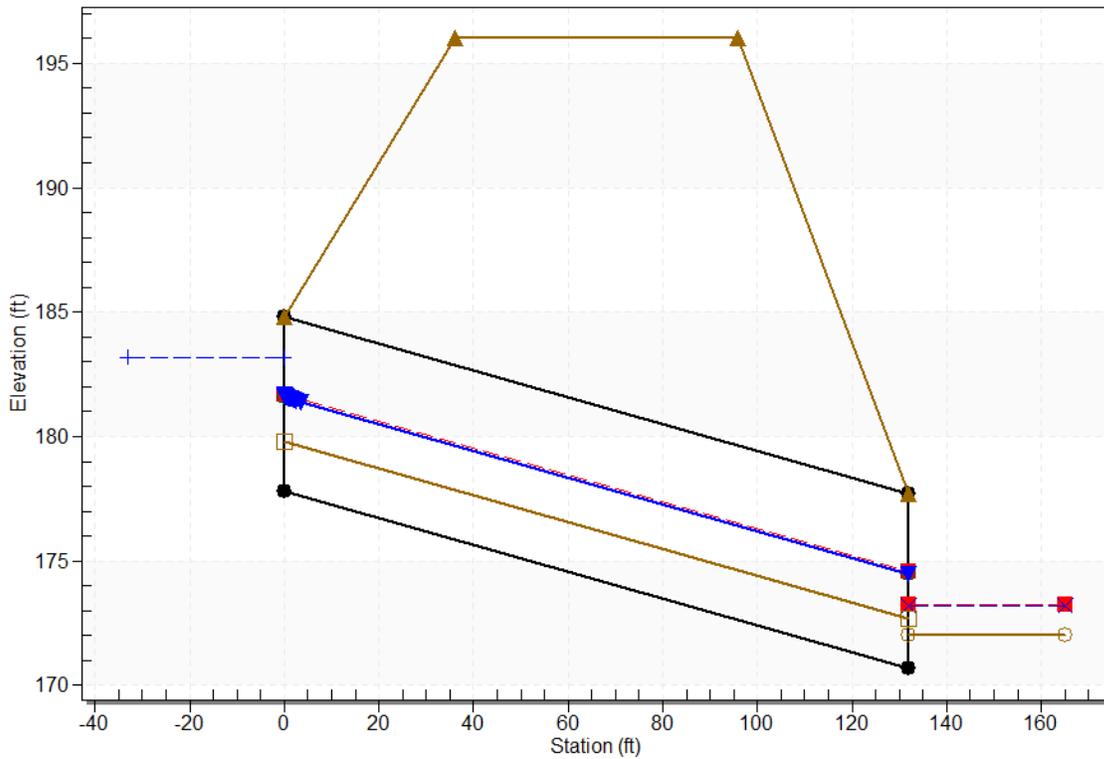
Performance Curve

Culvert: 84 in CMP



Water Surface Profile Plot for Culvert: 84 in CMP

Crossing - PROP CROSSING, Design Discharge - 97.5 cfs
Culvert - 84 in CMP, Culvert Discharge - 97.5 cfs



Site Data - 84 in CMP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 177.80 ft

Outlet Station: 132.00 ft

Outlet Elevation: 170.70 ft

Number of Barrels: 1

Culvert Data Summary - 84 in CMP

Barrel Shape: Circular

Barrel Diameter: 7.00 ft

Barrel Material: Corrugated Steel

Embedment: 24.00 in

Barrel Manning's n: 0.0240 (top and sides)

Manning's n: 0.0500 (bottom)

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Tailwater Data for Crossing: PROP CROSSING

Table 3 - Downstream Channel Rating Curve (Crossing: PROP CROSSING)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
28.53	172.58	0.58	4.03	1.60	0.98
49.73	172.81	0.81	4.90	2.21	1.02
70.92	172.99	0.99	5.52	2.72	1.05
97.52	173.19	1.19	6.13	3.27	1.08
113.31	173.30	1.30	6.43	3.56	1.09
134.50	173.43	1.43	6.80	3.92	1.10
155.70	173.55	1.55	7.12	4.26	1.11
176.90	173.67	1.67	7.40	4.58	1.12
198.09	173.78	1.78	7.67	4.87	1.13
219.28	173.88	1.88	7.91	5.16	1.14
240.48	173.98	1.98	8.13	5.43	1.15

Tailwater Channel Data - PROP CROSSING

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 11.00 ft

Side Slope (H:V): 2.00 (:1)

Channel Slope: 0.0440

Channel Manning's n: 0.0500

Channel Invert Elevation: 172.00 ft

Roadway Data for Crossing: PROP CROSSING

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 196.00 ft

Roadway Surface: Paved

Roadway Top Width: 60.00 ft