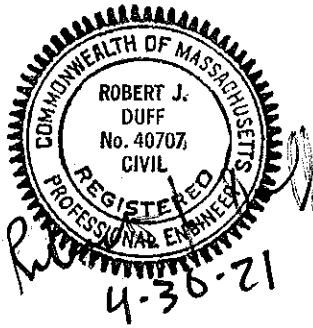


***Stormwater Report
Eagle Path
Holliston, MA***

Date: April 29, 2021



Prepared For:
Eagle Path LLC.
185 Underwood Street
Holliston, MA 01746

Prepared By:
Guerriere & Halnon, Inc.
333 West street
Milford, MA 01757

G&H Project G-10212



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.

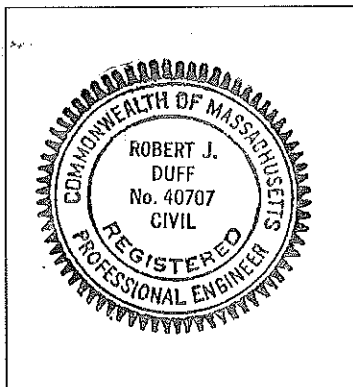
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



Robert J. Duff
Signature and Date

4/30/2021

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.

Project Description

The project is a 6.29-acre vacant lot located off Prospect Street, between Wilkins and Marked Trail Road. The applicant is proposing a 4-lot conventional residential subdivision. The site will have municipal water for both domestic and fire protection. On-site subsurface disposal systems are proposed to service each of the 4 lots.

The property currently consists of a small isolate Bordering Vegetative Wetland on the southwest side of the property.

Stormwater will be treated and attenuated by a catch basin-manhole system that discharges on to a on-site basin. The basin will discharge into the existing wetland on the west side of the property.

Compliance with the 10 Stormwater Standards

Standard 1: No new untreated Discharges

No new untreated discharges. Stormwater discharge from BMP's have been designed to control scour and erosion of soils that could be deposited in the wetland. The drainage systems will collect most of the paved area for treatment.

Standard 2: Peak Rate Attenuation

Stormwater in the pre-development condition flows to four areas off the site. A majority of the site (Sub catchment 4E) flows to the westerly side of the property towards an off- site wetlands. The other sub catchment areas flow to the on- site isolated wetland (1E), the westerly side (2E) and the easterly side of the project(3E). In the post-development conditions, a majority of the paved areas will flow to a infiltration basin that discharge to adjacent wetlands.

Table 1: Peak Rate Attenuation Summary

	2-yr Storm	10-yr Storm	25-yr Storm	100-yr Storm
Runoff to Wetlands				
Pre-Development (E-1)	1.53 cfs	3.05 cfs	3.98 cfs	5.46 cfs
Post-Development(P-1)	1.32 cfs	2.49 cfs	2.77 cfs	4.29 cfs
Runoff to West				
Pre-Development (E-2)	0.51 cfs	1.03 cfs	1.34 cfs	1.82 cfs
Post-Development(P-2)	0.38 cfs	0.76 cfs	0.85 cfs	1.35 cfs
Runoff to the East				
Pre-Development (E-3)	1.05 cfs	2.10 cfs	2.75 cfs	3.74 cfs
Post-Development(P-3)	0.66 cfs	1.25 cfs	1.38 cfs	2.14 cfs
Runoff to the West				
Pre-Development (E-4)	2.57 cfs	5.15 cfs	6.73 cfs	9.17 cfs
Post-Development(6R)	1.67 cfs	3.25 cfs	3.60 cfs	5.63 cfs

All post development flows for the 2 yr,10-yr,25-yr and 100-yr storm events are reduced from the pre-development flows rates.

Standard 3: Recharge

Soil Evaluation

Soil evaluation is broken down into two stages. Stage 1 identifies the underlying soils just beneath the surface that contribute to how much runoff is generated as stormwater falls and moves across the surface. Stage 2 evaluates the soils in direct contact with the proposed infiltration BMPs. Appendix 2 includes the NRCS Soil Survey used for Stage 1 while the on-site soil textural analysis in the specific locations of the proposed infiltration is included on the Pre Development plan(appendix 7)

Recharge Volume

The recharge volume is determined by calculating the impervious area proposed over the corresponding soil identified in the NRCS Soil Survey. The site consists of sandy loam. The area of impervious within the Soil Hydrologic Group "D" is compiled from the Post Development Plan and included in the HydroCAD Report in Appendix.

Table 2: Required Recharge Volume Calculation

Soil type	Basin	Impervious area	Volume required	Adjusted Volume required	Volume provided
D-Sandy Loam	0.25 in/ sq. ft.	27,094 sq. ft.	565 c.f.	750 c.f.	2,905 c.f.

Stormwater Basin Sizing

There are three ways of determining the recharge volume provided by a stormwater basin (Static, Simple Dynamic and Dynamic Field). The Static Method, used here, includes the volume of water that can be stored beneath the lowest outlet of the basin. This, the most conservative method of determining the recharge volume, doesn't account for any infiltration that takes place while the basin is filling with water and is less dependent on maintenance of the basin since the only way for the water below the lowest invert can leave the basin is through infiltration.

72-hour Drawdown

The Rawls Rate is used to represent the infiltration rate. The specific rate chosen is based on the textural analysis of the in-site soil. A Massachusetts Certified Soil Evaluator performed a soil evaluation at the proposed infiltration BMPs. The soil textural analysis for each of the infiltration BMPs is listed below with the associated Rawls Rate used in the HydroCAD calculations. Where textural analysis varied within any single BMP, the most restrictive textural evaluation and Rawls Rate were used.

Table 4: Rawls Rate

	Most Restrictive Soil Texture	Rawls Rate (in/hour)
Basin 1	Sandy Loam	1.02 in/ hr.

Table 5: Basin Drawdown Calculation

<u>2,905 cubic ft</u>		
$(1.02 \text{ in/hr} // 12 \text{ in/ft}) (3,032 \text{ sq ft})$	$=$	12 hours

Standard 4: Water Quality**Water Quality Volume**

The required water quality volume is determined through a calculation of the proposed impervious pavement throughout the site and a determination of whether the site is located in a critical area or the proposed use is considered to produce a high pollutant load. The proposed development does not qualify as a use with high pollutant load and no critical area was identified for this site, so the water quality volume is calculated at 0.5 inch over the area of proposed impervious pavement.

The area of impervious pavement within the proposed site is calculated from the information entered into HydroCAD and can be found in Appendix 3. The water quality volume is 0.5 inch across 0.44 acres of impervious pavement equals 799 cubic feet.

One of the proposed treatment train includes a sediment forebay and infiltration basin to meet the required water quality volume needed to be treated. Sediment forebays are sized to (0.1 inches) X (0.40 acre) = 144 cubic feet. The difference between the 0.44 acre and 0.40 acre is that 1,800 sq ft of impervious area does not travel to the forebay/basin. The minimum forebay size and the provided forebay size are summarized in the following table.

Table 6: Sediment Forebay Sizing

	Impervious Area being Discharged	Required Volume	Volume Provided
Forebay 1	17,283 Sq Ft	144 c.f.	1,340 c.f

Removal of Total Suspended Solids

The water quality volume, as calculated in the previous section, is treated through a “Treatment Train” to provide a minimum of 80-percent TSS removal. The TSS Removal Worksheets are included in Appendix 5. A majority of the site drainage is collected by deep sump catch basins and discharged to a sediment forebay for pretreatment. The forebay in conjunction with the infiltration basin will complete the treatment train at 85 percent of the TSS removal.

Standard 5: Land Uses with Higher Potential Pollutant Loads

The proposed residential project does not qualify as a LUHPPL.

Standard 6: Critical Areas

The proposed project is not within, nor does it discharge stormwater to an identified Critical Area.

Standard 7: Redevelopment Project

The project is not a redevelopment.

Standard 8: Construction Period Controls

The project area includes two resource areas protected by the Wetlands Protection Act. In accordance with the Wetlands Protection Act, this Stormwater Report is being submitted to the local Conservation Commission and MassDEP for review prior to issuance of an Order of Conditions. The Order of Conditions and the Construction Period Pollution Control Plan included in Appendix 6 will be followed to prevent discharge of erosion to resource areas and abutting properties.

Standard 9: Operation and Maintenance Plan

The Long Term Operations and Maintenance Plan included in Appendix 6 address the responsibilities of maintaining the stormwater BMPs.

Standard 10: Illicit Discharges to Drainage System

It is the intent of the developer to follow the Order of Conditions to mitigate the affects of the proposed project on the adjacent environment. Following completion of construction and road acceptance by the town, the Long Term Operations and Maintenance Plan will continue with the Town of Holliston doing the maintenance of the project.

CAPTURED AREA ADJUSTMENT

Total impervious area = 19,053 sq ft

Impervious area not captured = 4,800 sq ft

Captured area = 14,253 sq ft

$$19,053/14,253 = 1.33$$

Required adjusted recharge volume

$$(565 \text{ cubic feet}) \times 1.33 = 750 \text{ cubic feet}$$

Locus Map

Appendix 1

NRCS Soils Report

Appendix 2

HydroCAD Calculations

Appendix 3

TSS Removal Worksheet

Appendix 4

Construction Period Inspection Forms

Appendix 5

Long Term Operations and Maintenance Plan

Appendix 6

Pre- Post Drainage Plans

Appendix 7

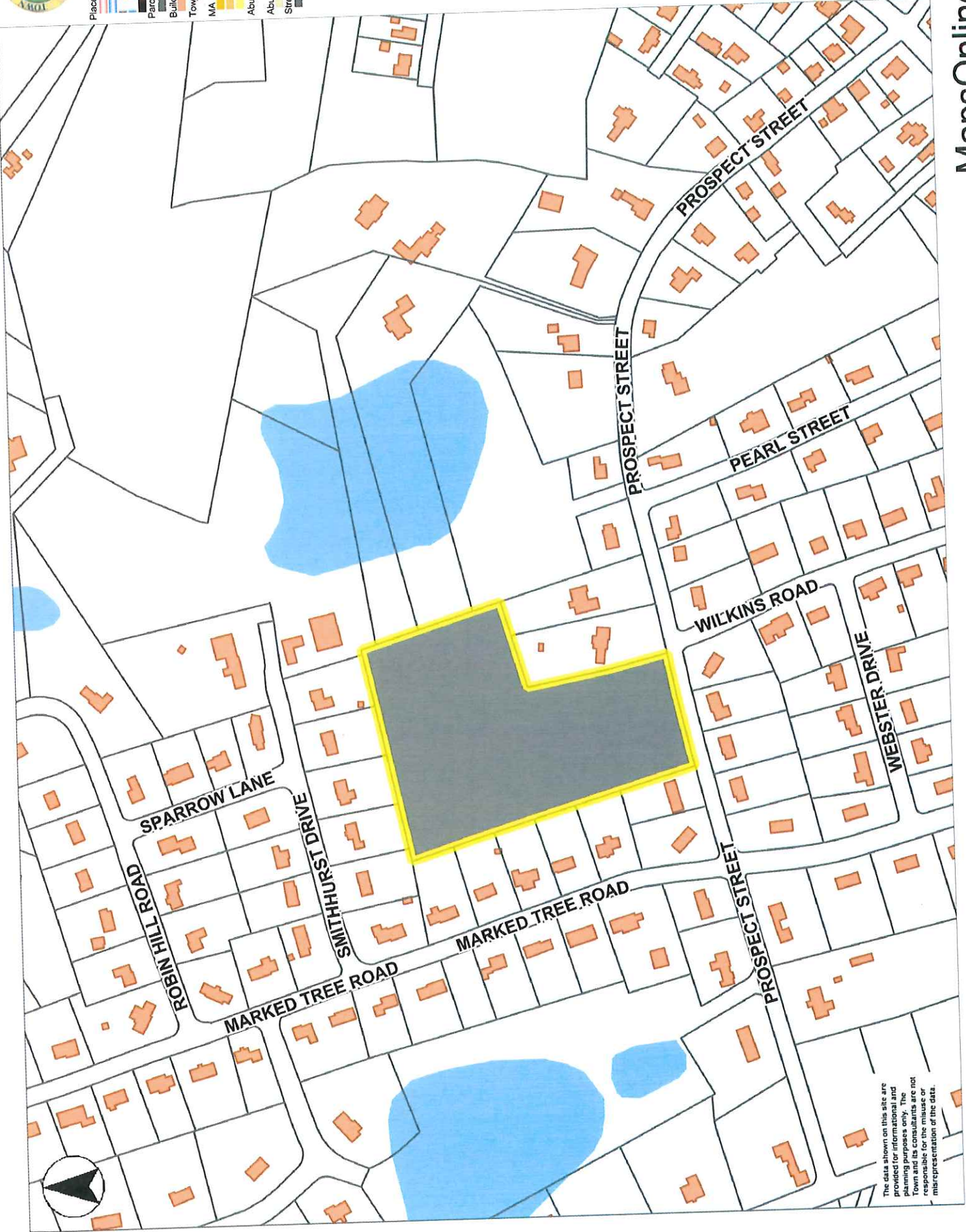
Street Drainage Calculations

Appendix 8

LOCUS MAP



- Places
- Fire Station
 - Police Station
 - Town Hall
 - Public Library
 - School
 - Parcels
 - Buildings 2018
 - Town Boundary
 - MA Highways
 - Interstate
 - US Highway
 - Numbered Routes
 - Abutting Town Labels
 - Abutting Towns
 - Streets



The data shown on this site are provided for informational and planning purposes only. The Town and its consultants are not responsible for the misuse or misrepresentation of the data.

NRCS Soils Report
Appendix 2

Soil Map—Middlesex County, Massachusetts



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
33B	Raypol silt loam, 0 to 5 percent slopes	0.9	1.7%
52A	Freetown muck, 0 to 1 percent slopes	4.2	7.7%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	6.8	12.5%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	7.1	13.1%
106C	Narragansett-Hollis-Rock outcrop complex, 3 to 15 percent slopes	2.7	5.0%
335B	Rainbow silt loam, 3 to 8 percent slopes	12.8	23.5%
341B	Broadbrook very fine sandy loam, 3 to 8 percent slopes, very stony	19.9	36.5%
Totals for Area of Interest		54.4	100.0%



Middlesex County, Massachusetts

341B—Broadbrook very fine sandy loam, 3 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 9936
Elevation: 160 to 540 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Broadbrook

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable silty eolian deposits over dense loamy lodgment till derived from gneiss

Typical profile

H1 - 0 to 2 inches: moderately decomposed plant material
H2 - 2 to 10 inches: very fine sandy loam
H3 - 10 to 20 inches: gravelly very fine sandy loam
H4 - 20 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 18 to 39 inches to densic material
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D

Middlesex County, Massachusetts

335B—Rainbow silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9931

Elevation: 110 to 510 feet

Mean annual precipitation: 45 to 54 inches

Mean annual air temperature: 43 to 54 degrees F

Frost-free period: 145 to 240 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Rainbow and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rainbow

Setting

Landform: Hillslopes

Landform position (two-dimensional): Toeslope, shoulder

Landform position (three-dimensional): Base slope, nose slope

Down-slope shape: Linear

Across-slope shape: Concave

Parent material: Friable fine-loamy eolian deposits over dense loamy lodgment till derived from metamorphic rock

Typical profile

H1 - 0 to 8 inches: silt loam

H2 - 8 to 22 inches: silt loam

H3 - 22 to 32 inches: very fine sandy loam

H4 - 32 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: 20 to 39 inches to densic material

Drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)

Depth to water table: About 18 to 21 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

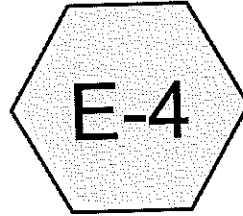
Hydrologic Soil Group: C/D

Ecological site: F144AY037MA - Moist Dense Till Uplands

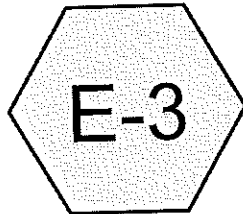
Hydric soil rating: No

HydroCAD Calculations
Appendix 3

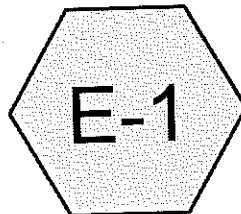
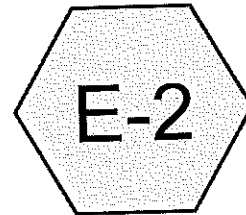
PRE-DEVELOPMENT



To the West

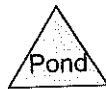


To the East



To the West

To isolated wetlands



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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
6.186	77	Woods, Good, HSG D (E-1, E-2, E-3, E-4)
6.186	77	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
6.186	HSG D	E-1, E-2, E-3, E-4
0.000	Other	
6.186		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	6.186	0.000	6.186	Woods, Good	E-1, E-2, E-3, E-4
0.000	0.000	0.000	6.186	0.000	6.186	TOTAL AREA	

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Type III 24-hr 2-Year Rainfall=3.10"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: To isolated wetlands	Runoff Area=57,712 sf 0.00% Impervious Runoff Depth=1.14" Flow Length=160' Tc=8.7 min CN=77 Runoff=1.53 cfs 0.126 af
Subcatchment E-2: To the West	Runoff Area=20,000 sf 0.00% Impervious Runoff Depth=1.14" Flow Length=90' Tc=9.9 min CN=77 Runoff=0.51 cfs 0.044 af
Subcatchment E-3: To the East	Runoff Area=47,811 sf 0.00% Impervious Runoff Depth=1.14" Flow Length=250' Tc=15.6 min CN=77 Runoff=1.05 cfs 0.104 af
Subcatchment E-4: To the West	Runoff Area=143,933 sf 0.00% Impervious Runoff Depth=1.14" Flow Length=550' Tc=25.8 min CN=77 Runoff=2.57 cfs 0.314 af

Total Runoff Area = 6.186 ac Runoff Volume = 0.588 af Average Runoff Depth = 1.14"
100.00% Pervious = 6.186 ac 0.00% Impervious = 0.000 ac

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Type III 24-hr 2-Year Rainfall=3.10"

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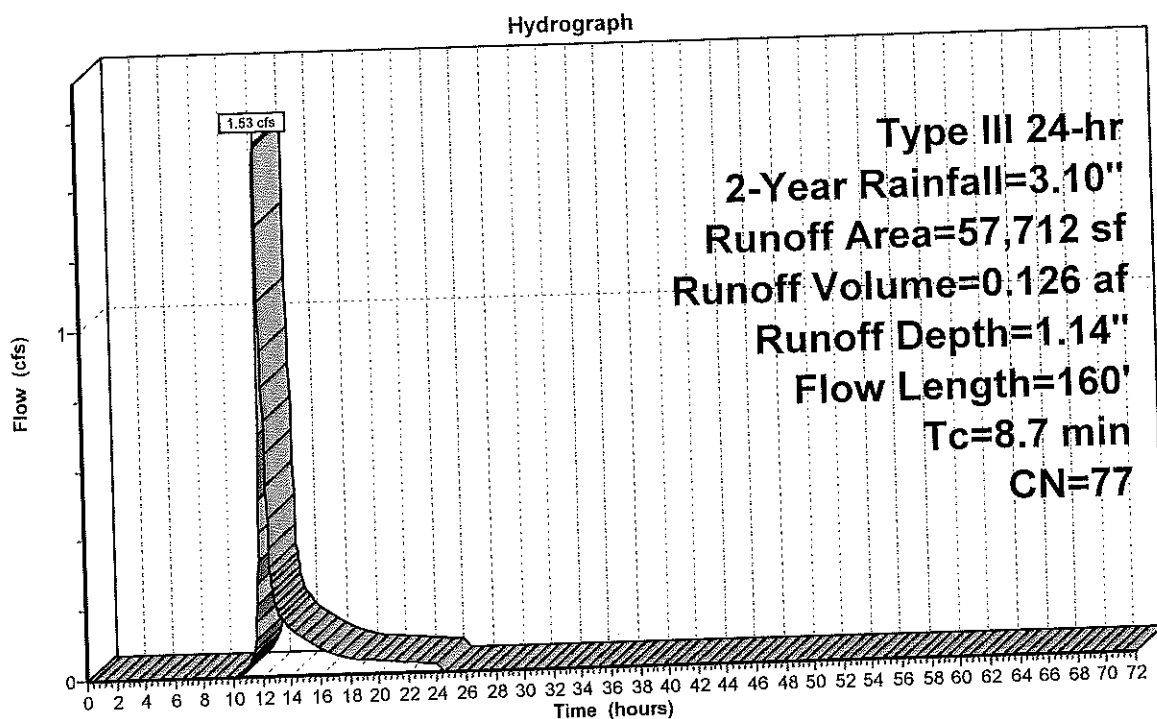
Summary for Subcatchment E-1: To isolated wetlands

Runoff = 1.53 cfs @ 12.13 hrs, Volume= 0.126 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
57,712	77	Woods, Good, HSG D
57,712		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	110	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.7	160	Total			

Subcatchment E-1: To isolated wetlands

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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment E-2: To the West

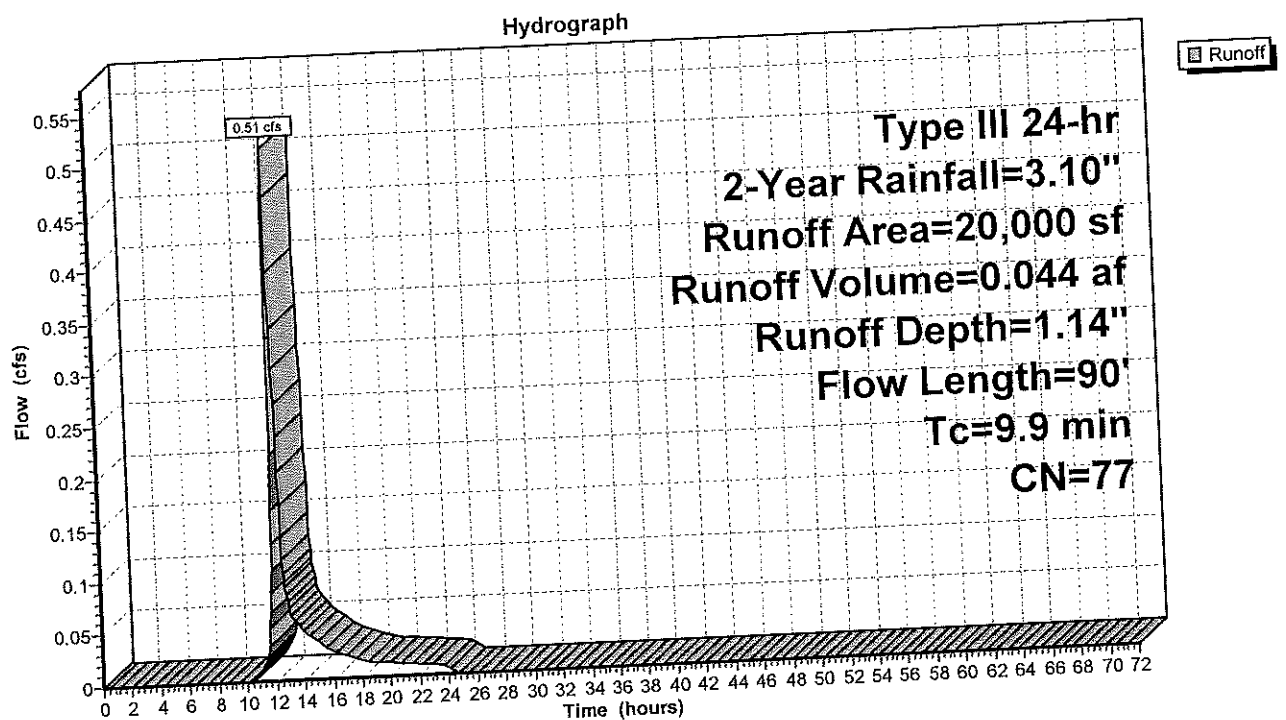
Runoff = 0.51 cfs @ 12.15 hrs, Volume= 0.044 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
20,000	77	Woods, Good, HSG D
20,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	40	0.0500	1.12		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
9.9	90	Total			

Subcatchment E-2: To the West



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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment E-3: To the East

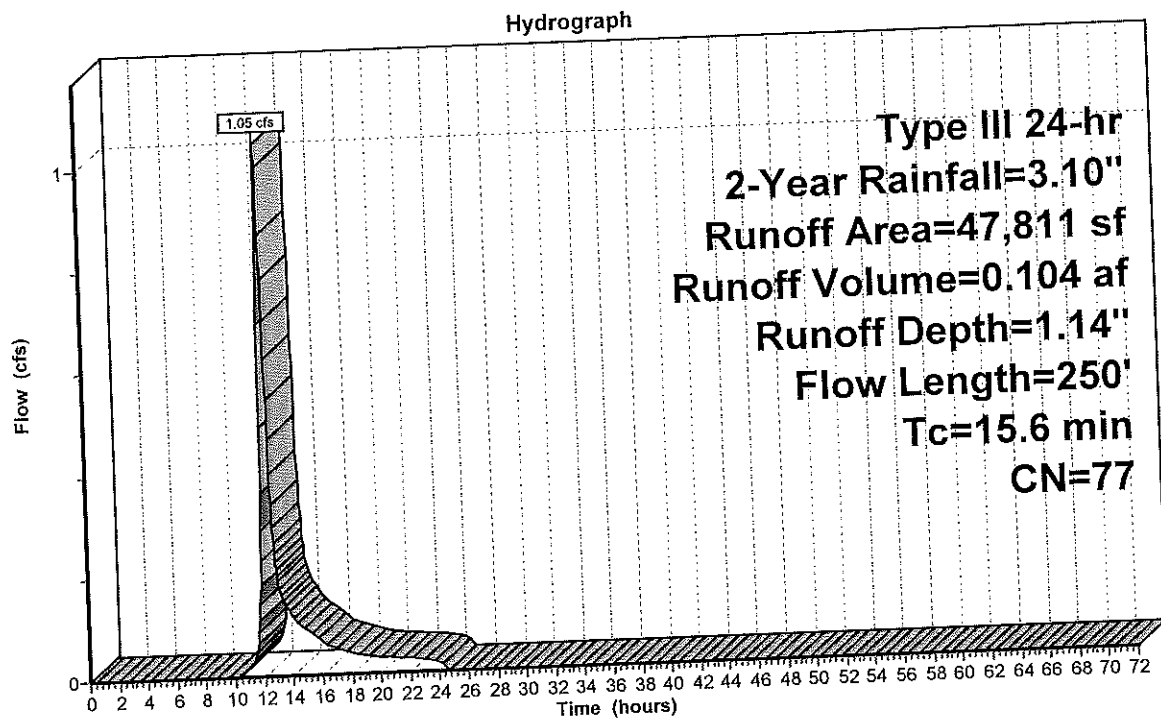
Runoff = 1.05 cfs @ 12.23 hrs, Volume= 0.104 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
47,811	77	Woods, Good, HSG D
47,811		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
3.3	200	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.6	250	Total			

Subcatchment E-3: To the East



Summary for Subcatchment E-4: To the West

Runoff = 2.57 cfs @ 12.38 hrs, Volume= 0.314 af, Depth= 1.14"

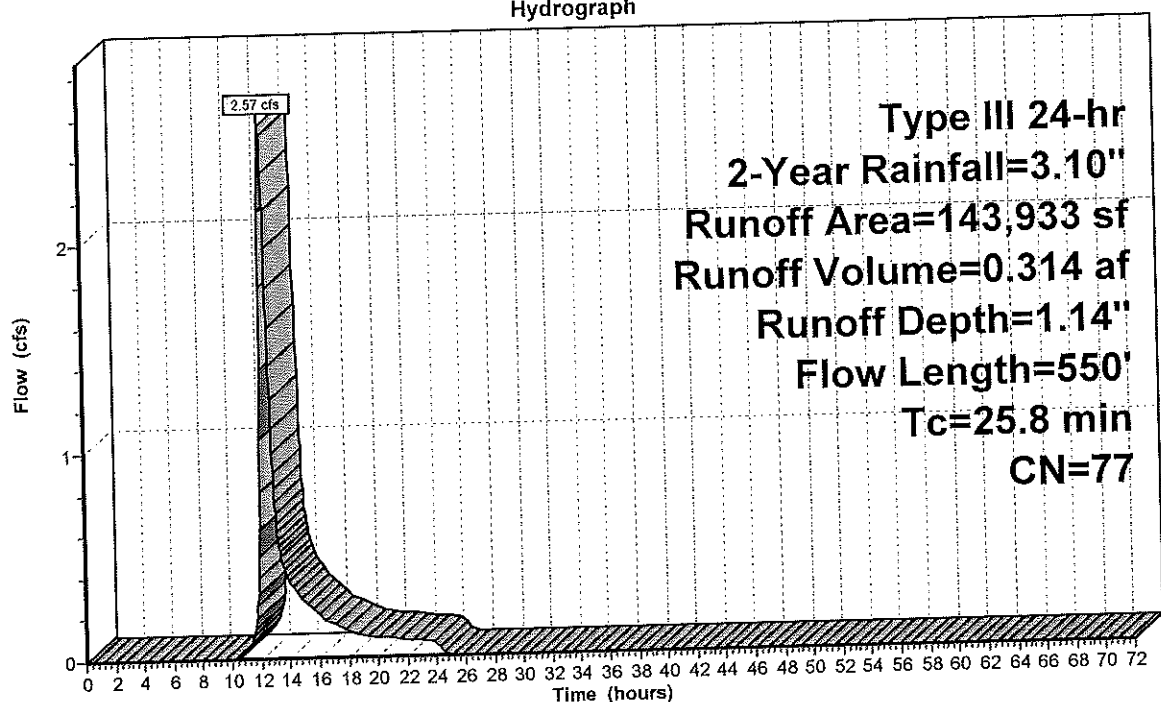
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
143,933	77	Woods, Good, HSG D
143,933		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
5.7	240	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.8	260	0.0520	1.14		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
25.8	550	Total			

Subcatchment E-4: To the West

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.50"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: To isolated wetlands	Runoff Area=57,712 sf 0.00% Impervious Runoff Depth=2.21" Flow Length=160' Tc=8.7 min CN=77 Runoff=3.05 cfs 0.244 af
Subcatchment E-2: To the West	Runoff Area=20,000 sf 0.00% Impervious Runoff Depth=2.21" Flow Length=90' Tc=9.9 min CN=77 Runoff=1.03 cfs 0.085 af
Subcatchment E-3: To the East	Runoff Area=47,811 sf 0.00% Impervious Runoff Depth=2.21" Flow Length=250' Tc=15.6 min CN=77 Runoff=2.10 cfs 0.202 af
Subcatchment E-4: To the West	Runoff Area=143,933 sf 0.00% Impervious Runoff Depth=2.21" Flow Length=550' Tc=25.8 min CN=77 Runoff=5.15 cfs 0.609 af

Total Runoff Area = 6.186 ac Runoff Volume = 1.140 af Average Runoff Depth = 2.21"
100.00% Pervious = 6.186 ac 0.00% Impervious = 0.000 ac

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Type III 24-hr 10-Year Rainfall=4.50"

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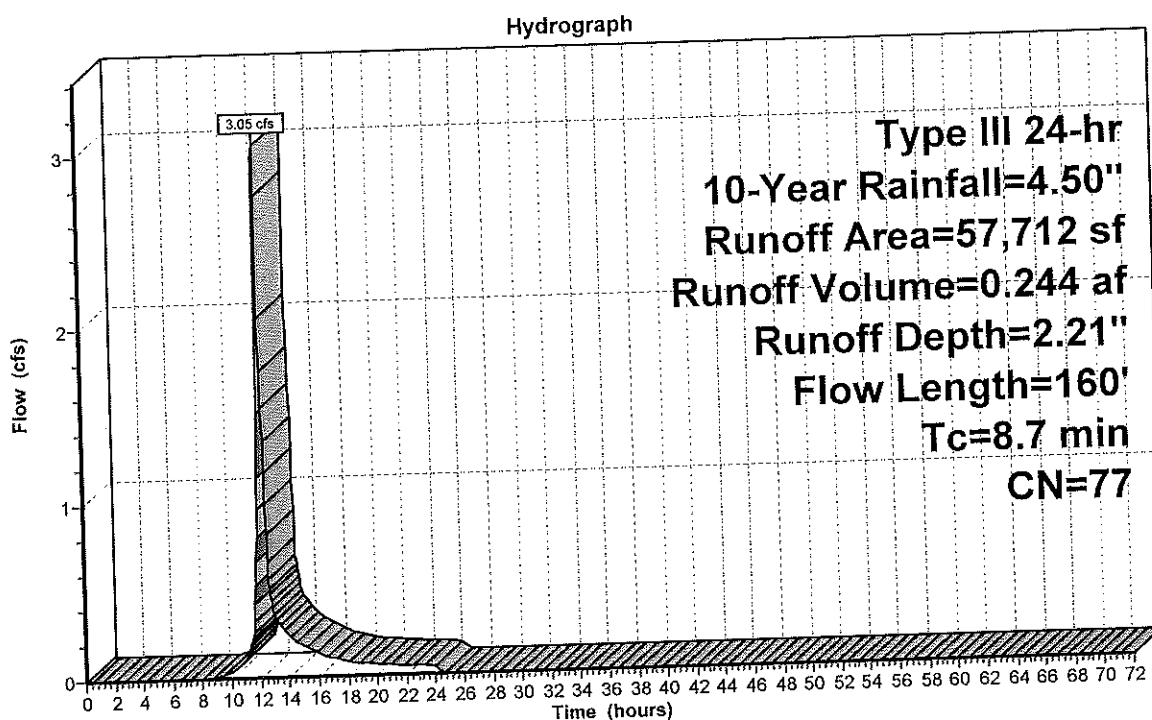
Summary for Subcatchment E-1: To isolated wetlands

Runoff = 3.05 cfs @ 12.13 hrs, Volume= 0.244 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
57,712	77	Woods, Good, HSG D
57,712		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	110	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.7	160	Total			

Subcatchment E-1: To isolated wetlands

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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Subcatchment E-2: To the West

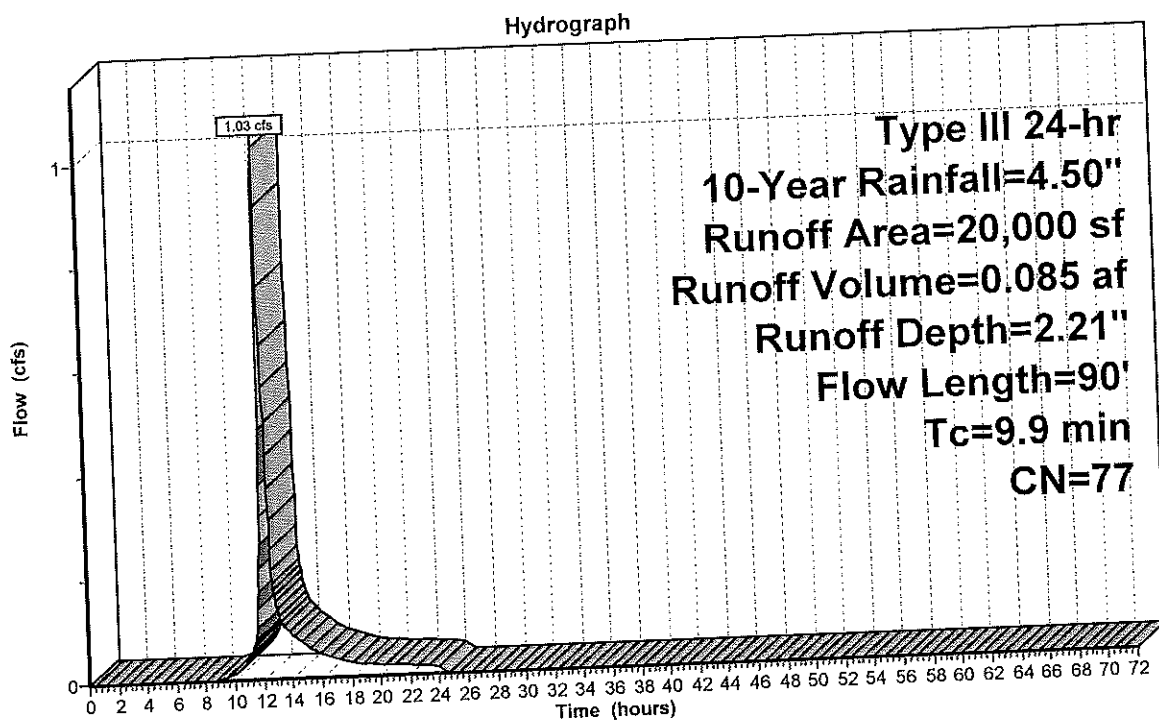
Runoff = 1.03 cfs @ 12.15 hrs, Volume= 0.085 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
20,000	77	Woods, Good, HSG D
20,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	40	0.0500	1.12		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
9.9	90	Total			

Subcatchment E-2: To the West



Summary for Subcatchment E-3: To the East

Runoff = 2.10 cfs @ 12.22 hrs, Volume= 0.202 af, Depth= 2.21"

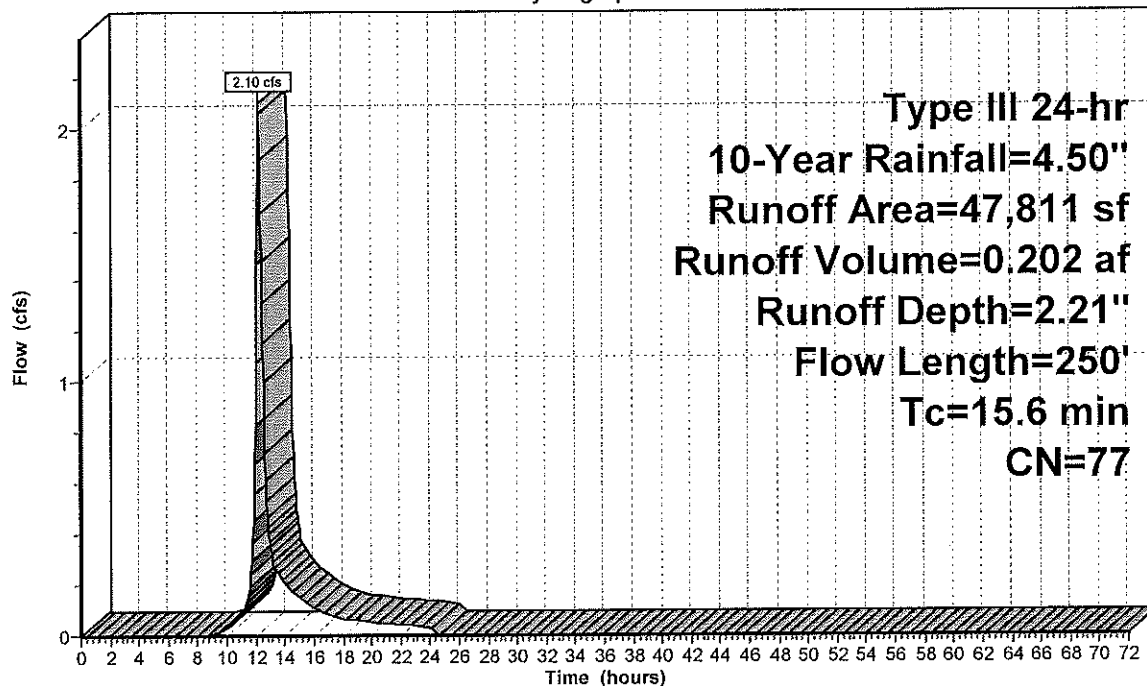
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
47,811	77	Woods, Good, HSG D
47,811		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
3.3	200	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.6	250	Total			

Subcatchment E-3: To the East

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Subcatchment E-4: To the West

Runoff = 5.15 cfs @ 12.37 hrs, Volume= 0.609 af, Depth= 2.21"

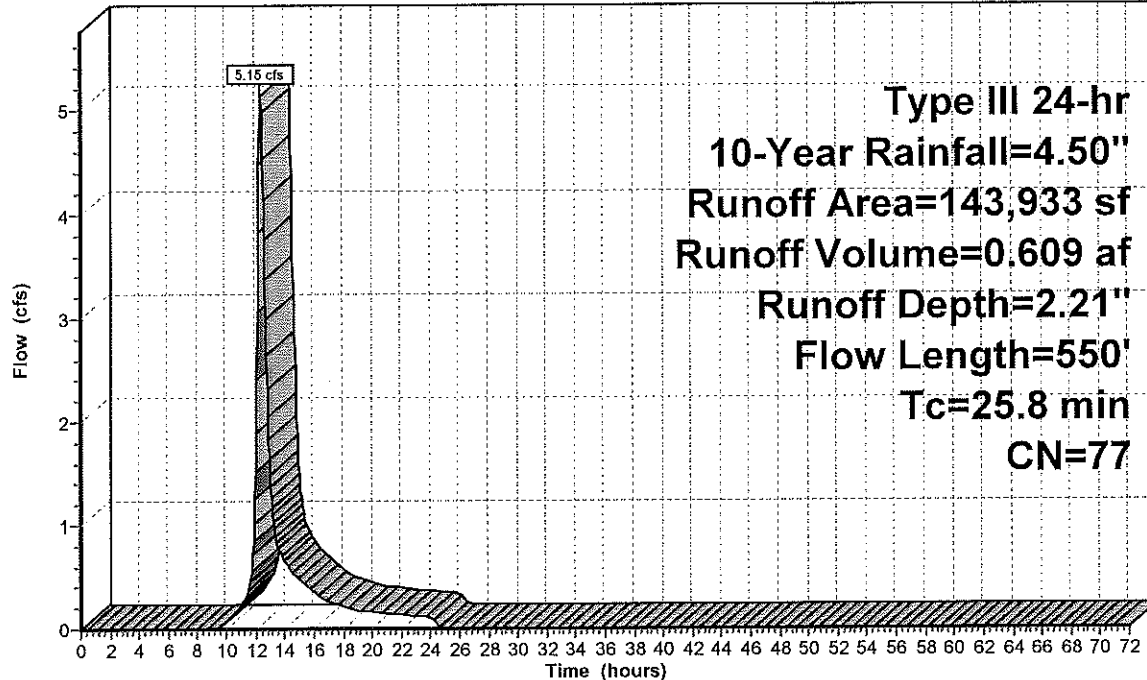
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
143,933	77	Woods, Good, HSG D
143,933		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
5.7	240	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.8	260	0.0520	1.14		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
25.8	550	Total			

Subcatchment E-4: To the West

Hydrograph



g-10212 pre development*Type III 24-hr 25-Year Rainfall=5.30"*

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: To isolated wetlands Runoff Area=57,712 sf 0.00% Impervious Runoff Depth=2.88"
Flow Length=160' Tc=8.7 min CN=77 Runoff=3.98 cfs 0.318 af

Subcatchment E-2: To the West Runoff Area=20,000 sf 0.00% Impervious Runoff Depth=2.88"
Flow Length=90' Tc=9.9 min CN=77 Runoff=1.34 cfs 0.110 af

Subcatchment E-3: To the East Runoff Area=47,811 sf 0.00% Impervious Runoff Depth=2.88"
Flow Length=250' Tc=15.6 min CN=77 Runoff=2.75 cfs 0.263 af

Subcatchment E-4: To the West Runoff Area=143,933 sf 0.00% Impervious Runoff Depth=2.88"
Flow Length=550' Tc=25.8 min CN=77 Runoff=6.73 cfs 0.792 af

Total Runoff Area = 6.186 ac Runoff Volume = 1.482 af Average Runoff Depth = 2.88"
100.00% Pervious = 6.186 ac 0.00% Impervious = 0.000 ac

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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Subcatchment E-1: To isolated wetlands

Runoff = 3.98 cfs @ 12.13 hrs, Volume= 0.318 af, Depth= 2.88"

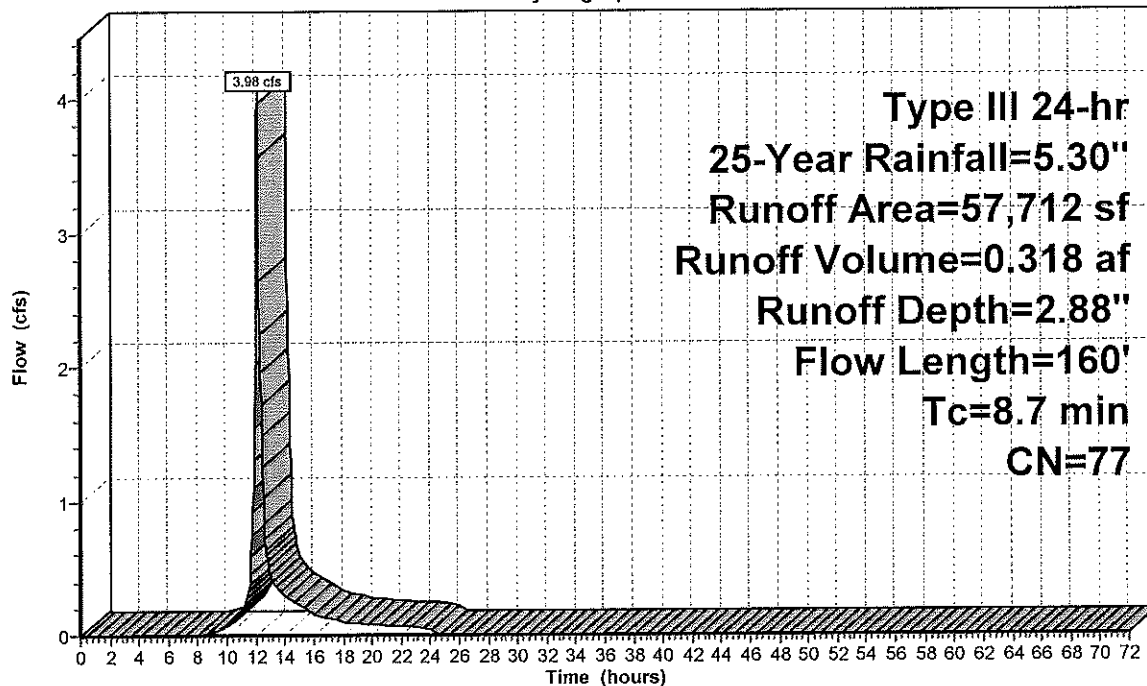
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
57,712	77	Woods, Good, HSG D
57,712		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	110	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.7	160	Total			

Subcatchment E-1: To isolated wetlands

Hydrograph



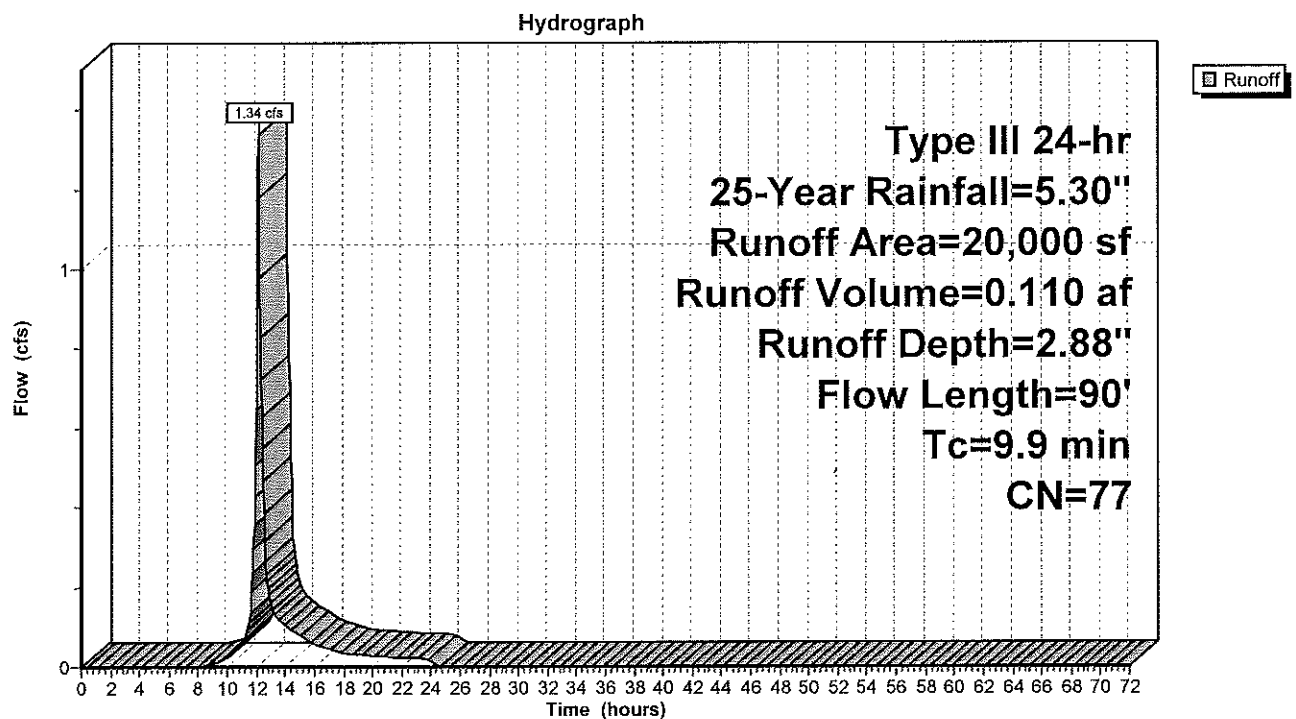
Summary for Subcatchment E-2: To the West

Runoff = 1.34 cfs @ 12.14 hrs, Volume= 0.110 af, Depth= 2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
20,000	77	Woods, Good, HSG D
20,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	40	0.0500	1.12		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
9.9	90	Total			

Subcatchment E-2: To the West

Summary for Subcatchment E-3: To the East

Runoff = 2.75 cfs @ 12.22 hrs, Volume= 0.263 af, Depth= 2.88"

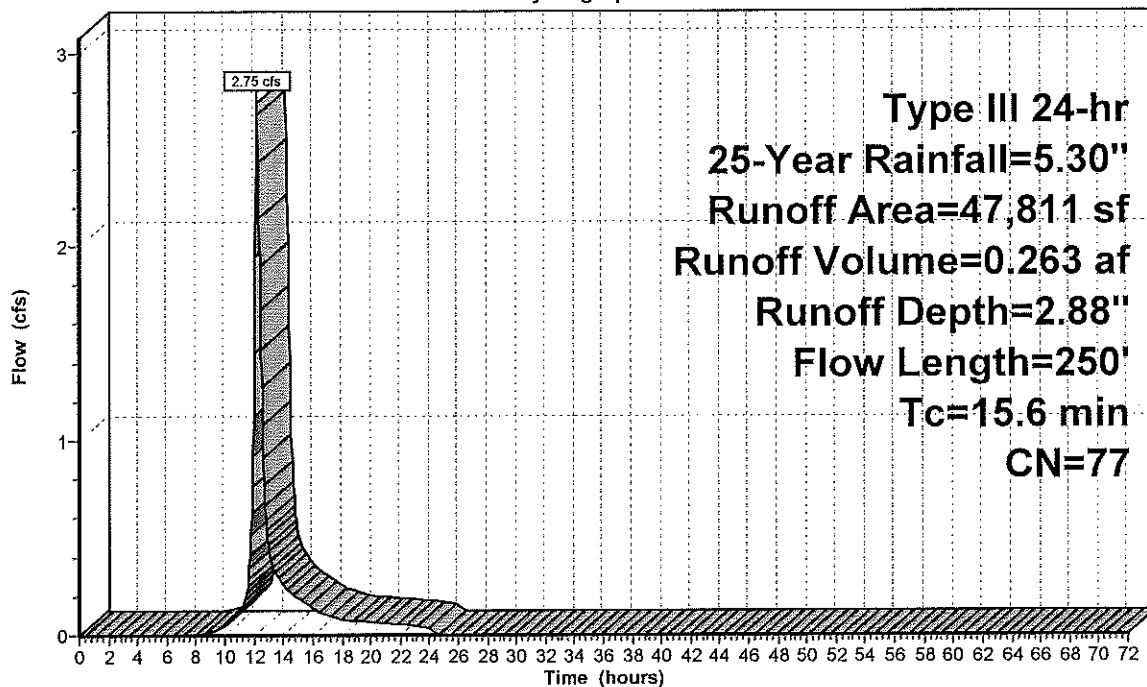
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
47,811	77	Woods, Good, HSG D
47,811		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
3.3	200	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.6	250	Total			

Subcatchment E-3: To the East

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Subcatchment E-4: To the West

Runoff = 6.73 cfs @ 12.36 hrs, Volume= 0.792 af, Depth= 2.88"

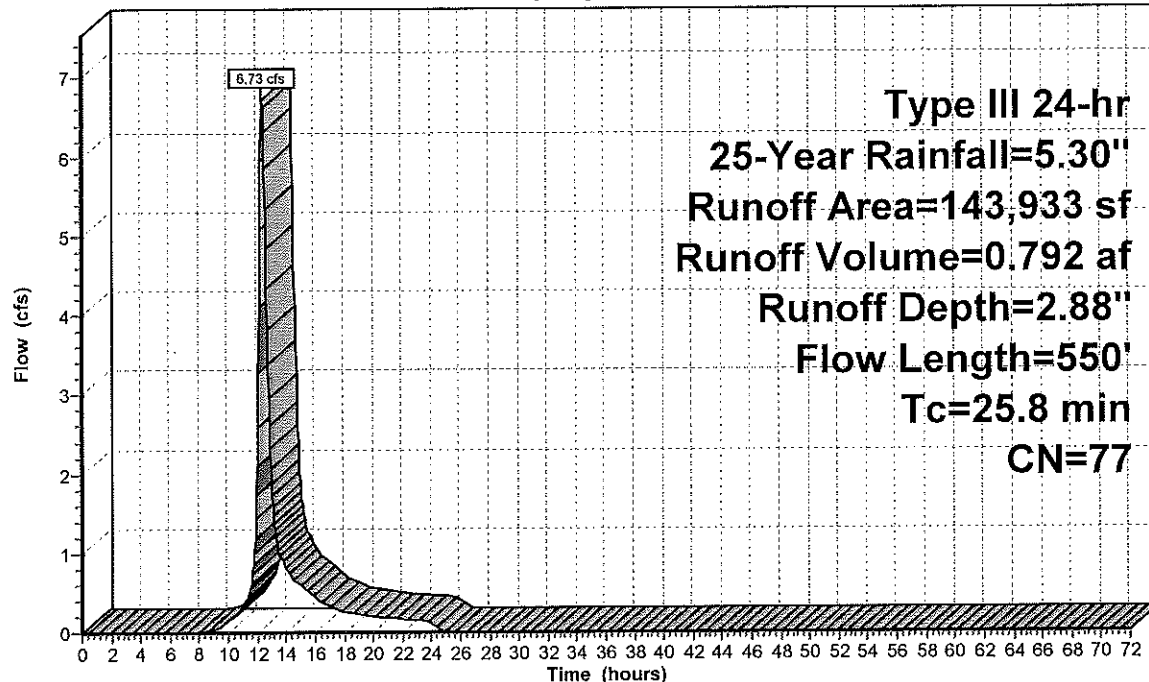
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
143,933	77	Woods, Good, HSG D
143,933		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
5.7	240	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.8	260	0.0520	1.14		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
25.8	550	Total			

Subcatchment E-4: To the West

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.50"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

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

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

Subcatchment E-1: To isolated wetlands Runoff Area=57,712 sf 0.00% Impervious Runoff Depth=3.92"
Flow Length=160' Tc=8.7 min CN=77 Runoff=5.46 cfs 0.433 af

Subcatchment E-2: To the West Runoff Area=20,000 sf 0.00% Impervious Runoff Depth=3.92"
Flow Length=90' Tc=9.9 min CN=77 Runoff=1.82 cfs 0.150 af

Subcatchment E-3: To the East Runoff Area=47,811 sf 0.00% Impervious Runoff Depth=3.92"
Flow Length=250' Tc=15.6 min CN=77 Runoff=3.74 cfs 0.358 af

Subcatchment E-4: To the West Runoff Area=143,933 sf 0.00% Impervious Runoff Depth=3.92"
Flow Length=550' Tc=25.8 min CN=77 Runoff=9.17 cfs 1.079 af

Total Runoff Area = 6.186 ac Runoff Volume = 2.020 af Average Runoff Depth = 3.92"
100.00% Pervious = 6.186 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment E-1: To isolated wetlands

Runoff = 5.46 cfs @ 12.12 hrs, Volume= 0.433 af, Depth= 3.92"

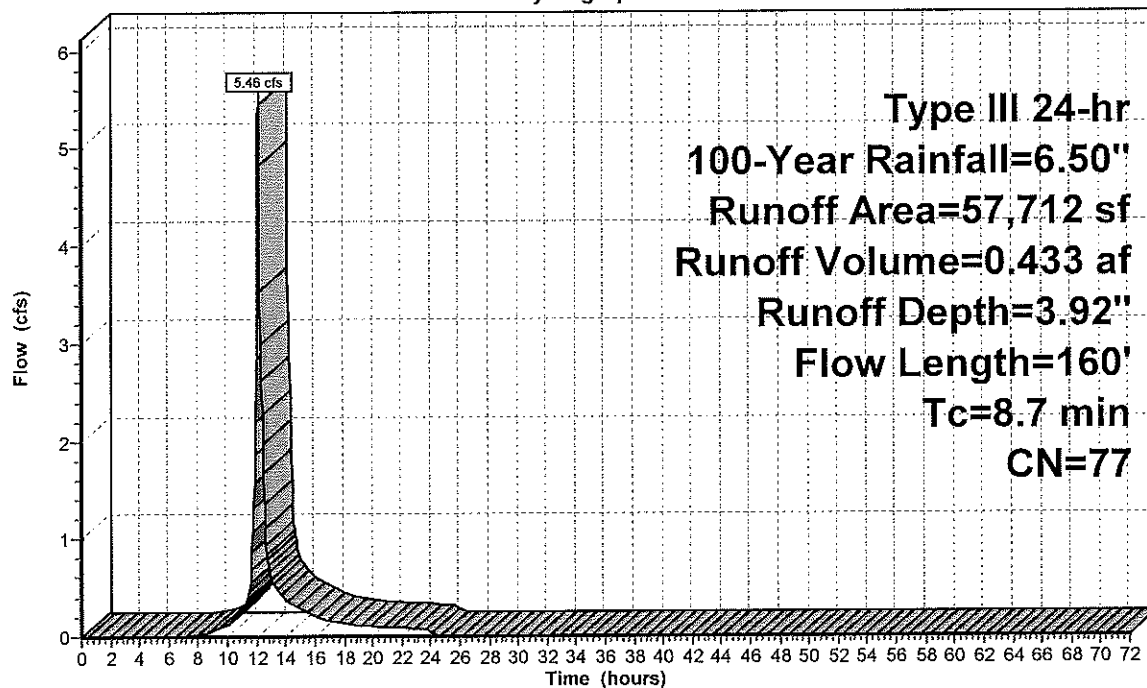
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
57,712	77	Woods, Good, HSG D
57,712		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	110	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.7	160	Total			

Subcatchment E-1: To isolated wetlands

Hydrograph



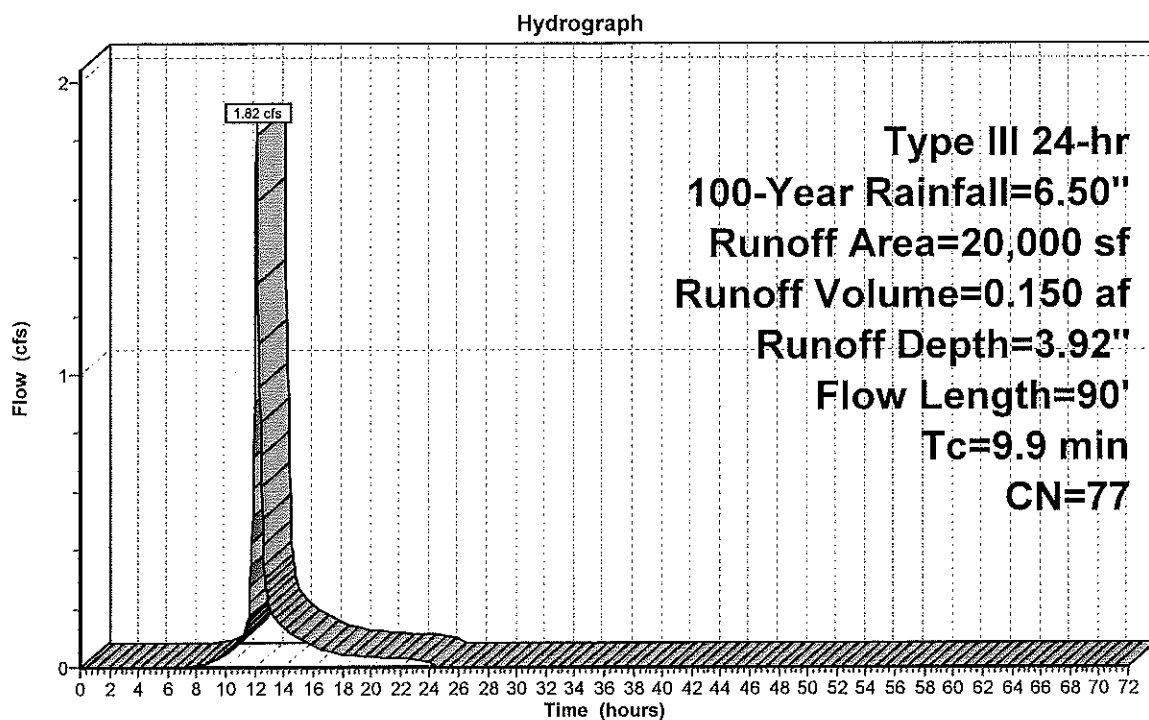
Summary for Subcatchment E-2: To the West

Runoff = 1.82 cfs @ 12.14 hrs, Volume= 0.150 af, Depth= 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
20,000	77	Woods, Good, HSG D
20,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	40	0.0500	1.12		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
9.9	90	Total			

Subcatchment E-2: To the West

Summary for Subcatchment E-3: To the East

Runoff = 3.74 cfs @ 12.21 hrs, Volume= 0.358 af, Depth= 3.92"

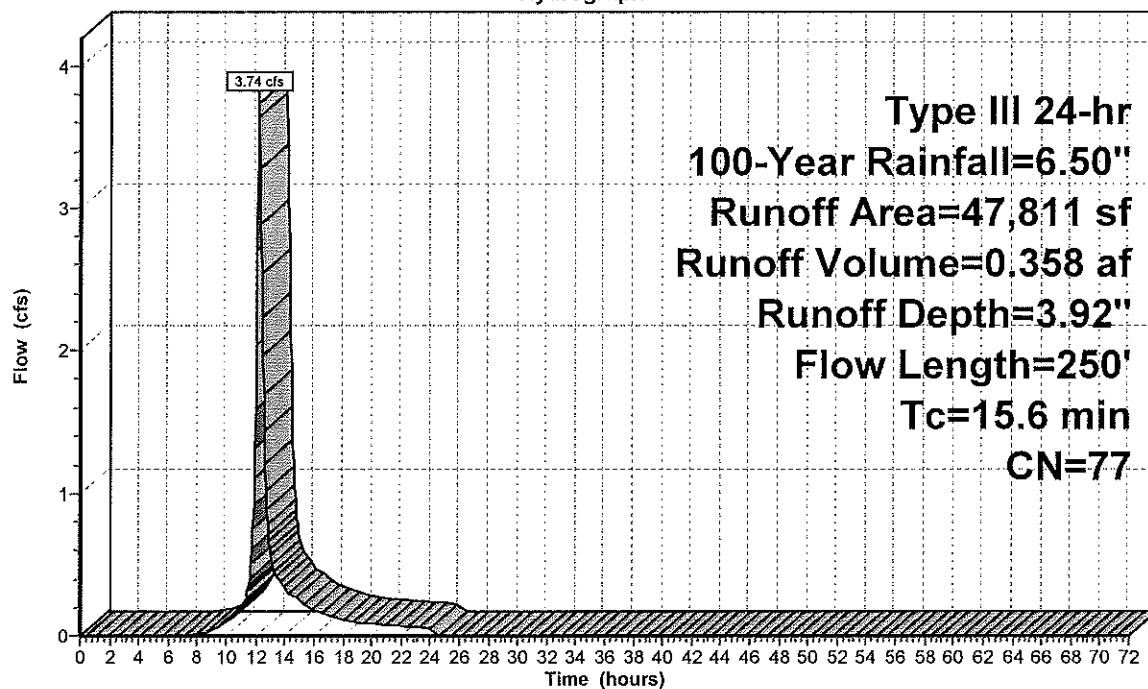
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
47,811	77	Woods, Good, HSG D
47,811		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
3.3	200	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.6	250	Total			

Subcatchment E-3: To the East

Hydrograph



Summary for Subcatchment E-4: To the West

Runoff = 9.17 cfs @ 12.36 hrs, Volume= 1.079 af, Depth= 3.92"

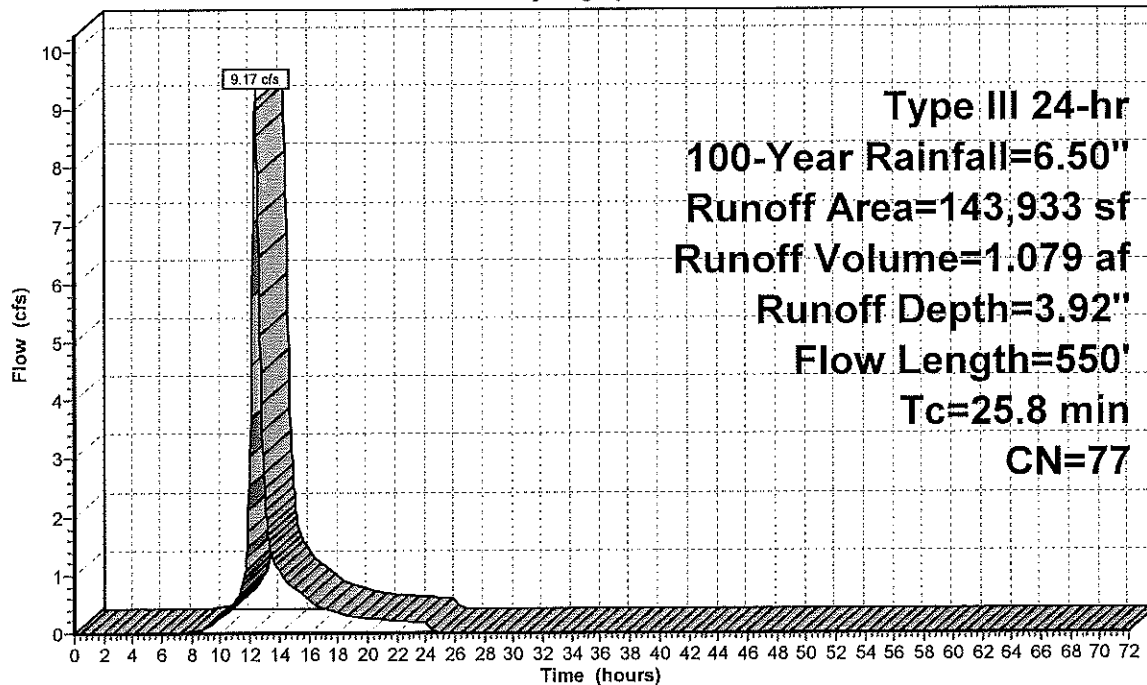
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
143,933	77	Woods, Good, HSG D
143,933		100.00% Pervious Area

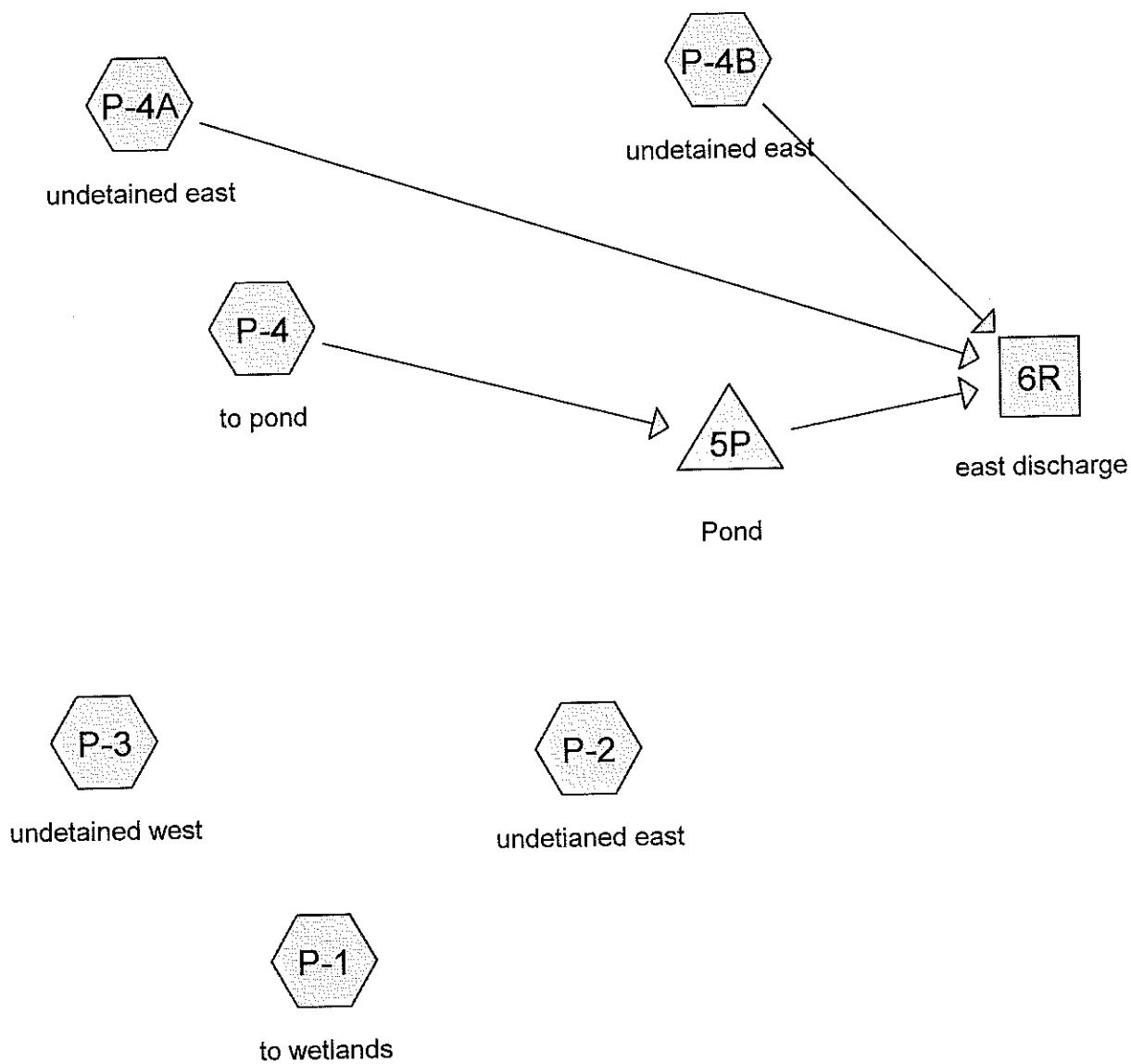
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
5.7	240	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.8	260	0.0520	1.14		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
25.8	550	Total			

Subcatchment E-4: To the West

Hydrograph



POST-DEVELOPMENT



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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.935	80	>75% Grass cover, Good, HSG D (P-1, P-3, P-4, P-4A, P-4B)
0.438	98	Paved parking, HSG D (P-1, P-4)
0.184	98	Unconnected roofs, HSG D (P-1, P-3, P-4, P-4A)
1.170	77	Woods, Good, HSG D (P-2, P-4B)
0.459	79	Woods/grass comb., Good, HSG D (P-1)
6.186	81	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
6.186	HSG D	P-1, P-2, P-3, P-4, P-4A, P-4B
0.000	Other	
6.186		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	3.935	0.000	3.935	>75% Grass cover, Good	P-1, P-3, P-4, P-4A, P-4B
0.000	0.000	0.000	0.438	0.000	0.438	Paved parking	P-1, P-4
0.000	0.000	0.000	0.184	0.000	0.184	Unconnected roofs	P-1, P-3, P-4, P-4A
0.000	0.000	0.000	1.170	0.000	1.170	Woods, Good	P-2, P-4B
0.000	0.000	0.000	0.459	0.000	0.459	Woods/grass comb., Good	P-1
0.000	0.000	0.000	6.186	0.000	6.186	TOTAL AREA	

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Type III 24-hr 2-Year Rainfall=3.10"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: to wetlands	Runoff Area=42,137 sf 5.46% Impervious Runoff Depth=1.33" Flow Length=160' Tc=8.7 min UI Adjusted CN=80 Runoff=1.32 cfs 0.107 af
Subcatchment P-2: undetained east	Runoff Area=13,055 sf 0.00% Impervious Runoff Depth=1.14" Flow Length=90' Tc=6.0 min CN=77 Runoff=0.38 cfs 0.028 af
Subcatchment P-3: undetained west	Runoff Area=24,906 sf 2.01% Impervious Runoff Depth=1.33" Flow Length=200' Tc=14.8 min CN=80 Runoff=0.66 cfs 0.063 af
Subcatchment P-4: to pond	Runoff Area=111,026 sf 20.07% Impervious Runoff Depth=1.53" Flow Length=530' Tc=26.4 min UI Adjusted CN=83 Runoff=2.72 cfs 0.324 af
Subcatchment P-4A: undetained east	Runoff Area=32,151 sf 6.22% Impervious Runoff Depth=1.39" Flow Length=250' Tc=9.2 min CN=81 Runoff=1.05 cfs 0.086 af
Subcatchment P-4B: undetained east	Runoff Area=46,191 sf 0.00% Impervious Runoff Depth=1.20" Flow Length=480' Tc=21.9 min CN=78 Runoff=0.94 cfs 0.106 af
Reach 6R: east discharge	Inflow=1.67 cfs 0.192 af Outflow=1.67 cfs 0.192 af
Pond 5P: Pond	Peak Elev=244.01' Storage=37 cf Inflow=2.72 cfs 0.324 af Discarded=2.72 cfs 0.324 af Primary=0.00 cfs 0.000 af Outflow=2.72 cfs 0.324 af
Total Runoff Area = 6.186 ac Runoff Volume = 0.715 af Average Runoff Depth = 1.39" 89.95% Pervious = 5.564 ac 10.05% Impervious = 0.622 ac	

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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment P-1: to wetlands

Runoff = 1.32 cfs @ 12.13 hrs, Volume= 0.107 af, Depth= 1.33"

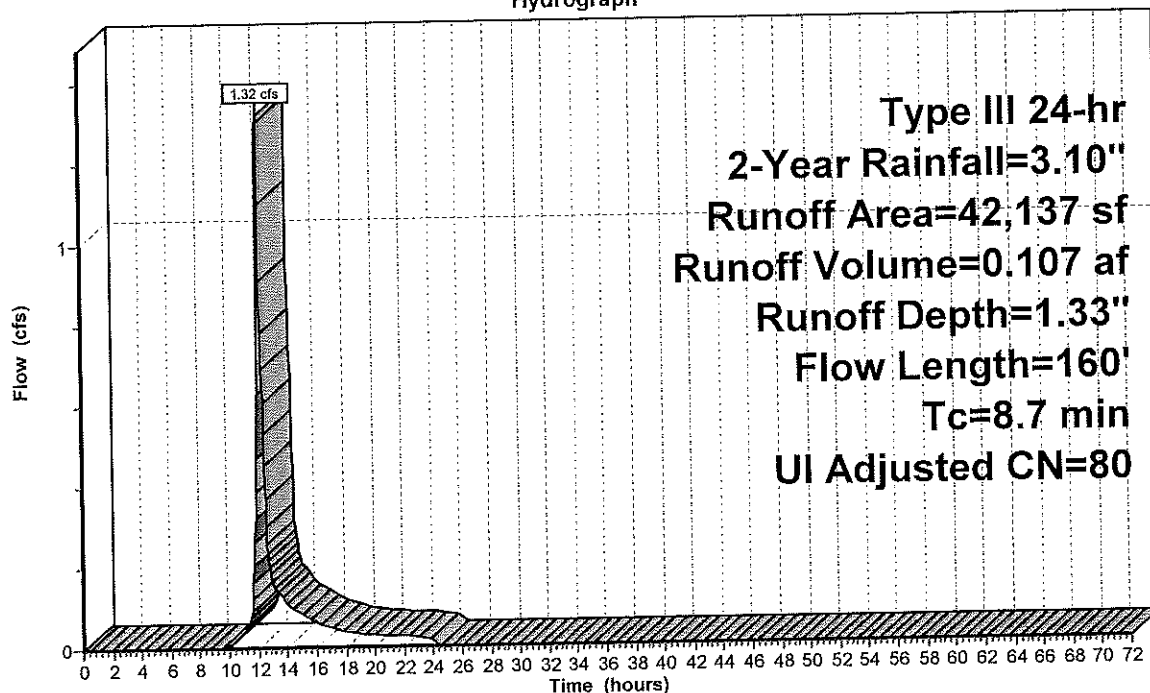
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Adj	Description
19,822	80		>75% Grass cover, Good, HSG D
1,800	98		Paved parking, HSG D
20,015	79		Woods/grass comb., Good, HSG D
500	98		Unconnected roofs, HSG D
42,137	81	80	Weighted Average, UI Adjusted
39,837			94.54% Pervious Area
2,300			5.46% Impervious Area
500			21.74% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	110	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.7	160	Total			

Subcatchment P-1: to wetlands

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment P-2: undetianed east

Runoff = 0.38 cfs @ 12.10 hrs, Volume= 0.028 af, Depth= 1.14"

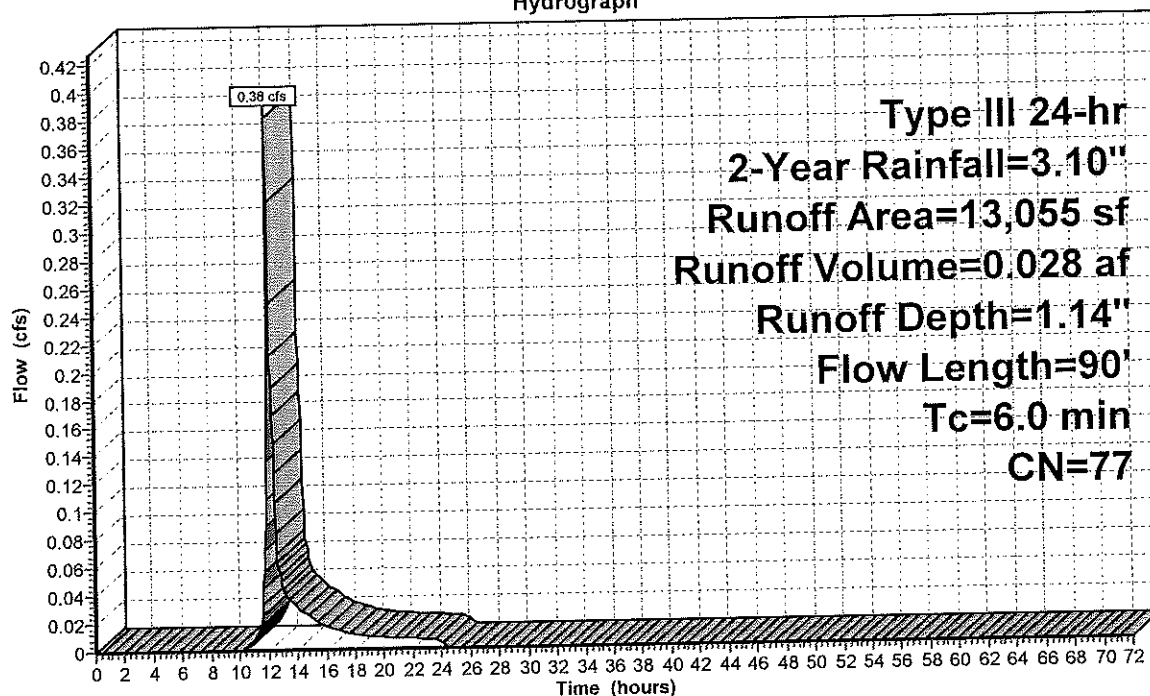
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
13,055	77	Woods, Good, HSG D
13,055		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	90		0.25		Direct Entry,

Subcatchment P-2: undetianed east

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment P-3: undetained west

Runoff = 0.66 cfs @ 12.21 hrs, Volume= 0.063 af, Depth= 1.33"

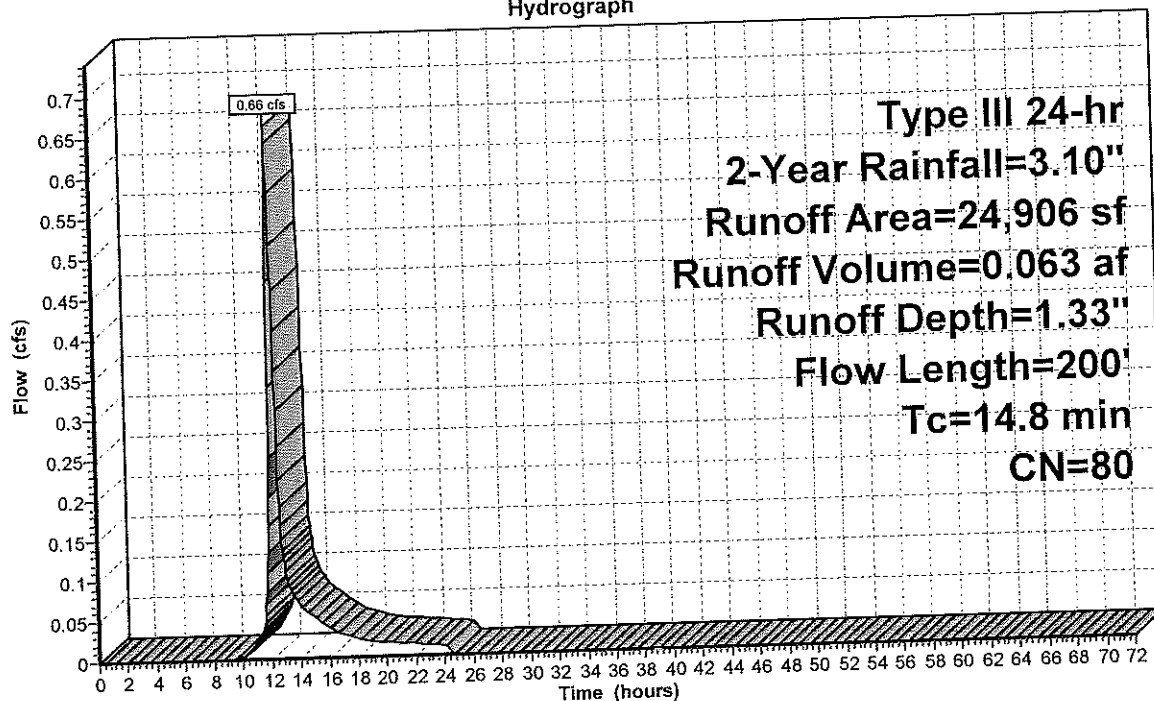
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
24,406	80	>75% Grass cover, Good, HSG D
500	98	Unconnected roofs, HSG D
24,906	80	Weighted Average
24,406		97.99% Pervious Area
500		2.01% Impervious Area
500		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
2.5	150	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
14.8	200	Total			

Subcatchment P-3: undetained west

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment P-4: to pond

Runoff = 2.72 cfs @ 12.37 hrs, Volume= 0.324 af, Depth= 1.53"

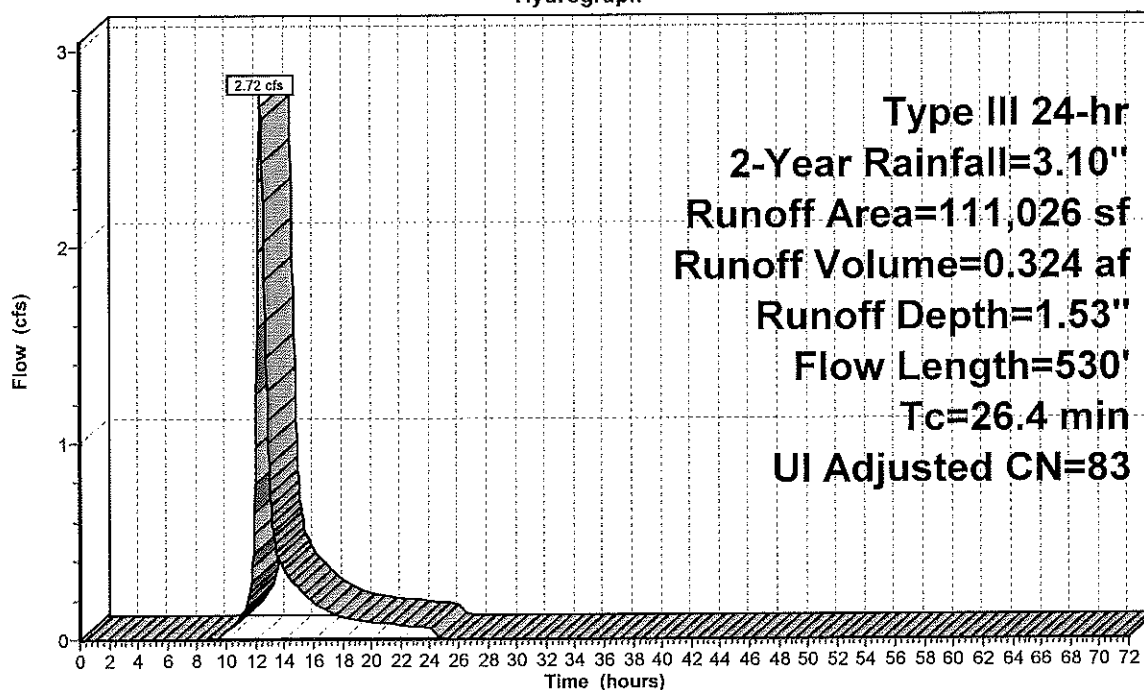
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Adj	Description
88,743	80		>75% Grass cover, Good, HSG D
5,000	98		Unconnected roofs, HSG D
17,283	98		Paved parking, HSG D
111,026	84	83	Weighted Average, UI Adjusted
88,743			79.93% Pervious Area
22,283			20.07% Impervious Area
5,000			22.44% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
10.1	480	0.0250	0.79		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.4	530	Total			

Subcatchment P-4: to pond

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.10"

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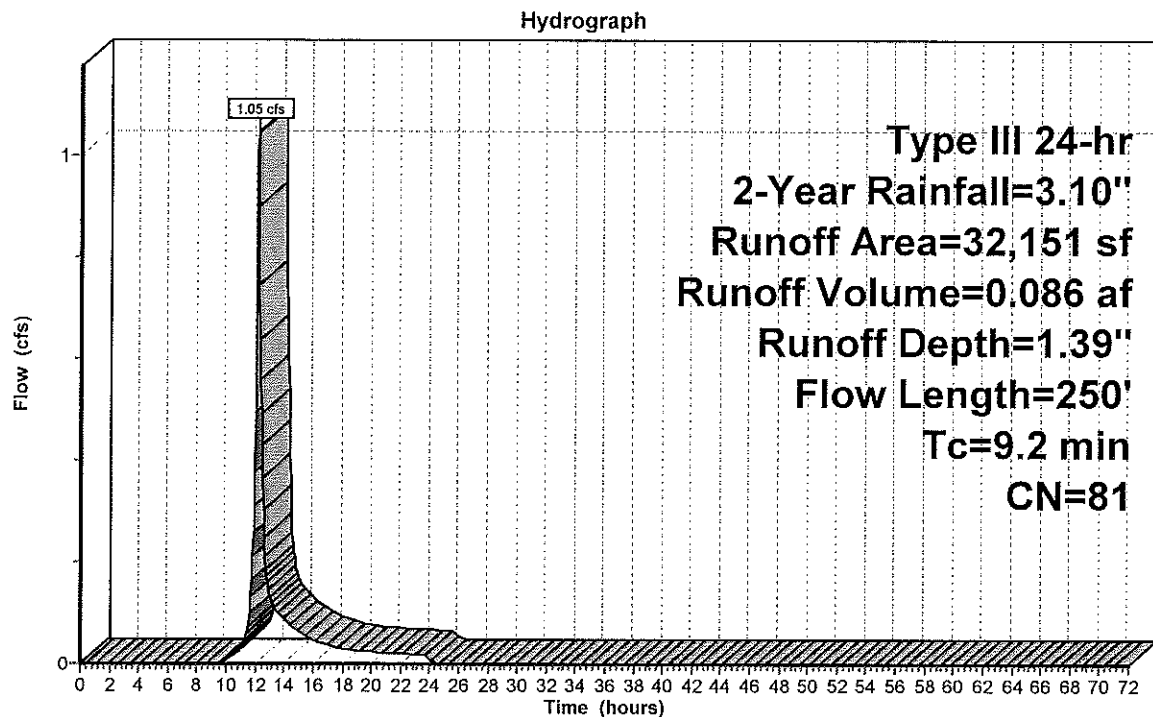
Summary for Subcatchment P-4A: undetained east

Runoff = 1.05 cfs @ 12.14 hrs, Volume= 0.086 af, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
30,151	80	>75% Grass cover, Good, HSG D
2,000	98	Unconnected roofs, HSG D
32,151	81	Weighted Average
30,151		93.78% Pervious Area
2,000		6.22% Impervious Area
2,000		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	200	0.1000	1.58		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
9.2	250	Total			

Subcatchment P-4A: undetained east

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Type III 24-hr 2-Year Rainfall=3.10"

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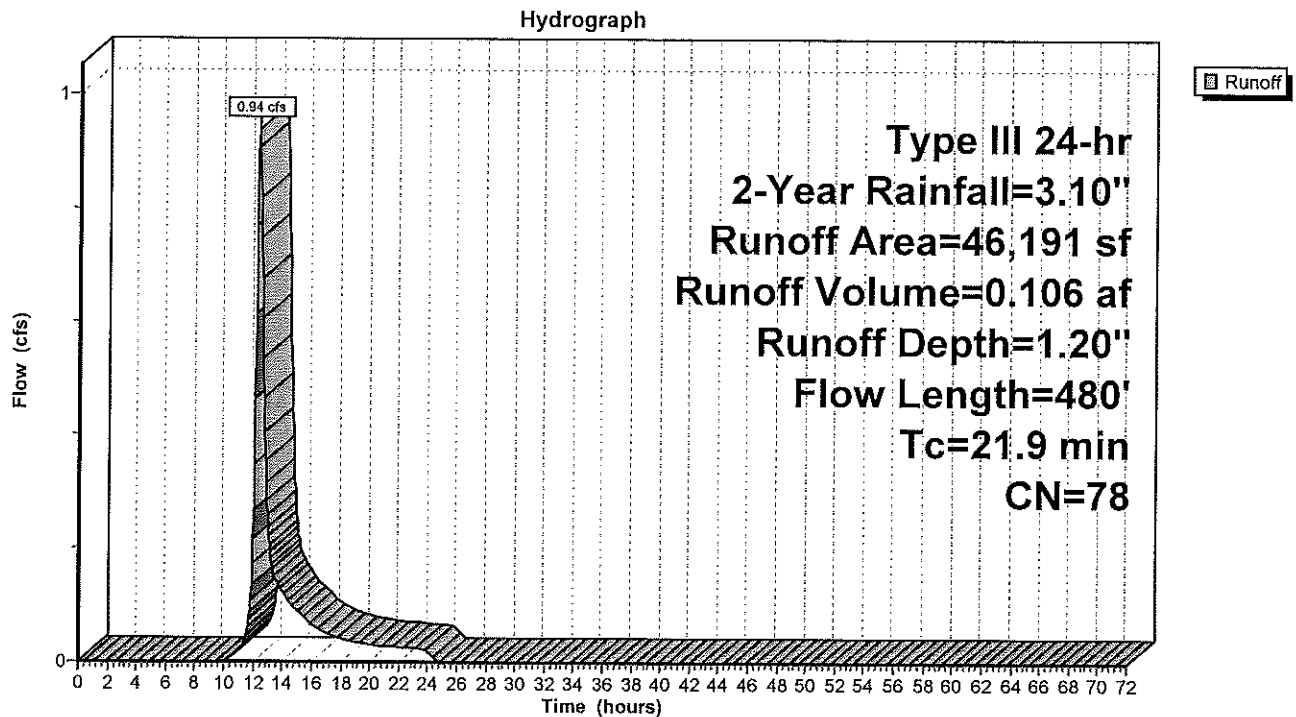
Summary for Subcatchment P-4B: undetained east

Runoff = 0.94 cfs @ 12.32 hrs, Volume= 0.106 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
37,905	77	Woods, Good, HSG D
8,286	80	>75% Grass cover, Good, HSG D
46,191	78	Weighted Average
46,191		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	430	0.0650	1.27		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
21.9	480	Total			

Subcatchment P-4B: undetained east

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Type III 24-hr 2-Year Rainfall=3.10"

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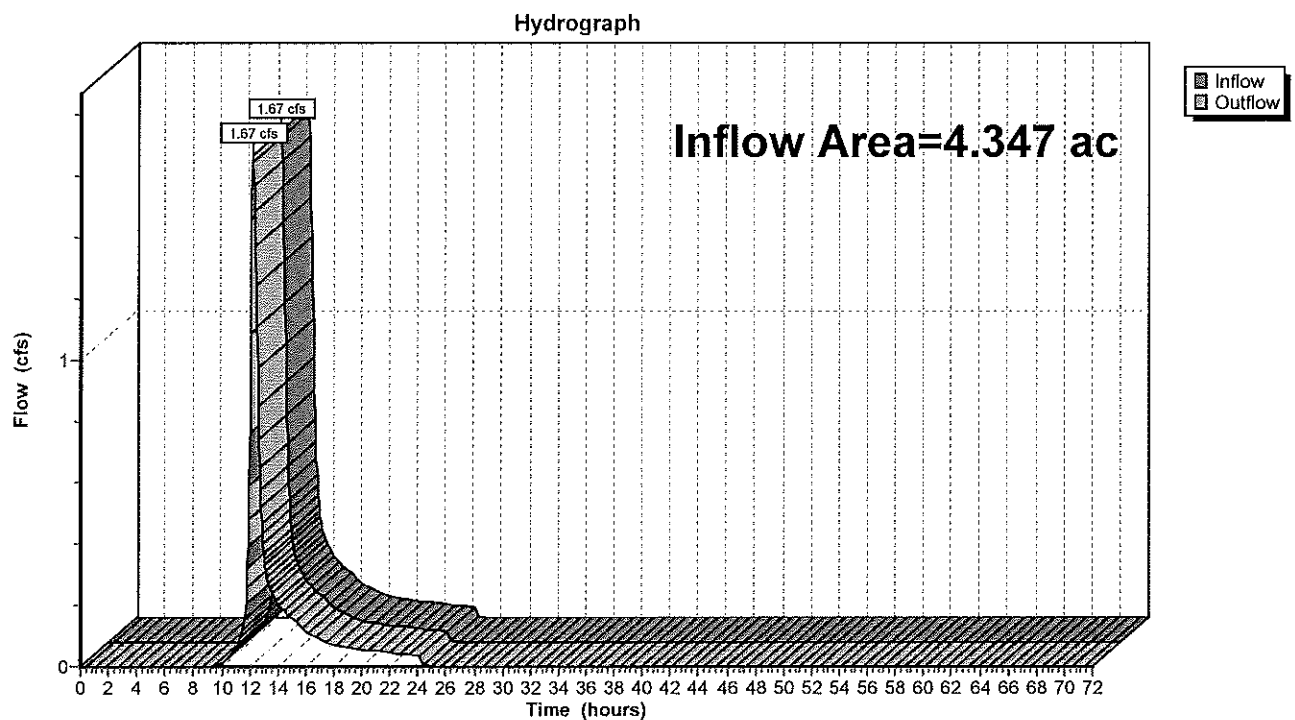
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Summary for Reach 6R: east discharge

Inflow Area = 4.347 ac, 12.82% Impervious, Inflow Depth = 0.53" for 2-Year event
Inflow = 1.67 cfs @ 12.18 hrs, Volume= 0.192 af
Outflow = 1.67 cfs @ 12.18 hrs, Volume= 0.192 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 6R: east discharge



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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Pond 5P: Pond

Inflow Area = 2.549 ac, 20.07% Impervious, Inflow Depth = 1.53" for 2-Year event
 Inflow = 2.72 cfs @ 12.37 hrs, Volume= 0.324 af
 Outflow = 2.72 cfs @ 12.38 hrs, Volume= 0.324 af, Atten= 0%, Lag= 0.2 min
 Discarded = 2.72 cfs @ 12.38 hrs, Volume= 0.324 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 244.01' @ 12.38 hrs Surf.Area= 3,029 sf Storage= 37 cf

Plug-Flow detention time= 0.2 min calculated for 0.324 af (100% of inflow)
 Center-of-Mass det. time= 0.2 min (853.6 - 853.4)

Volume	Invert	Avail.Storage	Storage Description
#1	244.00'	7,308 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
244.00	3,032	0	0
245.00	2,777	2,905	2,905
246.00	6,029	4,403	7,308

Device	Routing	Invert	Outlet Devices
#1	Discarded	244.00'	5.00 cfs Exfiltration at all elevations
#2	Primary	245.00'	15.0" Round Culvert L= 20.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 245.00' / 244.50' S= 0.0250 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Discarded OutFlow Max=5.00 cfs @ 12.38 hrs HW=244.01' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 5.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=244.00' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

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Type III 24-hr 2-Year Rainfall=3.10"

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Stage-Discharge for Pond 5P: Pond

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
244.00	0.00	0.00	0.00
244.05	5.00	5.00	0.00
244.10	5.00	5.00	0.00
244.15	5.00	5.00	0.00
244.20	5.00	5.00	0.00
244.25	5.00	5.00	0.00
244.30	5.00	5.00	0.00
244.35	5.00	5.00	0.00
244.40	5.00	5.00	0.00
244.45	5.00	5.00	0.00
244.50	5.00	5.00	0.00
244.55	5.00	5.00	0.00
244.60	5.00	5.00	0.00
244.65	5.00	5.00	0.00
244.70	5.00	5.00	0.00
244.75	5.00	5.00	0.00
244.80	5.00	5.00	0.00
244.85	5.00	5.00	0.00
244.90	5.00	5.00	0.00
244.95	5.00	5.00	0.00
245.00	5.00	5.00	0.00
245.05	5.01	5.00	0.01
245.10	5.05	5.00	0.05
245.15	5.11	5.00	0.11
245.20	5.19	5.00	0.19
245.25	5.30	5.00	0.30
245.30	5.42	5.00	0.42
245.35	5.57	5.00	0.57
245.40	5.73	5.00	0.73
245.45	5.91	5.00	0.91
245.50	6.10	5.00	1.10
245.55	6.31	5.00	1.31
245.60	6.54	5.00	1.54
245.65	6.77	5.00	1.77
245.70	7.01	5.00	2.01
245.75	7.27	5.00	2.27
245.80	7.53	5.00	2.53
245.85	7.79	5.00	2.79
245.90	8.06	5.00	3.06
245.95	8.32	5.00	3.32
246.00	8.58	5.00	3.58
246.05	8.84	5.00	3.84
246.10	9.08	5.00	4.08
246.15	9.31	5.00	4.31
246.20	9.52	5.00	4.52
246.25	9.67	5.00	4.67

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Type III 24-hr 10-Year Rainfall=4.50"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: to wetlands	Runoff Area=42,137 sf 5.46% Impervious Runoff Depth=2.46" Flow Length=160' Tc=8.7 min UI Adjusted CN=80 Runoff=2.49 cfs 0.198 af
Subcatchment P-2: undetained east	Runoff Area=13,055 sf 0.00% Impervious Runoff Depth=2.21" Flow Length=90' Tc=6.0 min CN=77 Runoff=0.76 cfs 0.055 af
Subcatchment P-3: undetained west	Runoff Area=24,906 sf 2.01% Impervious Runoff Depth=2.46" Flow Length=200' Tc=14.8 min CN=80 Runoff=1.25 cfs 0.117 af
Subcatchment P-4: to pond	Runoff Area=111,026 sf 20.07% Impervious Runoff Depth=2.73" Flow Length=530' Tc=26.4 min UI Adjusted CN=83 Runoff=4.87 cfs 0.579 af
Subcatchment P-4A: undetained east	Runoff Area=32,151 sf 6.22% Impervious Runoff Depth=2.55" Flow Length=250' Tc=9.2 min CN=81 Runoff=1.94 cfs 0.157 af
Subcatchment P-4B: undetained east	Runoff Area=46,191 sf 0.00% Impervious Runoff Depth=2.29" Flow Length=480' Tc=21.9 min CN=78 Runoff=1.84 cfs 0.203 af
Reach 6R: east discharge	Inflow=3.25 cfs 0.359 af Outflow=3.25 cfs 0.359 af
Pond 5P: Pond	Peak Elev=244.02' Storage=66 cf Inflow=4.87 cfs 0.579 af Discarded=4.87 cfs 0.579 af Primary=0.00 cfs 0.000 af Outflow=4.87 cfs 0.579 af
Total Runoff Area = 6.186 ac Runoff Volume = 1.309 af Average Runoff Depth = 2.54" 89.95% Pervious = 5.564 ac 10.05% Impervious = 0.622 ac	

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Type III 24-hr 10-Year Rainfall=4.50"

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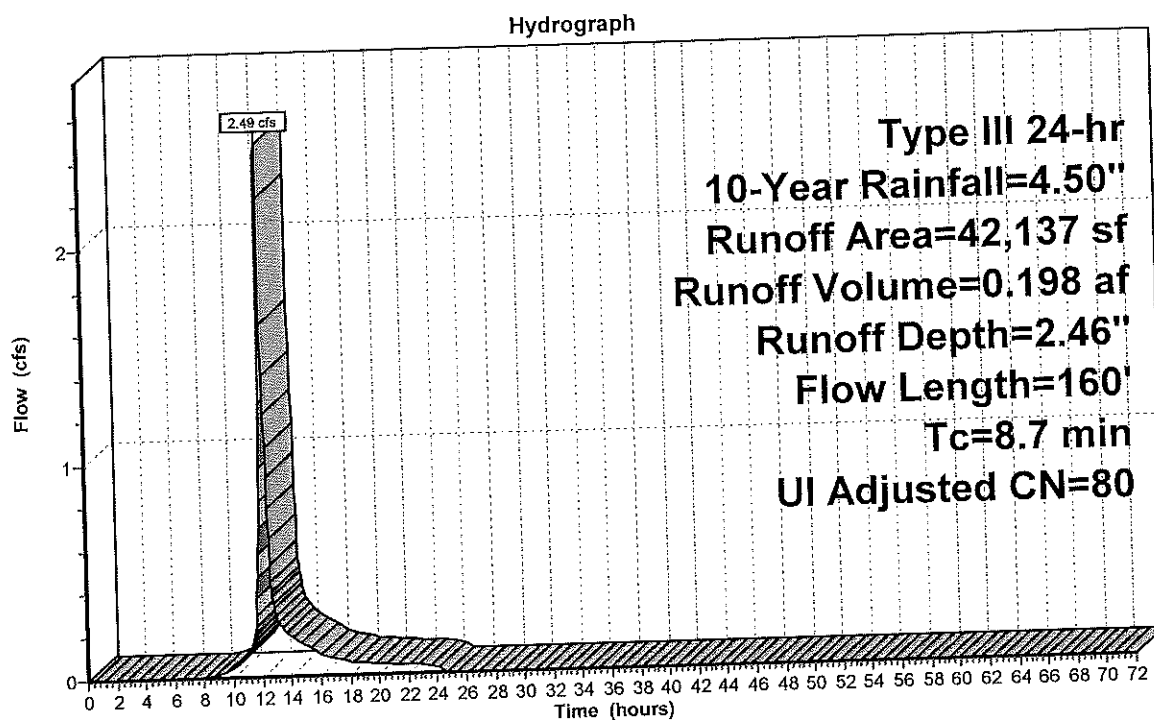
Summary for Subcatchment P-1: to wetlands

Runoff = 2.49 cfs @ 12.13 hrs, Volume= 0.198 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Adj	Description
19,822	80		>75% Grass cover, Good, HSG D
1,800	98		Paved parking, HSG D
20,015	79		Woods/grass comb., Good, HSG D
500	98		Unconnected roofs, HSG D
42,137	81	80	Weighted Average, UI Adjusted
39,837			94.54% Pervious Area
2,300			5.46% Impervious Area
500			21.74% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	110	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.7	160	Total			

Subcatchment P-1: to wetlands

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Type III 24-hr 10-Year Rainfall=4.50"

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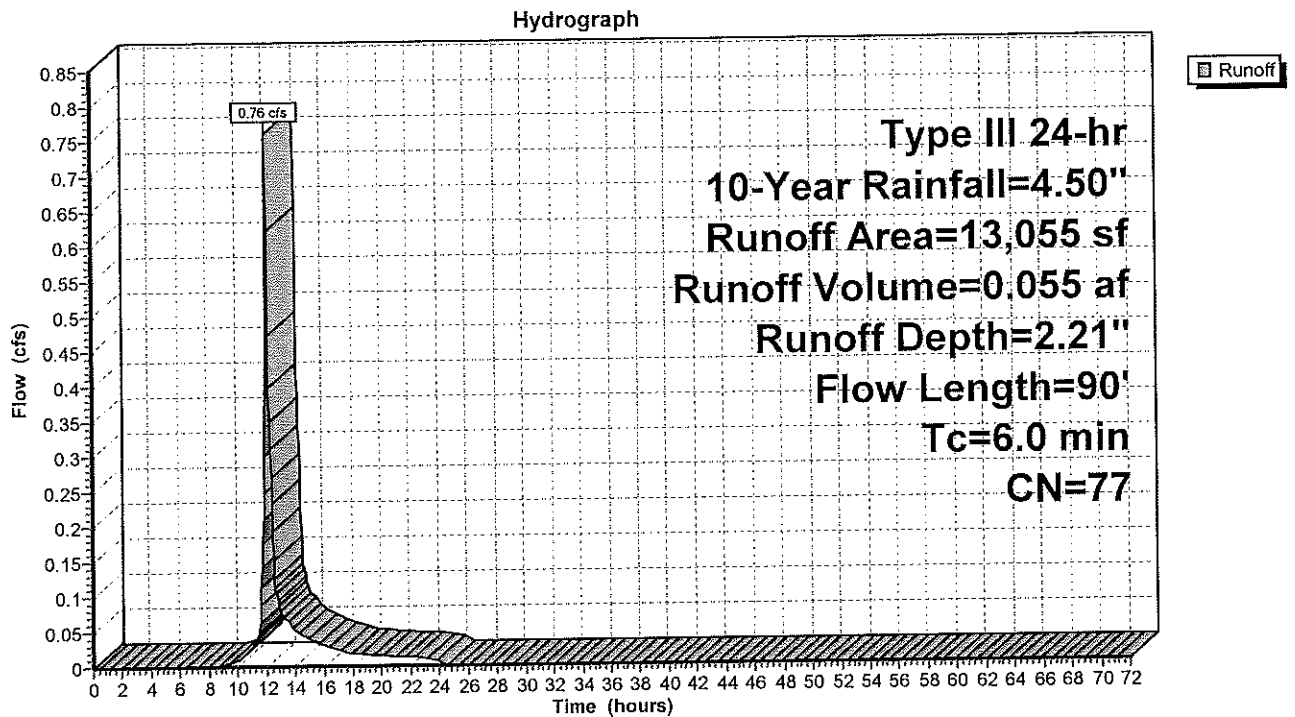
Summary for Subcatchment P-2: undetianed east

Runoff = 0.76 cfs @ 12.09 hrs, Volume= 0.055 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
13,055	77	Woods, Good, HSG D
13,055		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	90		0.25		Direct Entry,

Subcatchment P-2: undetianed east

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Type III 24-hr 10-Year Rainfall=4.50"

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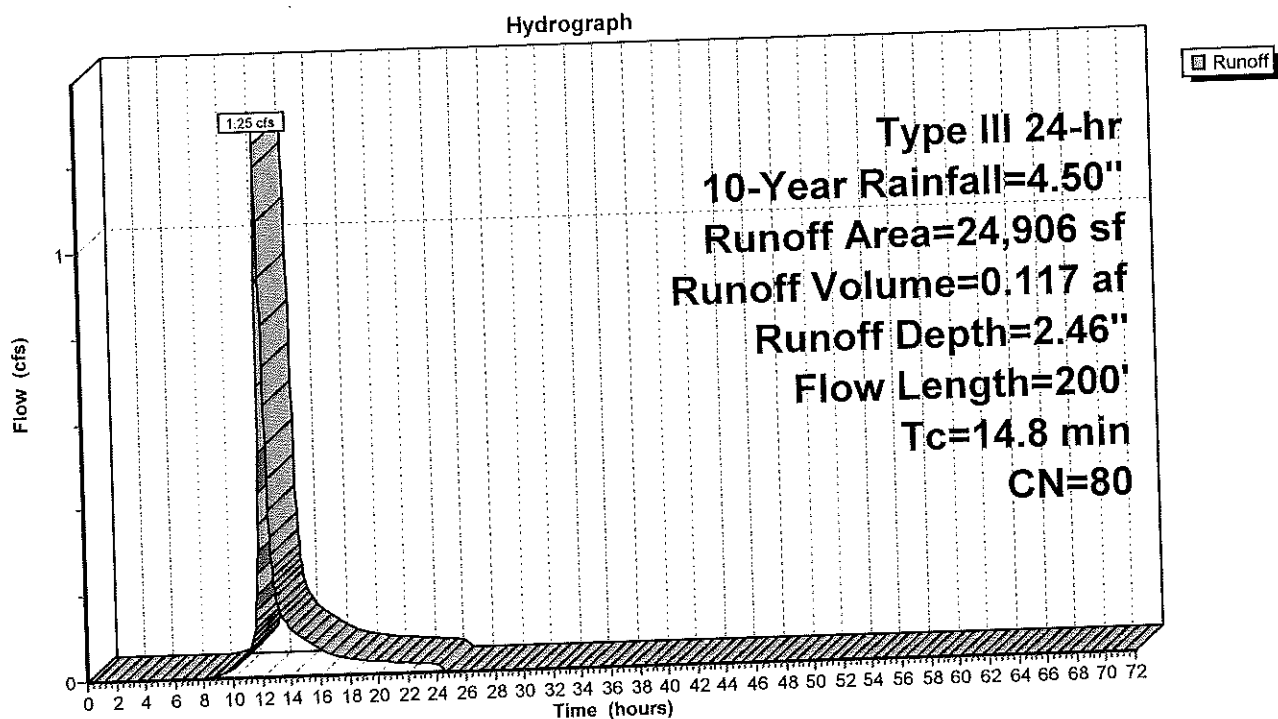
Summary for Subcatchment P-3: undetained west

Runoff = 1.25 cfs @ 12.21 hrs, Volume= 0.117 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
24,406	80	>75% Grass cover, Good, HSG D
500	98	Unconnected roofs, HSG D
24,906	80	Weighted Average
24,406		97.99% Pervious Area
500		2.01% Impervious Area
500		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
2.5	150	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
14.8	200	Total			

Subcatchment P-3: undetained west

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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Subcatchment P-4: to pond

Runoff = 4.87 cfs @ 12.36 hrs, Volume= 0.579 af, Depth= 2.73"

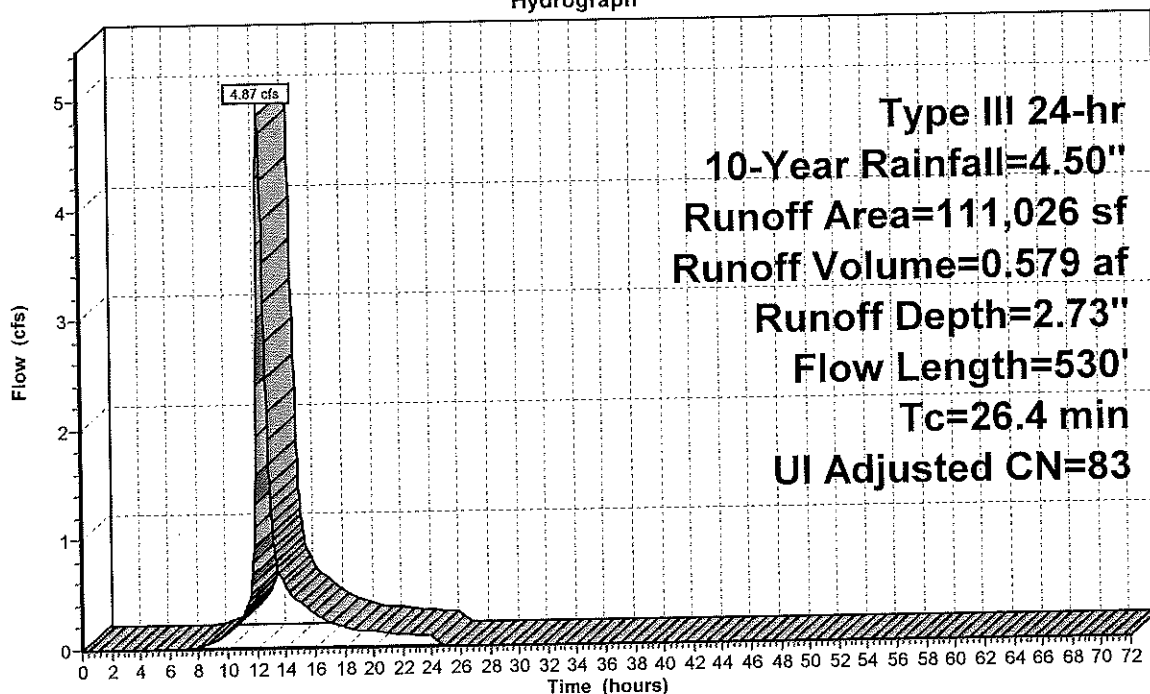
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Adj	Description
88,743	80		>75% Grass cover, Good, HSG D
5,000	98		Unconnected roofs, HSG D
17,283	98		Paved parking, HSG D
111,026	84	83	Weighted Average, UI Adjusted
88,743			79.93% Pervious Area
22,283			20.07% Impervious Area
5,000			22.44% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
10.1	480	0.0250	0.79		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.4	530	Total			

Subcatchment P-4: to pond

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.50"

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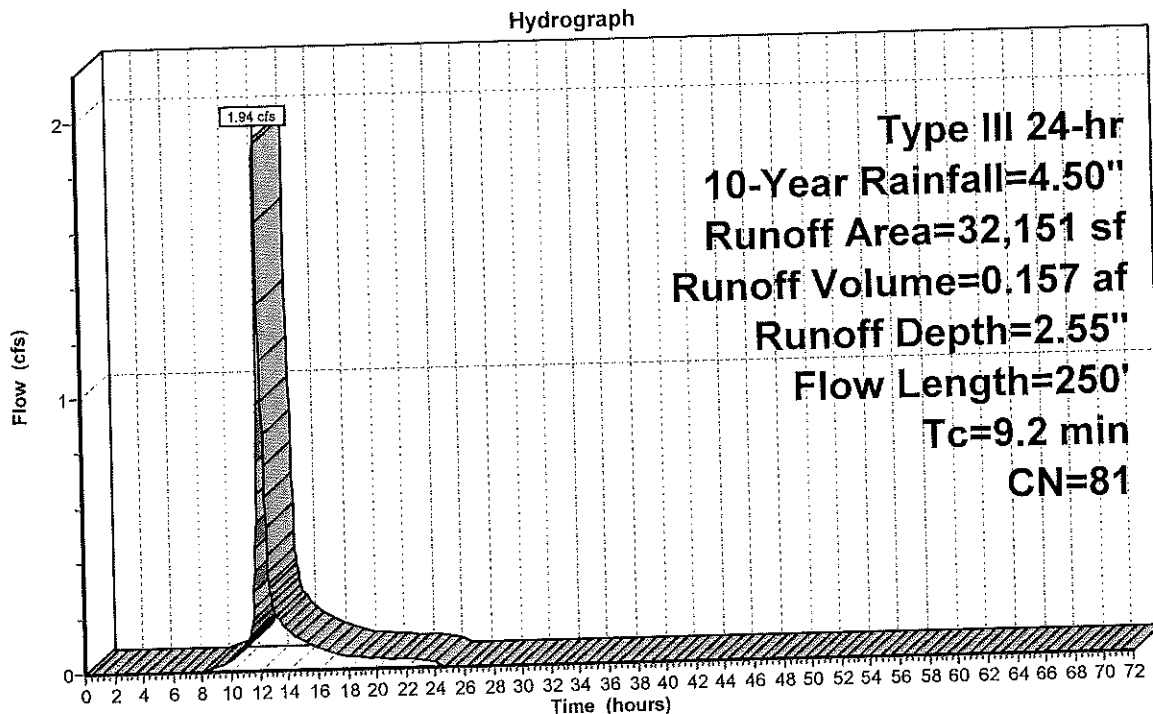
Summary for Subcatchment P-4A: undetained east

Runoff = 1.94 cfs @ 12.13 hrs, Volume= 0.157 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
30,151	80	>75% Grass cover, Good, HSG D
2,000	98	Unconnected roofs, HSG D
32,151	81	Weighted Average
30,151		93.78% Pervious Area
2,000		6.22% Impervious Area
2,000		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	200	0.1000	1.58		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
9.2	250	Total			

Subcatchment P-4A: undetained east

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Type III 24-hr 10-Year Rainfall=4.50"

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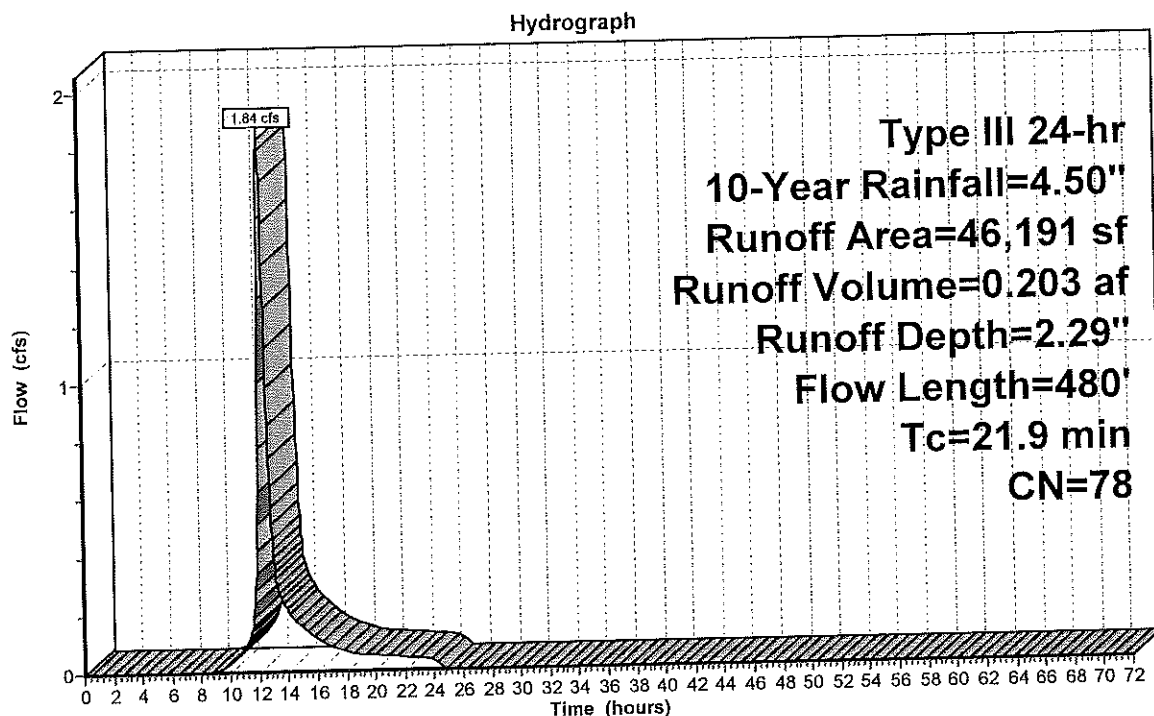
Summary for Subcatchment P-4B: undetained east

Runoff = 1.84 cfs @ 12.31 hrs, Volume= 0.203 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
37,905	77	Woods, Good, HSG D
8,286	80	>75% Grass cover, Good, HSG D
46,191	78	Weighted Average
46,191		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	430	0.0650	1.27		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
21.9	480	Total			

Subcatchment P-4B: undetained east

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Type III 24-hr 10-Year Rainfall=4.50"

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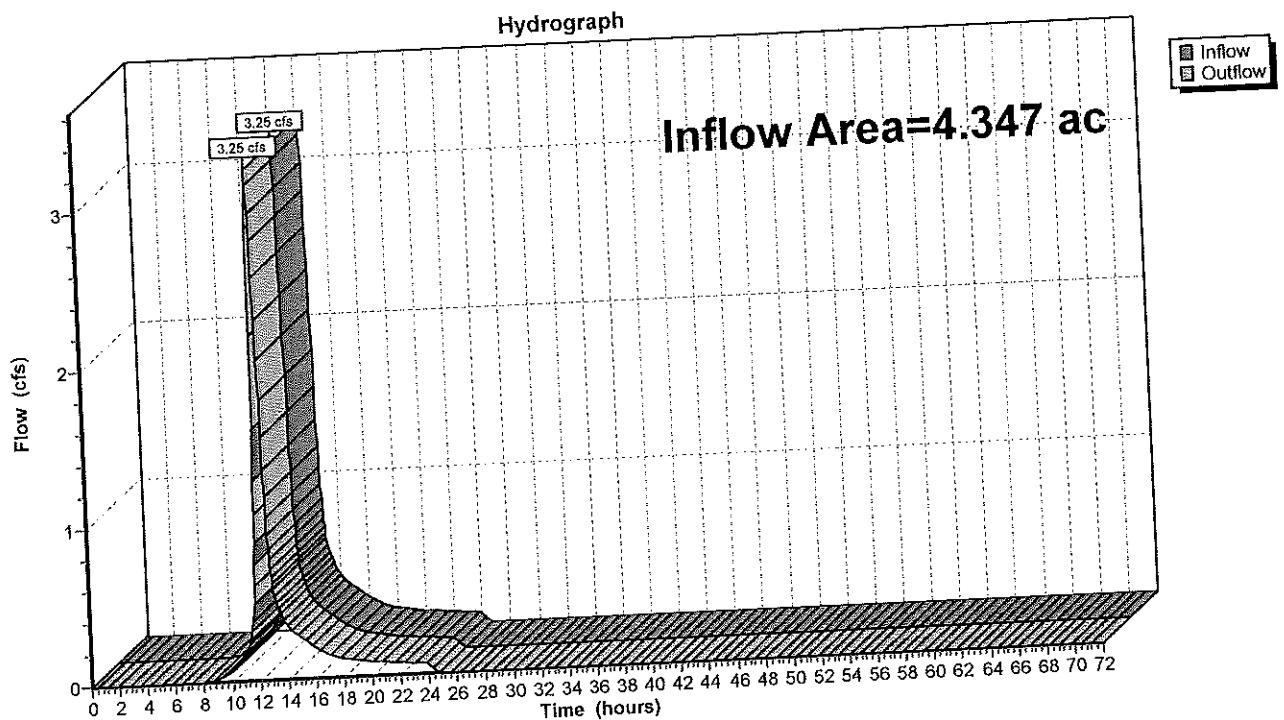
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Summary for Reach 6R: east discharge

Inflow Area = 4.347 ac, 12.82% Impervious, Inflow Depth = 0.99" for 10-Year event
Inflow = 3.25 cfs @ 12.17 hrs, Volume= 0.359 af
Outflow = 3.25 cfs @ 12.17 hrs, Volume= 0.359 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 6R: east discharge



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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Pond 5P: Pond

Inflow Area = 2.549 ac, 20.07% Impervious, Inflow Depth = 2.73" for 10-Year event
 Inflow = 4.87 cfs @ 12.36 hrs, Volume= 0.579 af
 Outflow = 4.87 cfs @ 12.37 hrs, Volume= 0.579 af, Atten= 0%, Lag= 0.2 min
 Discarded = 4.87 cfs @ 12.37 hrs, Volume= 0.579 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 244.02' @ 12.37 hrs Surf.Area= 3,026 sf Storage= 66 cf

Plug-Flow detention time= 0.2 min calculated for 0.579 af (100% of inflow)
 Center-of-Mass det. time= 0.2 min (836.9 - 836.7)

Volume	Invert	Avail.Storage	Storage Description
#1	244.00'	7,308 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
244.00	3,032	0	0
245.00	2,777	2,905	2,905
246.00	6,029	4,403	7,308

Device	Routing	Invert	Outlet Devices
#1	Discarded	244.00'	5.00 cfs Exfiltration at all elevations
#2	Primary	245.00'	15.0" Round Culvert L= 20.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 245.00' / 244.50' S= 0.0250 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Discarded OutFlow Max=5.00 cfs @ 12.37 hrs HW=244.02' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 5.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=244.00' (Free Discharge)

↑2=Culvert (Controls 0.00 cfs)

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Type III 24-hr 10-Year Rainfall=4.50"

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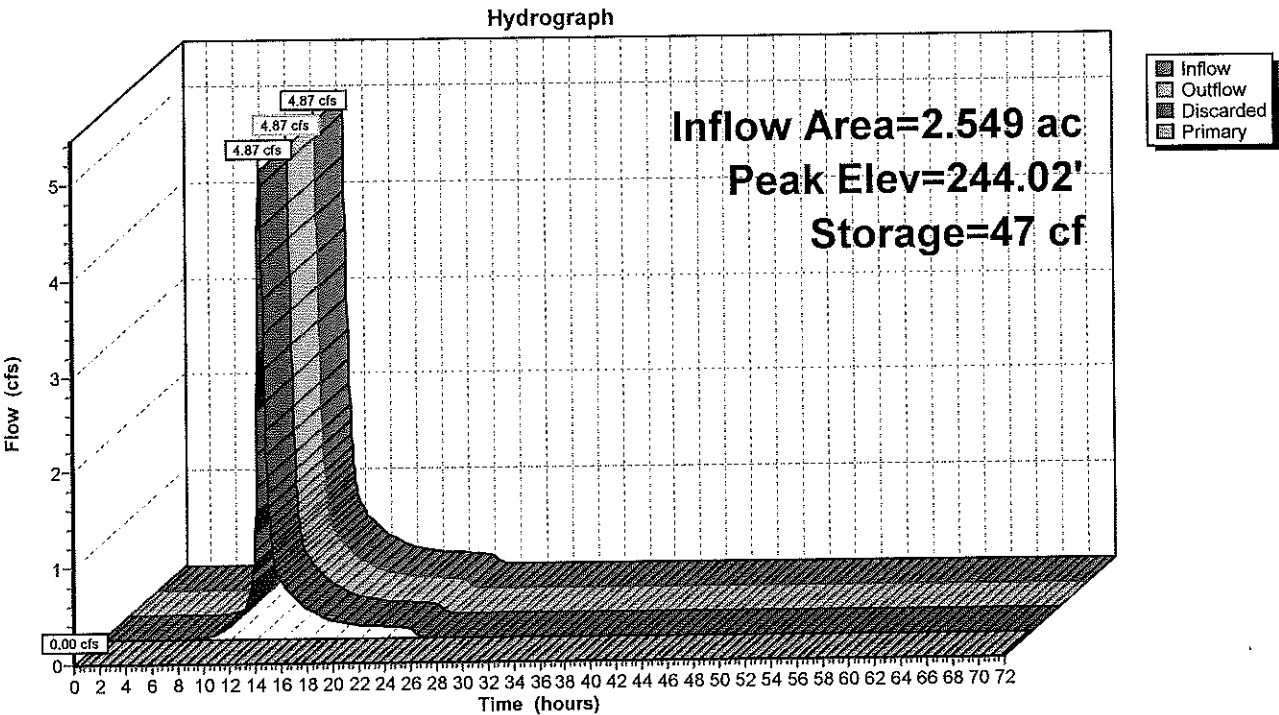
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Stage-Discharge for Pond 5P: Pond

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
244.00	0.00	0.00	0.00
244.05	5.00	5.00	0.00
244.10	5.00	5.00	0.00
244.15	5.00	5.00	0.00
244.20	5.00	5.00	0.00
244.25	5.00	5.00	0.00
244.30	5.00	5.00	0.00
244.35	5.00	5.00	0.00
244.40	5.00	5.00	0.00
244.45	5.00	5.00	0.00
244.50	5.00	5.00	0.00
244.55	5.00	5.00	0.00
244.60	5.00	5.00	0.00
244.65	5.00	5.00	0.00
244.70	5.00	5.00	0.00
244.75	5.00	5.00	0.00
244.80	5.00	5.00	0.00
244.85	5.00	5.00	0.00
244.90	5.00	5.00	0.00
244.95	5.00	5.00	0.00
245.00	5.00	5.00	0.00
245.05	5.01	5.00	0.01
245.10	5.05	5.00	0.05
245.15	5.11	5.00	0.11
245.20	5.19	5.00	0.19
245.25	5.30	5.00	0.30
245.30	5.42	5.00	0.42
245.35	5.57	5.00	0.57
245.40	5.73	5.00	0.73
245.45	5.91	5.00	0.91
245.50	6.10	5.00	1.10
245.55	6.31	5.00	1.31
245.60	6.54	5.00	1.54
245.65	6.77	5.00	1.77
245.70	7.01	5.00	2.01
245.75	7.27	5.00	2.27
245.80	7.53	5.00	2.53
245.85	7.79	5.00	2.79
245.90	8.06	5.00	3.06
245.95	8.32	5.00	3.32
246.00	8.58	5.00	3.58
246.05	8.84	5.00	3.84
246.10	9.08	5.00	4.08
246.15	9.31	5.00	4.31
246.20	9.52	5.00	4.52
246.25	9.67	5.00	4.67

Pond 5P: Pond



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Type III 24-hr 25-Year Rainfall=4.80"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: to wetlands	Runoff Area=42,137 sf 5.46% Impervious Runoff Depth=2.72" Flow Length=160' Tc=8.7 min UI Adjusted CN=80 Runoff=2.77 cfs 0.219 af
Subcatchment P-2: undetained east	Runoff Area=13,055 sf 0.00% Impervious Runoff Depth=2.46" Flow Length=90' Tc=6.0 min CN=77 Runoff=0.85 cfs 0.061 af
Subcatchment P-3: undetained west	Runoff Area=24,906 sf 2.01% Impervious Runoff Depth=2.72" Flow Length=200' Tc=14.8 min CN=80 Runoff=1.38 cfs 0.130 af
Subcatchment P-4: to pond	Runoff Area=111,026 sf 20.07% Impervious Runoff Depth=2.99" Flow Length=530' Tc=26.4 min UI Adjusted CN=83 Runoff=5.34 cfs 0.636 af
Subcatchment P-4A: undetained east	Runoff Area=32,151 sf 6.22% Impervious Runoff Depth=2.81" Flow Length=250' Tc=9.2 min CN=81 Runoff=2.14 cfs 0.173 af
Subcatchment P-4B: undetained east	Runoff Area=46,191 sf 0.00% Impervious Runoff Depth=2.54" Flow Length=480' Tc=21.9 min CN=78 Runoff=2.05 cfs 0.225 af
Reach 6R: east discharge	Inflow=3.60 cfs 0.397 af Outflow=3.60 cfs 0.397 af
Pond 5P: Pond	Peak Elev=244.07' Storage=210 cf Inflow=5.34 cfs 0.636 af Discarded=5.00 cfs 0.636 af Primary=0.00 cfs 0.000 af Outflow=5.00 cfs 0.636 af
Total Runoff Area = 6.186 ac Runoff Volume = 1.443 af Average Runoff Depth = 2.80" 89.95% Pervious = 5.564 ac 10.05% Impervious = 0.622 ac	

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Type III 24-hr 25-Year Rainfall=4.80"

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Summary for Subcatchment P-1: to wetlands

Runoff = 2.77 cfs @ 12.12 hrs, Volume= 0.219 af, Depth= 2.72"

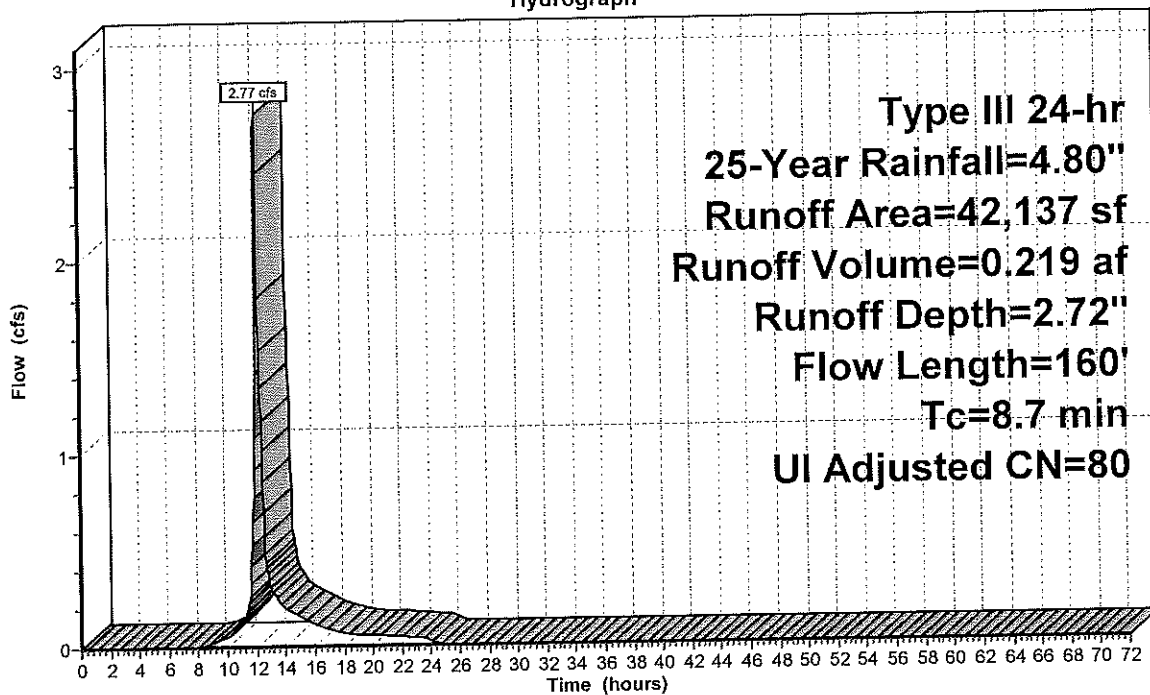
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=4.80"

Area (sf)	CN	Adj	Description
19,822	80		>75% Grass cover, Good, HSG D
1,800	98		Paved parking, HSG D
20,015	79		Woods/grass comb., Good, HSG D
500	98		Unconnected roofs, HSG D
42,137	81	80	Weighted Average, UI Adjusted
39,837			94.54% Pervious Area
2,300			5.46% Impervious Area
500			21.74% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	110	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.7	160	Total			

Subcatchment P-1: to wetlands

Hydrograph



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Type III 24-hr 25-Year Rainfall=4.80"

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Summary for Subcatchment P-2: undetianed east

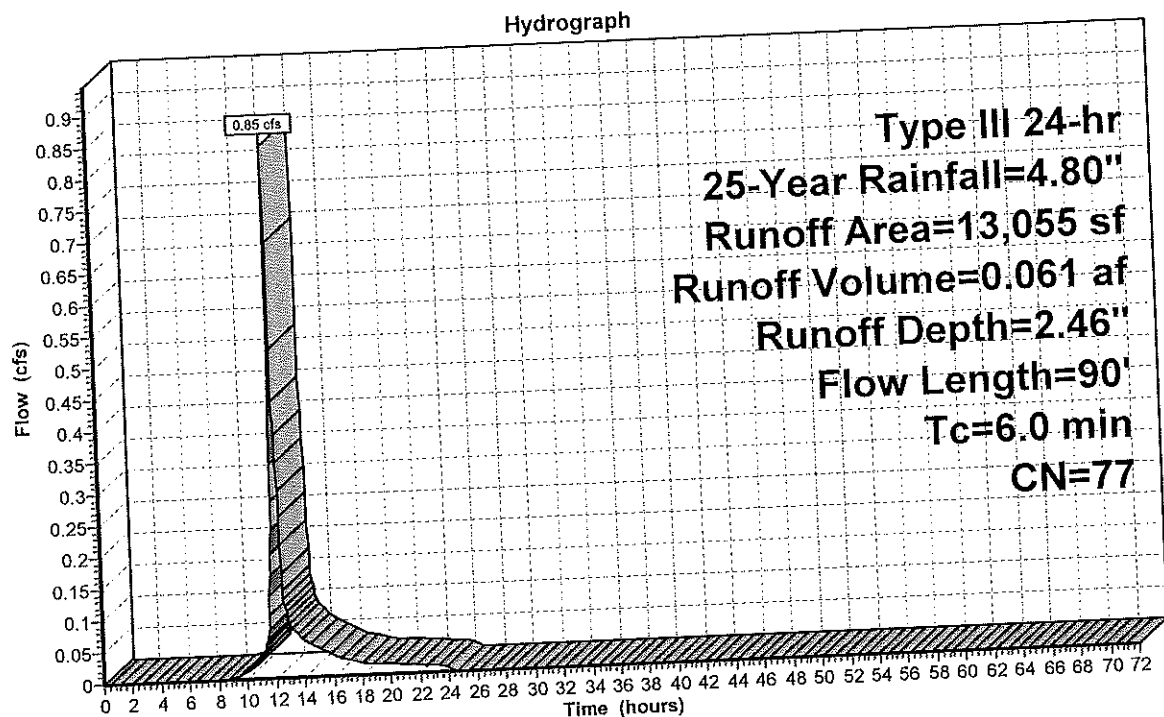
Runoff = 0.85 cfs @ 12.09 hrs, Volume= 0.061 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=4.80"

Area (sf)	CN	Description
13,055	77	Woods, Good, HSG D
13,055		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	90		0.25		Direct Entry,

Subcatchment P-2: undetianed east



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Type III 24-hr 25-Year Rainfall=4.80"

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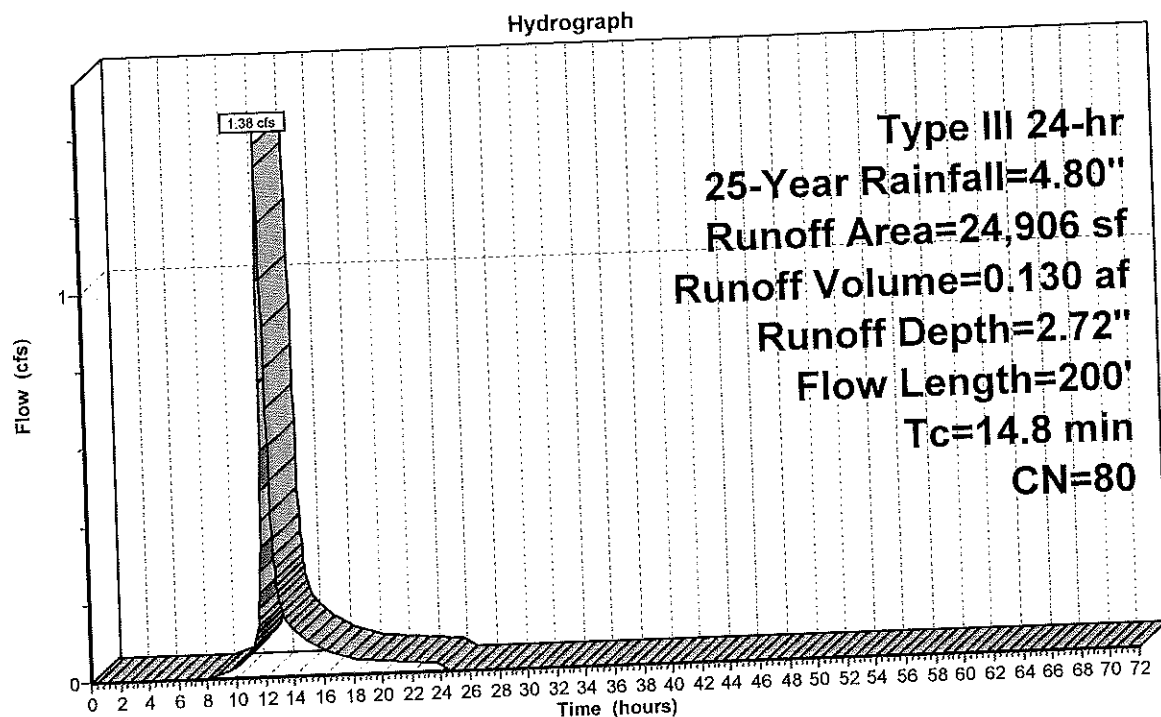
Summary for Subcatchment P-3: undetained west

Runoff = 1.38 cfs @ 12.21 hrs, Volume= 0.130 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=4.80"

Area (sf)	CN	Description
24,406	80	>75% Grass cover, Good, HSG D
500	98	Unconnected roofs, HSG D
24,906	80	Weighted Average
24,406		97.99% Pervious Area
500		2.01% Impervious Area
500		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
2.5	150	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
14.8	200	Total			

Subcatchment P-3: undetained west

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Summary for Subcatchment P-4: to pond

Runoff = 5.34 cfs @ 12.36 hrs, Volume= 0.636 af, Depth= 2.99"

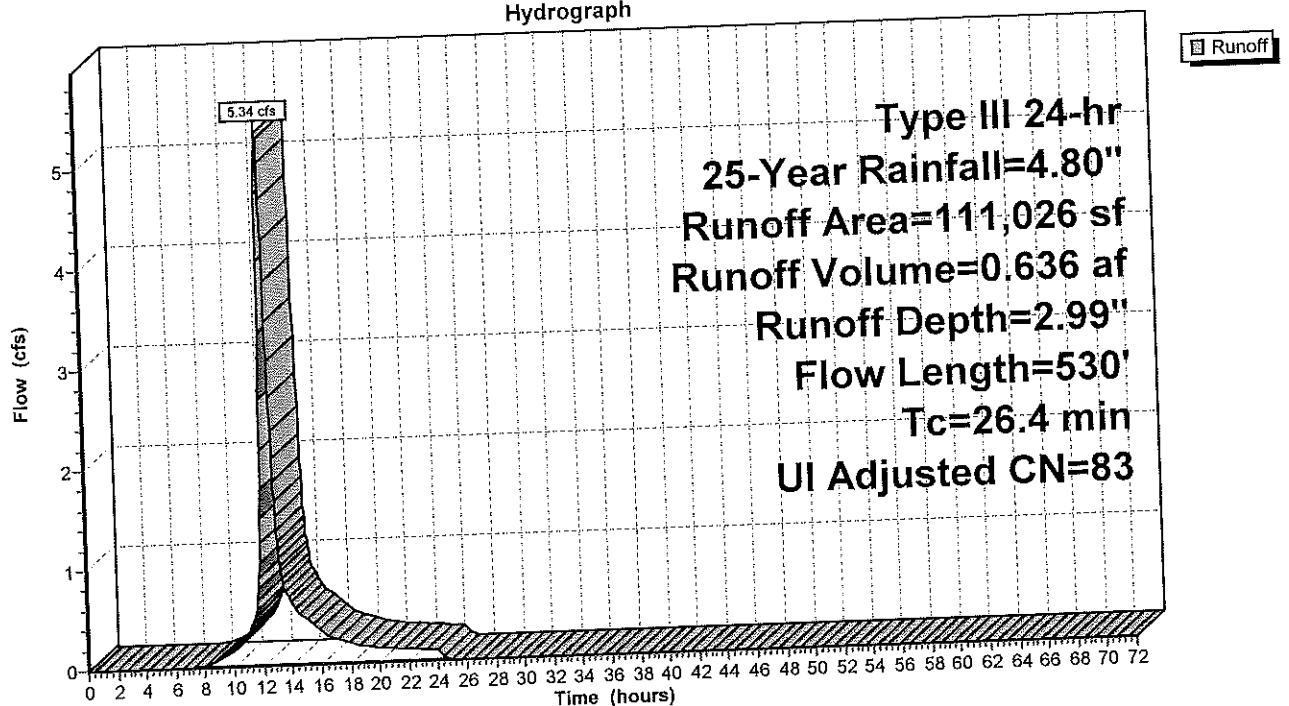
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=4.80"

Area (sf)	CN	Adj	Description
88,743	80		>75% Grass cover, Good, HSG D
5,000	98		Unconnected roofs, HSG D
17,283	98		Paved parking, HSG D
111,026	84	83	Weighted Average, UI Adjusted
88,743			79.93% Pervious Area
22,283			20.07% Impervious Area
5,000			22.44% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
10.1	480	0.0250	0.79		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.4	530	Total			

Subcatchment P-4: to pond

Hydrograph



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Type III 24-hr 25-Year Rainfall=4.80"

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Summary for Subcatchment P-4A: undetained east

Runoff = 2.14 cfs @ 12.13 hrs, Volume= 0.173 af, Depth= 2.81"

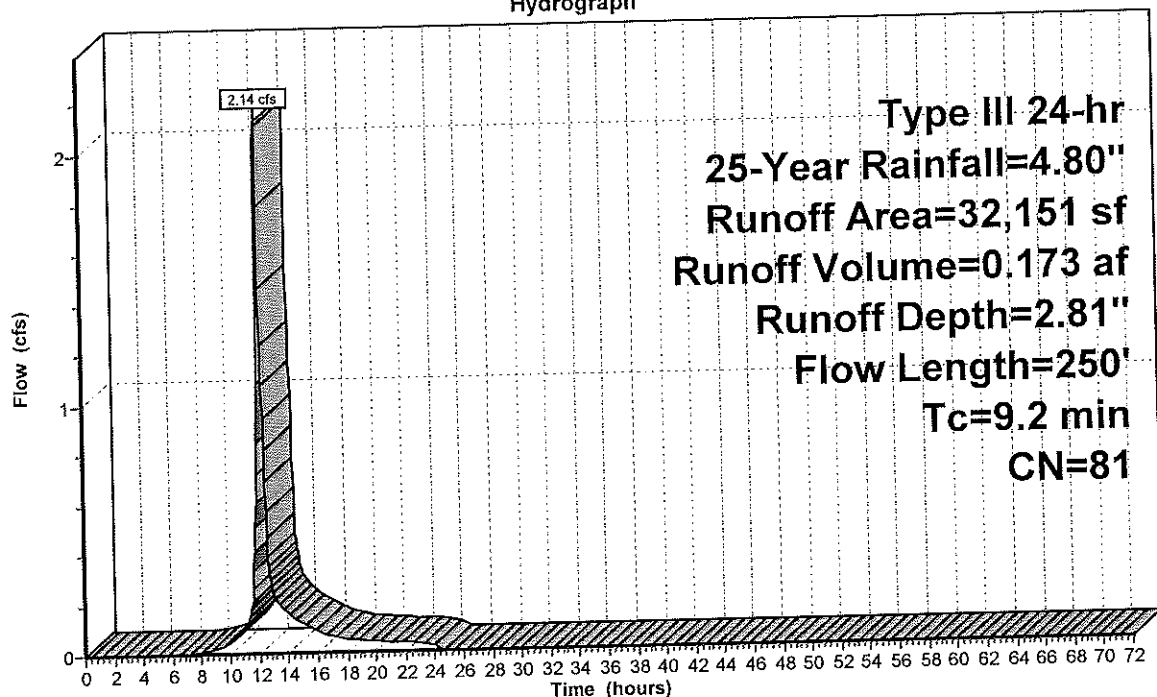
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=4.80"

Area (sf)	CN	Description
30,151	80	>75% Grass cover, Good, HSG D
2,000	98	Unconnected roofs, HSG D
32,151	81	Weighted Average
30,151		93.78% Pervious Area
2,000		6.22% Impervious Area
2,000		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	200	0.1000	1.58		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
9.2	250	Total			

Subcatchment P-4A: undetained east

Hydrograph



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Type III 24-hr 25-Year Rainfall=4.80"

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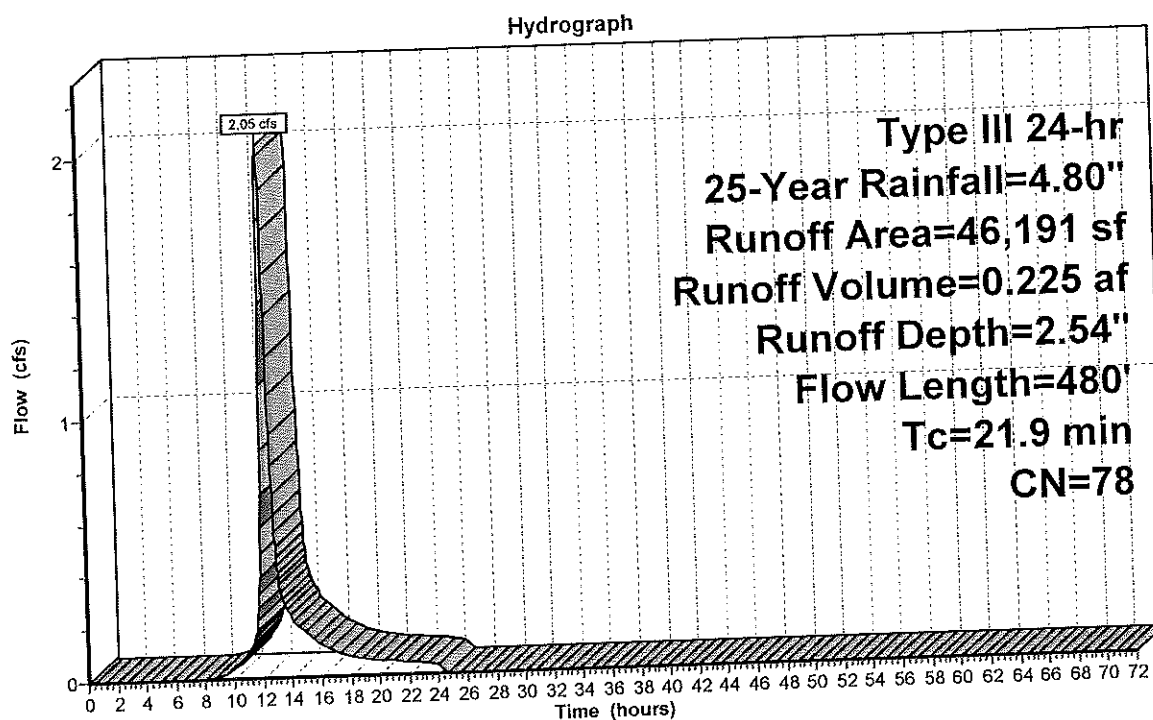
Summary for Subcatchment P-4B: undetained east

Runoff = 2.05 cfs @ 12.31 hrs, Volume= 0.225 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=4.80"

Area (sf)	CN	Description
37,905	77	Woods, Good, HSG D
8,286	80	>75% Grass cover, Good, HSG D
46,191	78	Weighted Average
46,191		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	430	0.0650	1.27		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
21.9	480	Total			

Subcatchment P-4B: undetained east

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Type III 24-hr 25-Year Rainfall=4.80"

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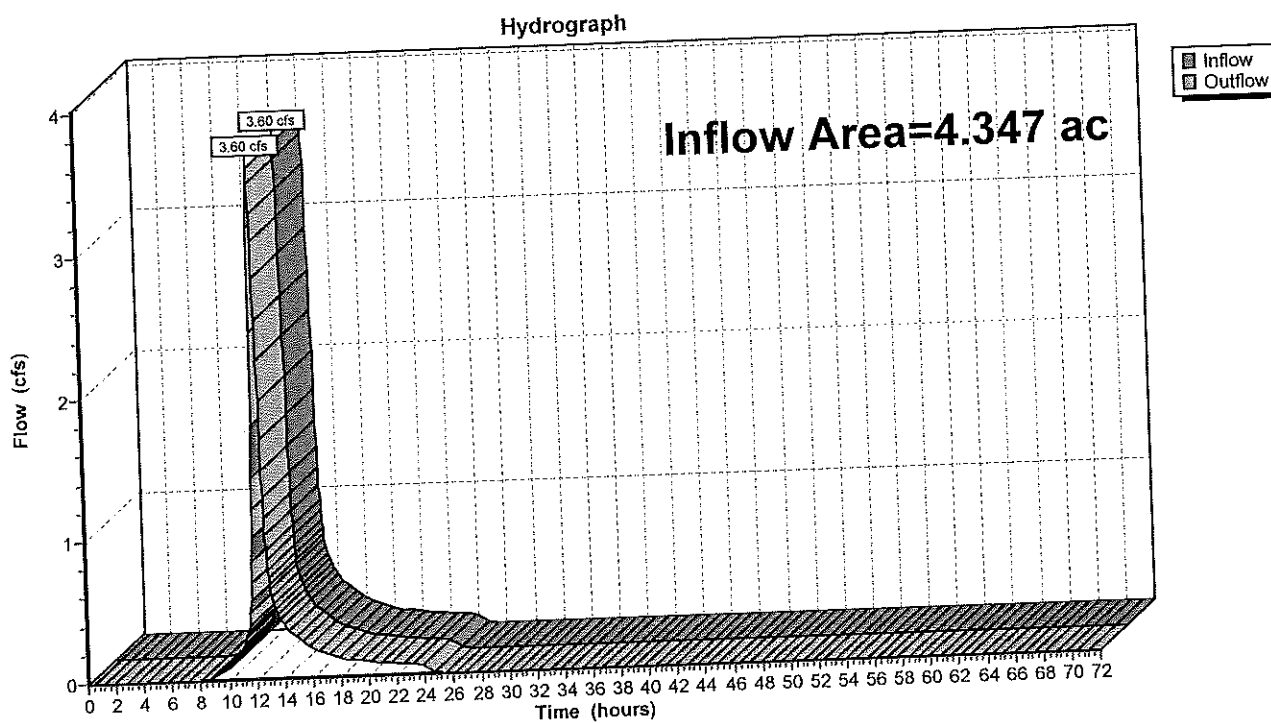
Page 33

Summary for Reach 6R: east discharge

Inflow Area = 4.347 ac, 12.82% Impervious, Inflow Depth = 1.10" for 25-Year event
Inflow = 3.60 cfs @ 12.17 hrs, Volume= 0.397 af
Outflow = 3.60 cfs @ 12.17 hrs, Volume= 0.397 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 6R: east discharge



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Type III 24-hr 25-Year Rainfall=4.80"

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Summary for Pond 5P: Pond

Inflow Area = 2.549 ac, 20.07% Impervious, Inflow Depth = 2.99" for 25-Year event
 Inflow = 5.34 cfs @ 12.36 hrs, Volume= 0.636 af
 Outflow = 5.00 cfs @ 12.30 hrs, Volume= 0.636 af, Atten= 6%, Lag= 0.0 min
 Discarded = 5.00 cfs @ 12.30 hrs, Volume= 0.636 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 244.07' @ 12.45 hrs Surf.Area= 3,014 sf Storage= 210 cf

Plug-Flow detention time= 0.3 min calculated for 0.635 af (100% of inflow)
 Center-of-Mass det. time= 0.3 min (834.3 - 834.0)

Volume	Invert	Avail. Storage	Storage Description
#1	244.00'	7,308 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)
244.00	3,032	0	0
245.00	2,777	2,905	2,905
246.00	6,029	4,403	7,308

Device	Routing	Invert	Outlet Devices
#1	Discarded	244.00'	5.00 cfs Exfiltration at all elevations
#2	Primary	245.00'	15.0" Round Culvert L= 20.0' RCP, sq. cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 245.00' / 244.50' S= 0.0250 ' / ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Discarded OutFlow Max=5.00 cfs @ 12.30 hrs HW=244.03' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 5.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=244.00' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

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Type III 24-hr 25-Year Rainfall=4.80"

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Stage-Discharge for Pond 5P: Pond

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
244.00	0.00	0.00	0.00
244.05	5.00	5.00	0.00
244.10	5.00	5.00	0.00
244.15	5.00	5.00	0.00
244.20	5.00	5.00	0.00
244.25	5.00	5.00	0.00
244.30	5.00	5.00	0.00
244.35	5.00	5.00	0.00
244.40	5.00	5.00	0.00
244.45	5.00	5.00	0.00
244.50	5.00	5.00	0.00
244.55	5.00	5.00	0.00
244.60	5.00	5.00	0.00
244.65	5.00	5.00	0.00
244.70	5.00	5.00	0.00
244.75	5.00	5.00	0.00
244.80	5.00	5.00	0.00
244.85	5.00	5.00	0.00
244.90	5.00	5.00	0.00
244.95	5.00	5.00	0.00
245.00	5.00	5.00	0.01
245.05	5.01	5.00	0.05
245.10	5.05	5.00	0.11
245.15	5.11	5.00	0.19
245.20	5.19	5.00	0.30
245.25	5.30	5.00	0.42
245.30	5.42	5.00	0.57
245.35	5.57	5.00	0.73
245.40	5.73	5.00	0.91
245.45	5.91	5.00	1.10
245.50	6.10	5.00	1.31
245.55	6.31	5.00	1.54
245.60	6.54	5.00	1.77
245.65	6.77	5.00	2.01
245.70	7.01	5.00	2.27
245.75	7.27	5.00	2.53
245.80	7.53	5.00	2.79
245.85	7.79	5.00	3.06
245.90	8.06	5.00	3.32
245.95	8.32	5.00	3.58
246.00	8.58	5.00	3.84
246.05	8.84	5.00	4.08
246.10	9.08	5.00	4.31
246.15	9.31	5.00	4.52
246.20	9.52	5.00	4.67
246.25	9.67	5.00	

G-10212 post development

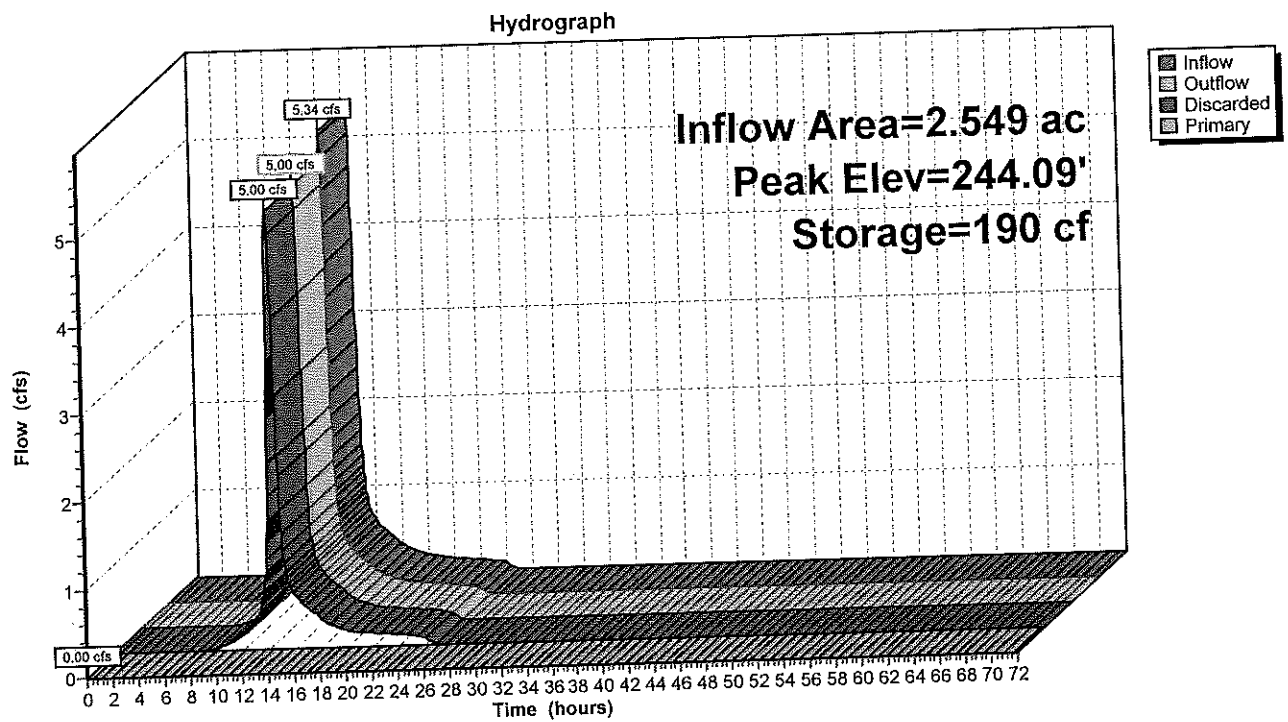
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Type III 24-hr 25-Year Rainfall=4.80"

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Pond 5P: Pond



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Type III 24-hr 100-Year Rainfall=6.50"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: to wetlands	Runoff Area=42,137 sf 5.46% Impervious Runoff Depth=4.24" Flow Length=160' Tc=8.7 min UI Adjusted CN=80 Runoff=4.29 cfs 0.341 af
Subcatchment P-2: undetained east	Runoff Area=13,055 sf 0.00% Impervious Runoff Depth=3.92" Flow Length=90' Tc=6.0 min CN=77 Runoff=1.35 cfs 0.098 af
Subcatchment P-3: undetained west	Runoff Area=24,906 sf 2.01% Impervious Runoff Depth=4.24" Flow Length=200' Tc=14.8 min CN=80 Runoff=2.14 cfs 0.202 af
Subcatchment P-4: to pond	Runoff Area=111,026 sf 20.07% Impervious Runoff Depth=4.56" Flow Length=530' Tc=26.4 min UI Adjusted CN=83 Runoff=8.06 cfs 0.968 af
Subcatchment P-4A: undetained east	Runoff Area=32,151 sf 6.22% Impervious Runoff Depth=4.34" Flow Length=250' Tc=9.2 min CN=81 Runoff=3.28 cfs 0.267 af
Subcatchment P-4B: undetained east	Runoff Area=46,191 sf 0.00% Impervious Runoff Depth=4.02" Flow Length=480' Tc=21.9 min CN=78 Runoff=3.24 cfs 0.356 af
Reach 6R: east discharge	Inflow=5.63 cfs 0.625 af Outflow=5.63 cfs 0.625 af
Pond 5P: Pond	Peak Elev=245.17' Storage=3,429 cf Inflow=8.06 cfs 0.968 af Discarded=5.00 cfs 0.966 af Primary=0.14 cfs 0.002 af Outflow=5.14 cfs 0.968 af
Total Runoff Area = 6.186 ac Runoff Volume = 2.232 af Average Runoff Depth = 4.33" 89.95% Pervious = 5.564 ac 10.05% Impervious = 0.622 ac	

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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment P-1: to wetlands

Runoff = 4.29 cfs @ 12.12 hrs, Volume= 0.341 af, Depth= 4.24"

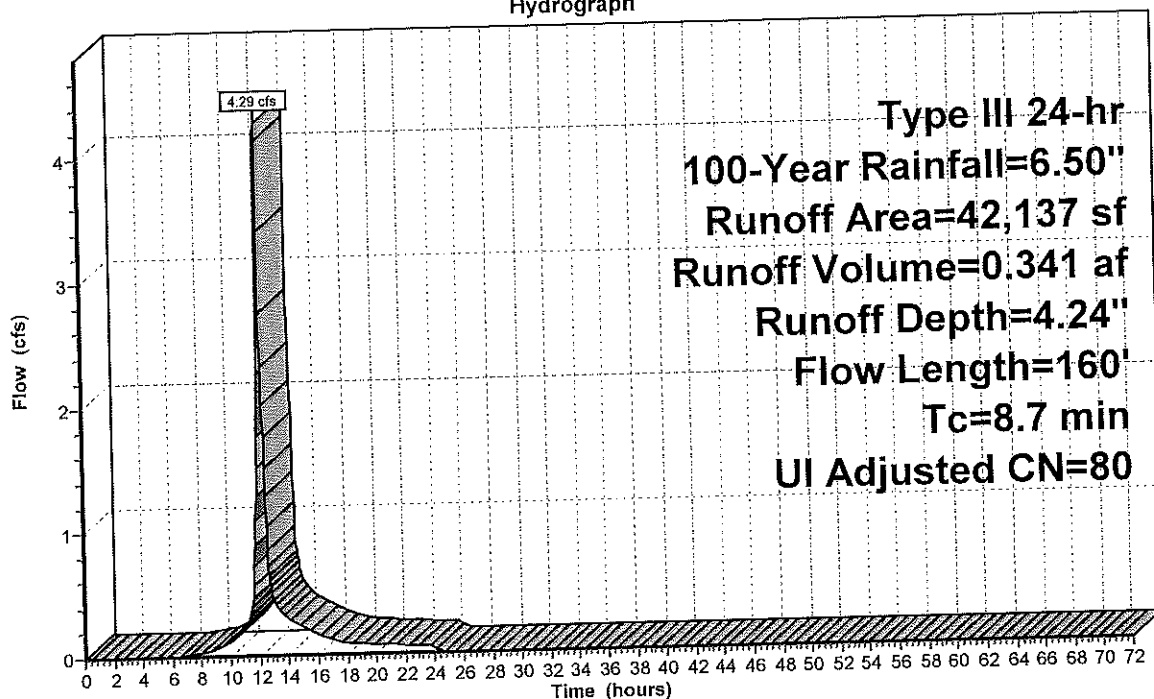
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Adj	Description
19,822	80		>75% Grass cover, Good, HSG D
1,800	98		Paved parking, HSG D
20,015	79		Woods/grass comb., Good, HSG D
500	98		Unconnected roofs, HSG D
42,137	81	80	Weighted Average, UI Adjusted
39,837			94.54% Pervious Area
2,300			5.46% Impervious Area
500			21.74% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	110	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.7	160	Total			

Subcatchment P-1: to wetlands

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment P-2: undetianed east

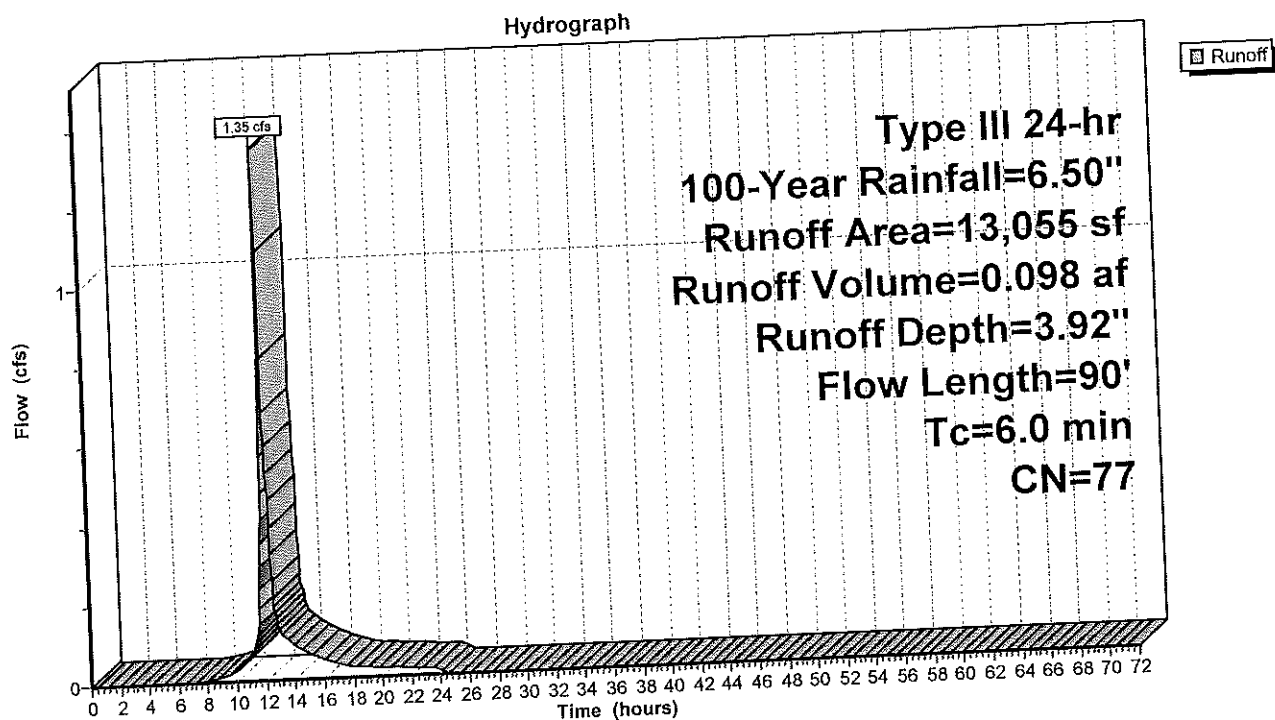
Runoff = 1.35 cfs @ 12.09 hrs, Volume= 0.098 af, Depth= 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
13,055	77	Woods, Good, HSG D
13,055		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	90		0.25		Direct Entry,

Subcatchment P-2: undetianed east



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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment P-3: undetained west

Runoff = 2.14 cfs @ 12.20 hrs, Volume= 0.202 af, Depth= 4.24"

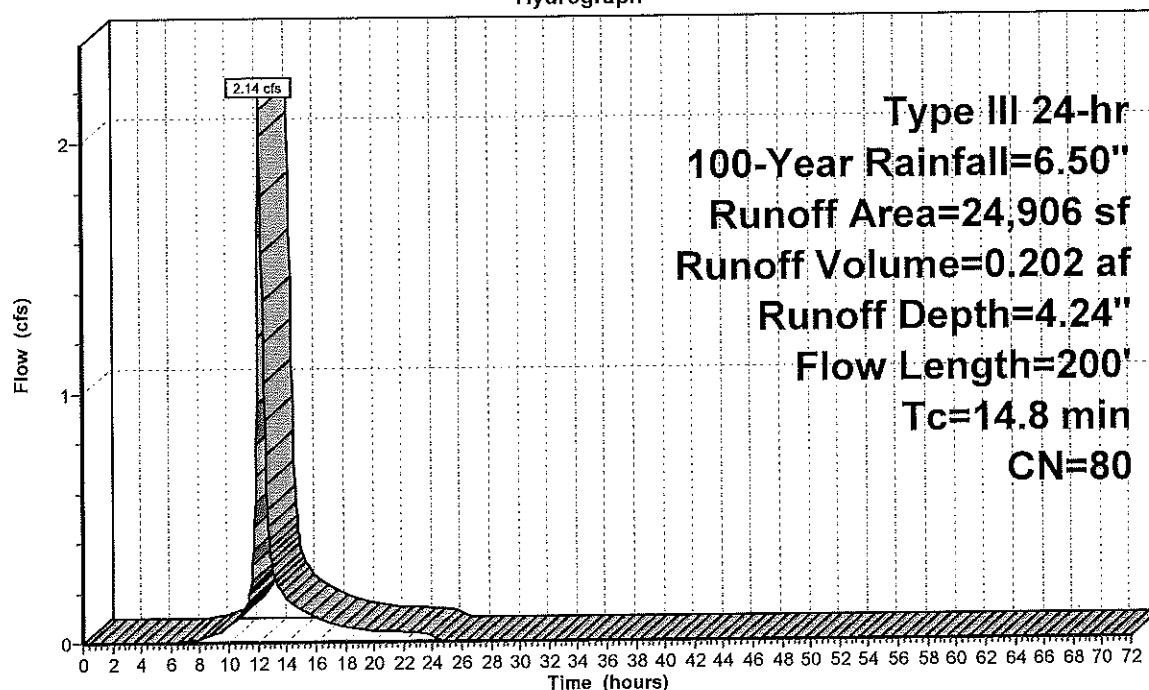
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
24,406	80	>75% Grass cover, Good, HSG D
500	98	Unconnected roofs, HSG D
24,906	80	Weighted Average
24,406		97.99% Pervious Area
500		2.01% Impervious Area
500		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
2.5	150	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
14.8	200	Total			

Subcatchment P-3: undetained west

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment P-4: to pond

Runoff = 8.06 cfs @ 12.36 hrs, Volume= 0.968 af, Depth= 4.56"

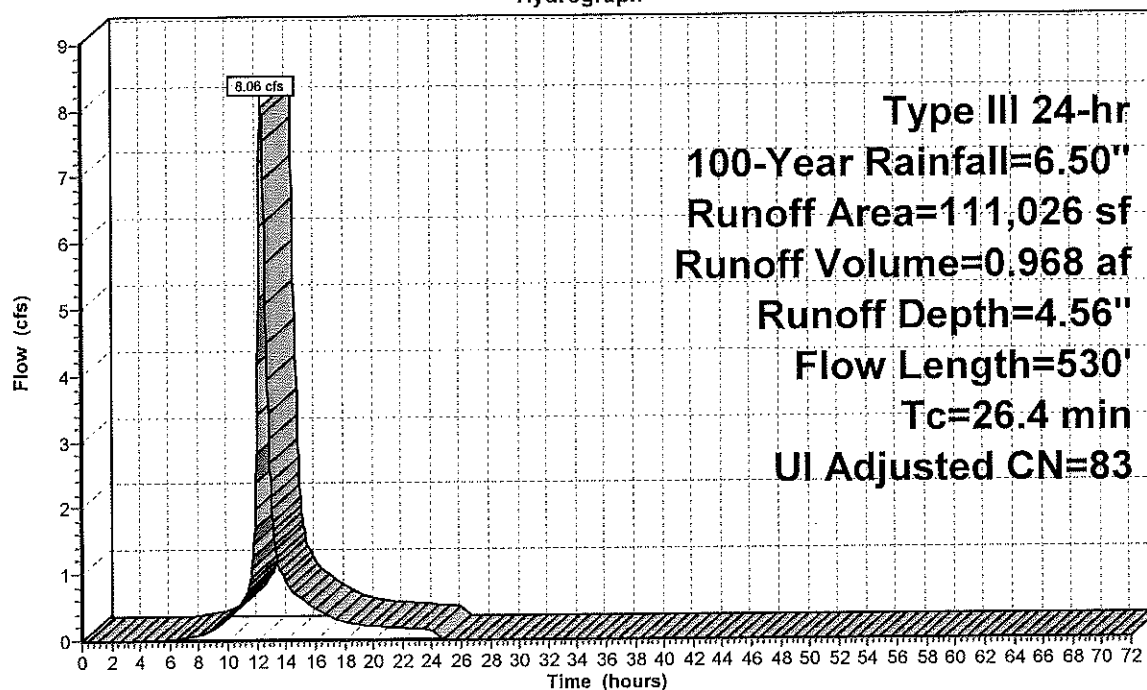
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Adj	Description
88,743	80		>75% Grass cover, Good, HSG D
5,000	98		Unconnected roofs, HSG D
17,283	98		Paved parking, HSG D
111,026	84	83	Weighted Average, UI Adjusted
88,743			79.93% Pervious Area
22,283			20.07% Impervious Area
5,000			22.44% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
10.1	480	0.0250	0.79		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.4	530	Total			

Subcatchment P-4: to pond

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.50"

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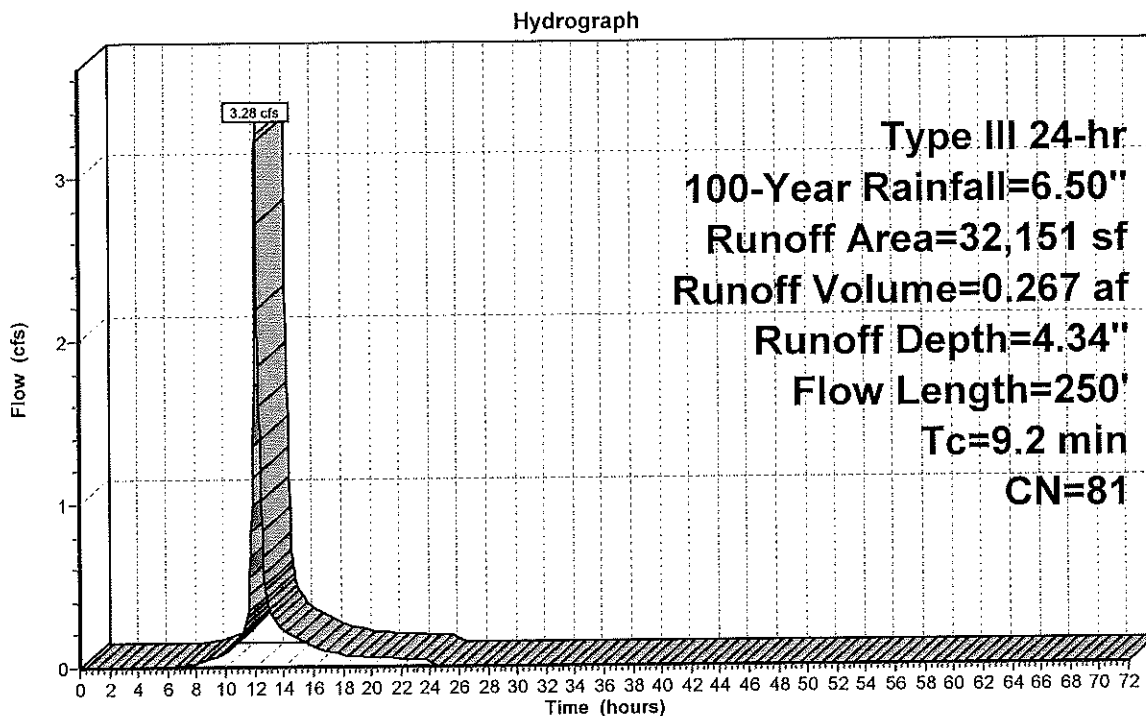
Summary for Subcatchment P-4A: undetained east

Runoff = 3.28 cfs @ 12.13 hrs, Volume= 0.267 af, Depth= 4.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
30,151	80	>75% Grass cover, Good, HSG D
2,000	98	Unconnected roofs, HSG D
32,151	81	Weighted Average
30,151		93.78% Pervious Area
2,000		6.22% Impervious Area
2,000		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	200	0.1000	1.58		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
9.2	250	Total			

Subcatchment P-4A: undetained east

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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment P-4B: undetained east

Runoff = 3.24 cfs @ 12.30 hrs, Volume= 0.356 af, Depth= 4.02"

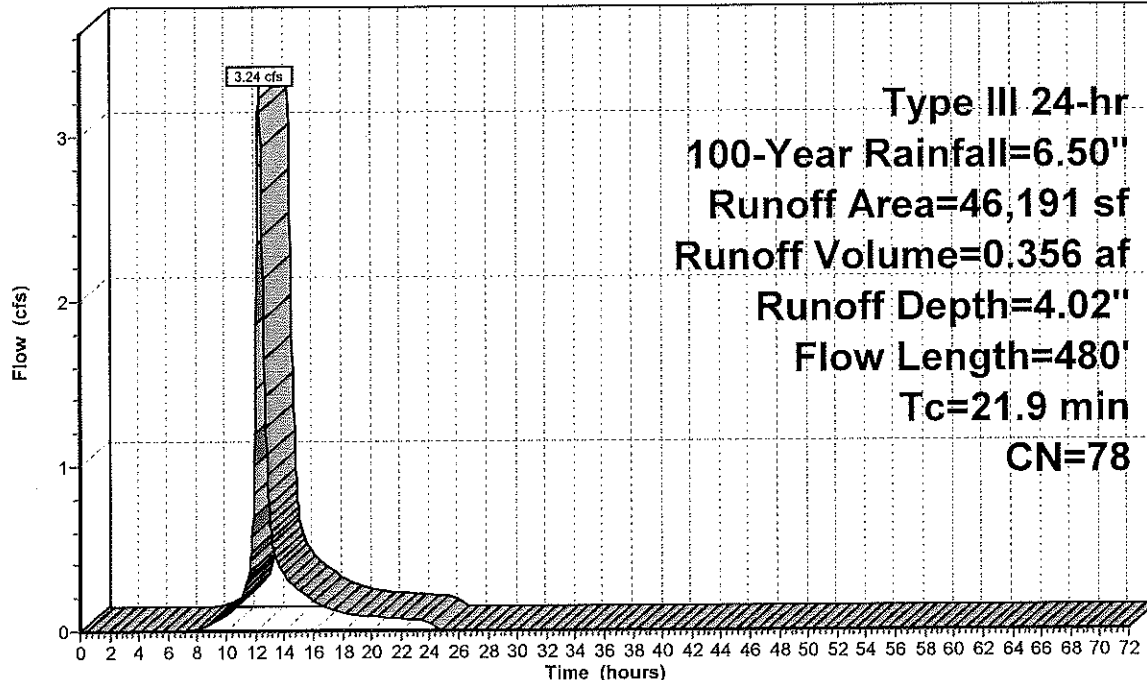
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
37,905	77	Woods, Good, HSG D
8,286	80	>75% Grass cover, Good, HSG D
46,191	78	Weighted Average
46,191		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	430	0.0650	1.27		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
21.9	480	Total			

Subcatchment P-4B: undetained east

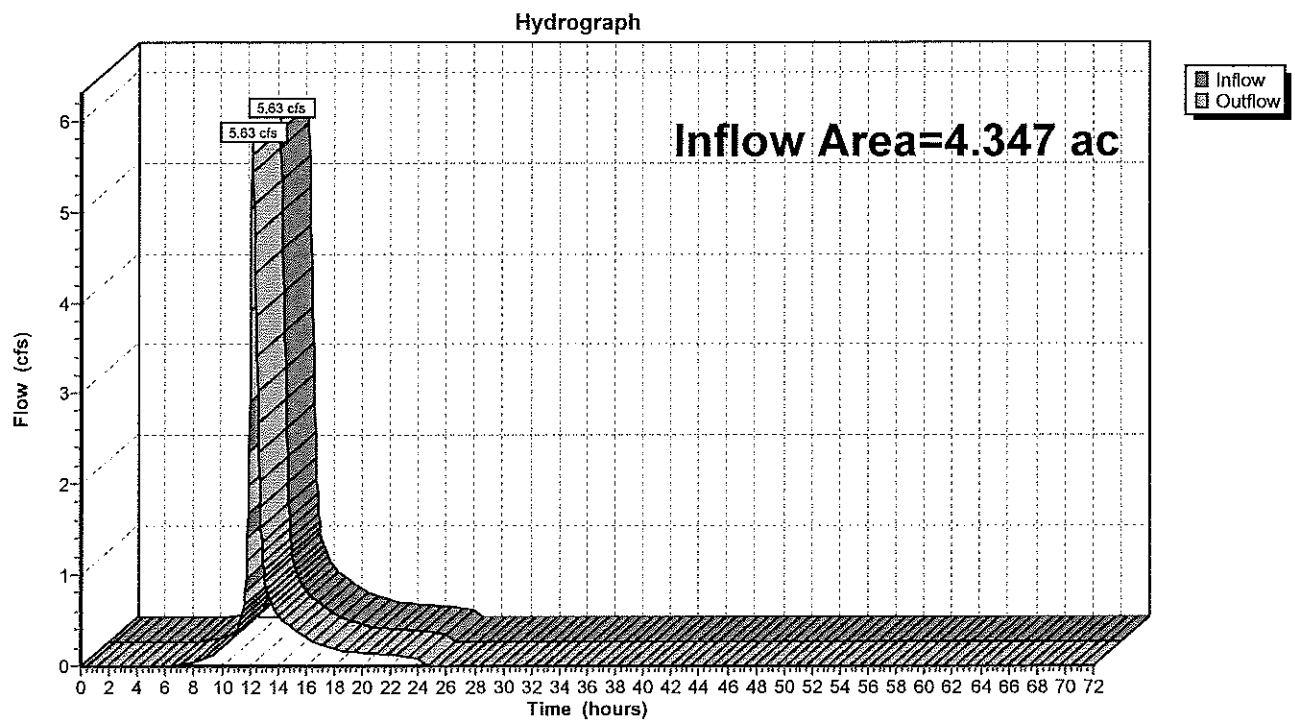
Hydrograph



Summary for Reach 6R: east discharge

Inflow Area = 4.347 ac, 12.82% Impervious, Inflow Depth = 1.72" for 100-Year event
Inflow = 5.63 cfs @ 12.17 hrs, Volume= 0.625 af
Outflow = 5.63 cfs @ 12.17 hrs, Volume= 0.625 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 6R: east discharge

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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Pond 5P: Pond

Inflow Area = 2.549 ac, 20.07% Impervious, Inflow Depth = 4.56" for 100-Year event
 Inflow = 8.06 cfs @ 12.36 hrs, Volume= 0.968 af
 Outflow = 5.14 cfs @ 12.65 hrs, Volume= 0.968 af, Atten= 36%, Lag= 17.3 min
 Discarded = 5.00 cfs @ 12.15 hrs, Volume= 0.966 af
 Primary = 0.14 cfs @ 12.65 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 245.17' @ 12.65 hrs Surf.Area= 3,336 sf Storage= 3,429 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 2.9 min (825.1 - 822.1)

Volume	Invert	Avail.Storage	Storage Description
#1	244.00'	7,308 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
244.00	3,032	0	0
245.00	2,777	2,905	2,905
246.00	6,029	4,403	7,308

Device	Routing	Invert	Outlet Devices
#1	Discarded	244.00'	5.00 cfs Exfiltration at all elevations
#2	Primary	245.00'	15.0" Round Culvert L= 20.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 245.00' / 244.50' S= 0.0250 ' / ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Discarded OutFlow Max=5.00 cfs @ 12.15 hrs HW=244.03' (Free Discharge)↑ **1=Exfiltration** (Exfiltration Controls 5.00 cfs)**Primary OutFlow** Max=0.14 cfs @ 12.65 hrs HW=245.17' (Free Discharge)↑ **2=Culvert** (Inlet Controls 0.14 cfs @ 1.41 fps)

G-10212 post development

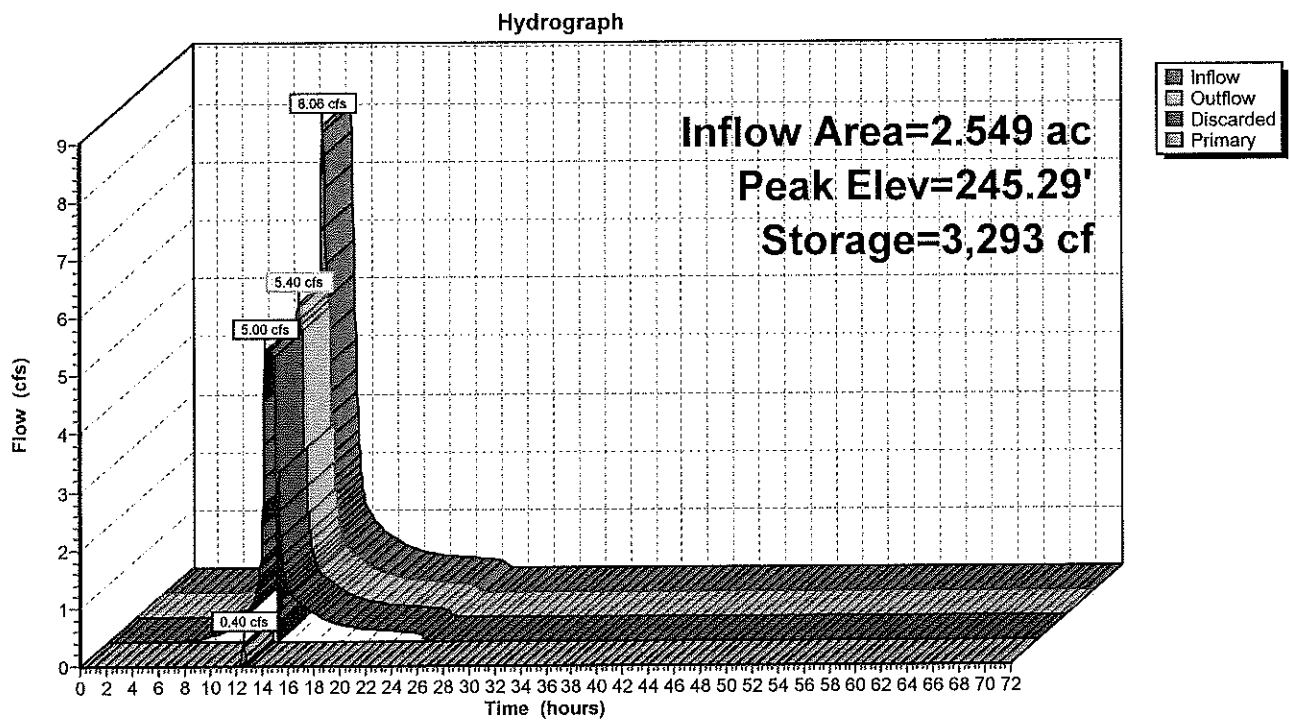
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Pond 5P: Pond



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Type III 24-hr 100-Year Rainfall=6.50"

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Stage-Discharge for Pond 5P: Pond

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
244.00	0.00	0.00	0.00
244.05	5.00	5.00	0.00
244.10	5.00	5.00	0.00
244.15	5.00	5.00	0.00
244.20	5.00	5.00	0.00
244.25	5.00	5.00	0.00
244.30	5.00	5.00	0.00
244.35	5.00	5.00	0.00
244.40	5.00	5.00	0.00
244.45	5.00	5.00	0.00
244.50	5.00	5.00	0.00
244.55	5.00	5.00	0.00
244.60	5.00	5.00	0.00
244.65	5.00	5.00	0.00
244.70	5.00	5.00	0.00
244.75	5.00	5.00	0.00
244.80	5.00	5.00	0.00
244.85	5.00	5.00	0.00
244.90	5.00	5.00	0.00
244.95	5.00	5.00	0.00
245.00	5.00	5.00	0.00
245.05	5.01	5.00	0.01
245.10	5.05	5.00	0.05
245.15	5.11	5.00	0.11
245.20	5.19	5.00	0.19
245.25	5.30	5.00	0.30
245.30	5.42	5.00	0.42
245.35	5.57	5.00	0.57
245.40	5.73	5.00	0.73
245.45	5.91	5.00	0.91
245.50	6.10	5.00	1.10
245.55	6.31	5.00	1.31
245.60	6.54	5.00	1.54
245.65	6.77	5.00	1.77
245.70	7.01	5.00	2.01
245.75	7.27	5.00	2.27
245.80	7.53	5.00	2.53
245.85	7.79	5.00	2.79
245.90	8.06	5.00	3.06
245.95	8.32	5.00	3.32
246.00	8.58	5.00	3.58
246.05	8.84	5.00	3.84
246.10	9.08	5.00	4.08
246.15	9.31	5.00	4.31
246.20	9.52	5.00	4.52
246.25	9.67	5.00	4.67

TSS Removal Worksheet
Appendix 4

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.

Location: PROSPECT ST HOLLISTON

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

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

Total TSS Removal =

85%

EAGLE PATH

Project:

Prepared By: RJD

Date: 4/15/2021

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

TSS Removal Calculation Worksheet

Construction Period Inspection Forms

Appendix 5

CONSTRUCTION PHASE INSPECTION FORMS

--

Date _____

Prev. Insp. Date: _____

Inspector: _____

Title: _____

Weather: _____

Weather Since Last Inspection _____

Erosion Control - Inspect Weekly

Comments:
Corrective measures taken and date

On Site Pavement Sweeping - Inspect Weekly

Comments:
Corrective measures taken and date

Catch Basins - Inspect Weekly

Comments:
Corrective measures taken and date

Stormceptor - Inspect Weekly

Comments:
Corrective measures taken and date

Temporary Sediment Traps/Basins - Inspect Weekly

Comments:
Corrective measures taken and date

CONSTRUCTION PHASE INSPECTION FORMS

--

Notify Conservation Commission RE Issues Effecting Resource Areas

Comments:

Corrective measures taken and date

Silt on Public Streets - Inspect Weekly

Comments:

Corrective measures taken and date

Stock Pile Materials - Ring with Haybales - Inspect Weekly

Comments:

Corrective measures taken and date

Any Fuel or Chemical Spill - Inspect Daily

Comments:

Corrective measures taken and date

Long Term Operations and Maintenance Plan

Appendix 6

The following shall serve as the (O&M) Plan required by Standard 9, as well as the Long-Term Pollution Prevention Plan required by Standard 4.

A. Names of Persons or Entity Responsible for Plan Compliance:

Applicant: John Hovsepain
127 Robin Hill Road
Holliston, Ma 02482

B. Good housekeeping practices

1. Maintain site, landscaping and vegetation.
2. Sweep and pick up litter on pavements and grounds.
3. Deliveries shall be monitored by owners or representative to ensure that if any spillage occurs, it shall be contained and cleaned up immediately.
4. Maintain pavement and curbing in good repair.

C. Requirements for routine inspections and maintenance of stormwater BMPs

1. Plans: The stormwater Operation and Maintenance Plan shall consist of all Plans, documents and all local state and federal approvals as required for the subject property.
2. Record Keeping:
 - a. Maintain a log of all operation and maintenance activities following construction, including inspections, repairs, replacement and disposal (for disposal, the log shall indicate the type of material and the disposal location);
 - b. Make this log available to MassDEP and the Conservation Commission upon request; and
 - c. Allow MassDEP and the Conservation Commission to inspect each BMP to determine whether the responsible party is implementing the Operation and Maintenance Plan.
 - d. Inspection logs for all portions of the on-site drainage system, including, but not limited to the infiltration system, must be submitted annually to the Town Engineer.
3. Descriptions and Designs: The Best Management Practices (BMP) incorporated into the design include the following:
 - a. Pavement Sweeping – Stipulated within the Construction Period Pollution Prevention Plan, the Long-Term Pollution Prevention Plan, and the Operation and Maintenance Plan. As the amount of TSS removal is discretionary, no credit was taken within the calculations for this BMP.
 - b. Deep sump catch basin installed to promote TSS Removal of solids and control floatable pollutants. This BMP has a design rate of 25% TSS Removal.
4. BMP Maintenance: After construction it is the responsibility of the owner to perform maintenance. The cleaning of the components of the stormwater management system shall generally be as follows:
 - a. Pavement: The Owner shall keep the roadway swept with a mechanical sweeper or hand swept semi-annually at a minimum.
 - b. Catch Basins: Shall be cleaned by excavating, pumping or vacuuming. The sediment shall be disposed of off-site by the Owner. Inspect quarterly, remove silt when ¼ full.
5. Access Provisions: All of the components of the storm water system will be accessible by the Owner

D. Spill prevention and response plans

1. Inventory materials to be present on-site during construction.
2. Train employees and subcontractors in prevention and clean up procedures.
3. All materials stored on site will be stored in their appropriate containers under a roof.
4. Follow manufacturer's recommendation for disposal of used containers.
5. Store only enough product on site to do the job.
6. On site equipment, fueling and maintenance measures:
 - a. Inspect on-site vehicles and equipment daily for leaks.
 - b. Conduct all vehicle and equipment maintenance and refueling in one location, away from storm drains.
 - c. Perform major repairs and maintenance off site.
 - d. Use drip pans, drip cloths or absorbent pads when replacing spent fuels.
 - e. Collect spent fuels and remove from site.
7. Clean up spills.
 - a. Never hose down "dirty" pavement or impermeable surfaces where fluids have spilled. Use dry clean up methods (sawdust, cat litter and/or rags and absorbent pads).
 - b. Sweep up dry materials immediately. Never wash them away or bury them.
 - c. Clean up spills on dirt areas by digging up and properly disposing of contaminated soil.
 - d. Report significant spills to the Fire Department and the Board of Health.

E. Provisions for maintenance of lawns, gardens, and other landscaped areas

Use only organic fertilizer. Dispose of clippings outside of the 100-foot buffer zone adjacent to any wetlands found within the project vicinity.

F. Requirements for storage and use of herbicides, and pesticides

The application of herbicides or pesticides will be completed by certified professionals.

G. Provisions for operation and management of septic system

Site to be serviced by municipal sewer.

H. Provisions for solid waste management

1. Waste Management Plan

- a. Dumpster for trash and bulk waste collection shall be located in a proper area on-site.
- b. Recycle materials whenever possible (paper, plaster cardboard, metal cans). Separate containers for material are recommended.
- c. Do not bury waste and debris on site.
- d. Certified haulers will be hired to remove the dumpster container waste as needed. Recycling products will also be removed off site weekly.

I. Snow disposal and plowing plans relative to Wetland Resource Areas

Snow storage is adequate around the site for large storm events.

J. Winter Road Salt and/or Sand Use and Storage restrictions

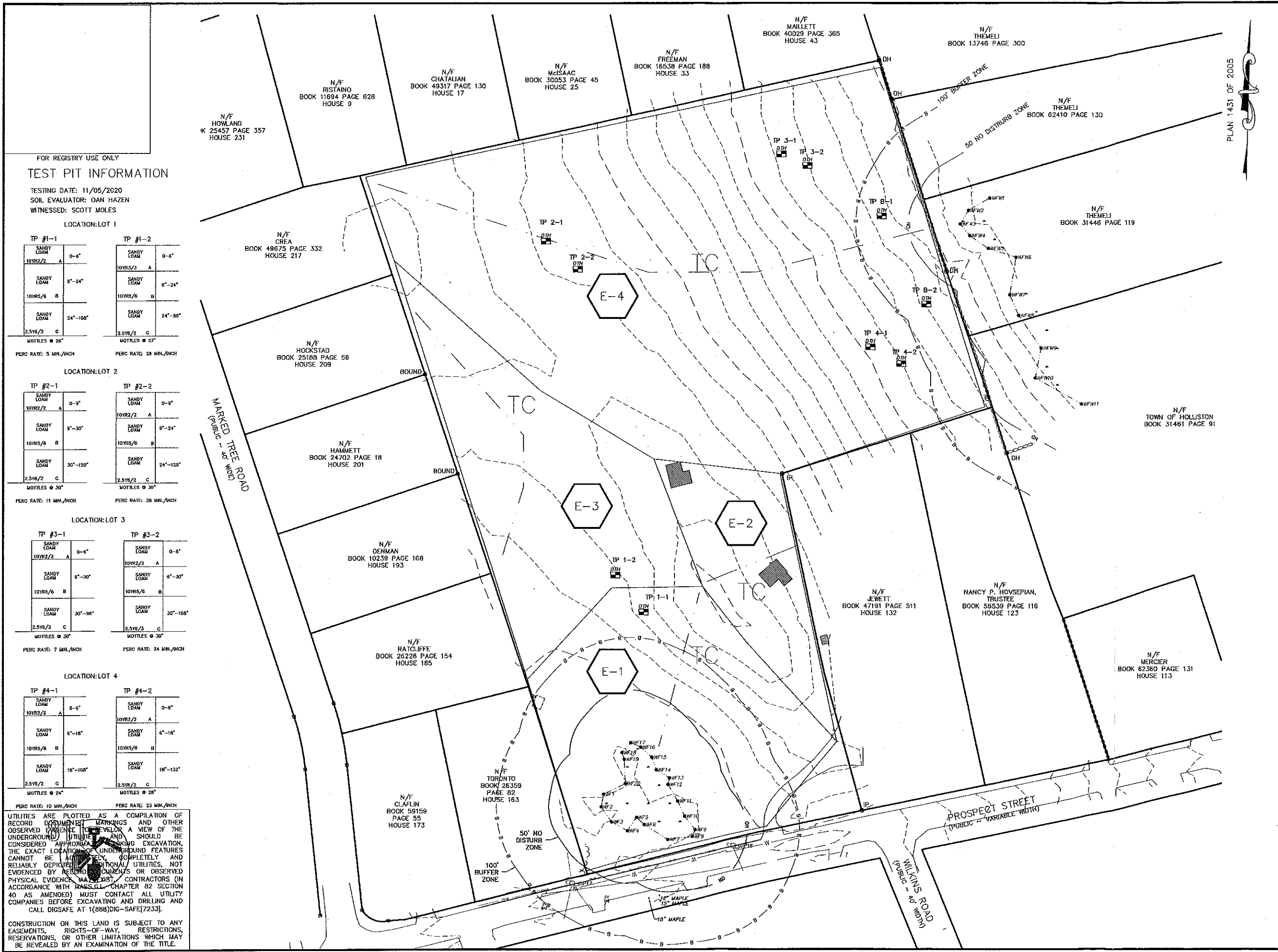
Sand, salt, or chemicals for de-icing will be used on-site to as needed per atmospheric conditions.

- K. Provisions for prevention of illicit discharges to the stormwater management system
The discharge into the stormwater system is not being violated, see attachment for illicit discharges compliance.
- L. Training staff or personnel involved with implementing Long-Term Pollution Prevention Plan
The owner shall develop policies and procedures for containing the illicit spilling of oils, soda, beer, paper and litter. These wastes provide a degradation to the water quality. The placement of signs and trash barrels with lids around the site would aid in contributing to clean water quality site conditions.
- M. List of Emergency contacts for implementing Long-Term Pollution Prevention Plan:
John Hovsepain
127 Robin Hill Road
Holliston, Ma 02482

This shall be the contact until such time as the road way is accepted by the Town.

Pre- Post Drainage Plans
Appendix 7

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PLAN 1431 OF 2005

PROFESSIONAL LAND SURVEYOR

PROFESSIONAL ENGINEER

APPROVAL UNDER THE SUBDIVISION CONTROL LAW IS REQUIRED

DATE: BEING A MAJORITY

MAP 8.E BLOCK 3 LOT 19.3
OWNER:
EAGLE PATH, LLC
195 UNDERWOOD STREET
HOLLISTON MA 01746
DEED BOOK 47446 PAGE 380

EAGLE PATH

PRE DEVELOPMENT CONDITIONS

DEFINITIVE SUBDIVISION
PROSPECT STREET
IN
HOLLISTON, MASS.
SCALE: 1"=40'
DATE: APRIL 29, 2021

GRAPHIC SCALE: 1"=40'
0 10 20 30 40 50 75 100
FEET
0 5 10 15 20 30
METERS

Guerriere & Halnon, Inc.
ENGINEERING & LAND SURVEYING
333 WEST STREET PH. (508) 473-8630
MILFORD, MA 01757 FX. (508) 473-8243
www.gandhengineering.com

SHEET 1 OF 2 G-10212

G-10212

G:\CD\Holliston\G-10212\DWG\G-10212.dwg 4-28-21.dwg



PLAN 1431 OF 2005



PROFESSIONAL LAND SURVEYOR

PROFESSIONAL ENGINEER

APPROVAL UNDER THE SUBDIVISION CONTROL LAW IS REQUIRED

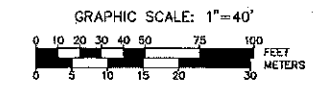
DATE BEING A MAJORITY

MAP 8.E BLOCK 3 LOT 19.3
OWNER:
EAGLE PATH, LLC
195 UNDERWOOD STREET
HOLLISTON MA 01746
DEED BOOK 47446 PAGE 380

EAGLE PATH

POST DEVELOPMENT CONDITIONS

DEFINITIVE SUBDIVISION
PROSPECT STREET
IN
HOLLISTON, MASS.
SCALE: 1"=40'
DATE: APRIL 29, 2021



Guerriere & Halnon, Inc.
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LEGAL NOTES

UTILITIES ARE PLOTTED AS A COMPILATION OF RECORD DOCUMENTS, MARKINGS AND OTHER OBSERVED EVIDENCE TO DEVELOP A VIEW OF THE UNDERGROUND UTILITIES AND SHOULD BE CONSIDERED APPROXIMATE. PRIOR TO EXCAVATION, THE EXACT LOCATION OF UNDERGROUND FEATURES CANNOT BE ACCURATELY COMPLETELY AND RELIABLY DEPICTED. ADDITIONAL UTILITIES, NOT EVIDENCED BY RECORD DOCUMENTS OR OBSERVED PHYSICAL EVIDENCE, MAY EXIST. CONTRACTORS (IN ACCORDANCE WITH MASS.G.L. CHAPTER 82 SECTION 40 AS AMENDED) MUST CONTACT ALL UTILITY COMPANIES BEFORE EXCAVATING AND DRILLING AND CALL DIGSAFE AT 1(888)DIG-SAFE(7233).

CONSTRUCTION ON THIS LAND IS SUBJECT TO ANY EASEMENTS, RIGHTS-OF-WAY, RESTRICTIONS, RESERVATIONS, OR OTHER LIMITATIONS WHICH MAY BE REVEALED BY AN EXAMINATION OF THE TITLE.

G-10212

Street Drainage Calculations

Appendix 8

Guerriere & Halnon, Inc
55 West Central Steet
Franklin, MA 01757-0235

Project _____
Job No. G-10212

Eagle Path

Prepared By RJD Date 4/30/2021 Revised 1/00/1900
Checked By _____ Date _____ Revised _____

DESIGN COMPUTATIONS FOR STORM DRAINS

[illegible]