TOWN OF BELLINGHAM, MA

Stormwater Management Report

MAY 2025

# Well No. 10 Access Road Design

WRIGHT-PIERCE
Engineering a Better Environment

# Well No. 10 Access Road Design
## TOWN OF BELLINGHAM, MA

**May 12, 2025**

5/12/2025

**Prepared By:**

**Wright-Pierce**
78 Blanchard Road, Suite 404
Burlington, MA 01803
978.416.8000 | wright-pierce.com

# Table of Contents



# List of Appendices

# Section 1 Introduction

The purpose of this Report is to summarize data collection and stormwater analysis efforts for the Well No. 10 Access Road site off High Street in the Town of Bellingham. This Report also describes the relative hydraulic performance of the access road site in general conformance with the Massachusetts Stormwater Handbook and Stormwater Standards. The project is a "Limited Project" and subject to the Stormwater Management Standards only to the maximum extent practicable as detailed with the attached MassDEP Checklist, which has been included in Appendix A.

## 1.1 Project Background

The Town of Bellingham owns and operates a pilot test well located adjacent to the Charles River off High Street. The parcel is # 56 and shown on Tax Map 45. Refer to the existing conditions survey plan provided herein for location details. Wright-Pierce (W-P) has been retained by the Town to provide engineering services for new source development at Well No. 10. During a site investigation and the test well drilling program, it was determined that access to the proposed Well No. 10 site would not be feasible for the larger drill rig required to drill the large-diameter potable well. To provide adequate access, it was deemed necessary to design and construct an access road, thereby adding the design details and permitting of an access road to the scope of services provided by W-P.

Currently, an existing access easement located adjacent to the Town softball fields links High Street to the Well No. 10 site area; however, it is not large enough to accommodate the required well rig and pipe materials. Most importantly, two (2) wetland crossings would be required for the access road to be constructed. W-P has redeveloped detailed site plans via an alternate route on the adjacent Varney Brothers parcel that grades the existing grown an existing gravel access cart path to ensure that the rig can easily drive into the Well No. 10 site for the new water source development project. This will enable the completion of the next phase of work, which includes large-diameter well drilling and a long-term pump test without significant wetland resource area impacts.

The proposed access road is primarily situated along an existing gravel cart path to the rear of the +/- 33 acre Varney parcel identified on the Town Assessor's Map 41 Lot 3, and adjacent to the Charles River. The river elevations are low lying which are mapped under the FEMA National Flood Insurance Program (NFIP). The designated Flood Insurance Rate Map (FIRM) for this area within the Town of Bellingham is identified as Map #25021C0304E, dated July 17, 2012. A portion of the existing / proposed access road is located within the special flood hazard area, which is subject to inundation by the 1% annual chance flood. This area is classified as Zone AE, with an established base flood elevation. This designation indicates a base water-surface elevation of +/- 209 feet. The proposed gravel access road that crosses a small portion of the mapped area as shown on the Site Plan does not cut-fill or change the grades of base-flood elevation of +/- 209 feet. The proposed "Limited Project" access road has no impact or change to the FEMA mapping in this area.

As detailed on the Site Plan, the access road currently exists to the rear portion of the lot. With the proposed scope of project and its proximity to bordering wetlands and the riverfront area, it necessitates a hydrologic and hydraulic (H&H) analysis to comply with the requirements outlined in the Massachusetts Stormwater Handbook.

# Section 2 Hydrologic & Hydraulic Analysis

## 2.1 Methodology

W-P prepared a H&H analysis for the Well No. 10 Access Road site using the US Department of Agriculture (USDA) Soil Conservation Services (SCS) TR—20 methodology to determine predicted stormwater runoff and outflow. HydroCAD (release 10.00) computer modeling software was used to perform the computations.

## 2.2 Watershed/Subcatchment

The contributing watershed was delineated utilizing ArcGIS computer software, topographic survey, and aerial orthographic photography. The watershed boundary follows the existing access pathway and is limited to both the property lines and natural barriers associated with the Charles River as depicted on the Drainage Plan provided in Appendix B.

The Drainage Exhibit provides an overview of the proposed land cover, drainage flow paths, and redevelopment areas. The Well No. 10 utility access road encompasses a total drainage subcatchment area of approximately 9.25 acres, with a net increase of 0.05 acres in dirt/gravel on the site. The contributing watershed for the pre-development area is designated as “Pre,” and the post-construction area is designated as "Post" in the HydroCAD model. Runoff generated by each delineated watershed flows to the existing wetlands leading to the Charles River which serve as the analysis point for this H&H analysis in both given conditions. Detailed HydroCAD modeling data is included in Appendix C.

## 2.3 Rainfall

As outlined by in Section 2 of the Massachusetts Stormwater Management Manual – and in accordance with the SCS TR-20 methodology – 24-hour rainfall events were used for the analysis. Statistical rainfall data published by the Northeast Regional Climate Center (NRCC) was used for the analysis. NRCC rainfall data for the 24-hour-storm events for 2-, 10-, and 100-year recurrence intervals in the Town of Bellingham are shown in Table 1.

**Table 1 24-Hour Duration Type III Rainfall for the Town of Bellingham, MA**

| Recurrence Interval | Precipitation (inches) |
|---|---|
| 2-Year Event | 3.26 |
| 10-Year Event | 4.88 |
| 100-Year Event | 8.74 |

## 2.4 Subsurface Explorations and Soils

Soil survey information for the proposed project area was sourced from the USDA Natural Resource Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database. The information indicated that the watershed area consists of Sandy Udorthents (Ud), which fall under Hydrologic Soil Group (HSG) rating "A." This aligns with the findings from the on-site Geotechnical Boring Log at the existing well site. Additional NRCS soil information for the defined watersheds and surrounding areas is included in Appendix D.

## 2.5 Land Cover

Land coverage areas were determined based on GIS data from the MassGIS online database. The land cover polygonal data was subsequently modified by W-P utilizing the latest orthographic imagery. Land cover for the Well No. 10 Access Road site was broken out into three types of cover: woods, dirt/gravel and brush/greenspace. Those land coverage types were then assigned a corresponding runoff curve number (CN), for integration into the HydroCAD model, taking into account the land coverage type and Hydrologic Soil Group (HSG) rating of "A." Table 2 below shows the summarized land cover areas for both the pre- and post-construction conditions. These areas are also summarized on the Drainage Plan provided in Appendix B.

**Table 2 Pre- vs Post-Construction Land Cover Area**

| Land Cover Type | Pre-Construction Area (SF) | Post-Construction Area (SF) |
|---|---|---|
| Woods | 372,605 | 323,299 |
| Dirt/Gravel | 30,475 | 32,819 |
| Brush/Greenspace | 0 | 46,962 |
| Total | 403,080 | 403,080 |

There are no brush/greeenspace areas for the pre-construction conditions as the site is primarily wooded and approximately 46,962 SF of total brush/greenspace areas for the post-construction conditions. This additional brush/greenspace will run adjacent to the roadway resulting from clearing and grubbing measures. However, from a modeling perspective, the wooded brush functions identically to wooded areas, possessing the same CN value

## 2.6 Time of Concentration

The time of concentration (Tc) for each watershed area was determined utilizing the SCS lag equation. The primary variables for the Lag equation are the hydraulic length (L) of flow along the longest path within the watershed, the SCS runoff curve number (CN), and the average slope of the watershed (S). On-site runoff primarily begins as sheet flow, which subsequently transitions into shallow concentrated flow. For the purposes of the model, a minimum Tc of 5 minutes was applied to areas that were small and in direct adjacent to the analysis points.

## 2.7 Hydrologic & Hydraulic Modeling

Based on the data collected and calculated above, an H&H model was prepared for both the pre- and post-construction Well No. 10 Access Road site. Below, Table 3 shows the modeled hydraulic performance of the pre- and post-construction subcatchments for the 2-, 10-, and 100-year storm events. For additional information see the HydroCAD model output reports in Appendix C.

**Table 3 Hydraulic Performance to Charles River Wetlands**

| Recurrence Interval (Year) | Rainfall (Inches) | Existing Conditions Peak Flow Rate (CFS) | Proposed Conditions Peak Flow Rate (CFS) |
|---|---|---|---|
| 2 | 3.26 | 0.0 | 0.0 |
| 10 | 4.88 | 0.0 | 0.0 |
| 100 | 8.74 | 3.0 | 3.0 |

Based on the TR-20 analysis results, the post-development peak discharge rates do not exceed the pre-development rates, ensuring compliance with Standard 2 of the Massachusetts Stormwater Handbook.

# Section 3 Erosion & Sedimentation

Various erosion and sedimentation control measures will be utilized to prevent or minimize soil erosion and sedimentation of the existing wetlands that border the project site. Sedimentation controls will include, but are not limited to, straw wattles, silt fences, erosion control matting and temporary anti-tracking aprons (stabilized construction exit at High Street) will also be utilized as shown on the project plans. These measures will be installed as detailed in the Site Plans. Land disturbance must be minimized to reduce soil erosion and sedimentation. Whenever possible, work should be phased to avoid disturbances of more than one acre at a time. Detailed BMPs associated with the Well No. 10 Access Road redevelopment will be provided in advance of construction.

Disturbed areas will be stabilized with mulch or temporary seeding in accordance with the requirements and timeframes noted on the site plans and specifications. At a minimum, any disturbed area left exposed for more than seven (7) days will be stabilized. Stabilization should occur no later than seven (7) days after the suspension of work in the disturbed areas. Site restoration will include the installation of dirt/gravel, loam, seed, and other restoration measures as shown on the site plans and detailed in the project specifications.

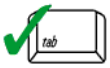
# Appendix A
# Stormwater Checklist

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

# Checklist for Stormwater Report

## A. Introduction

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





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

The Stormwater Report must include:

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

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

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

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

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

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

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

# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

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

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

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

## Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature


5/12/2025

Signature and Date

## Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

# Checklist for Stormwater Report

## Checklist (continued)

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

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

**Standard 1: No New Untreated Discharges**

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

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 2: Peak Rate Attenuation**

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

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

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

**Standard 3: Recharge**

☐ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

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

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

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

☐ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

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

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

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

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 3: Recharge** (continued)

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

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

**Standard 4: Water Quality**

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

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

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

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

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

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

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

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 4: Water Quality** (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

**Standard 6: Critical Areas**

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

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

# Checklist for Stormwater Report

## Checklist (continued)

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

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

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

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

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

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

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

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

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

# Checklist for Stormwater Report

## Checklist (continued)

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

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

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

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

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

**Standard 9: Operation and Maintenance Plan**

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

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

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

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

**Standard 10: Prohibition of Illicit Discharges**

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

☐ An Illicit Discharge Compliance Statement is attached;

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

# Appendix B
# Drainage Exhibit

LAST SAVED BY: LAWRENCE.RUSIECKI 2/28/2025 10:08 AM

| DRAINAGE AREAS | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | PRE-DEVELOPMENT | | | POST-DEVELOPMENT | | |
| | TOTAL AREA | WOODED AREA | GRAVEL | GREENSPACE | WOODED AREA | GRAVEL | GREENSPACE |
| AREA - A | 74,021 SF | 62,724 SF | 11,297 SF | -- | 51,261 SF | 12,166 SF | 10,594 SF |
| AREA - B | 101,154 SF | 93,672 SF | 7,482 SF | -- | 82,534 SF | 8,058 SF | 10,562 SF |
| AREA - C | 151,016 SF | 146,048 SF | 4,968 SF | -- | 135,216 SF | 5,350 SF | 10,450 SF |
| AREA - D | 76,888 SF | 70,161 SF | 6,727 SF | -- | 54,288 SF | 7,245 SF | 15,355 SF |

N

AREA - A
AP-A
MIN TC = 5 MIN
SOIL - 653
SOIL - 10
100' WETLAND BUFFER
AP-B
TC PATH
AREA - B
SOIL - 653
AP-C
SOIL - 10
AREA - C
TC PATH
AREA - D
SOIL - 5
AP-D
TC PATH
SOIL - 245B
SOIL - 10
SOIL - 245B
SOIL - 245C
SOIL - 245C
SOIL - 245B
N/F
VARNEY BORS SAND & GRAVEL 0
HIGH STREET
Tax Map 41, Parcel 3-0
Deed Book 2739, Page 314
N/F
TOWN OF BELLINGHAM
HIGH STREET
Tax Map 45, Parcel 56-0
11.5 ACRES±
N/F
TOWN OF BELLINGHAM
33 HIGH STREET
CHARLES RIVER
APPROXIMATE LOCATION
200' RIVER FRONT
BUFFER ZONE
HIGH STREET
BIT DRIVE
BIT DRIVE
BIT DRIVE
UP#17
UP#16
UP#15
UP#14-50
100' WETLAND BUFFER

## DRAINAGE PLAN
SCALE: 1"=60'

| NO | REVISIONS | APP'D | DATE |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |

PROJECT NO: 21390
DESIGNED: L.RUSIECKI
CAD COORD: S.CANTWELL
CAD: S.CANTWELL
CHECKED: L.RUSIECKI
DATE: 2025-2-26
APPROVED: LR
DATE: 2/28/2025
SUBMISSION: WETLANDS

WRIGHT-PIERCE
978-416-8000 | www.wright-pierce.com
94 NORTH ELM STREET 0 SUITE 205
WESTFIELD, MA 01085

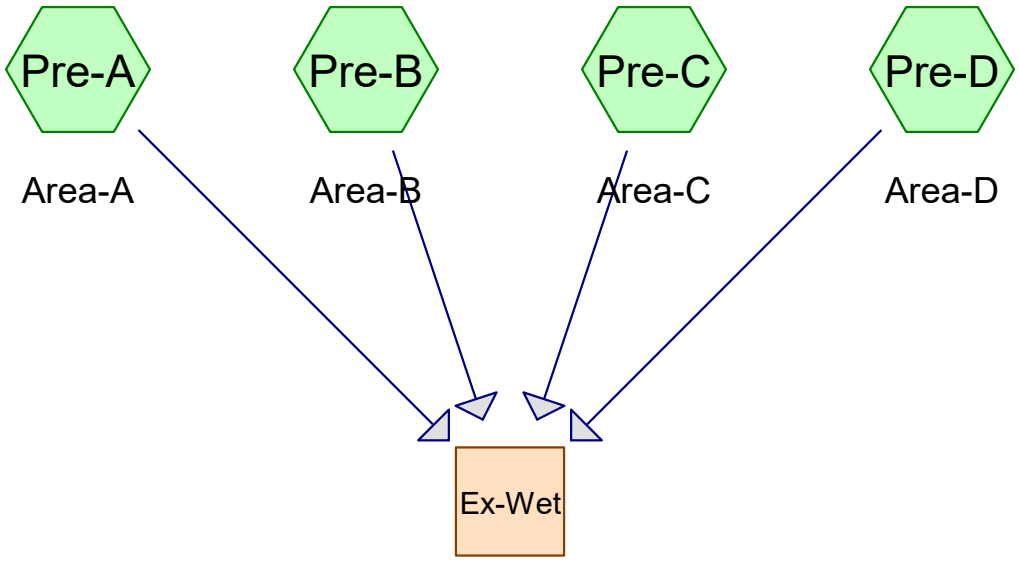
TOWN OF BELLINGHAM, MA
WELL #10 ACCESS ROUTE
HIGH STREET
BELLINGHAM, MA

DRAINAGE PLAN

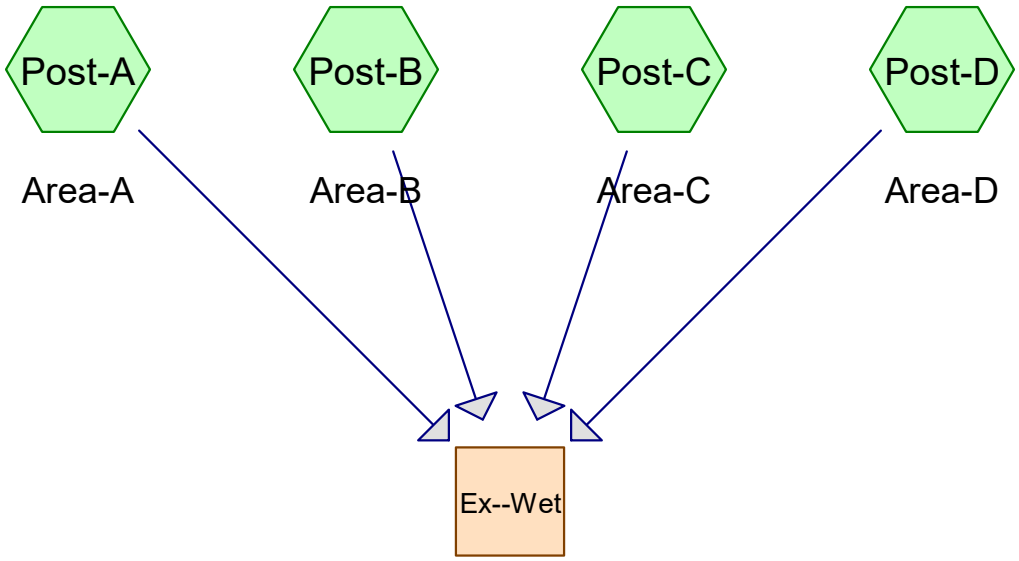
DRAWING
DRAIN - 1

J:\ENG\WA\BELLINGHAM\21390-WELL10ACCESSROADDESIGN_DRAWINGS\CIV\21390-C5-DRAINAGEPLAN-VARNEY.DWG | 24x36 Plan | 1:2.5849 | --- | 2/28/2025 10:36:07 AM | LAWRENCE.RUSIECKI

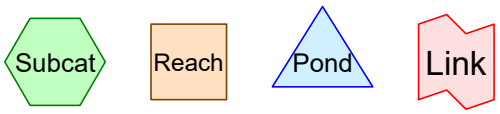
# Appendix C
# HydroCAD Model Results




Exisitng Wetlands to
Charles River




Existing Wetlands to
Charles River




**Routing Diagram for Bellingham MA - Well 10 Access Route - Varney (2-19-2025)**
Prepared by Wright - Pierce, Printed 2/20/2025
HydroCAD® 10.00-26 s/n 01135 © 2020 HydroCAD Software Solutions LLC

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 1.078 | 30 | Brush, Good, HSG A (Post-A, Post-B, Post-C, Post-D) |
| 1.453 | 72 | Dirt roads, HSG A (Post-A, Post-B, Post-C, Post-D, Pre-A, Pre-B, Pre-C, Pre-D) |
| 15.976 | 30 | Woods, Good, HSG A (Post-A, Post-B, Post-C, Post-D, Pre-A, Pre-B, Pre-C, Pre-D) |
| **18.507** | **33** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (acres) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 18.507 | HSG A | Post-A, Post-B, Post-C, Post-D, Pre-A, Pre-B, Pre-C, Pre-D |
| 0.000 | HSG B | |
| 0.000 | HSG C | |
| 0.000 | HSG D | |
| 0.000 | Other | |
| **18.507** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (acres) | HSG-B (acres) | HSG-C (acres) | HSG-D (acres) | Other (acres) | Total (acres) | Ground Cover | Subcatchment Numbers |
|---|---|---|---|---|---|---|---|
| 1.078 | 0.000 | 0.000 | 0.000 | 0.000 | 1.078 | Brush, Good | Post-A, Post-B, Post-C, Post-D |
| 1.453 | 0.000 | 0.000 | 0.000 | 0.000 | 1.453 | Dirt roads | Post-A, Post-B, Post-C, Post-D, Pre-A, Pre-B, Pre-C, Pre-D |
| 15.976 | 0.000 | 0.000 | 0.000 | 0.000 | 15.976 | Woods, Good | Post-A, Post-B, Post-C, Post-D, Pre-A, Pre-B, Pre-C, Pre-D |
| **18.507** | **0.000** | **0.000** | **0.000** | **0.000** | **18.507** | **TOTAL AREA** | |

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

**Subcatchment Post-A: Area-A** Runoff Area=74,021 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=37 Runoff=0.00 cfs 0.000 af

**Subcatchment Post-B: Area-B** Runoff Area=101,154 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=154' Slope=0.0900 '/' Tc=20.9 min CN=33 Runoff=0.00 cfs 0.000 af

**Subcatchment Post-C: Area-C** Runoff Area=151,016 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=268' Slope=0.0500 '/' Tc=28.2 min CN=31 Runoff=0.00 cfs 0.000 af

**Subcatchment Post-D: Area-D** Runoff Area=76,888 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=183' Slope=0.1089 '/' Tc=19.6 min CN=34 Runoff=0.00 cfs 0.000 af

**Subcatchment Pre-A: Area-A** Runoff Area=74,021 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=36 Runoff=0.00 cfs 0.000 af

**Subcatchment Pre-B: Area-B** Runoff Area=101,154 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=154' Slope=0.0900 '/' Tc=20.9 min CN=33 Runoff=0.00 cfs 0.000 af

**Subcatchment Pre-C: Area-C** Runoff Area=151,016 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=268' Slope=0.0500 '/' Tc=28.2 min CN=31 Runoff=0.00 cfs 0.000 af

**Subcatchment Pre-D: Area-D** Runoff Area=76,888 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=183' Slope=0.1089 '/' Tc=19.6 min CN=34 Runoff=0.00 cfs 0.000 af

**Reach Ex--Wet: Existing Wetlands to Charles River** Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

**Reach Ex-Wet: Exisitng Wetlands to Charles River** Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

**Total Runoff Area = 18.507 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"**
**100.00% Pervious = 18.507 ac 0.00% Impervious = 0.000 ac**

## Summary for Subcatchment Post-A: Area-A

[49] Hint: Tc<2dt may require smaller dt
[45] Hint: Runoff=Zero

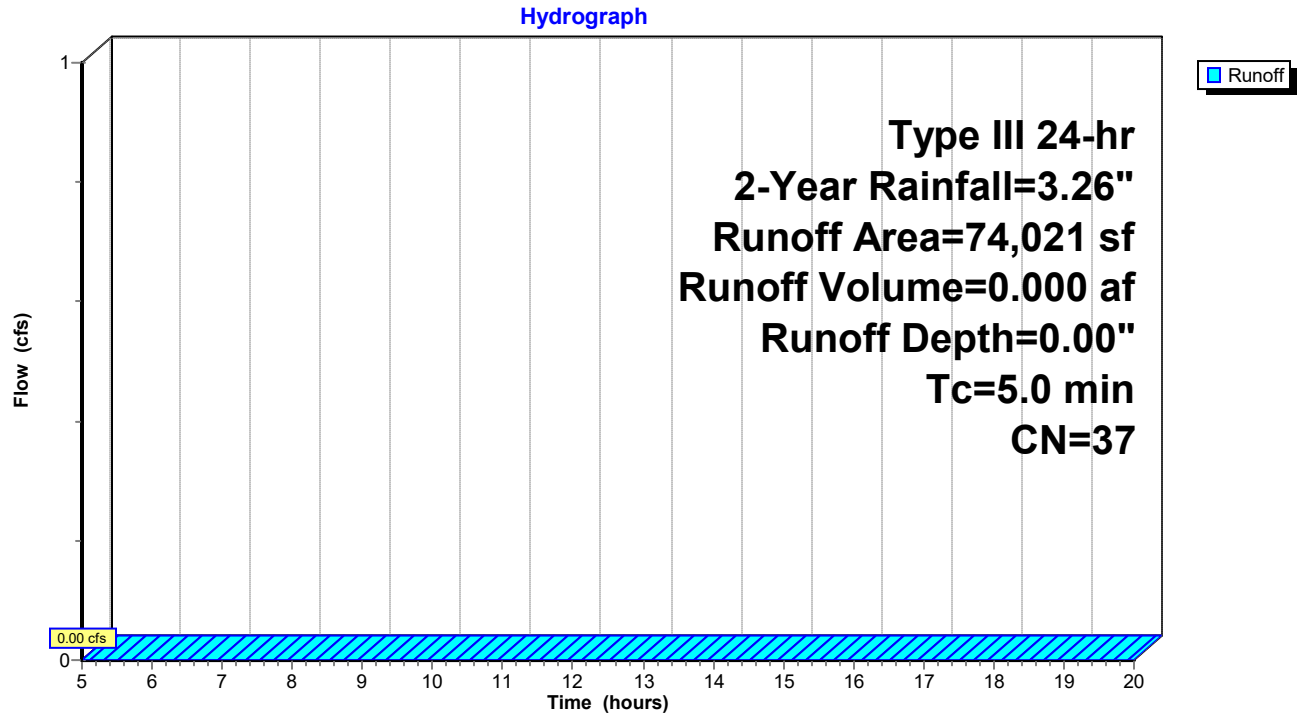
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.26"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 51,261 | 30 | Woods, Good, HSG A |
| | 12,166 | 72 | Dirt roads, HSG A |
| * | 10,594 | 30 | Brush, Good, HSG A |
| | 74,021 | 37 | Weighted Average |
| | 74,021 | | 100.00% Pervious Area |

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

## Subcatchment Post-A: Area-A



## Summary for Subcatchment Post-B: Area-B

[45] Hint: Runoff=Zero

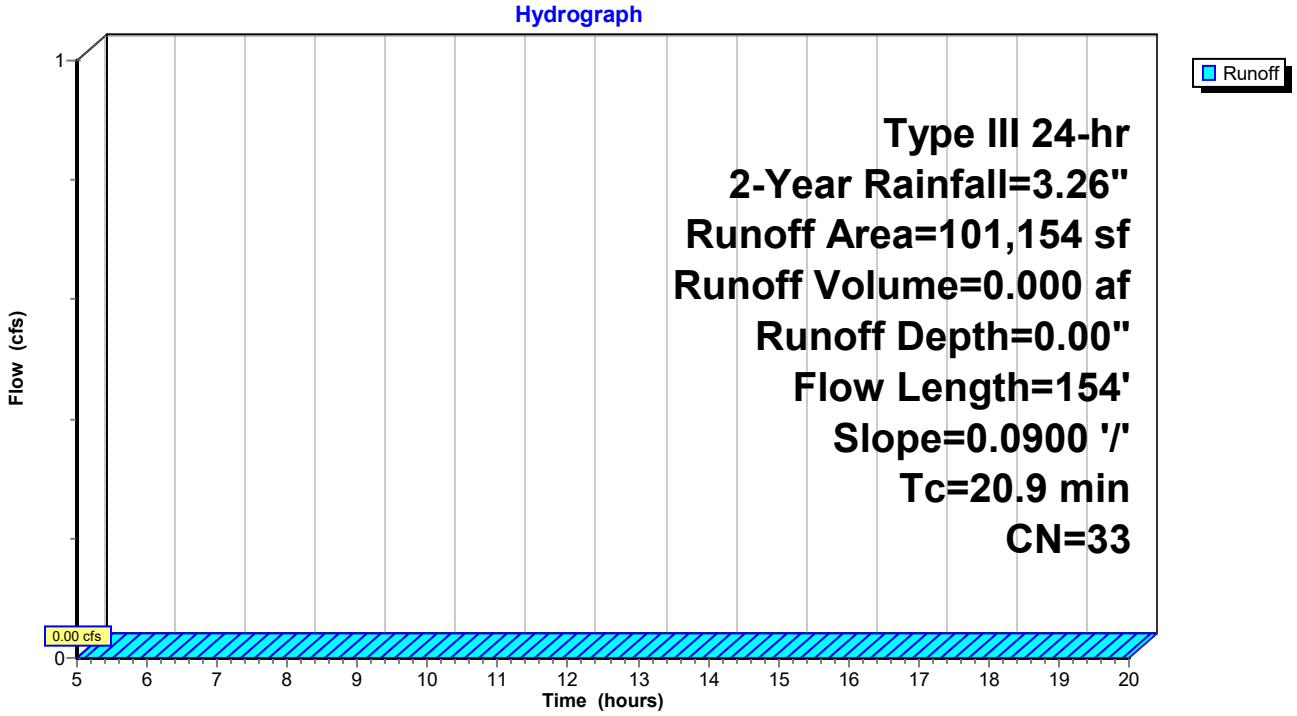
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.26"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 82,534 | 30 | Woods, Good, HSG A |
| | 8,058 | 72 | Dirt roads, HSG A |
| * | 10,562 | 30 | Brush, Good, HSG A |
| | 101,154 | 33 | Weighted Average |
| | 101,154 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 20.3 | 100 | 0.0900 | 0.08 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 0.6 | 54 | 0.0900 | 1.50 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 20.9 | 154 | Total | | | |

### Subcatchment Post-B: Area-B



## Summary for Subcatchment Post-C: Area-C

[45] Hint: Runoff=Zero

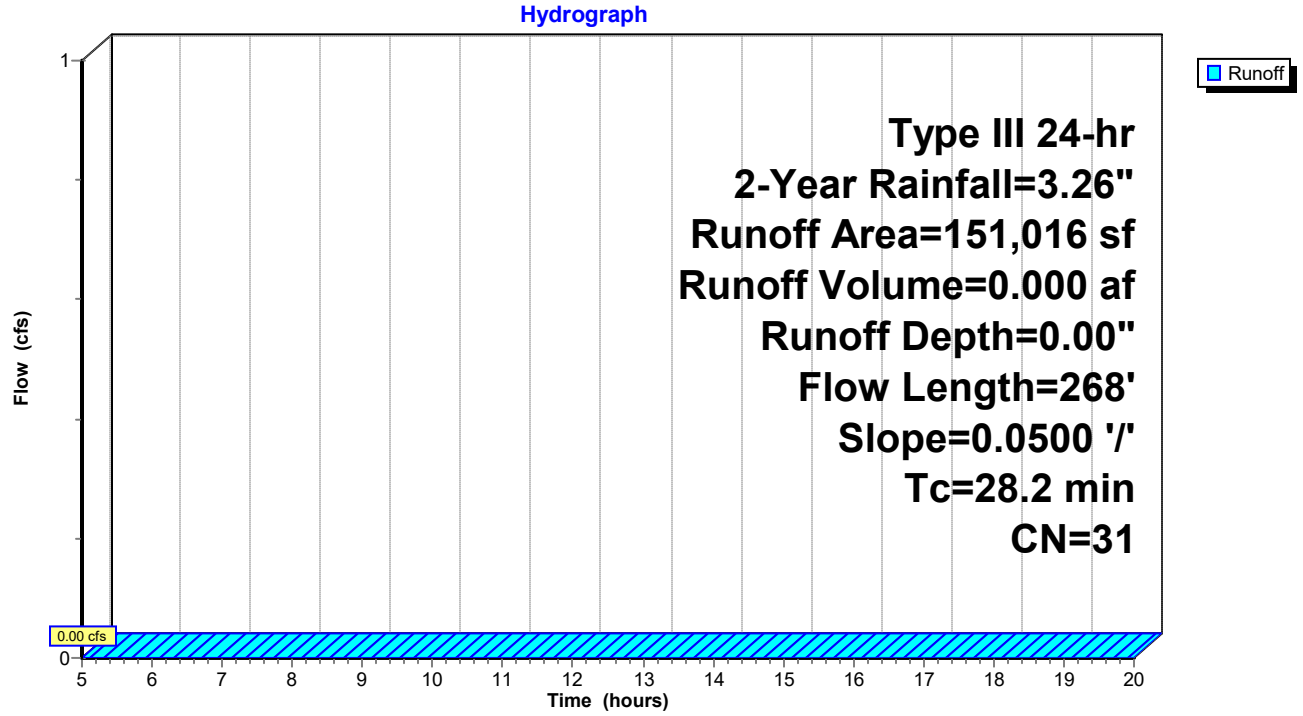
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.26"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 135,216 | 30 | Woods, Good, HSG A |
| | 5,350 | 72 | Dirt roads, HSG A |
| * | 10,450 | 30 | Brush, Good, HSG A |
| | 151,016 | 31 | Weighted Average |
| | 151,016 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.7 | 100 | 0.0500 | 0.06 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 2.5 | 168 | 0.0500 | 1.12 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 28.2 | 268 | Total | | | |

### Subcatchment Post-C: Area-C



## Summary for Subcatchment Post-D: Area-D

[45] Hint: Runoff=Zero

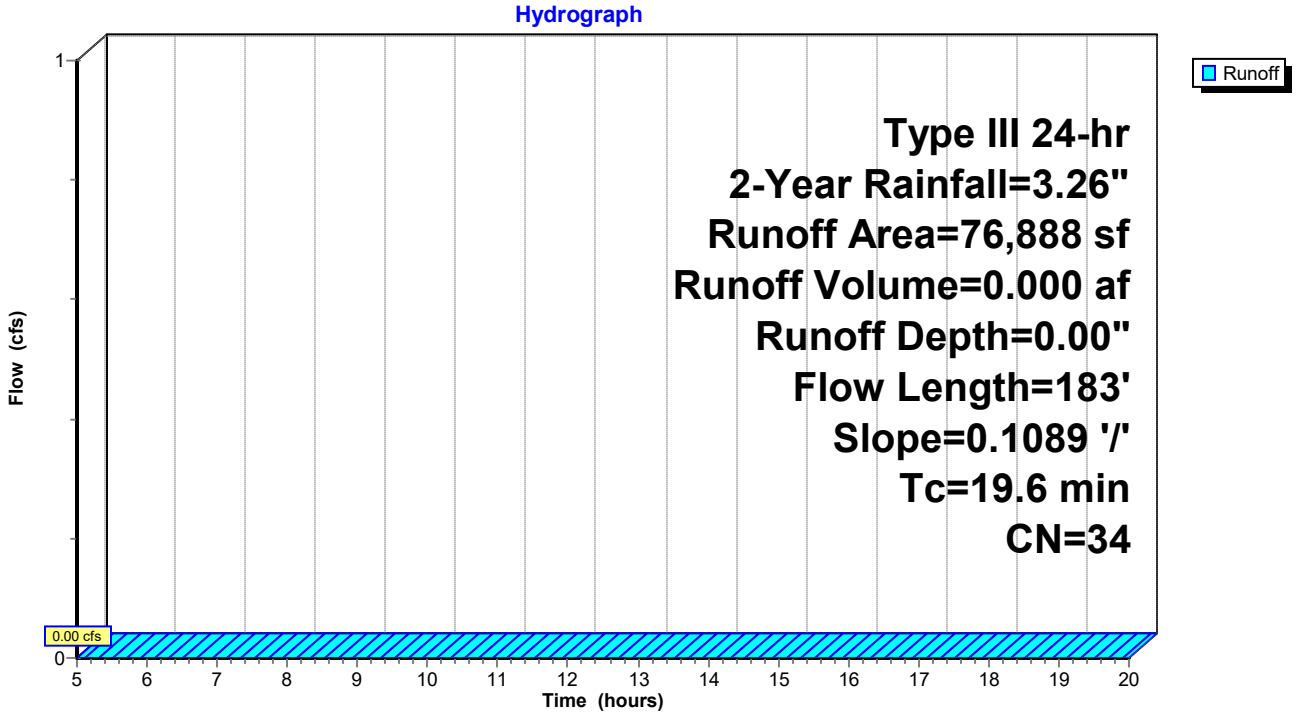
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.26"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 54,288 | 30 | Woods, Good, HSG A |
| | 7,245 | 72 | Dirt roads, HSG A |
| * | 15,355 | 30 | Brush, Good, HSG A |
| | 76,888 | 34 | Weighted Average |
| | 76,888 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.8 | 100 | 0.1089 | 0.09 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 0.8 | 83 | 0.1089 | 1.65 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 19.6 | 183 | Total | | | |

## Subcatchment Post-D: Area-D



## Summary for Subcatchment Pre-A: Area-A

[49] Hint: Tc<2dt may require smaller dt
[45] Hint: Runoff=Zero

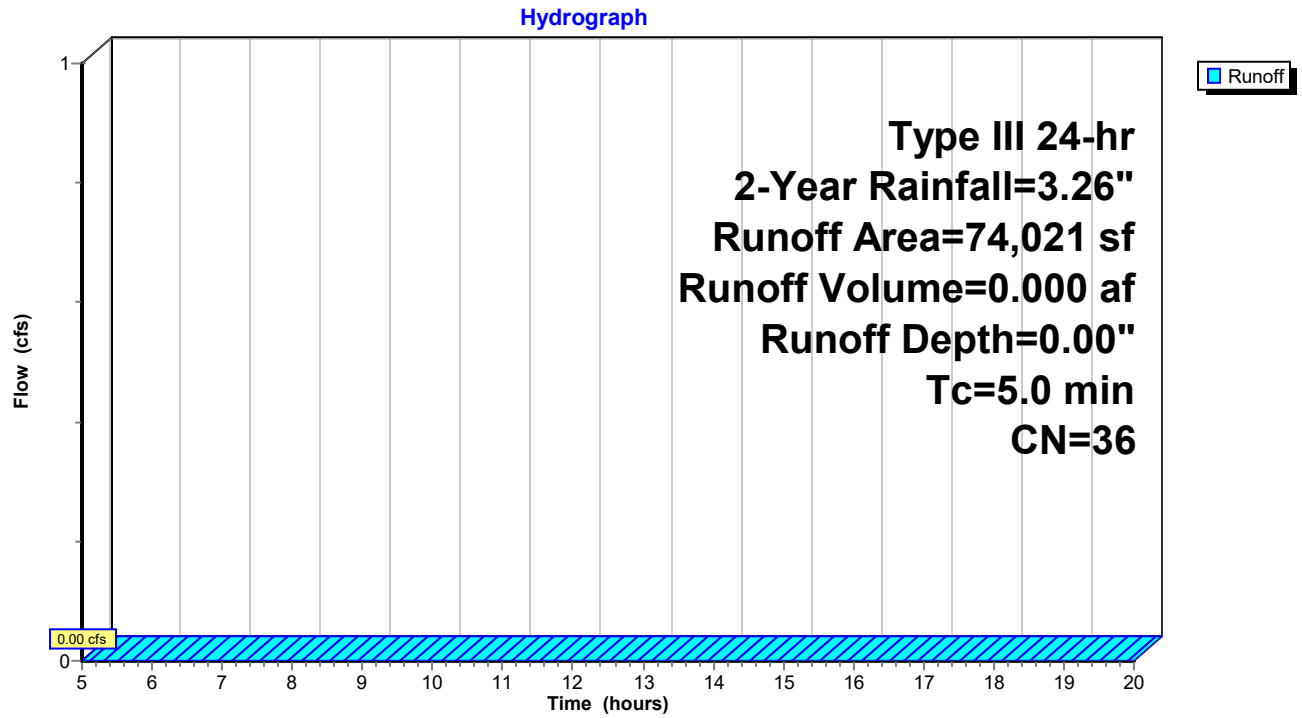
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.26"

| Area (sf) | CN | Description |
|---|---|---|
| 62,724 | 30 | Woods, Good, HSG A |
| 11,297 | 72 | Dirt roads, HSG A |
| 74,021 | 36 | Weighted Average |
| 74,021 | | 100.00% Pervious Area |

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

### Subcatchment Pre-A: Area-A



## Summary for Subcatchment Pre-B: Area-B

[45] Hint: Runoff=Zero

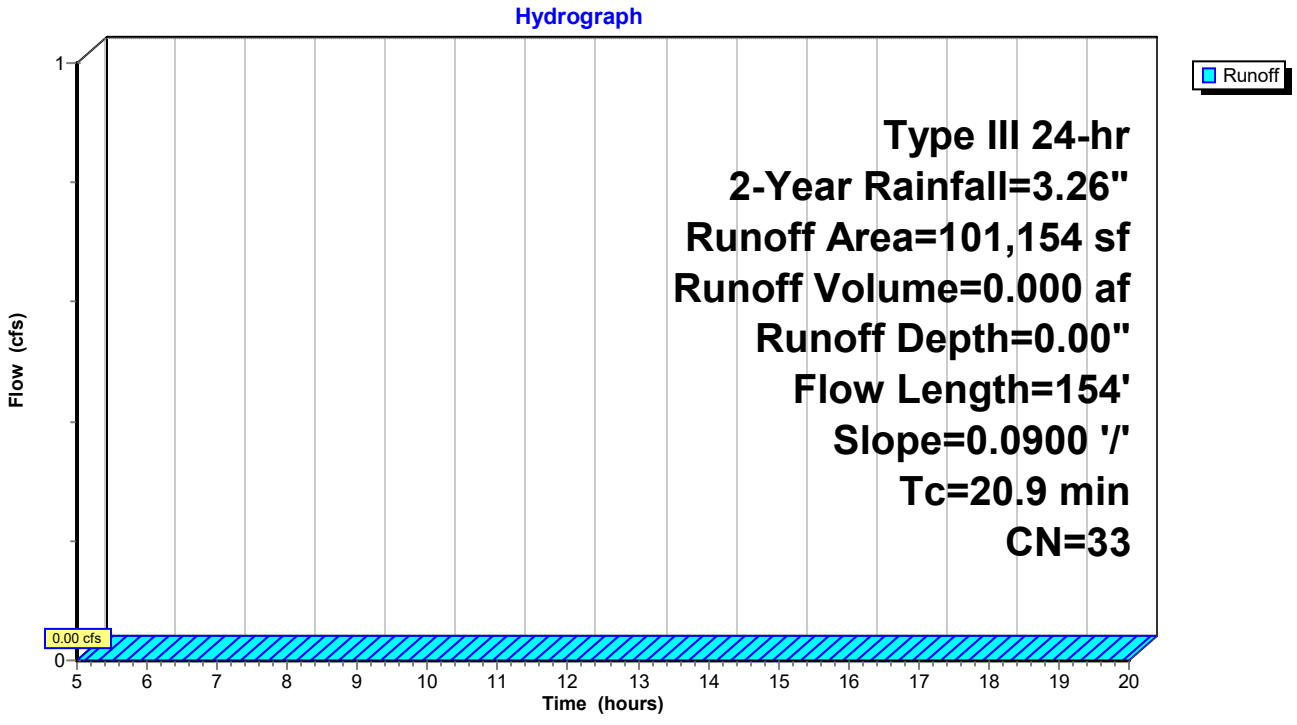
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.26"

| Area (sf) | CN | Description |
|---|---|---|
| 93,672 | 30 | Woods, Good, HSG A |
| 7,482 | 72 | Dirt roads, HSG A |
| 101,154 | 33 | Weighted Average |
| 101,154 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 20.3 | 100 | 0.0900 | 0.08 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 0.6 | 54 | 0.0900 | 1.50 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 20.9 | 154 | Total | | | |

### Subcatchment Pre-B: Area-B



## Summary for Subcatchment Pre-C: Area-C

[45] Hint: Runoff=Zero

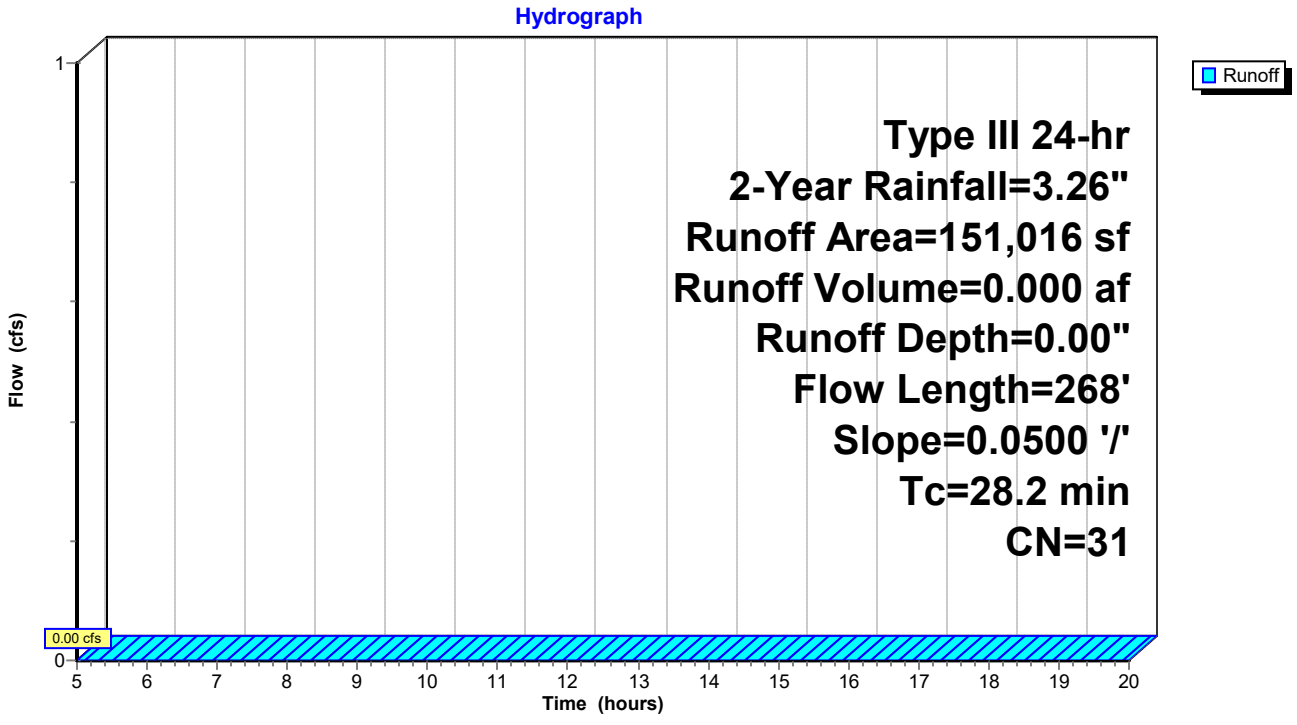
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.26"

| Area (sf) | CN | Description |
|---|---|---|
| 146,048 | 30 | Woods, Good, HSG A |
| 4,968 | 72 | Dirt roads, HSG A |
| 151,016 | 31 | Weighted Average |
| 151,016 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.7 | 100 | 0.0500 | 0.06 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 2.5 | 168 | 0.0500 | 1.12 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 28.2 | 268 | Total | | | |

### Subcatchment Pre-C: Area-C



## Summary for Subcatchment Pre-D: Area-D

[45] Hint: Runoff=Zero

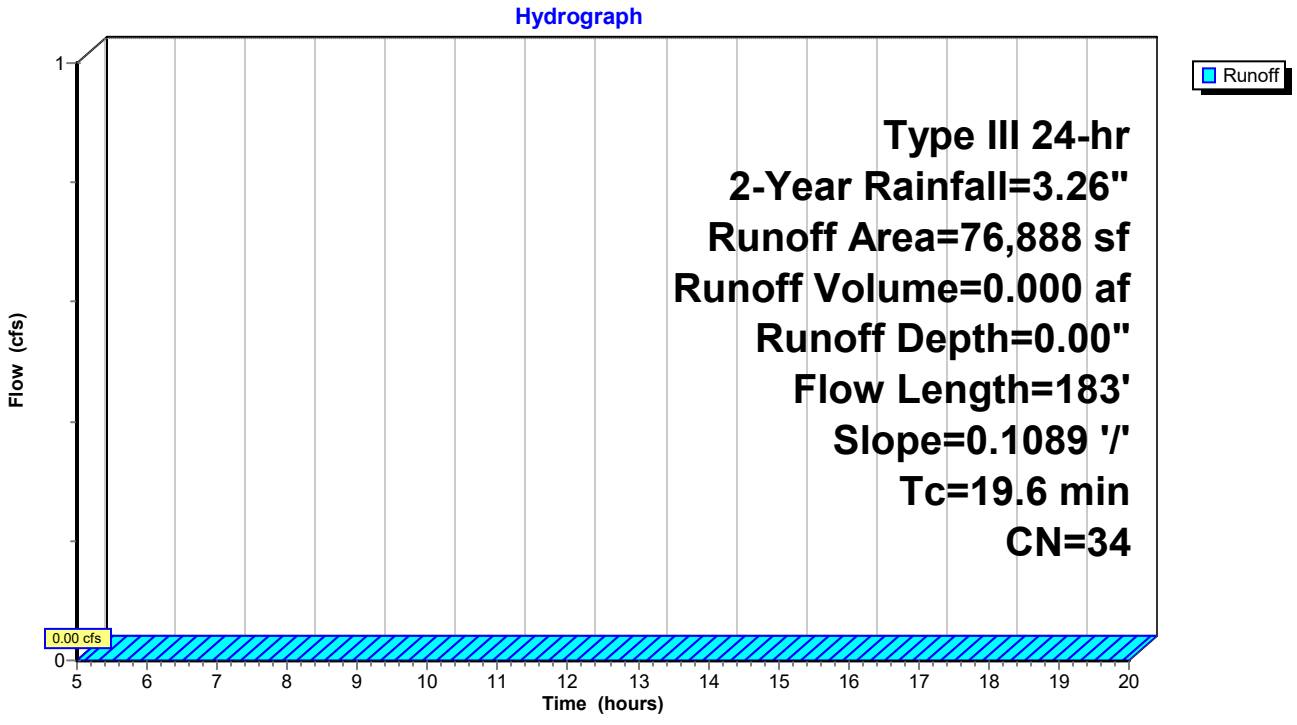
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.26"

| Area (sf) | CN | Description |
|---|---|---|
| 70,161 | 30 | Woods, Good, HSG A |
| 6,727 | 72 | Dirt roads, HSG A |
| 76,888 | 34 | Weighted Average |
| 76,888 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.8 | 100 | 0.1089 | 0.09 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 0.8 | 83 | 0.1089 | 1.65 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 19.6 | 183 | Total | | | |

## Subcatchment Pre-D: Area-D



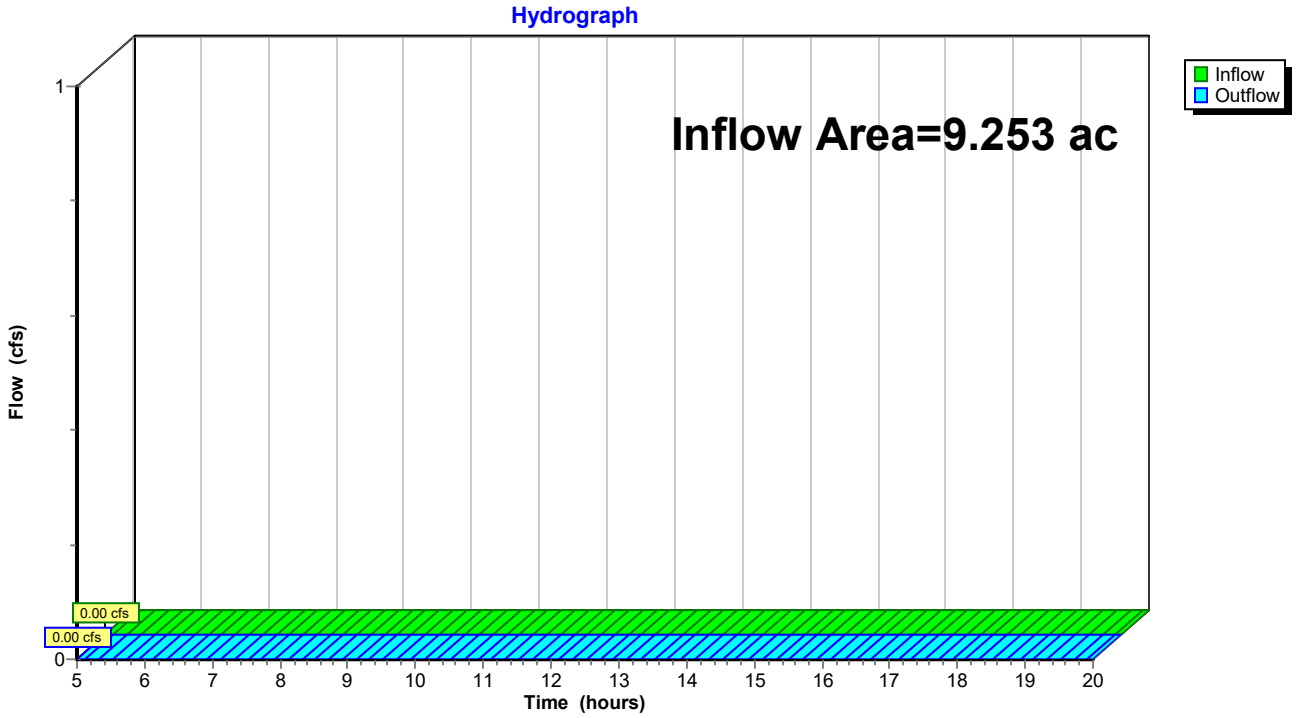
## Summary for Reach Ex--Wet: Existing Wetlands to Charles River

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9.253 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

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

### Reach Ex--Wet: Existing Wetlands to Charles River



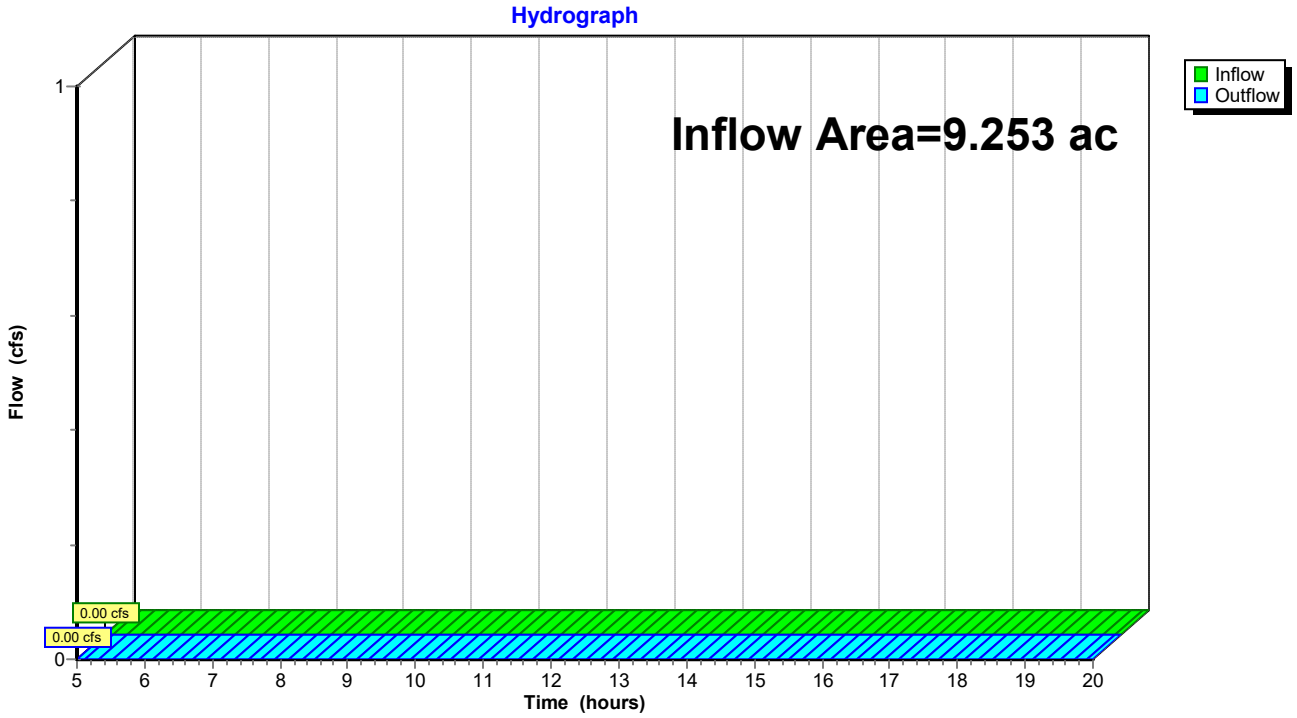
## Summary for Reach Ex-Wet: Exisitng Wetlands to Charles River

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9.253 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

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

### Reach Ex-Wet: Exisitng Wetlands to Charles River



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

**Subcatchment Post-A: Area-A** Runoff Area=74,021 sf 0.00% Impervious Runoff Depth>0.09"
Tc=5.0 min CN=37 Runoff=0.03 cfs 0.012 af

**Subcatchment Post-B: Area-B** Runoff Area=101,154 sf 0.00% Impervious Runoff Depth>0.02"
Flow Length=154' Slope=0.0900 '/' Tc=20.9 min CN=33 Runoff=0.01 cfs 0.003 af

**Subcatchment Post-C: Area-C** Runoff Area=151,016 sf 0.00% Impervious Runoff Depth>0.00"
Flow Length=268' Slope=0.0500 '/' Tc=28.2 min CN=31 Runoff=0.00 cfs 0.000 af

**Subcatchment Post-D: Area-D** Runoff Area=76,888 sf 0.00% Impervious Runoff Depth>0.03"
Flow Length=183' Slope=0.1089 '/' Tc=19.6 min CN=34 Runoff=0.01 cfs 0.004 af

**Subcatchment Pre-A: Area-A** Runoff Area=74,021 sf 0.00% Impervious Runoff Depth>0.07"
Tc=5.0 min CN=36 Runoff=0.02 cfs 0.009 af

**Subcatchment Pre-B: Area-B** Runoff Area=101,154 sf 0.00% Impervious Runoff Depth>0.02"
Flow Length=154' Slope=0.0900 '/' Tc=20.9 min CN=33 Runoff=0.01 cfs 0.003 af

**Subcatchment Pre-C: Area-C** Runoff Area=151,016 sf 0.00% Impervious Runoff Depth>0.00"
Flow Length=268' Slope=0.0500 '/' Tc=28.2 min CN=31 Runoff=0.00 cfs 0.000 af

**Subcatchment Pre-D: Area-D** Runoff Area=76,888 sf 0.00% Impervious Runoff Depth>0.03"
Flow Length=183' Slope=0.1089 '/' Tc=19.6 min CN=34 Runoff=0.01 cfs 0.004 af

**Reach Ex--Wet: Existing Wetlands to Charles River** Inflow=0.04 cfs 0.020 af
Outflow=0.04 cfs 0.020 af

**Reach Ex-Wet: Exisitng Wetlands to Charles River** Inflow=0.04 cfs 0.017 af
Outflow=0.04 cfs 0.017 af

**Total Runoff Area = 18.507 ac Runoff Volume = 0.038 af Average Runoff Depth = 0.02"**
**100.00% Pervious = 18.507 ac 0.00% Impervious = 0.000 ac**

## Summary for Subcatchment Post-A: Area-A

[49] Hint: Tc<2dt may require smaller dt

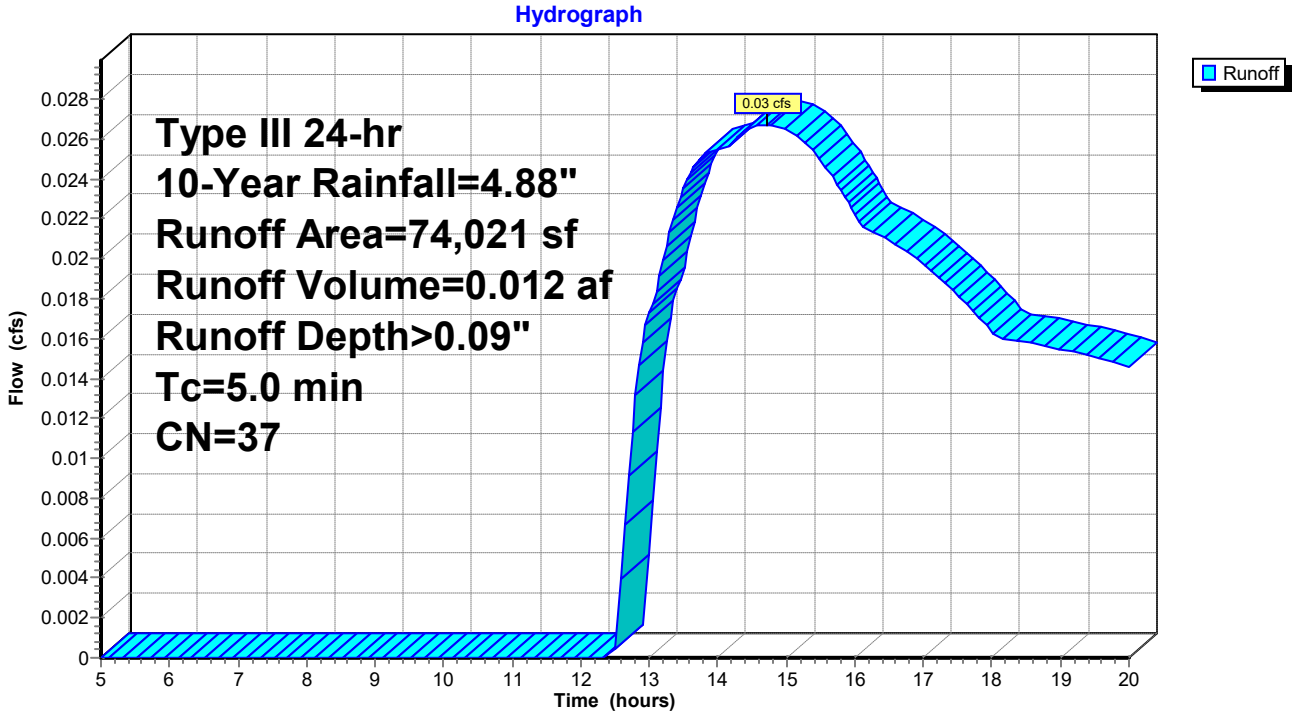
Runoff = 0.03 cfs @ 14.72 hrs, Volume= 0.012 af, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.88"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 51,261 | 30 | Woods, Good, HSG A |
| | 12,166 | 72 | Dirt roads, HSG A |
| * | 10,594 | 30 | Brush, Good, HSG A |
| | 74,021 | 37 | Weighted Average |
| | 74,021 | | 100.00% Pervious Area |

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

### Subcatchment Post-A: Area-A



## Summary for Subcatchment Post-B: Area-B

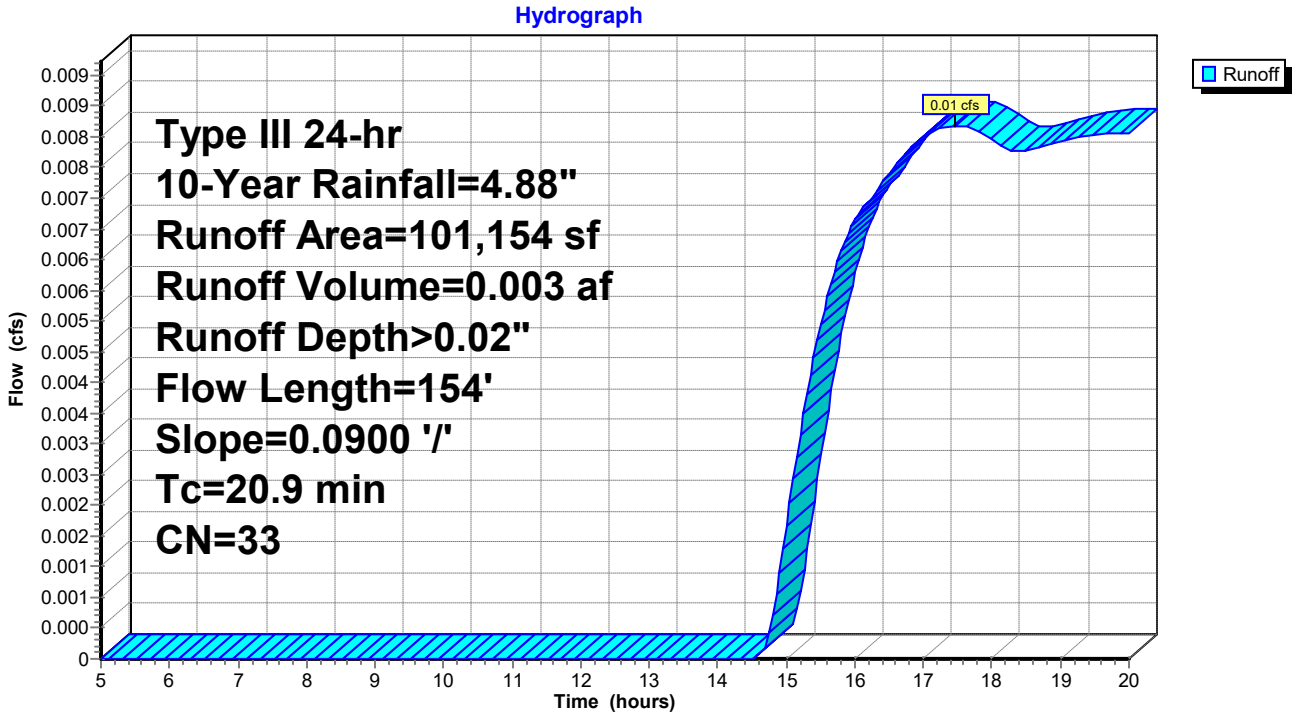
Runoff = 0.01 cfs @ 17.46 hrs, Volume= 0.003 af, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.88"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 82,534 | 30 | Woods, Good, HSG A |
| | 8,058 | 72 | Dirt roads, HSG A |
| * | 10,562 | 30 | Brush, Good, HSG A |
| | 101,154 | 33 | Weighted Average |
| | 101,154 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 20.3 | 100 | 0.0900 | 0.08 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 0.6 | 54 | 0.0900 | 1.50 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 20.9 | 154 | Total | | | |

## Subcatchment Post-B: Area-B



## Summary for Subcatchment Post-C: Area-C

[73] Warning: Peak may fall outside time span

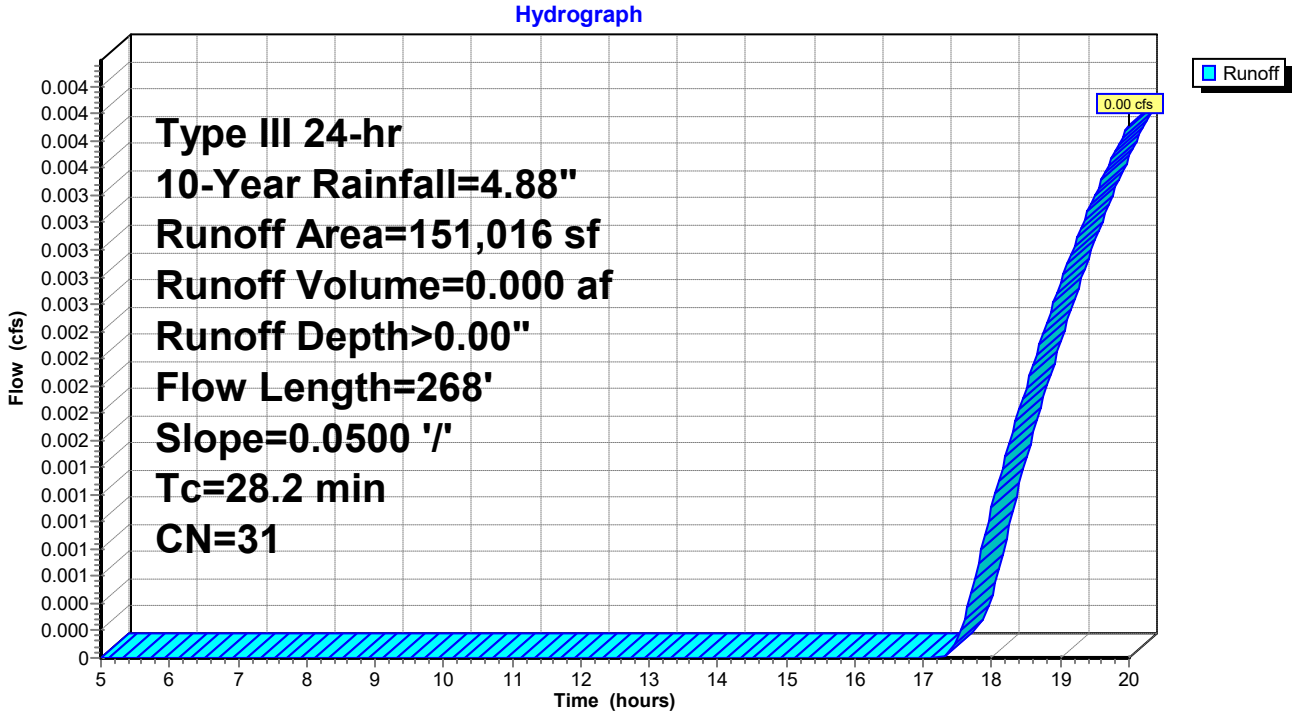
Runoff = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.88"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 135,216 | 30 | Woods, Good, HSG A |
| | 5,350 | 72 | Dirt roads, HSG A |
| * | 10,450 | 30 | Brush, Good, HSG A |
| | 151,016 | 31 | Weighted Average |
| | 151,016 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.7 | 100 | 0.0500 | 0.06 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 2.5 | 168 | 0.0500 | 1.12 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 28.2 | 268 | Total | | | |

### Subcatchment Post-C: Area-C



## Summary for Subcatchment Post-D: Area-D

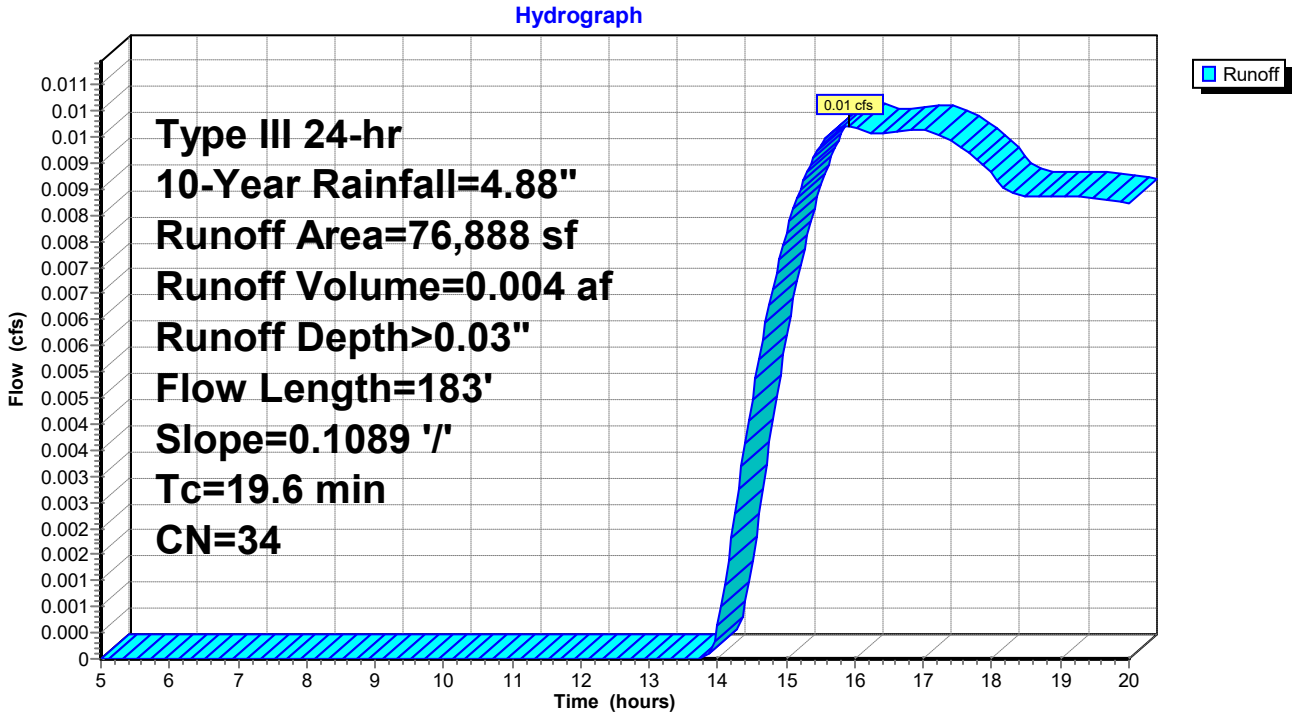
Runoff = 0.01 cfs @ 15.91 hrs, Volume= 0.004 af, Depth> 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.88"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 54,288 | 30 | Woods, Good, HSG A |
| | 7,245 | 72 | Dirt roads, HSG A |
| * | 15,355 | 30 | Brush, Good, HSG A |
| | 76,888 | 34 | Weighted Average |
| | 76,888 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.8 | 100 | 0.1089 | 0.09 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 0.8 | 83 | 0.1089 | 1.65 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 19.6 | 183 | Total | | | |

## Subcatchment Post-D: Area-D



## Summary for Subcatchment Pre-A: Area-A

[49] Hint: Tc<2dt may require smaller dt

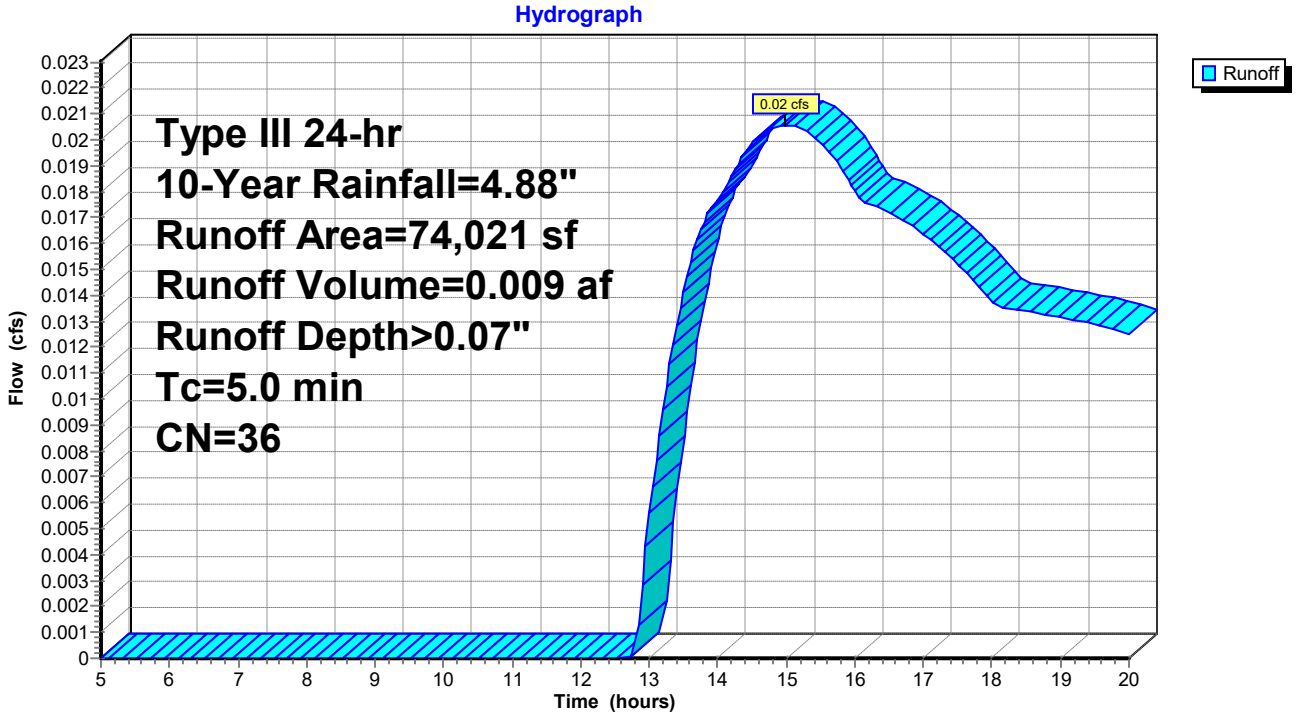
Runoff = 0.02 cfs @ 14.99 hrs, Volume= 0.009 af, Depth> 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.88"

| Area (sf) | CN | Description |
|---|---|---|
| 62,724 | 30 | Woods, Good, HSG A |
| 11,297 | 72 | Dirt roads, HSG A |
| 74,021 | 36 | Weighted Average |
| 74,021 | | 100.00% Pervious Area |

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

## Subcatchment Pre-A: Area-A



## Summary for Subcatchment Pre-B: Area-B

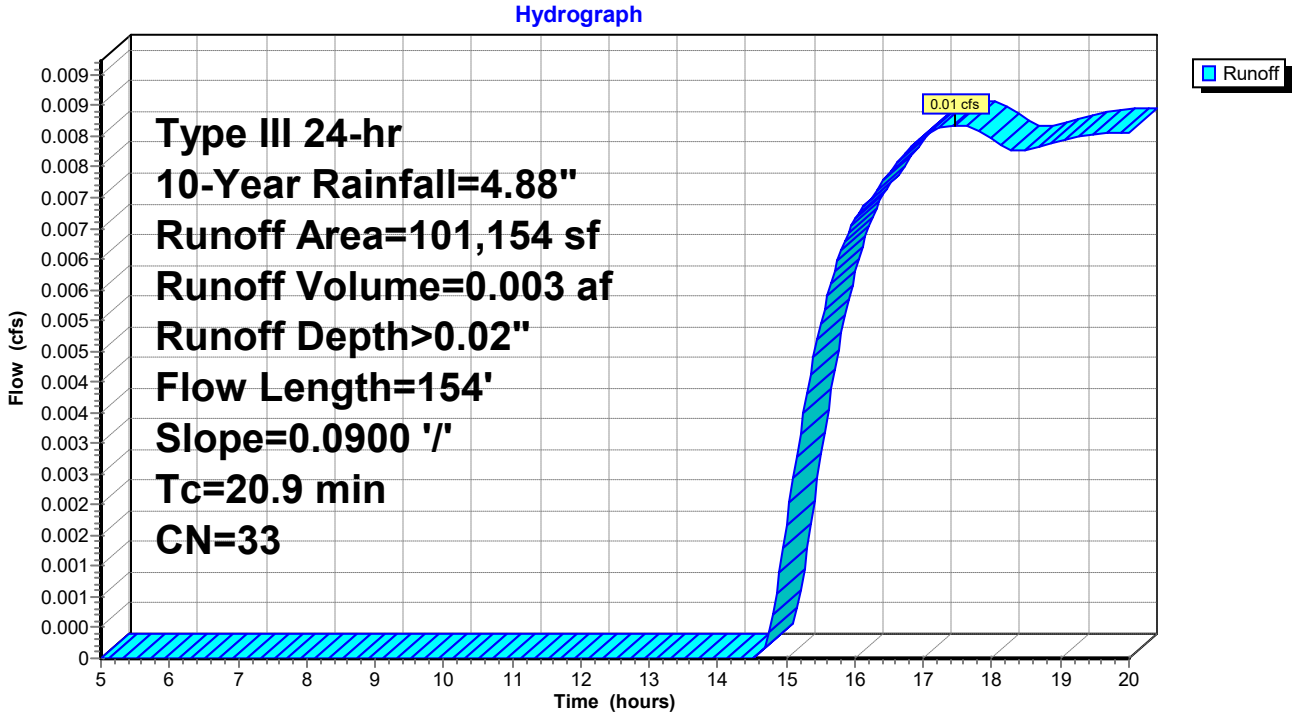
Runoff = 0.01 cfs @ 17.46 hrs, Volume= 0.003 af, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.88"

| Area (sf) | CN | Description |
|---|---|---|
| 93,672 | 30 | Woods, Good, HSG A |
| 7,482 | 72 | Dirt roads, HSG A |
| 101,154 | 33 | Weighted Average |
| 101,154 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 20.3 | 100 | 0.0900 | 0.08 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 0.6 | 54 | 0.0900 | 1.50 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 20.9 | 154 | Total | | | |

## Subcatchment Pre-B: Area-B



## Summary for Subcatchment Pre-C: Area-C

[73] Warning: Peak may fall outside time span

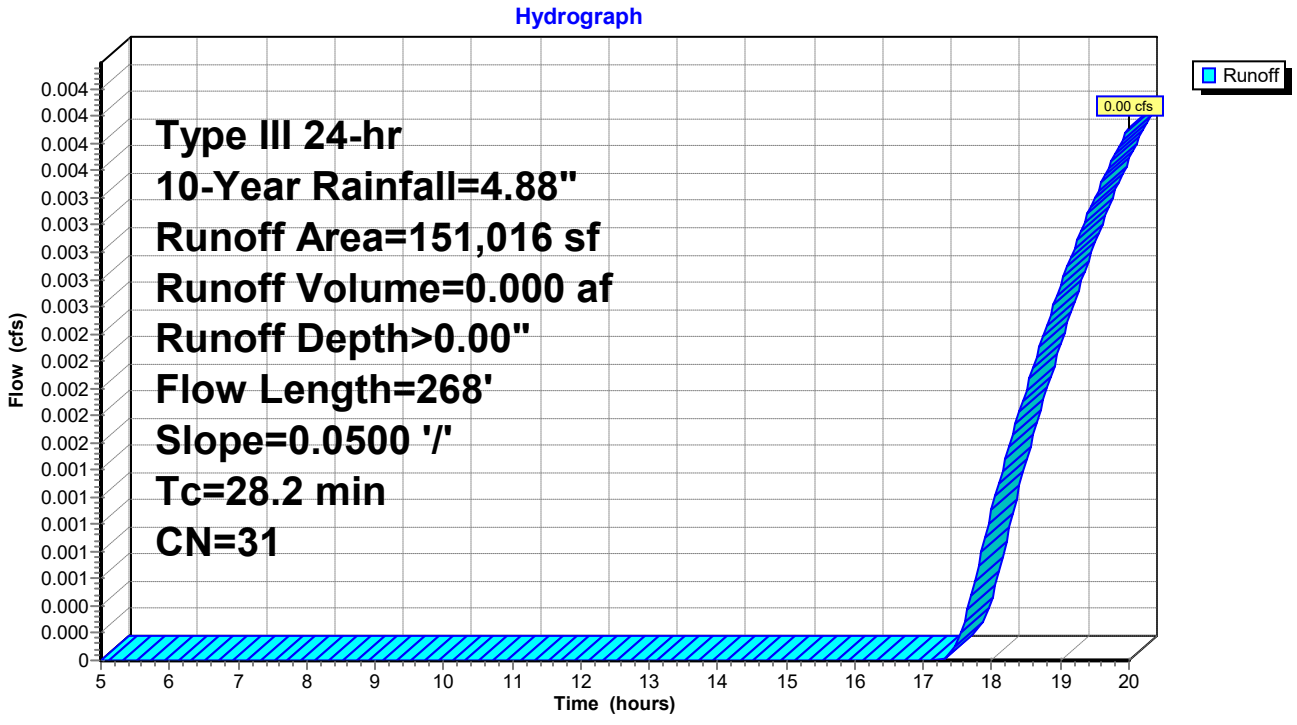
Runoff = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.88"

| Area (sf) | CN | Description |
|---|---|---|
| 146,048 | 30 | Woods, Good, HSG A |
| 4,968 | 72 | Dirt roads, HSG A |
| 151,016 | 31 | Weighted Average |
| 151,016 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.7 | 100 | 0.0500 | 0.06 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 2.5 | 168 | 0.0500 | 1.12 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 28.2 | 268 | Total | | | |

### Subcatchment Pre-C: Area-C



## Summary for Subcatchment Pre-D: Area-D

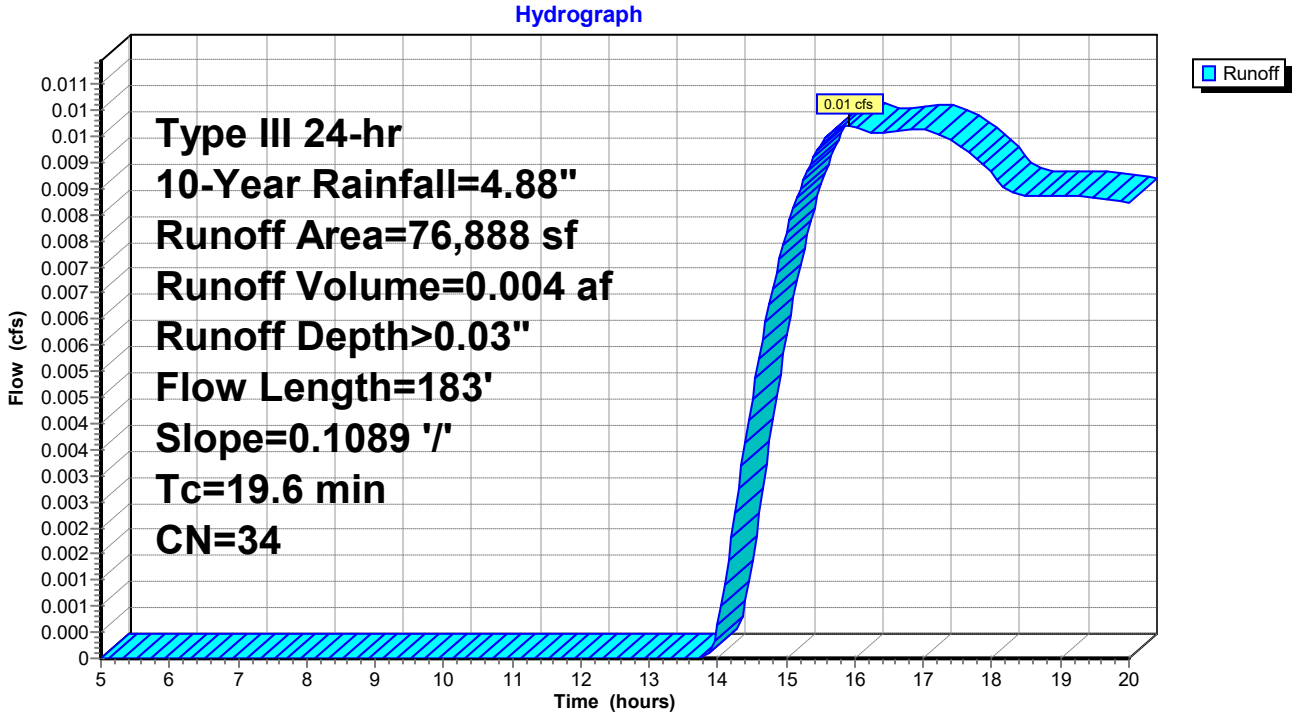
Runoff = 0.01 cfs @ 15.91 hrs, Volume= 0.004 af, Depth> 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.88"

| Area (sf) | CN | Description |
|---|---|---|
| 70,161 | 30 | Woods, Good, HSG A |
| 6,727 | 72 | Dirt roads, HSG A |
| 76,888 | 34 | Weighted Average |
| 76,888 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.8 | 100 | 0.1089 | 0.09 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 0.8 | 83 | 0.1089 | 1.65 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 19.6 | 183 | Total | | | |

## Subcatchment Pre-D: Area-D



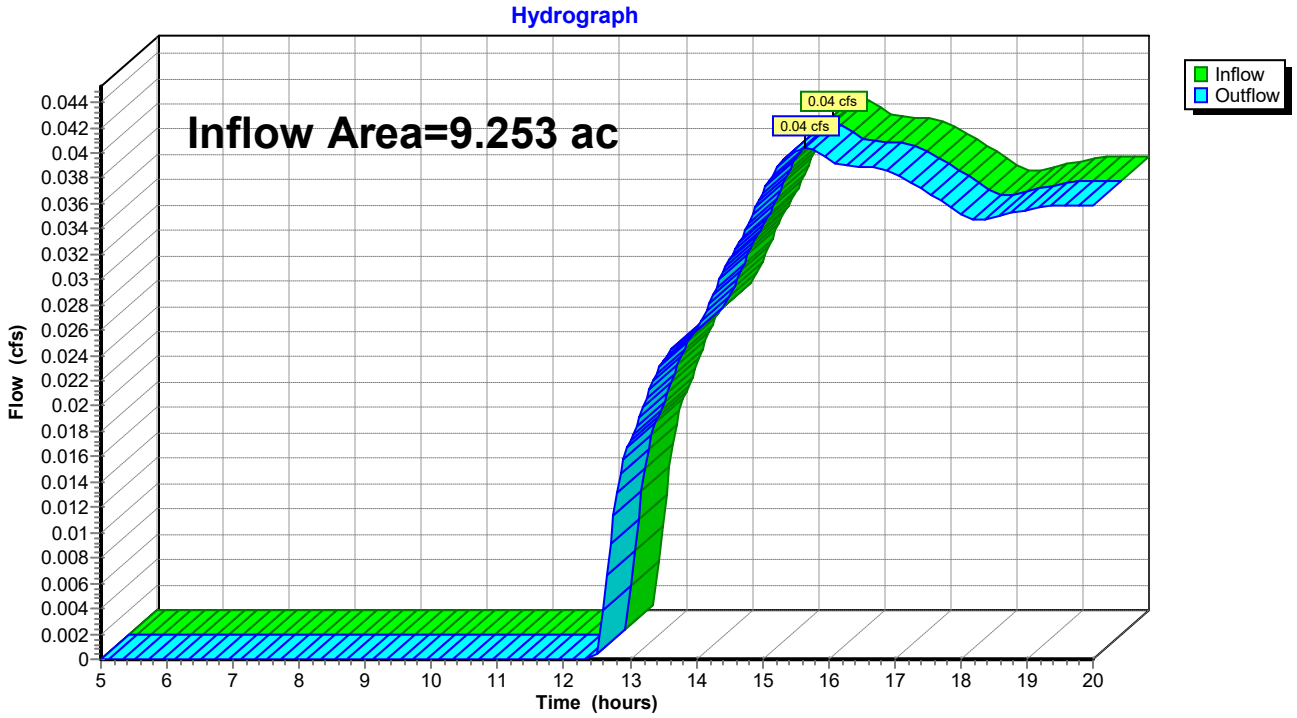
## Summary for Reach Ex--Wet: Existing Wetlands to Charles River

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9.253 ac, 0.00% Impervious, Inflow Depth > 0.03" for 10-Year event
Inflow = 0.04 cfs @ 15.66 hrs, Volume= 0.020 af
Outflow = 0.04 cfs @ 15.66 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

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

### Reach Ex--Wet: Existing Wetlands to Charles River



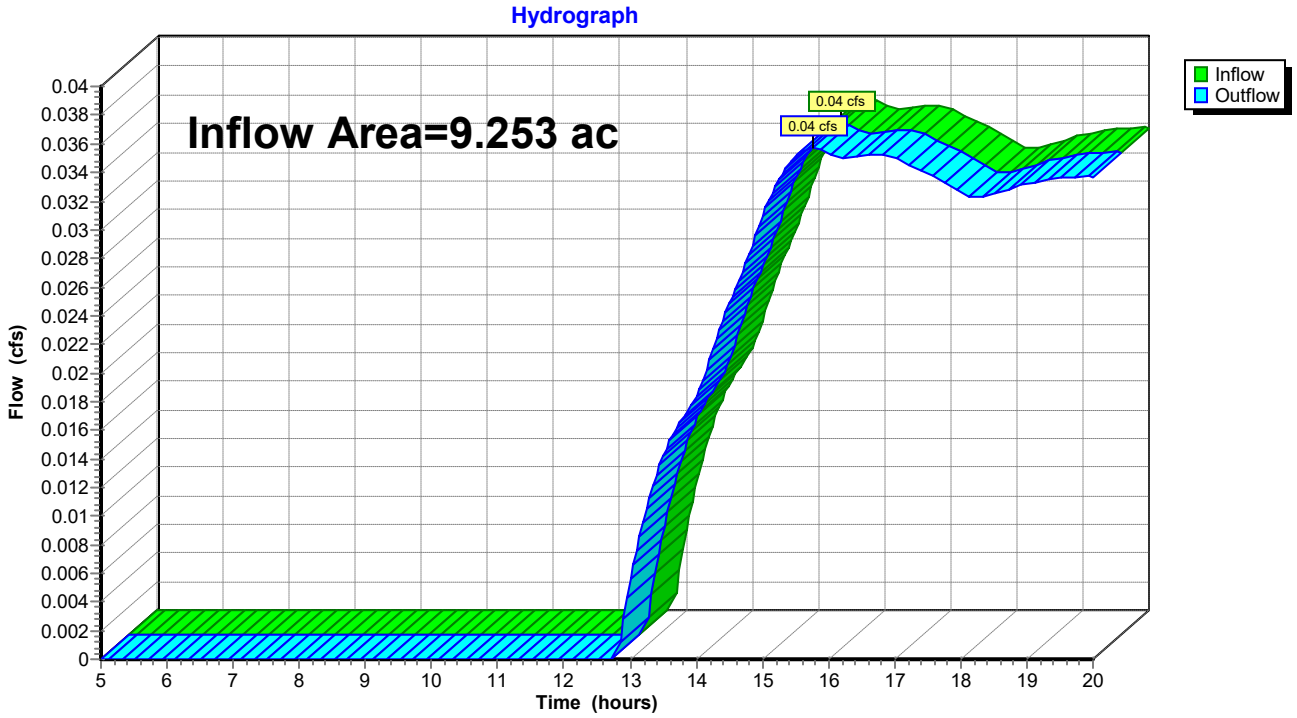
## Summary for Reach Ex-Wet: Exisitng Wetlands to Charles River

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9.253 ac, 0.00% Impervious, Inflow Depth > 0.02" for 10-Year event
Inflow = 0.04 cfs @ 15.77 hrs, Volume= 0.017 af
Outflow = 0.04 cfs @ 15.77 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

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

### Reach Ex-Wet: Exisitng Wetlands to Charles River



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

**Subcatchment Post-A: Area-A** Runoff Area=74,021 sf 0.00% Impervious Runoff Depth>1.12"
Tc=5.0 min CN=37 Runoff=1.71 cfs 0.158 af

**Subcatchment Post-B: Area-B** Runoff Area=101,154 sf 0.00% Impervious Runoff Depth>0.74"
Flow Length=154' Slope=0.0900 '/' Tc=20.9 min CN=33 Runoff=0.84 cfs 0.144 af

**Subcatchment Post-C: Area-C** Runoff Area=151,016 sf 0.00% Impervious Runoff Depth>0.57"
Flow Length=268' Slope=0.0500 '/' Tc=28.2 min CN=31 Runoff=0.75 cfs 0.165 af

**Subcatchment Post-D: Area-D** Runoff Area=76,888 sf 0.00% Impervious Runoff Depth>0.83"
Flow Length=183' Slope=0.1089 '/' Tc=19.6 min CN=34 Runoff=0.77 cfs 0.122 af

**Subcatchment Pre-A: Area-A** Runoff Area=74,021 sf 0.00% Impervious Runoff Depth>1.02"
Tc=5.0 min CN=36 Runoff=1.46 cfs 0.145 af

**Subcatchment Pre-B: Area-B** Runoff Area=101,154 sf 0.00% Impervious Runoff Depth>0.74"
Flow Length=154' Slope=0.0900 '/' Tc=20.9 min CN=33 Runoff=0.84 cfs 0.144 af

**Subcatchment Pre-C: Area-C** Runoff Area=151,016 sf 0.00% Impervious Runoff Depth>0.57"
Flow Length=268' Slope=0.0500 '/' Tc=28.2 min CN=31 Runoff=0.75 cfs 0.165 af

**Subcatchment Pre-D: Area-D** Runoff Area=76,888 sf 0.00% Impervious Runoff Depth>0.83"
Flow Length=183' Slope=0.1089 '/' Tc=19.6 min CN=34 Runoff=0.77 cfs 0.122 af

**Reach Ex--Wet: Existing Wetlands to Charles River** Inflow=2.95 cfs 0.589 af
Outflow=2.95 cfs 0.589 af

**Reach Ex-Wet: Exisitng Wetlands to Charles River** Inflow=2.88 cfs 0.575 af
Outflow=2.88 cfs 0.575 af

**Total Runoff Area = 18.507 ac Runoff Volume = 1.164 af Average Runoff Depth = 0.75"**
**100.00% Pervious = 18.507 ac 0.00% Impervious = 0.000 ac**

## Summary for Subcatchment Post-A: Area-A

[49] Hint: Tc<2dt may require smaller dt

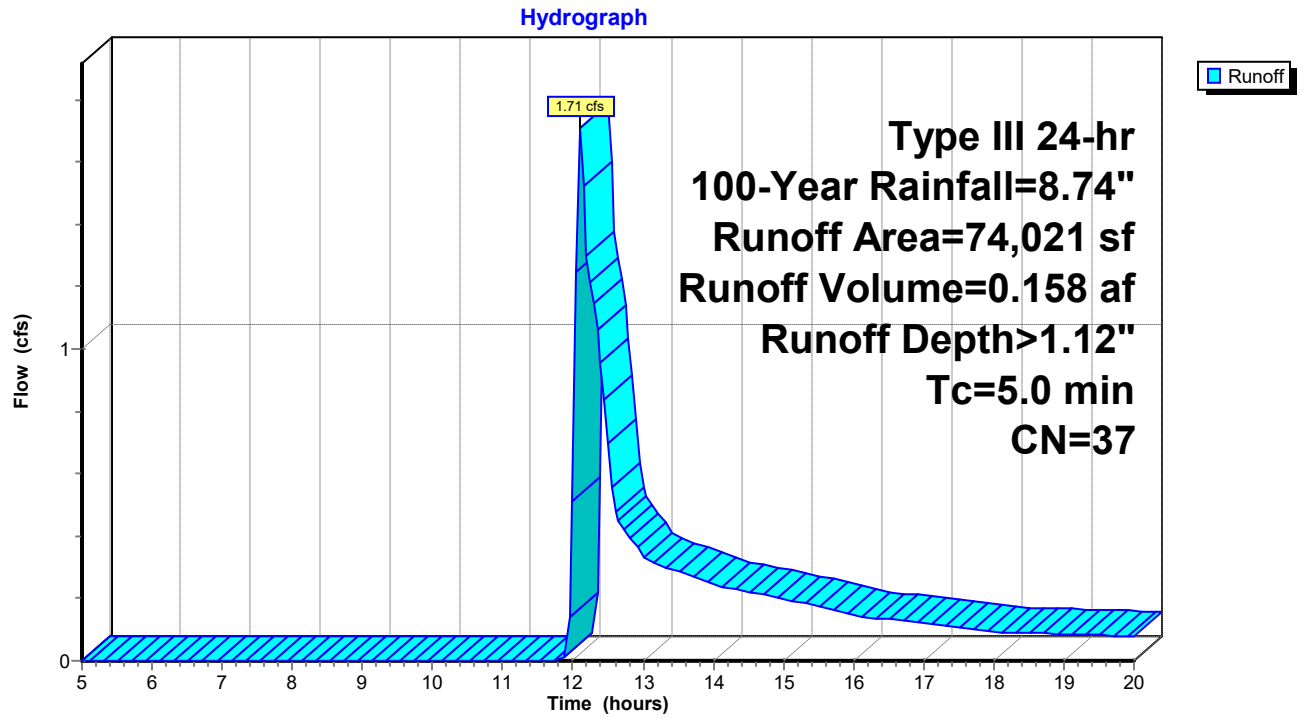
Runoff = 1.71 cfs @ 12.11 hrs, Volume= 0.158 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.74"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 51,261 | 30 | Woods, Good, HSG A |
| | 12,166 | 72 | Dirt roads, HSG A |
| * | 10,594 | 30 | Brush, Good, HSG A |
| | 74,021 | 37 | Weighted Average |
| | 74,021 | | 100.00% Pervious Area |

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

### Subcatchment Post-A: Area-A



## Summary for Subcatchment Post-B: Area-B

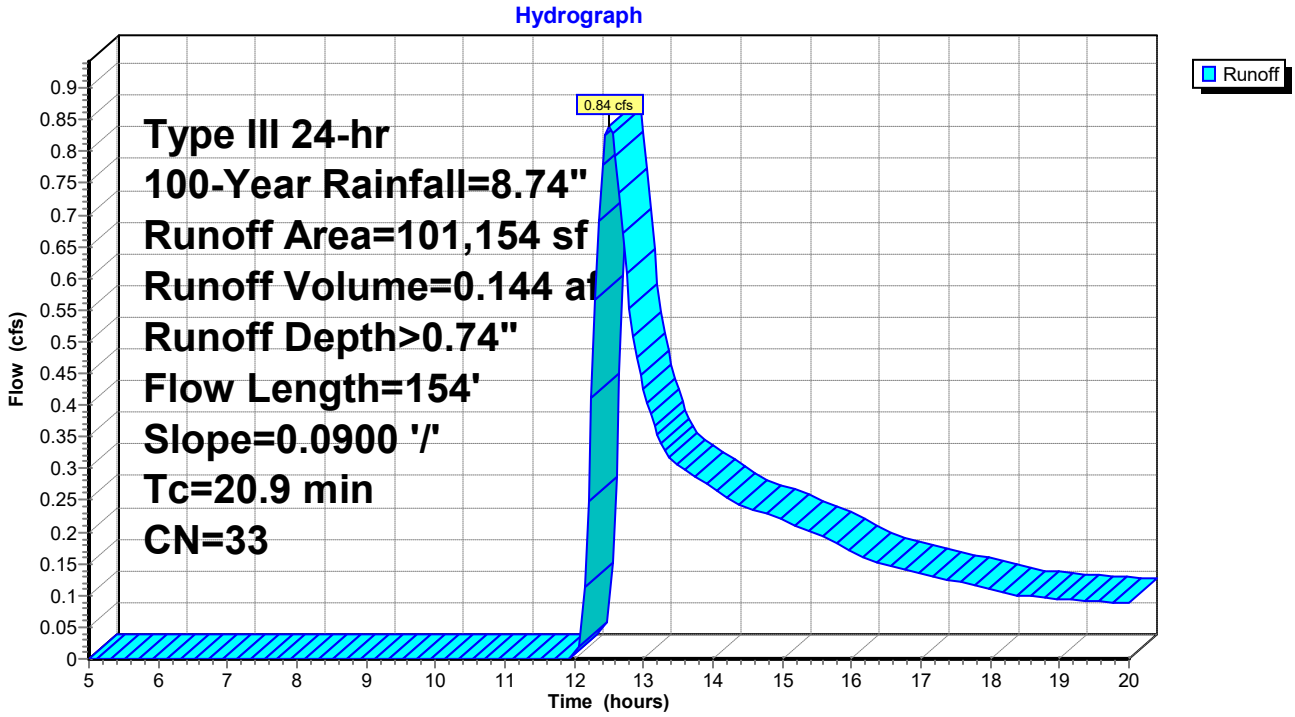
Runoff = 0.84 cfs @ 12.50 hrs, Volume= 0.144 af, Depth> 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.74"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 82,534 | 30 | Woods, Good, HSG A |
| | 8,058 | 72 | Dirt roads, HSG A |
| * | 10,562 | 30 | Brush, Good, HSG A |
| | 101,154 | 33 | Weighted Average |
| | 101,154 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 20.3 | 100 | 0.0900 | 0.08 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 0.6 | 54 | 0.0900 | 1.50 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 20.9 | 154 | Total | | | |

## Subcatchment Post-B: Area-B



## Summary for Subcatchment Post-C: Area-C

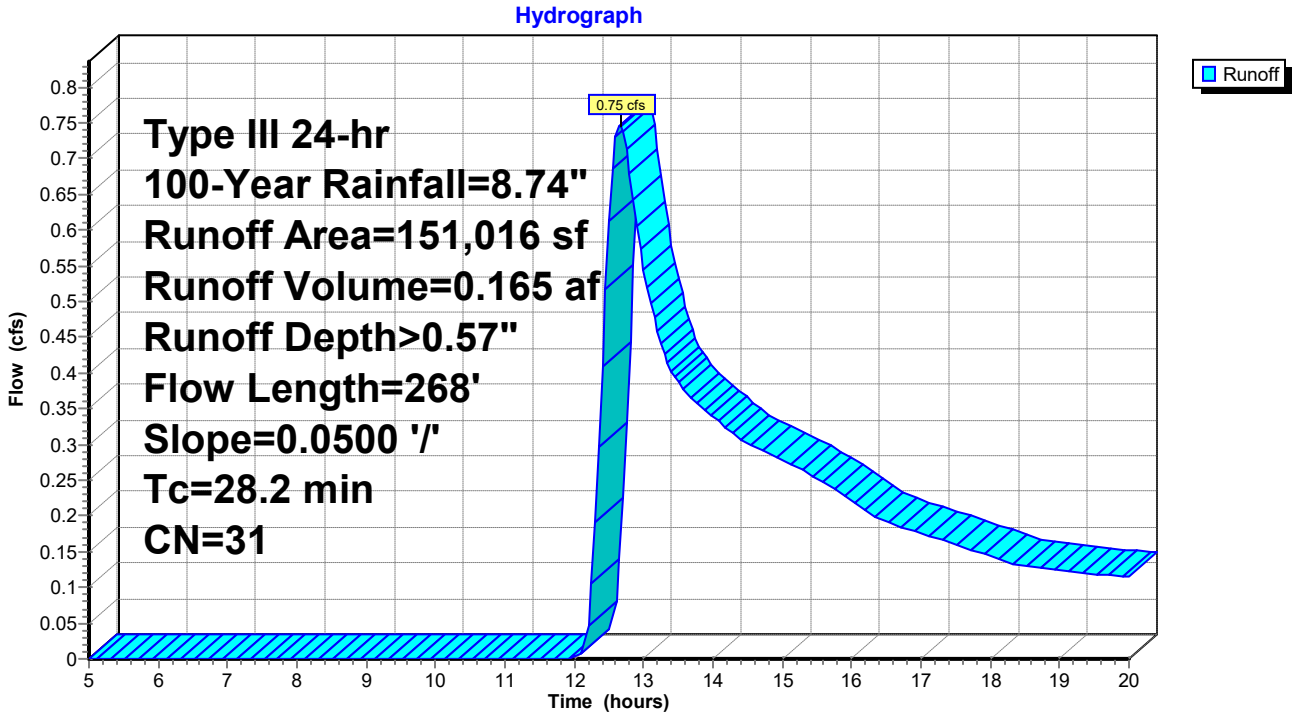
Runoff = 0.75 cfs @ 12.66 hrs, Volume= 0.165 af, Depth> 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.74"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 135,216 | 30 | Woods, Good, HSG A |
| | 5,350 | 72 | Dirt roads, HSG A |
| * | 10,450 | 30 | Brush, Good, HSG A |
| | 151,016 | 31 | Weighted Average |
| | 151,016 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.7 | 100 | 0.0500 | 0.06 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 2.5 | 168 | 0.0500 | 1.12 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 28.2 | 268 | Total | | | |

## Subcatchment Post-C: Area-C



## Summary for Subcatchment Post-D: Area-D

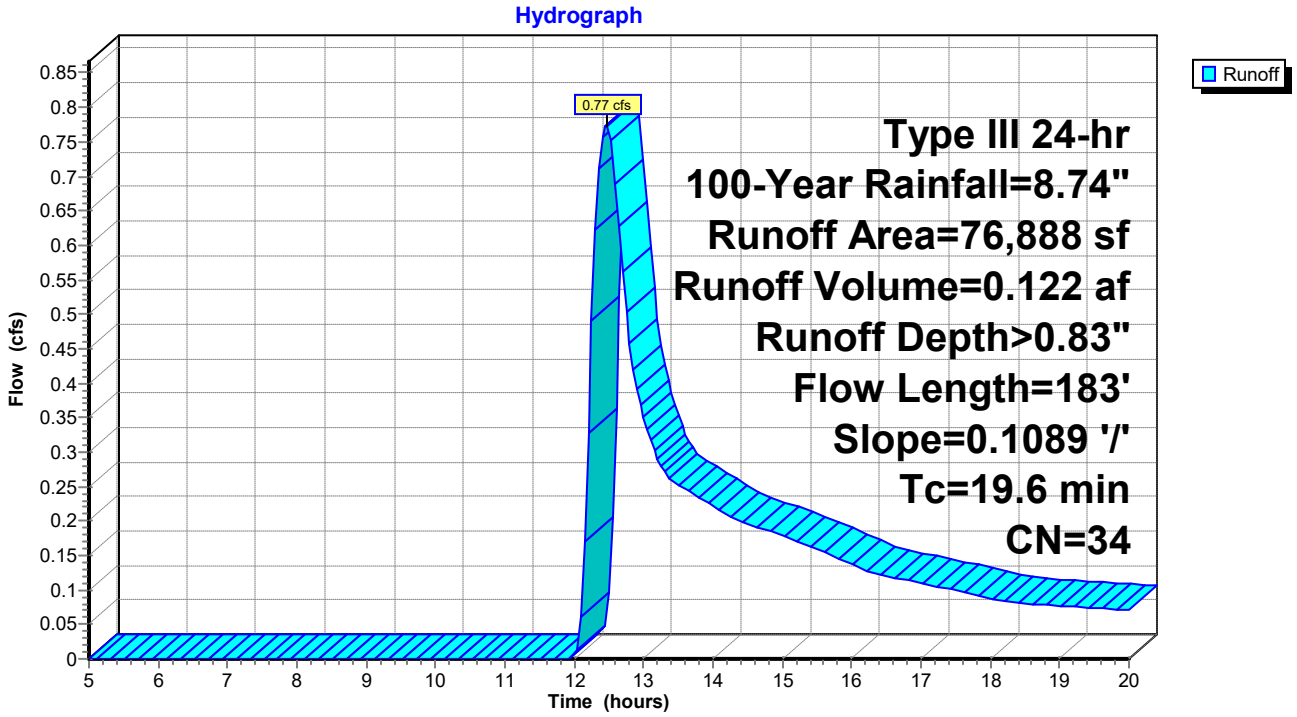
Runoff = 0.77 cfs @ 12.46 hrs, Volume= 0.122 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.74"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 54,288 | 30 | Woods, Good, HSG A |
| | 7,245 | 72 | Dirt roads, HSG A |
| * | 15,355 | 30 | Brush, Good, HSG A |
| | 76,888 | 34 | Weighted Average |
| | 76,888 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.8 | 100 | 0.1089 | 0.09 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 0.8 | 83 | 0.1089 | 1.65 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 19.6 | 183 | Total | | | |

## Subcatchment Post-D: Area-D



## Summary for Subcatchment Pre-A: Area-A

[49] Hint: Tc<2dt may require smaller dt

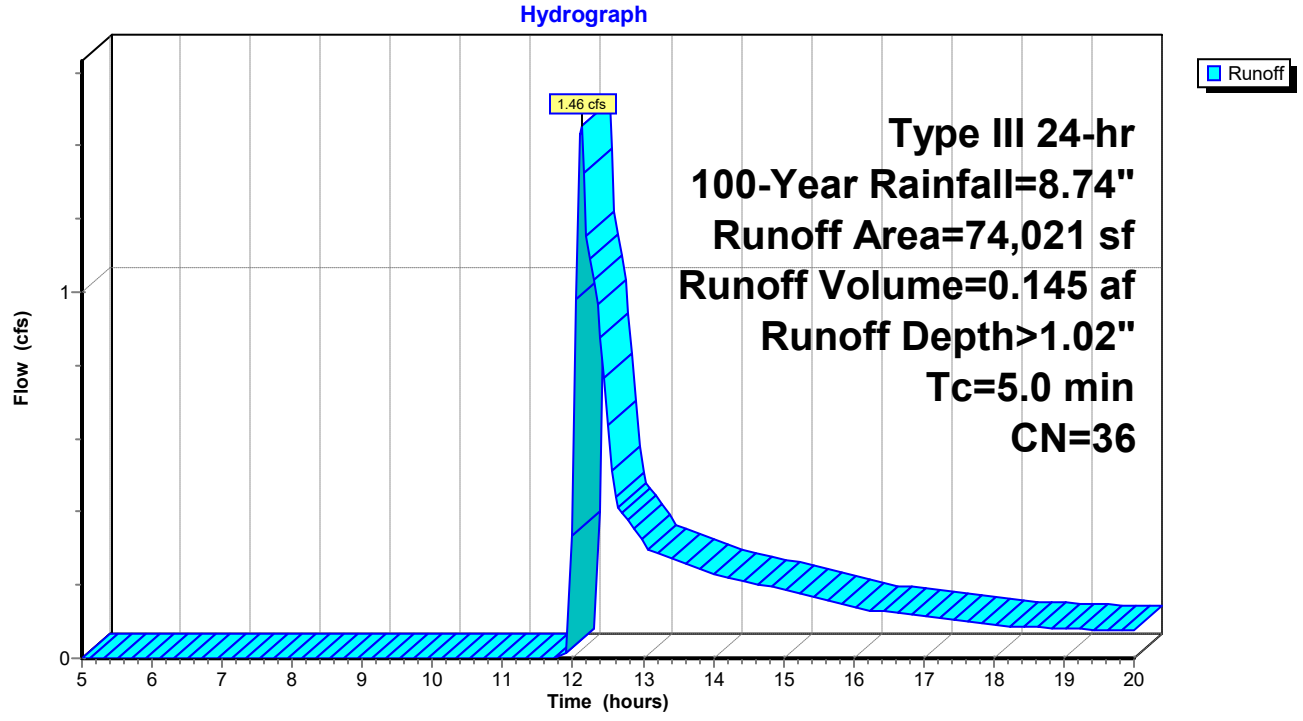
Runoff = 1.46 cfs @ 12.12 hrs, Volume= 0.145 af, Depth> 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.74"

| Area (sf) | CN | Description |
|---|---|---|
| 62,724 | 30 | Woods, Good, HSG A |
| 11,297 | 72 | Dirt roads, HSG A |
| 74,021 | 36 | Weighted Average |
| 74,021 | | 100.00% Pervious Area |

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

### Subcatchment Pre-A: Area-A



## Summary for Subcatchment Pre-B: Area-B

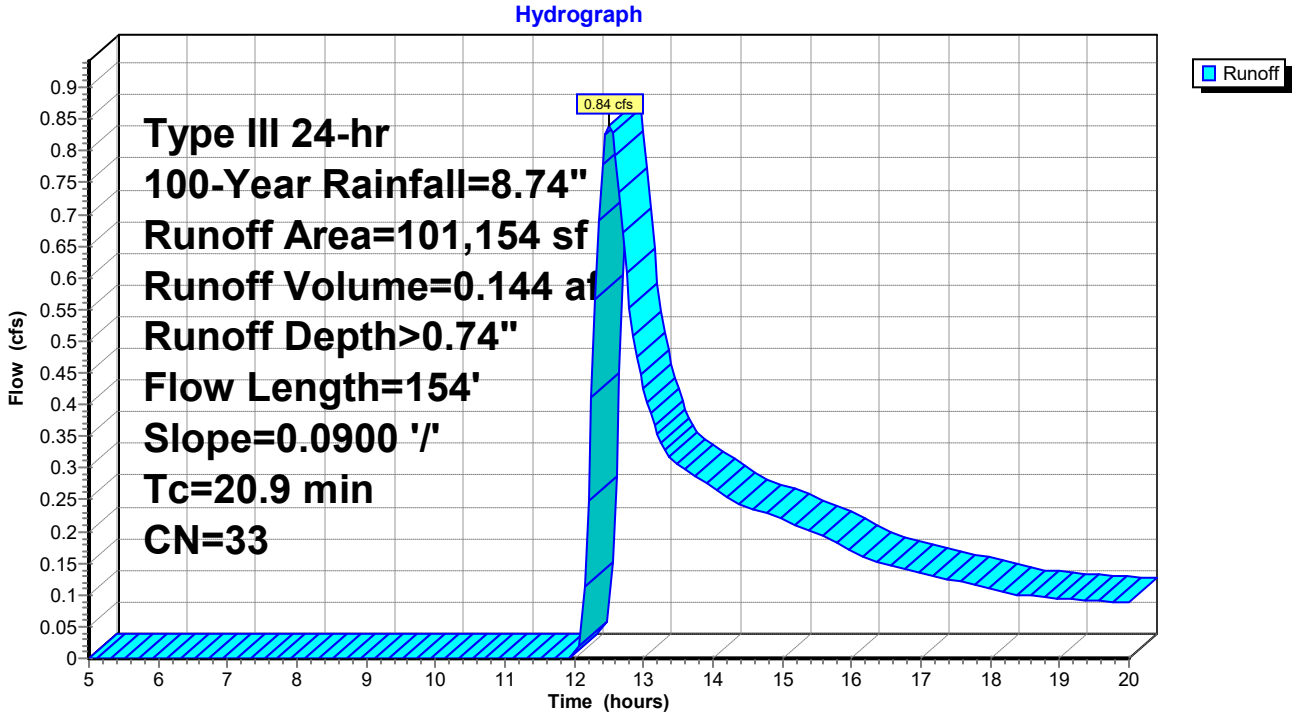
Runoff = 0.84 cfs @ 12.50 hrs, Volume= 0.144 af, Depth> 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.74"

| Area (sf) | CN | Description |
|---|---|---|
| 93,672 | 30 | Woods, Good, HSG A |
| 7,482 | 72 | Dirt roads, HSG A |
| 101,154 | 33 | Weighted Average |
| 101,154 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 20.3 | 100 | 0.0900 | 0.08 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 0.6 | 54 | 0.0900 | 1.50 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 20.9 | 154 | Total | | | |

## Subcatchment Pre-B: Area-B



## Summary for Subcatchment Pre-C: Area-C

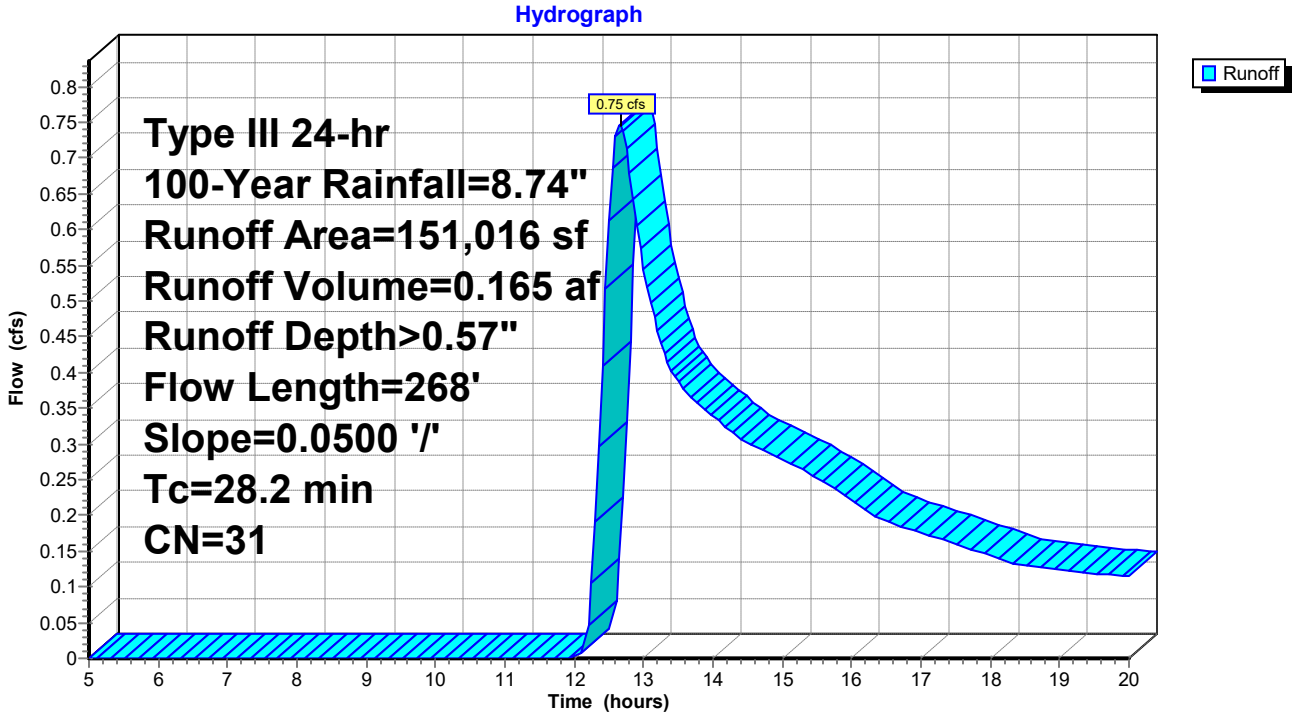
Runoff = 0.75 cfs @ 12.66 hrs, Volume= 0.165 af, Depth> 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.74"

| Area (sf) | CN | Description |
|---|---|---|
| 146,048 | 30 | Woods, Good, HSG A |
| 4,968 | 72 | Dirt roads, HSG A |
| 151,016 | 31 | Weighted Average |
| 151,016 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.7 | 100 | 0.0500 | 0.06 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 2.5 | 168 | 0.0500 | 1.12 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 28.2 | 268 | Total | | | |

## Subcatchment Pre-C: Area-C



## Summary for Subcatchment Pre-D: Area-D

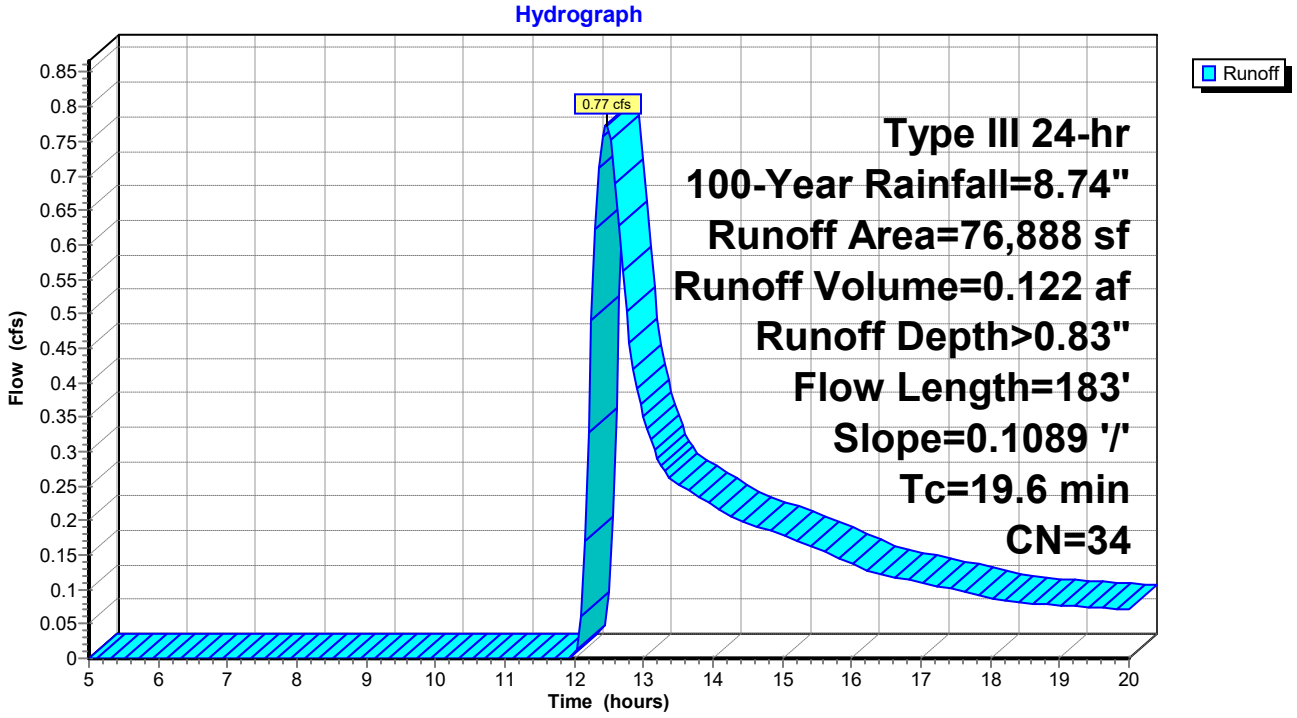
Runoff = 0.77 cfs @ 12.46 hrs, Volume= 0.122 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.74"

| Area (sf) | CN | Description |
|---|---|---|
| 70,161 | 30 | Woods, Good, HSG A |
| 6,727 | 72 | Dirt roads, HSG A |
| 76,888 | 34 | Weighted Average |
| 76,888 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.8 | 100 | 0.1089 | 0.09 | | **Sheet Flow, Overland Flow** Woods: Dense underbrush n= 0.800 P2= 3.26" |
| 0.8 | 83 | 0.1089 | 1.65 | | **Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps |
| 19.6 | 183 | Total | | | |

## Subcatchment Pre-D: Area-D



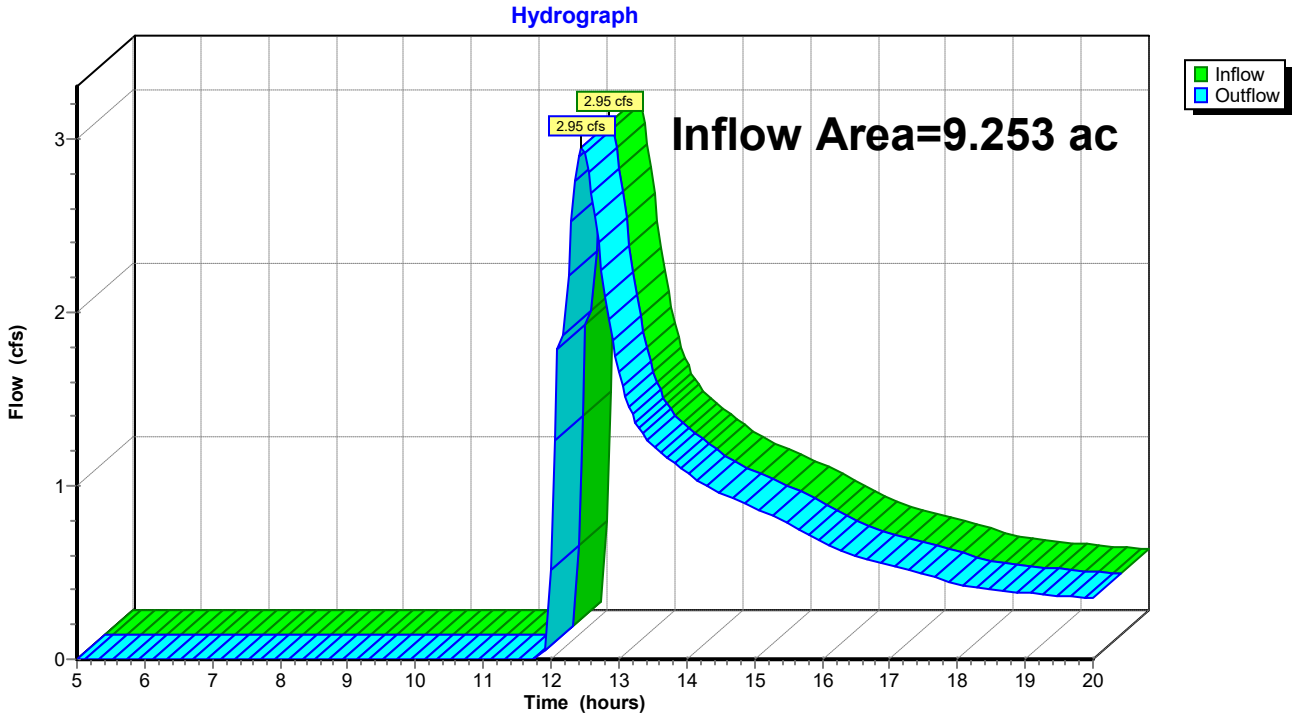
## Summary for Reach Ex--Wet: Existing Wetlands to Charles River

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9.253 ac, 0.00% Impervious, Inflow Depth > 0.76" for 100-Year event
Inflow = 2.95 cfs @ 12.45 hrs, Volume= 0.589 af
Outflow = 2.95 cfs @ 12.45 hrs, Volume= 0.589 af, Atten= 0%, Lag= 0.0 min

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

### Reach Ex--Wet: Existing Wetlands to Charles River



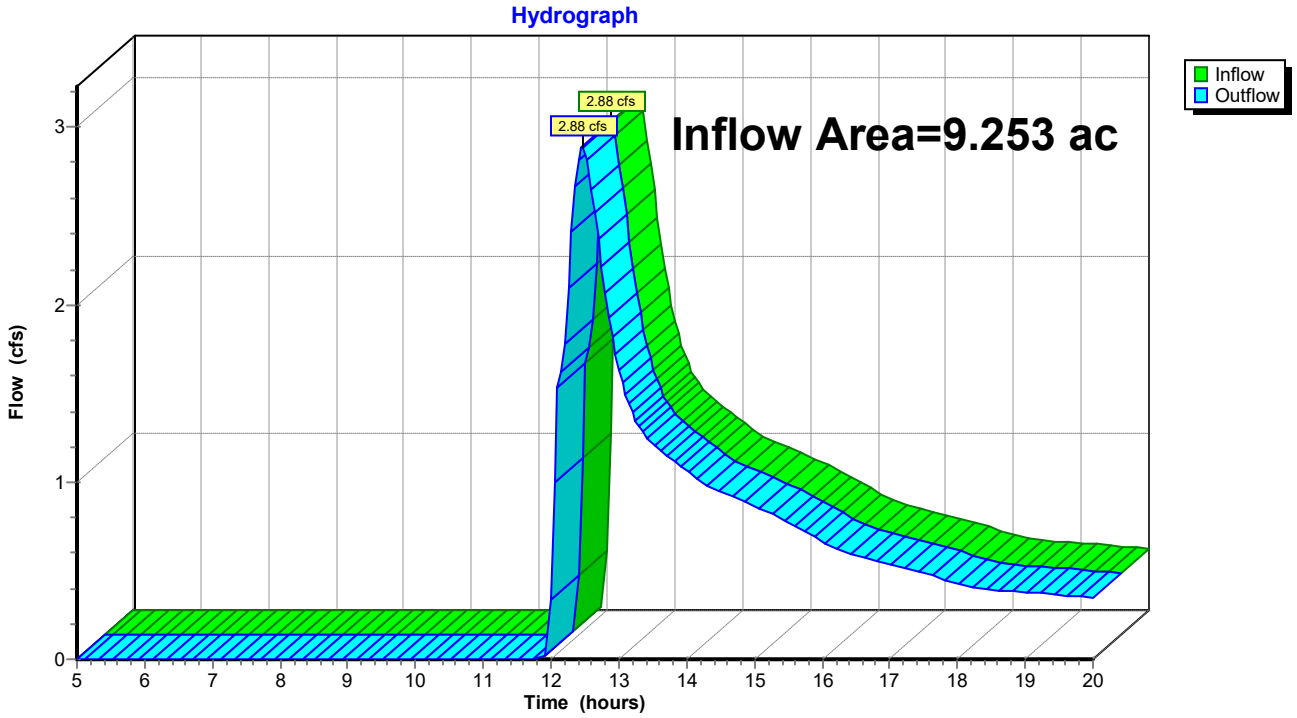
## Summary for Reach Ex-Wet: Exisitng Wetlands to Charles River

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9.253 ac, 0.00% Impervious, Inflow Depth > 0.75" for 100-Year event
Inflow = 2.88 cfs @ 12.46 hrs, Volume= 0.575 af
Outflow = 2.88 cfs @ 12.46 hrs, Volume= 0.575 af, Atten= 0%, Lag= 0.0 min

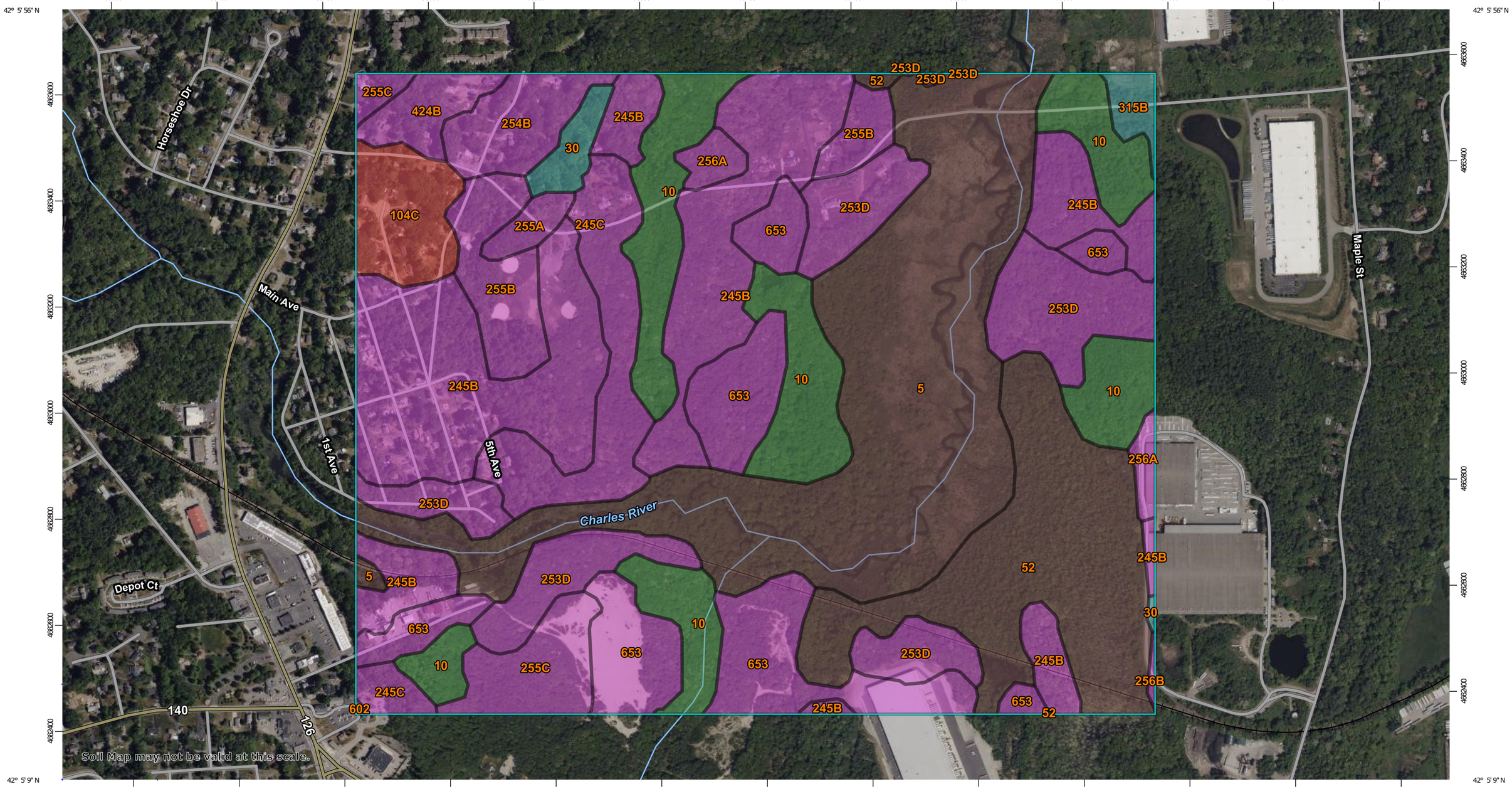
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Reach Ex-Wet: Exisitng Wetlands to Charles River



# Appendix D
# USDA NRCS Web Soil Survey

# Hydrologic Soil Group—Norfolk and Suffolk Counties, Massachusetts




Map Scale: 1:7,070 if printed on B landscape (17" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 300 600 1200 1800

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

## MAP LEGEND

**Area of Interest (AOI)**

- Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**

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

**Soil Rating Lines**

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

**Soil Rating Points**

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

**Water Features**

- Streams and Canals

**Transportation**

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

**Background**

- Aerial Photography

## MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 19, Sep 10, 2023

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

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

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

# Hydrologic Soil Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 5 | Saco silt loam, frequently ponded, 0 to 1 percent slopes, frequently flooded | B/D | 95.9 | 21.2% |
| 10 | Scarboro and Birdsall soils, 0 to 3 percent slopes | A/D | 50.7 | 11.2% |
| 30 | Raynham silt loam, 0 to 3 percent slopes | C | 3.9 | 0.9% |
| 52 | Freetown muck, 0 to 1 percent slopes | B/D | 47.6 | 10.5% |
| 104C | Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes | D | 11.4 | 2.5% |
| 245B | Hinckley loamy sand, 3 to 8 percent slopes | A | 83.6 | 18.4% |
| 245C | Hinckley loamy sand, 8 to 15 percent slopes | A | 22.2 | 4.9% |
| 253D | Hinckley loamy sand, 15 to 35 percent slopes | A | 41.2 | 9.1% |
| 254B | Merrimac fine sandy loam, 3 to 8 percent slopes | A | 9.6 | 2.1% |
| 255A | Windsor loamy sand, 0 to 3 percent slopes | A | 2.8 | 0.6% |
| 255B | Windsor loamy sand, 3 to 8 percent slopes | A | 15.2 | 3.4% |
| 255C | Windsor loamy sand, 8 to 15 percent slopes | A | 11.8 | 2.6% |
| 256A | Deerfield loamy fine sand, 0 to 3 percent slopes | A | 4.3 | 0.9% |
| 256B | Deerfield loamy fine sand, 3 to 8 percent slopes | A | 0.4 | 0.1% |
| 315B | Scituate fine sandy loam, 3 to 8 percent slopes | C | 2.7 | 0.6% |
| 424B | Canton fine sandy loam, 3 to 8 percent slopes, extremely bouldery | A | 5.9 | 1.3% |
| 602 | Urban land, 0 to 15 percent slopes | | 0.1 | 0.0% |
| 653 | Udorthents, sandy | A | 43.8 | 9.7% |
| **Totals for Area of Interest** | | | **453.0** | **100.0%** |

## Description

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

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

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

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

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

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

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

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

WRIGHT-PIERCE
Engineering a Better Environment

78 Blanchard Road, Suite 404
Burlington, MA 01803
978.416.8000 | wright-pierce.com