STORMWATER DESIGN NARRATIVE

PREPARED JANUARY 29, 2021
REVISED MARCH 29, 2021

APPLICANT:
NORTH VILLAGE LOFTS, LLC

PROJECT:
JEFFERSON MILL REDEVELOPMENT
1665 MAIN STREET, HOLDEN, MA

PREPARED BY:
PVI SITE DESIGN, LLC
18 GLENDALE ROAD, NORWOOD, MA 02062

COMMONWEALTH OF MASSACHUSETTS
TIMOTHY J. POWER
CIVIL
No. 46906
REGISTERED PROFESSIONAL ENGINEER

PVI SITE DESIGN

SECTION 1 – PROJECT OVERVIEW

1.1 INTRODUCTION

The applicant, North Village Lofts, LLC, is proposing to redevelop an existing developed parcel located at Main Street, Holden, MA. The project entails renovation of two existing mill structures, known as the Jefferson Mill Complex, into 47 market rate rental units,

The project will result in a deminimis increase in impervious area of 1,004 square feet. Because the change is so small by comparison to the total watershed study area, calculations are unable to demonstrate a change in runoff quantities. For this reason, the project will be considered a redevelopment as it relates to the Stormwater Management Standards and meet all standards to the Maximum Extent Practicable.

The system will employ various Best Management Practices (BMP's) in order to meet the applicable standards. Descriptions of each BMP and sizing calculations are included in this report.

1.2 LOCATION, TOPOGRAPHY, AND SOILS

LOCATION:

The project site is located at 1665 Main Street Holden, MA. The two structures sit on the south side of main street and straddle the Asnebumskit Brook. The Eagle Lake Dam is located along the southern boundary of the site. Village Way which leads to an existing Townhome community borders the property to the east. See Figure 1, USGS Map of the area.

FIGURE 1 – USGS MAP

TOPOGRAPHY

The topography within the site vary with plateaus and ramped areas constructed as part of the original mill construction. Elevations range from 764 down to 785.

SOILS

The underlying soils have been obtained from the Natural Resources Conservation Service as made available by the Web Soil Survey website and vary across the site. The soil types are as follows:

TABLE 1.1 – NRCS SOIL TYPES

NRCS MAP UNIT	MAP UNIT NAME	HYDROLOGIC SOIL GROUP
254B	Merrimac Fine Sandy Loam	A
311 B	Woodbridge Fine Sandy Loam	C/D
421C / 422C	Canton Fine Sandy Loam	B
651	Udorthents, Smoothed	-

Soils delineations have been included on the watershed maps as appropriate to calculate runoff values. For the purposes of runoff calculations, the Udorthents soils have been assumed to be Hydrologic Soil Group B due to their proximity to similar soil groups. A copy of the Web Soil Survey report is enclosed with this report.

1.3 WATERSHED DESCRIPTIONS

The project can divided into two subcatchment areas for the purpose of this stormwater analysis. Both subcatchments eventually discharge to the river, denoted as Design Point DP-1. Below is a discussion of the subcatchments. Refer to watershed plans WS-1 and WS-2 in the appendix for Existing and Proposed Watershed Plans respectively. Watershed plans provide information on total area, Curve Numbers, and Time of Concentration for each watershed.

1.3.1 EXISTING CONDITIONS

WATERSHED EX-1

This area encompasses majority of the project area including both buildings. This area drains overland or through an existing drainage pipe network to the river directly. Land cover includes pavement, concrete pads, and landscaped areas. There are no known treatment BMP's on the existing system.

WATERSHED EX-2

Watershed EX-2 includes a small existing paved area along the property boundary to the east, directly adjacent to Main St, and a small swath of landscaped areas between an existing building and main street. This area flows overland into the Main Street drainage system, and discharges to the river on the north side of Main Street.

1.3.2 PROPOSED CONDITIONS

In the proposed conditions, the watershed and drainage patterns will remain as in existing conditions. There will be a small increase in impervious area totaling 445 square feet for the project. Due to the size of the watershed, this small change in cover type does not impact the overall curve number of the watershed, and therefore results in no change to runoff quantities.

Watershed PR-2 will result in a net decrease in impervious area and therefore reduce stormwater runoff into Main Street from the property.

As summary of existing and proposed runoff flows and volumes are presented in Table 2.1 of this report, which will demonstrate no changes to the runoff quantities for DP-1. Additional detail regarding cover types and routing methods are included in the HydroCAD calculations found in the appendix of this report.

1.4 METHODOLOGY

The peak rate of runoff and sizing of retention BMP's was determined using techniques and data found in the following:

1. Urban Hydrology for Small Watersheds – Technical Release 55 by the United States Department of Agriculture Soils Conservation Service, June 1986. Runoff curve numbers and 24-hour precipitation values were obtained from this reference.
2. HydroCAD© Stormwater Modeling System by HydroCAD Software Solutions LLC, version 10.0. The HydroCAD program was used to generate the runoff hydrographs for the watershed areas, to determine discharge/stage/storage characteristics for the infiltration systems, to perform drainage routing and to combine the results of the runoff hydrographs. This software is based on the Soil Conservation Service (SCS) TR-20 program

SECTION 2 – STORMWATER MANAGEMENT STANDARDS

The following is a review of the project and how each of the 10 SWM Standards are met. As previously noted, the project is considered a Redevelopemt project and will only need to comply with standards 2,3,4,5, and 6 to the Maximum extent practicable. All other standards must be met to the full extent. Various supporting calculations are provided in the appendix when necessary.

2.1 STANDARD 1 – NO NEW UNTREATED DISCHARGES CAUSING EROSION

The proposed project does not create a new discharge to any "Waters of the Commonwealth". Therefore the standard is met.

2.2 STANDARD 2 - PEAK RATE ATTENUATION

Calculations are provided in the appendix to show that the proposed development will not cause an increase in peak discharge rates. Refer to the HydroCAD calculations provided within this report for detailed breakdowns of each watershed. As summary of peak flows and volumes for each watershed area is provided below.

TABLE 2.1 – RUNOFF FLOW (CFS) COMPARISON

Design Point		**2-YEAR**	**10-YEAR**	**100-YEAR**
Flow (CFS)	*Existing*	*4.46*	*8.33*	*17.78*
	Proposed	**4.43**	**8.30**	**17.75**
Volume (CF)	*Existing*	*13,373*	*25,559*	*57,040*
	Proposed	**13,292**	**25,450**	**56,904**

2.3 STANDARD 3 - ANNUAL RECHARGE TO GROUNDWATER

As a redevelopment, the project is only required to meet Standard 3 to the Maximum Extent Practicable. Because limited drainage improvements are proposed, limited access to landscaped areas and proximity to the river and related dam infrastructure, constructing a new recharge facility is not feasible.

The project will utilize porous pavers within the landscaped area between the buildings for walkways to maintain natural infiltration and minimize new impervious areas.

With a total increase of impervious area of 445 SF, the required recharge volume would be:

1,004 SF x 0.6 / 12 = 50 Cubic Feet.

(For a conservative estimate, the calculation has been simplified by using the Require Recharge factor for Hydrologic Soil Group A only.

The use of Porous Pavers provides an opportunity for groundwater recharge in the stone base material below the pavers. The typical detail calls for 6" of crushed stone. The total area of porous pavers proposed is approximately 2,200 SF. Therefore the volume of recharge provided can be calculated as:

2,220 SF x 6" / 12 x 0.40 void ratio = 440 Cubic Feet

440 > 50 therefore the standard is met for the new impervious area on the project.

2.4 STANDARD 4 - WATER QUALITY

TSS Removal

New stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). As a redevelopment, there is limited opportunity to retrofit with water quality BMPs. The project will, however, install an in-line proprietary sediment separator. This will provide treatment to the existing drainage system where none currently exists, improving the existing conditions. Refer to the proposed site plans for locations of Water Quality Units and sizing requirements.

Water Quality Flow for Proprietary Separators

The project falls with a Zone II of a public water supply, and therefore requires treatment of 1" of runoff for any new treatment devices. A 1-inch storm was modeled for the tributary area to a water quality structure to determine a Water Quality Flow. This provided a peak flow that which the structure must be able to provide treatment for. Required Water Quality Flow has been listed on the proposed drawings.

2.5 STANDARD 5 - LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS (LUHPPL)

The proposed use on the project is not considered a LUHPPL, and therefore the standard does not apply.

2.6 STANDARD 6 - CRITICAL AREAS

The project falls within the Zone II of a public water supply and therefore considered a Critical Area. In addition, the property falls within a Public Water Supply Watershed, which is noted as an Outstanding Resource Water (ORW) on the MassGIS system.

The following is a list of criteria to meet for discharges in Critical Areas, and how each is met, to comply with this standard:

- *Provide a Long Term Pollution Prevention Plan*

  The Operation and Maintenance Plan described in Section 3.0 includes a section to address long term pollution prevention.

- *Use Suitable BMP's for a Zone II area.*

  The Handbook lists the BMP's proposed in Volume 1, Chapter 1, Table CA 3, which includes Proprietary Sediment Separators making it an appropriate BMP for the project.

- *Use One-Inch rule in determining water quality requirements.*

  As noted in Section 2.4 of this report, the One-Inch rule was utilized for all water quality calculations.

- *44% of TSS removal prior to infiltration BMP's.*

  No Recharge systems are proposed for this project, therefore this standard does not apply.

2.7 STANDARD 7 - REDEVELOPMENT

As previously noted, the project can be considered a redevelopment project.

2.8 STANDARD 8 - CONSTRUCTION PERIOD CONTROLS

A Site Preparation Plan is included in the site plans to provide general guidance to the contractor for best practices in erosion controls on the site. The plans call for perimeter sediment controls, and other best practices to prevent erosion and sedimentation.

2.9 STANDARD 9 – LONG TERM OPERATION AND MAINTENANCE PLAN

An Operation and Maintenance Plan is included in Section 3 of this report. Literature for the Water Quality Unit from the preferred manufacturers is included in this document.

2.10 STANDARD 10 – ILLICIT DISCHARGES

Due to the nature of this project, we recommend submission of a final Illicit Discharge Statement prior to the completion of the project. Since being engaged for this project, PVI has performed multiple site visits, and limited inspections the existing sewer main along Village Drive. Due to the quantity of existing pipe systems associated with the former mill operations, it is not yet clear if any illicit discharges still exist. The construction of the units will allow for more invasive investigations during the limited demolition phase. Although it is the intent to construct new domestic sewer lines within the buildings and new sewer connections to sewer in Village Way, we recommend on-going investigations during construction of the residential units to identify and remove any illicit connections upon discovery.

SECTION 3 – OPERATION & MAINTENANCE PLAN

In accordance with the standards set forth by the Stormwater Management Regulations issued by the Department of Environmental Protection (DEP), PVI Site Design, LLC (PVI) has prepared the following Operation and Maintenance (O&M) plan for the proposed stormwater management system for the residential complex within the renovated Jefferson Mill Complex. This O&M plan addresses post construction pollution prevention and maintenance of stormwater systems.

This plan is broken into two major sections. The first section describes pollution prevention techniques to encourage source controls that prevent pollution. The second section is devoted to a post-development operation and maintenance plan of the stormwater management system. Reference is made to the drawing "Grading and Drainage Plan, Sheet C102" prepared by PVI as last revised, that details the proposed drainage system and its components.

BASIC INFORMATION

Proponent: North Village Lofts, LLC

Civil Engineer: PVI Site Design, LLC. 18 Glendale Road, Norwood, MA (339) 206-1030

3.1 LONG TERM POLLUTION PREVENTION PLAN

As a residential development, there are several potential sources of pollution including gasoline and oil from visiting vehicles, cleaning chemicals, and supplies landscape maintenance and general maintenance of the building. Other than leaks from vehicles, it is anticipated that these materials will be stored and maintained inside the building, however the following pollution prevention techniques are provided in the event that there is a spill outside the facility that may enter the stormwater management system.

The following measures will be employed to control potential sources of contamination and prevent pollution at The Project property:

Deicing

To prevent increased pollutant concentrations in stormwater discharges, the amount of road salt applied will be controlled. Calibration devices for spreaders in trucks will be encouraged to contractors employed to plow the parking areas. The amount of deicing materials used will be monitored with the goal of using only enough to make the roadway and parking areas safe. Limiting salt not only benefits the stormwater management system, but also saves on cost of snow and ice removal.

Snow Storage/Disposal

Snow storage/disposal will be allowed in landscaped islands within the property. In large storm events, temporary stockpiles may be generated for off-site disposal following a storm. As a residential use, each space will need to remain open, therefore off-site disposal will be required.

Pavement Sweeping

The project will implement a pavement sweeping program to remove contaminants directly from paved surfaces to prevent their release into the drainage system. Pavement sweeping can be an effective initial treatment for reducing pollutant loadings in stormwater. Once removed

from paved surfaces, the sweeping will be handled and disposed of in accordance with the MassDEP's Bureau of Waste Prevention's written policy regarding the reuse and disposal of street sweepings.

Fertilizer/Pesticide/Herbicide Application

No pesticides or herbicides are to be used unless a single spot treatment is required for a specific control application. Fertilizer usage will be avoided. If deemed necessary, slow release fertilizer will be used, and applied only in the minimum amounts recommended by the manufacturer. Once applied, the fertilizer will be worked into the soil to limit exposure to stormwater. Storage will be in a covered area; and the contents of any partially used bags will be transferred to a sealable, plastic bin to avoid spills. Fertilizer will be used to begin the establishment of vegetation in bare or damaged areas, but will not be applied on a regular basis unless necessary.

Materials Management/ Good Housekeeping Practices

The following product-specific practices will be followed on-site. Recommendations are provided for petroleum products, fertilizers, solvents, paints, and other hazardous substances, and concrete.

Petroleum Products - No vehicle maintenance or handling of petroleum products will occur on site outside of a building. Petroleum products will be stored in tightly sealed containers that are clearly labeled. Any asphalt substances used on-site will be applied according to manufacturer's recommendations. No petroleum-based or asphalt substances will be stored within 100 feet of a waterway.

Fertilizers – Fertilize should be limited to the minimum amount needed to establish good growth. Only enough fertilizer should be stored on-site for upcoming applications. Any remaining product should be disposed of properly, or kept in sealed containers in a dry area for future use. Weed control should only be applied as spot treatment. It is recommended to remove weeds to the root by hand before chemical control is utilized.

Solvents, Paints, and other Hazardous Substances - All containers will be tightly sealed and stored indoors when not required for use. Excess materials will not be discharged to the storm sewer system, but will be properly disposed according to manufacturer's instructions or state and local regulations. Outside storage on the property will be prohibited.

Spill Prevention and Control

The Property Manager will be responsible for training of people in the proper handling and cleanup of spilled materials. No spilled hazardous materials or hazardous wastes will be allowed to come in contact with storm water discharges. If such contact occurs, the storm water discharge will be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated storm water. An "In Case of Emergency or Hazardous Spill" sign with appropriate contract information can be posted in the common area of the residential building.

In order to minimize the potential for a spill of hazardous materials to come into contact with storm water, the following steps will be implemented:

1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.

2. The minimum practical quantity of all such materials will be kept on the site.
3. A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc. will be provided at the maintenance and/or storage area of the site.
4. Manufacturers recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

In the event of a spill, the following procedures should be followed:

1. All spills will be cleaned up immediately after discovery.
2. The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with the hazardous substances.
3. The Owner and Property Manager will be notified immediately.
4. Spills of toxic or hazardous materials will be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill.
5. If the spilt material enters the drainage system, the catch basin or other structure acting as the inlet shall be cleaned via a vac truck as soon as possible and before the next rainfall event to the extent practicable.

The Property Manager will be the spill prevention and response coordinator. He will designate the individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel will be posted in the material storage area and other applicable areas onsite.

Illicit Discharges

The redevelopment of the property included an evaluation of all systems connected to the stormwater drainage systems. The stormwater management system is the system for conveying, treating, and infiltrating stormwater on-site, including stormwater best management practices and any pipes intended to transport stormwater to the groundwater, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents.

3.2 STORMWATER MANAGEMENT SYSTEM – OPERATION AND MAINTENANCE

Paved Areas – Paved areas should be swept as part of the routine site maintenance. Pavement sweeping is an excellent source control for sedimentation to the existing drainage system and should be performed on a quarterly basis (four times a year) on or around the following times:

- April 1 – The end of snow season to capture sediment from winter sanding
- June 15 – General cleanup for Summer Months
- September 1 – General cleanup subsequent to active summer months.
- December 1 – Remove leaf litter and typical Autumn season debris.

1. Deicing - Salt for de-icing on the paved areas during the winter months shall be limited to the minimum amount practicable. Sand containing the minimum amount of sodium chloride (or approved equivalent) needed for handling may be applied as part of the routine winter maintenance activities.

2. Snow Removal – Snow may be stored in landscape areas at the edges of parking areas. Damaged landscape and plants will need to be restored in the spring. If snow storage areas are not adequate for larger storms, snow piles will need to be removed from the site to prevent a loss of parking spaces.

3. Building Drains – Building drains are equipped with cleanouts within the building in accordance with plumbing codes. Exterior gutters and downspouts should be inspected in the fall and cleaned of any leaf or other debris. Downspout connections to underground pipes should be removed and inspected for debris. Any blockages should be cleared.

4. Catch Basins – Catch Basins shall be inspected quarterly during the first year to determine sediment collection. Sumps shall be cleaned annually at a minimum, and when sediment and debris are within 2-feet of the outlet pipe. Catch Basins should be inspected four times per year when the parking lot is swept.

5. Proprietary Sediment Separators – Water Quality Units are CDS Inline treatment units as provided by Contech. The Unit is model 2020. Maintenance of the structures should be per manufacturer's recommendations. At a minimum, the unit should be inspected at the completion of construction to remove any construction sediment and/or debris, and then six (6) months after initial operation to determine rate of sediment capture. The unit should be cleaned every 3 years and more frequently as needed.

6. All sediments removed from the infiltration systems and catch basin sumps shall be disposed of properly, and in accordance with applicable local and state regulations.

7. All vegetated areas on the site shall be stabilized and maintained to control erosion. Any disturbed areas shall be re-seeded as soon as practicable. Trash and debris should be removed on a regular basis.

8. Work within any drainage structures shall performed in accordance with the latest OSHA regulations, and only by individuals with appropriate OSHA certification. Maintenance Responsibilities - All post-construction maintenance activities shall be documented and kept on file for up to 3 years and made available to the proper town authorities upon request.

For questions regarding proper maintenance, it is recommended to contact the Civil Engineer of Record:

PVI Site Design, LLC
Attn: Timothy Power, PE
18 Glendale Road
Norwood, MA 02062
(339) 206 1030

APPENDIX A

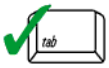
MA DEP Stormwater Management Checklist

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

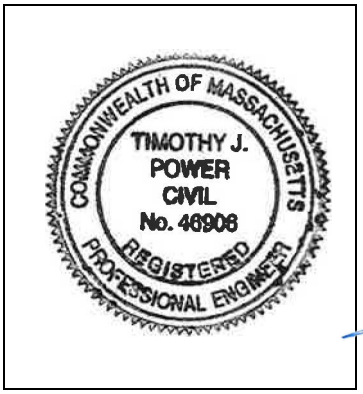
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



01-26-2021

Signature and Date

Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

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.

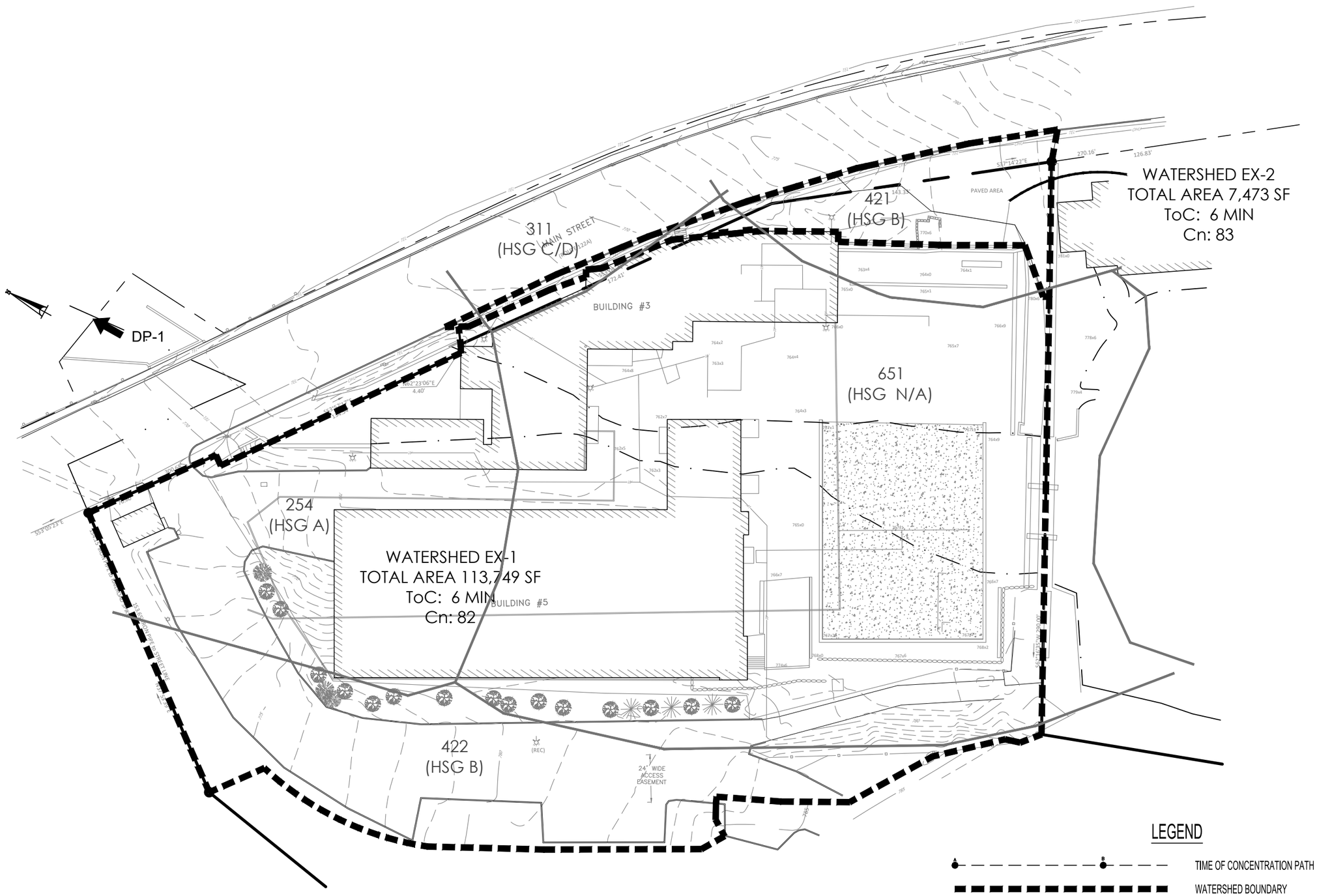
Standard 10: Prohibition of Illicit Discharges

☒ 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
Watershed Plans



CIVIL ENGINEER:

PVI SITE DESIGN

PVI Site Design, LLC
Civil Engineering - Land Entitlements
Master Planning - Project Management
339-206-1030

PROJECT:

JEFFERSON MILL REDEVLOPMENT
1665 MAIN STREET, HOLDEN, MA

OWNER::

NORTH VILLAGE LOFTS, LLC

TITLE:

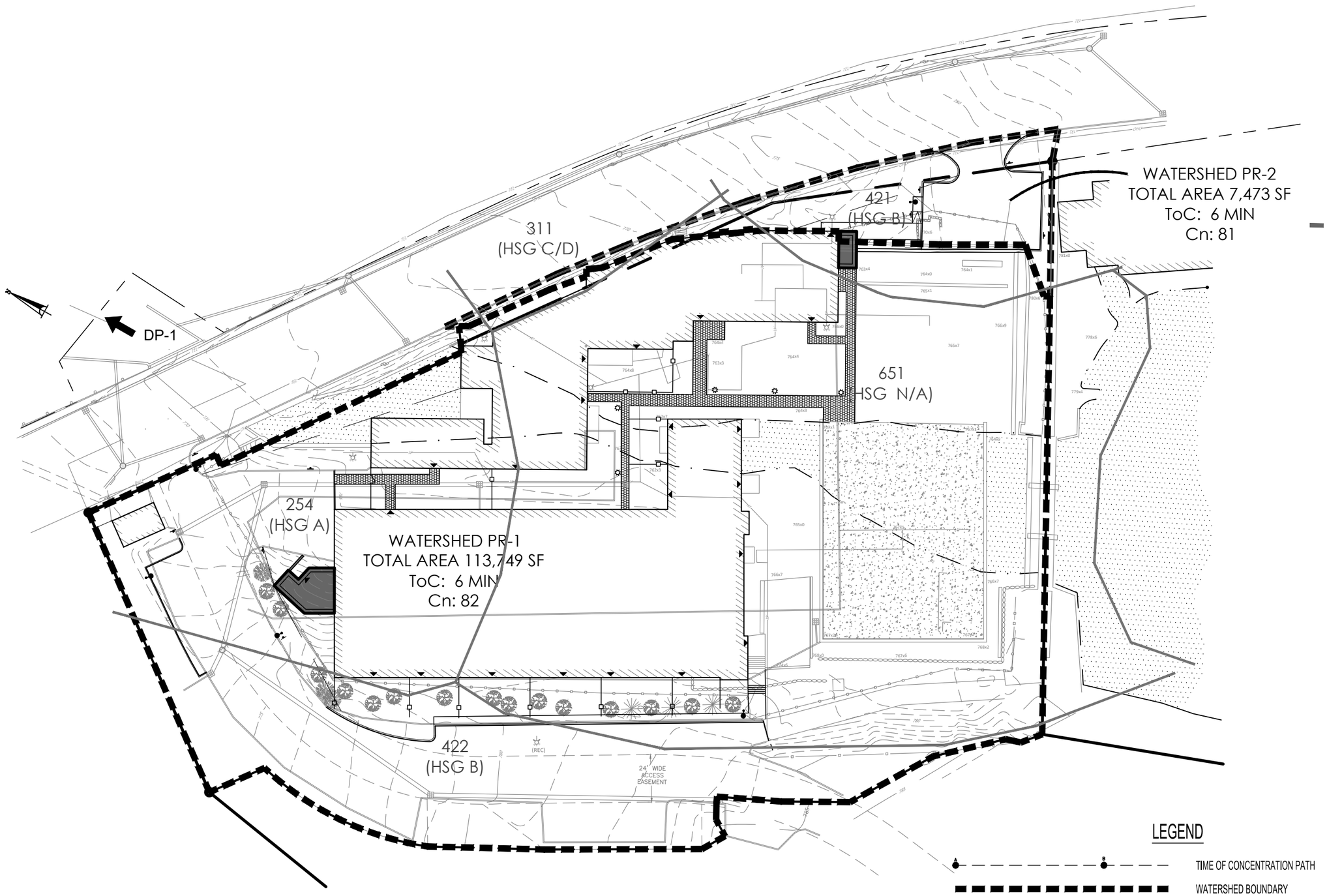
EXISTING WATERSHED PLAN

ISSUED:	01-26-2021
REV:	03-25-2021
REV:	
REV:	
REV:	
REV:	

SCALE:	1"=50'
PROJECT:	21-001
FILE:	21-001-WSP
DRAWN:	TJP
CHECKED:	TJP

SHEET NO:

WS-1



CIVIL ENGINEER:

PVI SITE DESIGN
PVI Site Design, LLC
Civil Engineering - Land Entitlements
Master Planning - Project Management
339-206-1030

PROJECT:

JEFFERSON MILL REDEVLOPMENT
1665 MAIN STREET, HOLDEN, MA

OWNER::

NORTH VILLAGE LOFTS, LLC

TITLE:

PROPOSED
WATERSHED PLAN

ISSUED:	01-26-2021
REV:	03-25-2021
REV:	
REV:	
REV:	
REV:	

SCALE:	1"=50'
PROJECT:	21-001
FILE:	21-001-WSP
DRAWN:	TJP
CHECKED:	TJP

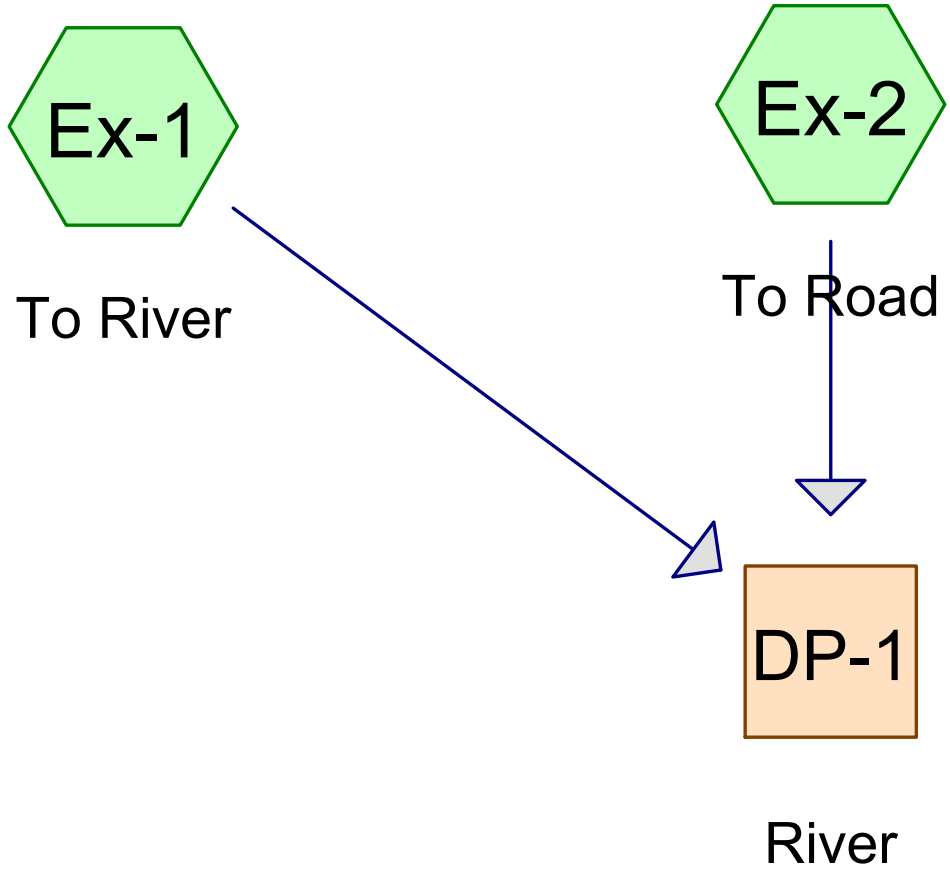
SHEET NO:

WS-2

APPENDIX C

HydroCAD Calculations

- ***Existing Conditions***
- ***Proposed Conditions***



Subcat Reach Pond Link

Routing Diagram for Existing Conditions
Prepared by PVI Site Design, LLC, Printed 3/29/2021

Summary for Subcatchment Ex-1: To River

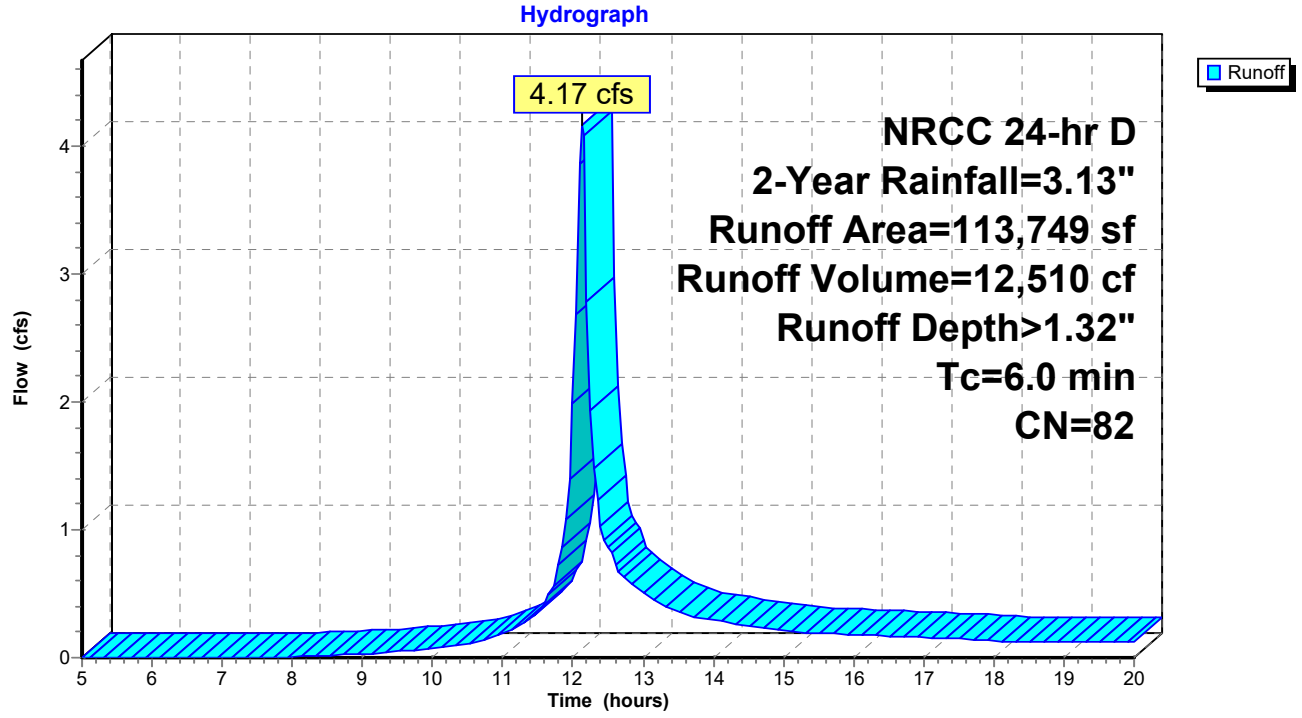
Runoff = 4.17 cfs @ 12.13 hrs, Volume= 12,510 cf, Depth> 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

	Area (sf)	CN	Description
*	4,150	98	Water Surface
	1,253	85	Gravel roads, HSG B
*	31,406	98	Buildings
*	31,230	98	Pavement
	41,101	61	>75% Grass cover, Good, HSG B
	4,609	39	>75% Grass cover, Good, HSG A
	113,749	82	Weighted Average
	46,963		41.29% Pervious Area
	66,786		58.71% Impervious Area

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

Subcatchment Ex-1: To River



Summary for Subcatchment Ex-2: To Road

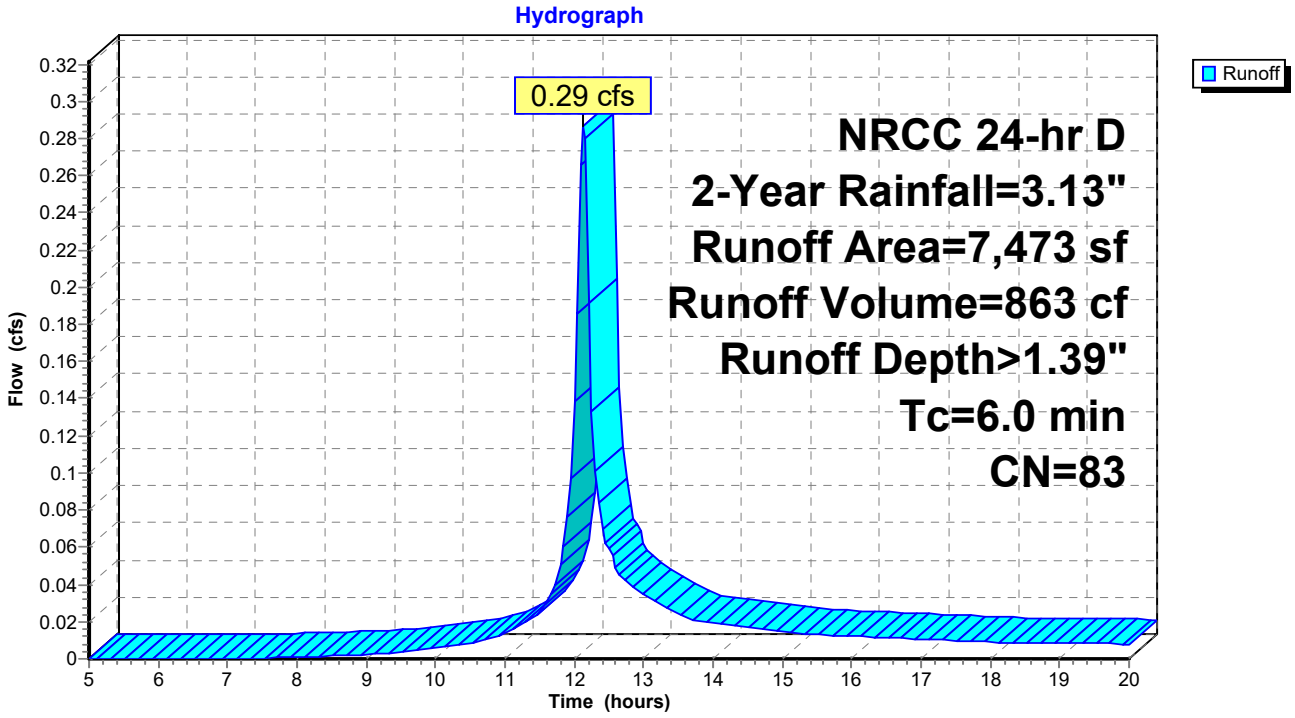
Runoff = 0.29 cfs @ 12.13 hrs, Volume= 863 cf, Depth> 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
3,523	98	Paved parking, HSG B
3,950	69	50-75% Grass cover, Fair, HSG B
7,473	83	Weighted Average
3,950		52.86% Pervious Area
3,523		47.14% Impervious Area

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

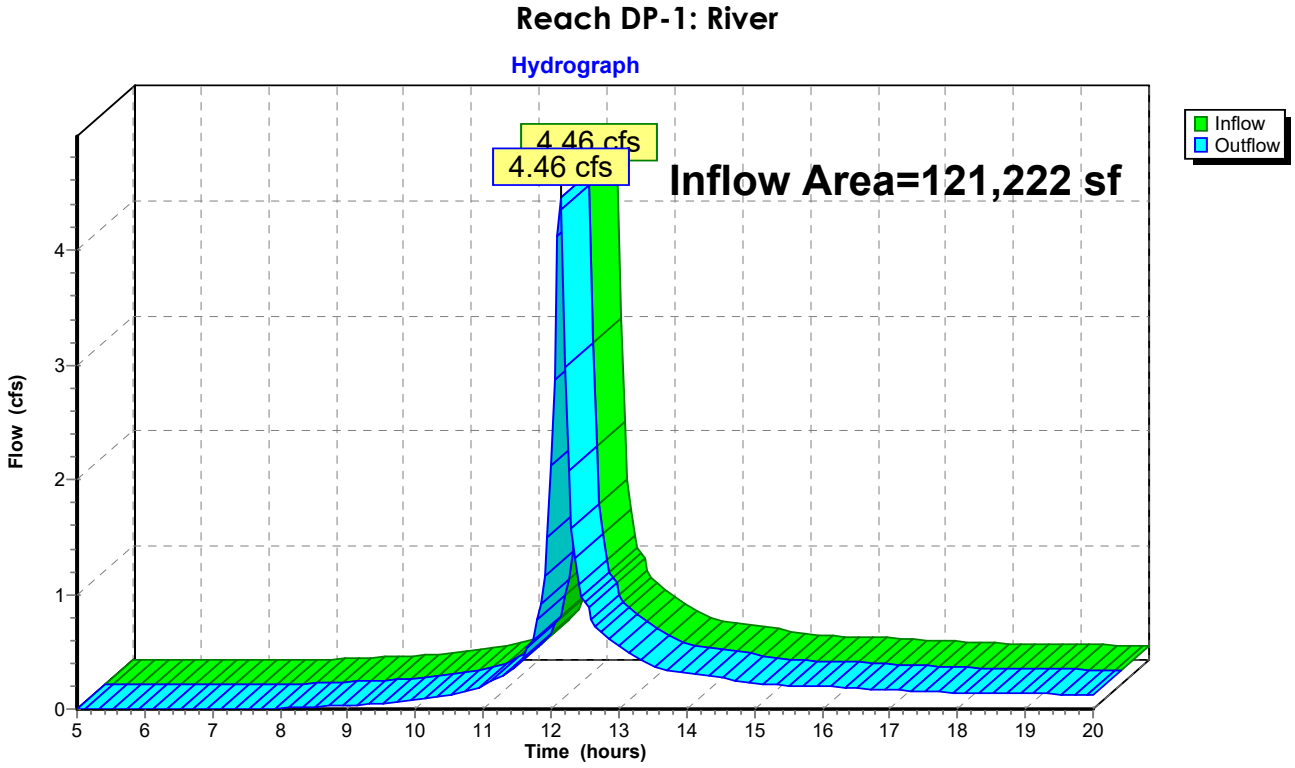
Subcatchment Ex-2: To Road



Summary for Reach DP-1: River

Inflow Area = 121,222 sf, 58.00% Impervious, Inflow Depth > 1.32" for 2-Year event
Inflow = 4.46 cfs @ 12.13 hrs, Volume= 13,373 cf
Outflow = 4.46 cfs @ 12.13 hrs, Volume= 13,373 cf, Atten= 0%, Lag= 0.0 min

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



Summary for Subcatchment Ex-1: To River

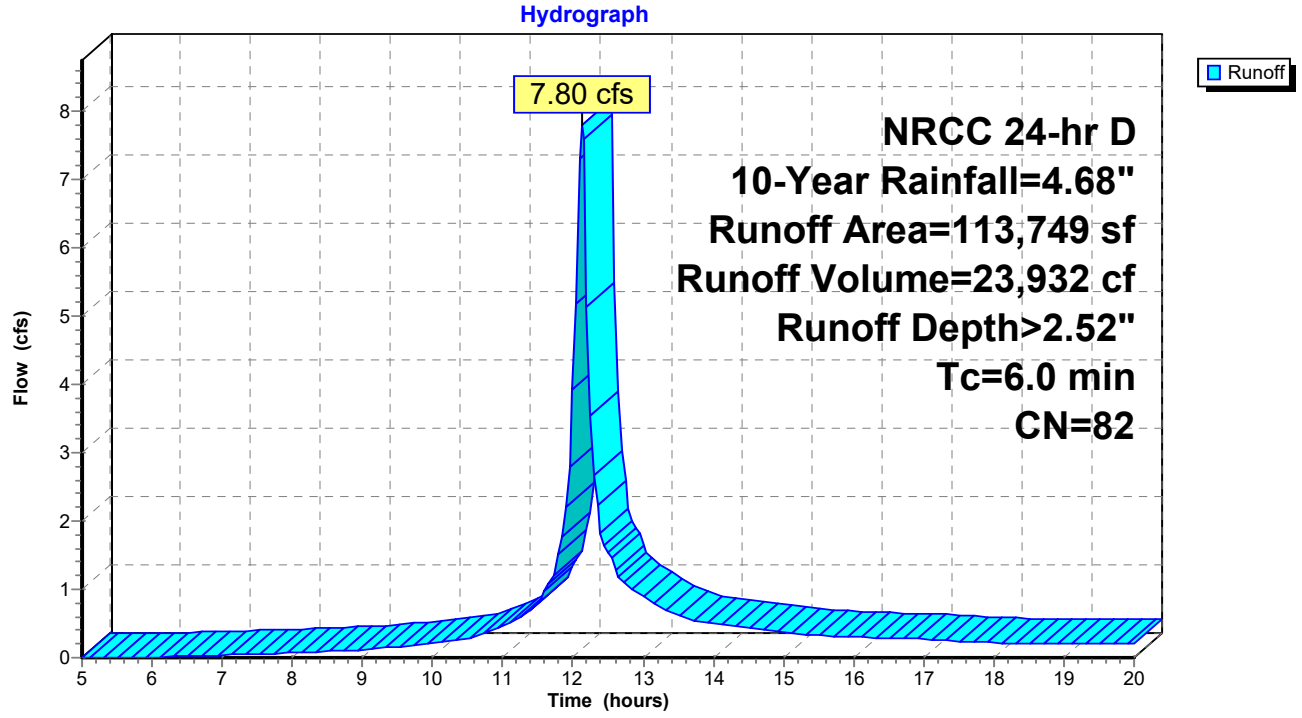
Runoff = 7.80 cfs @ 12.13 hrs, Volume= 23,932 cf, Depth> 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

	Area (sf)	CN	Description
*	4,150	98	Water Surface
	1,253	85	Gravel roads, HSG B
*	31,406	98	Buildings
*	31,230	98	Pavement
	41,101	61	>75% Grass cover, Good, HSG B
	4,609	39	>75% Grass cover, Good, HSG A
	113,749	82	Weighted Average
	46,963		41.29% Pervious Area
	66,786		58.71% Impervious Area

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

Subcatchment Ex-1: To River



Summary for Subcatchment Ex-2: To Road

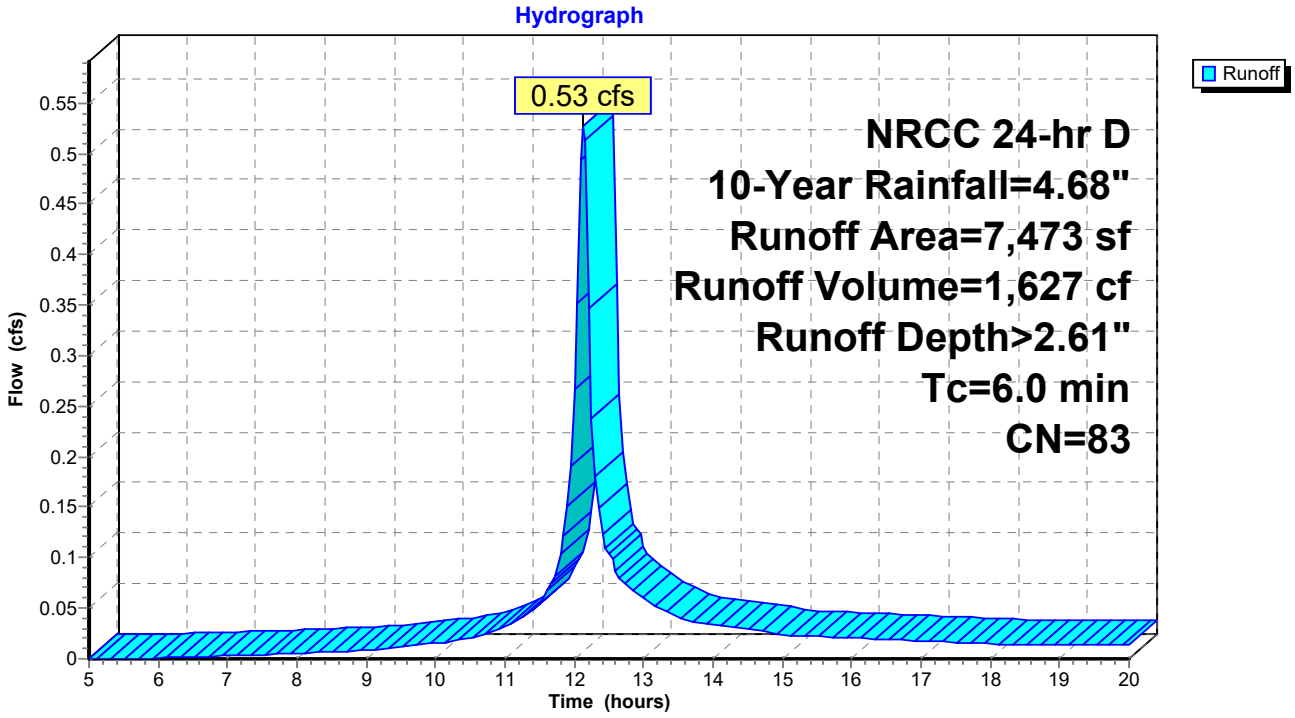
Runoff = 0.53 cfs @ 12.13 hrs, Volume= 1,627 cf, Depth> 2.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
3,523	98	Paved parking, HSG B
3,950	69	50-75% Grass cover, Fair, HSG B
7,473	83	Weighted Average
3,950		52.86% Pervious Area
3,523		47.14% Impervious Area

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

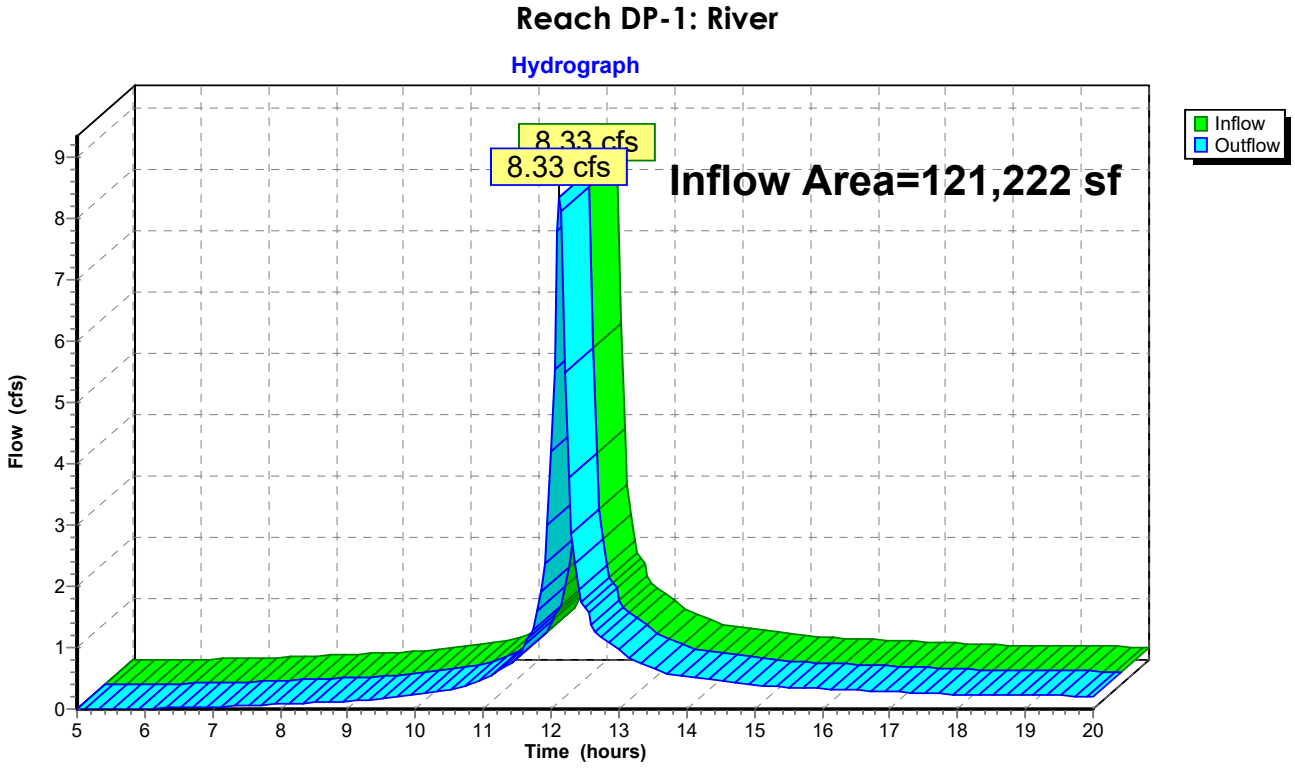
Subcatchment Ex-2: To Road



Summary for Reach DP-1: River

Inflow Area = 121,222 sf, 58.00% Impervious, Inflow Depth > 2.53" for 10-Year event
Inflow = 8.33 cfs @ 12.13 hrs, Volume= 25,559 cf
Outflow = 8.33 cfs @ 12.13 hrs, Volume= 25,559 cf, Atten= 0%, Lag= 0.0 min

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



Summary for Subcatchment Ex-1: To River

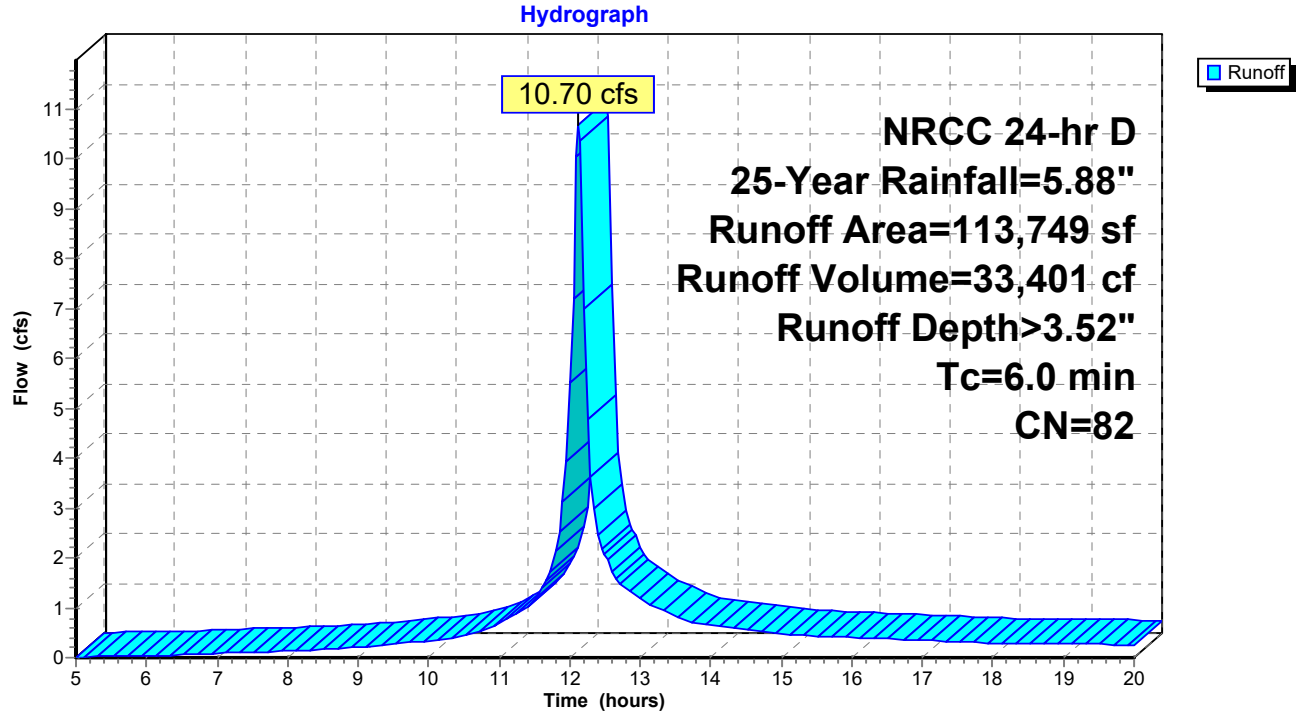
Runoff = 10.70 cfs @ 12.13 hrs, Volume= 33,401 cf, Depth> 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

	Area (sf)	CN	Description
*	4,150	98	Water Surface
	1,253	85	Gravel roads, HSG B
*	31,406	98	Buildings
*	31,230	98	Pavement
	41,101	61	>75% Grass cover, Good, HSG B
	4,609	39	>75% Grass cover, Good, HSG A
	113,749	82	Weighted Average
	46,963		41.29% Pervious Area
	66,786		58.71% Impervious Area

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

Subcatchment Ex-1: To River



Summary for Subcatchment Ex-2: To Road

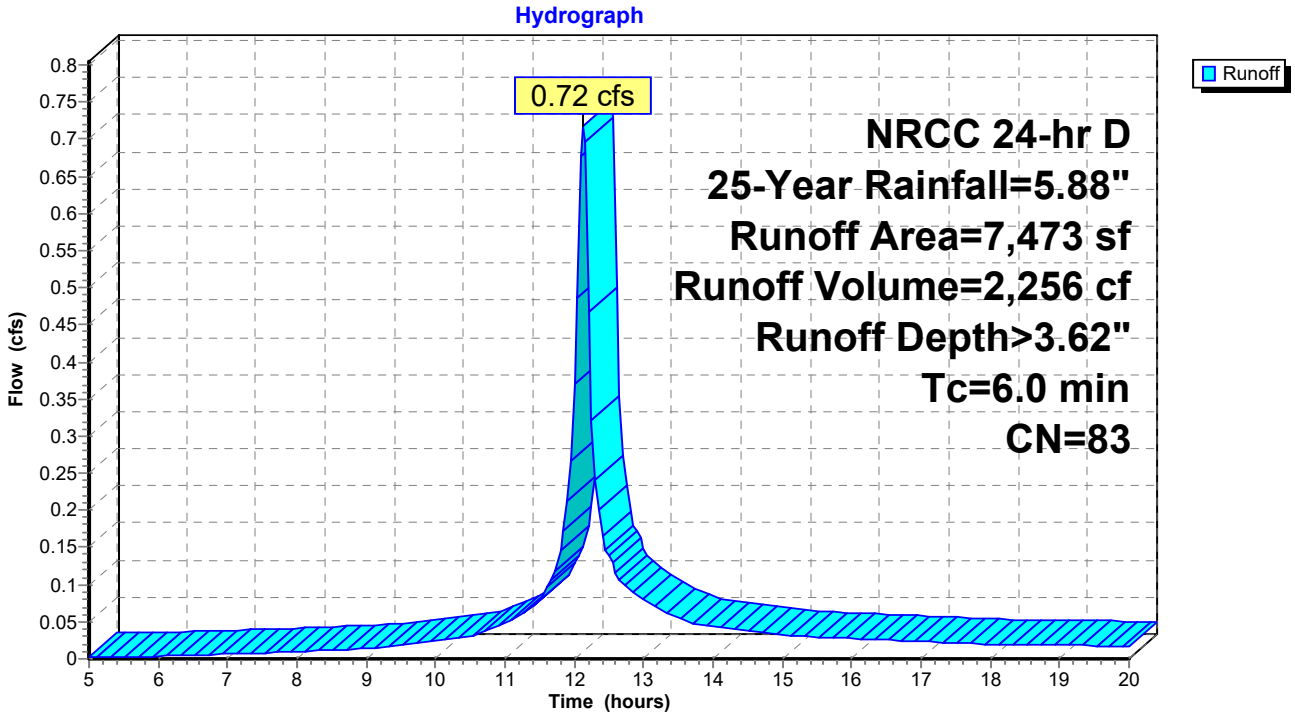
Runoff = 0.72 cfs @ 12.13 hrs, Volume= 2,256 cf, Depth> 3.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (sf)	CN	Description
3,523	98	Paved parking, HSG B
3,950	69	50-75% Grass cover, Fair, HSG B
7,473	83	Weighted Average
3,950		52.86% Pervious Area
3,523		47.14% Impervious Area

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

Subcatchment Ex-2: To Road

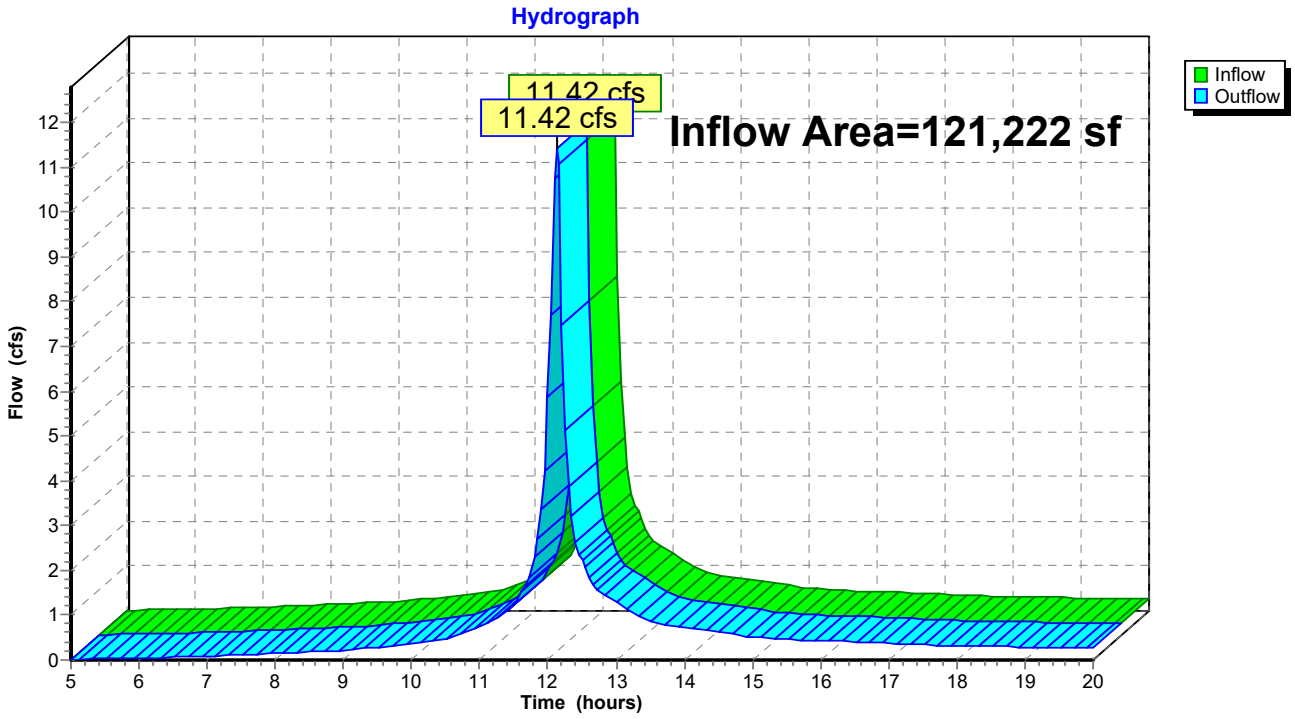


Summary for Reach DP-1: River

Inflow Area = 121,222 sf, 58.00% Impervious, Inflow Depth > 3.53" for 25-Year event
Inflow = 11.42 cfs @ 12.13 hrs, Volume= 35,657 cf
Outflow = 11.42 cfs @ 12.13 hrs, Volume= 35,657 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: River



Summary for Subcatchment Ex-1: To River

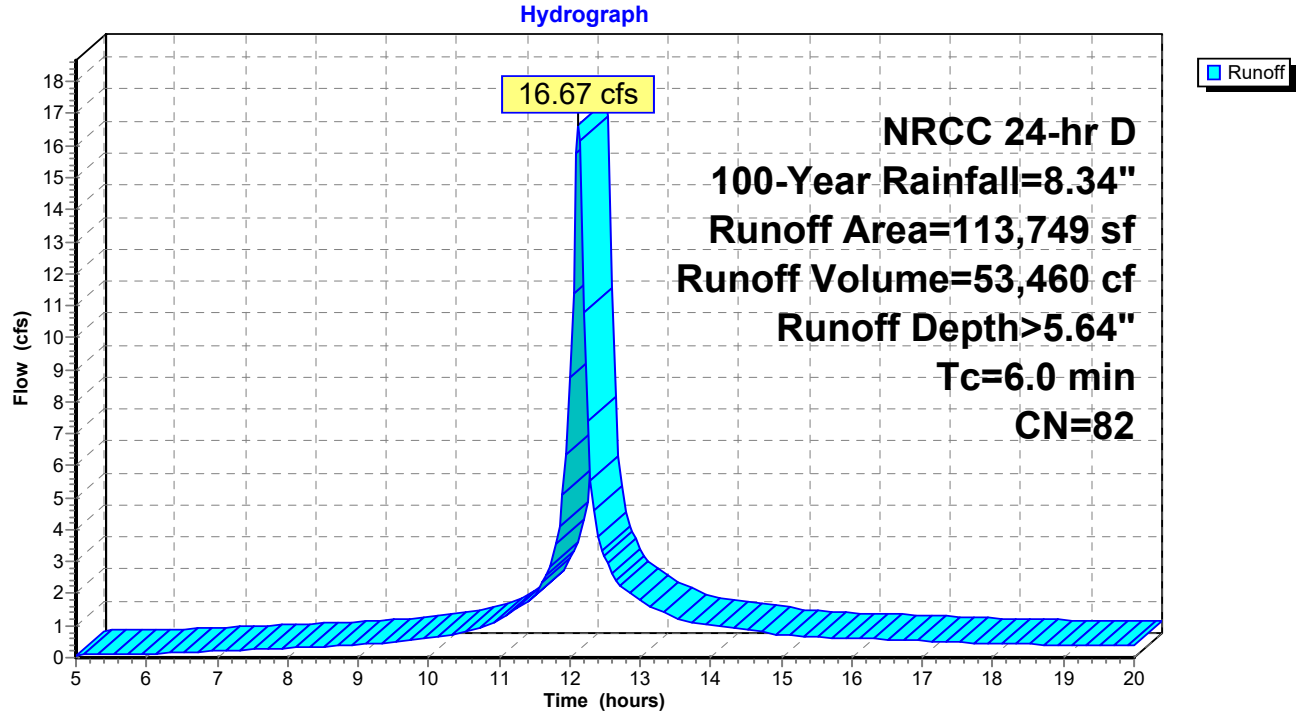
Runoff = 16.67 cfs @ 12.13 hrs, Volume= 53,460 cf, Depth> 5.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

	Area (sf)	CN	Description
*	4,150	98	Water Surface
	1,253	85	Gravel roads, HSG B
*	31,406	98	Buildings
*	31,230	98	Pavement
	41,101	61	>75% Grass cover, Good, HSG B
	4,609	39	>75% Grass cover, Good, HSG A
	113,749	82	Weighted Average
	46,963		41.29% Pervious Area
	66,786		58.71% Impervious Area

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

Subcatchment Ex-1: To River



Summary for Subcatchment Ex-2: To Road

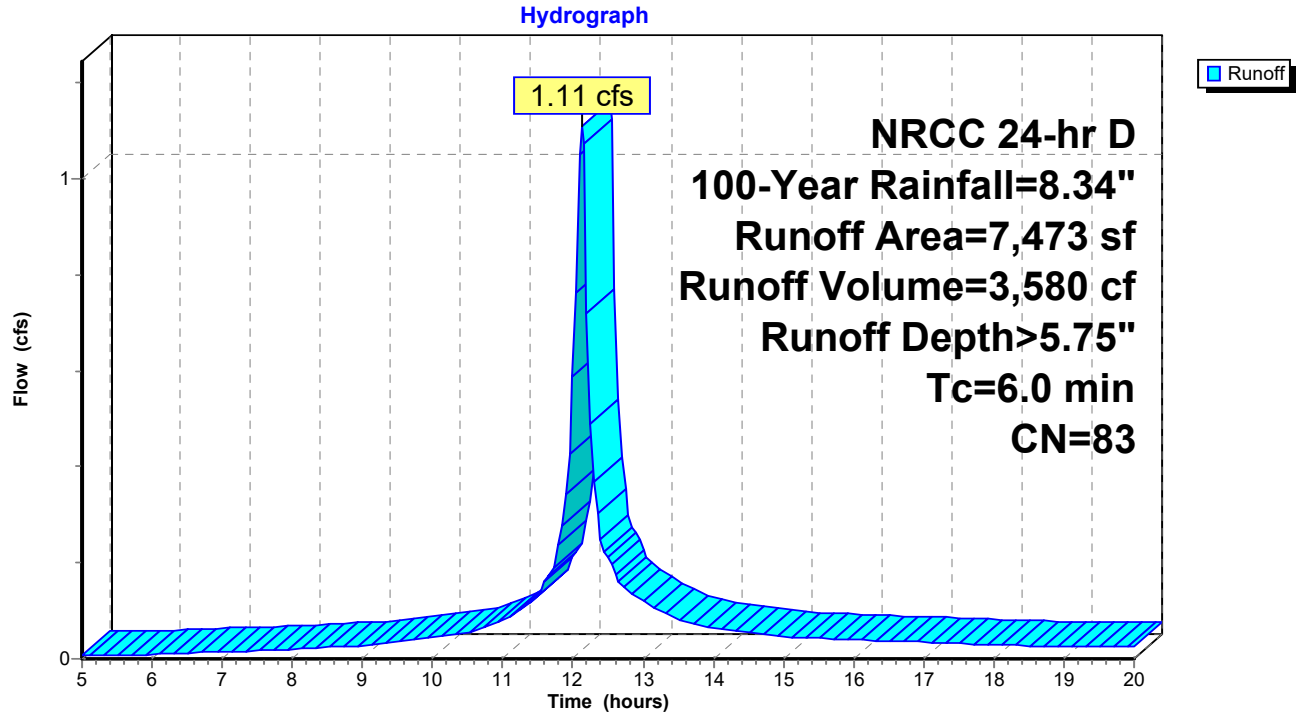
Runoff = 1.11 cfs @ 12.13 hrs, Volume= 3,580 cf, Depth> 5.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (sf)	CN	Description
3,523	98	Paved parking, HSG B
3,950	69	50-75% Grass cover, Fair, HSG B
7,473	83	Weighted Average
3,950		52.86% Pervious Area
3,523		47.14% Impervious Area

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

Subcatchment Ex-2: To Road

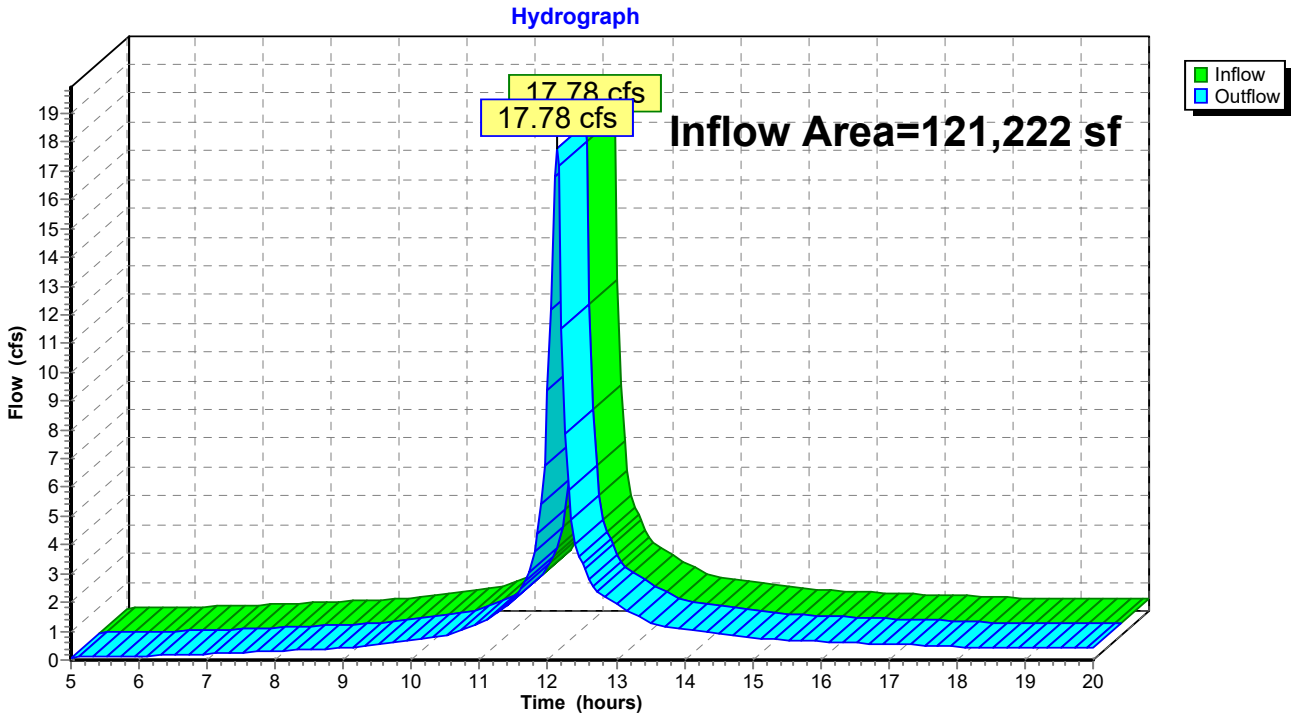


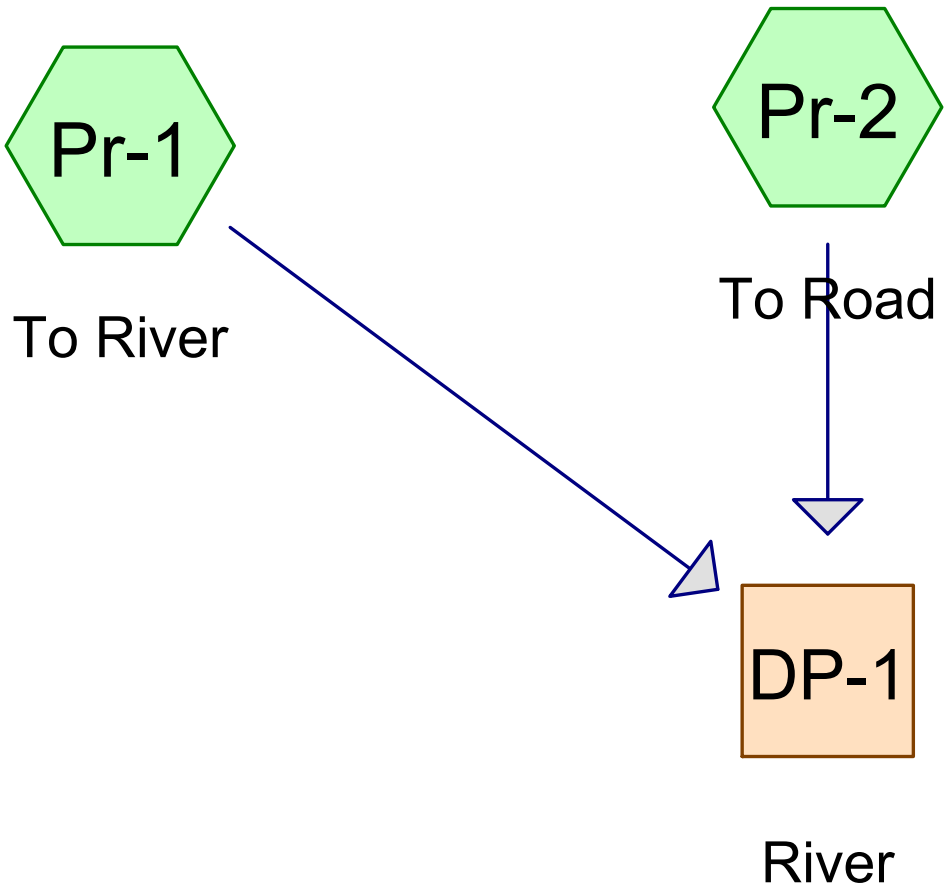
Summary for Reach DP-1: River

Inflow Area = 121,222 sf, 58.00% Impervious, Inflow Depth > 5.65" for 100-Year event
Inflow = 17.78 cfs @ 12.13 hrs, Volume= 57,040 cf
Outflow = 17.78 cfs @ 12.13 hrs, Volume= 57,040 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: River





Subcat Reach Pond Link

Routing Diagram for Proposed Conditions-Rev1
Prepared by PVI Site Design, LLC, Printed 3/29/2021

Summary for Subcatchment Pr-1: To River

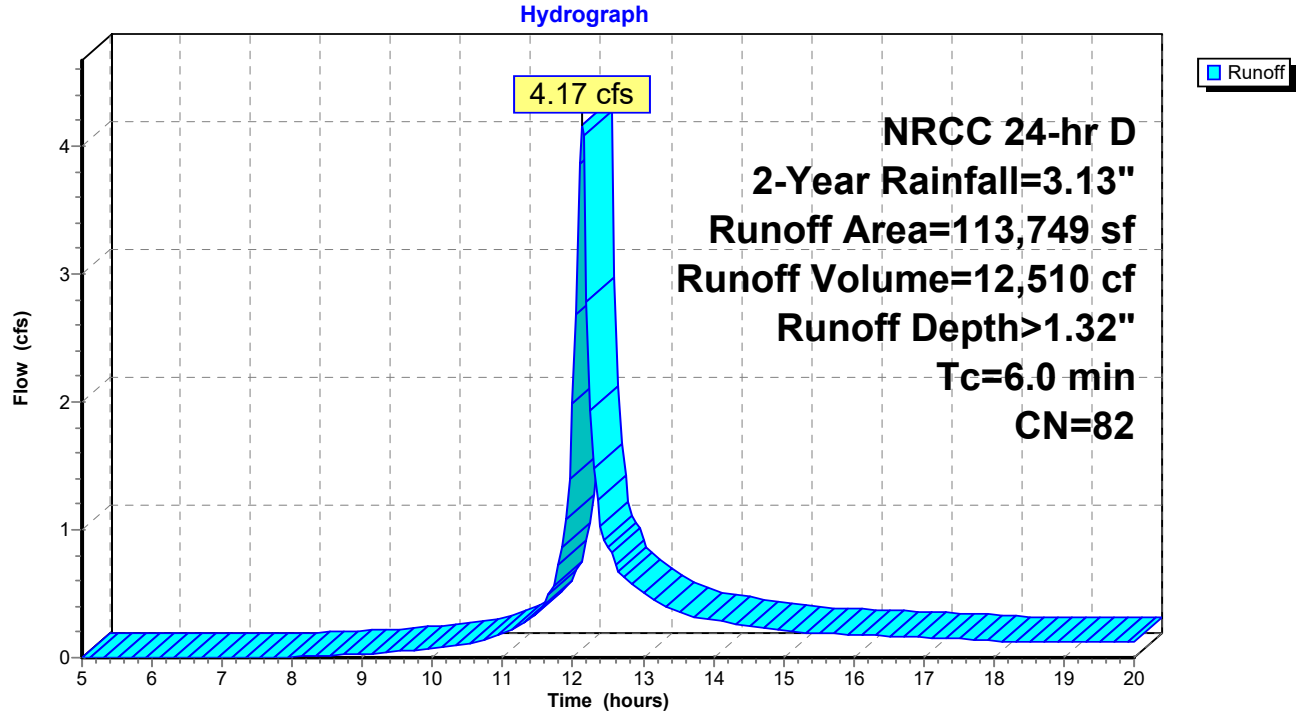
Runoff = 4.17 cfs @ 12.13 hrs, Volume= 12,510 cf, Depth> 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

	Area (sf)	CN	Description
	4,150	98	Water Surface, HSG A
	1,253	85	Gravel roads, HSG B
*	32,048	98	Buildings
*	31,602	98	Pavement
	39,763	61	>75% Grass cover, Good, HSG B
	4,933	39	>75% Grass cover, Good, HSG A
	113,749	82	Weighted Average
	45,949		40.40% Pervious Area
	67,800		59.60% Impervious Area

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

Subcatchment Pr-1: To River



Summary for Subcatchment Pr-2: To Road

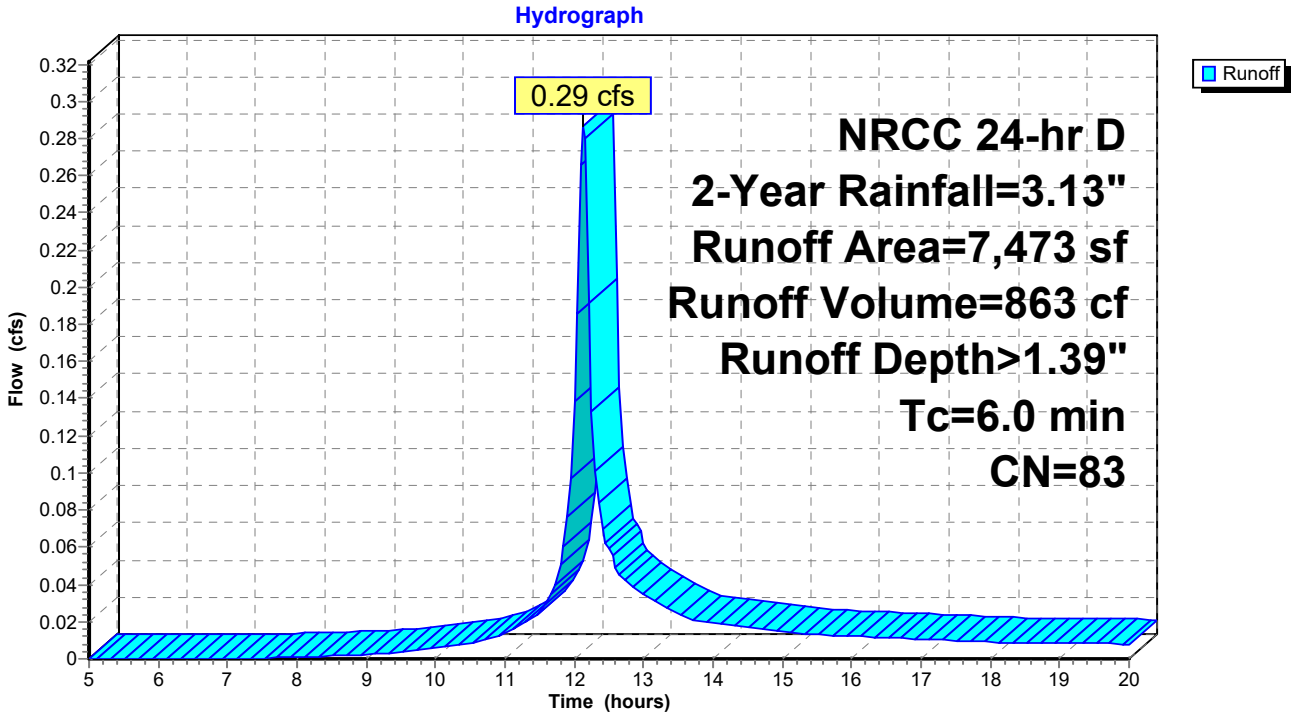
Runoff = 0.29 cfs @ 12.13 hrs, Volume= 863 cf, Depth> 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
3,523	98	Paved parking, HSG B
3,950	69	50-75% Grass cover, Fair, HSG B
7,473	83	Weighted Average
3,950		52.86% Pervious Area
3,523		47.14% Impervious Area

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

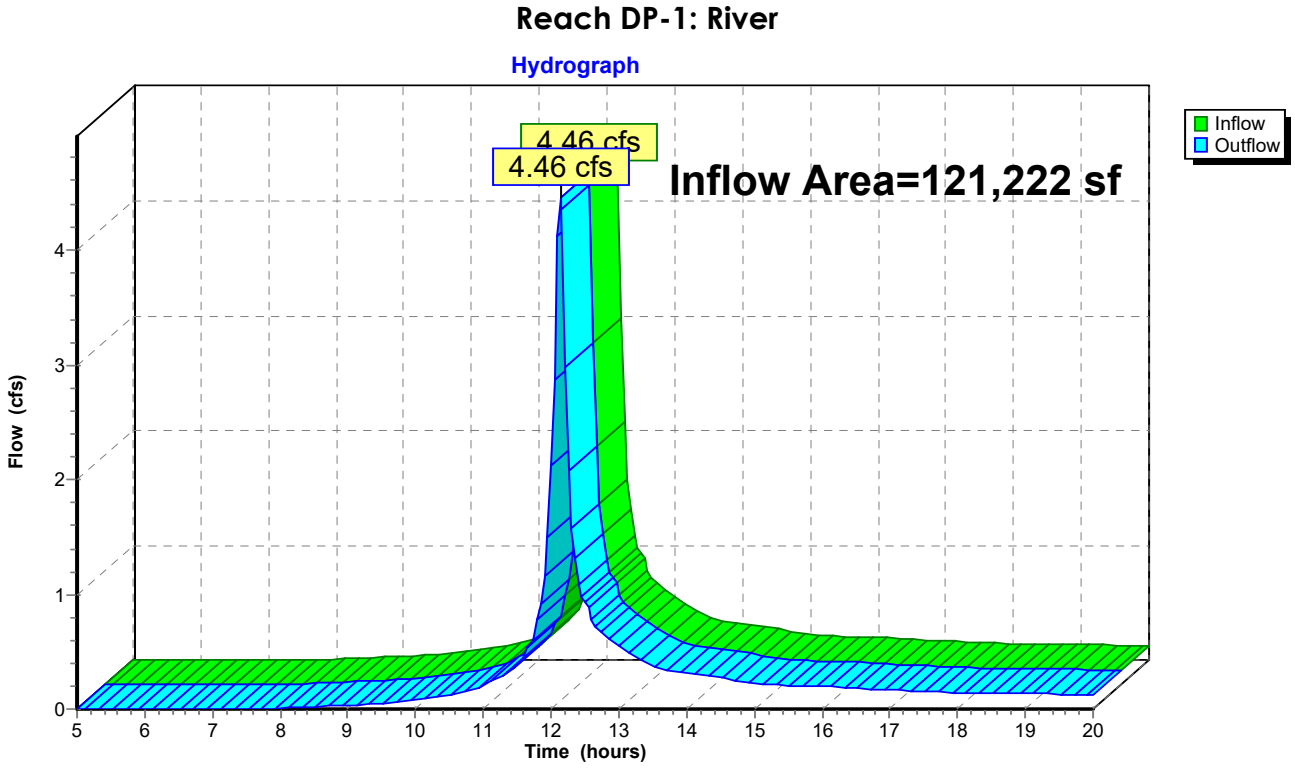
Subcatchment Pr-2: To Road



Summary for Reach DP-1: River

Inflow Area = 121,222 sf, 58.84% Impervious, Inflow Depth > 1.32" for 2-Year event
Inflow = 4.46 cfs @ 12.13 hrs, Volume= 13,373 cf
Outflow = 4.46 cfs @ 12.13 hrs, Volume= 13,373 cf, Atten= 0%, Lag= 0.0 min

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



Summary for Subcatchment Pr-1: To River

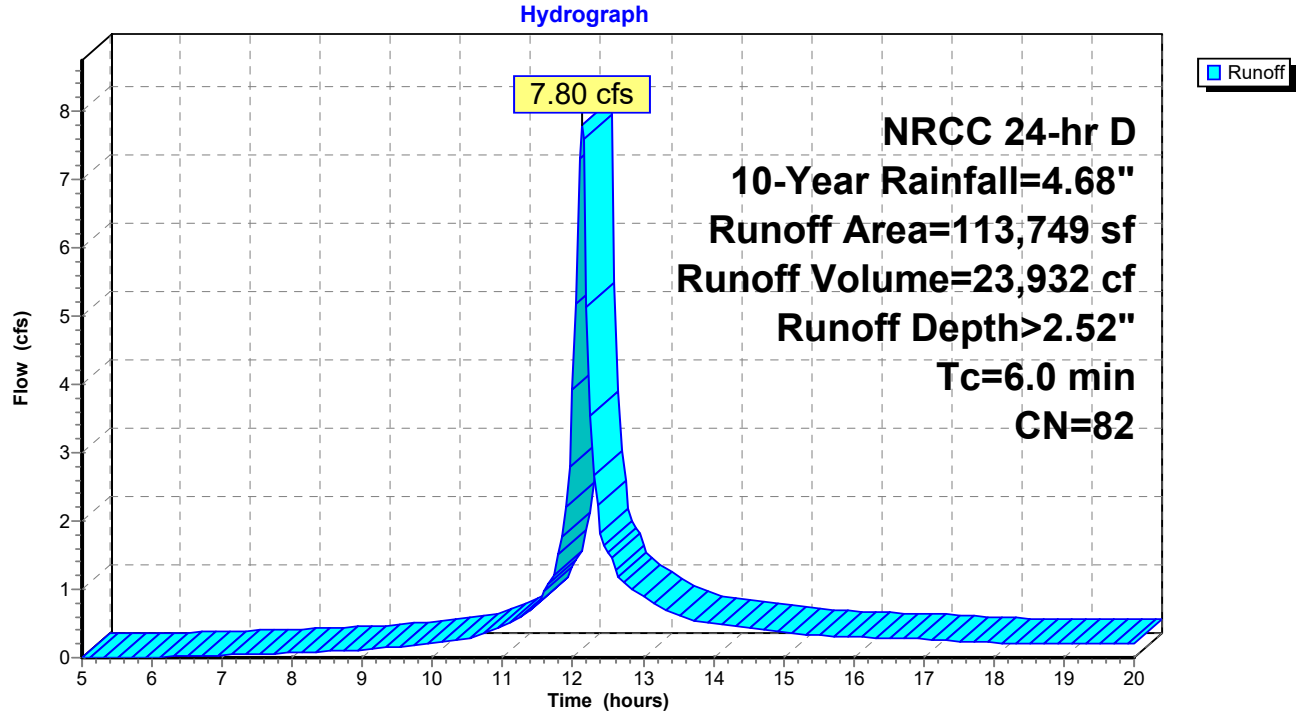
Runoff = 7.80 cfs @ 12.13 hrs, Volume= 23,932 cf, Depth> 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

	Area (sf)	CN	Description
	4,150	98	Water Surface, HSG A
	1,253	85	Gravel roads, HSG B
*	32,048	98	Buildings
*	31,602	98	Pavement
	39,763	61	>75% Grass cover, Good, HSG B
	4,933	39	>75% Grass cover, Good, HSG A
	113,749	82	Weighted Average
	45,949		40.40% Pervious Area
	67,800		59.60% Impervious Area

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

Subcatchment Pr-1: To River



Summary for Subcatchment Pr-2: To Road

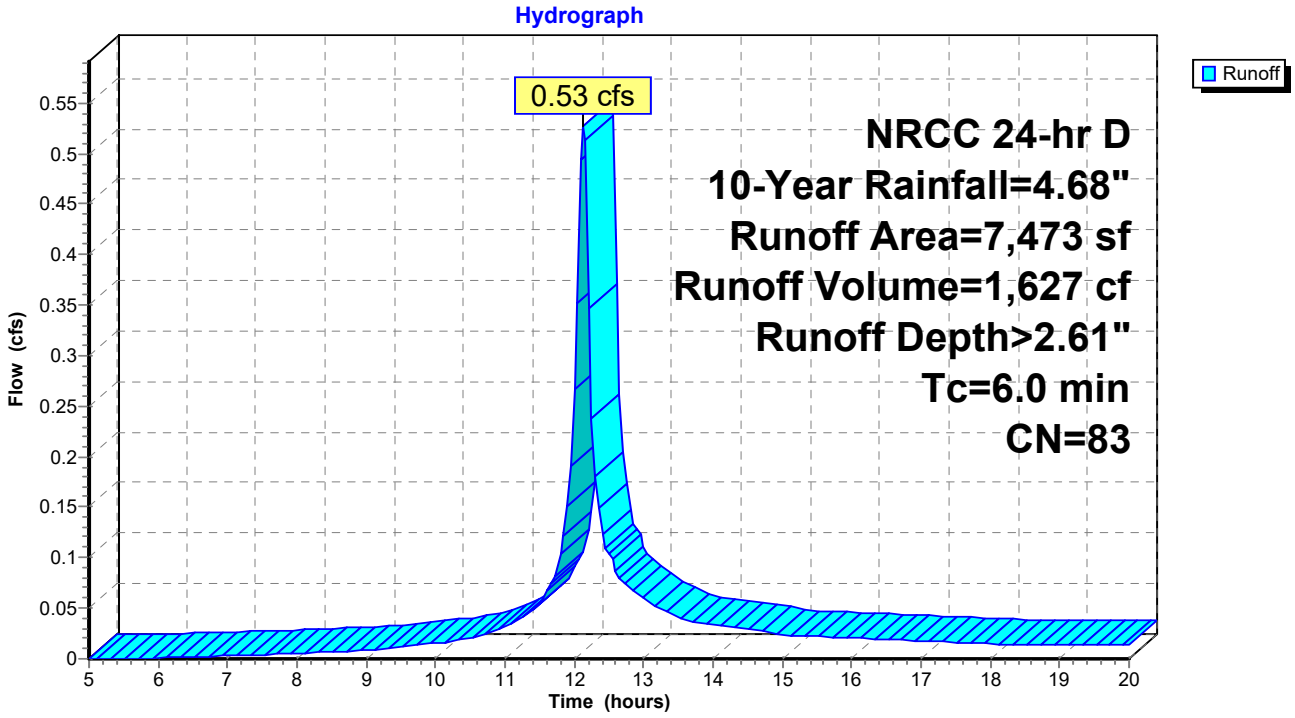
Runoff = 0.53 cfs @ 12.13 hrs, Volume= 1,627 cf, Depth> 2.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
3,523	98	Paved parking, HSG B
3,950	69	50-75% Grass cover, Fair, HSG B
7,473	83	Weighted Average
3,950		52.86% Pervious Area
3,523		47.14% Impervious Area

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

Subcatchment Pr-2: To Road

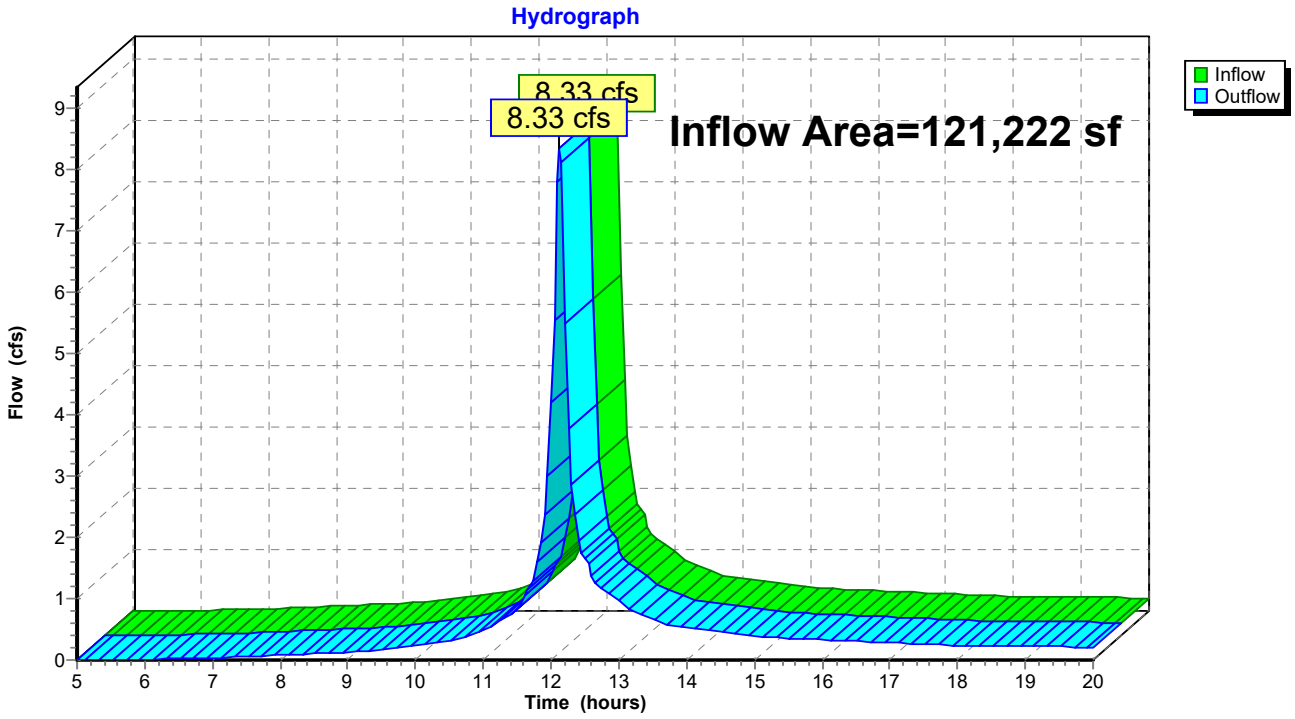


Summary for Reach DP-1: River

Inflow Area = 121,222 sf, 58.84% Impervious, Inflow Depth > 2.53" for 10-Year event
Inflow = 8.33 cfs @ 12.13 hrs, Volume= 25,559 cf
Outflow = 8.33 cfs @ 12.13 hrs, Volume= 25,559 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: River



Summary for Subcatchment Pr-1: To River

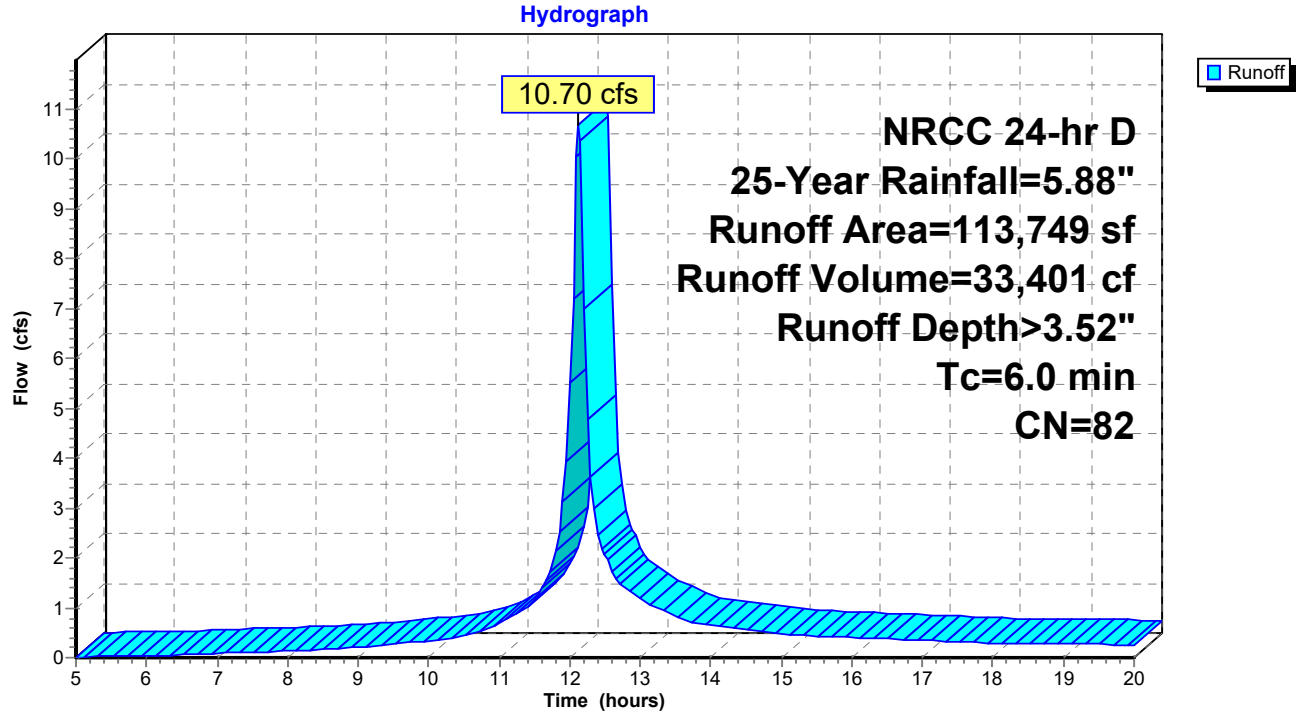
Runoff = 10.70 cfs @ 12.13 hrs, Volume= 33,401 cf, Depth> 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

	Area (sf)	CN	Description
	4,150	98	Water Surface, HSG A
	1,253	85	Gravel roads, HSG B
*	32,048	98	Buildings
*	31,602	98	Pavement
	39,763	61	>75% Grass cover, Good, HSG B
	4,933	39	>75% Grass cover, Good, HSG A
	113,749	82	Weighted Average
	45,949		40.40% Pervious Area
	67,800		59.60% Impervious Area

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

Subcatchment Pr-1: To River



Summary for Subcatchment Pr-2: To Road

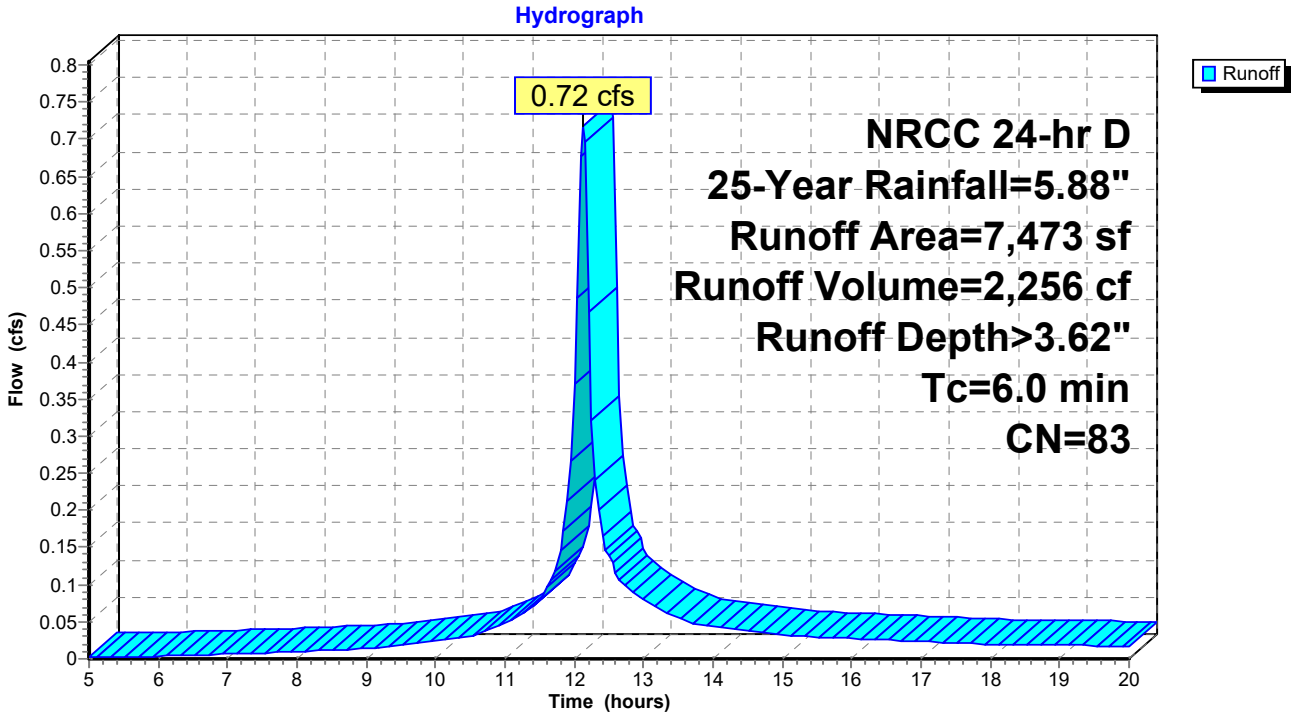
Runoff = 0.72 cfs @ 12.13 hrs, Volume= 2,256 cf, Depth> 3.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (sf)	CN	Description
3,523	98	Paved parking, HSG B
3,950	69	50-75% Grass cover, Fair, HSG B
7,473	83	Weighted Average
3,950		52.86% Pervious Area
3,523		47.14% Impervious Area

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

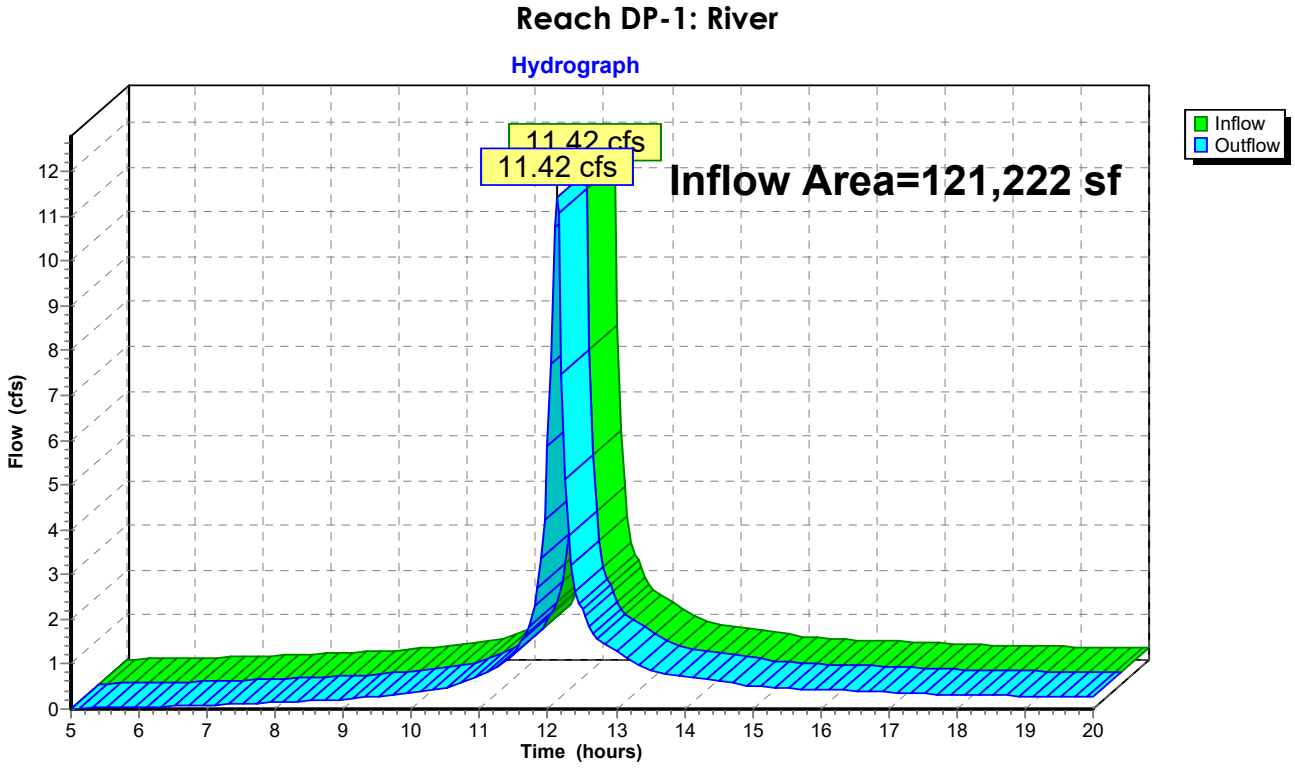
Subcatchment Pr-2: To Road



Summary for Reach DP-1: River

Inflow Area = 121,222 sf, 58.84% Impervious, Inflow Depth > 3.53" for 25-Year event
Inflow = 11.42 cfs @ 12.13 hrs, Volume= 35,657 cf
Outflow = 11.42 cfs @ 12.13 hrs, Volume= 35,657 cf, Atten= 0%, Lag= 0.0 min

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



Summary for Subcatchment Pr-1: To River

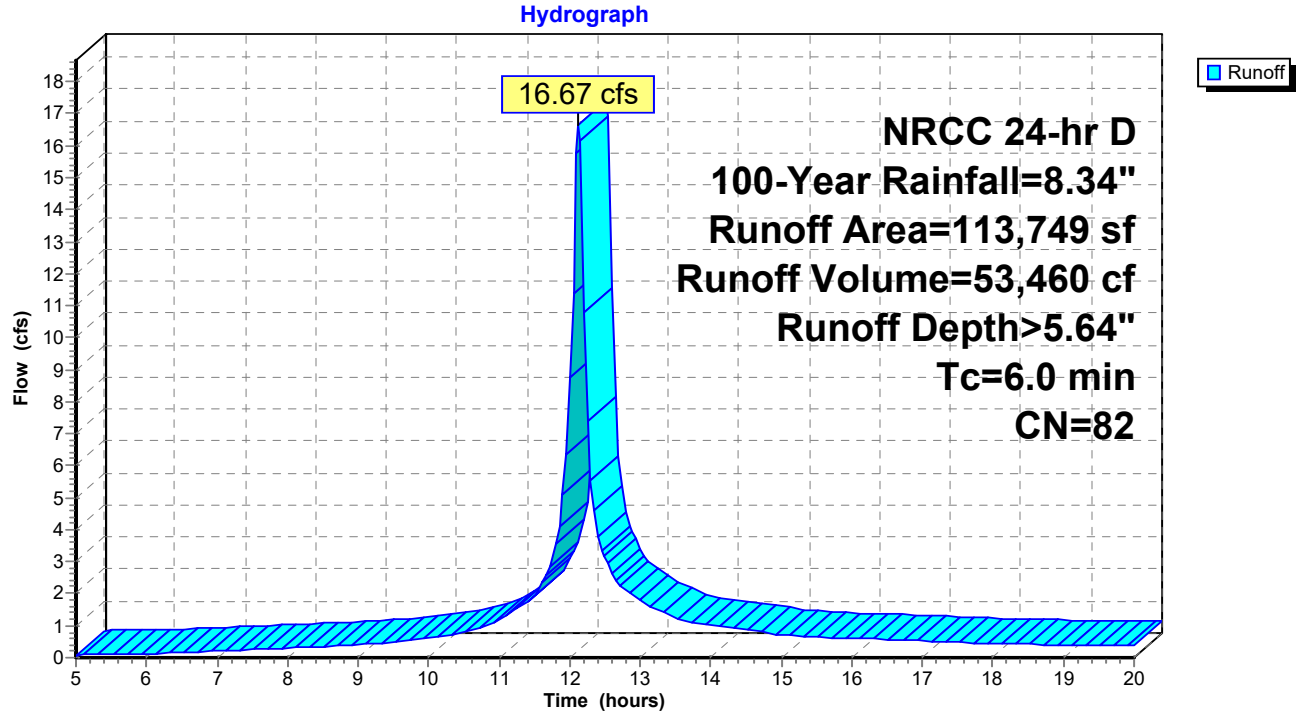
Runoff = 16.67 cfs @ 12.13 hrs, Volume= 53,460 cf, Depth> 5.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

	Area (sf)	CN	Description
	4,150	98	Water Surface, HSG A
	1,253	85	Gravel roads, HSG B
*	32,048	98	Buildings
*	31,602	98	Pavement
	39,763	61	>75% Grass cover, Good, HSG B
	4,933	39	>75% Grass cover, Good, HSG A
	113,749	82	Weighted Average
	45,949		40.40% Pervious Area
	67,800		59.60% Impervious Area

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

Subcatchment Pr-1: To River



Summary for Subcatchment Pr-2: To Road

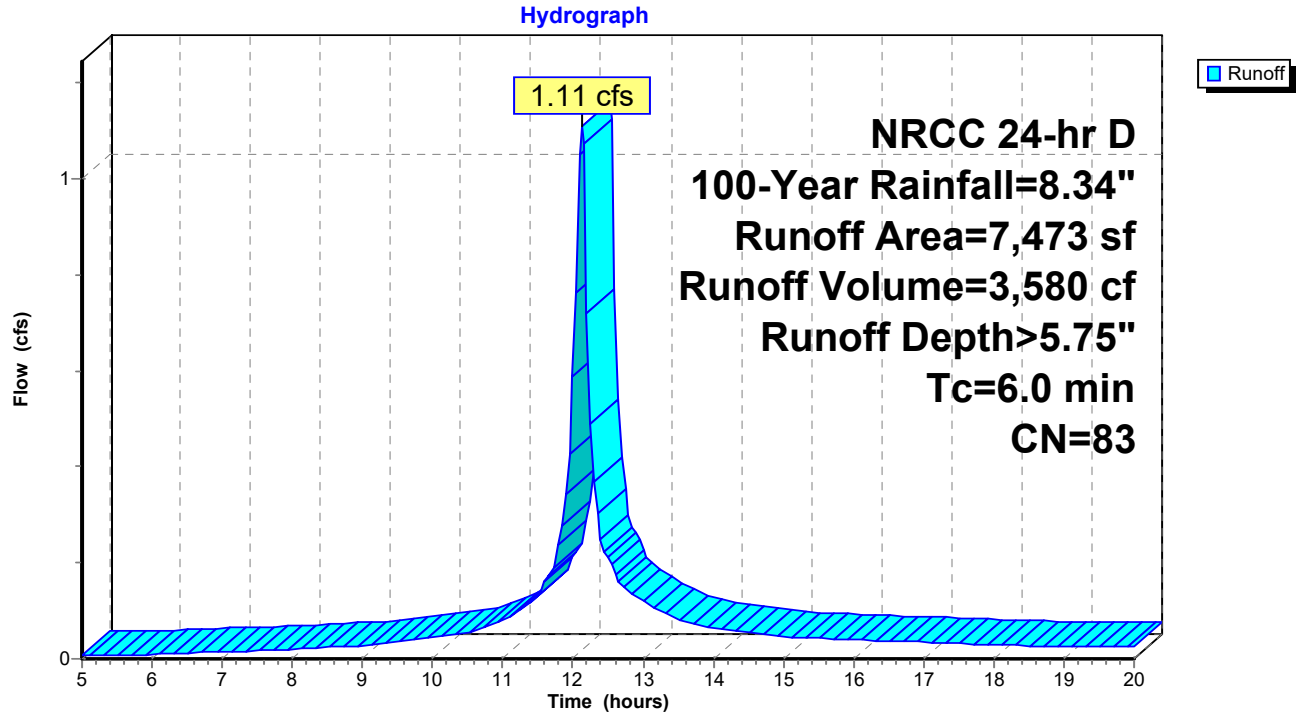
Runoff = 1.11 cfs @ 12.13 hrs, Volume= 3,580 cf, Depth> 5.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (sf)	CN	Description
3,523	98	Paved parking, HSG B
3,950	69	50-75% Grass cover, Fair, HSG B
7,473	83	Weighted Average
3,950		52.86% Pervious Area
3,523		47.14% Impervious Area

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

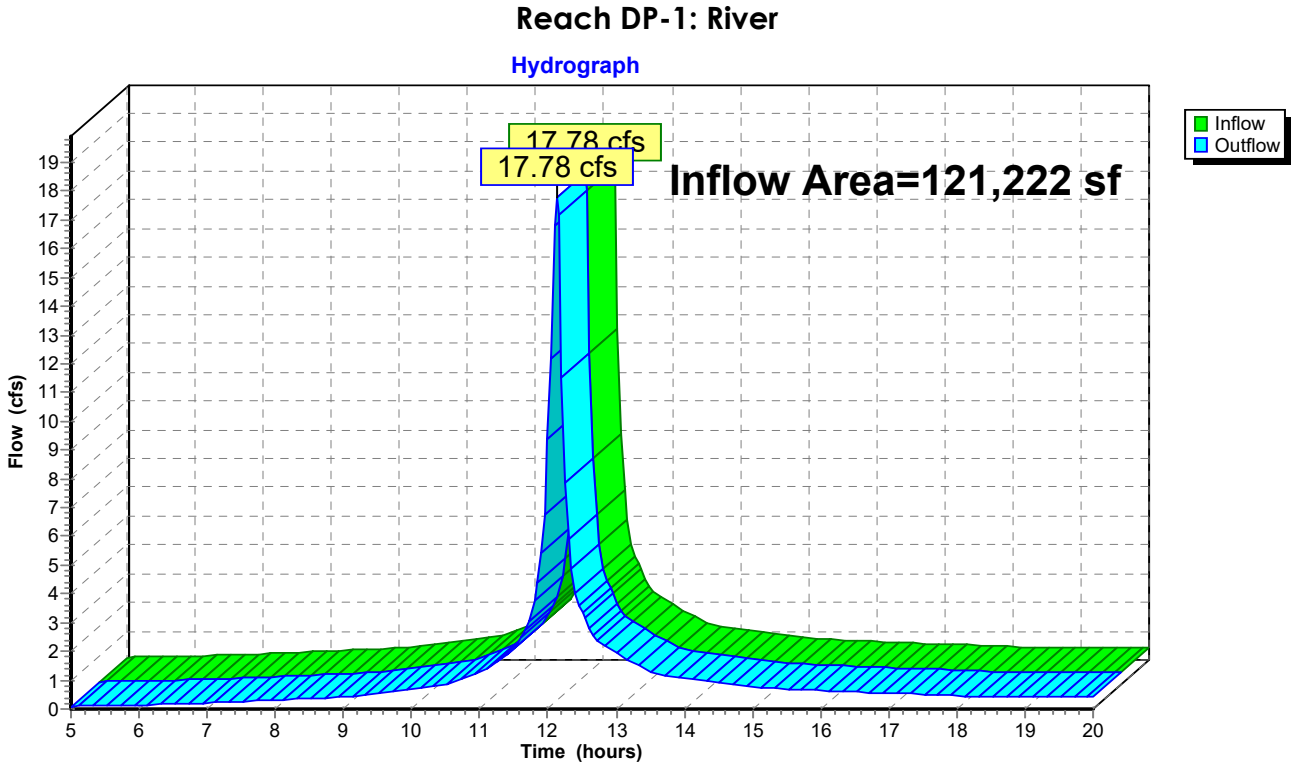
Subcatchment Pr-2: To Road



Summary for Reach DP-1: River

Inflow Area = 121,222 sf, 58.84% Impervious, Inflow Depth > 5.65" for 100-Year event
Inflow = 17.78 cfs @ 12.13 hrs, Volume= 57,040 cf
Outflow = 17.78 cfs @ 12.13 hrs, Volume= 57,040 cf, Atten= 0%, Lag= 0.0 min

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



APPENDIX D
NRCS Soils Map

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Worcester County, Massachusetts, Northeastern Part

January 26, 2021

Preface

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

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

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

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

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

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

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Contents

Soil Map

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


71° 53' 5" W
71° 52' 57" W
42° 21' 41" N
42° 21' 33" N
262460
262490
262520
262550
262580
262610
262430
4693950
4693920
4693890
4693860
4693830
4693800
4693770
4693740
4693710
Asnebumskit Brook
N Main St
Village Way
254B
311B
422C
651
421C
122a
1
Soil Map may not be valid at this scale.
Map Scale: 1:1,190 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 15 30 60 90
Feet
0 50 100 200 300
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Worcester County, Massachusetts, Northeastern Part
Survey Area Data: Version 15, Jun 10, 2020

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

Date(s) aerial images were photographed: May 18, 2019—Jul 9, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Jefferson Mill)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	0.1	4.3%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	0.7	19.0%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	0.1	2.1%
421C	Canton fine sandy loam, 8 to 15 percent slopes, very stony	0.3	9.5%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	0.6	16.1%
651	Udorthents, smoothed	1.7	48.9%
Totals for Area of Interest		**3.4**	**100.0%**

Map Unit Descriptions (Jefferson Mill)

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

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

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

was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

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

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

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

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

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

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

Worcester County, Massachusetts, Northeastern Part

1—Water

Map Unit Setting

National map unit symbol: w3qb
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

254B—Merrimac fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyqs
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Merrimac

Setting

Landform: Outwash terraces, eskers, kames, outwash plains, moraines
Landform position (two-dimensional): Backslope, footslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained

Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water capacity: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Outwash plains, deltas, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, eskers, kames, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Windsor

Percent of map unit: 3 percent
Landform: Deltas, outwash terraces, outwash plains, dunes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Riser, tread
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Stream terraces, moraines, outwash terraces, eskers, kames, outwash plains
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

311B—Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2t2qr
Elevation: 0 to 1,440 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Woodbridge, very stony, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Very Stony

Setting

Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 9 inches: fine sandy loam
Bw1 - 9 to 20 inches: fine sandy loam
Bw2 - 20 to 32 inches: fine sandy loam
Cd - 32 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 19 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: C/D
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Paxton, very stony
Percent of map unit: 10 percent
Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Ridgebury, very stony
Percent of map unit: 8 percent
Landform: Drumlins, drainageways, depressions, hills, ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

421C—Canton fine sandy loam, 8 to 15 percent slopes, very stony

Map Unit Setting
National map unit symbol: 2w814
Elevation: 0 to 1,160 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Canton, very stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Very Stony

Setting
Landform: Hills, moraines, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Montauk, very stony

Percent of map unit: 6 percent
Landform: Recessionial moraines, drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Scituate, very stony

Percent of map unit: 5 percent
Landform: Hills, ground moraines, drumlins
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, very stony

Percent of map unit: 3 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Hydric soil rating: No

Swansea

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

422C—Canton fine sandy loam, 8 to 15 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w815
Elevation: 0 to 1,310 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Canton, Extremely Stony

Setting

Landform: Moraines, ridges, hills
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate, extremely stony

Percent of map unit: 6 percent
Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Charlton, extremely stony

Percent of map unit: 5 percent
Landform: Ridges, hills, ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Montauk, extremely stony

Percent of map unit: 5 percent
Landform: Recessionial moraines, drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Hollis, extremely stony

Percent of map unit: 4 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

651—Udorthents, smoothed

Map Unit Setting

National map unit symbol: w3q6
Elevation: 180 to 1,020 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 80 percent
Urban land: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Parent material: Made land over firm loamy basal till

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group (Jefferson Mill)

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.

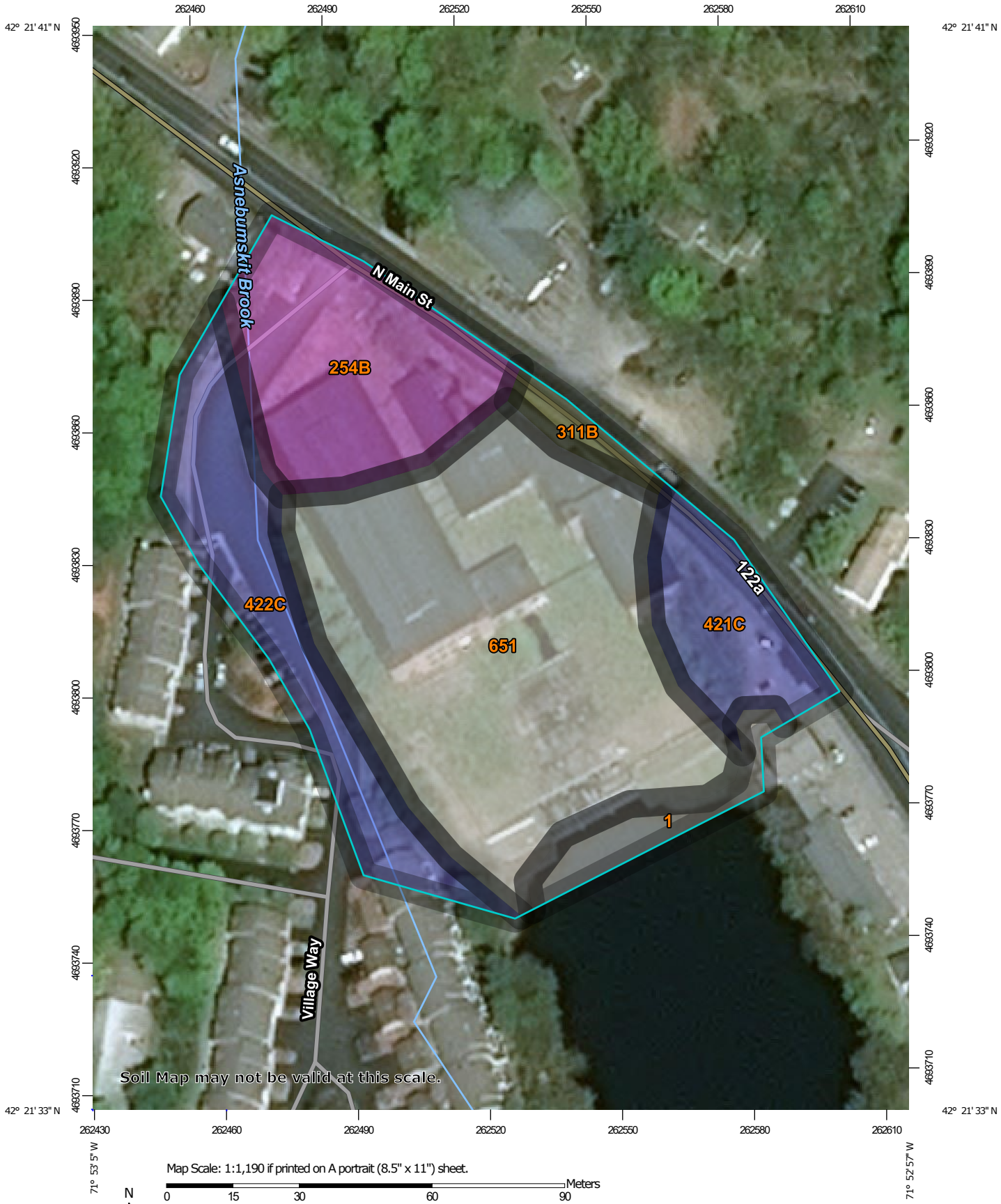
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Map—Hydrologic Soil Group (Jefferson Mill)



Map Scale: 1:1,190 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Worcester County, Massachusetts, Northeastern Part
Survey Area Data: Version 15, Jun 10, 2020

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

Date(s) aerial images were photographed: May 18, 2019—Jul 9, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group (Jefferson Mill)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		0.1	4.3%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	0.7	19.0%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	C/D	0.1	2.1%
421C	Canton fine sandy loam, 8 to 15 percent slopes, very stony	B	0.3	9.5%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	B	0.6	16.1%
651	Udorthents, smoothed		1.7	48.9%
Totals for Area of Interest			**3.4**	**100.0%**

Rating Options—Hydrologic Soil Group (Jefferson Mill)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX E
TSS Removal Calculations

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: Jefferson Mill - Holden, MA

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Street Sweeping	10%	**1.00**	0.10	0.90
CDS Sediment Seperator	80%	0.90	0.72	0.18

Total TSS Removal = 82%

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

Project: Jefferson Mill

Prepared By: PVI Site Design, LLC

Date: 01.28.2021

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

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

1. From MassDEP Stormwater Handbook Vol. 1

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

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

JEFFERSON MILLS
HOLDEN, MA

Area	**0.50 ac**	Unit Site Designation	**WQU 1**
Weighted C	**0.9**	Rainfall Station #	**70**
t_c	**6 min**		
CDS Model	**2015-4**	CDS Treatment Capacity	**1.4 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.04	15.1%	15.1%	0.02	0.02	15.1
0.08	24.6%	39.7%	0.04	0.04	24.6
0.12	13.7%	53.4%	0.05	0.05	13.6
0.16	9.4%	62.8%	0.07	0.07	9.3
0.20	6.6%	69.5%	0.09	0.09	6.5
0.24	5.2%	74.7%	0.11	0.11	5.1
0.28	4.8%	79.5%	0.13	0.13	4.6
0.32	3.1%	82.6%	0.14	0.14	3.0
0.36	2.7%	85.3%	0.16	0.16	2.6
0.40	2.1%	87.4%	0.18	0.18	2.0
0.48	2.5%	89.9%	0.22	0.22	2.3
0.56	2.0%	91.9%	0.25	0.25	1.9
0.64	1.4%	93.3%	0.29	0.29	1.3
0.72	1.0%	94.3%	0.32	0.32	0.9
0.80	1.1%	95.4%	0.36	0.36	1.0
1.00	1.6%	97.1%	0.45	0.45	1.4
1.20	0.9%	98.0%	0.54	0.54	0.8
1.40	0.6%	98.6%	0.63	0.63	0.5
1.60	0.5%	99.1%	0.72	0.72	0.4
1.80	0.5%	99.6%	0.81	0.81	0.4
0.00	0.0%	99.6%	0.00	0.00	0.0
					97.3
				Removal Efficiency Adjustment[2] =	0.0%
				Predicted % Annual Rainfall Treated =	99.6%
				Predicted Net Annual Load Removal Efficiency =	**97.3%**

1 - Based on 14 years of 15-minute rainfall data from NCDC Station 2107, East Brimfield Lake, Worcester County, M
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.