

Bay Colony Group, Inc.

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Storm Water Management Report Tanglewood Estates II Symphony Drive Extension Franklin, MA



December, 2025

Prepared for:

Cypress Real Estate Development, LLC
3 Rothchild Drive
Foxborough, MA 02035

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1.0 Introduction

The project involves the construction of a common driveway and two single-family homes on a 7.0 +/- acre parcel of land located beyond the end of the Symphony Drive cul-de-sac. The property is bordered by residential properties to the east, south and west and Town-owned land to the north. The property is located within the Rural Residential I Zoning District. **Figure 1** provides an extract from the USGS Franklin Quadrangle and shows the site locus.

Bay Colony Group, Inc. conducted a stormwater management study to ensure that the proposed project meets the stormwater standards outlined in the Town of Franklin Stormwater Management Bylaws and standard engineering practice. The project is not subject to the Massachusetts Stormwater Management Standards because the subdivision contains fewer than four lots, however, it will meet all applicable standards in accordance with the local Stormwater Management Bylaws. The scope of this study includes:

- Determining existing flood conditions and stormwater quality calculations and analysis;
- Developing proposed flood conditions and stormwater quality calculations and analysis;
- Designing a stormwater management system.

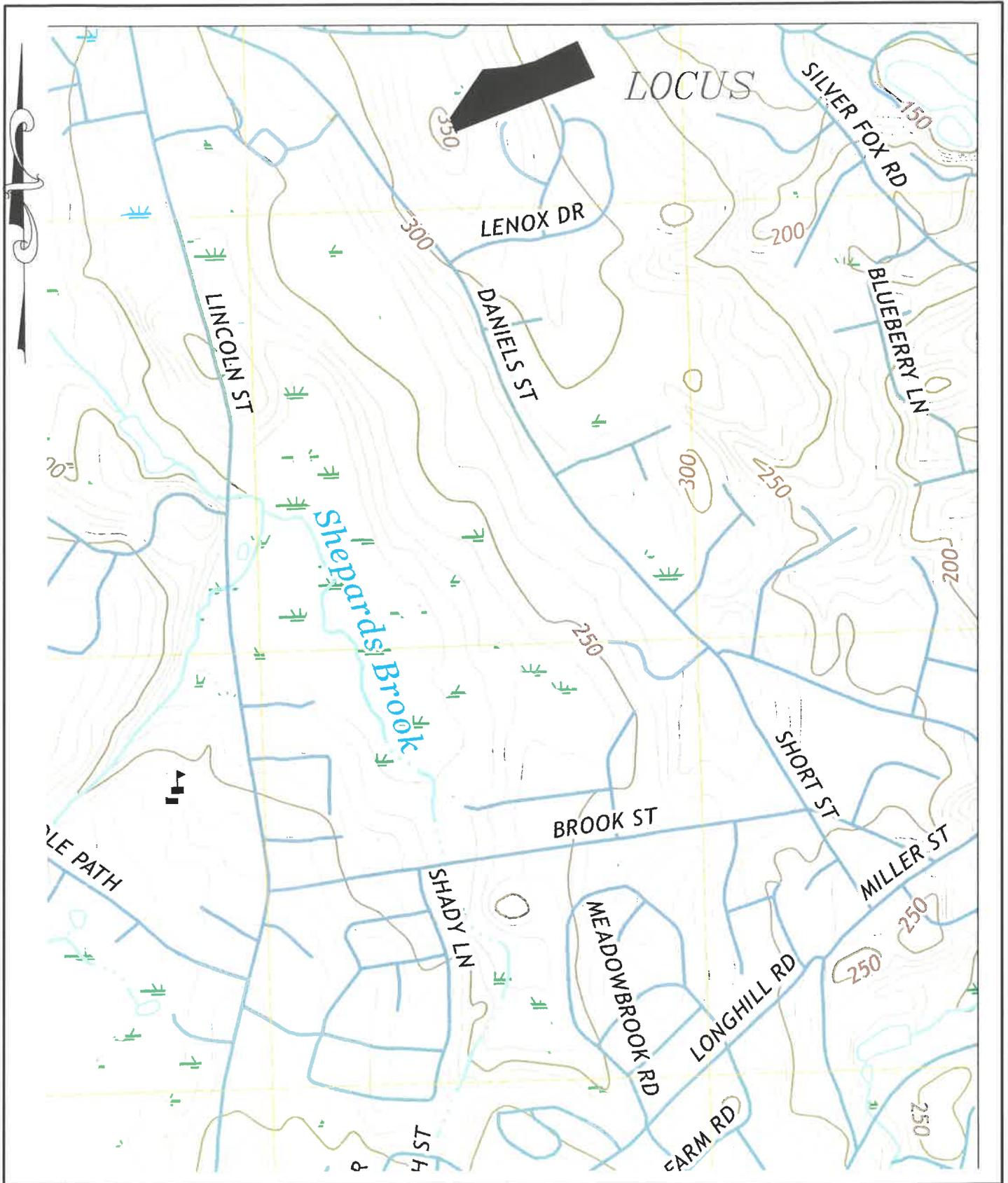
2.0 Existing Conditions

The site is located at the end of Symphony Drive and is listed as Assessor's Parcel No.218-020-00. The property is located on a hillside that generally slopes from west to east. The high point of the site is at approximately elevation 354 feet in the western portion of the property and slopes significantly to the east to approximately elevation 264 feet at the eastern property line. The property consists of an undeveloped wooded area. The site contains two Isolated Vegetated Wetlands (IVW) located in the eastern and western portions of the property.

The NRCS has mapped the soils on the site as Montauk fine sandy loam (**Appendix D**). Montauk soils are classified as Hydrologic Soil Group C. The wooded area on the site consists of a mixture of primary and secondary growth, including deciduous and coniferous trees. BCG conducted soil evaluations throughout the site to determine the general soil conditions, depth to groundwater and depth to refusal. The native soil identified at the proposed infiltration basin on Lot 2 is Loamy Sand. The RAWLS table provided in the DEP Stormwater Management Standards, Volume 3, Chapter 1 identifies an infiltration rate of 2.41 inches per hour for Loamy Sand. Copies of the basin soil logs and laboratory textural analyses are included in **Appendix D** and the locations of the test pits are shown on the existing conditions plan **Sheet 2**.

3.0 Flood Condition Analyses and Flood Control

The stormwater management system will consist of roof drainage, driveway drainage (runoff collection, pretreatment, and conveyance) and flood control and treatment. This report focuses on the stormwater basin design and the Town of Franklin performance standards. The proposed system will comply with all applicable requirements and will improve existing conditions.



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 FOXBOROUGH, MA 02035
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USGS QUADRANGLE EXTRACT
 SYMPHONY DRIVE
 FRANKLIN, MA
 FRANKLIN QUADRANGLE
 SCALE: 1" = 1000'

The proposed design will achieve runoff control through a multi-phase system that includes a detention basin (Drainage Basin #1) located in the western portion of the property and an infiltration basin (Drainage Basin #2) located in the eastern portion of the property. The basins will capture, treat and control runoff from the roof and driveway areas. All runoff from the pavement will be pretreated by stone trenches and sediment forebays before discharging to the basins. The basins have been designed to accommodate the 100-year storm event with six inches of freeboard. The system ensures that the post-development rate of runoff is less than the pre-development condition.

The current land uses consist of woodland and grass areas. The proposed land uses include single-family homes, driveways, lawns and remaining woods. The land uses for existing and proposed conditions are summarized in **Tables 1a** and **1b**. One study line was selected to develop the existing and proposed condition models. For the existing conditions, the watershed is molded as a single subarea. Subarea EA comprises the majority of the site and flows toward the eastern IVW. See the plan in **Appendix A – Existing Subareas**

Table 1a – Summary of Existing Land Uses

Subarea	Total Area (acre)	Land use	Area (acre)
EA	4.120	Woods, Good, HSG C	3.750
		>75% Grass cover, Good, HSG C	0.370
Total:	4.120		Total: 4.120

For proposed conditions, the watershed is divided into three separate subareas. Subarea PA represents the western portion of the site and drains to Drainage Basin #1. Subarea PB is located in the central portion of the site and drains to Drainage Basin #2. Subarea PC is located in the northern and eastern portion of the site and sheet flows to the IVW located in the eastern portion of the site. The proposed watershed area is larger than the existing watershed area due to changes in topography that direct more runoff toward the drainage system. See the plan in **Appendix A – Developed Subareas**

Table 1b – Summary of Proposed Land Uses

Subarea	Total Area (acre)	Land use	Area (acre)
PA	2.220	Roofs, HSG C	0.060
		Paved parking, HSG C	0.100
		>75% Grass cover, Good, HSG C	1.340
		Woods, Good, HSG C	0.720
PB	0.690	Roofs, HSG C	0.040
		Paved parking, HSG C	0.120
		>75% Grass cover, Good, HSG C	0.530
PC	1.380	Roofs, HSG C	0.040
		>75% Grass cover, Good, HSG C	0.760
		Woods, Good, HSG C	0.580
Total:	4.290		Total: 4.290

The runoff conditions derived from the land uses in **Tables 1a** and **1b** are summarized in **Table 2**. Detailed calculations are provided in **Appendix A**.

Table 2: Summary of Peak Runoff (cfs) at the Study Lines

Condition		2-year (cfs)	2-year (af)	10-year (cfs)	10-year (af)	100-year (cfs)	100-year (af)
Existing Conditions	Isolated Wetland	2.6	0.283	6.3	0.622	12.1	1.154
Proposed Conditions	Isolated Wetland	1.4	0.113	3.0	0.235	5.5	0.505

The detailed storm routing calculations are attached in **Appendix A**.

4.0 Stormwater Management

The site is not located within a groundwater protection district (Zone II). There are no private drinking water wells in proximity to the project site. There are no critical areas down-gradient of the project site based on 314 CMR 4.00 (Massachusetts Surface Water Quality Standards). There are no certified vernal pools in the vicinity of the site.

DEP STORMWATER MANAGEMENT STANDARDS

Standard #1: NO UNTREATED DISCHARGE OR EROSION TO WETLANDS

No untreated stormwater from the proposed project area will be discharged to a resource area. Runoff from all pavement will be discharged to stone trenches, then to sediment forebays and finally to the above-ground detention and infiltration basins. This treatment train will achieve a TSS removal rate of approximately 90%. The outfall has been designed to accept the 25-year storm flow from the basin without causing erosion in the wetlands or soils **Appendix B**.

Standard #2: PEAK RATE ATTENUATION

Stormwater controls have been designed for the 2-, 10-, and 100-year storms according with local regulations. Peak discharge rates are evaluated at a design point, typically the lowest point of discharge along the downgradient property line (Massachusetts Stormwater Handbook, Vol. 1, Ch. 1, P.5). The design ensures that the post-development peak runoff rates do not exceed pre-development rates at any design point. Proponents must also evaluate the impact of peak discharges from the 100-year storm event. If this evaluation shows that increased off-site flooding will result from peak discharge from the storm then BMPs must also attenuate that discharge (Massachusetts Stormwater Handbook, Vol. 1, Ch. 1, P.5). In this case, the post-development peak rates for the 100-year event are less than the pre-development condition everywhere **Table 2**.

Standard #3: STORMWATER RECHARGE

- 1) The project area is located on soils mapped as Hydrologic Soil Group C based on the NRCS soil survey. The target recharge depth for C soils is 0.25 inches. Due to the site consisting of C and D soils, the Required Recharge Volume (RRV) must be infiltrated to the maximum extent practicable. The RAWLS rate for Loamy Sand is 2.41 inches per hour and this rate will be used for the recharge calculations **Appendix B**.
- 2) The infiltration BMP that will be used will be the above ground infiltration basin **Appendix B**.
- 3) Using the RAWLS rates for the basin, the analysis shows that the drawdown time for the Required Recharge Volume is 0.3 hours, which meets the required 72 hours dewatering standard **Appendix B**.
- 4) A capture area adjustment is not necessary since 100% of the impervious area will be directed to the above-ground stormwater basin, which meets the 65% standard
- 5) A mounding analysis is not required because the Drainage Basin #1 as it is operating as a non-infiltrating BMP for the inflow and outflow analysis. A mounding analysis is necessary under Drainage Basin #2 per the DEP Stormwater standards since the vertical separation from the bottom of the basins and the estimated high ground water elevation is less than 4'. In accordance with the "Simple Dynamic" methodology, the RAWLS rate is used as the hydraulic conductivity and the mounding analysis assumes that the Required Recharge Volume is applied during a 2-hour period during the storm. The specific yield at the basins is based on the USDA Textural Analysis and USGS Water Supply Paper 1662-D **Appendix D**. The model used is the AQTESOLV V.4.50.002 program that uses the ground water mounding solution by Hantush (1967). The analysis found that the top of the mound is below the bottom of the basin. Therefore, the mound does not breach the bottom of the pond and will not impact the ability of the basin to drain within 72 hours as was previously discussed. **Appendix B**

Standard # 4: WATER QUALITY

- 1) The required water quality volume is based on 0.36 acres of impervious area and a 1.0-inch water quality depth, which yields a volume of 1,307 cubic feet or 0.0300 ac-ft. The Drainage Basin #2 can accommodate a volume of 9,714 cubic feet or 0.223 ac-ft prior to discharge **Appendix B**.
- 2) The BMPs used for the proposed project to improve water quality include: stone trenches, sediment forebays and stormwater basins. The estimated overall TSS removal is 90% **Appendix B**.
- 3) Since Drainage Basin #2 is being used to fulfill the requirements of Standards 3 and 4, it must handle the greater of the volumes. The basin provides a storage volume of 0.223 ac-

ft below discharge. The required recharge volume is 0.0075 ac-ft and the water quality volume is 0.0300 ac-ft **Appendix B**

Standard # 5: LAND USES WITH HIGHER POTENTIAL POLLUTION LOADS

The site will consist of a typical residential property, which is not considered to have a high potential pollutant load. The site will be compatible with the surrounding environment, which is a residential area.

Standard #6: CRITICAL AREAS

According to 314 CMR 14.400 and MASS MAPPER the project site does not contain any critical resource areas

Standard #7: REDEVELOPMENT

The proposed activity is not a redevelopment project

Standard #8: CONSTRUCTION PERIOD CONTROLS

Silt sock barriers will be installed at the downgradient limit of work before any excavation starts. A stone pad shall be spread at the entrance from the existing shared entrance to the project site to prevent mud from escaping the site during construction.

A Draft Stormwater Pollution Prevention Plan has been developed in accordance with the EPA General Permit for Construction Activities. A final SWPPP will be prepared once the construction schedule is finalized and the contractors are chosen. A copy of the Draft SWPPP is included in **Sheet 7**.

Standard #9: OPERATION AND MAINTENANCE PLAN

Pre- and Post-Development Operation and Maintenance Plans have been developed for the project **Appendix C**.

Standard # 10: ILLICIT DISCHARGES TO DRAINAGE SYSTEM

I certify to the best of my professional knowledge, information and belief that there are no illicit discharges to the stormwater management system, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease. The proposed systems as shown on the referenced plans do not allow entry of any illicit discharges into the system and there are no connections between the stormwater and wastewater management systems.

To be signed prior to construction
Owner _____

Date

**APPENDIX A – Pre- and Post-DEVELOPMENT ANALYSIS
AND STORM WATER POND DESIGNS**



PROJECT:
**Symphony Drive
 Extension**

**Franklin
 Massachusetts**

OWNER/APPLICANT:
**CYPRESS REAL
 ESTATE
 DEVELOPMENT LLC
 3 ROTHCHILD DRIVE
 FOXBOROUGH, MA
 02035**

Bay Colony Group, Inc.
 Professional Civil Engineers &
 Professional Land Surveyors

FOUR SCHOOL STREET
 P.O. BOX 9136
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 508-543-3939

STAMP

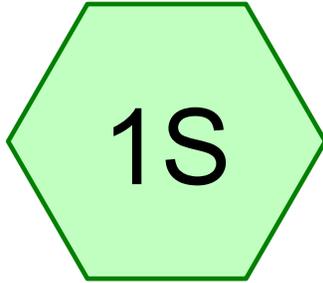
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Existing
 Subarea

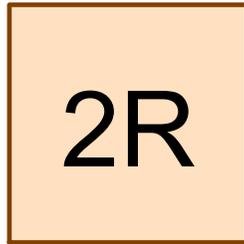
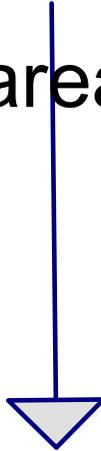
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DEC. 4, 2025 SHEET NUMBER

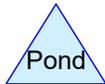
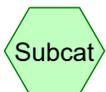
25-0108B **EX**



Subarea EA



Off site



Routing Diagram for 25-0108-Ex

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Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.370	74	>75% Grass cover, Good, HSG C (1S)
3.750	70	Woods, Good, HSG C (1S)
4.120	70	TOTAL AREA

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Page 3

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
4.120	HSG C	1S
0.000	HSG D	
0.000	Other	
4.120		TOTAL AREA

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Symphony Drive Franklin, MA
Type III 24-hr 2-Year Rainfall=3.20"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subarea EA

Runoff Area=4.120 ac 0.00% Impervious Runoff Depth>0.82"
Flow Length=648' Tc=15.6 min CN=70 Runoff=2.6 cfs 0.283 af

Reach 2R: Off site

Inflow=2.6 cfs 0.283 af
Outflow=2.6 cfs 0.283 af

Total Runoff Area = 4.120 ac Runoff Volume = 0.283 af Average Runoff Depth = 0.82"
100.00% Pervious = 4.120 ac 0.00% Impervious = 0.000 ac

25-0108-Ex

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Type III 24-hr 2-Year Rainfall=3.20"

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Summary for Subcatchment 1S: Subarea EA

Runoff = 2.6 cfs @ 12.25 hrs, Volume= 0.283 af, Depth> 0.82"
Routed to Reach 2R : Off site

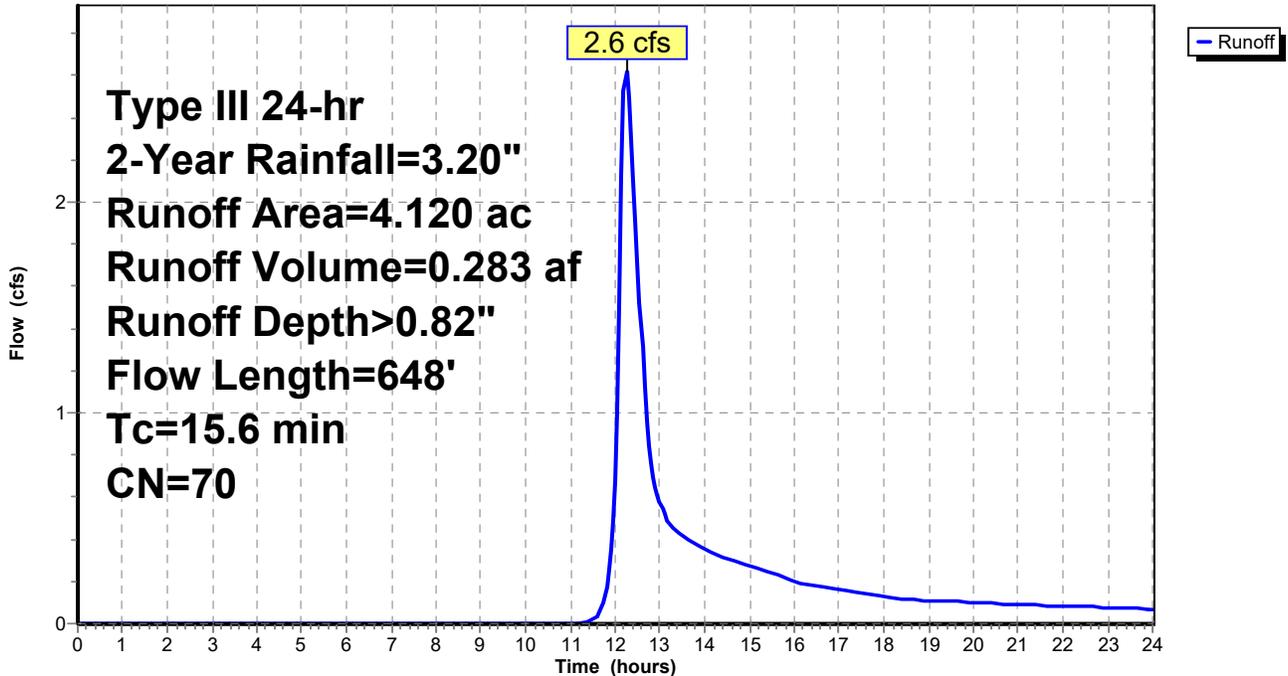
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (ac)	CN	Description
3.750	70	Woods, Good, HSG C
0.370	74	>75% Grass cover, Good, HSG C
4.120	70	Weighted Average
4.120		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	50	0.0420	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.3	118	0.0920	1.52		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.7	223	0.1880	2.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.4	257	0.0650	1.27		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.6	648	Total			

Subcatchment 1S: Subarea EA

Hydrograph



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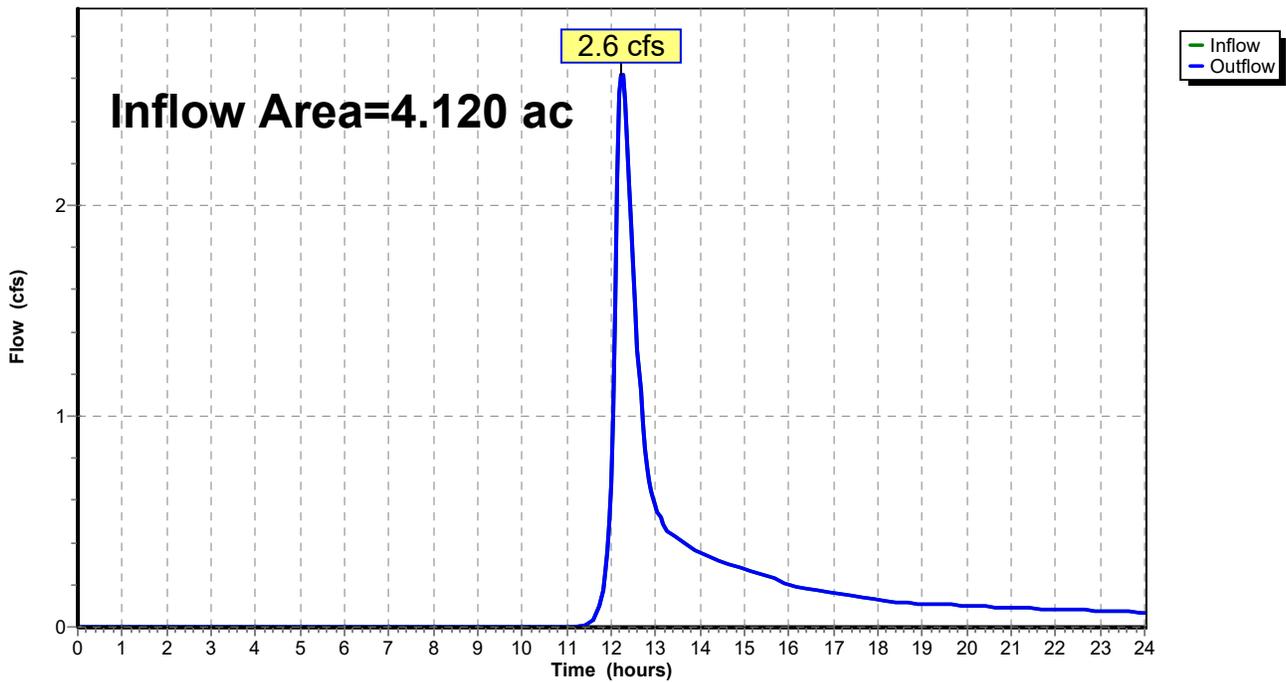
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Inflow Area = 4.120 ac, 0.00% Impervious, Inflow Depth > 0.82" for 2-Year event
Inflow = 2.6 cfs @ 12.25 hrs, Volume= 0.283 af
Outflow = 2.6 cfs @ 12.25 hrs, Volume= 0.283 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 2R: Off site

Hydrograph



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Symphony Drive Franklin, MA
Type III 24-hr 10-Year Rainfall=4.70"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subarea EA

Runoff Area=4.120 ac 0.00% Impervious Runoff Depth>1.81"
Flow Length=648' Tc=15.6 min CN=70 Runoff=6.3 cfs 0.622 af

Reach 2R: Off site

Inflow=6.3 cfs 0.622 af
Outflow=6.3 cfs 0.622 af

Total Runoff Area = 4.120 ac Runoff Volume = 0.622 af Average Runoff Depth = 1.81"
100.00% Pervious = 4.120 ac 0.00% Impervious = 0.000 ac

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Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 1S: Subarea EA

Runoff = 6.3 cfs @ 12.23 hrs, Volume= 0.622 af, Depth> 1.81"
Routed to Reach 2R : Off site

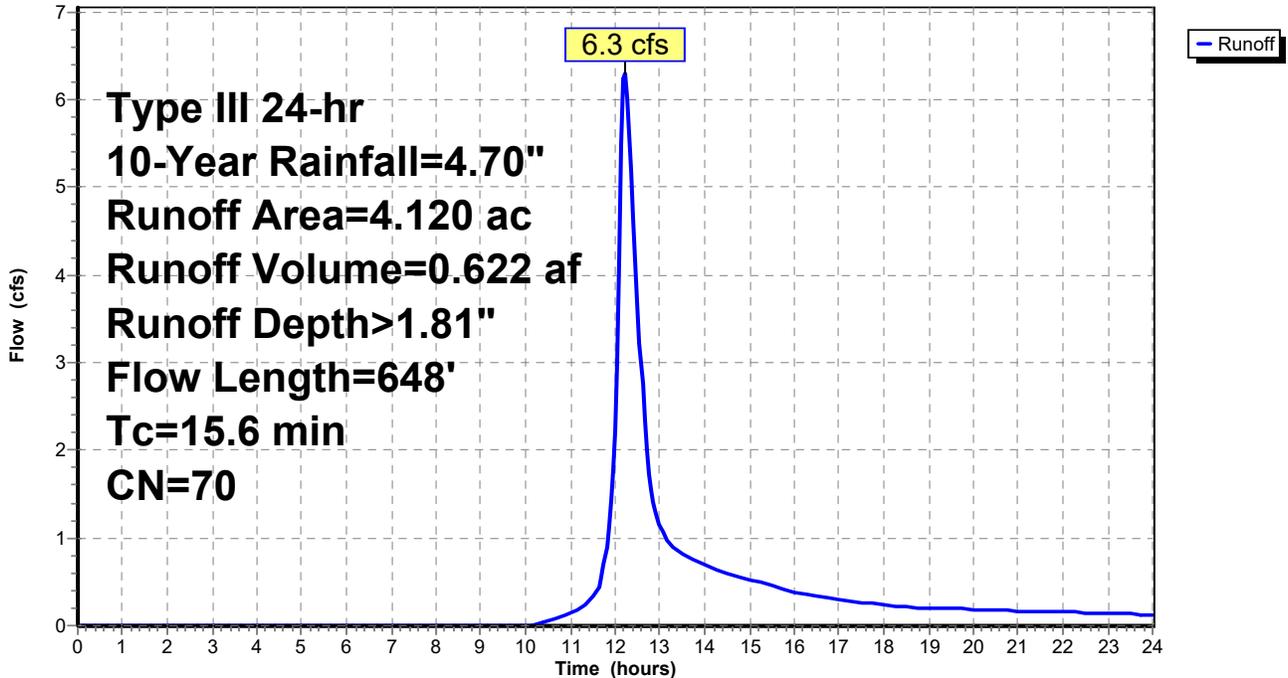
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Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
3.750	70	Woods, Good, HSG C
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4.120		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	50	0.0420	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
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15.6	648	Total			

Subcatchment 1S: Subarea EA

Hydrograph



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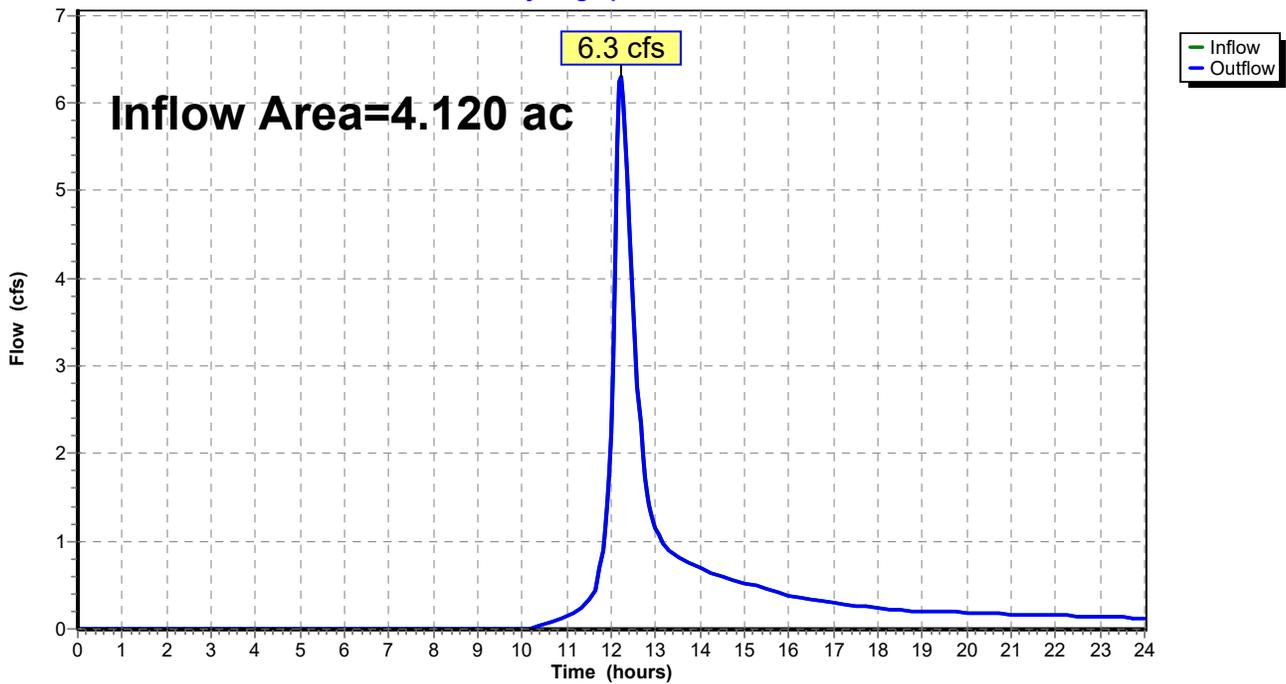
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Inflow = 6.3 cfs @ 12.23 hrs, Volume= 0.622 af
Outflow = 6.3 cfs @ 12.23 hrs, Volume= 0.622 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 2R: Off site

Hydrograph



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Subcatchment 1S: Subarea EA

Runoff Area=4.120 ac 0.00% Impervious Runoff Depth>3.36"
Flow Length=648' Tc=15.6 min CN=70 Runoff=12.1 cfs 1.154 af

Reach 2R: Off site

Inflow=12.1 cfs 1.154 af
Outflow=12.1 cfs 1.154 af

Total Runoff Area = 4.120 ac Runoff Volume = 1.154 af Average Runoff Depth = 3.36"
100.00% Pervious = 4.120 ac 0.00% Impervious = 0.000 ac

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Summary for Subcatchment 1S: Subarea EA

Runoff = 12.1 cfs @ 12.22 hrs, Volume= 1.154 af, Depth> 3.36"
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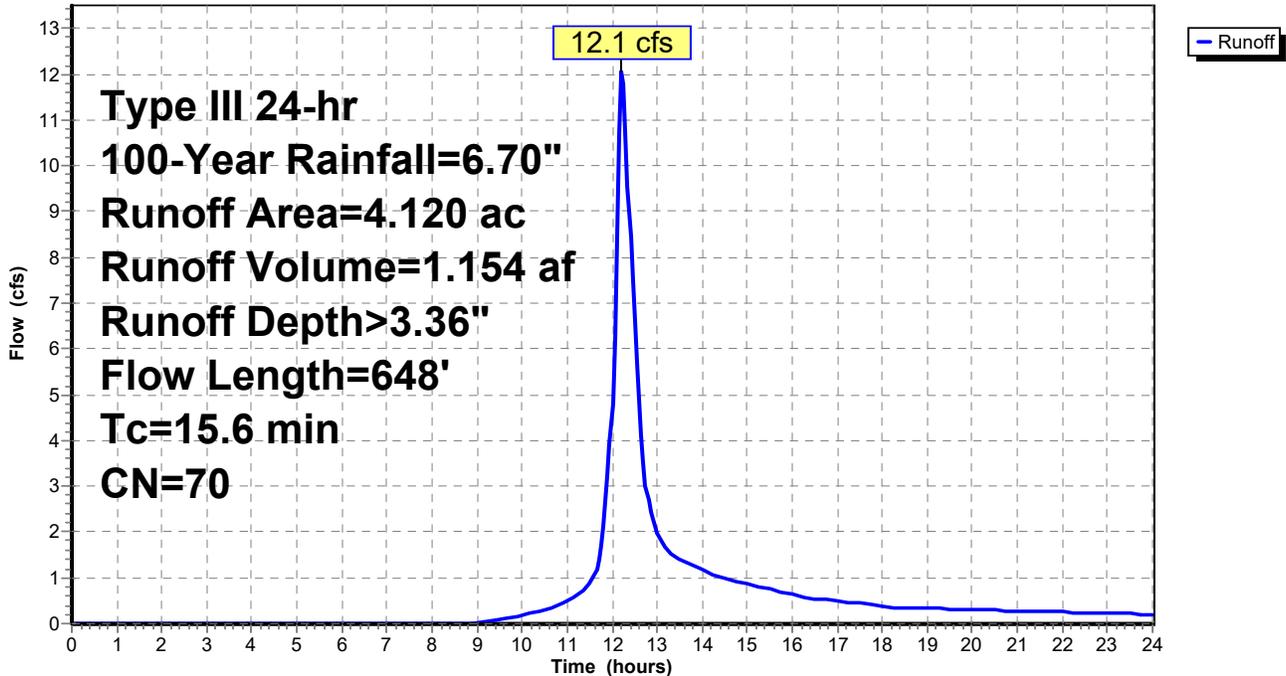
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (ac)	CN	Description
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0.370	74	>75% Grass cover, Good, HSG C
4.120	70	Weighted Average
4.120		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	50	0.0420	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
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15.6	648	Total			

Subcatchment 1S: Subarea EA

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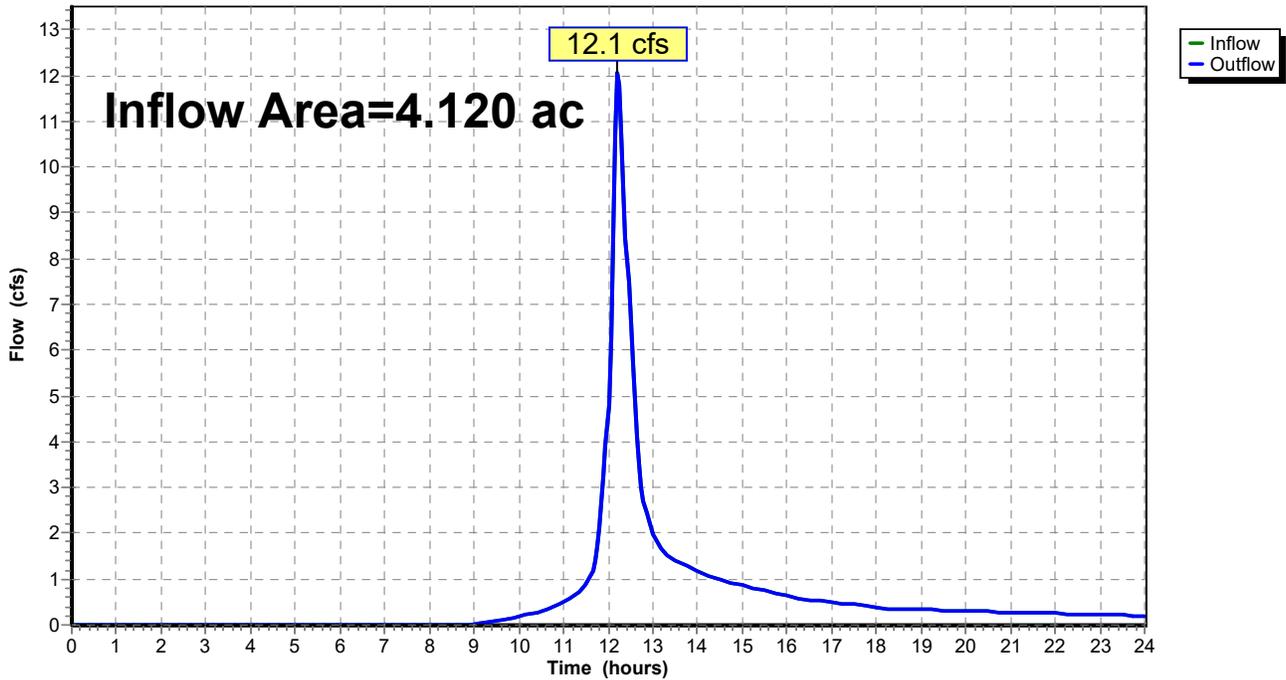
Summary for Reach 2R: Off site

Inflow Area = 4.120 ac, 0.00% Impervious, Inflow Depth > 3.36" for 100-Year event
Inflow = 12.1 cfs @ 12.22 hrs, Volume= 1.154 af
Outflow = 12.1 cfs @ 12.22 hrs, Volume= 1.154 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 2R: Off site

Hydrograph



25-0108-Ex

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Symphony Drive Franklin, MA

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- 1 Routing Diagram
- 2 Area Listing (all nodes)
- 3 Soil Listing (all nodes)

2-Year Event

- 4 Node Listing
- 5 Subcat 1S: Subarea EA
- 6 Reach 2R: Off site

10-Year Event

- 7 Node Listing
- 8 Subcat 1S: Subarea EA
- 9 Reach 2R: Off site

100-Year Event

- 10 Node Listing
- 11 Subcat 1S: Subarea EA
- 12 Reach 2R: Off site

PROJECT:

Symphony Drive Extension

Franklin
Massachusetts

OWNER/APPLICANT:

CYPRESS REAL
ESTATE
DEVELOPMENT LLC
3 ROTHCHILD DRIVE
FOXBOROUGH, MA
02035



FOUR SCHOOL STREET
P.O. BOX 9136
FOXBOROUGH, MA 02035
508-543-3939

STAMP

DRAWING TITLE

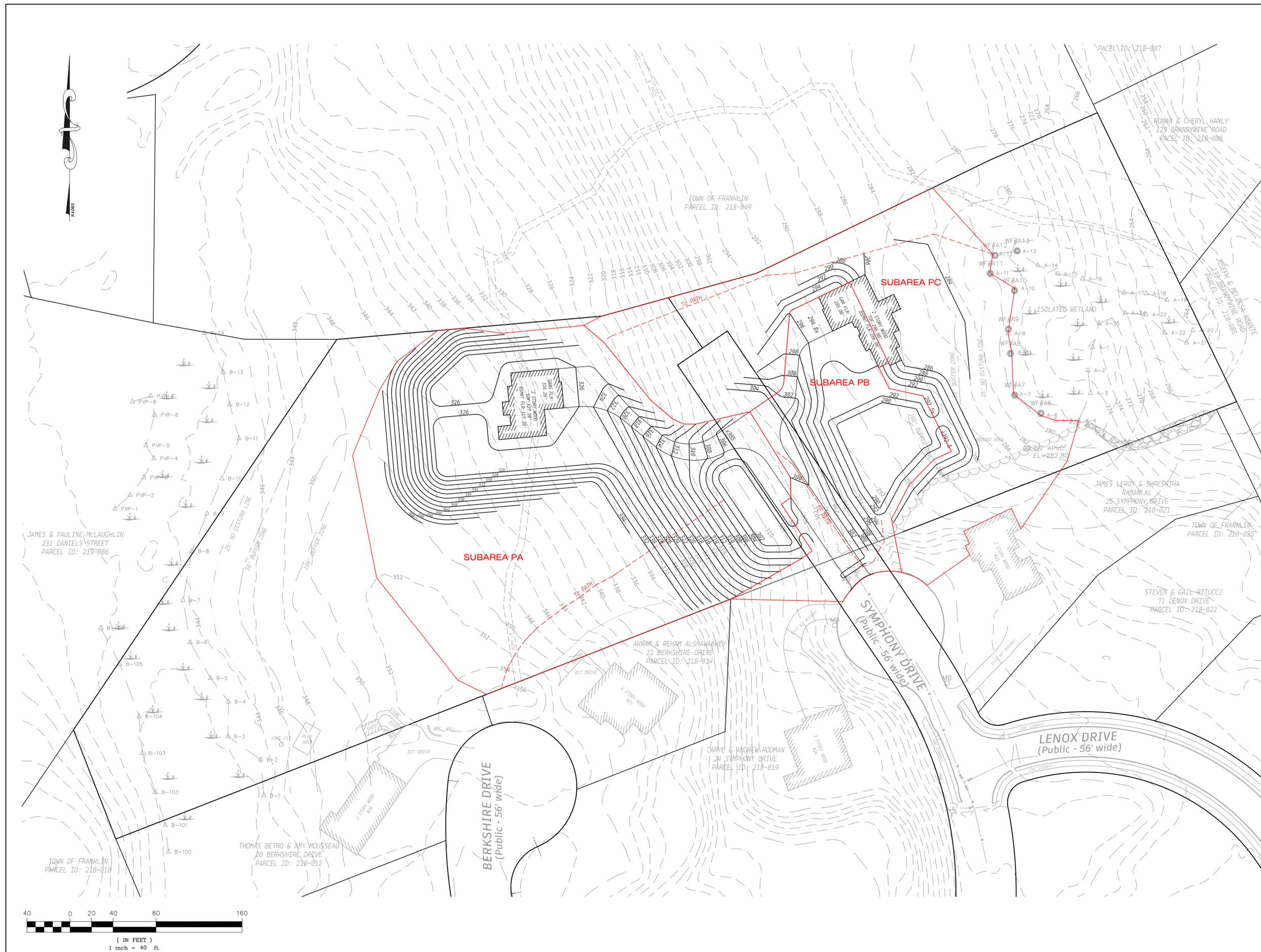
Proposed
Subarea

SCALE: 1" = 40'

DEC. 4, 2025 SHEET NUMBER

25-0108B

PR





Subarea PA



Subarea PB



Subarea PC



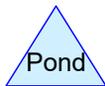
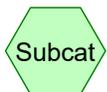
Detention Pond



Infiltration Pond



Isolated Wetland



Routing Diagram for 25-0108-Pr

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.630	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S)
0.220	98	Paved parking, HSG C (1S, 2S)
0.140	98	Roofs, HSG C (1S, 2S, 3S)
1.300	70	Woods, Good, HSG C (1S, 3S)
4.290	75	TOTAL AREA

25-0108-Pr

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
4.290	HSG C	1S, 2S, 3S
0.000	HSG D	
0.000	Other	
4.290		TOTAL AREA

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Symphony Drive Franklin, MA
Type III 24-hr 2-Year Rainfall=3.20"
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Page 16

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subarea PA

Runoff Area=2.220 ac 7.21% Impervious Runoff Depth>1.04"
Flow Length=276' Tc=7.5 min CN=74 Runoff=2.4 cfs 0.192 af

Subcatchment 2S: Subarea PB

Runoff Area=0.690 ac 23.19% Impervious Runoff Depth>1.40"
Flow Length=187' Tc=6.0 min CN=80 Runoff=1.1 cfs 0.081 af

Subcatchment 3S: Subarea PC

Runoff Area=1.380 ac 2.90% Impervious Runoff Depth>0.98"
Flow Length=379' Tc=8.0 min CN=73 Runoff=1.4 cfs 0.113 af

Reach 6R: Isolated Wetland

Inflow=1.4 cfs 0.113 af
Outflow=1.4 cfs 0.113 af

Pond 4P: Detention Pond

Peak Elev=302.68' Storage=0.037 af Inflow=2.4 cfs 0.192 af
18.0" Round Culvert n=0.012 L=62.0' S=0.0661 '/' Outflow=1.5 cfs 0.182 af

Pond 5P: Infiltration Pond

Peak Elev=290.32' Storage=0.036 af Inflow=2.1 cfs 0.262 af
Discarded=1.1 cfs 0.262 af Primary=0.0 cfs 0.000 af Outflow=1.1 cfs 0.262 af

Total Runoff Area = 4.290 ac Runoff Volume = 0.385 af Average Runoff Depth = 1.08"
91.61% Pervious = 3.930 ac 8.39% Impervious = 0.360 ac

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Symphony Drive Franklin, MA
Type III 24-hr 2-Year Rainfall=3.20"

Printed 12/12/2025

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Summary for Subcatchment 1S: Subarea PA

Runoff = 2.4 cfs @ 12.12 hrs, Volume= 0.192 af, Depth> 1.04"
 Routed to Pond 4P : Detention Pond

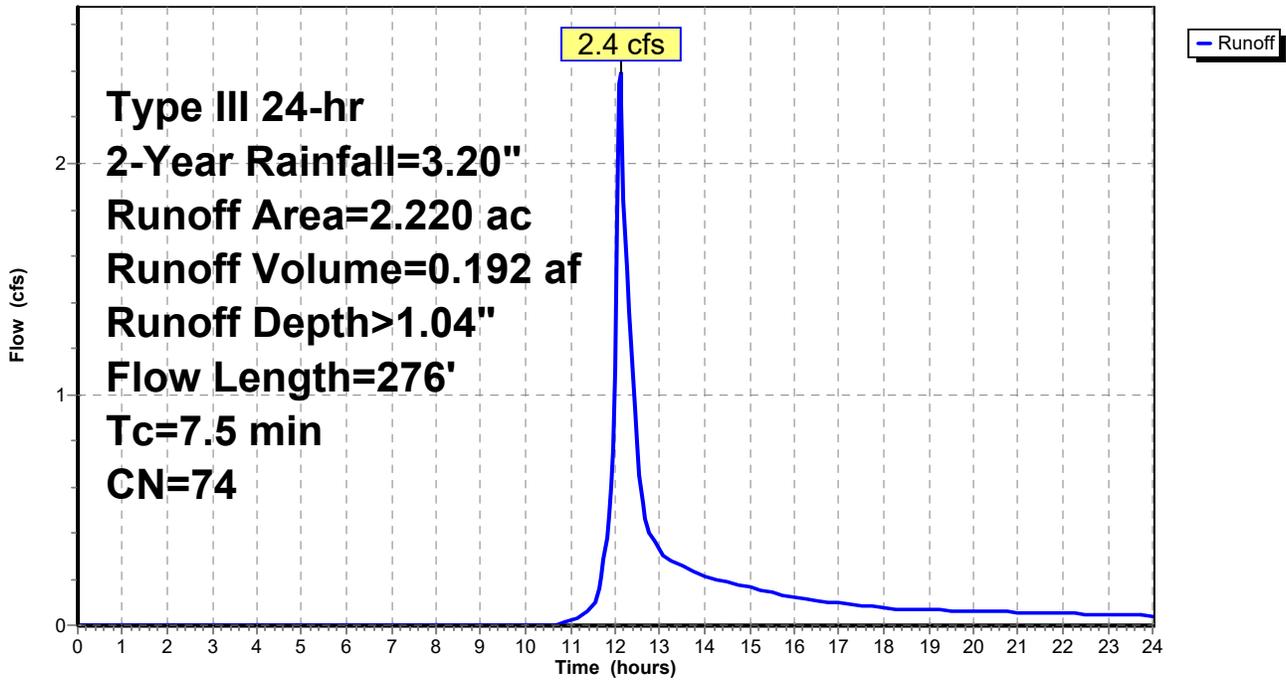
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.20"

Area (ac)	CN	Description
0.060	98	Roofs, HSG C
0.100	98	Paved parking, HSG C
1.340	74	>75% Grass cover, Good, HSG C
0.720	70	Woods, Good, HSG C
2.220	74	Weighted Average
2.060		92.79% Pervious Area
0.160		7.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1220	0.14		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	107	0.1210	1.74		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.5	119	0.2770	3.68		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
7.5	276	Total			

Subcatchment 1S: Subarea PA

Hydrograph



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Symphony Drive Franklin, MA
Type III 24-hr 2-Year Rainfall=3.20"

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Summary for Subcatchment 2S: Subarea PB

Runoff = 1.1 cfs @ 12.10 hrs, Volume= 0.081 af, Depth> 1.40"
Routed to Pond 5P : Infiltration Pond

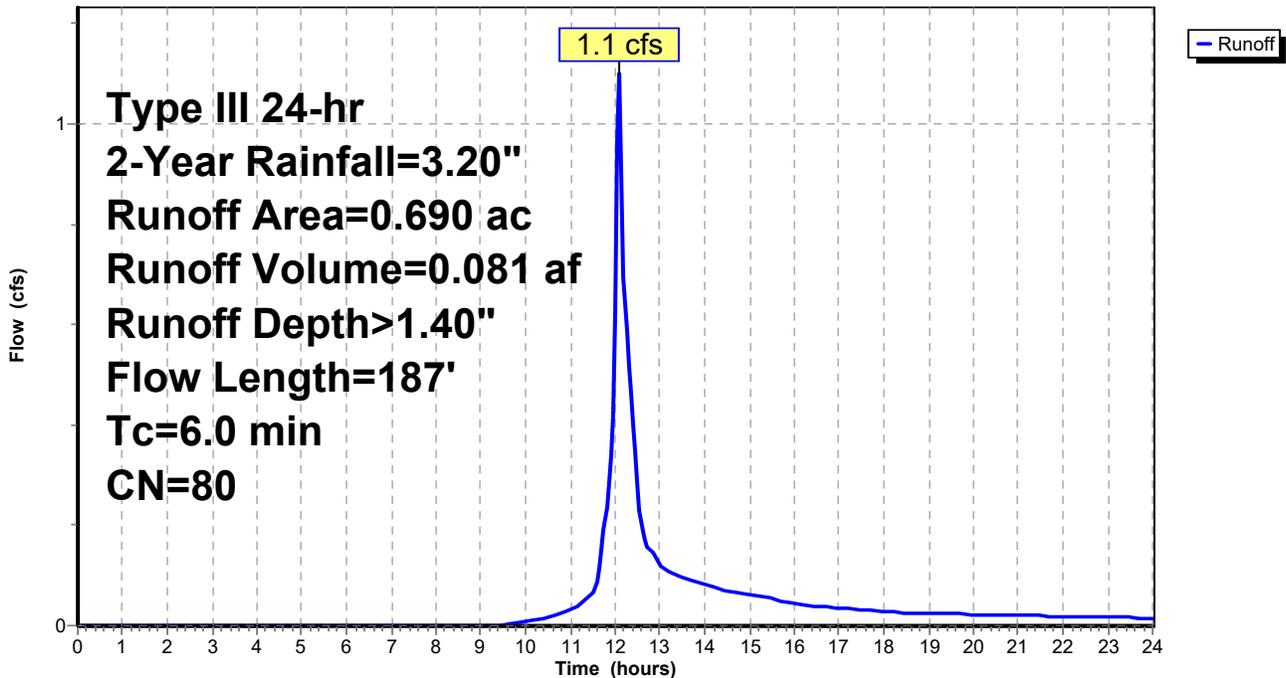
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (ac)	CN	Description
0.040	98	Roofs, HSG C
0.120	98	Paved parking, HSG C
0.530	74	>75% Grass cover, Good, HSG C
0.690	80	Weighted Average
0.530		76.81% Pervious Area
0.160		23.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
0.5	85	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.3	52	0.1940	3.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.5	187	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Subarea PB

Hydrograph



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Symphony Drive Franklin, MA
Type III 24-hr 2-Year Rainfall=3.20"

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Summary for Subcatchment 3S: Subarea PC

Runoff = 1.4 cfs @ 12.13 hrs, Volume= 0.113 af, Depth> 0.98"
Routed to Reach 6R : Isolated Wetland

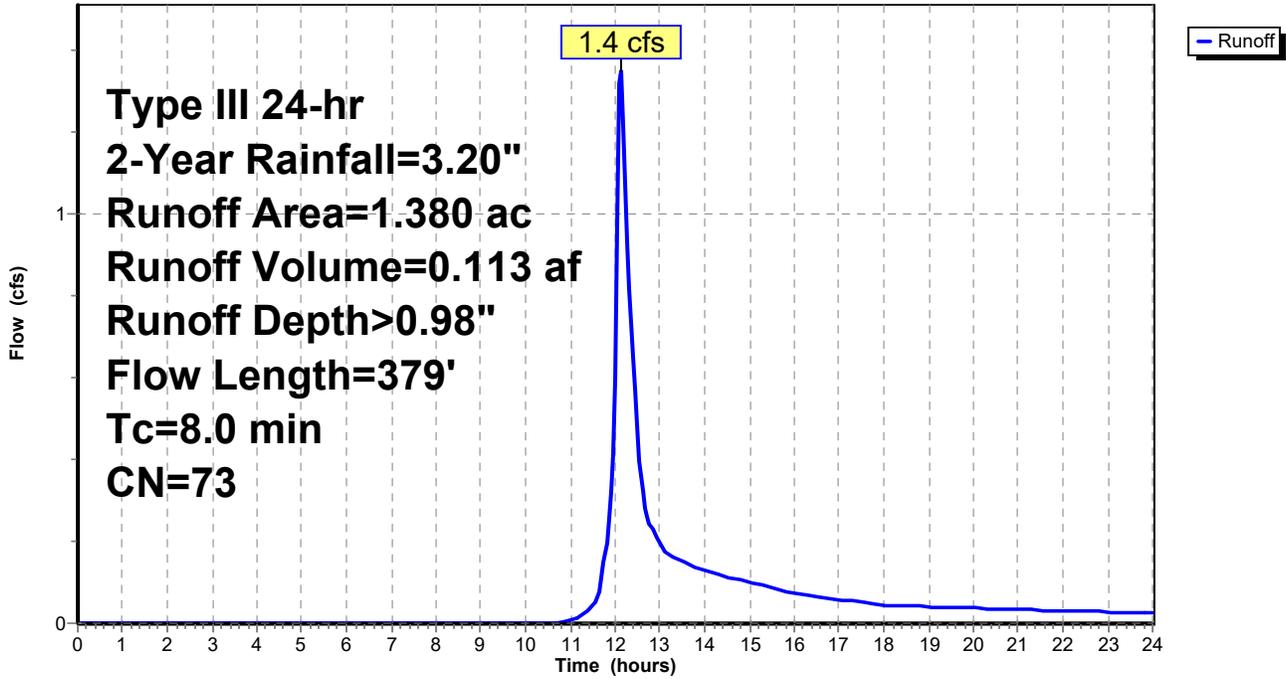
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (ac)	CN	Description
0.040	98	Roofs, HSG C
0.760	74	>75% Grass cover, Good, HSG C
0.580	70	Woods, Good, HSG C
1.380	73	Weighted Average
1.340		97.10% Pervious Area
0.040		2.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.2220	0.18		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	110	0.1800	2.12		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.5	148	0.0540	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.9	71	0.0630	1.25		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.0	379	Total			

Subcatchment 3S: Subarea PC

Hydrograph



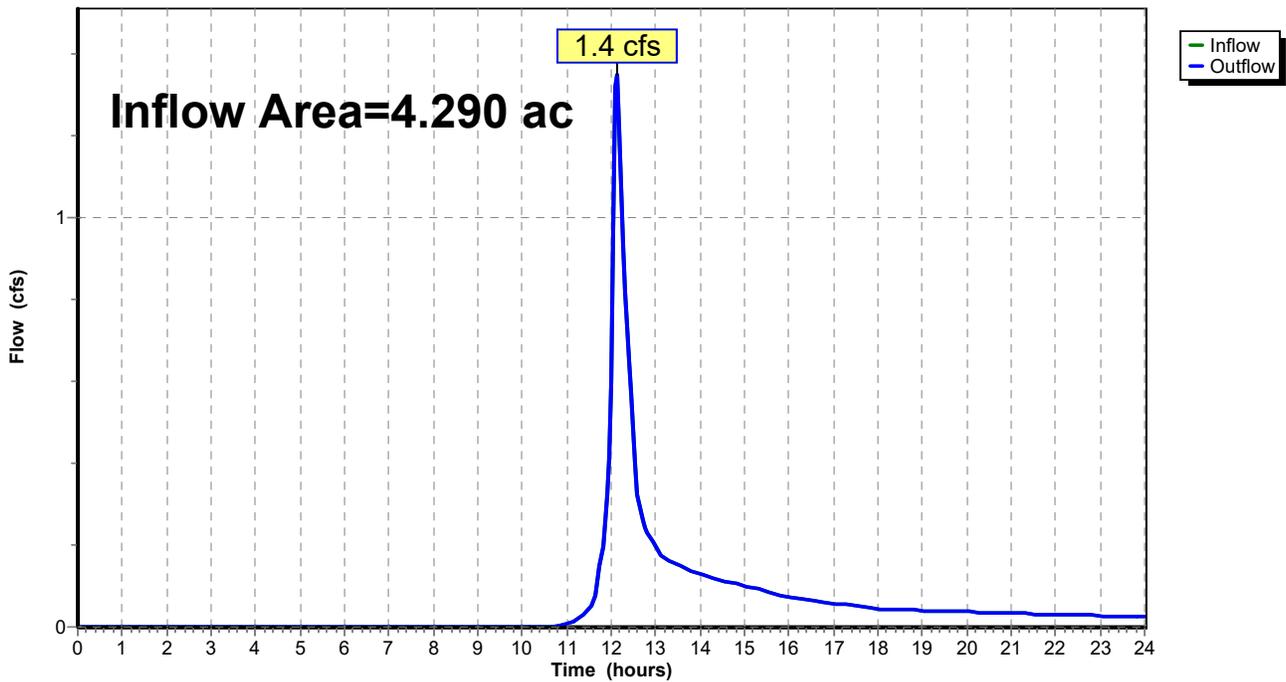
Summary for Reach 6R: Isolated Wetland

Inflow Area = 4.290 ac, 8.39% Impervious, Inflow Depth > 0.32" for 2-Year event
Inflow = 1.4 cfs @ 12.13 hrs, Volume= 0.113 af
Outflow = 1.4 cfs @ 12.13 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 6R: Isolated Wetland

Hydrograph



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Symphony Drive Franklin, MA
Type III 24-hr 2-Year Rainfall=3.20"

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Summary for Pond 4P: Detention Pond

Inflow Area = 2.220 ac, 7.21% Impervious, Inflow Depth > 1.04" for 2-Year event
Inflow = 2.4 cfs @ 12.12 hrs, Volume= 0.192 af
Outflow = 1.5 cfs @ 12.27 hrs, Volume= 0.182 af, Atten= 39%, Lag= 9.4 min
Primary = 1.5 cfs @ 12.27 hrs, Volume= 0.182 af
Routed to Pond 5P : Infiltration Pond

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 302.68' @ 12.27 hrs Surf.Area= 0.059 ac Storage= 0.037 af

Plug-Flow detention time= 52.9 min calculated for 0.181 af (95% of inflow)
Center-of-Mass det. time= 25.6 min (888.2 - 862.5)

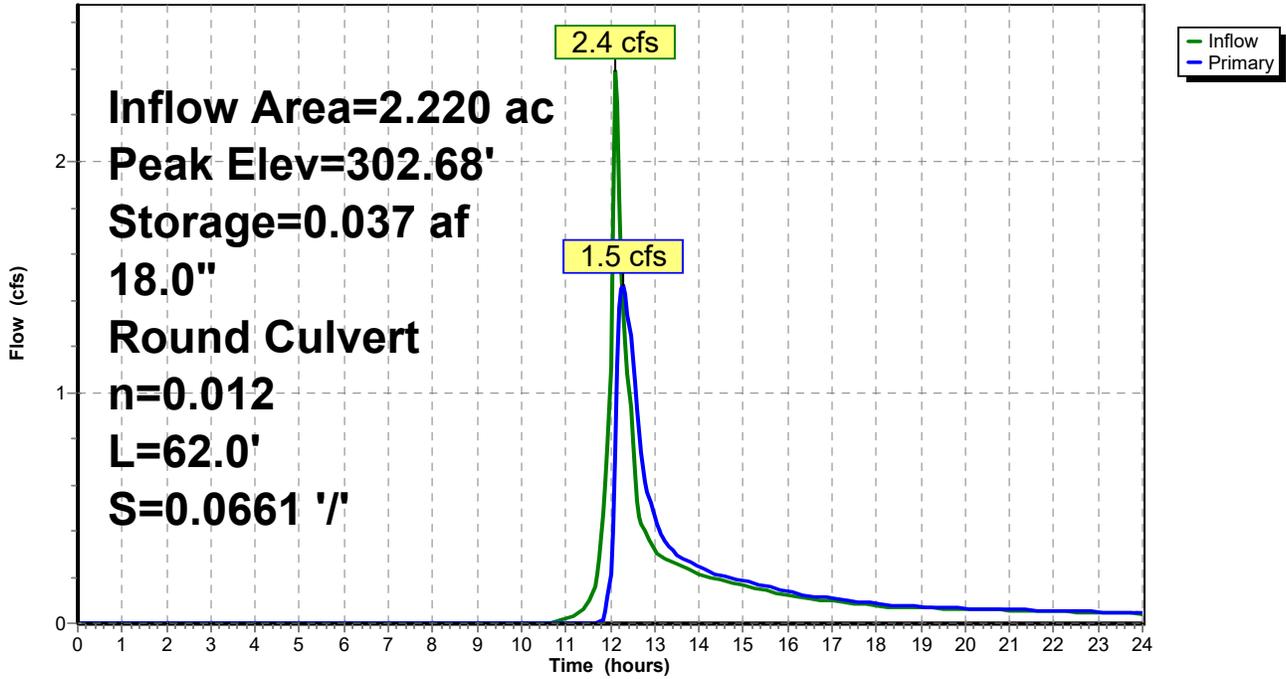
Volume	Invert	Avail.Storage	Storage Description		
#1	302.00'	0.129 af	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
302.00	0.050	215.0	0.000	0.000	0.050
304.00	0.080	264.0	0.129	0.129	0.094

Device	Routing	Invert	Outlet Devices
#1	Primary	302.10'	18.0" Round Culvert L= 62.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 302.10' / 298.00' S= 0.0661 ' S Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.5 cfs @ 12.27 hrs HW=302.68' (Free Discharge)
↑1=Culvert (Inlet Controls 1.5 cfs @ 2.29 fps)

Pond 4P: Detention Pond

Hydrograph



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Symphony Drive Franklin, MA
Type III 24-hr 2-Year Rainfall=3.20"

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Stage-Area-Storage for Pond 4P: Detention Pond

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
302.00	0.050	0.000	303.04	0.065	0.059
302.02	0.050	0.001	303.06	0.065	0.061
302.04	0.051	0.002	303.08	0.065	0.062
302.06	0.051	0.003	303.10	0.066	0.063
302.08	0.051	0.004	303.12	0.066	0.065
302.10	0.051	0.005	303.14	0.066	0.066
302.12	0.052	0.006	303.16	0.067	0.067
302.14	0.052	0.007	303.18	0.067	0.069
302.16	0.052	0.008	303.20	0.067	0.070
302.18	0.052	0.009	303.22	0.067	0.071
302.20	0.053	0.010	303.24	0.068	0.073
302.22	0.053	0.011	303.26	0.068	0.074
302.24	0.053	0.012	303.28	0.068	0.075
302.26	0.054	0.013	303.30	0.069	0.077
302.28	0.054	0.015	303.32	0.069	0.078
302.30	0.054	0.016	303.34	0.069	0.080
302.32	0.054	0.017	303.36	0.070	0.081
302.34	0.055	0.018	303.38	0.070	0.082
302.36	0.055	0.019	303.40	0.070	0.084
302.38	0.055	0.020	303.42	0.071	0.085
302.40	0.055	0.021	303.44	0.071	0.087
302.42	0.056	0.022	303.46	0.071	0.088
302.44	0.056	0.023	303.48	0.072	0.089
302.46	0.056	0.024	303.50	0.072	0.091
302.48	0.057	0.026	303.52	0.072	0.092
302.50	0.057	0.027	303.54	0.072	0.094
302.52	0.057	0.028	303.56	0.073	0.095
302.54	0.057	0.029	303.58	0.073	0.097
302.56	0.058	0.030	303.60	0.073	0.098
302.58	0.058	0.031	303.62	0.074	0.100
302.60	0.058	0.032	303.64	0.074	0.101
302.62	0.059	0.034	303.66	0.074	0.103
302.64	0.059	0.035	303.68	0.075	0.104
302.66	0.059	0.036	303.70	0.075	0.106
302.68	0.059	0.037	303.72	0.075	0.107
302.70	0.060	0.038	303.74	0.076	0.109
302.72	0.060	0.040	303.76	0.076	0.110
302.74	0.060	0.041	303.78	0.076	0.112
302.76	0.061	0.042	303.80	0.077	0.113
302.78	0.061	0.043	303.82	0.077	0.115
302.80	0.061	0.044	303.84	0.077	0.116
302.82	0.061	0.046	303.86	0.078	0.118
302.84	0.062	0.047	303.88	0.078	0.119
302.86	0.062	0.048	303.90	0.078	0.121
302.88	0.062	0.049	303.92	0.079	0.122
302.90	0.063	0.051	303.94	0.079	0.124
302.92	0.063	0.052	303.96	0.079	0.126
302.94	0.063	0.053	303.98	0.080	0.127
302.96	0.064	0.054	304.00	0.080	0.129
302.98	0.064	0.056			
303.00	0.064	0.057			
303.02	0.064	0.058			

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Symphony Drive Franklin, MA
Type III 24-hr 2-Year Rainfall=3.20"

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Summary for Pond 5P: Infiltration Pond

Inflow Area = 2.910 ac, 11.00% Impervious, Inflow Depth > 1.08" for 2-Year event
 Inflow = 2.1 cfs @ 12.20 hrs, Volume= 0.262 af
 Outflow = 1.1 cfs @ 12.62 hrs, Volume= 0.262 af, Atten= 48%, Lag= 24.7 min
 Discarded = 1.1 cfs @ 12.62 hrs, Volume= 0.262 af
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Reach 6R : Isolated Wetland

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 290.32' @ 12.62 hrs Surf.Area= 0.115 ac Storage= 0.036 af

Plug-Flow detention time= 8.9 min calculated for 0.261 af (100% of inflow)
 Center-of-Mass det. time= 8.5 min (882.6 - 874.0)

Volume	Invert	Avail.Storage	Storage Description		
#1	290.00'	0.339 af	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
290.00	0.109	220.0	0.000	0.000	0.109
292.00	0.152	331.0	0.260	0.260	0.221
292.50	0.164	340.0	0.079	0.339	0.233

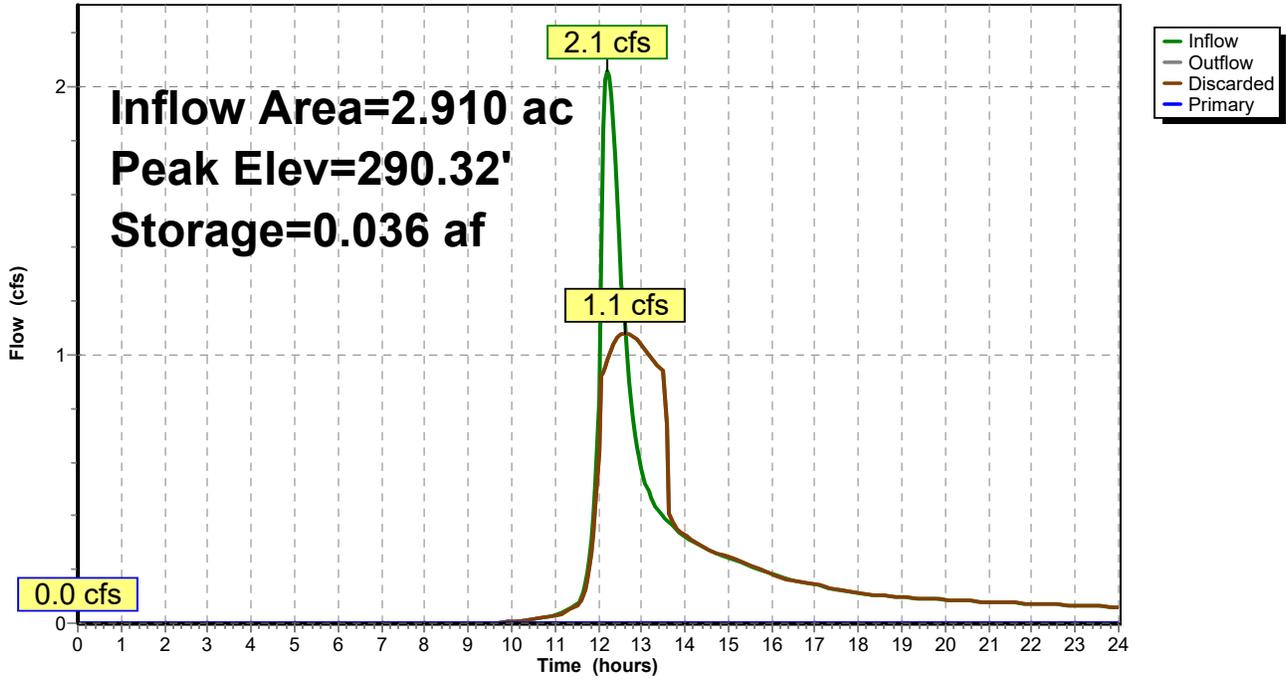
Device	Routing	Invert	Outlet Devices
#1	Discarded	290.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 287.50'
#2	Primary	291.75'	10.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=1.1 cfs @ 12.62 hrs HW=290.32' (Free Discharge)
 ↑1=Exfiltration (Controls 1.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=290.00' (Free Discharge)
 ↑2=Sharp-Crested Rectangular Weir (Controls 0.0 cfs)

Pond 5P: Infiltration Pond

Hydrograph



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Symphony Drive Franklin, MA
Type III 24-hr 2-Year Rainfall=3.20"

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Stage-Area-Storage for Pond 5P: Infiltration Pond

Elevation (feet)	Surface (acres)	Storage (acre-feet)
290.00	0.109	0.000
290.05	0.110	0.005
290.10	0.111	0.011
290.15	0.112	0.017
290.20	0.113	0.022
290.25	0.114	0.028
290.30	0.115	0.034
290.35	0.116	0.039
290.40	0.117	0.045
290.45	0.118	0.051
290.50	0.119	0.057
290.55	0.120	0.063
290.60	0.121	0.069
290.65	0.122	0.075
290.70	0.123	0.081
290.75	0.124	0.087
290.80	0.125	0.094
290.85	0.126	0.100
290.90	0.127	0.106
290.95	0.129	0.113
291.00	0.130	0.119
291.05	0.131	0.126
291.10	0.132	0.132
291.15	0.133	0.139
291.20	0.134	0.146
291.25	0.135	0.152
291.30	0.136	0.159
291.35	0.137	0.166
291.40	0.138	0.173
291.45	0.139	0.180
291.50	0.141	0.187
291.55	0.142	0.194
291.60	0.143	0.201
291.65	0.144	0.208
291.70	0.145	0.215
291.75	0.146	0.223
291.80	0.147	0.230
291.85	0.149	0.237
291.90	0.150	0.245
291.95	0.151	0.252
292.00	0.152	0.260
292.05	0.153	0.267
292.10	0.154	0.275
292.15	0.156	0.283
292.20	0.157	0.291
292.25	0.158	0.299
292.30	0.159	0.306
292.35	0.160	0.314
292.40	0.162	0.323
292.45	0.163	0.331
292.50	0.164	0.339

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Symphony Drive Franklin, MA
Type III 24-hr 10-Year Rainfall=4.70"
Printed 12/12/2025
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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subarea PA

Runoff Area=2.220 ac 7.21% Impervious Runoff Depth>2.12"
Flow Length=276' Tc=7.5 min CN=74 Runoff=5.1 cfs 0.393 af

Subcatchment 2S: Subarea PB

Runoff Area=0.690 ac 23.19% Impervious Runoff Depth>2.63"
Flow Length=187' Tc=6.0 min CN=80 Runoff=2.1 cfs 0.151 af

Subcatchment 3S: Subarea PC

Runoff Area=1.380 ac 2.90% Impervious Runoff Depth>2.04"
Flow Length=379' Tc=8.0 min CN=73 Runoff=3.0 cfs 0.235 af

Reach 6R: Isolated Wetland

Inflow=3.0 cfs 0.235 af
Outflow=3.0 cfs 0.235 af

Pond 4P: Detention Pond

Peak Elev=303.09' Storage=0.063 af Inflow=5.1 cfs 0.393 af
18.0" Round Culvert n=0.012 L=62.0' S=0.0661 '/' Outflow=3.7 cfs 0.381 af

Pond 5P: Infiltration Pond

Peak Elev=291.16' Storage=0.140 af Inflow=5.1 cfs 0.533 af
Discarded=1.6 cfs 0.532 af Primary=0.0 cfs 0.000 af Outflow=1.6 cfs 0.532 af

Total Runoff Area = 4.290 ac Runoff Volume = 0.779 af Average Runoff Depth = 2.18"
91.61% Pervious = 3.930 ac 8.39% Impervious = 0.360 ac

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Symphony Drive Franklin, MA
Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 1S: Subarea PA

Runoff = 5.1 cfs @ 12.11 hrs, Volume= 0.393 af, Depth> 2.12"
Routed to Pond 4P : Detention Pond

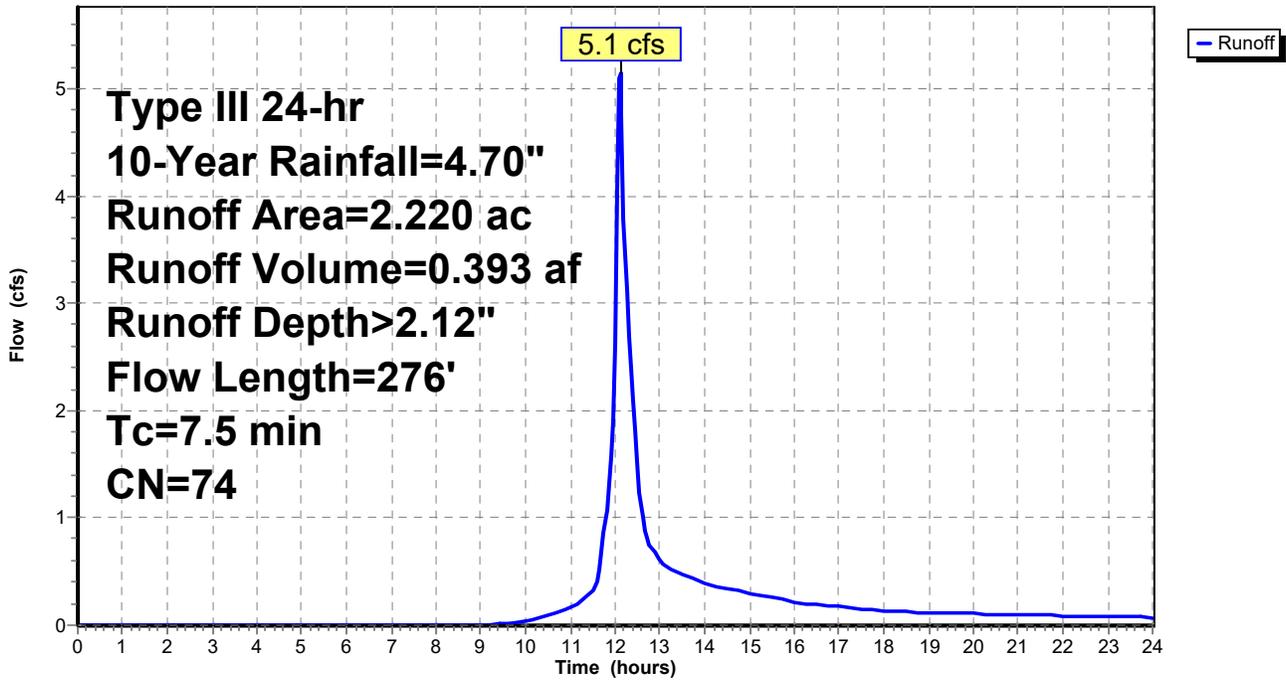
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
0.060	98	Roofs, HSG C
0.100	98	Paved parking, HSG C
1.340	74	>75% Grass cover, Good, HSG C
0.720	70	Woods, Good, HSG C
2.220	74	Weighted Average
2.060		92.79% Pervious Area
0.160		7.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1220	0.14		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	107	0.1210	1.74		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.5	119	0.2770	3.68		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
7.5	276	Total			

Subcatchment 1S: Subarea PA

Hydrograph



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Symphony Drive Franklin, MA
 Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 2S: Subarea PB

Runoff = 2.1 cfs @ 12.09 hrs, Volume= 0.151 af, Depth> 2.63"
 Routed to Pond 5P : Infiltration Pond

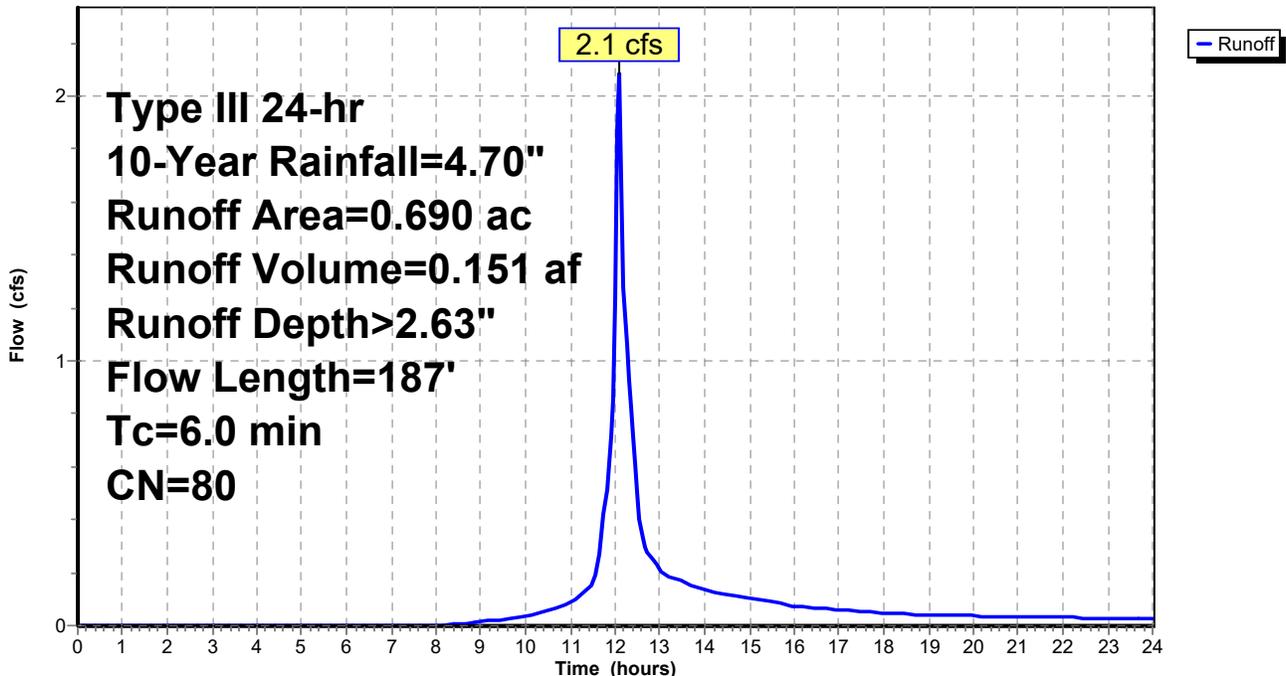
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
0.040	98	Roofs, HSG C
0.120	98	Paved parking, HSG C
0.530	74	>75% Grass cover, Good, HSG C
0.690	80	Weighted Average
0.530		76.81% Pervious Area
0.160		23.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
0.5	85	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.3	52	0.1940	3.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.5	187	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Subarea PB

Hydrograph



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Symphony Drive Franklin, MA
Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 3S: Subarea PC

Runoff = 3.0 cfs @ 12.12 hrs, Volume= 0.235 af, Depth> 2.04"
Routed to Reach 6R : Isolated Wetland

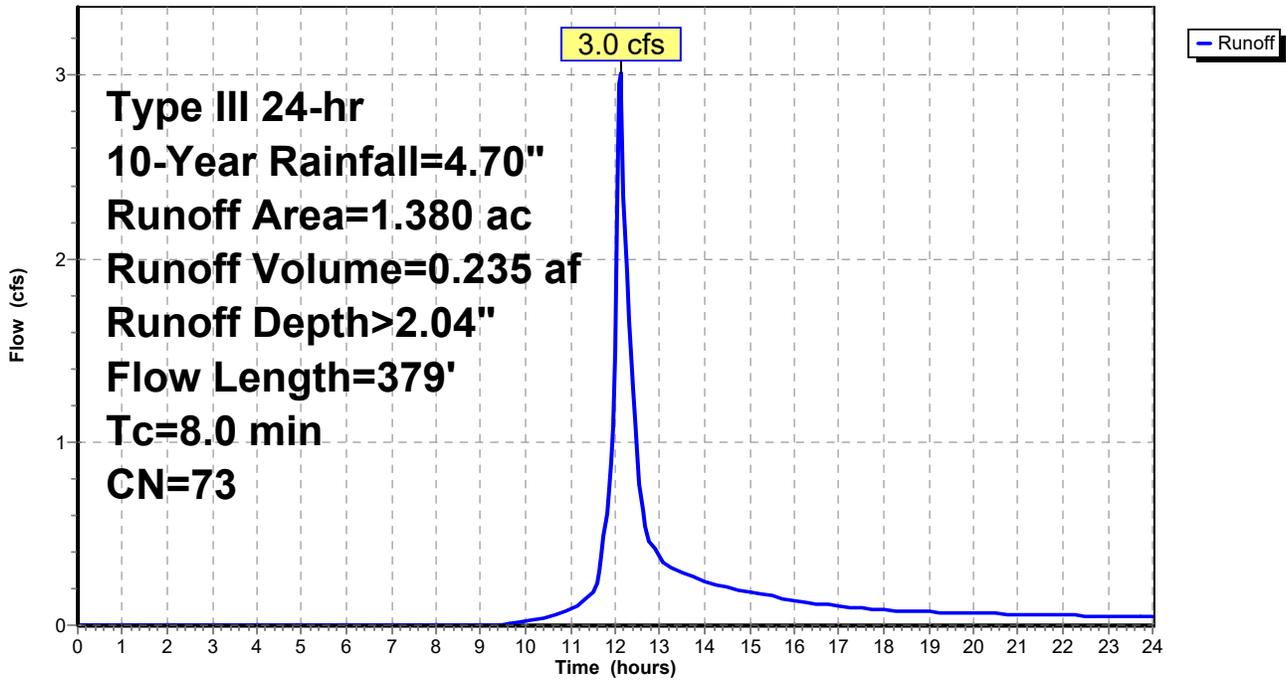
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
0.040	98	Roofs, HSG C
0.760	74	>75% Grass cover, Good, HSG C
0.580	70	Woods, Good, HSG C
1.380	73	Weighted Average
1.340		97.10% Pervious Area
0.040		2.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.2220	0.18		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	110	0.1800	2.12		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.5	148	0.0540	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.9	71	0.0630	1.25		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.0	379	Total			

Subcatchment 3S: Subarea PC

Hydrograph



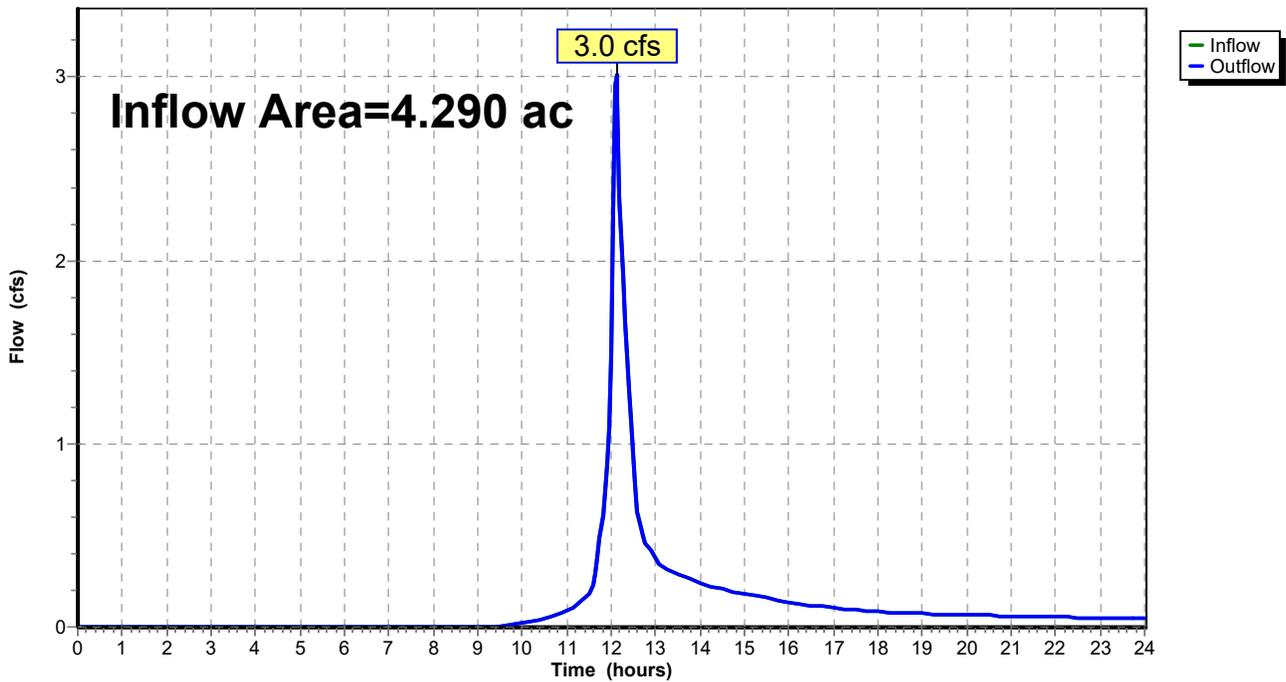
Summary for Reach 6R: Isolated Wetland

Inflow Area = 4.290 ac, 8.39% Impervious, Inflow Depth > 0.66" for 10-Year event
Inflow = 3.0 cfs @ 12.12 hrs, Volume= 0.235 af
Outflow = 3.0 cfs @ 12.12 hrs, Volume= 0.235 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 6R: Isolated Wetland

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Pond 4P: Detention Pond

Inflow Area = 2.220 ac, 7.21% Impervious, Inflow Depth > 2.12" for 10-Year event
Inflow = 5.1 cfs @ 12.11 hrs, Volume= 0.393 af
Outflow = 3.7 cfs @ 12.21 hrs, Volume= 0.381 af, Atten= 28%, Lag= 6.0 min
Primary = 3.7 cfs @ 12.21 hrs, Volume= 0.381 af
Routed to Pond 5P : Infiltration Pond

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 303.09' @ 12.21 hrs Surf.Area= 0.066 ac Storage= 0.063 af

Plug-Flow detention time= 35.3 min calculated for 0.381 af (97% of inflow)
Center-of-Mass det. time= 18.9 min (859.9 - 841.1)

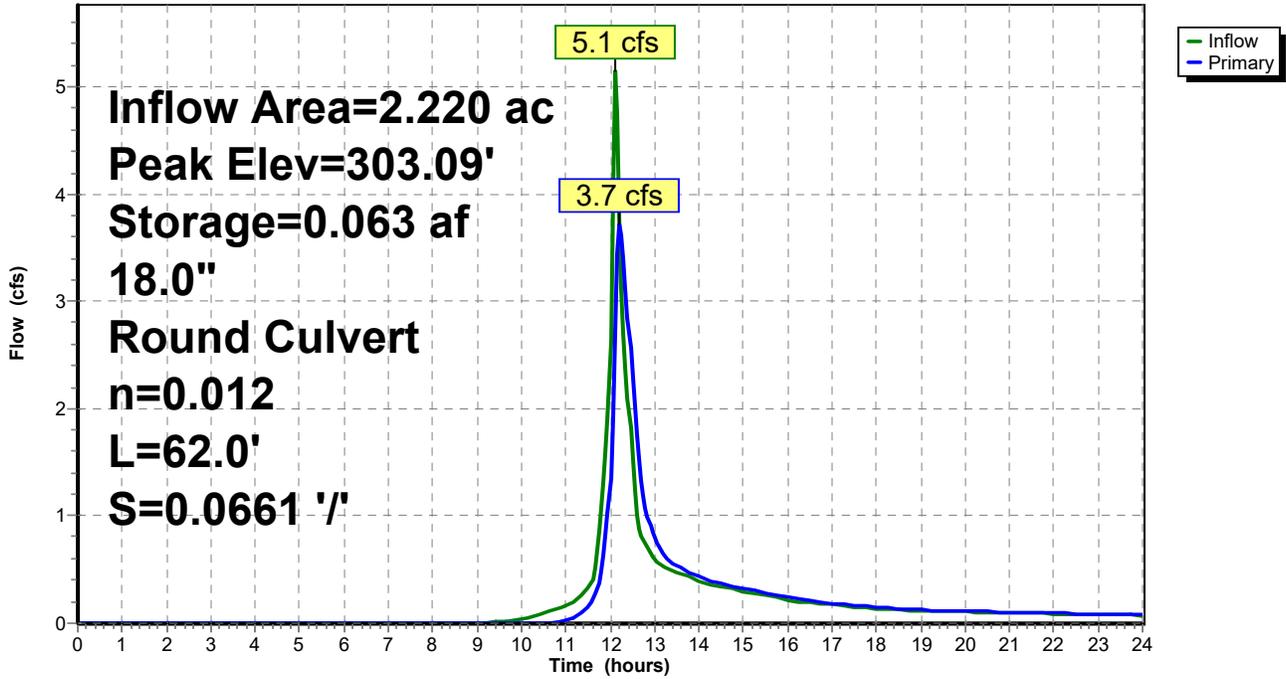
Volume	Invert	Avail.Storage	Storage Description		
#1	302.00'	0.129 af	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
302.00	0.050	215.0	0.000	0.000	0.050
304.00	0.080	264.0	0.129	0.129	0.094

Device	Routing	Invert	Outlet Devices
#1	Primary	302.10'	18.0" Round Culvert L= 62.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 302.10' / 298.00' S= 0.0661 ' S Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.7 cfs @ 12.21 hrs HW=303.09' (Free Discharge)
↑1=Culvert (Inlet Controls 3.7 cfs @ 2.99 fps)

Pond 4P: Detention Pond

Hydrograph



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Symphony Drive Franklin, MA
Type III 24-hr 10-Year Rainfall=4.70"

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Stage-Area-Storage for Pond 4P: Detention Pond

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
302.00	0.050	0.000	303.04	0.065	0.059
302.02	0.050	0.001	303.06	0.065	0.061
302.04	0.051	0.002	303.08	0.065	0.062
302.06	0.051	0.003	303.10	0.066	0.063
302.08	0.051	0.004	303.12	0.066	0.065
302.10	0.051	0.005	303.14	0.066	0.066
302.12	0.052	0.006	303.16	0.067	0.067
302.14	0.052	0.007	303.18	0.067	0.069
302.16	0.052	0.008	303.20	0.067	0.070
302.18	0.052	0.009	303.22	0.067	0.071
302.20	0.053	0.010	303.24	0.068	0.073
302.22	0.053	0.011	303.26	0.068	0.074
302.24	0.053	0.012	303.28	0.068	0.075
302.26	0.054	0.013	303.30	0.069	0.077
302.28	0.054	0.015	303.32	0.069	0.078
302.30	0.054	0.016	303.34	0.069	0.080
302.32	0.054	0.017	303.36	0.070	0.081
302.34	0.055	0.018	303.38	0.070	0.082
302.36	0.055	0.019	303.40	0.070	0.084
302.38	0.055	0.020	303.42	0.071	0.085
302.40	0.055	0.021	303.44	0.071	0.087
302.42	0.056	0.022	303.46	0.071	0.088
302.44	0.056	0.023	303.48	0.072	0.089
302.46	0.056	0.024	303.50	0.072	0.091
302.48	0.057	0.026	303.52	0.072	0.092
302.50	0.057	0.027	303.54	0.072	0.094
302.52	0.057	0.028	303.56	0.073	0.095
302.54	0.057	0.029	303.58	0.073	0.097
302.56	0.058	0.030	303.60	0.073	0.098
302.58	0.058	0.031	303.62	0.074	0.100
302.60	0.058	0.032	303.64	0.074	0.101
302.62	0.059	0.034	303.66	0.074	0.103
302.64	0.059	0.035	303.68	0.075	0.104
302.66	0.059	0.036	303.70	0.075	0.106
302.68	0.059	0.037	303.72	0.075	0.107
302.70	0.060	0.038	303.74	0.076	0.109
302.72	0.060	0.040	303.76	0.076	0.110
302.74	0.060	0.041	303.78	0.076	0.112
302.76	0.061	0.042	303.80	0.077	0.113
302.78	0.061	0.043	303.82	0.077	0.115
302.80	0.061	0.044	303.84	0.077	0.116
302.82	0.061	0.046	303.86	0.078	0.118
302.84	0.062	0.047	303.88	0.078	0.119
302.86	0.062	0.048	303.90	0.078	0.121
302.88	0.062	0.049	303.92	0.079	0.122
302.90	0.063	0.051	303.94	0.079	0.124
302.92	0.063	0.052	303.96	0.079	0.126
302.94	0.063	0.053	303.98	0.080	0.127
302.96	0.064	0.054	304.00	0.080	0.129
302.98	0.064	0.056			
303.00	0.064	0.057			
303.02	0.064	0.058			

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Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Pond 5P: Infiltration Pond

Inflow Area = 2.910 ac, 11.00% Impervious, Inflow Depth > 2.20" for 10-Year event
 Inflow = 5.1 cfs @ 12.16 hrs, Volume= 0.533 af
 Outflow = 1.6 cfs @ 12.72 hrs, Volume= 0.532 af, Atten= 69%, Lag= 33.4 min
 Discarded = 1.6 cfs @ 12.72 hrs, Volume= 0.532 af
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Reach 6R : Isolated Wetland

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 291.16' @ 12.72 hrs Surf.Area= 0.133 ac Storage= 0.140 af

Plug-Flow detention time= 30.8 min calculated for 0.532 af (100% of inflow)
 Center-of-Mass det. time= 30.4 min (880.2 - 849.7)

Volume	Invert	Avail.Storage	Storage Description		
#1	290.00'	0.339 af	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
290.00	0.109	220.0	0.000	0.000	0.109
292.00	0.152	331.0	0.260	0.260	0.221
292.50	0.164	340.0	0.079	0.339	0.233

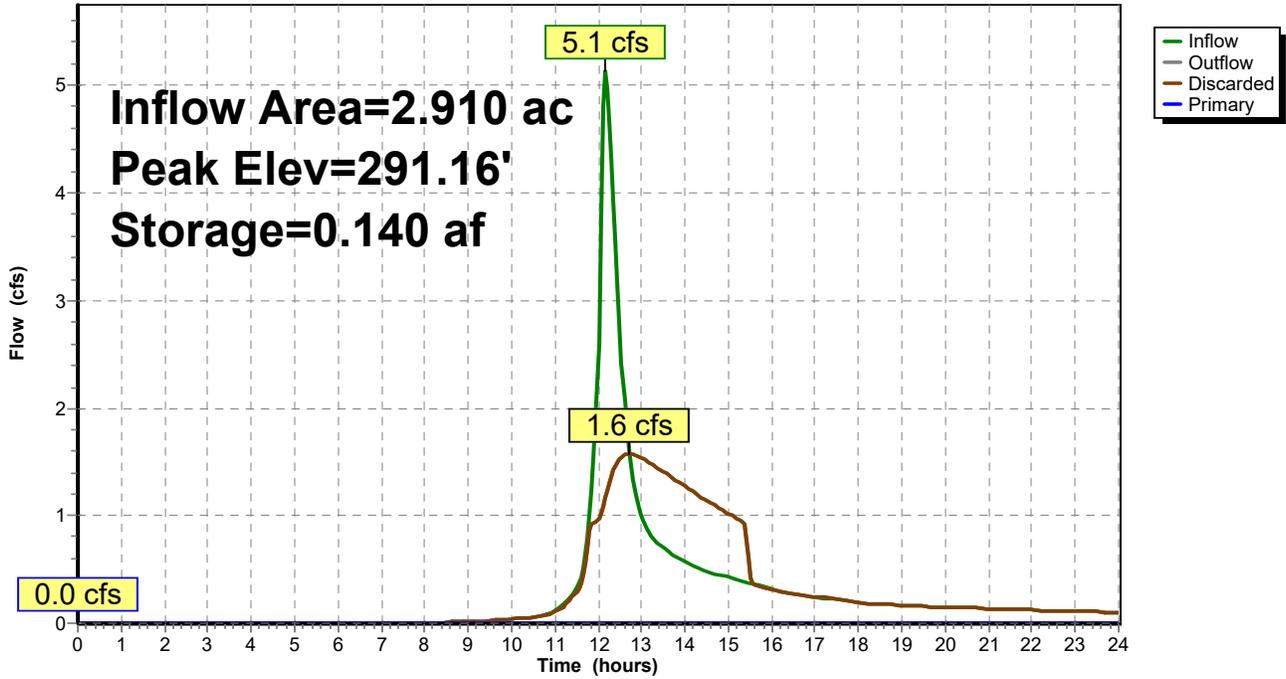
Device	Routing	Invert	Outlet Devices
#1	Discarded	290.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 287.50'
#2	Primary	291.75'	10.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=1.6 cfs @ 12.72 hrs HW=291.16' (Free Discharge)
 ↑1=Exfiltration (Controls 1.6 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=290.00' (Free Discharge)
 ↑2=Sharp-Crested Rectangular Weir (Controls 0.0 cfs)

Pond 5P: Infiltration Pond

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.70"

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Stage-Area-Storage for Pond 5P: Infiltration Pond

Elevation (feet)	Surface (acres)	Storage (acre-feet)
290.00	0.109	0.000
290.05	0.110	0.005
290.10	0.111	0.011
290.15	0.112	0.017
290.20	0.113	0.022
290.25	0.114	0.028
290.30	0.115	0.034
290.35	0.116	0.039
290.40	0.117	0.045
290.45	0.118	0.051
290.50	0.119	0.057
290.55	0.120	0.063
290.60	0.121	0.069
290.65	0.122	0.075
290.70	0.123	0.081
290.75	0.124	0.087
290.80	0.125	0.094
290.85	0.126	0.100
290.90	0.127	0.106
290.95	0.129	0.113
291.00	0.130	0.119
291.05	0.131	0.126
291.10	0.132	0.132
291.15	0.133	0.139
291.20	0.134	0.146
291.25	0.135	0.152
291.30	0.136	0.159
291.35	0.137	0.166
291.40	0.138	0.173
291.45	0.139	0.180
291.50	0.141	0.187
291.55	0.142	0.194
291.60	0.143	0.201
291.65	0.144	0.208
291.70	0.145	0.215
291.75	0.146	0.223
291.80	0.147	0.230
291.85	0.149	0.237
291.90	0.150	0.245
291.95	0.151	0.252
292.00	0.152	0.260
292.05	0.153	0.267
292.10	0.154	0.275
292.15	0.156	0.283
292.20	0.157	0.291
292.25	0.158	0.299
292.30	0.159	0.306
292.35	0.160	0.314
292.40	0.162	0.323
292.45	0.163	0.331
292.50	0.164	0.339

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Type III 24-hr 100-Year Rainfall=6.70"
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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subarea PA

Runoff Area=2.220 ac 7.21% Impervious Runoff Depth>3.78"
Flow Length=276' Tc=7.5 min CN=74 Runoff=9.2 cfs 0.699 af

Subcatchment 2S: Subarea PB

Runoff Area=0.690 ac 23.19% Impervious Runoff Depth>4.41"
Flow Length=187' Tc=6.0 min CN=80 Runoff=3.5 cfs 0.254 af

Subcatchment 3S: Subarea PC

Runoff Area=1.380 ac 2.90% Impervious Runoff Depth>3.67"
Flow Length=379' Tc=8.0 min CN=73 Runoff=5.5 cfs 0.422 af

Reach 6R: Isolated Wetland

Inflow=5.5 cfs 0.505 af
Outflow=5.5 cfs 0.505 af

Pond 4P: Detention Pond

Peak Elev=303.60' Storage=0.098 af Inflow=9.2 cfs 0.699 af
18.0" Round Culvert n=0.012 L=62.0' S=0.0661 '/' Outflow=6.5 cfs 0.685 af

Pond 5P: Infiltration Pond

Peak Elev=291.95' Storage=0.253 af Inflow=9.1 cfs 0.939 af
Discarded=2.1 cfs 0.857 af Primary=3.0 cfs 0.082 af Outflow=5.1 cfs 0.939 af

Total Runoff Area = 4.290 ac Runoff Volume = 1.375 af Average Runoff Depth = 3.85"
91.61% Pervious = 3.930 ac 8.39% Impervious = 0.360 ac

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Type III 24-hr 100-Year Rainfall=6.70"

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Summary for Subcatchment 1S: Subarea PA

Runoff = 9.2 cfs @ 12.11 hrs, Volume= 0.699 af, Depth> 3.78"
Routed to Pond 4P : Detention Pond

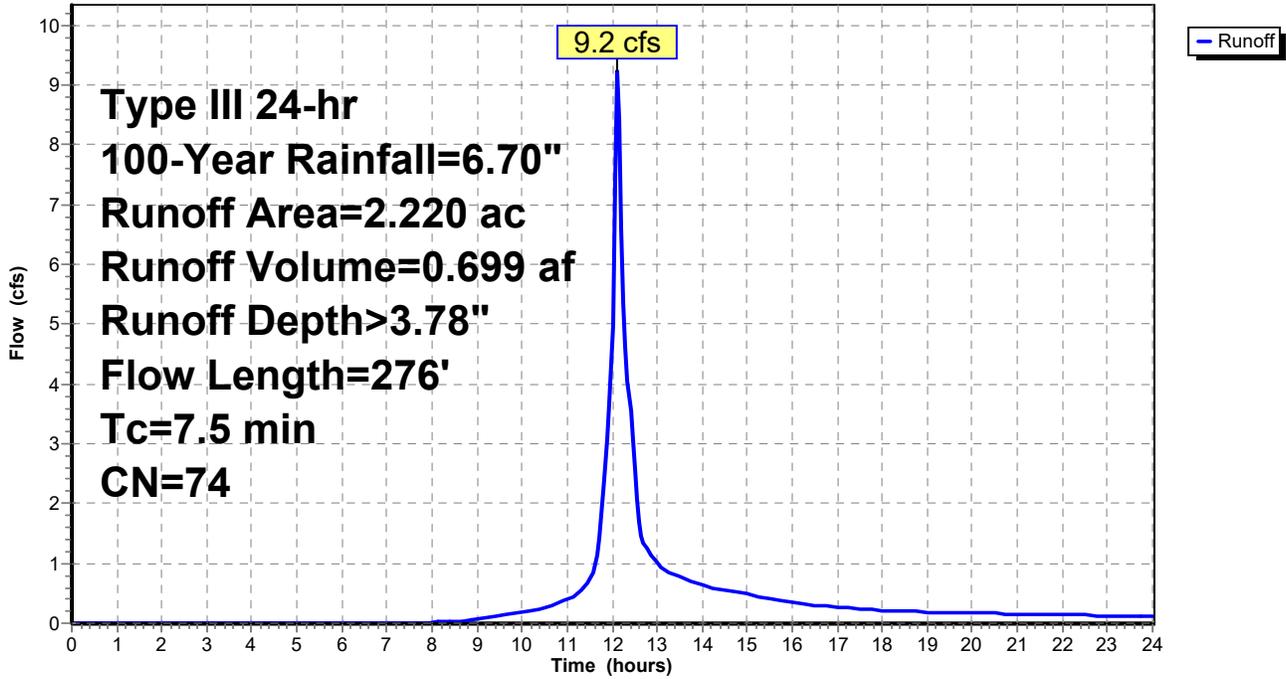
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (ac)	CN	Description
0.060	98	Roofs, HSG C
0.100	98	Paved parking, HSG C
1.340	74	>75% Grass cover, Good, HSG C
0.720	70	Woods, Good, HSG C
2.220	74	Weighted Average
2.060		92.79% Pervious Area
0.160		7.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1220	0.14		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	107	0.1210	1.74		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.5	119	0.2770	3.68		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
7.5	276	Total			

Subcatchment 1S: Subarea PA

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.70"

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Summary for Subcatchment 2S: Subarea PB

Runoff = 3.5 cfs @ 12.09 hrs, Volume= 0.254 af, Depth> 4.41"
Routed to Pond 5P : Infiltration Pond

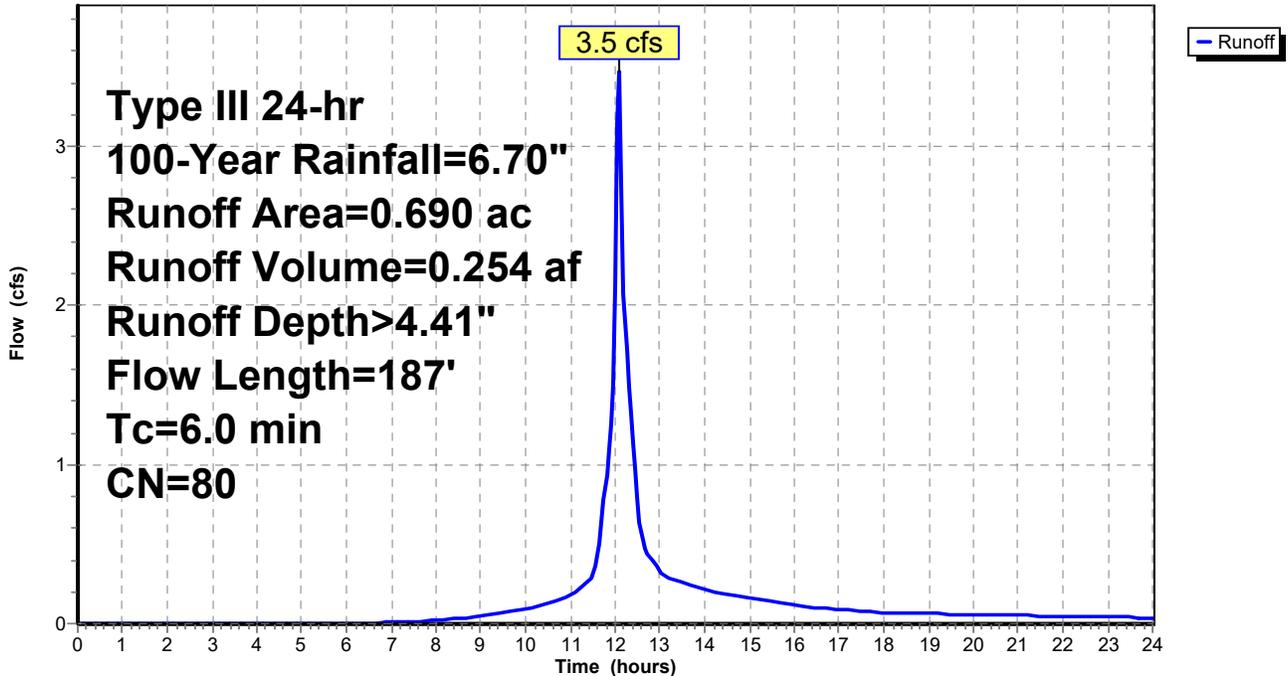
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (ac)	CN	Description
0.040	98	Roofs, HSG C
0.120	98	Paved parking, HSG C
0.530	74	>75% Grass cover, Good, HSG C
0.690	80	Weighted Average
0.530		76.81% Pervious Area
0.160		23.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
0.5	85	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.3	52	0.1940	3.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.5	187	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Subarea PB

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.70"

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Summary for Subcatchment 3S: Subarea PC

Runoff = 5.5 cfs @ 12.12 hrs, Volume= 0.422 af, Depth> 3.67"
Routed to Reach 6R : Isolated Wetland

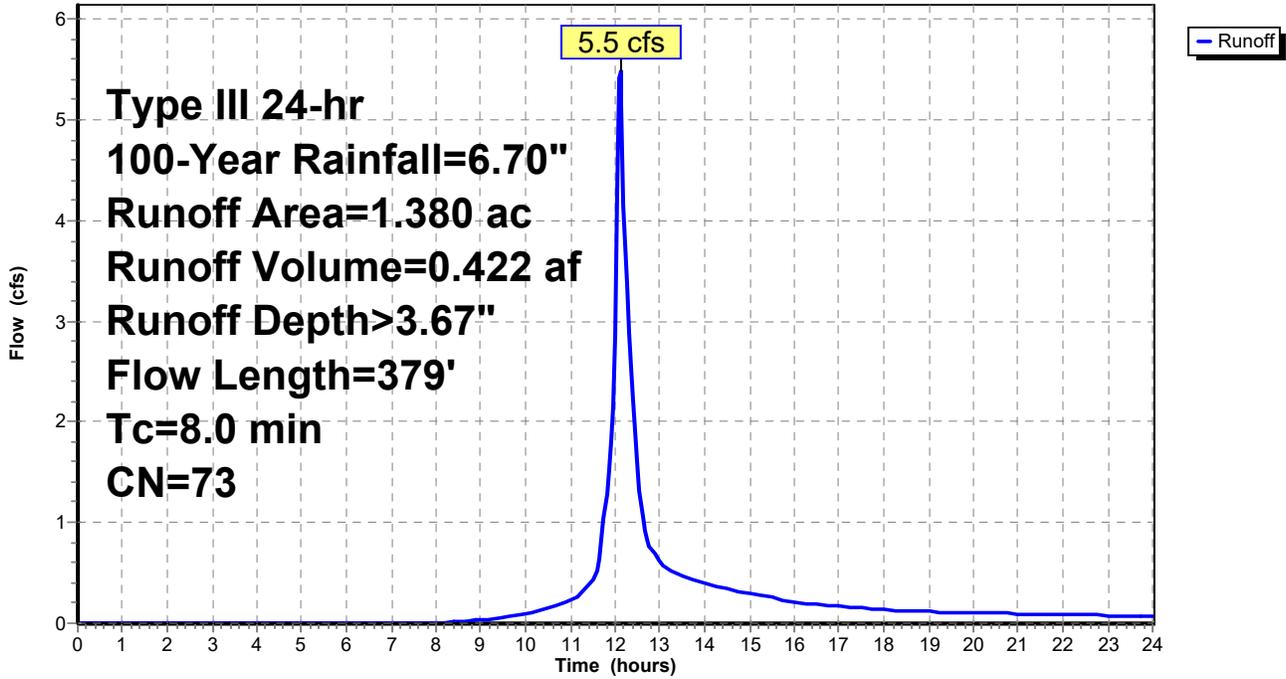
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (ac)	CN	Description
0.040	98	Roofs, HSG C
0.760	74	>75% Grass cover, Good, HSG C
0.580	70	Woods, Good, HSG C
1.380	73	Weighted Average
1.340		97.10% Pervious Area
0.040		2.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.2220	0.18		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	110	0.1800	2.12		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.5	148	0.0540	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.9	71	0.0630	1.25		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.0	379	Total			

Subcatchment 3S: Subarea PC

Hydrograph



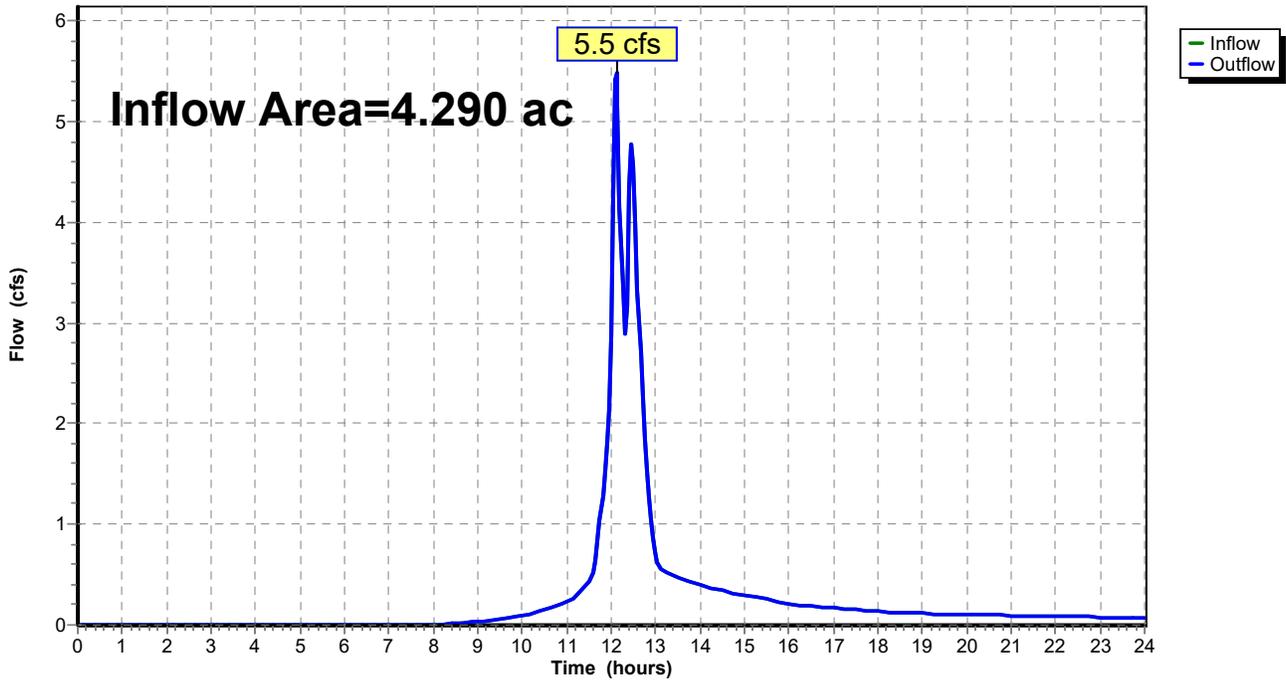
Summary for Reach 6R: Isolated Wetland

Inflow Area = 4.290 ac, 8.39% Impervious, Inflow Depth > 1.41" for 100-Year event
Inflow = 5.5 cfs @ 12.12 hrs, Volume= 0.505 af
Outflow = 5.5 cfs @ 12.12 hrs, Volume= 0.505 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 6R: Isolated Wetland

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.70"

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Summary for Pond 4P: Detention Pond

Inflow Area = 2.220 ac, 7.21% Impervious, Inflow Depth > 3.78" for 100-Year event
Inflow = 9.2 cfs @ 12.11 hrs, Volume= 0.699 af
Outflow = 6.5 cfs @ 12.21 hrs, Volume= 0.685 af, Atten= 29%, Lag= 6.1 min
Primary = 6.5 cfs @ 12.21 hrs, Volume= 0.685 af
Routed to Pond 5P : Infiltration Pond

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 303.60' @ 12.21 hrs Surf.Area= 0.073 ac Storage= 0.098 af

Plug-Flow detention time= 26.8 min calculated for 0.685 af (98% of inflow)
Center-of-Mass det. time= 15.7 min (840.2 - 824.5)

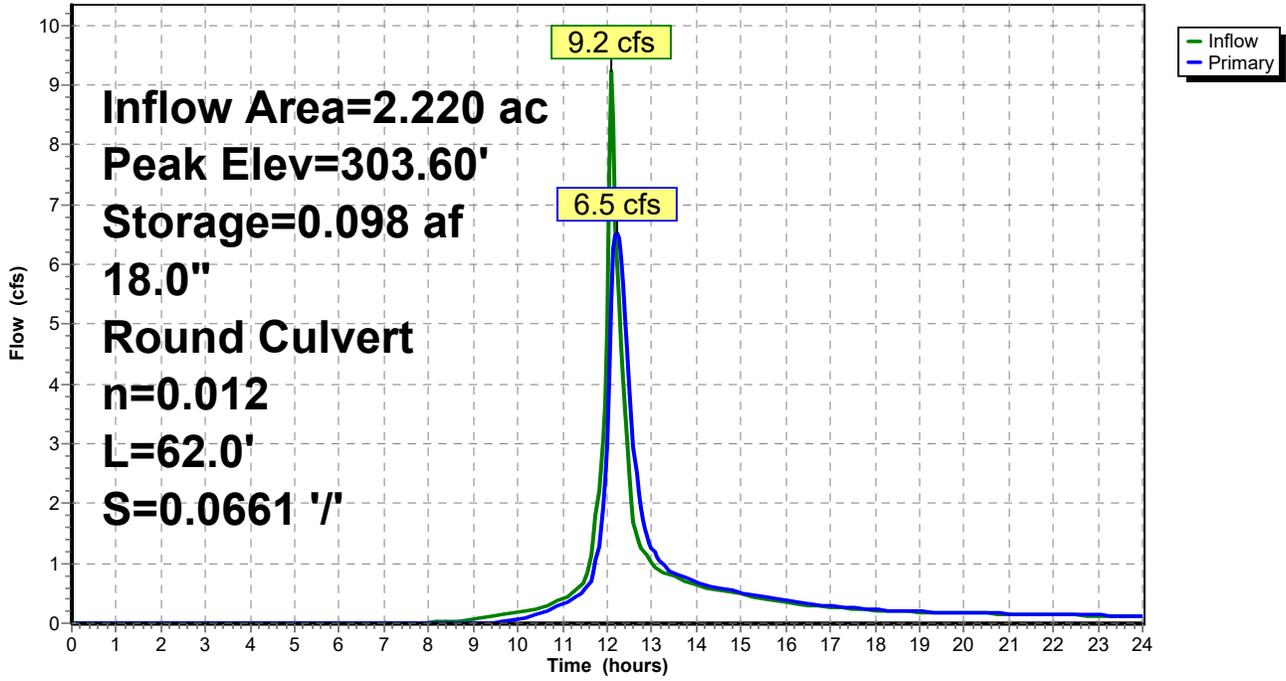
Volume	Invert	Avail.Storage	Storage Description		
#1	302.00'	0.129 af	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
302.00	0.050	215.0	0.000	0.000	0.050
304.00	0.080	264.0	0.129	0.129	0.094

Device	Routing	Invert	Outlet Devices
#1	Primary	302.10'	18.0" Round Culvert L= 62.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 302.10' / 298.00' S= 0.0661 ' S Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=6.5 cfs @ 12.21 hrs HW=303.60' (Free Discharge)
↑1=Culvert (Inlet Controls 6.5 cfs @ 3.67 fps)

Pond 4P: Detention Pond

Hydrograph



Stage-Area-Storage for Pond 4P: Detention Pond

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
302.00	0.050	0.000	303.04	0.065	0.059
302.02	0.050	0.001	303.06	0.065	0.061
302.04	0.051	0.002	303.08	0.065	0.062
302.06	0.051	0.003	303.10	0.066	0.063
302.08	0.051	0.004	303.12	0.066	0.065
302.10	0.051	0.005	303.14	0.066	0.066
302.12	0.052	0.006	303.16	0.067	0.067
302.14	0.052	0.007	303.18	0.067	0.069
302.16	0.052	0.008	303.20	0.067	0.070
302.18	0.052	0.009	303.22	0.067	0.071
302.20	0.053	0.010	303.24	0.068	0.073
302.22	0.053	0.011	303.26	0.068	0.074
302.24	0.053	0.012	303.28	0.068	0.075
302.26	0.054	0.013	303.30	0.069	0.077
302.28	0.054	0.015	303.32	0.069	0.078
302.30	0.054	0.016	303.34	0.069	0.080
302.32	0.054	0.017	303.36	0.070	0.081
302.34	0.055	0.018	303.38	0.070	0.082
302.36	0.055	0.019	303.40	0.070	0.084
302.38	0.055	0.020	303.42	0.071	0.085
302.40	0.055	0.021	303.44	0.071	0.087
302.42	0.056	0.022	303.46	0.071	0.088
302.44	0.056	0.023	303.48	0.072	0.089
302.46	0.056	0.024	303.50	0.072	0.091
302.48	0.057	0.026	303.52	0.072	0.092
302.50	0.057	0.027	303.54	0.072	0.094
302.52	0.057	0.028	303.56	0.073	0.095
302.54	0.057	0.029	303.58	0.073	0.097
302.56	0.058	0.030	303.60	0.073	0.098
302.58	0.058	0.031	303.62	0.074	0.100
302.60	0.058	0.032	303.64	0.074	0.101
302.62	0.059	0.034	303.66	0.074	0.103
302.64	0.059	0.035	303.68	0.075	0.104
302.66	0.059	0.036	303.70	0.075	0.106
302.68	0.059	0.037	303.72	0.075	0.107
302.70	0.060	0.038	303.74	0.076	0.109
302.72	0.060	0.040	303.76	0.076	0.110
302.74	0.060	0.041	303.78	0.076	0.112
302.76	0.061	0.042	303.80	0.077	0.113
302.78	0.061	0.043	303.82	0.077	0.115
302.80	0.061	0.044	303.84	0.077	0.116
302.82	0.061	0.046	303.86	0.078	0.118
302.84	0.062	0.047	303.88	0.078	0.119
302.86	0.062	0.048	303.90	0.078	0.121
302.88	0.062	0.049	303.92	0.079	0.122
302.90	0.063	0.051	303.94	0.079	0.124
302.92	0.063	0.052	303.96	0.079	0.126
302.94	0.063	0.053	303.98	0.080	0.127
302.96	0.064	0.054	304.00	0.080	0.129
302.98	0.064	0.056			
303.00	0.064	0.057			
303.02	0.064	0.058			

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Symphony Drive Franklin, MA
Type III 24-hr 100-Year Rainfall=6.70"

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Summary for Pond 5P: Infiltration Pond

Inflow Area = 2.910 ac, 11.00% Impervious, Inflow Depth > 3.87" for 100-Year event
 Inflow = 9.1 cfs @ 12.14 hrs, Volume= 0.939 af
 Outflow = 5.1 cfs @ 12.49 hrs, Volume= 0.939 af, Atten= 44%, Lag= 20.8 min
 Discarded = 2.1 cfs @ 12.49 hrs, Volume= 0.857 af
 Primary = 3.0 cfs @ 12.49 hrs, Volume= 0.082 af
 Routed to Reach 6R : Isolated Wetland

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 291.95' @ 12.49 hrs Surf.Area= 0.151 ac Storage= 0.253 af

Plug-Flow detention time= 41.7 min calculated for 0.939 af (100% of inflow)
 Center-of-Mass det. time= 41.4 min (873.2 - 831.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	290.00'	0.339 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
290.00	0.109	220.0	0.000	0.000	0.109	
292.00	0.152	331.0	0.260	0.260	0.221	
292.50	0.164	340.0	0.079	0.339	0.233	

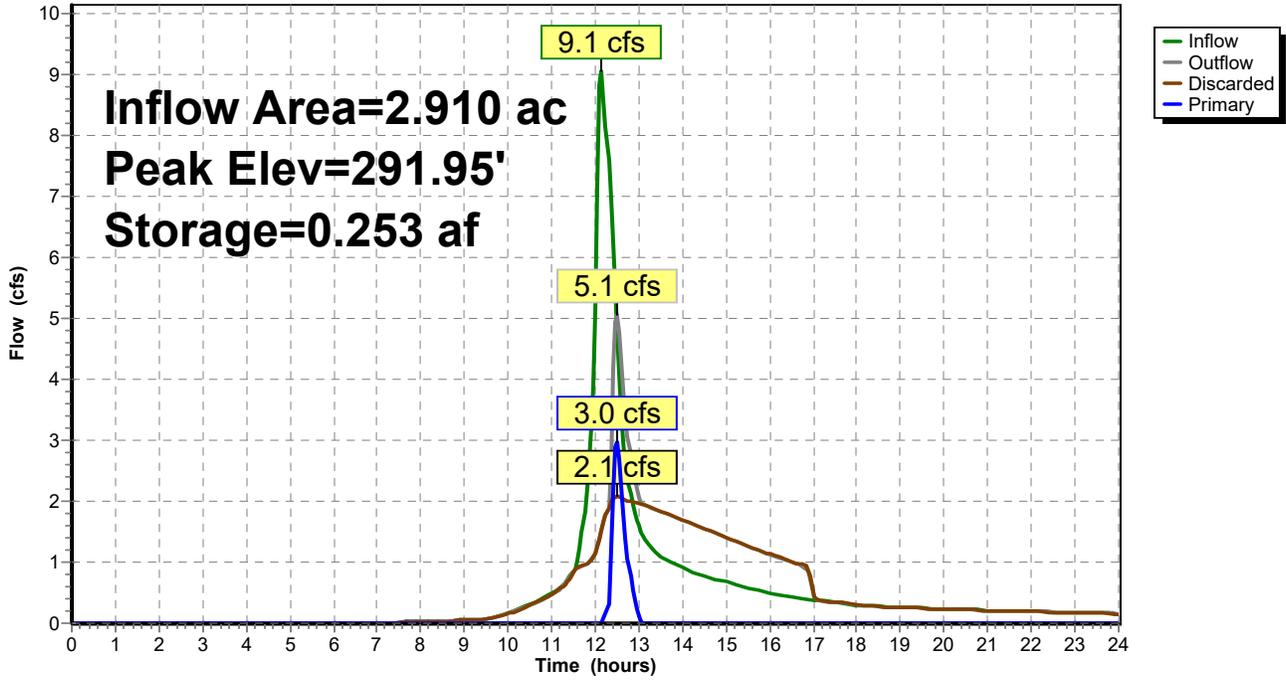
Device	Routing	Invert	Outlet Devices
#1	Discarded	290.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 287.50'
#2	Primary	291.75'	10.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=2.1 cfs @ 12.49 hrs HW=291.95' (Free Discharge)
 ↑1=Exfiltration (Controls 2.1 cfs)

Primary OutFlow Max=2.9 cfs @ 12.49 hrs HW=291.95' (Free Discharge)
 ↑2=Sharp-Crested Rectangular Weir (Weir Controls 2.9 cfs @ 1.47 fps)

Pond 5P: Infiltration Pond

Hydrograph



Stage-Area-Storage for Pond 5P: Infiltration Pond

Elevation (feet)	Surface (acres)	Storage (acre-feet)
290.00	0.109	0.000
290.05	0.110	0.005
290.10	0.111	0.011
290.15	0.112	0.017
290.20	0.113	0.022
290.25	0.114	0.028
290.30	0.115	0.034
290.35	0.116	0.039
290.40	0.117	0.045
290.45	0.118	0.051
290.50	0.119	0.057
290.55	0.120	0.063
290.60	0.121	0.069
290.65	0.122	0.075
290.70	0.123	0.081
290.75	0.124	0.087
290.80	0.125	0.094
290.85	0.126	0.100
290.90	0.127	0.106
290.95	0.129	0.113
291.00	0.130	0.119
291.05	0.131	0.126
291.10	0.132	0.132
291.15	0.133	0.139
291.20	0.134	0.146
291.25	0.135	0.152
291.30	0.136	0.159
291.35	0.137	0.166
291.40	0.138	0.173
291.45	0.139	0.180
291.50	0.141	0.187
291.55	0.142	0.194
291.60	0.143	0.201
291.65	0.144	0.208
291.70	0.145	0.215
291.75	0.146	0.223
291.80	0.147	0.230
291.85	0.149	0.237
291.90	0.150	0.245
291.95	0.151	0.252
292.00	0.152	0.260
292.05	0.153	0.267
292.10	0.154	0.275
292.15	0.156	0.283
292.20	0.157	0.291
292.25	0.158	0.299
292.30	0.159	0.306
292.35	0.160	0.314
292.40	0.162	0.323
292.45	0.163	0.331
292.50	0.164	0.339

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APPENDIX B – STORM WATER WORKSHEETS

Required Recharge Volume and Drawdown Worksheet
TSS Removal Worksheet
Checklist for Stormwater Report
Ground Water Mounding Summary Worksheet

Required Recharge Volume Worksheet

PROJECT LOCATION: Symphony Drive Franklin, MA
DATE: 12-Dec-25
PROJECT NUMBER: 25-0108

Subarea PA, PB & PC

<i>SCS Soil Type Hydrologic Group</i>	<i>Target Depth Factor (in)</i>	<i>Total Impervious Area (ac)</i>	<i>Required Volume to Recharge (ac-ft)</i>
HSG C - Pavement & Roofs	0.25	0.360	0.0075
TOTAL:			0.0075

SITE TOTAL Rv: 0.0075

Drainage Basin #2

Volume Recharged	
Volume of pond between bottom and outlet (el=291.75)	0.223 ac-ft

Drawdown Within 72 hours	
Soil Type:	Loamy Sand
RAWLS Rate (in/hr):	2.41
Infiltration Area (sf):	4,761
Drawdown Time (hours):	0.3

TSS Phosphorous Removal Worksheet

PROJECT LOCATION: Symphony Drive Franklin, MA
DATE: 12-Dec-25
PROJECT NUMBER: 25-0108

TSS Removal

Subarea PA

Impervious Area =		0.360 acres		
Runoff depth to be treated =		1.00 inches		
Runoff volume to be treated =		0.0300 ac-ft		
<i>BMP</i>	<i>TSS Removal Rate</i>	<i>Starting TSS Load</i>	<i>Amount Removed</i>	<i>Remaining Load</i>
Detention Basin	0.50	1.00	0.50	0.50
Infiltration Basin	0.80	0.50	0.40	0.10
TOTAL TSS REMOVED =				90 %

Phosphorous Removal

BMP	Phosphorous Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Detention Basin	0.1	1.00	0.10	0.90
Infiltration Basin	0.6	0.90	0.54	0.36
TOTAL PHOSPHOROUS REMOVED =				64%



Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

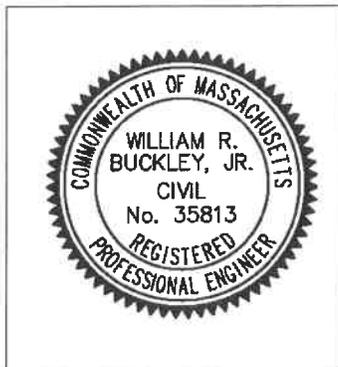
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Signature and Date

Checklist

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

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



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

Standard 3: Recharge

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

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

Standard 4: Water Quality

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

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



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the proprietary 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.

Transient Water-Table Rise Beneath a Rectangular Recharge Area
Groundwater Mounding Solution by Hantush (1967)

Aquifer Properties:

Hydraulic conductivity, $K = 4.82$ ft/day
Specific yield, $S_y = 0.23$
Initial saturated thickness, $h(0) = 10$ ft

Recharge Area Properties:

Recharge rate, $w = 0.8$ ft/day
Simulation time, $t = 1$ day
Time when recharge stops, $t(0) = 0.0833$ day
X coordinate at center of recharge area, $X = 0$ ft
Y coordinate at center of recharge area, $Y = 0$ ft
Length in x direction, $l = 75$ ft
Length in y direction, $a = 63.48$ ft

Water-Table Rise at Center of Recharge Area:

t (day)	h (ft)
0.1	0.289739
0.2	0.289687
0.3	0.288865
0.4	0.286056
0.5	0.280992
0.6	0.274163
0.7	0.266207
0.8	0.257658
0.9	0.248898
1	0.240183

Note: recovery begins after 0.0833 day.

PROJECT LOCATION: **Symphony Drive**
 DATE: 12-Dec-25
 PROJECT NUMBER: 25-0108

Basin 2

Aquifer Properties:

Hydraulic Conductivity (K-ft/day): 4.82 RAWLS rate for LOAMY SAND
Specific Yield (Sy): 0.23 Medium Gravel (USGS Water Supply Paper 1662-
Initial Saturated Thickness (ft): 10

Recharge Area Properties:

Required Recharge Volume (Rv-ft3): 327 See Required Recharge Volume Worksheet
Elevation of Estimated High Groundwater (ft): 287.50
Bottom of Recharge System (ft): 290.00 Bottom basin el-290.0'
Bottom Area (ft2): 4,761 Bottom basin el-290.0'

Application Rate Calculation:

$$\frac{Rv \text{ (ft3)}}{\text{Bottom Area (ft2)}} * \frac{24 \text{ hrs/day}}{2 \text{ (DEP stan)}} =$$

$$\frac{327}{4,761} * \frac{24}{2} = 0.8 \text{ ft/day}$$

Length of Time to Generate Rv (days): 0.0833 assume Rv generated during a 2 hour period - see DEP Stormwater Handbook, Vol.3, Ch.1, p.20

Groundwater Mounding Solution by Hantush (1967)

Maximum Water Table Rise in Center of Recharge Area (ft) 0.29 See output run using AQTESOLV V4.50.002

Depth From Top of Mound to Bottom of Recharge Area (ft): 2.21

Mound does not breach bottom of system

**APPENDIX C - OPERATION AND MAINTENANCE PLAN
FOR STORM WATER BMPS**

Construction Period O & M Plan
Post-Construction O & M Plan

**Appendix C: LONG TERM OPERATION AND MAINTENANCE PLAN
FOR STORMWATER BMPs
138 Washington Street Foxborough, MA**

	During Construction	Post-construction
<i>BMP Owner:</i>	Owner	Owner
<i>Party of Plan Responsibility:</i>	Owner	Owner

References:

- Private Definitive Plan of Land of land in Franklin, MA Tanglewood Estates II Symphony Drive Extensions dated December 4, 2025
- Storm Water Report “Symphony Drive Extension” Franklin, MA dated December, 2025

Operation and Maintenance

Infiltration Basin: Once the infiltration system is in use, inspect it after every major storm (3.2 inches in 24 hours) for the first few months to ensure it is functioning properly and if necessary, take corrective action. Note how long water remains standing in the basin after a storm; standing water within the basin 72 hours after a storm indicates that there is an issue. If the ponding is due to clogging, immediately address the reasons for the clogging (such as upland sediment erosion). Thereafter, inspect the detention basin at least twice per year to ensure that it is dry.

Estimated Operations and Maintenance Budget

The following is an estimate of the O&M Budget, post construction.
Inspections (3 times per year): \$200

**CONSTRUCTION PERIOD MAINTENANCE PLAN
FOR STORMWATER BMPs
138 Washington Street Foxborough, MA**

References:

- Private Definitive Plan of Land of land in Franklin, MA Tanglewood Estates II Symphony Drive Extensions dated December 4, 2025
- Storm Water Report “Symphony Drive Extension” Franklin, MA dated December, 2025

Operation and Maintenance

Item 1: During construction, **weekly** inspection of the crushed stone construction entrance pad and erosion control silt socks shall be conducted by a qualified staff member of the responsible party or an independent sediment and erosion control expert hired by the responsible party. Any displaced barriers shall be restored or repaired immediately.

Item 2: The infiltration system shall be inspected three times a year: once after leaf fall, once before the arrival of hurricane season, the third in the early or mid-spring after the snow melt. Any debris should be cleaned out.

Item 3: During construction every effort will be made to ensure that silt does not enter the stormwater basin. Additional silt socks shall be used as necessary. If silt does enter the basin, then the contractor shall be responsible for its removal.

Item 4: During construction, the stone pad at the entrance to the project shall be inspected **weekly** and replenished if siltation is impeding the cleaning of truck tires. Any materials tracked into the roadway shall be swept up within a day.

APPENDIX D – SOIL DATA

Soil Evaluation Forms
NRCS Soil Resource Report

No. 25-0108

Date: June 3, 2025

Commonwealth of Massachusetts
Franklin, Massachusetts

Soil Suitability Assessment for On-Site Sewage Disposal

Performed By: William Buckley, Jr. Date: June 3, 2025

Witnessed By: Steve Donatelli

Location Address or Lot #: Symphony Drive Extension, Lot 1 Franklin, MA 02038 New Construction: <input checked="" type="checkbox"/> Repair <input type="checkbox"/>	Owner's Name, Address, and Telephone #: Cypress Real Estate Development, LLC 3 Rothchild Drive Foxborough, MA 02035 781.223.1188
--	---

Office Review

Published Soil Survey Available: No Yes
Year Published 1989 Publication Scale 1:25,000 Soil Map Unit Montauk FSL
Drainage Class C Soil Limitations Bedrock
Surficial Geology Report Available: No Yes
Year Published 1992 Publication Scale 1:250,000
Geologic Material (Map Unit) Coarse Deposits
Landform Glacial Outwash Plain

Flood Insurance Rate Map:

Above 500 year flood boundary No Yes
Within 500 year flood boundary No Yes
Within 100 year flood boundary No Yes

Wetland Area:

National Wetland Inventory Map (map unit) _____
Wetlands Conservancy Program Map (map unit) _____

Current Water Resource Conditions (USGS): Month June, 2025

Range: Above Normal Normal Below Normal

Other References Reviewed: _____

Location Address or Lot No. Symphony Drive Extension, Lot 1

On-site Review

Deep Hole Number: 5 Date: 6/3/2025 Time: 1030 Weather: 60°/Sunny

Location (identify on site plan) See site plan

Land Use Vacant Slope (%) 5% Surface Stones Some

Vegetation Mixed Woods

Landform Glacial Outwash Plain

Position on landscape (sketch on back) See site plan

Distances from:

Open Water Body	<u>>150'</u>	Drainageway	<u>>100'</u>
Possible Wet Area	<u>>100'</u>	Property Line	<u>25'+/-</u>
Drinking Water Well	<u>>100'</u>	Other	<u> </u>

DEEP OBSERVATION HOLE LOG*					
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0" - 6"	A	SL	10YR3/2		
6" - 24"	B	SL	5YR4/6		
24" - 60"	B2	SL	5YR3/4		
60" - 120"	C	LS	7.5YR5/4		Gravelly, Cobbly, Coarse

*MINIMUM OF TWO HOLES REQUIRED AT EVERY DISPOSAL AREA

Parent Material (geologic) Glacial outwash Depth to Bedrock:

Depth to Groundwater Standing Water in Hole: 80" Weeping from Pit Face: 29"

Estimated Seasonal High Groundwater: 29"

Location Address or Lot No. Symphony Drive Extension, Lot 1

On-site Review

Deep Hole Number: 6 Date: 6/3/2025 Time: 1100 Weather: 60°/Sunny

Location (identify on site plan) See site plan

Land Use Vacant Slope (%) 5% Surface Stones Some

Vegetation Mixed Woods

Landform Glacial Outwash Plain

Position on landscape (sketch on back) See site plan

Distances from:

Open Water Body	<u>>150'</u>	Drainageway	<u>>100'</u>
Possible Wet Area	<u>>100'</u>	Property Line	<u>25'+/-</u>
Drinking Water Well	<u>>100'</u>	Other	<u> </u>

DEEP OBSERVATION HOLE LOG*					
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0" - 6"	A	SL	10YR3/2		Gravelly, Cobbly, Coarse
6" - 30"	B	SL	5YR4/6		
30" - 120"	C	LS	7.5YR5/4		

*MINIMUM OF TWO HOLES REQUIRED AT EVERY DISPOSAL AREA

Parent Material (geologic) Glacial outwash Depth to Bedrock:

Depth to Groundwater Standing Water in Hole: Weeping from Pit Face: 29"

Estimated Seasonal High Groundwater: 29"

No. 25-0108

Date: June 3, 2025

Commonwealth of Massachusetts

Franklin, Massachusetts

Soil Suitability Assessment for On-Site Sewage Disposal

Performed By: William Buckley, Jr. Date: June 3, 2025

Witnessed By: Steve Donatelli

Location Address or Lot #: Symphony Drive Extension, Lot 2 Franklin, MA 02038 New Construction: <input checked="" type="checkbox"/> Repair <input type="checkbox"/>	Owner's Name, Address, and Telephone #: Cypress Real Estate Development, LLC 3 Rothchild Drive Foxborough, MA 02035 781.223.1188
--	---

Office Review

Published Soil Survey Available: No Yes
Year Published 1989 Publication Scale 1:25,000 Soil Map Unit Montauk FSL
Drainage Class C Soil Limitations Bedrock
Surficial Geology Report Available: No Yes
Year Published 1992 Publication Scale 1:250,000
Geologic Material (Map Unit) Coarse Deposits
Landform Glacial Outwash Plain

Flood Insurance Rate Map:

Above 500 year flood boundary No Yes
Within 500 year flood boundary No Yes
Within 100 year flood boundary No Yes

Wetland Area:

National Wetland Inventory Map (map unit) _____
Wetlands Conservancy Program Map (map unit) _____

Current Water Resource Conditions (USGS): Month June, 2025
Range: Above Normal Normal Below Normal

Other References Reviewed: _____

Location Address or Lot No. Symphony Drive Extension, Lot 2

On-site Review

Deep Hole Number: 1 Date: 6/3/2025 Time: 0800 Weather: 60°/Sunny

Location (identify on site plan) See site plan

Land Use Vacant Slope (%) 5% Surface Stones Some

Vegetation Mixed Woods

Landform Glacial Outwash Plain

Position on landscape (sketch on back) See site plan

Distances from:

Open Water Body >150'

Drainageway >100'

Possible Wet Area >100'

Property Line 25'+/-

Drinking Water Well >100'

Other _____

DEEP OBSERVATION HOLE LOG*					
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0" - 5"	A	SL	10YR3/2		Gravelly, Cobbly, Coarse
5" - 36"	B	SL	5YR4/6		
36" - 120"	C	LS	7.5YR5/4		

*MINIMUM OF TWO HOLES REQUIRED AT EVERY DISPOSAL AREA

Parent Material (geologic) Glacial outwash Depth to Bedrock: _____

Depth to Groundwater Standing Water in Hole: 80" Weeping from Pit Face: 32"

Estimated Seasonal High Groundwater: 32"

Location Address or Lot No. Symphony Drive Extension, Lot 2

On-site Review

Deep Hole Number: 2 Date: 6/3/2025 Time: 0830 Weather: 60°/Sunny

Location (identify on site plan) See site plan

Land Use Vacant Slope (%) 5% Surface Stones Some

Vegetation Mixed Woods

Landform Glacial Outwash Plain

Position on landscape (sketch on back) See site plan

Distances from:

Open Water Body	<u>>150'</u>	Drainageway	<u>>100'</u>
Possible Wet Area	<u>>100'</u>	Property Line	<u>25'+/-</u>
Drinking Water Well	<u>>100'</u>	Other	<u> </u>

DEEP OBSERVATION HOLE LOG*					
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0" - 5"	A	SL	10YR3/2		Gravelly, Cobbly, Coarse
5" - 42"	B	SL	5YR4/6		
42" - 120"	C	LS	7.5YR5/4		

*MINIMUM OF TWO HOLES REQUIRED AT EVERY DISPOSAL AREA

Parent Material (geologic) Glacial outwash Depth to Bedrock:

Depth to Groundwater Standing Water in Hole: 80" Weeping from Pit Face: 36"

Estimated Seasonal High Groundwater: 36"



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 Norfolk and Suffolk Counties, Massachusetts



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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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

Custom Soil Resource Report

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

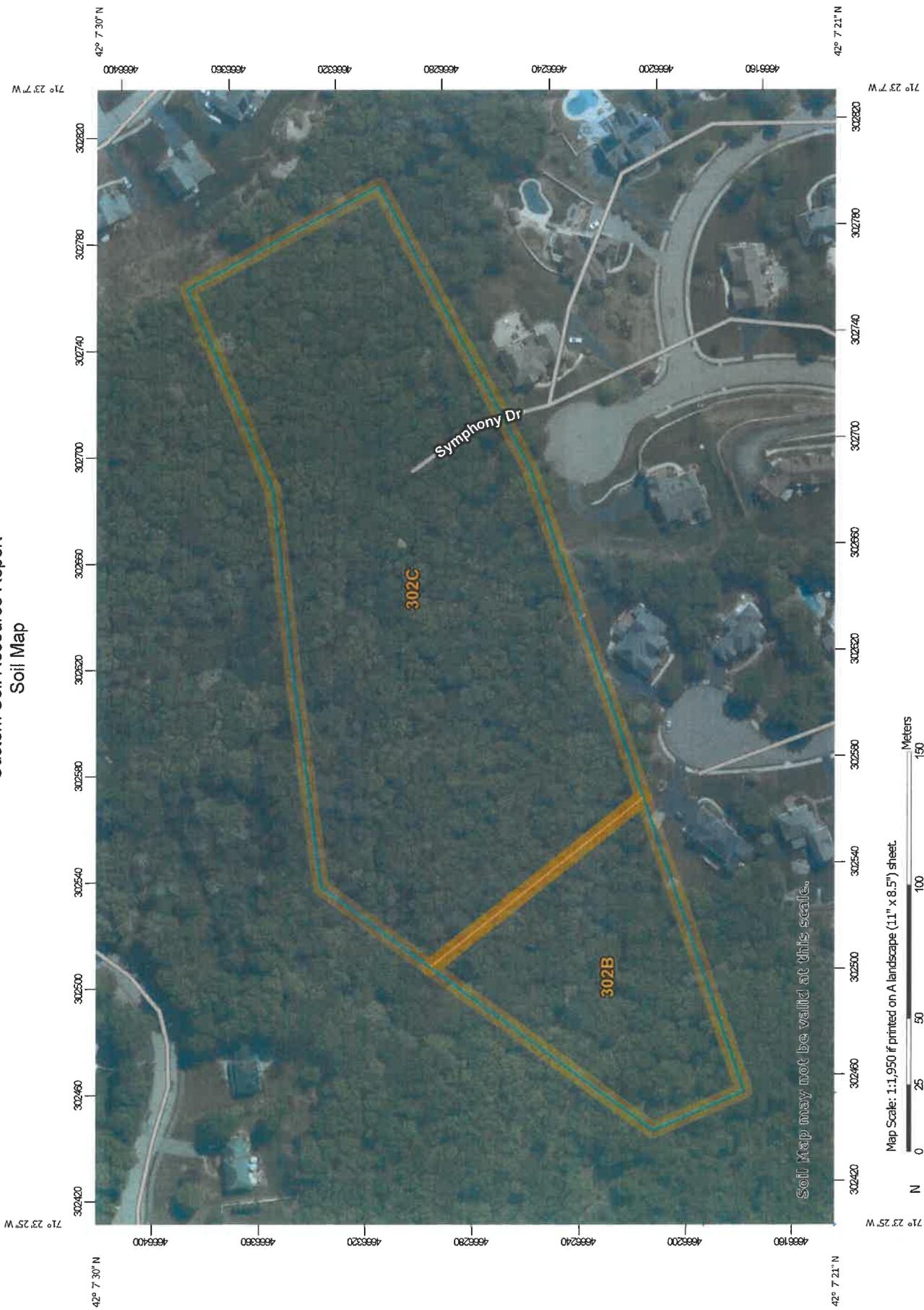
Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

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.

Custom Soil Resource Report Soil Map



Map Scale: 1:1,950 if printed on A landscape (11" x 8.5") sheet.

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

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
 Survey Area Data: Version 20, Aug 27, 2024

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

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

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

MAP LEGEND

- 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
- Water Features**
 - Streams and Canals
- Transportation**
 - Rails
 - Interstate Highways
 - US Routes
 - Major Roads
 - Local Roads
- Background**
 - Aerial Photography
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
302B	Montauk fine sandy loam, 0 to 8 percent slopes, extremely stony	1.8	21.4%
302C	Montauk fine sandy loam, 8 to 15 percent slopes, extremely stony	6.6	78.6%
Totals for Area of Interest		8.4	100.0%

Map Unit Descriptions

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

Custom Soil Resource Report

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.

Norfolk and Suffolk Counties, Massachusetts

302B—Montauk fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w80t
Elevation: 30 to 1,120 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: Not prime farmland

Map Unit Composition

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

Description of Montauk, Extremely Stony

Setting

Landform: Ground moraines, drumlins, recessional moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 6 inches: fine sandy loam
Bw1 - 6 to 28 inches: fine sandy loam
Bw2 - 28 to 36 inches: sandy loam
2Cd - 36 to 74 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 1.42 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

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Minor Components

Scituate, extremely stony

Percent of map unit: 8 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Canton, extremely stony

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 2 percent
Landform: Depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

302C—Montauk fine sandy loam, 8 to 15 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w80s
Elevation: 0 to 1,080 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: Not prime farmland

Map Unit Composition

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

Description of Montauk, Extremely Stony

Setting

Landform: Hills, recessional moraines, ground moraines, drumlins
Landform position (two-dimensional): Backslope

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Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 6 inches: fine sandy loam
Bw1 - 6 to 28 inches: fine sandy loam
Bw2 - 28 to 36 inches: sandy loam
2Cd - 36 to 74 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: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 1.42 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Scituate, extremely stony

Percent of map unit: 8 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Canton, extremely stony

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 2 percent
Landform: Depressions, ground moraines, hills, drainageways

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Landform position (two-dimensional): Footslope, toeslope

Landform position (three-dimensional): Head slope, base slope

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

References

- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
- American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
- Federal Register. July 13, 1994. Changes in hydric soils of the United States.
- Federal Register. September 18, 2002. Hydric soils of the United States.
- Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.
- National Research Council. 1995. Wetlands: Characteristics and boundaries.
- Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262
- Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577
- Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580
- Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.
- United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.
- United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374
- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelpdb1043084>

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United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf