GRADY CONSULTING, L.L.C.

Civil Engineers ♦ Land Surveyors ♦ Landscape Architects

STORMWATER REPORT

Re-Development
106 County Road
Plympton, Massachusetts

Prepared for:

B2B-SP1
#30 Brackett Road
Rye, NH 03870

June 21, 2023

SUMMARY

This Stormwater Report has been prepared to document compliance with Stormwater Management Standards for the re-development of commercial storage facility. The applicant is proposing to add 46 relocatable storage units and crushed stone area.

The re-development of the site will not increase the impervious coverage. The proposed relocatable units will rest on a 6" crushed stone area allowing stormwater from the roof structure to infiltrate to the ground below the units. The proposed drainage consists of routing the runoff from the units to a crushed stone infiltration system surrounding the area and below the units. The design as proposed reduces peak runoff rates, improves and promotes infiltration, improves stormwater quality and treatment.

This analysis is divided into the following sections:

Section I	Compliance with Massachusetts Stormwater Management Regulations
Section II	Overall Site Analysis
Section III	Operation and Maintenance Plan

Pre Development -
Catchment (Subcat 1E) consists of existing stormwater runoff to the southwest limit of work.

Post Development -
Catchment (Subcat 2P) consists of proposed stormwater runoff from the storage units and crushed stone area to the proposed crushed stone infiltration system.

The calculations have been performed for the 2, 10, 25, and 100-year 24 hour storm event, using HydroCAD 10.00 Stormwater Modeling computer program. This computer program is based upon the TR-55 computer models and uses the SCS Curvilinear Unit rainfall distribution. The closed drainage system calculation were performed using the HydroCAD Stormwater Modeling program

SUMMARY OF STORMWATER FLOWS
(cfs)

Events for Subcatchment 1E: To Southwest Limit of Work

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.44	0.00	9	0.01
10-Year	5.07	0.02	314	0.21
25-Year	6.08	0.08	687	0.47
100-Year	**7.65**	**0.29**	**1,487**	**1.01**

Events for Subcatchment 2P: Storage Unit Roofs/Crushed

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.44	1.18	3,771	2.58
10-Year	5.07	1.86	6,078	4.15
25-Year	6.08	2.28	7,526	5.14
100-Year	**7.65**	**2.92**	**9,791**	**6.69**

Events for Pond 4P: Crushed Stone

Event	Inflow (cfs)	Discarded (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	1.18	**0.21**	91.62	1,054
10-Year	1.86	0.21	91.74	2,064
25-Year	2.28	0.21	91.82	2,751
100-Year	**2.92**	0.21	**91.95**	**3,913**

Section I

Compliance with Massachusetts Stormwater Management Regulations

STANDARD 1. NO NEW STORMWATER CONVEYANCES

The proposed re-development proposes no new stormwater conveyances that discharge untreated stormwater off-site or cause down gradient erosion.

STANDARD 2. PEAK RATE ATTENUATION

The overall site analysis demonstrates that the stormwater management system has been designed so that the post-development peak discharge rates do not exceed the pre-development discharge rate.

STANDARD 3. STORMWATER RECHARGE

TABLE 1
REQUIRED RECHARGE VOLUME AND DRAWDOWN

Impervious Area = 8,849 SF (relocatable storage units)
Target Depth Factor (F) = 0.60"

Rv = F x impervious area = 0.60"x 8,849 SF x 1'/12"= 442 CF

Total Required Recharge =442 CF

Proposed:
Subsurface (100 Year Infiltration) = 543 CF

Drawdown Within 72 Hours

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)}$$

Where:
Rv = Storage Volume
K = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate (see Table 2.3.3). For "Dynamic Field" Method, use 50% of the in-situ saturated hydraulic conductivity.
Bottom Area = Bottom Area of Recharge Structure

Subsurface Crushed Stone

$$\text{Time} = \frac{543\ CF}{(8.27"/hr)(1'/12")(8{,}709\ SF)} = 0.1\ \text{hours} < 72\ \text{hours}$$

Mounding Analysis

"Mounding analysis is required when the vertical separation from the bottom of an exfiltration system to seasonal high groundwater is less than four (4) feet and the recharge system is proposed to attenuate the peak discharge from a 10-year or higher 24-hour storm (e.g., 10-year, 25-year, 50-year, or 100-year 24-hour storm). In such cases, the mounding analysis must demonstrate that the Required Recharge Volume (e.g., infiltration basin storage) is fully dewatered within 72 hours (so the next storm can be stored for exfiltration). The mounding analysis must also show that the groundwater mound that forms under the recharge system will not break out above the land or water surface of a wetland (e.g., it doesn't increase the water sheet elevation in a Bordering Vegetated Wetland, Salt Marsh, or Land Under Water within the 72-hour evaluation period)."

"The Hantush[1] or other equivalent method may be used to conduct the mounding analysis. The Hantush method predicts the maximum height of the groundwater mound beneath a rectangular or circular recharge area. It assumes unconfined groundwater flow, and that a linear relation exists between the water table elevation and water table decline rate. It results in a water table recession hydrograph depicting exponential decline. The Hantush method is available in proprietary software and free on-line calculators on the Web in automated format. If the analysis indicates the mound will prevent the infiltration BMP from fully draining within the 72-hour period, an iterative process must be employed to determine an alternative design that drains within the 72-hour period."

A Mounding Analysis is not required.

[1] Hantush 1967 – See Reference for Standard 3.

STANDARD 4. WATER QUALITY

TSS Removal

The proposed work meets the requirement for removal of total suspended solids (TSS). See TSS Removal Worksheet

Long-Term Pollution Prevention Plan

The long-term pollution prevention plan will be combined with the Operation and Maintenance Plan required by Standard 9.

WATER QUALITY TREATMENT VOLUME

V_{WQ} = (D_{WQ}/12 inches/foot) * (A_{IMP} * 43,560 square feet/acre)

V_{WQ} = *Required Water Quality Volume* (in cubic feet)
D_{WQ} = Water Quality Depth: one-inch for discharges within a Zone II or Interim Wellhead Protection Area, to or near another critical area, runoff from a LUHPPL, or exfiltration to soils with infiltration rate greater than 2.4 inches/hour or greater; ½-inch for discharges near or to other areas.
A_{IMP} = Impervious Area (in acres)

The site is located in soils with an infiltration rate greater than 2.4 inches/hour so a Water Quality Depth of 1-inch is required.

V_{WQ} = (1 inch/12 inches/foot) * (8,849 square feet) = 737 CF

1,742 CF storage volume provided in the Subsurface System.

INSTRUCTIONS:

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

Version 1, Automated: Mar. 4, 2008

Location: 106 County Road, Plympton

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Trench	**0.80**	**1.00**	**0.80**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**

Total TSS Removal = **80%**

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

Project: 22-489
Prepared By: **Paul Seaberg**
Date: **6/21/2023**

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

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

1. From MassDEP Stormwater Handbook Vol. 1

STANDARD 5 LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS

The land use is not considered a higher potential pollutant load.

STANDARD 6. CRITICAL AREAS

The project site is not located within a Zone II. The proposed BMP's provide 80% TSS removal prior to discharge. Required water quality standards have been met.

STANDARD 7. REDEVELOPMENT PROJECT

"A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions."

The project consists of re-developing commercial site. The re-development of the site will not increase the impervious area since the units will not have a foundation and runoff will be directed to the crushed stone below allowing infiltration to the ground. The proposed drainage consists of a subsurface crushed stone infiltration system to attenuate roof runoff from the relocatable storage units.

STANDARD 8. CONSTRUCTION PERIOD CONTROLS

A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

The proposed re-development project will not disturb more than one acre of land and is not required to obtain coverage under the NPDES Construction General Permit issued by EPA and will not require a Stormwater Pollution Plan (see attached O&M Plan during construction)

STANDARD 9. LONG-TERM OPERATION AND MAINTENANCE (O&M) PLAN

A Long -Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

The Long-Term Operation and Maintenance Plan shall at a minimum include:

1. *Stormwater management system(s) owners;*
2. *The party or parties responsible for operation and maintenance, including how future property owners will be notified of the presence of the stormwater management system and the requirement for proper operation and maintenance;*
3. *The routine and non-routine maintenance tasks to be undertaken after construction is complete and a schedule for implementing those tasks;*
4. *A plan that is drawn to scale and shows the location of all stormwater BMPs in each treatment train along with the discharge point;*
5. *A description and delineation of public safety features; and*

6. *An estimated operations and maintenance budget.*

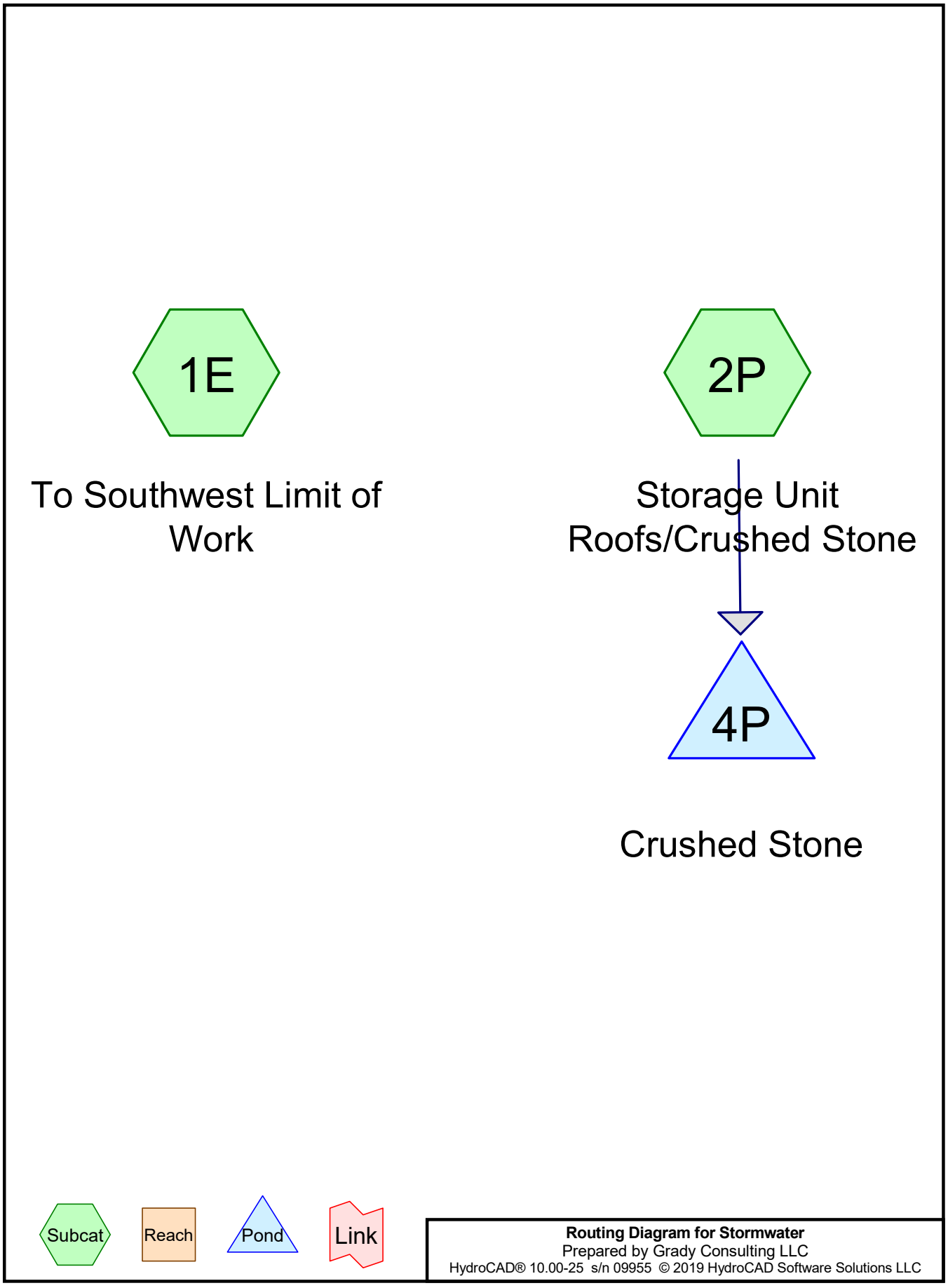
(see attached O&M Plan post construction)

STANDARD 10. ILLICIT DISCHARGES PROHIBITED

"All illicit discharges to the stormwater management system are prohibited."

Section II

Overall Site Analysis



Routing Diagram for Stormwater
Prepared by Grady Consulting LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
17,639	39	>75% Grass cover, Good, HSG A (1E)
8,709	85	Crushed Stone (2P)
8,849	98	Roofs, HSG A (2P)
35,197	**65**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
26,488	HSG A	1E, 2P
0	HSG B	
0	HSG C	
0	HSG D	
8,709	Other	2P
35,197		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
17,639	0	0	0	0	17,639	>75% Grass cover, Good	
0	0	0	0	8,709	8,709	Crushed Stone	
8,849	0	0	0	0	8,849	Roofs	
26,488	**0**	**0**	**0**	**8,709**	**35,197**	**TOTAL AREA**	

Time span=0.10-24.00 hrs, dt=0.02 hrs, 1196 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 1E: To Southwest Limit of Runoff Area=17,639 sf 0.00% Impervious Runoff Depth>0.01"
Tc=6.0 min CN=39 Runoff=0.00 cfs 9 cf

Subcatchment 2P: Storage Unit Runoff Area=17,558 sf 50.40% Impervious Runoff Depth>2.58"
Tc=6.0 min CN=92 Runoff=1.18 cfs 3,771 cf

Pond 4P: Crushed Stone Peak Elev=91.50' Storage=12 cf Inflow=1.18 cfs 3,771 cf
Outflow=1.18 cfs 3,771 cf

Total Runoff Area = 35,197 sf Runoff Volume = 3,779 cf Average Runoff Depth = 1.29"
74.86% Pervious = 26,348 sf 25.14% Impervious = 8,849 sf

Summary for Subcatchment 1E: To Southwest Limit of Work

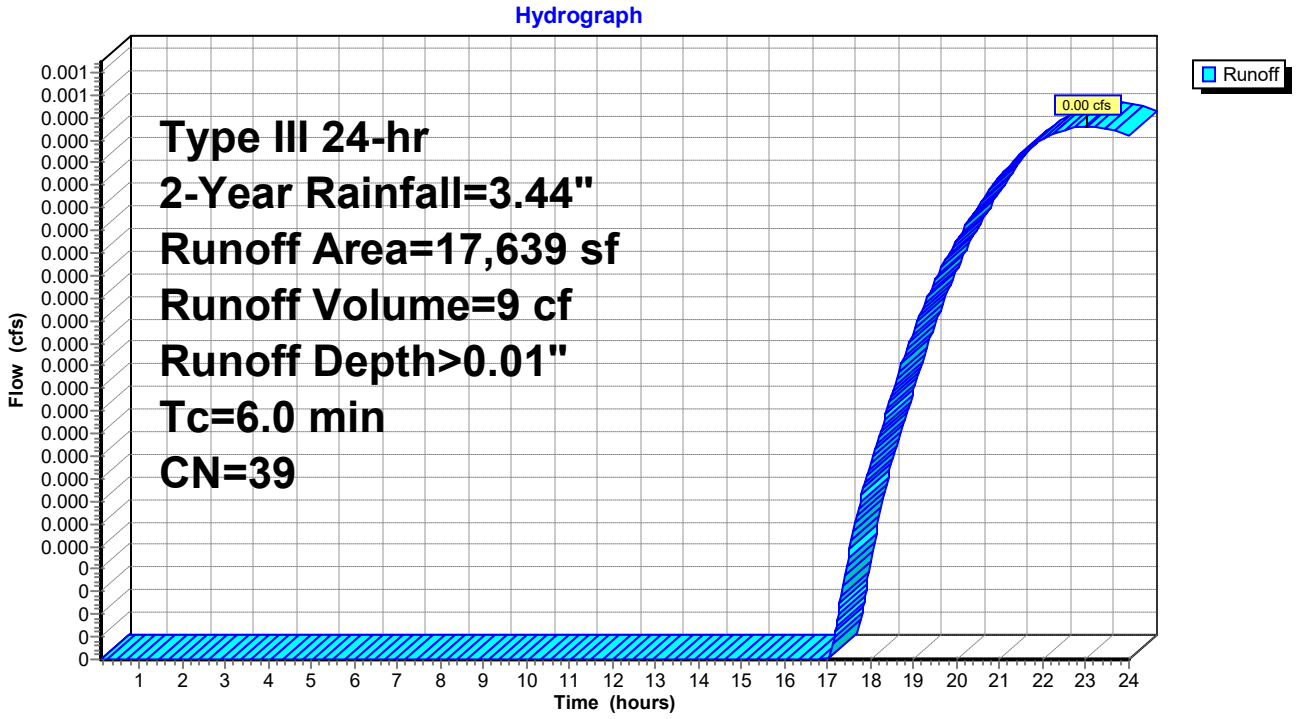
Runoff = 0.00 cfs @ 23.04 hrs, Volume= 9 cf, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
17,639	39	>75% Grass cover, Good, HSG A
17,639		100.00% Pervious Area

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

Subcatchment 1E: To Southwest Limit of Work



Summary for Subcatchment 2P: Storage Unit Roofs/Crushed Stone

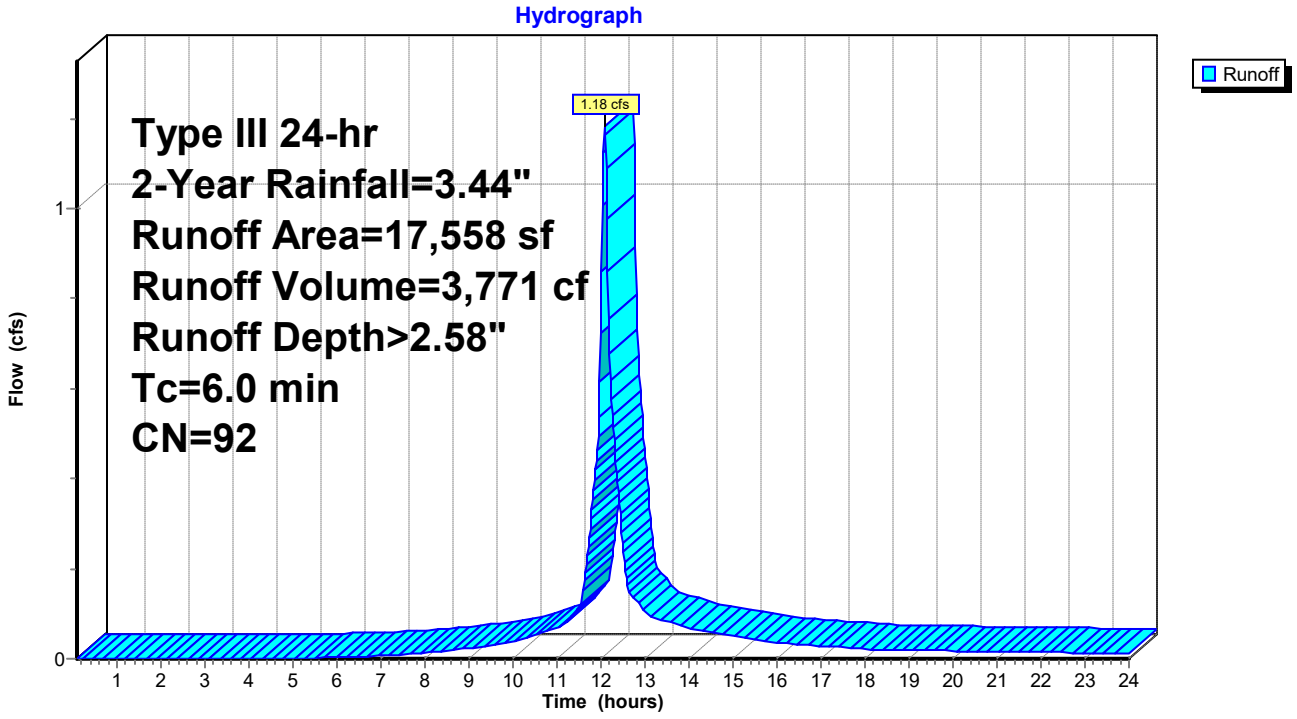
Runoff = 1.18 cfs @ 12.09 hrs, Volume= 3,771 cf, Depth> 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

	Area (sf)	CN	Description
	8,849	98	Roofs, HSG A
*	8,709	85	Crushed Stone
	17,558	92	Weighted Average
	8,709		49.60% Pervious Area
	8,849		50.40% Impervious Area

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

Subcatchment 2P: Storage Unit Roofs/Crushed Stone



Summary for Pond 4P: Crushed Stone

Inflow Area = 17,558 sf, 50.40% Impervious, Inflow Depth > 2.58" for 2-Year event
Inflow = 1.18 cfs @ 12.09 hrs, Volume= 3,771 cf
Outflow = 1.18 cfs @ 12.09 hrs, Volume= 3,771 cf, Atten= 0%, Lag= 0.2 min
Discarded = 1.18 cfs @ 12.09 hrs, Volume= 3,771 cf

Routing by Stor-Ind method, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Peak Elev= 91.50' @ 12.09 hrs Surf.Area= 8,709 sf Storage= 12 cf

Plug-Flow detention time= 0.2 min calculated for 3,767 cf (100% of inflow)
Center-of-Mass det. time= 0.2 min (794.7 - 794.6)

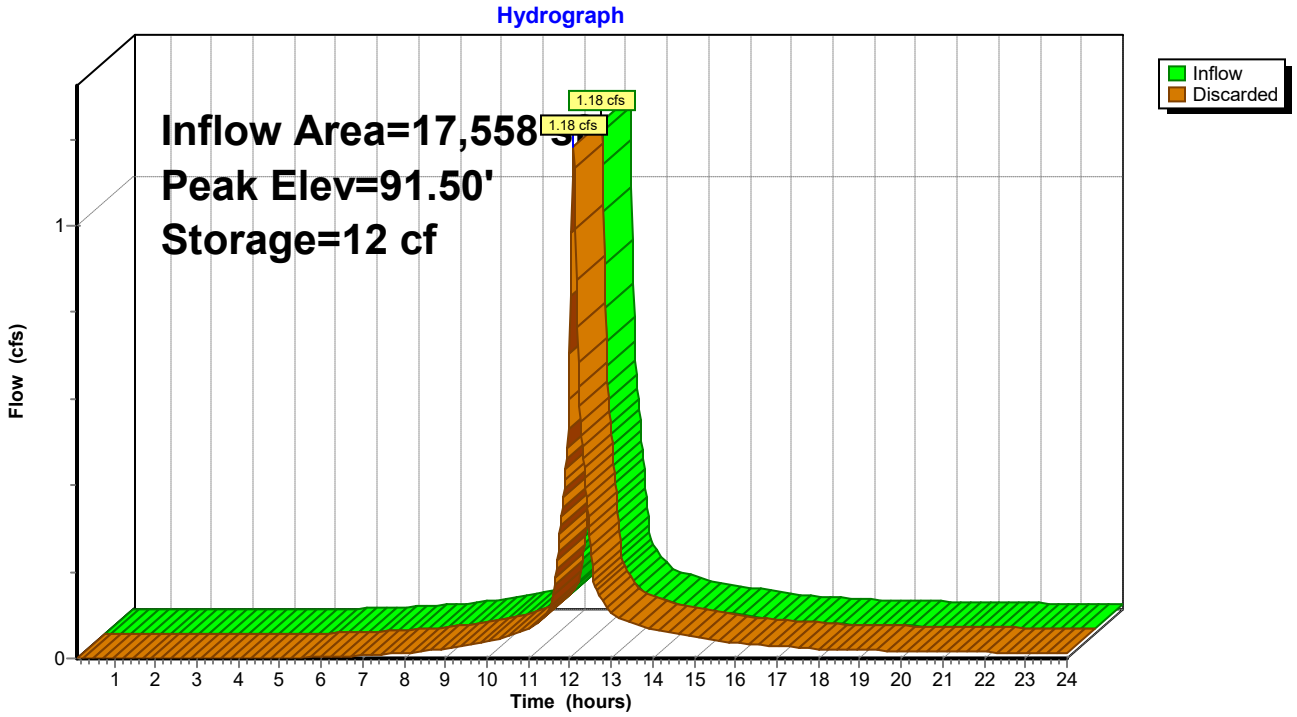
Volume	Invert	Avail.Storage	Storage Description
#1	91.50'	1,742 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.50	8,709	0.0	0	0
91.75	8,709	40.0	871	871
92.00	8,709	40.0	871	1,742

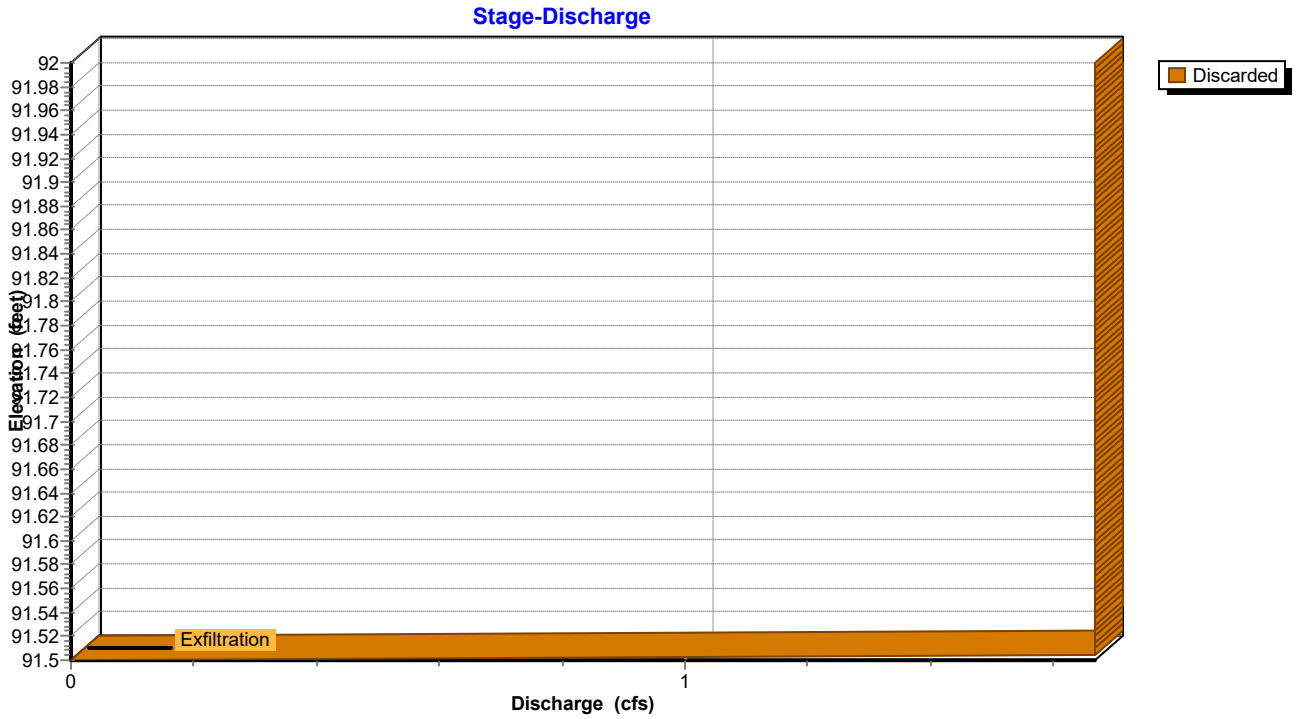
Device	Routing	Invert	Outlet Devices
#1	Discarded	91.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.67 cfs @ 12.09 hrs HW=91.50' (Free Discharge)
1=Exfiltration (Exfiltration Controls 1.67 cfs)

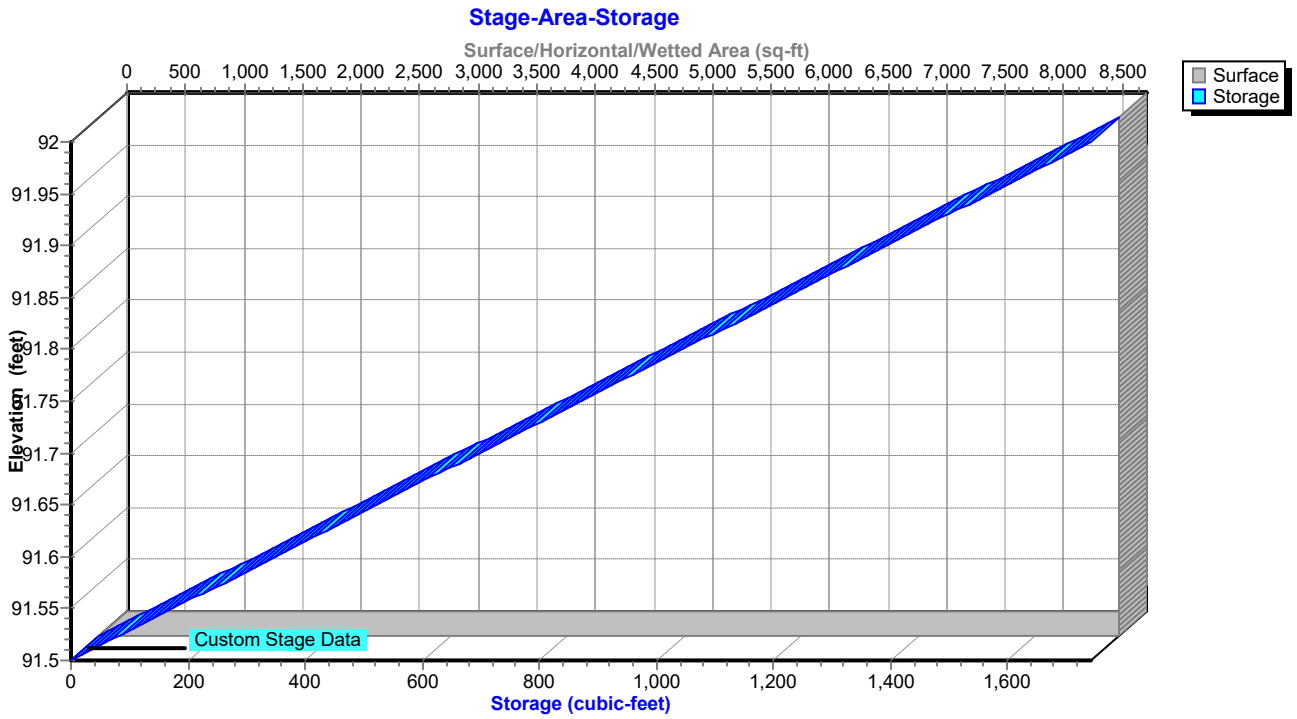
Pond 4P: Crushed Stone



Pond 4P: Crushed Stone



Pond 4P: Crushed Stone



Time span=0.10-24.00 hrs, dt=0.02 hrs, 1196 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 1E: To Southwest Limit of Runoff Area=17,639 sf 0.00% Impervious Runoff Depth>0.21"
Tc=6.0 min CN=39 Runoff=0.02 cfs 314 cf

Subcatchment 2P: Storage Unit Runoff Area=17,558 sf 50.40% Impervious Runoff Depth>4.15"
Tc=6.0 min CN=92 Runoff=1.86 cfs 6,078 cf

Pond 4P: Crushed Stone Peak Elev=91.51' Storage=52 cf Inflow=1.86 cfs 6,078 cf
Outflow=1.67 cfs 6,078 cf

Total Runoff Area = 35,197 sf Runoff Volume = 6,392 cf Average Runoff Depth = 2.18"
74.86% Pervious = 26,348 sf 25.14% Impervious = 8,849 sf

Summary for Subcatchment 1E: To Southwest Limit of Work

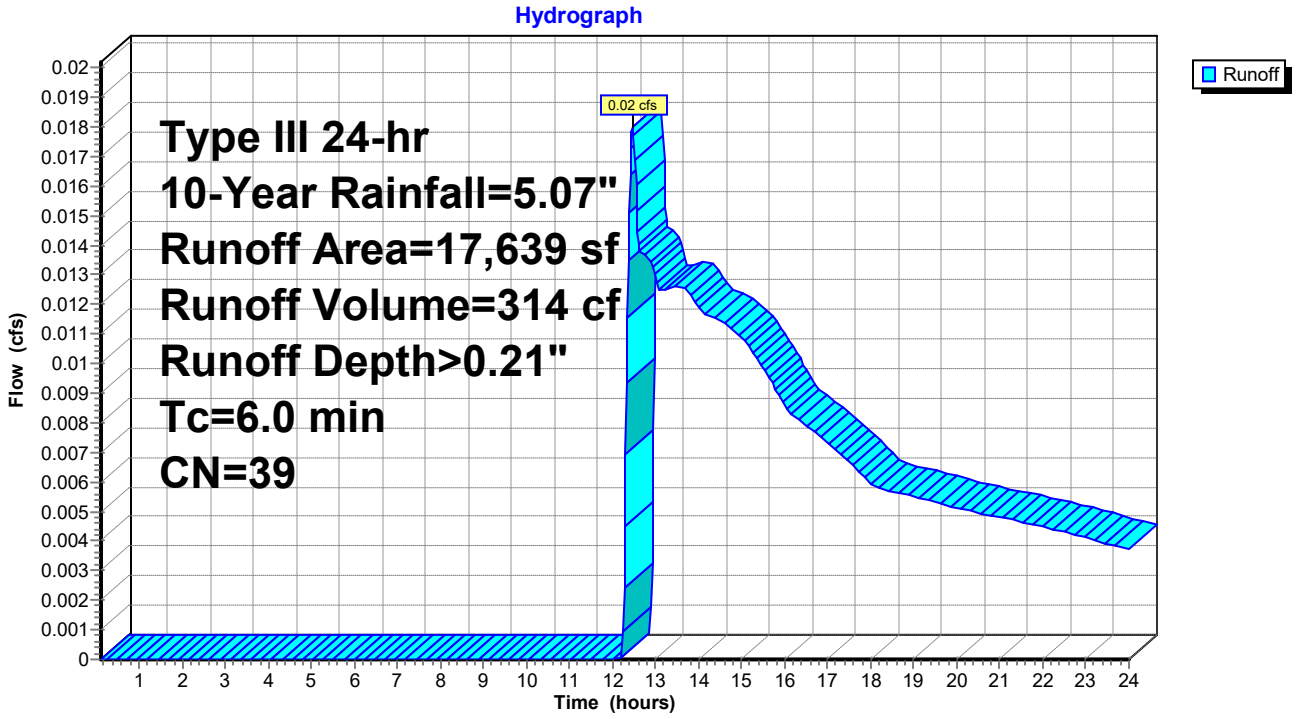
Runoff = 0.02 cfs @ 12.46 hrs, Volume= 314 cf, Depth> 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.07"

Area (sf)	CN	Description
17,639	39	>75% Grass cover, Good, HSG A
17,639		100.00% Pervious Area

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

Subcatchment 1E: To Southwest Limit of Work



Summary for Subcatchment 2P: Storage Unit Roofs/Crushed Stone

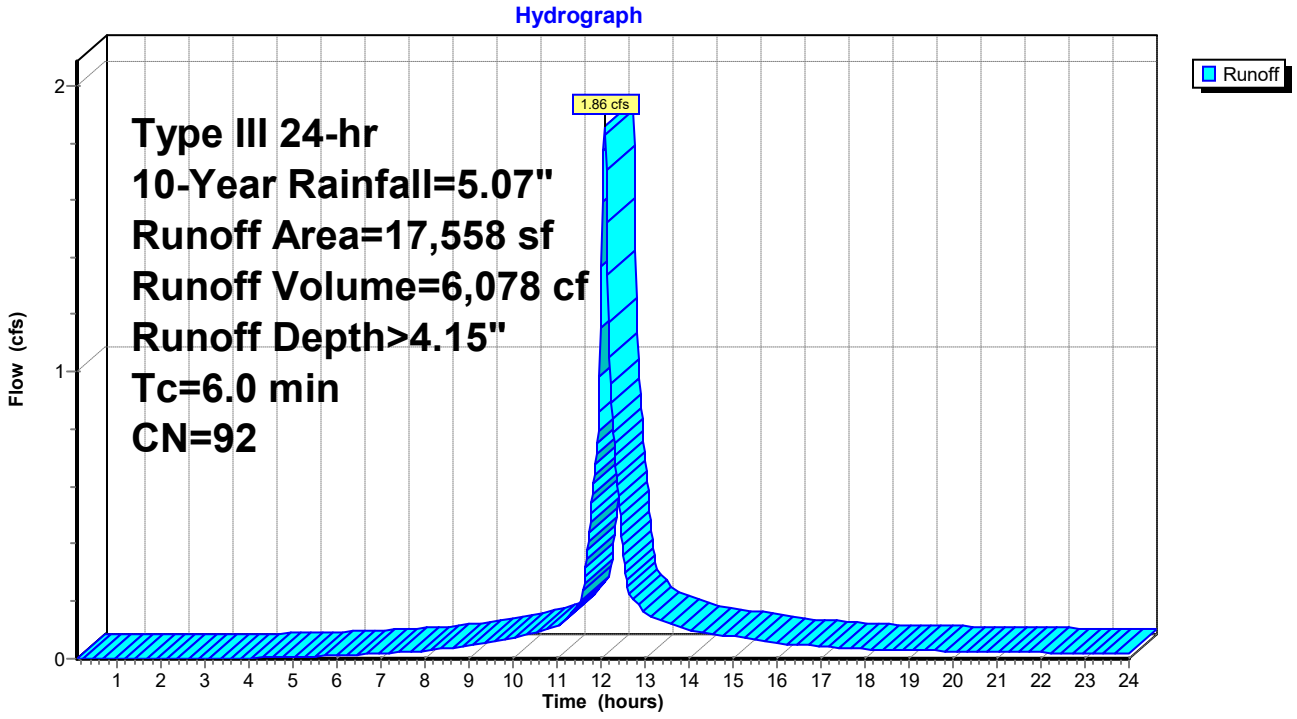
Runoff = 1.86 cfs @ 12.08 hrs, Volume= 6,078 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.07"

	Area (sf)	CN	Description
	8,849	98	Roofs, HSG A
*	8,709	85	Crushed Stone
	17,558	92	Weighted Average
	8,709		49.60% Pervious Area
	8,849		50.40% Impervious Area

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

Subcatchment 2P: Storage Unit Roofs/Crushed Stone



Summary for Pond 4P: Crushed Stone

Inflow Area = 17,558 sf, 50.40% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 1.86 cfs @ 12.08 hrs, Volume= 6,078 cf
Outflow = 1.67 cfs @ 12.06 hrs, Volume= 6,078 cf, Atten= 10%, Lag= 0.0 min
Discarded = 1.67 cfs @ 12.06 hrs, Volume= 6,078 cf

Routing by Stor-Ind method, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Peak Elev= 91.51' @ 12.12 hrs Surf.Area= 8,709 sf Storage= 52 cf

Plug-Flow detention time= 0.2 min calculated for 6,073 cf (100% of inflow)
Center-of-Mass det. time= 0.2 min (781.9 - 781.7)

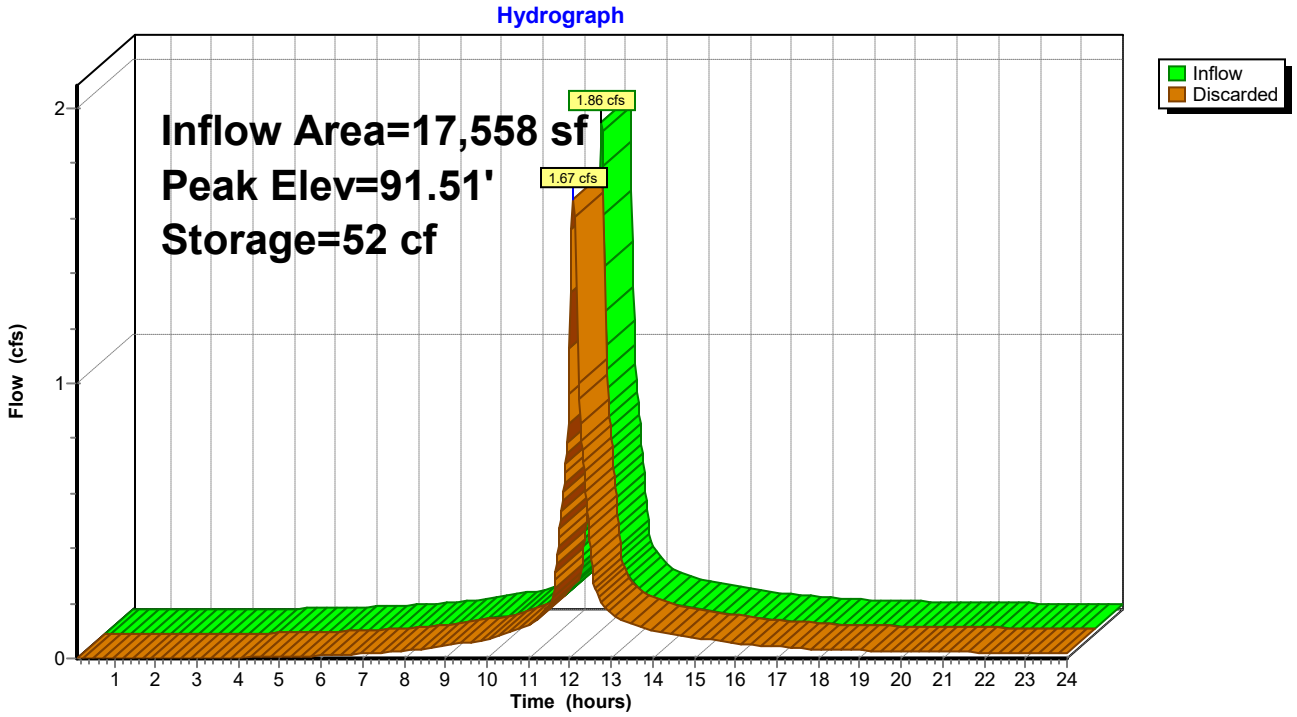
Volume	Invert	Avail.Storage	Storage Description
#1	91.50'	1,742 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.50	8,709	0.0	0	0
91.75	8,709	40.0	871	871
92.00	8,709	40.0	871	1,742

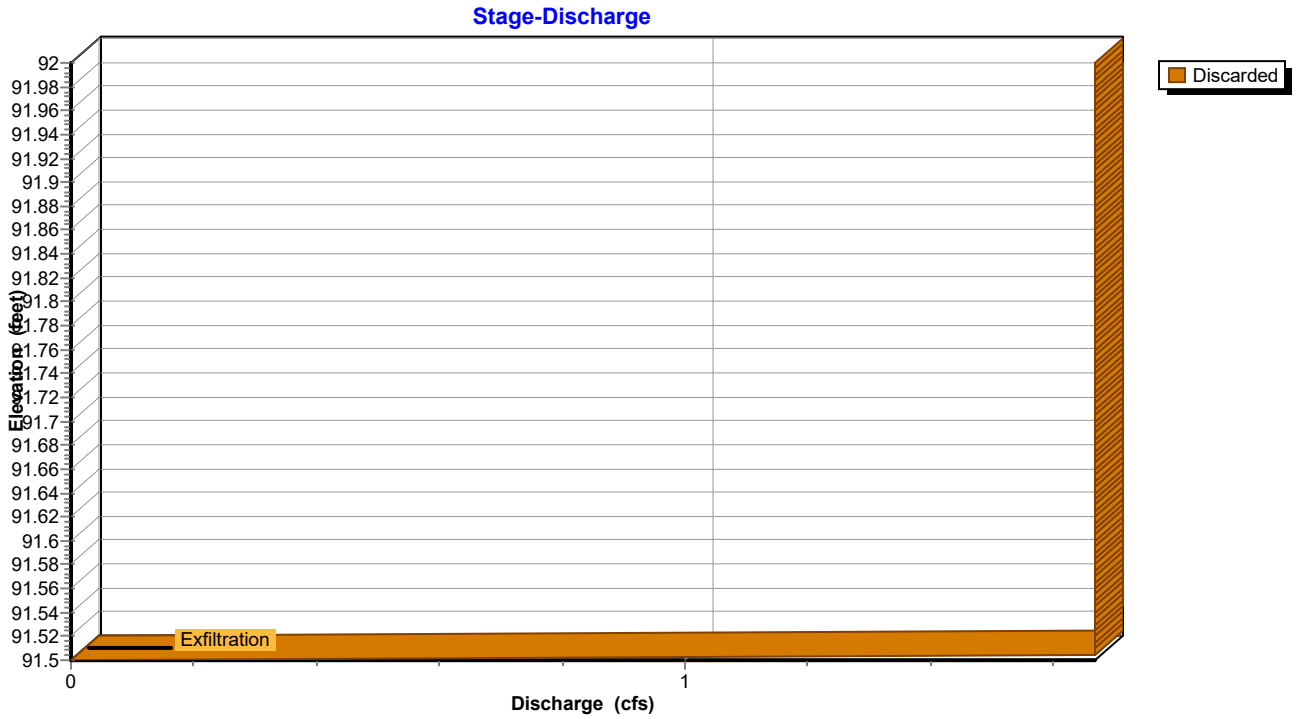
Device	Routing	Invert	Outlet Devices
#1	Discarded	91.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.67 cfs @ 12.06 hrs HW=91.51' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 1.67 cfs)

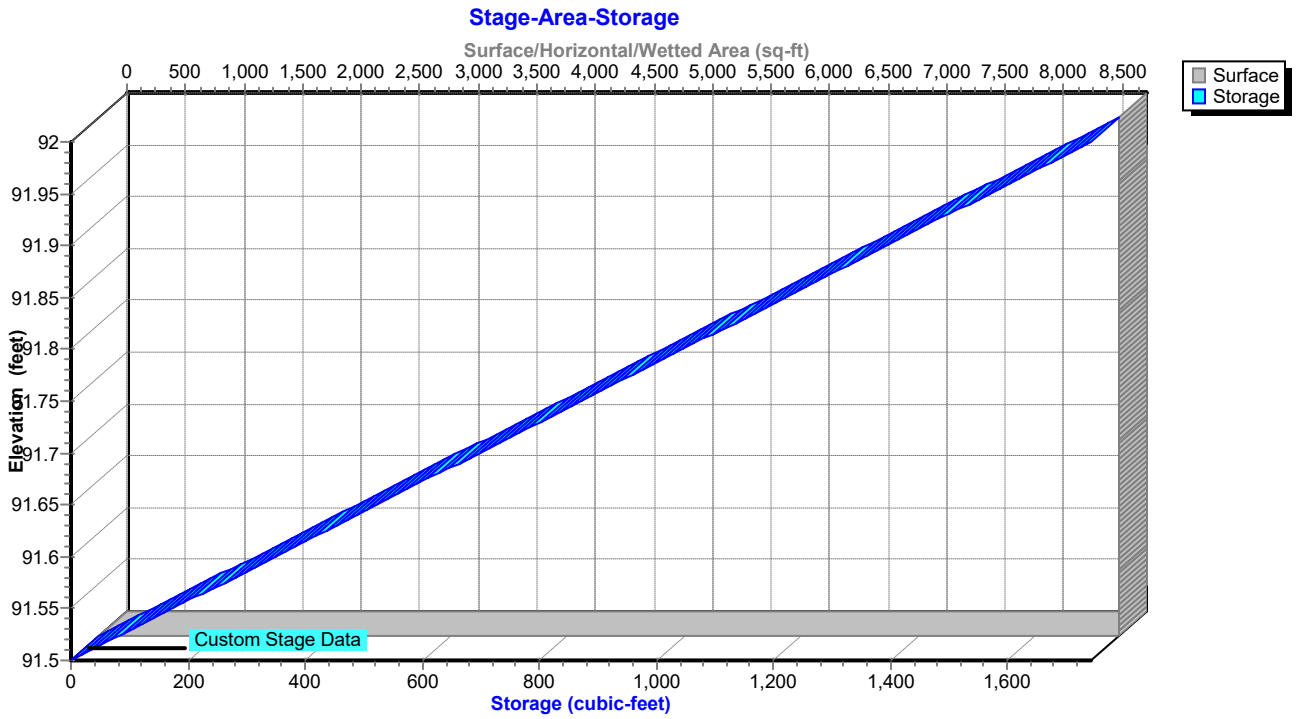
Pond 4P: Crushed Stone



Pond 4P: Crushed Stone



Pond 4P: Crushed Stone



Time span=0.10-24.00 hrs, dt=0.02 hrs, 1196 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 1E: To Southwest Limit of Runoff Area=17,639 sf 0.00% Impervious Runoff Depth>0.47"
Tc=6.0 min CN=39 Runoff=0.08 cfs 687 cf

Subcatchment 2P: Storage Unit Runoff Area=17,558 sf 50.40% Impervious Runoff Depth>5.14"
Tc=6.0 min CN=92 Runoff=2.28 cfs 7,526 cf

Pond 4P: Crushed Stone Peak Elev=91.56' Storage=202 cf Inflow=2.28 cfs 7,526 cf
Outflow=1.67 cfs 7,526 cf

Total Runoff Area = 35,197 sf Runoff Volume = 8,213 cf Average Runoff Depth = 2.80"
74.86% Pervious = 26,348 sf 25.14% Impervious = 8,849 sf

Summary for Subcatchment 1E: To Southwest Limit of Work

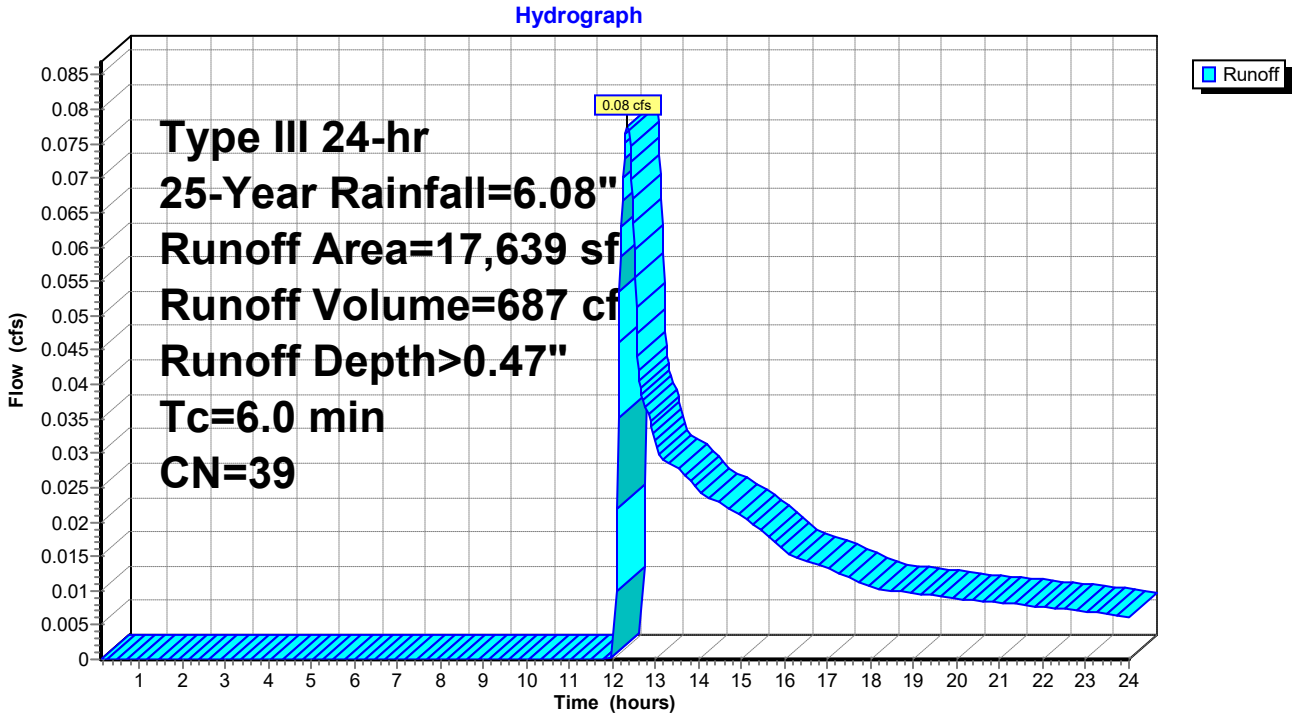
Runoff = 0.08 cfs @ 12.34 hrs, Volume= 687 cf, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=6.08"

Area (sf)	CN	Description
17,639	39	>75% Grass cover, Good, HSG A
17,639		100.00% Pervious Area

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

Subcatchment 1E: To Southwest Limit of Work



Summary for Subcatchment 2P: Storage Unit Roofs/Crushed Stone

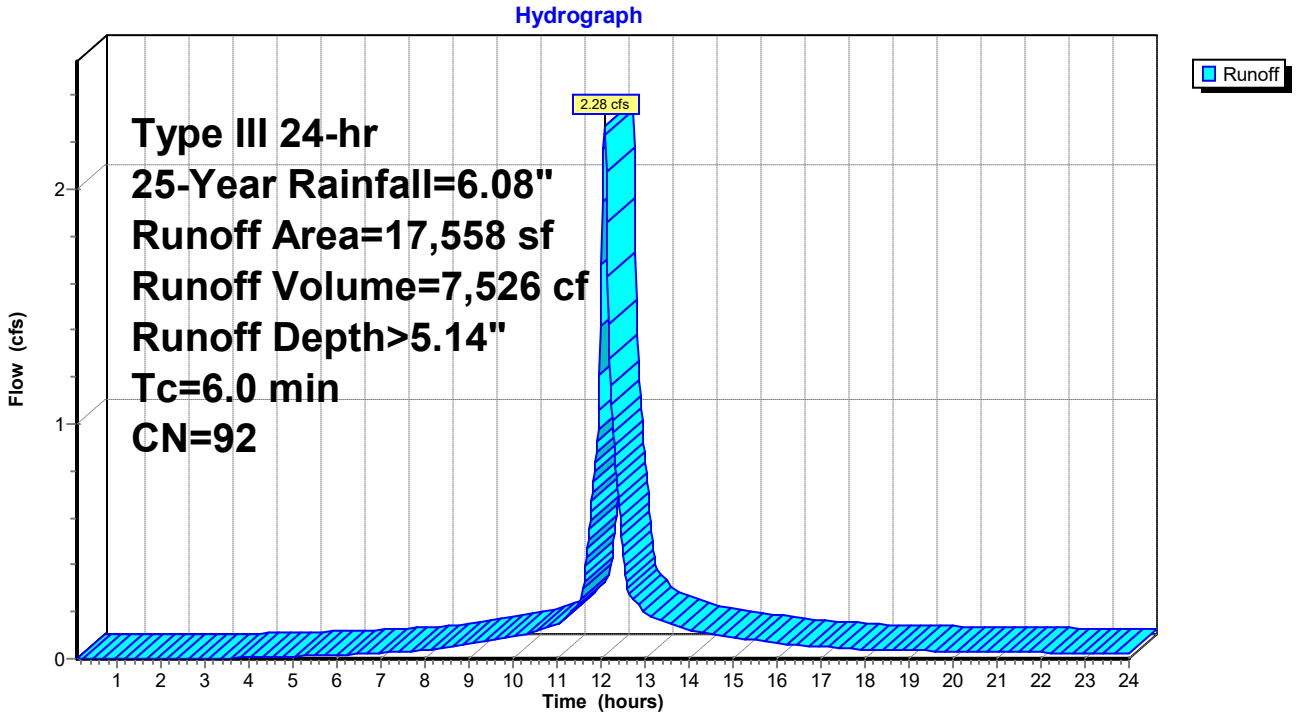
Runoff = 2.28 cfs @ 12.08 hrs, Volume= 7,526 cf, Depth> 5.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=6.08"

	Area (sf)	CN	Description
	8,849	98	Roofs, HSG A
*	8,709	85	Crushed Stone
	17,558	92	Weighted Average
	8,709		49.60% Pervious Area
	8,849		50.40% Impervious Area

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

Subcatchment 2P: Storage Unit Roofs/Crushed Stone



Summary for Pond 4P: Crushed Stone

Inflow Area = 17,558 sf, 50.40% Impervious, Inflow Depth > 5.14" for 25-Year event
Inflow = 2.28 cfs @ 12.08 hrs, Volume= 7,526 cf
Outflow = 1.67 cfs @ 12.04 hrs, Volume= 7,526 cf, Atten= 27%, Lag= 0.0 min
Discarded = 1.67 cfs @ 12.04 hrs, Volume= 7,526 cf

Routing by Stor-Ind method, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Peak Elev= 91.56' @ 12.16 hrs Surf.Area= 8,709 sf Storage= 202 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.4 min (776.6 - 776.2)

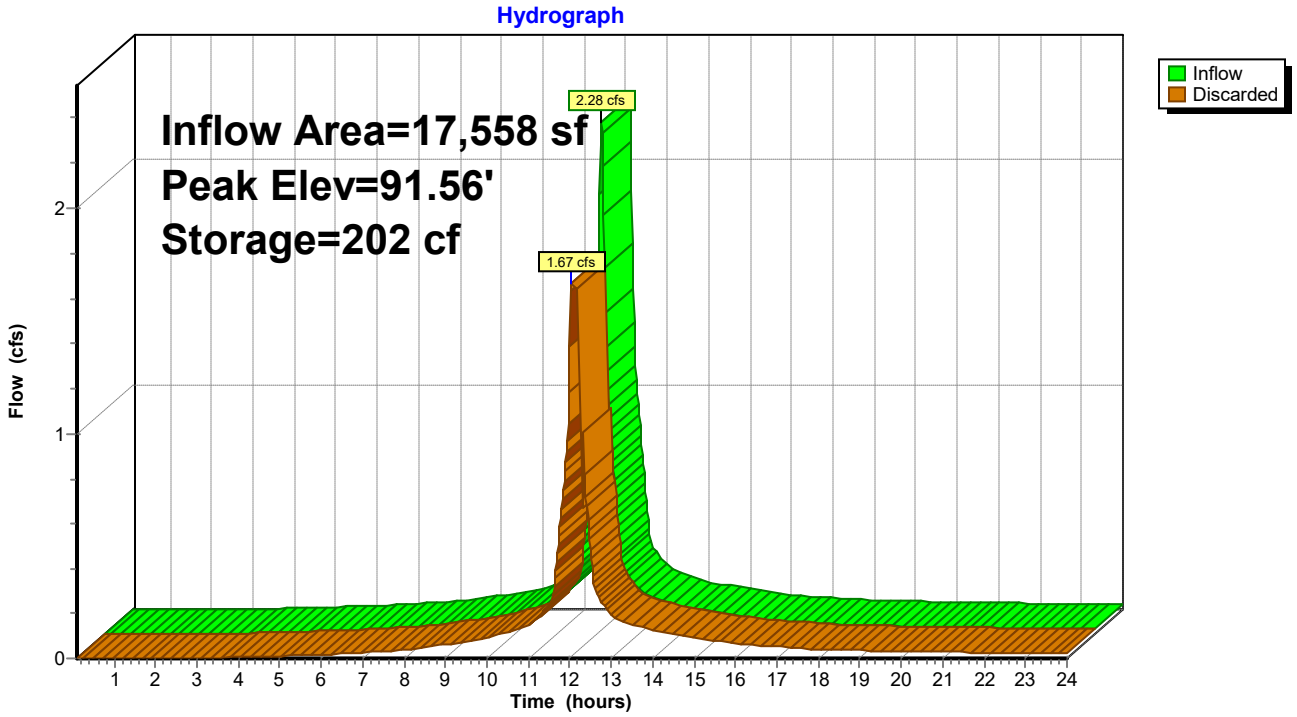
Volume	Invert	Avail.Storage	Storage Description
#1	91.50'	1,742 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.50	8,709	0.0	0	0
91.75	8,709	40.0	871	871
92.00	8,709	40.0	871	1,742

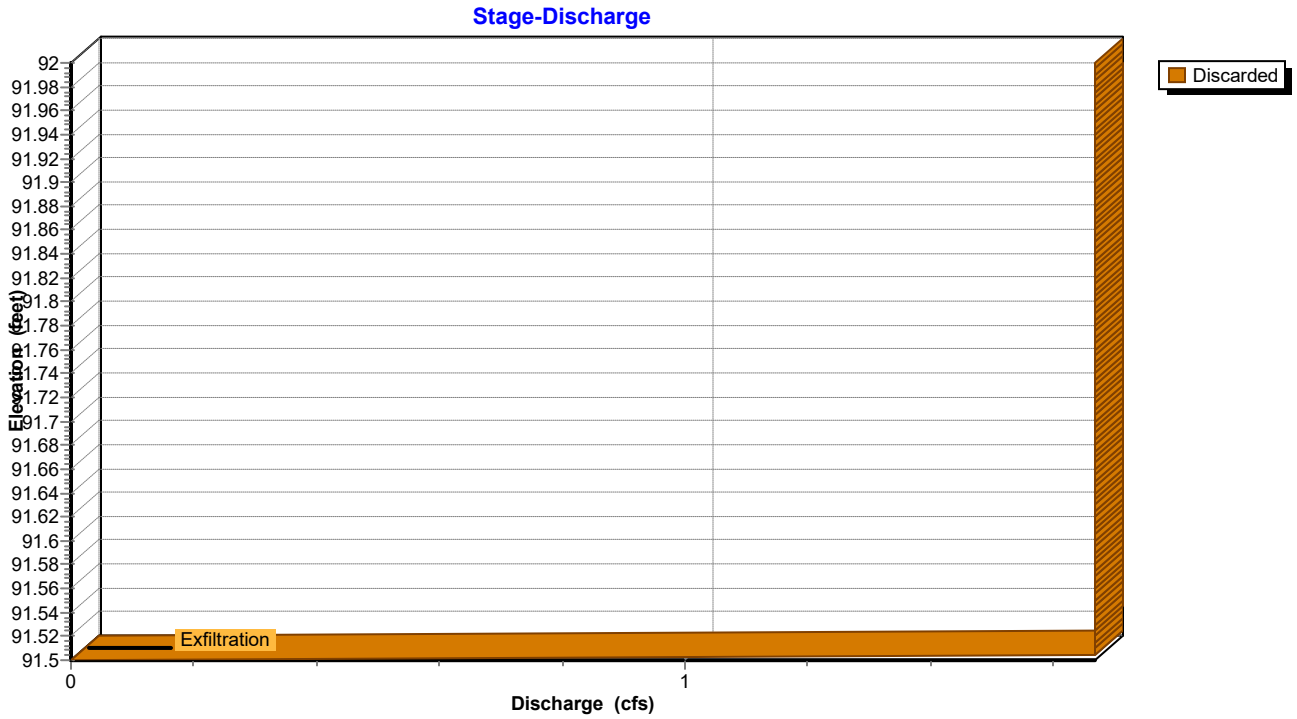
Device	Routing	Invert	Outlet Devices
#1	Discarded	91.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.67 cfs @ 12.04 hrs HW=91.51' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 1.67 cfs)

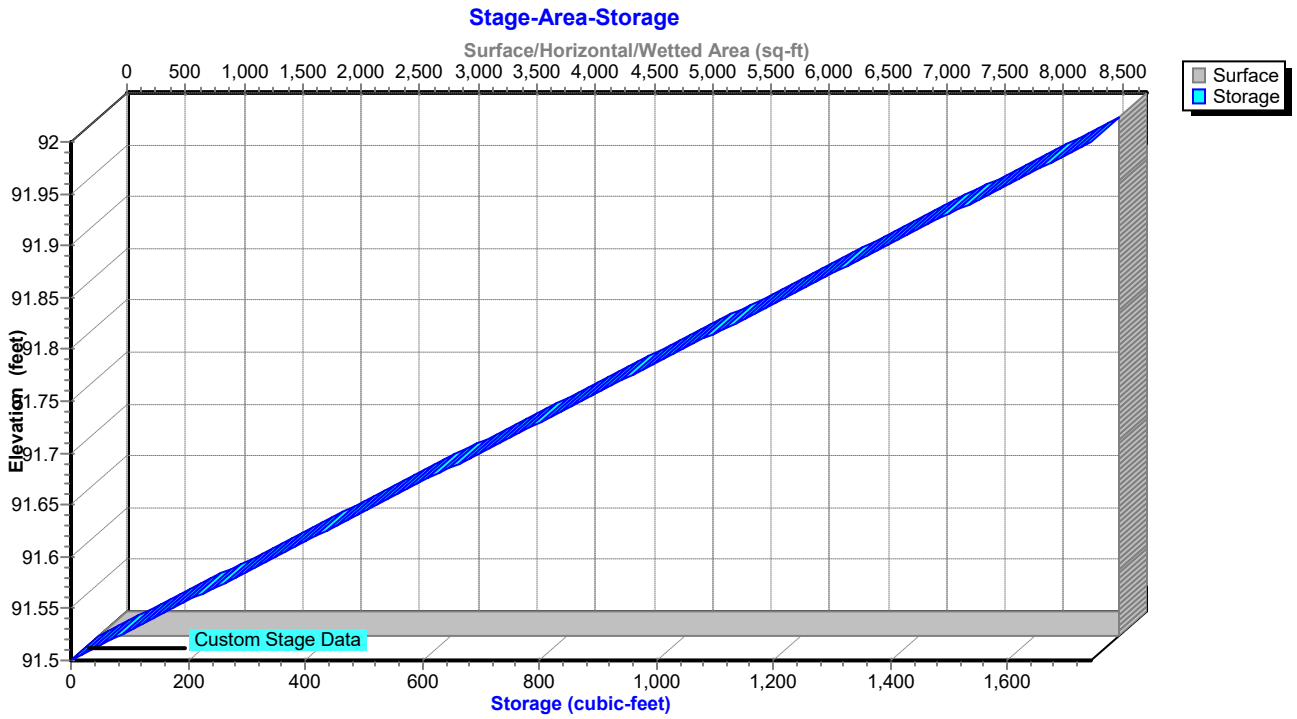
Pond 4P: Crushed Stone



Pond 4P: Crushed Stone



Pond 4P: Crushed Stone



Time span=0.10-24.00 hrs, dt=0.02 hrs, 1196 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 1E: To Southwest Limit of Runoff Area=17,639 sf 0.00% Impervious Runoff Depth>1.01"
Tc=6.0 min CN=39 Runoff=0.29 cfs 1,487 cf

Subcatchment 2P: Storage Unit Runoff Area=17,558 sf 50.40% Impervious Runoff Depth>6.69"
Tc=6.0 min CN=92 Runoff=2.92 cfs 9,791 cf

Pond 4P: Crushed Stone Peak Elev=91.66' Storage=543 cf Inflow=2.92 cfs 9,791 cf
Outflow=1.67 cfs 9,791 cf

Total Runoff Area = 35,197 sf Runoff Volume = 11,279 cf Average Runoff Depth = 3.85"
74.86% Pervious = 26,348 sf 25.14% Impervious = 8,849 sf

Summary for Subcatchment 1E: To Southwest Limit of Work

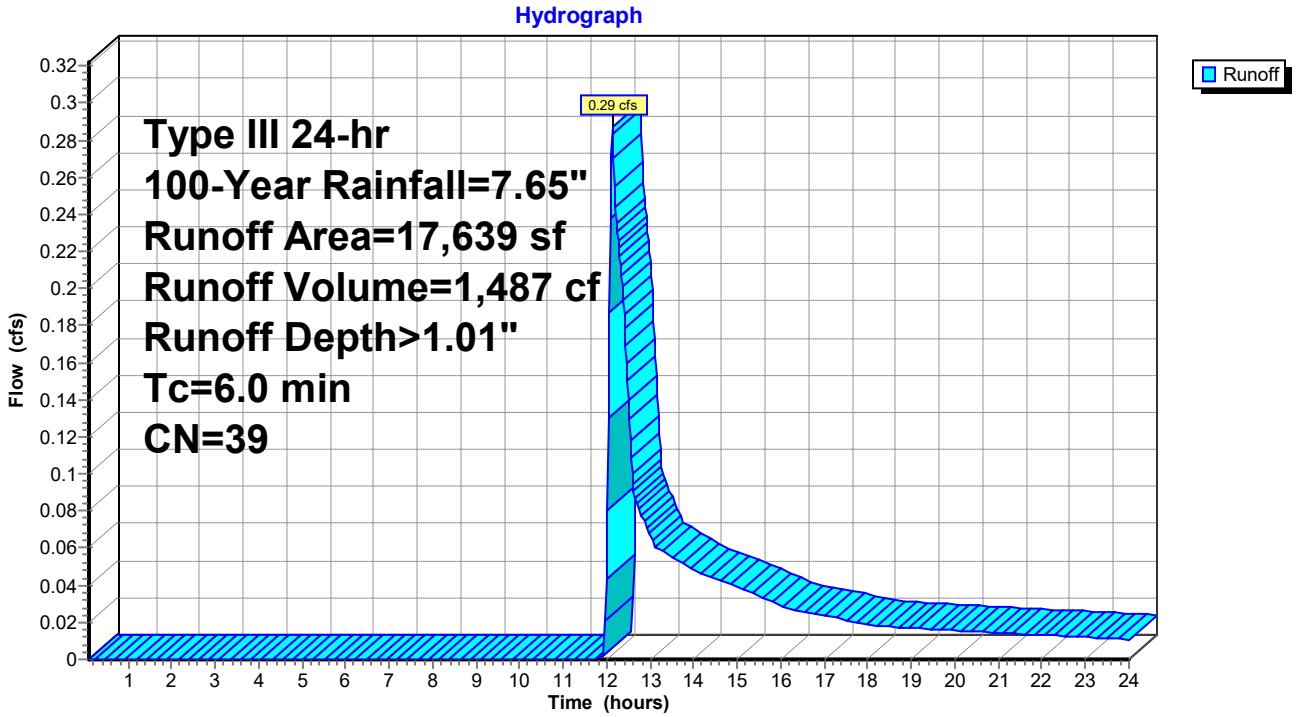
Runoff = 0.29 cfs @ 12.13 hrs, Volume= 1,487 cf, Depth> 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.65"

Area (sf)	CN	Description
17,639	39	>75% Grass cover, Good, HSG A
17,639		100.00% Pervious Area

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

Subcatchment 1E: To Southwest Limit of Work



Summary for Subcatchment 2P: Storage Unit Roofs/Crushed Stone

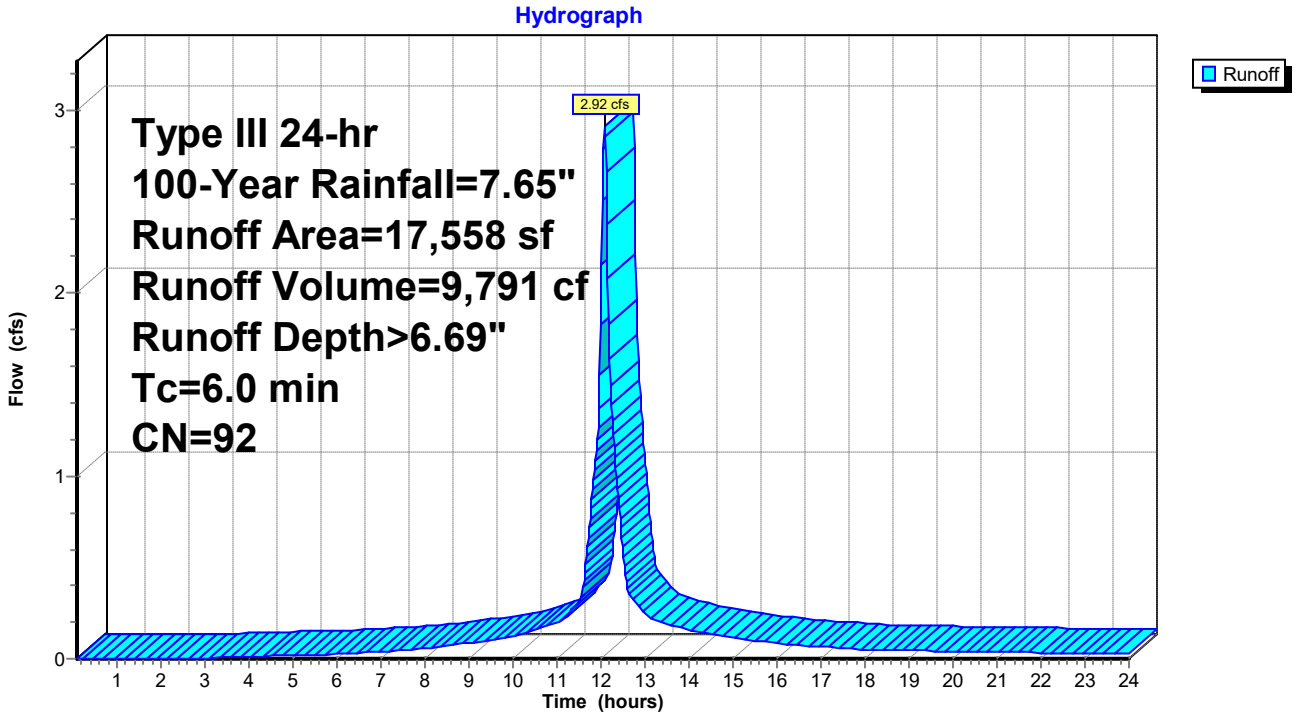
Runoff = 2.92 cfs @ 12.08 hrs, Volume= 9,791 cf, Depth> 6.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.65"

	Area (sf)	CN	Description
	8,849	98	Roofs, HSG A
*	8,709	85	Crushed Stone
	17,558	92	Weighted Average
	8,709		49.60% Pervious Area
	8,849		50.40% Impervious Area

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

Subcatchment 2P: Storage Unit Roofs/Crushed Stone



Summary for Pond 4P: Crushed Stone

Inflow Area = 17,558 sf, 50.40% Impervious, Inflow Depth > 6.69" for 100-Year event
Inflow = 2.92 cfs @ 12.08 hrs, Volume= 9,791 cf
Outflow = 1.67 cfs @ 12.00 hrs, Volume= 9,791 cf, Atten= 43%, Lag= 0.0 min
Discarded = 1.67 cfs @ 12.00 hrs, Volume= 9,791 cf

Routing by Stor-Ind method, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Peak Elev= 91.66' @ 12.20 hrs Surf.Area= 8,709 sf Storage= 543 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.0 min (770.8 - 769.7)

Volume	Invert	Avail.Storage	Storage Description
#1	91.50'	1,742 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

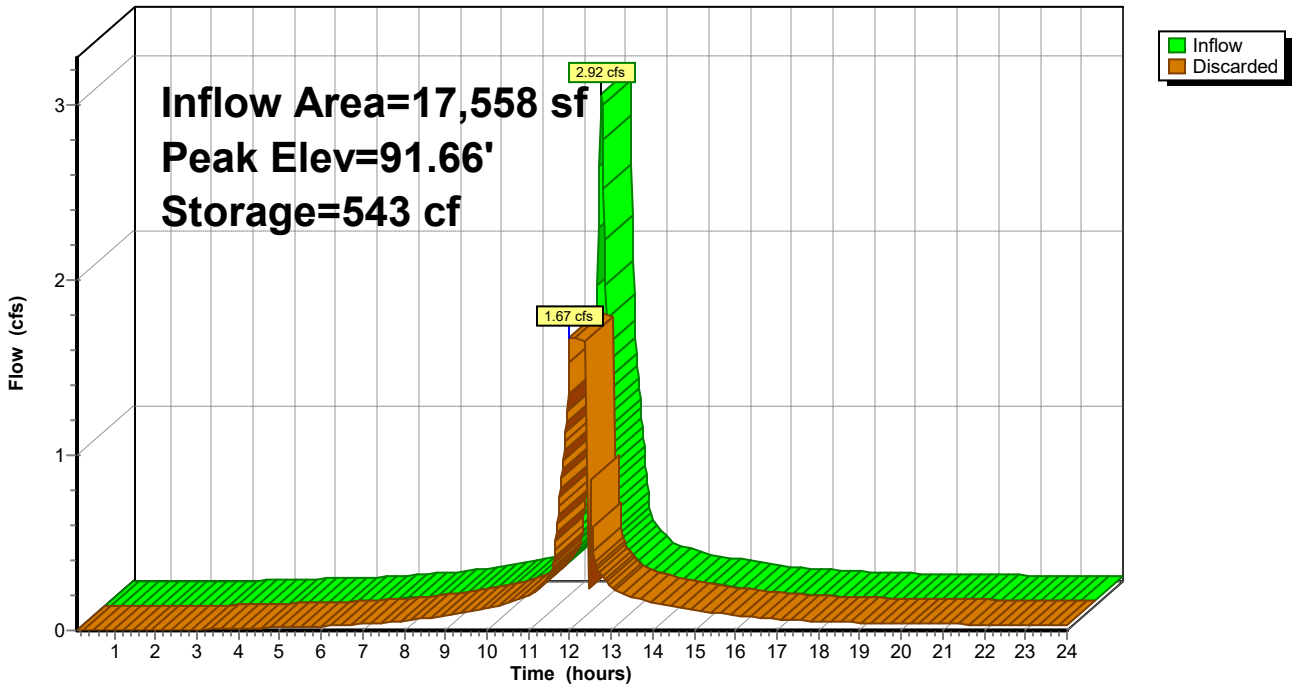
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.50	8,709	0.0	0	0
91.75	8,709	40.0	871	871
92.00	8,709	40.0	871	1,742

Device	Routing	Invert	Outlet Devices
#1	Discarded	91.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.67 cfs @ 12.00 hrs HW=91.51' (Free Discharge)
1=Exfiltration (Exfiltration Controls 1.67 cfs)

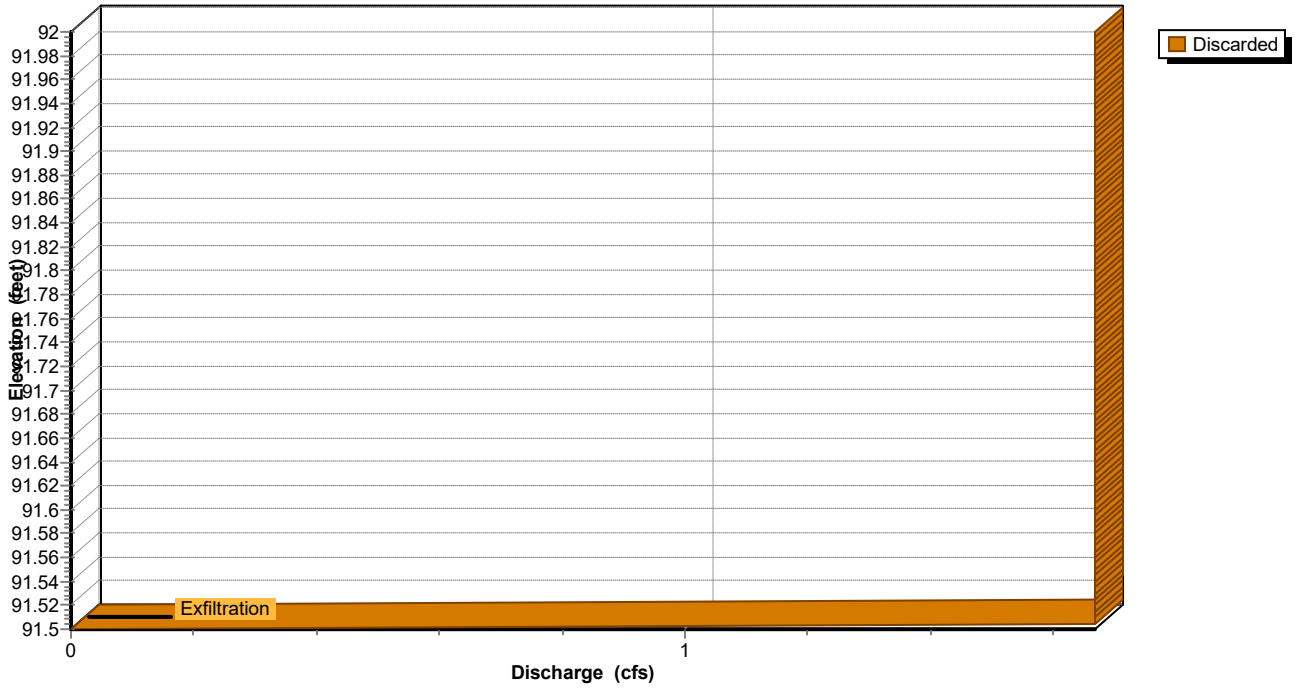
Pond 4P: Crushed Stone

Hydrograph

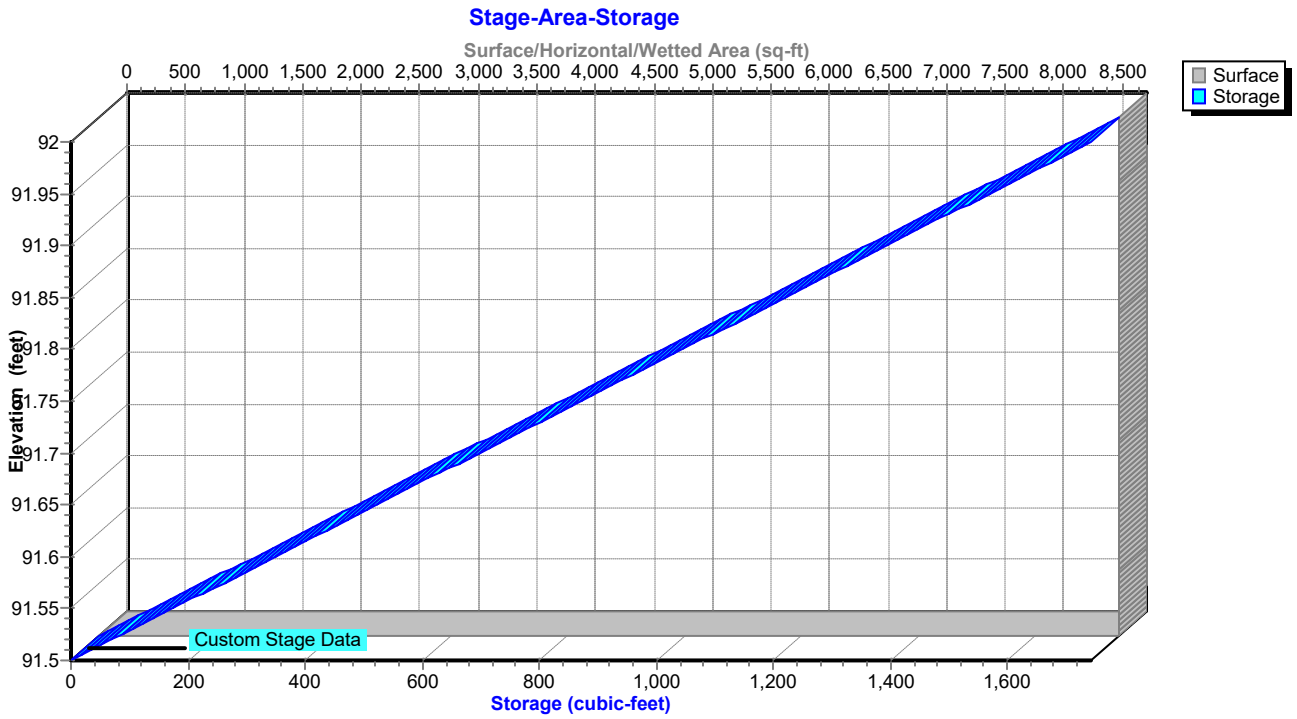


Pond 4P: Crushed Stone

Stage-Discharge



Pond 4P: Crushed Stone



Section III

OPERATION AND MAINTENANCE PLAN

OPERATION AND MAINTENANCE PLAN
DURING CONSTRUCTION
106 County Road
Plympton, MA 02367

Owner: B2B-SP1
30 Brackett Road
Rye, NH 03870
Contact: (617-820-8443)

Party Responsible for Operation and Maintenance:

B2B-SP1
30 Brackett Road
Rye, NH 03870
Contact: (617-820-8443)

Source of Funding:

Operation and Maintenance of this stormwater management system will be the responsibility of the property owner to include its successor and/or assigns, as the same may appear on record with the appropriate register of deeds.

During Construction:

During periods of active construction the stormwater management system shall be inspected on a weekly basis and within 24 hours of a storm event of greater than ½". Maintenance tasks shall be performed monthly or after significant rainfall events of 1" of rain or greater. During construction, silt-laden runoff shall be prevented from entering the drainage system and off-site properties. Temporary swales shall be constructed as needed during construction to direct runoff to sediment traps. Subsurface systems shall not be placed in service until after the installation of base course pavement and vegetative stabilization of the areas contributing to the systems.

If dewatering operations are necessary, all water pumped from the dewatering shall be directed to a "dirt bag" pumped sediment removal system (or approved equal) as manufactured by ACF Environmental. The unit shall be placed on a crushed stone blanket. Disposal of such "dirt bag" shall occur when the device is full and can no longer effectively filter sediment or allow water to pass at a reasonable flow rate. Disposal of this unit shall be the responsibility of the contractor and shall be as directed by the owner in accordance with applicable local, state, and federal guidelines and regulations.

All erosion and sedimentation control measures shall be in place prior to the commencement of any site work or earthwork operations, shall be maintained during construction, and shall remain in place until all site work is complete and ground cover is established.

All exposed soils not to be paved shall be stabilized as soon as practical. Seed mixes shall only be applied during appropriate periods as recommended by the seed supplier, typically May 1 to October 15. Any exposed soils that can not be stabilized by vegetation during these dates shall be stabilized with hay bales, hay mulch, check dams, jute netting or other acceptable means.

Once each structure is in place, it should be maintained in accordance with the procedures described in the post-construction Operations and Maintenance Plan.

During dry periods where dust is created by construction activities the following control measures should be implemented.

- Sprinkling – The contractor may sprinkle the ground along haul roads and traffic areas until moist.
- Vegetative cover – Areas that are not expected to be disturbed regularly may be stabilized with vegetative cover.
- Mulch – Mulching can be used as a quick and effective means of dust control in recently disturbed areas.
- Spray on chemical soil treatments may be utilized. Application rates shall conform to manufacturers recommendations.

Inspections

The Owner shall be responsible to secure the services of a Professional Engineer to perform inspections as required. Inspections during periods of active construction shall be weekly and within 24 hours of a storm event of greater than ½ “. The Professional Engineer shall perform inspections to insure that the approved plan is being followed with particular attention to the Planning Board Approval and the Construction Sequencing. The Engineer shall be responsible for inspections during the construction of the stormwater management system. The Engineer shall prepare and submit to the Planning Board, the Inspection Schedule and Evaluation Checklist (see attached) and, if necessary, request the required maintenance and/or repair of the necessary items. This form shall be stamped by the Engineer and the Owner shall be notified that specific changes and/or repairs are necessary.

For additional information, refer to Performance, Standards and Guidelines for Stormwater Management in Massachusetts, published by the Department of Environmental Protection.

STORMWATER MANAGEMENT
BEST MANAGEMENT PRACTICES
INSPECTION SCHEDULE AND EVALUATION CHECKLIST – CONSTRUCTION PHASE

PROJECT LOCATION: 106 County Road, Plympton MA
Latest Revision: 6/22/23

Stormwater Control Manager: _____ **Stamp**

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning / Repair Needed yes/no List items	Date of Cleaning/Repair	Performed By	Water Level in Detention System
Silt sock & swales and silt traps	After every major storm event							
Temporary Construction Entrance (if needed)	Daily or as needed.							

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook for recommendations regarding frequency for inspection and maintenance of specific BMPs.

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended. Slow release fertilizer recommended.
Other notes:(Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan)

OPERATION AND MAINTENANCE PLAN
POST CONSTRUCTION
106 County Road
Plympton, MA 02367

Owner: B2B-SP1
30 Brackett Road
Rye, NH 03870
Contact: (617-820-8443)

Party Responsible for Operation and Maintenance:

B2B-SP1
30 Brackett Road
Rye, NH 03870
Contact: (617-820-8443)

Source of Funding:
Operation and Maintenance of this stormwater management system will be the responsibility of the owner.

Post Construction Inspection and Maintenance:

Subsurface Structures
After construction, the subsurface structures shall be inspected for proper function and stabilization after every major storm event until the lot is completely developed and stabilized. Inspection and routine maintenance of gutters and roof drains is required to prevent sediment from entering the system. Inspection shall be done quarterly. If sediment begins to occur within the system perform corrective measures such as vacuum cleaning. Evaluate the system to determine the source of sediment in order to maintain infiltration capacity; as required by the Stormwater Management Policy.

Definition of Major Storm Event
For the purposes of this operation and maintenance plan a major storm event should be defined as a rainfall of such intensity or duration that causes observable movement of sediment on the roadway or site. It is the intent of this plan to prevent this sediment from entering the drainage system. Prior to stabilization of the site this may occur more frequently with less intense storms. As the site is stabilized with ground cover the movement of sediment will only occur during more severe storms. For additional information, refer to Performance Standards and Guidelines for Stormwater Management in Massachusetts, published by the Department of Environmental Protection.

STORMWATER MANAGEMENT
BEST MANAGEMENT PRACTICES

INSPECTION SCHEDULE AND EVALUATION CHECKLIST – POST CONSTRUCTION PHASE

PROJECT LOCATION: 106 County Road
Latest Revision 6/22/23

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/ Repair Needed yes/no List items	Date of Cleaning/ Repair	Performed By	Water Level in Drainage System
Subsurface Crushed Stone Infiltration System	Quarterly							

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook for recommendations regarding frequency for inspection and maintenance of specific BMPs.
(2) records shall be kept for a minimum of three years.

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended. Slow release fertilizer recommended.
Other notes:(Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan)

Stormwater Control Manager: _____ **Stamp**

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 Plymouth County, Massachusetts

June 21, 2023

Preface

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

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

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

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

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

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

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Contents

Soil Map

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

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,050 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 15, Sep 9, 2022

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

Date(s) aerial images were photographed: Jun 10, 2022—Jun 30, 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 Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
52A	Freetown muck, 0 to 1 percent slopes	0.0	0.0%
69A	Mattapoisett loamy sand, 0 to 3 percent slopes, extremely stony	3.5	61.4%
320B	Birchwood sand, 3 to 8 percent slopes	0.3	5.7%
700A	Udipsamments, wet substratum, 0 to 3 percent slopes	1.9	32.9%
Totals for Area of Interest		**5.7**	**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 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.

Plymouth County, Massachusetts

52A—Freetown muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2q9
Elevation: 0 to 1,110 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

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

Description of Freetown

Setting

Landform: Depressions, depressions, swamps, kettles, marshes, bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material

Typical profile

Oe - 0 to 2 inches: mucky peat
Oa - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands
Hydric soil rating: Yes

Minor Components

Scarboro

Percent of map unit: 5 percent
Landform: Drainageways, depressions

Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea

Percent of map unit: 5 percent
Landform: Bogs, swamps, marshes, depressions, depressions, kettles
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

69A—Mattapoisett loamy sand, 0 to 3 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: bcxg
Elevation: 10 to 400 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Mattapoisett, Extremely Stony

Setting

Landform: Drainageways, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy eolian deposits and/or sandy glaciofluvial deposits over coarse-loamy lodgment till

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
Oa - 1 to 3 inches: highly decomposed plant material
A - 3 to 7 inches: loamy sand
Eg1 - 7 to 10 inches: loamy sand
Eg2 - 10 to 14 inches: loamy coarse sand
Bh - 14 to 18 inches: loamy coarse sand
Bhsm - 18 to 23 inches: loamy coarse sand
Bsm - 23 to 31 inches: loamy coarse sand
2Cd - 31 to 65 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 11 to 20 inches to ortstein; 31 to 53 inches to densic material
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY009CT - Wet Till Depressions
Hydric soil rating: Yes

Minor Components

Birchwood, very stony

Percent of map unit: 7 percent
Landform: Till plains, ground moraines, drumlins
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Brockton, extremely stony

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Norwell, extremely stony

Percent of map unit: 3 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Footslope, toeslope

Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

320B—Birchwood sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9y42
Elevation: 10 to 400 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Birchwood

Setting

Landform: Till plains, ground moraines, drumlins
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy eolian deposits and/or sandy glaciofluvial deposits over coarse-loamy lodgment till

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 3 inches: moderately decomposed plant material
Oa - 3 to 4 inches: highly decomposed plant material
E - 4 to 5 inches: sand
Ap - 5 to 8 inches: loamy sand
Bs - 8 to 13 inches: loamy sand
Bw1 - 13 to 19 inches: loamy sand
Bw2 - 19 to 29 inches: loamy sand
BC - 29 to 40 inches: sand
Cd1 - 40 to 55 inches: gravelly sandy loam
Cd2 - 55 to 75 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 35 to 59 inches to densic material
Drainage class: Moderately well drained
Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 12 to 29 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Poquonock

Percent of map unit: 6 percent
Landform: Till plains, ground moraines, drumlins
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Mattapoisett

Percent of map unit: 6 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scituate

Percent of map unit: 5 percent
Landform: Ridges, drumlins
Landform position (two-dimensional): Shoulder, footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Newfields

Percent of map unit: 3 percent
Landform: Moraines, hills, till plains
Landform position (two-dimensional): Shoulder, footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

700A—Udipsamments, wet substratum, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: bd02
Elevation: 0 to 390 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 195 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udipsamments, wet substratum, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udipsamments, Wet Substratum

Setting

Landform: Dikes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: Sandy human transported material over sandy and gravelly glaciofluvial deposits

Typical profile

^Ap - 0 to 3 inches: loamy fine sand
^C1 - 3 to 20 inches: fine sand
Ab - 20 to 24 inches: loamy fine sand
Bwb - 24 to 31 inches: fine sand
BC - 31 to 44 inches: fine sand
C2 - 44 to 51 inches: fine sand
C3 - 51 to 72 inches: very fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: About 20 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: A/D
Ecological site: R149BY002MA - Coastal Dunes
Hydric soil rating: No

Minor Components

Tihonet
Percent of map unit: 10 percent
Landform: Bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F144AY028MA - Wet Outwash
Hydric soil rating: Yes

Udipsamments
Percent of map unit: 5 percent
Landform: Dikes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Ecological site: R149BY002MA - Coastal Dunes
Hydric soil rating: No

Udorthents, wet substratum
Percent of map unit: 5 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No