Stormwater Management Report

Comstock Industrial Park

Plat 36/4 Lot 46

Cranston, RI

PREPARED FOR

Development Plan Review Committee

869 Park Avenue

Cranston, RI 02910

September 2022

benesch

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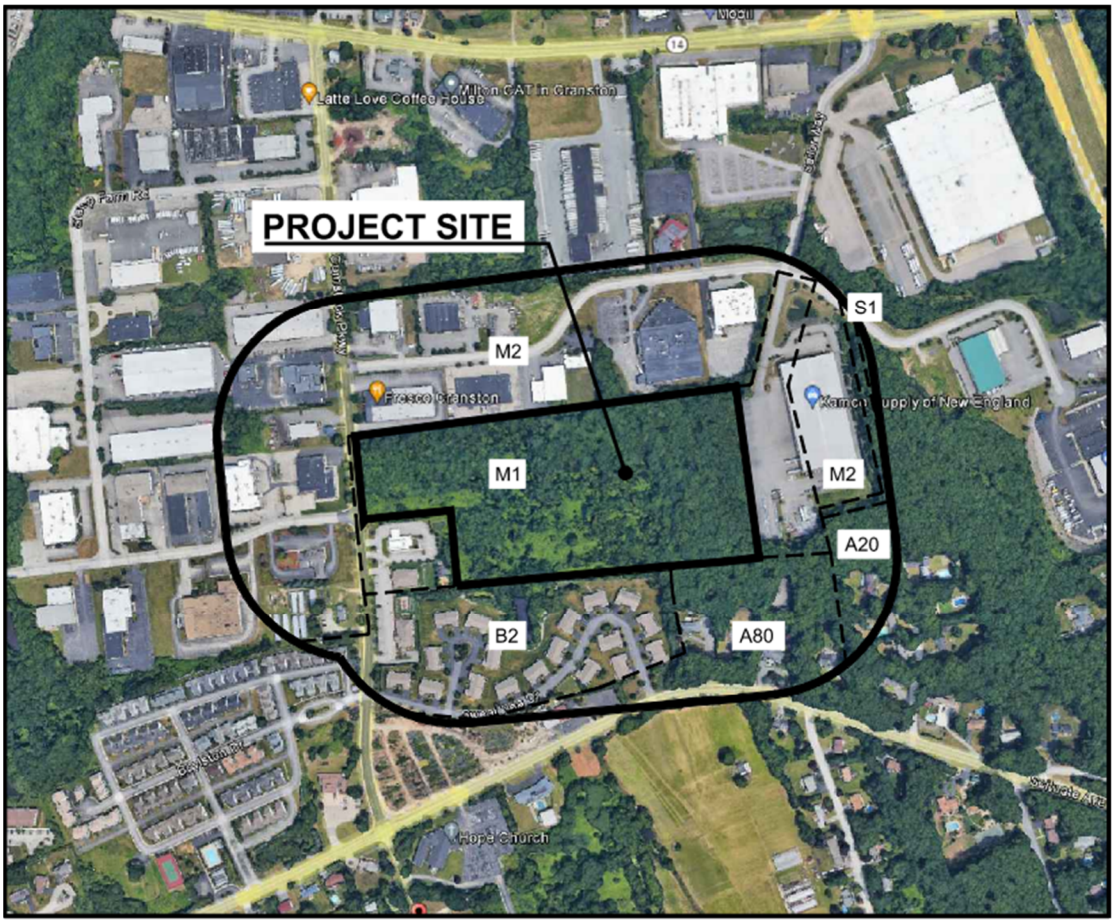
SECTION 1 - INTRODUCTION

The property is situated at Plat 36/4, Lot 46 on Comstock Parkway in Cranston, Rhode Island. The site is approximately 17.5 acres and consists primarily of undeveloped wooded area. There are, however, several long stone walls that run through and around the property. The project proposes construction of two moderate hazard storage (S-1) and office accessory building-type structures. The buildings are anticipated to have tractor trailers load, unload, and store various products inside. In addition to the buildings, the project proposes paved parking areas, truck loading bays and storage spaces, various stormwater practices, and installation of new utilities. The property is bordered to the south by residential properties on Sweet Pea Drive, to the east by Kamco Supply of New England (37 Amflex Drive), to the west by Comstock Parkway, and to the north by various businesses on Amflex Drive.



The project was prepared in accordance with the City of Cranston Regulations, the Rhode Island Soil Erosion and Sediment Control Handbook, and the Rhode Island Department of Environmental Management (RIDEM) Stormwater Design and Installation Standards Manual (Amended March 2015).

SECTION 2 – HYDROLOGY

The intent of the hydrologic analysis is to determine rates of runoff for maximum storm frequencies of the 1.2", 1, 10, and 100-year intervals under existing and proposed conditions for the designated offsite discharge points. RIDEM requires analysis of the 1-, 10-, and 100-year storm.

Methodology

The analysis to determine peak flows generated from the site was prepared using TR-55 procedures for calculating peak rates of runoff resulting from precipitation events and procedures for developing runoff hydrographs. HydroCAD software was utilized to perform hydrologic computations. Rainfall Frequency Estimates for precipitation frequency, based on Rhode Island Code of Regulations Section 250-RICR-150-10-8.6E for Providence County, were utilized to generate the flows. The following 24-hour (Type III), precipitation estimates were utilized:

1.2"	1.2 inches
1-Year	2.7 inches
10-Year	4.9 inches
100-Year	8.7 inches

Existing Conditions

Topography generally slopes from the western and eastern portions of the site into the central portion where flow is then diverted north or south into pocket wetlands. The pocket wetlands on the northern portion of the site ultimately flows into Meshanticut Brook to the north while the wetlands to the south appear to be isolated with no known outlet. The existing elevation is approximate elevation 346 at the west side of the property and 354 at the east side of the property both sloping down to elevation 336 in the center of the property. Runoff then flows north or south to approximate elevation 334 at either wetlands. The site currently consists of undeveloped wooded areas with several long rock walls through and along the property. There are two (2) discharge points, being either of the two wetlands located on site.

NRCS soils mapping indicates the site consists of various soil types with hydrologic soil groups ("HSG") B and D.

Existing Watershed Data (Existing Conditions Cover Characteristics and Existing Watershed Area Map) have been included as Appendix A.

NRCS Soil mapping has been included as Appendix G.

Proposed Conditions

The discharge points remain the same under proposed conditions. All stormwater drainage from the site will discharge to one of the two wetlands located on site. The northern wetland will continue to discharge to the Meshanticut Brook and the southern wetland continues to be isolated. To accommodate the increased impervious cover, we are proposing subsurface detention chambers and above ground bioretention areas to detain peak flows which will outfall into rip rap aprons and into the wetlands after treatment. In addition, we are proposing several best management practices in the form of sediment forebays, dry swales, proprietary treatment units (CDS2015-4-C and JFPD0806), and bioretention areas to provide pre-treatment that meet the required water quality volume, groundwater recharge volume, channel protection volume, overbank flood protection, surface area, and pollutant loading requirements.

The northern underground detention basin volume will be achieved by subsurface detention chambers (StormTrap ST2 SingleTrap 2-0 units) located underneath the truck loading bays just north of Building 1. Due to the potential for land uses with higher potential pollutant loads, this system will be lined to prevent infiltration. This system accepts flow from the truck loading bays collected within a trench drain along the edge of Building 1 and has been designed with oil/water separators for pre-treatment to remove oils in case there are any spills in the loading area. The northern system discharges to a proprietary treatment unit (Jellyfish Filter JFPD0806) for treatment of the water quality flow prior to discharge to a riprap apron and ultimately the wetlands. The southern underground detention basin volume will be achieved by subsurface detention chambers (StormTrap ST2 SingleTrap 4-0 units) located underneath the employee parking lot just south of Building 1. This system collects runoff from the employee parking lot south of the building and will be designed to infiltrate beneath its stone bedding. Each set of chambers accepts flow from its own pipe network.

There are three bioretention areas that will be constructed on site which will accept sheet flow from access drives, parking and storage areas, and both buildings. All three bioretention areas will be constructed with 24” of bioretention soil mix (20% void spaces). In addition to the soil void spaces, the bioretention areas all have an above-grade storage volume which help to meet the RIDEM requirements for water quality, groundwater recharge, channel protection, and overbank flood protection volumes. Each of the bioretention areas will be equipped with sediment forebays which are sized to provide the required pretreatment volume (10% of the required water quality volume). The sediment forebays will be formed by an 18-24” high earthen berm which segregates the pretreatment volume from the water quality volume. As the water level in the sediment forebay rises, sediment is filtered to the bottom and clean water overflows into the water quality volume of the bioretention area. When the water quality holding volume reaches capacity, storm runoff overflows into the last segment of the pond designed to provide the remaining peak flow reduction. All three bioretention areas are designed with their bottom elevations at least three feet above seasonal high groundwater. Benesch was on site on June 13, 2022 to accompany D’libro Excavating in digging test pits to confirm seasonal high groundwater (See Appendix F). A conservative infiltration rate of 1.02 inches/hour was used in computations for exfiltration. All three bioretention areas will be

constructed with an outlet control structure to provide peak flow attenuation through the 100-year event. The outlet control structures consist of a standard RIDOT catch basin that will be fitted with the following orifices/grates, designed to regulate peak flow:

Bioretention Area 1 accepts surface runoff through two (2) curb cuts and has an above-grade holding volume between elevations 336.00 – 338.00. Each curb cut first discharges into a sediment forebay before overflowing into the main bioretention area. An outlet control structure has a 6" orifice at elevation 336.25 and a horizontal overflow frame elevation at 33.50. Runoff then flows to a 15" pipe and ultimately a riprap outlet protection apron and the northern wetlands.

Bioretention Area 2 accepts surface runoff through one (1) curb cut and has an above-grade holding volume between elevations 336.00 – 338.00. The curb cut first discharges into a sediment forebay before overflowing into the main bioretention area. An outlet control structure has a 36"W x 4"H weir at elevation 336.50 and a horizontal overflow frame elevation at 337.50. Runoff then flows to a 12" pipe and ultimately a riprap outlet protection apron and the northern wetlands.

Bioretention Area 3 accepts pipe flow runoff through three drainage networks and has an above-grade holding volume between elevations 336.00 – 341.00. The drainage networks first discharge into sediment forebays before overflowing into the main bioretention area. An outlet control structure has a 30"W x 6"H weir at elevation 337.00 and a horizontal overflow frame elevation at 339.10. Runoff then flows to an 18" pipe and ultimately a riprap outlet protection apron and the southern wetlands. Due to the size of this bioretention area, it is also designed with an emergency spillway being the 35' long low point in the southern access drive. The bioretention area is designed to hold the entirety of the 100-year storm before discharge over the emergency spillway.

Proposed Watershed Data (Proposed Conditions Cover Characteristics and Proposed Watershed Area Map) have been included as Appendix B.

Test hole information has been included as Appendix F.

Peak Flow Comparison

Peak flows at the off-site analysis points are as follows:

Drainage Summary - Total Site Comparison Industrial Complex, Cranston, RI Project # 70753.00			
Comparison of Existing to Proposed Peak Flows			
Watershed	**Storm Event (Type III)**	**Existing Flow to Wetlands (cfs)**	**Proposed Flow to Wetlands (cfs)**
Flow to Comstock Parkway	**1-year**	0.01	0.13
	10-year	0.19	0.23
	100-year	0.81	0.42
Flow to Northern Wetlands	**1-year**	1.60	1.47
	10-year	8.79	8.79
	100-year	25.51	24.61
Flow to Southern Wetlands	**1-year**	3.66	1.83
	10-year	14.65	11.52
	100-year	38.00	31.65

It can be seen that peak flow will be reduced or maintained under proposed conditions for all design storms other than the 1- and 10- year storms for flow to Comstock Parkway which are slightly increased.

SECTION 3 – HYDRAULICS

The intent of the hydraulic analysis is to ensure that new on-site drainage facilities could accommodate and safely convey the 10-year, 24-hour (TYPE III) design storm.

Methodology

The storm drain system was analyzed using the Rational Method for estimating runoff for a 10-year design storm. The software "Hydraflow Stormsewers" was used to model pipe flow through the pipe network.

Proposed Conditions

The site has been designed with a series of drainage facilities, including catch basins, manholes, and piping designed to remove stormwater from paved and pervious surfaces, and convey it to subsurface detention structures that provide water quality treatment and peak flow reduction.

The drainage systems have been designed to safely convey storm flows from the 10-Year Design Storm, with all pipes designed with sufficient capacity and the hydraulic grade lines through the entire systems sufficiently below grade. The storm system 10-year design storm uses the peak flow elevation from the 10-year rainfall event as its tail water. Detailed calculations (Catchment Map and computations) for the on-site stormwater system hydraulics are included in Appendix C.

Outlet Protection

The systems have been designed to prevent scour at their pipe outlets through the use of rip rap outlet protection.

SECTION 4 – STORMWATER QUALITY

The project has been designed to address both short-term and long-term stormwater quality. Short term (during construction) treatment has been provided in the form of erosion control measures and long-term (post construction) treatment has been provided through the use of Low Impact Development principals. Erosion control has been designed per the Rhode Island Soil Erosion and Sediment Control Handbook (Erosion Control Handbook). Long-term stormwater quality has been designed to meet the stormwater quality standards set forth in the RIDEM Stormwater Design and Installation Standards Manual.

Short Term Erosion Control

The proposed erosion and sedimentation controls consider the specific characteristics of the site and the anticipated construction activities, and have been designed in accordance with the RIDEM) Stormwater Design and Installation Standards Manual. Additionally, a Rhode Island Pollutant Discharge Elimination System (RIPDES) General Permit for Stormwater Associated with Construction Activity (CGP) will be obtained, as required by RIDEM regulations.

Construction Entrances

Construction entrances will be utilized to remove sediment from construction vehicle tires and prevent it from being tracked onto adjoining paved roadway areas.

Erosion Control Barriers

Prior to any construction activity, hay bales, silt fence, or combination hay bale/silt fence barriers will be placed at the down gradient limits of construction. These barriers will be inspected once every seven calendar days and within 24 hours after every rainfall generating 0.25 inches of discharge and replaced as necessary. Collected silt will be removed when one-half the barrier height is reached.

Soil Stabilization- Mulches

Structural (non-living) soil stabilization will be utilized to protect the soil surface on a temporary basis without the intention of promoting plant growth. When grading of the disturbed area will be suspended for a period of 30 or more consecutive days, but less than 5 months, disturbed areas will be stabilized within 7 days of the suspension of grading through the use of mulch, non-bituminous tackifiers, erosion control netting, or other approved materials appropriate for use as a temporary soil protector. For surfaces that are not to be reworked within 5 months but will be reworked within 1 year, use temporary seeding, seeding-type mulch (hay, straw, or cellulose fiber) or when slopes are less than 3:1, wood chips, bark chips or shredded bark.

Temporary Filter Inserts

Temporary Filter Inserts will be placed in each existing catch basin and yard drains prior to the start of construction, and in each new catch basin or yard drain during construction. These devices will be removed upon final site stabilization. Filter inserts will be inspected once every seven (7) calendar days and within 24 hours after every rainfall generating 0.25 inches of discharge. Replacement of the inserts will be as often as necessary to maintain function of the drainage

structure and prevent excessive ponding due to clogged fabric. Ripped or otherwise damaged inserts will be replaced immediately.

Temporary Diversion Swale

Temporary Diversion Swales will be used, where appropriate, to collect and convey sediment-laden sheet runoff to temporary sediment traps. They will be inspected at least once a week and within 24 hours after the end of a storm generating 0.25 inches of discharge. They will be inspected daily when construction activities are in close proximity to the swales. Damages shall be repaired within 24 hours of observed failure. The swales will be maintained until the contributing disturbed area is stabilized.

Temporary Sediment Traps

Temporary Sediment Traps shall be used to collect sediment-laden runoff and provide time for the sediment to settle and filter as it is discharged. They shall be inspected monthly and within 24 hours after a storm generating 0.25 inches of discharge. Sediment and oil shall be removed when the storage volume is reduced by one half, or at least every 6 months during construction.

Stockpile Management

The topsoil stockpiles which will be idle for at least 30 days will be stabilized with temporary seed and mulch immediately. Small stockpiles may be covered with impervious tarps or erosion control matting in lieu of seeding and mulching.

Long Term Stormwater Quality

The project was designed with guidance and direction from the RIDEM Stormwater Design and Installation Standards Manual

As required by the manual, the Appendix A: Stormwater Management Checklist and LID Planning Report has been included as Appendix E of this report. It contains documentation of compliance for the standards set forth in the manual.

Maintenance and Operation

Operation and maintenance shall be the responsibility of the owner.

During Construction

- Dust Control: Moisten disturbed soil areas with water periodically, or use a non-asphaltic soil tacifier to minimize dust.
- Temporary Soil Protection: Inspect seeded areas weekly and within 24 hours after a storm generating a discharge.
- Hay Bale/ Silt Fence Barrier: Inspect the barrier at least once a week and within 24 hours after the end of a storm generating a discharge. For dewatering operations, inspect frequently before, during and after pumping operations. Remove the sediment deposits when the depth reaches one half the barrier heights. Repair or replace a barrier within 24 hours of observed failure. Maintain the barrier until the contributing disturbed area is stabilized.

- Construction Entrance/Exit Pad: Maintain the pad in a condition that will prevent tracking and washing of sediment onto paved surfaces. Place additional clean gravel on top of gravel that has become silted, or remove the silted gravel and replace the gravel to the depth removed with clean gravel, as conditions warrant. Remove immediately all sediment spilled, dropped, washed or tracked onto paved surfaces. Roads adjacent to the construction site shall be cleaned at the end of each day by hand sweeping or sweeper truck.
- Temporary Stockpiles: Inspect temporary stockpiles at the end of each workday to ensure that tarps are in place and secured. Temporary stockpiles that are expected to be inactive for more than 30 days should be temporarily seeded (see above).

The erosion control measures and sequencing have been designed to meet the fifteen (15) performance criteria required by RIDEM, specifically as follows:

1. Provide Natural Buffers and Maintain Existing Vegetation – the site is approximately 17 acres and the entirety of the development is located on the western portion of the site, encompassing approximately five (5) acres of disturbance. It has been specifically placed upgradient of the wetlands system. Erosion control measures have been placed to ensure no sediment-laden water enters the adjacent wetlands. Furthermore, the existing mounds of boulders will be removed from the wetlands buffer and restored with loam and seed in its place.
2. Minimize Area of Disturbance – all work has been confined to upland areas such that the majority of the site, including the wetlands, will not be disturbed.
3. Minimize Disturbance of Steep Slopes – the existing steep slopes on site are a result of significant fill of boulders. The boulders will be reused on site as retaining walls and slope stabilization.
4. Preserve Topsoil – the existing area of clearing will be grubbed and the topsoil will be excavated, screened, amended with organics and reused on site.
5. Stabilize Soils – proposed slopes greater than 1:3 (V:H) will be stabilized with stabilization fabric or reused on-site boulders.
6. Protect Storm Drain Inlets – all existing and proposed drain inlets will be fitted with protection throughout construction, until all areas are stabilized, to prevent sediment-laden water from entering the resource area.
7. Protect Storm Drain Outlets – proposed storm drain outlets will be surrounded, on the downstream side, with hay bales and silt fence, to prevent sediment-laden water from entering the resource area.
8. Establish Temporary Controls for the Protection of Post-Construction Stormwater Control Measures - proposed drain inlets will be fitted with protection throughout construction, until all areas are stabilized, to prevent sediment-laden water from entering the resource area. Proposed storm drain outlets will be surrounded, on the downstream side, with hay bales and silt fence, to prevent sediment-laden water from entering the resource area. The detention basin will act as a sediment trap and the sediment will be removed from the basin after the site has been stabilized.
9. Establish Perimeter Controls and Sediment Barriers – silt fence and hay bales will be placed around the perimeter of the site prior to any site disturbance.

10. Divert or Manage Run-On from Up-Gradient Areas – very little off-site run-on will occur at this site, due to the natural topography.
11. Property Design Constructed Stormwater Conveyance Channels – during construction the site will utilized temporary diversion swales to convey runoff to the temporary sediment trap.
12. Retain Sediment On-Site – a combination of diversion swales and the temporary sediment trap will allow all runoff to be collected and sediment settled, prior to discharge to the resource area. Perimeter hay bales and silt fence will provide an additional layer of protection.
13. Control Temporary Increases in Stormwater Velocity, Volume and Peak Flows – the permanent detention basin has been designed to reduce peak flows. The basin will be utilized as a temporary sediment trap, during construction, to ensure compliance RIDEM requirements.
14. Apply Construction Activity Pollution Prevention Control Measures – as documented throughout this report, pollution measures such as construction entrance, street sweeping, dust control, erosion control barriers and structures, as well as inspections, will be employed to ensure no sediment-laden water enters the resource area.
15. Install, Inspect and Maintain Control Measures and Take Corrective Actions – as described above, all measures will be inspected and corrected in the time required by RIDEM.
16. Qualified SESC Plan Preparer's Information and Certification – this report, as well as the erosion control plans, were prepared by a Rhode Island Profession Engineer, whose has signed and sealed both.
17. Operators Information and Certification – it is not known at this time who the contractor will be. However, the site will be subject to a RIPDES General Permit for Stormwater Associated with Construction Activity.
18. Description of Control Measures – sufficient description of erosion control measures has been provided throughout this report.

During Construction, the Contractor shall be required to remove accumulated sediment from sediment control measures and water quality measures. Sediment shall be disposed of off-site in a manner and location approved by local and state agencies. Temporary storage of sediment on-site is permissible if it is protected from erosion and stockpiled in a manner that will prevent it from being carried by erosion into adjacent property, a wetland, a watercourse or other sensitive areas.

For hay bale barriers, the stakes may be removed as soon as the upslope areas have been permanently stabilized. Unless proposed construction requires otherwise, any accumulated sediment shall be left in place and the hay bales left in place or broken up for ground cover.

Upon the stabilization of the contributing drainage area, silt fence shall be inspected for sediment accumulation prior to removal. For sediment depths greater than 6", the sediment shall be re-graded or removed. The silt fence shall be removed by pulling the support posts and cutting the geotextile at the ground level. Re-grade or remove the sediment as necessary and stabilize the disturbed soils by placing temporary or permanent seeding and mulch.

When dewatering has been completed, remove the hay bale barrier, sediment and stone, as appropriate, and re-grade the area to original or proposed grade. Stabilize the disturbed area with temporary or permanent seed and mulch.

After the drainage areas to the new and existing catch basins have been stabilized, the Contractor shall be required to clean all sumps and hoods of debris and silt. In addition, within the limits of work, the Contractor shall clean all storm drain piping of collected silt and debris by flushing with water. If the storm system discharges to ground, a hay bale and silt fence barrier must remain in place at each outfall to capture any sediment or debris carried down by the flushing. If the storm drain system discharges into a public or private drainage collection system, the Contractor must install a means of collecting debris and filtering the sediment from the flushing water in the on-site storm system before discharge to the existing storm system.

After Construction

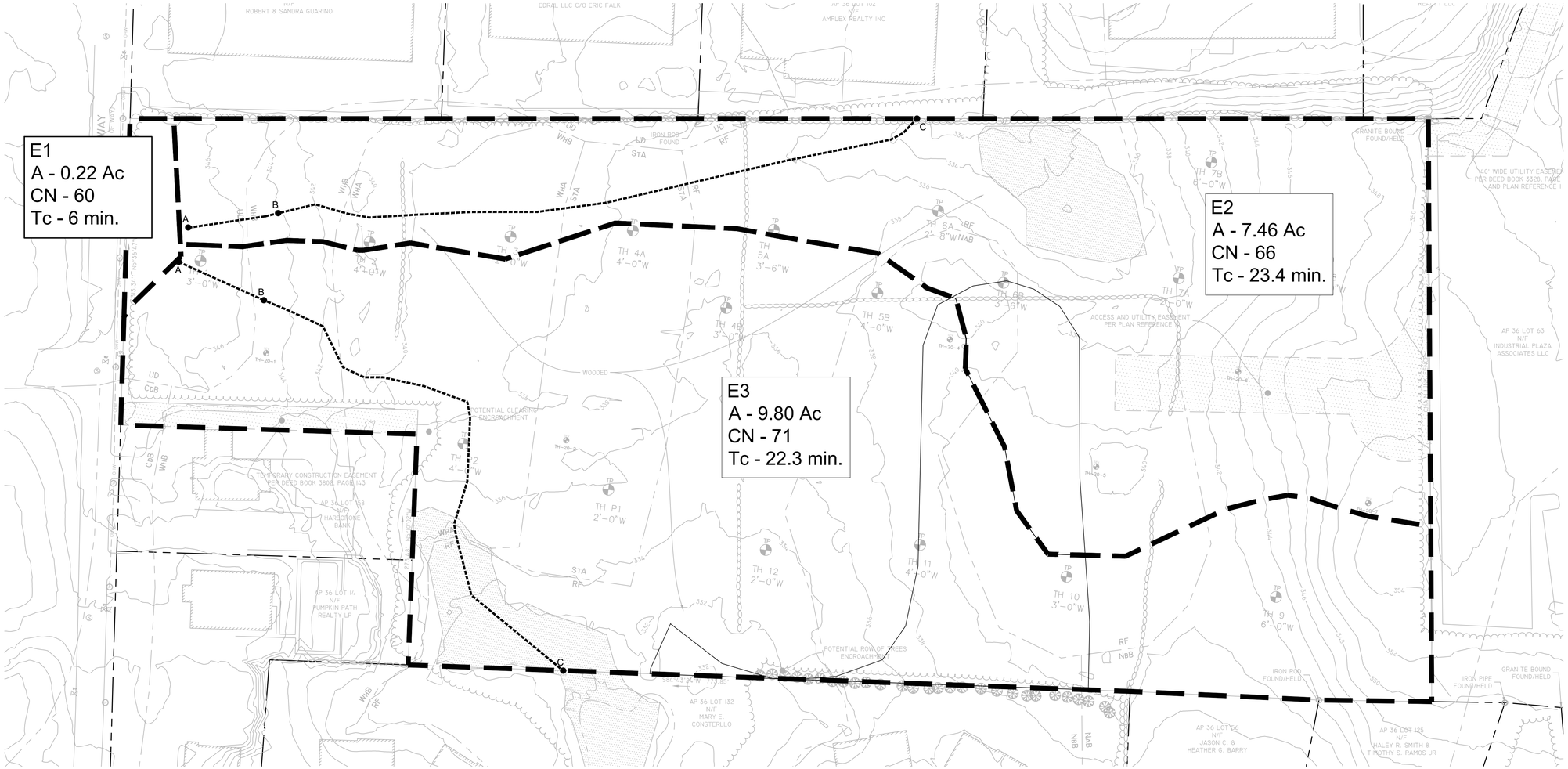
- Sediment Forebays/Bioretention Areas/Water Quality Swale/Rip Rap Outlet Protection: Inspect several times during the first few months to ensure storm features are functioning as intended. Inspect semi-annually and after major rain events for the first year. Inspect swales annually after the first year. Trash should be removed as accumulated. Sediment build-up should be removed when its depth is greater than four (4) inches. Rip rap swales and scour holes shall be inspected regularly to ensure there is no overgrown vegetation.
- Subsurface Detention: Inspect yearly for accumulated sediment and remove sediment as necessary.
- Parking Lot and Site Cleanup: Inspect on a regular basis not to exceed weekly for litter and debris.
- Parking Lot and Driveway Sweeping: At least twice a year, with the first occurring as soon as possible after snowmelt and the second not less than 90 days following the first.
- Landscaped Areas: Inspect semi-annually for erosion or dying vegetation. Repair and stabilize any bare or eroded areas and replace vegetation as soon as possible.

APPENDIX A

EXISTING WATERSHED DATA

Existing Watershed Cover Characteristics
Industrial Complex - Cranston, RI
Project # 70753.00

Watershed	Description	Total Area (ac)	Good Woods "B"	Good Woods "D"	Wetlands	CN	Tc (min)
E1	Direct Flow to Comstock Parkway	0.22	0.22	-	-	66	6
E2	Direct Flow to Northern Wetlands	7.55	3.85	3.30	0.40	75	23.4
E3	Direct Flow to Southern Wetlands	9.71	2.81	6.50	0.40	78	22.3
TOTAL	Entire Site	17.48	6.88	9.80	0.80	76.6	-



0 60' 120'

SCALE: 1" = 60'

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COMSTOCK INDUSTRIAL PARK COMSTOCK PARKWAY

CRANSTON, RI

PLAT 36/4 LOT 46

DATE:	REVISION:

KEY PLAN

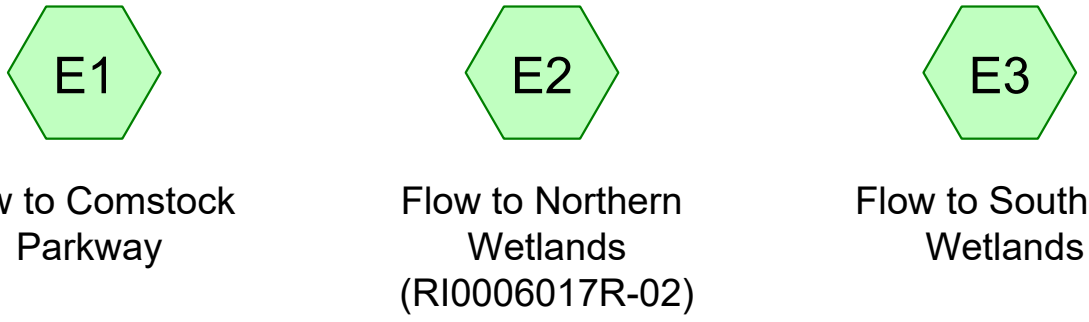
PROJECT NO.: **70753.00**
SCALE: **AS NOTED**
DATE: **03/18/2022**

DRAWN BY: **GSL**
CHECKED BY: **WGW**

EXISTING WATERSHED AREA MAP

DRAWING NO.:

EWAM



Subcat Reach Pond Link

Routing Diagram for 70753.00 EWAM
Prepared by {enter your company name here}, Printed 6/15/2022

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1 YR	Type III 24-hr		Default	24.00	1	2.70	2
2	10 YR	Type III 24-hr		Default	24.00	1	4.90	2
3	100-YR	Type III 24-hr		Default	24.00	1	8.70	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.800	90	Wetlands (E2, E3)
6.880	55	Woods, Good, HSG B (E1, E2, E3)
9.800	77	Woods, Good, HSG D (E2, E3)
17.480	**69**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
6.880	HSG B	E1, E2, E3
0.000	HSG C	
9.800	HSG D	E2, E3
0.800	Other	E2, E3
17.480		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	0.800	0.800	Wetlands	E2, E3
0.000	6.880	0.000	9.800	0.000	16.680	Woods, Good	E1, E2, E3
0.000	**6.880**	**0.000**	**9.800**	**0.800**	**17.480**	**TOTAL AREA**	

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 E1: Flow to Comstock Runoff Area=0.220 ac 0.00% Impervious Runoff Depth>0.12"
Tc=6.0 min CN=55 Runoff=0.01 cfs 0.002 af

Subcatchment E2: Flow to Northern Runoff Area=7.550 ac 0.00% Impervious Runoff Depth>0.41"
Flow Length=817' Tc=23.4 min CN=66 Runoff=1.60 cfs 0.255 af

Subcatchment E3: Flow to Southern Runoff Area=9.710 ac 0.00% Impervious Runoff Depth>0.59"
Flow Length=697' Tc=22.3 min CN=71 Runoff=3.66 cfs 0.478 af

Total Runoff Area = 17.480 ac Runoff Volume = 0.735 af Average Runoff Depth = 0.50"
100.00% Pervious = 17.480 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment E1: Flow to Comstock Parkway

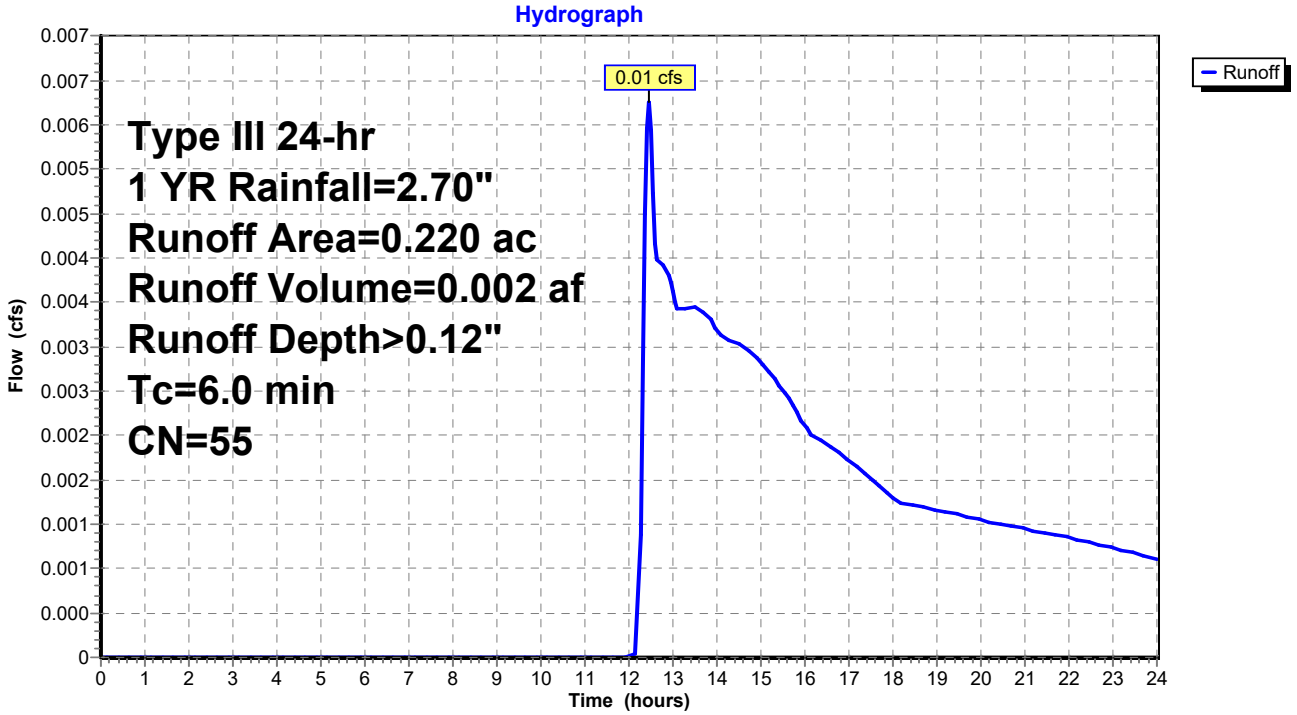
Runoff = 0.01 cfs @ 12.45 hrs, Volume= 0.002 af, Depth> 0.12"
Routed to nonexistent node WET

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 1 YR Rainfall=2.70"

Area (ac)	CN	Description
0.220	55	Woods, Good, HSG B
0.220		100.00% Pervious Area

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

Subcatchment E1: Flow to Comstock Parkway



Summary for Subcatchment E2: Flow to Northern Wetlands (RI0006017R-02)

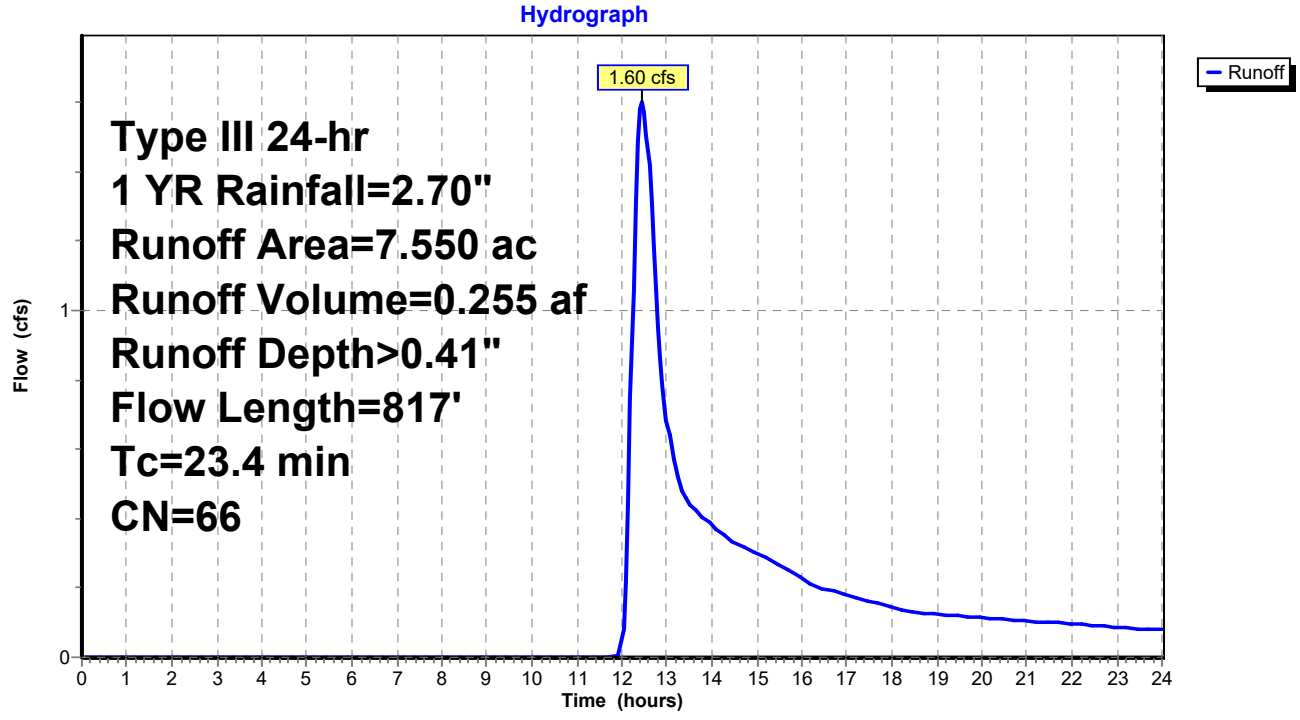
Runoff = 1.60 cfs @ 12.44 hrs, Volume= 0.255 af, Depth> 0.41"
Routed to nonexistent node WET

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 1 YR Rainfall=2.70"

	Area (ac)	CN	Description
	3.850	55	Woods, Good, HSG B
	3.300	77	Woods, Good, HSG D
*	0.400	90	Wetlands
	7.550	66	Weighted Average
	7.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	100	0.0300	0.09		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.39"
5.7	717	0.0170	2.10		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
23.4	817	Total			

Subcatchment E2: Flow to Northern Wetlands (RI0006017R-02)



Summary for Subcatchment E3: Flow to Southern Wetlands

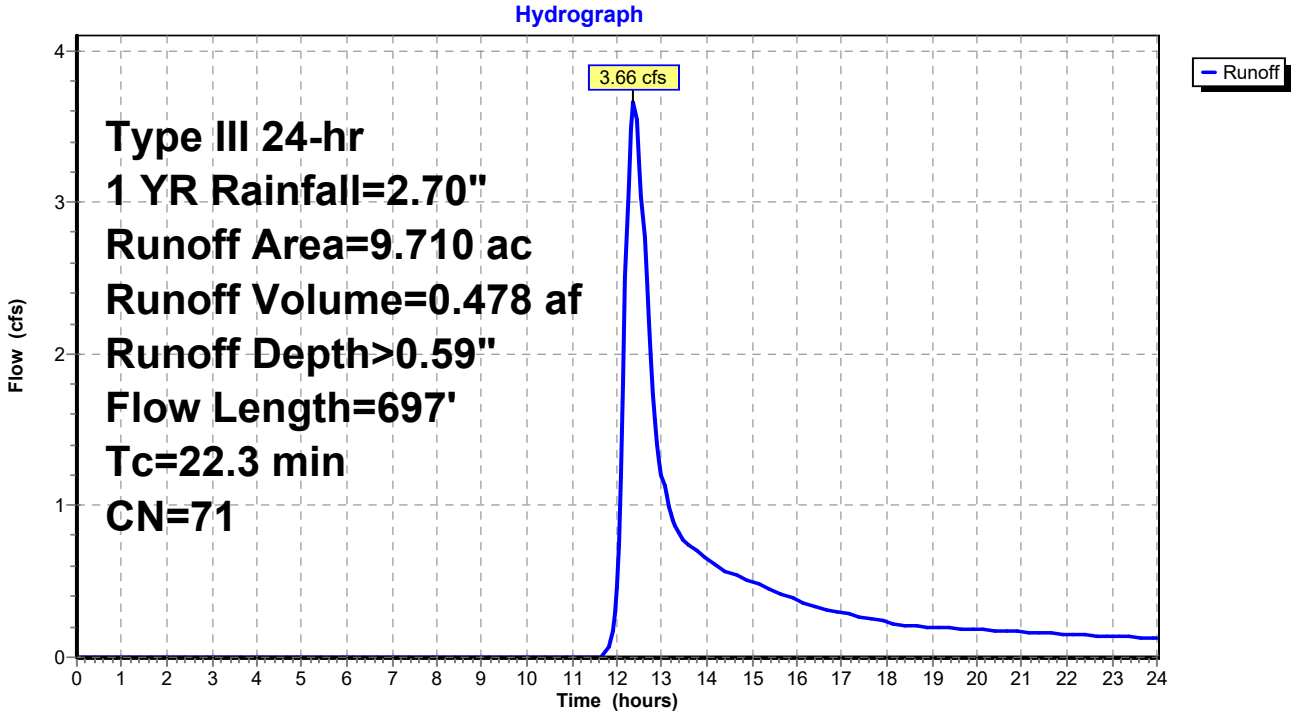
Runoff = 3.66 cfs @ 12.37 hrs, Volume= 0.478 af, Depth> 0.59"
Routed to nonexistent node 1R

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 1 YR Rainfall=2.70"

	Area (ac)	CN	Description
	2.810	55	Woods, Good, HSG B
	6.500	77	Woods, Good, HSG D
*	0.400	90	Wetlands
	9.710	71	Weighted Average
	9.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	100	0.0300	0.09		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.39"
4.6	597	0.0180	2.16		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
22.3	697	Total			

Subcatchment E3: Flow to Southern Wetlands



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 E1: Flow to Comstock Runoff Area=0.220 ac 0.00% Impervious Runoff Depth>0.93"
Tc=6.0 min CN=55 Runoff=0.19 cfs 0.017 af

Subcatchment E2: Flow to Northern Runoff Area=7.550 ac 0.00% Impervious Runoff Depth>1.65"
Flow Length=817' Tc=23.4 min CN=66 Runoff=8.79 cfs 1.038 af

Subcatchment E3: Flow to Southern Runoff Area=9.710 ac 0.00% Impervious Runoff Depth>2.03"
Flow Length=697' Tc=22.3 min CN=71 Runoff=14.65 cfs 1.643 af

Total Runoff Area = 17.480 ac Runoff Volume = 2.699 af Average Runoff Depth = 1.85"
100.00% Pervious = 17.480 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment E1: Flow to Comstock Parkway

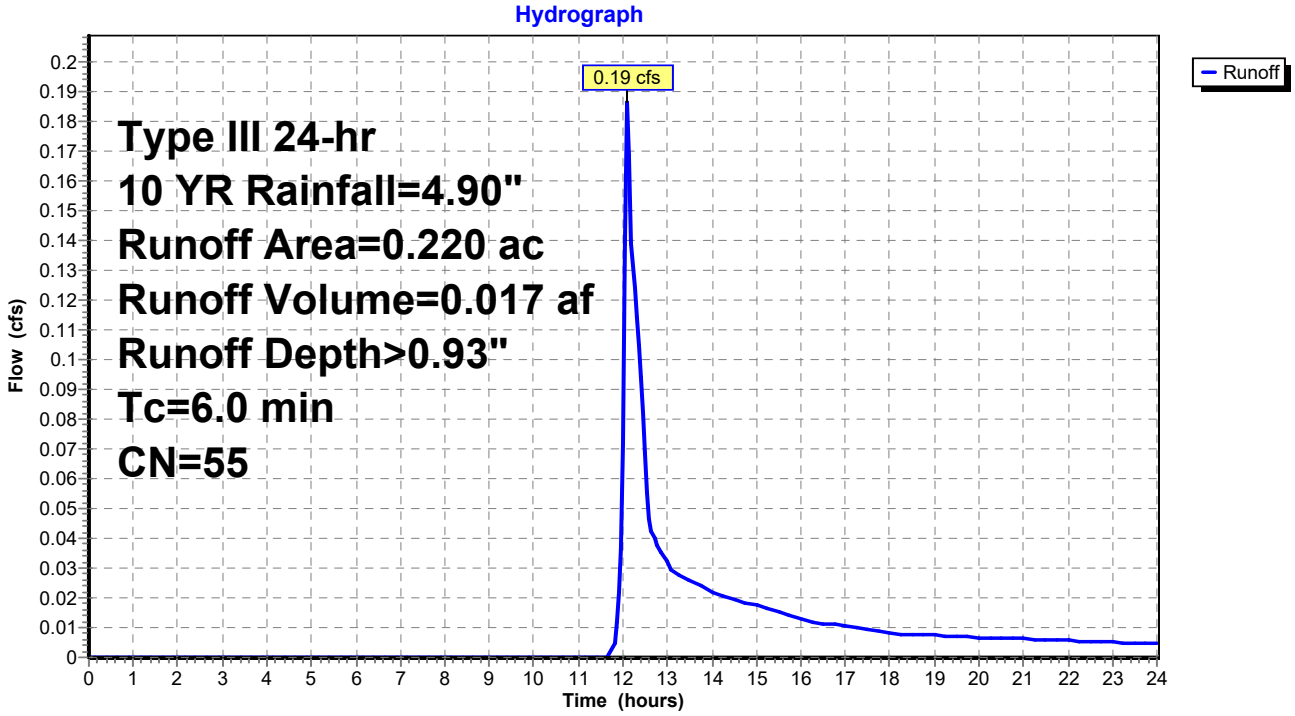
Runoff = 0.19 cfs @ 12.11 hrs, Volume= 0.017 af, Depth> 0.93"
Routed to nonexistent node WET

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 YR Rainfall=4.90"

Area (ac)	CN	Description
0.220	55	Woods, Good, HSG B
0.220		100.00% Pervious Area

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

Subcatchment E1: Flow to Comstock Parkway



Summary for Subcatchment E2: Flow to Northern Wetlands (RI0006017R-02)

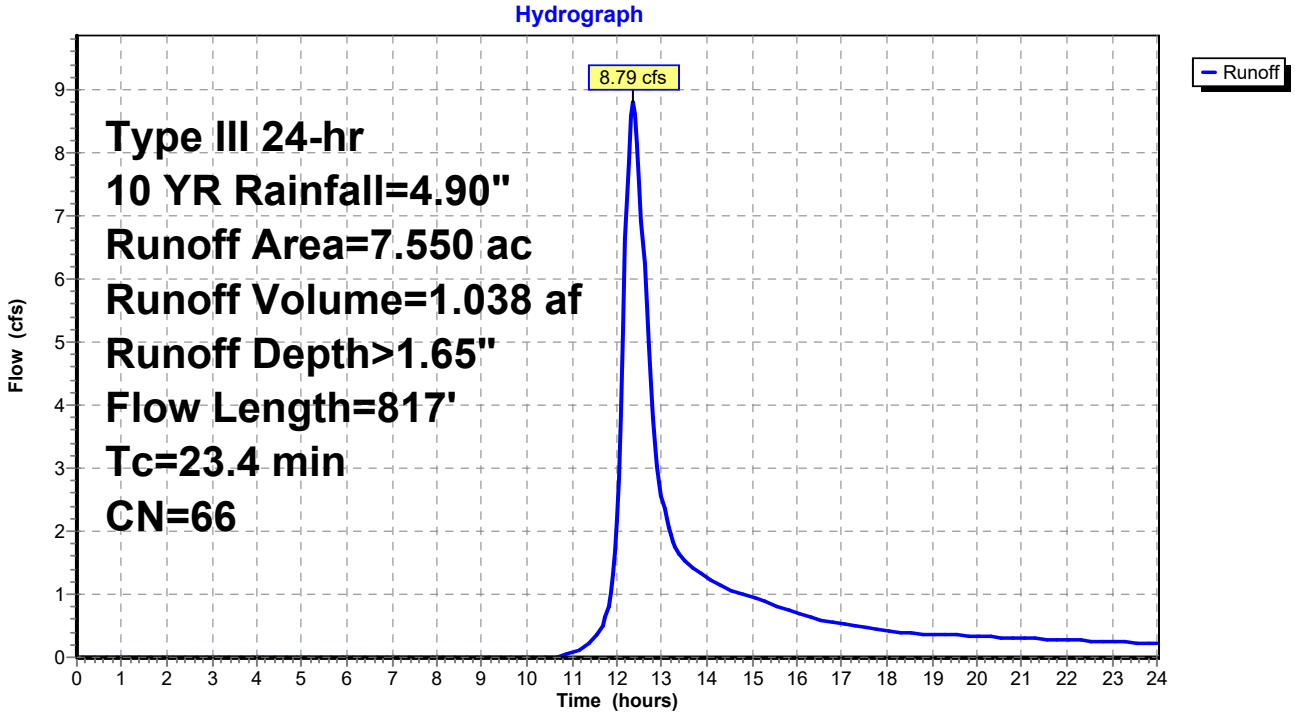
Runoff = 8.79 cfs @ 12.35 hrs, Volume= 1.038 af, Depth> 1.65"
Routed to nonexistent node WET

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 YR Rainfall=4.90"

	Area (ac)	CN	Description
	3.850	55	Woods, Good, HSG B
	3.300	77	Woods, Good, HSG D
*	0.400	90	Wetlands
	7.550	66	Weighted Average
	7.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	100	0.0300	0.09		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.39"
5.7	717	0.0170	2.10		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
23.4	817	Total			

Subcatchment E2: Flow to Northern Wetlands (RI0006017R-02)



Summary for Subcatchment E3: Flow to Southern Wetlands

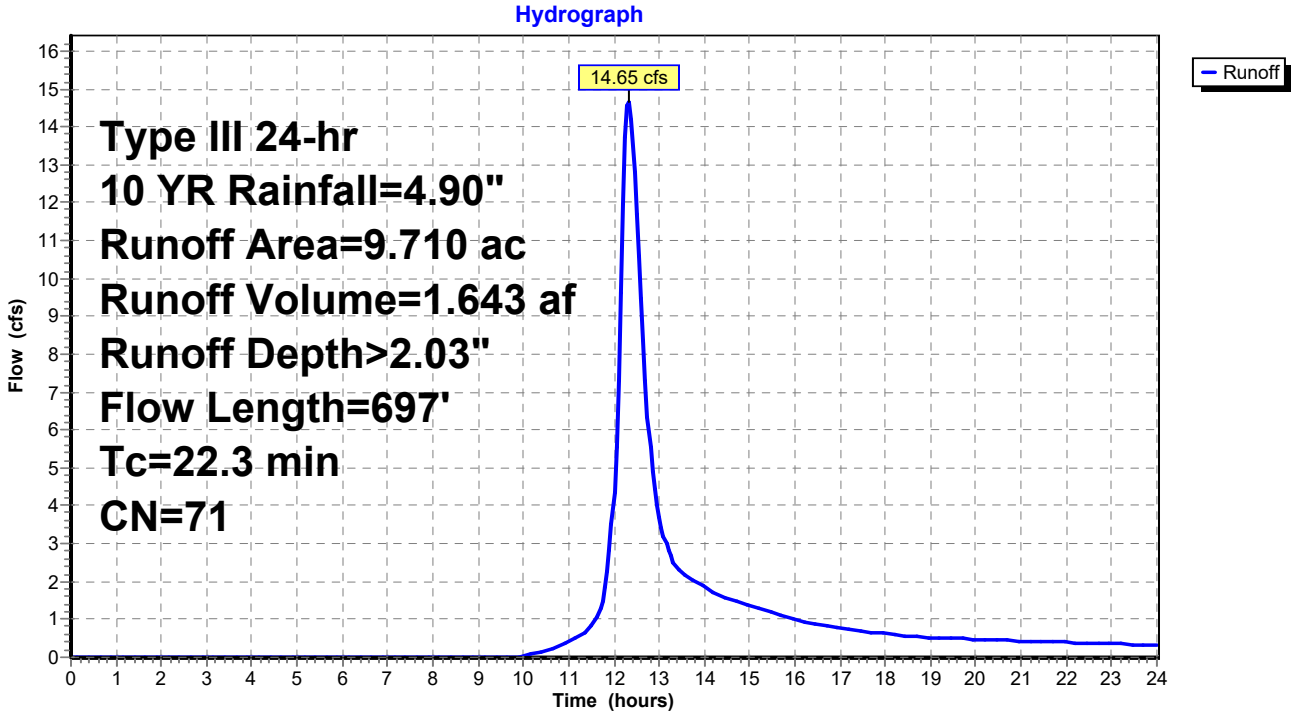
Runoff = 14.65 cfs @ 12.32 hrs, Volume= 1.643 af, Depth> 2.03"
Routed to nonexistent node 1R

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 YR Rainfall=4.90"

	Area (ac)	CN	Description
	2.810	55	Woods, Good, HSG B
	6.500	77	Woods, Good, HSG D
*	0.400	90	Wetlands
	9.710	71	Weighted Average
	9.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	100	0.0300	0.09		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.39"
4.6	597	0.0180	2.16		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
22.3	697	Total			

Subcatchment E3: Flow to Southern Wetlands



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 E1: Flow to Comstock Runoff Area=0.220 ac 0.00% Impervious Runoff Depth>3.27"
Tc=6.0 min CN=55 Runoff=0.81 cfs 0.060 af

Subcatchment E2: Flow to Northern Runoff Area=7.550 ac 0.00% Impervious Runoff Depth>4.57"
Flow Length=817' Tc=23.4 min CN=66 Runoff=25.51 cfs 2.873 af

Subcatchment E3: Flow to Southern Runoff Area=9.710 ac 0.00% Impervious Runoff Depth>5.17"
Flow Length=697' Tc=22.3 min CN=71 Runoff=38.00 cfs 4.184 af

Total Runoff Area = 17.480 ac Runoff Volume = 7.117 af Average Runoff Depth = 4.89"
100.00% Pervious = 17.480 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment E1: Flow to Comstock Parkway

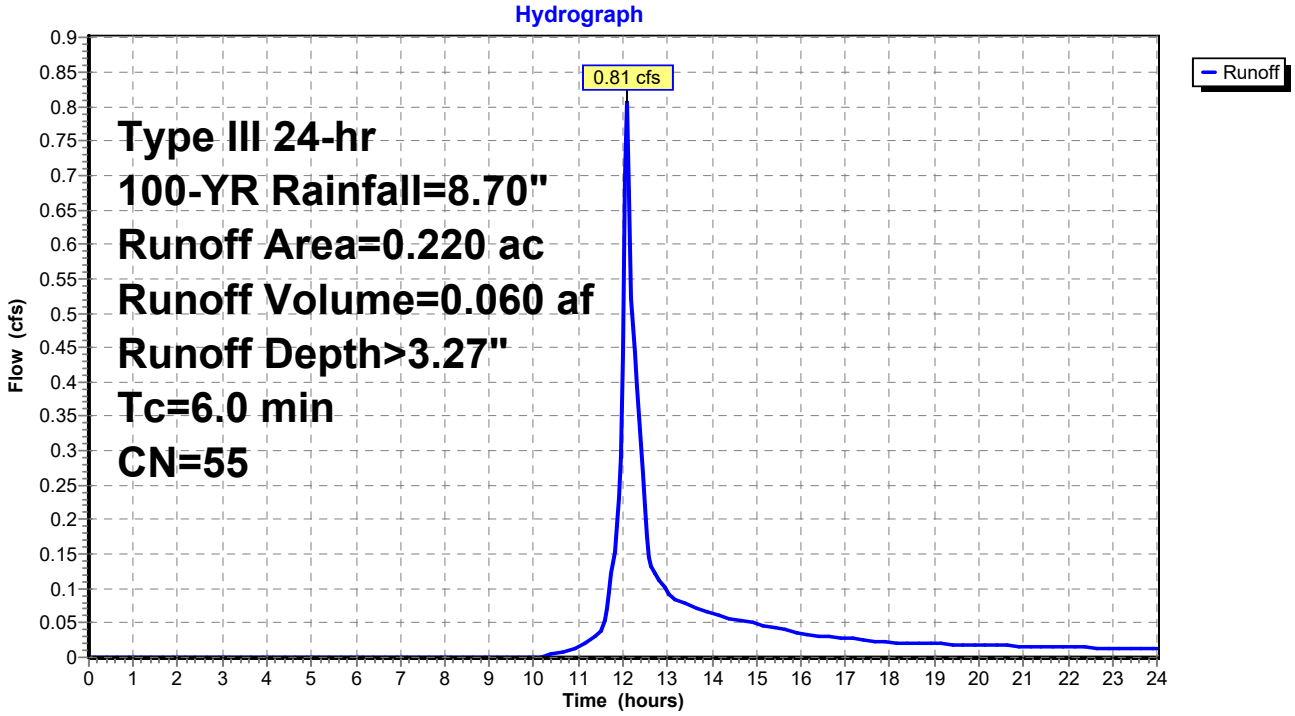
Runoff = 0.81 cfs @ 12.10 hrs, Volume= 0.060 af, Depth> 3.27"
Routed to nonexistent node WET

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-YR Rainfall=8.70"

Area (ac)	CN	Description
0.220	55	Woods, Good, HSG B
0.220		100.00% Pervious Area

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

Subcatchment E1: Flow to Comstock Parkway



Summary for Subcatchment E2: Flow to Northern Wetlands (RI0006017R-02)

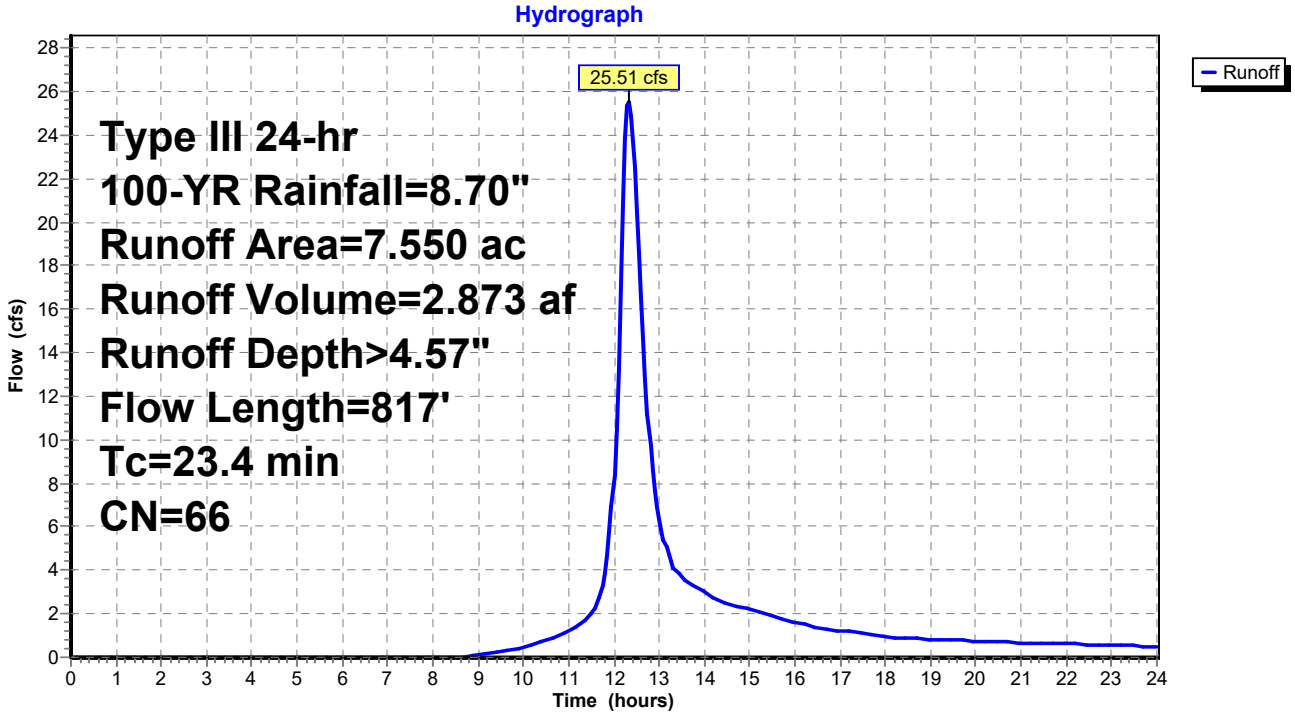
Runoff = 25.51 cfs @ 12.33 hrs, Volume= 2.873 af, Depth> 4.57"
Routed to nonexistent node WET

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-YR Rainfall=8.70"

	Area (ac)	CN	Description
	3.850	55	Woods, Good, HSG B
	3.300	77	Woods, Good, HSG D
*	0.400	90	Wetlands
	7.550	66	Weighted Average
	7.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	100	0.0300	0.09		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.39"
5.7	717	0.0170	2.10		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
23.4	817	Total			

Subcatchment E2: Flow to Northern Wetlands (RI0006017R-02)



Summary for Subcatchment E3: Flow to Southern Wetlands

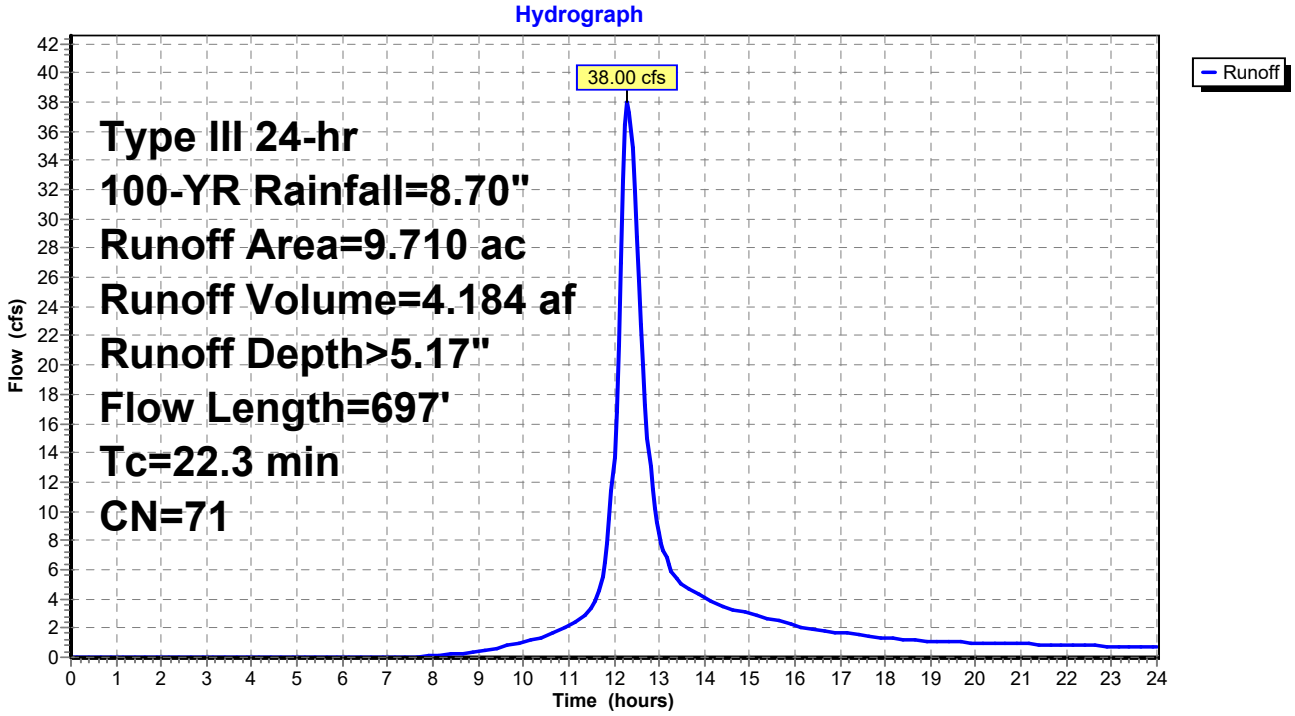
Runoff = 38.00 cfs @ 12.31 hrs, Volume= 4.184 af, Depth> 5.17"
Routed to nonexistent node 1R

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-YR Rainfall=8.70"

	Area (ac)	CN	Description
	2.810	55	Woods, Good, HSG B
	6.500	77	Woods, Good, HSG D
*	0.400	90	Wetlands
	9.710	71	Weighted Average
	9.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	100	0.0300	0.09		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.39"
4.6	597	0.0180	2.16		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
22.3	697	Total			

Subcatchment E3: Flow to Southern Wetlands

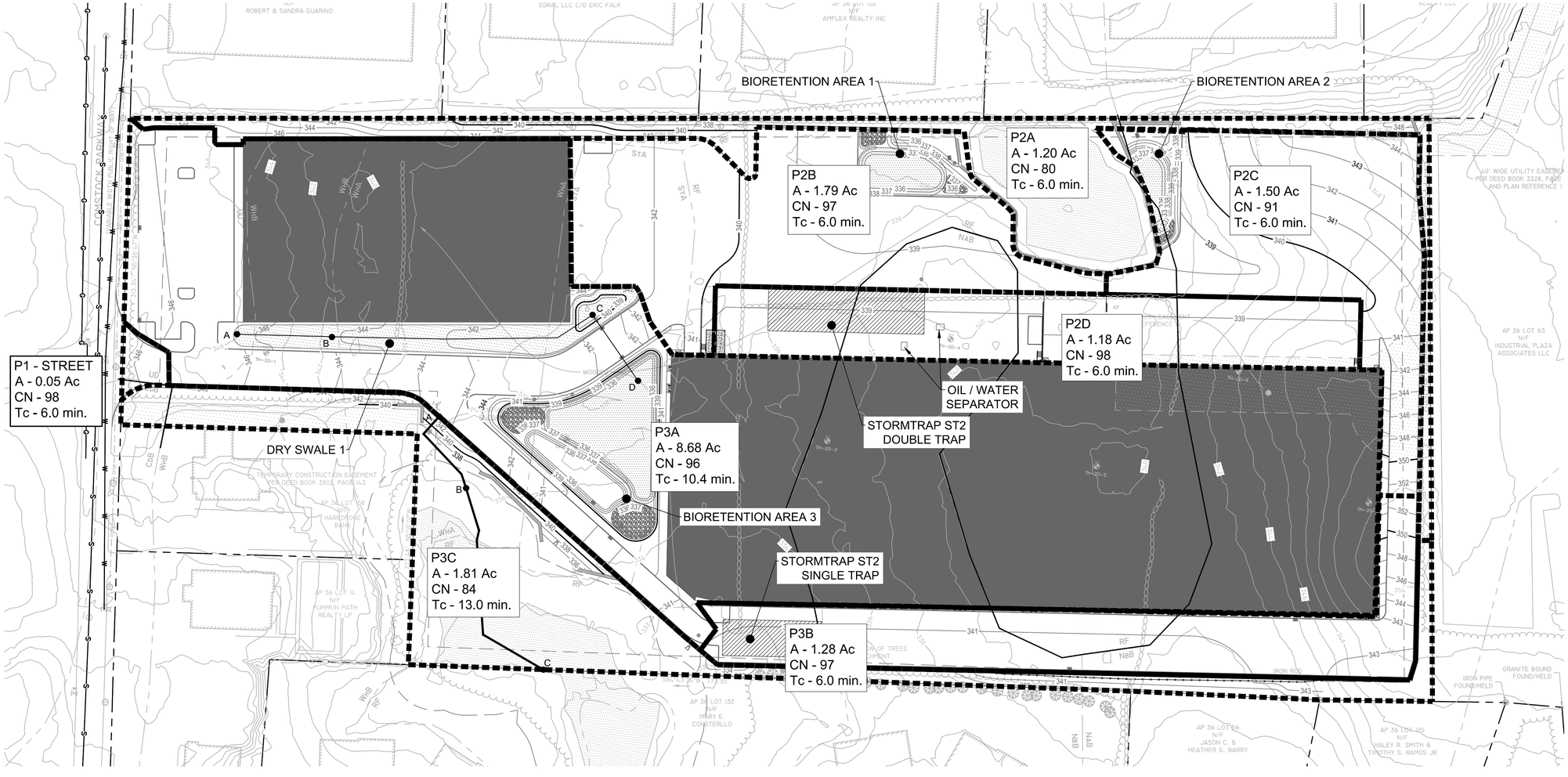


APPENDIX B

PROPOSED WATERSHED DATA

Proposed Watershed Cover Characteristics
Industrial Complex - Cranston, RI
Project # 70753.00

Watershed	Description	Total Area (ac)	Impervious Cover	Roofs	Good Grass "B"	Good Grass "D"	Poor Woods "D"	Wetlands	CN	Tc (min)
P1	Direct Flow to Comstock Parkway	0.05	0.05	-	-	-	-	-	98	6.0
P2A	Direct Flow to Northern Wetlands	1.20	-	-	0.23	0.57	-	0.40	80	6.0
P2B	Flow to Bioretention Area 1	1.78	1.69	-	-	0.09	-	-	97	6.0
P2C	Flow to Bioretention Area 2	1.50	1.22	-	0.28	-	-	-	93	6.0
P2D	Flow to Underground Detention North	1.18	1.18		-	-	-	-	98	6.0
P3A	Flow to Bioretention Area 3	8.68	1.40	6.18	-	1.10	-	-	96	13.0
P3B	Flow to Underground Detention South	1.28	1.24		-	0.04	-	-	98	6.0
P3C	Direct Flow to Southern Wetlands	1.81	0.02	-	0.04	0.18	1.16	0.41	84	10.4
TOTAL	Entire Site	17.48	6.80	6.18	0.55	1.98	1.16	0.81	#REF!	-



Prepared by:

benesch

Alfred Benesch & Company
120 Hebron Avenue, 2nd Floor
Glastonbury, Connecticut 06033
860-633-8341

Prepared for:

Comstock Industrial, LLC
36 Sherwood Place
Greenwich, Connecticut 06830
203-292-1850

COMSTOCK INDUSTRIAL PARK COMSTOCK PARKWAY

CRANSTON, RI

PLAT 36/ 4 LOT 46

DATE:	REVISION:
6/15/2022	PER RIDEM COMMENTS

KEY PLAN

0 60' 120'
SCALE: 1" = 60'

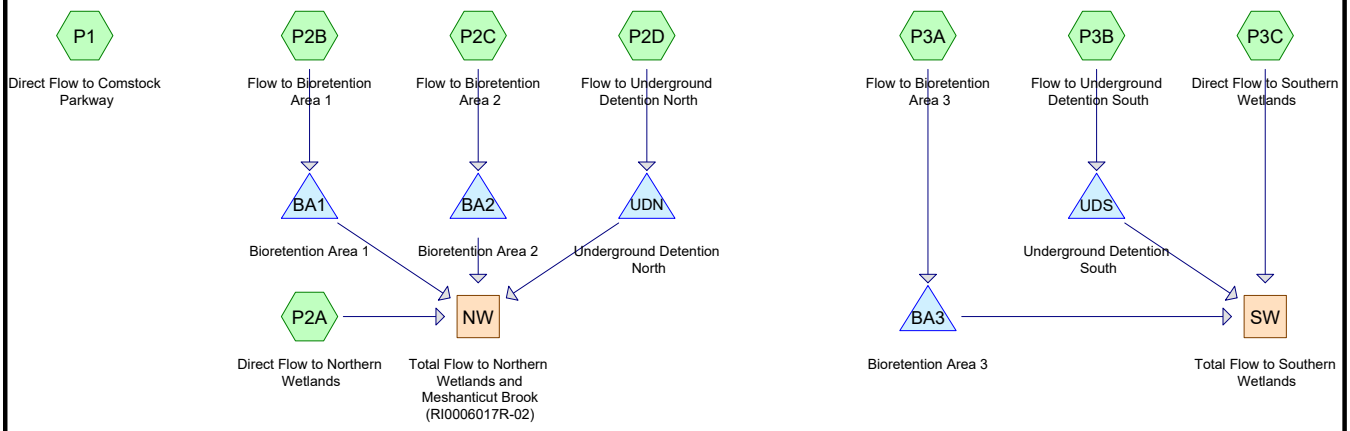
WILLIAM G. WALTER
No. 12234
REGISTERED PROFESSIONAL ENGINEER
CIVIL

PROJECT NO.: **70753.00**
SCALE: **AS NOTED**
DATE: **04/12/2022**
DRAWN BY: **GSL**
CHECKED BY: **WGW**

PROPOSED WATERSHED AREA MAP

DRAWING NO.:

PWAM



Subcat Reach Pond Link

Routing Diagram for 70753.00 PWAM

Prepared by {enter your company name here}, Printed 8/4/2022

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1 YR	Type III 24-hr		Default	24.00	1	2.70	2
2	10 YR	Type III 24-hr		Default	24.00	1	4.90	2
3	100 YR	Type III 24-hr		Default	24.00	1	8.70	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.550	61	>75% Grass cover, Good, HSG B (P2A, P2C, P3C)
1.980	80	>75% Grass cover, Good, HSG D (P2A, P2B, P3A, P3B, P3C)
0.050	98	Paved parking (P1)
6.750	98	Paved parking, HSG D (P2B, P2C, P2D, P3A, P3B, P3C)
6.180	98	Roofs, HSG D (P3A)
0.810	90	Wetlands (P2A, P3C)
1.160	77	Woods, Good, HSG D (P3C)
17.480	**93**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.550	HSG B	P2A, P2C, P3C
0.000	HSG C	
16.070	HSG D	P2A, P2B, P2C, P2D, P3A, P3B, P3C
0.860	Other	P1, P2A, P3C
17.480		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.550	0.000	1.980	0.000	2.530	>75% Grass cover, Good	P2A, P2B, P2C, P3A, P3B, P3C
0.000	0.000	0.000	6.750	0.050	6.800	Paved parking	P1, P2B, P2C, P2D, P3A, P3B, P3C
0.000	0.000	0.000	6.180	0.000	6.180	Roofs	P3A
0.000	0.000	0.000	0.000	0.810	0.810	Wetlands	P2A, P3C
0.000	0.000	0.000	1.160	0.000	1.160	Woods, Good	P3C
0.000	**0.550**	**0.000**	**16.070**	**0.860**	**17.480**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	P3A	0.00	0.00	83.0	0.0200	0.011	0.0	15.0	0.0
2	BA1	333.80	333.70	10.0	0.0100	0.011	0.0	15.0	0.0
3	BA2	334.18	334.00	18.0	0.0100	0.011	0.0	12.0	0.0
4	BA3	336.00	335.45	55.0	0.0100	0.011	0.0	18.0	0.0
5	UDN	335.00	334.60	126.0	0.0032	0.012	0.0	12.0	0.0
6	UDS	333.88	333.75	13.0	0.0100	0.011	0.0	15.0	0.0

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 P1: Direct Flow to Runoff Area=0.050 ac 100.00% Impervious Runoff Depth=2.47"
Tc=6.0 min CN=98 Runoff=0.13 cfs 0.010 af

Subcatchment P2A: Direct Flow to Northern Runoff Area=1.200 ac 0.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=80 Runoff=1.39 cfs 0.103 af

Subcatchment P2B: Flow to Bioretention Runoff Area=1.780 ac 94.94% Impervious Runoff Depth=2.36"
Tc=6.0 min CN=97 Runoff=4.44 cfs 0.350 af

Subcatchment P2C: Flow to Bioretention Runoff Area=1.500 ac 81.33% Impervious Runoff Depth=1.79"
Tc=6.0 min CN=91 Runoff=3.06 cfs 0.224 af

Subcatchment P2D: Flow to Underground Runoff Area=1.180 ac 100.00% Impervious Runoff Depth=2.47"
Tc=6.0 min CN=98 Runoff=3.01 cfs 0.243 af

Subcatchment P3A: Flow to Bioretention Runoff Area=8.680 ac 87.33% Impervious Runoff Depth=2.26"
Flow Length=470' Tc=10.4 min CN=96 Runoff=18.52 cfs 1.633 af

Subcatchment P3B: Flow to Underground Runoff Area=1.280 ac 96.88% Impervious Runoff Depth=2.36"
Tc=6.0 min CN=97 Runoff=3.20 cfs 0.252 af

Subcatchment P3C: Direct Flow to Southern Runoff Area=1.810 ac 1.10% Impervious Runoff Depth=1.03"
Flow Length=334' Tc=13.0 min CN=80 Runoff=1.68 cfs 0.155 af

Reach NW: Total Flow to Northern Wetlands and Meshanticut Brook Inflow=1.47 cfs 0.307 af
Outflow=1.47 cfs 0.307 af

Reach SW: Total Flow to Southern Wetlands Inflow=1.83 cfs 0.425 af
Outflow=1.83 cfs 0.425 af

Pond BA1: Bioretention Area 1 Peak Elev=335.99' Storage=9,075 cf Inflow=4.44 cfs 0.350 af
Discarded=0.14 cfs 0.308 af Primary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.308 af

Pond BA2: Bioretention Area 2 Peak Elev=336.33' Storage=6,019 cf Inflow=3.06 cfs 0.224 af
Discarded=0.11 cfs 0.194 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.194 af

Pond BA3: Bioretention Area 3 Peak Elev=337.33' Storage=38,651 cf Inflow=18.52 cfs 1.633 af
Discarded=0.61 cfs 1.120 af Primary=1.52 cfs 0.270 af Outflow=2.14 cfs 1.390 af

Pond UDN: Underground Detention North Peak Elev=335.91' Storage=6,312 cf Inflow=3.01 cfs 0.243 af
Outflow=0.31 cfs 0.204 af

Pond UDS: Underground Detention South Peak Elev=334.72' Storage=6,073 cf Inflow=3.20 cfs 0.252 af
Discarded=0.12 cfs 0.252 af Primary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.252 af

Total Runoff Area = 17.480 ac Runoff Volume = 2.970 af Average Runoff Depth = 2.04"
25.74% Pervious = 4.500 ac 74.26% Impervious = 12.980 ac

Summary for Subcatchment P1: Direct Flow to Comstock Parkway

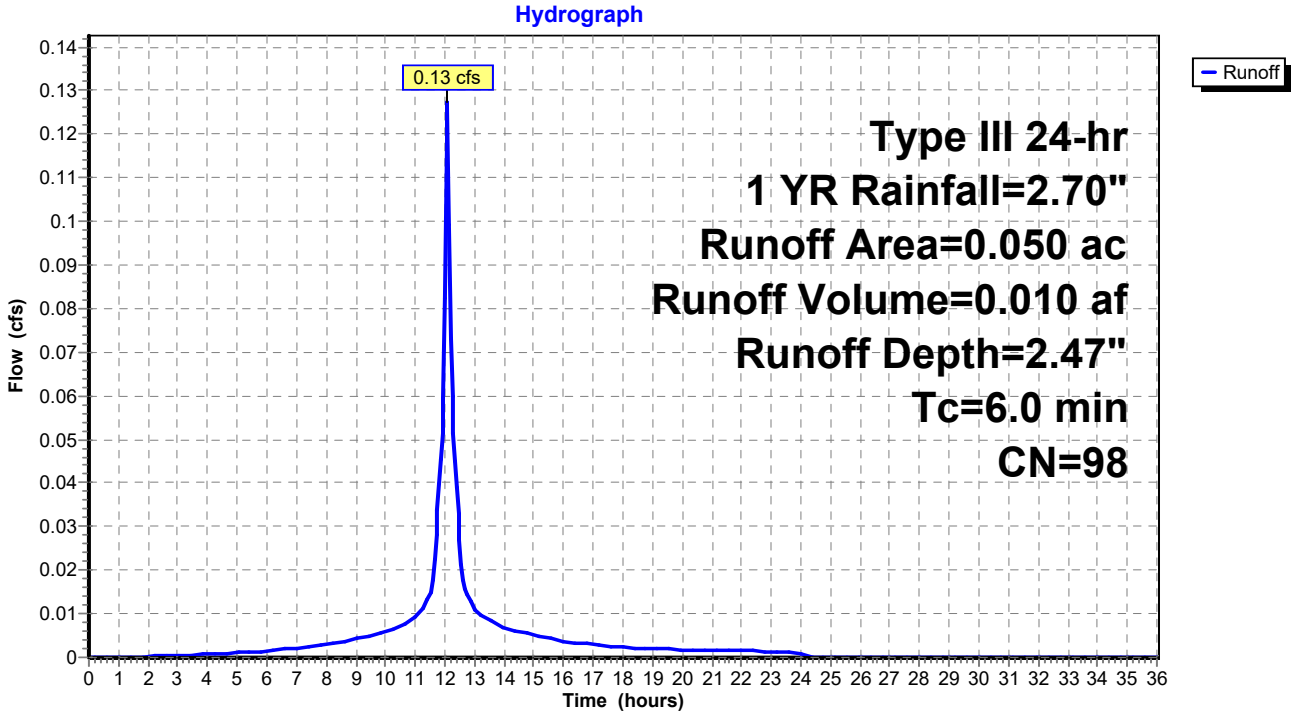
Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.010 af, Depth= 2.47"
Routed to nonexistent node WET

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YR Rainfall=2.70"

	Area (ac)	CN	Description
*	0.050	98	Paved parking
	0.050		100.00% Impervious Area

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

Subcatchment P1: Direct Flow to Comstock Parkway



Summary for Subcatchment P2A: Direct Flow to Northern Wetlands

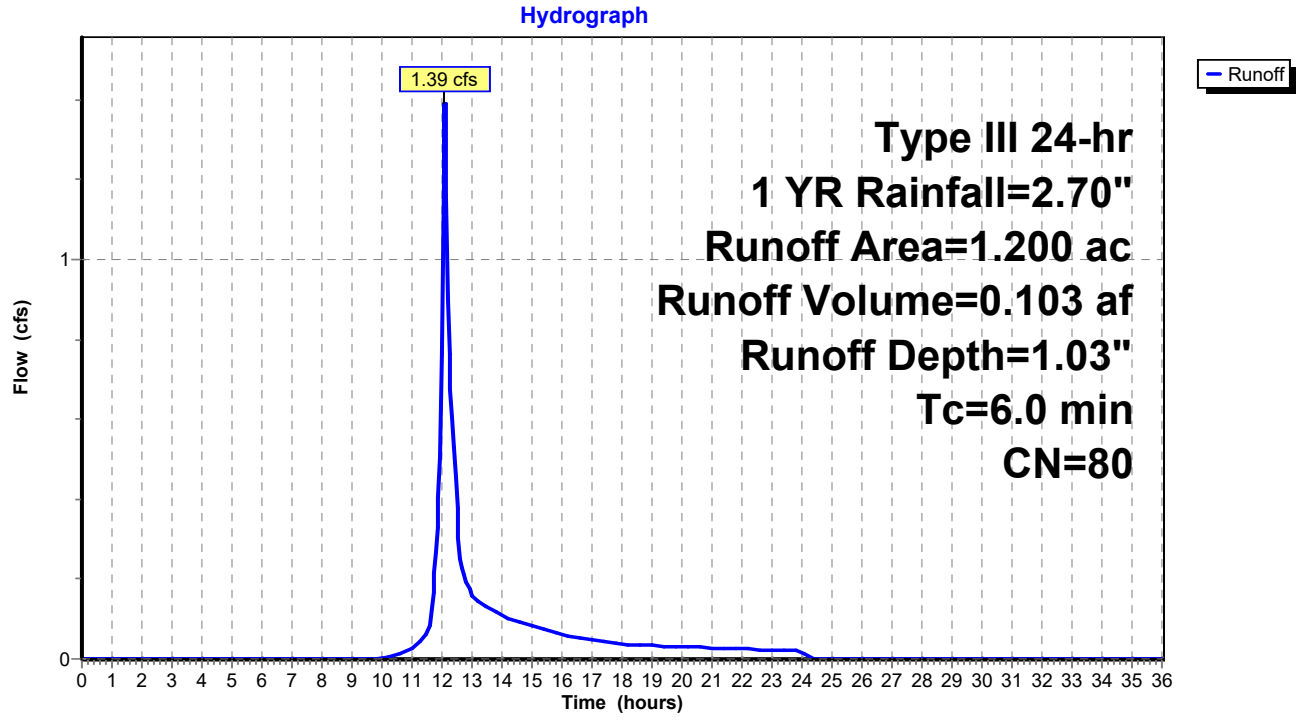
Runoff = 1.39 cfs @ 12.10 hrs, Volume= 0.103 af, Depth= 1.03"
Routed to Reach NW : Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YR Rainfall=2.70"

	Area (ac)	CN	Description
	0.230	61	>75% Grass cover, Good, HSG B
	0.570	80	>75% Grass cover, Good, HSG D
*	0.400	90	Wetlands
	1.200	80	Weighted Average
	1.200		100.00% Pervious Area

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

Subcatchment P2A: Direct Flow to Northern Wetlands



Summary for Subcatchment P2B: Flow to Bioretention Area 1

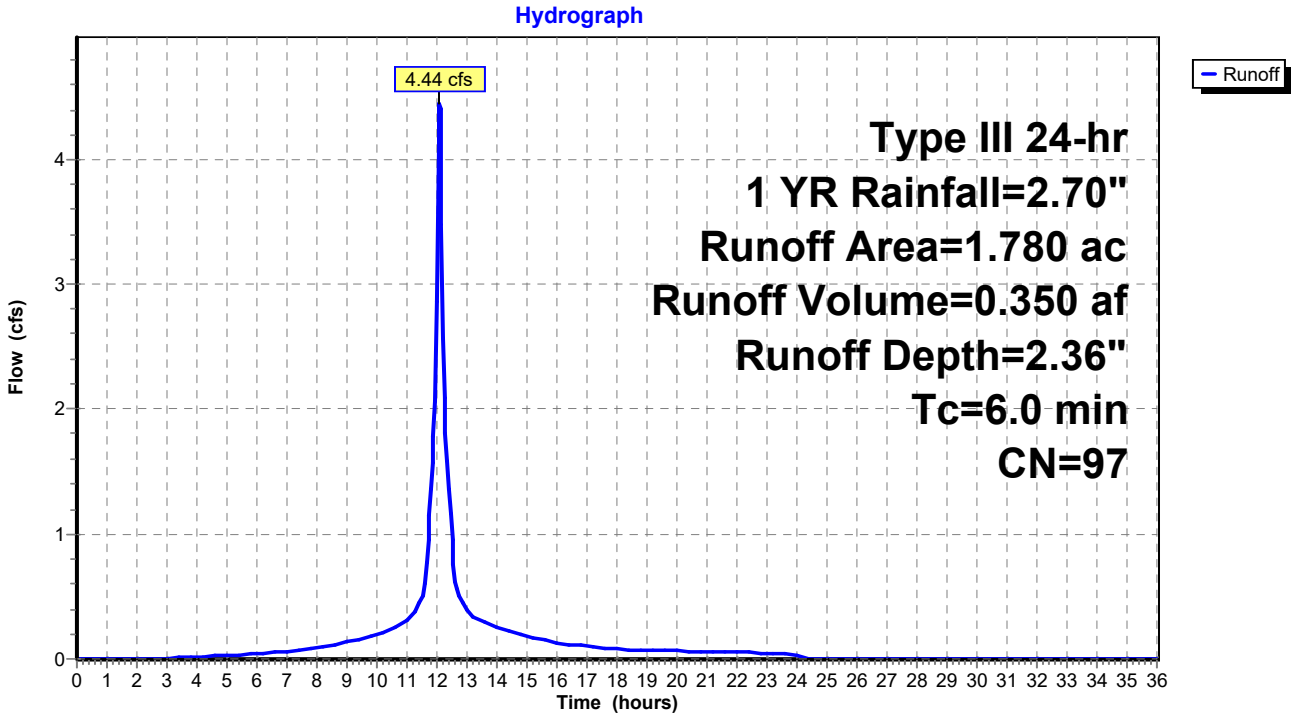
Runoff = 4.44 cfs @ 12.09 hrs, Volume= 0.350 af, Depth= 2.36"
Routed to Pond BA1 : Bioretention Area 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YR Rainfall=2.70"

Area (ac)	CN	Description
1.690	98	Paved parking, HSG D
0.090	80	>75% Grass cover, Good, HSG D
1.780	97	Weighted Average
0.090		5.06% Pervious Area
1.690		94.94% Impervious Area

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

Subcatchment P2B: Flow to Bioretention Area 1



Summary for Subcatchment P2C: Flow to Bioretention Area 2

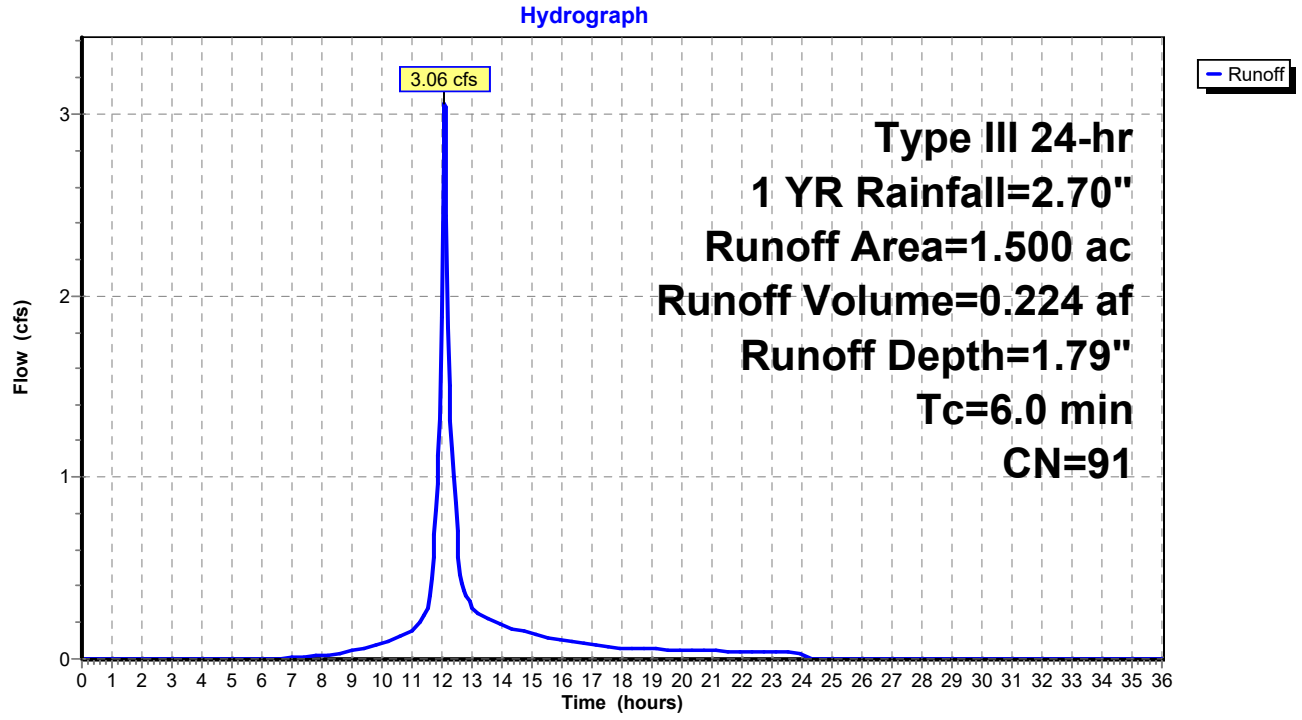
Runoff = 3.06 cfs @ 12.09 hrs, Volume= 0.224 af, Depth= 1.79"
Routed to Pond BA2 : Bioretention Area 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YR Rainfall=2.70"

Area (ac)	CN	Description
1.220	98	Paved parking, HSG D
0.280	61	>75% Grass cover, Good, HSG B
1.500	91	Weighted Average
0.280		18.67% Pervious Area
1.220		81.33% Impervious Area

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

Subcatchment P2C: Flow to Bioretention Area 2



Summary for Subcatchment P2D: Flow to Underground Detention North

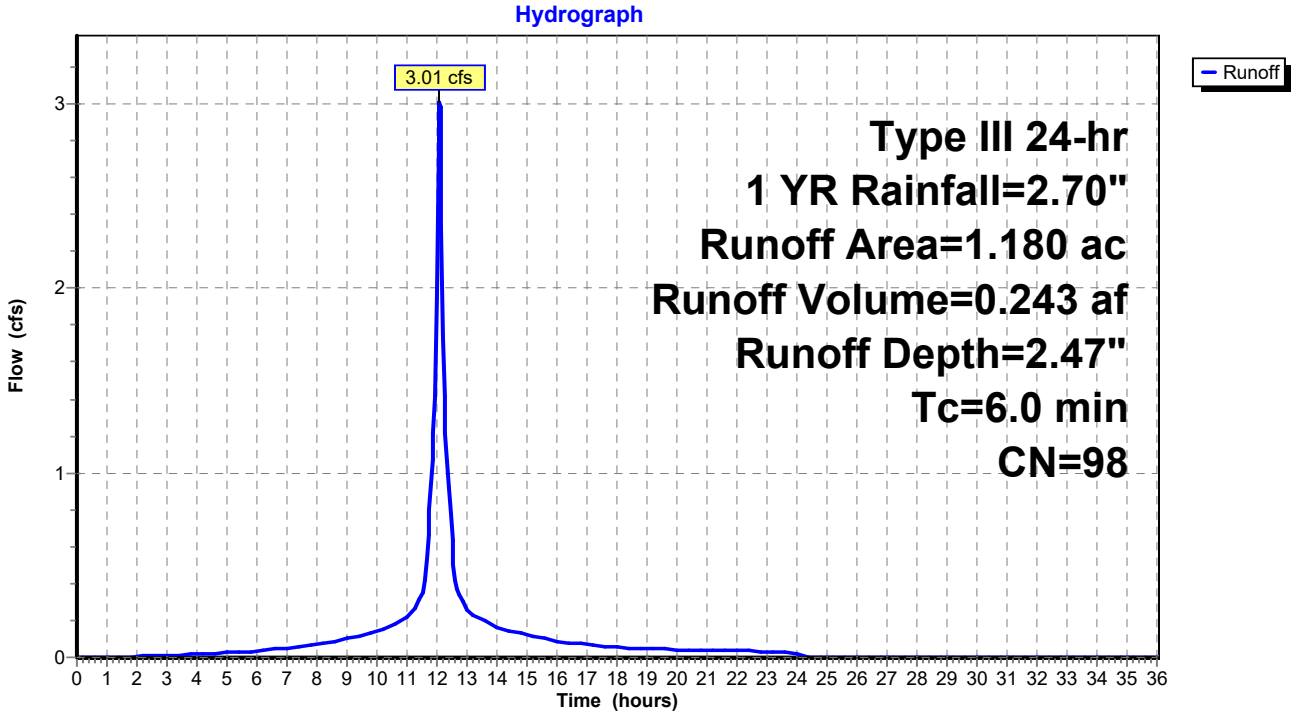
Runoff = 3.01 cfs @ 12.09 hrs, Volume= 0.243 af, Depth= 2.47"
Routed to Pond UDN : Underground Detention North

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YR Rainfall=2.70"

Area (ac)	CN	Description
1.180	98	Paved parking, HSG D
1.180		100.00% Impervious Area

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

Subcatchment P2D: Flow to Underground Detention North



Summary for Subcatchment P3A: Flow to Bioretention Area 3

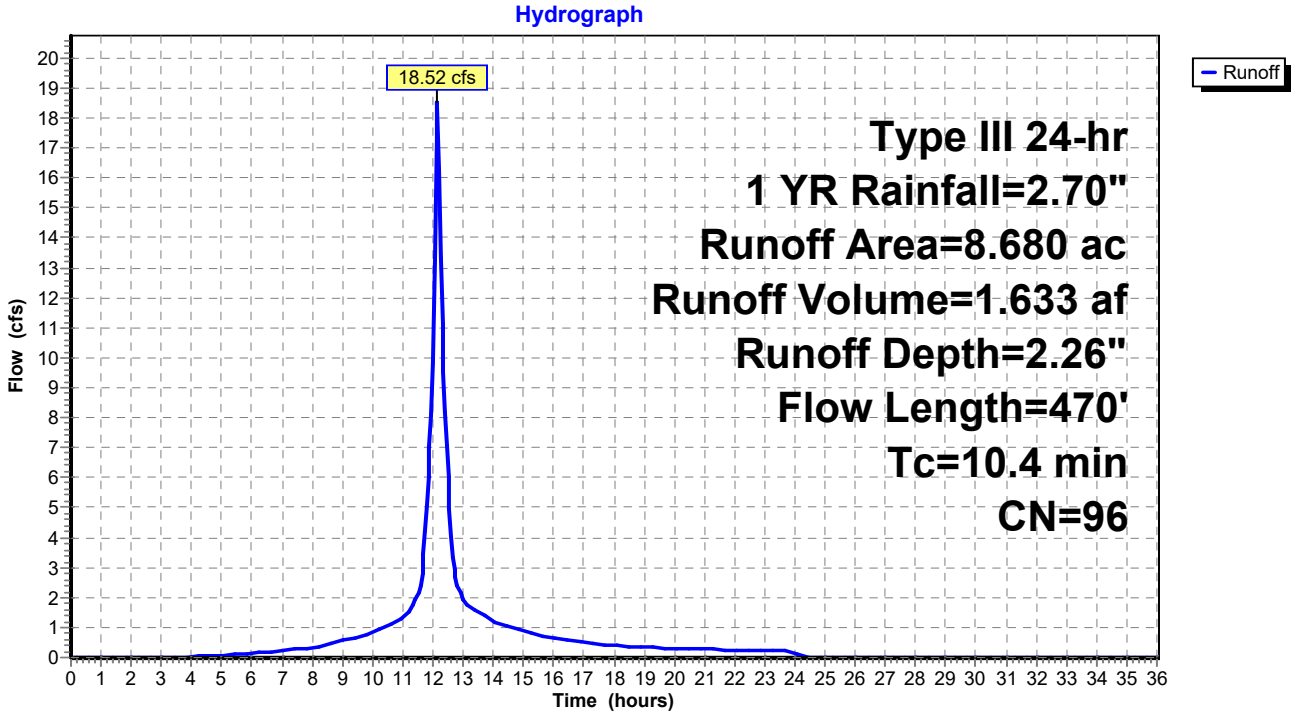
Runoff = 18.52 cfs @ 12.14 hrs, Volume= 1.633 af, Depth= 2.26"
Routed to Pond BA3 : Bioretention Area 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YR Rainfall=2.70"

Area (ac)	CN	Description
1.400	98	Paved parking, HSG D
6.180	98	Roofs, HSG D
1.100	80	>75% Grass cover, Good, HSG D
8.680	96	Weighted Average
1.100		12.67% Pervious Area
7.580		87.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0200	0.18		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.39"
0.7	287	0.2000	6.71		**Shallow Concentrated Flow, BC** Grassed Waterway Kv= 15.0 fps
0.2	83	0.0200	8.80	10.80	**Pipe Channel, CD** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
10.4	470	Total			

Subcatchment P3A: Flow to Bioretention Area 3



Summary for Subcatchment P3B: Flow to Underground Detention South

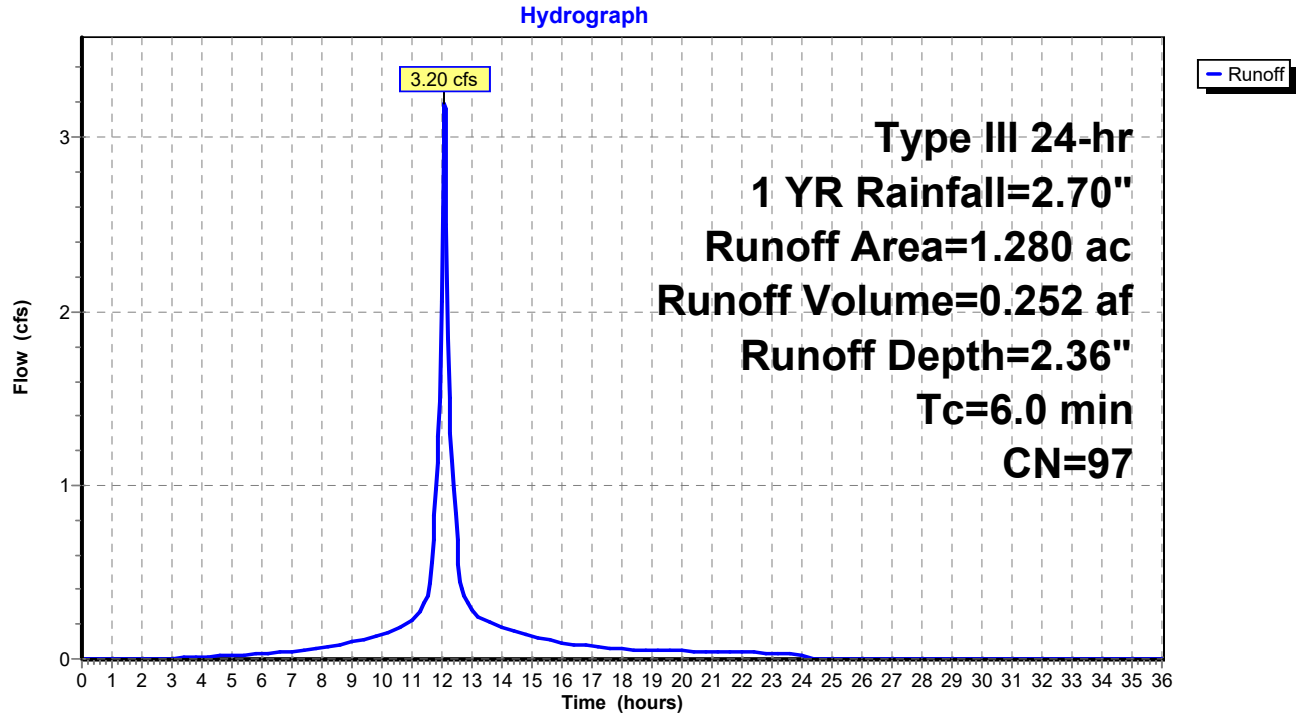
Runoff = 3.20 cfs @ 12.09 hrs, Volume= 0.252 af, Depth= 2.36"
Routed to Pond UDS : Underground Detention South

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YR Rainfall=2.70"

Area (ac)	CN	Description
1.240	98	Paved parking, HSG D
0.040	80	>75% Grass cover, Good, HSG D
1.280	97	Weighted Average
0.040		3.13% Pervious Area
1.240		96.88% Impervious Area

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

Subcatchment P3B: Flow to Underground Detention South



Summary for Subcatchment P3C: Direct Flow to Southern Wetlands

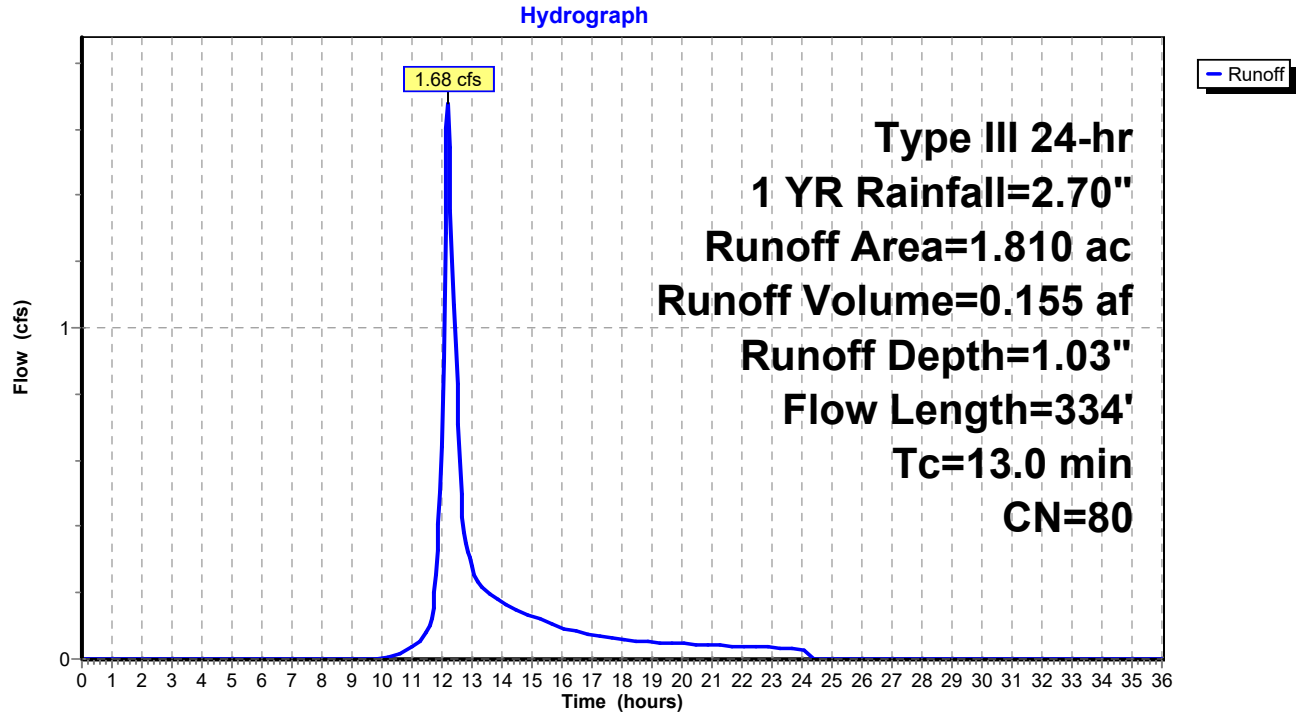
Runoff = 1.68 cfs @ 12.19 hrs, Volume= 0.155 af, Depth= 1.03"
Routed to Reach SW : Total Flow to Southern Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YR Rainfall=2.70"

	Area (ac)	CN	Description
	0.020	98	Paved parking, HSG D
	0.040	61	>75% Grass cover, Good, HSG B
	0.180	80	>75% Grass cover, Good, HSG D
	1.160	77	Woods, Good, HSG D
*	0.410	90	Wetlands
	1.810	80	Weighted Average
	1.790		98.90% Pervious Area
	0.020		1.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.0900	0.32		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.39"
7.8	234	0.0100	0.50		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
13.0	334	Total			

Subcatchment P3C: Direct Flow to Southern Wetlands

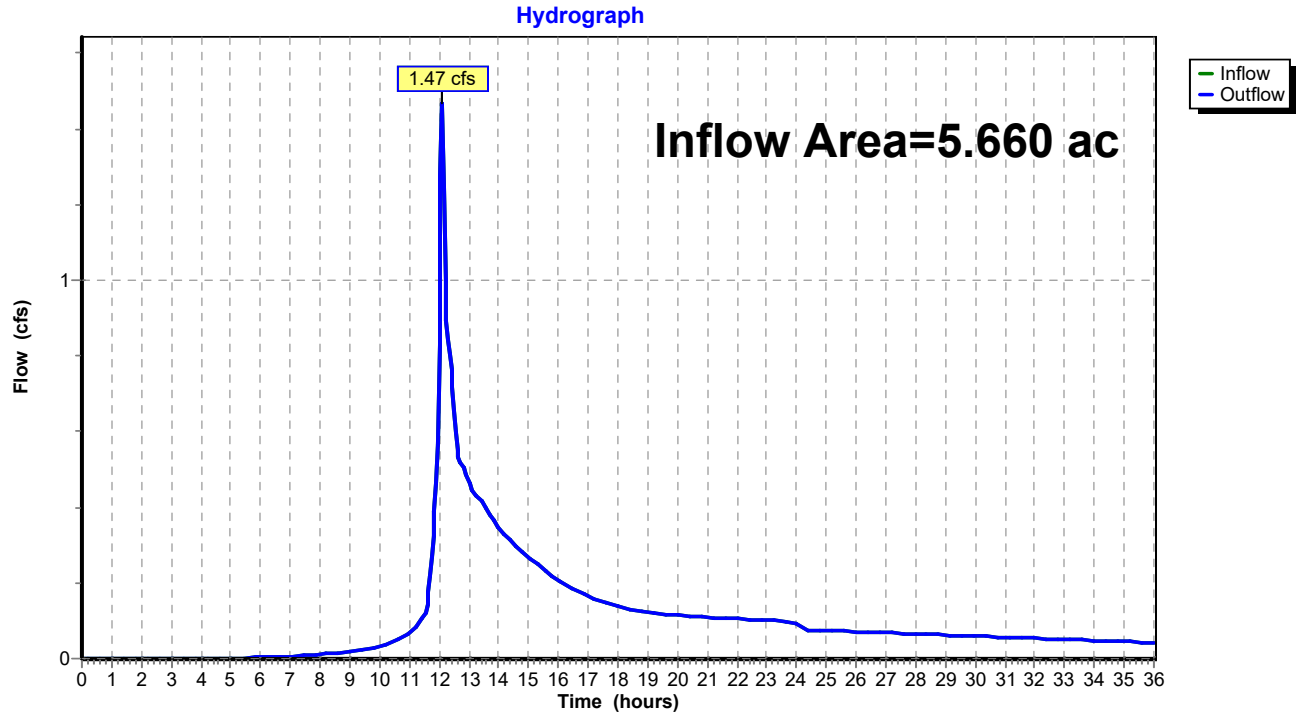


Summary for Reach NW: Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Inflow Area = 5.660 ac, 72.26% Impervious, Inflow Depth > 0.65" for 1 YR event
Inflow = 1.47 cfs @ 12.10 hrs, Volume= 0.307 af
Outflow = 1.47 cfs @ 12.10 hrs, Volume= 0.307 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach NW: Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

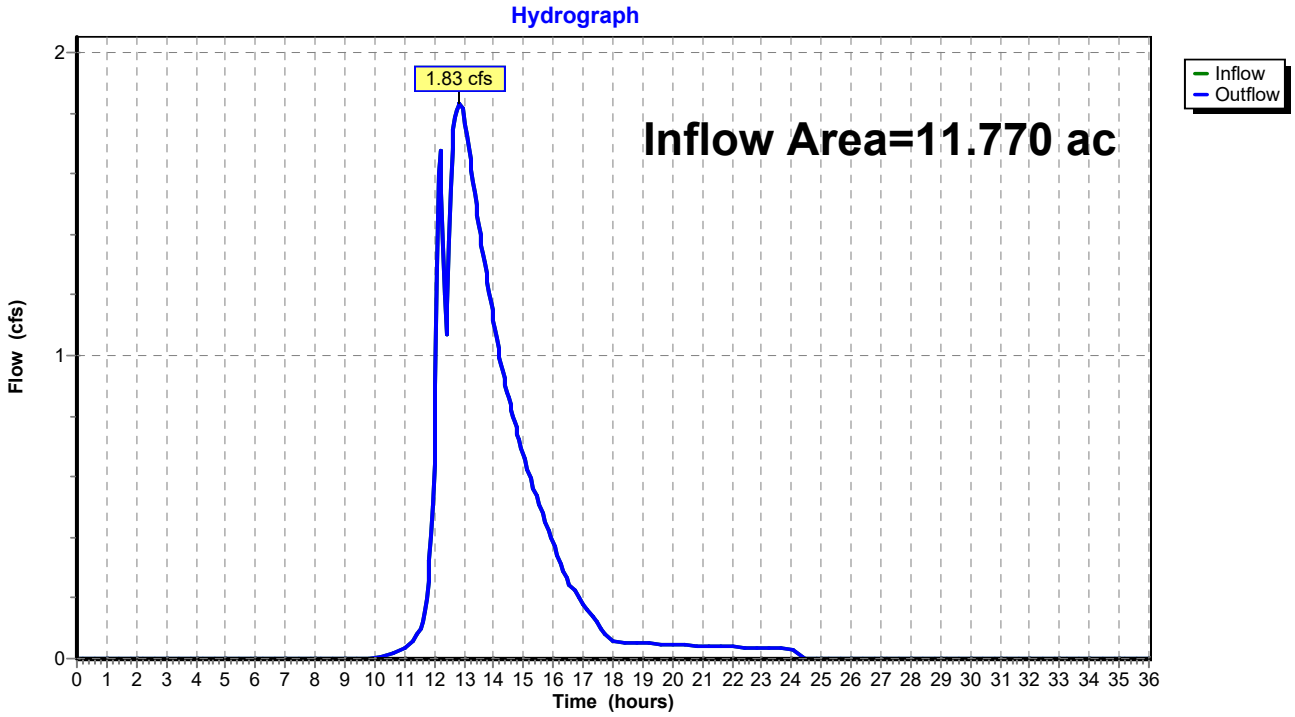


Summary for Reach SW: Total Flow to Southern Wetlands

Inflow Area = 11.770 ac, 75.11% Impervious, Inflow Depth = 0.43" for 1 YR event
Inflow = 1.83 cfs @ 12.86 hrs, Volume= 0.425 af
Outflow = 1.83 cfs @ 12.86 hrs, Volume= 0.425 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach SW: Total Flow to Southern Wetlands



Summary for Pond BA1: Bioretention Area 1

Inflow Area = 1.780 ac, 94.94% Impervious, Inflow Depth = 2.36" for 1 YR event
Inflow = 4.44 cfs @ 12.09 hrs, Volume= 0.350 af
Outflow = 0.14 cfs @ 15.81 hrs, Volume= 0.308 af, Atten= 97%, Lag= 223.1 min
Discarded = 0.14 cfs @ 15.81 hrs, Volume= 0.308 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach NW : Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 335.99' @ 15.81 hrs Surf.Area= 4,628 sf Storage= 9,075 cf

Plug-Flow detention time= 555.2 min calculated for 0.308 af (88% of inflow)
Center-of-Mass det. time= 500.7 min (1,271.1 - 770.5)

Volume	Invert	Avail.Storage	Storage Description
#1	333.99'	19,848 cf	**Bioretention Area 1 (Prismatic)**Listed below (Recalc)

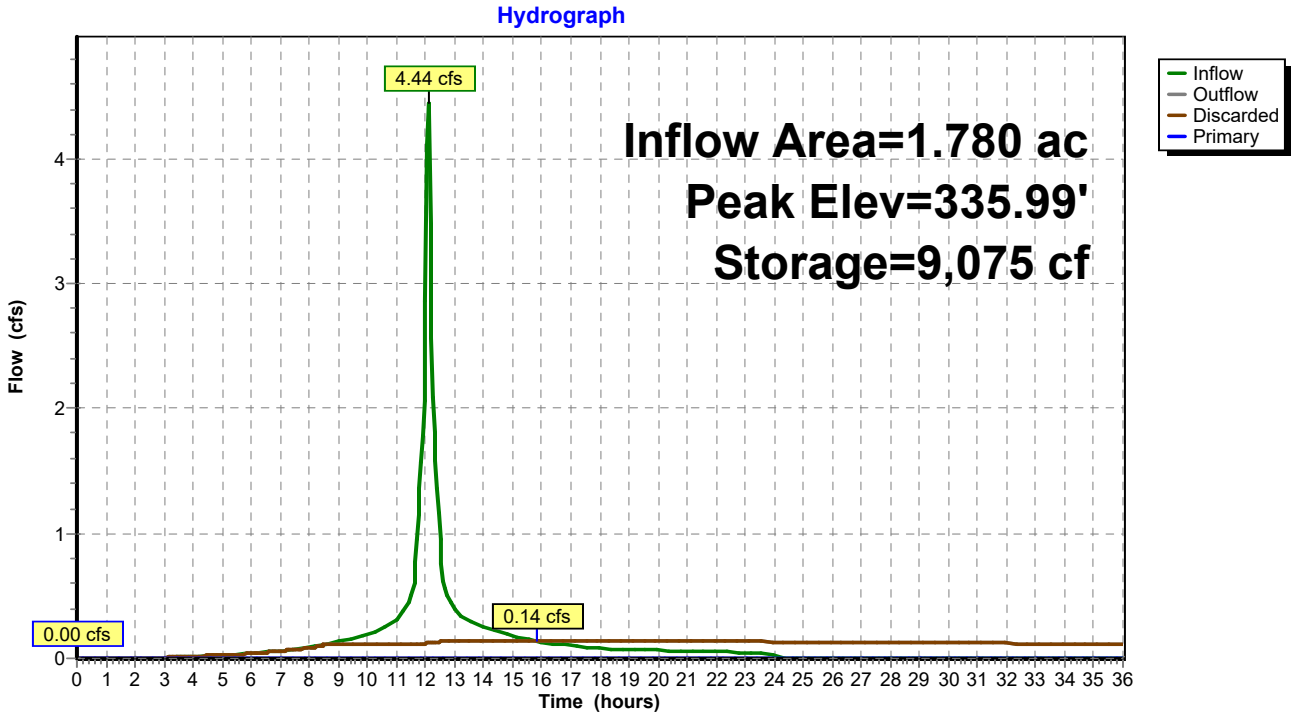
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
333.99	4,494	0.0	0	0
334.00	4,494	20.0	9	9
336.00	4,629	100.0	9,123	9,132
337.00	5,276	100.0	4,953	14,084
338.00	6,251	100.0	5,764	19,848

Device	Routing	Invert	Outlet Devices
#1	Primary	333.80'	**15.0" Round 15" Outlet Pipe** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 333.80' / 333.70' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	337.70'	**24.0" x 24.0" Horiz. Top Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	336.00'	**12.0" Vert. 12" Orifice** C= 0.600 Limited to weir flow at low heads
#4	Discarded	333.99'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 327.00'

Discarded OutFlow Max=0.14 cfs @ 15.81 hrs HW=335.99' (Free Discharge)
└**4=Exfiltration** (Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=333.99' (Free Discharge)
└**1=15" Outlet Pipe** (Passes 0.00 cfs of 0.15 cfs potential flow)
  ├**2=Top Grate** (Controls 0.00 cfs)
  └**3=12" Orifice** (Controls 0.00 cfs)

Pond BA1: Bioretention Area 1



Summary for Pond BA2: Bioretention Area 2

Inflow Area = 1.500 ac, 81.33% Impervious, Inflow Depth = 1.79" for 1 YR event
Inflow = 3.06 cfs @ 12.09 hrs, Volume= 0.224 af
Outflow = 0.11 cfs @ 15.86 hrs, Volume= 0.194 af, Atten= 97%, Lag= 225.9 min
Discarded = 0.11 cfs @ 15.86 hrs, Volume= 0.194 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach NW : Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 336.33' @ 15.86 hrs Surf.Area= 3,013 sf Storage= 6,019 cf

Plug-Flow detention time= 566.1 min calculated for 0.194 af (87% of inflow)
Center-of-Mass det. time= 506.8 min (1,315.8 - 809.0)

Volume	Invert	Avail.Storage	Storage Description
#1	333.99'	11,805 cf	**Bioretention Area 2 (Prismatic)**Listed below (Recalc)

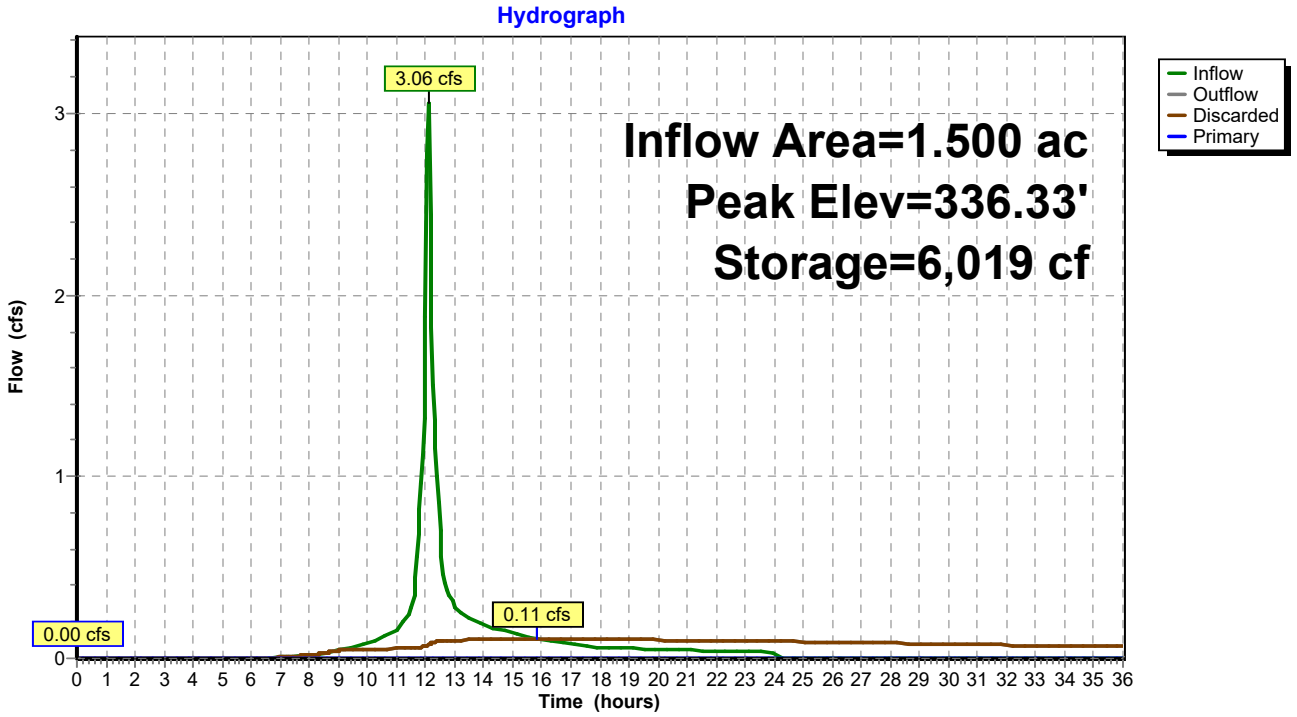
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
333.99	2,163	0.0	0	0
334.00	2,163	20.0	4	4
336.00	2,876	100.0	5,039	5,043
337.00	3,290	100.0	3,083	8,126
338.00	4,068	100.0	3,679	11,805

Device	Routing	Invert	Outlet Devices
#1	Primary	334.18'	**12.0" Round 12" Outlet Pipe** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 334.18' / 334.00' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	337.80'	**24.0" x 24.0" Horiz. Top Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	336.50'	**24.0" W x 10.0" H Vert. 24" x 10" Weir** C= 0.600 Limited to weir flow at low heads
#4	Discarded	333.99'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 330.00'

Discarded OutFlow Max=0.11 cfs @ 15.86 hrs HW=336.33' (Free Discharge)
└**4=Exfiltration** (Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=333.99' (Free Discharge)
└**1=12" Outlet Pipe** (Controls 0.00 cfs)
  ├**2=Top Grate** (Controls 0.00 cfs)
  └**3=24" x 10" Weir** (Controls 0.00 cfs)

Pond BA2: Bioretention Area 2



Summary for Pond BA3: Bioretention Area 3

Inflow Area = 8.680 ac, 87.33% Impervious, Inflow Depth = 2.26" for 1 YR event
Inflow = 18.52 cfs @ 12.14 hrs, Volume= 1.633 af
Outflow = 2.14 cfs @ 12.94 hrs, Volume= 1.390 af, Atten= 88%, Lag= 47.9 min
Discarded = 0.61 cfs @ 12.94 hrs, Volume= 1.120 af
Primary = 1.52 cfs @ 12.94 hrs, Volume= 0.270 af
Routed to Reach SW : Total Flow to Southern Wetlands

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 337.33' @ 12.94 hrs Surf.Area= 13,383 sf Storage= 38,651 cf

Plug-Flow detention time= 464.2 min calculated for 1.390 af (85% of inflow)
Center-of-Mass det. time= 400.7 min (1,183.8 - 783.1)

Volume	Invert	Avail.Storage	Storage Description
#1	333.99'	96,748 cf	**Bioretention Area 3 (Prismatic)**Listed below (Recalc)

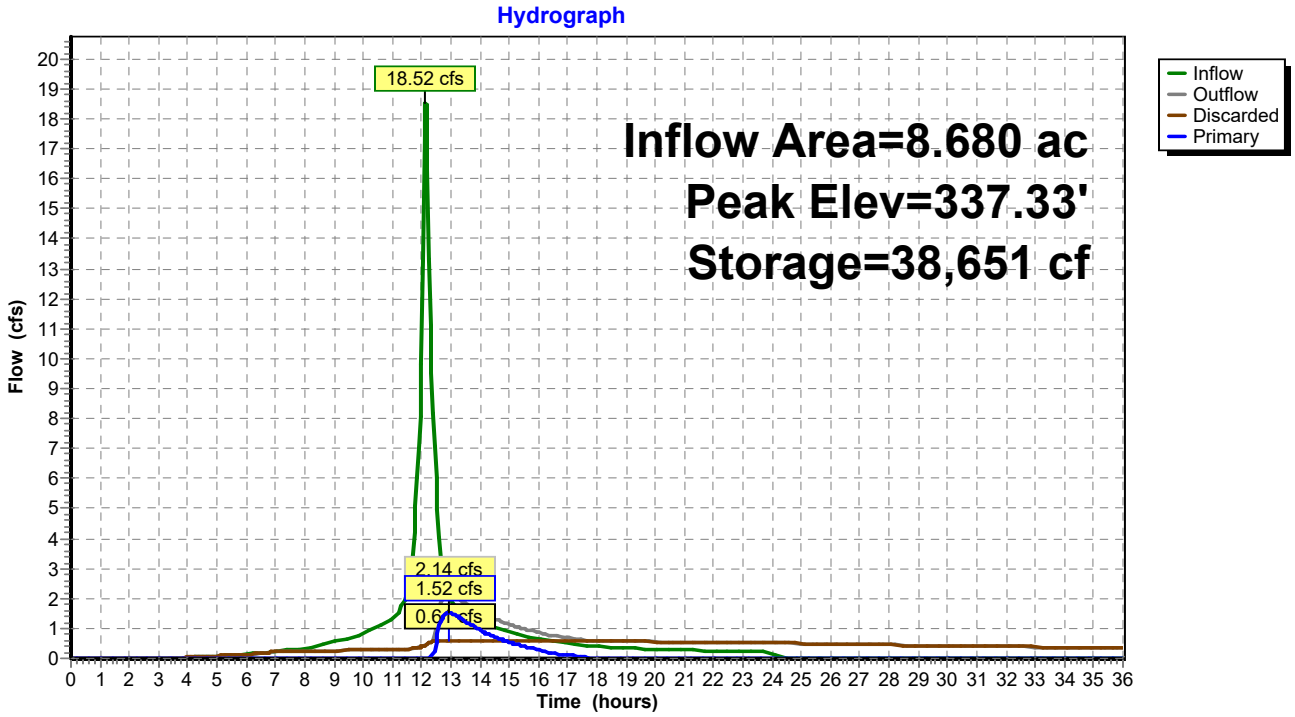
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
333.99	10,621	0.0	0	0
334.00	10,621	20.0	21	21
336.00	11,485	100.0	22,106	22,127
337.00	12,900	100.0	12,193	34,320
338.00	14,365	100.0	13,633	47,952
339.00	15,880	100.0	15,123	63,075
341.01	17,626	100.0	33,674	96,748

Device	Routing	Invert	Outlet Devices
#1	Primary	336.00'	**18.0" Round 18" Culvert** L= 55.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 336.00' / 335.45' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Device 1	339.10'	**24.0" x 24.0" Horiz. Top Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	337.00'	**30.0" W x 6.0" H Vert. 30" x 6" Weir** C= 0.600 Limited to weir flow at low heads
#4	Device 1	341.00'	**35.0' long x 24.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#5	Discarded	333.99'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 331.00'

Discarded OutFlow Max=0.61 cfs @ 12.94 hrs HW=337.33' (Free Discharge)
└**5=Exfiltration** (Controls 0.61 cfs)

Primary OutFlow Max=1.52 cfs @ 12.94 hrs HW=337.33' (Free Discharge)
└**1=18" Culvert** (Passes 1.52 cfs of 6.50 cfs potential flow)
  ├**2=Top Grate** (Controls 0.00 cfs)
  ├**3=30" x 6" Weir** (Orifice Controls 1.52 cfs @ 1.84 fps)
  └**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BA3: Bioretention Area 3



Summary for Pond UDN: Underground Detention North

Inflow Area = 1.180 ac,100.00% Impervious, Inflow Depth = 2.47" for 1 YR event
Inflow = 3.01 cfs @ 12.09 hrs, Volume= 0.243 af
Outflow = 0.31 cfs @ 12.82 hrs, Volume= 0.204 af, Atten= 90%, Lag= 44.1 min
Primary = 0.31 cfs @ 12.82 hrs, Volume= 0.204 af
Routed to Reach NW : Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 335.91' @ 12.82 hrs Surf.Area= 7,900 sf Storage= 6,312 cf

Plug-Flow detention time= 497.9 min calculated for 0.204 af (84% of inflow)
Center-of-Mass det. time= 432.2 min (1,192.3 - 760.1)

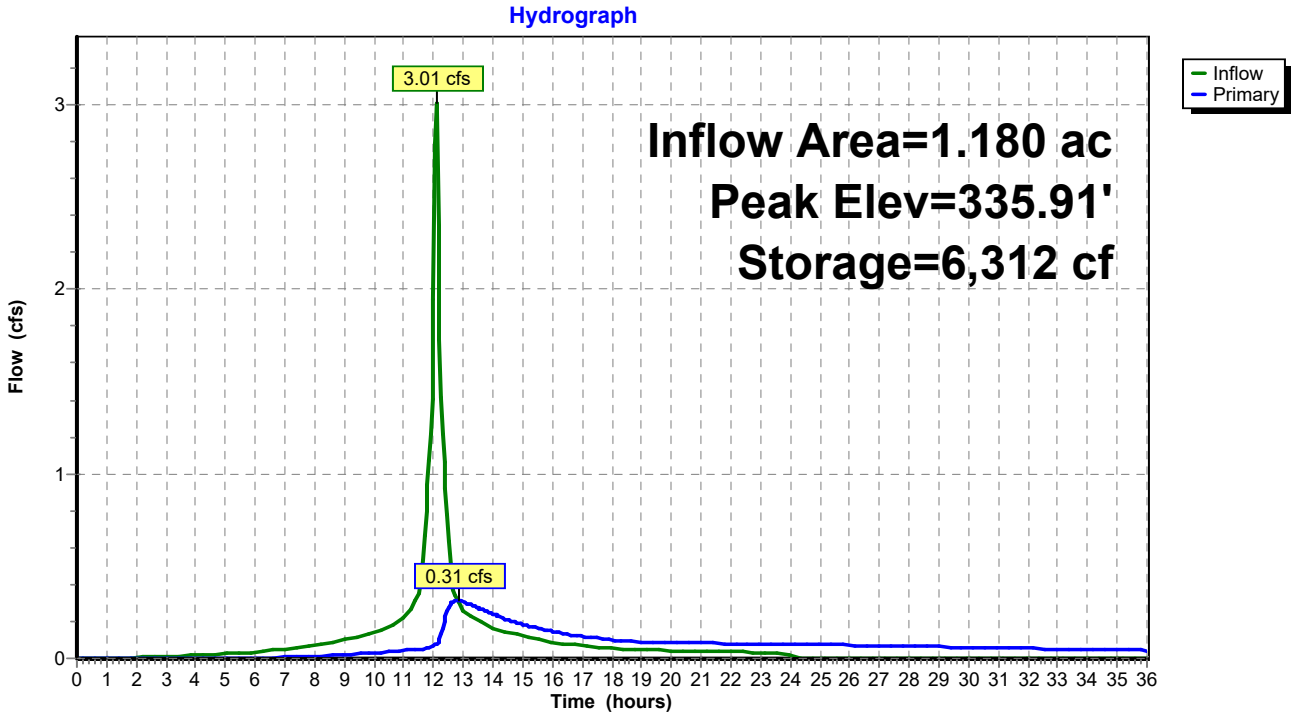
Volume	Invert	Avail.Storage	Storage Description
#1A	335.00'	0 cf	**47.23'W x 167.27'L x 2.50'H Field A** 19,750 cf Overall - 19,750 cf Embedded = 0 cf x 40.0% Voids
#2A	335.00'	13,846 cf	**StormTrap ST2 SingleTrap 2-0** x 40 Inside #1 Inside= 101.7"W x 24.0"H => 15.05 sf x 15.40'L = 231.7 cf Outside= 101.7"W x 30.0"H => 21.20 sf x 15.40'L = 326.4 cf 40 Chambers in 4 Rows 33.92' x 153.96' Core + 6.66' Border = 47.23' x 167.27' System
		13,846 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	335.00'	**12.0" Round Culvert** L= 126.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 335.00' / 334.60' S= 0.0032 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	335.00'	**2.0" Vert. 2" Weep Hole** C= 0.600 Limited to weir flow at low heads
#3	Device 1	335.70'	**15.0" Vert. 15" Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.31 cfs @ 12.82 hrs HW=335.91' (Free Discharge)
└**1=Culvert** (Passes 0.31 cfs of 1.77 cfs potential flow)
  ├**2=2" Weep Hole** (Orifice Controls 0.10 cfs @ 4.38 fps)
  └**3=15" Orifice** (Orifice Controls 0.22 cfs @ 1.57 fps)

Pond UDN: Underground Detention North



Summary for Pond UDS: Underground Detention South

Inflow Area = 1.280 ac, 96.88% Impervious, Inflow Depth = 2.36" for 1 YR event
Inflow = 3.20 cfs @ 12.09 hrs, Volume= 0.252 af
Outflow = 0.12 cfs @ 15.26 hrs, Volume= 0.252 af, Atten= 96%, Lag= 190.7 min
Discarded = 0.12 cfs @ 15.26 hrs, Volume= 0.252 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach SW : Total Flow to Southern Wetlands

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 334.72' @ 15.26 hrs Surf.Area= 4,095 sf Storage= 6,073 cf

Plug-Flow detention time= 469.3 min calculated for 0.252 af (100% of inflow)
Center-of-Mass det. time= 469.2 min (1,239.7 - 770.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	332.50'	1,638 cf	**38.75'W x 105.69'L x 5.50'H Field A** 22,525 cf Overall - 18,429 cf Embedded = 4,095 cf x 40.0% Voids
#2A	333.50'	14,502 cf	**StormTrap ST2 SingleTrap 4-0** x 18 Inside #1 Inside= 101.7"W x 48.0"H => 30.55 sf x 15.40'L = 470.3 cf Outside= 101.7"W x 54.0"H => 38.16 sf x 15.40'L = 587.4 cf 18 Chambers in 3 Rows 25.44' x 92.38' Core + 6.66' Border = 38.75' x 105.69' System
		16,140 cf	Total Available Storage

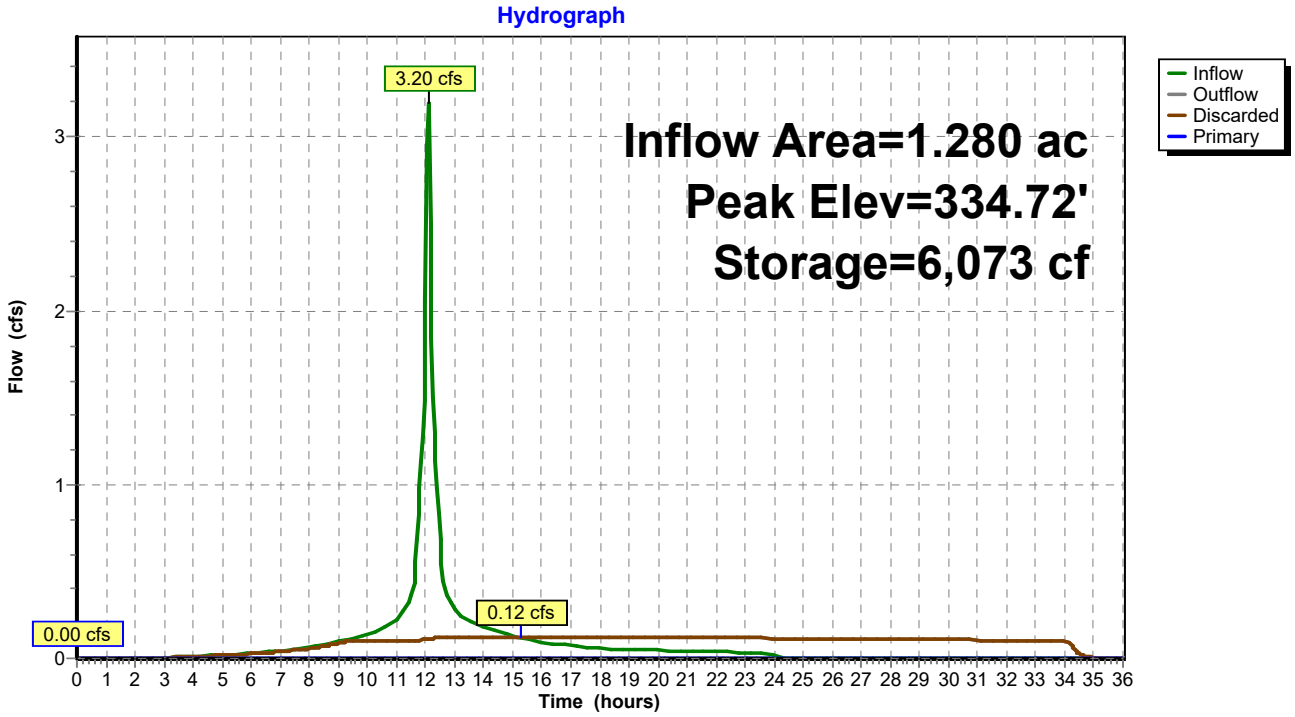
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	333.88'	**15.0" Round 15" Culvert** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 333.88' / 333.75' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	336.55'	**15.0" Vert. 12" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Discarded	332.50'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 324.00'

Discarded OutFlow Max=0.12 cfs @ 15.26 hrs HW=334.72' (Free Discharge)
└**3=Exfiltration** (Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=332.50' (Free Discharge)
└**1=15" Culvert** (Controls 0.00 cfs)
└**2=12" Orifice** (Controls 0.00 cfs)

Pond UDS: Underground Detention South



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 P1: Direct Flow to Runoff Area=0.050 ac 100.00% Impervious Runoff Depth=4.66"
Tc=6.0 min CN=98 Runoff=0.23 cfs 0.019 af

Subcatchment P2A: Direct Flow to Northern Runoff Area=1.200 ac 0.00% Impervious Runoff Depth=2.81"
Tc=6.0 min CN=80 Runoff=3.87 cfs 0.281 af

Subcatchment P2B: Flow to Bioretention Runoff Area=1.780 ac 94.94% Impervious Runoff Depth=4.55"
Tc=6.0 min CN=97 Runoff=8.27 cfs 0.675 af

Subcatchment P2C: Flow to Bioretention Runoff Area=1.500 ac 81.33% Impervious Runoff Depth=3.89"
Tc=6.0 min CN=91 Runoff=6.40 cfs 0.486 af

Subcatchment P2D: Flow to Underground Runoff Area=1.180 ac 100.00% Impervious Runoff Depth=4.66"
Tc=6.0 min CN=98 Runoff=5.52 cfs 0.459 af

Subcatchment P3A: Flow to Bioretention Runoff Area=8.680 ac 87.33% Impervious Runoff Depth=4.43"
Flow Length=470' Tc=10.4 min CN=96 Runoff=35.05 cfs 3.207 af

Subcatchment P3B: Flow to Underground Runoff Area=1.280 ac 96.88% Impervious Runoff Depth=4.55"
Tc=6.0 min CN=97 Runoff=5.95 cfs 0.485 af

Subcatchment P3C: Direct Flow to Southern Runoff Area=1.810 ac 1.10% Impervious Runoff Depth=2.81"
Flow Length=334' Tc=13.0 min CN=80 Runoff=4.70 cfs 0.423 af

Reach NW: Total Flow to Northern Wetlands and Meshanticut Brook Inflow=8.79 cfs 1.152 af
Outflow=8.79 cfs 1.152 af

Reach SW: Total Flow to Southern Wetlands Inflow=11.52 cfs 2.048 af
Outflow=11.52 cfs 2.048 af

Pond BA1: Bioretention Area 1 Peak Elev=336.86' Storage=13,338 cf Inflow=8.27 cfs 0.675 af
Discarded=0.17 cfs 0.347 af Primary=2.26 cfs 0.255 af Outflow=2.43 cfs 0.602 af

Pond BA2: Bioretention Area 2 Peak Elev=337.10' Storage=8,445 cf Inflow=6.40 cfs 0.486 af
Discarded=0.13 cfs 0.229 af Primary=2.95 cfs 0.205 af Outflow=3.08 cfs 0.434 af

Pond BA3: Bioretention Area 3 Peak Elev=339.19' Storage=66,155 cf Inflow=35.05 cfs 3.207 af
Discarded=0.87 cfs 1.289 af Primary=9.13 cfs 1.605 af Outflow=10.00 cfs 2.894 af

Pond UDN: Underground Detention North Peak Elev=336.37' Storage=9,510 cf Inflow=5.52 cfs 0.459 af
Outflow=2.00 cfs 0.412 af

Pond UDS: Underground Detention South Peak Elev=336.69' Storage=13,206 cf Inflow=5.95 cfs 0.485 af
Discarded=0.14 cfs 0.332 af Primary=0.10 cfs 0.020 af Outflow=0.24 cfs 0.352 af

Total Runoff Area = 17.480 ac Runoff Volume = 6.034 af Average Runoff Depth = 4.14"
25.74% Pervious = 4.500 ac 74.26% Impervious = 12.980 ac

Summary for Subcatchment P1: Direct Flow to Comstock Parkway

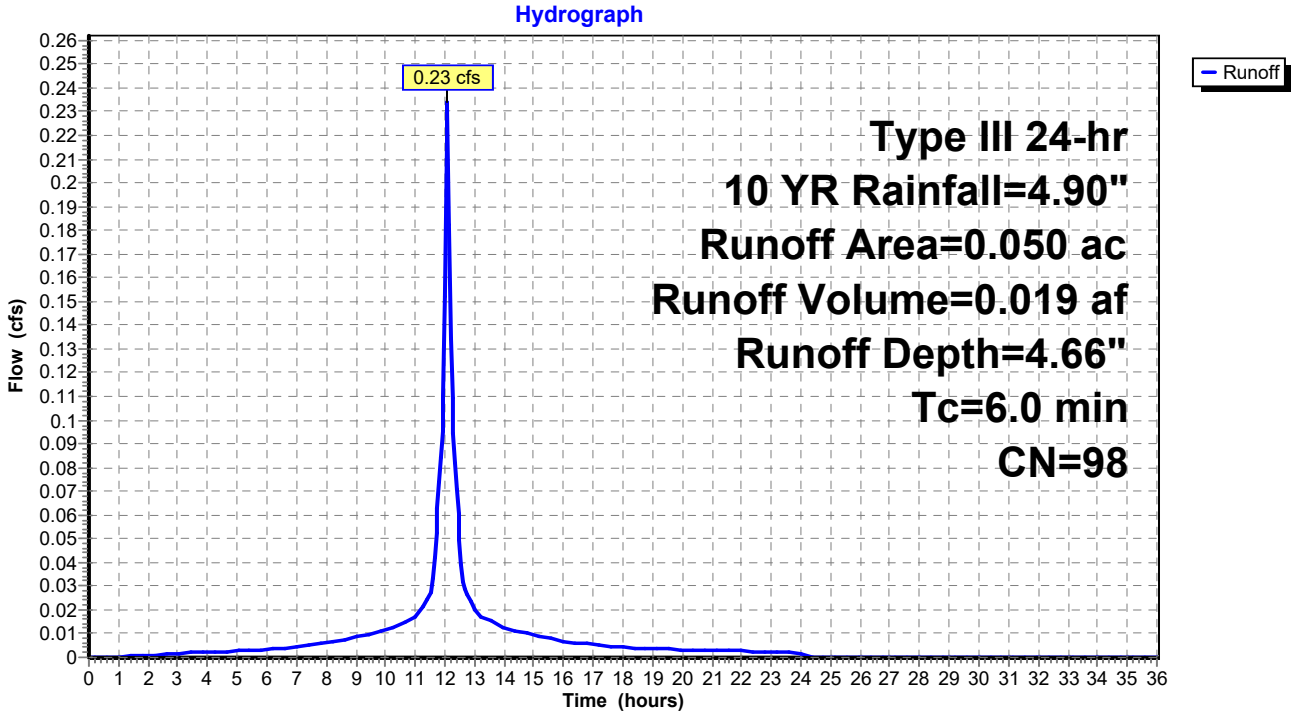
Runoff = 0.23 cfs @ 12.09 hrs, Volume= 0.019 af, Depth= 4.66"
Routed to nonexistent node WET

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.90"

	Area (ac)	CN	Description
*	0.050	98	Paved parking
	0.050		100.00% Impervious Area

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

Subcatchment P1: Direct Flow to Comstock Parkway



Summary for Subcatchment P2A: Direct Flow to Northern Wetlands

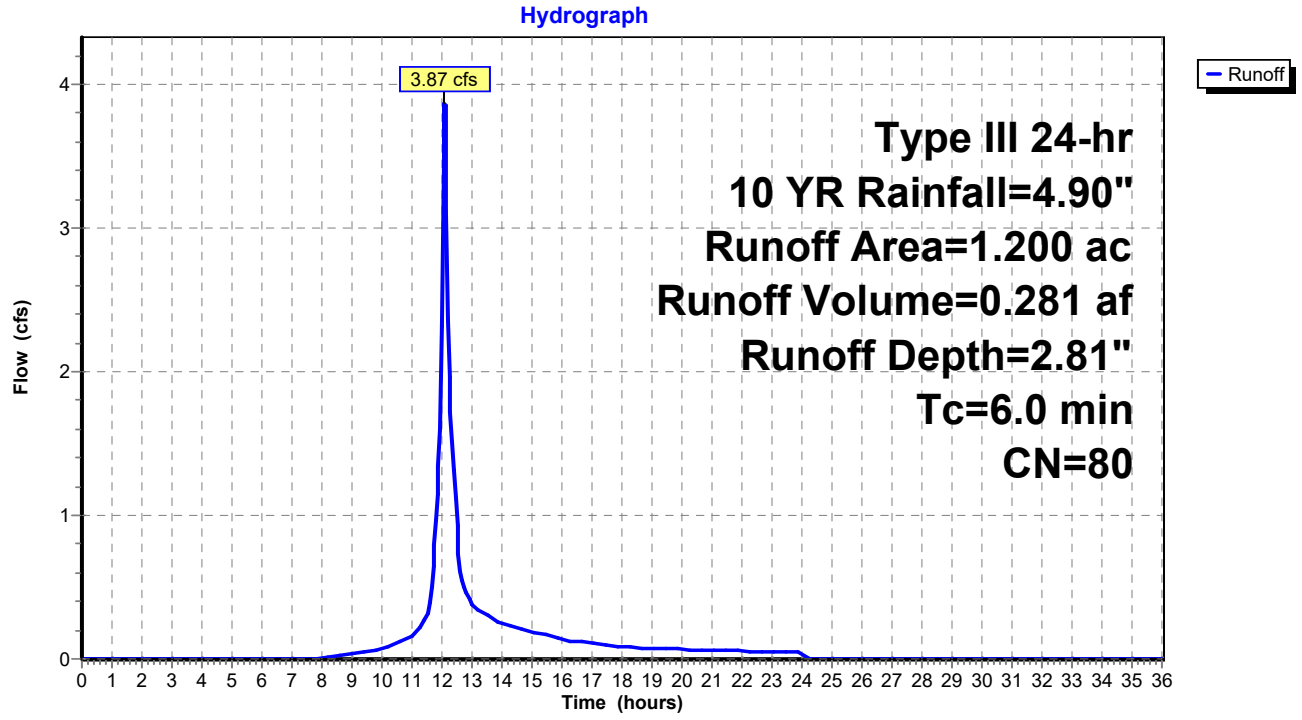
Runoff = 3.87 cfs @ 12.09 hrs, Volume= 0.281 af, Depth= 2.81"
Routed to Reach NW : Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.90"

	Area (ac)	CN	Description
	0.230	61	>75% Grass cover, Good, HSG B
	0.570	80	>75% Grass cover, Good, HSG D
*	0.400	90	Wetlands
	1.200	80	Weighted Average
	1.200		100.00% Pervious Area

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

Subcatchment P2A: Direct Flow to Northern Wetlands



Summary for Subcatchment P2B: Flow to Bioretention Area 1

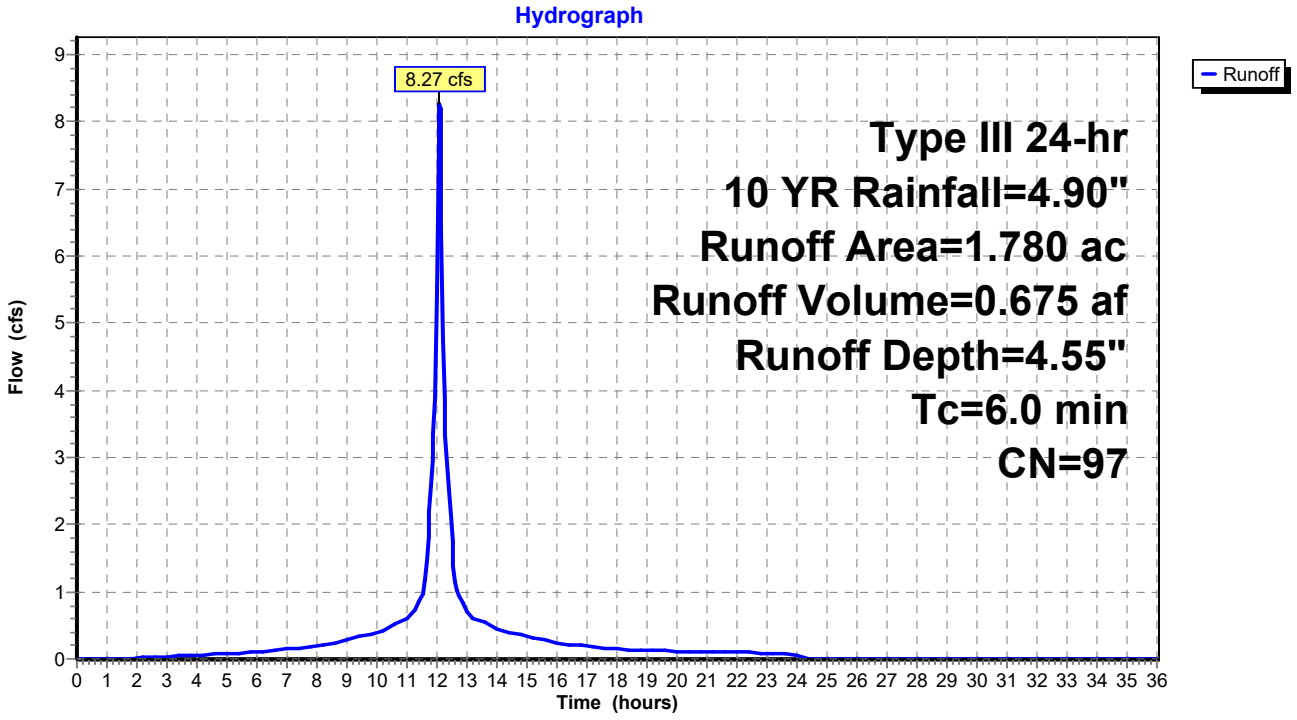
Runoff = 8.27 cfs @ 12.09 hrs, Volume= 0.675 af, Depth= 4.55"
Routed to Pond BA1 : Bioretention Area 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.90"

Area (ac)	CN	Description
1.690	98	Paved parking, HSG D
0.090	80	>75% Grass cover, Good, HSG D
1.780	97	Weighted Average
0.090		5.06% Pervious Area
1.690		94.94% Impervious Area

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

Subcatchment P2B: Flow to Bioretention Area 1



Summary for Subcatchment P2C: Flow to Bioretention Area 2

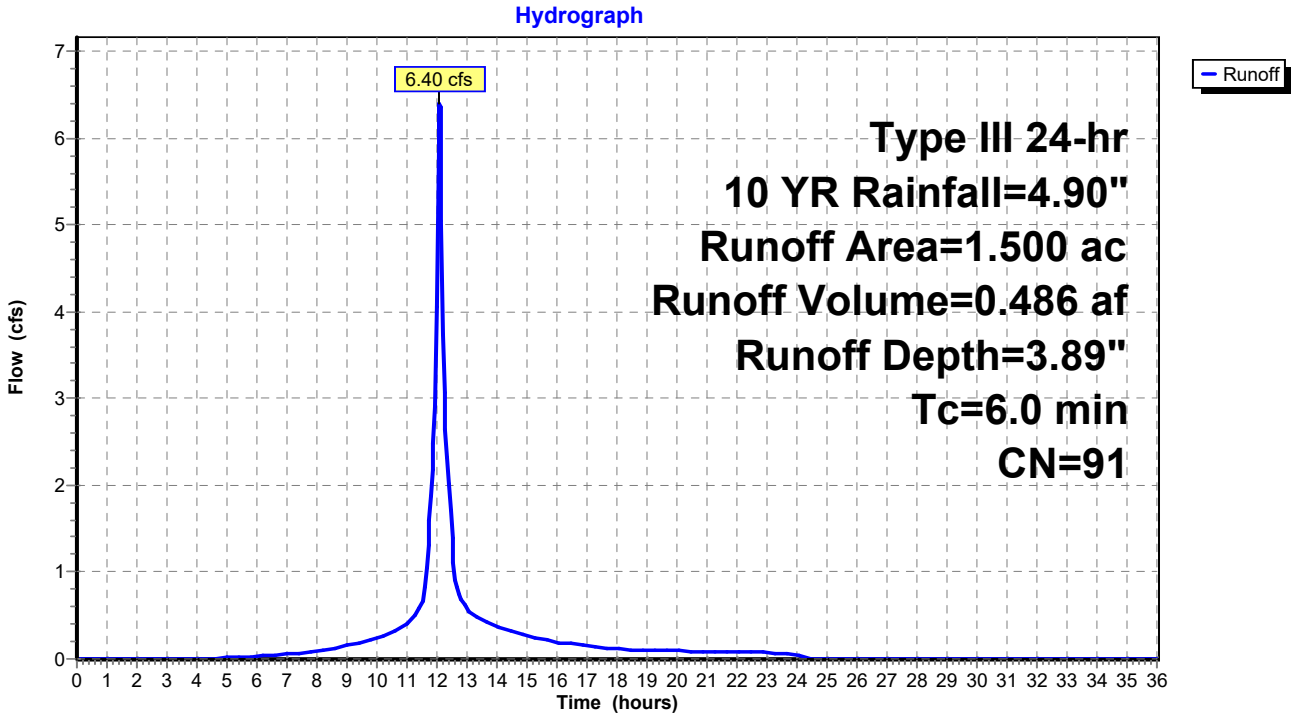
Runoff = 6.40 cfs @ 12.09 hrs, Volume= 0.486 af, Depth= 3.89"
Routed to Pond BA2 : Bioretention Area 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.90"

Area (ac)	CN	Description
1.220	98	Paved parking, HSG D
0.280	61	>75% Grass cover, Good, HSG B
1.500	91	Weighted Average
0.280		18.67% Pervious Area
1.220		81.33% Impervious Area

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

Subcatchment P2C: Flow to Bioretention Area 2



Summary for Subcatchment P2D: Flow to Underground Detention North

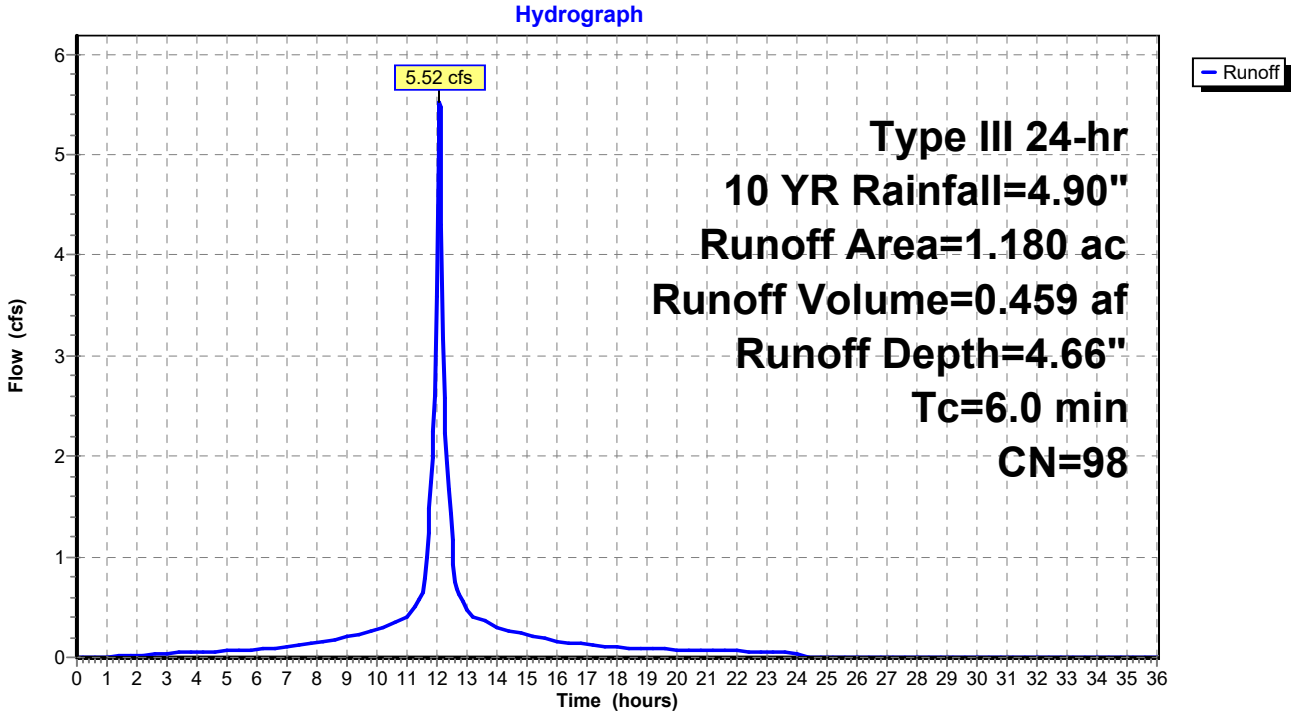
Runoff = 5.52 cfs @ 12.09 hrs, Volume= 0.459 af, Depth= 4.66"
Routed to Pond UDN : Underground Detention North

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.90"

Area (ac)	CN	Description
1.180	98	Paved parking, HSG D
1.180		100.00% Impervious Area

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

Subcatchment P2D: Flow to Underground Detention North



Summary for Subcatchment P3A: Flow to Bioretention Area 3

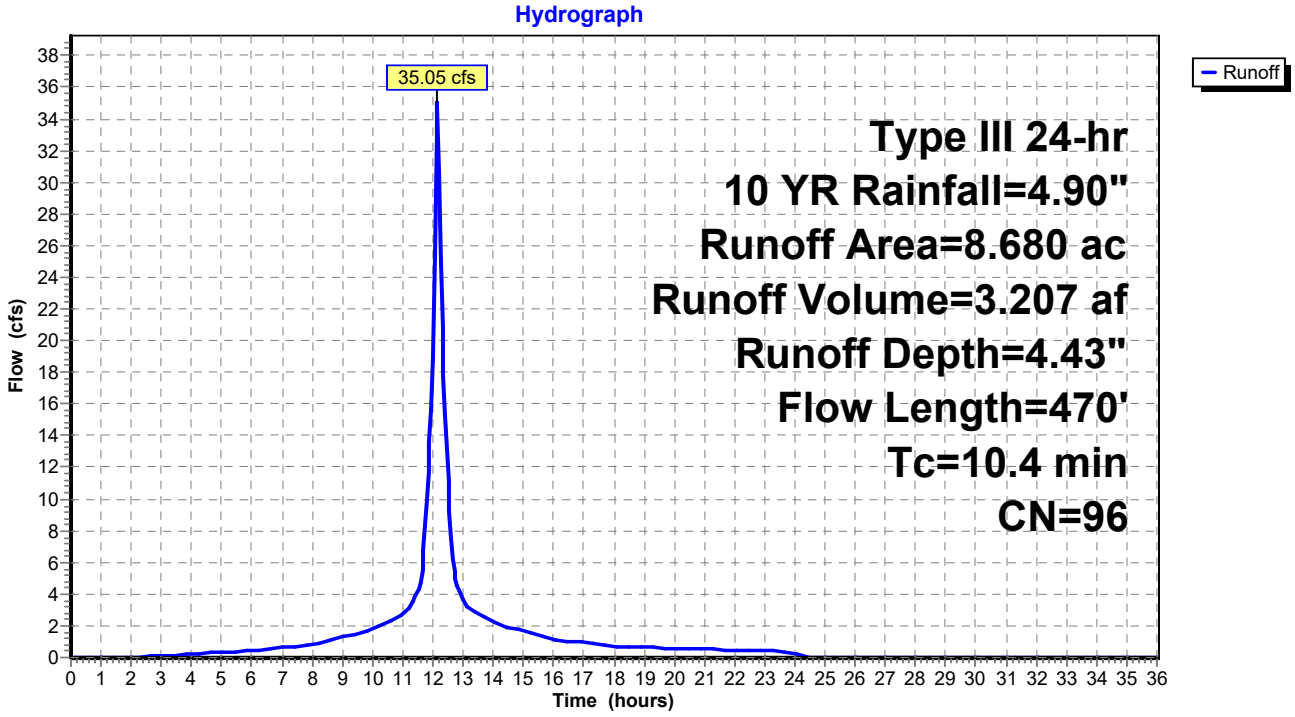
Runoff = 35.05 cfs @ 12.14 hrs, Volume= 3.207 af, Depth= 4.43"
Routed to Pond BA3 : Bioretention Area 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.90"

Area (ac)	CN	Description
1.400	98	Paved parking, HSG D
6.180	98	Roofs, HSG D
1.100	80	>75% Grass cover, Good, HSG D
8.680	96	Weighted Average
1.100		12.67% Pervious Area
7.580		87.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0200	0.18		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.39"
0.7	287	0.2000	6.71		**Shallow Concentrated Flow, BC** Grassed Waterway Kv= 15.0 fps
0.2	83	0.0200	8.80	10.80	**Pipe Channel, CD** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
10.4	470	Total			

Subcatchment P3A: Flow to Bioretention Area 3



Summary for Subcatchment P3B: Flow to Underground Detention South

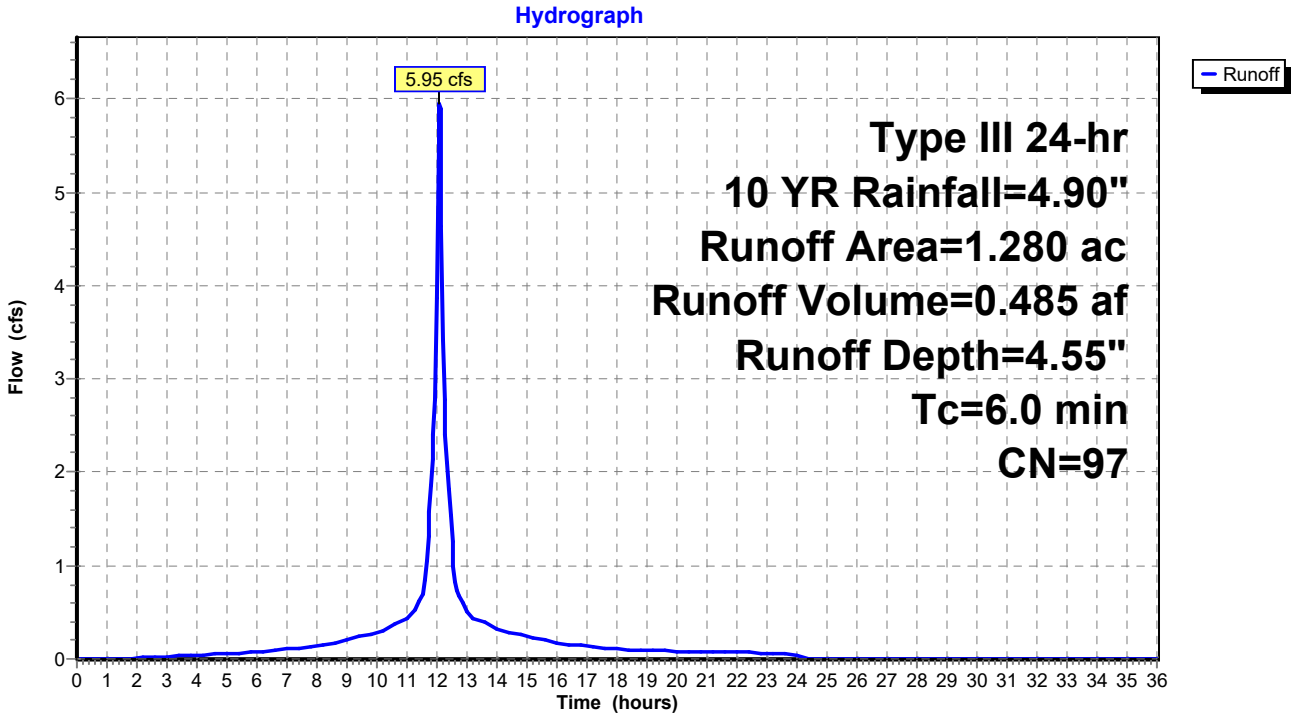
Runoff = 5.95 cfs @ 12.09 hrs, Volume= 0.485 af, Depth= 4.55"
Routed to Pond UDS : Underground Detention South

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.90"

Area (ac)	CN	Description
1.240	98	Paved parking, HSG D
0.040	80	>75% Grass cover, Good, HSG D
1.280	97	Weighted Average
0.040		3.13% Pervious Area
1.240		96.88% Impervious Area

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

Subcatchment P3B: Flow to Underground Detention South



Summary for Subcatchment P3C: Direct Flow to Southern Wetlands

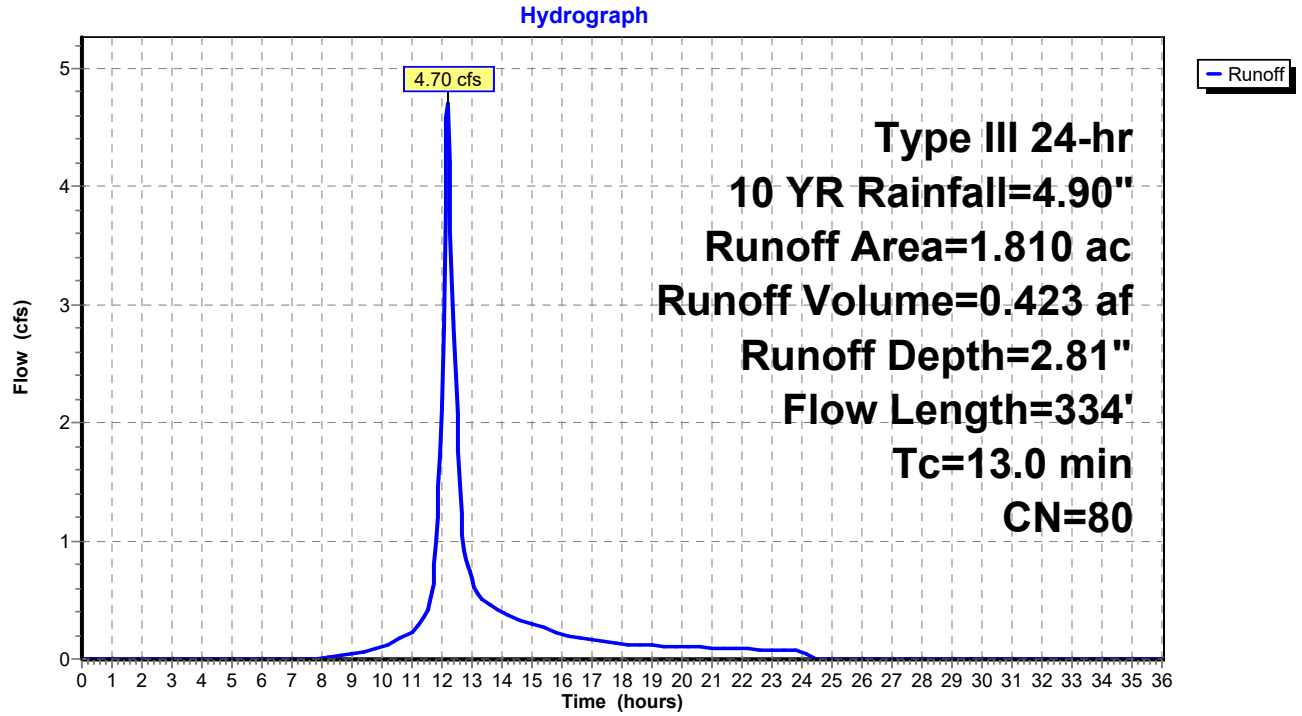
Runoff = 4.70 cfs @ 12.18 hrs, Volume= 0.423 af, Depth= 2.81"
Routed to Reach SW : Total Flow to Southern Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.90"

	Area (ac)	CN	Description
	0.020	98	Paved parking, HSG D
	0.040	61	>75% Grass cover, Good, HSG B
	0.180	80	>75% Grass cover, Good, HSG D
	1.160	77	Woods, Good, HSG D
*	0.410	90	Wetlands
	1.810	80	Weighted Average
	1.790		98.90% Pervious Area
	0.020		1.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.0900	0.32		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.39"
7.8	234	0.0100	0.50		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
13.0	334	Total			

Subcatchment P3C: Direct Flow to Southern Wetlands

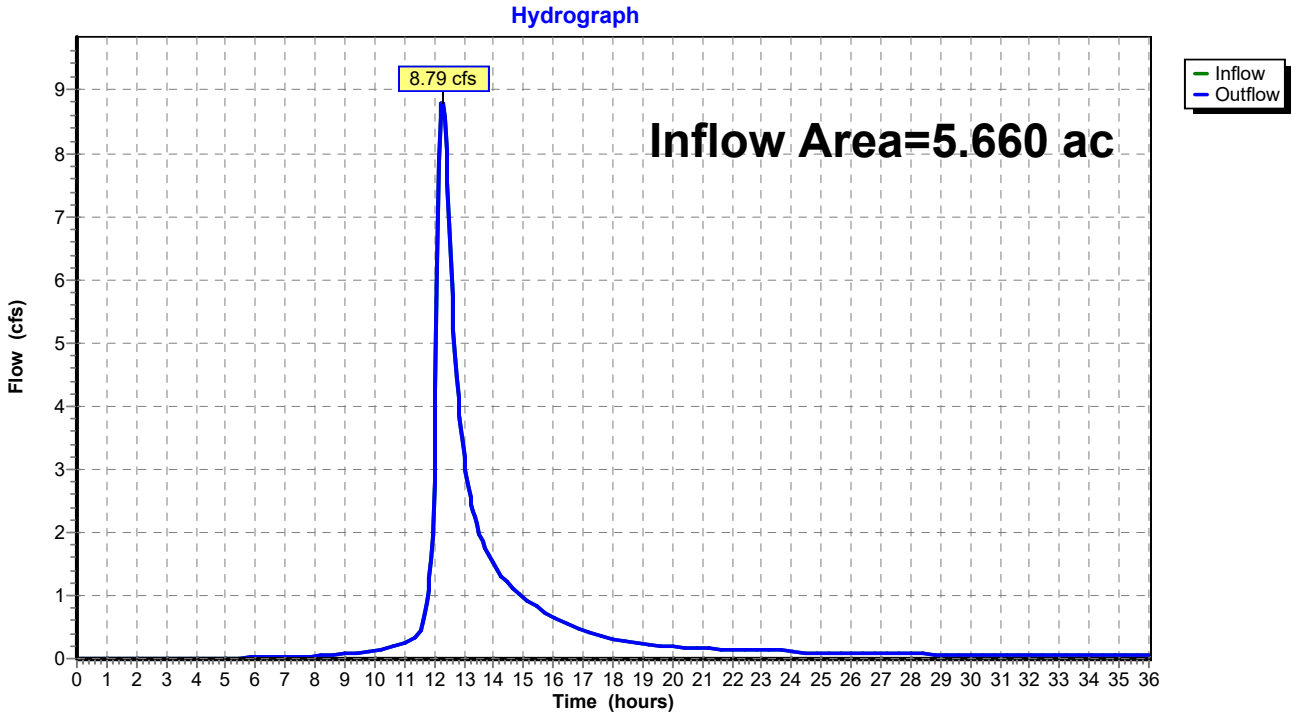


Summary for Reach NW: Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Inflow Area = 5.660 ac, 72.26% Impervious, Inflow Depth > 2.44" for 10 YR event
Inflow = 8.79 cfs @ 12.26 hrs, Volume= 1.152 af
Outflow = 8.79 cfs @ 12.26 hrs, Volume= 1.152 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach NW: Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

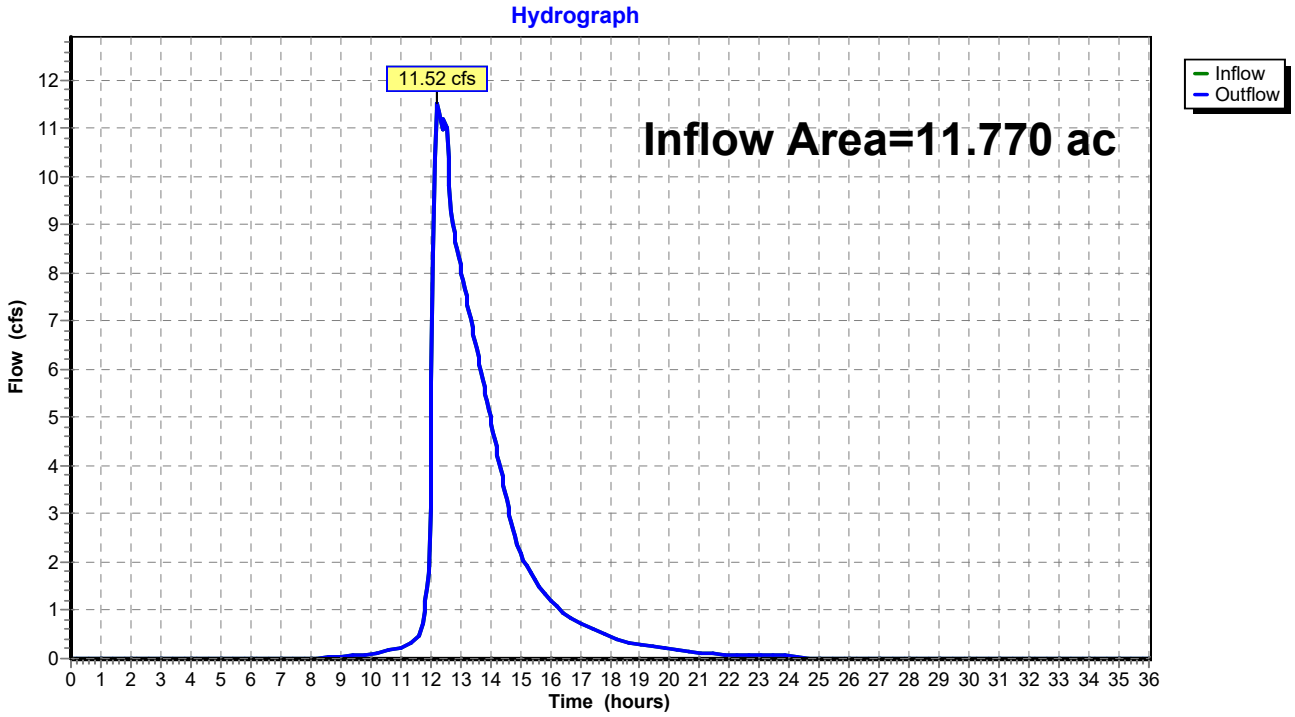


Summary for Reach SW: Total Flow to Southern Wetlands

Inflow Area = 11.770 ac, 75.11% Impervious, Inflow Depth = 2.09" for 10 YR event
Inflow = 11.52 cfs @ 12.25 hrs, Volume= 2.048 af
Outflow = 11.52 cfs @ 12.25 hrs, Volume= 2.048 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach SW: Total Flow to Southern Wetlands



Summary for Pond BA1: Bioretention Area 1

Inflow Area = 1.780 ac, 94.94% Impervious, Inflow Depth = 4.55" for 10 YR event
Inflow = 8.27 cfs @ 12.09 hrs, Volume= 0.675 af
Outflow = 2.43 cfs @ 12.41 hrs, Volume= 0.602 af, Atten= 71%, Lag= 19.6 min
Discarded = 0.17 cfs @ 12.41 hrs, Volume= 0.347 af
Primary = 2.26 cfs @ 12.41 hrs, Volume= 0.255 af
Routed to Reach NW : Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 336.86' @ 12.41 hrs Surf.Area= 5,184 sf Storage= 13,338 cf

Plug-Flow detention time= 334.1 min calculated for 0.601 af (89% of inflow)
Center-of-Mass det. time= 283.2 min (1,039.3 - 756.2)

Volume	Invert	Avail.Storage	Storage Description
#1	333.99'	19,848 cf	**Bioretention Area 1 (Prismatic)**Listed below (Recalc)

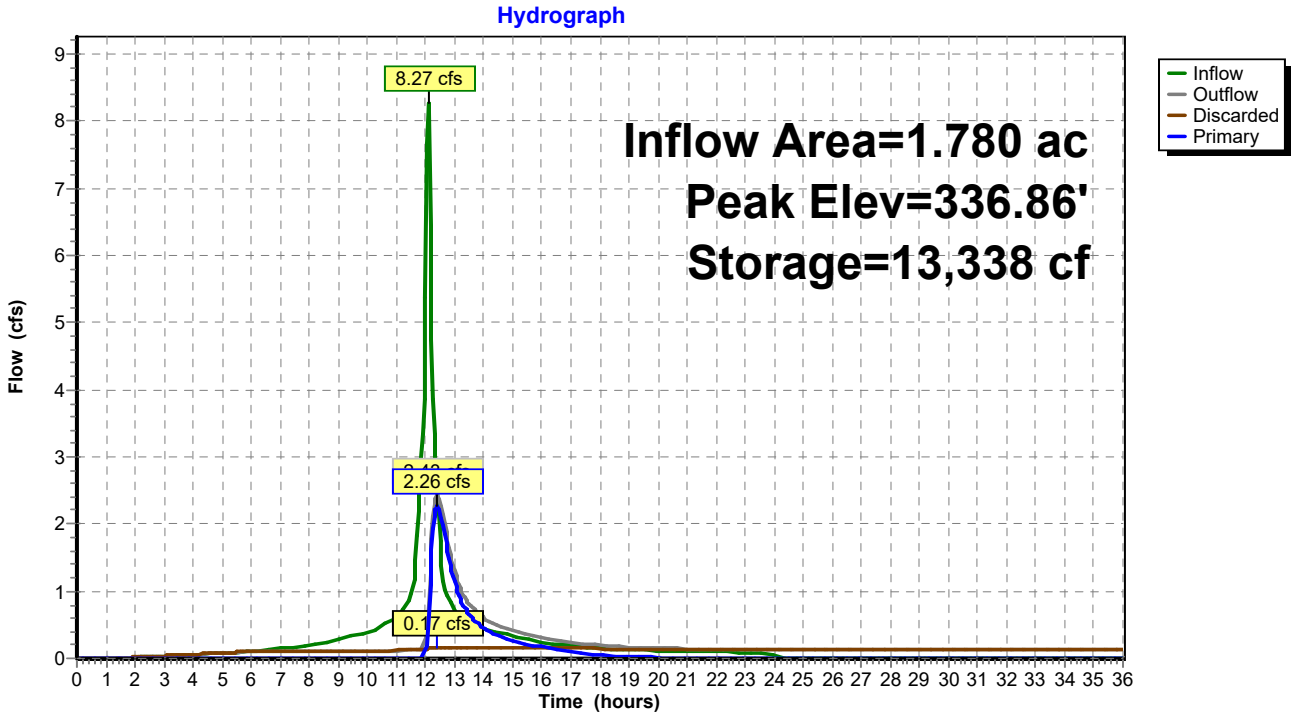
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
333.99	4,494	0.0	0	0
334.00	4,494	20.0	9	9
336.00	4,629	100.0	9,123	9,132
337.00	5,276	100.0	4,953	14,084
338.00	6,251	100.0	5,764	19,848

Device	Routing	Invert	Outlet Devices
#1	Primary	333.80'	**15.0" Round 15" Outlet Pipe** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 333.80' / 333.70' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	337.70'	**24.0" x 24.0" Horiz. Top Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	336.00'	**12.0" Vert. 12" Orifice** C= 0.600 Limited to weir flow at low heads
#4	Discarded	333.99'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 327.00'

Discarded OutFlow Max=0.17 cfs @ 12.41 hrs HW=336.86' (Free Discharge)
└**4=Exfiltration** (Controls 0.17 cfs)

Primary OutFlow Max=2.25 cfs @ 12.41 hrs HW=336.86' (Free Discharge)
└**1=15" Outlet Pipe** (Passes 2.25 cfs of 9.21 cfs potential flow)
  ├**2=Top Grate** (Controls 0.00 cfs)
  └**3=12" Orifice** (Orifice Controls 2.25 cfs @ 3.15 fps)

Pond BA1: Bioretention Area 1



Summary for Pond BA2: Bioretention Area 2

Inflow Area = 1.500 ac, 81.33% Impervious, Inflow Depth = 3.89" for 10 YR event
Inflow = 6.40 cfs @ 12.09 hrs, Volume= 0.486 af
Outflow = 3.08 cfs @ 12.26 hrs, Volume= 0.434 af, Atten= 52%, Lag= 10.3 min
Discarded = 0.13 cfs @ 12.26 hrs, Volume= 0.229 af
Primary = 2.95 cfs @ 12.26 hrs, Volume= 0.205 af
Routed to Reach NW : Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 337.10' @ 12.26 hrs Surf.Area= 3,364 sf Storage= 8,445 cf

Plug-Flow detention time= 309.4 min calculated for 0.433 af (89% of inflow)
Center-of-Mass det. time= 259.6 min (1,047.1 - 787.5)

Volume	Invert	Avail.Storage	Storage Description
#1	333.99'	11,805 cf	**Bioretention Area 2 (Prismatic)**Listed below (Recalc)

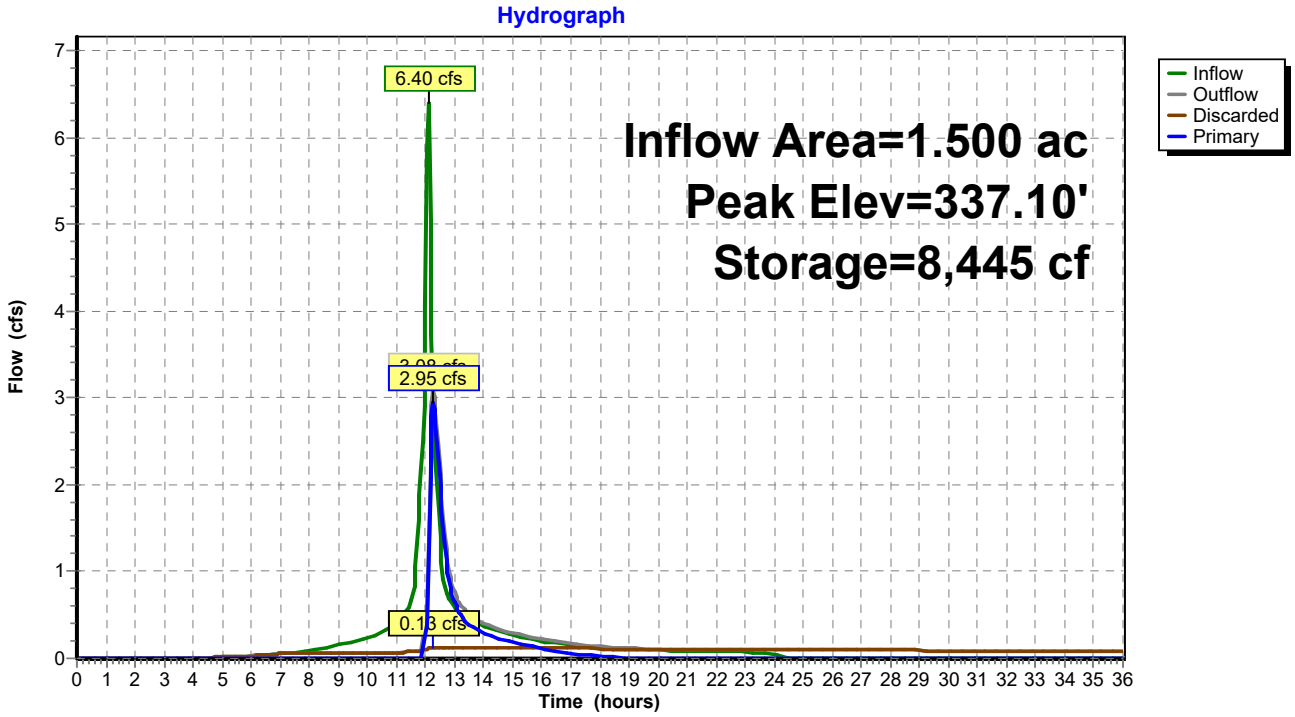
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
333.99	2,163	0.0	0	0
334.00	2,163	20.0	4	4
336.00	2,876	100.0	5,039	5,043
337.00	3,290	100.0	3,083	8,126
338.00	4,068	100.0	3,679	11,805

Device	Routing	Invert	Outlet Devices
#1	Primary	334.18'	**12.0" Round 12" Outlet Pipe** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 334.18' / 334.00' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	337.80'	**24.0" x 24.0" Horiz. Top Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	336.50'	**24.0" W x 10.0" H Vert. 24" x 10" Weir** C= 0.600 Limited to weir flow at low heads
#4	Discarded	333.99'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 330.00'

Discarded OutFlow Max=0.13 cfs @ 12.26 hrs HW=337.09' (Free Discharge)
└**4=Exfiltration** (Controls 0.13 cfs)

Primary OutFlow Max=2.93 cfs @ 12.26 hrs HW=337.09' (Free Discharge)
└**1=12" Outlet Pipe** (Passes 2.93 cfs of 5.87 cfs potential flow)
├**2=Top Grate** (Controls 0.00 cfs)
└**3=24" x 10" Weir** (Orifice Controls 2.93 cfs @ 2.47 fps)

Pond BA2: Bioretention Area 2



Summary for Pond BA3: Bioretention Area 3

Inflow Area = 8.680 ac, 87.33% Impervious, Inflow Depth = 4.43" for 10 YR event
Inflow = 35.05 cfs @ 12.14 hrs, Volume= 3.207 af
Outflow = 10.00 cfs @ 12.53 hrs, Volume= 2.894 af, Atten= 71%, Lag= 23.5 min
Discarded = 0.87 cfs @ 12.53 hrs, Volume= 1.289 af
Primary = 9.13 cfs @ 12.53 hrs, Volume= 1.605 af
Routed to Reach SW : Total Flow to Southern Wetlands

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 339.19' @ 12.53 hrs Surf.Area= 16,048 sf Storage= 66,155 cf

Plug-Flow detention time= 276.5 min calculated for 2.890 af (90% of inflow)
Center-of-Mass det. time= 229.2 min (996.2 - 767.0)

Volume	Invert	Avail.Storage	Storage Description
#1	333.99'	96,748 cf	**Bioretention Area 3 (Prismatic)**Listed below (Recalc)

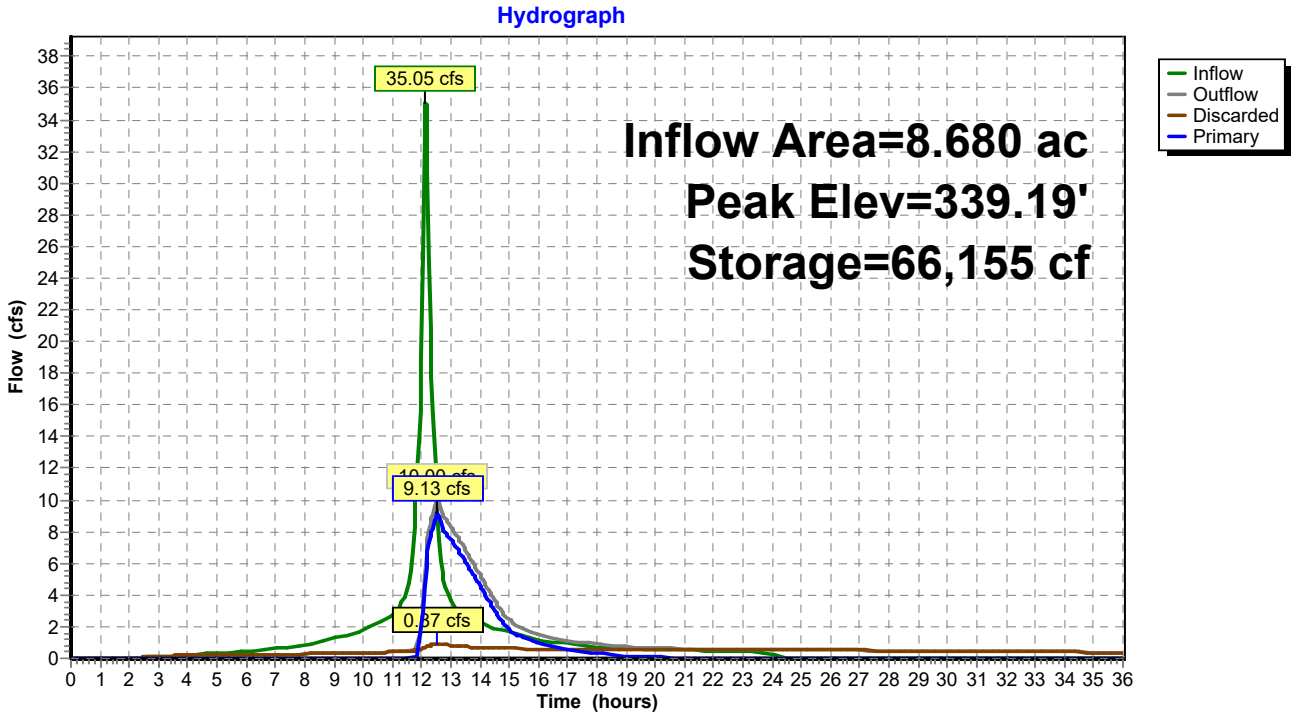
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
333.99	10,621	0.0	0	0
334.00	10,621	20.0	21	21
336.00	11,485	100.0	22,106	22,127
337.00	12,900	100.0	12,193	34,320
338.00	14,365	100.0	13,633	47,952
339.00	15,880	100.0	15,123	63,075
341.01	17,626	100.0	33,674	96,748

Device	Routing	Invert	Outlet Devices
#1	Primary	336.00'	**18.0" Round 18" Culvert** L= 55.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 336.00' / 335.45' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Device 1	339.10'	**24.0" x 24.0" Horiz. Top Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	337.00'	**30.0" W x 6.0" H Vert. 30" x 6" Weir** C= 0.600 Limited to weir flow at low heads
#4	Device 1	341.00'	**35.0' long x 24.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#5	Discarded	333.99'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 331.00'

Discarded OutFlow Max=0.87 cfs @ 12.53 hrs HW=339.19' (Free Discharge)
└**5=Exfiltration** (Controls 0.87 cfs)

Primary OutFlow Max=9.09 cfs @ 12.53 hrs HW=339.19' (Free Discharge)
└**1=18" Culvert** (Passes 9.09 cfs of 13.29 cfs potential flow)
  ├**2=Top Grate** (Weir Controls 0.71 cfs @ 0.98 fps)
  ├**3=30" x 6" Weir** (Orifice Controls 8.38 cfs @ 6.70 fps)
  └**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BA3: Bioretention Area 3



Summary for Pond UDN: Underground Detention North

Inflow Area = 1.180 ac,100.00% Impervious, Inflow Depth = 4.66" for 10 YR event
Inflow = 5.52 cfs @ 12.09 hrs, Volume= 0.459 af
Outflow = 2.00 cfs @ 12.34 hrs, Volume= 0.412 af, Atten= 64%, Lag= 15.2 min
Primary = 2.00 cfs @ 12.34 hrs, Volume= 0.412 af
Routed to Reach NW : Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 336.37' @ 12.34 hrs Surf.Area= 7,900 sf Storage= 9,510 cf

Plug-Flow detention time= 310.1 min calculated for 0.411 af (90% of inflow)
Center-of-Mass det. time= 260.5 min (1,008.8 - 748.4)

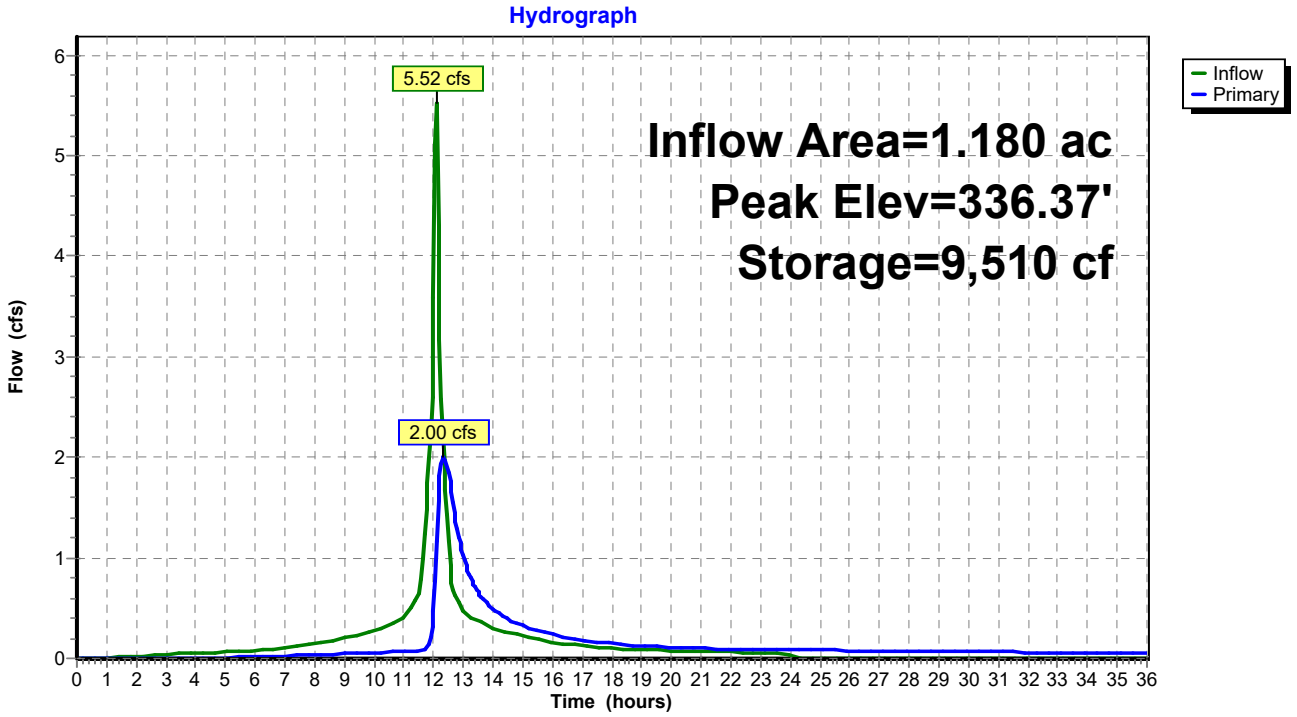
Volume	Invert	Avail.Storage	Storage Description
#1A	335.00'	0 cf	**47.23'W x 167.27'L x 2.50'H Field A** 19,750 cf Overall - 19,750 cf Embedded = 0 cf x 40.0% Voids
#2A	335.00'	13,846 cf	**StormTrap ST2 SingleTrap 2-0** x 40 Inside #1 Inside= 101.7"W x 24.0"H => 15.05 sf x 15.40'L = 231.7 cf Outside= 101.7"W x 30.0"H => 21.20 sf x 15.40'L = 326.4 cf 40 Chambers in 4 Rows 33.92' x 153.96' Core + 6.66' Border = 47.23' x 167.27' System
		13,846 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	335.00'	**12.0" Round Culvert** L= 126.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 335.00' / 334.60' S= 0.0032 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	335.00'	**2.0" Vert. 2" Weep Hole** C= 0.600 Limited to weir flow at low heads
#3	Device 1	335.70'	**15.0" Vert. 15" Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.00 cfs @ 12.34 hrs HW=336.37' (Free Discharge)
└**1=Culvert** (Passes 2.00 cfs of 2.51 cfs potential flow)
  └**2=2" Weep Hole** (Orifice Controls 0.12 cfs @ 5.47 fps)
  └**3=15" Orifice** (Orifice Controls 1.88 cfs @ 2.79 fps)

Pond UDN: Underground Detention North



Summary for Pond UDS: Underground Detention South

Inflow Area = 1.280 ac, 96.88% Impervious, Inflow Depth = 4.55" for 10 YR event
Inflow = 5.95 cfs @ 12.09 hrs, Volume= 0.485 af
Outflow = 0.24 cfs @ 14.99 hrs, Volume= 0.352 af, Atten= 96%, Lag= 174.2 min
Discarded = 0.14 cfs @ 14.99 hrs, Volume= 0.332 af
Primary = 0.10 cfs @ 14.99 hrs, Volume= 0.020 af
Routed to Reach SW : Total Flow to Southern Wetlands

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 336.69' @ 14.99 hrs Surf.Area= 4,095 sf Storage= 13,206 cf

Plug-Flow detention time= 561.3 min calculated for 0.351 af (72% of inflow)
Center-of-Mass det. time= 472.3 min (1,228.5 - 756.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	332.50'	1,638 cf	**38.75'W x 105.69'L x 5.50'H Field A** 22,525 cf Overall - 18,429 cf Embedded = 4,095 cf x 40.0% Voids
#2A	333.50'	14,502 cf	**StormTrap ST2 SingleTrap 4-0** x 18 Inside #1 Inside= 101.7"W x 48.0"H => 30.55 sf x 15.40'L = 470.3 cf Outside= 101.7"W x 54.0"H => 38.16 sf x 15.40'L = 587.4 cf 18 Chambers in 3 Rows 25.44' x 92.38' Core + 6.66' Border = 38.75' x 105.69' System
		16,140 cf	Total Available Storage

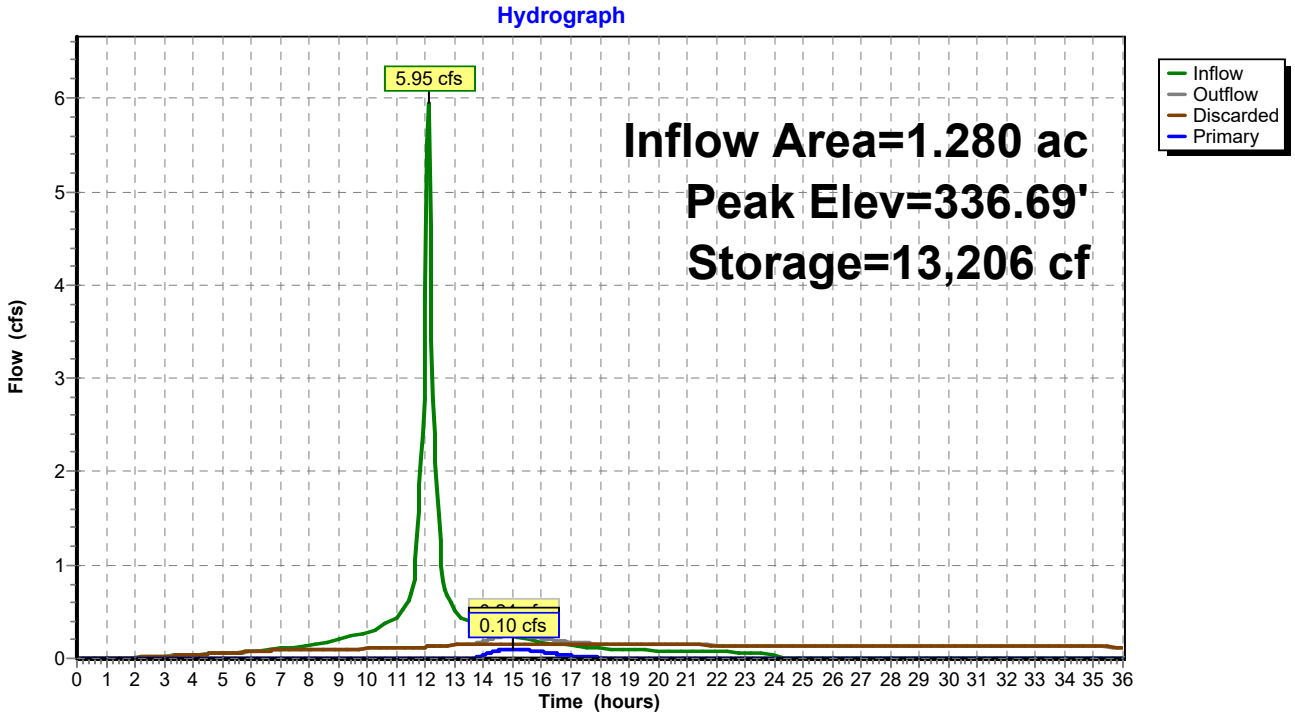
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	333.88'	**15.0" Round 15" Culvert** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 333.88' / 333.75' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	336.55'	**15.0" Vert. 12" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Discarded	332.50'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 324.00'

Discarded OutFlow Max=0.14 cfs @ 14.99 hrs HW=336.69' (Free Discharge)
↑**3=Exfiltration** (Controls 0.14 cfs)

Primary OutFlow Max=0.10 cfs @ 14.99 hrs HW=336.69' (Free Discharge)
↑**1=15" Culvert** (Passes 0.10 cfs of 8.74 cfs potential flow)
↑**2=12" Orifice** (Orifice Controls 0.10 cfs @ 1.28 fps)

Pond UDS: Underground Detention South



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 P1: Direct Flow to Runoff Area=0.050 ac 100.00% Impervious Runoff Depth=8.46"
Tc=6.0 min CN=98 Runoff=0.42 cfs 0.035 af

Subcatchment P2A: Direct Flow to Northern Runoff Area=1.200 ac 0.00% Impervious Runoff Depth=6.28"
Tc=6.0 min CN=80 Runoff=8.47 cfs 0.628 af

Subcatchment P2B: Flow to Bioretention Runoff Area=1.780 ac 94.94% Impervious Runoff Depth=8.34"
Tc=6.0 min CN=97 Runoff=14.81 cfs 1.237 af

Subcatchment P2C: Flow to Bioretention Runoff Area=1.500 ac 81.33% Impervious Runoff Depth=7.62"
Tc=6.0 min CN=91 Runoff=12.07 cfs 0.952 af

Subcatchment P2D: Flow to Underground Runoff Area=1.180 ac 100.00% Impervious Runoff Depth=8.46"
Tc=6.0 min CN=98 Runoff=9.85 cfs 0.832 af

Subcatchment P3A: Flow to Bioretention Runoff Area=8.680 ac 87.33% Impervious Runoff Depth=8.22"
Flow Length=470' Tc=10.4 min CN=96 Runoff=63.20 cfs 5.945 af

Subcatchment P3B: Flow to Underground Runoff Area=1.280 ac 96.88% Impervious Runoff Depth=8.34"
Tc=6.0 min CN=97 Runoff=10.65 cfs 0.890 af

Subcatchment P3C: Direct Flow to Southern Runoff Area=1.810 ac 1.10% Impervious Runoff Depth=6.28"
Flow Length=334' Tc=13.0 min CN=80 Runoff=10.35 cfs 0.948 af

Reach NW: Total Flow to Northern Wetlands and Meshanticut Brook Inflow=24.61 cfs 2.805 af
Outflow=24.61 cfs 2.805 af

Reach SW: Total Flow to Southern Wetlands Inflow=31.65 cfs 5.192 af
Outflow=31.65 cfs 5.192 af

Pond BA1: Bioretention Area 1 Peak Elev=337.99' Storage=19,767 cf Inflow=14.81 cfs 1.237 af
Discarded=0.21 cfs 0.379 af Primary=8.64 cfs 0.770 af Outflow=8.85 cfs 1.149 af

Pond BA2: Bioretention Area 2 Peak Elev=337.99' Storage=11,757 cf Inflow=12.07 cfs 0.952 af
Discarded=0.16 cfs 0.254 af Primary=6.88 cfs 0.638 af Outflow=7.04 cfs 0.892 af

Pond BA3: Bioretention Area 3 Peak Elev=341.01' Storage=96,744 cf Inflow=63.20 cfs 5.945 af
Discarded=1.10 cfs 1.457 af Primary=17.56 cfs 3.897 af Outflow=18.66 cfs 5.354 af

Pond UDN: Underground Detention North Peak Elev=337.11' Storage=13,846 cf Inflow=9.85 cfs 0.832 af
Outflow=3.51 cfs 0.769 af

Pond UDS: Underground Detention South Peak Elev=337.92' Storage=16,140 cf Inflow=10.65 cfs 0.890 af
Discarded=0.16 cfs 0.361 af Primary=5.13 cfs 0.346 af Outflow=5.29 cfs 0.707 af

Total Runoff Area = 17.480 ac Runoff Volume = 11.467 af Average Runoff Depth = 7.87"
25.74% Pervious = 4.500 ac 74.26% Impervious = 12.980 ac

Summary for Subcatchment P1: Direct Flow to Comstock Parkway

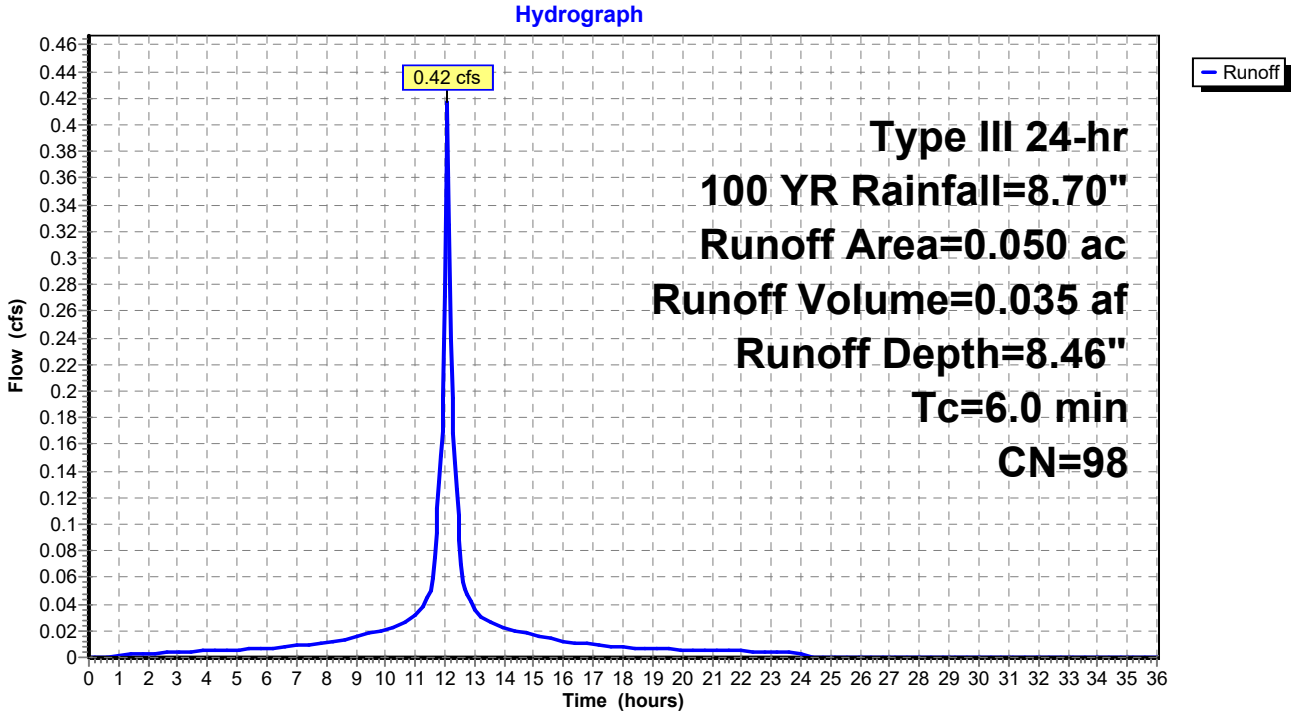
Runoff = 0.42 cfs @ 12.09 hrs, Volume= 0.035 af, Depth= 8.46"
Routed to nonexistent node WET

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.70"

	Area (ac)	CN	Description
*	0.050	98	Paved parking
	0.050		100.00% Impervious Area

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

Subcatchment P1: Direct Flow to Comstock Parkway



Summary for Subcatchment P2A: Direct Flow to Northern Wetlands

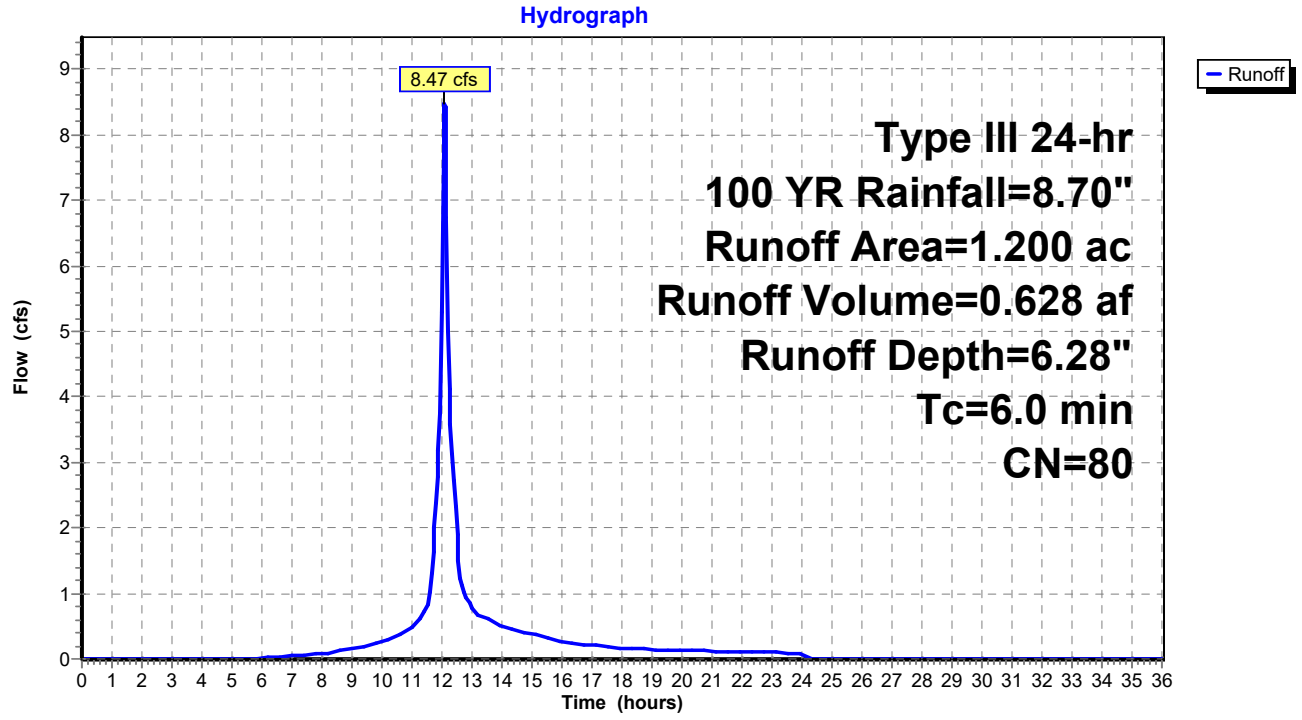
Runoff = 8.47 cfs @ 12.09 hrs, Volume= 0.628 af, Depth= 6.28"
Routed to Reach NW : Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.70"

	Area (ac)	CN	Description
	0.230	61	>75% Grass cover, Good, HSG B
	0.570	80	>75% Grass cover, Good, HSG D
*	0.400	90	Wetlands
	1.200	80	Weighted Average
	1.200		100.00% Pervious Area

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

Subcatchment P2A: Direct Flow to Northern Wetlands



Summary for Subcatchment P2B: Flow to Bioretention Area 1

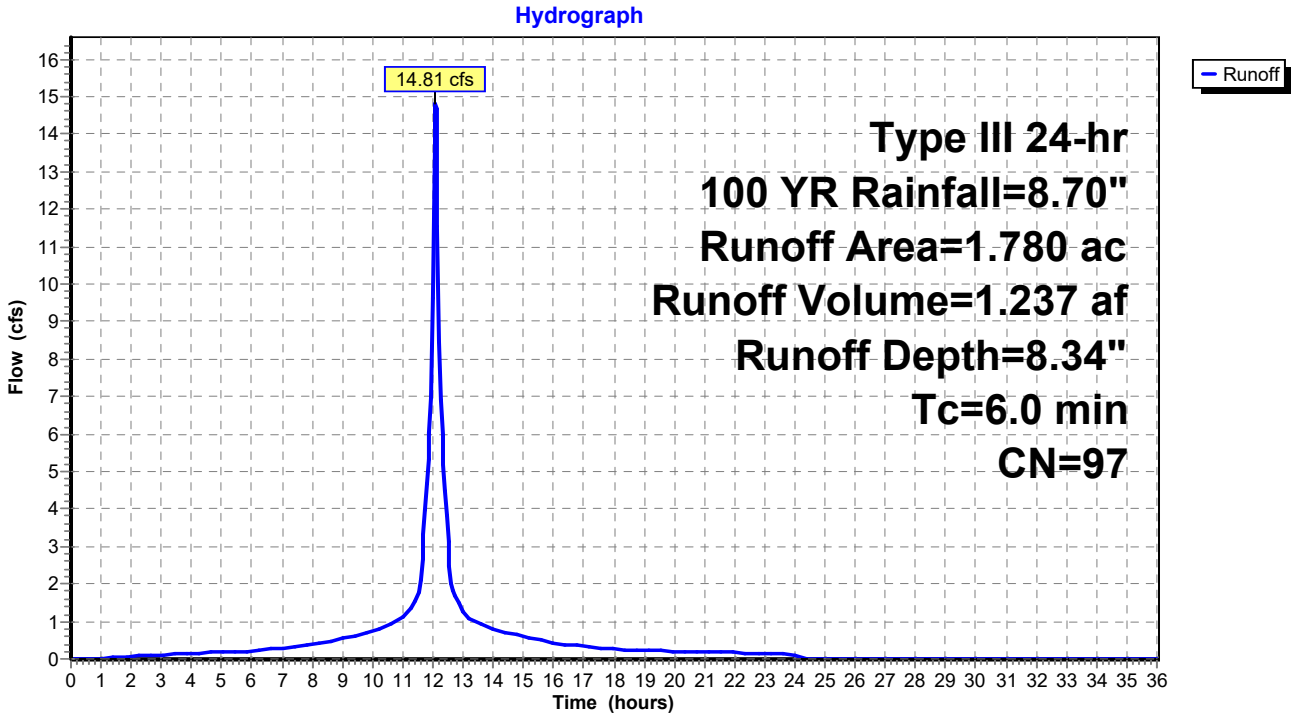
Runoff = 14.81 cfs @ 12.09 hrs, Volume= 1.237 af, Depth= 8.34"
Routed to Pond BA1 : Bioretention Area 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.70"

Area (ac)	CN	Description
1.690	98	Paved parking, HSG D
0.090	80	>75% Grass cover, Good, HSG D
1.780	97	Weighted Average
0.090		5.06% Pervious Area
1.690		94.94% Impervious Area

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

Subcatchment P2B: Flow to Bioretention Area 1



Summary for Subcatchment P2C: Flow to Bioretention Area 2

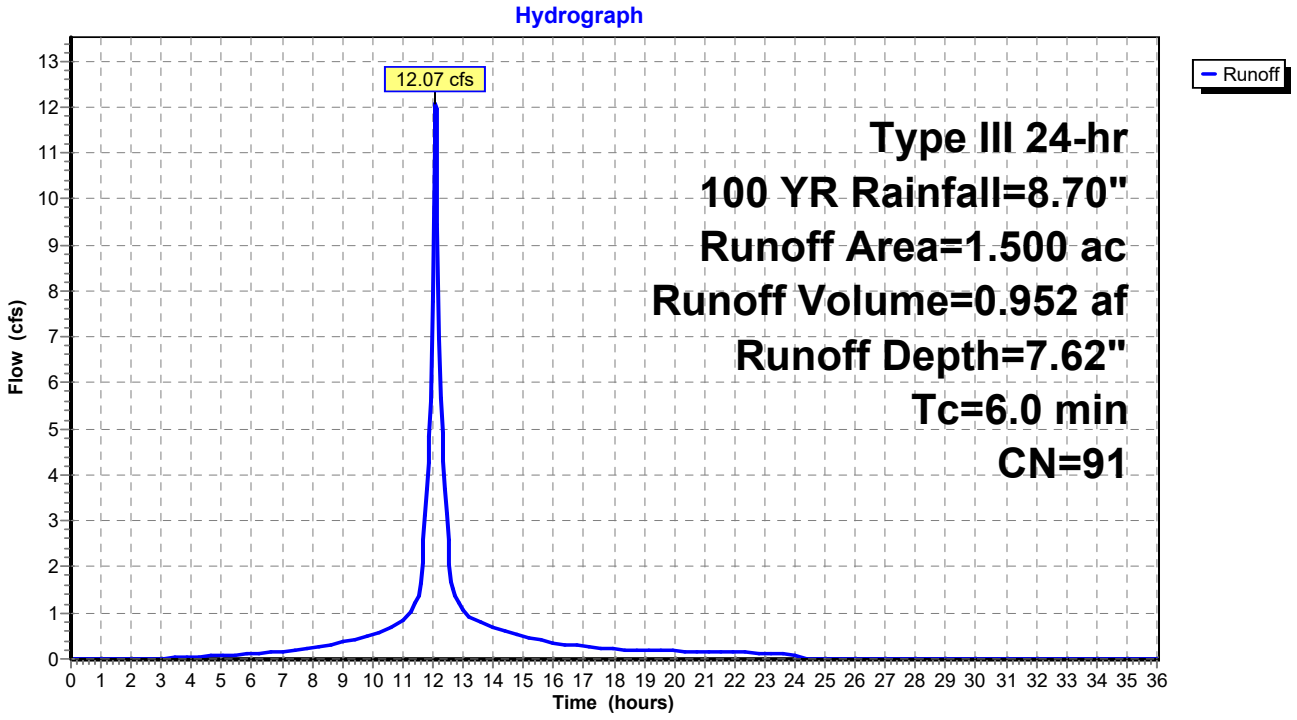
Runoff = 12.07 cfs @ 12.09 hrs, Volume= 0.952 af, Depth= 7.62"
Routed to Pond BA2 : Bioretention Area 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.70"

Area (ac)	CN	Description
1.220	98	Paved parking, HSG D
0.280	61	>75% Grass cover, Good, HSG B
1.500	91	Weighted Average
0.280		18.67% Pervious Area
1.220		81.33% Impervious Area

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

Subcatchment P2C: Flow to Bioretention Area 2



Summary for Subcatchment P2D: Flow to Underground Detention North

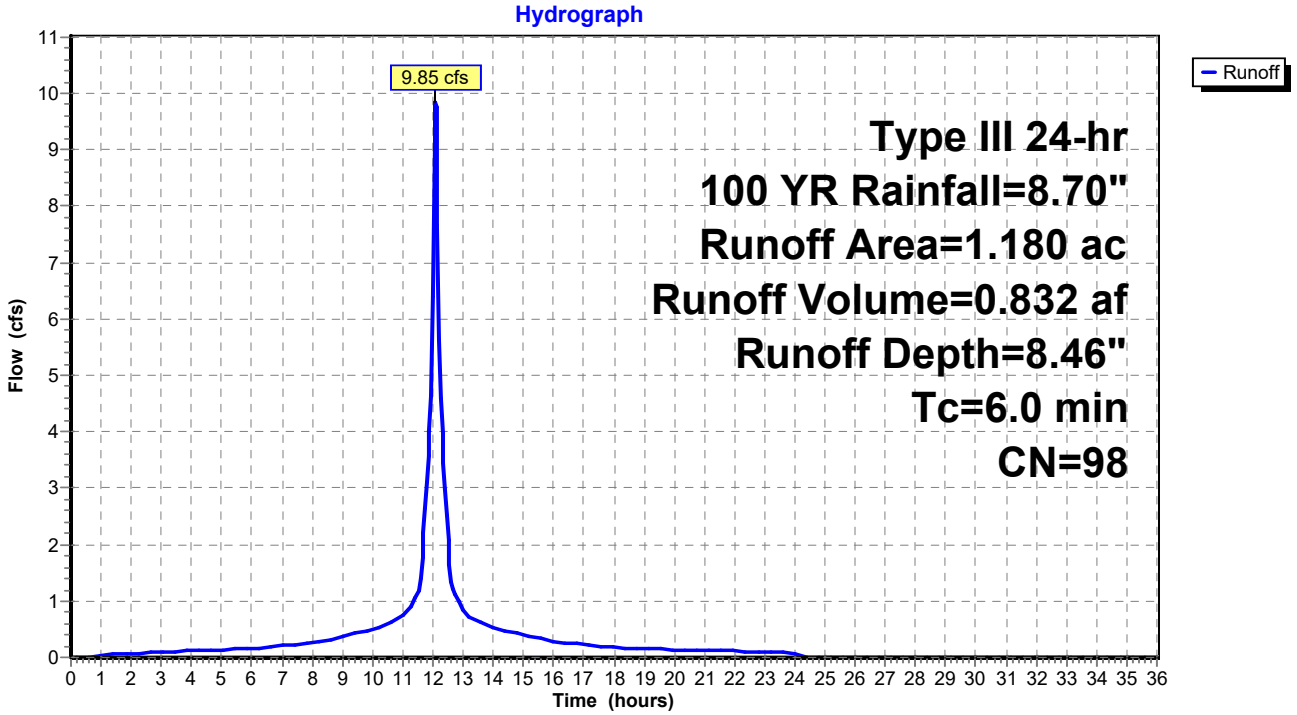
Runoff = 9.85 cfs @ 12.09 hrs, Volume= 0.832 af, Depth= 8.46"
Routed to Pond UDN : Underground Detention North

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.70"

Area (ac)	CN	Description
1.180	98	Paved parking, HSG D
1.180		100.00% Impervious Area

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

Subcatchment P2D: Flow to Underground Detention North



Summary for Subcatchment P3A: Flow to Bioretention Area 3

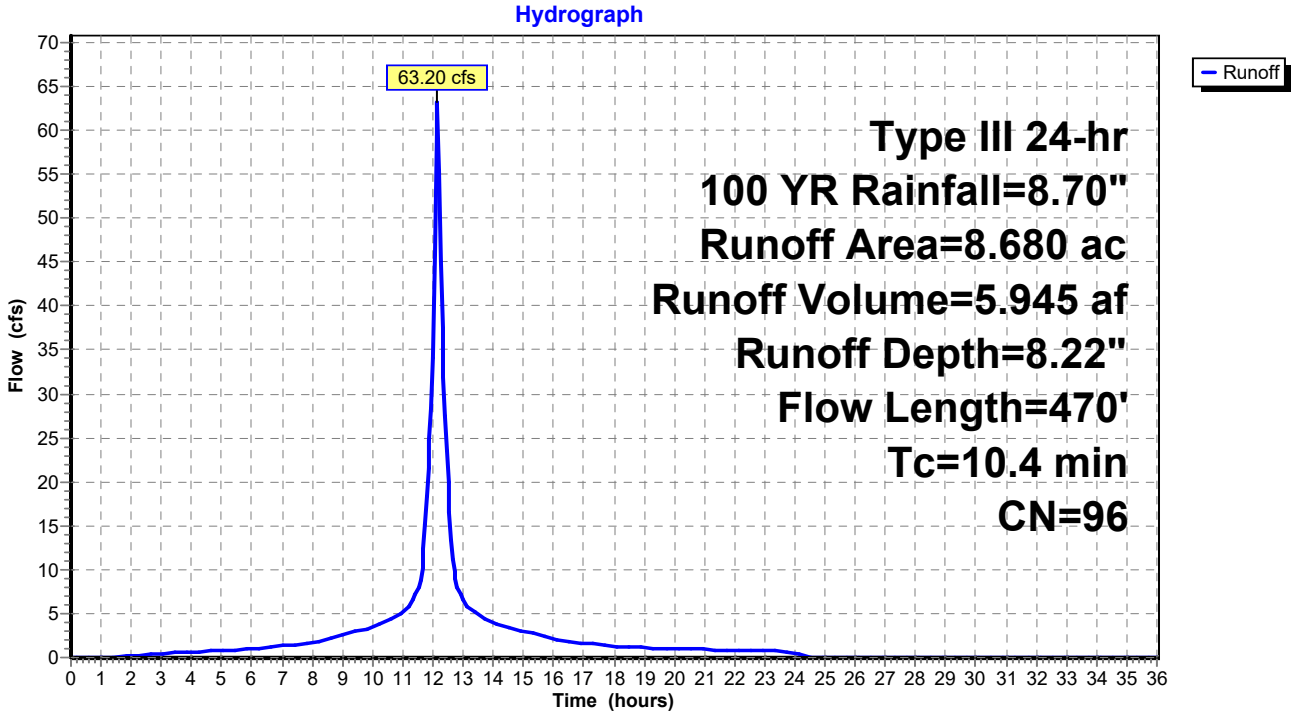
Runoff = 63.20 cfs @ 12.14 hrs, Volume= 5.945 af, Depth= 8.22"
Routed to Pond BA3 : Bioretention Area 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.70"

Area (ac)	CN	Description
1.400	98	Paved parking, HSG D
6.180	98	Roofs, HSG D
1.100	80	>75% Grass cover, Good, HSG D
8.680	96	Weighted Average
1.100		12.67% Pervious Area
7.580		87.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0200	0.18		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.39"
0.7	287	0.2000	6.71		**Shallow Concentrated Flow, BC** Grassed Waterway Kv= 15.0 fps
0.2	83	0.0200	8.80	10.80	**Pipe Channel, CD** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
10.4	470	Total			

Subcatchment P3A: Flow to Bioretention Area 3



Summary for Subcatchment P3B: Flow to Underground Detention South

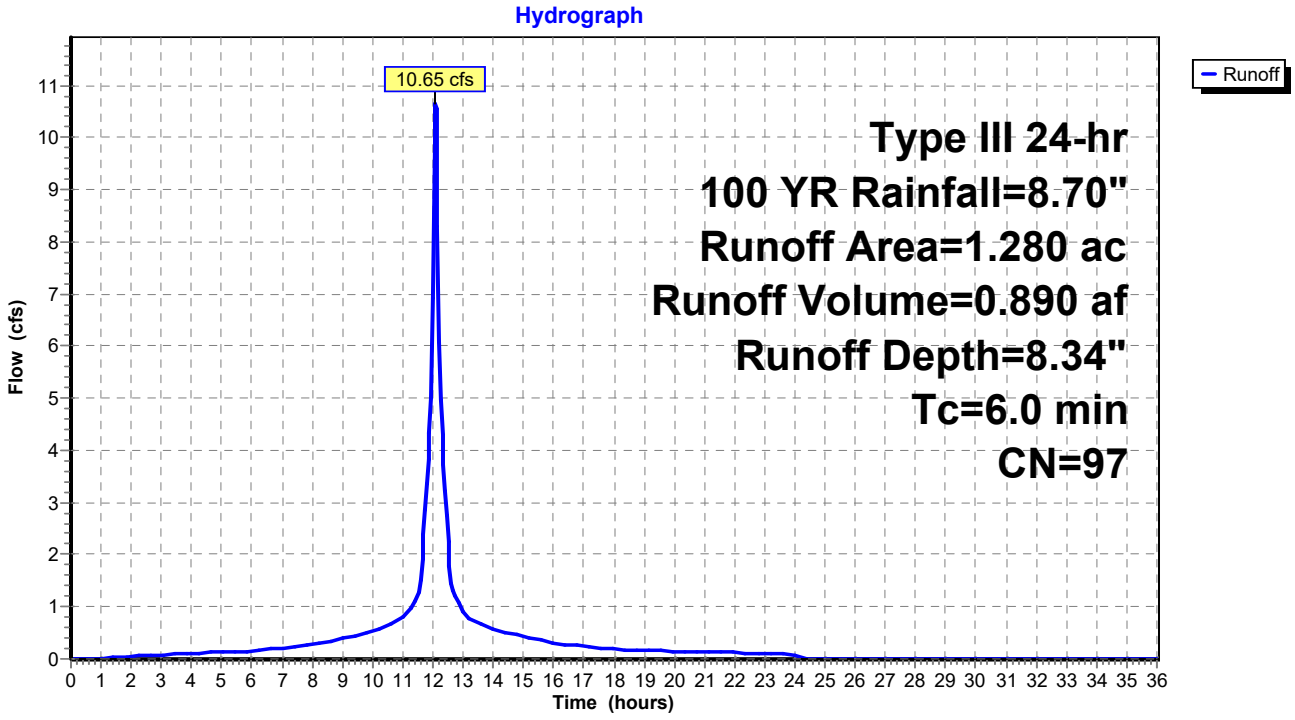
Runoff = 10.65 cfs @ 12.09 hrs, Volume= 0.890 af, Depth= 8.34"
Routed to Pond UDS : Underground Detention South

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.70"

Area (ac)	CN	Description
1.240	98	Paved parking, HSG D
0.040	80	>75% Grass cover, Good, HSG D
1.280	97	Weighted Average
0.040		3.13% Pervious Area
1.240		96.88% Impervious Area

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

Subcatchment P3B: Flow to Underground Detention South



Summary for Subcatchment P3C: Direct Flow to Southern Wetlands

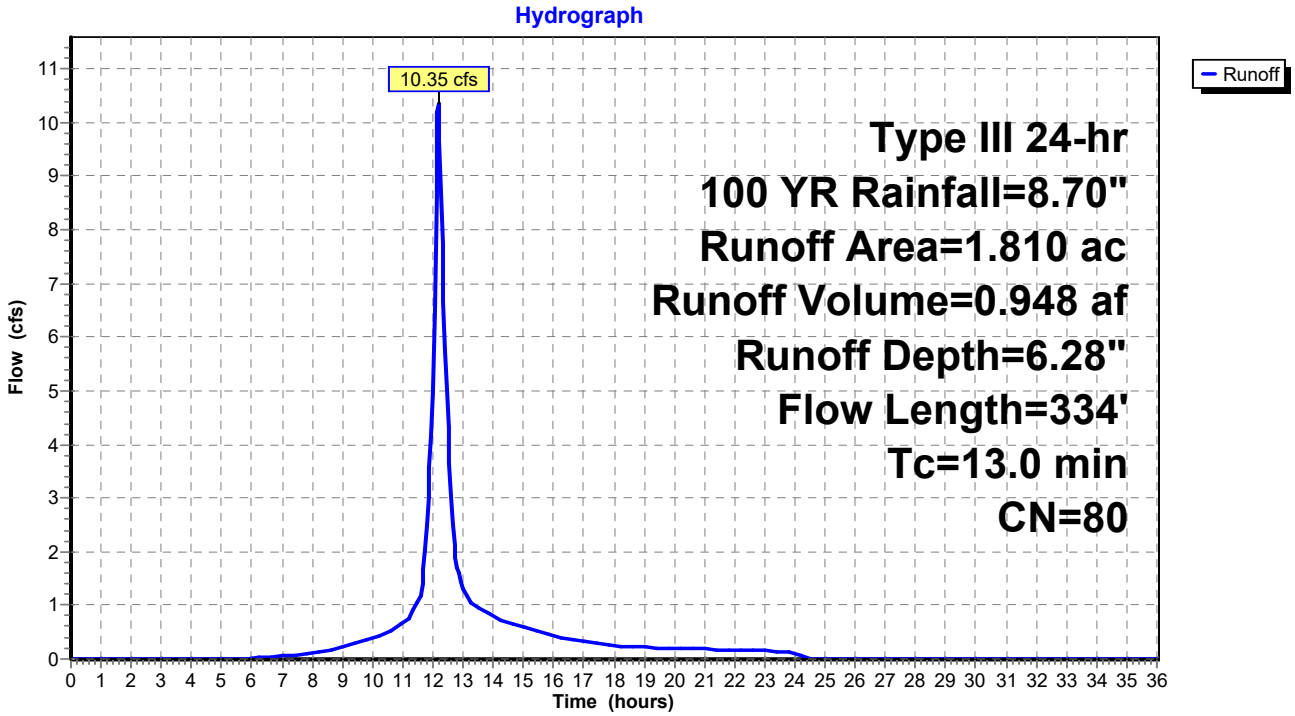
Runoff = 10.35 cfs @ 12.18 hrs, Volume= 0.948 af, Depth= 6.28"
Routed to Reach SW : Total Flow to Southern Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.70"

	Area (ac)	CN	Description
	0.020	98	Paved parking, HSG D
	0.040	61	>75% Grass cover, Good, HSG B
	0.180	80	>75% Grass cover, Good, HSG D
	1.160	77	Woods, Good, HSG D
*	0.410	90	Wetlands
	1.810	80	Weighted Average
	1.790		98.90% Pervious Area
	0.020		1.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.0900	0.32		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.39"
7.8	234	0.0100	0.50		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
13.0	334	Total			

Subcatchment P3C: Direct Flow to Southern Wetlands

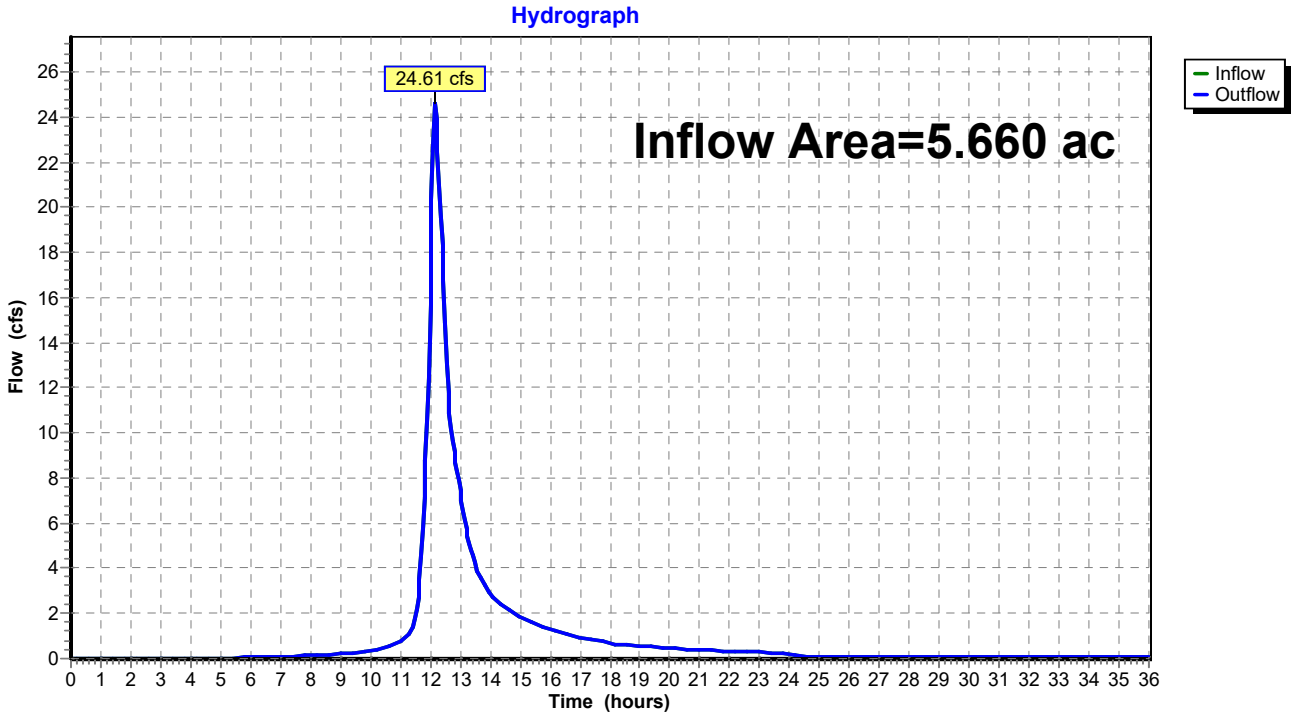


Summary for Reach NW: Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Inflow Area = 5.660 ac, 72.26% Impervious, Inflow Depth > 5.95" for 100 YR event
Inflow = 24.61 cfs @ 12.16 hrs, Volume= 2.805 af
Outflow = 24.61 cfs @ 12.16 hrs, Volume= 2.805 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach NW: Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

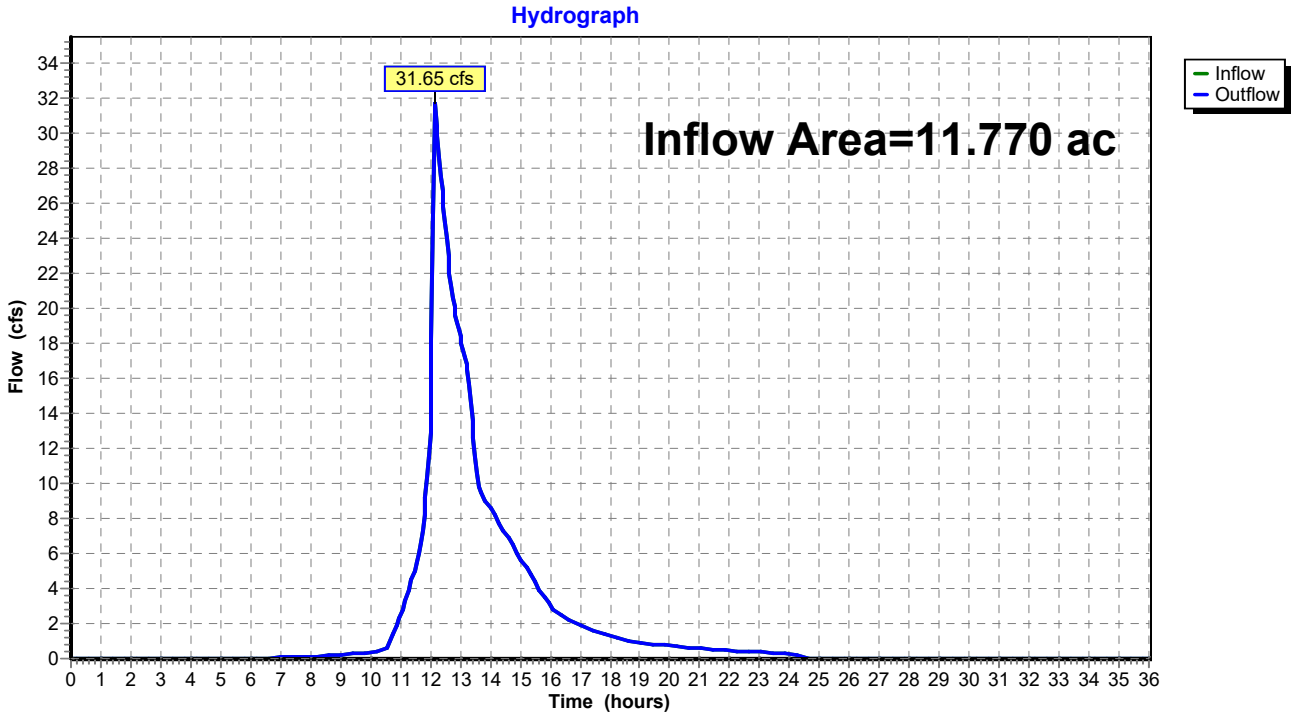


Summary for Reach SW: Total Flow to Southern Wetlands

Inflow Area = 11.770 ac, 75.11% Impervious, Inflow Depth = 5.29" for 100 YR event
Inflow = 31.65 cfs @ 12.17 hrs, Volume= 5.192 af
Outflow = 31.65 cfs @ 12.17 hrs, Volume= 5.192 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach SW: Total Flow to Southern Wetlands



Summary for Pond BA1: Bioretention Area 1

Inflow Area = 1.780 ac, 94.94% Impervious, Inflow Depth = 8.34" for 100 YR event
Inflow = 14.81 cfs @ 12.09 hrs, Volume= 1.237 af
Outflow = 8.85 cfs @ 12.21 hrs, Volume= 1.149 af, Atten= 40%, Lag= 7.1 min
Discarded = 0.21 cfs @ 12.21 hrs, Volume= 0.379 af
Primary = 8.64 cfs @ 12.21 hrs, Volume= 0.770 af
Routed to Reach NW : Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 337.99' @ 12.21 hrs Surf.Area= 6,238 sf Storage= 19,767 cf

Plug-Flow detention time= 213.2 min calculated for 1.147 af (93% of inflow)
Center-of-Mass det. time= 175.3 min (921.1 - 745.8)

Volume	Invert	Avail.Storage	Storage Description
#1	333.99'	19,848 cf	**Bioretention Area 1 (Prismatic)**Listed below (Recalc)

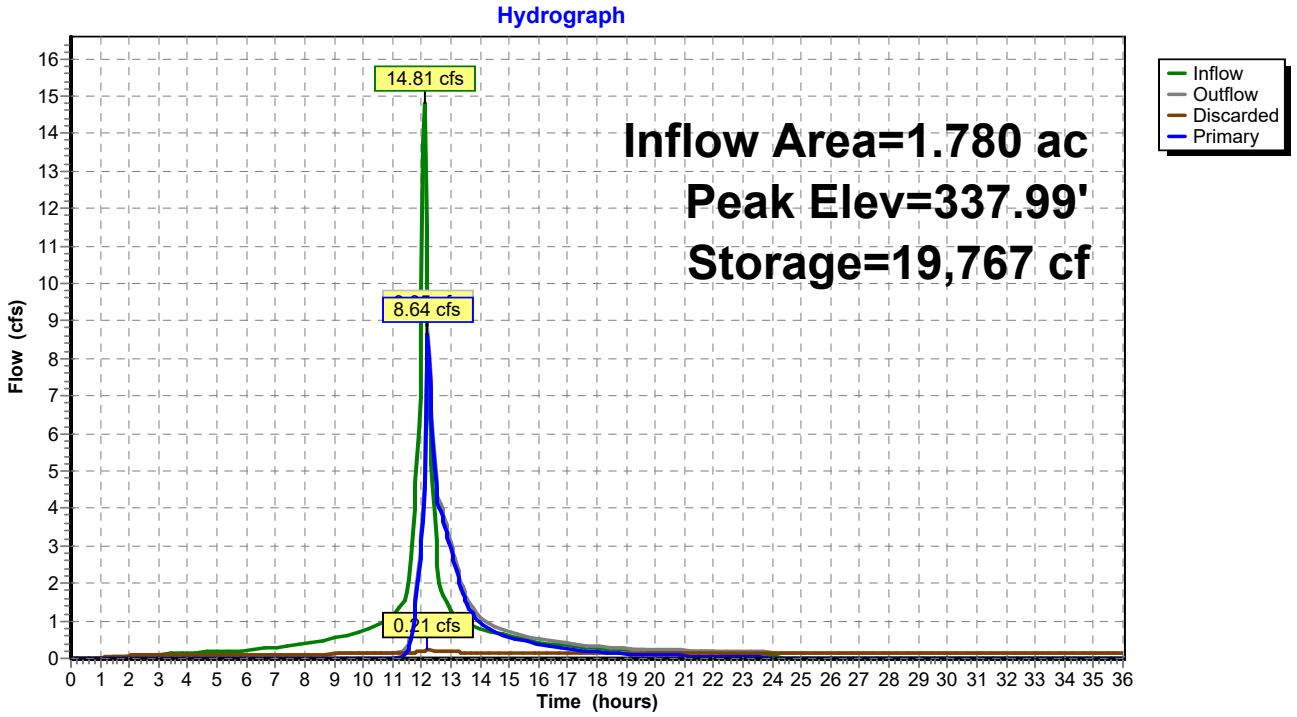
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
333.99	4,494	0.0	0	0
334.00	4,494	20.0	9	9
336.00	4,629	100.0	9,123	9,132
337.00	5,276	100.0	4,953	14,084
338.00	6,251	100.0	5,764	19,848

Device	Routing	Invert	Outlet Devices
#1	Primary	333.80'	**15.0" Round 15" Outlet Pipe** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 333.80' / 333.70' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	337.70'	**24.0" x 24.0" Horiz. Top Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	336.00'	**12.0" Vert. 12" Orifice** C= 0.600 Limited to weir flow at low heads
#4	Discarded	333.99'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 327.00'

Discarded OutFlow Max=0.21 cfs @ 12.21 hrs HW=337.98' (Free Discharge)
└**4=Exfiltration** (Controls 0.21 cfs)

Primary OutFlow Max=8.56 cfs @ 12.21 hrs HW=337.98' (Free Discharge)
└**1=15" Outlet Pipe** (Passes 8.56 cfs of 11.15 cfs potential flow)
  ├**2=Top Grate** (Weir Controls 3.95 cfs @ 1.74 fps)
  └**3=12" Orifice** (Orifice Controls 4.61 cfs @ 5.86 fps)

Pond BA1: Bioretention Area 1



Summary for Pond BA2: Bioretention Area 2

Inflow Area = 1.500 ac, 81.33% Impervious, Inflow Depth = 7.62" for 100 YR event
Inflow = 12.07 cfs @ 12.09 hrs, Volume= 0.952 af
Outflow = 7.04 cfs @ 12.21 hrs, Volume= 0.892 af, Atten= 42%, Lag= 7.2 min
Discarded = 0.16 cfs @ 12.21 hrs, Volume= 0.254 af
Primary = 6.88 cfs @ 12.21 hrs, Volume= 0.638 af
Routed to Reach NW : Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 337.99' @ 12.21 hrs Surf.Area= 4,059 sf Storage= 11,757 cf

Plug-Flow detention time= 177.9 min calculated for 0.891 af (94% of inflow)
Center-of-Mass det. time= 144.5 min (914.8 - 770.3)

Volume	Invert	Avail.Storage	Storage Description
#1	333.99'	11,805 cf	**Bioretention Area 2 (Prismatic)**Listed below (Recalc)

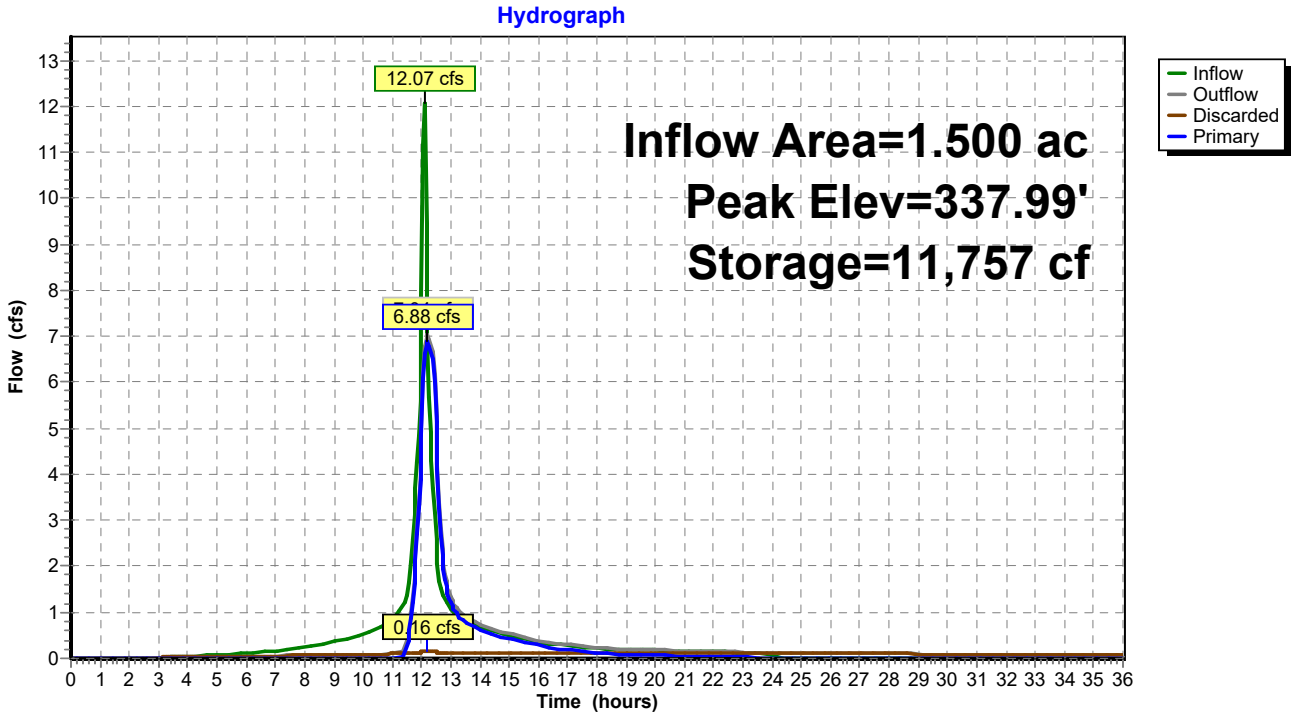
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
333.99	2,163	0.0	0	0
334.00	2,163	20.0	4	4
336.00	2,876	100.0	5,039	5,043
337.00	3,290	100.0	3,083	8,126
338.00	4,068	100.0	3,679	11,805

Device	Routing	Invert	Outlet Devices
#1	Primary	334.18'	**12.0" Round 12" Outlet Pipe** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 334.18' / 334.00' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	337.80'	**24.0" x 24.0" Horiz. Top Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	336.50'	**24.0" W x 10.0" H Vert. 24" x 10" Weir** C= 0.600 Limited to weir flow at low heads
#4	Discarded	333.99'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 330.00'

Discarded OutFlow Max=0.16 cfs @ 12.21 hrs HW=337.98' (Free Discharge)
└**4=Exfiltration** (Controls 0.16 cfs)

Primary OutFlow Max=6.87 cfs @ 12.21 hrs HW=337.98' (Free Discharge)
└**1=12" Outlet Pipe** (Inlet Controls 6.87 cfs @ 8.75 fps)
├**2=Top Grate** (Passes < 2.05 cfs potential flow)
└**3=24" x 10" Weir** (Passes < 8.23 cfs potential flow)

Pond BA2: Bioretention Area 2



Summary for Pond BA3: Bioretention Area 3

Inflow Area = 8.680 ac, 87.33% Impervious, Inflow Depth = 8.22" for 100 YR event
Inflow = 63.20 cfs @ 12.14 hrs, Volume= 5.945 af
Outflow = 18.66 cfs @ 12.45 hrs, Volume= 5.354 af, Atten= 70%, Lag= 18.6 min
Discarded = 1.10 cfs @ 12.45 hrs, Volume= 1.457 af
Primary = 17.56 cfs @ 12.45 hrs, Volume= 3.897 af
Routed to Reach SW : Total Flow to Southern Wetlands

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 341.01' @ 12.45 hrs Surf.Area= 17,626 sf Storage= 96,744 cf

Plug-Flow detention time= 210.6 min calculated for 5.347 af (90% of inflow)
Center-of-Mass det. time= 162.3 min (917.1 - 754.9)

Volume	Invert	Avail.Storage	Storage Description
#1	333.99'	96,748 cf	**Bioretention Area 3 (Prismatic)**Listed below (Recalc)

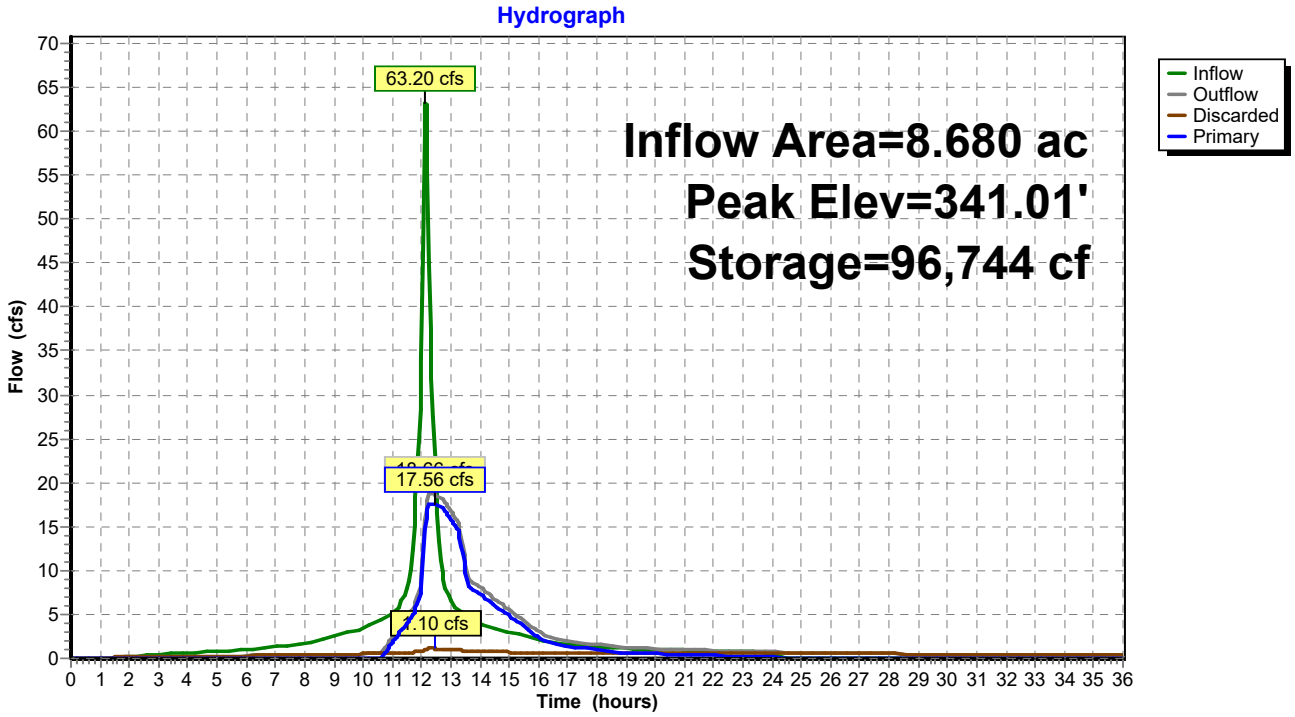
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
333.99	10,621	0.0	0	0
334.00	10,621	20.0	21	21
336.00	11,485	100.0	22,106	22,127
337.00	12,900	100.0	12,193	34,320
338.00	14,365	100.0	13,633	47,952
339.00	15,880	100.0	15,123	63,075
341.01	17,626	100.0	33,674	96,748

Device	Routing	Invert	Outlet Devices
#1	Primary	336.00'	**18.0" Round 18" Culvert** L= 55.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 336.00' / 335.45' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Device 1	339.10'	**24.0" x 24.0" Horiz. Top Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	337.00'	**30.0" W x 6.0" H Vert. 30" x 6" Weir** C= 0.600 Limited to weir flow at low heads
#4	Device 1	341.00'	**35.0' long x 24.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#5	Discarded	333.99'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 331.00'

Discarded OutFlow Max=1.10 cfs @ 12.45 hrs HW=341.01' (Free Discharge)
└**5=Exfiltration** (Controls 1.10 cfs)

Primary OutFlow Max=17.56 cfs @ 12.45 hrs HW=341.01' (Free Discharge)
└**1=18" Culvert** (Inlet Controls 17.56 cfs @ 9.94 fps)
  ├**2=Top Grate** (Passes < 26.61 cfs potential flow)
  ├**3=30" x 6" Weir** (Passes < 11.67 cfs potential flow)
  └**4=Broad-Crested Rectangular Weir** (Passes < 0.09 cfs potential flow)

Pond BA3: Bioretention Area 3



Summary for Pond UDN: Underground Detention North

Inflow Area = 1.180 ac,100.00% Impervious, Inflow Depth = 8.46" for 100 YR event
Inflow = 9.85 cfs @ 12.09 hrs, Volume= 0.832 af
Outflow = 3.51 cfs @ 12.25 hrs, Volume= 0.769 af, Atten= 64%, Lag= 9.9 min
Primary = 3.51 cfs @ 12.25 hrs, Volume= 0.769 af
Routed to Reach NW : Total Flow to Northern Wetlands and Meshanticut Brook (RI0006017R-02)

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 337.11' @ 12.25 hrs Surf.Area= 7,900 sf Storage= 13,846 cf

Plug-Flow detention time= 218.3 min calculated for 0.769 af (92% of inflow)
Center-of-Mass det. time= 177.0 min (917.2 - 740.2)

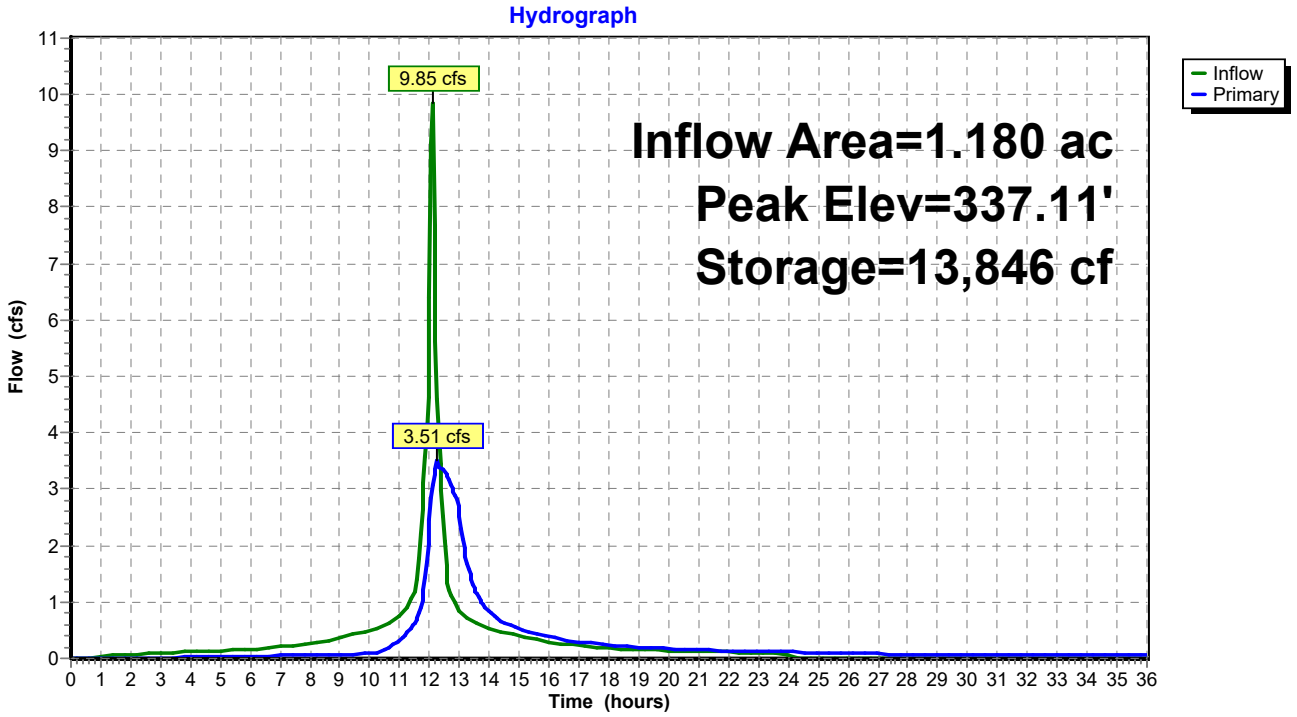
Volume	Invert	Avail.Storage	Storage Description
#1A	335.00'	0 cf	**47.23'W x 167.27'L x 2.50'H Field A** 19,750 cf Overall - 19,750 cf Embedded = 0 cf x 40.0% Voids
#2A	335.00'	13,846 cf	**StormTrap ST2 SingleTrap 2-0** x 40 Inside #1 Inside= 101.7"W x 24.0"H => 15.05 sf x 15.40'L = 231.7 cf Outside= 101.7"W x 30.0"H => 21.20 sf x 15.40'L = 326.4 cf 40 Chambers in 4 Rows 33.92' x 153.96' Core + 6.66' Border = 47.23' x 167.27' System
		13,846 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	335.00'	**12.0" Round Culvert** L= 126.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 335.00' / 334.60' S= 0.0032 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	335.00'	**2.0" Vert. 2" Weep Hole** C= 0.600 Limited to weir flow at low heads
#3	Device 1	335.70'	**15.0" Vert. 15" Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.50 cfs @ 12.25 hrs HW=337.11' (Free Discharge)
└**1=Culvert** (Barrel Controls 3.50 cfs @ 4.46 fps)
└**2=2" Weep Hole** (Passes < 0.15 cfs potential flow)
└**3=15" Orifice** (Passes < 5.22 cfs potential flow)

Pond UDN: Underground Detention North



Summary for Pond UDS: Underground Detention South

Inflow Area = 1.280 ac, 96.88% Impervious, Inflow Depth = 8.34" for 100 YR event
Inflow = 10.65 cfs @ 12.09 hrs, Volume= 0.890 af
Outflow = 5.29 cfs @ 12.16 hrs, Volume= 0.707 af, Atten= 50%, Lag= 4.3 min
Discarded = 0.16 cfs @ 12.16 hrs, Volume= 0.361 af
Primary = 5.13 cfs @ 12.16 hrs, Volume= 0.346 af
Routed to Reach SW : Total Flow to Southern Wetlands

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 337.92' @ 12.16 hrs Surf.Area= 4,095 sf Storage= 16,140 cf

Plug-Flow detention time= 336.1 min calculated for 0.706 af (79% of inflow)
Center-of-Mass det. time= 259.0 min (1,004.8 - 745.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	332.50'	1,638 cf	**38.75'W x 105.69'L x 5.50'H Field A** 22,525 cf Overall - 18,429 cf Embedded = 4,095 cf x 40.0% Voids
#2A	333.50'	14,502 cf	**StormTrap ST2 SingleTrap 4-0** x 18 Inside #1 Inside= 101.7"W x 48.0"H => 30.55 sf x 15.40'L = 470.3 cf Outside= 101.7"W x 54.0"H => 38.16 sf x 15.40'L = 587.4 cf 18 Chambers in 3 Rows 25.44' x 92.38' Core + 6.66' Border = 38.75' x 105.69' System
		16,140 cf	Total Available Storage

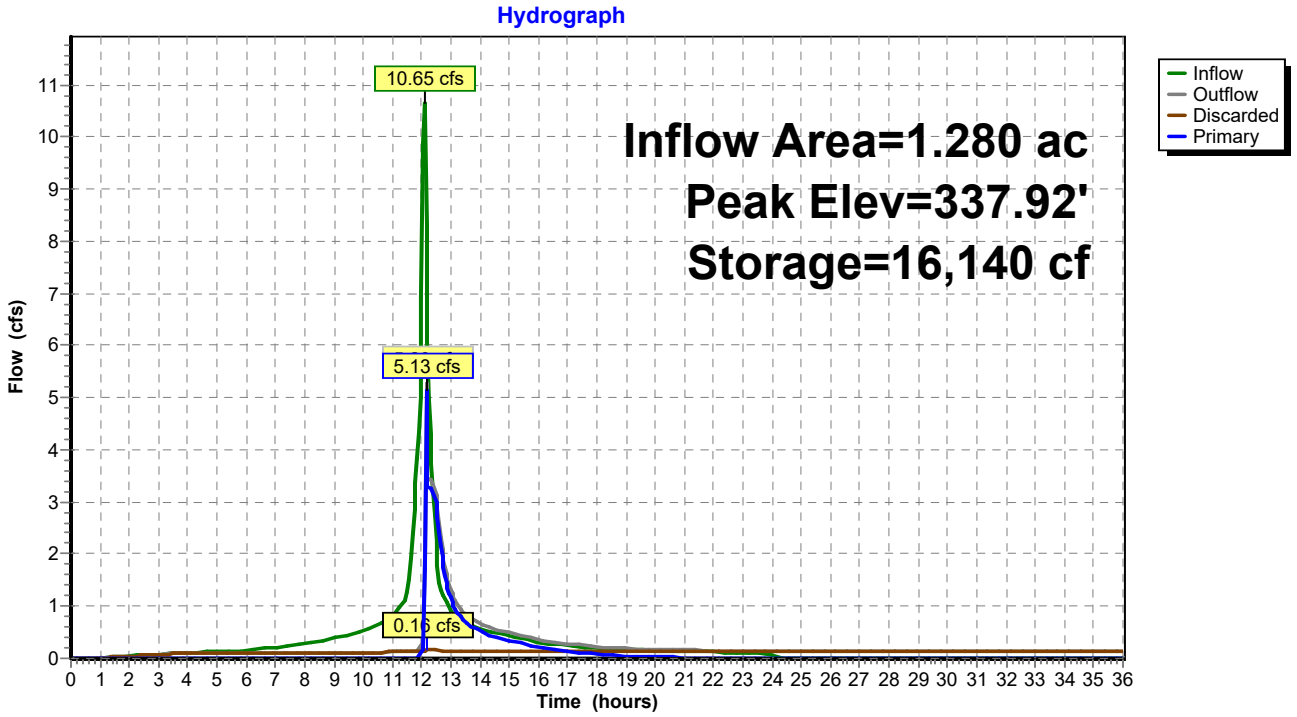
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	333.88'	**15.0" Round 15" Culvert** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 333.88' / 333.75' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	336.55'	**15.0" Vert. 12" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Discarded	332.50'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 324.00'

Discarded OutFlow Max=0.16 cfs @ 12.16 hrs HW=337.86' (Free Discharge)
└**3=Exfiltration** (Controls 0.16 cfs)

Primary OutFlow Max=4.85 cfs @ 12.16 hrs HW=337.85' (Free Discharge)
└**1=15" Culvert** (Passes 4.85 cfs of 10.80 cfs potential flow)
└**2=12" Orifice** (Orifice Controls 4.85 cfs @ 3.95 fps)

Pond UDS: Underground Detention South



APPENDIX C

HYDRAULIC COMPUTATIONS

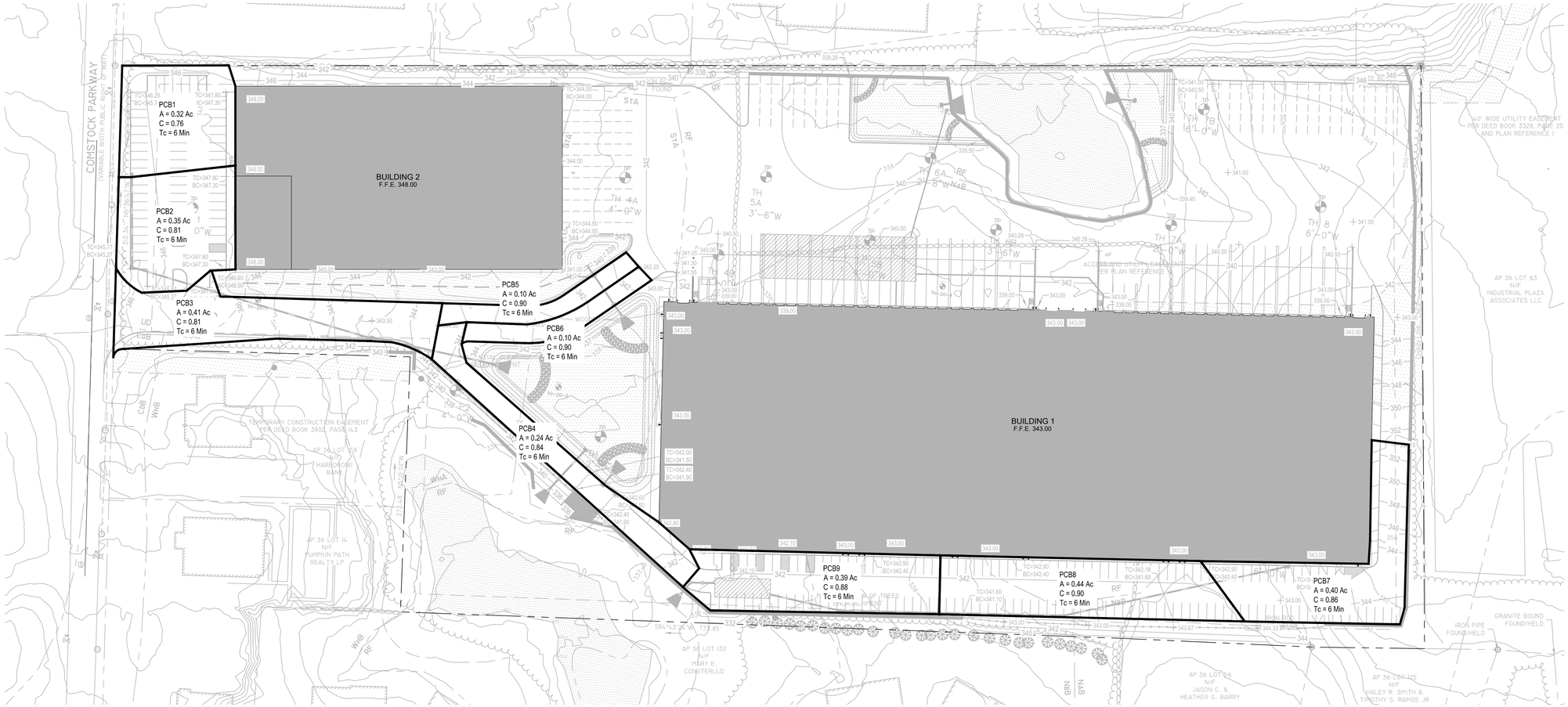
Drainage Analysis for Proposed Conditions
Comstock Industrial Park Comstock Parkway
Plat 36/4 Lot 46, Cranston, RI

4/6/2022

Job Number: 70753.00 **JJD**

Drainage Areas

BASIN	TOTAL (AC.)	IMPERVIOUS (AC.)	PERVIOUS (AC.)	C-Value	Tc (Min.)
PCB1	0.32	0.25	0.07	0.76	6.00
PCB2	0.35	0.29	0.05	0.81	6.00
PCB3	0.41	0.35	0.06	0.81	6.00
PCB4	0.24	0.22	0.02	0.84	6.00
PCB5	0.10	0.10	0.00	0.90	6.00
PCB6	0.10	0.10	0.00	0.90	6.00
PCB7	0.40	0.38	0.03	0.86	6.00
PCB8	0.44	0.44	0.00	0.90	6.00
PCB9	0.39	0.37	0.01	0.88	6.00
TOT	2.75	2.49	0.25	5.02	-



Prepared by:

benesch

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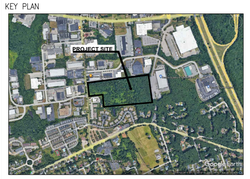
COMSTOCK INDUSTRIAL PARK COMSTOCK PARKWAY

CRANSTON, RI

PLAT 36/ 4 LOT 46

DATE:	REVISION:

KEY PLAN



PROJECT NO.: **70753.00**
SCALE: **AS NOTED**
DATE: **03/18/2022**

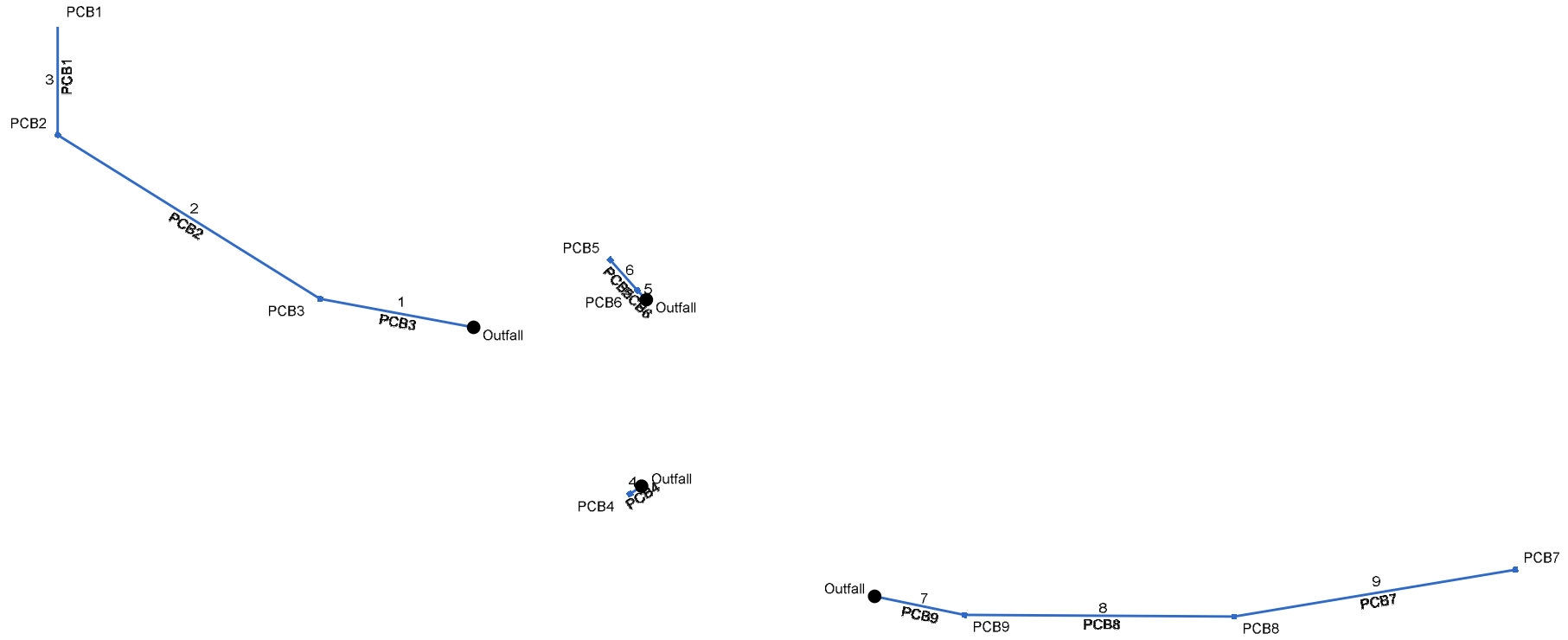
DRAWN BY: **JJD**
CHECKED BY: **WGW**

CATCHMENT AREA MAP

DRAWING NO.:

CAM

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: 70753.00 HYDRAULICS.stm	Number of lines: 9	Date: 4/6/2022

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	133.000	0.41	1.08	0.81	0.33	0.86	6.0	8.0	5.8	5.00	10.79	4.66	15	2.79	337.00	340.71	340.38	341.62	337.00	343.28	PCB3
2	1	264.000	0.35	0.67	0.81	0.28	0.53	6.0	6.9	6.2	3.29	4.57	3.92	15	0.50	340.71	342.03	341.62	342.76	343.28	345.27	PCB2
3	2	95.000	0.32	0.32	0.76	0.24	0.24	6.0	6.0	6.6	1.61	4.54	1.81	15	0.49	342.03	342.50	343.16	343.21	345.27	345.50	PCB1
4	End	12.000	0.24	0.24	0.84	0.20	0.20	6.0	6.0	6.6	1.34	22.06	1.09	15	11.67	337.00	338.40	340.38	340.39	337.00	341.40	PCB4
5	End	11.000	0.10	0.20	0.90	0.09	0.18	6.0	7.2	6.1	1.10	25.98	0.90	15	16.18	337.00	338.78	340.38	340.38	337.00	341.78	PCB6
6	5	35.000	0.10	0.10	0.90	0.09	0.09	6.0	6.0	6.6	0.60	4.50	0.49	15	0.49	338.78	338.95	340.39	340.39	341.78	341.78	PCB5
7	End	78.000	0.39	1.23	0.88	0.34	1.08	6.0	8.8	5.6	6.01	4.57	5.33	15	0.50	336.65	337.04	337.64	338.48	341.50	340.50	PCB9
8	7	230.000	0.44	0.84	0.90	0.40	0.74	6.0	7.7	5.9	4.38	4.57	3.57	15	0.50	337.04	338.19	338.67	339.73	340.50	341.28	PCB8
9	8	243.000	0.40	0.40	0.86	0.34	0.34	6.0	6.0	6.6	2.28	4.56	2.31	15	0.50	338.19	339.40	339.83	340.19	341.28	342.40	PCB7

Project File: 70753.00 HYDRAULICS.stm | Number of lines: 9 | Run Date: 4/6/2022

NOTES:Intensity = 32.89 / (Inlet time + 3.80) ^ 0.70; Return period =Yrs. 10 ; c = cir e = ellip b = box

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	PCB3	2.20	0.00	2.20	0.00	Comb	4.0	2.15	1.90	0.95	2.00	Sag	2.00	0.020	0.020	0.000	0.26	12.92	0.26	12.92	0.0	Off
2	PCB2	1.88	0.32	2.20	0.00	Comb	4.0	2.15	1.89	0.95	2.00	Sag	2.00	0.020	0.020	0.000	0.26	12.91	0.26	12.91	0.0	Off
3	PCB1	1.61	0.00	1.29	0.32	Comb	4.0	2.15	0.00	6.25	2.00	0.020	2.00	0.020	0.020	0.013	0.14	7.01	0.08	3.82	0.0	2
4	PCB4	1.34	0.00	1.34	0.00	Comb	4.0	2.15	0.47	0.23	2.00	Sag	2.00	0.020	0.020	0.000	0.19	9.37	0.19	9.37	0.0	Off
5	PCB6	0.60	0.00	0.60	0.00	Comb	4.0	2.15	0.21	0.10	2.00	Sag	2.00	0.020	0.020	0.000	0.11	5.73	0.11	5.73	0.0	Off
6	PCB5	0.60	0.00	0.60	0.00	Comb	4.0	2.15	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.12	6.05	0.12	6.05	0.0	Off
7	PCB9	2.27	0.45	2.73	0.00	Comb	4.0	2.15	4.27	2.13	2.00	Sag	2.00	0.020	0.020	0.000	0.30	14.97	0.30	14.97	0.0	Off
8	PCB8	2.62	0.00	2.17	0.45	Comb	4.0	2.15	0.00	8.68	2.00	0.020	2.00	0.020	0.020	0.013	0.17	8.41	0.09	4.35	0.0	7
9	PCB7	2.28	0.00	2.28	0.00	Comb	4.0	2.15	2.26	1.13	2.00	Sag	2.00	0.020	0.020	0.000	0.26	13.24	0.26	13.24	0.0	Off

Project File: 70753.00 HYDRAULICS.stm | Number of lines: 9 | Run Date: 4/6/2022

NOTES: Inlet N-Values = 0.016; Intensity = 32.89 / (Inlet time + 3.80) ^ 0.70; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

APPENDIX D

WATER QUALITY

GROUNDWATER RECHARGE

CHANNEL PROTECTION VOLUME

SURFACE AREA COMPUTATIONS

POLLUTANT LOADING ANALYSIS

Water Quality Volume Computations
WQV = (1")*(I) /12

Watershed	Description	Total Area (ac)	Total Impervious Area, I (ac)	Impervious Coverage (%)	Req'd WQV (ac-ft) WQV = (1")*(I) /12	Required WQV (cf)	Required Pretreatment 10% of WQV (cf)	Area of Bioretention Area (sf)	Provided WQV (cf) 24" Soil Mix (20% Voids, cf)	12"-3/4" Stone (40% Voids, cf)	Holding Storage (cf)	Total WQV Provided	Pretreatment Provided Volume of Sediment Forebay (cf)
2B	Flow to Bioretention Area 1	1.78	1.69	94.9	0.141	**6,135**	613	4,394	879	-	7,098	**7,977**	732
2C	Flow to Bioretention Area 2	1.50	1.22	81.3	0.102	**4,429**	443	2,188	875	-	3,554	**4,429**	445
2D	Flow to Underground Detention North	1.18	1.18	100.0	0.098	**4,283**	428	7,900	Treatment Unit - See WQF Calculation Below				-
3A	Flow to Bioretention Area 3	8.68	7.58	87.3	0.632	**27,515**	2,752	10,621	4,248	-	23,773	**28,021**	2,822
3B	Flow to Underground Detention South	1.28	1.24	96.9	0.103	**4,501**	450	4,095	-	1,638	12,490	**14,128**	CDS Unit
	Total =	14.42	12.91	89.53	1.08	**46,863**	**4,686**	**29,198**	-				-

Water Quality Flow Computations
WQ_f - q_u*A*Q

Watershed	Description	WQV Applied Impervious Area (ac-ft)	Total Drainage Area (ac)	Total Drainage Area (sq. mi)	P (1.2" for water quality storm, in)	Q, runoff volume (in)	CN (1000 / [10+5P +10Q-10(Q^2+1.25QP)$^{1/2}$]	Tc, (hr)	Ia, (in, Table 4-1, TR-55)	Peak unit discharge, qu, (csm/in, Exhibit 4-III, TR-55)	Required WQF	Proposed Treatment Unit
2D	Northern Treatment Unit	0.098	1.18	0.002	1.2	1.00	98	0.1	0.041	700	1.29	JFPD0806 (Jellyfish)

Groundwater Recharge Computations $Re_v = (1")(F)(I) / 12$											
Watershed	Description	Total Site Area (Ac)	Impervious Area, I (Ac)	HSG "B" (Ac)	HSG "D" (Ac)	F (HSG "B")	F (HSG "D")	F (Weighted)	Re_v (ac-ft) Req'd (1"*F* I) / 12	Re_v (cf) Req'd (1"*F* I) / 12	Total Re_v (cf) Provided
2B	Flow to Bioretention Area 1	1.78	1.69	1.59	1.5	0.35	0.1	0.40	0.06	2,435	7,977
2C	Flow to Bioretention Area 2	1.5	1.22	0.11	1.39	0.35	0.1	0.12	0.01	524	4,429
3A	Flow to Bioretention Area 3	8.68	7.58	2.24	6.44	0.35	0.1	0.16	0.10	4,527	28,021

Channel Protection Volume, CP_v $V_s = CP_v = 0.65*V_r$					
Watershed	Description	V_r (ac-ft)	V_r (cf)	Required CP_v, V_s (cf)	Provided CP_v, V_s (cf)*
2B	Flow to Bioretention Area 1	0	0	0	7,977
2C	Flow to Bioretention Area 2	0	0	0	4,429
2D	Flow to Underground Detention North	0.205	8,930	5,804	-
3A	Flow to Bioretention Area 3	0	0	0	28,021
3B	Flow to Underground Detention South	0.226	9,845	6,399	14,128
TS	Total Site	0.431	18,774	12,203	54,555

Note: *Provided CP_v comes from provided WQV

Surface Area of Filter Bed $A_f = (WQv)(d_f) / [(k)(h_f+d_f)(t_f)]$								
Watershed	Description	WQV (cf)	d_f (ft)	k (ft/day)	h_f (ft)	t_f (days)	Required A_f (sf)	Provided A_f (sf)
2B	Flow to Bioretention Area 1	6,135	2	1	0.4	2	2,556	4,394
2C	Flow to Bioretention Area 2	4,429	2	1	1.2	2	1,384	2,163
3A	Flow to Bioretention Area 3	27,515	2	1	1	2	9,172	10,621

Pollutant Loading Analysis
Simple Method
$L = [(P)(Pj)(Rv)/12](C)(A)(2.72)$
$L = 1.03(10^{-3})[(P)(Pj)(Rv)](C')(A)$ For Bacteria Only

Pollutant	Description	P (depth of rainfall, in.) Figure H-8	Pj (rainfall correction factor)	I (Site Impervious %)	Rv (runoff coefficient) Rv = 0.05 + 0.009*I	C, Exist. (flow-weighted mean conc. of pollutant, mg/L) Table H-2	C, Prop. (flow-weighted mean conc. of pollutant, mg/L) Table H-2	A (overall contributing drainage area of site, ac)	L, Exist. (Stormwater pollutant load, lbs or billion coloies for bacteria)	L, Prop. (Stormwater pollutant load, lbs or billion colonies for bacteria)	Median Pollutant Removal Efficiency,%, (Infiltration Basin) Table H-3	Median Pollutant Removal Efficiency,%, (Subsurface Chambers) Table H-3	Median Pollutant Removal Efficiency,%, (Dry Swale) Table H-3	Median Pollutant Removal Efficiency,%, (Jellyfish Filter) Contech Specs.	L, Prop. w/ BMPs (Stormwater pollutant load, lbs or billion colonies for bacteria)
TSS	Total Suspended Solids	49	0.9	74.2	0.718	51	120	17.48	6396	15051	90	90	90	85	1,505
TP	Total Phosphorus	49	0.9	74.2	0.718	0.11	0.25	17.48	14	31	65	55	30	50	11
TN	Total Nitrogen	49	0.9	74.2	0.718	1.74	2.1	17.48	218	263	65	40	55	30	92
Cu	Copper	49	0.9	74.2	0.718	0	0.002	17.48	0	0.3	-	-	-	-	0.1
Pb	Lead	49	0.9	74.2	0.718	0	0.026	17.48	0	3.3	-	-	-	-	0
Zn	Zinc	49	0.9	74.2	0.718	0	0.112	17.48	0	14	-	-	-	-	7
BOD	Biological Oxygen Demand	49	0.9	74.2	0.718	3	9	17.48	376	1129	-	-	-	-	0
COD	Chemical Oxygen Demand	49	0.9	74.2	0.718	27	58.6	17.48	3386	7350	-	-	-	-	0
Bacteria	-	49	0.9	74.2	0.718	300	2400	17.48	171	1368	95	90	70	60	68

CONTECH Stormwater Solutions Inc. Engineer: PVP
Date Prepared: **6/16/2022**

Site Information

Project Name	**Comstock Industrial Park**
Project State	**RI**
Project City	**Providence**

Total Drainage Area, Ad	**1.18**	ac
Post Development Impervious Area, Ai	**1.18**	ac
Pervious Area, Ap	**0.00**	ac
% Impervious	**100%**	
Runoff Coefficient, Rc	**0.95**	

Mass Loading Calculations

Mean Annual Rainfall, P	**44.0**	in
Agency Required % Removal	**80%**	
Percent Runoff Capture	**90%**	
Mean Annual Runoff, Vt	**161,142**	ft^3
Event Mean Concentration of Pollutant, EMC	**75**	mg/l
Annual Mass Load, M total	**754**	lbs

Filter System

Filtration Brand	**Jelly Fish**	
Cartridge Length	**54**	in

Jelly Fish Sizing

Mass to be Captured by System	**603**	lbs
Water Quality Flow	**1.29**	cfs

Method to Use **FLOW BASED**

Summary			
Mass	Treatment Mass	688.00	lbs
	Required Size	**JFPD0806-5-1**	
Flow	Treatment Flow Rate	1.43	cfs
	Required Size	**JFPD0806-7-2**	

Rhode Island Department of Environmental Management

Office of Water Resources – Stormwater Technology Review Committee

235 Promenade St. Providence, RI 02908 Ph: 401-222-4700

Alternative Stormwater Technology Program

Vendor Information:
Contech Engineered Solutions, LLC
71 US Route 1, Suite F
Scarborough, Maine 04074

Contact:
Derek M. Berg
Director of Stormwater Management
Email: Derek.Berg@ContechLLC.com
Web: www.conteches.com
Phone: 207-885-6174

Technology Name:
Jellyfish® Filter - Offline
Jellyfish® Filter - Peak Diversion

Approval Type
Pretreatment/Retrofits/WQBMP

Certification Dates:
Issued: August 10, 2021
Expires: August 10, 2026

RE-CERTIFICATION:

The Rhode Island Stormwater Technology Review Committee which consists of members from the Department of Environmental Management (DEM), Department of Transportation (DOT) and the Coastal Resources Management Council (CRMC) have reviewed the **Jellyfish®** Filter application for re-certification of its Technology Approval and accepted use for Stormwater Treatment in the State of Rhode Island.

In accordance with Stormwater Rule 250-RICR-150-10-8.9B, **Contech Engineered Solutions, LLC** has petitioned the permitting agencies to re-certify the **Jellyfish®** Filter as an acceptable structural stormwater control described in Sections 8.19 through 8.25 of Stormwater Rule 250-RICR-150-10. They have submitted a re-certification application that contains any changes made to the design of the **Jellyfish®** Filter, any reported system failures (along with their cause and how the failure was remedied); as well as annual lists of all installed units in the state of Rhode Island since its original certification was issued on November 23, 2015. The manufacturer has also submitted monitoring results and supporting information developed in accordance with the provisions of the Technology Assessment Protocol for Innovate and Emerging Technologies as described in Stormwater Rule 250-RICR-150-10 Sections 8.39 and 8.40.

The **Jellyfish®** Filter is granted reciprocity in Rhode Island as a proprietary stormwater treatment technology, given that it has been issued a TAPE (Technology Assessment Protocol – Ecology) general use level designation for basic, enhanced and phosphorus treatment by the Washington State Department of Ecology in January 2021; as a result of their *Jellyfish® Filter: General Use Level Designation Technical Evaluation Report* field study conducted by Contech Engineered Solutions, LLC with third-party oversight conducted by Herrera Environmental Consultants in Dundee, Oregon during the period between March 2017 and April 2020 in accordance with the Washington Department of Ecology's TAPE procedures described in the 2018 Guidance for Evaluating Emerging Stormwater Treatment Technologies.

The **Jellyfish®** Filter is a membrane filter that serves as a physical barrier to treat stormwater runoff. This product was developed by **Contech Engineered Solutions, LLC**. The **Jellyfish®** Filter is considered a flow-through treatment practice. It can be designed to handle flows from the water quality storm event with or without upstream detention. The system contains Hi-Flo and drain down filter cartridges which are removable, rinseable and reusable.

This device varies from the design guidance for filtering systems described in Stormwater Rule 250-RICR-150-10-8.23 because of the device's atypically high design treatment flow rates associated with the device's utilization of

numerous high surface area filter cartridges in lieu of traditional filter medias such as: ASTM C33 concrete sand, USDA loamy sand or USDA sandy loam. Additionally, the device itself does not meet minimum requirements for filter bed area or minimum temporary water quality storage. However, the increased infiltration rate provided by the numerous high surface area filter cartridges compensates for the devices smaller footprint and temporary storage volume. The manufacturer has demonstrated through the provided TAPE study that the device provides the minimum water quality pollutant removal rates specified in Stormwater Rule 250-RICR-150-10-8.9B. The system is approved for the following removals when designed using a maximum hydraulic loading rate of 0.21 gallons per minute per square foot of filter surface area for hi-flow cartridges and 0.11 gallons per minute per square foot of filter surface area for drain-down cartridges: **85%** removal of total suspended solids (TSS), **60%** removal of pathogens, **50%** removal of total phosphorus (TP) for discharges to freshwaters, and **30%** removal of total nitrogen (TN) for discharges to tidal waters. This device may be used as an approved water quality BMP provided that the design, installation and maintenance are conducted in accordance with the following terms and conditions:

I. GENERAL CERTIFICATION REQUIREMENTS

1. The system must be designed to adhere to the manufacturer's specifications titled "Jellyfish® Membrane Filtration System Stormwater Quality – Membrane Filtration System Standard Specification". This specification is located in the Technical Guidance section of the manufacturer's website (https://www.conteches.com/technical-guides/search?filter=Q5R3MC9K3X) under the Stormwater Management – Treatment section for the Jellyfish Filter.

2. The system must be designed as a **Jellyfish®** Filter "Peak Diversion" configuration, or the "Offline" configuration preceded by a flow diversion structure. Other **Jellyfish®** Filter configurations may be approved by the state permitting agency on a case-by-case basis.

3. This device is **certified as a pretreatment device** in accordance with Stormwater Rule 250-RICR-150-10-8.31, provided the device treats the first inch of runoff from the capture area, unless waived by the state permitting agency on a case-by-case basis.

4. The Vendor must verify that each proprietary device was installed in accordance with the manufacturer's specifications and the approved design.

5. A representative from the vendor must be on site during the installation of systems to ensure that they are properly constructed.

6. This device is **certified as a retrofit device** in accordance with Stormwater Rule 250-RICR-150-10-8.6A. Retrofits are allowed flexibility with regards to the eleven minimum standards described in Sections 8.6 through 8.17 of Stormwater Rule 250-RICR-150-10, but in general they are considered effective if they capture at least 50% of the catchment, and meet the target water quality treatment of at least the first 0.5 inches of the water quality volume.

7. This device is **certified as a Water Quality BMP** in accordance with pollutant removal requirements specified in Stormwater Rule 250-RICR-150-10-8.9B, provided that:

   a) The unit is sized to treat the water quality volume and the water quality flow. Various pre-detention practices may be utilized as long as the first inch of runoff is treated. The unit must be designed using a maximum hydraulic loading rate of 0.21 gallons per minute per square foot of filter surface area for hi-flow cartridges and 0.11 gallons per minute per square foot of filter surface area for drain-down cartridges. The water quality flow rate for a **Jellyfish®** unit is calculated by multiplying the number of cartridges by their respective maximum hydraulic loading rates and then multiplying that product by each cartridge's respective surface area (refer to Table 1: Sizing Table – Rhode Island Approved Jellyfish Filters). Should the permitting agency waive or relieve the applicant from the full water

quality volume (i.e. for a redevelopment project or retrofit), the applicant is granted relief and may design the system to treat a smaller volume, as required by the permitting agency.

b) This product, as designed, does not meet the recharge volume requirements, as specified in Stormwater Rule 250-RICR-150-10-8.8. However, use of this unit is not prohibited so long as the applicant can demonstrate to the permitting agency that the required recharge is met within the sub-watershed.

II. MAINTENANCE REQUIREMENTS

1. The device must be maintained in accordance with the manufacturer's specifications provided in the **Jellyfish®** Filter Operation & Maintenance Manual. https://www.conteches.com/Portals/0/Documents/Maintenance%20Guides/Jellyfish_Filter_Owners%20Manual.pdf?ver=2019-12-02-110802-027

2. The entire device (drain down cartridges, Hi-Flo cartridges, cartridge deck, weirs/baffles, inlets/outlets, etc.) must be maintained in accordance with the requirements for filtering system water quality BMPs, as stated in Stormwater Rule 250-RICR-150-10-8.23-F.3 which requires the entire device to be inspected on at least an annual basis and after storms equal to or greater than the 1-year Type-III 24-hour design storm.

3. The device's sump must be maintained in accordance with the requirements for proprietary pre-treatment devices, as stated in Stormwater Rule 250-RICR-150-10-8.31-C, which requires the sump to be inspected a minimum of 2 times per year. Additionally, the sump must be cleaned out when 50% or more of the pollutant storage capacity is filled or displaced (50% capacity is 12 inches or more in sump depth for this device).

4. All material removed from the unit must be properly disposed of and is the responsibility of the owner.

5. The applicant must provide evidence of a maintenance contract which extends for a minimum of two years. The contracted maintenance provider must receive training by **Contech Engineered Solutions, LLC** on how to properly maintain **Jellyfish®** Filter devices. This requirement excludes maintenance providers recognized by the RIDEM to be qualified in maintenance of **Jellyfish®** Filter devices.

6. The applicant must include a copy of the **Jellyfish®** Filter Operation & Maintenance Manual in their project specific long term operation and maintenance plan.

III. REPORTING REQUIREMENTS

1. The Vendor shall provide a recommended maintenance schedule to the applicant and the permitting agency after the first year of operation. This recommended maintenance schedule must account for additional future pollutant loads on sites where contributing drainage areas may be subject to further development (i.e. strip malls).

2. The Vendor shall provide a listing to the RIDEM Office of Water Resources of all systems installed within the State of Rhode Island on an annual basis. This list shall also include the name of the Vendor representative who was on-site to verify proper installation of each system.

3. The Vendor shall provide an annual listing to the RIDEM Office of Water Resources of all Rhode Island maintenance providers that they trained in **Jellyfish®** Filter maintenance.

4. The Vendor shall immediately notify the RIDEM Office of Water Resources if and when any changes are made to the model name or number of any **Jellyfish®** Filter device applicable to this certification.

5. The Vendor shall immediately notify the RIDEM Office of Water Resources if and when any revisions are made to the design, installation or operation and maintenance manuals for all models applicable to this certification.

6. The Vendor shall notify the RIDEM at least thirty (30) days prior to any proposed transfer of ownership of the Component technology. Notification shall include the name and address of the new owner and a written agreement between the existing and new owner specifying a date for transfer of ownership, responsibility, and liability for the Component. All provisions of this Certification shall be applicable to any new owners.

IV. RIGHTS OF THE RIDEM AND CRMC

1. The RIDEM may suspend, modify or revoke this approval for cause, including but not limited to: non-compliance with any of the conditions or provisions of this approval, mis-representation or failure to fully disclose all relevant data, or receipt of new information indicating that the use of the **Jellyfish®** Filter system is contrary to the public interest, public health or the environment.

2. This approval does not represent an endorsement of the **Jellyfish®** Filter system by the RIDEM, RIDOT or CRMC. This letter of approval may be reproduced only in its entirety.

3. The **Jellyfish®** Filter Standard Specification and operation and maintenance manual referenced herein are approved upon the date of approval of this Certification.

4. The RIDEM reserves the right to suspend or revoke this Certification if updated design, installation, and O&M manuals are not provided to the RIDEM within thirty (30) days of RIDEM request or one hundred and eighty (180) days prior to the expiration date of this Certification. All revisions must be reviewed and approved by the RIDEM prior to re-certification.

Eric A. Beck, P.E. Date
Administrator, Groundwater and Wetlands Protection
RIDEM - Office of Water Resources

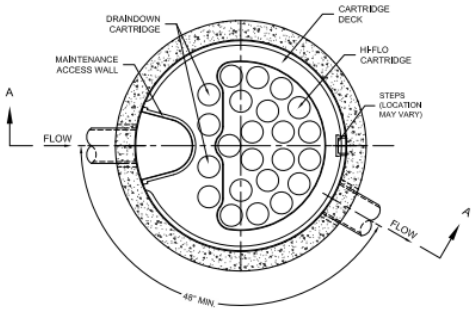
ATTACHMENTS:

Table 1: Sizing Table – Rhode Island Approved Jellyfish Filters

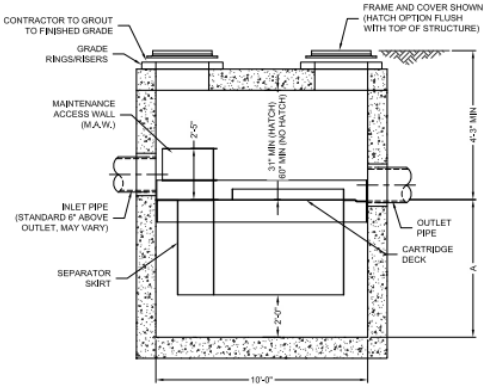
Jellyfish Filter Model #	Approximate Impervious Catchment Area (ac)	Water Quality Flow Rate (cfs)
JF 4-2-1	0.37	0.45
JF 6-3-1	0.51	0.62
JF 6-6-1	0.96	1.16
JF 8-6-2	1.03	1.25
JF 8-10-2	1.62	1.96
JF 10-11-3	1.84	2.23
JF 10-19-4	3.09	3.74
JF 12-20-5	3.32	4.01
JF 12-27-5	4.35	5.26

Table 2: Sizing Table – Rhode Island Approved Jellyfish Filter Cartridges

Jellyfish Filter Model #	Approximate Impervious Catchment Area (ac)	Water Quality Flow Rate (cfs)
15” Draindown	0.02	0.02
15” HiFLo	0.04	0.05
27” Draindown	0.04	0.05
27” HiFlo	0.07	0.09
40” Draindown	0.06	0.07
40” HiFlo	0.11	0.13
54” Draindown	0.07	0.09
54” HiFlo	0.15	0.18



PLAN VIEW



SECTION A-A

Jellyfish Filter

JELLYFISH DESIGN NOTES

JELLYFISH TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD MANHOLE STYLE IS SHOWN. Ø120" MANHOLE JELLYFISH PEAK TREATMENT CAPACITY IS 3.74 CFS. IF THE SITE CONDITIONS EXCEED 3.74 CFS AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION

CARTRIDGE DEPTH	54"	40"	27"	15"
OUTLET INVERT TO STRUCTURE INVERT (A)	6'-5"	5'-3"	4'-2"	3'-2"
FLOW RATE HIGH-FLO / DRAINDOWN (cfs) (per cart)	0,18 / 0,09	0,13 / 0,065	0,09 / 0,045	0,05 / 0,025
MAX. CARTS HIGH-FLO / DRAINDOWN	19 / 4			

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs)	*
PEAK FLOW RATE (cfs)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
# OF CARTRIDGES REQUIRED (HF / DD)	* / *
CARTRIDGE SIZE	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE #1	*	*	*
INLET PIPE #2	*	*	*
OUTLET PIPE	*	*	*

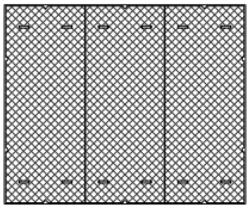
RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

FRAME AND COVER
(DIAMETER VARIES)
N.T.S.



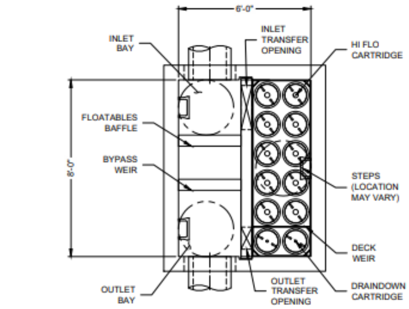
HATCH
(84" x 102" WITH SLAB)
N.T.S.

GENERAL NOTES:
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS REPRESENTATIVE, www.ContechES.com
3. JELLYFISH WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS-20 OR PER APPROVING JURISDICTION REQUIREMENTS, WHICHEVER IS MORE STRINGENT, ASSUMING EARTH COVER OF 0' - 3', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 LOAD RATING AND BE CAST WITH THE CONTECH LOGO.
5. STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

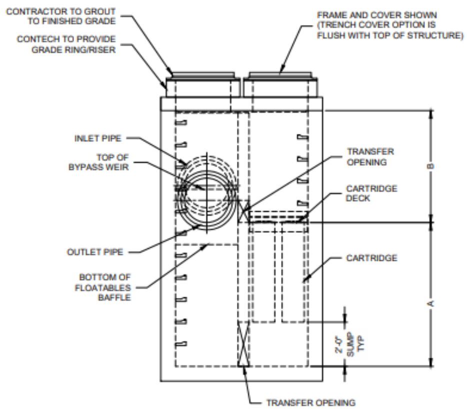
INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. CARTRIDGE INSTALLATION, BY CONTECH, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT CONTECH TO COORDINATE CARTRIDGE INSTALLATION WITH SITE STABILIZATION AT (866) 740-3318.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

JELLYFISH JF10
STANDARD DETAIL
OFFLINE CONFIGURATION



PLAN VIEW
(TOP SLAB NOT SHOWN FOR CLARITY)



ELEVATION VIEW

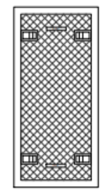
JELLYFISH DESIGN NOTES

JELLYFISH TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE LENGTH AND THE NUMBER OF CARTRIDGES. THE STANDARD PEAK DIVERSION STYLE WITH PRECAST TOP SLAB IS SHOWN. ALTERNATE OFFLINE VAULT AND/OR SHALLOW ORIENTATIONS ARE AVAILABLE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD

CARTRIDGE SELECTION

CARTRIDGE LENGTH	54"	40"	27"	15"
OUTLET INVERT TO STRUCTURE INVERT (A)	6'-6"	5'-4"	4'-3"	3'-3"
FLOW RATE HI-FLO / DRAINDOWN (CFS) (PER CART)	0.178 / 0.089	0.133 / 0.067	0.089 / 0.045	0.049 / 0.025
MAX. TREATMENT (CFS)	1.96	1.47	0.98	0.54
DECK TO INSIDE TOP (MIN) (B)	5.00	4.00	4.00	4.00

FRAME AND COVER
(DIAMETER VARIES)
N.T.S.



24"
TRENCH COVER
(LENGTH VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs)	*
PEAK FLOW RATE (cfs)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
# OF CARTRIDGES REQUIRED (HF / DD)	*
CARTRIDGE LENGTH	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

SEE GENERAL NOTES 6-7 FOR INLET AND OUTLET HYDRAULIC AND SIZING REQUIREMENTS.

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES:
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS REPRESENTATIVE. www.ContechES.com
3. JELLYFISH WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS-20 OR PER APPROVING JURISDICTION REQUIREMENTS, WHICHEVER IS MORE STRINGENT, ASSUMING EARTH COVER OF 0' - 10', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 LOAD RATING AND BE CAST WITH THE CONTECH LOGO.
5. STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-857, ASTM C-918, AND AASHTO LOAD FACTOR DESIGN METHOD.
6. OUTLET PIPE INVERT IS EQUAL TO THE CARTRIDGE DECK ELEVATION.
7. THE OUTLET PIPE DIAMETER FOR NEW INSTALLATIONS IS RECOMMENDED TO BE ONE PIPE SIZE LARGER THAN THE INLET PIPE AT EQUAL OR GREATER SLOPE.
8. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE.
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT).
D. CARTRIDGE INSTALLATION, BY CONTECH, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT CONTECH TO COORDINATE CARTRIDGE INSTALLATION WITH SITE STABILIZATION.

Jellyfish® Filter
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING: U.S. PATENT NO. 8,287,726; 8,221,618; US 8,123,935; OTHER INTERNATIONAL PATENTS PENDING

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

JELLYFISH JFPD0806
STANDARD DETAIL
PEAK DIVERSION CONFIGURATION

APPENDIX E

RIDEM STORMWATER MANAGEMENT PLAN CHECKLIST AND LID PLANNING REPORT

APPENDIX A: STORMWATER MANAGEMENT PLAN CHECKLIST AND LID PLANNING REPORT – STORMWATER DESIGN SUMMARY

PROJECT NAME Comstock Industrial Park	(RIDEM USE ONLY) STW/WQC File #: Date Received:
TOWN Cranston, RI	
BRIEF PROJECT DESCRIPTION: The project proposes development of Plat 36/4 Lot 46 into an industrial site for the loading and unloading of various products in two large warehouses (one 200,000 SF building, one 70,000 SF building). The project also proposes access drives, trailer storage spaces, and employee parking lots. Additionally, the project will include utility connections, stormwater management areas, and various other site upgrades.	

Stormwater Management Plan (SMP) Elements – Minimum Standards

When submitting a SMP,[1] submit four separately bound documents: Appendix A Checklist; Stormwater Site Planning, Analysis and Design Report with Plan Set/Drawings; Soil Erosion and Sediment Control (SESC) Plan, and Post Construction Operations and Maintenance (O&M) Plan. Please refer to Suggestions to Promote Brevity.

Note: **All stormwater construction projects must create a Stormwater Management Plan (SMP). However, not every element listed below is required per the RIDEM Stormwater Rules and the RIPDES Construction General Permit (CGP). This checklist will help identify the required elements to be submitted with an Application for Stormwater Construction Permit & Water Quality Certification.**

PART 1. PROJECT AND SITE INFORMATION

PROJECT TYPE (Check all that apply)

☐ Residential	☐ Commercial	☐ Federal	☐ Retrofit	☐ Restoration
☐ Road	☒ Utility	☒ Fill	☐ Dredge	☐ Mine
☒ Other (specify): Industrial Warehousing				

SITE INFORMATION

☒ Vicinity Map

INITIAL DISCHARGE LOCATION(S): The WQv discharges to: (You may choose more than one answer if several discharge points are associated with the project.)

☐ **Groundwater**	☐ **Surface Water**	☐ **MS4**
☐ GAA	☒ Isolated Wetland	☐ RIDOT
☒ GA	☒ Named Waterbody Meshanticut Brook	☐ RIDOT Alteration Permit is Approved
☐ GB	☐ Unnamed Waterbody Connected to Named Waterbody	☐ Town
		☐ Other (specify):

ULTIMATE RECEIVING WATERBODY LOCATION(S): Include pertinent information that applies to both WQ_v and flow from larger storm events including overflows. Choose all that apply, and repeat table for each waterbody.

☐ Groundwater or Disconnected Wetland	☐ SRWP N/A		
☒ Waterbody Name: Meshanticut Brook	☐ Coldwater	☒ Warmwater	☐ Unassessed
☒ Waterbody ID: RI006017R-02	☐ 4th order stream of pond 50 acres or more N/A		
☒ TMDL for: Enterococcus	☐ Watershed of flood prone river (e.g., Pocasset River) N/A		
☐ Contributes to a priority outfall listed in the TMDL N/A	☐ Contributes stormwater to a public beach N/A		
☒ 303(d) list – Impairment(s) for: metals (Cu, Pb)	☐ Contributes to shellfishing grounds N/A		

[1] Applications for a Construction General Permit that do not require any other permits from RIDEM and will disturb less than 5 acres over the entire course of the project do not need to submit a SMP. The Appendix A checklist must still be submitted.

ULTIMATE RECEIVING WATERBODY LOCATION(S): Include pertinent information that applies to both WQ_v and flow from larger storm events including overflows. Choose all that apply, and repeat table for each waterbody.			
☒ Groundwater or Disconnected Wetland	☐ SRWP N/A		
☐ Waterbody Name: N/A	☐ Coldwater	☐ Warmwater	☐ Unassessed
☐ Waterbody ID: N/A	☐ 4th order stream of pond 50 acres or more N/A		
☐ TMDL for: N/A	☐ Watershed of flood prone river (e.g., Pocasset River) N/A		
☐ Contributes to a priority outfall listed in the TMDL	☐ Contributes stormwater to a public beach N/A		
☐ 303(d) list – Impairment(s) for: N/A	☐ Contributes to shellfishing grounds N/A		

PROJECT HISTORY		
☒ RIDEM Pre- Application Meeting	Meeting Date: 3/23/2022	☒ Minutes Attached
☒ Municipal Master Plan Approval	Approval Date: 12/7/2021	☒ Minutes Attached
☐ Subdivision Suitability Required N/A	Approval #: N/A	
☐ Previous Enforcement Action has been taken on the property	Enforcement #: N/A	

FLOODPLAIN & FLOODWAY See Guidance Pertaining to Floodplain and Floodways	
☐ Riverine 100-year floodplain: **FEMA FLOODPLAIN FIRMETTE** has been reviewed and the 100-year floodplain is on site	
☐ Delineated from FEMA Maps N/A	
NOTE: Per Rule 250-RICR-150-10-8-1.1(B)(5)(d)(3), provide volumetric floodplain compensation calculations for cut and fill/displacement calculated by qualified professional N/A	
☐ Calculated by Professional Engineer N/A	
☐ Calculations are provided for cut vs. fill/displacement volumes proposed within the 100-year floodplain N/A	Amount of Fill (CY): N/A Amount of Cut (CY): N/A
☐ Restrictions or modifications are proposed to the flow path or velocities in a floodway N/A	
☐ Floodplain storage capacity is impacted N/A	
☒ Project area is not within 100-year floodplain as defined by RIDEM	

CRMC JURISDICTION
☐ CRMC Assent required N/A
☐ Property subject to a Special Area Management Plan (SAMP). If so, specify which SAMP: N/A
☐ Sea level rise mitigation has been designed into this project N/A

LUHPPL IDENTIFICATION - MINIMUM STANDARD 8:
1. OFFICE OF Land Revitalization and Sustainable Materials Management (OLRSMM)

	☐ Known or suspected releases of HAZARDOUS MATERIAL are present at the site (Hazardous Material is defined in Rule 1.4(A)(33) of 250-140-30-1 of the RIDEM Rules and Regulations for Investigation and Remediation of Hazardous Materials (the Remediation Regulations)) **N/A**	**RIDEM CONTACT:**
	☐ Known or suspected releases of PETROLEUM PRODUCT are present at the site (Petroleum Product as defined in Rule 1.5(A)(84) of 250-140-25-1 of the RIDEM Rules and Regulations for Underground Storage Facilities Used for Regulated Substances and Hazardous Materials) N/A	
	☐ This site is identified on the RIDEM Environmental Resources Map as one of the following regulated facilities	**SITE ID#**:
	☐ CERCLIS/Superfund (NPL) **N/A**	
	☐ State Hazardous Waste Site (SHWS) **N/A**	
	☐ Environmental Land Usage Restriction (ELUR) **N/A**	
	☐ Leaking Underground Storage Tank (LUST) **N/A**	
	☐ Closed Landfill **N/A**	
Note:	If any boxes in 1 above are checked, the applicant must contact the RIDEM OLRSMM Project Manager associated with the Site to determine if subsurface infiltration of stormwater is allowable for the project. Indicate if the infiltration corresponds to "Red," "Yellow" or "Green" as described in Section 3.2.8 of the RISDISM Guidance (Subsurface Contamination Guidance). Also, note and reference approval in PART 3, Minimum Standard 2: Groundwater Recharge/Infiltration**.**	
2.	**PER MINIMUM STANDARD 8 of RICR 8.14.C.1-6 "LUHPPLS," THE SITE IS/HAS:**	
	☐ Industrial Site with RIPDES MSGP, except where No Exposure Certification exists. http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/status.php N/A	
	☐ Auto Fueling Facility (e.g., gas station) N/A	
	☐ Exterior Vehicles Service, Maintenance, or Equipment Cleaning Area N/A	

	☐ Road Salt Storage and Loading Areas (exposed to rainwater) N/A	
	☐ Outdoor Storage and Loading/Unloading of Hazardous Substances N/A	
3.	**STORMWATER INDUSTRIAL PERMITTING**	
	☐ The site is associated with existing or proposed activities that are considered Land Uses with Higher Potential Pollutant Loads (LUHPPLS) (see RICR 8.14.C) N/A	Activities: Sector:
	☐ Construction is proposed on a site that is subject to THE MULTI-SECTOR GENERAL PERMIT (MSGP) UNDER RULE 31(B)15 OF THE RIPDES REGULATIONS. N/A	MSGP permit #
	☐ Additional stormwater treatment is required by the MSGP Explain: N/A	

REDEVELOPMENT STANDARD – MINIMUM STANDARD 6		
☐ Pre Construction Impervious Area 0.0 acres		
	☐ Total Pre-Construction Impervious Area (**TIA**) 0.00 acres	
	☐ Total Site Area (**TSA**) 17.48 acres	
	☐ Jurisdictional Wetlands (**JW**) 0.81 acres	
	☐ Conservation Land (**CL**) 0.00 acres	
☐ Calculate the Site Size (defined as contiguous properties under same ownership)		
	☐ Site Size (**SS**) = (**TSA**) – (**JW**) – (**CL**) 17.48 – 0.81 – 0.00 = 16.67 acres	
	☐ (**TIA**) / (**SS**) = 0.00 acres / 16.67 acres = 0.00	☐ (**TIA**) / (**SS**) >**0.4**? NO
☐ YES, Redevelopment N/A		

PART 2. LOW IMPACT DEVELOPMENT ASSESSMENT – MINIMUM STANDARD 1

(NOT REQUIRED FOR REDEVELOPMENT OR RETROFITS)

This section may be deleted if not required.

Note: A written description must be provided specifying why each method is not being used or is not applicable at the Site. Appropriate answers may include:

- Town requires … (state the specific local requirement)
- Meets Town's dimensional requirement of …
- Not practical for site because …
- Applying for waiver/variance to achieve this (pending/approved/denied)
- Applying for wavier/variance to seek relief from this (pending/approved/denied)

A) PRESERVATION OF UNDISTURBED AREAS, BUFFERS, AND FLOODPLAINS	**IF NOT IMPLEMENTED, EXPLAIN HERE**
☒ Sensitive resource areas and site constraints are identified (required) ☒ Local development regulations have been reviewed (required) ☒ All vegetated buffers and coastal and freshwater wetlands will be protected during and after construction ☒ Conservation Development or another site design technique has been incorporated to protect open space and pre-development hydrology. **Note:** If Conservation Development has been used, check box and skip to Subpart C ☒ As much natural vegetation and pre-development hydrology as possible has been maintained	

B) LOCATE DEVELOPMENT IN LESS SENSITIVE AREAS AND WORK WITH THE NATURAL LANDSCAPE CONDITIONS, HYDROLOGY, AND SOILS ☒ Development sites and building envelopes have been appropriately distanced from wetlands and waterbodies ☒ Development and stormwater systems have been located in areas with greatest infiltration capacity (e.g., soil groups A and B) ☒ Plans show measures to prevent soil compaction in areas designated as Qualified Pervious Areas (QPA's) ☒ Development sites and building envelopes have been positioned outside of floodplains ☒ Site design positions buildings, roadways and parking areas in a manner that avoids impacts to surface water features ☒ Development sites and building envelopes have been located to minimize impacts to steep slopes (≥15%) ☐ Other (describe):	
C) MINIMIZE CLEARING AND GRADING ☒ Site clearing has been restricted to minimum area needed for building footprints, development activities, construction access, and safety. ☒ Site has been designed to position buildings, roadways, and parking areas in a manner that minimizes grading (cut and fill quantities) ☒ Protection for stands of trees and individual trees and their root zones to be preserved has been specified, and such protection extends at least to the tree canopy drip line(s) ☒ Plan notes specify that public trees removed or damaged during construction shall be replaced with equivalent	
D) REDUCE IMPERVIOUS COVER ☐ Reduced roadway widths (≤22 feet for ADT ≤ 400; ≤ 26 feet for ADT 400 - 2,000) Wider roadway widths are needed to accommodate the turning movements of WB-67 tractor trailers ☐ Reduced driveway areas (length minimized via reduced ROW width (≤ 45 ft.) and/or reduced (or absolute minimum) front yard setback; width minimized to ≤ 9 ft. wide one lane; ≤ 18 ft. wide two lanes; shared driveways; pervious surface) In addition to setbacks, there are various other site constraints (i.e. wetlands) that dictate the location of buildings, drives, walks, etc. ☒ Reduced building footprint: Explain approach: The proposed building footprints are sized to fit the program needs for moderate hazard storage (S-1) & office (B) accessory area. ☐ Reduced sidewalk area (≤ 4 ft. wide; one side of the street; unpaved path; pervious surface) ☐ Reduced cul-de-sacs (radius < 45 ft; vegetated island; alternative turn-around) N/A ☒ Reduced parking lot area: Explain approach Parking lots are sized to meet the required number of spaces per local requirements ☐ Use of pervious surfaces for driveways, sidewalks, parking areas/overflow parking areas, etc. Pervious surfaces for driveways, parking areas, etc. are not suitable for the site's traffic ☒ Minimized impervious surfaces (project meets or is less than maximum specified by Zoning Ordinance) Impervious surfaces have been minimized to the greatest extent possible ☐ Other (describe):	
E) DISCONNECT IMPERVIOUS AREA ☒ Impervious surfaces have been disconnected, and runoff has been diverted to QPAs to the maximum extent possible ☐ Residential street edges allow side-of-the-road drainage into vegetated open swales N/A ☐ Parking lot landscaping breaks up impervious expanse AND accepts runoff ☒ Other (describe): the site has been designed to capture and treat all of the runoff from impervious areas	
F) MITIGATE RUNOFF AT THE POINT OF GENERATION ☒ Small-scale BMPs have been designated to treat runoff as close as possible to the source	

G) PROVIDE LOW-MAINTENANCE NATIVE VEGETATION ☒ Low-maintenance landscaping has been proposed using native species and cultivars ☒ Plantings of native trees and shrubs in areas previously cleared of native vegetation are shown on site plan ☐ Lawn areas have been limited/minimized, and yards have been kept undisturbed to the maximum extent practicable on residential lots N/A	
H) RESTORE STREAMS/WETLANDS ☒ Historic drainage patterns have been restored by removing closed drainage systems, daylighting buried streams, and/or restoring degraded stream channels and/or wetlands ☒ Removal of invasive species ☐ Other	

PART 3. SUMMARY OF REMAINING STANDARDS

GROUNDWATER RECHARGE – MINIMUM STANDARD 2		
YES	**NO**	
☒	☐	The project has been designed to meet the groundwater recharge standard.
☐	☐	If "No," the justification for groundwater recharge criterion waiver has been explained in the Narrative (e.g., threat of groundwater contamination or physical limitation), if applicable (see RICR 8.8.D); N/A
☐	☐	Your waiver request has been explained in the Narrative, if applicable. N/A
☐	☒	Is this site identified as a Regulated Facility in Part 1, Minimum Standard 8: LUHPPL Identification?
☐	☐	If "Yes," has approval for infiltration by the OLRSMM Site Project Manager, per Part 1, Minimum Standard 8, been requested? N/A

TABLE 2-1: Summary of Recharge (see RISDISM Section 3.3.2)
(Add or Subtract Rows as Necessary)

Design Point	Impervious Area Treated (sq ft)	Total Re_v Required (cu ft)	LID Stormwater Credits (see RISDISM Section 4.6.1)	Recharge Required by Remaining BMPs (cu ft)	Recharge Provided by BMPs (cu ft)
			Portion of Re_v directed to a QPA (cu ft)		
DP-1: Bioretention Area 1	73,616	2,435	0	2,435	6,153
DP-2: Bioretention Area 2	53,143	524	0	524	4,837
DP-3: Bioretention Area 3	330,185	4,527	0	4,527	28,143
DP-4:					
TOTALS:					

Notes:
1. Only BMPs listed in RISDISM Table 3-5 "List of BMPs Acceptable for Recharge" may be used to meet the recharge requirement.
2. Recharge requirement must be satisfied for each waterbody ID.

☒ Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.): Stormwater Management Report Appendix D

WATER QUALITY – MINIMUM STANDARD 3		
YES	**NO**	
☒	☐	Does this project meet or exceed the required water quality volume WQv (see RICR 8.9.E-I)?
☒	☐	Is the proposed final impervious cover greater than 20% of the disturbed area (see RICR 8.9.E-I)?
☐	☐	If "Yes," either the Modified Curve Number Method or the Split Pervious/Impervious method in Hydro-CAD was used to calculate WQv; or,
☒	☐	If "Yes," either TR-55 or TR-20 was used to calculate WQv; and,
☐	☐	If "No," the project meets the minimum WQv of 0.2 watershed inches over the entire disturbed area.
☐	☐	Not Applicable
☒	☐	Does this project meet or exceed the ability to treat required water quality flow WQf (see RICR 8.9.I.1-3)?
☒	☐	Does this project propose an increase of impervious cover to a receiving water body with impairments? If "Yes," please indicate below the method that was used to address the water quality requirements of no further degradation to a low-quality water. The site proposes bioretention areas with infiltration 3' above seasonal high groundwater. Additionally, pre-treatment will be provided with the use of a dry swale, sediment forebays and proprietary treatment units (CDS).
☐	☒	RICR 8.36. A Pollutant Loading Analysis is needed and has been completed. N/A
☒	☐	The Water Quality Guidance Document (Water Quality Goals and Pollutant Loading Analysis Guidance for Discharges to Impaired Waters) has been followed as applicable.
☐	☒	BMPs are proposed that are on the approved technology list . If "Yes," please provide all required worksheets from the manufacturer. CDS units are proposed for pre-treatment
☐	☒	Additional pollutant-specific requirements and/or pollutant removal efficiencies are applicable to the site as the result of a TMDL, SAMP, or other watershed-specific requirements. If "Yes," please describe:

TABLE 3-1: Summary of Water Quality (see RICR 8.9)

Design Point and WB ID	Impervious area treated (sq ft)	Total WQ_v Required (cu ft)	LID Stormwater Credits (see RICR 8.18) WQv directed to a QPA (cu ft)	Water Quality Treatment Remaining (cu ft)	Water Quality Provided by BMPs (cu ft)
DP-1: Bioretention Area 1	73,616	6,135	0	6,135	6,153
DP-2: Bioretention Area 2	53,143	4,429	0	4,429	4,837
DP-3: Bioretention Area 3	330,185	27,515	0	27,515	28,143
DP-4:					
TOTALS:					

Notes:
1. Only BMPs listed in RICR 8.20 and 8.25 or the Approved Technologies List of BMPs is Acceptable for Water Quality treatment.
2. For each Design Point, the Water Quality Volume Standard must be met for each Waterbody ID.

☒ YES ☐ NO	This project has met the setback requirements for each BMP. If "No," please explain:

☐ Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.): Stormwater Management Report Appendix D.

CONVEYANCE AND NATURAL CHANNEL PROTECTION (RICR 8.10) – MINIMUM STANDARD 4		
YES	**NO**	
☐	☒	Is this standard waived? If "Yes," please indicate one or more of the reasons below:
		☐ The project directs discharge to a large river (i.e., 4th-order stream or larger. See RISDISM Appendix I for State-wide list and map of stream orders), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters. ☐ The project is a small facility with impervious cover of less than or equal to 1 acre. ☐ The project has a post-development peak discharge rate from the facility that is less than 2 cfs for the 1-year, 24-hour Type III design storm event (prior to any attenuation). (Note: LID design strategies can greatly reduce the peak discharge rate).
☒	☐	Conveyance and natural channel protection for the site have been met. If "No,' explain why:

TABLE 4-1: Summary of Channel Protection Volumes (see RICR 8.10)					
Design Point	**Receiving Water Body Name**	**Coldwater Fishery? (Y/N)**	**Total CPv Required (cu ft)**	**Total CPv Provided (cu ft)**	**Average Release Rate Modeled in the 1-yr storm (cfs)**
DP-1: Bioretention Area 1	Meshanticut Brook	N	3,737	6,153	0.62
DP-2: Bioretention Area 2	Meshanticut Brook	N	2,520	4,837	1.34
DP-3: Bioretention Area 3	Isolated Wetland	N	21,405	28,143	5.06
DP-4:					
TOTALS:					
Note: The Channel Protection Volume Standard must be met in each waterbody ID.					
☒ YES ☐ NO	The CPv is released at roughly a uniform rate over a 24-hour duration (see examples of sizing calculations in Appendix D of the RISDISM).				
☐ YES ☒ NO	Do additional design restrictions apply resulting from any discharge to cold-water fisheries; If "Yes," please indicate restrictions and solutions below.				
☐ Indicate below where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.). Stormwater Management Report Appendix D					

OVERBANK FLOOD PROTECTION (RICR 8.11) AND OTHER POTENTIAL HIGH FLOWS – MINIMUM STANDARD 5			
YES	**NO**		
☐	☒	Is this standard waived? If yes, please indicate one or more of the reasons below:	
		☐	The project directs discharge to a large river (i.e., 4th-order stream or larger. See Appendix I for state-wide list and map of stream orders), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters.
		☐	A Downstream Analysis (see RICR 8.11.D and E) indicates that peak discharge control would not be beneficial or would exacerbate peak flows in a downstream tributary of a particular site (e.g., through coincident peaks).
☐	☒	Does the project flow to an MS4 system or subject to other stormwater requirements? If "Yes," indicate as follows:	
		☐	RIDOT
		☐	Other (specify):
Note: The project could be approved by RIDEM but not meet RIDOT or Town standards. RIDOT's regulations indicate that post-volumes must be **less** than pre-volumes for the 10-yr storm at the design point entering the RIDOT system. If you have not already received approval for the discharge to an MS4, please explain below your strategy to comply with RIDEM and the MS4.			
		Indicate below which model was used for your analysis. ☐ TR-55 ☒ TR-20 ☒ HydroCAD ☐ Bentley/Haestad ☐ Intellisolve ☐ Other (Specify):	
YES	**NO**		
☒	☐	Does the drainage design demonstrate that flows from the 100-year storm event through a BMP will safely manage and convey the 100-year storm? If "No," please explain briefly below and reference where in the application further documentation can be found (i.e., name of report/document, page numbers, appendices, etc.):	
☐	☒	Do off-site areas contribute to the sub-watersheds and design points? If "Yes,"	
☐	☐	Are the areas modeled as "present condition" for both pre- and post-development analysis?	
☐	☐	Are the off-site areas shown on the subwatershed maps?	
☒	☐	Does the drainage design confirm safe passage of the 100-year flow through the site for off-site runoff?	
☐	☒	Is a Downstream Analysis required (see RICR 8.11.E.1)?	
☒	☐	Calculate the following:	
		☐	Area of disturbance within the sub-watershed (areas) 17.48
		☐	Impervious cover (%) 74.2
☐	☒	Is a dam breach analysis required (earthen embankments over six (6) feet in height, or a capacity of 15 acre-feet or more, and contributes to a significant or high hazard dam)?	
☒	☐	Does this project meet the overbank flood protection standard?	

Table 5-1 Hydraulic Analysis Summary								
Subwatershed (Design Point)	**1.2" Peak Flow** (cfs) **		**1-yr Peak Flow** (cfs)		**10-yr Peak Flow** (cfs)		**100-yr Peak Flow** (cfs)	
	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
DP-1: Flow to Comstock Parkway	0.00	0.05	0.08	0.13	0.43	0.24	0.96	0.37
DP-2: Flow to Northern Wetlands	0.14	0.12	4.36	2.71	13.94	9.14	26.87	23.5
DP-3: Flow to Southern Wetlands	0.45	0.39	7.02	7.43	20.34	17.71	37.61	32.57
DP-4:								
TOTALS:								

** Utilize modified curve number method or split pervious /impervious method in HydroCAD.

Note: The hydraulic analysis must demonstrate no impact to each individual subwatershed DP unless each DP discharges to the same wetland or water resource.

Indicate as follows where the pertinent calculations and/or information for the items above are provided	**Name of report/document, page numbers, appendices, etc.**
Existing conditions analysis for each subwatershed, including curve numbers, times of concentration, runoff rates, volumes, and water surface elevations showing methodologies used and supporting calculations.	Stormwater Report Appendix A
Proposed conditions analysis for each subwatershed, including curve numbers, times of concentration, runoff rates, volumes, water surface elevations, and routing showing the methodologies used and supporting calculations.	Stormwater Report Appendix B
Final sizing calculations for structural stormwater BMPs, including contributing drainage area, storage, and outlet configuration.	Stormwater Report Appendix D
Stage-storage, inflow and outflow hydrographs for storage facilities (e.g., detention, retention, or infiltration facilities).	Stormwater Report Appendix A, B

Table 5-2 Summary of Best Management Practices											
BMP ID	**DP #**	**BMP Type** (e.g., bioretention, tree filter)	**BMP Functions**					**Bypass Type**	**Horizontal Setback Criteria are met per RICR 8.21.B.10, 8.22.D.11, and 8.35.B.4**		
			Pre-Treatment (Y/N/NA)	Re_v (cf)	WQ_v (cf)	CP_v (Y/N/NA)	Overbank Flood Reduction (Y/N/NA)	External (E) Internal (I) or NA	Yes/No	Technical Justification (Design Report page number)	Distance Provided
BA1	2	Bioretention	Y	6,153	6,153	Y	Y	NA	Y		172' to Bldg 1
BA2	2	Bioretention	Y	4,837	4,837	Y	Y	NA	Y		129' to Bldg 1
BA3	3	Bioretention	Y	28,143	28,143	Y	Y	NA	N		7' to Bldg 1
		TOTALS:		39,133	39,133	Y	Y	NA	-		

Table 5.3 Summary of Soils to Evaluate Each BMP									
DP #	BMP ID	BMP Type (e.g., bioretention, tree filter)	Soils Analysis for Each BMP						
			Test Pit ID# and Ground Elevation		SHWT Elevation (ft)	Bottom of Practice Elevation* (ft)	Separation Distance Provided (ft)	Hydrologic Soil Group (A, B, C, D)	Exfiltration Rate Applied (in/hr)
			Primary	Secondary					
2	BA1	Bioretention	Test Pit 1	-	327	337	10	D	1.02
2	BA2	Bioretention	Test Pit 2	-	330	337	7	D	1.02
3	BA3	Bioretention	Test Pit 3	-	331	337	6	B/D	1.02
3	UDS	Bioretention	Test Pit 4	-	324	332.50	8.50	D	1.02
		TOTALS:							

* For underground infiltration systems (UICs) bottom equals bottom of stone, for surface infiltration basins bottom equals bottom of basin, for filters bottom equals interface of storage and top of filter layer

LAND USES WITH HIGHER POTENTIAL POLLUTANTS LOADS (LUHPPLs) – MINIMUM STANDARD 8			
YES	**NO**	**N/A**	
☐	☐	☒	Describe any LUHPPLs identified in Part 1, Minimum Standard 8, Section 2. If not applicable, continue to Minimum Standard 9.
☐	☐	☐	Are these activities already covered under an MSGP? If "No," please explain if you have applied for an MSGP or intend to do so?
☐	☐	☐	List the specific BMPs that are proposed for this project that receive stormwater from LUHPPL drainage areas. These BMP types must be listed in RISDISM Table 3-3, "Acceptable BMPs for Use at LUHPPLs." Please list BMPs:
☐	☐	☐	Additional BMPs, or additional pretreatment BMP's if any, that meet RIPDES MSGP requirements; Please list BMPs:
			Indicate below where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.).

ILLICIT DISCHARGES – MINIMUM STANDARD 9			
Illicit discharges are defined as unpermitted discharges to Waters of the State that do not consist entirely of stormwater or uncontaminated groundwater, except for certain discharges identified in the RIPDES Phase II Stormwater General Permit.			
YES	**NO**	**N/A**	
☒	☐	☐	Have you checked for illicit discharges?
☐	☒	☐	Have any been found and/or corrected? If "Yes," please identify.
☒	☐	☐	Does your report explain preventative measures that keep non-stormwater discharges out of the Waters of the State (during and after construction)?

SOIL EROSION AND SEDIMENT CONTROL (SESC) – MINIMUM STANDARD 10				
YES	**NO**	**N/A**		
☒	☐	☐	Have you included a Soil Erosion and Sediment Control Plan Set and/or Complete Construction Plan Set?	
☒	☐	☐	Have you provided a **separately-bound** document based upon the SESC Template? If yes, proceed to Minimum Standard 11 (the following items can be assumed to be addressed).	
			If "No," include a document with your submittal that addresses the following elements of an SESC Plan:	
			☐	Soil Erosion and Sediment Control Plan Project Narrative, including a description of how the fifteen (15) Performance Criteria have been met:
			☐	Provide Natural Buffers and Maintain Existing Vegetation
			☐	Minimize Area of Disturbance
			☐	Minimize the Disturbance of Steep Slopes
			☐	Preserve Topsoil
			☐	Stabilize Soils
			☐	Protect Storm Drain Inlets
			☐	Protect Storm Drain Outlets
			☐	Establish Temporary Controls for the Protection of Post-Construction Stormwater Control Measures
			☐	Establish Perimeter Controls and Sediment Barriers
			☐	Divert or Manage Run-On from Up-Gradient Areas
			☐	Properly Design Constructed Stormwater Conveyance Channels
			☐	Retain Sediment On-Site
			☐	Control Temporary Increases in Stormwater Velocity, Volume, and Peak Flows
			☐	Apply Construction Activity Pollution Prevention Control Measures
			☐	Install, Inspect, and Maintain Control Measures and Take Corrective Actions
			☐	Qualified SESC Plan Preparer's Information and Certification
			☐	Operator's Information and Certification; if not known at the time of application, the Operator must certify the SESC Plan upon selection and prior to initiating site activities
			☐	Description of Control Measures, such as Temporary Sediment Trapping and Conveyance Practices, including design calculations and supporting documentation, as required

STORMWATER MANAGEMENT SYSTEM OPERATION, MAINTENANCE, AND POLLUTION PREVENTION PLAN – MINIMUM STANDARDS 7 AND 9		
Operation and Maintenance Section		
YES	**NO**	
☒	☐	Have you minimized all sources of pollutant contact with stormwater runoff, to the maximum extent practicable?
☒	☐	Have you provided a **separately-bound** Operation and Maintenance Plan for the site and for all of the BMPs, and does it address each element of RICR 8.17 and RISDISM Appendix C and E?
☒	☐	Lawn, Garden, and Landscape Management meet the requirements of RISDISM Section G.7? If "No," why not?
☒	☐	Is the property owner or homeowner's association responsible for the stormwater maintenance of all BMP's? If "No," you must provide a legally binding and enforceable maintenance agreement (see RISDISM Appendix E, page 26) that identifies the entity that will be responsible for maintenance of the stormwater. Indicate where this agreement can be found in your report (i.e., name of report/document, page numbers, appendices, etc.).
☐	☒	Do you anticipate that you will need legal agreements related to the stormwater structures? (e.g. off-site easements, deed restrictions, covenants, or ELUR per the Remediation Regulations). If "Yes," have you obtained them? Or please explain your plan to obtain them:

☐	☒	Is stormwater being directed from public areas to private property? If "Yes," note the following: Note: This is not allowed unless a funding mechanism is in place to provide the finances for the long-term maintenance of the BMP and drainage, or a funding mechanism is demonstrated that can guarantee the long-term maintenance of a stormwater BMP by an individual homeowner.
Pollution Prevention Section		
☒	☐	Designated snow stockpile locations?
☒	☐	Trash racks to prevent floatables, trash, and debris from discharging to Waters of the State?
☒	☐	Asphalt-only based sealants?
☐	☒	Pet waste stations? (Note: If a receiving water has a bacterial impairment, and the project involves housing units, then this could be an important part of your pollution prevention plan). N/A
☒	☐	Regular sweeping? Please describe: Pavement sweeping required twice per year
☐	☒	De-icing specifications, in accordance with RISDISM Appendix G. (NOTE: If the groundwater is GAA, or this area contributes to a drinking water supply, then this could be an important part of your pollution prevention plan).
☐	☒	A prohibition of phosphate-based fertilizers? (Note: If the site discharges to a phosphorus impaired waterbody, then this could be an important part of your pollution prevention plan).

PART 4. SUBWATERSHED MAPPING AND SITE-PLAN DETAILS

Existing and Proposed Subwatershed Mapping (REQUIRED)			
YES	**NO**		
☒	☐		Existing and proposed drainage area delineations
☒	☐		Locations of all streams and drainage swales
☒	☐		Drainage flow paths, mapped according to the DEM *Guidance for Preparation of Drainage Area Maps* (included in RISDISM Appendix K)
☒	☐		Complete drainage area boundaries; include off-site areas in both mapping and analyses, as applicable
☒	☐		Logs of borings and/or test pit investigations along with supporting soils/geotechnical report
☒	☐		Mapped seasonal high-water-table test pit locations
☒	☐		Mapped locations of the site-specific borings and/or test pits and soils information from the test pits at the locations of the BMPs
☒	☐		Mapped locations of the BMPs, with the BMPs consistently identified on the Site Construction Plans
☐	☒		Mapped bedrock outcrops adjacent to any infiltration BMP
☐	☐		Soils were logged by a:
		☒	DEM-licensed Class IV soil evaluator Name: Chris Sutter
		☐	RI-registered P.E. Name:

Subwatershed and Impervious Area Summary				
Subwatershed (area to each design point)	**First Receiving Water ID or MS4**	**Area Disturbed (units)**	**Existing Impervious (units)**	**Proposed Impervious (units)**
DP-1: Flow to Comstock Pwy	MS4	0.05 acres	0.00 acres	0.05 acres
DP-2: Flow to North Wetland	Meshanticut Brook	5.66 acres	0.00 acres	4.09 acres
DP-3: Flow to South Wetland	Isolated Wetland	11.77 acres	0.00 acres	8.84 acres
DP-4:				
TOTALS:		17.48 acres	0.00 acres	12.98 acres

Site Construction Plans (Indicate that the following applicable specifications are provided)		
YES	**NO**	
☒	☐	Existing and proposed plans (scale not greater than 1" = 40') with North arrow
☒	☐	Existing and proposed site topography (with 1 or 2-foot contours); 10-foot contours accepted for off-site areas
☒	☐	Boundaries of existing predominant vegetation and proposed limits of clearing
☒	☐	Site Location clarification
☒	☐	Location and field-verified boundaries of resource protection areas such as: ▸ freshwater and coastal wetlands, including lakes and ponds ▸ coastal shoreline features Perennial and intermittent streams, in addition to Areas Subject to Storm Flowage (ASSFs)
☒	☐	All required setbacks (e.g., buffers, water-supply wells, septic systems)
☒	☐	Representative cross-section and profile drawings, and notes and details of structural stormwater management practices and conveyances (i.e., storm drains, open channels, swales, etc.), which include: ▸ Location and size of the stormwater treatment practices (type of practice, depth, area). Stormwater treatment practices (BMPs) must have labels that correspond to RISDISM Table 5-2; ▸ Design water surface elevations (applicable storms); ▸ Structural details of outlet structures, embankments, spillways, stilling basins, grade-control structures, conveyance channels, etc.; ▸ Existing and proposed structural elevations (e.g., inverts of pipes, manholes, etc.); ▸ Location of floodplain and, if applicable, floodway limits and relationship of site to upstream and downstream properties or drainage that could be affected by work in the floodplain; ▸ Planting plans for structural stormwater BMPs, including species, size, planting methods, and maintenance requirements of proposed planting
☒	☐	Logs of borings and/or test pit investigations along with supporting soils/geotechnical report and corresponding water tables
☐	☒	Mapping of any OLRSMM-approved remedial actions/systems (including ELURs)
☒	☐	Location of existing and proposed roads, buildings, and other structures including limits of disturbance; ▸ Existing and proposed utilities (e.g., water, sewer, gas, electric) and easements; ▸ Location of existing and proposed conveyance systems, such as grass channels, swales, and storm drains, and location(s) of final discharge point(s) (wetland, waterbody, etc.); ▸ Cross sections of roadways, with edge details such as curbs and sidewalks; ▸ Location and dimensions of channel modifications, such as bridge or culvert crossings
☐	☒	Locations, cross sections, and profiles of all stream or wetland crossings and their method of stabilization

APPENDIX F

TEST HOLE DATA

Alfred Benesch & Company
120 Hebron Avenue, 2nd Floor
Glastonbury, CT 06033
www.benesch.com
P 860-633-8341
F 860-633-1068

Field Observation Report

Comstock Industrial Park

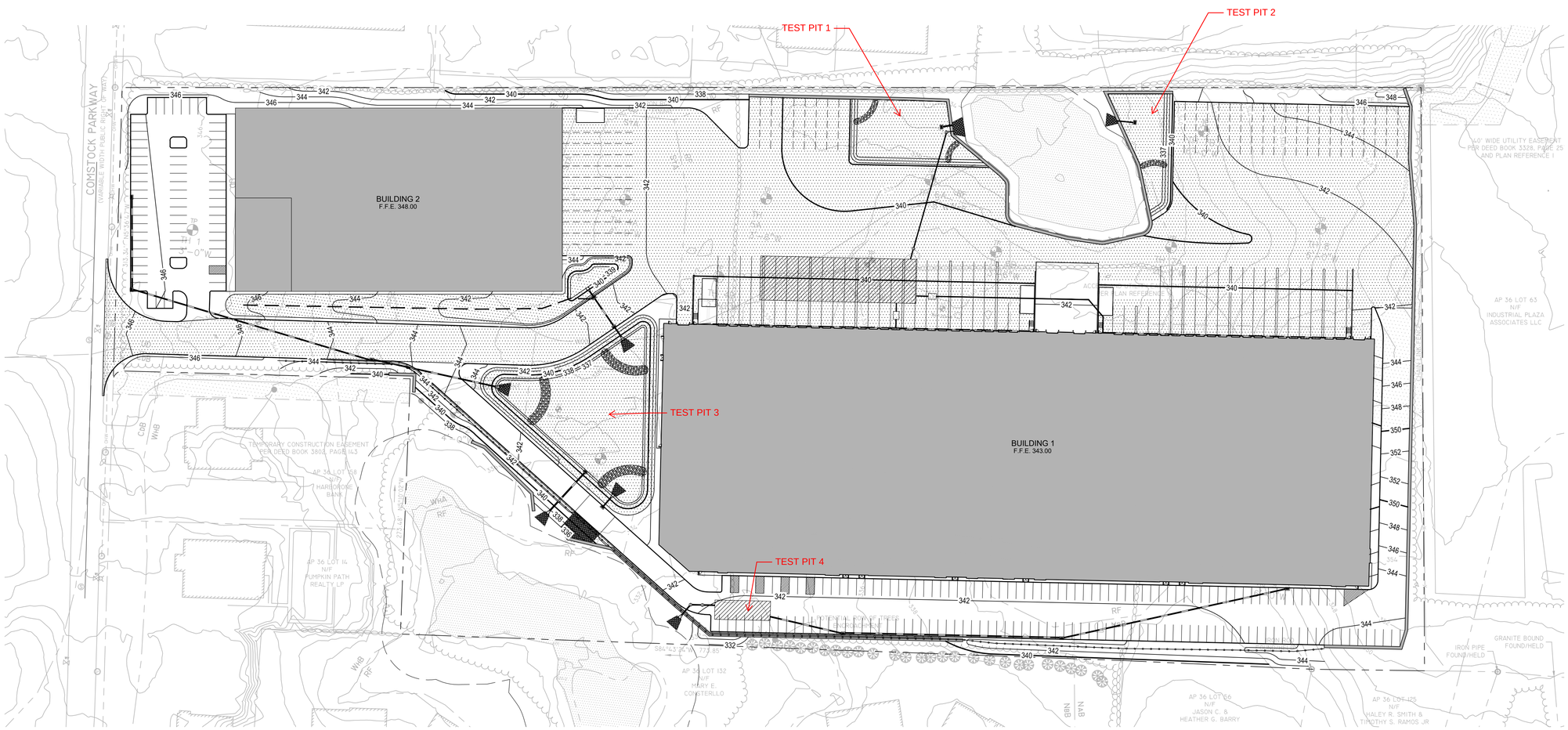
Cranston, RI
Job # 70753.00

ISSUED BY:	John Oliveto, PE Project Engineer
DATE:	June 13, 2022
WEATHER:	Mostly Sunny 72°
LOCATION:	Plat 36 Lot 46, Comstock Parkway, Cranston RI

On Site:
John Oliveto – Alfred Benesch & Company (Benesch)
John Walsh – West Passage Capital
Henry – D'Libro Excavating, Inc.
Josh – D'Libro Excavating, Inc.

General Observations:

Benesch visited the site on Monday June 13, 2022, at approximately 8:30 am and were accompanied by the owner and developer, John Walsh, as well as two individuals from D'libro Excavating, Henry and Josh, who excavated the test pits. The purpose of this field visit was to perform test pits in the proximity of the proposed bioretention areas for Comstock Industrial Park and to determine the depth to seasonal high groundwater. The individual observations are as follows:



GRADING AND DRAINAGE LEGEND

- SPOT GRADE — 343.00
- MAJOR CONTOUR — 340
- MINOR CONTOUR — 342
- DRAINAGE PIPE
- WETLAND BUFFER
- UNDERGROUND DETENTION CHAMBERS
- BIORETENTION AREA
- RETAINING WALL
- SURFACE DRAINAGE FLOW ARROW
- CATCH BASIN — 'CL' / 'C' / DOUBLE GRATE 'CL'

GRADING NOTES:

1. PROPOSED GRADES INDICATE DESIGN INTENT. VERIFY ELEVATIONS AND MAKE ADJUSTMENTS TO MEET FIELD CONDITIONS. DO NOT PROCEED WITH ANY ADJUSTMENT OR FIELD MODIFICATION UNTIL APPROVED BY THE ENGINEER.
2. GRADE TRANSITION BETWEEN TOPOGRAPHIC LINES AND SPOT GRADES SHALL BE UNIFORM UNLESS OTHERWISE INDICATED.
3. MAXIMUM LANDSCAPE SLOPES SHALL BE 2(H):1(V) UNLESS OTHERWISE INDICATED.
4. ALL NEW UTILITY STRUCTURES SHALL BE INSTALLED WITH TOPS, RIMS, FRAMES, GRATES, AND COVERS (AS APPLICABLE) TO FINAL GRADE IN A FLUSH CONDITION.

DRAINAGE NOTES:

1. CONTRACTOR IS RESPONSIBLE TO ENSURE THAT PROPER STORM DRAINAGE IS MAINTAINED THROUGHOUT CONSTRUCTION AND SHALL MAINTAIN ALL EXISTING AND NEW UTILITIES IN GOOD WORKING ORDER AND SHALL PROTECT THEM AT ALL TIMES UNTIL THE WORK IS COMPLETED AND ACCEPTED.
2. FUNCTIONAL COMPLETION OF STORM WATER DETENTION SYSTEMS AND STRUCTURES SHALL PRECEDE SITE DEVELOPMENT OF AREAS, ROADS, OR LOTS CONTRIBUTING TO THESE SYSTEMS.

STORM SEWER

1. EACH BUILDING TO RECEIVE 8" HDPE ROOF LEADER COLLECTION PIPE WITH A MINIMUM 0.5% SLOPE AND 2 FT OF COVER UNLESS OTHERWISE NOTED.
2. CONTRACTOR IS RESPONSIBLE TO ENSURE ADEQUATE SIZING OF MANHOLES TO ACCEPT PROPOSED PIPES.
3. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH APPLICABLE STANDARDS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DEWATERING DURING THE EXECUTION OF HIS WORK.
5. THE LOCATION OF EXISTING UNDERGROUND UTILITIES IS DEVELOPED FROM THE BEST AVAILABLE INFORMATION. THE ACTUAL LOCATION OF EXISTING UTILITIES SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO THE START OF EXCAVATION ACTIVITIES.
6. AT THE CONCLUSION OF THE WORK, CONTRACTOR SHALL REMOVE ALL ACCUMULATED SEDIMENT MATERIAL FROM ALL PORTIONS OF THE STORM DRAINAGE SYSTEM.
7. ALL STORM DRAINAGE COMPONENTS (STORMWATER DETENTION SYSTEMS AND PROPRIETARY UNITS) SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
8. ALL NEW UTILITY STRUCTURES SHALL BE INSTALLED WITH TOPS, RIMS, FRAMES, GRATS, AND COVERS (AS APPLICABLE) TO FINAL GRADE IN A FLUSH CONDITION.

UNDERGROUND DETENTION

1. ALL LAYERS OF LOAM SHALL BE REMOVED BENEATH THE UNDERGROUND DETENTION SYSTEMS AND REPLACED WITH ASTM C-33 CONCRETE SAND.

ACCESSIBILITY NOTES:

1. SLOPES ALONG THE ACCESSIBLE ROUTE SHALL BE LESS THAN 1:20 (5%) AND THE CROSS SLOPES SHALL NOT EXCEED 1:50 (2%). CHANGES IN LEVELS SHALL NOT BE GREATER THAN $\frac{1}{4}$ INCH.
2. SLOPES ALONG THE HANDICAP ACCESSIBLE RAMP SHALL NOT EXCEED 1:12 (8.3%) AND THE CROSS SLOPE SHALL NOT EXCEED 1:50 (2%). CHANGES IN LEVEL SHALL NOT BE GREATER THAN $\frac{1}{4}$ INCH.
3. LANDINGS SHALL NOT HAVE A SLOPE GREATER THAN 1:50 (2%) IN ANY DIRECTION.
4. SLOPES WITHIN THE HANDICAP PARKING SPACE SHALL NOT EXCEED 1:50 (2%) IN ANY DIRECTION.

	MAINTENANCE MEASURE	ACTIVITY	SCHEDULE
BIORETENTION AREAS, SEDIMENT FOREBAYS AND DRY SWALE	1	• INSPECT FOR DAMAGE • NOTE SIGNS OF HYDROCARBON BUILDUP, AND REMOVE IF DETECTED • MONITOR FOR SEDIMENT ACCUMULATION • EXAMINE TO ENSURE THAT INLET AND OUTLET DEVICES ARE FREE OF DEBRIS	ANNUALLY
	2	• REPAIR UNDERCUT OR ERODED AREAS	AS-NEEDED MAINTENANCE
	3	• CLEAN AND REMOVE DEBRIS FROM INLET AND OUTLET STRUCTURES • MOW SIDES AND BOTTOM SEEDMIX	SPRING AND FALL
	4	• REMOVE SEDIMENT WHEN THE VOLUME HAS BEEN SIGNIFICANTLY REDUCED OR WHEN SIGNIFICANT ALGAL GROWTH IS OBSERVED	10-YEAR MAINTENANCE
CATCH BASIN	5	• INSPECT AND CLEAN WHEN THE SUMP IS HALF FULL OF SILT AND/OR DEBRIS	SEMI-ANNUALLY
OUTLET PROTECTION	6	• INSPECT FOR SEDIMENT AND DEBRIS BUILDUP AND REMOVE AS NECESSARY • ENSURE STRUCTURAL INTEGRITY OF RIPRAP HAS NOT BEEN COMPROMISED BY DISCHARGE • REPAIR OR REPLACE RIPRAP AS NECESSARY	SEMI-ANNUALLY
UNDERGROUND DETENTION	7	• USING THE INSPECTION PORTS, INSPECT FOR SEDIMENT ACCUMULATION AND REMOVE VIA HYDROVAC IF NECESSARY	ANNUALLY
HYDRODYNAMIC SEPARATOR	8	• INSPECT AND MAINTAIN PER MANUFACTURER'S RECOMMENDATIONS	ANNUALLY

Prepared by:

benesch

Alfred Benesch & Company
120 Hebron Avenue, 2nd Floor
Glastonbury, Connecticut 06033
860-633-8341

Prepared for:

Comstock Industrial, LLC
36 Sherwood Place
Greenwich, Connecticut 06830
203-292-1850

COMSTOCK INDUSTRIAL PARK COMSTOCK PARKWAY

CRANSTON, RI

PLAT 36/ 4 LOT 46

DATE:	REVISION:

KEY PLAN

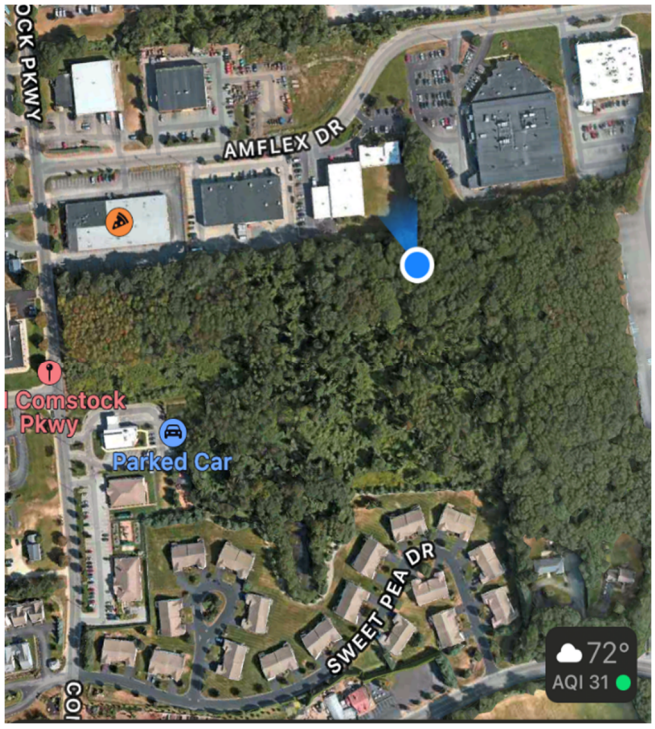
0 60' 120'
SCALE: 1" = 60'

PROJECT NO.: **70753.00**
SCALE: **AS NOTED**
DATE: **04/12/2022**
DRAWN BY: **JCO**
CHECKED BY: **WGW**

OVERALL GRADING & DRAINAGE PLAN

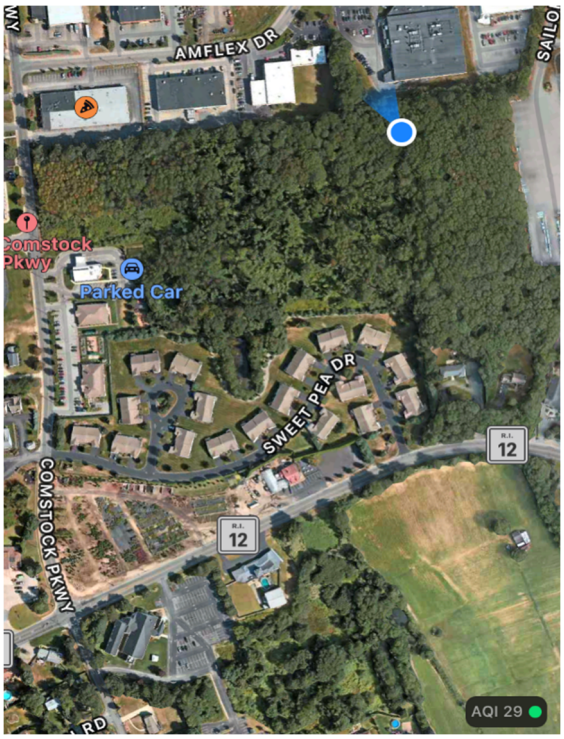
DRAWING NO.:

C-3.0



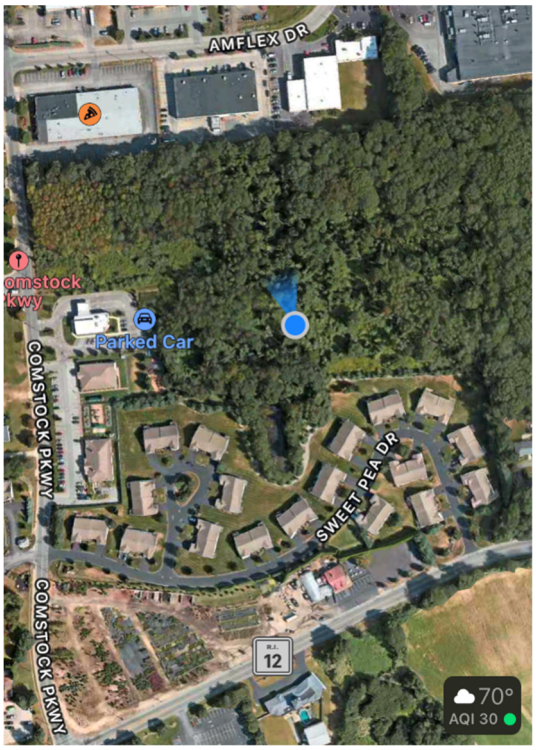
Test Pit 1 Observations:

- **Location: Approximately 30' west of wetland flag C12**
- **Total depth 102" (bottom of pit approx. elevation 327)**
  - **No groundwater encountered**
  - **No mottles encountered**
  - **Sandy loam, some small boulders**



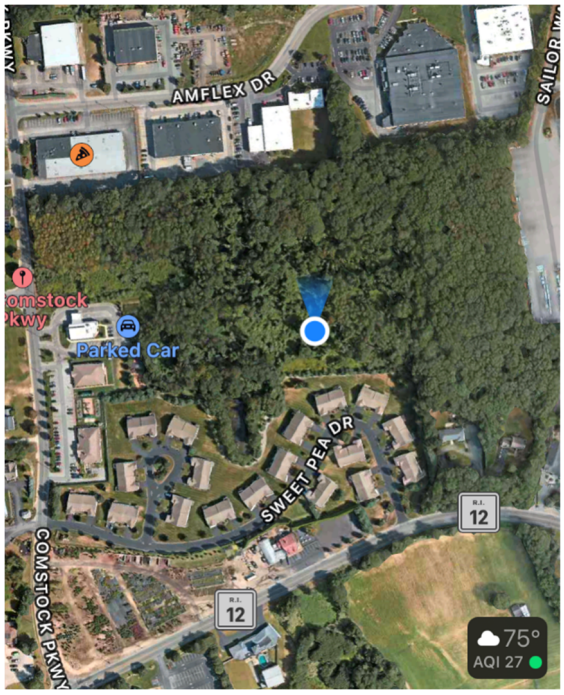
Test Pit 2 Observations:

- **Location: Approximately 33' east of wetland flag C6**
- **Total depth 84" (bottom of pit approx. elevation 330)**
  - **No groundwater encountered**
  - **No mottles encountered**
  - **Sandy loam, some small boulders**



Test Pit 3 Observations:

- **Total depth 53”**
  - **Groundwater encountered at 51” (bottom of pit approx. elevation 331)**
  - **Mottles encountered at 48”**
  - **Sandy loam**



Test Pit 4 Observations:

- **Total depth 101" (bottom of pit approx. elevation 324)**
  - **No groundwater encountered**
  - **No mottles encountered**
  - **Sandy loam**

Alfred Benesch & Company
120 Hebron Avenue, 2nd Floor
Glastonbury, CT 06033
www.benesch.com
P 860-633-8341
F 860-633-1068

Field Observation Report

Comstock Industrial Park

Cranston, RI
Job # 70753.00

ISSUED BY:	John Oliveto, PE Project Engineer
DATE:	June 24, 2022
WEATHER:	Mostly Sunny 72°
LOCATION:	Plat 36 Lot 46, Comstock Parkway, Cranston RI

On Site:
John Oliveto – Alfred Benesch & Company (Benesch)

General Observations:

Benesch visited the site on Friday June 24, 2022, at approximately 9:00 am with a spade hand shovel and post-hole digger. The purpose of this field visit was to perform a shallow test pit in the area of the northern pocket wetlands per the request of Nick Pisani (RIDEM). Specifically, the task was to confirm that the wetland area is not in fact comprised of soils typical of a wetland due to the fact that no groundwater was found 7-8.5' deep in the areas of the proposed bioretention areas 11 days prior. The findings did indeed confirm the previous field visit's findings and are documented as follows:

Total depth of hole – 18"

- 0-7" Dark Brown Organic Topsoil with Large Roots
- 7" – 18" Ashy grey silt / gravel with cobbles (dry)
- No signs of groundwater or mottles

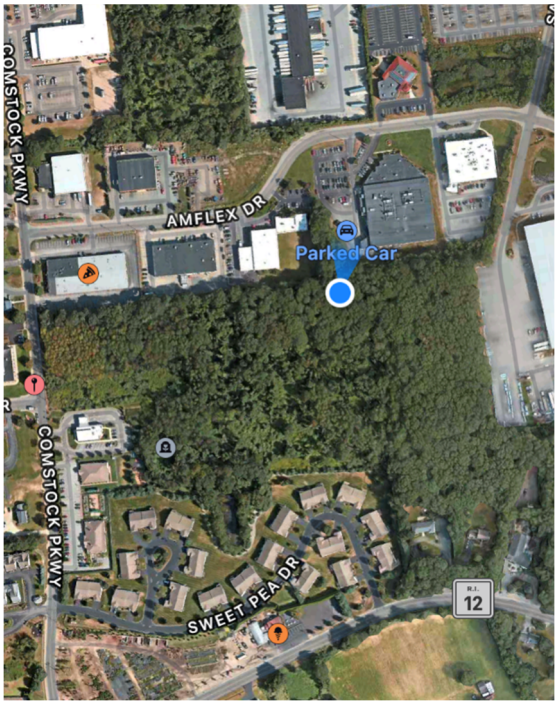


Photo 1 – GPS Location of Test Hole

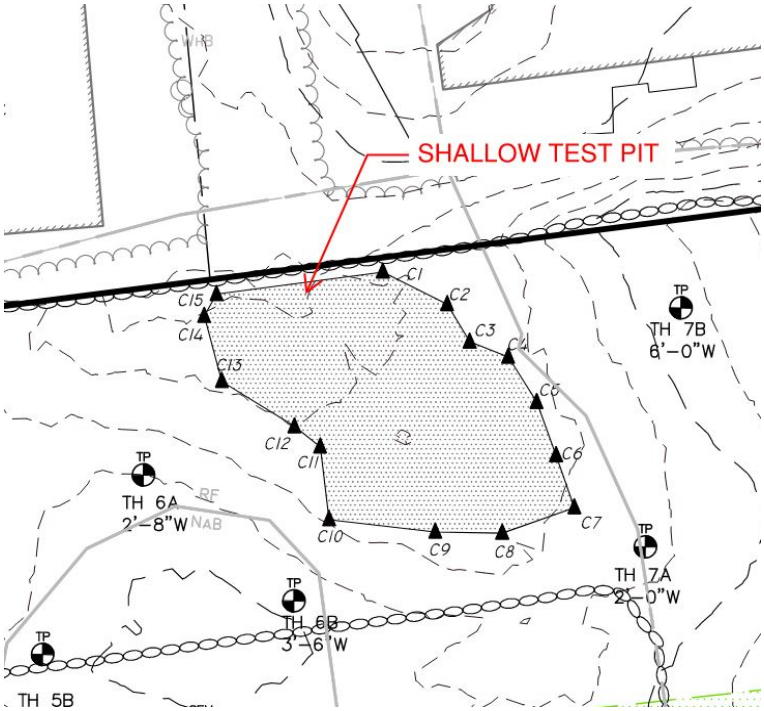


Photo 2 – Approximate Survey Location of Test Hole

Photo 3 – 18" Deep Test Hole with Ashy-Grey colored silt / gravel (dry)

General Notes:

1. PROPOSED BUILDINGS ARE TO BE SERVICED BY PUBLIC WATER AND PUBLIC SEWER.
2. PROPOSED PUBLIC RIGHT OF WAY IS TO BE 55' WIDE WITH 40' WIDE PAVEMENT (20' TRAVEL LANES) AND 6" CONCRETE CURBING ON EITHER SIDE.
3. THE BOUNDARY LINE AS SHOWN ON THIS PLAN DEPICTS A CLASS 1 SURVEY AS PERFORMED BY DIPRETE ENGINEERING ASSOCIATES, INC. THE PLAN ITSELF CONFORMS ONLY TO A CLASS III STANDARD AS ADOPTED BY RHODE ISLAND BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS. THIS PLAN IS NOT TO BE CONSTRUED AS A CLASS I BOUNDARY PLAN AND IS NOT SUITABLE FOR RECORDING AS A CLASS I STANDARD.
4. ALL EXISTING UTILITIES SHOWN ARE FROM VISIBLE INFORMATION, DRAWINGS BY OTHERS, OR INFORMATION PROVIDED TO DEA AND ARE SUBJECT TO CHANGE. NO ONE SHOULD RELY ON THE UTILITY LOCATIONS SHOWN FOR CONSTRUCTION AND DIG SAFE SHOULD BE NOTIFIED PRIOR TO ANY WORK (1-888-DIG-SAFE).
5. THE CONTRACTOR SHALL COORDINATE WITH ALL OF THE APPROPRIATE UTILITY COMPANIES FOR AGREEMENTS TO SERVICE THE PROPOSED BUILDINGS. THIS SHALL BE DONE PRIOR TO CONSTRUCTION. NO REPRESENTATIONS ARE MADE BY DIPRETE ENGINEERING ASSOCIATES, INC. THAT UTILITY SERVICE IS AVAILABLE.
6. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING FINISH GRADING AND DRAINAGE AROUND THE BUILDINGS TO ENSURE SURFACE WATER AND/OR GROUND WATER ARE DIRECTED AWAY FROM THE STRUCTURES. THIS PLAN SHOWS GENERAL GRADING ONLY AND ADDITIONAL DETAIL IS LIKELY TO BE REQUIRED AROUND THE BUILDINGS.
7. THE PROJECT WILL CONSIST OF TWO PHASES. PHASE 1 CONSISTS OF THE CONSTRUCTION OF LOTS 1-3, THE DETENTION POND AND THE PROPOSED ROAD TO A CUL-DE-SAC AT STATION 5+50. PHASE 2 CONSISTS OF THE REMAINING LAND OF LOT 4 THAT IS NOT TO BE DEVELOPED AT THIS TIME.

Dimensional Regulations:

CURRENT ZONING:	M-1
MINIMUM LOT AREA:	30,000 SF
MINIMUM FRONTAGE AND LOT WIDTH:	150'
MINIMUM FRONT AND CORNER SIDE YARD:	40'
MINIMUM SIDE YARD:	20'
MINIMUM REAR YARD:	30'
MAXIMUM STRUCTURE HEIGHT:	35'
MAXIMUM LOT COVERAGE	60% OF LOT

Development Data:

GROSS AREA OF PARCEL:	17.31 ACRES±
NUMBER OF BUILDABLE LOTS:	4 LOTS
AVERAGE LOT AREA:	3.68 ACRES
TOTAL AREA OF BUILDABLE LOTS:	14.71 ACRES
AREA OF RIGHT OF WAY:	0.81 ACRES
APPROXIMATE LENGTH OF ROADWAY:	640 LF.

General Construction Notes:

1. THE CONTRACTOR IS TO NOTIFY DIG SAFE PRIOR TO THE START OF CONSTRUCTION.
2. NO STOCKPILING OF MATERIAL IS TO BE ALLOWED WITHIN A PUBLIC R.O.W. NO OPEN TRENCHES ARE TO BE LEFT OVERNIGHT.
3. ALL LOAM IN DISTURBED AREAS TO BE STOCKPILED FOR FUTURE USE. CUT & FILL CALCULATIONS TO BE VERIFIED BY THE CONTRACTOR.
4. CONTRACTOR TO OBTAIN ALL FEDERAL, STATE, AND MUNICIPAL APPROVALS PRIOR TO THE START OF CONSTRUCTION.
5. ALL WORK PERFORMED HEREIN SHALL BE GOVERNED BY THE RHODE ISLAND STANDARD SPECIFICATION FOR ROAD AND BRIDGE CONSTRUCTION AND CITY OF CRANSTON STANDARD SPECIFICATIONS AND DETAILS.
6. ALL EXCESS SOIL, STUMPS, TREES, ROCKS, BOULDERS, AND OTHER REFUSE, SHALL BE DISCARDED OFF SITE IN AN ACCEPTABLE MANNER AT AN APPROVED LOCATION.
7. THE DRAINAGE SYSTEM IS DESIGNED TO MEET THE CITY OF CRANSTON SUBDIVISION REGULATIONS WITH THE USE OF CATCH BASINS AND A DRAINAGE DETENTION POND. THE POND IS SIZED TO CONTROL THE DISCHARGE OF STORMWATER TO LEVELS WHICH PRESENTLY EXIST FOR THE 2-100 YEAR STORMS. THE STORMWATER MANAGEMENT WILL MEET THE BEST MANAGEMENT PRACTICES OF RIDEM.
8. INSPECTIONS FOR ELECTRIC, CABLE, TELEPHONE, AND GAS UTILITIES SHALL BE COMPLETED BY THE RESPECTIVE UTILITY COMPANIES.

ADA Notes:

1. ALL APPROPRIATE IMPROVEMENTS SHALL COMPLY WITH THE AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES (ADAAG) BY THE DEPARTMENT OF JUSTICE.
2. MAXIMUM RUNNING SLOPE ALONG ALL ACCESSIBLE PATHS OF TRAVEL SHALL BE 0.045'/' AND MAXIMUM CROSS SLOPE ALONG ALL ACCESSIBLE PATHS OF TRAVEL SHALL BE 0.015'/'.
3. AT A MINIMUM, A 5' X 5' LANDING WITH A MAXIMUM SLOPE OF 0.015'/' IN ANY DIRECTION SHALL BE PROVIDED IN FRONT OF ALL PUBLICLY ACCESSIBLE BUILDING ENTRANCES/EGRESSES.
4. SIDEWALK CURB RAMPS SHALL COMPLY WITH DEA DETAILS MEETING OR EXCEEDING RIDOT STANDARDS 43.3.0, 43.3.1 & 43.4.1 AS SHOWN ON THE DETAIL SHEET.
5. PLEASE NOTE THAT THE GRADING AND PLAN VIEWS AS WELL AS THE STANDARD DETAILS MAY NOT SHOW THE DETAIL NECESSARY TO CONSTRUCT WALKWAYS AND RAMPS TO ADA STANDARDS. THE CONTRACTOR IS RESPONSIBLE TO PROVIDE THE LEVEL OF CARE NECESSARY TO BE CERTAIN THAT THE CONSTRUCTED PRODUCT MEETS THE ADA STANDARDS, IN THE EVENT OF ANY CONFLICTS, THE CONTRACTOR SHALL NOTIFY THE DESIGNER BEFORE CONSTRUCTION FOR ADVICE IN FINDING A RESOLUTION.

Waivers Requested:

1. LENGTH OF CUL-DE SAC GREATER THAN 400': ACCORDING TO SECTION X11 DESIGN AND PUBLIC IMPROVEMENT STANDARDS- CUL-DE-SACS SHALL NOT EXCEED FOUR HUNDRED (400) FEET IN LENGTH. PROPOSED INDUSTRIAL SUBDIVISION REQUESTS A WAIVER TO ALLOW THE PROPOSED CUL-DE-SAC TO BE 640 FT.
2. RIGHT-OF-WAY WIDTH REDUCTION: ACCORDING TO SECTION X11 - DESIGN AND PUBLIC IMPROVEMENT STANDARDS -RIGHT OF WAY WIDTHS FOR INDUSTRIAL STREETS SHALL BE A MINIMUM OF 60 FEET WIDE. THE PROPOSED INDUSTRIAL SUBDIVISION REQUESTS A WAIVER TO ALLOW THE PROPOSED RIGHT-OF-WAY TO BE 55 FT IN WIDTH.

Scale: 1"=60'
0 30' 60' 120'

DiPrete Engineering
Two Stafford Court Cranston, RI 02920
tel 401-943-1000 fax 401-464-6006 www.diprete-eng.com
Boston • Providence • Newport

No.	Date	Description
4	12/03/20	[illegible]
3	09/15/20	[illegible]
2	06/18/20	[illegible]
1	03/30/20	[illegible]
0	03/30/20	[illegible]

Drawn By: K.M.R. Design By: L.R.B

Comstock Industrial Subdivision

Assessor's Plat 36/4 Lot 46
Cranston, Rhode Island

Prepared For
RAL Realty Limited Partnership & Andrea Finkel & Ronald R.S Picerne & Robert E. DeBlois Sr. Trustees
c/o Richard Licht, One Citizens Plaza, 8th Floor, Providence, RI 02903
tel 401-274-7200 fax 401-751-0604

SHEET 1 OF 1

DRAFT 12/10/2020

z:\demain\projects\0161-117 comstock parkway lawton farm\autocad drawings\0161-117-cp05.dwg Plotted: 12/10/2020

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

Site Evaluation Form
Part A – Soil Profile Description **Application Number** NA

Property Owner: RAL Realty Limited Partnership
Property Location: Comstock Parkway (AP 36 Lot 46) Cranston, RI
Date of Test Hole: December 10, 2020
Soil Evaluator: Chris Sutter License Number: D-4077
Weather: Clear 30's Shaded: Yes ☐ No ☑ Time: 8:00 AM

TH 20-1 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Contr.				
Ap	0-10"	C	S	10YR 3/4					sl	1-sbk	fri	3
Bw	10-28"	C	S	10YR 4/6					sl	1-sbk	fri	3
C1	28-42"	C	S	2.5Y 5/3	7.5YR 5/8	C	3	P	gls	0-m	fri	6
C2	42-96"			2.5Y 4/3	7.5YR 5/8	C	3	P	gls	0-m	fri	6
R	96"											

TH 20-2 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Contr.				
Ap	0-12"	C	S	10YR 3/2					sl	1-sbk	fri	3
Bw	12-26"	C	S	10YR 5/6					sl	1-sbk	fri	3
Cd	26-84"	C	S	2.5Y 5/3	7.5YR 5/8	C	3	P	gsl	0-m	fri	6
R	84"											

TH 20-1 Soil Class Ablation Till Total Depth 96" Impervious/Limiting Layer Depth 96" (og) GW Seepage Depth 84" SHWT 36" (og)
TH 20-2 Soil Class Ablation Till Total Depth 84" Impervious/Limiting Layer Depth 84" (og) GW Seepage Depth 40" SHWT 26" (og)

Comments:

Revised 11/25/18

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
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Site Evaluation Form
Part A – Soil Profile Description **Application Number** NA

Property Owner: RAL Realty Limited Partnership
Property Location: Comstock Parkway (AP 36 Lot 46) Cranston, RI
Date of Test Hole: December 10, 2020
Soil Evaluator: Chris Sutter License Number: D-4077
Weather: Clear 30's Shaded: Yes ☐ No ☑ Time: 8:00 AM

TH 20-3 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Contr.				
Ap	0-12"	C	S	10YR 3/4					fsl	1-sbk	fri	7
Bw	12-26"	C	S	10YR 5/6					fsl	1-sbk	fri	7
C	26-96"			2.5Y 5/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7

TH 20-4 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Contr.				
Ap	0-10"	C	S	10YR 3/2					fsl	1-sbk	fri	4
Bw	10-22"	C	S	10YR 5/6					fsl	1-sbk	fri	4
C	22-30"	C	S	2.5Y 5/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	30-108"			2.5Y 5/3					gls	0-m	fri	6

TH 20-3 Soil Class Ablation Till Total Depth 96" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth 66" SHWT 19" (og)
TH 20-4 Soil Class Ablation Till Total Depth 108" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth NA SHWT 84" (og)

Comments:

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

Site Evaluation Form
Part A – Soil Profile Description **Application Number** NA

Property Owner: RAL Realty Limited Partnership
Property Location: Comstock Parkway (AP 36 Lot 46) Cranston, RI
Date of Test Hole: December 10, 2020
Soil Evaluator: Chris Sutter License Number: D-4077
Weather: Clear 30's Shaded: Yes ☐ No ☑ Time: 8:00 AM

TH 20-5 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Contr.				
Ap	0-9"	C	S	10YR 3/3					fsl	1-sbk	fri	7
Bw	9-19"	C	S	10YR 5/6					fsl	1-sbk	fri	7
Cd	19-39"	C	S	2.5Y 5/3	7.5YR 5/8	C	3	P	sl	0-m	fri	6
2C	39-96"			2.5Y 5/4					gls	0-m	fri	6

TH 20-6 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Contr.				
Ap	0-7"	C	S	10YR 3/4					fsl	1-sbk	fri	4
Bw	7-24"	C	S	10YR 4/6					sl	1-sbk	fri	3
C1	24-82"	C	S	2.5Y 5/3					gls	0-m	fri	6
C2	82-102"			2.5Y 4/4					gls	0-m	fri	6

TH 20-5 Soil Class Ablation Till Total Depth 96" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth NA SHWT 30" (og)
TH 20-6 Soil Class Ablation Till Total Depth 102" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth NA SHWT 82" (og)

Comments:

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

Site Evaluation Form
Part A – Soil Profile Description **Application Number** NA

Property Owner: RAL Realty Limited Partnership
Property Location: Comstock Parkway (AP 36 Lot 46) Cranston, RI
Date of Test Hole: December 10, 2020
Soil Evaluator: Chris Sutter License Number: D-4077
Weather: Clear 30's Shaded: Yes ☐ No ☑ Time: 8:00 AM

TH 20-7 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Contr.				
Ap	0-6"	C	S	10YR 3/2					sl	1-sbk	fri	3
Bw	6-28"	C	S	10YR 4/6					sl	1-sbk	fri	3
C	28-108"			2.5Y 5/4					gls	0-m	fri	6

TH____ Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Contr.				

TH 20-7 Soil Class Ablation Till Total Depth 108" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth NA SHWT 96" (og)

TH _____ Soil Class _____ Total Depth _____ Impervious/Limiting Layer Depth _____ (og) GW Seepage Depth _____ SHWT _____ (og)

Comments: _____

APPENDIX G

NRCS SOIL MAPPING

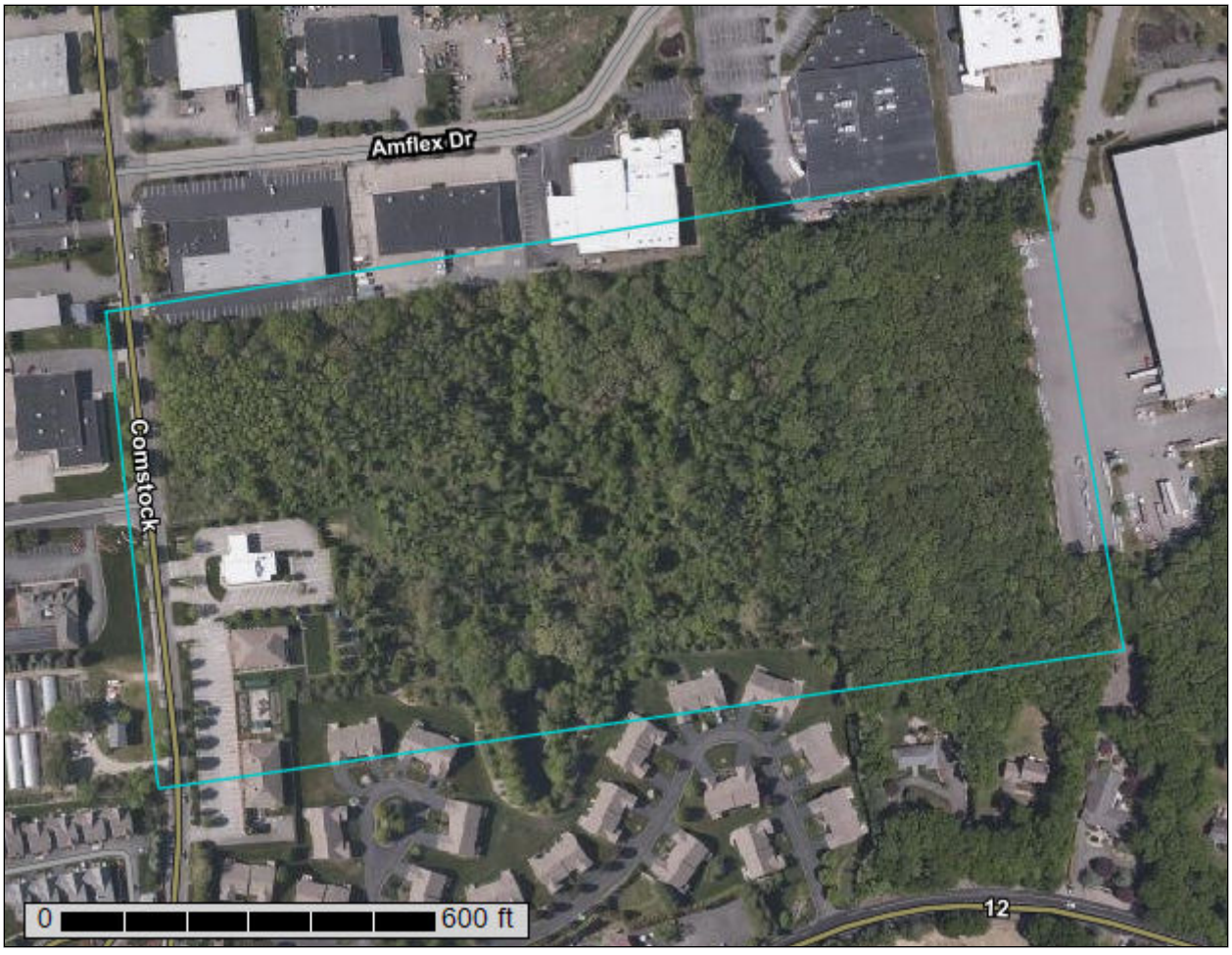
United States Department of Agriculture

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 State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties



February 9, 2022

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

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

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: 1:2,740 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

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: State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties
Survey Area Data: Version 21, Sep 3, 2021

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

Date(s) aerial images were photographed: May 24, 2020—Jul 18, 2020

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

MAP LEGEND

MAP INFORMATION

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CdB	Canton and Charlton fine sandy loams, 3 to 8 percent slopes	0.8	2.8%
NaB	Narragansett silt loam, 3 to 8 percent slopes	2.6	9.4%
NbB	Narragansett very stony silt loam, 0 to 8 percent slopes	6.2	22.5%
Re	Ridgebury fine sandy loam, 0 to 3 percent slopes	0.1	0.4%
Rf	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	7.4	26.9%
StA	Sutton fine sandy loam, 0 to 3 percent slopes	1.5	5.3%
UD	Udorthents-Urban land complex	2.8	10.0%
WhA	Woodbridge fine sandy loam, 0 to 3 percent slopes	2.3	8.4%
WhB	Woodbridge fine sandy loam, 3 to 8 percent slopes	3.8	13.6%
WoB	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	0.2	0.7%
Totals for Area of Interest		**27.7**	**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.

State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties

CdB—Canton and Charlton fine sandy loams, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w81s
Elevation: 0 to 1,460 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Canton and similar soils: 50 percent
Charlton and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

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

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: gravelly fine sandy loam
2C - 26 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Charlton

Setting

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

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw - 7 to 22 inches: gravelly fine sandy loam
C - 22 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Sutton

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

Chatfield

Percent of map unit: 5 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Leicester

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

NaB—Narragansett silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9lvz
Elevation: 0 to 810 feet
Mean annual precipitation: 44 to 50 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 115 to 190 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Narragansett and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Narragansett

Setting

Landform: Till plains, hills
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly melt-out till derived from gneiss and/or schist and/or granite

Typical profile

Ap - 0 to 6 inches: silt loam
Bw1 - 6 to 15 inches: silt loam
Bw2 - 15 to 24 inches: silt loam
Bw3 - 24 to 28 inches: gravelly silt loam
2C - 28 to 60 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.3 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Bridgehampton
Percent of map unit: 3 percent
Landform: Outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Charlton
Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Wapping
Percent of map unit: 2 percent
Landform: Till plains, hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Canton
Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge
Percent of map unit: 1 percent
Landform: Drumlins
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

NbB—Narragansett very stony silt loam, 0 to 8 percent slopes

Map Unit Setting
National map unit symbol: 9lw0

Elevation: 0 to 810 feet
Mean annual precipitation: 44 to 50 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 115 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Narragansett and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Narragansett

Setting

Landform: Till plains, hills
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly melt-out till derived from gneiss and/or schist and/or granite

Typical profile

Ap - 0 to 6 inches: silt loam
Bw1 - 6 to 15 inches: silt loam
Bw2 - 15 to 24 inches: silt loam
Bw3 - 24 to 28 inches: gravelly silt loam
2C - 28 to 60 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.3 inches)

Interpretive groups

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

Minor Components

Bridgehampton

Percent of map unit: 4 percent
Landform: Outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Canton

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Scio

Percent of map unit: 1 percent
Landform: Terraces, lakebeds
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Wapping

Percent of map unit: 1 percent
Landform: Till plains, hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Charlton

Percent of map unit: 1 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge

Percent of map unit: 1 percent
Landform: Drumlins
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Re—Ridgebury fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2w69f
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Ridgebury

Setting

Landform: Ground moraines, hills, drumlins, depressions, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 6 inches: fine sandy loam
Bw - 6 to 10 inches: sandy loam
Bg - 10 to 19 inches: gravelly sandy loam
Cd - 19 to 66 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 15 to 35 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 6 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 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Ecological site: F144AY009CT - Wet Till Depressions
Hydric soil rating: Yes

Minor Components

Woodbridge

Percent of map unit: 9 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Crest, base slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Whitman

Percent of map unit: 5 percent
Landform: Hills, drainageways, drumlins, ground moraines, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave

Hydric soil rating: Yes

Leicester

Percent of map unit: 1 percent
Landform: Ground moraines, hills, drainageways, depressions
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

Rf—Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2t2qt
Elevation: 0 to 1,480 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

Ridgebury, extremely stony, and similar soils: 40 percent
Leicester, extremely stony, and similar soils: 35 percent
Whitman, extremely stony, and similar soils: 17 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ridgebury, Extremely Stony

Setting

Landform: Drumlins, ground moraines, hills, drainageways, depressions
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 6 inches: fine sandy loam
Bw - 6 to 10 inches: sandy loam
Bg - 10 to 19 inches: gravelly sandy loam
Cd - 19 to 66 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 15 to 35 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 6 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 3.0 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

Description of Leicester, Extremely Stony

Setting

Landform: Ground moraines, hills, drainageways, depressions
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Coarse-loamy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 7 inches: fine sandy loam
Bg - 7 to 18 inches: fine sandy loam
BC - 18 to 24 inches: fine sandy loam
C1 - 24 to 39 inches: gravelly fine sandy loam
C2 - 39 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Very high
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: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.0 inches)

Interpretive groups

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

Description of Whitman, Extremely Stony

Setting

Landform: Drumlins, ground moraines, hills, drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 1 inches: peat
A - 1 to 10 inches: fine sandy loam
Bg - 10 to 17 inches: gravelly fine sandy loam
Cdg - 17 to 61 inches: fine 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: 7 to 38 inches to densic material
Drainage class: Very poorly drained
Runoff class: Negligible
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 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 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

Woodbridge, extremely stony

Percent of map unit: 6 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Swansea

Percent of map unit: 2 percent
Landform: Bogs, swamps
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

StA—Sutton fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

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

Map Unit Composition

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

Description of Sutton

Setting

Landform: Ground moraines, ridges, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 5 inches: fine sandy loam
Bw1 - 5 to 17 inches: fine sandy loam
Bw2 - 17 to 25 inches: sandy loam
C1 - 25 to 39 inches: gravelly sandy loam
C2 - 39 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
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 12 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Ecological site: F144AY008CT - Moist Till Uplands
Hydric soil rating: No

Minor Components

Leicester

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

Charlton

Percent of map unit: 5 percent
Landform: Ground moraines, ridges, hills
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Canton

Percent of map unit: 4 percent
Landform: Hills, moraines, ridges
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Whitman

Percent of map unit: 1 percent
Landform: Ground moraines, drumlins, hills, 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

UD—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 9lxj
Elevation: 0 to 670 feet

Mean annual precipitation: 44 to 50 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 211 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 70 percent
Urban land: 20 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Human transported material

Typical profile

A - 0 to 12 inches: sandy loam
C1 - 12 to 25 inches: sandy loam
C2 - 25 to 60 inches: stratified sand to very gravelly coarse sand

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 42 to 54 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Description of Urban Land

Setting

Parent material: Human transported material

Typical profile

R - 0 to 6 inches: variable

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Landform: Terraces, outwash plains, kames
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Quonset

Percent of map unit: 5 percent

Landform: Outwash plains, terraces, outwash terraces, eskers
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

WhA—Woodbridge fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2w686
Elevation: 0 to 1,420 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Woodbridge

Setting

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 18 inches: fine sandy loam
Bw2 - 18 to 30 inches: fine sandy loam
Cd - 30 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Moderately well 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 18 to 30 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 4.7 inches)

Interpretive groups

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

Minor Components

Paxton

Percent of map unit: 7 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury

Percent of map unit: 6 percent
Landform: Depressions, ground moraines, drainageways, drumlins, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sutton

Percent of map unit: 1 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Whitman, extremely stony

Percent of map unit: 1 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

WhB—Woodbridge fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t2ql
Elevation: 0 to 1,470 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Woodbridge, Fine Sandy Loam

Setting

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

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 18 inches: fine sandy loam
Bw2 - 18 to 30 inches: fine sandy loam
Cd - 30 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 30 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 3.6 inches)

Interpretive groups

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

Minor Components

Paxton

Percent of map unit: 10 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury

Percent of map unit: 8 percent
Landform: Depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Toeslope, backslope, footslope
Landform position (three-dimensional): Base slope, head slope, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

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

Map Unit Setting

National map unit symbol: 2t2qr
Elevation: 0 to 1,440 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Woodbridge, Very Stony

Setting

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

Typical profile

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

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 19 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Paxton, very stony

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

Ridgebury, very stony

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

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