



December 16, 2019

Stormwater Management Report

Town of Weymouth

#1093 Main Street, Weymouth, MA

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Stormwater Management Report

Definitive Site Plan

#1093 Main Street
Weymouth, Massachusetts

December 16, 2019

STORMWATER MANAGEMENT REPORT AND HYDROLOGIC-HYDRAULIC ANALYSIS

Project Summary

The project proponent, Mr. John O'Brien, proposes to redevelop a 19,673± square foot parcel of land on Main Street (Route 18) in Weymouth, Massachusetts. The proposed redevelopment consists of razing the existing dwelling and sheds, construction of a 4-unit residential building with an approximate footprint of 2,450± square feet, associated parking area, stormwater management facilities, utility service connections and associated infrastructure.

The subject property is located on the west side of Main Street (Route 18) and consists of a parcel identified as Parcel 554-8 on the Town of Weymouth Assessor maps. The property is located within the "Highway Transition (HT)" District and the "Watershed Protection" Overlay Districts. The property is bordered by wetlands to the west, Main Street to the east, developed commercial property to the north and developed residential property to the south. Refer to Figure-1 USGS Locus Map for the location of the parcel. The property consists of a total of 0.45± acres of which all is upland. The site is located within a Zone X, as shown on the current FEMA Flood Map (25021C0237E, dated July 17, 2012). Refer to Figure-2 FEMA Flood Map. Site inspection by Brad Holmes of Environmental Consulting and Restoration, LLC indicates that just off site to the west there are bordering vegetated wetlands (BVW).

Methodology

Drainage computations were performed using the Natural Resources Conservation Services (NRCS) TR-20 method and HydroCAD® Drainage Calculation Software. Sketches of the existing and proposed watershed areas, HydroCAD® Report, and copies of the calculation sheets are included as appendices to this report.

Existing Conditions

The site presently consists of a residential dwelling, two small sheds, and a driveway. The remainder of the site is wooded or is covered in long grass and littered with debris. The site's topography is gentle, with slopes ranging from 0 to 5 percent draining towards wetlands to the west. The site has frontage along Main Street with a single access drive.

Soil types were obtained from NRCS mapping and were found to be hydrologic soil group (HSG) B/D soils. In order to confirm the soil class and groundwater depth characteristics of these soils, test pits were performed by Merrill Engineers and Land Surveyors in August of 2019. Based on soil textures encountered at the time of testing, the overall site was found to be consistent with

a B/D soils. Sand and tightly packed loamy sand within the upland areas. Refer to Figure-4 NRCS Soils Map and Appendix E – Soil Testing Results for supporting documentation.

Under existing conditions, the majority of the stormwater runoff from the project site flows overland towards the rear property line and the wetlands located just off-site (Design Point 1). In both the existing and proposed stormwater analysis, the watershed area analyzed was 24,359± square feet consisting of the subject parcel and upland developed tributary areas.

Proposed Conditions/Stormwater Management

Under the post development condition, the proposed building roof runoff will be discharged directly to the rear of the property via roof leaders. A bio-retention area will collect and treat the proposed parking and driveway areas surrounding the proposed building through pre-treatment of a pea stone diaphragm prior to discharge to the aforementioned bio-retention area. As portions of the project are located within an area subject to protection under the Wetlands Protection Act, M.G.L. c. 131, Section 40 and is considered a redevelopment project, the stormwater management systems were designed to be in compliance with the DEP Stormwater Management Regulations (SMR) to the extent practicable.

Compliance with Stormwater Management Standards

Standard 1 – No New Untreated Discharges

No new stormwater conveyances will discharge untreated pavement runoff into, or cause erosion to downgradient areas.

Standard 2 – Peak Rate Attenuation

Peak rates of runoff were calculated using the TR-20 methodology developed by the NRCS computer based program, HydroCAD (refer to Appendices A & B). There is an increase in stormwater runoff due to an increase in impervious surfaces on the site. The increase in runoff towards the wetland area is attenuated by the proposed bio-retention system. This measure will both detain and infiltrate runoff, mitigating increased rates and volumes of runoff for the 2, 10, 25 and 100-year storms events to the extent practicable. The following is a summary of pre- and post-construction rates of runoff:

RETURN PERIOD	PEAK RATES OF RUNOFF	
	Design Point 1 - (Washington Street)	
	EXISTING (cfs)	PROPOSED (cfs)
2YR	0.25	0.15
10YR	0.76	0.44
25YR	1.25	0.70
100YR	2.34	2.33

The following is a summary of pre- and post-construction peak volume of runoff:

RETURN PERIOD	PEAK VOLUME OF RUNOFF	
	Design Point 1 - (Washington Street)	
	EXISTING (cf)	PROPOSED (cf)
2YR	1,251	662
10YR	3,103	1,605
25YR	4,842	3,018
100YR	8,824	6,960

Standard 3 –

Groundwater Recharge

Runoff will be infiltrated by the proposed bio-retention system. The bottom grade of the bio-retention will be a minimum of two feet above seasonal high groundwater. The hydraulic conductivity of 1.02 in/hr used in the stormwater calculations was based on soil conditions found on the site via soil testing and DEP SMR Table 2.3.3 1982 Rawls Rates - values developed from Rawls, Brakensiek and Saxton, 1982. The total required groundwater recharge volume for the entire site was calculated to be 296 cubic feet. The proposed bio-retention will provide 1,910 cubic feet of recharge below the minimum outlet elevation. Refer to Appendix C for recharge volume and Appendix E for soil testing results.

Standard 4 – Water Quality

A Long Term Source Control/Pollution Prevention Plan has been incorporated into the Operation and Maintenance Plan. Refer to Appendix D for BMP Operation and Maintenance Plans. The water quality volume was calculated using the one-inch rule as the site is within the “Watershed Protection” District. The total required water quality treatment volume was calculated to be 846 cubic feet. Refer to Appendix C for water quality calculations for each treatment stream.

In accordance with the guidelines of the Stormwater Management Policy, the Total Suspended Solids (TSS) Removal was calculated to be 80% or greater for the new treatment trains which will handle the stormwater runoff from the proposed project area. The treatment trains consist of a bioretention area to achieve the required removal rate of 80% total suspended solids. TSS removal calculations are included in Appendix C.

Standard 5 – Land Use with Higher Potential Pollutants Loads (LUHPPL)

The site does not include land uses with higher potential pollutant loads. Not Applicable.

Standard 6 – Critical Areas

The proposed project does not discharge to any critical areas. Not Applicable.

Standard 7 – Redevelopment and Other Projects Subject to the Standards only to the maximum extent practicable

The project site is currently developed and the proposed project consists of razing the existing residential structure and proposing a new 4-unit residential development. The redevelopment will also incorporate site improvements including associated access and parking areas, drainage system and utility services. The proposed development is considered a redevelopment project and has met the standards to the maximum extent practicable.

Standard 8 – Construction Period Pollutions Prevention and Erosion and Sedimentation Control

Silt socks will be placed at the limit of work as erosion control barriers prior to commencement of any construction activity. A Construction Operation and Maintenance Plan and Construction Pollution Prevention Plan have been provided. Refer to the construction detail plan for erosion control details and the BMP Operation and Maintenance Plans in Appendix D.

Standard 9 – Operation and Maintenance Plan

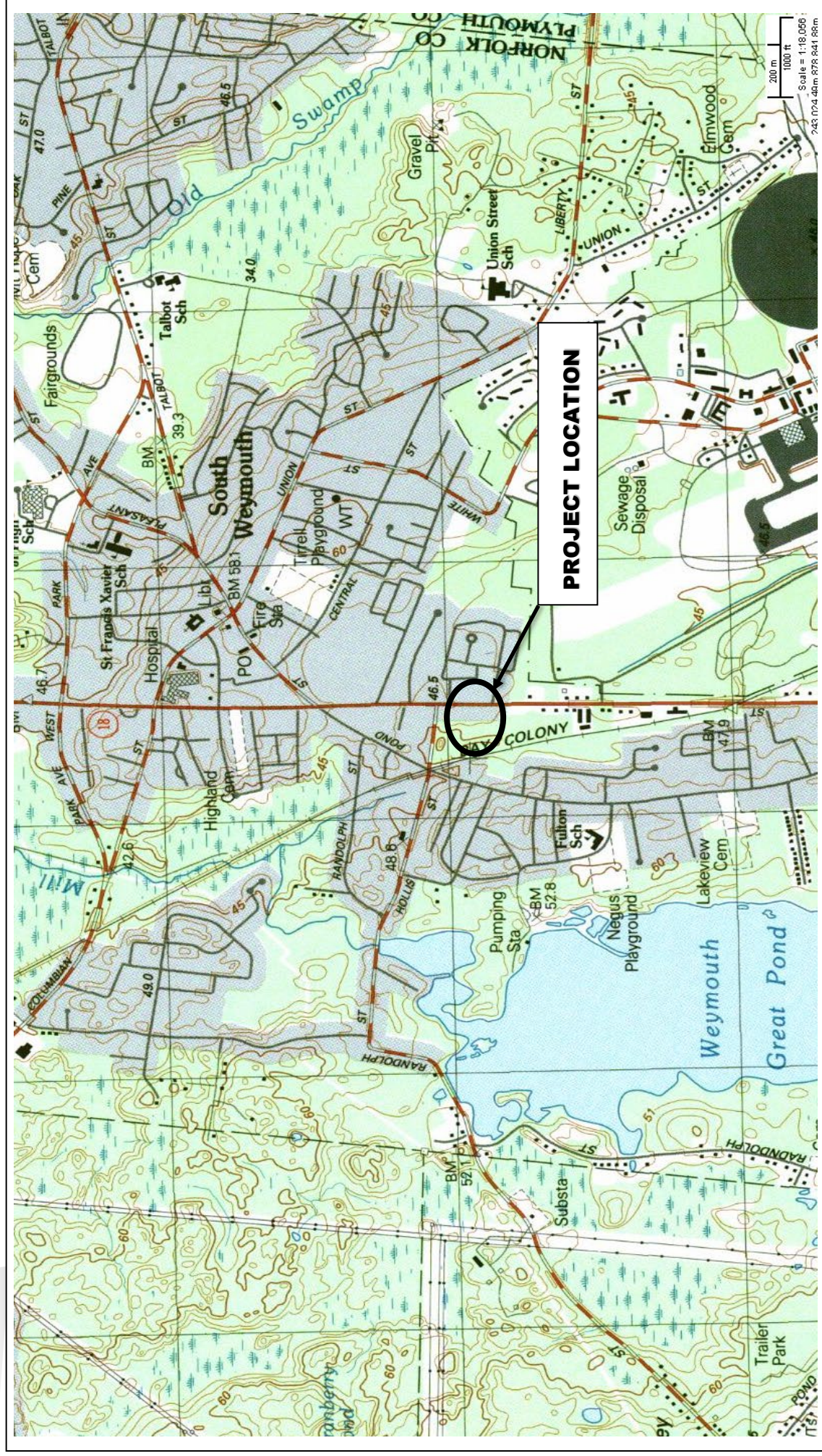
The Long Term Source Control/Pollution Prevention Plan and Operation and Maintenance Plan is also provided within Appendix D.

Standard 10 – Prohibition of Illicit Discharges

No illicit discharges are anticipated on site. Measures to prevent illicit discharges area included in the Long-Term Source Control/Pollution Prevention Plan.



Figure 1: USGS Map



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26 Union Street, Plymouth, MA 02360 / Tel: (508) 746-6060

Figure 2: FEMA Flood Map

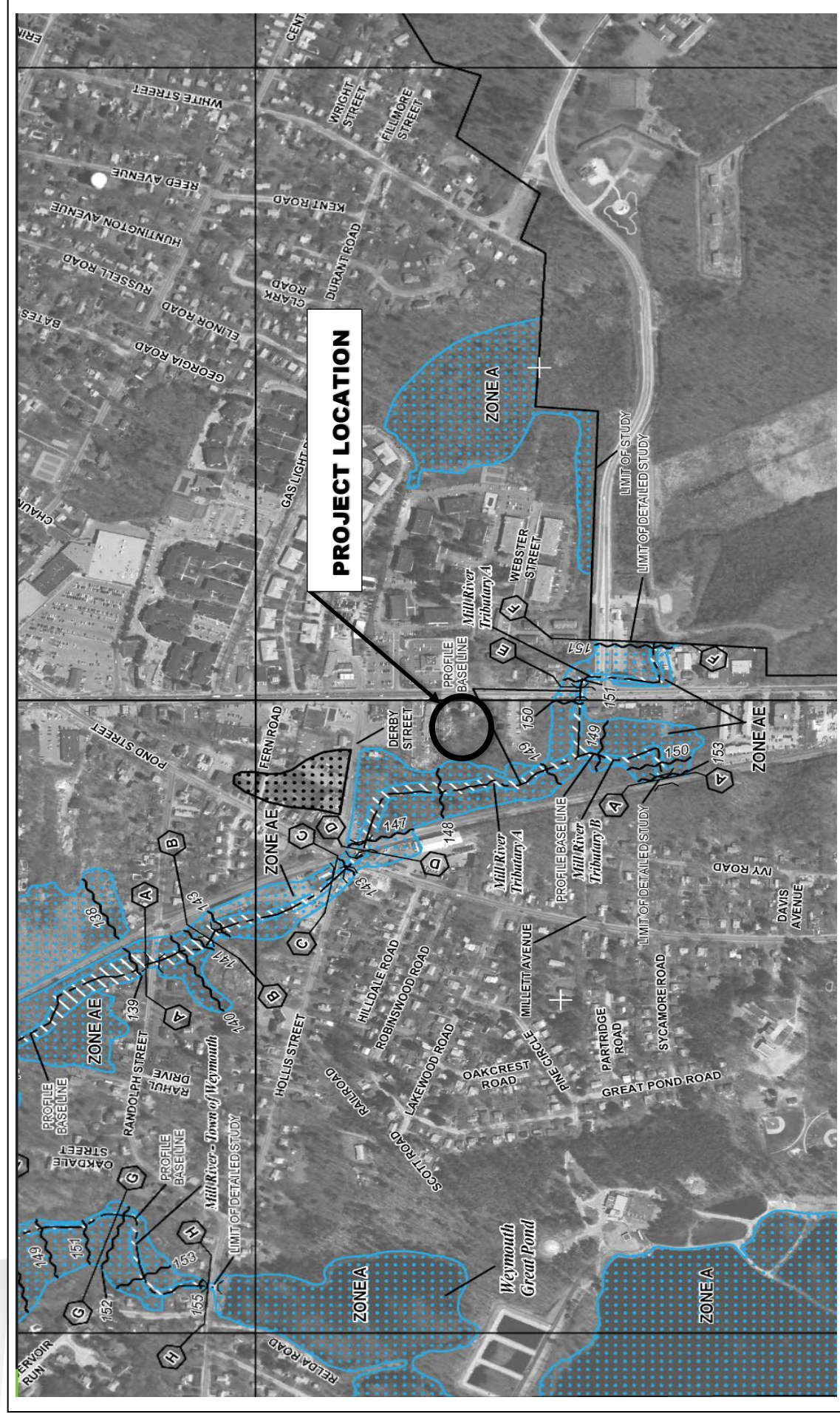


Figure 3: NHESP Map



Figure 4: NRCS Soil Map



Figure 5: Google Earth Aerial



Site Photographs



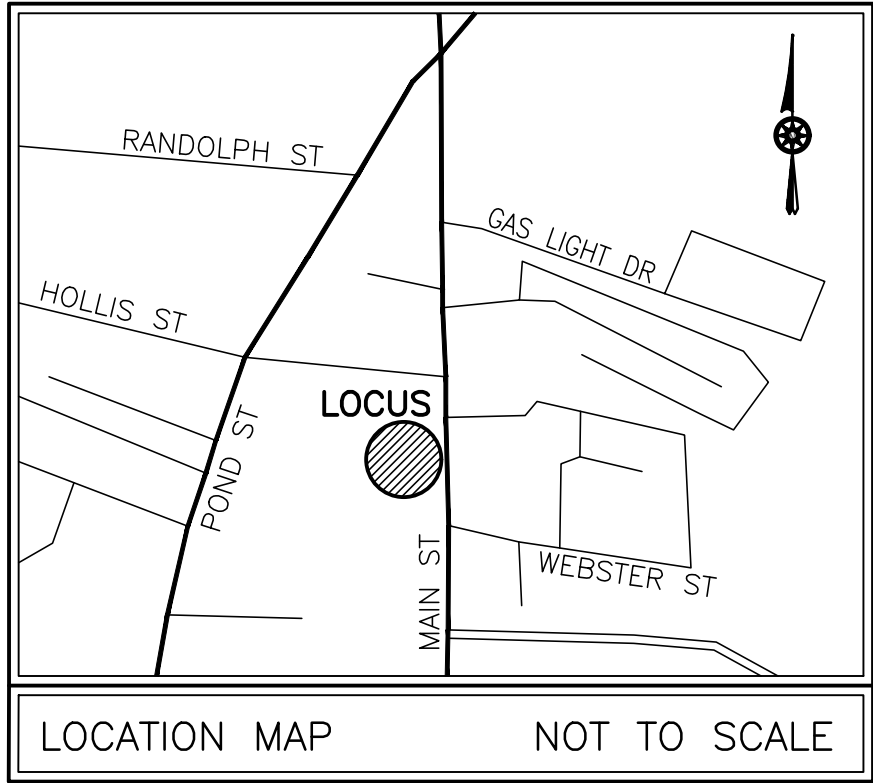
merrillinc.com / 427 Columbia Road, Hanover, MA 02339 / Tel: (781) 826-9200
26 Union Street, Plymouth, MA 02360 / Tel: (508) 746-6060





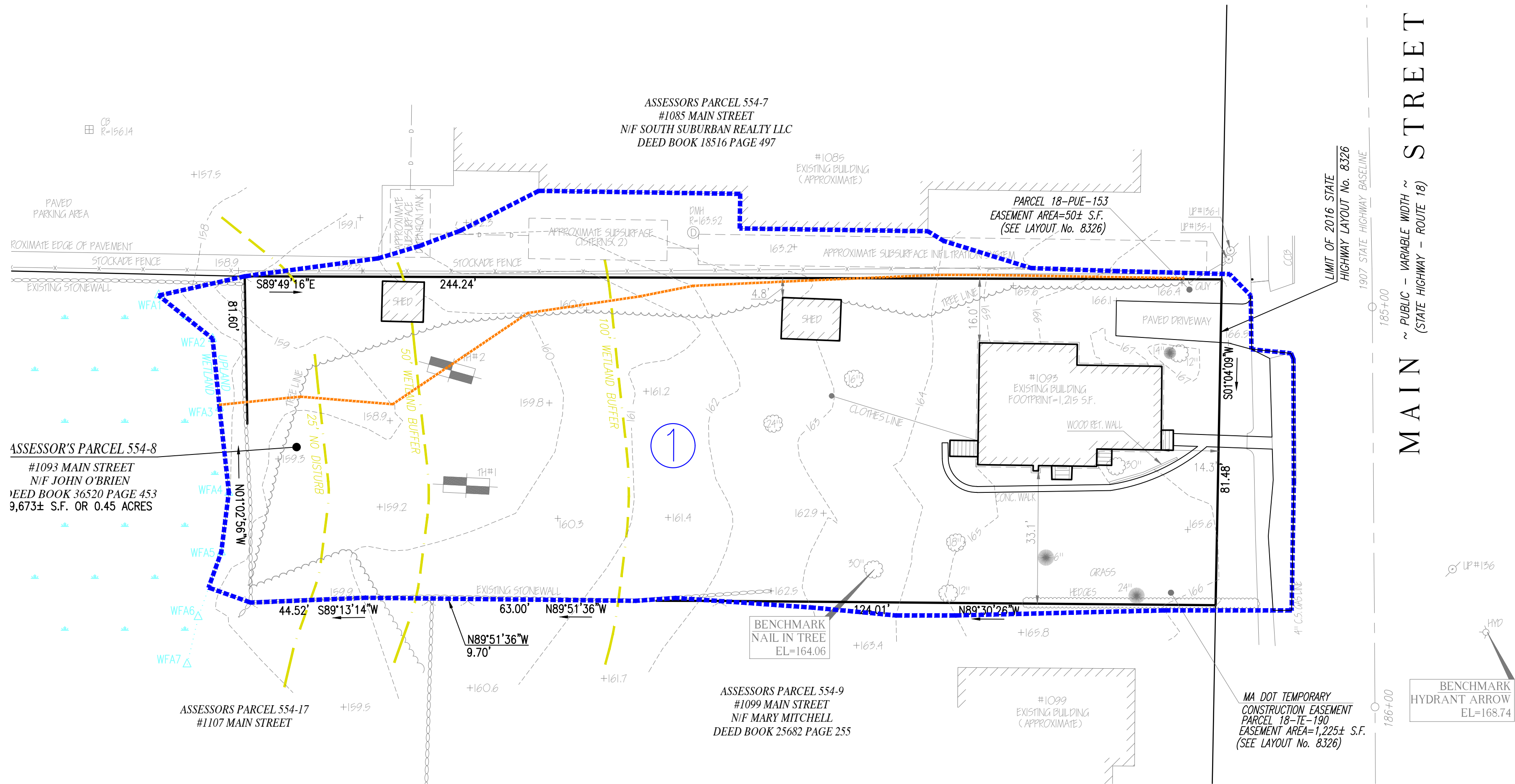
Appendix A

Existing Conditions with Watershed Delineation Plan



PRE DEVELOPMENT CONDITIONS WATERSHED

SUBCATCHMENT 1S	
DESCRIPTION	AREA (S.F.)
PAVED PARKING	854 S.F.
BUILDING ROOF	1,547 S.F.
WOODS, GOOD	3,738 S.F.
LANDSCAPE/LAWN, GOOD	18,220 S.F.
TOTAL AREA	24,359 S.F.



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REVISIONS	

DRAWN BY: JG

DESIGNED BY: JG

CHECKED BY: DK

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Engineers and Land Surveyors
427 COLUMBIA ROAD, HANOVER, MA 02339 / T: (781) 826-9200
26 UNION STREET, PLYMOUTH MA 02360 / T: (508) 746-6060
WWW.MERRILLINC.COM

SITE PLAN
#1093 MAIN STREET
WEYMOUTH, MASSACHUSETTS

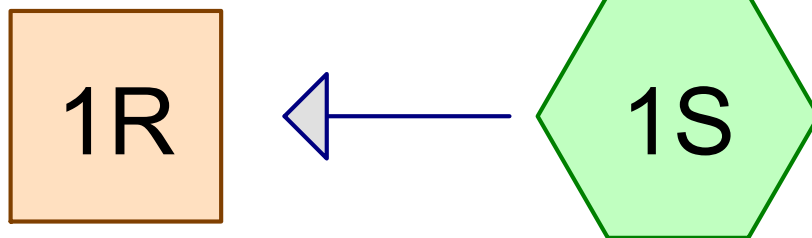
PREPARED FOR: MR. JOHN O'BRIEN
1150 TURNPIKE STREET
STOUGHTON, MA 02072

DECEMBER 16, 2019

SCALE: 1"=20'

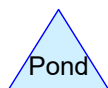
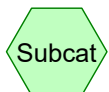
JOB No. 19-065

LATEST REVISION:



Wetlands

1S



Routing Diagram for 19-065 Pre WS

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19-065 Pre WS

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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
18,220	61	>75% Grass cover, Good, HSG B (1S)
854	98	Paved parking, HSG B (1S)
1,547	98	Roofs, HSG B (1S)
3,738	55	Woods, Good, HSG B (1S)
24,359	64	TOTAL AREA

19-065 Pre WS*Type III 24-hr 2-Year Rainfall=3.32"*

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Page 3

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: 1SRunoff Area=24,359 sf 9.86% Impervious Runoff Depth=0.62"
Flow Length=248' Tc=11.7 min CN=64 Runoff=0.25 cfs 1,251 cf**Reach 1R: Wetlands**Inflow=0.25 cfs 1,251 cf
Outflow=0.25 cfs 1,251 cf**Total Runoff Area = 24,359 sf Runoff Volume = 1,251 cf Average Runoff Depth = 0.62"**
90.14% Pervious = 21,958 sf 9.86% Impervious = 2,401 sf

19-065 Pre WS

Type III 24-hr 2-Year Rainfall=3.32"

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Summary for Subcatchment 1S: 1S

Runoff = 0.25 cfs @ 12.20 hrs, Volume= 1,251 cf, Depth= 0.62"

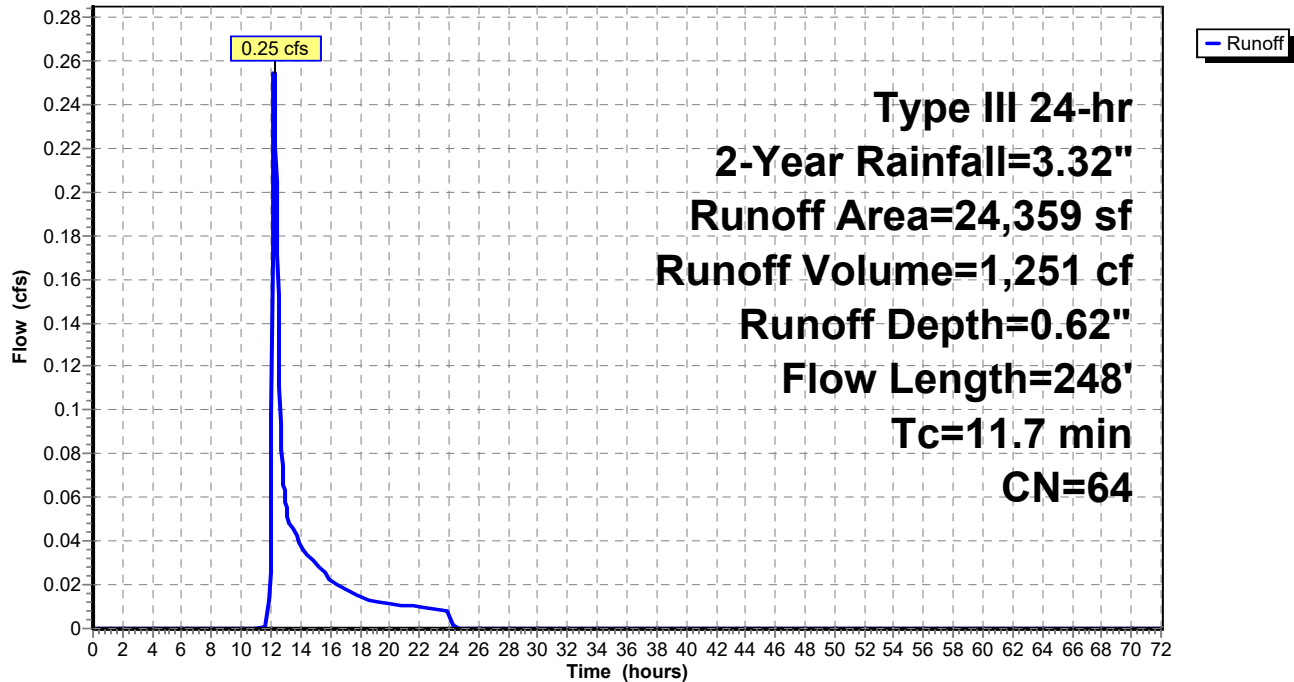
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
854	98	Paved parking, HSG B
18,220	61	>75% Grass cover, Good, HSG B
1,547	98	Roofs, HSG B
3,738	55	Woods, Good, HSG B
24,359	64	Weighted Average
21,958		90.14% Pervious Area
2,401		9.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0280	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.39"
0.6	114	0.0440	3.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	64	0.0190	2.22		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.1	20	0.0450	3.42		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
11.7	248	Total			

Subcatchment 1S: 1S

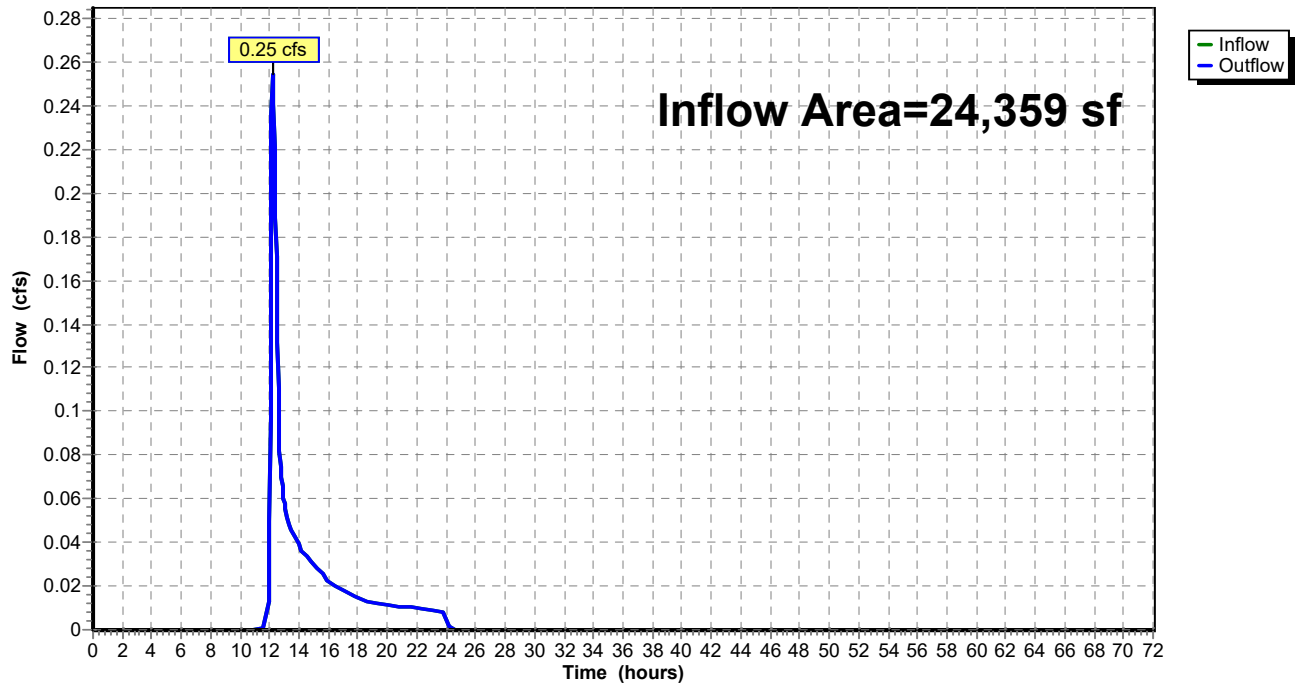
Hydrograph



Summary for Reach 1R: Wetlands

Inflow Area = 24,359 sf, 9.86% Impervious, Inflow Depth = 0.62" for 2-Year event
Inflow = 0.25 cfs @ 12.20 hrs, Volume= 1,251 cf
Outflow = 0.25 cfs @ 12.20 hrs, Volume= 1,251 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: Wetlands**Hydrograph**

19-065 Pre WS*Type III 24-hr 10-Year Rainfall=4.92"*

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: 1SRunoff Area=24,359 sf 9.86% Impervious Runoff Depth=1.53"
Flow Length=248' Tc=11.7 min CN=64 Runoff=0.76 cfs 3,103 cf**Reach 1R: Wetlands**Inflow=0.76 cfs 3,103 cf
Outflow=0.76 cfs 3,103 cf**Total Runoff Area = 24,359 sf Runoff Volume = 3,103 cf Average Runoff Depth = 1.53"**
90.14% Pervious = 21,958 sf 9.86% Impervious = 2,401 sf

19-065 Pre WS

Type III 24-hr 10-Year Rainfall=4.92"

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Summary for Subcatchment 1S: 1S

Runoff = 0.76 cfs @ 12.18 hrs, Volume= 3,103 cf, Depth= 1.53"

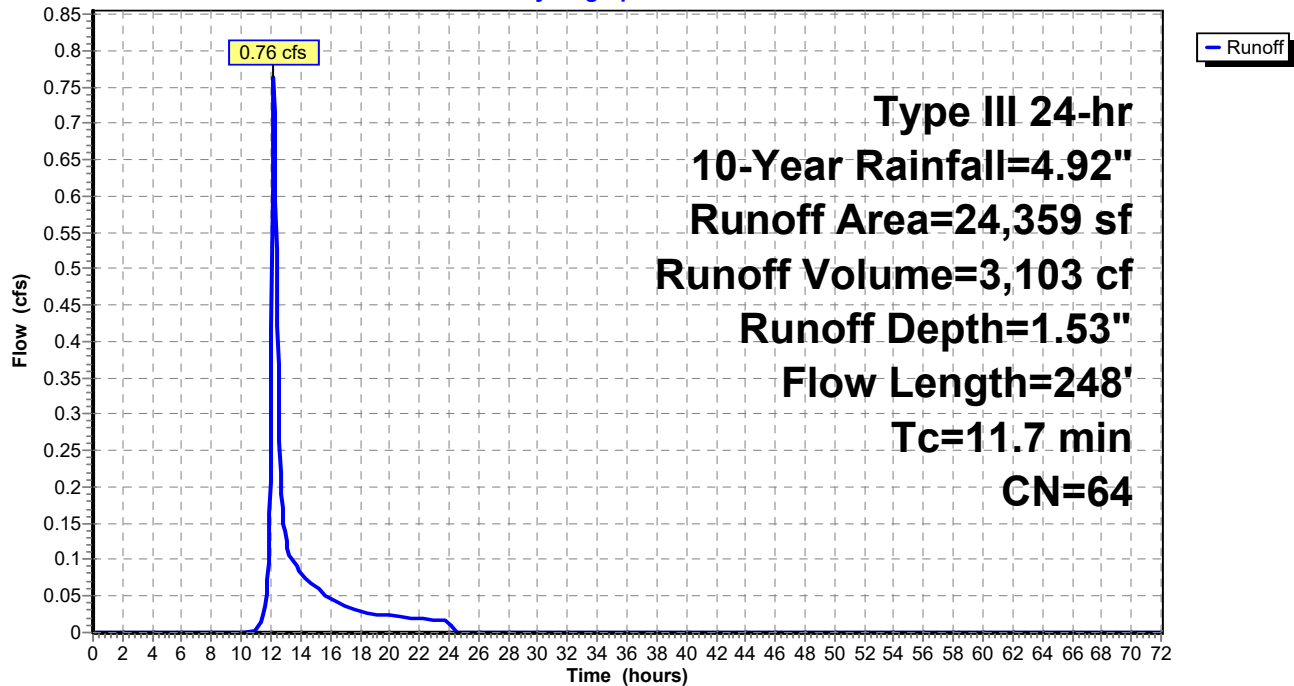
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.92"

Area (sf)	CN	Description
854	98	Paved parking, HSG B
18,220	61	>75% Grass cover, Good, HSG B
1,547	98	Roofs, HSG B
3,738	55	Woods, Good, HSG B
24,359	64	Weighted Average
21,958		90.14% Pervious Area
2,401		9.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0280	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.39"
0.6	114	0.0440	3.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	64	0.0190	2.22		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.1	20	0.0450	3.42		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
11.7	248	Total			

Subcatchment 1S: 1S

Hydrograph



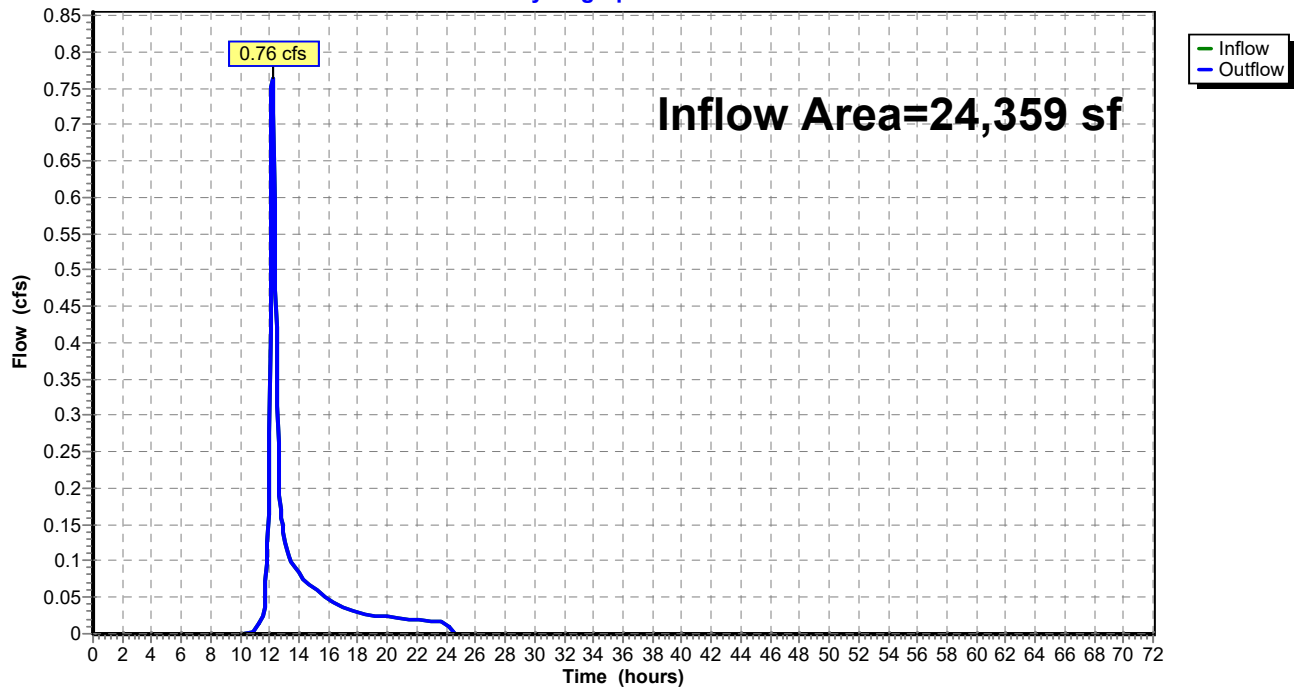
Summary for Reach 1R: Wetlands

Inflow Area = 24,359 sf, 9.86% Impervious, Inflow Depth = 1.53" for 10-Year event
Inflow = 0.76 cfs @ 12.18 hrs, Volume= 3,103 cf
Outflow = 0.76 cfs @ 12.18 hrs, Volume= 3,103 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: Wetlands

Hydrograph



19-065 Pre WS*Type III 24-hr 25-Year Rainfall=6.17"*

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: 1SRunoff Area=24,359 sf 9.86% Impervious Runoff Depth=2.39"
Flow Length=248' Tc=11.7 min CN=64 Runoff=1.25 cfs 4,842 cf**Reach 1R: Wetlands**Inflow=1.25 cfs 4,842 cf
Outflow=1.25 cfs 4,842 cf**Total Runoff Area = 24,359 sf Runoff Volume = 4,842 cf Average Runoff Depth = 2.39"**
90.14% Pervious = 21,958 sf 9.86% Impervious = 2,401 sf

Summary for Subcatchment 1S: 1S

Runoff = 1.25 cfs @ 12.17 hrs, Volume= 4,842 cf, Depth= 2.39"

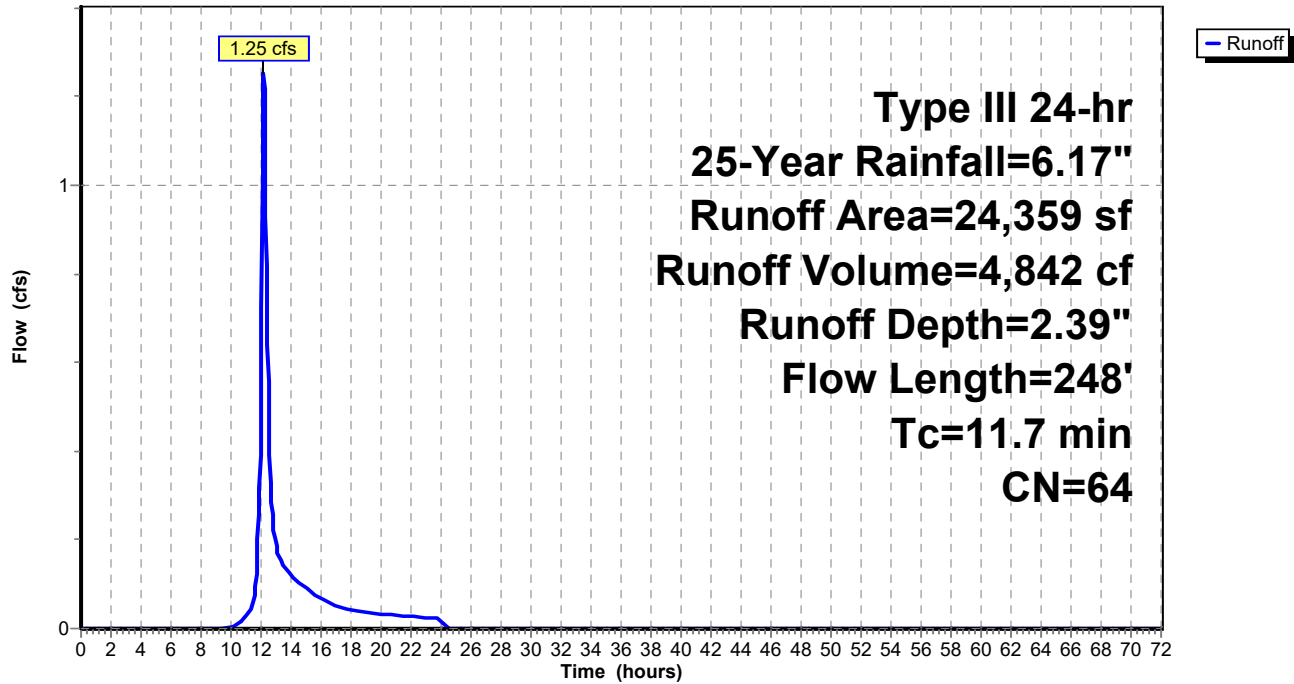
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.17"

Area (sf)	CN	Description
854	98	Paved parking, HSG B
18,220	61	>75% Grass cover, Good, HSG B
1,547	98	Roofs, HSG B
3,738	55	Woods, Good, HSG B
24,359	64	Weighted Average
21,958		90.14% Pervious Area
2,401		9.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0280	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.39"
0.6	114	0.0440	3.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	64	0.0190	2.22		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.1	20	0.0450	3.42		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
11.7	248	Total			

Subcatchment 1S: 1S

Hydrograph



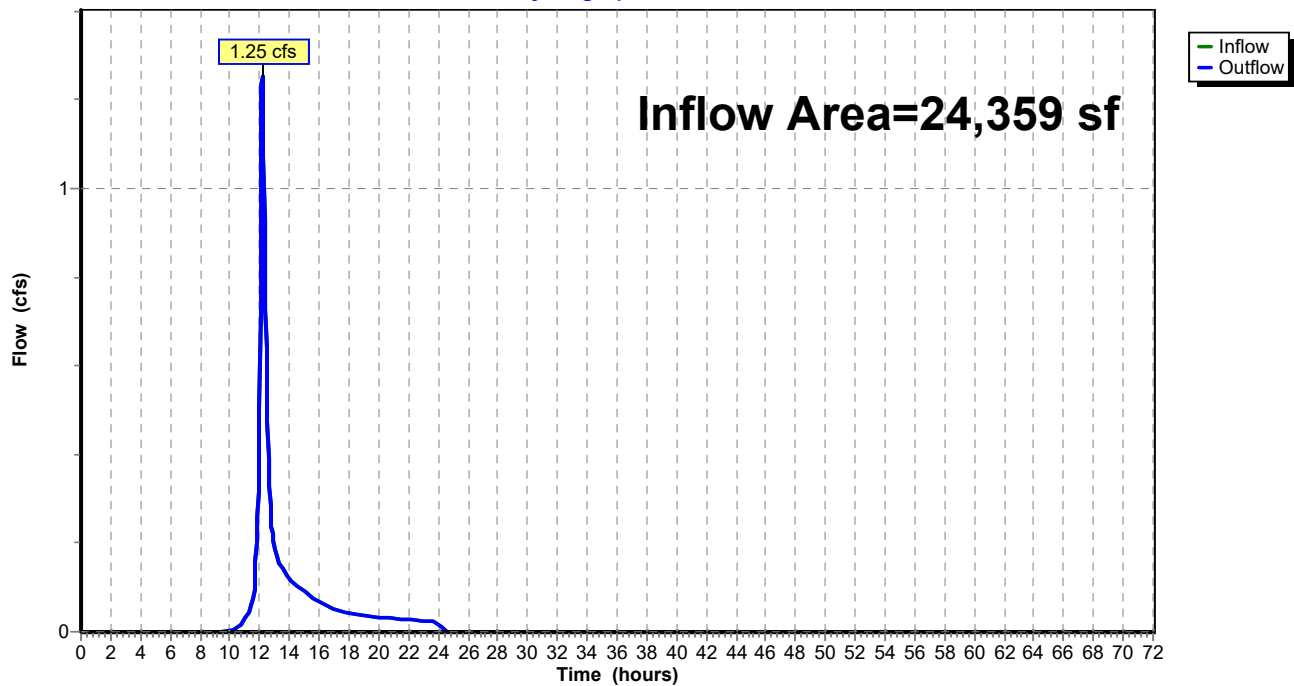
Summary for Reach 1R: Wetlands

Inflow Area = 24,359 sf, 9.86% Impervious, Inflow Depth = 2.39" for 25-Year event
Inflow = 1.25 cfs @ 12.17 hrs, Volume= 4,842 cf
Outflow = 1.25 cfs @ 12.17 hrs, Volume= 4,842 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: Wetlands

Hydrograph



19-065 Pre WS*Type III 24-hr 100-Year Rainfall=8.70"*

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: 1S

Runoff Area=24,359 sf 9.86% Impervious Runoff Depth=4.35"

Flow Length=248' Tc=11.7 min CN=64 Runoff=2.34 cfs 8,824 cf

Reach 1R: Wetlands

Inflow=2.34 cfs 8,824 cf

Outflow=2.34 cfs 8,824 cf

Total Runoff Area = 24,359 sf Runoff Volume = 8,824 cf Average Runoff Depth = 4.35"
90.14% Pervious = 21,958 sf 9.86% Impervious = 2,401 sf

19-065 Pre WS

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Subcatchment 1S: 1S

Runoff = 2.34 cfs @ 12.17 hrs, Volume= 8,824 cf, Depth= 4.35"

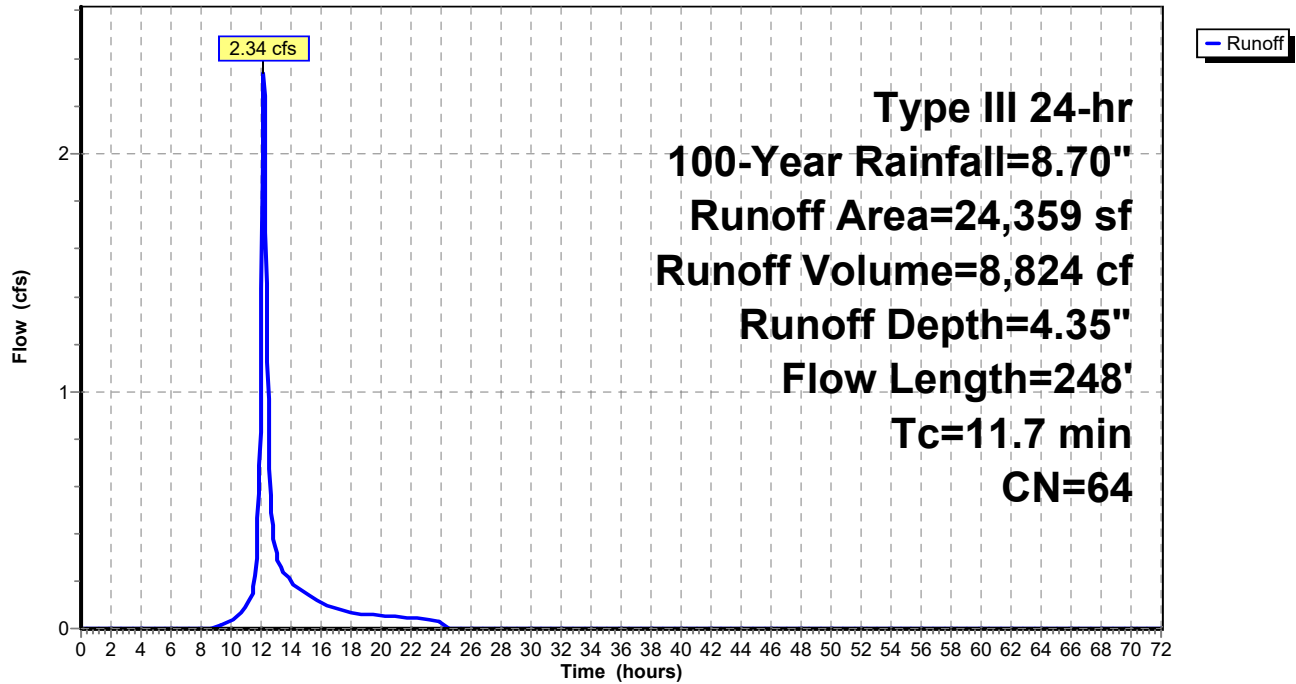
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
854	98	Paved parking, HSG B
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0.6	114	0.0440	3.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	64	0.0190	2.22		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.1	20	0.0450	3.42		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
11.7	248	Total			

Subcatchment 1S: 1S

Hydrograph



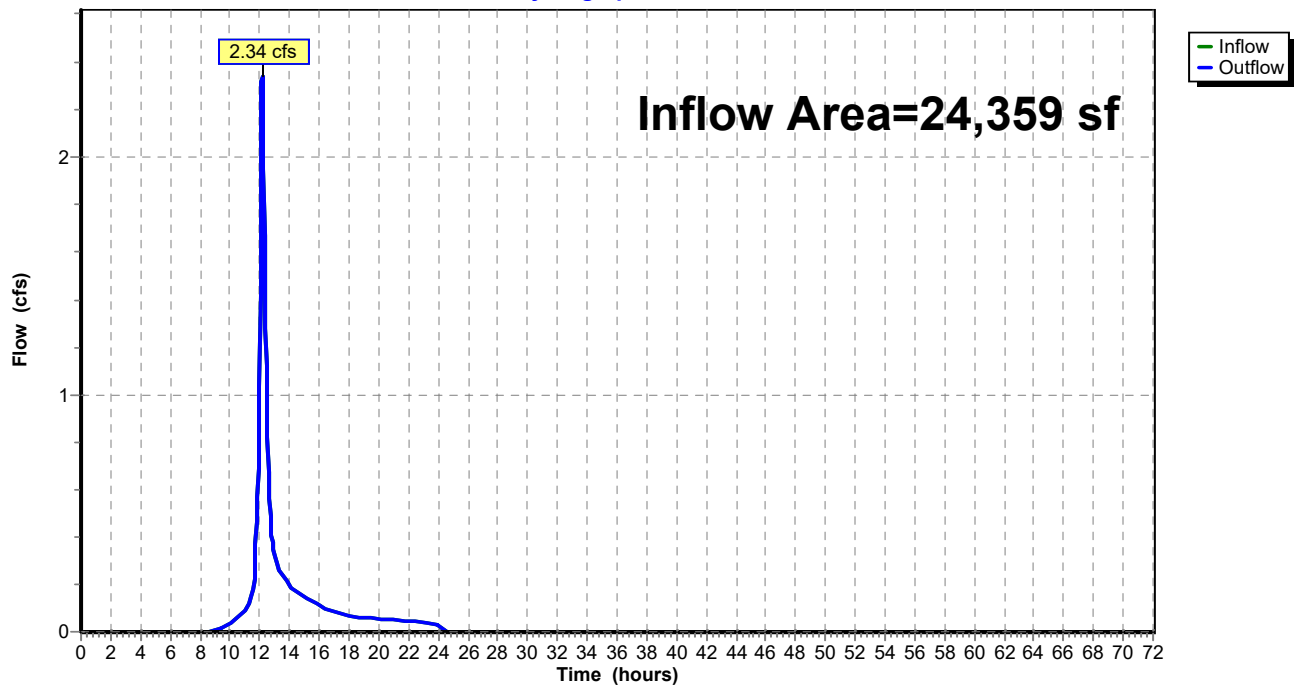
Summary for Reach 1R: Wetlands

Inflow Area = 24,359 sf, 9.86% Impervious, Inflow Depth = 4.35" for 100-Year event
Inflow = 2.34 cfs @ 12.17 hrs, Volume= 8,824 cf
Outflow = 2.34 cfs @ 12.17 hrs, Volume= 8,824 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: Wetlands

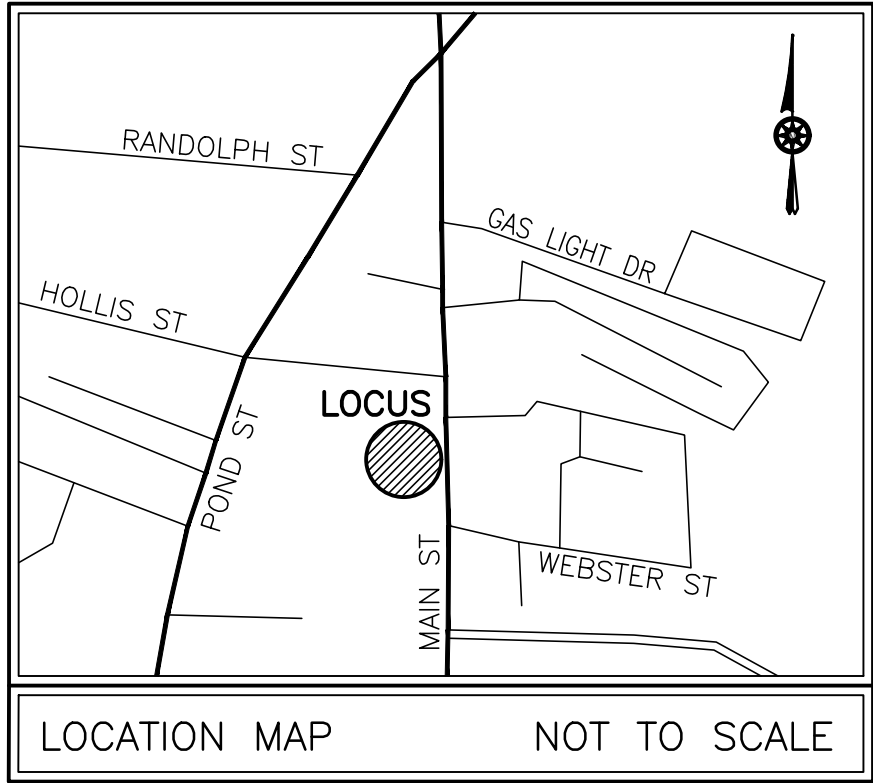
Hydrograph





Appendix B

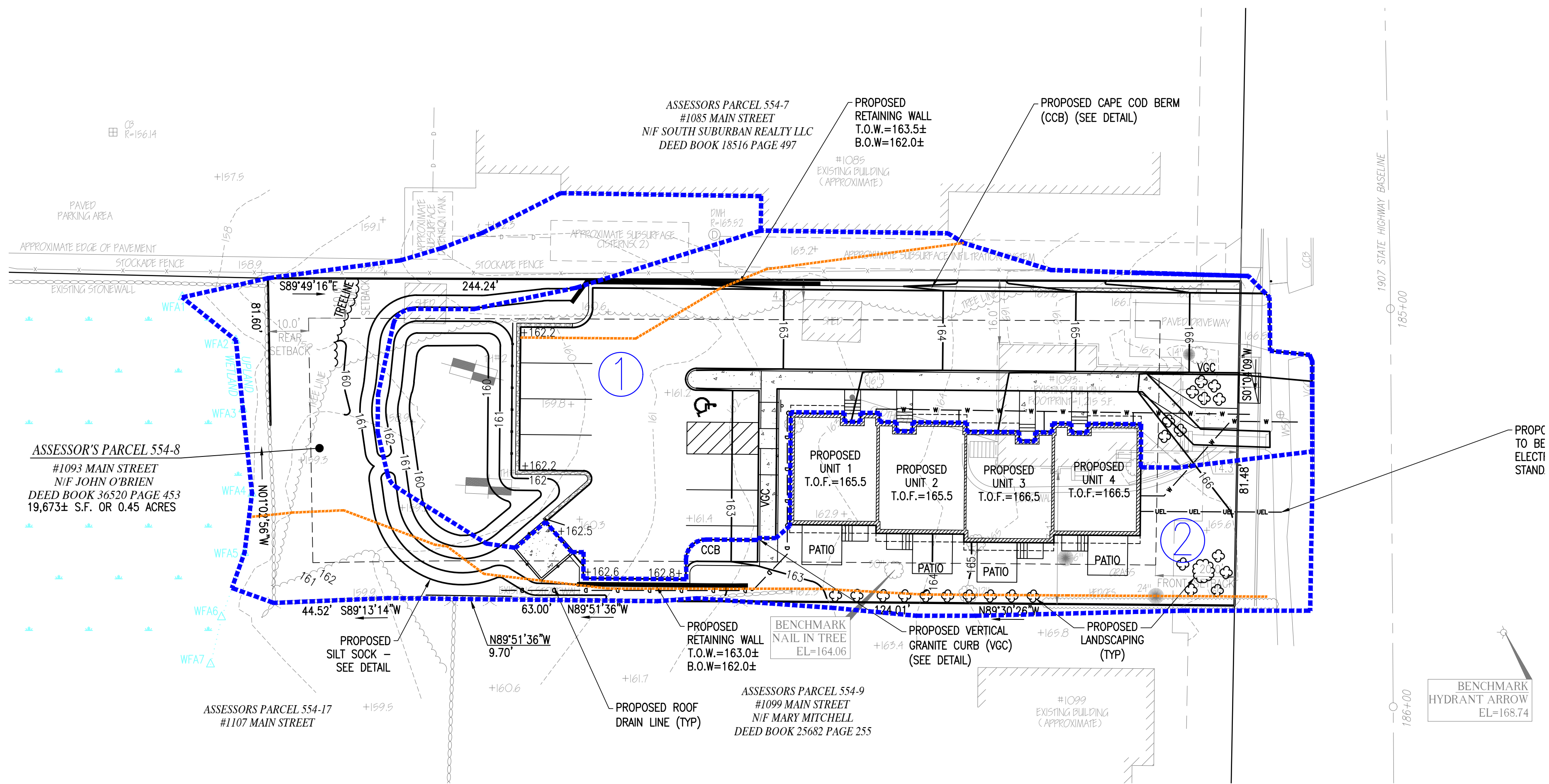
Proposed Conditions with Watershed Delineation Plan



POST DEVELOPMENT CONDITIONS WATERSHED

SUBCATCHMENT 1S	
DESCRIPTION	AREA (S.F.)
PAVED PARKING	7,112 S.F.
LANDSCAPE/LAWN, GOOD	5,340 S.F.
TOTAL AREA	12,452 S.F.

SUBCATCHMENT 2S	
DESCRIPTION	AREA (S.F.)
PAVED PARKING	500 S.F.
BUILDING ROOF	2,537 S.F.
WOODS, GOOD	1,845 S.F.
LANDSCAPE/LAWN, GOOD	7,025 S.F.
TOTAL AREA	11,907 S.F.




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REVISIONS

DRAWN BY: JG

DESIGNED BY: JG

CHECKED BY: DK

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26 UNION STREET, PLYMOUTH MA 02360 / T: (508) 746-6060
WWW.MERRILLINC.COM

SITE PLAN

#1093 MAIN STREET
WEYMOUTH, MASSACHUSETTS

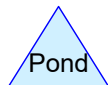
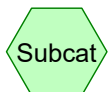
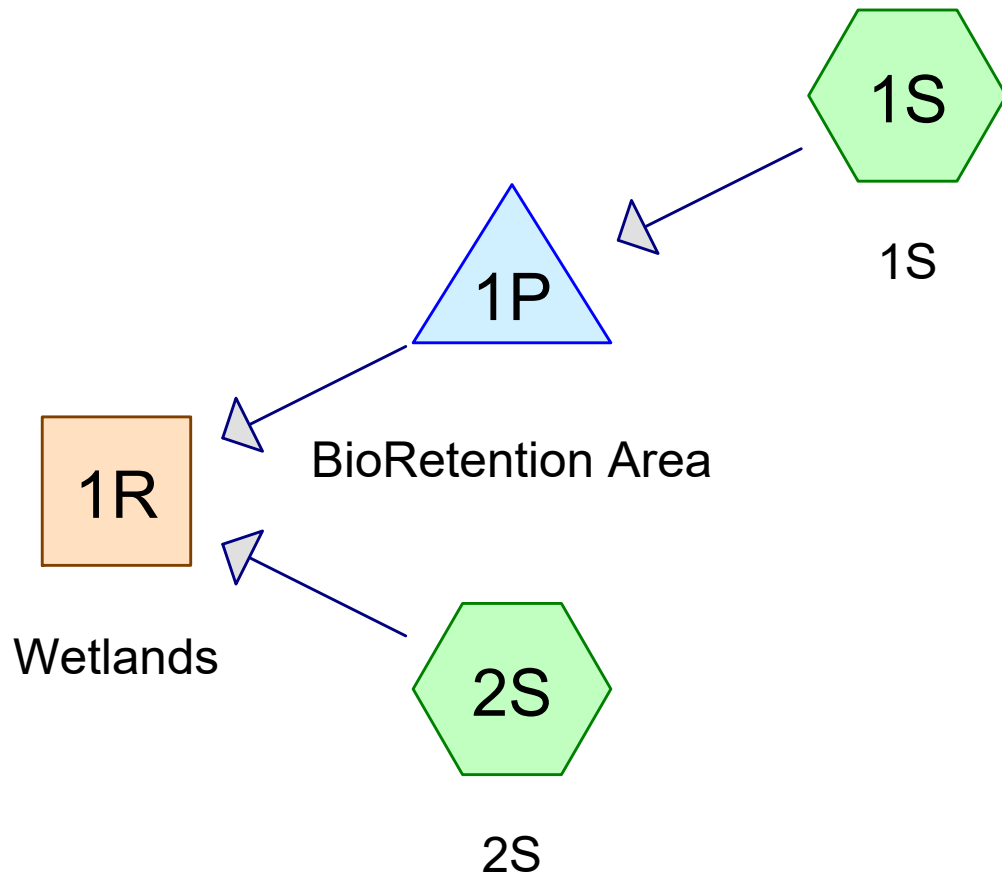
PREPARED FOR: MR. JOHN O'BRIEN
1150 TURNPIKE STREET
STOUGHTON, MA 02072

DECEMBER 16, 2019

SCALE: 1"=20'

JOB No. 19-065

LATEST REVISION:



Routing Diagram for 19-065 Post WS

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
12,365	61	>75% Grass cover, Good, HSG B (1S, 2S)
7,612	98	Paved parking, HSG B (1S, 2S)
2,537	98	Unconnected roofs, HSG B (2S)
1,845	55	Woods, Good, HSG B (2S)
24,359	76	TOTAL AREA

19-065 Post WS*Type III 24-hr 2-Year Rainfall=3.32"*

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: 1S

Runoff Area=12,452 sf 57.12% Impervious Runoff Depth=1.64"

Tc=6.0 min CN=82 Runoff=0.54 cfs 1,697 cf

Subcatchment2S: 2S

Runoff Area=11,907 sf 25.51% Impervious Runoff Depth=0.66"

Flow Length=285' Tc=8.5 min UI Adjusted CN=65 Runoff=0.15 cfs 655 cf

Reach 1R: Wetlands

Inflow=0.15 cfs 655 cf

Outflow=0.15 cfs 655 cf

Pond 1P: BioRetention Area

Peak Elev=160.72' Storage=777 cf Inflow=0.54 cfs 1,697 cf

Discarded=0.04 cfs 1,697 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 1,697 cf

Total Runoff Area = 24,359 sf Runoff Volume = 2,351 cf Average Runoff Depth = 1.16"
58.34% Pervious = 14,210 sf 41.66% Impervious = 10,149 sf

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Type III 24-hr 2-Year Rainfall=3.32"

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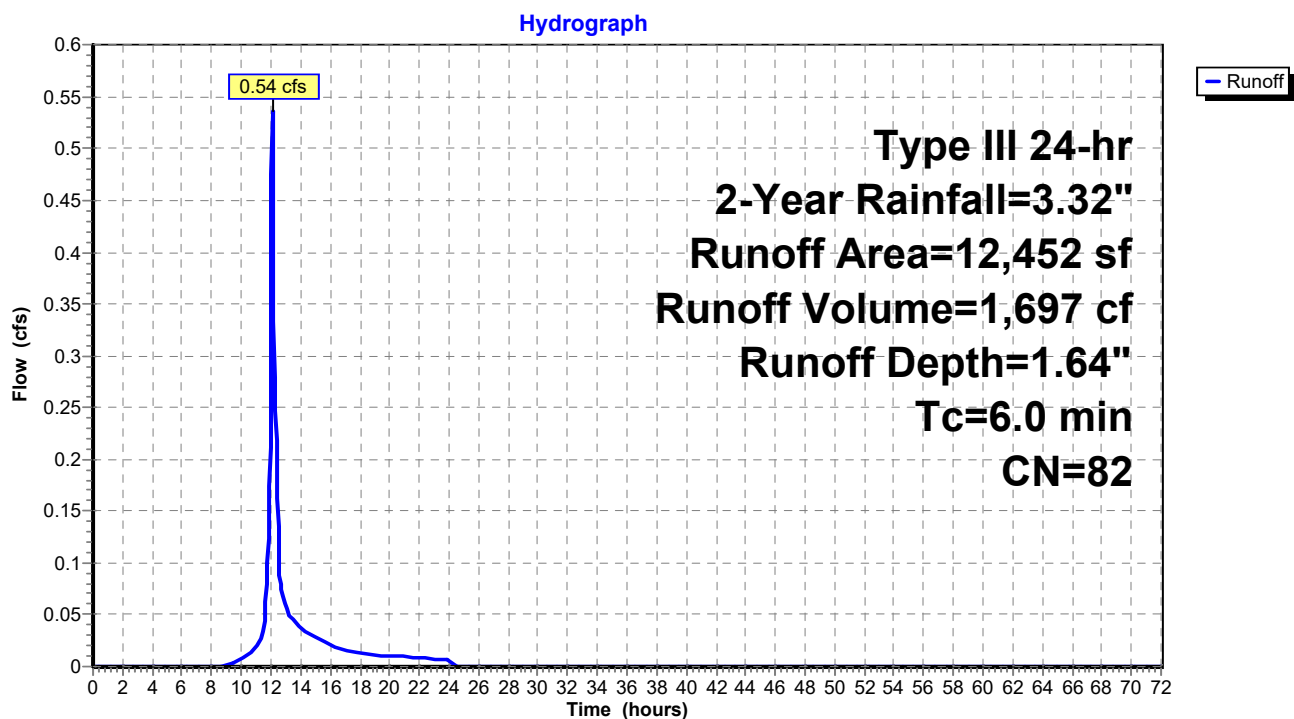
Summary for Subcatchment 1S: 1S

Runoff = 0.54 cfs @ 12.09 hrs, Volume= 1,697 cf, Depth= 1.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
7,112	98	Paved parking, HSG B
5,340	61	>75% Grass cover, Good, HSG B
12,452	82	Weighted Average
5,340		42.88% Pervious Area
7,112		57.12% Impervious Area

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

Subcatchment 1S: 1S

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Type III 24-hr 2-Year Rainfall=3.32"

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Summary for Subcatchment 2S: 2S

Runoff = 0.15 cfs @ 12.15 hrs, Volume= 655 cf, Depth= 0.66"

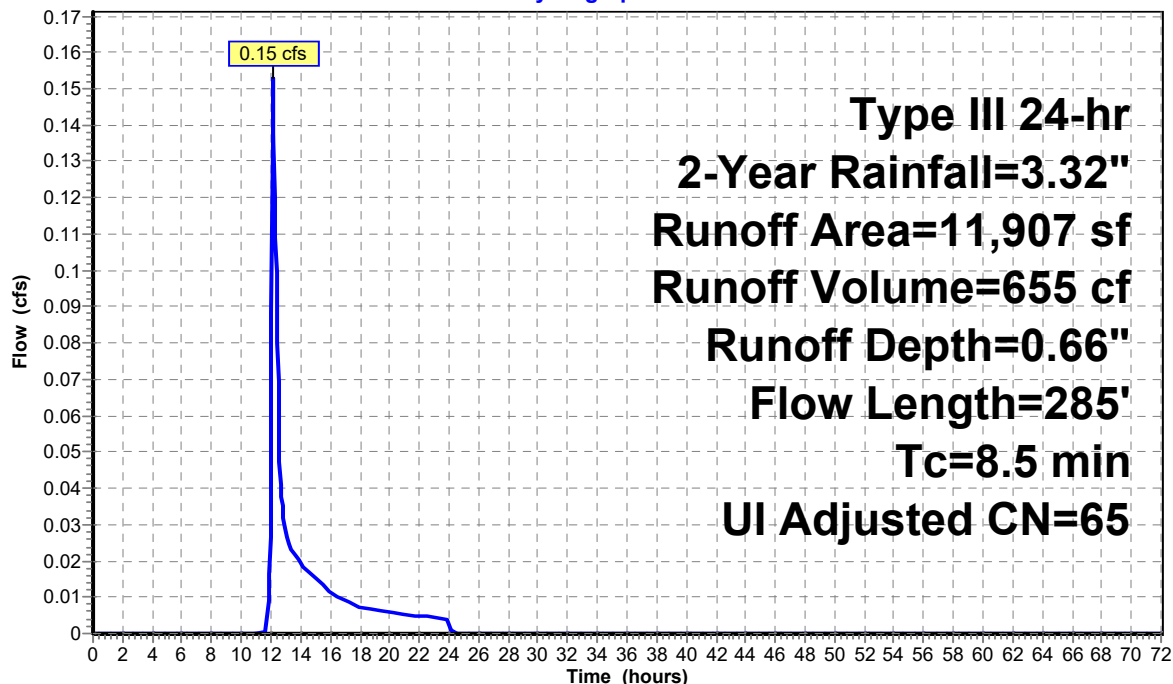
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Adj	Description
500	98		Paved parking, HSG B
7,025	61		>75% Grass cover, Good, HSG B
1,845	55		Woods, Good, HSG B
2,537	98		Unconnected roofs, HSG B
11,907	70	65	Weighted Average, UI Adjusted
8,870			74.49% Pervious Area
3,037			25.51% Impervious Area
2,537			83.54% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.39"
1.2	214	0.0330	2.92		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.1	21	0.0450	3.42		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
8.5	285	Total			

Subcatchment 2S: 2S

Hydrograph



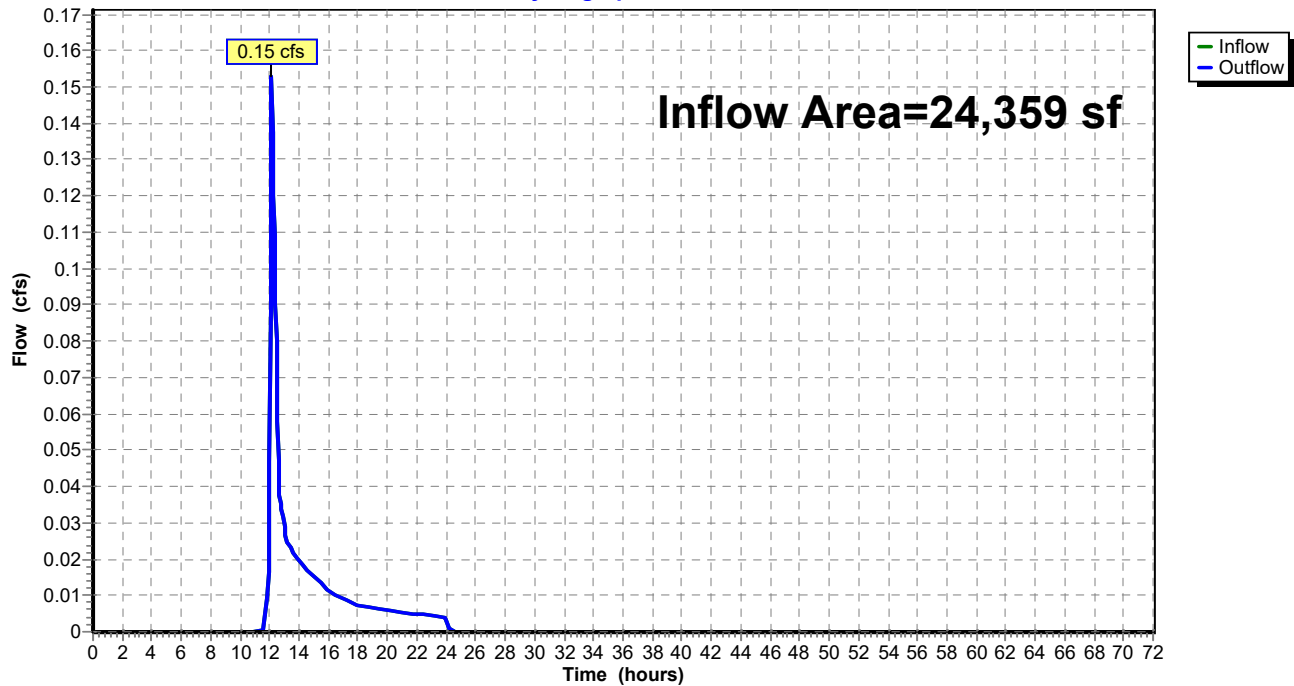
Summary for Reach 1R: Wetlands

Inflow Area = 24,359 sf, 41.66% Impervious, Inflow Depth = 0.32" for 2-Year event
Inflow = 0.15 cfs @ 12.15 hrs, Volume= 655 cf
Outflow = 0.15 cfs @ 12.15 hrs, Volume= 655 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: Wetlands

Hydrograph



19-065 Post WS

Type III 24-hr 2-Year Rainfall=3.32"

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Summary for Pond 1P: BioRetention Area

Inflow Area = 12,452 sf, 57.12% Impervious, Inflow Depth = 1.64" for 2-Year event
 Inflow = 0.54 cfs @ 12.09 hrs, Volume= 1,697 cf
 Outflow = 0.04 cfs @ 13.93 hrs, Volume= 1,697 cf, Atten= 93%, Lag= 109.9 min
 Discarded = 0.04 cfs @ 13.93 hrs, Volume= 1,697 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 160.72' @ 13.93 hrs Surf.Area= 1,256 sf Storage= 777 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 226.6 min (1,061.1 - 834.5)

Volume	Invert	Avail.Storage	Storage Description
#1	160.00'	2,800 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
160.00	904	0	0
161.00	1,393	1,149	1,149
162.00	1,910	1,652	2,800

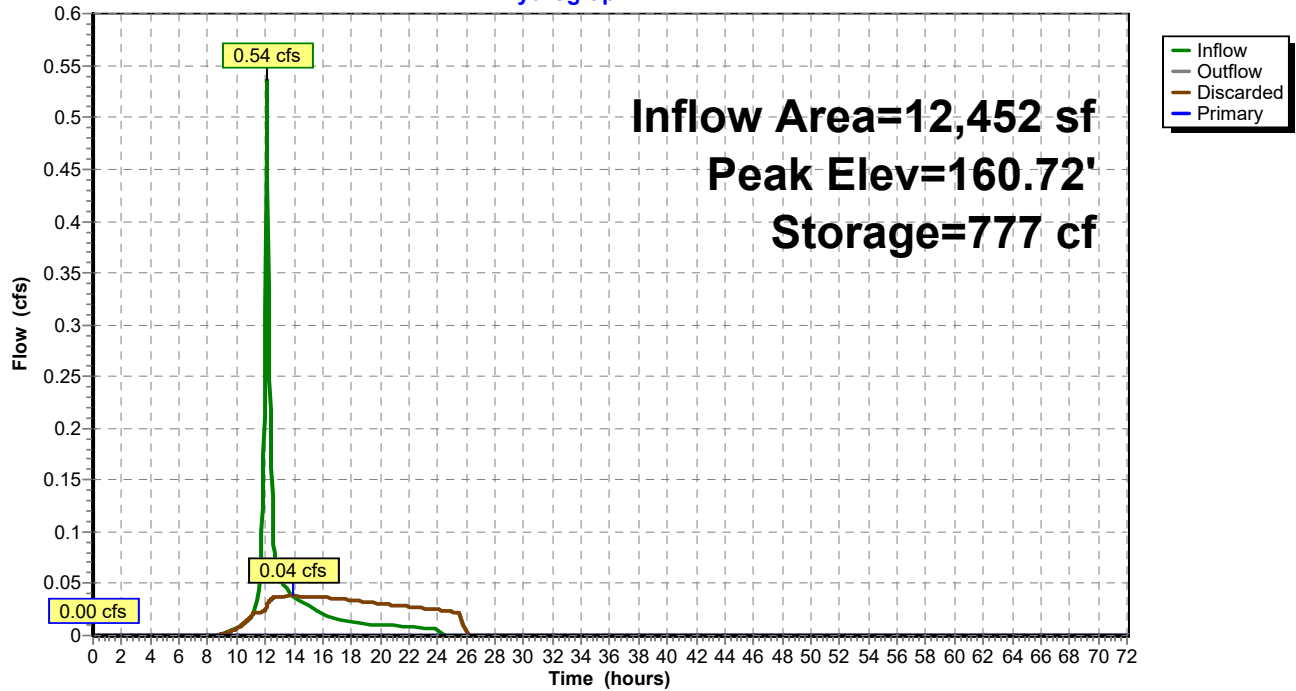
Device	Routing	Invert	Outlet Devices
#1	Discarded	160.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 157.90'
#2	Primary	161.50'	3.5' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.04 cfs @ 13.93 hrs HW=160.72' (Free Discharge)
 ↑1=Exfiltration (Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=160.00' TW=0.00' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: BioRetention Area

Hydrograph



19-065 Post WS*Type III 24-hr 10-Year Rainfall=4.92"*

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: 1S

Runoff Area=12,452 sf 57.12% Impervious Runoff Depth=3.01"

Tc=6.0 min CN=82 Runoff=0.99 cfs 3,121 cf

Subcatchment2S: 2S

Runoff Area=11,907 sf 25.51% Impervious Runoff Depth=1.60"

Flow Length=285' Tc=8.5 min UI Adjusted CN=65 Runoff=0.44 cfs 1,588 cf

Reach 1R: Wetlands

Inflow=0.44 cfs 1,588 cf

Outflow=0.44 cfs 1,588 cf

Pond 1P: BioRetention Area

Peak Elev=161.33' Storage=1,643 cf Inflow=0.99 cfs 3,121 cf

Discarded=0.05 cfs 3,121 cf Primary=0.00 cfs 0 cf Outflow=0.05 cfs 3,121 cf

Total Runoff Area = 24,359 sf Runoff Volume = 4,709 cf Average Runoff Depth = 2.32"
58.34% Pervious = 14,210 sf 41.66% Impervious = 10,149 sf

19-065 Post WS

Type III 24-hr 10-Year Rainfall=4.92"

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Summary for Subcatchment 1S: 1S

Runoff = 0.99 cfs @ 12.09 hrs, Volume= 3,121 cf, Depth= 3.01"

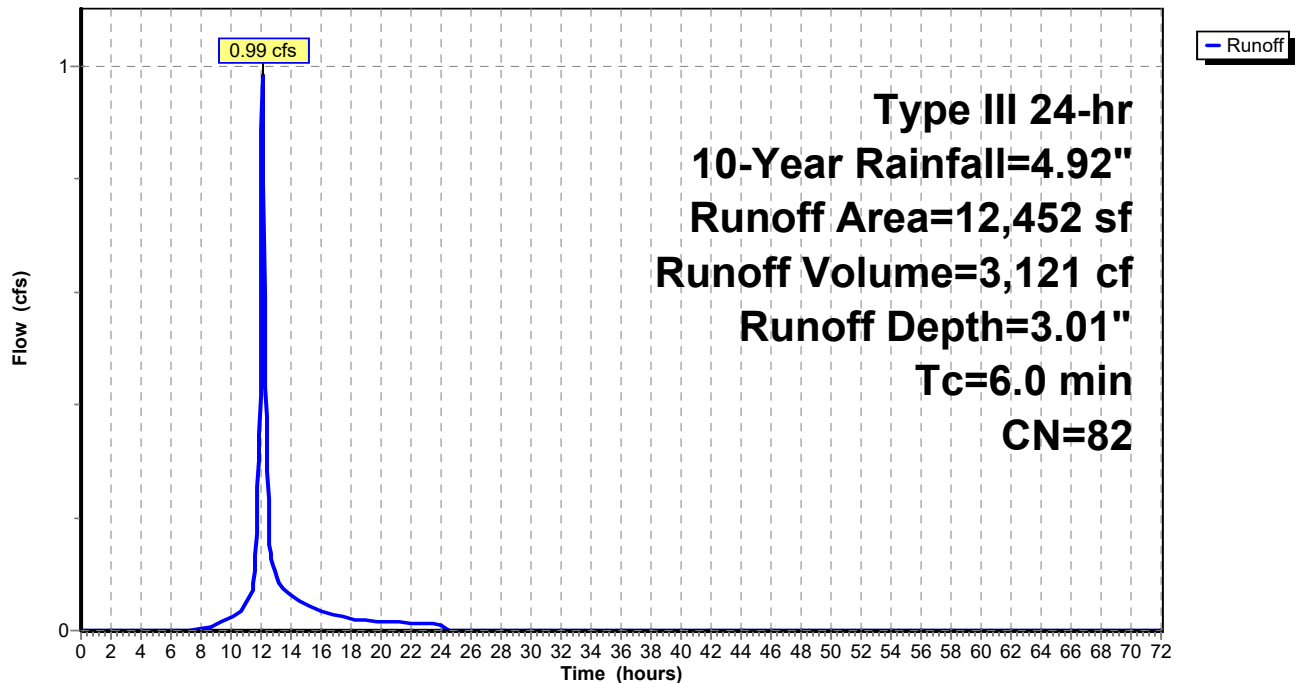
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.92"

Area (sf)	CN	Description
7,112	98	Paved parking, HSG B
5,340	61	>75% Grass cover, Good, HSG B
12,452	82	Weighted Average
5,340		42.88% Pervious Area
7,112		57.12% Impervious Area

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

Subcatchment 1S: 1S

Hydrograph



19-065 Post WS

Type III 24-hr 10-Year Rainfall=4.92"

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Summary for Subcatchment 2S: 2S

Runoff = 0.44 cfs @ 12.13 hrs, Volume= 1,588 cf, Depth= 1.60"

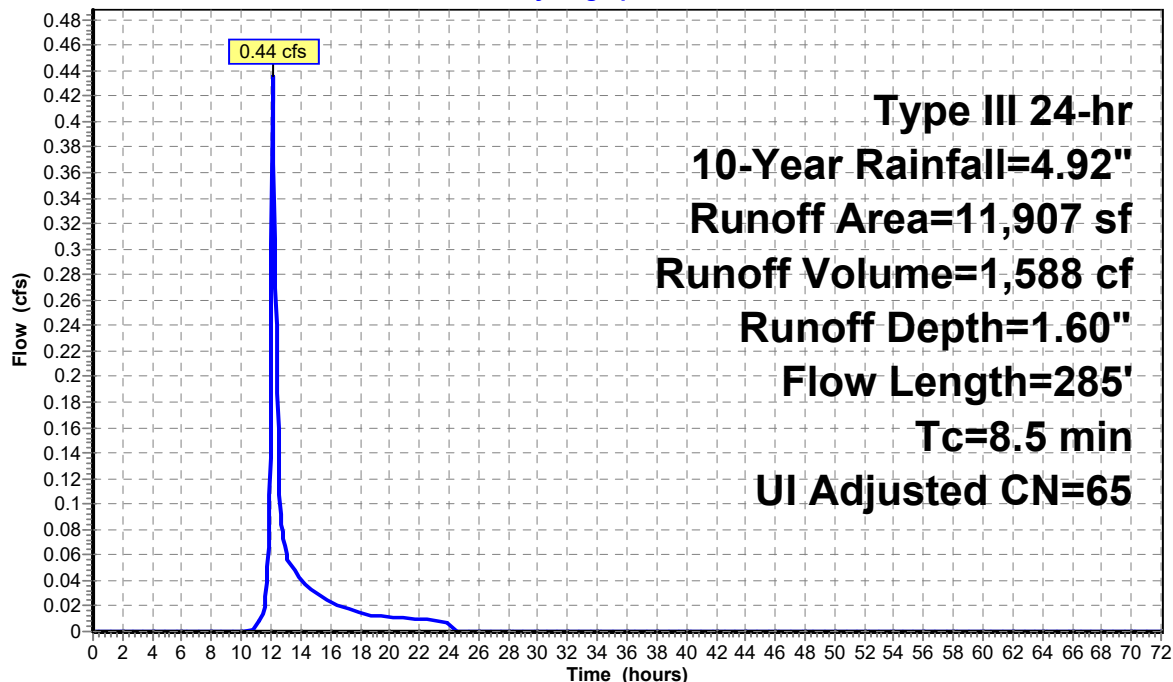
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.92"

Area (sf)	CN	Adj	Description
500	98		Paved parking, HSG B
7,025	61		>75% Grass cover, Good, HSG B
1,845	55		Woods, Good, HSG B
2,537	98		Unconnected roofs, HSG B
11,907	70	65	Weighted Average, UI Adjusted
8,870			74.49% Pervious Area
3,037			25.51% Impervious Area
2,537			83.54% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.39"
1.2	214	0.0330	2.92		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.1	21	0.0450	3.42		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
8.5	285	Total			

Subcatchment 2S: 2S

Hydrograph



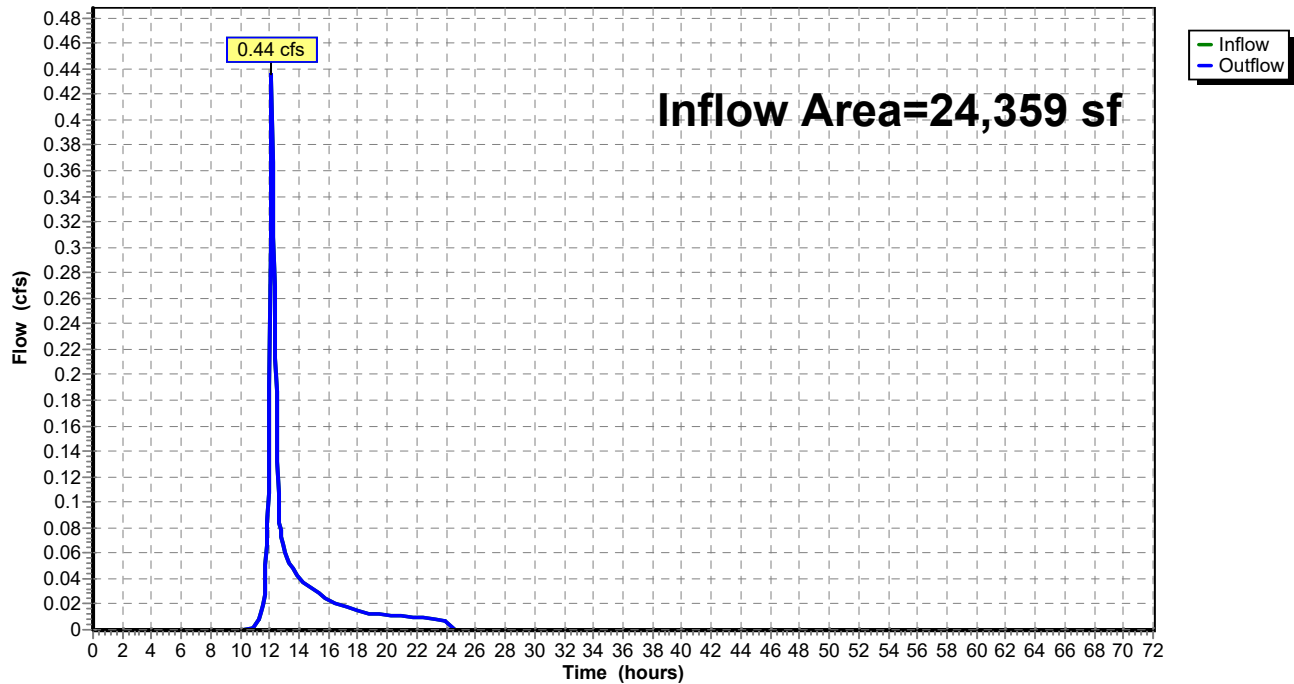
Summary for Reach 1R: Wetlands

Inflow Area = 24,359 sf, 41.66% Impervious, Inflow Depth = 0.78" for 10-Year event
Inflow = 0.44 cfs @ 12.13 hrs, Volume= 1,588 cf
Outflow = 0.44 cfs @ 12.13 hrs, Volume= 1,588 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: Wetlands

Hydrograph



19-065 Post WS

Type III 24-hr 10-Year Rainfall=4.92"

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Summary for Pond 1P: BioRetention Area

Inflow Area = 12,452 sf, 57.12% Impervious, Inflow Depth = 3.01" for 10-Year event
 Inflow = 0.99 cfs @ 12.09 hrs, Volume= 3,121 cf
 Outflow = 0.05 cfs @ 14.45 hrs, Volume= 3,121 cf, Atten= 94%, Lag= 141.8 min
 Discarded = 0.05 cfs @ 14.45 hrs, Volume= 3,121 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 161.33' @ 14.45 hrs Surf.Area= 1,566 sf Storage= 1,643 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 354.7 min (1,171.6 - 817.0)

Volume	Invert	Avail.Storage	Storage Description
#1	160.00'	2,800 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
160.00	904	0	0
161.00	1,393	1,149	1,149
162.00	1,910	1,652	2,800

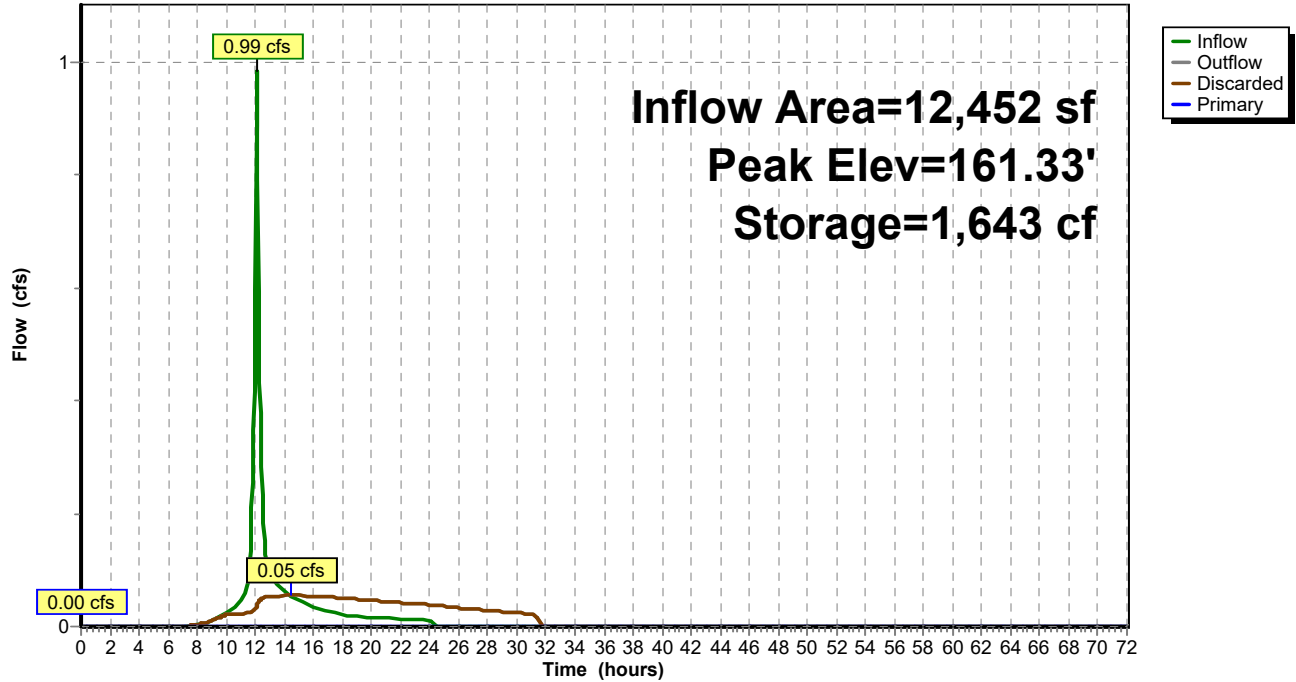
Device	Routing	Invert	Outlet Devices
#1	Discarded	160.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 157.90'
#2	Primary	161.50'	3.5' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.05 cfs @ 14.45 hrs HW=161.33' (Free Discharge)
 ↑**1=Exfiltration** (Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=160.00' TW=0.00' (Dynamic Tailwater)
 ↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: BioRetention Area

Hydrograph



19-065 Post WS*Type III 24-hr 25-Year Rainfall=6.17"*

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: 1S

Runoff Area=12,452 sf 57.12% Impervious Runoff Depth=4.14"

Tc=6.0 min CN=82 Runoff=1.35 cfs 4,300 cf

Subcatchment2S: 2S

Runoff Area=11,907 sf 25.51% Impervious Runoff Depth=2.48"

Flow Length=285' Tc=8.5 min UI Adjusted CN=65 Runoff=0.70 cfs 2,456 cf

Reach 1R: Wetlands

Inflow=0.70 cfs 2,992 cf

Outflow=0.70 cfs 2,992 cf

Pond 1P: BioRetention Area

Peak Elev=161.57' Storage=2,034 cf Inflow=1.35 cfs 4,300 cf

Discarded=0.06 cfs 3,765 cf Primary=0.17 cfs 535 cf Outflow=0.24 cfs 4,300 cf

Total Runoff Area = 24,359 sf Runoff Volume = 6,756 cf Average Runoff Depth = 3.33"
58.34% Pervious = 14,210 sf 41.66% Impervious = 10,149 sf

19-065 Post WS

Type III 24-hr 25-Year Rainfall=6.17"

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Summary for Subcatchment 1S: 1S

Runoff = 1.35 cfs @ 12.09 hrs, Volume= 4,300 cf, Depth= 4.14"

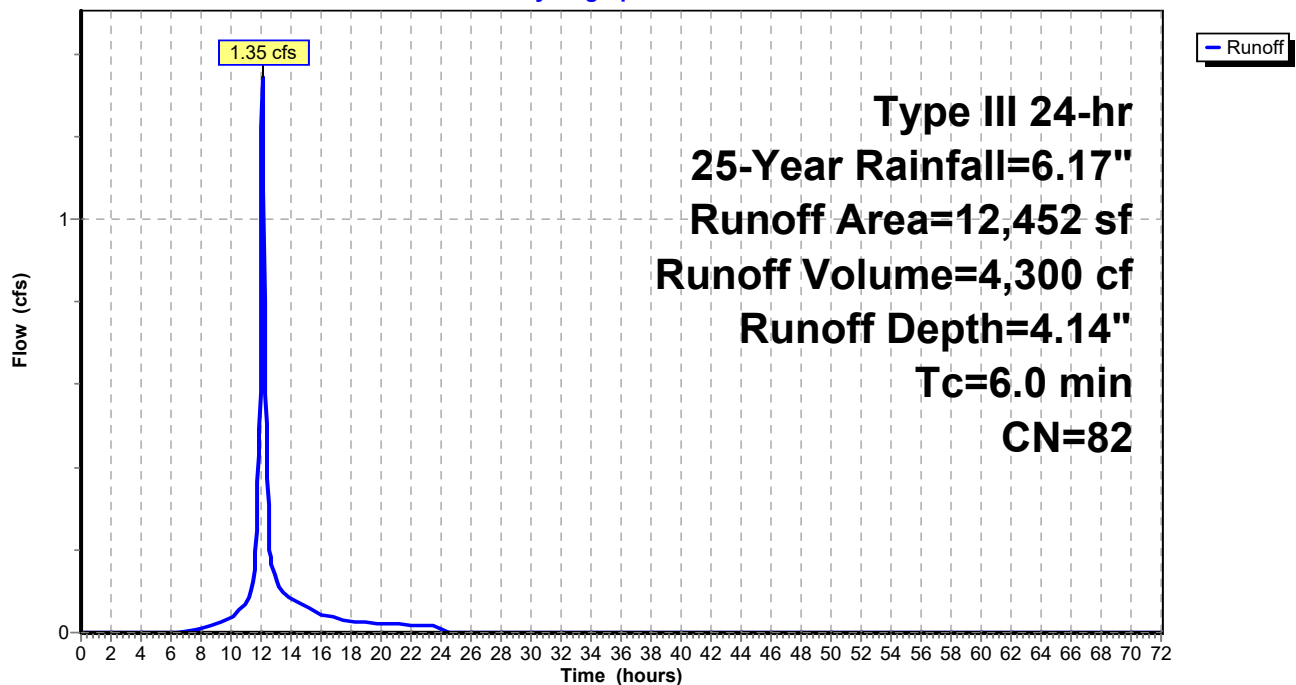
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.17"

Area (sf)	CN	Description
7,112	98	Paved parking, HSG B
5,340	61	>75% Grass cover, Good, HSG B
12,452	82	Weighted Average
5,340		42.88% Pervious Area
7,112		57.12% Impervious Area

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

Subcatchment 1S: 1S

Hydrograph



19-065 Post WS

Type III 24-hr 25-Year Rainfall=6.17"

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Summary for Subcatchment 2S: 2S

Runoff = 0.70 cfs @ 12.13 hrs, Volume= 2,456 cf, Depth= 2.48"

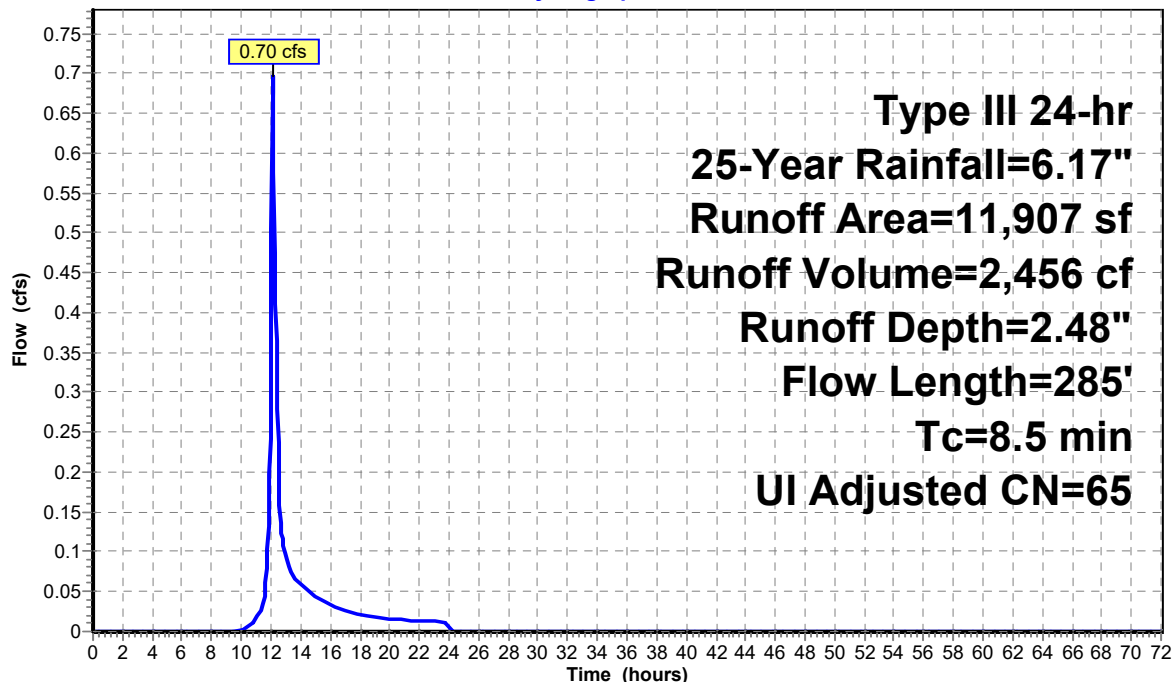
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.17"

Area (sf)	CN	Adj	Description
500	98		Paved parking, HSG B
7,025	61		>75% Grass cover, Good, HSG B
1,845	55		Woods, Good, HSG B
2,537	98		Unconnected roofs, HSG B
11,907	70	65	Weighted Average, UI Adjusted
8,870			74.49% Pervious Area
3,037			25.51% Impervious Area
2,537			83.54% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.39"
1.2	214	0.0330	2.92		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.1	21	0.0450	3.42		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
8.5	285	Total			

Subcatchment 2S: 2S

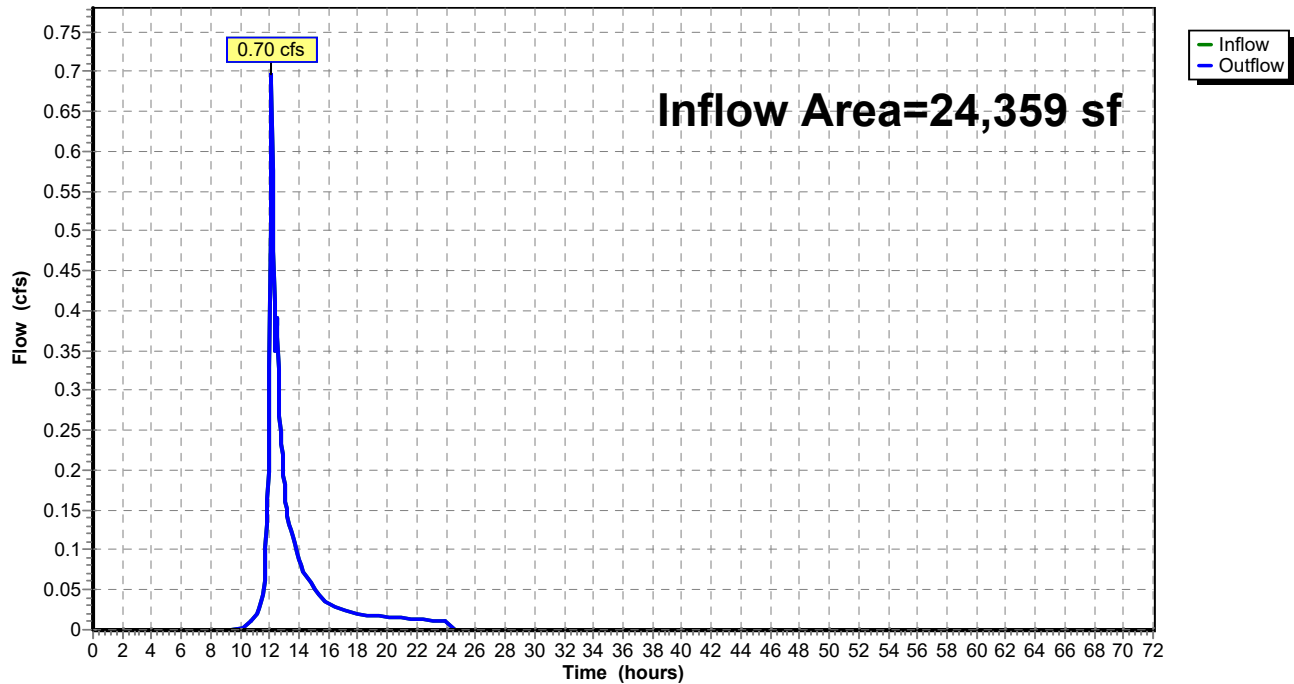
Hydrograph



Summary for Reach 1R: Wetlands

Inflow Area = 24,359 sf, 41.66% Impervious, Inflow Depth = 1.47" for 25-Year event
Inflow = 0.70 cfs @ 12.13 hrs, Volume= 2,992 cf
Outflow = 0.70 cfs @ 12.13 hrs, Volume= 2,992 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: Wetlands**Hydrograph**

19-065 Post WS

Type III 24-hr 25-Year Rainfall=6.17"

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Summary for Pond 1P: BioRetention Area

Inflow Area = 12,452 sf, 57.12% Impervious, Inflow Depth = 4.14" for 25-Year event
 Inflow = 1.35 cfs @ 12.09 hrs, Volume= 4,300 cf
 Outflow = 0.24 cfs @ 12.57 hrs, Volume= 4,300 cf, Atten= 83%, Lag= 28.6 min
 Discarded = 0.06 cfs @ 12.57 hrs, Volume= 3,765 cf
 Primary = 0.17 cfs @ 12.57 hrs, Volume= 535 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 161.57' @ 12.57 hrs Surf.Area= 1,690 sf Storage= 2,034 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 342.0 min (1,149.9 - 807.8)

Volume	Invert	Avail.Storage	Storage Description
#1	160.00'	2,800 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
160.00	904	0	0
161.00	1,393	1,149	1,149
162.00	1,910	1,652	2,800

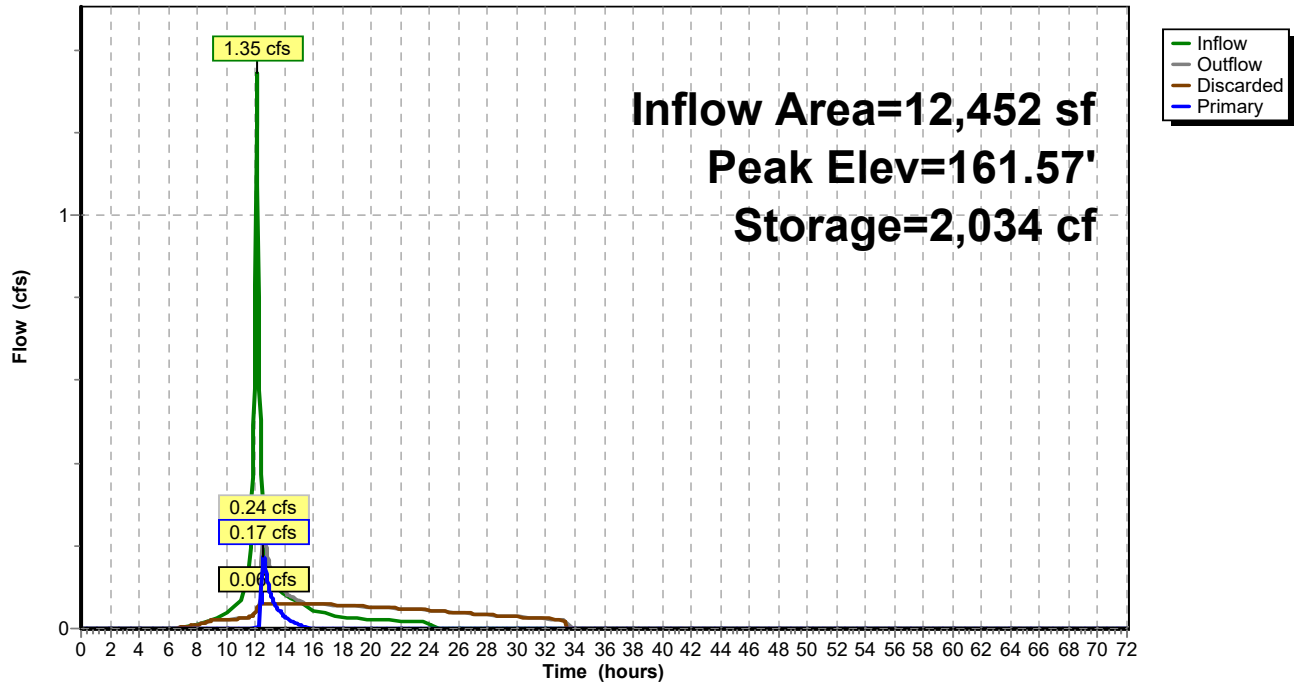
Device	Routing	Invert	Outlet Devices
#1	Discarded	160.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 157.90'
#2	Primary	161.50'	3.5' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.06 cfs @ 12.57 hrs HW=161.57' (Free Discharge)
 ↑**1=Exfiltration** (Controls 0.06 cfs)

Primary OutFlow Max=0.17 cfs @ 12.57 hrs HW=161.57' TW=0.00' (Dynamic Tailwater)
 ↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.17 cfs @ 0.66 fps)

Pond 1P: BioRetention Area

Hydrograph



19-065 Post WS*Type III 24-hr 100-Year Rainfall=8.70"*

Prepared by {enter your company name here}

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: 1S

Runoff Area=12,452 sf 57.12% Impervious Runoff Depth=6.53"

Tc=6.0 min CN=82 Runoff=2.08 cfs 6,773 cf

Subcatchment2S: 2S

Runoff Area=11,907 sf 25.51% Impervious Runoff Depth=4.47"

Flow Length=285' Tc=8.5 min UI Adjusted CN=65 Runoff=1.29 cfs 4,433 cf

Reach 1R: Wetlands

Inflow=2.31 cfs 6,912 cf

Outflow=2.31 cfs 6,912 cf

Pond 1P: BioRetention Area

Peak Elev=161.77' Storage=2,367 cf Inflow=2.08 cfs 6,773 cf

Discarded=0.07 cfs 4,294 cf Primary=1.19 cfs 2,479 cf Outflow=1.26 cfs 6,773 cf

Total Runoff Area = 24,359 sf Runoff Volume = 11,205 cf Average Runoff Depth = 5.52"
58.34% Pervious = 14,210 sf 41.66% Impervious = 10,149 sf

19-065 Post WS

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Subcatchment 1S: 1S

Runoff = 2.08 cfs @ 12.09 hrs, Volume= 6,773 cf, Depth= 6.53"

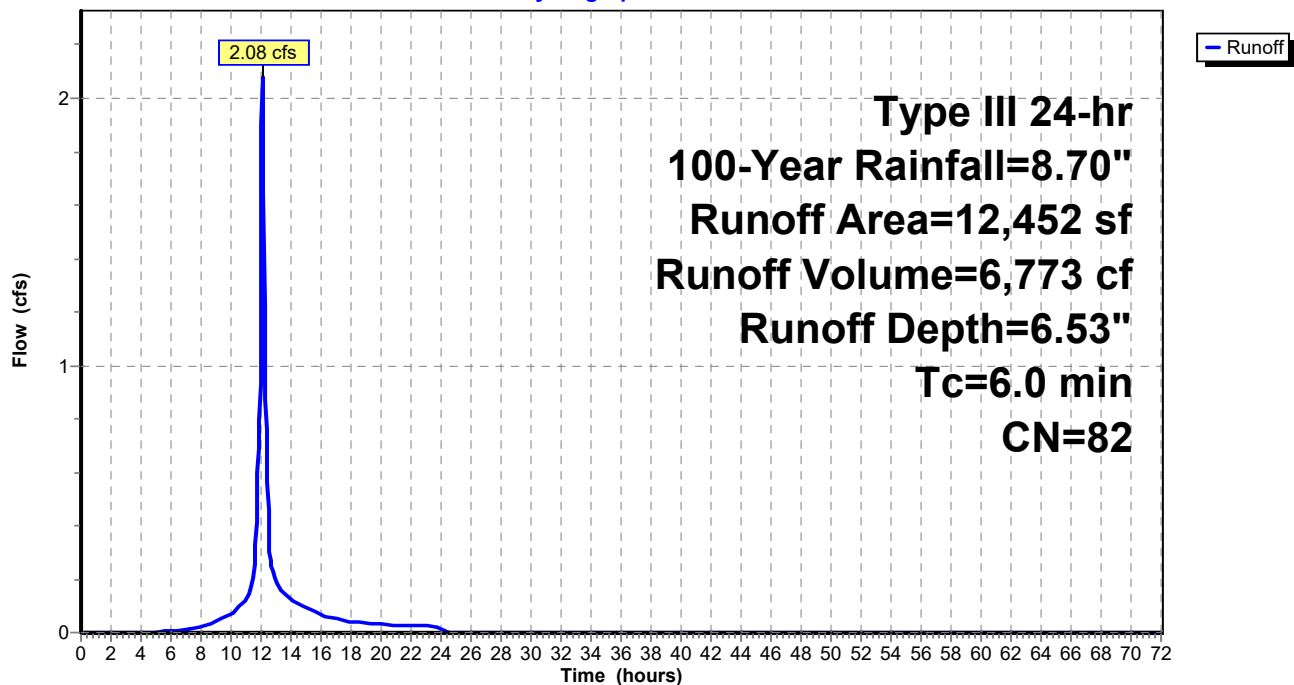
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
7,112	98	Paved parking, HSG B
5,340	61	>75% Grass cover, Good, HSG B
12,452	82	Weighted Average
5,340		42.88% Pervious Area
7,112		57.12% Impervious Area

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

Subcatchment 1S: 1S

Hydrograph



19-065 Post WS

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Subcatchment 2S: 2S

Runoff = 1.29 cfs @ 12.12 hrs, Volume= 4,433 cf, Depth= 4.47"

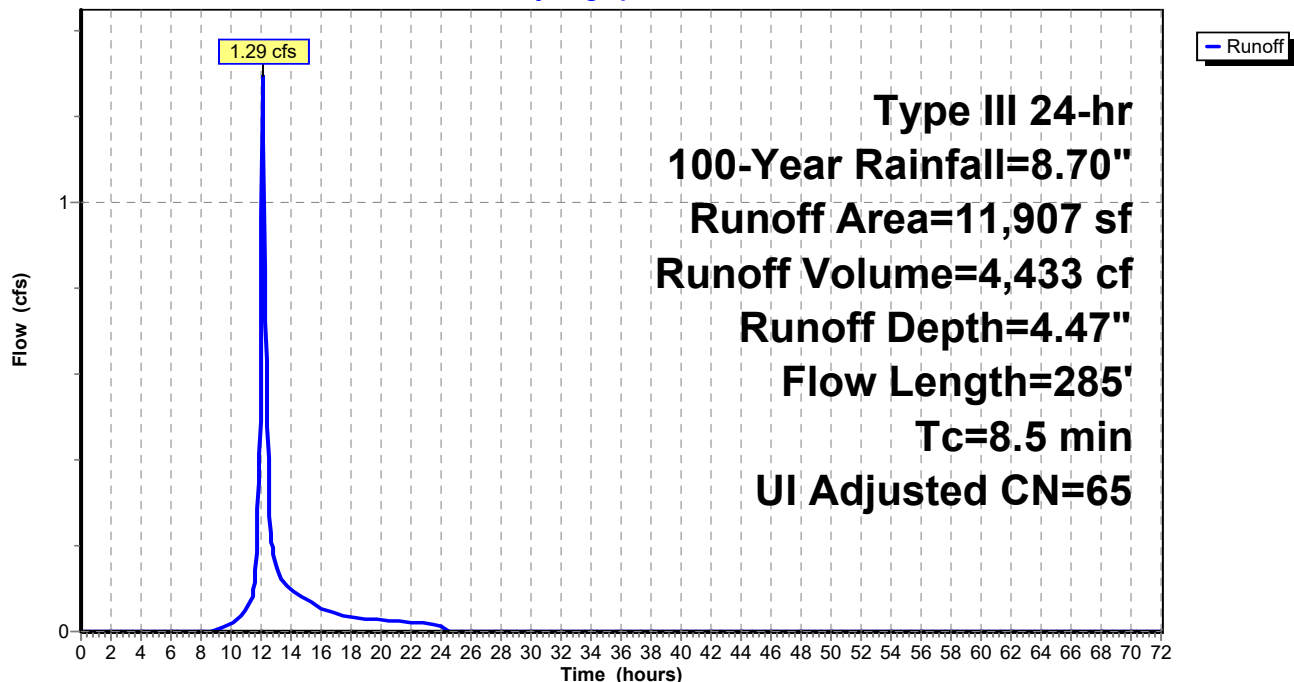
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Adj	Description
500	98		Paved parking, HSG B
7,025	61		>75% Grass cover, Good, HSG B
1,845	55		Woods, Good, HSG B
2,537	98		Unconnected roofs, HSG B
11,907	70	65	Weighted Average, UI Adjusted
8,870			74.49% Pervious Area
3,037			25.51% Impervious Area
2,537			83.54% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.39"
1.2	214	0.0330	2.92		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.1	21	0.0450	3.42		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
8.5	285	Total			

Subcatchment 2S: 2S

Hydrograph



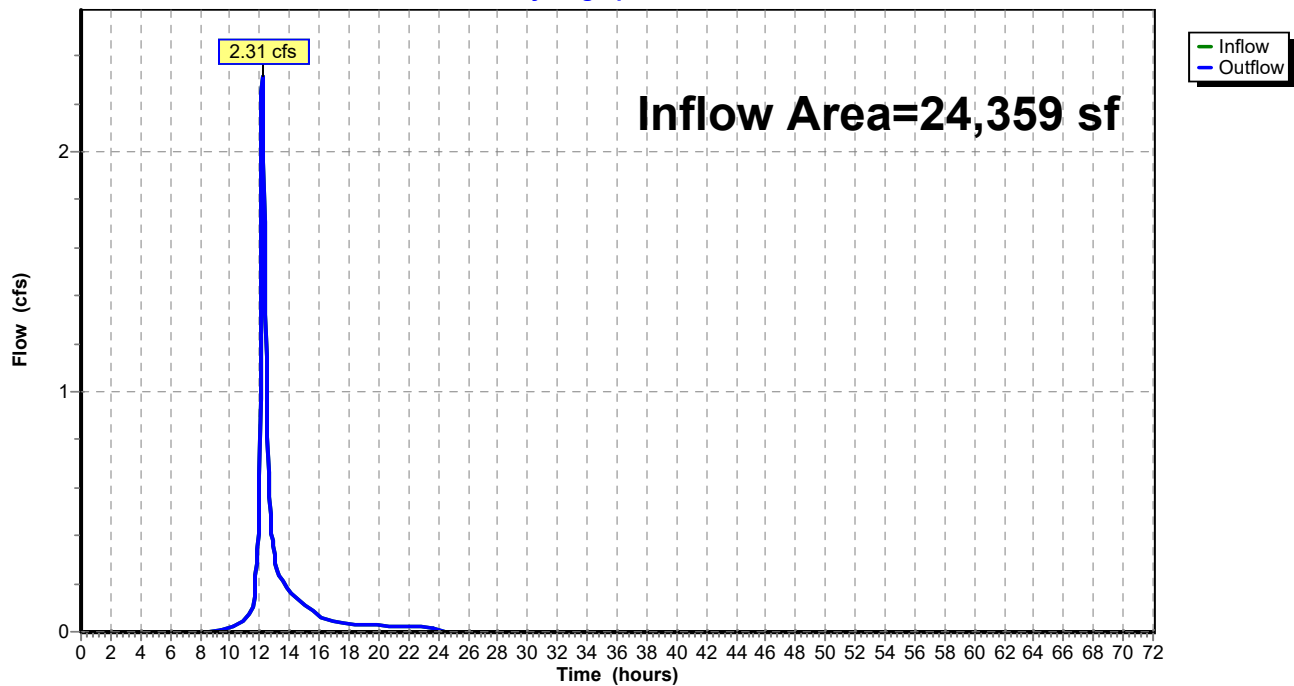
Summary for Reach 1R: Wetlands

Inflow Area = 24,359 sf, 41.66% Impervious, Inflow Depth = 3.41" for 100-Year event
Inflow = 2.31 cfs @ 12.17 hrs, Volume= 6,912 cf
Outflow = 2.31 cfs @ 12.17 hrs, Volume= 6,912 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: Wetlands

Hydrograph



19-065 Post WS

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Pond 1P: BioRetention Area

Inflow Area = 12,452 sf, 57.12% Impervious, Inflow Depth = 6.53" for 100-Year event
 Inflow = 2.08 cfs @ 12.09 hrs, Volume= 6,773 cf
 Outflow = 1.26 cfs @ 12.21 hrs, Volume= 6,773 cf, Atten= 39%, Lag= 7.3 min
 Discarded = 0.07 cfs @ 12.21 hrs, Volume= 4,294 cf
 Primary = 1.19 cfs @ 12.21 hrs, Volume= 2,479 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 161.77' @ 12.21 hrs Surf.Area= 1,789 sf Storage= 2,367 cf

Plug-Flow detention time= 254.8 min calculated for 6,769 cf (100% of inflow)
 Center-of-Mass det. time= 255.2 min (1,050.3 - 795.1)

Volume	Invert	Avail.Storage	Storage Description
#1	160.00'	2,800 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
160.00	904	0	0
161.00	1,393	1,149	1,149
162.00	1,910	1,652	2,800

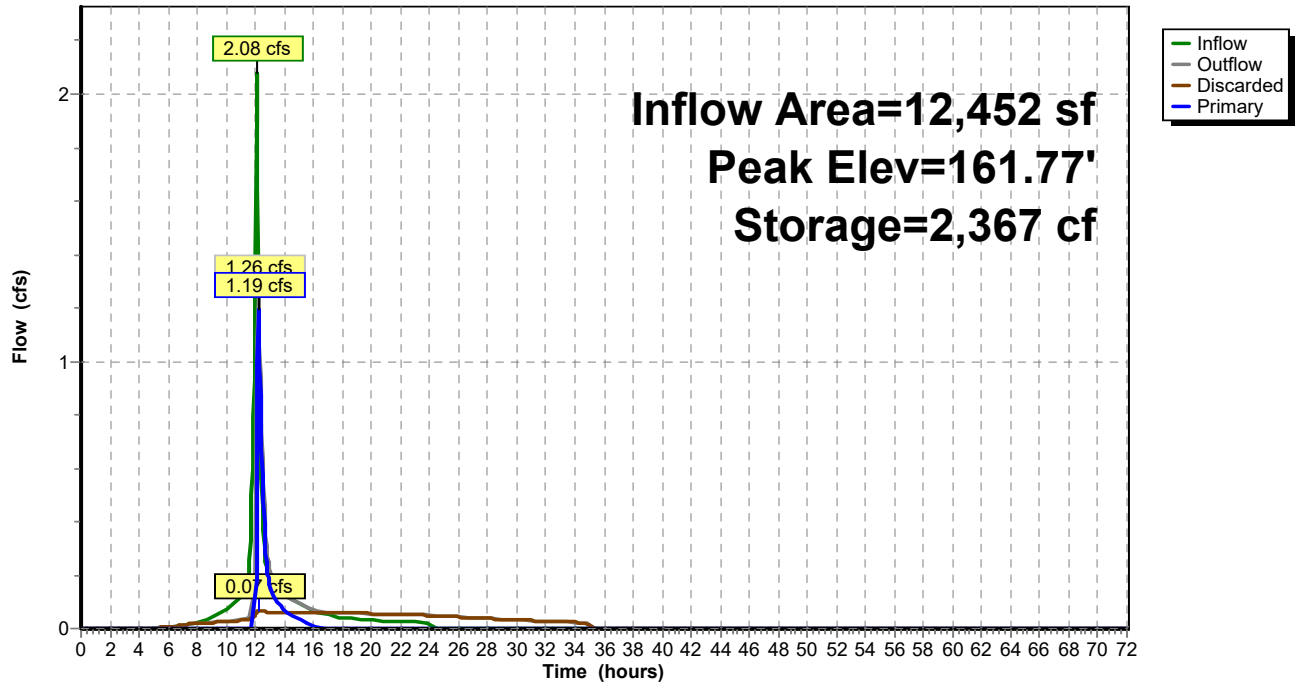
Device	Routing	Invert	Outlet Devices
#1	Discarded	160.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 157.90'
#2	Primary	161.50'	3.5' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.07 cfs @ 12.21 hrs HW=161.76' (Free Discharge)
 ↑**1=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=1.17 cfs @ 12.21 hrs HW=161.76' TW=0.00' (Dynamic Tailwater)
 ↑**2=Broad-Crested Rectangular Weir** (Weir Controls 1.17 cfs @ 1.27 fps)

Pond 1P: BioRetention Area

Hydrograph





Appendix C

Stormwater Management Calculations:

- 1. Recharge Volumes Calculation**
- 2. Water Quality Volume**
- 3. TSS Removal Calculations**

MERRILL ASSOCIATES INC.

REGISTERED PROFESSIONAL ENGINEERS
 427 COLUMBIA ROAD, HANOVER, MA. 02339
 TEL. (781) 826-9200

JOB **16-095**
 SHEET NO. 1 of 1
 CALCULATED BY JG
 CHECKED BY DK 12/15/2019

Location: **1093 Main Street Weymouth, MA**

Recharge Volumes (Standard #3)

Total Area (Ac.)=	0.560		
Total Impervious Area A Soil (Ac.)=	0	0	
Total Impervious Area B Soil (Ac.)=	0.233	10,149 S.F.	
Total Impervious Area C Soil (Ac.)=	0		
	Vol. To		
	Recharge	Volume (Imp.	
	(inches per	Area x inches	
	Imp. Acre)	per Acre)	
Recharge Volume (A soil)	0.6	0.00	
Recharge Volume (B soil)	0.35	0.08	
Recharge Volume (C soil)	0.25	0.00	
		0.08	AC-IN
Total Required Recharge Volume:		0.01	AC-FT
		296	C.F.

**Recharge volume provided by Infiltration
 System:**

Volume Provided (below outlet): **1,910±** C.F.

Drawdown Calculations for Infiltration Systems:

Drawdown Time = $R_v / (k)(\text{basin bottom area})$

where R_v will be total storage volume
 below lowest outlet elevation

Bio Retention Area =

$R_v = \frac{24.86}{1910 \text{ cf}} < 72 \text{ hrs.}$

$k = 1.02 \text{ in/hr (convert to ft)}$
 Bot. Area = 904 sf

MERRILL ASSOCIATES INC.
REGISTERED PROFESSIONAL ENGINEERS
427 COLUMBIA ROAD, HANOVER, MA. 02339
TEL. (781) 826-9200

JOB 16-095
SHEET NO. 1 of 1
CALCULATED BY JG
CHECKED BY DK
DATE: 12/15/2019
REV'D:

WATER QUALITY VOLUME (STANDARD #4)

Location: **1093 Main Street Weymouth, MA**

Total New Impervious Area
Parking Area 10,149 S.F.
(includes roof area)

Total Area: 10,149 S.F.

Water Quality
Volume using: 0.5 or 1.0 inch x Imp. Area (per S.W. Mgmt Policy)
1 inch x Imp. Area 846 cubic feet

1,910± c.f. (Below outlet)

INSTRUCTIONS:

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

Version 1, Automated: Mar. 4, 2008

Location: 1093 Main Street

B	C	D	E	F
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
Bioretention Area	0.90	1.00	0.90	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10

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

Total TSS Removal =

90%

Project:	19-065
Prepared By:	JG
Date:	12/11/2019

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



Appendix D

Operation and Maintenance Plans:

- 1. Stormwater Report Checklist**
- 2. Construction Operation and Maintenance Plan / Construction Pollution Prevention Plan with Inspection Schedule and Evaluation Checklist**
- 3. Long Term Source Control / Pollution Prevention Plan & Operation and Maintenance Plan with Inspection Schedule and Evaluation Checklist**



Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

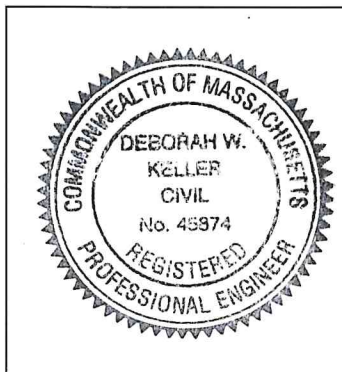
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Deborah W. Keller
Signature and Date

12/16/19

Checklist

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

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



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

Standard 3: Recharge

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

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

Standard 4: Water Quality

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

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



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- ☐ The BMP is sized (and calculations provided) based on:
 - ☒ The ½" or 1" Water Quality Volume or
 - ☒ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☐ Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- ☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
- ☐ Limited Project
 - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - ☒ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - ☐ Bike Path and/or Foot Path
 - ☒ Redevelopment Project
 - ☐ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- ☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☒ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - ☒ Name of the stormwater management system owners;
 - ☒ Party responsible for operation and maintenance;
 - ☒ Schedule for implementation of routine and non-routine maintenance tasks;
 - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
 - ☒ Description and delineation of public safety features;
 - ☐ Estimated operation and maintenance budget; and
 - ☐ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- ☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☒ An Illicit Discharge Compliance Statement is attached;
- ☐ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

**CONSTRUCTION OPERATION AND MAINTENANCE PLAN/
CONSTRUCTION POLLUTION PREVENTION PLAN**

**1093 Main Street
Weymouth, Massachusetts**

Owner:

John O'Brien
1150 Turnpike Street
Stoughton, MA 02072

Party Responsible for Operation and Maintenance:

John O'Brien
1150 Turnpike Street
Stoughton, MA 02072

Source of Funding:

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

During Construction:

Construction activities shall be as shown on the approved plan. During periods of active construction, the stormwater management system shall be inspected on a weekly basis and within 24 hours of a storm event of greater than 1/2". Maintenance tasks shall be performed monthly or after significant rainfall events of 1" of rain or greater. During construction, silt laden runoff shall be prevented from entering off-site properties. Erosion control measures shall be installed in advance of construction along the edge of all disturbed areas and shall be maintained throughout the project. The location of erosion control measures is shown on the approved plans.

All areas disturbed by construction and not to be paved or otherwise treated as noted on plan shall be treated with 4" of loam, seeded with and hay mulched for erosion control. All erosion and sedimentation control measures shall be constructed in accordance with the Massachusetts erosion and sediment control guidelines for urban and suburban areas dated March 1997 and all municipal regulations. Erosion and sedimentation control measures shall be in place prior to the commencement of any site work or earthwork operations, shall be maintained during construction, and shall remain in place until all site work is complete and ground cover is established.

Earthwork activity on the site shall be done in a manner such that runoff is directed to the line of erosion control measures. Disturbed areas remaining idle for more than 14 days shall be stabilized.

All erosion control measures shall be routinely inspected, cleaned and repaired or replaced as necessary throughout all phases of construction, in addition, inspection shall take place after each rainfall event. The location of erosion control measures shall be field verified during site preparation operations by the design engineer. The contractor shall keep on site at all times additional erosion control measures for installation at the direction of the engineer or town officials to mitigate any emergency condition. Sediment shall be removed once the volume reaches $\frac{1}{4}$ to $\frac{1}{2}$ the height of the silt fence.

The area or areas of entrance and exit to and from the site shall be maintained in a condition that will prevent tracking or flowing of sediment outside the construction area. All sediment, dropped, washed or tracked onto public right-of-way must be removed immediately. Dust shall be controlled on site.

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

The bio-retention system should be inspected after every major storm event during construction and cleaned to ensure proper function.

**LONG TERM SOURCE CONTROL/POLLUTION PREVENTION PLAN AND
OPERATION AND MAINTENANCE PLAN
1093 Main Street
Weymouth, MA**

Owner:

John O'Brien
1150 Turnpike Street
Stoughton, MA 02072

Party Responsible for Operation and Maintenance:

John O'Brien
1150 Turnpike Street
Stoughton, MA 02072

1.0 Requirements for Routine Inspections and Maintenance of Stormwater Best Management Practices

Bio-Retention Area

After construction, the parking area should be periodically swept to remove any accumulated leaves, debris or accumulated sediment. Inspect pretreatment stone apron/grass slope and bio-retention area regularly for sediment build-up, structural damage, and standing water.

Replace stone on an "as needed" basis when showing signs of clogging and bound with sediment.

Inspect soil and repair eroded areas monthly. Re-mulch void areas as needed. Remove litter and debris monthly. Treat diseased vegetation as needed. Remove and replace dead vegetation twice per year (spring and fall.)

Proper selection of plant species and support during establishment of vegetation should minimize-if not eliminate-the need for fertilizers and pesticides. Remove invasive species as needed to prevent these species from spreading into the bioretention area. Replace mulch every two years, in the early spring. Upon failure, excavate bioretention area, scarify bottom and sides, replace the soil, replant, and mulch.

The soil medium filters contaminants from runoff; the cation exchange capacity of the soil media will eventually be exhausted. When the cation exchange capacity of the soil media decreases, change the soil media to prevent contaminants from migrating to the ground water, or from being discharged via an underdrain outlet. Using small shrubs and plants instead of larger trees will make it easier to replace the media with clean material when needed.

Plant maintenance is critical. Concentrated salts in roadway runoff may kill plants, necessitating removal of dead vegetation each spring and replanting.

Never store snow in bioretention areas.

Inspections

Yearly inspections of the stormwater management system shall be performed. The inspection shall review the project with respect to the following:

- Proper installation and performance of the Stormwater Management System.
- Review of the controls to determine any damaged or ineffective controls.
- Corrective actions.

2.0 Illicit Discharge Statement

To the best of our knowledge, there are no current illicit discharges present on the site. No new discharges from the site are proposed, illicit or otherwise.



Deborah W. Keller, P.E.



Appendix E

Soil Testing Results (Drainage Facilities)

ON-SITE REVIEW

DEEP HOLE #: 1 DATE: 8/20/2019 TIME: 7:50 WEATHER: Sunny 70° F
SITE ADDRESS or MAP/LOT #: 1093 Main Street Weymouth, MA
OWNER: John O'Brien JOB NO.: 19-065
LOCATION (Identify on Plan): _____ GROUND ELEVATION AT SURFACE OF HOLE: _____

LAND USE: Woodland (cleared) SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 1-3%

VEGETATION: Grass and Weeds LANDFORM: Till Plains

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: 60-70 ft DRAINAGEWAY: _____ ft

DRINKING WATER WELL: _____ ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0-11"	Ap	Sandy Loam	10 YR 2/1		Massive, Friable
11-50"	B/C	Loamy Sand	10 YR 5/6	2.5Y 6/2 (R) 5YR 5/6 (O)	Massive, Friable
50-84"	C	Sand	2.5Y 5/2		Loose, Single Grain, Saturated

PARENT MATERIAL: Till Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: _____
Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater:
Standing in Hole: 80" Weeping from Face: _____ Saturating the Face: 65" Mottling: 20"

Estimated Depth to Seasonal High Ground Water : 20"

PERCOLATION TEST

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/	_____	Test Passed/ Failed/ Discon/	_____
Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: Joshua Green Witnessed By: _____ Mach./Oper.: _____
Comments: Redox pronounced from 20" down to roughly 40". C Layer was saturated which made texturing difficult, however little to no staining on hands after handling and it was apparent that much of its composition was a coarse sand.

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work may be necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

ON-SITE REVIEW

DEEP HOLE #: 2 DATE: 8/20/2019 TIME: 8:20 WEATHER: Sunny 70° F

SITE ADDRESS or MAP/LOT #: 1093 Main Street Weymouth, MA

OWNER: John O'Brien JOB NO.: 19-065

LOCATION (Identify on Plan): _____ GROUND ELEVATION AT SURFACE OF HOLE: _____

LAND USE: Woodland (Cleared) SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 1-3%

VEGETATION: Grass and Weeds LANDFORM: Till Plains

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: 60-70 ft DRAINAGEWAY: _____ ft

DRINKING WATER WELL: _____ ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0-12"	Ap	Sandy Loam	10 YR 2/1		Massive, Friable
12-52"	B/C	Loamy Sand	10 YR 5/6	2.5Y 6/2 (R) 5YR 5/6 (O)	Massive, Friable
52"-88"	C	Sand	2.5Y 5/2		Loose, Single Grain, Saturated

PARENT MATERIAL: Till Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: _____

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☐ No: ☐ If Yes: What is the depth of Groundwater: _____

Standing in Hole: 84" Weeping from Face: _____ Saturating the Face: 65" Mottling: 18"

Estimated Depth to Seasonal High Ground Water : 18"

PERCOLATION TEST

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/	_____	Test Passed/ Failed/ Discon/	_____
Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: Joshua Green Witnessed By: _____ Mach./Oper.: _____

Comments: _____

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work may be necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.