

STORMWATER MANAGEMENT REPORT

Proposed Development Project
Franklin Crossing

380 King Street
Franklin MA 02038

Assessors Plat 303, Lot 042
Zoned Commercial II
Issued 4/29/25



Civil • Survey • Structural • Environmental • Design
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NEI Job Number: 24.0168

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PROJECT DESCRIPTION

Introduction

The proposed subdivision comprises of reallocating parcel boundaries of like-owned land plots to accommodate the construction of a new 30 – unit residential housing complex. The development will be serviced by a walkway surrounding the building and parking along three sides of the newly defined lot. Accessible routes are proposed onsite as well as regrading and resurfacing the west portion of a travel drive off the immediate parcel boundary in the adjoining lot. The project area encompasses approximately 1.26 acres and is bound by the King Street Café development at 390 King St to the west, Sierra’s Brick Oven Pizza at 370 King St to the east, King Street to the south and Spruce Pond Road to the south.

Methodology

Hydrologic calculations for existing and proposed conditions were performed using HydroCAD Version 10.20-5C software, which uses TR-55 methodology to calculate runoff and TR-20 methodology for storm routing through the stormwater detention facilities. Site hydrology was evaluated for the water quality storm (WQ), 2-, 10-, 25-, and 100-year storms. Existing and Proposed Watershed Maps, indicating the subwatersheds and associated stormwater flow paths can be found in Appendix C.

The stormwater drainage design was developed in accordance with the February 2008 Massachusetts Stormwater Handbook and Stormwater Standards with revisions to the Wetlands regulations, 310 CMR 10.00 and Water Quality Regulations 314.

Existing Conditions

The watershed area analyzed for the project consists of the Limit of Disturbance (LOD) with a total area of 1.26 acres. This area includes the unimproved lot, landscaping patches throughout, paved parking areas and paved access drives along the north and south borders of the site. The Pre-DA map, which depicts the limits of the existing condition hydrology, can be found in Appendix C. The topography of the site slopes due east, towards the southern side of the 370 King Street lot (approximate elevation 334) from the elevation (approximate 346).

According to the Soil Survey of Massachusetts (US Department of Agriculture Soil Conservation Service 1981), the soils at the project site includes Woodbridge fine sandy loam. The on-site soils are classified within Hydrologic Group “C/D” by the Soil Survey.

Test pits were excavated on November 26th, 2024 to review below grade conditions on the site. The test pit information is provided in Appendix A. The on-site soils are generally comprised of sandy loams in most areas. The estimated seasonal high groundwater table (SHGWT) varies across the site from 79” to 91” below existing grade. Water table adjustment factors have been taken into account for the project site. A report of the findings of this adjustment can be found in Appendix A. The composition of the on-site soils and Hydrologic soil group allows for a conservative permeability rate of 1.02 inches/hour in sandy loam soils.

The existing site contains approximately 0.36 acres (28%) of impervious area within the LOD, which consists of unimproved lot, landscaping patches throughout, paved parking areas and paved access drives along the north and south borders of the site. Stormwater generated on the site flows in an easterly direction captured by existing drainage structures offsite which directs runoff to Spruce Pond. Stormwater offsite to the east flows towards the site and is directed to a structure which also directs flows to Spruce Pond to the northeast.

According to the Massachusetts Integrated Lists of Waters Spruce Pond does not have any current or upcoming Total Maximum Daily Loads (TMDLs) associated with the waterbody. Regardless, a pollutant loading calculation has been provided in Appendix B.

Under existing conditions, three sub-watersheds were analyzed, EDA-1, EDA-2, and EDA-3. EDA-1 is comprised of the entirety of the site southeast of the cross travel way adjacent to King Street. This includes the existing unimproved parking area and paved access drive to the southeast. EDA-1 drains easterly to the design point "Spruce Pond". Stormwater structures exist in EDA-1 in the form of catch basins in the easterly portion of the sub watershed directing flow to the existing conveyance system. EDA-2 is comprised of the pervious areas due south of King Street as well as the northly access drive onsite. EDA-2 drains easterly to the design point "Spruce Pond". Stormwater structures within EDA-2 allow runoff to gather within the existing stormwater conveyance system. EDA-3 is comprised of the paved egress off of King Street that serves the site as well as adjacent sites and landscape areas within the general vicinity of said paved egress. EDA-3 drains to the north to the design point "King St System".

Proposed Conditions

The proposed development of this site includes the construction of the 30 – unit residential complex with associated parking and landscaped areas throughout. Site improvements include the construction of walkways, landscaping features, underground stormwater facilities with at grade conveyance structures among other utility improvements. The existing paved parking areas shall be resurfaced within the parcel along with construction activities to the southwest of the site at the southern access drive within the adjacent parcel. This development within the neighboring parcel shall provide steady grading and an opportunity to collect more runoff in the form of installing at grade structures in designated spots to maximize this runoff collection. The proposed condition has approximately 0.97 acres of impervious area within the project limits.

The project will include three subsurface infiltration systems to treat and mitigate peak runoff rates and volumes. Drainage structures within the paved parking areas will convey stormwater runoff to the best management practices (BMP's), which are designed to reduce the peak flow rate discharged from the site and provide total suspended solids (TSS) removal. Three subsurface infiltration systems have been designed to convey stormwater to the proper areas while mitigating peak flows and volumes when compared to existing conditions.

The subsurface BMP's have been designed in accordance with Massachusetts Stormwater Standards to mitigate the peak flow rate and promote the settling of total suspended solids. The subsurface infiltration systems include an isolator row which acts as the pretreatment system for the BMP. The isolator rows are lined to make them impermeable as compared to the rest of the

system and provides TSS removal, allowing runoff within the remainder of the system for infiltration. Any runoff directed to the BMPs receive pretreatment via the isolator rows. The inflow to each system is directed by overland flow to catch basins and convey it to the BMPs for treatment. The outlets of the BMP's are designed to allow the water quality volume to remain for 24-hours while it slowly drains via infiltration following the storm event. The system then outflows to the remainder of the drainage system to the final design point through the conveyance system.

Under proposed conditions, the site was divided into a total of six sub watersheds: PDA-1 through PDA-6.

PDA-1 encompasses the eastern landscaped areas including wheelchair ramp and stairwell to the east entrance of the building and a mid-portion of the southeasterly access drive and parking lot delineated by at grade drainage structures conveying runoff to their designated BMPs. See Appendix C for precise sub watershed boundaries. The landscaped areas are bisected by the proposed housing facility to the west and the short retaining wall to the east. This design directs flow to the south along a flow path parallel with both bisecting structures at a terminus in the southerly parking lot. The parking lot consists of at grade drainage structures to convey runoff to the subsurface BMP within this sub watershed. The subsurface BMP is designed with an isolator row to provide pretreatment and then provides storage for peak volumes and slowly infiltrates reducing peak flows. Runoff overflow is directed out back to the drainage system which directs flows to the design point "Spruce Pond".

PDA-2 includes the northern portion of the parking lot from the paved egress to King Street and within the parcel boundaries as well as the parking area due east of the proposed housing complex and landscaped areas throughout the aforementioned areas. The parking lot consists of at grade drainage structures to convey runoff to the subsurface BMP within this sub watershed. The subsurface BMP is designed with an isolator row to provide pretreatment and then provides storage for peak volumes and slowly infiltrates reducing peak flows. Runoff overflow is directed out back to the drainage system which directs flows to the design point "Spruce Pond".

PDA-3 includes a portion of paved egress to King Street as well as landscaped island directly adjacent King Street. Due to various site constraints, this area couldn't be captured and directed to a stormwater BMP. This area will retain its existing flow path and will discharge to the design point "King Street".

PDA-4 includes the housing complex, and access drive to be resurfaced within the adjacent parcel to the west. The proposed housing development shall incorporate its runoff flow via downspout collection piping to discharge to the landscaped areas to the west ultimately reaching the BMP within this sub watershed. The access drive consists of at grade drainage structures at their terminus to convey runoff to the subsurface BMP. The subsurface BMP is designed with an isolator row to provide pretreatment and then provides storage for peak volumes and slowly infiltrates reducing peak flows. Runoff overflow is directed out back to the drainage system which directs flows to the design point "Spruce Pond".

PDA-5 includes the southeasterly section of the existing paved access drive and surrounding areas. Due to various site constraints, this area couldn't be captured and directed to a stormwater

BMP. These areas will retain their existing flow path and will discharge to the design point “Spruce Pond”.

PDA-6 includes the portion of drive not collected by the proposed drainage system leading north to the parking lot serving 370 King Street. Due to various site constraints, this area couldn't be captured and directed to a stormwater BMP. Runoff from this subwatershed ultimately reaches the design point “Spruce Pond”.

The hydrologic model shows a decrease in the peak flow rate offsite at each design storm and at each design point. Tables 1 and 2 below provided a summary of the peak flow rates for the existing and proposed conditions at both design points.

Peak Flow Rates and Volumes

Table 1: Peak Flow Rate – Spruce Pond

Design Point - Spruce Pond			
Peak Flow Rate (cfs)			
Design Storm	Existing	Proposed	Change
WQ Storm (1")	0.07	0.01	-0.06
2 - Year	0.89	0.38	-0.51
10 - Year	1.80	1.69	-0.11
25 - Year	2.38	1.87	-0.51
100 - Year	3.31	2.80	-0.51
Peak Volume (cf)			
Design Storm	Existing	Proposed	Change
WQ Storm (1")	877	107	-770
2 - Year	7,366	2,463	-4,903
10 - Year	14,554	9,141	-5,413
25 - Year	19,280	13,340	-5,940
100 - Year	26,863	20,465	-6,398

Table 2: Peak Flow Rate – King St. Drainage System

Design Point - King St System			
Peak Flow Rate (cfs)			
Design Storm	Existing	Proposed	Change
WQ Storm (1")	0.00	0.00	0.00
2 - Year	0.01	0.01	0.00
10 - Year	0.01	0.01	0.00
25 - Year	0.01	0.01	0.00
100 - Year	0.02	0.02	0.00
Peak Volume (cf)			
Design Storm	Existing	Proposed	Change
WQ Storm (1")	8	8	0
2 - Year	47	48	1
10 - Year	86	89	3
25 - Year	111	114	3
100 - Year	151	155	4

Water Quality

The proposed stormwater management system has been designed to remove a net annual 85% total suspended solids from the runoff collected from the proposed site. Several best management practices are proposed to enhance total suspended solids removal. The required WQ to be treated was calculated at 3,348 cubic feet. The proposed design is capable of providing 3,885 cubic feet of WQ volume. The subsurface infiltration systems have been designed to detain the water quality volume from upstream areas to allow total suspended solids to settle. See Appendix B for water quality calculations for the stormwater facilities.

Minimum Stormwater Management Standards

1. Minimum Standard 1: No New Untreated Discharges

“Applicants must demonstrate that there are no new untreated discharges. To demonstrate that all new discharges are adequately treated, applicants may rely on the computations required to demonstrate compliance with Standards 4 through 6. No additional computations are required”

Refer to the calculations in Appendix B for compliance under this standard.

2. Minimum Standard 2: Peak Flow Attenuation

“Show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year storms.”

Refer to the calculations in Appendix B for compliance under this standard.

3. Minimum Standard 3: Groundwater Recharge

“Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance.”

See Recharge Calculation in Appendix B.

Landscape areas and the subsurface infiltration practices are allowed to infiltrate and meet the recharge requirements.

4. Minimum Standard 4: Water Quality

“Stormwater management systems shall be designed to remove 80% of average annual post-construction load of total suspended solids (TSS).”

Pre-treatment: Pre-treatment equal to 25% of the water quality volume is required for parking lots, driveways, and sidewalks; no pre-treatment is required for stormwater generated from the building

roofs entering infiltration systems. For the parking lot, access drives, and sidewalks pre-treatment is achieved using isolator rows prior to entry to the subsurface infiltration practices.

Due to the existing site constraints, it is not feasible to infiltrate or treat the WQV along some portions of the proposed impervious covers. To make up for this deficit, the water quality volumes to the other systems have been increased to ensure the total WQV for the site has been reached, the details of this can be seen in the BMP sizing calculations in Appendix B.

Accordingly, the pre-treatment and treatment requirements of Minimum Standard 3 have been satisfied.

5. Minimum Standard 5: Land Uses with Higher Potential Pollutant Loads

“Source controls and pollution prevention measures to minimize or eliminate the exposure of any LUHPPLs to rain, snow, snow melt, and runoff must be identified in the Long-Term Pollution Prevention Plan”

In accordance with the *Massachusetts Stormwater Handbook* definition, the project is not considered a “land use with higher potential pollutant loads;” therefore Minimum Standard 5 is not applicable to this project.

6. Minimum Standard 6: Critical Areas

“Standard 6 applies to discharges within Zone II, Interim Wellhead Protection Areas or near or to other Critical Areas: Shellfish Growing Areas, Bathing Beaches, Outstanding Resource Waters, Special Resource Waters, and Cold-Water Fisheries.”

In accordance with the *Massachusetts Stormwater Handbook* definition, the project is not within a “critical area” therefore Minimum Standard 6 is not applicable to this project.

7. Minimum Standard 7: Redevelopment

“Redevelopments and other projects subject to the Standards only to the maximum extent practicable”

This project is not considered a redevelopment project due to the nature of the proposed work when compared to existing conditions of the site.

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

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

A construction activity NPDES Stormwater Pollution Prevention Plan has been prepared and included in Appendix D.

9. Minimum Standard 9: Operation and Maintenance Plan

“Operation and Maintenance Plan as required by Standard 9 must be submitted”

A drainage system Operations and Maintenance Plan (O&M) has been prepared and included in Appendix D.

10. Minimum Standard 10: Prohibition of Illicit Discharges

“Measures to prevent illicit discharges must be included in Pollution Prevention Plan.”

The existing property is partly developed. To the best of our knowledge there is no existing discharges from the site, other than natural overland flow and existing stormwater conveyance systems. There are no direct connections between sources containing wastewater, hazardous substances, oil, or grease and the proposed stormwater management system. Oil and sediment deposited on the parking lot or landscaped areas upstream of the stormwater collection system may be conveyed to catch basins by stormwater runoff. Outlet hoods and deep sumps are provided within the proposed catch basins to trap pollutants and preclude them from traveling to the downstream stormwater management areas.

Conclusion

In conclusion, the proposed stormwater management system provides reductions in peak runoff rates and volumes within the hydrologic analysis area for the design storm events evaluated. Additionally, the stormwater management system has been designed to promote total suspended solids removal and to improve the overall water quality to downstream resources and offsite areas.



Town of Franklin, MA

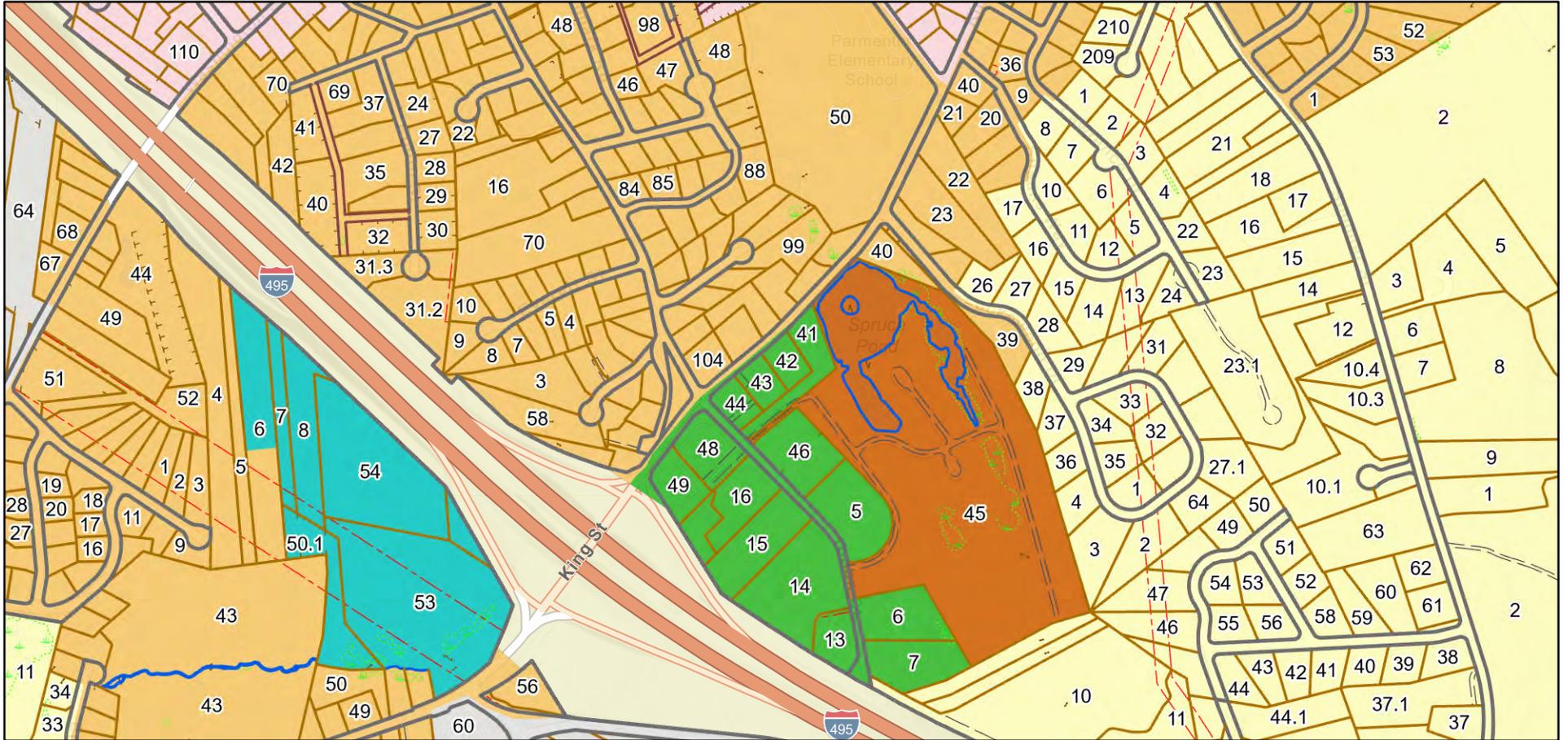
1 inch = 800 Feet



January 3, 2025

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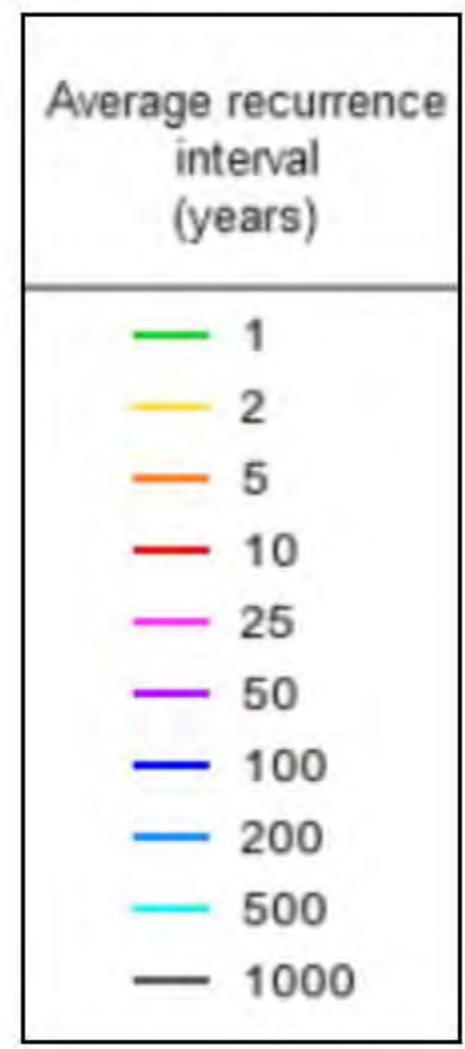
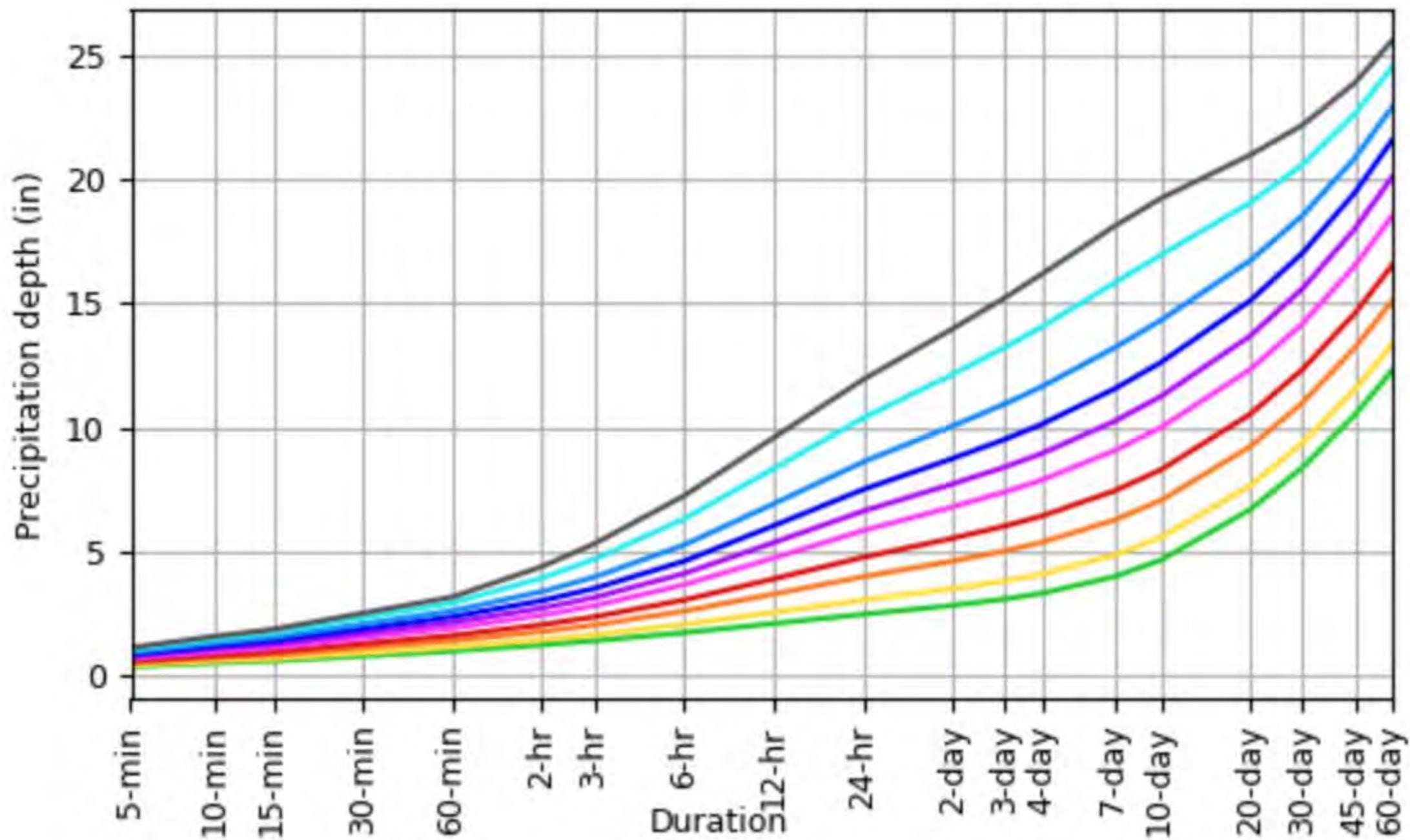
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	TownPoly		Undeveloped Public Road		Wetland		Wet Areas		Rural Residential I
	PWater		Property Hook		Private Road ROW		Business		Single Family III
	Private Road		Property TIC		Right of Way		Commercial II		Single Family IV
	Property Line		RoadNotPar		Utility		Industrial		
	Public Road		Travel Way		Shadow		Residential VI		

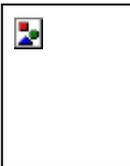
This information is believed to be correct but is subject to change and is not warranted.

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.3621°, Longitude: -72.1625°



PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)¹

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.322 (0.255-0.402)	0.392 (0.310-0.490)	0.507 (0.399-0.636)	0.602 (0.471-0.760)	0.733 (0.554-0.969)	0.832 (0.615-1.12)	0.935 (0.668-1.31)	1.05 (0.709-1.51)	1.21 (0.783-1.80)	1.33 (0.844-2.04)
10-min	0.456 (0.361-0.570)	0.555 (0.439-0.694)	0.717 (0.566-0.900)	0.852 (0.667-1.08)	1.04 (0.784-1.37)	1.18 (0.870-1.59)	1.32 (0.946-1.86)	1.48 (1.00-2.14)	1.71 (1.11-2.56)	1.89 (1.20-2.89)
15-min	0.537 (0.425-0.670)	0.654 (0.517-0.817)	0.845 (0.666-1.06)	1.00 (0.786-1.27)	1.22 (0.923-1.61)	1.39 (1.02-1.88)	1.56 (1.11-2.19)	1.75 (1.18-2.52)	2.01 (1.30-3.01)	2.22 (1.41-3.40)
30-min	0.736 (0.583-0.919)	0.896 (0.709-1.12)	1.16 (0.912-1.45)	1.37 (1.08-1.73)	1.67 (1.26-2.21)	1.90 (1.40-2.57)	2.13 (1.53-3.00)	2.39 (1.62-3.45)	2.76 (1.79-4.13)	3.05 (1.93-4.67)
60-min	0.935 (0.740-1.17)	1.14 (0.900-1.42)	1.47 (1.16-1.84)	1.75 (1.37-2.20)	2.12 (1.61-2.81)	2.41 (1.78-3.26)	2.71 (1.94-3.81)	3.04 (2.06-4.38)	3.50 (2.27-5.24)	3.88 (2.45-5.93)
2-hr	1.20 (0.956-1.48)	1.47 (1.17-1.83)	1.92 (1.53-2.39)	2.29 (1.81-2.87)	2.81 (2.14-3.70)	3.19 (2.38-4.31)	3.60 (2.61-5.08)	4.09 (2.77-5.86)	4.82 (3.14-7.18)	5.45 (3.46-8.28)
3-hr	1.39 (1.11-1.71)	1.71 (1.37-2.11)	2.24 (1.78-2.77)	2.67 (2.12-3.33)	3.27 (2.51-4.31)	3.72 (2.79-5.02)	4.20 (3.07-5.93)	4.79 (3.26-6.85)	5.70 (3.72-8.45)	6.49 (4.13-9.82)
6-hr	1.79 (1.45-2.19)	2.20 (1.78-2.70)	2.87 (2.31-3.52)	3.42 (2.74-4.23)	4.18 (3.24-5.47)	4.74 (3.59-6.36)	5.36 (3.95-7.53)	6.12 (4.18-8.69)	7.31 (4.78-10.8)	8.34 (5.32-12.5)
12-hr	2.29 (1.87-2.78)	2.79 (2.27-3.39)	3.61 (2.93-4.40)	4.29 (3.46-5.27)	5.22 (4.07-6.77)	5.92 (4.51-7.86)	6.67 (4.93-9.28)	7.59 (5.21-10.7)	9.01 (5.92-13.2)	10.2 (6.55-15.3)
24-hr	2.74 (2.25-3.30)	3.36 (2.76-4.05)	4.37 (3.58-5.29)	5.22 (4.24-6.35)	6.37 (5.00-8.20)	7.23 (5.55-9.54)	8.16 (6.08-11.3)	9.31 (6.42-13.0)	11.1 (7.31-16.1)	12.6 (8.10-18.7)



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Marguerite Family Trust

Owner Name

380 King Street

Street Address

Franklin

City

Massachusetts

State

303/42

Map/Lot #

02038

Zip Code

B. Site Information

1. (Check one) New Construction Upgrade

2. Soil Survey USDA-NRCS

Source

310B

Soil Map Unit

Woodbridge

Soil Series

Drumlin, footslope

Landform

depth to saturated zone

Soil Limitations

lodgement till with eolian mantle

Soil Parent material

3. Surficial Geological Report

Mass GIS December 2024

Year Published/Source

sd-c

Map Unit

glacial stratified deposits, coarse

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? Yes No

5. Within a velocity zone? Yes No

6. Within a Mapped Wetland Area? Yes No

If yes, MassGIS Wetland Data Layer:

Wetland Type

7. Current Water Resource Conditions (USGS):

Month/Day/ Year

Range: Above Normal

Normal

Below Normal

8. Other references reviewed:

(Zone II, IWPA, Zone A, EEA Data Portal, etc.)



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 1 11/26/24 9 AM rain 32 degrees F 42.06757 -71.39720
Hole # Date Time Weather Latitude Longitude

1. Land Use vacant lot a few shrubs none
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.)
 Description of Location: vacant lot at 380 King St, between King St Cafe and Sierra's Pizza
Slope (%) 0-3

2. Soil Parent Material: lodgement till drumlin FS
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body 202 feet Drainage Way _____ feet Wetlands _____ feet
 Property Line 49 feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
-49 - -22	^C1	SL	10YR 5/4	--	Cnc :-- Dpl:--	--	15	5	--	FR	fill
-22 - 0	^C2	FSL	25Y 4/1	--	Cnc :-- Dpl:--	--	20	0	--	FI	fill
0 - 3	Ab	FSL	10YR 3/2	--	Cnc :-- Dpl:--	--	0	0	1 FGR	FR	
3 - 17	Bwb	FSL	10YR 5/4	--	Cnc :-- Dpl:--	--	5	0	1 MSBK	FR	
17 - 47	Cd1	S	10YR 5/3	24	Cnc :-- Dpl: 2.5Y 6/2	2	25	5	0 MA	VFI	Dp1 occurred as line 2-3" thick
47 - 71	Cd2	S	10YR 5/3	--	Cnc :-- Dpl: --	--	25	5	0 MA	FI	

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 2 11/26/24 9 AM rain 32 degrees F 42.067404 -71.39703
Hole # Date Time Weather Latitude Longitude

1. Land Use: vacant lot a few shrubs none
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.)
 Description of Location: vacant lot at 380 King St, between King St Cafe and Sierra's Pizza
Slope (%) 0-3

2. Soil Parent Material: lodgement till drumlin FS
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body 178 feet Drainage Way _____ feet Wetlands _____ feet
 Property Line 43 feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
-32 - -11	^C1	SL	10YR 5/4	--	Cnc : -- Dpl: --	--	15	5	--	FR	fill
-11 - 0	^C2	FSL	2.5Y 4/1	--	Cnc : -- Dpl: --	--	20	2	--	F1	fill
0 - 2	Ab	FSL	10YR 3/2	--	Cnc : -- Dpl: --	--	0	0	1 FGR	FR	
2 - 13	Bwb	FSL	10YR 5/4	10	Cnc : -- Dpl: 2.5Y 6/2	2	5	0	1 MSBK	FR	
13 - 57	Cd1	S	10YR 5/3	--	Cnc : -- Dpl: --	--	25	5	0 MA	VFI	Dp1 line 2" thick
57 - 88	Cd2	S	10YR 5/3	--	Cnc : -- Dpl: --	--	25	5	0 MA	FI	

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 3 Hole # 11/26/24 Date 9 AM Time rain 32 degrees F Weather 42.067297 Latitude -71.397083 Longitude

1. Land Use vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) a few shrubs Vegetation none Surface Stones (e.g., cobbles, stones, boulders, etc.) 0-3 Slope (%)

Description of Location: vacant lot at 380 King St, between King St Cafe and Sierra's Pizza

2. Soil Parent Material: lodgement till Landform drumlin Landform FS Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body 208 feet Drainage Way _____ feet Wetlands _____ feet
 Property Line 29 feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
-26 - -16	^C1	SL	10YR 5/4	--	Cnc : -- Dpl: --	--	15	5	--	FR	fill
-16 - 0	^C2	FSL	2.5Y 4/1	--	Cnc : -- Dpl: --	--	20	0	--	FI	fill
0 - 2	Ab	FSL	10YR 3/2	--	Cnc : -- Dpl: --	--	0	0	1 FGR	FR	
2 - 17	Bwb	FSL	10YR 5/4	2	Cnc : 7.5YR 5/6 Dpl: --	<2	5	0	1 MSBK	FR	
17 - 82	Cd	S	10YR 5/3	24	Cnc : 7.5YR 5/6 Dpl: 2.5Y 6/2	5	25	5	0 MA	FI	
					Cnc : Dpl:						

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

- | | | | |
|--|----------------------|----------------------|-----------|
| 1. Method Used (Choose one): | Obs. Hole # <u>1</u> | Obs. Hole # <u>2</u> | Hole 3 |
| <input checked="" type="checkbox"/> Depth to soil redoximorphic features | <u>24</u> inches | <u>24</u> inches | 24 inches |
| <input type="checkbox"/> Depth to observed standing water in observation hole | _____ inches | _____ inches | |
| <input type="checkbox"/> Depth to adjusted seasonal high groundwater (S_h)
(USGS methodology) | _____ inches | _____ inches | |

Index Well Number _____

Reading Date _____

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

Yes No

- | | | |
|--|---|---|
| b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? | Upper boundary: <u>3 (o.g.)</u>
inches | Lower boundary: <u>71 - 88 (o.g.)</u>
inches |
| c. If no, at what depth was impervious material observed? | Upper boundary: _____
inches | Lower boundary: _____
inches |



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

Amber K. Hardy, M.S. | D4098

Typed or Printed Name of Soil Evaluator / License #

3 January 2025

Date

Expiration Date of License

Name of Approving Authority Witness

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with [Percolation Test Form 12](#).

Field Diagrams: Use this area for field diagrams:



130 ft Angle: 210.99°

perc1 TH1

70 ft Angle: 142.51°

perc2 TH2

42 ft Angle: 200°

perc3 TH3

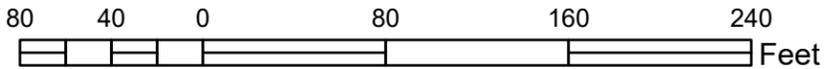
143 ft Angle: 259.14°



2021 AERIAL MAP
A.P. 303, Lot 42 | 380 King Street
Franklin, Massachusetts

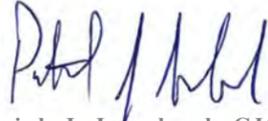
LEGEND

 PROPERTY LINE



- General Notes:
- 1. This map should not be interpreted as a survey quality graphic. It is designed for preliminary planning purposes only. AES recommends consultation with a Professional Land Surveyor for accurate site feature locations.
 - 2. Property lines as depicted on this map have been approximated from plat maps available from the town assessor's online database.
 - 3. 2021 Aerial photograph base map acquired from the Massachusetts OLIVER database.

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors

Map created by: 
Patrick J. Laveland, GIS Specialist

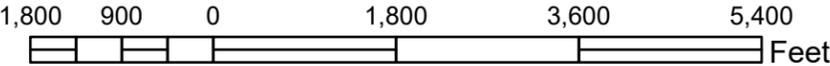
11/11/2024



NHESP PRIORITY HABITATS OF RARE SPECIES AND VERNAL POOL MAP
 A.P. 303, Lot 42 | 380 King Street
 Franklin, Massachusetts

LEGEND

-  PRIORITY HABITAT OF RARE SPECIES
-  CERTIFIED VERNAL POOL
-  POTENTIAL VERNAL POOL
-  PROPERTY LINE



General Notes:
 1. This map should not be interpreted as a survey quality graphic. It is designed for preliminary planning purposes only. AES recommends consultation with a Professional Land Surveyor for accurate site feature locations.
 2. Property lines as depicted on this map have been approximated from plat maps available from the town assessor's online database.
 3. 2021 Aerial photograph base map acquired from the Massachusetts OLIVER database.

Esri, NASA, NGA, USGS, FEMA, Sources: Esri, TomTom, Garmin

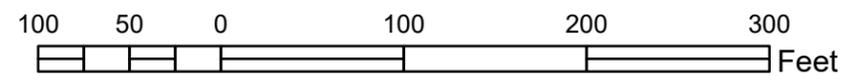
Map created by: Patrick J. Loveland, GIS Specialist 11/11/2024



USDA - NRCS SOIL SURVEY MAP
 MASSACHUSETTS STATE SOIL SURVEY
 A.P. 303, Lot 42 | 380 King Street
 Franklin, Massachusetts

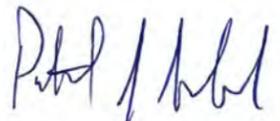
LEGEND

- 1 - Water
- 10 - Scarborough and Birdsall soils, 0 to 3 percent slopes
- 71B - Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony
- 254A - Merrimac fine sandy loam, 0 to 3 percent slopes
- 300B - Montauk fine sandy loam, 3 to 8 percent slopes
- 310B - Woodbridge fine sandy loam, 3 to 8 percent slopes
- 653 - Udorthents, sandy

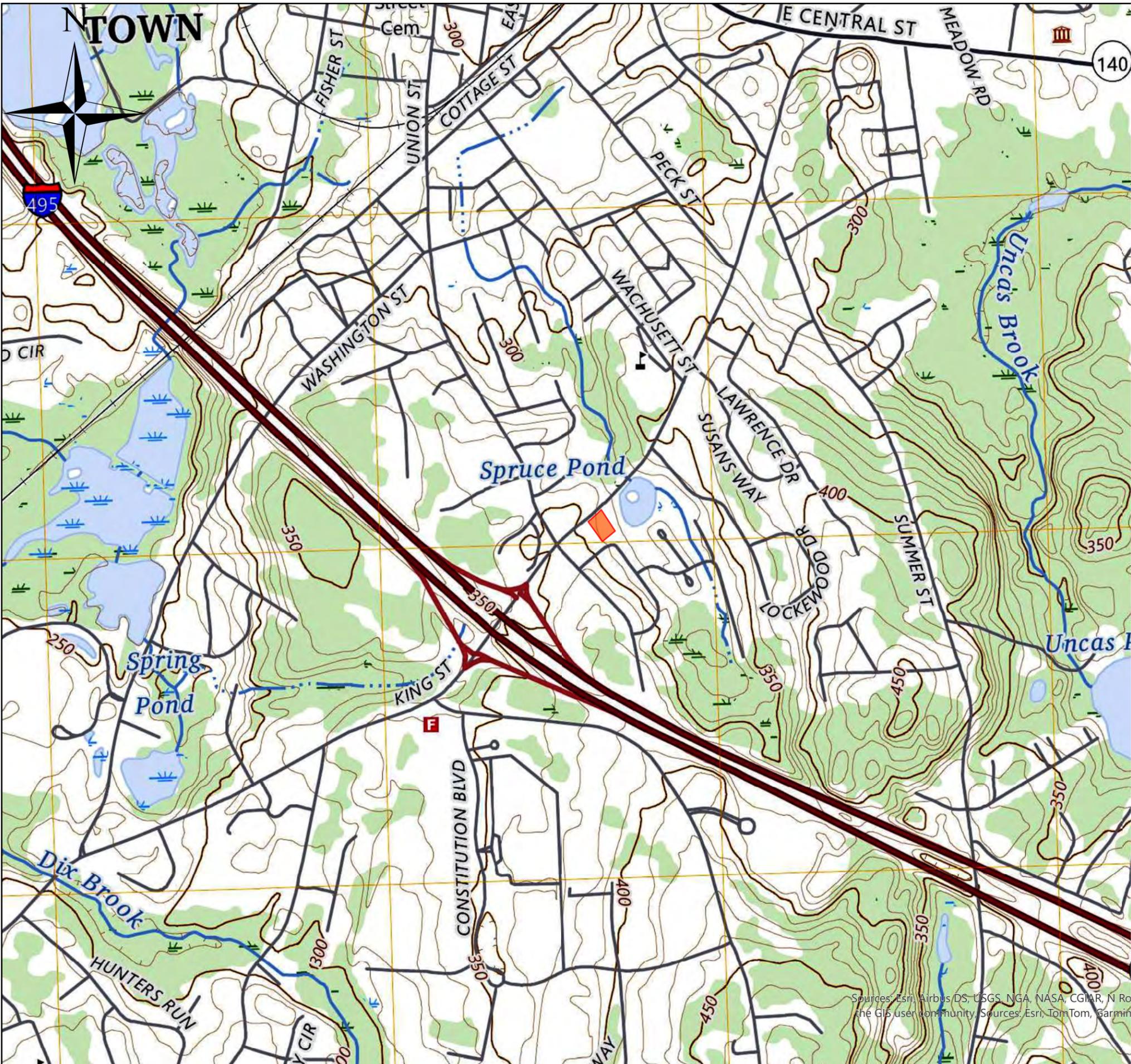


- General Notes:
1. This map should not be interpreted as a survey quality graphic. It is designed for preliminary planning purposes only. AES recommends consultation with a Professional Land Surveyor for accurate site feature locations.
 2. Property lines as depicted on this map have been approximated from plat maps available from the town assessor's online database.
 3. 2021 Aerial photograph base map acquired from the Massachusetts OLIVER database.

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS. © OpenStreetMap contributors, and the GIS User Community. No restrictions apply to these data. However, users should be aware that temporal changes may have occurred since this dataset was collected and that some parts of these data may no longer represent actual surface conditions. Users should not use these data for critical applications without a full awareness of their limitations. Acknowledgement of MassGIS would be appreciated for products derived from these data.

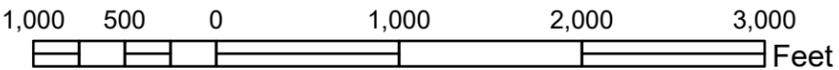
Map created by: 
 Patrick J. Loveland, GIS Specialist

11/11/2024



USGS TOPOGRAPHIC MAP
 A.P. 303, Lot 42 | 380 King Street
 Franklin, Massachusetts

LEGEND
 [Red Rectangle] PROPERTY LINE



- General Notes:
1. This map should not be interpreted as a survey quality graphic. It is designed for preliminary planning purposes only. AES recommends consultation with a Professional Land Surveyor for accurate site feature locations.
 2. Property lines as depicted on this map have been approximated from plat maps available from the town assessor's online database.
 3. 2021 Aerial photograph base map acquired from the Massachusetts OLIVER database.

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Rod, the GIS user community, Sources: Esri, TomTom, Garmin

Map created by: Patrick J. Loveland, GIS Specialist

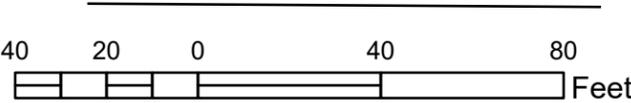
11/11/2024



2024 SOIL EVALUATION MAP
 A.P. 303, Lot 42 | 380 King Street
 Franklin, Massachusetts

LEGEND

-  PROPERTY LINE
-  PERCOLATION TEST
-  SOIL EVALUATION



- General Notes:
1. This map should not be interpreted as a survey quality graphic. It is designed for preliminary planning purposes only. AES recommends consultation with a Professional Land Surveyor for an accurate site plan.
 2. Property lines as depicted on this map have been approximated from plat maps available from the town assessor's online database.
 3. 2021 Aerial photograph base map acquired from the Massachusetts OLIVER database.
 4. Site features located with a Juniper Geode Submetric GNSS receiver with SWmaps data collection software. Non-delineated wetland edges have not been field verified and are depicted for graphic purposes only.

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, Nasa, the GIS user community, Sources: Esri, TomTom, Garmin, P

Delineation performed by: *Amber K. Hardy*
 Amber K. Hardy, M.S., Soil Evaluator D4098 11/26/2024

Map created by: *Patrick J. Loveland*
 Patrick J. Loveland, GIS Specialist 01/03/2025

March 18, 2025

Town of Franklin
355 East Central Street
Franklin, MA 02038

**RE: Water Table Adjustment – 380 King St
Condominiums NEI Job #24.0168**



Civil - Survey - Structural - Environmental - Design
3102 East Main Road, Portsmouth RI 02871
Tel. 401.683.6630 www.nei-cds.com

Background

The goal of this report is to adjust the measured water table to an adjusted water table to aid in the stormwater mitigation design for the proposed development at 380 King St, Franklin MA.

Initially, a soil evaluator performed a soil evaluation at 3 test hole locations on site (see attachment A.1). The results of this soil evaluation revealed each test hole to have a 24" water table (based on redoximorphic features) with varying amounts of fill above the native soil. Each test hole was dry during the soil evaluation. A perforated pipe with filter fabric was installed at each test hole to monitor wet season ground water levels during the wet season. Weekly groundwater measurements have revealed that the test holes have remained dry all the way down to the bottom on the test hole.

We have implemented two methods to adjust the wet season groundwater reading to an adjusted high-water table to be used in the stormwater mitigation design.

Frimpter Method

The Frimpter Method is a method developed by the New England Water Science Center that uses a groundwater measurement from a test site, groundwater measurements from an index well, and a distribution of high groundwater levels from wells in similar geologic and topographic settings. ([Updating a Method to Estimate Probable High Groundwater Levels in Massachusetts | U.S. Geological Survey](#)) To start, two index wells in close proximity to our site with enough data were chosen to utilize the Frimpter method on the groundwater readings at our site at 380 King St Franklin, MA. The difference between 10-year maximum water level and seasonal maximum water level was used to create an adjustment factor for the on site groundwater monitoring measurements.

Norfolk MA Index Well (USGS 420544071173701 MA-NNW 27R NORFOLK, MA)

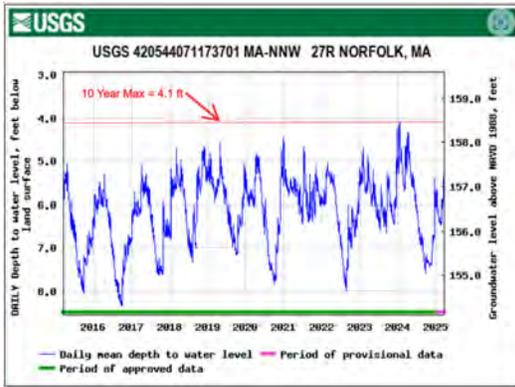


Figure 1: Norfolk MA Index Well – 10 years

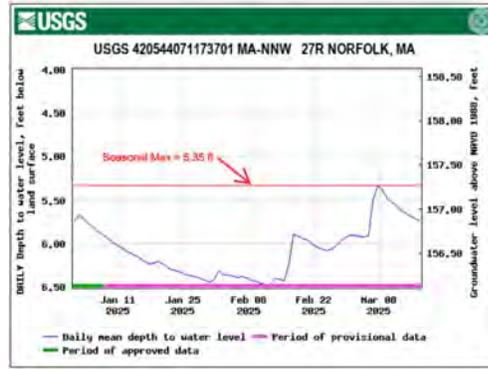


Figure 2: Norfolk MA Index Well – Seasonal

Equation: (Seasonal Max) – (10-year Max) = Adjustment Factor

$$(5.35) - (4.10) = 1.25' \text{ Adjustment Factor}$$

Seekonk MA Index Well (USGS 414714071175901 MA-SHW 275 SEEKONK, MA)

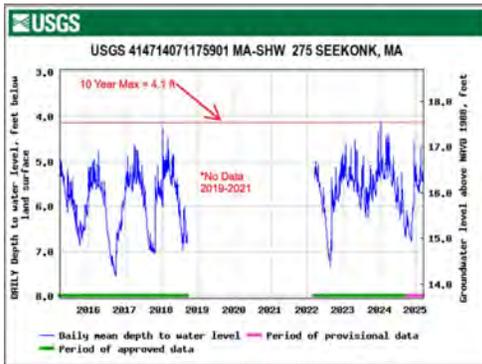


Figure 3: Seekonk MA Index Well – 10 years

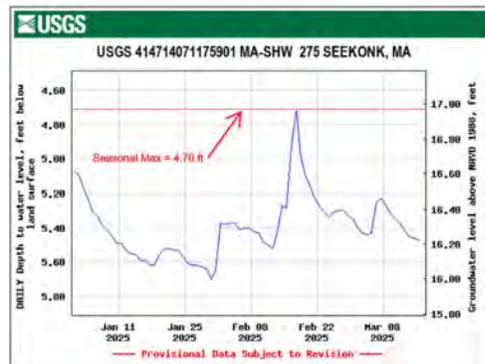


Figure 4: Seekonk MA Index Well – Seasonal

Equation: (Seasonal Max) – (10-year Max) = Adjustment Factor

$$(4.70) - (4.10) = 0.6' \text{ Adjustment Factor}$$

If the Frimpter method were to be used to create an adjusted water table, we would take the more conservative adjustment factor (1.25') and add that to our measured water table during groundwater monitoring.

Rhode Island Groundwater Table Adjustment Factor Method

Similarly to the Frimpter method, the Rhode Island Department of Environmental Management (RIDEM) monitors water table fluctuations throughout the year by periodically measuring water table depths at test wells in various locations around the state. ([Wet Season Groundwater Table Monitoring](#)).

RIDEM produces a groundwater adjustment factor table for Glacial Outwash and Glacial Till areas in Rhode island.

Groundwater Table Adjustment Factors

Factors are updated as needed during the wet season. They are an approximation of the groundwater table status for the soil types listed. For further information, contact [Andrew DeRiso](mailto:Andrew.DeRiso@ridem.org) at [401-537-4218](tel:401-537-4218).

***Note: Some monitoring wells dry/factors may be greater than the number indicates.**

****A negative number indicates a flooded condition.**

Date	Glacial outwash (inches)	Glacial till (inches) West Bay	Glacial till (inches) East Bay
3/7/2025	29	58	44
2/21/2025	27	61	15
2/7/2025	29	68	54
1/16/2025	29	69	48
4/4/2024	0	0	0

Figure 5: RIDEM Groundwater Table Adjustment Factors – Accessed on 3/18/25

Since Franklin MA is in an area of glacial outwash, the glacial outwash adjustment factor of 29” would be used create an adjusted water table. We would take the given adjustment factor (29” or 2.42’) and add that to our measured water table during groundwater monitoring.

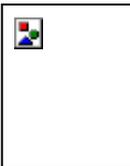
Conclusion

In an effort to be conservative, the stormwater mitigation design shall utilize the “Rhode Island Groundwater Table Adjustment Factor” which will use 29” adjustment factor from the measured water levels during groundwater monitoring. Please see the attached in the appendix at the end of this report.

Appendix

A.1 - Soil Evaluation Report

A.2 - Soil Profiles with Adjustments



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Marguerite Family Trust

Owner Name

380 King Street

Street Address

Franklin

City

Massachusetts

State

303/42

Map/Lot #

02038

Zip Code

B. Site Information

1. (Check one) New Construction Upgrade

2. Soil Survey USDA-NRCS

Source

310B

Soil Map Unit

Woodbridge

Soil Series

Drumlin, footslope

Landform

depth to saturated zone

Soil Limitations

lodgement till with eolian mantle

Soil Parent material

3. Surficial Geological Report

Mass GIS December 2024

Year Published/Source

sd-c

Map Unit

glacial stratified deposits, coarse

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? Yes No

5. Within a velocity zone? Yes No

6. Within a Mapped Wetland Area? Yes No

If yes, MassGIS Wetland Data Layer:

Wetland Type

7. Current Water Resource Conditions (USGS):

Month/Day/ Year

Range: Above Normal

Normal

Below Normal

8. Other references reviewed:

(Zone II, IWPA, Zone A, EEA Data Portal, etc.)



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 1 11/26/24 9 AM rain 32 degrees F 42.06757 -71.39720
Hole # Date Time Weather Latitude Longitude

1. Land Use vacant lot a few shrubs none
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.)
 Description of Location: vacant lot at 380 King St, between King St Cafe and Sierra's Pizza
Slope (%) 0-3

2. Soil Parent Material: lodgement till drumlin FS
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body 202 feet Drainage Way _____ feet Wetlands _____ feet
 Property Line 49 feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
-49 - -22	^C1	SL	10YR 5/4	--	Cnc :-- Dpl:--	--	15	5	--	FR	fill
-22 - 0	^C2	FSL	25Y 4/1	--	Cnc :-- Dpl:--	--	20	0	--	FI	fill
0 - 3	Ab	FSL	10YR 3/2	--	Cnc :-- Dpl:--	--	0	0	1 FGR	FR	
3 - 17	Bwb	FSL	10YR 5/4	--	Cnc :-- Dpl:--	--	5	0	1 MSBK	FR	
17 - 47	Cd1	S	10YR 5/3	24	Cnc :-- Dpl: 2.5Y 6/2	2	25	5	0 MA	VFI	Dp1 occurred as line 2-3" thick
47 - 71	Cd2	S	10YR 5/3	--	Cnc :-- Dpl: --	--	25	5	0 MA	FI	

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 2 11/26/24 9 AM rain 32 degrees F 42.067404 -71.39703
Hole # Date Time Weather Latitude Longitude

1. Land Use: vacant lot a few shrubs none
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.)
 Description of Location: vacant lot at 380 King St, between King St Cafe and Sierra's Pizza
Slope (%) 0-3

2. Soil Parent Material: lodgement till drumlin FS
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body 178 feet Drainage Way _____ feet Wetlands _____ feet
 Property Line 43 feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
-32 - -11	^C1	SL	10YR 5/4	--	Cnc : -- Dpl: --	--	15	5	--	FR	fill
-11 - 0	^C2	FSL	2.5Y 4/1	--	Cnc : -- Dpl: --	--	20	2	--	F1	fill
0 - 2	Ab	FSL	10YR 3/2	--	Cnc : -- Dpl: --	--	0	0	1 FGR	FR	
2 - 13	Bwb	FSL	10YR 5/4	10	Cnc : -- Dpl: 2.5Y 6/2	2	5	0	1 MSBK	FR	
13 - 57	Cd1	S	10YR 5/3	--	Cnc : -- Dpl: --	--	25	5	0 MA	VFI	Dp1 line 2" thick
57 - 88	Cd2	S	10YR 5/3	--	Cnc : -- Dpl: --	--	25	5	0 MA	FI	

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 3 Hole # 11/26/24 Date 9 AM Time rain 32 degrees F Weather 42.067297 Latitude -71.397083 Longitude

1. Land Use vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) a few shrubs Vegetation none Surface Stones (e.g., cobbles, stones, boulders, etc.) 0-3 Slope (%)

Description of Location: vacant lot at 380 King St, between King St Cafe and Sierra's Pizza

2. Soil Parent Material: lodgement till Landform drumlin Landform FS Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body 208 feet Drainage Way _____ feet Wetlands _____ feet
 Property Line 29 feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
-26 - -16	^C1	SL	10YR 5/4	--	Cnc : -- Dpl: --	--	15	5	--	FR	fill
-16 - 0	^C2	FSL	2.5Y 4/1	--	Cnc : -- Dpl: --	--	20	0	--	FI	fill
0 - 2	Ab	FSL	10YR 3/2	--	Cnc : -- Dpl: --	--	0	0	1 FGR	FR	
2 - 17	Bwb	FSL	10YR 5/4	2	Cnc : 7.5YR 5/6 Dpl: --	<2	5	0	1 MSBK	FR	
17 - 82	Cd	S	10YR 5/3	24	Cnc : 7.5YR 5/6 Dpl: 2.5Y 6/2	5	25	5	0 MA	FI	
					Cnc : Dpl:						

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):
- | | | | |
|--|--|--|---------------------|
| <input checked="" type="checkbox"/> Depth to soil redoximorphic features | Obs. Hole # <u>1</u>
<u>24</u> inches | Obs. Hole # <u>2</u>
<u>24</u> inches | Hole 3
24 inches |
| <input type="checkbox"/> Depth to observed standing water in observation hole | _____ inches | _____ inches | |
| <input type="checkbox"/> Depth to adjusted seasonal high groundwater (S_h)
(USGS methodology) | _____ inches | _____ inches | |

Index Well Number _____

Reading Date _____

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

Yes No

- b. If yes, at what depth was it observed (exclude O, A, and E Horizons)?
- | | | | |
|-----------------|---------------------------|-----------------|---------------------------------|
| Upper boundary: | <u>3 (o.g.)</u>
inches | Lower boundary: | <u>71 - 88 (o.g.)</u>
inches |
|-----------------|---------------------------|-----------------|---------------------------------|
- c. If no, at what depth was impervious material observed?
- | | | | |
|-----------------|--------------|-----------------|--------------|
| Upper boundary: | _____ inches | Lower boundary: | _____ inches |
|-----------------|--------------|-----------------|--------------|



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

Amber K. Hardy, M.S. | D4098

Typed or Printed Name of Soil Evaluator / License #

3 January 2025

Date

Expiration Date of License

Name of Approving Authority Witness

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with [Percolation Test Form 12](#).

Field Diagrams: Use this area for field diagrams:



130 ft Angle: 210.99°

142 ft Angle: 142.51°

42 ft Angle: 200°

143 ft Angle: 259.14°

perc1

perc2

perc3

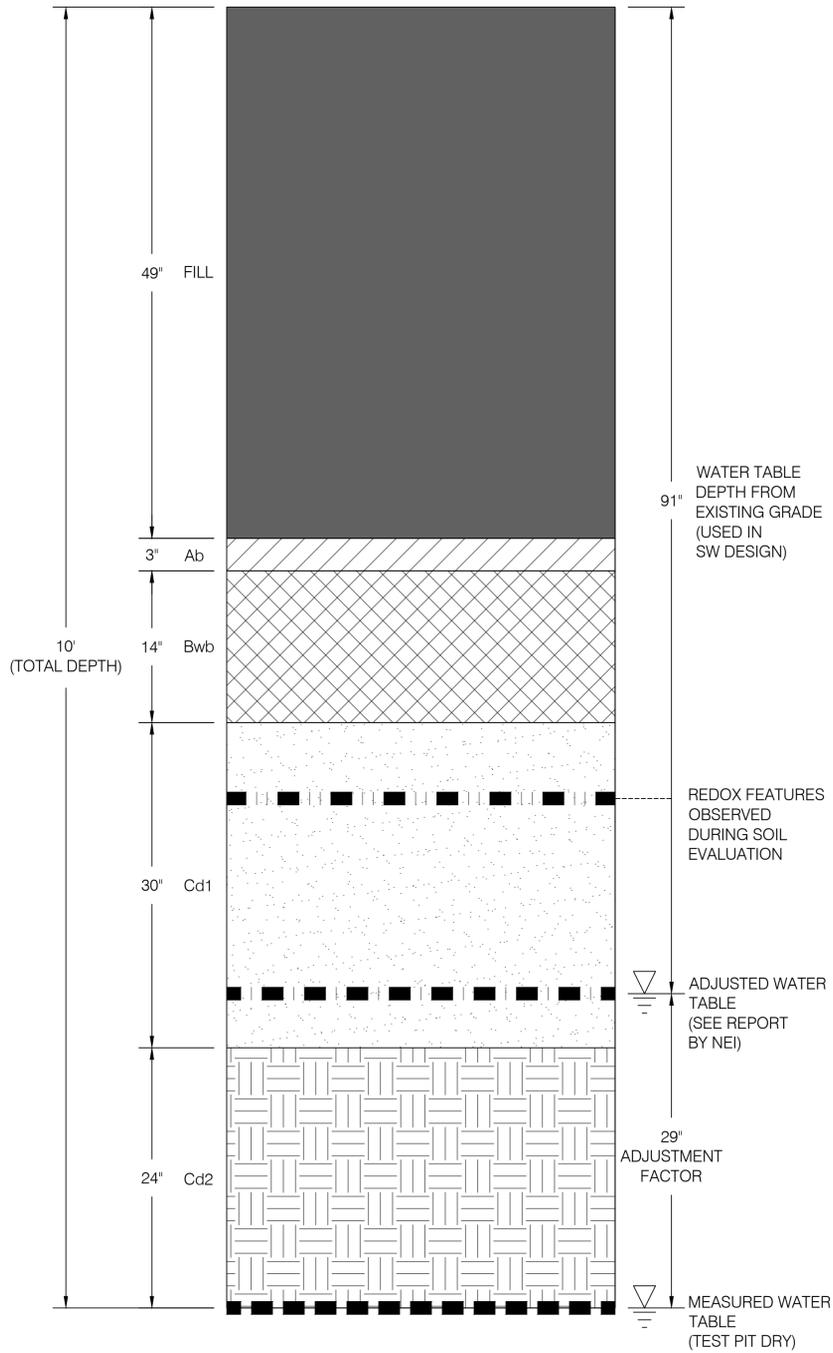
TH1

TH2

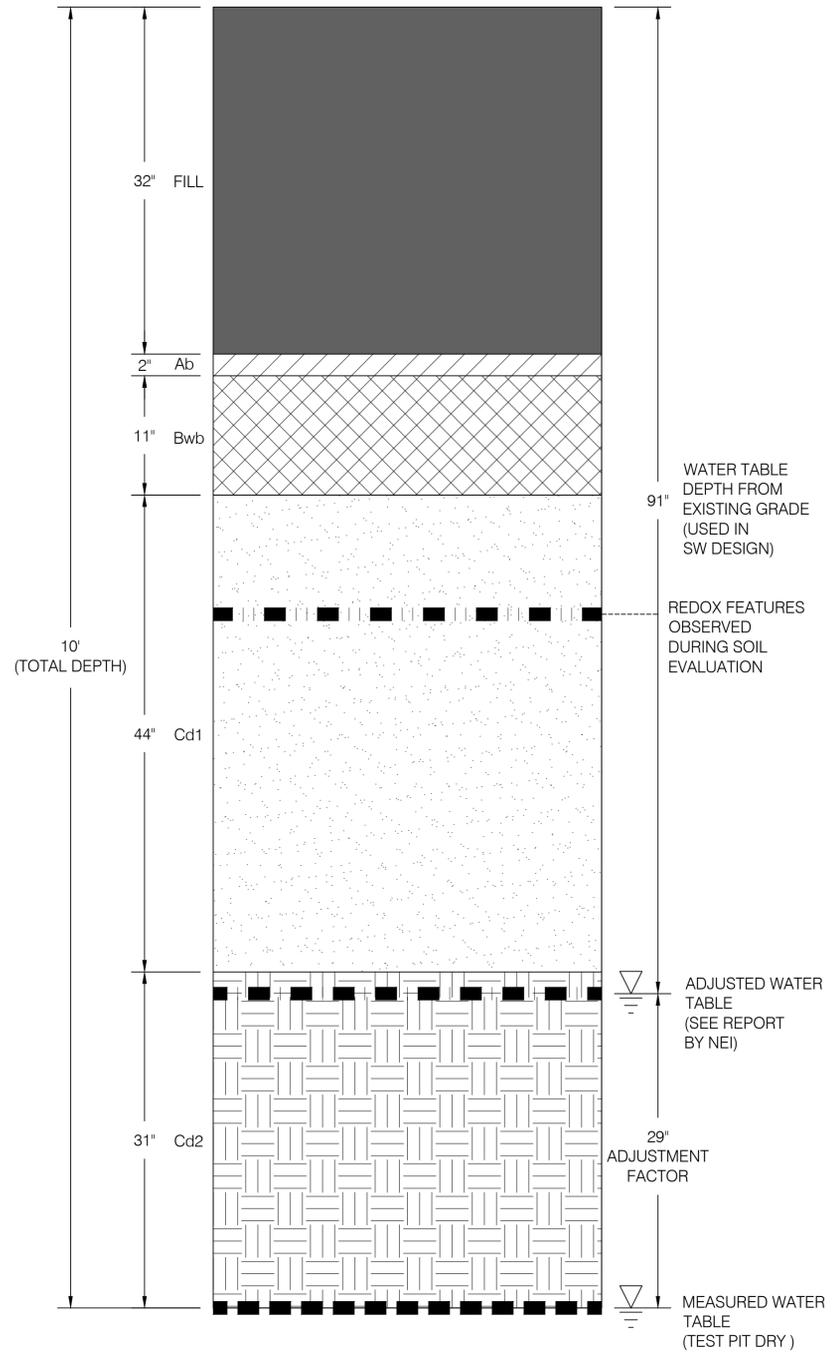
TH3

N:\PROJECTS\24.0168 - MARGUERITE COMMONWEALTH UNION CROSSING\SITE CIVIL\24.0168 FRANKLIN CROSSING CIVIL.DWG C-300 NEI-Standard.ctb 3/18/2025 Craig Barry

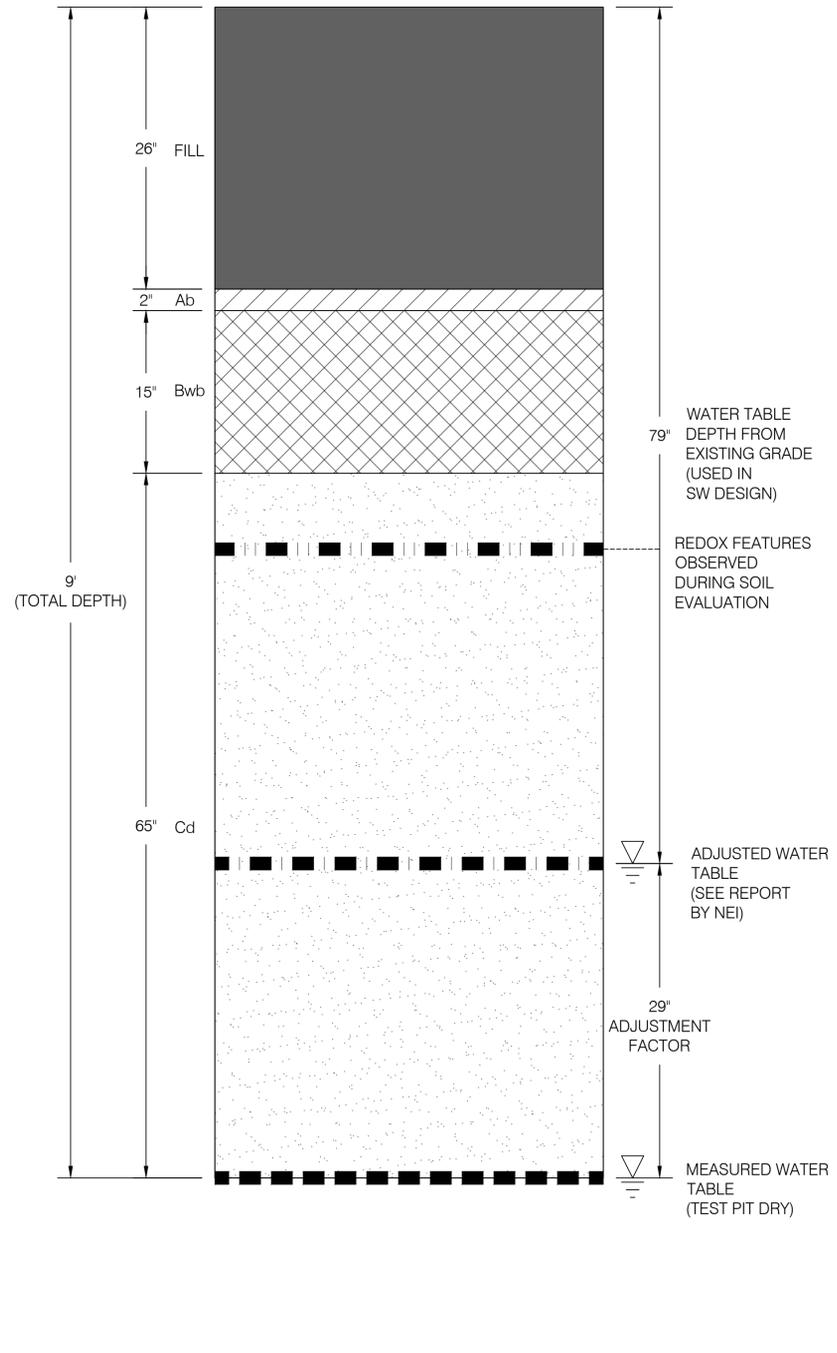
OBSERVATION HOLE #1



OBSERVATION HOLE #2



OBSERVATION HOLE #3



NEI
Narragansett
Engineering Inc.
 Civil - Survey Structural Environmental Design
 3102 East Main Road, Portsmouth RI 02871
 Tel. 401.683.6630 www.nei-cds.com

SHEET TITLE
 380 KING ST - CONDOMINIUMS
 SOIL PROFILES

Property Record:
 Principal Parcel:
 380 King St, Franklin, MA 02038
 Plat: 303, Lot:42, Area: 0.919 Acres, Zone: C-II
 N/F: Marguerite Margaret, TR, Marguerite Family Trust
 Book/Page: 8145-260
 Also Part of Subject Application:
 370 King St, Franklin, MA 02038
 Plat: 303, Lot:41, Area: 1.8 Acres, Zone: C-II
 N/F: Marguerite Margaret, TR, Marguerite Family Trust
 Book/Page 8145-260
 390 King St, Franklin, MA 02038
 Plat: 303, Lot:43, Area: 0.919 Acres, Zone: C-II
 N/F: Marguerite Margaret, TR, Marguerite Family Trust
 Book/Page 8145-260
 400 King St, Franklin, MA 02038
 Plat: 303, Lot:44, Area: 0.928 Acres, Zone: C-II
 N/F: DECOY INC.

PROJECT NO.	DATE	BY
24.0168	10.10.24	NKH

DRAWING ISSUE:

- CONCEPT / DISCUSSION
- PERMITTING
- CONSTRUCTION
- AS-BUILT
- OTHER

ONLY PLANS ISSUED FOR CONSTRUCTION SHALL BE USED FOR CONSTRUCTION

RELEASED FOR USE IN AGREEMENT WITH ABUTTER

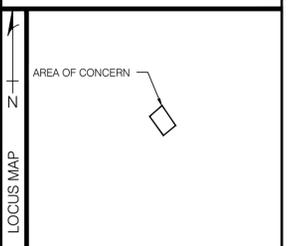
INTERNAL REVIEW

No	CHECK	CAD	DESCRIPTION/NOTES
1	BY	EB	PARKING LAYOUT
	DATE	11.26.24	
2	BY	EB	STORMWATER DESIGN
	DATE	2.28.25	UTILITY REVIEW PENDING
3	BY	EB	GENERAL PLAN REVISIONS
	DATE	3.11.25	

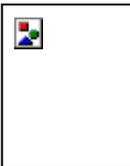
FORMAL PLAN REVISIONS

No	DATE	STAGE/DESCRIPTION	BY

Drawings must be printed in color to be valid. This note should be blue. If this note is not blue, please reprint in color or contact NEI.



SCALE
 1"=20'
C-300



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Marguerite Family Trust

Owner Name

380 King Street

Street Address

Franklin

City

Massachusetts

State

303/42

Map/Lot #

02038

Zip Code

B. Site Information

1. (Check one) New Construction Upgrade

2. Soil Survey USDA-NRCS

Source

310B

Soil Map Unit

Woodbridge

Soil Series

Drumlin, footslope

Landform

depth to saturated zone

Soil Limitations

lodgement till with eolian mantle

Soil Parent material

3. Surficial Geological Report

Mass GIS December 2024

Year Published/Source

sd-c

Map Unit

glacial stratified deposits, coarse

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? Yes No

5. Within a velocity zone? Yes No

6. Within a Mapped Wetland Area? Yes No

If yes, MassGIS Wetland Data Layer:

Wetland Type

7. Current Water Resource Conditions (USGS):

Month/Day/ Year

Range: Above Normal

Normal

Below Normal

8. Other references reviewed:

(Zone II, IWPA, Zone A, EEA Data Portal, etc.)



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 1 11/26/24 9 AM rain 32 degrees F 42.06757 -71.39720
Hole # Date Time Weather Latitude Longitude

1. Land Use vacant lot a few shrubs none
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.)
 Description of Location: vacant lot at 380 King St, between King St Cafe and Sierra's Pizza
Slope (%) 0-3

2. Soil Parent Material: lodgement till drumlin FS
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body 202 feet Drainage Way _____ feet Wetlands _____ feet
 Property Line 49 feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
-49 - -22	^C1	SL	10YR 5/4	--	Cnc :-- Dpl:--	--	15	5	--	FR	fill
-22 - 0	^C2	FSL	25Y 4/1	--	Cnc :-- Dpl:--	--	20	0	--	FI	fill
0 - 3	Ab	FSL	10YR 3/2	--	Cnc :-- Dpl:--	--	0	0	1 FGR	FR	
3 - 17	Bwb	FSL	10YR 5/4	--	Cnc :-- Dpl:--	--	5	0	1 MSBK	FR	
17 - 47	Cd1	S	10YR 5/3	24	Cnc :-- Dpl: 2.5Y 6/2	2	25	5	0 MA	VFI	Dp1 occurred as line 2-3" thick
47 - 71	Cd2	S	10YR 5/3	--	Cnc :-- Dpl: --	--	25	5	0 MA	FI	

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 2 11/26/24 9 AM rain 32 degrees F 42.067404 -71.39703
Hole # Date Time Weather Latitude Longitude

1. Land Use: vacant lot a few shrubs none
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.)
 Description of Location: vacant lot at 380 King St, between King St Cafe and Sierra's Pizza 0-3
Slope (%)

2. Soil Parent Material: lodgement till drumlin FS
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body 178 feet Drainage Way _____ feet Wetlands _____ feet
 Property Line 43 feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
-32 - -11	^C1	SL	10YR 5/4	--	Cnc : -- Dpl: --	--	15	5	--	FR	fill
-11 - 0	^C2	FSL	2.5Y 4/1	--	Cnc : -- Dpl:--	--	20	2	--	F1	fill
0 - 2	Ab	FSL	10YR 3/2	--	Cnc : -- Dpl:--	--	0	0	1 FGR	FR	
2 - 13	Bwb	FSL	10YR 5/4	10	Cnc : -- Dpl: 2.5Y 6/2	2	5	0	1 MSBK	FR	
13 - 57	Cd1	S	10YR 5/3	--	Cnc : -- Dpl:--	--	25	5	0 MA	VFI	Dp1 line 2" thick
57 - 88	Cd2	S	10YR 5/3	--	Cnc : -- Dpl:--	--	25	5	0 MA	FI	

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 3 Hole # 11/26/24 Date 9 AM Time rain 32 degrees F Weather 42.067297 Latitude -71.397083 Longitude

1. Land Use vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) a few shrubs Vegetation none Surface Stones (e.g., cobbles, stones, boulders, etc.) 0-3 Slope (%)

Description of Location: vacant lot at 380 King St, between King St Cafe and Sierra's Pizza

2. Soil Parent Material: lodgement till Landform drumlin Landform FS Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body 208 feet Drainage Way _____ feet Wetlands _____ feet
 Property Line 29 feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
-26 - -16	^C1	SL	10YR 5/4	--	Cnc : -- Dpl: --	--	15	5	--	FR	fill
-16 - 0	^C2	FSL	2.5Y 4/1	--	Cnc : -- Dpl: --	--	20	0	--	FI	fill
0 - 2	Ab	FSL	10YR 3/2	--	Cnc : -- Dpl: --	--	0	0	1 FGR	FR	
2 - 17	Bwb	FSL	10YR 5/4	2	Cnc : 7.5YR 5/6 Dpl: --	<2	5	0	1 MSBK	FR	
17 - 82	Cd	S	10YR 5/3	24	Cnc : 7.5YR 5/6 Dpl: 2.5Y 6/2	5	25	5	0 MA	FI	
					Cnc : Dpl:						

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):
- | | | | |
|--|--|--|---------------------|
| <input checked="" type="checkbox"/> Depth to soil redoximorphic features | Obs. Hole # <u>1</u>
<u>24</u> inches | Obs. Hole # <u>2</u>
<u>24</u> inches | Hole 3
24 inches |
| <input type="checkbox"/> Depth to observed standing water in observation hole | _____ inches | _____ inches | |
| <input type="checkbox"/> Depth to adjusted seasonal high groundwater (S_h)
(USGS methodology) | _____ inches | _____ inches | |

Index Well Number _____

Reading Date _____

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

Yes No

- b. If yes, at what depth was it observed (exclude O, A, and E Horizons)?
- | | | | |
|-----------------|---------------------------|-----------------|---------------------------------|
| Upper boundary: | <u>3 (o.g.)</u>
inches | Lower boundary: | <u>71 - 88 (o.g.)</u>
inches |
|-----------------|---------------------------|-----------------|---------------------------------|
- c. If no, at what depth was impervious material observed?
- | | | | |
|-----------------|--------------|-----------------|--------------|
| Upper boundary: | _____ inches | Lower boundary: | _____ inches |
|-----------------|--------------|-----------------|--------------|



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

Amber K. Hardy, M.S. | D4098

Typed or Printed Name of Soil Evaluator / License #

3 January 2025

Date

Expiration Date of License

Name of Approving Authority Witness

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with [Percolation Test Form 12](#).

Field Diagrams: Use this area for field diagrams:



130 ft Angle: 210.99°

142 ft Angle: 142.51°

42 ft Angle: 200°

perc1

TH1

perc2

TH2

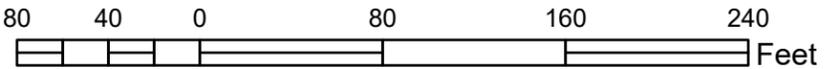
perc3

TH3



2021 AERIAL MAP
A.P. 303, Lot 42 | 380 King Street
Franklin, Massachusetts

LEGEND



- General Notes:
- 1. This map should not be interpreted as a survey quality graphic. It is designed for preliminary planning purposes only. AES recommends consultation with a Professional Land Surveyor for accurate site feature locations.
 - 2. Property lines as depicted on this map have been approximated from plat maps available from the town assessor's online database.
 - 3. 2021 Aerial photograph base map acquired from the Massachusetts OLIVER database.

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors

Map created by: Patrick J. Laveland, GIS Specialist

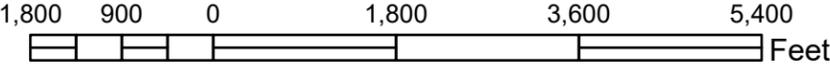
11/11/2024



NHESP PRIORITY HABITATS OF RARE SPECIES AND VERNAL POOL MAP
 A.P. 303, Lot 42 | 380 King Street
 Franklin, Massachusetts

LEGEND

-  PRIORITY HABITAT OF RARE SPECIES
-  CERTIFIED VERNAL POOL
-  POTENTIAL VERNAL POOL
-  PROPERTY LINE



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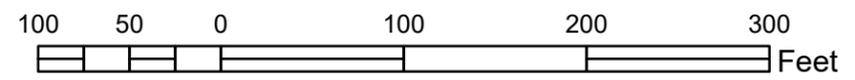
Map created by: Patrick J. Loveland, GIS Specialist 11/11/2024



USDA - NRCS SOIL SURVEY MAP
 MASSACHUSETTS STATE SOIL SURVEY
 A.P. 303, Lot 42 | 380 King Street
 Franklin, Massachusetts

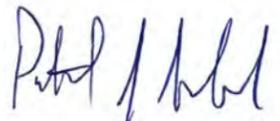
LEGEND

- 1 - Water
- 10 - Scarborough and Birdsall soils, 0 to 3 percent slopes
- 71B - Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony
- 254A - Merrimac fine sandy loam, 0 to 3 percent slopes
- 300B - Montauk fine sandy loam, 3 to 8 percent slopes
- 310B - Woodbridge fine sandy loam, 3 to 8 percent slopes
- 653 - Udorthents, sandy

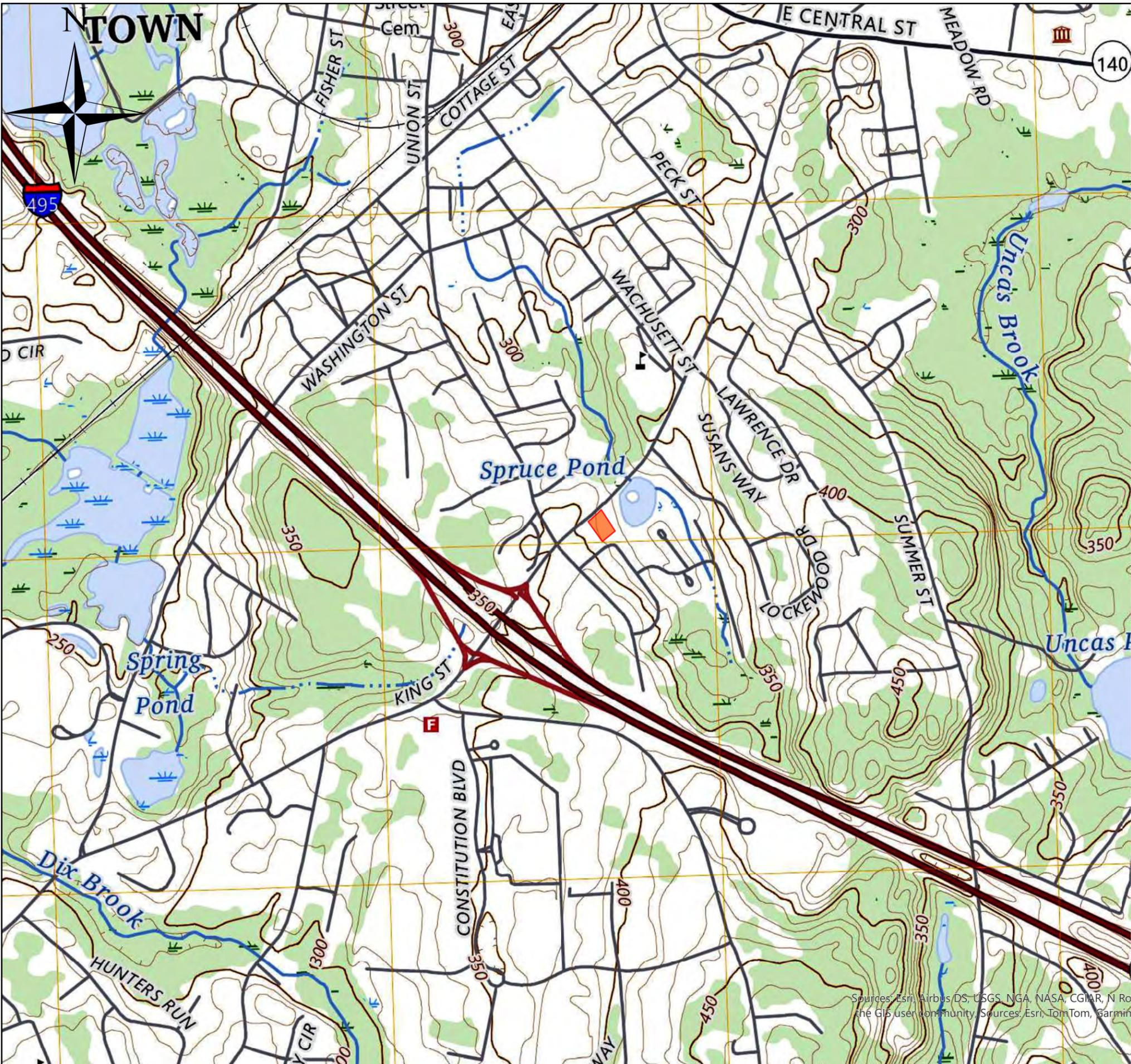


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Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS. © OpenStreetMap contributors, and the GIS User Community. No restrictions apply to these data. However, users should be aware that temporal changes may have occurred since this dataset was collected and that some parts of these data may no longer represent actual surface conditions. Users should not use these data for critical applications without a full awareness of their limitations. Acknowledgement of MassGIS would be appreciated for products derived from these data.

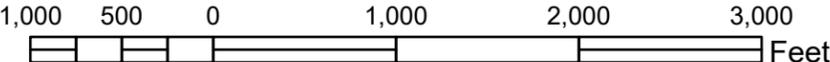
Map created by: 
 Patrick J. Loveland, GIS Specialist

11/11/2024



USGS TOPOGRAPHIC MAP
 A.P. 303, Lot 42 | 380 King Street
 Franklin, Massachusetts

LEGEND
 PROPERTY LINE



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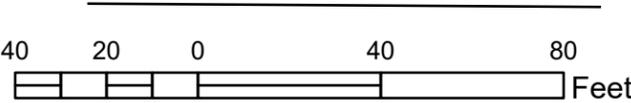
11/11/2024



2024 SOIL EVALUATION MAP
 A.P. 303, Lot 42 | 380 King Street
 Franklin, Massachusetts

LEGEND

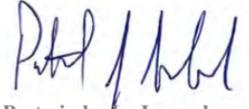
-  PROPERTY LINE
-  PERCOLATION TEST
-  SOIL EVALUATION



- General Notes:
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 2. Property lines as depicted on this map have been approximated from plat maps available from the town assessor's online database.
 3. 2021 Aerial photograph base map acquired from the Massachusetts OLIVER database.
 4. Site features located with a Juniper Geode Submetric GNSS receiver with SWmaps data collection software. Non-delineated wetland edges have not been field verified and are depicted for graphic purposes only.

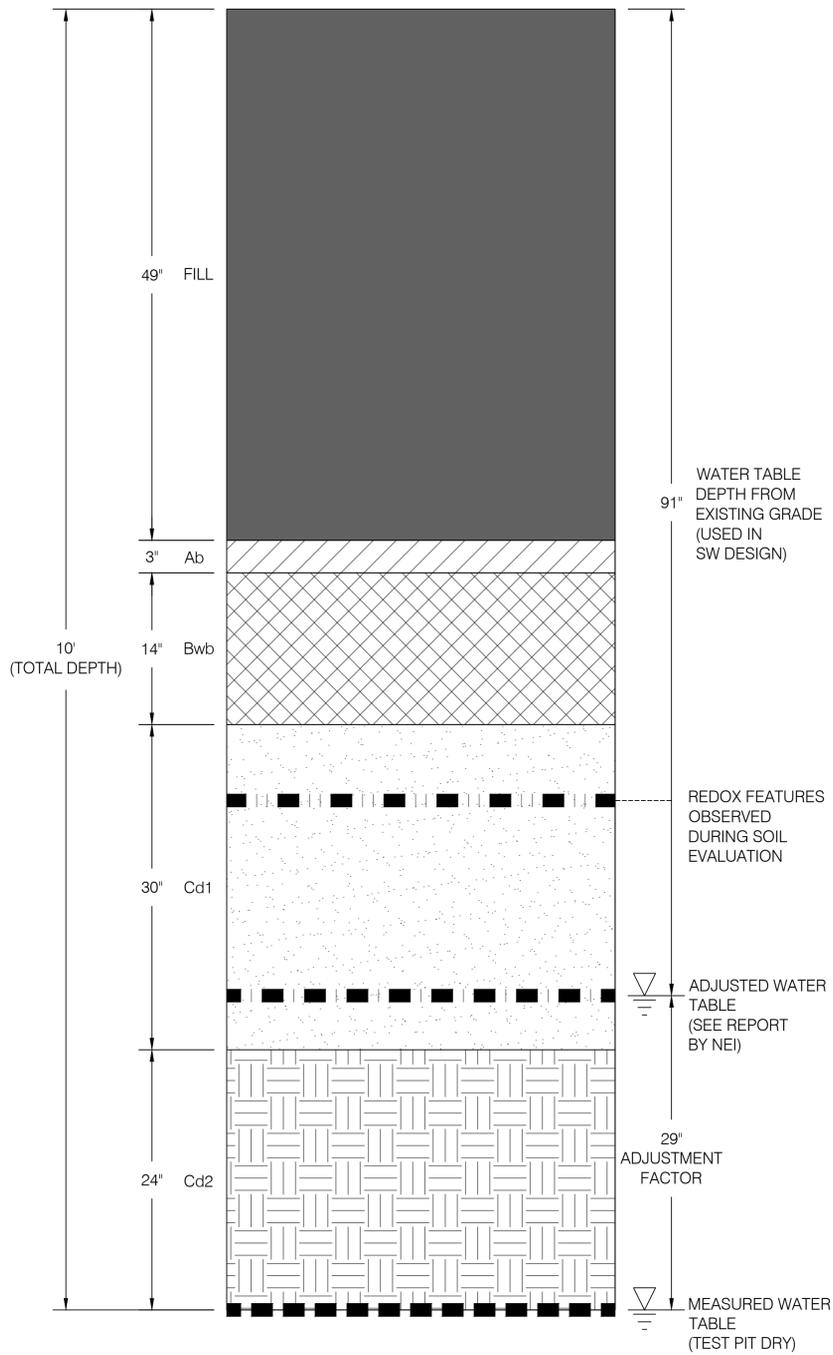
Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, Nasa, the GIS user community, Sources: Esri, TomTom, Garmin, P

Delineation performed by: 
 Amber K. Hardy, M.S., Soil Evaluator D4098 11/26/2024

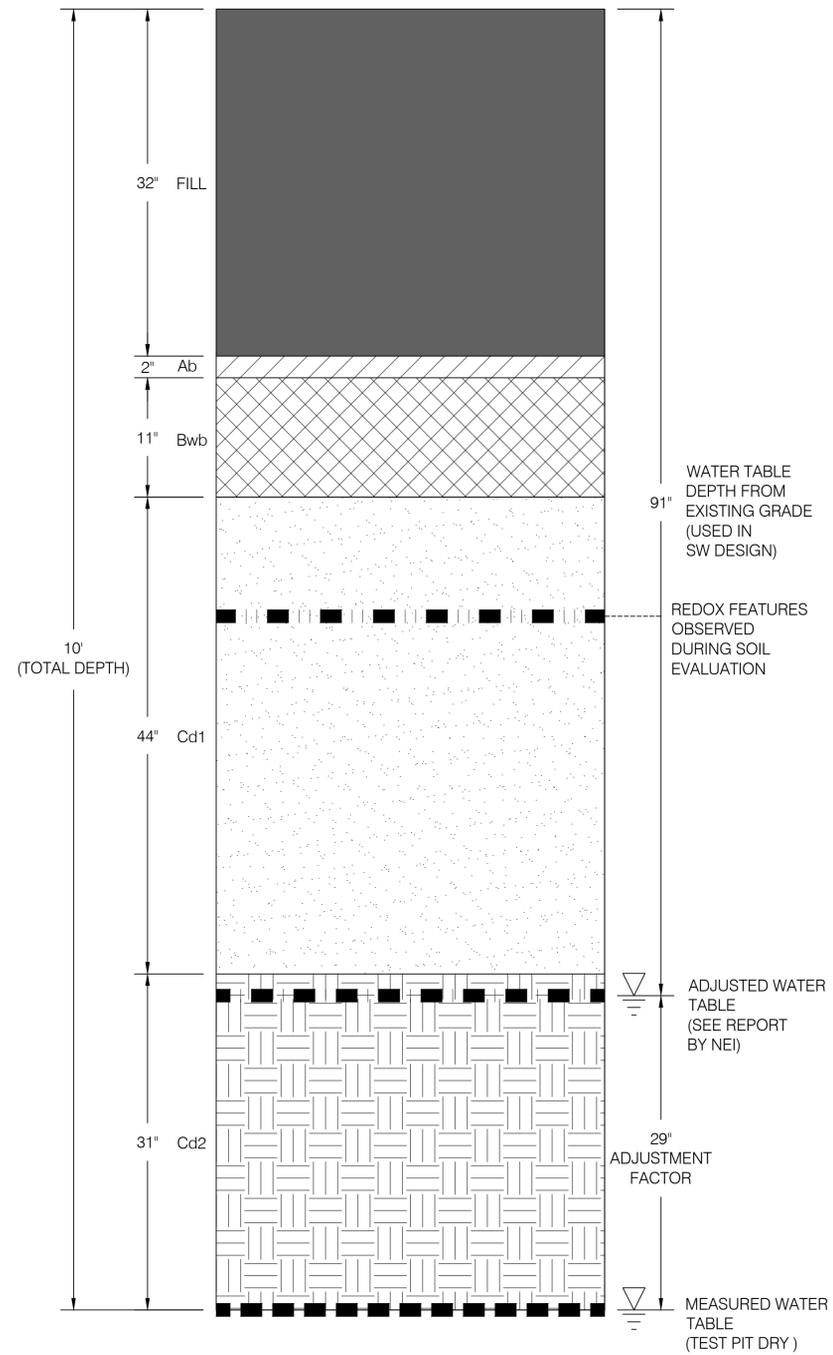
Map created by: 
 Patrick J. Loveland, GIS Specialist 01/03/2025

N:\PROJECTS\24.0168 - MARGUERITE COMMONWEALTH UNION CROSSING\SITE CIVIL\24.0168 FRANKLIN CROSSING CIVIL.DWG C-300 NEI-Standard.ctb 3/18/2025 Craig Barry

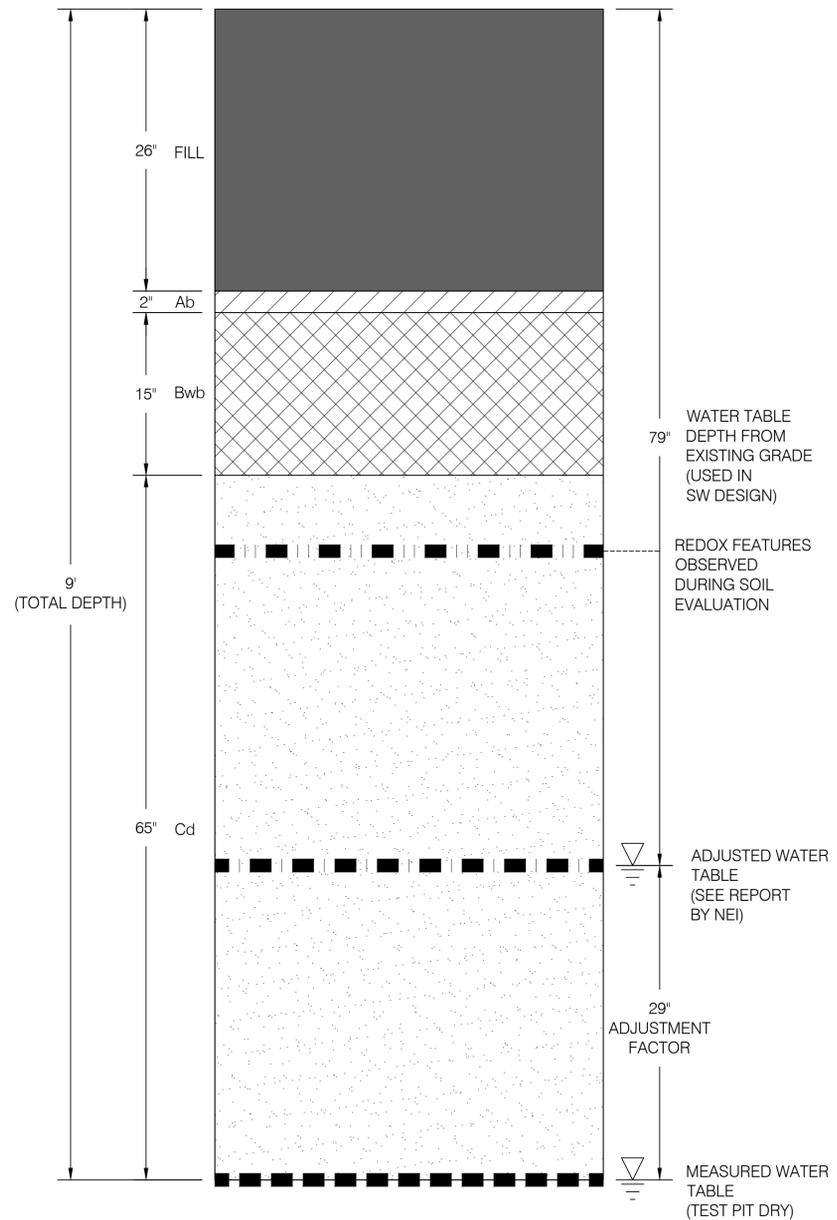
OBSERVATION HOLE #1



OBSERVATION HOLE #2



OBSERVATION HOLE #3



NEI
Narragansett
Engineering Inc.
Civil - Survey Structural Environmental Design
3102 East Main Road, Portsmouth RI 02871
Tel. 401.683.6630 www.nei-cds.com

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380 KING ST - CONDOMINIUMS
SOIL PROFILES

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Book/Page 8145-260
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PROJECT NO.	DATE	BY
24.0168	10.10.24	NKH

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- PERMITTING
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RELEASED FOR USE IN AGREEMENT WITH ABUTTER

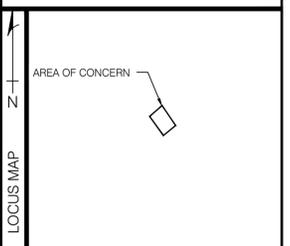
INTERNAL REVIEW

No	CHECK	CAD	DESCRIPTION/NOTES
1	BY	EB	PARKING LAYOUT
	DATE	11.26.24	
2	BY	EB	STORMWATER DESIGN
	DATE	2.28.25	UTILITY REVIEW PENDING
3	BY	EB	GENERAL PLAN REVISIONS
	DATE	3.11.25	

FORMAL PLAN REVISIONS

No	DATE	STAGE/DESCRIPTION	BY

ne-i-cds.com
DRAWINGS MUST BE PRINTED IN COLOR TO BE VALID. THIS NOTE SHOULD BE BLUE. IF THIS NOTE IS NOT BLUE, PLEASE REPRINT IN COLOR OR CONTACT NEI.



SCALE
1"=20'
C-300



Civil • Survey • Structural • Environmental • Design
 3102 East Main Road, Portsmouth RI 02871
 Tel. 401.683.6630 www.nei-cds.com

PROJECT Franklin Crossing PROJECT NUMBER 24.0168

SUBJECT Underground Infiltration

COMPUTATIONS BY CB DATE

CHECK BY JM DATE 5/6/2025

Site Water Quality Calculations

Total Site Water Quality Calculations

Total Area Site =	54,876	SF	
Total Impervious of treated site area =	42,266	SF	(PDA 1,2,4)
Water Quality Required for Site =	3,522	CF	
Water Quality Provided by BMP 1 =	1,571	CF	
Water Quality Provided by BMP 2 =	1,209	CF	
Water Quality Provided by BMP 3 =	1,105	CF	
Water Quality Provided by ADS system =	3,885	CF	

Water quality provided is greater than the water quality required



Civil - Survey - Structural - Environmental - Design
 3102 East Main Road, Portsmouth RI 02871
 Tel. 401.683.6630 www.nei-cds.com

PROJECT	Franklin Crossing	PROJECT NUMBER	24.0168
SUBJECT	Underground Infiltration		
COMPUTATIONS BY	CB	DATE	
CHECK BY	JM	DATE	5/6/2025

Infiltration System Calculations

Total Area to Infiltration (PDA - 1) =	15,336	SF
Total Impervious Area =	13,416	SF

Cell Volume shall be larger than Recharge Volume and Water Quality Volume

Recharge Volume - Rev

Total Impervious Area within Hydrologic Group "C" Soils =	13,416	SF
F (from MA Stormwater Handbook Table 2.3.2)	0.25	inches
Required Recharge Volume =	280	CF

Water Quality Volume (WQV)

WQV = Total Impervious Area x 1 inch =	1,118	CF
--	-------	----

Required WQV Volume =	1,118	CF
------------------------------	--------------	-----------

Provided Water Quality Volume =	1,571	CF @ Elev. 331.9 (Volume below lowest outlet invert from HydroCAD)
---------------------------------	-------	--

Total Volume Provided =	1,571	CF
--------------------------------	--------------	-----------

Filter Bed Area

$$A_f = \frac{WQV}{(d_f + (k \cdot t_f))}$$

Where :
 A_f = Surface area of filter bed (ft²)
 d_f = Filter bed depth (ft)
 k = Saturated hydraulic conductivity (ft/day)
 t_f = Allowable Drawdown (hours)

PDA -1 Water Quality Volume (WQV) =	1,118	cf
d_f =	1.5	ft
k =	0.17	inches/hour
t_f =	2.0	hours

A_f =	608	SF	Area of System from HydroCAD
Provided Surface Area =	1,617	SF	

Pretreatment Volume

Water Quality Volume (WQV)

WQV = Impervious Area treated by Sediment Chamber x 1 inches =	1,118	CF
--	-------	----

Pretreatment Volume = 25% WQV =	280	CF	2 isolater rows (32CF per chamber - 6 chambers per row)
Pretreatment Volume Provided =	384	CF	

Drawdown within 48 hours

Time = (Provided Volume) / (K x Bottom Area)			
Provided Volume =	1,571	CF	
K = saturated hydraulic conductivity =	0.17	inches/hour (from Table 2.3.3 of the MA Stormwater Handbook)	
Bottom Area (Average) =	1,617	SF	< 72 hrs
Time (hrs) =	6	hrs	



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PROJECT	Franklin Crossing	PROJECT NUMBER	24.0168
SUBJECT	Underground Infiltration		
COMPUTATIONS BY	CB	DATE	
CHECK BY	JM	DATE	5/6/2025

Infiltration System Calculations

Total Area to Infiltration (PDA - 4) =	20,104	SF
Total Impervious Area =	13,957	SF

Cell Volume shall be larger than Recharge Volume and Water Quality Volume

Recharge Volume - Rev

Total Impervious Area within Hydrologic Group "C" Soils =	13,957	SF
F (from MA Stormwater Stormwater Handbook Table 2.3.2) =	0.25	inches
Required Recharge Volume =	291	CF

Water Quality Volume (WQV)

WQV = Total Impervious Area x 1 inch =	1,163	CF
--	-------	----

Required WQV Volume = 1,163 CF

Provided Water Quality Volume =	1,209	CF @ Elev. 335.35 (Volume below lowest outlet invert from HydroCAD)
---------------------------------	-------	---

Total Volume Provided = 1,209 CF

Filter Bed Area

$$A_f = (WQV) / [(d_f) + (k \cdot t_f)]$$

Where :

- A_f = Surface area of filter bed (ft²)
- d_f = Filter bed depth (ft)
- k = Saturated hydraulic conductivity (ft/day)
- t_f = Allowable Drawdown (hours)

PDA -1 Water Quality Volume (WQV) =	1,163	cf
d _f =	1.5	ft
k =	0.17	inches/hour
t _f =	2.0	hours

A_f = 632 SF

Provided Surface Area = 1,421 SF Area of System from HydroCAD

Pretreatment Volume

Water Quality Volume (WQV)

WQV = Impervious Area treated by Sediment Chamber x 1 inches =	1,163	CF
--	-------	----

Pretreatment Volume = 25% WQV =	291	CF
Pretreatment Volume Provided =	384	CF

2 isolater rows (32CF per chamber - 6 chambers per row)

Drawdown within 48 hours

Time = (Provided Volume) / (K x Bottom Area)		
Provided Volume =	1,209	CF
K = saturated hydraulic conductivity =	0.17	inches/hour (from Table 2.3.3 of the MA Stormwater Handbook)
Bottom Area (Average) =	1,421	SF

Time (hrs) = 5 hrs < 72 hrs



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PROJECT Franklin Crossing PROJECT NUMBER 24.0168

SUBJECT Underground Infiltration

COMPUTATIONS BY CB DATE

CHECK BY JM DATE 5/6/2025

Infiltration System Calculations

Total Area to Infiltration (PDA - 2) = 15,905 SF
 Total Impervious Area = 12,807 SF

Cell Volume shall be larger than Recharge Volume and Water Quality Volume

Recharge Volume - Rev

Total Impervious Area within Hydrologic Group "C" Soils = 12,807 SF
 F (from MA Stormwater Stormwater Handbook Table 2.3.2) = 0.25 inches
 Required Recharge Volume = 267 CF

Water Quality Volume (WQV)

WQV = Total Impervious Area x 1 inch = 1,067 CF

Required WQV Volume = 1,067 CF

Provided Water Quality Volume = 1,105 CF @ Elev. 335.00 (Volume below lowest outlet invert from HydroCAD)

Total Volume Provided = 1,105 CF

Filter Bed Area

$$A_f = (WQV) / [(d_f) + (k \cdot t_f)]$$

Where :

A_f = Surface area of filter bed (ft²)
 d_f = Filter bed depth (ft)
 k = Saturated hydraulic conductivity (ft/day)
 t_f = Allowable Drawdown (hours)

PDA -1 Water Quality Volume (WQV) = 1,067 cf
 d_f = 1.0 ft
 k = 0.17 inches/hour
 t_f = 2.0 hours

A_f = 796 SF

Provided Surface Area = 2,673 SF Area of System from HydroCAD

Pretreatment Volume

Water Quality Volume (WQV)

WQV = Impervious Area treated by Sediment Chamber x 1 inches = 1,067 CF

Pretreatment Volume = 25% WQV = 267 CF
Pretreatment Volume Provided = 414 CF

2 isolater rows (20.7CF per chamber - 10 chambers per row

Drawdown within 48 hours

Time = (Provided Volume) / (K x Bottom Area)
 Provided Volume = 1,105 CF
 K = saturated hydraulic conductivity = 0.17 inches/hour (from Table 2.3.3 of the MA Stormwater Handbook)
 Bottom Area (Average) = 2,673 SF

Time (hrs) = **2** hrs < 72 hrs

Pollutant Loading Calculations

Franklin Crossing
4/29/2025

Pollutant Loading Rates

Pollutant, mg/l	Residential	Commercial	Industrial	Highways	Undev.
TSS	100	75	120	150	51
TP	0.3	0.2	0.25	0.25	0.11
TN	2.1	2.1	2.1	2.3	1.74
Cu	0.005	0.096	0.002	0.001	-
Pb	0.012	0.018	0.026	0.035	-
Zn	0.073	0.059	0.112	0.051	-
BOD	9.0	11.0	9.0	8.0	3.0
COD	54.5	58.0	58.6	100.0	27.0
Bacteria (#col/100 ml)	7,000	4,600	2,400	1,700	300

Notes:

1. Pollutant Loading Units: lbs or billion colonies per year
2. Pollutant Loading = $P \times P_j \times (R_v/12) \times C \times A \times 2.72$ ($P = 50$ in, $P_j = 0.9$, $R_v = 0.05 + 0.009 \times$ Percent Impervious)
3. Pollutant Loading for Bacteria = $1.03 \times 10^{-3} \times P \times P_j \times R_v \times C \times A$

Existing Development Pollutant Loading

	Subcatchment Area	1	Total
Site Info	Land Use	Commercial	
	Area, ac	1.26	
	Imp. Area, ac	0.36	
	Percent Imp.	28.2%	
	Rv	0.304	
Untreated Pollutant Loading	TSS	292.67	292.67
	TP	0.78	0.78
	TN	8.19	8.19
	Cu	0.37	0.37
	Pb	0.07	0.07
	Zn	0.23	0.23
	BOD	42.93	42.93
	COD	226.33	226.33
Bacteria	81.57	81.57	

Pollutant Loading Calculations

Franklin Crossing

4/29/2025

Proposed Development Pollutant Loading

	Subcatchment Area	Subsurface Infiltration	Untreated	Total
Site Info	Land Use	Commercial	Commercial	
	Area, ac	1.26	0.05	
	Imp. Area, ac	0.97	0.05	
	Percent Imp. Rv	77.0%	100.0%	
		0.743	0.950	
Untreated Pollutant Loading	TSS	716.22	34.74	750.95
	TP	1.91	0.09	2.00
	TN	20.05	0.97	21.03
	Cu	0.92	0.04	0.96
	Pb	0.17	0.01	0.18
	Zn	0.56	0.03	0.59
	BOD	105.05	5.09	110.14
	COD	553.88	26.86	580.74
Bacteria	199.61	9.68	209.30	
Treatment	Treatment	Infiltration	-	
	TSS	85%	-	
	TP	NA	-	
	TN	NA	-	
	Cu	NA	-	
	Pb	NA	-	
	Zn	NA	-	
	BOD	NA	-	
	COD	NA	-	
Bacteria	NA	-		
Treated Pollutant Loading	TSS	107.43	34.74	142.17
	TP	1.91	0.09	2.00
	TN	20.05	0.97	21.03
	Cu	0.92	0.04	0.96
	Pb	0.17	0.01	0.18
	Zn	0.56	0.03	0.59
	BOD	105.05	5.09	110.14
	COD	553.88	26.86	580.74
	Bacteria	199.61	9.68	209.30

Summary

	Existing	Proposed	Change
TSS	292.67	142.17	-150.50
TP	0.78	2.00	1.22
TN	8.19	21.03	12.83
Cu	0.37	0.96	0.59
Pb	0.07	0.18	0.11
Zn	0.23	0.59	0.36
BOD	42.93	110.14	67.21
COD	226.33	580.74	354.41
Bacteria	81.57	209.30	127.73



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PROJECT	Franklin Crossing	PROJECT NUMBER	24.0168
SUBJECT	Pipe Sizing		
COMPUTATIONS BY	EB	DATE	4/28/2025
CHECK BY		DATE	

Pipe Flow using Manning's Equation - Q = CIA - 25 Year Storm

- Q = Peak rate of runoff in cubic feet per second (cfs)**
- A = Area (acres)**
- I = Rainfall intensity (in/hr)**
- C = Runoff coefficient**
- Q = Peak rate of runoff in cubic feet per second (cfs)**

I (25 year storm Intensity) = 6.37
C = 0.95

Pipe DMH-2 - BMP-1

A = 15336 SF
0.35 Acres
Q₁₀₀ = 2.13 CFS

$$Q = 1.49/nAR_N^{2/3}S^{1/2}$$

Pipe Size (inches)	Pipe Size (feet)	Area (sq. ft.)	Circum., Pw (ft)	Rh, Full Flow (ft)	Slope (ft/ft)	Manning's 'n'	Velocity (fps)	Q, Flow (cfs)
12	1.000	0.785	3.14	0.25	0.005	0.012	3.48	2.74

2.13 CFS < 2.74 Use 12" Pipe

Pipe DMH-6 - BMP-2

C = 0.91
A = 20104 SF
0.46 Acres
Q₁₀₀ = 2.68 CFS

$$Q = 1.49/nAR_N^{2/3}S^{1/2}$$

Pipe Size (inches)	Pipe Size (feet)	Area (sq. ft.)	Circum., Pw (ft)	Rh, Full Flow (ft)	Slope (ft/ft)	Manning's 'n'	Velocity (fps)	Q, Flow (cfs)
12	1.000	0.785	3.14	0.25	0.009	0.012	4.67	3.67

2.68 CFS < 3.67 Use 12" Pipe

Pipe DMH-10 - BMP-3

C = 0.93
A = 15905 SF
0.37 Acres
Q₁₀₀ = 2.16 CFS

$$Q = 1.49/nAR_N^{2/3}S^{1/2}$$

Pipe Size (inches)	Pipe Size (feet)	Area (sq. ft.)	Circum., Pw (ft)	Rh, Full Flow (ft)	Slope (ft/ft)	Manning's 'n'	Velocity (fps)	Q, Flow (cfs)
10	0.833	0.545	2.62	0.21	0.020	0.012	6.17	3.37

2.16 CFS < 3.37 Use 10" Pipe

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

Location: 380 King St Franklin MA 02038

A	B	C	D	E
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)
Proprietary Treatment Practice (Isolation Row)	0.25	1.00	0.25	0.75
Subsurface Infiltration Structure	0.80	0.75	0.60	0.15

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

Total TSS Removal = 85%

Project: 24-0168 Franklin Crossing
 Prepared By: EB
 Date: 4-14-25

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



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 Certification

Vendor Contact:

Ms. Michelle Mangan
Standards and Compliance Manager
Cultec
878 Federal Road
Brookfield, CT 06804
Michelle.mangan@cultec.com
www.cultec.com
Ph: 475-289-7083

Technology Name:

Separator™ Row

Approval Type:

Pretreatment/Retrofits

Certification Dates:

Issued: April 9, 2024

Expires: April 9, 2029

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 **Separator™ Row** application for 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, **Cultec** has petitioned the permitting agencies to certify the **Separator™ Row** as an acceptable structural stormwater control described in Stormwater Rule 250-RICR-150-10-8.31. They have submitted monitoring results and supporting information developed in accordance with the provisions of the Technology Assessment Protocol (TAP) for Innovative and Emerging Technologies as described in in Stormwater Rule 250-RICR-150-10 Sections 8.39 and 8.40.

The **Separator™ Row** is granted reciprocity in Rhode Island as a proprietary stormwater treatment technology, given that it has been issued an Environmental Technology Verification (ETV) in accordance with International Organization for Standardization (ISO) 14034:2016 – Laboratory Testing of Oil-Grit Separators (June 2014). The laboratory study was conducted at Good Harbour Laboratories in Mississauga, Ontario, Canada with third-party verification provided by Globe Performance Solutions. The ISO is not a member of the Technology Acceptance Reciprocity Protocol (TARP) and the ETV is not equivalent to an approval from the Washington Department of Ecology Technology Assessment Protocol (TAPE). However, the TAPE program takes data from ETV studies into consideration when evaluating the effectiveness of emerging stormwater treatment technologies. Furthermore, the Massachusetts Department of Environmental Protection (DEP) allows the **Separator™ Row** to be utilized to meet TSS removal requirements. Additionally, the RIDEM has historically allowed the use of this device for the purpose of pre-treatment. This Environmental Technology Verification recognizes the **Separator™ Row** as a stormwater treatment technology which provides at least 25% removal of total suspended solids when operating at the maximum treatment flow rate for each device specified in the attached **Table 1: Separator™ Row Sizing Table**. The State of Massachusetts is a member of the Technology Acceptance Reciprocity Partnership (TARP). As per Stormwater Rule 250-RICR-150-10-8.39, both TAPE and TARP approved devices are allowed reciprocity consideration in Rhode Island.

The **Separator™ Row** is a pre-treatment or retrofit device that captures TSS from stormwater runoff as described in Stormwater Rule 250-RICR-150-10-8.31. It is an open-bottom thermoplastic molded arch whose sides are wrapped in non-woven geotextile filter fabric and bottom lined with a woven geotextile filter fabric. The device is designed to remove trash and sediment from stormwater. This product was developed by **Cultec**. The **Separator™ Row** is approved for off-line use only.

The manufacturer has demonstrated that this product meets the minimum water quality standards for pretreatment as described in Stormwater Rule 250-RICR-150-10-8.31. The **Separator™ Row** is approved for at

least **25%** removal of total suspended solids (TSS) when designed using flow rates specified in the attached **Table 1: Separator™ Row Sizing Table** which is based on a maximum loading rate of 2.1 gallons per minute per square foot of bottom chamber area. The **Separator™ Row** is NOT recognized for removal of Pathogens, Total Phosphorus or Nitrogen. This device may be used as pretreatment or retrofit device 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 adhere to the manufacturer's specification for the **Separator™ Row** located in the general notes section of the Cultec **Separator™ Row** detail sheet that is located on the last page of this certification letter. The detail sheet containing the **Separator™ Row** specifications can also be found at: <https://cultec.com/Asset/separator-row-stormwater-details.pdf>
2. The system must be installed in accordance with the manufacturer's installation manual for the **Separator™ Row**, which can be found at: <https://cultec.com/Asset/CLT058-stormwater-installation-instructions-c4-330x1hd.pdf> and <https://cultec.com/Asset/CLT009-recharger-360hd-902hd-installation-instructions-stormwater-imperial.pdf>
3. The **Separator™ Row** is **certified as a pretreatment** device in accordance with Stormwater Rule 250-RICR-150-10-8.31, provided the device treats the flow of the first inch of runoff from the capture area, unless waived by the state permitting agency. The system's design must utilize flow rates, impervious catchment sizes, and maximum sediment capacities listed in the attached **Table 1: Separator™ Row Sizing Table**.
4. The system must be designed to meet the following requirements:
 - a. The device must be attached to an upstream flow-splitter diversion manhole with either a weir or an elevated bypass manifold designed to ensure that the first inch of runoff is routed to the device prior to bypass. The weir or elevated bypass manifold's invert must be located at least 9" above the bottom invert of the **Separator™ Row** chamber elevation.
 - b. If the upstream flow-splitter diversion manhole is designed with a weir, then the manhole must be at least 30" wide. The manhole must be at least 48" wide if its rim is more than 4' above the invert of the device.
 - c. The upstream flow-splitter diversion manhole must also provide a 2' sump.
 - d. Each individual row of **Separator™ Row** chambers must be directly connected to a maintenance access manhole.
 - e. The inlet pipe connecting the diversion manhole to the device must be the maximum allowable diameter per chamber as specified on the vendor's construction details.
 - f. The inlet must be the only pipe connected to the **Separator™ Row**. No outlet pipes shall be directly connected to the pre-treatment chambers.
 - g. Each device must provide an inspection port at the point located furthest from the inlet.
 - h. The maximum distance between maintenance access manholes connected to each individual row of **Separator™ Row** chambers shall not exceed 200' to ensure that the JetVac hose is sufficiently long.
5. 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.

6. The approved devices shall be located such that they are accessible for maintenance and/or emergency removal of oil or chemical spills.
7. The device cannot be used in series with another Hydrodynamic separator to achieve enhanced removal rates for TSS.

II. MAINTENANCE REQUIREMENTS

1. Standard permitting conditions for inclusion of this technology will, at a minimum include the following:
 - a. Each individual owner must ensure that any and all of their proprietary stormwater treatment devices are maintained in accordance with the manufacturer's specifications, which are provided in the **Cultec Separator™ Row** Operation & Maintenance Manual: <https://cultec.com/Asset/CLT043-cultec-separator-row-o-m.pdf>
 - b. Each individual owner must ensure that any and all of their proprietary stormwater pre-treatment devices are maintained in accordance with the requirements stated in Stormwater Rule 250-RICR-150-10-8.31-C, which requires the device to be inspected a minimum of 2 times per year. Additionally, the device must be cleaned out with a JetVac when either pollutant removal capacity is reduced by 50% or more, or when average sediment depth is 3" or greater.
 - c. All material removed from the unit must be properly disposed of and is the responsibility of the owner.
 - d. The applicant must include a copy of the **Separator™ Row** Inspection and Maintenance Guide in their project specific long-term operation and maintenance plan.
2. 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 **Cultec** on how to properly maintain **Separator™ Row** devices. This requirement excludes maintenance providers recognized by the RIDEM to be qualified in maintenance of **Separator™ Row** devices.

III. REPORTING REQUIREMENTS

1. Upon request from the owner of any **Separator™ Row** system installed in the State of Rhode Island, the vendor shall provide the owner with a recommended maintenance schedule after the first year of the device's operation. If a recommended maintenance schedule is requested by the owner after the first year of the device's operation, then the owner is responsible for notifying the vendor of any additional pollutant loading sites where contributing drainage areas may be subject to further development (i.e., strip malls).
2. 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 **Separator™ Row** device for all models applicable to this certification.
3. The Vendor shall immediately notify the RIDEM Office of Water Resources if and when any revisions are made to the design, installation operation and maintenance manuals for all models applicable to this certification. Revisions deemed by the RIDEM to be substantial, may require re-application to the Alternative Stormwater Technology Program.

4. The Vendor shall notify the RIDEM at least thirty (30) days following 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, misrepresentation, or failure to fully disclose all relevant data, or receipt of new information indicating that the use of the **Separator™ Row** system is contrary to the public interest, public health, or the environment.
2. This approval does not represent an endorsement of the **Separator™ Row** system by the RIDEM, RIDOT or CRMC. This letter of approval may be reproduced only in its entirety.
3. The **Separator™ Row** General Specification and **Separator™ Row** 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.
Administrator of Groundwater and Freshwater Wetlands Protection

Date

SEE ATTACHMENTS ON NEXT PAGE:

Table 1: Separator™ Row Sizing Table

Model #	Chamber Dimensions (H x W x L)	Chamber Bottom Surface Area (ft²)	Maximum Treatment Flow Rate per Chamber (cfs)	Approximate Maximum Impervious Treatment Area (acres)
Contactar® 100HD	12.5" x 36" x 8'	22.5	0.11	0.095
Recharger® 150XLHD	18.5" x 33" x 11'	24.0	0.11	0.105
Recharger® 180HD	20.5" x 36" x 7.33'	19.0	0.09	0.083
Recharger® 280HD	26.5" x 47" x 8'	27.4	0.13	0.114
Recharger® 330XLHD	30.5" x 52" x 8.5'	31.3	0.15	0.130
Recharger® 360HD	36" x 60" x 4.17'	18.4	0.09	0.077
Recharger® 902HD	48" x 78" x 4.25'	23.9	0.11	0.102

TYPICAL STANDARD DETAIL FOR SEPARATOR™ ROW - ON NEXT PAGE

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

Cultec Separator™ Row Filtration System

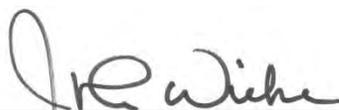
Developed by Cultec
Brookfield, Connecticut, USA

Registration: **GPS-ETV_VR2024-03-31**

In accordance with

ISO 14034:2016

**Environmental Management —
Environmental Technology Verification (ETV)**



John D. Wiebe, PhD
Executive Chairman
GLOBE Performance Solutions

March 31, 2024
Vancouver, BC, Canada



Verification Body
GLOBE Performance Solutions
404 – 999 Canada Place | Vancouver, B.C | Canada |V6C 3E2

Technology description and application

Cultec Recharger and Contactor chambers are used for infiltration, detention and/or retention of stormwater underground. The system is comprised of thermoplastic arch-shaped chambers surrounded by clear crushed stone. Water enters the system through a Separator row and then flows through the stone and into a Chamber row prior to exiting. The Cultec stormwater system is sized based on the volume of stormwater which is stored in the voids created by the chamber and the voids in the clear stone surround, with a void ratio of 40%. The entire system is wrapped in a non-woven geotextile and/or impermeable geomembrane. In order to minimize fine particles and silts from blinding the voids in the clear stone surround, a single chamber row is wrapped in non-woven geotextile and placed on a woven geotextile. This row is connected to the inlet pipe of the Cultec system providing a filtration function as the surface stormwater run-off passes through the geotextile wrapped inlet row. Sediment is trapped within the Cultec Separator™ Row and may be removed through back flushing of this row. A typical system installation is illustrated in Figure 1 and Figure 2 below.

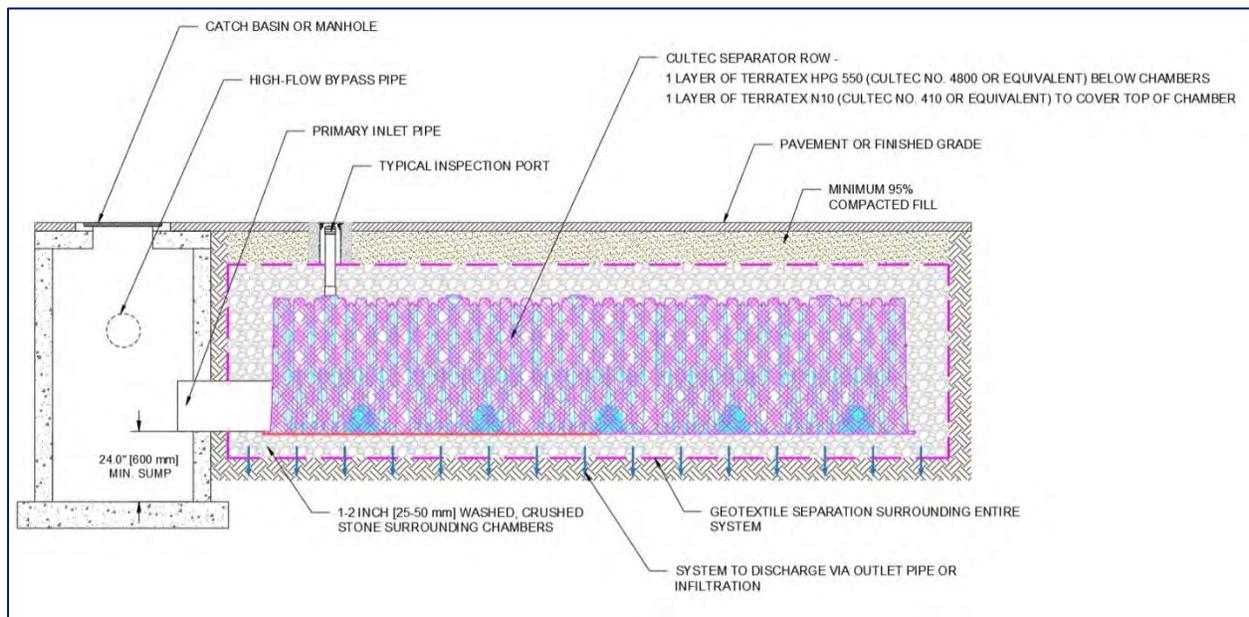


Figure 1: Cultec Separator™ Row Filtration System – Cross-Sectional View

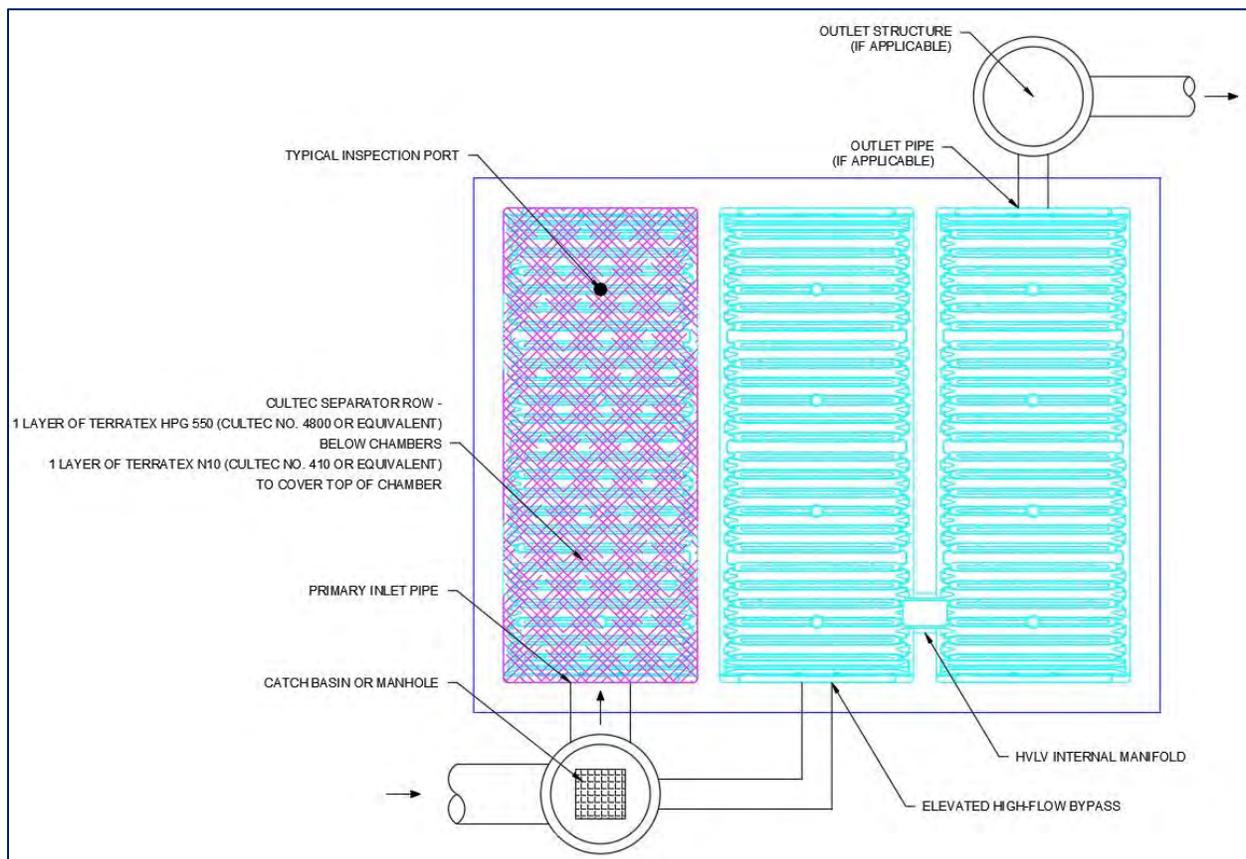


Figure 2: Cultec Separator™ Row Filtration System – Plan View

Performance & testing conditions

The data and results published in this Verification Statement were obtained from the testing program conducted on the Cultec Separator™ Row in accordance with a technology specific test plan (TSTP) developed and approved by the client and test lab (Good Harbour Laboratories, Mississauga, Ontario), and reviewed by the Verification Expert and Verifying Organization, in compliance with ISO/IEC 14034.

The device tested was a Cultec Recharger 150XLHD R chamber with a base width of 838 mm (33") and height of 470 mm (18.5").

Test Setup

Two chambers were used for this study, a receiving chamber and a separation chamber. The two chambers were housed in a containment cell constructed out of wood, lined with an impermeable membrane. The dimensions of the test cell were 142" X 71" X 23.5" (3.58 m X 1.80 m X 0.60 m, L X W X H). The chambers were set up in the test cell in a manner consistent with a normal installation. The floor of the cell was covered with approximately 76 mm (3") of washed, crushed, clear stone¹ which in turn was covered by one layer of woven geotextile fabric as required for the installation of the system. The two chambers sat next to each other, in parallel. Washed crushed stone filled in the space around the test units up to a height of approximately 51 mm (2") from the base.² The test set-up is illustrated in Figure 3.

The geotextiles used for this study were:

Woven: Terratex HPG 550
 Nonwoven: Terratex NI0

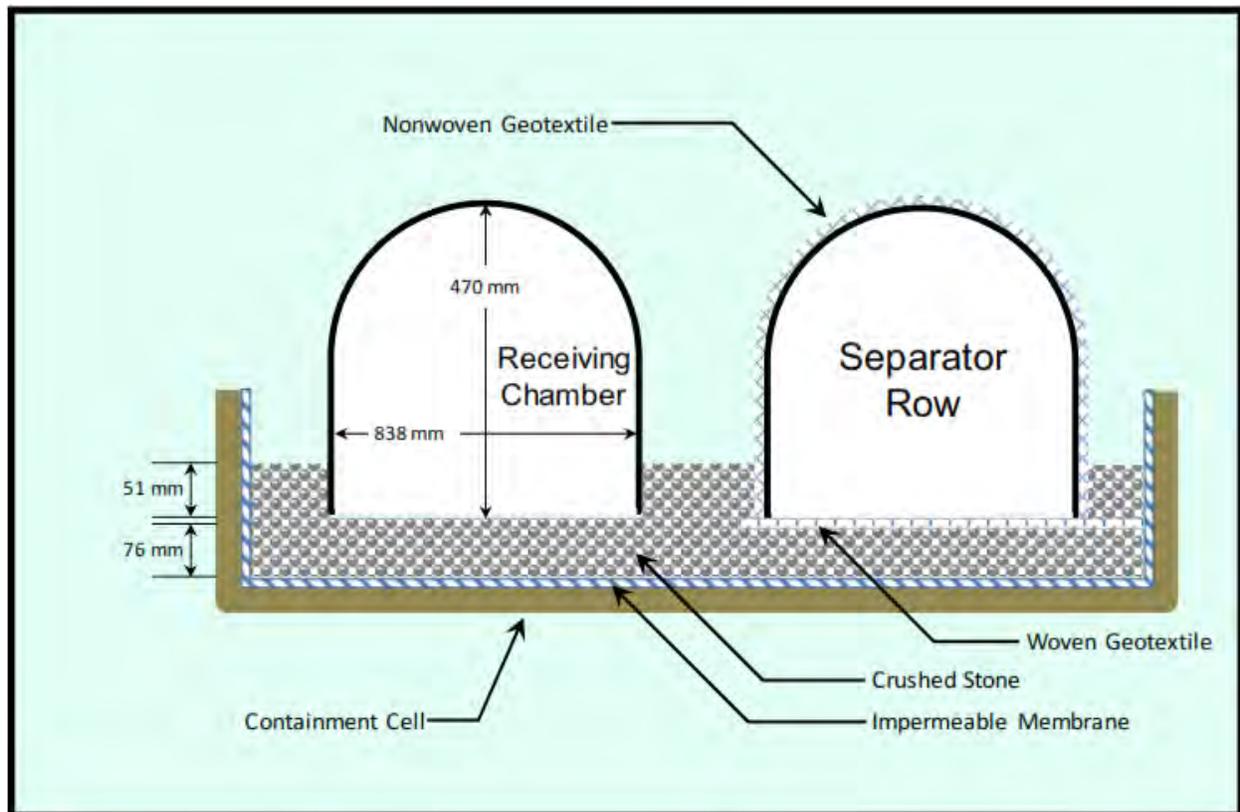


Figure 3: Test Cell Cross-Section for Model Recharger® I50XLHD R

¹ A normal installation would typically have a crushed stone depth of 150 mm (6").

² For a normal installation, the stone completely fills the column between chamber rows and up to a minimum of 6" above the top of the crown of the chamber.

The laboratory test set-up was a water flow loop, capable of moving water at a rate of up to 900 L/min. The loop was comprised of water reservoirs, pumps, stand pipe, receiving tank and a flow meter, in addition to the test cell.

Fresh water was pumped from the storage tank through a flow meter to the stand pipe, and from there it flowed by gravity through an inlet pipe to the separation chamber in the test cell. Sediment was added at an addition port in the inlet pipe upstream of the separation chamber.

From the water supply tanks, water was pumped by a centrifugal pump. Flow measurement was done using an electromagnetic type flow meter with an accuracy of $\pm 0.5\%$ of reading (1 – 200 gpm). The data logger was configured to record a flow measurement once every minute.

The influent pipe was 100 mm (4 inches) in diameter and sediment addition was done through a port at the crown of the influent pipe, 4 pipe diameters (406 mm) upstream of the containment cell. The sediment feeder was a volumetric screw feeder with vibratory hopper.

Water flow exited the receiving chamber and terminated with a free-fall into the Receiving Tank. Water was pumped from the Receiving Tank back to the storage tanks to complete the flow loop.

Sample Collection & Parameter Measurement

Background water samples were collected in 1 L jars from the standpipe. The sample was taken by submerging the jar below the surface of the water until full.

Effluent samples were also grabbed by hand. The effluent pipe drained freely into the Receiving Tank and the effluent sample was taken at that point. The sampling technique was to take the grab sample by sweeping a wide-mouth 1 L jar through the stream of effluent flow such that the jar was full after a single pass.

Effluent water temperature was taken using a data logger submerged into the receiving tank during each run and configured to take a temperature reading once every minute. Run and sampling times were measured using NIST traceable stopwatches. The sediment feed samples that were taken during the run were collected in 500 mL jars and weighed on an analytical balance.

Test Sediment

The final test sediment particle size distribution (PSD) met the required tolerances of the Canada ETV Procedure for Laboratory Testing of Oil-Grit Separators (Rev. June 6, 2014 – Ver. 3.0). Three replicate samples of the test sediment blend were sent to a qualified 3rd party analytical laboratory for analysis of the sediment PSD in a manner consistent with ASTM method D422-63 (Reapproved 2007), “Standard Test Method for Particle-Size Analysis of Soils”. The samples were composite samples created by taking samples throughout the blending process and in various positions within the blending drum.

Removal Efficiency Testing

The objective of this study was to establish a baseline for treatment performance (removal efficiency) over a range of flow rates up to 125% of the maximum treatment flow rate (MTFR) with an influent suspended sediment concentration (SSC) of 200 mg/L. Sediment removal efficiency testing was conducted at 25%, 50%, 75%, 100% and 125% MTFR. The sediment feed rate had a coefficient of variance (COV) ≤ 0.10 and the influent sediment concentration was maintained within ± 20 mg/L of target, based on the average sediment feed rate and water flow rate for the run. The water flow rates were held within 10% of target with a COV of 0.03 and water temperatures were maintained below 25°C.

A minimum of eight influent background samples were taken at regular intervals. A minimum of 15 effluent samples were collected during each test run. The first sample was collected after a minimum of 3 detention times (DT), at which time a constant flow and sediment feed were established. The interval between sequential effluent samples was evenly spaced; however, when the test sediment feed was interrupted for measurement, the next effluent sample was collected after waiting at least 3 DT to re-establish equilibrium conditions.

The system detention time was determined empirically by measuring the height of water in the containment cell during clean water flow at the chosen flow rate. The wet volume of the system was calculated and the approximate volume of the stones was subtracted. The remaining volume was the estimated water volume in the containment cell, which was divided by the flow rate to give detention time.

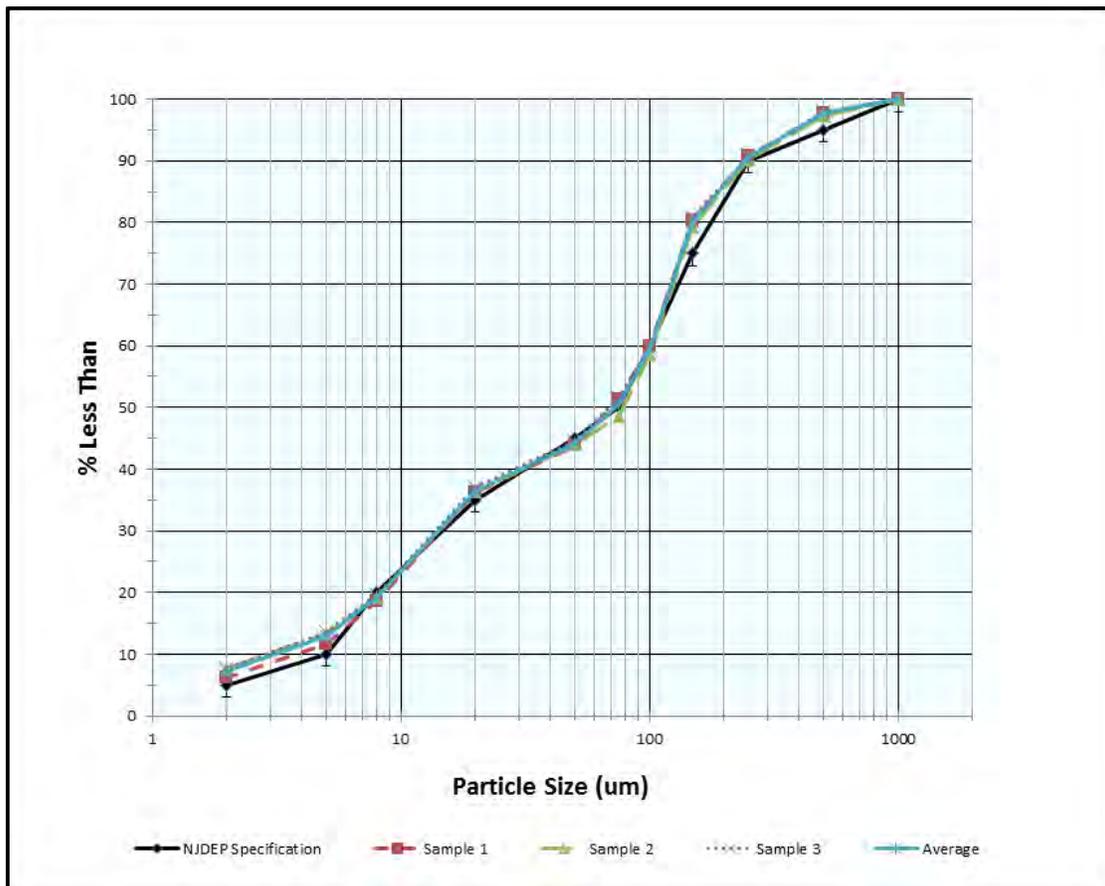
The sediment feed rate was checked using six calibration samples taken at evenly spaced intervals over the duration of each test run. Each sample was collected over an interval timed to the nearest 0.01 second and was a minimum of 0.1 liters, or the collection interval did not exceed one minute, whichever came first. The COV of the samples was < 0.10. The feed rate samples were also used to calculate an influent concentration in order to double check the concentration calculated by mass balance.

Performance claims

When installed with Terratex HPG 550 and Terratex N10 geotextiles, and tested with silica sediment having a particle size distribution conforming to the *Canadian Environmental Technology Verification Program Procedure for Laboratory Testing of Oil-Grit Separators*, the Cultec Recharger® 150XLHD Separator Row™ will remove at least the following fractions of suspended sediment at the corresponding flow rates: 80% at 24 gpm, 77% at 49 gpm, 73% at 73 gpm, 70% at 97 gpm, and 65% at 121 gpm. These performance claims are verified statistically at a 95% level of confidence.

Performance results

TEST SEDIMENT PARTICLE SIZE DISTRIBUTION IN RELATION TO SPECIFIED PSD



SUSPENDED SEDIMENT REMOVAL EFFICIENCY AT A FLOW RATE OF 24 GPM

	Suspended Sediment Concentration (mg/L)														
Sample #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Effluent	39.6	38.7	39.2	39.8	39.1	39.5	41.7	41.9	41.1	42.4	43.2	41.6	40.8	41.1	41.6
Background	2		2		2		2		2		2		2		2
Adjusted Effluent	37.6	36.7	37.2	37.8	37.1	37.5	39.7	39.9	39.1	40.4	41.2	39.6	38.8	39.1	39.6
Average Adjusted Effluent Concentration	38.8 mg/L					Removal Efficiency					80.2%				

SUSPENDED SEDIMENT REMOVAL EFFICIENCY AT A FLOW RATE OF 48 GPM

	Suspended Sediment Concentration (mg/L)														
Sample #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Effluent	47.1	47.0	47.1	46.8	47.3	47.3	49.0	50.1	49.5	50.4	49.1	50.2	52.2	49.7	51.8
Background	2		2		2		2		2		2		2		2
Adjusted Effluent	45.1	45.0	45.1	44.8	45.3	45.3	47.0	48.1	47.5	48.4	47.1	48.2	50.2	47.7	49.8
Average Adjusted Effluent Concentration	47.0 mg/L					Removal Efficiency					76.9%				

SUSPENDED SEDIMENT REMOVAL EFFICIENCY AT A FLOW RATE OF 73 GPM

	Suspended Sediment Concentration (mg/L)														
Sample #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Effluent	54.3	55.2	53.3	53.8	55.8	55.8	55.3	54.5	53.5	56.2	56.4	56.5	58.4	56.8	57.7
Background	2		2		2		2		2		2		2		2
Adjusted Effluent	52.3	53.2	51.3	51.8	53.8	53.8	53.3	52.5	51.5	54.2	54.4	54.5	56.4	54.8	55.7
Average Adjusted Effluent Concentration	53.6 mg/L					Removal Efficiency					73.3%				

SUSPENDED SEDIMENT REMOVAL EFFICIENCY AT A FLOW RATE OF 97 GPM

	Suspended Sediment Concentration (mg/L)														
Sample #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Effluent	58.4	59.4	59.0	61.2	61.6	61.1	58.9	60.4	59.9	63.9	63.3	62.5	61.9	61.0	61.0
Background	2		2		2		2		2		2		2		2
Adjusted Effluent	56.4	57.4	57.0	59.2	59.6	59.1	56.9	58.4	57.9	61.9	61.3	60.5	59.9	59.0	59.0
Average Adjusted Effluent Concentration	58.9 mg/L					Removal Efficiency					70.0 %				

SUSPENDED SEDIMENT REMOVAL EFFICIENCY AT A FLOW RATE OF 121 GPM

	Suspended Sediment Concentration (mg/L)														
Sample #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Effluent	72.0	72.8	71.7	72.1	70.1	72.1	69.3	72.3	77.2	71.0	70.7	72.7	71.1	70.4	73.0
Background	2		2		2		2		2		2		2		2
Adjusted Effluent	70.0	70.8	69.7	70.1	68.1	70.1	67.3	70.3	75.2*	69.0	68.7	70.7	69.1	68.4	71.0
Average Adjusted Effluent Concentration	69.9 mg/L					Removal Efficiency					65.3%				

*Note: This data point was considered to be a significant outlier and was therefore omitted as part of the overall statistical calculations to verify performance at a 95% level of confidence.

Verification

This verification was completed by the Verification Expert, the Centre for Advancement of Water and Wastewater Technologies (“CAWT”), contracted by GLOBE Performance Solutions, using the International Standard **ISO 14034:2016 Environmental Management – Environmental Technology Verification (ETV)**. Data and information provided by Cultec to support the performance claim included the final test report prepared by Good Harbour Laboratories of Mississauga, Ontario and dated November 9, 2017. The test report is based on testing completed in compliance with the requirements of ISO/IEC 17025.

What is ISO 14034:2016 Environmental Management – Environmental Technology Verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV), and was developed and published by the *International Organization for Standardization (ISO)*. The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

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For more information on ISO 14034:2016 / ETV please contact:

GLOBE Performance Solutions
404 – 999 Canada Place
Vancouver, BC
V6C 3E2 Canada
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etv@globepformance.com
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Limitation of verification: Registration: GPS-ETV_VR2024-03-31

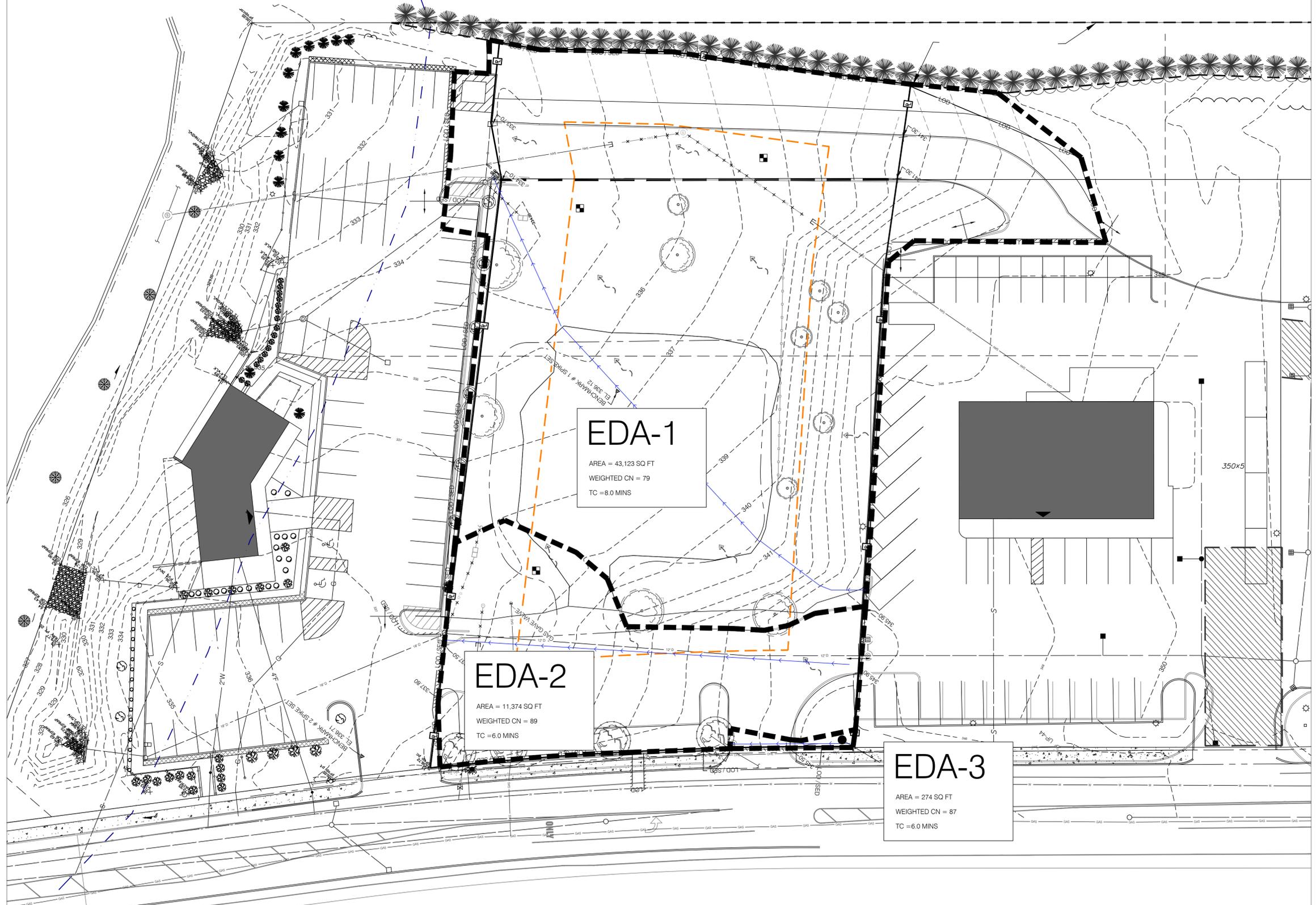
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LEGEND

--- WATERSHED BOUNDARY

--- TIME OF CONCENTRATION (Tc) PATH



EDA-1
 AREA = 43,123 SQ FT
 WEIGHTED CN = 79
 TC = 8.0 MINS

EDA-2
 AREA = 11,374 SQ FT
 WEIGHTED CN = 89
 TC = 6.0 MINS

EDA-3
 AREA = 274 SQ FT
 WEIGHTED CN = 87
 TC = 6.0 MINS

NEI
 Narragansett
 Engineering Inc.
 Civil - Survey Structural Environmental Design
 3102 East Main Road, Portsmouth RI 02871
 Tel. 401.683.6630 www.nei-cds.com

SHEET TITLE
 PRE DA
 KING ST CONDOMINIUMS

PROPERTY RECORD
 380 KING ST, FRANKLIN, MA
 02038
 PLAT: 303, LOT: 42
 ZONE: OI AREA: 0.919 ACRES
 N/F: MARGUERITE MARGARET,
 TR. MARGUERITE FAMILY TRUST
 YEAR BUILT: 2024
 BOOK/PAGE: 8145-260

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No	DATE	REVISIONS/DESCRIPTION	BY
1	4/15/25	UPDATED PER HYDROCAD	EB

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SCALE
 1" = 20'
PRE DA

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Subcat EDA-1



12" Pipe



Subcat EDA-2



18" Pipe



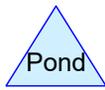
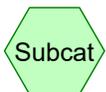
Subcat EDA-3



Spruce Pond



King St System



Routing Diagram for 24.0168 PRE HydroCAD
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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	WQv	Type III 24-hr		Default	24.00	1	1.20	2
2	2-Year	Type III 24-hr		Default	24.00	1	3.36	2
3	10-Year	Type III 24-hr		Default	24.00	1	5.22	2
4	25-Year	Type III 24-hr		Default	24.00	1	6.37	2
5	100-Year	Type III 24-hr		Default	24.00	1	8.16	2

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,286	74	>75% Grass cover, Good, HSG C (EDA-2, EDA-3)
9,564	89	Gravel roads, HSG C (EDA-1, EDA-2)
15,469	98	Paved parking, HSG C (EDA-1, EDA-2, EDA-3)
27,451	70	Woods, Good, HSG C (EDA-1, EDA-2)
54,771	81	TOTAL AREA

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Type III 24-hr WQv Rainfall=1.20"

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Time span=0.00-48.00 hrs, dt=1.00 hrs, 49 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 EDA-1: Subcat EDA-1 Runoff Area=43,123 sf 18.78% Impervious Runoff Depth=0.13"
Flow Length=251' Tc=8.0 min CN=79 Runoff=0.03 cfs 483 cf

Subcatchment EDA-2: Subcat EDA-2 Runoff Area=11,374 sf 63.49% Impervious Runoff Depth=0.41"
Tc=6.0 min CN=89 Runoff=0.05 cfs 393 cf

Subcatchment EDA-3: Subcat EDA-3 Runoff Area=274 sf 54.12% Impervious Runoff Depth=0.34"
Tc=6.0 min CN=87 Runoff=0.00 cfs 8 cf

Reach 5R: 18" Pipe Avg. Flow Depth=0.07' Max Vel=1.59 fps Inflow=0.05 cfs 393 cf
18.0" Round Pipe n=0.012 L=133.0' S=0.0105 '/' Capacity=11.68 cfs Outflow=0.04 cfs 394 cf

Reach 6R: 12" Pipe Avg. Flow Depth=0.07' Max Vel=1.43 fps Inflow=0.03 cfs 483 cf
12.0" Round Pipe n=0.012 L=92.0' S=0.0104 '/' Capacity=3.94 cfs Outflow=0.03 cfs 483 cf

Link 1L: Spruce Pond Inflow=0.07 cfs 877 cf
Primary=0.07 cfs 877 cf

Link 2L: King St System Inflow=0.00 cfs 8 cf
Primary=0.00 cfs 8 cf

Total Runoff Area = 54,771 sf Runoff Volume = 883 cf Average Runoff Depth = 0.19"
71.76% Pervious = 39,302 sf 28.24% Impervious = 15,469 sf

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Type III 24-hr WQv Rainfall=1.20"

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Summary for Subcatchment EDA-1: Subcat EDA-1

Runoff = 0.03 cfs @ 12.41 hrs, Volume= 483 cf, Depth= 0.13"
 Routed to Reach 6R : 12" Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
8,100	98	Paved parking, HSG C
25,916	70	Woods, Good, HSG C
9,107	89	Gravel roads, HSG C
43,123	79	Weighted Average
35,023	75	81.22% Pervious Area
8,100	98	18.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	12	0.0083	0.65		Sheet Flow, Sheet Flow - Paved Smooth surfaces n= 0.011 P2= 3.36"
6.1	51	0.1157	0.14		Sheet Flow, Sheet Flow - Woods Woods: Light underbrush n= 0.400 P2= 3.36"
0.4	37	0.0459	1.61		Sheet Flow, Sheet Flow - Gravel Smooth surfaces n= 0.011 P2= 3.36"
0.2	45	0.0418	3.29		Shallow Concentrated Flow, Shallow Concentrated - Gravel Unpaved Kv= 16.1 fps
0.8	80	0.0252	1.59		Shallow Concentrated Flow, Shallow Concentrated - Woods Nearly Bare & Untilled Kv= 10.0 fps
0.2	26	0.0151	2.49		Shallow Concentrated Flow, Shallow Concentrated - Paved Paved Kv= 20.3 fps
8.0	251	Total			

Summary for Subcatchment EDA-2: Subcat EDA-2

Runoff = 0.05 cfs @ 12.10 hrs, Volume= 393 cf, Depth= 0.41"
 Routed to Reach 5R : 18" Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
7,221	98	Paved parking, HSG C
1,536	70	Woods, Good, HSG C
2,160	74	>75% Grass cover, Good, HSG C
457	89	Gravel roads, HSG C
11,374	89	Weighted Average
4,153	74	36.51% Pervious Area
7,221	98	63.49% Impervious Area

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Type III 24-hr WQv Rainfall=1.20"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

Summary for Subcatchment EDA-3: Subcat EDA-3

Runoff = 0.00 cfs @ 12.12 hrs, Volume= 8 cf, Depth= 0.34"
 Routed to Link 2L : King St System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
148	98	Paved parking, HSG C
126	74	>75% Grass cover, Good, HSG C
274	87	Weighted Average
126	74	45.88% Pervious Area
148	98	54.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

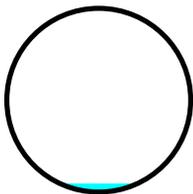
Summary for Reach 5R: 18" Pipe

Inflow Area = 11,374 sf, 63.49% Impervious, Inflow Depth = 0.41" for WQv event
 Inflow = 0.05 cfs @ 12.10 hrs, Volume= 393 cf
 Outflow = 0.04 cfs @ 12.13 hrs, Volume= 394 cf, Atten= 5%, Lag= 2.3 min
 Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Max. Velocity= 1.59 fps, Min. Travel Time= 1.4 min
 Avg. Velocity = 0.82 fps, Avg. Travel Time= 2.7 min

Peak Storage= 4 cf @ 12.17 hrs
 Average Depth at Peak Storage= 0.07' , Surface Width= 0.63'
 Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.68 cfs

18.0" Round Pipe
 n= 0.012 Concrete pipe, finished
 Length= 133.0' Slope= 0.0105 '/'
 Inlet Invert= 330.15', Outlet Invert= 328.75'



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Type III 24-hr WQv Rainfall=1.20"

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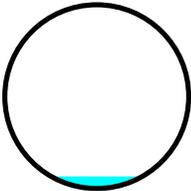
Summary for Reach 6R: 12" Pipe

Inflow Area = 43,123 sf, 18.78% Impervious, Inflow Depth = 0.13" for WQv event
Inflow = 0.03 cfs @ 12.41 hrs, Volume= 483 cf
Outflow = 0.03 cfs @ 12.49 hrs, Volume= 483 cf, Atten= 3%, Lag= 4.7 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 1.43 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 1.6 min

Peak Storage= 2 cf @ 12.48 hrs
Average Depth at Peak Storage= 0.07' , Surface Width= 0.49'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.94 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 92.0' Slope= 0.0104 '/
Inlet Invert= 330.10', Outlet Invert= 329.14'



Summary for Link 1L: Spruce Pond

Inflow Area = 54,497 sf, 28.11% Impervious, Inflow Depth = 0.19" for WQv event
Inflow = 0.07 cfs @ 12.23 hrs, Volume= 877 cf
Primary = 0.07 cfs @ 12.23 hrs, Volume= 877 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

Summary for Link 2L: King St System

Inflow Area = 274 sf, 54.12% Impervious, Inflow Depth = 0.34" for WQv event
Inflow = 0.00 cfs @ 12.12 hrs, Volume= 8 cf
Primary = 0.00 cfs @ 12.12 hrs, Volume= 8 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

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Type III 24-hr 2-Year Rainfall=3.36"

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Time span=0.00-48.00 hrs, dt=1.00 hrs, 49 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 EDA-1: Subcat EDA-1 Runoff Area=43,123 sf 18.78% Impervious Runoff Depth=1.46"
Flow Length=251' Tc=8.0 min CN=79 Runoff=0.64 cfs 5,240 cf

Subcatchment EDA-2: Subcat EDA-2 Runoff Area=11,374 sf 63.49% Impervious Runoff Depth=2.23"
Tc=6.0 min CN=89 Runoff=0.27 cfs 2,112 cf

Subcatchment EDA-3: Subcat EDA-3 Runoff Area=274 sf 54.12% Impervious Runoff Depth=2.06"
Tc=6.0 min CN=87 Runoff=0.01 cfs 47 cf

Reach 5R: 18" Pipe Avg. Flow Depth=0.16' Max Vel=2.72 fps Inflow=0.27 cfs 2,112 cf
18.0" Round Pipe n=0.012 L=133.0' S=0.0105 '/' Capacity=11.68 cfs Outflow=0.26 cfs 2,116 cf

Reach 6R: 12" Pipe Avg. Flow Depth=0.27' Max Vel=3.67 fps Inflow=0.64 cfs 5,240 cf
12.0" Round Pipe n=0.012 L=92.0' S=0.0104 '/' Capacity=3.94 cfs Outflow=0.63 cfs 5,250 cf

Link 1L: Spruce Pond Inflow=0.89 cfs 7,366 cf
Primary=0.89 cfs 7,366 cf

Link 2L: King St System Inflow=0.01 cfs 47 cf
Primary=0.01 cfs 47 cf

Total Runoff Area = 54,771 sf Runoff Volume = 7,398 cf Average Runoff Depth = 1.62"
71.76% Pervious = 39,302 sf 28.24% Impervious = 15,469 sf

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Type III 24-hr 2-Year Rainfall=3.36"

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Summary for Subcatchment EDA-1: Subcat EDA-1

Runoff = 0.64 cfs @ 12.08 hrs, Volume= 5,240 cf, Depth= 1.46"
 Routed to Reach 6R : 12" Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
8,100	98	Paved parking, HSG C
25,916	70	Woods, Good, HSG C
9,107	89	Gravel roads, HSG C
43,123	79	Weighted Average
35,023	75	81.22% Pervious Area
8,100	98	18.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	12	0.0083	0.65		Sheet Flow, Sheet Flow - Paved Smooth surfaces n= 0.011 P2= 3.36"
6.1	51	0.1157	0.14		Sheet Flow, Sheet Flow - Woods Woods: Light underbrush n= 0.400 P2= 3.36"
0.4	37	0.0459	1.61		Sheet Flow, Sheet Flow - Gravel Smooth surfaces n= 0.011 P2= 3.36"
0.2	45	0.0418	3.29		Shallow Concentrated Flow, Shallow Concentrated - Gravel Unpaved Kv= 16.1 fps
0.8	80	0.0252	1.59		Shallow Concentrated Flow, Shallow Concentrated - Woods Nearly Bare & Untilled Kv= 10.0 fps
0.2	26	0.0151	2.49		Shallow Concentrated Flow, Shallow Concentrated - Paved Paved Kv= 20.3 fps
8.0	251	Total			

Summary for Subcatchment EDA-2: Subcat EDA-2

Runoff = 0.27 cfs @ 12.04 hrs, Volume= 2,112 cf, Depth= 2.23"
 Routed to Reach 5R : 18" Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
7,221	98	Paved parking, HSG C
1,536	70	Woods, Good, HSG C
2,160	74	>75% Grass cover, Good, HSG C
457	89	Gravel roads, HSG C
11,374	89	Weighted Average
4,153	74	36.51% Pervious Area
7,221	98	63.49% Impervious Area

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Type III 24-hr 2-Year Rainfall=3.36"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

Summary for Subcatchment EDA-3: Subcat EDA-3

Runoff = 0.01 cfs @ 12.05 hrs, Volume= 47 cf, Depth= 2.06"
Routed to Link 2L : King St System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
148	98	Paved parking, HSG C
126	74	>75% Grass cover, Good, HSG C
274	87	Weighted Average
126	74	45.88% Pervious Area
148	98	54.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

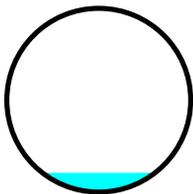
Summary for Reach 5R: 18" Pipe

Inflow Area = 11,374 sf, 63.49% Impervious, Inflow Depth = 2.23" for 2-Year event
Inflow = 0.27 cfs @ 12.04 hrs, Volume= 2,112 cf
Outflow = 0.26 cfs @ 12.06 hrs, Volume= 2,116 cf, Atten= 3%, Lag= 1.1 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 2.72 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 1.9 min

Peak Storage= 13 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 0.92'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.68 cfs

18.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 133.0' Slope= 0.0105 '/'
Inlet Invert= 330.15', Outlet Invert= 328.75'



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Type III 24-hr 2-Year Rainfall=3.36"

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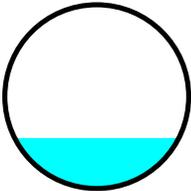
Summary for Reach 6R: 12" Pipe

Inflow Area = 43,123 sf, 18.78% Impervious, Inflow Depth = 1.46" for 2-Year event
Inflow = 0.64 cfs @ 12.08 hrs, Volume= 5,240 cf
Outflow = 0.63 cfs @ 12.09 hrs, Volume= 5,250 cf, Atten= 2%, Lag= 0.6 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 3.67 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.76 fps, Avg. Travel Time= 0.9 min

Peak Storage= 16 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.27' , Surface Width= 0.89'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.94 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 92.0' Slope= 0.0104 '/
Inlet Invert= 330.10', Outlet Invert= 329.14'



Summary for Link 1L: Spruce Pond

Inflow Area = 54,497 sf, 28.11% Impervious, Inflow Depth = 1.62" for 2-Year event
Inflow = 0.89 cfs @ 12.08 hrs, Volume= 7,366 cf
Primary = 0.89 cfs @ 12.08 hrs, Volume= 7,366 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

Summary for Link 2L: King St System

Inflow Area = 274 sf, 54.12% Impervious, Inflow Depth = 2.06" for 2-Year event
Inflow = 0.01 cfs @ 12.05 hrs, Volume= 47 cf
Primary = 0.01 cfs @ 12.05 hrs, Volume= 47 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

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Type III 24-hr 10-Year Rainfall=5.22"

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Time span=0.00-48.00 hrs, dt=1.00 hrs, 49 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 EDA-1: Subcat EDA-1 Runoff Area=43,123 sf 18.78% Impervious Runoff Depth=2.99"
Flow Length=251' Tc=8.0 min CN=79 Runoff=1.35 cfs 10,752 cf

Subcatchment EDA-2: Subcat EDA-2 Runoff Area=11,374 sf 63.49% Impervious Runoff Depth=3.98"
Tc=6.0 min CN=89 Runoff=0.47 cfs 3,775 cf

Subcatchment EDA-3: Subcat EDA-3 Runoff Area=274 sf 54.12% Impervious Runoff Depth=3.77"
Tc=6.0 min CN=87 Runoff=0.01 cfs 86 cf

Reach 5R: 18" Pipe Avg. Flow Depth=0.21' Max Vel=3.22 fps Inflow=0.47 cfs 3,775 cf
18.0" Round Pipe n=0.012 L=133.0' S=0.0105 '/ Capacity=11.68 cfs Outflow=0.46 cfs 3,783 cf

Reach 6R: 12" Pipe Avg. Flow Depth=0.40' Max Vel=4.54 fps Inflow=1.35 cfs 10,752 cf
12.0" Round Pipe n=0.012 L=92.0' S=0.0104 '/ Capacity=3.94 cfs Outflow=1.33 cfs 10,771 cf

Link 1L: Spruce Pond Inflow=1.80 cfs 14,554 cf
Primary=1.80 cfs 14,554 cf

Link 2L: King St System Inflow=0.01 cfs 86 cf
Primary=0.01 cfs 86 cf

Total Runoff Area = 54,771 sf Runoff Volume = 14,613 cf Average Runoff Depth = 3.20"
71.76% Pervious = 39,302 sf 28.24% Impervious = 15,469 sf

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Type III 24-hr 10-Year Rainfall=5.22"

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Summary for Subcatchment EDA-1: Subcat EDA-1

Runoff = 1.35 cfs @ 12.06 hrs, Volume= 10,752 cf, Depth= 2.99"
 Routed to Reach 6R : 12" Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
8,100	98	Paved parking, HSG C
25,916	70	Woods, Good, HSG C
9,107	89	Gravel roads, HSG C
43,123	79	Weighted Average
35,023	75	81.22% Pervious Area
8,100	98	18.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	12	0.0083	0.65		Sheet Flow, Sheet Flow - Paved Smooth surfaces n= 0.011 P2= 3.36"
6.1	51	0.1157	0.14		Sheet Flow, Sheet Flow - Woods Woods: Light underbrush n= 0.400 P2= 3.36"
0.4	37	0.0459	1.61		Sheet Flow, Sheet Flow - Gravel Smooth surfaces n= 0.011 P2= 3.36"
0.2	45	0.0418	3.29		Shallow Concentrated Flow, Shallow Concentrated - Gravel Unpaved Kv= 16.1 fps
0.8	80	0.0252	1.59		Shallow Concentrated Flow, Shallow Concentrated - Woods Nearly Bare & Untilled Kv= 10.0 fps
0.2	26	0.0151	2.49		Shallow Concentrated Flow, Shallow Concentrated - Paved Paved Kv= 20.3 fps
8.0	251	Total			

Summary for Subcatchment EDA-2: Subcat EDA-2

Runoff = 0.47 cfs @ 12.03 hrs, Volume= 3,775 cf, Depth= 3.98"
 Routed to Reach 5R : 18" Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
7,221	98	Paved parking, HSG C
1,536	70	Woods, Good, HSG C
2,160	74	>75% Grass cover, Good, HSG C
457	89	Gravel roads, HSG C
11,374	89	Weighted Average
4,153	74	36.51% Pervious Area
7,221	98	63.49% Impervious Area

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Type III 24-hr 10-Year Rainfall=5.22"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

Summary for Subcatchment EDA-3: Subcat EDA-3

Runoff = 0.01 cfs @ 12.03 hrs, Volume= 86 cf, Depth= 3.77"
 Routed to Link 2L : King St System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
148	98	Paved parking, HSG C
126	74	>75% Grass cover, Good, HSG C
274	87	Weighted Average
126	74	45.88% Pervious Area
148	98	54.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

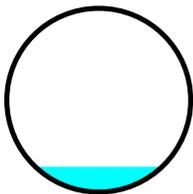
Summary for Reach 5R: 18" Pipe

Inflow Area = 11,374 sf, 63.49% Impervious, Inflow Depth = 3.98" for 10-Year event
 Inflow = 0.47 cfs @ 12.03 hrs, Volume= 3,775 cf
 Outflow = 0.46 cfs @ 12.04 hrs, Volume= 3,783 cf, Atten= 2%, Lag= 0.9 min
 Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Max. Velocity= 3.22 fps, Min. Travel Time= 0.7 min
 Avg. Velocity= 1.35 fps, Avg. Travel Time= 1.6 min

Peak Storage= 19 cf @ 12.05 hrs
 Average Depth at Peak Storage= 0.21' , Surface Width= 1.03'
 Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.68 cfs

18.0" Round Pipe
 n= 0.012 Concrete pipe, finished
 Length= 133.0' Slope= 0.0105 '/'
 Inlet Invert= 330.15', Outlet Invert= 328.75'



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Type III 24-hr 10-Year Rainfall=5.22"

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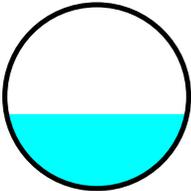
Summary for Reach 6R: 12" Pipe

Inflow Area = 43,123 sf, 18.78% Impervious, Inflow Depth = 2.99" for 10-Year event
Inflow = 1.35 cfs @ 12.06 hrs, Volume= 10,752 cf
Outflow = 1.33 cfs @ 12.07 hrs, Volume= 10,771 cf, Atten= 1%, Lag= 0.5 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 4.54 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.06 fps, Avg. Travel Time= 0.7 min

Peak Storage= 27 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.40' , Surface Width= 0.98'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.94 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 92.0' Slope= 0.0104 '/
Inlet Invert= 330.10', Outlet Invert= 329.14'



Summary for Link 1L: Spruce Pond

Inflow Area = 54,497 sf, 28.11% Impervious, Inflow Depth = 3.20" for 10-Year event
Inflow = 1.80 cfs @ 12.06 hrs, Volume= 14,554 cf
Primary = 1.80 cfs @ 12.06 hrs, Volume= 14,554 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

Summary for Link 2L: King St System

Inflow Area = 274 sf, 54.12% Impervious, Inflow Depth = 3.77" for 10-Year event
Inflow = 0.01 cfs @ 12.03 hrs, Volume= 86 cf
Primary = 0.01 cfs @ 12.03 hrs, Volume= 86 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

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Type III 24-hr 25-Year Rainfall=6.37"

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Time span=0.00-48.00 hrs, dt=1.00 hrs, 49 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 EDA-1: Subcat EDA-1 Runoff Area=43,123 sf 18.78% Impervious Runoff Depth=4.01"
Flow Length=251' Tc=8.0 min CN=79 Runoff=1.82 cfs 14,417 cf

Subcatchment EDA-2: Subcat EDA-2 Runoff Area=11,374 sf 63.49% Impervious Runoff Depth=5.09"
Tc=6.0 min CN=89 Runoff=0.60 cfs 4,829 cf

Subcatchment EDA-3: Subcat EDA-3 Runoff Area=274 sf 54.12% Impervious Runoff Depth=4.87"
Tc=6.0 min CN=87 Runoff=0.01 cfs 111 cf

Reach 5R: 18" Pipe Avg. Flow Depth=0.23' Max Vel=3.46 fps Inflow=0.60 cfs 4,829 cf
18.0" Round Pipe n=0.012 L=133.0' S=0.0105 '/' Capacity=11.68 cfs Outflow=0.59 cfs 4,838 cf

Reach 6R: 12" Pipe Avg. Flow Depth=0.48' Max Vel=4.91 fps Inflow=1.82 cfs 14,417 cf
12.0" Round Pipe n=0.012 L=92.0' S=0.0104 '/' Capacity=3.94 cfs Outflow=1.80 cfs 14,442 cf

Link 1L: Spruce Pond Inflow=2.38 cfs 19,280 cf
Primary=2.38 cfs 19,280 cf

Link 2L: King St System Inflow=0.01 cfs 111 cf
Primary=0.01 cfs 111 cf

Total Runoff Area = 54,771 sf Runoff Volume = 19,356 cf Average Runoff Depth = 4.24"
71.76% Pervious = 39,302 sf 28.24% Impervious = 15,469 sf

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Type III 24-hr 25-Year Rainfall=6.37"

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Summary for Subcatchment EDA-1: Subcat EDA-1

Runoff = 1.82 cfs @ 12.05 hrs, Volume= 14,417 cf, Depth= 4.01"
 Routed to Reach 6R : 12" Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr 25-Year Rainfall=6.37"

Area (sf)	CN	Description
8,100	98	Paved parking, HSG C
25,916	70	Woods, Good, HSG C
9,107	89	Gravel roads, HSG C
43,123	79	Weighted Average
35,023	75	81.22% Pervious Area
8,100	98	18.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	12	0.0083	0.65		Sheet Flow, Sheet Flow - Paved Smooth surfaces n= 0.011 P2= 3.36"
6.1	51	0.1157	0.14		Sheet Flow, Sheet Flow - Woods Woods: Light underbrush n= 0.400 P2= 3.36"
0.4	37	0.0459	1.61		Sheet Flow, Sheet Flow - Gravel Smooth surfaces n= 0.011 P2= 3.36"
0.2	45	0.0418	3.29		Shallow Concentrated Flow, Shallow Concentrated - Gravel Unpaved Kv= 16.1 fps
0.8	80	0.0252	1.59		Shallow Concentrated Flow, Shallow Concentrated - Woods Nearly Bare & Untilled Kv= 10.0 fps
0.2	26	0.0151	2.49		Shallow Concentrated Flow, Shallow Concentrated - Paved Paved Kv= 20.3 fps
8.0	251	Total			

Summary for Subcatchment EDA-2: Subcat EDA-2

Runoff = 0.60 cfs @ 12.02 hrs, Volume= 4,829 cf, Depth= 5.09"
 Routed to Reach 5R : 18" Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr 25-Year Rainfall=6.37"

Area (sf)	CN	Description
7,221	98	Paved parking, HSG C
1,536	70	Woods, Good, HSG C
2,160	74	>75% Grass cover, Good, HSG C
457	89	Gravel roads, HSG C
11,374	89	Weighted Average
4,153	74	36.51% Pervious Area
7,221	98	63.49% Impervious Area

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Type III 24-hr 25-Year Rainfall=6.37"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

Summary for Subcatchment EDA-3: Subcat EDA-3

Runoff = 0.01 cfs @ 12.03 hrs, Volume= 111 cf, Depth= 4.87"
 Routed to Link 2L : King St System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr 25-Year Rainfall=6.37"

Area (sf)	CN	Description
148	98	Paved parking, HSG C
126	74	>75% Grass cover, Good, HSG C
274	87	Weighted Average
126	74	45.88% Pervious Area
148	98	54.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

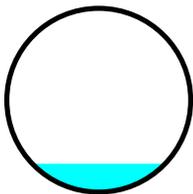
Summary for Reach 5R: 18" Pipe

Inflow Area = 11,374 sf, 63.49% Impervious, Inflow Depth = 5.09" for 25-Year event
 Inflow = 0.60 cfs @ 12.02 hrs, Volume= 4,829 cf
 Outflow = 0.59 cfs @ 12.04 hrs, Volume= 4,838 cf, Atten= 2%, Lag= 0.8 min
 Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Max. Velocity= 3.46 fps, Min. Travel Time= 0.6 min
 Avg. Velocity = 1.43 fps, Avg. Travel Time= 1.6 min

Peak Storage= 23 cf @ 12.05 hrs
 Average Depth at Peak Storage= 0.23' , Surface Width= 1.08'
 Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.68 cfs

18.0" Round Pipe
 n= 0.012 Concrete pipe, finished
 Length= 133.0' Slope= 0.0105 '/'
 Inlet Invert= 330.15', Outlet Invert= 328.75'



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Type III 24-hr 25-Year Rainfall=6.37"

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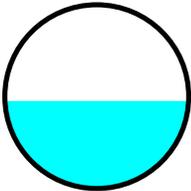
Summary for Reach 6R: 12" Pipe

Inflow Area = 43,123 sf, 18.78% Impervious, Inflow Depth = 4.01" for 25-Year event
Inflow = 1.82 cfs @ 12.05 hrs, Volume= 14,417 cf
Outflow = 1.80 cfs @ 12.06 hrs, Volume= 14,442 cf, Atten= 1%, Lag= 0.4 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 4.91 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.19 fps, Avg. Travel Time= 0.7 min

Peak Storage= 34 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.48' , Surface Width= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.94 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 92.0' Slope= 0.0104 '/
Inlet Invert= 330.10', Outlet Invert= 329.14'



Summary for Link 1L: Spruce Pond

Inflow Area = 54,497 sf, 28.11% Impervious, Inflow Depth = 4.25" for 25-Year event
Inflow = 2.38 cfs @ 12.05 hrs, Volume= 19,280 cf
Primary = 2.38 cfs @ 12.05 hrs, Volume= 19,280 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

Summary for Link 2L: King St System

Inflow Area = 274 sf, 54.12% Impervious, Inflow Depth = 4.87" for 25-Year event
Inflow = 0.01 cfs @ 12.03 hrs, Volume= 111 cf
Primary = 0.01 cfs @ 12.03 hrs, Volume= 111 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

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Type III 24-hr 100-Year Rainfall=8.16"

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Time span=0.00-48.00 hrs, dt=1.00 hrs, 49 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 EDA-1: Subcat EDA-1 Runoff Area=43,123 sf 18.78% Impervious Runoff Depth=5.66"
Flow Length=251' Tc=8.0 min CN=79 Runoff=2.55 cfs 20,329 cf

Subcatchment EDA-2: Subcat EDA-2 Runoff Area=11,374 sf 63.49% Impervious Runoff Depth=6.84"
Tc=6.0 min CN=89 Runoff=0.80 cfs 6,487 cf

Subcatchment EDA-3: Subcat EDA-3 Runoff Area=274 sf 54.12% Impervious Runoff Depth=6.61"
Tc=6.0 min CN=87 Runoff=0.02 cfs 151 cf

Reach 5R: 18" Pipe Avg. Flow Depth=0.26' Max Vel=3.76 fps Inflow=0.80 cfs 6,487 cf
18.0" Round Pipe n=0.012 L=133.0' S=0.0105 '/ Capacity=11.68 cfs Outflow=0.78 cfs 6,499 cf

Reach 6R: 12" Pipe Avg. Flow Depth=0.58' Max Vel=5.33 fps Inflow=2.55 cfs 20,329 cf
12.0" Round Pipe n=0.012 L=92.0' S=0.0104 '/ Capacity=3.94 cfs Outflow=2.53 cfs 20,363 cf

Link 1L: Spruce Pond Inflow=3.31 cfs 26,863 cf
Primary=3.31 cfs 26,863 cf

Link 2L: King St System Inflow=0.02 cfs 151 cf
Primary=0.02 cfs 151 cf

Total Runoff Area = 54,771 sf Runoff Volume = 26,967 cf Average Runoff Depth = 5.91"
71.76% Pervious = 39,302 sf 28.24% Impervious = 15,469 sf

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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment EDA-1: Subcat EDA-1

Runoff = 2.55 cfs @ 12.04 hrs, Volume= 20,329 cf, Depth= 5.66"
 Routed to Reach 6R : 12" Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
8,100	98	Paved parking, HSG C
25,916	70	Woods, Good, HSG C
9,107	89	Gravel roads, HSG C
43,123	79	Weighted Average
35,023	75	81.22% Pervious Area
8,100	98	18.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	12	0.0083	0.65		Sheet Flow, Sheet Flow - Paved Smooth surfaces n= 0.011 P2= 3.36"
6.1	51	0.1157	0.14		Sheet Flow, Sheet Flow - Woods Woods: Light underbrush n= 0.400 P2= 3.36"
0.4	37	0.0459	1.61		Sheet Flow, Sheet Flow - Gravel Smooth surfaces n= 0.011 P2= 3.36"
0.2	45	0.0418	3.29		Shallow Concentrated Flow, Shallow Concentrated - Gravel Unpaved Kv= 16.1 fps
0.8	80	0.0252	1.59		Shallow Concentrated Flow, Shallow Concentrated - Woods Nearly Bare & Untilled Kv= 10.0 fps
0.2	26	0.0151	2.49		Shallow Concentrated Flow, Shallow Concentrated - Paved Paved Kv= 20.3 fps
8.0	251	Total			

Summary for Subcatchment EDA-2: Subcat EDA-2

Runoff = 0.80 cfs @ 12.02 hrs, Volume= 6,487 cf, Depth= 6.84"
 Routed to Reach 5R : 18" Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
7,221	98	Paved parking, HSG C
1,536	70	Woods, Good, HSG C
2,160	74	>75% Grass cover, Good, HSG C
457	89	Gravel roads, HSG C
11,374	89	Weighted Average
4,153	74	36.51% Pervious Area
7,221	98	63.49% Impervious Area

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Type III 24-hr 100-Year Rainfall=8.16"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

Summary for Subcatchment EDA-3: Subcat EDA-3

Runoff = 0.02 cfs @ 12.02 hrs, Volume= 151 cf, Depth= 6.61"
 Routed to Link 2L : King St System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
148	98	Paved parking, HSG C
126	74	>75% Grass cover, Good, HSG C
274	87	Weighted Average
126	74	45.88% Pervious Area
148	98	54.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

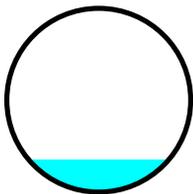
Summary for Reach 5R: 18" Pipe

Inflow Area = 11,374 sf, 63.49% Impervious, Inflow Depth = 6.84" for 100-Year event
 Inflow = 0.80 cfs @ 12.02 hrs, Volume= 6,487 cf
 Outflow = 0.78 cfs @ 12.03 hrs, Volume= 6,499 cf, Atten= 2%, Lag= 0.7 min
 Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Max. Velocity= 3.76 fps, Min. Travel Time= 0.6 min
 Avg. Velocity = 1.53 fps, Avg. Travel Time= 1.4 min

Peak Storage= 28 cf @ 12.04 hrs
 Average Depth at Peak Storage= 0.26' , Surface Width= 1.14'
 Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.68 cfs

18.0" Round Pipe
 n= 0.012 Concrete pipe, finished
 Length= 133.0' Slope= 0.0105 '/'
 Inlet Invert= 330.15', Outlet Invert= 328.75'



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Type III 24-hr 100-Year Rainfall=8.16"

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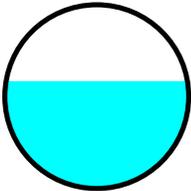
Summary for Reach 6R: 12" Pipe

Inflow Area = 43,123 sf, 18.78% Impervious, Inflow Depth = 5.66" for 100-Year event
Inflow = 2.55 cfs @ 12.04 hrs, Volume= 20,329 cf
Outflow = 2.53 cfs @ 12.05 hrs, Volume= 20,363 cf, Atten= 1%, Lag= 0.4 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 5.33 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.37 fps, Avg. Travel Time= 0.6 min

Peak Storage= 44 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.58' , Surface Width= 0.99'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.94 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 92.0' Slope= 0.0104 '/
Inlet Invert= 330.10', Outlet Invert= 329.14'



Summary for Link 1L: Spruce Pond

Inflow Area = 54,497 sf, 28.11% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 3.31 cfs @ 12.05 hrs, Volume= 26,863 cf
Primary = 3.31 cfs @ 12.05 hrs, Volume= 26,863 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

Summary for Link 2L: King St System

Inflow Area = 274 sf, 54.12% Impervious, Inflow Depth = 6.61" for 100-Year event
Inflow = 0.02 cfs @ 12.02 hrs, Volume= 151 cf
Primary = 0.02 cfs @ 12.02 hrs, Volume= 151 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs



LEGEND

- WATERSHED BOUNDARY
- > TIME OF CONCENTRATION (Tc) PATH

PDA-5
 AREA = 2,975 SQ FT
 WEIGHTED CN = 87
 TC = 6.0 MINS

PDA-1
 AREA = 15,336 SQ FT
 WEIGHTED CN = 95
 TC = 6.0 MINS

PDA-4
 AREA = 20,104 SQ FT
 WEIGHTED CN = 91
 TC = 6.0 MINS

PDA-2
 AREA = 15,905 SQ FT
 WEIGHTED CN = 93
 TC = 6.0 MINS

PDA-6
 AREA = 273 SQ FT
 WEIGHTED CN = 98
 TC = 6.0 MINS

PDA-3
 AREA = 281 SQ FT
 WEIGHTED CN = 87
 TC = 6.0 MINS

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 3102 East Main Road, Portsmouth RI 02871
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PROPERTY RECORD
 380 KING ST, FRANKLIN, MA
 02038
 PLAT: 303, LOT: 42
 ZONE: C11 AREA: 0.919 ACRES
 NF: MARGUERITE MARGARET,
 TR. MARGUERITE FAMILY TRUST
 YEAR BUILT: 2024
 BOOK/PAGE: 8145-260

PROJECT #	DATE	DRAWN	CHECK
24.0168	2/18/25	CB	JM
No	DATE	REVISIONS/DESCRIPTION	BY
1	4-28-25	REVISED WATERSHEDS	EB

DRAWINGS MUST BE PRINTED IN COLOR TO BE VALID.
 THIS NOTE SHOULD BE BLUE. IF THIS NOTE IS NOT
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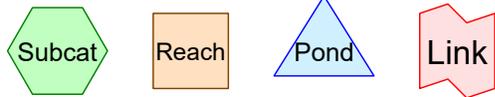
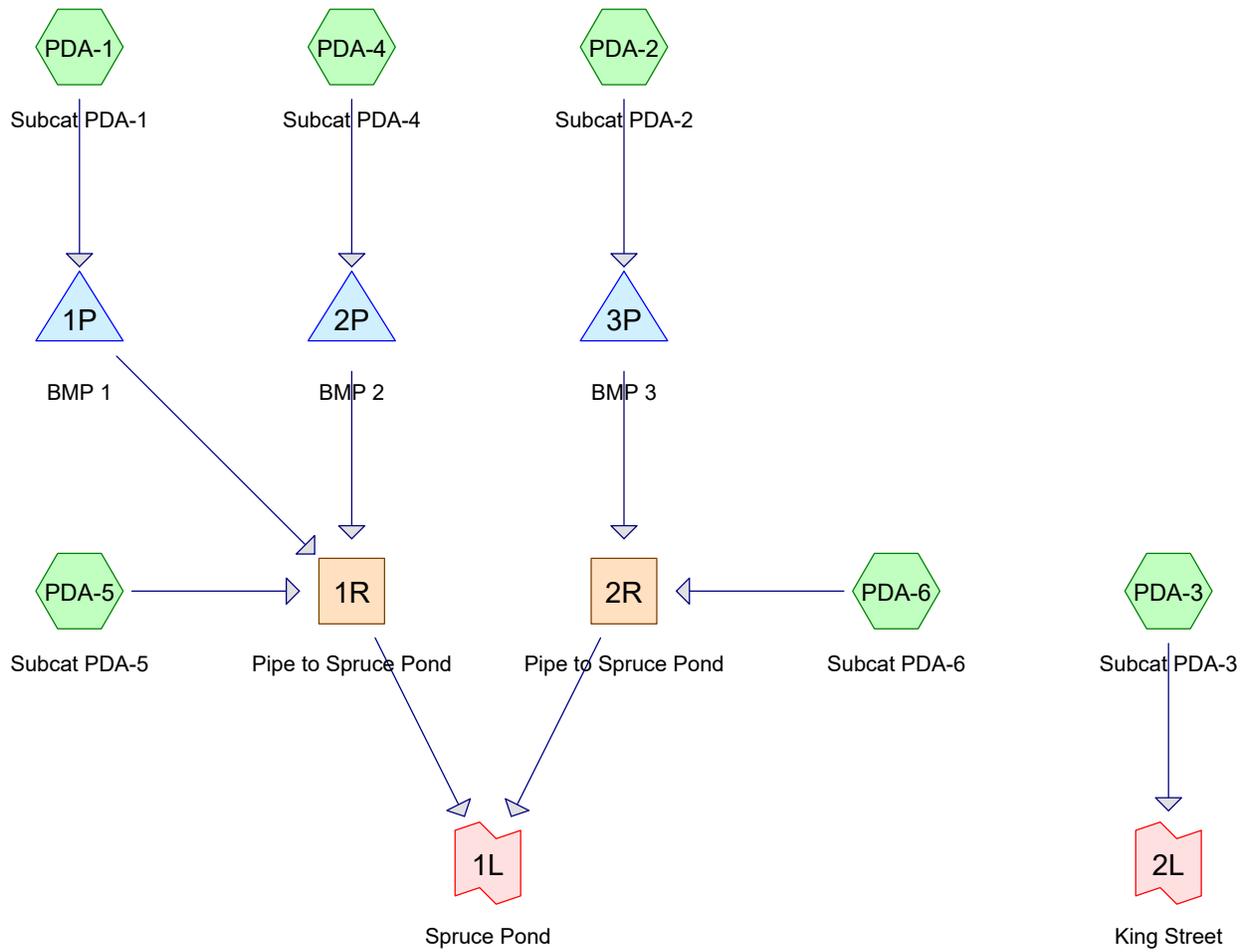
SCALE
 1" = 20'

POST DA

12" IN V = 328.66

POST DA
 Scale: 1" = 20'

N:\PROJECTS\24.0168 - MARGUERITE COMMONWEALTH UNION CROSSING\SITE CIVIL\STORMWATER\HYDROCAD\SSD\24.0168 PROPOSED HYDROCAD.DWG POST DA NEI Standard.ctb 4/29/2025 Eric Buzzi



Routing Diagram for 24.0168 POST HydroCAD
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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	WQv	Type III 24-hr		Default	24.00	1	1.20	2
2	2-Year	Type III 24-hr		Default	24.00	1	3.36	2
3	10-Year	Type III 24-hr		Default	24.00	1	5.22	2
4	25-Year	Type III 24-hr		Default	24.00	1	6.37	2
5	100-Year	Type III 24-hr		Default	24.00	1	8.16	2

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
12,613	74	>75% Grass cover, Good, HSG C (PDA-1, PDA-2, PDA-3, PDA-4, PDA-5)
42,263	98	Paved parking, HSG C (PDA-1, PDA-2, PDA-3, PDA-4, PDA-5, PDA-6)
54,876	92	TOTAL AREA

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Type III 24-hr WQv Rainfall=1.20"

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Time span=0.00-48.00 hrs, dt=1.00 hrs, 49 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 PDA-1: Subcat PDA-1	Runoff Area=15,336 sf 87.48% Impervious Runoff Depth=0.74" Tc=6.0 min CN=95 Runoff=0.12 cfs 945 cf
Subcatchment PDA-2: Subcat PDA-2	Runoff Area=15,905 sf 80.52% Impervious Runoff Depth=0.61" Tc=6.0 min CN=93 Runoff=0.10 cfs 810 cf
Subcatchment PDA-3: Subcat PDA-3	Runoff Area=282 sf 53.71% Impervious Runoff Depth=0.34" Flow Length=127' Tc=6.0 min CN=87 Runoff=0.00 cfs 8 cf
Subcatchment PDA-4: Subcat PDA-4	Runoff Area=20,105 sf 69.42% Impervious Runoff Depth=0.50" Tc=6.0 min CN=91 Runoff=0.10 cfs 845 cf
Subcatchment PDA-5: Subcat PDA-5	Runoff Area=2,975 sf 55.72% Impervious Runoff Depth=0.34" Tc=6.0 min CN=87 Runoff=0.01 cfs 84 cf
Subcatchment PDA-6: Subcat PDA-6	Runoff Area=273 sf 100.00% Impervious Runoff Depth=0.99" Tc=6.0 min CN=98 Runoff=0.00 cfs 22 cf
Reach 1R: Pipe to Spruce Pond	Avg. Flow Depth=0.02' Max Vel=2.04 fps Inflow=0.01 cfs 84 cf 12.0" Round Pipe n=0.010 L=18.0' S=0.0483 '/' Capacity=10.18 cfs Outflow=0.01 cfs 84 cf
Reach 2R: Pipe to Spruce Pond	Avg. Flow Depth=0.02' Max Vel=0.59 fps Inflow=0.00 cfs 22 cf 18.0" Round Pipe n=0.010 L=24.0' S=0.0042 '/' Capacity=8.81 cfs Outflow=0.00 cfs 22 cf
Pond 1P: BMP 1	Peak Elev=330.92' Storage=308 cf Inflow=0.12 cfs 945 cf Discarded=0.04 cfs 948 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 948 cf
Pond 2P: BMP 2	Peak Elev=334.53' Storage=277 cf Inflow=0.10 cfs 845 cf Discarded=0.03 cfs 864 cf Primary=0.00 cfs 0 cf Outflow=0.03 cfs 864 cf
Pond 3P: BMP 3	Peak Elev=334.30' Storage=92 cf Inflow=0.10 cfs 810 cf Discarded=0.07 cfs 810 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 810 cf
Link 1L: Spruce Pond	Inflow=0.01 cfs 107 cf Primary=0.01 cfs 107 cf
Link 2L: King Street	Inflow=0.00 cfs 8 cf Primary=0.00 cfs 8 cf

Total Runoff Area = 54,876 sf Runoff Volume = 2,714 cf Average Runoff Depth = 0.59"
22.98% Pervious = 12,613 sf 77.02% Impervious = 42,263 sf

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Type III 24-hr WQv Rainfall=1.20"

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Summary for Subcatchment PDA-1: Subcat PDA-1

Runoff = 0.12 cfs @ 12.05 hrs, Volume= 945 cf, Depth= 0.74"
Routed to Pond 1P : BMP 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
13,416	98	Paved parking, HSG C
1,920	74	>75% Grass cover, Good, HSG C
15,336	95	Weighted Average
1,920	74	12.52% Pervious Area
13,416	98	87.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-2: Subcat PDA-2

Runoff = 0.10 cfs @ 12.06 hrs, Volume= 810 cf, Depth= 0.61"
Routed to Pond 3P : BMP 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
12,807	98	Paved parking, HSG C
3,098	74	>75% Grass cover, Good, HSG C
15,905	93	Weighted Average
3,098	74	19.48% Pervious Area
12,807	98	80.52% Impervious Area

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

Summary for Subcatchment PDA-3: Subcat PDA-3

Runoff = 0.00 cfs @ 12.12 hrs, Volume= 8 cf, Depth= 0.34"
Routed to Link 2L : King Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr WQv Rainfall=1.20"

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Type III 24-hr WQv Rainfall=1.20"

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Area (sf)	CN	Description
151	98	Paved parking, HSG C
130	74	>75% Grass cover, Good, HSG C
282	87	Weighted Average
130	74	46.29% Pervious Area
151	98	53.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	60	0.0500	0.23		Sheet Flow, Sheet Flow - Grass Grass: Short n= 0.150 P2= 3.36"
0.3	67	0.0400	3.22		Shallow Concentrated Flow, Shallow Concentrated - Grass Unpaved Kv= 16.1 fps
1.3					Direct Entry, MIn 6 Min
6.0	127	Total			

Summary for Subcatchment PDA-4: Subcat PDA-4

Runoff = 0.10 cfs @ 12.08 hrs, Volume= 845 cf, Depth= 0.50"
Routed to Pond 2P : BMP 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
13,957	98	Paved parking, HSG C
6,147	74	>75% Grass cover, Good, HSG C
20,105	91	Weighted Average
6,147	74	30.58% Pervious Area
13,957	98	69.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-5: Subcat PDA-5

Runoff = 0.01 cfs @ 12.12 hrs, Volume= 84 cf, Depth= 0.34"
Routed to Reach 1R : Pipe to Spruce Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
1,658	98	Paved parking, HSG C
1,317	74	>75% Grass cover, Good, HSG C
2,975	87	Weighted Average
1,317	74	44.28% Pervious Area
1,658	98	55.72% Impervious Area

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Type III 24-hr WQv Rainfall=1.20"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

Summary for Subcatchment PDA-6: Subcat PDA-6

Runoff = 0.00 cfs @ 12.02 hrs, Volume= 22 cf, Depth= 0.99"
Routed to Reach 2R : Pipe to Spruce Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
273	98	Paved parking, HSG C
273	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

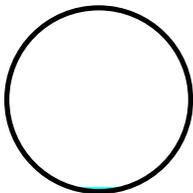
Summary for Reach 1R: Pipe to Spruce Pond

Inflow Area = 38,416 sf, 75.57% Impervious, Inflow Depth = 0.03" for WQv event
Inflow = 0.01 cfs @ 12.12 hrs, Volume= 84 cf
Outflow = 0.01 cfs @ 12.12 hrs, Volume= 84 cf, Atten= 1%, Lag= 0.3 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 2.04 fps, Min. Travel Time= 0.1 min
Avg. Velocity= 1.28 fps, Avg. Travel Time= 0.2 min

Peak Storage= 0 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.02' , Surface Width= 0.30'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.18 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 18.0' Slope= 0.0483 '/'
Inlet Invert= 332.77', Outlet Invert= 331.90'



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Type III 24-hr WQv Rainfall=1.20"

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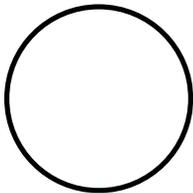
Summary for Reach 2R: Pipe to Spruce Pond

Inflow Area = 16,178 sf, 80.85% Impervious, Inflow Depth = 0.02" for WQv event
Inflow = 0.00 cfs @ 12.02 hrs, Volume= 22 cf
Outflow = 0.00 cfs @ 12.04 hrs, Volume= 22 cf, Atten= 2%, Lag= 0.9 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 0.59 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 0.45 fps, Avg. Travel Time= 0.9 min

Peak Storage= 0 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.02' , Surface Width= 0.34'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.81 cfs

18.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 24.0' Slope= 0.0042 '/
Inlet Invert= 335.20', Outlet Invert= 335.10'



Summary for Pond 1P: BMP 1

Inflow Area = 15,336 sf, 87.48% Impervious, Inflow Depth = 0.74" for WQv event
Inflow = 0.12 cfs @ 12.05 hrs, Volume= 945 cf
Outflow = 0.04 cfs @ 12.00 hrs, Volume= 948 cf, Atten= 68%, Lag= 0.0 min
Discarded = 0.04 cfs @ 12.00 hrs, Volume= 948 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach 1R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Peak Elev= 330.92' @ 13.27 hrs Surf.Area= 1,617 sf Storage= 308 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 62.7 min (877.3 - 814.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	330.40'	608 cf	33.00'W x 49.00'L x 2.50'H Field A 4,043 cf Overall - 2,304 cf Embedded = 1,738 cf x 35.0% Voids
#2A	330.90'	1,544 cf	Shea Leaching Chamber 4x8x1.5 x 48 Inside #1 Inside= 42.0"W x 15.0"H => 4.29 sf x 7.50'L = 32.2 cf Outside= 48.0"W x 18.0"H => 6.00 sf x 8.00'L = 48.0 cf 48 Chambers in 8 Rows
		2,153 cf	Total Available Storage

Storage Group A created with Chamber Wizard

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Device	Routing	Invert	Outlet Devices
#1	Discarded	330.40'	1.020 in/hr Exfiltration over Surface area
#2	Primary	331.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.00 hrs HW=330.67' (Free Discharge)

↳ **1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=330.40' (Free Discharge)

↳ **2=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 2P: BMP 2

Inflow Area = 20,105 sf, 69.42% Impervious, Inflow Depth = 0.50" for WQv event
 Inflow = 0.10 cfs @ 12.08 hrs, Volume= 845 cf
 Outflow = 0.03 cfs @ 12.00 hrs, Volume= 864 cf, Atten= 68%, Lag= 0.0 min
 Discarded = 0.03 cfs @ 12.00 hrs, Volume= 864 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Reach 1R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Peak Elev= 334.53' @ 13.35 hrs Surf.Area= 1,421 sf Storage= 277 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 68.9 min (912.5 - 843.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	334.00'	538 cf	29.00'W x 49.00'L x 2.50'H Field A 3,553 cf Overall - 2,016 cf Embedded = 1,536 cf x 35.0% Voids
#2A	334.50'	1,351 cf	Shea Leaching Chamber 4x8x1.5 x 42 Inside #1 Inside= 42.0"W x 15.0"H => 4.29 sf x 7.50'L = 32.2 cf Outside= 48.0"W x 18.0"H => 6.00 sf x 8.00'L = 48.0 cf 42 Chambers in 7 Rows
		1,889 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	334.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	335.35'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 12.00 hrs HW=334.26' (Free Discharge)

↳ **1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=334.00' (Free Discharge)

↳ **2=Orifice/Grate** (Controls 0.00 cfs)

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Type III 24-hr WQv Rainfall=1.20"

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Summary for Pond 3P: BMP 3

Inflow Area = 15,905 sf, 80.52% Impervious, Inflow Depth = 0.61" for WQv event
 Inflow = 0.10 cfs @ 12.06 hrs, Volume= 810 cf
 Outflow = 0.07 cfs @ 12.50 hrs, Volume= 810 cf, Atten= 32%, Lag= 26.4 min
 Discarded = 0.07 cfs @ 12.50 hrs, Volume= 810 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Reach 2R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Peak Elev= 334.30' @ 12.62 hrs Surf.Area= 2,673 sf Storage= 92 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 14.3 min (844.4 - 830.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	334.20'	1,007 cf	33.00'W x 81.00'L x 2.08'H Field A 5,560 cf Overall - 2,682 cf Embedded = 2,878 cf x 35.0% Voids
#2A	334.70'	1,658 cf	Shea Leaching Chamber 4x8x1 x 80 Inside #1 Inside= 42.0"W x 10.0"H => 2.76 sf x 7.50'L = 20.7 cf Outside= 48.0"W x 13.0"H => 4.19 sf x 8.00'L = 33.5 cf 80 Chambers in 8 Rows
		2,665 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	334.20'	1.020 in/hr Exfiltration over Surface area
#2	Primary	335.00'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 12.50 hrs HW=334.29' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=334.20' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

Summary for Link 1L: Spruce Pond

Inflow Area = 54,594 sf, 77.14% Impervious, Inflow Depth = 0.02" for WQv event
 Inflow = 0.01 cfs @ 12.10 hrs, Volume= 107 cf
 Primary = 0.01 cfs @ 12.10 hrs, Volume= 107 cf, Atten= 0%, Lag= 0.0 min
 Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

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Type III 24-hr WQv Rainfall=1.20"

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Summary for Link 2L: King Street

Inflow Area = 282 sf, 53.71% Impervious, Inflow Depth = 0.34" for WQv event
Inflow = 0.00 cfs @ 12.12 hrs, Volume= 8 cf
Primary = 0.00 cfs @ 12.12 hrs, Volume= 8 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

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Type III 24-hr 2-Year Rainfall=3.36"

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Time span=0.00-48.00 hrs, dt=1.00 hrs, 49 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 PDA-1: Subcat PDA-1 Runoff Area=15,336 sf 87.48% Impervious Runoff Depth=2.80"
 Tc=6.0 min CN=95 Runoff=0.44 cfs 3,581 cf

Subcatchment PDA-2: Subcat PDA-2 Runoff Area=15,905 sf 80.52% Impervious Runoff Depth=2.60"
 Tc=6.0 min CN=93 Runoff=0.43 cfs 3,446 cf

Subcatchment PDA-3: Subcat PDA-3 Runoff Area=282 sf 53.71% Impervious Runoff Depth=2.06"
 Flow Length=127' Tc=6.0 min CN=87 Runoff=0.01 cfs 48 cf

Subcatchment PDA-4: Subcat PDA-4 Runoff Area=20,105 sf 69.42% Impervious Runoff Depth=2.41"
 Tc=6.0 min CN=91 Runoff=0.51 cfs 4,036 cf

Subcatchment PDA-5: Subcat PDA-5 Runoff Area=2,975 sf 55.72% Impervious Runoff Depth=2.06"
 Tc=6.0 min CN=87 Runoff=0.07 cfs 510 cf

Subcatchment PDA-6: Subcat PDA-6 Runoff Area=273 sf 100.00% Impervious Runoff Depth=3.13"
 Tc=6.0 min CN=98 Runoff=0.01 cfs 71 cf

Reach 1R: Pipe to Spruce Pond Avg. Flow Depth=0.12' Max Vel=5.99 fps Inflow=0.34 cfs 2,107 cf
 12.0" Round Pipe n=0.010 L=18.0' S=0.0483 '/' Capacity=10.18 cfs Outflow=0.34 cfs 2,108 cf

Reach 2R: Pipe to Spruce Pond Avg. Flow Depth=0.08' Max Vel=1.31 fps Inflow=0.05 cfs 354 cf
 18.0" Round Pipe n=0.010 L=24.0' S=0.0042 '/' Capacity=8.81 cfs Outflow=0.05 cfs 354 cf

Pond 1P: BMP 1 Peak Elev=332.02' Storage=1,723 cf Inflow=0.44 cfs 3,581 cf
 Discarded=0.04 cfs 3,266 cf Primary=0.04 cfs 337 cf Outflow=0.08 cfs 3,604 cf

Pond 2P: BMP 2 Peak Elev=335.66' Storage=1,549 cf Inflow=0.51 cfs 4,036 cf
 Discarded=0.03 cfs 2,798 cf Primary=0.30 cfs 1,260 cf Outflow=0.33 cfs 4,057 cf

Pond 3P: BMP 3 Peak Elev=335.15' Storage=1,426 cf Inflow=0.43 cfs 3,446 cf
 Discarded=0.06 cfs 3,203 cf Primary=0.04 cfs 283 cf Outflow=0.11 cfs 3,486 cf

Link 1L: Spruce Pond Inflow=0.38 cfs 2,463 cf
 Primary=0.38 cfs 2,463 cf

Link 2L: King Street Inflow=0.01 cfs 48 cf
 Primary=0.01 cfs 48 cf

Total Runoff Area = 54,876 sf Runoff Volume = 11,691 cf Average Runoff Depth = 2.56"
22.98% Pervious = 12,613 sf 77.02% Impervious = 42,263 sf

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Type III 24-hr 2-Year Rainfall=3.36"

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Summary for Subcatchment PDA-1: Subcat PDA-1

Runoff = 0.44 cfs @ 12.02 hrs, Volume= 3,581 cf, Depth= 2.80"
Routed to Pond 1P : BMP 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
13,416	98	Paved parking, HSG C
1,920	74	>75% Grass cover, Good, HSG C
15,336	95	Weighted Average
1,920	74	12.52% Pervious Area
13,416	98	87.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-2: Subcat PDA-2

Runoff = 0.43 cfs @ 12.03 hrs, Volume= 3,446 cf, Depth= 2.60"
Routed to Pond 3P : BMP 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
12,807	98	Paved parking, HSG C
3,098	74	>75% Grass cover, Good, HSG C
15,905	93	Weighted Average
3,098	74	19.48% Pervious Area
12,807	98	80.52% Impervious Area

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

Summary for Subcatchment PDA-3: Subcat PDA-3

Runoff = 0.01 cfs @ 12.05 hrs, Volume= 48 cf, Depth= 2.06"
Routed to Link 2L : King Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 2-Year Rainfall=3.36"

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Type III 24-hr 2-Year Rainfall=3.36"

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Area (sf)	CN	Description
151	98	Paved parking, HSG C
130	74	>75% Grass cover, Good, HSG C
282	87	Weighted Average
130	74	46.29% Pervious Area
151	98	53.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	60	0.0500	0.23		Sheet Flow, Sheet Flow - Grass Grass: Short n= 0.150 P2= 3.36"
0.3	67	0.0400	3.22		Shallow Concentrated Flow, Shallow Concentrated - Grass Unpaved Kv= 16.1 fps
1.3					Direct Entry, MIn 6 Min
6.0	127	Total			

Summary for Subcatchment PDA-4: Subcat PDA-4

Runoff = 0.51 cfs @ 12.03 hrs, Volume= 4,036 cf, Depth= 2.41"
Routed to Pond 2P : BMP 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
13,957	98	Paved parking, HSG C
6,147	74	>75% Grass cover, Good, HSG C
20,105	91	Weighted Average
6,147	74	30.58% Pervious Area
13,957	98	69.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-5: Subcat PDA-5

Runoff = 0.07 cfs @ 12.05 hrs, Volume= 510 cf, Depth= 2.06"
Routed to Reach 1R : Pipe to Spruce Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
1,658	98	Paved parking, HSG C
1,317	74	>75% Grass cover, Good, HSG C
2,975	87	Weighted Average
1,317	74	44.28% Pervious Area
1,658	98	55.72% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

Summary for Subcatchment PDA-6: Subcat PDA-6

Runoff = 0.01 cfs @ 12.01 hrs, Volume= 71 cf, Depth= 3.13"
Routed to Reach 2R : Pipe to Spruce Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
273	98	Paved parking, HSG C
273	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

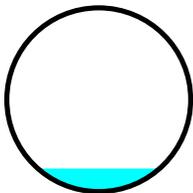
Summary for Reach 1R: Pipe to Spruce Pond

Inflow Area = 38,416 sf, 75.57% Impervious, Inflow Depth = 0.66" for 2-Year event
Inflow = 0.34 cfs @ 13.00 hrs, Volume= 2,107 cf
Outflow = 0.34 cfs @ 13.00 hrs, Volume= 2,108 cf, Atten= 0%, Lag= 0.1 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 5.99 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.18 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 13.00 hrs
Average Depth at Peak Storage= 0.12' , Surface Width= 0.66'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.18 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 18.0' Slope= 0.0483 '/'
Inlet Invert= 332.77', Outlet Invert= 331.90'



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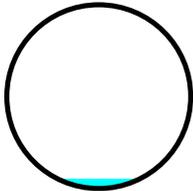
Summary for Reach 2R: Pipe to Spruce Pond

Inflow Area = 16,178 sf, 80.85% Impervious, Inflow Depth = 0.26" for 2-Year event
Inflow = 0.05 cfs @ 13.19 hrs, Volume= 354 cf
Outflow = 0.05 cfs @ 13.20 hrs, Volume= 354 cf, Atten= 1%, Lag= 0.6 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 1.31 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 0.7 min

Peak Storage= 1 cf @ 13.23 hrs
Average Depth at Peak Storage= 0.08' , Surface Width= 0.67'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.81 cfs

18.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 24.0' Slope= 0.0042 '/'
Inlet Invert= 335.20', Outlet Invert= 335.10'



Summary for Pond 1P: BMP 1

Inflow Area = 15,336 sf, 87.48% Impervious, Inflow Depth = 2.80" for 2-Year event
Inflow = 0.44 cfs @ 12.02 hrs, Volume= 3,581 cf
Outflow = 0.08 cfs @ 13.89 hrs, Volume= 3,604 cf, Atten= 81%, Lag= 112.4 min
Discarded = 0.04 cfs @ 10.00 hrs, Volume= 3,266 cf
Primary = 0.04 cfs @ 13.89 hrs, Volume= 337 cf
Routed to Reach 1R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Peak Elev= 332.02' @ 13.88 hrs Surf.Area= 1,617 sf Storage= 1,723 cf

Plug-Flow detention time= 358.0 min calculated for 3,530 cf (99% of inflow)
Center-of-Mass det. time= 364.2 min (1,142.3 - 778.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	330.40'	608 cf	33.00'W x 49.00'L x 2.50'H Field A 4,043 cf Overall - 2,304 cf Embedded = 1,738 cf x 35.0% Voids
#2A	330.90'	1,544 cf	Shea Leaching Chamber 4x8x1.5 x 48 Inside #1 Inside= 42.0"W x 15.0"H => 4.29 sf x 7.50'L = 32.2 cf Outside= 48.0"W x 18.0"H => 6.00 sf x 8.00'L = 48.0 cf 48 Chambers in 8 Rows
		2,153 cf	Total Available Storage

Storage Group A created with Chamber Wizard

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Type III 24-hr 2-Year Rainfall=3.36"

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Device	Routing	Invert	Outlet Devices
#1	Discarded	330.40'	1.020 in/hr Exfiltration over Surface area
#2	Primary	331.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 10.00 hrs HW=330.44' (Free Discharge)

↳ **1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.04 cfs @ 13.89 hrs HW=332.02' (Free Discharge)

↳ **2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 1.18 fps)

Summary for Pond 2P: BMP 2

Inflow Area = 20,105 sf, 69.42% Impervious, Inflow Depth = 2.41" for 2-Year event
 Inflow = 0.51 cfs @ 12.03 hrs, Volume= 4,036 cf
 Outflow = 0.33 cfs @ 13.00 hrs, Volume= 4,057 cf, Atten= 36%, Lag= 58.3 min
 Discarded = 0.03 cfs @ 10.00 hrs, Volume= 2,798 cf
 Primary = 0.30 cfs @ 13.00 hrs, Volume= 1,260 cf
 Routed to Reach 1R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Peak Elev= 335.66' @ 13.13 hrs Surf.Area= 1,421 sf Storage= 1,549 cf

Plug-Flow detention time= 265.8 min calculated for 3,974 cf (98% of inflow)
 Center-of-Mass det. time= 273.1 min (1,072.1 - 799.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	334.00'	538 cf	29.00'W x 49.00'L x 2.50'H Field A 3,553 cf Overall - 2,016 cf Embedded = 1,536 cf x 35.0% Voids
#2A	334.50'	1,351 cf	Shea Leaching Chamber 4x8x1.5 x 42 Inside #1 Inside= 42.0"W x 15.0"H => 4.29 sf x 7.50'L = 32.2 cf Outside= 48.0"W x 18.0"H => 6.00 sf x 8.00'L = 48.0 cf 42 Chambers in 7 Rows
		1,889 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	334.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	335.35'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 10.00 hrs HW=334.04' (Free Discharge)

↳ **1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.29 cfs @ 13.00 hrs HW=335.65' (Free Discharge)

↳ **2=Orifice/Grate** (Orifice Controls 0.29 cfs @ 1.88 fps)

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Summary for Pond 3P: BMP 3

Inflow Area = 15,905 sf, 80.52% Impervious, Inflow Depth = 2.60" for 2-Year event
Inflow = 0.43 cfs @ 12.03 hrs, Volume= 3,446 cf
Outflow = 0.11 cfs @ 13.23 hrs, Volume= 3,486 cf, Atten= 75%, Lag= 72.4 min
Discarded = 0.06 cfs @ 11.00 hrs, Volume= 3,203 cf
Primary = 0.04 cfs @ 13.23 hrs, Volume= 283 cf
Routed to Reach 2R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Peak Elev= 335.15' @ 13.43 hrs Surf.Area= 2,673 sf Storage= 1,426 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 167.0 min (956.5 - 789.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	334.20'	1,007 cf	33.00'W x 81.00'L x 2.08'H Field A 5,560 cf Overall - 2,682 cf Embedded = 2,878 cf x 35.0% Voids
#2A	334.70'	1,658 cf	Shea Leaching Chamber 4x8x1 x 80 Inside #1 Inside= 42.0"W x 10.0"H => 2.76 sf x 7.50'L = 20.7 cf Outside= 48.0"W x 13.0"H => 4.19 sf x 8.00'L = 33.5 cf 80 Chambers in 8 Rows
		2,665 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	334.20'	1.020 in/hr Exfiltration over Surface area
#2	Primary	335.00'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 11.00 hrs HW=334.22' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.04 cfs @ 13.23 hrs HW=335.11' (Free Discharge)
↑**2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 1.15 fps)

Summary for Link 1L: Spruce Pond

Inflow Area = 54,594 sf, 77.14% Impervious, Inflow Depth = 0.54" for 2-Year event
Inflow = 0.38 cfs @ 13.01 hrs, Volume= 2,463 cf
Primary = 0.38 cfs @ 13.01 hrs, Volume= 2,463 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

Summary for Link 2L: King Street

Inflow Area = 282 sf, 53.71% Impervious, Inflow Depth = 2.06" for 2-Year event
Inflow = 0.01 cfs @ 12.05 hrs, Volume= 48 cf
Primary = 0.01 cfs @ 12.05 hrs, Volume= 48 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

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Type III 24-hr 10-Year Rainfall=5.22"

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Time span=0.00-48.00 hrs, dt=1.00 hrs, 49 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 PDA-1: Subcat PDA-1 Runoff Area=15,336 sf 87.48% Impervious Runoff Depth=4.64"
 Tc=6.0 min CN=95 Runoff=0.71 cfs 5,927 cf

Subcatchment PDA-2: Subcat PDA-2 Runoff Area=15,905 sf 80.52% Impervious Runoff Depth=4.41"
 Tc=6.0 min CN=93 Runoff=0.72 cfs 5,850 cf

Subcatchment PDA-3: Subcat PDA-3 Runoff Area=282 sf 53.71% Impervious Runoff Depth=3.77"
 Flow Length=127' Tc=6.0 min CN=87 Runoff=0.01 cfs 89 cf

Subcatchment PDA-4: Subcat PDA-4 Runoff Area=20,105 sf 69.42% Impervious Runoff Depth=4.20"
 Tc=6.0 min CN=91 Runoff=0.87 cfs 7,030 cf

Subcatchment PDA-5: Subcat PDA-5 Runoff Area=2,975 sf 55.72% Impervious Runoff Depth=3.77"
 Tc=6.0 min CN=87 Runoff=0.12 cfs 936 cf

Subcatchment PDA-6: Subcat PDA-6 Runoff Area=273 sf 100.00% Impervious Runoff Depth=4.98"
 Tc=6.0 min CN=98 Runoff=0.01 cfs 113 cf

Reach 1R: Pipe to Spruce Pond Avg. Flow Depth=0.25' Max Vel=8.90 fps Inflow=1.31 cfs 7,082 cf
 12.0" Round Pipe n=0.010 L=18.0' S=0.0483 '/' Capacity=10.18 cfs Outflow=1.31 cfs 7,084 cf

Reach 2R: Pipe to Spruce Pond Avg. Flow Depth=0.21' Max Vel=2.49 fps Inflow=0.38 cfs 2,053 cf
 18.0" Round Pipe n=0.010 L=24.0' S=0.0042 '/' Capacity=8.81 cfs Outflow=0.38 cfs 2,057 cf

Pond 1P: BMP 1 Peak Elev=332.59' Storage=1,979 cf Inflow=0.71 cfs 5,927 cf
 Discarded=0.04 cfs 3,638 cf Primary=0.62 cfs 2,341 cf Outflow=0.66 cfs 5,979 cf

Pond 2P: BMP 2 Peak Elev=335.88' Storage=1,637 cf Inflow=0.87 cfs 7,030 cf
 Discarded=0.03 cfs 3,249 cf Primary=0.66 cfs 3,805 cf Outflow=0.69 cfs 7,054 cf

Pond 3P: BMP 3 Peak Elev=335.41' Storage=1,971 cf Inflow=0.72 cfs 5,850 cf
 Discarded=0.06 cfs 3,966 cf Primary=0.38 cfs 1,940 cf Outflow=0.44 cfs 5,906 cf

Link 1L: Spruce Pond Inflow=1.69 cfs 9,141 cf
 Primary=1.69 cfs 9,141 cf

Link 2L: King Street Inflow=0.01 cfs 89 cf
 Primary=0.01 cfs 89 cf

Total Runoff Area = 54,876 sf Runoff Volume = 19,945 cf Average Runoff Depth = 4.36"
22.98% Pervious = 12,613 sf 77.02% Impervious = 42,263 sf

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Type III 24-hr 10-Year Rainfall=5.22"

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Summary for Subcatchment PDA-1: Subcat PDA-1

Runoff = 0.71 cfs @ 12.02 hrs, Volume= 5,927 cf, Depth= 4.64"
Routed to Pond 1P : BMP 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
13,416	98	Paved parking, HSG C
1,920	74	>75% Grass cover, Good, HSG C
15,336	95	Weighted Average
1,920	74	12.52% Pervious Area
13,416	98	87.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-2: Subcat PDA-2

Runoff = 0.72 cfs @ 12.02 hrs, Volume= 5,850 cf, Depth= 4.41"
Routed to Pond 3P : BMP 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
12,807	98	Paved parking, HSG C
3,098	74	>75% Grass cover, Good, HSG C
15,905	93	Weighted Average
3,098	74	19.48% Pervious Area
12,807	98	80.52% Impervious Area

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

Summary for Subcatchment PDA-3: Subcat PDA-3

Runoff = 0.01 cfs @ 12.03 hrs, Volume= 89 cf, Depth= 3.77"
Routed to Link 2L : King Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 10-Year Rainfall=5.22"

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Type III 24-hr 10-Year Rainfall=5.22"

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Area (sf)	CN	Description
151	98	Paved parking, HSG C
130	74	>75% Grass cover, Good, HSG C
282	87	Weighted Average
130	74	46.29% Pervious Area
151	98	53.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	60	0.0500	0.23		Sheet Flow, Sheet Flow - Grass Grass: Short n= 0.150 P2= 3.36"
0.3	67	0.0400	3.22		Shallow Concentrated Flow, Shallow Concentrated - Grass Unpaved Kv= 16.1 fps
1.3					Direct Entry, MIn 6 Min
6.0	127	Total			

Summary for Subcatchment PDA-4: Subcat PDA-4

Runoff = 0.87 cfs @ 12.02 hrs, Volume= 7,030 cf, Depth= 4.20"
Routed to Pond 2P : BMP 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
13,957	98	Paved parking, HSG C
6,147	74	>75% Grass cover, Good, HSG C
20,105	91	Weighted Average
6,147	74	30.58% Pervious Area
13,957	98	69.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-5: Subcat PDA-5

Runoff = 0.12 cfs @ 12.03 hrs, Volume= 936 cf, Depth= 3.77"
Routed to Reach 1R : Pipe to Spruce Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
1,658	98	Paved parking, HSG C
1,317	74	>75% Grass cover, Good, HSG C
2,975	87	Weighted Average
1,317	74	44.28% Pervious Area
1,658	98	55.72% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

Summary for Subcatchment PDA-6: Subcat PDA-6

Runoff = 0.01 cfs @ 12.01 hrs, Volume= 113 cf, Depth= 4.98"
Routed to Reach 2R : Pipe to Spruce Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
273	98	Paved parking, HSG C
273	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

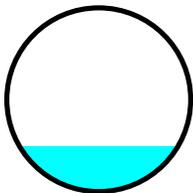
Summary for Reach 1R: Pipe to Spruce Pond

Inflow Area = 38,416 sf, 75.57% Impervious, Inflow Depth = 2.21" for 10-Year event
Inflow = 1.31 cfs @ 12.89 hrs, Volume= 7,082 cf
Outflow = 1.31 cfs @ 12.89 hrs, Volume= 7,084 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 8.90 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.58 fps, Avg. Travel Time= 0.1 min

Peak Storage= 3 cf @ 12.85 hrs
Average Depth at Peak Storage= 0.25' , Surface Width= 0.86'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.18 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 18.0' Slope= 0.0483 '/'
Inlet Invert= 332.77', Outlet Invert= 331.90'



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Type III 24-hr 10-Year Rainfall=5.22"

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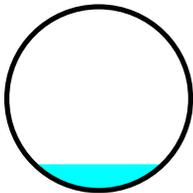
Summary for Reach 2R: Pipe to Spruce Pond

Inflow Area = 16,178 sf, 80.85% Impervious, Inflow Depth = 1.52" for 10-Year event
Inflow = 0.38 cfs @ 13.01 hrs, Volume= 2,053 cf
Outflow = 0.38 cfs @ 13.01 hrs, Volume= 2,057 cf, Atten= 0%, Lag= 0.2 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 2.49 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 0.6 min

Peak Storage= 4 cf @ 13.01 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 1.05'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.81 cfs

18.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 24.0' Slope= 0.0042 '/'
Inlet Invert= 335.20', Outlet Invert= 335.10'



Summary for Pond 1P: BMP 1

Inflow Area = 15,336 sf, 87.48% Impervious, Inflow Depth = 4.64" for 10-Year event
Inflow = 0.71 cfs @ 12.02 hrs, Volume= 5,927 cf
Outflow = 0.66 cfs @ 12.99 hrs, Volume= 5,979 cf, Atten= 8%, Lag= 58.2 min
Discarded = 0.04 cfs @ 9.00 hrs, Volume= 3,638 cf
Primary = 0.62 cfs @ 12.99 hrs, Volume= 2,341 cf
Routed to Reach 1R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Peak Elev= 332.59' @ 12.87 hrs Surf.Area= 1,617 sf Storage= 1,979 cf

Plug-Flow detention time= 226.7 min calculated for 5,857 cf (99% of inflow)
Center-of-Mass det. time= 238.2 min (1,004.0 - 765.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	330.40'	608 cf	33.00'W x 49.00'L x 2.50'H Field A 4,043 cf Overall - 2,304 cf Embedded = 1,738 cf x 35.0% Voids
#2A	330.90'	1,544 cf	Shea Leaching Chamber 4x8x1.5 x 48 Inside #1 Inside= 42.0"W x 15.0"H => 4.29 sf x 7.50'L = 32.2 cf Outside= 48.0"W x 18.0"H => 6.00 sf x 8.00'L = 48.0 cf 48 Chambers in 8 Rows
		2,153 cf	Total Available Storage

Storage Group A created with Chamber Wizard

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Device	Routing	Invert	Outlet Devices
#1	Discarded	330.40'	1.020 in/hr Exfiltration over Surface area
#2	Primary	331.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 9.00 hrs HW=330.48' (Free Discharge)
 ↳ **1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.61 cfs @ 12.99 hrs HW=332.57' (Free Discharge)
 ↳ **2=Orifice/Grate** (Orifice Controls 0.61 cfs @ 3.13 fps)

Summary for Pond 2P: BMP 2

Inflow Area = 20,105 sf, 69.42% Impervious, Inflow Depth = 4.20" for 10-Year event
 Inflow = 0.87 cfs @ 12.02 hrs, Volume= 7,030 cf
 Outflow = 0.69 cfs @ 12.83 hrs, Volume= 7,054 cf, Atten= 21%, Lag= 48.2 min
 Discarded = 0.03 cfs @ 9.00 hrs, Volume= 3,249 cf
 Primary = 0.66 cfs @ 12.83 hrs, Volume= 3,805 cf
 Routed to Reach 1R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Peak Elev= 335.88' @ 12.68 hrs Surf.Area= 1,421 sf Storage= 1,637 cf

Plug-Flow detention time= 179.3 min calculated for 6,910 cf (98% of inflow)
 Center-of-Mass det. time= 189.4 min (973.4 - 784.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	334.00'	538 cf	29.00'W x 49.00'L x 2.50'H Field A 3,553 cf Overall - 2,016 cf Embedded = 1,536 cf x 35.0% Voids
#2A	334.50'	1,351 cf	Shea Leaching Chamber 4x8x1.5 x 42 Inside #1 Inside= 42.0"W x 15.0"H => 4.29 sf x 7.50'L = 32.2 cf Outside= 48.0"W x 18.0"H => 6.00 sf x 8.00'L = 48.0 cf 42 Chambers in 7 Rows
		1,889 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	334.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	335.35'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 9.00 hrs HW=334.09' (Free Discharge)
 ↳ **1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.59 cfs @ 12.83 hrs HW=335.81' (Free Discharge)
 ↳ **2=Orifice/Grate** (Orifice Controls 0.59 cfs @ 2.31 fps)

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Summary for Pond 3P: BMP 3

Inflow Area = 15,905 sf, 80.52% Impervious, Inflow Depth = 4.41" for 10-Year event
 Inflow = 0.72 cfs @ 12.02 hrs, Volume= 5,850 cf
 Outflow = 0.44 cfs @ 13.02 hrs, Volume= 5,906 cf, Atten= 38%, Lag= 59.7 min
 Discarded = 0.06 cfs @ 10.00 hrs, Volume= 3,966 cf
 Primary = 0.38 cfs @ 13.02 hrs, Volume= 1,940 cf
 Routed to Reach 2R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Peak Elev= 335.41' @ 13.02 hrs Surf.Area= 2,673 sf Storage= 1,971 cf

Plug-Flow detention time= 136.1 min calculated for 5,785 cf (99% of inflow)
 Center-of-Mass det. time= 141.1 min (916.7 - 775.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	334.20'	1,007 cf	33.00'W x 81.00'L x 2.08'H Field A 5,560 cf Overall - 2,682 cf Embedded = 2,878 cf x 35.0% Voids
#2A	334.70'	1,658 cf	Shea Leaching Chamber 4x8x1 x 80 Inside #1 Inside= 42.0"W x 10.0"H => 2.76 sf x 7.50'L = 20.7 cf Outside= 48.0"W x 13.0"H => 4.19 sf x 8.00'L = 33.5 cf 80 Chambers in 8 Rows
		2,665 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	334.20'	1.020 in/hr Exfiltration over Surface area
#2	Primary	335.00'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 10.00 hrs HW=334.24' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.38 cfs @ 13.02 hrs HW=335.41' (Free Discharge)
 ↑**2=Orifice/Grate** (Orifice Controls 0.38 cfs @ 2.18 fps)

Summary for Link 1L: Spruce Pond

Inflow Area = 54,594 sf, 77.14% Impervious, Inflow Depth = 2.01" for 10-Year event
 Inflow = 1.69 cfs @ 12.92 hrs, Volume= 9,141 cf
 Primary = 1.69 cfs @ 12.92 hrs, Volume= 9,141 cf, Atten= 0%, Lag= 0.0 min
 Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

Summary for Link 2L: King Street

Inflow Area = 282 sf, 53.71% Impervious, Inflow Depth = 3.77" for 10-Year event
Inflow = 0.01 cfs @ 12.03 hrs, Volume= 89 cf
Primary = 0.01 cfs @ 12.03 hrs, Volume= 89 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

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Type III 24-hr 25-Year Rainfall=6.37"

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Time span=0.00-48.00 hrs, dt=1.00 hrs, 49 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 PDA-1: Subcat PDA-1 Runoff Area=15,336 sf 87.48% Impervious Runoff Depth=5.78"
 Tc=6.0 min CN=95 Runoff=0.88 cfs 7,386 cf

Subcatchment PDA-2: Subcat PDA-2 Runoff Area=15,905 sf 80.52% Impervious Runoff Depth=5.55"
 Tc=6.0 min CN=93 Runoff=0.89 cfs 7,353 cf

Subcatchment PDA-3: Subcat PDA-3 Runoff Area=282 sf 53.71% Impervious Runoff Depth=4.87"
 Flow Length=127' Tc=6.0 min CN=87 Runoff=0.01 cfs 114 cf

Subcatchment PDA-4: Subcat PDA-4 Runoff Area=20,105 sf 69.42% Impervious Runoff Depth=5.32"
 Tc=6.0 min CN=91 Runoff=1.10 cfs 8,913 cf

Subcatchment PDA-5: Subcat PDA-5 Runoff Area=2,975 sf 55.72% Impervious Runoff Depth=4.87"
 Tc=6.0 min CN=87 Runoff=0.15 cfs 1,208 cf

Subcatchment PDA-6: Subcat PDA-6 Runoff Area=273 sf 100.00% Impervious Runoff Depth=6.13"
 Tc=6.0 min CN=98 Runoff=0.02 cfs 139 cf

Reach 1R: Pipe to Spruce Pond Avg. Flow Depth=0.26' Max Vel=8.87 fps Inflow=1.39 cfs 10,127 cf
 12.0" Round Pipe n=0.010 L=18.0' S=0.0483 '/ Capacity=10.18 cfs Outflow=1.39 cfs 10,128 cf

Reach 2R: Pipe to Spruce Pond Avg. Flow Depth=0.25' Max Vel=2.71 fps Inflow=0.51 cfs 3,210 cf
 18.0" Round Pipe n=0.010 L=24.0' S=0.0042 '/ Capacity=8.81 cfs Outflow=0.51 cfs 3,212 cf

Pond 1P: BMP 1 Peak Elev=332.68' Storage=2,027 cf Inflow=0.88 cfs 7,386 cf
 Discarded=0.04 cfs 4,027 cf Primary=0.68 cfs 3,410 cf Outflow=0.71 cfs 7,437 cf

Pond 2P: BMP 2 Peak Elev=335.96' Storage=1,639 cf Inflow=1.10 cfs 8,913 cf
 Discarded=0.03 cfs 3,439 cf Primary=0.76 cfs 5,509 cf Outflow=0.80 cfs 8,947 cf

Pond 3P: BMP 3 Peak Elev=335.54' Storage=2,182 cf Inflow=0.89 cfs 7,353 cf
 Discarded=0.06 cfs 4,313 cf Primary=0.51 cfs 3,070 cf Outflow=0.57 cfs 7,383 cf

Link 1L: Spruce Pond Inflow=1.87 cfs 13,340 cf
 Primary=1.87 cfs 13,340 cf

Link 2L: King Street Inflow=0.01 cfs 114 cf
 Primary=0.01 cfs 114 cf

Total Runoff Area = 54,876 sf Runoff Volume = 25,114 cf Average Runoff Depth = 5.49"
22.98% Pervious = 12,613 sf 77.02% Impervious = 42,263 sf

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Type III 24-hr 25-Year Rainfall=6.37"

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Summary for Subcatchment PDA-1: Subcat PDA-1

Runoff = 0.88 cfs @ 12.02 hrs, Volume= 7,386 cf, Depth= 5.78"
Routed to Pond 1P : BMP 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 25-Year Rainfall=6.37"

Area (sf)	CN	Description
13,416	98	Paved parking, HSG C
1,920	74	>75% Grass cover, Good, HSG C
15,336	95	Weighted Average
1,920	74	12.52% Pervious Area
13,416	98	87.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-2: Subcat PDA-2

Runoff = 0.89 cfs @ 12.02 hrs, Volume= 7,353 cf, Depth= 5.55"
Routed to Pond 3P : BMP 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 25-Year Rainfall=6.37"

Area (sf)	CN	Description
12,807	98	Paved parking, HSG C
3,098	74	>75% Grass cover, Good, HSG C
15,905	93	Weighted Average
3,098	74	19.48% Pervious Area
12,807	98	80.52% Impervious Area

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

Summary for Subcatchment PDA-3: Subcat PDA-3

Runoff = 0.01 cfs @ 12.03 hrs, Volume= 114 cf, Depth= 4.87"
Routed to Link 2L : King Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 25-Year Rainfall=6.37"

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Type III 24-hr 25-Year Rainfall=6.37"

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Area (sf)	CN	Description
151	98	Paved parking, HSG C
130	74	>75% Grass cover, Good, HSG C
282	87	Weighted Average
130	74	46.29% Pervious Area
151	98	53.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	60	0.0500	0.23		Sheet Flow, Sheet Flow - Grass Grass: Short n= 0.150 P2= 3.36"
0.3	67	0.0400	3.22		Shallow Concentrated Flow, Shallow Concentrated - Grass Unpaved Kv= 16.1 fps
1.3					Direct Entry, MIn 6 Min
6.0	127	Total			

Summary for Subcatchment PDA-4: Subcat PDA-4

Runoff = 1.10 cfs @ 12.02 hrs, Volume= 8,913 cf, Depth= 5.32"
Routed to Pond 2P : BMP 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 25-Year Rainfall=6.37"

Area (sf)	CN	Description
13,957	98	Paved parking, HSG C
6,147	74	>75% Grass cover, Good, HSG C
20,105	91	Weighted Average
6,147	74	30.58% Pervious Area
13,957	98	69.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-5: Subcat PDA-5

Runoff = 0.15 cfs @ 12.03 hrs, Volume= 1,208 cf, Depth= 4.87"
Routed to Reach 1R : Pipe to Spruce Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 25-Year Rainfall=6.37"

Area (sf)	CN	Description
1,658	98	Paved parking, HSG C
1,317	74	>75% Grass cover, Good, HSG C
2,975	87	Weighted Average
1,317	74	44.28% Pervious Area
1,658	98	55.72% Impervious Area

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Type III 24-hr 25-Year Rainfall=6.37"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

Summary for Subcatchment PDA-6: Subcat PDA-6

Runoff = 0.02 cfs @ 12.01 hrs, Volume= 139 cf, Depth= 6.13"
Routed to Reach 2R : Pipe to Spruce Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 25-Year Rainfall=6.37"

Area (sf)	CN	Description
273	98	Paved parking, HSG C
273	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

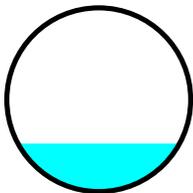
Summary for Reach 1R: Pipe to Spruce Pond

Inflow Area = 38,416 sf, 75.57% Impervious, Inflow Depth = 3.16" for 25-Year event
Inflow = 1.39 cfs @ 12.61 hrs, Volume= 10,127 cf
Outflow = 1.39 cfs @ 12.61 hrs, Volume= 10,128 cf, Atten= 0%, Lag= 0.1 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 8.87 fps, Min. Travel Time= 0.0 min
Avg. Velocity= 2.94 fps, Avg. Travel Time= 0.1 min

Peak Storage= 3 cf @ 12.59 hrs
Average Depth at Peak Storage= 0.26' , Surface Width= 0.88'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.18 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 18.0' Slope= 0.0483 '/'
Inlet Invert= 332.77', Outlet Invert= 331.90'



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Type III 24-hr 25-Year Rainfall=6.37"

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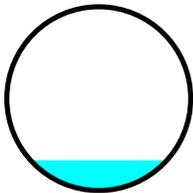
Summary for Reach 2R: Pipe to Spruce Pond

Inflow Area = 16,178 sf, 80.85% Impervious, Inflow Depth = 2.38" for 25-Year event
Inflow = 0.51 cfs @ 12.93 hrs, Volume= 3,210 cf
Outflow = 0.51 cfs @ 12.93 hrs, Volume= 3,212 cf, Atten= 0%, Lag= 0.2 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 2.71 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 0.5 min

Peak Storage= 5 cf @ 12.92 hrs
Average Depth at Peak Storage= 0.25' , Surface Width= 1.11'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.81 cfs

18.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 24.0' Slope= 0.0042 '/
Inlet Invert= 335.20', Outlet Invert= 335.10'



Summary for Pond 1P: BMP 1

Inflow Area = 15,336 sf, 87.48% Impervious, Inflow Depth = 5.78" for 25-Year event
Inflow = 0.88 cfs @ 12.02 hrs, Volume= 7,386 cf
Outflow = 0.71 cfs @ 12.88 hrs, Volume= 7,437 cf, Atten= 19%, Lag= 51.9 min
Discarded = 0.04 cfs @ 8.00 hrs, Volume= 4,027 cf
Primary = 0.68 cfs @ 12.88 hrs, Volume= 3,410 cf
Routed to Reach 1R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Peak Elev= 332.68' @ 12.80 hrs Surf.Area= 1,617 sf Storage= 2,027 cf

Plug-Flow detention time= 220.5 min calculated for 7,285 cf (99% of inflow)
Center-of-Mass det. time= 233.3 min (994.2 - 760.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	330.40'	608 cf	33.00'W x 49.00'L x 2.50'H Field A 4,043 cf Overall - 2,304 cf Embedded = 1,738 cf x 35.0% Voids
#2A	330.90'	1,544 cf	Shea Leaching Chamber 4x8x1.5 x 48 Inside #1 Inside= 42.0"W x 15.0"H => 4.29 sf x 7.50'L = 32.2 cf Outside= 48.0"W x 18.0"H => 6.00 sf x 8.00'L = 48.0 cf 48 Chambers in 8 Rows
		2,153 cf	Total Available Storage

Storage Group A created with Chamber Wizard

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Type III 24-hr 25-Year Rainfall=6.37"

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Device	Routing	Invert	Outlet Devices
#1	Discarded	330.40'	1.020 in/hr Exfiltration over Surface area
#2	Primary	331.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 8.00 hrs HW=330.45' (Free Discharge)
 ↳ **1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.63 cfs @ 12.88 hrs HW=332.60' (Free Discharge)
 ↳ **2=Orifice/Grate** (Orifice Controls 0.63 cfs @ 3.22 fps)

Summary for Pond 2P: BMP 2

Inflow Area = 20,105 sf, 69.42% Impervious, Inflow Depth = 5.32" for 25-Year event
 Inflow = 1.10 cfs @ 12.02 hrs, Volume= 8,913 cf
 Outflow = 0.80 cfs @ 12.34 hrs, Volume= 8,947 cf, Atten= 27%, Lag= 19.0 min
 Discarded = 0.03 cfs @ 8.00 hrs, Volume= 3,439 cf
 Primary = 0.76 cfs @ 12.34 hrs, Volume= 5,509 cf
 Routed to Reach 1R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Peak Elev= 335.96' @ 12.43 hrs Surf.Area= 1,421 sf Storage= 1,639 cf

Plug-Flow detention time= 153.4 min calculated for 8,765 cf (98% of inflow)
 Center-of-Mass det. time= 165.1 min (942.9 - 777.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	334.00'	538 cf	29.00'W x 49.00'L x 2.50'H Field A 3,553 cf Overall - 2,016 cf Embedded = 1,536 cf x 35.0% Voids
#2A	334.50'	1,351 cf	Shea Leaching Chamber 4x8x1.5 x 42 Inside #1 Inside= 42.0"W x 15.0"H => 4.29 sf x 7.50'L = 32.2 cf Outside= 48.0"W x 18.0"H => 6.00 sf x 8.00'L = 48.0 cf 42 Chambers in 7 Rows
		1,889 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	334.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	335.35'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 8.00 hrs HW=334.06' (Free Discharge)
 ↳ **1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.67 cfs @ 12.34 hrs HW=335.85' (Free Discharge)
 ↳ **2=Orifice/Grate** (Orifice Controls 0.67 cfs @ 2.40 fps)

Summary for Pond 3P: BMP 3

Inflow Area = 15,905 sf, 80.52% Impervious, Inflow Depth = 5.55" for 25-Year event
 Inflow = 0.89 cfs @ 12.02 hrs, Volume= 7,353 cf
 Outflow = 0.57 cfs @ 12.94 hrs, Volume= 7,383 cf, Atten= 36%, Lag= 55.4 min
 Discarded = 0.06 cfs @ 10.00 hrs, Volume= 4,313 cf
 Primary = 0.51 cfs @ 12.94 hrs, Volume= 3,070 cf
 Routed to Reach 2R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Peak Elev= 335.54' @ 12.94 hrs Surf.Area= 2,673 sf Storage= 2,182 cf

Plug-Flow detention time= 124.2 min calculated for 7,232 cf (98% of inflow)
 Center-of-Mass det. time= 127.1 min (897.1 - 770.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	334.20'	1,007 cf	33.00'W x 81.00'L x 2.08'H Field A 5,560 cf Overall - 2,682 cf Embedded = 2,878 cf x 35.0% Voids
#2A	334.70'	1,658 cf	Shea Leaching Chamber 4x8x1 x 80 Inside #1 Inside= 42.0"W x 10.0"H => 2.76 sf x 7.50'L = 20.7 cf Outside= 48.0"W x 13.0"H => 4.19 sf x 8.00'L = 33.5 cf 80 Chambers in 8 Rows
		2,665 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	334.20'	1.020 in/hr Exfiltration over Surface area
#2	Primary	335.00'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 10.00 hrs HW=334.29' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.49 cfs @ 12.94 hrs HW=335.52' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.49 cfs @ 2.50 fps)

Summary for Link 1L: Spruce Pond

Inflow Area = 54,594 sf, 77.14% Impervious, Inflow Depth = 2.93" for 25-Year event
 Inflow = 1.87 cfs @ 12.72 hrs, Volume= 13,340 cf
 Primary = 1.87 cfs @ 12.72 hrs, Volume= 13,340 cf, Atten= 0%, Lag= 0.0 min
 Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

Summary for Link 2L: King Street

Inflow Area = 282 sf, 53.71% Impervious, Inflow Depth = 4.87" for 25-Year event
Inflow = 0.01 cfs @ 12.03 hrs, Volume= 114 cf
Primary = 0.01 cfs @ 12.03 hrs, Volume= 114 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

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Time span=0.00-48.00 hrs, dt=1.00 hrs, 49 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 PDA-1: Subcat PDA-1	Runoff Area=15,336 sf 87.48% Impervious Runoff Depth=7.56" Tc=6.0 min CN=95 Runoff=1.14 cfs 9,663 cf
Subcatchment PDA-2: Subcat PDA-2	Runoff Area=15,905 sf 80.52% Impervious Runoff Depth=7.32" Tc=6.0 min CN=93 Runoff=1.16 cfs 9,704 cf
Subcatchment PDA-3: Subcat PDA-3	Runoff Area=282 sf 53.71% Impervious Runoff Depth=6.61" Flow Length=127' Tc=6.0 min CN=87 Runoff=0.02 cfs 155 cf
Subcatchment PDA-4: Subcat PDA-4	Runoff Area=20,105 sf 69.42% Impervious Runoff Depth=7.08" Tc=6.0 min CN=91 Runoff=1.44 cfs 11,866 cf
Subcatchment PDA-5: Subcat PDA-5	Runoff Area=2,975 sf 55.72% Impervious Runoff Depth=6.61" Tc=6.0 min CN=87 Runoff=0.20 cfs 1,638 cf
Subcatchment PDA-6: Subcat PDA-6	Runoff Area=273 sf 100.00% Impervious Runoff Depth=7.92" Tc=6.0 min CN=98 Runoff=0.02 cfs 180 cf
Reach 1R: Pipe to Spruce Pond	Avg. Flow Depth=0.33' Max Vel=10.36 fps Inflow=2.26 cfs 15,321 cf 12.0" Round Pipe n=0.010 L=18.0' S=0.0483 '/ Capacity=10.18 cfs Outflow=2.26 cfs 15,324 cf
Reach 2R: Pipe to Spruce Pond	Avg. Flow Depth=0.31' Max Vel=3.04 fps Inflow=0.77 cfs 5,139 cf 18.0" Round Pipe n=0.010 L=24.0' S=0.0042 '/ Capacity=8.81 cfs Outflow=0.77 cfs 5,141 cf
Pond 1P: BMP 1	Peak Elev=332.82' Storage=2,106 cf Inflow=1.14 cfs 9,663 cf Discarded=0.04 cfs 4,303 cf Primary=0.76 cfs 5,407 cf Outflow=0.80 cfs 9,710 cf
Pond 2P: BMP 2	Peak Elev=336.31' Storage=1,795 cf Inflow=1.44 cfs 11,866 cf Discarded=0.03 cfs 3,602 cf Primary=1.33 cfs 8,277 cf Outflow=1.37 cfs 11,879 cf
Pond 3P: BMP 3	Peak Elev=335.88' Storage=2,292 cf Inflow=1.16 cfs 9,704 cf Discarded=0.06 cfs 4,783 cf Primary=0.76 cfs 4,959 cf Outflow=0.83 cfs 9,742 cf
Link 1L: Spruce Pond	Inflow=2.80 cfs 20,465 cf Primary=2.80 cfs 20,465 cf
Link 2L: King Street	Inflow=0.02 cfs 155 cf Primary=0.02 cfs 155 cf

Total Runoff Area = 54,876 sf Runoff Volume = 33,205 cf Average Runoff Depth = 7.26"
22.98% Pervious = 12,613 sf 77.02% Impervious = 42,263 sf

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Summary for Subcatchment PDA-1: Subcat PDA-1

Runoff = 1.14 cfs @ 12.01 hrs, Volume= 9,663 cf, Depth= 7.56"
Routed to Pond 1P : BMP 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
13,416	98	Paved parking, HSG C
1,920	74	>75% Grass cover, Good, HSG C
15,336	95	Weighted Average
1,920	74	12.52% Pervious Area
13,416	98	87.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-2: Subcat PDA-2

Runoff = 1.16 cfs @ 12.02 hrs, Volume= 9,704 cf, Depth= 7.32"
Routed to Pond 3P : BMP 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
12,807	98	Paved parking, HSG C
3,098	74	>75% Grass cover, Good, HSG C
15,905	93	Weighted Average
3,098	74	19.48% Pervious Area
12,807	98	80.52% Impervious Area

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

Summary for Subcatchment PDA-3: Subcat PDA-3

Runoff = 0.02 cfs @ 12.02 hrs, Volume= 155 cf, Depth= 6.61"
Routed to Link 2L : King Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 100-Year Rainfall=8.16"

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Area (sf)	CN	Description
151	98	Paved parking, HSG C
130	74	>75% Grass cover, Good, HSG C
282	87	Weighted Average
130	74	46.29% Pervious Area
151	98	53.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	60	0.0500	0.23		Sheet Flow, Sheet Flow - Grass Grass: Short n= 0.150 P2= 3.36"
0.3	67	0.0400	3.22		Shallow Concentrated Flow, Shallow Concentrated - Grass Unpaved Kv= 16.1 fps
1.3					Direct Entry, MIn 6 Min
6.0	127	Total			

Summary for Subcatchment PDA-4: Subcat PDA-4

Runoff = 1.44 cfs @ 12.02 hrs, Volume= 11,866 cf, Depth= 7.08"
Routed to Pond 2P : BMP 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
13,957	98	Paved parking, HSG C
6,147	74	>75% Grass cover, Good, HSG C
20,105	91	Weighted Average
6,147	74	30.58% Pervious Area
13,957	98	69.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-5: Subcat PDA-5

Runoff = 0.20 cfs @ 12.02 hrs, Volume= 1,638 cf, Depth= 6.61"
Routed to Reach 1R : Pipe to Spruce Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
1,658	98	Paved parking, HSG C
1,317	74	>75% Grass cover, Good, HSG C
2,975	87	Weighted Average
1,317	74	44.28% Pervious Area
1,658	98	55.72% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

Summary for Subcatchment PDA-6: Subcat PDA-6

Runoff = 0.02 cfs @ 12.01 hrs, Volume= 180 cf, Depth= 7.92"
Routed to Reach 2R : Pipe to Spruce Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
273	98	Paved parking, HSG C
273	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 Mins)

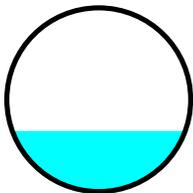
Summary for Reach 1R: Pipe to Spruce Pond

Inflow Area = 38,416 sf, 75.57% Impervious, Inflow Depth = 4.79" for 100-Year event
Inflow = 2.26 cfs @ 12.18 hrs, Volume= 15,321 cf
Outflow = 2.26 cfs @ 12.18 hrs, Volume= 15,324 cf, Atten= 0%, Lag= 0.1 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 10.36 fps, Min. Travel Time= 0.0 min
Avg. Velocity= 3.28 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.33' , Surface Width= 0.94'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.18 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 18.0' Slope= 0.0483 '/'
Inlet Invert= 332.77', Outlet Invert= 331.90'



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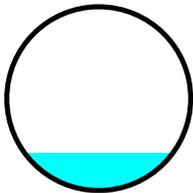
Summary for Reach 2R: Pipe to Spruce Pond

Inflow Area = 16,178 sf, 80.85% Impervious, Inflow Depth = 3.81" for 100-Year event
Inflow = 0.77 cfs @ 12.79 hrs, Volume= 5,139 cf
Outflow = 0.77 cfs @ 12.80 hrs, Volume= 5,141 cf, Atten= 0%, Lag= 0.2 min
Routed to Link 1L : Spruce Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Max. Velocity= 3.04 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 0.5 min

Peak Storage= 6 cf @ 12.76 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 1.21'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.81 cfs

18.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 24.0' Slope= 0.0042 '/
Inlet Invert= 335.20', Outlet Invert= 335.10'



Summary for Pond 1P: BMP 1

Inflow Area = 15,336 sf, 87.48% Impervious, Inflow Depth = 7.56" for 100-Year event
Inflow = 1.14 cfs @ 12.01 hrs, Volume= 9,663 cf
Outflow = 0.80 cfs @ 12.45 hrs, Volume= 9,710 cf, Atten= 29%, Lag= 25.9 min
Discarded = 0.04 cfs @ 7.00 hrs, Volume= 4,303 cf
Primary = 0.76 cfs @ 12.45 hrs, Volume= 5,407 cf
Routed to Reach 1R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Peak Elev= 332.82' @ 12.45 hrs Surf.Area= 1,617 sf Storage= 2,106 cf

Plug-Flow detention time= 186.5 min calculated for 9,512 cf (98% of inflow)
Center-of-Mass det. time= 199.9 min (955.2 - 755.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	330.40'	608 cf	33.00'W x 49.00'L x 2.50'H Field A 4,043 cf Overall - 2,304 cf Embedded = 1,738 cf x 35.0% Voids
#2A	330.90'	1,544 cf	Shea Leaching Chamber 4x8x1.5 x 48 Inside #1 Inside= 42.0"W x 15.0"H => 4.29 sf x 7.50'L = 32.2 cf Outside= 48.0"W x 18.0"H => 6.00 sf x 8.00'L = 48.0 cf 48 Chambers in 8 Rows
		2,153 cf	Total Available Storage

Storage Group A created with Chamber Wizard

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Type III 24-hr 100-Year Rainfall=8.16"

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Device	Routing	Invert	Outlet Devices
#1	Discarded	330.40'	1.020 in/hr Exfiltration over Surface area
#2	Primary	331.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 7.00 hrs HW=330.45' (Free Discharge)
 ↳1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.67 cfs @ 12.45 hrs HW=332.66' (Free Discharge)
 ↳2=Orifice/Grate (Orifice Controls 0.67 cfs @ 3.43 fps)

Summary for Pond 2P: BMP 2

Inflow Area = 20,105 sf, 69.42% Impervious, Inflow Depth = 7.08" for 100-Year event
 Inflow = 1.44 cfs @ 12.02 hrs, Volume= 11,866 cf
 Outflow = 1.37 cfs @ 12.11 hrs, Volume= 11,879 cf, Atten= 5%, Lag= 5.5 min
 Discarded = 0.03 cfs @ 7.00 hrs, Volume= 3,602 cf
 Primary = 1.33 cfs @ 12.11 hrs, Volume= 8,277 cf
 Routed to Reach 1R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
 Peak Elev= 336.31' @ 12.13 hrs Surf.Area= 1,421 sf Storage= 1,795 cf

Plug-Flow detention time= 122.8 min calculated for 11,636 cf (98% of inflow)
 Center-of-Mass det. time= 133.7 min (904.3 - 770.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	334.00'	538 cf	29.00'W x 49.00'L x 2.50'H Field A 3,553 cf Overall - 2,016 cf Embedded = 1,536 cf x 35.0% Voids
#2A	334.50'	1,351 cf	Shea Leaching Chamber 4x8x1.5 x 42 Inside #1 Inside= 42.0"W x 15.0"H => 4.29 sf x 7.50'L = 32.2 cf Outside= 48.0"W x 18.0"H => 6.00 sf x 8.00'L = 48.0 cf 42 Chambers in 7 Rows
		1,889 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	334.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	335.35'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 7.00 hrs HW=334.07' (Free Discharge)
 ↳1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.25 cfs @ 12.11 hrs HW=336.24' (Free Discharge)
 ↳2=Orifice/Grate (Orifice Controls 1.25 cfs @ 3.59 fps)

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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Pond 3P: BMP 3

Inflow Area = 15,905 sf, 80.52% Impervious, Inflow Depth = 7.32" for 100-Year event
Inflow = 1.16 cfs @ 12.02 hrs, Volume= 9,704 cf
Outflow = 0.83 cfs @ 12.80 hrs, Volume= 9,742 cf, Atten= 29%, Lag= 47.3 min
Discarded = 0.06 cfs @ 9.00 hrs, Volume= 4,783 cf
Primary = 0.76 cfs @ 12.80 hrs, Volume= 4,959 cf
Routed to Reach 2R : Pipe to Spruce Pond

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs
Peak Elev= 335.88' @ 12.85 hrs Surf.Area= 2,673 sf Storage= 2,292 cf

Plug-Flow detention time= 109.2 min calculated for 9,543 cf (98% of inflow)
Center-of-Mass det. time= 113.6 min (877.2 - 763.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	334.20'	1,007 cf	33.00'W x 81.00'L x 2.08'H Field A 5,560 cf Overall - 2,682 cf Embedded = 2,878 cf x 35.0% Voids
#2A	334.70'	1,658 cf	Shea Leaching Chamber 4x8x1 x 80 Inside #1 Inside= 42.0"W x 10.0"H => 2.76 sf x 7.50'L = 20.7 cf Outside= 48.0"W x 13.0"H => 4.19 sf x 8.00'L = 33.5 cf 80 Chambers in 8 Rows
		2,665 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	334.20'	1.020 in/hr Exfiltration over Surface area
#2	Primary	335.00'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 9.00 hrs HW=334.27' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.69 cfs @ 12.80 hrs HW=335.79' (Free Discharge)
↑**2=Orifice/Grate** (Orifice Controls 0.69 cfs @ 3.54 fps)

Summary for Link 1L: Spruce Pond

Inflow Area = 54,594 sf, 77.14% Impervious, Inflow Depth = 4.50" for 100-Year event
Inflow = 2.80 cfs @ 12.28 hrs, Volume= 20,465 cf
Primary = 2.80 cfs @ 12.28 hrs, Volume= 20,465 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 3L

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs

Summary for Link 2L: King Street

Inflow Area = 282 sf, 53.71% Impervious, Inflow Depth = 6.61" for 100-Year event
Inflow = 0.02 cfs @ 12.02 hrs, Volume= 155 cf
Primary = 0.02 cfs @ 12.02 hrs, Volume= 155 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 1.00 hrs