Stormwater and Hydrologic Report

for the

Proposed Building & Site Development

located at

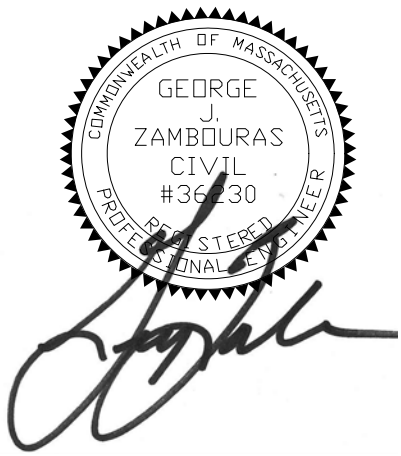
185 Leslie Road

Rowley, Massachusetts 01969

Prepared For

Sean R. Connolly, Representative of the Estate of John R. Connolly
278 Wethersfield Road
Methuen, MA 01844

2, 10, 25 & 100 Year Storm
24 Hour Duration



Date: April 25, 2023

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INTRODUCTION:

This report describes the pre and post hydraulic analysis and stormwater management measures to be implemented to regulate stormwater and mitigate the impacts to the environment and surrounding properties in the construction of the single family dwelling and associated site development for the property located at 185 Leslie Road, Rowley, MA.

The design of the stormwater system's components is based on the hydraulic analysis performed utilizing "HydroCAD Storm water Modeling Software" for storm events of 2, 10, 25 and 100-year storm frequencies in accordance with the Town of Rowley's regulations and guidelines.

The selection and sizing of the stormwater mitigation devices is based on maximizing groundwater recharge and achieving no increases in runoff from the added impervious areas and development of the site for all storm events.

EXISTING CONDITIONS:

The site known as 185 Leslie Road is identified by the Town of Rowley as Assessors Map 6 - Parcel 3 and is located on the westerly side of Leslie Road approximately 100 feet southerly of the Leslie Road and Meetinghouse Road intersection. The site also has a frontage along the southerly side of Meetinghouse Road.

The site is an undeveloped 4.36 +/- acre wooded parcel with a bordering vegetated wetland located along the easterly boundary of the parcel.
The site's topography is gradual to moderately steep sloped with elevations ranging from 100 to 116. As a result of the site's topography stormwater runoff flows in northeasterly and southwesterly directions.

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PROPOSED CONDITIONS:

The proposed site development consists of constructing a new 3,456 square foot residential dwelling and garage; a 2,400 square foot barn; inground pool with patio and pool house; associated walkways, patios, deck, septic system, gravel driveway, paved driveway, lawn, plantings and associated site grading. The total site development results in the creation of approximately 18,860 square feet of impervious surfaces and the disturbance or alteration of approximately 2.3 acres.

To mitigate the effects of the added impervious surfaces resulting from the new construction; the run-off from portions of proposed buildings and numerous impervious areas will be directed to bioretention areas; significant portions of the gravel driveway will be constructed as an infiltrating stoned storage area; and infiltrating stoned filter strips will be installed alongside of the proposed paved driveway. These stormwater management devices will reduce runoff, control sedimentation and erosion; thereby ensuring water quality, protection of ground water and provide for stormwater recharge.

These stormwater components are depicted on the drawings and are explained in detail within this report.

SITE SOILS:

Existing soils within the portion of the site to be disturbed are identified by the United States Department of Agriculture Natural Resources Conservation Services (NRCS) Soil Report (located in Appendix "C") are Deerfield loamy fine sands and Canton fine sandy loams. Deerfield soils have underlying sands as the restrictive payer and are classified by NRCS as soils belonging to the Hydrologic Soil Group "A". Canton soils have underlying gravely loamy sands as the restrictive payer and are classified by NRCS as soils belonging to the Hydrologic Soil Group "A/B".

Additionally, soil tests were performed in conjunction with the design of the proposed septic system for the site. These tests were performed in January 2020 and the restrictive soil layer was determined to be loamy sands. At the location of the soil testing the estimated high ground water was approximately 50" below grade and perk rates ranged from 3.3 to 8 min/inch.

Based on the NRCS soil report and the on-site soil testing performed, throughout this analysis the site is modeled utilizing soils belonging to the Hydrologic Soil Groups A and B to establish a comparison of pre and post run-off rates and volumes.

Additionally, the model utilizes the Rawls infiltration rate of 2.41 inches per hour for the loamy sand soils and 1.02 for sandy loam soils (Table 2.3.3 DEP Stormwater Manual).

STORMWATER MANAGEMENT

To effectively manage the impacts of the project to the environment; to surrounding properties; provide recharge; protect groundwater and water supplies; control sedimentation and erosion; and to mitigate post construction run-off rates the design relies on conventional stormwater management components and best management practices.

The proposed stormwater management components to be utilized consist of the following;

- Bioretention Rain Gardens to treat and provide infiltration of run-off from roof surfaces, patios, driveways and general site run-off
- Use of an infiltrating stoned filter trench along the edges of the proposed paved driveway
- Creation of an infiltrating stoned driveway storage surfaces for collection and mitigation of site run-off.

Driveway Stoned Filter Trenches – The run-off from the proposed paved driveway is directed into the 3' wide stone filter trench located along the downhill sides of the driveway. The proposed stoned trenches consist of 490 linear feet of 2.5' deep trenches and 90 linear feet of a 3' deep trench. The stone filter trench control sedimentation and erosion from the driveway; mitigates the driveways run-off rate and provides for infiltration of the driveways run-off.

Driveway Stoned Storage – A portion of the proposed stoned driveway is constructed as a stoned filter storage. This area consisting of approximately 11,000 s.f. is constructed with a 4" stone depth to provide storage, enable infiltration of run-off and provides control of sedimentation and erosion.

Bioretention Rain Gardens – To control and mitigate stormwater run-off; provide for water quality and the prevention of pollution; protection of groundwater and water supplies the site includes the construction of three (3) rain gardens. The rain gardens are of various sizes and have a total surface area of approximately 3,300 s.f.. These gardens are designed to capture run-off from roof surfaces, patios, driveways and general site run-off.

To control erosion and sedimentation during construction the following Best Management Practices (BMP) are proposed are to be implemented:

- Stone construction entrance
- Perimeter erosion \ siltation barrier
- Protection of all stored material
- Protection of exposed disturbed surfaces

As designed the proposed improvements and stormwater management system provides the following:

- Reduces post development run-off rates and volumes when compared to pre-development rates and volumes.
- Treatment of stormwater for TSS removal
- Provides for infiltration resulting from added impervious areas.
- Imposes construction BMPs to control sedimentation and erosion during construction.
- Establishes a long-term Operation and Maintenance Plan to ensure the protection of the resource areas.

SUMMARY:

As indicated in the summary below the stormwater management system effectively mitigates the effects of the site's development by approximating or reducing peak runoff rates and volumes for the 2, 10, 25 and 100-year storm events thereby meeting the Town of Rowley's requirements.

Summary of Total Site Discharge Flows and Volumes

Design Storm	*Pre-Development Max. Discharge (CFS.)*	*Post-Development Max. Discharge (CFS.)*	*Pre-Development Max. Volume (Cubic-FT.)*	*Post-Development Max. Volume (Cubic-FT.)*
2 Yr.	***0.10***	***0.10***	***960***	***1,068***
10 Yr.	***0.77***	***0.72***	***6,215***	***5,010***
25 Yr.	***1.95***	***1.87***	***13,456***	***10,681***
100 Yr.	***7.32***	***7.13***	***34,708***	***28,768***

Assumptions:

The following assumptions are being used for design purposes:

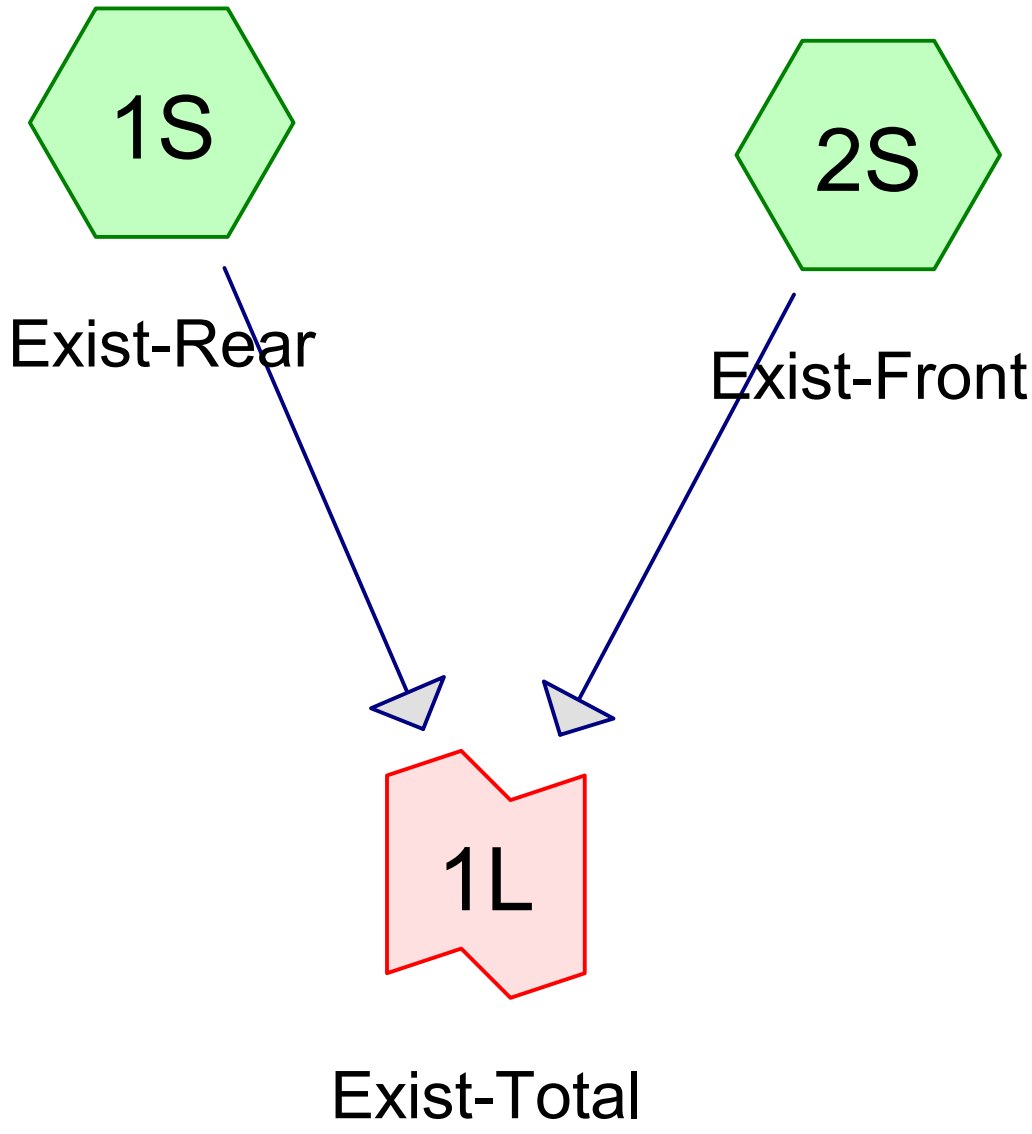
1) ***2, 10, 25 & 100 year storm frequency.***
2) ***24 hour storm duration (min.)***
3) ***Hydro logic soils groups for the run-off areas are classified class as "C" – Sandy Clay Loams.***
4) ***Existing and proposed Cn values are as noted in the report.***
5) ***Within small drainage areas a minimum Tc value of 6 min. is used.***
6) ***Exfiltration rate of 2.41 inches/hour for Loamy Sands and 1.02 inches/hour for Sandy Loams based on DEP's Table 2.3.3 "1982 Rawls Rates".***

Design Criteria:

1) ***Run-off quantities are calculated using TR-20 method***
2) ***Rainfall intensity numbers using NRCC extreme precipitation data:***
   I = 3.15 for 2 yr. / 24 hr. duration, 4.83 in./10 yr., 6.16 in/ 25 yr. & 8.94 in./100 yr.
3) ***Proposed Cn values are as noted in the report.***
4) ***Hyetograph shape = NRCC extreme precipitation type D (eastern U.S.)***
5) ***The maximum rates and volumes of post development run-off for the 2, 10, 25 & 100 yr. design storms will be equal or less than pre-development run-off rates and volumes.***

Appendix A

Pre-Development Calculations



Subcat Reach Pond Link

Routing Diagram for 185-Leslie
Prepared by George J. Zambouras, P.E., Printed 2/17/2023

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,953	35	Brush, Fair, HSG A (2S)
76,142	30	Woods, Good, HSG A (2S)
110,824	55	Woods, Good, HSG B (1S, 2S)
189,919	**45**	**TOTAL AREA**

Time span=0.00-26.00 hrs, dt=0.05 hrs, 521 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Exist-Rear Runoff Area=45,669 sf 0.00% Impervious Runoff Depth=0.24"
Flow Length=225' Tc=8.6 min CN=55 Runoff=0.10 cfs 899 cf

Subcatchment 2S: Exist-Front Runoff Area=144,250 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=445' Tc=14.0 min CN=41 Runoff=0.00 cfs 61 cf

Link 1L: Exist-Total Inflow=0.10 cfs 960 cf
Primary=0.10 cfs 960 cf

Total Runoff Area = 189,919 sf Runoff Volume = 960 cf Average Runoff Depth = 0.06"
100.00% Pervious = 189,919 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1S: Exist-Rear

Runoff = 0.10 cfs @ 12.38 hrs, Volume= 899 cf, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
45,669	55	Woods, Good, HSG B
45,669		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.0950	0.13		**Sheet Flow, Overland** Woods: Light underbrush n= 0.400 P2= 3.15"
1.9	175	0.0970	1.56		**Shallow Concentrated Flow, Overland** Woodland Kv= 5.0 fps
8.6	225	Total			

Summary for Subcatchment 2S: Exist-Front

Runoff = 0.00 cfs @ 23.30 hrs, Volume= 61 cf, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
76,142	30	Woods, Good, HSG A
2,953	35	Brush, Fair, HSG A
65,155	55	Woods, Good, HSG B
144,250	41	Weighted Average
144,250		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0750	0.11		**Sheet Flow, Overland** Woods: Light underbrush n= 0.400 P2= 3.15"
0.8	72	0.1000	1.58		**Shallow Concentrated Flow, Overland** Woodland Kv= 5.0 fps
4.5	224	0.0270	0.82		**Shallow Concentrated Flow, Overland** Woodland Kv= 5.0 fps
1.4	99	0.0130	1.14		**Shallow Concentrated Flow, Overland to Wetland** Nearly Bare & Untilled Kv= 10.0 fps
14.0	445	Total			

Summary for Link 1L: Exist-Total

Inflow Area = 189,919 sf, 0.00% Impervious, Inflow Depth = 0.06" for 2-Year event
Inflow = 0.10 cfs @ 12.38 hrs, Volume= 960 cf
Primary = 0.10 cfs @ 12.38 hrs, Volume= 960 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Time span=0.00-26.00 hrs, dt=0.05 hrs, 521 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Exist-Rear Runoff Area=45,669 sf 0.00% Impervious Runoff Depth=0.90"
Flow Length=225' Tc=8.6 min CN=55 Runoff=0.77 cfs 3,412 cf

Subcatchment 2S: Exist-Front Runoff Area=144,250 sf 0.00% Impervious Runoff Depth=0.23"
Flow Length=445' Tc=14.0 min CN=41 Runoff=0.17 cfs 2,803 cf

Link 1L: Exist-Total Inflow=0.77 cfs 6,215 cf
Primary=0.77 cfs 6,215 cf

Total Runoff Area = 189,919 sf Runoff Volume = 6,215 cf Average Runoff Depth = 0.39"
100.00% Pervious = 189,919 sf 0.00% Impervious = 0 sf

Time span=0.00-26.00 hrs, dt=0.05 hrs, 521 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Exist-Rear Runoff Area=45,669 sf 0.00% Impervious Runoff Depth=1.61"
Flow Length=225' Tc=8.6 min CN=55 Runoff=1.59 cfs 6,130 cf

Subcatchment 2S: Exist-Front Runoff Area=144,250 sf 0.00% Impervious Runoff Depth=0.61"
Flow Length=445' Tc=14.0 min CN=41 Runoff=0.90 cfs 7,327 cf

Link 1L: Exist-Total Inflow=1.95 cfs 13,456 cf
Primary=1.95 cfs 13,456 cf

Total Runoff Area = 189,919 sf Runoff Volume = 13,456 cf Average Runoff Depth = 0.85"
100.00% Pervious = 189,919 sf 0.00% Impervious = 0 sf

Time span=0.00-26.00 hrs, dt=0.05 hrs, 521 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Exist-Rear Runoff Area=45,669 sf 0.00% Impervious Runoff Depth=3.44"
Flow Length=225' Tc=8.6 min CN=55 Runoff=3.69 cfs 13,110 cf

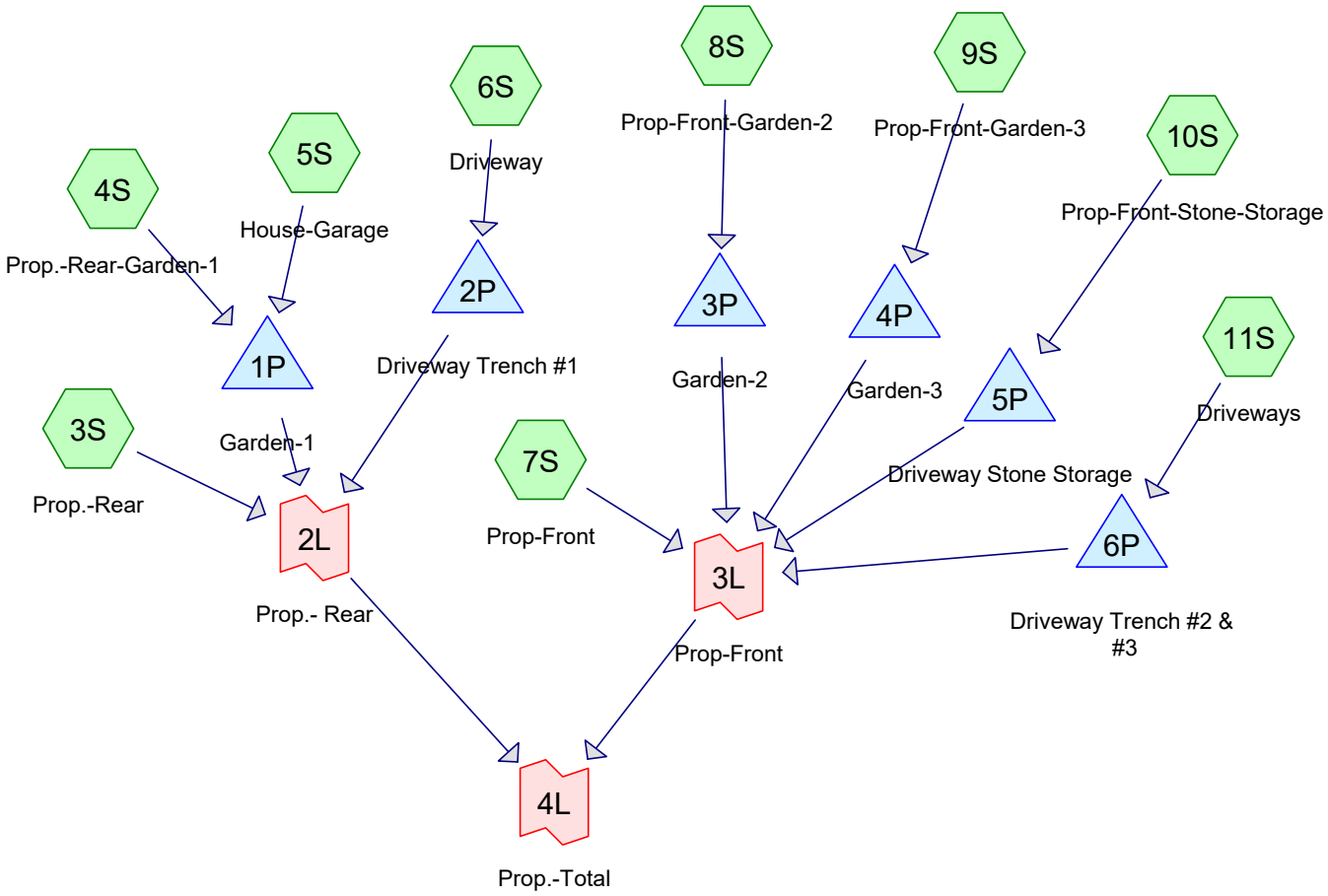
Subcatchment 2S: Exist-Front Runoff Area=144,250 sf 0.00% Impervious Runoff Depth=1.80"
Flow Length=445' Tc=14.0 min CN=41 Runoff=4.28 cfs 21,598 cf

Link 1L: Exist-Total Inflow=7.32 cfs 34,708 cf
Primary=7.32 cfs 34,708 cf

Total Runoff Area = 189,919 sf Runoff Volume = 34,708 cf Average Runoff Depth = 2.19"
100.00% Pervious = 189,919 sf 0.00% Impervious = 0 sf

Appendix B

Post-Development Calculations



Subcat Reach Pond Link

Routing Diagram for 185-Leslie
Prepared by George J. Zambouras, P.E., Printed 4/25/2023

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
20,809	39	>75% Grass cover, Good, HSG A (7S, 10S)
38,211	61	>75% Grass cover, Good, HSG B (3S, 4S, 7S, 8S, 9S, 10S)
2,953	35	Brush, Fair, HSG A (7S)
739	30	Brush, Good, HSG A (10S)
3,693	72	Dirt roads, HSG A (7S, 11S)
3,718	82	Dirt roads, HSG B (7S, 9S, 10S)
1,171	98	Paved parking, HSG A (11S)
8,317	98	Paved parking, HSG B (6S, 8S, 11S)
3,456	98	Roofs, HSG B (5S, 8S, 9S)
10,600	72	Stone roads, HSG A (10S)
3,238	98	Unconnected pavement, HSG B (3S, 4S, 7S, 8S, 9S)
2,400	98	Unconnected roofs, HSG A (10S)
280	98	Unconnected roofs, HSG B (4S)
3,291	98	Water Surface, 0% imp, HSG B (4S, 8S, 9S)
38,630	30	Woods, Good, HSG A (7S, 10S)
47,765	55	Woods, Good, HSG B (3S, 7S, 10S)
189,271	**56**	**TOTAL AREA**

Time span=0.00-26.00 hrs, dt=0.05 hrs, 521 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 3S: Prop.-Rear Runoff Area=29,031 sf 2.55% Impervious Runoff Depth=0.32"
Flow Length=197' Tc=12.0 min UI Adjusted CN=58 Runoff=0.10 cfs 783 cf

Subcatchment 4S: Prop.-Rear-Garden-1 Runoff Area=8,970 sf 20.35% Impervious Runoff Depth=0.71"
Flow Length=113' Slope=0.0120 '/' Tc=11.5 min UI Adjusted CN=68 Runoff=0.12 cfs 527 cf

Subcatchment 5S: House-Garage Runoff Area=1,728 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.12 cfs 420 cf

Subcatchment 6S: Driveway Runoff Area=1,357 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.09 cfs 330 cf

Subcatchment 7S: Prop-Front Runoff Area=66,625 sf 0.33% Impervious Runoff Depth=0.05"
Flow Length=445' Tc=14.8 min CN=46 Runoff=0.01 cfs 285 cf

Subcatchment 8S: Prop-Front-Garden-2 Runoff Area=8,426 sf 37.14% Impervious Runoff Depth=1.36"
Flow Length=84' Tc=2.9 min CN=80 Runoff=0.33 cfs 957 cf

Subcatchment 9S: Prop-Front-Garden-3 Runoff Area=7,882 sf 19.87% Impervious Runoff Depth=1.18"
Flow Length=84' Tc=2.9 min CN=77 Runoff=0.27 cfs 773 cf

Subcatchment 10S: Prop-Front-Stone-Storage Runoff Area=57,456 sf 4.18% Impervious Runoff Depth=0.10"
Flow Length=294' Tc=12.9 min UI Adjusted CN=49 Runoff=0.02 cfs 476 cf

Subcatchment 11S: Driveways Runoff Area=7,796 sf 75.63% Impervious Runoff Depth=2.30"
Tc=6.0 min CN=92 Runoff=0.46 cfs 1,496 cf

Pond 1P: Garden-1 Peak Elev=111.88' Storage=439 cf Inflow=0.21 cfs 948 cf
Discarded=0.01 cfs 813 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 813 cf

Pond 2P: Driveway Trench #1 Peak Elev=101.24' Storage=134 cf Inflow=0.09 cfs 330 cf
Discarded=0.01 cfs 330 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 330 cf

Pond 3P: Garden-2 Peak Elev=107.74' Storage=480 cf Inflow=0.33 cfs 957 cf
Discarded=0.02 cfs 883 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 883 cf

Pond 4P: Garden-3 Peak Elev=103.38' Storage=173 cf Inflow=0.27 cfs 773 cf
Discarded=0.06 cfs 772 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 772 cf

Pond 5P: Driveway Stone Storage Peak Elev=104.67' Storage=2 cf Inflow=0.02 cfs 476 cf
Discarded=0.02 cfs 476 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 476 cf

Pond 6P: Driveway Trench #2 & #3 Peak Elev=100.91' Storage=478 cf Inflow=0.46 cfs 1,496 cf
Discarded=0.07 cfs 1,496 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 1,496 cf

Link 2L: Prop.- Rear Inflow=0.10 cfs 783 cf
Primary=0.10 cfs 783 cf

Link 3L: Prop-Front Inflow=0.01 cfs 285 cf
Primary=0.01 cfs 285 cf

Link 4L: Prop.-Total Inflow=0.10 cfs 1,068 cf
Primary=0.10 cfs 1,068 cf

Total Runoff Area = 189,271 sf Runoff Volume = 6,048 cf Average Runoff Depth = 0.38"
90.03% Pervious = 170,409 sf 9.97% Impervious = 18,862 sf

Summary for Subcatchment 3S: Prop.-Rear

Runoff = 0.10 cfs @ 12.36 hrs, Volume= 783 cf, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Adj	Description
15,485	55		Woods, Good, HSG B
12,806	61		>75% Grass cover, Good, HSG B
740	98		Unconnected pavement, HSG B
29,031	59	58	Weighted Average, UI Adjusted
28,291			97.45% Pervious Area
740			2.55% Impervious Area
740			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0350	0.08		**Sheet Flow, Overland** Woods: Light underbrush n= 0.400 P2= 3.15"
1.7	77	0.0120	0.77		**Shallow Concentrated Flow, Lawn** Short Grass Pasture Kv= 7.0 fps
0.1	35	0.3100	3.90		**Shallow Concentrated Flow, Slope** Short Grass Pasture Kv= 7.0 fps
0.3	35	0.1500	1.94		**Shallow Concentrated Flow, Overland** Woodland Kv= 5.0 fps
12.0	197	Total			

Summary for Subcatchment 4S: Prop.-Rear-Garden-1

Runoff = 0.12 cfs @ 12.19 hrs, Volume= 527 cf, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Adj	Description
6,516	61		>75% Grass cover, Good, HSG B
805	98		Unconnected pavement, HSG B
629	98		Water Surface, 0% imp, HSG B
280	98		Unconnected roofs, HSG B
740	98		Unconnected pavement, HSG B
8,970	71	68	Weighted Average, UI Adjusted
7,145			79.65% Pervious Area
1,825			20.35% Impervious Area
1,825			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	50	0.0120	0.08		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 3.15"
1.4	63	0.0120	0.77		**Shallow Concentrated Flow, Lawn** Short Grass Pasture Kv= 7.0 fps
11.5	113	Total			

Summary for Subcatchment 5S: House-Garage

Runoff = 0.12 cfs @ 12.09 hrs, Volume= 420 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
1,728	98	Roofs, HSG B
1,728		100.00% Impervious Area

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

Summary for Subcatchment 6S: Driveway

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 330 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
1,357	98	Paved parking, HSG B
1,357		100.00% Impervious Area

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

Summary for Subcatchment 7S: Prop-Front

Runoff = 0.01 cfs @ 15.31 hrs, Volume= 285 cf, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
21,258	30	Woods, Good, HSG A
9,949	39	>75% Grass cover, Good, HSG A
2,953	35	Brush, Fair, HSG A
22,704	55	Woods, Good, HSG B
5,451	61	>75% Grass cover, Good, HSG B
221	98	Unconnected pavement, HSG B
2,296	82	Dirt roads, HSG B
1,793	72	Dirt roads, HSG A
66,625	46	Weighted Average
66,404		99.67% Pervious Area
221		0.33% Impervious Area
221		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0750	0.11		**Sheet Flow, Overland**
					Woods: Light underbrush n= 0.400 P2= 3.15"
0.8	74	0.1000	1.58		**Shallow Concentrated Flow, Overland**
					Woodland Kv= 5.0 fps
1.3	67	0.0150	0.86		**Shallow Concentrated Flow, Overland/Lawn**
					Short Grass Pasture Kv= 7.0 fps
3.5	103	0.0050	0.49		**Shallow Concentrated Flow, Stone DW**
					Short Grass Pasture Kv= 7.0 fps
0.5	52	0.0700	1.85		**Shallow Concentrated Flow, Overland/Slope**
					Short Grass Pasture Kv= 7.0 fps
1.4	99	0.0130	1.14		**Shallow Concentrated Flow, Overland to Wetland**
					Nearly Bare & Untilled Kv= 10.0 fps
14.8	445	Total			

Summary for Subcatchment 8S: Prop-Front-Garden-2

Runoff = 0.33 cfs @ 12.05 hrs, Volume= 957 cf, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
4,212	61	>75% Grass cover, Good, HSG B
1,085	98	Water Surface, 0% imp, HSG B
168	98	Unconnected pavement, HSG B
2,235	98	Paved parking, HSG B
726	98	Roofs, HSG B
8,426	80	Weighted Average
5,297		62.86% Pervious Area
3,129		37.14% Impervious Area
168		5.37% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	22	0.0150	0.90		**Sheet Flow, Walk-Driveway**
					Smooth surfaces n= 0.011 P2= 3.15"
2.2	28	0.0700	0.22		**Sheet Flow, Lawn**
					Grass: Short n= 0.150 P2= 3.15"
0.2	22	0.0700	1.85		**Shallow Concentrated Flow, Lawn**
					Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0100	2.03		**Shallow Concentrated Flow, Driveway**
					Paved Kv= 20.3 fps
2.9	84	Total			

Summary for Subcatchment 9S: Prop-Front-Garden-3

Runoff = 0.27 cfs @ 12.05 hrs, Volume= 773 cf, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
4,089	61	>75% Grass cover, Good, HSG B
1,577	98	Water Surface, 0% imp, HSG B
564	98	Unconnected pavement, HSG B
650	82	Dirt roads, HSG B
1,002	98	Roofs, HSG B
7,882	77	Weighted Average
6,316		80.13% Pervious Area
1,566		19.87% Impervious Area
564		36.02% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	22	0.0150	0.90		**Sheet Flow, Walk-Driveway** Smooth surfaces n= 0.011 P2= 3.15"
2.2	28	0.0700	0.22		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.15"
0.2	22	0.0700	1.85		**Shallow Concentrated Flow, Lawn** Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0100	2.03		**Shallow Concentrated Flow, Driveway** Paved Kv= 20.3 fps
2.9	84	Total			

Summary for Subcatchment 10S: Prop-Front-Stone-Storage

Runoff = 0.02 cfs @ 13.84 hrs, Volume= 476 cf, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

	Area (sf)	CN	Adj	Description
	17,372	30		Woods, Good, HSG A
	10,860	39		>75% Grass cover, Good, HSG A
	739	30		Brush, Good, HSG A
	9,576	55		Woods, Good, HSG B
	5,137	61		>75% Grass cover, Good, HSG B
	772	82		Dirt roads, HSG B
*	10,600	72		Stone roads, HSG A
	2,400	98		Unconnected roofs, HSG A
	57,456	50	49	Weighted Average, UI Adjusted
	55,056			95.82% Pervious Area
	2,400			4.18% Impervious Area
	2,400			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0750	0.11		**Sheet Flow, Overland** Woods: Light underbrush n= 0.400 P2= 3.15"
0.8	74	0.1000	1.58		**Shallow Concentrated Flow, Overland** Woodland Kv= 5.0 fps
1.3	67	0.0150	0.86		**Shallow Concentrated Flow, Overland/Lawn** Short Grass Pasture Kv= 7.0 fps
3.5	103	0.0050	0.49		**Shallow Concentrated Flow, Stone DW** Short Grass Pasture Kv= 7.0 fps
12.9	294	Total			

Summary for Subcatchment 11S: Driveways

Runoff = 0.46 cfs @ 12.09 hrs, Volume= 1,496 cf, Depth= 2.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
4,725	98	Paved parking, HSG B
1,900	72	Dirt roads, HSG A
1,171	98	Paved parking, HSG A
7,796	92	Weighted Average
1,900		24.37% Pervious Area
5,896		75.63% Impervious Area

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

Summary for Pond 1P: Garden-1

Inflow Area = 10,698 sf, 33.21% Impervious, Inflow Depth = 1.06" for 2-Year event
Inflow = 0.21 cfs @ 12.13 hrs, Volume= 948 cf
Outflow = 0.01 cfs @ 11.70 hrs, Volume= 813 cf, Atten= 93%, Lag= 0.0 min
Discarded = 0.01 cfs @ 11.70 hrs, Volume= 813 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 111.88' @ 15.67 hrs Surf.Area= 585 sf Storage= 439 cf

Plug-Flow detention time= 296.6 min calculated for 813 cf (86% of inflow)
Center-of-Mass det. time= 229.7 min (1,060.4 - 830.7)

Volume	Invert	Avail.Storage	Storage Description
#1	110.00'	1,846 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.00	585	0.0	0	0
112.00	585	40.0	468	468
113.50	585	10.0	88	556
114.50	980	100.0	783	1,338
115.00	1,050	100.0	508	1,846

Device	Routing	Invert	Outlet Devices
#1	Primary	114.40'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	110.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 11.70 hrs HW=110.06' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=110.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2P: Driveway Trench #1

Inflow Area = 1,357 sf,100.00% Impervious, Inflow Depth = 2.92" for 2-Year event
Inflow = 0.09 cfs @ 12.09 hrs, Volume= 330 cf
Outflow = 0.01 cfs @ 11.10 hrs, Volume= 330 cf, Atten= 93%, Lag= 0.0 min
Discarded = 0.01 cfs @ 11.10 hrs, Volume= 330 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 101.24' @ 13.43 hrs Surf.Area= 270 sf Storage= 134 cf

Plug-Flow detention time= 166.2 min calculated for 329 cf (100% of inflow)
Center-of-Mass det. time= 165.9 min (922.7 - 756.7)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	324 cf	**3.00'W x 90.00'L x 3.00'H Prismatoid** 810 cf Overall x 40.0% Voids
#2	103.00'	270 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) -Impervious
		594 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	270	0	0
104.00	270	270	270

Device	Routing	Invert	Outlet Devices
#1	Primary	103.00'	**50.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	100.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 11.10 hrs HW=100.04' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=100.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 3P: Garden-2

Inflow Area = 8,426 sf, 37.14% Impervious, Inflow Depth = 1.36" for 2-Year event
Inflow = 0.33 cfs @ 12.05 hrs, Volume= 957 cf
Outflow = 0.02 cfs @ 11.60 hrs, Volume= 883 cf, Atten= 95%, Lag= 0.0 min
Discarded = 0.02 cfs @ 11.60 hrs, Volume= 883 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 107.74' @ 15.09 hrs Surf.Area= 690 sf Storage= 480 cf

Plug-Flow detention time= 308.5 min calculated for 883 cf (92% of inflow)
Center-of-Mass det. time= 268.7 min (1,109.4 - 840.7)

Volume	Invert	Avail.Storage	Storage Description
#1	106.00'	2,114 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
106.00	690	0.0	0	0
108.00	690	40.0	552	552
109.50	690	10.0	104	656
110.50	1,085	100.0	888	1,543
111.00	1,200	100.0	571	2,114

Device	Routing	Invert	Outlet Devices
#1	Primary	110.40'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	106.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 11.60 hrs HW=106.05' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=106.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 4P: Garden-3

Inflow Area = 7,882 sf, 19.87% Impervious, Inflow Depth = 1.18" for 2-Year event
Inflow = 0.27 cfs @ 12.05 hrs, Volume= 773 cf
Outflow = 0.06 cfs @ 11.95 hrs, Volume= 772 cf, Atten= 76%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.95 hrs, Volume= 772 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 103.38' @ 12.46 hrs Surf.Area= 1,130 sf Storage= 173 cf

Plug-Flow detention time= 18.2 min calculated for 771 cf (100% of inflow)
Center-of-Mass det. time= 18.1 min (868.5 - 850.4)

Volume	Invert	Avail.Storage	Storage Description
#1	103.00'	3,246 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	1,130	0.0	0	0
105.00	1,130	40.0	904	904
106.50	1,130	10.0	170	1,074
107.50	1,577	100.0	1,354	2,427
108.00	1,700	100.0	819	3,246

Device	Routing	Invert	Outlet Devices
#1	Primary	107.40'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	103.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.06 cfs @ 11.95 hrs HW=103.06' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 5P: Driveway Stone Storage

Inflow Area = 57,456 sf, 4.18% Impervious, Inflow Depth = 0.10" for 2-Year event
Inflow = 0.02 cfs @ 13.84 hrs, Volume= 476 cf
Outflow = 0.02 cfs @ 13.87 hrs, Volume= 476 cf, Atten= 0%, Lag= 1.5 min
Discarded = 0.02 cfs @ 13.87 hrs, Volume= 476 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 104.67' @ 13.87 hrs Surf.Area= 10,600 sf Storage= 2 cf

Plug-Flow detention time= 1.6 min calculated for 475 cf (100% of inflow)
Center-of-Mass det. time= 1.6 min (1,039.2 - 1,037.6)

Volume	Invert	Avail.Storage	Storage Description
#1	104.67'	12,699 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.67	10,600	0.0	0	0
105.00	10,600	40.0	1,399	1,399
106.00	12,000	100.0	11,300	12,699

Device	Routing	Invert	Outlet Devices
#1	Primary	105.05'	**50.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	104.67'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.59 cfs @ 13.87 hrs HW=104.67' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.59 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.67' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 6P: Driveway Trench #2 & #3

Inflow Area = 7,796 sf, 75.63% Impervious, Inflow Depth = 2.30" for 2-Year event
Inflow = 0.46 cfs @ 12.09 hrs, Volume= 1,496 cf
Outflow = 0.07 cfs @ 11.80 hrs, Volume= 1,496 cf, Atten= 85%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.80 hrs, Volume= 1,496 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 100.91' @ 12.60 hrs Surf.Area= 2,940 sf Storage= 478 cf

Plug-Flow detention time= 48.8 min calculated for 1,494 cf (100% of inflow)
Center-of-Mass det. time= 48.8 min (847.2 - 798.3)

Volume	Invert	Avail.Storage	Storage Description
#1	100.50'	2,940 cf	**3.00'W x 490.00'L x 2.50'H Prismatoid** x 2 7,350 cf Overall x 40.0% Voids
#2	103.00'	1,380 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) -Impervious
		4,320 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	1,380	0	0
104.00	1,380	1,380	1,380

Device	Routing	Invert	Outlet Devices
#1	Primary	103.00'	**300.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	100.50'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.07 cfs @ 11.80 hrs HW=100.54' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=100.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link 2L: Prop.- Rear

Inflow Area = 41,086 sf, 13.75% Impervious, Inflow Depth = 0.23" for 2-Year event
Inflow = 0.10 cfs @ 12.36 hrs, Volume= 783 cf
Primary = 0.10 cfs @ 12.36 hrs, Volume= 783 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Summary for Link 3L: Prop-Front

Inflow Area = 148,185 sf, 8.92% Impervious, Inflow Depth = 0.02" for 2-Year event
Inflow = 0.01 cfs @ 15.31 hrs, Volume= 285 cf
Primary = 0.01 cfs @ 15.31 hrs, Volume= 285 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Summary for Link 4L: Prop.-Total

Inflow Area = 189,271 sf, 9.97% Impervious, Inflow Depth = 0.07" for 2-Year event
Inflow = 0.10 cfs @ 12.36 hrs, Volume= 1,068 cf
Primary = 0.10 cfs @ 12.36 hrs, Volume= 1,068 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Time span=0.00-26.00 hrs, dt=0.05 hrs, 521 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 3S: Prop.-Rear Runoff Area=29,031 sf 2.55% Impervious Runoff Depth=1.08"
Flow Length=197' Tc=12.0 min UI Adjusted CN=58 Runoff=0.57 cfs 2,604 cf

Subcatchment 4S: Prop.-Rear-Garden-1 Runoff Area=8,970 sf 20.35% Impervious Runoff Depth=1.76"
Flow Length=113' Slope=0.0120 '/' Tc=11.5 min UI Adjusted CN=68 Runoff=0.34 cfs 1,315 cf

Subcatchment 5S: House-Garage Runoff Area=1,728 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.18 cfs 661 cf

Subcatchment 6S: Driveway Runoff Area=1,357 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.14 cfs 519 cf

Subcatchment 7S: Prop-Front Runoff Area=66,625 sf 0.33% Impervious Runoff Depth=0.43"
Flow Length=445' Tc=14.8 min CN=46 Runoff=0.27 cfs 2,405 cf

Subcatchment 8S: Prop-Front-Garden-2 Runoff Area=8,426 sf 37.14% Impervious Runoff Depth=2.75"
Flow Length=84' Tc=2.9 min CN=80 Runoff=0.68 cfs 1,928 cf

Subcatchment 9S: Prop-Front-Garden-3 Runoff Area=7,882 sf 19.87% Impervious Runoff Depth=2.48"
Flow Length=84' Tc=2.9 min CN=77 Runoff=0.57 cfs 1,630 cf

Subcatchment 10S: Prop-Front-Stone-Storage Runoff Area=57,456 sf 4.18% Impervious Runoff Depth=0.57"
Flow Length=294' Tc=12.9 min UI Adjusted CN=49 Runoff=0.39 cfs 2,749 cf

Subcatchment 11S: Driveways Runoff Area=7,796 sf 75.63% Impervious Runoff Depth=3.92"
Tc=6.0 min CN=92 Runoff=0.77 cfs 2,549 cf

Pond 1P: Garden-1 Peak Elev=114.29' Storage=1,145 cf Inflow=0.48 cfs 1,977 cf
Discarded=0.02 cfs 1,178 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 1,178 cf

Pond 2P: Driveway Trench #1 Peak Elev=102.32' Storage=251 cf Inflow=0.14 cfs 519 cf
Discarded=0.01 cfs 441 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 441 cf

Pond 3P: Garden-2 Peak Elev=110.11' Storage=1,153 cf Inflow=0.68 cfs 1,928 cf
Discarded=0.02 cfs 1,175 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 1,175 cf

Pond 4P: Garden-3 Peak Elev=104.25' Storage=565 cf Inflow=0.57 cfs 1,630 cf
Discarded=0.06 cfs 1,630 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 1,630 cf

Pond 5P: Driveway Stone Storage Peak Elev=104.68' Storage=37 cf Inflow=0.39 cfs 2,749 cf
Discarded=0.39 cfs 2,749 cf Primary=0.00 cfs 0 cf Outflow=0.39 cfs 2,749 cf

Pond 6P: Driveway Trench #2 & #3 Peak Elev=101.33' Storage=973 cf Inflow=0.77 cfs 2,549 cf
Discarded=0.07 cfs 2,549 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 2,549 cf

Link 2L: Prop.- Rear Inflow=0.57 cfs 2,604 cf
Primary=0.57 cfs 2,604 cf

Link 3L: Prop-Front Inflow=0.27 cfs 2,405 cf
Primary=0.27 cfs 2,405 cf

Link 4L: Prop.-Total Inflow=0.72 cfs 5,010 cf
Primary=0.72 cfs 5,010 cf

Total Runoff Area = 189,271 sf Runoff Volume = 16,361 cf Average Runoff Depth = 1.04"
90.03% Pervious = 170,409 sf 9.97% Impervious = 18,862 sf

Summary for Pond 1P: Garden-1

Inflow Area = 10,698 sf, 33.21% Impervious, Inflow Depth = 2.22" for 10-Year event
Inflow = 0.48 cfs @ 12.14 hrs, Volume= 1,977 cf
Outflow = 0.02 cfs @ 16.40 hrs, Volume= 1,178 cf, Atten= 96%, Lag= 255.4 min
Discarded = 0.02 cfs @ 16.40 hrs, Volume= 1,178 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 114.29' @ 16.40 hrs Surf.Area= 899 sf Storage= 1,145 cf

Plug-Flow detention time= 343.1 min calculated for 1,175 cf (59% of inflow)
Center-of-Mass det. time= 224.5 min (1,047.2 - 822.7)

Volume	Invert	Avail.Storage	Storage Description
#1	110.00'	1,846 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.00	585	0.0	0	0
112.00	585	40.0	468	468
113.50	585	10.0	88	556
114.50	980	100.0	783	1,338
115.00	1,050	100.0	508	1,846

Device	Routing	Invert	Outlet Devices
#1	Primary	114.40'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	110.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 16.40 hrs HW=114.29' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=110.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2P: Driveway Trench #1

Inflow Area = 1,357 sf,100.00% Impervious, Inflow Depth = 4.59" for 10-Year event
Inflow = 0.14 cfs @ 12.09 hrs, Volume= 519 cf
Outflow = 0.01 cfs @ 9.85 hrs, Volume= 441 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.01 cfs @ 9.85 hrs, Volume= 441 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 102.32' @ 14.69 hrs Surf.Area= 270 sf Storage= 251 cf

Plug-Flow detention time= 291.0 min calculated for 440 cf (85% of inflow)
Center-of-Mass det. time= 226.2 min (974.8 - 748.6)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	324 cf	**3.00'W x 90.00'L x 3.00'H Prismatoid** 810 cf Overall x 40.0% Voids
#2	103.00'	270 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) -Impervious
		594 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	270	0	0
104.00	270	270	270

Device	Routing	Invert	Outlet Devices
#1	Primary	103.00'	**50.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	100.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 9.85 hrs HW=100.04' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=100.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 3P: Garden-2

Inflow Area = 8,426 sf, 37.14% Impervious, Inflow Depth = 2.75" for 10-Year event
Inflow = 0.68 cfs @ 12.05 hrs, Volume= 1,928 cf
Outflow = 0.02 cfs @ 15.89 hrs, Volume= 1,175 cf, Atten= 97%, Lag= 230.3 min
Discarded = 0.02 cfs @ 15.89 hrs, Volume= 1,175 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 110.11' @ 15.89 hrs Surf.Area= 932 sf Storage= 1,153 cf

Plug-Flow detention time= 359.0 min calculated for 1,172 cf (61% of inflow)
Center-of-Mass det. time= 253.0 min (1,073.4 - 820.4)

Volume	Invert	Avail.Storage	Storage Description
#1	106.00'	2,114 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
106.00	690	0.0	0	0
108.00	690	40.0	552	552
109.50	690	10.0	104	656
110.50	1,085	100.0	888	1,543
111.00	1,200	100.0	571	2,114

Device	Routing	Invert	Outlet Devices
#1	Primary	110.40'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	106.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 15.89 hrs HW=110.11' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=106.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 4P: Garden-3

Inflow Area = 7,882 sf, 19.87% Impervious, Inflow Depth = 2.48" for 10-Year event
Inflow = 0.57 cfs @ 12.05 hrs, Volume= 1,630 cf
Outflow = 0.06 cfs @ 11.70 hrs, Volume= 1,630 cf, Atten= 89%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.70 hrs, Volume= 1,630 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 104.25' @ 12.79 hrs Surf.Area= 1,130 sf Storage= 565 cf

Plug-Flow detention time= 72.0 min calculated for 1,630 cf (100% of inflow)
Center-of-Mass det. time= 71.8 min (900.2 - 828.4)

Volume	Invert	Avail.Storage	Storage Description
#1	103.00'	3,246 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	1,130	0.0	0	0
105.00	1,130	40.0	904	904
106.50	1,130	10.0	170	1,074
107.50	1,577	100.0	1,354	2,427
108.00	1,700	100.0	819	3,246

Device	Routing	Invert	Outlet Devices
#1	Primary	107.40'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	103.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.06 cfs @ 11.70 hrs HW=103.05' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 5P: Driveway Stone Storage

Inflow Area = 57,456 sf, 4.18% Impervious, Inflow Depth = 0.57" for 10-Year event
Inflow = 0.39 cfs @ 12.31 hrs, Volume= 2,749 cf
Outflow = 0.39 cfs @ 12.35 hrs, Volume= 2,749 cf, Atten= 1%, Lag= 2.1 min
Discarded = 0.39 cfs @ 12.35 hrs, Volume= 2,749 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 104.68' @ 12.35 hrs Surf.Area= 10,600 sf Storage= 37 cf

Plug-Flow detention time= 1.6 min calculated for 2,744 cf (100% of inflow)
Center-of-Mass det. time= 1.6 min (933.2 - 931.6)

Volume	Invert	Avail.Storage	Storage Description
#1	104.67'	12,699 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.67	10,600	0.0	0	0
105.00	10,600	40.0	1,399	1,399
106.00	12,000	100.0	11,300	12,699

Device	Routing	Invert	Outlet Devices
#1	Primary	105.05'	**50.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	104.67'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.59 cfs @ 12.35 hrs HW=104.68' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.59 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.67' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 6P: Driveway Trench #2 & #3

Inflow Area = 7,796 sf, 75.63% Impervious, Inflow Depth = 3.92" for 10-Year event
Inflow = 0.77 cfs @ 12.09 hrs, Volume= 2,549 cf
Outflow = 0.07 cfs @ 11.55 hrs, Volume= 2,549 cf, Atten= 91%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.55 hrs, Volume= 2,549 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 101.33' @ 12.98 hrs Surf.Area= 2,940 sf Storage= 973 cf

Plug-Flow detention time= 109.9 min calculated for 2,544 cf (100% of inflow)
Center-of-Mass det. time= 109.7 min (893.5 - 783.8)

Volume	Invert	Avail.Storage	Storage Description
#1	100.50'	2,940 cf	**3.00'W x 490.00'L x 2.50'H Prismatoid** x 2 7,350 cf Overall x 40.0% Voids
#2	103.00'	1,380 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) -Impervious
		4,320 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	1,380	0	0
104.00	1,380	1,380	1,380

Device	Routing	Invert	Outlet Devices
#1	Primary	103.00'	**300.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	100.50'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.07 cfs @ 11.55 hrs HW=100.54' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=100.50' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Link 2L: Prop.- Rear

Inflow Area = 41,086 sf, 13.75% Impervious, Inflow Depth = 0.76" for 10-Year event
Inflow = 0.57 cfs @ 12.20 hrs, Volume= 2,604 cf
Primary = 0.57 cfs @ 12.20 hrs, Volume= 2,604 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Summary for Link 3L: Prop-Front

Inflow Area = 148,185 sf, 8.92% Impervious, Inflow Depth = 0.19" for 10-Year event
Inflow = 0.27 cfs @ 12.44 hrs, Volume= 2,405 cf
Primary = 0.27 cfs @ 12.44 hrs, Volume= 2,405 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Summary for Link 4L: Prop.-Total

Inflow Area = 189,271 sf, 9.97% Impervious, Inflow Depth = 0.32" for 10-Year event
Inflow = 0.72 cfs @ 12.26 hrs, Volume= 5,010 cf
Primary = 0.72 cfs @ 12.26 hrs, Volume= 5,010 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Time span=0.00-26.00 hrs, dt=0.05 hrs, 521 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 3S: Prop.-Rear Runoff Area=29,031 sf 2.55% Impervious Runoff Depth=1.86"
Flow Length=197' Tc=12.0 min UI Adjusted CN=58 Runoff=1.09 cfs 4,493 cf

Subcatchment 4S: Prop.-Rear-Garden-1 Runoff Area=8,970 sf 20.35% Impervious Runoff Depth=2.74"
Flow Length=113' Slope=0.0120 '/' Tc=11.5 min UI Adjusted CN=68 Runoff=0.54 cfs 2,051 cf

Subcatchment 5S: House-Garage Runoff Area=1,728 sf 100.00% Impervious Runoff Depth=5.92"
Tc=6.0 min CN=98 Runoff=0.23 cfs 853 cf

Subcatchment 6S: Driveway Runoff Area=1,357 sf 100.00% Impervious Runoff Depth=5.92"
Tc=6.0 min CN=98 Runoff=0.18 cfs 670 cf

Subcatchment 7S: Prop-Front Runoff Area=66,625 sf 0.33% Impervious Runoff Depth=0.93"
Flow Length=445' Tc=14.8 min CN=46 Runoff=0.85 cfs 5,188 cf

Subcatchment 8S: Prop-Front-Garden-2 Runoff Area=8,426 sf 37.14% Impervious Runoff Depth=3.93"
Flow Length=84' Tc=2.9 min CN=80 Runoff=0.96 cfs 2,757 cf

Subcatchment 9S: Prop-Front-Garden-3 Runoff Area=7,882 sf 19.87% Impervious Runoff Depth=3.62"
Flow Length=84' Tc=2.9 min CN=77 Runoff=0.84 cfs 2,377 cf

Subcatchment 10S: Prop-Front-Stone-Storage Runoff Area=57,456 sf 4.18% Impervious Runoff Depth=1.15"
Flow Length=294' Tc=12.9 min UI Adjusted CN=49 Runoff=1.09 cfs 5,497 cf

Subcatchment 11S: Driveways Runoff Area=7,796 sf 75.63% Impervious Runoff Depth=5.23"
Tc=6.0 min CN=92 Runoff=1.00 cfs 3,396 cf

Pond 1P: Garden-1 Peak Elev=114.45' Storage=1,291 cf Inflow=0.72 cfs 2,904 cf
Discarded=0.02 cfs 1,312 cf Primary=0.16 cfs 635 cf Outflow=0.18 cfs 1,947 cf

Pond 2P: Driveway Trench #1 Peak Elev=103.00' Storage=324 cf Inflow=0.18 cfs 670 cf
Discarded=0.01 cfs 462 cf Primary=0.01 cfs 33 cf Outflow=0.02 cfs 495 cf

Pond 3P: Garden-2 Peak Elev=110.42' Storage=1,458 cf Inflow=0.96 cfs 2,757 cf
Discarded=0.02 cfs 1,389 cf Primary=0.06 cfs 332 cf Outflow=0.09 cfs 1,721 cf

Pond 4P: Garden-3 Peak Elev=105.50' Storage=960 cf Inflow=0.84 cfs 2,377 cf
Discarded=0.06 cfs 2,377 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 2,377 cf

Pond 5P: Driveway Stone Storage Peak Elev=104.79' Storage=524 cf Inflow=1.09 cfs 5,497 cf
Discarded=0.59 cfs 5,494 cf Primary=0.00 cfs 0 cf Outflow=0.59 cfs 5,494 cf

Pond 6P: Driveway Trench #2 & #3 Peak Elev=101.71' Storage=1,419 cf Inflow=1.00 cfs 3,396 cf
Discarded=0.07 cfs 3,396 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 3,396 cf

Link 2L: Prop.- Rear Inflow=1.09 cfs 5,161 cf
Primary=1.09 cfs 5,161 cf

Link 3L: Prop-Front Inflow=0.85 cfs 5,520 cf
Primary=0.85 cfs 5,520 cf

Link 4L: Prop.-Total Inflow=1.87 cfs 10,681 cf
Primary=1.87 cfs 10,681 cf

Total Runoff Area = 189,271 sf Runoff Volume = 27,282 cf Average Runoff Depth = 1.73"
90.03% Pervious = 170,409 sf 9.97% Impervious = 18,862 sf

Summary for Pond 1P: Garden-1

Inflow Area = 10,698 sf, 33.21% Impervious, Inflow Depth = 3.26" for 25-Year event
Inflow = 0.72 cfs @ 12.14 hrs, Volume= 2,904 cf
Outflow = 0.18 cfs @ 12.62 hrs, Volume= 1,947 cf, Atten= 75%, Lag= 28.9 min
Discarded = 0.02 cfs @ 12.62 hrs, Volume= 1,312 cf
Primary = 0.16 cfs @ 12.62 hrs, Volume= 635 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 114.45' @ 12.62 hrs Surf.Area= 961 sf Storage= 1,291 cf

Plug-Flow detention time= 252.5 min calculated for 1,943 cf (67% of inflow)
Center-of-Mass det. time= 147.9 min (964.6 - 816.8)

Volume	Invert	Avail.Storage	Storage Description
#1	110.00'	1,846 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.00	585	0.0	0	0
112.00	585	40.0	468	468
113.50	585	10.0	88	556
114.50	980	100.0	783	1,338
115.00	1,050	100.0	508	1,846

Device	Routing	Invert	Outlet Devices
#1	Primary	114.40'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	110.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.62 hrs HW=114.45' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.15 cfs @ 12.62 hrs HW=114.45' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.15 cfs @ 0.61 fps)

Summary for Pond 2P: Driveway Trench #1

Inflow Area = 1,357 sf,100.00% Impervious, Inflow Depth = 5.92" for 25-Year event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 670 cf
Outflow = 0.02 cfs @ 13.00 hrs, Volume= 495 cf, Atten= 91%, Lag= 54.8 min
Discarded = 0.01 cfs @ 9.05 hrs, Volume= 462 cf
Primary = 0.01 cfs @ 13.00 hrs, Volume= 33 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 103.00' @ 13.00 hrs Surf.Area= 270 sf Storage= 324 cf

Plug-Flow detention time= 283.3 min calculated for 495 cf (74% of inflow)
Center-of-Mass det. time= 193.9 min (938.6 - 744.8)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	324 cf	**3.00'W x 90.00'L x 3.00'H Prismatoid** 810 cf Overall x 40.0% Voids
#2	103.00'	270 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) -Impervious
		594 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	270	0	0
104.00	270	270	270

Device	Routing	Invert	Outlet Devices
#1	Primary	103.00'	**50.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	100.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 9.05 hrs HW=100.04' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 13.00 hrs HW=103.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.00 cfs @ 0.05 fps)

Summary for Pond 3P: Garden-2

Inflow Area = 8,426 sf, 37.14% Impervious, Inflow Depth = 3.93" for 25-Year event
Inflow = 0.96 cfs @ 12.05 hrs, Volume= 2,757 cf
Outflow = 0.09 cfs @ 12.93 hrs, Volume= 1,721 cf, Atten= 91%, Lag= 52.7 min
Discarded = 0.02 cfs @ 12.93 hrs, Volume= 1,389 cf
Primary = 0.06 cfs @ 12.93 hrs, Volume= 332 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 110.42' @ 12.93 hrs Surf.Area= 1,054 sf Storage= 1,458 cf

Plug-Flow detention time= 308.0 min calculated for 1,717 cf (62% of inflow)
Center-of-Mass det. time= 205.8 min (1,016.0 - 810.2)

Volume	Invert	Avail.Storage	Storage Description
#1	106.00'	2,114 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
106.00	690	0.0	0	0
108.00	690	40.0	552	552
109.50	690	10.0	104	656
110.50	1,085	100.0	888	1,543
111.00	1,200	100.0	571	2,114

Device	Routing	Invert	Outlet Devices
#1	Primary	110.40'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	106.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.93 hrs HW=110.42' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.04 cfs @ 12.93 hrs HW=110.42' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.04 cfs @ 0.38 fps)

Summary for Pond 4P: Garden-3

Inflow Area = 7,882 sf, 19.87% Impervious, Inflow Depth = 3.62" for 25-Year event
Inflow = 0.84 cfs @ 12.05 hrs, Volume= 2,377 cf
Outflow = 0.06 cfs @ 11.60 hrs, Volume= 2,377 cf, Atten= 92%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.60 hrs, Volume= 2,377 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 105.50' @ 13.25 hrs Surf.Area= 1,130 sf Storage= 960 cf

Plug-Flow detention time= 134.3 min calculated for 2,373 cf (100% of inflow)
Center-of-Mass det. time= 134.1 min (951.7 - 817.6)

Volume	Invert	Avail.Storage	Storage Description
#1	103.00'	3,246 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	1,130	0.0	0	0
105.00	1,130	40.0	904	904
106.50	1,130	10.0	170	1,074
107.50	1,577	100.0	1,354	2,427
108.00	1,700	100.0	819	3,246

Device	Routing	Invert	Outlet Devices
#1	Primary	107.40'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	103.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.06 cfs @ 11.60 hrs HW=103.06' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 5P: Driveway Stone Storage

Inflow Area = 57,456 sf, 4.18% Impervious, Inflow Depth = 1.15" for 25-Year event
Inflow = 1.09 cfs @ 12.22 hrs, Volume= 5,497 cf
Outflow = 0.59 cfs @ 12.15 hrs, Volume= 5,494 cf, Atten= 46%, Lag= 0.0 min
Discarded = 0.59 cfs @ 12.15 hrs, Volume= 5,494 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 104.79' @ 12.56 hrs Surf.Area= 10,600 sf Storage= 524 cf

Plug-Flow detention time= 5.0 min calculated for 5,484 cf (100% of inflow)
Center-of-Mass det. time= 4.7 min (906.8 - 902.2)

Volume	Invert	Avail.Storage	Storage Description
#1	104.67'	12,699 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.67	10,600	0.0	0	0
105.00	10,600	40.0	1,399	1,399
106.00	12,000	100.0	11,300	12,699

Device	Routing	Invert	Outlet Devices
#1	Primary	105.05'	**50.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	104.67'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.59 cfs @ 12.15 hrs HW=104.69' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.59 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.67' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 6P: Driveway Trench #2 & #3

Inflow Area = 7,796 sf, 75.63% Impervious, Inflow Depth = 5.23" for 25-Year event
Inflow = 1.00 cfs @ 12.09 hrs, Volume= 3,396 cf
Outflow = 0.07 cfs @ 11.20 hrs, Volume= 3,396 cf, Atten= 93%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.20 hrs, Volume= 3,396 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 101.71' @ 13.47 hrs Surf.Area= 2,940 sf Storage= 1,419 cf

Plug-Flow detention time= 168.6 min calculated for 3,389 cf (100% of inflow)
Center-of-Mass det. time= 168.3 min (944.7 - 776.4)

Volume	Invert	Avail.Storage	Storage Description
#1	100.50'	2,940 cf	**3.00'W x 490.00'L x 2.50'H Prismatoid** x 2 7,350 cf Overall x 40.0% Voids
#2	103.00'	1,380 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) -Impervious
		4,320 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	1,380	0	0
104.00	1,380	1,380	1,380

Device	Routing	Invert	Outlet Devices
#1	Primary	103.00'	**300.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	100.50'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.07 cfs @ 11.20 hrs HW=100.54' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=100.50' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Link 2L: Prop.- Rear

Inflow Area = 41,086 sf, 13.75% Impervious, Inflow Depth = 1.51" for 25-Year event
Inflow = 1.09 cfs @ 12.18 hrs, Volume= 5,161 cf
Primary = 1.09 cfs @ 12.18 hrs, Volume= 5,161 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Summary for Link 3L: Prop-Front

Inflow Area = 148,185 sf, 8.92% Impervious, Inflow Depth = 0.45" for 25-Year event
Inflow = 0.85 cfs @ 12.28 hrs, Volume= 5,520 cf
Primary = 0.85 cfs @ 12.28 hrs, Volume= 5,520 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Summary for Link 4L: Prop.-Total

Inflow Area = 189,271 sf, 9.97% Impervious, Inflow Depth = 0.68" for 25-Year event
Inflow = 1.87 cfs @ 12.22 hrs, Volume= 10,681 cf
Primary = 1.87 cfs @ 12.22 hrs, Volume= 10,681 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Time span=0.00-26.00 hrs, dt=0.05 hrs, 521 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 3S: Prop.-Rear Runoff Area=29,031 sf 2.55% Impervious Runoff Depth=3.81"
Flow Length=197' Tc=12.0 min UI Adjusted CN=58 Runoff=2.39 cfs 9,216 cf

Subcatchment 4S: Prop.-Rear-Garden-1 Runoff Area=8,970 sf 20.35% Impervious Runoff Depth=5.04"
Flow Length=113' Slope=0.0120 '/' Tc=11.5 min UI Adjusted CN=68 Runoff=1.01 cfs 3,764 cf

Subcatchment 5S: House-Garage Runoff Area=1,728 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=0.34 cfs 1,253 cf

Subcatchment 6S: Driveway Runoff Area=1,357 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=0.27 cfs 984 cf

Subcatchment 7S: Prop-Front Runoff Area=66,625 sf 0.33% Impervious Runoff Depth=2.37"
Flow Length=445' Tc=14.8 min CN=46 Runoff=2.86 cfs 13,162 cf

Subcatchment 8S: Prop-Front-Garden-2 Runoff Area=8,426 sf 37.14% Impervious Runoff Depth=6.51"
Flow Length=84' Tc=2.9 min CN=80 Runoff=1.57 cfs 4,572 cf

Subcatchment 9S: Prop-Front-Garden-3 Runoff Area=7,882 sf 19.87% Impervious Runoff Depth=6.14"
Flow Length=84' Tc=2.9 min CN=77 Runoff=1.40 cfs 4,035 cf

Subcatchment 10S: Prop-Front-Stone-Storage Runoff Area=57,456 sf 4.18% Impervious Runoff Depth=2.72"
Flow Length=294' Tc=12.9 min UI Adjusted CN=49 Runoff=3.10 cfs 13,043 cf

Subcatchment 11S: Driveways Runoff Area=7,796 sf 75.63% Impervious Runoff Depth=7.97"
Tc=6.0 min CN=92 Runoff=1.49 cfs 5,181 cf

Pond 1P: Garden-1 Peak Elev=114.59' Storage=1,426 cf Inflow=1.27 cfs 5,017 cf
Discarded=0.02 cfs 1,418 cf Primary=1.11 cfs 2,524 cf Outflow=1.13 cfs 3,943 cf

Pond 2P: Driveway Trench #1 Peak Elev=103.01' Storage=326 cf Inflow=0.27 cfs 984 cf
Discarded=0.01 cfs 498 cf Primary=0.16 cfs 261 cf Outflow=0.17 cfs 759 cf

Pond 3P: Garden-2 Peak Elev=110.57' Storage=1,617 cf Inflow=1.57 cfs 4,572 cf
Discarded=0.03 cfs 1,516 cf Primary=0.93 cfs 1,877 cf Outflow=0.95 cfs 3,393 cf

Pond 4P: Garden-3 Peak Elev=107.14' Storage=1,884 cf Inflow=1.40 cfs 4,035 cf
Discarded=0.08 cfs 4,032 cf Primary=0.00 cfs 0 cf Outflow=0.08 cfs 4,032 cf

Pond 5P: Driveway Stone Storage Peak Elev=105.10' Storage=2,418 cf Inflow=3.10 cfs 13,043 cf
Discarded=0.60 cfs 11,322 cf Primary=1.30 cfs 1,728 cf Outflow=1.90 cfs 13,050 cf

Pond 6P: Driveway Trench #2 & #3 Peak Elev=102.64' Storage=2,516 cf Inflow=1.49 cfs 5,181 cf
Discarded=0.07 cfs 4,567 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 4,567 cf

Link 2L: Prop.- Rear Inflow=3.56 cfs 12,002 cf
Primary=3.56 cfs 12,002 cf

Link 3L: Prop-Front Inflow=3.89 cfs 16,767 cf
Primary=3.89 cfs 16,767 cf

Link 4L: Prop.-Total Inflow=7.13 cfs 28,768 cf
Primary=7.13 cfs 28,768 cf

Total Runoff Area = 189,271 sf Runoff Volume = 55,211 cf Average Runoff Depth = 3.50"
90.03% Pervious = 170,409 sf 9.97% Impervious = 18,862 sf

Summary for Pond 1P: Garden-1

Inflow Area = 10,698 sf, 33.21% Impervious, Inflow Depth = 5.63" for 100-Year event
Inflow = 1.27 cfs @ 12.14 hrs, Volume= 5,017 cf
Outflow = 1.13 cfs @ 12.22 hrs, Volume= 3,943 cf, Atten= 11%, Lag= 4.7 min
Discarded = 0.02 cfs @ 12.20 hrs, Volume= 1,418 cf
Primary = 1.11 cfs @ 12.22 hrs, Volume= 2,524 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 114.59' @ 12.22 hrs Surf.Area= 992 sf Storage= 1,426 cf

Plug-Flow detention time= 148.6 min calculated for 3,935 cf (78% of inflow)
Center-of-Mass det. time= 67.8 min (874.6 - 806.8)

Volume	Invert	Avail.Storage	Storage Description
#1	110.00'	1,846 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.00	585	0.0	0	0
112.00	585	40.0	468	468
113.50	585	10.0	88	556
114.50	980	100.0	783	1,338
115.00	1,050	100.0	508	1,846

Device	Routing	Invert	Outlet Devices
#1	Primary	114.40'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	110.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.20 hrs HW=114.58' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.05 cfs @ 12.22 hrs HW=114.58' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.05 cfs @ 1.15 fps)

Summary for Pond 2P: Driveway Trench #1

Inflow Area = 1,357 sf,100.00% Impervious, Inflow Depth = 8.70" for 100-Year event
Inflow = 0.27 cfs @ 12.09 hrs, Volume= 984 cf
Outflow = 0.17 cfs @ 12.18 hrs, Volume= 759 cf, Atten= 38%, Lag= 5.9 min
Discarded = 0.01 cfs @ 7.80 hrs, Volume= 498 cf
Primary = 0.16 cfs @ 12.18 hrs, Volume= 261 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 103.01' @ 12.20 hrs Surf.Area= 270 sf Storage= 326 cf

Plug-Flow detention time= 200.7 min calculated for 758 cf (77% of inflow)
Center-of-Mass det. time= 117.6 min (857.5 - 739.9)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	324 cf	**3.00'W x 90.00'L x 3.00'H Prismatoid** 810 cf Overall x 40.0% Voids
#2	103.00'	270 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) -Impervious
		594 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	270	0	0
104.00	270	270	270

Device	Routing	Invert	Outlet Devices
#1	Primary	103.00'	**50.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	100.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 7.80 hrs HW=100.04' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.06 cfs @ 12.18 hrs HW=103.01' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.06 cfs @ 0.21 fps)

Summary for Pond 3P: Garden-2

Inflow Area = 8,426 sf, 37.14% Impervious, Inflow Depth = 6.51" for 100-Year event
Inflow = 1.57 cfs @ 12.05 hrs, Volume= 4,572 cf
Outflow = 0.95 cfs @ 12.14 hrs, Volume= 3,393 cf, Atten= 39%, Lag= 5.4 min
Discarded = 0.03 cfs @ 12.14 hrs, Volume= 1,516 cf
Primary = 0.93 cfs @ 12.14 hrs, Volume= 1,877 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 110.57' @ 12.14 hrs Surf.Area= 1,101 sf Storage= 1,617 cf

Plug-Flow detention time= 183.9 min calculated for 3,386 cf (74% of inflow)
Center-of-Mass det. time= 98.5 min (894.4 - 795.9)

Volume	Invert	Avail.Storage	Storage Description
#1	106.00'	2,114 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
106.00	690	0.0	0	0
108.00	690	40.0	552	552
109.50	690	10.0	104	656
110.50	1,085	100.0	888	1,543
111.00	1,200	100.0	571	2,114

Device	Routing	Invert	Outlet Devices
#1	Primary	110.40'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	106.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.14 hrs HW=110.56' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.90 cfs @ 12.14 hrs HW=110.56' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.90 cfs @ 1.09 fps)

Summary for Pond 4P: Garden-3

Inflow Area = 7,882 sf, 19.87% Impervious, Inflow Depth = 6.14" for 100-Year event
Inflow = 1.40 cfs @ 12.05 hrs, Volume= 4,035 cf
Outflow = 0.08 cfs @ 13.85 hrs, Volume= 4,032 cf, Atten= 94%, Lag= 108.3 min
Discarded = 0.08 cfs @ 13.85 hrs, Volume= 4,032 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 107.14' @ 13.85 hrs Surf.Area= 1,415 sf Storage= 1,884 cf

Plug-Flow detention time= 245.5 min calculated for 4,025 cf (100% of inflow)
Center-of-Mass det. time= 244.9 min (1,047.4 - 802.5)

Volume	Invert	Avail.Storage	Storage Description
#1	103.00'	3,246 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	1,130	0.0	0	0
105.00	1,130	40.0	904	904
106.50	1,130	10.0	170	1,074
107.50	1,577	100.0	1,354	2,427
108.00	1,700	100.0	819	3,246

Device	Routing	Invert	Outlet Devices
#1	Primary	107.40'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	103.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.08 cfs @ 13.85 hrs HW=107.14' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 5P: Driveway Stone Storage

Inflow Area = 57,456 sf, 4.18% Impervious, Inflow Depth = 2.72" for 100-Year event
Inflow = 3.10 cfs @ 12.20 hrs, Volume= 13,043 cf
Outflow = 1.90 cfs @ 12.44 hrs, Volume= 13,050 cf, Atten= 39%, Lag= 14.7 min
Discarded = 0.60 cfs @ 12.44 hrs, Volume= 11,322 cf
Primary = 1.30 cfs @ 12.44 hrs, Volume= 1,728 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 105.10' @ 12.44 hrs Surf.Area= 10,734 sf Storage= 2,418 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 21.2 min (893.5 - 872.3)

Volume	Invert	Avail.Storage	Storage Description
#1	104.67'	12,699 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.67	10,600	0.0	0	0
105.00	10,600	40.0	1,399	1,399
106.00	12,000	100.0	11,300	12,699

Device	Routing	Invert	Outlet Devices
#1	Primary	105.05'	**50.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	104.67'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.60 cfs @ 12.44 hrs HW=105.10' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.60 cfs)

Primary OutFlow Max=1.30 cfs @ 12.44 hrs HW=105.10' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 1.30 cfs @ 0.57 fps)

Summary for Pond 6P: Driveway Trench #2 & #3

Inflow Area = 7,796 sf, 75.63% Impervious, Inflow Depth = 7.97" for 100-Year event
Inflow = 1.49 cfs @ 12.09 hrs, Volume= 5,181 cf
Outflow = 0.07 cfs @ 10.25 hrs, Volume= 4,567 cf, Atten= 95%, Lag= 0.0 min
Discarded = 0.07 cfs @ 10.25 hrs, Volume= 4,567 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 102.64' @ 14.57 hrs Surf.Area= 2,940 sf Storage= 2,516 cf

Plug-Flow detention time= 294.7 min calculated for 4,567 cf (88% of inflow)
Center-of-Mass det. time= 239.5 min (1,005.7 - 766.2)

Volume	Invert	Avail.Storage	Storage Description
#1	100.50'	2,940 cf	**3.00'W x 490.00'L x 2.50'H Prismatoid** x 2 7,350 cf Overall x 40.0% Voids
#2	103.00'	1,380 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) -Impervious
		4,320 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	1,380	0	0
104.00	1,380	1,380	1,380

Device	Routing	Invert	Outlet Devices
#1	Primary	103.00'	**300.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	100.50'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.07 cfs @ 10.25 hrs HW=100.54' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=100.50' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Link 2L: Prop.- Rear

Inflow Area = 41,086 sf, 13.75% Impervious, Inflow Depth = 3.51" for 100-Year event
Inflow = 3.56 cfs @ 12.20 hrs, Volume= 12,002 cf
Primary = 3.56 cfs @ 12.20 hrs, Volume= 12,002 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Summary for Link 3L: Prop-Front

Inflow Area = 148,185 sf, 8.92% Impervious, Inflow Depth = 1.36" for 100-Year event
Inflow = 3.89 cfs @ 12.38 hrs, Volume= 16,767 cf
Primary = 3.89 cfs @ 12.38 hrs, Volume= 16,767 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Summary for Link 4L: Prop.-Total

Inflow Area = 189,271 sf, 9.97% Impervious, Inflow Depth = 1.82" for 100-Year event
Inflow = 7.13 cfs @ 12.20 hrs, Volume= 28,768 cf
Primary = 7.13 cfs @ 12.20 hrs, Volume= 28,768 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Appendix C

NRCS Soils Resource Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Essex County, Massachusetts, Northern Part

185 Leslie Road - Rowley

November 2, 2022

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,460 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
52A	Freetown muck, 0 to 1 percent slopes	0.1	1.2%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	1.3	30.0%
421C	Canton fine sandy loam, 8 to 15 percent slopes, very stony	2.5	58.0%
421D	Canton fine sandy loam, 15 to 25 percent slopes, very stony	0.5	10.8%
Totals for Area of Interest		**4.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

Essex County, Massachusetts, Northern Part

52A—Freetown muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2q9
Elevation: 0 to 1,110 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Freetown

Setting

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

Typical profile

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

Properties and qualities

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

Interpretive groups

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

Minor Components

Whitman

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

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

Swansea

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

Scarboro

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

256A—Deerfield loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2xfg8
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Deerfield

Setting

Landform: Outwash terraces, outwash deltas, outwash plains, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

Ap - 0 to 9 inches: loamy fine sand
Bw - 9 to 25 inches: loamy fine sand

BC - 25 to 33 inches: fine sand
Cg - 33 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: About 15 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 11.0
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 7 percent
Landform: Outwash terraces, kame terraces, outwash deltas, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Wareham

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury

Percent of map unit: 2 percent
Landform: Outwash plains, kame terraces, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent
Landform: Kame terraces, outwash plains, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Hydric soil rating: No

421C—Canton fine sandy loam, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w814
Elevation: 0 to 1,160 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Canton, Very Stony

Setting

Landform: Moraines, ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Montauk, very stony
Percent of map unit: 6 percent
Landform: Recessionial moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Scituate, very stony
Percent of map unit: 5 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, very stony
Percent of map unit: 3 percent
Landform: Hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Swansea
Percent of map unit: 1 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

421D—Canton fine sandy loam, 15 to 25 percent slopes, very stony

Map Unit Setting
National map unit symbol: vj5c
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Canton

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable coarse-loamy eolian deposits over friable sandy and gravelly basal till derived from granite and gneiss

Typical profile

H1 - 0 to 6 inches: fine sandy loam
H2 - 6 to 33 inches: fine sandy loam
H3 - 33 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 18 to 36 inches to strongly contrasting textural stratification
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

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

Minor Components

Scituate

Percent of map unit: 10 percent
Hydric soil rating: No

Charlton

Percent of map unit: 5 percent
Hydric soil rating: No

Appendix D

Erosion Control and Stormwater Pollution Prevention Plan

Construction

Erosion Control and Stormwater Pollution Prevention Plan

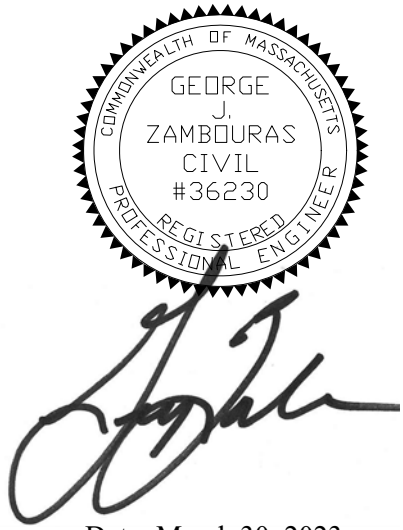
for

185 Leslie Road

Rowley, Massachusetts 01969

Prepared For

Sean R. Connolly, Representative of the Estate of John R. Connolly
278 Wethersfield Road
Methuen, MA 01844



Date: March 30, 2023

George J. Zambouras, P.E.
17 Noble Hill Road, Beverly, Massachusetts
(978) 922-0217

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Stormwater Pollution Prevention Plan

Site: 185 Leslie Road
Rowley, MA 01969

Owner: Name: Sean R. Connolly, Representative of the Estate of John R. Connolly

Address: 278 Wethersfield Road
Methuen, MA 01844

Operator - TBD

Preparation Date: March 30, 2023

SITE MANAGEMENT

I - CONSTRUCTION SEQUENCE

GENERAL
This construction sequence provides the Contractor with an order of construction that will ensure protection of abutting properties; minimize erosion and the transport of sediments. The individual objectives of the construction process described herein shall be considered an integral component of the project design intent for each project phase. The construction sequence is not intended to prescribe a definitive construction schedule or methods and shall not be interpreted as a construction specification document. The contractor shall use the construction sequence and techniques as a general guide and shall modify the suggested methods and procedures as required to best suit seasonal, atmospheric, and site specific physical constraints for the purpose of minimizing the environmental impact of construction.

SITE ACCESS
Construction site access will be confined to the proposed roadway entrance on Leslie Road. A secondary access from Meeting House Road may be used during the development of portions of the site.

INSTALLATION OF TEMPORARY EROSION CONTROL (TEC) DEVICES
The Contractor shall install TEC devices as required herein or deemed necessary by the Engineer and/or Municipal Inspector. If necessary, an area shall be selectively cut and cleared for the TEC devices. In general, use of existing trees to back hay bales and silt fence is encouraged. When all disturbed slopes have been stabilized, the accumulated silt shall be removed and re-used or disposed of off-site. The final site and roadway grades and geometry shall be as shown on the proposed improvement plans.

LIMIT OF WORK AND LOCATION OF TEMPORARY EROSION CONTROL (TEC) DEVICES
The limits of anticipated work and TEC devices locations are shown on the site plan in Section IV. TEC indicated along the roadway entrance shall be installed prior to the start of any work, to provide protection to the existing abutting properties. The remainder of the site TEC devices shall be installed immediately following tree cutting. All TEC devices shall be installed prior to the removal of topsoil.

CUTTING AND CLEARING
Clear and cut only trees that are within the limits of the construction of project side slopes, drainage and paved areas. Logged timber shall be removed from the site. Tree bases and slash shall be ground and chipped and stockpiled on site for use as temporary erosion control as well as for mulch to stabilize slopes and other exposed areas. No tree bases shall be buried on site. All remaining tree bases and slash shall be removed from the site. All exposed surfaces that will not be under immediate construction shall be stabilized.

DEMOLITION
No demolition of structures is necessary for this project.

GRUBBING AND STRIPING
Inspect positioning and condition of TEC devices to assure integrity and purpose. Adjust and supplement TEC devices as necessary to assure prevention of sediment transport. Remove balance of slash and stumps from site. Consideration should be given to additional grinding and chipping for creation of mulch and chips for slope stabilization. Remove all brush, scrub and roots. Remove same from site. Remove and stockpile

all topsoil upslope of TEC. Provide a solid secure ring of hay bales around the lower portion and sides of the stockpile leaving the upper side open to work from. Stabilize all exposed surfaces that will not be under immediate construction.

PROJECT ROUGH GRADING

Inspect positioning and condition of TEC devices to assure integrity and purpose. Adjust and supplement TEC devices as necessary to assure prevention of sediment transport. Perform cut and fill earthwork for project construction to rough subgrade. All excess and unusable material shall be removed from the site as soon as practicable. Stockpile excess material to be used in the course of construction upslope of the TEC devices. Imported material to be used in fill operations shall be stockpiled upslope of TEC devices. Stockpiles shall be located to ensure that any potential erosion is confined through the use of hay bales or silt barriers. Stabilize all exposed surfaces that will not be under immediate construction. Dress paved areas to finished level subgrade. Install stone sub-base in compacted lifts. Apply water as necessary to achieve proper compaction and to control air suspension of dust.

WALL CONSTRUCTION

Inspect positioning and condition of down-gradient TEC devices to assure integrity and purpose. Perform cut and fill earthwork for footings to rough sub-grade. All excess and unusable material shall be removed from the site as soon as practicable. Stockpile excess material to be used in the course of construction upslope of the TEC devices. Install wall base stones and sub-drain as indicated on the structural drawings. Wall stones shall be placed in layers with the indicated geotextile fabric grids as the roadway is bought up to sub-grade. The contractor shall re-grade and loam and seed the area between the wall base stones and TEC following the application of the second visible wall stone layer. This will ensure restoration of the disturbed area without requiring additional disruption following completion of the wall.

RIP RAP SLOPE

Inspect positioning and condition of down-gradient TEC devices to assure integrity and purpose. Riprap stones and geotextile fabric shall be placed as the roadway is bought up to sub-grade. The contractor shall re-grade and loam and seed the area between the riprap slope and TEC following the application of the first eight (8) vertical feet of rip rap slopping. This will ensure restoration of the disturbed area without requiring additional disruption following completion of the wall.

WORK IN EXISTING ROADWAYS

Contractor shall provide for police protection if deemed necessary by the local police department. Proper signage shall be installed to adequately warn local residents of construction or open excavations. When excavated pavement may cause a temporary blockage of roadways, all public safety officials, appropriate city departments and affected residents shall be notified a minimum of 72 hours in advance of construction. Excavations shall be performed in a manner that allows the passage of safety vehicles at all times. Excavated paved areas shall be made passable to local residents upon the completion of days work through the use of steel plates or backfilling of the trench. Upon completion of construction within the existing roadway, the roadway shall be re-paved as soon as practicable.

UTILITY INSTALLATION

Inspect positioning and condition of TEC devices to assure integrity and purpose. Adjust and supplement TEC devices as necessary to assure prevention of sediment transport. Complete the installation of the of the drainage system. Install drain lines, infiltration chambers, catch basin frames, and grates per plan. The catch basins should be set with a temporary grate setting at a grade that will allow them to receive ponded run-off during construction. Install temporary erosion control and sediment receiving area around the catch basins. Catch basins shall be equipped with appropriate silt traps during construction.

DRAINAGE SYSTEM (as applicable)
Install all drainage system components making final adjustments as necessary for all catch basin frames, and grates. Clean and remove any sediment from all catch basins, drain lines and swales upon completion of work. Install all hoods and grease traps in catch basins.

PAVEMENT BASE COURSE CONSTRUCTION
Fine grade and compact sub-base to design grades. Install pavement base course. Upon completion of base course, restore hay bale rings around catch basins receiving run-off. Maintain hay bales and silt traps until application of final pavement and completion of all work.

LOT DEVELOPMENT
Inspect positioning and condition of TEC devices to assure integrity and purpose in vicinity of lot. Complete remaining cut and fill earthwork to bring lot to sub-grade, following procedures previously indicated in Project Rough Grading.

CURB AND SIDEWALK CONSTRUCTION (as applicable)
Install curbing as shown on the plans. Install curb cuts for driveway. Prepare finished sub grade and gravel subbase and install pavement for sidewalks and driveway.

FINISHED SLOPE CONSTRUCTION, FINISHED GRADING, SLOPE STABILIZATION, TOPSOIL AND SEEDING
Inspect positioning and condition of TEC devices to assure integrity and purpose. Adjust and supplement TEC devices as necessary to assure prevention of sediment transport. Complete all finished grading and slope construction including all grass and rip-rap slopes. Apply loam and seed and stabilize all exposed surface areas and slopes. When loam and seed areas are completed outside of the growing season mulch shall be installed on all areas subject to erosion. All areas shall be seeded as soon as possible. TEC devices shall remain in place until seed has established through one growing season.

PLANTINGS
Inspect positioning and condition of TEC devices to assure integrity and purpose. Adjust and supplement TEC devices as necessary to assure prevention of sediment transport. Install plantings.

FINAL SURFACE
Inspect positioning and condition of TEC devices to assure integrity and purpose. Adjust and supplement TEC devices as necessary to assure prevention of sediment transport. Repair any damaged side slopes, curbs, other. Adjust any drainage structures as necessary to finish grade. Install finish gravel surface course.

FINAL CLEAN-UP
Clean Inverts of culverts and catch basins. Remove sediment and debris from site. Repair side slopes as necessary. Remove all construction debris from site. Remove all TEC devices in areas where permanent vegetation and erosion control has been established. Secure and supplement TEC devices in areas where permanent vegetation and erosion control has yet to be established. Install signs as applicable; supplement finished loam and seeding as required. TEC devices protecting seed areas adjacent to abutting properties shall remain in place until seed has established through one growing season.

II - BEST MANAGEMENT PRACTICES (BMP'S)

BMP'S FOR EROSION AND SEDIMENTATION CONTROL

GENERAL

The BMP's to be used during project construction are to prevent the generation of erosion products and their transport to environmentally and off-site sensitive areas. Environmentally and off-site sensitive areas include all designated resource areas, those areas of the site that do not need to be altered for development purposes and all off-site abutting properties and roadways. The primary BMP is to maintain an organized, smooth flowing and rapid Construction Sequence as outlined. Coupled with the continuous monitoring of TEC devices and their integrity, this rapid construction process should result in prompt stabilization of surfaces thereby reducing erosion potential. The Contractor is responsible for maintaining the Construction Sequence subject to seasonal, atmospheric and site specific physical constraints. A second important BMP is the prevention of concentrated water flow. Sheet flow does not demonstrate the erosive potential of concentrated channels. The Contractor is therefore encouraged to apply construction methods which will promote sheet flow with concentrated shallow channel flow paths only as necessary. The Contractor shall be solely responsible for erosion and sedimentation control on site. The Contractor shall use a method of operation and construction and all necessary erosion and sedimentation control measures, even if not specified herein or on the plans, to minimize erosion damage on and off site. The BMPs to follow should be used as a guide for erosion and sedimentation control and do not replace the practice of good judgment, common sense and thoughtful environmentally sensitive construction practices.

2.1 Minimize Disturbed Area and Protect Natural Features and Soil

To minimize disturbed areas, all work will be completed within defined work limits. These work limits are shown on the site plans included with this submission. The Contractor will be responsible to make sure that all workers know the proper work limits and do not extend their work outside the limits of work or into abutting properties. The protective measures to ensure this protection are described in more detail in the following sections.

2.2 Control Stormwater Flowing onto and through the project.

The Contractor will be required to install compost mulch filter tubes along the perimeter of the work area as shown on the plans.

2.3 Stabilize Soils

The Contractor shall limit the area of land which is exposed and free from vegetation during the project. Disturbed soils outside of active work areas that will be exposed for longer than two weeks shall be stabilized to prevent erosion and the transport of sedimentation to off-site areas.

Stabilization of surfaces shall be an ongoing process. Stabilization of surfaces includes the placement of hay, mulch and the establishment of vegetated surfaces. Upon the completion of construction, all surfaces shall be stabilized.

2.4 Proper storage and cover of material stockpiles.

The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site. Earth product stockpiles shall be consolidated and placed within the rear of the site at locations where sediments will not be transported off-site when possible.

Adequate measures for erosion and sediment control, such as the placement of compost mulch filter tubes around the downstream perimeter of stockpiles, shall be employed to protect any downstream off-site areas from sediments, as necessary.

2.5 Perimeter Controls and Sediment Barriers

Erosion control lines as described in Section 5 will be utilized to ensure that no sedimentation occurs outside the perimeter of the work area.

2.6 Storm Drain Inlet Protection

Storm drain inlet protection is not required as no catch basin or drainage system is proposed or located within or adjacent to the site.

2.7 Retain Sediment On-Site

The Contractor will be responsible for monitoring all erosion control measures. Whenever necessary, the Contractor will clear all sediment from the compost mulch filter tubes. Daily monitoring should be conducted using the attached Inspection Form.

2.8 Cutting and Clearing

Vehicles used in the wood clearing process shall not travel through running water. As the clearing process continues, the movement of vehicles shall be limited, as much as possible, to the area of development. Trees shall be felled directly down or up slope to prevent the diversion and concentration of storm water runoff around the trunks. Wheel ruts shall be filled in and graded to prevent concentration of storm water runoff. Vehicle tracks leading downhill shall be blocked during period of intense precipitation by hay bales, dikes, crushed stone filter dams or silt fences which shall be constructed to entrap the sediment. All timber and cordwood shall be used for its value; consideration shall be given to chipping of brush and branches that generate wood chip mulch for the use in stabilization of disturbed surfaces. No spoil (e.g., tree stumps) shall be disposed of by burying.

2.9 Construction Entrance

A temporary construction entrance shall be installed at the proposed roadway entrance. The entrance construction entrance shall be maintained as a crushed stoned entrance until completion of the roadway binder coat.

2.10 Grubbing, Stripping and Grading

Erosion control devices shall be in place before grading commences. As much topsoil as possible shall be reclaimed for on-site use. Striping shall be done in a manner which will not concentrate runoff. If precipitation is expected, earthen berms shall be constructed around the area being stripped, with a silt fence, hay bale dikes located in an arc at the low point of the berm. If intense precipitation is anticipated, hay bales

dikes and/or silt fences shall be used as required to prevent erosion and sediment transport. The materials required shall be stored on site at all times. If water is required for soils compaction, it shall be added in a uniform manner that does not allow excess water to flow off the area being compacted. Dust should be held at a minimum by sprinkling exposed soil with an appropriate amount of water.

2.11 Maintenance of Disturbed Surfaces

Runoff shall be diverted from disturbed side slopes in both cut and fill. Mulching may be used for temporary stabilization. Hay bale dikes or silt fences shall be set where required to trap products of erosion and shall be maintained on a continuing basis during the construction process.

2.12 Loaming

Loaming and seeding of slopes shall be an ongoing construction process and is not limited to any one phase of construction. Loam shall not be placed unless it is to be seeded directly thereafter. All disturbed areas shall have a minimum of 4" of loam placed before being seeded and mulched. Consideration should be given to hydro-mulching, especially on slopes in excess of 3 to 1. Loamed and seeded slopes shall be protected from washout by mulching or other acceptable slope protection until vegetation beings to grow.

2.13 Storm Water Collection System Installation

A temporarily sedimentation basins shall be installed in the area of the riprap sloping until the drainage system is installed and made operational. The basin shall be cleaned periodically during construction. The storm water infiltration system shall be installed in a manner which will not allow run-off from disturbed areas to enter the chambers during construction. Excavations for the drainage system shall not be left open when rainfall is expected overnight. If left open under other circumstances, pipe ends should be closed by a staked board or by an equivalent method. All catch basin openings shall be covered by filter fabric placed between the grate and the frame and protected from heavy sediment by staked hay bales surrounding the catch basin grate. Manholes and catch basins shall be periodically inspected during construction and immediately following heavy rainfalls for accumulation of sediment. Manholes and catch basin sumps shall be cleaned as necessary during construction to insure the prevention of siltation of infiltration structures and abutting property.

2.14 Stabilization of Surfaces

Stabilization of surfaces shall be an ongoing process. Stabilization of surfaces includes the placement of pavement, rip rap, wood bark mulch and the establishment of vegetated surfaces. Upon the completion of construction all surfaces shall be stabilized even though it is apparent that future construction efforts will cause their disturbance. Vegetated cover shall be established during the proper growing season and should be enhanced by soils adjustment for proper pH, nutrients and moisture content. Surfaces that are disturbed by erosion processes, vandalism or by construction shall be stabilized as soon as possible. Hydro-mulching of grass surfaces is recommended; especially it seeding of the surfaces is required outside the normal growing season. Hay mulch, if used, must be properly secured.

2.15 Non-Stormwater Discharges

It is anticipated that trenches for utility installation may need to be dewatered during construction depending upon timing and seasonal conditions. Any discharges will be directed away from abutting properties or areas within wetland jurisdiction whenever possible. All discharges will be treated prior to discharge or directed to appropriate BMPs to ensure proper treatment. When necessary, temporary settling basins and sedimentation barriers shall be constructed to prevent erosion and sedimentation during dewatering operations.

BMP'S POST-CONSTRUCTION

DRAINAGE STRUCTURES AND PIPES
After construction is complete all drainage structures and pipes should be inspected, and all sediments shall be removed and properly disposed of.

SUGGESTED SEEDING MIXTURE AND APPLICATION RATE
The seed bed should be prepared by conducting a soils test and fertilizing as required. When a soils test is not available, the following minimum amount should be applied:

Limestone, 2 tons per acre.
Nitrogen, (N). 40 lb. per acre or 1 lb. per 1000 square feet.
Phosphate (P205) 80 lb. per acre or 2 lb. per 1000 square feet.
Pot Ash (K20) 80 lb. per acre or 2 lb. per 1000 square feet.

Roadway slopes shall be seeded using New England Roadside Matrix Upland Seed Mix and detention basin slopes shall be seeded using New England Conservation Wildlife Seed Mix in the location and at the rates specified on the drawings. All non-specified disturbed areas shall be seeded as follows:

The following seed mix (State Slope Mix) shall be applied at the rate of 200 lb. per acre:

5% Red Top
50% Creeping Red Fescue
5% Lindino Clover
30% Kentucky Tall Fescue
10% Annual Rye

Seed should be spread uniformly by the method most appropriate for the site. Methods include broadcasting, drilling and hydro-seeding. Hydro-seeding is the preferred method of seeding. The soil should be rolled or packed after seeding if possible. All legumes (Crown Vetch, Birdsfoot Trefoil and Clovers) must be inoculated. Once seeded areas have been mulched, plantings may be placed from early Spring to late October. If seeded areas are not mulched, planting should be made from early Spring to June 20th or between August 1st and September 15th. Plantings made after mid-November must be mulched. If required, hay, straw or other mulch should be applied immediately after seeding. For hydro-seeding, a tackifier heavy mulch at the rate of 1500 lb. per acre shall be applied. Planted areas should be protected from damage. Fertilization requirements during the establishment period may be determined by on-site inspections.

BMP'S CONSTRUCTION REQUIREMENTS

SEDIMENTATION BARRIER CONSTRUCTION REQUIREMENTS
Silt socs will be installed as indicated on the plans and will be staked in accordance with the manufacture's specifications. Where two sections of barriers adjoin, they shall be overlapped by one foot and staked.

TEMPORARY SEDIMENTATION BASIN
When used temporary sedimentation basins shall be constructed in an area down-gradient from the majority of construction activities. The basin shall be of sufficient size to permit the settlement of solids during periods of runoff. The down-gradient edge of the basin shall be lined with ¾" crushed stone to further filter runoff prior to discharge.

CONSTRUCTION ENTRANCE
The stoned entrance shall be constructed of 2" to 4" crushed stone and forty (40) feet in length or as detailed on the drawings.

MULCH NETTING
Mulch netting shall be used when loam and seed areas are at final grade outside of the growing season.

BMP'S MAINTENANCE REQUIREMENTS

GENERAL
BMPs shall be inspected during and after each major storm event.

SEDIMENTATION REMOVAL
Where sediment removal is indicated for BMP maintenance, the sediment shall be disposed of in a suitable area that is outside wetland jurisdiction and is not susceptible to re-suspension of sediments by flowing water.

SEDIMENTATION BARRIER
Inspect weekly for signs of damage, repairing and/or replacing hay bales or silt fence as needed.
Remove any silt accumulations that exceed half the height of the barrier.
For construction exceeding one season, replace hay bales that have decomposed and silt fence that has deteriorated due to ultraviolet rays. (It is usually preferable to leave the original barrier and install a new set of barriers in front (upgradient/construction side) of the existing barriers.)

TEMPORARY SEDIMENTATION BASIN
Inspect weekly and following major storm events for signs of excess siltation or clogging of stone discharge.
Remove sediments and top dress with new stone or replace completely as appropriate.

STABILIZED CONSTRUCTION ENTRANCES & CONSTRUCTION ROAD STABILIZATION
Inspect weekly for signs of clogging and top dress with new stone or replace completely as appropriate.
Install additional stabilized construction entrances wherever new road construction is initiated that departs from road construction that has been stabilized with asphalt binder coat.

INFILTRATION CHAMBER PROTECTION (as applicable)
Inspect drainage system structures weekly or following large storm events for accumulation of sediments.
Remove any silt accumulations that exceed one-third to one-half of the sumps of the structures.

TEMPORARY SEEDING
Inspect weekly for signs of germination or erosion.
Repair/reseed any exposed soils that do not germinate in approximately 14 or less depending upon seed mix used. (Annual ryegrass can germinate in as little as three days under ideal conditions.)
Mow seeded areas if weeds become excessive.

MULCH NETTING
Inspect weekly for signs of germination (assuming permanent seeding) or erosion.
Repair any channel erosion and/or blanket mulch dislodged by flowing water.
Repair/reseed any exposed soils that do not germinate in approximately 14 or less depending upon seed mix used.
If permanent seeding has taken place, mow vegetated areas if weeds become excessive.

DUST CONTROL
Inspect weekly for signs of potential wind erosion.
Spray water (daily as needed) or calcium chloride on gravel roadways.
Spray water or blow mulch hay on exposed soils as needed.
Apply temporary seed mixtures to exposed soils and/or stockpiles.

SOIL STOCKPILING
Inspect weekly for erosion.
If soil stockpiles remain undisturbed for 30 day or more, install erosion control barriers around base of pile and/or apply temporary seed mixture to stockpile.
If soil stockpiles become subject to concentrated flow, relocate soil stockpiles to secure area.

MAJOR STORM EVENT
For the purposes of this program, a major storm event is defined as 2.0 inches or more of rain in 24 hours or less.

III - CONSTRUCTION SITE MANAGEMENT

GENERAL
In addition to the storm water management and erosion control methods discussed above, responsible construction site management is required to minimize the transport of sediment and non-sediment related pollutants from entering storm water runoff.

EQUIPMENT AND VEHICLE MANAGEMENT

MAINTENANCE
Specific areas shall be designated for equipment and vehicle maintenance and repair. Maintenance areas shall include appropriate waste receptacles for spent gasoline, oil, grease, and solvents.

WASHDOWN
Specific areas shall be designated for equipment and vehicle washdowns. Wash down areas shall be located on sections of the site that drain to regularly maintained sediment and non-sediment pollution control devices designed to accommodate such discharges.

DUST AND MUD CONTROL
The contractor shall provide positive controls to minimize dust from construction activities on this site. All dust and mud control measures shall be as approved by the Municipality. The contractor shall use the existing entrance for access to the site. Excess mud from construction activities shall be swept off of streets as necessary.

MATERIAL STORAGE AND USE

PESTICIDES
Pesticides shall be stored in a dry area that is protected from precipitation. Pesticides shall be handled as infrequently as possible. The manufacturers' recommendations as well as all applicable local, State, and federal regulations shall be strictly followed when pesticides are handled.

FERTILIZERS
Application of fertilizer shall be limited to minimum required area and amount. More frequent, lower applications are preferable to infrequent high application rates. After application, fertilizer shall be worked into the soil where feasible.

PETROLEUM PRODUCTS
Fueling vehicles and petroleum products including oil, gasoline, lubricants, and asphalt materials shall be stored in covered areas where feasible. Routinely maintain on-site equipment and vehicles to prevent leakage of gas, oil or lubricants.

HAZARDOUS MATERIALS
Hazardous materials include but are not limited to paints, acids, solvents, soil stabilization chemicals, concrete admixtures and other materials that have been mixed with hazardous substances. All hazardous materials shall be stored in a dry area protected from precipitation. The manufactures' recommendations as well as all applicable local, State, and federal regulations shall be strictly followed when hazardous materials are handled, transported, applied, or disposed of.

RAW MATERIALS
Storage areas for raw materials used in construction that can be carried by storm water runoff shall be located only in areas which drain to retention-type sedimentation control devices.

WASTE DISPOSAL

CONSTRUCTION WASTE
Construction waste may include but is not limited to trees, stumps, shrubs, scrap or surplus building materials, demolition material, and packaging material. Designated waste collection areas shall be established at locations convenient to site workers. Receptacles shall be of adequate capacity to hold waste accumulated between collection times. Receptacles shall be covered or otherwise protected from precipitation.

WASTE CONCRETE
Excess concrete and wash water from concrete trucks shall be disposed of in a manner that prevents contact between these materials and storm water that shall be used to contain waste concrete and wash water until it hardens and can be properly disposed of.

SANITARY FACILITIES
Temporary sanitary facilities shall be provided on-site in convenient locations for site workers. Sanitary facilities shall be adequately maintained to prevent contact between associated wastes and storm water runoff.

ALLOWABLE NON-STORMWATER DISCHARGE MANAGEMENT

There will be no non-permitted non-storm water discharges associated with this project. Specifically prohibited are the discharges of process waters, non-contact cooling water and sanitary wastewater via the storm water drainage system. Naturally occurring waters on the site may be routed off-site via the storm water drainage system, and that system may also carry waters from firefighting activities, irrigation, water flushings, uncontaminated groundwater, and paving wash-down waters containing no detergent or hazardous materials, provided these uses are incorporated into this plan.

If groundwater discharge is necessary, water will be directed to the temporary water quality swales for settlement of solids and treatment prior to discharge.

Type of Allowable Non-storm water Discharge	Anticipated
Discharges from emergency fire-fighting activities	N
Fire hydrant flushings	N
Landscape irrigation	Y
Waters used to wash vehicles and equipment	N
Water used to control dust	Y
Potable water including uncontaminated water line flushings	N
Routine equipment wash down	Y
Pavement wash waters	N
Uncontaminated air conditioning or compressor condensate	N
Uncontaminated, non-turbid discharges of ground water or spring water	N
Foundation or footing drains	N
Construction dewatering water	Y

FOR EROSION CONTROL PLAN CONPONENTS AND PLACEMENT REFER TO SITE DRAWINGS

Appendix E

Post Construction Stormwater Operation and Maintenance Plan

Post Construction StormWater

Maintenance Operation and Plan

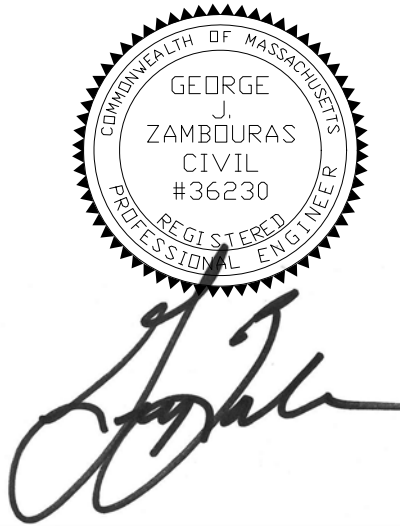
for

185 Leslie Road

Rowley, Massachusetts 01969

Prepared For

Sean R. Connolly, Representative of the Estate of John R. Connolly
278 Wethersfield Road
Methuen, MA 01844



Date: April 25, 2023

George J. Zambouras, P.E.
17 Noble Hill Road, Beverly, Massachusetts
(978) 922-0217

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Stormwater Pollution Prevention Plan

Site: 185 Leslie Road
Rowley, MA 01969

Owner: Name: Sean R. Connolly, Representative of the Estate of John R. Connolly

Address: 278 Wethersfield Road
Methuen, MA 01844

Operator - TBD

Preparation Date: April 25, 2023

Post Construction Operation and Maintenance Plan

POST CONSTRUCTION MAINTENANCE RESPONSIBILITIES

Long-term post construction operation, monitoring and maintenance of the drainage system BMP's will be the responsibility of the site property owner or Homeowners Association (if any). All maintenance inspections, cleaning and repair logs should be maintained by the Owner and\or Association. The following is a recommended maintenance program for the installed devices.

GENERAL CONDITIONS

- Inspection and maintenance logs shall be performed for BMP's in accordance with the requirements indicated below
- Bi-annual inspection and maintenance logs for the site shall be prepared annually.
- A copy of all maintenance inspections, cleaning and repair logs shall be submitted to city officials annually by or on January 1st.
- A rain event shall be considered a major storm event when rainfall exceeds 2 inches in a 24 hour period.
- In the event any road at the site experiences a chemical release equal to or greater than five (5) gallons, the property owners shall immediately remediate the spill, and notify the Local Board of Health and Mass Department of Environmental Protection.

SITE AND DRAINAGE SYSTEM BMPs

SNOW MANAGEMENT

It is recommended winter snow operations are managed as follows:

- Snow storage shall not be stored within the water quality swale, detention basin or rain garden.
- Snow storage shall be managed to prevent blockage of the stoned filter strips, inlets and outfalls, water quality swale and detention basin, the sedimentation basins and water quality swales. Snow combined with sand and debris may block a storm drainage system, diminish the infiltration capacity of the system and causing localized flooding.
- Sand and debris deposited on the paved roadway areas shall be cleared from the site and properly disposed of at the end of the snow season, no later than May 30.

DRIVEWAY STONED STORAGE AND STONE FILTER STRIPS

- The access roadway and rain garden stoned filter strips shall be inspected annually and after major storms for accumulation of debris and sediments.
- The top layer of stone shall be kept free of debris and yard waste; and removed as observed.
- Areas found to be clogged shall be removed and replaced to a depth necessary to assure proper functioning of the filter strip.

RAIN GARDEN

- Rain gardens should be inspected following major rain events for displaced mulch and repaired as needed
- Inspect and remove trash monthly
- Mulch, fertilize, remove dead vegetation and prune – annually
- Replace dead plants as needed