ASE
Andrews Survey & Engineering, Inc.
Land Surveying - Civil Engineering - Site Planning

ENTERING
EST. 1870
NORFOLK

STORMWATER MANAGEMENT REPORT

November 27, 2019

Project:
Lakeland Hills
A Townhouse Community
144 Seekonk Street
Norfolk, MA 02056

Assessors Map/Lot:
Map 23, Block 76, Lot 71

Owner / Applicant:
Lakeland Hills, LLC
136 Seekonk Street
Norfolk, MA 02056

Representative:
Andrews Survey & Engineering, Inc.
104 Mendon Street
Uxbridge, MA 01569

ASE JN: 2015-219

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Norfolk, MA

November 27, 2019

Prepared for:

Lakeland Hill, LLC
136 Seekonk Street
Norfolk, MA 02056

Prepared by:

Andrews Survey & Engineering, Inc.
P.O. Box 312, 104 Mendon Street
Uxbridge, MA 01569

ASE Project #2015-219

Prepared by: Kristen LaBrie
Kristen N. LaBrie, EIT

Reviewed by: 11/27/19
Richard M. Mainville, P.E.

PART I - SUMMARY

1.0 Introduction

Existing Conditions

The site is located on the east side of Seekonk Street in the vicinity of the intersection with Cleveland Street, approximately 1.5 mile north/northeast of Route 115 in Norfolk, MA. The project address is 144 Seekonk Street and has a total area of 21.22± acres. The site primarily consists of undeveloped forest land comprised of mature trees. Single-family residential properties abut on the southern and western boundaries that front on Seekonk Street; single-family residential properties abut on the northern boundary that front on Seekonk Street and Stop River Road; residential properties abut on the eastern boundary with land owned by the Town of Norfolk beyond that. The property is further identified on the Norfolk Assessor Tax Map 23, Block 76, Lot 71. Seekonk Street has a pavement width of 22 feet.

Post Development Conditions

The proposed site is a 40B residential development. Lakeland Hills is An eighty-four (84) unit townhouse community consisting of forty-eight (48) single units and eighteen (18) duplex style dwelling units with available town water, an on-site sewage disposal system and associated utilities and earthwork. The proposed project has and entrance the goes to a round-about to allow for easy turnaround and bus pick up. From the roundabout there is one main road that loops around and back to a t-intersection, with a stop sign. There is a proposed septic area in the southern side of the site. There are four (4) proposed stormwater basins to handle the runoff from the site. The stormwater is collected through catch basins and piped underground to the stormwater basins. The proposed topography is to bring down some of the various onsite high points. The proposed topography ranges from 250 to 164. There is one proposed wetland crossing onsite in the southeast portion of the site.

2.0 Background Data

Soils explorations were performed on the property by Andrews Survey & Engineering, Inc. in August 2017 and test pit data has been provided on the site plan. Additional soil exploration and installation of monitoring wells was completed in October 2019 performed by Daniel O'Driscoll. These locations are included in the site plan as well. The observed material on site at the test pit locations is identified generally as loamy sand and sand classification below the top and sub-soil layers. The U.S. Natural Resources Conservation Service (NRCS), formerly SCS Soil Survey Maps indicate that soils with hydrologic soil group classification B and D are present on the site, see Part IV of this report. The observed soil classification differs from the mapped soil classification in the area where test pits were conducted. The observed soil classifications (Soil group A) were utilized in the pre and post stormwater model and the design of the infiltration basins as shown in the HydroCAD model enclosed herein.

3.0 Stormwater Compliance

Standard 1 – No Untreated Discharges or Erosion to Wetland

No new stormwater conveyances (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

Standard 2 – Peak Rate Attenuation

Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. Evaluation of 100-year 24-hour storm to determine if off-site flooding will result for peak discharges from this storm.

The following table is a summary of the hydrologic calculations performed using HydroCAD© v.10.0 an USSCS TR-20 modeling system.

Peak Flow Summary Tables
Analysis Points analyzed are as follows: Seekonk St (AP1), Offsite-West (AP2), Offsite South-East (AP3), Offsite-North (AP4), Offsite-East (AP5), and Offsite-South (AP6)

Stormwater Peak Rate Summary Table				
Analysis Point	**2-year, 24-hour Storm (3.20 inches)**	**10-year, 24-hour Storm (4.70 inches)**	**25-year, 24-hour Storm (5.50 inches)**	**100-year, 24-hour Storm (6.70 inches)**
Pre-development Seekonk St (AP1)	0.00 cfs	0.00 cfs	0.00 cfs	0.01 cfs
Post-development Seekonk St (AP1)	0.02 cfs	0.08 cfs	0.12 cfs	0.18 cfs
Rate Decrease	***+0.02 cfs***	***+0.08 cfs***	***+0.12 cfs***	***+0.17 cfs***
Pre-development Offsite-West (AP2)	0.00 cfs	0.00 cfs	0.01 cfs	0.08 cfs
Post-development Offsite-West (AP2)	0.00 cfs	0.00 cfs	0.00 cfs	0.00 cfs
Rate Decrease	***-0.00 cfs***	***-0.00 cfs***	***-0.01 cfs***	***-0.08 cfs***
Pre-development South-East (AP3)	0.00 cfs	0.00 cfs	0.07 cfs	0.40 cfs
Post-development South-East (AP3)	0.00 cfs	0.02 cfs	0.07 cfs	0.41 cfs
Rate Decrease	***-0.00 cfs***	***+0.02 cfs***	***-0.00 cfs***	***+0.01 cfs***
Pre-development Offsite-North (AP4)	0.00 cfs	0.00 cfs	0.00 cfs	0.03 cfs
Post-development Offsite-North (AP4)	0.00 cfs	0.00 cfs	0.02 cfs	0.09 cfs
Rate Decrease	***-0.00 cfs***	***-0.00 cfs***	***+0.02 cfs***	***+0.06 cfs***
Pre-development Offsite-East (AP5)	0.00 cfs	0.00 cfs	0.01 cfs	0.07 cfs
Post-development Offsite-East (AP5)	0.00 cfs	0.01 cfs	0.02 cfs	0.13 cfs
Rate Decrease	***-0.00 cfs***	***+0.01 cfs***	***+0.01 cfs***	***+0.06 cfs***
Pre-development Offsite-South (AP6)	0.00 cfs	0.00 cfs	0.02 cfs	0.10 cfs
Post-development Offsite-South (AP6)	0.00 cfs	0.00 cfs	0.01 cfs	0.07 cfs
Rate Decrease	***-0.00 cfs***	***-0.00 cfs***	***-0.01 cfs***	***-0.03 cfs***

This table shows no increase in offsite runoff for 2, 10, 25 and 100-year storm events. Increases equal to or less than 0.1 cfs are considered negligible.

Infiltration ponds 1 and 2 were also analyzed using an 8.5", 24-hr storm to ensure their sizing was adequate for a large storm event exceed the 100-yr storm (6.7").

Infiltration Basin 1 has a berm elevation of 216.0, in an 8.5" storm event the peak elevation of water reaches an elevation of 214.48. There would be 1.52' of separation between max water elevation and top of the basin.
Infiltration Basin 2 has a berm elevation of 222.0, and an emergency overflow weir at elevation 221.0, in an 8.5" storm event the peak elevation of water reaches an elevation of 219.90. There would be 1.10' of separation between max water elevation and the emergency weir.

Standard 3 – Stormwater Recharge
Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to the maximum extent practicable. The annual recharge from the post-development site should approximate the annual recharge from the pre-development or existing site conditions, based on soil types.

The prescribed stormwater runoff volume to be recharged to groundwater has been determined using the hydrologic soil classification and the proposed post development increase in impervious area:

Hydrologic Group	***Volume to Recharge (x Total New Impervious Area)***
A 0.60 inches of runoff	273,441 SF x (0.6/12) = 13,672 CF
B 0.35 inches of runoff	No B soils were found on site
C 0.25 inches of runoff	No C soils were found on site
D 0.10 inches of runoff	No D soils were found on site

The total infiltration volume provided in the proposed Stormwater Basins provides a volume of approximately 107,360 cubic feet.

Capture Area Adjustment
Total Recharge volume required: 13,672 CF
New Impervious areas that drain to recharge areas: 273,441 SF
Total New Site Impervious/Impervious to Infiltration = 1.0
Total adjusted recharge needed= 13,672 x 1.0 = 13,672 CF
107,360 cf provided

Drawdown Within 72 Hours
To determine whether an infiltration BMP will drain within 72 hours, the following formula must be used:

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

Where:
Rv= Storage Volume
K = Saturated Hydraulic Conductivity For "Static" and "Simply Dynamic" Methods
Bottom Area = Bottom Area of Recharge Structure

Infiltration Basin 1 *Time = 6,983 cf/(8.27in/hr x 1/12ft/in x 381 sf)*

26.6 hours required to fully draw down

Infiltration Basin 2
Time = 13,891 cf/(8.27in/hr x 1/12ft/in x 1,702 sf)
11.8 hours required to fully draw down

Time = 17,425 cf/(8.27in/hr x 1/12ft/in x 1,221 sf)
20.7 hours required to fully draw down

Infiltration Basin 4
Time = 68,686 cf/(8.27in/hr x 1/12ft/in x 4,076 sf)
24.5 hours required to fully draw down

Infiltration Basin 3

Standard 4 - Water Quality Treatment Volume

For new development, stormwater management systems must be designed to remove 80% of the average annual load (post-development conditions) of Total Suspended Solids (TSS). It is presumed that this standard is met when:

a) *Suitable nonstructural practices for source control and pollution prevention are implemented;*
b) *Stormwater management best management practices (BMPs) are sized to capture the prescribed runoff volume; and*
c) *Stormwater management BMPs are maintained as designed.*

V_{wq}=(D_{wq}/12 inches/ ft) x (A_{imp} x 43,560 sf/ acre)
V_{wq}=Required Water Quality Volume (cf)
D_{wq}=Required Water Quality Depth: 1 inch for discharges within a Zone II or Interim Wellhead Protection Area, to or near another critical area, runoff from LUHPPL, or exfiltration to soils with infiltration rate greater than 2.4 inches/hour or greater, ½ inch for discharges near or to other areas.
A_{imp}= Impervious Area (acres)

Infiltration Basin 1
V_{wq}= (1 in/12 inches/ ft) x 8,529 sf)
711 cf is required
***866 cf** provided in the Sediment Forebay*

Infiltration Basin 2
V_{wq}= (1 in/12 inches/ ft) x 14,934 sf)
1,245 cf is required
***1,303 cf** provided in the Sediment Forebay*

Infiltration Basin 4
V_{wq}= (1 in/12 inches/ ft) x 100,978 sf)
8,415 cf is required
***8,800 cf** provided in the Sediment Forebay*

Downstream Defender 1 (DD1)
Infiltration Basin 3
WQV = 1 inch
A_{IMP} = 51,316 sf = 0.0018407082 sq. mi.
t_c = 6.0 min = 0.1 hours
q_u = 752 csm/in (from MassDEP Q Rate Table for 1" WQV)
*Q_1 = (752 csm/in) * (0.0018407082 mi^2)* (1 inch) = 1.38 cfs*

Downstream defender 6 ft diameter has a treatment capacity of 8.0 cfs.

Standard 5 – Land Uses with High Potential Pollutant Loads

Stormwater discharges from areas with higher potential pollutant loads require the use of specific stormwater management BMPs. The use of infiltration practices without pretreatment is prohibited.

The proposed use is not considered a use with a higher potential pollutant load as defined by the Stormwater Management Standards.

Standard 6 – Critical Areas
Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas). Critical areas are Outstanding Resource Waters (ORWs), shellfish beds, swimming beaches, cold water fisheries and recharge areas for public water supplies.

No portion of the site is in a critical area.

Standard 7 – Redevelopment
Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. However, if it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.

This project is not considered a redevelopment site.

Standard 8 – Construction Period Controls
Erosion and sediment controls must be implemented to prevent impacts during construction or land disturbance activities.

Construction Period controls consist of silt fence and hay bales erosion control measures and practices contained within the plan set.

Standard 9 – Operation and Maintenance Plan
All stormwater management systems must have an operation and maintenance plan to ensure that systems function as designed.

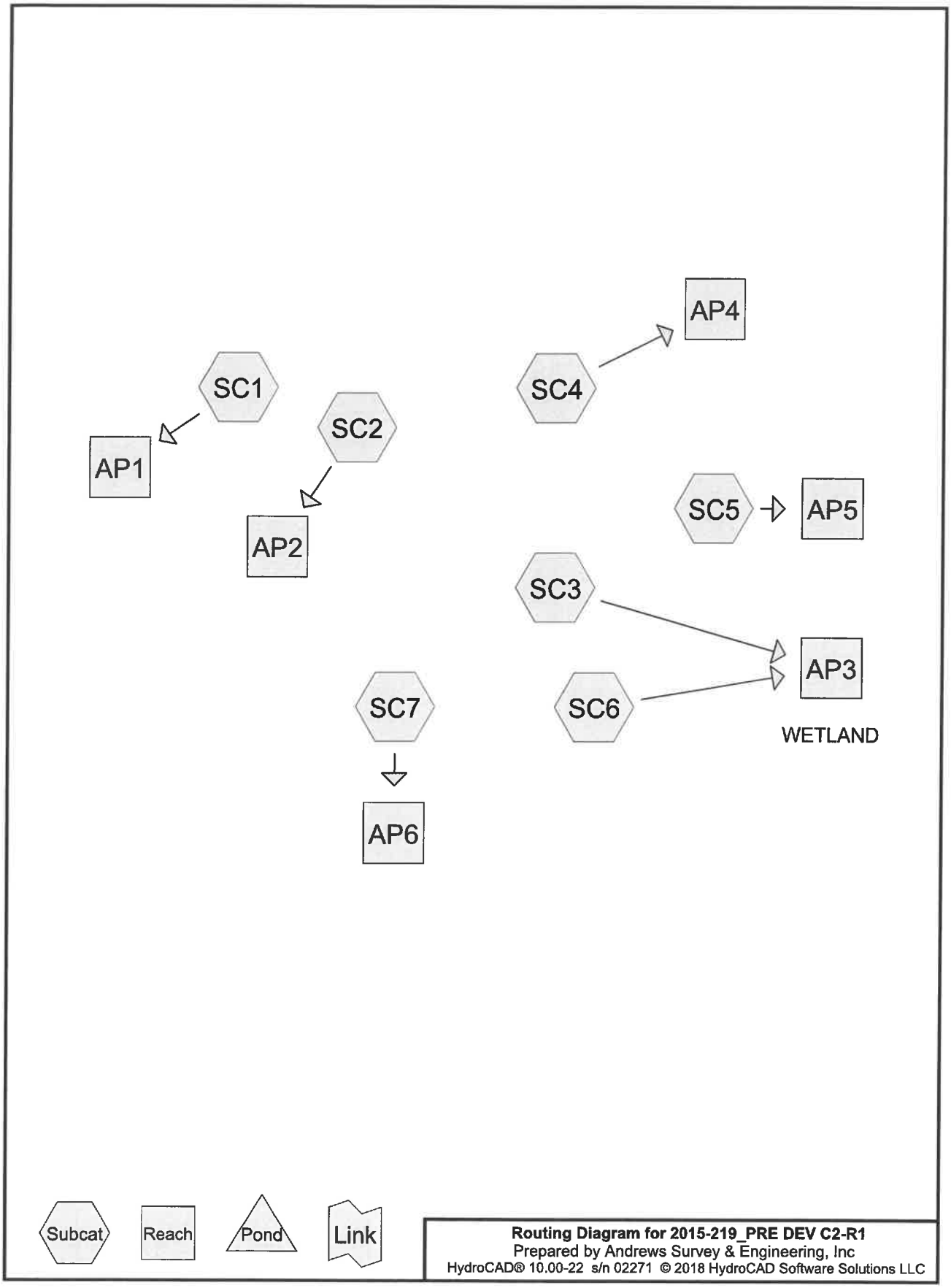
The Operation and Maintenance Plan has been developed and included in Part V.

Standard 10 – Illicit Discharge to Drainage System
Illicit discharge. The owner will provide an illicit discharge statement to the NRC prior to construction.

Illicit Discharge Compliance Statement
To the best of my knowledge no illicit discharges currently exist on the site and no future illicit discharge will be allowed, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease.

_____ _____
Signature of Property Owner Date

PART II – PRE & POST-CONSTRUCTION COMPUTATIONS



Routing Diagram for 2015-219_PRE DEV C2-R1
Prepared by Andrews Survey & Engineering, Inc
HydroCAD® 10.00-22 s/n 02271 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment SC1:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
18,326	30	Woods, Good, HSG A
18,326		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0660	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.5	163	0.0490	1.11		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.2	213	Total			

Summary for Subcatchment SC2:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
162,258	30	Woods, Good, HSG A
162,258		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	216	0.1944	2.20		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.5	249	0.0560	1.18		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	122	0.1311	1.81		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.7	128	0.0625	1.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.4	241	0.0050	0.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
27.2	1,006	Total			

Summary for Subcatchment SC3:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
749,401	30	Woods, Good, HSG A
749,401		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
3.6	441	0.0860	2.05		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	260	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.4	751	Total			

Summary for Subcatchment SC4:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
49,939	30	Woods, Good, HSG A
49,939		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0550	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.2	235	0.1250	1.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.4	285	Total			

Summary for Subcatchment SC5:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
130,886	30	Woods, Good, HSG A
130,886		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.0	228	0.1500	1.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	135	0.0888	1.49		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.4	413	Total			

Summary for Subcatchment SC6:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
52,177	30	Woods, Good, HSG A
52,177		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.2400	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	190	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.1	240	Total			

Summary for Subcatchment SC7:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
195,953	30	Woods, Good, HSG A
195,953		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	128	0.0781	1.40		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.0	408	0.2058	2.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.9	242	0.0785	1.40		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.3	828	Total			

Summary for Reach AP1:

Inflow Area = 18,326 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach AP2:

Inflow Area = 162,258 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach AP3: WETLAND

Inflow Area = 801,578 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach AP4:

Inflow Area = 49,939 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach AP5:

Inflow Area = 130,886 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach AP6:

Inflow Area = 195,953 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentSC1: Runoff Area=18,326 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=213' Tc=10.2 min CN=30 Runoff=0.00 cfs 0 cf

SubcatchmentSC2: Runoff Area=162,258 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,006' Tc=27.2 min CN=30 Runoff=0.00 cfs 1 cf

SubcatchmentSC3: Runoff Area=749,401 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=751' Tc=12.4 min CN=30 Runoff=0.00 cfs 3 cf

SubcatchmentSC4: Runoff Area=49,939 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=285' Tc=10.4 min CN=30 Runoff=0.00 cfs 0 cf

SubcatchmentSC5: Runoff Area=130,886 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=413' Tc=8.4 min CN=30 Runoff=0.00 cfs 1 cf

SubcatchmentSC6: Runoff Area=52,177 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=240' Tc=6.1 min CN=30 Runoff=0.00 cfs 0 cf

SubcatchmentSC7: Runoff Area=195,953 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=828' Tc=15.3 min CN=30 Runoff=0.00 cfs 1 cf

Reach AP1: Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Reach AP2: Inflow=0.00 cfs 1 cf
Outflow=0.00 cfs 1 cf

Reach AP3: WETLAND Inflow=0.00 cfs 3 cf
Outflow=0.00 cfs 3 cf

Reach AP4: Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Reach AP5: Inflow=0.00 cfs 1 cf
Outflow=0.00 cfs 1 cf

Reach AP6: Inflow=0.00 cfs 1 cf
Outflow=0.00 cfs 1 cf

Total Runoff Area = 1,358,940 sf Runoff Volume = 5 cf Average Runoff Depth = 0.00"
100.00% Pervious = 1,358,940 sf 0.00% Impervious = 0 sf

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentSC1: Runoff Area=18,326 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=213' Tc=10.2 min CN=30 Runoff=0.00 cfs 44 cf

SubcatchmentSC2: Runoff Area=162,258 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=1,006' Tc=27.2 min CN=30 Runoff=0.01 cfs 389 cf

SubcatchmentSC3: Runoff Area=749,401 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=751' Tc=12.4 min CN=30 Runoff=0.06 cfs 1,795 cf

SubcatchmentSC4: Runoff Area=49,939 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=285' Tc=10.4 min CN=30 Runoff=0.00 cfs 120 cf

SubcatchmentSC5: Runoff Area=130,886 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=413' Tc=8.4 min CN=30 Runoff=0.01 cfs 313 cf

SubcatchmentSC6: Runoff Area=52,177 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=240' Tc=6.1 min CN=30 Runoff=0.00 cfs 125 cf

SubcatchmentSC7: Runoff Area=195,953 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=828' Tc=15.3 min CN=30 Runoff=0.02 cfs 469 cf

Reach AP1: Inflow=0.00 cfs 44 cf
Outflow=0.00 cfs 44 cf

Reach AP2: Inflow=0.01 cfs 389 cf
Outflow=0.01 cfs 389 cf

Reach AP3: WETLAND Inflow=0.07 cfs 1,919 cf
Outflow=0.07 cfs 1,919 cf

Reach AP4: Inflow=0.00 cfs 120 cf
Outflow=0.00 cfs 120 cf

Reach AP5: Inflow=0.01 cfs 313 cf
Outflow=0.01 cfs 313 cf

Reach AP6: Inflow=0.02 cfs 469 cf
Outflow=0.02 cfs 469 cf

Total Runoff Area = 1,358,940 sf Runoff Volume = 3,254 cf Average Runoff Depth = 0.03"
100.00% Pervious = 1,358,940 sf 0.00% Impervious = 0 sf

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentSC1: Runoff Area=18,326 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=213' Tc=10.2 min CN=30 Runoff=0.01 cfs 249 cf

SubcatchmentSC2: Runoff Area=162,258 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=1,006' Tc=27.2 min CN=30 Runoff=0.08 cfs 2,204 cf

SubcatchmentSC3: Runoff Area=749,401 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=751' Tc=12.4 min CN=30 Runoff=0.38 cfs 10,179 cf

SubcatchmentSC4: Runoff Area=49,939 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=285' Tc=10.4 min CN=30 Runoff=0.03 cfs 678 cf

SubcatchmentSC5: Runoff Area=130,886 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=413' Tc=8.4 min CN=30 Runoff=0.07 cfs 1,778 cf

SubcatchmentSC6: Runoff Area=52,177 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=240' Tc=6.1 min CN=30 Runoff=0.03 cfs 709 cf

SubcatchmentSC7: Runoff Area=195,953 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=828' Tc=15.3 min CN=30 Runoff=0.10 cfs 2,661 cf

Reach AP1: Inflow=0.01 cfs 249 cf
Outflow=0.01 cfs 249 cf

Reach AP2: Inflow=0.08 cfs 2,204 cf
Outflow=0.08 cfs 2,204 cf

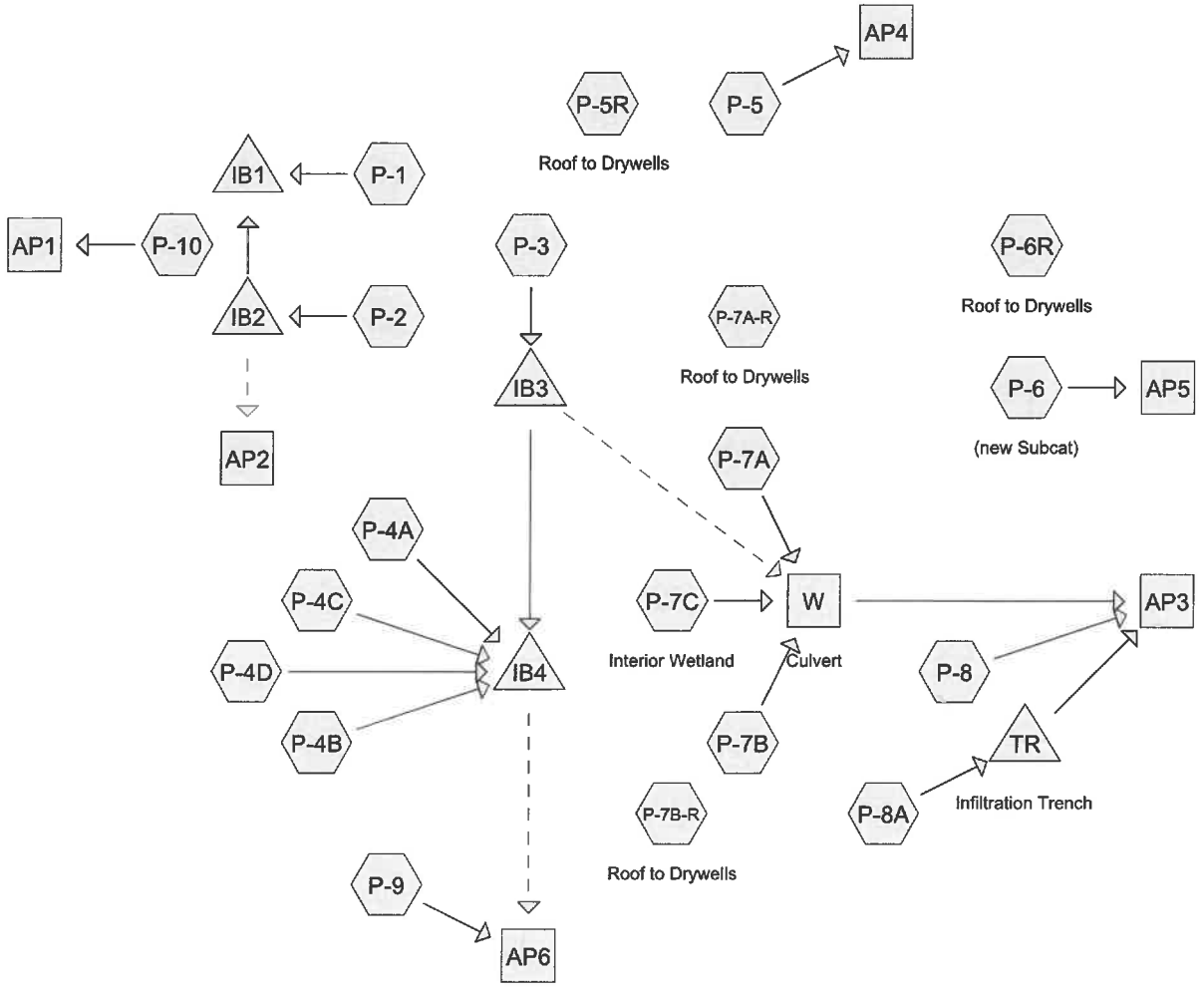
Reach AP3: WETLAND Inflow=0.40 cfs 10,887 cf
Outflow=0.40 cfs 10,887 cf

Reach AP4: Inflow=0.03 cfs 678 cf
Outflow=0.03 cfs 678 cf

Reach AP5: Inflow=0.07 cfs 1,778 cf
Outflow=0.07 cfs 1,778 cf

Reach AP6: Inflow=0.10 cfs 2,661 cf
Outflow=0.10 cfs 2,661 cf

Total Runoff Area = 1,358,940 sf Runoff Volume = 18,457 cf Average Runoff Depth = 0.16"
100.00% Pervious = 1,358,940 sf 0.00% Impervious = 0 sf



Subcat Reach Pond Link

Routing Diagram for 2015-219_POST DEV C2-R1
Prepared by Andrews Survey & Engineering, Inc

Summary for Subcatchment P-1:

Runoff = 0.00 cfs @ 17.23 hrs, Volume= 117 cf, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
25,953	39	>75% Grass cover, Good, HSG A
8,529	98	Paved parking, HSG A
29,772	30	Woods, Good, HSG A
64,254	43	Weighted Average
55,725		86.73% Pervious Area
8,529		13.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
3.2	153	0.0260	0.81		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	122	0.0570	3.58		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.3	325	Total			

Summary for Subcatchment P-10:

Runoff = 0.02 cfs @ 12.15 hrs, Volume= 97 cf, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
1,066	98	Paved parking, HSG A
2,049	39	>75% Grass cover, Good, HSG A
3,115	59	Weighted Average
2,049		65.78% Pervious Area
1,066		34.22% Impervious Area

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

Summary for Subcatchment P-2:

Runoff = 0.00 cfs @ 24.03 hrs, Volume= 4 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
45,432	39	>75% Grass cover, Good, HSG A
14,934	98	Paved parking, HSG A
96,304	30	Woods, Good, HSG A
156,670	39	Weighted Average
141,736		90.47% Pervious Area
14,934		9.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.7	314	0.1560	1.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	27	0.2200	7.04		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.3	381	0.0577	4.88		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.4	772	Total			

Summary for Subcatchment P-3:

Runoff = 0.84 cfs @ 12.41 hrs, Volume= 6,410 cf, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
77,656	39	>75% Grass cover, Good, HSG A
51,316	98	Paved parking, HSG A
24,795	98	Roofs, HSG A
51,847	30	Woods, Good, HSG A
205,614	59	Weighted Average
129,503		62.98% Pervious Area
76,111		37.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7					**Direct Entry, Tc from Pipe Calcs**

Summary for Subcatchment P-4A:

Runoff = 3.41 cfs @ 12.25 hrs, Volume= 17,046 cf, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
120,407	39	>75% Grass cover, Good, HSG A
95,378	98	Paved parking, HSG A
49,432	98	Roofs, HSG A
32,505	30	Woods, Good, HSG A
297,722	67	Weighted Average
152,912		51.36% Pervious Area
144,810		48.64% Impervious Area

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

Summary for Subcatchment P-4B:

Runoff = 0.01 cfs @ 21.69 hrs, Volume= 137 cf, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
87,221	39	>75% Grass cover, Good, HSG A
5,600	98	Paved parking, HSG A
4,224	98	Roofs, HSG A
25,363	30	Woods, Good, HSG A
122,408	42	Weighted Average
112,584		91.97% Pervious Area
9,824		8.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.3	86	0.0463	1.08		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	79	0.1519	1.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	81	0.2977	2.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	92	0.1086	1.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	57	0.4200	3.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	84	0.0714	4.01		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.2	90	0.2222	7.07		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
3.6	270	0.0070	1.25		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
17.1	889	Total			

Summary for Subcatchment P-4C:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
21,594	39	>75% Grass cover, Good, HSG A
3,414	98	Roofs, HSG A
153,419	30	Woods, Good, HSG A
178,427	32	Weighted Average
175,013		98.09% Pervious Area
3,414		1.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	210	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	177	0.2490	2.49		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	115	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.7	281	0.0355	2.83		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
18.5	833	Total			

Summary for Subcatchment P-4D:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
2,029	39	>75% Grass cover, Good, HSG A
54,757	30	Woods, Good, HSG A
56,786	30	Weighted Average
56,786		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.1	115	0.1217	1.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	90	0.0888	1.49		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	55	0.0360	0.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.2	162	0.0617	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	115	0.4520	3.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	26	0.1615	2.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	41	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
13.7	654	Total			

Summary for Subcatchment P-5:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
22,057	39	>75% Grass cover, Good, HSG A
34,708	30	Woods, Good, HSG A
56,765	33	Weighted Average
56,765		100.00% Pervious Area

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

Summary for Subcatchment P-5R: Roof to Drywells

Runoff = 0.28 cfs @ 12.09 hrs, Volume= 1,001 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
4,049	98	Roofs, HSG A
4,049		100.00% Impervious Area

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

Summary for Subcatchment P-6: (new Subcat)

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
22,947	39	>75% Grass cover, Good, HSG A
16,902	30	Woods, Good, HSG A
39,849	35	Weighted Average
39,849		100.00% Pervious Area

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

Summary for Subcatchment P-6R: Roof to Drywells

Runoff = 0.26 cfs @ 12.00 hrs, Volume= 791 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
3,198	98	Roofs, HSG A
3,198		100.00% Impervious Area

Summary for Subcatchment P-7A:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
30,097	39	>75% Grass cover, Good, HSG A
905	98	Unconnected pavement, HSG A
14,165	30	Woods, Good, HSG A
45,167	37	Weighted Average
44,262		98.00% Pervious Area
905		2.00% Impervious Area
905		100.00% Unconnected

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

Summary for Subcatchment P-7A-R: Roof to Drywells

Runoff = 0.36 cfs @ 12.00 hrs, Volume= 1,092 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
4,415	98	Roofs, HSG A
4,415		100.00% Impervious Area

Summary for Subcatchment P-7B:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
18,914	39	>75% Grass cover, Good, HSG A
15,463	30	Woods, Good, HSG A
34,377	35	Weighted Average
34,377		100.00% Pervious Area

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

Summary for Subcatchment P-7B-R: Roof to Drywells

Runoff = 0.25 cfs @ 12.00 hrs, Volume= 762 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
3,082	98	Roofs, HSG A
3,082		100.00% Impervious Area

Summary for Subcatchment P-7C: Interior Wetland

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
15,141	30	Woods, Good, HSG A
15,141		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0	50	0.0060	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
7.0	414	0.0386	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
27.0	464	Total			

Summary for Subcatchment P-8:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
11,015	39	>75% Grass cover, Good, HSG A
3,283	30	Woods, Good, HSG A
14,298	37	Weighted Average
14,298		100.00% Pervious Area

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

Summary for Subcatchment P-8A:

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 1 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
24,874	39	>75% Grass cover, Good, HSG A
24,874		100.00% Pervious Area

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

Summary for Subcatchment P-9:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
13,370	39	>75% Grass cover, Good, HSG A
15,360	30	Woods, Good, HSG A
28,730	34	Weighted Average
28,730		100.00% Pervious Area

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

Summary for Reach AP1:

Inflow Area = 3,115 sf, 34.22% Impervious, Inflow Depth = 0.37" for 2-Year event
Inflow = 0.02 cfs @ 12.15 hrs, Volume= 97 cf
Outflow = 0.02 cfs @ 12.15 hrs, Volume= 97 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP2:

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP3:

Inflow Area = 133,857 sf, 0.68% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP4:

Inflow Area = 56,765 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP5:

Inflow Area = 39,849 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP6:

Inflow Area = 28,730 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Summary for Reach W: Culvert

Inflow Area = 94,685 sf, 0.96% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Summary for Pond IB1:

Inflow Area = 220,924 sf, 10.62% Impervious, Inflow Depth = 0.01" for 2-Year event
Inflow = 0.00 cfs @ 17.23 hrs, Volume= 117 cf
Outflow = 0.00 cfs @ 17.23 hrs, Volume= 117 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 17.23 hrs, Volume= 117 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 212.00' @ 0.00 hrs Surf.Area= 520 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,174.0 - 1,174.0)

Volume	Invert	Avail.Storage	Storage Description
#1	212.00'	6,055 cf	**Infiltration Basin 1 (Irregular)** Listed below (Recalc) 7,075 cf Overall - 1,020 cf Embedded = 6,055 cf
#2	212.00'	866 cf	**Sediment Forebay (Irregular)** Listed below (Recalc) Inside #1
#3	212.00'	62 cf	**Gabion Wall (Prismatic)** Listed below (Recalc) Inside #1 154 cf Overall x 40.0% Voids
		6,983 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
212.00	520	149.8	0	0	520
214.00	1,684	220.7	2,093	2,093	2,643
216.00	3,397	298.3	4,982	7,075	5,890

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
212.00	110	44.6	0	0	110
214.00	350	78.7	437	437	467
215.00	512	95.3	428	866	712

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
212.00	29	0	0
214.00	59	88	88
215.00	73	66	154

Device	Routing	Invert	Outlet Devices
#1	Discarded	212.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 17.23 hrs HW=212.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.10 cfs potential flow)

Summary for Pond IB2:

Inflow Area = 156,670 sf, 9.53% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.03 hrs, Volume= 4 cf
Outflow = 0.00 cfs @ 24.03 hrs, Volume= 4 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 24.03 hrs, Volume= 4 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 218.00' @ 0.00 hrs Surf.Area= 1,866 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,406.2 - 1,406.2)

Volume	Invert	Avail.Storage	Storage Description
#1	218.00'	12,532 cf	**Infiltration Basin 2 (Irregular)** Listed below (Recalc) 13,976 cf Overall - 1,444 cf Embedded = 12,532 cf
#2	218.00'	1,303 cf	**Sediment Forebay (Irregular)** Listed below (Recalc) Inside #1
#3	218.00'	56 cf	**Gabion Wall (Prismatic)** Listed below (Recalc) Inside #1 140 cf Overall x 40.0% Voids
		13,891 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
218.00	1,866	232.3	0	0	1,866
220.00	3,472	288.0	5,256	5,256	4,230
222.00	5,313	325.7	8,720	13,976	6,171

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
218.00	141	54.2	0	0	141
220.00	461	86.5	571	571	529
221.25	720	106.0	732	1,303	851

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
218.00	23	0	0
220.00	48	71	71
221.25	63	69	140

Device	Routing	Invert	Outlet Devices
#1	Discarded	218.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	221.00'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.00 cfs @ 24.03 hrs HW=218.00' (Free Discharge)
└**1=Exfiltration** (Passes 0.00 cfs of 0.36 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=218.00' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond IB3:

Inflow Area = 205,614 sf, 37.02% Impervious, Inflow Depth = 0.37" for 2-Year event
Inflow = 0.84 cfs @ 12.41 hrs, Volume= 6,410 cf
Outflow = 0.30 cfs @ 13.16 hrs, Volume= 6,412 cf, Atten= 65%, Lag= 44.9 min
Discarded = 0.30 cfs @ 13.16 hrs, Volume= 6,412 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 214.74' @ 13.16 hrs Surf.Area= 1,556 sf Storage= 1,023 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 25.9 min (963.1 - 937.2)

Volume	Invert	Avail.Storage	Storage Description
#1	214.00'	17,425 cf	**Infiltration Basin 3 (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
214.00	1,221	143.4	0	0	1,221
216.00	2,224	188.5	3,395	3,395	2,458
218.00	3,473	227.2	5,651	9,046	3,804
220.00	4,949	264.9	8,379	17,425	5,360

Device	Routing	Invert	Outlet Devices
#1	Discarded	214.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	216.00'	**12.0" Round Culvert** L= 44.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 216.00' / 214.00' S= 0.0455 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#3	Device 2	216.75'	**3.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#4	Device 2	217.75'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	219.00'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Discarded OutFlow Max=0.30 cfs @ 13.16 hrs HW=214.74' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=214.00' TW=180.00' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=214.00' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond IB4:

Inflow Area =	860,957 sf, 27.20% Impervious,	Inflow Depth =	0.24"	for 2-Year event
Inflow =	3.41 cfs @ 12.25 hrs,	Volume=	17,184 cf	
Outflow =	1.22 cfs @ 12.73 hrs,	Volume=	17,211 cf,	Atten= 64%, Lag= 28.9 min
Discarded =	1.22 cfs @ 12.73 hrs,	Volume=	17,211 cf	
Secondary =	0.00 cfs @ 0.00 hrs,	Volume=	0 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 180.52' @ 12.73 hrs Surf.Area= 6,372 sf Storage= 3,064 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.9 min (912.9 - 898.0)

Volume	Invert	Avail.Storage	Storage Description
#1	180.00'	59,754 cf	**Infiltration Basin 4 (Irregular)** Listed below (Recalc) 68,884 cf Overall - 9,129 cf Embedded = 59,754 cf
#2	180.00'	8,800 cf	**Sediment Forebay (Irregular)** Listed below (Recalc) Inside #1
#3	180.00'	132 cf	**Gabion Wall (Prismatic)** Listed below (Recalc) Inside #1 329 cf Overall x 40.0% Voids
		68,686 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
180.00	5,466	609.3	0	0	5,466
182.00	9,320	687.5	14,616	14,616	13,639
184.00	13,569	727.7	22,756	37,372	18,383
186.00	18,049	765.4	31,512	68,884	23,104

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
180.00	1,332	162.5	0	0	1,332
182.00	2,188	193.5	3,485	3,485	2,280
184.00	3,157	224.5	5,315	8,800	3,392

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
180.00	58	0	0
182.00	82	140	140
184.00	107	189	329

Device	Routing	Invert	Outlet Devices
#1	Discarded	180.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	185.00'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.22 cfs @ 12.73 hrs HW=180.52' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.22 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=180.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond TR: Infiltration Trench

Inflow Area = 24,874 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 1 cf
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 1 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 24.00 hrs, Volume= 1 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 170.00' @ 0.00 hrs Surf.Area= 460 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,396.6 - 1,396.6)

Volume	Invert	Avail.Storage	Storage Description
#1	170.00'	368 cf	**2.00'W x 230.00'L x 2.00'H Prismatoid** 920 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	170.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	172.00'	**230.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.00 cfs @ 24.00 hrs HW=170.00' (Free Discharge)
↑—**1=Exfiltration** (Passes 0.00 cfs of 0.09 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=170.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentP-1: Runoff Area=64,254 sf 13.27% Impervious Runoff Depth=0.27"
Flow Length=325' Tc=10.3 min CN=43 Runoff=0.12 cfs 1,469 cf

SubcatchmentP-10: Runoff Area=3,115 sf 34.22% Impervious Runoff Depth=1.07"
Tc=6.0 min CN=59 Runoff=0.08 cfs 277 cf

SubcatchmentP-2: Runoff Area=156,670 sf 9.53% Impervious Runoff Depth=0.14"
Flow Length=772' Tc=16.4 min CN=39 Runoff=0.07 cfs 1,874 cf

SubcatchmentP-3: Runoff Area=205,614 sf 37.02% Impervious Runoff Depth=1.07"
Tc=17.7 min CN=59 Runoff=3.53 cfs 18,300 cf

SubcatchmentP-4A: Runoff Area=297,722 sf 48.64% Impervious Runoff Depth=1.60"
Tc=15.0 min CN=67 Runoff=9.16 cfs 39,628 cf

SubcatchmentP-4B: Runoff Area=122,408 sf 8.03% Impervious Runoff Depth=0.24"
Flow Length=889' Tc=17.1 min CN=42 Runoff=0.15 cfs 2,433 cf

SubcatchmentP-4C: Runoff Area=178,427 sf 1.91% Impervious Runoff Depth=0.01"
Flow Length=833' Tc=18.5 min CN=32 Runoff=0.01 cfs 139 cf

SubcatchmentP-4D: Runoff Area=56,786 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=654' Tc=13.7 min CN=30 Runoff=0.00 cfs 0 cf

SubcatchmentP-5: Runoff Area=56,765 sf 0.00% Impervious Runoff Depth=0.02"
Tc=6.0 min CN=33 Runoff=0.00 cfs 92 cf

SubcatchmentP-5R: Roof to Drywells Runoff Area=4,049 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.42 cfs 1,506 cf

SubcatchmentP-6: (new Subcat) Runoff Area=39,849 sf 0.00% Impervious Runoff Depth=0.05"
Tc=6.0 min CN=35 Runoff=0.01 cfs 165 cf

SubcatchmentP-6R: Roof to Drywells Runoff Area=3,198 sf 100.00% Impervious Runoff Depth=4.46"
Tc=0.0 min CN=98 Runoff=0.39 cfs 1,190 cf

SubcatchmentP-7A: Runoff Area=45,167 sf 2.00% Impervious Runoff Depth=0.09"
Tc=6.0 min CN=37 Runoff=0.01 cfs 344 cf

SubcatchmentP-7A-R: Roof to Drywells Runoff Area=4,415 sf 100.00% Impervious Runoff Depth=4.46"
Tc=0.0 min CN=98 Runoff=0.53 cfs 1,642 cf

SubcatchmentP-7B: Runoff Area=34,377 sf 0.00% Impervious Runoff Depth=0.05"
Tc=6.0 min CN=35 Runoff=0.00 cfs 142 cf

SubcatchmentP-7B-R: Roof to Drywells Runoff Area=3,082 sf 100.00% Impervious Runoff Depth=4.46"
Tc=0.0 min CN=98 Runoff=0.37 cfs 1,146 cf

SubcatchmentP-7C: Interior Wetland Runoff Area=15,141 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=464' Tc=27.0 min CN=30 Runoff=0.00 cfs 0 cf

SubcatchmentP-8: Runoff Area=14,298 sf 0.00% Impervious Runoff Depth=0.09"
Tc=6.0 min CN=37 Runoff=0.00 cfs 109 cf

SubcatchmentP-8A: Runoff Area=24,874 sf 0.00% Impervious Runoff Depth=0.14"
Tc=6.0 min CN=39 Runoff=0.01 cfs 298 cf

SubcatchmentP-9: Runoff Area=28,730 sf 0.00% Impervious Runoff Depth=0.03"
Tc=6.0 min CN=34 Runoff=0.00 cfs 79 cf

Reach AP1: Inflow=0.08 cfs 277 cf
Outflow=0.08 cfs 277 cf

Reach AP2: Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Reach AP3: Inflow=0.02 cfs 596 cf
Outflow=0.02 cfs 596 cf

Reach AP4: Inflow=0.00 cfs 92 cf
Outflow=0.00 cfs 92 cf

Reach AP5: Inflow=0.01 cfs 165 cf
Outflow=0.01 cfs 165 cf

Reach AP6: Inflow=0.00 cfs 79 cf
Outflow=0.00 cfs 79 cf

Reach W: Culvert Inflow=0.02 cfs 487 cf
Outflow=0.02 cfs 487 cf

Pond IB1: Peak Elev=212.03' Storage=13 cf Inflow=0.12 cfs 1,469 cf
Outflow=0.10 cfs 1,470 cf

Pond IB2: Peak Elev=218.00' Storage=0 cf Inflow=0.07 cfs 1,874 cf
Discarded=0.07 cfs 1,874 cf Secondary=0.00 cfs 0 cf Outflow=0.07 cfs 1,874 cf

Pond IB3: Peak Elev=216.96' Storage=5,791 cf Inflow=3.53 cfs 18,300 cf
Discarded=0.53 cfs 16,972 cf Primary=0.32 cfs 1,330 cf Secondary=0.00 cfs 0 cf Outflow=0.86 cfs 18,302 cf

Pond IB4: Peak Elev=181.90' Storage=13,614 cf Inflow=9.17 cfs 43,530 cf
Discarded=1.74 cfs 43,555 cf Secondary=0.00 cfs 0 cf Outflow=1.74 cfs 43,555 cf

Pond TR: Infiltration Trench Peak Elev=170.00' Storage=0 cf Inflow=0.01 cfs 298 cf
Discarded=0.01 cfs 298 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 298 cf

Total Runoff Area = 1,358,941 sf Runoff Volume = 70,834 cf Average Runoff Depth = 0.63"
79.81% Pervious = 1,084,604 sf 20.19% Impervious = 274,337 sf

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentP-1: Runoff Area=64,254 sf 13.27% Impervious Runoff Depth=0.50"
Flow Length=325' Tc=10.3 min CN=43 Runoff=0.33 cfs 2,698 cf

SubcatchmentP-10: Runoff Area=3,115 sf 34.22% Impervious Runoff Depth=1.53"
Tc=6.0 min CN=59 Runoff=0.12 cfs 397 cf

SubcatchmentP-2: Runoff Area=156,670 sf 9.53% Impervious Runoff Depth=0.31"
Flow Length=772' Tc=16.4 min CN=39 Runoff=0.30 cfs 4,077 cf

SubcatchmentP-3: Runoff Area=205,614 sf 37.02% Impervious Runoff Depth=1.53"
Tc=17.7 min CN=59 Runoff=5.41 cfs 26,174 cf

SubcatchmentP-4A: Runoff Area=297,722 sf 48.64% Impervious Runoff Depth=2.16"
Tc=15.0 min CN=67 Runoff=12.69 cfs 53,573 cf

SubcatchmentP-4B: Runoff Area=122,408 sf 8.03% Impervious Runoff Depth=0.45"
Flow Length=889' Tc=17.1 min CN=42 Runoff=0.48 cfs 4,622 cf

SubcatchmentP-4C: Runoff Area=178,427 sf 1.91% Impervious Runoff Depth=0.07"
Flow Length=833' Tc=18.5 min CN=32 Runoff=0.04 cfs 1,033 cf

SubcatchmentP-4D: Runoff Area=56,786 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=654' Tc=13.7 min CN=30 Runoff=0.00 cfs 136 cf

SubcatchmentP-5: Runoff Area=56,765 sf 0.00% Impervious Runoff Depth=0.10"
Tc=6.0 min CN=33 Runoff=0.02 cfs 451 cf

SubcatchmentP-5R: Roof to Drywells Runoff Area=4,049 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=0.49 cfs 1,776 cf

SubcatchmentP-6: (new Subcat) Runoff Area=39,849 sf 0.00% Impervious Runoff Depth=0.16"
Tc=6.0 min CN=35 Runoff=0.02 cfs 520 cf

SubcatchmentP-6R: Roof to Drywells Runoff Area=3,198 sf 100.00% Impervious Runoff Depth=5.26"
Tc=0.0 min CN=98 Runoff=0.45 cfs 1,402 cf

SubcatchmentP-7A: Runoff Area=45,167 sf 2.00% Impervious Runoff Depth=0.23"
Tc=6.0 min CN=37 Runoff=0.05 cfs 864 cf

SubcatchmentP-7A-R: Roof to Drywells Runoff Area=4,415 sf 100.00% Impervious Runoff Depth=5.26"
Tc=0.0 min CN=98 Runoff=0.62 cfs 1,936 cf

SubcatchmentP-7B: Runoff Area=34,377 sf 0.00% Impervious Runoff Depth=0.16"
Tc=6.0 min CN=35 Runoff=0.02 cfs 449 cf

SubcatchmentP-7B-R: Roof to Drywells Runoff Area=3,082 sf 100.00% Impervious Runoff Depth=5.26"
Tc=0.0 min CN=98 Runoff=0.44 cfs 1,352 cf

SubcatchmentP-7C: Interior Wetland Runoff Area=15,141 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=464' Tc=27.0 min CN=30 Runoff=0.00 cfs 36 cf

SubcatchmentP-8: Runoff Area=14,298 sf 0.00% Impervious Runoff Depth=0.23"
Tc=6.0 min CN=37 Runoff=0.02 cfs 273 cf

SubcatchmentP-8A: Runoff Area=24,874 sf 0.00% Impervious Runoff Depth=0.31"
Tc=6.0 min CN=39 Runoff=0.06 cfs 647 cf

SubcatchmentP-9: Runoff Area=28,730 sf 0.00% Impervious Runoff Depth=0.12"
Tc=6.0 min CN=34 Runoff=0.01 cfs 298 cf

Reach AP1: Inflow=0.12 cfs 397 cf
Outflow=0.12 cfs 397 cf

Reach AP2: Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Reach AP3: Inflow=0.07 cfs 1,622 cf
Outflow=0.07 cfs 1,622 cf

Reach AP4: Inflow=0.02 cfs 451 cf
Outflow=0.02 cfs 451 cf

Reach AP5: Inflow=0.02 cfs 520 cf
Outflow=0.02 cfs 520 cf

Reach AP6: Inflow=0.01 cfs 298 cf
Outflow=0.01 cfs 298 cf

Reach W: Culvert Inflow=0.05 cfs 1,349 cf
Outflow=0.05 cfs 1,349 cf

Pond IB1: Peak Elev=212.49' Storage=298 cf Inflow=0.33 cfs 2,698 cf
Outflow=0.14 cfs 2,700 cf

Pond IB2: Peak Elev=218.00' Storage=0 cf Inflow=0.30 cfs 4,077 cf
Discarded=0.30 cfs 4,077 cf Secondary=0.00 cfs 0 cf Outflow=0.30 cfs 4,077 cf

Pond IB3: Peak Elev=217.82' Storage=8,417 cf Inflow=5.41 cfs 26,174 cf
Discarded=0.64 cfs 20,210 cf Primary=0.82 cfs 5,969 cf Secondary=0.00 cfs 0 cf Outflow=1.46 cfs 26,179 cf

Pond IB4: Peak Elev=182.87' Storage=23,346 cf Inflow=12.86 cfs 65,332 cf
Discarded=2.12 cfs 65,333 cf Secondary=0.00 cfs 0 cf Outflow=2.12 cfs 65,333 cf

Pond TR: Infiltration Trench Peak Elev=170.00' Storage=0 cf Inflow=0.06 cfs 647 cf
Discarded=0.06 cfs 647 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 647 cf

Total Runoff Area = 1,358,941 sf Runoff Volume = 102,713 cf Average Runoff Depth = 0.91"
79.81% Pervious = 1,084,604 sf 20.19% Impervious = 274,337 sf

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentP-1: Runoff Area=64,254 sf 13.27% Impervious Runoff Depth=0.95"
Flow Length=325' Tc=10.3 min CN=43 Runoff=0.88 cfs 5,072 cf

SubcatchmentP-10: Runoff Area=3,115 sf 34.22% Impervious Runoff Depth=2.30"
Tc=6.0 min CN=59 Runoff=0.18 cfs 597 cf

SubcatchmentP-2: Runoff Area=156,670 sf 9.53% Impervious Runoff Depth=0.66"
Flow Length=772' Tc=16.4 min CN=39 Runoff=1.04 cfs 8,669 cf

SubcatchmentP-3: Runoff Area=205,614 sf 37.02% Impervious Runoff Depth=2.30"
Tc=17.7 min CN=59 Runoff=8.56 cfs 39,411 cf

SubcatchmentP-4A: Runoff Area=297,722 sf 48.64% Impervious Runoff Depth=3.07"
Tc=15.0 min CN=67 Runoff=18.36 cfs 76,155 cf

SubcatchmentP-4B: Runoff Area=122,408 sf 8.03% Impervious Runoff Depth=0.87"
Flow Length=889' Tc=17.1 min CN=42 Runoff=1.27 cfs 8,914 cf

SubcatchmentP-4C: Runoff Area=178,427 sf 1.91% Impervious Runoff Depth=0.25"
Flow Length=833' Tc=18.5 min CN=32 Runoff=0.15 cfs 3,766 cf

SubcatchmentP-4D: Runoff Area=56,786 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=654' Tc=13.7 min CN=30 Runoff=0.03 cfs 771 cf

SubcatchmentP-5: Runoff Area=56,765 sf 0.00% Impervious Runoff Depth=0.30"
Tc=6.0 min CN=33 Runoff=0.09 cfs 1,436 cf

SubcatchmentP-5R: Roof to Drywells Runoff Area=4,049 sf 100.00% Impervious Runoff Depth=6.46"
Tc=6.0 min CN=98 Runoff=0.60 cfs 2,180 cf

SubcatchmentP-6: (new Subcat) Runoff Area=39,849 sf 0.00% Impervious Runoff Depth=0.41"
Tc=6.0 min CN=35 Runoff=0.13 cfs 1,373 cf

SubcatchmentP-6R: Roof to Drywells Runoff Area=3,198 sf 100.00% Impervious Runoff Depth=6.46"
Tc=0.0 min CN=98 Runoff=0.55 cfs 1,722 cf

SubcatchmentP-7A: Runoff Area=45,167 sf 2.00% Impervious Runoff Depth=0.53"
Tc=6.0 min CN=37 Runoff=0.23 cfs 2,010 cf

SubcatchmentP-7A-R: Roof to Drywells Runoff Area=4,415 sf 100.00% Impervious Runoff Depth=6.46"
Tc=0.0 min CN=98 Runoff=0.76 cfs 2,377 cf

SubcatchmentP-7B: Runoff Area=34,377 sf 0.00% Impervious Runoff Depth=0.41"
Tc=6.0 min CN=35 Runoff=0.11 cfs 1,185 cf

SubcatchmentP-7B-R: Roof to Drywells Runoff Area=3,082 sf 100.00% Impervious Runoff Depth=6.46"
Tc=0.0 min CN=98 Runoff=0.53 cfs 1,659 cf

SubcatchmentP-7C: Interior Wetland Runoff Area=15,141 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=464' Tc=27.0 min CN=30 Runoff=0.01 cfs 206 cf

SubcatchmentP-8: Runoff Area=14,298 sf 0.00% Impervious Runoff Depth=0.53"
Tc=6.0 min CN=37 Runoff=0.07 cfs 636 cf

SubcatchmentP-8A: Runoff Area=24,874 sf 0.00% Impervious Runoff Depth=0.66"
Tc=6.0 min CN=39 Runoff=0.18 cfs 1,376 cf

SubcatchmentP-9: Runoff Area=28,730 sf 0.00% Impervious Runoff Depth=0.36"
Tc=6.0 min CN=34 Runoff=0.07 cfs 855 cf

Reach AP1: Inflow=0.18 cfs 597 cf
Outflow=0.18 cfs 597 cf

Reach AP2: Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Reach AP3: Inflow=0.41 cfs 4,037 cf
Outflow=0.41 cfs 4,037 cf

Reach AP4: Inflow=0.09 cfs 1,436 cf
Outflow=0.09 cfs 1,436 cf

Reach AP5: Inflow=0.13 cfs 1,373 cf
Outflow=0.13 cfs 1,373 cf

Reach AP6: Inflow=0.07 cfs 855 cf
Outflow=0.07 cfs 855 cf

Reach W: Culvert Inflow=0.34 cfs 3,401 cf
Outflow=0.34 cfs 3,401 cf

Pond IB1: Peak Elev=213.34' Storage=1,102 cf Inflow=0.88 cfs 5,072 cf
Outflow=0.23 cfs 5,074 cf

Pond IB2: Peak Elev=218.51' Storage=1,045 cf Inflow=1.04 cfs 8,669 cf
Discarded=0.43 cfs 8,670 cf Secondary=0.00 cfs 0 cf Outflow=0.43 cfs 8,670 cf

Pond IB3: Peak Elev=218.89' Storage=12,414 cf Inflow=8.56 cfs 39,411 cf
Discarded=0.78 cfs 24,457 cf Primary=2.05 cfs 14,966 cf Secondary=0.00 cfs 0 cf Outflow=2.83 cfs 39,423 cf

Pond IB4: Peak Elev=184.47' Storage=43,778 cf Inflow=19.41 cfs 104,571 cf
Discarded=2.79 cfs 104,659 cf Secondary=0.00 cfs 0 cf Outflow=2.79 cfs 104,659 cf

Pond TR: Infiltration Trench Peak Elev=170.68' Storage=125 cf Inflow=0.18 cfs 1,376 cf
Discarded=0.09 cfs 1,378 cf Primary=0.00 cfs 0 cf Outflow=0.09 cfs 1,378 cf

Total Runoff Area = 1,358,941 sf Runoff Volume = 160,373 cf Average Runoff Depth = 1.42"
79.81% Pervious = 1,084,604 sf 20.19% Impervious = 274,337 sf

Summary for Pond IB1:

Inflow Area = 220,924 sf, 10.62% Impervious, Inflow Depth = 0.28" for 100-Year event
Inflow = 0.88 cfs @ 12.21 hrs, Volume= 5,072 cf
Outflow = 0.23 cfs @ 13.02 hrs, Volume= 5,074 cf, Atten= 74%, Lag= 48.6 min
Discarded = 0.23 cfs @ 13.02 hrs, Volume= 5,074 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 213.34' @ 13.02 hrs Surf.Area= 1,225 sf Storage= 1,102 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 45.6 min (963.1 - 917.5)

Volume	Invert	Avail.Storage	Storage Description
#1	212.00'	6,055 cf	**Infiltration Basin 1 (Irregular)** Listed below (Recalc) 7,075 cf Overall - 1,020 cf Embedded = 6,055 cf
#2	212.00'	866 cf	**Sediment Forebay (Irregular)** Listed below (Recalc) Inside #1
#3	212.00'	62 cf	**Gabion Wall (Prismatic)** Listed below (Recalc) Inside #1 154 cf Overall x 40.0% Voids
		6,983 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
212.00	520	149.8	0	0	520
214.00	1,684	220.7	2,093	2,093	2,643
216.00	3,397	298.3	4,982	7,075	5,890

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
212.00	110	44.6	0	0	110
214.00	350	78.7	437	437	467
215.00	512	95.3	428	866	712

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
212.00	29	0	0
214.00	59	88	88
215.00	73	66	154

Device	Routing	Invert	Outlet Devices
#1	Discarded	212.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.23 cfs @ 13.02 hrs HW=213.34' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.23 cfs)

Summary for Pond IB2:

Inflow Area = 156,670 sf, 9.53% Impervious, Inflow Depth = 0.66" for 100-Year event
Inflow = 1.04 cfs @ 12.44 hrs, Volume= 8,669 cf
Outflow = 0.43 cfs @ 13.08 hrs, Volume= 8,670 cf, Atten= 59%, Lag= 38.2 min
Discarded = 0.43 cfs @ 13.08 hrs, Volume= 8,670 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 218.51' @ 13.08 hrs Surf.Area= 2,232 sf Storage= 1,045 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 15.6 min (963.3 - 947.7)

Volume	Invert	Avail.Storage	Storage Description
#1	218.00'	12,532 cf	**Infiltration Basin 2 (Irregular)** Listed below (Recalc) 13,976 cf Overall - 1,444 cf Embedded = 12,532 cf
#2	218.00'	1,303 cf	**Sediment Forebay (Irregular)** Listed below (Recalc) Inside #1
#3	218.00'	56 cf	**Gabion Wall (Prismatic)** Listed below (Recalc) Inside #1 140 cf Overall x 40.0% Voids
		13,891 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
218.00	1,866	232.3	0	0	1,866
220.00	3,472	288.0	5,256	5,256	4,230
222.00	5,313	325.7	8,720	13,976	6,171

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
218.00	141	54.2	0	0	141
220.00	461	86.5	571	571	529
221.25	720	106.0	732	1,303	851

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
218.00	23	0	0
220.00	48	71	71
221.25	63	69	140

Device	Routing	Invert	Outlet Devices
#1	Discarded	218.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	221.00'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.43 cfs @ 13.08 hrs HW=218.51' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.43 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=218.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Summary for Pond IB3:

Inflow Area = 205,614 sf, 37.02% Impervious, Inflow Depth = 2.30" for 100-Year event
Inflow = 8.56 cfs @ 12.26 hrs, Volume= 39,411 cf
Outflow = 2.83 cfs @ 12.76 hrs, Volume= 39,423 cf, Atten= 67%, Lag= 29.7 min
Discarded = 0.78 cfs @ 12.76 hrs, Volume= 24,457 cf
Primary = 2.05 cfs @ 12.76 hrs, Volume= 14,966 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 218.89' @ 12.76 hrs Surf.Area= 4,098 sf Storage= 12,414 cf

Plug-Flow detention time= 99.2 min calculated for 39,368 cf (100% of inflow)
Center-of-Mass det. time= 99.3 min (968.7 - 869.4)

Volume	Invert	Avail.Storage	Storage Description
#1	214.00'	17,425 cf	**Infiltration Basin 3 (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
214.00	1,221	143.4	0	0	1,221
216.00	2,224	188.5	3,395	3,395	2,458
218.00	3,473	227.2	5,651	9,046	3,804
220.00	4,949	264.9	8,379	17,425	5,360

Device	Routing	Invert	Outlet Devices
#1	Discarded	214.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	216.00'	**12.0" Round Culvert** L= 44.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 216.00' / 214.00' S= 0.0455 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#3	Device 2	216.75'	**3.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#4	Device 2	217.75'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	219.00'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Discarded OutFlow Max=0.78 cfs @ 12.76 hrs HW=218.89' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.78 cfs)

Primary OutFlow Max=2.05 cfs @ 12.76 hrs HW=218.89' TW=183.81' (Dynamic Tailwater)
└**2=Culvert** (Passes 2.05 cfs of 4.61 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 1.04 cfs @ 7.04 fps)
  └**4=Orifice/Grate** (Orifice Controls 1.01 cfs @ 5.14 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=214.00' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Summary for Pond IB4:

Inflow Area = 860,957 sf, 27.20% Impervious, Inflow Depth = 1.46" for 100-Year event
Inflow = 19.41 cfs @ 12.23 hrs, Volume= 104,571 cf
Outflow = 2.79 cfs @ 14.27 hrs, Volume= 104,659 cf, Atten= 86%, Lag= 122.5 min
Discarded = 2.79 cfs @ 14.27 hrs, Volume= 104,659 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 184.47' @ 14.27 hrs Surf.Area= 14,563 sf Storage= 43,778 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 185.2 min (1,044.6 - 859.4)

Volume	Invert	Avail.Storage	Storage Description
#1	180.00'	59,754 cf	**Infiltration Basin 4 (Irregular)**Listed below (Recalc) 68,884 cf Overall - 9,129 cf Embedded = 59,754 cf
#2	180.00'	8,800 cf	**Sediment Forebay (Irregular)**Listed below (Recalc) Inside #1
#3	180.00'	132 cf	**Gabion Wall (Prismatic)**Listed below (Recalc) Inside #1 329 cf Overall x 40.0% Voids
		68,686 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
180.00	5,466	609.3	0	0	5,466
182.00	9,320	687.5	14,616	14,616	13,639
184.00	13,569	727.7	22,756	37,372	18,383
186.00	18,049	765.4	31,512	68,884	23,104

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
180.00	1,332	162.5	0	0	1,332
182.00	2,188	193.5	3,485	3,485	2,280
184.00	3,157	224.5	5,315	8,800	3,392

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
180.00	58	0	0
182.00	82	140	140
184.00	107	189	329

Device	Routing	Invert	Outlet Devices
#1	Discarded	180.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	185.00'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=2.79 cfs @ 14.27 hrs HW=184.47' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 2.79 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=180.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Summary for Pond TR: Infiltration Trench

Inflow Area = 24,874 sf, 0.00% Impervious, Inflow Depth = 0.66" for 100-Year event
Inflow = 0.18 cfs @ 12.26 hrs, Volume= 1,376 cf
Outflow = 0.09 cfs @ 12.10 hrs, Volume= 1,378 cf, Atten= 52%, Lag= 0.0 min
Discarded = 0.09 cfs @ 12.10 hrs, Volume= 1,378 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 170.68' @ 12.61 hrs Surf.Area= 460 sf Storage= 125 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 6.3 min (944.3 - 938.0)

Volume	Invert	Avail.Storage	Storage Description
#1	170.00'	368 cf	**2.00'W x 230.00'L x 2.00'H Prismatoid**
			920 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	170.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	172.00'	**230.0' long x 2.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.09 cfs @ 12.10 hrs HW=170.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=170.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

PART III – PIPE SIZING CALCULATIONS

Pipe Flow Spreadsheets

"Lakeland Hills"
Norfolk, MA

From	To	Area (AC.) Incremental	Weighted Runoff Coefficient "C"	CxA	Cumulative CxA	Pipe Length (Feet)	Flow Time (min) To Inlet	Flow Time (min) In Channel	Design Storm (Year)	Intensity (IN/HR)	Q (CFS)	Size (IN)	Slope (FT/FT)	Mannings n	Full Capacity (cfs)	Full Velocity (fps)	Upper End Rim	Upper End Invert	Lower End Rim	Lower End Invert
IB1																				
CB1	DMH1	0.16	0.71	0.11	0.11	9.30	5.0	0.03	25	6.60	0.76	12	0.0108	0.013	3.69	4.70	216.15	213.15	216.70	213.05
CB2	DMH1	0.30	0.47	0.14	0.14	9.70	5.0	0.05	25	6.60	0.94	12	0.0052	0.013	2.56	3.26	216.10	213.10	216.70	213.05
DHM1	FES1	--	--	--	0.26	32.80	5.0	0.15	25	6.60	1.70	12	0.0061	0.013	2.78	3.54	216.70	212.95	-	212.75
IB2																				
CB3	DMH2	0.58	0.50	0.29	0.29	12.40	5.0	0.03	25	6.60	1.91	12	0.0323	0.013	6.40	8.15	226.13	222.10	225.84	221.70
CB4	DMH2	1.88	0.35	0.66	0.66	11.90	16.4	0.02	25	4.50	2.95	12	0.0336	0.013	6.53	8.32	226.11	222.10	225.84	221.70
DMH2	FES2	--	--	--	0.95	46.90	16.4	0.08	25	4.50	4.25	12	0.0469	0.013	7.72	9.82	225.84	220.70	-	218.50
IB3																				
CB5	DMH3	0.66	0.49	0.33	0.33	15.50	5.0	0.05	25	6.60	2.16	12	0.0129	0.013	4.05	5.15	241.50	238.00	241.30	237.80
CB6	DMH3	0.71	0.39	0.27	0.27	16.10	16.6	0.05	25	4.50	1.23	12	0.0124	0.013	3.97	5.06	241.50	238.00	241.30	237.80
DMH3	DMH4	--	--	--	0.60	211.00	16.7	0.46	25	4.50	2.71	12	0.0280	0.013	5.96	7.59	241.30	237.70	234.80	231.80
DCB8	DMH4	1.41	0.52	0.74	0.74	10.50	5.0	0.03	25	6.60	4.85	12	0.0190	0.013	4.92	6.26	234.40	230.90	234.80	230.70
DMH4	DMH5	--	--	--	1.34	18.95	17.1	0.04	25	4.50	6.01	15	0.0264	0.013	10.49	8.55	234.80	230.60	234.00	230.10
CB7	DMH5	0.11	0.73	0.08	0.08	28.00	5.0	0.07	25	6.60	0.52	12	0.0250	0.013	5.63	7.17	234.60	231.10	234.00	230.40
CB9	DMH5	0.24	0.72	0.17	0.17	32.20	5.0	0.09	25	6.60	1.14	12	0.0186	0.013	4.86	6.19	234.50	231.00	234.00	230.40
DMH5	DMH6	--	--	--	1.59	278.70	17.2	0.51	25	4.50	7.15	12	0.0407	0.013	7.19	9.15	234.00	228.95	220.90	217.60
CB10	DMH6	1.00	0.53	0.53	0.53	17.40	5.0	0.06	25	6.60	3.49	12	0.0115	0.013	3.82	4.86	221.35	217.85	220.90	217.65
CB11	DMH6	0.39	0.73	0.29	0.29	17.40	5.0	0.06	25	6.60	1.91	12	0.0115	0.013	3.82	4.86	221.35	217.85	220.90	217.65
DMH6	DSD1	--	--	--	2.41	41.50	17.7	0.08	25	4.50	10.83	18	0.0217	0.013	15.47	8.75	220.90	217.40	220.00	216.50
DSD1	FES3	--	--	--	2.41	24.50	17.7	0.06	25	4.50	10.83	18	0.0122	0.013	11.62	6.58	220.00	218.00		217.70
IB4																				
OS1	DMH7A	-	-		0.00	54.50	5.0	0.09	25	6.60	2.05	12	0.0477	0.013	7.78	9.91	219.00	216.00	216.40	213.40
DMH7A	DMH7	--	--	--	0.00	69.00	5.1	0.14	25	6.60	2.05	12	0.0348	0.013	6.64	8.46	216.40	213.30	213.90	210.90
CB12	DMH7	4.10	0.31	1.28	1.28	82.25	18.5	0.23	25	4.00	7.15	15	0.0134	0.013	7.47	6.09	213.88	210.50	211.90	209.40
DMH7	DMH8	--	--	--	1.28	44.00	18.7	0.12	25	4.00	7.15	15	0.0136	0.013	7.54	6.15	213.90	209.30	212.90	208.70
CB13	DMH8	0.29	0.68	0.20	0.20	11.50	5.0	0.05	25	6.60	1.30	12	0.0087	0.013	3.32	4.23	212.70	209.20	212.90	209.10
CB14	DMH8	0.34	0.54	0.18	0.18	11.50	5.0	0.05	25	6.60	1.20	12	0.0087	0.013	3.32	4.23	212.70	209.20	212.90	209.10
DMH8	DMH9	--	--	--	1.65	56.30	18.8	0.19	25	4.00	8.66	18	0.0071	0.013	8.85	5.01	212.90	208.60	212.15	208.20
CB15	DMH9	1.30	0.30	0.39	0.39	86.70	13.7	0.25	25	5.10	1.99	12	0.0161	0.013	4.53	5.76	213.60	210.50	212.15	209.10
DMH9	DMH10	--	--	--	2.04	159.60	19.0	0.39	25	3.98	10.18	18	0.0132	0.013	12.05	6.82	212.15	208.10	210.05	206.00
CB16	DMH10	0.35	0.78	0.27	0.27	8.30	5.0	0.03	25	6.60	1.80	12	0.0120	0.013	3.91	4.98	209.80	206.30	210.05	206.20
CB17	DMH10	0.50	0.63	0.31	0.31	8.50	5.0	0.02	25	6.60	2.06	12	0.0235	0.013	5.47	6.96	209.90	206.40	210.05	206.20
DMH10	DMH11	--	--	--	2.63	82.05	19.4	0.18	25	3.99	12.54	18	0.0171	0.013	13.72	7.76	210.05	205.90	208.00	204.50
DMH11	DMH12	--	--	--	2.63	49.40	19.6	0.11	25	3.99	12.54	18	0.0162	0.013	13.37	7.56	208.00	203.60	206.30	202.80
DMH12	DMH13	--	--	--	2.63	171.40	19.7	0.33	25	3.99	12.54	18	0.0216	0.013	15.43	8.73	206.30	200.80	200.65	197.10
CB18	DMH13	0.73	0.55	0.41	0.41	13.80	5.0	0.04	25	6.60	2.68	12	0.0181	0.013	4.80	6.11	200.75	197.25	200.65	197.00
CB19	DMH13	1.34	0.45	0.60	0.60	13.80	5.0	0.04	25	6.60	3.96	12	0.0181	0.013	4.80	6.11	200.75	197.25	200.65	197.00
DMH13	DMH14	--	--	--	3.64	79.60	20.0	0.16	25	3.95	16.41	24	0.0138	0.013	26.59	8.47	200.65	193.50	196.50	192.40
DMH14	FES4	--	--	--	3.64	47.30	20.2	0.11	25	3.95	16.41	24	0.0106	0.013	23.26	7.40	196.50	184.50		184.00
CB26	DMH22	0.30	0.73	0.22	0.22	10.60	5.0	0.03	25	6.60	1.47	12	0.0189	0.013	4.89	6.23	225.60	222.10	225.40	221.90
CB27	DMH22	0.98	0.53	0.52	0.52	11.00	5.0	0.03	25	6.60	3.43	12	0.0182	0.013	4.80	6.12	225.60	222.10	225.40	221.90
DMH22	DMH21	--	--	--	0.74	117.90	5.0	0.23	25	6.60	4.89	12	0.0352	0.013	6.68	8.51	225.40	218.90	218.25	214.75
DMH21	DMH20	--	--	--	0.74	83.80	5.3	0.17	25	6.58	4.87	12	0.0310	0.013	6.28	7.99	218.25	212.75	213.65	210.15
DMH20	DMH19	--	--	--	0.74	81.80	5.4	0.17	25	6.55	4.86	12	0.0300	0.013	6.17	7.85	213.65	208.15	208.70	205.70
CB24	DMH19	0.38	0.78	0.29	0.29	11.20	5.0	0.03	25	6.60	1.95	12	0.0223	0.013	5.32	6.78	208.95	205.45	208.70	205.20
CB25	DMH19	0.65	0.57	0.37	0.37	11.60	5.0	0.03	25	6.60	2.44	12	0.0216	0.013	5.23	6.66	208.95	205.45	208.70	205.20
DMH19	DMH18	--	--	--	1.41	104.60	5.6	0.20	25	6.45	9.07	15	0.0287	0.013	10.94	8.91	208.70	202.00	202.60	199.00
DMH18	DMH17	--	--	--	1.41	85.00	5.8	0.18	25	6.35	8.93	15	0.0229	0.013	9.78	7.97	202.60	197.75	199.05	195.80
CB22	DMH17	0.29	0.55	0.16	0.16	11.80	5.0	0.03	25	6.60	1.04	12	0.0169	0.013	4.64	5.91	199.30	195.60	199.05	195.40

Pipe Calculations

"Lakeland Hills"
Norfolk, MA

From	To	Area (AC.) Incremental	Weighted Runoff Coefficient "C"	CxA	Cumulative CxA	Pipe Length (Feet)	Flow Time (min) To Inlet	Flow Time (min) In Channel	Design Storm (Year)	Intensity (IN/HR)	Q (CFS)	Size (IN)	Slope (FT/FT)	Mannings n	Full Capacity (cfs)	Full Velocity (fps)	Upper End Rim	Upper End Invert	Lower End Rim	Lower End Invert
CB23	DMH17	0.24	0.73	0.18	0.18	13.20	5.0	0.04	25	6.60	1.16	12	0.0152	0.013	4.39	5.58	199.10	195.60	199.05	195.40
DMH17	DMH16	--	--	--	1.74	125.40	6.0	0.29	25	6.35	11.03	18	0.0152	0.013	12.93	7.32	199.05	194.60	196.70	192.70
CB20	DMH16	0.22	0.71	0.15	0.15	9.00	5.0	0.02	25	6.60	1.02	12	0.0278	0.013	5.94	7.56	196.45	192.95	196.70	192.70
CB21	DMH16	0.23	0.79	0.18	0.18	9.50	5.0	0.03	25	6.60	1.22	12	0.0105	0.013	3.66	4.65	196.30	192.80	196.70	192.70
DMH16	DMH15	--	--	--	2.08	32.50	6.3	0.06	25	6.30	13.08	18	0.0215	0.013	15.42	8.72	196.70	192.20	196.20	191.50
DMH15	FES5	--	--	--	2.08	43.10	6.3	0.09	25	6.25	12.98	18	0.0162	0.013	13.39	7.58	196.20	184.70		184.00

Pipe Calculations

PART IV – SUPPLEMENTAL DOCUMENTATION

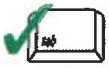
DEP Checklist for Stormwater Report

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

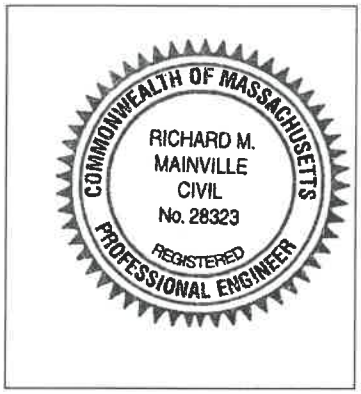
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



11/27/2019
Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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

Checklist (continued)

Standard 3: Recharge (continued)

☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist (continued)

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

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

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

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Flood Insurance Rate Map

National Flood Hazard Layer FIRMette

FEMA

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile *Zone*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximat point selected by the user and does not represe an authoritative property location.

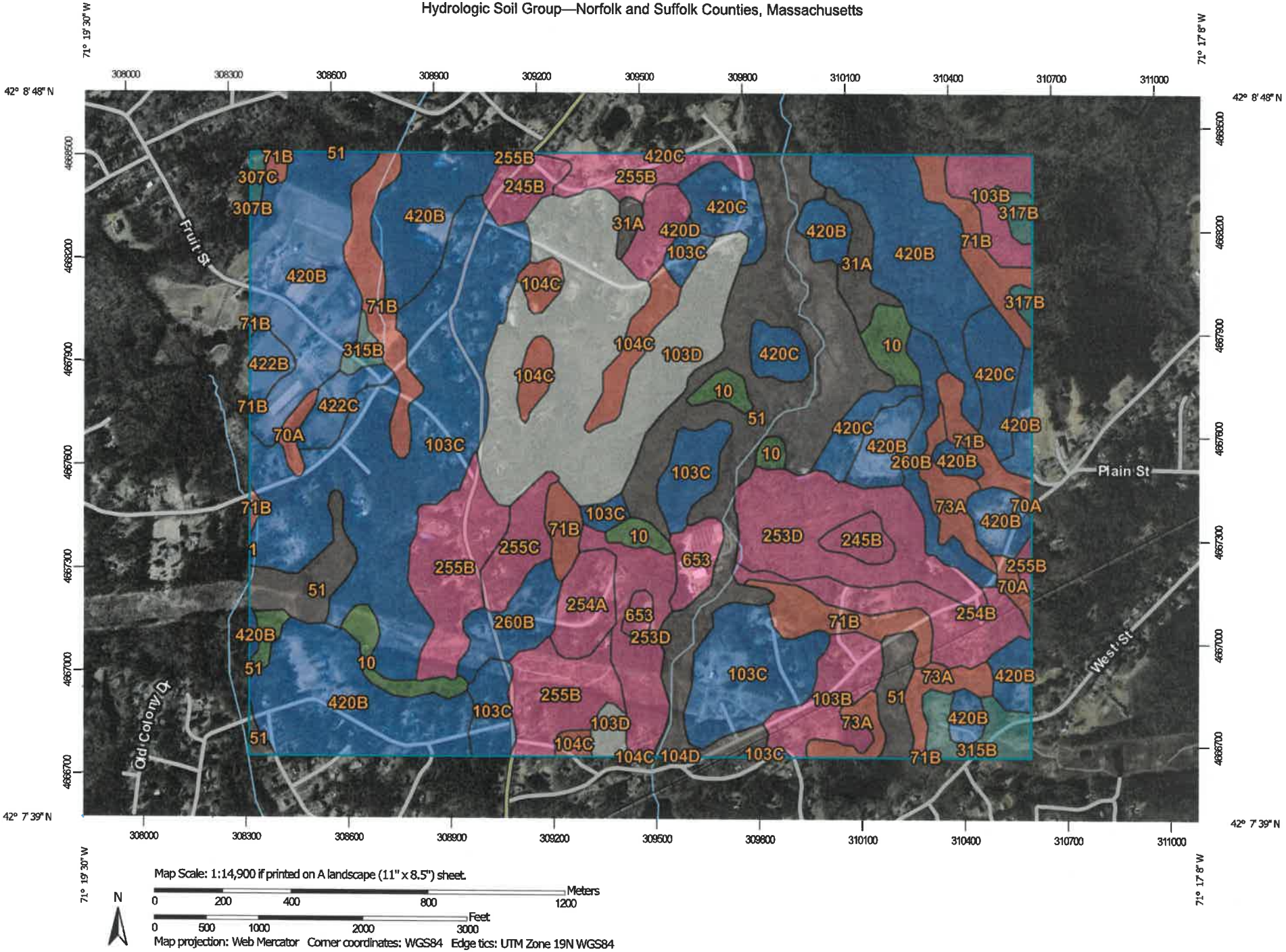
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/22/2019 at 4:20:34 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

NRCS Soil Survey Report

Hydrologic Soil Group—Norfolk and Suffolk Counties, Massachusetts



Map Scale: 1:14,900 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 12, Sep 15, 2016

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

Date(s) aerial images were photographed: Mar 30, 2011—Apr 8, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Norfolk and Suffolk Counties, Massachusetts (MA616)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		0.1	0.0%
10	Scarboro and Birdsall soils, 0 to 3 percent slopes	A/D	23.5	2.4%
31A	Walpole sandy loam, 0 to 3 percent slopes	B/D	10.3	1.0%
51	Swansea muck, 0 to 1 percent slopes	B/D	111.5	11.2%
70A	Ridgebury fine sandy loam, 0 to 3 percent slopes	D	5.7	0.6%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	D	54.5	5.5%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	20.2	2.0%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	A	28.5	2.9%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	B	156.4	15.7%
103D	Charlton-Hollis-Rock outcrop complex, 15 to 25 percent slopes		94.9	9.5%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	D	18.5	1.9%
104D	Hollis-Rock outcrop-Charlton complex, 15 to 35 percent slopes		0.1	0.0%
245B	Hinckley loamy sand, 3 to 8 percent slopes	A	13.2	1.3%
253D	Hinckley loamy sand, 15 to 35 percent slopes	A	58.1	5.8%
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	A	11.4	1.1%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	19.9	2.0%

Hydrologic Soil Group— Summary by Map Unit — Norfolk and Suffolk Counties, Massachusetts (MA616)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
255B	Windsor loamy sand, 3 to 8 percent slopes	A	59.8	6.0%
255C	Windsor loamy sand, 8 to 15 percent slopes	A	10.9	1.1%
260B	Sudbury fine sandy loam, 2 to 8 percent slopes	B	24.2	2.4%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	C	0.0	0.0%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	C	1.6	0.2%
315B	Scituate fine sandy loam, 3 to 8 percent slopes	C	13.0	1.3%
317B	Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony	C	4.4	0.4%
420B	Canton fine sandy loam, 3 to 8 percent slopes	B	188.7	19.0%
420C	Canton fine sandy loam, 8 to 15 percent slopes	B	36.0	3.6%
420D	Canton fine sandy loam, 15 to 35 percent slopes	A	7.9	0.8%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B	5.0	0.5%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	B	7.5	0.8%
653	Udorthents, sandy	A	9.3	0.9%
Totals for Area of Interest			**995.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

TSS Removal Worksheet

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

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Basin 1

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
Infiltration Basin	0.80	0.56	0.45	0.11
	0.00	0.11	0.00	0.11
	0.00	0.11	0.00	0.11

Total TSS Removal = 89%

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

Project: Lakeland Hills, Seekonk Street
Prepared By: KNL
Date: 11/26/2019

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

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

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Basin 2

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
Infiltration Basin	0.80	0.56	0.45	0.11
	0.00	0.11	0.00	0.11
	0.00	0.11	0.00	0.11

Total TSS Removal = 89%

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

Project: Lakeland Hills, Seekonk Street
Prepared By: KNL
Date: 11/26/2019

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

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

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Basin 3

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Oil Grit Separator	0.25	0.75	0.19	0.56
Infiltration Basin	0.80	0.56	0.45	0.11
	0.00	0.11	0.00	0.11
	0.00	0.11	0.00	0.11

Total TSS Removal = 89%

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

Project: Lakeland Hills, Seekonk Street
Prepared By: KNL
Date: 11/26/2019

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

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

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Basin 4

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
Infiltration Basin	0.80	0.56	0.45	0.11
	0.00	0.11	0.00	0.11
	0.00	0.11	0.00	0.11

Total TSS Removal = 89%

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

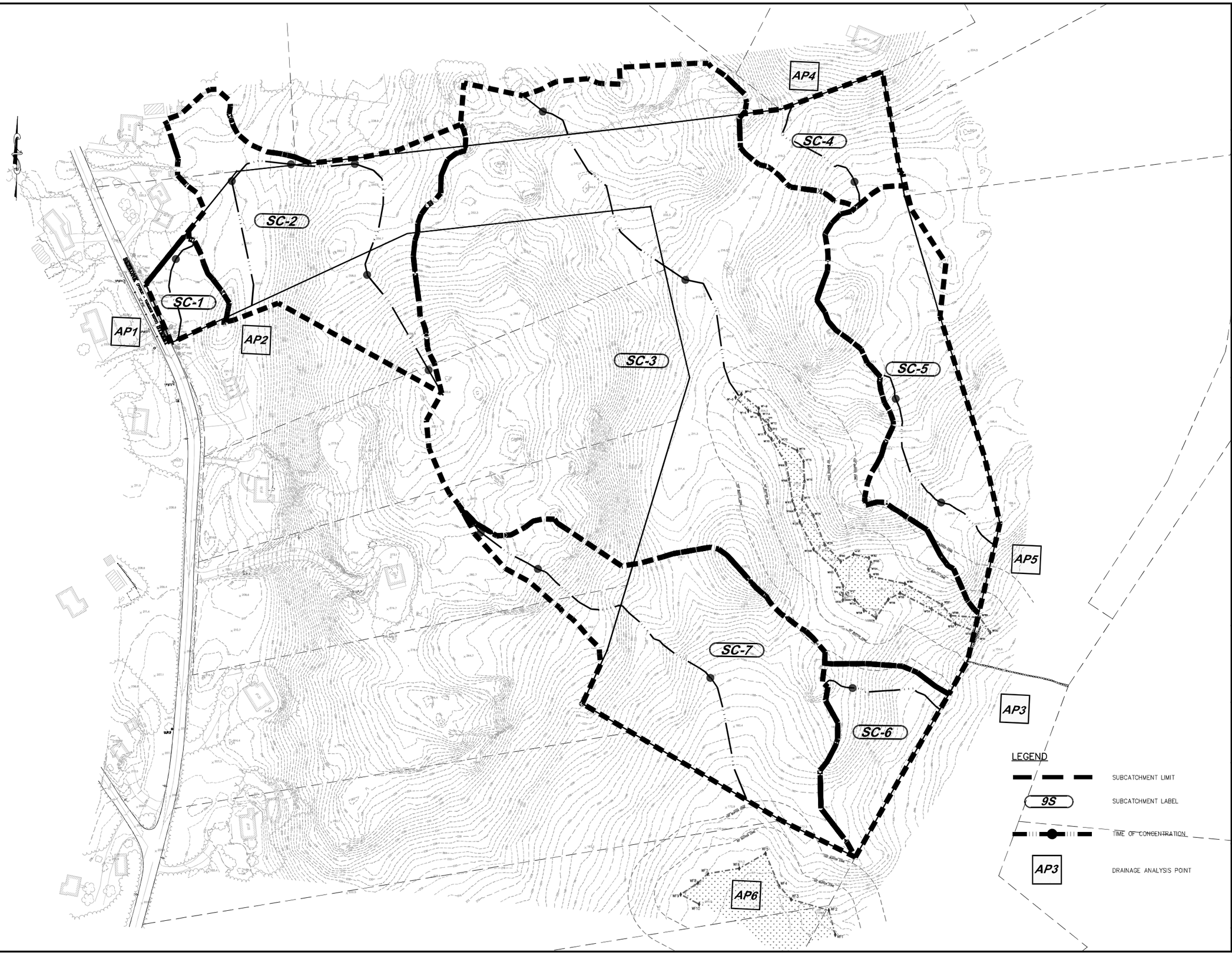
Project: Lakeland Hills, Seekonk Street
Prepared By: KNL
Date: 11/26/2019

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

PART V – MAPS

Watershed Map Existing Conditions



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500 East Washington Street
North Attleboro, Massachusetts 02760
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PROJECT:
LAKELAND HILLS
TOWNHOUSE COMMUNITY
144 SEEKONK STREET
NORFOLK, MA 02056

APPLICANT:
LAKELAND HILLS, LLC
136 SEEKONK STREET
NORFOLK, MA 02056

REVISIONS

NO.	DATE	DESCRIPTION

GRAPHIC SCALE
80 0 40 80 160
(IN FEET)
1 inch = 80 feet

SHEET TITLE
PRE-DEVELOPMENT
WATERSHED MAP

DES BY: KNL | DATE: NOV 27, 2019
CHK BY: RMM | PROJECT NO. 2015-219
D-1.0

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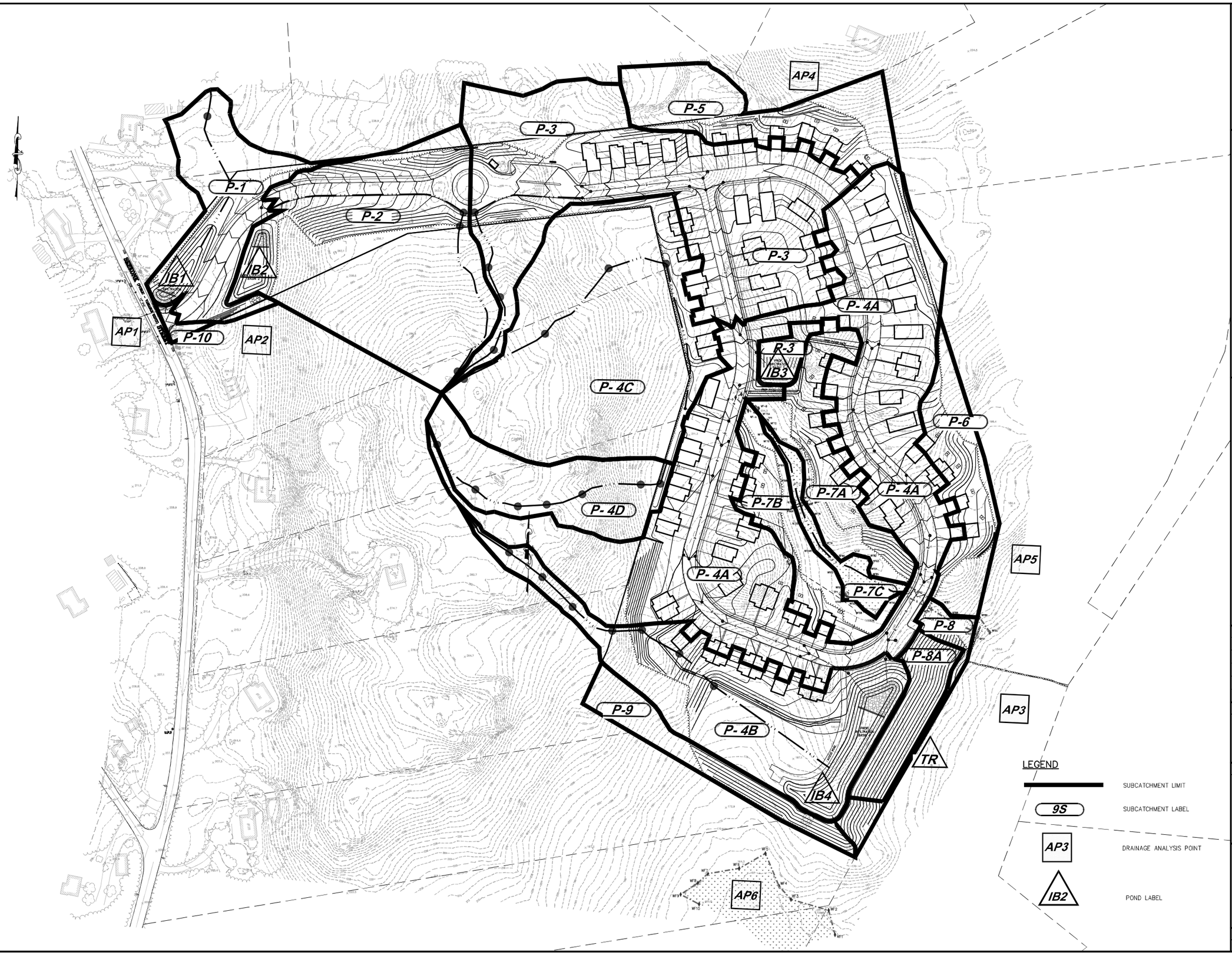
Watershed Map Developed Conditions



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LAKELAND HILLS, LLC
136 SEEKONK STREET
NORFOLK, MA 02056

REVISIONS

NO.	DATE	DESCRIPTION

GRAPHIC SCALE
80 0 40 80 160
(IN FEET)
1 inch = 80 feet

SHEET TITLE
POST-DEVELOPMENT WATERSHED MAP

DES BY: KNL	DATE: NOV 27, 2019	D-2.0
CHK BY: RMM	PROJECT NO. 2015-219	

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PART VI – LONG TERM POLLUTION PREVENTION AND STORMWATER SYSTEM OPERATION AND MAINTENANCE PLAN

Long Term Pollution Prevention and Stormwater System Operation and Maintenance Plan

TABLE OF CONTENTS

Preface:

The goal of this manual is to improve water quality by initiating performance standards for the operation and maintenance of stormwater management structures, facilities, and recognized practices. The stormwater performance standards are set up to meet the statutory and regulatory authorities of the Department of Environmental Protection, including the Wetland Protection Act, surface water discharge permits under the Clean Waters Act, the 401 certification program for fill in wetlands, and the 401 certification of federal permits based on the water quality standards.

The local Conservation Commission and the Department of Environmental Protection are responsible for ensuring the protection of wetlands through the issuance of permits for activities in flood plains and in or near wetlands, as per the Wetlands Protection Act, MGL c.131 s. 40. Proposed work within a resource area or a one hundred (100') foot buffer zone requires an order of conditions.

Resource areas include freshwater and coastal wetlands, banks, beaches, and dunes bordering on estuaries, streams, riverfront, ponds, lakes, or the ocean; lands under any of these bodies of water; land subject to tidal action, coastal storm flowage, or flooding.

The discharge of pollutants to water of the Commonwealth without a permit is prohibited under the state Clean Waters Act, MGL c. 21, ss 26-53. Stormwater discharges are subject to regulations when two criteria are met under 314 CMR 3.04(2). First, there must be "conveyance or system of conveyances (including pipes, ditches, and channels) primarily used for collecting and conveying stormwater runoff." 314 CMR 3.04(2)(a). Second, the stormwater runoff must be "contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, or oil and grease," or, be designated on a case-by-case basis. Such designations must be made when the "stormwater discharge" is subject to effluent or toxic pollutant limitations, is located in an industrial plant area, or may be a significant contributor of pollutants to waters of the Commonwealth. Any activity resulting in a discharge to waters of the United States must comply with Section 401 of the Federal Clean Water Act and comply with state water quality standards. All stormwater discharges must be set back from the receiving waters or wetlands and best management practices (BMP) must be implemented. A permit is required for any stormwater discharge to an Outstanding Resource Water (ORW) which meets the regulatory definition in 314 CMR 3.04(2). Outstanding Resource Waters are defined under Surface Water Quality Standards 314 CMR 4.06 and include public surface water supplies, coastal and some inland Areas of Critical Environmental Concern (ACECs), and certified vernal pools.

This manual is set up to explain how to operate and maintain Best Management Practices that control erosion and minimize delivery of sediment and other pollutants to surrounding water and air.

Chapter 1 is an introduction to the site and describes the Best Management Practices used on this site.

Chapter 2 outlines the inspection and maintenance schedules for the site.

Chapter 3 outlines the operation and function of the Best Management Practices.

Chapter 4 describes how and when the Best Management Practices should be inspected and how frequently they must be maintained and cleaned.

1. Project Description

The proposed development is for a subdivision under the state's comprehensive permit statute, Chapter 40B. The stormwater will be handled through a series of infiltration basins throughout the site. There is a total of 6 infiltration basins. Stormwater is collected and transported to Stormwater BMPs through deep sump hooded catch basins, underground pipe network and natural grading. Sediment Forebays are used with infiltration basins to meet water quality treatment volumes and TSS Removal. There are emergency over flows and maintenance access to the Infiltration Basins.

Stormwater runoff from the development will be collected in a number of Best Management Practices (BMP's), including infiltration basins.

To control erosion and minimize delivery of sediment and other pollutants into the atmosphere and adjacent wetlands, Best Management Practices (BMP's) have been provided within the site's stormwater management system. These practices include but are not limited to:

- Deep Sump Catch Basin
- Sediment Forebay
- Infiltration Basin
- Infiltration Trench
- Oil/Grit Separator;

This manual is designed to help responsible parties become aware of urban non-point pollution problems and to provide detailed information about operating and maintaining stormwater management practices. The success of the Best Management Practices is dependent on their continued operations and maintenance.

2. Maintenance Requirements

- Owner
  The owner(s) of the BMP's shall be the person, persons, trust, corporation, etc., or their successors who have title to the land on which the BMP is located. It is anticipated that all BMP's will be owned and maintained by Lakeland Hills, LLC, until the title of the land upon which they are located are transferred. At that time, the purchaser of the property will assume all responsibilities set forth within this document.

- Operation and Maintenance Responsibilities
  - The party or parties responsible for the funding, operation and maintenance of the BMP's shall be the OWNER or their designees.

- BMP's each have specific maintenance requirements to ensure long-term effectiveness. These stormwater management systems will be operated, inspected and maintained on a regular basis by a qualified professional with expertise in inspecting drainage system components. All of the stormwater BMP's shall be kept in good working order at all times.
- A maintenance agreement providing for the funding, operation and maintenance of all the stormwater management BMP's shall be provided.

- Source of Funding for Operation and Maintenance
  - The party or parties responsible for the funding, operation and maintenance of the BMP's shall be the OWNER or their designees.
  - A maintenance agreement providing for the funding, operation and maintenance of all the stormwater management BMP's shall be provided.

- Schedule for Inspection and Maintenance:
  - BMP's each have specific maintenance requirements to ensure long-term effectiveness. These stormwater management systems will be operated, inspected and maintained on a regular basis in accordance with this manual. All of the stormwater BMP's shall be kept in good working order at all times.
  - As a minimum, the owner shall follow the general guidelines outlined herein for the BMP's provided on this site.
  - An Operation and Maintenance log must be maintained for the last three years, outlining inspections, repairs, replacement and disposal for each Best Management Practice (BMP). In the case of disposal, the log shall indicate the type and material and the disposal location. This rolling log shall be made available to the Mass DEP and/or the Norfolk Conservation Commission upon request.

3. Operation of Best Management Practices

Deep Sump Hooded Catch Basin

Is an underground concrete structure which is designed to retain removed trash, debris and coarse sediment from stormwater runoff and serve as temporary spill containment devices for floatables such as oil and greases prior to discharge into a storm sewer pipe. The functions of a deep sump hooded catch basin include:

- A grate and/or vertical notch found in the curbing, that allow stormwater to enter the structure while filtering out larger objects such as trash and leaves;
- A four-foot (minimum) sump below the invert of the storm sewer pipe provides an area for detention time which allows sands and other sediments to settle out of the runoff prior to discharge.

Sediment Forebays

Is a post-construction practice consisting of an excavated pit, bermed area or cast (in-place or pre-) structure combined with a weir, designed to slow incoming stormwater runoff and facilitating the gravity separation of suspended solids prior to flowing to a subsequent BMP or system discharge. The functions of the sediment forebays include:

- Filter out sediments within the stormwater runoff

- Reduce runoff velocities;
- Reduce peak discharge flows.

Infiltration Basins

Are stormwater runoff impoundments that are constructed over permeable soils which allow for the recharge of treated runoff into the groundwater. The functions of an infiltration basin include:

- Provide groundwater recharge;
- Reduce local flooding;
- Preserve the natural water balance of the site.

4. Inspection and Maintenance of Best Management Practices

Deep Sump Hooded Catch Basins and Manholes

At a minimum, deep sump hooded catch basin and manhole inlets shall be inspected four times per year. Inlet inspection should be conducted at the end of the foliage and snow removal seasons. Each structure should be cleaned whenever the depth of sediment deposits is greater than or equal to one half the depth of the sump from the bottom of the structure to the bottom of the lowest pipe invert. Structures shall be inspected for a buildup of sediments, oils and debris, cracks, breaks, or deformations. Any function of the catch basin or manhole structure that is not in working order will be replaced with similar materials, as per the detail, to prevent the storm sewer system from failing.

The catch basins and manhole sumps will be cleaned by means of hand held shovels, scallop shovel and/or vactor trucks. The grate opening shall be clear of any foreign or lodged object. Sands and salts used in the winter will be removed from the catch basin sumps in the early spring. Leaves, pine needles, and branches brought down by autumn winds, rain, and cold weather will be removed from the catch basins sumps in the late fall.

Collected sediment and debris will be properly disposed of per local, state and federal requirements. Any sediment and debris removed from a catch basin deemed to be contaminated must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000, and handled as hazardous waste.

Sediment Forebay

At a minimum, the forebay shall be inspected after every major storm event (1-inch of rain or greater) for the first six (6) months, then monthly thereafter. Sediment and debris should be removed a minimum of four (4) times per year, starting in the spring and spaced at even time increments until the late fall season, thereafter.

Rip-rap area between the flared end section and the gabion wall, as well as the gabion wall itself shall be inspected within the sediment forebay. Riprap should be checked after every major storm event (1-inch of rain or greater) for displaced stones, slumping, and erosion at edges, especially downstream or downslope. If the riprap has been damaged, it should be repaired immediately before further damage can take place.

Collected sediment and debris will be properly disposed of per local, state and federal requirements. Any sediment and debris removed from the sediment forebay deemed to be contaminated must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000, and handled as hazardous waste.

Infiltration Basins (including drawdown devices, flared end sections and rip-rap aprons)
At a minimum shall be inspected after every major storm event (1-inch of rain or greater) for the first six (6) months, then in the spring and fall of every year, thereafter. Note how long water remains standing in basin after a storm; standing water within the basin >72 hours after storm events suggests potential clogging and should be immediately addressed. Also, check for signs of differential settlement, cracking, erosion, leakage in embankments, tree growth in embankments, condition of riprap aprons, sediment accumulation and the health of the turf. If necessary, the drawdown device in each infiltration basin shall be utilized to conduct the required maintenance.

At a minimum, inspect drawdown devices, flared end sections and rip-rap aprons associated with the infiltration basins at least twice a year. Inspect the drawdown device for sediment collection, erosion, and overall operation. Inspect the flared end sections for condition of the riprap stone, signs of erosion, integrity and joint connection with the drawdown device pipe, and vegetative growth. Riprap outfalls should be checked after every major storm event (1-inch of rain or greater) for displaced stones, slumping, and erosion at edges, especially downstream or downslope. If the riprap has been damaged, it should be repaired immediately before further damage can take place.

Infiltration basins shall be mowed a minimum of twice per year. Grass clippings and accumulated organic matter should be removed to a non-sensitive area. Repairs and reseeding should be done as required. Sediment and debris should be removed manually when infiltration basin is thoroughly dry, a minimum of once per year or when the sediment level reaches a depth of 3".

At a minimum, inspect and clean pretreatment devices associated with the infiltration basins at least twice a year.

Infiltration Trench
Because infiltration trenches are prone to failure due to clogging, it is imperative that they be aggressively maintained on a regular schedule. Perform preventive maintenance at least twice a year. Inspect the infiltration trench after the first several rainfall events, after all major storms, and on regularly scheduled dates every six months. The grassed trench must be mowed on a seasonal basis. Grass height must be maintained to be no more than four inches. Routinely remove grass clippings leaves and accumulated sediment from the surface of the trench.

Inspect the trench 24 hours or several days after a rain event, to look for ponded water. If there is ponded water at the surface of the trench, it is likely that the trench surface is clogged. To address surface clogging, remove and replace the topsoil or first layer of stone aggregate and the filter fabric. If water is ponded inside the trench, it may indicate that the bottom of the trench has failed. To rehabilitate a failed trench, all accumulated sediment must be stripped from the

bottom, the bottom of the trench must be scarified and tilled to induce infiltration, and all of the stone aggregate and filter fabric or media must be removed and replaced.

Downstream defender (oil/grit separator)
At minimum during the first year of installation the structure should be inspected ever 6 months. At least once a year, structure should have all sediment, oil, and floatables cleared to prevent clogging. For more detailed operation and maintenance see Hydro International O&M for the structure

5. Pollution Prevention Plan During Construction

A. Good Housekeeping

The following good housekeeping practices will be followed onsite during the construction project.

1. An effort will be made to store only enough products required to do the job.
2. All materials stored onsite will be stored in a neat, orderly manner and, if possible, under a roof or in a containment area. At a minimum, all containers will be stored with lids on when not in use. Drip pans shall be provided under all dispensers.
3. Products will be kept in their original containers with the original manufacturer's label in legible condition.
4. Substances will not be mixed with one another unless recommended by the manufacturer.
5. Whenever possible, all of a product will be used up before disposing of the container.
6. Manufacturer's recommendations for proper use and disposal will be followed.
7. The job site superintendent will be responsible for daily inspections to ensure proper use and disposal of materials.

B. Inspection and Maintenance Procedures

1. All controls will be inspected at least once every seven days and within 24 hours following a rainfall event of one-half (½) inch or more.
2. All measures will be maintained in good working order; if repairs or other measures are found to be necessary, they will be initiated within 24 hours of report.
3. Built up sediment will be removed from silt fence when it has reached one-third the height of the fence.
4. Silt fences will be inspected for depth of sediment, tears, etc., to see if the fabric is securely attached to the fence posts, and to see that the fence posts are securely in the ground.
5. Temporary and permanent seeding and all other stabilization measures will be inspected for bare spots, washouts, and healthy growth.
6. Disturbed areas and materials storage areas will be inspected for evidence of or potential pollutants entering the stormwater system.
7. Release of hazardous substances or oil in excess or reportable quantities (as established under 40 CFR 110, 40 CFR 117 or 40 CFR 302) must be reported.
8. BMP Maintenance:

a. All BMP's shall be inspected as at least once every seven days and within 24 hours following a rainfall event of one-half (½) inch or more during construction and shall be repaired as necessary.

Best Management Practices (BMP) Inspection Log

General Information			
Project Name	Lakeland Hills, LLC		
Location	Seekonk Street, Norfolk, MA		
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Type of Inspection: ❑ Regular ❑ Emergency			
Weather Information			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			
Are there any discharges at the time of inspection? ❑Yes ❑No **If yes, describe:**			

Site-specific BMPs

- *The structural BMPs are identified on the BEST MANAGEMENT PRACTICES LOCUS included within the LONG TERM POLLUTION PREVENTION & STORMWATER SYSTEM OPERATION & MAINTENANCE PLAN. Carry a copy of the Locus map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
1	Deep Sump Catch Basin	❑Yes ❑No	❑Yes ❑No	
2	Sediment Forebay	❑Yes ❑No	❑Yes ❑No	
3	Infiltration Basin 1	❑Yes ❑No	❑Yes ❑No	
4	Infiltration Basin 2	❑Yes ❑No	❑Yes ❑No	
5	Infiltration Basin 3	❑Yes ❑No	❑Yes ❑No	
6	Infiltration Basin 4	❑Yes ❑No	❑Yes ❑No	
7	Infiltration Trench	❑Yes ❑No	❑Yes ❑No	
8	Downstream Defender 1	❑Yes ❑No	❑Yes ❑No	
9		❑Yes ❑No	❑Yes ❑No	
10		❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
2	Are storm drain inlets properly working?	❑Yes ❑No	❑Yes ❑No	
3	Is trash/litter from site areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
4	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	
5	Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
5	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
6	(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____

Signature: _____ **Date:** _____