STORMWATER REPORT

815 Edmands Road (Lot E1)
Framingham, MA

July 13, 2015

PREPARED BY:
Connorstone Engineering, Inc.
10 Southwest Cutoff, Suite 7
Northborough, MA 01532

Site Description

Site Location: 815 Edmands Road, Framingham

Zoning District: R-1 Single Family Residential (no overlays)

Assessors Map / Parcel: Sheet 421, Block 1, Lot 16 (locus) and easements over Lot 13

Surface Conditions: Vegetated with typical upland forest

Site Topography: The site slopes from north to south at moderate to steep slopes of 15% to 20% leading to Edmands Road.

Wetland Resource Areas: No known regulated wetland resources have been located within 125 feet of the site. The proposed project is not located in an Estimated or Priority Habitat of Rare Wildlife as indicated on the 2008 Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP).

Soil Conditions: The Natural Resource Conservation Service has mapped the soils on site as "Narragansett-Hollis-Rock Complex," which is classified as Hydrologic Soil Group B. test pits have also been performed on-site that generally agree with the soil mapping, and show no groundwater to the bottom of test hole (greater than 110 inches).

Proposed Project Summary

Proposed Use: Four bedroom Single family house with associated septic system , utilities, site work, and driveway access off Edmands Road.

Disturbed Area: Approximately 25,000 square feet

Proposed Impervious Area: 5,410 square feet +/- (driveway and house footprint)

Stormwater Management

Existing Conditions: Under the existing conditions, all surface runoff from the project area flows uncollected to Edmands Road. The upgradient drainage area includes approximately 2.9 acres of wooded uplands.

Proposed Conditions: A proposed drainage system has been provided in compliance with the Town Bylaws to ensure the rate and volume of runoff does not exceed the existing conditions.

Surface runoff from the upgradient areas and the roof will be collected and directed to two drywells to the east of the proposed house. Overflow from this system will discharge to undisturbed areas. Runoff from the driveway and front lawn area will be collected through the infiltration swale or surface inlet and directed to two drywells located at the base of the driveway. Additional information and calculations have been attached to verify the proposed design and stormwater flows.

HYDROLOGIC ANALYSIS

An analysis was performed to determine the peak rate and volume of stormwater runoff leaving the site, and verify the stormwater management system meets the requiredments of the Bylaw. Existing conditions were compared to proposed conditions to ensure that the proposed design will not increase the rateor volume of runoff from the site and/or result in downstream impacts.

Calculation Methods:

1. HydroCAD 9.10 Stormwater modeling Software
2. Data/Equation Source: Soil Conservation Service (SCS) Technical Release No. 20 (TR-20) and SCS Technical Release 55 (TR-55), Urban Hydrology for Small Watersheds.

Storm Event:

1. Rainfall Distribution: Type III, 24-hour storm
2. Rainfall frequency and intensity:
   2-year 3.2 in/hr 100- year: 7.0 in/hr
   10-year 4.8 in/hr
3. Data Source: National Weather Service Technical Paper 40

Soil Classification / Information:

1. Soil Classification: Narragansett-Hollis-Rock Complex
2. Hydrologic Group: HSG B
3. depth to Groundwater: Greater than 110 inches (none encountered to bottom of test pit)
4. Data Source: a.) NRCS / USDA Soil Survey
   b.) On-site test pits

*See report for soils mapping, test pit results are shown on the plans

Analysis Points

AP-1. Flow to Edmands Road

Summary:

The following table presents the pre- and post- development analysis for the 2-, 10-, and 100-year storm events.

Table 1: PEAK RATE of Runoff Summary

Analysis Point - AP	2-Year Storm Existing (Proposed)	10-Year Storm Existing (Proposed)	100-Year Storm Existing (Proposed)
1 Edmands Road	0.2 cfs (0.3 cfs)	2.0 cfs (1.5 cfs)	6.4 cfs (6.3 cfs)

Table 2: VOLUME of Runoff Summary

Analysis Point - AP	2-Year Storm Existing (Proposed)	10-Year Storm Existing (Proposed)	100-Year Storm Existing (Proposed)
1 Edmands Road	0.06 acre-feet (0.04 acre-feet)	0.20 acre-feet (0.18 acre-feet)	0.50 acre-feet (0.50 acre-feet)

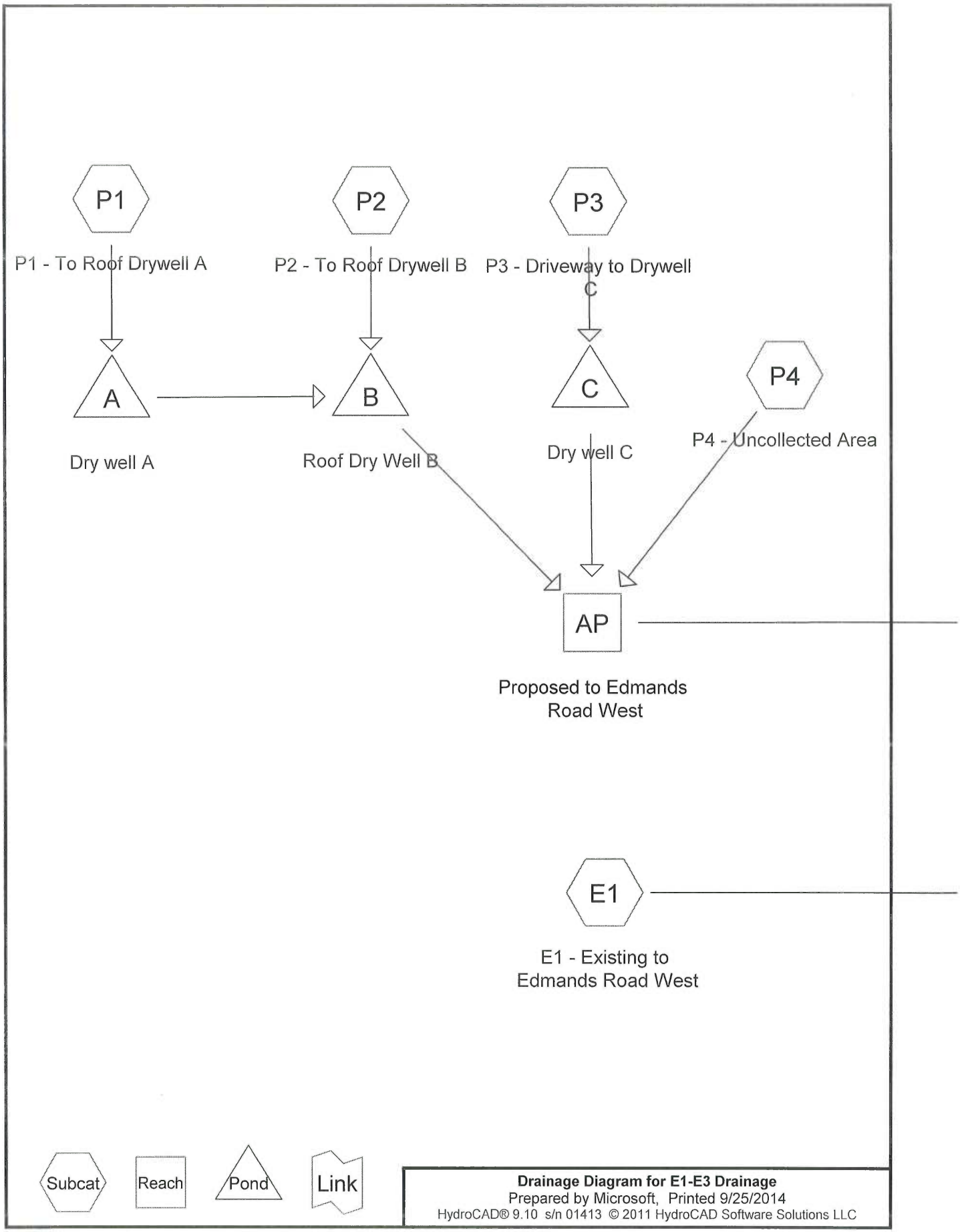
HYDROCAD CALCULATIONS

EXISTING CONDITION
2 Year, 10 Year , 25 Year & 100 Year Storm
Calculation Sheets

AND

PROPOSED CONDITION
2 Year, 10 Year, 25 Year & 100 Year Storm
Calculation Sheets

Lot E1 Edmands Road
Framingham, MA



Drainage Diagram for E1-E3 Drainage
Prepared by Microsoft, Printed 9/25/2014
HydroCAD® 9.10 s/n 01413 © 2011 HydroCAD Software Solutions LLC

EXISTING DRAINAGE AREAS
815 EDMANDS ROAD

DATE:	SCALE:
7/13/2015	1"=100'

CONNORSTONE ENGINEERING
CONSULTING CIVIL ENGINEERS AND LAND SURVEYORS
10 SOUTHWEST CUTOFF, SUITE 7
NORTHBOROUGH, MASSACHUSETTS 01532

PROPOSED DRAINAGE AREAS 815 EDMANDS ROAD		CONNORSTONE ENGINEERING CONSULTING CIVIL ENGINEERS AND LAND SURVEYORS 10 SOUTHWEST CUTOFF, SUITE 7 NORTHBOROUGH, MASSACHUSETTS 01532
DATE: 7/13/2015	SCALE: 1"=100'	

EXISTING 2, 10, 100 yr.

Summary for Subcatchment E1: E1 - Existing to Edmands Road West

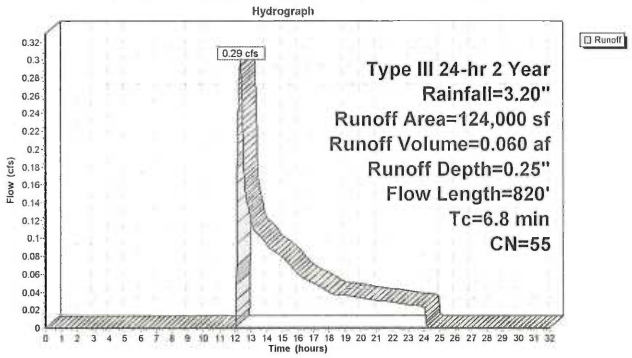
Runoff = 0.29 cfs @ 12.34 hrs, Volume= 0.060 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
124,000	55	Woods, Good, HSG B
124,000		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"
1.9	770	0.1700	6.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	820	Total			

Subcatchment E1: E1 - Existing to Edmands Road West



Summary for Subcatchment E1: E1 - Existing to Edmands Road West

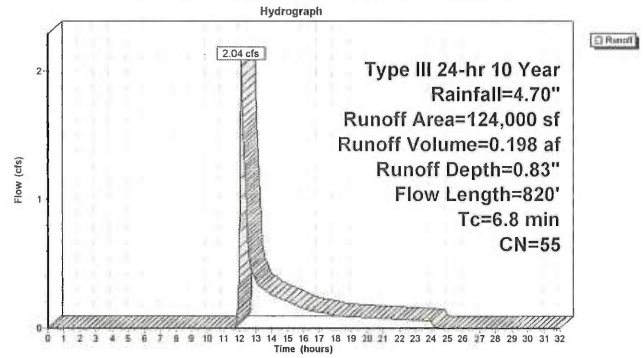
Runoff = 2.04 cfs @ 12.12 hrs, Volume= 0.198 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.70"

Area (sf)	CN	Description
124,000	55	Woods, Good, HSG B
124,000		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"
1.9	770	0.1700	6.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	820	Total			

Subcatchment E1: E1 - Existing to Edmands Road West



Summary for Subcatchment E1: E1 - Existing to Edmands Road West

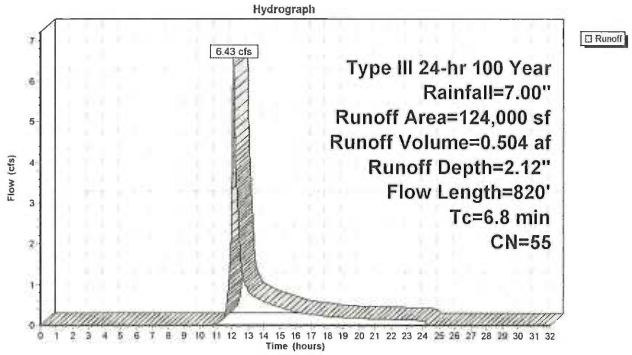
Runoff = 6.43 cfs @ 12.11 hrs, Volume= 0.504 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.00"

Area (sf)	CN	Description
124,000	55	Woods, Good, HSG B
124,000		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"
1.9	770	0.1700	6.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	820	Total			

Subcatchment E1: E1 - Existing to Edmands Road West



PROPOSED 2 year

Summary for Subcatchment P1: P1 - To Roof Drywell A

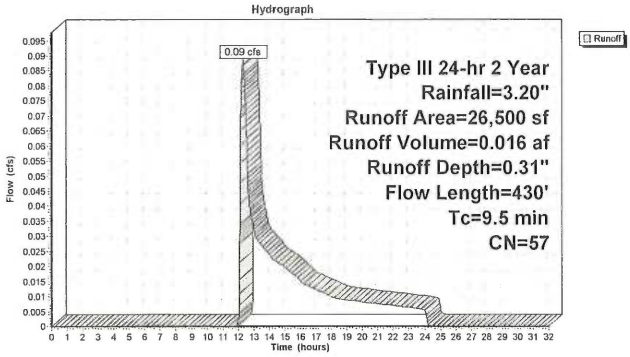
Runoff = 0.09 cfs @ 12.34 hrs, Volume= 0.016 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

	Area (sf)	CN	Description
	4,000	61	>75% Grass cover, Good, HSG B
*	875	98	Roof
	21,625	55	Woods, Good, HSG B
	26,500	57	Weighted Average
	25,625		96.70% Pervious Area
	875		3.30% Impervious 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"
0.5	230	0.2500	8.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	150	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.5	430	Total			

Subcatchment P1: P1 - To Roof Drywell A



Summary for Subcatchment P2: P2 - To Roof Drywell B

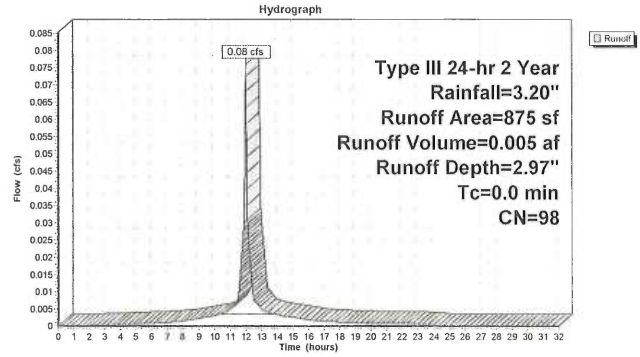
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.08 cfs @ 12.00 hrs, Volume= 0.005 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

	Area (sf)	CN	Description
*	875	98	Roof
	875		100.00% Impervious Area

Subcatchment P2: P2 - To Roof Drywell B



Summary for Subcatchment P3: P3 - Driveway to Drywell C

[49] Hint: Tc<2dt may require smaller dt

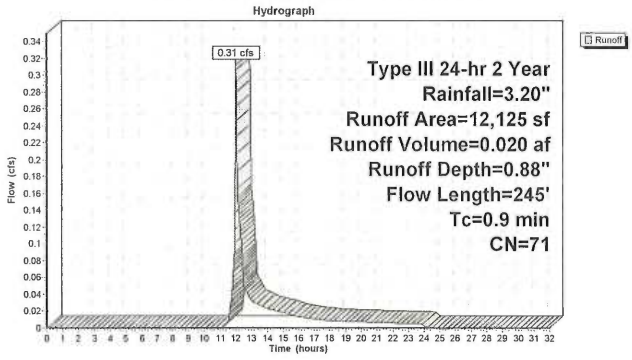
Runoff = 0.31 cfs @ 12.02 hrs, Volume= 0.020 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
8,925	61	>75% Grass cover, Good, HSG B
3,200	98	Paved parking, HSG B
12,125	71	Weighted Average
8,925		73.61% Pervious Area
3,200		26.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0550	1.79		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	195	0.1400	7.60		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	245	Total			

Subcatchment P3: P3 - Driveway to Drywell C



Summary for Subcatchment P4: P4 - Uncollected Area

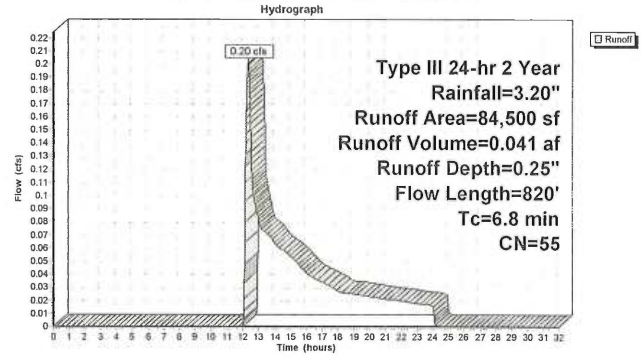
Runoff = 0.20 cfs @ 12.34 hrs, Volume= 0.041 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
81,050	55	Woods, Good, HSG B
550	98	Paved parking, HSG B
2,900	61	>75% Grass cover, Good, HSG B
84,500	55	Weighted Average
83,950		99.35% Pervious Area
550		0.65% Impervious 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"
1.9	770	0.1700	6.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	820	Total			

Subcatchment P4: P4 - Uncollected Area



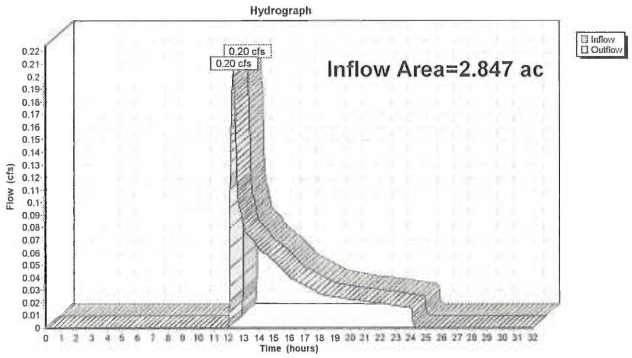
Summary for Reach AP: Proposed to Edmands Road West

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.847 ac, 4.44% Impervious, Inflow Depth = 0.17" for 2 Year event
Inflow = 0.20 cfs @ 12.34 hrs, Volume= 0.041 af
Outflow = 0.20 cfs @ 12.34 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs

Reach AP: Proposed to Edmands Road West



Summary for Pond A: Dry well A

Inflow Area = 0.608 ac, 3.30% Impervious, Inflow Depth = 0.31" for 2 Year event
Inflow = 0.09 cfs @ 12.34 hrs, Volume= 0.016 af
Outflow = 0.02 cfs @ 14.26 hrs, Volume= 0.013 af, Atten= 74%, Lag= 115.2 min
Discarded = 0.01 cfs @ 14.26 hrs, Volume= 0.009 af
Primary = 0.02 cfs @ 14.26 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs / 4
Peak Elev= 320.46' @ 14.26 hrs Surf.Area= 79 sf Storage= 268 cf

Plug-Flow detention time= 342.7 min calculated for 0.013 af (82% of inflow)
Center-of-Mass det. time= 264.5 min (1,207.5 - 943.0)

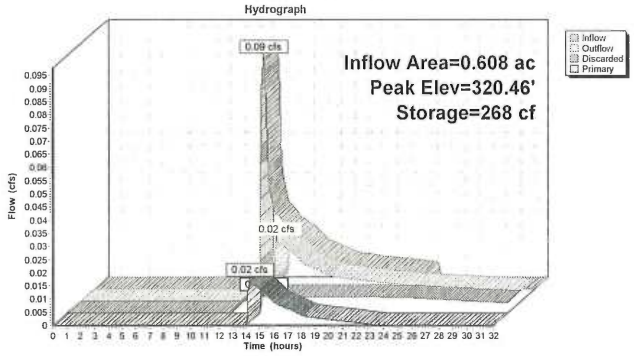
Volume	Invert	Avail.Storage	Storage Description
#1	314.75'	146 cf	**10.00'D x 7.00'H Vertical Cone/Cylinder** 550 cf Overall - 184 cf Embedded = 366 cf x 40.0% Voids
#2	315.25'	184 cf	**6.00'D x 6.50'H Vertical Cone/Cylinder** Inside #1
#3	321.75'	4 cf	**2.00'D x 1.25'H Riser to Grade** -Impervious
		334 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	314.75'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	320.40'	**8.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.01 cfs @ 14.26 hrs HW=320.46' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.01 cfs @ 14.26 hrs HW=320.46' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 0.83 fps)

Pond A: Dry well A



Summary for Pond B: Roof Dry Well B

Inflow Area = 0.628 ac, 6.39% Impervious, Inflow Depth = 0.17" for 2 Year event
Inflow = 0.08 cfs @ 12.00 hrs, Volume= 0.009 af
Outflow = 0.01 cfs @ 17.96 hrs, Volume= 0.008 af, Atten= 93%, Lag= 357.7 min
Discarded = 0.01 cfs @ 17.96 hrs, Volume= 0.008 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 318.07' @ 17.96 hrs Surf.Area= 79 sf Storage= 201 cf

Plug-Flow detention time= 392.6 min calculated for 0.008 af (87% of inflow)
Center-of-Mass det. time= 340.4 min (1,194.6 - 854.2)

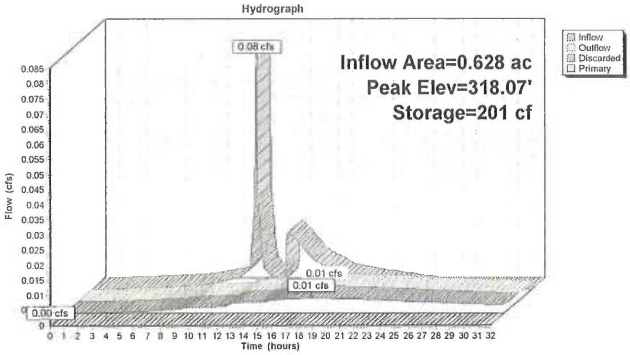
Volume	Invert	Avail.Storage	Storage Description
#1	313.75'	146 cf	**10.00'D x 7.00'H Vertical Cone/Cylinder** 550 cf Overall - 184 cf Embedded = 366 cf x 40.0% Voids
#2	314.25'	184 cf	**6.00'D x 6.50'H Vertical Cone** Inside #1
#3	321.25'	6 cf	**2.00'D x 2.00'H Riser to grade** -Impervious
		336 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	313.75'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	319.40'	**8.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.01 cfs @ 17.96 hrs HW=318.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=313.75' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond B: Roof Dry Well B



Summary for Pond C: Dry well C

Inflow Area = 0.278 ac, 26.39% Impervious, Inflow Depth = 0.88" for 2 Year event
Inflow = 0.31 cfs @ 12.02 hrs, Volume= 0.020 af
Outflow = 0.01 cfs @ 16.49 hrs, Volume= 0.017 af, Atten= 96%, Lag= 268.1 min
Discarded = 0.01 cfs @ 16.49 hrs, Volume= 0.017 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 289.47' @ 16.49 hrs Surf.Area= 157 sf Storage= 513 cf

Plug-Flow detention time= 479.6 min calculated for 0.017 af (81% of inflow)
Center-of-Mass det. time= 400.5 min (1,267.9 - 867.5)

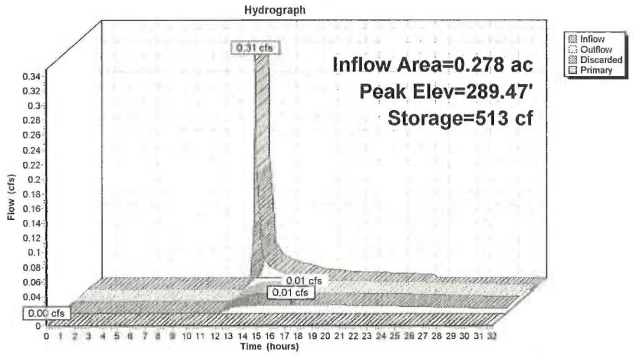
Volume	Invert	Avail.Storage	Storage Description
#1	284.00'	304 cf	**10.00'D x 7.00'H Vertical Cone/Cylinder** x 2 1,100 cf Overall - 339 cf Embedded = 760 cf x 40.0% Voids
#2	284.50'	339 cf	**6.00'D x 6.00'H Vertical Cone/Cylinder** x 2 Inside #1
#3	291.00'	6 cf	**2.00'D x 2.00'H Riser to Grade** -Impervious
		650 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	284.00'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	291.75'	**2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.01 cfs @ 16.49 hrs HW=289.47' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=284.00' (Free Discharge)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond C: Dry well C



PROPOSED 10 year

Summary for Subcatchment P1: P1 - To Roof Drywell A

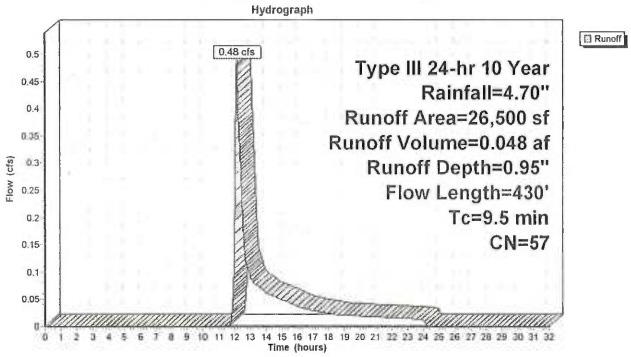
Runoff = 0.48 cfs @ 12.16 hrs, Volume= 0.048 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.70"

	Area (sf)	CN	Description
	4,000	61	>75% Grass cover, Good, HSG B
*	875	98	Roof
	21,625	55	Woods, Good, HSG B
	26,500	57	Weighted Average
	25,625		96.70% Pervious Area
	875		3.30% Impervious 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"
0.5	230	0.2500	8.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	150	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.5	430	Total			

Subcatchment P1: P1 - To Roof Drywell A



Summary for Subcatchment P2: P2 - To Roof Drywell B

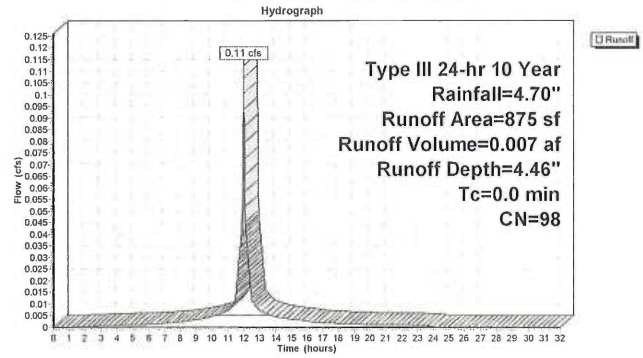
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.11 cfs @ 12.00 hrs, Volume= 0.007 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.70"

	Area (sf)	CN	Description
*	875	98	Roof
	875		100.00% Impervious Area

Subcatchment P2: P2 - To Roof Drywell B



Summary for Subcatchment P3: P3 - Driveway to Drywell C

[49] Hint: Tc<2dt may require smaller dt

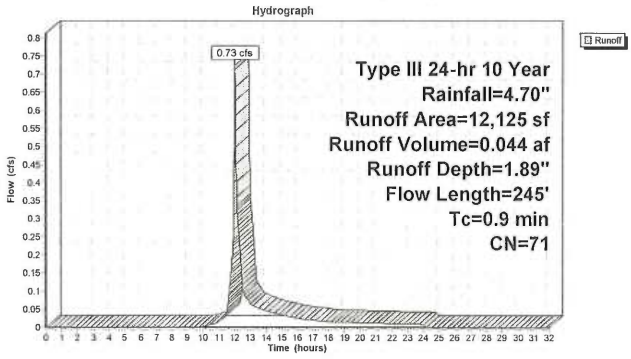
Runoff = 0.73 cfs @ 12.02 hrs, Volume= 0.044 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.70"

	Area (sf)	CN	Description
	8,925	61	>75% Grass cover, Good, HSG B
	3,200	98	Paved parking, HSG B
	12,125	71	Weighted Average
	8,925		73.61% Pervious Area
	3,200		26.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0550	1.79		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	195	0.1400	7.60		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	245	Total			

Subcatchment P3: P3 - Driveway to Drywell C



Summary for Subcatchment P4: P4 - Uncollected Area

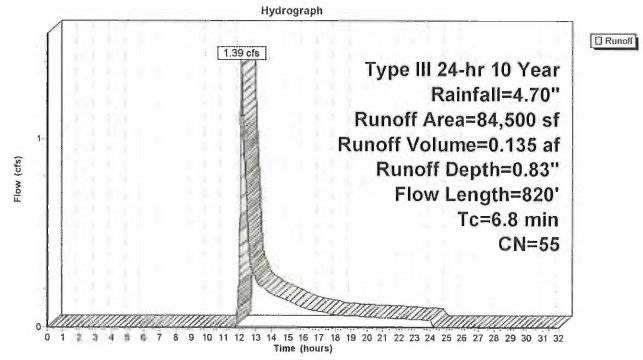
Runoff = 1.39 cfs @ 12.12 hrs, Volume= 0.135 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.70"

	Area (sf)	CN	Description
	81,050	55	Woods, Good, HSG B
	550	98	Paved parking, HSG B
	2,900	61	>75% Grass cover, Good, HSG B
	84,500	55	Weighted Average
	83,950		99.35% Pervious Area
	550		0.65% Impervious 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"
1.9	770	0.1700	6.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	820	Total			

Subcatchment P4: P4 - Uncollected Area



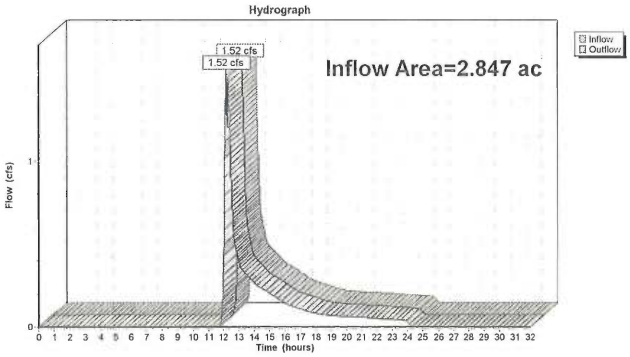
Summary for Reach AP: Proposed to Edmands Road West

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.847 ac, 4.44% Impervious, Inflow Depth = 0.76" for 10 Year event
Inflow = 1.52 cfs @ 12.18 hrs, Volume= 0.180 af
Outflow = 1.52 cfs @ 12.18 hrs, Volume= 0.180 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs

Reach AP: Proposed to Edmands Road West



Summary for Pond A: Dry well A

Inflow Area = 0.608 ac, 3.30% Impervious, Inflow Depth = 0.95" for 10 Year event
Inflow = 0.48 cfs @ 12.16 hrs, Volume= 0.048 af
Outflow = 0.43 cfs @ 12.22 hrs, Volume= 0.045 af, Atten= 10%, Lag= 3.7 min
Discarded = 0.01 cfs @ 12.22 hrs, Volume= 0.009 af
Primary = 0.43 cfs @ 12.22 hrs, Volume= 0.036 af

Routing by Stor-Ind method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs / 4
Peak Elev= 320.78' @ 12.22 hrs Surf.Area= 79 sf Storage= 283 cf

Plug-Flow detention time= 109.2 min calculated for 0.045 af (94% of inflow)
Center-of-Mass det. time= 78.5 min (972.6 - 894.1)

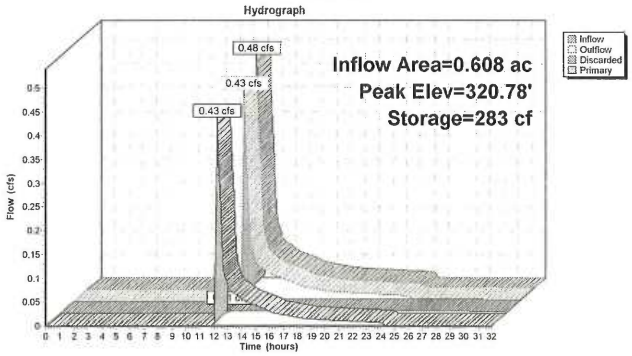
Volume	Invert	Avail.Storage	Storage Description
#1	314.75'	146 cf	**10.00'D x 7.00'H Vertical Cone/Cylinder** 550 cf Overall - 184 cf Embedded = 366 cf x 40.0% Voids
#2	315.25'	184 cf	**6.00'D x 6.50'H Vertical Cone/Cylinder** Inside #1
#3	321.75'	4 cf	**2.00'D x 1.25'H Riser to Grade** -Impervious
		334 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	314.75'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	320.40'	**8.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.01 cfs @ 12.22 hrs HW=320.78' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.42 cfs @ 12.22 hrs HW=320.78' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.42 cfs @ 2.09 fps)

Pond A: Dry well A



Summary for Pond B: Roof Dry Well B

Inflow Area = 0.628 ac, 6.39% Impervious, Inflow Depth = 0.83" for 10 Year event
Inflow = 0.46 cfs @ 12.22 hrs, Volume= 0.043 af
Outflow = 0.38 cfs @ 12.31 hrs, Volume= 0.040 af, Atten= 18%, Lag= 5.6 min
Discarded = 0.01 cfs @ 12.31 hrs, Volume= 0.011 af
Primary = 0.37 cfs @ 12.31 hrs, Volume= 0.030 af

Routing by Stor-Ind method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 319.75' @ 12.31 hrs Surf.Area= 79 sf Storage= 282 cf

Plug-Flow detention time= 121.6 min calculated for 0.040 af (93% of inflow)
Center-of-Mass det. time= 88.3 min (954.3 - 866.0)

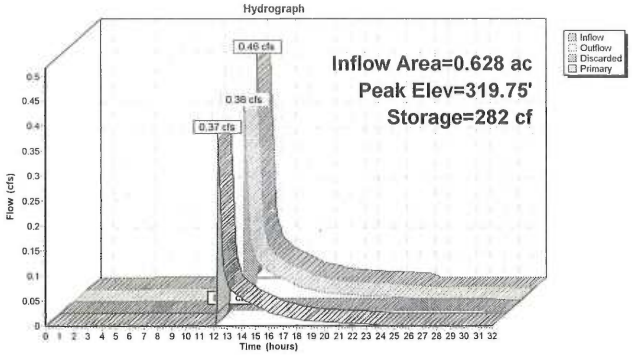
Volume	Invert	Avail.Storage	Storage Description
#1	313.75'	146 cf	**10.00'D x 7.00'H Vertical Cone/Cylinder** 550 cf Overall - 184 cf Embedded = 366 cf x 40.0% Voids
#2	314.25'	184 cf	**6.00'D x 6.50'H Vertical Cone** Inside #1
#3	321.25'	6 cf	**2.00'D x 2.00'H Riser to grade** -Impervious
		336 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	313.75'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	319.40'	**8.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.01 cfs @ 12.31 hrs HW=319.75' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.37 cfs @ 12.31 hrs HW=319.75' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.37 cfs @ 2.01 fps)

Pond B: Roof Dry Well B



Summary for Pond C: Dry well C

Inflow Area = 0.278 ac, 26.39% Impervious, Inflow Depth = 1.89" for 10 Year event
Inflow = 0.73 cfs @ 12.02 hrs, Volume= 0.044 af
Outflow = 0.34 cfs @ 12.18 hrs, Volume= 0.037 af, Atten= 53%, Lag= 9.9 min
Discarded = 0.01 cfs @ 12.17 hrs, Volume= 0.021 af
Primary = 0.33 cfs @ 12.18 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 291.88' @ 12.18 hrs Surf.Area= 157 sf Storage= 646 cf

Plug-Flow detention time= 289.0 min calculated for 0.037 af (85% of inflow)
Center-of-Mass det. time= 221.7 min (1,065.3 - 843.7)

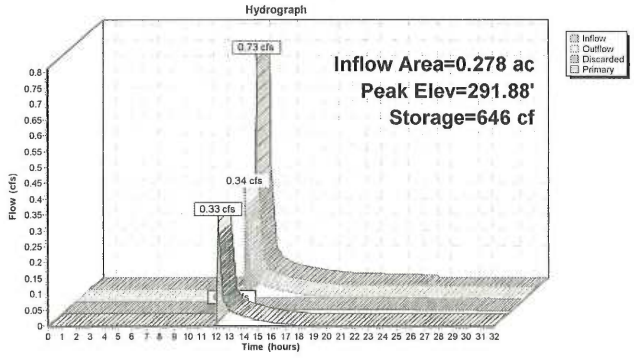
Volume	Invert	Avail.Storage	Storage Description
#1	284.00'	304 cf	**10.00'D x 7.00'H Vertical Cone/Cylinder** x 2 1,100 cf Overall - 339 cf Embedded = 760 cf x 40.0% Voids
#2	284.50'	339 cf	**6.00'D x 6.00'H Vertical Cone/Cylinder** x 2 Inside #1
#3	291.00'	6 cf	**2.00'D x 2.00'H Riser to Grade** -Impervious
		650 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	284.00'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	291.75'	**2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.01 cfs @ 12.17 hrs HW=291.85' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.30 cfs @ 12.18 hrs HW=291.88' (Free Discharge)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.30 cfs @ 1.18 fps)

Pond C: Dry well C



PROPOSED 100 year

Summary for Subcatchment P1: P1 - To Roof Drywell A

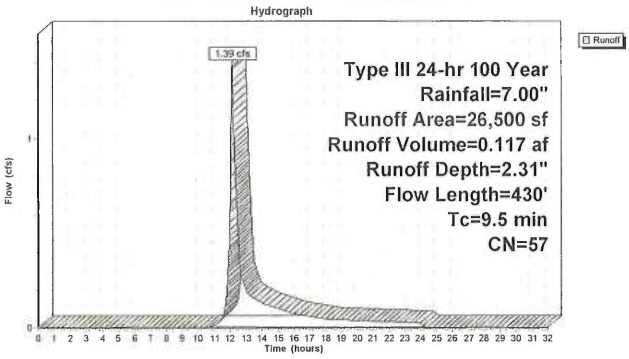
Runoff = 1.39 cfs @ 12.14 hrs, Volume= 0.117 af, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.00"

	Area (sf)	CN	Description
	4,000	61	>75% Grass cover, Good, HSG B
*	875	98	Roof
	21,625	55	Woods, Good, HSG B
	26,500	57	Weighted Average
	25,625		96.70% Pervious Area
	875		3.30% Impervious 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"
0.5	230	0.2500	8.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	150	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.5	430	Total			

Subcatchment P1: P1 - To Roof Drywell A



Summary for Subcatchment P2: P2 - To Roof Drywell B

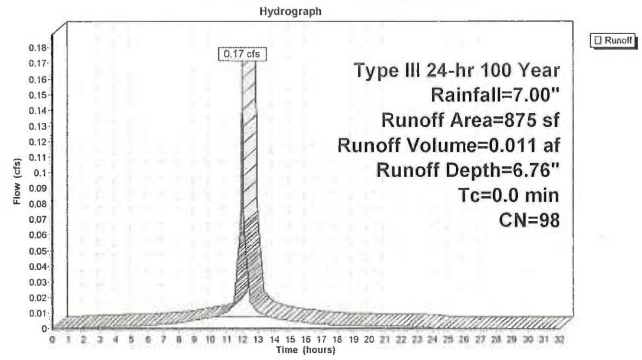
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.17 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.00"

	Area (sf)	CN	Description
*	875	98	Roof
	875		100.00% Impervious Area

Subcatchment P2: P2 - To Roof Drywell B



Summary for Subcatchment P3: P3 - Driveway to Drywell C

[49] Hint: Tc<2dt may require smaller dt

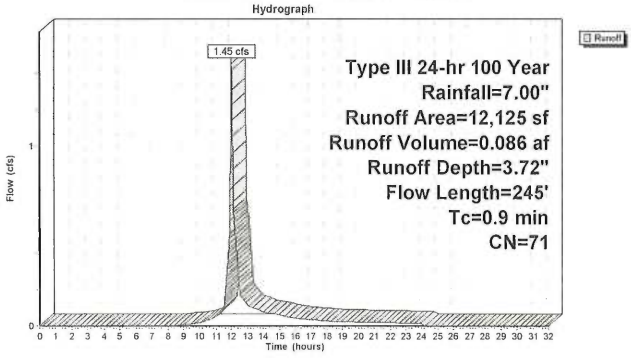
Runoff = 1.45 cfs @ 12.02 hrs, Volume= 0.086 af, Depth= 3.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.00"

Area (sf)	CN	Description
8,925	61	>75% Grass cover, Good, HSG B
3,200	98	Paved parking, HSG B
12,125	71	Weighted Average
8,925		73.61% Pervious Area
3,200		26.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0550	1.79		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	195	0.1400	7.60		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	245	Total			

Subcatchment P3: P3 - Driveway to Drywell C



Summary for Subcatchment P4: P4 - Uncollected Area

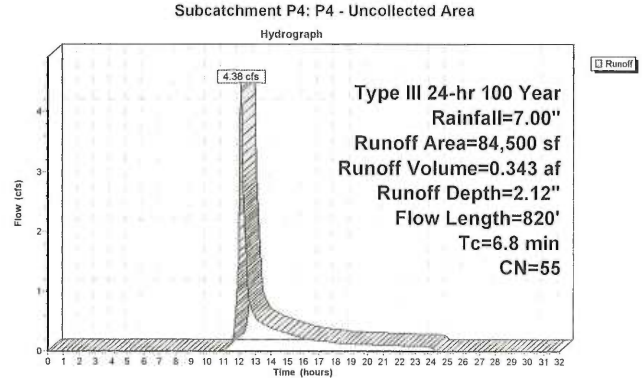
Runoff = 4.38 cfs @ 12.11 hrs, Volume= 0.343 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.00"

Area (sf)	CN	Description
81,050	55	Woods, Good, HSG B
550	98	Paved parking, HSG B
2,900	61	>75% Grass cover, Good, HSG B
84,500	55	Weighted Average
83,950		99.35% Pervious Area
550		0.65% Impervious 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"
1.9	770	0.1700	6.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	820	Total			

Subcatchment P4: P4 - Uncollected Area



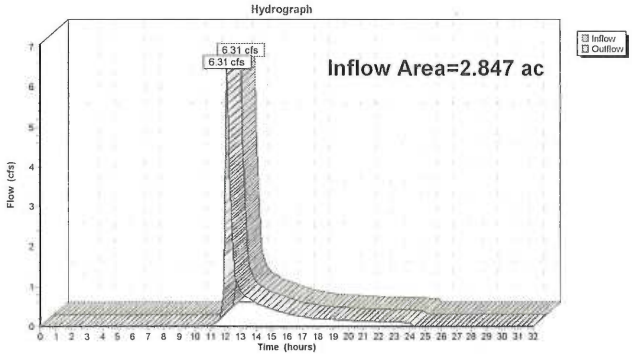
Summary for Reach AP: Proposed to Edmands Road West

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.847 ac, 4.44% Impervious, Inflow Depth = 2.11" for 100 Year event
Inflow = 6.31 cfs @ 12.10 hrs, Volume= 0.501 af
Outflow = 6.31 cfs @ 12.10 hrs, Volume= 0.501 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs

Reach AP: Proposed to Edmands Road West



Summary for Pond A: Dry well A

Inflow Area = 0.608 ac, 3.30% Impervious, Inflow Depth = 2.31" for 100 Year event
Inflow = 1.39 cfs @ 12.14 hrs, Volume= 0.117 af
Outflow = 1.38 cfs @ 12.16 hrs, Volume= 0.114 af, Atten= 1%, Lag= 0.7 min
Discarded = 0.01 cfs @ 12.16 hrs, Volume= 0.010 af
Primary = 1.37 cfs @ 12.16 hrs, Volume= 0.105 af

Routing by Stor-Ind method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs / 4
Peak Elev= 321.40' @ 12.16 hrs Surf.Area= 79 sf Storage= 313 cf

Plug-Flow detention time= 45.8 min calculated for 0.114 af (97% of inflow)
Center-of-Mass det. time= 32.0 min (896.1 - 864.2)

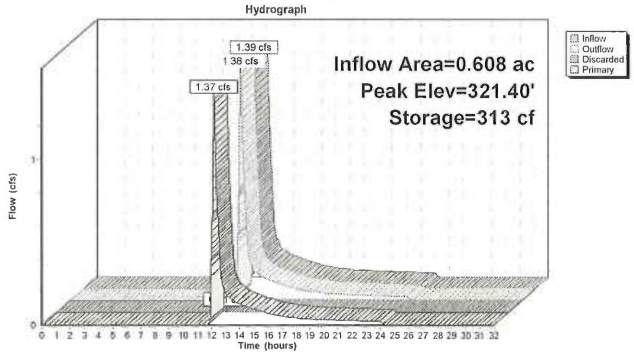
Volume	Invert	Avail.Storage	Storage Description
#1	314.75'	146 cf	**10.00'D x 7.00'H Vertical Cone/Cylinder** 550 cf Overall - 184 cf Embedded = 366 cf x 40.0% Voids
#2	315.25'	184 cf	**6.00'D x 6.50'H Vertical Cone/Cylinder** Inside #1
#3	321.75'	4 cf	**2.00'D x 1.25'H Riser to Grade** -Impervious
		334 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	314.75'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	320.40'	**8.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.01 cfs @ 12.16 hrs HW=321.40' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.37 cfs @ 12.16 hrs HW=321.40' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 1.37 cfs @ 3.92 fps)

Pond A: Dry well A



Summary for Pond B: Roof Dry Well B

[79] Warning: Submerged Pond A Primary device # 2 by 0.04'

Inflow Area = 0.628 ac, 6.39% Impervious, Inflow Depth = 2.21" for 100 Year event
Inflow = 1.43 cfs @ 12.15 hrs, Volume= 0.116 af
Outflow = 1.42 cfs @ 12.17 hrs, Volume= 0.113 af, Atten= 1%, Lag= 0.8 min
Discarded = 0.01 cfs @ 12.17 hrs, Volume= 0.011 af
Primary = 1.41 cfs @ 12.17 hrs, Volume= 0.102 af

Routing by Stor-Ind method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 320.44' @ 12.17 hrs Surf.Area= 79 sf Storage= 315 cf

Plug-Flow detention time= 47.0 min calculated for 0.113 af (97% of inflow)
Center-of-Mass det. time= 33.1 min (883.0 - 849.9)

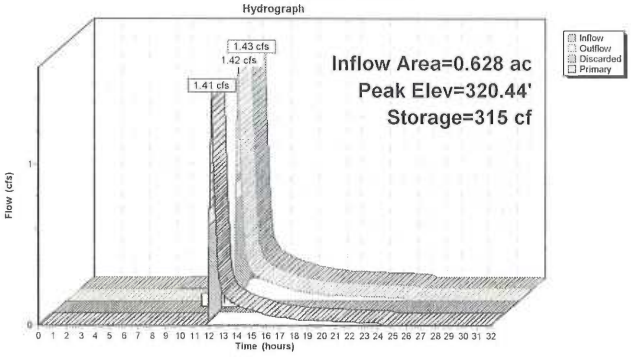
Volume	Invert	Avail.Storage	Storage Description
#1	313.75'	146 cf	**10.00'D x 7.00'H Vertical Cone/Cylinder** 550 cf Overall - 184 cf Embedded = 366 cf x 40.0% Voids
#2	314.25'	184 cf	**6.00'D x 6.50'H Vertical Cone** Inside #1
#3	321.25'	6 cf	**2.00'D x 2.00'H Riser to grade** -Impervious
		336 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	313.75'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	319.40'	**8.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.01 cfs @ 12.17 hrs HW=320.44' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.41 cfs @ 12.17 hrs HW=320.44' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 1.41 cfs @ 4.04 fps)

Pond B: Roof Dry Well B



Summary for Pond C: Dry well C

Inflow Area = 0.278 ac, 26.39% Impervious, Inflow Depth = 3.72" for 100 Year event
Inflow = 1.45 cfs @ 12.02 hrs, Volume= 0.086 af
Outflow = 1.45 cfs @ 12.02 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.01 cfs @ 11.91 hrs, Volume= 0.023 af
Primary = 1.44 cfs @ 12.02 hrs, Volume= 0.056 af

Routing by Stor-Ind method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 292.12' @ 12.02 hrs Surf.Area= 157 sf Storage= 647 cf

Plug-Flow detention time= 149.0 min calculated for 0.079 af (91% of inflow)
Center-of-Mass det. time= 105.6 min (929.5 - 823.9)

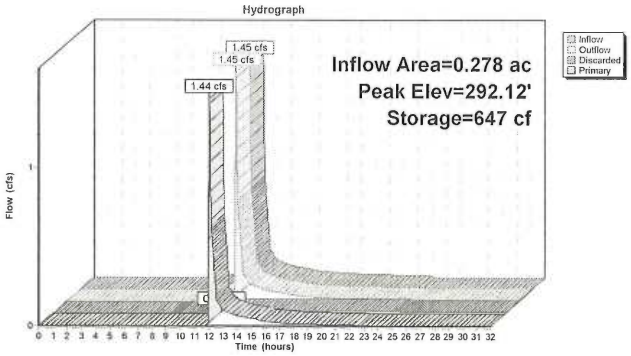
Volume	Invert	Avail.Storage	Storage Description
#1	284.00'	304 cf	**10.00'D x 7.00'H Vertical Cone/Cylinder** x 2 1,100 cf Overall - 339 cf Embedded = 760 cf x 40.0% Voids
#2	284.50'	339 cf	**6.00'D x 6.00'H Vertical Cone/Cylinder** x 2 Inside #1
#3	291.00'	6 cf	**2.00'D x 2.00'H Riser to Grade** -Impervious
		650 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	284.00'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	291.75'	**2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.01 cfs @ 11.91 hrs HW=291.78' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.43 cfs @ 12.02 hrs HW=292.12' (Free Discharge)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.43 cfs @ 1.99 fps)

Pond C: Dry well C



DRYWELL STORAGE TABLES & RECHARGE CALCULAITONS

The project has proposed four drywells on-site that will provide a groundwater recharge volume greater than that typically require under the MassDEP Stormwater Standards

Standard requirement = 0.35"x impervious area = 0.35"x 5,410 s.f. = 158 Cubic Feet

Proposed recharge volume = 1,170 Cubic Feet

Summary for Pond A: Dry well A

Inflow Area = 0.608 ac, 3.30% Impervious, Inflow Depth = 0.31" for 2 Year event
Inflow = 0.09 cfs @ 12.34 hrs, Volume= 0.016 af
Outflow = 0.02 cfs @ 14.35 hrs, Volume= 0.013 af, Atten= 75%, Lag= 120.7 min
Discarded = 0.01 cfs @ 14.35 hrs, Volume= 0.009 af
Primary = 0.02 cfs @ 14.35 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs / 4
Peak Elev= 320.55' @ 14.35 hrs Surf.Area= 79 sf Storage= 272 cf

Plug-Flow detention time= 348.8 min calculated for 0.013 af (81% of inflow)
Center-of-Mass det. time= 269.1 min (1,212.1 - 943.0)

Volume	Invert	Avail.Storage	Storage Description
#1	314.75'	146 cf	**10.00'D x 7.00'H Vertical Cone/Cylinder** 550 cf Overall - 184 cf Embedded = 366 cf x 40.0% Voids
#2	315.25'	184 cf	**6.00'D x 6.50'H Vertical Cone/Cylinder** Inside #1
#3	321.75'	4 cf	**2.00'D x 1.25'H Riser to Grade** -Impervious
		334 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	314.75'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	320.50'	**8.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.01 cfs @ 14.35 hrs HW=320.55' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.01 cfs @ 14.35 hrs HW=320.55' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 0.79 fps)

Stage-Area-Storage for Pond A: Dry well A

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
314.75	79	0	320.05	245	248
314.85	82	3	320.15	248	253
314.95	85	6	320.25	251	258
315.05	88	9	320.35	254	262
315.15	91	13	320.45	258	267
315.25	94	16	320.55	261	272
315.35	97	21	320.65	264	277
315.45	101	25	320.75	267	282
315.55	104	30	320.85	270	287
315.65	107	35	320.95	273	291
315.75	110	40	321.05	276	296
315.85	113	45	321.15	280	301
315.95	116	50	321.25	283	306
316.05	119	54	321.35	286	311
316.15	123	59	321.45	289	316
316.25	126	64	321.55	292	321
316.35	129	69	321.65	295	325
316.45	132	74	321.75	298	330
316.55	135	79	321.85	298	330
316.65	138	83	321.95	298	331
316.75	141	88	322.05	298	331
316.85	145	93	322.15	298	331
316.95	148	98	322.25	298	332
317.05	151	103	322.35	298	332
317.15	154	108	322.45	298	332
317.25	157	112	322.55	298	333
317.35	160	117	322.65	298	333
317.45	163	122	322.75	298	333
317.55	167	127	322.85	298	334
317.65	170	132	322.95	298	334
317.75	173	137			
317.85	176	141			
317.95	179	146			
318.05	182	151			
318.15	185	156			
318.25	188	161			
318.35	192	166			
318.45	195	171			
318.55	198	175			
318.65	201	180			
318.75	204	185			
318.85	207	190			
318.95	210	195			
319.05	214	200			
319.15	217	204			
319.25	220	209			
319.35	223	214			
319.45	226	219			
319.55	229	224			
319.65	232	229			
319.75	236	233			
319.85	239	238			
319.95	242	243			

OUTLET
VOL = 265 CF
@ 320.4

Summary for Pond B: Roof Dry Well B

Inflow Area = 0.628 ac, 6.39% Impervious, Inflow Depth = 0.16" for 2 Year event
Inflow = 0.08 cfs @ 12.00 hrs, Volume= 0.009 af
Outflow = 0.00 cfs @ 17.91 hrs, Volume= 0.008 af, Atten= 93%, Lag= 354.6 min
Discarded = 0.00 cfs @ 17.91 hrs, Volume= 0.008 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 317.97' @ 17.91 hrs Surf.Area= 79 sf Storage= 196 cf

Plug-Flow detention time= 390.7 min calculated for 0.008 af (88% of inflow)
Center-of-Mass det. time= 340.2 min (1,192.6 - 852.5)

Volume	Invert	Avail.Storage	Storage Description
#1	313.75'	146 cf	**10.00'D x 7.00'H Vertical Cone/Cylinder**
			550 cf Overall - 184 cf Embedded = 366 cf x 40.0% Voids
#2	314.25'	184 cf	**6.00'D x 6.50'H Vertical Cone** Inside #1
#3	321.25'	6 cf	**2.00'D x 2.00'H Riser to grade** -Impervious
		336 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	313.75'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	319.50'	**8.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.00 cfs @ 17.91 hrs HW=317.97' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=313.75' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Stage-Area-Storage for Pond B: Roof Dry Well B

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
313.75	79	0	319.05	245	248
313.85	82	3	319.15	248	253
313.95	85	6	319.25	251	258
314.05	88	9	319.35	254	262
314.15	91	13	319.45	258	267
314.25	94	16	319.55	261	272
314.35	97	21	319.65	264	277
314.45	101	25	319.75	267	282
314.55	104	30	319.85	270	287
314.65	107	35	319.95	273	291
314.75	110	40	320.05	276	296
314.85	113	45	320.15	280	301
314.95	116	50	320.25	283	306
315.05	119	54	320.35	286	311
315.15	123	59	320.45	289	316
315.25	126	64	320.55	292	321
315.35	129	69	320.65	295	325
315.45	132	74	320.75	**298**	330
315.55	135	79	320.85	298	330
315.65	138	83	320.95	298	330
315.75	141	88	321.05	298	330
315.85	145	93	321.15	298	330
315.95	148	98	321.25	298	330
316.05	151	103	321.35	298	330
316.15	154	108	321.45	298	331
316.25	157	112	321.55	298	331
316.35	160	117	321.65	298	331
316.45	163	122	321.75	298	332
316.55	167	127	321.85	298	332
316.65	170	132	321.95	298	332
316.75	173	137	322.05	298	333
316.85	176	141	322.15	298	333
316.95	179	146	322.25	298	333
317.05	182	151	322.35	298	334
317.15	185	156	322.45	298	334
317.25	188	161	322.55	298	334
317.35	192	166	322.65	298	335
317.45	195	171	322.75	298	335
317.55	198	175	322.85	298	335
317.65	201	180	322.95	298	336
317.75	204	185	323.05	298	336
317.85	207	190	323.15	298	336
317.95	210	195	323.25	298	**336**
318.05	214	200			
318.15	217	204			
318.25	220	209			
318.35	223	214			
318.45	226	219			
318.55	229	224			
318.65	232	229			
318.75	236	233			
318.85	239	238			
318.95	242	243			

OUTLET
VOL = 265 CF
@ 319.40

Summary for Pond C: Dry well C

Inflow Area = 0.278 ac, 26.39% Impervious, Inflow Depth = 0.88" for 2 Year event
Inflow = 0.31 cfs @ 12.02 hrs, Volume= 0.020 af
Outflow = 0.01 cfs @ 16.49 hrs, Volume= 0.017 af, Atten= 96%, Lag= 268.1 min
Discarded = 0.01 cfs @ 16.49 hrs, Volume= 0.017 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 289.47' @ 16.49 hrs Surf.Area= 157 sf Storage= 513 cf

Plug-Flow detention time= 479.6 min calculated for 0.017 af (81% of inflow)
Center-of-Mass det. time= 400.5 min (1,267.9 - 867.5)

Volume	Invert	Avail.Storage	Storage Description
#1	284.00'	304 cf	**10.00'D x 7.00'H Vertical Cone/Cylinder** x 2 1,100 cf Overall - 339 cf Embedded = 760 cf x 40.0% Voids
#2	284.50'	339 cf	**6.00'D x 6.00'H Vertical Cone/Cylinder** x 2 Inside #1
#3	291.00'	6 cf	**2.00'D x 2.00'H Riser to Grade** -Impervious
		650 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	284.00'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	291.75'	**2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.01 cfs @ 16.49 hrs HW=289.47' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=284.00' (Free Discharge)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Stage-Area-Storage for Pond C: Dry well C

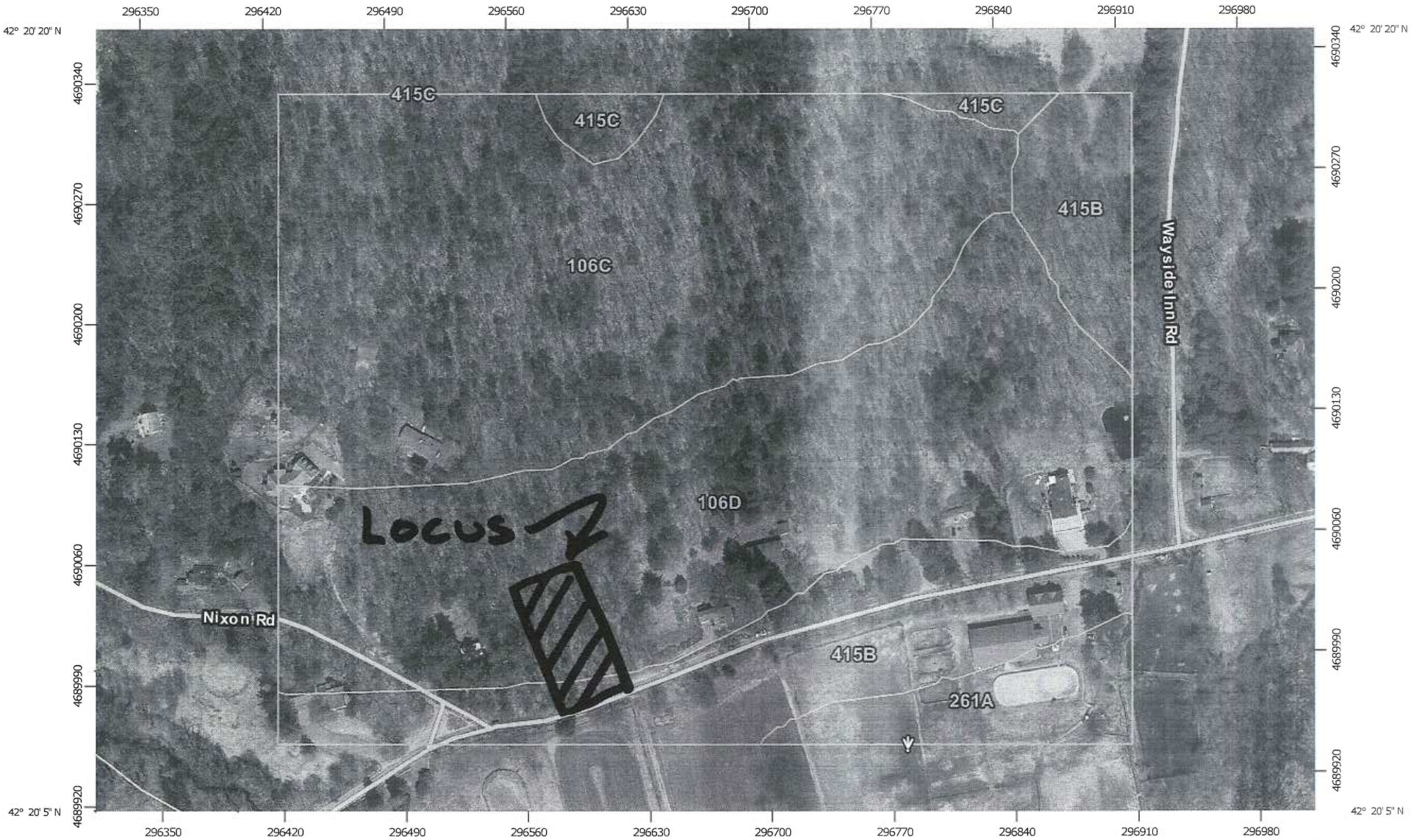
Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
284.00	157	0	289.30	490	496
284.10	163	6	289.40	496	506
284.20	170	13	289.50	503	515
284.30	176	19	289.60	509	525
284.40	182	25	289.70	515	535
284.50	188	31	289.80	522	544
284.60	195	41	289.90	528	554
284.70	201	51	290.00	534	564
284.80	207	60	290.10	540	573
284.90	214	70	290.20	547	583
285.00	220	80	290.30	553	593
285.10	226	89	290.40	559	602
285.20	232	99	290.50	565	612
285.30	239	109	290.60	572	618
285.40	245	119	290.70	578	625
285.50	251	128	290.80	584	631
285.60	258	138	290.90	591	637
285.70	264	148	291.00	597	643
285.80	270	157	291.10	597	644
285.90	276	167	291.20	597	644
286.00	283	177	291.30	597	644
286.10	289	186	291.40	597	645
286.20	295	196	291.50	597	645
286.30	302	206	291.60	597	645
286.40	308	215	291.70	597	646
286.50	314	225	291.80	597	646
286.60	320	235	291.90	597	646
286.70	327	244	292.00	597	647
286.80	333	254	292.10	597	647
286.90	339	264	292.20	597	647
287.00	346	273	292.30	597	647
287.10	352	283	292.40	597	648
287.20	358	293	292.50	597	648
287.30	364	302	292.60	597	648
287.40	371	312	292.70	597	649
287.50	377	322	292.80	597	649
287.60	383	331	292.90	597	649
287.70	390	341	293.00	597	**650**
287.80	396	351			
287.90	402	360			
288.00	408	370			
288.10	415	380			
288.20	421	389			
288.30	427	399			
288.40	434	409			
288.50	440	418			
288.60	446	428			
288.70	452	438			
288.80	459	447			
288.90	465	457			
289.00	471	467			
289.10	478	477			
289.20	484	486			

VOLUME
= 640 C.F.

NRCS SOIL MAPPING

Lot E1 Edmands Road
Framingham, MA

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,200 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

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

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Middlesex County, Massachusetts (MA017)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
106C	Narragansett-Hollis-Rock outcrop complex, 3 to 15 percent slopes	B	18.4	40.1%
106D	Narragansett-Hollis-Rock outcrop complex, 15 to 25 percent slopes	B	16.2	35.4%
261A	Tisbury silt loam, 0 to 3 percent slopes	B	2.1	4.5%
415B	Narragansett silt loam, 3 to 8 percent slopes	B	8.4	18.2%
415C	Narragansett silt loam, 8 to 15 percent slopes	B	0.8	1.7%
Totals for Area of Interest			**45.9**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

815 Edmands Road (Lot E1) Framingham, MA
Stormwater Operations and Management Plan

StormWater Management System Owner: and Responsible Party Property Owner

General Conditions:

- System Components: Roof Drain Drywells (including collection system of gutters and drains)
  Driveway Drywells
  Stone swale
- Any material removed from the drainage system shall be dispose of offsite.
- Discharge of any material other that stormwater to the system is not permitted.
- The use of sand and salt should be kept to the minimum required for safety

Continuing Inspection/Maintenance

Stormwater systems should be inspected twice per year, and be scheduled, whenever possible, within 48 hours of a 1" or larger storm event. Upon completion of inspection, the inspector should specify any necessary corrective actions to be taken by ownership. Items to be inspected and maintained are described in the following sections. All assessments can be based upon visual inspections. Some minor maintenance, such as the removal of blockages or debris accumulation may be conducted at the time of the inspection. It should be noted that there should little to no sediment accumulation within the drywell.

Drywells (two roof drain & two at driveway)

The systems should inspect via the cover or grate two to three days after the rainfall of a major storm has ended to ensure that the facility has drained to the appropriate level. If significant water remains ponded in the system three (3) days after the latest rainfall, sediment removal/blockage removal activities should be investigated and/or performed. The owner should contact an Engineer for review. Roof gutters should be cleaned twice annually to help prevent debris from clogging the collection system and from entering the drywell.

The ground surface above the system should exhibit no visible signs of erosion, settlement, slope failure, wildlife damage, or vehicle damage. Damaged areas should be repaired using similar fill of adequate permeability. Eroded areas should be reseeded as appropriate.

Stone Swale (located along driveway)

The swale should be cleaned of leaves and debris twice per year (or more often as required). Any ruts or displaced stone shall be replaced / repaired.

Site Vegetation

The site vegetation should be inspected for bare spots or erosion. Eroded areas shall be filled and compacted, if necessary, and reseeded as soon as possible. If an area erodes twice, then an erosion fabric shall be installed to stabilize the area to allow vegetation to be established. These maintenance activities shall take place during the planting season. Areas of repeated erosion/scour problems shall be lined with riprap only after twice attempting to stabilize the area with geotextile fabric.

Driveways

Snow shall not be plowed toward abutting properties or Edmands Road. All inlets shall be uncovered and functional immediately after snow plowing. Sweeping should be performed a minimum of twice per year or any time accumulated sediment or debris is visible. The condition of the berms should be inspected to verify stormwater is collected along the gutter lines.