EXHIBIT 1h.

DRAINAGE REPORT

for

81 CREEPER HILL ROAD, GRAFTON, MA

Job #110-1216 Client #2010

FILE

AUGUST 8, 2017

RECEIVED

AUG - 9 2017

PLANNING BOARD
GRAFTON, MA

COMMONWEALTH OF MASSACHUSETTS
JAMES L. TETREAULT
CIVIL
NO. 19548
REGISTERED PROFESSIONAL ENGINEER

8/8/2017

THOMPSON-LISTON ASSOCIATES, INC. CIVIL ENGINEERS & LAND SURVEYORS
51 Main Street, P.O. Box 570 Boylston, MA 01505 (508) 869-6151

Drainage Report

for
Proposed building addition at
73-81 Creeper Hill Road
Grafton, Massachusetts

August 8, 2017

Project Description

The site is located on the easterly side of Creeper Hill Road in Grafton. The property has an area of 8.4 acres and the existing facility is the Dimitria Delights bakery.

The entire site drains to Town of Grafton owned land bordering it to the east. Much of the site has already been developed and in addition to the bakery and its associated parking and driving aisles, there is a softball field on the applicant's property used by local leagues.

Soils on the westerly portion of the site are identified as Hinckley series soils categorized as hydrologic soil group A soils. Soils in the middle of the site are identified as "Udorthents" series soils and the description from the USGS soil report categorized them as hydrologic soil group A soils. The deep observation holes dug by a previous engineer and the deep hole observed by Thompson-Liston Associates, Inc. on July 21, 2017 seem to confirm this as all these holes revealed loamy sand or sand texured soils. A portion of the easterly end of the site centered on the wetlands in that area are identified as Freetown series soils and the USGS soil report described them as likely hydrologic soil group B soils in dry areas but hydrologic soil group D soils in wetland areas.

In order to mitigate the increase in impervious cover proposed as part of the construction of the addition we propose an infiltration structure. It will receive piped flow from the roof of 12,000 square feet of the new addition.

We also propose two new catch basins, a drain manhole and a model 2015 CDS unit to capture parking and driving surface runoff in this area and remove total suspended solids in accordance with DEP guidelines.

Methodology

In order to evaluate the existing and proposed hydrologic conditions of the site, we have employed the HydroCAD™ stormwater modeling software, which emulates the United States Department of Agriculture, Soil Conservation Service (SCS) hydrograph method as outlined in Technical Release 20 (1982). We have used the SCS modified soil cover complex method of evaluating cover conditions and underlying soil features in developing runoff curve numbers (RCN), and have determined Times of Concentration (ToC), using the methods described in the SCS's National Engineering Handbook, Section 4, Hydrology (1985). Each watershed with its Area, RCN and ToC, is described as a "Subcatchment" in HydroCAD™.

HydroCAD™ uses the Storage-Indication method for routing flows from "Subcatchment" areas through "Reaches" and "Ponds." Reaches are overland flow paths, pipe segments, or stream segments. Ponds are areas that collect water, such as basins, ponds or swales where outlet devices control outflow.

Rainfall was determined from the Cornell university web site and was found to be 3.25, 4.90, 6.20 and 8.84 inches in 24 hours for the 2, 10, 25 and 100 year return frequency storm events, respectively. The SCS's Type III Rainfall Distribution is used for these calculations, and is described in SCS Technical Release 55 (1986).

Additionally, in accordance with ordinary standards of review, the stormwater collection system is generally designed for the 25-year storm, and the effects of the 100-year storm are studied.

Design Point

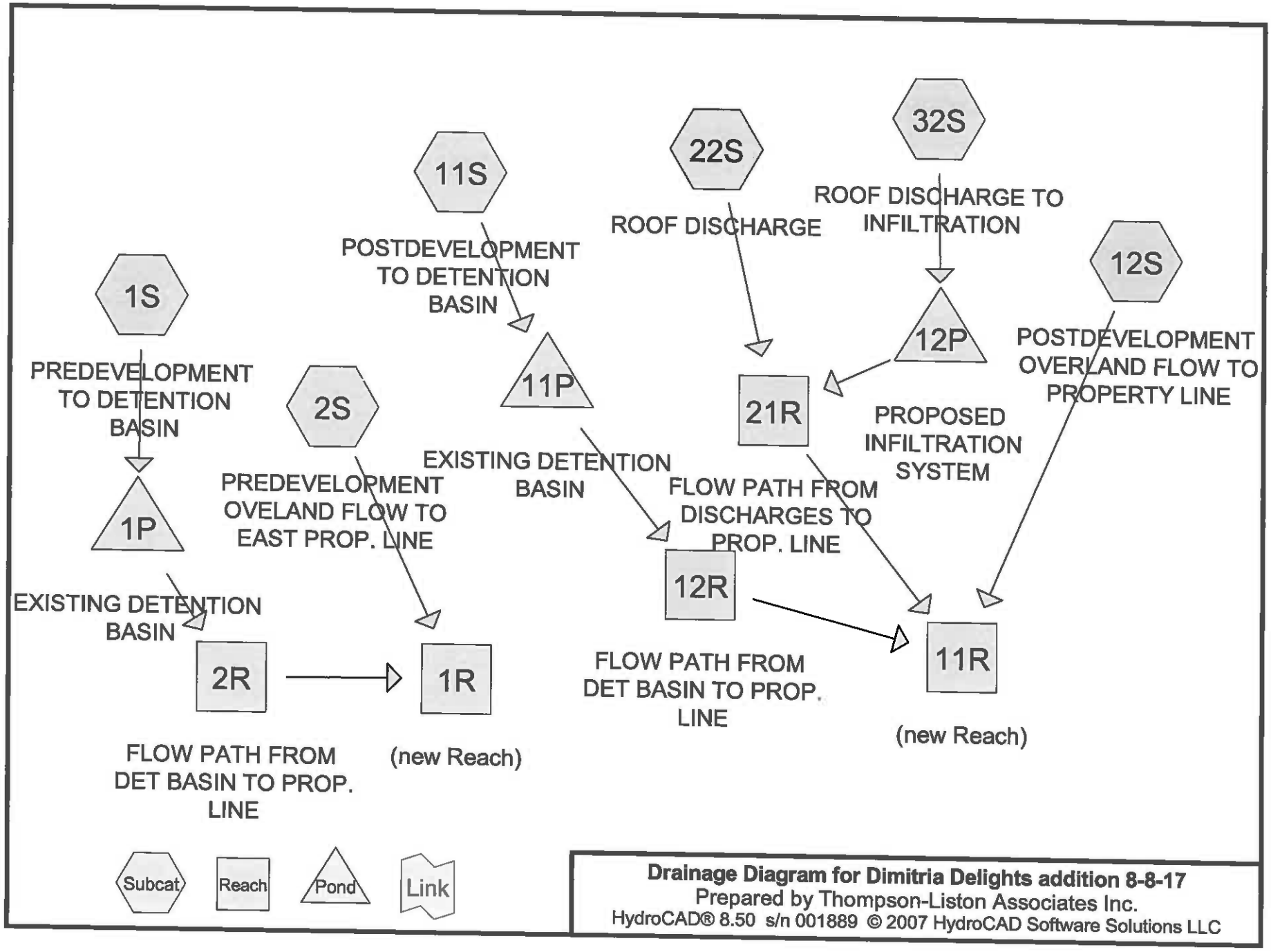
There is just one design point for this study, the easterly boundary of the site. Runoff from this site will flow to that Town owned land in significant storm events.

Calculation Summary and Comparison of Flows:

In all of the storms studied, the 2-, 10-, 25-- and 100-year storms, the runoff leaving the site in the post-development condition will not exceed the peak runoff in the existing (pre-development) condition. The following Table A shows the comparison of pre- and post-development flows at the Design Points:

TABLE A
Runoff Summaries for Storm Events

Design Point	2-YR	10-YR	25-YR	100-YR
Easterly property line				
Reach 1 pre 0.72 cfs	3.15 cfs	9.15 cfs	14.81 cfs	28.31
Reach 11 post 0.27	2.94	7.71	12.74	25.09



Drainage Diagram for Dimitria Delights addition 8-8-17
Prepared by Thompson-Liston Associates Inc.
HydroCAD® 8.50 s/n 001889 © 2007 HydroCAD Software Solutions LLC

2 YEAR STORM

Summary for Subcatchment 1S: PREDEVELOPMENT TO DETENTION BASIN

Runoff = 3.68 cfs @ 12.28 hrs, Volume= 0.361 af, Depth> 1.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Cornell Rainfall=3.25"

Area (sf)	CN	Description
95	61	>75% Grass cover, Good, HSG B
8,777	39	>75% Grass cover, Good, HSG A
19,794	76	Gravel roads, HSG A
17,634	30	Woods, Good, HSG A
45,509	98	Paved parking & roofs
20,147	39	>75% Grass cover, Good, HSG A
2,253	30	Woods, Good, HSG A
51,371	98	Paved parking & roofs
165,580	77	Weighted Average
68,700		Pervious Area
96,880		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.18		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
2.2	266	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	321	0.0020	0.45		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
4.5	243	0.0020	0.91		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.4	880	Total			

Summary for Subcatchment 2S: PREDEVELOPMENT OVELAND FLOW TO EAST PROP. LINE

Runoff = 2.93 cfs @ 12.16 hrs, Volume= 0.260 af, Depth> 0.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Cornell Rainfall=3.25"

Area (sf)	CN	Description
39,117	61	>75% Grass cover, Good, HSG B
5,308	85	Gravel roads, HSG B
9,437	55	Woods, Good, HSG B
42,517	77	Woods, Good, HSG D
874	98	Paved parking & roofs
33,105	76	Gravel roads, HSG A
26,493	30	Woods, Good, HSG A
38,964	98	Paved parking & roofs
32,673	39	>75% Grass cover, Good, HSG A
228,488	66	Weighted Average
188,650		Pervious Area
39,838		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	45	0.0100	0.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.3	48	0.2000	3.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.5	148	0.0050	0.71		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
5.1	152	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	393	Total			

Summary for Subcatchment 11S: POSTDEVELOPMENT TO DETENTION BASIN

Runoff = 3.68 cfs @ 12.28 hrs, Volume= 0.361 af, Depth> 1.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Cornell Rainfall=3.25"

Area (sf)	CN	Description
95	61	>75% Grass cover, Good, HSG B
8,777	39	>75% Grass cover, Good, HSG A
19,794	76	Gravel roads, HSG A
17,634	30	Woods, Good, HSG A
45,509	98	Paved parking & roofs
20,147	39	>75% Grass cover, Good, HSG A
2,253	30	Woods, Good, HSG A
51,371	98	Paved parking & roofs
165,580	77	Weighted Average
68,700		Pervious Area
96,880		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.18		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
2.2	266	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	321	0.0020	0.45		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
4.5	243	0.0020	0.91		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.4	880	Total			

Summary for Subcatchment 12S: POSTDEVELOPMENT OVERLAND FLOW TO PROPERTY LINE

Runoff = 2.09 cfs @ 12.17 hrs, Volume= 0.200 af, Depth> 0.52"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Cornell Rainfall=3.25"

Area (sf)	CN	Description
39,117	61	>75% Grass cover, Good, HSG B
5,308	85	Gravel roads, HSG B
9,437	55	Woods, Good, HSG B
42,517	77	Woods, Good, HSG D
874	98	Paved parking & roofs
30,452	76	Gravel roads, HSG A
26,493	30	Woods, Good, HSG A
21,777	98	Paved parking & roofs
26,513	39	>75% Grass cover, Good, HSG A
202,488	64	Weighted Average
179,837		Pervious Area
22,651		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	45	0.0100	0.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.3	48	0.2000	3.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.5	148	0.0050	0.71		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
5.1	152	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	393	Total			

Summary for Subcatchment 22S: ROOF DISCHARGE

Runoff = 1.05 cfs @ 12.07 hrs, Volume= 0.075 af, Depth> 2.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Cornell Rainfall=3.25"

Area (sf)	CN	Description
14,000	98	Paved parking & roofs
14,000		Impervious Area

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

Summary for Subcatchment 32S: ROOF DISCHARGE TO INFILTRATION

Runoff = 0.90 cfs @ 12.07 hrs, Volume= 0.065 af, Depth> 2.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Cornell Rainfall=3.25"

Area (sf)	CN	Description
12,000	98	Paved parking & roofs
12,000		Impervious Area

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

Summary for Reach 1R: (new Reach)

Inflow Area = 9.047 ac, 34.69% Impervious, Inflow Depth > 0.81" for 2-Cornell event
Inflow = 3.15 cfs @ 12.16 hrs, Volume= 0.609 af
Outflow = 3.15 cfs @ 12.16 hrs, Volume= 0.609 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: FLOW PATH FROM DET BASIN TO PROP. LINE

Inflow Area = 3.801 ac, 58.51% Impervious, Inflow Depth > 1.12" for 2-Cornell event
Inflow = 2.33 cfs @ 12.55 hrs, Volume= 0.355 af
Outflow = 2.10 cfs @ 12.91 hrs, Volume= 0.349 af, Atten= 10%, Lag= 21.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.35 fps, Min. Travel Time= 11.8 min
Avg. Velocity = 0.21 fps, Avg. Travel Time= 19.6 min

Peak Storage= 1,487 cf @ 12.72 hrs, Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 262.23 cfs

10.00' x 2.00' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 50.0 '/' Top Width= 210.00'
Length= 248.0' Slope= 0.0060 '/'
Inlet Invert= 358.00', Outlet Invert= 356.50'

‡

Summary for Reach 11R: (new Reach)

Inflow Area =	9.047 ac, 36.93% Impervious, Inflow Depth > 0.83" for 2-Cornell event				
Inflow =	2.94 cfs @	12.85 hrs, Volume=	0.622 af		
Outflow =	2.94 cfs @	12.85 hrs, Volume=	0.622 af, Atten= 0%, Lag= 0.0 min		

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 12R: FLOW PATH FROM DET BASIN TO PROP. LINE

Inflow Area =	3.801 ac, 58.51% Impervious, Inflow Depth > 1.12" for 2-Cornell event				
Inflow =	2.33 cfs @	12.55 hrs, Volume=	0.355 af		
Outflow =	2.10 cfs @	12.91 hrs, Volume=	0.349 af, Atten= 10%, Lag= 21.6 min		

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.35 fps, Min. Travel Time= 11.8 min
Avg. Velocity = 0.21 fps, Avg. Travel Time= 19.6 min

Peak Storage= 1,487 cf @ 12.72 hrs, Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 262.23 cfs

10.00' x 2.00' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 50.0 '/' Top Width= 210.00'
Length= 248.0' Slope= 0.0060 '/'
Inlet Invert= 358.00', Outlet Invert= 356.50'

‡

Summary for Reach 21R: FLOW PATH FROM DISCHARGES TO PROP. LINE

Inflow Area = 0.597 ac,100.00% Impervious, Inflow Depth > 1.52" for 2-Cornell event
Inflow = 1.05 cfs @ 12.07 hrs, Volume= 0.075 af
Outflow = 0.58 cfs @ 12.51 hrs, Volume= 0.074 af, Atten= 45%, Lag= 26.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.17 fps, Min. Travel Time= 19.9 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 44.4 min

Peak Storage= 688 cf @ 12.18 hrs, Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 151.55 cfs

10.00' x 2.00' deep channel, n= 0.100 Very weedy reaches w/pools
Side Slope Z-value= 50.0 '/' Top Width= 210.00'
Length= 198.0' Slope= 0.0020 '/'
Inlet Invert= 356.90', Outlet Invert= 356.50'

‡

Summary for Pond 1P: EXISTING DETENTION BASIN

Inflow Area = 3.801 ac, 58.51% Impervious, Inflow Depth > 1.14" for 2-Cornell event
Inflow = 3.68 cfs @ 12.28 hrs, Volume= 0.361 af
Outflow = 2.33 cfs @ 12.55 hrs, Volume= 0.355 af, Atten= 37%, Lag= 16.7 min
Primary = 2.33 cfs @ 12.55 hrs, Volume= 0.355 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 360.37' @ 12.55 hrs Surf.Area= 4,639 sf Storage= 3,506 cf

Plug-Flow detention time= 27.7 min calculated for 0.355 af (98% of inflow)
Center-of-Mass det. time= 22.1 min (842.6 - 820.5)

Volume	Invert	Avail.Storage	Storage Description
#1	358.00'	13,183 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
358.00	4	0	0
359.00	347	176	176
360.00	3,384	1,866	2,041
361.00	6,820	5,102	7,143
361.80	8,280	6,040	13,183

Device	Routing	Invert	Outlet Devices
#1	Primary	361.00'	**9.0' long x 30.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	358.91'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	359.95'	**1.50' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#4	Primary	361.51'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=2.33 cfs @ 12.55 hrs HW=360.37' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **2=Orifice/Grate** (Orifice Controls 1.04 cfs @ 5.29 fps)
- **3=Orifice/Grate** (Orifice Controls 1.29 cfs @ 2.07 fps)
- **4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 11P: EXISTING DETENTION BASIN

Inflow Area =	3.801 ac, 58.51% Impervious, Inflow Depth > 1.14" for 2-Cornell event			
Inflow =	3.68 cfs @	12.28 hrs, Volume=	0.361 af	
Outflow =	2.33 cfs @	12.55 hrs, Volume=	0.355 af, Atten= 37%, Lag= 16.7 min	
Primary =	2.33 cfs @	12.55 hrs, Volume=	0.355 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 360.37' @ 12.55 hrs Surf.Area= 4,639 sf Storage= 3,506 cf

Plug-Flow detention time= 27.7 min calculated for 0.355 af (98% of inflow)
Center-of-Mass det. time= 22.1 min (842.6 - 820.5)

Volume	Invert	Avail.Storage	Storage Description
#1	358.00'	13,183 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
358.00	4	0	0
359.00	347	176	176
360.00	3,384	1,866	2,041
361.00	6,820	5,102	7,143
361.80	8,280	6,040	13,183

Device	Routing	Invert	Outlet Devices
#1	Primary	361.00'	**9.0' long x 30.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	358.91'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	359.95'	**1.50' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#4	Primary	361.51'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=2.33 cfs @ 12.55 hrs HW=360.37' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **2=Orifice/Grate** (Orifice Controls 1.04 cfs @ 5.29 fps)
- **3=Orifice/Grate** (Orifice Controls 1.29 cfs @ 2.07 fps)
- **4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 12P: PROPOSED INFILTRATION SYSTEM

Inflow Area =	0.275 ac,100.00% Impervious, Inflow Depth > 2.82" for 2-Cornell event				
Inflow =	0.90 cfs @	12.07 hrs,	Volume=	0.065 af	
Outflow =	0.09 cfs @	11.43 hrs,	Volume=	0.065 af,	Atten= 90%, Lag= 0.0 min
Discarded =	0.09 cfs @	11.43 hrs,	Volume=	0.065 af	
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 359.86' @ 12.78 hrs Surf.Area= 468 sf Storage= 989 cf

Plug-Flow detention time= 77.9 min calculated for 0.065 af (100% of inflow)
Center-of-Mass det. time= 77.7 min (815.3 - 737.6)

Volume	Invert	Avail.Storage	Storage Description
#1	357.00'	288 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 1,872 cf Overall - 1,152 cf Embedded = 720 cf x 40.0% Voids
#2	357.50'	1,037 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) Inside #1 1,152 cf Overall x 90.0% Voids
		1,325 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	468	0	0
361.00	468	1,872	1,872

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.50	384	0	0
360.50	384	1,152	1,152

Device	Routing	Invert	Outlet Devices
#1	Discarded	357.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	360.00'	**6.0" x 15.0' long Culvert X 3.00** Ke= 0.500 Outlet Invert= 359.50' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Discarded OutFlow Max=0.09 cfs @ 11.43 hrs HW=357.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=357.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)

10 YEAR STORM

Summary for Subcatchment 1S: PREDEVELOPMENT TO DETENTION BASIN

Runoff = 7.72 cfs @ 12.27 hrs, Volume= 0.744 af, Depth> 2.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Cornell Rainfall=4.90"

Area (sf)	CN	Description
95	61	>75% Grass cover, Good, HSG B
8,777	39	>75% Grass cover, Good, HSG A
19,794	76	Gravel roads, HSG A
17,634	30	Woods, Good, HSG A
45,509	98	Paved parking & roofs
20,147	39	>75% Grass cover, Good, HSG A
2,253	30	Woods, Good, HSG A
51,371	98	Paved parking & roofs
165,580	77	Weighted Average
68,700		Pervious Area
96,880		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.18		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
2.2	266	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	321	0.0020	0.45		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
4.5	243	0.0020	0.91		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.4	880	Total			

Summary for Subcatchment 2S: PREDEVELOPMENT OVELAND FLOW TO EAST PROP. LINE

Runoff = 8.54 cfs @ 12.14 hrs, Volume= 0.662 af, Depth> 1.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Cornell Rainfall=4.90"

Area (sf)	CN	Description
39,117	61	>75% Grass cover, Good, HSG B
5,308	85	Gravel roads, HSG B
9,437	55	Woods, Good, HSG B
42,517	77	Woods, Good, HSG D
874	98	Paved parking & roofs
33,105	76	Gravel roads, HSG A
26,493	30	Woods, Good, HSG A
38,964	98	Paved parking & roofs
32,673	39	>75% Grass cover, Good, HSG A
228,488	66	Weighted Average
188,650		Pervious Area
39,838		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	45	0.0100	0.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.3	48	0.2000	3.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.5	148	0.0050	0.71		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
5.1	152	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	393	Total			

Summary for Subcatchment 11S: POSTDEVELOPMENT TO DETENTION BASIN

Runoff = 7.72 cfs @ 12.27 hrs, Volume= 0.744 af, Depth> 2.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Cornell Rainfall=4.90"

Area (sf)	CN	Description
95	61	>75% Grass cover, Good, HSG B
8,777	39	>75% Grass cover, Good, HSG A
19,794	76	Gravel roads, HSG A
17,634	30	Woods, Good, HSG A
45,509	98	Paved parking & roofs
20,147	39	>75% Grass cover, Good, HSG A
2,253	30	Woods, Good, HSG A
51,371	98	Paved parking & roofs
165,580	77	Weighted Average
68,700		Pervious Area
96,880		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.18		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
2.2	266	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	321	0.0020	0.45		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
4.5	243	0.0020	0.91		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.4	880	Total			

Summary for Subcatchment 12S: POSTDEVELOPMENT OVERLAND FLOW TO PROPERTY LINE

Runoff = 6.77 cfs @ 12.15 hrs, Volume= 0.533 af, Depth> 1.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Cornell Rainfall=4.90"

Area (sf)	CN	Description
39,117	61	>75% Grass cover, Good, HSG B
5,308	85	Gravel roads, HSG B
9,437	55	Woods, Good, HSG B
42,517	77	Woods, Good, HSG D
874	98	Paved parking & roofs
30,452	76	Gravel roads, HSG A
26,493	30	Woods, Good, HSG A
21,777	98	Paved parking & roofs
26,513	39	>75% Grass cover, Good, HSG A
202,488	64	Weighted Average
179,837		Pervious Area
22,651		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	45	0.0100	0.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.3	48	0.2000	3.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.5	148	0.0050	0.71		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
5.1	152	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	393	Total			

Summary for Subcatchment 22S: ROOF DISCHARGE

Runoff = 1.60 cfs @ 12.07 hrs, Volume= 0.116 af, Depth> 4.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Cornell Rainfall=4.90"

Area (sf)	CN	Description
14,000	98	Paved parking & roofs
14,000		Impervious Area

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

Summary for Subcatchment 32S: ROOF DISCHARGE TO INFILTRATION

Runoff = 1.37 cfs @ 12.07 hrs, Volume= 0.099 af, Depth> 4.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Cornell Rainfall=4.90"

Area (sf)	CN	Description
12,000	98	Paved parking & roofs
12,000		Impervious Area

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

Summary for Reach 1R: (new Reach)

Inflow Area = 9.047 ac, 34.69% Impervious, Inflow Depth > 1.84" for 10-Cornell event
Inflow = 9.15 cfs @ 12.15 hrs, Volume= 1.389 af
Outflow = 9.15 cfs @ 12.15 hrs, Volume= 1.389 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: FLOW PATH FROM DET BASIN TO PROP. LINE

Inflow Area = 3.801 ac, 58.51% Impervious, Inflow Depth > 2.33" for 10-Cornell event
Inflow = 4.53 cfs @ 12.56 hrs, Volume= 0.737 af
Outflow = 4.36 cfs @ 12.87 hrs, Volume= 0.728 af, Atten= 4%, Lag= 18.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.42 fps, Min. Travel Time= 9.8 min
Avg. Velocity = 0.24 fps, Avg. Travel Time= 17.1 min

Peak Storage= 2,553 cf @ 12.71 hrs, Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 262.23 cfs

10.00' x 2.00' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 50.0 '/' Top Width= 210.00'
Length= 248.0' Slope= 0.0060 '/'
Inlet Invert= 358.00', Outlet Invert= 356.50'

‡

Summary for Reach 11R: (new Reach)

Inflow Area =	9.047 ac, 36.93% Impervious, Inflow Depth > 1.85" for 10-Cornell event			
Inflow =	7.71 cfs @ 12.15 hrs, Volume=	1.392 af		
Outflow =	7.71 cfs @ 12.15 hrs, Volume=	1.392 af, Atten= 0%, Lag= 0.0 min		

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 12R: FLOW PATH FROM DET BASIN TO PROP. LINE

Inflow Area =	3.801 ac, 58.51% Impervious, Inflow Depth > 2.33" for 10-Cornell event			
Inflow =	4.53 cfs @ 12.56 hrs, Volume=	0.737 af		
Outflow =	4.36 cfs @ 12.87 hrs, Volume=	0.728 af, Atten= 4%, Lag= 18.8 min		

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.42 fps, Min. Travel Time= 9.8 min
Avg. Velocity = 0.24 fps, Avg. Travel Time= 17.1 min

Peak Storage= 2,553 cf @ 12.71 hrs, Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 262.23 cfs

10.00' x 2.00' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 50.0 '/' Top Width= 210.00'
Length= 248.0' Slope= 0.0060 '/'
Inlet Invert= 358.00', Outlet Invert= 356.50'

‡

Summary for Reach 21R: FLOW PATH FROM DISCHARGES TO PROP. LINE

Inflow Area = 0.597 ac,100.00% Impervious, Inflow Depth > 2.68" for 10-Cornell event
Inflow = 1.64 cfs @ 12.15 hrs, Volume= 0.133 af
Outflow = 1.14 cfs @ 12.54 hrs, Volume= 0.131 af, Atten= 31%, Lag= 23.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.20 fps, Min. Travel Time= 16.6 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 38.4 min

Peak Storage= 1,132 cf @ 12.26 hrs, Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 151.55 cfs

10.00' x 2.00' deep channel, n= 0.100 Very weedy reaches w/pools
Side Slope Z-value= 50.0 '/' Top Width= 210.00'
Length= 198.0' Slope= 0.0020 '/'
Inlet Invert= 356.90', Outlet Invert= 356.50'

‡

Summary for Pond 1P: EXISTING DETENTION BASIN

Inflow Area = 3.801 ac, 58.51% Impervious, Inflow Depth > 2.35" for 10-Cornell event
Inflow = 7.72 cfs @ 12.27 hrs, Volume= 0.744 af
Outflow = 4.53 cfs @ 12.56 hrs, Volume= 0.737 af, Atten= 41%, Lag= 17.3 min
Primary = 4.53 cfs @ 12.56 hrs, Volume= 0.737 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 361.01' @ 12.56 hrs Surf.Area= 6,830 sf Storage= 7,179 cf

Plug-Flow detention time= 26.6 min calculated for 0.737 af (99% of inflow)
Center-of-Mass det. time= 23.0 min (827.5 - 804.5)

Volume	Invert	Avail.Storage	Storage Description
#1	358.00'	13,183 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
358.00	4	0	0
359.00	347	176	176
360.00	3,384	1,866	2,041
361.00	6,820	5,102	7,143
361.80	8,280	6,040	13,183

Device	Routing	Invert	Outlet Devices
#1	Primary	361.00'	**9.0' long x 30.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	358.91'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	359.95'	**1.50' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#4	Primary	361.51'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=4.52 cfs @ 12.56 hrs HW=361.01' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.19 fps)
- **2=Orifice/Grate** (Orifice Controls 1.28 cfs @ 6.54 fps)
- **3=Orifice/Grate** (Orifice Controls 3.23 cfs @ 4.30 fps)
- **4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 11P: EXISTING DETENTION BASIN

Inflow Area =	3.801 ac, 58.51% Impervious, Inflow Depth > 2.35" for 10-Cornell event			
Inflow =	7.72 cfs @	12.27 hrs, Volume=	0.744 af	
Outflow =	4.53 cfs @	12.56 hrs, Volume=	0.737 af, Atten= 41%, Lag= 17.3 min	
Primary =	4.53 cfs @	12.56 hrs, Volume=	0.737 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 361.01' @ 12.56 hrs Surf.Area= 6,830 sf Storage= 7,179 cf

Plug-Flow detention time= 26.6 min calculated for 0.737 af (99% of inflow)
Center-of-Mass det. time= 23.0 min (827.5 - 804.5)

Volume	Invert	Avail.Storage	Storage Description
#1	358.00'	13,183 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
358.00	4	0	0
359.00	347	176	176
360.00	3,384	1,866	2,041
361.00	6,820	5,102	7,143
361.80	8,280	6,040	13,183

Device	Routing	Invert	Outlet Devices
#1	Primary	361.00'	**9.0' long x 30.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	358.91'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	359.95'	**1.50' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#4	Primary	361.51'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=4.52 cfs @ 12.56 hrs HW=361.01' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.19 fps)
- **2=Orifice/Grate** (Orifice Controls 1.28 cfs @ 6.54 fps)
- **3=Orifice/Grate** (Orifice Controls 3.23 cfs @ 4.30 fps)
- **4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 12P: PROPOSED INFILTRATION SYSTEM

Inflow Area =	0.275 ac,100.00% Impervious, Inflow Depth > 4.33" for 10-Cornell event				
Inflow =	1.37 cfs @	12.07 hrs,	Volume=	0.099 af	
Outflow =	0.76 cfs @	12.18 hrs,	Volume=	0.099 af,	Atten= 44%, Lag= 6.3 min
Discarded =	0.09 cfs @	10.87 hrs,	Volume=	0.082 af	
Primary =	0.67 cfs @	12.18 hrs,	Volume=	0.017 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 360.30' @ 12.18 hrs Surf.Area= 468 sf Storage= 1,154 cf

Plug-Flow detention time= 74.5 min calculated for 0.099 af (100% of inflow)
Center-of-Mass det. time= 74.3 min (808.8 - 734.5)

Volume	Invert	Avail.Storage	Storage Description
#1	357.00'	288 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 1,872 cf Overall - 1,152 cf Embedded = 720 cf x 40.0% Voids
#2	357.50'	1,037 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) Inside #1 1,152 cf Overall x 90.0% Voids
		1,325 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	468	0	0
361.00	468	1,872	1,872

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.50	384	0	0
360.50	384	1,152	1,152

Device	Routing	Invert	Outlet Devices
#1	Discarded	357.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	360.00'	**6.0" x 15.0' long Culvert X 3.00** Ke= 0.500 Outlet Invert= 359.50' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Discarded OutFlow Max=0.09 cfs @ 10.87 hrs HW=357.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.67 cfs @ 12.18 hrs HW=360.29' (Free Discharge)
└**2=Culvert** (Inlet Controls 0.67 cfs @ 1.85 fps)

25 YEAR STORM

Summary for Subcatchment 1S: PREDEVELOPMENT TO DETENTION BASIN

Runoff = 11.13 cfs @ 12.27 hrs, Volume= 1.077 af, Depth> 3.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Cornell Rainfall=6.20"

Area (sf)	CN	Description
95	61	>75% Grass cover, Good, HSG B
8,777	39	>75% Grass cover, Good, HSG A
19,794	76	Gravel roads, HSG A
17,634	30	Woods, Good, HSG A
45,509	98	Paved parking & roofs
20,147	39	>75% Grass cover, Good, HSG A
2,253	30	Woods, Good, HSG A
51,371	98	Paved parking & roofs
165,580	77	Weighted Average
68,700		Pervious Area
96,880		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.18		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
2.2	266	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	321	0.0020	0.45		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
4.5	243	0.0020	0.91		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.4	880	Total			

Summary for Subcatchment 2S: PREDEVELOPMENT OVELAND FLOW TO EAST PROP. LINE

Runoff = 13.76 cfs @ 12.14 hrs, Volume= 1.041 af, Depth> 2.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Cornell Rainfall=6.20"

Area (sf)	CN	Description
39,117	61	>75% Grass cover, Good, HSG B
5,308	85	Gravel roads, HSG B
9,437	55	Woods, Good, HSG B
42,517	77	Woods, Good, HSG D
874	98	Paved parking & roofs
33,105	76	Gravel roads, HSG A
26,493	30	Woods, Good, HSG A
38,964	98	Paved parking & roofs
32,673	39	>75% Grass cover, Good, HSG A
228,488	66	Weighted Average
188,650		Pervious Area
39,838		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	45	0.0100	0.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.3	48	0.2000	3.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.5	148	0.0050	0.71		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
5.1	152	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	393	Total			

Summary for Subcatchment 11S: POSTDEVELOPMENT TO DETENTION BASIN

Runoff = 11.13 cfs @ 12.27 hrs, Volume= 1.077 af, Depth> 3.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Cornell Rainfall=6.20"

Area (sf)	CN	Description
95	61	>75% Grass cover, Good, HSG B
8,777	39	>75% Grass cover, Good, HSG A
19,794	76	Gravel roads, HSG A
17,634	30	Woods, Good, HSG A
45,509	98	Paved parking & roofs
20,147	39	>75% Grass cover, Good, HSG A
2,253	30	Woods, Good, HSG A
51,371	98	Paved parking & roofs
165,580	77	Weighted Average
68,700		Pervious Area
96,880		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.18		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
2.2	266	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	321	0.0020	0.45		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
4.5	243	0.0020	0.91		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.4	880	Total			

Summary for Subcatchment 12S: POSTDEVELOPMENT OVERLAND FLOW TO PROPERTY LINE

Runoff = 11.23 cfs @ 12.14 hrs, Volume= 0.855 af, Depth> 2.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Cornell Rainfall=6.20"

Area (sf)	CN	Description
39,117	61	>75% Grass cover, Good, HSG B
5,308	85	Gravel roads, HSG B
9,437	55	Woods, Good, HSG B
42,517	77	Woods, Good, HSG D
874	98	Paved parking & roofs
30,452	76	Gravel roads, HSG A
26,493	30	Woods, Good, HSG A
21,777	98	Paved parking & roofs
26,513	39	>75% Grass cover, Good, HSG A
202,488	64	Weighted Average
179,837		Pervious Area
22,651		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	45	0.0100	0.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.3	48	0.2000	3.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.5	148	0.0050	0.71		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
5.1	152	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	393	Total			

Summary for Subcatchment 22S: ROOF DISCHARGE

Runoff = 2.02 cfs @ 12.07 hrs, Volume= 0.148 af, Depth> 5.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Cornell Rainfall=6.20"

Area (sf)	CN	Description
14,000	98	Paved parking & roofs
14,000		Impervious Area

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

Summary for Subcatchment 32S: ROOF DISCHARGE TO INFILTRATION

Runoff = 1.73 cfs @ 12.07 hrs, Volume= 0.126 af, Depth> 5.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Cornell Rainfall=6.20"

Area (sf)	CN	Description
12,000	98	Paved parking & roofs
12,000		Impervious Area

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

Summary for Reach 1R: (new Reach)

Inflow Area = 9.047 ac, 34.69% Impervious, Inflow Depth > 2.78" for 25-Cornell event
Inflow = 14.81 cfs @ 12.14 hrs, Volume= 2.098 af
Outflow = 14.81 cfs @ 12.14 hrs, Volume= 2.098 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

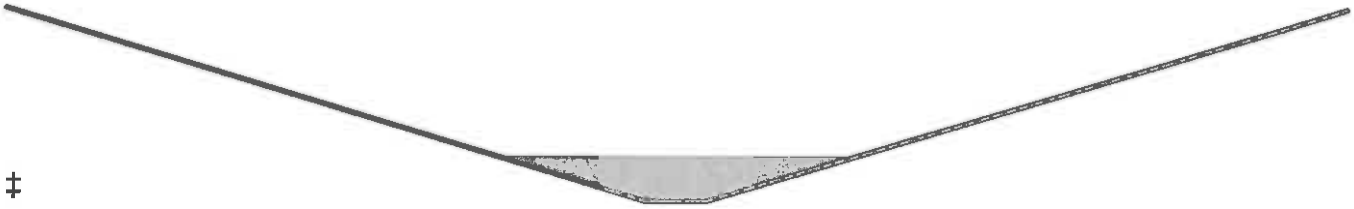
Summary for Reach 2R: FLOW PATH FROM DET BASIN TO PROP. LINE

Inflow Area = 3.801 ac, 58.51% Impervious, Inflow Depth > 3.37" for 25-Cornell event
Inflow = 8.63 cfs @ 12.43 hrs, Volume= 1.069 af
Outflow = 7.72 cfs @ 12.69 hrs, Volume= 1.057 af, Atten= 11%, Lag= 15.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.49 fps, Min. Travel Time= 8.4 min
Avg. Velocity = 0.26 fps, Avg. Travel Time= 16.0 min

Peak Storage= 3,904 cf @ 12.55 hrs, Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 262.23 cfs

10.00' x 2.00' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 50.0 '/' Top Width= 210.00'
Length= 248.0' Slope= 0.0060 '/'
Inlet Invert= 358.00', Outlet Invert= 356.50'



‡

Summary for Reach 11R: (new Reach)

Inflow Area =	9.047 ac, 36.93% Impervious, Inflow Depth > 2.77" for 25-Cornell event				
Inflow =	12.74 cfs @	12.15 hrs, Volume=	2.092 af		
Outflow =	12.74 cfs @	12.15 hrs, Volume=	2.092 af, Atten= 0%, Lag= 0.0 min		

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 12R: FLOW PATH FROM DET BASIN TO PROP. LINE

Inflow Area =	3.801 ac, 58.51% Impervious, Inflow Depth > 3.37" for 25-Cornell event				
Inflow =	8.63 cfs @	12.43 hrs, Volume=	1.069 af		
Outflow =	7.72 cfs @	12.69 hrs, Volume=	1.057 af, Atten= 11%, Lag= 15.6 min		

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.49 fps, Min. Travel Time= 8.4 min
Avg. Velocity = 0.26 fps, Avg. Travel Time= 16.0 min

Peak Storage= 3,904 cf @ 12.55 hrs, Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 262.23 cfs

10.00' x 2.00' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 50.0 '/' Top Width= 210.00'
Length= 248.0' Slope= 0.0060 '/'
Inlet Invert= 358.00', Outlet Invert= 356.50'

‡

Summary for Reach 21R: FLOW PATH FROM DISCHARGES TO PROP. LINE

Inflow Area = 0.597 ac,100.00% Impervious, Inflow Depth > 3.66" for 25-Cornell event
Inflow = 3.27 cfs @ 12.09 hrs, Volume= 0.182 af
Outflow = 1.82 cfs @ 12.45 hrs, Volume= 0.180 af, Atten= 44%, Lag= 21.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.23 fps, Min. Travel Time= 14.7 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 35.4 min

Peak Storage= 1,606 cf @ 12.21 hrs, Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 151.55 cfs

10.00' x 2.00' deep channel, n= 0.100 Very weedy reaches w/pools
Side Slope Z-value= 50.0 '/' Top Width= 210.00'
Length= 198.0' Slope= 0.0020 '/'
Inlet Invert= 356.90', Outlet Invert= 356.50'

‡

Summary for Pond 1P: EXISTING DETENTION BASIN

Inflow Area = 3.801 ac, 58.51% Impervious, Inflow Depth > 3.40" for 25-Cornell event
Inflow = 11.13 cfs @ 12.27 hrs, Volume= 1.077 af
Outflow = 8.63 cfs @ 12.43 hrs, Volume= 1.069 af, Atten= 22%, Lag= 9.8 min
Primary = 8.63 cfs @ 12.43 hrs, Volume= 1.069 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 361.28' @ 12.43 hrs Surf.Area= 7,324 sf Storage= 9,097 cf

Plug-Flow detention time= 25.2 min calculated for 1.068 af (99% of inflow)
Center-of-Mass det. time= 22.1 min (818.3 - 796.1)

Volume	Invert	Avail.Storage	Storage Description
#1	358.00'	13,183 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
358.00	4	0	0
359.00	347	176	176
360.00	3,384	1,866	2,041
361.00	6,820	5,102	7,143
361.80	8,280	6,040	13,183

Device	Routing	Invert	Outlet Devices
#1	Primary	361.00'	**9.0' long x 30.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	358.91'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	359.95'	**1.50' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#4	Primary	361.51'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=8.63 cfs @ 12.43 hrs HW=361.28' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** (Weir Controls 3.51 cfs @ 1.41 fps)
- **2=Orifice/Grate** (Orifice Controls 1.38 cfs @ 7.00 fps)
- **3=Orifice/Grate** (Orifice Controls 3.74 cfs @ 4.98 fps)
- **4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 11P: EXISTING DETENTION BASIN

Inflow Area =	3.801 ac, 58.51% Impervious, Inflow Depth > 3.40" for 25-Cornell event			
Inflow =	11.13 cfs @	12.27 hrs, Volume=	1.077 af	
Outflow =	8.63 cfs @	12.43 hrs, Volume=	1.069 af, Atten= 22%, Lag= 9.8 min	
Primary =	8.63 cfs @	12.43 hrs, Volume=	1.069 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 361.28' @ 12.43 hrs Surf.Area= 7,324 sf Storage= 9,097 cf

Plug-Flow detention time= 25.2 min calculated for 1.068 af (99% of inflow)
Center-of-Mass det. time= 22.1 min (818.3 - 796.1)

Volume	Invert	Avail.Storage	Storage Description
#1	358.00'	13,183 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
358.00	4	0	0
359.00	347	176	176
360.00	3,384	1,866	2,041
361.00	6,820	5,102	7,143
361.80	8,280	6,040	13,183

Device	Routing	Invert	Outlet Devices
#1	Primary	361.00'	**9.0' long x 30.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	358.91'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	359.95'	**1.50' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#4	Primary	361.51'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=8.63 cfs @ 12.43 hrs HW=361.28' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** (Weir Controls 3.51 cfs @ 1.41 fps)
- **2=Orifice/Grate** (Orifice Controls 1.38 cfs @ 7.00 fps)
- **3=Orifice/Grate** (Orifice Controls 3.74 cfs @ 4.98 fps)
- **4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 12P: PROPOSED INFILTRATION SYSTEM

Inflow Area =	0.275 ac,100.00% Impervious, Inflow Depth > 5.51" for 25-Cornell event			
Inflow =	1.73 cfs @ 12.07 hrs, Volume=	0.126 af		
Outflow =	1.49 cfs @ 12.11 hrs, Volume=	0.126 af, Atten= 14%, Lag= 2.7 min		
Discarded =	0.09 cfs @ 10.28 hrs, Volume=	0.091 af		
Primary =	1.40 cfs @ 12.11 hrs, Volume=	0.035 af		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 360.49' @ 12.11 hrs Surf.Area= 468 sf Storage= 1,228 cf

Plug-Flow detention time= 69.7 min calculated for 0.126 af (99% of inflow)
Center-of-Mass det. time= 67.0 min (800.2 - 733.3)

Volume	Invert	Avail.Storage	Storage Description
#1	357.00'	288 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 1,872 cf Overall - 1,152 cf Embedded = 720 cf x 40.0% Voids
#2	357.50'	1,037 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) Inside #1 1,152 cf Overall x 90.0% Voids
		1,325 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	468	0	0
361.00	468	1,872	1,872

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.50	384	0	0
360.50	384	1,152	1,152

Device	Routing	Invert	Outlet Devices
#1	Discarded	357.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	360.00'	**6.0" x 15.0' long Culvert X 3.00** Ke= 0.500 Outlet Invert= 359.50' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Discarded OutFlow Max=0.09 cfs @ 10.28 hrs HW=357.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=1.40 cfs @ 12.11 hrs HW=360.49' (Free Discharge)
└**2=Culvert** (Inlet Controls 1.40 cfs @ 2.38 fps)

100 YEAR STORM

Summary for Subcatchment 1S: PREDEVELOPMENT TO DETENTION BASIN

Runoff = 18.27 cfs @ 12.26 hrs, Volume= 1.795 af, Depth> 5.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Cornell Rainfall=8.84"

Area (sf)	CN	Description
95	61	>75% Grass cover, Good, HSG B
8,777	39	>75% Grass cover, Good, HSG A
19,794	76	Gravel roads, HSG A
17,634	30	Woods, Good, HSG A
45,509	98	Paved parking & roofs
20,147	39	>75% Grass cover, Good, HSG A
2,253	30	Woods, Good, HSG A
51,371	98	Paved parking & roofs
165,580	77	Weighted Average
68,700		Pervious Area
96,880		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.18		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
2.2	266	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	321	0.0020	0.45		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
4.5	243	0.0020	0.91		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.4	880	Total			

Summary for Subcatchment 2S: PREDEVELOPMENT OVELAND FLOW TO EAST PROP. LINE

Runoff = 25.44 cfs @ 12.14 hrs, Volume= 1.912 af, Depth> 4.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Cornell Rainfall=8.84"

Area (sf)	CN	Description
39,117	61	>75% Grass cover, Good, HSG B
5,308	85	Gravel roads, HSG B
9,437	55	Woods, Good, HSG B
42,517	77	Woods, Good, HSG D
874	98	Paved parking & roofs
33,105	76	Gravel roads, HSG A
26,493	30	Woods, Good, HSG A
38,964	98	Paved parking & roofs
32,673	39	>75% Grass cover, Good, HSG A
228,488	66	Weighted Average
188,650		Pervious Area
39,838		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	45	0.0100	0.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.3	48	0.2000	3.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.5	148	0.0050	0.71		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
5.1	152	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	393	Total			

Summary for Subcatchment 11S: POSTDEVELOPMENT TO DETENTION BASIN

Runoff = 18.27 cfs @ 12.26 hrs, Volume= 1.795 af, Depth> 5.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Cornell Rainfall=8.84"

Area (sf)	CN	Description
95	61	>75% Grass cover, Good, HSG B
8,777	39	>75% Grass cover, Good, HSG A
19,794	76	Gravel roads, HSG A
17,634	30	Woods, Good, HSG A
45,509	98	Paved parking & roofs
20,147	39	>75% Grass cover, Good, HSG A
2,253	30	Woods, Good, HSG A
51,371	98	Paved parking & roofs
165,580	77	Weighted Average
68,700		Pervious Area
96,880		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.18		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
2.2	266	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	321	0.0020	0.45		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
4.5	243	0.0020	0.91		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.4	880	Total			

Summary for Subcatchment 12S: POSTDEVELOPMENT OVERLAND FLOW TO PROPERTY LINE

Runoff = 21.34 cfs @ 12.14 hrs, Volume= 1.603 af, Depth> 4.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Cornell Rainfall=8.84"

Area (sf)	CN	Description
39,117	61	>75% Grass cover, Good, HSG B
5,308	85	Gravel roads, HSG B
9,437	55	Woods, Good, HSG B
42,517	77	Woods, Good, HSG D
874	98	Paved parking & roofs
30,452	76	Gravel roads, HSG A
26,493	30	Woods, Good, HSG A
21,777	98	Paved parking & roofs
26,513	39	>75% Grass cover, Good, HSG A
202,488	64	Weighted Average
179,837		Pervious Area
22,651		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	45	0.0100	0.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.3	48	0.2000	3.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.5	148	0.0050	0.71		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
5.1	152	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	393	Total			

Summary for Subcatchment 22S: ROOF DISCHARGE

Runoff = 2.89 cfs @ 12.07 hrs, Volume= 0.212 af, Depth> 7.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Cornell Rainfall=8.84"

Area (sf)	CN	Description
14,000	98	Paved parking & roofs
14,000		Impervious Area

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

Summary for Subcatchment 32S: ROOF DISCHARGE TO INFILTRATION

Runoff = 2.48 cfs @ 12.07 hrs, Volume= 0.181 af, Depth> 7.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Cornell Rainfall=8.84"

Area (sf)	CN	Description
12,000	98	Paved parking & roofs
12,000		Impervious Area

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

Summary for Reach 1R: (new Reach)

Inflow Area = 9.047 ac, 34.69% Impervious, Inflow Depth > 4.88" for 100-Cornell event
Inflow = 28.31 cfs @ 12.14 hrs, Volume= 3.678 af
Outflow = 28.31 cfs @ 12.14 hrs, Volume= 3.678 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: FLOW PATH FROM DET BASIN TO PROP. LINE

Inflow Area = 3.801 ac, 58.51% Impervious, Inflow Depth > 5.63" for 100-Cornell event
Inflow = 16.77 cfs @ 12.34 hrs, Volume= 1.782 af
Outflow = 15.00 cfs @ 12.56 hrs, Volume= 1.766 af, Atten= 11%, Lag= 13.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.58 fps, Min. Travel Time= 7.1 min
Avg. Velocity = 0.28 fps, Avg. Travel Time= 14.7 min

Peak Storage= 6,407 cf @ 12.44 hrs, Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 262.23 cfs

10.00' x 2.00' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 50.0 '/' Top Width= 210.00'
Length= 248.0' Slope= 0.0060 '/'
Inlet Invert= 358.00', Outlet Invert= 356.50'

‡

Summary for Reach 11R: (new Reach)

Inflow Area =	9.047 ac,	36.93% Impervious,	Inflow Depth >	4.84"	for 100-Cornell event
Inflow =	25.09 cfs @	12.14 hrs,	Volume=	3.652 af	
Outflow =	25.09 cfs @	12.14 hrs,	Volume=	3.652 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 12R: FLOW PATH FROM DET BASIN TO PROP. LINE

Inflow Area =	3.801 ac,	58.51% Impervious,	Inflow Depth >	5.63"	for 100-Cornell event
Inflow =	16.77 cfs @	12.34 hrs,	Volume=	1.782 af	
Outflow =	15.00 cfs @	12.56 hrs,	Volume=	1.766 af,	Atten= 11%, Lag= 13.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.58 fps, Min. Travel Time= 7.1 min
Avg. Velocity = 0.28 fps, Avg. Travel Time= 14.7 min

Peak Storage= 6,407 cf @ 12.44 hrs, Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 262.23 cfs

10.00' x 2.00' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 50.0 '/' Top Width= 210.00'
Length= 248.0' Slope= 0.0060 '/'
Inlet Invert= 358.00', Outlet Invert= 356.50'

‡

Summary for Reach 21R: FLOW PATH FROM DISCHARGES TO PROP. LINE

Inflow Area = 0.597 ac,100.00% Impervious, Inflow Depth > 5.76" for 100-Cornell event
Inflow = 5.10 cfs @ 12.08 hrs, Volume= 0.287 af
Outflow = 3.24 cfs @ 12.38 hrs, Volume= 0.284 af, Atten= 37%, Lag= 18.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.26 fps, Min. Travel Time= 12.6 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 31.3 min

Peak Storage= 2,457 cf @ 12.17 hrs, Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 151.55 cfs

10.00' x 2.00' deep channel, n= 0.100 Very weedy reaches w/pools
Side Slope Z-value= 50.0 '/' Top Width= 210.00'
Length= 198.0' Slope= 0.0020 '/'
Inlet Invert= 356.90', Outlet Invert= 356.50'

‡

Summary for Pond 1P: EXISTING DETENTION BASIN

Inflow Area = 3.801 ac, 58.51% Impervious, Inflow Depth > 5.67" for 100-Cornell event
Inflow = 18.27 cfs @ 12.26 hrs, Volume= 1.795 af
Outflow = 16.77 cfs @ 12.34 hrs, Volume= 1.782 af, Atten= 8%, Lag= 4.8 min
Primary = 16.77 cfs @ 12.34 hrs, Volume= 1.782 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 361.58' @ 12.34 hrs Surf.Area= 7,871 sf Storage= 11,374 cf

Plug-Flow detention time= 22.4 min calculated for 1.782 af (99% of inflow)
Center-of-Mass det. time= 19.6 min (803.9 - 784.3)

Volume	Invert	Avail.Storage	Storage Description
#1	358.00'	13,183 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
358.00	4	0	0
359.00	347	176	176
360.00	3,384	1,866	2,041
361.00	6,820	5,102	7,143
361.80	8,280	6,040	13,183

Device	Routing	Invert	Outlet Devices
#1	Primary	361.00'	**9.0' long x 30.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	358.91'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	359.95'	**1.50' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#4	Primary	361.51'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=16.76 cfs @ 12.34 hrs HW=361.58' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** (Weir Controls 10.62 cfs @ 2.05 fps)
- **2=Orifice/Grate** (Orifice Controls 1.47 cfs @ 7.48 fps)
- **3=Orifice/Grate** (Orifice Controls 4.23 cfs @ 5.64 fps)
- **4=Orifice/Grate** (Weir Controls 0.44 cfs @ 0.84 fps)

Summary for Pond 11P: EXISTING DETENTION BASIN

Inflow Area =	3.801 ac, 58.51% Impervious, Inflow Depth > 5.67" for 100-Cornell event			
Inflow =	18.27 cfs @	12.26 hrs, Volume=	1.795 af	
Outflow =	16.77 cfs @	12.34 hrs, Volume=	1.782 af, Atten= 8%, Lag= 4.8 min	
Primary =	16.77 cfs @	12.34 hrs, Volume=	1.782 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 361.58' @ 12.34 hrs Surf.Area= 7,871 sf Storage= 11,374 cf

Plug-Flow detention time= 22.4 min calculated for 1.782 af (99% of inflow)
Center-of-Mass det. time= 19.6 min (803.9 - 784.3)

Volume	Invert	Avail.Storage	Storage Description
#1	358.00'	13,183 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
358.00	4	0	0
359.00	347	176	176
360.00	3,384	1,866	2,041
361.00	6,820	5,102	7,143
361.80	8,280	6,040	13,183

Device	Routing	Invert	Outlet Devices
#1	Primary	361.00'	**9.0' long x 30.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	358.91'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	359.95'	**1.50' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#4	Primary	361.51'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=16.76 cfs @ 12.34 hrs HW=361.58' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** (Weir Controls 10.62 cfs @ 2.05 fps)
- **2=Orifice/Grate** (Orifice Controls 1.47 cfs @ 7.48 fps)
- **3=Orifice/Grate** (Orifice Controls 4.23 cfs @ 5.64 fps)
- **4=Orifice/Grate** (Weir Controls 0.44 cfs @ 0.84 fps)

Summary for Pond 12P: PROPOSED INFILTRATION SYSTEM

Inflow Area =	0.275 ac,100.00% Impervious, Inflow Depth > 7.90" for 100-Cornell event			
Inflow =	2.48 cfs @ 12.07 hrs, Volume=	0.181 af		
Outflow =	2.36 cfs @ 12.09 hrs, Volume=	0.173 af, Atten= 5%, Lag= 1.5 min		
Discarded =	0.09 cfs @ 9.08 hrs, Volume=	0.098 af		
Primary =	2.27 cfs @ 12.09 hrs, Volume=	0.075 af		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 360.89' @ 12.09 hrs Surf.Area= 468 sf Storage= 1,304 cf

Plug-Flow detention time= 59.5 min calculated for 0.173 af (95% of inflow)
Center-of-Mass det. time= 41.4 min (773.4 - 732.0)

Volume	Invert	Avail.Storage	Storage Description
#1	357.00'	288 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 1,872 cf Overall - 1,152 cf Embedded = 720 cf x 40.0% Voids
#2	357.50'	1,037 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) Inside #1 1,152 cf Overall x 90.0% Voids
		1,325 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	468	0	0
361.00	468	1,872	1,872

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.50	384	0	0
360.50	384	1,152	1,152

Device	Routing	Invert	Outlet Devices
#1	Discarded	357.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	360.00'	**6.0" x 15.0' long Culvert X 3.00** Ke= 0.500 Outlet Invert= 359.50' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

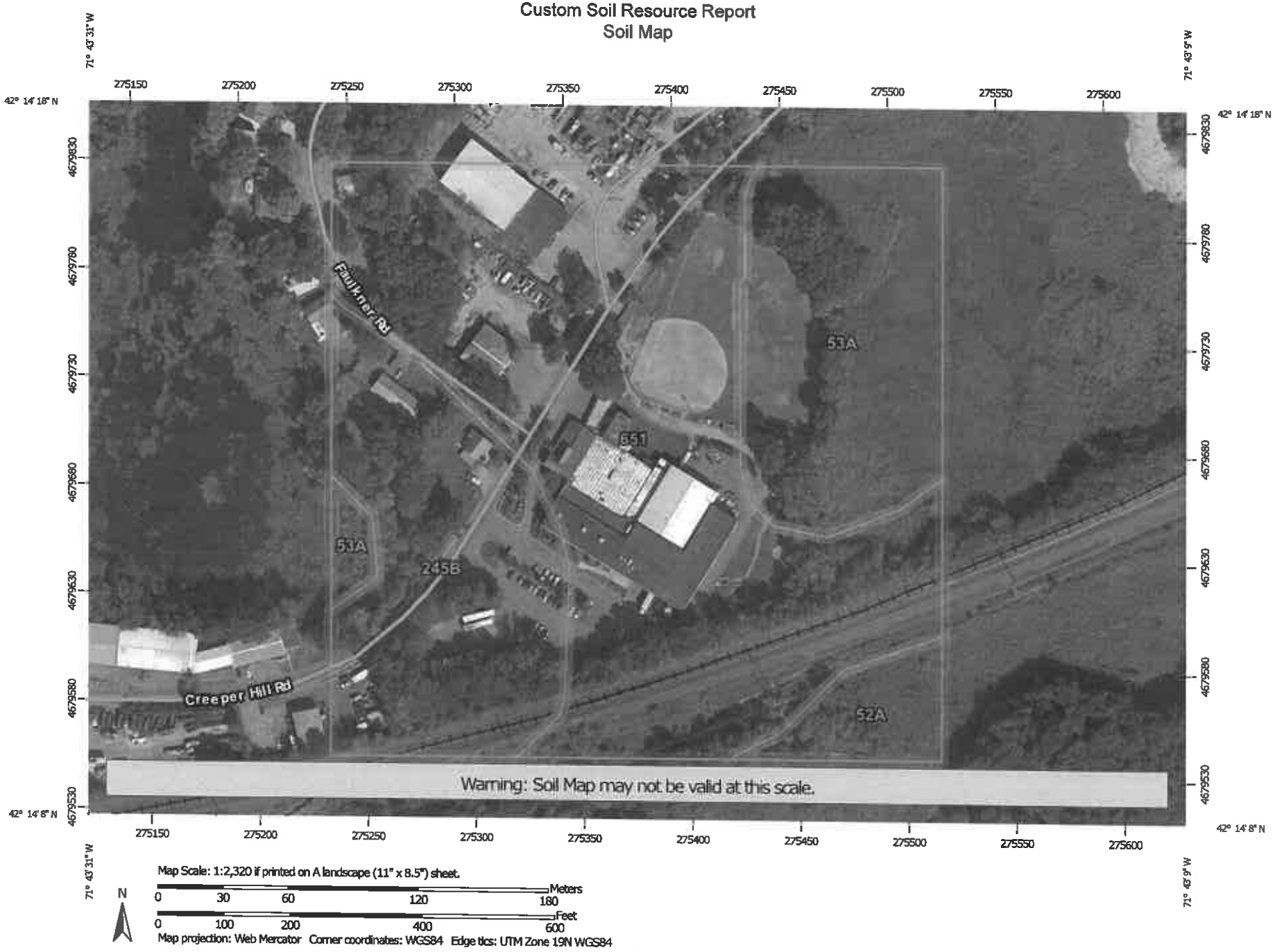
Discarded OutFlow Max=0.09 cfs @ 9.08 hrs HW=357.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=2.27 cfs @ 12.09 hrs HW=360.89' (Free Discharge)
└**2=Culvert** (Inlet Controls 2.27 cfs @ 3.85 fps)

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 9, 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: Sep 12, 2014—Sep 28, 2014

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.

Map Unit Legend

Worcester County, Massachusetts, Southern Part (MA615)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
52A	Freetown muck, 0 to 1 percent slopes	0.8	4.2%
53A	Freetown muck, ponded, 0 to 1 percent slopes	3.9	20.5%
245B	Hinckley loamy sand, 3 to 8 percent slopes	4.2	21.9%
651	Udorthents, smoothed	10.3	53.4%
Totals for Area of Interest		**19.2**	**100.0%**

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that

have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Worcester County, Massachusetts, Southern Part

52A—Freetown muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2q9
Elevation: 0 to 1,110 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of unique importance

Map Unit Composition

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

Description of Freetown

Setting

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

Typical profile

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

Properties and qualities

Slope: 0 to 1 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Whitman

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope

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

Scarboro

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

Swansea

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

53A—Freetown muck, ponded, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2qc
Elevation: 0 to 1,140 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of unique importance

Map Unit Composition

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

Description of Freetown, Ponded

Setting

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

Typical profile

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

Properties and qualities

Slope: 0 to 1 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Swansea, ponded

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

Whitman, ponded

Percent of map unit: 5 percent
Landform: Depressions on ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

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

245B—Hinckley loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svm8
Elevation: 0 to 1,430 feet
Mean annual precipitation: 36 to 53 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Hinckley

Setting

Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, tread, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 8 percent
Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, tread, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope, head slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, tread, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

651—Udorthents, smoothed

Map Unit Setting

National map unit symbol: 9bfc
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 80 percent
Urban land: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Parent material: Made land over firm coarse-loamy basal till and/or dense coarse-loamy lodgment till

Typical profile

H1 - 0 to 6 inches: variable
H2 - 6 to 60 inches: variable

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group (81 Creeper Hill Road)

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.

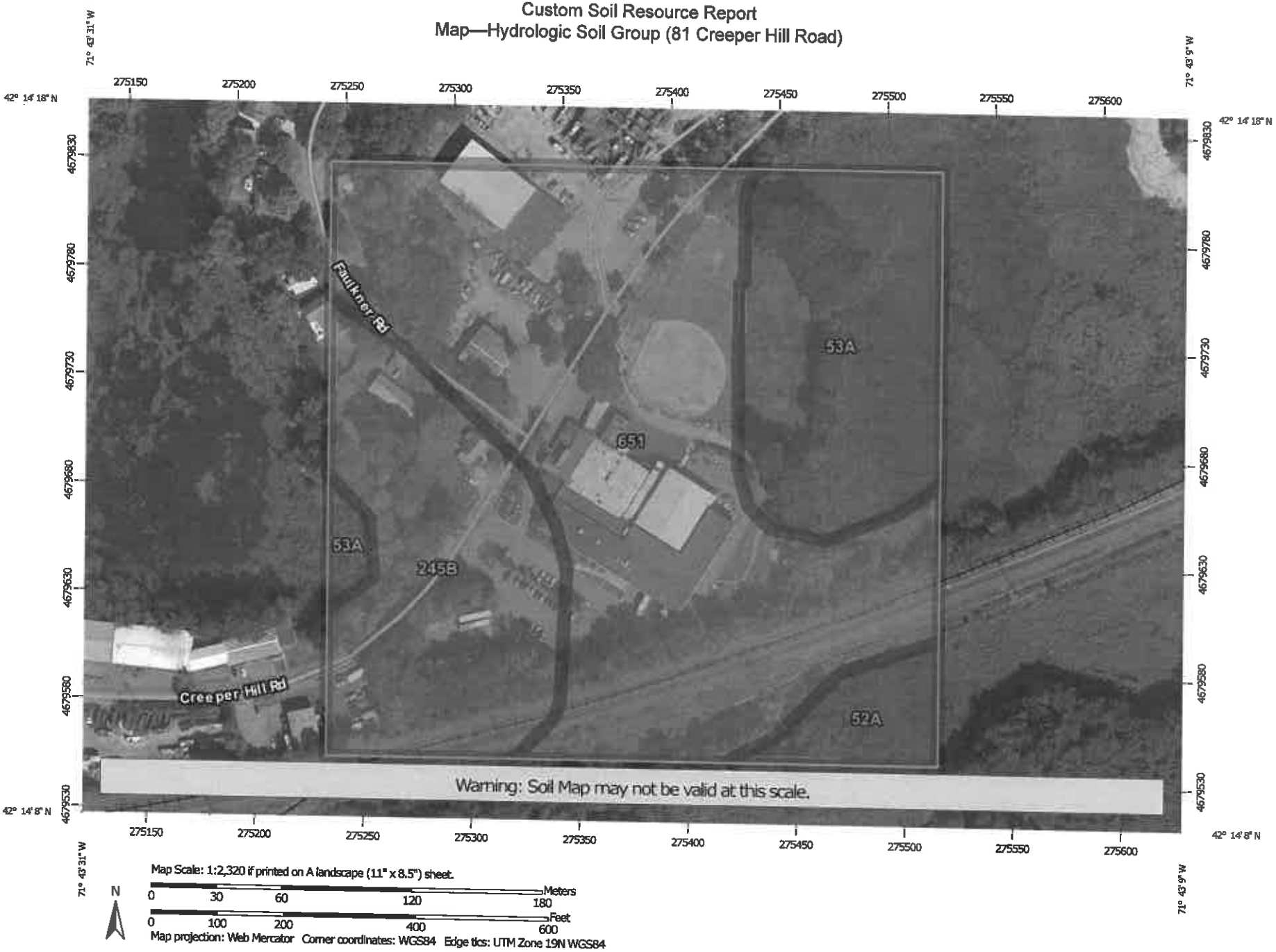
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Custom Soil Resource Report
Map—Hydrologic Soil Group (81 Creeper Hill Road)



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.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 9, 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: Sep 12, 2014—Sep 28, 2014

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.

Table—Hydrologic Soil Group (81 Creeper Hill Road)

Hydrologic Soil Group— Summary by Map Unit — Worcester County, Massachusetts, Southern Part (MA615)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
52A	Freetown muck, 0 to 1 percent slopes	B/D	0.8	4.2%
53A	Freetown muck, ponded, 0 to 1 percent slopes	B/D	3.9	20.5%
245B	Hinckley loamy sand, 3 to 8 percent slopes	A	4.2	21.9%
651	Udorthents, smoothed	A	10.3	53.4%
Totals for Area of Interest			19.2	100.0%

Rating Options—Hydrologic Soil Group (81 Creeper Hill Road)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher