

# KCE CT5 BESS

# Wilmington

Village Hill Road  
Wilmington, Connecticut

PREPARED FOR

---

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Yarmouth, ME 04096

PREPARED BY



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**June 2023**



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# Stormwater Report Narrative

The Project was designed to incorporate measures provided in the Connecticut Stormwater Quality Manual (CTDEEP 2004) as well as the CTDEEP Stormwater General Permit effective December 31, 2020. The conclusion of this analysis is that the proposed improvements will not increase the post-development peak runoff rates in comparison to existing predevelopment rates at any of the critical design points analyzed and the quality of stormwater runoff leaving the Site will be treated prior to discharge from the Site.

## Project Description

The Petitioner is proposing to construct a  $\pm 5$  MW battery energy storage system on roughly 2.25 acre of previously undeveloped wooded area along with all associated utilities, access paths, fencing and landscaping to support this use (the Project). The 2.25 acre site is part of a larger parcel totaling 65 acres and the southwestern portion of the property is not intended for development. The town boundary between Willington and Stafford splits the access road into the site.

## Site Description

The Project Site will be comprised on approximately  $\pm 2.25$  acres west of Village Hill Road, (Map, Block, Lot: 52-1-0) in Willington, Connecticut (see Figure 1). The site is bounded by Village Hill Road to the east, the Stafford town boundary to the north and residential to the south and west. The development site is all within the R80 zone (Residential).

The project area under existing conditions is a previously undeveloped woodland to the rear of a property on Village Hill Rd. This woodland is lightly vegetated with minimal brush. An existing access road connects the farm field to the east of the site to the forest in the proposed project area. The topography of the site generally slopes from the road to a steadily increasing grade due west. Under existing conditions, runoff from the project area generally flows overland to the west downhill towards Blair Rd.

According to available soil mapping<sup>1</sup>, the on-Site soils within the Project are divided by Hydraulic Soil Group "B" in the west and "C" in the east, indicating that the soils have a moderate infiltration rate when thoroughly wet. The soil profiles examined in field test pits were mostly consistent or similar to the named series in the mapped units available on-line. See Appendix B for NRCS Web Soil Survey output.

<sup>1</sup> <https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>

According to available CTDEEP Groundwater Classification maps, groundwater at the site is GA (see Appendix A). The CTDEEP Aquifer Protection Areas Mapping website displays that there are no listed APA's in the vicinity of the site.

According to FEMA Flood Insurance Rate Map Community Panel Number 0901590002A dated June 15, 1982, the site is not located within a Flood Hazard Area.

## Existing Drainage Conditions

Under existing conditions, runoff from the project area flows overland to the west of the site through woodland. The Site is generally at its highest elevation in the east of the development area. The majority of the Project area is comprised of undeveloped forest. Terrain slopes in the Project area range from 3% to approximately 10%. Figure 2 illustrates the existing drainage patterns on the Site. Only areas of the Site that are proposed to be disturbed by construction have been included in this drainage analysis, while portions of the Site unaffected by construction have been excluded.

For the existing conditions hydrologic analysis, the Site is encompassed by 1 watershed area, which has been identified as an area around the Project limits where flow is directed naturally to the west. Table 1 provides a summary of the existing conditions hydrologic data. Figure 2 illustrates the existing drainage patterns on the Site. All portions of the Project area have been considered in the hydrologic analysis.

**Drainage Area 1A** - This ±2.25-acre area encompasses the Project. Untreated stormwater in this area flows to the west.

Table 1 provides a summary of the existing conditions hydrologic data.

**Table 1 Existing Conditions Hydrologic Data**

Drainage Area	Discharge Location	Area (Acres)	Curve Number	Time of Concentration (min)
1	Blair Road	2.25	70	12.2

## Proposed Drainage Conditions

The Site has been designed to maintain existing topography and mimic existing drainage patterns to the maximum extents feasible. Across the proposed development areas, the Project proposes to install permanent battery facility with gravel access road and pad along with a stormwater basin which will assist in lowering runoff rates from the facility to the surrounding discharge points. As a result, the Project will have minimal impact to surrounding ecologically sensitive areas.

The only impervious surfaces proposed to be constructed are access roads and small concrete pads for utility equipment. Once operational, vehicular access to the Project will be limited to infrequent maintenance visits. The vegetated buffers and proposed stormwater basins will provide water quality treatment for the Project.

Figure 3 illustrates the proposed "post construction" drainage conditions for the project. The proposed conditions analysis utilizes the same one (1) drainage area from existing conditions.

Natural drainage patterns will be maintained throughout the Site so that the proposed hydrologic conditions will closely match existing conditions. The proposed conditions analysis utilizes the same drainage area from existing conditions. Only areas of the Site that are proposed to be disturbed by construction have been included in this drainage analysis, while portions of the Site unaffected by construction have been excluded.

An upgraded intermittent stream crossing is proposed as part of this Project as well. The crossing has been sized to safely convey 25-year rainfall events through the proposed pipes.

**Drainage Area 1** - This ±2.25-acre area encompasses the Project. Stormwater will flow into a proposed stormwater basin. After being treated by this basin, stormwater will be conveyed to the west.

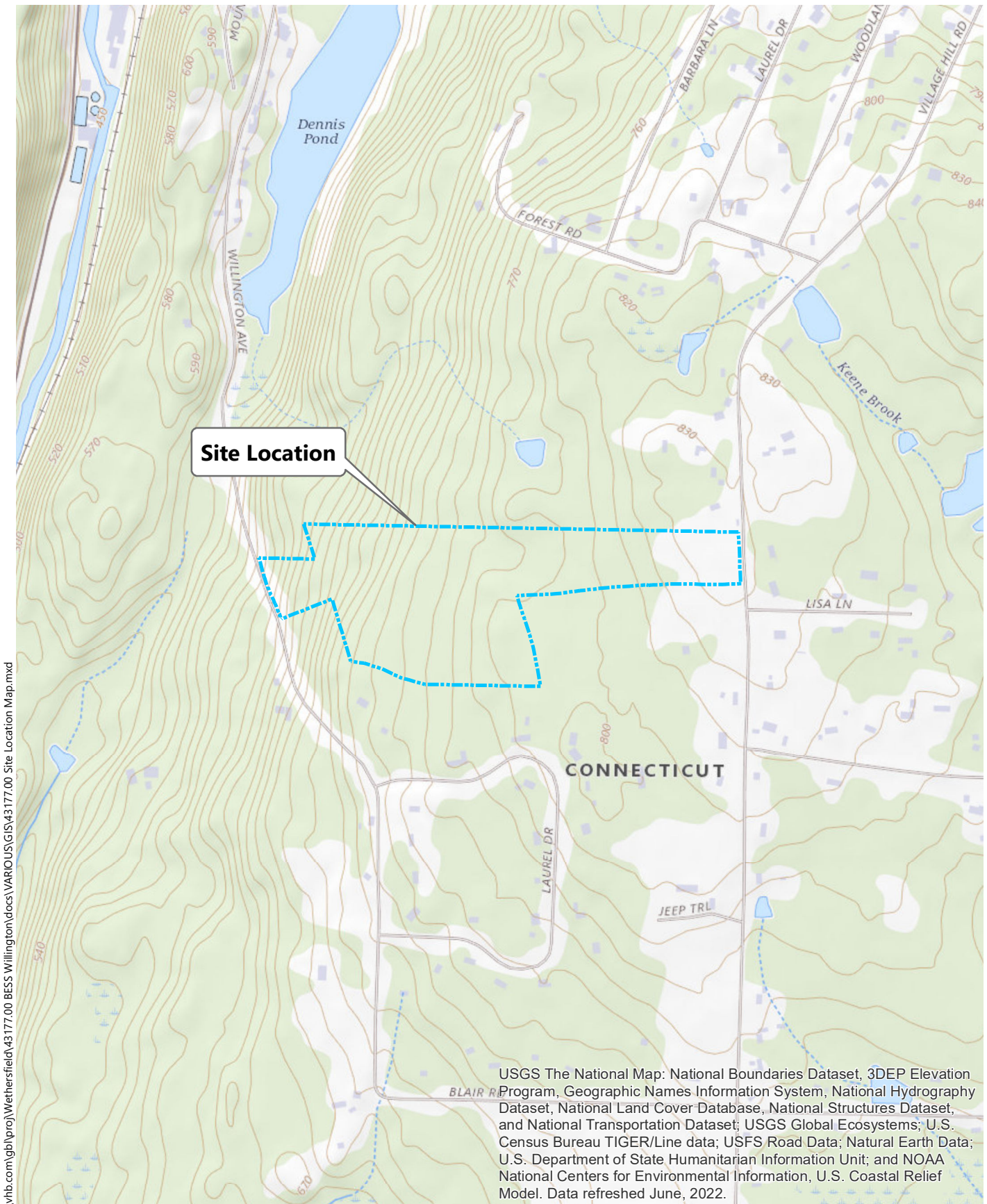
Table 2 below provides a summary of the proposed conditions hydrologic data.

**Table 2 Proposed Conditions Hydrologic Data**

Drainage Area	Discharge Location	Area (Acres)	Curve Number	Time of Concentration (min)
1	Blair Road	2.25	75	11.4

**Figure 1**    **Site Location Map**





\\vhb.com\gb\proj\Wethersfield\43177.00 BESS Willington\docs\VARIOUS\GIS\43177.00 Site Location Map.mxd

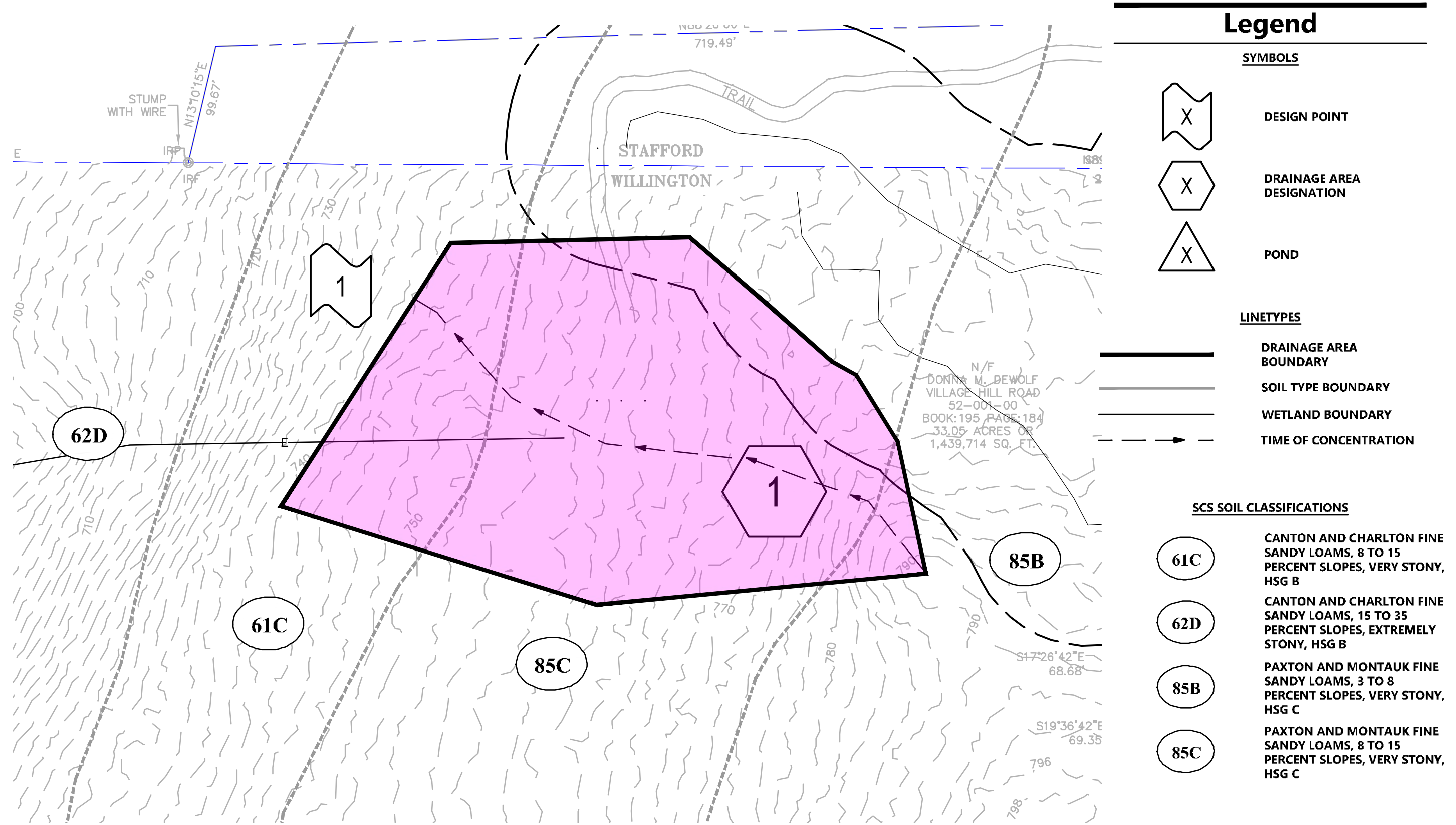
USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed June, 2022.



### Site Location Map



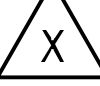
**Flycatcher BESS Willington  
Village Hill Road  
Willington, Connecticut**

**Figure 2 Existing Drainage Area**







## Legend





### SYMBOLS

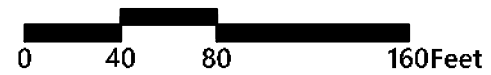
-  DESIGN POINT
-  DRAINAGE AREA DESIGNATION
-  POND

### LINETYPES

-  DRAINAGE AREA BOUNDARY
-  SOIL TYPE BOUNDARY
-  WETLAND BOUNDARY
-  TIME OF CONCENTRATION

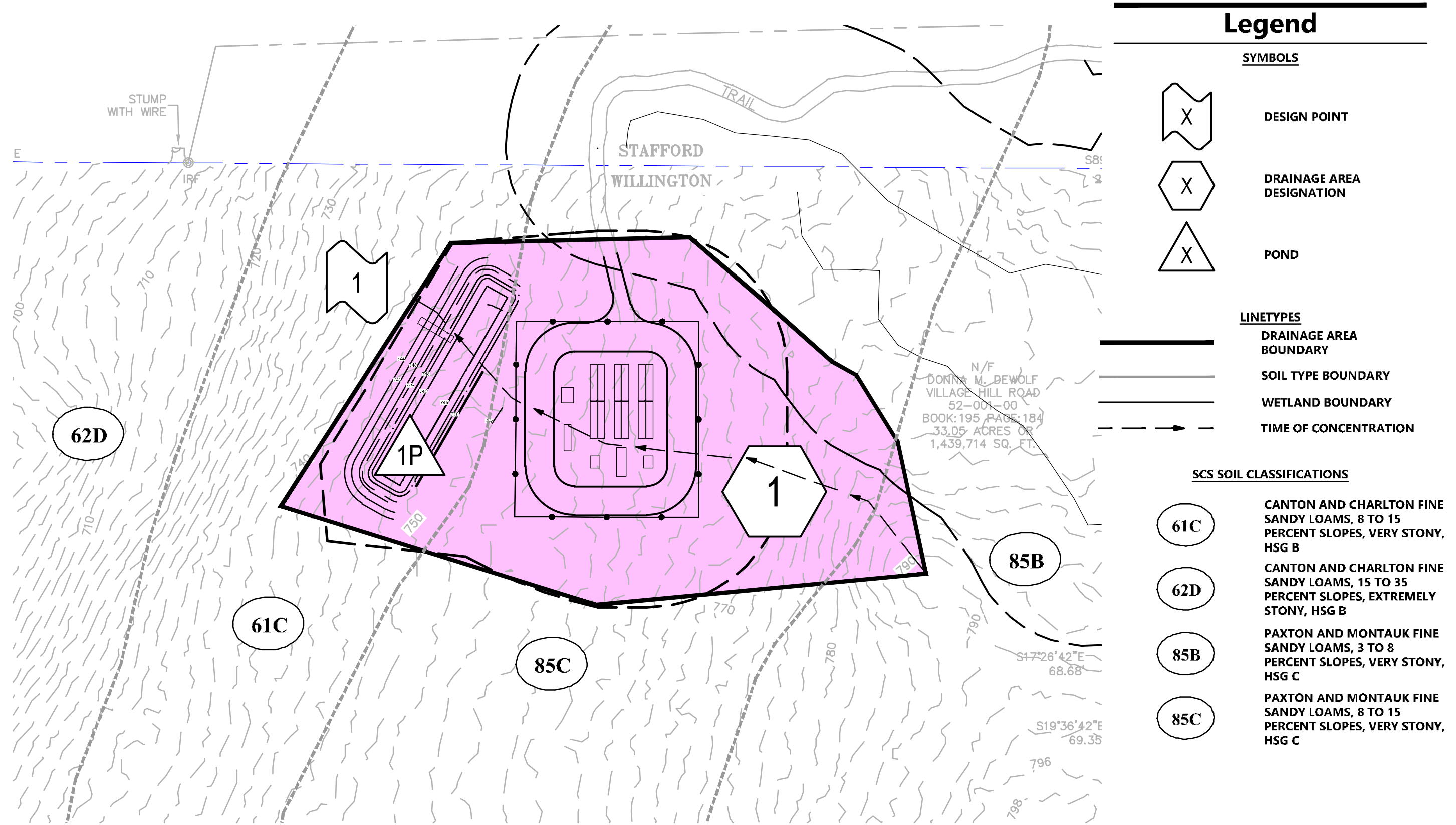
### SCS SOIL CLASSIFICATIONS

-  CANTON AND CHARLTON FINE SANDY LOAMS, 8 TO 15 PERCENT SLOPES, VERY STONY, HSG B
-  CANTON AND CHARLTON FINE SANDY LOAMS, 15 TO 35 PERCENT SLOPES, EXTREMELY STONY, HSG B
-  PAXTON AND MONTAUK FINE SANDY LOAMS, 3 TO 8 PERCENT SLOPES, VERY STONY, HSG C
-  PAXTON AND MONTAUK FINE SANDY LOAMS, 8 TO 15 PERCENT SLOPES, VERY STONY, HSG C





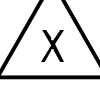
**Figure 3 Proposed Drainage Area**









### Legend





**SYMBOLS**

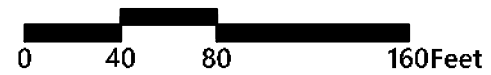
-  DESIGN POINT
-  DRAINAGE AREA DESIGNATION
-  POND

**LINETYPES**

-  DRAINAGE AREA BOUNDARY
-  SOIL TYPE BOUNDARY
-  WETLAND BOUNDARY
-  TIME OF CONCENTRATION

**SCS SOIL CLASSIFICATIONS**

-  CANTON AND CHARLTON FINE SANDY LOAMS, 8 TO 15 PERCENT SLOPES, VERY STONY, HSG B
-  CANTON AND CHARLTON FINE SANDY LOAMS, 15 TO 35 PERCENT SLOPES, EXTREMELY STONY, HSG B
-  PAXTON AND MONTAUK FINE SANDY LOAMS, 3 TO 8 PERCENT SLOPES, VERY STONY, HSG C
-  PAXTON AND MONTAUK FINE SANDY LOAMS, 8 TO 15 PERCENT SLOPES, VERY STONY, HSG C



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## Appendix A: Hydrologic Computations and Supporting Information

The rainfall-runoff response of the Site under existing and proposed conditions was evaluated for storm events with recurrence intervals of 2, 25, 50 and 100-years. Rainfall volumes used for this analysis were based on the NOAA National Weather Service Hydrometeorological Design Studies Center volumes Type III, 24-hour storm event: 3.25, 6.21, 7.05, and 7.97 inches, respectively. Runoff coefficients for the pre- and post-development conditions, as previously shown in Tables 1 and 2 respectively, were determined using NRCS Technical Release 55 (TR-55) methodology as provided in HydroCAD. Drainage areas used in the analyses were described in previous sections and shown on Figures 2 and 3. The HydroCAD model is based on the NRCS Technical Release 20 (TR-20) Model for Project Formulation Hydrology.

The results of the pre- and post-development hydrologic models indicate that peak runoff rates from the Site will be reduced for all design storms.

Drainage area used in the analyses were described in pervious sections and shown on Figures 2 and 3. Detailed printouts of the HydroCAD analyses are included in this Appendix.

Table 3 presents a summary of the existing and proposed conditions peak discharge rates.

**Table 3 Peak Discharge Rates (cfs\*)**

Watershed	2-year	25-year	50-year	100-year
<b>Drainage Area 1</b>				
Existing	1.65	6.36	7.87	9.56
Proposed	0.00	3.40	5.53	8.15

\*expressed in cubic feet per second

## Water Quality Volume

Water Quality Volume (WQV) is based upon the first inch of rainfall, or a 1-inch rainfall event, over the acreage of proposed impervious surfaces for the development. The crushed stone access paths will be trafficked infrequently and the permanent stormwater basin will provide residence time of stormwater runoff to remove the small amount of sediment from runoff.

To be conservative, water quality computations have been performed using 2004 CTDEEP Stormwater Quality Manual for the access roads and equipment pads to determine required water quality volumes. These water quality volumes are addressed in the design of the proposed permanent stormwater basins.

## Water Quality Flow

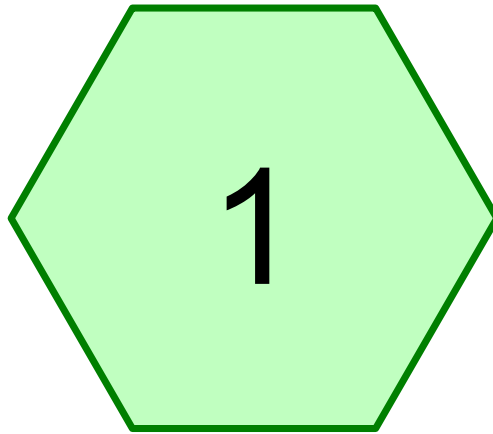
Water Quality Flow (WQF) is a rate of stormwater runoff based upon the first inch of rainfall, or a 1-inch rainfall event. This regulation is generally followed for "flow-through" treatment devices. As the proposed development does not incorporate any "flow-through" water quality treatment devices, WQF is not applicable to this project.



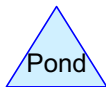
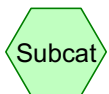
## Appendix A: Attachments

- › HydroCAD Analysis: Existing Conditions
- › HydroCAD Analysis: Proposed Conditions
- › NOAA Rainfall Data
- › Water Quality Volume Calculations
- › Sediment Trap Sizing Calculations

## HydroCAD Analysis: Existing Conditions



# Drainage Area 1



**Rainfall Events Listing**

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 YEAR	Type III 24-hr		Default	24.00	1	3.25	2
2	25 YEAR	Type III 24-hr		Default	24.00	1	6.21	2
3	50-YEAR	Type III 24-hr		Default	24.00	1	7.05	2
4	100 YEAR	Type III 24-hr		Default	24.00	1	7.97	2

**Area Listing (all nodes)**

Area (acres)	CN	Description (subcatchment-numbers)
0.556	60	Woods, Fair, HSG B (1)
1.699	73	Woods, Fair, HSG C (1)
<b>2.255</b>	<b>70</b>	<b>TOTAL AREA</b>

**Soil Listing (all nodes)**

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.556	HSG B	1
1.699	HSG C	1
0.000	HSG D	
0.000	Other	
<b>2.255</b>		<b>TOTAL AREA</b>

**43177.00EXHydroCAD**

Prepared by VHB

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**Ground Covers (all nodes)**

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.556	1.699	0.000	0.000	2.255	Woods, Fair	1
<b>0.000</b>	<b>0.556</b>	<b>1.699</b>	<b>0.000</b>	<b>0.000</b>	<b>2.255</b>	<b>TOTAL AREA</b>	

Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1: Drainage Area 1**

Runoff Area=2.255 ac 0.00% Impervious Runoff Depth=0.86"  
Flow Length=506' Tc=12.2 min CN=70 Runoff=1.65 cfs 0.161 af

**Total Runoff Area = 2.255 ac Runoff Volume = 0.161 af Average Runoff Depth = 0.86"**  
**100.00% Pervious = 2.255 ac 0.00% Impervious = 0.000 ac**



**Summary for Subcatchment 1: Drainage Area 1**

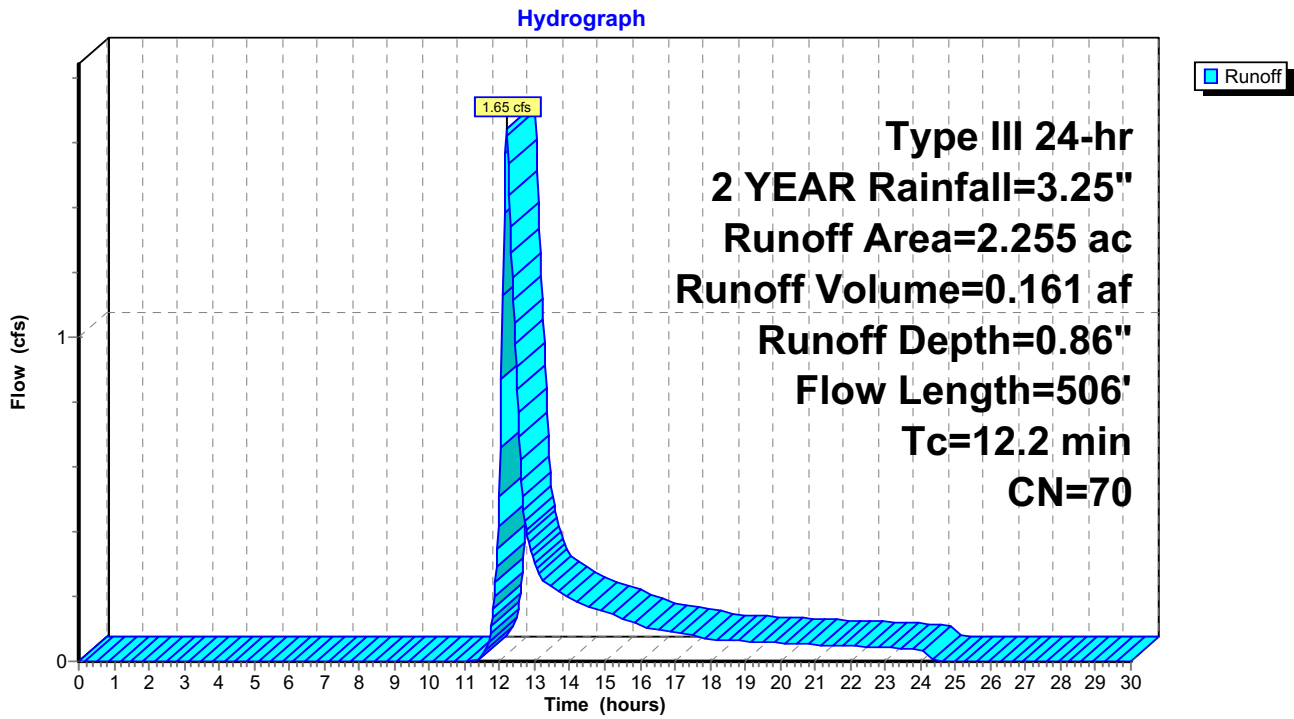
Runoff = 1.65 cfs @ 12.19 hrs, Volume= 0.161 af, Depth= 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs  
Type III 24-hr 2 YEAR Rainfall=3.25"

Area (ac)	CN	Description
0.556	60	Woods, Fair, HSG B
1.699	73	Woods, Fair, HSG C
2.255	70	Weighted Average
2.255		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.1000	0.12		<b>Sheet Flow, 0-50</b> Woods: Light underbrush n= 0.400 P2= 2.64"
0.2	26	0.1530	1.96		<b>Shallow Concentrated Flow, 50-76</b> Woodland Kv= 5.0 fps
0.9	101	0.1380	1.86		<b>Shallow Concentrated Flow, 76-177</b> Woodland Kv= 5.0 fps
1.5	125	0.0800	1.41		<b>Shallow Concentrated Flow, 177-302</b> Woodland Kv= 5.0 fps
1.1	88	0.0680	1.30		<b>Shallow Concentrated Flow, 302-390</b> Woodland Kv= 5.0 fps
1.2	94	0.0638	1.26		<b>Shallow Concentrated Flow, 390-484</b> Woodland Kv= 5.0 fps
0.2	22	0.0900	1.50		<b>Shallow Concentrated Flow, 484-506</b> Woodland Kv= 5.0 fps
12.2	506	Total			

### Subcatchment 1: Drainage Area 1



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1: Drainage Area 1**

Runoff Area=2.255 ac 0.00% Impervious Runoff Depth=2.97"  
Flow Length=506' Tc=12.2 min CN=70 Runoff=6.36 cfs 0.559 af

**Total Runoff Area = 2.255 ac Runoff Volume = 0.559 af Average Runoff Depth = 2.97"**  
**100.00% Pervious = 2.255 ac 0.00% Impervious = 0.000 ac**

**Summary for Subcatchment 1: Drainage Area 1**

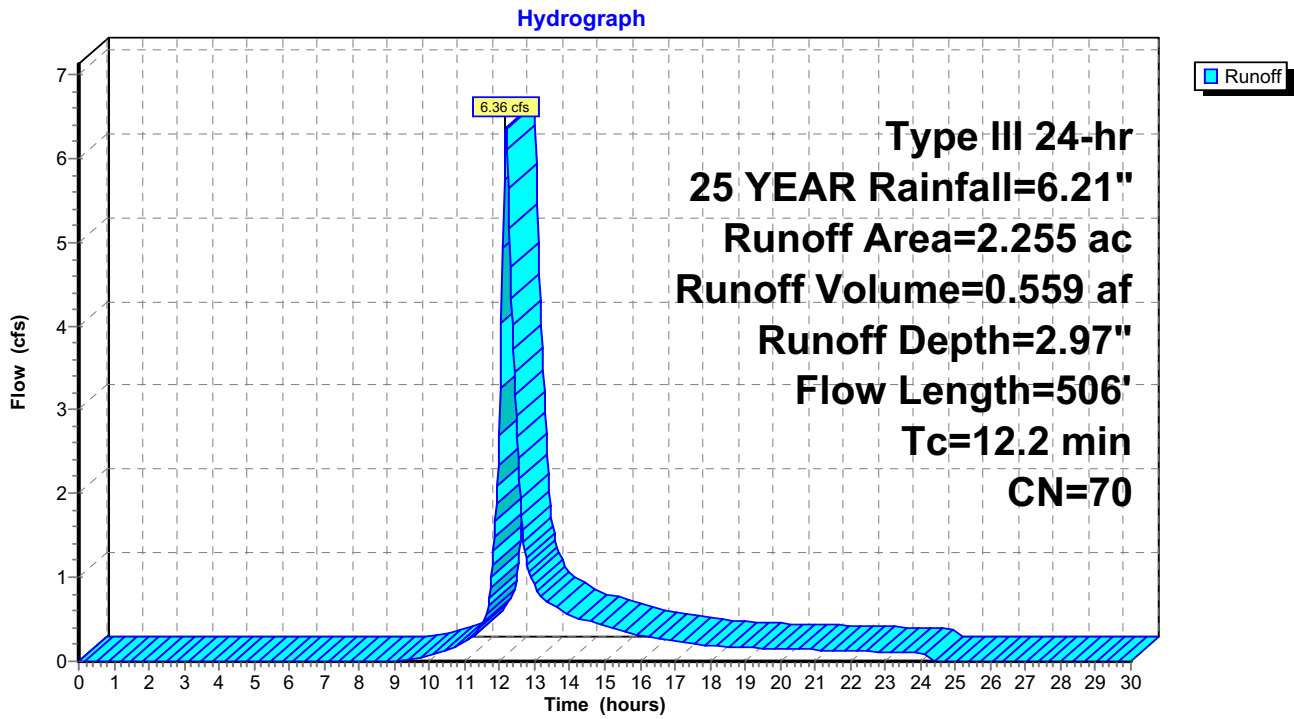
Runoff = 6.36 cfs @ 12.17 hrs, Volume= 0.559 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs  
 Type III 24-hr 25 YEAR Rainfall=6.21"

Area (ac)	CN	Description
0.556	60	Woods, Fair, HSG B
1.699	73	Woods, Fair, HSG C
2.255	70	Weighted Average
2.255		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.1000	0.12		<b>Sheet Flow, 0-50</b> Woods: Light underbrush n= 0.400 P2= 2.64"
0.2	26	0.1530	1.96		<b>Shallow Concentrated Flow, 50-76</b> Woodland Kv= 5.0 fps
0.9	101	0.1380	1.86		<b>Shallow Concentrated Flow, 76-177</b> Woodland Kv= 5.0 fps
1.5	125	0.0800	1.41		<b>Shallow Concentrated Flow, 177-302</b> Woodland Kv= 5.0 fps
1.1	88	0.0680	1.30		<b>Shallow Concentrated Flow, 302-390</b> Woodland Kv= 5.0 fps
1.2	94	0.0638	1.26		<b>Shallow Concentrated Flow, 390-484</b> Woodland Kv= 5.0 fps
0.2	22	0.0900	1.50		<b>Shallow Concentrated Flow, 484-506</b> Woodland Kv= 5.0 fps
12.2	506	Total			

### Subcatchment 1: Drainage Area 1



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1: Drainage Area 1**

Runoff Area=2.255 ac 0.00% Impervious Runoff Depth=3.66"  
Flow Length=506' Tc=12.2 min CN=70 Runoff=7.87 cfs 0.688 af

**Total Runoff Area = 2.255 ac Runoff Volume = 0.688 af Average Runoff Depth = 3.66"**  
**100.00% Pervious = 2.255 ac 0.00% Impervious = 0.000 ac**

**Summary for Subcatchment 1: Drainage Area 1**

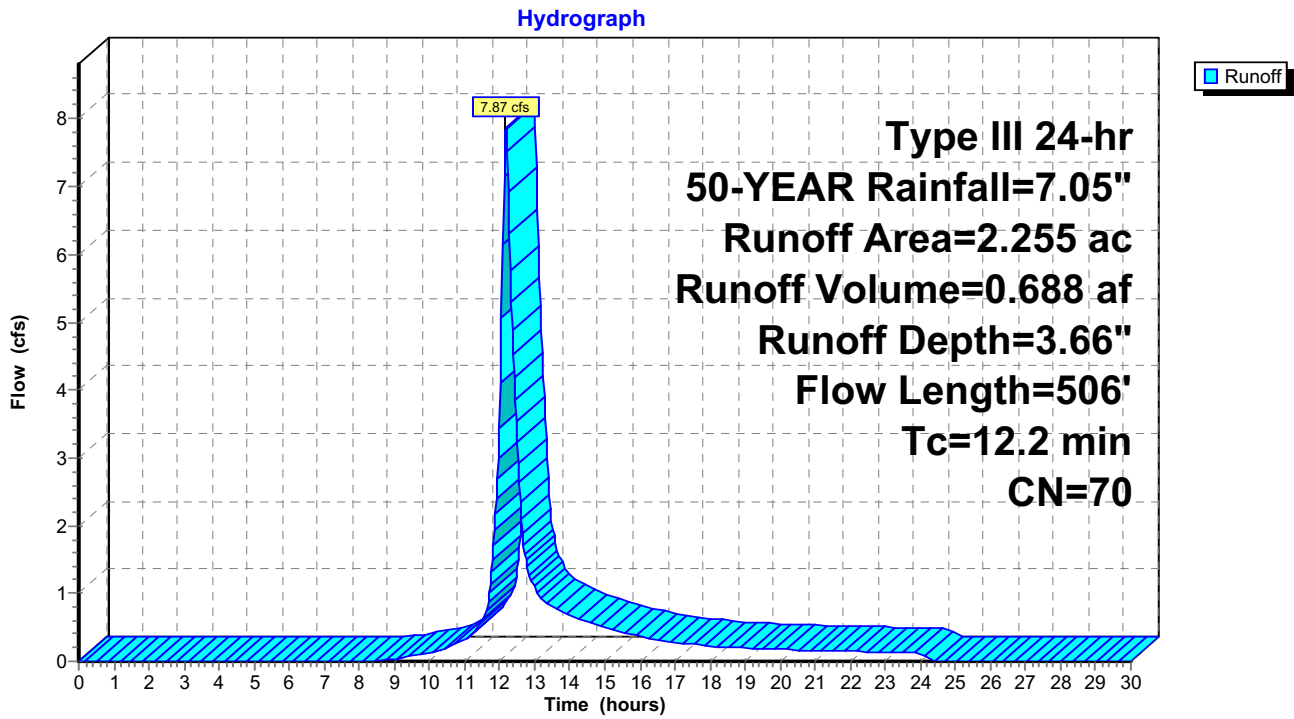
Runoff = 7.87 cfs @ 12.17 hrs, Volume= 0.688 af, Depth= 3.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs  
 Type III 24-hr 50-YEAR Rainfall=7.05"

Area (ac)	CN	Description
0.556	60	Woods, Fair, HSG B
1.699	73	Woods, Fair, HSG C
2.255	70	Weighted Average
2.255		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.1000	0.12		<b>Sheet Flow, 0-50</b> Woods: Light underbrush n= 0.400 P2= 2.64"
0.2	26	0.1530	1.96		<b>Shallow Concentrated Flow, 50-76</b> Woodland Kv= 5.0 fps
0.9	101	0.1380	1.86		<b>Shallow Concentrated Flow, 76-177</b> Woodland Kv= 5.0 fps
1.5	125	0.0800	1.41		<b>Shallow Concentrated Flow, 177-302</b> Woodland Kv= 5.0 fps
1.1	88	0.0680	1.30		<b>Shallow Concentrated Flow, 302-390</b> Woodland Kv= 5.0 fps
1.2	94	0.0638	1.26		<b>Shallow Concentrated Flow, 390-484</b> Woodland Kv= 5.0 fps
0.2	22	0.0900	1.50		<b>Shallow Concentrated Flow, 484-506</b> Woodland Kv= 5.0 fps
12.2	506	Total			

### Subcatchment 1: Drainage Area 1





Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1: Drainage Area 1**

Runoff Area=2.255 ac 0.00% Impervious Runoff Depth=4.44"  
Flow Length=506' Tc=12.2 min CN=70 Runoff=9.56 cfs 0.834 af

**Total Runoff Area = 2.255 ac Runoff Volume = 0.834 af Average Runoff Depth = 4.44"**  
**100.00% Pervious = 2.255 ac 0.00% Impervious = 0.000 ac**

**Summary for Subcatchment 1: Drainage Area 1**

Runoff = 9.56 cfs @ 12.17 hrs, Volume= 0.834 af, Depth= 4.44"

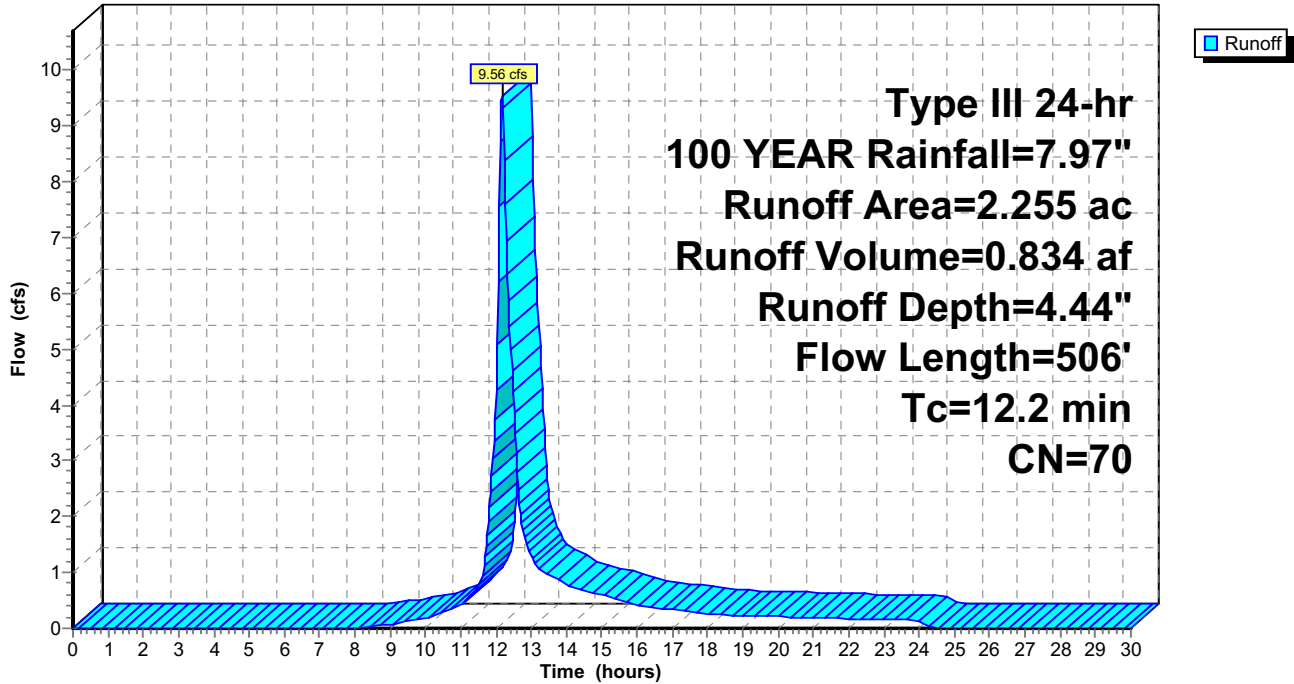
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs  
Type III 24-hr 100 YEAR Rainfall=7.97"

Area (ac)	CN	Description
0.556	60	Woods, Fair, HSG B
1.699	73	Woods, Fair, HSG C
2.255	70	Weighted Average
2.255		100.00% Pervious Area

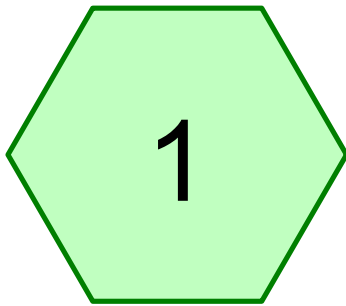
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.1000	0.12		<b>Sheet Flow, 0-50</b> Woods: Light underbrush n= 0.400 P2= 2.64"
0.2	26	0.1530	1.96		<b>Shallow Concentrated Flow, 50-76</b> Woodland Kv= 5.0 fps
0.9	101	0.1380	1.86		<b>Shallow Concentrated Flow, 76-177</b> Woodland Kv= 5.0 fps
1.5	125	0.0800	1.41		<b>Shallow Concentrated Flow, 177-302</b> Woodland Kv= 5.0 fps
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0.2	22	0.0900	1.50		<b>Shallow Concentrated Flow, 484-506</b> Woodland Kv= 5.0 fps
12.2	506	Total			

### Subcatchment 1: Drainage Area 1

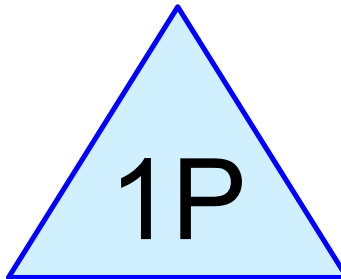
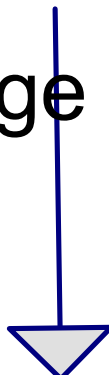
Hydrograph



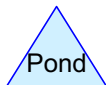
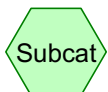
## HydroCAD Analysis: Proposed Conditions



Drainage Area 1



Stormwater Basin



**Rainfall Events Listing**

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 YEAR	Type III 24-hr		Default	24.00	1	3.25	2
2	25 YEAR	Type III 24-hr		Default	24.00	1	6.21	2
3	50-year	Type III 24-hr		Default	24.00	1	7.05	2
4	100 YEAR	Type III 24-hr		Default	24.00	1	7.97	2

**Area Listing (all nodes)**

Area (acres)	CN	Description (subcatchment-numbers)
0.416	61	>75% Grass cover, Good, HSG B (1)
0.787	74	>75% Grass cover, Good, HSG C (1)
0.045	96	Gravel surface, HSG B (1)
0.426	96	Gravel surface, HSG C (1)
0.096	60	Woods, Fair, HSG B (1)
0.486	73	Woods, Fair, HSG C (1)
<b>2.256</b>	<b>75</b>	<b>TOTAL AREA</b>

**Soil Listing (all nodes)**

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.557	HSG B	1
1.699	HSG C	1
0.000	HSG D	
0.000	Other	
<b>2.256</b>		<b>TOTAL AREA</b>



**43177.00PRHydroCAD**

Prepared by VHB

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Page 5

**Ground Covers (all nodes)**

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.416	0.787	0.000	0.000	1.203	>75% Grass cover, Good	1
0.000	0.045	0.426	0.000	0.000	0.471	Gravel surface	1
0.000	0.096	0.486	0.000	0.000	0.582	Woods, Fair	1
<b>0.000</b>	<b>0.557</b>	<b>1.699</b>	<b>0.000</b>	<b>0.000</b>	<b>2.256</b>	<b>TOTAL AREA</b>	

Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1: Drainage Area 1**

Runoff Area=2.256 ac 0.00% Impervious Runoff Depth=1.13"  
Flow Length=506' Tc=11.4 min CN=75 Runoff=2.37 cfs 0.212 af

**Pond 1P: Stormwater Basin**

Peak Elev=747.92' Storage=9,237 cf Inflow=2.37 cfs 0.212 af  
Outflow=0.00 cfs 0.000 af

**Total Runoff Area = 2.256 ac Runoff Volume = 0.212 af Average Runoff Depth = 1.13"**  
**100.00% Pervious = 2.256 ac 0.00% Impervious = 0.000 ac**

**Summary for Subcatchment 1: Drainage Area 1**

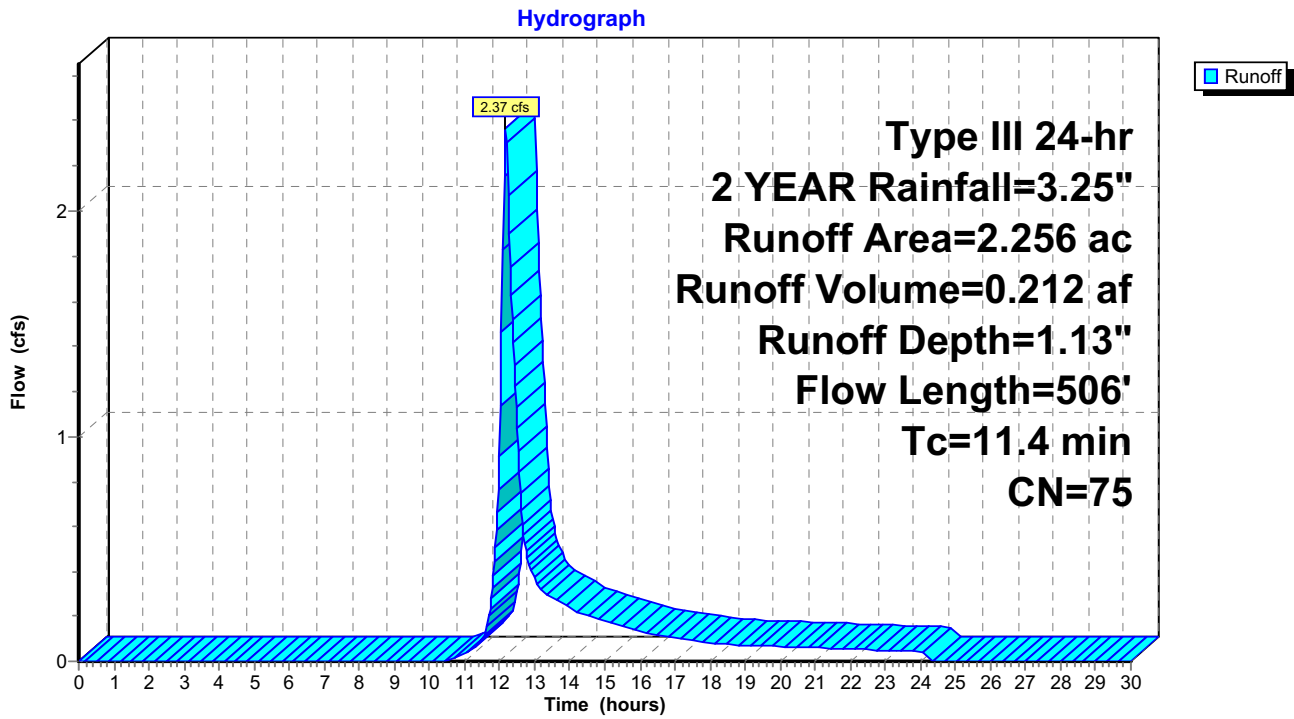
Runoff = 2.37 cfs @ 12.17 hrs, Volume= 0.212 af, Depth= 1.13"  
 Routed to Pond 1P : Stormwater Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs  
 Type III 24-hr 2 YEAR Rainfall=3.25"

Area (ac)	CN	Description
0.416	61	>75% Grass cover, Good, HSG B
0.787	74	>75% Grass cover, Good, HSG C
0.045	96	Gravel surface, HSG B
0.426	96	Gravel surface, HSG C
0.096	60	Woods, Fair, HSG B
0.486	73	Woods, Fair, HSG C
2.256	75	Weighted Average
2.256		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.1000	0.11		<b>Sheet Flow, 0-50</b> Woods: Light underbrush n= 0.400 P2= 2.46"
0.2	26	0.1500	1.94		<b>Shallow Concentrated Flow, 50-76</b> Woodland Kv= 5.0 fps
0.7	76	0.1510	1.94		<b>Shallow Concentrated Flow, 76-152</b> Woodland Kv= 5.0 fps
0.2	25	0.1000	2.21		<b>Shallow Concentrated Flow, 152-177</b> Short Grass Pasture Kv= 7.0 fps
0.5	65	0.0900	2.10		<b>Shallow Concentrated Flow, 177-242</b> Short Grass Pasture Kv= 7.0 fps
1.7	183	0.0650	1.78		<b>Shallow Concentrated Flow, 242-425</b> Short Grass Pasture Kv= 7.0 fps
0.7	81	0.0740	1.90		<b>Shallow Concentrated Flow, 425-506</b> Short Grass Pasture Kv= 7.0 fps
11.4	506	Total			

### Subcatchment 1: Drainage Area 1



**Summary for Pond 1P: Stormwater Basin**

Inflow Area = 2.256 ac, 0.00% Impervious, Inflow Depth = 1.13" for 2 YEAR event  
 Inflow = 2.37 cfs @ 12.17 hrs, Volume= 0.212 af  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs  
 Peak Elev= 747.92' @ 24.69 hrs Surf.Area= 6,043 sf Storage= 9,237 cf

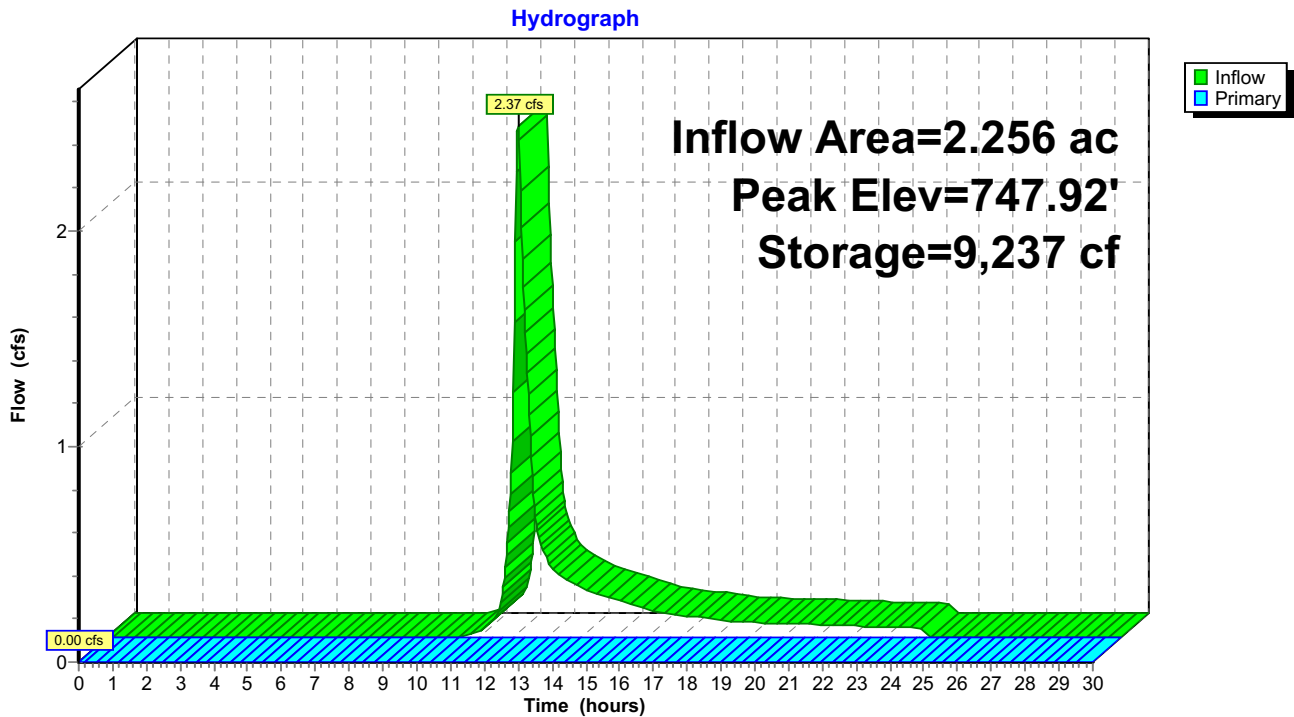
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	746.00'	16,524 cf	180.00'W x 20.00'L x 3.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	748.00'	6.0' long + 1.0 ' SideZ x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=746.00' (Free Discharge)  
 ←1=Broad-Crested Rectangular Weir( Controls 0.00 cfs)

**Pond 1P: Stormwater Basin**



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1: Drainage Area 1**

Runoff Area=2.256 ac 0.00% Impervious Runoff Depth=3.46"  
Flow Length=506' Tc=11.4 min CN=75 Runoff=7.64 cfs 0.651 af

**Pond 1P: Stormwater Basin**

Peak Elev=748.36' Storage=12,015 cf Inflow=7.64 cfs 0.651 af  
Outflow=3.40 cfs 0.428 af

**Total Runoff Area = 2.256 ac Runoff Volume = 0.651 af Average Runoff Depth = 3.46"**  
**100.00% Pervious = 2.256 ac 0.00% Impervious = 0.000 ac**

**Summary for Subcatchment 1: Drainage Area 1**

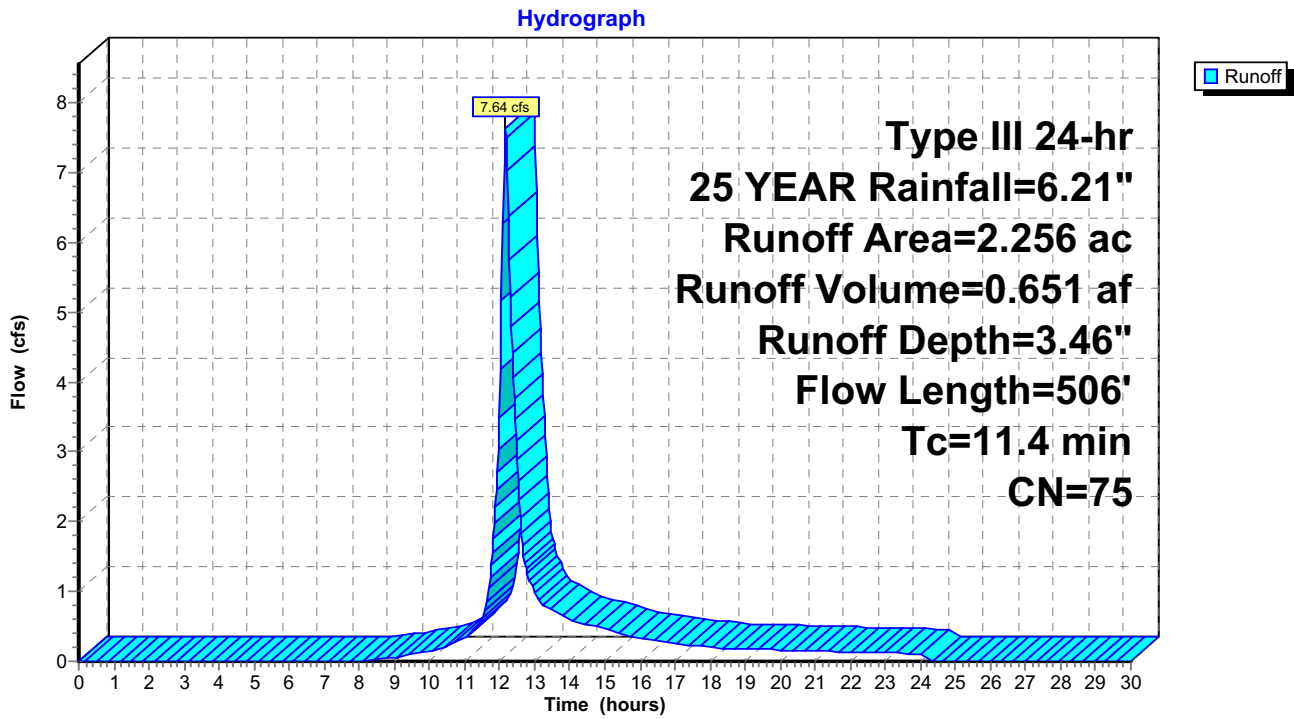
Runoff = 7.64 cfs @ 12.16 hrs, Volume= 0.651 af, Depth= 3.46"  
 Routed to Pond 1P : Stormwater Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs  
 Type III 24-hr 25 YEAR Rainfall=6.21"

Area (ac)	CN	Description
0.416	61	>75% Grass cover, Good, HSG B
0.787	74	>75% Grass cover, Good, HSG C
0.045	96	Gravel surface, HSG B
0.426	96	Gravel surface, HSG C
0.096	60	Woods, Fair, HSG B
0.486	73	Woods, Fair, HSG C
2.256	75	Weighted Average
2.256		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.1000	0.11		<b>Sheet Flow, 0-50</b> Woods: Light underbrush n= 0.400 P2= 2.46"
0.2	26	0.1500	1.94		<b>Shallow Concentrated Flow, 50-76</b> Woodland Kv= 5.0 fps
0.7	76	0.1510	1.94		<b>Shallow Concentrated Flow, 76-152</b> Woodland Kv= 5.0 fps
0.2	25	0.1000	2.21		<b>Shallow Concentrated Flow, 152-177</b> Short Grass Pasture Kv= 7.0 fps
0.5	65	0.0900	2.10		<b>Shallow Concentrated Flow, 177-242</b> Short Grass Pasture Kv= 7.0 fps
1.7	183	0.0650	1.78		<b>Shallow Concentrated Flow, 242-425</b> Short Grass Pasture Kv= 7.0 fps
0.7	81	0.0740	1.90		<b>Shallow Concentrated Flow, 425-506</b> Short Grass Pasture Kv= 7.0 fps
11.4	506	Total			

### Subcatchment 1: Drainage Area 1





**Summary for Pond 1P: Stormwater Basin**

Inflow Area = 2.256 ac, 0.00% Impervious, Inflow Depth = 3.46" for 25 YEAR event  
 Inflow = 7.64 cfs @ 12.16 hrs, Volume= 0.651 af  
 Outflow = 3.40 cfs @ 12.46 hrs, Volume= 0.428 af, Atten= 55%, Lag= 17.9 min  
 Primary = 3.40 cfs @ 12.46 hrs, Volume= 0.428 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs  
 Peak Elev= 748.36' @ 12.46 hrs Surf.Area= 6,637 sf Storage= 12,015 cf

Plug-Flow detention time= 189.4 min calculated for 0.428 af (66% of inflow)  
 Center-of-Mass det. time= 87.5 min ( 917.4 - 829.9 )

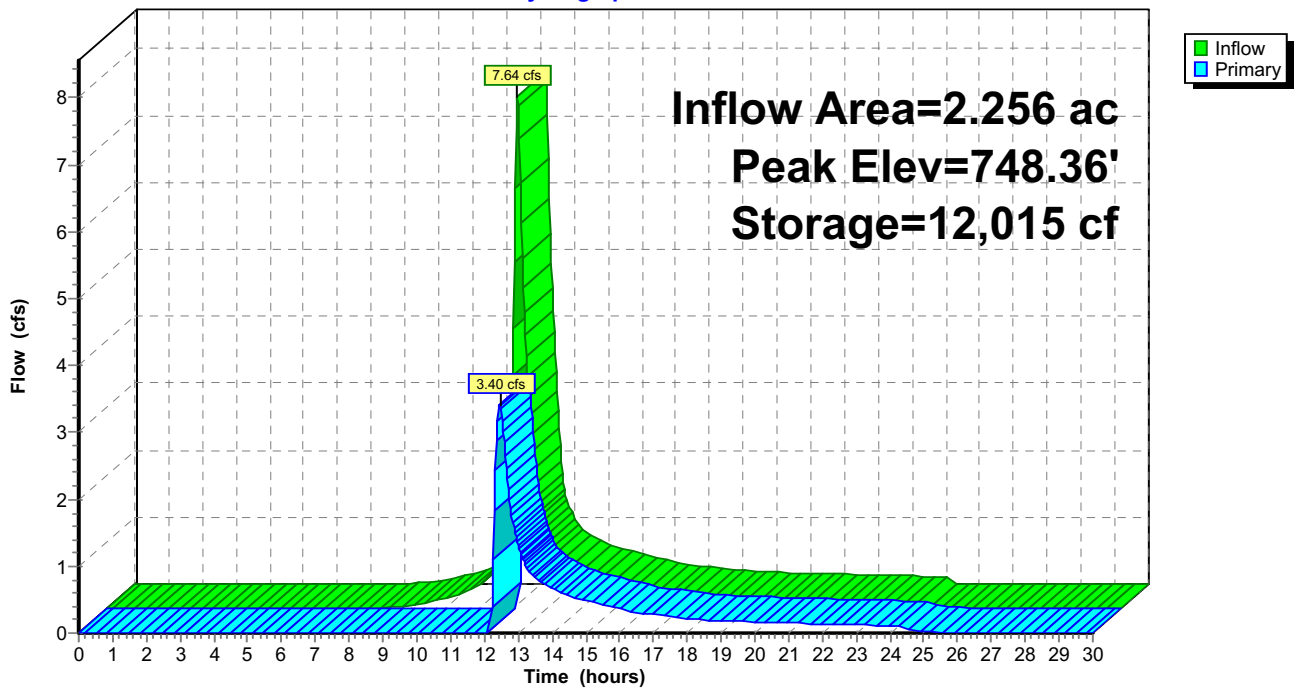
Volume	Invert	Avail.Storage	Storage Description
#1	746.00'	16,524 cf	180.00'W x 20.00'L x 3.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	748.00'	6.0' long + 1.0 ' SideZ x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=3.39 cfs @ 12.46 hrs HW=748.36' (Free Discharge)  
 ←1=Broad-Crested Rectangular Weir (Weir Controls 3.39 cfs @ 1.47 fps)

**Pond 1P: Stormwater Basin**

Hydrograph



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1: Drainage Area 1**

Runoff Area=2.256 ac 0.00% Impervious Runoff Depth=4.19"  
Flow Length=506' Tc=11.4 min CN=75 Runoff=9.25 cfs 0.788 af

**Pond 1P: Stormwater Basin**

Peak Elev=748.48' Storage=12,820 cf Inflow=9.25 cfs 0.788 af  
Outflow=5.53 cfs 0.566 af

**Total Runoff Area = 2.256 ac Runoff Volume = 0.788 af Average Runoff Depth = 4.19"**  
**100.00% Pervious = 2.256 ac 0.00% Impervious = 0.000 ac**

**Summary for Subcatchment 1: Drainage Area 1**

Runoff = 9.25 cfs @ 12.16 hrs, Volume= 0.788 af, Depth= 4.19"  
 Routed to Pond 1P : Stormwater Basin

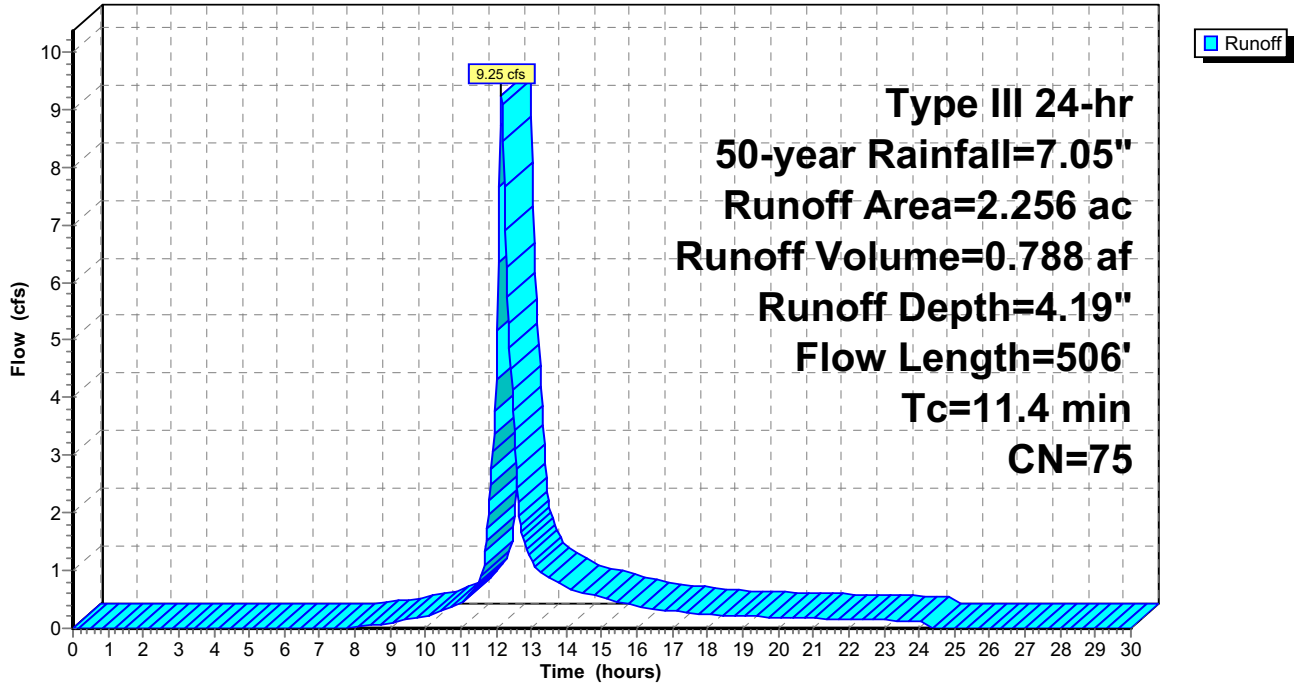
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs  
 Type III 24-hr 50-year Rainfall=7.05"

Area (ac)	CN	Description
0.416	61	>75% Grass cover, Good, HSG B
0.787	74	>75% Grass cover, Good, HSG C
0.045	96	Gravel surface, HSG B
0.426	96	Gravel surface, HSG C
0.096	60	Woods, Fair, HSG B
0.486	73	Woods, Fair, HSG C
2.256	75	Weighted Average
2.256		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.1000	0.11		<b>Sheet Flow, 0-50</b> Woods: Light underbrush n= 0.400 P2= 2.46"
0.2	26	0.1500	1.94		<b>Shallow Concentrated Flow, 50-76</b> Woodland Kv= 5.0 fps
0.7	76	0.1510	1.94		<b>Shallow Concentrated Flow, 76-152</b> Woodland Kv= 5.0 fps
0.2	25	0.1000	2.21		<b>Shallow Concentrated Flow, 152-177</b> Short Grass Pasture Kv= 7.0 fps
0.5	65	0.0900	2.10		<b>Shallow Concentrated Flow, 177-242</b> Short Grass Pasture Kv= 7.0 fps
1.7	183	0.0650	1.78		<b>Shallow Concentrated Flow, 242-425</b> Short Grass Pasture Kv= 7.0 fps
0.7	81	0.0740	1.90		<b>Shallow Concentrated Flow, 425-506</b> Short Grass Pasture Kv= 7.0 fps
11.4	506	Total			

### Subcatchment 1: Drainage Area 1

Hydrograph



**Summary for Pond 1P: Stormwater Basin**

Inflow Area = 2.256 ac, 0.00% Impervious, Inflow Depth = 4.19" for 50-year event  
 Inflow = 9.25 cfs @ 12.16 hrs, Volume= 0.788 af  
 Outflow = 5.53 cfs @ 12.34 hrs, Volume= 0.566 af, Atten= 40%, Lag= 11.2 min  
 Primary = 5.53 cfs @ 12.34 hrs, Volume= 0.566 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs  
 Peak Elev= 748.48' @ 12.34 hrs Surf.Area= 6,801 sf Storage= 12,820 cf

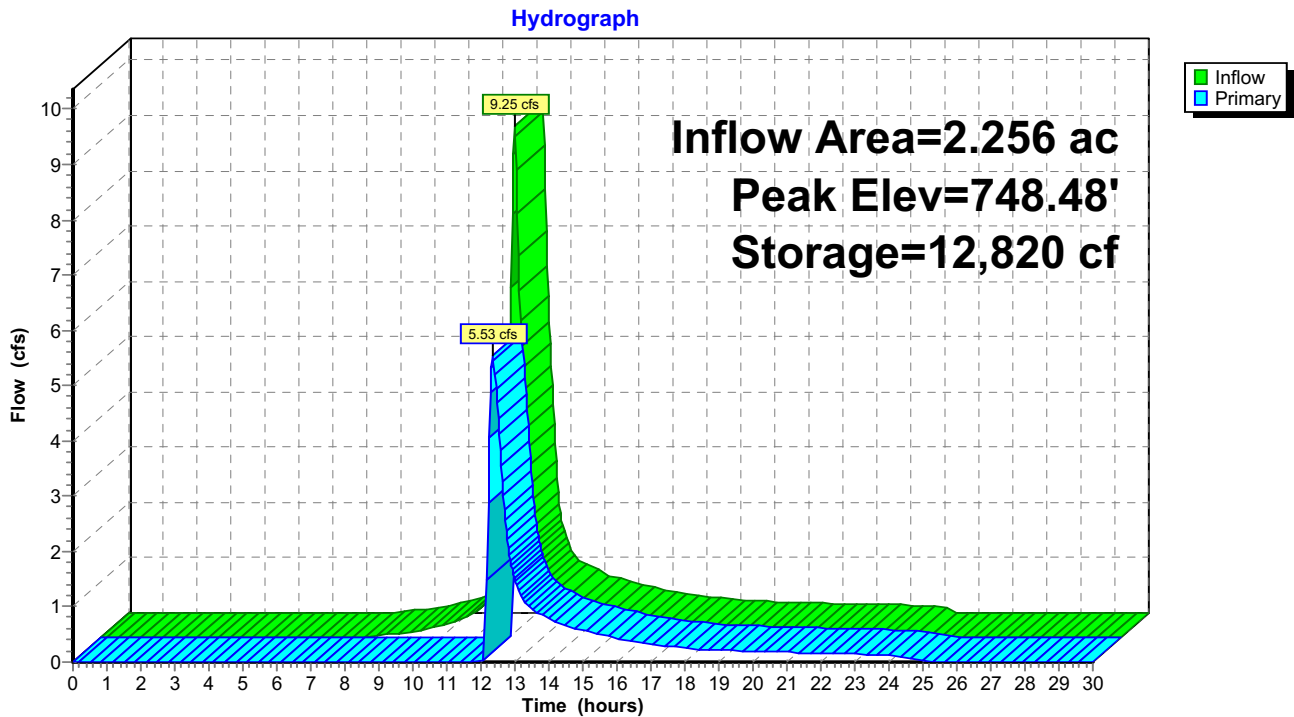
Plug-Flow detention time= 163.6 min calculated for 0.565 af (72% of inflow)  
 Center-of-Mass det. time= 71.6 min ( 896.0 - 824.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	746.00'	16,524 cf	180.00'W x 20.00'L x 3.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	748.00'	6.0' long + 1.0 ' SideZ x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=5.51 cfs @ 12.34 hrs HW=748.48' (Free Discharge)  
 ←1=Broad-Crested Rectangular Weir (Weir Controls 5.51 cfs @ 1.76 fps)

**Pond 1P: Stormwater Basin**



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1: Drainage Area 1**

Runoff Area=2.256 ac 0.00% Impervious Runoff Depth=5.01"  
Flow Length=506' Tc=11.4 min CN=75 Runoff=11.04 cfs 0.943 af

**Pond 1P: Stormwater Basin**

Peak Elev=748.60' Storage=13,638 cf Inflow=11.04 cfs 0.943 af  
Outflow=8.15 cfs 0.720 af

**Total Runoff Area = 2.256 ac Runoff Volume = 0.943 af Average Runoff Depth = 5.01"**  
**100.00% Pervious = 2.256 ac 0.00% Impervious = 0.000 ac**

**Summary for Subcatchment 1: Drainage Area 1**

Runoff = 11.04 cfs @ 12.16 hrs, Volume= 0.943 af, Depth= 5.01"  
 Routed to Pond 1P : Stormwater Basin

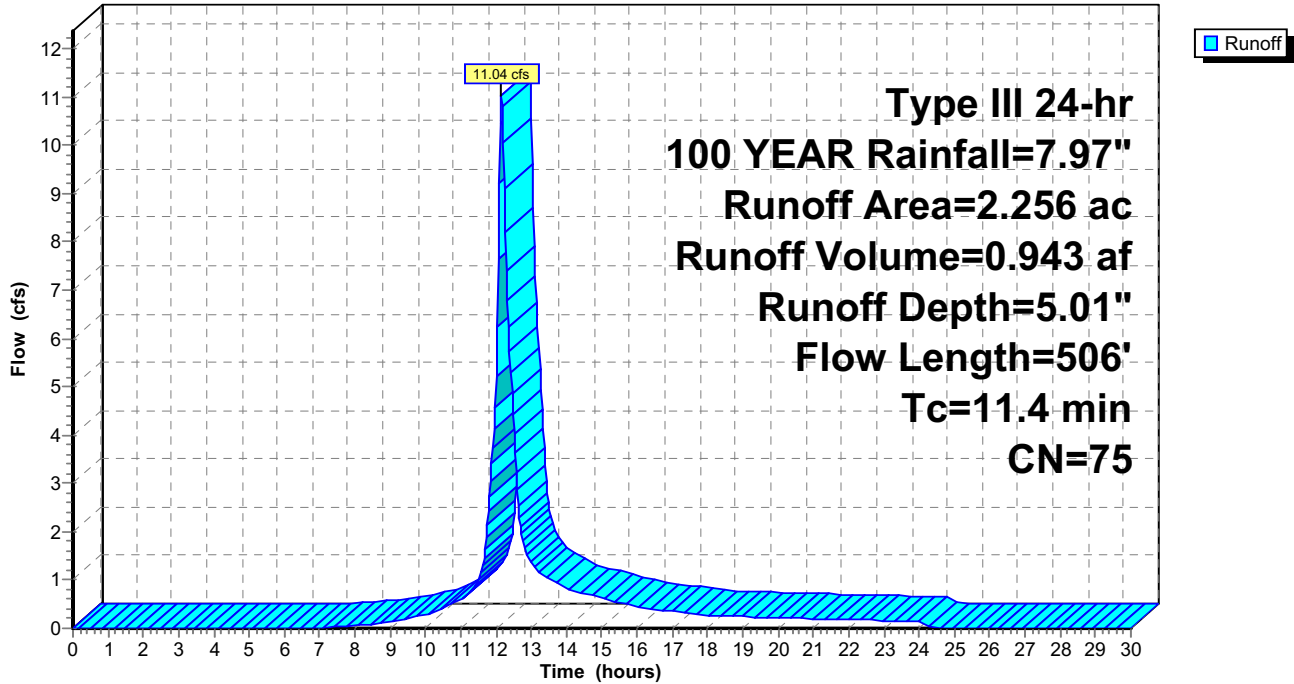
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs  
 Type III 24-hr 100 YEAR Rainfall=7.97"

Area (ac)	CN	Description
0.416	61	>75% Grass cover, Good, HSG B
0.787	74	>75% Grass cover, Good, HSG C
0.045	96	Gravel surface, HSG B
0.426	96	Gravel surface, HSG C
0.096	60	Woods, Fair, HSG B
0.486	73	Woods, Fair, HSG C
2.256	75	Weighted Average
2.256		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.1000	0.11		<b>Sheet Flow, 0-50</b> Woods: Light underbrush n= 0.400 P2= 2.46"
0.2	26	0.1500	1.94		<b>Shallow Concentrated Flow, 50-76</b> Woodland Kv= 5.0 fps
0.7	76	0.1510	1.94		<b>Shallow Concentrated Flow, 76-152</b> Woodland Kv= 5.0 fps
0.2	25	0.1000	2.21		<b>Shallow Concentrated Flow, 152-177</b> Short Grass Pasture Kv= 7.0 fps
0.5	65	0.0900	2.10		<b>Shallow Concentrated Flow, 177-242</b> Short Grass Pasture Kv= 7.0 fps
1.7	183	0.0650	1.78		<b>Shallow Concentrated Flow, 242-425</b> Short Grass Pasture Kv= 7.0 fps
0.7	81	0.0740	1.90		<b>Shallow Concentrated Flow, 425-506</b> Short Grass Pasture Kv= 7.0 fps
11.4	506	Total			

### Subcatchment 1: Drainage Area 1

Hydrograph





**Summary for Pond 1P: Stormwater Basin**

Inflow Area = 2.256 ac, 0.00% Impervious, Inflow Depth = 5.01" for 100 YEAR event  
 Inflow = 11.04 cfs @ 12.16 hrs, Volume= 0.943 af  
 Outflow = 8.15 cfs @ 12.28 hrs, Volume= 0.720 af, Atten= 26%, Lag= 7.1 min  
 Primary = 8.15 cfs @ 12.28 hrs, Volume= 0.720 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs  
 Peak Elev= 748.60' @ 12.28 hrs Surf.Area= 6,965 sf Storage= 13,638 cf

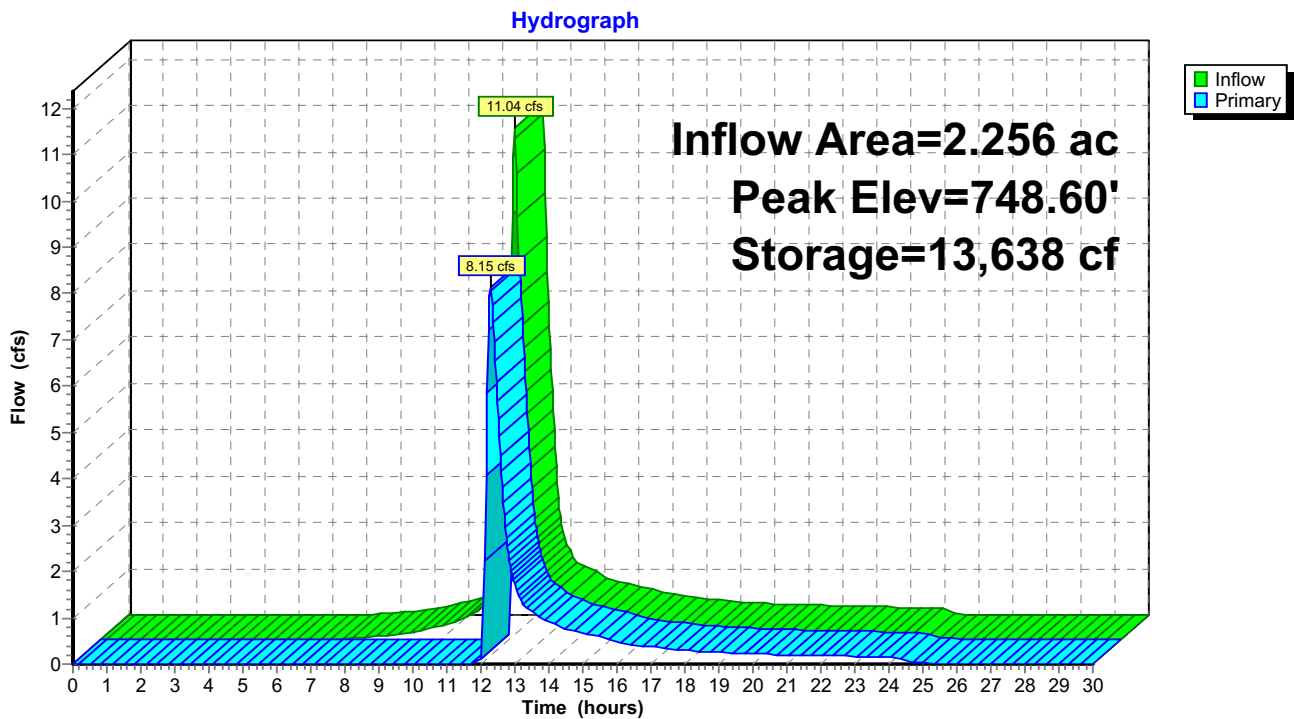
Plug-Flow detention time= 145.4 min calculated for 0.720 af (76% of inflow)  
 Center-of-Mass det. time= 61.4 min ( 880.7 - 819.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	746.00'	16,524 cf	180.00'W x 20.00'L x 3.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	748.00'	6.0' long + 1.0 ' SideZ x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=8.14 cfs @ 12.28 hrs HW=748.60' (Free Discharge)  
 ←1=Broad-Crested Rectangular Weir (Weir Controls 8.14 cfs @ 2.05 fps)

**Pond 1P: Stormwater Basin**



## NOAA Rainfall Data



NOAA Atlas 14, Volume 10, Version 3  
Location name: Town of Willington, Connecticut,  
USA\*

Latitude: 41.9401°, Longitude: -72.2975°

Elevation: m/ft\*\*

\* source: ESRI Maps

\*\* source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps\\_&\\_aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.336 (0.257-0.441)	0.403 (0.307-0.529)	0.512 (0.389-0.674)	0.602 (0.455-0.797)	0.726 (0.534-1.00)	0.820 (0.592-1.16)	0.918 (0.645-1.34)	1.02 (0.687-1.53)	1.18 (0.761-1.82)	1.30 (0.822-2.05)
10-min	0.476 (0.364-0.625)	0.571 (0.435-0.749)	0.725 (0.551-0.956)	0.853 (0.645-1.13)	1.03 (0.756-1.42)	1.16 (0.838-1.64)	1.30 (0.913-1.90)	1.45 (0.973-2.17)	1.67 (1.08-2.58)	1.84 (1.17-2.90)
15-min	0.561 (0.428-0.735)	0.672 (0.512-0.881)	0.853 (0.648-1.12)	1.00 (0.759-1.33)	1.21 (0.889-1.67)	1.37 (0.985-1.93)	1.53 (1.07-2.23)	1.71 (1.15-2.55)	1.96 (1.27-3.03)	2.17 (1.37-3.41)
30-min	0.758 (0.579-0.994)	0.909 (0.693-1.19)	1.16 (0.878-1.52)	1.36 (1.03-1.80)	1.64 (1.21-2.26)	1.85 (1.34-2.61)	2.07 (1.46-3.02)	2.32 (1.55-3.46)	2.66 (1.72-4.11)	2.94 (1.86-4.63)
60-min	0.956 (0.729-1.25)	1.15 (0.873-1.50)	1.46 (1.11-1.92)	1.71 (1.30-2.27)	2.07 (1.52-2.86)	2.34 (1.69-3.29)	2.62 (1.84-3.81)	2.92 (1.96-4.37)	3.36 (2.17-5.19)	3.71 (2.35-5.84)
2-hr	1.22 (0.933-1.59)	1.46 (1.12-1.90)	1.85 (1.41-2.42)	2.17 (1.65-2.86)	2.62 (1.93-3.60)	2.95 (2.14-4.15)	3.30 (2.35-4.83)	3.72 (2.50-5.52)	4.33 (2.81-6.66)	4.85 (3.08-7.60)
3-hr	1.40 (1.08-1.82)	1.68 (1.29-2.18)	2.13 (1.63-2.78)	2.50 (1.91-3.28)	3.02 (2.24-4.15)	3.40 (2.48-4.78)	3.82 (2.72-5.58)	4.31 (2.90-6.39)	5.06 (3.29-7.76)	5.71 (3.63-8.90)
6-hr	1.77 (1.37-2.29)	2.14 (1.65-2.76)	2.73 (2.10-3.54)	3.23 (2.47-4.21)	3.91 (2.91-5.35)	4.41 (3.23-6.17)	4.95 (3.56-7.24)	5.63 (3.80-8.29)	6.68 (4.35-10.2)	7.59 (4.84-11.8)
12-hr	2.22 (1.72-2.84)	2.70 (2.09-3.47)	3.49 (2.69-4.50)	4.14 (3.18-5.37)	5.05 (3.78-6.88)	5.71 (4.21-7.97)	6.44 (4.66-9.38)	7.35 (4.97-10.8)	8.76 (5.72-13.3)	10.00 (6.40-15.4)
24-hr	2.64 (2.05-3.36)	3.25 (2.52-4.15)	4.24 (3.29-5.44)	5.07 (3.91-6.53)	6.21 (4.67-8.42)	7.05 (5.22-9.79)	7.97 (5.79-11.6)	9.12 (6.19-13.3)	10.9 (7.17-16.5)	12.5 (8.05-19.2)
2-day	2.99 (2.34-3.80)	3.71 (2.90-4.72)	4.89 (3.81-6.23)	5.87 (4.55-7.52)	7.22 (5.46-9.74)	8.21 (6.11-11.3)	9.30 (6.80-13.4)	10.7 (7.28-15.5)	12.9 (8.48-19.3)	14.9 (9.56-22.6)
3-day	3.25 (2.55-4.11)	4.04 (3.16-5.11)	5.33 (4.16-6.76)	6.39 (4.96-8.16)	7.86 (5.96-10.6)	8.93 (6.67-12.3)	10.1 (7.42-14.6)	11.6 (7.94-16.8)	14.1 (9.26-21.0)	16.2 (10.5-24.6)
4-day	3.49 (2.74-4.40)	4.33 (3.39-5.46)	5.69 (4.45-7.21)	6.83 (5.31-8.69)	8.39 (6.37-11.3)	9.53 (7.13-13.1)	10.8 (7.93-15.5)	12.4 (8.48-17.9)	15.0 (9.89-22.3)	17.3 (11.2-26.2)
7-day	4.14 (3.26-5.19)	5.08 (4.00-6.38)	6.63 (5.20-8.35)	7.91 (6.17-10.0)	9.67 (7.37-12.9)	11.0 (8.22-15.0)	12.4 (9.12-17.7)	14.2 (9.73-20.3)	17.1 (11.3-25.3)	19.6 (12.7-29.6)
10-day	4.79 (3.78-5.99)	5.80 (4.57-7.26)	7.44 (5.85-9.35)	8.81 (6.89-11.1)	10.7 (8.15-14.2)	12.1 (9.05-16.4)	13.6 (9.98-19.3)	15.5 (10.6-22.1)	18.4 (12.2-27.2)	21.0 (13.6-31.6)
20-day	6.87 (5.44-8.53)	7.94 (6.29-9.88)	9.70 (7.66-12.1)	11.2 (8.77-14.0)	13.2 (10.0-17.2)	14.7 (11.0-19.6)	16.3 (11.9-22.6)	18.1 (12.5-25.6)	20.8 (13.8-30.4)	23.0 (15.0-34.3)
30-day	8.62 (6.86-10.7)	9.72 (7.72-12.1)	11.5 (9.12-14.3)	13.0 (10.2-16.3)	15.1 (11.5-19.6)	16.6 (12.4-22.0)	18.2 (13.2-24.9)	19.9 (13.8-28.1)	22.3 (14.9-32.5)	24.2 (15.7-35.9)
45-day	10.8 (8.62-13.3)	11.9 (9.51-14.7)	13.8 (10.9-17.1)	15.3 (12.1-19.1)	17.4 (13.3-22.4)	19.0 (14.2-25.0)	20.6 (14.9-27.8)	22.2 (15.4-31.1)	24.2 (16.2-35.0)	25.6 (16.7-38.0)
60-day	12.6 (10.1-15.6)	13.8 (11.0-17.0)	15.7 (12.5-19.4)	17.2 (13.6-21.4)	19.4 (14.8-24.8)	21.1 (15.7-27.5)	22.7 (16.3-30.3)	24.1 (16.8-33.7)	25.9 (17.4-37.4)	27.0 (17.7-40.0)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

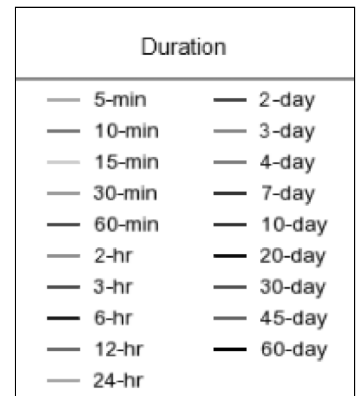
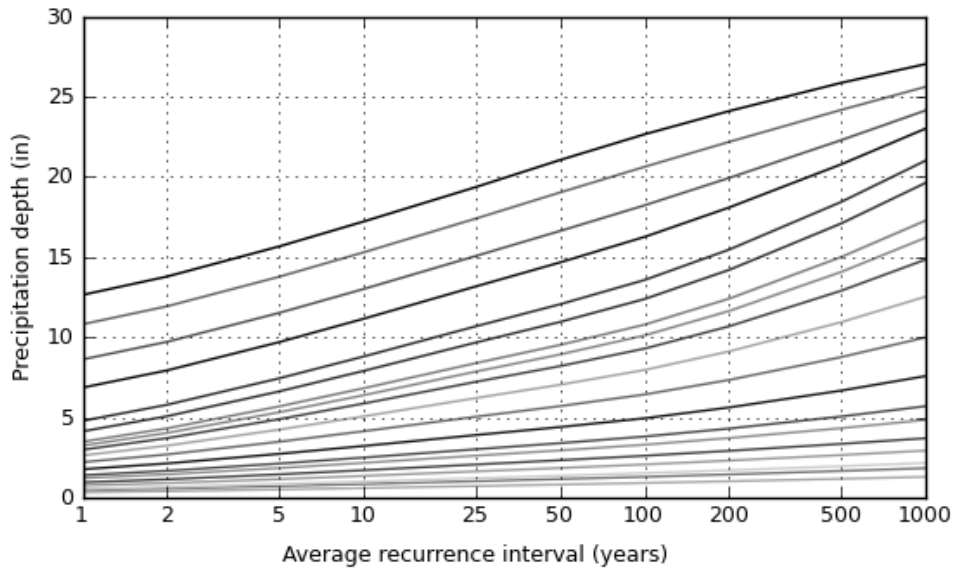
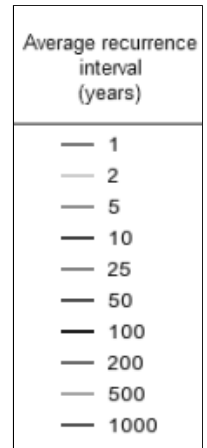
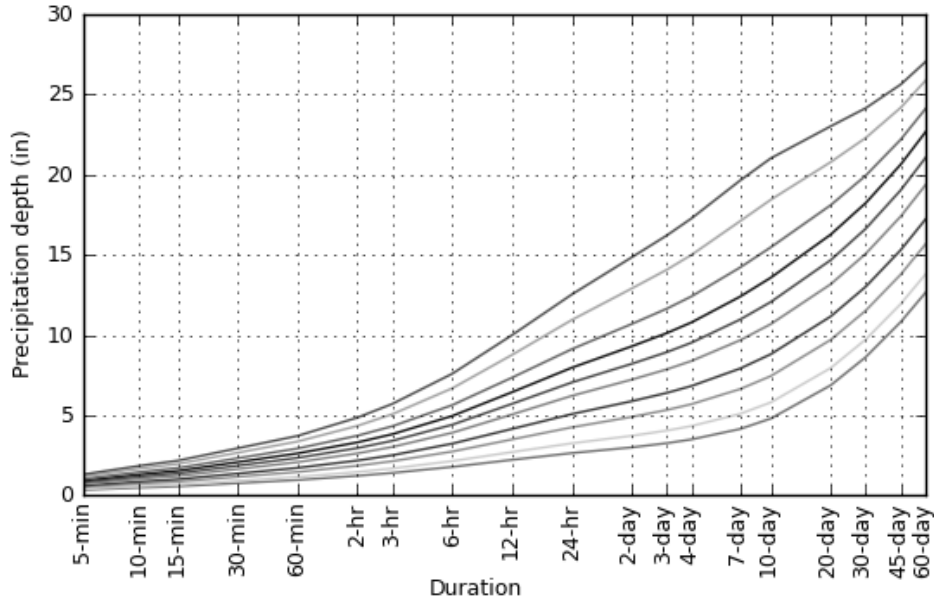
Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

PF graphical

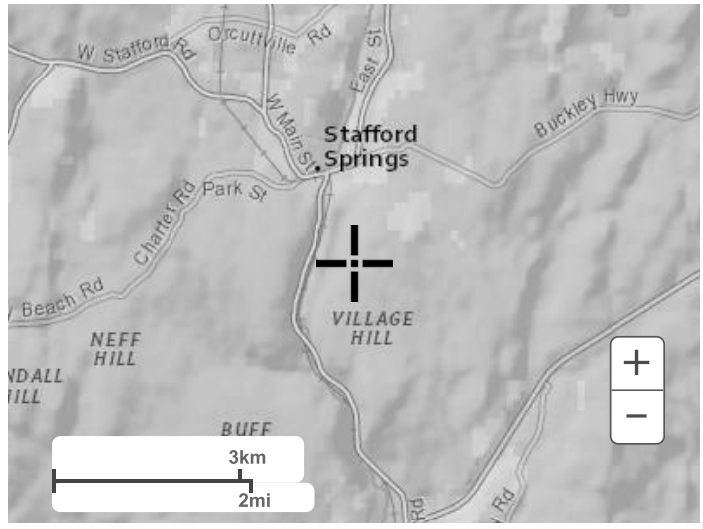
PDS-based depth-duration-frequency (DDF) curves

Latitude: 41.9401°, Longitude: -72.2975°

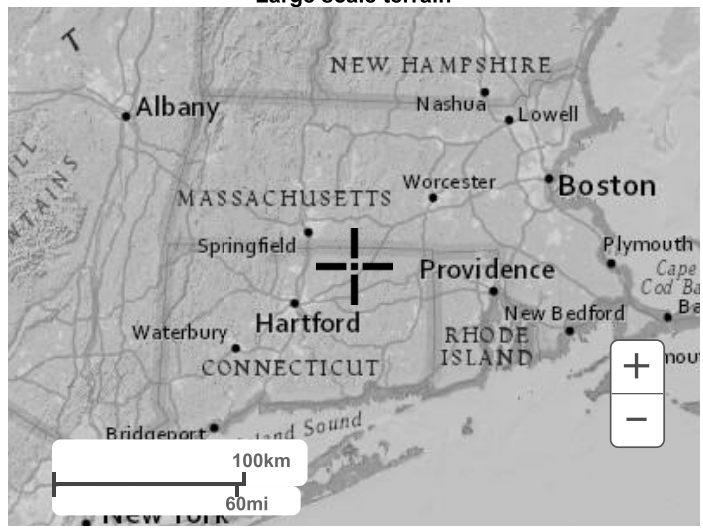


**Maps & aerials**

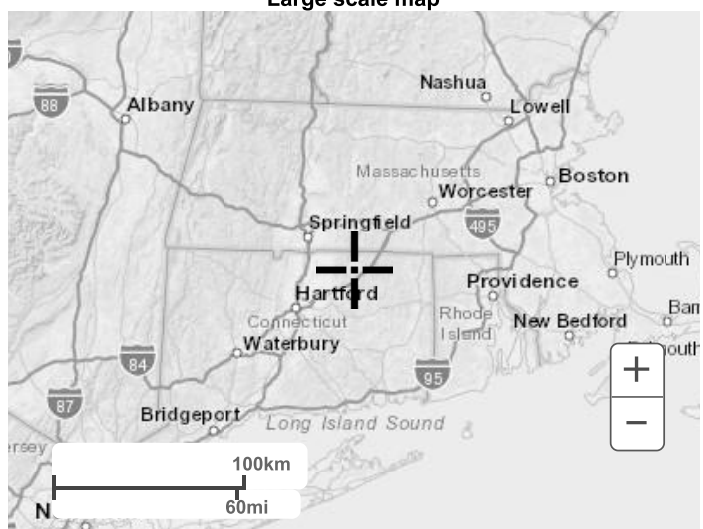
**Small scale terrain**



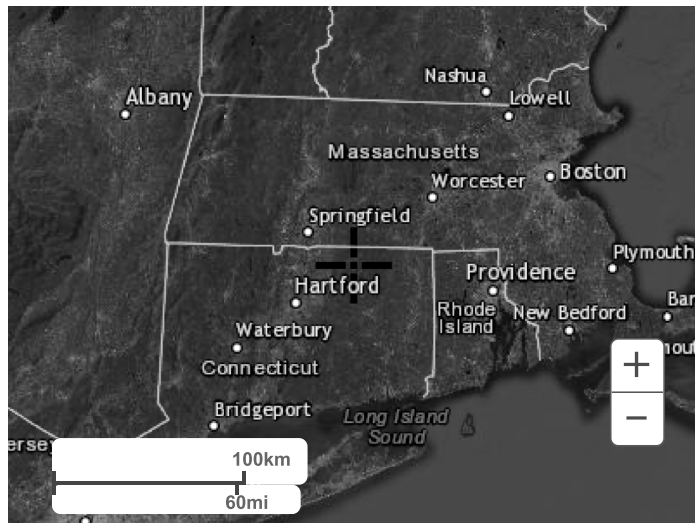
Large scale terrain



Large scale map



Large scale aerial



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[US Department of Commerce](#)  
[National Oceanic and Atmospheric Administration](#)  
[National Weather Service](#)  
[National Water Center](#)  
1325 East West Highway  
Silver Spring, MD 20910  
Questions?: [HDSC.Questions@noaa.gov](mailto:HDSC.Questions@noaa.gov)

[Disclaimer](#)

## Water Quality Volume Calculations

## Water Quality Volume Calculations

Project: Flycatcher BESS Willington      By: AMK      Date: 5/12/23  
 Location: Village Hill Road      Checked: \_\_\_\_\_      Date: \_\_\_\_\_

Basin Name	Drainage Area 1	
Rainfall, P	1.0 in.	a
Area, A	2.25 ac	b
Impervious Cover Area	0.47 ac	c
% Impervious, I	21 %	
Volumetric Runoff Coeff., R	0.238	d
Water Quality Volume, WQV	0.045 ac-ft	e
	1,947 cf	

- a First one inch of rainfall; 2004 Connecticut Stormwater Quality Manual
- b Area tributary to the stormwater management basin
- c Impervious cover area tributary to the stormwater management basin
- d  $R=0.05+0.009*I$ ; Section 7.4.1 from 2004 Connecticut Stormwater Quality Manual
- e  $WQV=P*R*A/12$ ; Section 7.4.1 from 2004 Connecticut Stormwater Quality Manual





## Sediment Trap Sizing Calculations

## Sediment Trap Sizing

Project: Flycatcher BESS Willington By: AMK Date: 5/12/23  
Location: Village Hill Road Checked: \_\_\_\_\_ Date: \_\_\_\_\_

*(134 cy / acre)\**

TST #	Tributary Acreage, ac	Volume Required Below Top of Spillway, cf	Volume Provided in Permanent Basin Below Top of Spillway, cf
1	2.25	8,141	16,524

\* Per 2002 Connecticut Guidelines for Soil Erosion and Sediment Control



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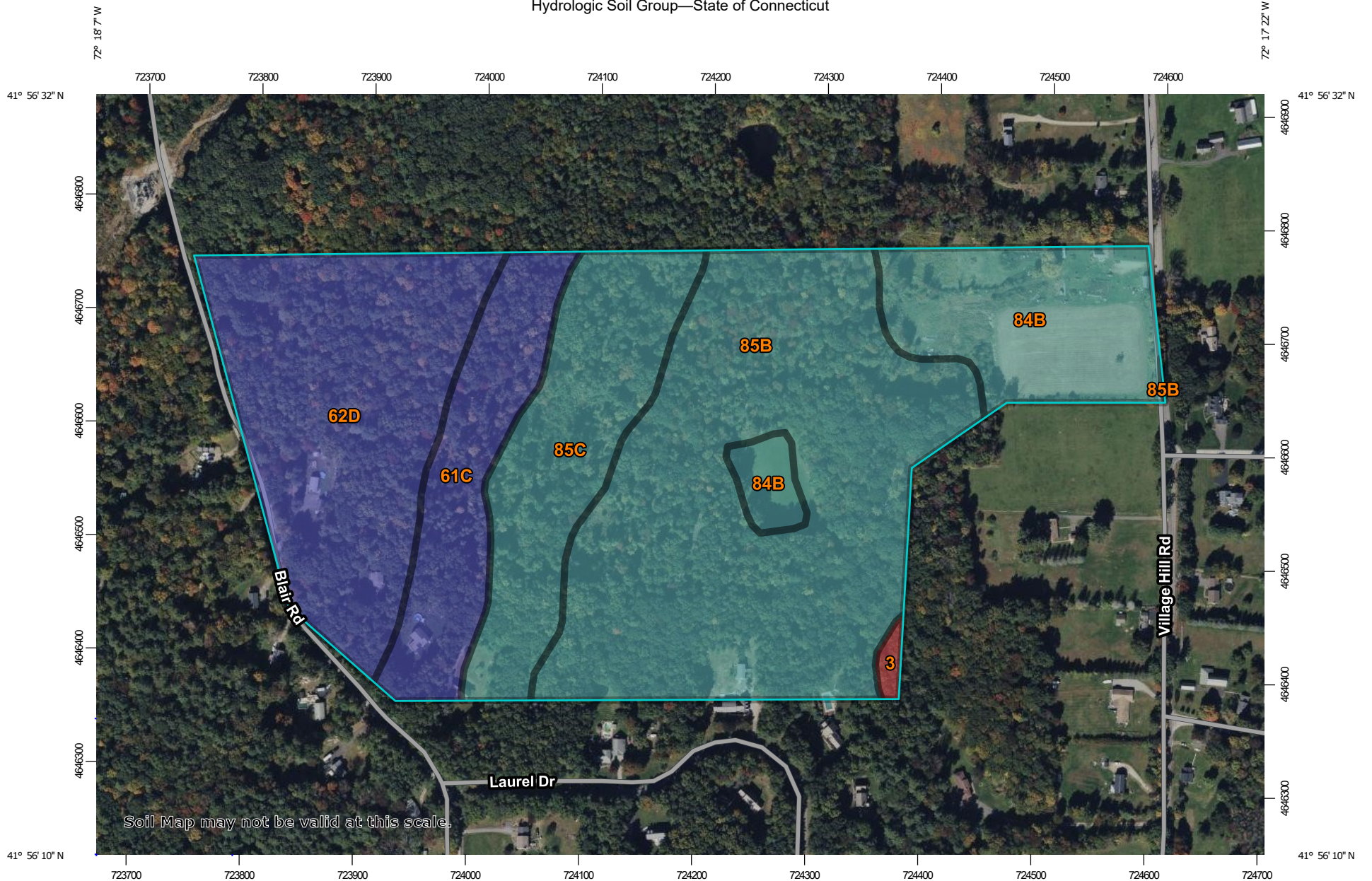
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## Appendix B: Additional Mapping

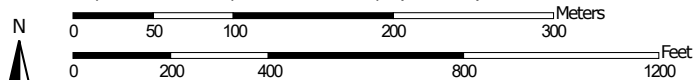
- › NRCS Web Soil Survey Mapping
- › FEMA Flood Insurance Rate Map
- › CTDEEP Groundwater Classification Map

# NCRS Web Soil Survey Mapping

Hydrologic Soil Group—State of Connecticut



Map Scale: 1:4,720 if printed on A landscape (11" x 8.5") sheet.




Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84



## MAP LEGEND

### Area of Interest (AOI)









 Area of Interest (AOI)

### Soils

#### Soil Rating Polygons





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

#### Soil Rating Lines


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

#### Soil Rating Points






 A  
 A/D  
 B  
 B/D

 C  
 C/D  
 D  
 Not rated or not available


### Water Features

 Streams and Canals

### Transportation

 Rails  
 Interstate Highways  
 US Routes  
 Major Roads  
 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

**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:  
 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: State of Connecticut  
 Survey Area Data: Version 22, Sep 12, 2022

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

Date(s) aerial images were photographed: Jun 14, 2022—Oct 6, 2022

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

## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	D	0.3	0.5%
61C	Canton and Charlton fine sandy loams, 8 to 15 percent slopes, very stony	B	6.6	10.4%
62D	Canton and Charlton fine sandy loams, 15 to 35 percent slopes, extremely stony	B	14.8	23.1%
84B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes	C	8.5	13.3%
85B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes, very stony	C	24.8	38.8%
85C	Paxton and Montauk fine sandy loams, 8 to 15 percent slopes, very stony	C	9.0	14.0%
<b>Totals for Area of Interest</b>			<b>64.0</b>	<b>100.0%</b>



## Description

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

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

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

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

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

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

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

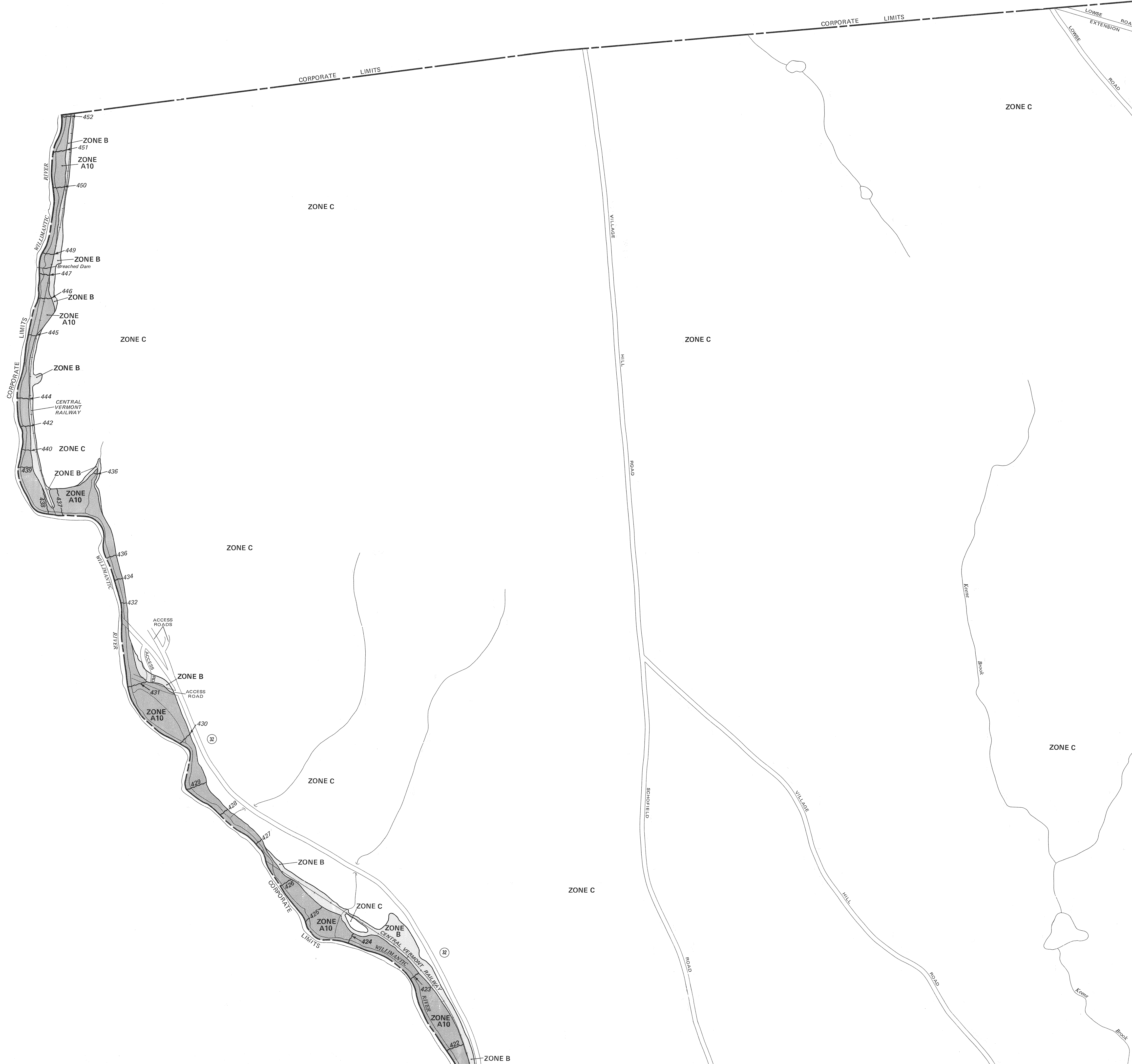
## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher

## FEMA Flood Insurance Rate Map



**KEY TO MAP**

500-Year Flood Boundary ————

100-Year Flood Boundary ————

Zone Designations\*

100-Year Flood Boundary ————

500-Year Flood Boundary ————

Base Flood Elevation Line With Elevation In Feet\*\*

Base Flood Elevation In Feet Where Uniform Within Zone\*\*

Elevation Reference Mark

Zone D Boundary ————

River Mile

\*\*Referenced to the National Geodetic Vertical Datum of 1929

**\*EXPLANATION OF ZONE DESIGNATIONS**

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

**NOTES TO USER**

Certain areas not in the special flood hazard areas (Zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:  
DECEMBER 20, 1974

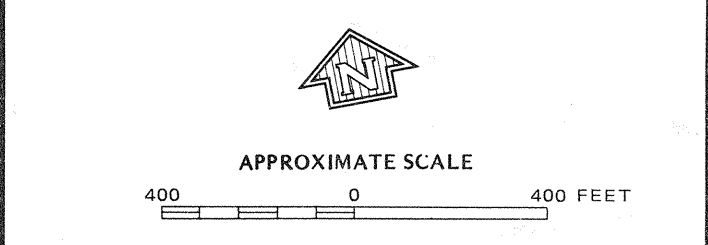
FLOOD HAZARD BOUNDARY MAP REVISIONS:

FLOOD INSURANCE RATE MAP EFFECTIVE:  
JUNE 15, 1982

FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.



**NATIONAL FLOOD INSURANCE PROGRAM**

**FIRM**  
FLOOD INSURANCE RATE MAP

**TOWN OF WILLINGTON,  
CONNECTICUT  
TOLLAND COUNTY**

**PANEL 2 OF 20**  
(SEE MAP INDEX FOR PANELS NOT PRINTED)

**COMMUNITY-PANEL NUMBER**  
090159 0002 A

**EFFECTIVE DATE:**  
JUNE 15, 1982

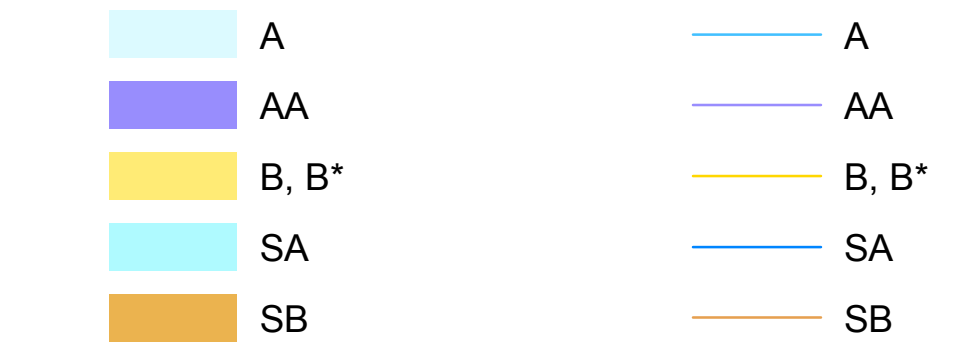
Federal Emergency Management Agency

## CTDEEP Groundwater Classification Map



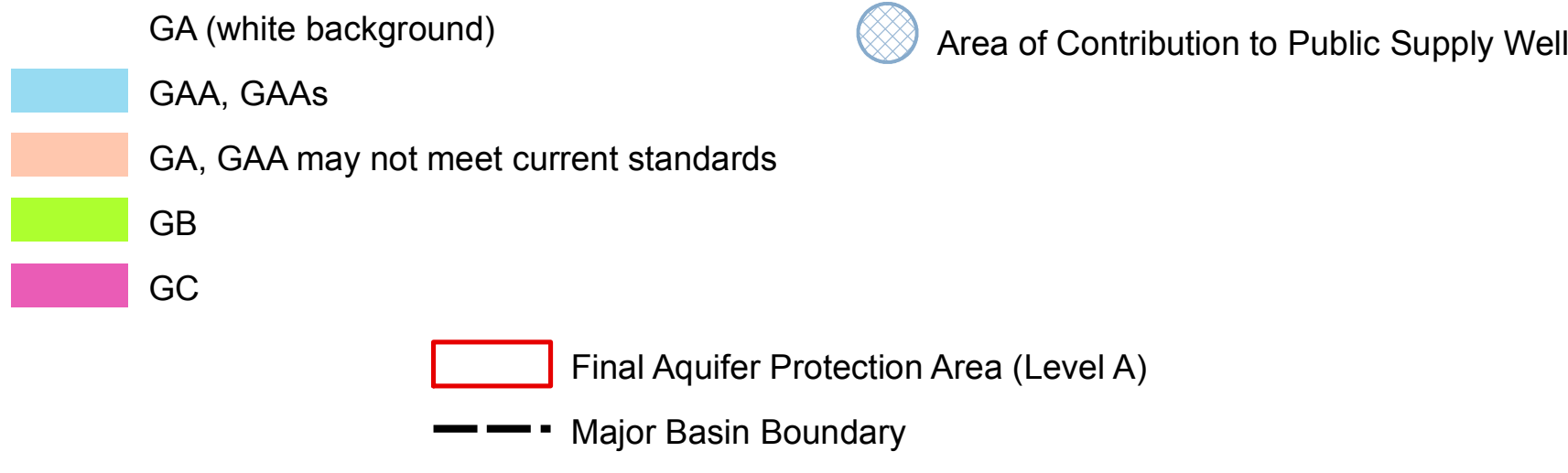
# WATER QUALITY CLASSIFICATIONS WILLINGTON, CT

## SURFACE WATER QUALITY CLASSES



**NOTES:**  
Surface Water Classifications beginning with S refer to Coastal and Marine Surface Water. B\* is a subset of Class B where no direct wastewater discharges are allowed other than those consistent with Class AA, A and SA surface waters.

## GROUND WATER QUALITY CLASSES



## EXPLANATION

WATER QUALITY CLASSIFICATIONS (WQC) MAPS are one of the elements of the Water Quality Standards (WQS) for the State of Connecticut. The WQS are a part of Connecticut's clean water program and are essential for protecting and improving water quality. The WQS follow the principles of Connecticut's Clean Water Act which is in Chapter 440k of the Connecticut General Statutes. The WQS provide policy guidance in many areas, for example decisions on acceptable discharges to water resources, siting of landfills, remediation or prioritization of municipal sewerage system projects. The first two elements of the WQS are the Standards, which set an overall policy for management of water quality, and the Criteria, which are descriptive and numerical standards that describe the allowable parameters and goals for various water quality classifications. A discussion of these two elements is found in the Water Quality Standards document available on the CT DEEP website. The third element is the Classifications and the Water Quality Classification Maps which show the Classification assigned to each surface and groundwater resource throughout the State. The WQS are adopted using a public participation process. The WQC maps are also adopted using a public participation process but go through hearings separately from the Standards and Criteria hearings. Revision and adoption of the WQC data occurs in accordance with the public participation procedures contained in Section 22a-226 of the Connecticut General Statutes. Ground WQC is subject to Connecticut regulation and changes must be reviewed and adopted. All changes to the Surface WQC require an adoption process which is subject to federal review and approval in addition to CT regulation. The adoption dates for the WQC by major drainage basin are: Housatonic River, Hudson River and Southwest Coastal Basins - March 1999; Connecticut River and South Central Coastal Basins - February 1993; Thames River, Pawcatuck River and Southeast Coastal Basins - December 1986. Surface Water Classifications do not change after the adoption date until the next major revision. Ground Water Classifications may change after the adoption date under specific circumstances. The map may have more than one WQC adoption date because a town may be in more than one major drainage basin.

SURFACE WATERS in Connecticut are divided into freshwater classified as AA, A, B or B\* and saline waters classified as SA or SB. Class AA designated uses are existing or proposed drinking water supplies; habitat for fish and other aquatic life and wildlife; recreation; and water supply for industry and agriculture. Class A designated uses are habitat for fish and other aquatic life and wildlife; potential drinking water supplies; recreation; navigation; and water supply for industry and agriculture. Class SA designated uses are habitat for marine fish, other aquatic life and wildlife; shellfish harvesting for direct human consumption; recreation; industrial water supply; and navigation. Class B designated uses are habitat for fish and aquatic life and wildlife; recreation; navigation and industrial water supply. Class B\* applicable to Candlewood Lake, is a subset of Class B and is identical in all ways to the designated uses, criteria and standards for Class B waters except for the restriction on direct discharges. Class SB designated uses are habitat for marine fish and aquatic life and wildlife; commercial shellfish harvesting; recreation; industrial water supply; and navigation.

## DATA SOURCES

WATER QUALITY CLASSIFICATIONS DATA - Water quality classifications shown on this map are based on information from the following digital spatial datasets that are typically shown together - Ground Water Quality Classifications Poly, Surface Water Quality Classifications Line, and Surface Water Quality Classifications Poly. The map legend above reflects the content of these three data sources. These WQC data were initially compiled on 1:24,000-scale 7.5 minute USGS topographic quadrangle maps and later digitized at 1:24,000 scale. For example, the Surface Water Quality Classifications Line and Surface Water Quality Classifications Poly digital data assigns surface water quality classifications to water bodies such as rivers, streams, reservoirs, lakes, ponds and covers found in 1:24,000-scale hydrography data available from CT DEEP. The hydrography may not include all the waterbodies in Connecticut. The Ground Water Quality Classifications Poly data assigns ground water quality classifications, at 1:24,000 scale, to the remaining land areas in Connecticut.

AQUIFER PROTECTION AREA DATA - Aquifer Protection Areas shown on this map are from the Aquifer Protection Area digital dataset which contains polygon data intended to be used at 1:24,000 scale. The dataset contains regulated areas classified as Level A Aquifer Protection Area (Final) and Level B Aquifer Protection Area (Preliminary). The Level B areas are not shown on the WQC maps. The data was collected from 1991 to the present and is actively updated as Final area mapping replaces earlier Preliminary areas. The Aquifer Protection Areas are delineated by

Surface waters which are not specifically classified shall be considered as Class A or Class AA. Surface waters in GA ground water areas are assumed Class A or Class SA unless otherwise indicated. Surface waters in GAA ground water areas are assumed Class AA unless otherwise indicated.

On the WQC map a surface water quality goal of A is represented by blue colored water bodies. Surface water quality goal of AA is represented by purple colored water bodies. Surface water quality goal of B is represented by gold colored water bodies.

GROUND WATERS in Connecticut are classified as GAA, GA, GB and GC. Class GAA designated uses are existing or potential public supply of water suitable for drinking without treatment and baseflow for hydraulically-connected surface water bodies. The Class GAAs is a subclass of GAA for ground water that is tributary to a public water supply reservoir. The area of contribution to a public water supply well is represented by a 500-foot radius around the well and is assumed to be Class GAA unless otherwise classified. Class GA designated uses are existing private and potential public or private supplies of water suitable for drinking without treatment and baseflow for hydraulically-connected surface water bodies. All ground waters not specifically classified are considered as Class GA. Class GB designated uses are industrial process water and cooling waters and baseflow for hydraulically-connected water bodies and is presumed not suitable for human consumption without treatment. Class GC designated uses are assimilation of discharges authorized by the Commissioner pursuant to Section 22a-430 of the General Statutes.

On the WQC map GA is represented by white colored land areas. Class GAA and class GAAs are represented by blue colored land areas. The area of contribution to a public water supply well is shown by a blue cross-hatch overprint. A notation of GAA followed by a state abbreviation indicates a watershed that contributes to the public water supply for a state other than Connecticut. Class GA or Class GAA areas that currently may not be meeting the GA or GAA standards are represented on the WQC maps by tan colored land areas. Class GB is represented by green colored land areas. Class GC is represented by magenta colored land areas.

FINAL AQUIFER PROTECTION AREAS (Level A) are included on the WQC maps for informational purposes. These areas are anticipated to be reclassified GAA during the next major basin updates, subject to public participation. The Aquifer Protection Program helps protect Connecticut's public drinking water resources by delineating aquifer protection areas (also called wellhead protection areas) for public supply wells and establishing land use regulations within these areas. These areas represent the land area contributing ground water to active public water supply wells or well fields that serve more than 1000 people and are set in sand and gravel aquifers (stratified drift deposits).

the individual water companies owning the well fields and submitted to the CT DEEP for approval. Preliminary mapping provides a general estimate of the area contributing ground water to the well field. Final mapping is based on extensive site-specific detailed modeling of the ground water flow system. CT DEEP may adjust Final area boundaries to be consistent with 1:24,000 scale topography and base map data where appropriate during the approval process.

MAJOR DRAINAGE BASIN DATA - Major drainage basins shown on this map are from Major Basin Line data developed by CT DEEP and intended to be used at 1:24,000 scale.

BASE MAP DATA - Based on data originally from 1:24,000-scale USGS 7.5 minute topographic quadrangle maps published between 1969 and 1992. It includes political boundaries, railroads, airports, hydrography, geographic names and geographic places. Streets and street names are from Tele Atlas' copyrighted data. Base map information is neither current nor complete.

RELATED INFORMATION  
This map is intended to be printed at its original dimensions in order to maintain the 1:24,000 scale (1 inch = 2000 feet).  
WATER QUALITY STANDARDS - Go to the CT DEEP website for a summary and the full text of the "Water Quality Standards" and for other information on water quality.  
AQUIFER PROTECTION AREAS - Go to the CT DEEP website for more information.

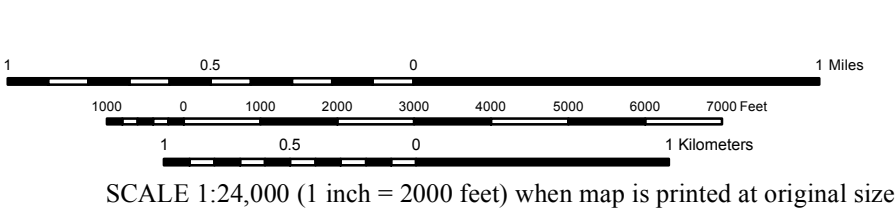
### ADOPTED DATES

- Water Quality Standards  
February 25, 2011
- Thames River, Pawcatuck River and Southeast Coastal Basins: December 1986
- Connecticut River and South Central Coastal Basins: February 1993
- Housatonic River, Hudson River and Southwest Coastal Basins: March 1999

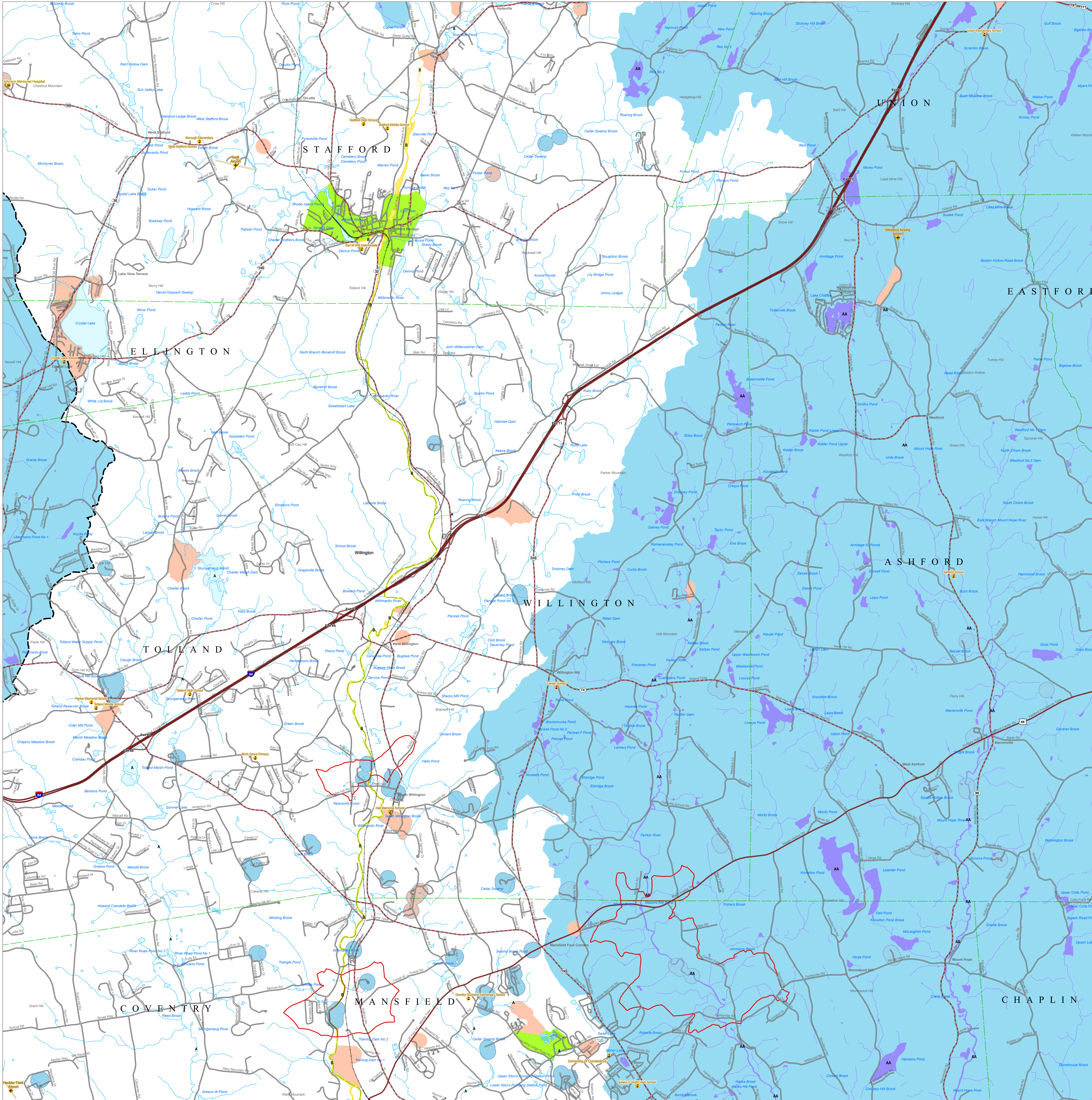
### MAJOR BASINS

- Pawcatuck
- Southeast Coast
- Thames
- Connecticut
- South Central Coast
- Housatonic
- Southeast Coast
- Hudson

Date Plane Coordinate System of 1983, Zone 2028  
Lambert Conformal Conic Projection  
North American Datum of 1983



Map created by CT DEEP  
October 2018  
Map is not colorfast  
Protect from light and moisture





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## Appendix C: Operation and Maintenance Plan

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## Project Information

Project Name: KCE CT5 BESS Willington  
Address or Locus: Village Hill Road  
City, State & Zip: Willington, CT

### **Developer**

Client Name: Key Capture Energy  
Client Address:  
Client City, State & Zip:  
Client Telephone No.:  
Client Cell Phone:  
Client E-Mail:

### **Site Supervisor**

Site Manager Name: TBD  
Site Manager Address:  
Site Manager City, State & Zip:  
Site Manager Telephone No.:  
Site Manager Cell Phone:  
Site Manager E-Mail:

## Long Term Stormwater Maintenance Measures

The following maintenance program is proposed to ensure the continued effectiveness of the structural water quality controls:

- › Inspect infiltration basins once annually, in the spring, for accumulated sediment. Necessary sediment removal, and/or repair will be performed immediately upon identification.
- › Paved areas will be swept, at a minimum, two (2) times per year.
- › Routinely pick up and remove litter from the parking areas, islands and perimeter landscape areas in addition to regular pavement sweeping.

### **Structural Stormwater Management Devices**

#### **Stormwater Outfalls**

- › Inspect outfall locations monthly for the first three months after construction to ensure proper functioning and correct any areas that have settled or experienced washouts.
- › Inspect outfalls annually after initial three-month period.
- › Annual inspections should be supplemented after large storms when washouts may occur.
- › Maintain vegetation around outfalls to prevent blockages at the outfall.
- › Maintain rip rap pad below each outfall and replace any washouts.
- › Remove and dispose of any trash or debris at the outfall.

#### **Infiltration Basins**

- › Inspect monthly for the first three months after construction.
- › After initial three-month period, basins are to be inspected once per year and cleaned a minimum of at least once per year or when sediment reaches 8" in depth.



## Best Management Practices – Maintenance/ Evaluation Checklists

# KCE CT5 BESS Willington – Village Hill Road – Willington, CT

## Best Management Practices – Maintenance/ Evaluation Checklist

### Construction Practices

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed <input type="checkbox"/> yes <input type="checkbox"/> no (List Items)	Date of Cleaning/Repair	Performed by
Silt Fencing	Once per week or after a 0.5" or greater storm event						
Compost Filter Sock	Once per week or after a 0.5" or greater storm event						
Straw Wattles	Once per week or after a 0.5" or greater storm event						
Stabilized Construction Entrance/Exit	Once per week or after a 0.5" or greater storm event						

Temporary Sediment Trap/Basin & Diversion Swales	Once per week or after a 0.5" or greater storm event						
Vegetated Slope Stabilization	Once per week or after a 0.5" or greater storm event						
Energy Dissipators	Once per week or after a 0.5" or greater storm event						

**Stormwater Control Manager** \_\_\_\_\_

# KCE CT5 BESS Willington – Village Hill Road – Willington, CT

## Best Management Practices – Maintenance/ Evaluation Checklist

### Long Term Practices

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed <input type="checkbox"/> yes <input type="checkbox"/> no (List Items)	Date of Cleaning/Repair	Performed by
Trash/Litter	Routinely pick up and remove litter from entire property as required						
Vegetated Areas	Inspect bi-annually Replant bare areas upon identification						
Energy Dissipators	Inspect monthly for the first 3 months and after any rain event exceeding 0.5" Inspect 2x a year thereafter.						
Diversion Swales	Inspect monthly for the first 3 months and after						

	any rain event exceeding 0.5" Inspect 2x a year thereafter.						
Infiltration Basins	Inspect monthly for the first 3 months and after any rain event exceeding 0.5" Inspect 2x a year thereafter.						

**Stormwater Control Manager** \_\_\_\_\_

