Stormwater Management Design Report

Bokum Road Business Park

Bokum Road
Essex, Connecticut

July 1, 2021

Prepared for:

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Table of Contents

List of Tables

List of Figures

Appendices

1.0 Introduction

This Stormwater Management Design Report has been prepared on behalf of the George C. Field Company, Inc. who has submitted an application to the Town of Essex Inland Wetlands and Watercourses Commission seeking approval to develop an approximate 8.9 acre land parcel located in the south central portion of the Town of Essex (Figure 1). The parcel is an interior lot located on the north side of Bokum Road approximately 0.35 miles southeast of its intersection with Spencer Plains Road (Conn. Route 153).

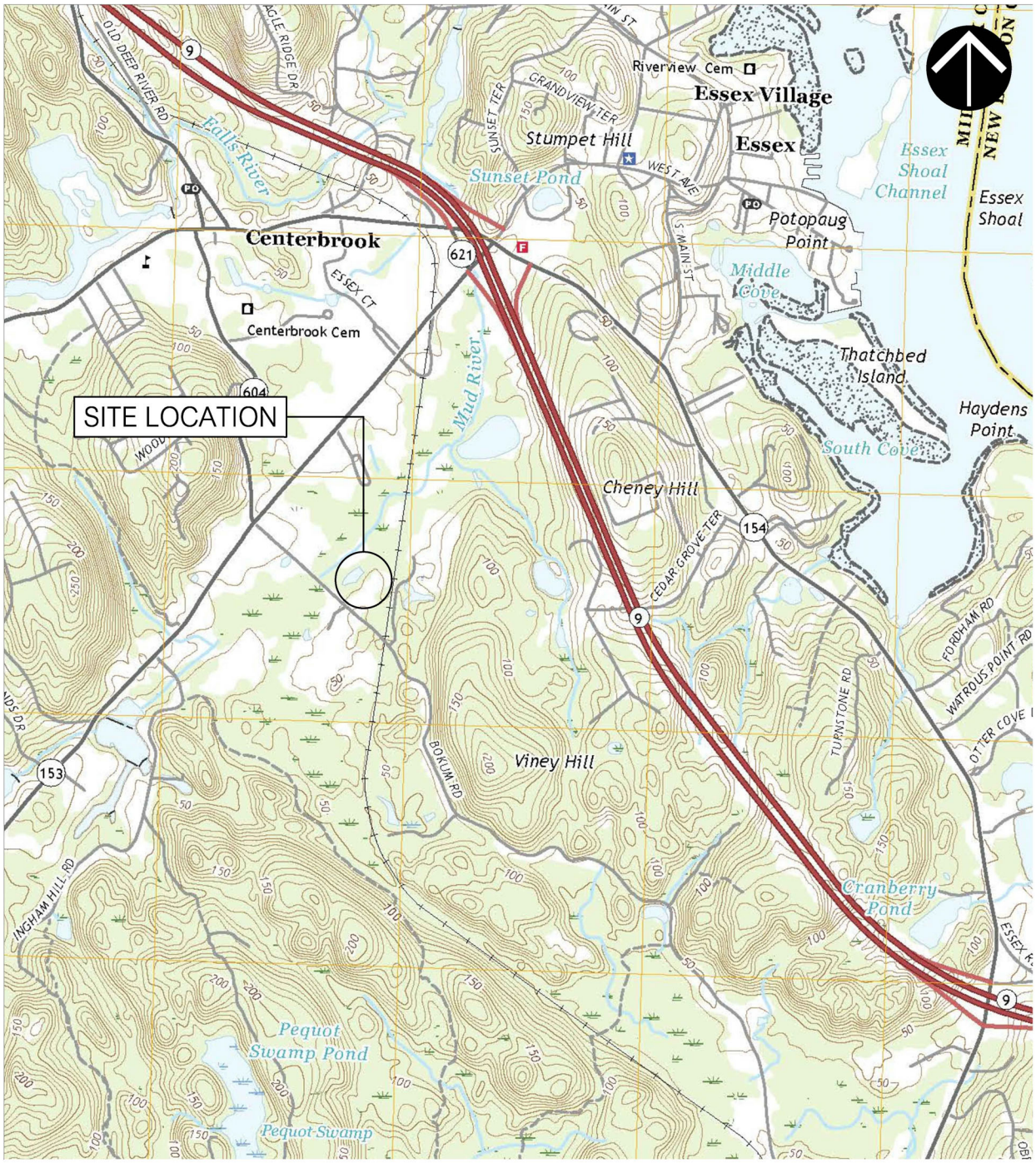

Figure 1. Project Location
U.S.G.S. Essex Connecticut Quadrangle

The planned development proposal consists of the construction of a commercial business park. The improvements include a 28,000 square foot building and a 24,800 square foot building and associated access road, driveways, parking area, retaining wall, utility services, on-site wastewater systems, stormwater management facilities, guiderail, signage, and landscaping.

The project site is located within a Limited Industrial (LI) zoning district. The existing land uses adjacent to and in the vicinity of the site are residential and commercial. The project site is undeveloped.

The site is served by the Connecticut Water Company public water system, and public communication, electric, and gas utilities within the Bokum Road right-of-way.

The site is located within the Falls River subregional drainage basin (HUC 4019). The Mud River flows southerly along the site's northerly boundary and to the west of the site and joins Tiffany Brook approximately 0.3 miles to the southwest of the site.

Surface water runoff from the planned development area of the site drains to an inland wetland associated with the Mud River.

The site is located within an un-numbered Special Flood Hazard Area Zone A and Flood Zone X (Figure 2). The planned development portion of the site is partially located within the special flood hazard area zone.

The site is not located within a public water supply watershed area, an aquifer protection area, or an identified Connecticut Department of Energy and Environmental Protection Natural Diversity Database Area.

The Natural Resources Conservation Service Soil Survey of the State of Connecticut indicates that the upland surficial soil types on and in the near vicinity of the planned development portion of the site are classified as Windsor loamy sands, 3-8% slopes (36B).

The approximate area of inland wetland disturbance is 0.02 acres and the disturbed area within the 100-foot inland wetland upland review area is approximately 2.7 acres.

The total area of land disturbance associated with the complete project construction activities is approximately 3.75 acres.

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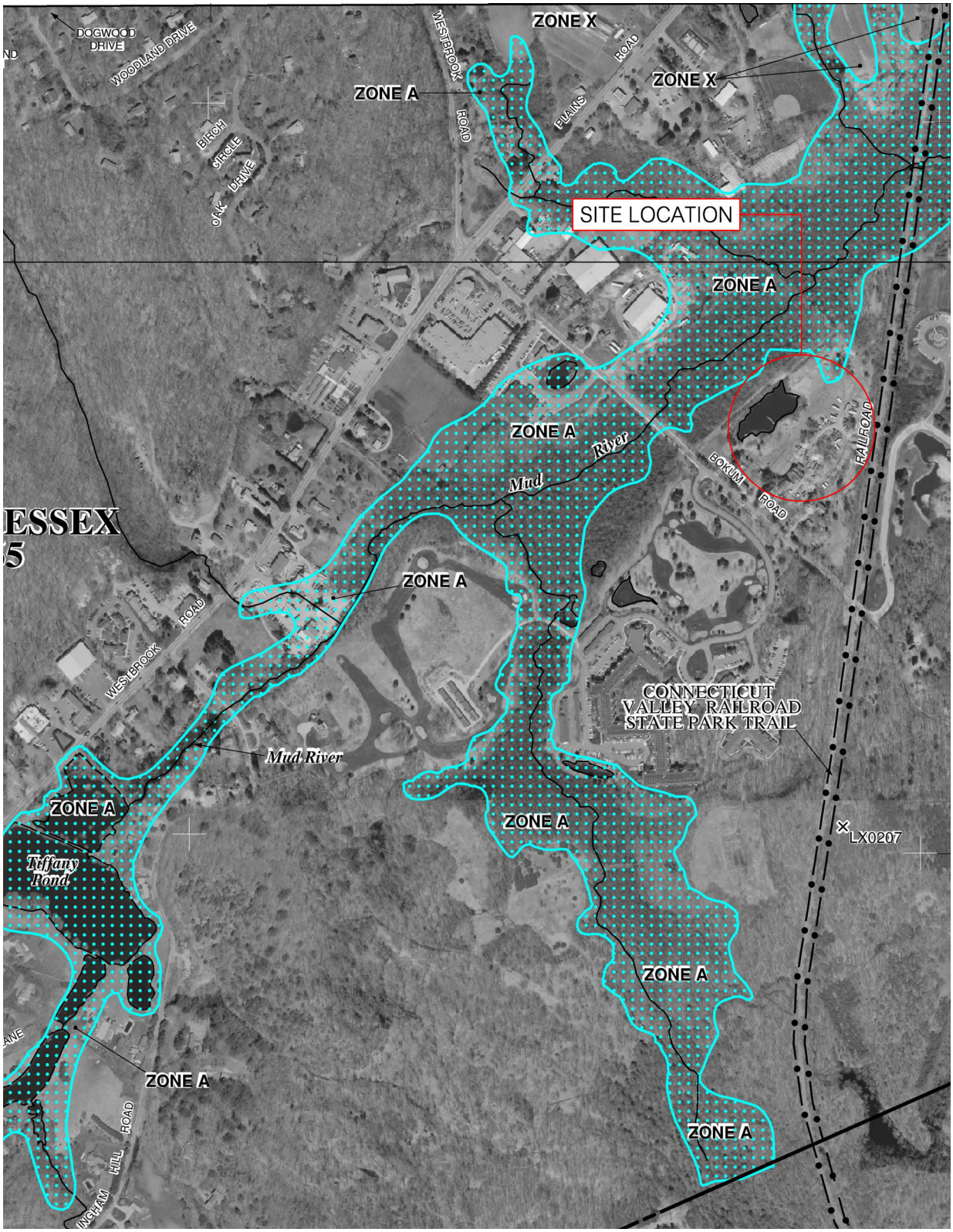

Figure 2. Flood Insurance Rate Map
Map No. 00907C0333G

2.0 Hydrologic Model Development

The site stormwater management system has been designed in accordance with standard hydrologic and hydraulic engineering practices.

HydroCAD Version 10.10 hydrologic modeling software (HydroCAD Software Solutions, LLC) was used to create the hydrologic models and estimates of peak rates of discharge and volumes of stormwater runoff. The U.S. Department of Agriculture Soil Conservation Service (now Natural Resources Conservation Service) Technical Release 20 Computer Program for Project Formulation Hydrology methodology was used within the HydroCAD software program. TR-20 is a single event, lumped parameter surface water hydrologic model that simulates the precipitation-runoff relationships of a drainage area. The model uses the Soil Conservation Service Curve Number and Unit-Hydrograph methods to represent infiltration losses and to transform excess precipitation into runoff, and the Modified Puls (Storage-Indication) method to perform reservoir routing.

NOAA Precipitation Frequency Atlas 14 for the Northeastern States 24-hour rainfall depths in the project site vicinity shown in Table 1 were accessed from the NOAA precipitation frequency data server and entered into the models.

Table 1. 24-Hour Rainfall Depths for the Project Site Vicinity

Recurrence Interval Year	Rainfall Depth Inches
2	3.44
5	4.41
10	5.21
25	6.31
50	7.13
100	8.01

Partial duration series precipitation frequency data was also accessed from the NOAA precipitation frequency data server and entered into the models to create a synthetic rainfall distribution specific to the project site vicinity.

Catchment area boundaries were delineated using the existing conditions mapping for the site. The delineations were checked and adjusted based on a field inspection.

Catchment area composite runoff curve numbers and times of concentration were assumed to be 98 and 0.10 hours respectively using values presented in the National Engineering Handbook, Section 4 - Hydrology (1985).

Antecedent moisture condition II was used to represent the soil moisture condition in the catchment areas prior to the modeled rainfall events.

3.0 Stormwater Management System

The site stormwater management system consists of a typical catch basin inlet structure and storm sewer collection and conveyance system that will direct stormwater runoff from the developed sites access road, driveways, parking area, and building roofs to two constructed stormwater wetlands.

The stormwater wetlands have been designed to meet the water quality volume and annual groundwater recharge volume requirements of the Connecticut Department of Energy and Environmental Protection Stormwater Quality Manual for the developed site and to provide a level of attenuation of the rates of peak discharge of stormwater runoff from the developed portion of the site.

The site stormwater collection and conveyance system has been designed in accordance with the procedures outlined in the Connecticut Department of Transportation Drainage Manual. Drainage structure inlets and storm sewers have been designed for peak discharges generated from a 25-year design frequency rainfall event computed using the Rational Method. Outlet protection measures were designed for the 25-year design frequency peak discharge and checked for the 100-year discharge. All times of concentration were assumed to be 5 minutes and all runoff coefficients were assumed to be 0.90.

Stormwater runoff will be directed from the conveyance and collection system to the constructed stormwater wetlands which have been designed to temporarily store runoff and allow it to infiltrate into the underlying natural soils. The water surface elevations (and rates of discharge) for each of the wetlands will be controlled by a V-notch weir principal outlet within a precast concrete outlet control structure. The elevation of the weir crests have been set such that the storage volume below the crests exceeds both the computed water quality volume and annual groundwater recharge volume.

During less frequent, greater depth rainfall events, when the ponded water surface within the wetlands exceeds the elevation of the principal outlet crests, stormwater will be discharged directly to the adjacent natural wetlands.

An overflow inlet grate at the top of each outlet control structure has been set one foot below the top berm elevation of each of the wetlands. The inlet grates have been chosen to have the capacity to pass the 100-year peak discharge with the principal outlet not operating (clogged).

A summary of the rates of peak discharges and the reservoir routing results for the stormwater wetlands are given below.

Table 2. Stormwater Wetland 1 - Peak Discharges and Reservoir Routings

	Recurrence Interval					
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Peak Discharge (cfs)	2.9	3.7	4.4	5.3	5.9	6.7
Routed Outflow (cfs)	0.7	1.1	1.4	1.9	2.3	2.7
Peak Stage (ft)	31.5	31.7	31.8	32.0	32.1	32.2

Table 3. Stormwater Wetland 2 - Peak Discharges and Reservoir Routings

	Recurrence Interval					
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Peak Discharge (cfs)	4.0	5.2	6.1	7.4	8.4	9.4
Routed Outflow (cfs)	0.9	1.3	1.6	2.1	2.5	2.9
Peak Stage (ft)	22.6	22.7	22.8	22.9	23.0	23.0

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Appendix A
Design Computations

Summer Hill

Civil Engineers & Land Surveyors, P.C.

BY: MJO DATE: 7-1-21 SUBJECT: Bokum Road Business Park Essex, Connecticut SHEET No.: 1 OF 3

CHECKED: LJM DATE: 7-1-21 Stormwater Management System Design Computations PROJECT No.: 20-50

1. Water quality volume computed using the CT Stormwater Quality Manual equation

   WQV = 1.0 in(R)(A)/12, where:

   WQV, Water Quality Volume (Ac-ft)
   R, Volumetric Runoff Coefficient = 0.05 + 0.009(I)
   I, Percent impervious cover
   A, Site area (Ac.)

   I = 27.9%
   R = 0.05 + 0.009(27.9) = 0.30
   A = 388,259 ft^2 = 8.91 Ac.

   WQV = 1 in(R)(A)/12 = (1 in)(0.30)(8.91)/12 = 0.2228 Ac-ft = 9,703 ft^3

2. Groundwater recharge volume computed using the CT Stormwater Quality Manual equation

   GRV = D(A)(I)/12, where:

   GRV, Groundwater Recharge Volume (Ac-ft)
   D, Depth of runoff to be recharged (in)
   A, Site area (Ac.)
   I, Net increase in percent of impervious cover

   For Hydrologic Soil Group A, D = 0.40 in

   A = 388,259 ft^2 = 8.91 Ac.

   I (Existing) = 0 ft^2

   I (Proposed) = 108,425 ft^2 / 388,259 ft^2 = 0.279

   Net increase = 0.279 – 0 = 0.279

   GRV = (0.40 in x 8.91 Ac. x 0.279)/12 = 0.0829 Ac-ft = 3,609 ft^3

3. Constructed stormwater wetland storage volumes

Stormwater Wetland 1 Stage-Storage

Elevation ft	Area ft^2	Average Area ft^2	Incremental Volume ft^3	Cumulative Volume ft^3	Cumulative Volume Ac-ft
30.00	3,060	3,060	0	0	0.0000
31.00	3,537	3,299	3,299	3,299	0.0757
32.00	4,038	3,788	3,788	7,086	0.1627
33.00	4,566	4,302	4,302	11,388	0.2614
34.00	5,118	4,842	4,842	16,230	0.3726

Stormwater Wetland 2 Stage-Storage

Elevation ft	Area ft^2	Average Area ft^2	Incremental Volume ft^3	Cumulative Volume ft^3	Cumulative Volume Ac-ft
22.00	8,590	2,210	0	0	0.0000
23.00	9,430	9,010	9,010	9,010	0.2068
24.00	10,295	9,863	9,863	18,873	0.4333
25.00	11,185	10,740	10,740	29,613	0.6798

4. Outlet control structure inlet grate capacity computations

Grate inlet capacity using ConnDOT Drainage Manual equations:

Capacity of grate inlets operating as a weir (0 ft $\leq$ d $\leq$ 0.4 ft):

$Q = CPd^{1.5}/CFS$, where:

Q, Discharge (cfs)
C, Weir Discharge Coefficient = 3.0
P, Grate perimeter (ft)
d, Depth over grate (ft)
CFS, Factor of safety for clogging = 1.0 - 2.0

Capacity of grate inlets operating as an orifice (d $\geq$ 1.4 ft):

$Q = CA(2gd)^{0.5}/CFS$, where:

Q, Discharge (cfs)
C, Orifice Discharge Coefficient = 0.67
A, Grate clear opening area (ft^2)
g, Gravitational constant = 32.2 (ft/s^2)
d, Depth over grate (ft)
CFS, Factor of safety for clogging = 1.0 – 2.0

Check grate inlet capacities for maximum 100-year inflow peak discharge = 9.4 cfs and a water surface elevation depth of 1.0 feet (equal to the top of berm elevations:

Grate perimeter (P) = (4 + 4 + 4 +4)ft = 16.0 ft

Grate clear open area (A) (ignore openings at grate perimeter):

4 rows x 10 rows = 40 openings

40 x (0.3125 ft x 0.6458 ft) = = 8.1 ft^2

$Q_w = 3.0(16.0)(1.00)^{1.5}/2.0 = 24.0$ cfs

$Q_o = 0.67(8.1)(2(32.2)(1.00))^{0.5}/2.0 = 21.8$ cfs

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5. Outlet Protection Computations

Riprap apron dimensions based on ConnDOT Drainage Manual design procedure:

Using critical depth (dc) as tailwater depth (TW), dc for maximum design discharge (Q_{100}) = 9.4 ft^3/s = 1.1 ft

1.1 ft > $0.5R_p$ = 0.5(1.5) = 0.75 ft

Type B Riprap Apron (maximum tailwater condition) dimensions:

$L_a = (3.0(Q - 5)/S_p^{1.5}) + 10$
W1 = 3 S_p (min.)
W2 = 3 S_p + 0.4 L_a

Q Design Discharge (ft^3/s)
S_p Pipe Span (ft)
R_p Pipe Rise (ft)
L_a Length of Apron (ft)
W_1 Width of Apron at Pipe Outlet (ft)
W_2 Width of Apron at Apron Outlet (ft)

Q_{100} = 9.4 ft^3/s
S_p = 1.5 ft
R_p = 1.5 ft
$L_a = 3.0(9.4 – 5)/1.5^{1.5} + 10$ = 17.2 ft – Use 18 ft
W_1 = 3(1.5) = 4.5 ft – Use 5 ft
W_2 = 3(1.5) + 0.4(18.0) = 11.7 ft – Use 12 ft

Use modified riprap (D_{50} = 0.42 ft)

Depth (d) = 1.0 ft

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Appendix B
Hydrologic Model Input Data and Results

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	CT-Essex 24-hr S1	2-yr	Default	24.00	1	3.44	2
2	5-yr	CT-Essex 24-hr S1	5-yr	Default	24.00	1	4.41	2
3	10-yr	CT-Essex 24-hr S1	10-yr	Default	24.00	1	5.21	2
4	25-yr	CT-Essex 24-hr S1	25-yr	Default	24.00	1	6.31	2
5	50-yr	CT-Essex 24-hr S1	50-yr	Default	24.00	1	7.13	2
6	100-yr	CT-Essex 24-hr S1	100-yr	Default	24.00	1	8.01	2

Time span=0.00-24.10 hrs, dt=0.05 hrs, 483 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 20: DA 1 Runoff Area=34,790 sf 100.00% Impervious Runoff Depth>3.21"
Tc=6.0 min CN=98 Runoff=2.89 cfs 0.213 af

Pond 25: SWL 1 Peak Elev=31.53' Storage=5,306 cf Inflow=2.89 cfs 0.213 af
Outflow=0.75 cfs 0.188 af

Total Runoff Area = 0.799 ac Runoff Volume = 0.213 af Average Runoff Depth = 3.21"
0.00% Pervious = 0.000 ac 100.00% Impervious = 0.799 ac

Summary for Subcatchment 20: DA 1

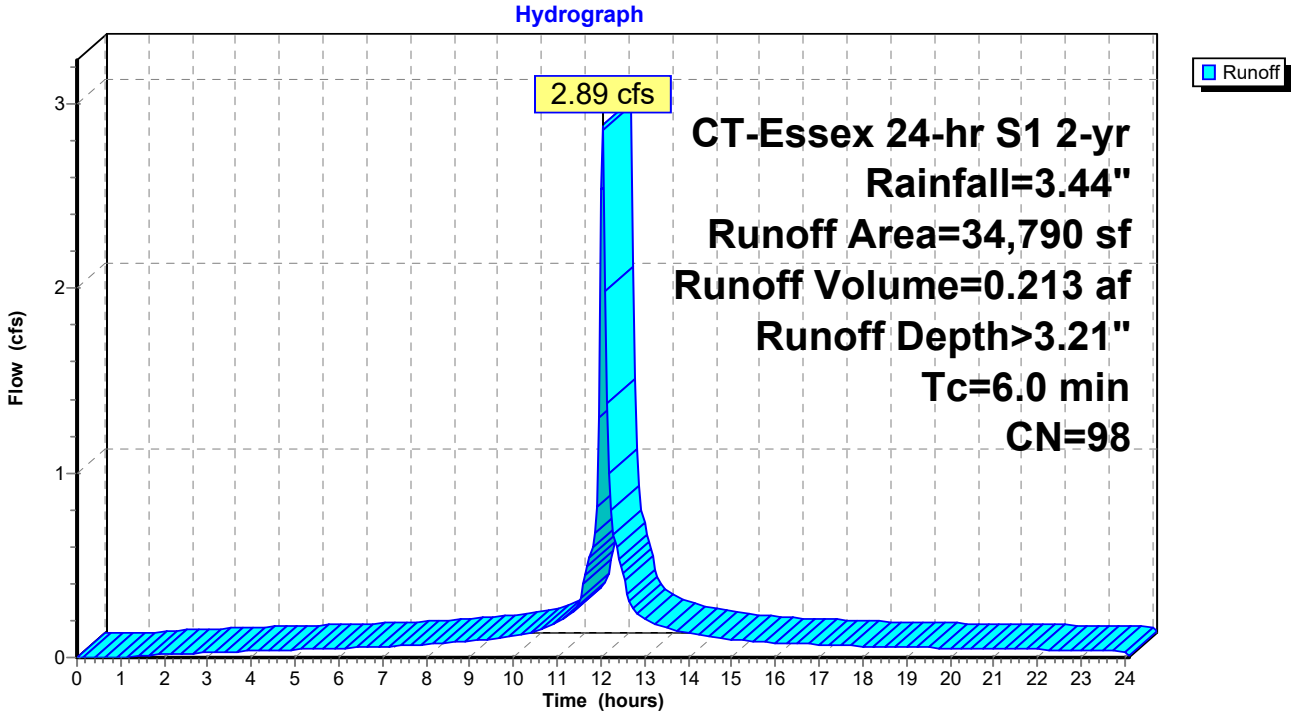
Runoff = 2.89 cfs @ 12.04 hrs, Volume= 0.213 af, Depth> 3.21"
Routed to Pond 25 : SWL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 2-yr Rainfall=3.44"

	Area (sf)	CN	Description
*	34,790	98	
	34,790		100.00% Impervious Area

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

Subcatchment 20: DA 1



Summary for Pond 25: SWL 1

Inflow Area = 0.799 ac,100.00% Impervious, Inflow Depth > 3.21" for 2-yr event
Inflow = 2.89 cfs @ 12.04 hrs, Volume= 0.213 af
Outflow = 0.75 cfs @ 12.27 hrs, Volume= 0.188 af, Atten= 74%, Lag= 13.9 min
Primary = 0.75 cfs @ 12.27 hrs, Volume= 0.188 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 30.50' Storage= 1,650 cf
Peak Elev= 31.53' @ 12.27 hrs Storage= 5,306 cf (3,656 cf above start)

Plug-Flow detention time= 286.0 min calculated for 0.150 af (70% of inflow)
Center-of-Mass det. time= 112.7 min (869.8 - 757.2)

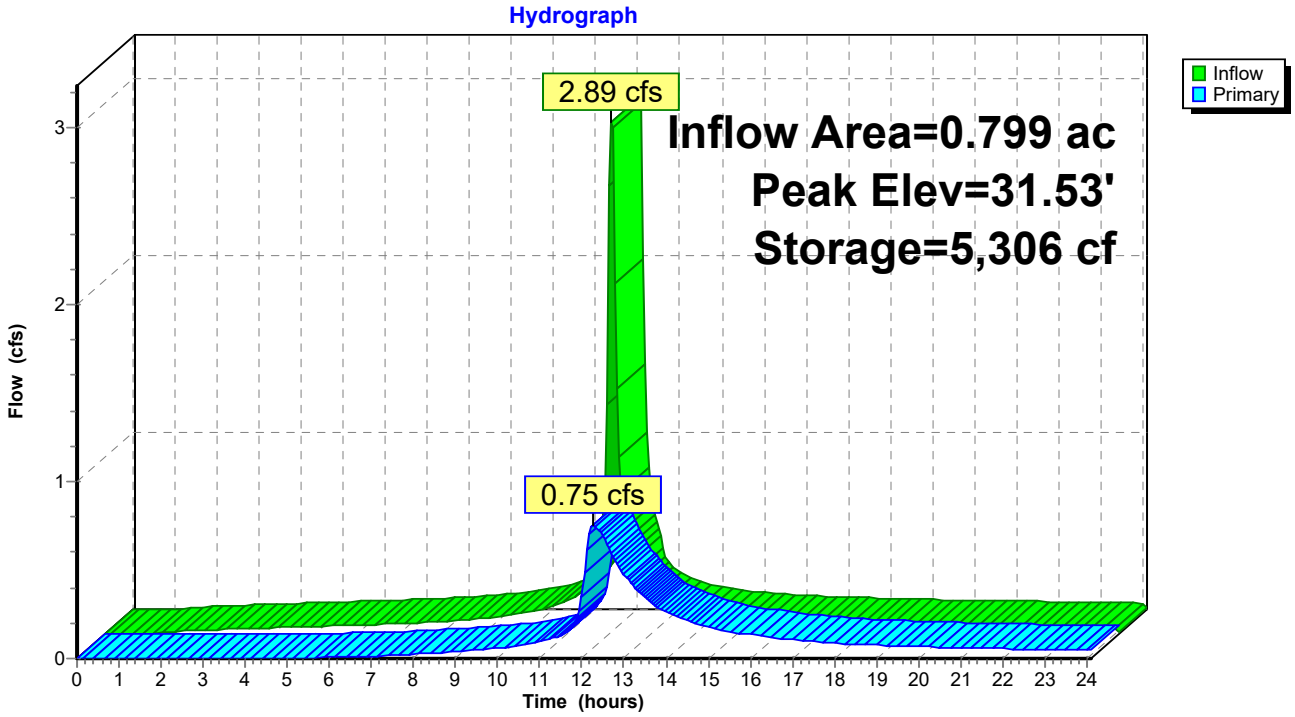
Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	16,231 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	0	0
31.00	3,299	3,299
32.00	3,788	7,087
33.00	4,302	11,389
34.00	4,842	16,231

Device	Routing	Invert	Outlet Devices
#1	Primary	30.00'	**15.0" Round Culvert** L= 14.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.00' / 29.93' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	30.50'	**30.0 deg x 2.33' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.75 cfs @ 12.27 hrs HW=31.53' (Free Discharge)
↑**1=Culvert** (Passes 0.75 cfs of 4.85 cfs potential flow)
↑**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.75 cfs @ 2.65 fps)

Pond 25: SWL 1


Hydrograph
2.89 cfs
0.75 cfs
Inflow Area=0.799 ac
Peak Elev=31.53'
Storage=5,306 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0
1
2
3
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Time span=0.00-24.10 hrs, dt=0.05 hrs, 483 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 20: DA 1 Runoff Area=34,790 sf 100.00% Impervious Runoff Depth>4.17"
Tc=6.0 min CN=98 Runoff=3.70 cfs 0.278 af

Pond 25: SWL 1 Peak Elev=31.71' Storage=5,970 cf Inflow=3.70 cfs 0.278 af
Outflow=1.12 cfs 0.250 af

Total Runoff Area = 0.799 ac Runoff Volume = 0.278 af Average Runoff Depth = 4.17"
0.00% Pervious = 0.000 ac 100.00% Impervious = 0.799 ac

Summary for Subcatchment 20: DA 1

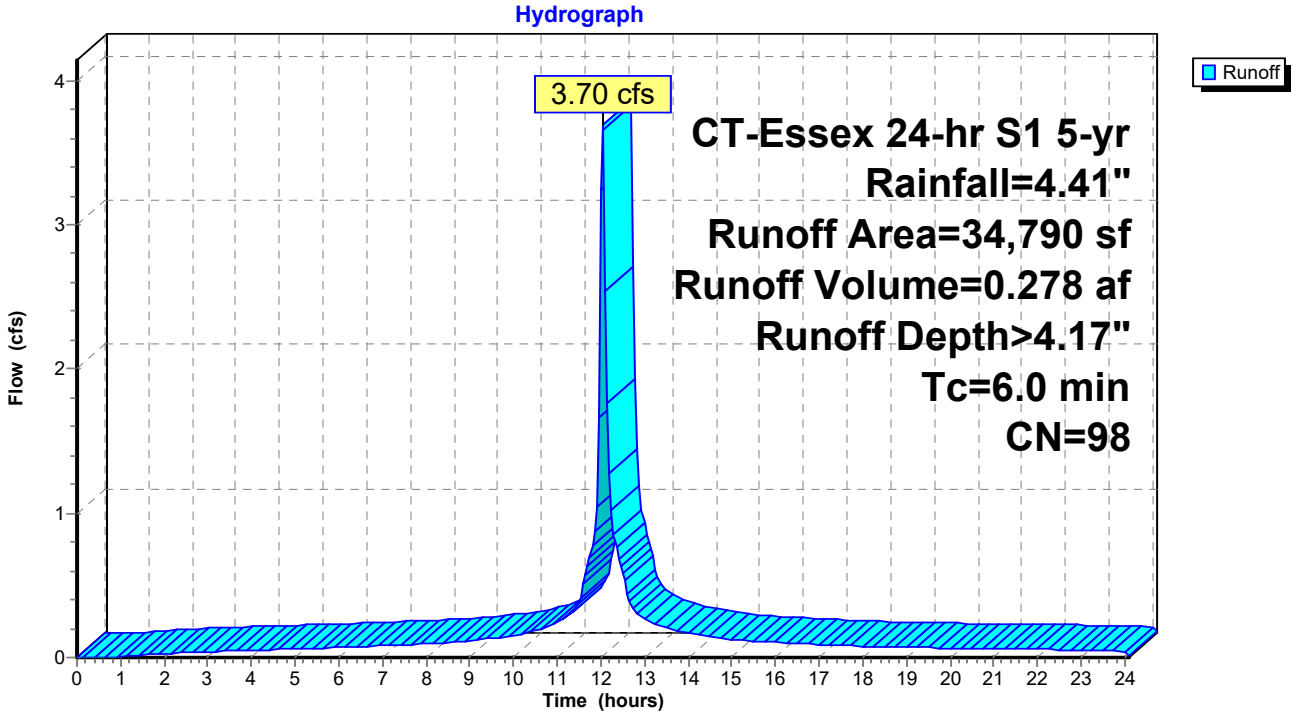
Runoff = 3.70 cfs @ 12.04 hrs, Volume= 0.278 af, Depth> 4.17"
Routed to Pond 25 : SWL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 5-yr Rainfall=4.41"

	Area (sf)	CN	Description
*	34,790	98	
	34,790		100.00% Impervious Area

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

Subcatchment 20: DA 1



Summary for Pond 25: SWL 1

Inflow Area = 0.799 ac,100.00% Impervious, Inflow Depth > 4.17" for 5-yr event
Inflow = 3.70 cfs @ 12.04 hrs, Volume= 0.278 af
Outflow = 1.12 cfs @ 12.23 hrs, Volume= 0.250 af, Atten= 70%, Lag= 11.8 min
Primary = 1.12 cfs @ 12.23 hrs, Volume= 0.250 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 30.50' Storage= 1,650 cf
Peak Elev= 31.71' @ 12.23 hrs Storage= 5,970 cf (4,321 cf above start)

Plug-Flow detention time= 252.5 min calculated for 0.212 af (76% of inflow)
Center-of-Mass det. time= 100.4 min (852.1 - 751.7)

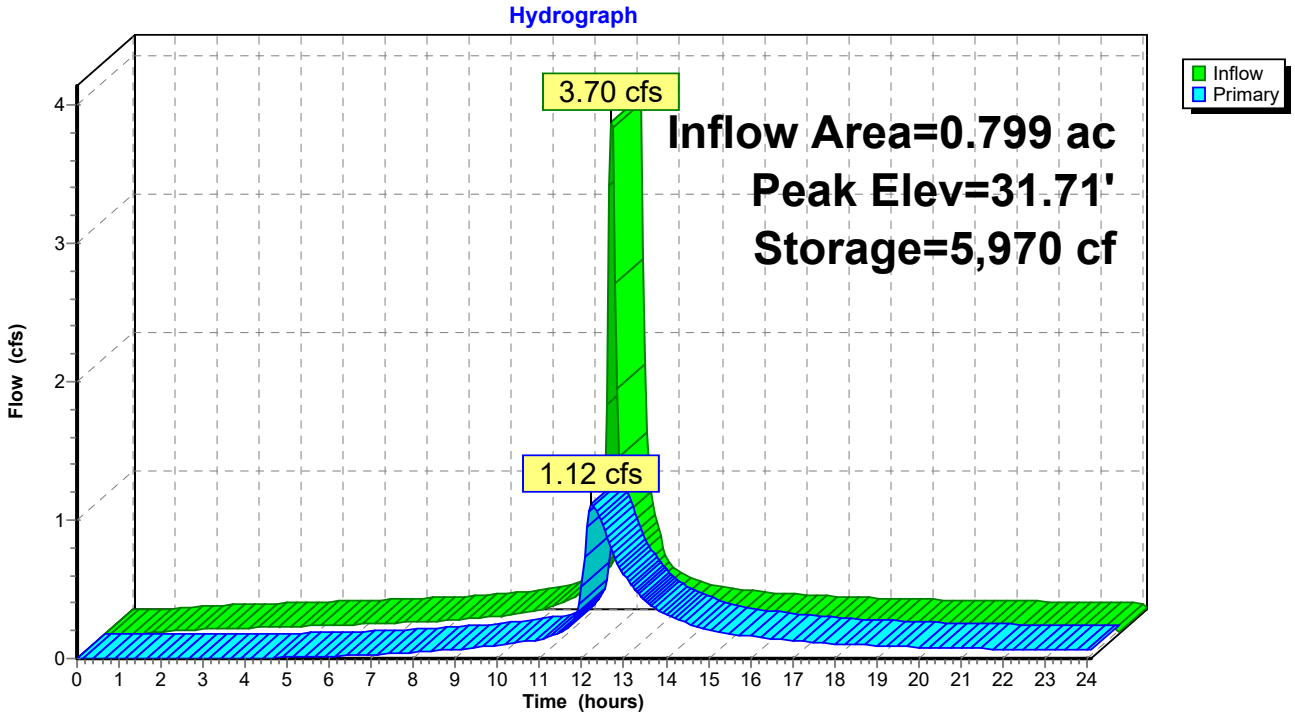
Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	16,231 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	0	0
31.00	3,299	3,299
32.00	3,788	7,087
33.00	4,302	11,389
34.00	4,842	16,231

Device	Routing	Invert	Outlet Devices
#1	Primary	30.00'	**15.0" Round Culvert** L= 14.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.00' / 29.93' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	30.50'	**30.0 deg x 2.33' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=1.11 cfs @ 12.23 hrs HW=31.70' (Free Discharge)
↑**1=Culvert** (Passes 1.11 cfs of 5.35 cfs potential flow)
↑**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 1.11 cfs @ 2.86 fps)

Pond 25: SWL 1


Hydrograph
3.70 cfs
1.12 cfs
Inflow Area=0.799 ac
Peak Elev=31.71'
Storage=5,970 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0
1
2
3
4
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Time span=0.00-24.10 hrs, dt=0.05 hrs, 483 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 20: DA 1 Runoff Area=34,790 sf 100.00% Impervious Runoff Depth>4.97"
Tc=6.0 min CN=98 Runoff=4.37 cfs 0.331 af

Pond 25: SWL 1 Peak Elev=31.84' Storage=6,469 cf Inflow=4.37 cfs 0.331 af
Outflow=1.45 cfs 0.301 af

Total Runoff Area = 0.799 ac Runoff Volume = 0.331 af Average Runoff Depth = 4.97"
0.00% Pervious = 0.000 ac 100.00% Impervious = 0.799 ac

Summary for Subcatchment 20: DA 1

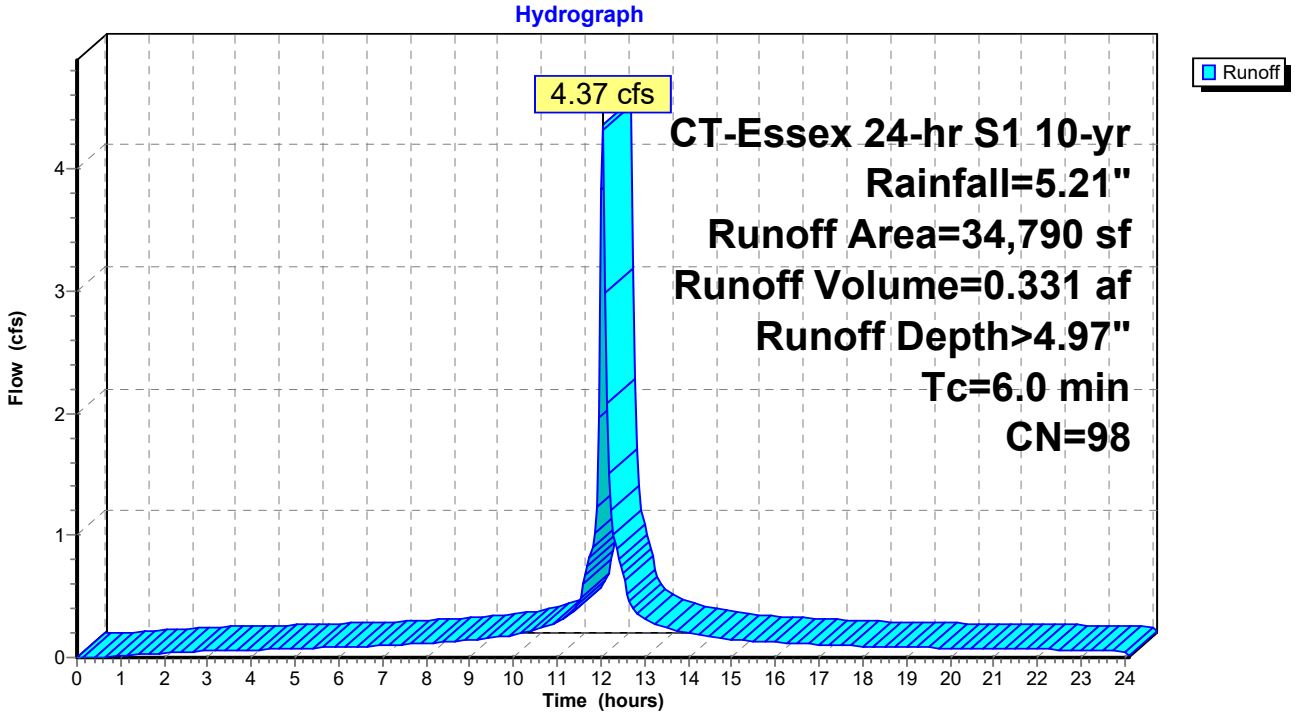
Runoff = 4.37 cfs @ 12.04 hrs, Volume= 0.331 af, Depth> 4.97"
Routed to Pond 25 : SWL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 10-yr Rainfall=5.21"

	Area (sf)	CN	Description
*	34,790	98	
	34,790		100.00% Impervious Area

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

Subcatchment 20: DA 1



Summary for Pond 25: SWL 1

Inflow Area = 0.799 ac,100.00% Impervious, Inflow Depth > 4.97" for 10-yr event
Inflow = 4.37 cfs @ 12.04 hrs, Volume= 0.331 af
Outflow = 1.45 cfs @ 12.22 hrs, Volume= 0.301 af, Atten= 67%, Lag= 10.7 min
Primary = 1.45 cfs @ 12.22 hrs, Volume= 0.301 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 30.50' Storage= 1,650 cf
Peak Elev= 31.84' @ 12.22 hrs Storage= 6,469 cf (4,820 cf above start)

Plug-Flow detention time= 231.9 min calculated for 0.263 af (79% of inflow)
Center-of-Mass det. time= 92.8 min (841.2 - 748.4)

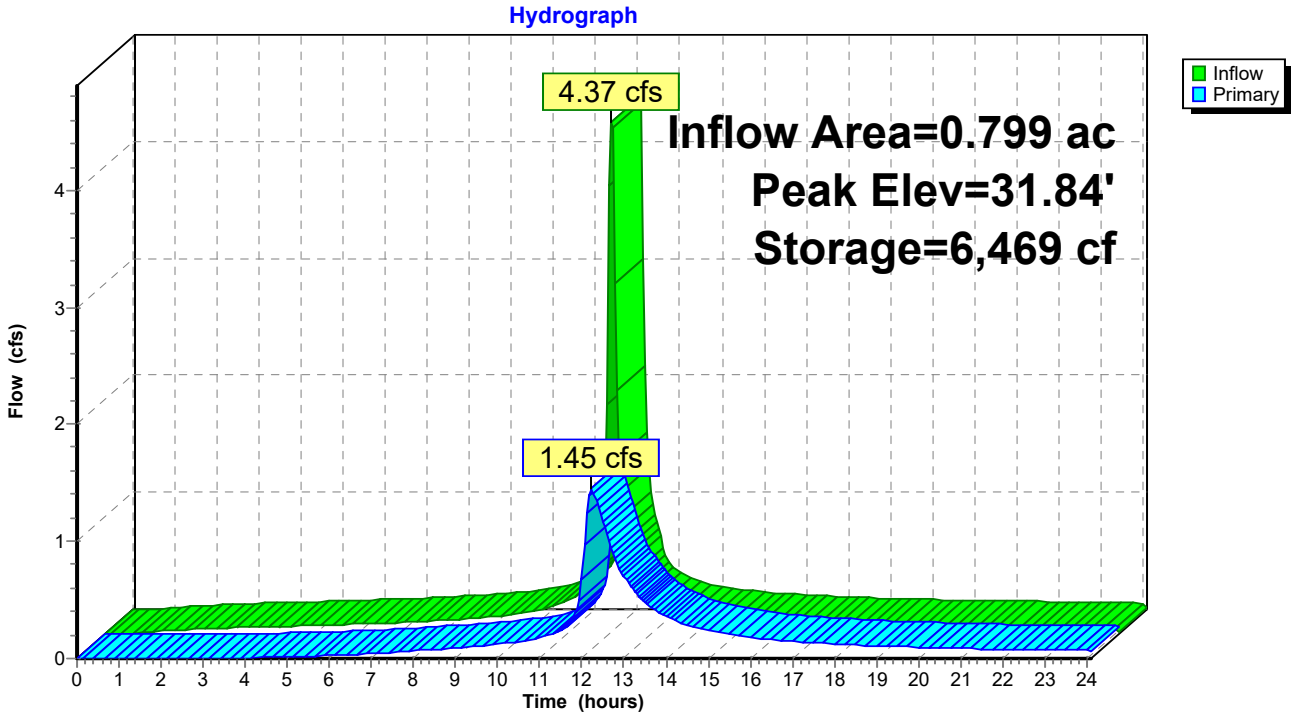
Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	16,231 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	0	0
31.00	3,299	3,299
32.00	3,788	7,087
33.00	4,302	11,389
34.00	4,842	16,231

Device	Routing	Invert	Outlet Devices
#1	Primary	30.00'	**15.0" Round Culvert** L= 14.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.00' / 29.93' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	30.50'	**30.0 deg x 2.33' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=1.44 cfs @ 12.22 hrs HW=31.83' (Free Discharge)
↑**1=Culvert** (Passes 1.44 cfs of 5.97 cfs potential flow)
↑**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 1.44 cfs @ 3.02 fps)

Pond 25: SWL 1


Hydrograph
4.37 cfs
1.45 cfs
Inflow Area=0.799 ac
Peak Elev=31.84'
Storage=6,469 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0
1
2
3
4
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Time span=0.00-24.10 hrs, dt=0.05 hrs, 483 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 20: DA 1 Runoff Area=34,790 sf 100.00% Impervious Runoff Depth>6.07"
Tc=6.0 min CN=98 Runoff=5.29 cfs 0.404 af

Pond 25: SWL 1 Peak Elev=32.00' Storage=7,096 cf Inflow=5.29 cfs 0.404 af
Outflow=1.93 cfs 0.372 af

Total Runoff Area = 0.799 ac Runoff Volume = 0.404 af Average Runoff Depth = 6.07"
0.00% Pervious = 0.000 ac 100.00% Impervious = 0.799 ac

Summary for Subcatchment 20: DA 1

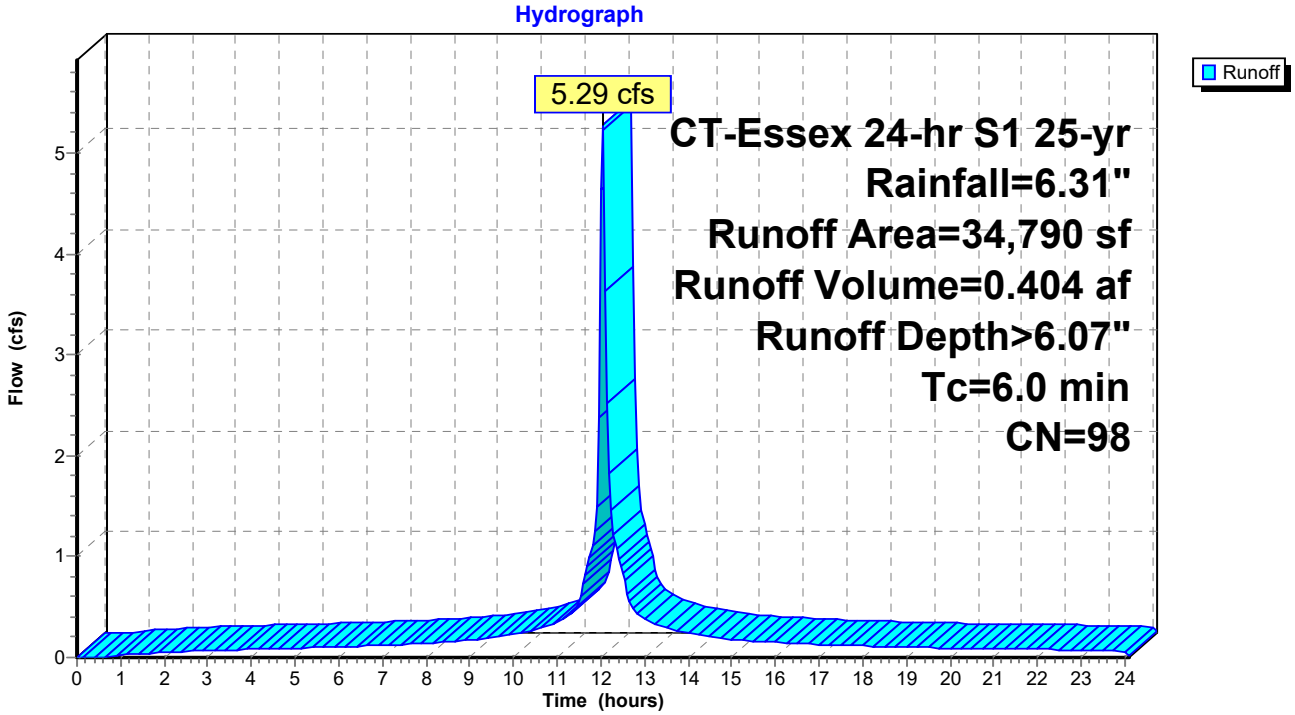
Runoff = 5.29 cfs @ 12.04 hrs, Volume= 0.404 af, Depth> 6.07"
Routed to Pond 25 : SWL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 25-yr Rainfall=6.31"

	Area (sf)	CN	Description
*	34,790	98	
	34,790		100.00% Impervious Area

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

Subcatchment 20: DA 1



Summary for Pond 25: SWL 1

Inflow Area = 0.799 ac,100.00% Impervious, Inflow Depth > 6.07" for 25-yr event
Inflow = 5.29 cfs @ 12.04 hrs, Volume= 0.404 af
Outflow = 1.93 cfs @ 12.20 hrs, Volume= 0.372 af, Atten= 63%, Lag= 9.7 min
Primary = 1.93 cfs @ 12.20 hrs, Volume= 0.372 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 30.50' Storage= 1,650 cf
Peak Elev= 32.00' @ 12.20 hrs Storage= 7,096 cf (5,446 cf above start)

Plug-Flow detention time= 210.3 min calculated for 0.335 af (83% of inflow)
Center-of-Mass det. time= 84.6 min (829.6 - 745.0)

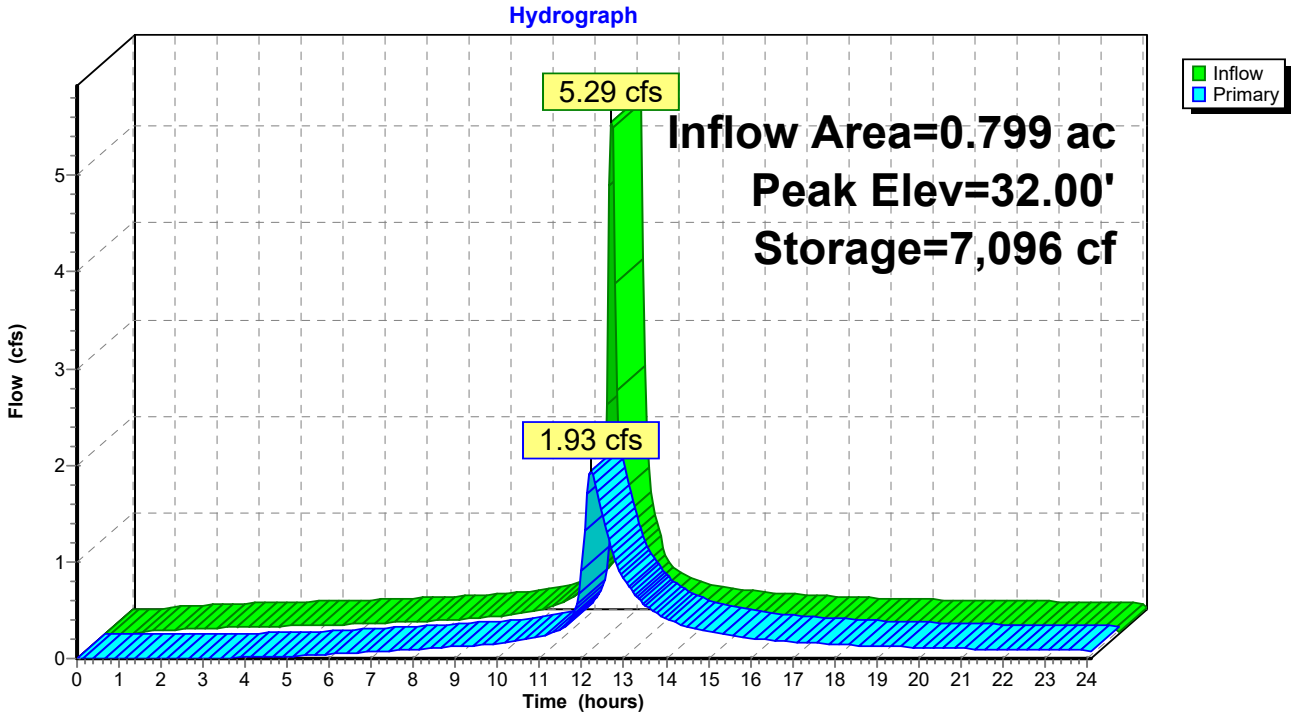
Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	16,231 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	0	0
31.00	3,299	3,299
32.00	3,788	7,087
33.00	4,302	11,389
34.00	4,842	16,231

Device	Routing	Invert	Outlet Devices
#1	Primary	30.00'	**15.0" Round Culvert** L= 14.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.00' / 29.93' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	30.50'	**30.0 deg x 2.33' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=1.93 cfs @ 12.20 hrs HW=32.00' (Free Discharge)
↑—**1=Culvert** (Passes 1.93 cfs of 6.70 cfs potential flow)
↑—**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 1.93 cfs @ 3.20 fps)

Pond 25: SWL 1


Hydrograph
5.29 cfs
1.93 cfs
Inflow Area=0.799 ac
Peak Elev=32.00'
Storage=7,096 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Time span=0.00-24.10 hrs, dt=0.05 hrs, 483 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 20: DA 1 Runoff Area=34,790 sf 100.00% Impervious Runoff Depth>6.89"
Tc=6.0 min CN=98 Runoff=5.98 cfs 0.459 af

Pond 25: SWL 1 Peak Elev=32.10' Storage=7,537 cf Inflow=5.98 cfs 0.459 af
Outflow=2.28 cfs 0.426 af

Total Runoff Area = 0.799 ac Runoff Volume = 0.459 af Average Runoff Depth = 6.89"
0.00% Pervious = 0.000 ac 100.00% Impervious = 0.799 ac

Summary for Subcatchment 20: DA 1

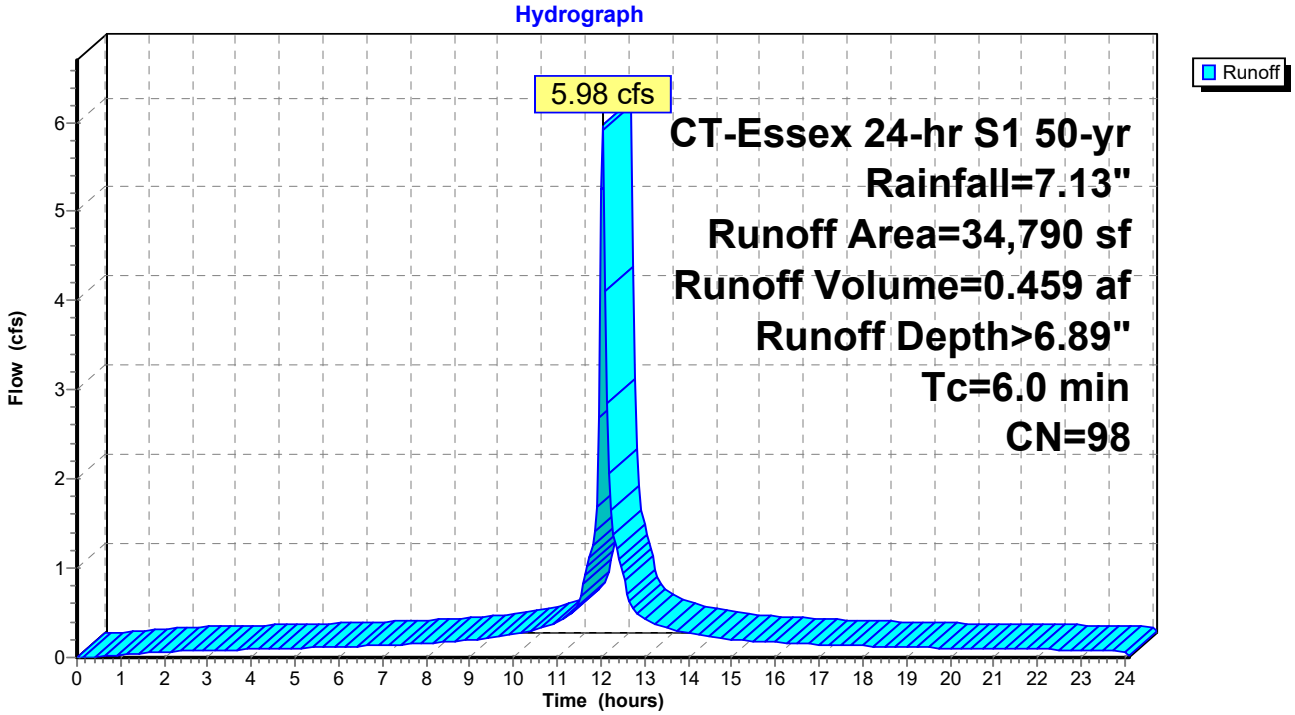
Runoff = 5.98 cfs @ 12.04 hrs, Volume= 0.459 af, Depth> 6.89"
Routed to Pond 25 : SWL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 50-yr Rainfall=7.13"

	Area (sf)	CN	Description
*	34,790	98	
	34,790		100.00% Impervious Area

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

Subcatchment 20: DA 1



Summary for Pond 25: SWL 1

Inflow Area = 0.799 ac,100.00% Impervious, Inflow Depth > 6.89" for 50-yr event
Inflow = 5.98 cfs @ 12.04 hrs, Volume= 0.459 af
Outflow = 2.28 cfs @ 12.19 hrs, Volume= 0.426 af, Atten= 62%, Lag= 9.2 min
Primary = 2.28 cfs @ 12.19 hrs, Volume= 0.426 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 30.50' Storage= 1,650 cf
Peak Elev= 32.10' @ 12.19 hrs Storage= 7,537 cf (5,887 cf above start)

Plug-Flow detention time= 196.3 min calculated for 0.387 af (84% of inflow)
Center-of-Mass det. time= 79.7 min (822.8 - 743.1)

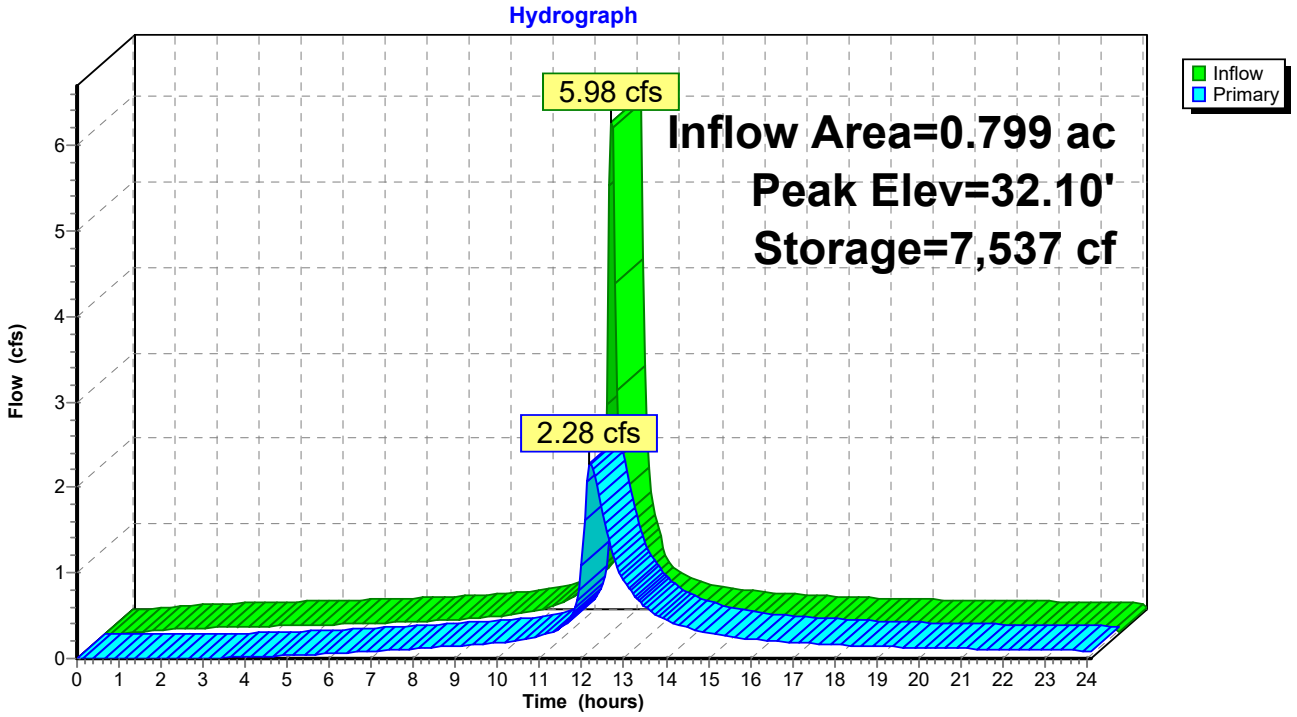
Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	16,231 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	0	0
31.00	3,299	3,299
32.00	3,788	7,087
33.00	4,302	11,389
34.00	4,842	16,231

Device	Routing	Invert	Outlet Devices
#1	Primary	30.00'	**15.0" Round Culvert** L= 14.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.00' / 29.93' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	30.50'	**30.0 deg x 2.33' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=2.27 cfs @ 12.19 hrs HW=32.10' (Free Discharge)
↑**1=Culvert** (Passes 2.27 cfs of 7.09 cfs potential flow)
↑**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 2.27 cfs @ 3.30 fps)

Pond 25: SWL 1


Hydrograph
5.98 cfs
2.28 cfs
Inflow Area=0.799 ac
Peak Elev=32.10'
Storage=7,537 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Time span=0.00-24.10 hrs, dt=0.05 hrs, 483 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 20: DA 1 Runoff Area=34,790 sf 100.00% Impervious Runoff Depth>7.77"
Tc=6.0 min CN=98 Runoff=6.70 cfs 0.517 af

Pond 25: SWL 1 Peak Elev=32.21' Storage=7,976 cf Inflow=6.70 cfs 0.517 af
Outflow=2.66 cfs 0.483 af

Total Runoff Area = 0.799 ac Runoff Volume = 0.517 af Average Runoff Depth = 7.77"
0.00% Pervious = 0.000 ac 100.00% Impervious = 0.799 ac

Summary for Subcatchment 20: DA 1

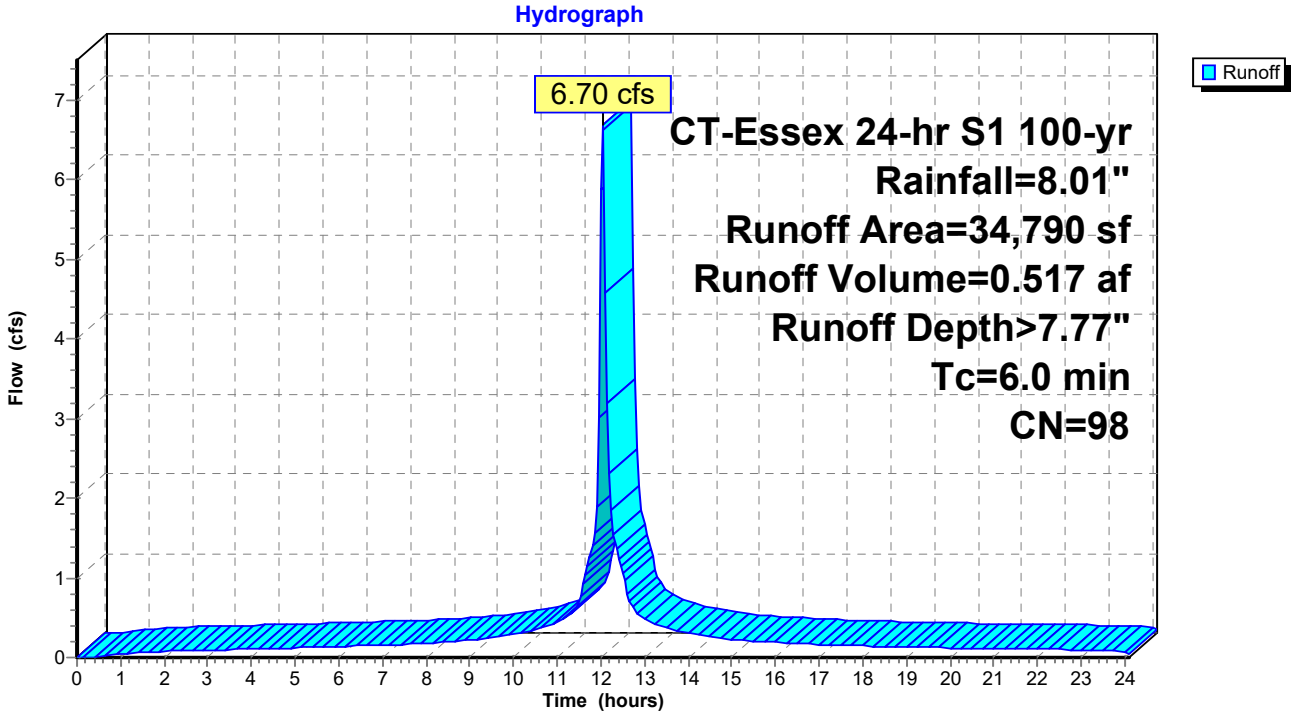
Runoff = 6.70 cfs @ 12.04 hrs, Volume= 0.517 af, Depth> 7.77"
Routed to Pond 25 : SWL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 100-yr Rainfall=8.01"

	Area (sf)	CN	Description
*	34,790	98	
	34,790		100.00% Impervious Area

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

Subcatchment 20: DA 1



Summary for Pond 25: SWL 1

Inflow Area = 0.799 ac,100.00% Impervious, Inflow Depth > 7.77" for 100-yr event
Inflow = 6.70 cfs @ 12.04 hrs, Volume= 0.517 af
Outflow = 2.66 cfs @ 12.18 hrs, Volume= 0.483 af, Atten= 60%, Lag= 8.7 min
Primary = 2.66 cfs @ 12.18 hrs, Volume= 0.483 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 30.50' Storage= 1,650 cf
Peak Elev= 32.21' @ 12.18 hrs Storage= 7,976 cf (6,326 cf above start)

Plug-Flow detention time= 184.9 min calculated for 0.445 af (86% of inflow)
Center-of-Mass det. time= 75.4 min (816.8 - 741.4)

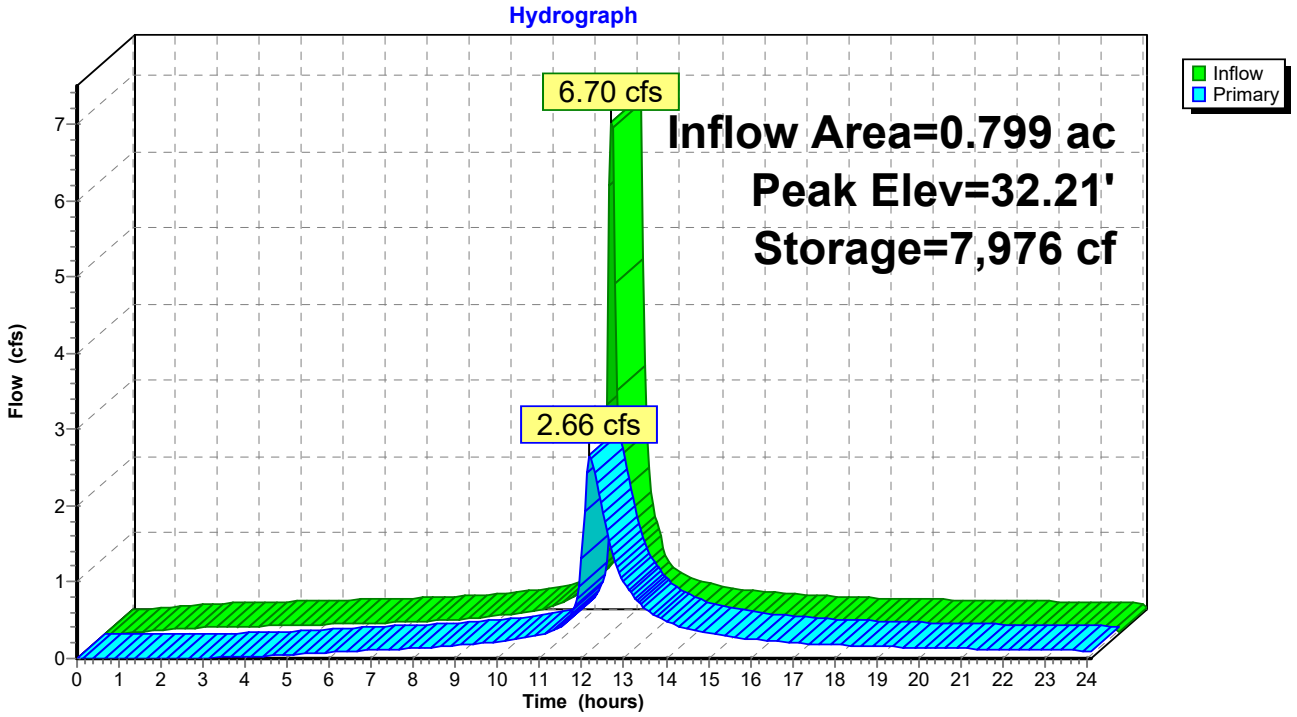
Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	16,231 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	0	0
31.00	3,299	3,299
32.00	3,788	7,087
33.00	4,302	11,389
34.00	4,842	16,231

Device	Routing	Invert	Outlet Devices
#1	Primary	30.00'	**15.0" Round Culvert** L= 14.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.00' / 29.93' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	30.50'	**30.0 deg x 2.33' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=2.65 cfs @ 12.18 hrs HW=32.20' (Free Discharge)
↑—**1=Culvert** (Passes 2.65 cfs of 7.42 cfs potential flow)
↑—**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 2.65 cfs @ 3.41 fps)

Pond 25: SWL 1


Hydrograph
6.70 cfs
2.66 cfs
Inflow Area=0.799 ac
Peak Elev=32.21'
Storage=7,976 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	CT-Essex 24-hr S1	2-yr	Default	24.00	1	3.44	2
2	5-yr	CT-Essex 24-hr S1	5-yr	Default	24.00	1	4.41	2
3	10-yr	CT-Essex 24-hr S1	10-yr	Default	24.00	1	5.21	2
4	25-yr	CT-Essex 24-hr S1	25-yr	Default	24.00	1	6.31	2
5	50-yr	CT-Essex 24-hr S1	50-yr	Default	24.00	1	7.13	2
6	100-yr	CT-Essex 24-hr S1	100-yr	Default	24.00	1	8.01	2

Time span=0.00-24.10 hrs, dt=0.05 hrs, 483 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 20: DA 2 Runoff Area=48,685 sf 100.00% Impervious Runoff Depth>3.21"
Tc=6.0 min CN=98 Runoff=4.05 cfs 0.299 af

Pond 25: SWL 2 Peak Elev=22.56' Storage=5,027 cf Inflow=4.05 cfs 0.299 af
Outflow=0.93 cfs 0.375 af

Total Runoff Area = 1.118 ac Runoff Volume = 0.299 af Average Runoff Depth = 3.21"
0.00% Pervious = 0.000 ac 100.00% Impervious = 1.118 ac

Summary for Subcatchment 20: DA 2

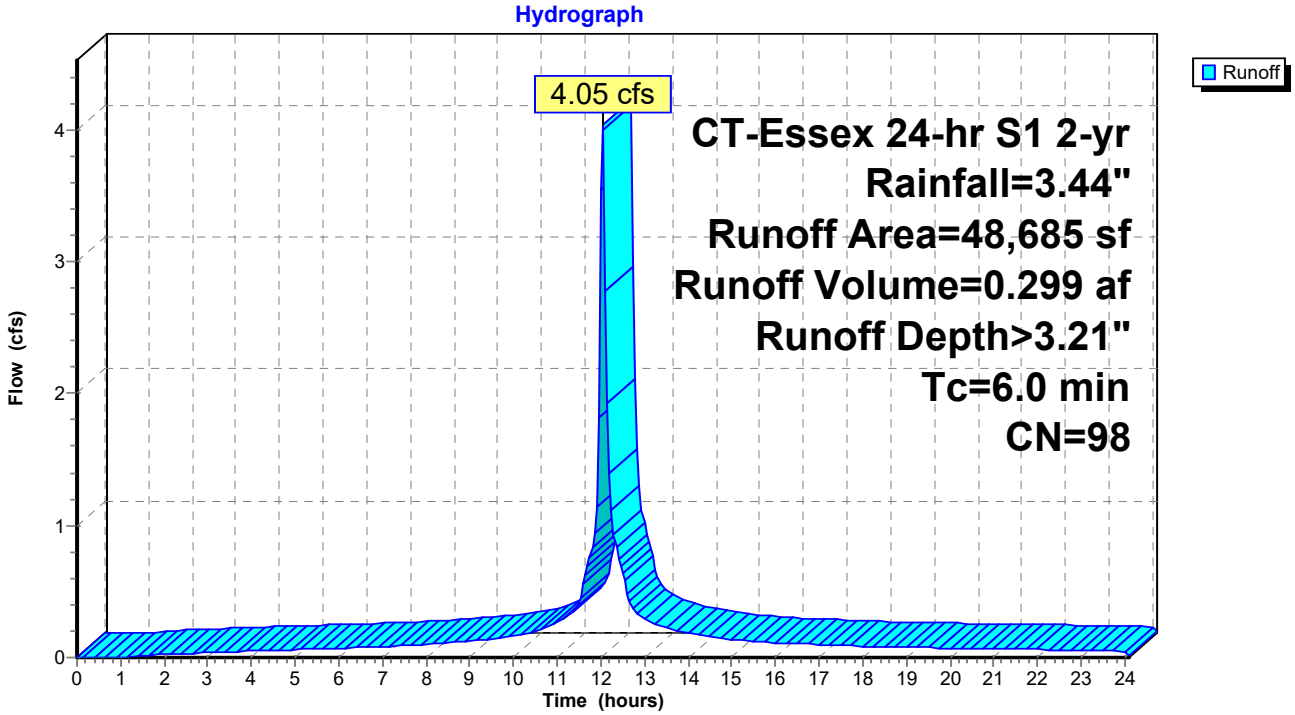
Runoff = 4.05 cfs @ 12.04 hrs, Volume= 0.299 af, Depth> 3.21"
Routed to Pond 25 : SWL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 2-yr Rainfall=3.44"

	Area (sf)	CN	Description
*	48,685	98	
	48,685		100.00% Impervious Area

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

Subcatchment 20: DA 2



Summary for Pond 25: SWL 2

Inflow Area = 1.118 ac,100.00% Impervious, Inflow Depth > 3.21" for 2-yr event
Inflow = 4.05 cfs @ 12.04 hrs, Volume= 0.299 af
Outflow = 0.93 cfs @ 12.31 hrs, Volume= 0.375 af, Atten= 77%, Lag= 16.2 min
Primary = 0.93 cfs @ 12.31 hrs, Volume= 0.375 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 22.50' Storage= 4,505 cf
Peak Elev= 22.56' @ 12.31 hrs Storage= 5,027 cf (522 cf above start)

Plug-Flow detention time= 164.8 min calculated for 0.271 af (91% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

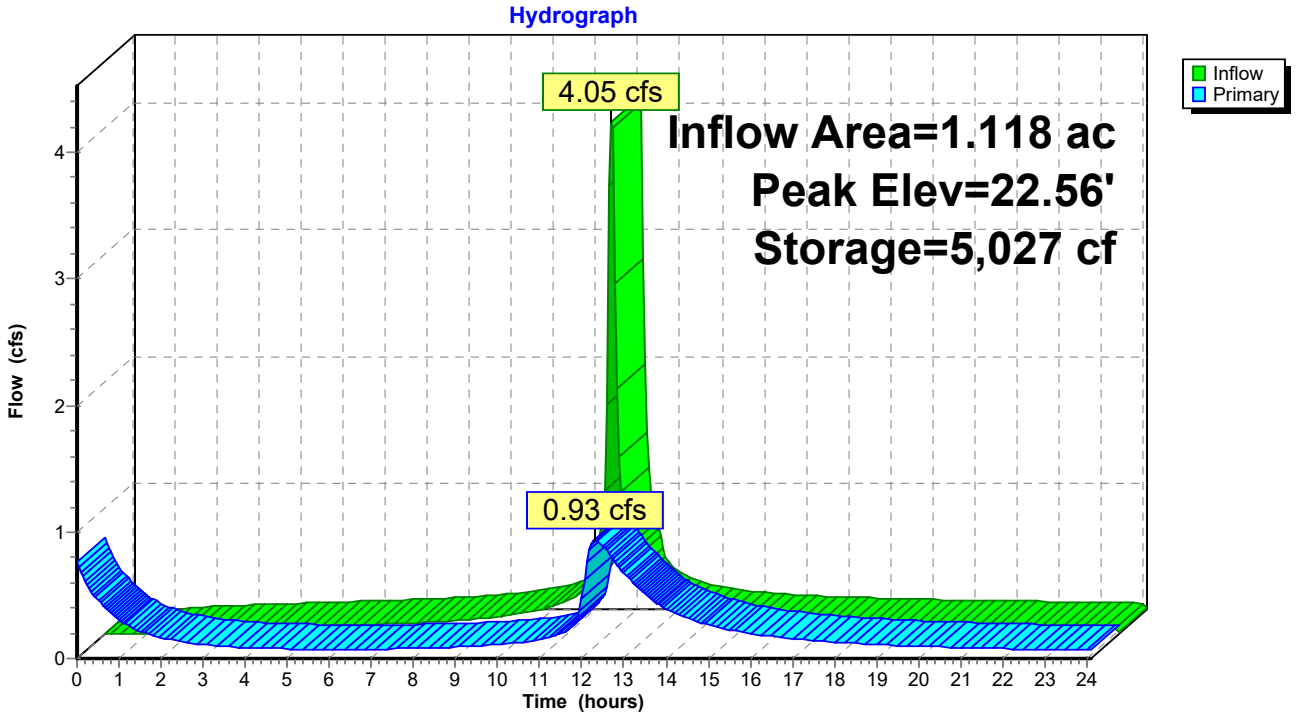
Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	29,613 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	0	0
23.00	9,010	9,010
24.00	9,863	18,873
25.00	10,740	29,613

Device	Routing	Invert	Outlet Devices
#1	Primary	22.00'	**15.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 21.96' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Primary	22.50'	**30.0 deg x 1.33' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.93 cfs @ 12.31 hrs HW=22.56' (Free Discharge)
1=Culvert (Barrel Controls 0.93 cfs @ 2.58 fps)
2=Sharp-Crested Vee/Trap Weir (Weir Controls 0.00 cfs @ 0.63 fps)

Pond 25: SWL 2


Hydrograph
4.05 cfs
0.93 cfs
Inflow Area=1.118 ac
Peak Elev=22.56'
Storage=5,027 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Time span=0.00-24.10 hrs, dt=0.05 hrs, 483 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 20: DA 2 Runoff Area=48,685 sf 100.00% Impervious Runoff Depth>4.17"
Tc=6.0 min CN=98 Runoff=5.18 cfs 0.389 af

Pond 25: SWL 2 Peak Elev=22.67' Storage=6,049 cf Inflow=5.18 cfs 0.389 af
Outflow=1.31 cfs 0.462 af

Total Runoff Area = 1.118 ac Runoff Volume = 0.389 af Average Runoff Depth = 4.17"
0.00% Pervious = 0.000 ac 100.00% Impervious = 1.118 ac

Summary for Subcatchment 20: DA 2

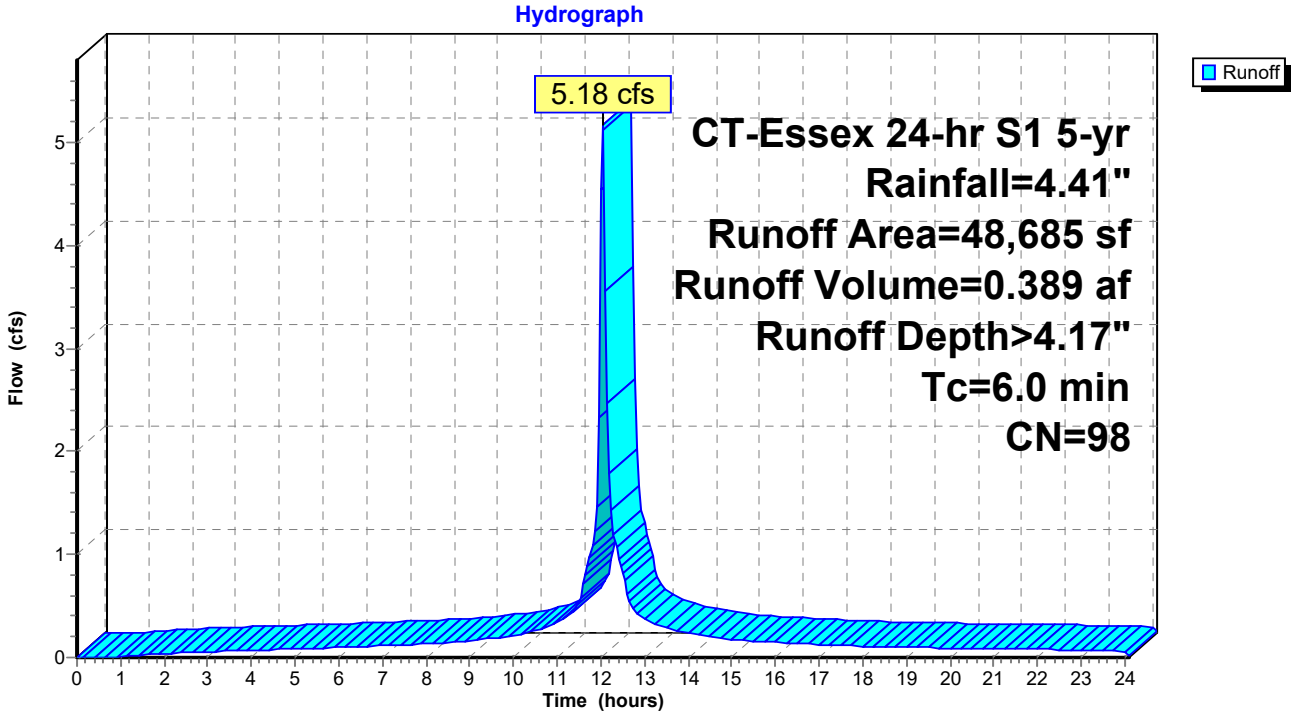
Runoff = 5.18 cfs @ 12.04 hrs, Volume= 0.389 af, Depth> 4.17"
Routed to Pond 25 : SWL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 5-yr Rainfall=4.41"

	Area (sf)	CN	Description
*	48,685	98	
	48,685		100.00% Impervious Area

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

Subcatchment 20: DA 2



Summary for Pond 25: SWL 2

Inflow Area = 1.118 ac,100.00% Impervious, Inflow Depth > 4.17" for 5-yr event
Inflow = 5.18 cfs @ 12.04 hrs, Volume= 0.389 af
Outflow = 1.31 cfs @ 12.28 hrs, Volume= 0.462 af, Atten= 75%, Lag= 14.3 min
Primary = 1.31 cfs @ 12.28 hrs, Volume= 0.462 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 22.50' Storage= 4,505 cf
Peak Elev= 22.67' @ 12.28 hrs Storage= 6,049 cf (1,544 cf above start)

Plug-Flow detention time= 148.2 min calculated for 0.357 af (92% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

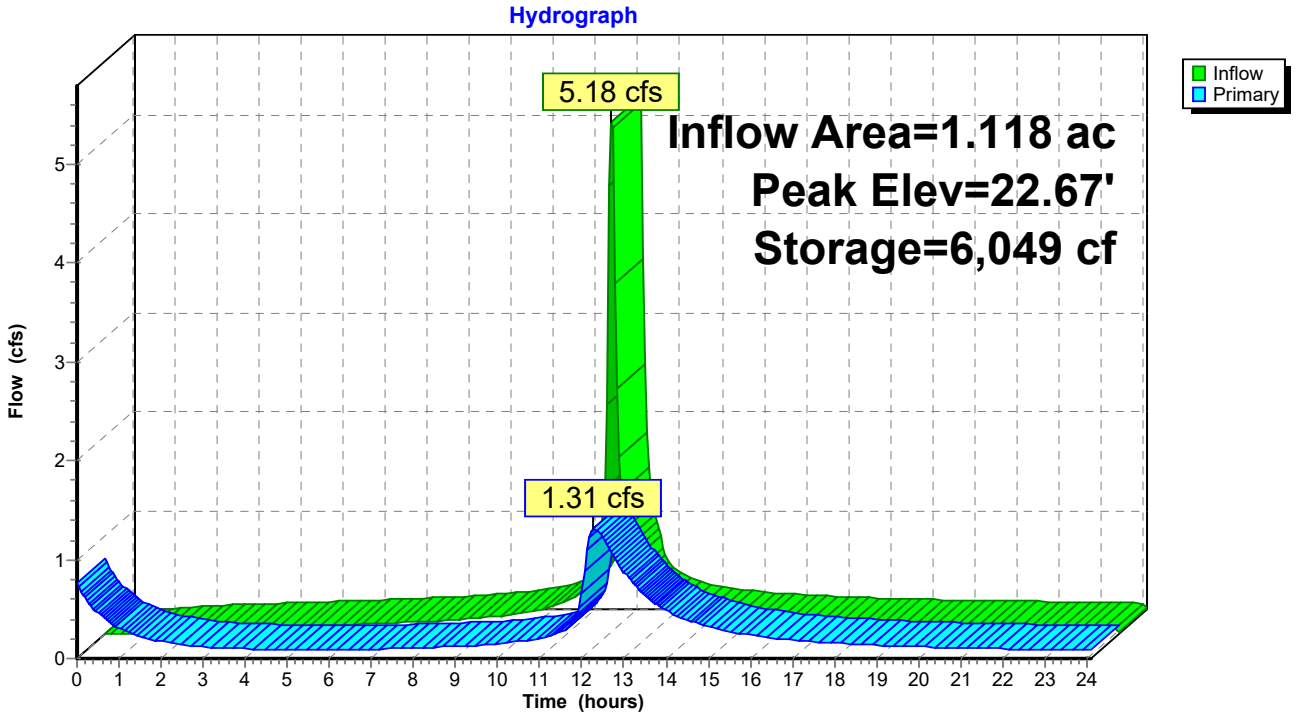
Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	29,613 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	0	0
23.00	9,010	9,010
24.00	9,863	18,873
25.00	10,740	29,613

Device	Routing	Invert	Outlet Devices
#1	Primary	22.00'	**15.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 21.96' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Primary	22.50'	**30.0 deg x 1.33' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=1.31 cfs @ 12.28 hrs HW=22.67' (Free Discharge)
1=Culvert (Barrel Controls 1.30 cfs @ 2.81 fps)
2=Sharp-Crested Vee/Trap Weir (Weir Controls 0.01 cfs @ 1.08 fps)

Pond 25: SWL 2


Hydrograph
5.18 cfs
1.31 cfs
Inflow Area=1.118 ac
Peak Elev=22.67'
Storage=6,049 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Time span=0.00-24.10 hrs, dt=0.05 hrs, 483 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 20: DA 2 Runoff Area=48,685 sf 100.00% Impervious Runoff Depth>4.97"
Tc=6.0 min CN=98 Runoff=6.12 cfs 0.463 af

Pond 25: SWL 2 Peak Elev=22.76' Storage=6,845 cf Inflow=6.12 cfs 0.463 af
Outflow=1.65 cfs 0.533 af

Total Runoff Area = 1.118 ac Runoff Volume = 0.463 af Average Runoff Depth = 4.97"
0.00% Pervious = 0.000 ac 100.00% Impervious = 1.118 ac

Summary for Subcatchment 20: DA 2

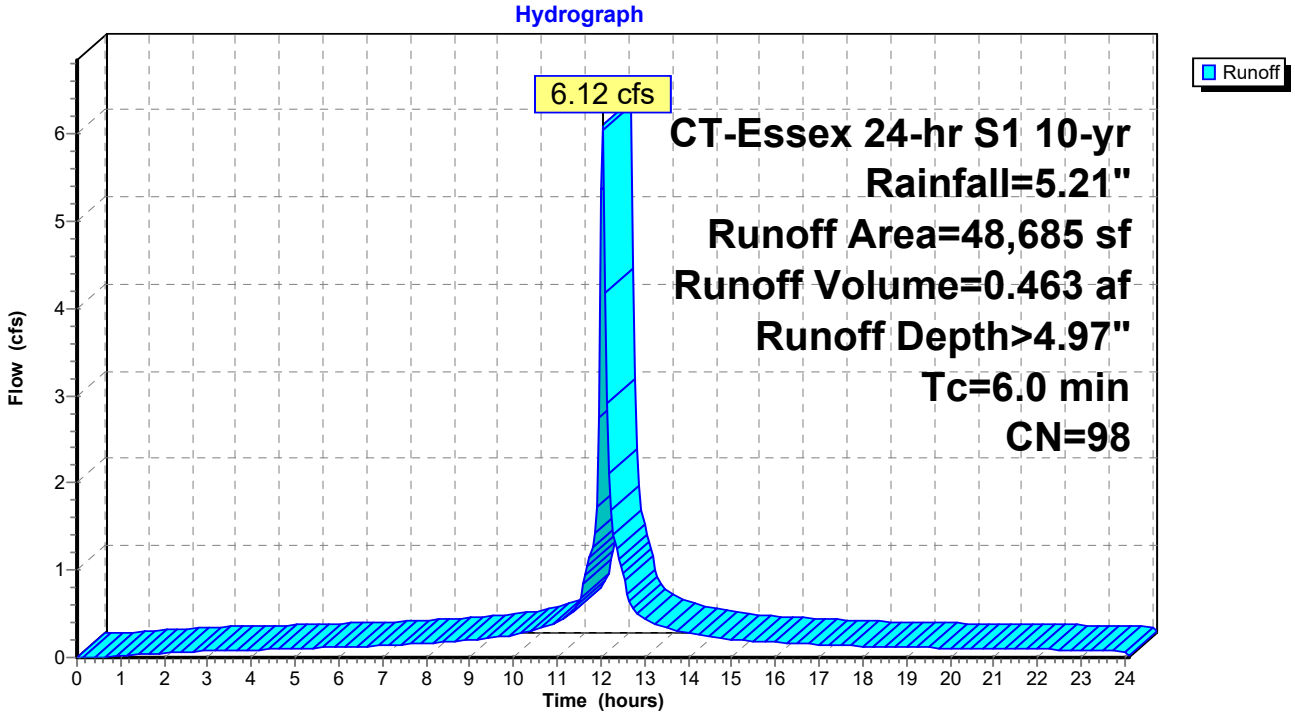
Runoff = 6.12 cfs @ 12.04 hrs, Volume= 0.463 af, Depth> 4.97"
Routed to Pond 25 : SWL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 10-yr Rainfall=5.21"

	Area (sf)	CN	Description
*	48,685	98	
	48,685		100.00% Impervious Area

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

Subcatchment 20: DA 2



Summary for Pond 25: SWL 2

Inflow Area = 1.118 ac,100.00% Impervious, Inflow Depth > 4.97" for 10-yr event
Inflow = 6.12 cfs @ 12.04 hrs, Volume= 0.463 af
Outflow = 1.65 cfs @ 12.26 hrs, Volume= 0.533 af, Atten= 73%, Lag= 13.4 min
Primary = 1.65 cfs @ 12.26 hrs, Volume= 0.533 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 22.50' Storage= 4,505 cf
Peak Elev= 22.76' @ 12.26 hrs Storage= 6,845 cf (2,340 cf above start)

Plug-Flow detention time= 138.0 min calculated for 0.429 af (93% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

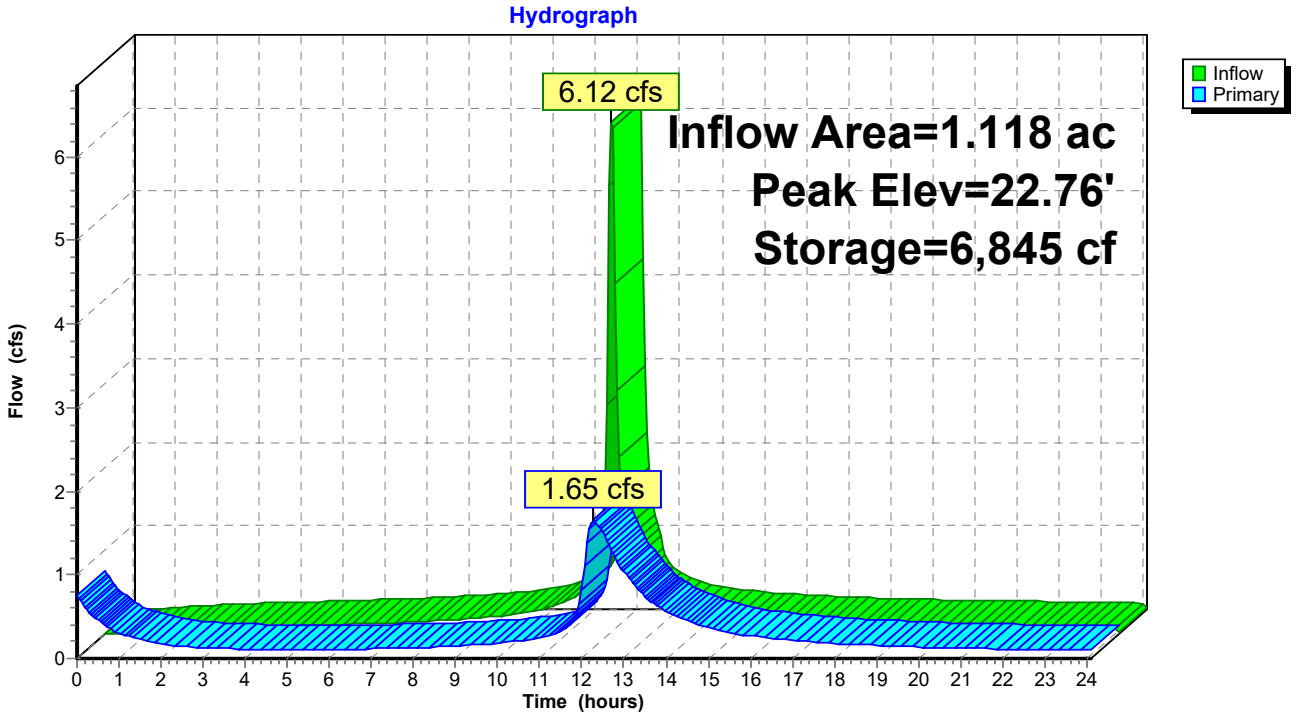
Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	29,613 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	0	0
23.00	9,010	9,010
24.00	9,863	18,873
25.00	10,740	29,613

Device	Routing	Invert	Outlet Devices
#1	Primary	22.00'	**15.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 21.96' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Primary	22.50'	**30.0 deg x 1.33' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=1.64 cfs @ 12.26 hrs HW=22.76' (Free Discharge)
1=Culvert (Barrel Controls 1.62 cfs @ 2.97 fps)
2=Sharp-Crested Vee/Trap Weir (Weir Controls 0.02 cfs @ 1.33 fps)

Pond 25: SWL 2


Hydrograph
6.12 cfs
1.65 cfs
Inflow Area=1.118 ac
Peak Elev=22.76'
Storage=6,845 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Time span=0.00-24.10 hrs, dt=0.05 hrs, 483 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 20: DA 2 Runoff Area=48,685 sf 100.00% Impervious Runoff Depth>6.07"
Tc=6.0 min CN=98 Runoff=7.41 cfs 0.565 af

Pond 25: SWL 2 Peak Elev=22.88' Storage=7,891 cf Inflow=7.41 cfs 0.565 af
Outflow=2.14 cfs 0.633 af

Total Runoff Area = 1.118 ac Runoff Volume = 0.565 af Average Runoff Depth = 6.07"
0.00% Pervious = 0.000 ac 100.00% Impervious = 1.118 ac

Summary for Subcatchment 20: DA 2

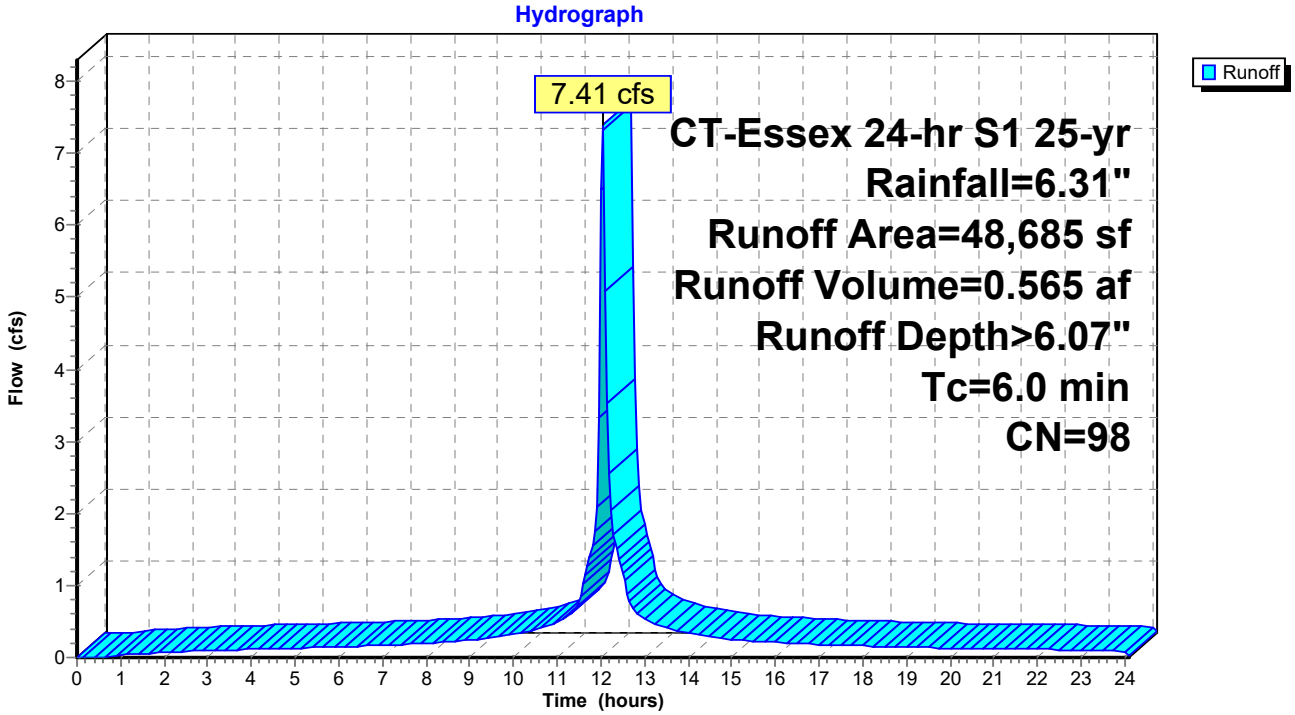
Runoff = 7.41 cfs @ 12.04 hrs, Volume= 0.565 af, Depth> 6.07"
Routed to Pond 25 : SWL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 25-yr Rainfall=6.31"

	Area (sf)	CN	Description
*	48,685	98	
	48,685		100.00% Impervious Area

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

Subcatchment 20: DA 2



Summary for Pond 25: SWL 2

Inflow Area = 1.118 ac,100.00% Impervious, Inflow Depth > 6.07" for 25-yr event
Inflow = 7.41 cfs @ 12.04 hrs, Volume= 0.565 af
Outflow = 2.14 cfs @ 12.25 hrs, Volume= 0.633 af, Atten= 71%, Lag= 12.4 min
Primary = 2.14 cfs @ 12.25 hrs, Volume= 0.633 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 22.50' Storage= 4,505 cf
Peak Elev= 22.88' @ 12.25 hrs Storage= 7,891 cf (3,386 cf above start)

Plug-Flow detention time= 126.8 min calculated for 0.528 af (93% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

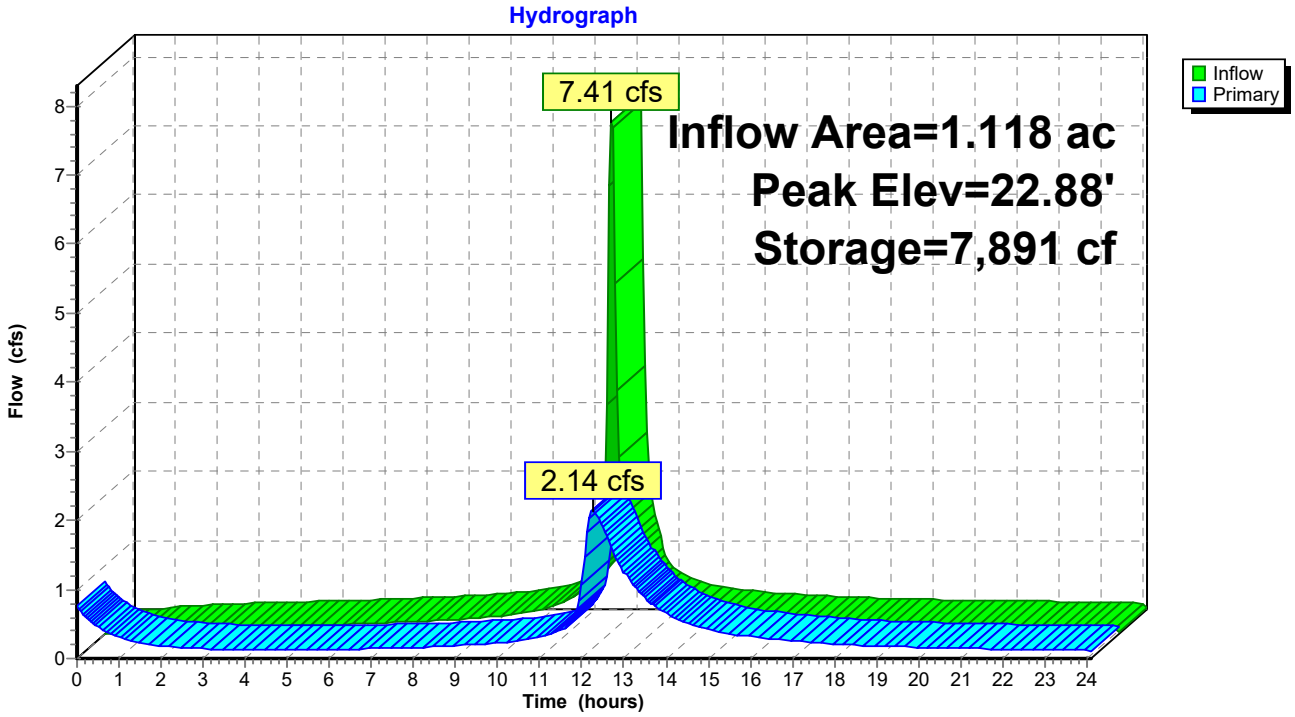
Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	29,613 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	0	0
23.00	9,010	9,010
24.00	9,863	18,873
25.00	10,740	29,613

Device	Routing	Invert	Outlet Devices
#1	Primary	22.00'	**15.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 21.96' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Primary	22.50'	**30.0 deg x 1.33' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=2.13 cfs @ 12.25 hrs HW=22.88' (Free Discharge)
1=Culvert (Barrel Controls 2.07 cfs @ 3.18 fps)
2=Sharp-Crested Vee/Trap Weir (Weir Controls 0.06 cfs @ 1.60 fps)

Pond 25: SWL 2


Hydrograph
7.41 cfs
2.14 cfs
Inflow Area=1.118 ac
Peak Elev=22.88'
Storage=7,891 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Time span=0.00-24.10 hrs, dt=0.05 hrs, 483 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 20: DA 2 Runoff Area=48,685 sf 100.00% Impervious Runoff Depth>6.89"
Tc=6.0 min CN=98 Runoff=8.37 cfs 0.642 af

Pond 25: SWL 2 Peak Elev=22.96' Storage=8,633 cf Inflow=8.37 cfs 0.642 af
Outflow=2.52 cfs 0.707 af

Total Runoff Area = 1.118 ac Runoff Volume = 0.642 af Average Runoff Depth = 6.89"
0.00% Pervious = 0.000 ac 100.00% Impervious = 1.118 ac

Summary for Subcatchment 20: DA 2

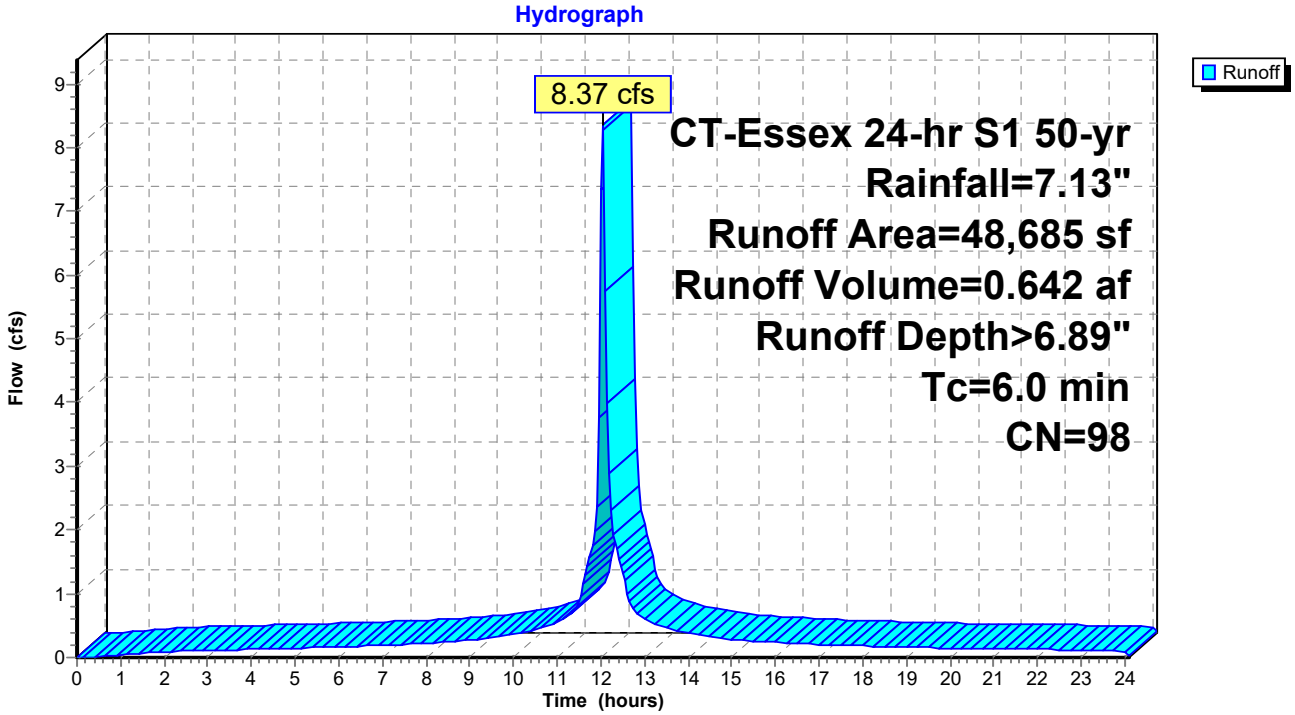
Runoff = 8.37 cfs @ 12.04 hrs, Volume= 0.642 af, Depth> 6.89"
Routed to Pond 25 : SWL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 50-yr Rainfall=7.13"

	Area (sf)	CN	Description
*	48,685	98	
	48,685		100.00% Impervious Area

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

Subcatchment 20: DA 2



Summary for Pond 25: SWL 2

Inflow Area = 1.118 ac,100.00% Impervious, Inflow Depth > 6.89" for 50-yr event
Inflow = 8.37 cfs @ 12.04 hrs, Volume= 0.642 af
Outflow = 2.52 cfs @ 12.23 hrs, Volume= 0.707 af, Atten= 70%, Lag= 11.8 min
Primary = 2.52 cfs @ 12.23 hrs, Volume= 0.707 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 22.50' Storage= 4,505 cf
Peak Elev= 22.96' @ 12.23 hrs Storage= 8,633 cf (4,128 cf above start)

Plug-Flow detention time= 120.5 min calculated for 0.603 af (94% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

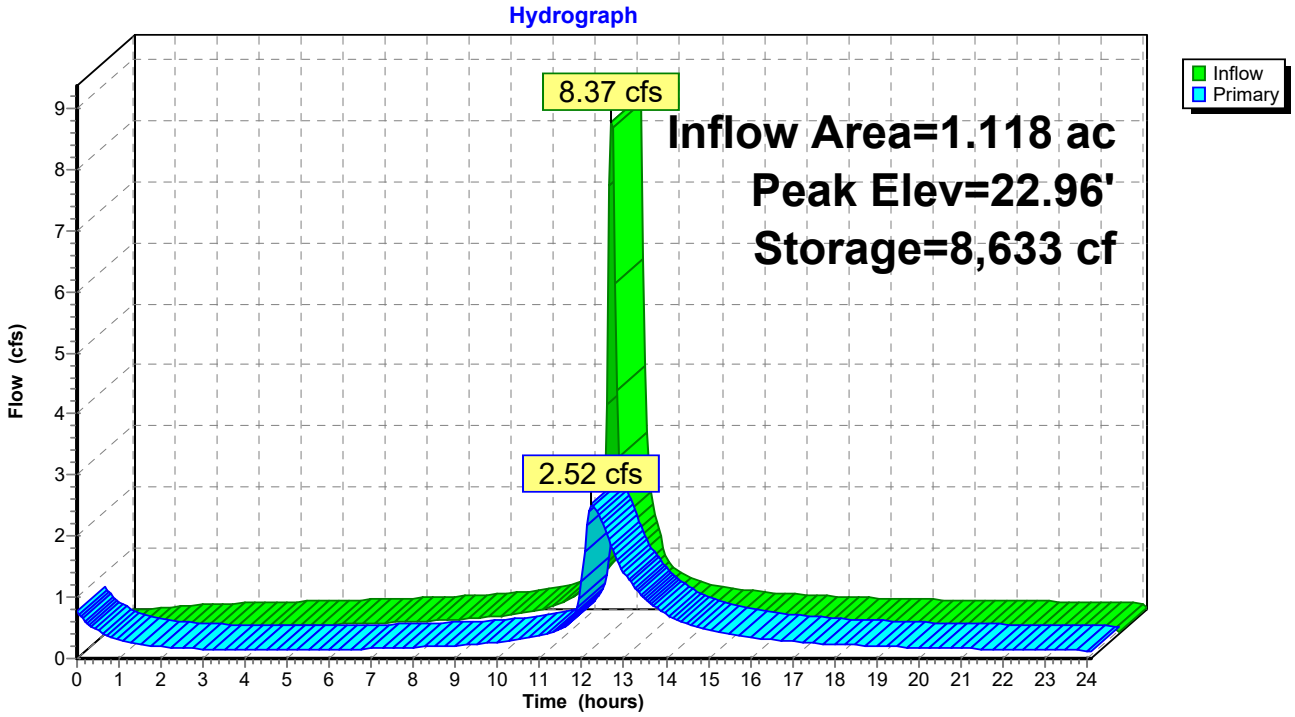
Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	29,613 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	0	0
23.00	9,010	9,010
24.00	9,863	18,873
25.00	10,740	29,613

Device	Routing	Invert	Outlet Devices
#1	Primary	22.00'	**15.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 21.96' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Primary	22.50'	**30.0 deg x 1.33' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=2.51 cfs @ 12.23 hrs HW=22.96' (Free Discharge)
1=Culvert (Barrel Controls 2.41 cfs @ 3.31 fps)
2=Sharp-Crested Vee/Trap Weir (Weir Controls 0.10 cfs @ 1.76 fps)

Pond 25: SWL 2


Hydrograph
8.37 cfs
2.52 cfs
Inflow Area=1.118 ac
Peak Elev=22.96'
Storage=8,633 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Time span=0.00-24.10 hrs, dt=0.05 hrs, 483 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 20: DA 2 Runoff Area=48,685 sf 100.00% Impervious Runoff Depth>7.77"
Tc=6.0 min CN=98 Runoff=9.38 cfs 0.724 af

Pond 25: SWL 2 Peak Elev=23.04' Storage=9,389 cf Inflow=9.38 cfs 0.724 af
Outflow=2.91 cfs 0.786 af

Total Runoff Area = 1.118 ac Runoff Volume = 0.724 af Average Runoff Depth = 7.77"
0.00% Pervious = 0.000 ac 100.00% Impervious = 1.118 ac

Summary for Subcatchment 20: DA 2

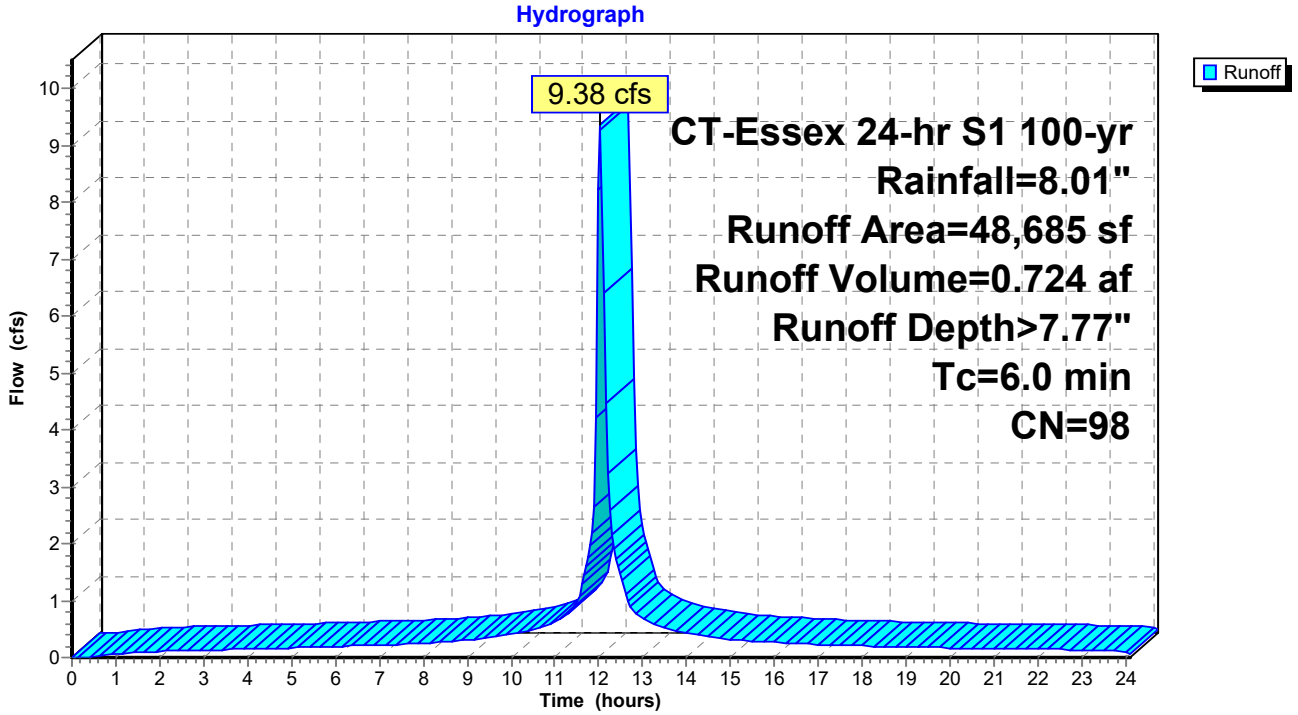
Runoff = 9.38 cfs @ 12.04 hrs, Volume= 0.724 af, Depth> 7.77"
Routed to Pond 25 : SWL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 100-yr Rainfall=8.01"

	Area (sf)	CN	Description
*	48,685	98	
	48,685		100.00% Impervious Area

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

Subcatchment 20: DA 2



Summary for Pond 25: SWL 2

Inflow Area = 1.118 ac,100.00% Impervious, Inflow Depth > 7.77" for 100-yr event
Inflow = 9.38 cfs @ 12.04 hrs, Volume= 0.724 af
Outflow = 2.91 cfs @ 12.23 hrs, Volume= 0.786 af, Atten= 69%, Lag= 11.2 min
Primary = 2.91 cfs @ 12.23 hrs, Volume= 0.786 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 22.50' Storage= 4,505 cf
Peak Elev= 23.04' @ 12.23 hrs Storage= 9,389 cf (4,884 cf above start)

Plug-Flow detention time= 114.4 min calculated for 0.681 af (94% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

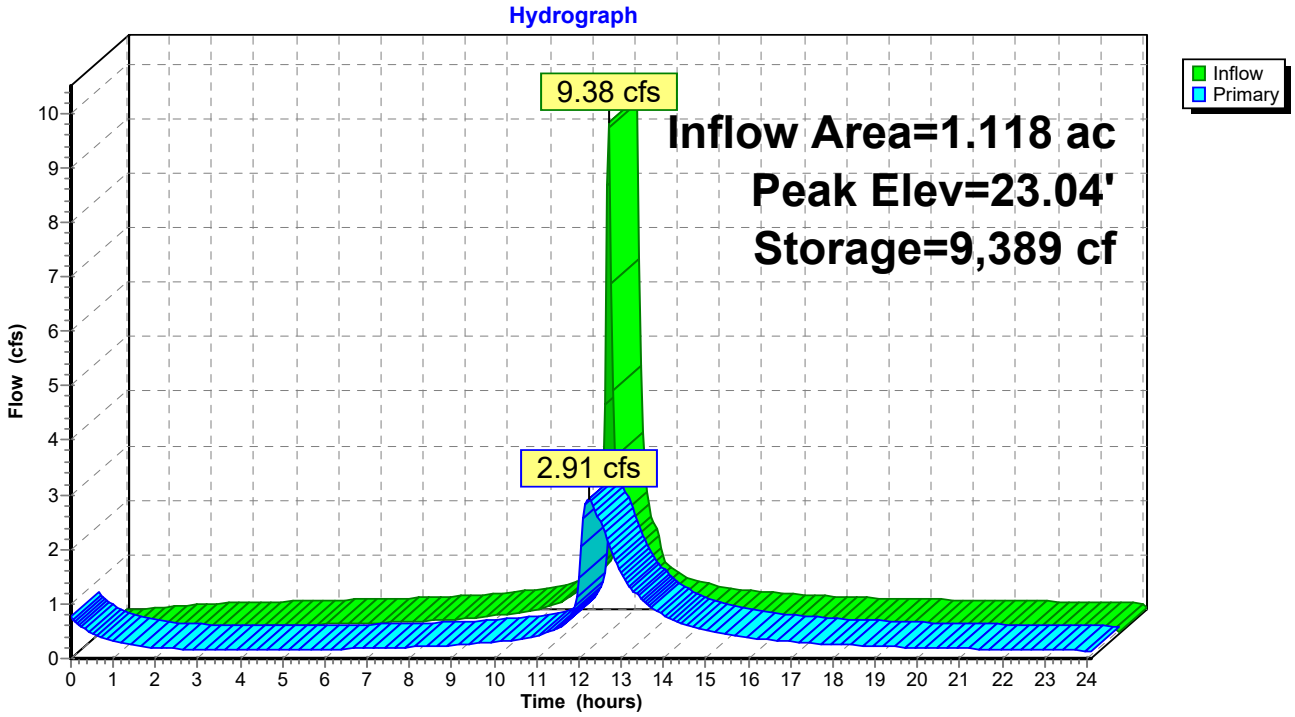
Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	29,613 cf	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	0	0
23.00	9,010	9,010
24.00	9,863	18,873
25.00	10,740	29,613

Device	Routing	Invert	Outlet Devices
#1	Primary	22.00'	**15.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 21.96' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Primary	22.50'	**30.0 deg x 1.33' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=2.90 cfs @ 12.23 hrs HW=23.04' (Free Discharge)
1=Culvert (Barrel Controls 2.76 cfs @ 3.43 fps)
2=Sharp-Crested Vee/Trap Weir (Weir Controls 0.15 cfs @ 1.91 fps)

Pond 25: SWL 2


Hydrograph
9.38 cfs
2.91 cfs
Inflow Area=1.118 ac
Peak Elev=23.04'
Storage=9,389 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Appendix C
NRCS Soils Information

Custom Soil Resource Report
Soil Map

Map Scale: 1:4,210 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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 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 1:12,000.

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 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Dec 31, 2009—Sep 6, 2017

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
13	Walpole sandy loam, 0 to 3 percent slopes	4.2	4.8%
17	Timakwa and Natchaug soils, 0 to 2 percent slopes	34.1	38.6%
18	Catden and Freetown soils, 0 to 2 percent slopes	0.0	0.0%
23A	Sudbury sandy loam, 0 to 5 percent slopes	2.7	3.1%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	4.4	4.9%
36B	Windsor loamy sand, 3 to 8 percent slopes	30.2	34.1%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	0.1	0.1%
221A	Ninigret-Urban land complex, 0 to 5 percent slopes	0.8	0.9%
307	Urban land	9.9	11.2%
701A	Ninigret fine sandy loam, 0 to 3 percent slopes	0.9	1.0%
W	Water	1.2	1.3%
Totals for Area of Interest		**88.3**	**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.

State of Connecticut

13—Walpole sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkl
Elevation: 0 to 1,020 feet
Mean annual precipitation: 36 to 71 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

Walpole and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Walpole

Setting

Landform: Outwash terraces, outwash plains, depressions, deltas, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits derived from igneous, metamorphic and sedimentary rock

Typical profile

Oe - 0 to 1 inches: mucky peat
A - 1 to 7 inches: sandy loam
Bg - 7 to 21 inches: sandy loam
BC - 21 to 25 inches: gravelly sandy loam
C - 25 to 65 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Very high
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 4 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Ecological site: F144AY028MA - Wet Outwash
Hydric soil rating: Yes

Minor Components

Sudbury

Percent of map unit: 10 percent
Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Scarboro

Percent of map unit: 10 percent
Landform: Outwash terraces, deltas, outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

17—Timakwa and Natchaug soils, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2t2qx
Elevation: 0 to 1,420 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Timakwa and similar soils: 45 percent
Natchaug and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Timakwa

Setting

Landform: Depressions
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Herbaceous and woody organic material over sandy and gravelly glaciofluvial deposits

Typical profile

Oa1 - 0 to 12 inches: muck
Oa2 - 12 to 37 inches: muck
2Cg1 - 37 to 47 inches: very gravelly loamy coarse sand

2Cg2 - 47 to 60 inches: gravelly loamy very fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: NoneRare
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Very high (about 14.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY042NY - Semi-Rich Organic Wetlands
Hydric soil rating: Yes

Description of Natchaug

Setting

Landform: Depressions, depressions, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material over loamy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy till

Typical profile

Oa1 - 0 to 12 inches: muck
Oa2 - 12 to 31 inches: muck
2Cg1 - 31 to 39 inches: silt loam
2Cg2 - 39 to 79 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.01 to 14.17 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: RareNone
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 25 percent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Very high (about 17.9 inches)

Interpretive groups

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

Ecological site: F144AY042NY - Semi-Rich Organic Wetlands
Hydric soil rating: Yes

Minor Components

Whitman
Percent of map unit: 7 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

Catden
Percent of map unit: 3 percent
Landform: Kettles, depressions, fens, depressions, depressions, swamps, bogs, marshes
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Maybid
Percent of map unit: 3 percent
Landform: Depressions, terraces, drainageways
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro
Percent of map unit: 2 percent
Landform: Drainageways, outwash terraces, depressions, outwash deltas
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

18—Catden and Freetown soils, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 2t2r2
Elevation: 0 to 1,390 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Merrimac

Percent of map unit: 3 percent
Landform: Kames, eskers, moraines, outwash terraces, outwash plains
Landform position (two-dimensional): Backslope, footslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 2 percent
Landform: Deltas, outwash plains, dunes, outwash terraces
Landform position (three-dimensional): Riser, tread
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

36B—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svkf
Elevation: 0 to 1,210 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Windsor, Loamy Sand

Setting

Landform: Outwash terraces, deltas, outwash plains, dunes
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material

A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: 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
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley, loamy sand

Percent of map unit: 10 percent
Landform: Eskers, kames, deltas, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

73C—Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky

Map Unit Setting

National map unit symbol: 2w698
Elevation: 0 to 1,550 feet
Mean annual precipitation: 36 to 71 inches

Appendix D
NOAA Atlas 14 Precipitation Information

NOAA Atlas 14, Volume 10, Version 3
Location name: Essex, Connecticut, USA*
Latitude: 41.3393°, Longitude: -72.4089°
Elevation: 28.95 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)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.338** (0.259-0.436)	**0.406** (0.311-0.523)	**0.517** (0.394-0.667)	**0.610** (0.462-0.791)	**0.737** (0.543-0.989)	**0.832** (0.601-1.13)	**0.932** (0.657-1.31)	**1.05** (0.700-1.49)	**1.21** (0.780-1.76)	**1.34** (0.847-1.99)
10-min	**0.479** (0.367-0.617)	**0.576** (0.440-0.742)	**0.734** (0.560-0.948)	**0.864** (0.655-1.12)	**1.04** (0.769-1.40)	**1.18** (0.853-1.61)	**1.32** (0.931-1.86)	**1.48** (0.992-2.11)	**1.71** (1.11-2.50)	**1.90** (1.20-2.82)
15-min	**0.564** (0.431-0.726)	**0.677** (0.518-0.872)	**0.862** (0.656-1.11)	**1.02** (0.770-1.32)	**1.23** (0.904-1.65)	**1.39** (1.00-1.89)	**1.55** (1.10-2.18)	**1.74** (1.17-2.48)	**2.01** (1.30-2.94)	**2.23** (1.41-3.32)
30-min	**0.784** (0.599-1.01)	**0.940** (0.719-1.21)	**1.20** (0.912-1.55)	**1.41** (1.07-1.83)	**1.70** (1.25-2.29)	**1.92** (1.39-2.62)	**2.15** (1.52-3.03)	**2.41** (1.62-3.44)	**2.79** (1.80-4.07)	**3.09** (1.96-4.59)
60-min	**1.00** (0.767-1.29)	**1.20** (0.920-1.55)	**1.53** (1.17-1.98)	**1.80** (1.37-2.34)	**2.18** (1.60-2.92)	**2.46** (1.78-3.35)	**2.75** (1.94-3.87)	**3.09** (2.07-4.39)	**3.56** (2.30-5.21)	**3.95** (2.50-5.86)
2-hr	**1.31** (1.01-1.68)	**1.58** (1.21-2.02)	**2.00** (1.54-2.57)	**2.36** (1.80-3.04)	**2.85** (2.11-3.80)	**3.21** (2.34-4.36)	**3.60** (2.56-5.04)	**4.05** (2.72-5.73)	**4.72** (3.06-6.85)	**5.28** (3.35-7.77)
3-hr	**1.53** (1.18-1.94)	**1.83** (1.41-2.33)	**2.33** (1.79-2.97)	**2.74** (2.09-3.51)	**3.30** (2.46-4.39)	**3.72** (2.72-5.04)	**4.18** (2.98-5.83)	**4.71** (3.17-6.62)	**5.50** (3.58-7.95)	**6.17** (3.92-9.05)
6-hr	**1.95** (1.51-2.46)	**2.33** (1.81-2.95)	**2.96** (2.29-3.76)	**3.48** (2.68-4.44)	**4.20** (3.15-5.55)	**4.74** (3.48-6.37)	**5.31** (3.81-7.37)	**5.99** (4.05-8.37)	**7.01** (4.57-10.0)	**7.86** (5.02-11.4)
12-hr	**2.42** (1.90-3.05)	**2.91** (2.27-3.65)	**3.69** (2.88-4.65)	**4.34** (3.37-5.50)	**5.24** (3.95-6.87)	**5.91** (4.37-7.88)	**6.63** (4.77-9.11)	**7.47** (5.07-10.3)	**8.71** (5.71-12.4)	**9.77** (6.25-14.1)
24-hr	**2.85** (2.24-3.55)	**3.44** (2.71-4.29)	**4.41** (3.45-5.52)	**5.21** (4.06-6.55)	**6.31** (4.78-8.23)	**7.13** (5.30-9.46)	**8.01** (5.82-11.0)	**9.07** (6.19-12.5)	**10.7** (7.00-15.0)	**12.0** (7.71-17.2)
2-day	**3.18** (2.52-3.94)	**3.89** (3.08-4.82)	**5.05** (3.98-6.27)	**6.01** (4.71-7.50)	**7.33** (5.60-9.51)	**8.31** (6.23-11.0)	**9.37** (6.87-12.8)	**10.7** (7.32-14.6)	**12.7** (8.40-17.8)	**14.5** (9.36-20.6)
3-day	**3.44** (2.74-4.25)	**4.21** (3.35-5.20)	**5.47** (4.33-6.77)	**6.51** (5.13-8.09)	**7.94** (6.08-10.3)	**9.00** (6.77-11.8)	**10.2** (7.47-13.8)	**11.6** (7.95-15.7)	**13.8** (9.13-19.3)	**15.8** (10.2-22.3)
4-day	**3.70** (2.95-4.55)	**4.50** (3.59-5.55)	**5.82** (4.62-7.18)	**6.91** (5.46-8.57)	**8.41** (6.46-10.8)	**9.52** (7.18-12.5)	**10.7** (7.90-14.6)	**12.2** (8.40-16.6)	**14.6** (9.63-20.2)	**16.6** (10.7-23.3)
7-day	**4.42** (3.54-5.40)	**5.29** (4.24-6.48)	**6.71** (5.36-8.24)	**7.90** (6.27-9.73)	**9.52** (7.34-12.2)	**10.7** (8.11-13.9)	**12.0** (8.86-16.1)	**13.6** (9.39-18.3)	**16.0** (10.6-22.1)	**18.1** (11.7-25.3)
10-day	**5.12** (4.12-6.24)	**6.03** (4.85-7.36)	**7.52** (6.02-9.20)	**8.76** (6.97-10.7)	**10.5** (8.07-13.3)	**11.7** (8.87-15.1)	**13.1** (9.63-17.4)	**14.7** (10.2-19.6)	**17.1** (11.4-23.4)	**19.1** (12.4-26.6)
20-day	**7.27** (5.89-8.80)	**8.25** (6.68-10.0)	**9.87** (7.96-12.0)	**11.2** (8.98-13.7)	**13.0** (10.1-16.4)	**14.4** (10.9-18.4)	**15.9** (11.6-20.7)	**17.5** (12.2-23.1)	**19.7** (13.2-26.7)	**21.5** (14.0-29.6)
30-day	**9.07** (7.38-10.9)	**10.1** (8.21-12.2)	**11.8** (9.55-14.3)	**13.2** (10.6-16.0)	**15.1** (11.7-18.8)	**16.6** (12.6-20.9)	**18.1** (13.2-23.3)	**19.6** (13.7-25.9)	**21.7** (14.5-29.3)	**23.2** (15.2-31.9)
45-day	**11.3** (9.25-13.6)	**12.4** (10.1-14.9)	**14.2** (11.5-17.1)	**15.6** (12.6-18.9)	**17.7** (13.8-21.8)	**19.2** (14.6-24.1)	**20.8** (15.2-26.5)	**22.2** (15.6-29.2)	**24.1** (16.2-32.4)	**25.4** (16.6-34.7)
60-day	**13.2** (10.8-15.8)	**14.3** (11.7-17.2)	**16.2** (13.2-19.4)	**17.7** (14.3-21.3)	**19.8** (15.4-24.3)	**21.4** (16.3-26.7)	**23.0** (16.8-29.1)	**24.4** (17.2-31.9)	**26.1** (17.6-35.0)	**27.3** (17.9-37.1)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

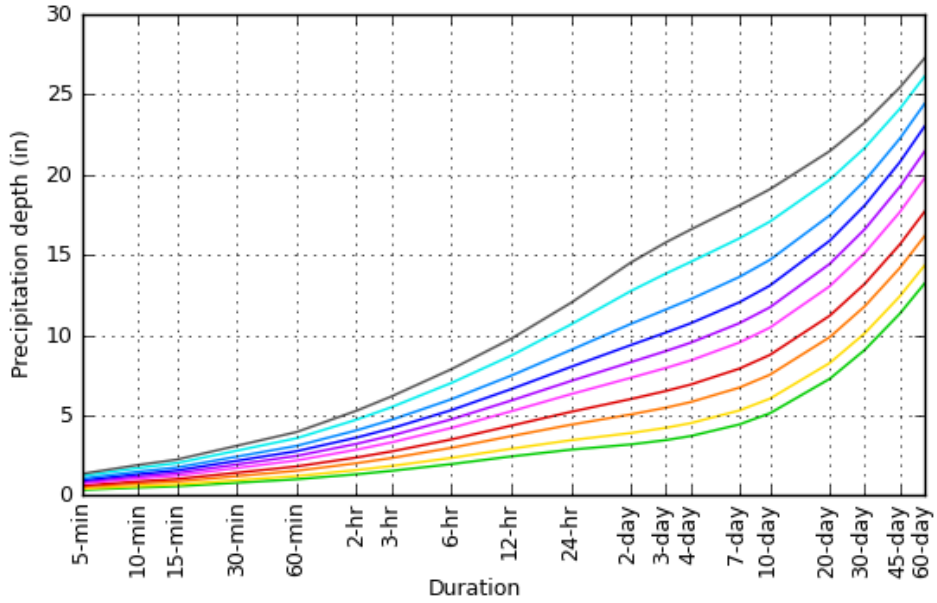
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper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

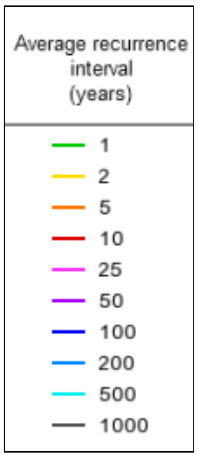
Please refer to NOAA Atlas 14 document for more information.

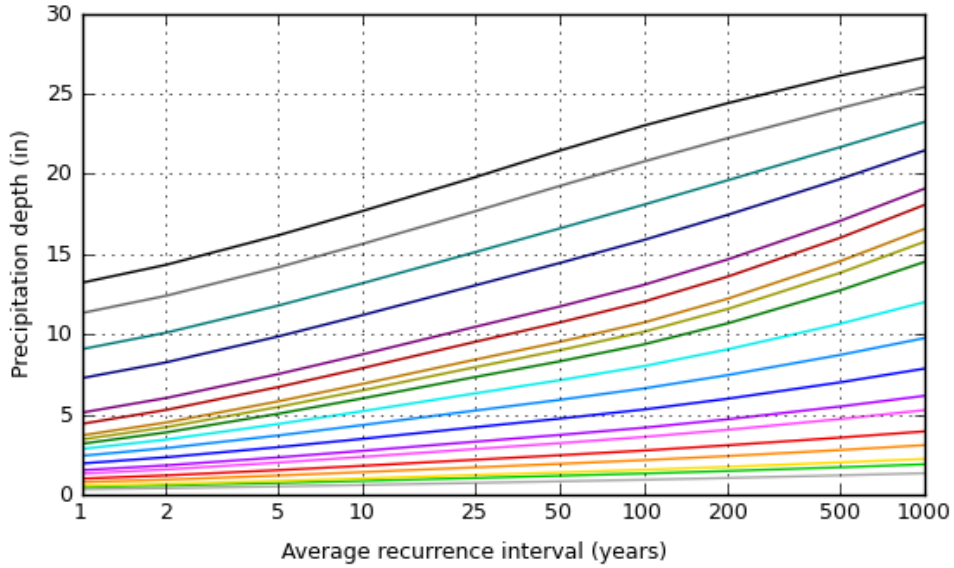
Back to Top

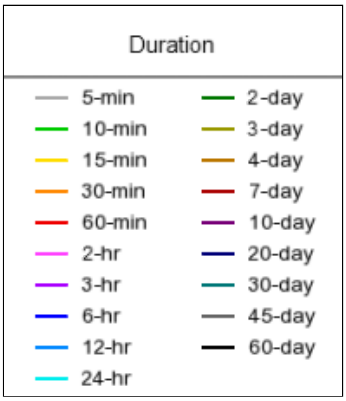
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 41.3393°, Longitude: -72.4089°









NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Mon Aug 2 23:25:17 2021

Back to Top

Maps & aerials

Small scale terrain

Appendix E
Catchment Area Map

N/F
NEW ENGLAND BUILDERS FINISH, LLC
67-3

BOUNDARY ALONG CENTER OF MUD RIVER
698'±

N 57°-56'-41" E 193.20'

N 59°-03'-13" E 392.74'

N 34°-56'-48" W 219.09'

25' Setback

N/F
THOMAS J. MACWHINNEY
67-7

N/F
THOMAS J. MACWHINNEY
67-5

N/F
HELEN MACWHINNEY
67-6

BOKUM ROAD

N 37°-56'-41" W 68.58'

N 37°-56'-41" W 82.29'

N 37°-56'-41" W 160.00'

N 52°-08'-09" E 118.61'

N 52°-08'-09" E 200.80'

S 52°-08'-09" W 204.00'

S 52°-08'-09" W 115.28'

N 19°-30'-09" E 1,409'±

BUILDING 1
F.F. EL. 36.90

BUILDING 2
F.F. EL. 36.90

CA1

CA2

STATE OF CONNECTICUT
VALLEY RAILROAD

N/F
LEE COMPANY
68-7

N/F
SANDRA M. HUBER
67-4-1

Pond

Wetland Setback

Inland Wetland

DA 1
A = 0.80 Ac.
CN = 98
Tc = 0.10 Hr

DA 2
A = 1.12 Ac.
CN = 98
Tc = 0.10 Hr

GRAPHIC SCALE
40 30 20 10 0 40 80 120
(IN FEET)

REVISIONS:

NO.	DATE	DESCRIPTION
		REVISIONS

TITLE:

LAND
OF
GEORGE C. FIELD COMPANY, INC.
BOKUM ROAD
ESSEX, CONNECTICUT

SEAL:

PREPARED BY:

Summer Hill
Civil Engineers & Land Surveyors, P.C.
60 Wall Street
P.O. Box 708
Madison, Connecticut 06443-0708
Telephone: (203) 245-0722

PROJECT:
BOKUM ROAD BUSINESS PARK
BOKUM ROAD
ESSEX, CONNECTICUT

DATE: 7-1-21
SCALE: 1"=40'
DESIGNED: MJO
CHECKED: LJM

SHEET:
CATCHMENT AREA MAP

FIELD BOOK: -
PROJECT NO.: 20-50

SHEET NO.:
CA 1