

# Stormwater Management Report

*For the Proposed:*

## **Chipotle Restaurant**

*Located at:*

1313 East Main Street  
Torrington, Connecticut

*Prepared for Submission to:*

**City of Torrington, Connecticut**

August 6, 2020

*Prepared for:*

**Garrett Homes, LLC**

59 Field Street  
Torrington, CT

*Prepared by:*



### **BL Companies**

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BL Project Number: 2000995

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## Executive Summary

This report has been prepared in support of a Permit Application by Garrett Homes, LLC to the City of Torrington for the proposed Chipotle Restaurant at 1313 East Main Street. The project parcel, located at 1313 East Main St., is approximately 1.25 acres in size and is currently developed with a 2,576 square foot pizza restaurant building, a 2165 square foot bank building, and a 782 square foot single family residential building with a 318 square foot detached garage. The entire site has been previously developed containing impervious paved parking with drive aisle areas, turf and paved islands, a lawn surrounding the house, and a patio behind the pizza restaurant. The south side of the property fronts on East Main St. across from Pfeffer Lane and the northwest side of the property fronts on Tarringford West St. It is bordered by commercial properties to the east and west, and residential property to the north.

In general, the existing topography slopes from northeast to southwest across the site from approximately elevation 1018' to 1009'. Slopes on site vary from approximately 2% to 6%. In the existing condition, approximately 80% of the stormwater flows to East Main St., with the remaining 20% flowing to Tarringford West St. Stormwater is mostly collected in catch basins that connect to the city drainage system. There is some sheet flow that flows directly to East Main St. where it enters a catch basin at the corner of Tarringford West St. and East Main St. There are currently no formal stormwater management systems located within the project parcel.

Proposed site improvements will include removing the existing bank building and residential house and garage, a 2,288 square foot Chipotle restaurant building, paved parking areas and driveways, landscaped areas, pedestrian sidewalks, site utilities and lighting, and a stormwater management system.

The proposed stormwater management system is designed to be in compliance with the 2002 State of Connecticut Guidelines for Soil Erosion and Sediment Control, and the 2004 State of Connecticut Stormwater Quality Manual.

A HydroCAD model, using TR-55 methodology, was developed to evaluate the existing and proposed drainage conditions of the property. The results of the analysis demonstrate that there will not be an increase in peak stormwater runoff rates for the 2-, 5-, 10-, 25-, and 100-year storm events. The proposed site development will reduce overall impervious area on the site by 1500 sf. Due to the reduction in impervious area, the peak flows for the site were reduced slightly without the use of detention.

Stormwater quality is being addressed by a formalized street sweeping program, deep sump and hooded outlet catch basins, and a hydrodynamic separator. These features will provide the minimum required 80% TSS removal as required in the CT Stormwater Quality Manual.

## Existing Site Conditions and Hydrologic Conditions

### *General Site Information*

The site soils identified by the United States Department of Agriculture (USDA) Natural Resources Conservation Services (NRCS) are Urban land and Paxton and Montauk fine sandy loams, 3 to 8 percent slopes. Per the USDA, the NRCS Hydrologic Soil Group ratings for soils within the project area are D and C respectively. A copy of the USDA NRCS Hydrologic Soil Group Map is included in Appendix A for reference.

Per the FEMA Flood Insurance Rate Map Number 0950810008B for the City of Torrington, Connecticut in Litchfield County, map revised date: April 4, 1983, the site resides in Zone C FEMA Flood Hazard Area, area of minimal flooding. A copy of the FEMA Flood insurance rate Map is included in Appendix A for reference.

### *Existing Hydrologic Conditions*

The existing site contains two drainage areas that were analyzed totaling 1.38 acres and are approximately 74.7% impervious. These areas include a portion of the residential property to the north of the site from which runoff sheet flows onto the project parcel. There is currently no existing stormwater management system onsite. Stormwater from the subject property flows untreated into the Tarringford West St. and East Main St. drainage systems by means of catch basins and sheet flow directly to the roadway. The two drainage systems connect at the corner of the two streets approximately 200' from the site. This catch basin was used as design point 1 DP-1 for the site.

The following is a brief analysis of the existing drainage areas as shown on the enclosed Existing Drainage Mapping (ED-1) Map, in Appendix E.

**Existing Drainage Area 10 (EDA-10):** This drainage area consists of the project parcel area that drains to East Main St. via catch basins and sheet flow directly to the roadway. It is 1.02 acres and is approximately 79.7% impervious. EDA-10 consists of buildings, parking areas, driveways and small lawn areas.

**Existing Drainage Area 20 (EDA-20):** This drainage area consists of the project parcel area and neighboring residential property that drains to Tarringford West St. via catch. It is 0.35 acres and is approximately 60.0% impervious. EDA-20 consists of buildings, parking areas, driveways and lawn areas.

**Table 1 – Pre-Development (Existing Conditions) Drainage Characteristics.**

Drainage Area	Area (square feet)	Composite Curve Number	Impervious Cover (%)	Time of Concentration (minutes)
EDA-10 (Area to East Main St.)	44,597	95	79.7	5.0
EDA-20 (Area to Tarringford W. St.)	15,383	91	60.0	5.0

**Table 2 – Pre-Development Conditions Peak Flows**

Analysis Point	Peak Flow (cfs)				
	2-yr	5-yr	10-yr	25-yr	100-yr
Design Point 1 (CB at corner of both roads)	6.52	8.99	11.04	13.82	18.08

### Developed Site Conditions and Hydrologic Conditions

In the proposed condition, stormwater from the site will connect to an existing pipe connecting to the stormwater system in East Main St. The stormwater system will also provide stormwater quality improvements through the implementation of a formalized street sweeping program for the impervious surfaces and the installation of deep sump and hooded outlet catch basins, and a hydrodynamic separator. These measures will treat the stormwater quality flow through structural means to provide water quality treatment in conformance with the State of Connecticut Water Quality Manual.

The proposed site drainage area totals 1.41 acres and is approximately 70.3% impervious. The intent of the proposed site drainage is to match existing drainage patterns to the maximum extent practical. For the hydrologic analysis, the developed site retained the same Design Point as the existing model. The following drainage area was developed to model the proposed site improvements.

**Proposed Drainage Area 100 (PDA-100):** This drainage area consists of the project parcel and the section of residential property to the north of the property. The entire drainage area will pass through a hydrodynamic separator to provide water quality treatment before entering the drainage system on East Main St. Design point 1 (catch basin at corner of Tarringford West St. and East Main St.) was used to determine peak flows to match with the existing conditions. This is next

structure downstream from the site and is where stormwater previously sheet flowing off the site flowed to.

**Table 3 – Post-Development Drainage Characteristics.**

<b>Drainage Area</b>	<b>Area (square feet)</b>	<b>Composite Curve Number</b>	<b>Impervious Cover (%)</b>	<b>Time of Concentration (minutes)</b>
PDA-100 (Area to East Main St.)	61,436	93	70.3	5.6

**Table 4 – Post-Development Conditions Peak Flows**

<b>Analysis Point</b>	<b>Peak Flow (cfs)</b>				
	<b>2-yr</b>	<b>5-yr</b>	<b>10-yr</b>	<b>25-yr</b>	<b>100-yr</b>
Design Point 1 (CB at corner of both roads)	6.39	8.89	10.94	13.74	18.02

**Table 5 – Existing vs Proposed Peak Rates of Runoff**

<b>Drainage Area</b>	<b>Peak Flow Rate in Cubic Feet per Second (cfs)</b>				
	<b>2-yr</b>	<b>5-yr</b>	<b>10-yr</b>	<b>25-yr</b>	<b>100-yr</b>
<b>Design Point 1</b>					
Existing	6.52	8.99	11.04	13.82	18.08
Proposed	6.39	8.89	10.94	13.74	18.02
Percent Change	-2.0%	-1.1%	-0.9%	-0.6%	-0.3%

## Stormwater Management

### *Hydrologic Modeling of the Entire Site*

The hydrologic analysis to determine peak stormwater discharge rates was performed using the HydroCAD stormwater modeling system computer program, version 10.00 developed by HydroCAD Software Solutions, LLC. Hydrographs for each watershed were developed using the SCS Synthetic Unit Hydrograph Method. Rainfall depths and distribution per the NOAA Atlas 14

for Torrington, CT were used for the calculation of peak flow rates and are listed in Table 6. The drainage areas, or subcatchments as labeled by the program, are depicted by hexagons on the attached drainage diagrams. Pre-development HydroCAD output can be found in Appendix B and Post-development HydroCAD output can be found in Appendix C.

**Table 6 – Rainfall Depths per NOAA Atlas 14  
Appendix B - 24 hour Rainfall Data**

<b>Return Period</b>	<b>24-hour Rainfall Depth</b>
2-year	3.54”
5-year	4.74”
10-year	5.74”
25-year	7.11”
100-year	9.22”

### Summary

The post-development peak discharge rates for the total developed site have been decreased for all storm events. All post development stormwater will be discharged offsite to match existing drainage patterns. Stormwater quality is being addressed by a formalized street sweeping program, deep sump and hooded outlet catch basins, and a hydrodynamic separator. These features will provide the minimum required 80% TSS removal as required in the CT Stormwater Manual. The proposed stormwater management system will meet the stormwater quality requirements of the State of Connecticut.

## APPENDIX A

### LOCATION MAPS

Figure 1: USGS Location Map

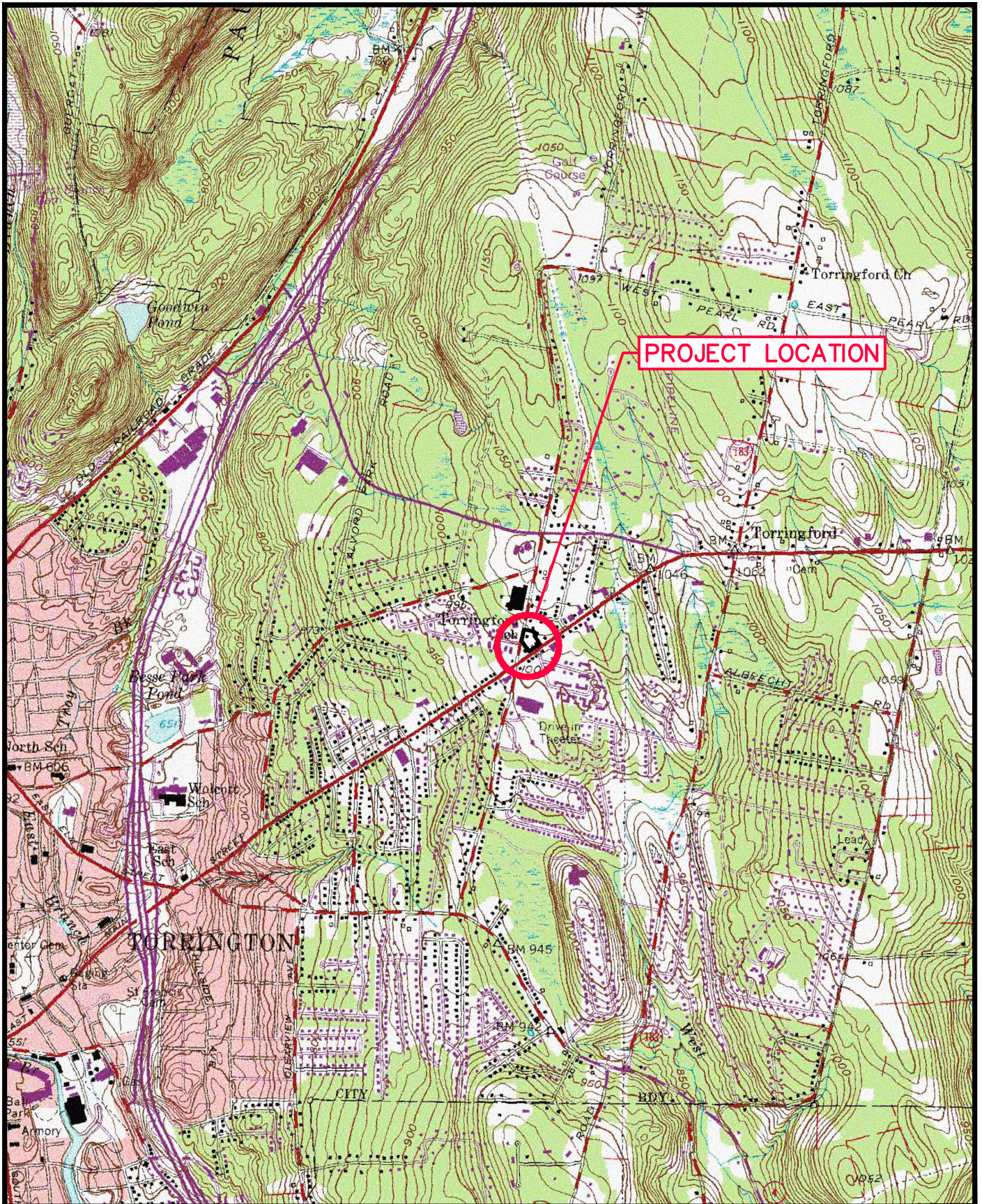
Figure 2: Aerial Location Map

Figure 3: NRCS Soil Survey Map with Hydrologic Soil Group Data

Figure 4: FEMA Federal Insurance Rate Map

Figure 5: NOAA Atlas 14 Storm Data



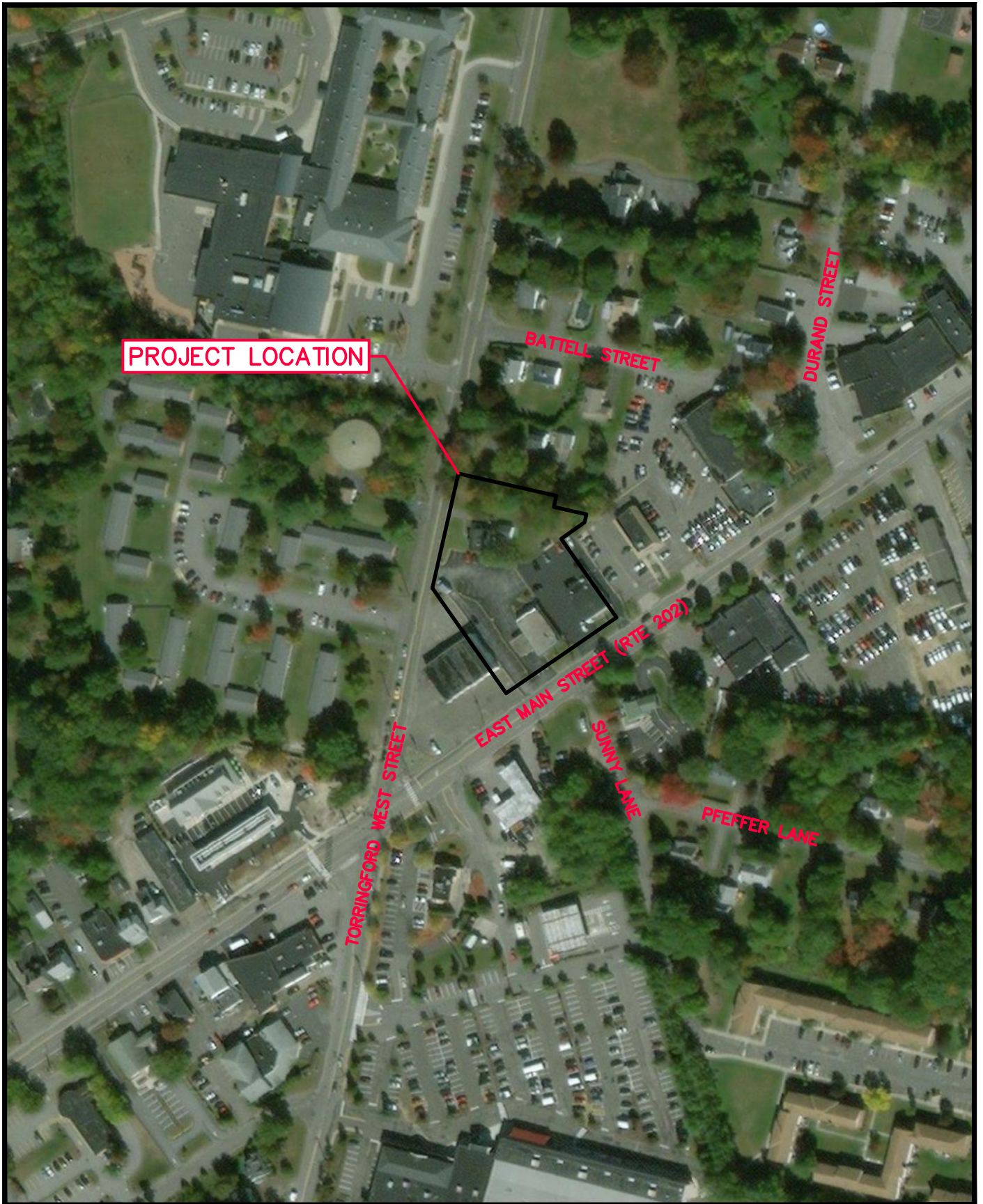


ARCHITECTURE  
 ENGINEERING  
 ENVIRONMENTAL  
 LAND SURVEYING

**PROPOSED CHIPOTLE  
 RESTAURANT**  
 1313 EAST MAIN STREET  
 TORRINGTON, CONNECTICUT

Designed E.P.Z.  
 Drawn E.P.Z.  
 Checked J.A.B.  
 Approved M.J.B.  
 Scale 1"=2,000'  
 Project No. 2000995  
 Date 08/06/2020  
 CAD File LOC200099501

**FIGURE 1**  
**USGS LOCATION MAP**



ARCHITECTURE  
ENGINEERING  
ENVIRONMENTAL  
LAND SURVEYING

**PROPOSED CHIPOTLE  
RESTAURANT**

1313 EAST MAIN STREET  
TORRINGTON, CONNECTICUT

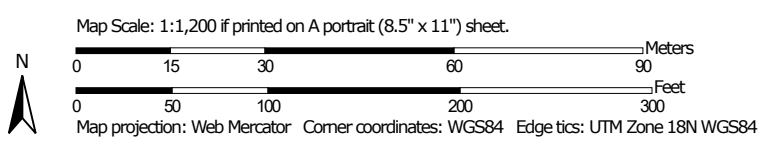
Designed	E.P.Z.
Drawn	E.P.Z.
Checked	J.A.B.
Approved	M.J.B.
Scale	1"=200'
Project No.	2000995
Date	08/06/2020
CAD File	LOC200099501

**FIGURE 2**  
**AERIAL LOCATION MAP**

Hydrologic Soil Group—State of Connecticut  
 (1313 East Main St. Torrington, CT)




Soil Map may not be valid at this scale.



## 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 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: Sep 29, 2013—Oct 16, 2016

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
46B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	C/D	0.0	0.4%
84B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes	C	1.4	20.2%
86C	Paxton and Montauk fine sandy loams, 3 to 15 percent slopes, extremely stony	C	0.9	13.2%
306	Udorthents-Urban land complex	B	0.8	11.4%
307	Urban land	D	3.8	54.8%
<b>Totals for Area of Interest</b>			<b>7.0</b>	<b>100.0%</b>



KEY TO MAP	
500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	ZONE A
Zone Designation With Date of Identification	ZONE A DATE
100-Year Flood Boundary	ZONE B DATE
500-Year Flood Boundary	ZONE B
Base Flood Elevation Line With Elevation of Feet**	5-2.5
Base Flood Elevation in Feet	(E1.987)
Which Uniform With Zone**	
Elevation Reference Mark	BM7x
Zone B Boundary	
River Mile	411.5

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

**\*EXPLANATION OF ZONE DESIGNATIONS**

ZONE	EXPLANATION
A	Area of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Area 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.
AH	Area 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	Area of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Area of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Area between limits of the 100-year flood and 500-year flood; no specific area subject to 100-year flooding is shown; contributing drainage area is less than one square mile; or area protected by levee from the base flood. (Medium shading)
C	Area of minimal flooding. (No shading)
D	Area of undetermined, but possible, flood hazards.
V	Area of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Area 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 streambed features outside special flood hazard areas.  
 For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:  
 JULY 1, 1970  
 FLOOD HAZARD BOUNDARY MAP REVISIONS:  
 NONE

FLOOD INSURANCE RATE MAP EFFECTIVE:  
 MAY 19, 1972

FLOOD INSURANCE RATE MAP REVISIONS:  
 July 1, 1974 - to change zone designations.  
 March 5, 1976 - to reflect curvilinear flood boundary and to add special flood hazard areas.  
 April 4, 1983 - to add special flood hazard areas, to change base flood elevations, to change zone designations.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6026.



**NATIONAL FLOOD INSURANCE PROGRAM**

**FIRM FLOOD INSURANCE RATE MAP**

**CITY OF TORRINGTON, CONNECTICUT LITCHFIELD COUNTY**

**PANEL 8 OF 14 (SEE MAP INDEX FOR PANELS NOT PRINTED)**

**COMMUNITY-PANEL NUMBER 095081008 B**

**MAP REVISED: APRIL 4, 1983**



Federal Emergency Management Agency

## 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



**NOAA Atlas 14, Volume 10, Version 3**  
**Location name: Torrington, Connecticut, USA\***  
**Latitude: 41.8173°, Longitude: -73.0924°**  
**Elevation: 1010.49 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**

<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b>										
<b>Duration</b>	<b>Average recurrence interval (years)</b>									
	<b>1</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>200</b>	<b>500</b>	<b>1000</b>
<b>5-min</b>	<b>0.360</b> (0.274-0.468)	<b>0.428</b> (0.326-0.558)	<b>0.540</b> (0.410-0.707)	<b>0.634</b> (0.478-0.832)	<b>0.762</b> (0.557-1.04)	<b>0.859</b> (0.618-1.20)	<b>0.959</b> (0.670-1.39)	<b>1.07</b> (0.713-1.59)	<b>1.21</b> (0.783-1.87)	<b>1.33</b> (0.839-2.09)
<b>10-min</b>	<b>0.510</b> (0.388-0.663)	<b>0.607</b> (0.461-0.791)	<b>0.766</b> (0.580-1.00)	<b>0.898</b> (0.677-1.18)	<b>1.08</b> (0.790-1.48)	<b>1.22</b> (0.874-1.70)	<b>1.36</b> (0.949-1.97)	<b>1.51</b> (1.01-2.25)	<b>1.72</b> (1.11-2.65)	<b>1.88</b> (1.19-2.97)
<b>15-min</b>	<b>0.599</b> (0.456-0.780)	<b>0.714</b> (0.543-0.930)	<b>0.901</b> (0.683-1.18)	<b>1.06</b> (0.796-1.39)	<b>1.27</b> (0.929-1.74)	<b>1.43</b> (1.03-2.00)	<b>1.60</b> (1.12-2.32)	<b>1.78</b> (1.19-2.65)	<b>2.02</b> (1.31-3.12)	<b>2.21</b> (1.40-3.49)
<b>30-min</b>	<b>0.817</b> (0.621-1.06)	<b>0.972</b> (0.739-1.27)	<b>1.23</b> (0.930-1.61)	<b>1.44</b> (1.09-1.89)	<b>1.73</b> (1.27-2.37)	<b>1.95</b> (1.40-2.73)	<b>2.18</b> (1.52-3.16)	<b>2.42</b> (1.62-3.61)	<b>2.75</b> (1.78-4.25)	<b>3.01</b> (1.91-4.76)
<b>60-min</b>	<b>1.03</b> (0.787-1.35)	<b>1.23</b> (0.936-1.60)	<b>1.55</b> (1.18-2.03)	<b>1.82</b> (1.37-2.40)	<b>2.19</b> (1.60-3.00)	<b>2.47</b> (1.77-3.46)	<b>2.76</b> (1.93-3.99)	<b>3.06</b> (2.05-4.57)	<b>3.48</b> (2.25-5.39)	<b>3.81</b> (2.41-6.02)
<b>2-hr</b>	<b>1.36</b> (1.04-1.76)	<b>1.60</b> (1.22-2.07)	<b>1.99</b> (1.51-2.58)	<b>2.31</b> (1.75-3.01)	<b>2.75</b> (2.03-3.76)	<b>3.08</b> (2.23-4.30)	<b>3.43</b> (2.42-4.97)	<b>3.82</b> (2.57-5.68)	<b>4.37</b> (2.84-6.74)	<b>4.82</b> (3.06-7.60)
<b>3-hr</b>	<b>1.58</b> (1.21-2.04)	<b>1.85</b> (1.42-2.39)	<b>2.30</b> (1.76-2.98)	<b>2.67</b> (2.04-3.48)	<b>3.19</b> (2.36-4.34)	<b>3.57</b> (2.60-4.98)	<b>3.97</b> (2.82-5.77)	<b>4.44</b> (2.99-6.59)	<b>5.13</b> (3.33-7.90)	<b>5.71</b> (3.63-8.97)
<b>6-hr</b>	<b>1.99</b> (1.54-2.54)	<b>2.37</b> (1.83-3.03)	<b>2.99</b> (2.30-3.84)	<b>3.50</b> (2.68-4.53)	<b>4.21</b> (3.15-5.74)	<b>4.74</b> (3.48-6.62)	<b>5.31</b> (3.81-7.75)	<b>6.00</b> (4.05-8.88)	<b>7.07</b> (4.60-10.9)	<b>7.98</b> (5.09-12.5)
<b>12-hr</b>	<b>2.42</b> (1.88-3.07)	<b>2.96</b> (2.30-3.77)	<b>3.86</b> (2.99-4.93)	<b>4.60</b> (3.55-5.92)	<b>5.63</b> (4.23-7.65)	<b>6.38</b> (4.72-8.91)	<b>7.21</b> (5.23-10.6)	<b>8.26</b> (5.59-12.2)	<b>9.91</b> (6.48-15.2)	<b>11.4</b> (7.27-17.8)
<b>24-hr</b>	<b>2.81</b> (2.20-3.55)	<b>3.54</b> (2.77-4.48)	<b>4.74</b> (3.69-6.02)	<b>5.74</b> (4.45-7.33)	<b>7.11</b> (5.38-9.65)	<b>8.10</b> (6.05-11.3)	<b>9.22</b> (6.77-13.6)	<b>10.7</b> (7.25-15.7)	<b>13.1</b> (8.56-20.0)	<b>15.2</b> (9.74-23.7)
<b>2-day</b>	<b>3.16</b> (2.49-3.96)	<b>4.05</b> (3.19-5.09)	<b>5.51</b> (4.32-6.95)	<b>6.73</b> (5.24-8.53)	<b>8.40</b> (6.41-11.4)	<b>9.60</b> (7.23-13.4)	<b>11.0</b> (8.15-16.2)	<b>12.8</b> (8.74-18.8)	<b>15.9</b> (10.5-24.3)	<b>18.8</b> (12.1-29.1)
<b>3-day</b>	<b>3.45</b> (2.72-4.30)	<b>4.43</b> (3.50-5.54)	<b>6.04</b> (4.75-7.58)	<b>7.37</b> (5.77-9.31)	<b>9.20</b> (7.06-12.4)	<b>10.5</b> (7.96-14.7)	<b>12.0</b> (8.98-17.8)	<b>14.1</b> (9.63-20.6)	<b>17.6</b> (11.6-26.8)	<b>20.8</b> (13.4-32.2)
<b>4-day</b>	<b>3.71</b> (2.94-4.62)	<b>4.76</b> (3.76-5.93)	<b>6.47</b> (5.11-8.11)	<b>7.90</b> (6.20-9.96)	<b>9.86</b> (7.58-13.3)	<b>11.3</b> (8.54-15.7)	<b>12.9</b> (9.63-19.0)	<b>15.1</b> (10.3-22.1)	<b>18.8</b> (12.4-28.6)	<b>22.2</b> (14.4-34.4)
<b>7-day</b>	<b>4.43</b> (3.53-5.48)	<b>5.61</b> (4.47-6.96)	<b>7.55</b> (5.99-9.41)	<b>9.16</b> (7.22-11.5)	<b>11.4</b> (8.77-15.2)	<b>13.0</b> (9.86-17.9)	<b>14.8</b> (11.1-21.6)	<b>17.3</b> (11.8-25.1)	<b>21.4</b> (14.1-32.3)	<b>25.1</b> (16.2-38.7)
<b>10-day</b>	<b>5.16</b> (4.12-6.37)	<b>6.41</b> (5.12-7.93)	<b>8.46</b> (6.73-10.5)	<b>10.2</b> (8.03-12.7)	<b>12.5</b> (9.65-16.7)	<b>14.2</b> (10.8-19.5)	<b>16.1</b> (12.0-23.4)	<b>18.7</b> (12.8-27.1)	<b>22.9</b> (15.2-34.5)	<b>26.7</b> (17.3-41.1)
<b>20-day</b>	<b>7.49</b> (6.03-9.19)	<b>8.79</b> (7.06-10.8)	<b>10.9</b> (8.73-13.4)	<b>12.7</b> (10.1-15.7)	<b>15.1</b> (11.7-19.8)	<b>16.8</b> (12.8-22.8)	<b>18.8</b> (14.0-26.8)	<b>21.3</b> (14.8-30.8)	<b>25.4</b> (16.9-38.1)	<b>29.0</b> (18.8-44.5)
<b>30-day</b>	<b>9.43</b> (7.61-11.5)	<b>10.7</b> (8.65-13.1)	<b>12.9</b> (10.3-15.8)	<b>14.6</b> (11.7-18.1)	<b>17.1</b> (13.2-22.3)	<b>18.9</b> (14.3-25.3)	<b>20.8</b> (15.4-29.3)	<b>23.2</b> (16.1-33.4)	<b>26.9</b> (18.0-40.4)	<b>30.2</b> (19.7-46.3)
<b>45-day</b>	<b>11.8</b> (9.56-14.4)	<b>13.1</b> (10.6-16.0)	<b>15.3</b> (12.3-18.7)	<b>17.1</b> (13.7-21.1)	<b>19.6</b> (15.2-25.3)	<b>21.5</b> (16.3-28.5)	<b>23.4</b> (17.3-32.5)	<b>25.7</b> (17.9-36.7)	<b>28.9</b> (19.4-43.2)	<b>31.6</b> (20.6-48.3)
<b>60-day</b>	<b>13.7</b> (11.2-16.7)	<b>15.1</b> (12.3-18.4)	<b>17.4</b> (14.1-21.2)	<b>19.3</b> (15.5-23.6)	<b>21.8</b> (17.0-28.0)	<b>23.8</b> (18.1-31.3)	<b>25.8</b> (18.9-35.3)	<b>27.9</b> (19.5-39.8)	<b>30.7</b> (20.6-45.7)	<b>32.8</b> (21.5-50.2)

<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.

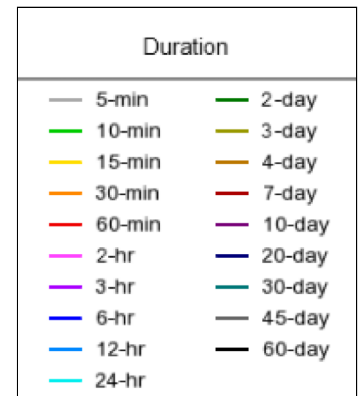
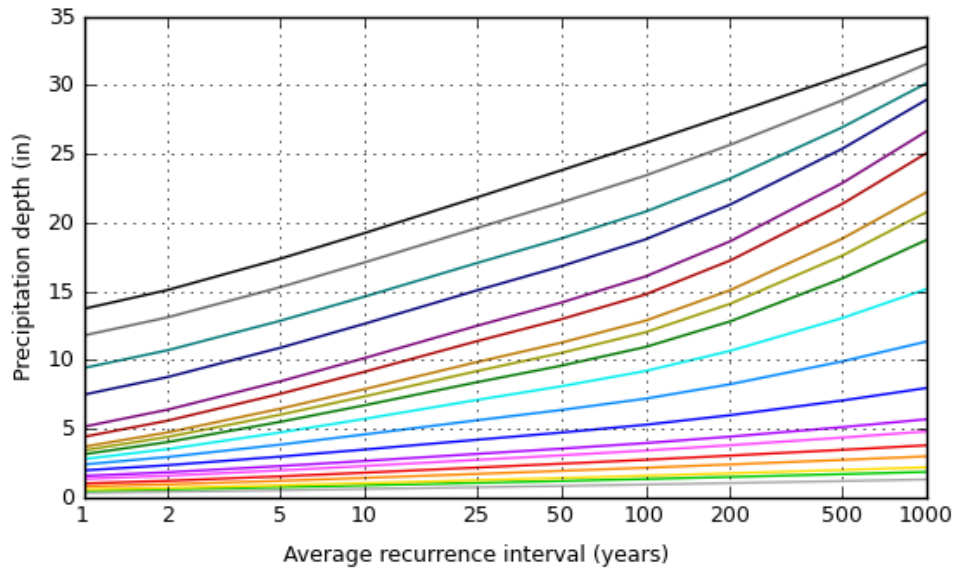
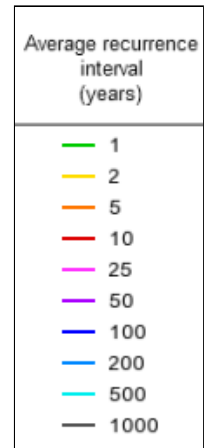
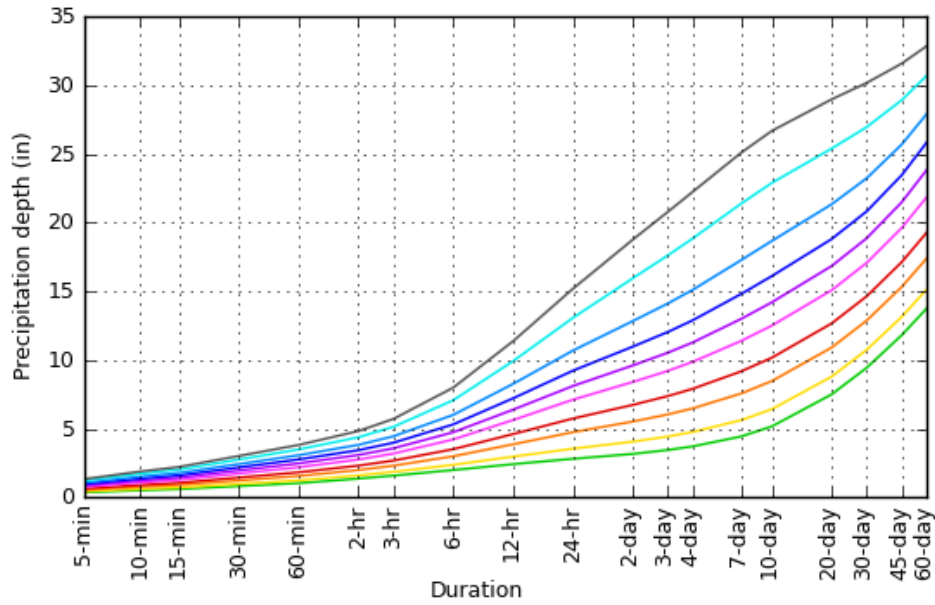
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**PF graphical**



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

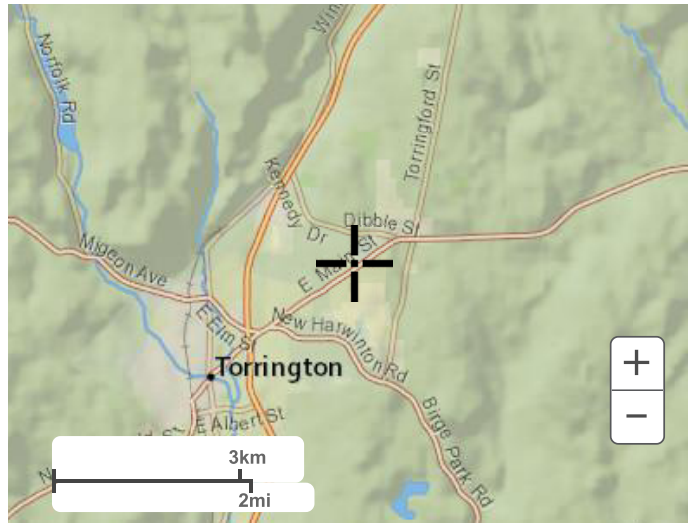
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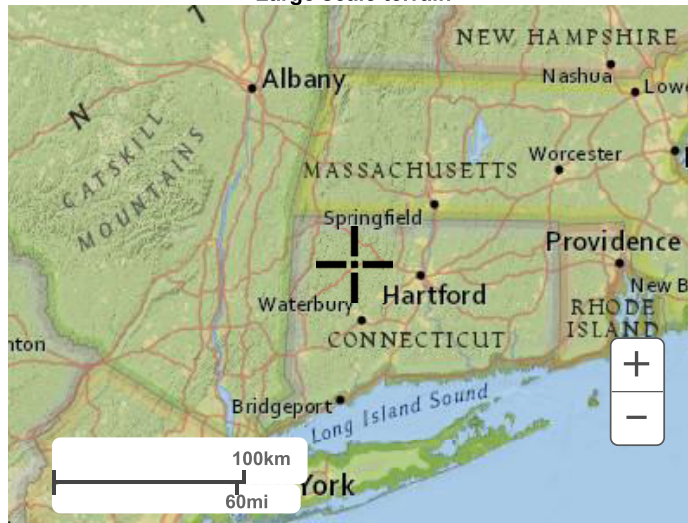
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**Maps & aerials**

**Small scale terrain**



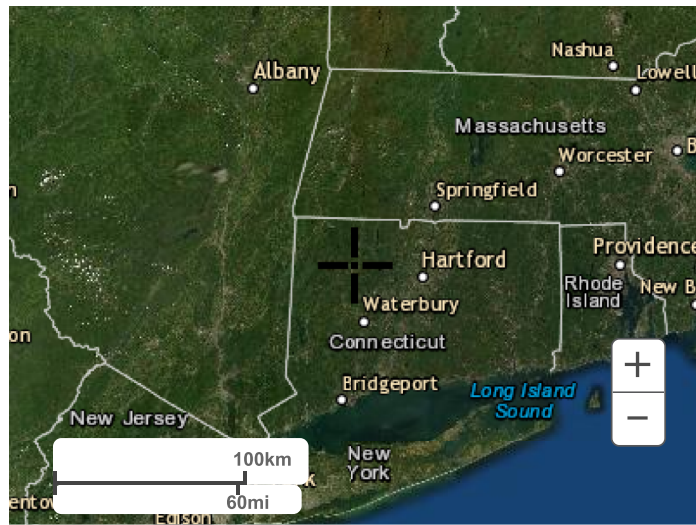
Large scale terrain



Large scale map



Large scale aerial



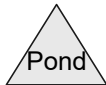
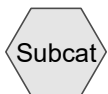
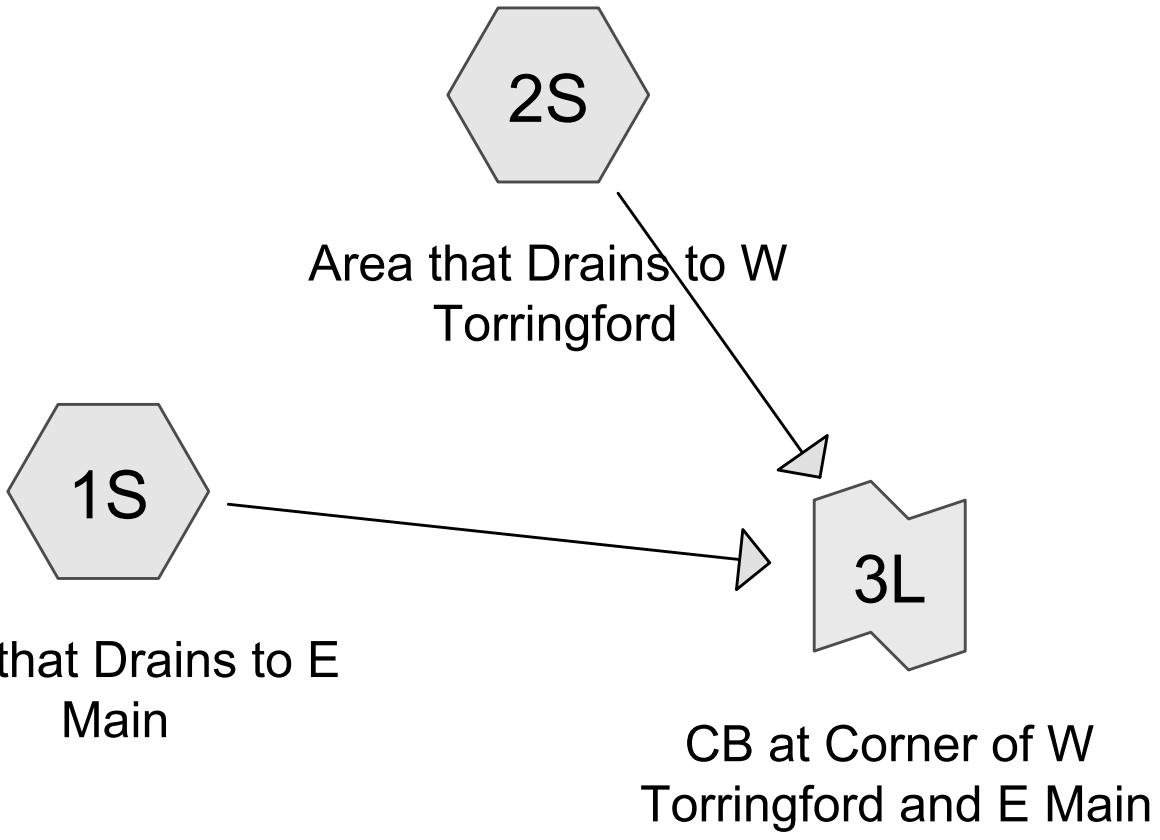
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APPENDIX B  
PRE-DEVELOPMENT HYDROLOGY



# C-HYD-2000995-EXISTING HYDROLOGY

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## Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.161	79	50-75% Grass cover, Fair, HSG C (1S, 2S)
0.188	84	50-75% Grass cover, Fair, HSG D (1S, 2S)
0.228	98	Paved parking, HSG C (1S, 2S)
0.800	98	Paved parking, HSG D (1S, 2S)
<b>1.377</b>	<b>94</b>	<b>TOTAL AREA</b>

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## Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.389	HSG C	1S, 2S
0.988	HSG D	1S, 2S
0.000	Other	
<b>1.377</b>		<b>TOTAL AREA</b>

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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	0.000	0.161	0.188	0.000	0.349	50-75% Grass cover, Fair	1S, 2S
0.000	0.000	0.228	0.800	0.000	1.028	Paved parking	1S, 2S
<b>0.000</b>	<b>0.000</b>	<b>0.389</b>	<b>0.988</b>	<b>0.000</b>	<b>1.377</b>	<b>TOTAL AREA</b>	



**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 2-yr Rainfall=3.54"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Area that Drains to E** Runoff Area=44,597 sf 79.71% Impervious Runoff Depth>2.79"  
Flow Length=123' Slope=0.0282 '/' Tc=5.0 min CN=95 Runoff=4.96 cfs 0.238 af

**Subcatchment2S: Area that Drains to W** Runoff Area=15,383 sf 59.99% Impervious Runoff Depth>2.42"  
Flow Length=110' Tc=5.0 min CN=91 Runoff=1.56 cfs 0.071 af

**Link 3L: CB at Corner of W Tarringford and E Main** Inflow=6.52 cfs 0.309 af  
Primary=6.52 cfs 0.309 af

**Total Runoff Area = 1.377 ac Runoff Volume = 0.309 af Average Runoff Depth = 2.69"**  
**25.35% Pervious = 0.349 ac 74.65% Impervious = 1.028 ac**

**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 2-yr Rainfall=3.54"

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**Summary for Subcatchment 1S: Area that Drains to E Main**

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

Runoff = 4.96 cfs @ 11.95 hrs, Volume= 0.238 af, Depth> 2.79"

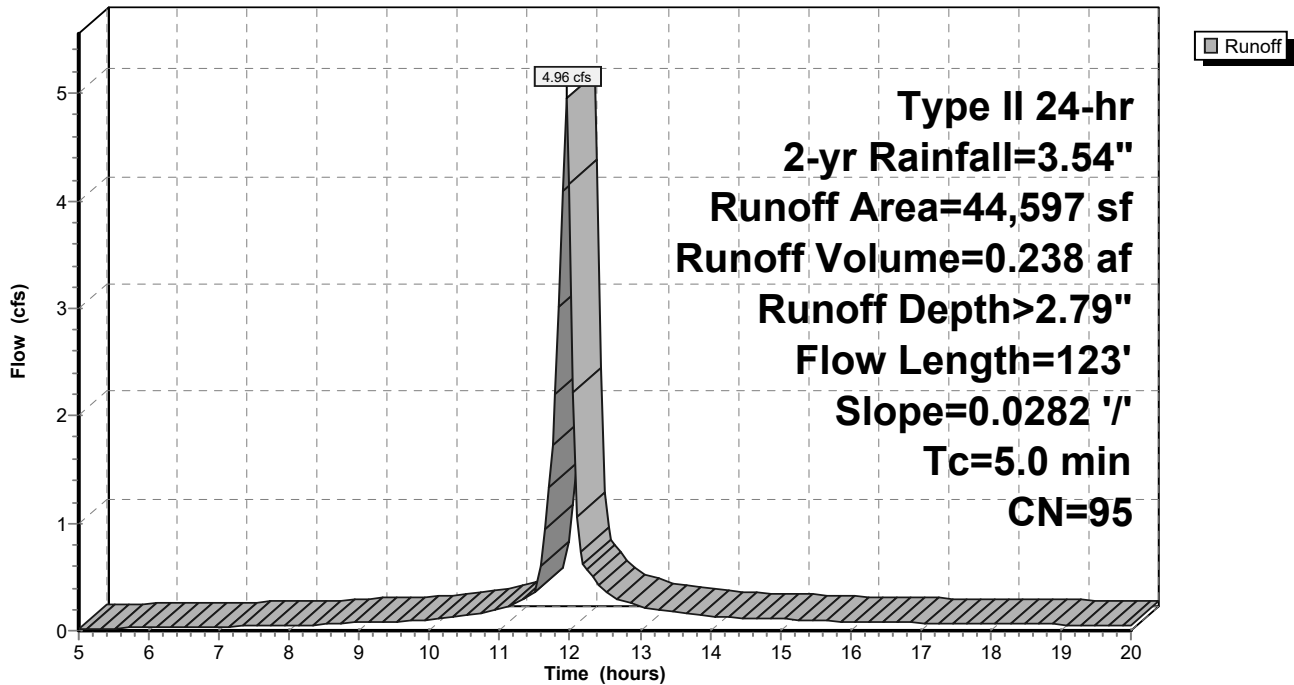
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-yr Rainfall=3.54"

Area (sf)	CN	Description
34,387	98	Paved parking, HSG D
1,161	98	Paved parking, HSG C
7,494	84	50-75% Grass cover, Fair, HSG D
1,555	79	50-75% Grass cover, Fair, HSG C
44,597	95	Weighted Average
9,049		20.29% Pervious Area
35,548		79.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	123	0.0282	1.73		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.54"
1.2	123	Total, Increased to minimum Tc = 5.0 min			

**Subcatchment 1S: Area that Drains to E Main**

Hydrograph



**C-HYD-2000995-EXISTING HYDROLOGY**

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Type II 24-hr 2-yr Rainfall=3.54"

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**Summary for Subcatchment 2S: Area that Drains to W Tarringford**

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

Runoff = 1.56 cfs @ 11.95 hrs, Volume= 0.071 af, Depth> 2.42"

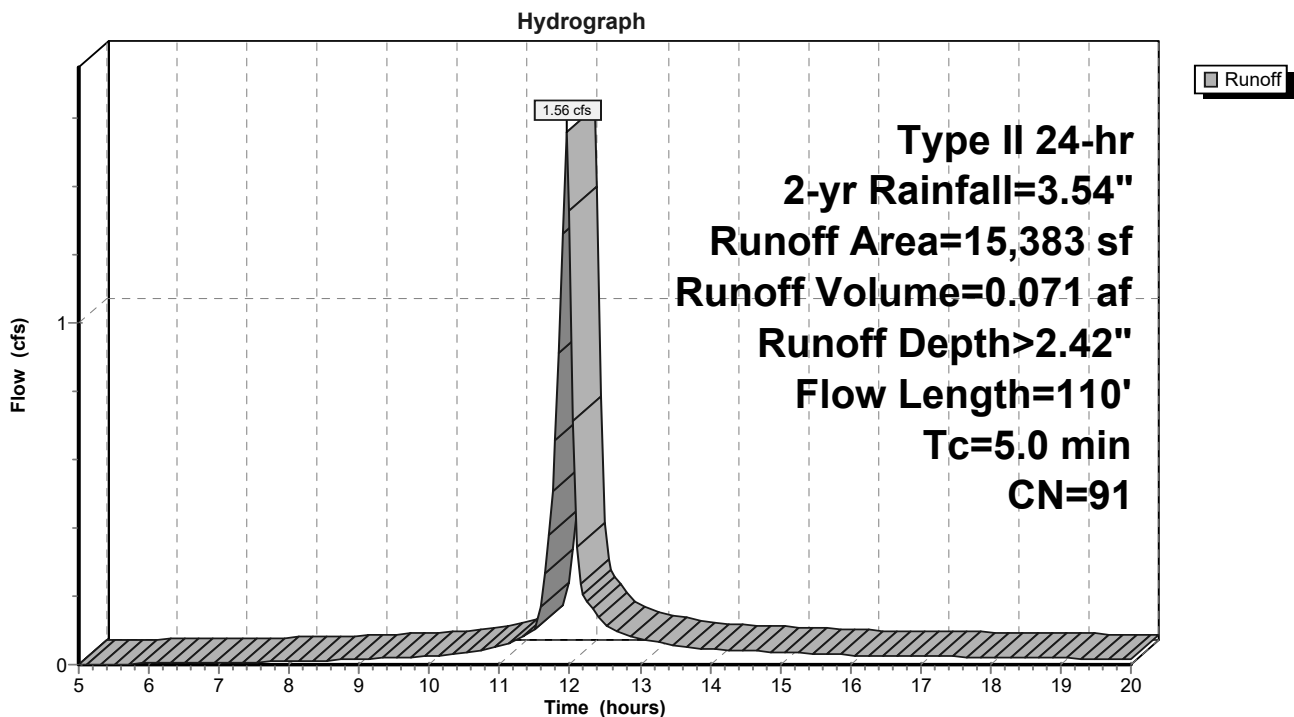
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-yr Rainfall=3.54"

Area (sf)	CN	Description
454	98	Paved parking, HSG D
8,775	98	Paved parking, HSG C
699	84	50-75% Grass cover, Fair, HSG D
5,455	79	50-75% Grass cover, Fair, HSG C
15,383	91	Weighted Average
6,154		40.01% Pervious Area
9,229		59.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	43	0.0312	0.18		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.54"
0.3	67	0.0261	3.28		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.3	110	Total, Increased to minimum Tc = 5.0 min			

**Subcatchment 2S: Area that Drains to W Tarringford**

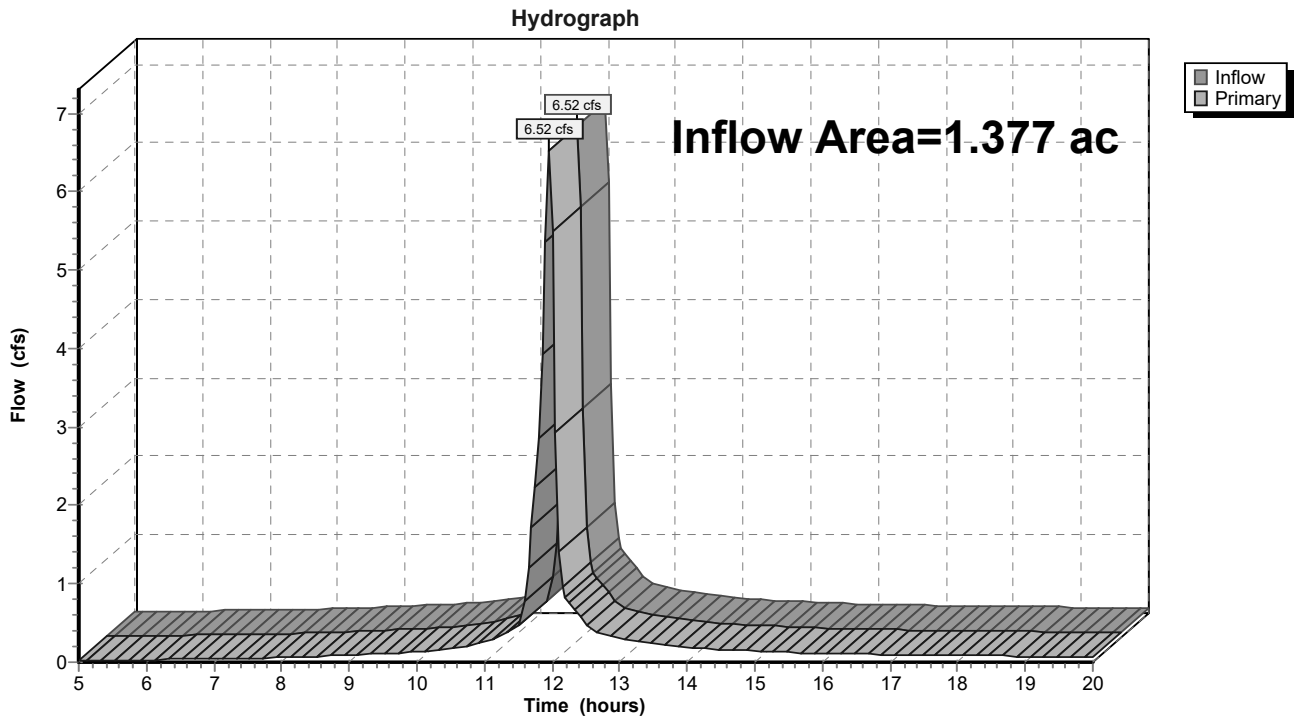


**Summary for Link 3L: CB at Corner of W Tarringford and E Main**

Inflow Area = 1.377 ac, 74.65% Impervious, Inflow Depth > 2.69" for 2-yr event  
Inflow = 6.52 cfs @ 11.95 hrs, Volume= 0.309 af  
Primary = 6.52 cfs @ 11.95 hrs, Volume= 0.309 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Link 3L: CB at Corner of W Tarringford and E Main**



**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 5-yr Rainfall=4.74"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Area that Drains to E** Runoff Area=44,597 sf 79.71% Impervious Runoff Depth>3.89"  
Flow Length=123' Slope=0.0282 '/' Tc=5.0 min CN=95 Runoff=6.79 cfs 0.331 af

**Subcatchment2S: Area that Drains to W** Runoff Area=15,383 sf 59.99% Impervious Runoff Depth>3.50"  
Flow Length=110' Tc=5.0 min CN=91 Runoff=2.20 cfs 0.103 af

**Link 3L: CB at Corner of W Tarringford and E Main** Inflow=8.99 cfs 0.434 af  
Primary=8.99 cfs 0.434 af

**Total Runoff Area = 1.377 ac Runoff Volume = 0.434 af Average Runoff Depth = 3.79"**  
**25.35% Pervious = 0.349 ac 74.65% Impervious = 1.028 ac**

**C-HYD-2000995-EXISTING HYDROLOGY**

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Type II 24-hr 5-yr Rainfall=4.74"

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**Summary for Subcatchment 1S: Area that Drains to E Main**

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

Runoff = 6.79 cfs @ 11.95 hrs, Volume= 0.331 af, Depth> 3.89"

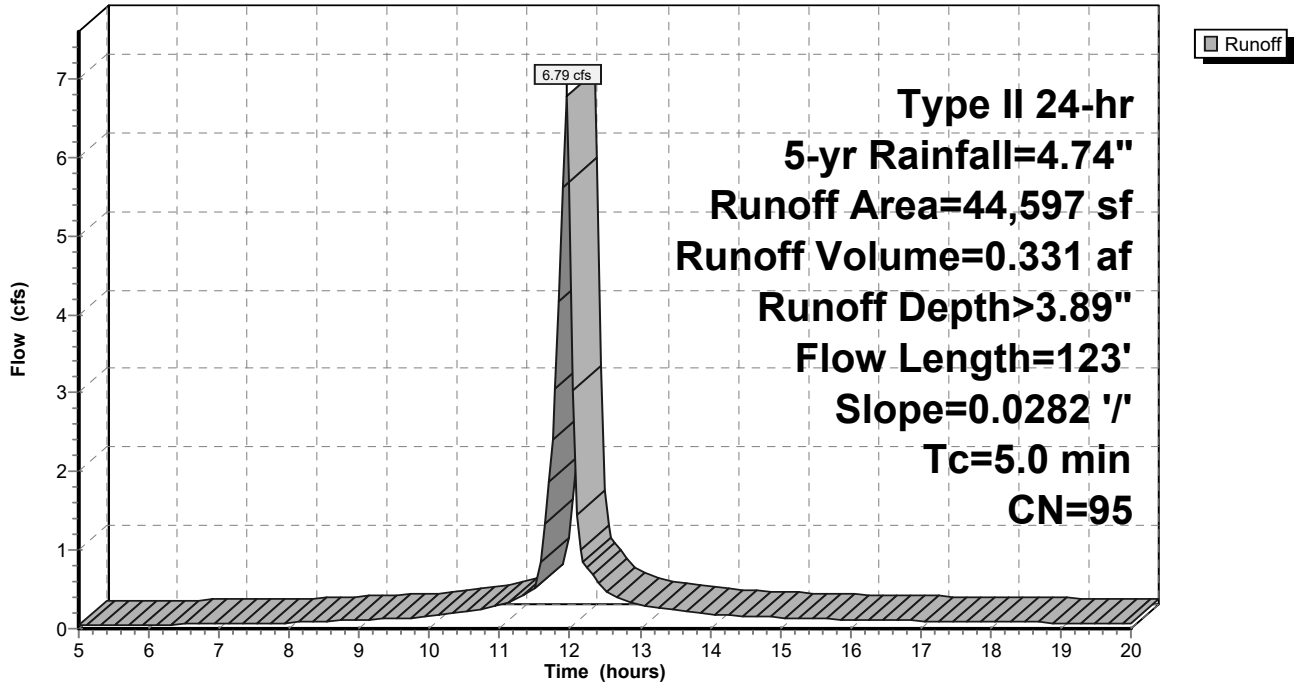
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 5-yr Rainfall=4.74"

Area (sf)	CN	Description
34,387	98	Paved parking, HSG D
1,161	98	Paved parking, HSG C
7,494	84	50-75% Grass cover, Fair, HSG D
1,555	79	50-75% Grass cover, Fair, HSG C
44,597	95	Weighted Average
9,049		20.29% Pervious Area
35,548		79.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	123	0.0282	1.73		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.54"
1.2	123	Total, Increased to minimum Tc = 5.0 min			

**Subcatchment 1S: Area that Drains to E Main**

Hydrograph



**C-HYD-2000995-EXISTING HYDROLOGY**

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Type II 24-hr 5-yr Rainfall=4.74"

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**Summary for Subcatchment 2S: Area that Drains to W Tarringford**

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

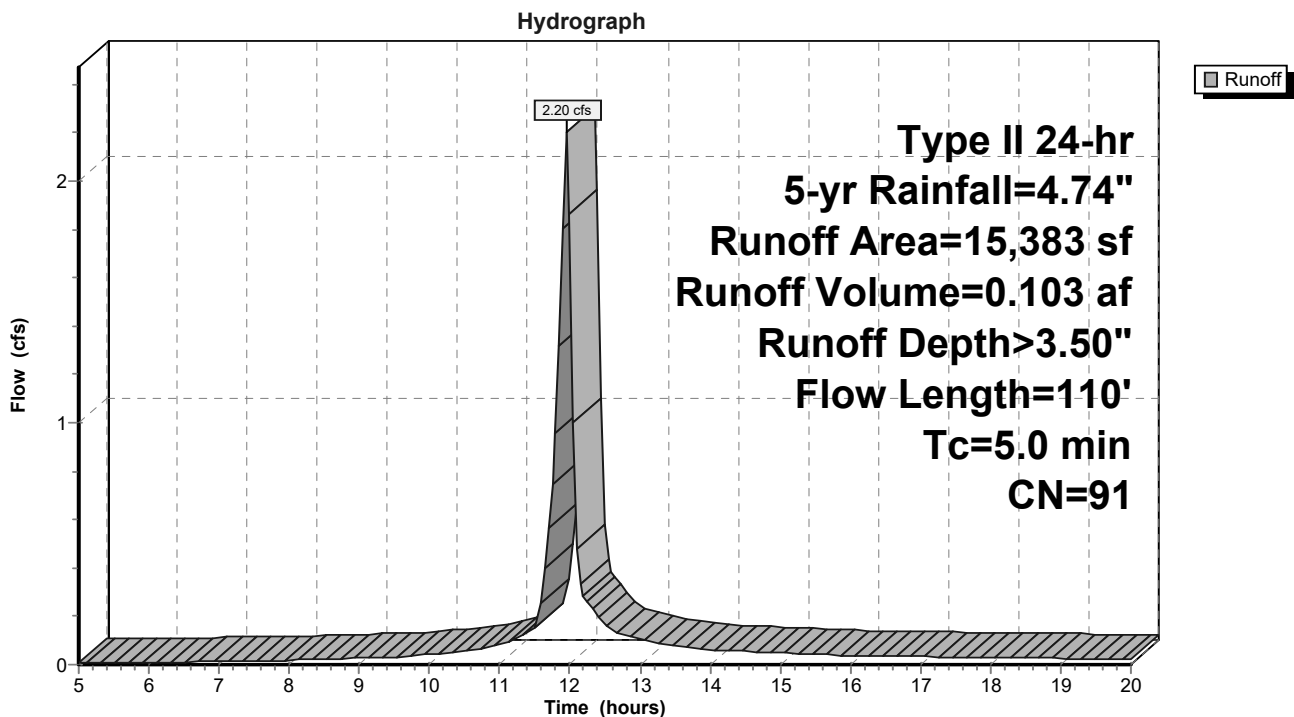
Runoff = 2.20 cfs @ 11.95 hrs, Volume= 0.103 af, Depth> 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 5-yr Rainfall=4.74"

Area (sf)	CN	Description
454	98	Paved parking, HSG D
8,775	98	Paved parking, HSG C
699	84	50-75% Grass cover, Fair, HSG D
5,455	79	50-75% Grass cover, Fair, HSG C
15,383	91	Weighted Average
6,154		40.01% Pervious Area
9,229		59.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	43	0.0312	0.18		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.54"
0.3	67	0.0261	3.28		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.3	110	Total, Increased to minimum Tc = 5.0 min			

**Subcatchment 2S: Area that Drains to W Tarringford**



**C-HYD-2000995-EXISTING HYDROLOGY**

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Type II 24-hr 5-yr Rainfall=4.74"

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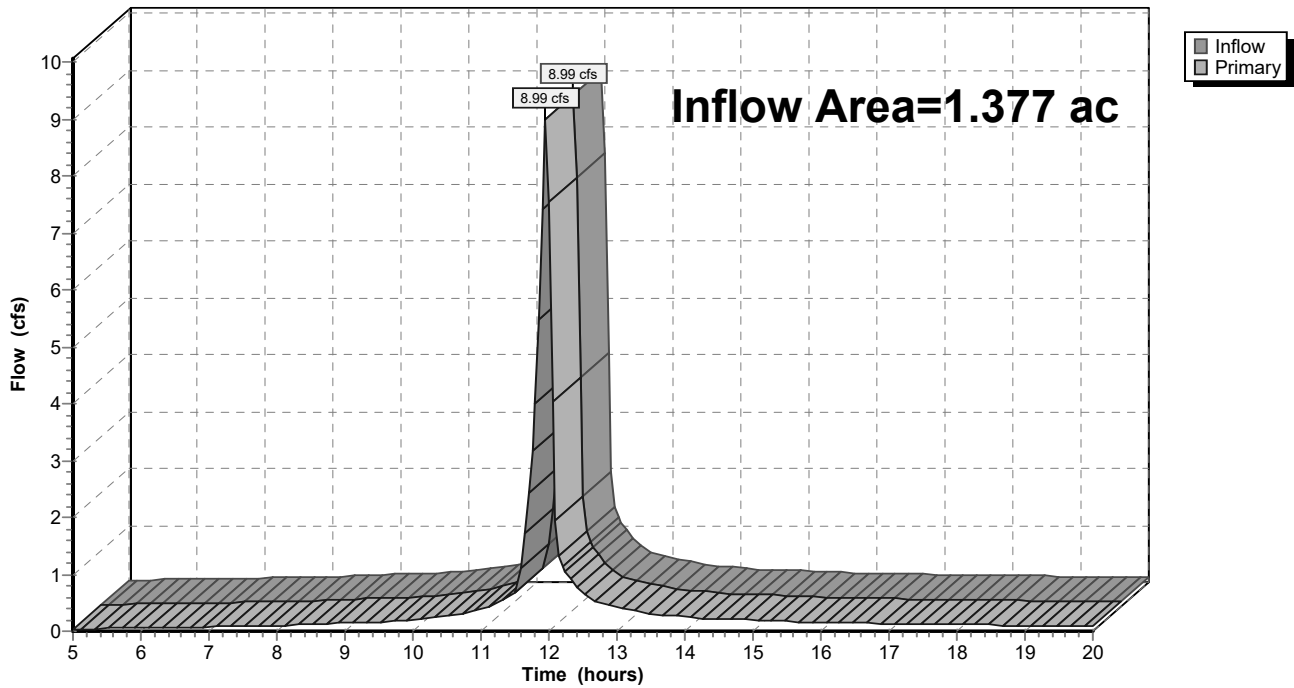
**Summary for Link 3L: CB at Corner of W Tarringford and E Main**

Inflow Area = 1.377 ac, 74.65% Impervious, Inflow Depth > 3.79" for 5-yr event  
Inflow = 8.99 cfs @ 11.95 hrs, Volume= 0.434 af  
Primary = 8.99 cfs @ 11.95 hrs, Volume= 0.434 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Link 3L: CB at Corner of W Tarringford and E Main**

Hydrograph





**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 10-yr Rainfall=5.74"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Area that Drains to E** Runoff Area=44,597 sf 79.71% Impervious Runoff Depth>4.80"  
Flow Length=123' Slope=0.0282 '/' Tc=5.0 min CN=95 Runoff=8.30 cfs 0.409 af

**Subcatchment2S: Area that Drains to W** Runoff Area=15,383 sf 59.99% Impervious Runoff Depth>4.41"  
Flow Length=110' Tc=5.0 min CN=91 Runoff=2.74 cfs 0.130 af

**Link 3L: CB at Corner of W Tarringford and E Main** Inflow=11.04 cfs 0.539 af  
Primary=11.04 cfs 0.539 af

**Total Runoff Area = 1.377 ac Runoff Volume = 0.539 af Average Runoff Depth = 4.70"**  
**25.35% Pervious = 0.349 ac 74.65% Impervious = 1.028 ac**

**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 10-yr Rainfall=5.74"

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**Summary for Subcatchment 1S: Area that Drains to E Main**

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

Runoff = 8.30 cfs @ 11.95 hrs, Volume= 0.409 af, Depth> 4.80"

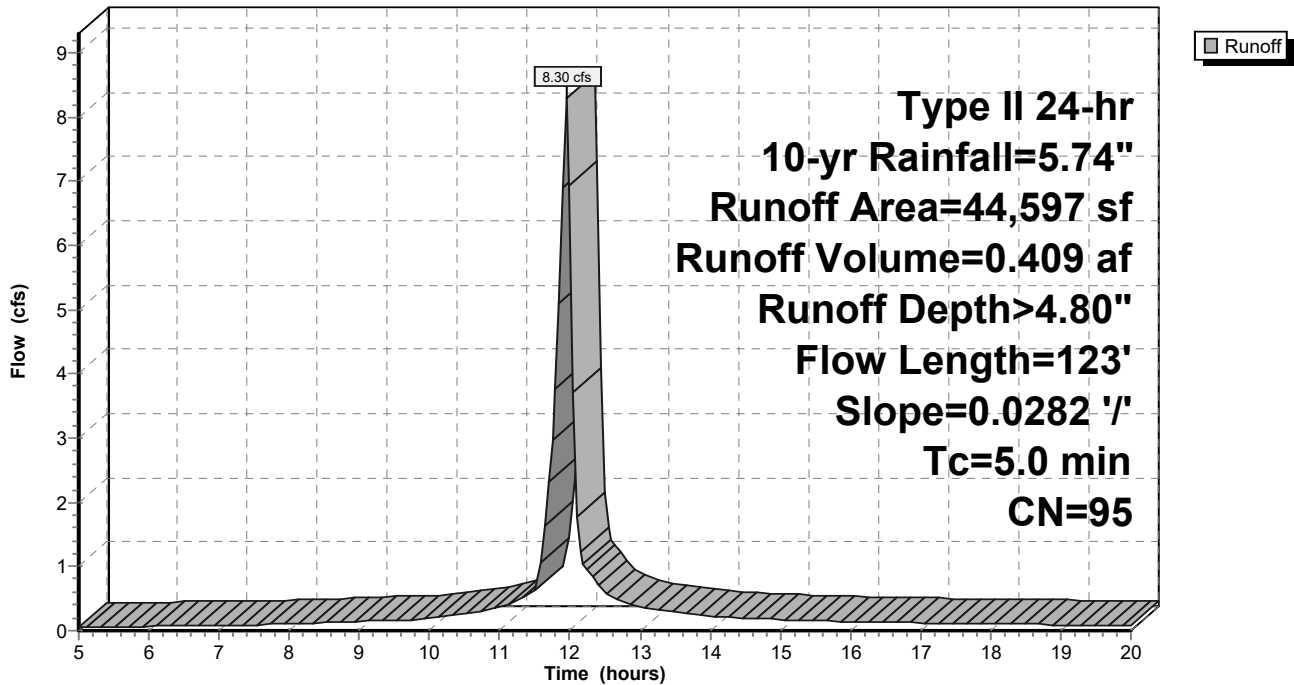
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-yr Rainfall=5.74"

Area (sf)	CN	Description
34,387	98	Paved parking, HSG D
1,161	98	Paved parking, HSG C
7,494	84	50-75% Grass cover, Fair, HSG D
1,555	79	50-75% Grass cover, Fair, HSG C
44,597	95	Weighted Average
9,049		20.29% Pervious Area
35,548		79.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	123	0.0282	1.73		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.54"
1.2	123	Total, Increased to minimum Tc = 5.0 min			

**Subcatchment 1S: Area that Drains to E Main**

Hydrograph



**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 10-yr Rainfall=5.74"

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**Summary for Subcatchment 2S: Area that Drains to W Tarringford**

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

Runoff = 2.74 cfs @ 11.95 hrs, Volume= 0.130 af, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-yr Rainfall=5.74"

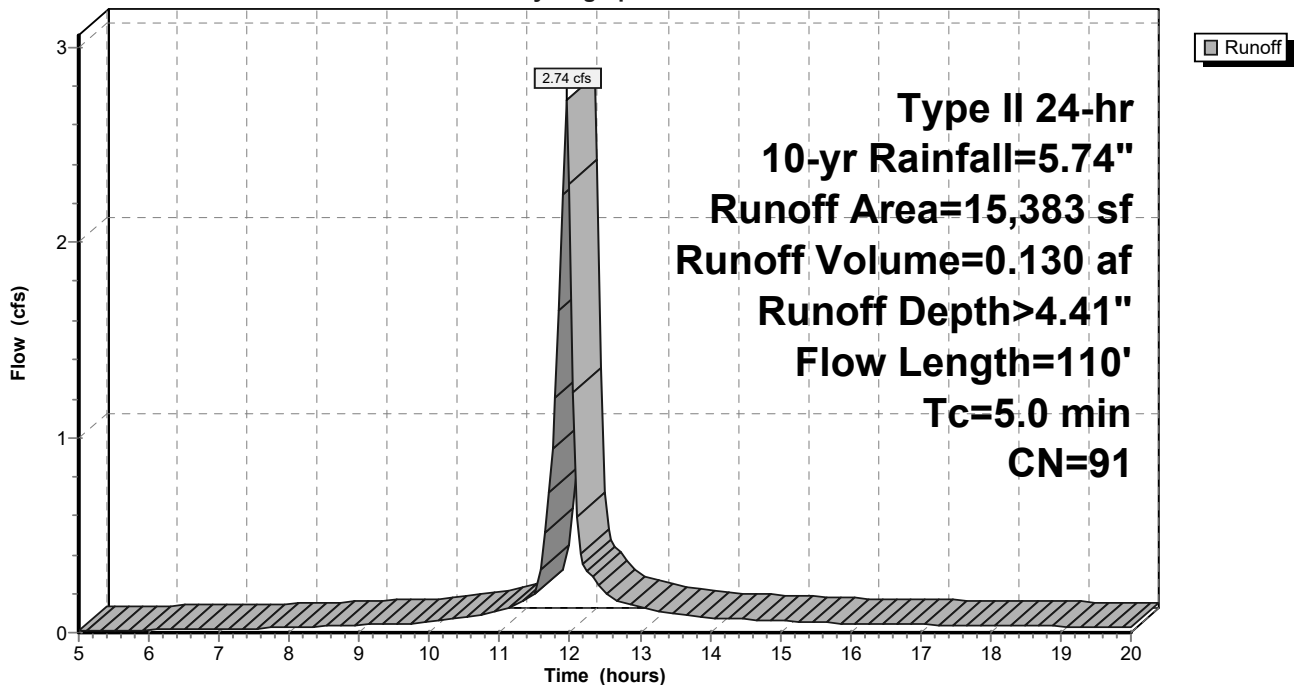
Area (sf)	CN	Description
454	98	Paved parking, HSG D
8,775	98	Paved parking, HSG C
699	84	50-75% Grass cover, Fair, HSG D
5,455	79	50-75% Grass cover, Fair, HSG C
15,383	91	Weighted Average
6,154		40.01% Pervious Area
9,229		59.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	43	0.0312	0.18		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.54"
0.3	67	0.0261	3.28		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.3	110	Total, Increased to minimum Tc = 5.0 min			

**Subcatchment 2S: Area that Drains to W Tarringford**

Hydrograph



**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 10-yr Rainfall=5.74"

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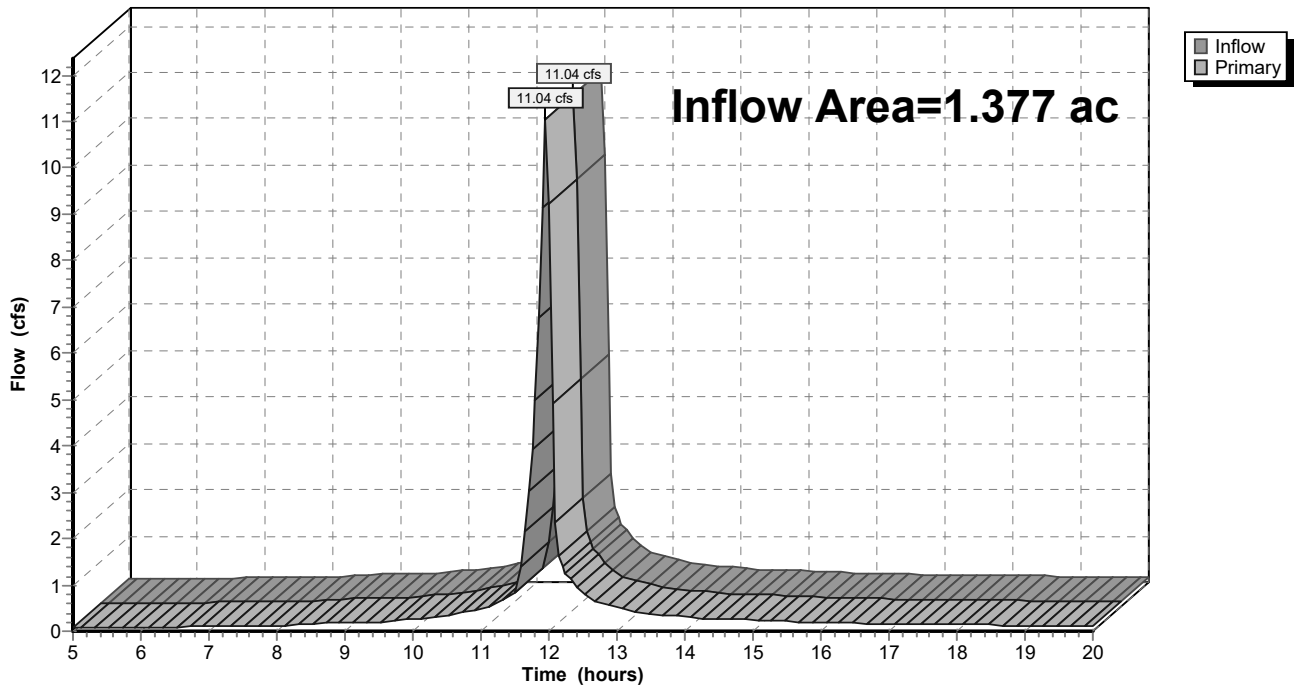
**Summary for Link 3L: CB at Corner of W Tarringford and E Main**

Inflow Area = 1.377 ac, 74.65% Impervious, Inflow Depth > 4.70" for 10-yr event  
Inflow = 11.04 cfs @ 11.95 hrs, Volume= 0.539 af  
Primary = 11.04 cfs @ 11.95 hrs, Volume= 0.539 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Link 3L: CB at Corner of W Tarringford and E Main**

Hydrograph



## C-HYD-2000995-EXISTING HYDROLOGY

Type II 24-hr 25-yr Rainfall=7.11"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Area that Drains to E** Runoff Area=44,597 sf 79.71% Impervious Runoff Depth>6.04"  
Flow Length=123' Slope=0.0282 '/' Tc=5.0 min CN=95 Runoff=10.36 cfs 0.516 af

**Subcatchment2S: Area that Drains to W** Runoff Area=15,383 sf 59.99% Impervious Runoff Depth>5.66"  
Flow Length=110' Tc=5.0 min CN=91 Runoff=3.46 cfs 0.167 af

**Link 3L: CB at Corner of W Tarringford and E Main**

Inflow=13.82 cfs 0.682 af  
Primary=13.82 cfs 0.682 af

**Total Runoff Area = 1.377 ac Runoff Volume = 0.682 af Average Runoff Depth = 5.94"**  
**25.35% Pervious = 0.349 ac 74.65% Impervious = 1.028 ac**

**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 25-yr Rainfall=7.11"

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**Summary for Subcatchment 1S: Area that Drains to E Main**

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

Runoff = 10.36 cfs @ 11.95 hrs, Volume= 0.516 af, Depth> 6.04"

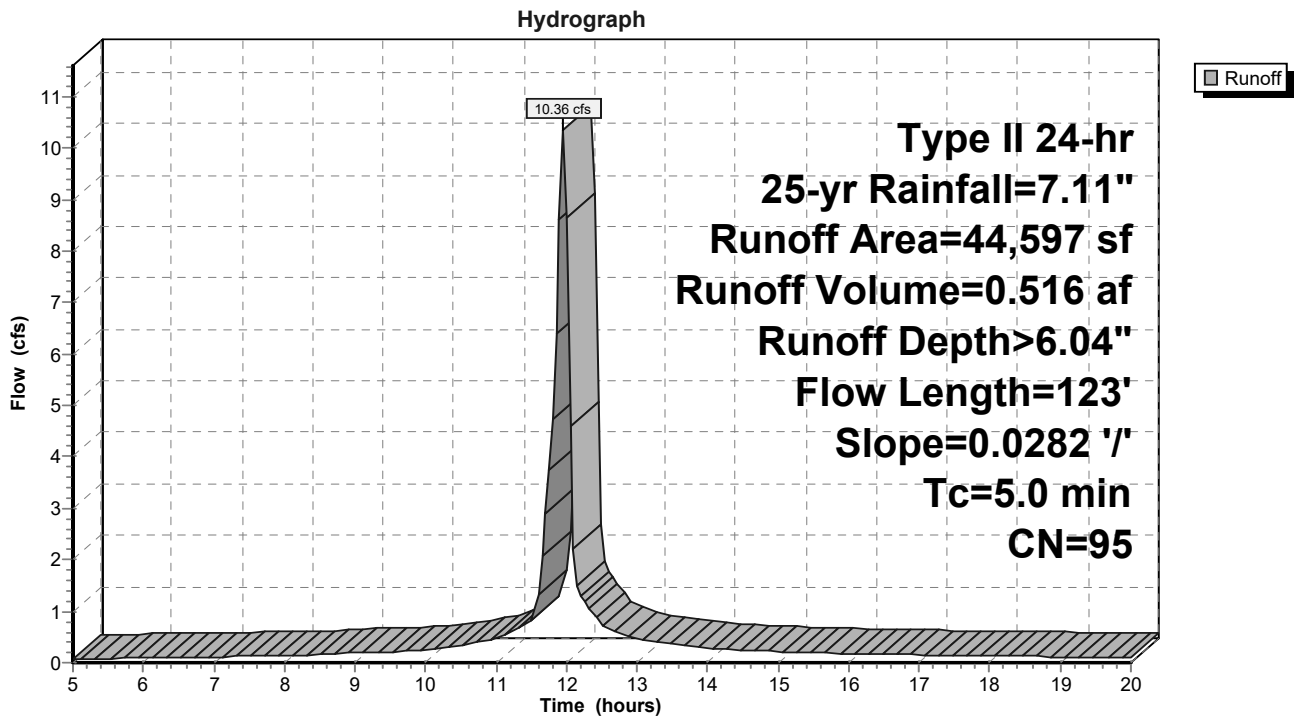
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25-yr Rainfall=7.11"

Area (sf)	CN	Description
34,387	98	Paved parking, HSG D
1,161	98	Paved parking, HSG C
7,494	84	50-75% Grass cover, Fair, HSG D
1,555	79	50-75% Grass cover, Fair, HSG C
44,597	95	Weighted Average
9,049		20.29% Pervious Area
35,548		79.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	123	0.0282	1.73		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.54"
1.2	123	Total, Increased to minimum Tc = 5.0 min			

**Subcatchment 1S: Area that Drains to E Main**



**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 25-yr Rainfall=7.11"

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**Summary for Subcatchment 2S: Area that Drains to W Tarringford**

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

Runoff = 3.46 cfs @ 11.95 hrs, Volume= 0.167 af, Depth> 5.66"

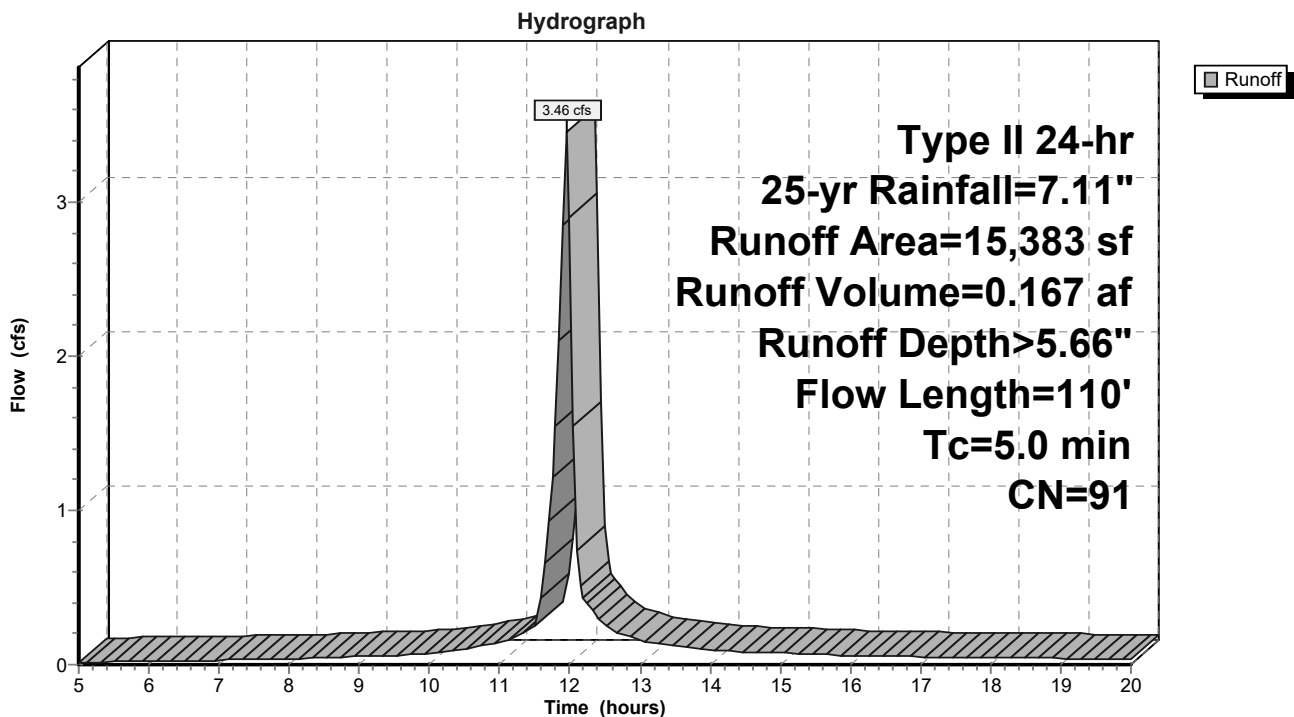
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25-yr Rainfall=7.11"

Area (sf)	CN	Description
454	98	Paved parking, HSG D
8,775	98	Paved parking, HSG C
699	84	50-75% Grass cover, Fair, HSG D
5,455	79	50-75% Grass cover, Fair, HSG C
15,383	91	Weighted Average
6,154		40.01% Pervious Area
9,229		59.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	43	0.0312	0.18		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.54"
0.3	67	0.0261	3.28		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.3	110	Total, Increased to minimum Tc = 5.0 min			

**Subcatchment 2S: Area that Drains to W Tarringford**



**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 25-yr Rainfall=7.11"

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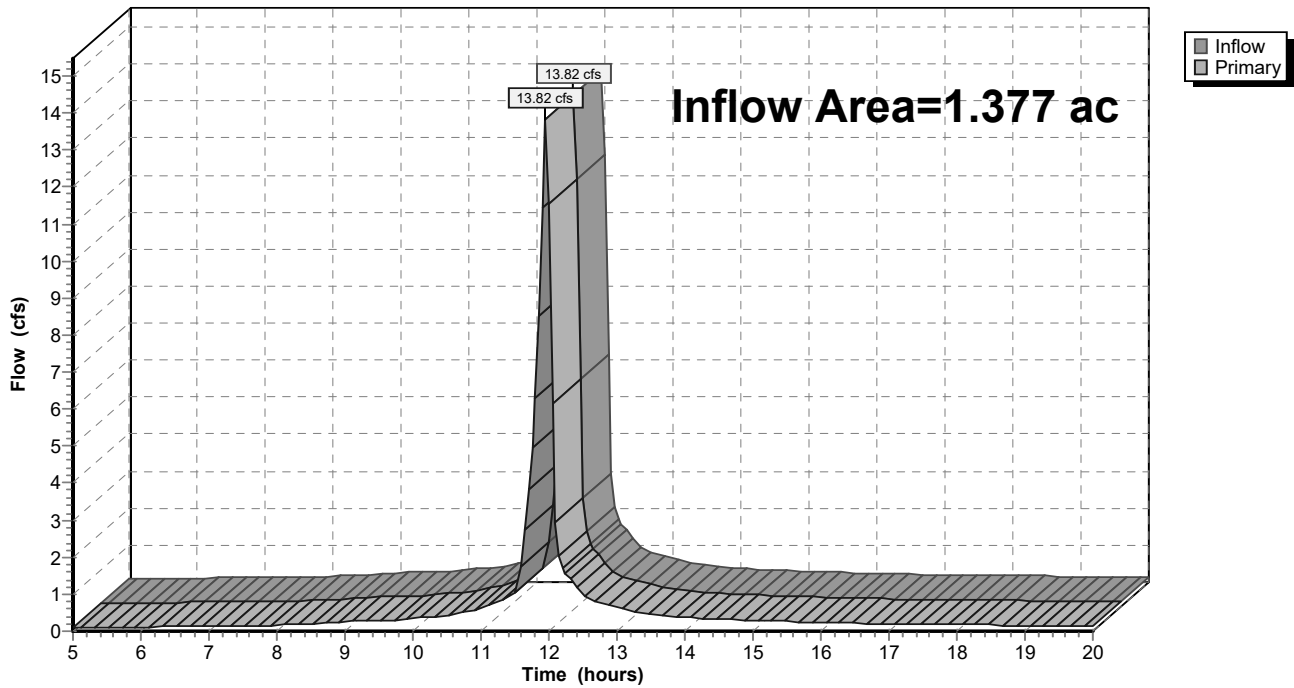
**Summary for Link 3L: CB at Corner of W Tarringford and E Main**

Inflow Area = 1.377 ac, 74.65% Impervious, Inflow Depth > 5.94" for 25-yr event  
Inflow = 13.82 cfs @ 11.95 hrs, Volume= 0.682 af  
Primary = 13.82 cfs @ 11.95 hrs, Volume= 0.682 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Link 3L: CB at Corner of W Tarringford and E Main**

Hydrograph





**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 50-yr Rainfall=8.10"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Area that Drains to E** Runoff Area=44,597 sf 79.71% Impervious Runoff Depth>6.94"  
Flow Length=123' Slope=0.0282 '/' Tc=5.0 min CN=95 Runoff=11.84 cfs 0.592 af

**Subcatchment2S: Area that Drains to W** Runoff Area=15,383 sf 59.99% Impervious Runoff Depth>6.56"  
Flow Length=110' Tc=5.0 min CN=91 Runoff=3.98 cfs 0.193 af

**Link 3L: CB at Corner of W Tarringford and E Main** Inflow=15.82 cfs 0.785 af  
Primary=15.82 cfs 0.785 af

**Total Runoff Area = 1.377 ac Runoff Volume = 0.785 af Average Runoff Depth = 6.84"**  
**25.35% Pervious = 0.349 ac 74.65% Impervious = 1.028 ac**

**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 50-yr Rainfall=8.10"

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**Summary for Subcatchment 1S: Area that Drains to E Main**

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

Runoff = 11.84 cfs @ 11.95 hrs, Volume= 0.592 af, Depth> 6.94"

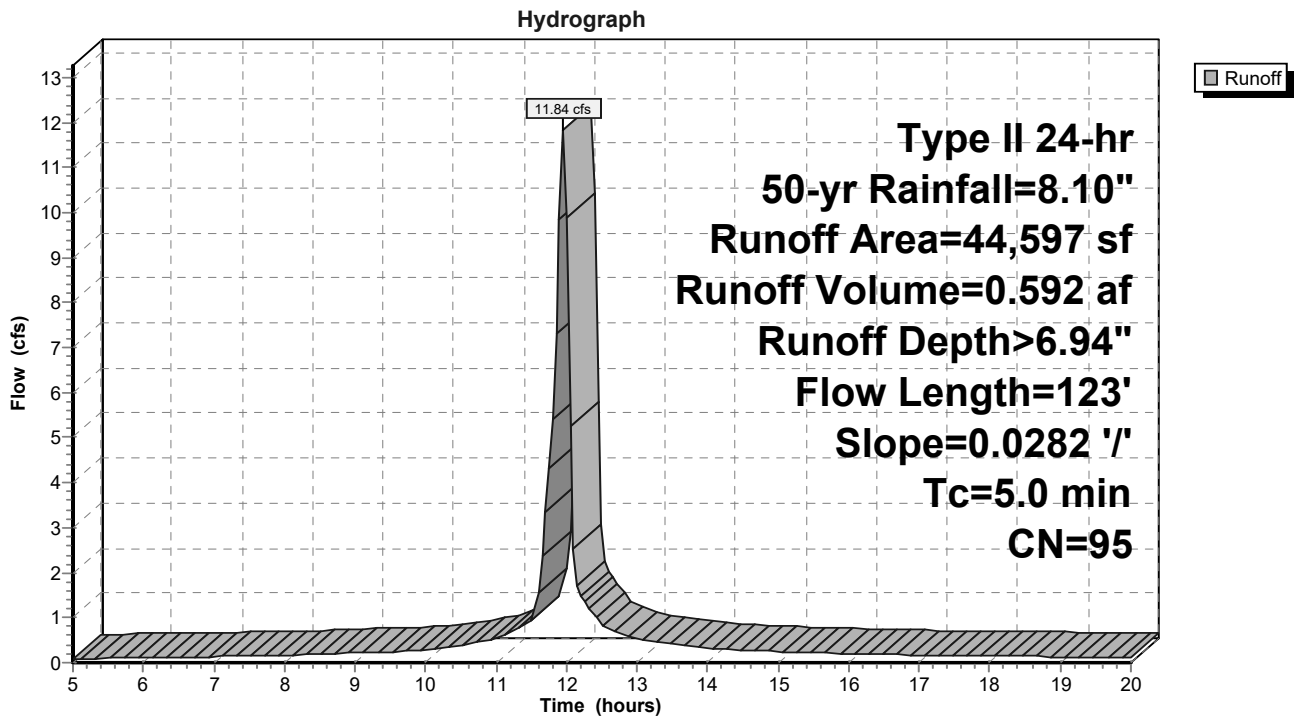
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 50-yr Rainfall=8.10"

Area (sf)	CN	Description
34,387	98	Paved parking, HSG D
1,161	98	Paved parking, HSG C
7,494	84	50-75% Grass cover, Fair, HSG D
1,555	79	50-75% Grass cover, Fair, HSG C
44,597	95	Weighted Average
9,049		20.29% Pervious Area
35,548		79.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	123	0.0282	1.73		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.54"
1.2	123	Total, Increased to minimum Tc = 5.0 min			

**Subcatchment 1S: Area that Drains to E Main**



**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 50-yr Rainfall=8.10"

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**Summary for Subcatchment 2S: Area that Drains to W Tarringford**

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

Runoff = 3.98 cfs @ 11.95 hrs, Volume= 0.193 af, Depth> 6.56"

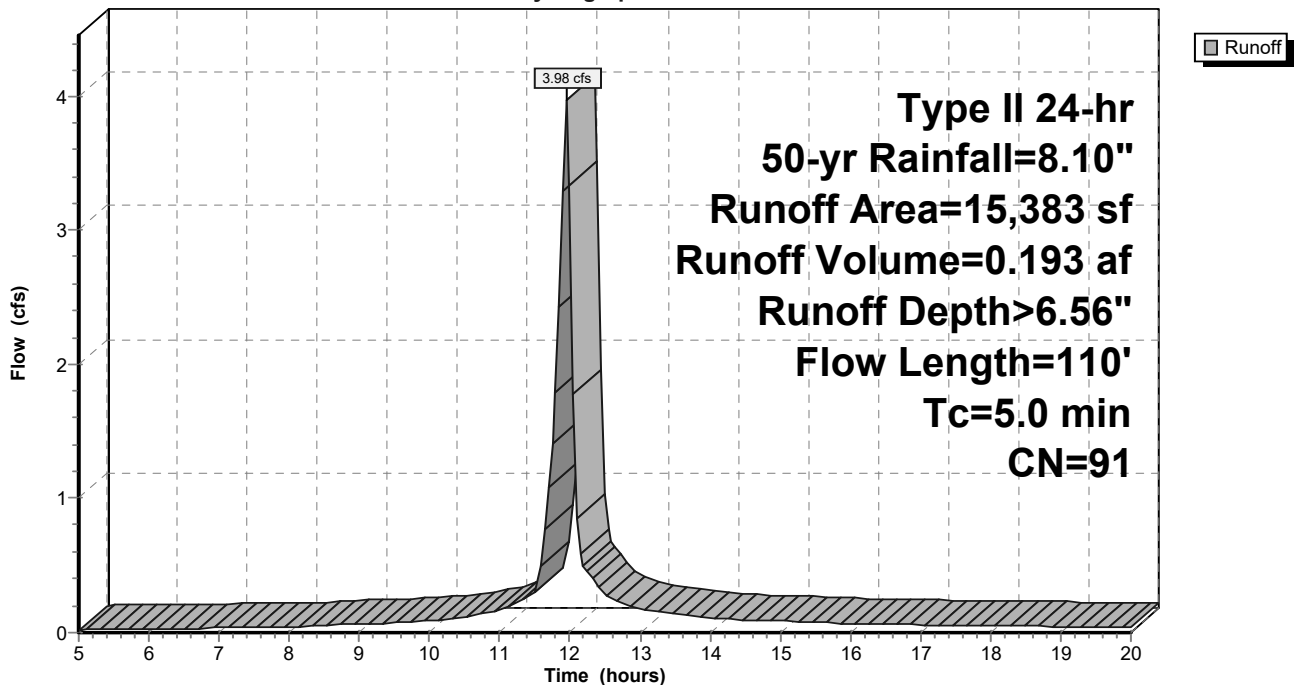
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 50-yr Rainfall=8.10"

Area (sf)	CN	Description
454	98	Paved parking, HSG D
8,775	98	Paved parking, HSG C
699	84	50-75% Grass cover, Fair, HSG D
5,455	79	50-75% Grass cover, Fair, HSG C
15,383	91	Weighted Average
6,154		40.01% Pervious Area
9,229		59.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	43	0.0312	0.18		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.54"
0.3	67	0.0261	3.28		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.3	110	Total, Increased to minimum Tc = 5.0 min			

**Subcatchment 2S: Area that Drains to W Tarringford**

Hydrograph



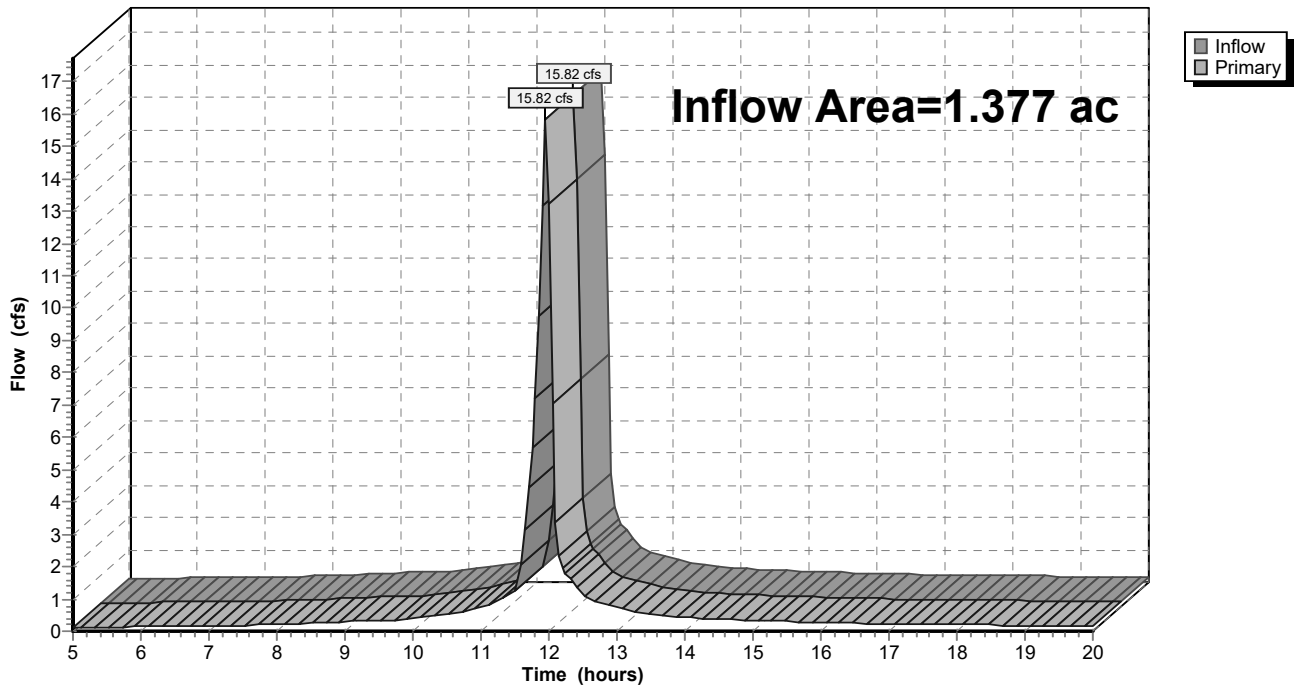
**Summary for Link 3L: CB at Corner of W Tarringford and E Main**

Inflow Area = 1.377 ac, 74.65% Impervious, Inflow Depth > 6.84" for 50-yr event  
Inflow = 15.82 cfs @ 11.95 hrs, Volume= 0.785 af  
Primary = 15.82 cfs @ 11.95 hrs, Volume= 0.785 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Link 3L: CB at Corner of W Tarringford and E Main**

Hydrograph



**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 100-yr Rainfall=9.22"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Area that Drains to E** Runoff Area=44,597 sf 79.71% Impervious Runoff Depth>7.95"  
Flow Length=123' Slope=0.0282 '/' Tc=5.0 min CN=95 Runoff=13.52 cfs 0.679 af

**Subcatchment2S: Area that Drains to W** Runoff Area=15,383 sf 59.99% Impervious Runoff Depth>7.59"  
Flow Length=110' Tc=5.0 min CN=91 Runoff=4.57 cfs 0.223 af

**Link 3L: CB at Corner of W Tarringford and E Main** Inflow=18.08 cfs 0.902 af  
Primary=18.08 cfs 0.902 af

**Total Runoff Area = 1.377 ac Runoff Volume = 0.902 af Average Runoff Depth = 7.86"**  
**25.35% Pervious = 0.349 ac 74.65% Impervious = 1.028 ac**

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Type II 24-hr 100-yr Rainfall=9.22"

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**Summary for Subcatchment 1S: Area that Drains to E Main**

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

Runoff = 13.52 cfs @ 11.95 hrs, Volume= 0.679 af, Depth> 7.95"

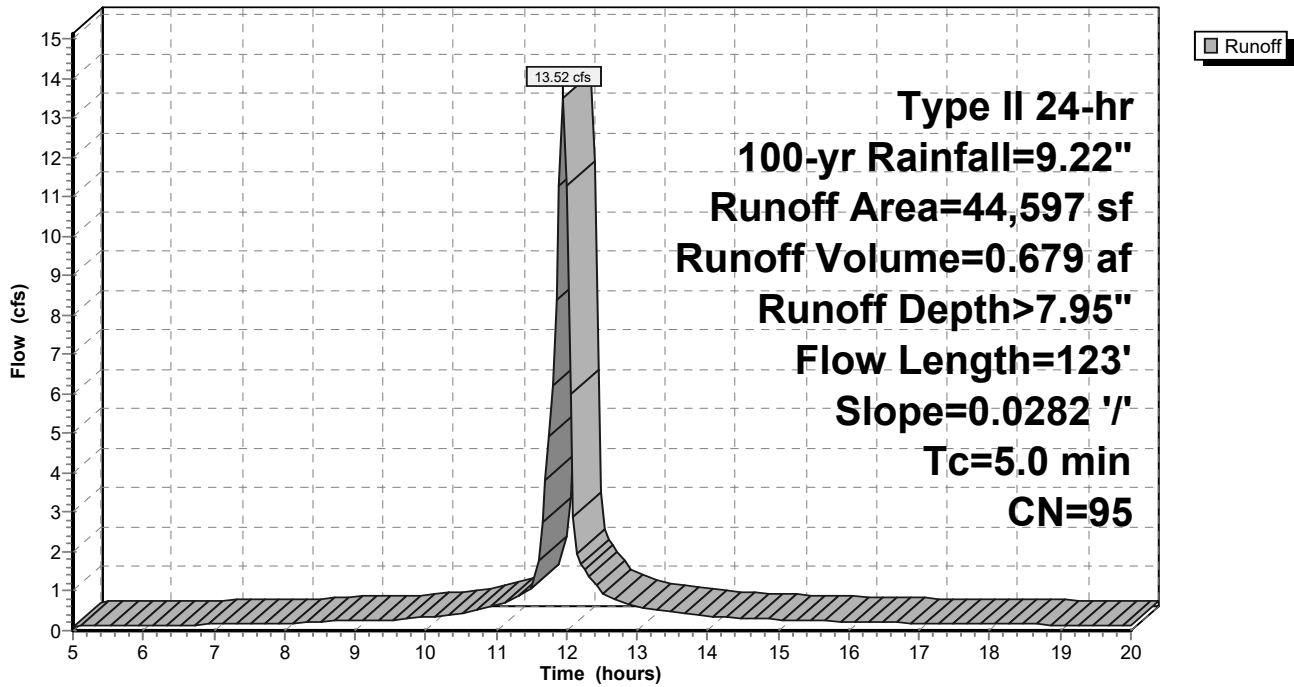
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-yr Rainfall=9.22"

Area (sf)	CN	Description
34,387	98	Paved parking, HSG D
1,161	98	Paved parking, HSG C
7,494	84	50-75% Grass cover, Fair, HSG D
1,555	79	50-75% Grass cover, Fair, HSG C
44,597	95	Weighted Average
9,049		20.29% Pervious Area
35,548		79.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	123	0.0282	1.73		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.54"
1.2	123	Total, Increased to minimum Tc = 5.0 min			

**Subcatchment 1S: Area that Drains to E Main**

Hydrograph



**C-HYD-2000995-EXISTING HYDROLOGY**

Type II 24-hr 100-yr Rainfall=9.22"

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**Summary for Subcatchment 2S: Area that Drains to W Tarringford**

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

Runoff = 4.57 cfs @ 11.95 hrs, Volume= 0.223 af, Depth> 7.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-yr Rainfall=9.22"

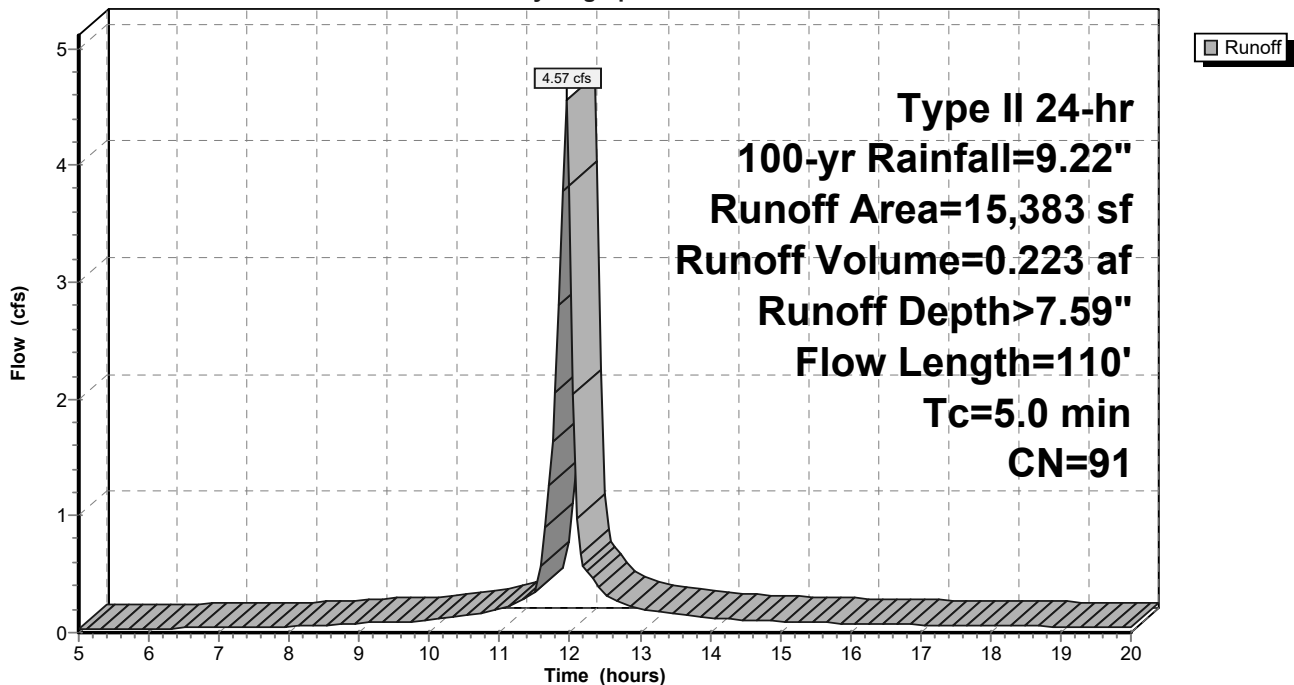
Area (sf)	CN	Description
454	98	Paved parking, HSG D
8,775	98	Paved parking, HSG C
699	84	50-75% Grass cover, Fair, HSG D
5,455	79	50-75% Grass cover, Fair, HSG C
15,383	91	Weighted Average
6,154		40.01% Pervious Area
9,229		59.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	43	0.0312	0.18		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.54"
0.3	67	0.0261	3.28		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.3	110	Total, Increased to minimum Tc = 5.0 min			

**Subcatchment 2S: Area that Drains to W Tarringford**

Hydrograph



**C-HYD-2000995-EXISTING HYDROLOGY**

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Type II 24-hr 100-yr Rainfall=9.22"

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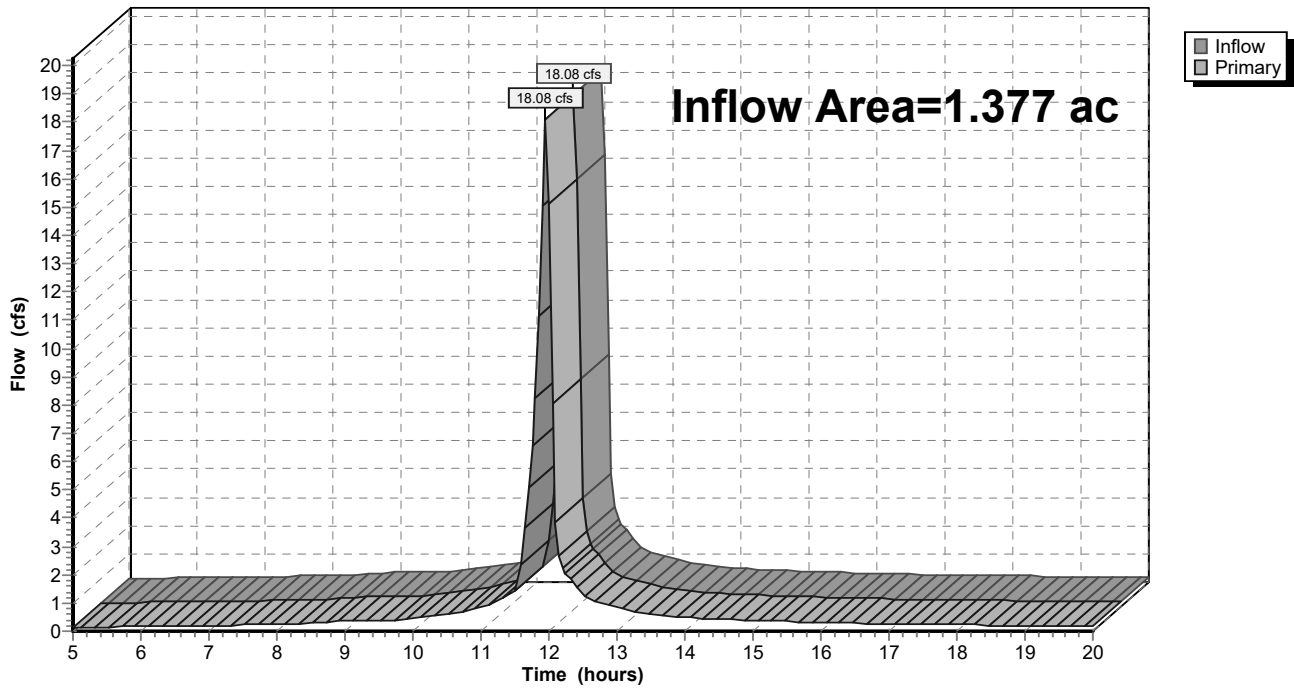
**Summary for Link 3L: CB at Corner of W Tarringford and E Main**

Inflow Area = 1.377 ac, 74.65% Impervious, Inflow Depth > 7.86" for 100-yr event  
Inflow = 18.08 cfs @ 11.95 hrs, Volume= 0.902 af  
Primary = 18.08 cfs @ 11.95 hrs, Volume= 0.902 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

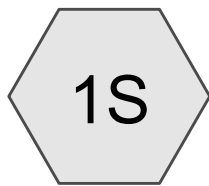
**Link 3L: CB at Corner of W Tarringford and E Main**

Hydrograph

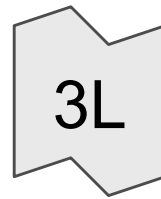
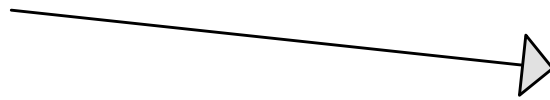




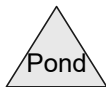
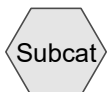
APPENDIX C  
POST-DEVELOPMENT HYDROLOGY



Area that Drains to E  
Main



CB at Corner of W  
Torrington and E Main



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## Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.171	79	50-75% Grass cover, Fair, HSG C (1S)
0.247	84	50-75% Grass cover, Fair, HSG D (1S)
0.255	98	Paved parking, HSG C (1S)
0.737	98	Paved parking, HSG D (1S)
<b>1.410</b>	<b>93</b>	<b>TOTAL AREA</b>

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## Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.426	HSG C	1S
0.984	HSG D	1S
0.000	Other	
<b>1.410</b>		<b>TOTAL AREA</b>

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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	0.000	0.171	0.247	0.000	0.418	50-75% Grass cover, Fair	1S
0.000	0.000	0.255	0.737	0.000	0.992	Paved parking	1S
<b>0.000</b>	<b>0.000</b>	<b>0.426</b>	<b>0.984</b>	<b>0.000</b>	<b>1.410</b>	<b>TOTAL AREA</b>	

**C-HYD-2000995-PROPOSED HYDROLOGY**

Type II 24-hr 2-yr Rainfall=3.54"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 1S: Area that Drains to E**    Runoff Area=61,436 sf    70.33% Impervious    Runoff Depth>2.60"  
Flow Length=211'    Tc=5.6 min    CN=93    Runoff=6.39 cfs    0.306 af

**Link 3L: CB at Corner of W Tarringford and E Main**

Inflow=6.39 cfs    0.306 af  
Primary=6.39 cfs    0.306 af

**Total Runoff Area = 1.410 ac    Runoff Volume = 0.306 af    Average Runoff Depth = 2.60"**  
**29.67% Pervious = 0.418 ac    70.33% Impervious = 0.992 ac**

**C-HYD-2000995-PROPOSED HYDROLOGY**

Type II 24-hr 2-yr Rainfall=3.54"

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**Summary for Subcatchment 1S: Area that Drains to E Main**

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

Runoff = 6.39 cfs @ 11.96 hrs, Volume= 0.306 af, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-yr Rainfall=3.54"

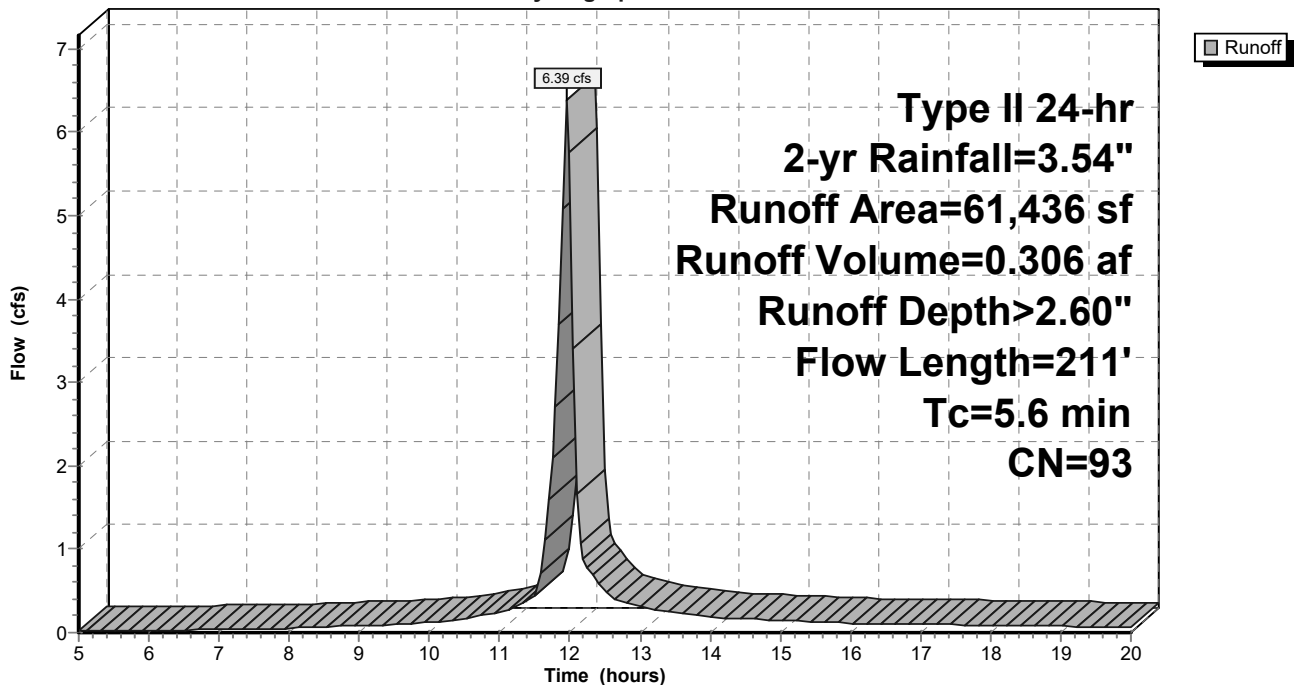
Area (sf)	CN	Description
32,103	98	Paved parking, HSG D
11,108	98	Paved parking, HSG C
10,768	84	50-75% Grass cover, Fair, HSG D
7,457	79	50-75% Grass cover, Fair, HSG C
61,436	93	Weighted Average
18,225		29.67% Pervious Area
43,211		70.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	44	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.54"
0.8	167	0.0300	3.52		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
5.6	211	Total			

**Subcatchment 1S: Area that Drains to E Main**

Hydrograph

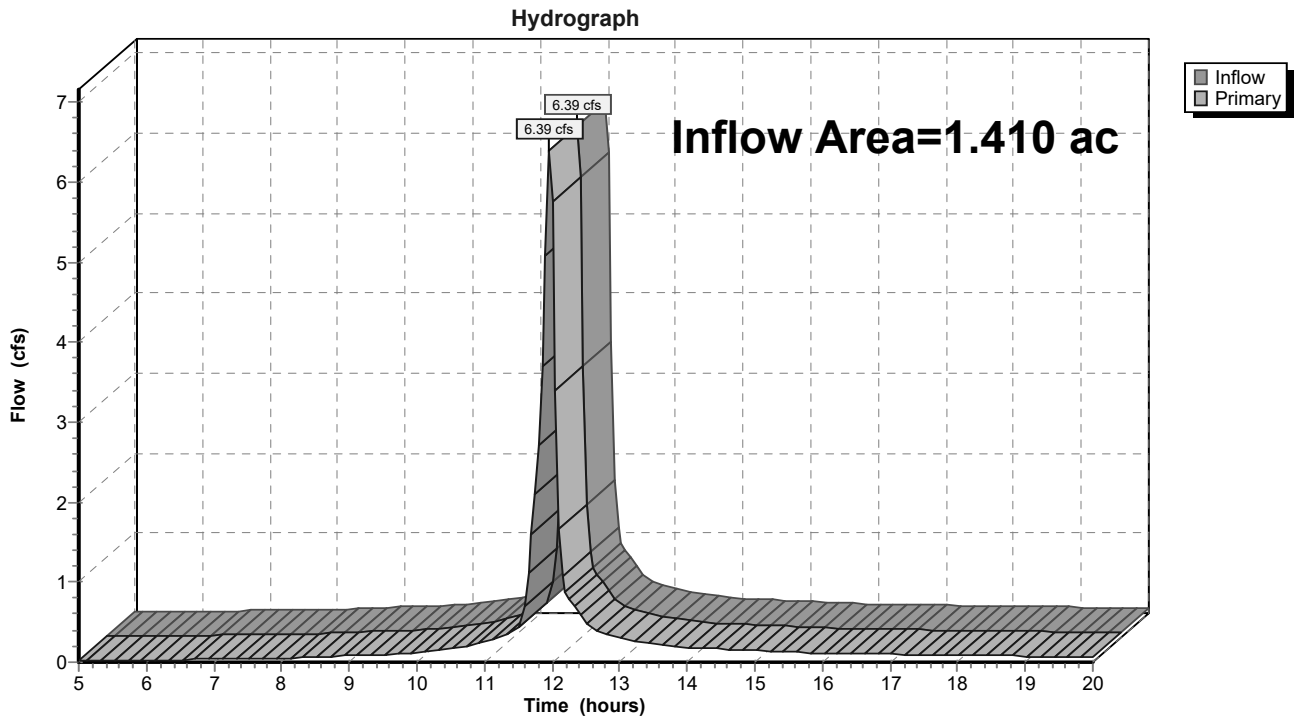


**Summary for Link 3L: CB at Corner of W Tarringford and E Main**

Inflow Area = 1.410 ac, 70.33% Impervious, Inflow Depth > 2.60" for 2-yr event  
Inflow = 6.39 cfs @ 11.96 hrs, Volume= 0.306 af  
Primary = 6.39 cfs @ 11.96 hrs, Volume= 0.306 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Link 3L: CB at Corner of W Tarringford and E Main**





**C-HYD-2000995-PROPOSED HYDROLOGY**

Type II 24-hr 5-yr Rainfall=4.74"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 1S: Area that Drains to E**    Runoff Area=61,436 sf    70.33% Impervious    Runoff Depth>3.69"  
Flow Length=211'    Tc=5.6 min    CN=93    Runoff=8.89 cfs    0.434 af

**Link 3L: CB at Corner of W Tarringford and E Main**

Inflow=8.89 cfs    0.434 af  
Primary=8.89 cfs    0.434 af

**Total Runoff Area = 1.410 ac    Runoff Volume = 0.434 af    Average Runoff Depth = 3.69"**  
**29.67% Pervious = 0.418 ac    70.33% Impervious = 0.992 ac**

**C-HYD-2000995-PROPOSED HYDROLOGY**

Type II 24-hr 5-yr Rainfall=4.74"

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**Summary for Subcatchment 1S: Area that Drains to E Main**

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

Runoff = 8.89 cfs @ 11.96 hrs, Volume= 0.434 af, Depth> 3.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 5-yr Rainfall=4.74"

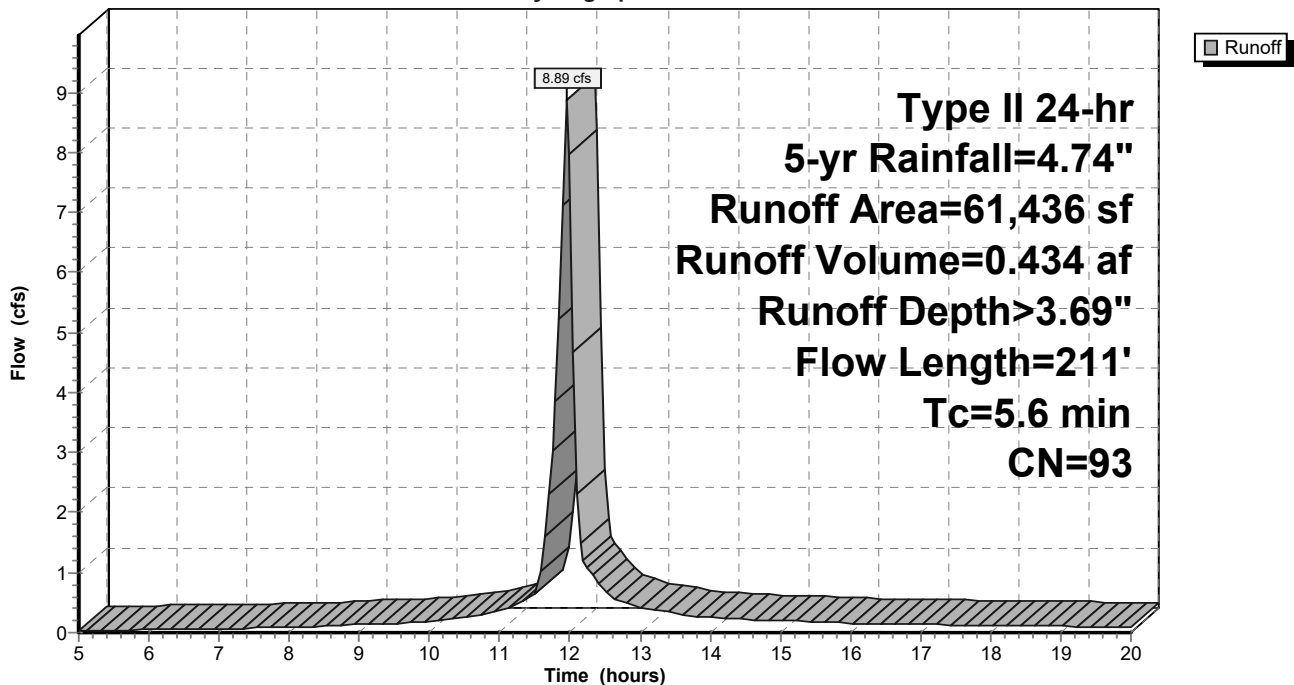
Area (sf)	CN	Description
32,103	98	Paved parking, HSG D
11,108	98	Paved parking, HSG C
10,768	84	50-75% Grass cover, Fair, HSG D
7,457	79	50-75% Grass cover, Fair, HSG C
61,436	93	Weighted Average
18,225		29.67% Pervious Area
43,211		70.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	44	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.54"
0.8	167	0.0300	3.52		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
5.6	211	Total			

**Subcatchment 1S: Area that Drains to E Main**

Hydrograph



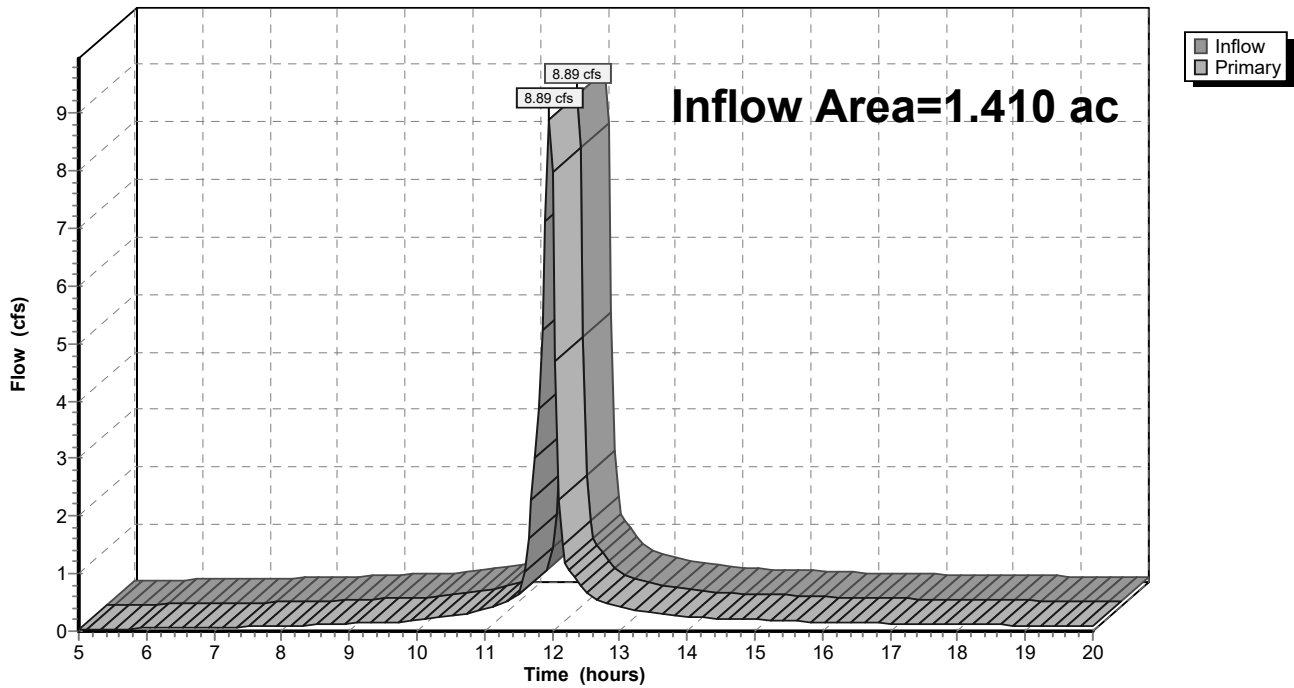
**Summary for Link 3L: CB at Corner of W Tarringford and E Main**

Inflow Area = 1.410 ac, 70.33% Impervious, Inflow Depth > 3.69" for 5-yr event  
Inflow = 8.89 cfs @ 11.96 hrs, Volume= 0.434 af  
Primary = 8.89 cfs @ 11.96 hrs, Volume= 0.434 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Link 3L: CB at Corner of W Tarringford and E Main**

Hydrograph



**C-HYD-2000995-PROPOSED HYDROLOGY**

*Type II 24-hr 10-yr Rainfall=5.74"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 1S: Area that Drains to E** Runoff Area=61,436 sf 70.33% Impervious Runoff Depth>4.61"  
Flow Length=211' Tc=5.6 min CN=93 Runoff=10.94 cfs 0.542 af

**Link 3L: CB at Corner of W Tarringford and E Main**

Inflow=10.94 cfs 0.542 af  
Primary=10.94 cfs 0.542 af

**Total Runoff Area = 1.410 ac Runoff Volume = 0.542 af Average Runoff Depth = 4.61"**  
**29.67% Pervious = 0.418 ac 70.33% Impervious = 0.992 ac**

**C-HYD-2000995-PROPOSED HYDROLOGY**

Type II 24-hr 10-yr Rainfall=5.74"

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**Summary for Subcatchment 1S: Area that Drains to E Main**

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

Runoff = 10.94 cfs @ 11.96 hrs, Volume= 0.542 af, Depth> 4.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-yr Rainfall=5.74"

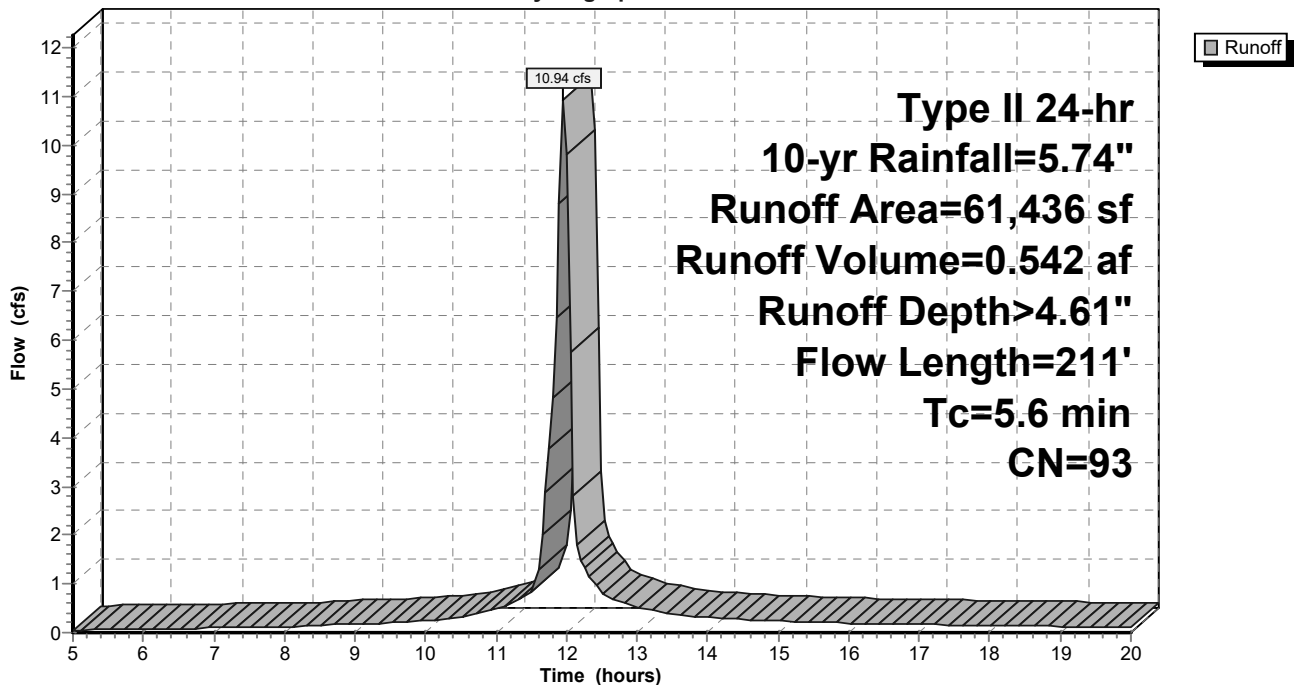
Area (sf)	CN	Description
32,103	98	Paved parking, HSG D
11,108	98	Paved parking, HSG C
10,768	84	50-75% Grass cover, Fair, HSG D
7,457	79	50-75% Grass cover, Fair, HSG C
61,436	93	Weighted Average
18,225		29.67% Pervious Area
43,211		70.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	44	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.54"
0.8	167	0.0300	3.52		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
5.6	211	Total			

**Subcatchment 1S: Area that Drains to E Main**

Hydrograph



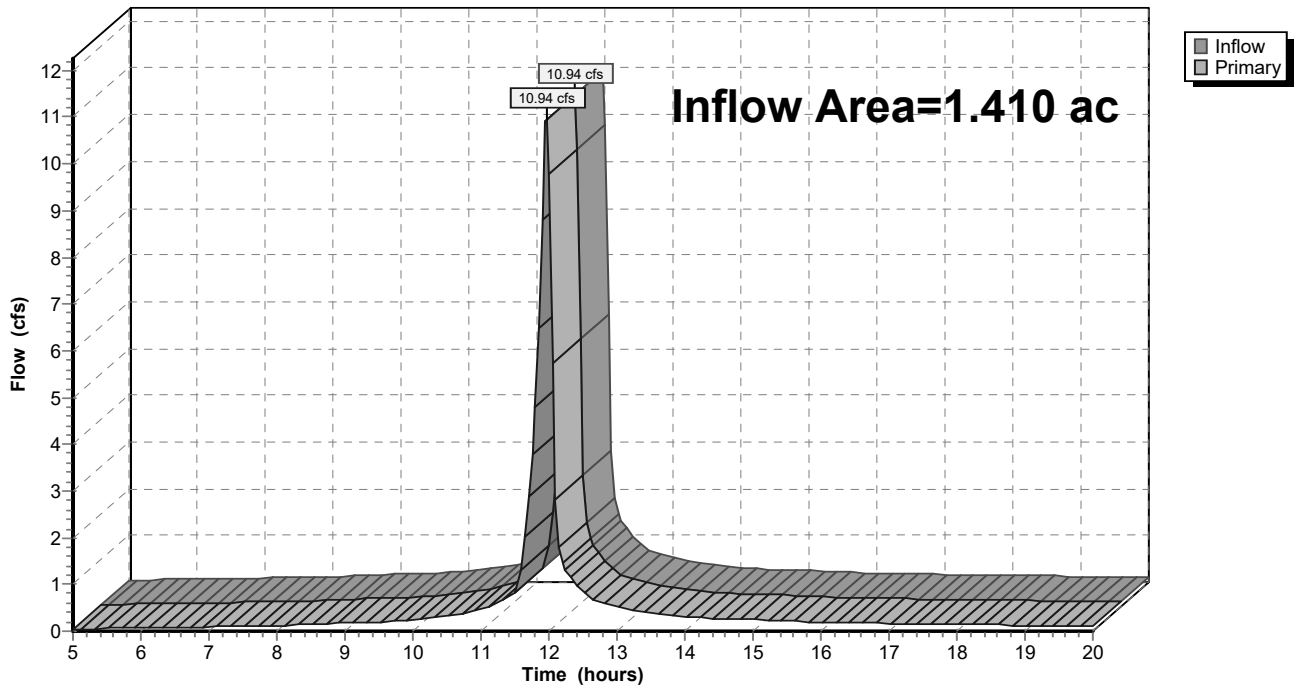
**Summary for Link 3L: CB at Corner of W Tarringford and E Main**

Inflow Area = 1.410 ac, 70.33% Impervious, Inflow Depth > 4.61" for 10-yr event  
Inflow = 10.94 cfs @ 11.96 hrs, Volume= 0.542 af  
Primary = 10.94 cfs @ 11.96 hrs, Volume= 0.542 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Link 3L: CB at Corner of W Tarringford and E Main**

Hydrograph



**C-HYD-2000995-PROPOSED HYDROLOGY**

Type II 24-hr 25-yr Rainfall=7.11"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 1S: Area that Drains to E** Runoff Area=61,436 sf 70.33% Impervious Runoff Depth>5.86"  
Flow Length=211' Tc=5.6 min CN=93 Runoff=13.74 cfs 0.689 af

**Link 3L: CB at Corner of W Tarringford and E Main**

Inflow=13.74 cfs 0.689 af  
Primary=13.74 cfs 0.689 af

**Total Runoff Area = 1.410 ac Runoff Volume = 0.689 af Average Runoff Depth = 5.86"**  
**29.67% Pervious = 0.418 ac 70.33% Impervious = 0.992 ac**

**C-HYD-2000995-PROPOSED HYDROLOGY**

Type II 24-hr 25-yr Rainfall=7.11"

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**Summary for Subcatchment 1S: Area that Drains to E Main**

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

Runoff = 13.74 cfs @ 11.96 hrs, Volume= 0.689 af, Depth> 5.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25-yr Rainfall=7.11"

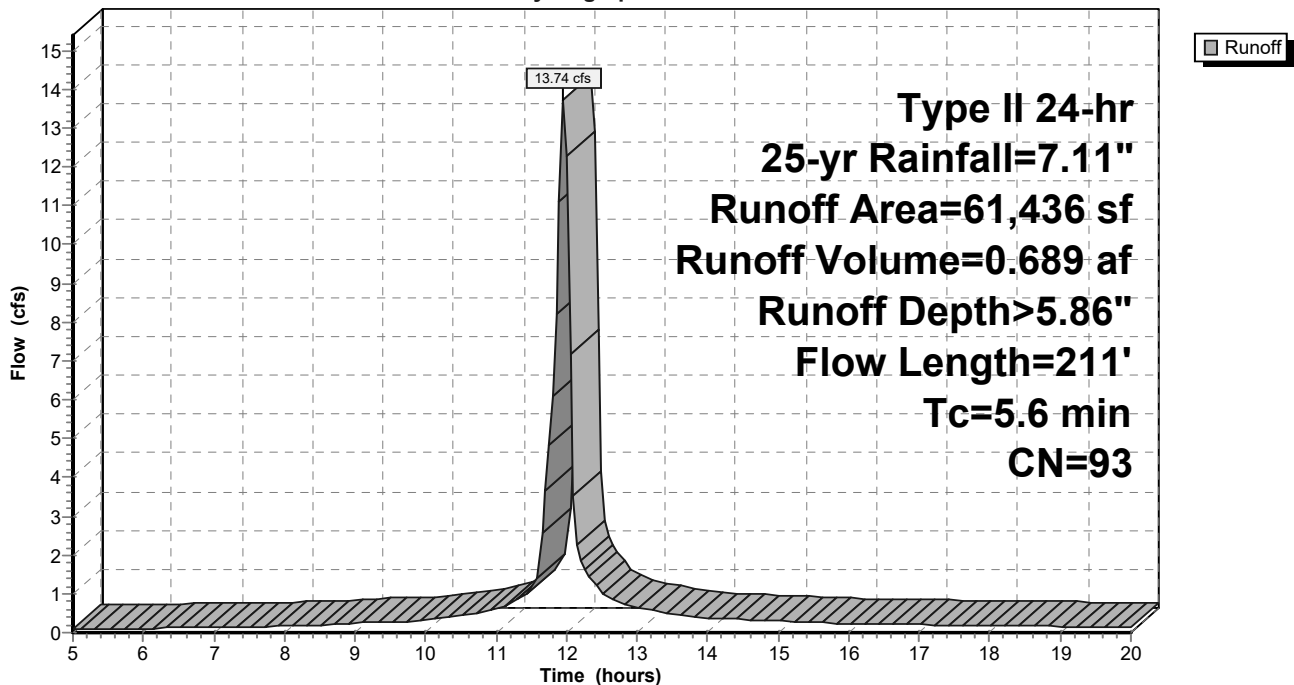
Area (sf)	CN	Description
32,103	98	Paved parking, HSG D
11,108	98	Paved parking, HSG C
10,768	84	50-75% Grass cover, Fair, HSG D
7,457	79	50-75% Grass cover, Fair, HSG C
61,436	93	Weighted Average
18,225		29.67% Pervious Area
43,211		70.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	44	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.54"
0.8	167	0.0300	3.52		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
5.6	211	Total			

**Subcatchment 1S: Area that Drains to E Main**

Hydrograph





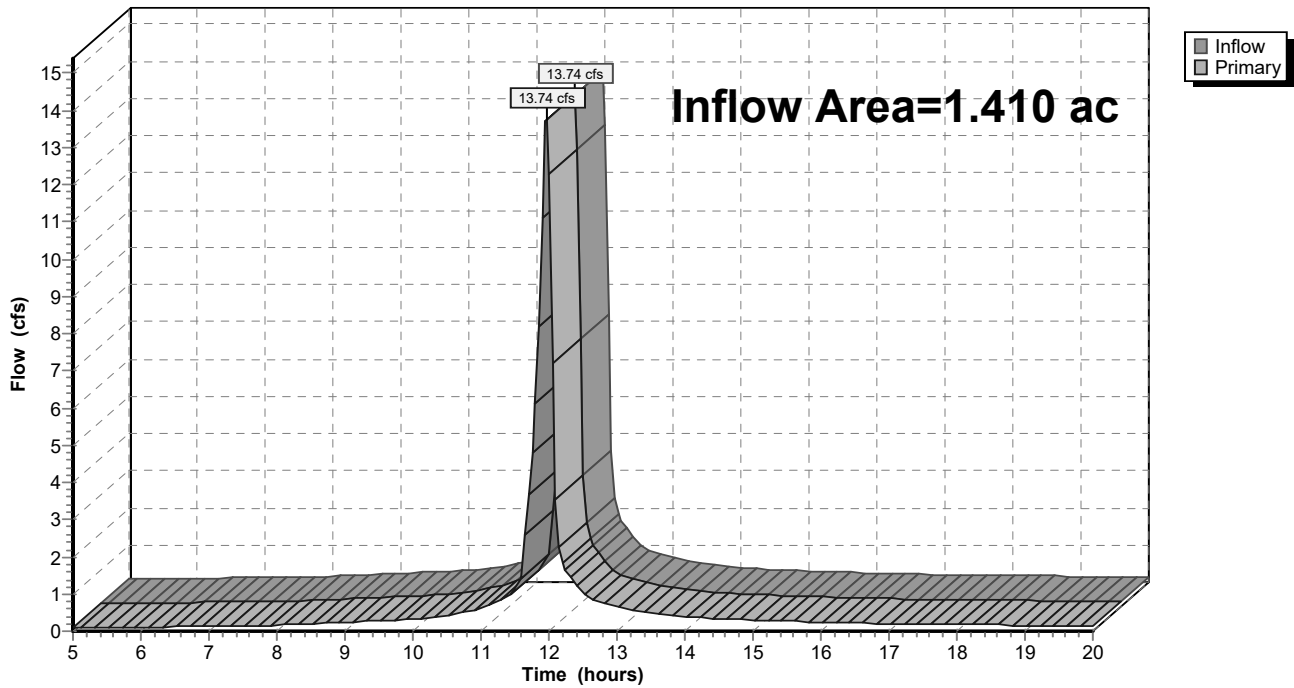
### Summary for Link 3L: CB at Corner of W Tarringford and E Main

Inflow Area = 1.410 ac, 70.33% Impervious, Inflow Depth > 5.86" for 25-yr event  
Inflow = 13.74 cfs @ 11.96 hrs, Volume= 0.689 af  
Primary = 13.74 cfs @ 11.96 hrs, Volume= 0.689 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Link 3L: CB at Corner of W Tarringford and E Main

Hydrograph



**C-HYD-2000995-PROPOSED HYDROLOGY**

*Type II 24-hr 50-yr Rainfall=8.10"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 1S: Area that Drains to E** Runoff Area=61,436 sf 70.33% Impervious Runoff Depth>6.76"  
Flow Length=211' Tc=5.6 min CN=93 Runoff=15.75 cfs 0.795 af

**Link 3L: CB at Corner of W Tarringford and E Main**

Inflow=15.75 cfs 0.795 af  
Primary=15.75 cfs 0.795 af

**Total Runoff Area = 1.410 ac Runoff Volume = 0.795 af Average Runoff Depth = 6.76"**  
**29.67% Pervious = 0.418 ac 70.33% Impervious = 0.992 ac**

**C-HYD-2000995-PROPOSED HYDROLOGY**

Type II 24-hr 50-yr Rainfall=8.10"

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**Summary for Subcatchment 1S: Area that Drains to E Main**

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

Runoff = 15.75 cfs @ 11.96 hrs, Volume= 0.795 af, Depth> 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 50-yr Rainfall=8.10"

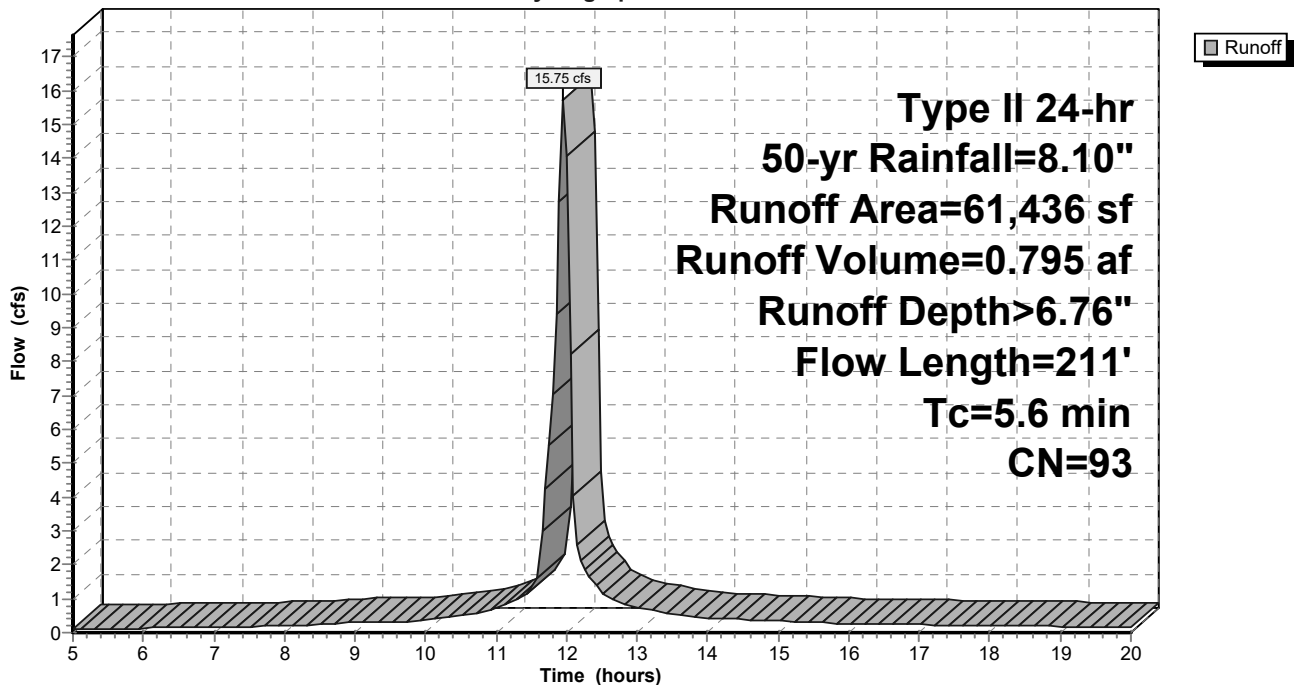
Area (sf)	CN	Description
32,103	98	Paved parking, HSG D
11,108	98	Paved parking, HSG C
10,768	84	50-75% Grass cover, Fair, HSG D
7,457	79	50-75% Grass cover, Fair, HSG C
61,436	93	Weighted Average
18,225		29.67% Pervious Area
43,211		70.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	44	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.54"
0.8	167	0.0300	3.52		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
5.6	211	Total			

**Subcatchment 1S: Area that Drains to E Main**

Hydrograph



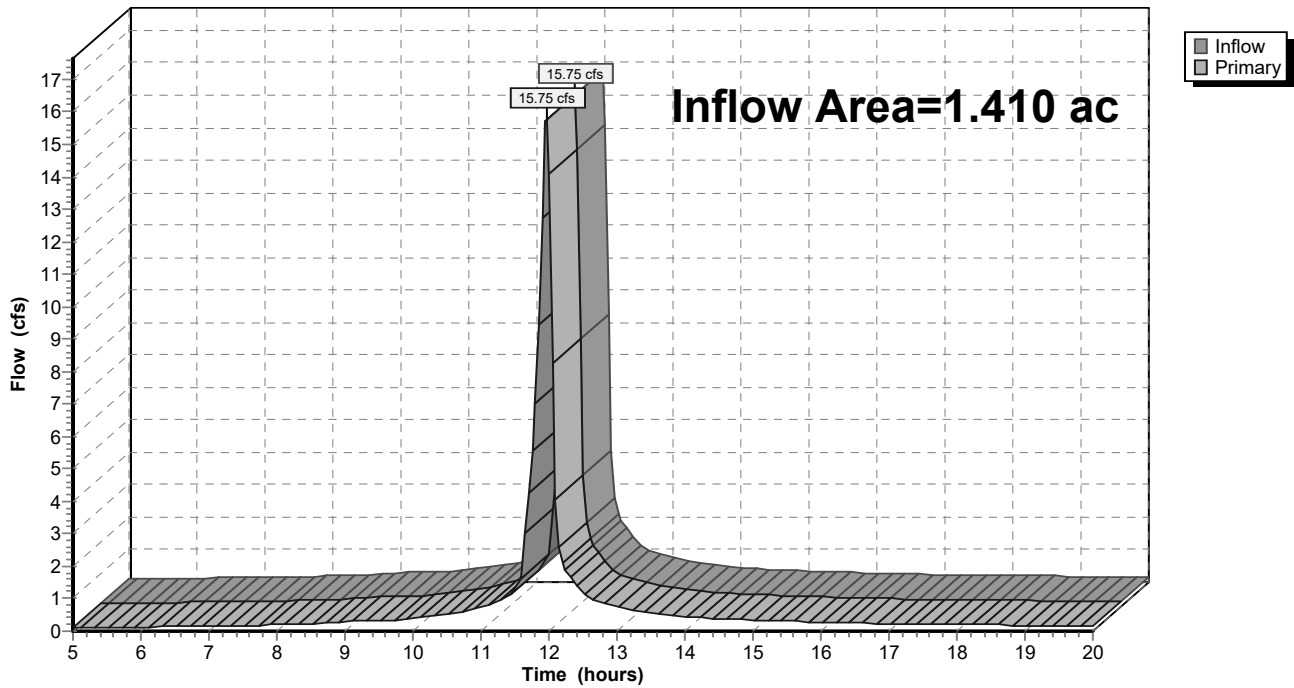
**Summary for Link 3L: CB at Corner of W Tarringford and E Main**

Inflow Area = 1.410 ac, 70.33% Impervious, Inflow Depth > 6.76" for 50-yr event  
Inflow = 15.75 cfs @ 11.96 hrs, Volume= 0.795 af  
Primary = 15.75 cfs @ 11.96 hrs, Volume= 0.795 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Link 3L: CB at Corner of W Tarringford and E Main**

Hydrograph



**C-HYD-2000995-PROPOSED HYDROLOGY**

Type II 24-hr 100-yr Rainfall=9.22"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 1S: Area that Drains to E** Runoff Area=61,436 sf 70.33% Impervious Runoff Depth>7.78"  
Flow Length=211' Tc=5.6 min CN=93 Runoff=18.02 cfs 0.914 af

**Link 3L: CB at Corner of W Tarringford and E Main**

Inflow=18.02 cfs 0.914 af  
Primary=18.02 cfs 0.914 af

**Total Runoff Area = 1.410 ac Runoff Volume = 0.914 af Average Runoff Depth = 7.78"**  
**29.67% Pervious = 0.418 ac 70.33% Impervious = 0.992 ac**

**C-HYD-2000995-PROPOSED HYDROLOGY**

Type II 24-hr 100-yr Rainfall=9.22"

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**Summary for Subcatchment 1S: Area that Drains to E Main**

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

Runoff = 18.02 cfs @ 11.96 hrs, Volume= 0.914 af, Depth> 7.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-yr Rainfall=9.22"

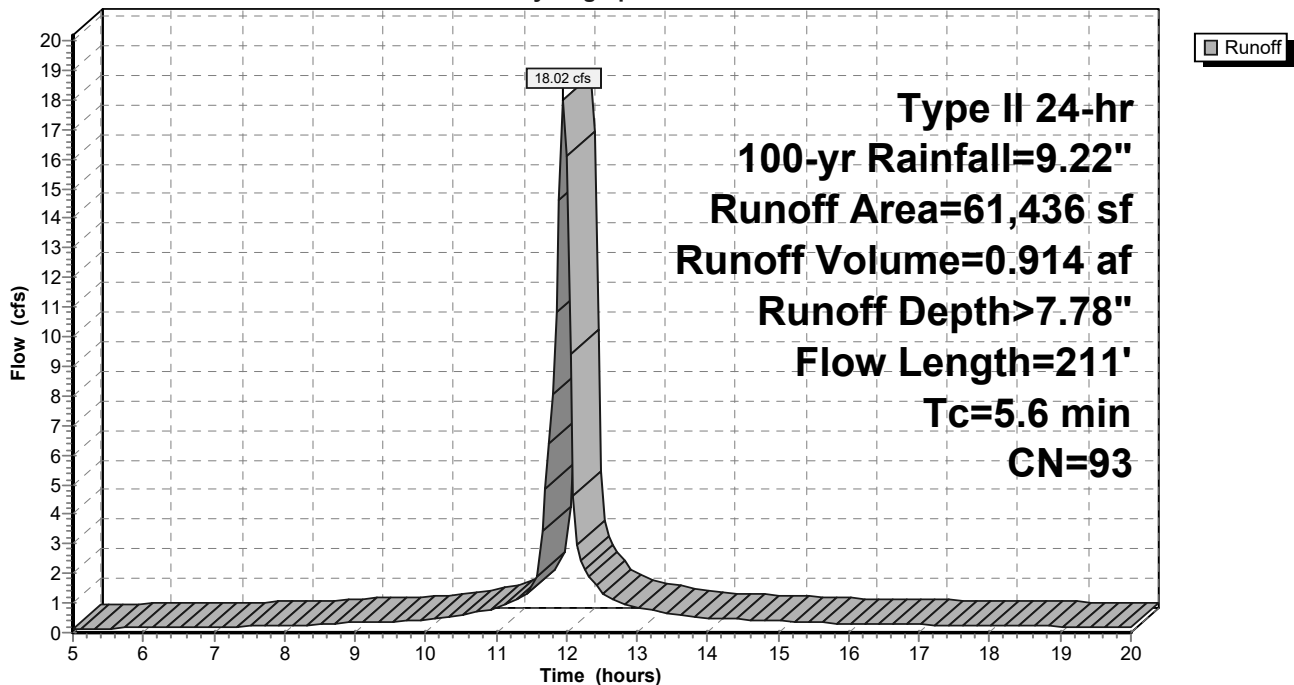
Area (sf)	CN	Description
32,103	98	Paved parking, HSG D
11,108	98	Paved parking, HSG C
10,768	84	50-75% Grass cover, Fair, HSG D
7,457	79	50-75% Grass cover, Fair, HSG C
61,436	93	Weighted Average
18,225		29.67% Pervious Area
43,211		70.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	44	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.54"
0.8	167	0.0300	3.52		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
5.6	211	Total			

**Subcatchment 1S: Area that Drains to E Main**

Hydrograph



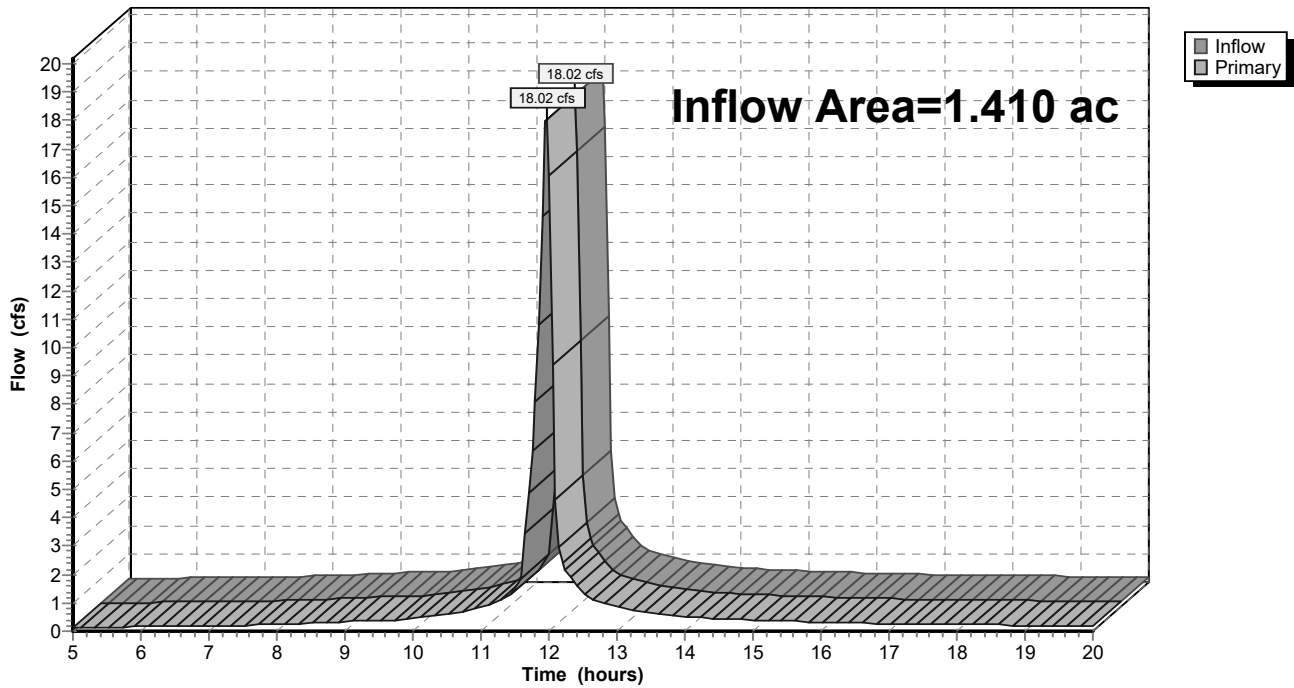
**Summary for Link 3L: CB at Corner of W Tarringford and E Main**

Inflow Area = 1.410 ac, 70.33% Impervious, Inflow Depth > 7.78" for 100-yr event  
Inflow = 18.02 cfs @ 11.96 hrs, Volume= 0.914 af  
Primary = 18.02 cfs @ 11.96 hrs, Volume= 0.914 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Link 3L: CB at Corner of W Tarringford and E Main**

Hydrograph



## APPENDIX D

### WATER QUALITY CALCULATIONS

CTDEEP Water Quality Flow Calculations

Treatment Train Efficiency Worksheet



**Water Quality Calculations**

**Determine Water Quality Flow**

From CT 2004 Stormwater Quality Manual:

$$CN = \frac{1000}{\left[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{\frac{1}{2}}\right]}$$

$$Q = \frac{[WQV(acre - feet) \times [12(inches / foot)]]}{DrainageArea(acres)}$$

$$WQF = (q_u)(A)(Q)$$

CN = Runoff Curve Number

P = design precipitation, inches, (1" for water quality storm)

Q = runoff depth (in watershed inches)

T<sub>c</sub> = time of concentration

I<sub>a</sub> = Initial abstraction, inches, from Table 4-1, Chapter 4, TR-55

q<sub>u</sub> = unit peak discharge,

WQF = water quality flow (cfs)

Structure		Total Area			Imp Area		Imp Cover	R	WQV	Q	P	CN	T <sub>c</sub>		I <sub>a</sub>	I <sub>a</sub> /P	q <sub>u</sub> *	WQF
		ft <sup>2</sup>	ac	mi <sup>2</sup>	ft <sup>2</sup>	ac	%	-	acre-feet	in	in	-	mins	hours	in	-	cfs/mi <sup>2</sup> /in	cfs
Hydrodynamic Separator	PDA 110	61,436	1.410	0.002	43,211	0.992	70.33	0.683	0.08	0.68	1.00	97	6.0	0.1	0.062	0.062	630	0.86

\* From Exhibit 4-III: Unit peak discharge (q<sub>u</sub>) for SCS type III rainfall distribution, Urban Hydrology for Small Watersheds (TR-55), USDS < SCS, June 1986.

**Best Management Practice (BMP) Treatment Train Efficiency Worksheet**

Prepared for:  
**Proposed Chipotle Restaurant**  
 1313 East Main Street  
 Torrington, Connecticut

Prepared by:  
**BL Companies**  
 100 Constitution Plaza, 10th Floor  
 Hartford, CT

Date prepared:  
**August 6, 2020**

**Overall Site Treatment Train Efficiency to Underground Stormwater Detention System**

Et=[(1-(E1)(1-E2)(1-E3)(1-E4)(1-E?)]*100	BMP	BMP Description	Type of Treatment	Efficiency
				Rate %
	E1	Impervious Surface Sweeping***	secondary (conventional)	10
	E2	Deep Sump and Hooded Catch Basin	secondary (conventional)	25
	E3	Hydrodynamic Separator**	Primary	80

Overall Treatment Train Efficiency (Et)= **87 % Total Suspended Solids (TSS) Removal**

\* 80% required per CT DEEP  
 \*\* Manufacturer Claims 80% TSS Removal  
 \*\*\* Schueler 1996 & EPA 1993

BMP	Type of Treatment	TSS Removal	Starting TSS	Amount	Remaining
		Rate	Load	Removed	Load
Impervious Surface Sweeping***	secondary (conventional)	0.10	1	0.10	0.9
Deep Sump and Hooded Catch Basin	secondary (conventional)	0.25	0.9	0.23	0.68
Hydrodynamic Separator**	Primary	0.8	0.68	0.54	0.14

Overall Treatment Train Efficiency (%) **87**

**TSS Removal Rates (adapted from Schueler, 1996, & EPA, 1993)**

BMP List	Design Rate	Range of Average TSS Removal Rates	Brief Design Requirements
Extended Detention Pond	70%	60-80%	Sediment forebay
Wet Pond (a)	70%	60-80%	Sediment forebay
Constructed Wetland (b)	80%	65-80%	Designed to infiltrate or retain
Water Quality Swale	70%	60-80%	Designed to infiltrate or retain
Infiltration Trench	80%	75-80%	Pretreatment critical
Infiltration Basin	80%	75-80% (predicted)	Pretreatment critical
Dry Well	80%	80% (predicted)	Roof-top runoff (uncontaminated only)
Sand Filter (c)	80%	80%	Pretreatment
Organic Filter (d)	80%	80%+	Pretreatment
Water Quality Inlet	25%	15-35% w/ cleanout	Off-line only; 0.1" minimum Water Quality Volume (WQV) storage
Sediment Trap (Forebay)	25%	25% w/ cleanout	Storm flows for 2-year event must not cause erosion; 0.1" minimum WQV storage
Drainage Channel	25%	25%	Check dams; non-erosive for 2-yr.
Deep Sump and Hooded Catch Basin	25%	25% w/ cleanout	Deep sump general rule = 4 x pipe diameter or 4.0' for pipes 18" or less
Street Sweeping	10%	10%	Discretionary non-structural credit, must be part of approved plan

## APPENDIX E






### DRAINAGE MAPS

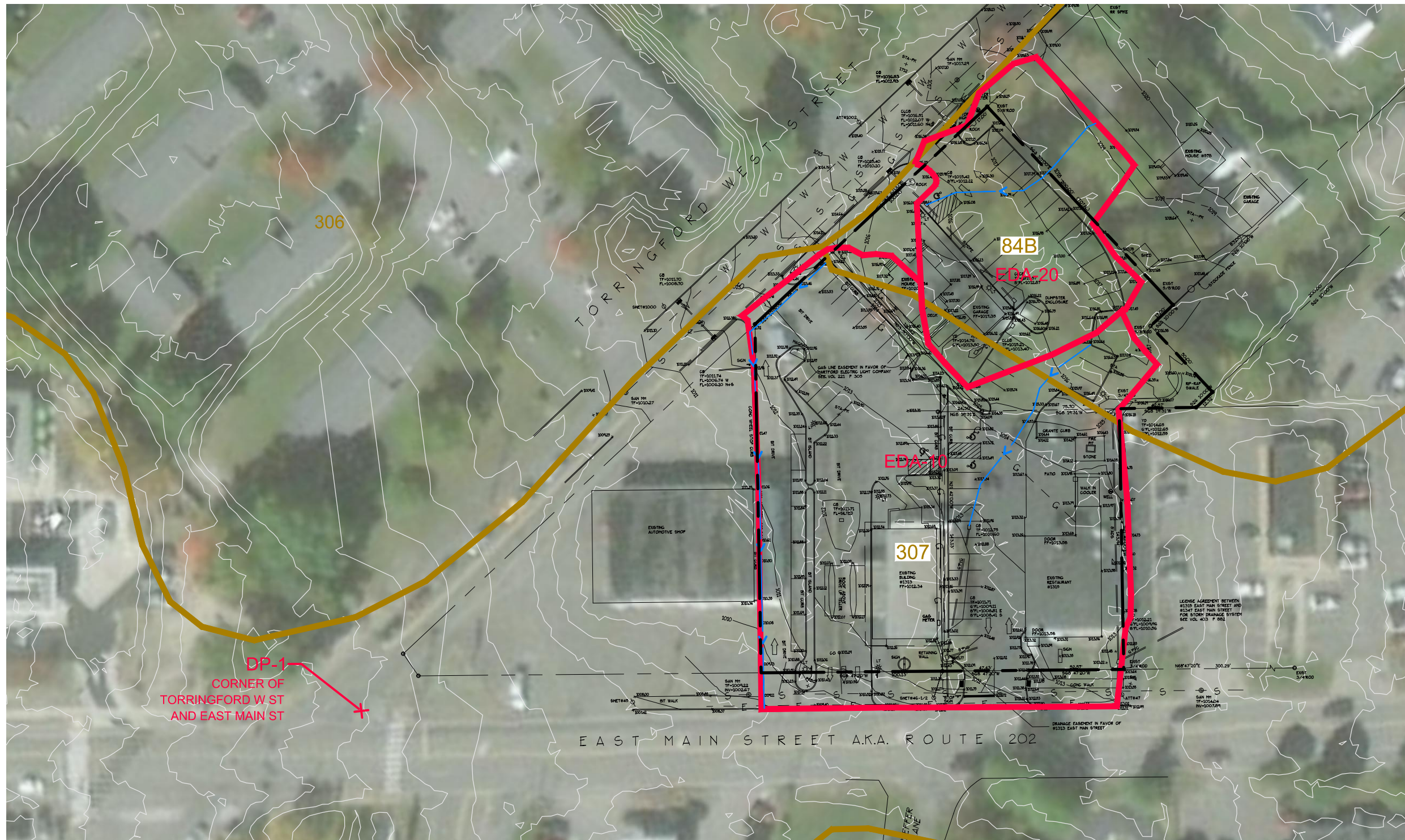
- ED-1 – Existing Drainage Mapping
- PD-1 – Proposed Drainage Mapping
- GD-1 – Grading and Drainage Plan

### EXISTING HYDROLOGY INFORMATION

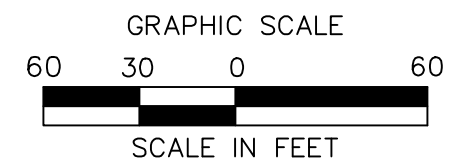
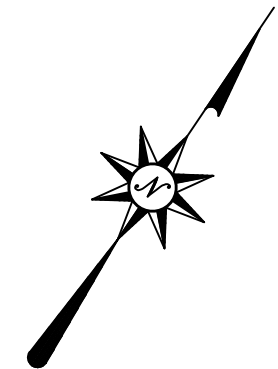
DRAINAGE AREA	TOTAL AREA (S.F.)	IMPERVIOUS AREA (S.F.)	PERVIOUS AREA (S.F.)	PERCENT IMPERVIOUS (%)	CN	TIME OF CONCENTRATION (MIN.)
EDA-10	44,597	35,548	9,049	79.7%	95	5.0
EDA-20	15,383	9,229	6,154	60.0%	91	5.0

### HYDROLOGY LEGEND

-  PROPERTY LINE
-  DRAINAGE AREA BOUNDARY
-  TIME OF CONCENTRATION FLOW PATH
-  SOIL TYPE BOUNDARY
-  SOIL TYPE DESIGNATION



**PROPOSED CHIPOTLE RESTAURANT**  
 1313 EAST MAIN STREET  
 TORRINGTON, CONNECTICUT



Designed E.P.Z.  
 Drawn E.P.Z.  
 Reviewed M.J.B.  
 Scale 1"=60'  
 Project 2000995  
 Date 08/06/2020






**EXISTING DRAINAGE MAPPING**

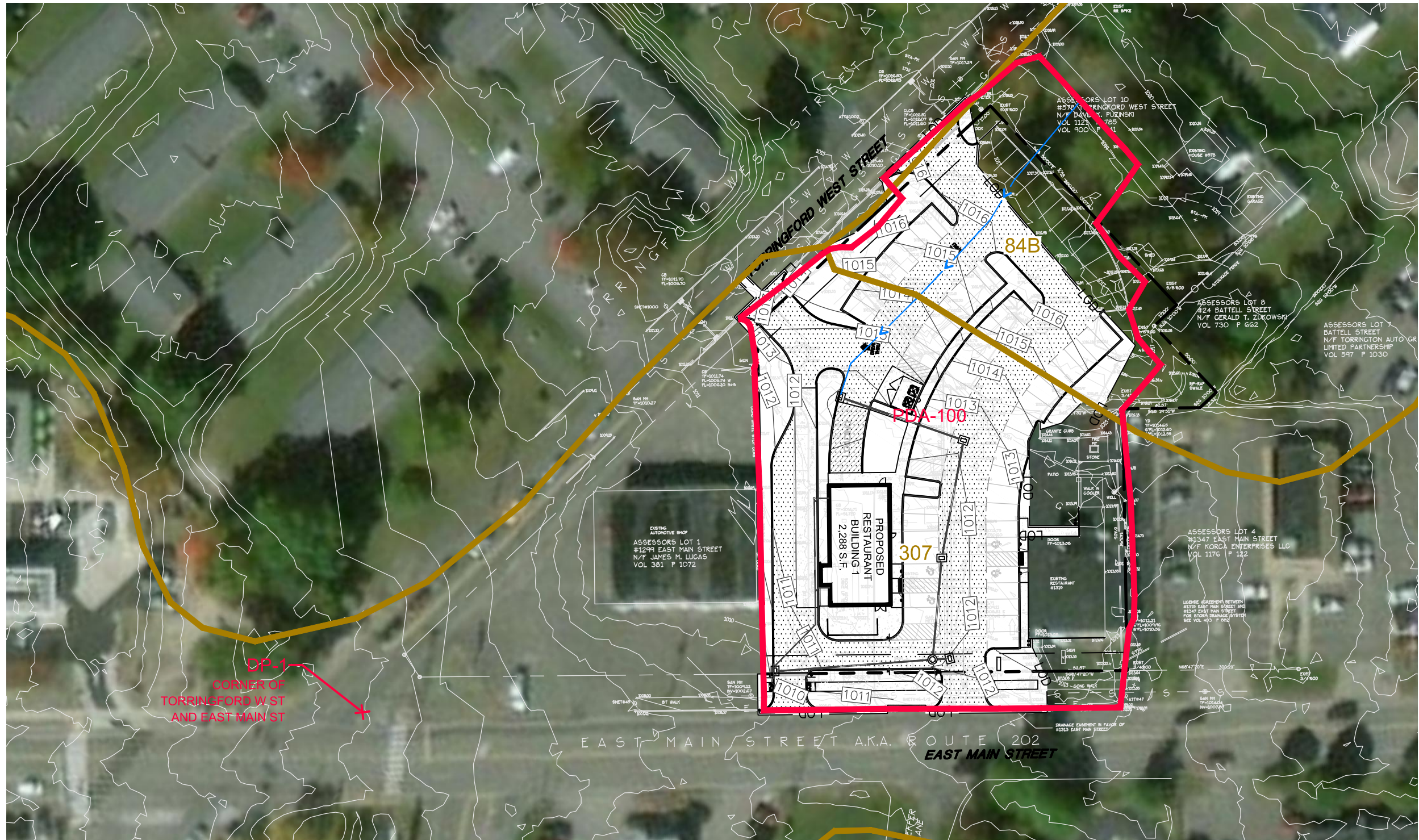
**ED-1**

**PROPOSED HYDROLOGY INFORMATION**

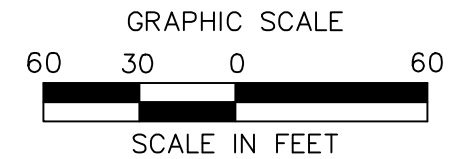
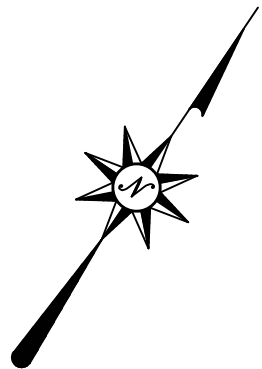
DRAINAGE AREA	TOTAL AREA (S.F.)	IMPERVIOUS AREA (S.F.)	PERVIOUS AREA (S.F.)	PERCENT IMPERVIOUS (%)	CN	TIME OF CONCENTRATION (MIN.)
PDA-100	61,436	43,211	18,225	70.3%	93	6.0

**HYDROLOGY LEGEND**

-  PROPERTY LINE
-  DRAINAGE AREA BOUNDARY
-  TIME OF CONCENTRATION FLOW PATH
-  SOIL TYPE BOUNDARY
-  SOIL TYPE DESIGNATION



**PROPOSED CHIPOTLE RESTAURANT**  
 1313 EAST MAIN STREET  
 TORRINGTON, CONNECTICUT



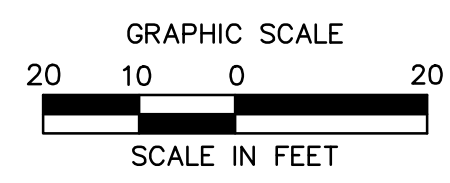
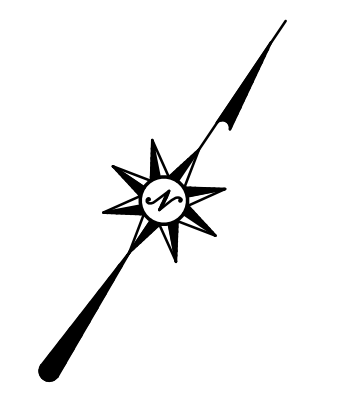
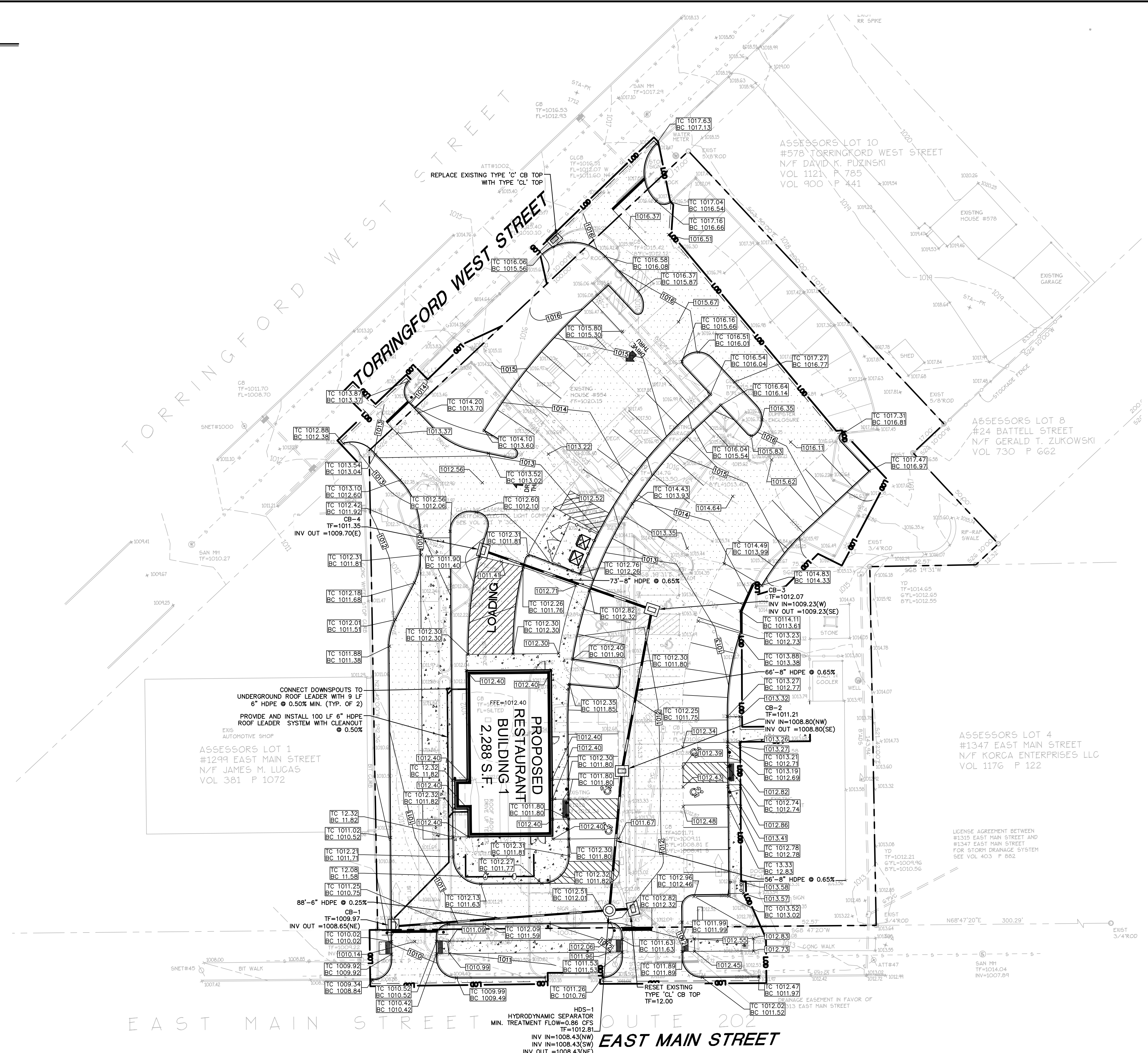
Designed E.P.Z.  
 Drawn E.P.Z.  
 Reviewed M.J.B.  
 Scale 1"=60'  
 Project 2000995  
 Date 08/06/2020

**PROPOSED DRAINAGE MAPPING**

**PD-1**

### GRADING AND DRAINAGE LEGEND

PROPERTY LINE	
LIMIT OF DISTURBANCE LINE AND CONTRACT LIMIT LINE	
STORM LINE	
CATCH BASIN	
STORM MANHOLE	
FLARED END	
END WALL OR HEADWALL	
OUTLET CONTROL STRUCTURE	
HYDRODYNAMIC SEPARATOR	
PROPOSED CONTOUR LINE	
PROPOSED SPOT GRADE	
<b>ABBREVIATIONS</b>	
- TC=TOP OF CURB	
- BC=BOTTOM OF CURB	
- TW=TOP OF WALL	
- BW=BOTTOM OF WALL	
<b>PROPOSED SURFACE SLOPE</b>	
2%	
<b>ELECTRIC LINE</b>	
ELECTRIC AND TELECOMMUNICATIONS LINES	
GAS LINE	
WATER LINE	
SANITARY SEWER LINE	
SANITARY SEWER FORCE MAIN	
OVERHEAD LINE	
TRANSFORMER	
HYDRANT	
UTILITY POLE	
SANITARY/STORM MANHOLE	
SANITARY/STORM CLEANOUT	
WATER VALVE	
GATE VALVE	
THRUST BLOCK	
GREASE TRAP	



NOT FOR CONSTRUCTION  
FOR PERMITTING PURPOSES ONLY

REVISIONS	Desc.
No.	Date
Designed	EPZ
Drawn	EPZ
Reviewed	
Scale	1"=20'
Project No.	2000995
Date	08/04/20
CAD File:	GD200099501
Title	<b>GRADING AND DRAINAGE PLAN</b>
Sheet No.	<b>GD-1</b>

APPENDIX F

STORMWATER SYSTEM  
OPERATION AND MAINTENANCE MANUAL

**Appendix F:**

**Stormwater System  
Operations and Maintenance Plan**

*For the Proposed:*  
**Chipotle Restaurant**

*Located at:*  
1313 East Main Street  
Torrington, Connecticut

*Prepared for Submission to:*  
**City of Torrington, Connecticut**

August 6, 2020

*Prepared for:*  
**Garrett Homes, LLC**  
59 Field Street  
Torrington, CT

*Prepared by:*



**BL Companies**  
100 Constitution Plaza, 10<sup>th</sup> Floor  
Hartford, Connecticut 06103  
Phone: (860) 249-2200  
Fax: (860) 249-2400

BL Project Number: 2000995



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## General Overview

The project parcel, located at 1313 East Main St., is approximately 1.25 acres in size and is currently developed with a 2,576 square foot pizza restaurant building, a 2165 square foot bank building, and a 782 square foot single family residential building with a 318 square foot detached garage. The entire site has been previously developed containing impervious paved parking with drive aisle areas, turf and paved islands, a lawn surrounding the house, and a patio behind the pizza restaurant. The south side of the property fronts on East Main St. across from Pfeffer Lane and the northwest side of the property fronts on Tarringford West St. It is bordered by commercial properties to the east and west, and residential property to the north. In general, the existing topography slopes from northeast to southwest across the site from approximately elevation 1018' to 1009'. Slopes on site vary from approximately 2% to 6%. In the existing condition, approximately 80% of the stormwater flows to East Main St., with the remaining 20% flowing to Tarringford West St. Stormwater is mostly collected in catch basins that connect to the city drainage system. There is some sheet flow that flows directly to East Main St. where it enters a catch basin at the corner of Tarringford West St. and East Main St. There are currently no formal stormwater management systems located within the project parcel.

Proposed site improvements will include removing the existing bank building and residential house and garage, a 2,288 square foot Chipotle restaurant building, paved parking areas and driveways, landscaped areas, pedestrian sidewalks, site utilities and lighting, and a stormwater management system. The proposed stormwater management system is designed to be in compliance with the 2002 State of Connecticut Guidelines for Soil Erosion and Sediment Control, and the 2004 State of Connecticut Stormwater Quality Manual.

The following Operations and Maintenance Plan was prepared specifically for this proposed development in the City of Torrington, Connecticut. The Plan was developed to satisfy the requirements of the Connecticut Department of Energy and Environmental Protection's 2002 Connecticut Guidelines for Soil Erosion and Sediment Control.

### Purpose & Goals

The purpose of this Manual is to ensure that the stormwater management components are operated in accordance with all approvals and permits. The primary goal is to inform all the property managers about how the system operates and what maintenance items are necessary to protect downstream wetlands and watercourses. The secondary goal is to provide a practical, efficient means of maintenance planning and record keeping to verify permit compliance.

### Responsible Parties

The Property Owner will be responsible for implementing the Plan on the property.

Maintenance inspections shall be performed by a qualified professional.

Some utilities located on the site will be owned and maintained by various utility companies in accordance with their standards. The property owner may maintain the service connections.

### List of Permits & Special Conditions

The project will receive several permits, which may contain special conditions that require compliance by the property owner and maintenance contractors. This permit may include the following:

- City of Torrington –Zoning Permit, Building Permit, Grading Permit
- State of Connecticut Department of Transportation – Encroachment Permit

### Maintenance Logs and Checklists

The property owner will keep a record of all maintenance procedures performed, date of inspection/ cleanings, etc. Copies of inspection reports and maintenance records shall be kept on-site.

### Forms

The following forms will be developed for annual maintenance. Copies of the forms will be kept on-site as part of the Storm Water Management Plan.

- Annual Checklist
- Quarterly Checklist
- Monthly Checklist

### Employee Training

The property owner will have an employee-training program, with annual up-dates, to ensure that the qualified employees charged with maintaining the buildings and grounds do so in accordance with the approved permit conditions. All employees that have maintenance duties will be adequately informed of their responsibilities.

### Spill Control

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and clean-up:

- Manufacturer’s recommended methods for spill clean-up will be clearly posted and site personnel will be made aware of the procedures and the location of the information and clean-up supplies.
- Materials and equipment necessary for spill clean-up will be kept in the material storage area on-site. Equipment and materials will include but not be limited to: absorbent booms or mats, brooms, dust pans, mops, rags, gloves, goggles, sand, and plastic and metal trash containers specifically for this purpose.

- All spills will be cleaned immediately after discovery.
- The spill area will be kept well-ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with hazardous substance.
- Spills of toxic or hazardous material, regardless of size, will be reported to the appropriate State or local government agency.
- If a spill occurs, this plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean the spill if there is another one. A description of the spill, the cause, and the remediation measures will also be included.

A spill report shall be prepared by the property owner following each occurrence. The spill report shall present a description of the release, including quantity and type of material, date of spill, circumstances leading to the release, location of spill, response actions and personnel, documentation of notifications and corrective measures implemented to prevent reoccurrence.

The property owner shall identify an appropriately qualified and trained site employee involved with day-to-day site operations to be the spill prevention and clean-up coordinator. The name(s) of responsible spill personnel shall be posted on-site. Each employee shall be instructed that all spills are to be reported to the spill prevention and clean-up coordinator.

## **Storm Water Management**

### System Components

The storm water management system has several components that are shown on the Grading and Drainage Plan (GD-1), that performs various functions in treating storm water runoff:

### Catch Basins and Manholes

The property owner is responsible for cleaning the catch basins and manholes on the property. A Connecticut Licensed hauler shall clean the sumps and dispose of removed sand legally. The road sand may be reused for winter sanding but may not be stored on-site. As part of the hauling contract, the hauler shall notify the property owner in writing where the material is being disposed.

Each catch basin shall be inspected every four months, with one inspection occurring during the month of April. Any debris occurring within one foot from the bottom of each sump shall be removed by Vacuum "Vactor" type of maintenance equipment.

During the inspection of each of the catch basin sumps, the hoods (where provided) on each of the outlet pipes shall also be observed for trash accumulation as well as overall condition. In the event that a hood is damaged or off the hanger, it shall be reset or repaired.

### Hydrodynamic Separator

The hydrodynamic separator shall be inspected every six months in the months of April and September or per manufacturers recommendations. It should be vacuumed out per the manufacturer's instructions. Dispose of waste materials per local authorities requirements.

## **Site Maintenance**

### Parking Lots

Parking lots and sidewalks shall be swept as necessary by the property owner, or at least once per year, to clean sediment, trash, and other debris. The property owner will sweep parking lots on the property in the spring to remove winter accumulations of road sand.

### Landscaping

The management company retained by the property owner will maintain landscaped areas. Normally the landscaping maintenance will consist of pruning, mulching, planting, mowing lawns, raking leaves, etc. Use of fertilizers and pesticides will be controlled and limited to minimal amounts necessary for healthy landscape maintenance.

The lawn areas, once established, will be maintained at a typical height of 3 ½". This will allow the grass to be maintained with minimal impact from weeds and/or pests. The low-maintenance areas will be maintained as a meadow or allowed to revert back to natural conditions. Topsoil, brush, leaves, clippings, woodchips, mulch, equipment, and other material shall be stored off site.

### Outdoor Storage

There will be no outdoor storage of hazardous chemicals, de-icing agents, fertilizer, pesticides, or herbicides anywhere around the buildings.

### Deicing and Snow Removal & Storage

The use of clean sand may be used to aid traction in conjunction with salt and/or chemicals for deicing, snow melting and other related winter weather management. Snow shall be shoveled and plowed from sidewalk and parking areas as soon as practical during and after winter storms. Sand accumulation shall be removed from the site at the end of the winter season or appropriate time when seasonal snow has melted. Alternative deicing methods must be submitted prior to use onsite for review to the City of Torrington for approval.

## MAINTENANCE SCHEDULE

During the First Year of Operation:		
Task:	Completion Date:	Manager's Initials:
JANUARY:		
Employee Training Program with Spill Program		
*Catch Basin Inspection		
APRIL:		
*Catch Basin Inspection		
Hydrodynamic Separator Inspection		
Sweeping of Paved Surfaces		
Shrub Fertilization		
Lawn Liming (if necessary)		
JUNE:		
*Catch Basin Inspection		
Sweeping of Paved Surfaces		
SEPTEMBER:		
Hydrodynamic Separator Inspection		
Sweeping of Paved Surfaces		
Tree and Lawn Fertilization		
DECEMBER:		
*Catch Basin Inspection		
Sweeping of Paved Surfaces		

\*NOTE: Use appropriate worksheet found in this plan to conduct the inspection.

**After the First Year of Operation:**

**FOR YEAR \_\_\_\_\_**

Task:		Completion Date:	Manager's Initials:
<b>JANUARY:</b>			
Employee Training Program with Spill Program			
<b>APRIL:</b>			
*Catch Basin Inspection			
Hydrodynamic Separator Inspection			
Sweeping of Paved Surfaces			
Shrub Fertilization			
Lawn Liming (if necessary)			
<b>JUNE:</b>			
*Catch Basin Inspection			
Sweeping of Paved Surfaces			
<b>SEPTEMBER:</b>			
Hydrodynamic Separator Inspection			
Sweeping of Paved Surfaces			
Tree and Lawn Fertilization			
<b>DECEMBER:</b>			
*Catch Basin Inspection			
Sweeping of Paved Surfaces			

\*NOTE: Use appropriate worksheet found in this plan to conduct the inspection.

## CATCH BASIN / CATCH BASIN INSERT INSPECTION LOG

Name of Inspector:

Date:

Catch Basin ID	Condition (circle one)		Debris above 1' within sump? (If yes then catch basin is to be cleaned)		Date of Catch Basin/Cleaning (if debris is greater than 1')		Condition of Hood (if applicable, remove trash/debris if necessary)	Comments:
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							



#### On-site Procedures for Inspection and Maintenance of Catch Basin Inserts

- Secure traffic and pedestrian traffic with cones, barrels, etc.
- Clean surface area around each catch basin.
- Remove grates and set aside
- Clean grates, remove litter and debris that may be trapped within the grate
- Visually inspect condition of outlet hood and remove trash and debris from hood if necessary.
- Remove by vacator hose the debris that has been trapped in the trough area. Dispose of in accordance with local, state and federal regulatory agency requirements. Most debris that is captured in the trough or sump area will fall into the non-hazardous waste category.
- Visually inspect and check the condition of the trough area.
- Replace grate and lockdown as needed.
- Un-secure traffic control area.
- Complete service report and submit to facility owner.