

FLOODING INVESTIGATION REPORT

DRAFT

PINE TREE DRIVE AND PECK LANE NEIGHBORHOOD



Prepared by:

CARDINAL
ENGINEERING ASSOCIATES

Prepared _____ Date: _____

by: Darin Lemire, PE

Reviewed _____ Date: _____

by: Gary Giroux, P.E.

**Flooding Investigation Report
Pine Tree Drive and Peck Lane Neighborhood**

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EXECUTIVE SUMMARY

A drainage study was performed by Cardinal Engineering at the request of the Town of Orange related to significant flooding that occurred in town during 2021 due to Tropical Storms Elsa and Ida. Tropical Storm Elsa occurred on July 9th dropping 4.09 inches of rain and Storm Ida occurred on September 1st dropping 5.77 inches of rain. In the Pine Tree Drive and Peck Lane area, there was flooding at residences (12 inches to 33 inches during Storm Ida). Two residential properties on Pine Tree Drive and two residential properties on Hawthorne Lane were determined to be impacted (319 Pine Tree, 309 Pine Tree, 312 Hawthorne, and 308 Hawthorne) along with flooding over Peck Lane.

Tumble Brook flows through the Pine Tree and Peck Lane neighborhood through a series of culverts. During the 2021 tropical storms, the brook overflowed its banks and entered the residences by way of the garage doors. The hydraulic capacity of the existing culverts at Pine Tree Drive is approximately a 15-year storm and at Peck Lane the capacity is a 12-year storm. Tropical Storm Elsa can be classified as a 25-year storm event and Storm Ida as a 100-year storm.

Cardinal conducted hydraulic modeling of the neighborhood's culverts to simulate the flooding that occurred during the 2021 storms. After verifying the flooding amounts, Cardinal used the model to determine potential mitigation measures. The options that were evaluated were the following:

- (1) Doing Nothing
- (2) Acquiring and Removing Houses
- (3) Adding an Additional Pipe Culvert at Pine Tree
- (4) Replacing the Pine Tree Culvert with a Box Culvert
- (5) Replacing the Pine Tree and Peck Lane Culverts with box culverts

Based on the analysis performed, the mitigation option that seems the most feasible and cost effective to be implemented is:

- **Option 4- Replacing the Pine Tree Culvert with a Box Culvert**

- Estimated Cost \$781,000**

Flooding of 9 inches at 309 Pine Tree Drive and 2 inches at 312 Hawthorne Lane are expected in a 100 year storm. It may be feasible to floodproof 309 Pine Tree Drive, which would include eliminating basement garage doors. It may be feasible to prevent flooding of 312 Hawthorne Lane by installing a berm or curb along the driveway on the

stream side. No flooding is expected in a 25 year storm. Flooding at Peck Lane would continue, but is less severe and does not impact houses.

Introduction

The Town of Orange engaged the services of Cardinal Engineering to perform a drainage study of one of their residential neighborhoods due to flooding that occurred during 2021. The residences that had the flooding issues are located on Pine Tree Drive and Hawthorne Lane. Peck Lane had flooding over the roadway. The flooding was caused by Tumble Brook overflowing its banks along with the roadway storm sewer system being overwhelmed. The floodwaters entered the residences from the garage door openings and migrated to some of the residences finished basements. This neighborhood is located in southern central part of Orange close to Fred Wolfe Park. The location is shown on Figure 1, Site Vicinity Map.

The Town of Orange, along with other parts of Connecticut, particularly Fairfield County, experienced significant rainfall events in 2021 most notably in July and September due to tropical storms. On July 9th 2021, Tropical Storm Elsa affected Connecticut with significant rainfall. On September 1st 2021, Tropical Storm Ida hit Connecticut. Both storm events were large rain producing events which were very intense, but with a relatively short duration (6 hour). The heavy rain from both events resulted in extensive flooding including road flooding and residential property flooding. In the Pine Tree Drive and Peck Lane area, there was significant flooding (12-inches to 33-inches during Storm Ida). In this neighborhood, 3 houses were identified as being impacted. The culverts in the neighborhood were significantly below capacity or undersized for these storm events. At Pine Tree Drive, the hydraulic capacity of the existing culverts is approximately the 15 year storm and at Peck Lane, the capacity is a 12-year storm. Tropical Storm Elsa was a 25-year storm (4% recurrence chance any given year) and Tropical Storm Ida was a 100-year storm (1% recurrence chance any given year).

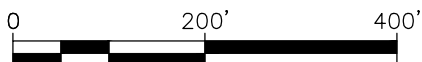
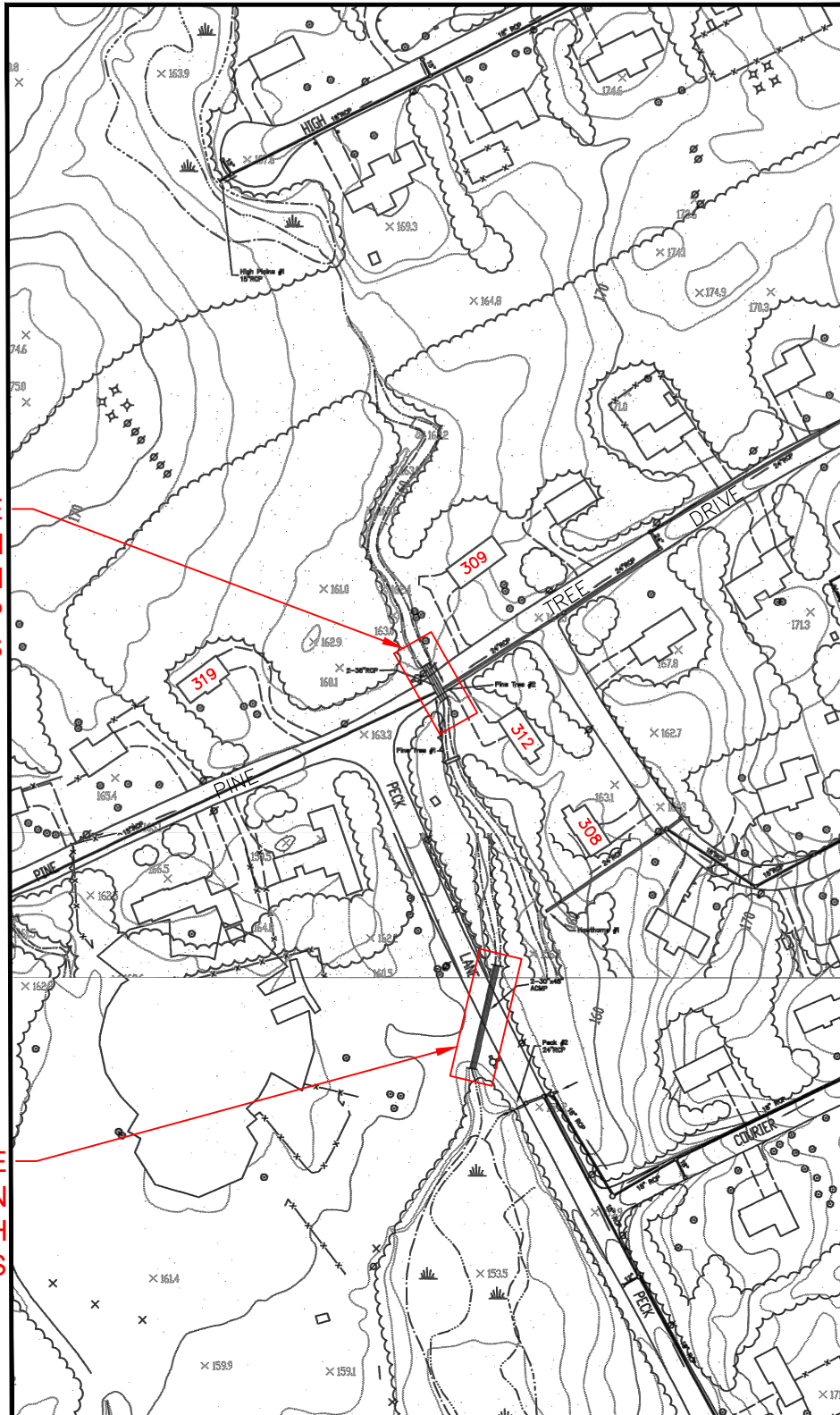
The flooding was a result of the area's culverts being undersized and the brook (Tumble Brook) in the neighborhood overtopping its banks. The brook has a drainage area of 211 acres or 0.33 square miles at the location of the Peck Lane crossing. At Pine Tree Drive, Tumble Brook crosses underneath the road in twin 46-foot long culverts (36-inch diameter RCP). The brook then flows for approximately 500 feet to the south towards Peck Lane. At Peck Lane, the brook enters twin 30-inch by 48-inch corrugated metal arch pipe culverts which are 125 feet long and discharge on the western side of Peck Lane near the school driveway entrance.

The Pine Tree-Peck Lane neighborhood is identified on the FEMA map as located within FEMA Zone X (defined as 0.2% annual chance flooding (500 year) or 1% annual chance with average depth of less than one foot or with drainage areas of less than less than one square mile) or slight flooding chances.



PINE TREE DRIVE
EXISTING TWIN
36 INCH
DIAMETER RCP
CULVERTS

PECK LANE
EXISTING TWIN
30 INCH X 48 INCH
ACMP CULVERTS



PROJECT TITLE:

PINE TREE DRIVE & PECK LANE
FLOODING INVESTIGATION REPORT
ORANGE, CT

DRAWING TITLE:

SITE VICINITY MAP

DRAFTER:

DL

DATE:

4/6/2022

DRAWING NUMBER:

FIGURE 1

CARDINAL
ENGINEERING ASSOCIATES

200 RESEARCH PARKWAY, SUITE 200
467 BANTAM RD | LITCHFIELD, CT 06039-1000-200-200

Hydrologic Analysis

Tumble Brook that is the source of flooding in the Pine Tree-Peck Lane neighborhood originates in a swampy area to the north of Harvester Road which east of Fred Wolfe Park. The brook flows to the south and passes High Plains Drive, crosses a high voltage electric utility corridor before it crosses underneath Pine Tree Drive. After Peck Lane, the brook flows south as open channel and discharges into a pond north of Old Tavern Road. The brook outlets from the pond and flows approximately 2 miles south until discharging into Clark Pond and the Indian River in Milford.

FEMA Flows

The current Flood Insurance Study (FIS) prepared by the Federal Emergency Management Agency (FEMA) for the Town of Orange is dated October 16, 2013. The FIS discusses major rivers in Orange including the Indian River and Housatonic River, but there is no discussion or any detailed analysis on flows for Tumble Brook in the neighborhoods described in this report. However, there is a detailed study of Tumble Brook farther downstream (approximately 1,5000 feet downstream of Old Tavern Road when it crosses into the Town of Milford). The area is shown on map number 09009C0419H with a revision date of December 17, 2010. The Pine Tree-Peck Lane neighborhood is included on the FEMA map as an area that experiences flooding. However, the FEMA mapping indicates flooding occurs rarely (500-year events) and that 100-year events are on the magnitude of less than 1 foot.

Determination of brook flows

The brook flows were determined by preparing a hydrologic model of the watershed. Hydraflow software was used for the hydrologic modeling and the model used NRCS methodology using TR-55 for time of concentration. The runoff curve numbers were based on soil types and land use. Land use was determined from GIS mapping and aerial photography. Soil types were determined from Natural Resources Conservation Service (NRCS) web soil survey.

The drainage area was delineated using Town of Orange topographic maps (prepared by Milone and MacBroom with a scale 1 inch =100 feet), USGS topographical maps, USGS StreamStats program, and through conducting field survey. The drainage area for the brook or watershed has a total area of 211 acres or 0.33 square miles and is shown on Figure 2, Existing Drainage Areas. The Pine Tree Drive and Peck Lane were analyzed as one watershed area due to Pine Tree and Peck Lane being located in close vicinity. The area consists of primarily 1-acre residential lots (57% of drainage area) and the soils consist of primarily Hydrologic Soil Group (HSG) type B soils. Of the 211 acres, there is approximately 20% or 42 acres that have soils which are more prone to stormwater runoff (type C and D). The watershed includes a large amount of forested land (43 acres) and a portion which is agricultural land (18 acres). The other land uses include a



PROJECT TITLE:

PINE TREE DRIVE & PECK LANE
FLOODING INVESTIGATION REPORT
ORANGE, CT

DRAWING TITLE:

EXISTING DRAINAGE AREAS

DRAFTER:

DL

DATE:

3/1/2022

DRAWING NUMBER:

FIGURE 2

CARDINAL
ENGINEERING ASSOCIATES

200 RESEARCH RD., WINDHAM, CT 06095-2000-2000-2000
467 BANTAM RD. | LITCHFIELD, CT 06039-2000-2000-2000

portion of the Fred Wolfe Park Area which has athletic fields, a utility right of way (ROW), and open lawn areas each associated with different stormwater runoff values. The composite runoff curve number (CN) was calculated to be 70.6. The time of concentration for this area was calculated to be 58.6 minutes consisting of sheet flow, concentrated flow, and channel flow.

Rainfall Data

Rainfall values for the hydrologic modeling were taken from the official National Weather Service Station gage at Sikorsky Airport in Bridgeport. This gage is located approximately 10 miles to the southwest of the site. On July 9th 2021 during Tropical Storm Elsa, the gage measured 4.09 inches of rainfall. The gage began collecting data at approximately 4 AM and stopped approximately at 10 AM for a duration of 6 hours. The rainfall amount was consistent with other reported values reported in Weather Underground Station Network located in Orange. The gage also measured over 1 inch of rainfall on the previous day and 1.3 inches of rainfall the previous week. For the entire month of July, there was a reported 8.55 inches of rainfall.

On September 1st 2021 during Tropical Storm Ida, the gage measured 5.77 inches of rainfall. The gage began collecting data at approximately 6 PM and stopped approximately at 12 AM for a duration of 6 hours. The rainfall amount was consistent with other reported values reported in Weather Underground Network located in Orange. During Ida, there was an extremely heavy rainfall between 10 PM and 11 PM with over 3 inches reported. As with the July storm, there was heavy rainfall only a short period before the storm. On August 22nd and August 23rd during Tropical Storm Henri, there was 1.5 to 2.0 inches of rainfall. As described above, both rainfall events occurred when the ground was saturated by previous rainfall. This condition magnified the runoff from the storms studied as the ground had reduced ability to infiltrate the rainfall during these events.

Both rainfall amounts were compared to the NOAA Atlas 14 rainfall data to determine the storm magnitude. Storm Elsa was determined to be a 25-year storm (4.09 inches measured vs. 4.30 inches Atlas 14 value) and Storm Ida was determined to be a 100-year storm (5.77 inches measured vs. 5.44 inches Atlas 14 value). Atlas 14 values were used for the other 6-hour storms: 2 year (2.38 inches), 10 year (3.56 inches) and 50 year (4.85 inches).

Calculated Brook Flows

Based on the hydrologic analysis and modeling, the brook flows were calculated to be as shown in Table 1.

Table 1
Calculated Flood Flows

LOCATION	DRAINAGE AREA (square miles)	PEAK DISCHARGE (cfs)			
		10 Yr	25 Yr	50 Yr	100 Yr
Pine Tree Drive and Peck Lane	0.33	100	150	200	340

Table Note: Values rounded up to nearest 10 cfs

Hydraulic Analysis

Following hydrologic modeling, hydraulic analysis was conducted using the U.S. Department of Transportation Federal Highway Administration HY-8 culvert modeling program. The HY-8 model and analysis reproduced the measured flooding depths reported by the residents during the flooding with similar results. A HY-8 model was prepared for both the Pine Tree and Peck Lane location. The modelling was used to determine the brook water surface elevations, depths, and velocities using the computed flows from Table 1 above. Water surface elevations were computed for the 2-, 10-, 25-, 50-, and 100-year storm events for the existing conditions and for the proposed conditions. Topographic field survey was performed in 2021 by Cardinal to obtain culvert inverts and the geometry of the crossings. Cross sections were taken upstream and downstream of each crossing. The topographic survey determined the following:

Pine Tree Drive

- West Culvert-3-foot diameter RCP (46 feet long), slope= -0.07 %
- East Culvert- 3-foot diameter RCP (46 feet long), slope= -0.09 %

Peck Lane

- West Culvert- 30-inch by 48-inch ACMP (125 feet long), slope=0.89%
- East Culvert- 30-inch by 48-inch ACMP (125 feet long), slope=0.70 %

Existing Hydraulic Analysis Results

The results of the existing hydraulics analysis are provided in the following tables (Table 2 and Table 3). These tables show the surveyed building elevations at the impacted properties along with modeled calculated water surface elevations (WSE) during both the July and September 2021 storms. The modeled flood amounts are provided along with reported flood values provided by residents.

**Table 2 – Pine Tree Flood Calculations
July 9th and September 1st Storm Events
Existing Conditions Modeled (Twin 36” RCP)**

Property Location	July 9, 2021 Storm (Elsa)				September 1, 2021 Storm (Ida)			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
319 Pinetree	162.01	162.17	+0.16	+2	162.01	162.76	+0.75	+9
309 Pinetree	160.24	162.17	+1.91	+23 (13 reported)	160.24	162.76	+2.52	+30 (33 reported)
312 Hawthorne	159.72	160.03	+0.31	+4	159.72	161.50	+1.78	+21
308 Hawthorne	160.21 Rear bldg. NW	159.44	0	0	160.21 Rear bldg. NW	160.59	+0.38	+4 (0 reported)

Notes:

1. WSE= Water Surface Elevation
2. Pine Tree Road Centerline Elev 162.0 (Both July and Sept reported over road)

**Table 3 – Peck Lane Flood Calculations
July 9th and September 1st Storm Events
Existing Conditions Modeled (Twin 30” x 48” ACMP)**

Property Location	July 9, 2021 Storm (Elsa)				September 1, 2021 Storm (Ida)			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
Upstream of Culvert	NA	158.43	+0.43	+5	NA	159.05	+1.05	+13
Downstream of Culvert	NA	155.30	0	0	NA	155.56	0	0

Notes: 1. Difference is compared to road elevation since no adjacent properties with garages flooded;

2. Peck Lane Centerline Elev 158.0

3. NA=Not applicable

4. WSE= Water Surface Elevation

Mitigation Analysis

The Town of Orange requested Cardinal evaluate potential strategies to alleviate the flooding in the Pine Tree Drive and Peck Lane residential neighborhood. The strategies involved construction work (replacement of culverts and installation of additional culvert capacity) as well as property acquisition and removal of houses. The three houses most impacted by the flooding on Pine Tree Drive that were considered for property acquisition were identified as:

- 319 Pine Tree Lane, 1.66 acre lot, 2017 town appraised value \$307,000
- 309 Pine Tree Lane, 1.25 acre lot, 2017 town appraised value \$312,000
- 312 Hawthorne Lane, 0.78 acre lot, 2017 town appraised value \$312,000

There were no houses identified as being impacted by the flooding on Peck Lane. The following are the options studied to identify and evaluate the most effective solution:

- Option 1-Do nothing
- Option 2A-Acquire and remove 2 houses
- Option 2B-Acquire and remove 3 houses
- Option 3-Add an additional 36 inch culvert at Pine Tree Drive
- Option 4-Replace existing 36-inch twin culverts with 12x4 box culvert
- Option 5-Replace existing culverts on Pine Tree and Peck Lane with larger box culverts
- Option 6-Replace existing culverts on Pine Tree and Peck Lane with larger box culverts and acquire 309 Pine Tree

Hydraulic Design Criteria

The Town of Orange requested that the 100-year design storm be used as the design basis for any new culverts in this neighborhood. Based on the frequency and magnitude of flooding, this appeared reasonable and conservative. The 100-year design standard for new culverts is more conservative than if the DOT design criteria was used. Based on the CTDOT classification any of the replacement culverts would be classified as “Small Structures”. These crossings include culverts and bridges with drainage areas less than one square mile (see CTDOT Drainage Manual Table 8-4). Small structures shall be designed to pass the 50-year frequency discharge. The effects of a discharge equal to the 100-year storm passing through the proposed culvert shall be investigated.

Mitigation Results and Discussion

The hydraulic and mitigation analysis that was developed by Cardinal identified several mitigation strategies that would have different levels of effectiveness (reduced flooding) at several different levels of costs. The mitigation results are shown on the Decision Matrix in Table 4.

Conclusions and Recommendations

The decision matrix summarizes the options including the pros and cons, the associated costs, and the impact with regard to the 100-year flooding if the option was selected. Some of the options may warrant splitting the option into different projects to make sure adequate funding (including state funding sources) could be obtained. Based on the decision matrix, the following strategies seem the most feasible if the funding can be obtained:

- **Option 4- Replace existing 36 inch twin culverts with 12x4 box at Pine Tree**

Estimated Cost \$781,000

Flooding of 9 inches at 309 Pine Tree Drive and 2 inches at 312 Hawthorne Lane are expected in a 100 year storm. It may be feasible to floodproof 309 Pine Tree Drive, which would include eliminating basement garage doors. It may be feasible to prevent flooding of 312 Hawthorne Lane by installing a berm or curb along the driveway on the stream side. No flooding is expected in a 25 year storm. Flooding at Peck Lane would continue, but is less severe and does not impact houses.

Table 4 Decision Matrix
Options 1 through 6
Pine Tree Drive and Peck Lane Neighborhood Flooding Investigation
Orange, CT



ID #	Alternative	Pro's	Con's	Estimated Costs	Property Impacts	100 Yr Flood Model Results	Permission Needed
1	Do Nothing	1. Easy to implement	1. Resident Dissatisfaction	\$0 Total	Flooding at 3 houses	319 Pine Tree-9 inches	None
		2. Lowest cost	2. Additional property damage likely to reoccur			309 Pine Tree-30 inches	
			3. Still need to maintain culverts			312 Hawthorne-27 inches	
2A	Acquire and remove 2 houses	1. No construction required	1. Additional property damage still possible	\$625K 2 Houses Acquired	Flooding still at 1 house if don't aquire all properties	319 Pine Tree-9 inches	Purchase/eminent domain
		2. Reduce affected houses	2. Still need to maintain culverts	\$60K 2 Houses Demo			
			3. Roadways still flood-Pine Tree 9" and Peck 13" during 100 yr storm	\$685K Total			
2B	Acquire and remove 3 houses	1. No construction required	1. Still need to maintain culverts	\$1.02M 3 houses acquired			Purchase/eminent domain
		2. Eliminate affected houses	2. Roadways still flood-Pine Tree 9" and Peck 13" during 100 yr storm	\$90K 3 Houses Demo			
				\$1,021,000 Total			
3	Add additional 36" RCP pipe culvert at Pine Tree	1. Improves capacity of crossing to 25 year storm	1. Doesn't remove all of flooding issues	\$183K Total	flooding still remains at three houses but it is reduced	319 Pine Tree-8 inches	
		2. Cost Effective	2. Roadways still flood-Pine Tree 8" and Peck 13" during 100 yr storm			309 Pine Tree-29 inches	
		3. No property acquisitions required				312 Hawthorne-27 inches	
4	Replace existing 36 inch twin culverts with 12x4 box at Pine Tree	1. Solves all flooding issues except 309 Pine Tree	1. Doesn't remove all flooding issues	\$781K Total	flooding still remains at 309 Pine Tree and 312 Hawthorne	309 Pine Tree-9 inches	
		2. Don't need to acquire property	2. Roadway still floods at Peck; 13" during 100 yr storm			312 Hawthorne-2 inches	
		3. Less costly than acquiring property					
5	Replace both Pine Tree and Peck Lane with 12x4 box	1. Solves almost all flooding issues	1. Doesn't remove all of flooding issues	\$781K Pine Tree	flooding still remains at 309 Pine Tree	309 Pine Tree-9 inches	
				\$979K Peck			
				\$1.76M Total			
6	Replace both Pine Tree and Peck Lane with 12x4 box	1. Solves all flooding issues	1. Costliest option	\$781K Pine Tree			Purchase/eminent domain
	and acquire 309 Pine Tree			\$979K Peck			
				\$312K 1 House Acquired			
				\$30K Demo			
				\$2.07M Total			

*Notes:
1. The cost estimates do not include drainage right-of-way or easement costs.
2. Estimated costs include design and permitting; break outs are shown in cost estimates located in appendix

3. Costs associated with design work including geotechnical, wetlands flagging/reporting, and additional survey if needed are included

**Table 5 – Pine Tree Flood Calculations
July 9th and September 1st Storm Events
Proposed Conditions
(Option 3-Additional 36” RCP)**

Property Location	July 9, 2021 Storm (Elsa)				September 1, 2021 Storm (Ida)			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
319 Pinetree	162.01	161.34	0	0	162.01	162.67	+0.66	+8
309 Pinetree	160.24	161.34	+1.08	+13	160.24	162.67	+2.43	+29
312 Hawthorne	159.72	160.03	+0.31	+4	159.72	161.50	+1.78	+21
308 Hawthorne	160.21 Rear bldg. NW	159.44	0	0	160.21 Rear bldg. NW	160.59	+0.38	+4

Notes: 1. WSE=Water Surface Elevation

2. Pine Tree Road Centerline Elev 162.0

Table 6 – Pine Tree Flood Calculations
July 9th and September 1st Storm Events
Proposed Conditions
Option 4 (12x4 Box with 45 deg wingwalls)

Property Location	July 9, 2021 Storm (Elsa)				September 1, 2021 Storm (Ida)			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
319 Pinetree	162.01	159.12	0	0	162.01	161.03	0	0
309 Pinetree	160.24	159.12	0	0	160.24	161.03	+0.79	+9
312 Hawthorne	159.72	158.59	0	0	159.72	159.91	+0.19	+2
308 Hawthorne	160.21 Rear bldg. NW	158.53	0	0	160.21 Rear bldg. NW	159.59	0	0

Notes: 1. WSE=Water Surface Elevation

2. Pine Tree Road Centerline Elev 162.0

**Table 7 – Pine Tree & Peck Flood Calculations
July 9th and September 1st Storm Events
Proposed Conditions
(Option 5-12x4 Box at each location)**

Property Location	July 9, 2021 Storm (Elsa)				September 1, 2021 Storm (Ida)			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
319 Pinetree	162.01	159.12	0	0	162.01	161.03	0	0
309 Pinetree	160.24	159.12	0	0	160.24	161.03	+0.79	+9
312 Hawthorne	159.72	158.59	0	0	159.72	158.59	0	0
Peck Lane Upstream of Culvert	NA	156.27	0	0	NA	158.41	0	0
Peck Lane Downstream of Culvert	NA	155.26	0	0	NA	156.62	0	0

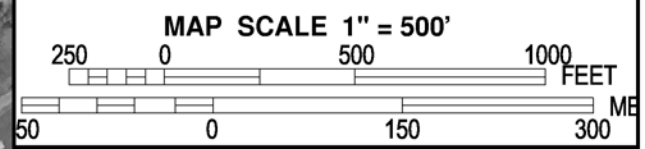
Notes: 1. WSE=Water Surface Elevation

2. Pine Tree Road Centerline Elev 162.0; Pine Tree Road Centerline Elev 158.0

3. Difference for Peck Lane is compared to top of road elev

APPENDIX A

FEMA MAP



NFIP

PANEL 0419H

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
NEW HAVEN COUNTY,
CONNECTICUT
(ALL JURISDICTIONS)

PANEL 419 OF 635
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
VILFORD, CITY OF	090082	0419	H
ORANGE, TOWN OF	090087	0419	H

**FEMA Zone X=500 year
storm**

Notice to User: The **Map Number** shown below should be used when placing map orders, the **Community Number** shown above should be used on insurance applications for the subject community.



MAP NUMBER
09009C0419H
EFFECTIVE DATE
DECEMBER 17, 2010

Federal Emergency Management Agency

TOV

This is an official FIRMette showing a portion of the above-referenced flood map created from the MSC FIRMette Web tool. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For additional information about how to make sure the map is current, please see the Flood Hazard Mapping Updates Overview Fact Sheet available on the FEMA Flood Map Service Center home page at <https://msc.fema.gov>.

APPENDIX B

RAINFALL DATA



NOAA Atlas 14, Volume 10, Version 3
Location name: Orange, Connecticut, USA*
Latitude: 41.2712°, Longitude: -73.0216°
Elevation: 212.93 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.351 (0.282-0.436)	0.422 (0.338-0.524)	0.537 (0.428-0.669)	0.633 (0.501-0.793)	0.764 (0.583-1.00)	0.863 (0.644-1.16)	0.967 (0.697-1.34)	1.08 (0.736-1.54)	1.25 (0.812-1.84)	1.38 (0.876-2.08)
10-min	0.498 (0.399-0.618)	0.598 (0.478-0.742)	0.761 (0.607-0.948)	0.896 (0.710-1.12)	1.08 (0.826-1.42)	1.22 (0.912-1.64)	1.37 (0.987-1.90)	1.53 (1.04-2.18)	1.77 (1.15-2.60)	1.96 (1.24-2.94)
15-min	0.586 (0.469-0.727)	0.703 (0.563-0.873)	0.895 (0.714-1.12)	1.05 (0.835-1.32)	1.27 (0.972-1.67)	1.44 (1.07-1.93)	1.61 (1.16-2.24)	1.80 (1.23-2.57)	2.08 (1.35-3.06)	2.31 (1.46-3.46)
30-min	0.812 (0.651-1.01)	0.975 (0.781-1.21)	1.24 (0.990-1.55)	1.46 (1.16-1.83)	1.77 (1.35-2.32)	2.00 (1.49-2.67)	2.24 (1.61-3.11)	2.51 (1.70-3.56)	2.89 (1.88-4.25)	3.20 (2.03-4.81)
60-min	1.04 (0.832-1.29)	1.25 (0.998-1.55)	1.59 (1.27-1.98)	1.87 (1.48-2.35)	2.26 (1.73-2.96)	2.55 (1.90-3.42)	2.86 (2.06-3.97)	3.21 (2.18-4.56)	3.70 (2.40-5.44)	4.10 (2.59-6.16)
2-hr	1.35 (1.09-1.66)	1.61 (1.30-1.99)	2.05 (1.65-2.54)	2.41 (1.93-3.01)	2.91 (2.24-3.80)	3.29 (2.47-4.38)	3.69 (2.68-5.10)	4.14 (2.82-5.85)	4.80 (3.13-7.02)	5.35 (3.40-7.99)
3-hr	1.56 (1.26-1.91)	1.87 (1.51-2.29)	2.37 (1.91-2.93)	2.79 (2.23-3.46)	3.37 (2.60-4.38)	3.80 (2.86-5.05)	4.26 (3.10-5.88)	4.79 (3.27-6.74)	5.57 (3.64-8.12)	6.22 (3.96-9.25)
6-hr	1.98 (1.62-2.42)	2.38 (1.94-2.90)	3.03 (2.45-3.71)	3.56 (2.87-4.39)	4.30 (3.34-5.55)	4.85 (3.68-6.40)	5.44 (3.99-7.46)	6.12 (4.20-8.55)	7.14 (4.68-10.3)	7.99 (5.10-11.8)
12-hr	2.48 (2.03-3.00)	2.98 (2.44-3.61)	3.80 (3.10-4.63)	4.49 (3.64-5.49)	5.43 (4.23-6.96)	6.13 (4.67-8.04)	6.88 (5.07-9.38)	7.75 (5.34-10.8)	9.06 (5.96-13.0)	10.2 (6.50-14.9)
24-hr	2.92 (2.41-3.52)	3.56 (2.94-4.29)	4.60 (3.78-5.56)	5.46 (4.45-6.64)	6.65 (5.22-8.48)	7.52 (5.78-9.83)	8.47 (6.30-11.5)	9.62 (6.64-13.3)	11.3 (7.48-16.2)	12.8 (8.23-18.7)
2-day	3.28 (2.73-3.92)	4.06 (3.37-4.86)	5.34 (4.41-6.41)	6.40 (5.25-7.73)	7.86 (6.22-10.00)	8.93 (6.92-11.6)	10.1 (7.59-13.8)	11.6 (8.02-15.9)	13.9 (9.18-19.7)	15.9 (10.2-23.0)
3-day	3.56 (2.97-4.23)	4.42 (3.68-5.26)	5.82 (4.83-6.96)	6.99 (5.76-8.40)	8.59 (6.83-10.9)	9.77 (7.59-12.7)	11.1 (8.34-15.0)	12.7 (8.81-17.3)	15.3 (10.1-21.6)	17.5 (11.3-25.2)
4-day	3.82 (3.19-4.53)	4.72 (3.95-5.61)	6.21 (5.16-7.40)	7.44 (6.14-8.92)	9.13 (7.27-11.5)	10.4 (8.07-13.4)	11.7 (8.86-15.9)	13.5 (9.36-18.3)	16.1 (10.7-22.7)	18.5 (11.9-26.5)
7-day	4.56	5.54	7.14	8.48	10.3	11.7	13.1	14.9	17.7	20.0

	(3.83-5.38)	(4.65-6.54)	(5.97-8.47)	(7.04-10.1)	(8.24-12.9)	(9.10-15.0)	(9.91-17.6)	(10.4-20.2)	(11.8-24.7)	(13.0-28.6)
10-day	5.27 (4.45-6.20)	6.30 (5.31-7.42)	7.98 (6.69-9.42)	9.37 (7.80-11.1)	11.3 (9.03-14.0)	12.7 (9.92-16.2)	14.2 (10.7-18.9)	16.1 (11.2-21.6)	18.8 (12.5-26.2)	21.1 (13.7-30.0)
20-day	7.43 (6.32-8.68)	8.55 (7.26-10.0)	10.4 (8.77-12.2)	11.9 (9.98-14.0)	14.0 (11.2-17.2)	15.6 (12.2-19.5)	17.2 (12.9-22.4)	19.0 (13.4-25.4)	21.6 (14.5-29.9)	23.8 (15.4-33.5)
30-day	9.23 (7.87-10.7)	10.4 (8.86-12.1)	12.3 (10.5-14.4)	13.9 (11.7-16.4)	16.1 (13.0-19.7)	17.8 (13.9-22.2)	19.5 (14.6-25.1)	21.3 (15.1-28.3)	23.8 (16.0-32.7)	25.7 (16.8-36.2)
45-day	11.4 (9.81-13.3)	12.7 (10.8-14.7)	14.7 (12.5-17.1)	16.4 (13.8-19.2)	18.7 (15.1-22.6)	20.4 (16.0-25.3)	22.2 (16.6-28.3)	24.0 (17.0-31.7)	26.3 (17.8-36.0)	28.0 (18.3-39.3)
60-day	13.3 (11.4-15.4)	14.6 (12.5-16.9)	16.6 (14.2-19.3)	18.4 (15.6-21.4)	20.7 (16.8-25.0)	22.6 (17.8-27.8)	24.4 (18.3-30.9)	26.1 (18.6-34.4)	28.3 (19.1-38.6)	29.8 (19.5-41.7)

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

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

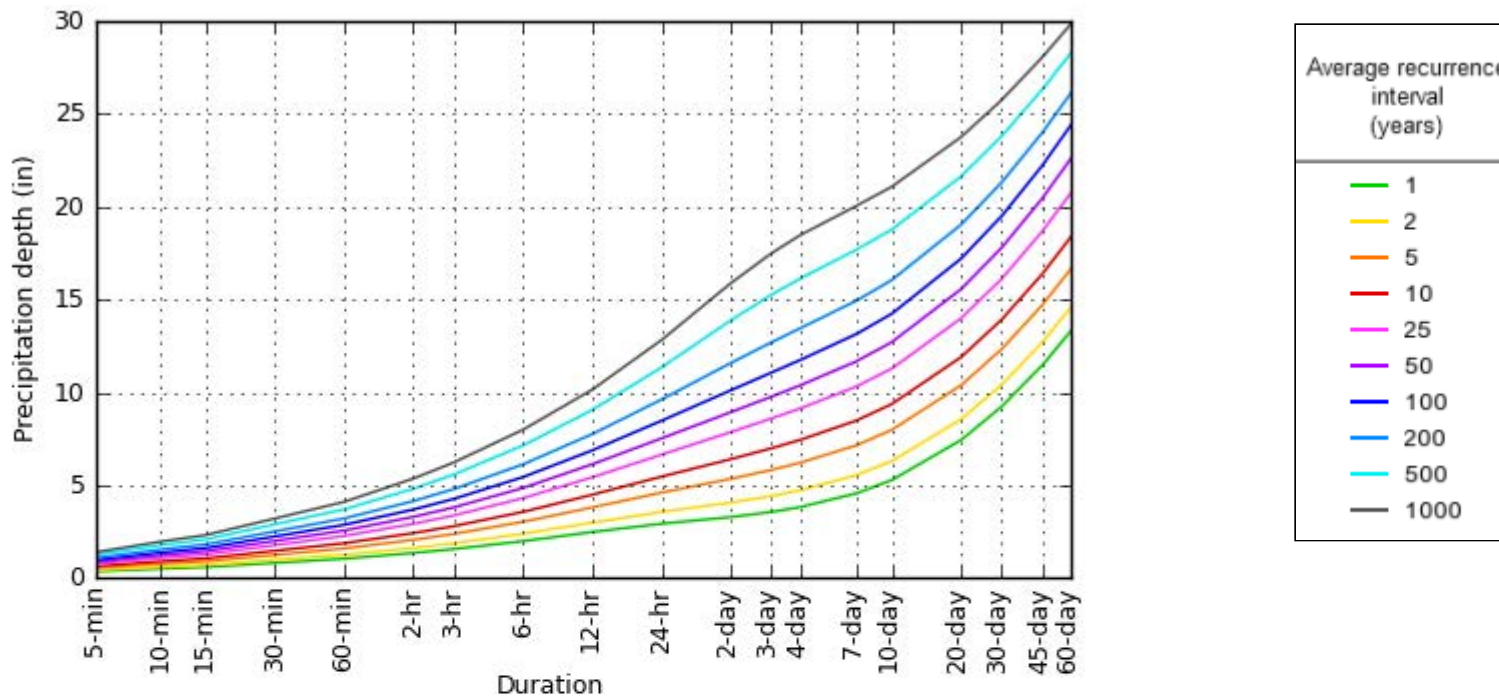
Please refer to NOAA Atlas 14 document for more information.

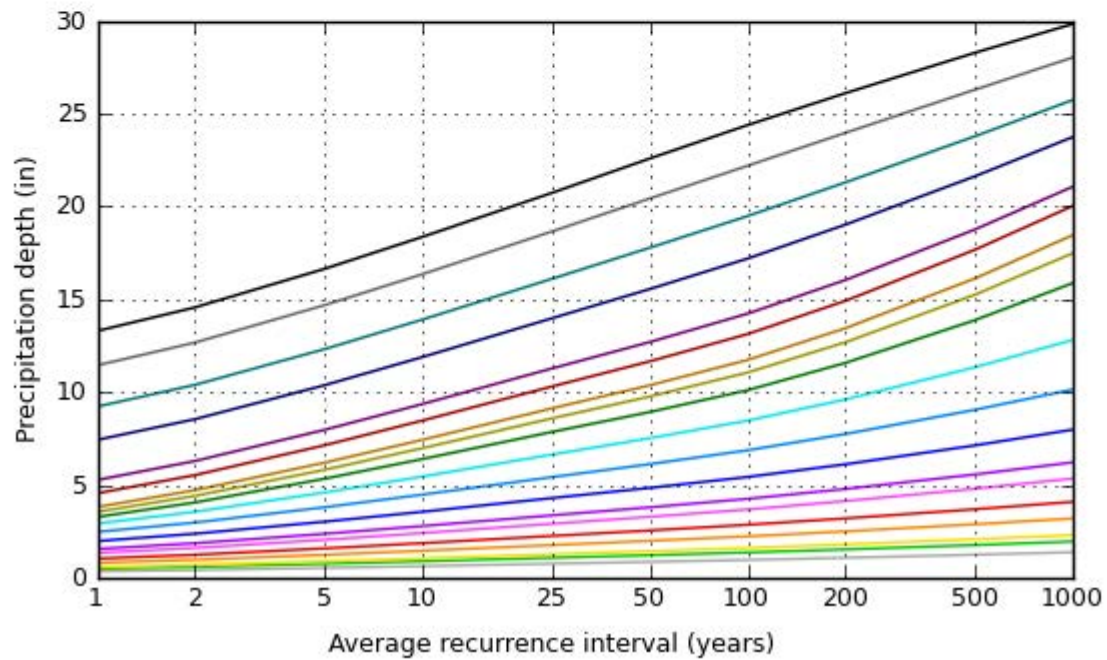
[Back to Top](#)

PF graphical

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

Latitude: 41.2712°, Longitude: -73.0216°





Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Tue Nov 23 19:55:10 2021

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Maps & aerals

Small scale terrain

Local Climatological Data
Hourly Observations
July 2021

Generated on 12/01/2021

Department of Commerce
National Oceanic & Atmospheric Administration

National Environmental Satellite, Data, and Information Service

Current Location: Elev: 5 ft. Lat: 41.1642° N Lon: -73.1267° W

Station: IGOR I SIKORSKY MEMORIAL AIRPORT, CT US WBAN: 72504094702

Weather Type (see documentation) AU | AW | MW 6

Visi- bility 5

Sky Conditions 4

Station Type 3

Time (LST) 2

1 2 3

0048 7

0052 7

0100 4

0110 7

0118 7

0148 7

0152 7

0224 7

0252 7

0312 7

0333 7

0352 7

0423 7

0433 7

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09	0623	7	SCT:04 7 OVC:08 16	2.00	+RA:02 BR:1 RA RA	73	22.8	72	22.2	72	22.2	96	18	070	29	29.73			FM-16	0.49	29.75
09	0629	7	BKN:07 7 BKN:07 13 OVC:08 18	2.00V	+RA:02 BR:1 RA RA	73	22.8	72	22.2	71	21.7	94	18	070		29.72			FM-16	0.55	29.74
09	0633	7	SCT:04 7 BKN:07 11 OVC:08 20	1.50	+RA:02 BR:1 RA RA	73	22.8	72	22.2	72	22.2	96	18	070		29.73			FM-16	0.60	29.75
09	0650	6	SCT:04 9 OVC:08 16	1.50	+RA:02 BR:1 RA RA	73	22.8	72	22.2	72	22.2	94	21	050	32	29.70			FM-16		29.72
09	0652	7	FEW:02 7 SCT:04 11 OVC:08 16	1.50	+RA:02 BR:1 RA RA	73	22.8	72	22.2	71	21.7	94	20	050		29.70	+0.09	29.72	FM-15	1.26	29.72
09	0700	4	8 SCT:04 9 OVC:08 14	1.49	RA	73	22.8	72	22.2	71	21.7	94	20	050		29.69	+0.09	29.72	FM-12		
09	0700	7	SCT:04 9 OVC:08 14	1.25	+RA:02 BR:1 RA RA	73	22.8	72	22.2	71	21.7	94	20	050	28	29.69			FM-16	0.22	29.71
09	0721	7	BKN:07 6 OVC:08 15	2.50	+RA:02 BR:1 RA RA	72	22.2	71	21.7	70	21.1	94	26	060	34	29.68			FM-16	0.55	29.70
09	0737	7	SCT:04 8 SCT:04 13 OVC:08 31	2.50	+RA:02 BR:1 RA RA	72	22.2	70	21.1	69	20.6	91	24	050	34	29.67			FM-16	0.64	29.69
09	0746	7	FEW:02 8 BKN:07 21 OVC:08 36	1.75	+RA:02 BR:1 RA RA	72	22.2	71	21.7	70	21.1	94	24	040	39	29.67			FM-16	0.68	29.69
09	0752	7	FEW:02 10 BKN:07 21 OVC:08 32	1.50	+RA:02 BR:1 RA RA	71	21.7	70	21.1	69	20.6	94	22	040	39	29.66		29.68	FM-15	0.56	29.68
09	0755	7	FEW:02 11 BKN:07 23 OVC:08 32	2.00	RA:02 BR:1 RA RA	71	21.7	70	21.1	69	20.6	94	23	040	34	29.67			FM-16	0.01	29.69
09	0819	7	FEW:02 11 BKN:07 27 OVC:08 37	1.00	+RA:02 BR:1 RA RA	70	21.1	69	20.6	68	20.0	93	26	030	33	29.67			FM-16	0.17	29.69
09	0852	7	BKN:07 28 OVC:08 50	1.00	+RA:02 BR:1 RA RA	70	21.1	68	20.0	67	19.4	90	32	050	41	29.64		29.65	FM-15	0.90	29.66
09	0906	7	BKN:07 34 OVC:08 70	1.75	+RA:02 BR:1 RA RA	70	21.1	69	20.6	68	20.0	93	22	040	36	29.63			FM-16	0.26	29.65
09	0911	7	BKN:07 36 BKN:07 50 OVC:08 90	3.00	+RA:02 BR:1 RA RA	71	21.7	69	20.6	68	20.0	90	20	030	33	29.64			FM-16	0.29	29.66
09	0952	7	SCT:04 19 BKN:07 75 OVC:08 100	10.00	-RA:02 RA RA	71	21.7	69	20.6	68	20.0	90	17	350		29.64	+0.02	29.66	FM-15	0.21	29.66
09	1014	7	BKN:07 18 BKN:07 40 BKN:07 95	10.00	-RA:02 RA RA	71	21.7	69	20.6	68	20.0	90	14	310	21	29.66			FM-16	0.02	29.68
09	1047	7	FEW:02 17 BKN:07 32 BKN:07 41	10.00		73	22.8	71	21.7	70	21.1	89	16	320	22	29.68			FM-16	0.05	29.70
09	1052	7	FEW:02 23 BKN:07 32	10.00		73	22.8	70	21.1	69	20.6	87	14	320		29.68		29.70	FM-15	0.04	29.70
09	1152	7	FEW:02 19	10.00		76	24.4	71	21.7	68	20.0	77	13	330		29.72		29.74	FM-15	0.00	29.74
09	1252	7	SCT:04 29 SCT:04 35	10.00		80	26.7	71	21.7	67	19.4	64	14	320	22	29.76	3	-0.07	FM-15	0.00	29.78
09	1300	4	26	9.94		80	26.7	71	21.7	67	19.4	64	14	320		29.75	3	-0.07	FM-12		
09	1352	7	FEW:02 35 BKN:07 47	10.00		82	27.8	74	23.3	70	21.1	67	10	280		29.77		29.79	FM-15	T	29.79
09	1452	7	FEW:02 37	10.00		82	27.8	73	22.8	69	20.6	65	9	220		29.77		29.79	FM-15	0.00	29.79
09	1552	7	SCT:04 43	10.00		81	27.2	73	22.8	69	20.6	67	13	210		29.78	1	-0.02	FM-15	0.00	29.80
09	1652	7	CLR:00	10.00		83	28.3	72	22.2	67	19.4	59	10	220		29.78		29.80	FM-15	0.00	29.80
09	1752	7	CLR:00	10.00		82	27.8	72	22.2	67	19.4	60	7	210		29.79		29.81	FM-15	0.00	29.81
09	1852	7	CLR:00	10.00		79	26.1	72	22.2	69	20.6	72	14	180		29.79	1	-0.02	FM-15	0.00	29.81
09	1900	4		9.94		79	26.1	72	22.2	69	20.6	72	14	180		29.78	1	-0.02	FM-12		
09	1952	7	FEW:02 49	10.00		77	25.0	72	22.2	70	21.1	79	8	210		29.82		29.84	FM-15	0.00	29.84

09	2052	7	FEW:02 46 OVC:08 100	10.00		76	24.4	72	22.2	70	21.1	82	9	230		29.86			29.88	FM-15	0.00	29.88
09	2152	7	SCT:04 60	10.00		75	23.9	72	22.2	70	21.1	84	3	260		29.87	1	-0.08	29.89	FM-15	0.00	29.89
09	2252	7	SCT:04 85 BKN:07 110	6.00	+RA:02 BR:1 RA RA	75	23.9	72	22.2	71	21.7	88	10	360		29.85			29.87	FM-15	0.05	29.87
09	2352	7	FEW:02 70	10.00		74	23.3	73	22.8	72	22.2	94	0	000		29.86			29.88	FM-15	0.01	29.88

Local Climatological Data
Hourly Remarks
July 2021

Generated on 12/01/2021

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service
Current Location: Elev: 5 ft. Lat: 41.1642° N Lon: -73.1267° W
Station: IGOR I SIKORSKY MEMORIAL AIRPORT, CT US WBAN: 72504094702
(KBDR)

Date	Time (LST)	Remarks
09	0048	MET0908/09/21 00:48:02 SPECI KBDR 090548Z 08003KT 8SM -RA SCT006 BKN120 22/21 A2994 RMK AO2 RAB01 P0000
09	0052	MET1460/09/21 00:52:02 METAR KBDR 090552Z 07003KT 8SM -RA FEW006 SCT029 BKN120 22/22 A2994 RMK AO2 RAB01 SLP139 P0000 60008 T02220217 10222 20217 56015
09	0100	SYNO9272504 17262 60703 10222 20217 30130 40139 56015 60021 761// 90552 333 10250 20217 555 90906=
09	0110	MET12107/09/21 01:10:02 SPECI KBDR 090610Z 10004KT 8SM -RA BKN004 BKN120 23/22 A2994 RMK AO2 CIG 003V010 P0001 T02280217
09	0118	MET10907/09/21 01:18:02 SPECI KBDR 090618Z 10004KT 8SM -RA SCT004 BKN017 OVC029 23/22 A2994 RMK AO2 P0001 T02280217
09	0148	MET09307/09/21 01:48:02 SPECI KBDR 090648Z 12004KT 10SM -RA BKN012 OVC018 23/22 A2993 RMK AO2 P0001
09	0152	MET11007/09/21 01:52:02 METAR KBDR 090652Z 11003KT 10SM -RA BKN010 OVC015 23/22 A2992 RMK AO2 SLP133 P0001 T02280217
09	0224	MET10307/09/21 02:24:02 SPECI KBDR 090724Z 08005KT 10SM -RA SCT010 SCT120 23/22 A2991 RMK AO2 P0001 T02280217
09	0252	MET10207/09/21 02:52:02 METAR KBDR 090752Z 05007KT 7SM -RA BKN120 23/22 A2988 RMK AO2 SLP118 P0002 T02280217
09	0312	MET11207/09/21 03:12:02 SPECI KBDR 090812Z 07009KT 6SM -RA BR BKN007 BKN070 BKN110 23/22 A2987 RMK AO2 P0002 T02280217
09	0333	MET10407/09/21 03:33:02 SPECI KBDR 090833Z 06011KT 6SM RA BR BKN003 OVC008 23/22 A2986 RMK AO2 P0004 T02280217
09	0352	MET11607/09/21 03:52:02 METAR KBDR 090852Z 06012KT 5SM RA BR OVC003 23/22 A2984 RMK AO2 SLP105 P0009 60012 T02280217 58028
09	0423	MET10907/09/21 04:23:02 SPECI KBDR 090923Z 07013KT 1 3/4SM -RA BR BKN003 OVC020 23/22 A2982 RMK AO2 P0019 T02280222
09	0433	MET11207/09/21 04:33:02 SPECI KBDR 090933Z 06009KT 2SM -RA BR SCT003 BKN010 OVC015 23/22 A2982 RMK AO2 P0051 T02280222
09	0437	MET11207/09/21 04:37:02 SPECI KBDR 090937Z 07012KT 3SM -RA BR BKN003 BKN009 OVC015 23/22 A2982 RMK AO2 P0057 T02280222
09	0449	MET09507/09/21 04:49:02 SPECI KBDR 090949Z 08014KT 5SM -RA BR BKN005 OVC009 23/22 A2981 RMK AO2 P0060
09	0452	MET11207/09/21 04:52:02 METAR KBDR 090952Z 08015KT 4SM -RA BR BKN005 OVC009 23/22 A2981 RMK AO2 SLP093 P0061 T02280222
09	0508	MET11207/09/21 05:08:02 SPECI KBDR 091008Z 07013KT 4SM -RA BR SCT005 BKN014 OVC047 23/22 A2980 RMK AO2 P0009 T02280222
09	0527	MET11207/09/21 05:27:02 SPECI KBDR 091027Z 06015KT 4SM -RA BR FEW011 BKN050 OVC070 23/22 A2978 RMK AO2 P0017 T02280222
09	0541	MET11707/09/21 05:41:02 SPECI KBDR 091041Z 06018KT 4SM -RA BR BKN011 BKN025 OVC070 23/22 A2977 RMK AO2 SLP082 P0033 T02280222 (WH)
09	0552	MET12807/09/21 05:52:02 METAR KBDR 091052Z 05015KT 2 1/2SM -RA BR BKN010 BKN023 OVC050 23/22 A2976 RMK AO2 P0022 T02280222 (WH)
09	0605	MET11707/09/21 06:05:02 SPECI KBDR 091105Z 07014KT 2SM -RA BR SCT007 OVC016 23/22 A2975 RMK AO2 P0049 T02280222 (WH)
09	0623	MET11307/09/21 06:23:02 SPECI KBDR 091123Z 07016G25KT 2SM -RA BR BKN007 BKN012 OVC018 23/22 A2974 RMK AO2 VIS 1 1/2V2 1/2 P0055 T02280217 (WH)
09	0629	MET13307/09/21 06:29:02 SPECI KBDR 091129Z 07016KT 2SM -RA BR BKN007 BKN013 OVC020 23/22 A2975 RMK AO2 P0060 T02280222 (WH)
09	0633	MET12107/09/21 06:33:02 SPECI KBDR 091133Z 07016KT 1 1/2SM -RA BR SCT007 BKN011 OVC020 23/22 A2972 RMK AO2 PK WND 06028/1142 P0107 FIBI (WH)
09	0650	MET13007/09/21 06:50:02 SPECI KBDR 091150Z 05018G28KT 1 1/2SM -RA BR SCT009 OVC016 23/22 A2972 RMK AO2 PK WND 06028/1142 SLP064 P0112 60218 70325 T02280217 10233
09	0652	MET17607/09/21 06:52:02 METAR KBDR 091152Z 05017KT 1 1/2SM -RA BR FEW007 SCT011 OVC016 23/22 A2972 RMK AO2 PK WND 06028/1142 SLP064 P0112 60218 70325 T02280217 10233
09	0700	SYN10472504 11324 80517 10228 20217 30055 40064 58030 60551 765// 91152 333 10250 20217 70826 96010 555 90912=
09	0700	MET11707/09/21 07:00:02 SPECI KBDR 091200Z 05017G24KT 1 1/4SM -RA BR SCT009 OVC014 23/22 A2971 RMK AO2 P0022 T02280217 (WH)
09	0721	MET13007/09/21 07:21:02 SPECI KBDR 091221Z 06023G30KT 2 1/2SM -RA BR BKN006 OVC015 22/21 A2970 RMK AO2 PK WND 06031/1203 P0055 T02220211
09	0737	MET14207/09/21 07:37:02 SPECI KBDR 091237Z 05021G30KT 2 1/2SM -RA BR SCT008 SCT013 OVC031 22/21 A2969 RMK AO2 PK WND 05033/1226 P0064 T02220206 (WH)
09	0746	MET13207/09/21 07:46:02 SPECI KBDR 091246Z 04021G34KT 1 3/4SM -RA BR FEW008 BKN021 OVC036 22/21 A2969 RMK AO2 PK WND 04034/1244 SLP052 P0074 T02170206 (WH)
09	0755	MET14907/09/21 07:52:02 METAR KBDR 091252Z 04019G34KT 1 1/2SM -RA BR FEW010 BKN023 OVC032 22/21 A2968 RMK AO2 PK WND 04030/1253 P0001 T02170206 (WH)
09	0819	MET13707/09/21 07:55:02 SPECI KBDR 091319Z 03023G29KT 1SM -RA BR BKN028 OVC050 21/19 A2966 RMK AO2 PK WND 03033/1306 P0017 T0210200 (WH)
09	0852	MET13807/09/21 08:52:02 METAR KBDR 091352Z 05028G39KT 1SM -RA BR FEW011 BKN027 OVC037 21/20 A2969 RMK AO2 PK WND 04037/1341 SLP042 P0076 T02110194 (WH)
09	0906	MET13807/09/21 09:06:02 SPECI KBDR 091406Z 04019G34KT 1 3/4SM -RA BR BKN036 BKN050 OVC070 21/20 A2965 RMK AO2 PK WND 06034/1353 P0026 T0210200 (WH)
09	0911	MET13807/09/21 09:11:02 SPECI KBDR 091411Z 03017G29KT 3SM -RA BR BKN036 BKN050 OVC090 22/20 A2966 RMK AO2 PK WND 06034/1353 P0029 T02170200 (WH)
09	0952	MET15207/09/21 09:52:02 METAR KBDR 091524Z 31012G18KT 10SM -RA SCT019 BKN075 OVC100 22/20 A2966 RMK AO2 PK WND 06034/1353 SLP043 P0036 60186 T02170200 55008 (WH)
09	1014	MET11807/09/21 10:14:02 SPECI KBDR 091542Z 32014G19KT 10SM -RA SCT019 BKN075 OVC100 22/20 A2966 RMK AO2 P0002 T02170200 (WH)
09	1047	MET11007/09/21 10:47:02 SPECI KBDR 091547Z 32014G19KT 10SM FEW017 BKN032 BKN041 23/21 A2970 RMK AO2 RAE46 SLP057 P0005 T02280206 (WH)
09	1052	MET11707/09/21 10:52:02 METAR KBDR 091552Z 32012KT 10SM FEW023 BKN032 23/21 A2970 RMK AO2 RAE46 SLP057 P0005 T02280206 (WH)
09	1152	MET09807/09/21 11:52:02 METAR KBDR 091652Z 33011KT 10SM FEW019 24/20 A2974 RMK AO2 SLP070 T02440200 (PD)
09	1252	MET13207/09/21 12:52:02 METAR KBDR 091752Z 32012G19KT 10SM SCT029 SCT035 27/19 A2978 RMK AO2 SLP083 60191 T02670194 10272 20206 53025 (PD)
09	1300	SYNO9272504 12566 43212 10267 20194 30076 40083 53025 60491 91752 333 10272 20206 91019 555 90918=
09	1352	MET12007/09/21 13:52:02 METAR KBDR 091852Z 28009KT 10SM FEW035 BKN047 28/21 A2979 RMK AO2 SLP087 P0000 T02780211 (PD)
09	1452	MET09807/09/21 14:52:02 METAR KBDR 091952Z 22008KT 10SM FEW037 28/21 A2979 RMK AO2 SLP089 T02780206 (PD)
09	1552	MET11007/09/21 15:52:02 METAR KBDR 092052Z 21011KT 10SM SCT043 27/21 A2980 RMK AO2 SLP089 60000 T02720206 51006 (PD)

09	1652	MET09507/09/21 16:52:02 METAR KBDR 092152Z 22009KT 10SM CLR 28/19 A2980 RMK AO2 SLP091 T02830194 (BR)	
09	1752	MET09507/09/21 17:52:02 METAR KBDR 092252Z 21006KT 10SM CLR 28/19 A2981 RMK AO2 SLP095 T02780194 (BR)	
09	1852	MET11907/09/21 18:52:02 METAR KBDR 092352Z 18012KT 10SM CLR 26/21 A2981 RMK AO2 SLP096 60000 T02610206 10289 20256 51006 (BR)	
09	1900	SYN08672504 12966 01812 10261 20206 30086 40096 51006 69901 92352 333 10289 20222 555 91000=	
09	1952	MET09307/09/21 19:52:01 METAR KBDR 100052Z 21007KT 10SM FEW049 25/21 A2984 RMK AO2 SLP105 T02500211	
09	2052	MET11107/09/21 20:52:01 METAR KBDR 100152Z 23008KT 10SM FEW046 OVC100 24/21 A2988 RMK AO2 LTG DSNT N SLP117 T02440211	
09	2152	MET11107/09/21 21:52:01 METAR KBDR 100252Z 26003KT 10SM SCT060 24/21 A2989 RMK AO2 LTG DSNT SW SLP122 T02390211 51026	
09	2252	MET12507/09/21 22:52:02 METAR KBDR 100352Z 36009KT 6SM +RA BR SCT085 BKN110 24/22 A2987 RMK AO2 RAB34 PRESFR SLP114 P0003 T02390217	
09	2352	MET11507/09/21 23:52:02 METAR KBDR 100452Z 00000KT 10SM FEW070 23/22 A2988 RMK AO2 RAE16 SLP117 P0003 T02330222 402890206	

Local Climatological Data
Hourly Precipitation
July 2021

Generated on 12/01/2021

Current Location: Elev: 5 ft. Lat: 41.1642° N Lon: -73.1267° W
Station: IGOR I SIKORSKY MEMORIAL AIRPORT, CT US WBAN: 72504094702
(KBDP)

Date	For Hour (LST) Ending at																								Maximum Short Duration Precipitation										Time Period (Minutes)	Precipitation (inches)	Ending Date Time (yyyy-mm-dd hh:mm)	Date
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID														
01													0.32s	0.20				0.02	0.10	0.10	0.28	0.28	T	T	01													
02	0.05	T	0.03	0.02	0.01													0.02	0.10	0.01	T	0.01	0.04	0.01	02													
03																									03													
04	T	T	T	T	T		0.01		T	T		0.30	0.11	0.02	T	T				0.06				T	04													
05																									05													
06																		0.21	0.02	0.05	0.03				06													
07																									07													
08		T												T	T	0.88s	0.04	0.05	0.02	0.07	0.01			T	08													
09	T	0.01	0.03	0.10	0.63	0.35	1.26	0.56	0.90	0.21	0.04			T				0.05	0.02			0.05	0.01	0.01	09													
10																									10													
11																									11													
12	T	T	0.03	0.03																T		T	T	T	12													
13	0.02	T				T	0.01																		13													
14																									14													
15																									15													
16																									16													
17																									17													
18	0.07s	0.05	T			T					T											T	T	0.01	18													
19																									19													
20																									20													
21														T			0.29	0.01	T						21													
22																									22													
23																									23													
24																									24													
25					0.02	0.01	T	T														0.02	T	T	25													
26																									26													
27																				T	T	T	T	T	27													
28	0.07s	0.04																							28													
29													T	T	T	0.03	0.01	0.05	T	0.12	0.02				29													
30																									30													
31																									31													

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

Current Location: Elev: 5 ft. Lat: 41.1642° N Lon: -73.1267° W
Station: IGOR I SIKORSKY MEMORIAL AIRPORT, CT US WBAN: 72504094702 (KBDK)

Date	Temperature (F)							Degree Days (base 65F)		Sun (LST)		Weather	Precipitation (in)			Pressure (inHg)		Wind	Maximum Wind Speed = MPH Direction = Degrees				
	Max	Min	Avg	Dep	ARH	ADP	AWB	Heat	Cool	Rise	Set		Weather Type	TLC	Snow Fall	Snow Depth	Avg Stn		Avg SL	Avg Speed	Peak Speed	Peak Dir	Sust. Speed
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
01	75	63	69	-2.1	85	65	66	0	4	0519	1826	TS RA FG BR	5.77	0.0	0	29.77	29.75	12.5	46	040	35	040	
02	77	61	69	-1.8	60	53	59	0	4	0520	1824	RA BR	0.17	0.0	0	29.73	29.80	13.5	44	020	31	020	
03	76	57	67	-3.6	62	52	58	0	2	0521	1822		0.00	0.0	0	29.98	30.00	8.1	23	350	16	340	
04	78	60	69	-1.3	63	56	62	0	4	0522	1821		0.00	0.0	0	29.98	29.98	8.7	20	300	15	210	
05	75	63	69	-1.1	84	65	67	0	4	0523	1819	RA BR	0.06	0.0	0	29.84	29.85	7.8	24	200	18	200	
06	84	67	76	6.2	66	61	66	0	11	0524	1817		0.00	0.0	0	29.77	29.80	8.1	24	300	18	290	
07	80	59	70	0.5	64	58	63	0	5	0525	1816		0.00	0.0	0	29.91	29.94	6.3	21	210	17	220	
08	82	67	75	5.8	77	68	71	0	10	0526	1814	RA	T	0.0	0	29.85	29.86	11.7	30	180	23	190	
09	76	67	72	3.1	88	68	69	0	7	0527	1812	TS RA BR	0.52	0.0	0	29.75	29.76	5.1	15	210	13	200	
10	76	59	68	-0.6	61	54	60	0	3	0528	1811		0.00	0.0	0	29.83	29.88	9.6	29	320	22	310	
11	79	55	67	-1.3	63	55	61	0	2	0529	1809		0.00	0.0	0	30.11	30.14	8.6	23	220	17	230	
12	82	70	76	8.1	68	64	68	0	11	0530	1807		0.00	0.0	0	30.04	30.04	12.6	28	220	21	220	
13	86*	69	78	10.4	64	64	69	0	13	0531	1806	RA	T	0.0	0	29.96	29.99	7.3	22	330	15	320	
14	77	66	72	4.7	70	61	65	0	7	0532	1804		0.00	0.0	0	30.04	30.05	6.1	17	040	10	180	
15	85	73	79	12.1	79	70	73	0	14	0533	1802		0.00	0.0	0	29.94	29.97	8.1	24	200	18	190	
16	75	68	72	5.4	80	65	68	0	7	0534	1800	TS RA BR	0.30	0.0	0	30.16	30.19	10.1	23	080	18	090	
17	77	67	72	5.8	86	67	68	0	7	0535	1759	RA BR	0.02	0.0	0	30.21	30.21	9.2	19	040	15	040	
18	80	67	74	8.2	75	66	69	0	9	0536	1757		0.00	0.0	0	30.02	30.03	6.6	16	340	12	320	
19	78	62	70	4.6	56	52	60	0	5	0537	1755		0.00	0.0	0	30.10	30.14	8.3	26	020	20	030	
20	74	58	66	0.9	70	56	61	0	1	0538	1754		0.00	0.0	0	30.30	30.34	7.6	17	110	14	100	
21	75	58	67	2.3	77	61	64	0	2	0539	1752		0.00	0.0	0	30.32	30.33	8.9	19	090	14	090	
22	80	72	76	11.7	85	70	72	0	11	0540	1750	RA	0.02	0.0	0	30.10	30.10	8.7	19	180	15	150	
23	82	67	75	11.1	83	71	72	0	10	0541	1748	RA BR	0.33	0.0	0	29.96	29.97	13.3	29	150	22	150	
24	75	58	67	3.5	72	56	60	0	2	0542	1747	RA BR	1.00	0.0	0	29.99	30.02	5.6	19	300	14	290	
25	74	56	65	1.9	67	54	59	0	0	0543	1745		0.00	0.0	0	29.98	29.98	4.1	14	160	10	150	
26	75	59	67	4.3	59	50	57	0	2	0544	1743		0.00	0.0	0	29.84	29.87	7.7	25	290	20	300	
27	79	56	68	5.7	60	54	61	0	3	0545	1742		0.00	0.0	0	29.90	29.91	11.6	29	210	23	210	
28	75	58	67	5.1	73	59	63	0	2	0546	1740	TS RA BR	0.19	0.0	0	29.80	29.83	8.4	22	220	17	230	
29	69	52	61	-0.5	57	45	52	4	0	0547	1738		0.00	0.0	0	29.93	29.96	8.0	30	350	20	350	
30	67	52*	60	-1.1	62	45	52	5	0	0548	1737		0.00	0.0	0	30.05	30.09	8.0	23	350	17	300	
77.4	62.2	69.8										Monthly Averages Totals	8.38			29.97	29.99	8.7					
3.4	3.9	3.6										Departure from Normal (1981-2010)	4.90										

Degree Days				Number of days with...											
Monthly		Season-to-date		Temperature				Precipitation				Snow		Weather	
Total	Departure	Total	Departure	Max	Min										
Heating	10	13	-54	>=90°	<=32°	<=32°	<=0°	>=0.01"	>=0.1"	>=1"	T-Storms	Heavy Fog			
Cooling	154	1053	56	0	0	0	0	10	7	0	4				
Date of 5-sec to 3-sec wind equipment change				Sea Level Pressure				Greatest...							
2009-06-17				Date		Time		24-Hr...		Snow Depth					
				21		0952		Precip		Snowfall					
				01		2152		5.94		0.0					
										Date					
										01-02					
Station Augmentation															
Name:BRIDGEPORT-SUCCESS HILL, CT Lat: 41.2004 Lon: -73.1569 Elevation: N/A Distance: 1mi S Elements: PRECIP, SNOW Equipment: SRG, SNOWBOARD															

Local Climatological Data
Hourly Observations
September 2021
Generated on 12/01/2021

D a t e	Time (LST)	Sta- tion Type	Sky Con- ditions	Visi- bility	Weather Type (see documentation)		Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3- Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Alti- meter Setting (inHg)
					AU AW MW	6	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5			7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
01	0052	7	BKN:07 95	10.00			73	22.8	67	19.4	63	17.2	71	7	360		29.78	3	-0.01	29.80	FM-15	0.00	29.80
01	0100	4		9.94			73	22.8	67	19.4	63	17.2	71	7	360		29.78	3	-0.01	29.80	FM-12		
01	0152	7	OVC:08 95	10.00			73	22.8	67	19.4	63	17.2	71	5	040		29.77			29.78	FM-15	0.00	29.79
01	0252	7	OVC:08 100	10.00			73	22.8	67	19.4	64	17.8	74	0	000		29.77			29.79	FM-15	0.00	29.79
01	0352	7	OVC:08 110	10.00			72	22.2	67	19.4	64	17.8	76	3	060		29.77	6	+0.01	29.79	FM-15	0.00	29.79
01	0452	7	FEW:02 75 OVC:08 95	10.00	-RA:02 RA RA		71	21.7	67	19.4	65	18.3	81	0	000		29.79			29.81	FM-15	T	29.81
01	0552	7	OVC:08 100	10.00	-RA:02 RA RA		70	21.1	67	19.4	65	18.3	84	5	360		29.81			29.83	FM-15	T	29.83
01	0652	7	FEW:02 80 SCT:04 100 BKN:07 110	10.00	-RA:02 RA RA		70	21.1	67	19.4	65	18.3	84	6	360		29.82	1	-0.05	29.84	FM-15	0.02	29.84
01	0700	4	74	9.94	RA		70	21.1	67	19.4	65	18.3	84	6	360		29.81	1	-0.05	29.84	FM-12		
01	0752	7	OVC:08 100	10.00	-RA:02 RA RA		70	21.1	67	19.4	66	18.9	87	7	360		29.82			29.84	FM-15	0.02	29.84
01	0852	7	BKN:07 120	10.00	-RA:02 RA RA		69	20.6	66	18.9	64	17.8	84	7	020		29.81			29.83	FM-15	0.01	29.83
01	0952	7	FEW:02 70 SCT:04 90 OVC:08 110	9.00	-RA:02 RA RA		70	21.1	67	19.4	66	18.9	87	8	010		29.82	5	+0.01	29.83	FM-15	0.03	29.84
01	1052	7	BKN:07 50 OVC:08 60	10.00	-RA:02 RA RA		70	21.1	67	19.4	66	18.9	87	9	040		29.81			29.83	FM-15	T	29.83
01	1152	7	FEW:02 90 OVC:08 110	10.00	-RA:02 RA RA		70	21.1	68	20.0	67	19.4	90	9	030		29.79			29.81	FM-15	0.01	29.81
01	1252	7	SCT:04 55 BKN:07 70 BKN:07 80	10.00			70	21.1	67	19.4	66	18.9	87	10	060		29.78	8	+0.03	29.80	FM-15	0.01	29.80
01	1300	4	57	9.94			70	21.1	67	19.4	66	18.9	87	10	060		29.78	8	+0.03	29.80	FM-12		
01	1321	7	FEW:02 8 BKN:07 50 BKN:07 65	10.00			70	21.1	68	20.0	67	19.4	90	13	050		29.77			FM-16	0.01	29.79	
01	1352	7	SCT:04 10 BKN:07 48 OVC:08 60	10.00			70	21.1	68	20.0	67	19.4	90	11	050		29.77			29.79	FM-15	T	29.79
01	1450	6	FEW:02 9 OVC:08 37	10.00			70	21.1	67	19.4	66	18.9	88	14	030		29.75			FM-16		29.77	
01	1452	7	FEW:02 9 OVC:08 37	10.00			70	21.1	67	19.4	66	18.9	87	14	030		29.75			29.77	FM-15	0.00	29.77
01	1552	7	BKN:07 31 OVC:08 38	10.00			69	20.6	66	18.9	65	18.3	87	15	030		29.74	6	+0.04	29.76	FM-15	0.00	29.76
01	1650	6	BKN:07 29 BKN:07 39 OVC:08 100	10.00			70	21.1	66	18.9	64	17.8	83	15	020		29.73			FM-16		29.75	
01	1652	7	BKN:07 29 OVC:08 100	10.00			69	20.6	66	18.9	64	17.8	84	13	020		29.74			29.75	FM-15	0.00	29.76
01	1752	7	BKN:07 27 BKN:07 43 OVC:08 110	10.00			68	20.0	66	18.9	64	17.8	87	14	030		29.72			29.74	FM-15	0.03	29.74
01	1803	7	SCT:04 27 BKN:07 60 BKN:07 120	10.00	RA:02 RA RA		68	20.0	66	18.9	65	18.3	90	13	030		29.72			FM-16	T	29.74	
01	1850	6	SCT:04 22 BKN:07 28 OVC:08 80	4.00	+RA:02 BR:1 RA RA		66	18.9	65	18.3	64	17.8	94	17	030		29.69			FM-16		29.71	

01	1852	7	SCT:04 22 BKN:07 28 OVC:08 75	3.00	+RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	20	040		29.69	8	+0.05	29.70	FM-15	0.25s	29.71
01	1900	4	26	2.98	RA	67	19.4	65	18.3	64	17.8	91	20	040		29.68	8	+0.05	29.70	FM-12		
01	1901	7	FEW:02 23 BKN:07 28 OVC:08 65	2.50	+RA:02 BR:1 RA RA	67	19.4	66	18.9	65	18.3	93	22	040	30	29.67				FM-16	0.13	29.69
01	1911	7	BKN:07 26 BKN:07 38 OVC:08 49	3.00	+RA:02 BR:1 RA RA	67	19.4	66	18.9	65	18.3	93	21	040	26	29.67				FM-16	0.20	29.69
01	1921	7	FEW:02 14 BKN:07 32 OVC:08 46	4.00	+RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	25	050	32	29.66				FM-16	0.26	29.68
01	1935	7	FEW:02 8 BKN:07 34 OVC:08 46	5.00	RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	21	050	28	29.67				FM-16	0.31	29.69
01	1947	7	FEW:02 8 BKN:07 23 OVC:08 35	6.00	RA:02 BR:1 RA RA	66	18.9	65	18.3	64	17.8	94	22	050	32	29.66				FM-16	0.37	29.68
01	1952	7	FEW:02 14 BKN:07 24 OVC:08 35	5.00	+RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	23	060	33	29.65			29.67	FM-15	0.34	29.67
01	2017	7	SCT:04 10 BKN:07 20 OVC:08 43	6.00	VCTS:7 RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	23	050	34	29.62				FM-16	0.15	29.64
01	2032	7	SCT:04 10 BKN:07 20 OVC:08 32	6.00	RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	25	050	40	29.59				FM-16	0.21	29.61
01	2048	7	FEW:02 10 BKN:07 18 OVC:08 30	3.00	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	94	29	050	41	29.59				FM-16	0.24	29.61
01	2050	6	FEW:02 10 BKN:07 18 OVC:08 30	2.50	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	94	30	050	41	29.60				FM-16		29.62
01	2052	7	FEW:02 10 BKN:07 21 OVC:08 30	1.75	TS:7 +RA:02 BR:1 RA TS RA	67	19.4	65	18.3	64	17.8	91	23	050	41	29.59			29.61	FM-15	0.45	29.61
01	2057	7	FEW:02 8 BKN:07 15 OVC:08 28	1.50	VCTS:7 +RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	25	050	38	29.58				FM-16	0.21	29.60
01	2109	7	FEW:02 10 BKN:07 21 OVC:08 33	2.00	VCTS:7 +RA:02 BR:1 RA RA	66	18.9	65	18.3	64	17.8	93	23	050	36	29.58				FM-16	0.41	29.60
01	2114	7	FEW:02 8 BKN:07 19 OVC:08 19	1.75	VCTS:7 +RA:02 BR:1 RA RA	66	18.9	65	18.3	64	17.8	93	25	050	32	29.57				FM-16	0.58	29.59
01	2122	7	FEW:02 8 BKN:07 21 OVC:08 27	1.75	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	93	22	050	37	29.57				FM-16	0.74	29.59
01	2130	7	FEW:02 15 BKN:07 23 OVC:08 30	2.50	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	93	28	050	37	29.54				FM-16	0.83	29.56
01	2143	7	FEW:02 15 BKN:07 21 OVC:08 33	2.00	VCTS:7 +RA:02 BR:1 RA RA	66	18.9	64	17.8	63	17.2	90	24	050	34	29.53				FM-16	1.06	29.55
01	2150	7	FEW:02 13 BKN:07 21 OVC:08 30	2.50V	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	94	26	050	39	29.49				FM-16	1.13	29.51
01	2152	7	FEW:02 11 BKN:07 21 OVC:08 30	2.00V	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	93	24	050	39	29.50	5	+0.09	29.52	FM-15	1.04	29.52
01	2203	7	SCT:04 9 BKN:07 16 OVC:08 21	2.00	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	93	26	060	33	29.48				FM-16	0.26	29.50
01	2207	7	FEW:02 7 BKN:07 10 OVC:08 23	1.75	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	93	28	060	37	29.47				FM-16	0.30	29.49

01	2217	7	BKN:07 9 OVC:08 18	1.00	VCTS:7 +RA:02 BR:1 RA RA	65	18.3	64	17.8	63	17.2	93	32	030	46	29.46			FM-16	0.59	29.48
01	2226	7	OVC:08 7	0.75	VCTS:7 +RA:02 BR:1 RA RA	65	18.3	64	17.8	64	17.8	97	30	280	39	29.58			FM-16	0.98	29.60
01	2229	7	VV:09 6	0.50	TS:7 +RA:02 FG:2 FG RA TS RA	65	18.3	64	17.8	63	17.2	93	25	350	39	29.54			FM-16	1.07	29.56
01	2240	7	VV:09 6	0.75	TS:7 +RA:02 BR:1 RA TS RA	64	17.8	63	17.2	63	17.2	96	17	340	37	29.56			FM-16	2.11	29.58
01	2252	7	VV:09 7	0.75	TS:7 +RA:02 BR:1 RA TS RA	64	17.8	63	17.2	62	16.7	93	26	010	32	29.52		29.54	FM-15	2.98	29.54
01	2259	7	VV:09 10	1.00	TS:7 +RA:02 BR:1 RA TS RA	64	17.8	63	17.2	62	16.7	93	24	020	36	29.53			FM-16	0.25	29.55
01	2310	7	BKN:07 11 OVC:08 33	1.25	VCTS:7 +RA:02 BR:1 RA RA	63	17.2	62	16.7	62	16.7	97	29	030	37	29.51			FM-16	0.59	29.53
01	2315	7	BKN:07 15 BKN:07 33 OVC:08 42	2.00	VCTS:7 +RA:02 BR:1 RA RA	63	17.2	62	16.7	62	16.7	97	26	020	38	29.51			FM-16	0.72	29.53
01	2324	7	BKN:07 23 BKN:07 45 OVC:08 55	7.00	-RA:02 RA RA	64	17.8	63	17.2	62	16.7	93	23	020	38	29.51			FM-16	0.74	29.53
01	2333	7	FEW:02 29 BKN:07 35 OVC:08 48	5.00	+RA:02 BR:1 RA RA	64	17.8	63	17.2	62	16.7	93	20	020	34	29.51			FM-16	0.74	29.53
01	2352	7	FEW:02 28 BKN:07 37 OVC:08 50	6.00	VCTS:7 RA:02 BR:1 RA RA	64	17.8	62	16.7	61	16.1	90	22	010	34	29.51		29.53	FM-15	0.58	29.53

Local Climatological Data
Hourly Remarks
September 2021
Generated on 12/01/2021

Date	Time (LST)	Remarks
01	0052	MET11109/01/21 00:52:02 METAR KBDR 010552Z 360008KT 10SM BKN095 23/17 A2980 RMK AO2 SLP092 T02280172 10261 20217 53005
01	0100	SYN08072504 35966 63606 10228 20172 30083 40092 53005 90552 333 10283 20217 555 90106=
01	0152	MET09309/01/21 01:52:02 METAR KBDR 010652Z 04004KT 10SM OVC095 23/17 A2979 RMK AO2 SLP086 T02280172
01	0252	MET09309/01/21 02:52:02 METAR KBDR 010752Z 00000KT 10SM OVC100 23/18 A2979 RMK AO2 SLP089 T02280178
01	0352	MET09309/01/21 03:52:02 METAR KBDR 010852Z 06003KT 10SM OVC110 22/18 A2979 RMK AO2 SLP088 T0220178 56004
01	0452	MET11609/01/21 04:52:02 METAR KBDR 010952Z 00000KT 10SM -RA FEW075 OVC095 22/18 A2981 RMK AO2 RAB05 SLP094 P0000 T02170183
01	0552	MET10809/01/21 05:52:02 METAR KBDR 011052Z 36004KT 10SM -RA OVC100 21/18 A2983 RMK AO2 SLP102 P0000 T02110183 (BR)
01	0652	MET15209/01/21 06:52:02 METAR KBDR 011152Z 36005KT 10SM -RA FEW080 SCT100 BKN110 21/18 A2984 RMK AO2 SLP106 P0002 60002 70002 T02110183 10239 20211 51017 (BR)
01	0700	SYN09872504 11866 63605 10211 20183 30096 40106 51017 69951 761// 91152 333 10289 20211 70005 555 90112=
01	0752	MET10809/01/21 07:52:02 METAR KBDR 011252Z 36006KT 10SM -RA OVC100 21/19 A2984 RMK AO2 SLP104 P0002 T02110189 (BR)
01	0852	MET10809/01/21 08:52:02 METAR KBDR 011352Z 02006KT 10SM -RA BKN120 21/18 A2983 RMK AO2 SLP103 P0001 T02060178 (BR)
01	0952	MET13309/01/21 09:52:02 METAR KBDR 011452Z 01007KT 9SM -RA FEW070 SCT090 OVC110 21/19 A2984 RMK AO2 SLP103 P0003 60006 T02110189 55003 (BR)
01	1052	MET12409/01/21 10:52:02 METAR KBDR 011552Z 04008KT 10SM -RA BKN050 OVC060 21/19 A2983 RMK AO2 RAE20B51 SLP101 P0000 T02110189 (BR)
01	1152	MET11509/01/21 11:52:02 METAR KBDR 011652Z 03008KT 10SM -RA FEW090 OVC110 21/19 A2981 RMK AO2 SLP095 P0001 T02110194 (BR)
01	1252	MET15409/01/21 12:52:02 METAR KBDR 011752Z 06009KT 10SM SCT055 BKN070 BKN080 21/19 A2980 RMK AO2 RAE12B30E40 SLP092 P0000 60007 T02110189 10217 20206 58011 (BR)
01	1300	SYN08872504 12766 60609 10211 20189 30083 40092 58011 60021 91752 333 10239 20206 555 90118=
01	1321	MET12209/01/21 13:21:02 SPECI KBDR 011821Z 05011KT 10SM FEW008 BKN050 BKN065 21/19 A2979 RMK AO2 RAB1754E16 P0001 T02110194 (BN)
01	1352	MET15509/01/21 13:52:02 METAR KBDR 011852Z 05010KT 10SM SCT010 BKN048 OVC060 21/19 A2979 RMK AO2 LTG DSNT SE AND W RAB1754E16B37E46 SLP088 P0001 T02110194 (BN)
01	1450	MET09309/01/21 14:50:02 SPECI KBDR 011950Z 03012KT 10SM FEW009 OVC037 21/19 A2977 RMK AO2 FIBI (BN)
01	1452	MET10509/01/21 14:52:02 METAR KBDR 011952Z 03012KT 10SM FEW009 OVC037 21/19 A2977 RMK AO2 SLP080 T02110189 (BN)
01	1552	MET11709/01/21 15:52:02 METAR KBDR 012052Z 03013KT 10SM BKN031 OVC038 21/18 A2976 RMK AO2 SLP077 60001 T02060183 56015 (BN)
01	1650	MET10009/01/21 16:50:02 SPECI KBDR 012150Z 02013KT 10SM BKN029 BKN039 OVC100 21/18 A2975 RMK AO2 FIBI (BN)
01	1652	MET10509/01/21 16:52:02 METAR KBDR 012152Z 02011KT 10SM BKN029 OVC100 21/18 A2976 RMK AO2 SLP076 T02060178 (BN)
01	1752	MET12709/01/21 17:52:02 METAR KBDR 012252Z 03012KT 10SM BKN027 BKN043 OVC110 20/18 A2974 RMK AO2 RAB19E47 SLP071 P0003 T02000178 (BN)
01	1803	MET12209/01/21 18:03:02 SPECI KBDR 012303Z 03011KT 10SM RA SCT027 BKN060 BKN120 20/18 A2974 RMK AO2 RAB2257 P0000 T02000183 (BN)
01	1850	MET12009/01/21 18:50:02 SPECI KBDR 012350Z 03015KT 4SM +RA BR SCT022 BKN028 OVC080 19/18 A2971 RMK AO2 RAB2257 P0011 FIBI (BN)
01	1852	MET15609/01/21 18:52:02 METAR KBDR 012352Z 04017KT 3SM +RA BR SCT022 BKN028 OVC075 19/18 A2971 RMK AO2 RAB2257 SLP059 P0013 60017 T01940178 10211 20194 58018 (BN)
01	1900	SYN09872504 11548 80417 10194 20178 30052 40059 58018 60041 765// 92352 333 10217 20194 96010 555 90200=
01	1901	MET14409/01/21 19:01:01 SPECI KBDR 020001Z 04019G26KT 2 1/2SM +RA BR FEW023 BKN065 19/18 A2969 RMK AO2 PK WND 04026/2358 PRESFR P0013 T01940183
01	1911	MET13309/01/21 19:11:01 SPECI KBDR 020011Z 04018G23KT 3SM +RA BR BKN026 BKN038 OVC049 19/18 A2969 RMK AO2 PK WND 04026/2358 P0020 T01940183
01	1921	MET13309/01/21 19:21:01 SPECI KBDR 020021Z 05022G28KT 4SM +RA BR FEW014 BKN032 OVC046 19/18 A2968 RMK AO2 PK WND 04028/0016 P0026 T01940178
01	1935	MET14409/01/21 19:35:01 SPECI KBDR 020035Z 05018G24KT 5SM RA BR FEW008 BKN034 OVC046 19/18 A2969 RMK AO2 PK WND 04028/0016 LTG DSNT SW P0031 T01940178
01	1947	MET13409/01/21 19:47:01 SPECI KBDR 020047Z 05019G28KT 6SM RA BR FEW008 BKN023 OVC035 19/18 A2968 RMK AO2 PK WND 04028/0016 LTG DSNT SW P0037
01	1952	MET15809/01/21 19:52:01 METAR KBDR 020052Z 06020G29KT 5SM +RA BR FEW014 BKN024 OVC035 19/18 A2967 RMK AO2 PK WND 05029/0051 LTG DSNT SW AND W SLP047 P0037 T01940178
01	2017	MET15509/01/21 20:17:01 SPECI KBDR 020117Z 05020G30KT 6SM VCTS RA BR SCT010 BKN020 OVC043 19/18 A2964 RMK AO2 PK WND 05030/0107 LTG DSNT E AND SW P0015 T01940178
01	2032	MET14509/01/21 20:32:01 SPECI KBDR 020132Z 05022G35KT 6SM RA BR SCT010 BKN020 OVC032 19/18 A2961 RMK AO2 PK WND 05035/0123 LTG DSNT S-W P0021 T01940178
01	2048	MET14509/01/21 20:48:01 SPECI KBDR 020148Z 05025G36KT 3SM +TSRA BR FEW010 BKN018 OVC030 19/18 A2961 RMK AO2 PK WND 04036/0143 LTG DSNT SW-N TSB42 P0024
01	2050	MET15809/01/21 20:50:03 SPECI KBDR 020150Z 05026G36KT 2 1/2SM +TSRA BR FEW010 BKN018 OVC030 19/18 A2962 RMK AO2 PK WND 04036/0143 LTG DSNT W-N TSB42 P0026 FIBI (BN)
01	2052	MET16509/01/21 20:52:01 METAR KBDR 020152Z 05020G36KT 1 3/4SM +TSRA BR FEW010 BKN021 OVC030 19/18 A2961 RMK AO2 PK WND 04036/0143 LTG DSNT W-N TSB42 SLP027 P0028 T01940178
01	2057	MET16309/01/21 20:57:01 SPECI KBDR 020157Z 05022G33KT 1 1/2SM VCTS +RA BR FEW008 BKN015 OVC028 19/18 A2960 RMK AO2 PK WND 04032/0154 LTG DSNT ALQDS TSE57 P0021 T01940178
01	2109	MET16109/01/21 21:09:01 SPECI KBDR 020209Z 05020G31KT 2SM VCTS +RA BR FEW010 BKN021 OVC033 19/18 A2960 RMK AO2 PK WND 04032/0154 LTG DSNT ALQDS TSE0157 P0041 T01890178
01	2114	MET15609/01/21 21:14:01 SPECI KBDR 020214Z 05022G28KT 1 3/4SM VCTS +RA BR FEW008 OVC019 19/18 A2959 RMK AO2 PK WND 04032/0154 LTG DSNT S-W TSE0157 P0058 T01890178
01	2122	MET16509/01/21 21:22:01 SPECI KBDR 020222Z 05019G32KT 1 3/4SM +TSRA BR FEW008 BKN021 OVC027 19/18 A2959 RMK AO2 PK WND 04032/0154 LTG DSNT SW-NW TSE0157B16 P0074 T01890178
01	2130	MET17209/01/21 21:30:01 SPECI KBDR 020230Z 05024G32KT 2 1/2SM +TSRA BR FEW015 BKN023 OVC030 19/18 A2956 RMK AO2 PK WND 06032/0229 LTG DSNT SW-NW TSE0157B16 PRESFR P0083 T01890178

01	2143	MET16709/01/21 21:43:01 SPECI KBDR 020243Z 05021G30KT 2SM VCTS +RA BR FEW015 BKN021 OVC033 19/17 A2955 RMK AO2 PK WND 06032/0229 LTG DSNT ALQDS TSE0157B16E37 P0106 T01890172
01	2150	MET18009/01/21 21:50:02 SPECI KBDR 020250Z 05023G34KT 2 1/2SM +TSRA BR FEW013 BKN021 OVC030 19/18 A2951 RMK AO2 PK WND 05034/0250 VIS 1 1/2V3 LTG DSNT ALQDS TSE0157B16E37B44 PRESFR P0113
01	2152	MET20509/01/21 21:52:02 METAR KBDR 020252Z 05021G34KT 2SM +TSRA BR FEW011 BKN021 OVC030 19/18 A2952 RMK AO2 PK WND 05034/0250 VIS 1 1/2V3 LTG DSNT ALQDS TSE0157B16E37B44 PRESFR SLP995 P0116 60181 T01890178 55032
01	2203	MET15709/01/21 22:03:02 SPECI KBDR 020303Z 06023G29KT 2SM +TSRA BR SCT009 BKN016 OVC021 19/18 A2950 RMK AO2 PK WND 06029/0303 LTG DSNT ALQDS PRESFR P0026 T01890178
01	2207	MET16109/01/21 22:07:02 SPECI KBDR 020307Z 06024G32KT 1 3/4SM +TSRA BR FEW007 BKN010 OVC023 19/18 A2949 RMK AO2 PK WND 07032/0306 LTG DSNT ALQDS PRESFR P0030 T01890178
01	2217	MET15209/01/21 22:17:02 SPECI KBDR 020317Z 03028G40KT 1SM VCTS +RA BR BKN009 OVC018 18/17 A2948 RMK AO2 PK WND 04040/0311 LTG DSNT ALQDS TSE17 P0059 T01830172
01	2226	MET16509/01/21 22:26:02 SPECI KBDR 020326Z 28026G34KT 3/4SM VCTS +RA BR OVC007 18/18 A2960 RMK AO2 PK WND 04040/0311 WSHFT 0312 LTG DSNT ALQDS TSE17 PRESRR P0098 T01830178
01	2229	MET15709/01/21 22:29:02 SPECI KBDR 020329Z 35022G34KT 1/2SM +TSRA FG V006 18/17 A2956 RMK AO2 PK WND 04040/0311 WSHFT 0312 LTG DSNT ALQDS TSE17B27 P0107 T01830172
01	2240	MET15709/01/21 22:40:02 SPECI KBDR 020340Z 34015G32KT 3/4SM +TSRA BR V006 18/17 A2958 RMK AO2 PK WND 04040/0311 WSHFT 0326 LTG DSNT ALQDS TSE17B27 P0211 T01780172
01	2252	MET16409/01/21 22:52:02 METAR KBDR 020352Z 01023G28KT 3/4SM +TSRA BR V007 18/17 A2954 RMK AO2 PK WND 04040/0311 WSHFT 0326 LTG DSNT ALQDS TSE17B27 SLP002 P0287 T01780167
01	2259	MET13409/01/21 22:59:02 SPECI KBDR 020359Z 02021G31KT 1SM +TSRA BR V010 18/17 A2955 RMK AO2 PK WND 01031/0355 LTG DSNT NE-S P0025 T01780167
01	2310	MET15509/01/21 23:10:02 SPECI KBDR 020410Z 03025G32KT 1 1/4SM VCTS +RA BR BKN011 OVC033 17/17 A2953 RMK AO2 PK WND 01032/0408 LTG DSNT NE-S TSE04 P0059 T01720167
01	2315	MET15809/01/21 23:15:02 SPECI KBDR 020415Z 02023G33KT 2SM VCTS +RA BR BKN015 BKN033 OVC042 17/17 A2953 RMK AO2 PK WND 03033/0411 LTG DSNT NE-S TSE04 P0072 T01720167
01	2324	MET15009/01/21 23:24:02 SPECI KBDR 020424Z 02020G33KT 7SM -RA BKN023 BKN045 OVC055 18/17 A2953 RMK AO2 PK WND 03033/0416 LTG DSNT NE-S TSE04 P0074 T01780167
01	2333	MET15309/01/21 23:33:02 SPECI KBDR 020433Z 02017G30KT 5SM +RA BR FEW029 BKN035 OVC048 18/17 A2953 RMK AO2 PK WND 03033/0416 LTG DSNT NE-S TSE04 P0074 T01780167
01	2352	MET17409/01/21 23:52:02 METAR KBDR 020452Z 01019G30KT 6SM VCTS RA BR FEW028 BKN037 OVC050 18/16 A2953 RMK AO2 PK WND 03033/0416 LTG DSNT NE-S TSE04 SLP000 P0081 T01780161 402390172

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
 s = Suspect
 * = Erroneous
 blank = No precipitation observed
 M = Missing

APPENDIX C

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Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

1 - Pine Tree Orange



Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	-----	-----	-----	-----	64.08	97.54	148.12	197.62	337.06	Pine Tree Orange
Proj. file: NRCS runoff Peck-Pinetree final.gpw									Wednesday, 04 / 6 / 2022		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

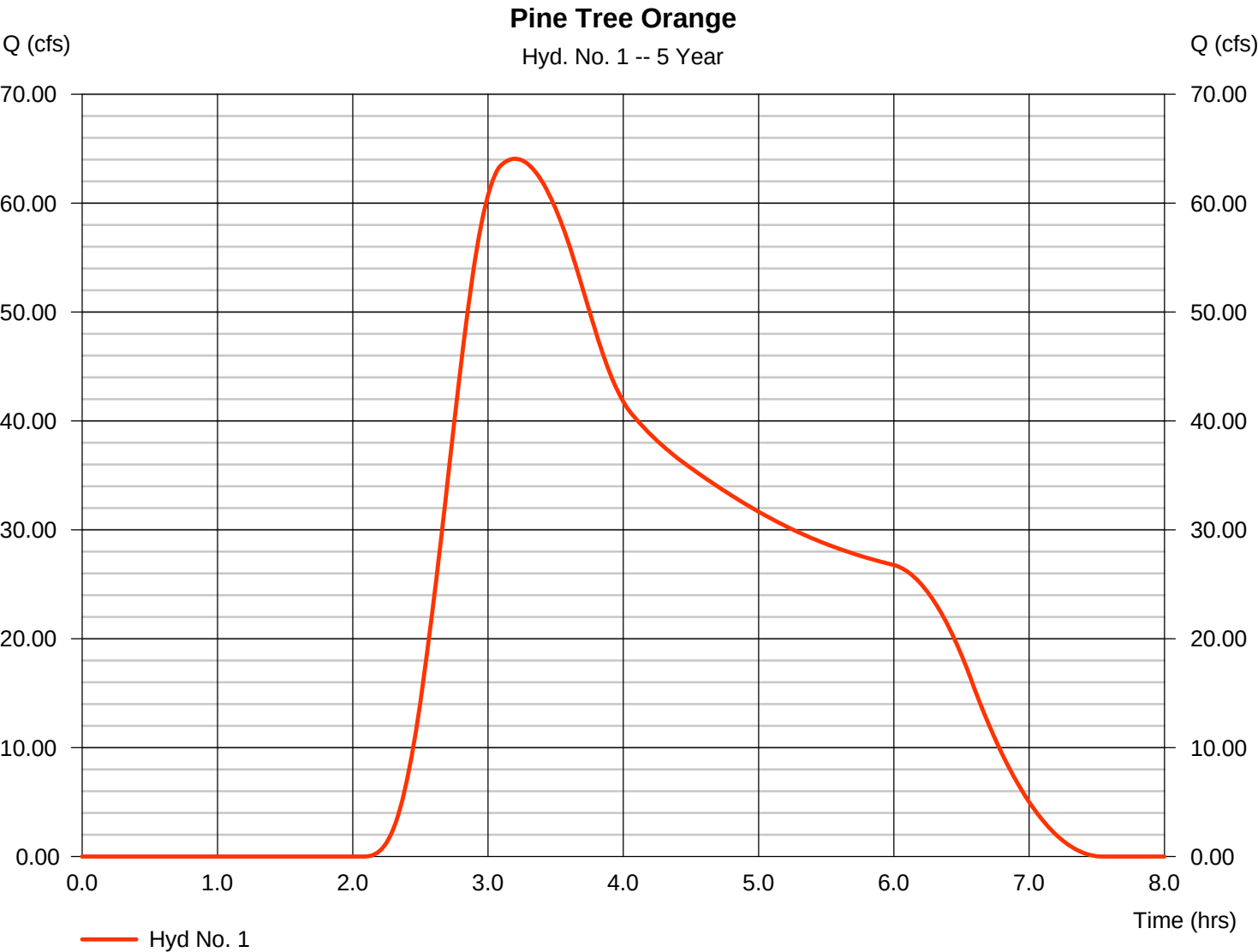
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	64.08	1	192	13.296	-----	-----	-----	Pine Tree Orange
NRCS runoff Peck-Pinetree final.gpw					Return Period: 5 Year			Wednesday, 04 / 6 / 2022	

Hydrograph Report

Hyd. No. 1

Pine Tree Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 64.08 cfs
Storm frequency	= 5 yrs	Time to peak	= 3.20 hrs
Time interval	= 1 min	Hyd. volume	= 13.296 acft
Drainage area	= 211.000 ac	Curve number	= 70.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 58.60 min
Total precip.	= 3.03 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

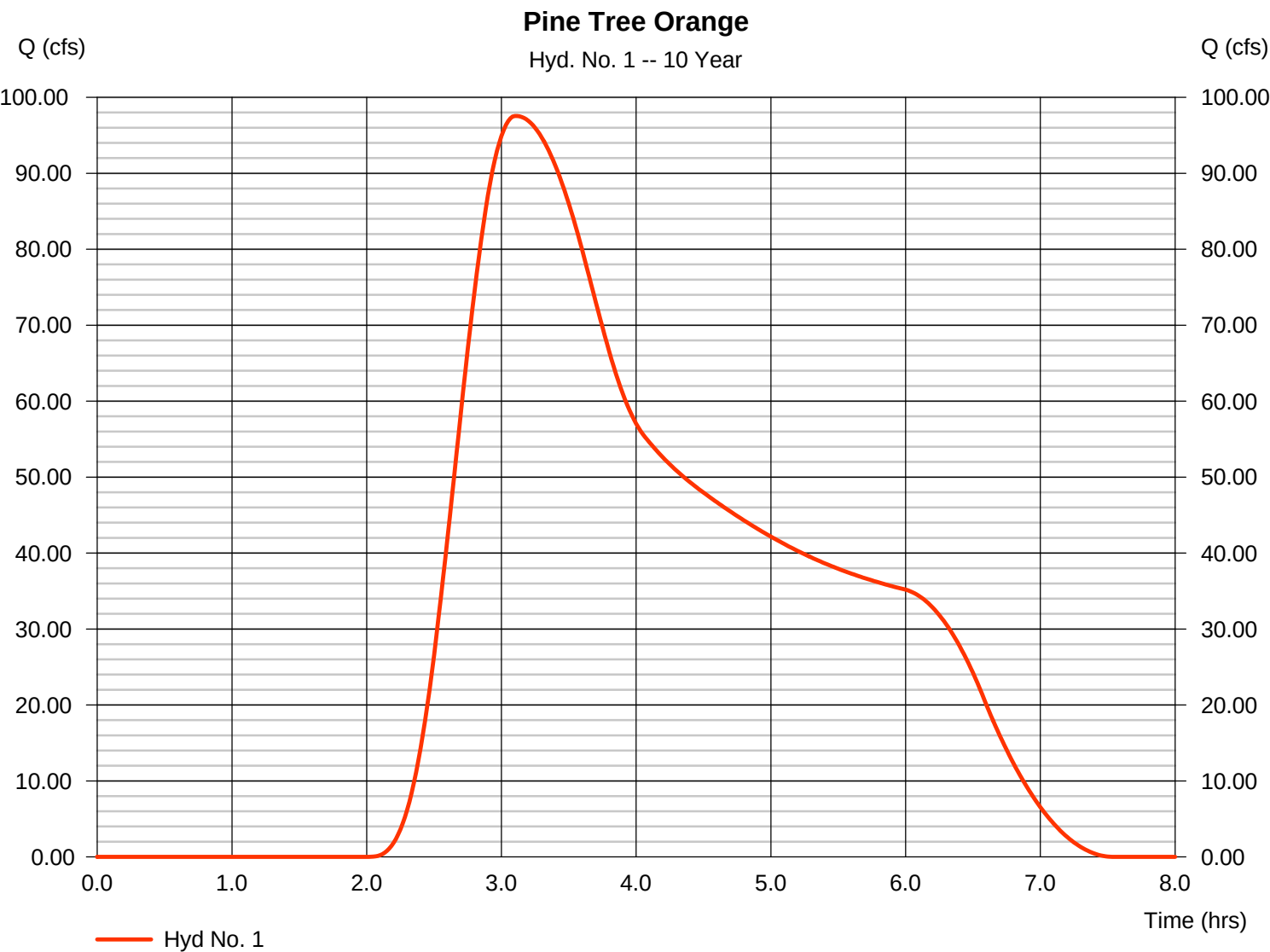
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	97.54	1	187	18.908	-----	-----	-----	Pine Tree Orange
NRCS runoff Peck-Pinetree final.gpw					Return Period: 10 Year			Wednesday, 04 / 6 / 2022	

Hydrograph Report

Hyd. No. 1

Pine Tree Orange

Hydrograph type	=	SCS Runoff	Peak discharge	=	97.54 cfs
Storm frequency	=	10 yrs	Time to peak	=	3.12 hrs
Time interval	=	1 min	Hyd. volume	=	18.908 acft
Drainage area	=	211.000 ac	Curve number	=	70.6
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	58.60 min
Total precip.	=	3.56 in	Distribution	=	SCS 6-Hr
Storm duration	=	6.00 hrs	Shape factor	=	484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

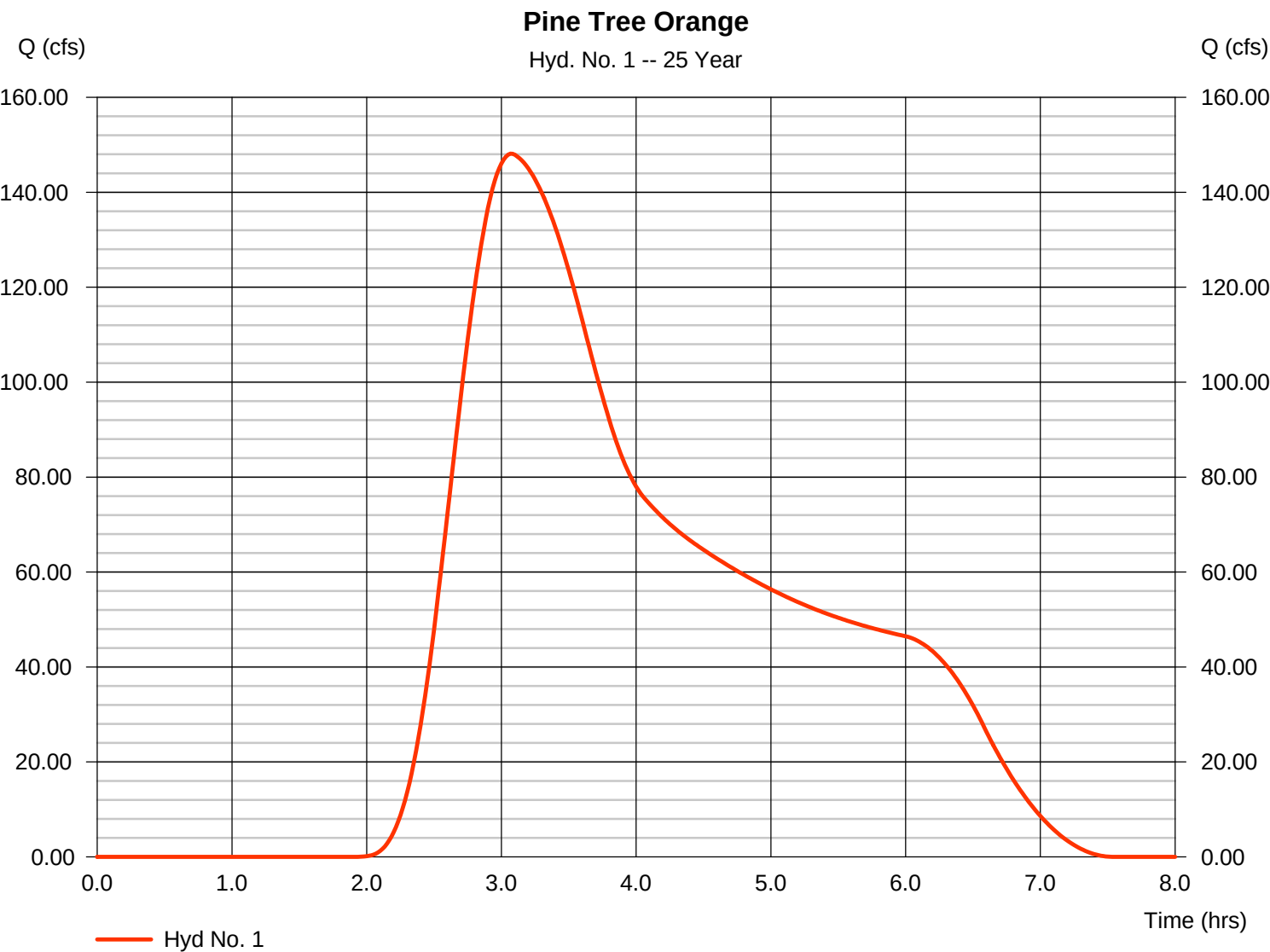
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	148.12	1	184	26.985	-----	-----	-----	Pine Tree Orange
NRCS runoff Peck-Pinetree final.gpw					Return Period: 25 Year			Wednesday, 04 / 6 / 2022	

Hydrograph Report

Hyd. No. 1

Pine Tree Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 148.12 cfs
Storm frequency	= 25 yrs	Time to peak	= 3.07 hrs
Time interval	= 1 min	Hyd. volume	= 26.985 acft
Drainage area	= 211.000 ac	Curve number	= 70.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 58.60 min
Total precip.	= 4.25 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

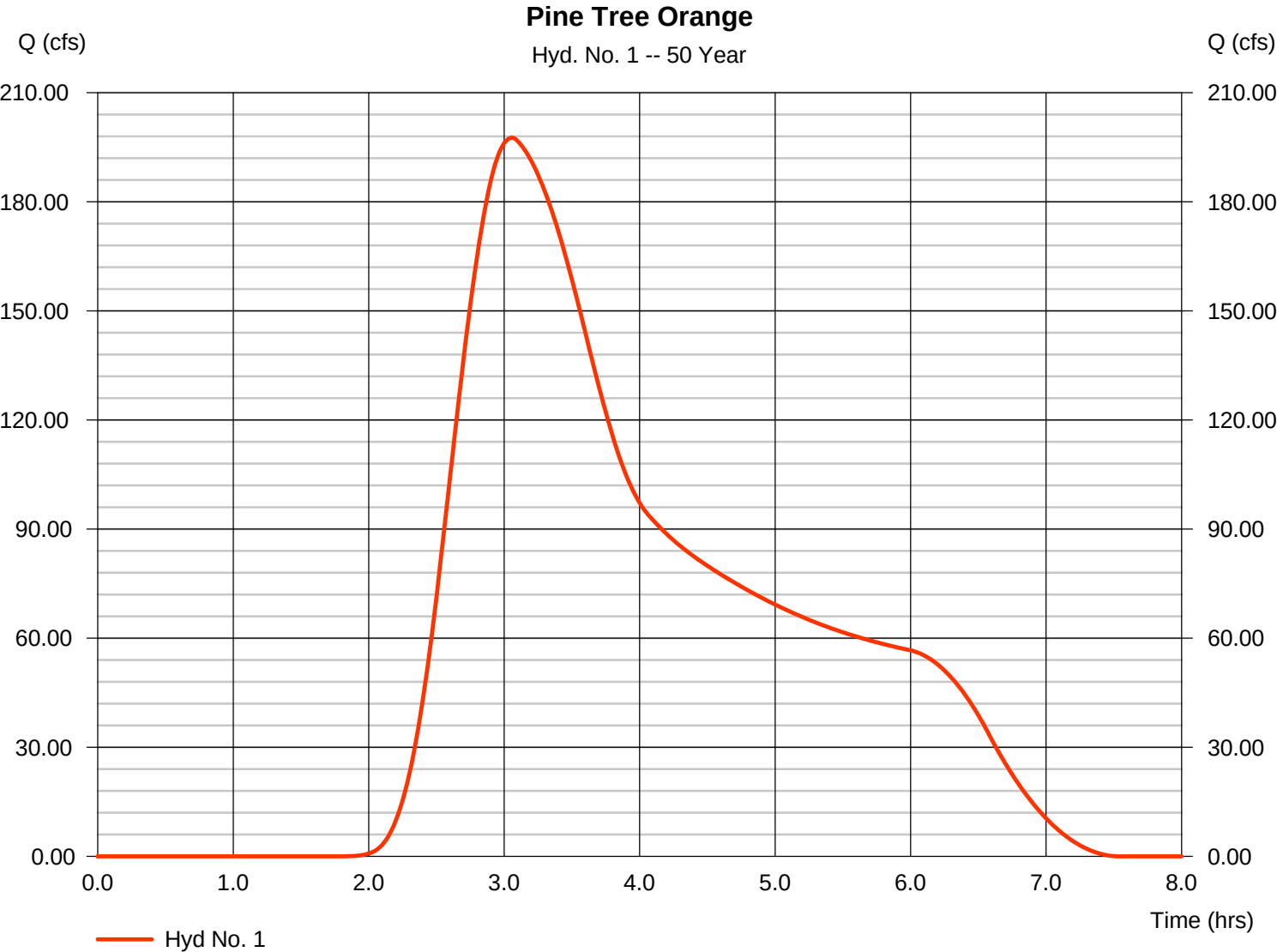
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	197.62	1	183	34.688	-----	-----	-----	Pine Tree Orange
NRCS runoff Peck-Pinetree final.gpw					Return Period: 50 Year			Wednesday, 04 / 6 / 2022	

Hydrograph Report

Hyd. No. 1

Pine Tree Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 197.62 cfs
Storm frequency	= 50 yrs	Time to peak	= 3.05 hrs
Time interval	= 1 min	Hyd. volume	= 34.688 acft
Drainage area	= 211.000 ac	Curve number	= 70.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 58.60 min
Total precip.	= 4.86 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	337.06	1	181	55.943	-----	-----	-----	Pine Tree Orange
NRCS runoff Peck-Pinetree final.gpw					Return Period: 100 Year			Wednesday, 04 / 6 / 2022	

Hydrograph Report

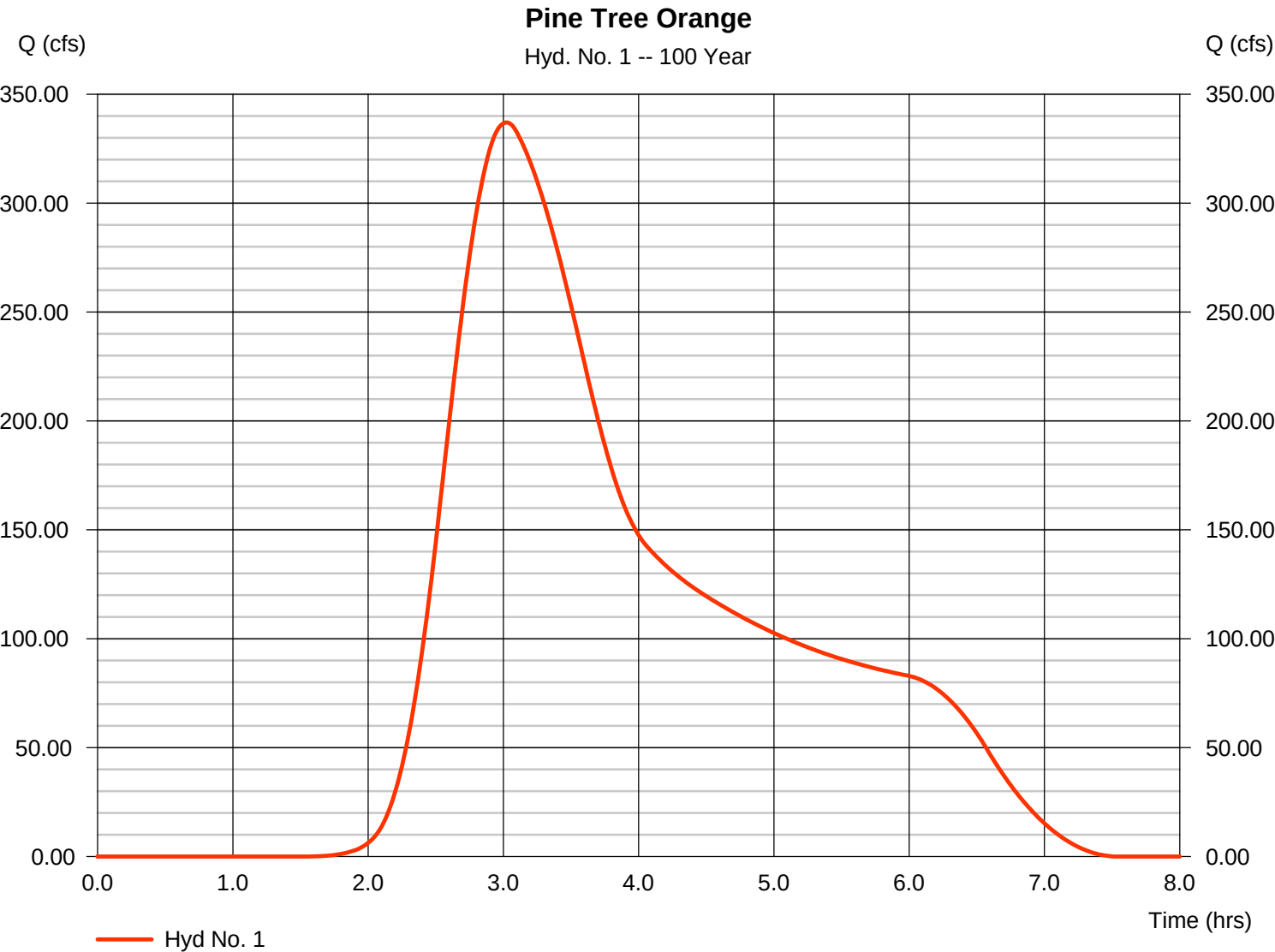
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 04 / 6 / 2022

Hyd. No. 1

Pine Tree Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 337.06 cfs
Storm frequency	= 100 yrs	Time to peak	= 3.02 hrs
Time interval	= 1 min	Hyd. volume	= 55.943 acft
Drainage area	= 211.000 ac	Curve number	= 70.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 58.60 min
Total precip.	= 6.41 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



Peck Lane/Pine Tree Culverts

Orange, CT

Existing Drainage Areas

NRCS

	Area (SF)	Area (Ac)	Percentage of Total Area (%)	CN*	CN Description
Cultivated land (crops)	770711	17.69	8.4	81	wo conservation treatment
Wolfe Park area, open space	473,404.00	10.87	5.1	85	turf fields, gravel lots
Open space lawn area good condition	433,000.00	9.94	4.7	68	large lawn area good condition B/C
Forested Area	1,877,436.00	43.10	20.4	71	thin stand poor cover
Utility ROW open area	438,370.00	10.06	4.8	69	fair condition, grass on 50 to 75%
Residential, 1 acre lots	5,200,000.00	119.38	56.6	68	assumes 20% impervious on lots
Total Drainage Area	9,192,921.00	211.0			

*Hydrologic Soil Group (HSG): B

Existing Conditions:
Composite CN 70.6

Project Peck Lane/Pinetree
 Location Existing Tc

Checked DL Date 12/5/2021
 Checked _____ Date _____

Circle One: Present Developed

Circle One: T_c T_i through subarea

TC1

NOTE: Map showing flow segments is attached.

Sheet Flow

1. Surface description.....
2. Manning's roughness coeff., n.....
3. Flow length, L (total L ≤ 200 ft).....
4. Two-yr 24-hr rainfall, P₂.....
5. Land slope, s.....
6. $T_t = (0.007(nL)^{0.8}) / (P_2^{0.5})(s^{0.4})$

Segment ID	AB	
	GRASSED	
	0.24	0.01
ft	300.00	
in	3.60	3.60
ft/ft	0.02	0.02
hr	0.58	+
		0.00
		=
		0.58

Shallow Concentrated Flow

7. Surface description.....
8. Flow length, L.....
9. Watercourse slope, s.....
10. Average velocity, V.....
11. $T_t = L / (3600V)$

Segment ID	CD	
	UNPAVED	
ft	870.00	
ft/ft	0.00	
ft/s	1.17	
hr	0.21	+
		0.00
		=
		0.21

Channel Flow

12. Cross sectional flow area, a.....
13. Wetted perimeter, P_w.....
14. Hydraulic radius, r = a/P_w.....
15. Channel slope, s.....
16. Manning's roughness coeff., n.....
17. $V = (1.49r^{2/3}s^{1/2})/n$
18. Flow length, L.....
19. $T_t = L / (3600V)$
20. Watershed or subarea T_c or T_i (add T_i in steps 6, 11, and 19)..... hr

Segment ID	DE	
ft ²	21.00	
ft	12.49	
ft	1.68	
ft/ft	0.01	
	0.04	
ft/s	3.94	
ft	2682.00	
hr	0.19	+
		0.00
		=
		0.19
		0.98
		58.6

T_c

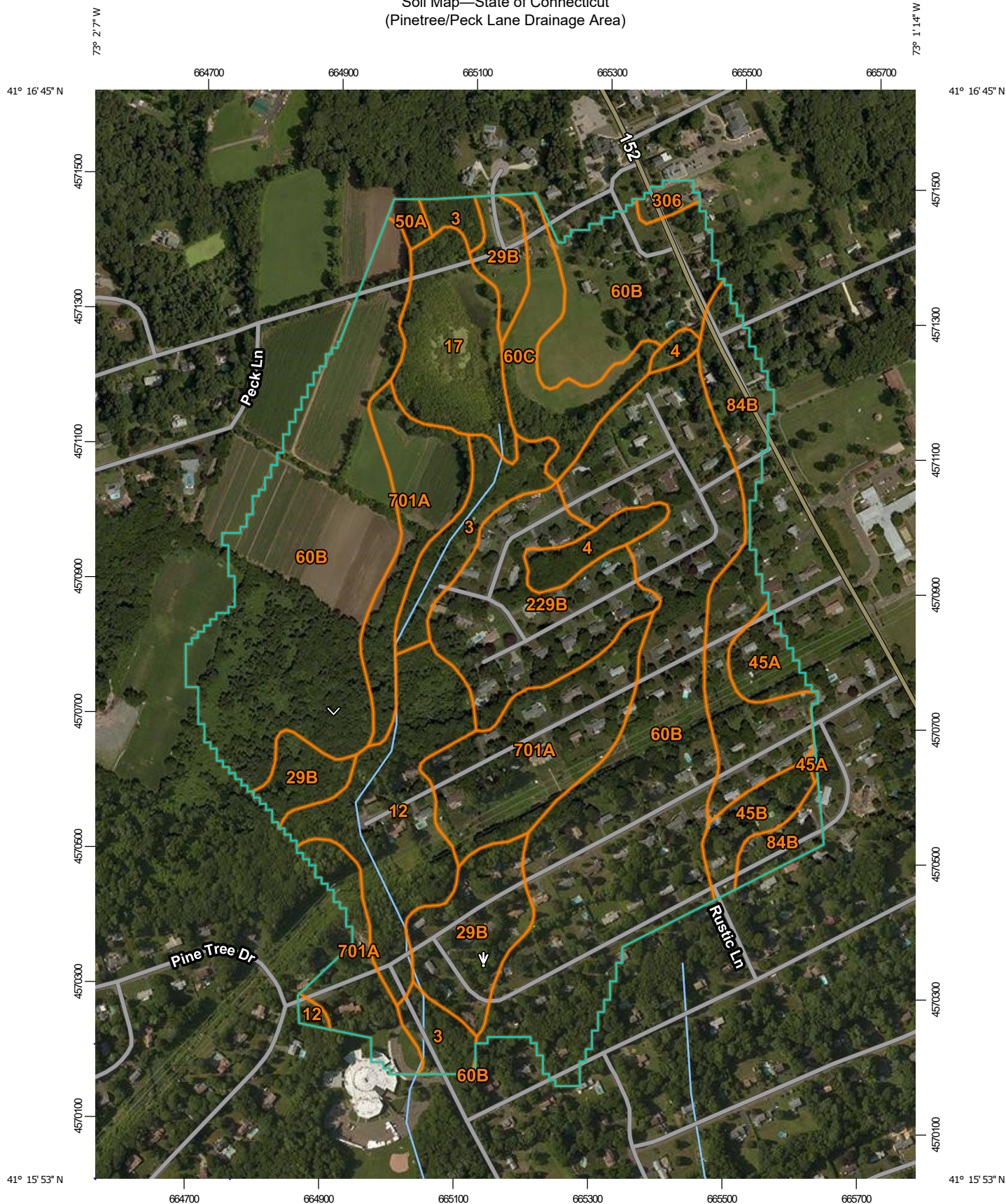
Peck Lane Culvert

Orange, CT

HSG Breakdown

Number	Map Unit	Map Unit Desc	Area (Ac)	Percentage of Total Area (%)	HSG Group	Notes
1	3	Ridgebury, leicester, 0 to 8, stony	9.10	4.25%	D	
2	4	Leicester fine sandy loam	3.30	1.54%	D	
3	12	Raypol silt loam	15.00	7.01%	C	
4	17	timakwa and natchaug, 0 to 2%	10.00	4.67%	C	
5	29B	agawam fsl, 3 to 8%	13.40	6.26%	B	
6	45A	woodbridge fsl, 0 to 3%	2.80	1.31%	A	
7	45B	woodbridge fsl, 3 to 8%	3.30	1.54%	B	
8	50A	sutton fsl, 0 to 3%	0.70	0.33%	A	
9	60B	canton and charlton fsl, 3 to 8%	90.10	42.10%	B	
10	60C	canton and charlton fsl, 8 to 15%	7.80	3.64%	C	
11	84B	paxton and montauk fsl, 3 to 8%	15.00	7.01%	B	
12	229B	agawam urban land complex 0 to 8%	15.20	7.10%	B	
13	306	udorthents-urban land complex	1.00	0.47%	C	
14	701A	ninigret fsl, 0 to 3%	27.30	12.76%	A	
Total Drainage Area			214.0			
	Total A	14.39%				
	Total B	62.48%				
	Total C	15.79%				
	Total D	5.79%				
*Recommended HSG:		B				

Soil Map—State of Connecticut (Pinetree/Peck Lane Drainage Area)



Map Scale: 1:7,860 if printed on A portrait (8.5" x 11") sheet.



0 100 200 400 600 Meters

0 350 700 1400 2100 Feet

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



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

11/18/2021
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

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

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 21, Sep 7, 2021

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

Date(s) aerial images were photographed: Mar 28, 2011—Jul 22, 2014

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	9.1	4.2%
4	Leicester fine sandy loam	3.3	1.5%
12	Raypol silt loam	15.0	7.0%
17	Timakwa and Natchaug soils, 0 to 2 percent slopes	10.0	4.7%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	13.4	6.3%
45A	Woodbridge fine sandy loam, 0 to 3 percent slopes	2.8	1.3%
45B	Woodbridge fine sandy loam, 3 to 8 percent slopes	3.3	1.5%
50A	Sutton fine sandy loam, 0 to 3 percent slopes	0.7	0.3%
60B	Canton and Charlton fine sandy loams, 3 to 8 percent slopes	90.1	42.1%
60C	Canton and Charlton fine sandy loams, 8 to 15 percent slopes	7.8	3.6%
84B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes	15.0	7.0%
229B	Agawam-Urban land complex, 0 to 8 percent slopes	15.2	7.1%
306	Udorthents-Urban land complex	1.0	0.4%
701A	Ninigret fine sandy loam, 0 to 3 percent slopes	27.3	12.7%
Totals for Area of Interest		214.0	100.0%

APPENDIX D

HYDRAULIC MODELING DATA AND CALCULATIONS

Existing Pinetree HY-8 Culvert Analysis Report

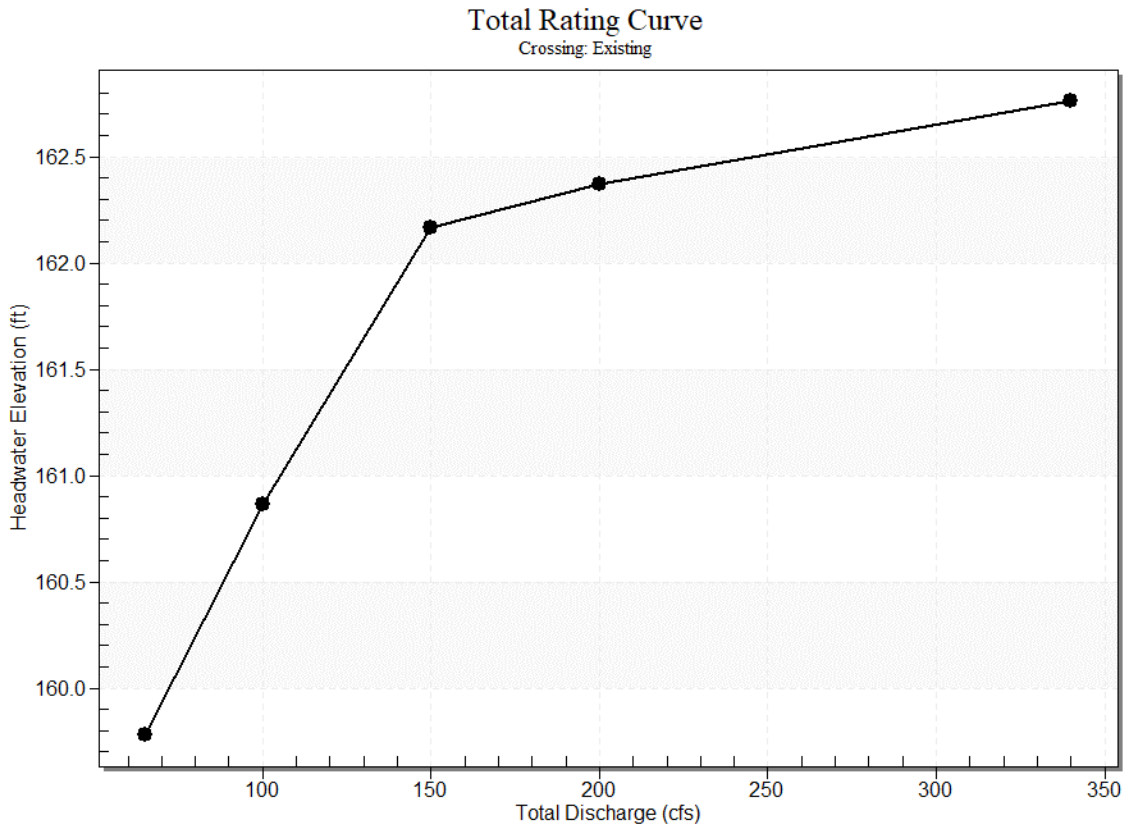
Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Existing

Headwater r Elevation (ft)	Discharge Names	Total Discharg e (cfs)	Existing 1-36 inch RCP Discharg e (cfs)	Existing 2-36 inch RCP Discharg e (cfs)	Roadway Discharg e (cfs)	Iterations
159.78	5 yr	65.00	33.09	31.95	0.00	7
160.87	10 yr	100.00	50.65	49.39	0.00	4
162.17	25 yr	150.00	62.81	62.81	24.02	9
162.37	50 yr	200.00	59.09	59.09	81.44	5
162.76	100 yr	340.00	49.09	49.09	241.74	4
162.00	Overtoppin g	129.02	64.86	64.16	0.00	Overtoppin g

Rating Curve Plot for Crossing: Existing



Culvert Data: Existing 1-36 inch RCP

Table 2 - Culvert Summary Table: Existing 1-36 inch RCP

Disc harg e Nam es	Total Disc harg e (cfs)	Culv ert Disc harg e (cfs)	Head water Eleva tion (ft)	Inle t Con trol Dep th (ft)	Out let Con trol Dep th (ft)	Fl o w Ty pe	Nor mal Dep th (ft)	Crit ical De pth (ft)	Ou tle t De pth (ft)	Tail water r Dept h (ft)	Outl et Vel ocit y (ft/ s)	Tail water r Velo city (ft/s)
5 yr	65.00 cfs	33.09 cfs	159.7 8	2.88	3.11 2	7- A2 t	- 1.00	1.8 7	2.1 5	2.18	6.11	3.37
10 yr	100.0 0 cfs	50.65 cfs	160.8 7	4.05	4.19 7	7- A2 t	- 1.00	2.3 2	2.6 5	2.68	7.66	3.78
25 yr	150.0 0 cfs	62.81 cfs	162.1 7	5.12	5.49 5	4- FF f	- 1.00	2.5 5	3.0 0	3.25	8.89	4.19
50 yr	200.0 0 cfs	59.09 cfs	162.3 7	4.77	5.70 0	4- FF f	- 1.00	2.4 8	3.0 0	3.71	8.36	4.52
100 yr	340.0 0 cfs	49.09 cfs	162.7 6	3.93	6.09 1	4- FF f	- 1.00	2.2 8	3.0 0	4.72	6.95	5.17

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

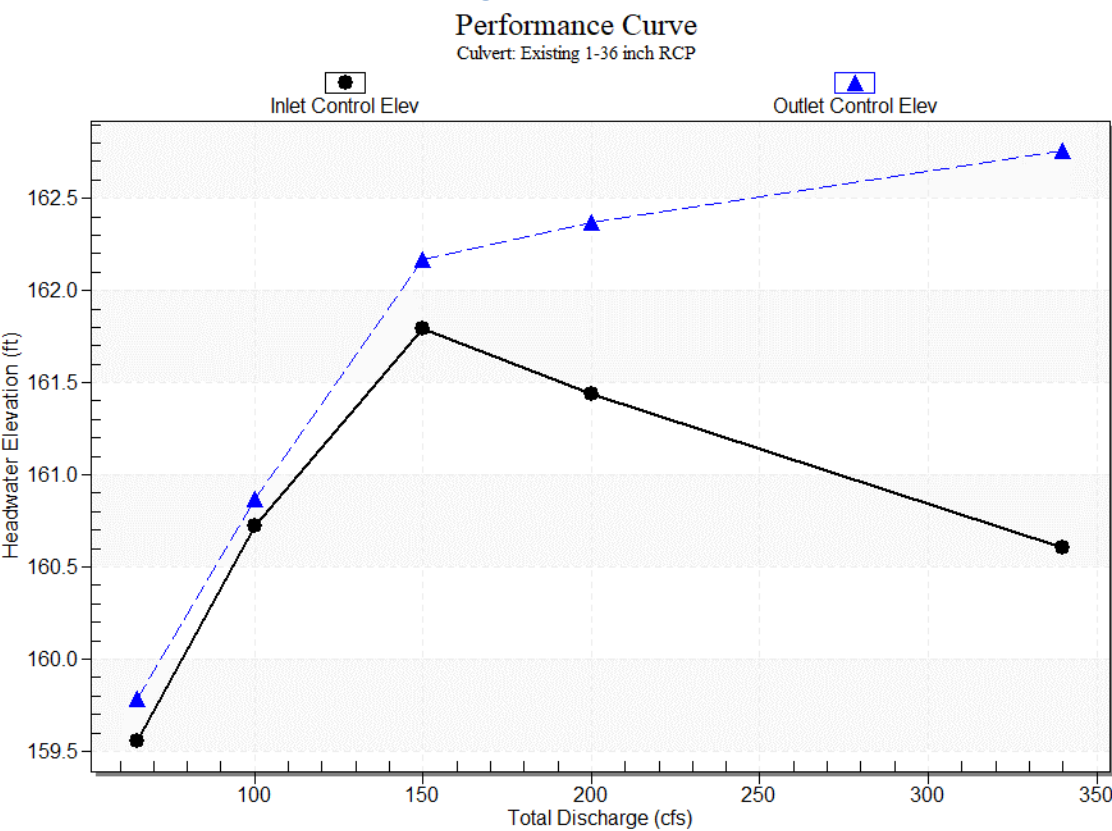
Inlet Elevation (invert): 156.67 ft,

Outlet Elevation (invert): 156.70 ft

Culvert Length: 46.00 ft,

Culvert Slope: -0.0007

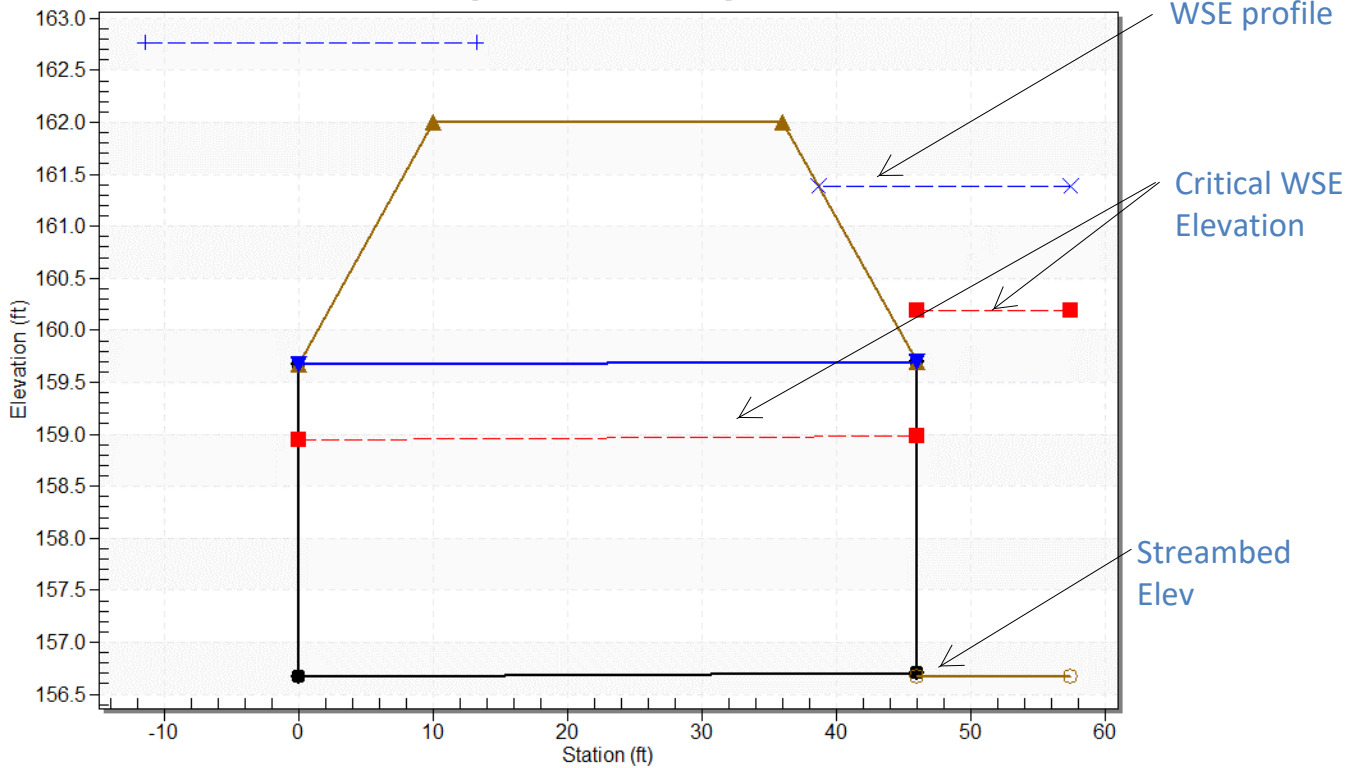
Culvert Performance Curve Plot: Existing 1-36 inch RCP



Water Surface Profile Plot for Culvert: Existing 1-36 inch RCP

Crossing - Existing, Design Discharge - 340.0 cfs

Culvert - Existing 1-36 inch RCP, Culvert Discharge - 49.1 cfs



Site Data - Existing 1-36 inch RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 156.67 ft

Outlet Station: 46.00 ft

Outlet Elevation: 156.70 ft

Number of Barrels: 1

Culvert Data Summary - Existing 1-36 inch RCP

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Culvert Data: Existing 2-36 inch RCP

Table 3 - Culvert Summary Table: Existing 2-36 inch RCP

Disc harg e Nam es	Total Disc harg e (cfs)	Culv ert Disc harg e (cfs)	Head water Eleva tion (ft)	Inle t Con trol Dep th (ft)	Out let Con trol Dep th (ft)	Fl o w Ty pe	Nor mal Dep th (ft)	Crit ical De pth (ft)	Ou tle t De pth (ft)	Tail water r Dept h (ft)	Outl et Vel ocit y (ft/ s)	Tail water r Velo city (ft/s)
5 yr	65.00 cfs	31.95 cfs	159.7 8	2.82	3.04 2	7- A2 t	- 1.00	1.8 3	2.0 7	2.18	6.15	3.37
10 yr	100.0 0 cfs	49.39 cfs	160.8 7	3.96	4.12 7	7- A2 t	- 1.00	2.2 9	2.5 7	2.68	7.65	3.78
25 yr	150.0 0 cfs	62.81 cfs	162.1 7	5.12	5.42 5	4- FF f	- 1.00	2.5 5	3.0 0	3.25	8.89	4.19
50 yr	200.0 0 cfs	59.09 cfs	162.3 7	4.77	5.63 0	4- FF f	- 1.00	2.4 8	3.0 0	3.71	8.36	4.52
100 yr	340.0 0 cfs	49.09 cfs	162.7 6	3.93	6.02 1	4- FF f	- 1.00	2.2 8	3.0 0	4.72	6.95	5.17

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

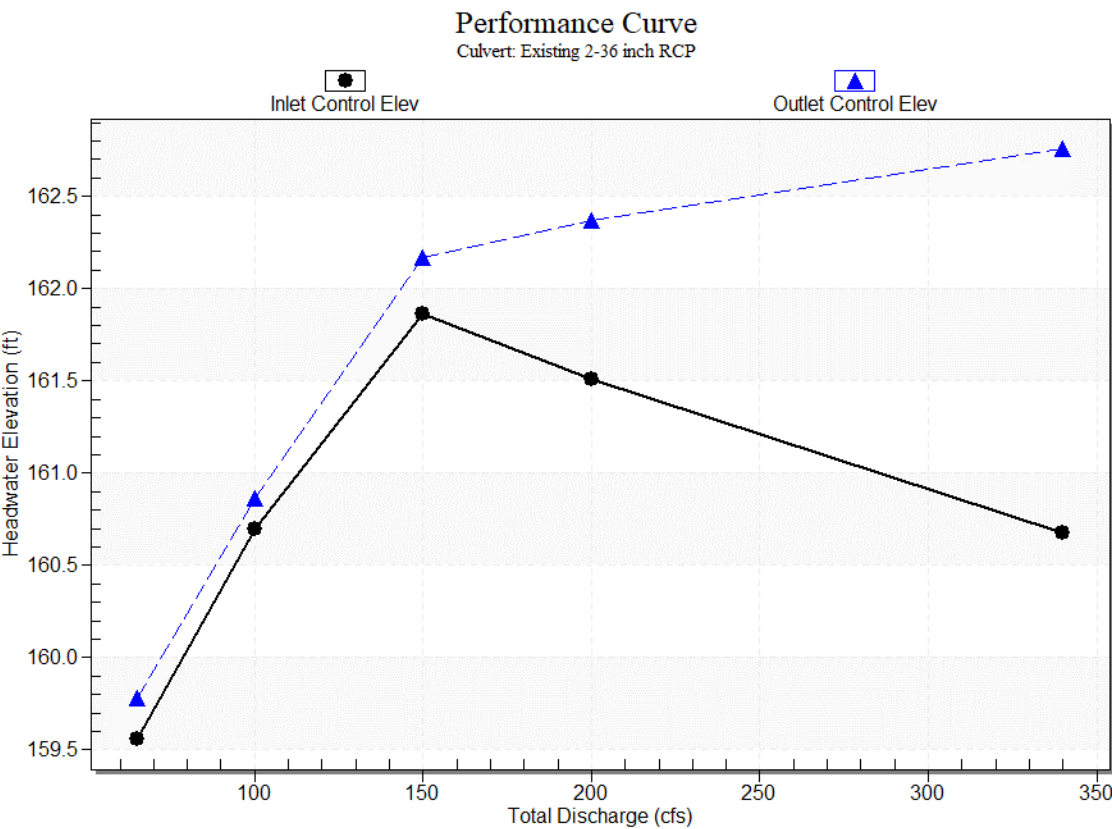
Inlet Elevation (invert): 156.74 ft,

Outlet Elevation (invert): 156.78 ft

Culvert Length: 46.00 ft,

Culvert Slope: -0.0009

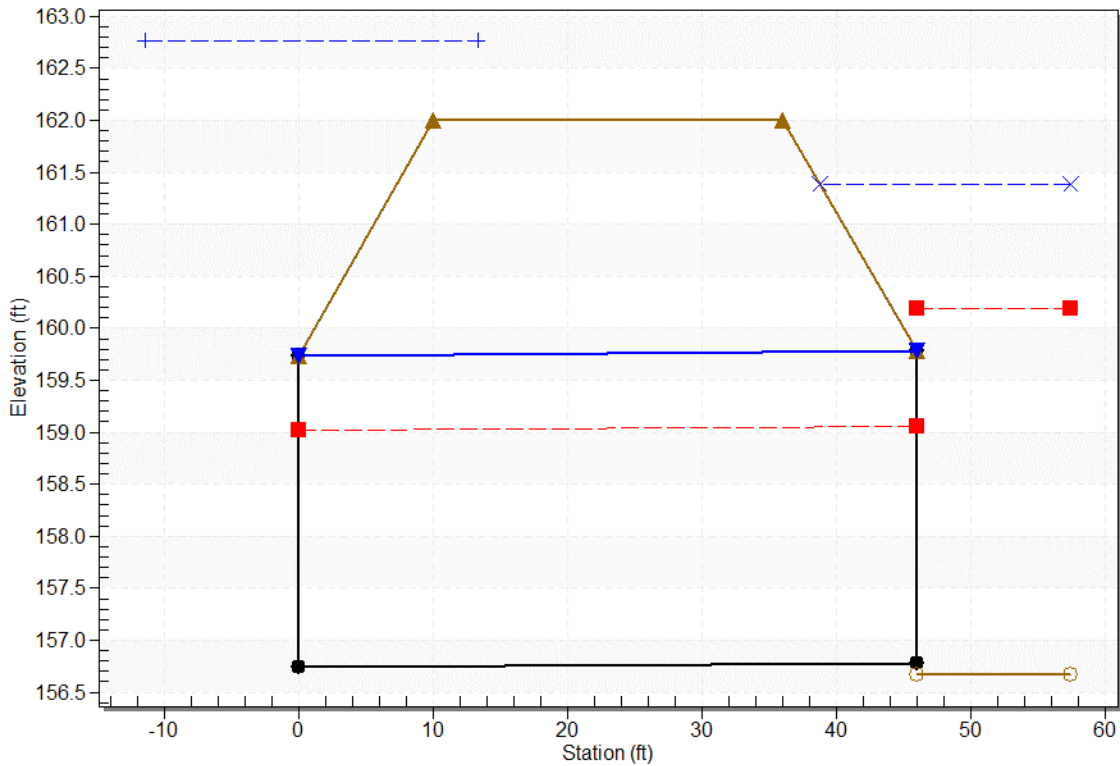
Culvert Performance Curve Plot: Existing 2-36 inch RCP



Water Surface Profile Plot for Culvert: Existing 2-36 inch RCP

Crossing - Existing, Design Discharge - 340.0 cfs

Culvert - Existing 2-36 inch RCP, Culvert Discharge - 49.1 cfs



Site Data - Existing 2-36 inch RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 156.74 ft

Outlet Station: 46.00 ft

Outlet Elevation: 156.78 ft

Number of Barrels: 1

Culvert Data Summary - Existing 2-36 inch RCP

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: Existing

Table 4 - Downstream Channel Rating Curve (Crossing: Existing)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
65.00	158.85	2.18	3.37	0.75	0.49
100.00	159.35	2.68	3.78	0.92	0.50
150.00	159.92	3.25	4.19	1.12	0.52
200.00	160.38	3.71	4.52	1.27	0.53
340.00	161.39	4.72	5.17	1.62	0.54

Tailwater Channel Data - Existing

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 4.50 ft

Side Slope (H:V): 2.00 (:1)

Channel Slope: 0.0055

Channel Manning's n: 0.0400

Channel Invert Elevation: 156.67 ft

Roadway Data for Crossing: Existing

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 120.00 ft

Crest Elevation: 162.00 ft

Roadway Surface: Paved

Roadway Top Width: 26.00 ft

Existing Peck Lane

HY-8 Culvert Analysis Report

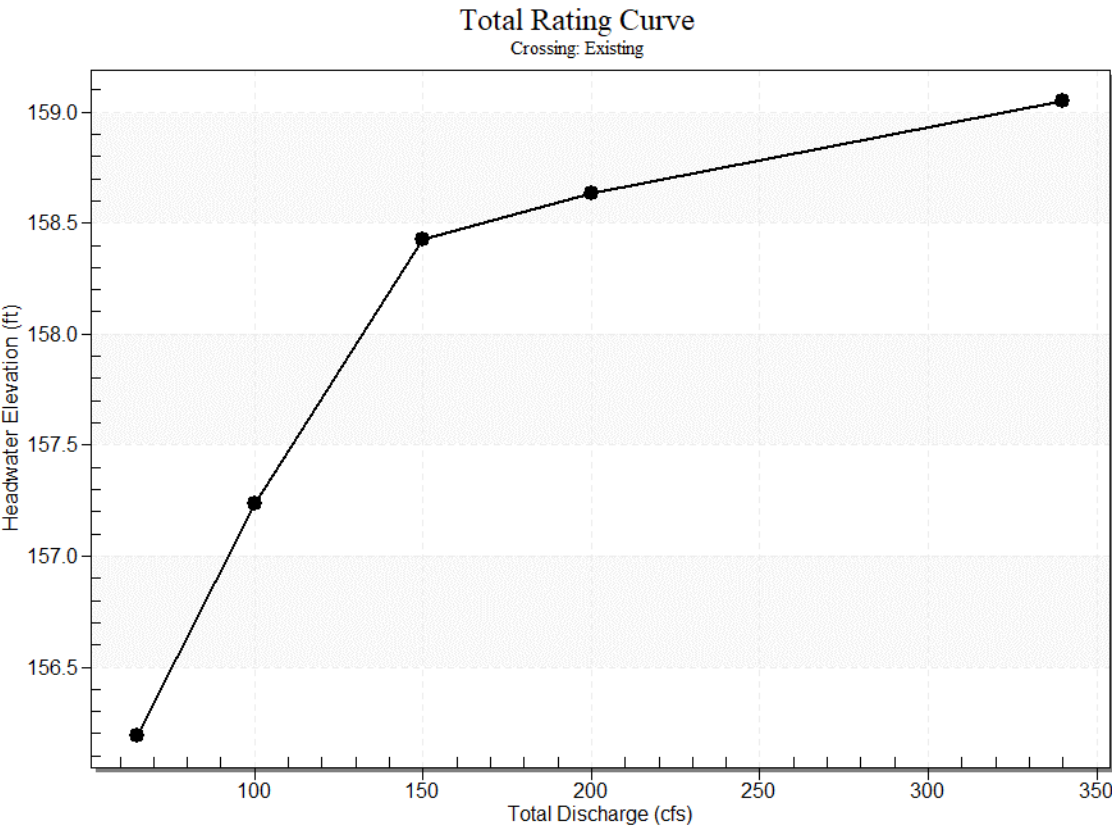
Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Existing

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Existing Culverts Pecklane Discharge (cfs)	Roadway Discharge (cfs)	Iterations
156.19	5-year	65.00	65.00	0.00	1
157.24	10-year	100.00	100.00	0.00	1
158.43	25-year	150.00	117.49	32.33	8
158.63	50-year	200.00	113.73	86.02	5
159.05	100-year	340.00	103.53	236.40	4
158.20	Overtopping	116.77	116.77	0.00	Overtopping

Rating Curve Plot for Crossing: Existing



Culvert Data: Existing Culverts Pecklane

Table 2 - Culvert Summary Table: Existing Culverts Pecklane

Disc harg e Nam es	Total Disc harg e (cfs)	Culv ert Disc harg e (cfs)	Head water Eleva tion (ft)	Inle t Con trol Dep th (ft)	Out let Con trol Dep th (ft)	Fl o w Ty pe	Nor mal Dep th (ft)	Crit ical De pth (ft)	Ou tle t De pth (ft)	Tail water r Dept h (ft)	Outl et Vel ocit y (ft/ s)	Tail water r Velo city (ft/s)
5- year	65.00 cfs	65.00 cfs	156.1 9	2.35	2.51 3	3- M 2t	1.77	1.3 9	1.5 8	1.58	5.65	3.14
10- year	100.0 0 cfs	100.0 0 cfs	157.2 4	3.31	3.55 6	3- M 2t	2.75	1.7 8	2.0 0	2.00	6.90	3.57
25- year	150.0 0 cfs	117.4 9 cfs	158.4 3	3.92	4.74 8	7- M 2t	2.75	1.9 5	2.4 9	2.49	6.86	4.02
50- year	200.0 0 cfs	113.7 3 cfs	158.6 3	3.78	4.95 4	4- FF f	2.75	1.9 1	2.7 5	2.90	6.37	4.37
100- year	340.0 0 cfs	103.5 3 cfs	159.0 5	3.43	5.36 8	4- FF f	2.75	1.8 1	2.7 5	3.81	5.80	5.06

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 153.68 ft,

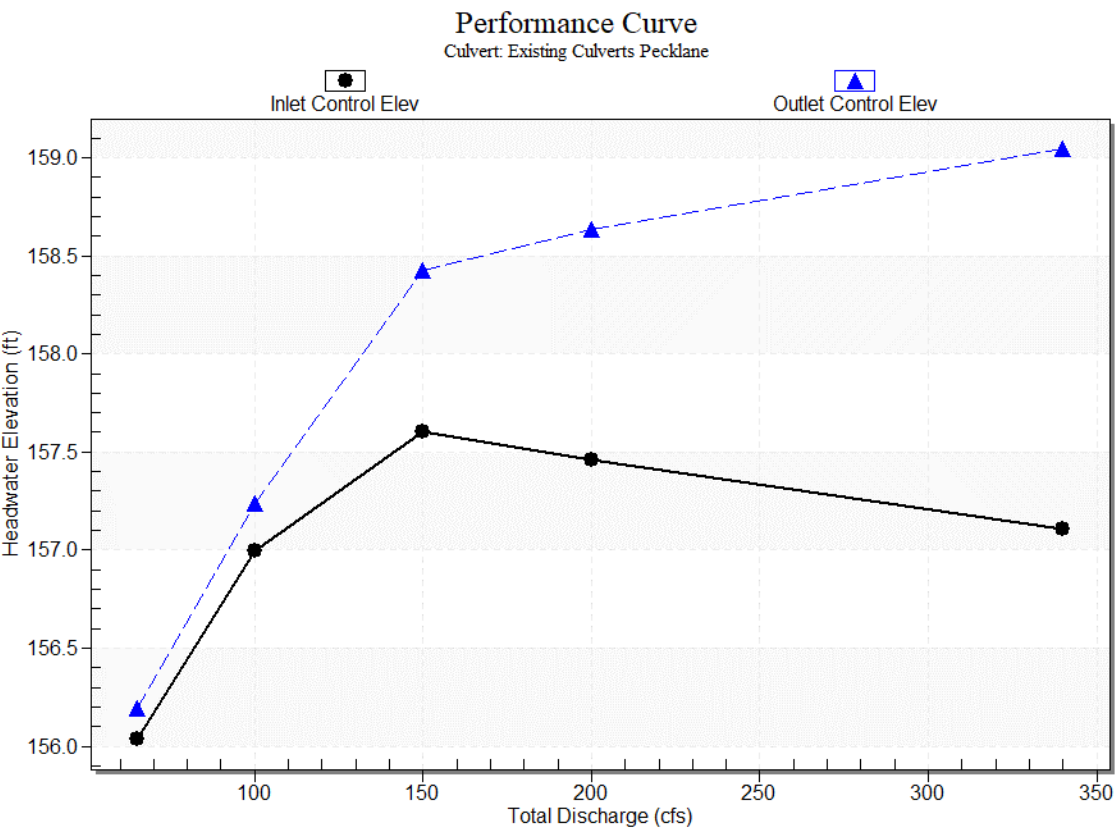
Outlet Elevation (invert): 152.81 ft

Culvert Length: 124.00 ft,

Culvert Slope: 0.0070

(Note: Modeled crossing assuming both culverts had 0.007 ft/ft slope; slope difference considered de minimus)

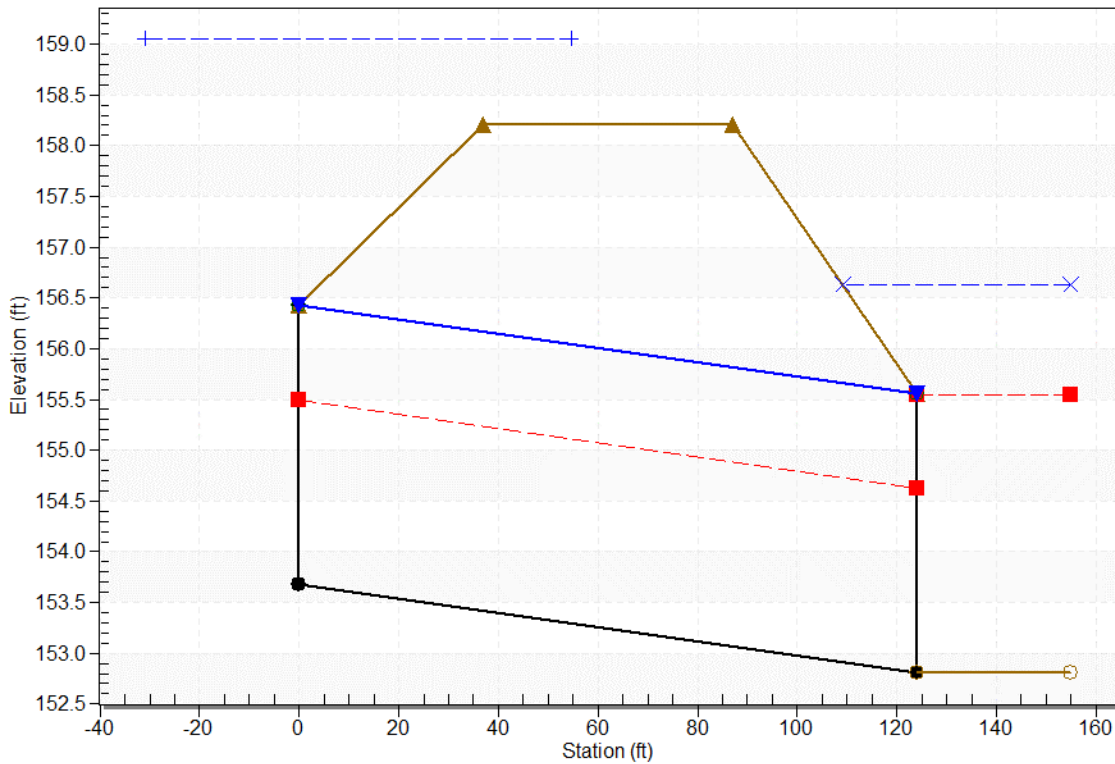
Culvert Performance Curve Plot: Existing Culverts Pecklane



Water Surface Profile Plot for Culvert: Existing Culverts Pecklane

Crossing - Existing, Design Discharge - 340.0 cfs

Culvert - Existing Culverts Pecklane, Culvert Discharge - 103.5 cfs



Site Data - Existing Culverts Pecklane

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 153.68 ft

Outlet Station: 124.00 ft

Outlet Elevation: 152.81 ft

Number of Barrels: 2

Culvert Data Summary - Existing Culverts Pecklane

Barrel Shape: Pipe Arch

Barrel Span: 49.00 in

Barrel Rise: 33.00 in

Barrel Material: Steel or Aluminum

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Projecting

Inlet Depression: None

Tailwater Data for Crossing: Existing

Table 3 - Downstream Channel Rating Curve (Crossing: Existing)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
65.00	154.39	1.58	3.14	0.54	0.49
100.00	154.81	2.00	3.57	0.69	0.51
150.00	155.30	2.49	4.02	0.85	0.52
200.00	155.71	2.90	4.37	1.00	0.53
340.00	156.62	3.81	5.06	1.31	0.55

Tailwater Channel Data - Existing

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 2.00 (:1)

Channel Slope: 0.0055

Channel Manning's n: 0.0400

Channel Invert Elevation: 152.81 ft

Roadway Data for Crossing: Existing

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 158.20 ft

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

Pinetree Proposed 12x4 HY-8 Culvert Analysis Report

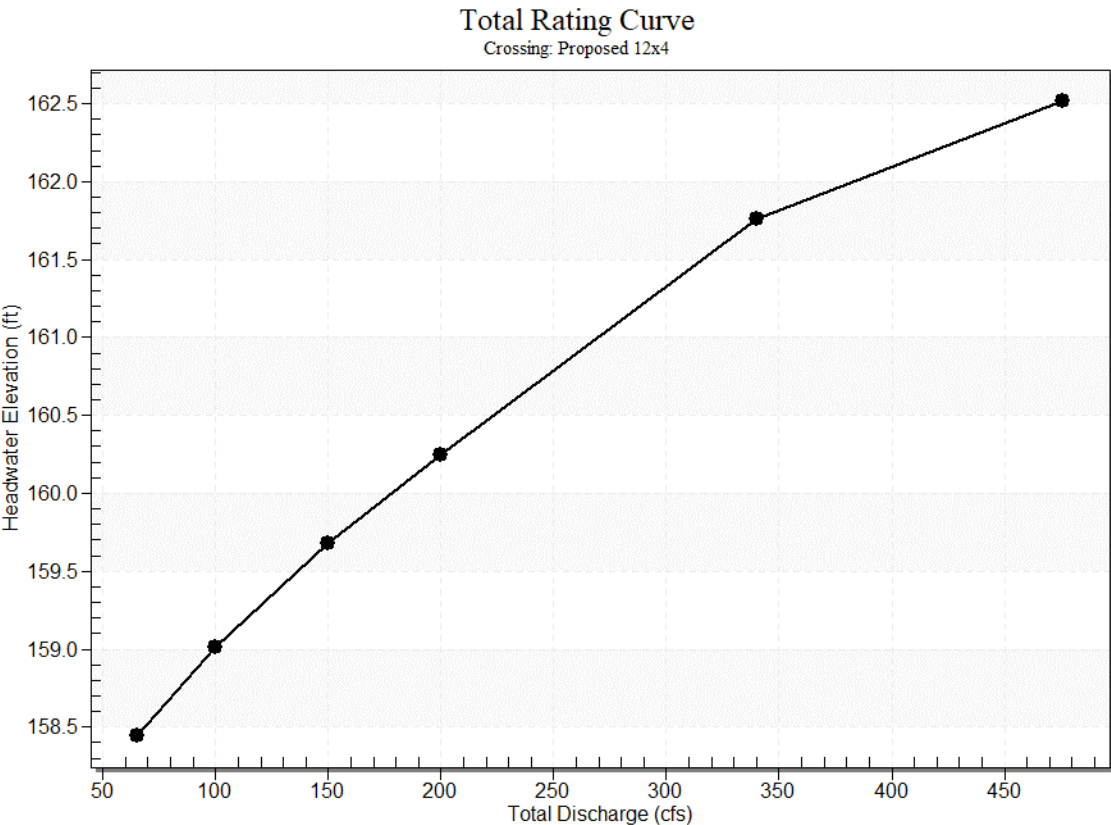
Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Proposed 12x4

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Proposed Box Discharge (cfs)	Roadway Discharge (cfs)	Iterations
158.45	5 yr	65.00	65.00	0.00	1
159.01	10 yr	100.00	100.00	0.00	1
159.68	25 yr	150.00	150.00	0.00	1
160.25	50 yr	200.00	200.00	0.00	1
161.76	100 yr	340.00	340.00	0.00	1
162.00	Overtopping	359.61	359.58	0.00	Overtopping

Rating Curve Plot for Crossing: Proposed 12x4



Culvert Data: Proposed Box

Table 2 - Culvert Summary Table: Proposed Box

Disc harg e Nam es	Total Disc harg e (cfs)	Culv ert Disc harg e (cfs)	Head water Eleva tion (ft)	Inle t Con trol Dep th (ft)	Out let Con trol Dep th (ft)	Fl o w Ty pe	Nor mal Dep th (ft)	Crit ical De pth (ft)	Ou tle t De pth (ft)	Tail water r Dept h (ft)	Outl et Vel ocit y (ft/ s)	Tail water r Velo city (ft/s)
5 yr	65.00 cfs	65.00 cfs	158.4 5	1.47	1.94 7	3- M 1t	1.02	0.9 7	1.8 7	1.97	2.90	3.32
10 yr	100.0 0 cfs	100.0 0 cfs	159.0 1	1.96	2.51 2	3- M 1t	1.35	1.2 9	2.3 6	2.46	3.54	3.73
25 yr	150.0 0 cfs	150.0 0 cfs	159.6 8	2.60	3.17 7	3- M 1t	1.76	1.6 9	2.9 0	3.00	4.31	4.16
50 yr	200.0 0 cfs	200.0 0 cfs	160.2 5	3.19	3.74 6	3- M 1t	2.13	2.0 5	3.3 5	3.45	4.97	4.49
100 yr	340.0 0 cfs	340.0 0 cfs	161.7 6	4.74	5.26 1	4- FF f	3.06	2.9 2	4.0 0	4.44	7.08	5.15

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

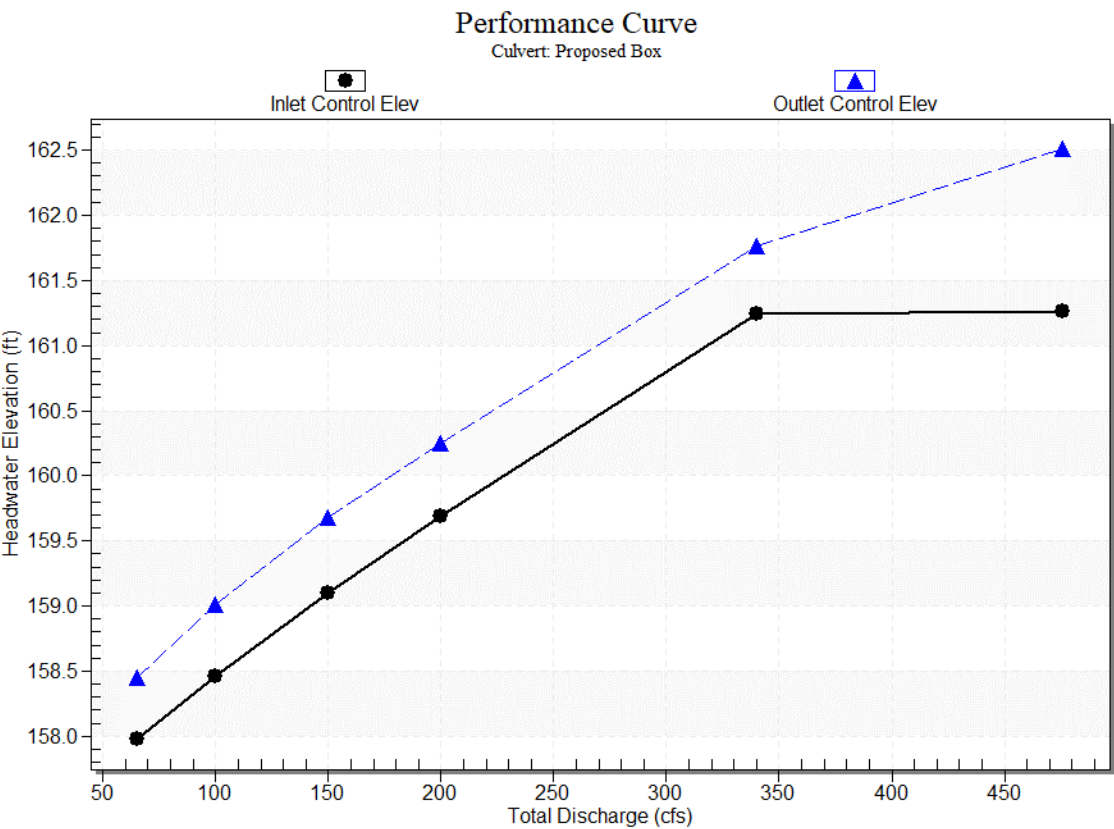
Inlet Elevation (invert): 156.50 ft,

Outlet Elevation (invert): 156.40 ft

Culvert Length: 46.00 ft,

Culvert Slope: 0.0022

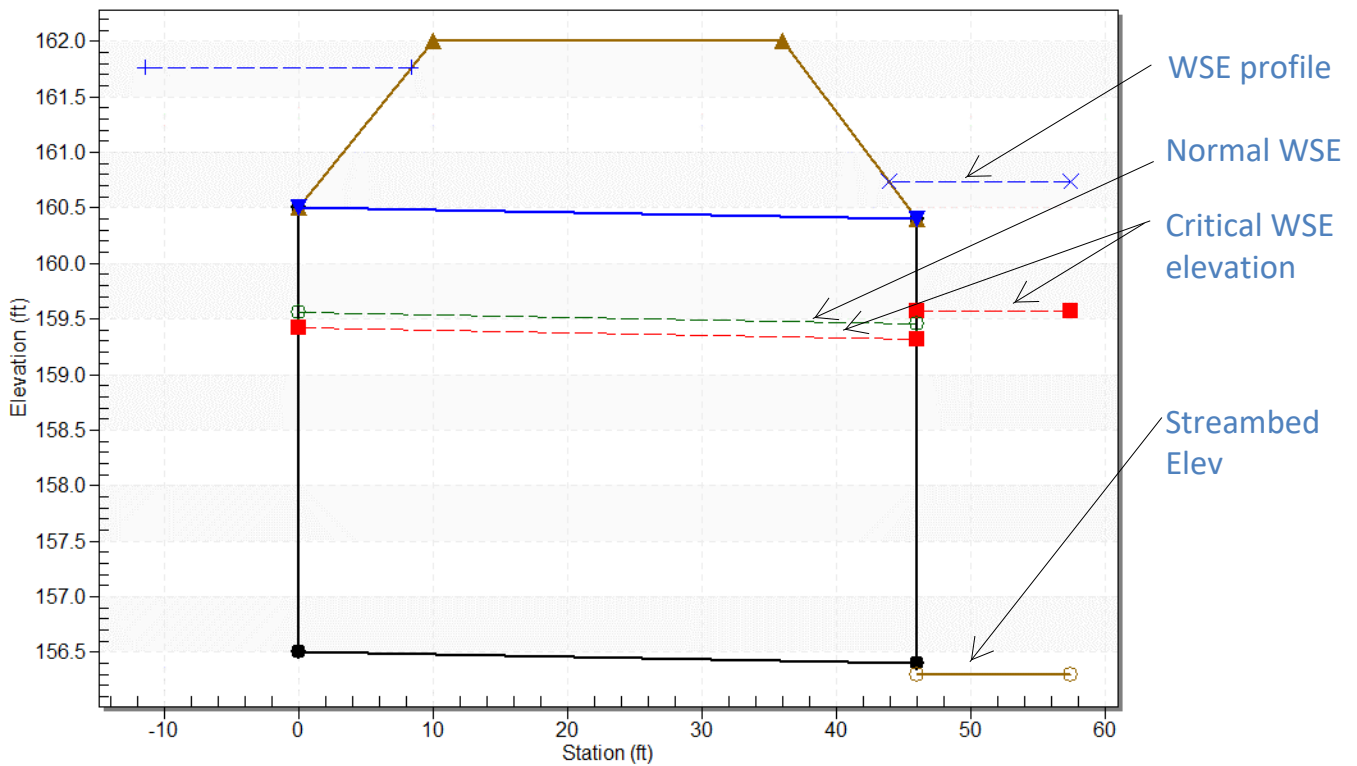
Culvert Performance Curve Plot: Proposed Box



Water Surface Profile Plot for Culvert: Proposed Box

Crossing - Proposed 12x4, Design Discharge - 340.0 cfs

Culvert - Proposed Box, Culvert Discharge - 340.0 cfs



Site Data - Proposed Box

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 156.50 ft

Outlet Station: 46.00 ft

Outlet Elevation: 156.40 ft

Number of Barrels: 1

Culvert Data Summary - Proposed Box

Barrel Shape: Concrete Box

Barrel Span: 12.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel (45° flare) Wingwall (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Proposed 12x4

Table 3 - Downstream Channel Rating Curve (Crossing: Proposed 12x4)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
65.00	158.27	1.97	3.32	0.68	0.49
100.00	158.76	2.46	3.73	0.84	0.51
150.00	159.30	3.00	4.16	1.03	0.52
200.00	159.75	3.45	4.49	1.19	0.53
340.00	160.74	4.44	5.15	1.52	0.54

Tailwater Channel Data - Proposed 12x4

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 6.00 ft

Side Slope (H:V): 2.00 (:1)

Channel Slope: 0.0055

Channel Manning's n: 0.0400

Channel Invert Elevation: 156.30 ft

Roadway Data for Crossing: Proposed 12x4

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 120.00 ft

Crest Elevation: 162.00 ft

Roadway Surface: Paved

Roadway Top Width: 26.00 ft

Pine Tree Proposed 12x4 box HY-8 Culvert Analysis Report

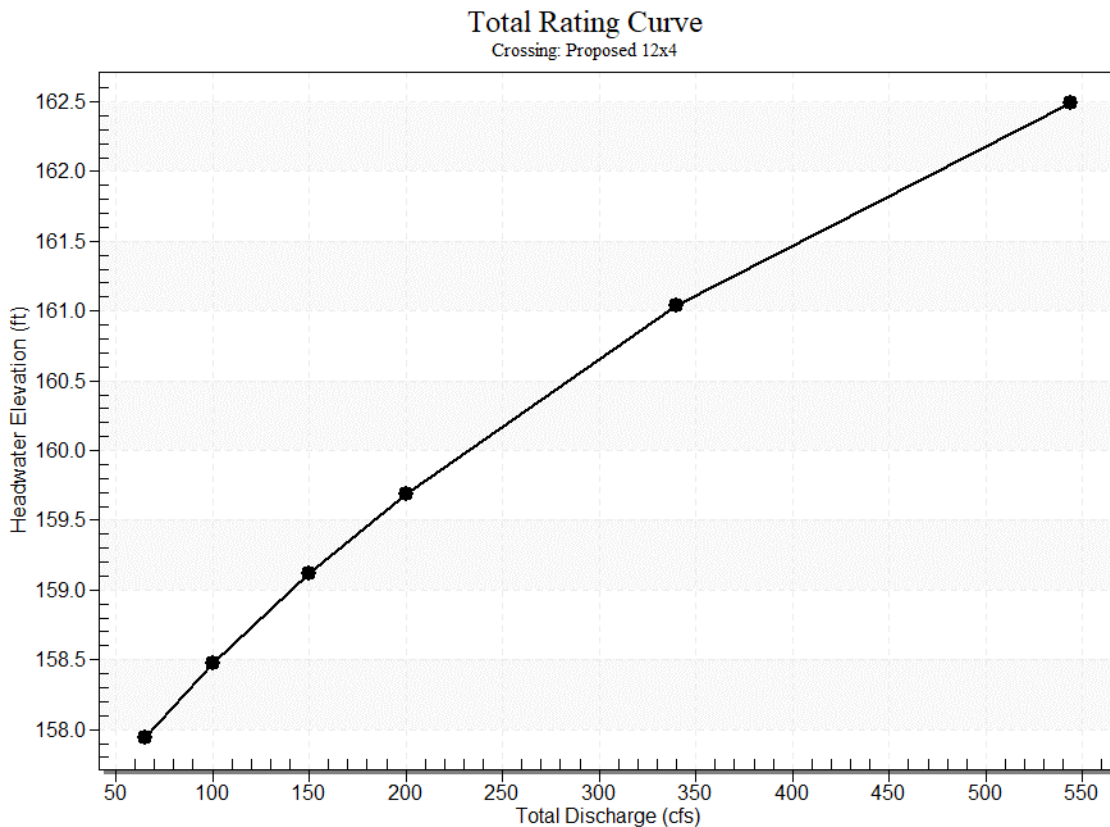
Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Proposed 12x4

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Proposed Box 12x4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
157.94	5 yr	65.00	65.00	0.00	1
158.48	10 yr	100.00	100.00	0.00	1
159.12	25 yr	150.00	150.00	0.00	1
159.68	50 yr	200.00	200.00	0.00	1
161.03	100 yr	340.00	340.00	0.00	1
162.00	Overtopping	421.17	421.17	0.00	Overtopping

Rating Curve Plot for Crossing: Proposed 12x4



Culvert Data: Proposed Box 12x4

Table 2 - Culvert Summary Table: Proposed Box 12x4

Disc harg e Nam es	Tota l Disc harg e (cfs)	Culv ert Disc harg e (cfs)	Head wate r Eleva tion (ft)	Inle t Con trol De pth (ft)	Out let Con trol De pth (ft)	Fl o w Ty pe	Nor mal De pth (ft)	Crit ical De pth (ft)	Ou tle t De pt h (ft)	Tail wate r Dept h (ft)	Out let Vel ocit y (ft/ s)	Tail wate r Velo city (ft/s)
5 yr	65.0 0 cfs	65.0 0 cfs	157.9 4	1.4 7	1.6 44	1- S1 t	0.8 2	0.9 7	1.5 8	1.58	3.44	3.14
10 yr	100. 00 cfs	100. 00 cfs	158.4 8	1.9 6	2.1 76	1- S1 t	1.0 8	1.2 9	2.0 0	2.00	4.17	3.57
25 yr	150. 00 cfs	150. 00 cfs	159.1 2	2.6 0	2.8 20	1- S1 t	1.4 0	1.6 9	2.4 9	2.49	5.02	4.02
50 yr	200. 00 cfs	200. 00 cfs	159.6 8	3.1 8	3.3 83	1- S1 t	1.6 9	2.0 5	2.9 0	2.90	5.75	4.37
100 yr	340. 00 cfs	340. 00 cfs	161.0 3	4.7 3	4.7 32	5- S1 t	2.4 1	2.9 2	3.8 1	3.81	7.43	5.06

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

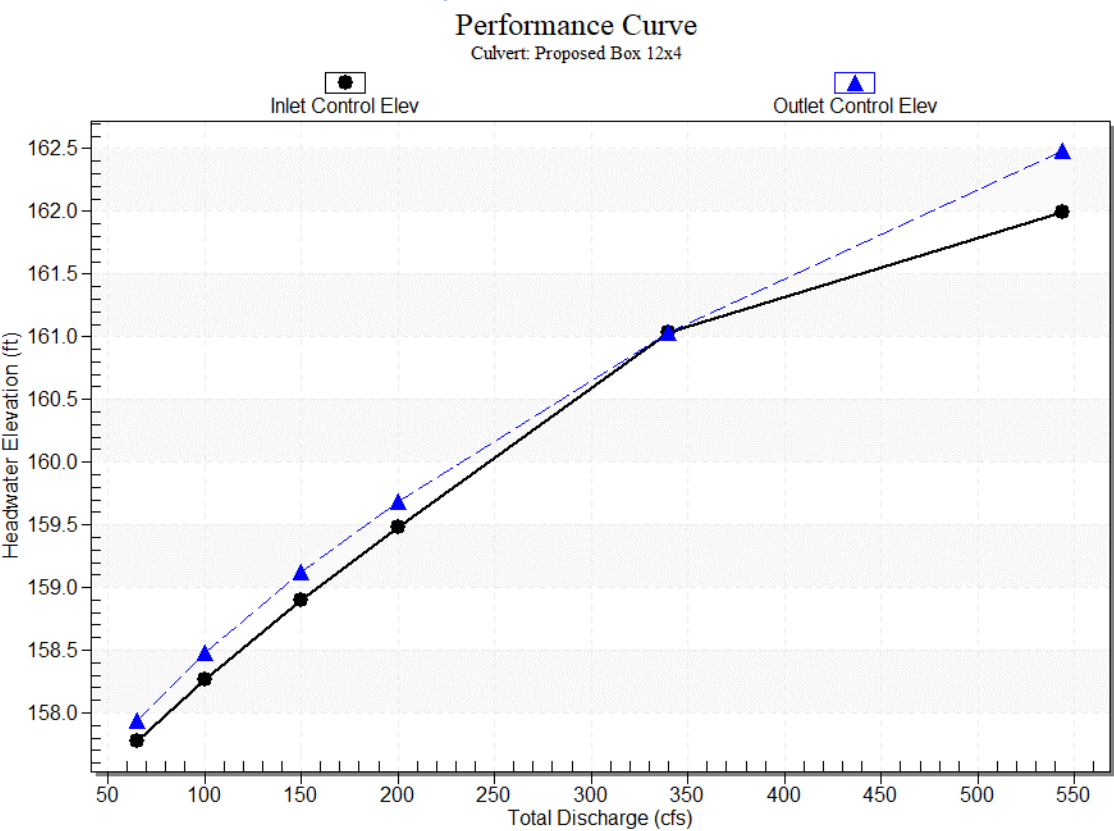
Inlet Elevation (invert): 156.30 ft,

Outlet Elevation (invert): 156.10 ft

Culvert Length: 46.00 ft,

Culvert Slope: 0.0043

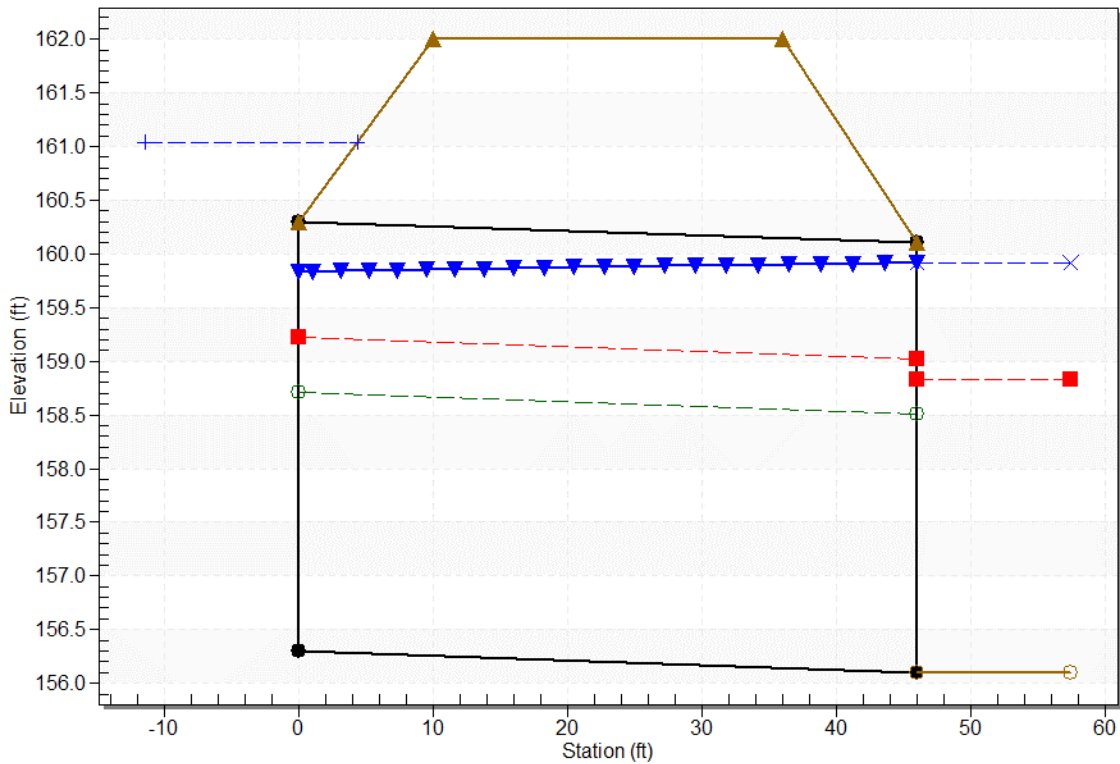
Culvert Performance Curve Plot: Proposed Box 12x4



Water Surface Profile Plot for Culvert: Proposed Box 12x4

Crossing - Proposed 12x4, Design Discharge - 340.0 cfs

Culvert - Proposed Box 12x4, Culvert Discharge - 340.0 cfs



Site Data - Proposed Box 12x4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 156.30 ft

Outlet Station: 46.00 ft

Outlet Elevation: 156.10 ft

Number of Barrels: 1

Culvert Data Summary - Proposed Box 12x4

Barrel Shape: Concrete Box

Barrel Span: 12.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel (45° flare) Wingwall (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Proposed 12x4

Table 3 - Downstream Channel Rating Curve (Crossing: Proposed 12x4)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
65.00	157.68	1.58	3.14	0.54	0.49
100.00	158.10	2.00	3.57	0.69	0.51
150.00	158.59	2.49	4.02	0.85	0.52
200.00	159.00	2.90	4.37	1.00	0.53
340.00	159.91	3.81	5.06	1.31	0.55

Tailwater Channel Data - Proposed 12x4

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 2.00 (:1)

Channel Slope: 0.0055

Channel Manning's n: 0.0400

Channel Invert Elevation: 156.10 ft

Roadway Data for Crossing: Proposed 12x4

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 120.00 ft

Crest Elevation: 162.00 ft

Roadway Surface: Paved

Roadway Top Width: 26.00 ft

Proposed Peck Lane HY-8 Culvert Analysis Report

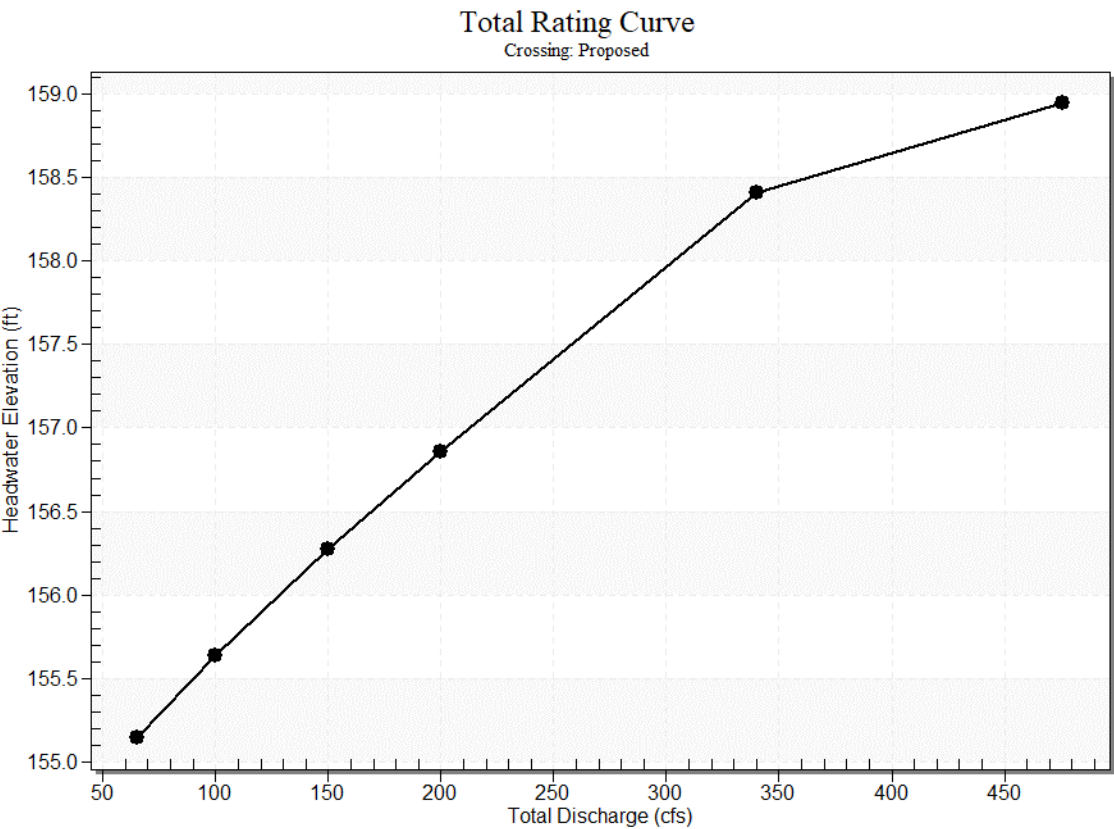
Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Proposed

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Proposed Culverts Pecklane Discharge (cfs)	Roadway Discharge (cfs)	Iterations
155.15	5-year	65.00	65.00	0.00	1
155.63	10-year	100.00	100.00	0.00	1
156.27	25-year	150.00	150.00	0.00	1
156.85	50-year	200.00	200.00	0.00	1
158.41	100-year	340.00	340.00	0.00	1
158.50	Overtopping	348.09	348.09	0.00	Overtopping

Rating Curve Plot for Crossing: Proposed



Culvert Data: Proposed Culverts Pecklane

Table 2 - Culvert Summary Table: Proposed Culverts Pecklane

Disc harg e Nam es	Total Disc harg e (cfs)	Culv ert Disc harg e (cfs)	Head water Eleva tion (ft)	Inle t Con trol Dep th (ft)	Out let Con trol Dep th (ft)	Fl o w Ty pe	Nor mal Dep th (ft)	Crit ical De pth (ft)	Ou tle t De pth (ft)	Tail water r Dept h (ft)	Outl et Vel ocit y (ft/ s)	Tail water r Velo city (ft/s)
5- year	65.00 cfs	65.00 cfs	155.1 5	1.47	0.69 1	1- JS 1t	0.68	0.9 7	1.6 2	1.62	3.35	3.04
10- year	100.0 0 cfs	100.0 0 cfs	155.6 3	1.95	1.18 3	1- JS 1t	0.90	1.2 9	2.0 5	2.05	4.06	3.46
25- year	150.0 0 cfs	150.0 0 cfs	156.2 7	2.59	1.81 1	1- JS 1t	1.16	1.6 9	2.5 5	2.55	4.90	3.89
50- year	200.0 0 cfs	200.0 0 cfs	156.8 5	3.17	2.40 8	1- JS 1t	1.40	2.0 5	2.9 7	2.97	5.61	4.22
100- year	340.0 0 cfs	340.0 0 cfs	158.4 1	4.73	4.10 8	5- JS 1t	1.98	2.9 2	3.9 1	3.91	7.25	4.88

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

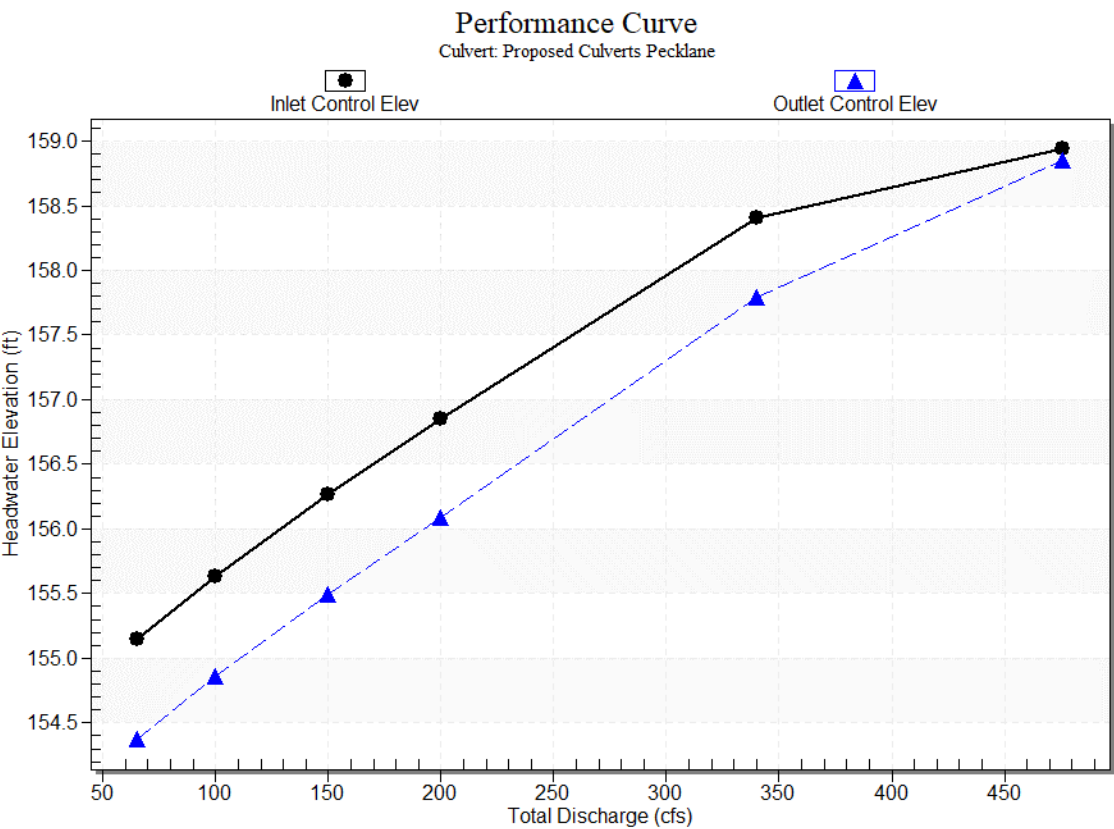
Inlet Elevation (invert): 153.68 ft,

Outlet Elevation (invert): 152.71 ft

Culvert Length: 124.00 ft,

Culvert Slope: 0.0078

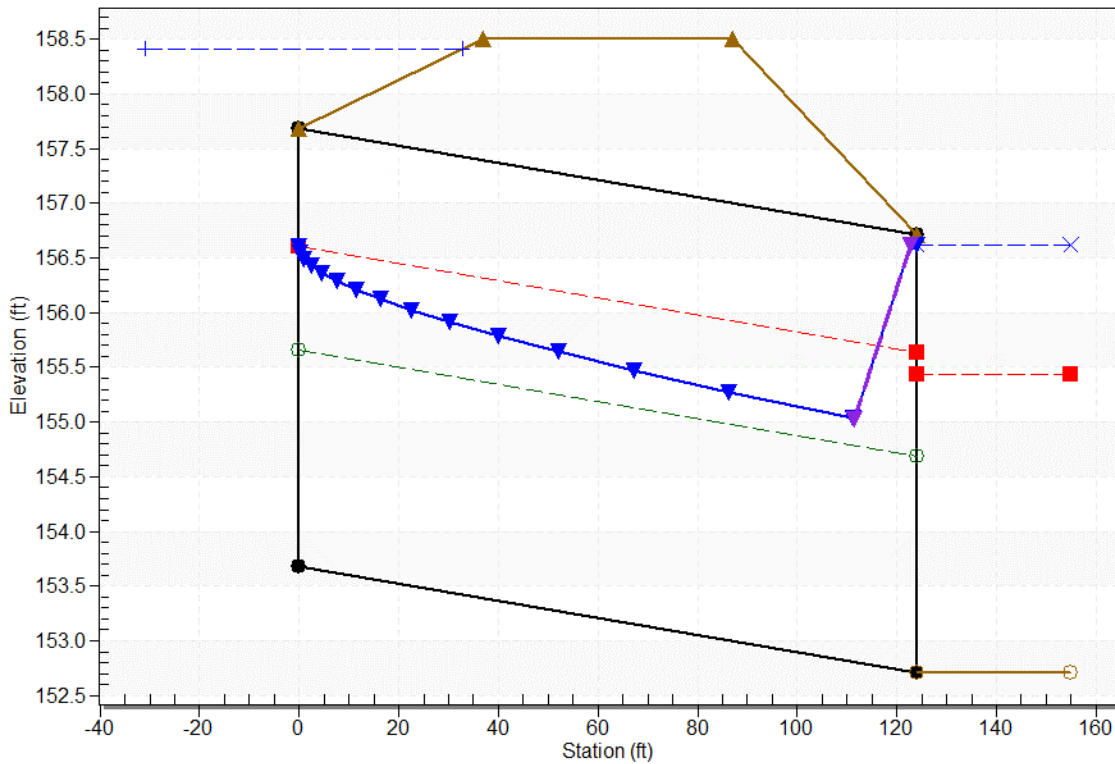
Culvert Performance Curve Plot: Proposed Culverts Pecklane



Water Surface Profile Plot for Culvert: Proposed Culverts Pecklane

Crossing - Proposed, Design Discharge - 340.0 cfs

Culvert - Proposed Culverts Pecklane, Culvert Discharge - 340.0 cfs



Site Data - Proposed Culverts Pecklane

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 153.68 ft

Outlet Station: 124.00 ft

Outlet Elevation: 152.71 ft

Number of Barrels: 1

Culvert Data Summary - Proposed Culverts Pecklane

Barrel Shape: Concrete Box

Barrel Span: 12.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel (45° flare) Wingwall

Inlet Depression: None

Tailwater Data for Crossing: Proposed

Table 3 - Downstream Channel Rating Curve (Crossing: Proposed)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
65.00	154.33	1.62	3.04	0.50	0.47
100.00	154.76	2.05	3.46	0.64	0.48
150.00	155.26	2.55	3.89	0.80	0.50
200.00	155.68	2.97	4.22	0.93	0.51
340.00	156.62	3.91	4.88	1.22	0.52

Tailwater Channel Data - Proposed

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 2.00 (:1)

Channel Slope: 0.0050

Channel Manning's n: 0.0400

Channel Invert Elevation: 152.71 ft

Roadway Data for Crossing: Proposed

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 158.50 ft

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

Pine Tree 12x4 (assumes 12x4 at Peck LANE) HY-8 Culvert Analysis Report

100 YEAR
only

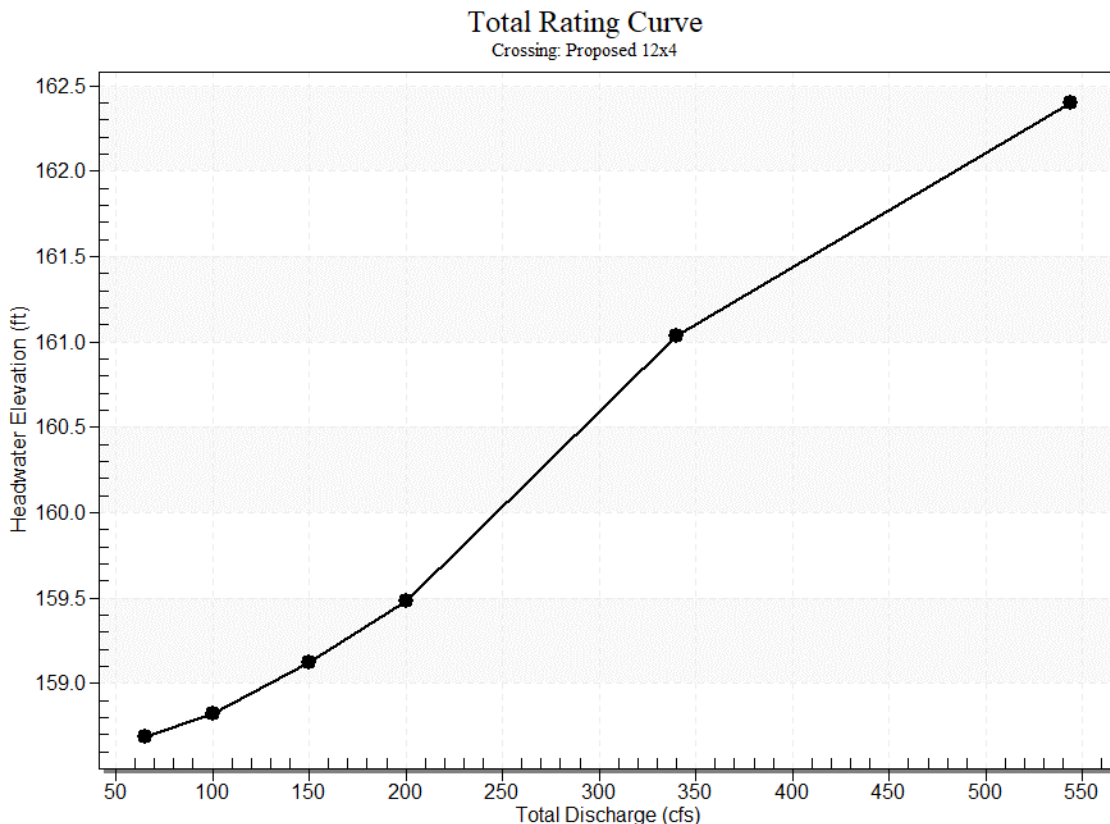
Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Proposed 12x4

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Proposed Box 12x4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
158.69	5 yr	65.00	65.00	0.00	1
158.82	10 yr	100.00	100.00	0.00	1
159.12	25 yr	150.00	150.00	0.00	1
159.48	50 yr	200.00	200.00	0.00	1
161.03	100 yr	340.00	340.00	0.00	1
162.00	Overtopping	421.12	421.12	0.00	Overtopping

Rating Curve Plot for Crossing: Proposed 12x4



Culvert Data: Proposed Box 12x4

Table 2 - Culvert Summary Table: Proposed Box 12x4

Disc harg e Nam es	Total Disc harg e (cfs)	Culv ert Disc harg e (cfs)	Head water Eleva tion (ft)	Inle t Con trol Dep th (ft)	Out let Con trol Dep th (ft)	Fl o w Ty pe	Nor mal Dep th (ft)	Crit ical De pth (ft)	Ou tle t De pth (ft)	Tail water r Dept h (ft)	Outl et Vel ocit y (ft/ s)	Tail water r Velo city (ft/s)
5 yr	65.00 cfs	65.00 cfs	158.6 9	1.47	2.38 9	1- S1 t	0.82	0.9 7	2.4 9	2.49	2.18	0.00
10 yr	100.0 0 cfs	100.0 0 cfs	158.8 2	1.96	2.52 4	1- S1 t	1.08	1.2 9	2.4 9	2.49	3.35	0.00
25 yr	150.0 0 cfs	150.0 0 cfs	159.1 2	2.60	2.82 0	1- S1 t	1.40	1.6 9	2.4 9	2.49	5.02	0.00
50 yr	200.0 0 cfs	200.0 0 cfs	159.4 8	3.18	2.64 4	1- JS 1t	1.69	2.0 5	2.4 9	2.49	6.69	0.00
100 yr	340.0 0 cfs	340.0 0 cfs	161.0 3	4.73	3.74 3	5- S2 n	2.41	2.9 2	2.6 2	2.49	10.8 3	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

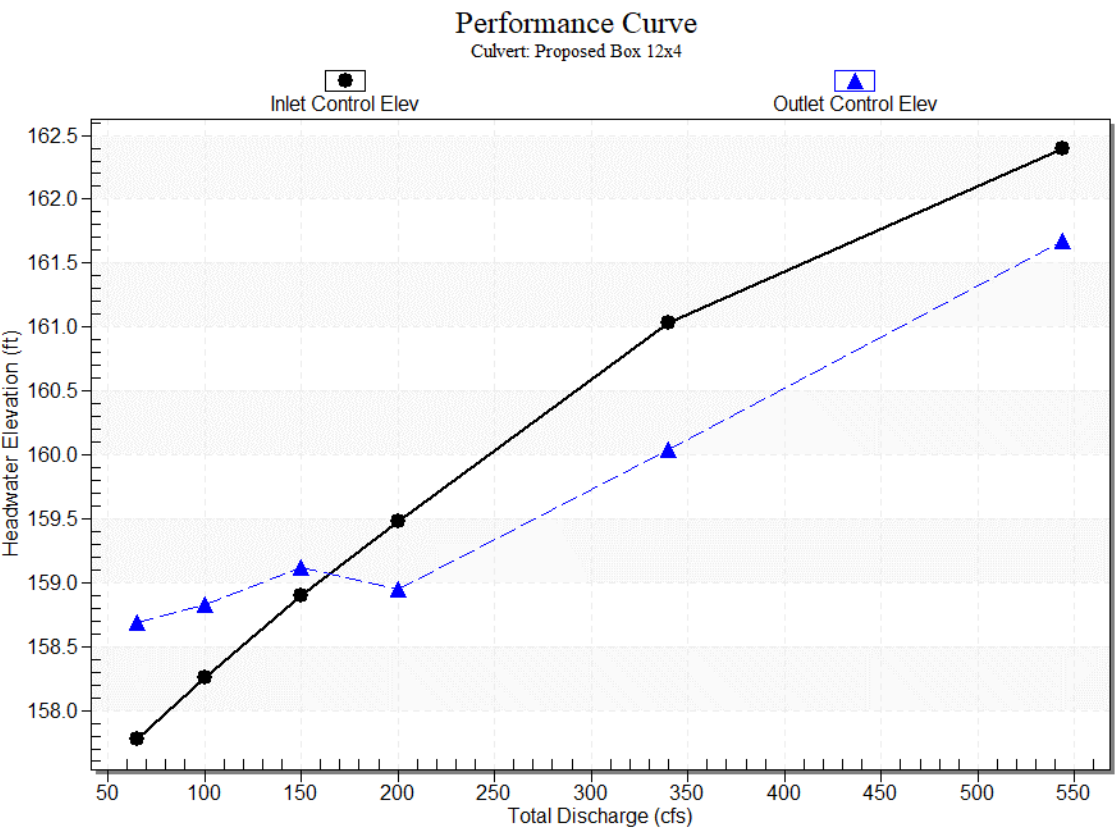
Inlet Elevation (invert): 156.30 ft,

Outlet Elevation (invert): 156.10 ft

Culvert Length: 46.00 ft,

Culvert Slope: 0.0043

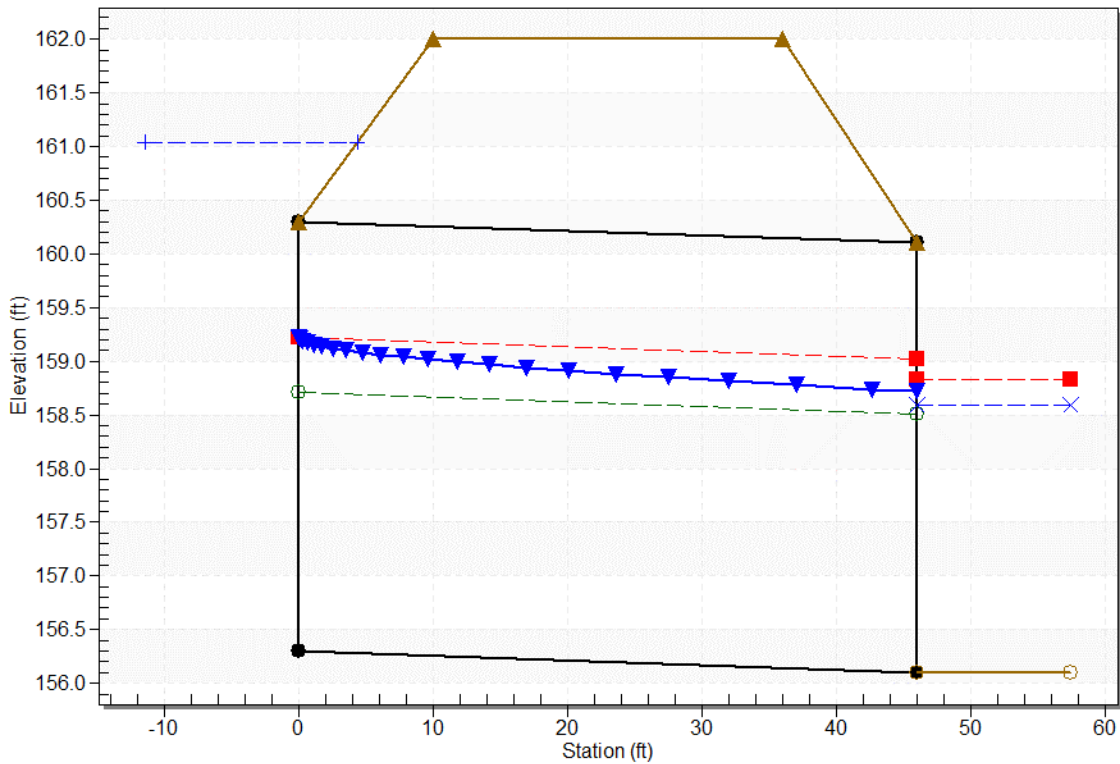
Culvert Performance Curve Plot: Proposed Box 12x4



Water Surface Profile Plot for Culvert: Proposed Box 12x4

Crossing - Proposed 12x4, Design Discharge - 340.0 cfs

Culvert - Proposed Box 12x4, Culvert Discharge - 340.0 cfs



Site Data - Proposed Box 12x4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 156.30 ft

Outlet Station: 46.00 ft

Outlet Elevation: 156.10 ft

Number of Barrels: 1

Culvert Data Summary - Proposed Box 12x4

Barrel Shape: Concrete Box

Barrel Span: 12.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel (45° flare) Wingwall (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Proposed 12x4

Table 3 - Downstream Channel Rating Curve (Crossing: Proposed 12x4)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
65.00	158.59	2.49
100.00	158.59	2.49
150.00	158.59	2.49
200.00	158.59	2.49
340.00	158.59	2.49

Tailwater Channel Data - Proposed 12x4

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 158.59 ft

Roadway Data for Crossing: Proposed 12x4

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 120.00 ft

Crest Elevation: 162.00 ft

Roadway Surface: Paved

Roadway Top Width: 26.00 ft

Channel Capacity Analysis
Hydraulic Toolbox-Pine Tree Existing

Channel Analysis

Type: Trapezoidal Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 4.5 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.0055 (ft/ft)

Manning's Roughness: 0.0400

☐ Enter Flow: 126.422 (cfs)

☒ Enter Depth: 3.000 (ft)

Calculate

Plot... Compute Curves...

OK Cancel

Parameter	Value	Units
Flow	126.422	cfs
Depth	3.000	ft
Area of Flow	31.500	sq ft
Wetted Perimeter	17.916	ft
Hydraulic Radius	1.758	ft
Average Velocity	4.013	fps
Top Width (T)	16.500	ft
Froude Number	0.512	
Critical Depth	2.127	ft
Critical Velocity	6.789	fps
Critical Slope	0.02286	ft/ft
Critical Top Width	13.008	ft
Max Shear Stress	1.030	lb/ft ²
Avg Shear Stress	0.603	lb/ft ²

Hydraulic Toolbox-Pinetree Proposed

Channel Analysis

Type: Trapezoidal Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 10.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.0055 (ft/ft)

Manning's Roughness: 0.0400

☐ Enter Flow: 213.400 (cfs)

☒ Enter Depth: 3.000 (ft)

Calculate

Plot...

Compute Curves...

OK

Cancel

Parameter	Value	Units
Flow	213.400	cfs
Depth	3.000	ft
Area of Flow	48.000	sq ft
Wetted Perimeter	23.416	ft
Hydraulic Radius	2.050	ft
Average Velocity	4.446	fps
Top Width (T)	22.000	ft
Froude Number	0.530	
Critical Depth	2.089	ft
Critical Velocity	7.207	fps
Critical Slope	0.02133	ft/ft
Critical Top Width	18.354	ft
Max Shear Stress	1.030	lb/ft ²
Avg Shear Stress	0.704	lb/ft ²

Channel Capacity Analysis

Hydraulic Toolbox-Peck Lane Existing and Proposed

Channel Analysis

Type: Trapezoidal Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 10.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.0055 (ft/ft)

Manning's Roughness: 0.0400

☐ Enter Flow: 213.400 (cfs)

☒ Enter Depth: 3.000 (ft)

Calculate

Plot...

Compute Curves...

OK

Cancel

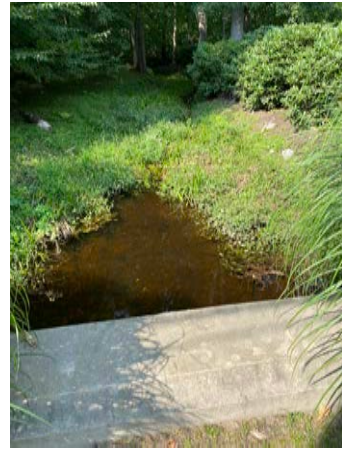
Parameter	Value	Units
Flow	213.400	cfs
Depth	3.000	ft
Area of Flow	48.000	sq ft
Wetted Perimeter	23.416	ft
Hydraulic Radius	2.050	ft
Average Velocity	4.446	fps
Top Width (T)	22.000	ft
Froude Number	0.530	
Critical Depth	2.089	ft
Critical Velocity	7.207	fps
Critical Slope	0.02133	ft/ft
Critical Top Width	18.354	ft
Max Shear Stress	1.030	lb/ft ²
Avg Shear Stress	0.704	lb/ft ²

APPENDIX E
SITE PHOTOGRAPHS

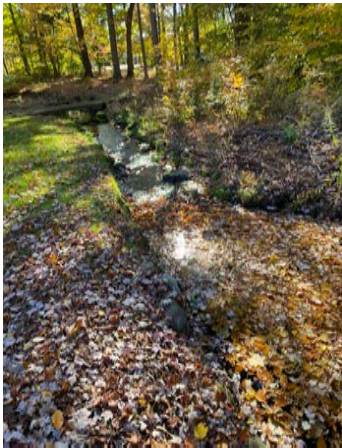
Pine Tree/Peck Lane Flooding Report



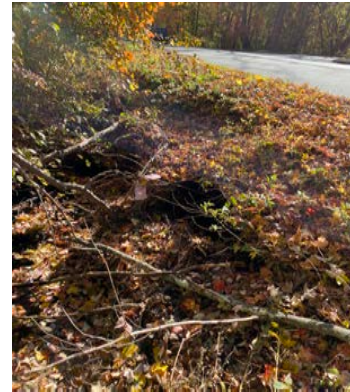
Pine Tree upstream



Pine Tree looking upstream



Pine Tree looking downstream

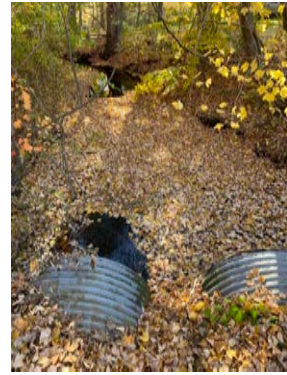


Peck Lane-upstream end of culverts

Pine Tree/Peck Lane Flooding Report



Peck Lane upstream channel



Peck Lane looking downstream



Peck Lane looking at culverts discharge pt

Resident Photos July 2021



Looking downstream from Pine Tree



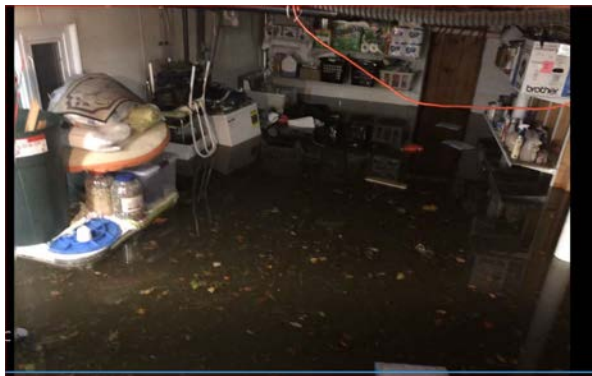
Looking at 319 Pine Tree in Distance



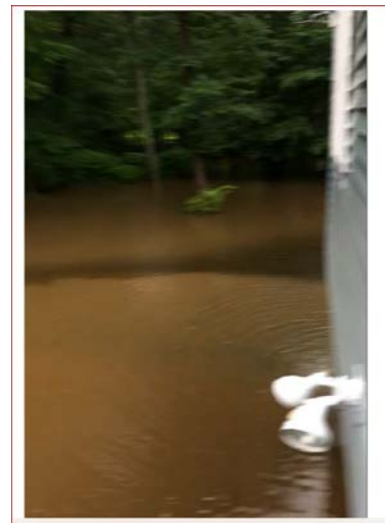
Pine Tree crossing looking upstream



Looking at flooding downstream from 309 Pine Tree



Flooding in garage at 309 Pine Tree



Flooding against house at 309 Pine Tree

APPENDIX F
COST ESTIMATES

Construction Cost Estimate
Additional 36" Pipe Culvert at Pine Tree
Orange, CT

Major and Minor Contract Items

Item No.	Item	Unit	Quantity	Unit \$	Total Cost
0201001	CLEARING AND GRUBBING	LS	1	*	*
0202000	EARTH EXCAVATION	CY	100	\$ 27.00	\$ 2,700.00
0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	20	\$ 80.00	\$ 1,600.00
0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	0	\$ 3,000.00	\$ -
0203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	CY	20	\$ 35.00	\$ 700.00
0203100	STRUCTURE EXCAVATION - ROCK (COMPLETE)	CY	10	\$ 75.00	\$ 750.00
0204151	HANDLING WATER	LS	1	\$ 5,000.00	\$ 5,000.00
0209001	FORMATION OF SUBGRADE	SY	400	\$ 3.00	\$ 1,200.00
0212000	SUBBASE	CY	90	\$ 48.00	\$ 4,320.00
0213100	GRANULAR FILL	CY	60	\$ 60.00	\$ 3,600.00
0216000	PERVIOUS STRUCTURE BACKFILL	CY	40	\$ 62.00	\$ 2,480.00
0219001	SEDIMENTATION CONTROL SYSTEM	LF	250	\$ 8.00	\$ 2,000.00
0304002	PROCESSED AGGREGATE BASE	CY	30	\$ 50.00	\$ 1,500.00
0305000	PROCESSED AGGREGATE	TON	20	\$ 45.00	\$ 900.00
0406010-2	BITUMINOUS CONCRETE CLASS 2	TON	50	\$ 150.00	\$ 7,500.00
0503001	REMOVAL OF SUPERSTRUCTURE	LS	0	\$ 50,000.00	\$ -
0601062	FOOTING CONCRETE	CY	10	\$ 750.00	\$ 7,500.00
0601064	ABUTMENT AND WALL CONCRETE	CY	10	\$ 850.00	\$ 8,500.00
0601125	36 INCH RCP CULVERT	LF	55	\$ 100.00	\$ 5,500.00
0602030	DEFORMED STEEL BARS - GALVANIZED	LB	0	\$ 2.00	\$ -
0703011	MODIFIED RIPRAP	CY	10	\$ 85.00	\$ 850.00
0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	10	\$ 80.00	\$ 800.00
0708001	DAMPPROOFING	SY	10	\$ 20.00	\$ 200.00
0822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	LF	40	\$ 45.00	\$ 1,800.00
0910184	METAL BEAM RAIL R-B 350 (TYPE II) SECTION	EA	2	\$ 3,500.00	\$ 7,000.00
0911924	R-B END ANCHORAGE TYPE II	EA	4	\$ 1,500.00	\$ 6,000.00
0913003	4' POLYVINYL CHLORIDE CHAIN LINK FENCE	LF	62	\$ 60.00	\$ 3,720.00
0944000	FURNISHING AND PLACING TOPSOIL	SY	150	\$ 8.00	\$ 1,200.00
0950005	TURF ESTABLISHMENT	SY	150	\$ 2.00	\$ 300.00
0969060	CONSTRUCTION FIELD OFFICE (SMALL)	MO	0	\$ 2,500.00	\$ -
0970006	TRAFFICPERSON (MUNICIPAL POLICE OFFICER)	EST	0	\$ 5,000.00	\$ -
0970001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	*	*
0974001	REMOVAL OF EXISTING MASONRY	CY	10	\$ 400.00	\$ 4,000.00
0975004	MOBILIZATION AND PROJECT CLOSE-OUT	LS	1	*	*
0979003	CONSTRUCTION BARRICADE - TYPE III	EA	6	\$ 130.00	\$ 780.00
0980001	CONSTRUCTION STAKING	LS	1	*	*
1209007	PAINTED PAVEMENT MARKINGS - 4" YELLOW	LF	150	\$ 1.00	\$ 150.00
1220027	CONSTRUCTION SIGNS	SF	180	\$ 25.00	\$ 4,500.00
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -

A Major Items Subtotal					\$ 87,050
B Minor Items Subtotal	10	% of Line "A"			\$ 8,705

C Major and Minor Contract Items Subtotal (A + B)					\$ 95,755
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Other Item Allowances

Clearing and Grubbing	2	% of Line "C"	\$ 1,915
M & P of Traffic	0	% of Line "C"	\$ -
Mobilization	8	% of Line "C"	\$ 7,660
Construction Staking	2	% of Line "C"	\$ 1,915

D Other Items Subtotal					\$ 11,490
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E CONTRACT SUBTOTAL (C + D)					\$ 107,245
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Inflation Costs (Simple Method)

Date of Estimate	May-22	
Anticipated Bid Date	Jul-22	
Annual Inflation	8%	
Inflation Subtotal	1.6% of Line "E"	\$ 1,716

G TOTAL CONTRACT COST ESTIMATE (E + F) (Rounded to nearest \$1000)					\$ 109,000
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Project Costs Summary

Contract Cost Estimate (Line "G")		\$ 109,000
Contingencies	10%	\$ 10,900
Incidentals	10%	\$ 10,900
ROW	LS	N/A
Utilities-Water Main Allocation	LS	\$ 25,000
Engineering Design	LS	\$ 20,000
Engineering Permitting	LS	\$ 7,000
TOTAL PROJECT COST		\$ 182,800

Major and Minor Contract Items

P:\1 ACTIVE PROJECTS\2396 Pine Tree-Peck - Orange\H&H\6-Reports\estimates\Cost Estimate Form pinetree -12x4 box AND NO berm.xlsx

Major and Minor Contract Items

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