FLOODING INVESTIGATION REPORT

DRAFT

OLD COUNTRY ROAD AND

COACHMANS LANE NEIGHBORHOOD

Prepared by:

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Flooding Investigation Report
Old Country Road and Coachmans 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 in the neighborhoods of Old Country Road and Coachmans Lane. 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 Old Country Road and Coachmans Lane area, there was significant flooding (20-inches to 36-inches during Storm Ida) at residences on both roads. Four residential properties on Old Country Lane were determined to be severely impacted (431 Old Country, 439 Old Country, 438 Old Country, and 430 Old Country) and three residential properties on Coachmans Lane were determined to be affected (347 Coachmans, 354 Coachmans, and 346 Coachmans).

The brook that caused the flooding (Stubby Plain Brook) flows through the Old Country and Coachmans neighborhood through a series of culverts. During the 2021 tropical storms, the neighborhood brook flowed over its banks and entered the residences by way of their garage doors. The existing culverts' capacity is less than the 10-year storm at both crossings. At Old Country, the capacity is approximately the 7.5 year storm and at Coachmans, the capacity is a 5-year storm. Tropical Storm Elsa can be classified as a 25-year storm event and Storm Ida as a 100-year storm. At both crossings, the culverts and their headwalls are in poor condition.

Cardinal prepared a hydraulic model 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 evaluated included the following:

(1) Doing Nothing

(2) Acquiring and Removing Houses

(3) Replacing the Culverts with a box culvert

(4) Replacing the Culverts with larger pipe culverts

Based on the analysis performed, the mitigation options that seem most feasible and cost effective to be implemented are summarized below:

Old Country Road

Option 3- Replacement of the existing twin 24-inch pipe culverts with 12 foot by 3 foot box culvert

Estimated Cost $614,000

Option Summary: Approximately 9 inches of flooding would be expected to occur during the 100-year storm at 430 Old Country. It may be feasible to prevent flooding of 430 Old Country by constructing a curb and/or berm along the driveway on the stream side. The roadway would no longer be flooded during 100-year frequency storms or smaller.

Coachmans Lane

Option 3- Replacement of the existing twin 24-inch pipe culverts with a 9 foot by 4 foot box culvert

Estimated Cost $650,000

Option Summary: This option is expected to remove all the house flooding at this location. The roadway would no longer be flooded during these types of storm events (100-year frequency and less).

Introduction

The Town of Orange engaged the services of Cardinal Engineering to perform a drainage study of the Old Country Drive and Coachmans Lane residential neighborhood due to significant flooding that occurred during 2021. The flooding was caused by Stubby Plain 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 part of Orange close to the City of Milford. The location is shown on the Figure 1, Site Vicinity Map.

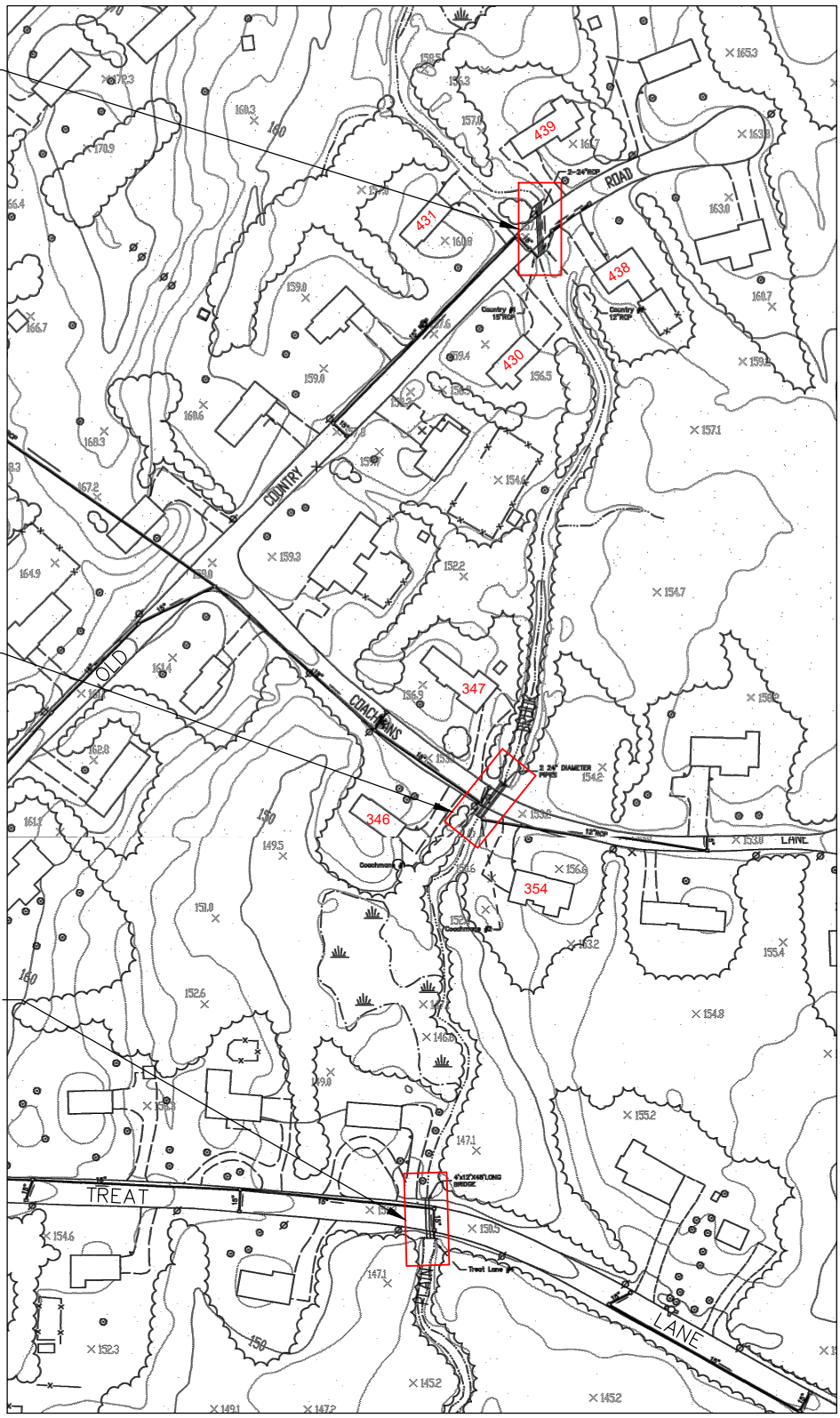
The Town of Orange, along with other parts of Connecticut, particularly Fairfield County, experienced significant rainfall events in 2021 most notably in July and September due to tropical storms. On July 9th 2021, Tropical Storm Elsa affected Connecticut with significant rainfall. On September 1st 2021, 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 both the Old Country and Coachmans Lane area, there was significant flooding (24 inches to 36 inches) that affected residential houses resulting in significant property damage. In this neighborhood, 7 houses were identified as being impacted. The culverts in the neighborhood were significantly undersized and have been determined to be in poor condition. At Old Country, the existing culverts capacity is a 7.5 year storm and at Coachmans, the capacity is a 5-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 undersized and the brook (Stubby Plain Brook) in the neighborhood overtopping its banks. The Old County-Coachmans 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 one square mile or slight flooding chances.

Old Country Rd
Existing twin
24-inch diameter
RCP culverts
55 feet long

Coachmans Lane
Existing twin
24-inch diameter
RCP culverts
52 feet long

Treat Lane
Existing 12 ft x 4 ft
box culvert
49 feet long



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PROJECT TITLE:
OLD COUNTRY ROAD/COACHMANS LANE
FLOODING INVESTIGATION REPORT
ORANGE, CT

DRAWING TITLE:
SITE VICINITY MAP

DRAFTER:	DATE:	DRAWING NUMBER:
DL	3/16/2022	FIGURE 1

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Hydrologic Analysis

Stubby Plain Brook that is the source of flooding in the Old Country-Coachmans neighborhood originates in a swampy area to east of Rosebud Lane and to the west of Fred Wolfe Park. The brook flows to the south to cross Pine Tree Drive at two locations. After Pine Tree it flows towards Old Country Road. The brook crosses Coachmans Lane and continues south flowing under Treat Lane. The brook flows for approximately 4 miles after Treat Lane until discharging into the Indian River in Milford.

The brook in the Old Country and Coachmans neighborhood is conveyed through a series of culverts. At Old Country Road, the brook crosses underneath the road in two 55-foot long culverts (24-inch diameter RCP). The brook then flows for approximately 600 feet to the south towards Coachmans Lane. At Coachmans Lane, the brook enters twin 24-inch diameter RCP culverts which are 52 feet long and discharges on the southern end of the street. Approximately 500 feet south of Coachmans, the brook flows under Treat Lane where is conveyed by a 12 foot by 4 foot concrete culvert underneath the roadway.

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 Stubby Brook in the neighborhoods described in this report. However, there is a detailed study of Stubby Brook farther downstream (approximately 1,000 feet downstream of Treat Lane). The area is shown on map number 09009C0418J with a revision date of May 16, 2017. The Old Country-Coachmans 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.

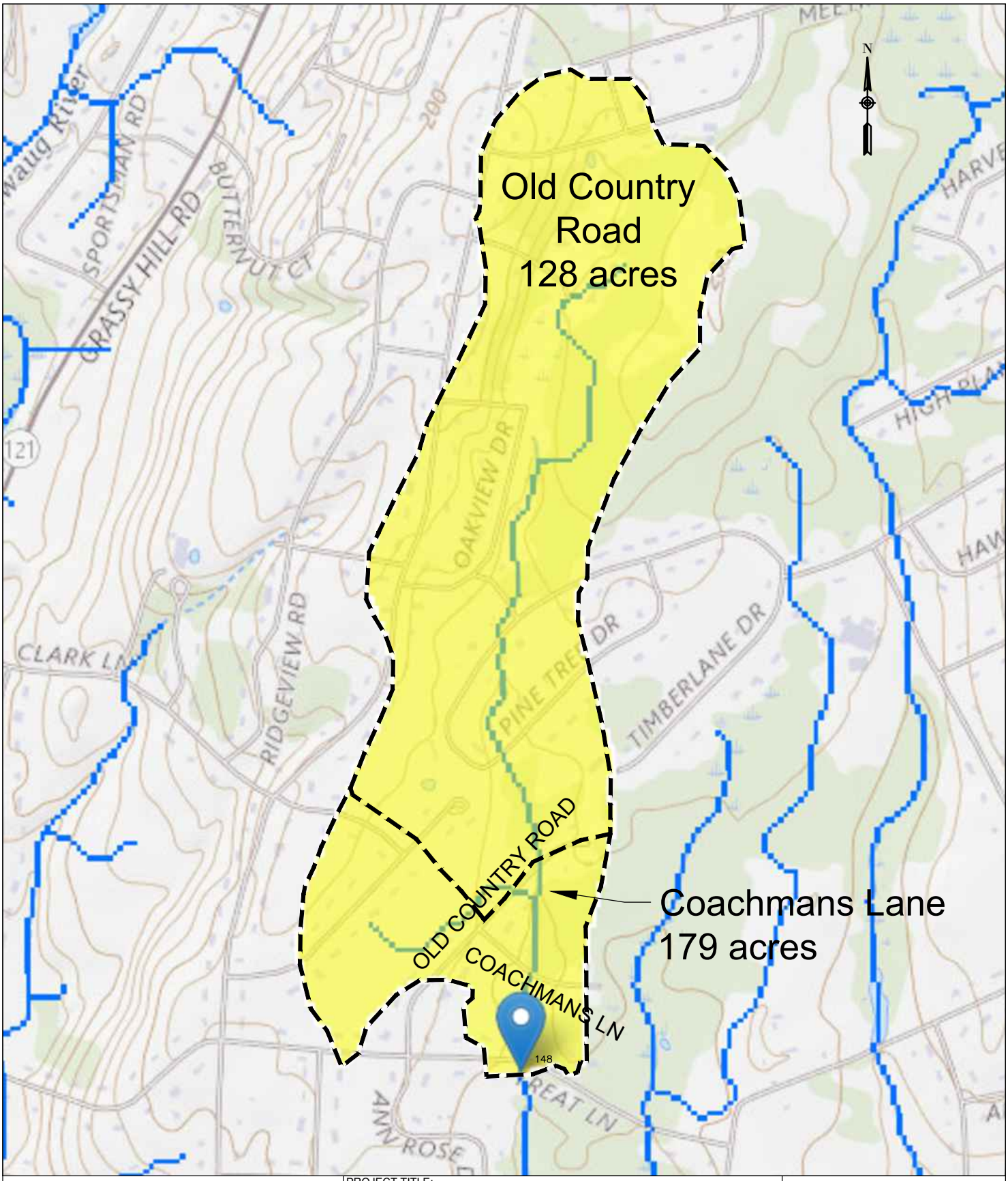
The drainage area was delineated using Town of Orange topographic maps (prepared by Milone and MacBroom scale 1" =100'), USGS topographical maps, USGS StreamStats program, and through field survey. The drainage area for the brook or watershed at Old Country Road is 128 acres or 0.200 square miles. The area consists of primarily 1-acre residential lots (55% of drainage area) and the soils consist of primarily HSG type B soils. Of the 128 acres, there is 26% or 33 acres that have soils which are more prone to stormwater runoff (type C and D). The other three types of land uses are a forested area (36.7 acres), the Fred Wolfe Park Area (16.7 acres) and a utility right of way (ROW) corridor associated with high voltage electric transmission lines (4.1 acres). The composite runoff curve number (CN) was calculated to be 71. The time of concentration for this area was calculated to be 48.9 minutes consisting of sheet flow, concentrated flow, and channel flow.

The drainage area for the brook at Coachmans Lane is composed of the watershed described above with some additional area since Coachmans is downstream of Old Country Road. The drainage area for the culverts at Coachmans Lane is 179 acres or 0.280 square miles. The area consists of primarily 1-acre residential lots (66% of drainage area) and the soils consist of primarily HSG type B soils. Of the 179 acres, there is 22% or 39 acres that are type C and D soils which are more prone to stormwater runoff. The other types of land use areas are a forested area (36.7 acres), the Wolfe Park Area, and 6.71 acres of utility right of way (ROW). The composite runoff curve number (CN) was calculated to be 70.2. The time of concentration for this area was calculated to be 54.2 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



0 750' 1500'

PROJECT TITLE:
OLD COUNTRY ROAD
FLOODING INVESTIGATION REPORT
ORANGE, CT

DRAWING TITLE:
EXISTING DRAINAGE AREAS

DRAFTER:	DATE:	DRAWING NUMBER:
DL	2/28/2022	FIGURE 2

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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 or absorb 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
Upstream of Old Country Road	0.200	68	94	137	183
Upstream of Coachmans Lane	0.280	85	118	173	233

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 Old Country and Coachmans location. The modeling 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:

Old Country Road

- West Culvert- 2-foot diameter RCP (55 feet long), slope=-0.36%, adverse
- East Culvert- 2-foot diameter RCP (55 feet long), slope=-0.27%, adverse

  Downstream Channel: 5 foot width, slope=0.008 ft/ft, estimated 2H:1V side slopes with 3 foot depth

Coachmans Lane

- West Culvert- 2-foot diameter RCP (52 feet long), slope=-0.37%, adverse
- East Culvert- 2-foot diameter RCP (52 feet long), slope= 0.42% (poor condition with joint separation)

  Downstream Channel: 5 foot width, slope= 0.0087 ft/ft, estimated 2H:1V side slopes with 3 foot depth

Treat Lane

- 12x4 Precast Concrete Box Culvert (49 feet long)

  Downstream Channel: 10 foot width, slope= 0.0087 ft/ft, estimated 2H:1V side slopes with 4 foot depth

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 – Flood Calculations
July 9th and September 1st Storm Events
Old Country Road
Existing Conditions Modeled (Twin 24" 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)
431 Old Country	153.75	155.23	+1.48	+18	153.75	155.52	+1.8	+22
439 Old Country	154.76	155.23	+0.47	+6 (24" reported)	154.76	155.52	+0.76	+9
438 Old Country	152.60	152.89	+0.29	+3	152.60	153.77	+1.17	+14
430 Old Country	151.83	152.89	+1.06	+13 (20" reported)	151.83	153.77	+1.94	+23 (36" reported)

Notes: Road Centerline Elev 155.0 (Both July and Sept reported over road); reported values are based on supplied information from Orange residents including photographs and Cardinal surveying

WSE=Water Surface Elevation

Table 3 – Flood Calculations
July 9th and September 1st Storm Events
Existing Conditions Modeled at Coachmans Lane (Twin 24" 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)
347 Coachmans	150.34	151.30	+0.96	+11	150.34	151.63	+1.29	+15
354 Coachmans	150.02	147.91	0	0	150.02	151.00	+0.98	+12
346 Coachmans	148.24	147.91	0	0	148.24	151.00	+2.76	+33

Notes: Road Centerline Elev 151.0; reported values are based on supplied information from Orange residents including photographs and Cardinal surveying

WSE=Water Surface Elevation

Mitigation Analysis

The Town of Orange requested that Cardinal evaluate potential strategies to alleviate the flooding in the Old Country Road and Coachmans Lane residential neighborhood. The strategies involve replacement of culverts as well as property acquisition and removal of houses. The four houses most impacted by the flooding on Old Country that were considered for property acquisition are identified:

- 431 Old Country, 1.08 acre lot, 2017 town appraised value $334,000
- 439 Old Country, 1.24 acre lot, 2017 town appraised value $344,000
- 438 Old Country, 1.21 acre lot, 2017 town appraised value $318,000
- 430 Old Country, 1.11 acre lot, 2017 town appraised value $322,000

The three houses most impacted by the flooding on Coachmans Lane that were considered for property acquisition are as follows:

- 347 Coachmans, 1.0 acre lot, 2017 town appraised value $352,000
- 354 Coachmans, 0.94 acre lot, 2017 town appraised value $357,000
- 346 Coachmans, 1.0 acre lot, 2017 town appraised value $395,000

The following are the options studied to evaluate the most effective solution:

<u>At Old Country Road</u>

- Option 1-Do nothing
- Option 2-Acquire and remove 4 houses
- Option 3-Replace existing 24-inch twin culverts with 12x3 box culvert with 45 degree wingwalls
- Option 4-Replace existing 24-inch twin culverts with 36-inch twin HDPE pipe culverts

<u>At Coachmans Lane</u>

- Option 1-Do nothing
- Option 2-Acquire and remove 3 houses
- Option 3- Replace existing 24-inch twin culverts with 9x4 box culvert with 45 degree wingwalls
- Option 4-Replace existing 24-inch twin culverts with 36-inch twin HDPE pipe culverts

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 9-2). 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 Tables 4 and 5.

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.

The identified strategies to mitigate the flooding in the Old Country and Coachmans neighborhood are the following:

- **Old Country Road Option 3- Replace existing 24-inch culverts with larger box culvert (12 foot by 3 foot)**

  Estimated Cost $604,000

  This option significantly reduces flooding of the road and at houses and the hydraulic results with this option are shown on Tables 6 and 7. Flooding of 9 inches is expected at 430 Old Country Road in a 100 year storm. It may be feasible to prevent flooding of 430 Old Country by constructing a curb and/or berm along the driveway on the stream side. No flooding is expected at 430 Old Country in a 25 year storm.

- **Coachmans Lane Option 3- Replace the existing culverts with a larger box culvert (9 foot by 4 foot)**

  Estimated Cost $640,000

  This option significantly reduces flooding of the road and at the houses. The hydraulic results with this option are shown on Tables 6 and 7.

Table 4 Decision Matrix
Options 1 through 4
Old Country Neighborhood Flooding Investigation
Orange, CT

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ID #	Alternative	Pros	Cons	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 4 houses	431 Old Country-22 inches	None
		2. Lowest cost	2. Additional property damage likely to reoccur			439 Old Country-9 inches	
			3. Still need to maintain culverts (most in poor condition)			438 Old Country-30 inches	
						430 Old Country-39 inches	
2	Acquire and remove 4 houses	1. No construction required	1. Highest Cost	**$1.4M 4 houses acquired**	- - -	Road overtopping +/- 9 inches	Purchase/eminent domain of all 4 houses
		2. Reduce affected residents	2. Still need to maintain culverts (some in poor condition)				
3	Replace existing 24 inch twin culverts with 12x3 box	1. Solves almost all of flooding issues		**$614K**		430 Old Country-9 inches	
		2. Don't need to acquire property					
4	Replace existing 24 inch twin culverts with 36-inch twin HDPE pipes	1. HDPE pipes are inexpensive	1. Doesn't solve flooding issues	**$349K**	Flooding at 4 houses	431 Old Country-19 inches	None
		2. Reduces flooding	2. Pipes are prone to blockage from debris during storms			439 Old Country-7 inches	
						438 Old Country-14 inches	
						430 Old Country-23 inches	

*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 Decision Matrix
Options 1 through 4
Coachman's Neighborhood Flooding Investigation
Orange, CT

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ID #	Alternative	Pros	Cons	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	347 Coachman's-15 inches	None
		2. Lowest cost	2. Additional property damage likely to reoccur			354 Coachman's-12 inches	
			3. Still need to maintain culverts (most in poor condition)			346 Coachman's-33 inches	
2	Acquire and remove 3 houses	1. No construction required	1. Highest Cost	**$1.2M 3 houses acquired**	- - -	Road will still overtop +/- 9 inches depth	Purchase/eminent domain for all three houses
		2. Reduce affected residents	2. Still need to maintain culverts (some in poor condition)				
3	Replace existing 24 inch twin culverts with 9x4 box	1. Solves all flooding issues		**$650K Total**	None		
		2. Don't need to acquire property					
		3. Less costly than acquiring property					
4	Replace existing 24 inch twin culverts with 36-inch twin HDPE pipes	1. HDPE pipes are inexpensive	1. Doesn't solve flooding issues	**$362K Total**	Flooding at 2 houses	347 Coachman's-6 inches	None
		2. Reduces flooding	2. Pipes are prone to blockage from debris during storms			346 Coachman's-16 inches	

*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 6 – Flood Calculations
July 9th and September 1st Storm Events
Old Country Road
Proposed Conditions Modeled (Option 3=12x3 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)
431 Old Country	153.75	152.07	0	0	153.75	153.20	0	0
439 Old Country	154.76	152.07	0	0	154.76	153.20	0	0
438 Old Country	152.60	151.68	0	0	152.60	152.55	0	0
430 Old Country	151.83	151.68	0	0	151.83	152.55	+0.72	+9

***Road Centerline Elev 155.0**
WSE=water surface elevation

Table 7 – Flood Calculations
July 9th and September 1st Storm Events
Coachmans Lane
Proposed Conditions Modeled (Option 3=9x4 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)
347 Coachmans	150.34	148.33	0	0	150.34	149.85	0	0
354 Coachmans	150.02	147.74	0	0	150.02	148.71	0	0
346 Coachmans	148.24	147.74	0	0	148.24	148.71	+0.47*	+6*

Note: *1. 100-year WSE above garage elevation but no flooding expected at residence since land between brook and house has elev of 148.9 ft
2. Road Centerline Elev 151.0
3. WSE=water surface elevation

Table 8 – Flood Calculations
July 9th and September 1st Storm Events
Old Country Road
Proposed Conditions Modeled (Twin 36" HDPE)

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)
431 Old Country	153.75	154.48	+0.75	+9	153.75	155.36	+1.61	+19
439 Old Country	154.76	154.48	0	0	154.76	155.36	+0.60	+7
438 Old Country	152.60	152.89	+0.29	+3	152.60	153.77	+1.17	+14
430 Old Country	151.83	152.89	+1.06	+13	151.83	153.77	+1.94	+23

Notes: Road Centerline Elev 155.0 (Both July and Sept reported over road); reported values are based on supplied information from Orange residents including photographs and Cardinal surveying

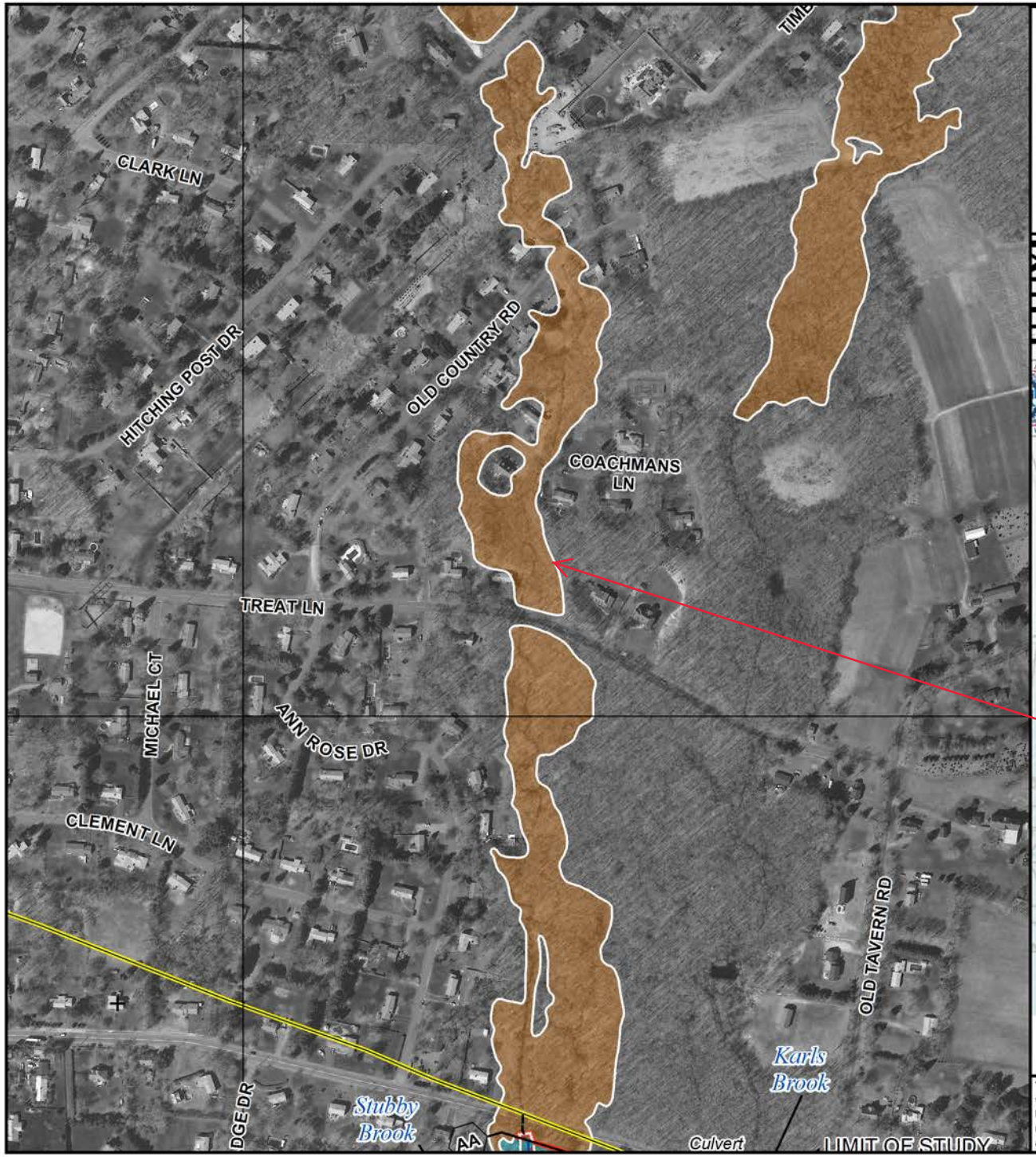
Table 9 – Flood Calculations
July 9th and September 1st Storm Events
Proposed Conditions Modeled at Coachman's Lane (Twin 36" HDPE)

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)
347 Coachmans	150.34	150.49	+0.15	+2	150.34	150.81	+0.47	+6
354 Coachmans	150.02	148.79	0	0	150.02	149.58	0	0
346 Coachmans	148.24	148.79	+0.55	+7	148.24	149.58	+1.34	+16

Notes: Road Centerline Elev 151.0; reported values are based on supplied information from Orange residents including photographs and Cardinal surveying

APPENDIX A

FEMA MAP



NATIONAL FLOOD INSURAN
FLOOD INSURANCE RATE MA

National Flood Insurance Program

New Haven County, CT
(ALL JURISDICTIONS)
PANEL 0418 OF 0635

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
MILFORD, CITY OF	090082	0418	J
ORANGE, TOWN OF	090087	0418	J

500 year flood zone
(FEMA Zone X)

VERSION NUMBER
2.3.3.2

MAP NUMBER
09009C0418J

MAP REVISED
May 16, 2017

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.

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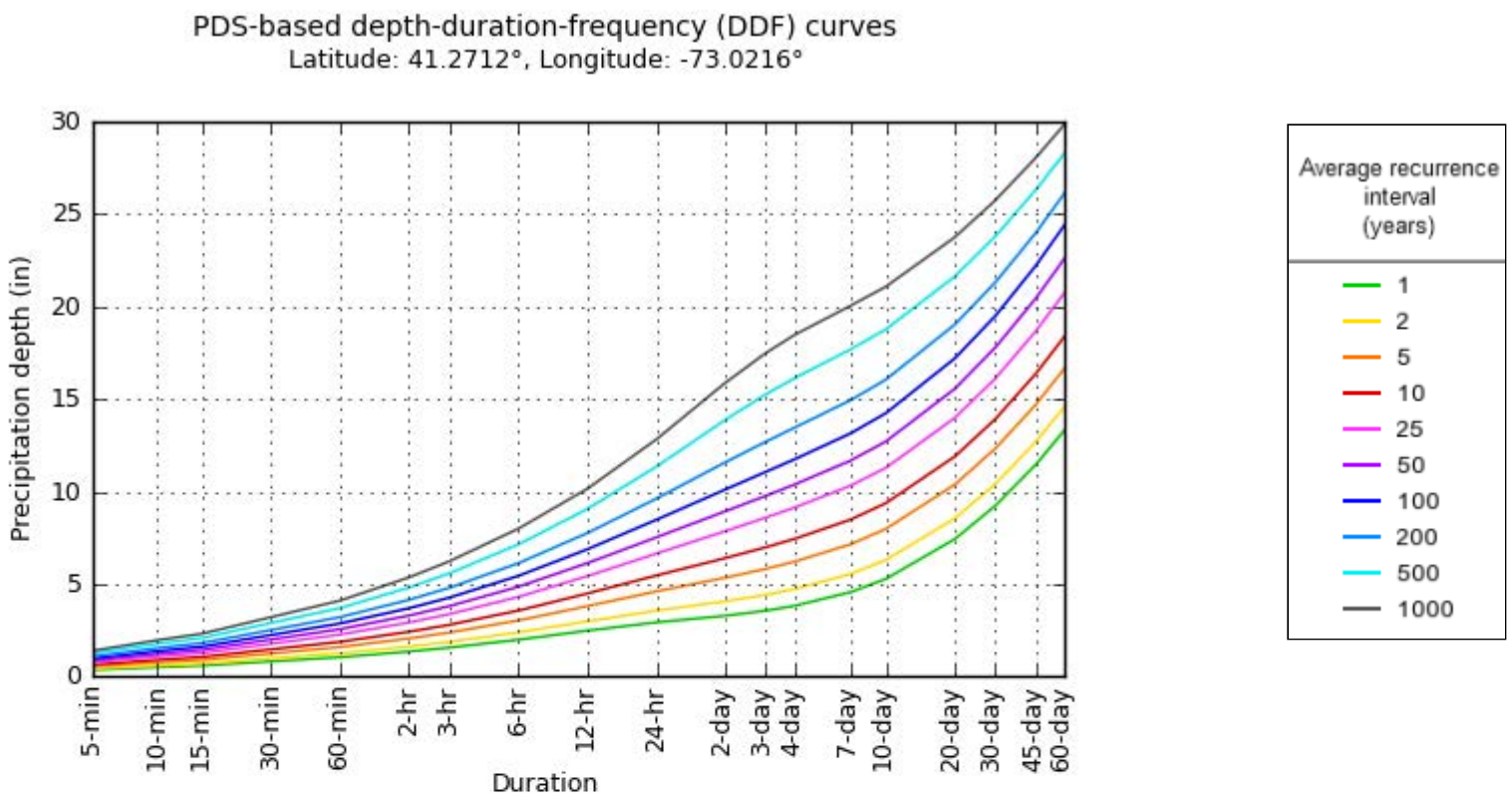
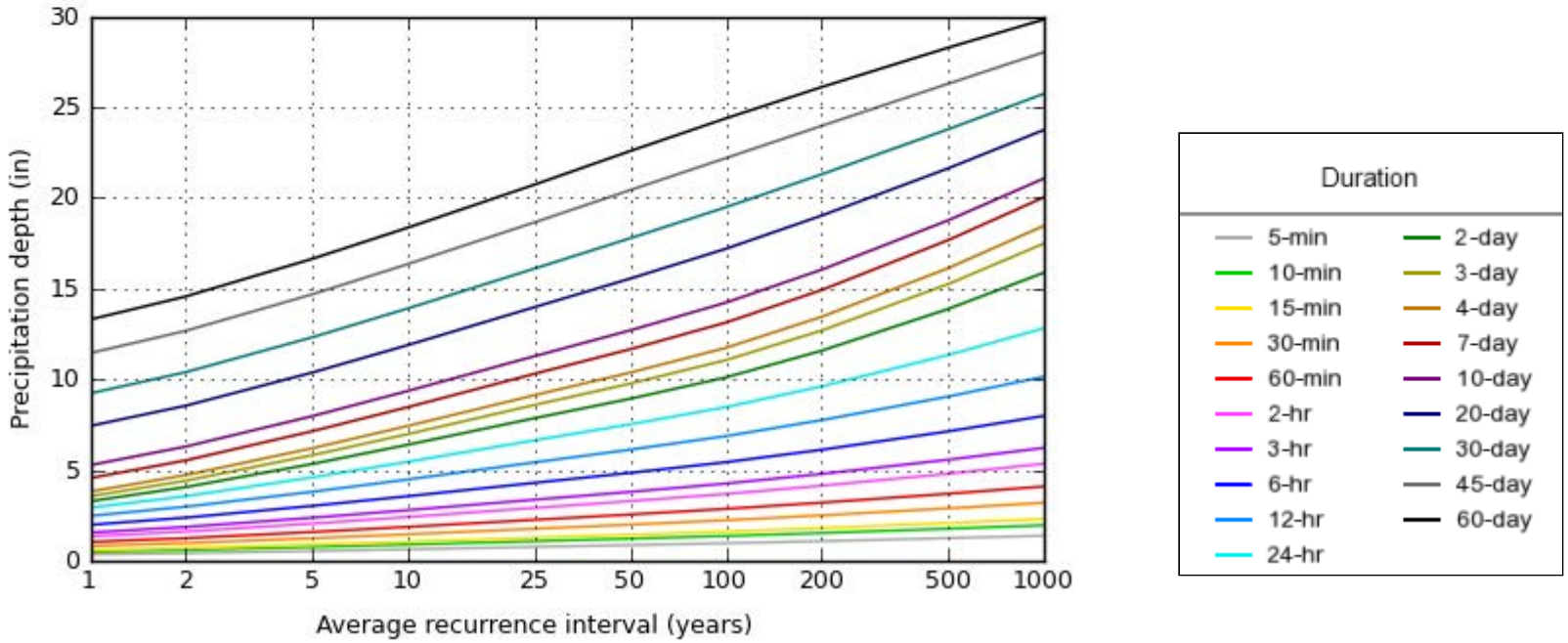
PF graphical





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Maps & aerials

Small scale terrain

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)**

Local Climatological Data
Daily Summary
July 2021

Generated on 12/01/2021

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

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	Sust. Dir
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
01	82	70	76	3.4	83	69	71	0	11	0423	1929	RA BR	1.30	0.0	0	29.83	29.83	4.3	22	310	16	310
02	76	60	68	-4.8	89	66	67	0	3	0424	1929	RA BR	0.30	0.0	0	29.73	29.75	10.6	31	100	24	090
03	64	60	62	-10.9	86	57	59	3	0	0424	1929	RA BR	0.50	0.0	0	29.78	29.80	10.6	21	030	16	030
04	73	58	66	-7.1	78	58	61	0	1	0425	1929		T	0.0	0	29.87	29.91	3.8	14	170	10	140
05	78	63	71	-2.3	81	64	66	0	6	0426	1928	BR	0.00	0.0	0	30.02	30.04	8.8	20	070	17	080
06	89	70	80	6.6	76	69	71	0	15	0426	1928	TS RA BR	0.31	0.0	0	29.93	29.94	10.8	31	320	23	320
07	92	72	82	8.4	73	70	73	0	17	0427	1928		0.00	0.0	0	29.91	29.93	9.3	20	190	15	190
08	77	71	74	0.3	87	69	70	0	9	0427	1927	TS RA BR	1.07	0.0	0	29.96	29.98	10.1	26	290	21	300
09	84	69	77	3.1	82	70	72	0	12	0428	1927	RA BR	4.15	0.0	0	29.79	29.80	12.0	42	040	32	050
10	81	71	76	2.0	73	66	69	0	11	0429	1927		0.00	0.0	0	29.93	29.97	6.4	22	030	16	020
11	77	71	74	-0.1	82	68	70	0	9	0430	1926	RA BR	0.01	0.0	0	30.08	30.08	6.9	17	070	15	070
12	81	71	76	1.8	84	69	71	0	11	0430	1926	RA BR	0.06	0.0	0	30.09	30.13	8.8	19	070	15	080
13	72	68	70	-4.3	89	66	67	0	5	0431	1925	RA BR	0.03	0.0	0	30.21	30.23	12.6	21	090	18	090
14	83	68	76	1.6	87	70	71	0	11	0432	1924	BR	0.00	0.0	0	30.12	30.13	5.8	17	190	14	190
15	88	72	80	5.5	75	70	73	0	15	0433	1924	BR	0.00	0.0	0	30.04	30.06	4.6	18	190	14	200
16	92*	74	83	8.5	74	73	76	0	18	0433	1923		0.00	0.0	0	29.97	29.99	6.9	18	180	15	190
17	85	75	80	5.4	82	74	76	0	15	0434	1923	RA	0.01	0.0	0	30.00	30.02	6.3	18	200	14	200
18	86	75	81	6.3	77	71	73	0	16	0435	1922	TS RA BR	0.12	0.0	0	29.93	29.94	8.5	19	220	15	220
19	81	71	76	1.3	75	66	69	0	11	0436	1921		0.00	0.0	0	29.91	29.93	6.7	17	330	13	330
20	85	68	77	2.3	76	69	72	0	12	0437	1921	BR HZ	0.00	0.0	0	29.87	29.88	4.8	16	210	14	220
21	83	68	76	1.2	69	64	68	0	11	0438	1920	TS RA HZ	0.30	0.0	0	29.85	29.88	6.1	19	350	15	350
22	84	64	74	-0.8	57	58	64	0	9	0438	1919		0.00	0.0	0	30.00	30.04	6.6	21	350	15	350
23	83	66	75	0.2	53	56	64	0	10	0439	1918		0.00	0.0	0	30.07	30.09	6.9	20	010	15	190
24	80	64	72	-2.8	65	60	65	0	7	0440	1917		0.00	0.0	0	30.06	30.08	6.4	18	160	12	190
25	80	69	75	0.2	80	68	70	0	10	0441	1916	TS RA	0.05	0.0	0	29.91	29.91	10.6	28	200	22	190
26	90	69	80	5.1	69	67	71	0	15	0442	1915	HZ	0.00	0.0	0	29.85	29.88	4.5	17	340	13	220
27	89	66	78	3.2	62	63	69	0	13	0443	1914	TS RA HZ	T	0.0	0	29.90	29.93	5.2	22	270	16	310
28	80	68	74	-0.8	72	64	68	0	9	0444	1914	RA	0.11	0.0	0	29.95	29.98	7.8	18	360	14	120
29	79	70	75	0.2	81	67	70	0	10	0445	1912	RA BR	0.23	0.0	0	29.92	29.91	9.9	29	210	23	210
30	84	64	74	-0.8	58	58	65	0	9	0446	1911	BR	0.00	0.0	0	29.73	29.78	9.9	29	340	21	340
31	78	56*	67	-7.8	55	51	59	0	2	0447	1910		0.00	0.0	0	29.93	29.96	6.7	20	210	17	200
	81.8	67.8	74.8									Monthly Averages | Totals	8.55			29.94	29.96	7.6				
	-0.4	1.4	0.5									Departure from Normal (1981-2010)	5.09									

Degree Days

	Monthly Total	Monthly Departure	Season-to-date Total	Season-to-date Departure
Heating	3	2	3	
Cooling	307	18	547	

Number of days with...

Temperature Max >=90°	Temperature Max <=32°	Temperature Min <=32°	Temperature Min <=0°	Precipitation >=0.01"	Precipitation >=0.1"	Snow >=1"	Weather T-Storms	Weather Heavy Fog
3	0	0	0	15	10	0	6	

Date of 5-sec to 3-sec wind equipment change

2009-06-17

Sea Level Pressure

		Date	Time
Maximum	30.26	13	1102
Minimum	29.65	09	0852

Greatest...

24-Hr... Precip	24-Hr... Snowfall	Snow Depth
5.16	0.0	0.0
Date 08-09		

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

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

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 (KBDR)**

Date	Time (LST)	Station Type	Sky Conditions	Visibility	Weather Type (see documentation) AU | AW | MW	Dry Bulb Temp (F)	Dry Bulb Temp (C)	Wet Bulb Temp (F)	Wet Bulb Temp (C)	Dew Point Temp (F)	Dew Point Temp (C)	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)	Altimeter Setting (inHg)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
09	0048	7	SCT:04 6 BKN:07 120	8.00	-RA:02 |RA |RA	72	22.2	71	21.7	70	21.1	94	3	080		29.92				FM-16	T	29.94
09	0052	7	FEW:02 6 SCT:04 29 BKN:07 120	8.00	-RA:02 |RA |RA	72	22.2	71	21.7	71	21.7	97	3	070		29.92	6	+0.04	29.94	FM-15	T	29.94
09	0100	4	5 ~	7.46	|RA |	72	22.2	71	21.7	71	21.7	97	3	070		29.91	6	+0.04	29.94	FM-12		
09	0110	7	BKN:07 4 BKN:07 19 BKN:07 120	8.00	-RA:02 |RA |RA	73	22.8	72	22.2	71	21.7	94	5	100		29.92				FM-16	0.01	29.94
09	0118	7	SCT:04 4 BKN:07 17 OVC:08 29	8.00	-RA:02 |RA |RA	73	22.8	72	22.2	71	21.7	94	5	100		29.92				FM-16	0.01	29.94
09	0148	7	BKN:07 12 OVC:08 18	10.00	-RA:02 |RA |RA	73	22.8	72	22.2	72	22.2	94	5	120		29.91				FM-16	0.01	29.93
09	0152	7	BKN:07 10 OVC:08 15	10.00	-RA:02 |RA |RA	73	22.8	72	22.2	71	21.7	94	3	110		29.90			29.92	FM-15	0.01	29.92
09	0224	7	SCT:04 10 SCT:04 120	10.00	-RA:02 |RA |RA	73	22.8	72	22.2	71	21.7	94	6	080		29.89				FM-16	0.01	29.91
09	0252	7	BKN:07 120	7.00	-RA:02 |RA |RA	73	22.8	72	22.2	71	21.7	94	8	050		29.86			29.88	FM-15	0.03	29.88
09	0312	7	BKN:07 7 BKN:07 70 BKN:07 110	6.00	-RA:02 BR:1 |RA |RA	73	22.8	72	22.2	71	21.7	94	10	070		29.85				FM-16	0.02	29.87
09	0333	7	BKN:07 3 OVC:08 8	6.00	RA:02 BR:1 |RA |RA	73	22.8	72	22.2	71	21.7	94	13	060		29.84				FM-16	0.04	29.86
09	0352	7	OVC:08 3	5.00	RA:02 BR:1 |RA |RA	73	22.8	72	22.2	71	21.7	94	14	060		29.82	8	+0.08	29.84	FM-15	0.10	29.84
09	0423	7	BKN:07 3 OVC:08 20	1.75	+RA:02 BR:1 |RA |RA	73	22.8	72	22.2	72	22.2	96	15	070		29.80				FM-16	0.19	29.82
09	0433	7	SCT:04 3 BKN:07 10 OVC:08 15	2.00	+RA:02 BR:1 |RA |RA	73	22.8	72	22.2	72	22.2	96	10	060		29.80				FM-16	0.51	29.82
09	0437	7	BKN:07 3 BKN:07 9 OVC:08 15	3.00	+RA:02 BR:1 |RA |RA	73	22.8	72	22.2	72	22.2	96	14	070		29.80				FM-16	0.57	29.82
09	0449	7	BKN:07 5 OVC:08 9	5.00	+RA:02 BR:1 |RA |RA	73	22.8	72	22.2	72	22.2	94	16	080		29.79				FM-16	0.60	29.81
09	0452	7	BKN:07 5 OVC:08 9	4.00	+RA:02 BR:1 |RA |RA	73	22.8	72	22.2	72	22.2	96	17	080		29.79			29.80	FM-15	0.63	29.81
09	0508	7	SCT:04 5 BKN:07 14 OVC:08 47	4.00	+RA:02 BR:1 |RA |RA	73	22.8	72	22.2	72	22.2	96	15	070		29.78				FM-16	0.09	29.80
09	0527	7	FEW:02 11 BKN:07 50 OVC:08 70	4.00	+RA:02 BR:1 |RA |RA	73	22.8	72	22.2	72	22.2	96	17	060		29.76				FM-16	0.17	29.78
09	0541	7	BKN:07 11 BKN:07 25 OVC:08 70	4.00	+RA:02 BR:1 |RA |RA	73	22.8	72	22.2	71	21.7	94	21	060		29.75				FM-16	0.22	29.77
09	0552	7	BKN:07 10 BKN:07 23 OVC:08 50	2.50	+RA:02 BR:1 |RA |RA	73	22.8	72	22.2	72	22.2	96	17	050		29.75			29.77	FM-15	0.35	29.77
09	0605	7	BKN:07 7 BKN:07 12 OVC:08 18	2.00	+RA:02 BR:1 |RA |RA	74	23.3	73	22.8	72	22.2	94	16	070		29.74				FM-16	0.22	29.76

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	8	+0.09	29.72	FM-15	1.26	29.72
09	0700	4	8	1.49	||RA	73	22.8	72	22.2	71	21.7	94	20	050		29.69	8	+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	5	+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	29.78	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	29.78	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	29.79	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	29.81	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	29.81	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

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Remarks
July 2021

Generated on 12/01/2021

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

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	MET09807/09/21 00:48:02 SPECI KBDR 090548Z 08003KT 8SM -RA SCT006 BKN120 22/21 A2994 RMK AO2 RAB01 P0000
09	0052	MET14607/09/21 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	SYN09272504 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 BKN019 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 P0022 T02280217 (WH)
09	0552	MET12807/09/21 05:52:02 METAR KBDR 091052Z 05015KT 2 1/2SM +RA BR BKN010 BKN023 OVC050 23/22 A2977 RMK AO2 SLP082 P0033 T02280222 (WH)
09	0605	MET11707/09/21 06:05:02 SPECI KBDR 091105Z 07014KT 2SM +RA BR BKN007 BKN012 OVC018 23/22 A2976 RMK AO2 P0022 T02330222 (WH)
09	0623	MET11307/09/21 06:23:02 SPECI KBDR 091123Z 07016G25KT 2SM +RA BR SCT007 OVC016 23/22 A2975 RMK AO2 P0049 T02280222 (WH)
09	0629	MET13307/09/21 06:29:02 SPECI KBDR 091129Z 07016KT 2SM +RA BR BKN007 BKN013 OVC018 23/22 A2974 RMK AO2 VIS 1 1/2V2 1/2 P0055 T02280217 (WH)
09	0633	MET12107/09/21 06:33:02 SPECI KBDR 091133Z 07016KT 1 1/2SM +RA BR SCT007 BKN011 OVC020 23/22 A2975 RMK AO2 P0060 T02280222 (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 P0107 FIBI (WH)
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 20222 58030 (WH)
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 P0068 (WH)
09	0752	MET14907/09/21 07:52:02 METAR KBDR 091252Z 04019G34KT 1 1/2SM +RA BR FEW010 BKN021 OVC032 22/21 A2968 RMK AO2 PK WND 04034/1244 SLP052 P0074 T02170206 (WH)
09	0755	MET13707/09/21 07:55:02 SPECI KBDR 091255Z 04020G30KT 2SM RA BR FEW011 BKN023 OVC032 22/21 A2969 RMK AO2 PK WND 04030/1253 P0001 T02170206 (WH)
09	0819	MET13807/09/21 08:19:02 SPECI KBDR 091319Z 03023G29KT 1SM +RA BR FEW011 BKN027 OVC037 21/20 A2969 RMK AO2 PK WND 03033/1306 P0017 T02110200 (WH)
09	0852	MET13807/09/21 08:52:02 METAR KBDR 091352Z 05028G36KT 1SM +RA BR BKN028 OVC050 21/19 A2966 RMK AO2 PK WND 04037/1341 SLP042 P0076 T02110194 (WH)
09	0906	MET13507/09/21 09:06:02 SPECI KBDR 091406Z 04019G31KT 1 3/4SM +RA BR BKN034 OVC070 21/20 A2965 RMK AO2 PK WND 06034/1353 P0026 T02110200 (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 091452Z 35015KT 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 091514Z 31012G18KT 10SM -RA BKN018 BKN040 BKN095 22/20 A2968 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 P0005 (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	SYN09272504 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 RAB38E48 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

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)**

Local Climatological Data
Hourly Precipitation
July 2021

Generated on 12/01/2021

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	For Hour (LST) Ending at																								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						T	0.01		T	T	T	0.30	0.11	0.02	T	T			T	0.06				T	03
04	T	T	T	T	T											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	0.01	09
10																									10
11																						T	T	0.01	11
12	T	T	0.03	0.03																T			T	T	12
13	0.02	T				T	0.01																		13
14																									14
15																									15
16																									16
17																T	T	T	T			T	T	0.01	17
18	0.07s	0.05	T			T					T	T													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	25
26																									26
27																				T	T		T	T	27
28	0.07s	0.04																							28
29														T	T	0.03	0.01	0.05	T	0.12	0.02				29
30																									30
31																									31

Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)	0.29	0.50	0.61	0.75	0.87	1.08	1.29	1.60	1.79	1.91	2.25	2.72
Ending Date Time (yyyy-mm-dd hh:mi)	2021-07-08 15:37	2021-07-08 15:38	2021-07-08 15:43	2021-07-08 15:46	2021-07-08 15:52	2021-07-09 07:15	2021-07-09 07:15	2021-07-09 07:20	2021-07-09 07:20	2021-07-09 07:49	2021-07-09 09:05	2021-07-09 09:02

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

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Daily Summary
September 2021

Generated on 12/01/2021

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

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	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	Sust. Dir
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
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

	Monthly Total	Monthly Departure	Season-to-date Total	Season-to-date Departure
Heating	10	-54	13	
Cooling	154	56	1053	

Number of days with...

Temperature Max >=90°	Temperature Max <=32°	Temperature Min <=32°	Temperature Min <=0°	Precipitation >=0.01"	Precipitation >=0.1"	Snow >=1"	Weather T-Storms	Weather Heavy Fog
0	0	0	0	10	7	0	4	

Date of 5-sec to 3-sec wind equipment change

2009-06-17

Sea Level Pressure

		Date	Time
Maximum	30.38	21	0952
Minimum	29.52	01	2152

Greatest...

24-Hr... Precip	24-Hr... Snowfall	Snow Depth
5.94	0.0	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

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)**

Local Climatological Data
Hourly Observations
September 2021

Generated on 12/01/2021

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	Time (LST)	Station Type	Sky Conditions	Visibility	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)	Altimeter Setting (inHg)
					AU | AW | MW	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	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 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

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)**

Local Climatological Data
Hourly Remarks
September 2021

Generated on 12/01/2021

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	Time (LST)	Remarks
01	0052	MET11109/01/21 00:52:02 METAR KBDR 010552Z 36006KT 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	MET09909/01/21 03:52:02 METAR KBDR 010852Z 06003KT 10SM OVC110 22/18 A2979 RMK AO2 SLP088 T02220178 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	SYN08672504 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	MET15309/01/21 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 BKN028 OVC065 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 VV006 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 VV006 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 VV007 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 VV010 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

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)**

Local Climatological Data
Hourly Precipitation
September 2021

Generated on 12/01/2021

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	For Hour (LST) Ending at																								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					T	T	0.02	0.02	0.01	0.03	T	0.01	0.01	T				0.03	0.25s	0.34	0.45	1.04	2.98	0.58	01
02	0.10	0.07	T																						02
03																									03
04																									04
05											T	T	T	T	0.02	0.02	0.02	T	T		T				05
06																									06
07																									07
08																							T	T	08
09		0.17	0.11				0.05	T	0.04	0.03	0.02	0.02	T	T	T	0.02s	0.02	0.01	0.03	T					09
10																									10
11																									11
12																									12
13																						T	T		13
14																									14
15																									15
16							0.08s	T				T	T							T	T	0.22			16
17															T	0.02	T								17
18																									18
19																									19
20																									20
21																									21
22											0.01					0.01									22
23										T								T		T	T	0.09	0.11	0.13	23
24	0.20	0.06	0.24	0.03	0.01	0.03	0.27	0.15	0.01	T															24
25																									25
26																									26
27																									27
28										0.01	T	0.04	0.14	T					T	T					28
29																									29
30																									30

Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)	0.57	0.97	1.23	1.66	2.09	2.69	3.15	3.57	3.87	4.22	4.81	4.90
Ending Date Time (yyyy-mm-dd hh:mi)	2021-09-01 22:51	2021-09-01 22:40	2021-09-01 22:49	2021-09-01 22:50	2021-09-01 22:50	2021-09-01 22:57	2021-09-01 23:12	2021-09-01 23:14	2021-09-01 23:15	2021-09-01 23:11	2021-09-01 23:18	2021-09-01 23:18

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

HYDROLOGY CALCULATIONS

Hydraflow Table of Contents

NRCS Stormwater final (Old Country-Coachmans).gpw

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

Wednesday, 03 / 16 / 2022

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	------	-------	25.60	-------	54.98	84.59	118.40	173.05	233.40	Coachmans Lane Orange
2	SCS Runoff	------	-------	18.95	-------	41.28	63.79	89.32	130.59	176.10	Old Country Orange

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 (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	25.60	1	198	257,002	------	------	------	Coachmans Lane Orange
2	SCS Runoff	18.95	1	192	183,498	------	------	------	Old Country Orange

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 03 / 16 / 2022

Hyd. No. 1

Coachmans Lane Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 25.60 cfs
Storm frequency	= 2 yrs	Time to peak	= 198 min
Time interval	= 1 min	Hyd. volume	= 257,002 cuft
Drainage area	= 179.200 ac	Curve number	= 70.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 54.20 min
Total precip.	= 2.36 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484

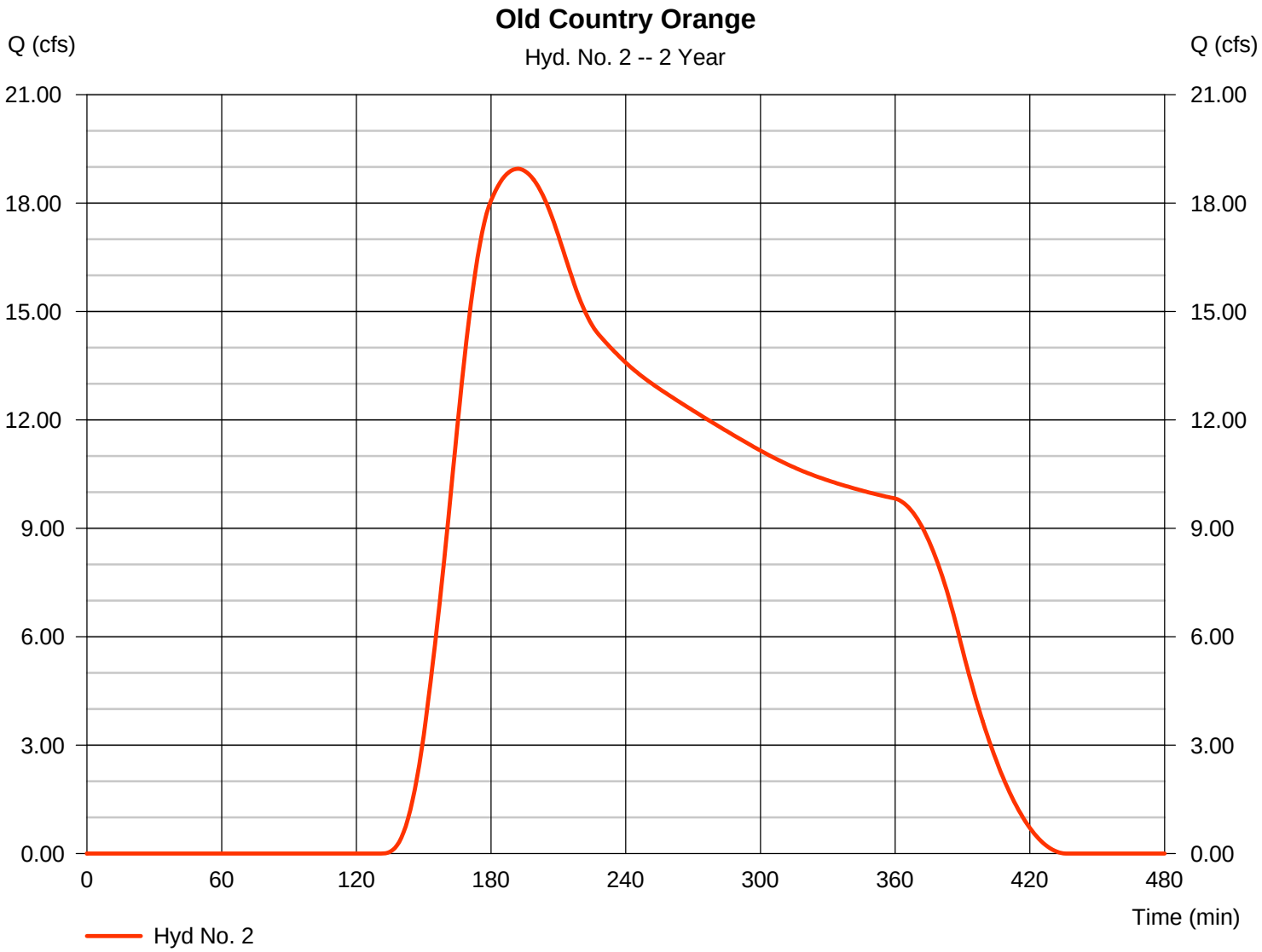
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 03 / 16 / 2022

Hyd. No. 2

Old Country Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 18.95 cfs
Storm frequency	= 2 yrs	Time to peak	= 192 min
Time interval	= 1 min	Hyd. volume	= 183,498 cuft
Drainage area	= 128.000 ac	Curve number	= 70.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 49.00 min
Total precip.	= 2.36 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 (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	54.98	1	187	479,600	------	------	------	Coachmans Lane Orange
2	SCS Runoff	41.28	1	181	342,433	------	------	------	Old Country Orange

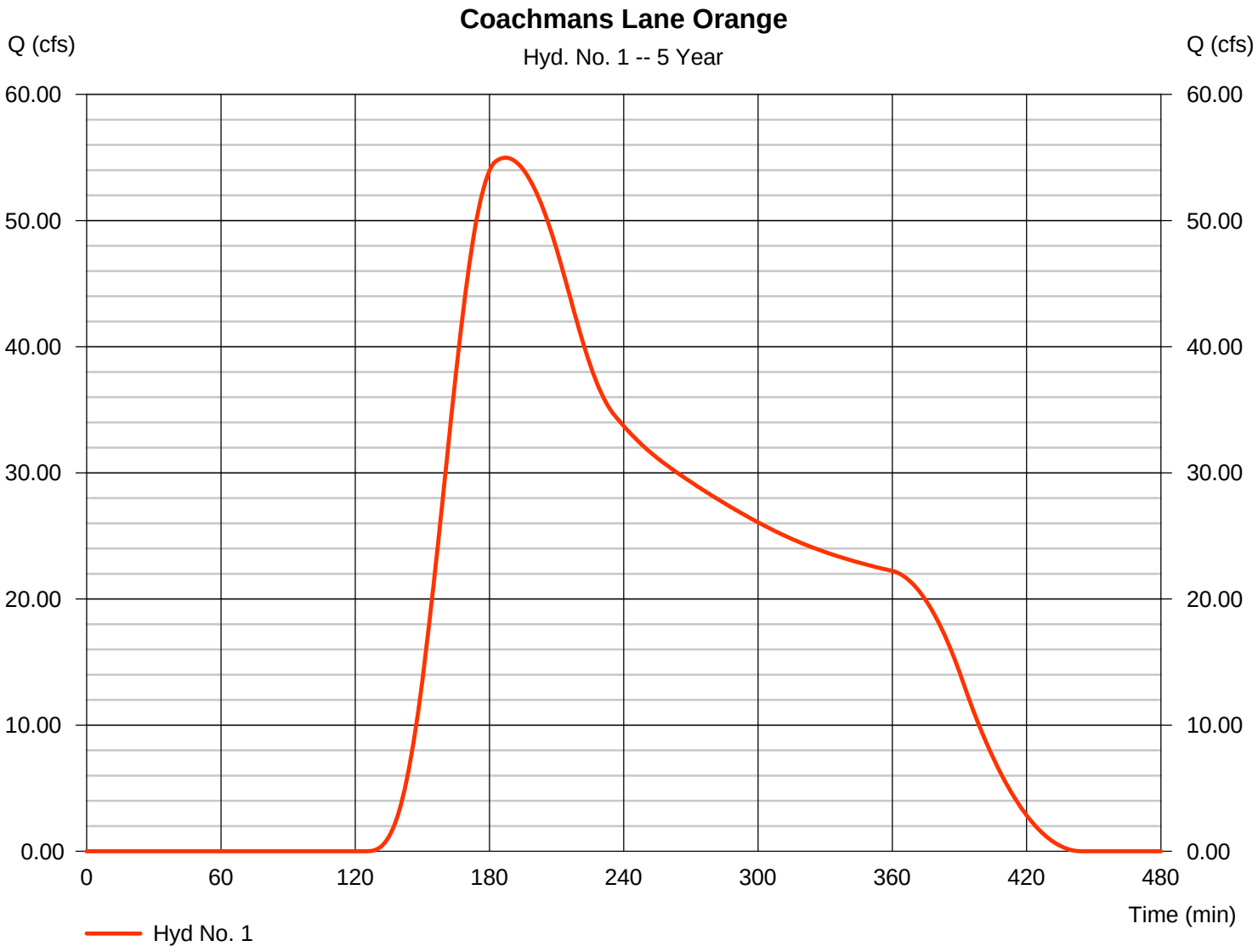
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 03 / 16 / 2022

Hyd. No. 1

Coachmans Lane Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 54.98 cfs
Storm frequency	= 5 yrs	Time to peak	= 187 min
Time interval	= 1 min	Hyd. volume	= 479,600 cuft
Drainage area	= 179.200 ac	Curve number	= 70.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 54.20 min
Total precip.	= 3.03 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



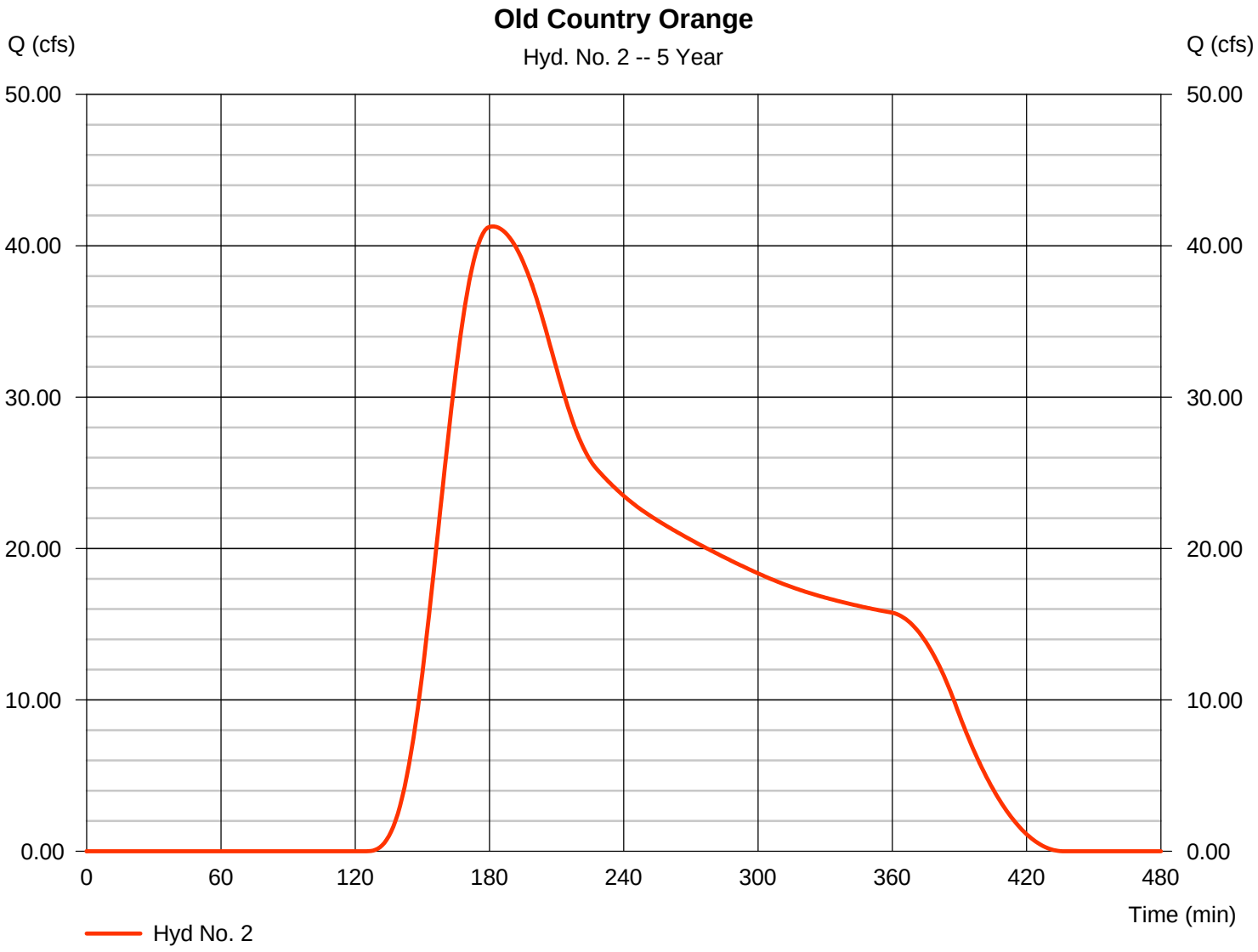
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 03 / 16 / 2022

Hyd. No. 2

Old Country Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 41.28 cfs
Storm frequency	= 5 yrs	Time to peak	= 181 min
Time interval	= 1 min	Hyd. volume	= 342,433 cuft
Drainage area	= 128.000 ac	Curve number	= 70.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 49.00 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 (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	84.59	1	182	684,609	------	------	------	Coachmans Lane Orange
2	SCS Runoff	63.79	1	179	488,808	------	------	------	Old Country Orange

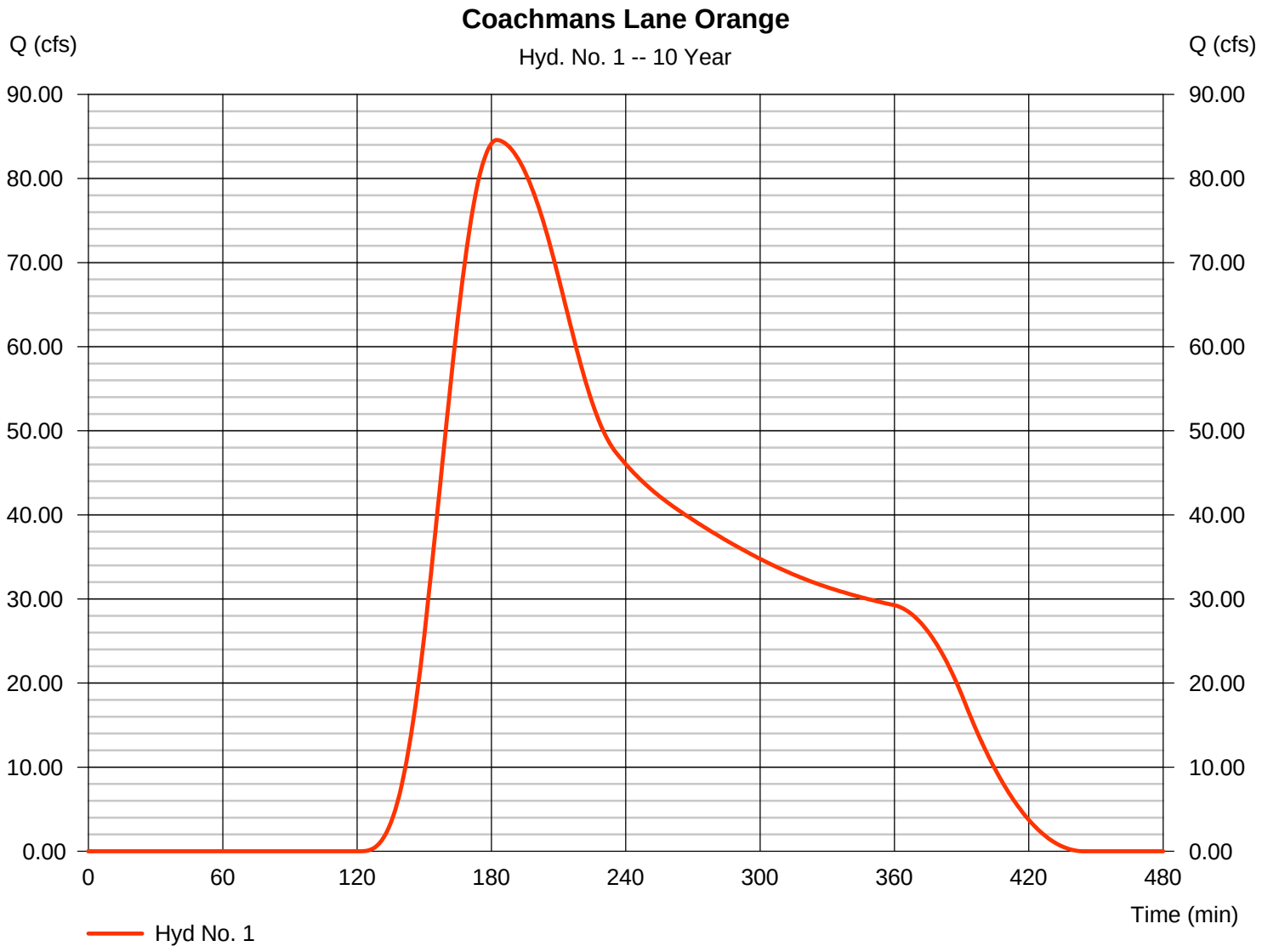
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 03 / 16 / 2022

Hyd. No. 1

Coachmans Lane Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 84.59 cfs
Storm frequency	= 10 yrs	Time to peak	= 182 min
Time interval	= 1 min	Hyd. volume	= 684,609 cuft
Drainage area	= 179.200 ac	Curve number	= 70.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 54.20 min
Total precip.	= 3.56 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



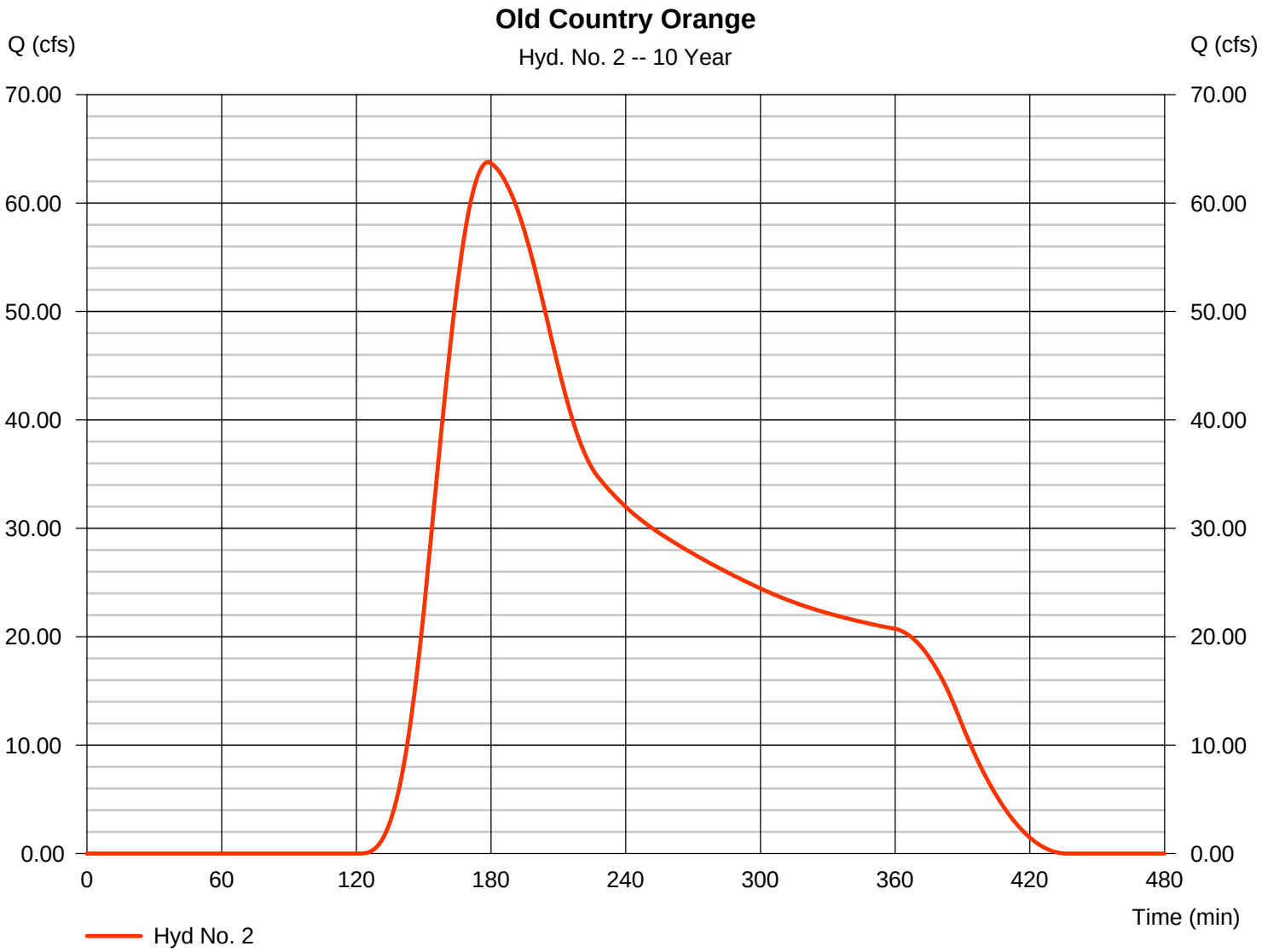
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 03 / 16 / 2022

Hyd. No. 2

Old Country Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 63.79 cfs
Storm frequency	= 10 yrs	Time to peak	= 179 min
Time interval	= 1 min	Hyd. volume	= 488,808 cuft
Drainage area	= 128.000 ac	Curve number	= 70.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 49.00 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 (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	118.40	1	181	909,161	------	------	------	Coachmans Lane Orange
2	SCS Runoff	89.32	1	177	649,137	------	------	------	Old Country Orange

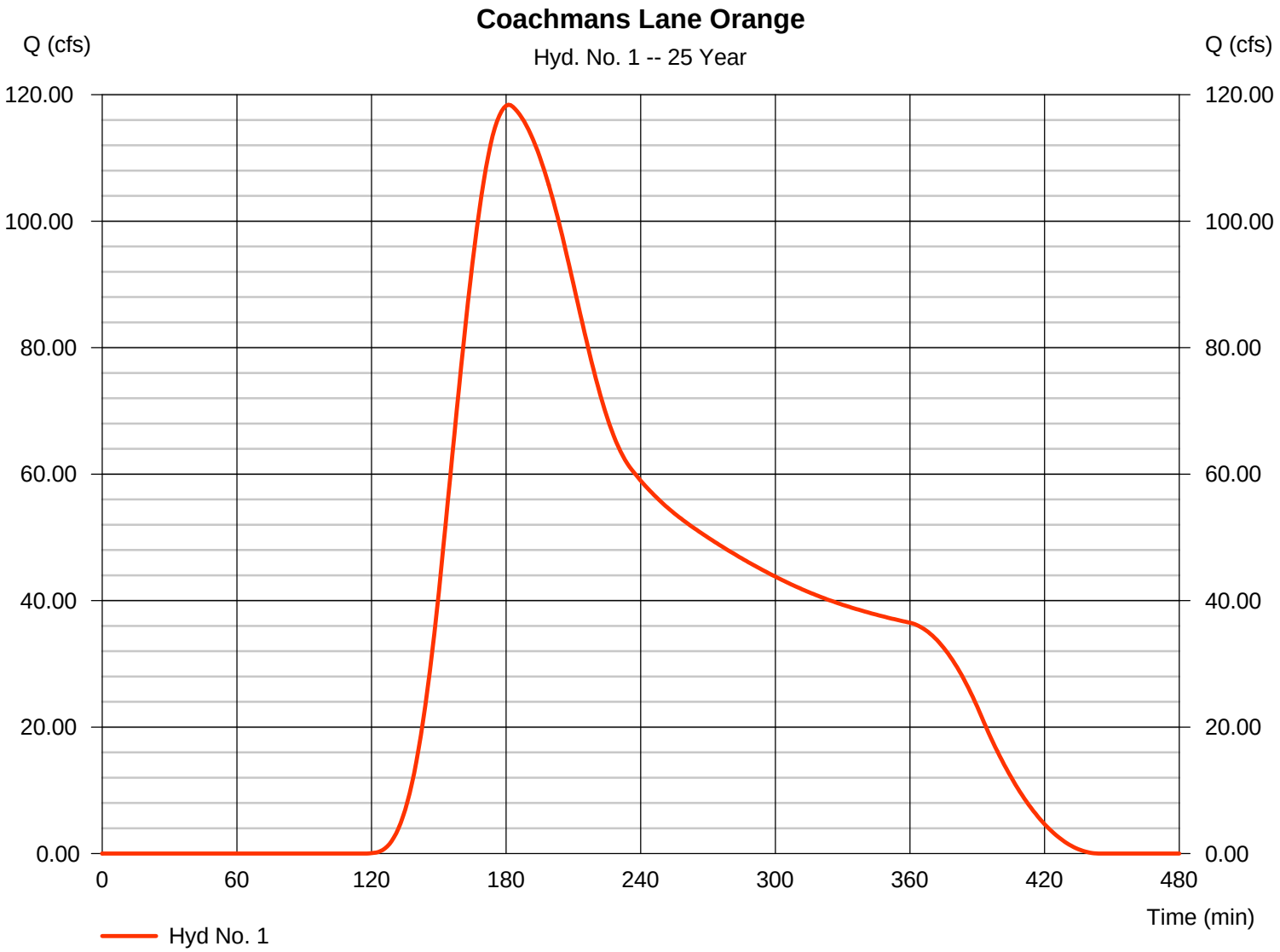
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 03 / 16 / 2022

Hyd. No. 1

Coachmans Lane Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 118.40 cfs
Storm frequency	= 25 yrs	Time to peak	= 181 min
Time interval	= 1 min	Hyd. volume	= 909,161 cuft
Drainage area	= 179.200 ac	Curve number	= 70.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 54.20 min
Total precip.	= 4.09 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



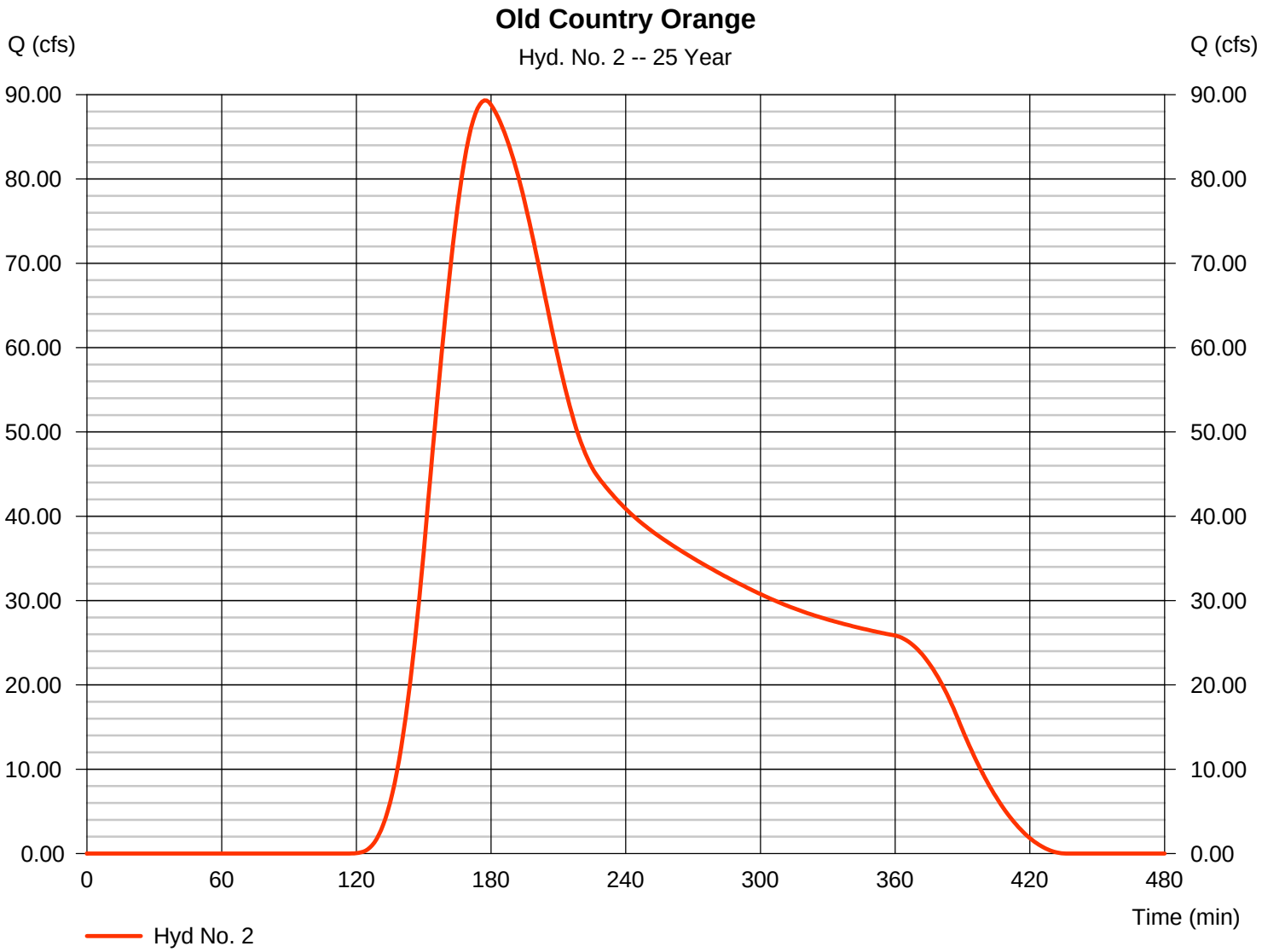
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 03 / 16 / 2022

Hyd. No. 2

Old Country Orange

Hydrograph type	=	SCS Runoff	Peak discharge	=	89.32 cfs
Storm frequency	=	25 yrs	Time to peak	=	177 min
Time interval	=	1 min	Hyd. volume	=	649,137 cuft
Drainage area	=	128.000 ac	Curve number	=	70.2
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	49.00 min
Total precip.	=	4.09 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 (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	173.05	1	180	1,262,638	------	------	------	Coachmans Lane Orange
2	SCS Runoff	130.59	1	176	901,520	------	------	------	Old Country Orange

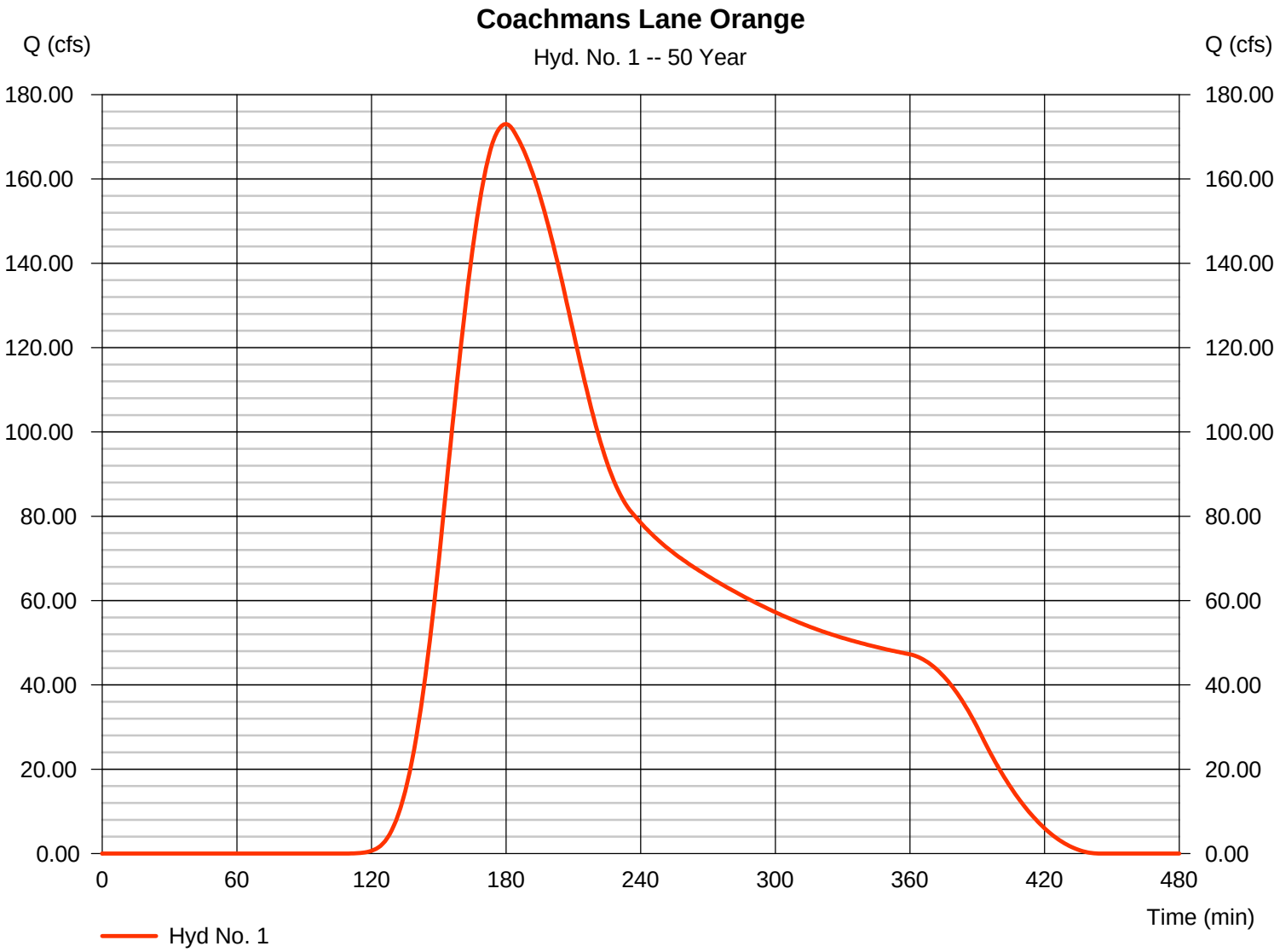
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 03 / 16 / 2022

Hyd. No. 1

Coachmans Lane Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 173.05 cfs
Storm frequency	= 50 yrs	Time to peak	= 180 min
Time interval	= 1 min	Hyd. volume	= 1,262,638 cuft
Drainage area	= 179.200 ac	Curve number	= 70.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 54.20 min
Total precip.	= 4.86 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



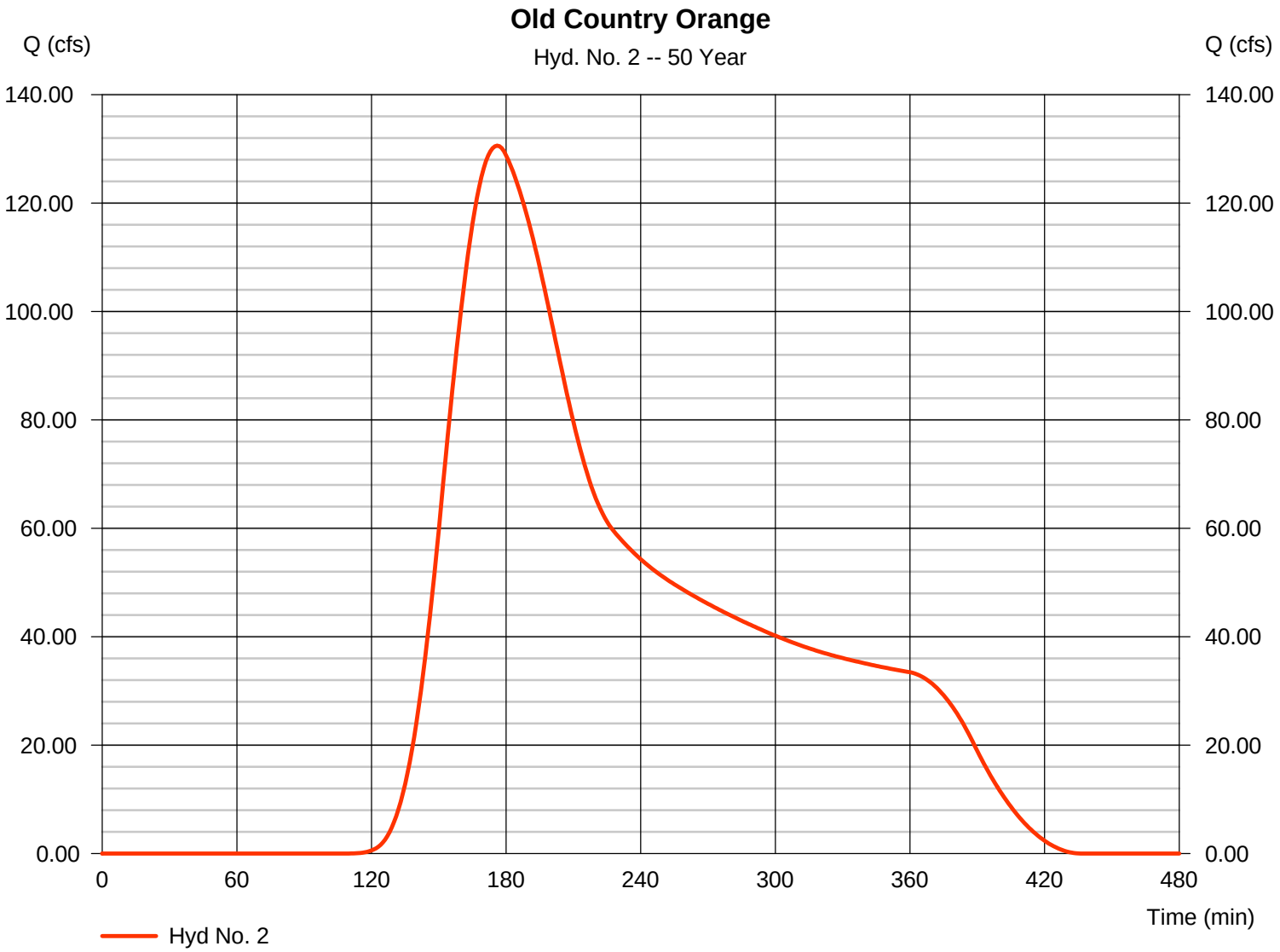
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 03 / 16 / 2022

Hyd. No. 2

Old Country Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 130.59 cfs
Storm frequency	= 50 yrs	Time to peak	= 176 min
Time interval	= 1 min	Hyd. volume	= 901,520 cuft
Drainage area	= 128.000 ac	Curve number	= 70.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 49.00 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 (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	233.40	1	179	1,645,962	------	------	------	Coachmans Lane Orange
2	SCS Runoff	176.10	1	175	1,175,211	------	------	------	Old Country Orange

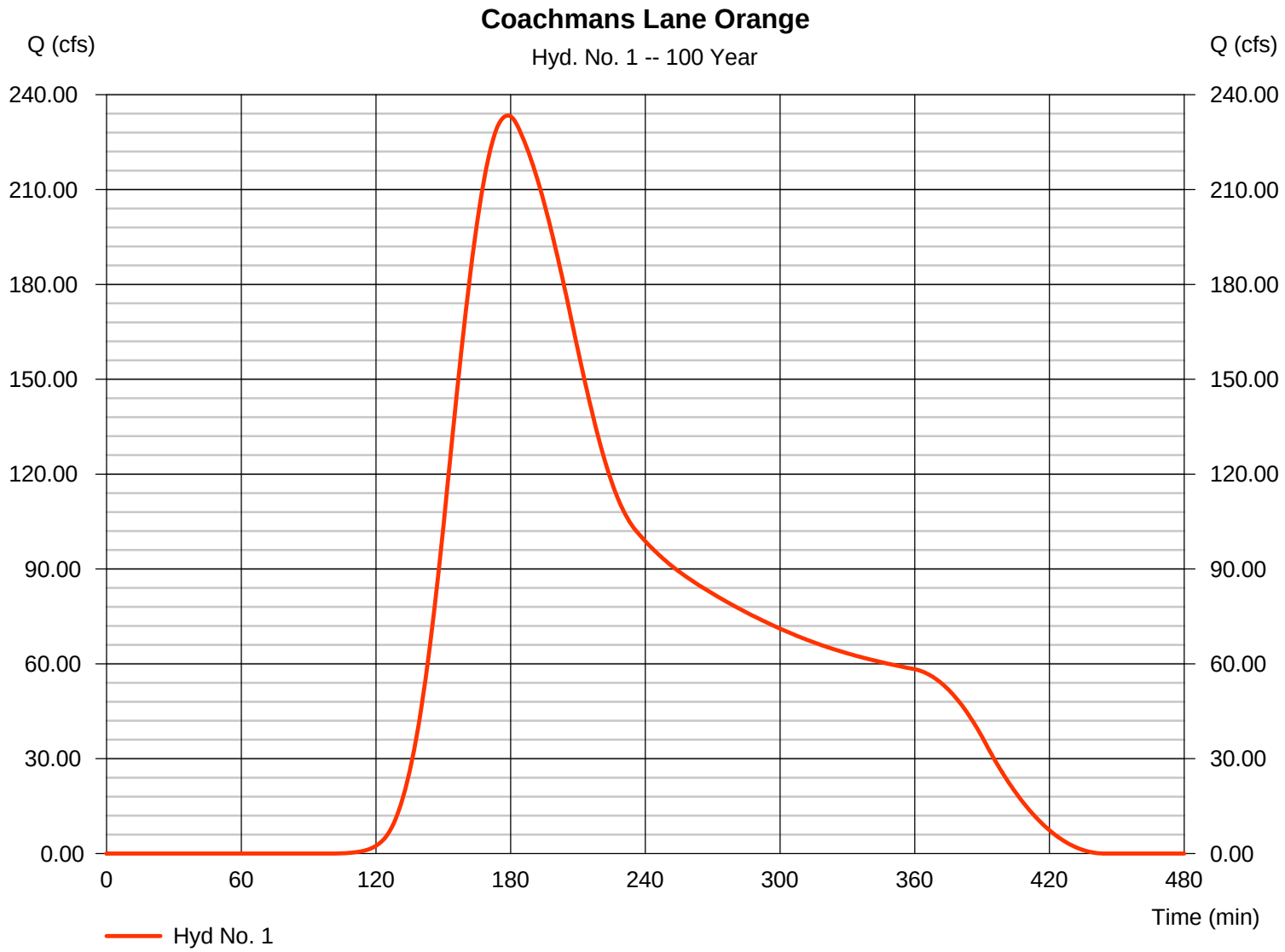
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 03 / 16 / 2022

Hyd. No. 1

Coachmans Lane Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 233.40 cfs
Storm frequency	= 100 yrs	Time to peak	= 179 min
Time interval	= 1 min	Hyd. volume	= 1,645,962 cuft
Drainage area	= 179.200 ac	Curve number	= 70.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 54.20 min
Total precip.	= 5.64 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



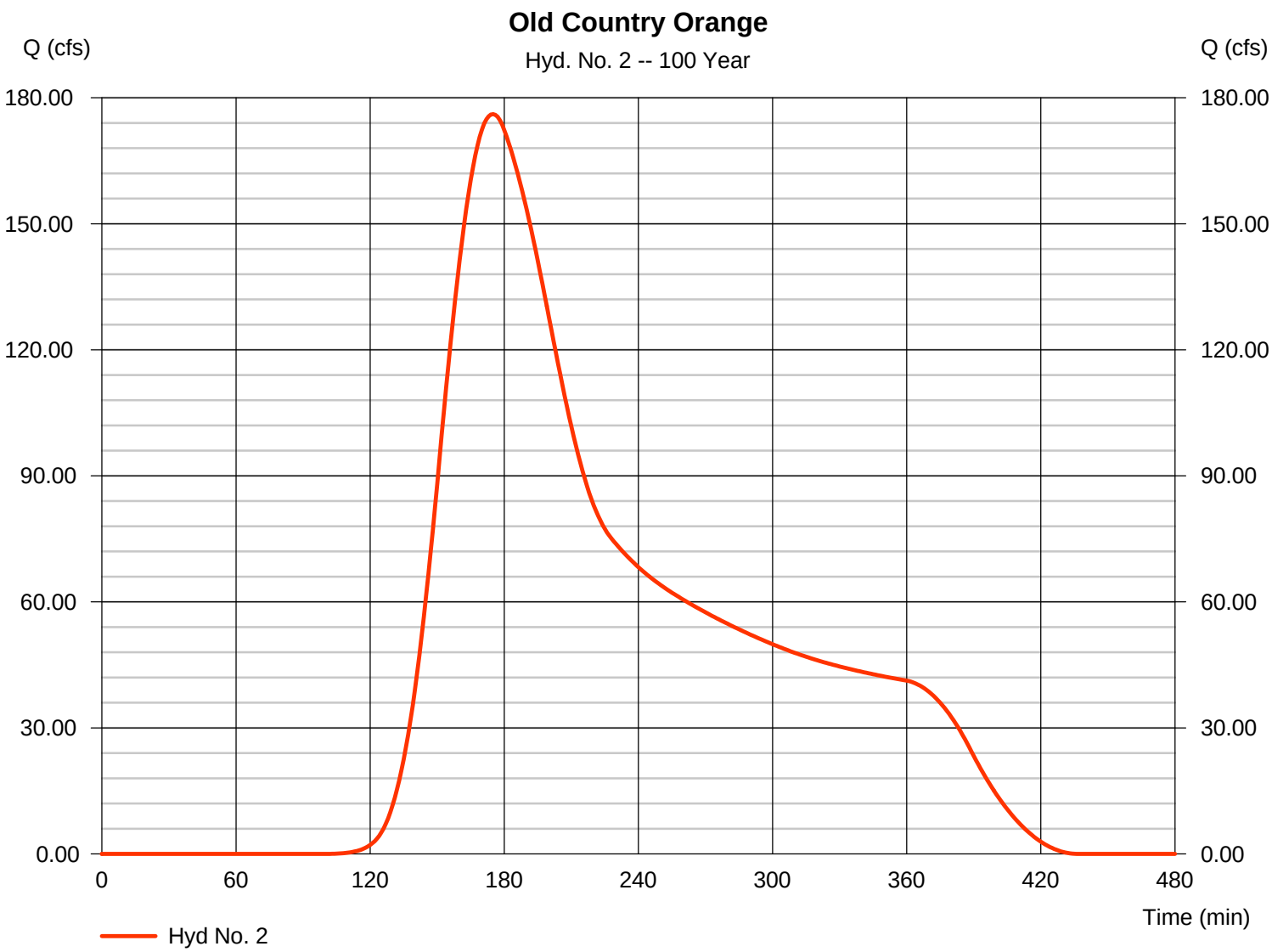
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 03 / 16 / 2022

Hyd. No. 2

Old Country Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 176.10 cfs
Storm frequency	= 100 yrs	Time to peak	= 175 min
Time interval	= 1 min	Hyd. volume	= 1,175,211 cuft
Drainage area	= 128.000 ac	Curve number	= 70.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 49.00 min
Total precip.	= 5.64 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



Old County

Orange, CT

Existing Drainage Areas

NRCS	Area (SF)	Area (Ac)	Percentage of Total Area (%)	CN*	CN Description
Wolfe Park area, open space	726,581.00	16.68	13.0	85	fair condition, grass on 50 to 75%
Forested Area	1,605,621.00	36.86	28.8	71	thin stand poor cover
Utility ROW	179,019.00	4.11	3.2	69	fair condition, grass on 50 to 75%
Residential, 1 acre lots	3,064,459.00	70.35	55.0	68	assumes 20% impervious on lots
Total Drainage Area	**5,575,680.00**	**128.0**			

*Hydrologic Soil Group (HSG): B

Existing Conditions:
Composite CN 71.1

Coachman's Culvert

Orange, CT

Existing Drainage Areas

NRCS	Area (SF)	Area (Ac)	Percentage of Total Area (%)	CN*	CN Description
Wolfe Park area, open space	726,581.00	16.68	9.3	85	fair condition, grass on 50 to 75%
Forested Area	1,605,621.00	36.86	20.6	71	thin stand poor cover
Utility ROW	292,288.00	6.71	3.7	69	fair condition, grass on 50 to 75%
Residential, 1 acre lots	5,172,750.00	118.75	66.3	68	assumes 20% impervious on lots
Total Drainage Area	**7,797,240.00**	**179.0**			

*Hydrologic Soil Group (HSG): B

Existing Conditions:
Composite CN 70.2

Coachmans 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	14.10	7.63%	D	
2	12	Raypol silt loam	10.88	5.88%	C	
3	17	timakwa and natchaug, 0 to 2%	8.20	4.44%	C	
4	29B	agawam fsl, 3 to 8%	44.20	23.91%	B	
5	60B	canton and charlton fsl, 3 to 8%	59.30	32.07%	B	
6	61B	canton and charlton fsl, 0 to 8%	24.80	13.41%	B	
7	61C	canton and charlton fsl, 8% to 15%	9.30	5.03%	C	
8	701A	ninigret fsl, 0 to 3%	14.10	7.63%	A	
Total Drainage Area			**184.9**			

Total A	7.63%
Total B	**69.40%**
Total C	15.35%
Total D	7.63%

*Recommended HSG: B

NRCS TR-55 method

Project	Old County	Checked	DL	Date	11/15/2021
Location	Existing Tc	Checked		Date	

Circle One: Present Developed

Circle One: T_c T_t through subarea

TC1

NOTE: Map showing flow segments is attached.

Sheet Flow						
	Segment ID	AB				
1. Surface description.....		GRASSED				
2. Manning's roughness coeff., n.....		0.15	0.011			
3. Flow length, L (total L ≤ 200 ft).....	ft	300				
4. Two-yr 24-hr rainfall, P_2	in	3.6	3.6			
5. Land slope, s.....	ft/ft	0.033333	0.022			
6. $T_t = (0.007(nL)^{0.8})/(P_2^{0.5})(s^{0.4})$.....	hr	0.30	+	0.00	=	0.30

Shallow Concentrated Flow						
	Segment ID	CD				
7. Surface description.....		UNPAVED				
8. Flow length, L.....	ft	1480				
9. Watercourse slope, s.....	ft/ft	0.002027				
10. Average velocity, V.....	ft/s	1.17				
11. $T_t = L/(3600V)$.....	hr	0.35	+	0.00	=	0.35

Channel Flow						
	Segment ID	DE				
12. Cross sectional flow area, a.....	ft^2	21				
13. Wetted perimeter, P_w	ft	12.485				
14. Hydraulic radius, $r = a/P_w$	ft	1.682				
15. Channel slope, s.....	ft/ft	0.00872				
16. Manning's roughness coeff., n.....		0.04				
17. $V = (1.49r^{2/3}s^{1/2})/n$.....	ft/s	4.92				
18. Flow length, L.....	ft	2867				
19. $T_t = L/(3600V)$.....	hr	0.16	+	0.00	=	0.16
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)..... hr						0.82
					T_c	48.9

NRCS TR-55 method

Project	Coachman	Checked	DL	Date	11/15/2021
Location	Existing Tc	Checked		Date	

Circle One: Present Developed

Circle One: T_c T_t through subarea TC1

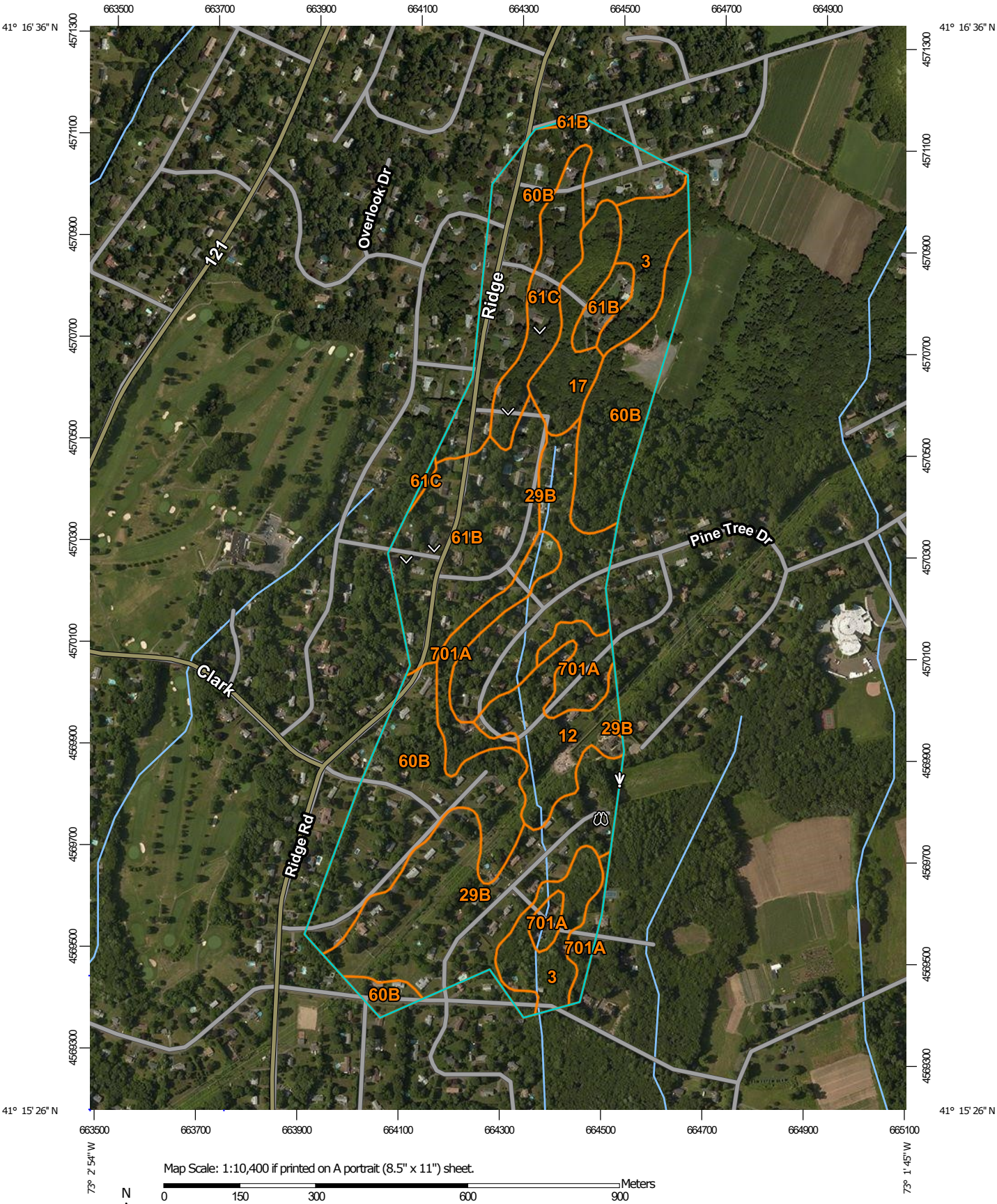
NOTE: Map showing flow segments is attached.

Sheet Flow					
	Segment ID	AB			
1. Surface description.....		GRASSED			
2. Manning's roughness coeff., n.....		0.15	0.011		
3. Flow length, L (total L ≤ 200 ft).....	ft	300			
4. Two-yr 24-hr rainfall, P_2	in	3.6	3.6		
5. Land slope, s.....	ft/ft	0.033333	0.022		
6. $T_t = (0.007(nL)^{0.8})/(P_2^{0.5})(s^{0.4})$.....	hr	0.30	+ 0.00	=	0.30

Shallow Concentrated Flow					
	Segment ID	CD			
7. Surface description.....		UNPAVED			
8. Flow length, L.....	ft	1480			
9. Watercourse slope, s.....	ft/ft	0.002027			
10. Average velocity, V.....	ft/s	1.17			
11. T_t = L/(3600V).....	hr	0.35	+ 0.00	=	0.35

Channel Flow					
	Segment ID	DE			
12. Cross sectional flow area, a.....	ft^2	21			
13. Wetted perimeter, P_w	ft	12.485			
14. Hydraulic radius, r = a/P_w	ft	1.682			
15. Channel slope, s.....	ft/ft	0.007219			
16. Manning's roughness coeff., n.....		0.04			
17. $V = (1.49r^{2/3}s^{1/2})/n$.....	ft/s	4.48			
18. Flow length, L.....	ft	4017			
19. T_t = L/(3600V).....	hr	0.25	+ 0.00	=	0.25
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)..... hr					0.90
				T_c	54.2

Soil Map—State of Connecticut
(Drainage Area to Treat Lane)



Map Scale: 1:10,400 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

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

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: Jun 27, 2014—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	14.1	7.6%
12	Raypol silt loam	10.8	5.8%
17	Timakwa and Natchaug soils, 0 to 2 percent slopes	8.2	4.5%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	44.2	23.9%
60B	Canton and Charlton fine sandy loams, 3 to 8 percent slopes	59.3	32.1%
61B	Canton and Charlton fine sandy loams, 0 to 8 percent slopes, very stony	24.8	13.4%
61C	Canton and Charlton fine sandy loams, 8 to 15 percent slopes, very stony	9.3	5.0%
701A	Ninigret fine sandy loam, 0 to 3 percent slopes	14.1	7.6%
Totals for Area of Interest		**184.9**	**100.0%**

APPENDIX D

HYDRAULIC MODELING DATA AND CALCULATIONS

Old Country Existing
HY-8 Culvert Analysis Report

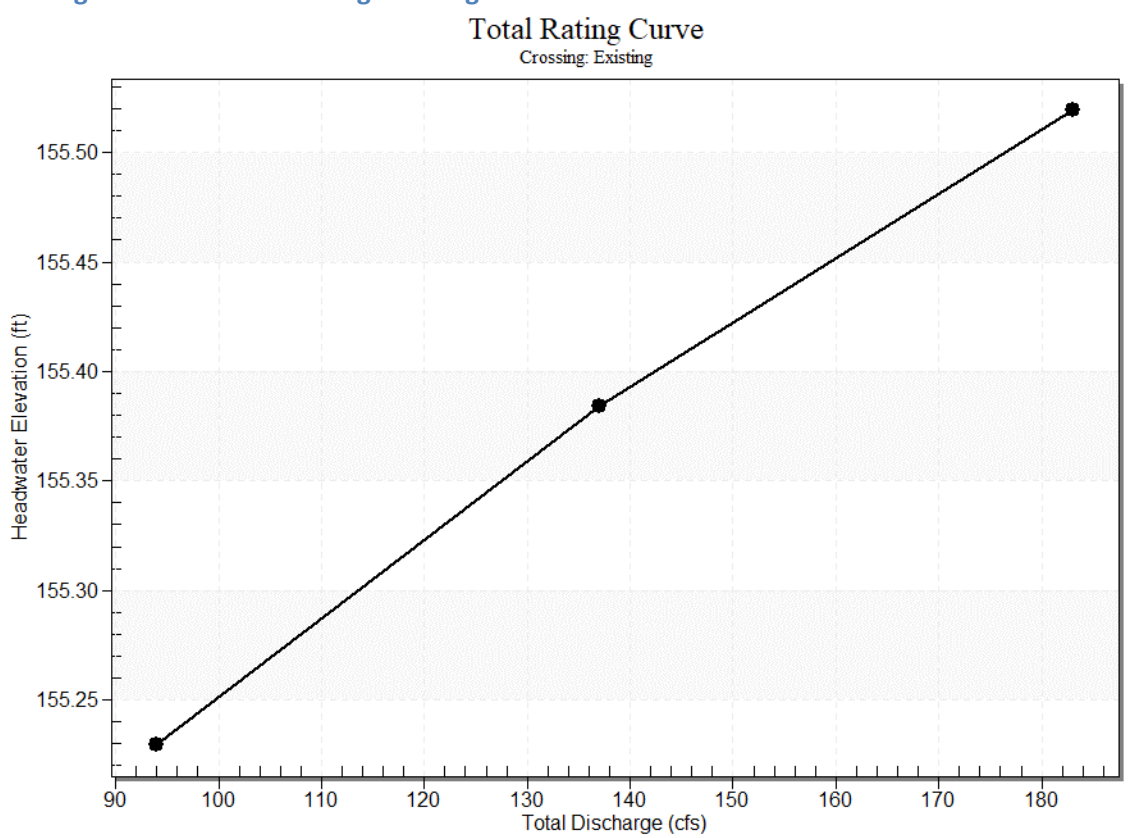
Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Existing

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Existing 1- 24 inch RCP Discharge (cfs)	Existing 2- 24 inch RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
155.23	25 year	94.00	26.12	28.13	39.44	8
155.38	50 year	137.00	24.31	26.18	86.33	4
155.52	100 year	183.00	22.58	24.32	135.83	3
155.00	Overtopping	59.77	28.32	31.45	0.00	Overtopping

Rating Curve Plot for Crossing: Existing



Culvert Data: Existing 1- 24 inch RCP

Table 2 - Culvert Summary Table: Existing 1- 24 inch RCP

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25 year	94.00 cfs	26.12 cfs	155.23	4.07	4.790	4-FFf	-1.00	1.79	2.00	2.31	8.32	4.23
50 year	137.00 cfs	24.31 cfs	155.38	3.71	4.945	4-FFf	-1.00	1.74	2.00	2.78	7.74	4.67
100 year	183.00 cfs	22.58 cfs	155.52	3.38	5.079	4-FFf	-1.00	1.69	2.00	3.19	7.19	5.04

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

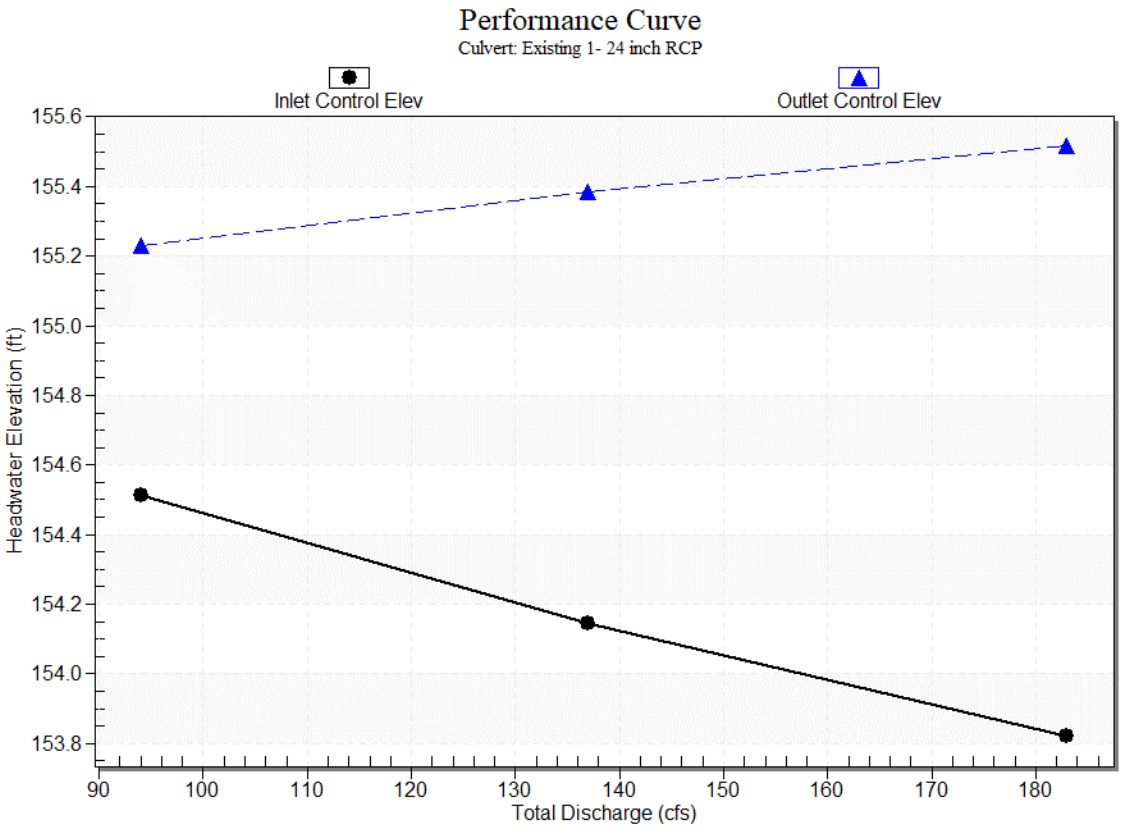
Inlet Elevation (invert): 150.44 ft,

Outlet Elevation (invert): 150.64 ft

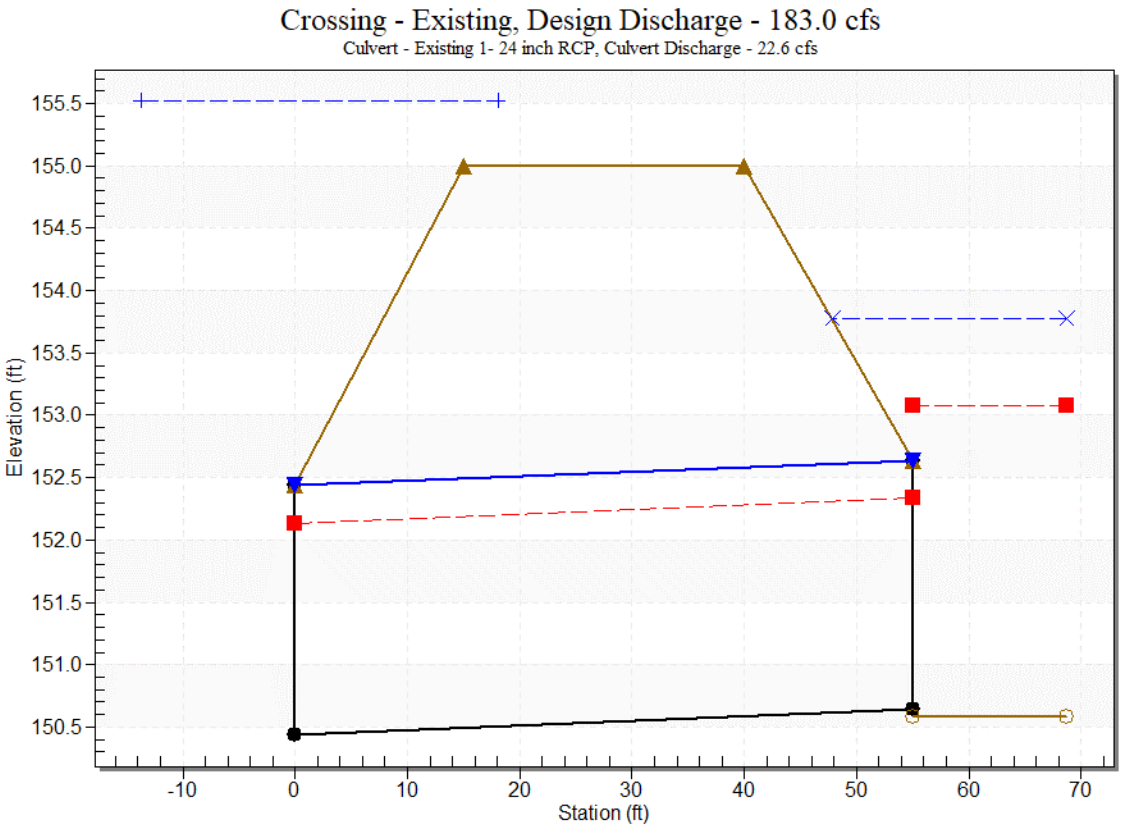
Culvert Length: 55.00 ft,

Culvert Slope: -0.0036

Culvert Performance Curve Plot: Existing 1- 24 inch RCP



Water Surface Profile Plot for Culvert: Existing 1- 24 inch RCP



Site Data - Existing 1- 24 inch RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 150.44 ft

Outlet Station: 55.00 ft

Outlet Elevation: 150.64 ft

Number of Barrels: 1

Culvert Data Summary - Existing 1- 24 inch RCP

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Culvert Data: Existing 2- 24 inch RCP

Table 3 - Culvert Summary Table: Existing 2- 24 inch RCP

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25 year	94.00 cfs	28.13 cfs	155.23	3.92	4.800	4-FFf	-1.00	1.83	2.00	2.31	8.95	4.23
50 year	137.00 cfs	26.18 cfs	155.38	3.58	4.954	4-FFf	-1.00	1.79	2.00	2.78	8.33	4.67
100 year	183.00 cfs	24.32 cfs	155.52	3.27	5.089	4-FFf	-1.00	1.74	2.00	3.19	7.74	5.04

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

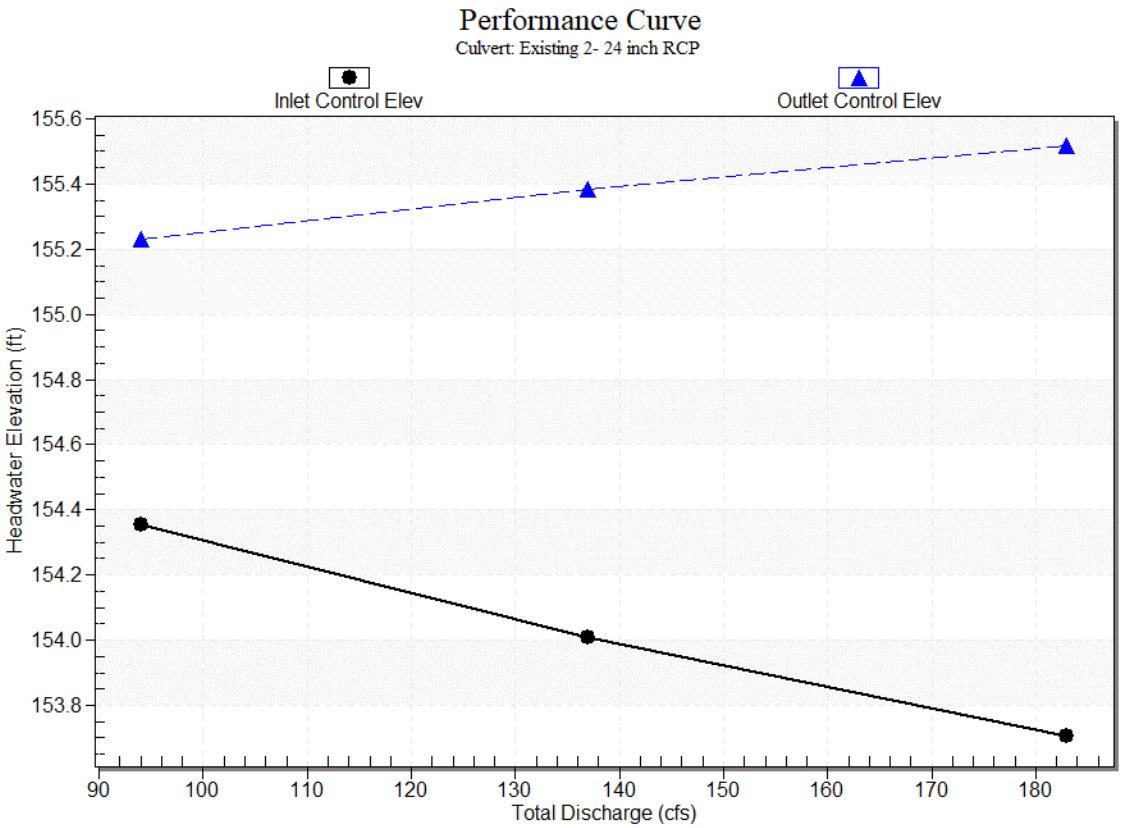
Inlet Elevation (invert): 150.43 ft,

Outlet Elevation (invert): 150.58 ft

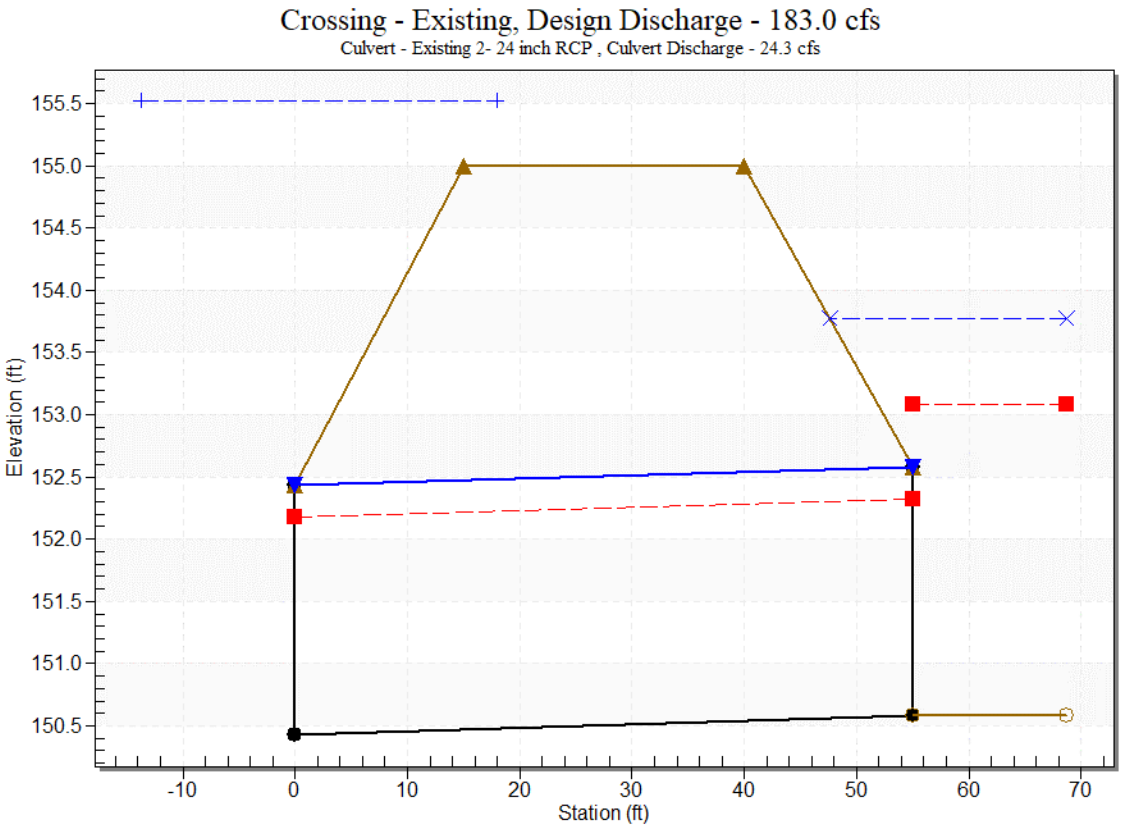
Culvert Length: 55.00 ft,

Culvert Slope: -0.0027

Culvert Performance Curve Plot: Existing 2- 24 inch RCP



Water Surface Profile Plot for Culvert: Existing 2- 24 inch RCP



Site Data - Existing 2- 24 inch RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 150.43 ft

Outlet Station: 55.00 ft

Outlet Elevation: 150.58 ft

Number of Barrels: 1

Culvert Data Summary - Existing 2- 24 inch RCP

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

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
94.00	152.89	2.31	4.23	1.14	0.60
137.00	153.36	2.78	4.67	1.37	0.61
183.00	153.77	3.19	5.04	1.57	0.62

Tailwater Channel Data - Existing

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 5.00 ft

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

Channel Slope: 0.0079

Channel Manning's n: 0.0400

Channel Invert Elevation: 150.58 ft

Roadway Data for Crossing: Existing

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 120.00 ft

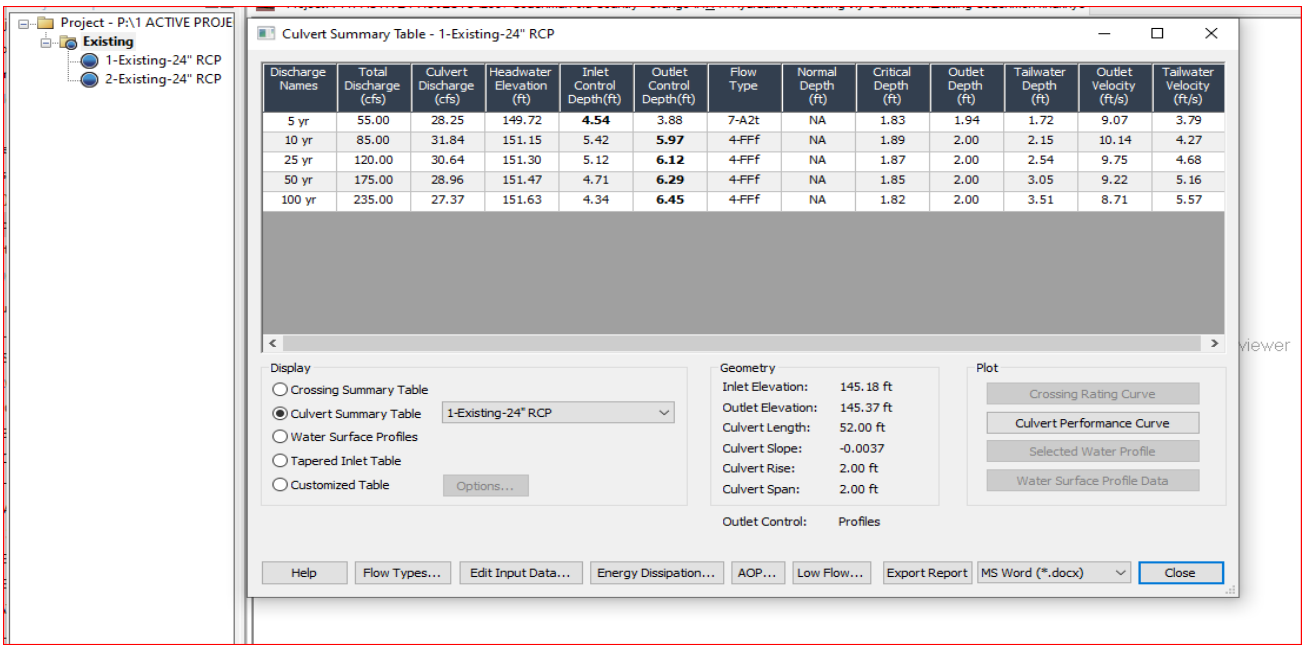
Crest Elevation: 155.00 ft

Roadway Surface: Paved

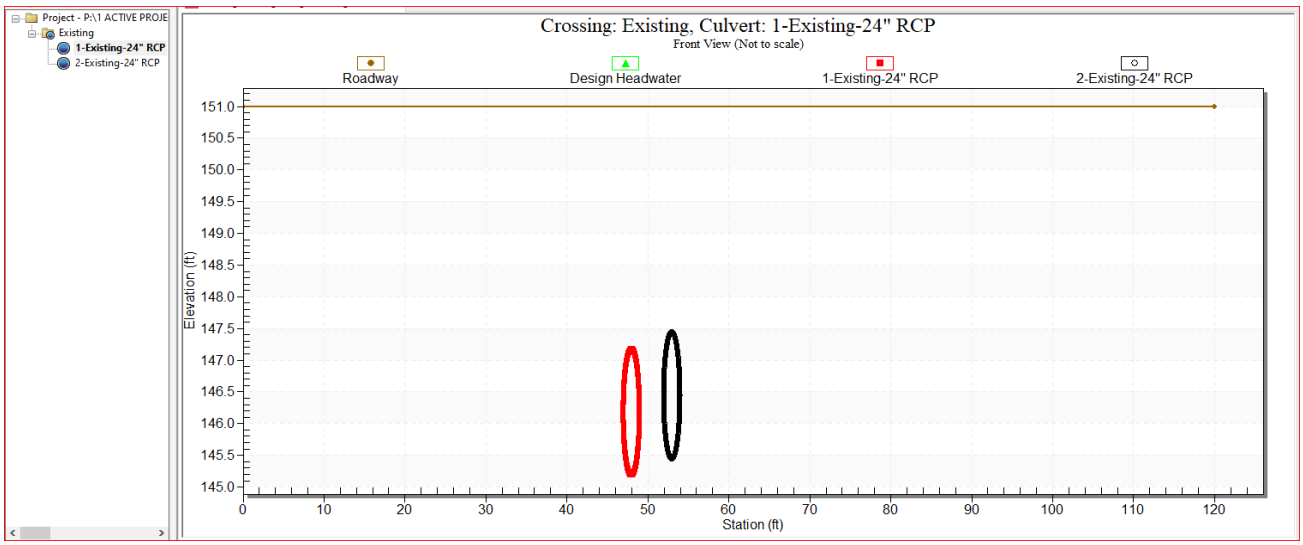
Roadway Top Width: 25.00 ft

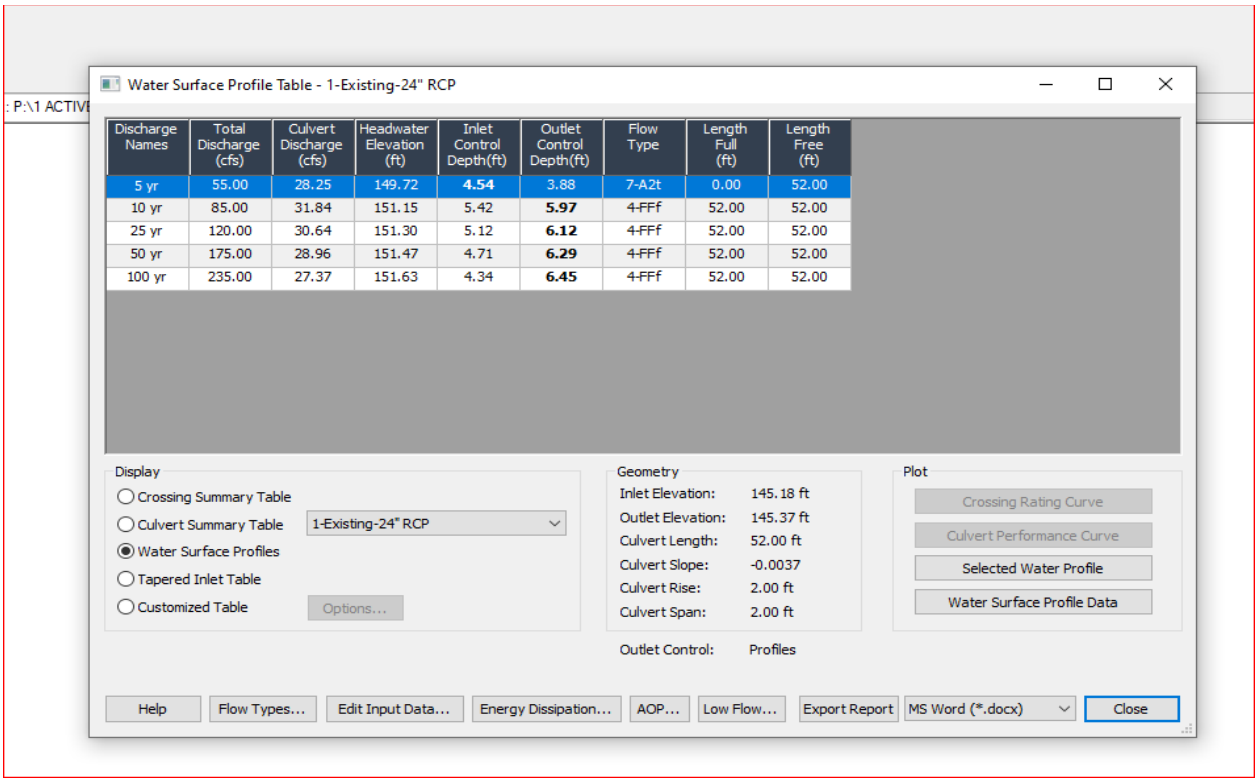
Coachmans Existing

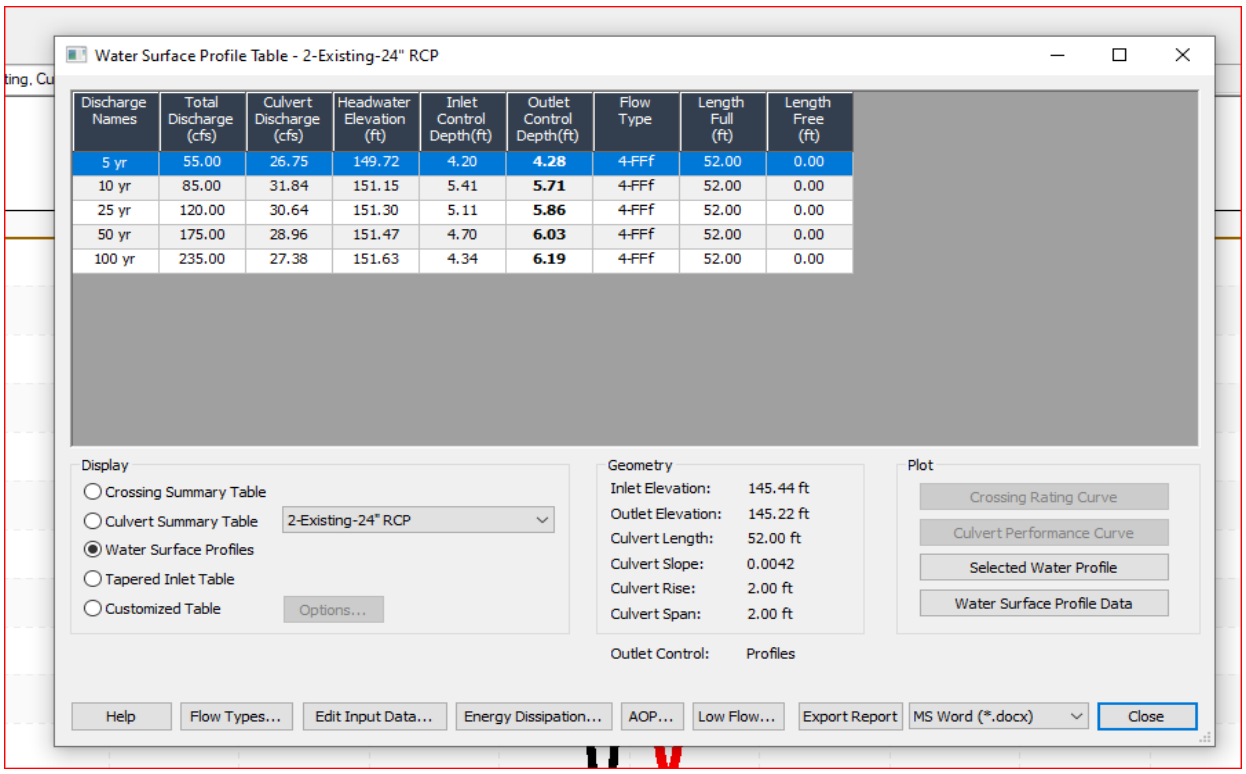
Crossing Summary Table



Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth(ft)	Outlet Control Depth(ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 yr	55.00	28.25	149.72	**4.54**	3.88	7-A2t	NA	1.83	1.94	1.72	9.07	3.79
10 yr	85.00	31.84	151.15	5.42	**5.97**	4-FFf	NA	1.89	2.00	2.15	10.14	4.27
25 yr	120.00	30.64	151.30	5.12	**6.12**	4-FFf	NA	1.87	2.00	2.54	9.75	4.68
50 yr	175.00	28.96	151.47	4.71	**6.29**	4-FFf	NA	1.85	2.00	3.05	9.22	5.16
100 yr	235.00	27.37	151.63	4.34	**6.45**	4-FFf	NA	1.82	2.00	3.51	8.71	5.57




Water Surface Profile Table - 1-Existing-24" RCP
Discharge Names | Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Inlet Control Depth(ft) | Outlet Control Depth(ft) | Flow Type | Length Full (ft) | Length Free (ft)
5 yr | 55.00 | 28.25 | 149.72 | 4.54 | 3.88 | 7-A2t | 0.00 | 52.00
10 yr | 85.00 | 31.84 | 151.15 | 5.42 | 5.97 | 4-FFf | 52.00 | 52.00
25 yr | 120.00 | 30.64 | 151.30 | 5.12 | 6.12 | 4-FFf | 52.00 | 52.00
50 yr | 175.00 | 28.96 | 151.47 | 4.71 | 6.29 | 4-FFf | 52.00 | 52.00
100 yr | 235.00 | 27.37 | 151.63 | 4.34 | 6.45 | 4-FFf | 52.00 | 52.00
Display
Crossing Summary Table
Culvert Summary Table
1-Existing-24" RCP
Water Surface Profiles
Tapered Inlet Table
Customized Table
Options...
Geometry
Inlet Elevation: 145.18 ft
Outlet Elevation: 145.37 ft
Culvert Length: 52.00 ft
Culvert Slope: -0.0037
Culvert Rise: 2.00 ft
Culvert Span: 2.00 ft
Outlet Control: Profiles
Plot
Crossing Rating Curve
Culvert Performance Curve
Selected Water Profile
Water Surface Profile Data
Help
Flow Types...
Edit Input Data...
Energy Dissipation...
AOP...
Low Flow...
Export Report
MS Word (*.docx)
Close


Water Surface Profile Table - 2-Existing-24" RCP
Discharge Names | Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Inlet Control Depth(ft) | Outlet Control Depth(ft) | Flow Type | Length Full (ft) | Length Free (ft)
5 yr | 55.00 | 26.75 | 149.72 | 4.20 | 4.28 | 4-FFf | 52.00 | 0.00
10 yr | 85.00 | 31.84 | 151.15 | 5.41 | 5.71 | 4-FFf | 52.00 | 0.00
25 yr | 120.00 | 30.64 | 151.30 | 5.11 | 5.86 | 4-FFf | 52.00 | 0.00
50 yr | 175.00 | 28.96 | 151.47 | 4.70 | 6.03 | 4-FFf | 52.00 | 0.00
100 yr | 235.00 | 27.38 | 151.63 | 4.34 | 6.19 | 4-FFf | 52.00 | 0.00
Display
Crossing Summary Table
Culvert Summary Table
2-Existing-24" RCP
Water Surface Profiles
Tapered Inlet Table
Customized Table
Options...
Geometry
Inlet Elevation: 145.44 ft
Outlet Elevation: 145.22 ft
Culvert Length: 52.00 ft
Culvert Slope: 0.0042
Culvert Rise: 2.00 ft
Culvert Span: 2.00 ft
Outlet Control: Profiles
Plot
Crossing Rating Curve
Culvert Performance Curve
Selected Water Profile
Water Surface Profile Data
Help
Flow Types...
Edit Input Data...
Energy Dissipation...
AOP...
Low Flow...
Export Report
MS Word (*.docx)
Close

Old Country Proposed 12x3 box
HY-8 Culvert Analysis Report

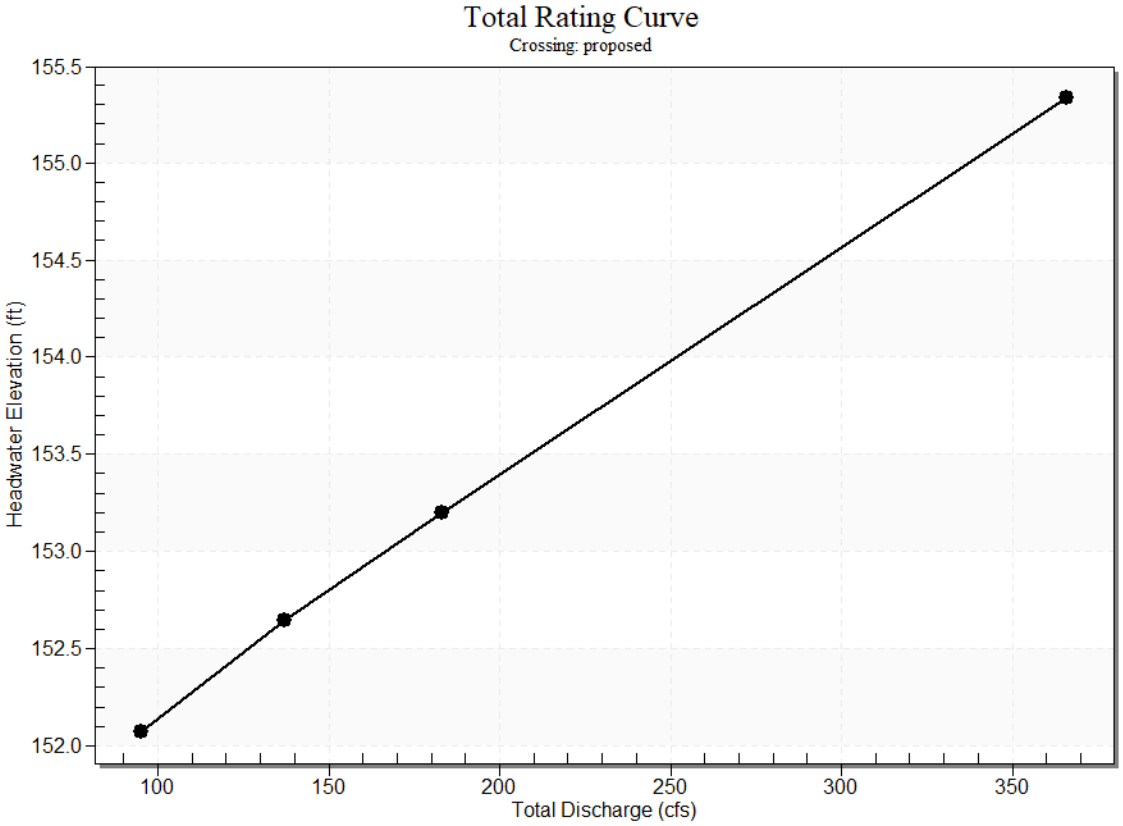
Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: proposed

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	proposed Discharge (cfs)	Roadway Discharge (cfs)	Iterations
152.07	25 yr	95.00	95.00	0.00	1
152.64	50 yr	137.00	137.00	0.00	1
153.20	100 yr	183.00	183.00	0.00	1
155.00	Overtopping	304.11	304.11	0.00	Overtopping

Rating Curve Plot for Crossing: proposed



Culvert Data: proposed

Table 2 - Culvert Summary Table: proposed

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25 yr	95.00 cfs	95.00 cfs	152.07	1.92	2.073	1-S1t	1.11	1.25	1.88	1.88	4.22	4.27
50 yr	137.00 cfs	137.00 cfs	152.64	2.48	2.643	1-S1t	1.40	1.59	2.32	2.32	4.91	4.78
100 yr	183.00 cfs	183.00 cfs	153.20	3.07	3.196	1-S1t	1.69	1.93	2.75	2.75	5.55	5.22

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

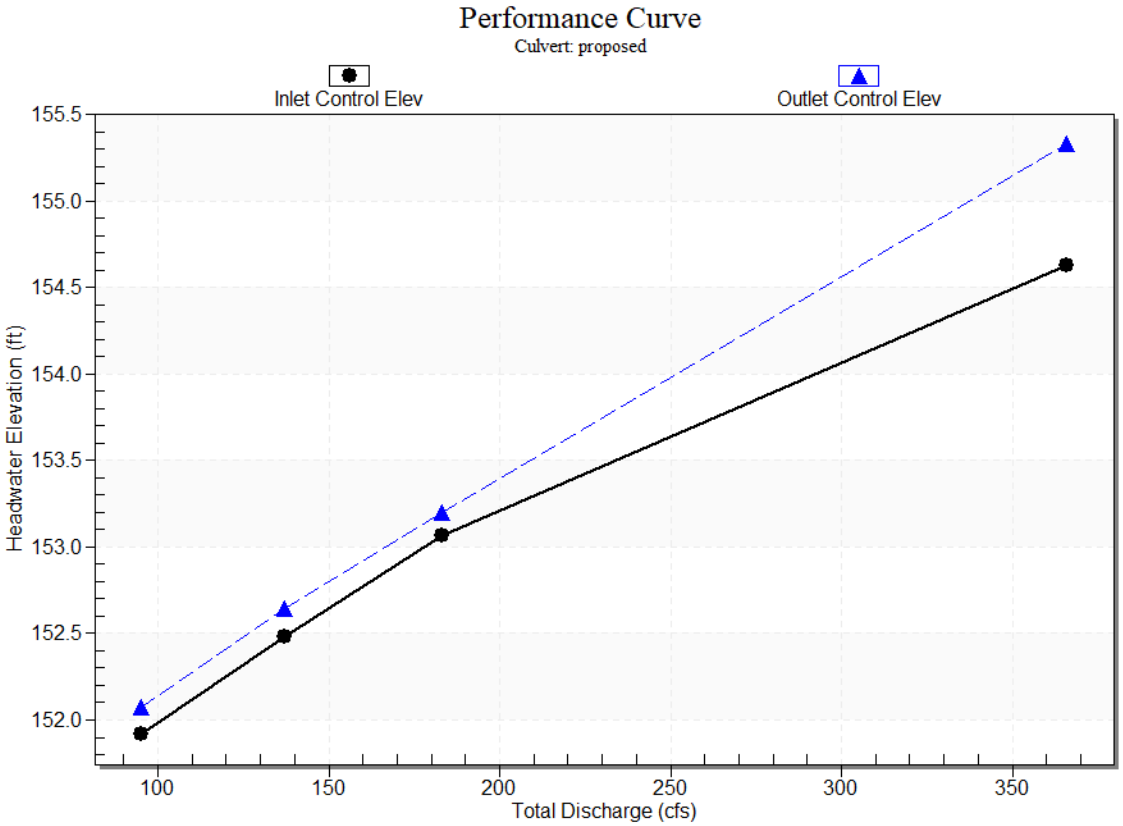
Inlet Elevation (invert): 150.00 ft,

Outlet Elevation (invert): 149.80 ft

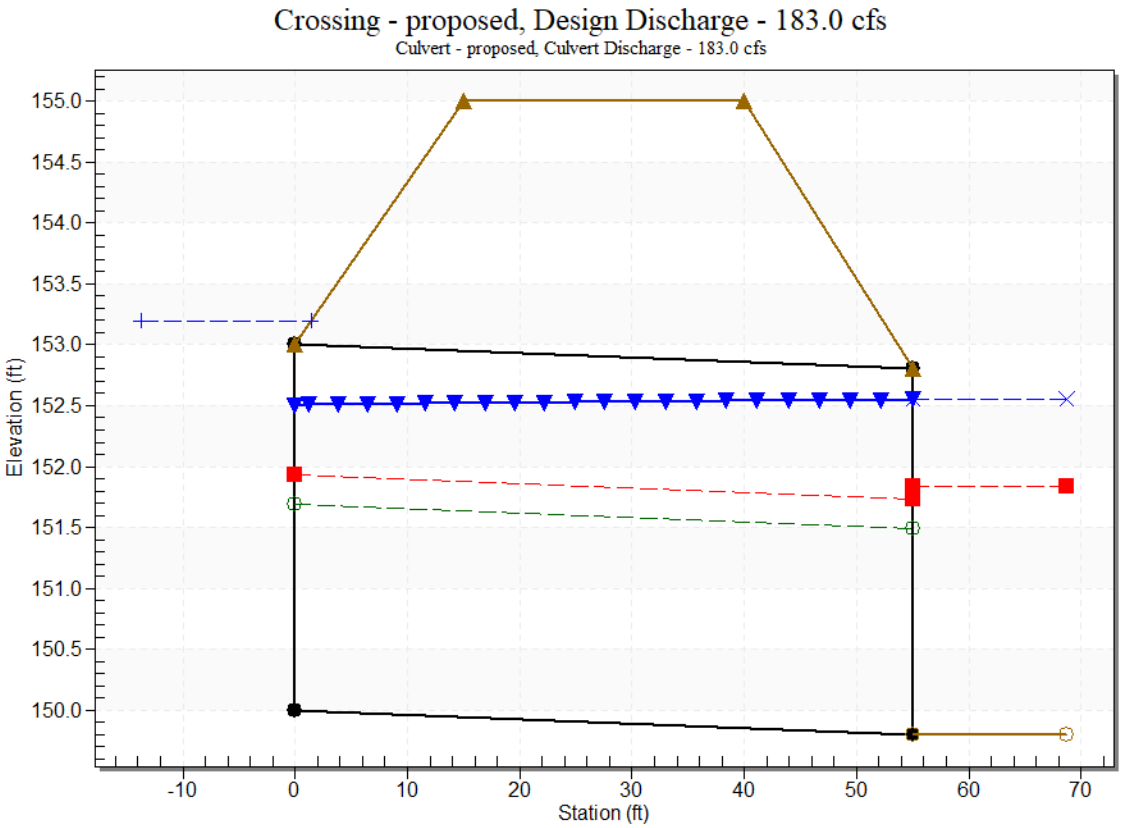
Culvert Length: 55.00 ft,

Culvert Slope: 0.0036

Culvert Performance Curve Plot: proposed



Water Surface Profile Plot for Culvert: proposed



Site Data - proposed

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 150.00 ft

Outlet Station: 55.00 ft

Outlet Elevation: 149.80 ft

Number of Barrels: 1

Culvert Data Summary - proposed

Barrel Shape: Concrete Box

Barrel Span: 12.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel (45º 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
95.00	151.68	1.88	4.27	0.94	0.59
137.00	152.12	2.32	4.78	1.16	0.60
183.00	152.55	2.75	5.22	1.37	0.61

Tailwater Channel Data - proposed

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 1.00 (_:1)

Channel Slope: 0.0080

Channel Manning's n: 0.0400

Channel Invert Elevation: 149.80 ft

Roadway Data for Crossing: proposed

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 120.00 ft

Crest Elevation: 155.00 ft

Roadway Surface: Paved

Roadway Top Width: 25.00 ft

Old Country 36” Twin
HY-8 Culvert Analysis Report

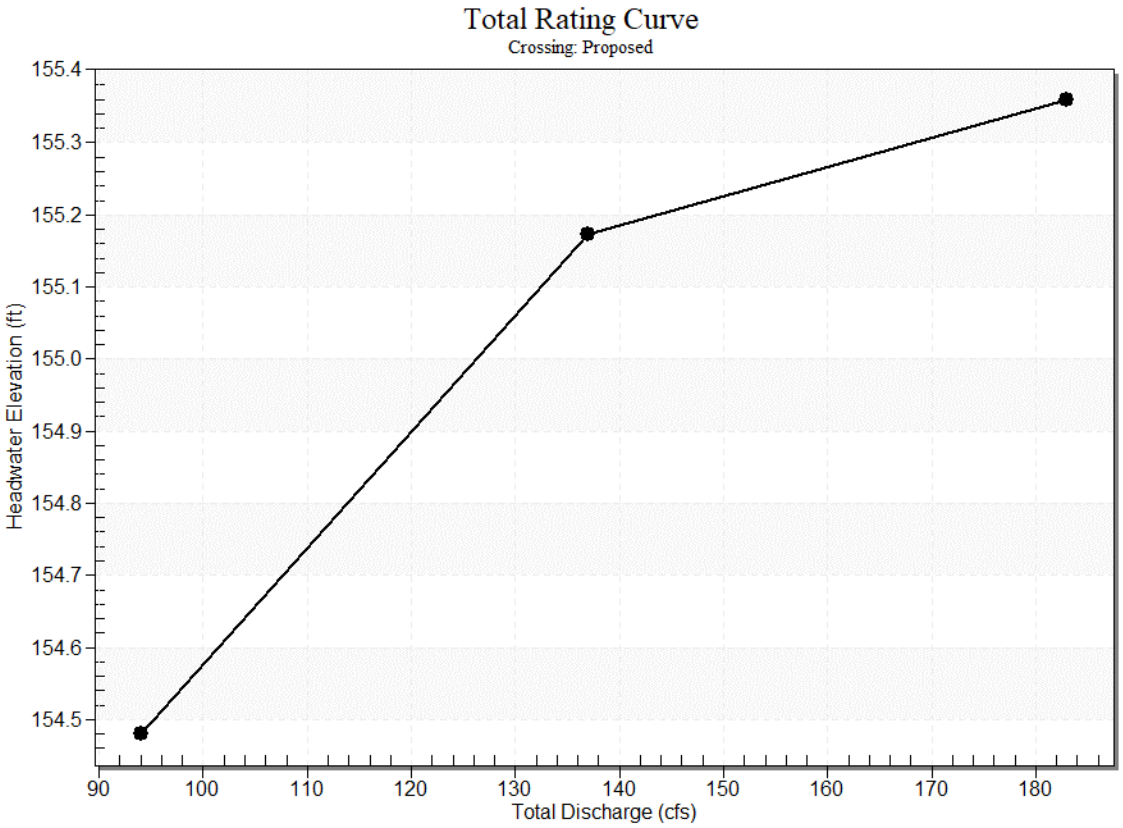
Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Proposed

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Proposed twin 36 HDPE Discharge (cfs)	Roadway Discharge (cfs)	Iterations
154.48	25 year	94.00	94.00	0.00	1
155.17	50 year	137.00	111.12	25.77	8
155.36	100 year	183.00	105.48	77.18	4
155.00	Overtopping	109.07	109.07	0.00	Overtopping

Rating Curve Plot for Crossing: Proposed



Culvert Data: Proposed twin 36 HDPE

Table 2 - Culvert Summary Table: Proposed twin 36 HDPE

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25 year	94.00 cfs	94.00 cfs	154.48	3.78	3.881	3-M2t	3.00	2.23	2.31	2.31	8.05	4.23
50 year	137.00 cfs	111.12 cfs	155.17	4.45	4.574	7-M2t	3.00	2.42	2.78	2.78	8.13	4.67
100 year	183.00 cfs	105.48 cfs	155.36	4.22	4.759	4-FFf	3.00	2.36	3.00	3.19	7.46	5.04

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

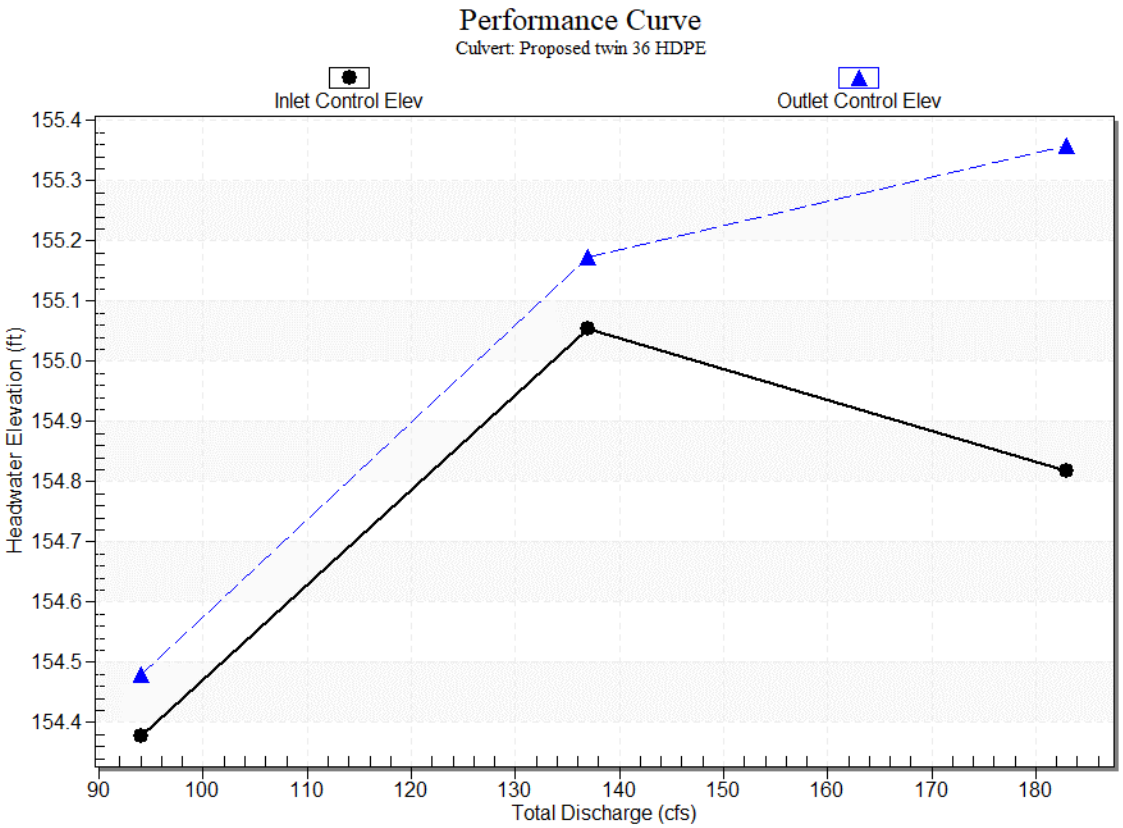
Inlet Elevation (invert): 150.60 ft,

Outlet Elevation (invert): 150.58 ft

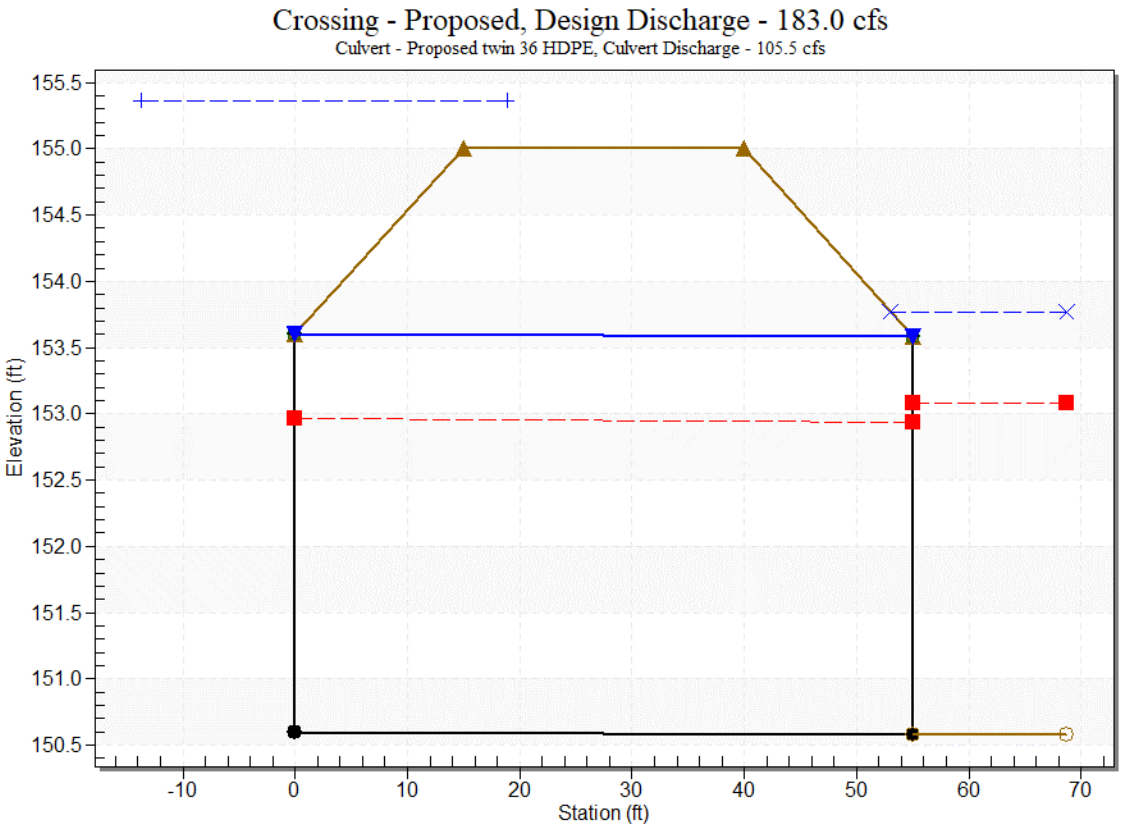
Culvert Length: 55.00 ft,

Culvert Slope: 0.0004

Culvert Performance Curve Plot: Proposed twin 36 HDPE



Water Surface Profile Plot for Culvert: Proposed twin 36 HDPE



Site Data - Proposed twin 36 HDPE

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 150.60 ft

Outlet Station: 55.00 ft

Outlet Elevation: 150.58 ft

Number of Barrels: 2

Culvert Data Summary - Proposed twin 36 HDPE

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

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
94.00	152.89	2.31	4.23	1.14	0.60
137.00	153.36	2.78	4.67	1.37	0.61
183.00	153.77	3.19	5.04	1.57	0.62

Tailwater Channel Data - Proposed

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 5.00 ft

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

Channel Slope: 0.0079

Channel Manning's n: 0.0400

Channel Invert Elevation: 150.58 ft

Roadway Data for Crossing: Proposed

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 120.00 ft

Crest Elevation: 155.00 ft

Roadway Surface: Paved

Roadway Top Width: 25.00 ft

Proposed 9x4 Box Culvert
HY-8 Culvert Analysis Report

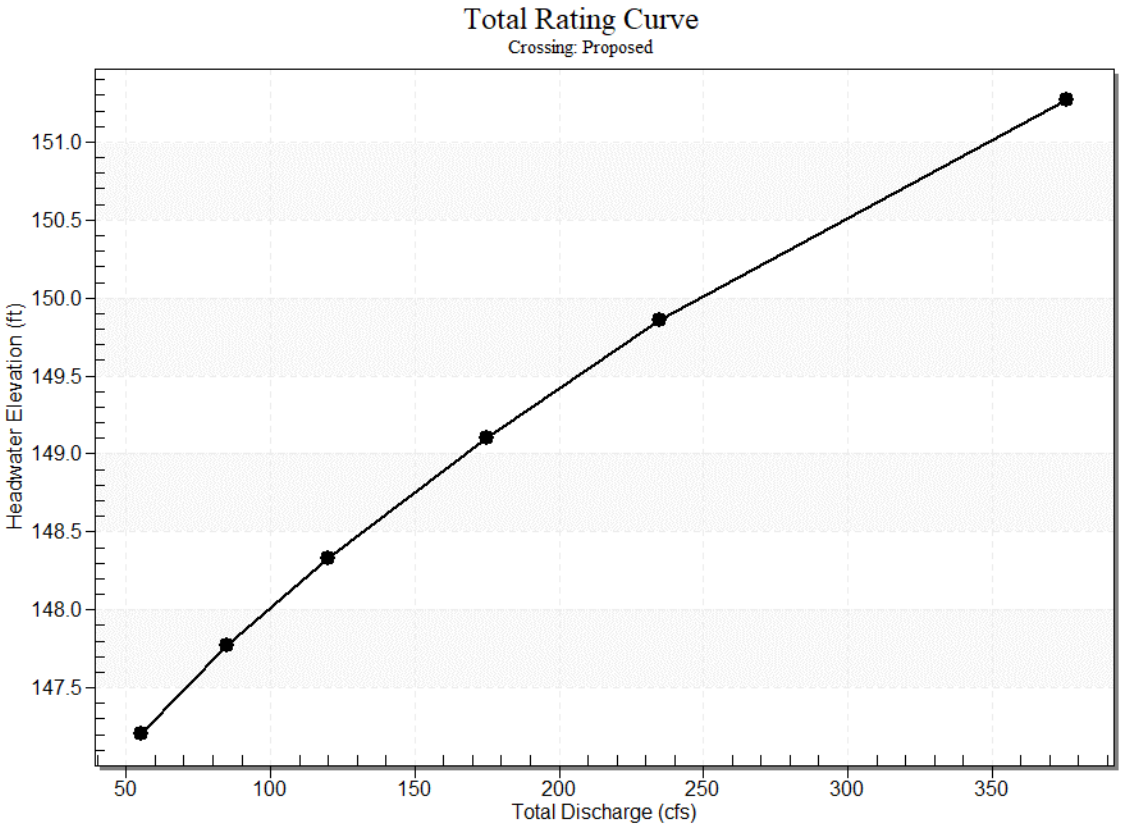
Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Proposed

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Proposed Discharge (cfs)	Roadway Discharge (cfs)	Iterations
147.21	5 yr	55.00	55.00	0.00	1
147.77	10 yr	85.00	85.00	0.00	1
148.33	25 yr	120.00	120.00	0.00	1
149.10	50 yr	175.00	175.00	0.00	1
149.85	100 yr	235.00	235.00	0.00	1
151.00	Overtopping	309.78	309.78	0.00	Overtopping

Rating Curve Plot for Crossing: Proposed



Culvert Data: Proposed

Table 2 - Culvert Summary Table: Proposed

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 yr	55.00 cfs	55.00 cfs	147.21	1.60	1.807	1-S1t	0.94	1.05	1.72	1.72	3.55	3.79
10 yr	85.00 cfs	85.00 cfs	147.77	2.14	2.369	1-S1t	1.25	1.40	2.15	2.15	4.40	4.27
25 yr	120.00 cfs	120.00 cfs	148.33	2.72	2.931	1-S1t	1.57	1.77	2.54	2.54	5.24	4.68
50 yr	175.00 cfs	175.00 cfs	149.10	3.55	3.702	1-S1t	2.02	2.27	3.05	3.05	6.37	5.16
100 yr	235.00 cfs	235.00 cfs	149.85	4.44	4.454	1-S1t	2.48	2.77	3.51	3.51	7.44	5.57

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

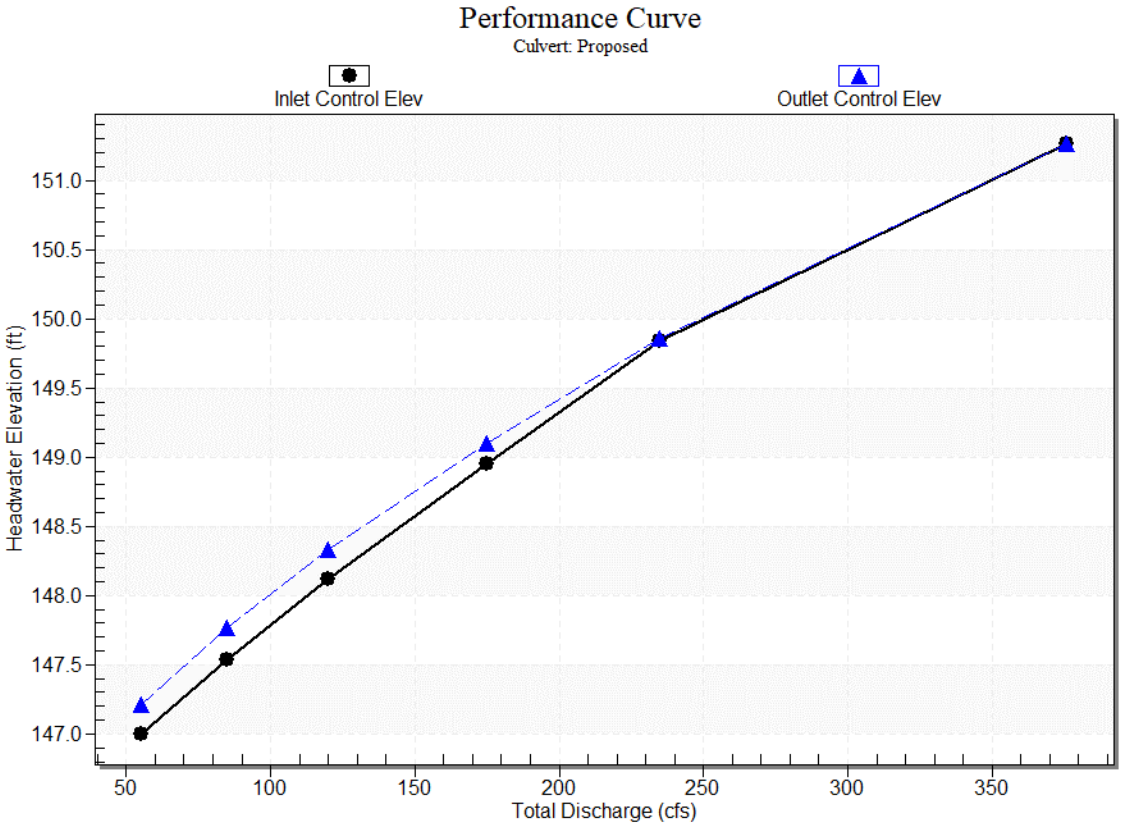
Inlet Elevation (invert): 145.40 ft,

Outlet Elevation (invert): 145.20 ft

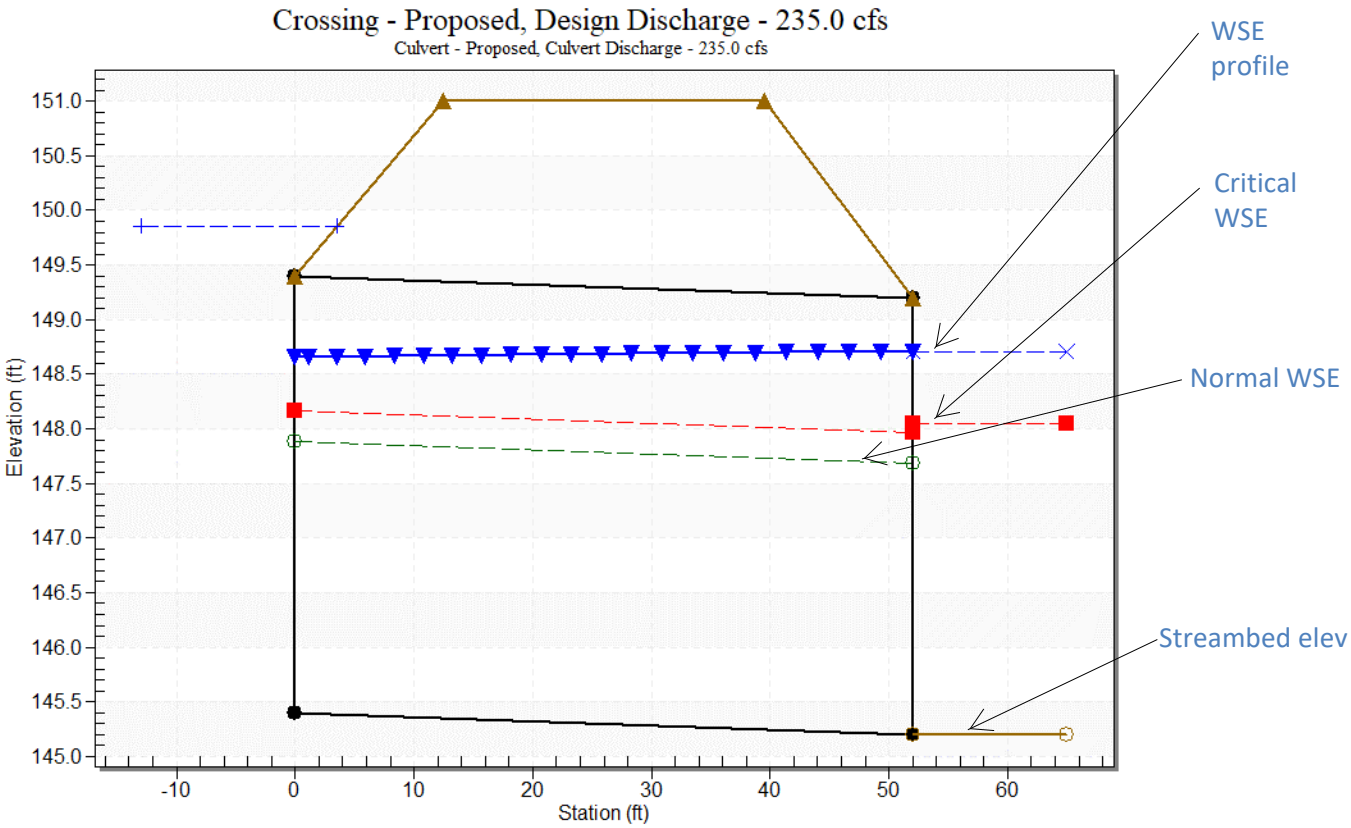
Culvert Length: 52.00 ft,

Culvert Slope: 0.0038

Culvert Performance Curve Plot: Proposed



Water Surface Profile Plot for Culvert: Proposed



Site Data - Proposed

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 145.40 ft

Outlet Station: 52.00 ft

Outlet Elevation: 145.20 ft

Number of Barrels: 1

Culvert Data Summary - Proposed

Barrel Shape: Concrete Box

Barrel Span: 9.00 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 (45º flare) Wingwall (Ke=0.2)

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
55.00	146.92	1.72	3.79	0.93	0.60
85.00	147.35	2.15	4.27	1.16	0.62
120.00	147.74	2.54	4.68	1.38	0.63
175.00	148.25	3.05	5.16	1.66	0.65
235.00	148.71	3.51	5.57	1.91	0.66

Tailwater Channel Data - Proposed

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 5.00 ft

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

Channel Slope: 0.0087

Channel Manning's n: 0.0400

Channel Invert Elevation: 145.20 ft

Roadway Data for Crossing: Proposed

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 120.00 ft

Crest Elevation: 151.00 ft

Roadway Surface: Paved

Roadway Top Width: 27.00 ft

Coachmans 36” Twin
HY-8 Culvert Analysis Report

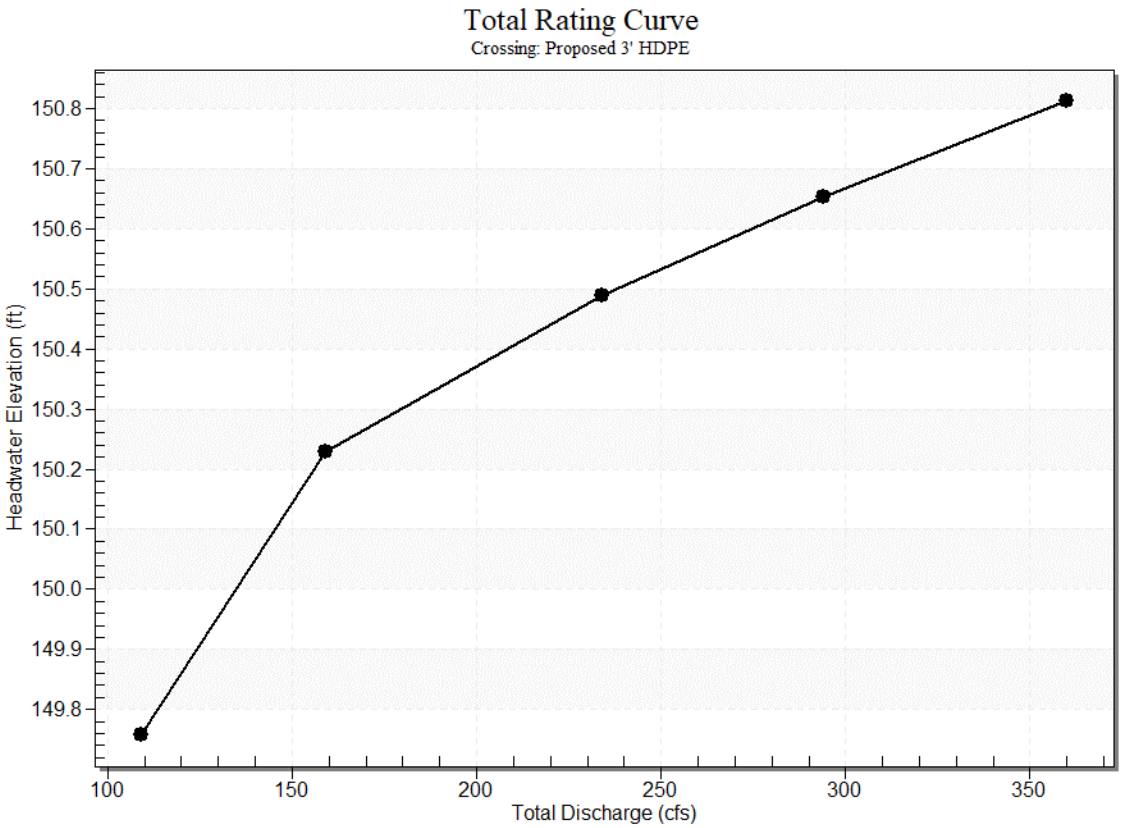
Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Proposed 3' HDPE

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Proposed 3' HDPE Coachmans Discharge (cfs)	Roadway Discharge (cfs)	Iterations
149.76	2-year NRCS	109.00	109.00	0.00	1
150.23	10-year NRCS	159.00	119.60	39.05	7
150.49	25-year NRCS	234.00	109.60	124.24	5
150.65	50-year NRCS	294.00	101.69	192.14	4
150.81	100-year NRCS	360.00	93.48	266.49	4
150.00	Overtopping	114.58	114.58	0.00	Overtopping

Rating Curve Plot for Crossing: Proposed 3' HDPE



Culvert Data: Proposed 3' HDPE Coachmans

Table 2 - Culvert Summary Table: Proposed 3' HDPE Coachmans

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2-year NRCS	109.00 cfs	109.00 cfs	149.76	4.36	4.251	3-M2t	3.00	2.40	2.48	2.48	8.73	4.42
10-year NRCS	159.00 cfs	119.60 cfs	150.23	4.83	4.818	7-M2t	3.00	2.50	3.00	2.98	8.47	4.88
25-year NRCS	234.00 cfs	109.60 cfs	150.49	4.38	5.089	4-FFf	3.00	2.40	3.00	3.57	7.75	5.39
50-year NRCS	294.00 cfs	101.69 cfs	150.65	4.06	5.253	4-FFf	3.00	2.32	3.00	3.97	7.19	5.72

100-year NRCS	360.00 cfs	93.48 cfs	150.81	3.75	5.412	4-FFf	3.00	2.23	3.00	4.36	6.61	6.02

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

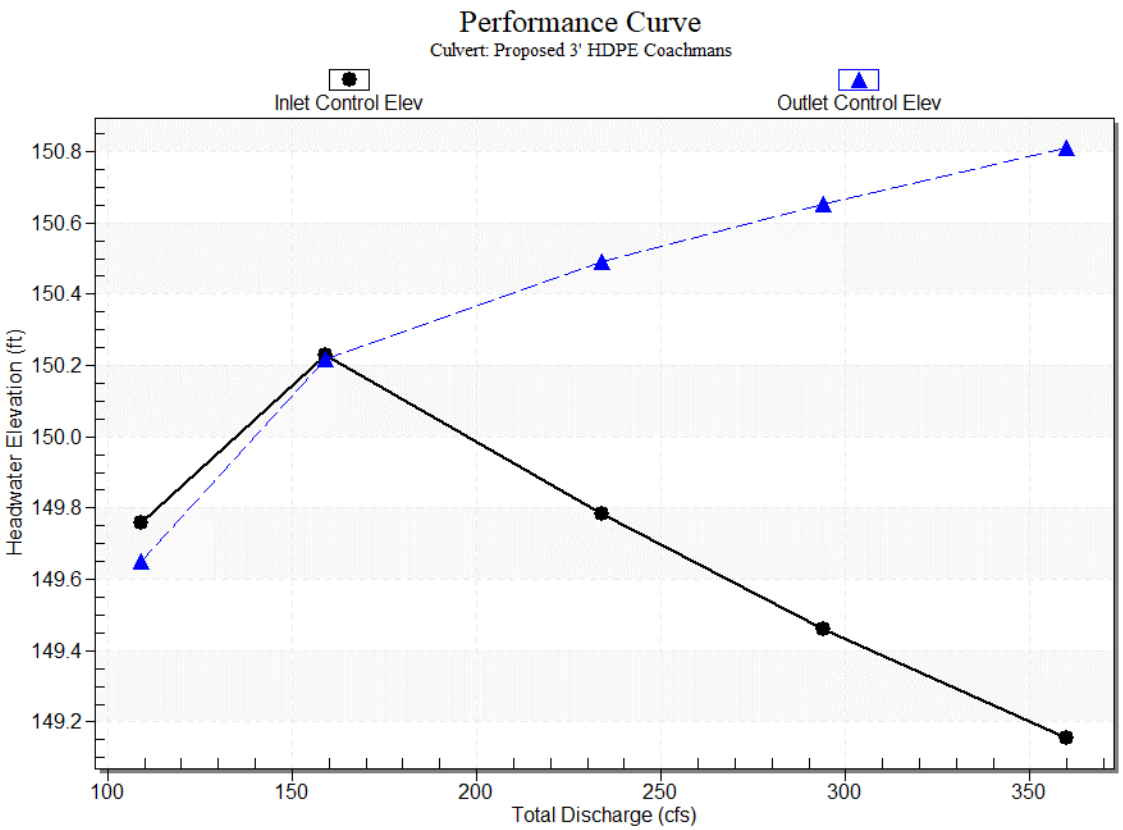
Inlet Elevation (invert): 145.40 ft,

Outlet Elevation (invert): 145.22 ft

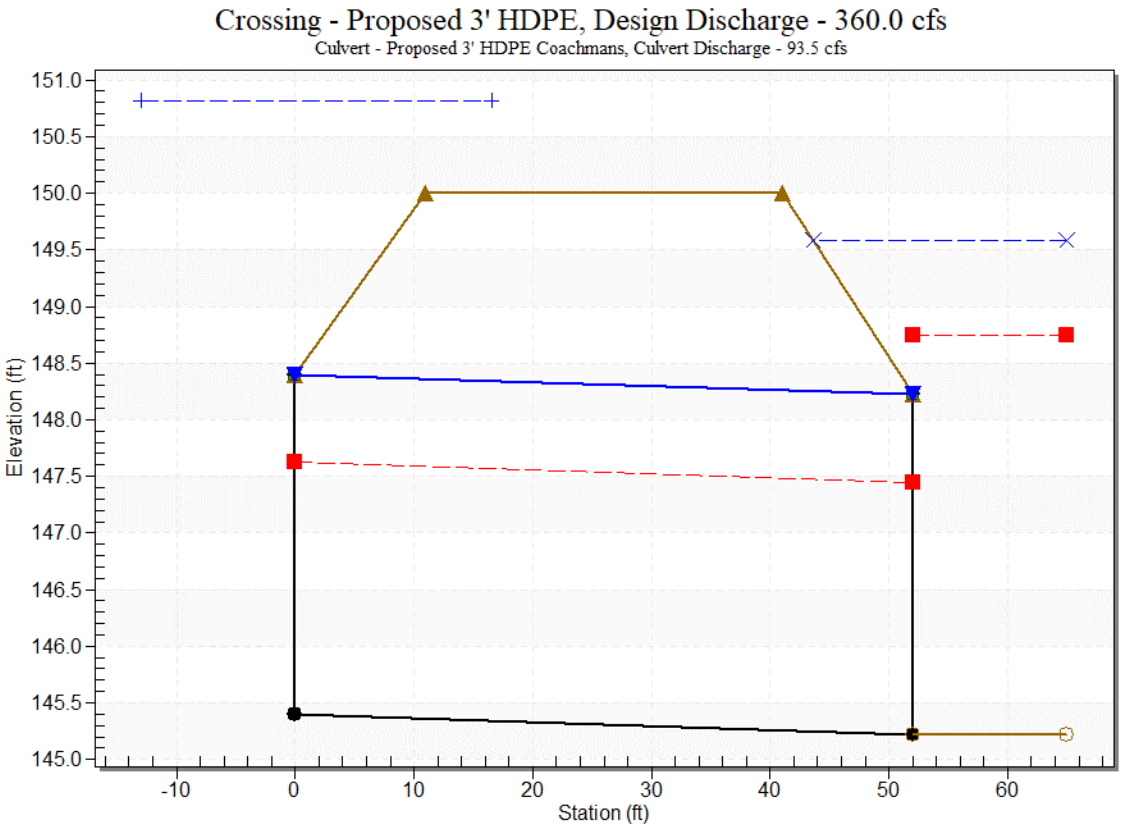
Culvert Length: 52.00 ft,

Culvert Slope: 0.0035

Culvert Performance Curve Plot: Proposed 3' HDPE Coachmans



Water Surface Profile Plot for Culvert: Proposed 3' HDPE Coachmans



Site Data - Proposed 3' HDPE Coachmans

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 145.40 ft

Outlet Station: 52.00 ft

Outlet Elevation: 145.22 ft

Number of Barrels: 2

Culvert Data Summary - Proposed 3' HDPE Coachmans

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: Proposed 3' HDPE

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

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
109.00	147.70	2.48	4.42	1.24	0.61
159.00	148.20	2.98	4.88	1.49	0.62
234.00	148.79	3.57	5.39	1.78	0.63
294.00	149.19	3.97	5.72	1.98	0.64
360.00	149.58	4.36	6.02	2.18	0.65

Tailwater Channel Data - Proposed 3' HDPE

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 5.00 ft

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

Channel Slope: 0.0080

Channel Manning's n: 0.0400

Channel Invert Elevation: 145.22 ft

Roadway Data for Crossing: Proposed 3' HDPE

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 120.00 ft

Crest Elevation: 150.00 ft

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

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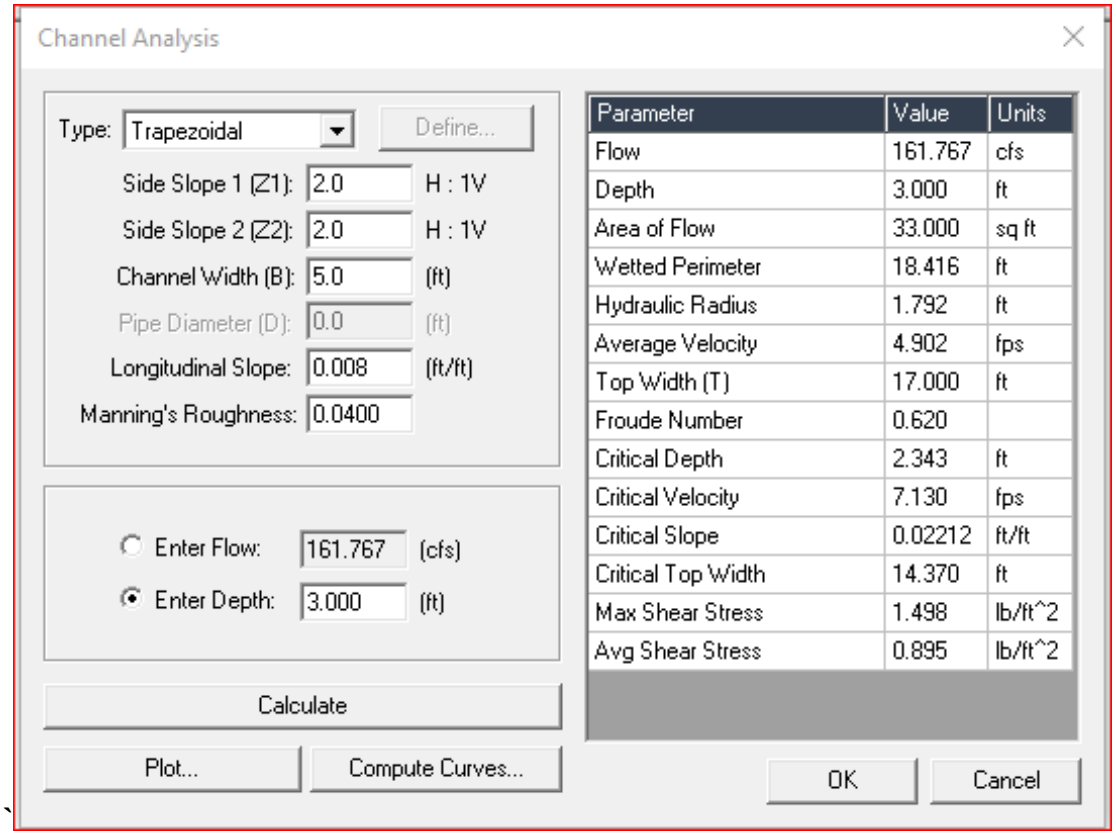
ENGINEERING ASSOCIATES

Channel Capacity Analysis

Hydraulic Toolbox-Old Country Existing



Parameter	Value	Units
Flow	161.767	cfs
Depth	3.000	ft
Area of Flow	33.000	sq ft
Wetted Perimeter	18.416	ft
Hydraulic Radius	1.792	ft
Average Velocity	4.902	fps
Top Width (T)	17.000	ft
Froude Number	0.620	
Critical Depth	2.343	ft
Critical Velocity	7.130	fps
Critical Slope	0.02212	ft/ft
Critical Top Width	14.370	ft
Max Shear Stress	1.498	lb/ft^2
Avg Shear Stress	0.895	lb/ft^2

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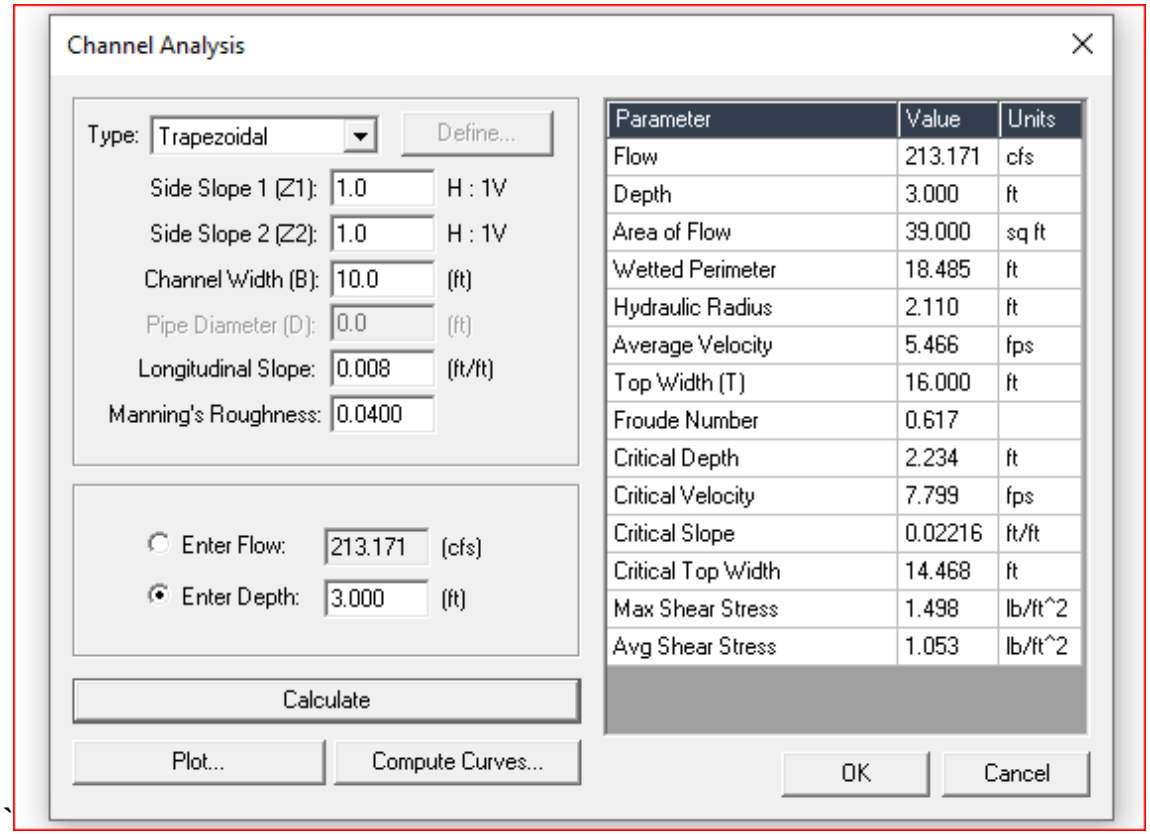
ENGINEERING ASSOCIATES

Hydraulic Toolbox-Old Country Proposed

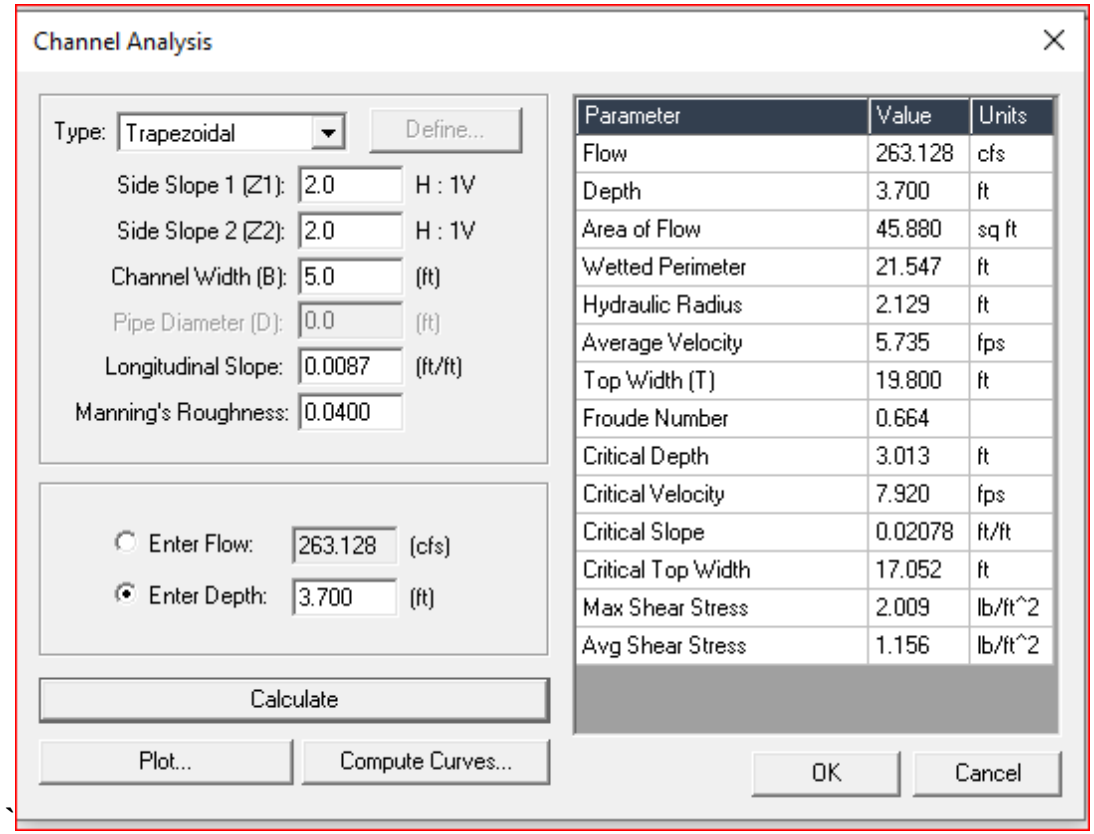


Parameter	Value	Units
Flow	213.171	cfs
Depth	3.000	ft
Area of Flow	39.000	sq ft
Wetted Perimeter	18.485	ft
Hydraulic Radius	2.110	ft
Average Velocity	5.466	fps
Top Width (T)	16.000	ft
Froude Number	0.617	
Critical Depth	2.234	ft
Critical Velocity	7.799	fps
Critical Slope	0.02216	ft/ft
Critical Top Width	14.468	ft
Max Shear Stress	1.498	lb/ft^2
Avg Shear Stress	1.053	lb/ft^2

CARDINAL
ENGINEERING ASSOCIATES

Channel Capacity Analysis

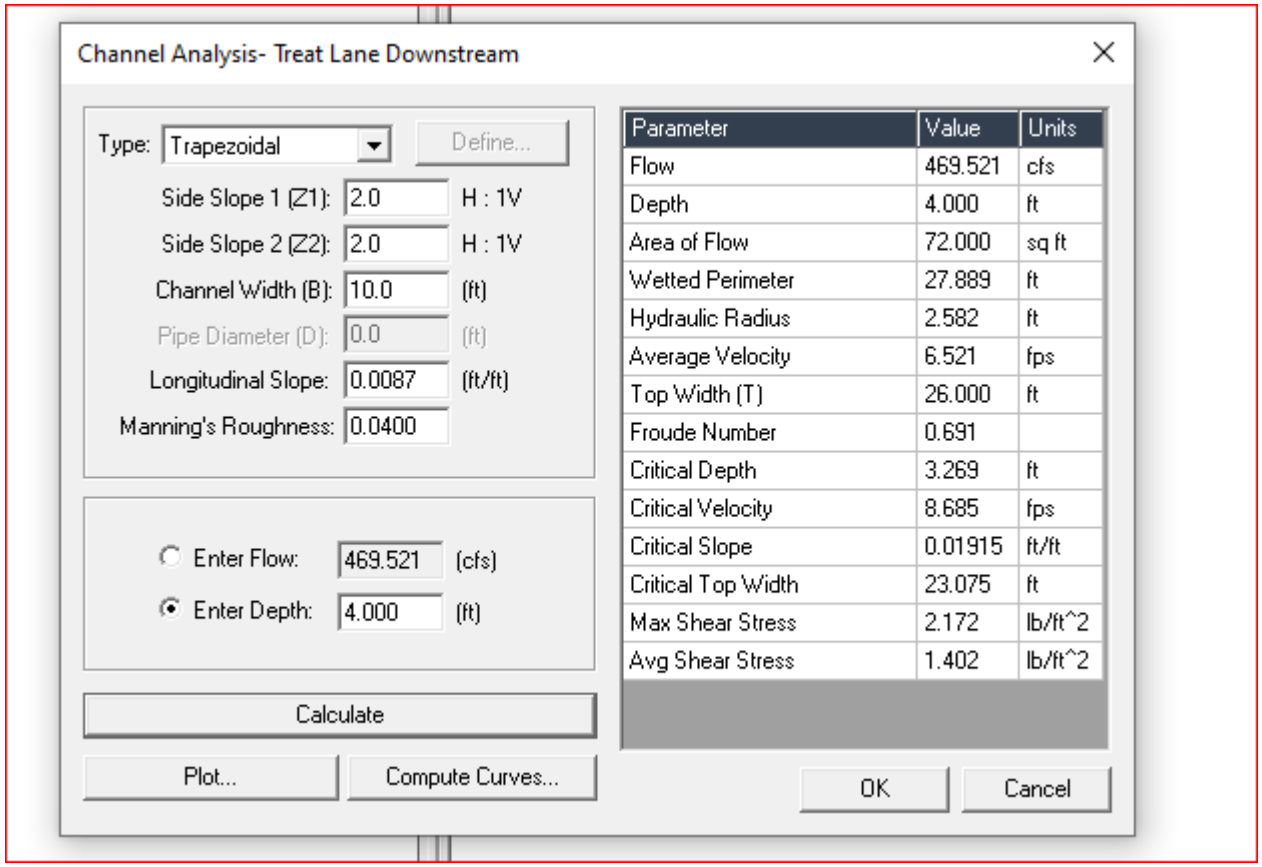
Hydraulic Toolbox-Coachmans Existing and Proposed



Parameter	Value	Units
Flow	263.128	cfs
Depth	3.700	ft
Area of Flow	45.880	sq ft
Wetted Perimeter	21.547	ft
Hydraulic Radius	2.129	ft
Average Velocity	5.735	fps
Top Width (T)	19.800	ft
Froude Number	0.664	
Critical Depth	3.013	ft
Critical Velocity	7.920	fps
Critical Slope	0.02078	ft/ft
Critical Top Width	17.052	ft
Max Shear Stress	2.009	lb/ft^2
Avg Shear Stress	1.156	lb/ft^2

CARDINAL
ENGINEERING ASSOCIATES

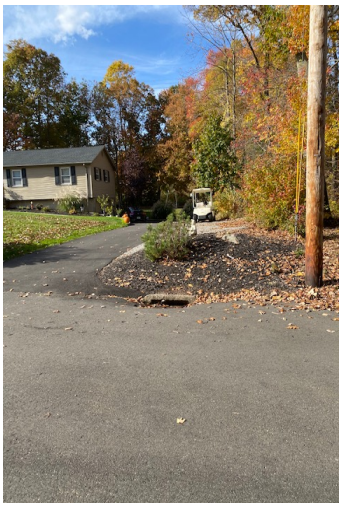
Hydraulic Toolbox-Treat



Parameter	Value	Units
Flow	469.521	cfs
Depth	4.000	ft
Area of Flow	72.000	sq ft
Wetted Perimeter	27.889	ft
Hydraulic Radius	2.582	ft
Average Velocity	6.521	fps
Top Width (T)	26.000	ft
Froude Number	0.691	
Critical Depth	3.269	ft
Critical Velocity	8.685	fps
Critical Slope	0.01915	ft/ft
Critical Top Width	23.075	ft
Max Shear Stress	2.172	lb/ft^2
Avg Shear Stress	1.402	lb/ft^2

APPENDIX E

SITE PHOTOGRAPHS



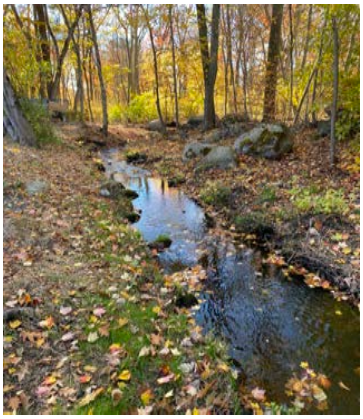
431 Old Country

430 Old Country

Coachmans culverts-looking upstream

Coachmans culverts-upstream channel

Upstream inverts at Coachmans



Downstream Channel at Coachmans

Coachmans culverts discharge

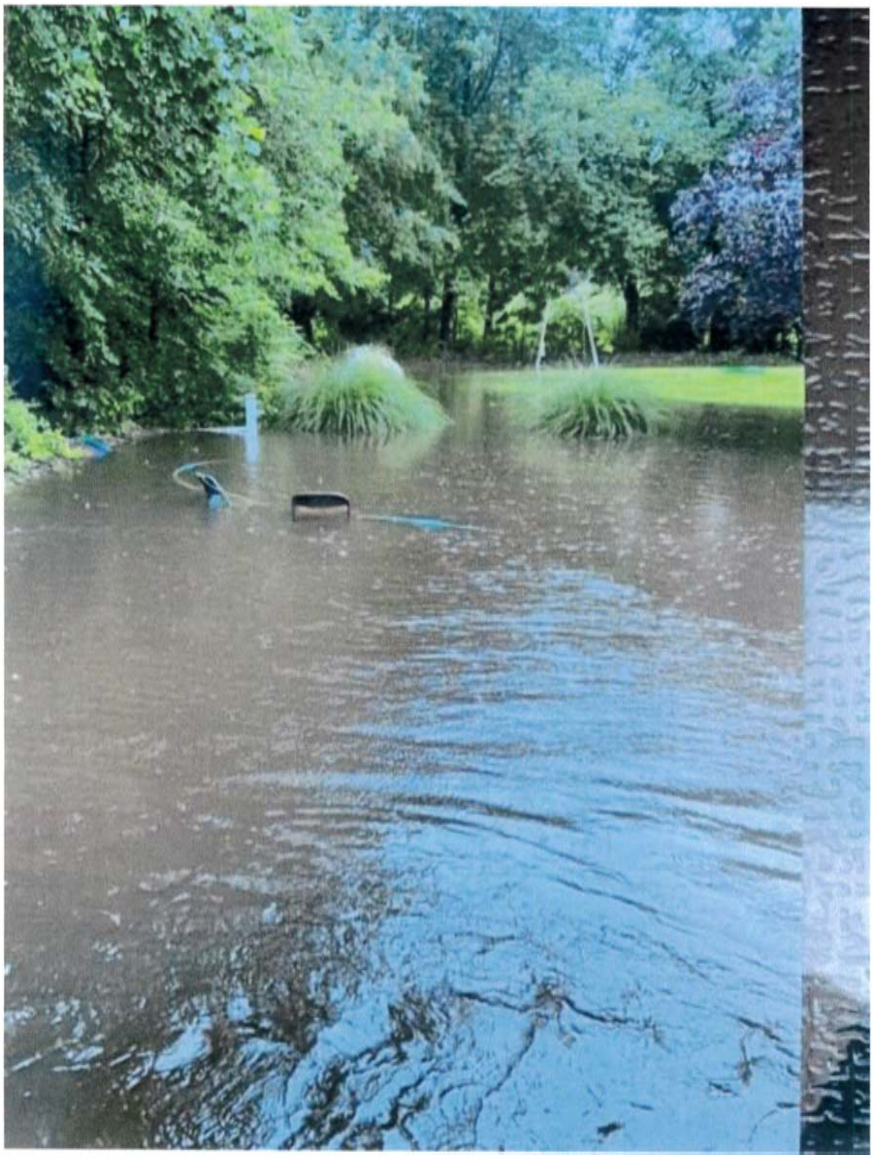
Coachmans culverts discharge

Treat Lane

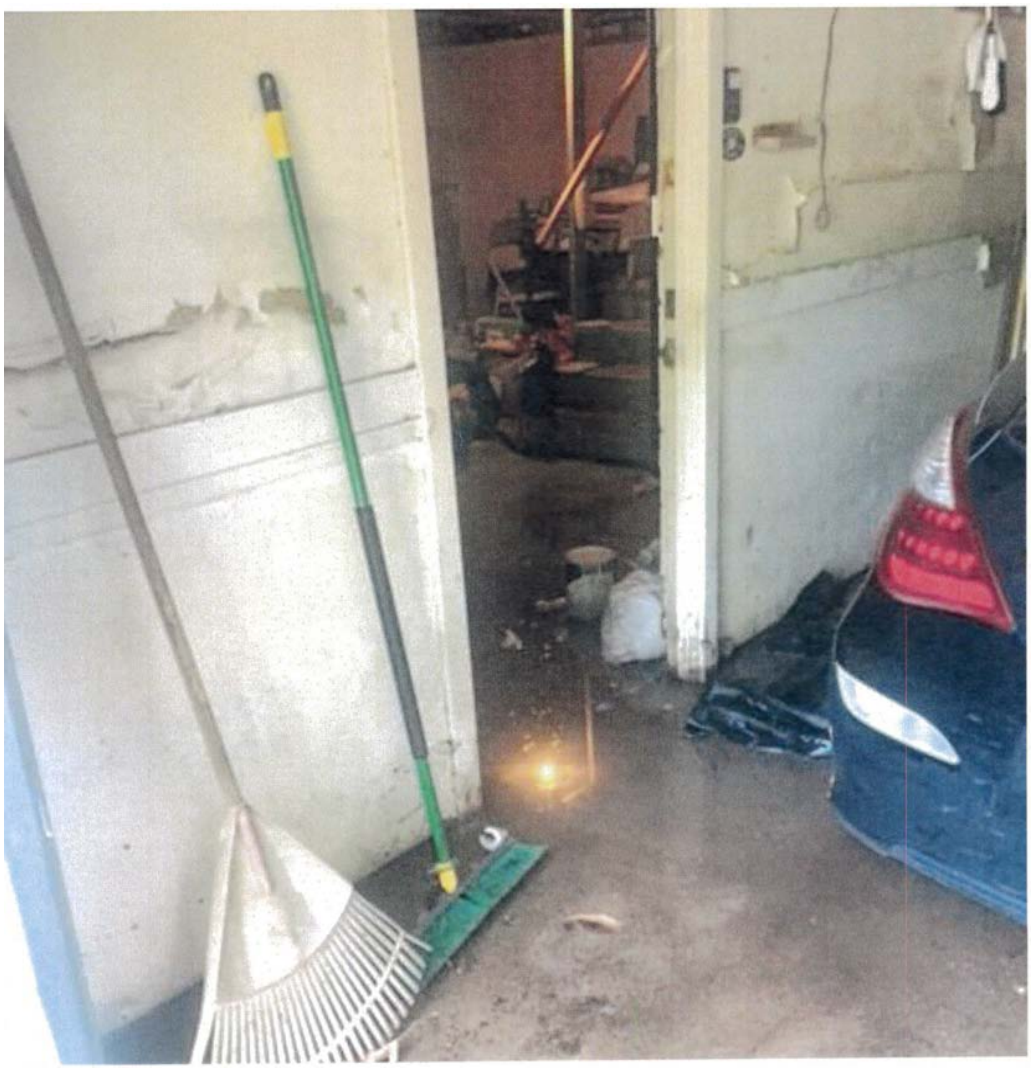
RESIDENT
PHOTOGRAPHS
JULY 2021

Roadway at Old Country

Altieri-431 Old Country



Robinson-438 Old Country

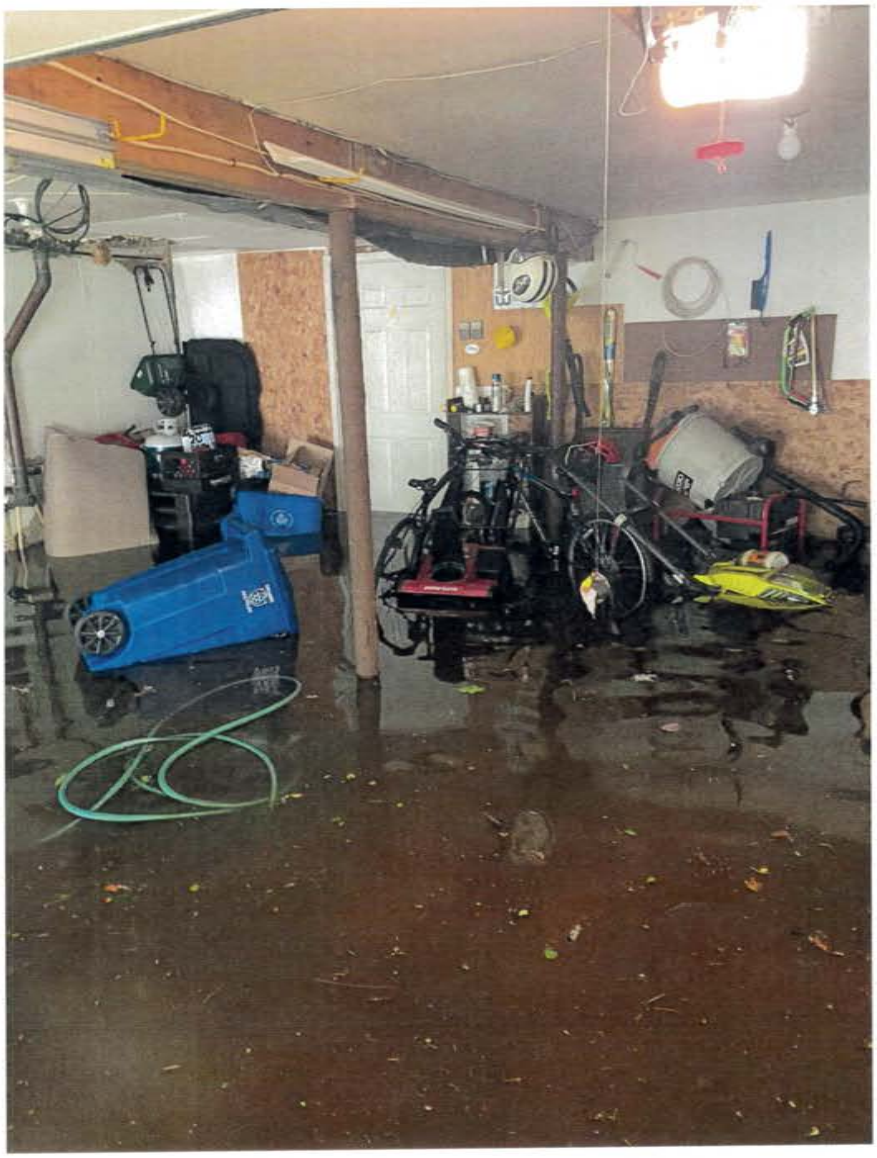


Saxa 430 Old Country

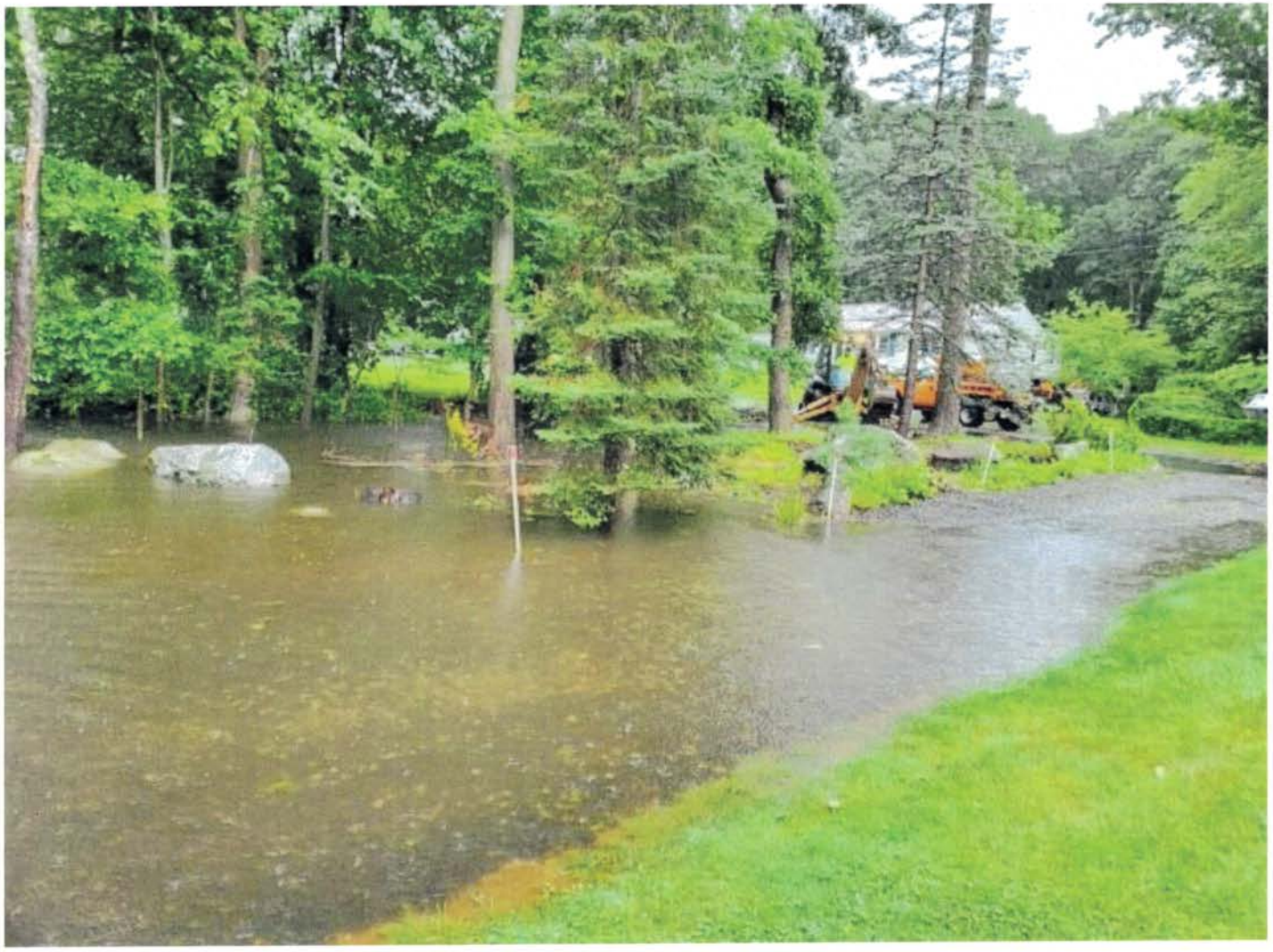
Saxa-430 Old Country

430 Old Country

SAXA-
430 OLD COUN



KANG & KOZEK
349 & 354
COACHMANS LANE



KANG
347 COACHMAN'S LANE

KANG –

347 COACHMAN'S LANE

347 Coachmans

RESIDENT
PHOTOGRAPHS
SEPTEMBER
2021

Coachman Crossing Sept 2021

APPENDIX F

COST ESTIMATES

Construction Cost Estimate

Replacement of Old Country Culverts (12x3 box)

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	400	$ 27.00	$ 10,800.00
	0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	50	$ 80.00	$ 4,000.00
	0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	1	$ 3,000.00	$ 3,000.00
	0203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	CY	80	$ 35.00	$ 2,800.00
	0203100	STRUCTURE EXCAVATION - ROCK (COMPLETE)	CY	10	$ 75.00	$ 750.00
	0204151	HANDLING WATER	LS	1	$ 50,000.00	$ 50,000.00
	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	120	$ 62.00	$ 7,440.00
	0219001	SEDIMENTATION CONTROL SYSTEM	LF	250	$ 8.00	$ 2,000.00
	0304002	PROCESSED AGGREGATE BASE	CY	50	$ 50.00	$ 2,500.00
	0305000	PROCESSED AGGREGATE	TON	25	$ 45.00	$ 1,125.00
	0406010-2	BITUMINOUS CONCRETE CLASS 2	TON	150	$ 150.00	$ 22,500.00
	0503001	REMOVAL OF EXISTING CULVERTS	LS	1	$ 43,000.00	$ 43,000.00
	0507750	RESET TYPE C CATCH BASIN	EA	2	$ 1,500.00	$ 3,000.00
	0586001-10	TYPE C CATCH BASIN 0 TO 10' DEEP	EA	3	$ 3,500.00	$ 10,500.00
	0601062	FOOTING CONCRETE	CY	20	$ 750.00	$ 15,000.00
	0601064	ABUTMENT AND WALL CONCRETE	CY	10	$ 850.00	$ 8,500.00
	0601125	12' x 3' PRECAST CONCRETE BOX CULVERT	LF	55	$ 1,800.00	$ 99,000.00
	0602030	DEFORMED STEEL BARS - GALVANIZED	LB	10000	$ 2.00	$ 20,000.00
	068600	15" R.C. PIPE- 0 TO 10' DEEP	LF	100	$ 80.00	$ 8,000.00
	0703011	MODIFIED RIPRAP	CY	40	$ 85.00	$ 3,400.00
	0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	65	$ 80.00	$ 5,200.00
	0708001	DAMPPROOFING	SY	55	$ 20.00	$ 1,100.00
	0822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	LF	40	$ 45.00	$ 1,800.00
	0910184	METAL BEAM RAIL R-B 350 (TYPE II) SECTION	EA	0	$ 3,500.00	$ -
	0911924	R-B END ANCHORAGE TYPE II	EA	0	$ 1,500.00	$ -
	0913003	4' POLYVINYL CHLORIDE CHAIN LINK FENCE	LF	62	$ 60.00	$ 3,720.00
	0944000	FURNISHING AND PLACING TOPSOIL	SY	300	$ 8.00	$ 2,400.00
	0950005	TURF ESTABLISHMENT	SY	300	$ 2.00	$ 600.00
	0969060	CONSTRUCTION FIELD OFFICE (SMALL)	MO	6	$ 2,500.00	$ 15,000.00
	0970006	TRAFFICPERSON (MUNICIPAL POLICE OFFICER)	EST	1	$ 5,000.00	$ 5,000.00
	0970001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	*	*
	0974001	REMOVAL OF EXISTING MASONRY	CY	30	$ 400.00	$ 12,000.00
	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**					**$ 378,685**
B	**Minor Items Subtotal**		10	% of Line "A"		**$ 37,869**
C	**Major and Minor Contract Items Subtotal (A + B)**					**$ 416,554**

Other Item Allowances

	Clearing and Grubbing	2	% of Line "C"	$ 8,331
	M & P of Traffic	2	% of Line "C"	$ 8,331
	Mobilization	8	% of Line "C"	$ 33,324
	Construction Staking	2	% of Line "C"	$ 8,331
D	**Other Items Subtotal**			**$ 58,317**
E	**CONTRACT SUBTOTAL (C + D)**			**$ 474,871**

Inflation Costs (Simple Method)

	Date of Estimate	May-22		
	Anticipated Bid Date	Jul-22		
	Annual Inflation	8%		
F	**Inflation Subtotal**	1.6%	of Line "E"	**$ 7,598**
G	**TOTAL CONTRACT COST ESTIMATE (E + F)** (Rounded to nearest $1000)			**$ 482,000**

Project Costs Summary		
Contract Cost Estimate (Line "G")		$ 482,000
Contingencies	10%	$ 48,200
Incidentals	10%	$ 48,200
ROW	LS	N/A
Utilities	LS	N/A
Engineering Design	LS	$ 30,000
Engineering Permitting	LS	$ 6,000
TOTAL PROJECT COST		**$ 614,400**

Construction Cost Estimate

Replacement of Culverts (twin 36" pipes) Old Country

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	400	$ 27.00	$ 10,800.00
	0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	50	$ 80.00	$ 4,000.00
	0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	1	$ 3,000.00	$ 3,000.00
	0203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	CY	40	$ 35.00	$ 1,400.00
	0203100	STRUCTURE EXCAVATION - ROCK (COMPLETE)	CY	5	$ 75.00	$ 375.00
	0204151	HANDLING WATER	LS	1	$ 50,000.00	$ 50,000.00
	0209001	FORMATION OF SUBGRADE	SY	200	$ 3.00	$ 600.00
	0212000	SUBBASE	CY	45	$ 48.00	$ 2,160.00
	0213100	GRANULAR FILL	CY	30	$ 60.00	$ 1,800.00
	0216000	PERVIOUS STRUCTURE BACKFILL	CY	60	$ 62.00	$ 3,720.00
	0219001	SEDIMENTATION CONTROL SYSTEM	LF	150	$ 8.00	$ 1,200.00
	0304002	PROCESSED AGGREGATE BASE	CY	25	$ 50.00	$ 1,250.00
	0305000	PROCESSED AGGREGATE	TON	20	$ 45.00	$ 900.00
	0406010-2	BITUMINOUS CONCRETE CLASS 2	TON	75	$ 150.00	$ 11,250.00
	0503001	REMOVAL OF EXISTING CULVERTS	LS	1	$ 43,000.00	$ 43,000.00
	0507750	RESET TYPE C CATCH BASIN	EA	2	$ 1,500.00	$ 3,000.00
	0586001-10	TYPE C CATCH BASIN 0 TO 10' DEEP	EA	3	$ 3,500.00	$ 10,500.00
	0601062	FOOTING CONCRETE	CY	10	$ 750.00	$ 7,500.00
	0601064	ABUTMENT AND WALL CONCRETE	CY	10	$ 850.00	$ 8,500.00
	0601125	TWIN 36 INCH HDPE PIPES	LF	110	$ 55.00	$ 6,050.00
	068600	15" R.C. PIPE- 0 TO 10' DEEP	LF	100	$ 80.00	$ 8,000.00
	0602030	DEFORMED STEEL BARS - GALVANIZED	LB	0	$ 2.00	$ -
	0703011	MODIFIED RIPRAP	CY	40	$ 85.00	$ 3,400.00
	0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	0	$ 80.00	$ -
	0708001	DAMPPROOFING	SY	0	$ 20.00	$ -
	0822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	LF	40	$ 45.00	$ 1,800.00
	815001	BITUMINOUS LIP CURBING	LF	0	$ 20.00	$ -
	0910184	METAL BEAM RAIL R-B 350 (TYPE II) SECTION	EA	0	$ 3,500.00	$ -
	0911924	R-B END ANCHORAGE TYPE II	EA	0	$ 1,500.00	$ -
	0913003	4' POLYVINYL CHLORIDE CHAIN LINK FENCE	LF	62	$ 60.00	$ 3,720.00
	0944000	FURNISHING AND PLACING TOPSOIL	SY	300	$ 8.00	$ 2,400.00
	0950005	TURF ESTABLISHMENT	SY	300	$ 2.00	$ 600.00
	0969060	CONSTRUCTION FIELD OFFICE (SMALL)	MO	3	$ 2,500.00	$ 7,500.00
	0970006	TRAFFICPERSON (MUNICIPAL POLICE OFFICER)	EST	1	$ 5,000.00	$ 5,000.00
	0970001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	*	*
	0974001	REMOVAL OF EXISTING MASONRY	CY	20	$ 400.00	$ 8,000.00
	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**					**$ 216,855**
B	**Minor Items Subtotal**		10	% of Line "A"		**$ 21,686**
C	**Major and Minor Contract Items Subtotal (A + B)**					**$ 238,541**

Other Item Allowances

	Clearing and Grubbing	2	% of Line "C"	$ 4,771
	M & P of Traffic	2	% of Line "C"	$ 4,771
	Mobilization	8	% of Line "C"	$ 19,083
	Construction Staking	2	% of Line "C"	$ 4,771
D	**Other Items Subtotal**			**$ 33,396**
E	**CONTRACT SUBTOTAL (C + D)**			**$ 271,937**

Inflation Costs (Simple Method)

	Date of Estimate	May-22		
	Anticipated Bid Date	Jul-22		
	Annual Inflation	8%		
F	**Inflation Subtotal**	1.6%	of Line "E"	**$ 4,351**
G	**TOTAL CONTRACT COST ESTIMATE (E + F)** (Rounded to nearest $1000)			**$ 276,000**

LOTCIP Project Costs Summary		
Contract Cost Estimate (Line "G")		$ 276,000
Contingencies	10%	$ 27,600
Incidentals	10%	$ 27,600
ROW	LS	N/A
Utilities	LS	N/A
Engineering Design	LS	$ 12,000
Engineering Permitting	LS	$ 6,000
TOTAL PROJECT COST		**$ 349,200**

Construction Cost Estimate

Replacement of Coachmans Lane culverts (9x4 box)

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	400	$ 27.00	$ 10,800.00
0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	50	$ 80.00	$ 4,000.00
0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	1	$ 3,000.00	$ 3,000.00
0203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	CY	80	$ 35.00	$ 2,800.00
0203100	STRUCTURE EXCAVATION - ROCK (COMPLETE)	CY	10	$ 75.00	$ 750.00
0204151	HANDLING WATER	LS	1	$ 60,000.00	$ 60,000.00
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	120	$ 62.00	$ 7,440.00
0219001	SEDIMENTATION CONTROL SYSTEM	LF	250	$ 8.00	$ 2,000.00
0304002	PROCESSED AGGREGATE BASE	CY	50	$ 50.00	$ 2,500.00
0305000	PROCESSED AGGREGATE	TON	25	$ 45.00	$ 1,125.00
0406010-2	BITUMINOUS CONCRETE CLASS 2	TON	150	$ 150.00	$ 22,500.00
0503001	REMOVAL OF EXISTING CULVERTS	LS	1	$ 43,000.00	$ 43,000.00
0586001-10	TYPE C CATCH BASIN 0 TO 10' DEEP	EA	3	$ 3,500.00	$ 10,500.00
0601062	FOOTING CONCRETE	CY	20	$ 750.00	$ 15,000.00
0601064	ABUTMENT AND WALL CONCRETE	CY	10	$ 850.00	$ 8,500.00
0601125	9' x 4' PRECAST CONCRETE BOX CULVERT	LF	52	$ 1,900.00	$ 98,800.00
0602030	DEFORMED STEEL BARS - GALVANIZED	LB	10000	$ 2.00	$ 20,000.00
068600	18" R.C. PIPE- 0 TO 10' DEEP	LF	150	$ 80.00	$ 12,000.00
0703011	MODIFIED RIPRAP	CY	40	$ 85.00	$ 3,400.00
0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	65	$ 80.00	$ 5,200.00
0708001	DAMPPROOFING	SY	55	$ 20.00	$ 1,100.00
0822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	LF	40	$ 45.00	$ 1,800.00
0910184	METAL BEAM RAIL R-B 350 (TYPE II) SECTION	EA	0	$ 3,500.00	$ -
0911924	R-B END ANCHORAGE TYPE II	EA	0	$ 1,500.00	$ -
0913003	4' POLYVINYL CHLORIDE CHAIN LINK FENCE	LF	62	$ 60.00	$ 3,720.00
0944000	FURNISHING AND PLACING TOPSOIL	SY	300	$ 8.00	$ 2,400.00
0950005	TURF ESTABLISHMENT	SY	300	$ 2.00	$ 600.00
0969060	CONSTRUCTION FIELD OFFICE (SMALL)	MO	6	$ 2,500.00	$ 15,000.00
0970006	TRAFFICPERSON (MUNICIPAL POLICE OFFICER)	EST	1	$ 5,000.00	$ 5,000.00
0970001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	*	*
0974001	REMOVAL OF EXISTING MASONRY	CY	60	$ 400.00	$ 24,000.00
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**				**$ 401,485**
B	**Minor Items Subtotal**	10	% of Line "A"		**$ 40,149**
C	**Major and Minor Contract Items Subtotal (A + B)**				**$ 441,634**

Other Item Allowances

	Clearing and Grubbing	2	% of Line "C"	$ 8,833
	M & P of Traffic	2	% of Line "C"	$ 8,833
	Mobilization	8	% of Line "C"	$ 35,331
	Construction Staking	2	% of Line "C"	$ 8,833
D	**Other Items Subtotal**			**$ 61,830**
E	**CONTRACT SUBTOTAL (C + D)**			**$ 503,464**

Inflation Costs (Simple Method)

	Date of Estimate	May-22		
	Anticipated Bid Date	Jul-22		
	Annual Inflation	8%		
F	**Inflation Subtotal**	1.6%	of Line "E"	**$ 8,055**
G	**TOTAL CONTRACT COST ESTIMATE (E + F)** (Rounded to nearest $1000)			**$ 512,000**

Project Costs Summary		
Contract Cost Estimate (Line "G")		$ 512,000
Contingencies	10%	$ 51,200
Incidentals	10%	$ 51,200
ROW	LS	N/A
Utilities	LS	N/A
Design	LS	$ 30,000
Permitting	LS	$ 6,000
TOTAL PROJECT COST		**$ 650,400**

Construction Cost Estimate

Replacement of Culverts (twin 36" pipes) Coachmans

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	300	$ 27.00	$ 8,100.00
	0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	50	$ 80.00	$ 4,000.00
	0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	1	$ 3,000.00	$ 3,000.00
	0203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	CY	40	$ 35.00	$ 1,400.00
	0203100	STRUCTURE EXCAVATION - ROCK (COMPLETE)	CY	5	$ 75.00	$ 375.00
	0204151	HANDLING WATER	LS	1	$ 60,000.00	$ 60,000.00
	0209001	FORMATION OF SUBGRADE	SY	200	$ 3.00	$ 600.00
	0212000	SUBBASE	CY	45	$ 48.00	$ 2,160.00
	0213100	GRANULAR FILL	CY	30	$ 60.00	$ 1,800.00
	0216000	PERVIOUS STRUCTURE BACKFILL	CY	60	$ 62.00	$ 3,720.00
	0219001	SEDIMENTATION CONTROL SYSTEM	LF	150	$ 8.00	$ 1,200.00
	0304002	PROCESSED AGGREGATE BASE	CY	25	$ 50.00	$ 1,250.00
	0305000	PROCESSED AGGREGATE	TON	20	$ 45.00	$ 900.00
	0406010-2	BITUMINOUS CONCRETE CLASS 2	TON	75	$ 150.00	$ 11,250.00
	0503001	REMOVAL OF EXISTING CULVERTS	LS	1	$ 43,000.00	$ 43,000.00
	0586001-10	TYPE C CATCH BASIN 0 TO 10' DEEP	EA	3	$ 3,500.00	$ 10,500.00
	0601062	FOOTING CONCRETE	CY	10	$ 750.00	$ 7,500.00
	0601064	ABUTMENT AND WALL CONCRETE	CY	10	$ 850.00	$ 8,500.00
	0601125	TWIN 36 INCH HDPE PIPES	LF	110	$ 55.00	$ 6,050.00
	068600	18" R.C. PIPE- 0 TO 10' DEEP	LF	150	$ 80.00	$ 12,000.00
	0703011	MODIFIED RIPRAP	CY	40	$ 85.00	$ 3,400.00
	0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	0	$ 80.00	$ -
	0708001	DAMPPROOFING	SY	0	$ 20.00	$ -
	0822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	LF	40	$ 45.00	$ 1,800.00
	815001	BITUMINOUS LIP CURBING	LF	0	$ 20.00	$ -
	0910184	METAL BEAM RAIL R-B 350 (TYPE II) SECTION	EA	0	$ 3,500.00	$ -
	0911924	R-B END ANCHORAGE TYPE II	EA	0	$ 1,500.00	$ -
	0913003	4' POLYVINYL CHLORIDE CHAIN LINK FENCE	LF	62	$ 60.00	$ 3,720.00
	0944000	FURNISHING AND PLACING TOPSOIL	SY	300	$ 8.00	$ 2,400.00
	0950005	TURF ESTABLISHMENT	SY	300	$ 2.00	$ 600.00
	0969060	CONSTRUCTION FIELD OFFICE (SMALL)	MO	3	$ 2,500.00	$ 7,500.00
	0970006	TRAFFICPERSON (MUNICIPAL POLICE OFFICER)	EST	1	$ 5,000.00	$ 5,000.00
	0970001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	*	*
	0974001	REMOVAL OF EXISTING MASONRY	CY	20	$ 400.00	$ 8,000.00
	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**					**$ 225,155**
B	**Minor Items Subtotal**		10	% of Line "A"		**$ 22,516**
C	**Major and Minor Contract Items Subtotal (A + B)**					**$ 247,671**

Other Item Allowances

	Clearing and Grubbing	2	% of Line "C"	$ 4,953
	M & P of Traffic	2	% of Line "C"	$ 4,953
	Mobilization	8	% of Line "C"	$ 19,814
	Construction Staking	2	% of Line "C"	$ 4,953
D	**Other Items Subtotal**			**$ 34,673**
E	**CONTRACT SUBTOTAL (C + D)**			**$ 282,344**

Inflation Costs (Simple Method)

	Date of Estimate	May-22		
	Anticipated Bid Date	Jul-22		
	Annual Inflation	8%		
F	**Inflation Subtotal**	1.6%	of Line "E"	**$ 4,518**
G	**TOTAL CONTRACT COST ESTIMATE (E + F)** (Rounded to nearest $1000)			**$ 287,000**

LOTCIP Project Costs Summary		
Contract Cost Estimate (Line "G")		$ 287,000
Contingencies	10%	$ 28,700
Incidentals	10%	$ 28,700
ROW	LS	N/A
Utilities	LS	N/A
Engineering Design	LS	$ 12,000
Engineering Permitting	LS	$ 6,000
TOTAL PROJECT COST		**$ 362,400**

Construction Cost Estimate

Replacement of Culverts (twin 36" pipes) Coachmans

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	300	$ 27.00	$ 8,100.00
	0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	50	$ 80.00	$ 4,000.00
	0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	1	$ 3,000.00	$ 3,000.00
	0203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	CY	40	$ 35.00	$ 1,400.00
	0203100	STRUCTURE EXCAVATION - ROCK (COMPLETE)	CY	5	$ 75.00	$ 375.00
	0204151	HANDLING WATER	LS	1	$ 60,000.00	$ 60,000.00
	0209001	FORMATION OF SUBGRADE	SY	200	$ 3.00	$ 600.00
	0212000	SUBBASE	CY	45	$ 48.00	$ 2,160.00
	0213100	GRANULAR FILL	CY	30	$ 60.00	$ 1,800.00
	0216000	PERVIOUS STRUCTURE BACKFILL	CY	60	$ 62.00	$ 3,720.00
	0219001	SEDIMENTATION CONTROL SYSTEM	LF	150	$ 8.00	$ 1,200.00
	0304002	PROCESSED AGGREGATE BASE	CY	25	$ 50.00	$ 1,250.00
	0305000	PROCESSED AGGREGATE	TON	20	$ 45.00	$ 900.00
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					$ 1.00	$ -
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					$ 1.00	$ -
					$ 1.00	$ -
					$ 1.00	$ -
					$ 1.00	$ -
A	**Major Items Subtotal**					**$ 225,155**
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Project Costs Summary		
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Contingencies	10%	$ 28,700
Incidentals	10%	$ 28,700
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Utilities	LS	N/A
Engineering Design	LS	$ 12,000
Engineering Permitting	LS	$ 6,000
TOTAL PROJECT COST		**$ 362,400**

APPENDIX G

INSPECTION REPORTS

Inspection Type: Screening

BRIDGE NO.

57600 - ORANGE

Old Country Road

Over

Stubby Plain Brook

Screening Inspection

9/15/16

Inspected by: GPI

Connecticut Department of Transportation

Project No.: 0170-3330

Inventory and Screening Form

for

Municipal Bridges Spanning 6 to 20 ft

Town: Orange Bridge No.: O-S09 Date of Inspection: 9/15/16

PE Stamp and Signature

Consultant Company: Greenman-Pedersen, Inc.

Inspector: Mark Nyerges, PE

Inspector: Ashley Kocsis

Reviewed by:_____ Date:_____

Inventory Data

Road: Old Country Road Crossing: Stubby Plain Brook

Bridge is located 0.1 miles North from the junction with Coachmans Lane.

Is this a border bridge? NO Border Town:_____ Border State: _____

Functional Classification of Roadway: Urban Local [Functional Classification Maps]

ADT:_____ ADT Year:_____ ADT Source:_____ [ADT MAPS]

(Do not use the ADT from previous 1991 report and do not estimate ADT – if no source, leave fields blank)

Main Span

Bridge Material: Concrete Bridge Type: Pipe Culvert or Box Culvert

Approach Span

Bridge Material:_____ Bridge Type:_____

NBIS Bridge Length: 6.1 ft Structure Length*: 6 ft

Number of Spans: 2 Span Lengths – Span 1: 2.4 ft Span 2: 2.4 ft Span 3:_____ft Span 4:_____ft

Bridge Width Out-Out**: 50.0 ft Curb-Curb: 28.0 ft

Deck Area * **: 300 sqft Number of lanes on Structure: 2

* Record Measurements to the nearest whole number, all other measurements are recorded to the nearest tenth.

** Under the screening phase of the program, Bridge Width (Out-Out) and Deck Area are not applicable to culverts that are significantly wider than the roadway (i.e. inlet – to – Outlet measurement is significantly greater than the curb – to – curb measurement)

Town Bridges (Span of 20 FT & under)– Inventory and Screening - Field Notes

Town: Orange Bridge No.: O-S09 Date of Inspection: 9/15/16

Mandatory / Standard Photos

1. Top View 3604
   Photo 1 - Looking north across bridge.
2. Elevation View 3596
   Photo 2 - East elevation (outlet).
3. Under View 3598
   Photo 3 - General underside view looking west (upstream), south pipe. Note tree root growth.

Additional Photos:

(include any safety concerns of an urgent nature)

4. 3599
   General underside view looking west (upstream), north pipe. Note tree root growth.
5. 3601
   West elevation (inlet). Note aggradation in channel.
6. 3602
   Rotated upstream stone masonry headwall. Note south end fractured due to tree growth.
7. 3606
   Widespread cracking, settlement, and developing potholes throughout the northbound lane.
8.
9.
10.
11.
12.
13.
14.

Connecticut Department of Transportation

Project No.: 0170-3330

Inventory and Screening Form

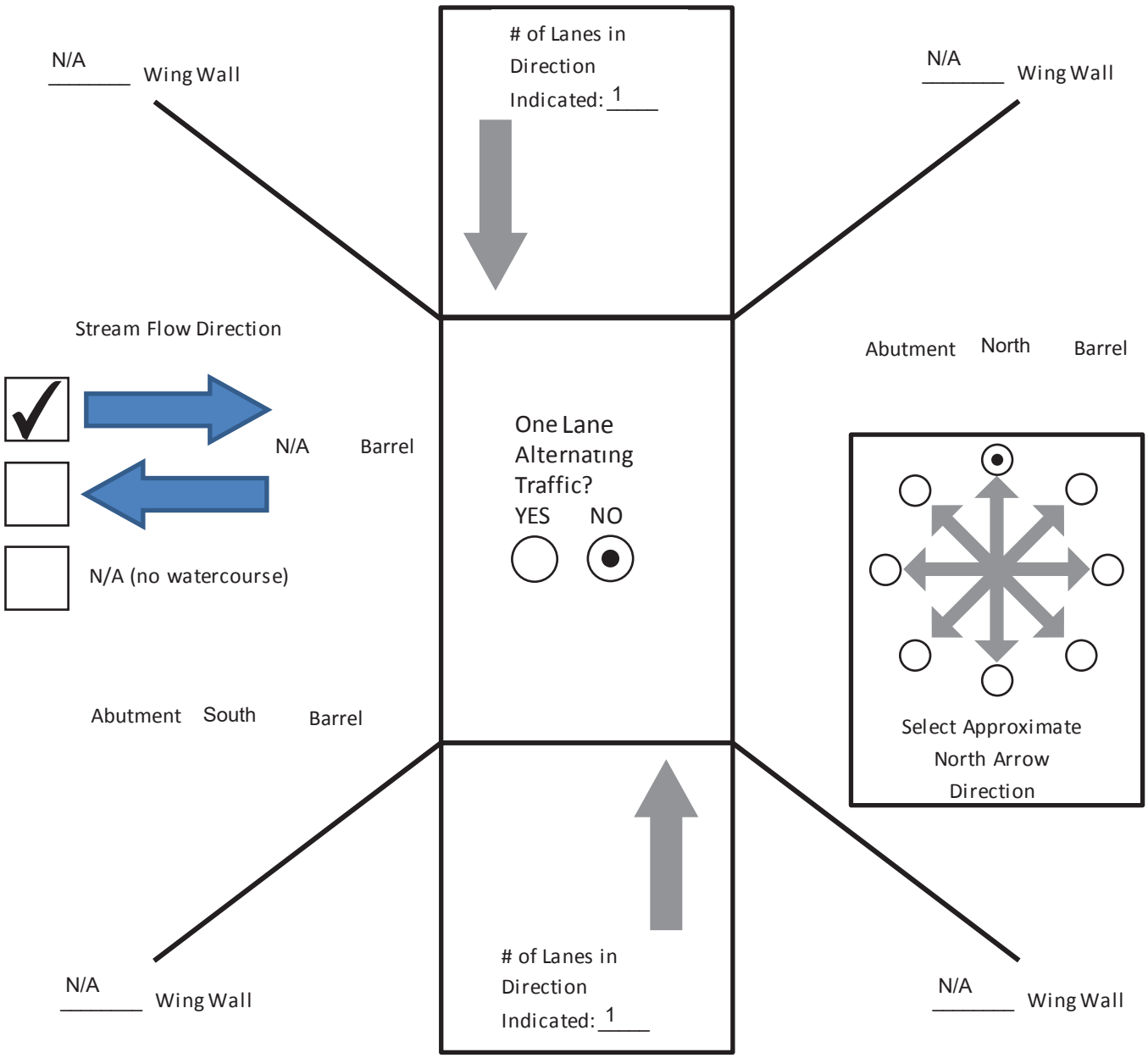
for

Municipal Bridges Spanning 6 to 20 ft

Town: Orange Bridge No.: O-S09 Date of Inspection: 9/15/16

Bridge Orientation Sketch

(Select North Arrow and Stream Flow Directions, Indicate Number of Traffic Lanes and add Wingwall/ Abutment Labels)



Connecticut Department of Transportation

Project No.: 0170-3330

Inventory and Screening Form

for

Municipal Bridges Spanning 6 to 20 ft

Town: Orange Bridge No.: O-S09 Date of Inspection: 9/15/16

Screening Data (Limited Inspection)

Previous Inspection Information	YES	NO
Was structure inspected under the previous CDOT project (#170-936)?	○	●
Is structure new or significantly modified since last CDOT inspection?	○	●
Has the structure been inspected by others since the last CDOT inspection?	○	●
Date of last inspection by others: _____		

Inspection Access	N/A	YES	NO
Is there ready access to both sides of bridge (up & downstream)?		●	○
Can stream be walked with waders?	○	●	○

Items for full inspection: ☐ Boat or raft ☐ Divers ☐ Ladder ☐ Tidal ☐ Low FB ☑ Confined Space

Other: _____

Topside (Bridge and Culvert)	Sat/Better	Fair/Worse
Condition of Topside (overlay, top of deck).	○	●
Safety concerns of urgent nature on topside? (include parapets, railing, etc)	NO ●	YES ○

Underside (Bridge)	N/A	Sat/Better	Fair/Worse
Condition of underside of deck	●	○	○
Condition of superstructure.	●	○	○
Condition of abutments	●	○	○
Condition of wingwalls	●	○	○
Safety concerns of urgent nature on underside?	●	NO ○	YES ○

Underside (Culvert)	N/A	Sat/Better	Fair/Worse
Condition of roof	○	○	●
Condition of sidewalls.	○	○	●
Condition of invert	○	○	●
Condition of wingwalls	●	○	○
Safety concerns of urgent nature on underside?	○	NO ●	YES ○

Channel	N/A	Sat/Better	Fair/Worse
Condition of scour	○	●	○
Condition of channel	○	○	●
Alignment of channel	○	●	○
Adequacy of channel to carry high flow	○	●	○

Connecticut Department of Transportation

Project No.: 0170-3330

Inventory and Screening Form

for

Municipal Bridges Spanning 6 to 20 ft

Town: Orange Bridge No.: O-S09 Date of Inspection: 9/15/16

Screening Data (Continued)

General Assessment	N/A	Sat/Better	Fair/Worse
58. Deck	●	○	○
59. Superstructure	●	○	○
60. Substructure	●	○	○
61. Channel	○	○	●
62. Culvert	○	○	●
67. Structural Evaluation	○	○	●
71. Waterway Adequacy	○	●	○

Safety Items

Was Town notified of any urgent safety concerns by e-mail (with Photos)? NO

Date Town was notified:

Topside: No safety features or approach guard rails present.
Cracking, settlement, and developing potholes throughout roadway, primarily in northbound lane and edge of southbound lane.

Underside: Significant tree root growth, concentrated at the last section joint in both pipes at downstream causing 50% blockages.
Moderate pipe misalignment throughout pipe run.
Both stone masonry headwalls have rotated outward; the south end of the upstream stone masonry headwall is fractured and displaced due to a large tree.

Channel: Significant aggradation along upstream channel.
Minor bank scour with undercutting along upstream north channel bank.

General: 2x24" RCPs spaced 12" apart, 35 degree skew.
No sidewalks, wingwalls, or parapets present.

Form: Asset Photos
Inspection Type: Screening
Inspection Date: 09/15/2016
Inspected By: GPI

Bridge No:

Town: ORANGE
Carried: Old Country Road
Crossed: Stubby Plain Brook
Inventory Route:

Photo Number: 1 Looking north across bridge. Photo Taken: 09/15/2016

Photo Number: 2 East elevation (outlet). Photo Taken: 09/15/2016

Form: Asset Photos
Inspection Type: Screening
Inspection Date: 09/15/2016
Inspected By: GPI

Bridge No:

Town: ORANGE
Carried: Old Country Road
Crossed: Stubby Plain Brook
Inventory Route:

Photo Number: 3 General underside view looking west (upstream), south pipe. Note tree root growth. Photo Taken: 09/15/2016

Photo Number: 4 General underside view looking west (upstream), north pipe. Note tree root growth. Photo Taken: 09/15/2016

Form: Asset Photos
Inspection Type: Screening
Inspection Date: 09/15/2016
Inspected By: GPI

Bridge No:

Town: ORANGE
Carried: Old Country Road
Crossed: Stubby Plain Brook
Inventory Route:

Photo Number: 5 West elevation (inlet). Note aggradation in channel. Photo Taken: 09/15/2016

Photo Number: 6 Rotated upstream stone masonry headwall. Note south end fractured due to tree growth. Photo Taken: 09/15/2016

Form: Asset Photos
Inspection Type: Screening
Inspection Date: 09/15/2016
Inspected By: GPI

Bridge No:

Town: ORANGE
Carried: Old Country Road
Crossed: Stubby Plain Brook
Inventory Route:

Photo Number: 7 Widespread cracking, settlement, and developing potholes throughout the northbound lane. Photo Taken: 09/15/2016