FINAL LOCATION HYDRAULICS REPORT

Florida Department of Transportation

District One

SR 35 (US 98) PD&E Study

Limits of Project: From North of West Socrum Loop Road to South of CR 54

Polk County, Florida

Financial Management Number: 436673-1-22-01

ETDM Number: 14334

Date: November 2021

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated December 14, 2016 and executed by FHWA and FDOT.

Location Hydraulics Report

FINAL

SR 35 (US 98)
Project Development and Environment (PD&E) Study
From North of West Socrum Loop Road to South of CR 54

FPID 436673-1
ETDM Project No. 14334
Polk County, Florida

Prepared for:

Florida Department of Transportation
District One

Prepared by:
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November 2021

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PROFESSIONAL ENGINEER CERTIFICATION
LOCATION HYDRAULICS REPORT

Project: US 98 PD&E Study

ETDM Number: 14334

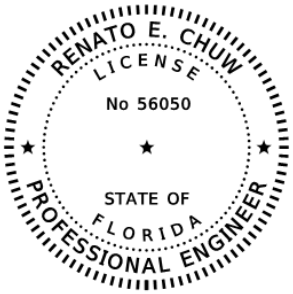
Financial Project ID: 436673-1-52-01

Federal Aid Project Number: N/A

This Location Hydraulics Report contains engineering information that fulfills the purpose and need for US 98 Project Development & Environment Study from W Socrum Loop Road to County Road 54 in Polk County, Florida. I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of transportation engineering as applied through professional judgment and experience.

I hereby certify that I am a registered professional engineer in the State of Florida practicing with Inwood Consulting Engineers, and that I have prepared or approved the evaluation, findings, opinions, conclusions or technical advice for this project.

Renato E Chuw
2021.11.29 14:00:55 -05'00'



This item has been digitally signed and sealed by Renato Chuw, PE on the date adjacent to the seal.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

EXECUTIVE SUMMARY

The Florida Department of Transportation (FDOT) District One is conducting a Project Development and Environment (PD&E) study along State Road 35/US Highway 98 (US 98) in Polk County to evaluate roadway and safety improvements along the corridor. The study limits extend for 8.7 miles from north of West Socrum Loop Road to south of County Road 54 (CR 54), near the Pasco County line. The study will evaluate the effects of widening this section of US 98 from a two-lane undivided roadway to a four-lane divided roadway and will also assess existing and future traffic operations, access management, and freight mobility.

The PD&E study is supported by preliminary engineering design activities and will determine the proposed build alternative, which will be depicted on typical roadway sections and conceptual design plans. The build alternative and the no-build, or "no action," alternative will be evaluated and compared to assess potential effects to the natural and physical environment, to determine their ability to meet the project's Purpose and Need, to obtain and consider agency and public comments, and to ensure compliance with all applicable federal and state laws. The proposed build alternative will include the construction of stormwater management facilities (SMFs) and floodplain compensation (FPC) sites. The no-build alternative will assume no improvements are made to the facility beyond routine roadway maintenance. A Type 2 Categorical Exclusion (Type 2 CE) is being prepared as the environmental document for this study.

The purpose of this Location Hydraulic Report is to address base floodplain encroachments resulting from the roadway improvements evaluated in the PD&E Study. In accordance with Executive Order 11988 "Floodplain Management", U.S.DOT Order 5650.2, "Floodplain Management Protection", and Federal-Aid Policy Guide 23 CFR 650A, Floodplains must be protected. The intent of these regulations is to avoid or minimize highway encroachments within the 100-year (base) floodplains and to avoid supporting land use development incompatible with floodplain values.

Floodplain encroachments areas resulting from the proposed US 98 roadway widening were quantified. It is determined that impacts will occur to the floodplain associated with the proposed widening throughout the project limits and the replacement of the existing cross drains and bridge culverts.

According to the FEMA FIRMs, the project is within Zone AE and Zone A of the 100-year floodplain within Polk County. These areas within Zone Ae are associated with wetlands which drain to Fox Branch and eventually to the Hillsborough River and have established 100-year flood elevations. Floodplain areas designated as Zone A are associated with adjacent wetlands and depressional areas and have a 1% probability of flooding every year and where predicted flood water elevations have not been established. There are no federally regulated floodways within the project limits.

No available watershed models are available that encompass the US 98 study limits. The Hillsborough River watershed model begins north of this study's limits within Pasco County. To the west of US 98, the New River watershed model exists, however, it does not include basins associated for US 98 itself.

A review of the FEMA 100-year floodplain boundary lines (December 2016) revealed that these lines follow exactly the 1' LiDAR contours available for the area. Therefore, it was agreed and concurred by SWFWMD that the best approach to establish the 100-year flood elevations would be to use the 1' LiDAR elevation that matched the particular floodplain boundary line.

It was concluded that the project will impact approximately 19.61 ac-ft of floodplain based on the proposed roadway alignment and preferred stormwater ponds. These impacts are minimal compared to the overall extent of the floodplain, therefore, it was determined that the floodplain encroachment is classified as "minimal". Minimal encroachments on a floodplain occur when there is a floodplain involvement, but the impacts on human life, transportation facilities, and natural and beneficial floodplain values are not significant and can be resolved with minimal efforts. Please refer to **Section 3.4** for additional information.

In conclusion, the following floodplain statement is a slightly modified version of statement Number 4 in the FDOT PD&E Manual (Part 2, Chapter 13 "Floodplains"), tailored for this project:

"The proposed cross drains and Floodplain compensation areas will perform hydraulically in a manner equal to or greater than the existing condition, and backwater surface elevations are not expected to increase. As a result, there will be no significant change in flood risk, and there will not be a significant change in the potential for interruption or termination of emergency service or in emergency evacuation routes. Therefore, it has been determined that this encroachment is not significant."

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SECTION 1 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Florida Department of Transportation (FDOT) District One is conducting a Project Development and Environment (PD&E) study to evaluate capacity and safety improvements along SR 35 (US 98) from north of West Socrum Loop Road to south of CR 54 in Polk County. Throughout the remainder of this document only the US 98 designation will be used. The project limits are shown in **Figure 1-1** and the total project length is approximately 8.7 miles. The purpose of this PD&E study is to evaluate and document the benefits, costs, and impacts of widening US 98 from the existing two-lane undivided roadway to a four-lane divided roadway. US 98 is not designated as a Strategic Intermodal System (SIS) facility. The portion from West Socrum Loop Road to just north of Rock Ridge Road is functionally classified as Urban Principal Arterial Other, while the portion from just north of Rock Ridge Road to CR 54 is functionally classified as Rural Principal Arterial Other.

Figure 1-1 Project Location Map

This PD&E study will aid FDOT District One and the FDOT Office of Environmental Management (OEM) in determining the type, preliminary design, and location of the proposed improvements. This improvement is necessary to provide additional capacity to accommodate the future year travel demand generated by the projected population and employment growth in both northwest Polk County and southeast Pasco County. US 98 is a major north-south roadway that connects US 92 (Memorial Boulevard) in Lakeland to US 301 (Gall Boulevard) in Dade City and provides a critical regional connection between Polk and Pasco Counties. US 98 is a designated evacuation route and is also included in the Polk Transportation Planning Organization (TPO) Regional Freight Network.

This project was screened through the Efficient Transportation Decision Making (ETDM) process as ETDM Project Number 14334. The initial results were published in the *Preliminary Programming Screen Summary Report* on March 11, 2021, with comments provided by the Environmental Technical Advisory Team (ETAT). The ETAT evaluated the proposed project's effects on various natural, physical, and social resources. The Class of Action was determined to be a Type 2 Categorical Exclusion (Type 2 CE).

1.2 PROJECT PURPOSE AND NEED

The following Purpose and Need statement was documented in the March 11, 2021, Preliminary Programming Screen Summary Report*:*

The purpose of the project is to improve an existing traffic bottleneck along US 98 from north of West Socrum Loop Road to south of CR 54 within unincorporated Polk County. The need for the project is based on the following criteria:

AREA WIDE NETWORK/SYSTEM LINKAGE – Improve Transportation Network Connectivity

The US 98 corridor is an intraregional connecting link between Polk and Pasco Counties. The project segment of US 98 transitions from four lanes just north of West Socrum Loop Road to an undivided two-lane facility, creating a traffic bottleneck. The project is intended to enhance transportation network connectivity by:

- Maintaining a critical link to an SIS facility (i.e., I-4), and
- Providing a viable alternate route to parallel north-south arterials (i.e., Kathleen Road and Old Dade City Road).

CAPACITY/TRANSPORTATION DEMAND – Improve Operational Conditions

US 98 serves as a regional freight mobility corridor as it connects to I-4 (an SIS facility) and US 301 (a designated regional freight mobility corridor). Approximately 13.1 percent of the Average Annual Daily Traffic (AADT) volume on US 98 is composed of trucks. Defined Freight Activity Centers (FAC's) in the area (clusters of industrial land parcels) include the Kathleen Road FAC, North Combee Road FAC and West Lakeland Industrial Area FAC. Not only does this roadway facilitate truck traffic and the distribution of goods to local activity areas, but it also functions as an important north-south corridor for commuters between Pasco and Polk Counties.

According to Momentum 2040 (the Polk TPO's Long Range Transportation Plan (LRTP)), the northwest area of Polk County where the project corridor is located, is projected to increase in population by approximately 39,000 people and employment by approximately 11,000 employees by 2040.

Per the Polk TPO's 2020 Roadway Network Database and Momentum 2040:

2019 AADT

- From West Socrum Loop Road to Rock Ridge Road = 16,900 vehicles per day (vpd)
- From Rock Ridge Road to SR 471 = 11,900 vpd
- From SR 471 to CR 54 (Pasco County Line) = 10,400 vpd

Existing Level of Service (LOS)

- From West Socrum Loop Road to Rock Ridge Road = LOS "C"
- From Rock Ridge Road to SR 471 = LOS "C"
- From SR 471 to CR 54 (Pasco County Line) = LOS "D"

Existing Volume-to-Capacity Ratio

- From West Socrum Loop Road to Rock Ridge Road = 0.51
- From Rock Ridge Road to SR 471 = 0.64
- From SR 471 to CR 54 (Pasco County Line) = 1.11

2040 Volume-to-Capacity Ratio

- From West Socrum Loop Road to SR 471 = 1.25 – 1.50
- From SR 471 to CR 54 (Pasco County Line) = 1.00 – 1.25

It is important to note that a Volume-to-Capacity (V/C) ratio greater than 1.0 means the volume of vehicles on the roadway segment is greater than what the roadway was designed for when it was constructed. The existing V/C ratio on US 98 from SR 471 to CR 54 is 1.11. The 2040 V/C ratios for the project corridor are 1.25 – 1.50 from West Socrum Loop Road to SR 471 and 1.00 – 1.25 from SR 471 to CR 54. Conditions along the roadway are anticipated to worsen by 2040 if no improvements occur as the roadway will exceed its capacity and not be able to accommodate future travel demand. The project is anticipated to enhance operational conditions within the corridor by increasing its capacity.

SAFETY – Improve Safety Conditions

According to Polk TPO's 2020 Roadway Network Database, during the five-year period from 2014 - 2018, there were 167 total crashes. The total number of crashes per roadway segment, along with the statewide average crash rate for similar facility types, are provided below:

- From West Socrum Loop Road to Rock Ridge Road - 37 crashes
  - Actual crash rate = 0.471
  - Statewide average crash rate = 1.202 (Suburban 2-3 lanes - 2-way undivided)

- From Rock Ridge Road to SR 471 – 93 crashes
  - Actual crash rate = 0.841
  - Statewide average crash rate = 0.768 (Rural 2-3 lanes - 2-way undivided)
- From SR 471 to CR 54 (Pasco County Line) – 37 crashes
  - Actual crash rate = 1.336
  - Statewide average crash rate = 0.768 (Rural 2-3 lanes - 2-way undivided)

The crash rates for two of the project roadway segments exceed the statewide average crash rate. The high number of crashes may be attributed to the current roadway's operational conditions. If no improvements are made to the existing roadway, the greater the probability for vehicle-to-vehicle conflicts to occur as traffic increases along the project corridor.

The proposed project is anticipated to improve safety conditions along the roadway by:

- Reducing congestion through the provision of additional capacity, and
- Enhancing a viable parallel alternate north-south route to Kathleen Road and Old Dade City Road that will aid in emergency access and response times.

1.3 EXISTING FACILITY AND PROPOSED IMPROVEMENTS

1.3.1 Existing Facility

US 98 is a two-lane undivided facility with a posted speed limit of 60 miles per hour (mph) throughout the project limits. The roadway is centered within 160 feet of existing right-of-way (ROW) and consists of one 12-foot travel lane in each direction and eight-foot outside shoulders (four feet paved). There are no existing designated bicycle or pedestrian facilities. Stormwater runoff is collected in roadside ditches that outfall to adjacent wetlands and ultimately convey to the Hillsborough and Withlacoochee River watersheds. There are 22 cross drains within the project limits, including bridge culverts at Main Stream, Fox Branch, and Cypress Run. The US 98 intersection with Rock Ridge Road is signalized and there is a flashing signal at the intersection with SR 471. Overhead utilities are located throughout the project limits and conservation lands are present along portions of the corridor. The assigned US 98 Context Classifications within the project limits are shown in **Table 1-1** and the existing typical roadway section is depicted in **Figure 1-2**.

Table 1-1 Existing Context Classification

Begin Limit	End Limit	Context Classification
North of West Socrum Loop Road	Rock Ridge Road	C3R – Suburban Residential
Rock Ridge Road	CR 54	C2 – Rural

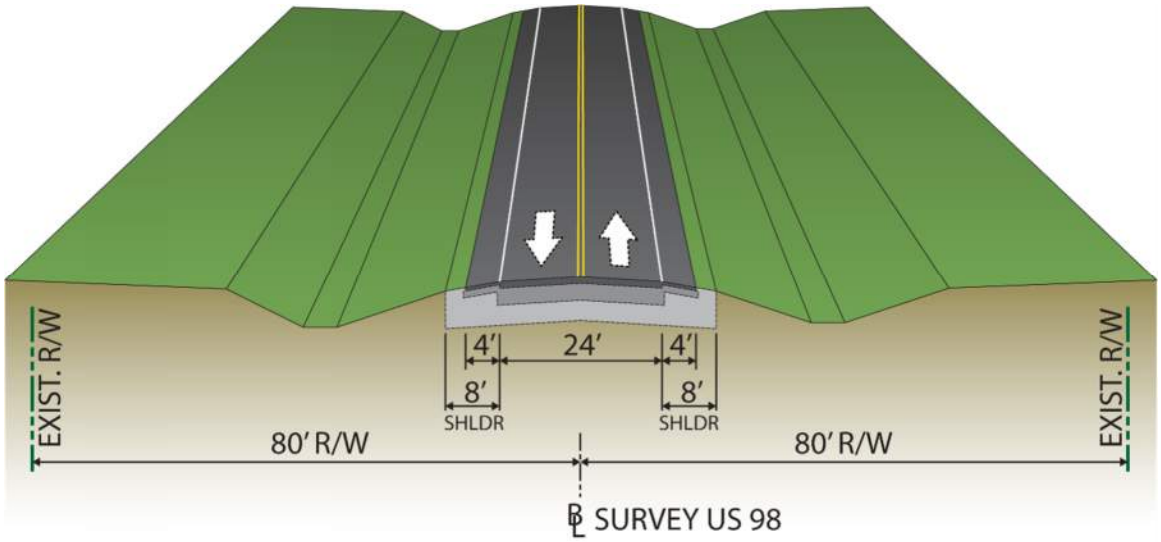


Figure 1-2 Existing US 98 Typical Section

1.3.2 Proposed Improvements

The proposed build alternative is a four-lane divided roadway throughout the project limits. The typical section for the portion of US 98 from north of West Socrum Loop Road to Rock Ridge Road includes 12-foot travel lanes, curb and gutter along the inside and outside edges of pavement, a 22-foot grassed median, and 10-foot shared use paths on both sides of the roadway, as shown in **Figure 1-3**. Design, target, and posted speeds of 45 mph are proposed for this 2.3-mile section of the project.

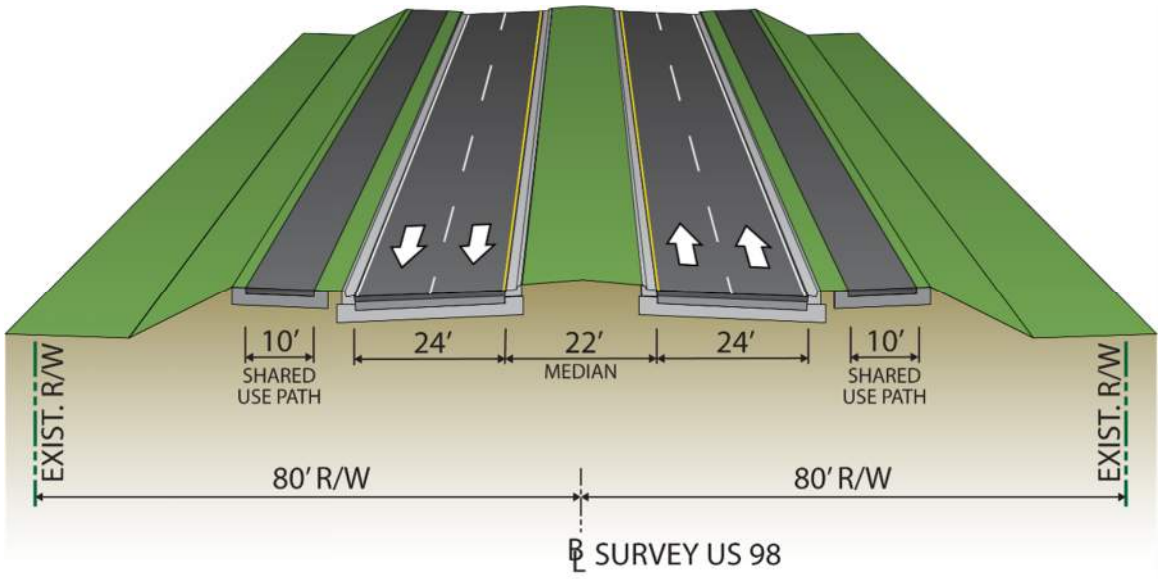


Figure 1-3 Proposed US 98 C3R (Suburban) Typical Section

The typical section for the portion of US 98 from Rock Ridge Road to CR 54 includes 11-foot travel lanes, four-foot paved shoulders with curb and gutter on the inside, ten-foot outside shoulders (five feet paved), and a 30-foot grassed median, as shown in **Figure 1-4**. Design, target, and posted speeds of 55 mph are proposed for this 6.4-mile section of the project.

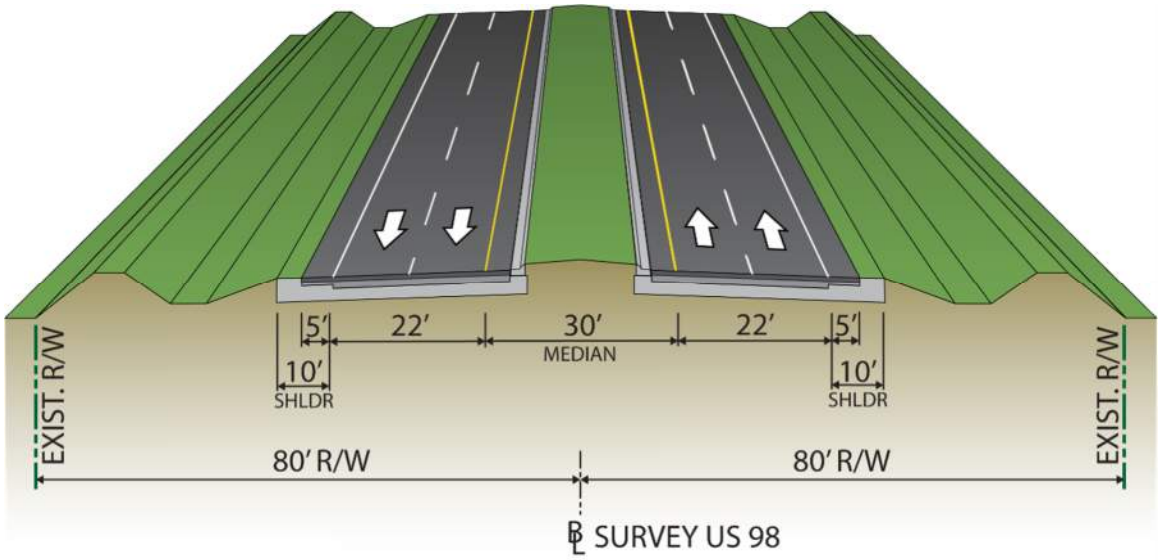


Figure 1-4 Proposed US 98 C2 (Rural) Typical Section

Both typical sections can be accommodated within the existing ROW. Stormwater runoff will be collected and conveyed to stormwater management facilities (SMFs) that will be constructed along the corridor and impacts to adjacent floodplains will be mitigated through the construction of floodplain compensation (FPC) sites.

1.4 PURPOSE OF THIS REPORT

The purpose of this Location Hydraulic Report is to document and address base floodplain encroachments resulting from the roadway improvements evaluated in the PD&E Study. This Location Hydraulics Report was prepared in accordance with the FDOT *PD&E Manual* to meet the requirements of the National Environmental Policy Act (NEPA) and other associated federal and state laws, rules, and regulations.

SECTION 2 DATA COLLECTION

The design team collected and reviewed data from the following sources:

- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel Nos. 12105C0025G, 12105C0135G, 12105C0155G, and 12105C0161G, Effective Date 12/22/2016, in Polk County, Florida.
- United States Geological Survey (USGS) Quadrangle Maps
- United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soils Survey of Polk County, Florida, 2020 and Soils Survey of Pasco County, Florida, 2020
- Field Reconnaissance (April 2021)
- Existing Permit Databases (SWFWMD)
- 1-ft LIDAR Data Source: Florida Division of Emergency Management (FDEM), Polk County, 2005

SECTION 3 EXISTING DRAINAGE CONDITIONS

3.1 TOPOGRAPHY & HYDRAULIC FEATURES

Topography throughout the project is relatively flat with a gradual downhill slope from the southern end of the project corridor to the north. Roadway elevations begin at 136 feet and decrease to 91 feet. All elevations mentioned in this report are in reference to the North American Vertical Datum of 1988 (NAVD) unless otherwise stated. Please refer to the **USGS Quadrangle Map**, **Figure 3** in **Appendix A**. US 98 does not traverse any OFWs within the project corridor. It is within three (3) Waterbody IDs (WBID) – 1445 Port Lonesome Ditches, 1449B Orange Hammock Drain, and 1454 Fox Branch, which are not impaired for nutrients, although Fox Branch is impaired for Fecal Coliform. Please refer to the **WBID Map**, **Figure 7** in **Appendix A**. There are nineteen (19) existing cross drains underneath US 98 and three (3) bridge culverts within the project limits. The cross drains and bridge culverts allow for conveyance of offsite and onsite runoff beneath the road toward its historical path. The size and geometry of all cross drains and bridges culverts have been established from survey, review of 1-foot LiDAR contours, and during field reconnaissance but should be verified during design. Please refer to **Table 3-1** for a **Summary of Existing Cross Drains and Bridges.**

Table 3-1 Summary of Existing Cross Drains and Bridges

Structure No.	Station	Description	Remarks
CD-1	463+36	42” RCP	
CD-2	472+52	30” RCP	
CD-3	489+64	5’W x 3’H CBC	
CD-4	499+51	24” RCP	
CD-5	559+35	5’W x 3’H CBC	
CD-6	580+00	42” RCP	
CD-7	597+50	Triple 24” RCP	
CD-8	625+00	10’W x 3’H CBC	
CD-9	655+00	4’W x 3’H CBC	
CD-10	666+00	30” RCP	
CD-11	682+00	30” RCP	
CD-12	725+00	Double 30” RCP	
CD-13	738+00	8’W x 4’H CBC	
CD-14	750+00	24” RCP	
CD-15	766+00	24” RCP	
BC-1	784+50	Double 10’W x 2’H BC	Main Stream
BC-2	849+00	Quadruple 10’W x 3’H BC	Fox Branch
CD-16	867+00	36” RCP	
CD-17	888+50	10’W x 2’H CBC	
BC-3	914+00	Triple 10’W x 2’H BC	Cypress Run

Structure No.	Station	Description	Remarks
CD-18	921+24	10'W x 3'H CBC	
CD-19	929+00	5'W x 3'H CBC	

3.2 SOILS DATA AND GEOTECHNICAL INVESTIGATIONS

The soil survey of Polk County, Florida (dated 2020) published by the USDA NRCS has been reviewed within the project vicinity. USDA Soil Survey Geographic database (SSURGO) data was also obtained from NRCS to create a soils map for the project limits using GIS ArcMap. The soil survey map for the project vicinity is illustrated in **Figures 4A**, **4B** and **4C** of **Appendix A**.

Table 3-2 USDA NRCS Soil Survey Information for Polk County

Soil No.	USDA Soil Name	Seasonal High Ground Water		HSG	Soil Classification		
		Depth* (feet)	Duration (months)		Depth (inches)	Unified	AASHTO
5	EauGallie Fine Sand	0-1.0	---	A/D	0-26	SP, SP-SM	A-3
					26-52	SM, SP-SM	A-2-4, A-3
					52-80	SC, SC-SM, SM	A-2-4, A-2-6
6	Eaton Mucky Fine Sand, Depressional	0	---	C/D	0-6	SP-SM	A-2-4, A-3
					6-29	SM, SP-SM	A-2-4, A-3
					29-33	SC	A-7, A-4, A-6
					33-80	CH, CL, SC	A-7
7	Pomona Fine Sand	0-1.0	---	A/D	0-21	SP, SP-SM	A-2-4, A-3
					21-26	SM, SP-SM	A-2-4, A-3
					26-48	SP, SP-SM	A-2-4, A-3
					48-73	SM, SC-SM, SC	A-2, A-4, A-6
					73-80	SM, SP-SM	A-2-4, A-3
9	Lynne Sand	0-1.0	---	C/D	0-21	SP, SP-SM	A-3
					21-28	SM, SP-SM	A-2-4, A-3
					28-33	SP-SM	A-2-4, A-3
					33-80	CH, CL, SC	A-6, A-7
10	Malabar Fine Sand, 0 to 2 Percent Slopes	0-0.5	---	A/D	0-5	SM, SP-SM	A-2-4, A-3
					5-17	SM, SP-SM	A-3, A-2-4, A-3
					17-42	SM, SP-SM	A-2-4, A-3
					42-59	SC-SM, SC, SL	A-2-4, A-6, A-4
					59-80	SM	A-4, A-2-4
13	Samsula Muck, Frequently Ponded, 0 to 1 percent slopes	0	---	A/D	0-32	PT	A-8
					32-35	SM, SP-SM	A-3, A-2-4
					35-44	SP-SM, SM	A-2-4, A-3
					44-80	SM, SP-SM	A-4, A-2-4
14	Sparr Sand, 0 to 5 Percent Slopes	0-2.0	---	A/D	0-57	SM, SP-SM	A-2-4, A-3
					57-80	SC-SM, SC	A-2-6, A-2-4, A-7-6
15	Tavares Fine Sand, 0 to 5 Percent Slopes	2.0-4.0	---	A	0-5	SP, SP-SM	A-3, A-2-4
					5-80	SP, SP-SM, SM	A-3, A-2-4
17	Smyrna and Myakka Fine Sands,	0-1.0	---	A/D	0-12	SP, SP-SM	A-2-4, A-3
					12-25	SM, SP-SM	A-2-4, A-3
					25-42	SP, SP-SM	A-3
					42-80	SM, SP-SM	A-2-4, A-3

Soil No.	USDA Soil Name	Seasonal High Ground Water		HSG	Soil Classification		
		Depth* (feet)	Duration (months)		Depth (inches)	Unified	AASHTO
19	Floridana Mucky Fine Sand, 0 to 1 Percent Slopes, Frequently Ponded	0	---	C/D	0-4	SM, SP-SM	A-3, A-2-4
					4-15	SP-SM, SM	A-2-4, A-3
					15-32	SM, SP-SM	A-3, A-2-4
					32-44	CL, SC, SC-SM	A-7-6, A-6, A-4
					44-80	SC, CL, SC-SM	A-7-6, A-2-4, A-4
20	Ft. Meade Sand, 0 to 5 Percent Slopes	> 6.0	---	A	0-80	SM	A-2-4
25	Placid and Myakka Fine Sands, Depressional	0	---	A/D	0-18	SM, SP, SP-SM	A-3, A-2-4
					18-80	SP-SM, SP, SM	A-2-4, A-3
26	Lochloosa Fine Sand	1.0-3.5	---	C	0-36	SM, SP-SM	A-2-4, A-3
					36-80	SC, SC-SM	A-2-6, A-4, A-6
31	Adamsville Fine Sand, 0 to 2 Percent Slopes	0-1.5	---	A/D	0-7	SP-SM, SP, SM	A-2-4, A-3
					7-80	SP, SP-SM, SM	A-2-4, A-3
32	Kaliga Muck, Frequently Ponded, 0 to 1 Percent Slopes	0	---	C/D	0-25	PT	A-8
					25-35	SM, SC	A-2-4, A-7-6, A-4
					35-60	CL, SC-SM	A-6, A-4
					60-80	SC, CL, SM	A-4, A-6
33	Holopaw Fine Sand, Frequently Ponded, 0 to 1 Percent Slopes	0	---	A/D	0-4	SM, SP-SM	A-2-4, A-3
					4-50	SM, SP-SM	A-3, A-2-4
					50-66	SC, SC-SM	A-2-4, A-4, A-6
					66-80	SC-SM, SM	A-2-4
35	Hontoon Muck, Frequently Ponded, 0 to 1 Percent Slopes	0	---	A/D	0-75	PT	A-8
					75-80	SM, SC-SM, SC	A-6, A-2-4
36	Basinger Mucky Fine Sand, Frequently Ponded 0 to 1 Percent Slopes	0	---	A/D	0-7	SP-SM, SM	A-2-4, A-3
					7-19	SP-SM, SM	A-3, A-2-4
					19-38	SP-SM, SM	A-2-4, A-3
					39-80	SP-SM, SM	A-3, A-2-4
38	Electra Fine Sand	1.0 -2.5	---	A/D	0-42	SP, SP-SM	A-3
					42-50	SM, SP-SM	A-2-4, A-3
					50-55	SP, SP-SM	A-3
					55-80	SC, SC-SM	A-2, A-4, A-6
40	Wauchula Fine Sand	0-1.0	---	C/D	0-7	SP-SM	A-2-4, A-3
					7-18	SP-SM	A-3, A-2-4
					18-33	SM, SP-SM	A-2-4, A-3
					33-70	SC, SC-SM, SM	A-2-4, A-2-6, A-4, A-6
					70-80	SC, SC-SM	A-2-4, A-2-6
43	Oldsmar Fine Sand	0-1.0	---	A/D	0-36	SP, SP-SM	A-3
					36-50	SM, SP-SM	A-2-4, A-3
					50-80	SC, SC-SM	A-2-4, A-2-6
47	Zolfo Fine Sand, 0 to 2 Percent Slopes	1.0-2.5	---	A	0-5	SP-SM, SM	A-2-4, A-3
					5-80	SM, SP-SM	A-2-4, A-3
62	Wabasso-Wabasso, Wet, Fine Sand, 0 to 2 Percent Slopes	0-1.0	---	B/D	0-7	SP-SM, SM	A-2-4, A-3
					7-24	SP-SM, SM	A-3, A-2-4
					24-39	SP-SM, SM	A-2-4, A-3
					39-80	CL, SC-SM	A-6, A-7-6, A-2-4

Soil No.	USDA Soil Name	Seasonal High Ground Water		HSG	Soil Classification		
		Depth* (feet)	Duration (months)		Depth (inches)	Unified	AASHTO
76	Millhopper Fine Sand, 0 to 5 Percent Slopes	2.0-4.0	---	A	0-7	SC, SC-SM	A-2-4
					7-59	SP-SM, SM, SC-SM	A-2-4
					59-64	SC, CL	A-2-4, A-6
					64-80	SC, CL	A-7-6, A-6
87	Basinger Fine Sand, 0 to 2 Percent Slopes	0-0.5	---	A/D	0-7	SP-SM, SM	A-2-4, A-3
					7-19	SP-SM, SM	A-3, A-2-4
					19-39	SP-SM, SM	A-2-4, A-3
					39-80	SM, SP-SM	A-2-4, A-3

*Seasonal High Ground Water Table: Depth is referenced below existing grade, except where indicated as "+".

The soils encountered along the project limits are mostly Hydrologic Soil Group (HSG) A/D and C/D. Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission. Group B Soils have a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture and have a moderate rate of water transmission. Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture and have a slow rate of water transmission. Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission. If a soil is assigned to a dual HSG, the first letter is for drained areas and the second is for un-drained areas. Soils are only assigned a dual class if they are group D in their natural condition. According to the Soil Survey, there are 25 different soil types located along the project limits within Polk County. **Table 3-2: USDA NRCS Soil Survey Information for Polk County** summarizes and lists the soil types and relevant information. The ground water depth varies from 0' to 6' along the project per the NRCS Soil Survey information.

A preliminary geotechnical investigation was performed by Tierra, Inc. for the pond site alternatives. A copy of the results of this investigation is provided in **Appendix I – Summary of Seasonal High Groundwater Table Estimates** of the *Pond Siting Report* prepared for this study. The geotechnical investigation estimated the seasonal high water depths at each pond site. Reasonable assumptions are made to set the control elevations of the pond site alternatives that are based on the results of the preliminary geotechnical investigation, adjacent wetland elevations, adjacent permitted stormwater systems and NRCS information. A more detailed geotechnical investigation should be supplemented during the design phase for the selected stormwater ponds.

3.3 EXISTING BRIDGE CULVERTS

The existing bridge culverts over Main Stream, Fox Branch and Cypress Run are identified by culvert numbers 160152, 160052 and 160053 respectively and were constructed in 1946 (160152) and 1947 (160052 and 160053). The existing bridge culverts have sufficiency ratings of 91.7, 86.6 and 78.0 respectively, though due to the age and Design Service Life (DSL) of the culverts, it is recommended that they be replaced. The National Bridge Inventory Data can be found in **Appendix E**.

3.4 ENVIRONMENTAL CHARACTERISTICS

3.4.1 Land Use Data

The project corridor is predominantly agricultural, forest/wetlands and residential for the majority of the project length, with some commercial and industrial properties along the project corridor. Additionally, the Cypress Lakes Golf Course and community lies adjacent to US 98 in the southern portion of the project corridor. Please see **Figures 5A**, **5B** and **5C** for the **Land Use Map** in **Appendix A**. The widening of US 98 does not alter the existing or future land uses in the area.

3.4.2 Natural and Biological Features

The proposed project has potential to involve several State and/or Federally listed protected wildlife species. These species and their anticipated involvement are identified in the *Natural Resources Evaluation Report* prepared under a separate cover for this study.

The project corridor was evaluated for the presence of potentially occurring protected species. Wetlands and other surface waters with potential to be affected by the proposed project were identified within the study area. A wetland assessment was performed for these wetlands and other surface waters in accordance with the Uniform Mitigation Assessment Method (UMAM) as described in Chapter 62-345, FAC to determine the functional value provided by the wetlands and other surface waters.

3.5 FLOODPLAINS / FLOODWAYS

According to the Federal Emergency Management Agency (FEMA), the relevant Flood Insurance Rate Map (FIRM) panel numbers are 12105C0025G, 12105C0135G, 12105C0155G, and 12105C0161G, dated 12/22/2016.

According to the FEMA FIRMs, portions of the project intersect Zone A of the 100-year floodplain in multiple areas of the project limits. These areas are associated with adjacent wetlands and depressional areas and have a 1% probability of flooding every year with predicted flood water elevations that have not been established. There are no federally regulated floodways within the project limits. Please refer to **Figure 6A**, **6B** and **6C** in **Appendix A** for the **FEMA Floodplains Map.**

There are no current flood studies that include this segment of US 98 and the only studies available are outside of the project limits. The Hillsborough River/Tampa Bypass Canal study is within FDOT

District 7's northern segment of US 98 and the New River Flood Study is west of US 98. The Fox Branch HEC-1/HEC-2 stormwater model is also located west of this segment of US 98.

General comments relating to floodplains include the fact that any development within the 100-year floodplain has the potential for placing citizens and property at risk of flooding and producing changes in floodplain elevations and plan view extent. Development (such as roadways, housing developments, strip malls and other commercial facilities) within floodplains increases the potential for flooding by limiting flood storage capacity and exposing people and property to flood hazards. Development also reduces vegetated buffers that protect water quality and destroys important habitats for fish and wildlife. The area surrounding the proposed roadway widening project has and will continue to experience growth.

Any floodplain impacts will be mitigated for in an offsite floodplain compensation site on a cup for cup basis. From the available data, thirteen (13) Floodplain Impact Areas (FIA) have been determined based on areas in which the 100-year floodplain lies within the proposed right-of-way. **Figures 3-1, 3-2,** and **3-3** illustrates the location of the FIAs.

Floodplain impacts were quantified by identifying and measuring areas in which the floodplain will potentially be impacted by proposed roadway fill. These areas were multiplied by an estimated depth from the estimated 100-year floodplain elevation to the estimated Seasonal High Water Table (SHWT) to calculate an impact volume. Since the majority of the impacted floodplains are classified as Zone A, the 100-year floodplain elevations were estimated by comparing the floodplain shapes to 1-foot contours obtained from LiDAR, which closely correlated in most locations. The SHWT was estimated through review of NRCS soil information, geotech boring data and wetland limits within the mainline R/W. The analysis data indicate that approximately 19.61 ac-ft of 100-year floodplain volume is impacted within the project limits. The project has the potential to impact floodplains and their functions in the area.

For the purpose of this study, a cup for cup approach was taken to provide FDOT with right-of-way estimates for offsite floodplain compensation (FPC) sites for funding projections. Compensation volumes were calculated to be the available volume between the SHWT of the proposed compensation site and the 100-year flood elevation of the FIA. The floodplain compensation (FPC) sites are shown in **Figure 3-1, 3-2,** and **3-3**. Refer to the *Pond Siting Report* prepared for the study for further information. Coordination with SWFWMD occurred regarding established watershed models in the region to determine 100-year floodplain elevations. It was indicated that no available watershed models are available that encompass the US 98 study limits. The Hillsborough River watershed model begins north of the project study limits within Pasco County. To the west of US 98, the New River watershed model exists, however, it does not include basins associated for US 98 itself. A review of the FEMA 100-year floodplain boundary lines (which are fairly recent – December 2016) revealed that these lines follow exactly the 1' LiDAR contours available for the area. Therefore, it was agreed and concurred by SWFWMD that the best approach to establish the 100-year flood elevations would be to use the 1' LiDAR elevation that matched the particular floodplain boundary line.

Figure 3-1 Floodplain Impact Area Map (FIA)

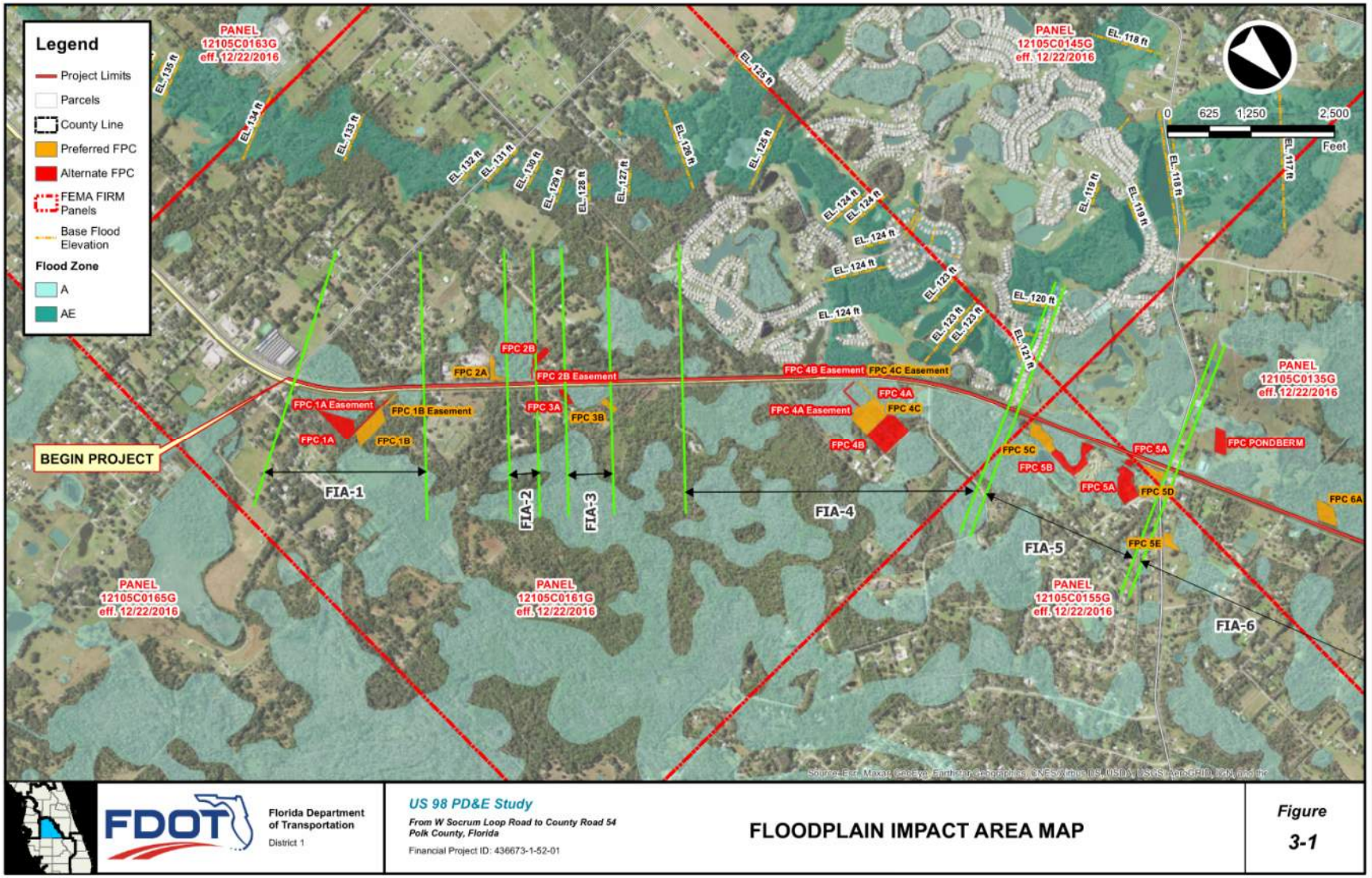


Figure 3-2 Floodplain Impact Area Map (FIA)

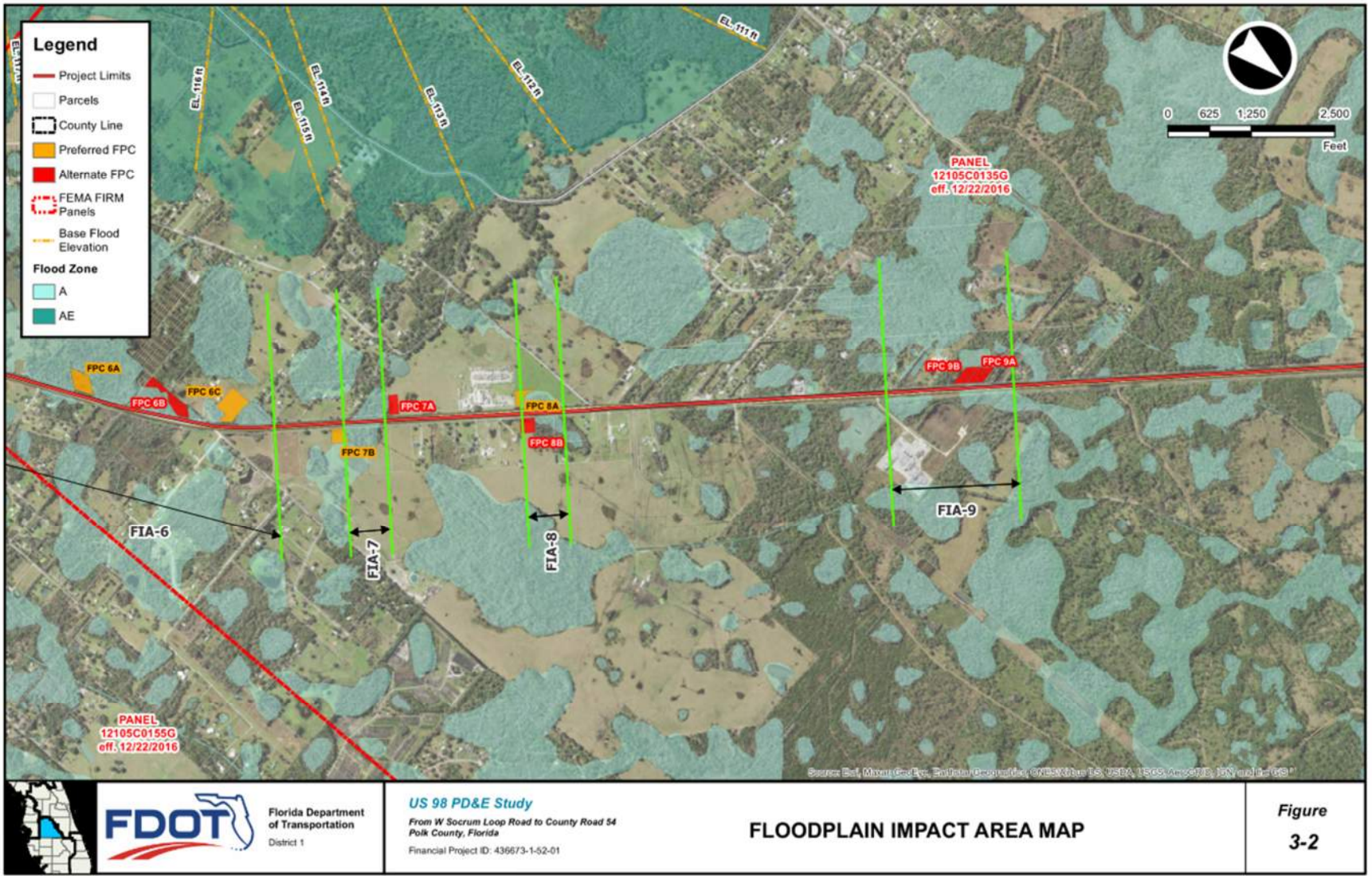
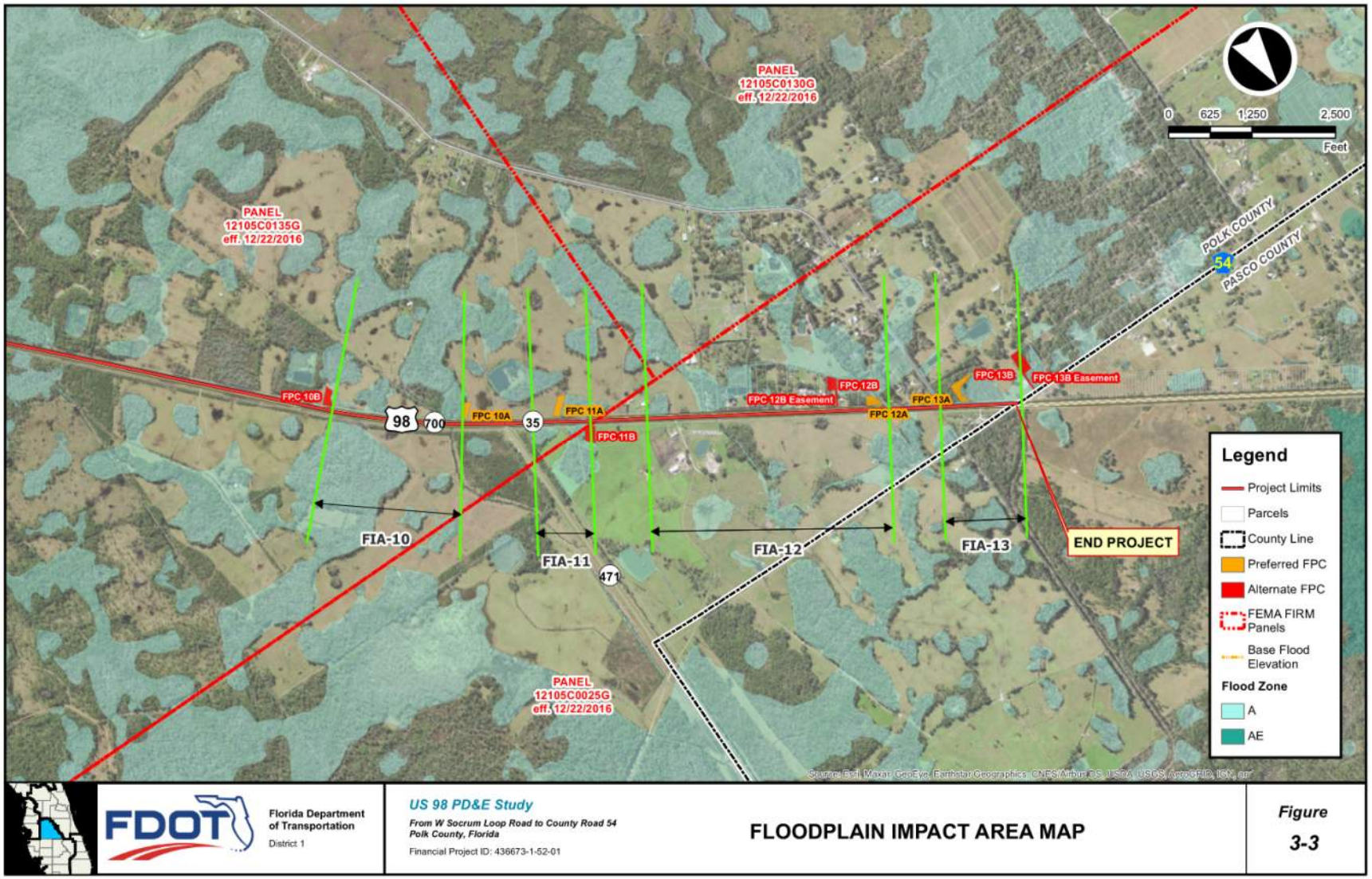


Figure 3-3 Floodplain Impact Area Map (FIA)



3.5.1 Flooding History and Maintenance Concern

Discussions were held with the FDOT Maintenance regarding drainage issues along the project corridor. Mark Barnes from the FDOT Maintenance Office indicated that he is unaware of any overtopping of the roadway, but that there are several areas along the project corridor that remain wet for the majority of the year.

SECTION 4 PROPOSED DRAINAGE CONDITIONS

The stormwater runoff from the project limits will be collected and conveyed to the recommended preferred pond alternative for each basin via curb and gutter in the southern segment and ditches in the northern segment. The various pond alternatives consist of wet detention ponds. The ponds will discharge at or near the same cross drains that carry the roadway runoff in the existing condition. The proposed ponds have been sized to achieve the required water quality treatment and water quantity attenuation and serve as a budget tool for right-of-way estimation for the project to the Department. Please refer to the *Pond Siting Report* prepared for this study for more information.

A preliminary analysis of the cross drains has been performed to determine whether the existing cross drains have adequate capacity due to the increase in length. Replacement of these cross drains is antcipated due to an increase in headwater elevations caused by extension of the pipe, the need to relocate the pipe due to the proposed roadway configuration, or age and service life. Please note that the hydraulic analysis is based on providing adequate conveyance capacity. **Table 4-1** below provides a **Summary of Cross Drains**.

Table 4-1 Summary of Cross Drains

Structure No.	Station	Existing Condition				Proposed Condition				Remarks
		# of Barrels	Size	Type	Length (ft)	# of Barrels	Size	Type	Length (ft)	
CD-1	463+36	1	42”	RCP	186	1	48”	RCP	221	Upsize
CD-2	472+52	1	30”	RCP	100	1	36”	RCP	160	Upsize
CD-3	489+64	1	5’ X 3’	CBC	98	1	5’ X 3’	CBC	160	Replace
CD-4	499+51	1	24”	RCP	99	1	30”	RCP	160	Upsize
CD-5	559+35	1	5’ X 3’	CBC	101	1	5’ X3’	CBC	160	Replace
CD-6	580+00	1	42”	RCP	103	1	48”	RCP	160	Upsize
CD-7	597+50	3	24”	RCP	101	3	30”	RCP	160	Upsize
CD-8	625+00	1	10’ X 3’	CBC	101	1	10’ X 3’	CBC	160	Replace
CD-9	655+00	1	4’ X 3’	CBC	98	1	4’ X 3’	CBC	160	Replace
CD-10	666+00	1	30”	RCP	103	1	36”	RCP	160	Upsize
CD-11	682+00	1	30”	RCP	100	1	36”	RCP	160	Upsize
CD-12	725+00	2	30”	RCP	103	3	30”	RCP	160	Upsize
CD-13	738+00	1	8’ X 4’	CBC	99	1	8’ X 4’	CBC	160	Replace
CD-14	750+00	1	24”	RCP	109	1	30”	RCP	160	Upsize
CD-15	766+00	1	24”	RCP	100	1	30”	RCP	160	Upsize
BC-1	784+50	2	10’ X 2’	BC	98	2	10’ X 2’	BC	160	Replace
BC-2	849+00	4	10’ X 3’	BC	101	4	10’ X 3’	BC	160	Replace
CD-16	867+00	1	36”	RCP	100	1	42”	RCP	160	Upsize
CD-17	888+50	1	10’ X 2’	CBC	98	1	10’ X 2’	CBC	160	Replace
BC-3	914+00	3	10’ X 2’	BC	98	3	10’ X 2’	BC	160	Replace

Structure No.	Station	Existing Condition				Proposed Condition				Remarks
		# of Barrels	Size	Type	Length (ft)	# of Barrels	Size	Type	Length (ft)	
CD-18	921+24	1	10' X 3'	CBC	98	1	10' X 3'	CBC	160	Replace
CD-19	929+00	1	5' X 3'	CBC	98	1	5' X 3'	CBC	160	Replace

The hydrologic analyses for the existing and proposed cross drains were based on the Velocity Method for a 50-year, 100-year, and 500-year storm frequencies. Recommended pipe sizes are based on certain assumptions for the hydraulic analyses such as roadway crest elevation and tailwater conditions. These assumptions were derived from the best available information at the time, including measurement of the cross drain stain lines. Cross drain sizes and inverts were taken from preliminary survey of the project corridor and verified during field reconnaissance. During the design phase, more accurate information regarding the tailwater conditions and roadway profile will be available to the designer. The cross drains were analyzed using the Federal Highway Administration HY-8 (v. 7.60) cross drain modeling software. For more information regarding the Cross Drain Analysis please refer to **Appendix C**.

4.1 LONGITUDINAL & TRANSVERSE FLOODPLAIN IMPACTS

The project will impact the 100-year floodplain in two (2) different ways;

1) Longitudinal impacts resulting from filling the floodplain areas associated with proposed roadway widening within the project limits, isolated wetlands, wetland systems, and depressional areas.

2) Transverse impacts resulting from the extension and replacement of the existing cross drain culverts.

The longitudinal impacts cannot be avoided since the floodplains extend both north and south of US 98 within the study limits. The floodplain impact area was quantified based on the FEMA FIRMs and established 100-year base flood elevation, and the existing ground elevations were established from 1-foot LIDAR contours. To be conservative, it was assumed that any fill from the proposed roadway above the estimated SHWT outside of the existing roadway was quantified as floodplain impacts.

The transverse impacts resulting from the extension or replacement of the culverts have not been analyzed in this report. To minimize upstream impacts, FDOT design criteria for conveyance systems (e.g. culverts) allow no significant rise in flood stages at the upstream end of the structures. During design, efforts should be made to show that proposed base headwater elevations will not surpass 0.1 feet of rise from the existing condition, and every necessary action should be taken to minimize upstream impacts. A preliminary hydraulic analysis of the cross drains has been performed as part of this study and included in this report.

A Bridge Hydraulics Report will be required during the design phase to evaluate the hydraulic impacts to Main Stream, Fox Branch and Cypress Run associated with the bridge culvert improvements. Preliminary proposed bridge culvert information is discussed in the *Preliminary Engineering Report* prepared for this study. A scour evaluation should also be performed as part of the Bridge Hydraulics Report for the proposed bridge culverts. Potential bridge scour considerations include the long-term aggradation and degradation of the channel and contraction and local scour at the bridge culverts.

4.2 PROJECT CLASSIFICATION

The floodplain is located in a low density, non-urbanized area, and the encroachment area is classified as "minimal". Minimal encroachments on a floodplain occur when there is a floodplain involvement, but the impacts on human life, transportation facilities, and natural and beneficial floodplain values are not significant and can be resolved with minimal efforts. Normally, these minimal efforts to address the impacts will consist of applying the Department's drainage design standards and following the Water Management District's procedures to achieve results that will not increase or significantly change the flood elevations and/or limits.

4.3 RISK EVALUATION

There is no change in flood "risk" associated with this project. The encroachments will not have a significant potential for interruption or termination of transportation facilities needed for emergency vehicles or used as an evacuation route. In addition, no significant adverse impacts on natural and beneficial floodplain values are anticipated and no significant impacts to highway users are expected.

4.4 PD&E MANUAL REQUIREMENTS WITH MINIMAL ENCROACHMENT

Chapter 13 – Floodplains of the FDOT's PD&E Manual, Part 2, defines four categories of encroachments as they pertain to base floodplain involvement; significant, minimal, none and no involvement, and also lists the report criteria corresponding to these encroachment categories. The FDOT has different requirements based on the category of encroachment. The proposed US 98 widening project was determined to have minimal encroachments and as a result, the requirements for this category are listed as follows:

a) General description of the project including location, length, existing and proposed typical sections, drainage basins, and cross drains.

See Sections 1.0 through 4.2 of this LHR for general project information and the Pond Siting Report for drainage basin descriptions.

b) Determination of whether the proposed action is in the base floodplain.

It has been determined that improvements associated with the widening of US 98 will encroach on the Zone A and Zone AE 100-year floodplain as established by the most recent FEMA maps dated 12/22/2016.

c) The history of flooding of the existing facilities and/or measures to minimize any impacts due to the proposed project improvements.

According to the FDOT Maintenance Office, US 98 has not experienced any overtopping of the roadway, but there are areas along the project corridor that remain wet for the majority of the year. Floodplain Compensation areas will be constructed to mitigate loss of storage in the floodplain throughout the length of the corridor due to the project improvements. In addition, stormwater treatment areas are proposed to attenuate runoff. The project will have no adverse impact on the existing condition.

d) Determination of whether the encroachment is longitudinal or transverse, and if it is a longitudinal encroachment an evaluation and discussion of practicable avoidance alternatives.

With the increase in the number of travel lanes proposed, there will be longitudinal and transverse impacts to the floodplain. Longitudinal impacts will be minimized by utilizing the maximum allowable roadway embankment slope.

The transverse floodplain impacts from the project occur due to the lengthening of the existing cross drains. The impacts at these locations are not analyzed during this study and will need to be addressed during the design phase. A preliminary hydraulic analysis for the longer cross drains has been performed for this study and included in this report.

The existing roadway bisects the floodplain in some locations. There are no economically feasible avoidance alternatives.

e) The practicability of avoidance alternatives and/or measures to minimize impacts.

The project will take every effort to minimize floodplain impacts resulting from the roadway fill. The maximum allowable roadway embankment slope will be used within the floodplain area to minimize the floodplain impacts.

f) Impact of the project on emergency services and evacuation.

The proposed cross drains and bridge culverts will perform hydraulically in a manner equal to or greater than the existing condition, and backwater elevations are not expected to increase. As a result, there will be no significant change in flood risk, and there will not be a significant change in the potential for interruption or termination of emergency service or in emergency evacuation routes.

g) Impacts of the project on the base flood, likelihood of flood risk, overtopping, location of overtopping, backwater.

The proposed cross drains and bridge culverts will perform hydraulically in a manner equal to or greater than the existing condition. As a result, there will be no significant change in flood risk or overtopping.

h) Determination of the impact of the proposed improvements on regulatory floodways, if any, and documentation of coordination with FEMA and local agencies to determine the project's consistency with the regulatory floodway.

There is no involvement with regulatory floodways on this project.

i) The impacts on natural and beneficial floodplain values, and measures to restore and preserve these values (this information may also be addressed as part of the wetland impact evaluation and recommendations).

Addressed as part of the Natural Resource Evaluation Report.

j) Consistency of the project with the local floodplain development plan or the land use elements in the Comprehensive Plan, and the potential impacts of encouraging development within the 100-year base floodplain.

The project will remain consistent with local floodplain development plans. The project will not support base floodplain development that is incompatible with existing floodplain management programs.

k) Measures to minimize floodplain impacts associated with the project, and measures to restore and preserve the natural and beneficial floodplain values impacted by the project.

The project will take every effort to minimize floodplain impacts resulting from the roadway fill. The maximum allowable roadway embankment slope will be used within the floodplain area to minimize the floodplain impacts and floodplain compensation areas will be provided as needed.

l) A map showing project, location and impacted floodplains. Copies of applicable maps should be included in the appendix.

See Figures 6, 6A, 6B and 6C in Appendix A and Figures 3-1, 3-2 and 3-3 in Section 3.5.

m) Results of any and all project risk assessments performed.

The proposed cross drains and bridge culverts will perform hydraulically in a manner equal to or greater than the existing condition. As a result, there will be no significant change in flood risk.

SECTION 5 CONCLUSION AND RECOMMENDATIONS

The modification to the drainage structures included in the project will result in an insignificant change in their capacity to carry floodwater. This change will cause minimal increases in flood heights and flood limits. An alternative encroachment location is not considered in this category as it defeats the project purpose or is economically unfeasible. The proposed structures should be hydraulically equivalent to or greater than the existing structures, and backwater surface elevations are not expected to increase. As a result, the project will not affect existing flood heights or floodplain limits. This project will not result in any new or increased adverse environmental impacts. There will be no significant change in the potential for interruption or termination of emergency service or emergency evacuation routes. Therefore, it has been determined that these encroachments are not significant.

APPENDICES

Appendix A Exhibits

Appendix B Floodplain Impact & Compensation Calculations

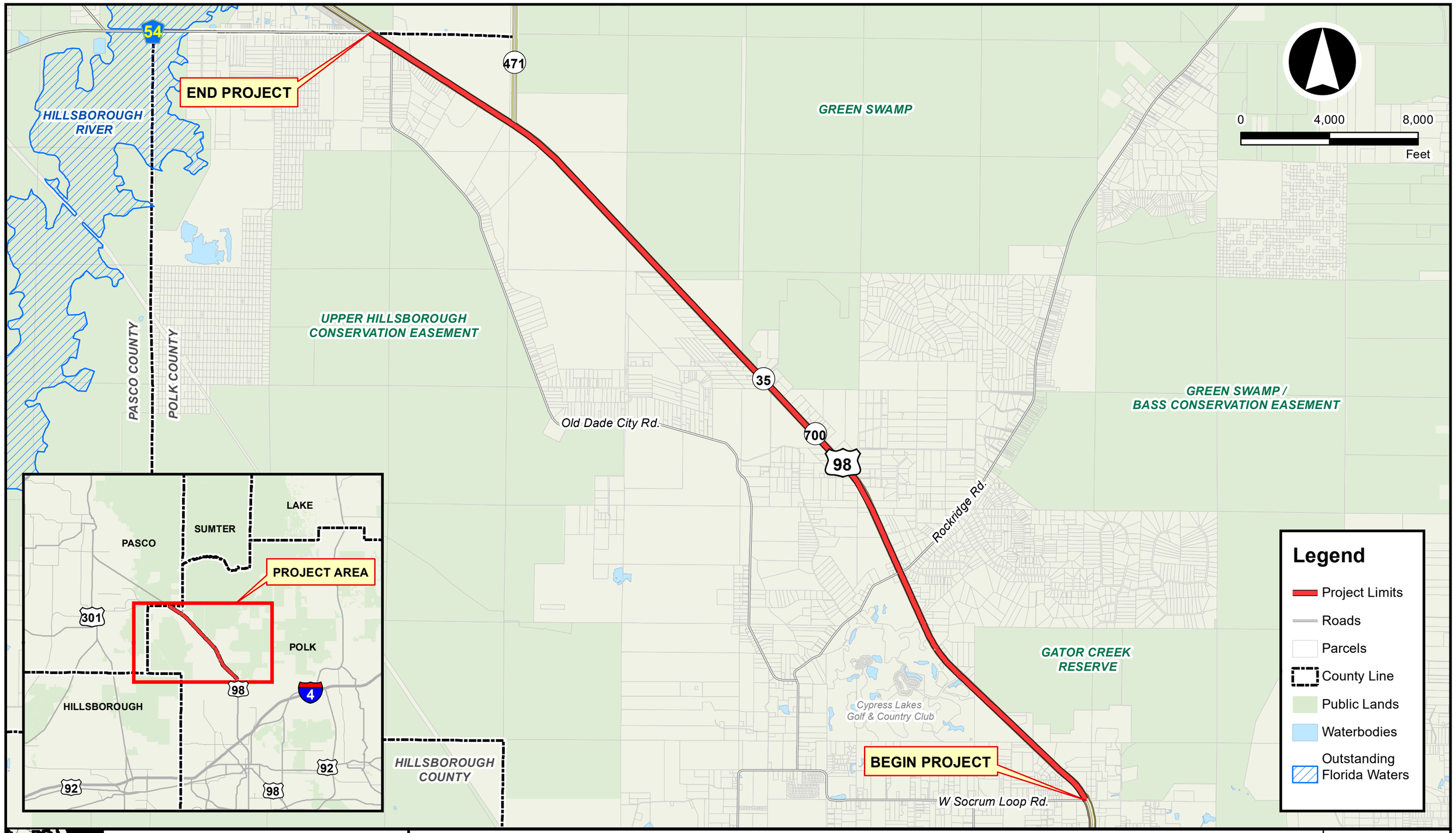
Appendix C Cross Drain Analysis

Appendix D Cross Drain Pictures, Review Checklist and FDOT SLD

Appendix E National Bridge Inventory Data

APPENDIX A

Exhibits



Florida Department of Transportation
District 1

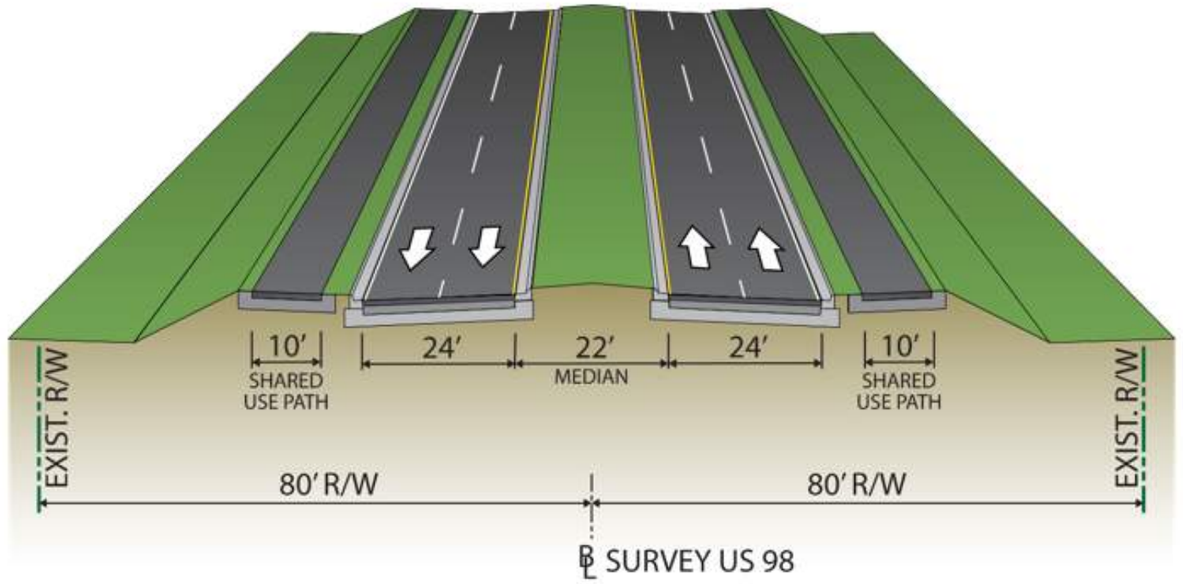
US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

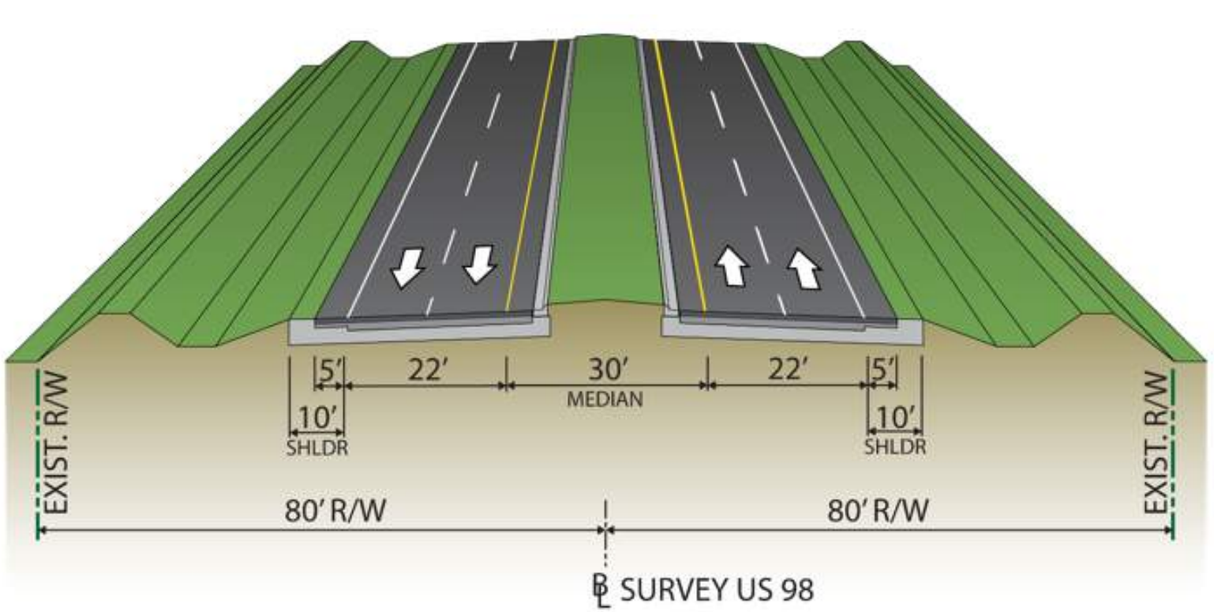
Financial Project ID: 436673-1-52-01

PROJECT LOCATION MAP

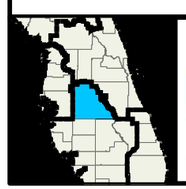
Figure 1



Proposed US 98 C3R (Suburban) Typical Section



Proposed US 98 C2 (Rural) Typical Section



Florida Department of Transportation
District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

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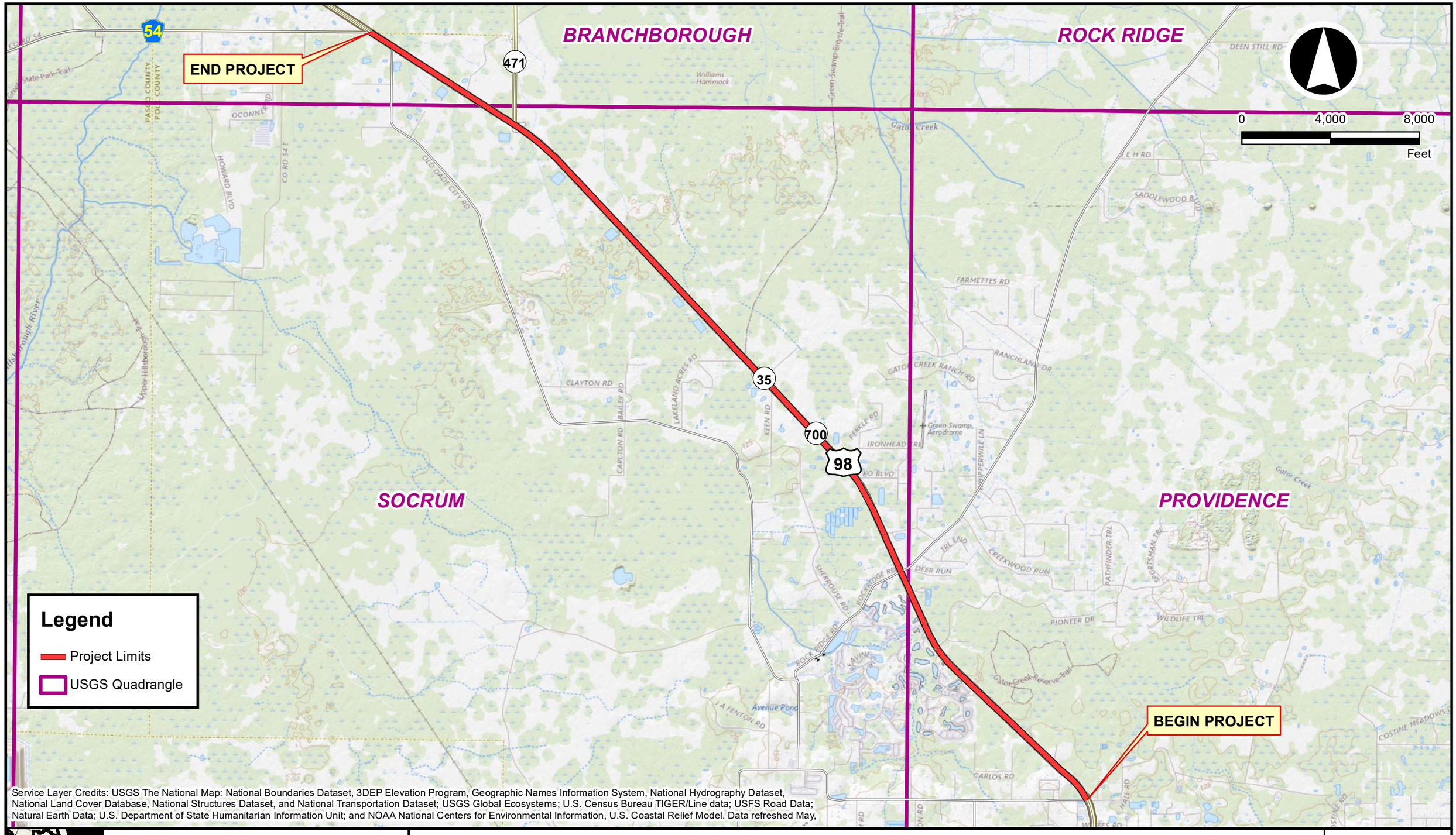
TYPICAL SECTION

Figure
2



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

Florida Department of Transportation
District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

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USGS QUADRANGLE MAP

Figure 3

Legend

- Project Limits
- Parcels
- County Line

Soil Rating

- A
- A/D
- B/D
- C
- C/D
- Water
- Urban Land / Udorthants, Excavated

0 625 1,250 2,500 Feet

BEGIN PROJECT

98 700

Polk County Soil Descriptions

5: EauGallie Fine Sand

6: Eaton Mucky Fine Sand, Depressional

7: Pomona Fine Sand

9: Lynne Sand

10: Malabar Fine Sand, 0 to 2 Percent Slopes

13: Samsula Muck, Frequently Ponded, 0 to 1 Percent Slopes

14: Sparr Sand, 0 to 5 Percent Slopes

15: Tavares Fine Sand, 0 to 5 Percent Slopes

16: Urban Land, 0 to 2 Percent Slopes

17: Smyrna and Myakka Fine Sands

19: Floridana Mucky Fine Sand, Frequently Ponded, 0 to 1 Percent Slopes

20: Fort Meade Sand, 0 to 5 Percent Slopes

25: Placid and Myakka Fine Sands, Depressional

26: Lochloosa Fine Sand

31: Adamsville Fine Sand, 0 to 2 Percent Slopes

32: Kaliga Muck, Frequently Ponded, 0 to 1 Percent Slopes

33: Holopaw Fine Sand, Frequently Ponded, 0 to 1 Percent Slopes

35: Hontoon Muck, Frequently Ponded, 0 to 1 Percent Slopes

36: Basinger Mucky Fine Sand, Frequently Ponded, 0 to 1 Percent Slopes

38: Electra Fine Sand

40: Wauchula Fine Sand

43: Oldsmar Fine Sand

47: Zolfo Fine Sand, 0 to 2 Percent Slopes

58: Udorthants, Excavated

62: Wabasso-Wabasso, Wet, Fine Sand, 0 to 2 Percent Slopes

76: Millhopper Fine Sand, 0 to 5 Percent Slopes

87: Basinger Fine Sand, 0 to 2 Percent Slopes

99: Water

Florida Department of Transportation

District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

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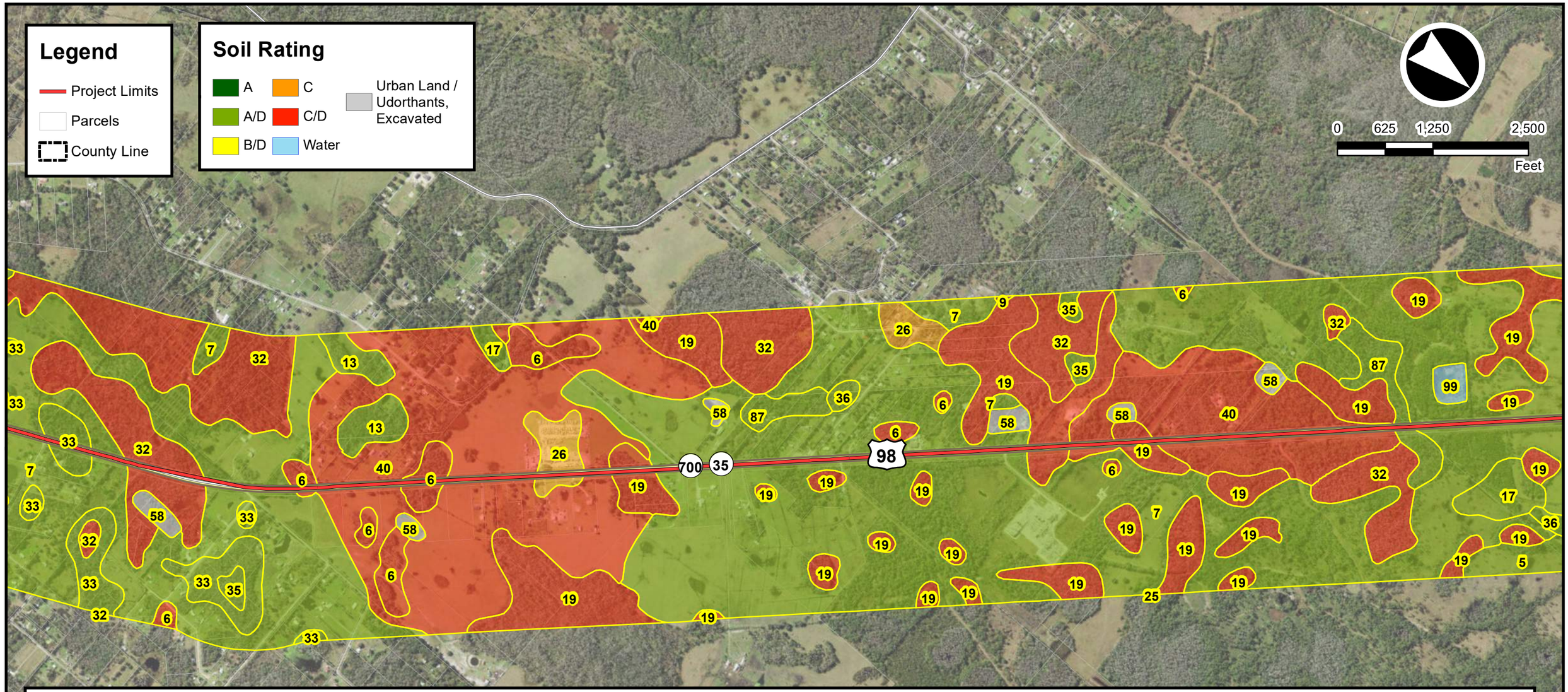
NRCS SOILS MAP

Figure 4A



Polk County Soil Descriptions

5: EauGallie Fine Sand

6: Eaton Mucky Fine Sand, Depressional

7: Pomona Fine Sand

9: Lynne Sand

10: Malabar Fine Sand, 0 to 2 Percent Slopes

13: Samsula Muck, Frequently Ponded, 0 to 1 Percent Slopes

14: Sparr Sand, 0 to 5 Percent Slopes

15: Tavares Fine Sand, 0 to 5 Percent Slopes

16: Urban Land, 0 to 2 Percent Slopes

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38: Electra Fine Sand

40: Wauchula Fine Sand

43: Oldsmar Fine Sand

47: Zolfo Fine Sand, 0 to 2 Percent Slopes

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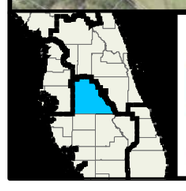
87: Basinger Fine Sand, 0 to 2 Percent Slopes

99: Water



Florida Department of Transportation

District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

Financial Project ID: 436673-1-52-01

NRCS SOILS MAP

Figure

4B

Legend

- Project Limits
- Parcels
- County Line

Soil Rating

- A
- A/D
- B/D
- C
- C/D
- Water
- Urban Land / Udorthants, Excavated

Pasco County Soil Descriptions

2: Pomona Fine Sand

5: Myakka-Myakka, wet, fine sands, 0 to 2 percent slopes

8: Sellers Mucky Loamy Fine Sand

16: Zephyr Muck

23: Basinger Fine Sand, Depressional, 0 to 1 Percent Slopes

35: EauGallie Fine Sand

0 625 1,250 2,500 Feet

POLK COUNTY

PASCO COUNTY

END PROJECT

Polk County Soil Descriptions

5: EauGallie Fine Sand

6: Eaton Mucky Fine Sand, Depressional

7: Pomona Fine Sand

9: Lynne Sand

10: Malabar Fine Sand, 0 to 2 Percent Slopes

13: Samsula Muck, Frequently Ponded, 0 to 1 Percent Slopes

14: Sparr Sand, 0 to 5 Percent Slopes

15: Tavares Fine Sand, 0 to 5 Percent Slopes

16: Urban Land, 0 to 2 Percent Slopes

17: Smyrna and Myakka Fine Sands

19: Floridana Mucky Fine Sand, Frequently Ponded, 0 to 1 Percent Slopes

20: Fort Meade Sand, 0 to 5 Percent Slopes

25: Placid and Myakka Fine Sands, Depressional

26: Lochloosa Fine Sand

31: Adamsville Fine Sand, 0 to 2 Percent Slopes

32: Kaliga Muck, Frequently Ponded, 0 to 1 Percent Slopes

33: Holopaw Fine Sand, Frequently Ponded, 0 to 1 Percent Slopes

35: Hontoon Muck, Frequently Ponded, 0 to 1 Percent Slopes

36: Basinger Mucky Fine Sand, Frequently Ponded, 0 to 1 Percent Slopes

38: Electra Fine Sand

40: Wauchula Fine Sand

43: Oldsmar Fine Sand

47: Zolfo Fine Sand, 0 to 2 Percent Slopes

58: Udorthants, Excavated

62: Wabasso-Wabasso, Wet, Fine Sand, 0 to 2 Percent Slopes

76: Millhopper Fine Sand, 0 to 5 Percent Slopes

87: Basinger Fine Sand, 0 to 2 Percent Slopes

99: Water

Florida Department of Transportation
District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

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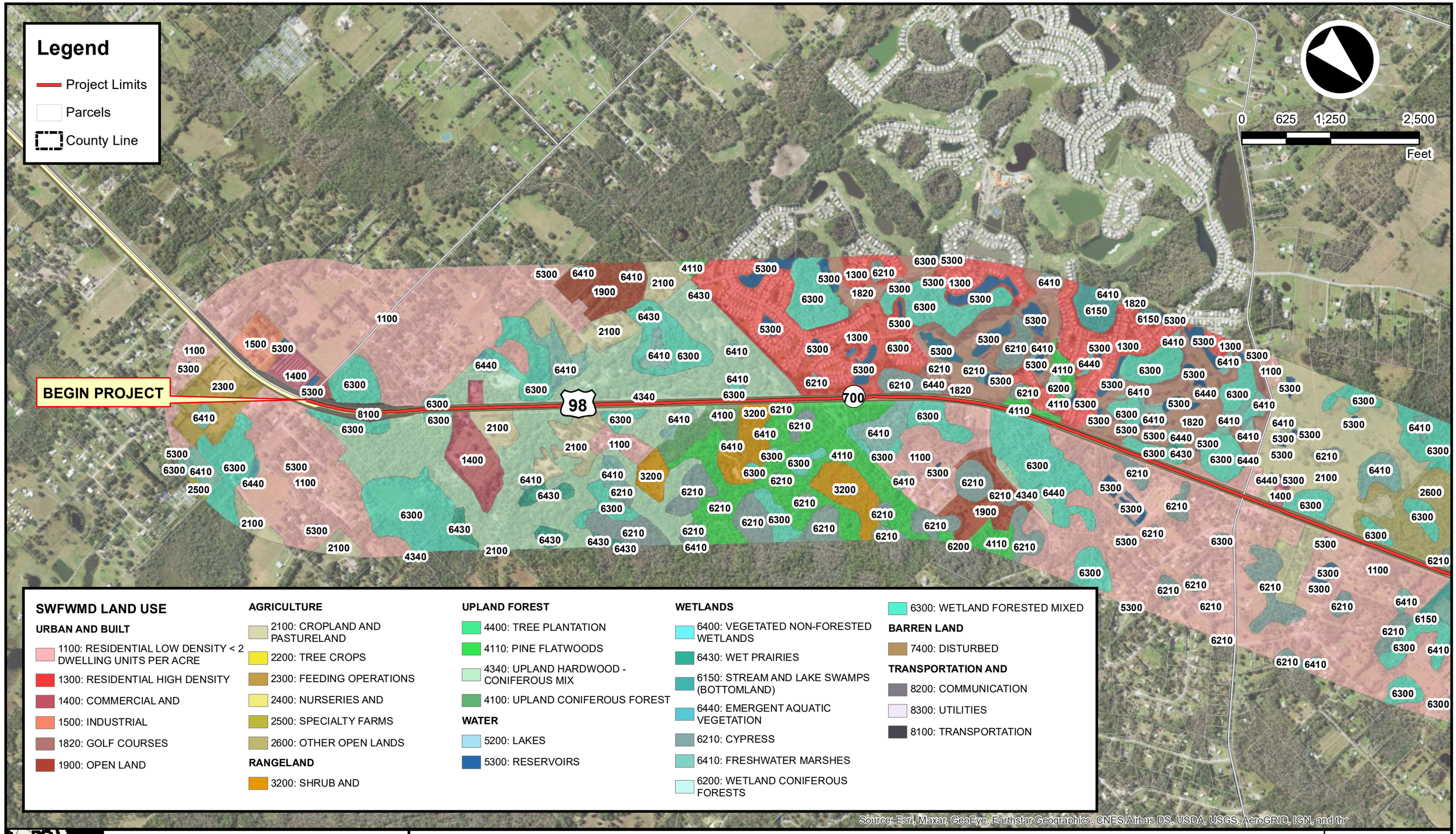
NRCS SOILS MAP

Figure 4C



Florida Department of Transportation
District 1

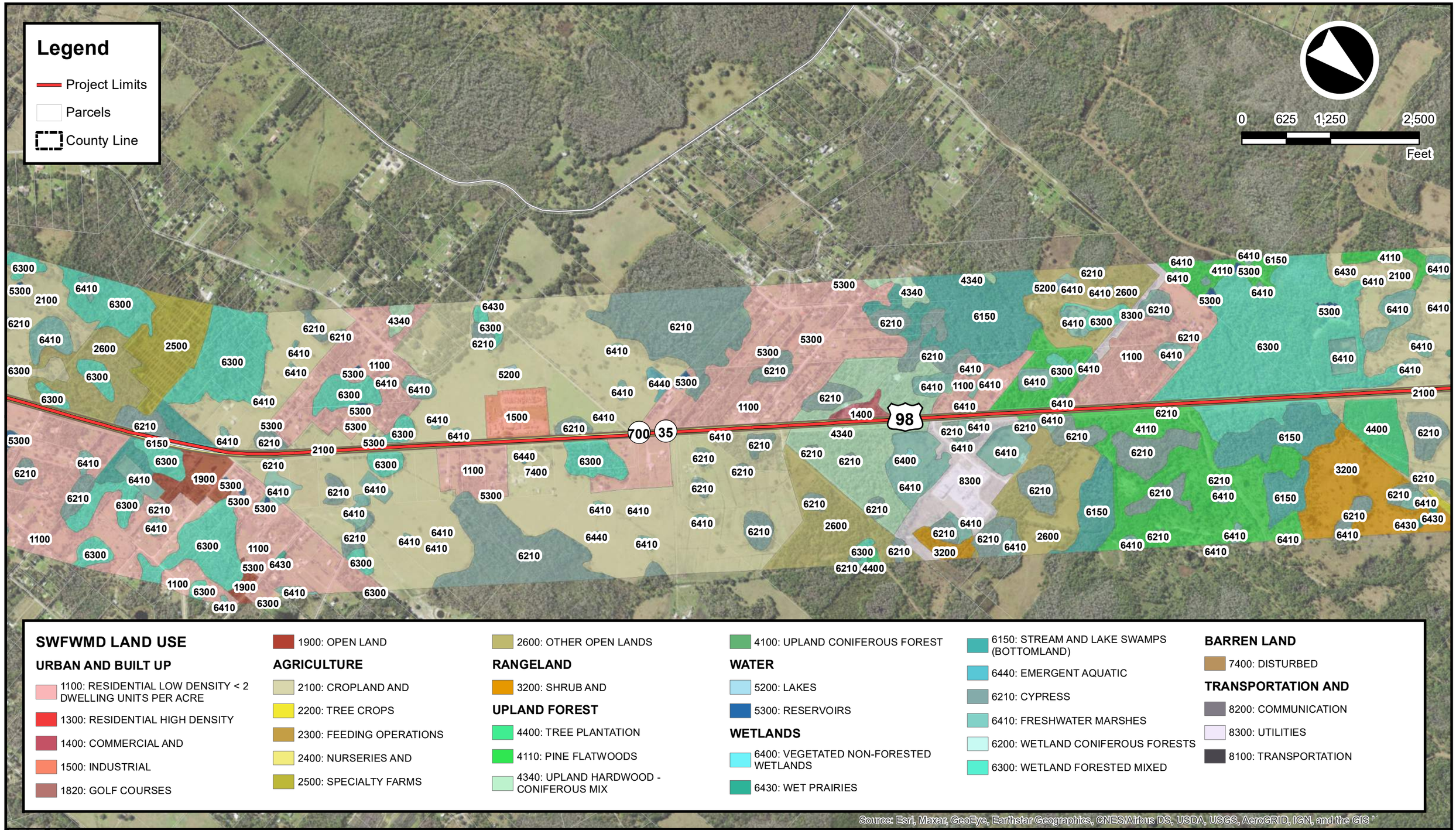
US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

Financial Project ID: 436673-1-52-01

LAND USE MAP

Figure
5A



Florida Department of Transportation
District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

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LAND USE MAP

Figure 5B

SWFWMD LAND USE

URBAN AND BUILT UP

- 1100: RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS PER ACRE
- 1300: RESIDENTIAL HIGH DENSITY
- 1400: COMMERCIAL AND
- 1500: INDUSTRIAL
- 1820: GOLF COURSES
- 1900: OPEN LAND

AGRICULTURE

- 2100: CROPLAND AND
- 2200: TREE CROPS
- 2300: FEEDING OPERATIONS
- 2400: NURSERIES AND
- 2500: SPECIALTY FARMS
- 2600: OTHER OPEN LANDS

RANGELAND

- 3200: SHRUB AND

UPLAND FOREST

- 4400: TREE PLANTATION
- 4110: PINE FLATWOODS
- 4340: UPLAND HARDWOOD - CONIFEROUS MIX
- 4100: UPLAND CONIFEROUS FOREST

WATER

- 5200: LAKES
- 5300: RESERVOIRS

WETLANDS

- 6400: VEGETATED NON-FORESTED WETLANDS
- 6430: WET PRAIRIES
- 6150: STREAM AND LAKE SWAMPS (BOTTOMLAND)
- 6440: EMERGENT AQUATIC
- 6210: CYPRESS
- 6410: FRESHWATER MARSHES
- 6200: WETLAND CONIFEROUS FORESTS
- 6300: WETLAND FORESTED MIXED

BARREN LAND

- 7400: DISTURBED

TRANSPORTATION AND

- 8200: COMMUNICATION
- 8300: UTILITIES
- 8100: TRANSPORTATION

Florida Department of Transportation
District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

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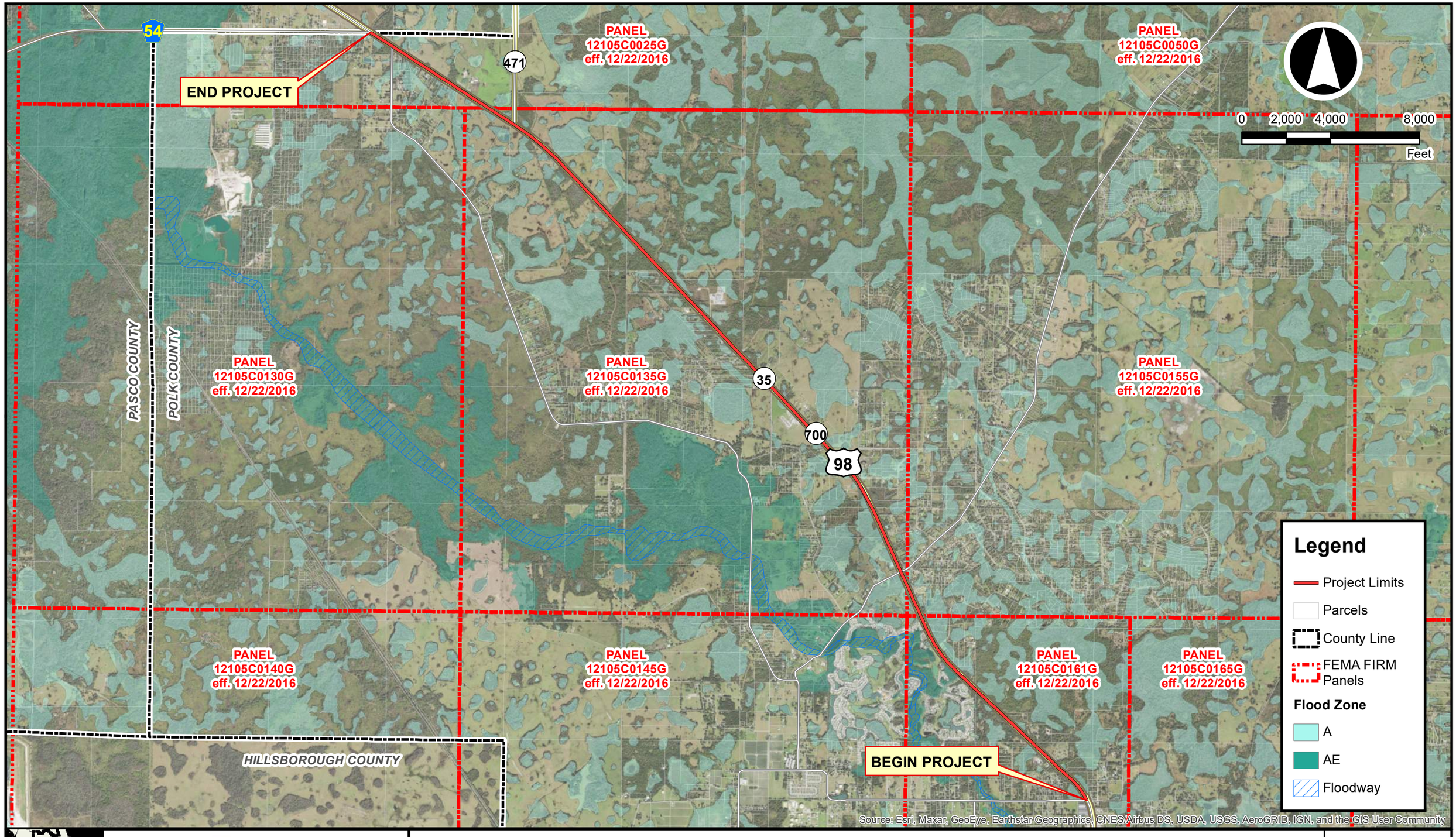
LAND USE MAP

Figure 5C



Florida Department of Transportation
District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

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FEMA FLOODPLAINS MAP

Figure
6

Florida Department of Transportation
District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

Financial Project ID: 436673-1-52-01

FEMA FLOODPLAINS MAP

Figure
6A

Florida Department of Transportation
District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

Financial Project ID: 436673-1-52-01

FEMA FLOODPLAINS MAP

Figure 6B

PANEL
12105C0135G
eff. 12/22/2016

PANEL
12105C0130G
eff. 12/22/2016

PANEL
12105C0025G
eff. 12/22/2016

0 625 1,250 2,500
Feet

POLK COUNTY
PASCO COUNTY

35 98 700 471 54

END PROJECT

Legend

- Project Limits
- Parcels
- County Line
- FEMA FIRM Panels
- Base Flood Elevation

Flood Zone

- A
- AE
- Floodway

Florida Department of Transportation
District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

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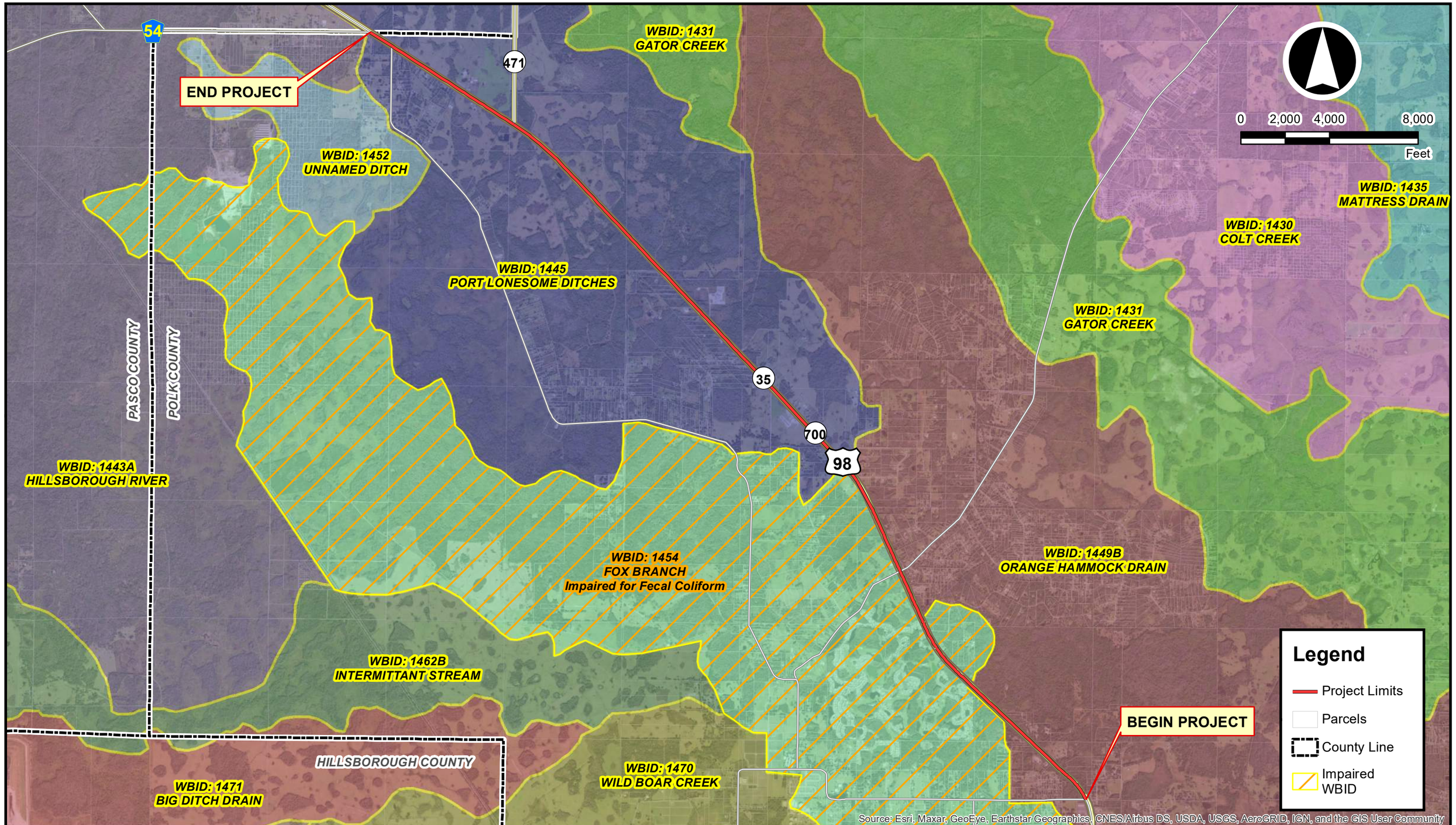
FEMA FLOODPLAINS MAP

Figure
6C



Florida Department of Transportation
District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

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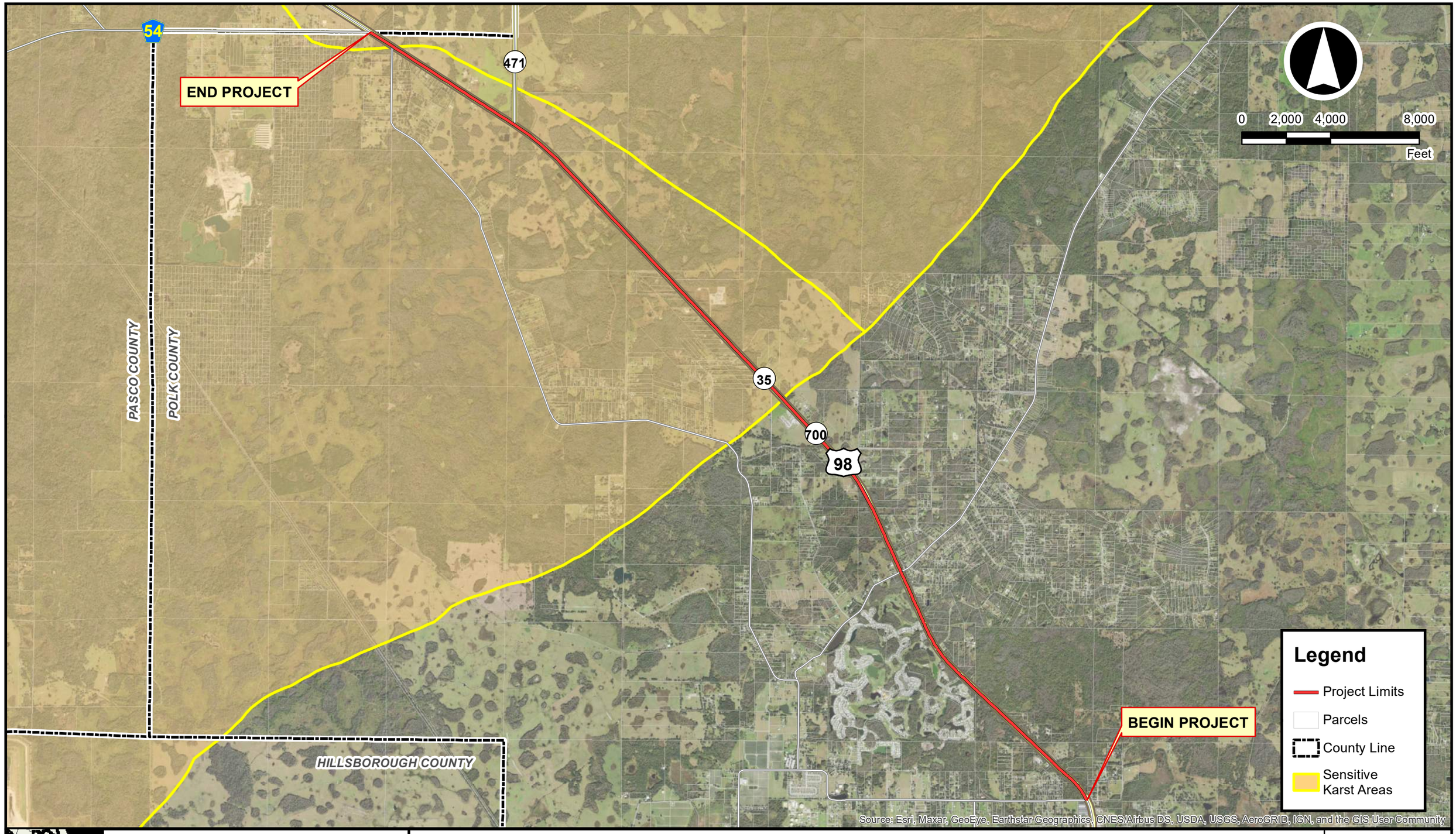
WBID MAP

Figure 7



Florida Department of Transportation
District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

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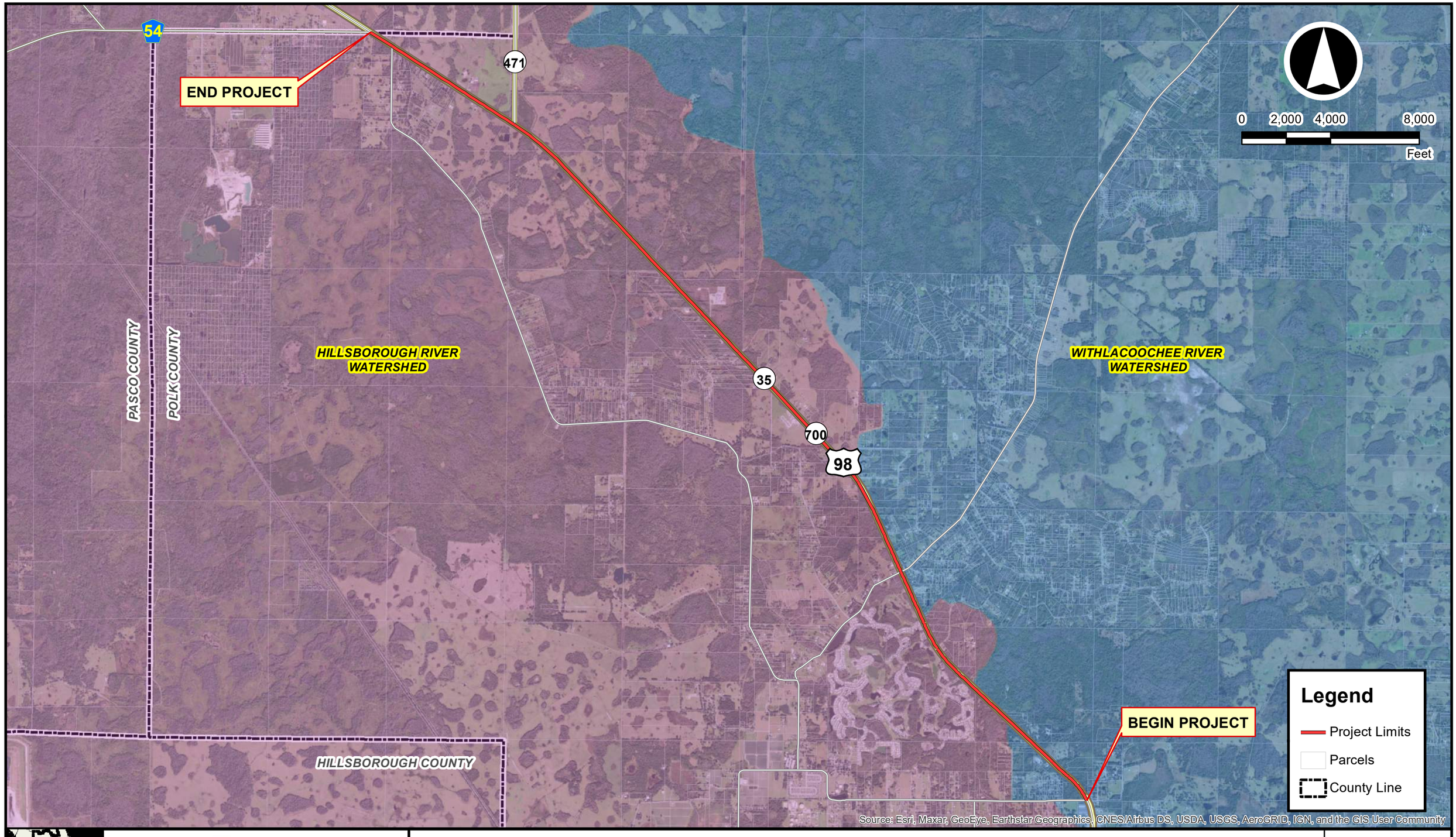
KARST MAP

Figure 8



Florida Department of Transportation
District 1

US 98 PD&E Study

From W Socrum Loop Road to County Road 54
Polk County, Florida

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SWFWMD WATERSHED MAP

Figure 9

APPENDIX B

Floodplain Impact and Compensation Calculations

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 20%	FPC Name	Remarks / Comments
1	454+57 to 467+01	LT	0.41	132	128	131.5	0.21	**3.74**	130	128	457	200	2.10	1.86	3.96	2.52	FPC 1A	Impacts associated with CD-1; potential to alleviate with cross drain modeling?
			0.23			130.5	0.35											
			0.23			129.5	0.58											
			0.25			128.5	0.88											
			0.20			128	0.80											
	455+17 to 465+91	RT	0.18	130	128	129.5	0.09											Impacts associated with CD-1; potential to alleviate with cross drain modeling?
			0.17			128.5	0.26											
			0.07			128	0.14											
	470+49 to 473+95	LT	0.10	130	129	129.5	0.05											Impacts associated with CD-2; potential to alleviate with cross drain modeling?
			0.15			129	0.15											
	469+89 to 473+78	RT	0.14	130	129	129.5	0.07											Impacts associated with CD-2; potential to alleviate with cross drain modeling?
			0.18			129	0.18											
									130	128	470	195	2.10	1.87	3.97	2.52	FPC 1B	

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 20%	FPC Name	Remarks / Comments
2	486+48 to 490+83	LT	0.18	129	127	128.5	0.09	**0.46**	129	128	325	85	0.63	0.56	0.60	0.76	FPC 2A	
			0.14			127.5	0.21											
			0.08			127	0.16											
									129	128	290	95	0.63	0.56	0.60	0.76	FPC 2B	

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 15-20%	FPC Name	Remarks / Comments
3	495+16 to 501+97	RT	0.44	123.5	123.25	123.25	0.11	**0.12**	123.5	123.25	204	100	0.47	0.45	0.12	0.54	FPC 3A	SHW per survey is 123.28; 100 year estimated 123.5
	Pond 1A	RT	0.05	123.5	123.25	123.25	0.01											**15% Contingency**
									123.5	123.25	225	100	0.52	0.50	0.13	0.62	FPC 3B	

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 5-15%	FPC Name	Remarks / Comments
4	512+72 to 517+25	LT	0.31	125	124.5	124.5	0.16	**5.55**	122	120.5	682	250	3.91	3.66	5.68	4.11	FPC 4A	
	533+94 to 549+07	LT	0.16	124	120.5	123.5	0.08											SHW per survey = 120.49
			0.59			122.5	0.89											
			0.36			121.5	0.90											
			0.47			120.5	1.65											**5% Contingency**
	519+90 to 521+29	RT	0.03	123.5	122.5	122.5	0.03											SHW per survey = 122.57
	534+35 to 545+11	RT	0.27	122	120.5	121.5	0.14											SHW per survey = 120.49
			0.7			120.5	1.05											
	549+47 to 562+19	RT	0.25	122	121.25	121.5	0.13											SHW per survey = 121.22
			0.73			121.25	0.55											
									122	120.5	668	250	3.83	3.58	5.56	4.41	FPC 4B	**15% Contingency**
									122	120.5	460	361	3.81	3.59	5.55	4.19	FPC 4C	**10% Contingency**

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 20%	FPC Name	Remarks / Comments
5	563+73 to 587+90	LT	0.78	121	119.6	120.5	0.39	**3.27**	120	118.7	518	220	2.62	2.44	3.29	3.14	FPC 5A	SHW per CD-6 stainline is 119.25
			1.89			119.6	2.65											FIA SHW per survey = 119.63
	567+48 to 577+33	RT	0.88	120	119.9	119.9	0.09											FIA SHW per survey = 119.87
	577+69 to 581+96	RT	0.36	120	119.6	119.6	0.14											FIA SHW per survey = 119.63
									120	118.7	1190	100	2.73	2.43	3.35	3.28	FPC 5B	
									120	118.9	480	139	1.53	1.41	1.62	1.84	FPC 5C	Utilized in conjunction with FPC 5D and 5E
									120	118.4	300	126	0.87	0.75	1.29	1.04	FPC 5D	Utilized in conjunction with FPC 5C and 5E
									117	116.3	200	150	0.69	0.64	0.47	0.83	FPC 5E	Utilized in conjunction with FPC 5C and 5D
														FPC 5C, 5D & 5E TOTAL:	3.37	3.71		

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 10%	FPC Name	Remarks / Comments
6	589+23 to 611+62	LT	1.06	119	118	118.5	0.53	**3.26**	119	118	275	252	1.59	1.50	1.54	1.75	FPC 6A	SHW per cd-7 stainline = 117, SHW per cd-8 stainline = 118
			0.95			118	0.95											FIA SHW per Survey = 118.06
	614+81 to 627+56	LT	0.39	119	118	118.5	0.20											
			0.76			118	0.76											**10% contingency**; Utilized in conjunction with FPC 6B or 6C
	606+80 to 612+42	RT	0.70	119	118.85	118.85	0.11											FIA SHW per survey = 118.84, 100 yr assumed at 119
	629+40 to 634+43	LT	0.38	119	118.5	118.5	0.19											
	636+33 to 642+36	LT	0.23	120	119	119.5	0.12											
			0.41			119	0.41											
									119	118	620	150	2.13	2.00	2.07	2.35	FPC 6B	**10% contingency**; Utilized in conjunction with FPC 6A or 6C;
									119.5	118.9	393	335	3.02	2.94	1.79	3.32	FPC 6C	**10% contingency**; Utilized in conjunction with FPC 6A or 6B
														FPC 6A & 6B TOTAL:		3.61		4.10
														FPC 6A & 6C TOTAL:		3.33		5.07
														FPC 6B & 6C TOTAL:		3.87		5.67

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 20%	FPC Name	Remarks / Comments
Pond 2B/R	Pond 2B/R	LT	3.63	119	117	118.5	1.81	**1.81**	119	117.25	338	155	1.20	1.05	1.97	1.44	FPC PONDBERM	

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 20%	FPC Name	Remarks / Comments
7	652+77 to 658+97	LT & RT	0.88	117	116.5	116.5	0.44	**0.44**	117	116.5	280	140	0.90	0.86	0.44	1.08	FPC 7A	Average SHW per survey = 116.5
									117	116.5	197	197	0.89	0.86	0.44	1.07	FPC 7B	

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 20%	FPC Name	Remarks / Comments
8	679+50 to 685+75	LT	0.58	113	112	112.5	0.29	**0.61**	113	112	170	170	0.66	0.60	0.63	0.80	FPC 8A	SHW per cd-11 stainline = 111.86; SHW per survey = 112.01
	681+63 to 684+84	RT	0.62	113	112	112.5	0.31											100yr estimated to match LT side 100 yr elevation.
	Pond 3D-1	LT	0.03	113	112	112.8	0.01											
									113	112	205	205	0.96	0.89	0.93	1.16	FPC 8B	

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 20%	FPC Name	Remarks / Comments
9	707+02 to 710+28	RT	0.08	106	105.5	105.75	0.02											Impact small enough to compensate in R/W
	717+23 to 723+81	LT	0.25	105	104.5	104.75	0.06											Impact small enough to compensate in R/W
	734+13 to 740+82	RT	0.68	104	103.9	103.9	0.07	**0.18**	103	102.8	255	170	1.00	0.98	0.20	1.19	FPC 9A	SHW per survey = 103.89, 100yr estimated at 104
	744+99 to 753+47	LT & RT	0.75	103	102.85	102.85	0.11											SHW per CD-14 stainline = 102.25; SHW per survey = 102.85
	755+65 to 758+22	LT	0.22	102	101.5	101.75	0.06											Impact small enough to compensate in R/W
									103	102.8	208	208	0.99	0.98	0.20	1.19	FPC 9B	

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 20%	FPC Name	Remarks / Comments
10	830+90 to 839+96	LT	0.64	96	95.75	95.75	0.16											
	847+41 to 850+53	LT	0.12	95	94.5	94.5	0.06	**0.25**	95	94.5	230	100	0.53	0.50	0.26	0.63	FPC 10A	Impacts associated with BC-2; potential to alleviate in cross drain modeling? SHW per BC-2 stainline =94.5
	Pond 4D-1	LT	0.11	96	95.75	95.75	0.03											
									96	95.5	280	85	0.55	0.51	0.26	0.66	FPC 10 B	

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 20%	FPC Name	Remarks / Comments
11	865+60 to 869+70	LT	0.24	94	93.5	93.5	0.12											SHW per CD-16 stainline = 93; SHW per survey = 93.50
	861+11 to 869+36	RT	0.47	94	93	93.5	0.24	**0.47**	94	93.3	300	105	0.72	0.67	0.49	0.87	FPC 11A	SHW per survey = 92.85
			0.11			93	0.11											
									94	93.3	230	138	0.73	0.68	0.49	0.87	FPC 11B	

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 5-20%	FPC Name	Remarks / Comments
12	878+19 to 882+22	LT	0.27	92.5	92	92	0.14	**0.48**	90	89	195	121	0.54	0.49	0.51	0.65	FPC 12A	FIA SHW per survey = 91.99, 100yr assumed as 92.5
	886+12 to 888+64	LT	0.10	92	91.3	91.3	0.07											Impacts associated with CD-17 (stianline = 91.3); potential to alleviate in cross drain modeling ; SHW per survey = 90.77
	888+41 to 888+55	RT	0.01	91	90.75	89.5	0.02											
	898+49 to 899+90	LT	0.10	91.5	91	91	0.05											FIA SHW per surey = 91.07, 100yr estimated 91.5
	913+70 to 914+17	LT	0.03	90	89.25	89.25	0.02											Impacts associated with BC-3; potential to alleviate in cross drain modeling? BC-3 stainline = 89.24, 100 yr estimated 90
	912+71 to 914+42	RT	0.15	90	89.25	89.25	0.11											
	Pond 4C-2	RT	0.26	89.5	89.25	89.25	0.07											100 yr estimated 89.5
									90	89.25	180	150	0.62	0.58	0.48	0.64	FPC 12B	**5% Contingency**

FIA Number	Stations	Side	Area (ac)	Floodplain Elevation (ft)	Est. SHW (ft)	Avg. Ground Elevation (ft)	Impact Volume (ac-ft)	Total Impact Volume for FIA (ac-ft)	Floodplain El. at FPC (ft)	Water Table El. at FPC (ft)	FPC Length (ft)	FPC Width (ft)	FPC Area Top (ac)	FPC Area Bottom (ac)	FPC Volume (ac-ft)	FPC Area + 20%	FPC Name	Remarks / Comments
13	922+10 to 934+31	LT	0.72	89	88	88.5	0.36	**0.78**	89	88	345	120	0.95	0.87	0.91	1.14	FPC 13A	
			0.13			88	0.13											
	Pond 4B	LT	0.59			88.5	0.29											
									89	88	284	160	1.04	0.96	1.00	1.25	FPC 13B	

APPENDIX C

Cross Drain Analysis

Inwood Consulting Engineers
3000 Dovera Drive, Suite 200, Oviedo, FL 327
(407) 971-8850 - (407) 971-8955 (fax)

Made by: CND **DATE:** 09/11/21
Ch'd by: REC **PROJECT #:** 436673-1-52-01

US 98 PD&E Study

CD-1: 1 - 42" RCP (Sta. 463+36.00) (Existing)

HYDROLOGIC ANALYSIS

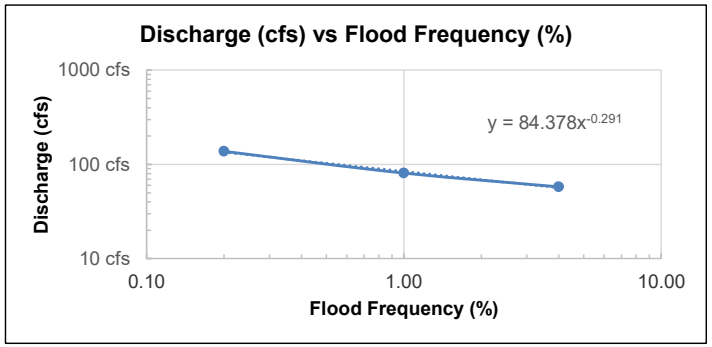
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 9.62 sq.ft.

$Q_{25yr} = A_1V =$ **58 cfs**
$Q_{50yr} = 84.378(2)^{-0.291} =$ **69 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **81 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **137 cfs**



Overtopping Frequency Determination for CD-1 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-1	463+36.00	48" RCP	1	Round	48"	48"	12.57	58	69	81	105.8	137

*OT = Overtopping

Sample Calculations:

$Q_{(OT)} = 84.378x^{-0.291}$ (from curve fitting equation)
x 0.46 %

Storm Event =1/Storm Freq
218-yr

Storm Event			
50-yr	100-yr	218-yr	500-yr
Strom Frequency (%)			
2	1	0.46	0.2

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Made by: CND **DATE:** 09/11/21
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US 98 PD&E Study

CD-2: 1 - 30" RCP (Sta. 472+52.00) (Existing)

HYDROLOGIC ANALYSIS

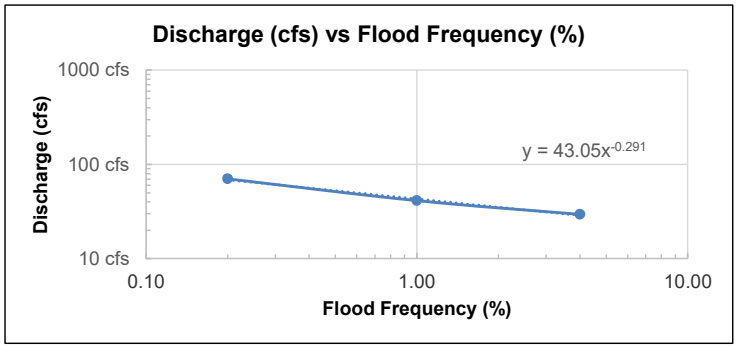
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 4.91 sq.ft.

$Q_{25yr} = A_1V =$ **29 cfs**
$Q_{50yr} = 43.05(2)^{-0.291} =$ **35 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **41 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **70 cfs**



Overtopping Frequency Determination for CD-2 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-2	472+52.00	36" RCP	1	Round	36"	36"	7.07	29	35	41	No Overtopping	70

*OT = Overtopping

Sample Calculations:

$Q_{(OT)} = 43.05x^{-0.291}$ (from curve fitting equation)
x = No Overtopping %

Storm Event =1/Storm Freq
No Overtopping

Storm Event			
50-yr	**100-yr**	**No Overtopping**	**500-yr**
Strom Frequency (%)			
2	**1**	**No Overtopping**	**0.2**

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Made by: CND **DATE:** 09/11/21
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US 98 PD&E Study

CD-3: 1 - 5'Wx3'H CBC (Sta.489+64.00) (Existing)

HYDROLOGIC ANALYSIS

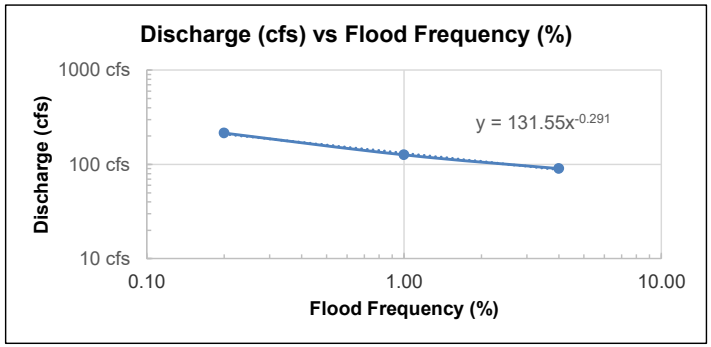
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1= 15.00 sq.ft.

$Q_{25yr} = A_1V =$ **90 cfs**
$Q_{50yr} = 131.55(2)^{-0.291} =$ **108 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **126 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **214 cfs**



Overtopping Frequency Determination for CD-3 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-3	489+64.00	5'Wx3'H CBC	1	Rectangular	36"	60"	15.00	90	108	126	164.6	214

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ = $131.55x^{-0.291}$ (from curve fitting equation)
x 0.46 %

Storm Event =1/Storm Freq
216-yr

Storm Event			
50-yr	100-yr	216-yr	500-yr
Strom Frequency (%)			
2	1	0.46	0.2

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Made by: CND **DATE:** 09/11/21
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US 98 PD&E Study

CD-4: 1 - 24" RCP (Sta. 499+51.00) (Existing)

HYDROLOGIC ANALYSIS

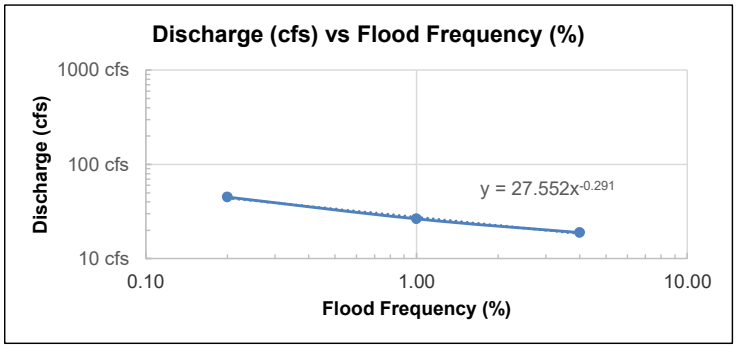
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 3.14 sq.ft.

$Q_{25yr} = A_1V =$ **19 cfs**
$Q_{50yr} = 27.552(2)^{-0.291} =$ **23 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **26 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **45 cfs**



Overtopping Frequency Determination for CD-4 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-4	499+51	30" RCP	1	Round	30"	30"	4.91	19	23	26	No Overtopping	45

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ = $27.552x^{-0.291}$ (from curve fitting equation)
x = No Overtopping %

Storm Event =1/Storm Freq
No Overtopping

Storm Event			
50-yr	100-yr	No Overtopping	500-yr
Strom Frequency (%)			
2	1	No Overtopping	0.2

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Made by: CND **DATE:** 09/11/21
Ch'd by: REC **PROJECT #:** 436673-1-52-01

US 98 PD&E Study

CD-5: 1 - 5'Wx3'H CBC (Sta. 559+35.00) (Existing)

HYDROLOGIC ANALYSIS

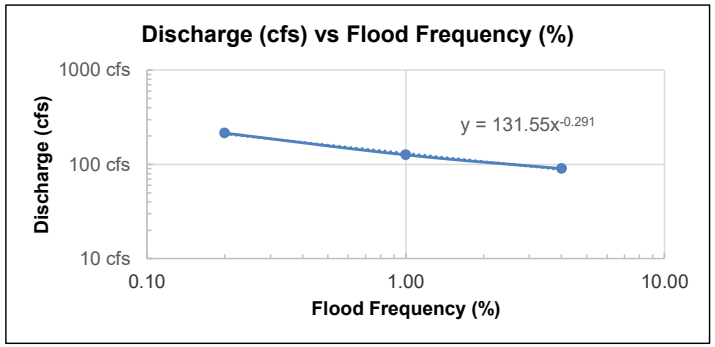
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 15.00 sq.ft.

$Q_{25yr} = A_1V =$ **90 cfs**
$Q_{50yr} = 131.55(2)^{-0.291} =$ **108 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **126 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **214 cfs**



Overtopping Frequency Determination for CD-5 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-5	559+35.00	5'Wx3'H CBC	1	Rectangular	36"	60"	15.00	90	108	126	161.2	214

*OT = Overtopping

Sample Calculations:

$Q_{(OT)} = 131.55x^{-0.291}$ (from curve fitting equation)
x 0.50 %

Storm Event =1/Storm Freq
201-yr

Storm Event			
50-yr	100-yr	201-yr	500-yr
Strom Frequency (%)			
2	1	0.50	0.2

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US 98 PD&E Study

CD-6: 1 - 42" RCP (Sta. 580+00.00) (Existing)

HYDROLOGIC ANALYSIS

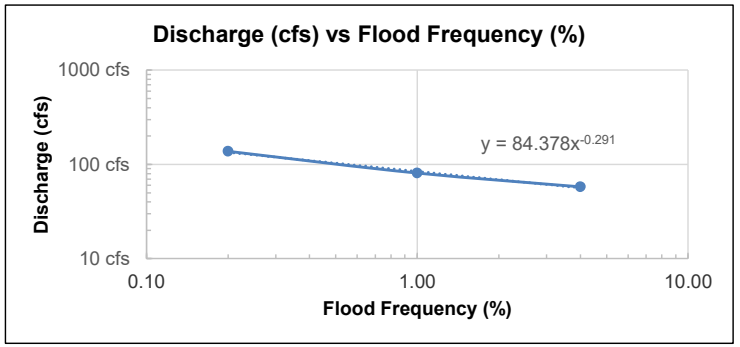
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 9.62 sq.ft.

$Q_{25yr} = A_1V =$ **58 cfs**
$Q_{50yr} = 84.378(2)^{-0.291} =$ **69 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **81 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **137 cfs**



Overtopping Frequency Determination for CD-6 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-6	580+00.00	42" RCP	1	Round	48"	48"	12.57	58	69	81	No Overtopping	137

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ = $84.378x^{-0.291}$ (from curve fitting equation)
x No Overtopping %

Storm Event =1/Storm Freq
No Overtopping

Storm Event			
50-yr	100-yr	No Overtopping	500-yr
Strom Frequency (%)			
2	1	No Overtopping	0.2

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US 98 PD&E Study

CD-7: 3 - 24" RCP (Sta. 597+50.00) (Existing)

HYDROLOGIC ANALYSIS

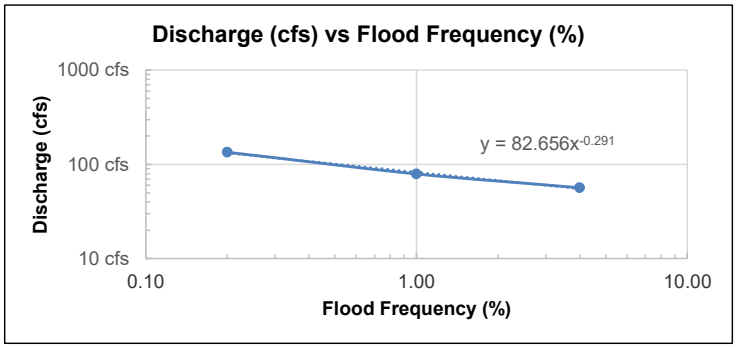
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 9.42 sq.ft.

$Q_{25yr} = A_1V =$ **57 cfs**
$Q_{50yr} = 82.656(2)^{-0.291} =$ **68 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **79 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **135 cfs**



Overtopping Frequency Determination for CD-7 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-7	597+50.00	24" RCP	3	Round	30"	30"	14.73	57	68	79	120.7	135

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ = $82.656x^{-0.291}$ (from curve fitting equation)
x 0.27 %

Storm Event =1/Storm Freq
367-yr

Storm Event			
50-yr	**100-yr**	**367-yr**	**500-yr**
Strom Frequency (%)			
2	**1**	**0.27**	**0.2**

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Made by: CND **DATE:** 09/11/21
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US 98 PD&E Study

CD-8: 1 - 10'Wx3'H CBC (Sta. 625+00.00) (Existing)

HYDROLOGIC ANALYSIS

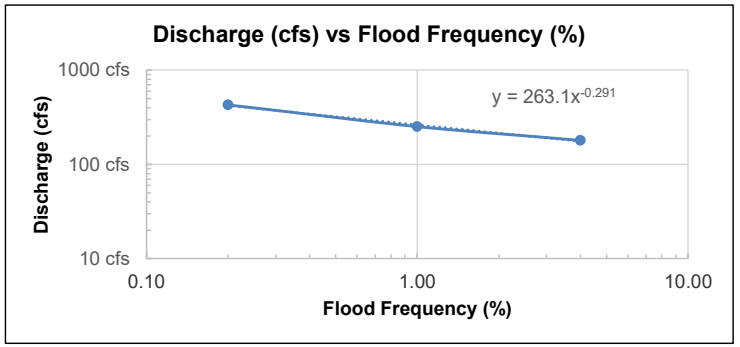
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 30.00 sq.ft.

$Q_{25yr} = A_1V =$ **180 cfs**
$Q_{50yr} = 263.1(2)^{-0.291} =$ **215 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **252 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **428 cfs**



Overtopping Frequency Determination for CD-8 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-8	625+00.00	10'Wx3'H	1	Rectangular	36"	120"	30.00	180	215	252	304.8	428

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ $= 263.1x^{-0.291}$ (from curve fitting equation)
x 0.60 %

Storm Event =1/Storm Freq
166-yr

Storm Event			
50-yr	**100-yr**	**166-yr**	**500-yr**
Strom Frequency (%)			
2	**1**	**0.60**	**0.2**

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Made by: CND **DATE:** 09/11/21
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US 98 PD&E Study

CD-9: 1 - 4'Wx3'H CBC (Sta. 655+00.00) (Existing)

HYDROLOGIC ANALYSIS

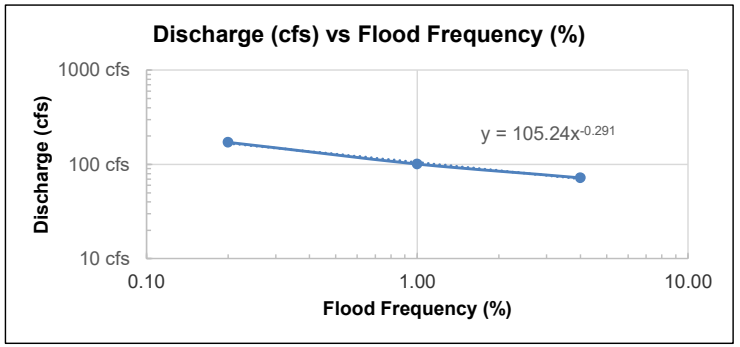
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 12.00 sq.ft.

$Q_{25yr} = A_1V =$ **72 cfs**
$Q_{50yr} = 105.24(2)^{-0.291} =$ **86 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **101 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **171 cfs**



Overtopping Frequency Determination for CD-9 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-9	655+00.00	4'Wx3'H	1	Rectangular	36"	48"	12.00	72	86	101	114.5	171

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ = $105.24x^{-0.291}$ (from curve fitting equation)
x 0.75 %

Storm Event =1/Storm Freq
133-yr

Storm Event			
50-yr	**100-yr**	**133-yr**	**500-yr**
Strom Frequency (%)			
2	**1**	**0.75**	**0.2**

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Made by: CND **DATE:** 09/11/21
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US 98 PD&E Study

CD-10: 1 - 30" RCP (Sta. 666+00.00) (Existing)

HYDROLOGIC ANALYSIS

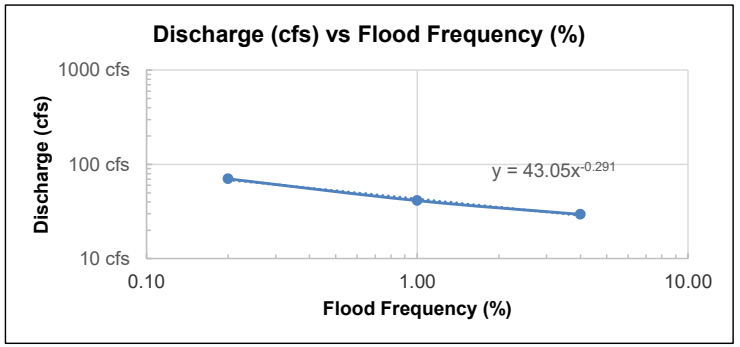
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1= 4.91 sq.ft.

$Q_{25yr} = A_1V =$ **29 cfs**
$Q_{50yr} = 43.05(2)^{-0.291} =$ **35 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **41 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **70 cfs**



Overtopping Frequency Determination for CD-10 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-10	666+00.00	36	1	Round	36"	36"	7.07	29	35	41	58.2	70

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ $= 43.05x^{-0.291}$ (from curve fitting equation)
x 0.36 %

Storm Event =1/Storm Freq
281-yr

Storm Event			
50-yr	**100-yr**	**281-yr**	**500-yr**
Strom Frequency (%)			
2	**1**	**0.36**	**0.2**

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Made by: CND **DATE:** 09/11/21
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US 98 PD&E Study

CD-11: 1 - 30" RCP (Sta. 682+00.00) (Existing)

HYDROLOGIC ANALYSIS

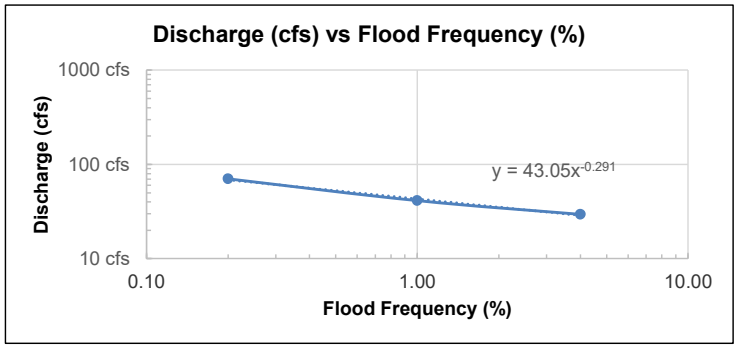
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1= 4.91 sq.ft.

$Q_{25yr} = A_1V =$ **29 cfs**
$Q_{50yr} = 43.05(2)^{-0.291} =$ **35 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **41 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **70 cfs**



Overtopping Frequency Determination for CD-11 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-11	682+00.00	54" RCP	1	Round	54"	54"	15.90	29	35	41	66.2	70

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ $= 43.05x^{-0.291}$ (from curve fitting equation)
x 0.23 %

Storm Event =1/Storm Freq
439-yr

Storm Event			
50-yr	**100-yr**	**439-yr**	**500-yr**
Strom Frequency (%)			
2	**1**	**0.23**	**0.2**

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US 98 PD&E Study

CD-12: 2 - 30" RCP (Sta. 725+00.00) (Existing)

HYDROLOGIC ANALYSIS

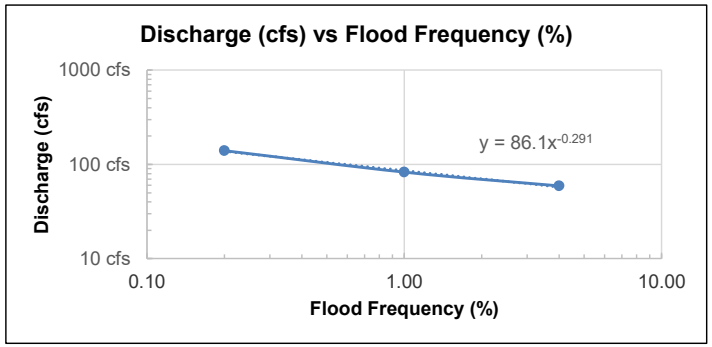
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 9.82 sq.ft.

$Q_{25yr} = A_1V =$ **59 cfs**
$Q_{50yr} = 86.1(2)^{-0.291} =$ **70 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **82 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **140 cfs**



Overtopping Frequency Determination for CD-12 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-12	725+00.00	36" RCP	3	Round	30"	30"	14.73	59	70	82	110.7	140

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ $= 86.1x^{-0.291}$ (from curve fitting equation)
x 0.42 %

Storm Event =1/Storm Freq
237-yr

Storm Event			
50-yr	100-yr	237-yr	500-yr
Strom Frequency (%)			
2	1	0.42	0.2

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US 98 PD&E Study

CD-13: 1 - 8'W x 4'H CBC (Sta. 738+00.00) (Existing)

HYDROLOGIC ANALYSIS

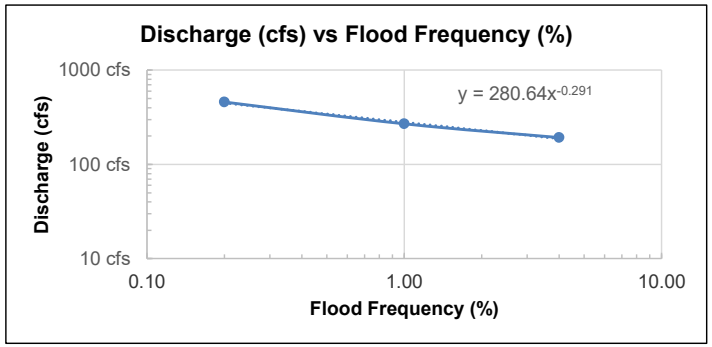
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 32.00 sq.ft.

$Q_{25yr} = A_1V =$ **192 cfs**
$Q_{50yr} = 280.64(2)^{-0.291} =$ **229 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **269 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **457 cfs**



Overtopping Frequency Determination for CD-13 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-13	738+00.00	8'W x 4'H CBC	1	Rectangular	48"	96"	384.00	192	229	269	275.7	457

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ = $280.64x^{-0.291}$ (from curve fitting equation)
x 0.97 %

Storm Event =1/Storm Freq
103-yr

Storm Event			
50-yr	100-yr	103-yr	500-yr
Strom Frequency (%)			
2	1	0.97	0.2

Note: Curve fitting equation yielded unrealistic results for the overtopping frequency. Therefore, linear interpolation was used.

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US 98 PD&E Study

CD-14: 1 - 24" RCP (Sta. 750+00.00) (Existing)

HYDROLOGIC ANALYSIS

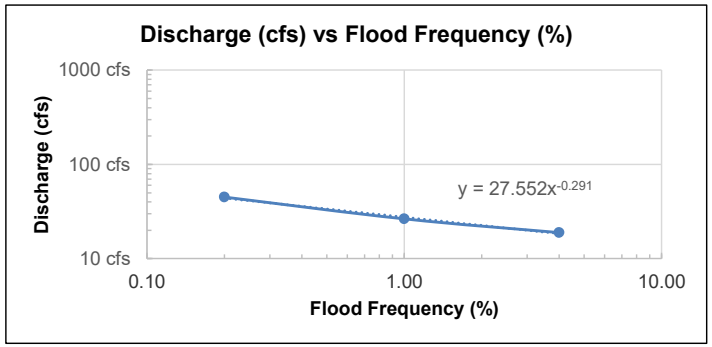
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 3.14 sq.ft.

$Q_{25yr} = A_1V =$ **19 cfs**
$Q_{50yr} = 27.552(2)^{-0.291} =$ **23 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **26 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **45 cfs**



Overtopping Frequency Determination for CD-14 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-14	750+00.00	30" RCP	1	Round	30"	30"	4.91	19	23	26	41.6	45

*OT = Overtopping

Sample Calculations:

$Q_{(OT)} = 27.552x^{-0.291}$ (from curve fitting equation)
x 0.24 %

Storm Event =1/Storm Freq
410-yr

Storm Event			
50-yr	100-yr	410-yr	500-yr
Strom Frequency (%)			
2	1	0.24	0.2

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US 98 PD&E Study

CD-15: 1 - 24" RCP (Sta. 766+00.00) (Existing)

HYDROLOGIC ANALYSIS

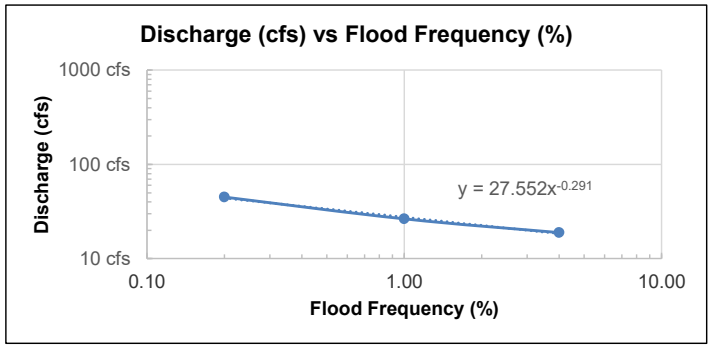
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 3.14 sq.ft.

$Q_{25yr} = A_1V =$ **19 cfs**
$Q_{50yr} = 27.552(2)^{-0.291} =$ **23 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **26 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **45 cfs**



Overtopping Frequency Determination for CD-15 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-15	766+00.00	30" RCP	1	Round	30"	30"	4.91	19	23	26	40.2	45

*OT = Overtopping

Sample Calculations:

$Q_{(OT)} = 27.552x^{-0.291}$ (from curve fitting equation)
x 0.27 %

Storm Event =1/Storm Freq
367-yr

Storm Event			
50-yr	100-yr	367-yr	500-yr
Strom Frequency (%)			
2	1	0.27	0.2

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US 98 PD&E Study

BC-1: 2 - 10'W x 2'H CBC (Sta. 784+50.00) (Existing)

HYDROLOGIC ANALYSIS

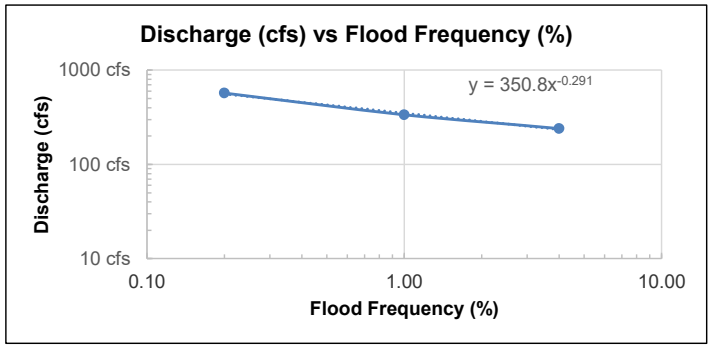
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 40.00 sq.ft.

$Q_{25yr} = A_1V =$ **240 cfs**
$Q_{50yr} = 350.8(2)^{-0.291} =$ **287 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **336 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **571 cfs**



Overtopping Frequency Determination for BC-1 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
BC-1	784+50.00	10'W x 2'H	2	Rectangular	24"	120"	40.00	240	287	336	389.5	571

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ = $350.8x^{-0.291}$ (from curve fitting equation)
x 0.70 %

Storm Event =1/Storm Freq
143-yr

Storm Event			
50-yr	100-yr	143-yr	500-yr
Strom Frequency (%)			
2	1	0.70	0.2

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US 98 PD&E Study

BC-2: 4 - 10'W x 3'H (Sta. 849+00.00) (Existing)

HYDROLOGIC ANALYSIS

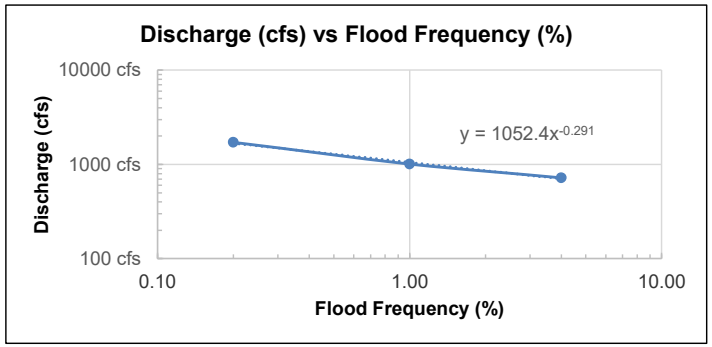
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 120.00 sq.ft.

$Q_{25yr} = A_1V =$ **720 cfs**
$Q_{50yr} = 1052.4(2)^{-0.291} =$ **860 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **1008 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **1714 cfs**



Overtopping Frequency Determination for BC-2 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
BC-2	849+00.00	10'W x 3'H	4	Rectangular	36"	120"	120.00	720	860	1008	1205.0	1714

*OT = Overtopping

Sample Calculations:

$Q_{(OT)} = 1052.4x^{-0.291}$ (from curve fitting equation)
x 0.63 %

Storm Event =1/Storm Freq
159-yr

Storm Event			
50-yr	100-yr	159-yr	500-yr
Strom Frequency (%)			
2	1	0.63	0.2

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US 98 PD&E Study

CD-16: 1 - 36" RCP (Sta. 867+00.00) (Existing)

HYDROLOGIC ANALYSIS

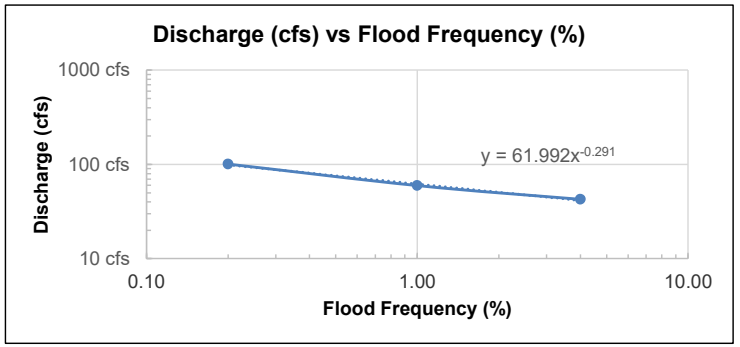
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 7.07 sq.ft.

$Q_{25yr} = A_1V =$ **42 cfs**
$Q_{50yr} = 61.992(2)^{-0.291} =$ **51 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **59 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **101 cfs**



Overtopping Frequency Determination for CD-16 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-16	144+80.00	42" RCP	1	Round	42"	42"	9.62	42	51	59	72.7	101

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ = $61.992x^{-0.291}$ (from curve fitting equation)
x 0.58 %

Storm Event =1/Storm Freq
173-yr

Storm Event			
50-yr	100-yr	173-yr	500-yr
Strom Frequency (%)			
2	1	0.58	0.2

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CD-17: 1 - 10'W x 2'H CBC (Sta. 888+50.00) (Existing)

HYDROLOGIC ANALYSIS

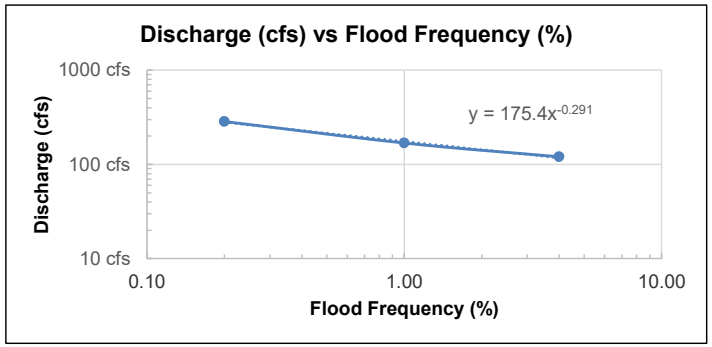
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 20.00 sq.ft.

$Q_{25yr} = A_1V =$ **120 cfs**
$Q_{50yr} = 175.4(2)^{-0.291} =$ **143 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **168 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **286 cfs**



Overtopping Frequency Determination for CD-17 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-17	888+50.00	10'W x 2'H	1	Rectangular	24"	120"	20.00	120	143	168	206.8	286

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ = $175.4x^{-0.291}$ (from curve fitting equation)
x 0.57 %

Storm Event =1/Storm Freq
176-yr

Storm Event			
50-yr	100-yr	176-yr	500-yr
Strom Frequency (%)			
2	1	0.57	0.2

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US 98 PD&E Study

BC-3: 3 - 10'W x 2'H CBC (Sta. 914+00.00) (Existing)

HYDROLOGIC ANALYSIS

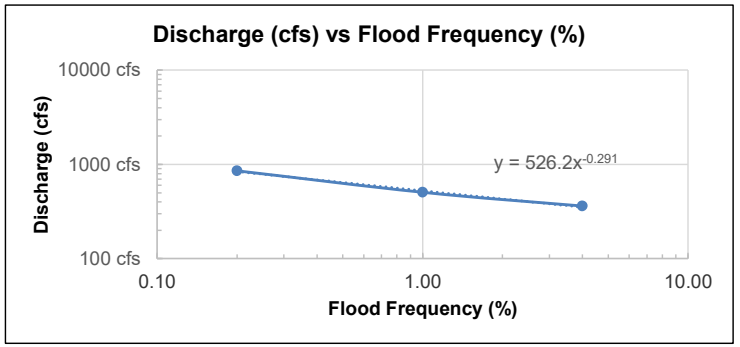
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 60.00 sq.ft.

$Q_{25yr} = A_1V =$ **360 cfs**
$Q_{50yr} = 526.2(2)^{-0.291} =$ **430 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **504 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **857 cfs**



Overtopping Frequency Determination for BC-3 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
BC-3	914+00.00	10'W x 2'H	3	Rectangular	24"	120"	60.00	360	430	504	655.0	857

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ $= 526.2x^{-0.291}$ (from curve fitting equation)
x 0.47 %

Storm Event =1/Storm Freq
212-yr

Storm Event			
50-yr	100-yr	212-yr	500-yr
Strom Frequency (%)			
2	1	0.47	0.2

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US 98 PD&E Study

CD-18: 1 - 10'W x 3'H CBC (Sta. 921+24.00) (Existing)

HYDROLOGIC ANALYSIS

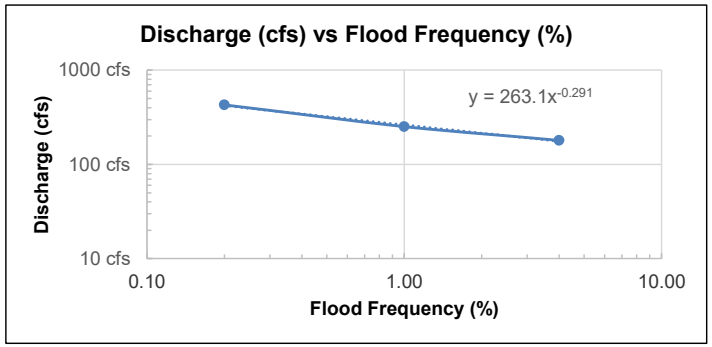
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 30.00 sq.ft.

$Q_{25yr} = A_1V =$ **180 cfs**
$Q_{50yr} = 263.1(2)^{-0.291} =$ **215 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **252 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **428 cfs**



Overtopping Frequency Determination for CD-18 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-18	921+24.00	10'W x 3'H	1	Rectangular	36"	120"	30.00	180	215	252	270.1	428

*OT = Overtopping

Sample Calculations:

$Q_{(OT)}$ = $263.1x^{-0.291}$ (from curve fitting equation)
x 0.91 %

Storm Event =1/Storm Freq
109-yr

Storm Event			
50-yr	100-yr	109-yr	500-yr
Strom Frequency (%)			
2	1	0.91	0.2

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US 98 PD&E Study

CD-19: 1 - 5'W x 3'H CBC (Sta. 929+00.00) (Existing)

HYDROLOGIC ANALYSIS

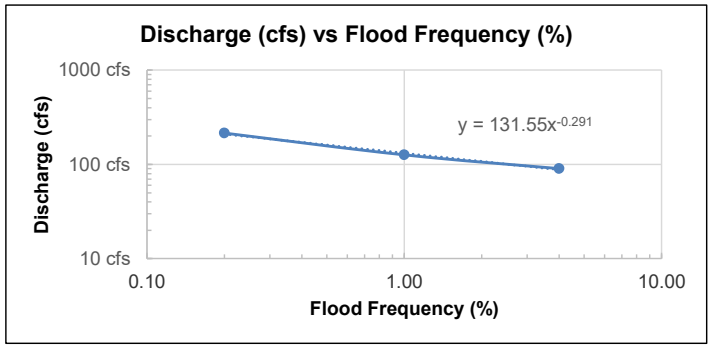
VELOCITY METHOD :

$Q = AV$

Q = Peak Runoff for Return Period T (cfs)
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 15.00 sq.ft.

$Q_{25yr} = A_1V =$ **90 cfs**
$Q_{50yr} = 131.55(2)^{-0.291} =$ **108 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **126 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **214 cfs**



Overtopping Frequency Determination for CD-19 (Proposed)

Name	Approximate Location	Description	Barrel	Geometry	Pipe Size			$Q_{(25)}$	$Q_{(50)}$	$Q_{(100)}$	$Q_{(OT)}$	$Q_{(500)}$
					Height	Width	Total Area (sf)					
CD-19	929+00.00	5'W x 3'H	1	Rectangular	36"	60"	15.00	90	108	126	128.7	214

*OT = Overtopping

Sample Calculations:

$Q_{(OT)} = 131.55x^{-0.291}$ (from curve fitting equation)
x 0.98 %

Storm Event =1/Storm Freq
103-yr

Storm Event			
50-yr	100-yr	103-yr	500-yr
Strom Frequency (%)			
2	1	0.98	0.2

Note: Curve fitting equation yielded unrealistic results for the overtopping frequency. Therefore, linear interpolation was used.

TABLE – CROSS DRAIN FLOOD DATA SHEET - EXISTING VS. PROPOSED

Structure Number	Approximate Location	Design Flood (50-yr Storm Event)					Base Flood (100-yr Storm Event)					Overtopping Flood				Greatest Flood (500-yr Storm Event)				
		Existing (A)		Proposed (B)		B-A	Existing (A)		Proposed (B)		B-A	Existing (A)		Proposed (B)		Existing (A)		Proposed (B)		B-A
		Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Stage (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Stage (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Stage (ft)
CD-01	Sta. 463+36.00	69	130.54	69	129.97	-0.57	81	131.42	81	130.48	-0.94	85.66	131.80	105.84	131.80	137	131.87	137	131.85	-0.02
CD-02	Sta. 472+52.00	35	130.84	35	130.13	-0.71	41	131.60	41	130.51	-1.09	48.14	132.60	No Overtopping	133.60	70	132.69	70	133.33	0.64
CD-03	Sta. 489+64.00	108	128.45	108	128.52	0.07	126	129.21	126	129.28	0.07	140.54	129.90	164.62	131.30	214	130.06	214	131.42	1.36
CD-04	Sta. 499+51.00	23	126.81	23	125.97	-0.84	26	127.21	26	126.20	-1.01	25.04	127.20	No Overtopping	128.90	45	127.25	45	128.77	1.52
CD-05	Sta. 559+35.00	108	123.26	108	123.32	0.06	126	124.02	126	124.08	0.06	134.24	124.40	161.23	125.90	214	124.49	214	125.97	1.48
CD-06	Sta. 580+00.00	69	120.69	69	120.38	-0.31	81	121.37	81	120.82	-0.55	87.05	121.80	No Overtopping	124.10	137	121.84	137	123.68	1.84
CD-07	Sta. 597+50.00	68	119.86	68	118.86	-1.00	79	120.22	79	119.20	-1.02	72.94	120.20	120.63	121.10	135	120.29	135	121.13	0.84
CD-08	Sta. 625+00.00	215	120.27	215	120.30	0.03	252	121.05	252	121.08	0.03	275.30	121.60	304.82	122.40	428	121.76	428	122.54	0.78
CD-09	Sta. 655+00.00	86	118.50	86	118.50	0.00	101	119.29	101	119.29	0.00	106.35	119.60	114.45	120.10	171	119.73	171	120.22	0.49
CD-10	Sta. 666+00.00	35	118.53	35	117.77	-0.76	41	119.30	41	118.16	-1.14	43.95	119.70	58.16	119.70	70	119.80	70	119.76	-0.04
CD-11	Sta. 682+00.00	35	113.76	35	113.05	-0.71	41	114.49	41	113.42	-1.07	50.23	115.80	66.18	115.80	70	115.85	70	115.81	-0.04
CD-12	Sta. 725+00.00	70	107.58	70	106.61	-0.97	82	108.03	82	107.03	-1.00	76.79	108.00	110.67	108.30	140	108.18	140	108.41	0.23
CD-13	Sta. 738+00.00	229	105.93	229	105.95	0.02	269	106.73	269	106.76	0.03	276.69	106.90	275.65	106.90	457	107.10	457	107.10	0.00
CD-14	Sta. 750+00.00	23	104.04	23	103.17	-0.87	26	104.71	26	103.40	-1.31	28.89	105.40	41.54	105.40	45	105.48	45	105.43	-0.05
CD-15	Sta. 766+00.00	23	103.94	23	103.29	-0.65	26	104.53	26	103.57	-0.96	26.31	104.60	40.17	105.50	45	104.68	45	105.53	0.85
BC-1	Sta. 784+50.00	287	101.92	287	101.94	0.02	336	102.69	336	102.70	0.01	358.82	103.10	389.51	103.70	571	103.42	571	103.99	0.57
BC-2	Sta. 849+00.00	860	97.00	860	97.00	0.00	1008	97.77	1008	97.78	0.01	1047.22	98.00	1205.01	99.00	1714	98.77	1714	99.65	0.88
CD-16	Sta. 867+00.00	51	96.40	51	95.93	-0.47	59	97.01	59	96.30	-0.71	58.08	97.00	72.66	97.00	101	97.11	101	97.09	-0.02
CD-17	Sta. 888+50.00	143	93.90	143	93.92	0.02	168	94.69	168	94.70	0.01	171.13	94.80	206.82	96.20	286	95.06	286	96.41	1.35
BC-3	Sta. 914+00.00	430	92.07	430	92.08	0.01	504	92.85	504	92.85	0.00	533.71	93.20	655.00	94.90	857	93.86	857	95.40	1.54
CD-18	Sta. 921+24.00	215	91.60	215	91.60	0.00	252	92.38	252	92.38	0.00	261.58	92.60	270.07	92.80	428	93.04	428	93.24	0.20
CD-19	Sta. 929+00.00	108	91.21	108	91.22	0.01	126	91.97	126	91.98	0.01	128.91	92.10	128.70	92.10	214	92.20	214	92.20	0.00

Existing conditions show deficiency. Upsize pipe to prevent base flood in proposed conditions
Upsize pipe to prevent base flood in proposed conditions. Cross drain does not show deficiency in existing conditions.
Maintain same existing conditions inverts to prevent from getting high headwater levels

Cross Drain Upsizing			
Structure Number	Existing Pipe Size	Proposed Pipe Size	
CD-01	Single 42" RCP	Single 48" RCP	Upsize
CD-02	Single 30" RCP	Single 36" RCP	Upsize
CD-03	Single 5' x 3' CBC	Single 5' x 3' CBC	Same
CD-04	Single 24" RCP	Single 30" RCP	Upsize
CD-05	Single 5' x 3' CBC	Single 5' x 3' CBC	Same
CD-06	Single 42" RCP	Single 48" RCP	Upsize
CD-07	Triple 24" RCP	Triple 30" RCP	Upsize
CD-08	Single 10' x 3' CBC	Single 10' x 3' CBC	Same
CD-09	Single 4' x 3' CBC	Single 4' x 3' CBC	Same
CD-10	Single 30" RCP	Single 36" RCP	Upsize
CD-11	Single 30" RCP	Single 36" RCP	Upsize
CD-12	Double 30" RCP	Triple 30" RCP	Upsize
CD-13	Single 8' x 4' CBC	Single 8' x 4' CBC	Same
CD-14	Single 24" RCP	Single 30" RCP	Upsize
CD-15	Single 24" RCP	Single 30" RCP	Upsize
BC-1	Double 10' x 2' BC	Double 10' x 2' BC	Same
BC-2	Quad 10' x 3' BC	Quad 10' x 3' BC	Same
CD-16	Single 36" RCP	Single 42" RCP	Upsize
CD-17	Single 10' x 2' CBC	Single 10' x 2' CBC	Same
BC-3	Triple 10' x 2' BC	Triple 10' x 2' BC	Same
CD-18	Single 10' x 3' CBC	Single 10' x 3' CBC	Same
CD-19	Single 5' x 3' CBC	Single 5' x 3' CBC	Same

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 69 cfs

Design Flow: 81 cfs

Maximum Flow: 137 cfs

Table 1 - Summary of Culvert Flows at Crossing: EX-CD-1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
130.54	69.00	69.00	0.00	1
131.03	75.80	75.80	0.00	1
131.42	81.00	81.00	0.00	1
131.81	89.40	85.81	2.98	41
131.82	96.20	85.99	9.77	5
131.83	103.00	86.14	16.41	4
131.84	109.80	86.25	22.68	3
131.85	116.60	86.36	29.48	3
131.86	123.40	86.48	36.36	3
131.86	130.20	86.58	43.22	3
131.87	137.00	86.68	50.04	3
131.80	85.66	85.66	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-1

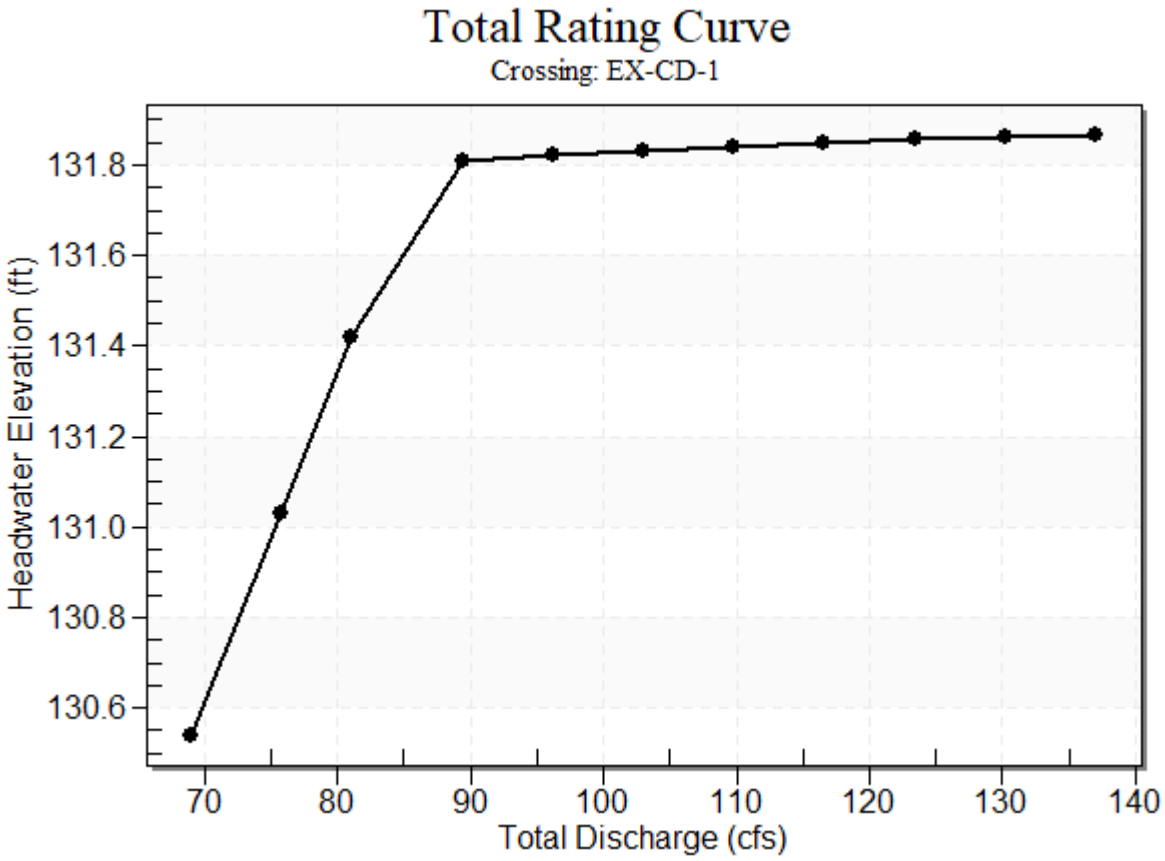


Table 2 - Culvert Summary Table: Culvert 1

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)
69.00	69.00	130.54	4.400	4.791	7-M2c	3.500	2.603	2.603	1.750	8.992	0.000
75.80	75.80	131.03	4.809	5.279	7-M2c	3.500	2.724	2.724	1.750	9.434	0.000
81.00	81.00	131.42	5.148	5.670	7-M2c	3.500	2.810	2.810	1.750	9.784	0.000
89.40	85.81	131.81	5.484	6.061	7-M2c	3.500	2.884	2.884	1.750	10.120	0.000
96.20	85.99	131.82	5.497	6.073	7-M2c	3.500	2.886	2.886	1.750	10.133	0.000
103.00	86.14	131.83	5.508	6.082	7-M2c	3.500	2.888	2.888	1.750	10.143	0.000
109.80	86.25	131.84	5.516	6.090	7-M2c	3.500	2.890	2.890	1.750	10.151	0.000
116.60	86.36	131.85	5.524	6.097	7-M2c	3.500	2.892	2.892	1.750	10.159	0.000
123.40	86.48	131.86	5.533	6.105	7-M2c	3.500	2.893	2.893	1.750	10.167	0.000
130.20	86.58	131.86	5.540	6.112	7-M2c	3.500	2.895	2.895	1.750	10.174	0.000
137.00	86.68	131.87	5.547	6.118	7-M2c	3.500	2.896	2.896	1.750	10.181	0.000

****

Straight Culvert

Inlet Elevation (invert): 125.75 ft, Outlet Elevation (invert): 125.59 ft

Culvert Length: 186.40 ft, Culvert Slope: 0.0009

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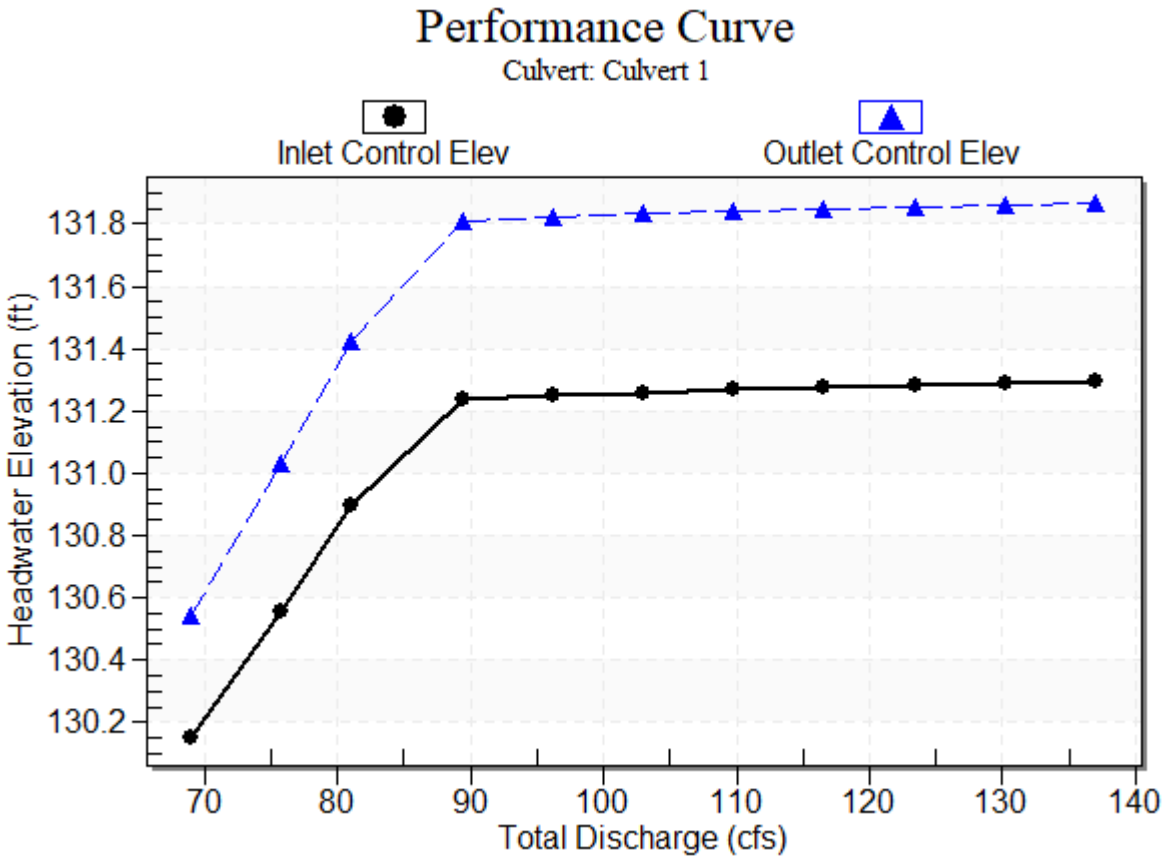
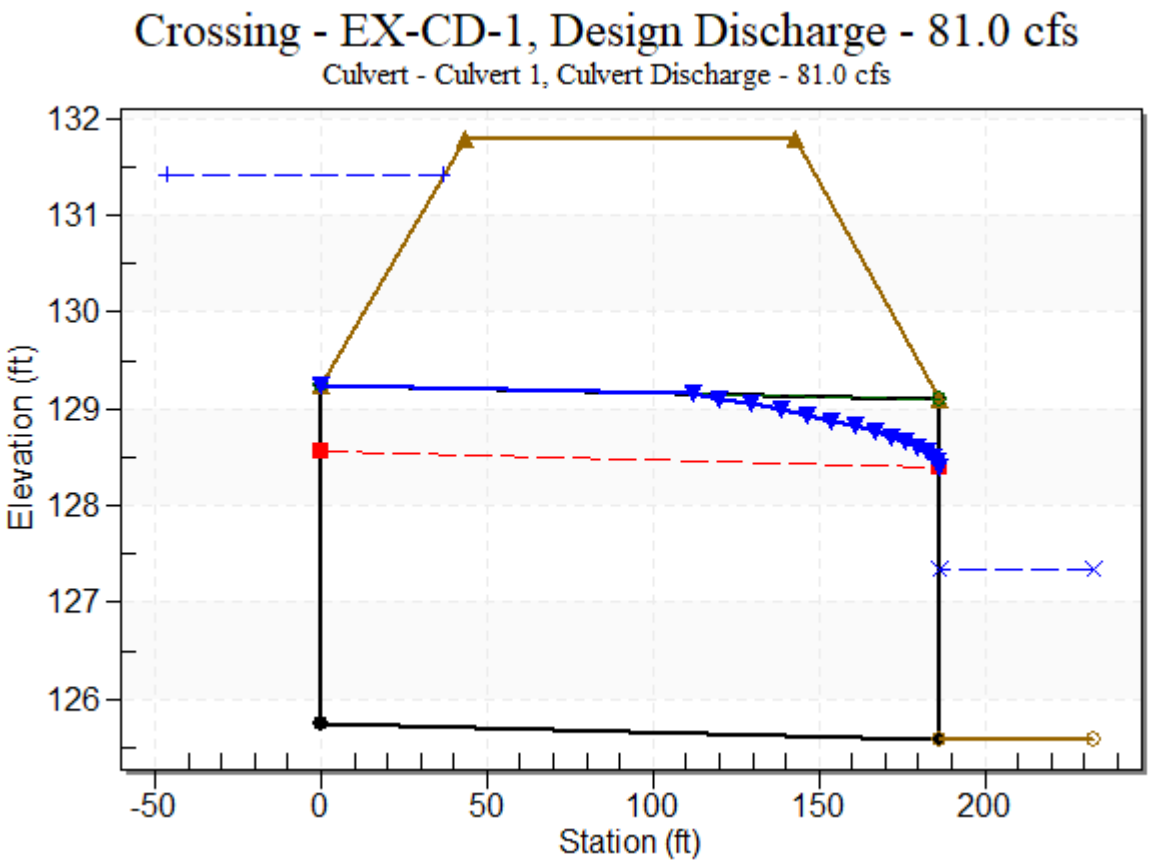
Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 125.75 ft

Outlet Station: 186.40 ft

Outlet Elevation: 125.59 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: EX-CD-1)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
69.00	127.34	1.75
75.80	127.34	1.75
81.00	127.34	1.75
89.40	127.34	1.75
96.20	127.34	1.75
103.00	127.34	1.75
109.80	127.34	1.75
116.60	127.34	1.75
123.40	127.34	1.75
130.20	127.34	1.75
137.00	127.34	1.75

Tailwater Channel Data - EX-CD-1

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 127.34 ft

Roadway Data for Crossing: EX-CD-1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 131.80 ft

Roadway Surface: Paved

Roadway Top Width: 100.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 69 cfs

Design Flow: 81 cfs

Maximum Flow: 137 cfs

Table 4 - Summary of Culvert Flows at Crossing: PR-CD-1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
129.97	69.00	69.00	0.00	1
130.26	75.80	75.80	0.00	1
130.48	81.00	81.00	0.00	1
130.86	89.40	89.40	0.00	1
131.23	96.20	96.20	0.00	1
131.63	103.00	103.00	0.00	1
131.81	109.80	106.01	2.89	27
131.82	116.60	106.21	9.36	4
131.83	123.40	106.38	16.49	4
131.84	130.20	106.51	22.81	3
131.85	137.00	106.63	29.61	3
131.80	105.84	105.84	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-1

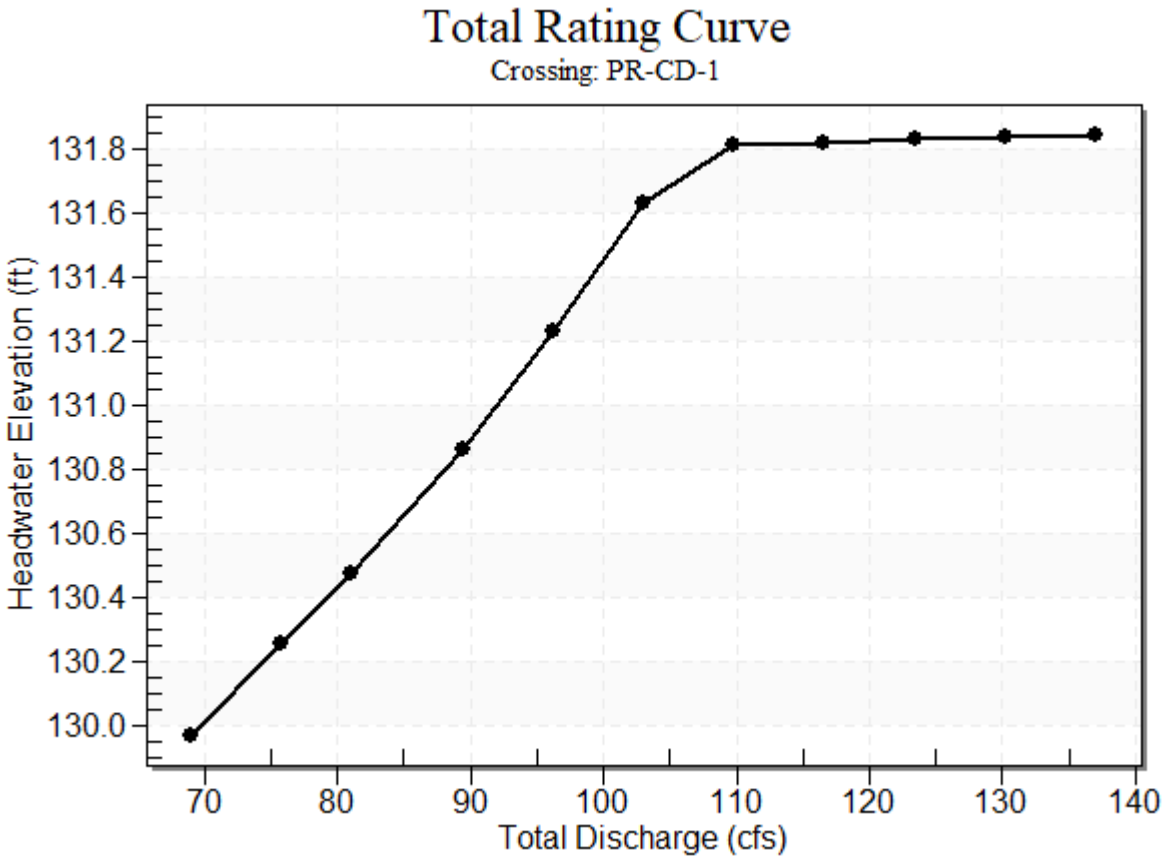


Table 5 - Culvert Summary Table: Culvert 1

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)
69.00	69.00	129.97	3.881	4.224	7-M2c	4.000	2.510	2.510	1.750	8.313	0.000
75.80	75.80	130.26	4.146	4.506	7-M2c	4.000	2.635	2.635	1.750	8.633	0.000
81.00	81.00	130.48	4.356	4.728	7-M2c	4.000	2.726	2.726	1.750	8.878	0.000
89.40	89.40	130.86	4.713	5.115	7-M2c	4.000	2.866	2.866	1.750	9.277	0.000
96.20	96.20	131.23	5.022	5.485	7-M2c	4.000	2.973	2.973	1.750	9.606	0.000
103.00	103.00	131.63	5.351	5.880	7-M2c	4.000	3.073	3.073	1.750	9.942	0.000
109.80	106.01	131.81	5.505	6.060	7-M2c	4.000	3.116	3.116	1.750	10.094	0.000
116.60	106.21	131.82	5.515	6.072	7-M2c	4.000	3.119	3.119	1.750	10.104	0.000
123.40	106.38	131.83	5.524	6.082	7-M2c	4.000	3.121	3.121	1.750	10.112	0.000
130.20	106.51	131.84	5.530	6.090	7-M2c	4.000	3.123	3.123	1.750	10.119	0.000
137.00	106.63	131.85	5.537	6.098	7-M2c	4.000	3.125	3.125	1.750	10.125	0.000

****

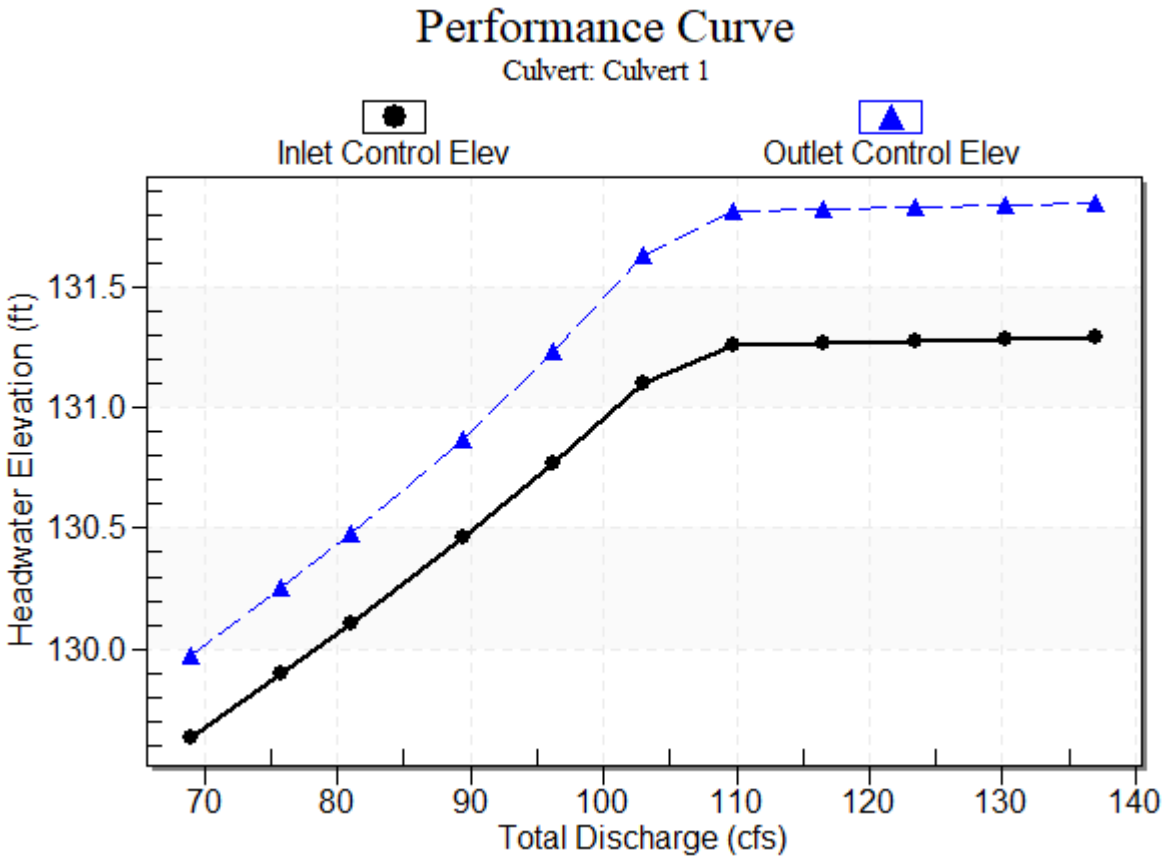
Straight Culvert

Inlet Elevation (invert): 125.75 ft, Outlet Elevation (invert): 125.59 ft

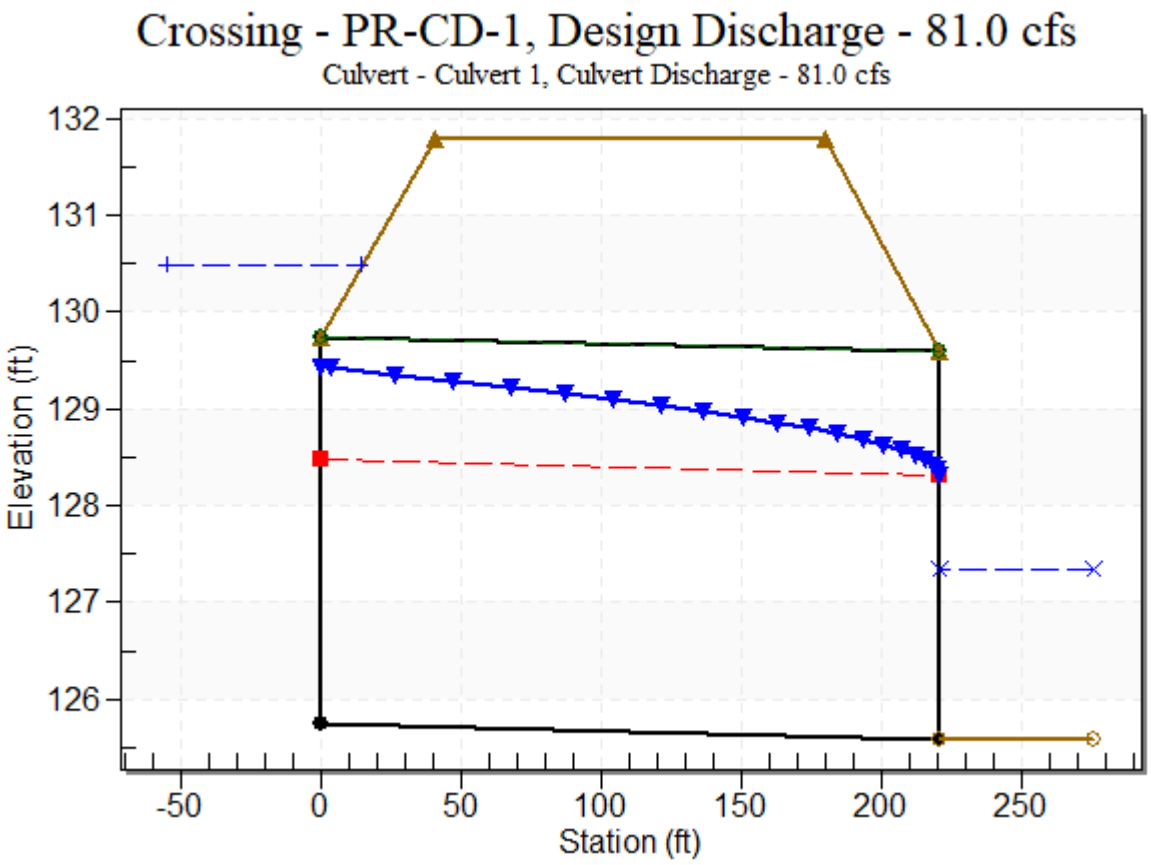
Culvert Length: 221.00 ft, Culvert Slope: 0.0007

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 125.75 ft

Outlet Station: 221.00 ft

Outlet Elevation: 125.59 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: PR-CD-1)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
69.00	127.34	1.75
75.80	127.34	1.75
81.00	127.34	1.75
89.40	127.34	1.75
96.20	127.34	1.75
103.00	127.34	1.75
109.80	127.34	1.75
116.60	127.34	1.75
123.40	127.34	1.75
130.20	127.34	1.75
137.00	127.34	1.75

Tailwater Channel Data - PR-CD-1

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 127.34 ft

Roadway Data for Crossing: PR-CD-1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 131.80 ft

Roadway Surface: Paved

Roadway Top Width: 139.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 35 cfs

Design Flow: 41 cfs

Maximum Flow: 70 cfs

Table 7 - Summary of Culvert Flows at Crossing: EX-CD-2

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
130.84	35.00	35.00	0.00	1
131.27	38.50	38.50	0.00	1
131.60	41.00	41.00	0.00	1
132.21	45.50	45.50	0.00	1
132.61	49.00	48.22	0.49	51
132.63	52.50	48.33	3.80	5
132.64	56.00	48.44	7.23	4
132.66	59.50	48.52	10.78	4
132.67	63.00	48.63	14.05	3
132.68	66.50	48.67	17.52	3
132.69	70.00	48.74	21.03	3
132.60	48.14	48.14	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-2

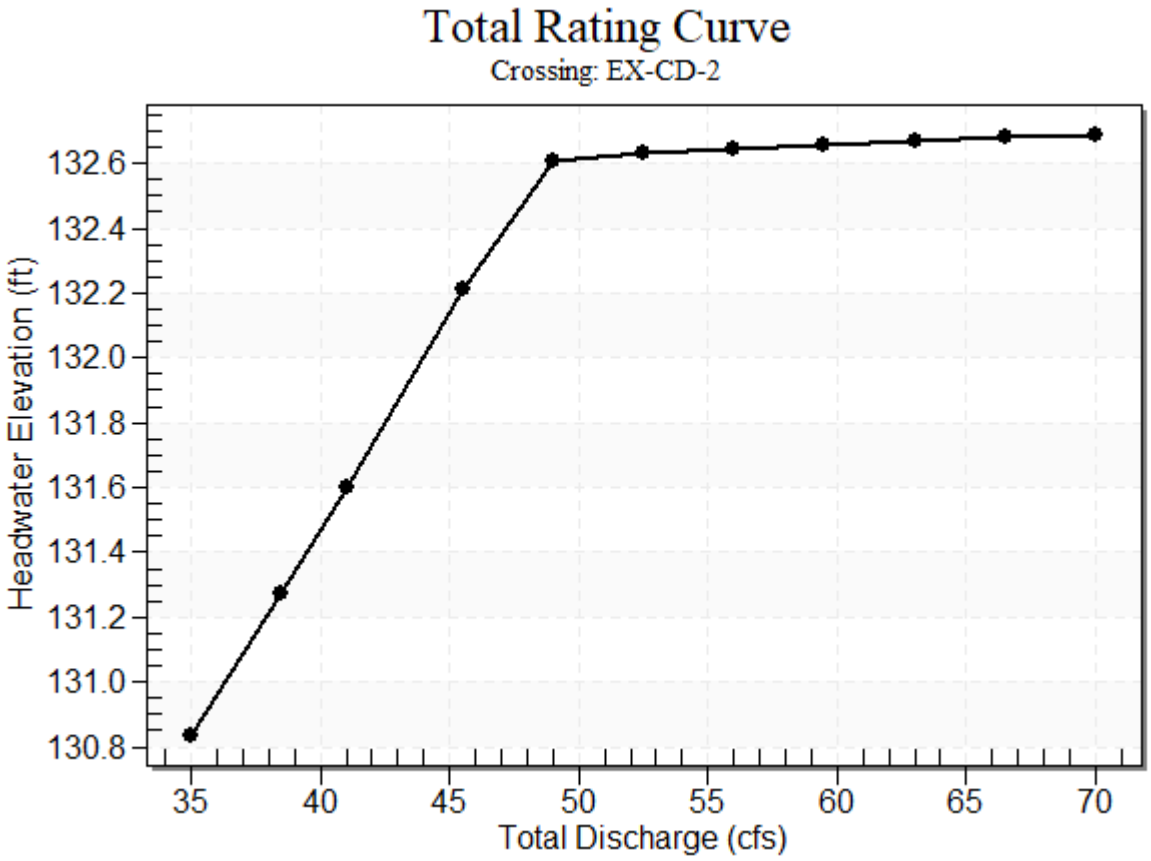


Table 8 - Culvert Summary Table: Culvert 1

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)
35.00	35.00	130.84	3.685	3.967	7-M2c	2.500	2.009	2.009	2.000	8.279	0.000
38.50	38.50	131.27	4.100	4.405	7-M2c	2.500	2.095	2.095	2.000	8.764	0.000
41.00	41.00	131.60	4.424	4.732	7-M2c	2.500	2.150	2.150	2.000	9.130	0.000
45.50	45.50	132.21	5.065	5.342	7-M2c	2.500	2.234	2.234	2.000	9.830	0.000
49.00	48.22	132.61	5.489	5.737	7-M2c	2.500	2.276	2.276	2.000	10.280	0.000
52.50	48.33	132.63	5.507	5.759	7-M2c	2.500	2.277	2.277	2.000	10.299	0.000
56.00	48.44	132.64	5.523	5.774	7-M2c	2.500	2.279	2.279	2.000	10.316	0.000
59.50	48.52	132.66	5.537	5.787	7-M2c	2.500	2.280	2.280	2.000	10.331	0.000
63.00	48.63	132.67	5.555	5.799	7-M2c	2.500	2.281	2.281	2.000	10.350	0.000
66.50	48.67	132.68	5.562	5.809	7-M2c	2.500	2.282	2.282	2.000	10.356	0.000
70.00	48.74	132.69	5.573	5.820	7-M2c	2.500	2.283	2.283	2.000	10.368	0.000

****

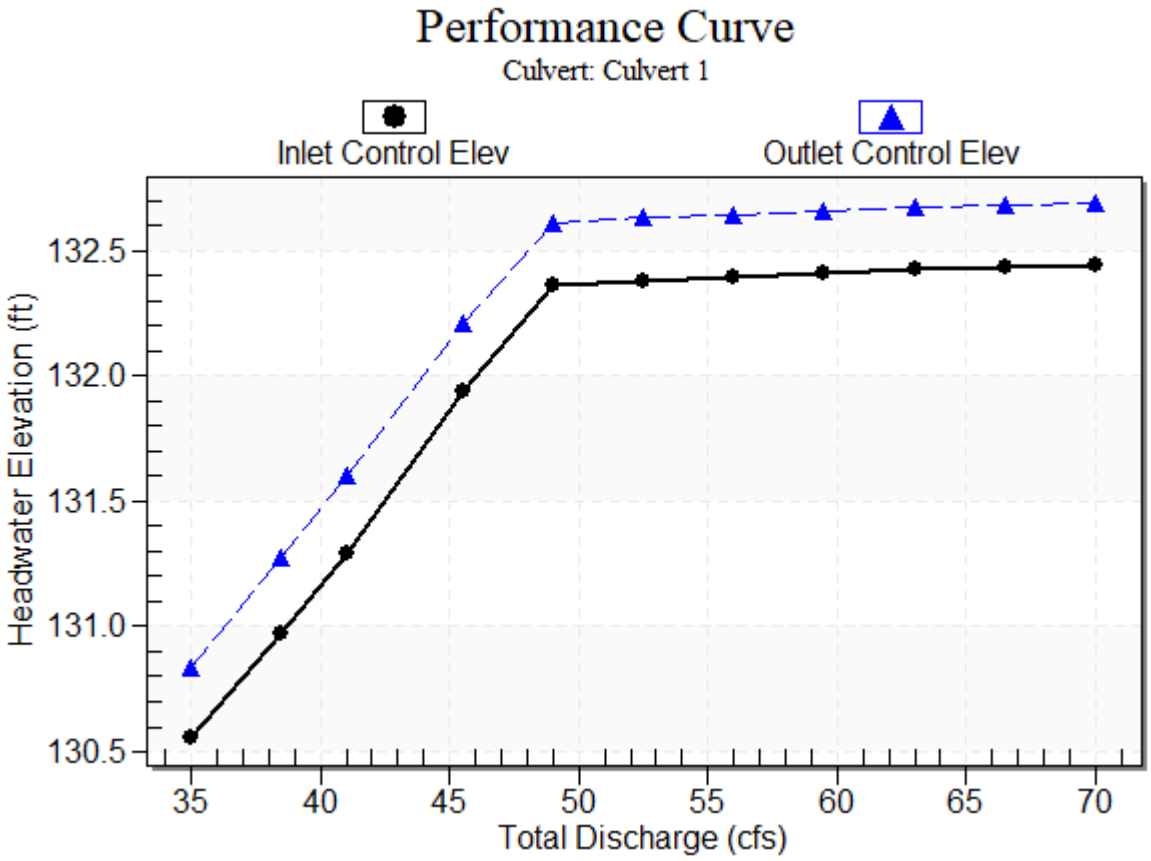
Straight Culvert

Inlet Elevation (invert): 126.87 ft, Outlet Elevation (invert): 126.78 ft

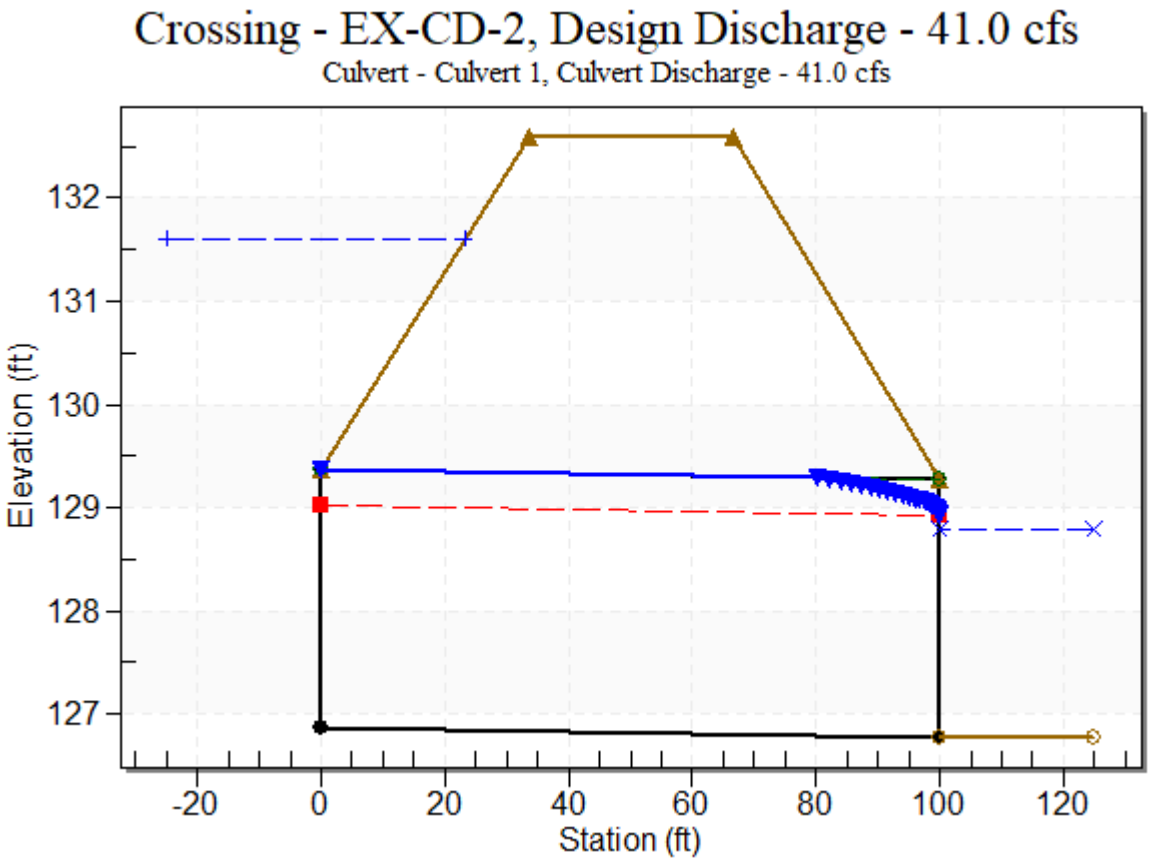
Culvert Length: 100.00 ft, Culvert Slope: 0.0009

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 126.87 ft

Outlet Station: 100.00 ft

Outlet Elevation: 126.78 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 9 - Downstream Channel Rating Curve (Crossing: EX-CD-2)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
35.00	128.78	2.00
38.50	128.78	2.00
41.00	128.78	2.00
45.50	128.78	2.00
49.00	128.78	2.00
52.50	128.78	2.00
56.00	128.78	2.00
59.50	128.78	2.00
63.00	128.78	2.00
66.50	128.78	2.00
70.00	128.78	2.00

Tailwater Channel Data - EX-CD-2

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 128.78 ft

Roadway Data for Crossing: EX-CD-2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 132.60 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 35 cfs

Design Flow: 41 cfs

Maximum Flow: 70 cfs

Table 10 - Summary of Culvert Flows at Crossing: PR-CD-2

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
130.13	35.00	35.00	0.00	1
130.35	38.50	38.50	0.00	1
130.51	41.00	41.00	0.00	1
130.85	45.50	45.50	0.00	1
131.18	49.00	49.00	0.00	1
131.49	52.50	52.50	0.00	1
131.85	56.00	56.00	0.00	1
132.19	59.50	59.50	0.00	1
132.55	63.00	63.00	0.00	1
132.94	66.50	66.50	0.00	1
133.33	70.00	70.00	0.00	1
133.60	72.27	72.27	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-2

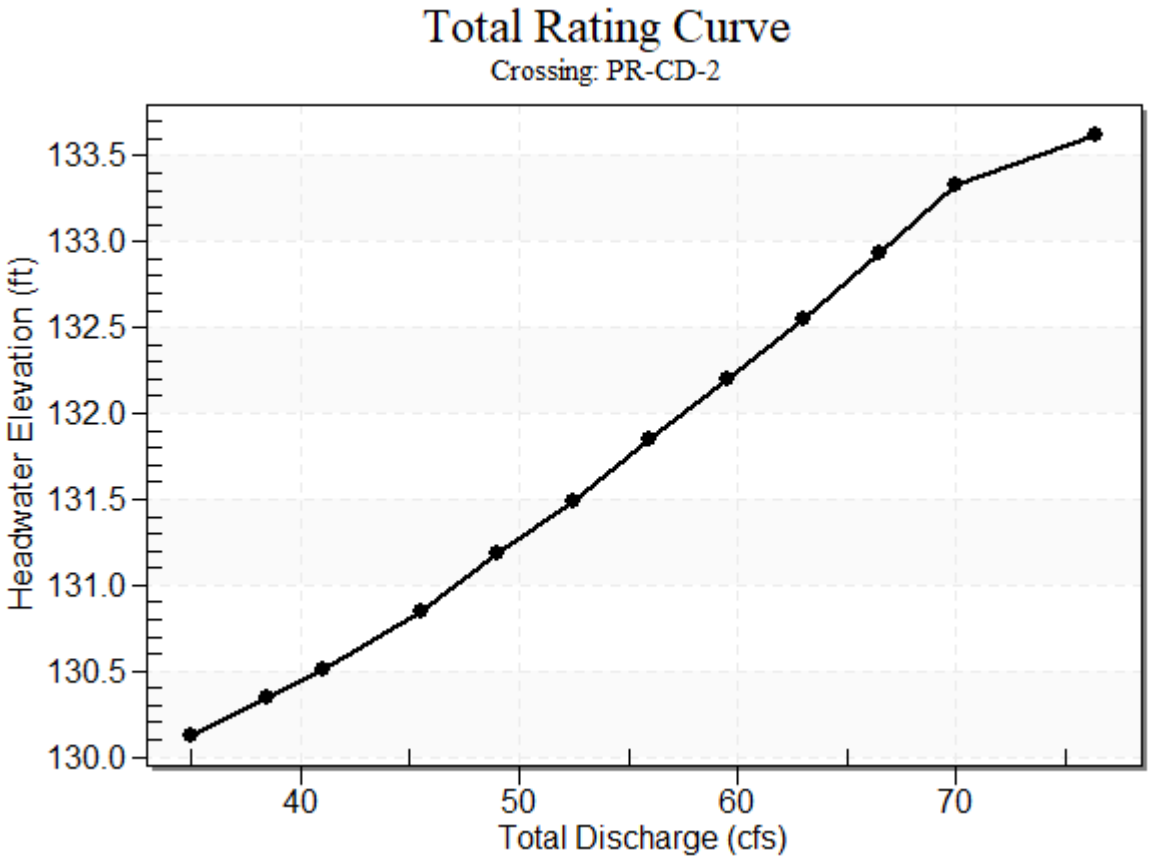


Table 11 - Culvert Summary Table: Culvert 1

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)
35.00	35.00	130.13	2.993	3.229	3-M2t	3.000	1.922	2.080	2.080	6.692	0.000
38.50	38.50	130.35	3.206	3.448	3-M2t	3.000	2.019	2.080	2.080	7.362	0.000
41.00	41.00	130.51	3.365	3.614	7-M2c	3.000	2.085	2.085	2.080	7.819	0.000
45.50	45.50	130.85	3.668	3.946	7-M2c	3.000	2.197	2.197	2.080	8.201	0.000
49.00	49.00	131.18	3.923	4.281	7-M2c	3.000	2.279	2.279	2.080	8.506	0.000
52.50	52.50	131.49	4.196	4.590	7-M2c	3.000	2.355	2.355	2.080	8.819	0.000
56.00	56.00	131.85	4.490	4.954	7-M2c	3.000	2.426	2.426	2.080	9.143	0.000
59.50	59.50	132.19	4.804	5.293	7-M2c	3.000	2.492	2.492	2.080	9.479	0.000
63.00	63.00	132.55	5.140	5.654	7-M2c	3.000	2.553	2.553	2.080	9.828	0.000
66.50	66.50	132.94	5.498	6.035	7-M2c	3.000	2.608	2.608	2.080	10.192	0.000
70.00	70.00	133.33	5.877	6.430	7-M2c	3.000	2.657	2.657	2.080	10.571	0.000

****

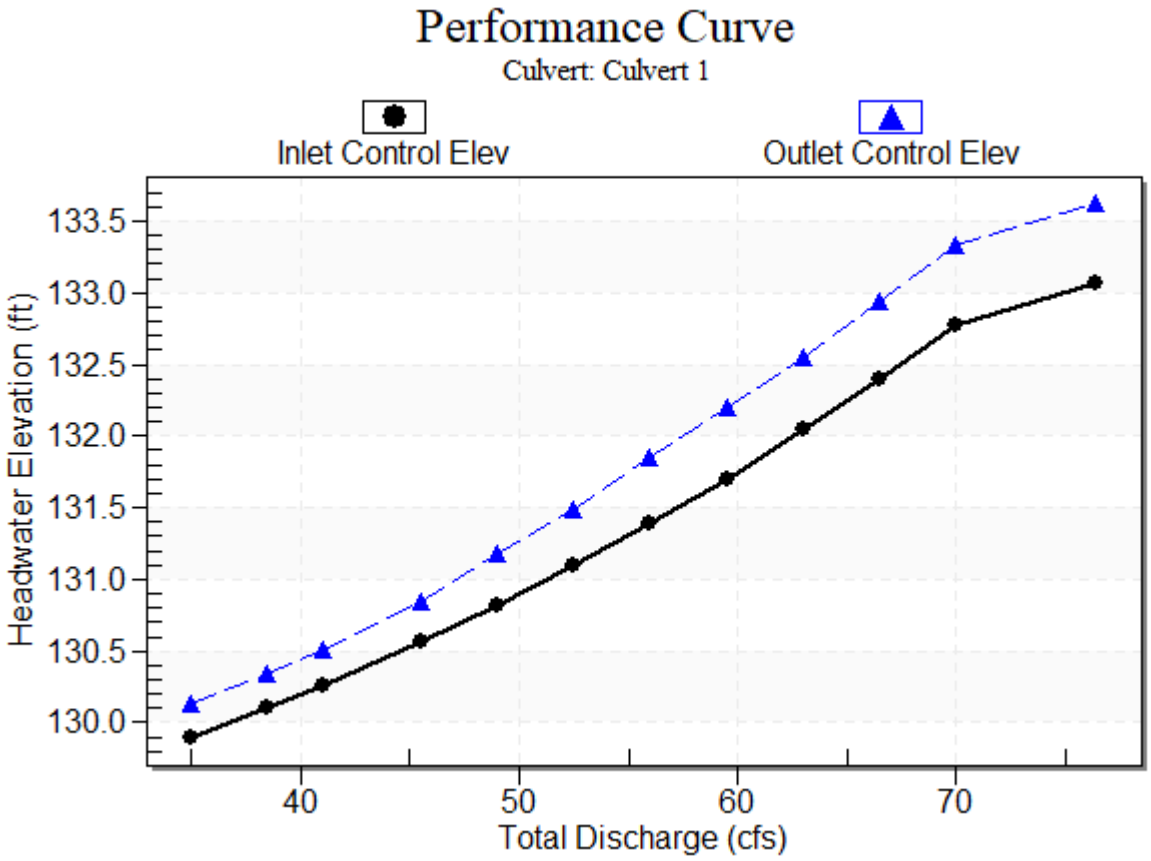
Straight Culvert

Inlet Elevation (invert): 126.90 ft, Outlet Elevation (invert): 126.70 ft

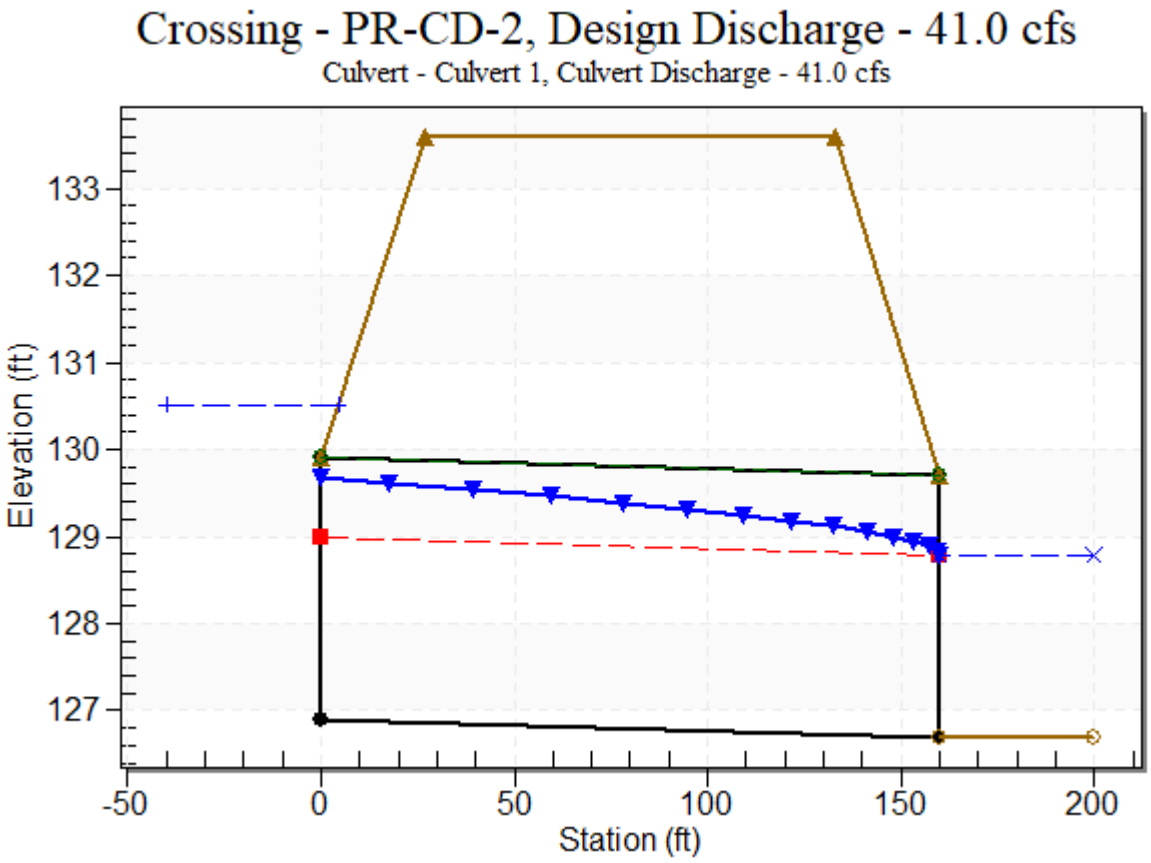
Culvert Length: 160.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 126.90 ft

Outlet Station: 160.00 ft

Outlet Elevation: 126.70 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 12 - Downstream Channel Rating Curve (Crossing: PR-CD-2)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
35.00	128.78	2.08
38.50	128.78	2.08
41.00	128.78	2.08
45.50	128.78	2.08
49.00	128.78	2.08
52.50	128.78	2.08
56.00	128.78	2.08
59.50	128.78	2.08
63.00	128.78	2.08
66.50	128.78	2.08
70.00	128.78	2.08

Tailwater Channel Data - PR-CD-2

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 128.78 ft

Roadway Data for Crossing: PR-CD-2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 133.60 ft

Roadway Surface: Paved

Roadway Top Width: 106.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 108 cfs

Design Flow: 126 cfs

Maximum Flow: 214 cfs

Table 13 - Summary of Culvert Flows at Crossing: EX-CD-3

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
128.45	108.00	108.00	0.00	1
128.88	118.60	118.60	0.00	1
129.21	126.00	126.00	0.00	1
129.86	139.80	139.80	0.00	1
129.94	150.40	141.33	8.59	9
129.97	161.00	141.87	18.70	5
129.99	171.60	142.30	28.74	4
130.01	182.20	142.70	39.15	4
130.03	192.80	143.06	49.53	4
130.04	203.40	143.37	59.44	3
130.06	214.00	143.69	69.77	3
129.90	140.54	140.54	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-3

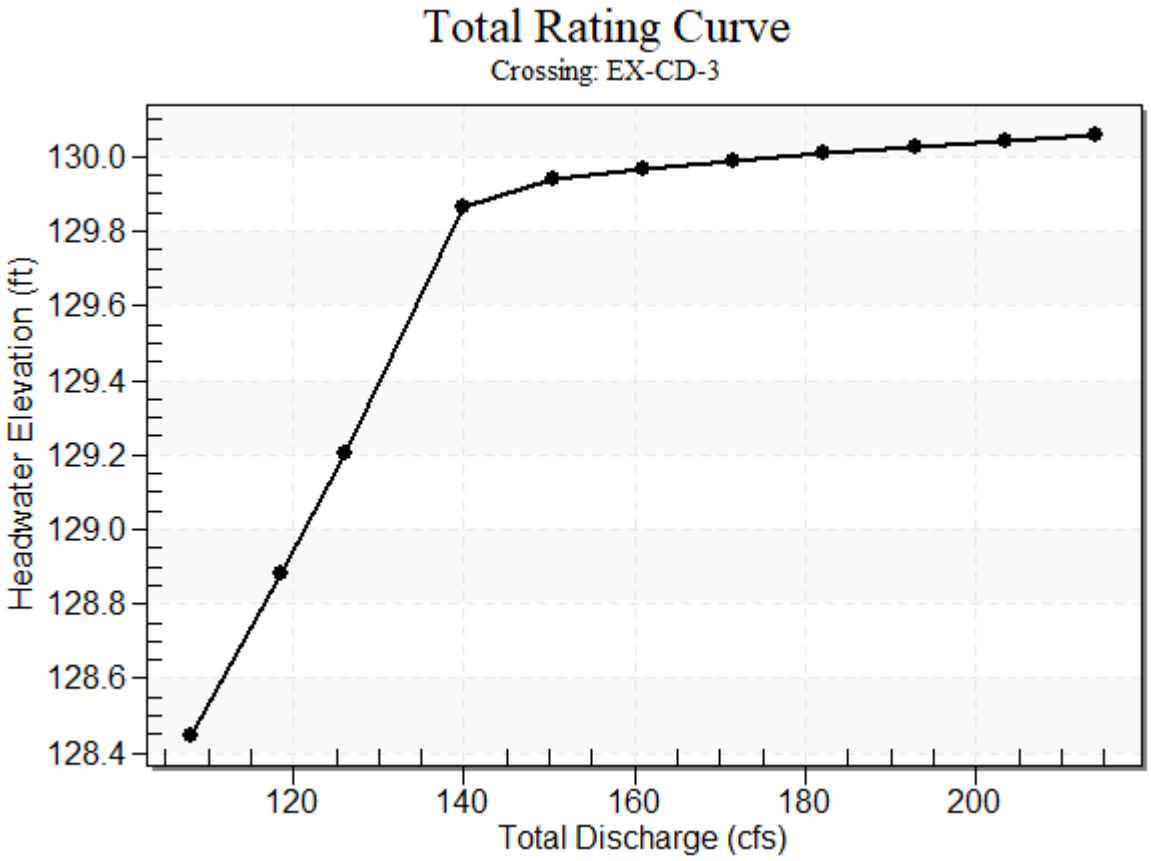


Table 14 - Culvert Summary Table: Culvert 1

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)
108.00	108.00	128.45	4.419	4.192	7-M2c	2.766	2.438	2.438	2.170	8.860	0.000
118.60	118.60	128.88	4.852	4.461	7-M2c	3.000	2.595	2.595	2.170	9.141	0.000
126.00	126.00	129.21	5.176	4.687	7-M2c	3.000	2.702	2.702	2.170	9.327	0.000
139.80	139.80	129.86	5.833	5.339	7-M2c	3.000	2.896	2.896	2.170	9.656	0.000
150.40	141.33	129.94	5.910	5.403	7-M2c	3.000	2.917	2.917	2.170	9.691	0.000
161.00	141.87	129.97	5.937	5.425	7-M2c	3.000	2.924	2.924	2.170	9.703	0.000
171.60	142.30	129.99	5.960	5.443	7-M2c	3.000	2.930	2.930	2.170	9.713	0.000
182.20	142.70	130.01	5.980	5.459	7-M2c	3.000	2.936	2.936	2.170	9.722	0.000
192.80	143.06	130.03	5.998	5.474	7-M2c	3.000	2.940	2.940	2.170	9.730	0.000
203.40	143.37	130.04	6.015	5.487	7-M2c	3.000	2.945	2.945	2.170	9.738	0.000
214.00	143.69	130.06	6.031	5.499	7-M2c	3.000	2.949	2.949	2.170	9.745	0.000

****

Straight Culvert

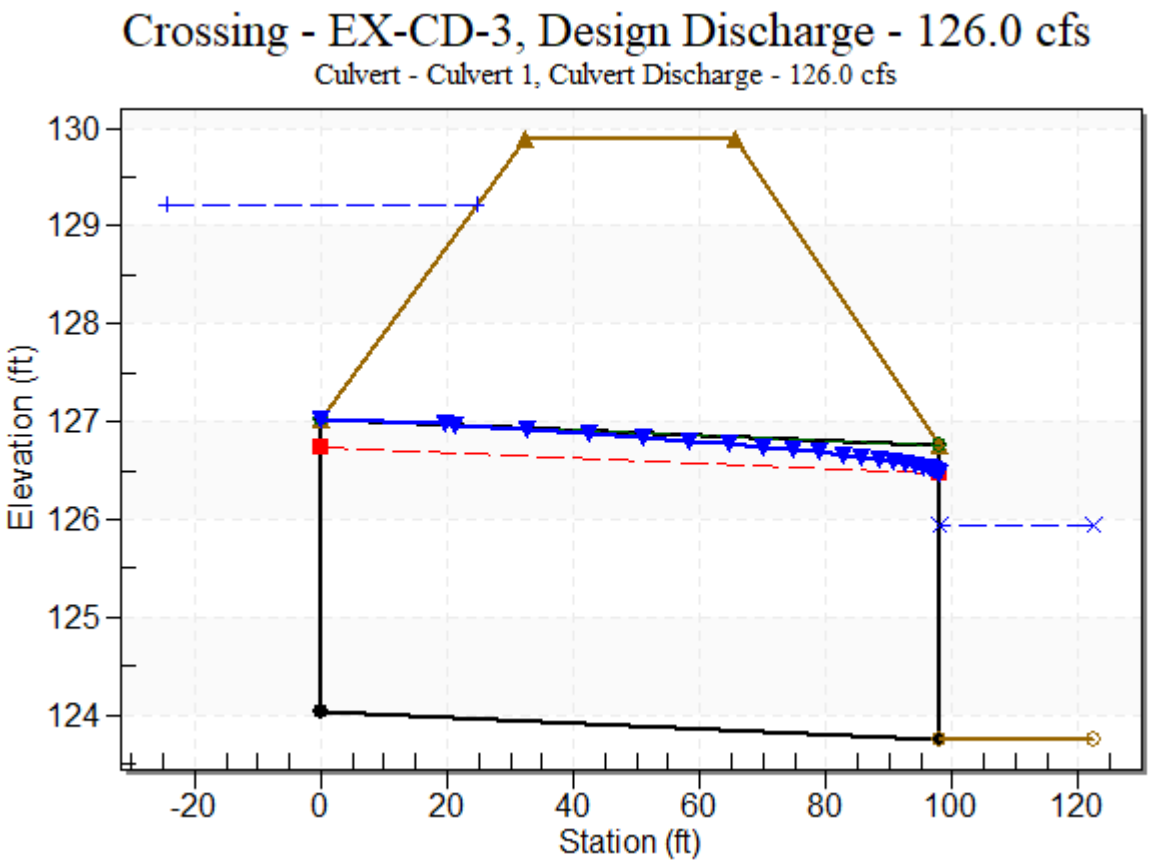
Inlet Elevation (invert): 124.03 ft, Outlet Elevation (invert): 123.76 ft

Culvert Length: 98.00 ft, Culvert Slope: 0.0028

****

Culvert Performance Curve Plot: Culvert 1

Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 124.03 ft

Outlet Station: 98.00 ft

Outlet Elevation: 123.76 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 15 - Downstream Channel Rating Curve (Crossing: EX-CD-3)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
108.00	125.93	2.17
118.60	125.93	2.17
126.00	125.93	2.17
139.80	125.93	2.17
150.40	125.93	2.17
161.00	125.93	2.17
171.60	125.93	2.17
182.20	125.93	2.17
192.80	125.93	2.17
203.40	125.93	2.17
214.00	125.93	2.17

Tailwater Channel Data - EX-CD-3

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 125.93 ft

Roadway Data for Crossing: EX-CD-3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 400.00 ft

Crest Elevation: 129.90 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 108 cfs

Design Flow: 126 cfs

Maximum Flow: 214 cfs

Table 16 - Summary of Culvert Flows at Crossing: PR-CD-3

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
128.52	108.00	108.00	0.00	1
128.95	118.60	118.60	0.00	1
129.28	126.00	126.00	0.00	1
129.93	139.80	139.80	0.00	1
130.49	150.40	150.40	0.00	1
131.09	161.00	161.00	0.00	1
131.33	171.60	165.13	5.83	19
131.36	182.20	165.62	16.00	5
131.38	192.80	166.00	26.13	4
131.40	203.40	166.34	36.65	4
131.42	214.00	166.65	47.11	4
131.30	164.62	164.62	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-3

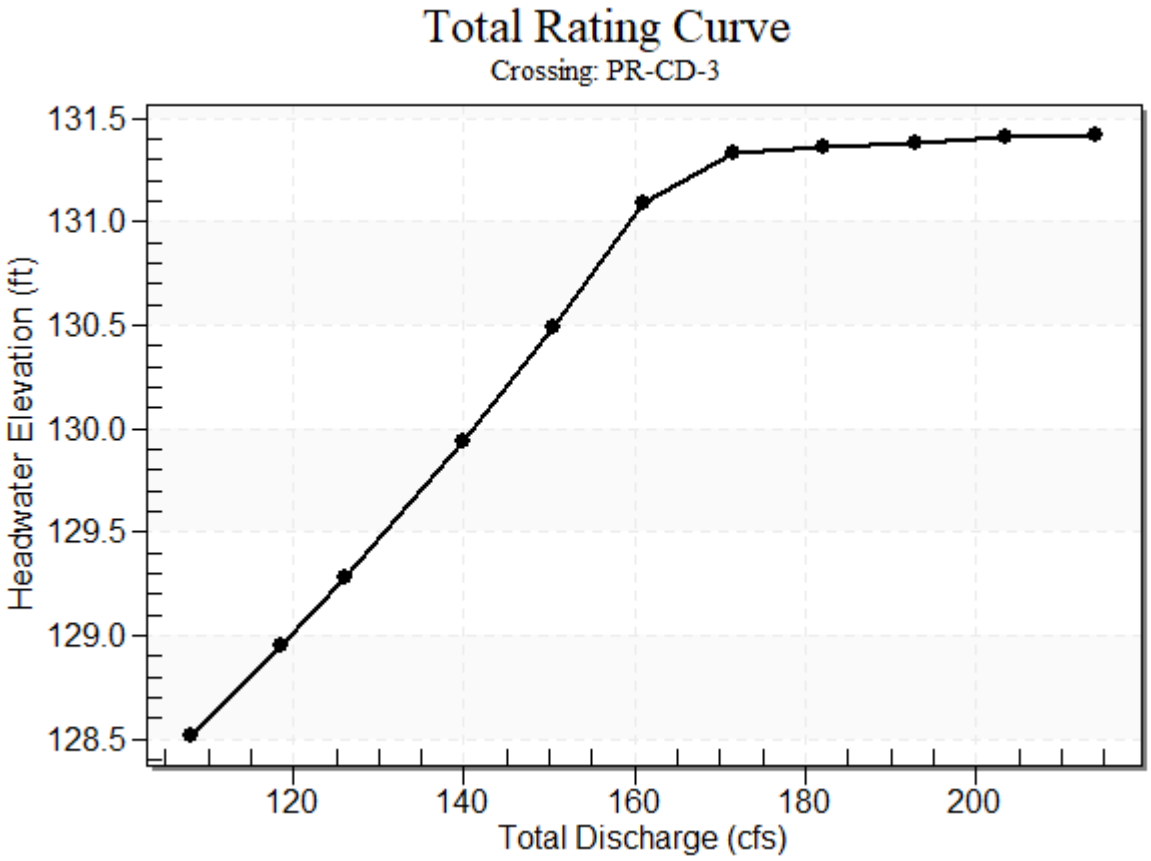


Table 17 - Culvert Summary Table: Culvert 1

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)
108.00	108.00	128.52	4.420	4.187	7-M2c	2.870	2.438	2.438	2.230	8.860	0.000
118.60	118.60	128.95	4.852	4.472	7-M2c	3.000	2.595	2.595	2.230	9.141	0.000
126.00	126.00	129.28	5.176	4.912	7-M2c	3.000	2.702	2.702	2.230	9.327	0.000
139.80	139.80	129.93	5.833	5.592	7-M2c	3.000	2.896	2.896	2.230	9.656	0.000
150.40	150.40	130.49	6.387	6.078	6-FFc	3.000	3.000	3.000	2.230	10.027	0.000
161.00	161.00	131.09	6.985	6.586	6-FFc	3.000	3.000	3.000	2.230	10.733	0.000
171.60	165.13	131.33	7.231	6.793	6-FFc	3.000	3.000	3.000	2.230	11.009	0.000
182.20	165.62	131.36	7.260	6.818	6-FFc	3.000	3.000	3.000	2.230	11.041	0.000
192.80	166.00	131.38	7.283	6.837	6-FFc	3.000	3.000	3.000	2.230	11.067	0.000
203.40	166.34	131.40	7.304	6.855	6-FFc	3.000	3.000	3.000	2.230	11.090	0.000
214.00	166.65	131.42	7.323	6.871	6-FFc	3.000	3.000	3.000	2.230	11.110	0.000

****

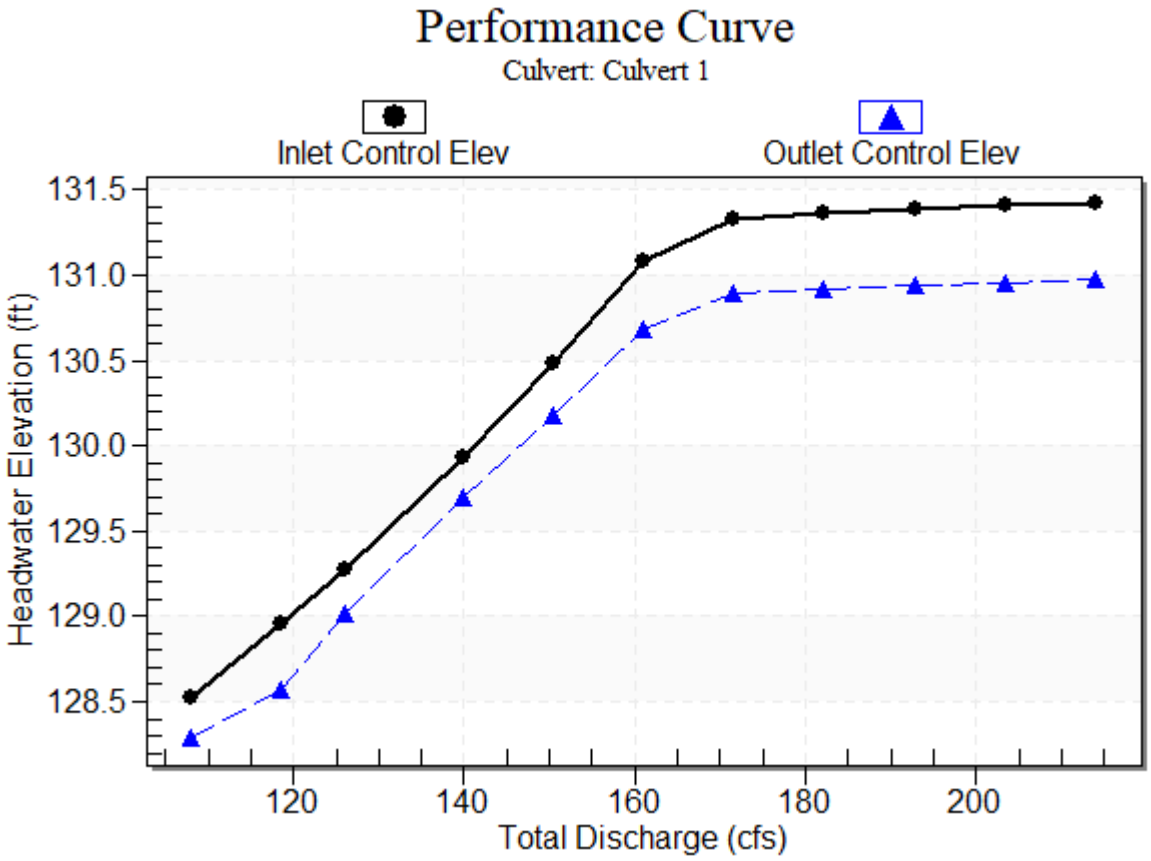
Straight Culvert

Inlet Elevation (invert): 124.10 ft, Outlet Elevation (invert): 123.70 ft

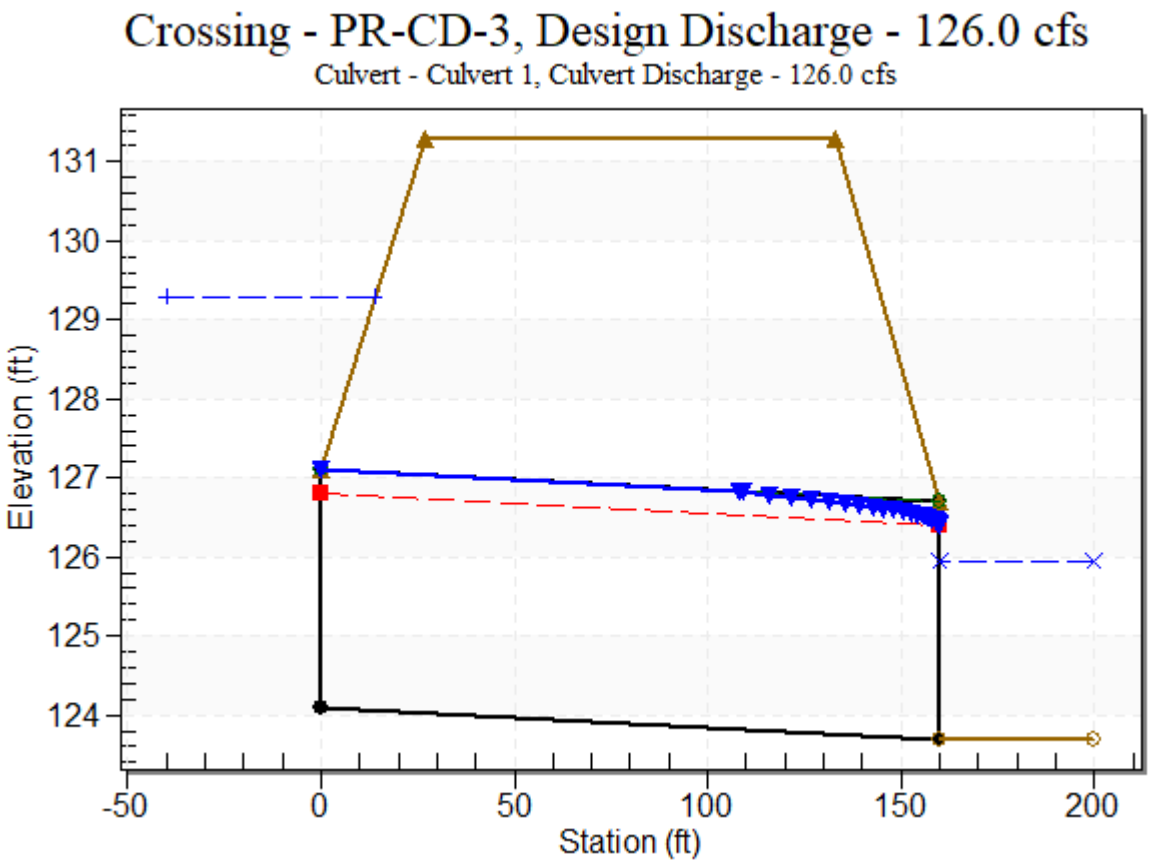
Culvert Length: 160.00 ft, Culvert Slope: 0.0025

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 124.10 ft

Outlet Station: 160.00 ft

Outlet Elevation: 123.70 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 18 - Downstream Channel Rating Curve (Crossing: PR-CD-3)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
108.00	125.93	2.23
118.60	125.93	2.23
126.00	125.93	2.23
139.80	125.93	2.23
150.40	125.93	2.23
161.00	125.93	2.23
171.60	125.93	2.23
182.20	125.93	2.23
192.80	125.93	2.23
203.40	125.93	2.23
214.00	125.93	2.23

Tailwater Channel Data - PR-CD-3

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 125.93 ft

Roadway Data for Crossing: PR-CD-3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 400.00 ft

Crest Elevation: 131.30 ft

Roadway Surface: Paved

Roadway Top Width: 106.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 19 - Summary of Culvert Flows at Crossing: EX-CD-4

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
126.81	23.00	23.00	0.00	1
127.21	26.00	25.07	0.74	55
127.21	27.40	25.10	2.15	5
127.22	29.60	25.13	4.27	4
127.23	31.80	25.17	6.52	4
127.23	34.00	25.19	8.58	3
127.24	36.20	25.21	10.78	3
127.24	38.40	25.24	13.01	3
127.24	40.60	25.26	15.23	3
127.25	42.80	25.28	17.44	3
127.25	45.00	25.30	19.30	2
127.20	25.04	25.04	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-4

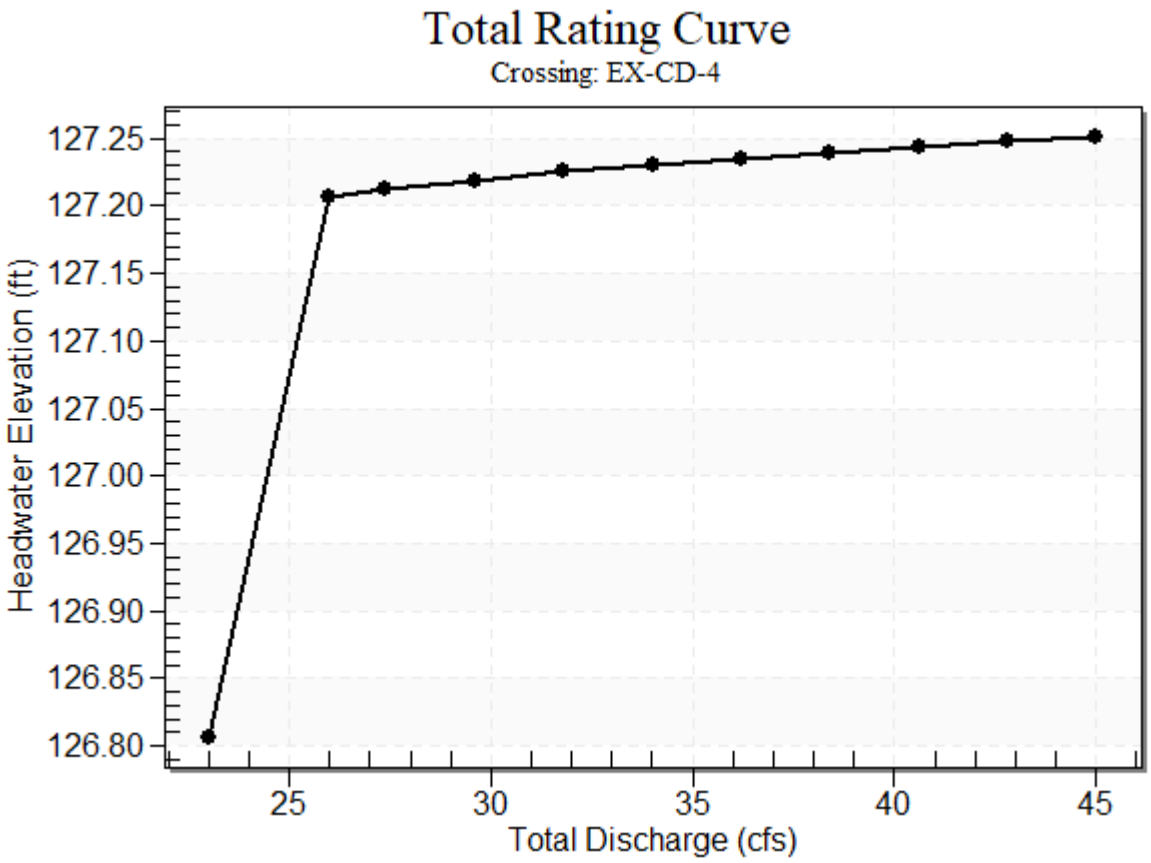


Table 20 - Culvert Summary Table: Culvert 1

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)
23.00	23.00	126.81	3.447	3.341	7-M2c	2.000	1.706	1.706	0.840	8.057	0.000
26.00	25.07	127.21	3.846	3.793	7-M2c	2.000	1.763	1.763	0.840	8.549	0.000
27.40	25.10	127.21	3.852	3.799	7-M2c	2.000	1.764	1.764	0.840	8.557	0.000
29.60	25.13	127.22	3.859	3.807	7-M2c	2.000	1.765	1.765	0.840	8.565	0.000
31.80	25.17	127.23	3.865	3.819	7-M2c	2.000	1.766	1.766	0.840	8.573	0.000
34.00	25.19	127.23	3.870	3.819	7-M2c	2.000	1.766	1.766	0.840	8.579	0.000
36.20	25.21	127.24	3.875	3.825	7-M2c	2.000	1.767	1.767	0.840	8.585	0.000
38.40	25.24	127.24	3.880	3.835	7-M2c	2.000	1.768	1.768	0.840	8.590	0.000
40.60	25.26	127.24	3.884	3.835	7-M2c	2.000	1.768	1.768	0.840	8.596	0.000
42.80	25.28	127.25	3.888	3.839	7-M2c	2.000	1.769	1.769	0.840	8.601	0.000
45.00	25.30	127.25	3.892	3.848	7-M2c	2.000	1.769	1.769	0.840	8.605	0.000

****

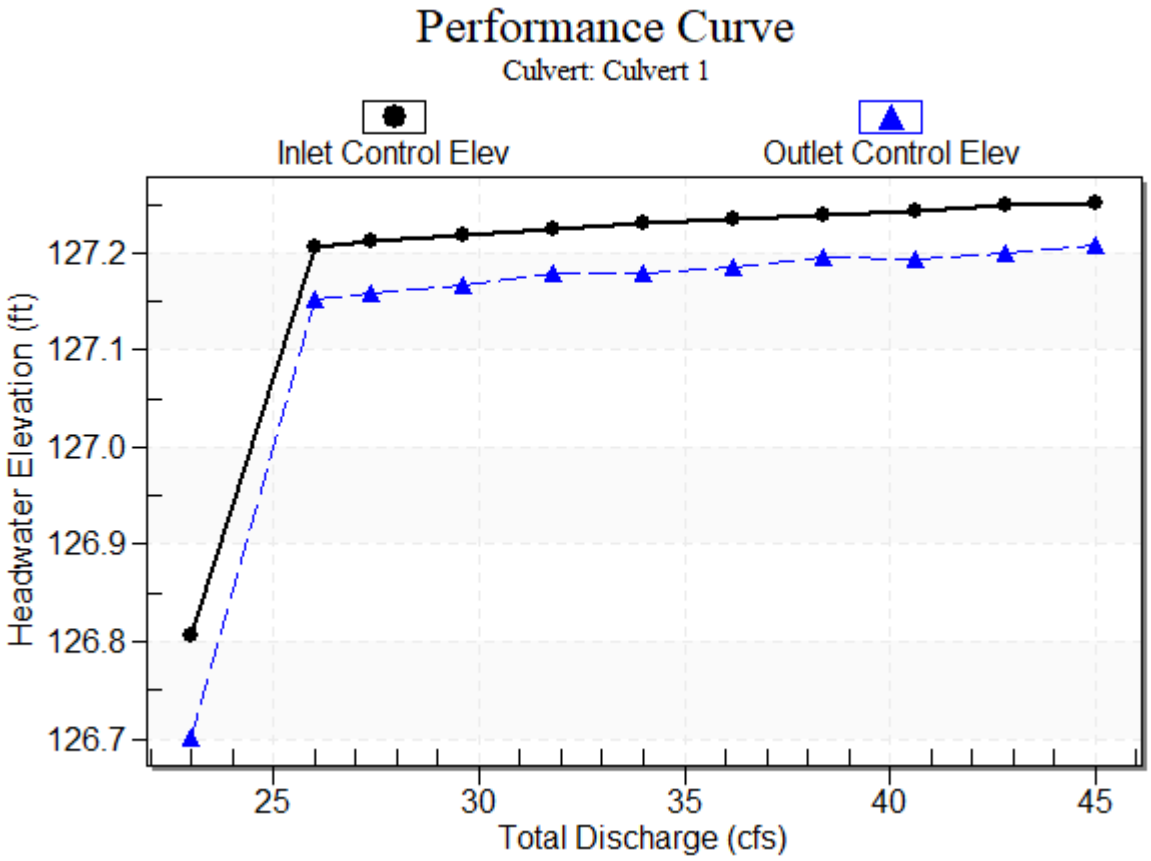
Straight Culvert

Inlet Elevation (invert): 123.36 ft, Outlet Elevation (invert): 122.76 ft

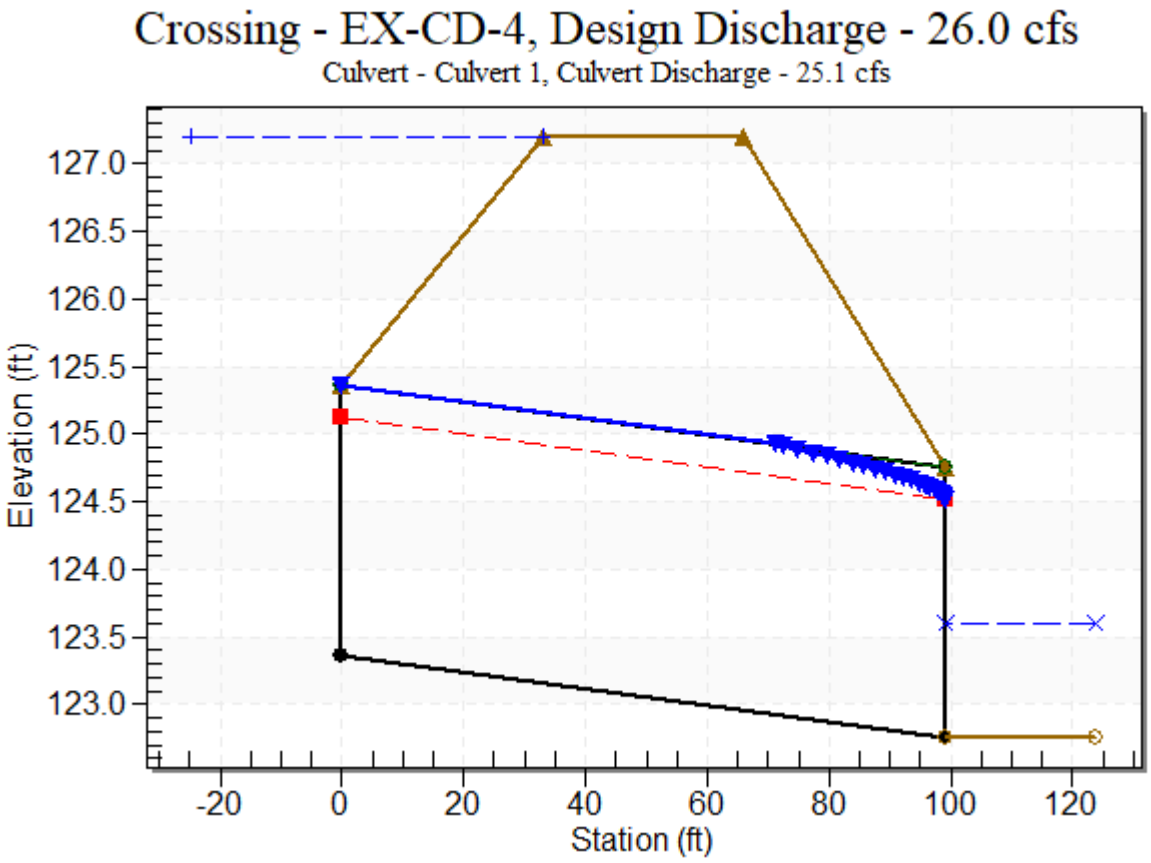
Culvert Length: 99.00 ft, Culvert Slope: 0.0061

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 123.36 ft

Outlet Station: 99.00 ft

Outlet Elevation: 122.76 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 21 - Downstream Channel Rating Curve (Crossing: EX-CD-4)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	123.60	0.84
26.00	123.60	0.84
27.40	123.60	0.84
29.60	123.60	0.84
31.80	123.60	0.84
34.00	123.60	0.84
36.20	123.60	0.84
38.40	123.60	0.84
40.60	123.60	0.84
42.80	123.60	0.84
45.00	123.60	0.84

Tailwater Channel Data - EX-CD-4

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 123.60 ft

Roadway Data for Crossing: EX-CD-4

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 600.00 ft

Crest Elevation: 127.20 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 22 - Summary of Culvert Flows at Crossing: PR-CD-4

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
125.97	23.00	23.00	0.00	1
126.20	26.00	26.00	0.00	1
126.32	27.40	27.40	0.00	1
126.51	29.60	29.60	0.00	1
126.74	31.80	31.80	0.00	1
127.07	34.00	34.00	0.00	1
127.39	36.20	36.20	0.00	1
127.72	38.40	38.40	0.00	1
128.06	40.60	40.60	0.00	1
128.41	42.80	42.80	0.00	1
128.77	45.00	45.00	0.00	1
128.90	45.74	45.74	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-4

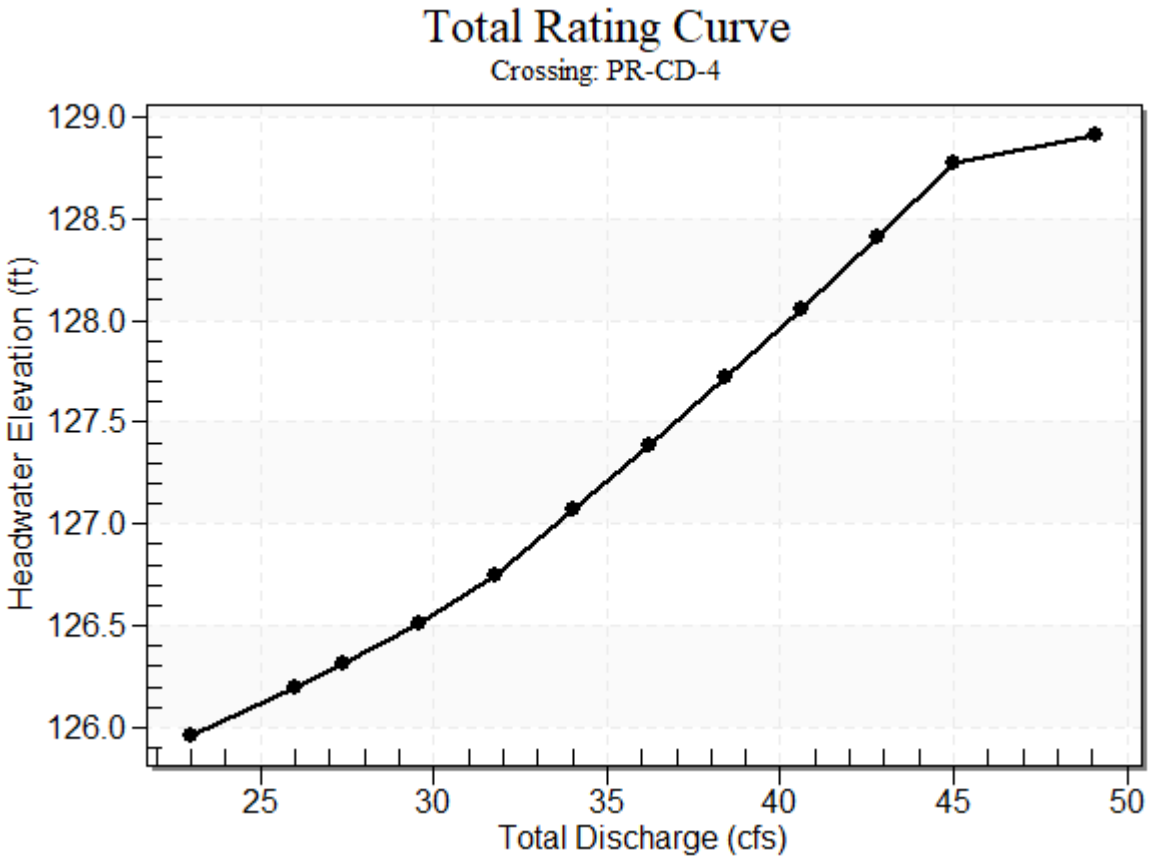


Table 23 - Culvert Summary Table: Culvert 1

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)
23.00	23.00	125.97	2.556	2.665	7-M2c	1.897	1.632	1.632	0.800	6.776	0.000
26.00	26.00	126.20	2.802	2.901	7-M2c	2.168	1.738	1.738	0.800	7.138	0.000
27.40	27.40	126.32	2.924	3.017	7-M2c	2.500	1.785	1.785	0.800	7.309	0.000
29.60	29.60	126.51	3.125	3.213	7-M2c	2.500	1.855	1.855	0.800	7.581	0.000
31.80	31.80	126.74	3.341	3.444	7-M2c	2.500	1.921	1.921	0.800	7.859	0.000
34.00	34.00	127.07	3.572	3.772	7-M2c	2.500	1.982	1.982	0.800	8.145	0.000
36.20	36.20	127.39	3.820	4.087	7-M2c	2.500	2.040	2.040	0.800	8.442	0.000
38.40	38.40	127.72	4.085	4.415	7-M2c	2.500	2.093	2.093	0.800	8.750	0.000
40.60	40.60	128.06	4.368	4.758	7-M2c	2.500	2.142	2.142	0.800	9.070	0.000
42.80	42.80	128.41	4.669	5.109	7-M2c	2.500	2.186	2.186	0.800	9.403	0.000
45.00	45.00	128.77	4.988	5.468	7-M2c	2.500	2.225	2.225	0.800	9.750	0.000

****

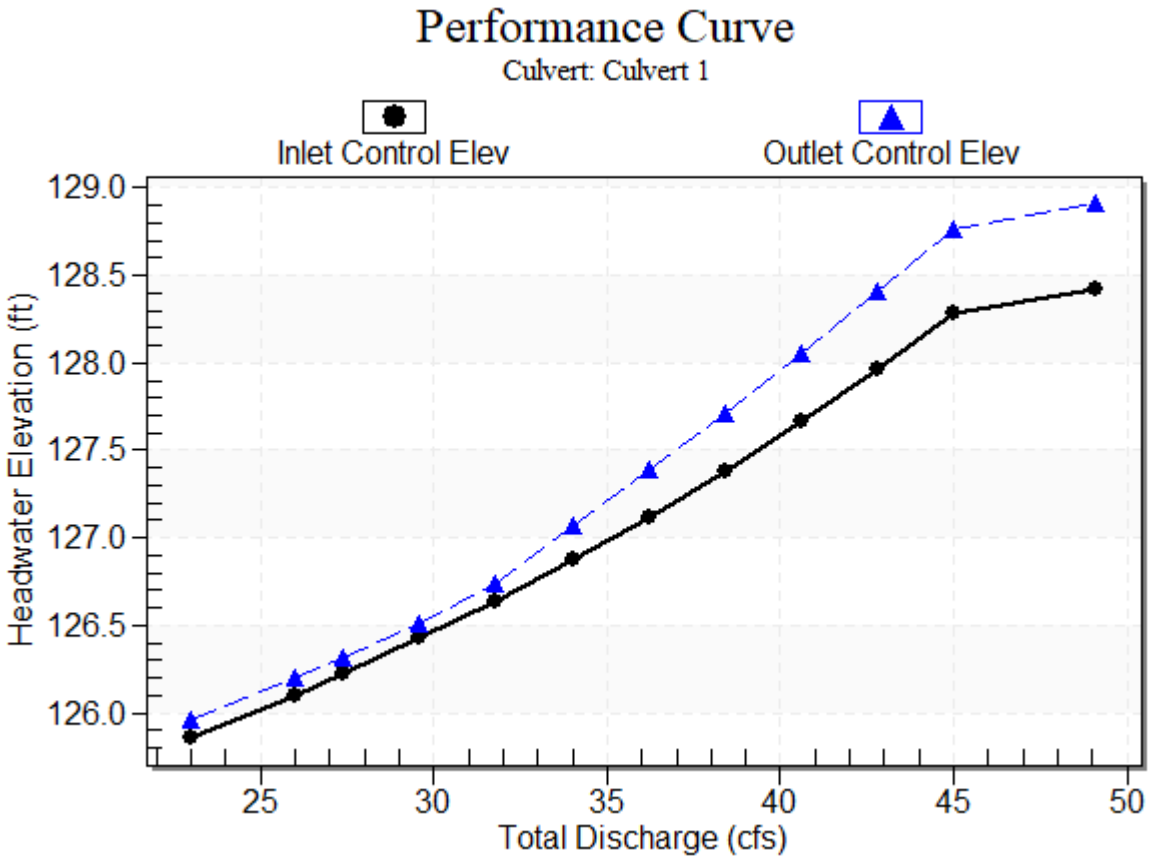
Straight Culvert

Inlet Elevation (invert): 123.30 ft, Outlet Elevation (invert): 122.80 ft

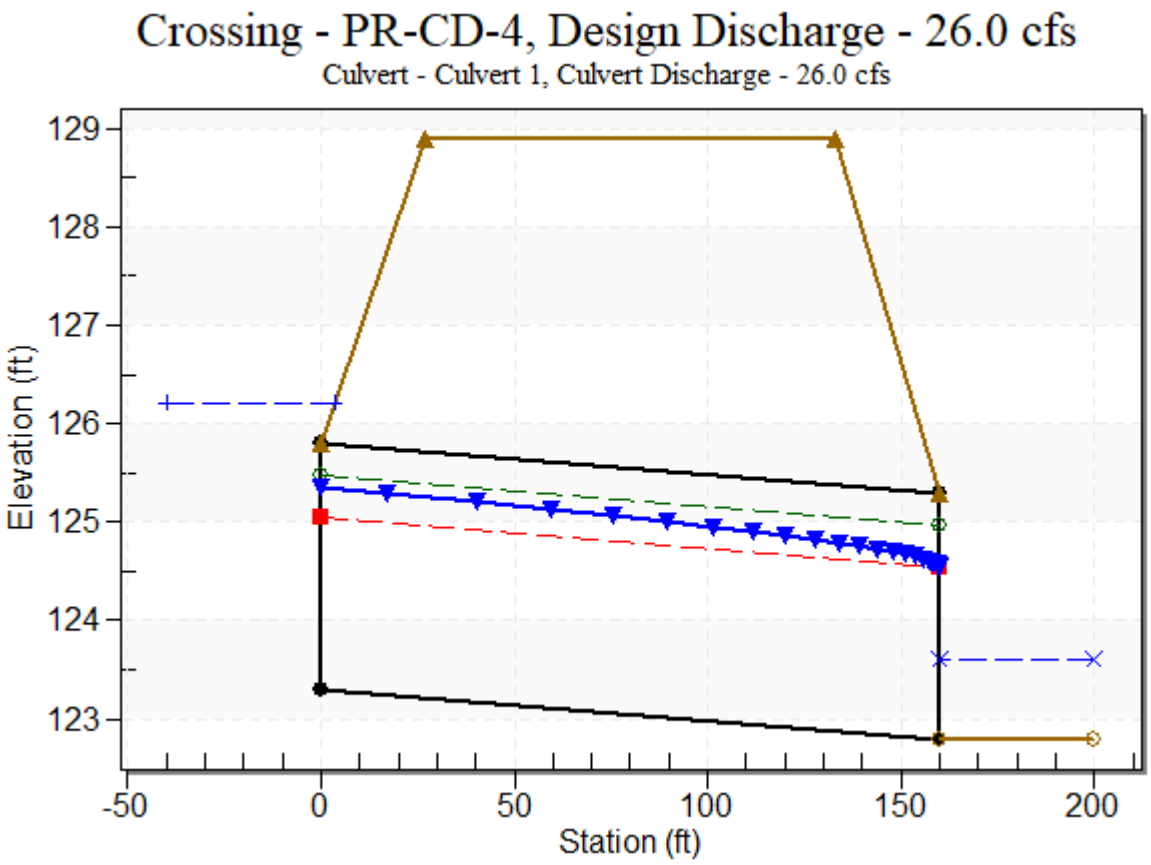
Culvert Length: 160.00 ft, Culvert Slope: 0.0031

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 123.30 ft

Outlet Station: 160.00 ft

Outlet Elevation: 122.80 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 24 - Downstream Channel Rating Curve (Crossing: PR-CD-4)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	123.60	0.80
26.00	123.60	0.80
27.40	123.60	0.80
29.60	123.60	0.80
31.80	123.60	0.80
34.00	123.60	0.80
36.20	123.60	0.80
38.40	123.60	0.80
40.60	123.60	0.80
42.80	123.60	0.80
45.00	123.60	0.80

Tailwater Channel Data - PR-CD-4

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 123.60 ft

Roadway Data for Crossing: PR-CD-4

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 600.00 ft

Crest Elevation: 128.90 ft

Roadway Surface: Paved

Roadway Top Width: 106.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 108 cfs

Design Flow: 126 cfs

Maximum Flow: 214 cfs

Table 25 - Summary of Culvert Flows at Crossing: EX-CD-5

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
123.26	108.00	108.00	0.00	1
123.69	118.60	118.60	0.00	1
124.02	126.00	126.00	0.00	1
124.41	139.80	134.50	4.18	35
124.43	150.40	134.86	14.80	5
124.44	161.00	135.12	25.15	4
124.45	171.60	135.34	34.88	3
124.46	182.20	135.55	45.44	3
124.47	192.80	135.75	56.15	3
124.48	203.40	135.93	66.83	3
124.49	214.00	136.10	77.44	3
124.40	134.24	134.24	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-5

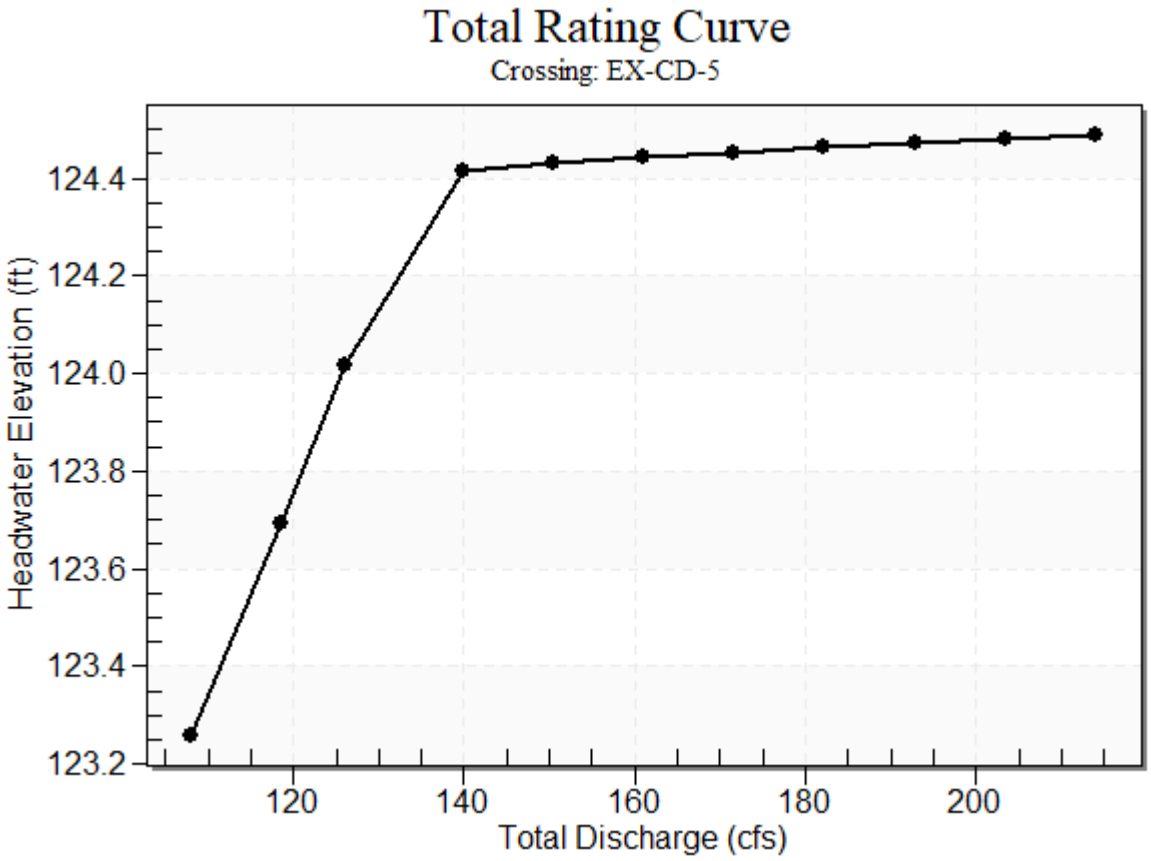


Table 26 - Culvert Summary Table: Culvert 1

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)
108.00	108.00	123.26	4.420	4.187	7-M2c	3.000	2.438	2.438	1.670	8.860	0.000
118.60	118.60	123.69	4.852	4.457	7-M2c	3.000	2.595	2.595	1.670	9.141	0.000
126.00	126.00	124.02	5.176	4.808	7-M2c	3.000	2.702	2.702	1.670	9.327	0.000
139.80	134.50	124.41	5.573	5.179	7-M2c	3.000	2.822	2.822	1.670	9.532	0.000
150.40	134.86	124.43	5.590	5.195	7-M2c	3.000	2.827	2.827	1.670	9.541	0.000
161.00	135.12	124.44	5.603	5.206	7-M2c	3.000	2.831	2.831	1.670	9.547	0.000
171.60	135.34	124.45	5.613	5.215	7-M2c	3.000	2.834	2.834	1.670	9.552	0.000
182.20	135.55	124.46	5.624	5.224	7-M2c	3.000	2.837	2.837	1.670	9.557	0.000
192.80	135.75	124.47	5.633	5.232	7-M2c	3.000	2.839	2.839	1.670	9.562	0.000
203.40	135.93	124.48	5.642	5.240	7-M2c	3.000	2.842	2.842	1.670	9.566	0.000
214.00	136.10	124.49	5.650	5.248	7-M2c	3.000	2.844	2.844	1.670	9.570	0.000

****

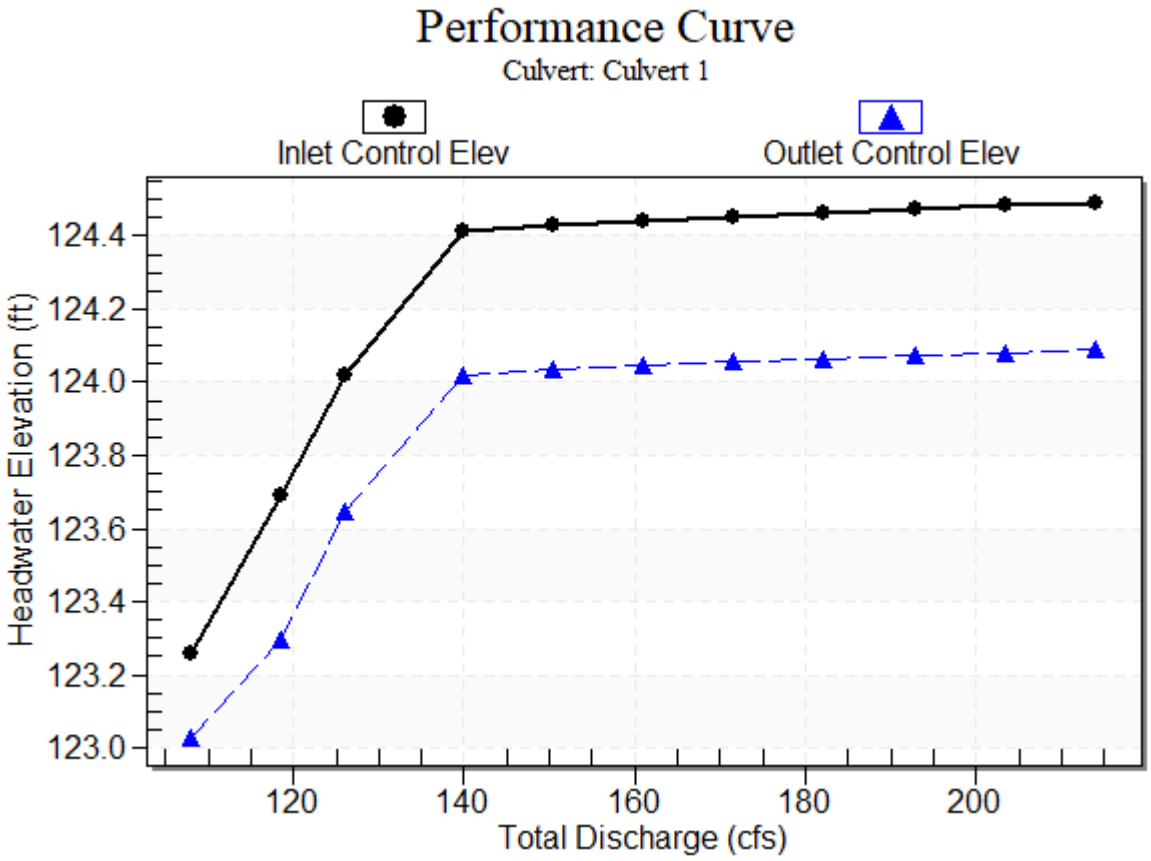
Straight Culvert

Inlet Elevation (invert): 118.84 ft, Outlet Elevation (invert): 118.61 ft

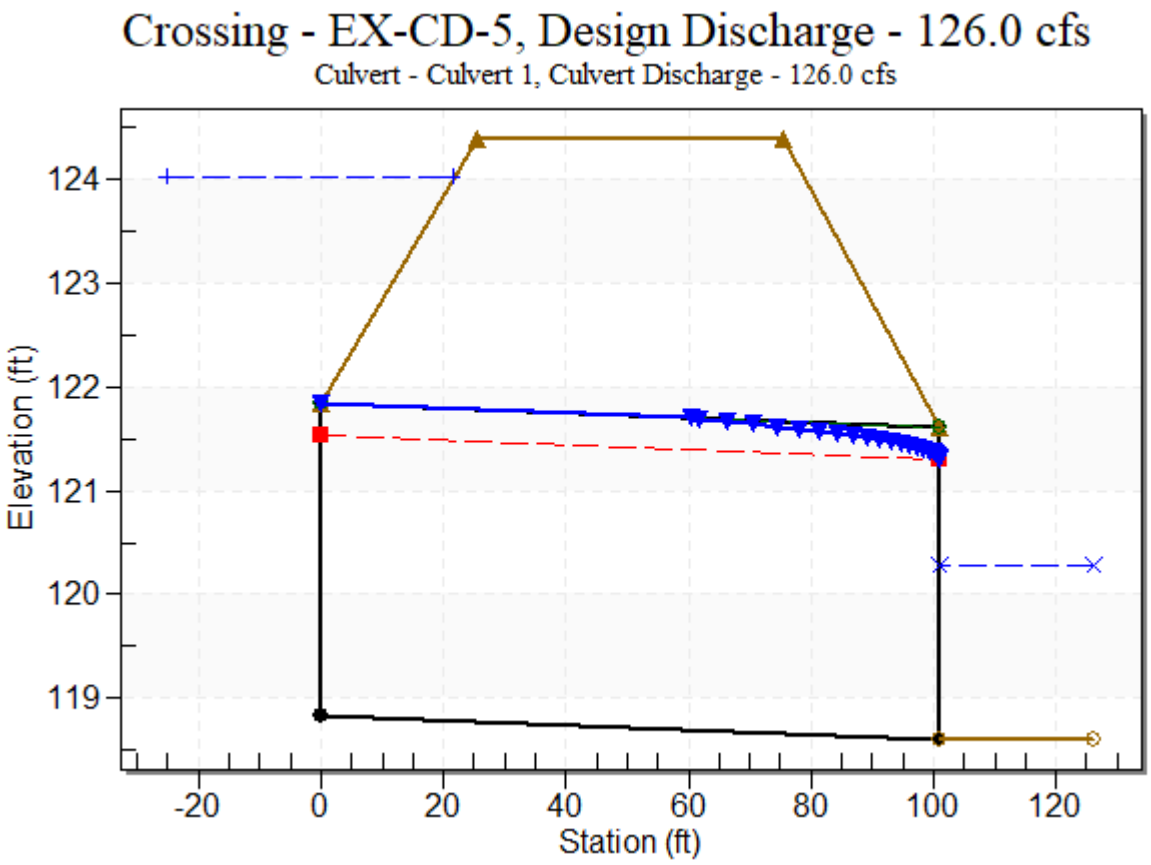
Culvert Length: 101.00 ft, Culvert Slope: 0.0023

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 118.84 ft

Outlet Station: 101.00 ft

Outlet Elevation: 118.61 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 27 - Downstream Channel Rating Curve (Crossing: EX-CD-5)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
108.00	120.28	1.67
118.60	120.28	1.67
126.00	120.28	1.67
139.80	120.28	1.67
150.40	120.28	1.67
161.00	120.28	1.67
171.60	120.28	1.67
182.20	120.28	1.67
192.80	120.28	1.67
203.40	120.28	1.67
214.00	120.28	1.67

Tailwater Channel Data - EX-CD-5

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 120.28 ft

Roadway Data for Crossing: EX-CD-5

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 124.40 ft

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 108 cfs

Design Flow: 126 cfs

Maximum Flow: 214 cfs

Table 28 - Summary of Culvert Flows at Crossing: PR-CD-5

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
123.32	108.00	108.00	0.00	1
123.75	118.60	118.60	0.00	1
124.08	126.00	126.00	0.00	1
124.73	139.80	139.80	0.00	1
125.29	150.40	150.40	0.00	1
125.89	161.00	161.00	0.00	1
125.92	171.60	161.60	8.88	7
125.94	182.20	161.84	19.23	4
125.95	192.80	162.06	30.12	4
125.96	203.40	162.23	40.01	3
125.97	214.00	162.39	50.59	3
125.90	161.23	161.23	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-5

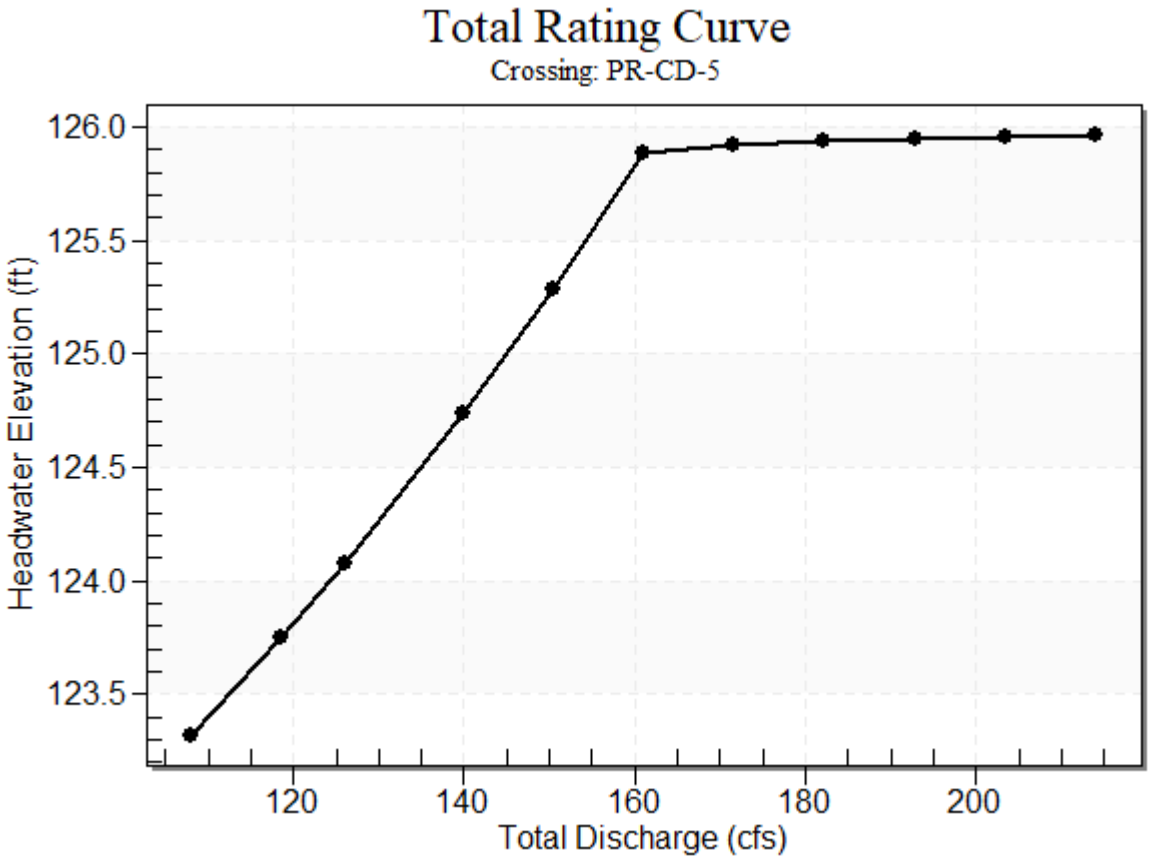


Table 29 - Culvert Summary Table: Culvert 1

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)
108.00	108.00	123.32	4.421	4.200	7-M2c	3.000	2.438	2.438	1.680	8.860	0.000
118.60	118.60	123.75	4.853	4.695	7-M2c	3.000	2.595	2.595	1.680	9.141	0.000
126.00	126.00	124.08	5.177	5.051	7-M2c	3.000	2.702	2.702	1.680	9.327	0.000
139.80	139.80	124.73	5.834	5.695	7-M2c	3.000	2.896	2.896	1.680	9.656	0.000
150.40	150.40	125.29	6.388	6.178	6-FFc	3.000	3.000	3.000	1.680	10.027	0.000
161.00	161.00	125.89	6.986	6.686	6-FFc	3.000	3.000	3.000	1.680	10.733	0.000
171.60	161.60	125.92	7.021	6.716	6-FFc	3.000	3.000	3.000	1.680	10.773	0.000
182.20	161.84	125.94	7.036	6.728	6-FFc	3.000	3.000	3.000	1.680	10.790	0.000
192.80	162.06	125.95	7.048	6.738	6-FFc	3.000	3.000	3.000	1.680	10.804	0.000
203.40	162.23	125.96	7.058	6.747	6-FFc	3.000	3.000	3.000	1.680	10.815	0.000
214.00	162.39	125.97	7.068	6.755	6-FFc	3.000	3.000	3.000	1.680	10.826	0.000

****

Straight Culvert

Inlet Elevation (invert): 118.90 ft, Outlet Elevation (invert): 118.60 ft

Culvert Length: 160.00 ft, Culvert Slope: 0.0019

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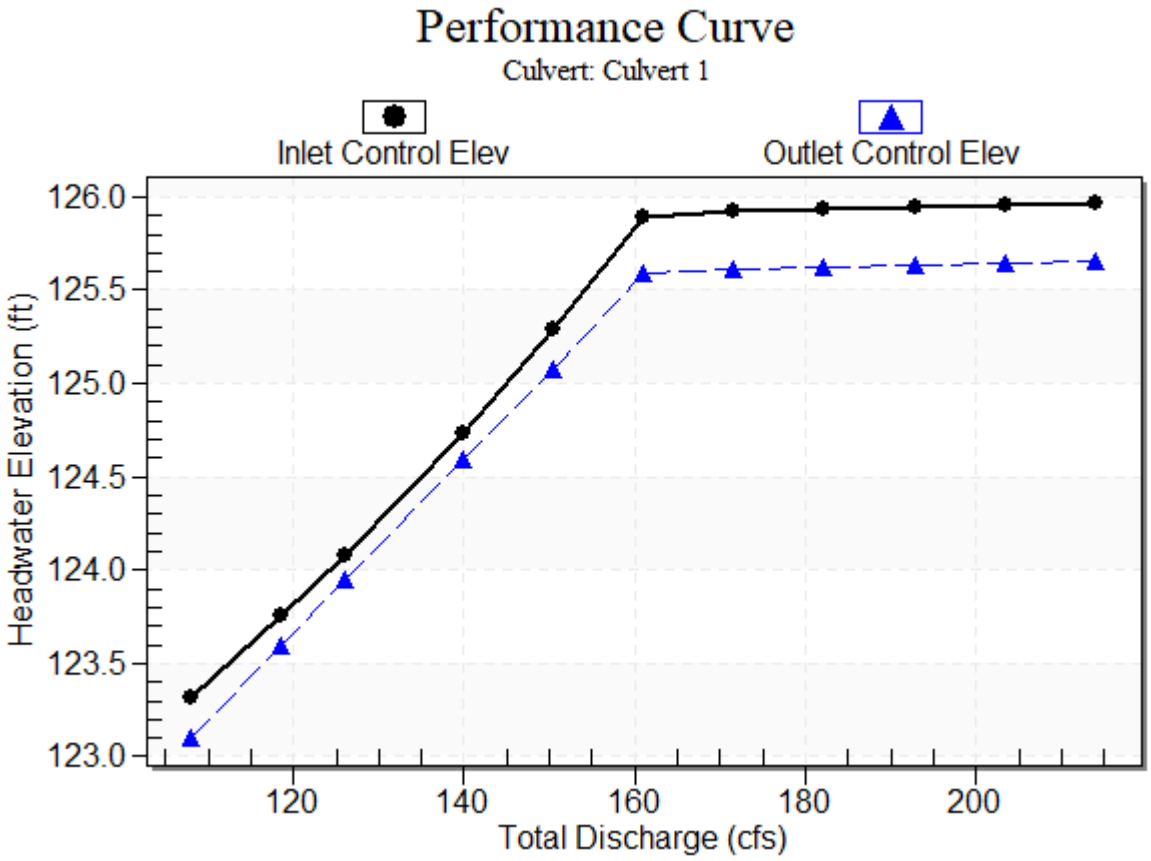
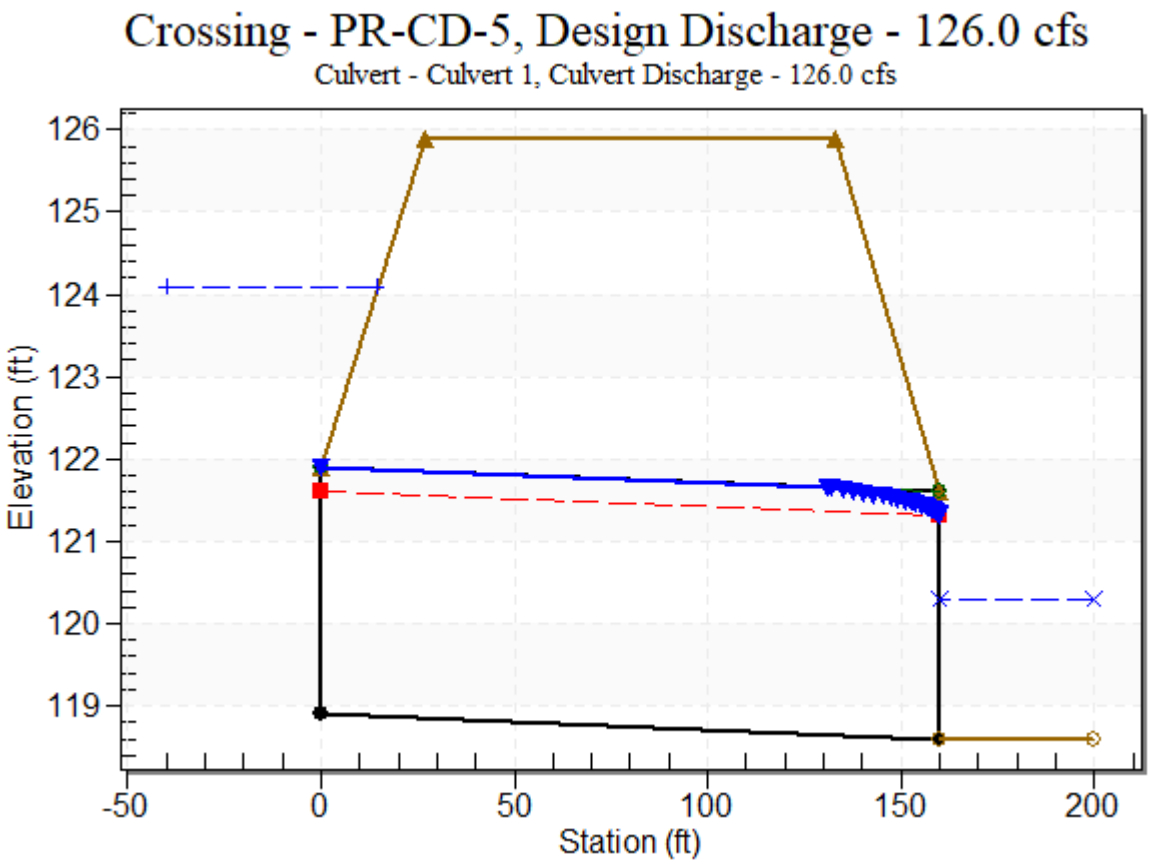
Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 118.90 ft

Outlet Station: 160.00 ft

Outlet Elevation: 118.60 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 30 - Downstream Channel Rating Curve (Crossing: PR-CD-5)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
108.00	120.28	1.68
118.60	120.28	1.68
126.00	120.28	1.68
139.80	120.28	1.68
150.40	120.28	1.68
161.00	120.28	1.68
171.60	120.28	1.68
182.20	120.28	1.68
192.80	120.28	1.68
203.40	120.28	1.68
214.00	120.28	1.68

Tailwater Channel Data - PR-CD-5

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 120.28 ft

Roadway Data for Crossing: PR-CD-5

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 125.90 ft

Roadway Surface: Paved

Roadway Top Width: 106.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 69 cfs

Design Flow: 81 cfs

Maximum Flow: 137 cfs

Table 31 - Summary of Culvert Flows at Crossing: EX-CD-6

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
120.69	69.00	69.00	0.00	1
121.03	75.80	75.80	0.00	1
121.37	81.00	81.00	0.00	1
121.80	89.40	87.11	1.52	68
121.81	96.20	87.23	8.38	5
121.82	103.00	87.31	15.16	4
121.82	109.80	87.38	21.48	3
121.83	116.60	87.45	28.34	3
121.83	123.40	87.51	35.30	3
121.84	130.20	87.57	42.21	3
121.84	137.00	87.62	49.08	3
121.80	87.05	87.05	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-6

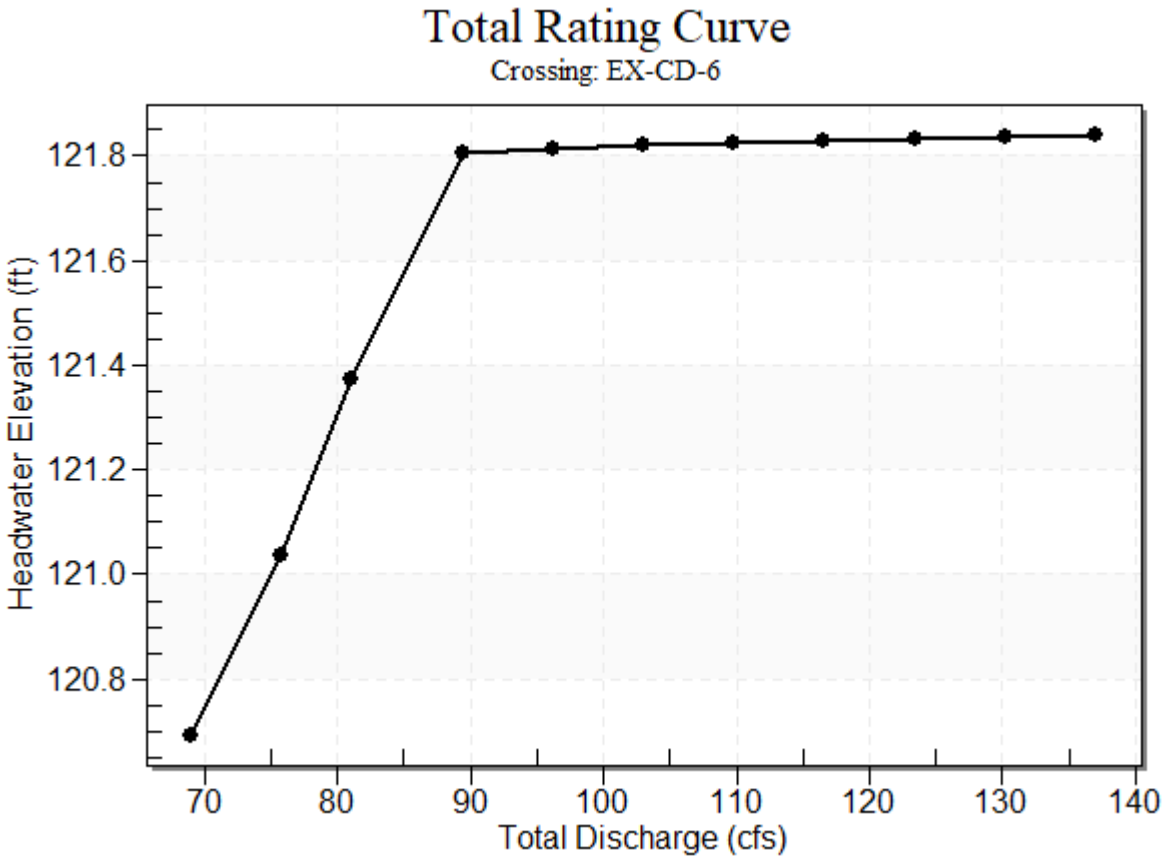


Table 32 - Culvert Summary Table: Culvert 1

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)
69.00	69.00	120.69	4.396	4.464	3-M2t	3.500	2.603	3.000	3.000	7.861	0.000
75.80	75.80	121.03	4.804	4.788	3-M2t	3.500	2.724	3.000	3.000	8.635	0.000
81.00	81.00	121.37	5.144	5.058	3-M2t	3.500	2.810	3.000	3.000	9.228	0.000
89.40	87.11	121.80	5.574	5.425	7-M2t	3.500	2.902	3.000	3.000	9.923	0.000
96.20	87.23	121.81	5.583	5.433	7-M2t	3.500	2.904	3.000	3.000	9.937	0.000
103.00	87.31	121.82	5.589	5.439	7-M2t	3.500	2.905	3.000	3.000	9.947	0.000
109.80	87.38	121.82	5.594	5.444	7-M2t	3.500	2.906	3.000	3.000	9.954	0.000
116.60	87.45	121.83	5.599	5.448	7-M2t	3.500	2.907	3.000	3.000	9.962	0.000
123.40	87.51	121.83	5.604	5.453	7-M2t	3.500	2.908	3.000	3.000	9.969	0.000
130.20	87.57	121.84	5.608	5.457	7-M2t	3.500	2.909	3.000	3.000	9.976	0.000
137.00	87.62	121.84	5.612	5.460	7-M2t	3.500	2.910	3.000	3.000	9.982	0.000

****

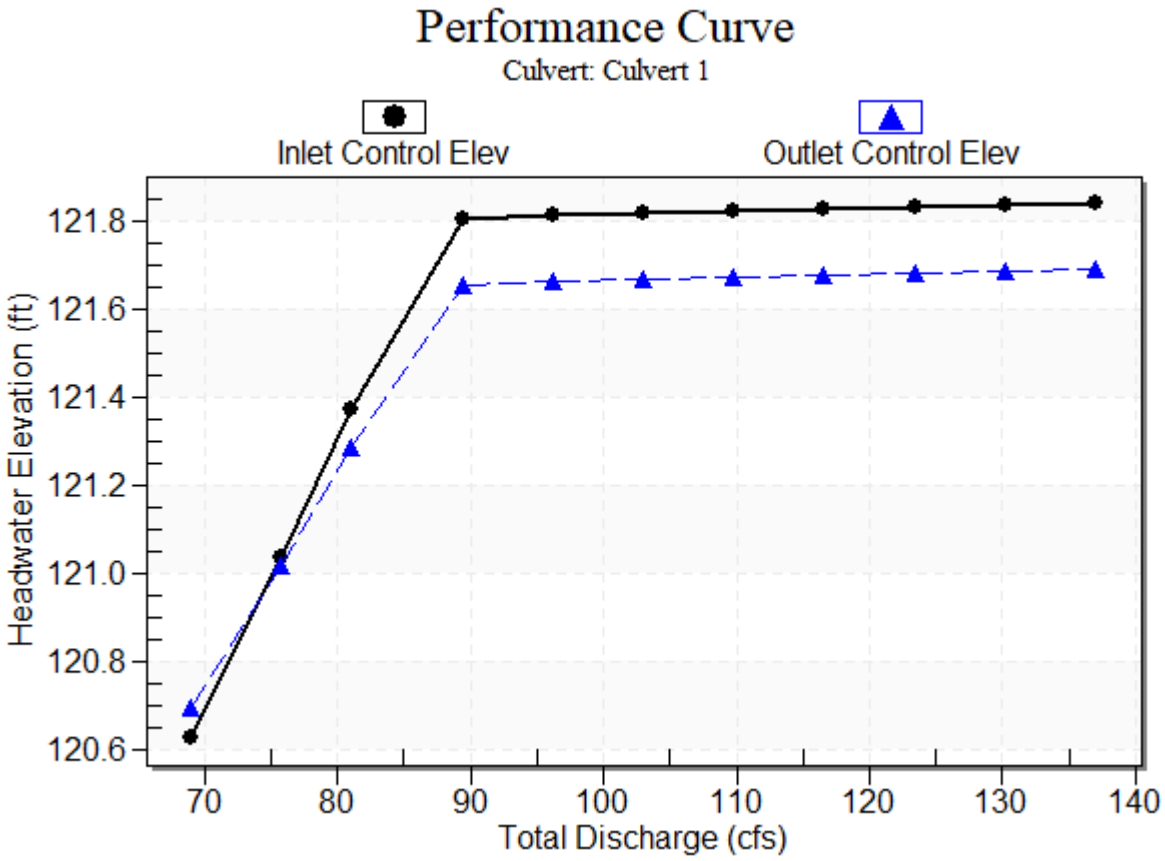
Straight Culvert

Inlet Elevation (invert): 116.23 ft, Outlet Elevation (invert): 115.90 ft

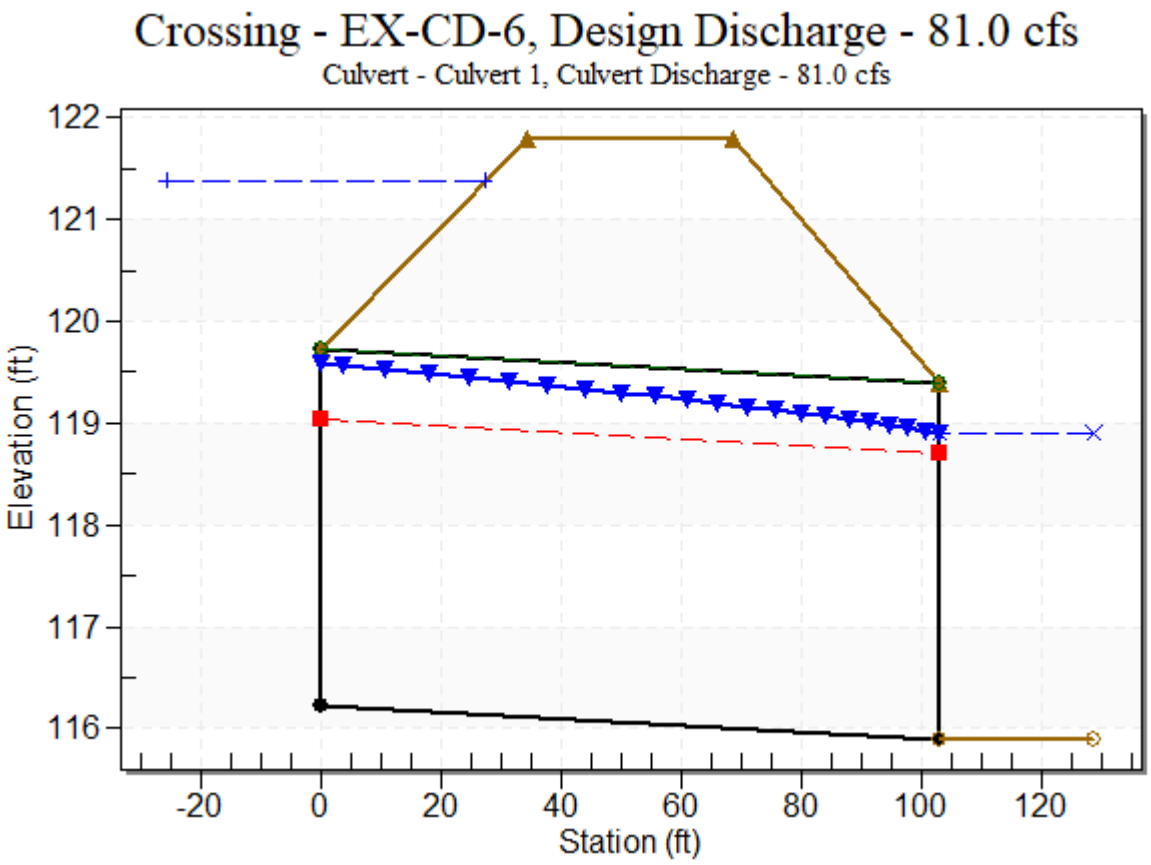
Culvert Length: 103.00 ft, Culvert Slope: 0.0032

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 116.23 ft

Outlet Station: 103.00 ft

Outlet Elevation: 115.90 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 33 - Downstream Channel Rating Curve (Crossing: EX-CD-6)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
69.00	118.90	3.00
75.80	118.90	3.00
81.00	118.90	3.00
89.40	118.90	3.00
96.20	118.90	3.00
103.00	118.90	3.00
109.80	118.90	3.00
116.60	118.90	3.00
123.40	118.90	3.00
130.20	118.90	3.00
137.00	118.90	3.00

Tailwater Channel Data - EX-CD-6

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 118.90 ft

Roadway Data for Crossing: EX-CD-6

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 2000.00 ft

Crest Elevation: 121.80 ft

Roadway Surface: Paved

Roadway Top Width: 34.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 69 cfs

Design Flow: 81 cfs

Maximum Flow: 137 cfs

Table 34 - Summary of Culvert Flows at Crossing: PR-CD-6

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
120.38	69.00	69.00	0.00	1
120.62	75.80	75.80	0.00	1
120.82	81.00	81.00	0.00	1
121.14	89.40	89.40	0.00	1
121.41	96.20	96.20	0.00	1
121.70	103.00	103.00	0.00	1
122.02	109.80	109.80	0.00	1
122.41	116.60	116.60	0.00	1
122.82	123.40	123.40	0.00	1
123.23	130.20	130.20	0.00	1
123.68	137.00	137.00	0.00	1
124.10	143.23	143.23	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-6

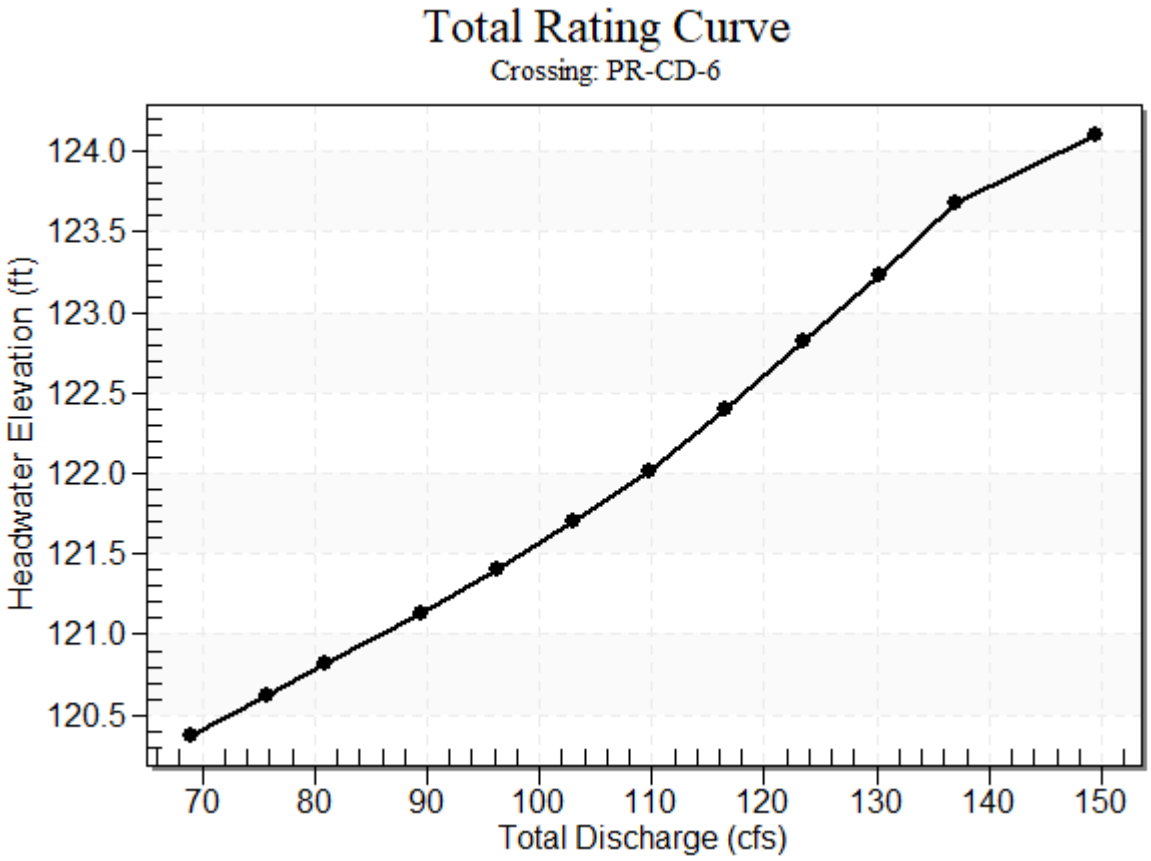


Table 35 - Culvert Summary Table: Culvert 1

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)
69.00	69.00	120.38	3.878	4.078	7-M1t	2.926	2.510	3.000	3.000	6.825	0.000
75.80	75.80	120.62	4.142	4.324	3-M2t	3.183	2.635	3.000	3.000	7.498	0.000
81.00	81.00	120.82	4.352	4.516	3-M2t	3.442	2.726	3.000	3.000	8.012	0.000
89.40	89.40	121.14	4.709	4.835	3-M2t	4.000	2.866	3.000	3.000	8.843	0.000
96.20	96.20	121.41	5.018	5.107	3-M2t	4.000	2.973	3.000	3.000	9.516	0.000
103.00	103.00	121.70	5.348	5.398	7-M2c	4.000	3.073	3.073	3.000	9.942	0.000
109.80	109.80	122.02	5.700	5.719	7-M2c	4.000	3.168	3.168	3.000	10.288	0.000
116.60	116.60	122.41	6.077	6.105	7-M2c	4.000	3.256	3.256	3.000	10.645	0.000
123.40	123.40	122.82	6.479	6.525	7-M2c	4.000	3.338	3.338	3.000	11.015	0.000
130.20	130.20	123.23	6.907	6.933	7-M2c	4.000	3.413	3.413	3.000	11.399	0.000
137.00	137.00	123.68	7.361	7.380	7-M2c	4.000	3.482	3.482	3.000	11.798	0.000

****

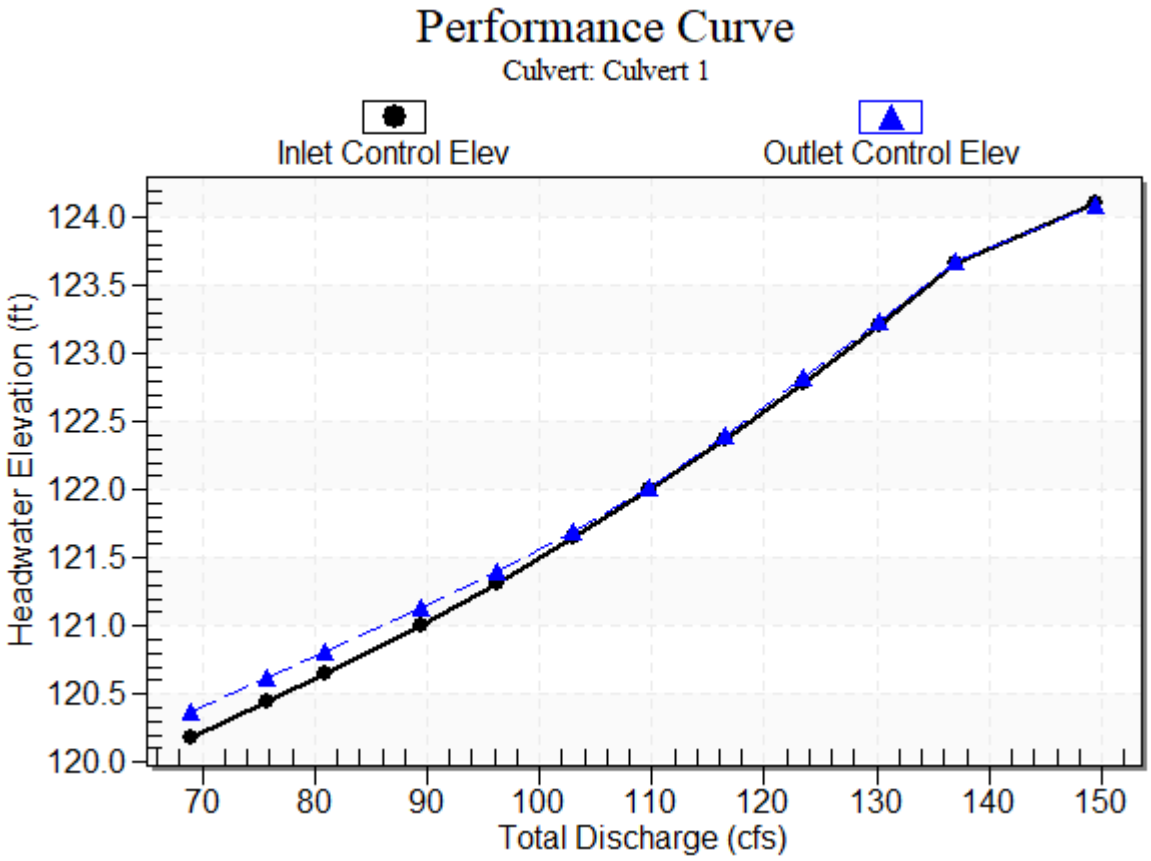
Straight Culvert

Inlet Elevation (invert): 116.30 ft, Outlet Elevation (invert): 115.90 ft

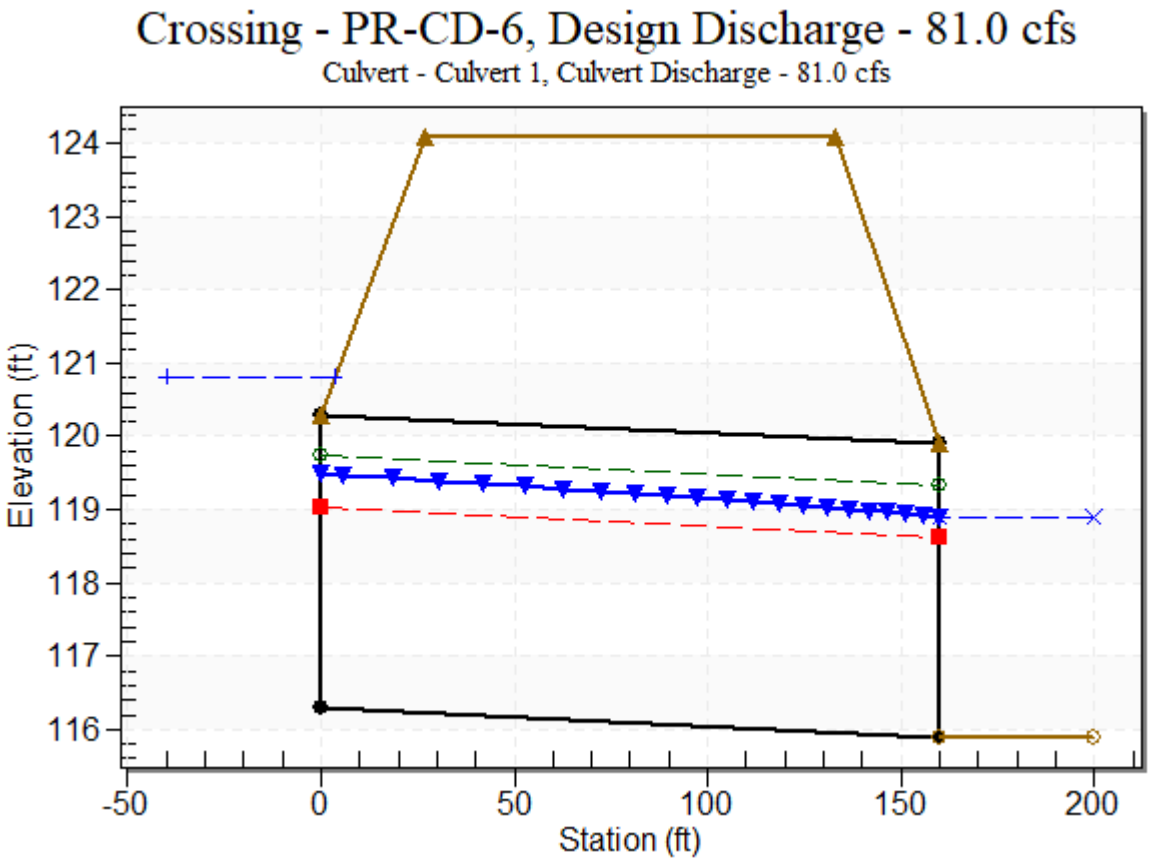
Culvert Length: 160.00 ft, Culvert Slope: 0.0025

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 116.30 ft

Outlet Station: 160.00 ft

Outlet Elevation: 115.90 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 36 - Downstream Channel Rating Curve (Crossing: PR-CD-6)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
69.00	118.90	3.00
75.80	118.90	3.00
81.00	118.90	3.00
89.40	118.90	3.00
96.20	118.90	3.00
103.00	118.90	3.00
109.80	118.90	3.00
116.60	118.90	3.00
123.40	118.90	3.00
130.20	118.90	3.00
137.00	118.90	3.00

Tailwater Channel Data - PR-CD-6

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 118.90 ft

Roadway Data for Crossing: PR-CD-6

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 2000.00 ft

Crest Elevation: 124.10 ft

Roadway Surface: Paved

Roadway Top Width: 106.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 68 cfs

Design Flow: 79 cfs

Maximum Flow: 135 cfs

Table 37 - Summary of Culvert Flows at Crossing: EX-CD-7

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Culvert 3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
119.86	68.00	22.50	22.71	22.79	0.00	5
120.21	74.70	24.19	24.37	24.46	1.04	53
120.22	79.00	24.24	24.41	24.52	5.23	5
120.23	88.10	24.31	24.49	24.61	13.90	4
120.24	94.80	24.36	24.55	24.64	20.90	4
120.25	101.50	24.39	24.59	24.67	27.19	3
120.26	108.20	24.43	24.62	24.71	33.86	3
120.27	114.90	24.46	24.65	24.75	40.60	3
120.28	121.60	24.50	24.68	24.79	47.31	3
120.28	128.30	24.53	24.71	24.83	53.98	3
120.29	135.00	24.56	24.77	24.87	59.64	2
120.20	72.94	24.14	24.35	24.45	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-7

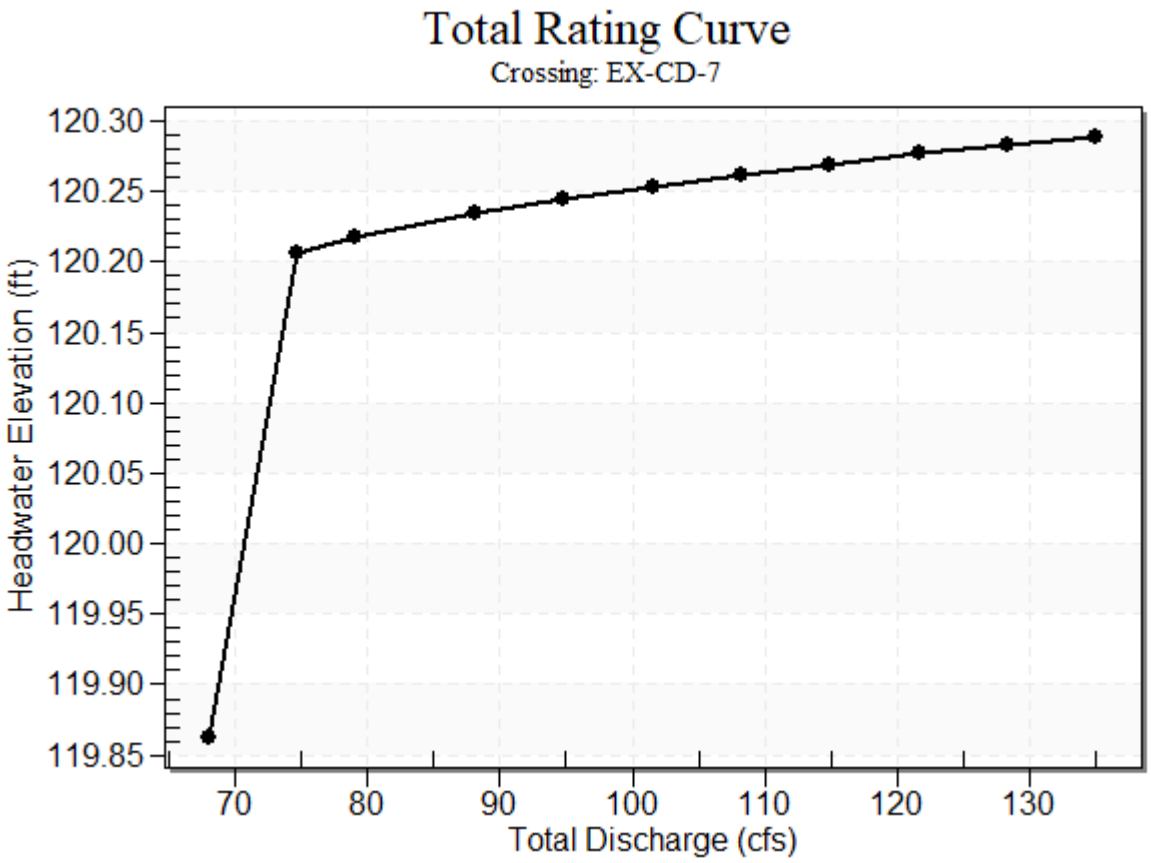


Table 38 - Culvert Summary Table: Culvert 1

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)
68.00	22.50	119.86	3.361	3.839	7-M2c	2.000	1.691	1.691	1.000	7.942	0.000
74.70	24.19	120.21	3.676	4.185	7-M2c	2.000	1.740	1.740	1.000	8.335	0.000
79.00	24.24	120.22	3.686	4.196	7-M2c	2.000	1.742	1.742	1.000	8.347	0.000
88.10	24.31	120.23	3.701	4.217	7-M2c	2.000	1.744	1.744	1.000	8.365	0.000
94.80	24.36	120.24	3.709	4.220	7-M2c	2.000	1.745	1.745	1.000	8.376	0.000
101.50	24.39	120.25	3.715	4.232	7-M2c	2.000	1.746	1.746	1.000	8.383	0.000
108.20	24.43	120.26	3.724	4.242	7-M2c	2.000	1.747	1.747	1.000	8.394	0.000
114.90	24.46	120.27	3.730	4.249	7-M2c	2.000	1.748	1.748	1.000	8.401	0.000
121.60	24.50	120.28	3.738	4.258	7-M2c	2.000	1.749	1.749	1.000	8.412	0.000
128.30	24.53	120.28	3.744	4.264	7-M2c	2.000	1.749	1.749	1.000	8.418	0.000
135.00	24.56	120.29	3.749	4.269	7-M2c	2.000	1.750	1.750	1.000	8.425	0.000

****

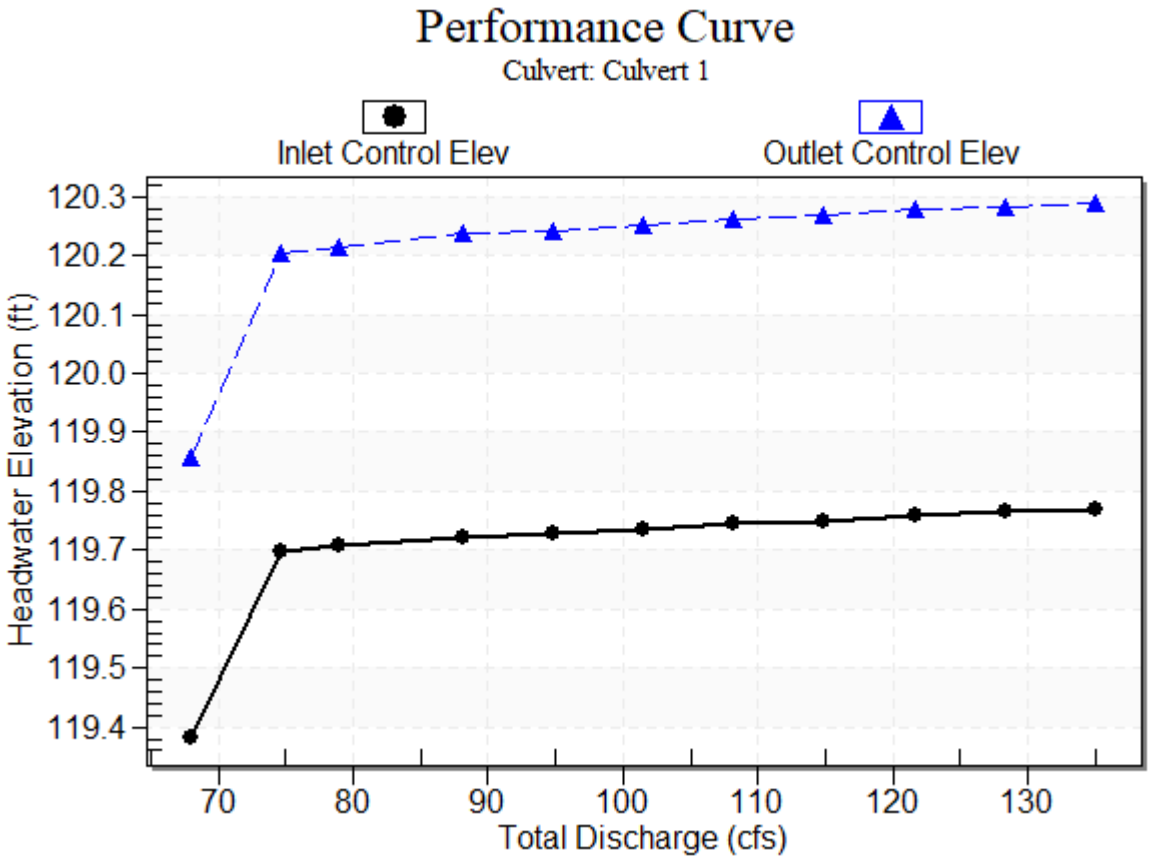
Straight Culvert

Inlet Elevation (invert): 116.02 ft, Outlet Elevation (invert): 115.96 ft

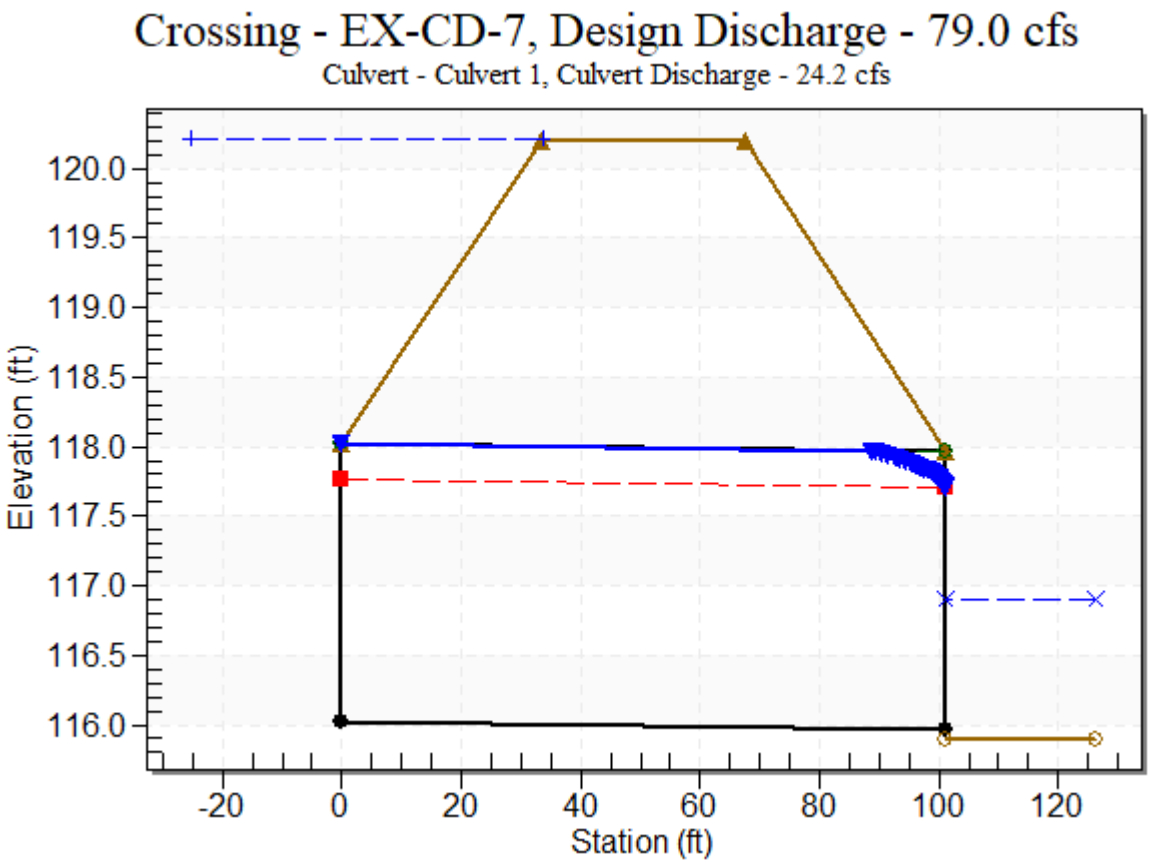
Culvert Length: 101.00 ft, Culvert Slope: 0.0006

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 116.02 ft

Outlet Station: 101.00 ft

Outlet Elevation: 115.96 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 39 - Culvert Summary Table: Culvert 2

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)
68.00	22.71	119.86	3.400	3.932	7-M2c	2.000	1.697	1.697	1.000	7.990	0.000
74.70	24.37	120.21	3.712	4.273	7-M2c	2.000	1.745	1.745	1.000	8.378	0.000
79.00	24.41	120.22	3.720	4.288	7-M2c	2.000	1.746	1.746	1.000	8.388	0.000
88.10	24.49	120.23	3.735	4.304	7-M2c	2.000	1.748	1.748	1.000	8.407	0.000
94.80	24.55	120.24	3.749	4.313	7-M2c	2.000	1.750	1.750	1.000	8.424	0.000
101.50	24.59	120.25	3.756	4.327	7-M2c	2.000	1.751	1.751	1.000	8.433	0.000
108.20	24.62	120.26	3.761	4.332	7-M2c	2.000	1.752	1.752	1.000	8.439	0.000
114.90	24.65	120.27	3.767	4.339	7-M2c	2.000	1.753	1.753	1.000	8.446	0.000
121.60	24.68	120.28	3.774	4.346	7-M2c	2.000	1.753	1.753	1.000	8.454	0.000
128.30	24.71	120.28	3.780	4.353	7-M2c	2.000	1.754	1.754	1.000	8.462	0.000
135.00	24.77	120.29	3.791	4.359	7-M2c	2.000	1.756	1.756	1.000	8.476	0.000

****

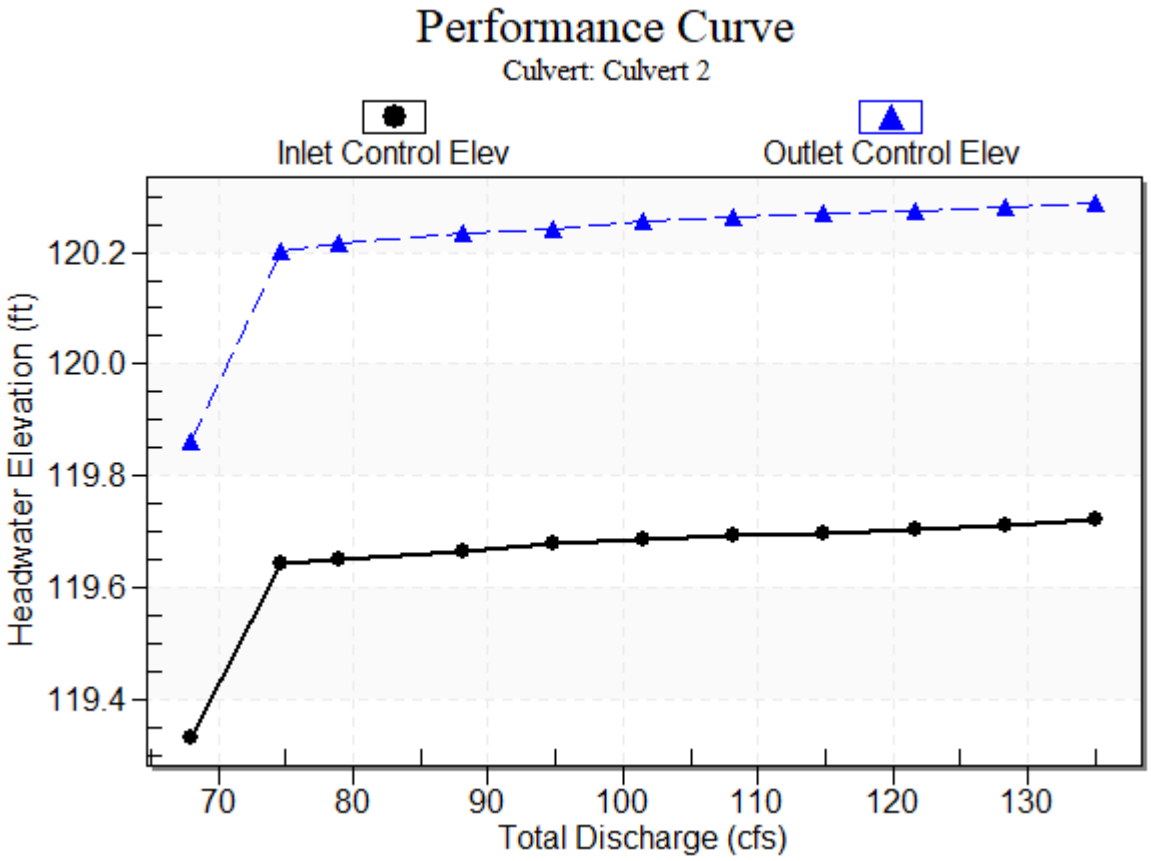
Straight Culvert

Inlet Elevation (invert): 115.93 ft, Outlet Elevation (invert): 115.92 ft

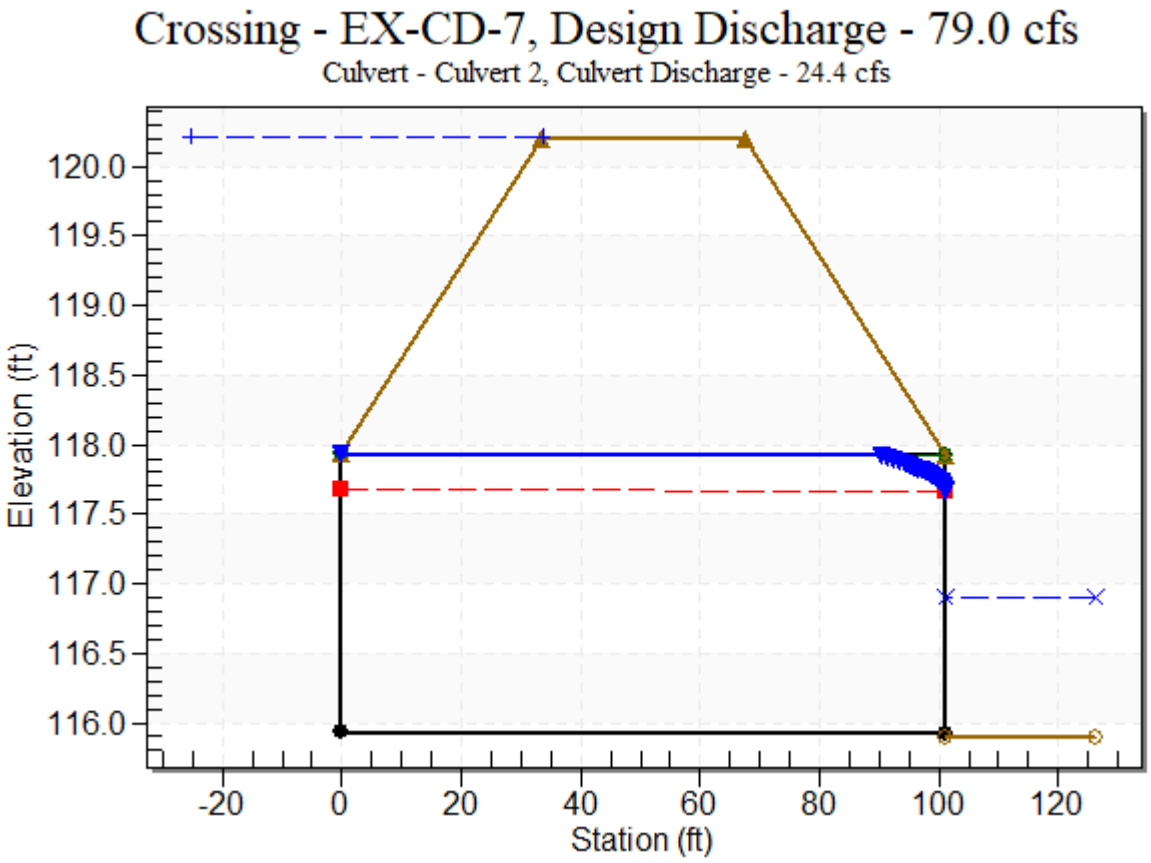
Culvert Length: 101.00 ft, Culvert Slope: 0.0001

****

Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 115.93 ft

Outlet Station: 101.00 ft

Outlet Elevation: 115.92 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 40 - Culvert Summary Table: Culvert 3

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)
68.00	22.79	119.86	3.414	3.854	7-M2c	2.000	1.700	1.700	1.000	8.009	0.000
74.70	24.46	120.21	3.729	4.197	7-M2c	2.000	1.747	1.747	1.000	8.400	0.000
79.00	24.52	120.22	3.741	4.210	7-M2c	2.000	1.749	1.749	1.000	8.415	0.000
88.10	24.61	120.23	3.758	4.223	7-M2c	2.000	1.751	1.751	1.000	8.437	0.000
94.80	24.64	120.24	3.765	4.230	7-M2c	2.000	1.752	1.752	1.000	8.445	0.000
101.50	24.67	120.25	3.771	4.242	7-M2c	2.000	1.753	1.753	1.000	8.452	0.000
108.20	24.71	120.26	3.779	4.251	7-M2c	2.000	1.754	1.754	1.000	8.461	0.000
114.90	24.75	120.27	3.787	4.259	7-M2c	2.000	1.755	1.755	1.000	8.471	0.000
121.60	24.79	120.28	3.794	4.267	7-M2c	2.000	1.756	1.756	1.000	8.480	0.000
128.30	24.83	120.28	3.802	4.276	7-M2c	2.000	1.757	1.757	1.000	8.490	0.000
135.00	24.87	120.29	3.810	4.279	7-M2c	2.000	1.758	1.758	1.000	8.500	0.000

****

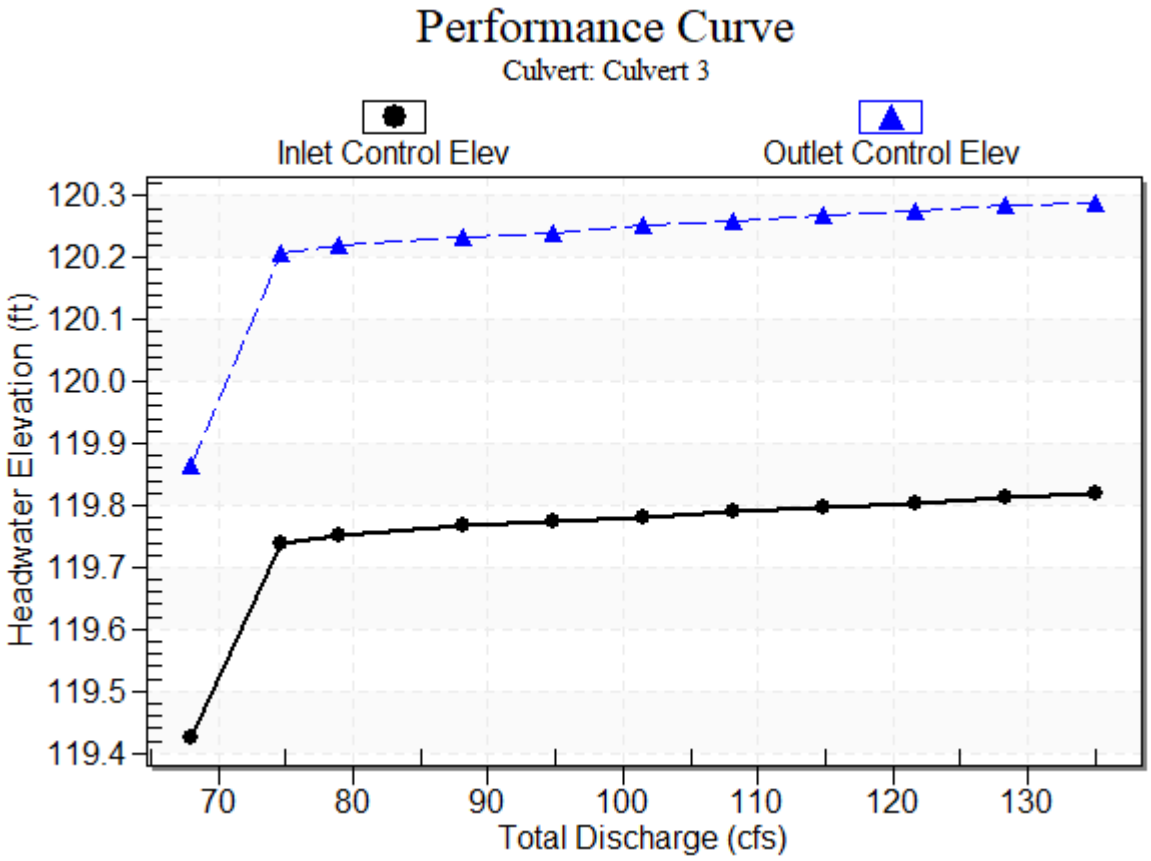
Straight Culvert

Inlet Elevation (invert): 116.01 ft, Outlet Elevation (invert): 115.90 ft

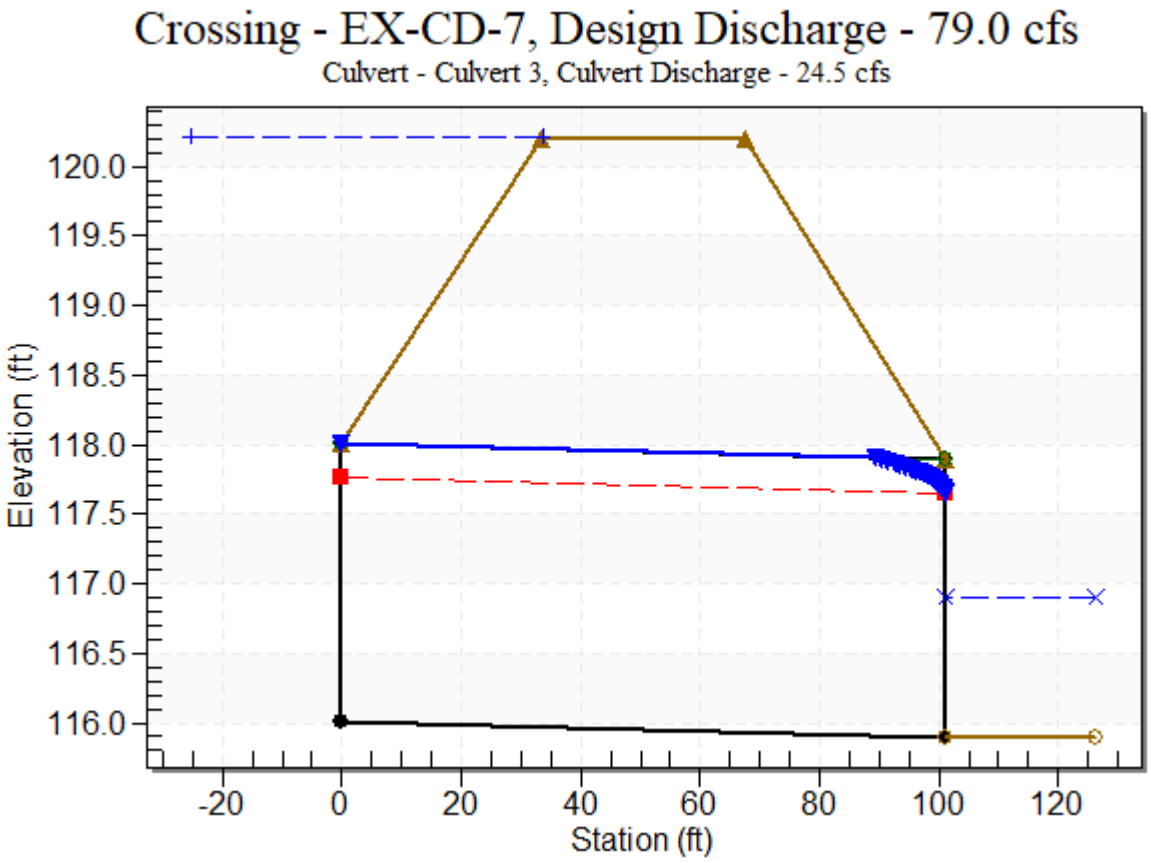
Culvert Length: 101.00 ft, Culvert Slope: 0.0011

****

Culvert Performance Curve Plot: Culvert 3



Water Surface Profile Plot for Culvert: Culvert 3



Site Data - Culvert 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 116.01 ft

Outlet Station: 101.00 ft

Outlet Elevation: 115.90 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 3

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 41 - Downstream Channel Rating Curve (Crossing: EX-CD-7)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
68.00	116.90	1.00
74.70	116.90	1.00
79.00	116.90	1.00
88.10	116.90	1.00
94.80	116.90	1.00
101.50	116.90	1.00
108.20	116.90	1.00
114.90	116.90	1.00
121.60	116.90	1.00
128.30	116.90	1.00
135.00	116.90	1.00

Tailwater Channel Data - EX-CD-7

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 116.90 ft

Roadway Data for Crossing: EX-CD-7

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 800.00 ft

Crest Elevation: 120.20 ft

Roadway Surface: Paved

Roadway Top Width: 34.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 68 cfs

Design Flow: 79 cfs

Maximum Flow: 135 cfs

Table 42 - Summary of Culvert Flows at Crossing: PR-CD-7

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Culvert 3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
118.86	68.00	22.68	22.68	22.68	0.00	3
119.06	74.70	24.90	24.90	24.90	0.00	4
119.20	79.00	26.33	26.33	26.33	0.00	4
119.57	88.10	29.36	29.36	29.36	0.00	3
119.86	94.80	31.60	31.60	31.60	0.00	3
120.18	101.50	33.83	33.83	33.83	0.00	4
120.49	108.20	36.04	36.04	36.04	0.00	16
120.80	114.90	38.20	38.20	38.20	0.00	40
121.10	121.60	40.23	40.23	40.23	0.12	60
121.12	128.30	40.34	40.34	40.34	6.84	6
121.13	135.00	40.38	40.38	40.38	13.25	4
121.10	120.63	40.21	40.21	40.21	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-7

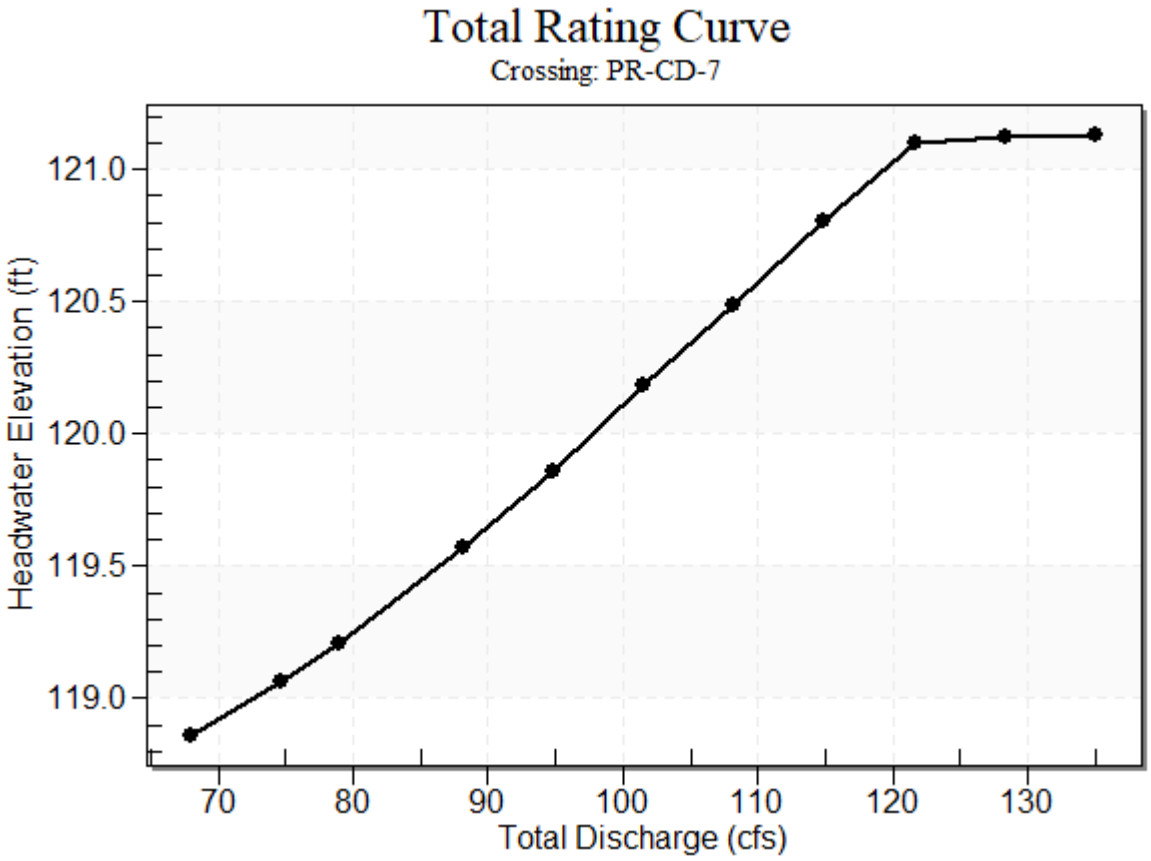


Table 43 - Culvert Summary Table: Culvert 1

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)
68.00	22.68	118.86	2.532	2.763	7-M2c	2.500	1.620	1.620	1.000	6.737	0.000
74.70	24.90	119.06	2.712	2.964	7-M2c	2.500	1.700	1.700	1.000	7.005	0.000
79.00	26.33	119.20	2.833	3.104	7-M2c	2.500	1.749	1.749	1.000	7.179	0.000
88.10	29.36	119.57	3.105	3.468	7-M2c	2.500	1.847	1.847	1.000	7.551	0.000
94.80	31.60	119.86	3.323	3.758	7-M2c	2.500	1.915	1.915	1.000	7.833	0.000
101.50	33.83	120.18	3.556	4.082	7-M2c	2.500	1.978	1.978	1.000	8.123	0.000
108.20	36.04	120.49	3.803	4.387	7-M2c	2.500	2.036	2.036	1.000	8.419	0.000
114.90	38.20	120.80	4.062	4.702	7-M2c	2.500	2.088	2.088	1.000	8.721	0.000
121.60	40.23	121.10	4.321	5.000	7-M2c	2.500	2.134	2.134	1.000	9.015	0.000
128.30	40.34	121.12	4.336	5.018	7-M2c	2.500	2.136	2.136	1.000	9.031	0.000
135.00	40.38	121.13	4.342	5.033	7-M2c	2.500	2.137	2.137	1.000	9.038	0.000

****

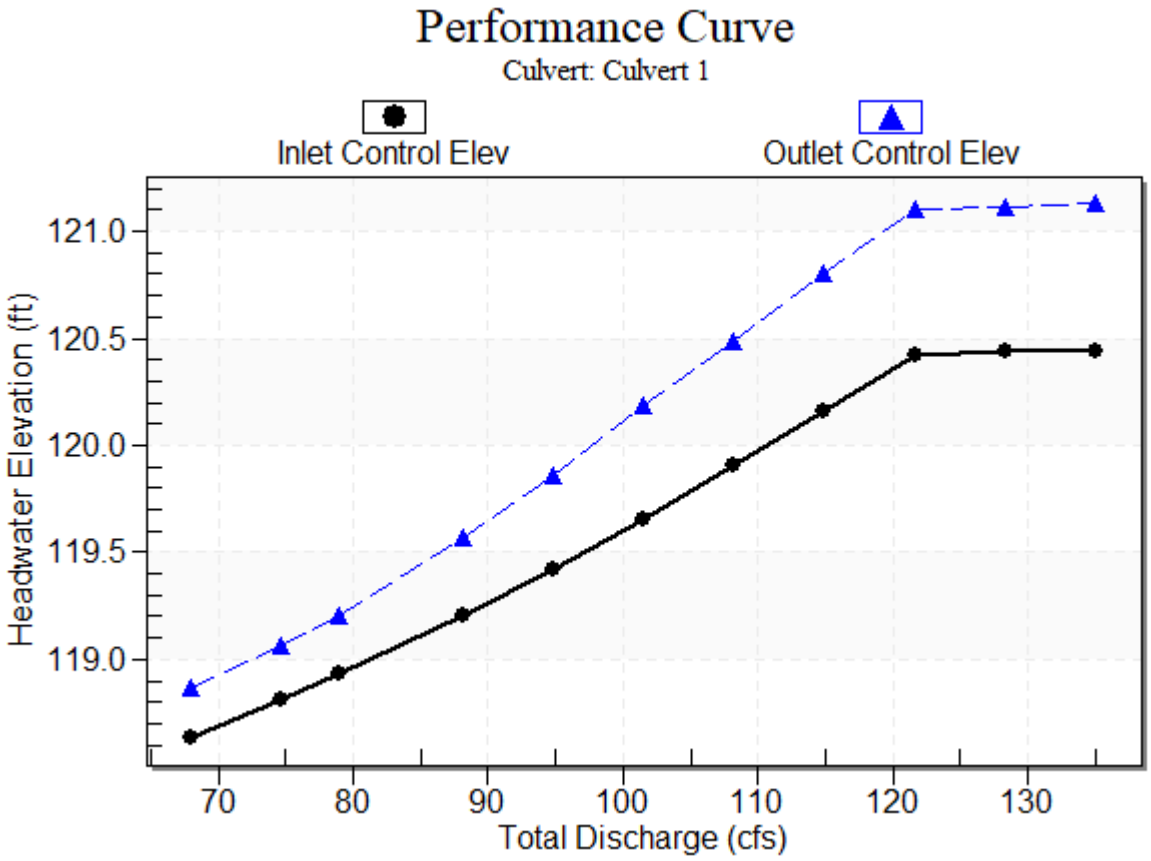
Straight Culvert

Inlet Elevation (invert): 116.10 ft, Outlet Elevation (invert): 115.90 ft

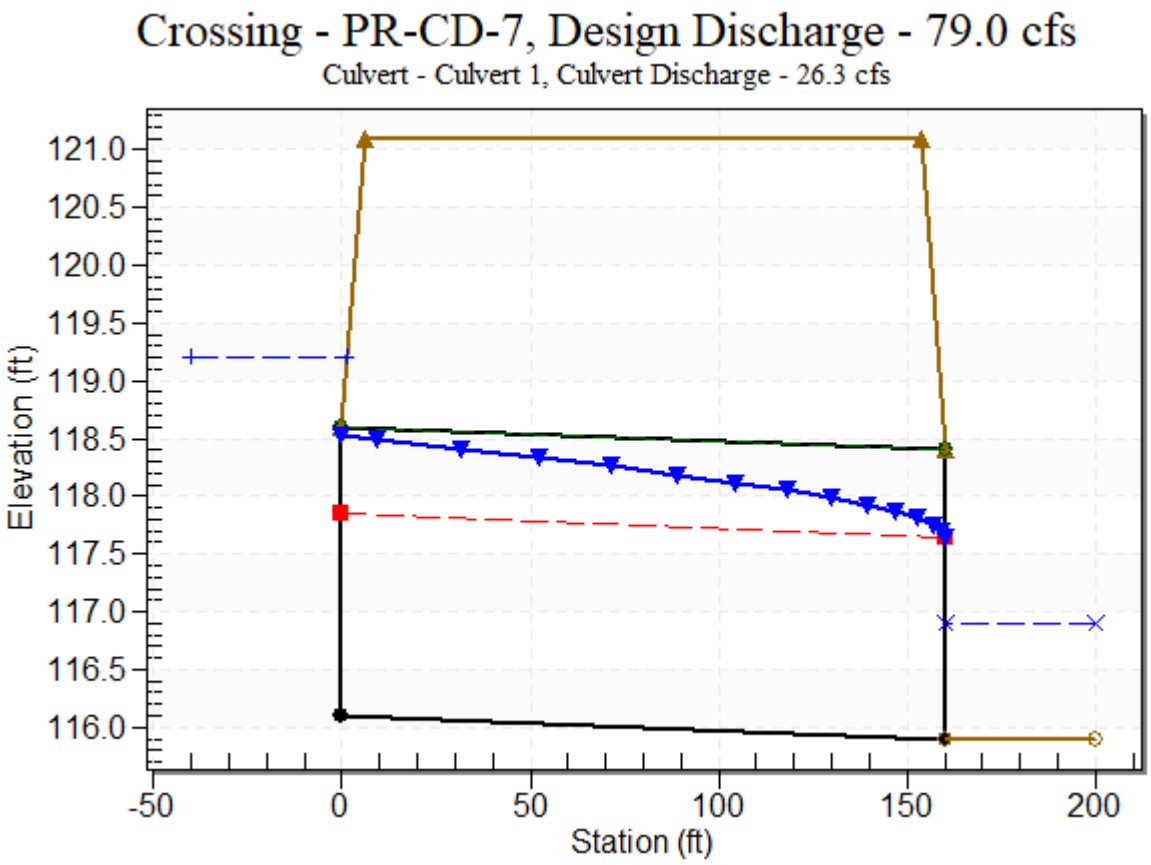
Culvert Length: 160.00 ft, Culvert Slope: 0.0012

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 116.10 ft

Outlet Station: 160.00 ft

Outlet Elevation: 115.90 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 44 - Culvert Summary Table: Culvert 2

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)
68.00	22.68	118.86	2.532	2.763	7-M2c	2.500	1.620	1.620	1.000	6.737	0.000
74.70	24.90	119.06	2.712	2.964	7-M2c	2.500	1.700	1.700	1.000	7.005	0.000
79.00	26.33	119.20	2.833	3.104	7-M2c	2.500	1.749	1.749	1.000	7.179	0.000
88.10	29.36	119.57	3.105	3.468	7-M2c	2.500	1.847	1.847	1.000	7.551	0.000
94.80	31.60	119.86	3.323	3.758	7-M2c	2.500	1.915	1.915	1.000	7.833	0.000
101.50	33.83	120.18	3.556	4.082	7-M2c	2.500	1.978	1.978	1.000	8.123	0.000
108.20	36.04	120.49	3.803	4.387	7-M2c	2.500	2.036	2.036	1.000	8.419	0.000
114.90	38.20	120.80	4.062	4.702	7-M2c	2.500	2.088	2.088	1.000	8.721	0.000
121.60	40.23	121.10	4.321	5.000	7-M2c	2.500	2.134	2.134	1.000	9.015	0.000
128.30	40.34	121.12	4.336	5.018	7-M2c	2.500	2.136	2.136	1.000	9.031	0.000
135.00	40.38	121.13	4.342	5.033	7-M2c	2.500	2.137	2.137	1.000	9.038	0.000

****

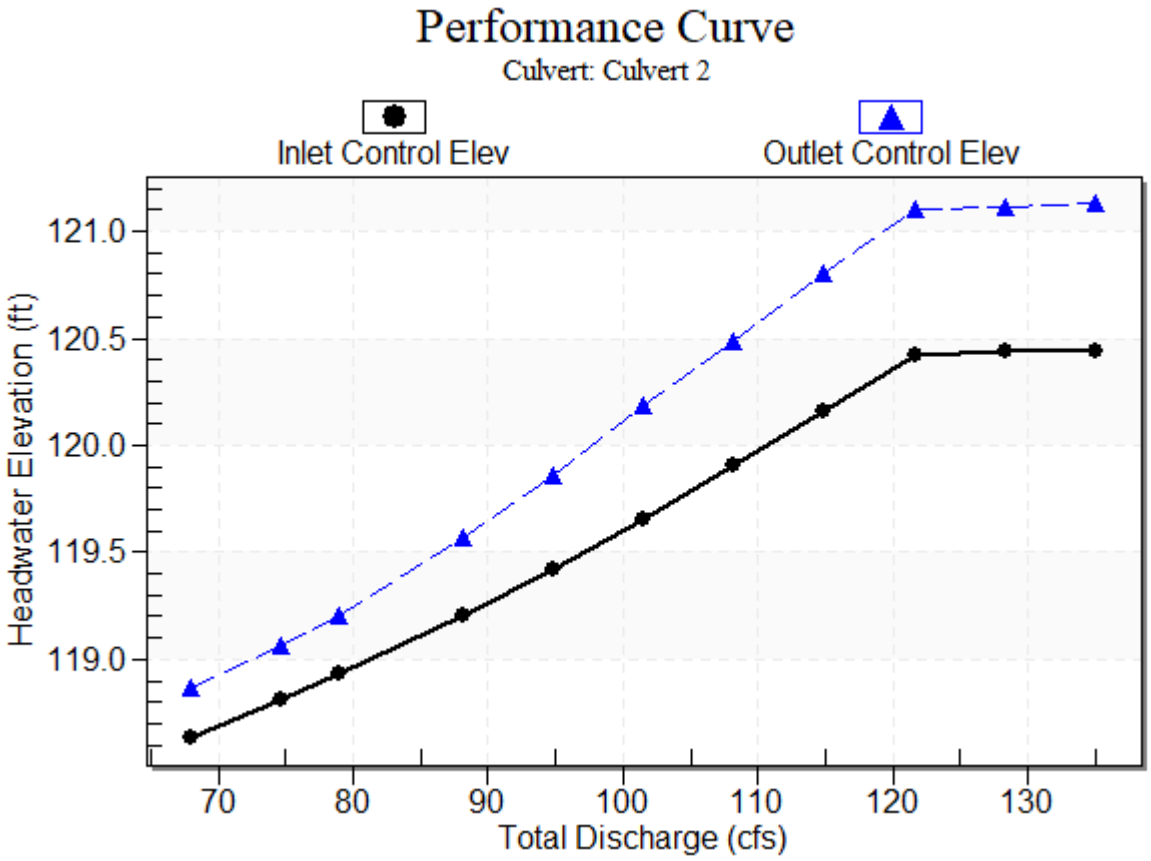
Straight Culvert

Inlet Elevation (invert): 116.10 ft, Outlet Elevation (invert): 115.90 ft

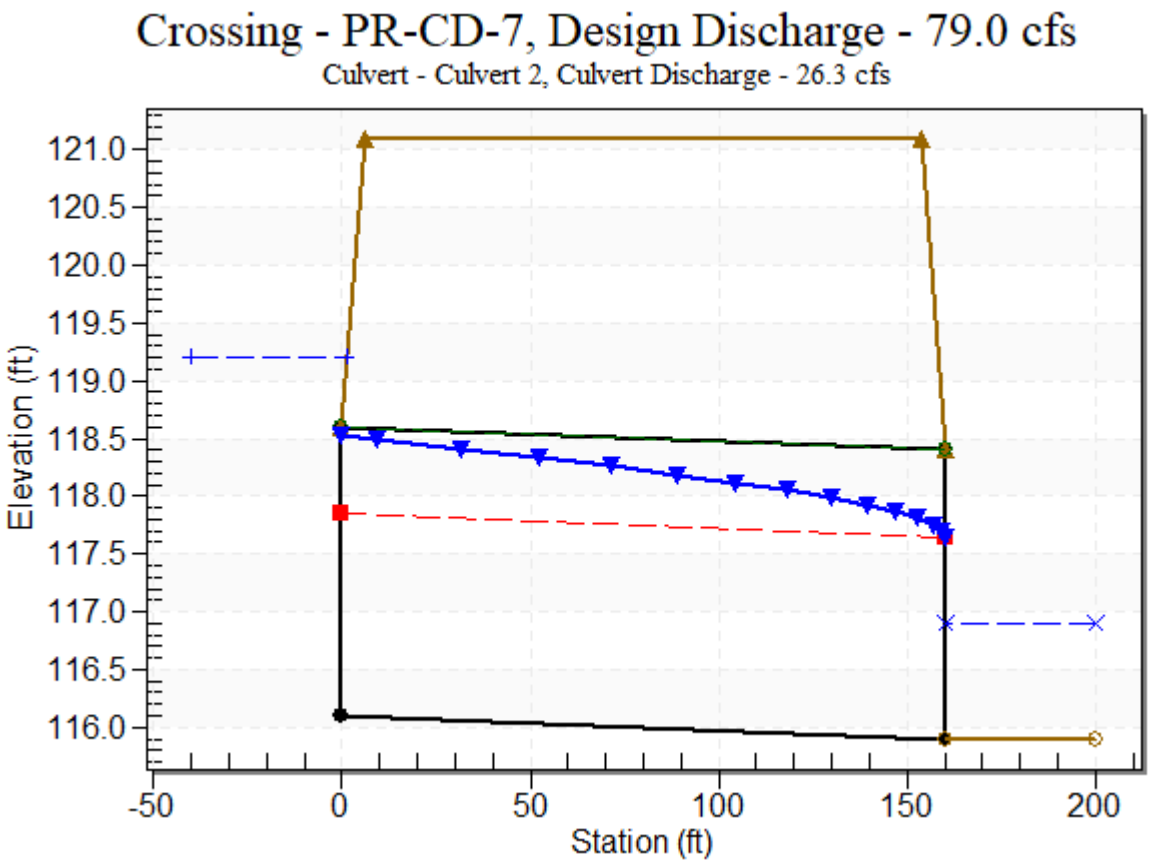
Culvert Length: 160.00 ft, Culvert Slope: 0.0012

****

Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 116.10 ft

Outlet Station: 160.00 ft

Outlet Elevation: 115.90 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 45 - Culvert Summary Table: Culvert 3

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)
68.00	22.68	118.86	2.532	2.763	7-M2c	2.500	1.620	1.620	1.000	6.737	0.000
74.70	24.90	119.06	2.712	2.964	7-M2c	2.500	1.700	1.700	1.000	7.005	0.000
79.00	26.33	119.20	2.833	3.104	7-M2c	2.500	1.749	1.749	1.000	7.179	0.000
88.10	29.36	119.57	3.105	3.468	7-M2c	2.500	1.847	1.847	1.000	7.551	0.000
94.80	31.60	119.86	3.323	3.758	7-M2c	2.500	1.915	1.915	1.000	7.833	0.000
101.50	33.83	120.18	3.556	4.082	7-M2c	2.500	1.978	1.978	1.000	8.123	0.000
108.20	36.04	120.49	3.803	4.387	7-M2c	2.500	2.036	2.036	1.000	8.419	0.000
114.90	38.20	120.80	4.062	4.702	7-M2c	2.500	2.088	2.088	1.000	8.721	0.000
121.60	40.23	121.10	4.321	5.000	7-M2c	2.500	2.134	2.134	1.000	9.015	0.000
128.30	40.34	121.12	4.336	5.018	7-M2c	2.500	2.136	2.136	1.000	9.031	0.000
135.00	40.38	121.13	4.342	5.033	7-M2c	2.500	2.137	2.137	1.000	9.038	0.000

****

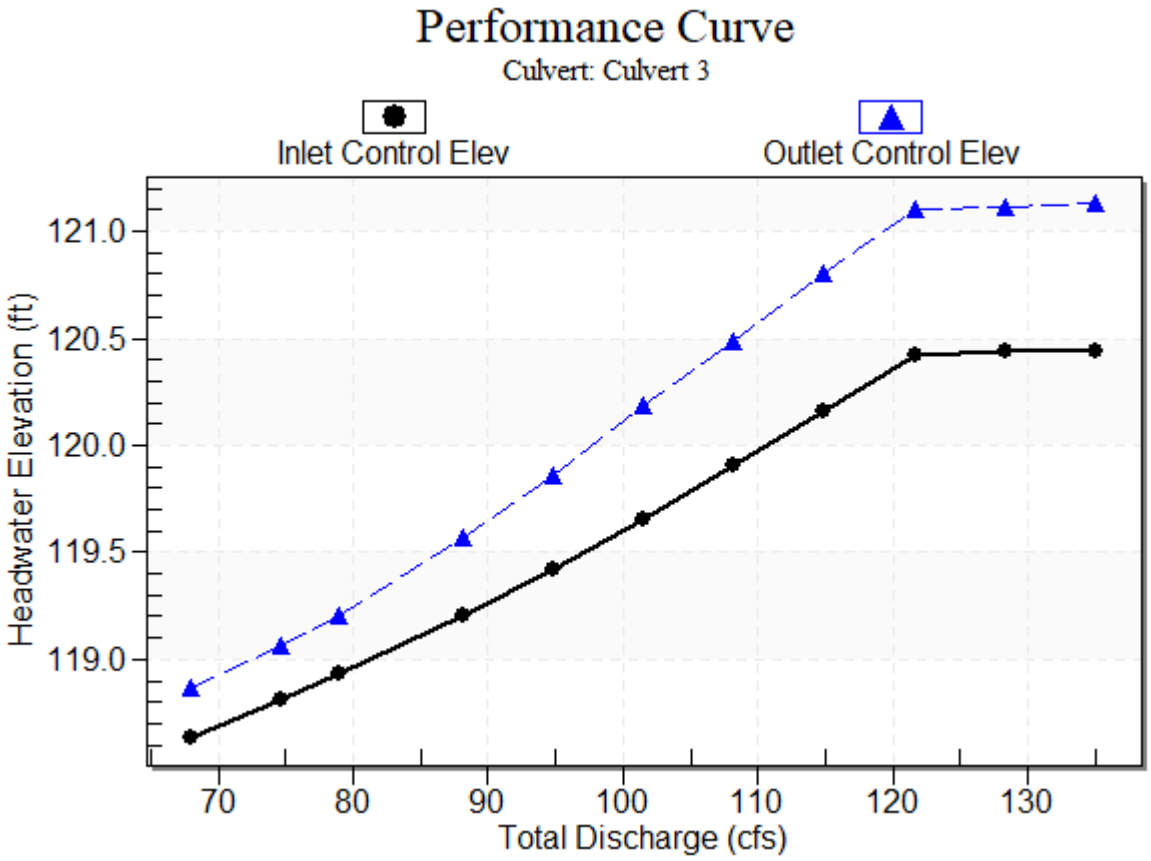
Straight Culvert

Inlet Elevation (invert): 116.10 ft, Outlet Elevation (invert): 115.90 ft

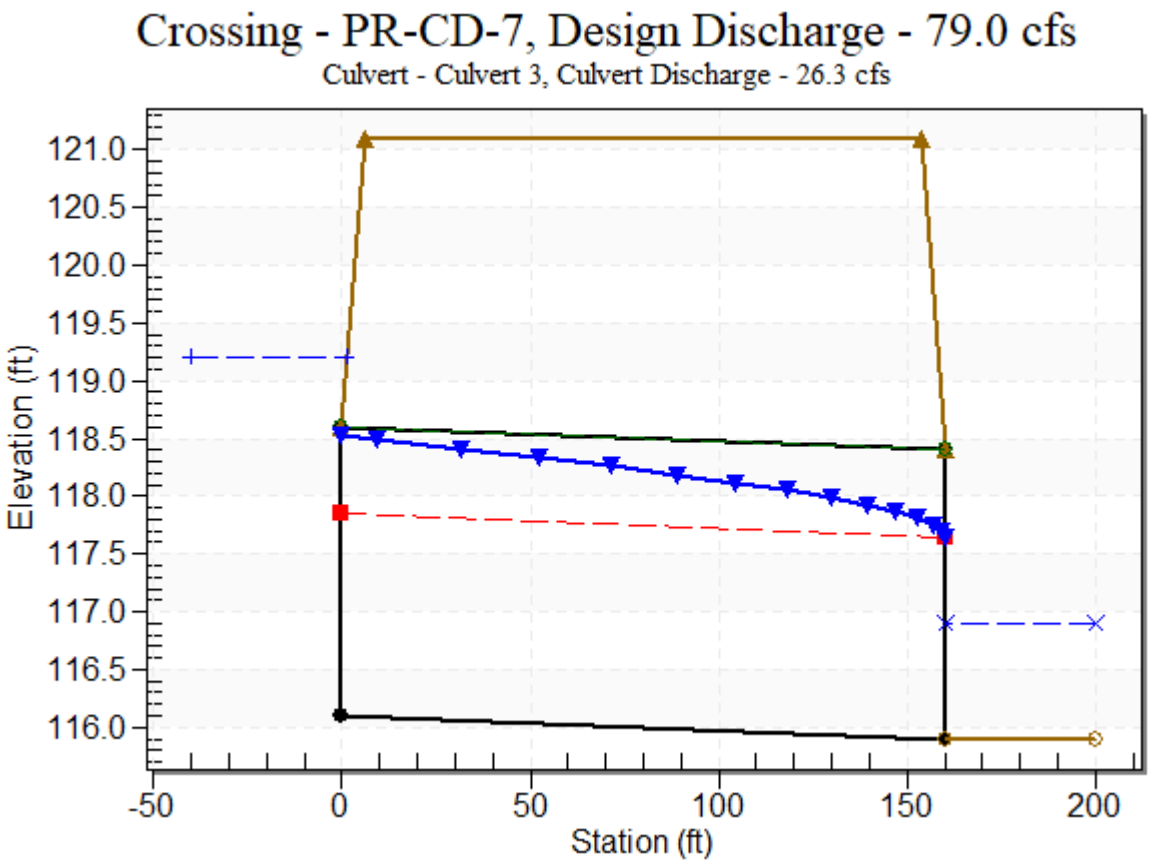
Culvert Length: 160.00 ft, Culvert Slope: 0.0012

****

Culvert Performance Curve Plot: Culvert 3



Water Surface Profile Plot for Culvert: Culvert 3



Site Data - Culvert 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 116.10 ft

Outlet Station: 160.00 ft

Outlet Elevation: 115.90 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 3

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 46 - Downstream Channel Rating Curve (Crossing: PR-CD-7)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
68.00	116.90	1.00
74.70	116.90	1.00
79.00	116.90	1.00
88.10	116.90	1.00
94.80	116.90	1.00
101.50	116.90	1.00
108.20	116.90	1.00
114.90	116.90	1.00
121.60	116.90	1.00
128.30	116.90	1.00
135.00	116.90	1.00

Tailwater Channel Data - PR-CD-7

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 116.90 ft

Roadway Data for Crossing: PR-CD-7

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 800.00 ft

Crest Elevation: 121.10 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 215 cfs

Design Flow: 252 cfs

Maximum Flow: 428 cfs

Table 47 - Summary of Culvert Flows at Crossing: EX-CD-8

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
120.27	215.00	215.00	0.00	1
120.71	236.30	236.30	0.00	1
121.05	252.00	252.00	0.00	1
121.61	278.90	275.72	2.00	50
121.65	300.20	277.19	21.89	6
121.67	321.50	278.18	42.61	5
121.69	342.80	279.04	62.81	4
121.71	364.10	279.78	83.71	4
121.73	385.40	280.47	103.42	3
121.74	406.70	281.12	124.25	3
121.76	428.00	281.74	145.22	3
121.60	275.30	275.30	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-8

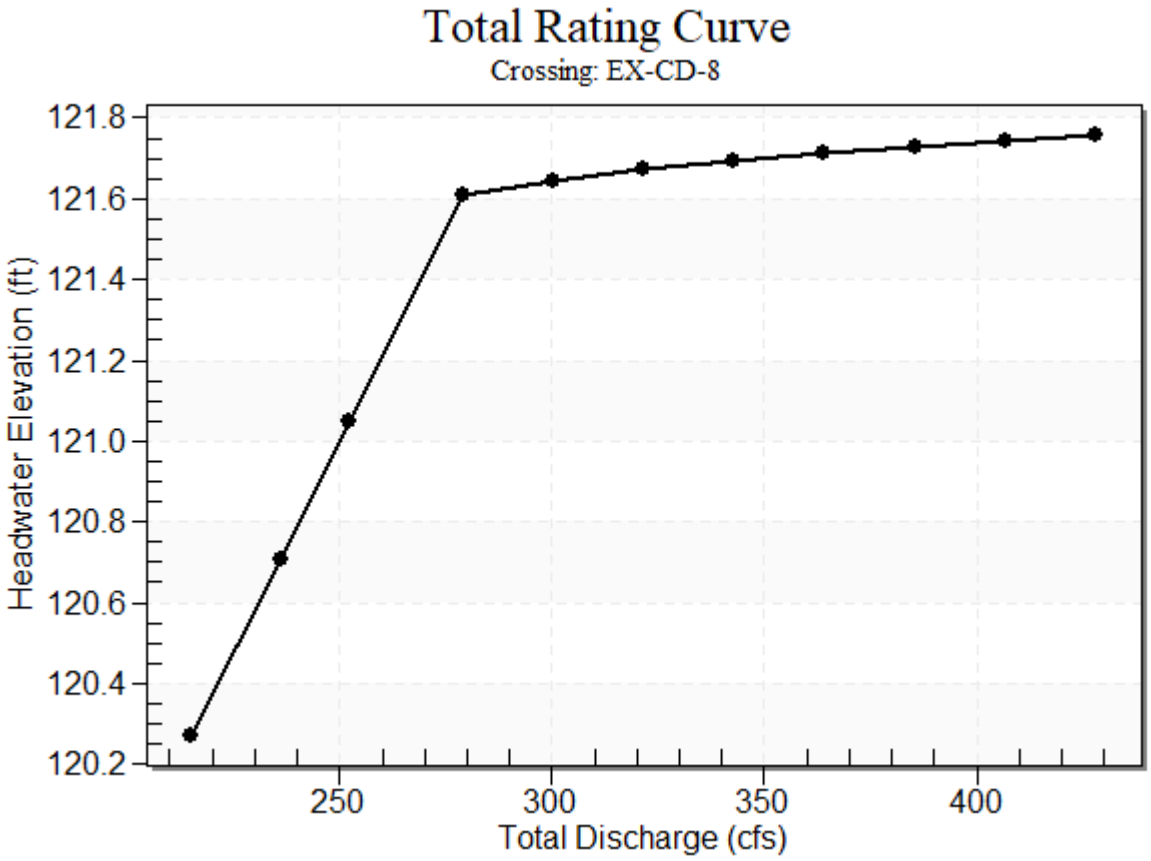


Table 48 - Culvert Summary Table: Culvert 1

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)
215.00	215.00	120.27	4.403	4.189	7-M2c	3.000	2.430	2.430	2.080	8.846	0.000
236.30	236.30	120.71	4.836	4.589	7-M2c	3.000	2.588	2.588	2.080	9.129	0.000
252.00	252.00	121.05	5.179	4.894	7-M2c	3.000	2.702	2.702	2.080	9.327	0.000
278.90	275.72	121.61	5.739	5.358	7-M2c	3.000	2.869	2.869	2.080	9.611	0.000
300.20	277.19	121.65	5.776	5.387	7-M2c	3.000	2.879	2.879	2.080	9.628	0.000
321.50	278.18	121.67	5.800	5.405	7-M2c	3.000	2.886	2.886	2.080	9.640	0.000
342.80	279.04	121.69	5.822	5.422	7-M2c	3.000	2.892	2.892	2.080	9.650	0.000
364.10	279.78	121.71	5.841	5.436	7-M2c	3.000	2.897	2.897	2.080	9.658	0.000
385.40	280.47	121.73	5.858	5.449	7-M2c	3.000	2.902	2.902	2.080	9.666	0.000
406.70	281.12	121.74	5.874	5.462	7-M2c	3.000	2.906	2.906	2.080	9.674	0.000
428.00	281.74	121.76	5.890	5.474	7-M2c	3.000	2.910	2.910	2.080	9.681	0.000

****

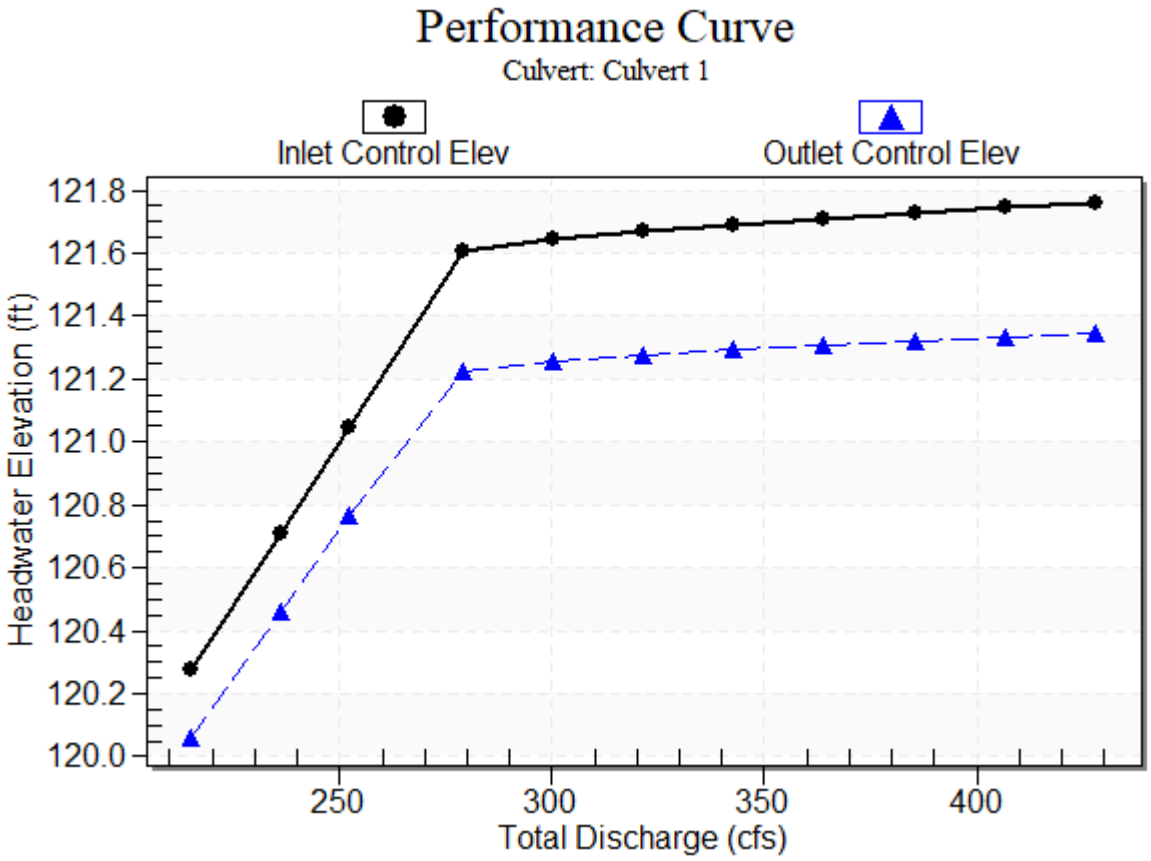
Straight Culvert

Inlet Elevation (invert): 115.87 ft, Outlet Elevation (invert): 115.82 ft

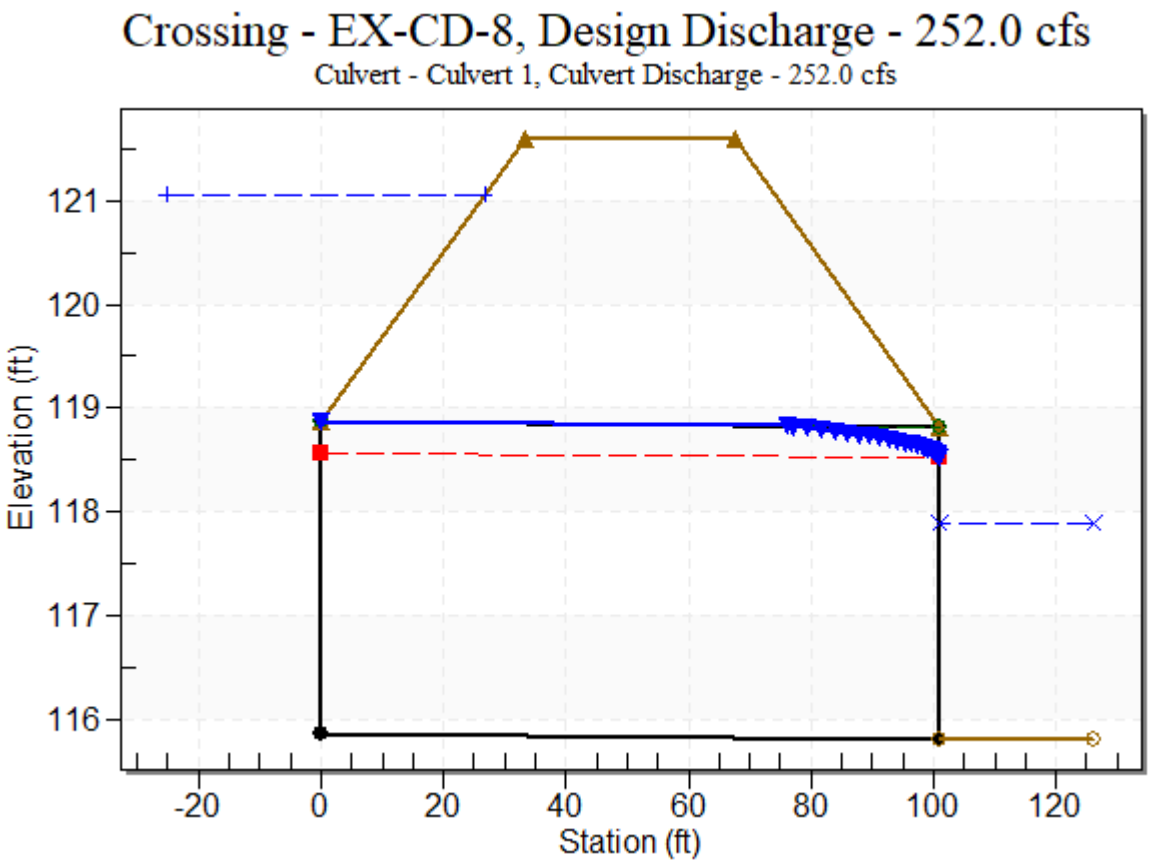
Culvert Length: 101.00 ft, Culvert Slope: 0.0005

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 115.87 ft

Outlet Station: 101.00 ft

Outlet Elevation: 115.82 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 49 - Downstream Channel Rating Curve (Crossing: EX-CD-8)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
215.00	117.90	2.08
236.30	117.90	2.08
252.00	117.90	2.08
278.90	117.90	2.08
300.20	117.90	2.08
321.50	117.90	2.08
342.80	117.90	2.08
364.10	117.90	2.08
385.40	117.90	2.08
406.70	117.90	2.08
428.00	117.90	2.08

Tailwater Channel Data - EX-CD-8

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 117.90 ft

Roadway Data for Crossing: EX-CD-8

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 800.00 ft

Crest Elevation: 121.60 ft

Roadway Surface: Paved

Roadway Top Width: 34.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 215 cfs

Design Flow: 252 cfs

Maximum Flow: 428 cfs

Table 50 - Summary of Culvert Flows at Crossing: PR-CD-8

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
120.30	215.00	215.00	0.00	1
120.74	236.30	236.30	0.00	1
121.08	252.00	252.00	0.00	1
121.72	278.90	278.90	0.00	1
122.27	300.20	300.20	0.00	1
122.43	321.50	306.07	14.26	14
122.46	342.80	307.08	34.71	5
122.48	364.10	307.88	55.01	4
122.51	385.40	308.60	76.05	4
122.52	406.70	309.26	97.00	4
122.54	428.00	309.83	116.94	3
122.40	304.82	304.82	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-8

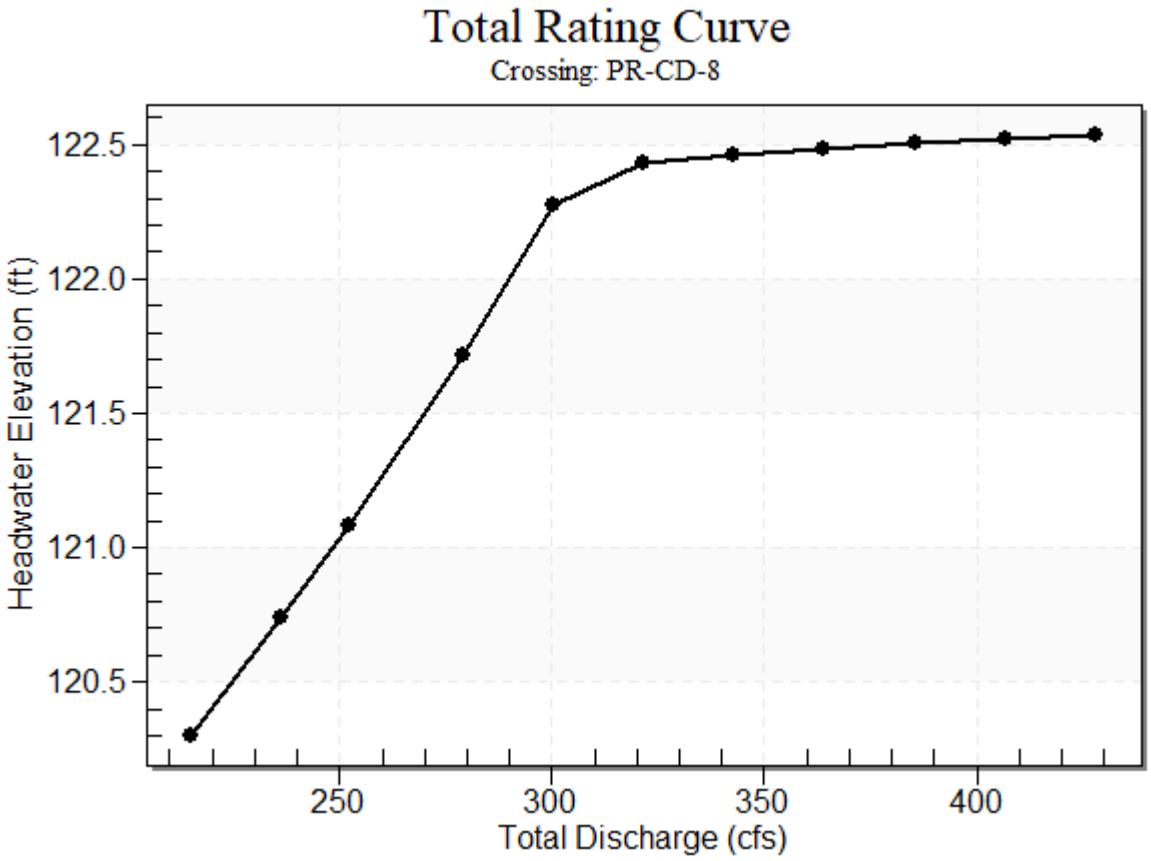


Table 51 - Culvert Summary Table: Culvert 1

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)
215.00	215.00	120.30	4.403	4.271	7-M2c	3.000	2.430	2.430	2.100	8.846	0.000
236.30	236.30	120.74	4.836	4.729	7-M2c	3.000	2.588	2.588	2.100	9.129	0.000
252.00	252.00	121.08	5.179	5.064	7-M2c	3.000	2.702	2.702	2.100	9.327	0.000
278.90	278.90	121.72	5.818	5.642	7-M2c	3.000	2.891	2.891	2.100	9.648	0.000
300.20	300.20	122.27	6.374	6.091	6-FFc	3.000	3.000	3.000	2.100	10.007	0.000
321.50	306.07	122.43	6.535	6.217	6-FFc	3.000	3.000	3.000	2.100	10.202	0.000
342.80	307.08	122.46	6.562	6.239	6-FFc	3.000	3.000	3.000	2.100	10.236	0.000
364.10	307.88	122.48	6.585	6.256	6-FFc	3.000	3.000	3.000	2.100	10.263	0.000
385.40	308.60	122.51	6.605	6.272	6-FFc	3.000	3.000	3.000	2.100	10.287	0.000
406.70	309.26	122.52	6.623	6.286	6-FFc	3.000	3.000	3.000	2.100	10.309	0.000
428.00	309.83	122.54	6.639	6.299	6-FFc	3.000	3.000	3.000	2.100	10.328	0.000

****

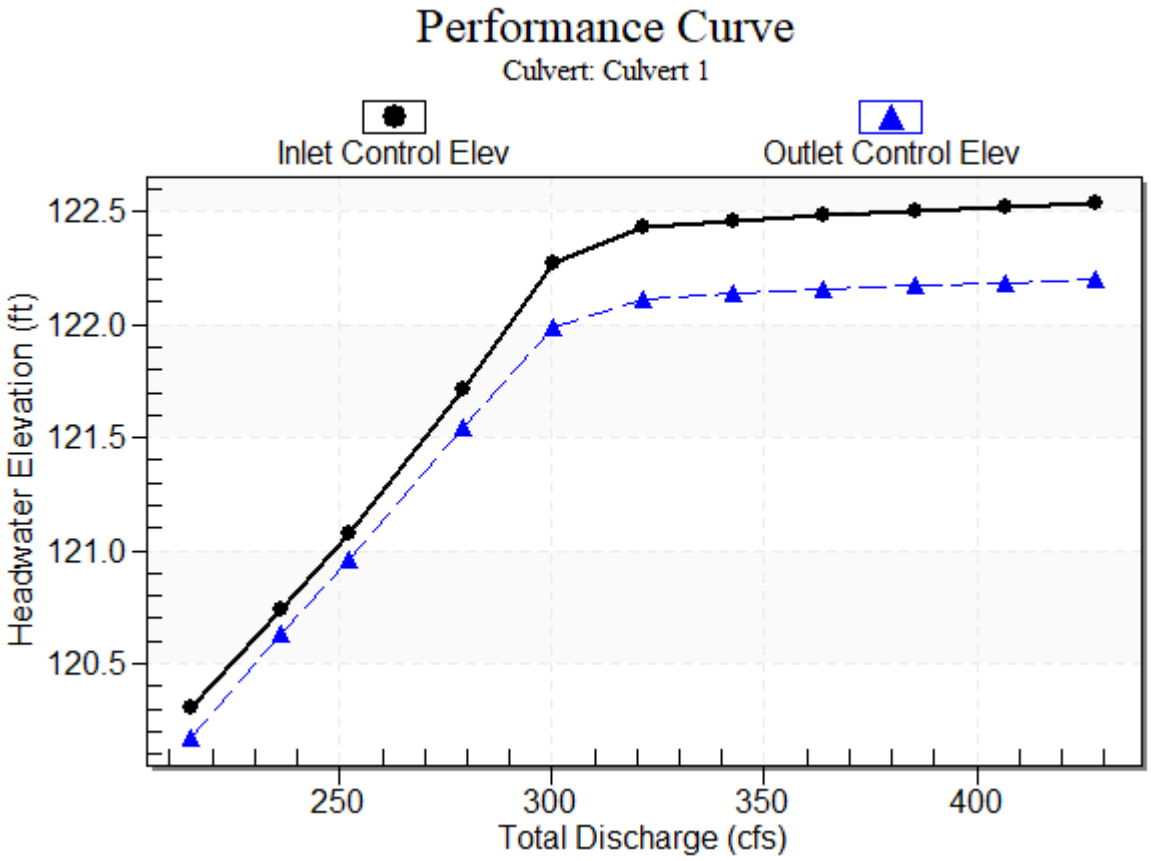
Straight Culvert

Inlet Elevation (invert): 115.90 ft, Outlet Elevation (invert): 115.80 ft

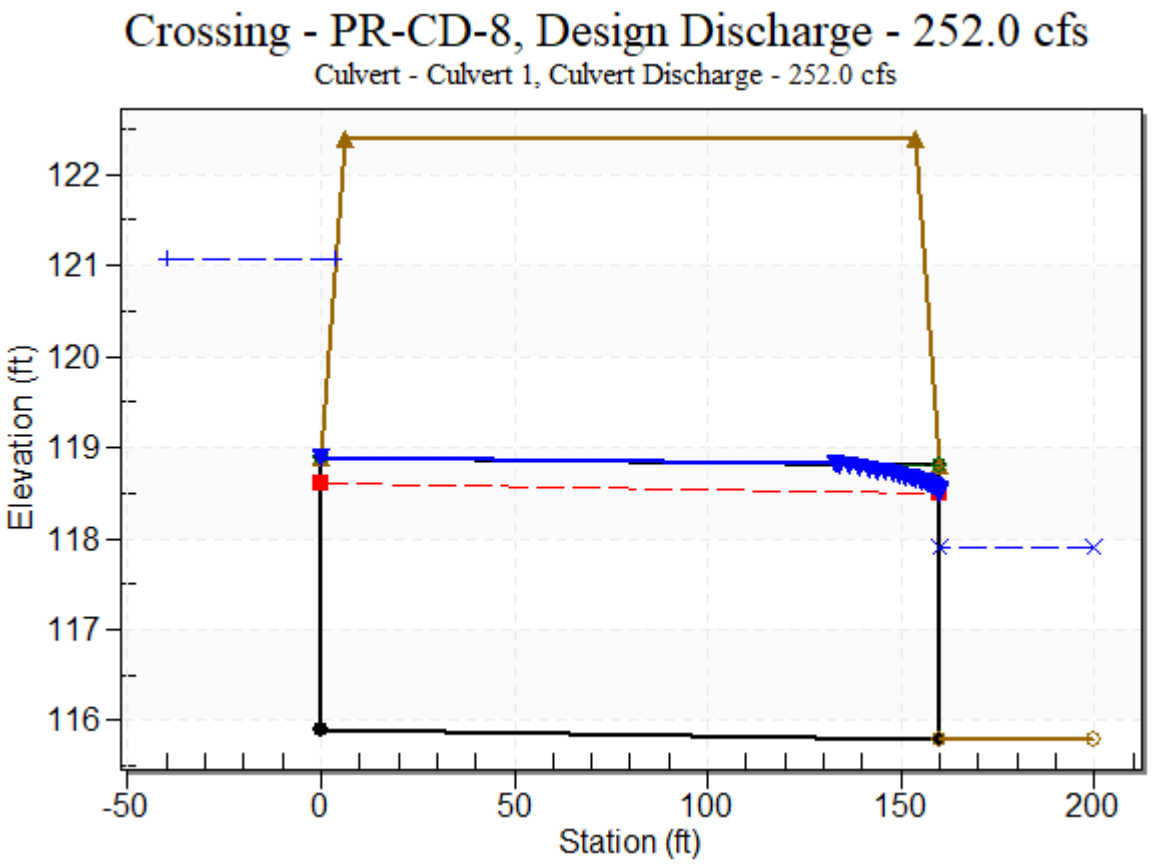
Culvert Length: 160.00 ft, Culvert Slope: 0.0006

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 115.90 ft

Outlet Station: 160.00 ft

Outlet Elevation: 115.80 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 52 - Downstream Channel Rating Curve (Crossing: PR-CD-8)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
215.00	117.90	2.10
236.30	117.90	2.10
252.00	117.90	2.10
278.90	117.90	2.10
300.20	117.90	2.10
321.50	117.90	2.10
342.80	117.90	2.10
364.10	117.90	2.10
385.40	117.90	2.10
406.70	117.90	2.10
428.00	117.90	2.10

Tailwater Channel Data - PR-CD-8

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 117.90 ft

Roadway Data for Crossing: PR-CD-8

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 800.00 ft

Crest Elevation: 122.40 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 86 cfs

Design Flow: 101 cfs

Maximum Flow: 171 cfs

Table 53 - Summary of Culvert Flows at Crossing: EX-CD-9

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
118.50	86.00	86.00	0.00	1
118.93	94.50	94.50	0.00	1
119.29	101.00	101.00	0.00	1
119.62	111.50	106.72	4.28	26
119.64	120.00	107.09	12.42	5
119.66	128.50	107.38	20.57	4
119.68	137.00	107.64	29.03	4
119.69	145.50	107.86	36.90	3
119.70	154.00	108.08	45.27	3
119.72	162.50	108.28	53.73	3
119.73	171.00	108.47	62.17	3
119.60	106.35	106.35	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-9

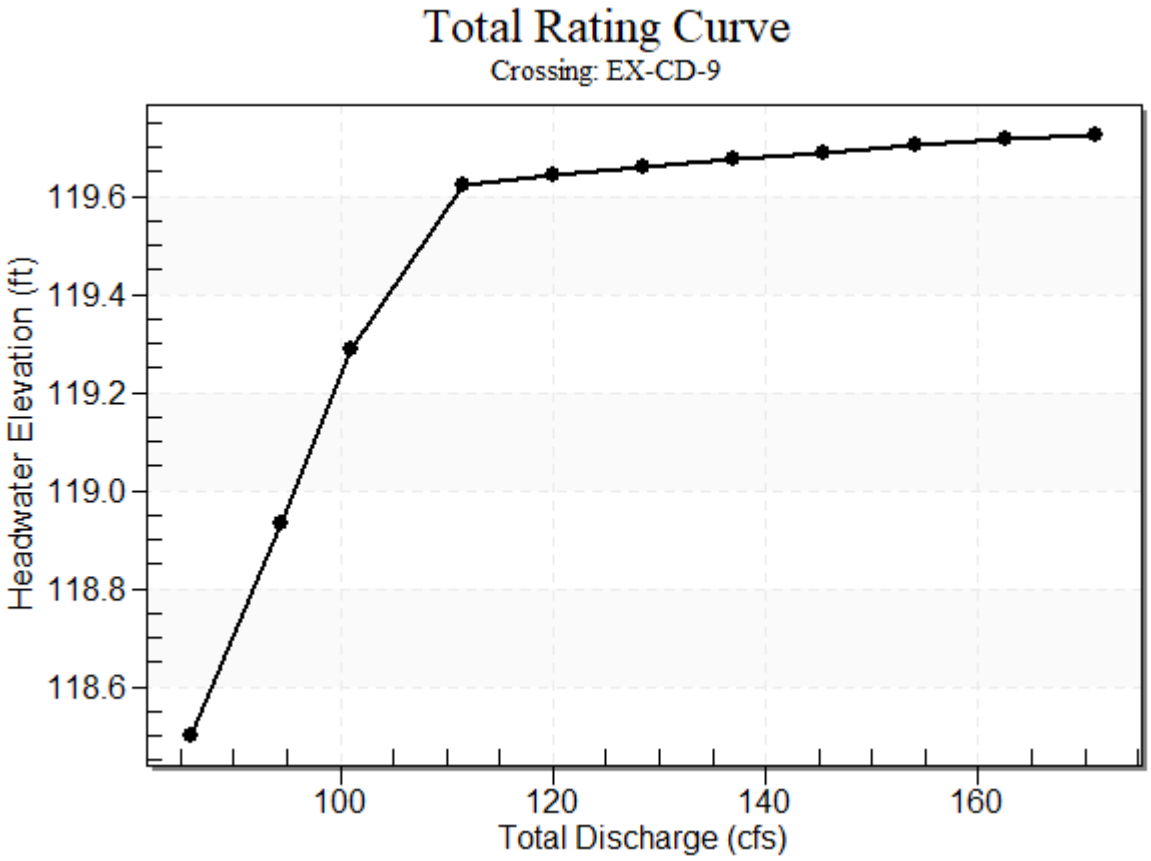


Table 54 - Culvert Summary Table: Culvert 1

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)
86.00	86.00	118.50	4.402	4.249	7-M2c	3.000	2.430	2.430	1.920	8.846	0.000
94.50	94.50	118.93	4.834	4.677	7-M2c	3.000	2.588	2.588	1.920	9.129	0.000
101.00	101.00	119.29	5.189	5.007	7-M2c	3.000	2.705	2.705	1.920	9.333	0.000
111.50	106.72	119.62	5.521	5.300	7-M2c	3.000	2.807	2.807	1.920	9.506	0.000
120.00	107.09	119.64	5.544	5.319	7-M2c	3.000	2.813	2.813	1.920	9.517	0.000
128.50	107.38	119.66	5.561	5.334	7-M2c	3.000	2.818	2.818	1.920	9.526	0.000
137.00	107.64	119.68	5.577	5.347	7-M2c	3.000	2.823	2.823	1.920	9.534	0.000
145.50	107.86	119.69	5.590	5.358	7-M2c	3.000	2.827	2.827	1.920	9.540	0.000
154.00	108.08	119.70	5.603	5.370	7-M2c	3.000	2.830	2.830	1.920	9.547	0.000
162.50	108.28	119.72	5.615	5.380	7-M2c	3.000	2.834	2.834	1.920	9.553	0.000
171.00	108.47	119.73	5.627	5.389	7-M2c	3.000	2.837	2.837	1.920	9.558	0.000

****

Straight Culvert

Inlet Elevation (invert): 114.10 ft, Outlet Elevation (invert): 113.97 ft

Culvert Length: 98.00 ft, Culvert Slope: 0.0013

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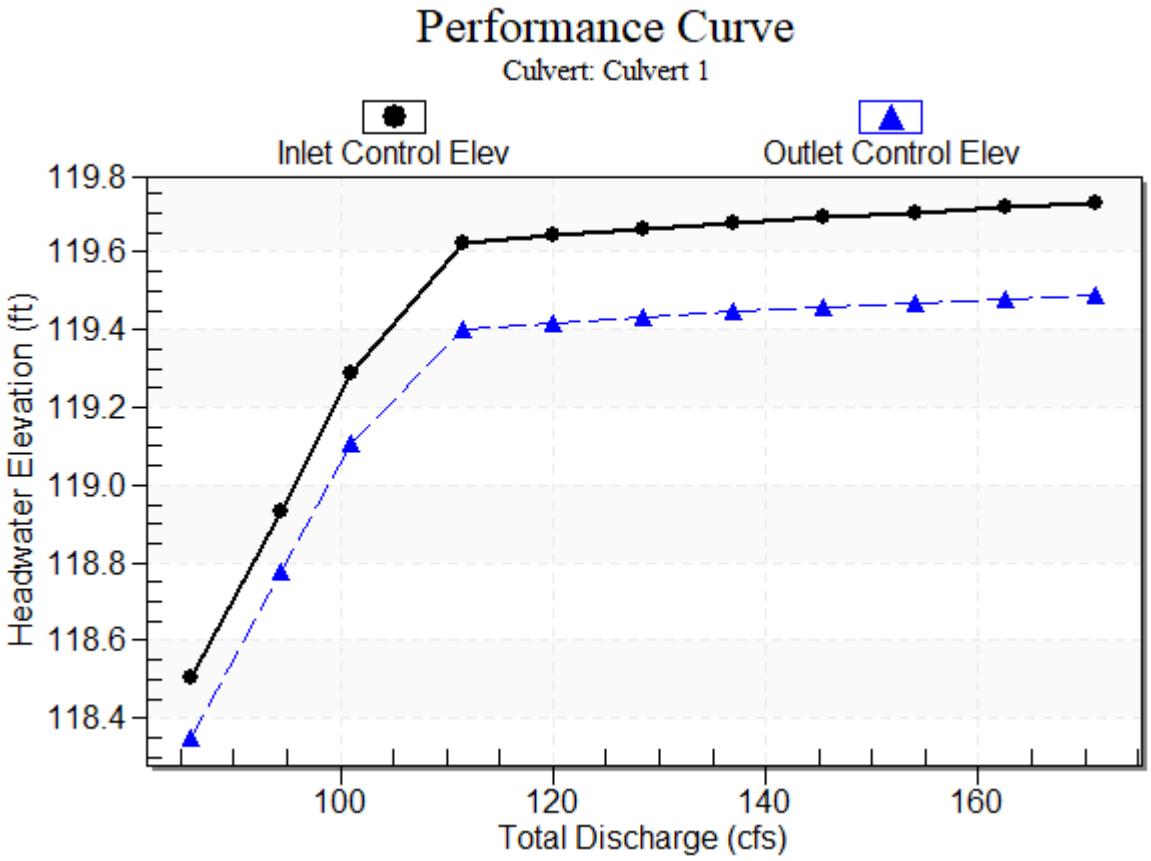
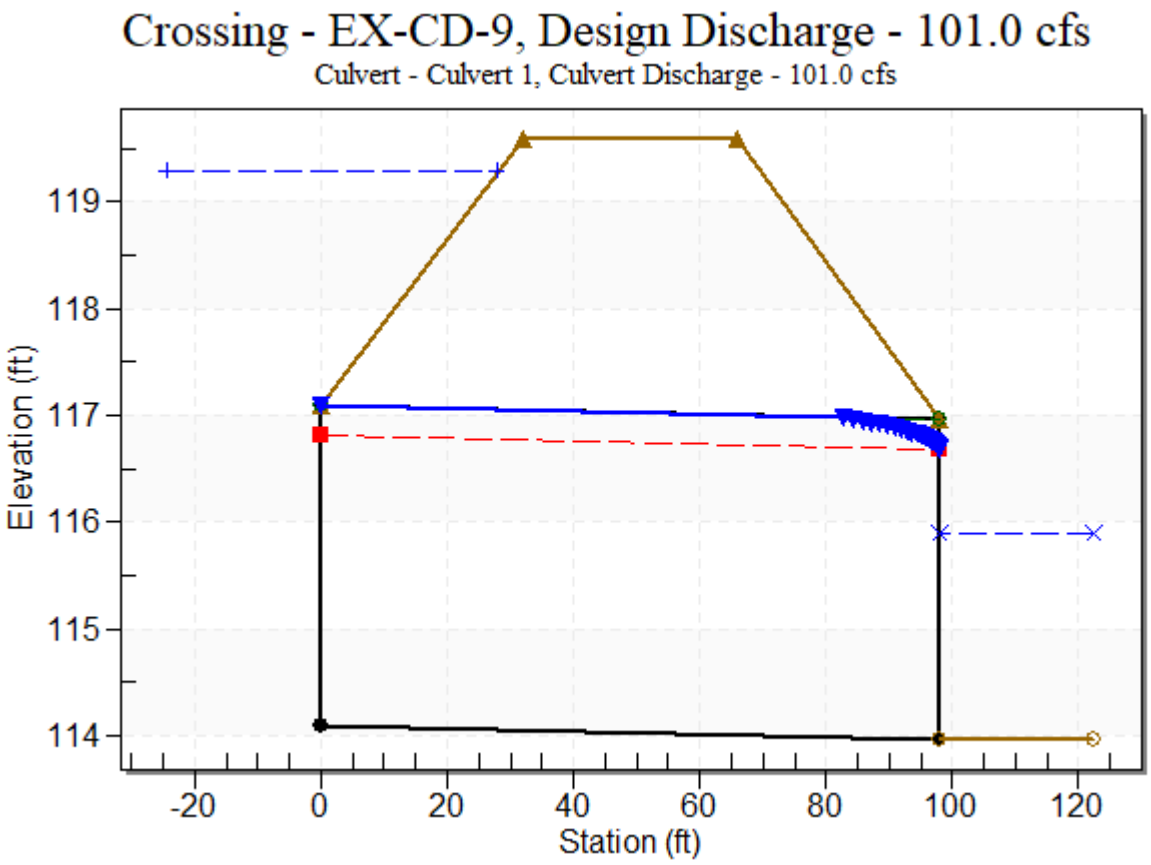
Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 114.10 ft

Outlet Station: 98.00 ft

Outlet Elevation: 113.97 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 4.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 55 - Downstream Channel Rating Curve (Crossing: EX-CD-9)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
86.00	115.89	1.92
94.50	115.89	1.92
101.00	115.89	1.92
111.50	115.89	1.92
120.00	115.89	1.92
128.50	115.89	1.92
137.00	115.89	1.92
145.50	115.89	1.92
154.00	115.89	1.92
162.50	115.89	1.92
171.00	115.89	1.92

Tailwater Channel Data - EX-CD-9

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 115.89 ft

Roadway Data for Crossing: EX-CD-9

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 119.60 ft

Roadway Surface: Paved

Roadway Top Width: 34.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 86 cfs

Design Flow: 101 cfs

Maximum Flow: 171 cfs

Table 56 - Summary of Culvert Flows at Crossing: PR-CD-9

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
118.50	86.00	86.00	0.00	1
118.93	94.50	94.50	0.00	1
119.29	101.00	101.00	0.00	1
119.91	111.50	111.50	0.00	1
120.12	120.00	114.80	4.51	20
120.15	128.50	115.15	12.86	5
120.16	137.00	115.42	21.05	4
120.18	145.50	115.66	29.52	4
120.19	154.00	115.86	37.41	3
120.20	162.50	116.06	45.80	3
120.22	171.00	116.25	54.27	3
120.10	114.45	114.45	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-9

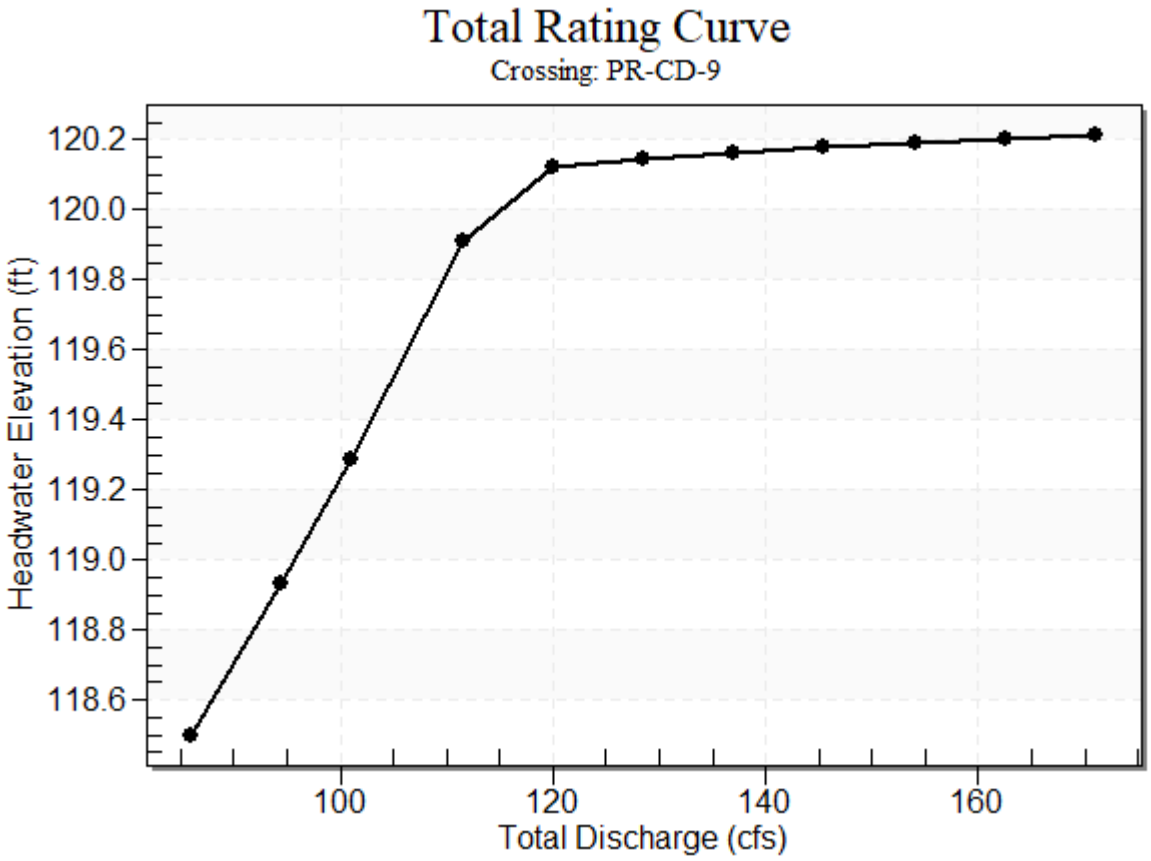


Table 57 - Culvert Summary Table: Culvert 1

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)
86.00	86.00	118.50	4.401	4.293	7-M2c	3.000	2.430	2.430	2.090	8.846	0.000
94.50	94.50	118.93	4.833	4.798	7-M2c	3.000	2.588	2.588	2.090	9.129	0.000
101.00	101.00	119.29	5.188	5.180	7-M2c	3.000	2.705	2.705	2.090	9.333	0.000
111.50	111.50	119.91	5.813	5.801	7-M2c	3.000	2.890	2.890	2.090	9.646	0.000
120.00	114.80	120.12	6.022	5.995	7-M2c	3.000	2.946	2.946	2.090	9.740	0.000
128.50	115.15	120.15	6.045	6.016	7-M2c	3.000	2.952	2.952	2.090	9.750	0.000
137.00	115.42	120.16	6.062	6.032	7-M2c	3.000	2.957	2.957	2.090	9.758	0.000
145.50	115.66	120.18	6.078	6.046	7-M2c	3.000	2.961	2.961	2.090	9.765	0.000
154.00	115.86	120.19	6.091	6.058	7-M2c	3.000	2.965	2.965	2.090	9.770	0.000
162.50	116.06	120.20	6.105	6.070	7-M2c	3.000	2.968	2.968	2.090	9.776	0.000
171.00	116.25	120.22	6.117	6.081	7-M2c	3.000	2.971	2.971	2.090	9.781	0.000

****

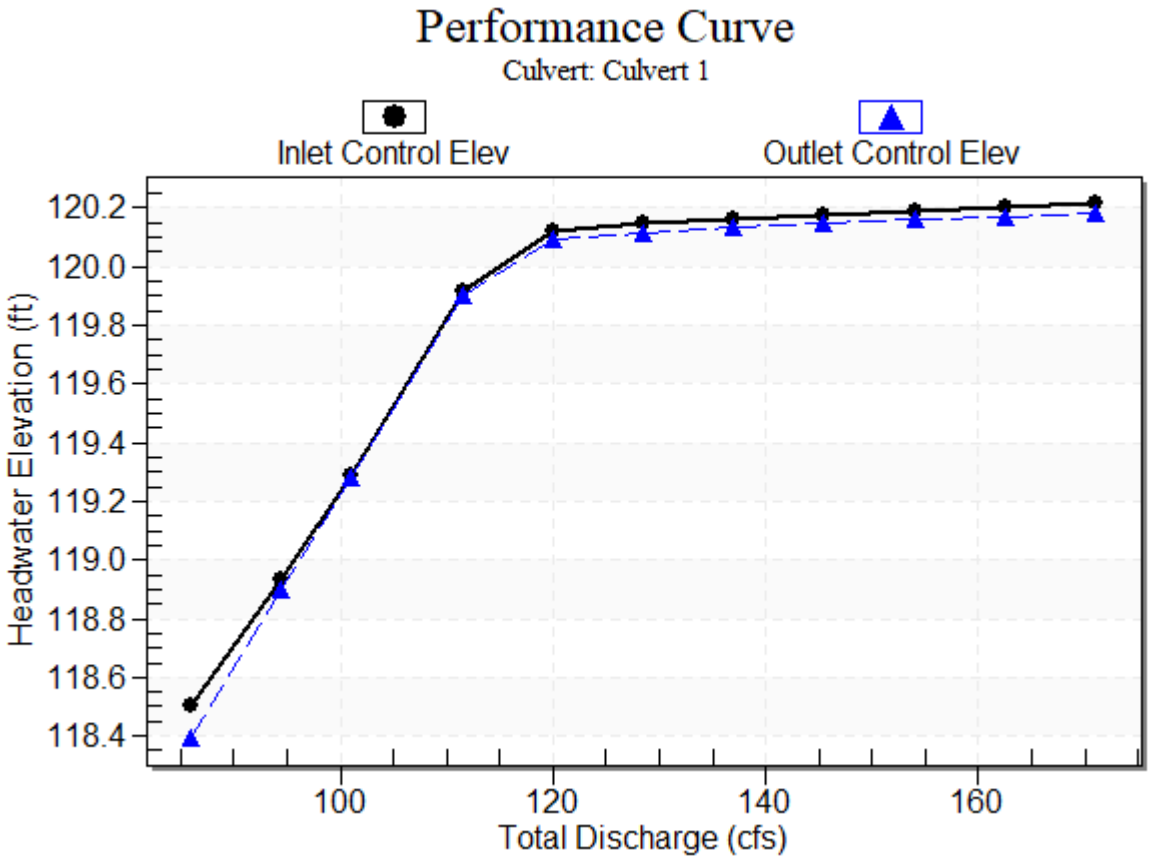
Straight Culvert

Inlet Elevation (invert): 114.10 ft, Outlet Elevation (invert): 113.80 ft

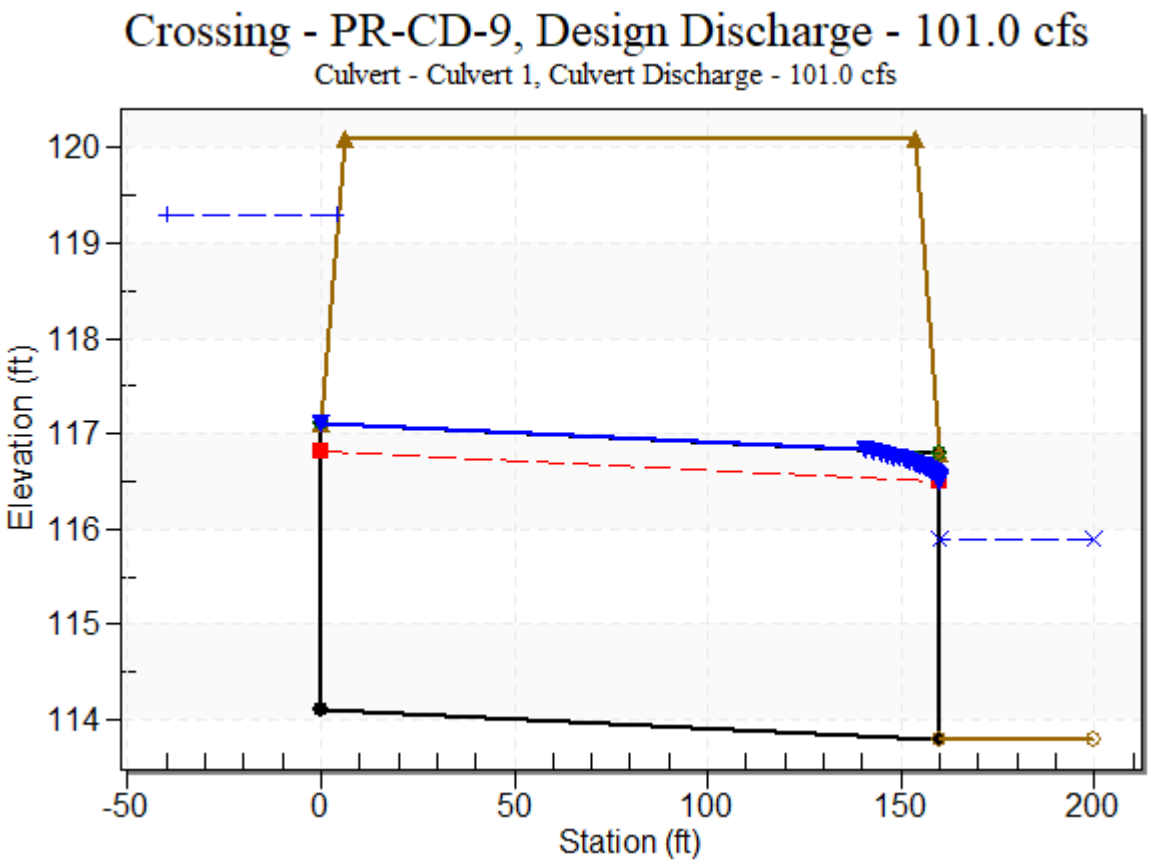
Culvert Length: 160.00 ft, Culvert Slope: 0.0019

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 114.10 ft

Outlet Station: 160.00 ft

Outlet Elevation: 113.80 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 4.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 58 - Downstream Channel Rating Curve (Crossing: PR-CD-9)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
86.00	115.89	2.09
94.50	115.89	2.09
101.00	115.89	2.09
111.50	115.89	2.09
120.00	115.89	2.09
128.50	115.89	2.09
137.00	115.89	2.09
145.50	115.89	2.09
154.00	115.89	2.09
162.50	115.89	2.09
171.00	115.89	2.09

Tailwater Channel Data - PR-CD-9

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 115.89 ft

Roadway Data for Crossing: PR-CD-9

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 120.10 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 35 cfs

Design Flow: 41 cfs

Maximum Flow: 70 cfs

Table 59 - Summary of Culvert Flows at Crossing: EX-CD-10

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
118.53	35.00	35.00	0.00	1
118.97	38.50	38.50	0.00	1
119.30	41.00	41.00	0.00	1
119.71	45.50	44.09	1.13	37
119.73	49.00	44.18	4.52	5
119.75	52.50	44.32	7.93	4
119.76	56.00	44.42	11.43	4
119.77	59.50	44.50	14.71	3
119.78	63.00	44.53	18.15	3
119.79	66.50	44.64	21.67	3
119.80	70.00	44.68	25.17	3
119.70	43.95	43.95	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-10

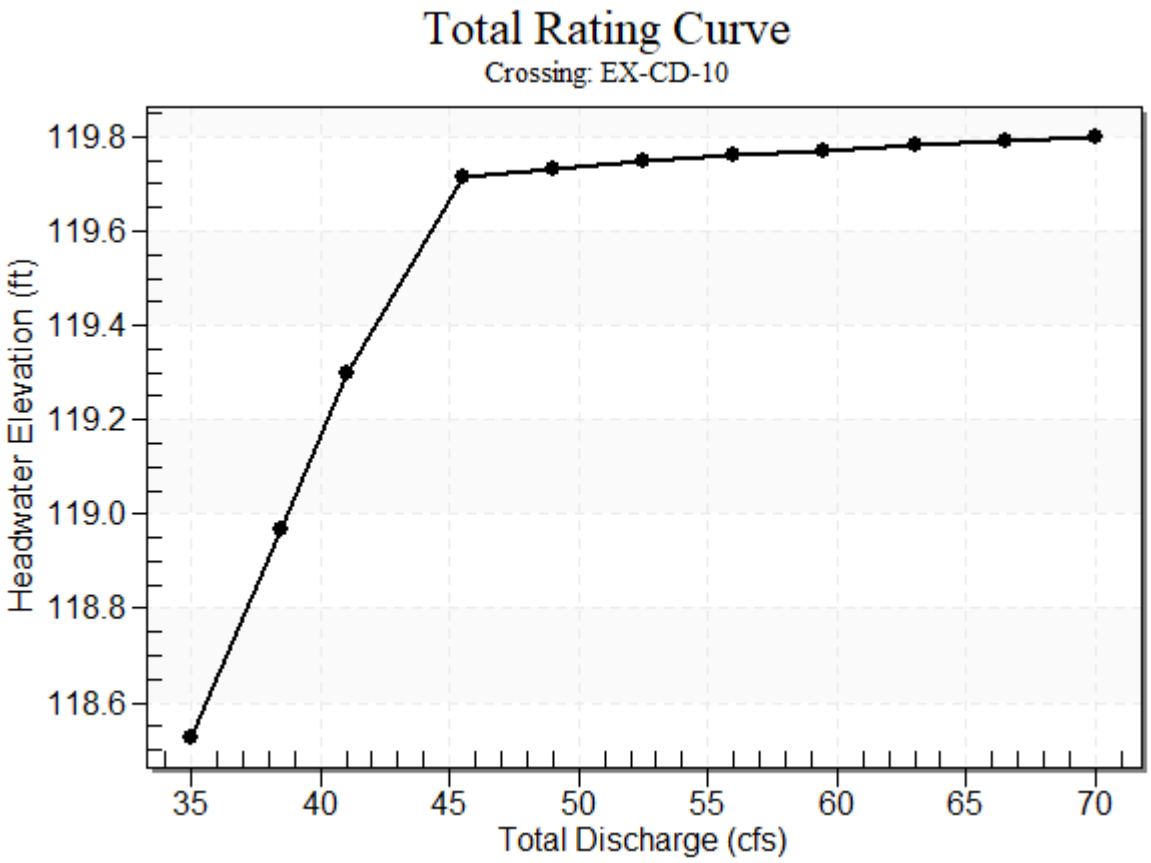


Table 60 - Culvert Summary Table: Culvert 1

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)
35.00	35.00	118.53	3.686	4.028	7-M2c	2.500	2.009	2.009	0.830	8.279	0.000
38.50	38.50	118.97	4.101	4.469	7-M2c	2.500	2.095	2.095	0.830	8.764	0.000
41.00	41.00	119.30	4.425	4.799	7-M2c	2.500	2.150	2.150	0.830	9.130	0.000
45.50	44.09	119.71	4.856	5.213	7-M2c	2.500	2.209	2.209	0.830	9.604	0.000
49.00	44.18	119.73	4.869	5.232	7-M2c	2.500	2.211	2.211	0.830	9.618	0.000
52.50	44.32	119.75	4.891	5.246	7-M2c	2.500	2.214	2.214	0.830	9.642	0.000
56.00	44.42	119.76	4.904	5.259	7-M2c	2.500	2.215	2.215	0.830	9.656	0.000
59.50	44.50	119.77	4.917	5.271	7-M2c	2.500	2.217	2.217	0.830	9.670	0.000
63.00	44.53	119.78	4.922	5.282	7-M2c	2.500	2.217	2.217	0.830	9.675	0.000
66.50	44.64	119.79	4.937	5.297	7-M2c	2.500	2.219	2.219	0.830	9.692	0.000
70.00	44.68	119.80	4.943	5.302	7-M2c	2.500	2.220	2.220	0.830	9.698	0.000

****

Straight Culvert

Inlet Elevation (invert): 114.50 ft, Outlet Elevation (invert): 114.45 ft

Culvert Length: 103.00 ft, Culvert Slope: 0.0005

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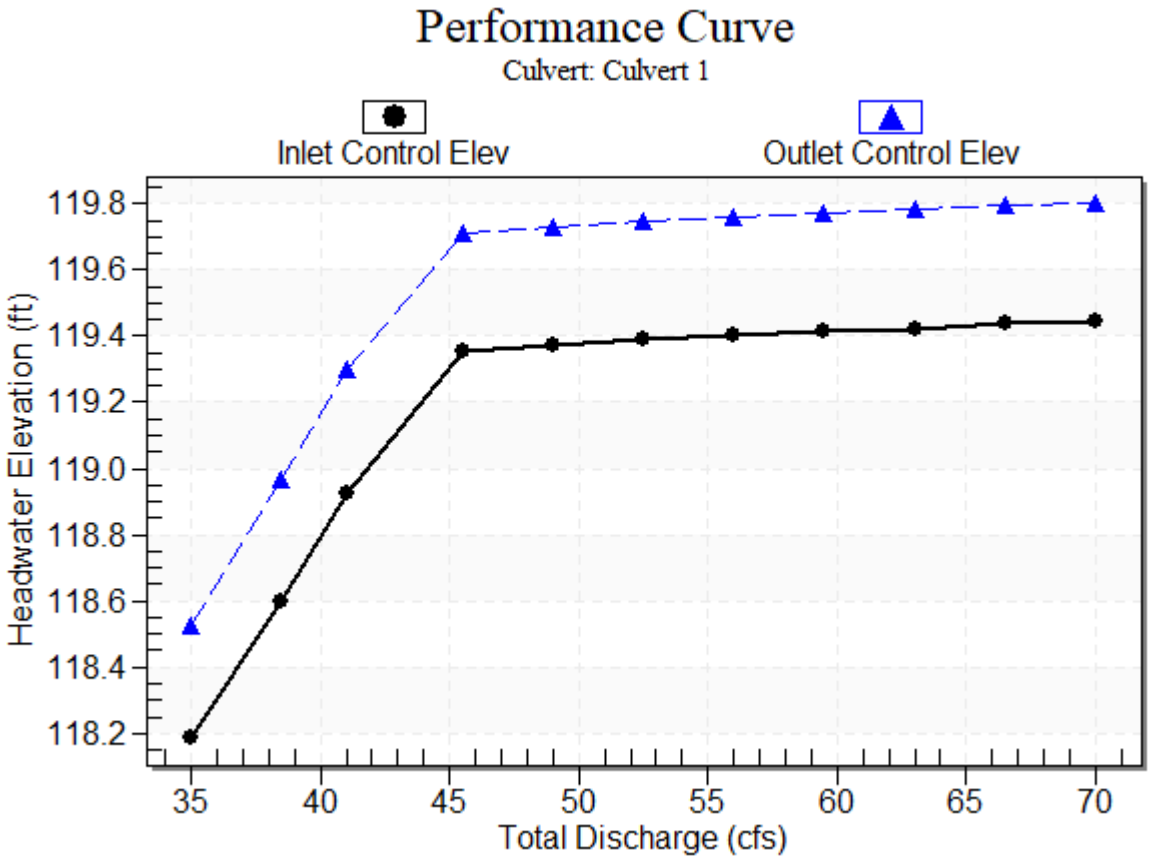
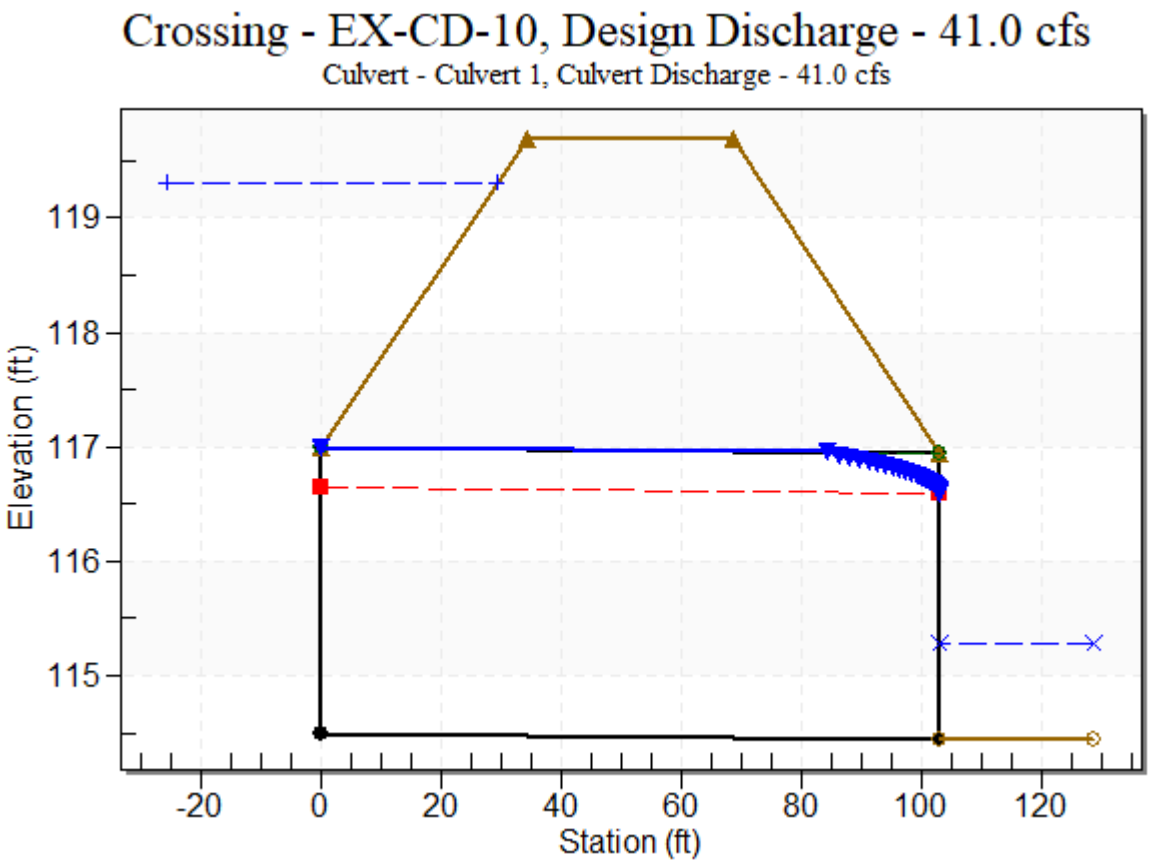
Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 114.50 ft

Outlet Station: 103.00 ft

Outlet Elevation: 114.45 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 61 - Downstream Channel Rating Curve (Crossing: EX-CD-10)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
35.00	115.28	0.83
38.50	115.28	0.83
41.00	115.28	0.83
45.50	115.28	0.83
49.00	115.28	0.83
52.50	115.28	0.83
56.00	115.28	0.83
59.50	115.28	0.83
63.00	115.28	0.83
66.50	115.28	0.83
70.00	115.28	0.83

Tailwater Channel Data - EX-CD-10

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 115.28 ft

Roadway Data for Crossing: EX-CD-10

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 119.70 ft

Roadway Surface: Paved

Roadway Top Width: 34.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 35 cfs

Design Flow: 41 cfs

Maximum Flow: 70 cfs

Table 62 - Summary of Culvert Flows at Crossing: PR-CD-10

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
117.77	35.00	35.00	0.00	1
118.00	38.50	38.50	0.00	1
118.16	41.00	41.00	0.00	1
118.50	45.50	45.50	0.00	1
118.83	49.00	49.00	0.00	1
119.14	52.50	52.50	0.00	1
119.50	56.00	56.00	0.00	1
119.71	59.50	58.28	0.97	29
119.73	63.00	58.47	4.26	5
119.75	66.50	58.55	7.65	4
119.76	70.00	58.55	11.26	4
119.70	58.16	58.16	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-10

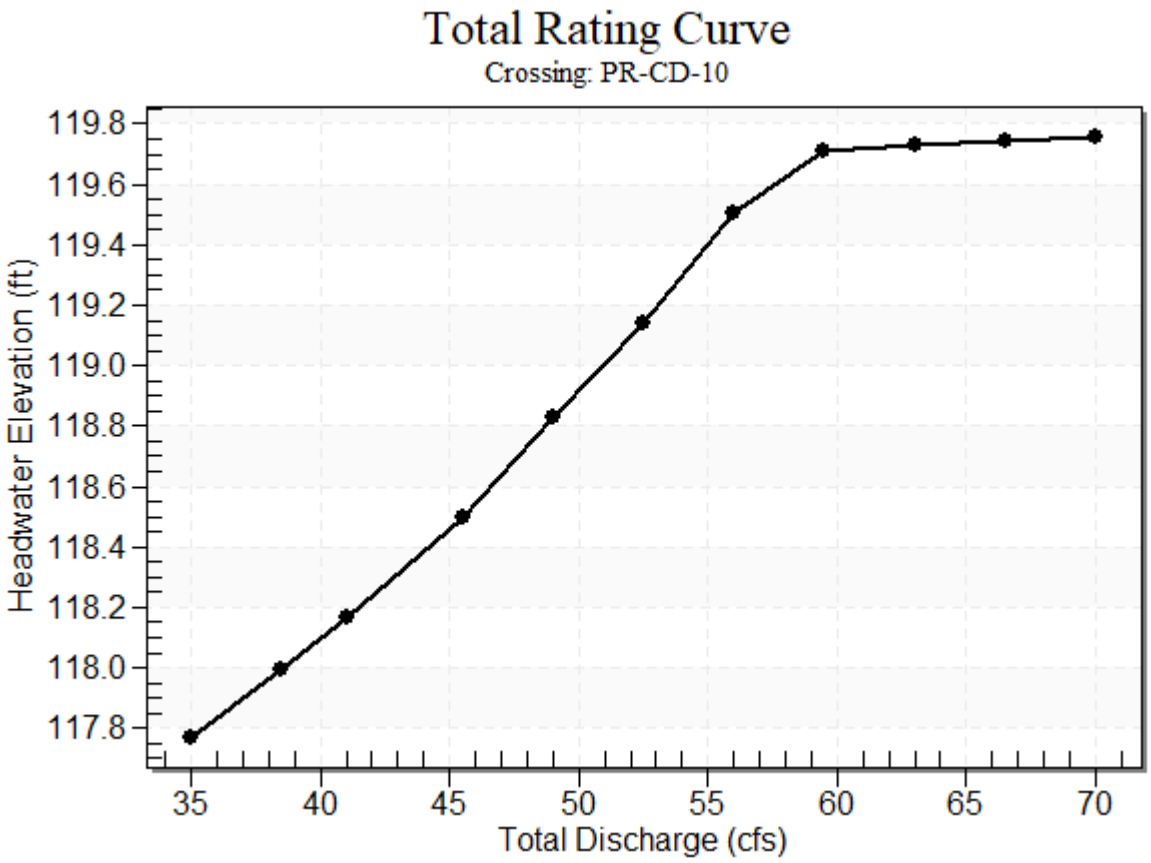


Table 63 - Culvert Summary Table: Culvert 1

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)
35.00	35.00	117.77	2.993	3.222	7-M2c	3.000	1.922	1.922	0.930	7.316	0.000
38.50	38.50	118.00	3.206	3.447	7-M2c	3.000	2.019	2.019	0.930	7.609	0.000
41.00	41.00	118.16	3.365	3.614	7-M2c	3.000	2.085	2.085	0.930	7.819	0.000
45.50	45.50	118.50	3.668	3.946	7-M2c	3.000	2.197	2.197	0.930	8.201	0.000
49.00	49.00	118.83	3.923	4.281	7-M2c	3.000	2.279	2.279	0.930	8.506	0.000
52.50	52.50	119.14	4.196	4.590	7-M2c	3.000	2.355	2.355	0.930	8.819	0.000
56.00	56.00	119.50	4.490	4.954	7-M2c	3.000	2.426	2.426	0.930	9.143	0.000
59.50	58.28	119.71	4.692	5.161	7-M2c	3.000	2.470	2.470	0.930	9.360	0.000
63.00	58.47	119.73	4.710	5.181	7-M2c	3.000	2.474	2.474	0.930	9.379	0.000
66.50	58.55	119.75	4.717	5.212	7-M2c	3.000	2.475	2.475	0.930	9.387	0.000
70.00	58.55	119.76	4.717	5.212	7-M2c	3.000	2.475	2.475	0.930	9.387	0.000

****

Straight Culvert

Inlet Elevation (invert): 114.55 ft, Outlet Elevation (invert): 114.35 ft

Culvert Length: 160.00 ft, Culvert Slope: 0.0013

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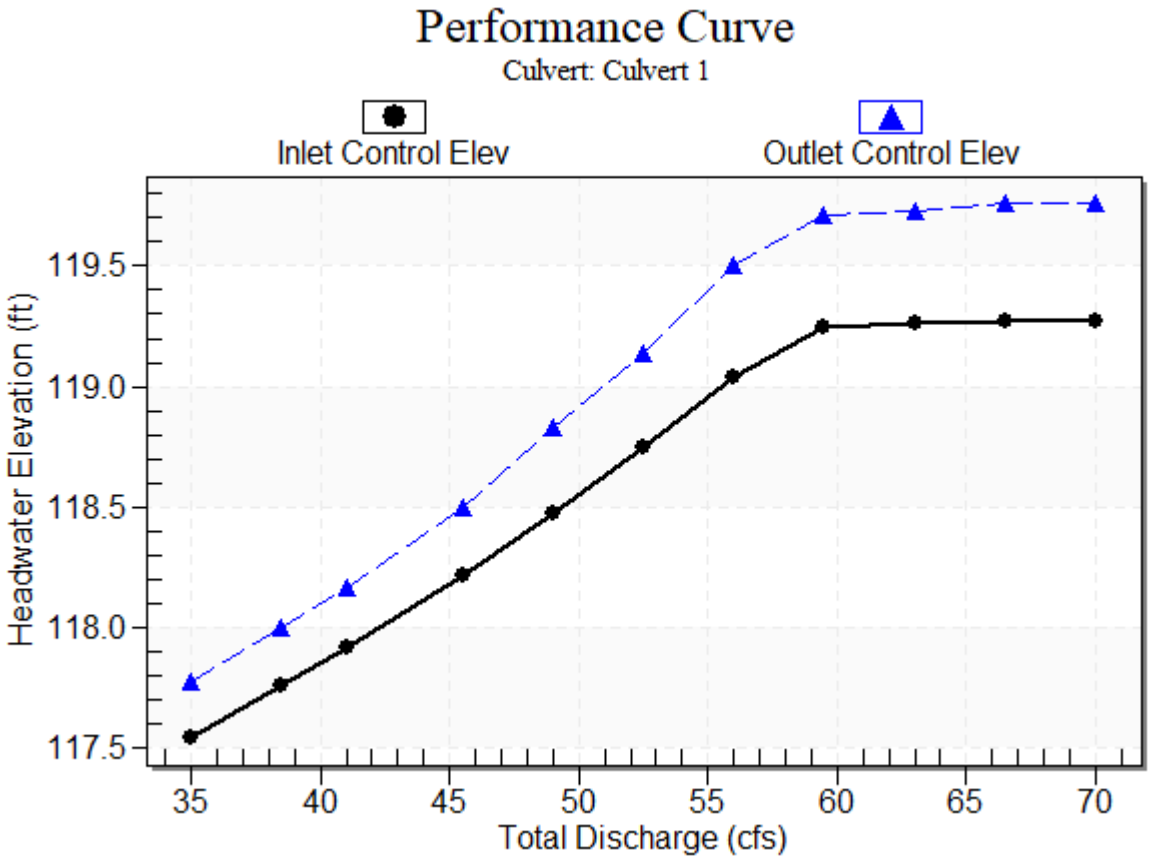
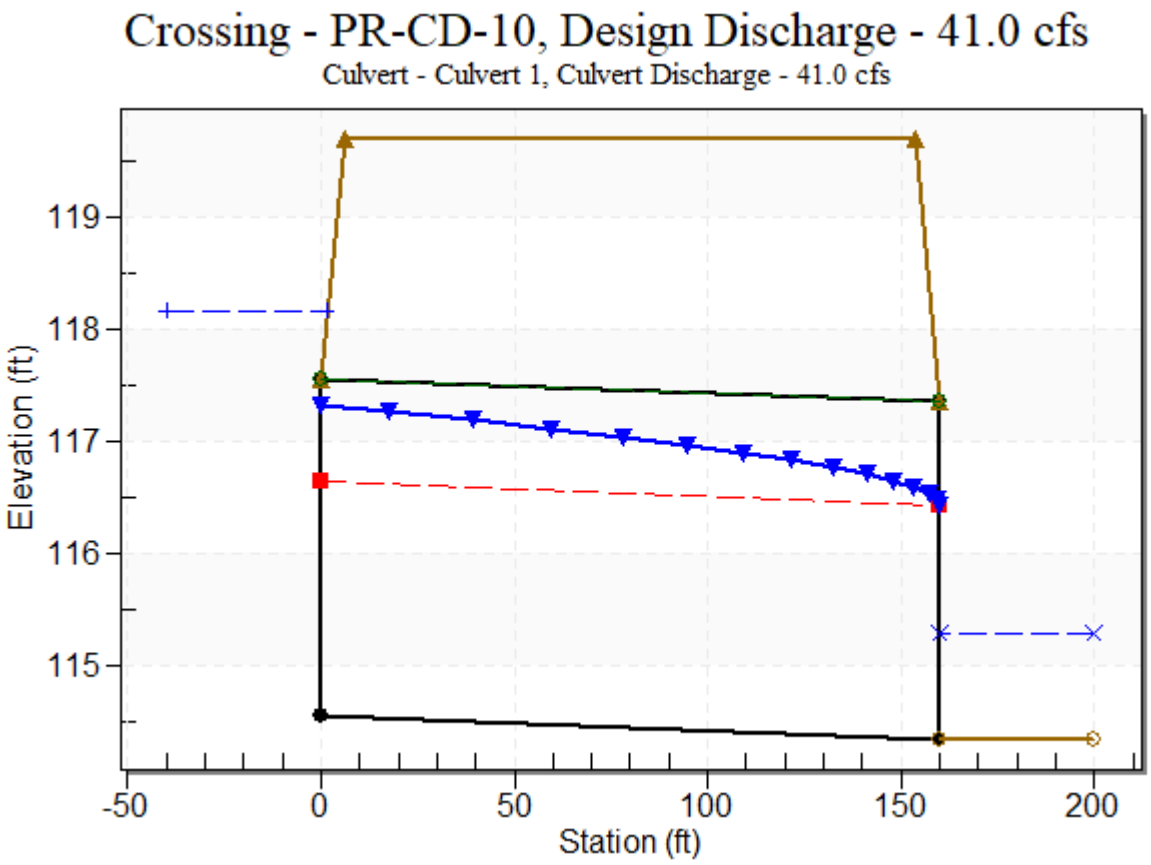
Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 114.55 ft

Outlet Station: 160.00 ft

Outlet Elevation: 114.35 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 64 - Downstream Channel Rating Curve (Crossing: PR-CD-10)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
35.00	115.28	0.93
38.50	115.28	0.93
41.00	115.28	0.93
45.50	115.28	0.93
49.00	115.28	0.93
52.50	115.28	0.93
56.00	115.28	0.93
59.50	115.28	0.93
63.00	115.28	0.93
66.50	115.28	0.93
70.00	115.28	0.93

Tailwater Channel Data - PR-CD-10

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 115.28 ft

Roadway Data for Crossing: PR-CD-10

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 119.70 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 35 cfs

Design Flow: 41 cfs

Maximum Flow: 70 cfs

Table 65 - Summary of Culvert Flows at Crossing: EX-CD-11

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
113.76	35.00	35.00	0.00	1
114.17	38.50	38.50	0.00	1
114.49	41.00	41.00	0.00	1
115.10	45.50	45.50	0.00	1
115.62	49.00	49.00	0.00	1
115.81	52.50	50.27	1.81	30
115.82	56.00	50.32	5.18	4
115.83	59.50	50.41	8.84	4
115.83	63.00	50.44	12.12	3
115.84	66.50	50.49	15.66	3
115.85	70.00	50.51	19.23	3
115.80	50.23	50.23	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-11

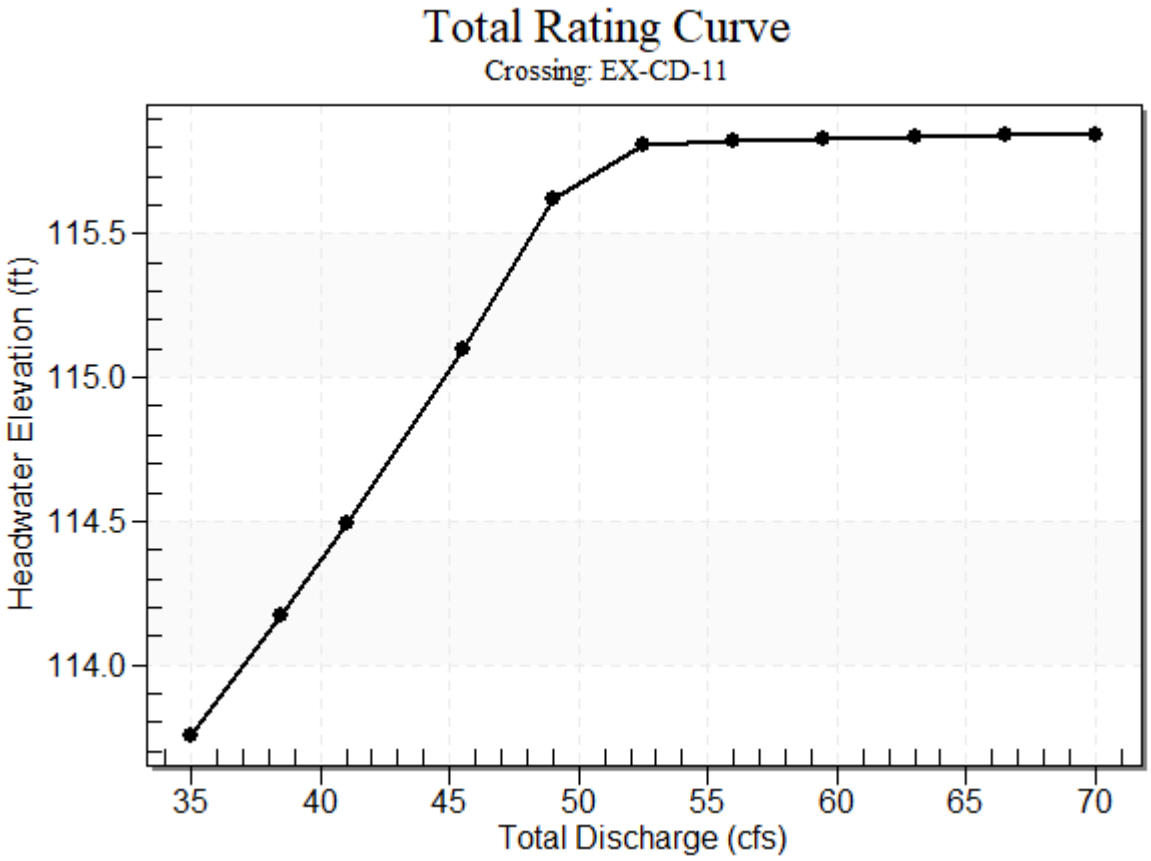


Table 66 - Culvert Summary Table: Culvert 1

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)
35.00	35.00	113.76	3.685	3.948	7-M2t	2.500	2.009	2.170	2.170	7.734	0.000
38.50	38.50	114.17	4.100	4.362	7-M2t	2.500	2.095	2.170	2.170	8.508	0.000
41.00	41.00	114.49	4.423	4.681	7-M2t	2.500	2.150	2.170	2.170	9.060	0.000
45.50	45.50	115.10	5.065	5.291	7-M2c	2.500	2.234	2.234	2.170	9.830	0.000
49.00	49.00	115.62	5.614	5.808	7-M2c	2.500	2.286	2.286	2.170	10.412	0.000
52.50	50.27	115.81	5.824	6.001	7-M2c	2.500	2.303	2.303	2.170	10.630	0.000
56.00	50.32	115.82	5.834	6.009	7-M2c	2.500	2.304	2.304	2.170	10.640	0.000
59.50	50.41	115.83	5.847	6.018	7-M2c	2.500	2.305	2.305	2.170	10.654	0.000
63.00	50.44	115.83	5.854	6.023	7-M2c	2.500	2.305	2.305	2.170	10.661	0.000
66.50	50.49	115.84	5.861	6.030	7-M2c	2.500	2.306	2.306	2.170	10.669	0.000
70.00	50.51	115.85	5.864	6.037	7-M2c	2.500	2.306	2.306	2.170	10.672	0.000

****

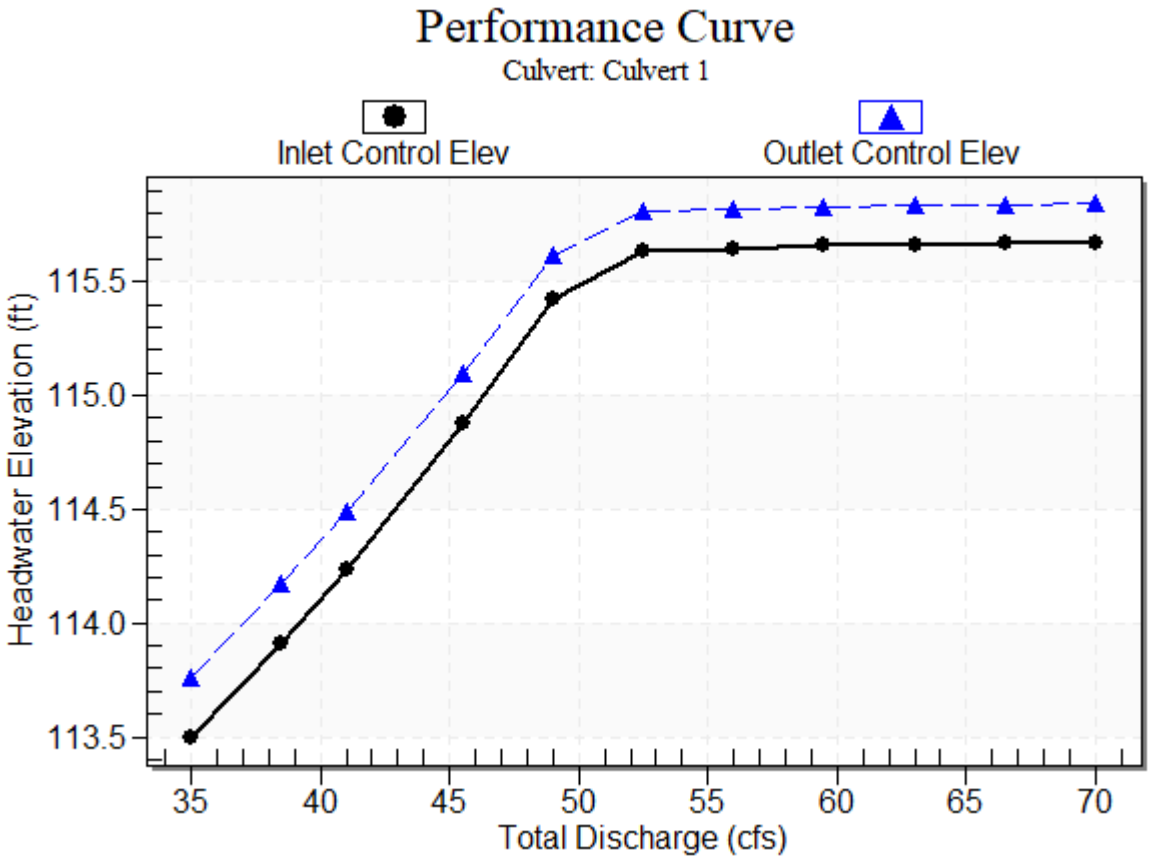
Straight Culvert

Inlet Elevation (invert): 109.81 ft, Outlet Elevation (invert): 109.67 ft

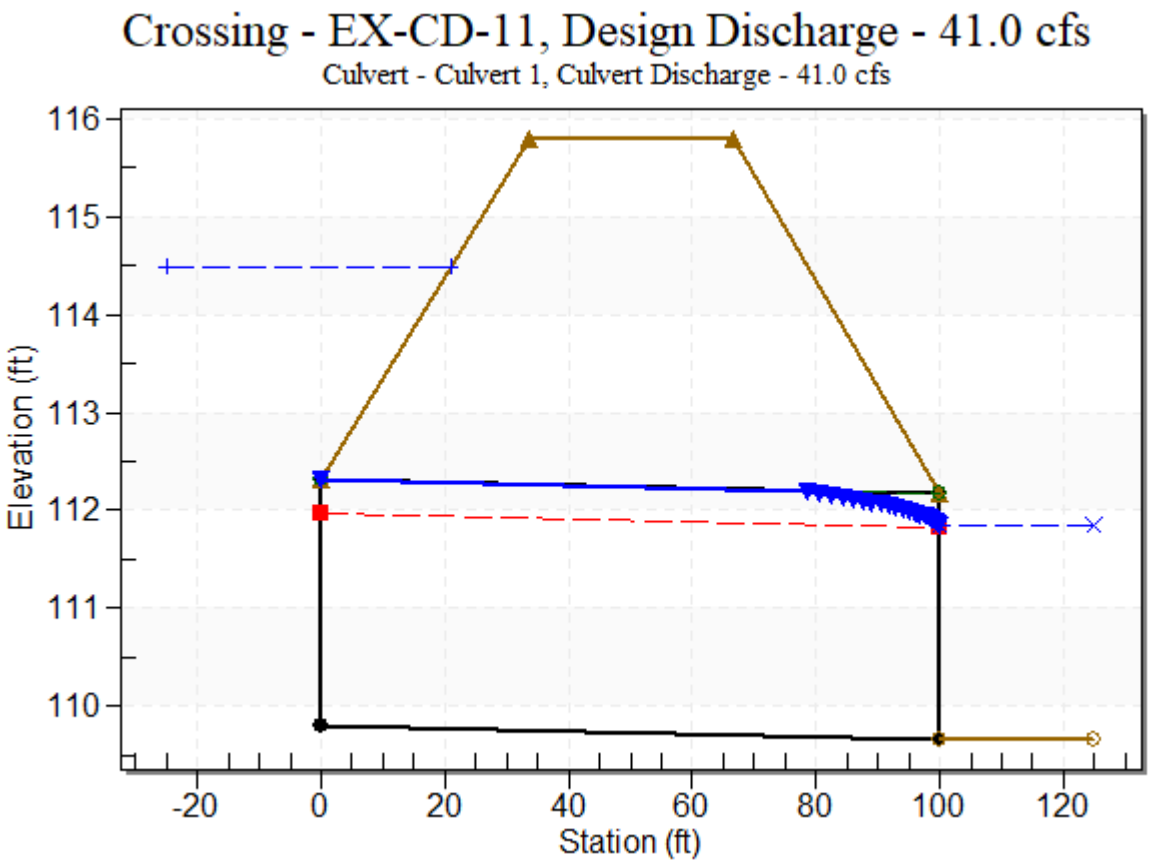
Culvert Length: 100.00 ft, Culvert Slope: 0.0014

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 109.81 ft

Outlet Station: 100.00 ft

Outlet Elevation: 109.67 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 67 - Downstream Channel Rating Curve (Crossing: EX-CD-11)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
35.00	111.84	2.17
38.50	111.84	2.17
41.00	111.84	2.17
45.50	111.84	2.17
49.00	111.84	2.17
52.50	111.84	2.17
56.00	111.84	2.17
59.50	111.84	2.17
63.00	111.84	2.17
66.50	111.84	2.17
70.00	111.84	2.17

Tailwater Channel Data - EX-CD-11

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 111.84 ft

Roadway Data for Crossing: EX-CD-11

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 700.00 ft

Crest Elevation: 115.80 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 35 cfs

Design Flow: 41 cfs

Maximum Flow: 70 cfs

Table 68 - Summary of Culvert Flows at Crossing: PR-CD-11

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
113.05	35.00	35.00	0.00	1
113.26	38.50	38.50	0.00	1
113.42	41.00	41.00	0.00	1
113.75	45.50	45.50	0.00	1
114.08	49.00	49.00	0.00	1
114.39	52.50	52.50	0.00	1
114.75	56.00	56.00	0.00	1
115.09	59.50	59.50	0.00	1
115.45	63.00	63.00	0.00	1
115.78	66.50	65.97	0.00	66
115.81	70.00	66.30	3.06	8
115.80	66.18	66.18	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-11

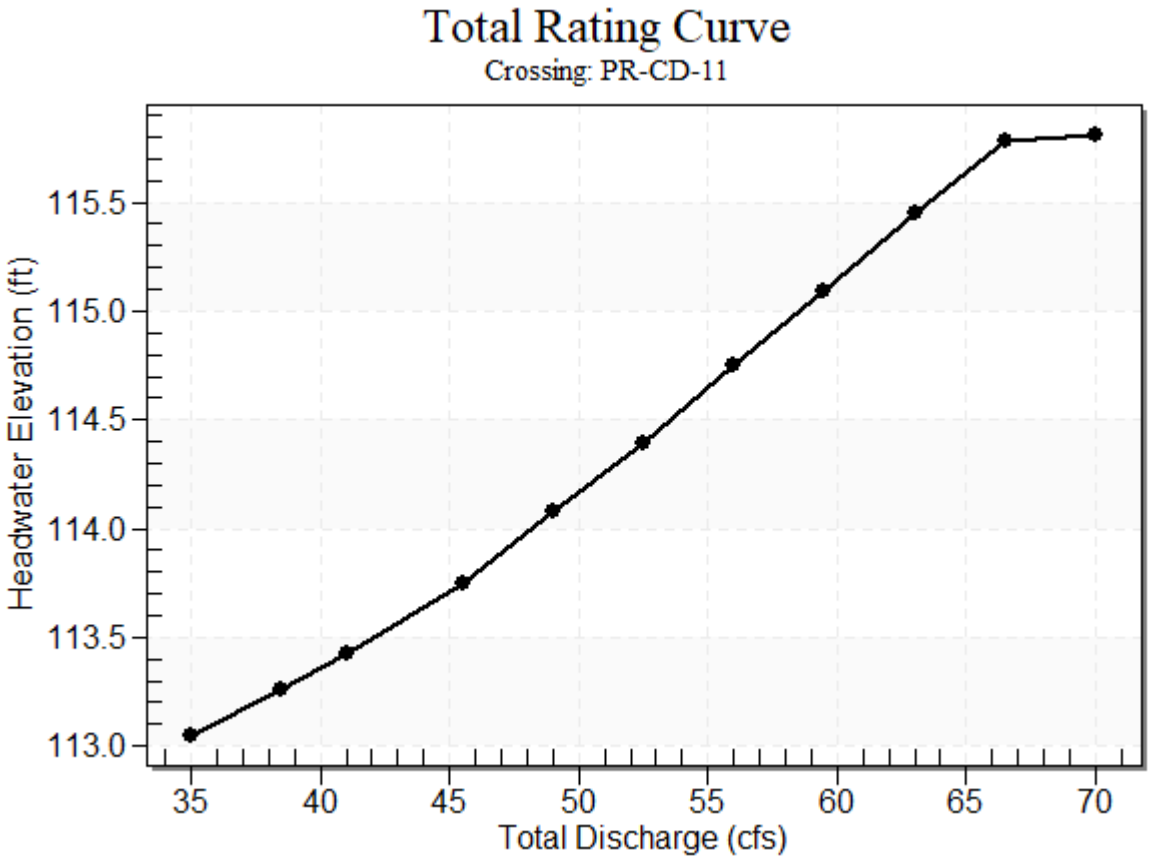


Table 69 - Culvert Summary Table: Culvert 1

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)
35.00	35.00	113.05	2.993	3.253	3-M2t	3.000	1.922	2.240	2.240	6.183	0.000
38.50	38.50	113.26	3.206	3.463	3-M2t	3.000	2.019	2.240	2.240	6.801	0.000
41.00	41.00	113.42	3.365	3.623	3-M2t	3.000	2.085	2.240	2.240	7.243	0.000
45.50	45.50	113.75	3.668	3.947	3-M2t	3.000	2.197	2.240	2.240	8.038	0.000
49.00	49.00	114.08	3.923	4.281	7-M2c	3.000	2.279	2.279	2.240	8.506	0.000
52.50	52.50	114.39	4.196	4.590	7-M2c	3.000	2.355	2.355	2.240	8.819	0.000
56.00	56.00	114.75	4.490	4.954	7-M2c	3.000	2.426	2.426	2.240	9.143	0.000
59.50	59.50	115.09	4.804	5.293	7-M2c	3.000	2.492	2.492	2.240	9.479	0.000
63.00	63.00	115.45	5.140	5.654	7-M2c	3.000	2.553	2.553	2.240	9.828	0.000
66.50	65.97	115.78	5.442	5.977	7-M2c	3.000	2.600	2.600	2.240	10.136	0.000
70.00	66.30	115.81	5.477	6.013	7-M2c	3.000	2.605	2.605	2.240	10.171	0.000

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Straight Culvert

Inlet Elevation (invert): 109.80 ft, Outlet Elevation (invert): 109.60 ft

Culvert Length: 160.00 ft, Culvert Slope: 0.0013

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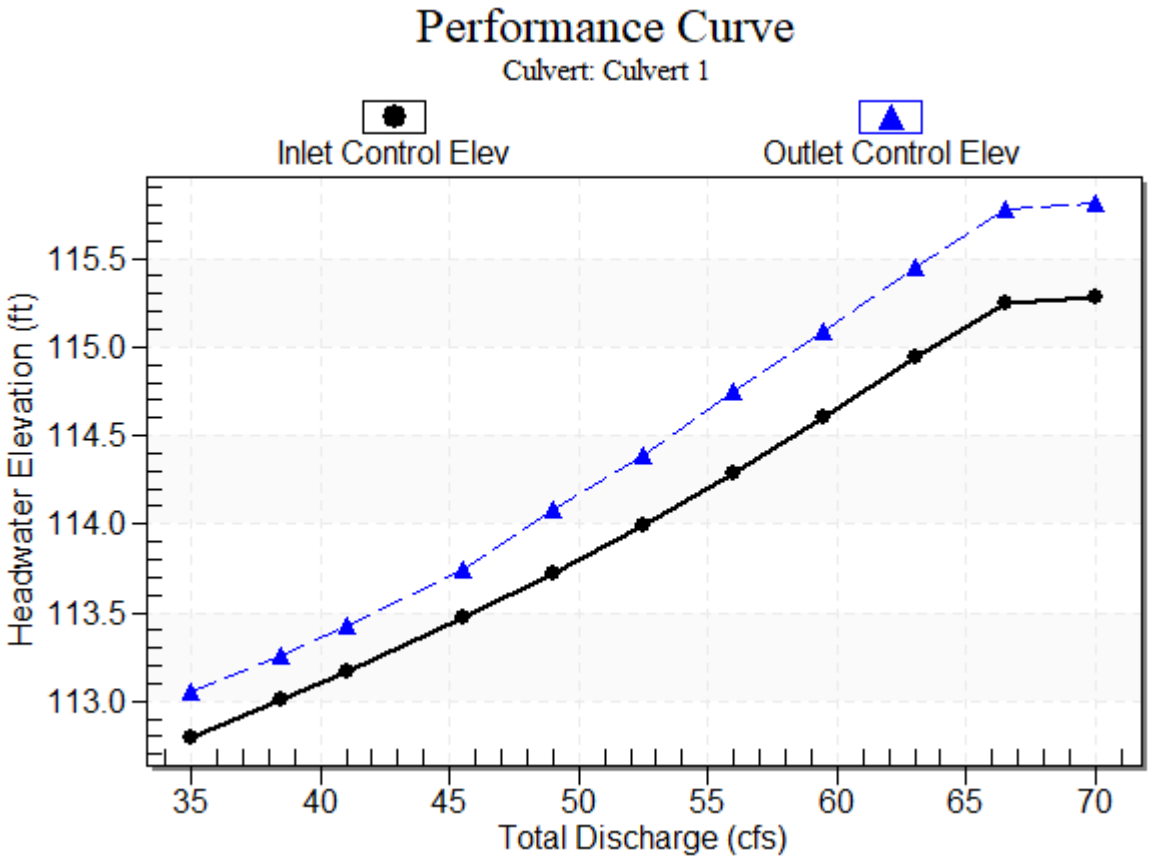
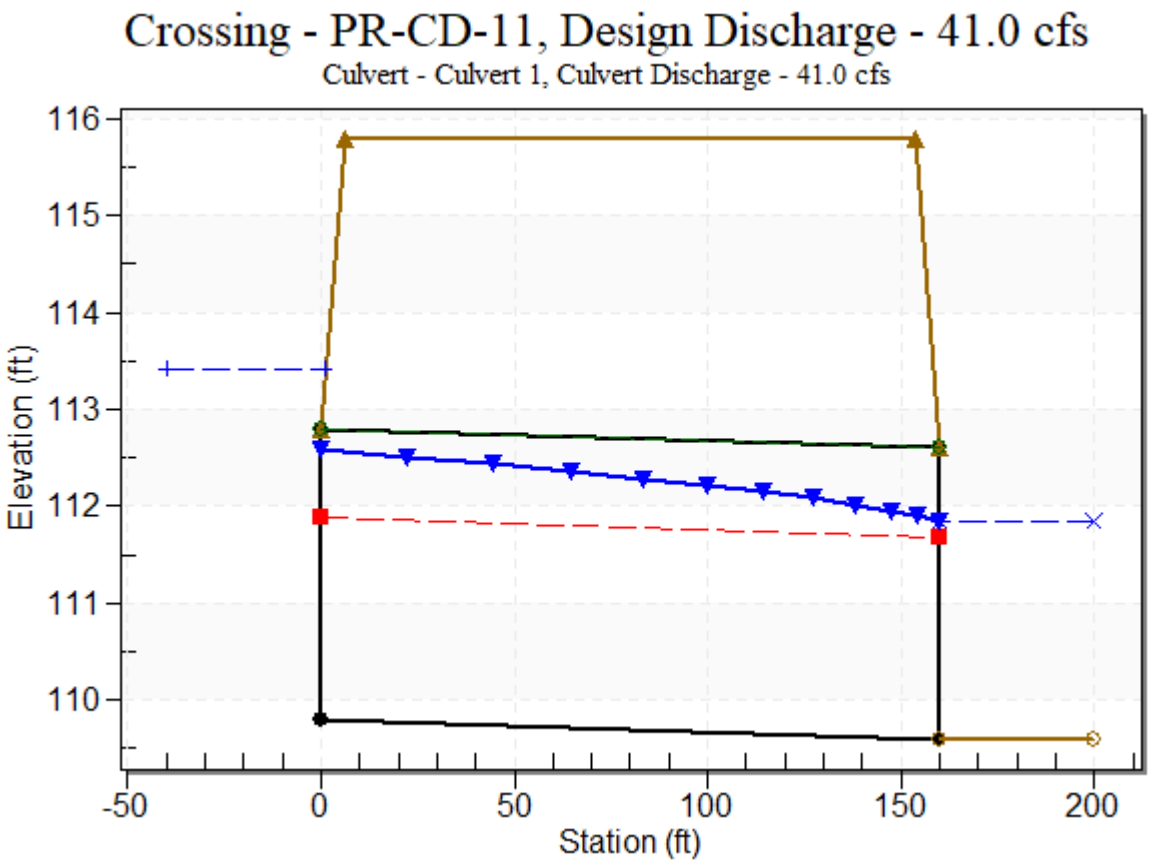
Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 109.80 ft

Outlet Station: 160.00 ft

Outlet Elevation: 109.60 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 70 - Downstream Channel Rating Curve (Crossing: PR-CD-11)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
35.00	111.84	2.24
38.50	111.84	2.24
41.00	111.84	2.24
45.50	111.84	2.24
49.00	111.84	2.24
52.50	111.84	2.24
56.00	111.84	2.24
59.50	111.84	2.24
63.00	111.84	2.24
66.50	111.84	2.24
70.00	111.84	2.24

Tailwater Channel Data - PR-CD-11

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 111.84 ft

Roadway Data for Crossing: PR-CD-11

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 700.00 ft

Crest Elevation: 115.80 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 70 cfs

Design Flow: 82 cfs

Maximum Flow: 140 cfs

Table 71 - Summary of Culvert Flows at Crossing: EX-CD-12

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
107.58	70.00	33.41	36.48	0.00	26
107.99	77.00	36.77	39.79	0.00	58
108.03	82.00	37.14	40.14	4.38	8
108.07	91.00	37.41	40.39	12.85	5
108.09	98.00	37.57	40.55	19.53	4
108.11	105.00	37.64	40.69	26.43	4
108.12	112.00	37.70	40.82	32.95	3
108.14	119.00	37.83	40.94	39.78	3
108.15	126.00	37.98	41.05	46.63	3
108.17	133.00	38.11	41.16	53.47	3
108.18	140.00	38.24	41.26	60.31	3
108.00	76.79	36.89	39.90	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-12

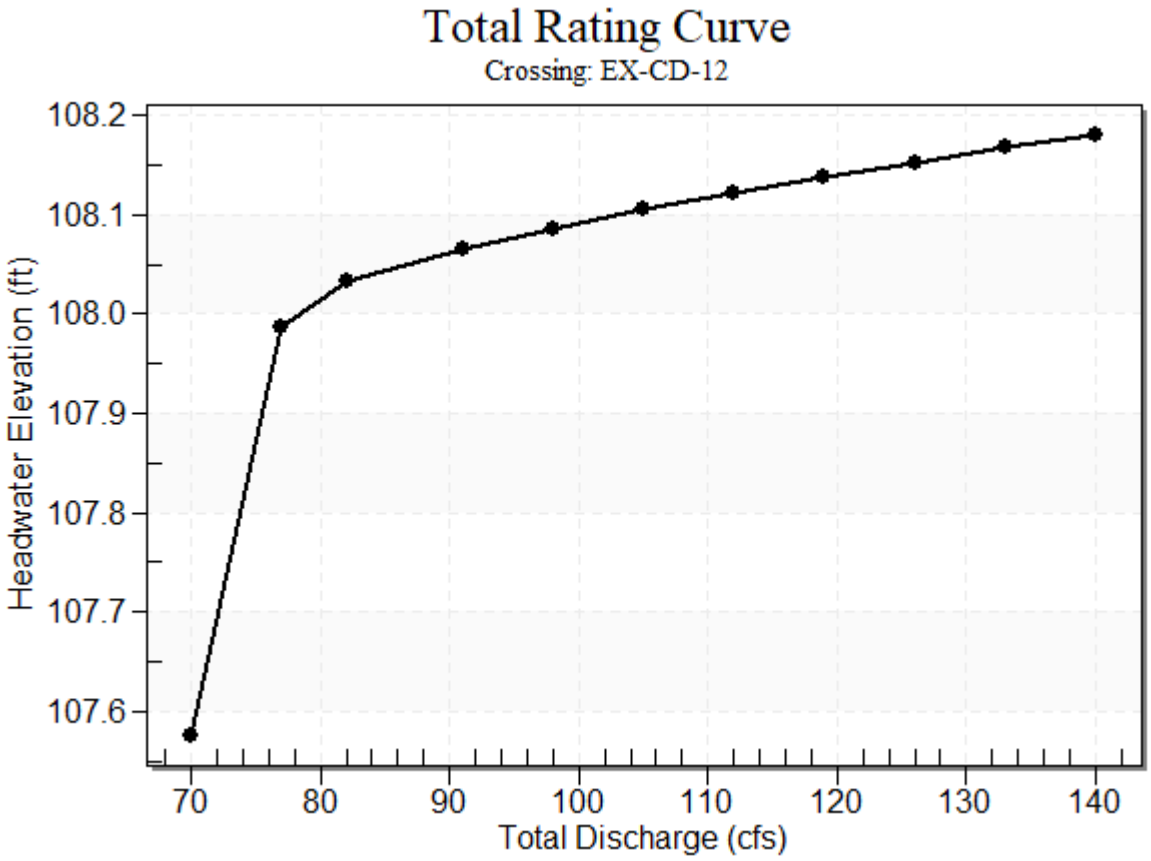


Table 72 - Culvert Summary Table: Culvert 1

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)
70.00	33.41	107.58	3.511	3.816	7-M2c	2.500	1.966	1.966	1.500	8.067	0.000
77.00	36.77	107.99	3.890	4.225	7-M2c	2.500	2.054	2.054	1.500	8.521	0.000
82.00	37.14	108.03	3.934	4.271	7-M2c	2.500	2.063	2.063	1.500	8.572	0.000
91.00	37.41	108.07	3.966	4.304	7-M2c	2.500	2.069	2.069	1.500	8.609	0.000
98.00	37.57	108.09	3.986	4.325	7-M2c	2.500	2.073	2.073	1.500	8.632	0.000
105.00	37.64	108.11	3.994	4.356	7-M2c	2.500	2.075	2.075	1.500	8.641	0.000
112.00	37.70	108.12	4.001	4.362	7-M2c	2.500	2.076	2.076	1.500	8.650	0.000
119.00	37.83	108.14	4.018	4.377	7-M2c	2.500	2.080	2.080	1.500	8.669	0.000
126.00	37.98	108.15	4.036	4.392	7-M2c	2.500	2.083	2.083	1.500	8.690	0.000
133.00	38.11	108.17	4.053	4.407	7-M2c	2.500	2.086	2.086	1.500	8.709	0.000
140.00	38.24	108.18	4.069	4.420	7-M2c	2.500	2.089	2.089	1.500	8.727	0.000

****

Straight Culvert

Inlet Elevation (invert): 103.76 ft, Outlet Elevation (invert): 103.69 ft

Culvert Length: 103.00 ft, Culvert Slope: 0.0007

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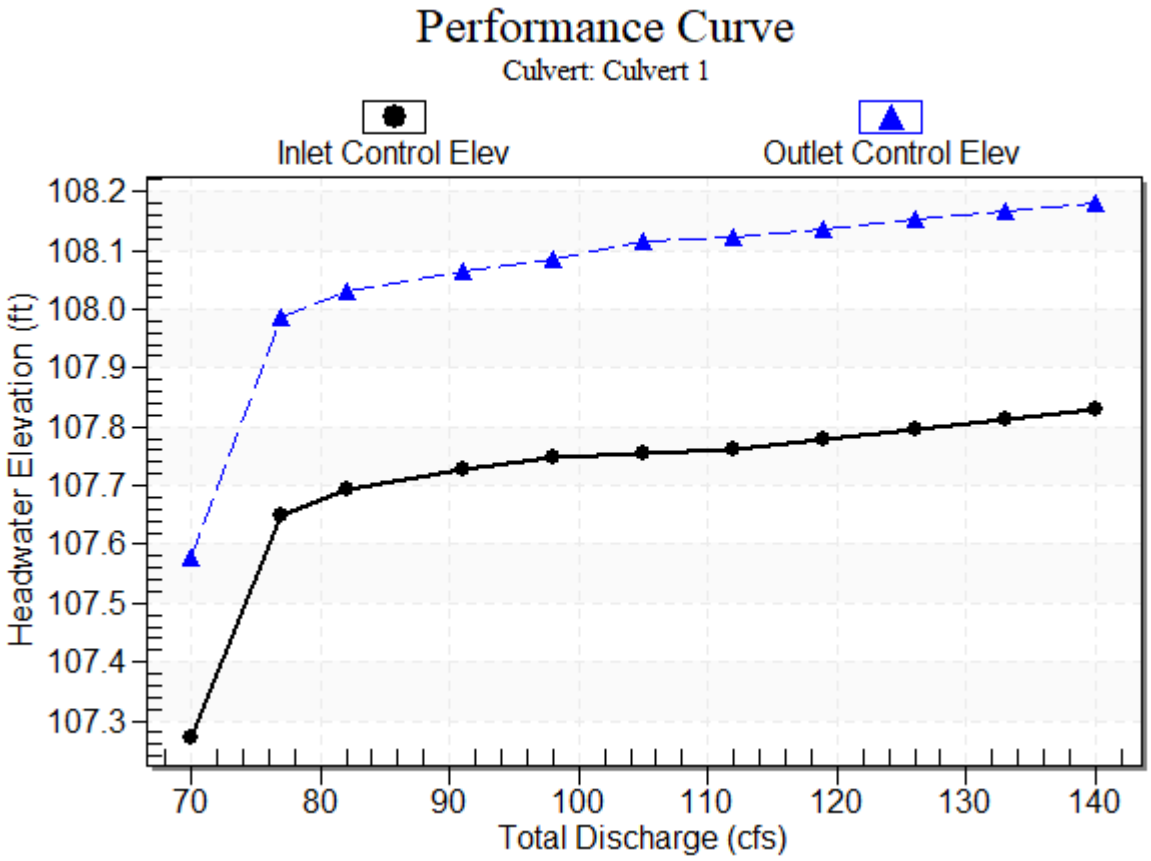
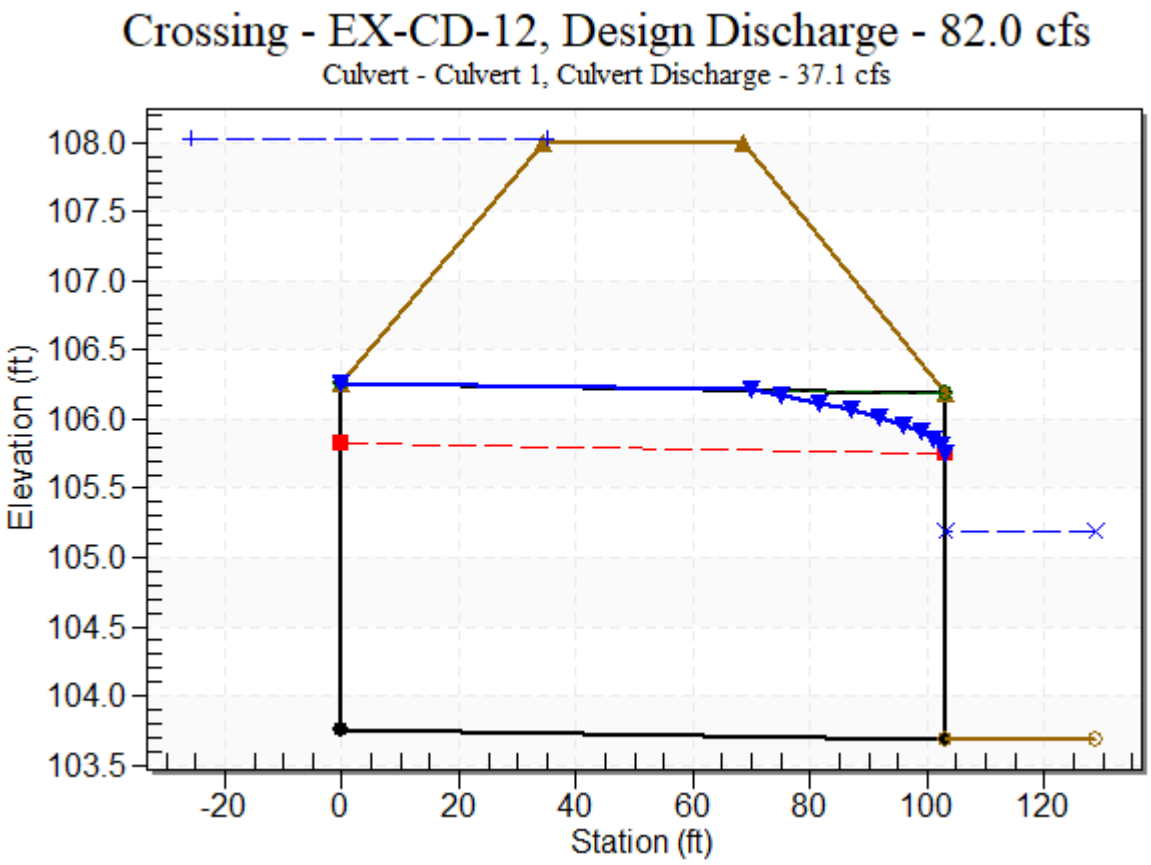
Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 103.76 ft

Outlet Station: 103.00 ft

Outlet Elevation: 103.69 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 73 - Culvert Summary Table: Culvert 2

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)
70.00	36.48	107.58	3.856	3.787	7-JA2c	-1.000	2.047	2.047	1.500	8.480	0.000
77.00	39.79	107.99	4.266	4.032	7-JA2c	-1.000	2.124	2.124	1.500	8.952	0.000
82.00	40.14	108.03	4.311	4.059	7-JA2c	-1.000	2.132	2.132	1.500	9.003	0.000
91.00	40.39	108.07	4.344	4.078	7-JA2c	-1.000	2.137	2.137	1.500	9.041	0.000
98.00	40.55	108.09	4.365	4.091	7-JA2c	-1.000	2.141	2.141	1.500	9.064	0.000
105.00	40.69	108.11	4.384	4.102	7-JA2c	-1.000	2.144	2.144	1.500	9.086	0.000
112.00	40.82	108.12	4.401	4.112	7-JA2c	-1.000	2.146	2.146	1.500	9.104	0.000
119.00	40.94	108.14	4.417	4.121	7-JA2c	-1.000	2.149	2.149	1.500	9.122	0.000
126.00	41.05	108.15	4.432	4.130	7-JA2t	-1.000	2.151	2.151	1.500	9.139	0.000
133.00	41.16	108.17	4.446	4.139	7-JA2t	-1.000	2.153	2.153	1.500	9.155	0.000
140.00	41.26	108.18	4.460	4.147	7-JA2c	-1.000	2.155	2.155	1.500	9.170	0.000

****

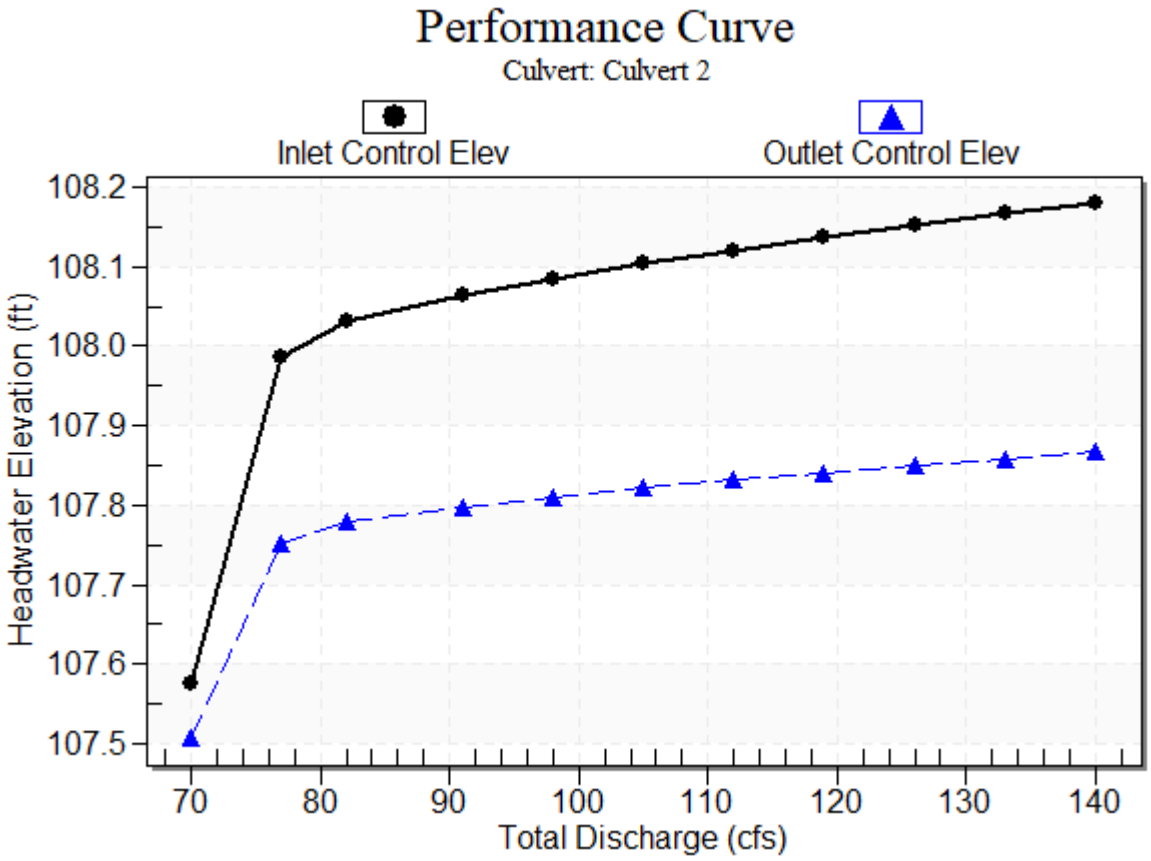
Straight Culvert

Inlet Elevation (invert): 103.72 ft, Outlet Elevation (invert): 103.74 ft

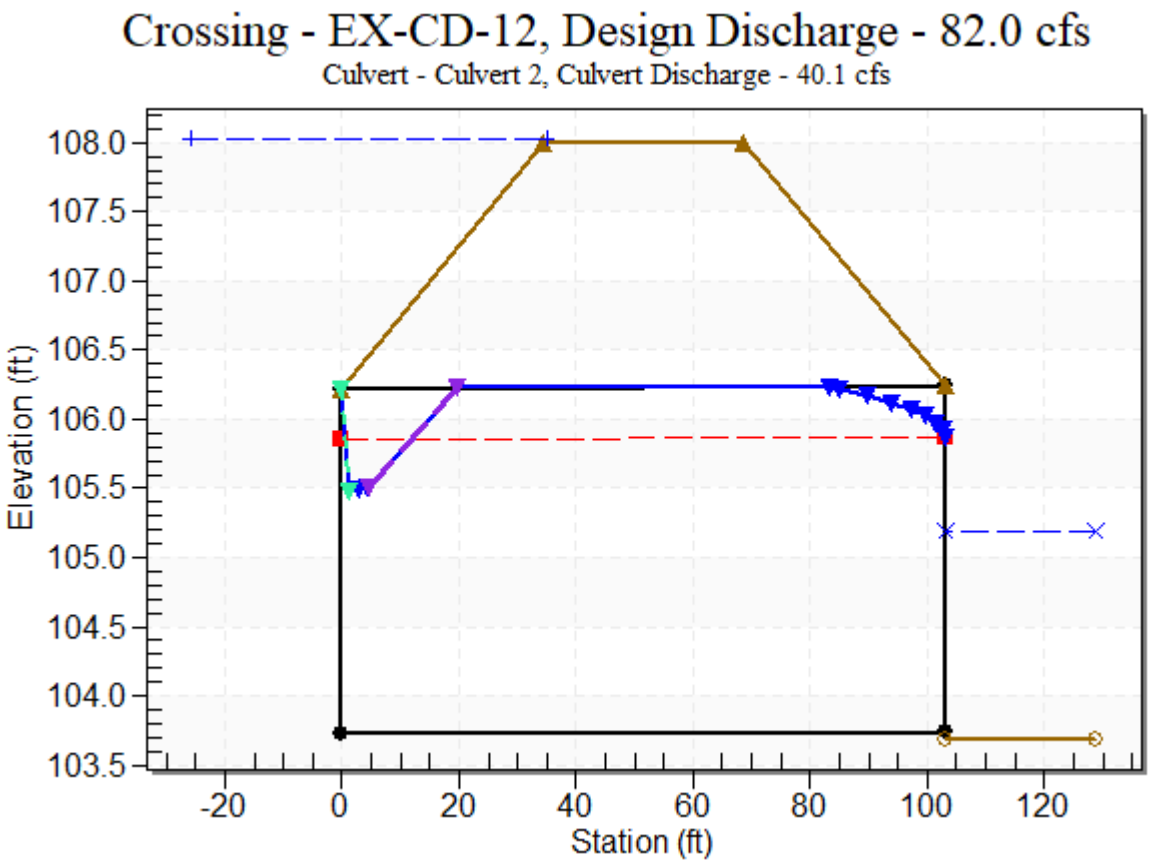
Culvert Length: 103.00 ft, Culvert Slope: -0.0002

****

Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 103.72 ft

Outlet Station: 103.00 ft

Outlet Elevation: 103.74 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 74 - Downstream Channel Rating Curve (Crossing: EX-CD-12)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
70.00	105.19	1.50
77.00	105.19	1.50
82.00	105.19	1.50
91.00	105.19	1.50
98.00	105.19	1.50
105.00	105.19	1.50
112.00	105.19	1.50
119.00	105.19	1.50
126.00	105.19	1.50
133.00	105.19	1.50
140.00	105.19	1.50

Tailwater Channel Data - EX-CD-12

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 105.19 ft

Roadway Data for Crossing: EX-CD-12

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 108.00 ft

Roadway Surface: Paved

Roadway Top Width: 34.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 70 cfs

Design Flow: 82 cfs

Maximum Flow: 140 cfs

Table 75 - Summary of Culvert Flows at Crossing: PR-CD-12

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Culvert 3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
106.61	70.00	23.21	23.40	23.40	0.00	5
106.83	77.00	25.61	25.70	25.70	0.00	4
107.03	82.00	27.37	27.32	27.32	0.00	4
107.42	91.00	30.36	30.32	30.32	0.00	4
107.71	98.00	32.67	32.64	32.64	0.00	10
108.02	105.00	34.93	34.92	34.92	0.00	34
108.31	112.00	36.97	36.96	36.96	0.74	34
108.34	119.00	37.20	37.19	37.19	7.08	6
108.37	126.00	37.37	37.36	37.36	13.69	5
108.39	133.00	37.51	37.50	37.50	20.20	4
108.41	140.00	37.63	37.62	37.62	26.93	4
108.30	110.67	36.90	36.89	36.89	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-12

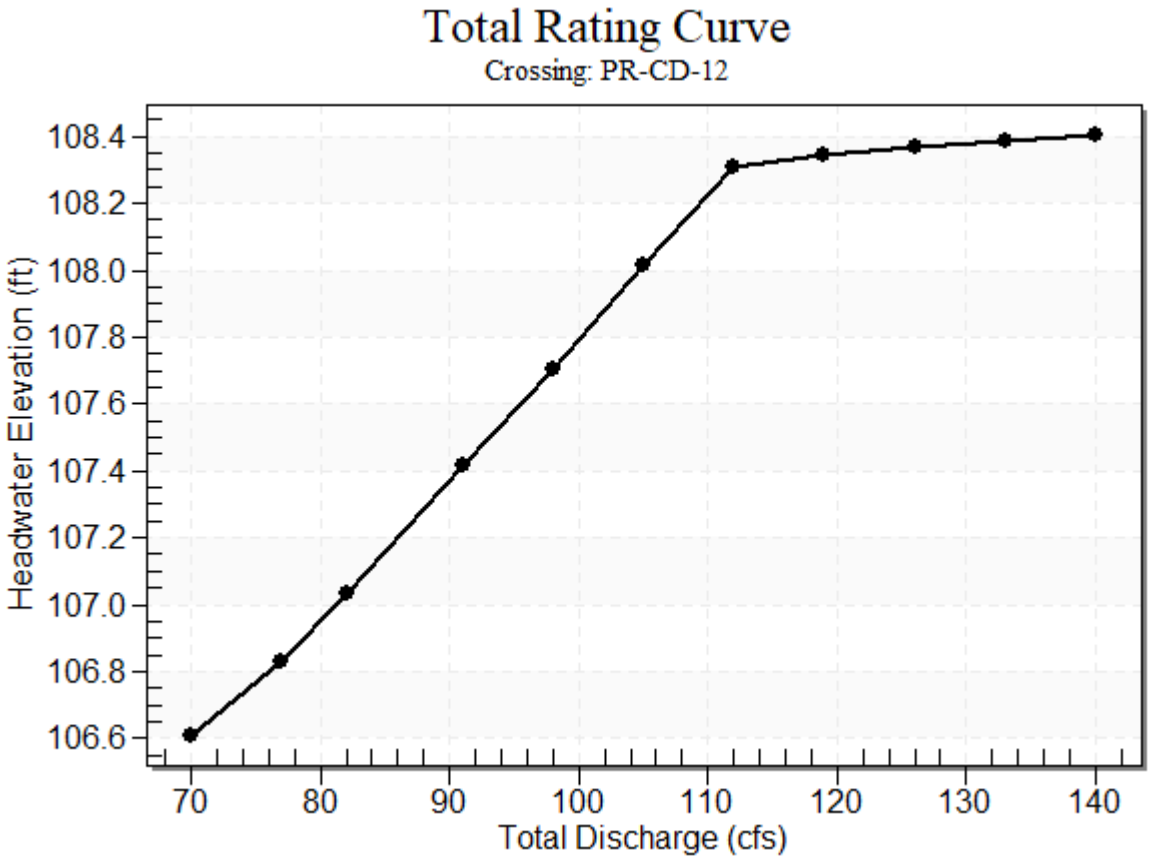


Table 76 - Culvert Summary Table: Culvert 1

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)
70.00	23.21	106.61	2.575	2.810	7-M2c	2.500	1.640	1.640	1.590	6.802	0.000
77.00	25.61	106.83	2.771	3.032	7-M2c	2.500	1.724	1.724	1.590	7.091	0.000
82.00	27.37	107.03	2.923	3.231	7-M2c	2.500	1.783	1.783	1.590	7.305	0.000
91.00	30.36	107.42	3.200	3.615	7-M2c	2.500	1.878	1.878	1.590	7.675	0.000
98.00	32.67	107.71	3.432	3.905	7-M2c	2.500	1.945	1.945	1.590	7.970	0.000
105.00	34.93	108.02	3.677	4.216	7-M2c	2.500	2.007	2.007	1.590	8.269	0.000
112.00	36.97	108.31	3.913	4.509	7-M2c	2.500	2.059	2.059	1.590	8.548	0.000
119.00	37.20	108.34	3.941	4.544	7-M2c	2.500	2.065	2.065	1.590	8.581	0.000
126.00	37.37	108.37	3.961	4.568	7-M2c	2.500	2.069	2.069	1.590	8.604	0.000
133.00	37.51	108.39	3.977	4.588	7-M2c	2.500	2.072	2.072	1.590	8.623	0.000
140.00	37.63	108.41	3.993	4.607	7-M2c	2.500	2.075	2.075	1.590	8.641	0.000

****

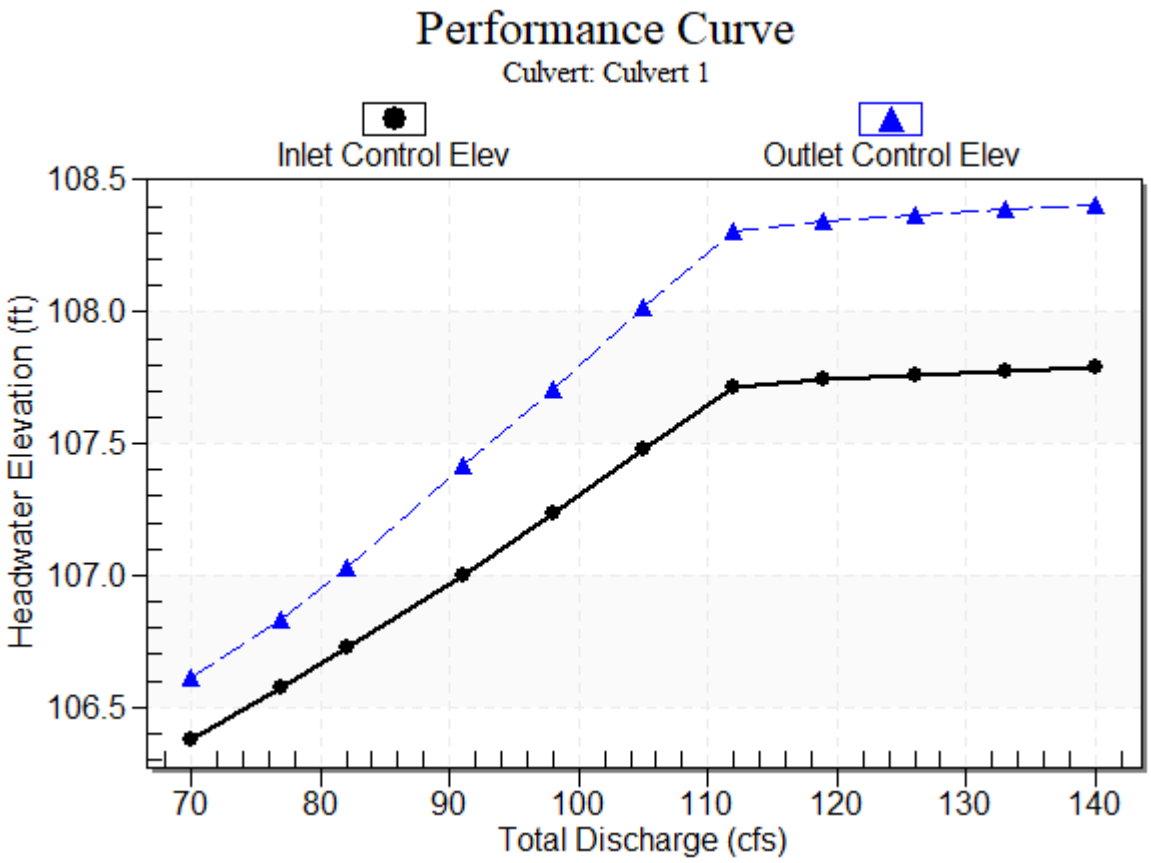
Straight Culvert

Inlet Elevation (invert): 103.80 ft, Outlet Elevation (invert): 103.60 ft

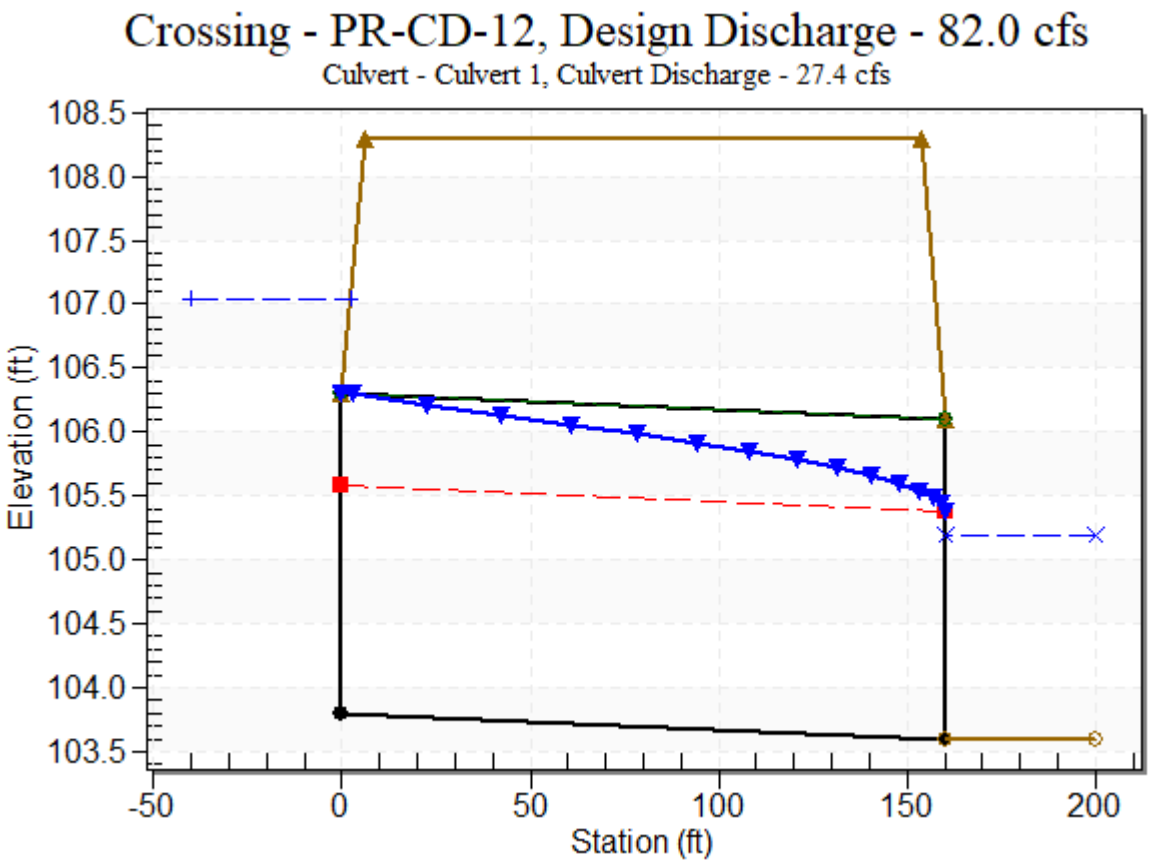
Culvert Length: 160.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 103.80 ft

Outlet Station: 160.00 ft

Outlet Elevation: 103.60 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 77 - Culvert Summary Table: Culvert 2

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)
70.00	23.40	106.61	2.590	2.860	7-M2c	2.500	1.646	1.646	1.590	6.824	0.000
77.00	25.70	106.83	2.779	3.081	7-M2c	2.500	1.728	1.728	1.590	7.102	0.000
82.00	27.32	107.03	2.919	3.283	7-M2c	2.500	1.782	1.782	1.590	7.299	0.000
91.00	30.32	107.42	3.197	3.665	7-M2c	2.500	1.877	1.877	1.590	7.671	0.000
98.00	32.64	107.71	3.430	3.955	7-M2c	2.500	1.945	1.945	1.590	7.967	0.000
105.00	34.92	108.02	3.676	4.266	7-M2c	2.500	2.007	2.007	1.590	8.267	0.000
112.00	36.96	108.31	3.912	4.559	7-M2c	2.500	2.059	2.059	1.590	8.546	0.000
119.00	37.19	108.34	3.940	4.594	7-M2c	2.500	2.064	2.064	1.590	8.579	0.000
126.00	37.36	108.37	3.960	4.618	7-M2c	2.500	2.068	2.068	1.590	8.602	0.000
133.00	37.50	108.39	3.976	4.638	7-M2c	2.500	2.072	2.072	1.590	8.621	0.000
140.00	37.62	108.41	3.992	4.657	7-M2c	2.500	2.075	2.075	1.590	8.639	0.000

****

Straight Culvert

Inlet Elevation (invert): 103.75 ft, Outlet Elevation (invert): 103.60 ft

Culvert Length: 160.00 ft, Culvert Slope: 0.0009

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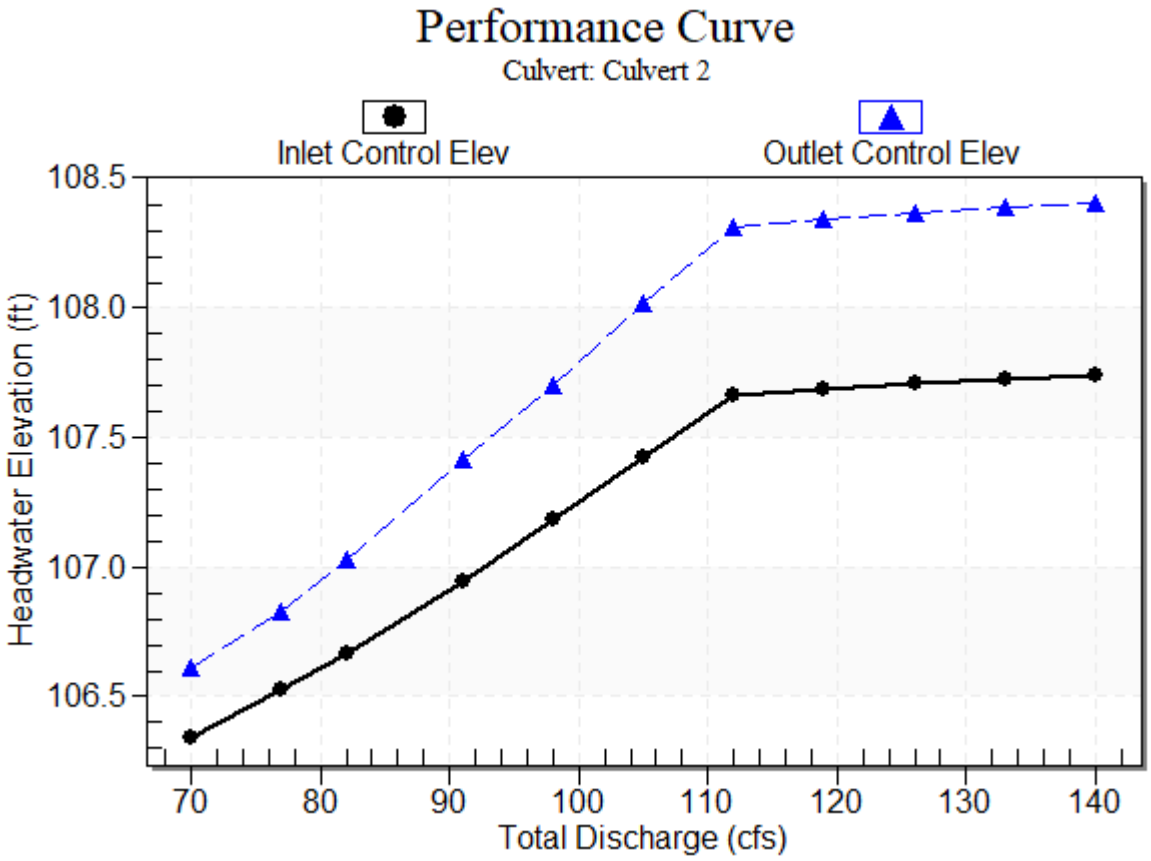
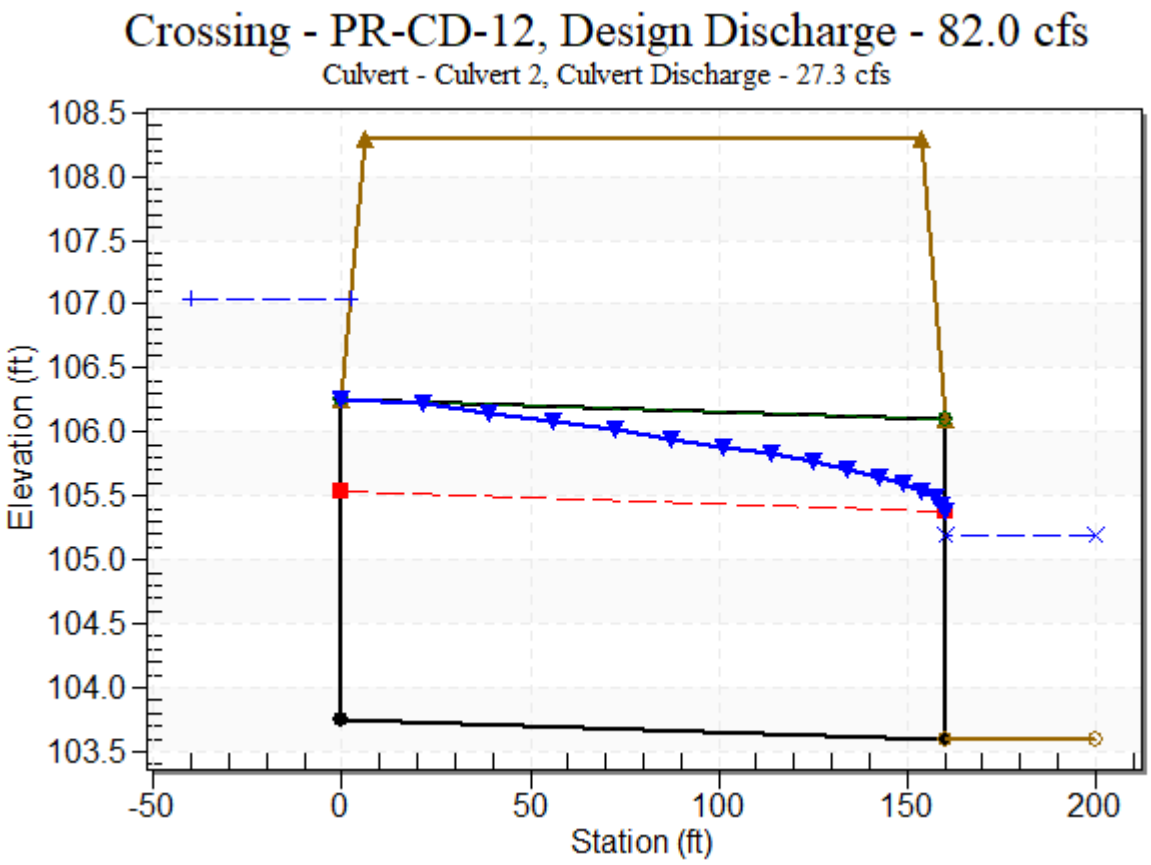
Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 103.75 ft

Outlet Station: 160.00 ft

Outlet Elevation: 103.60 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 78 - Culvert Summary Table: Culvert 3

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)
70.00	23.40	106.61	2.590	2.860	7-M2c	2.500	1.646	1.646	1.590	6.824	0.000
77.00	25.70	106.83	2.779	3.081	7-M2c	2.500	1.728	1.728	1.590	7.102	0.000
82.00	27.32	107.03	2.919	3.283	7-M2c	2.500	1.782	1.782	1.590	7.299	0.000
91.00	30.32	107.42	3.197	3.665	7-M2c	2.500	1.877	1.877	1.590	7.671	0.000
98.00	32.64	107.71	3.430	3.955	7-M2c	2.500	1.945	1.945	1.590	7.967	0.000
105.00	34.92	108.02	3.676	4.266	7-M2c	2.500	2.007	2.007	1.590	8.267	0.000
112.00	36.96	108.31	3.912	4.559	7-M2c	2.500	2.059	2.059	1.590	8.546	0.000
119.00	37.19	108.34	3.940	4.594	7-M2c	2.500	2.064	2.064	1.590	8.579	0.000
126.00	37.36	108.37	3.960	4.618	7-M2c	2.500	2.068	2.068	1.590	8.602	0.000
133.00	37.50	108.39	3.976	4.638	7-M2c	2.500	2.072	2.072	1.590	8.621	0.000
140.00	37.62	108.41	3.992	4.657	7-M2c	2.500	2.075	2.075	1.590	8.639	0.000

****

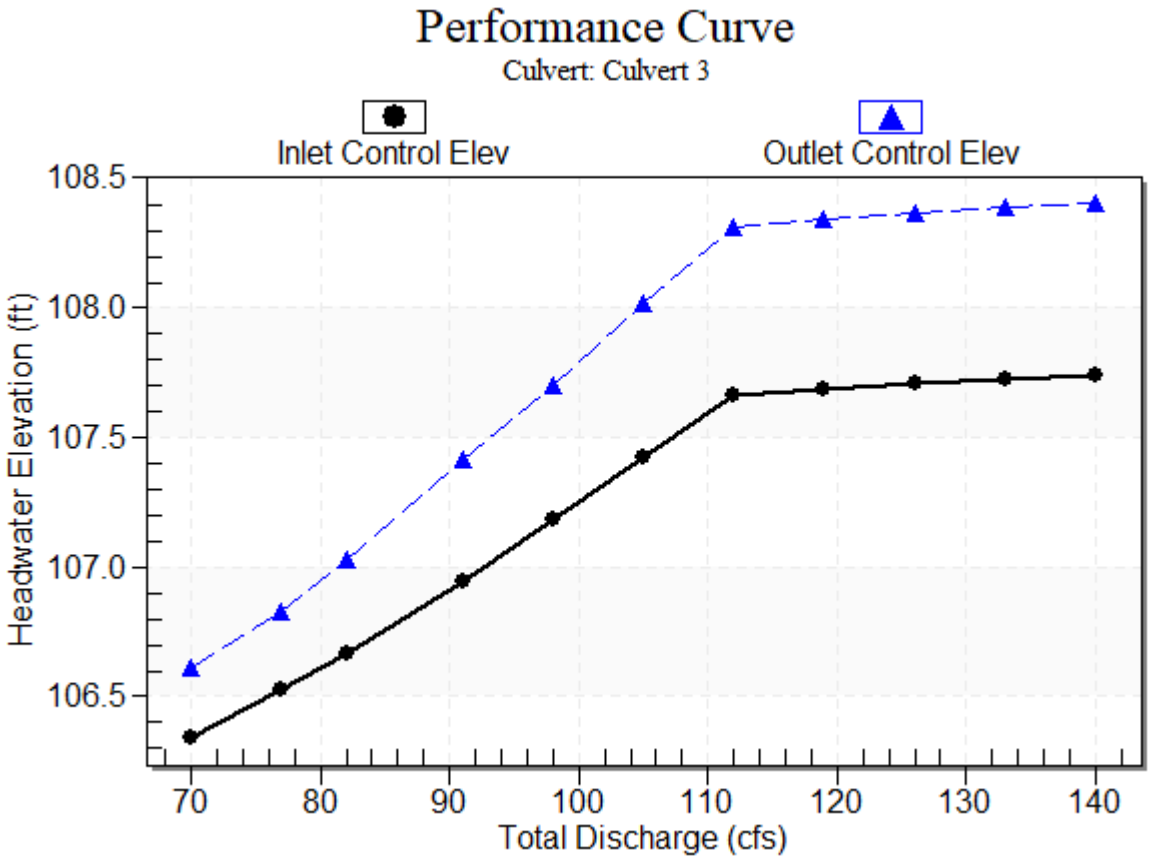
Straight Culvert

Inlet Elevation (invert): 103.75 ft, Outlet Elevation (invert): 103.60 ft

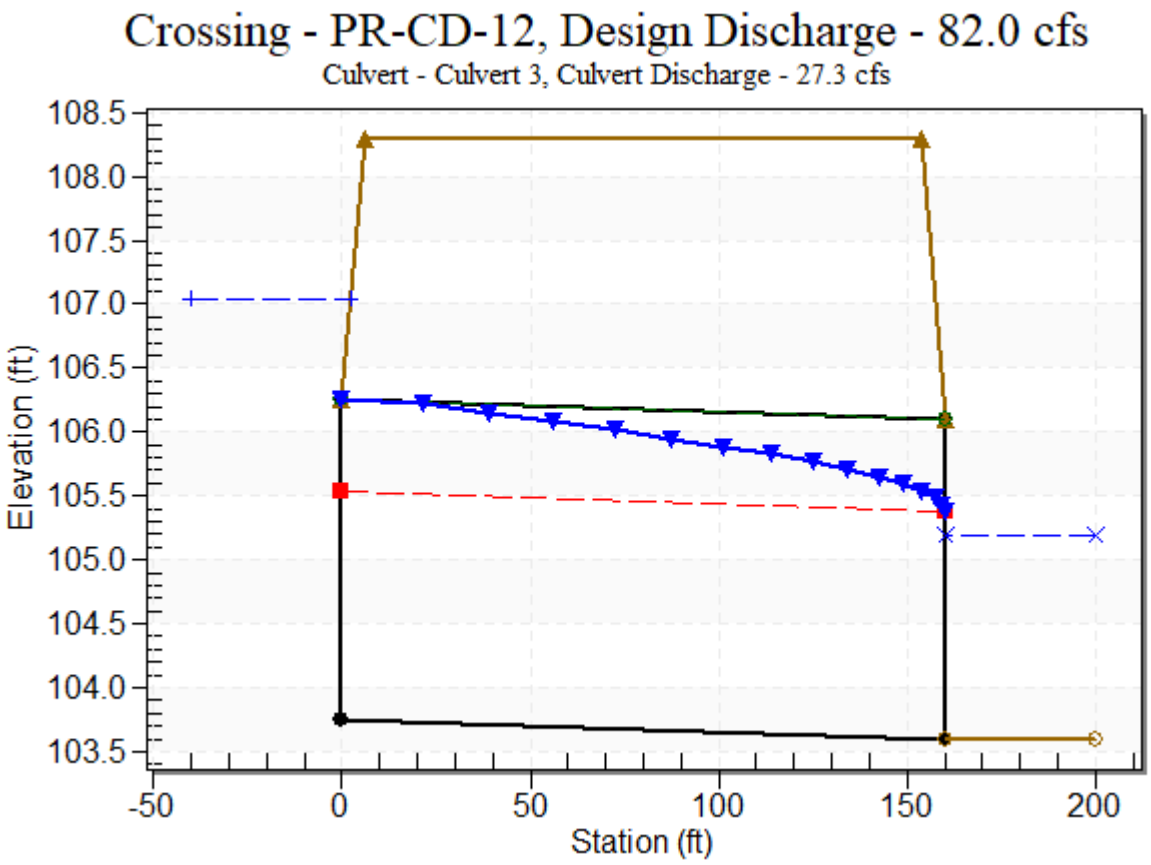
Culvert Length: 160.00 ft, Culvert Slope: 0.0009

****

Culvert Performance Curve Plot: Culvert 3



Water Surface Profile Plot for Culvert: Culvert 3



Site Data - Culvert 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 103.75 ft

Outlet Station: 160.00 ft

Outlet Elevation: 103.60 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 3

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 79 - Downstream Channel Rating Curve (Crossing: PR-CD-12)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
70.00	105.19	1.59
77.00	105.19	1.59
82.00	105.19	1.59
91.00	105.19	1.59
98.00	105.19	1.59
105.00	105.19	1.59
112.00	105.19	1.59
119.00	105.19	1.59
126.00	105.19	1.59
133.00	105.19	1.59
140.00	105.19	1.59

Tailwater Channel Data - PR-CD-12

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 105.19 ft

Roadway Data for Crossing: PR-CD-12

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 108.30 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 229 cfs

Design Flow: 269 cfs

Maximum Flow: 457 cfs

Table 80 - Summary of Culvert Flows at Crossing: EX-CD-13

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
105.93	229.00	229.00	0.00	1
106.38	251.80	251.80	0.00	1
106.73	269.00	269.00	0.00	1
106.94	297.40	278.68	17.86	14
106.97	320.20	280.05	39.25	5
107.00	343.00	281.16	60.66	4
107.02	365.80	282.18	82.89	4
107.04	388.60	283.09	105.06	4
107.06	411.40	283.91	126.20	3
107.08	434.20	284.71	148.31	3
107.10	457.00	285.48	170.62	3
106.90	276.69	276.69	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-13

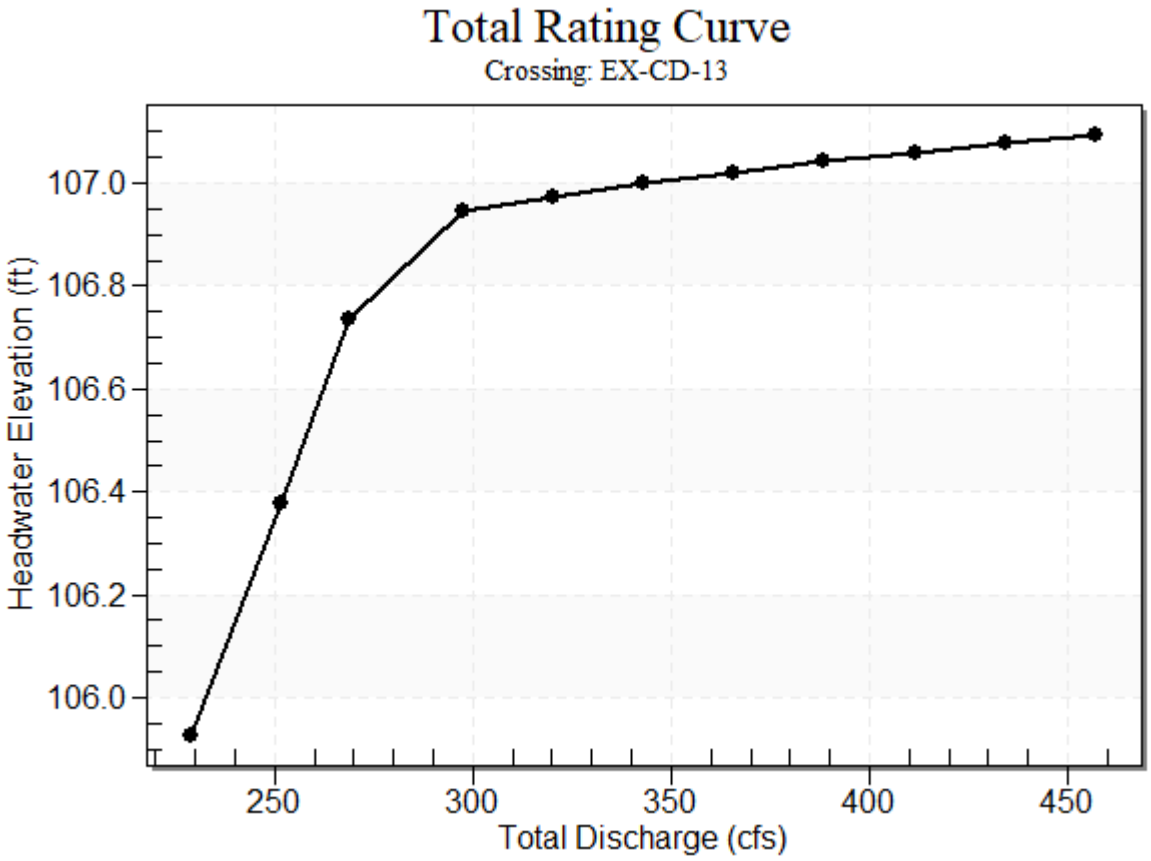


Table 81 - Culvert Summary Table: Culvert 1

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)
229.00	229.00	105.93	5.148	3.998	5-S2n	2.759	2.941	2.776	2.670	10.313	0.000
251.80	251.80	106.38	5.596	4.920	5-S2n	2.954	3.133	2.970	2.670	10.596	0.000
269.00	269.00	106.73	5.954	5.232	5-S2n	3.099	3.275	3.115	2.670	10.795	0.000
297.40	278.68	106.94	6.164	5.415	5-S2n	3.180	3.353	3.195	2.670	10.902	0.000
320.20	280.05	106.97	6.194	5.441	5-S2n	3.191	3.364	3.207	2.670	10.917	0.000
343.00	281.16	107.00	6.219	5.462	5-S2n	3.200	3.373	3.216	2.670	10.929	0.000
365.80	282.18	107.02	6.241	5.482	5-S2n	3.209	3.381	3.224	2.670	10.940	0.000
388.60	283.09	107.04	6.262	5.499	5-S2n	3.216	3.388	3.232	2.670	10.950	0.000
411.40	283.91	107.06	6.280	5.515	5-S2n	3.223	3.394	3.238	2.670	10.958	0.000
434.20	284.71	107.08	6.298	5.531	5-S2n	3.230	3.401	3.245	2.670	10.967	0.000
457.00	285.48	107.10	6.315	5.545	5-S2n	3.236	3.407	3.251	2.670	10.975	0.000

****

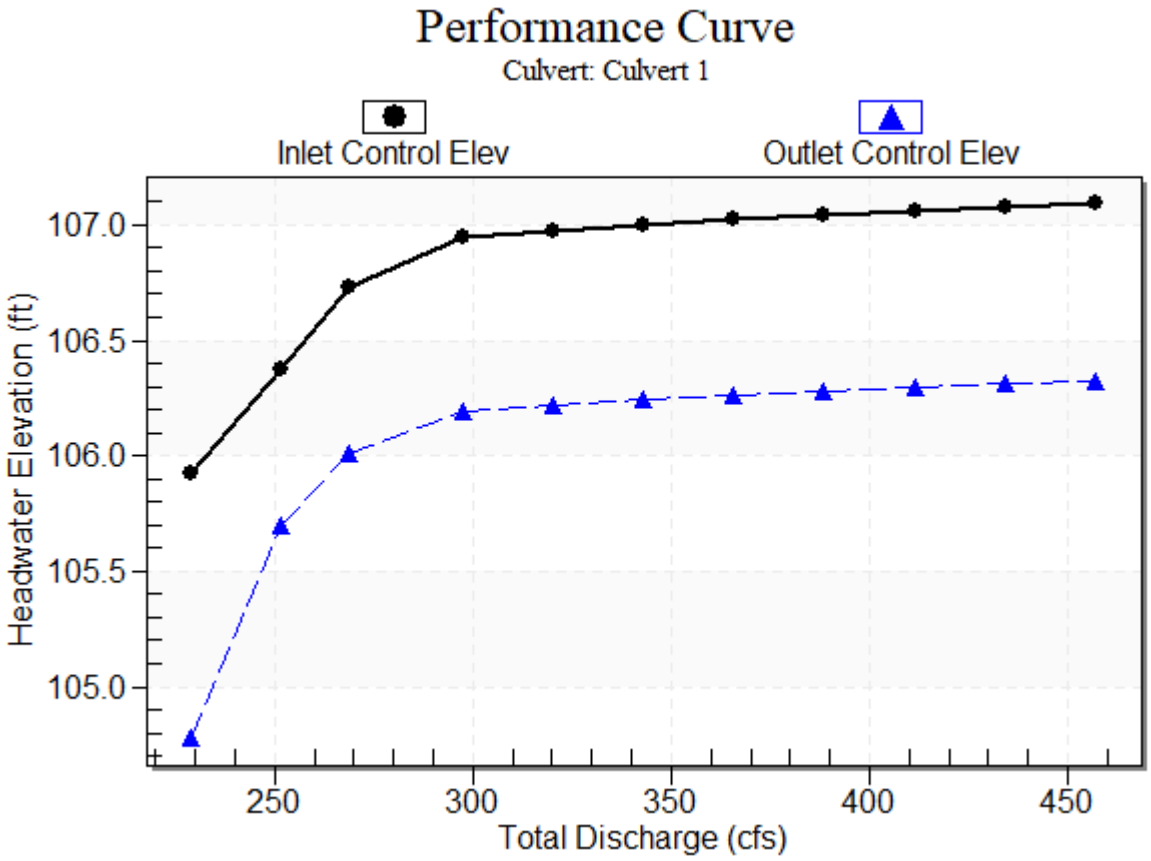
Straight Culvert

Inlet Elevation (invert): 100.78 ft, Outlet Elevation (invert): 100.42 ft

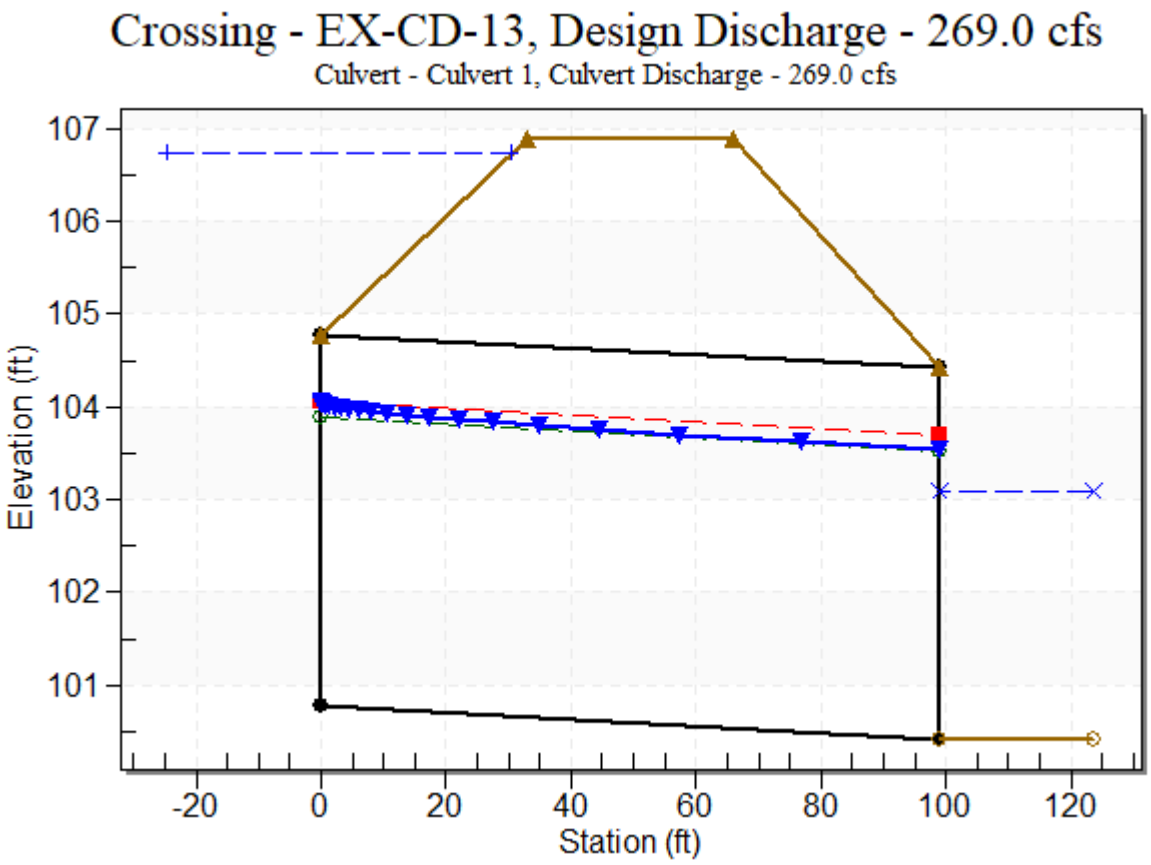
Culvert Length: 99.00 ft, Culvert Slope: 0.0036

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 100.78 ft

Outlet Station: 99.00 ft

Outlet Elevation: 100.42 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 82 - Downstream Channel Rating Curve (Crossing: EX-CD-13)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
229.00	103.09	2.67
251.80	103.09	2.67
269.00	103.09	2.67
297.40	103.09	2.67
320.20	103.09	2.67
343.00	103.09	2.67
365.80	103.09	2.67
388.60	103.09	2.67
411.40	103.09	2.67
434.20	103.09	2.67
457.00	103.09	2.67

Tailwater Channel Data - EX-CD-13

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 103.09 ft

Roadway Data for Crossing: EX-CD-13

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 700.00 ft

Crest Elevation: 106.90 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 229 cfs

Design Flow: 269 cfs

Maximum Flow: 457 cfs

Table 83 - Summary of Culvert Flows at Crossing: PR-CD-13

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
105.95	229.00	229.00	0.00	1
106.40	251.80	251.80	0.00	1
106.76	269.00	269.00	0.00	1
106.95	297.40	277.74	18.82	13
106.98	320.20	279.10	40.23	5
107.00	343.00	280.21	61.64	4
107.02	365.80	281.23	83.85	4
107.04	388.60	282.15	106.02	4
107.06	411.40	282.97	127.15	3
107.08	434.20	283.78	149.26	3
107.10	457.00	284.55	171.56	3
106.90	275.65	275.65	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-13

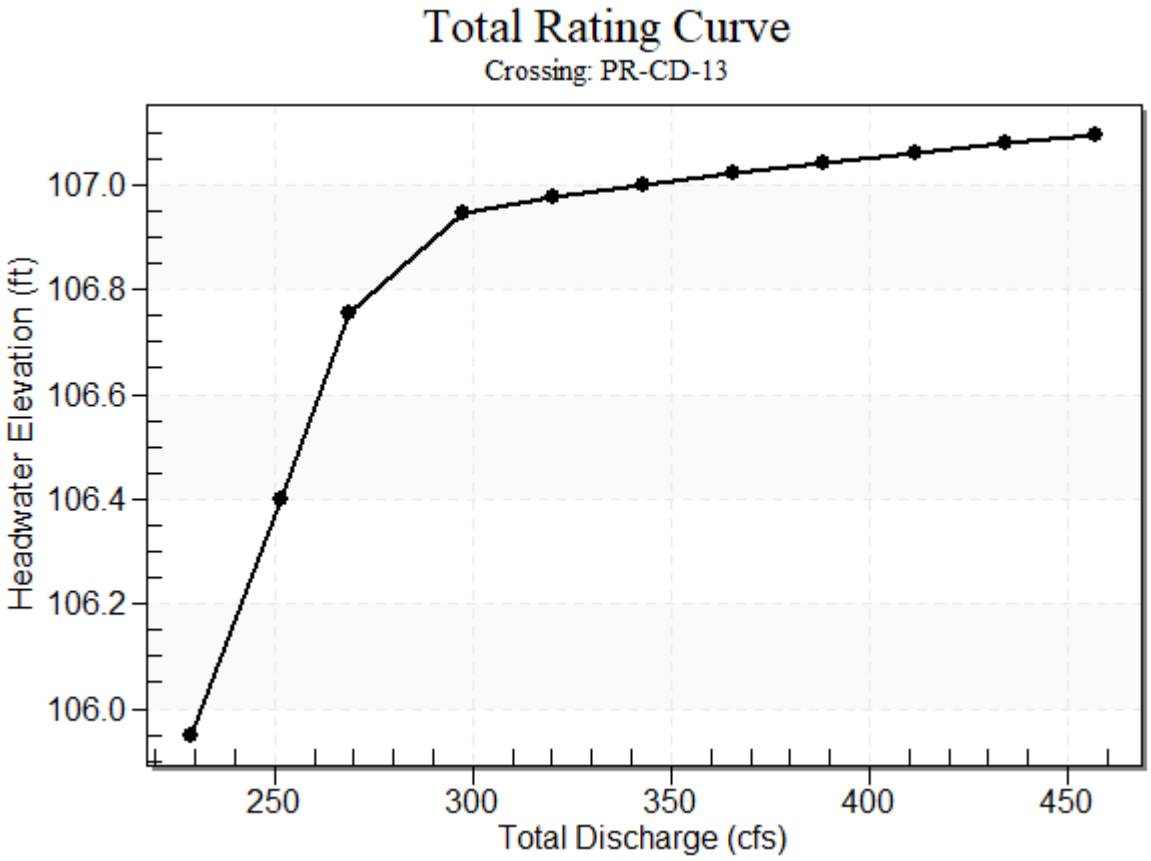


Table 84 - Culvert Summary Table: Culvert 1

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)
229.00	229.00	105.95	5.151	5.066	7-M2c	3.219	2.941	2.941	2.690	9.732	0.000
251.80	251.80	106.40	5.598	5.395	7-M2c	3.451	3.133	3.133	2.690	10.045	0.000
269.00	269.00	106.76	5.956	5.637	7-M2c	3.623	3.275	3.275	2.690	10.268	0.000
297.40	277.74	106.95	6.146	5.758	7-M2c	3.710	3.345	3.345	2.690	10.378	0.000
320.20	279.10	106.98	6.176	5.776	7-M2c	3.724	3.356	3.356	2.690	10.395	0.000
343.00	280.21	107.00	6.200	5.792	7-M2c	3.735	3.365	3.365	2.690	10.409	0.000
365.80	281.23	107.02	6.223	5.806	7-M2c	3.745	3.373	3.373	2.690	10.422	0.000
388.60	282.15	107.04	6.243	5.818	7-M2c	3.754	3.380	3.380	2.690	10.433	0.000
411.40	282.97	107.06	6.262	5.829	7-M2c	3.762	3.387	3.387	2.690	10.443	0.000
434.20	283.78	107.08	6.280	5.840	7-M2c	3.770	3.393	3.393	2.690	10.453	0.000
457.00	284.55	107.10	6.297	5.851	7-M2c	3.778	3.400	3.400	2.690	10.463	0.000

****

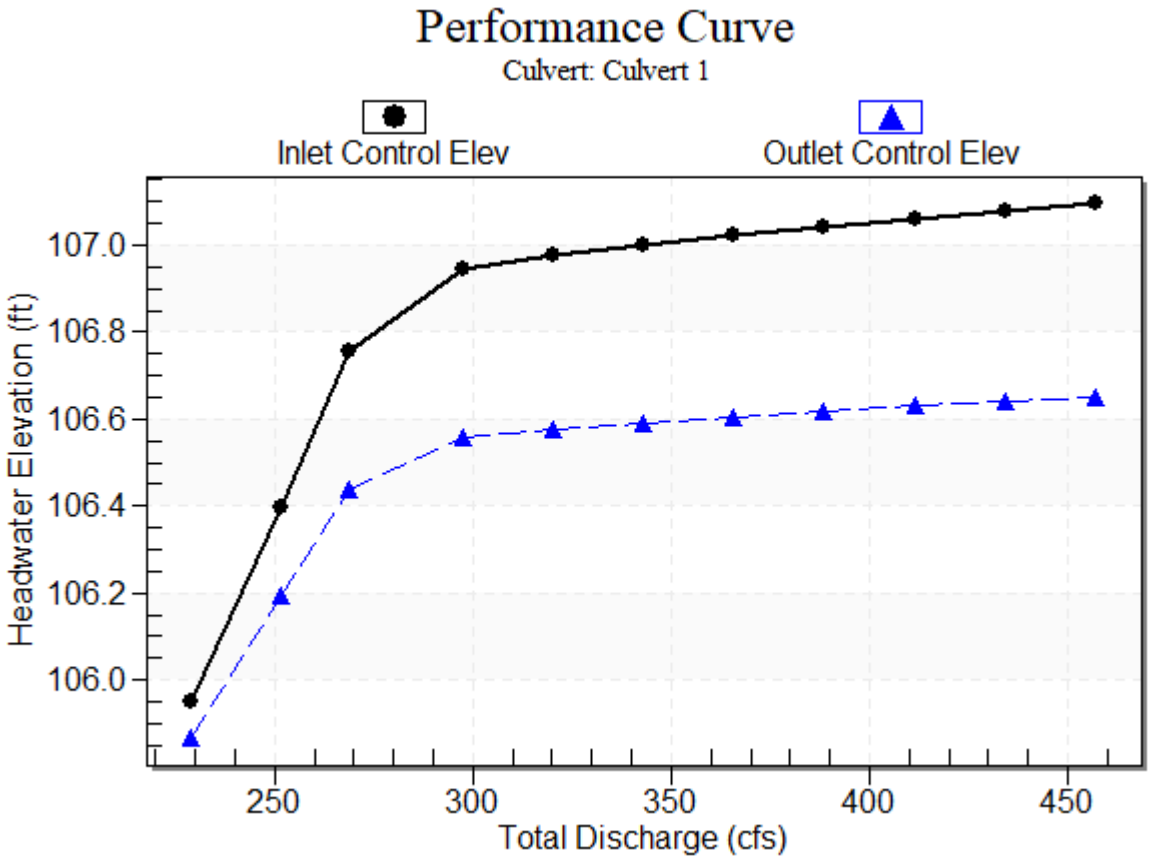
Straight Culvert

Inlet Elevation (invert): 100.80 ft, Outlet Elevation (invert): 100.42 ft

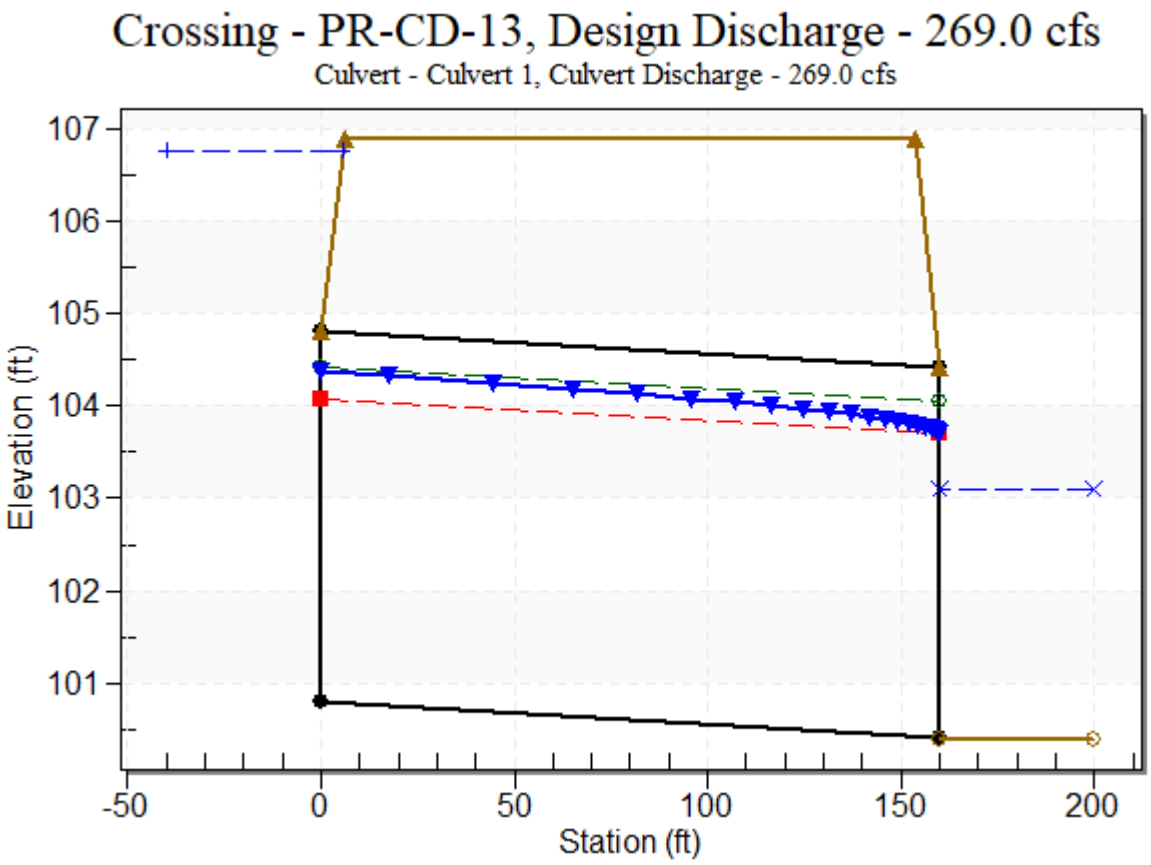
Culvert Length: 160.00 ft, Culvert Slope: 0.0024

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 100.80 ft

Outlet Station: 160.00 ft

Outlet Elevation: 100.42 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 85 - Downstream Channel Rating Curve (Crossing: PR-CD-13)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
229.00	103.09	2.69
251.80	103.09	2.69
269.00	103.09	2.69
297.40	103.09	2.69
320.20	103.09	2.69
343.00	103.09	2.69
365.80	103.09	2.69
388.60	103.09	2.69
411.40	103.09	2.69
434.20	103.09	2.69
457.00	103.09	2.69

Tailwater Channel Data - PR-CD-13

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 103.09 ft

Roadway Data for Crossing: PR-CD-13

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 700.00 ft

Crest Elevation: 106.90 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 86 - Summary of Culvert Flows at Crossing: EX-CD-14

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
104.04	23.00	23.00	0.00	1
104.71	26.00	26.00	0.00	1
105.04	27.40	27.40	0.00	1
105.41	29.60	28.90	0.49	52
105.42	31.80	28.98	2.64	5
105.43	34.00	29.02	4.80	4
105.44	36.20	29.05	6.82	3
105.45	38.40	29.09	9.04	3
105.46	40.60	29.12	11.27	3
105.47	42.80	29.16	13.50	3
105.48	45.00	29.19	15.71	3
105.40	28.89	28.89	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-14

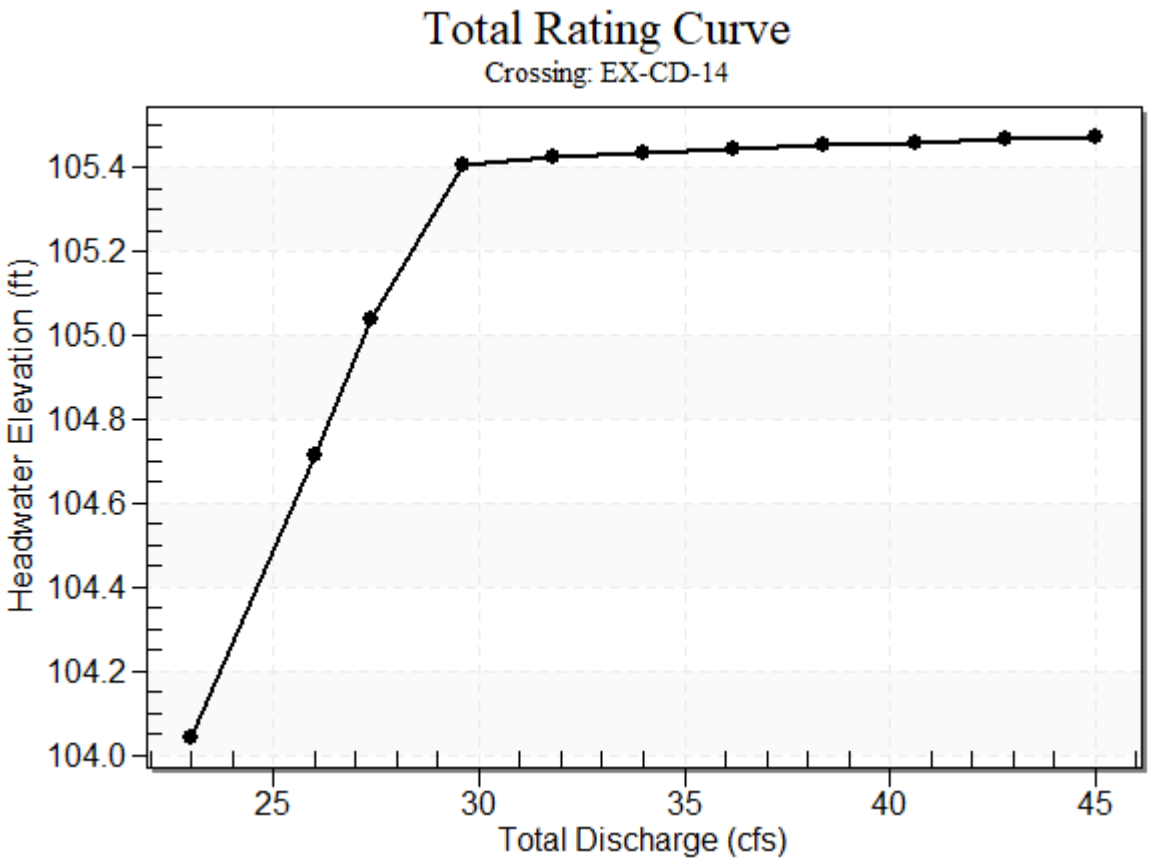


Table 87 - Culvert Summary Table: Culvert 1

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)
23.00	23.00	104.04	3.448	3.543	7-M2t	2.000	1.706	1.750	1.750	7.890	0.000
26.00	26.00	104.71	4.039	4.213	7-M2c	2.000	1.786	1.786	1.750	8.781	0.000
27.40	27.40	105.04	4.342	4.537	7-M2c	2.000	1.816	1.816	1.750	9.141	0.000
29.60	28.90	105.41	4.686	4.907	7-M2c	2.000	1.845	1.845	1.750	9.543	0.000
31.80	28.98	105.42	4.704	4.923	7-M2c	2.000	1.846	1.846	1.750	9.563	0.000
34.00	29.02	105.43	4.714	4.934	7-M2c	2.000	1.847	1.847	1.750	9.575	0.000
36.20	29.05	105.44	4.720	4.943	7-M2c	2.000	1.847	1.847	1.750	9.582	0.000
38.40	29.09	105.45	4.731	4.952	7-M2c	2.000	1.848	1.848	1.750	9.595	0.000
40.60	29.12	105.46	4.738	4.959	7-M2c	2.000	1.848	1.848	1.750	9.603	0.000
42.80	29.16	105.47	4.746	4.968	7-M2c	2.000	1.849	1.849	1.750	9.612	0.000
45.00	29.19	105.48	4.753	4.975	7-M2c	2.000	1.849	1.849	1.750	9.620	0.000

****

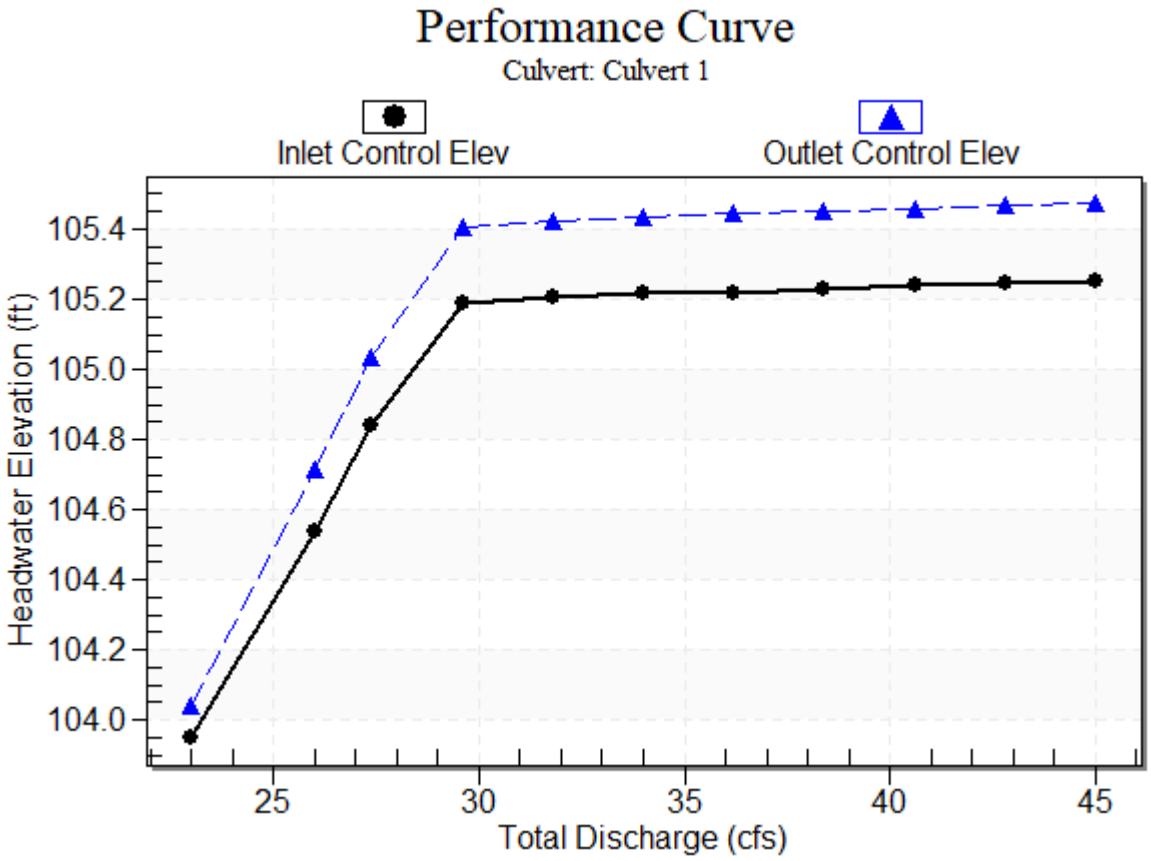
Straight Culvert

Inlet Elevation (invert): 100.50 ft, Outlet Elevation (invert): 99.99 ft

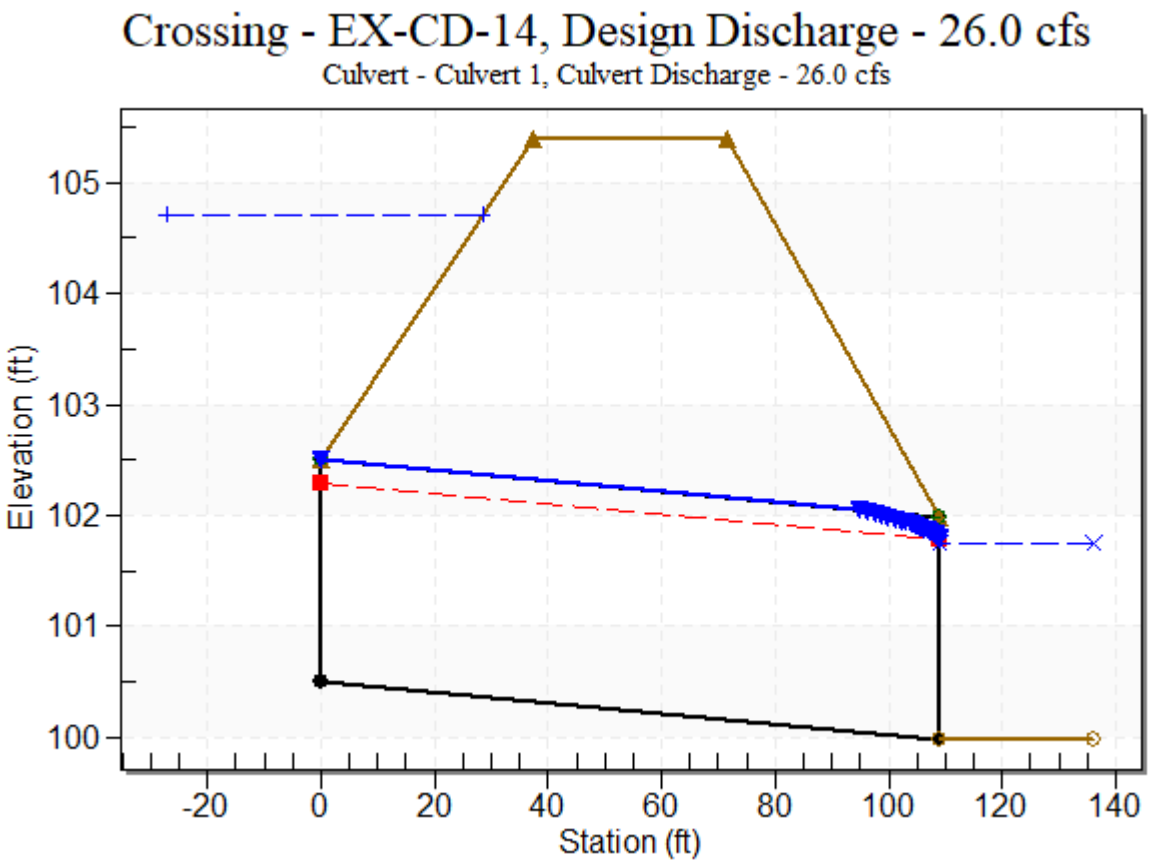
Culvert Length: 109.00 ft, Culvert Slope: 0.0047

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 100.50 ft

Outlet Station: 109.00 ft

Outlet Elevation: 99.99 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 88 - Downstream Channel Rating Curve (Crossing: EX-CD-14)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	101.74	1.75
26.00	101.74	1.75
27.40	101.74	1.75
29.60	101.74	1.75
31.80	101.74	1.75
34.00	101.74	1.75
36.20	101.74	1.75
38.40	101.74	1.75
40.60	101.74	1.75
42.80	101.74	1.75
45.00	101.74	1.75

Tailwater Channel Data - EX-CD-14

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 101.74 ft

Roadway Data for Crossing: EX-CD-14

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 105.40 ft

Roadway Surface: Paved

Roadway Top Width: 34.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 89 - Summary of Culvert Flows at Crossing: PR-CD-14

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
103.17	23.00	23.00	0.00	1
103.40	26.00	26.00	0.00	1
103.52	27.40	27.40	0.00	1
103.71	29.60	29.60	0.00	1
103.94	31.80	31.80	0.00	1
104.27	34.00	34.00	0.00	1
104.59	36.20	36.20	0.00	1
104.92	38.40	38.40	0.00	1
105.26	40.60	40.60	0.00	1
105.41	42.80	41.61	0.87	23
105.43	45.00	41.71	3.14	5
105.40	41.54	41.54	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-14

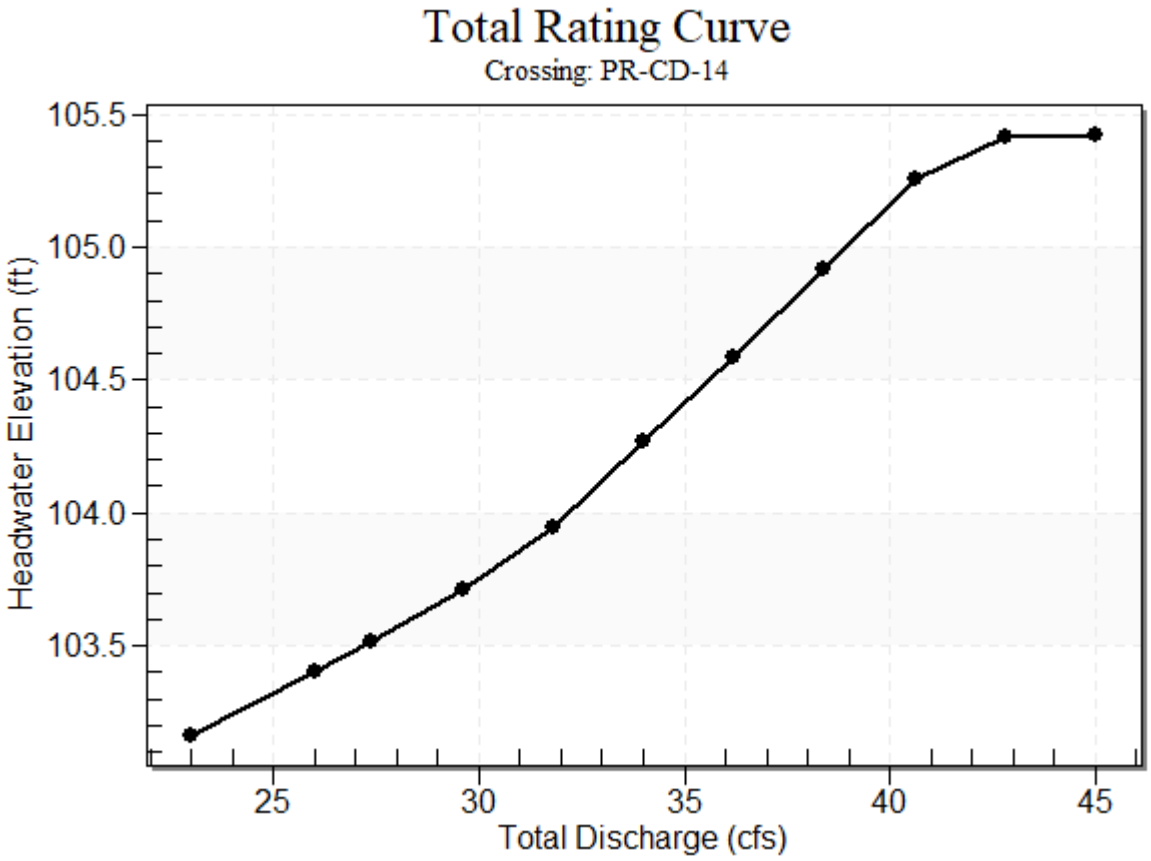


Table 90 - Culvert Summary Table: Culvert 1

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)
23.00	23.00	103.17	2.556	2.666	3-M2t	1.897	1.632	1.740	1.740	6.306	0.000
26.00	26.00	103.40	2.802	2.901	3-M2t	2.168	1.738	1.740	1.740	7.129	0.000
27.40	27.40	103.52	2.924	3.017	7-M2c	2.500	1.785	1.785	1.740	7.309	0.000
29.60	29.60	103.71	3.125	3.213	7-M2c	2.500	1.855	1.855	1.740	7.581	0.000
31.80	31.80	103.94	3.341	3.444	7-M2c	2.500	1.921	1.921	1.740	7.859	0.000
34.00	34.00	104.27	3.572	3.772	7-M2c	2.500	1.982	1.982	1.740	8.145	0.000
36.20	36.20	104.59	3.820	4.087	7-M2c	2.500	2.040	2.040	1.740	8.442	0.000
38.40	38.40	104.92	4.085	4.415	7-M2c	2.500	2.093	2.093	1.740	8.750	0.000
40.60	40.60	105.26	4.368	4.758	7-M2c	2.500	2.142	2.142	1.740	9.070	0.000
42.80	41.61	105.41	4.504	4.911	7-M2c	2.500	2.162	2.162	1.740	9.222	0.000
45.00	41.71	105.43	4.517	4.925	7-M2c	2.500	2.164	2.164	1.740	9.236	0.000

****

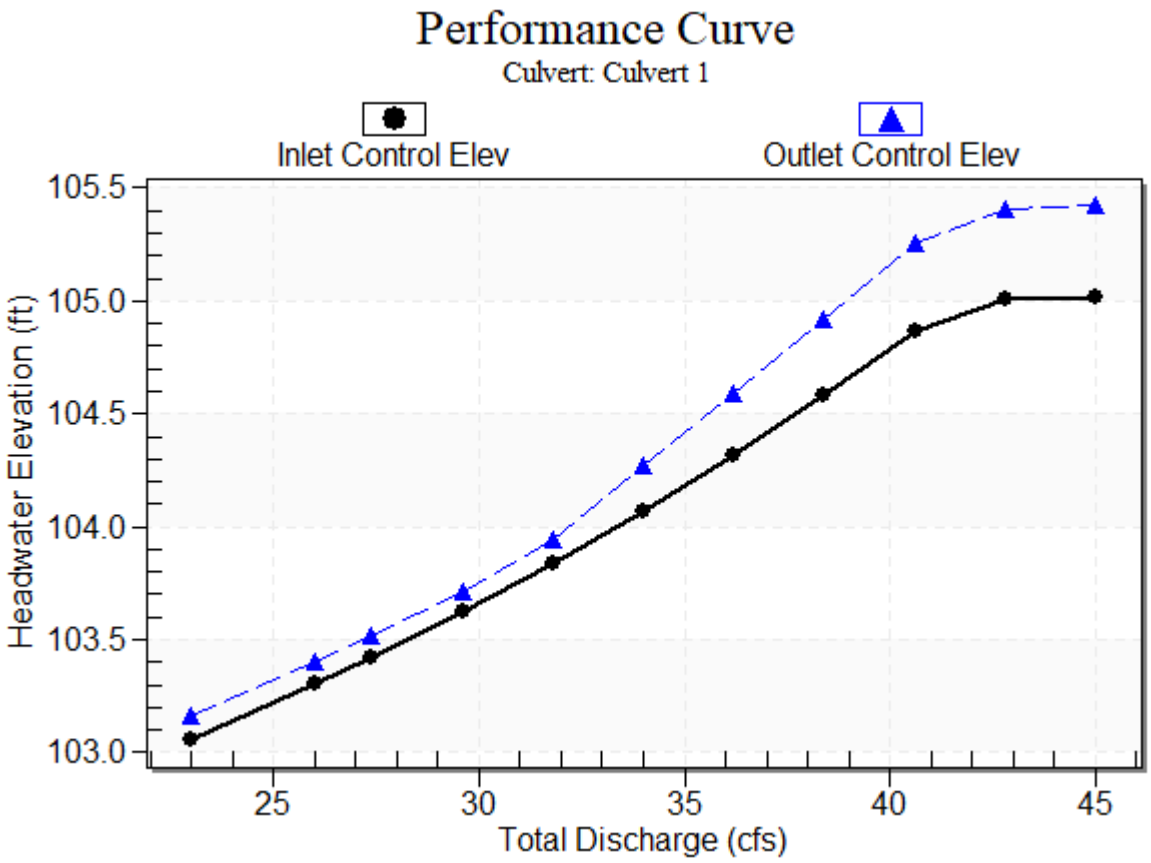
Straight Culvert

Inlet Elevation (invert): 100.50 ft, Outlet Elevation (invert): 100.00 ft

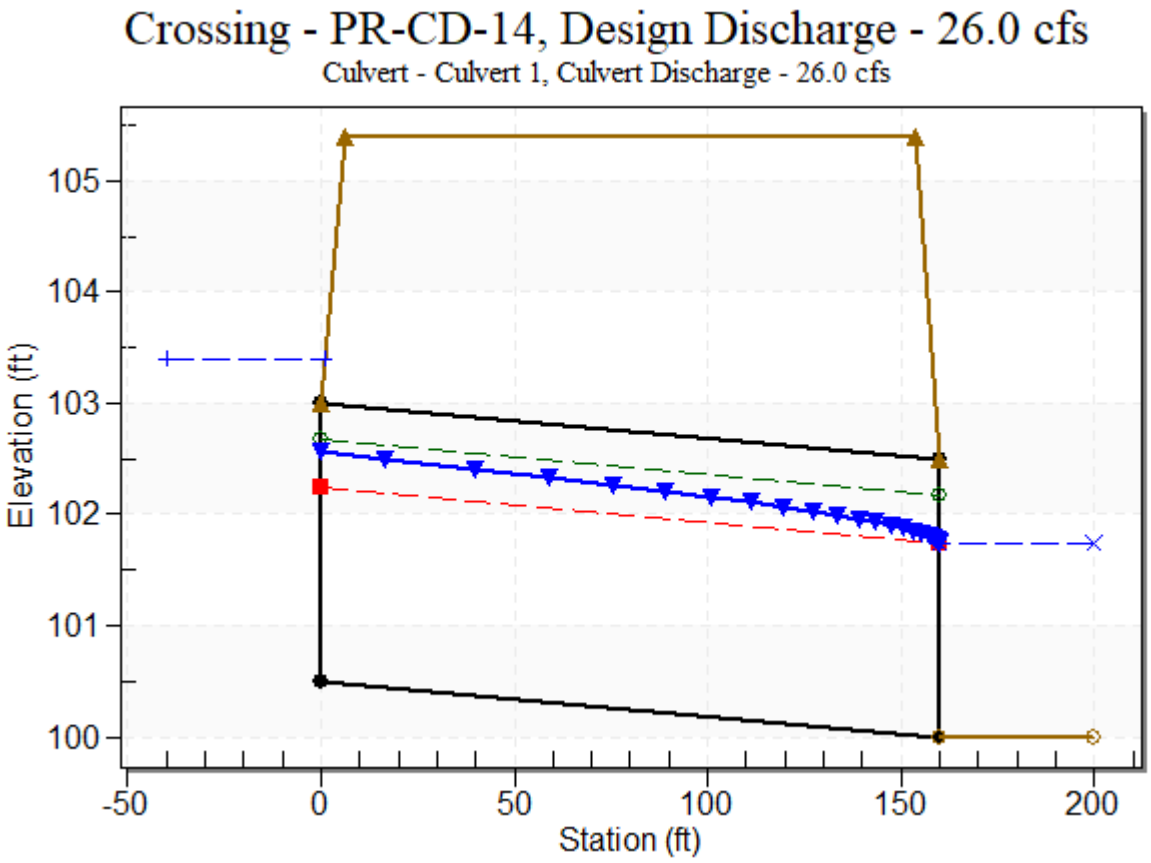
Culvert Length: 160.00 ft, Culvert Slope: 0.0031

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 100.50 ft

Outlet Station: 160.00 ft

Outlet Elevation: 100.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 91 - Downstream Channel Rating Curve (Crossing: PR-CD-14)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	101.74	1.74
26.00	101.74	1.74
27.40	101.74	1.74
29.60	101.74	1.74
31.80	101.74	1.74
34.00	101.74	1.74
36.20	101.74	1.74
38.40	101.74	1.74
40.60	101.74	1.74
42.80	101.74	1.74
45.00	101.74	1.74

Tailwater Channel Data - PR-CD-14

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 101.74 ft

Roadway Data for Crossing: PR-CD-14

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 105.40 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 92 - Summary of Culvert Flows at Crossing: EX-CD-15

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
103.94	23.00	23.00	0.00	1
104.53	26.00	26.00	0.00	1
104.61	27.40	26.36	0.81	19
104.62	29.60	26.43	3.01	5
104.64	31.80	26.48	5.16	4
104.64	34.00	26.52	7.18	3
104.65	36.20	26.56	9.38	3
104.66	38.40	26.60	11.61	3
104.67	40.60	26.63	13.83	3
104.68	42.80	26.66	16.04	3
104.68	45.00	26.70	18.23	3
104.60	26.31	26.31	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-15

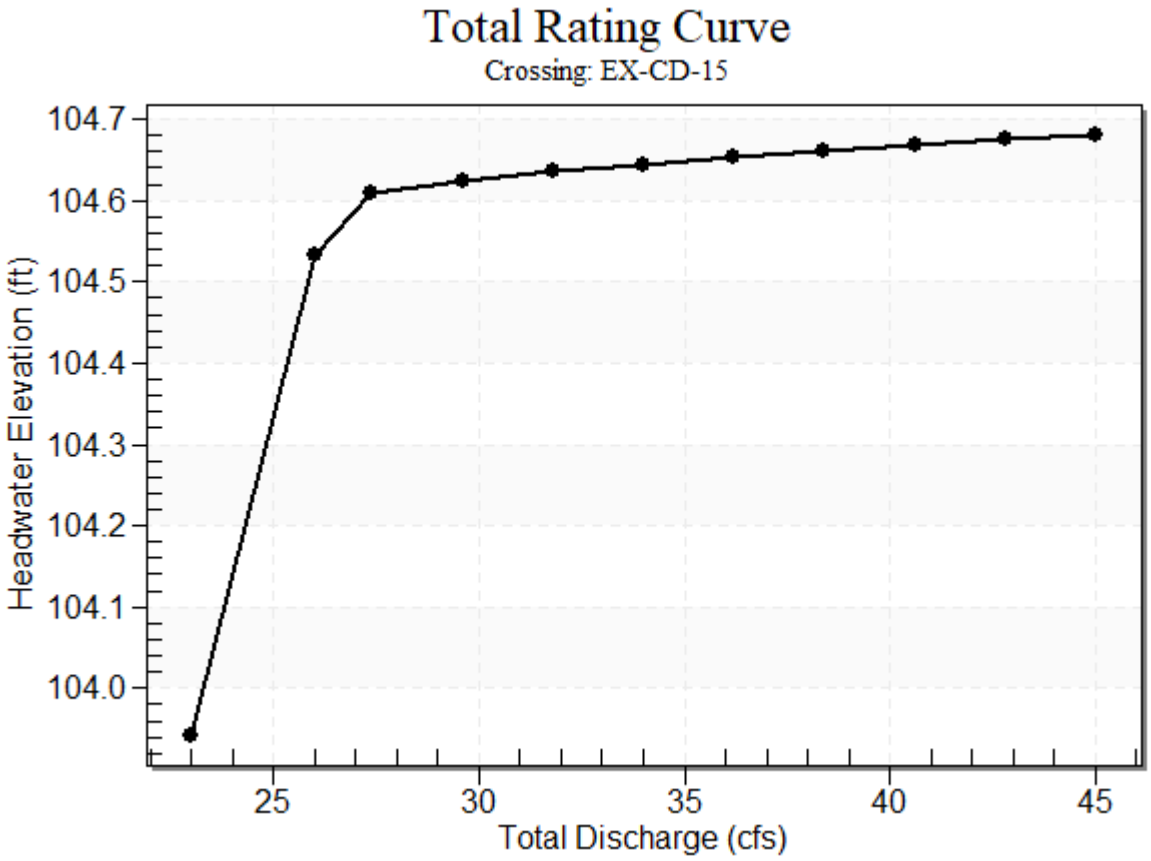


Table 93 - Culvert Summary Table: Culvert 1

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)
23.00	23.00	103.94	3.453	3.249	7-JH2c	-1.000	1.706	1.706	0.830	8.058	0.000
26.00	26.00	104.53	4.043	3.597	7-JH2c	-1.000	1.786	1.786	0.830	8.782	0.000
27.40	26.36	104.61	4.120	3.642	7-JH2t	-1.000	1.794	1.794	0.830	8.873	0.000
29.60	26.43	104.62	4.135	3.650	7-JH2t	-1.000	1.796	1.796	0.830	8.890	0.000
31.80	26.48	104.64	4.145	3.656	7-JH2t	-1.000	1.797	1.797	0.830	8.903	0.000
34.00	26.52	104.64	4.154	3.661	7-JH2t	-1.000	1.798	1.798	0.830	8.914	0.000
36.20	26.56	104.65	4.163	3.666	7-JH2t	-1.000	1.799	1.799	0.830	8.924	0.000
38.40	26.60	104.66	4.171	3.671	7-JH2t	-1.000	1.799	1.799	0.830	8.934	0.000
40.60	26.63	104.67	4.178	3.675	7-JH2t	-1.000	1.800	1.800	0.830	8.943	0.000
42.80	26.66	104.68	4.185	3.679	7-JH2t	-1.000	1.801	1.801	0.830	8.951	0.000
45.00	26.70	104.68	4.192	3.683	7-JH2t	-1.000	1.802	1.802	0.830	8.959	0.000

****

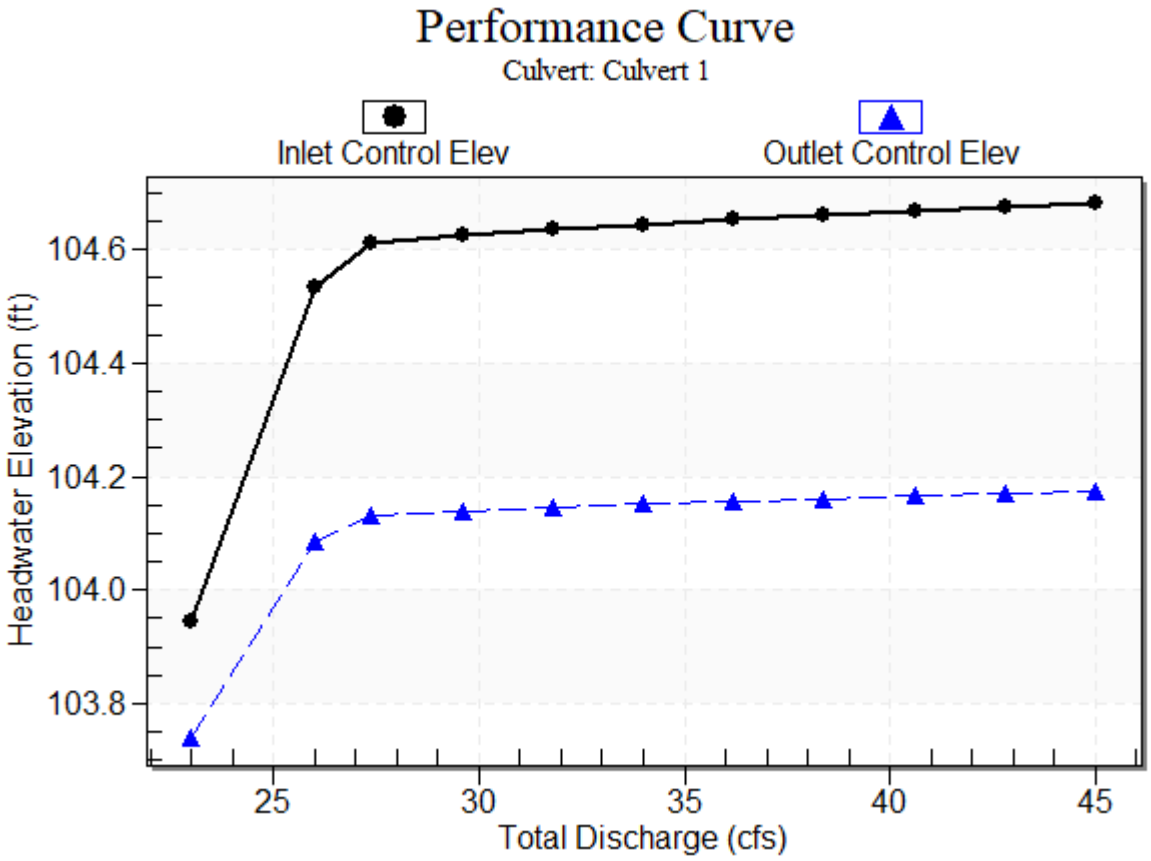
Straight Culvert

Inlet Elevation (invert): 100.49 ft, Outlet Elevation (invert): 100.48 ft

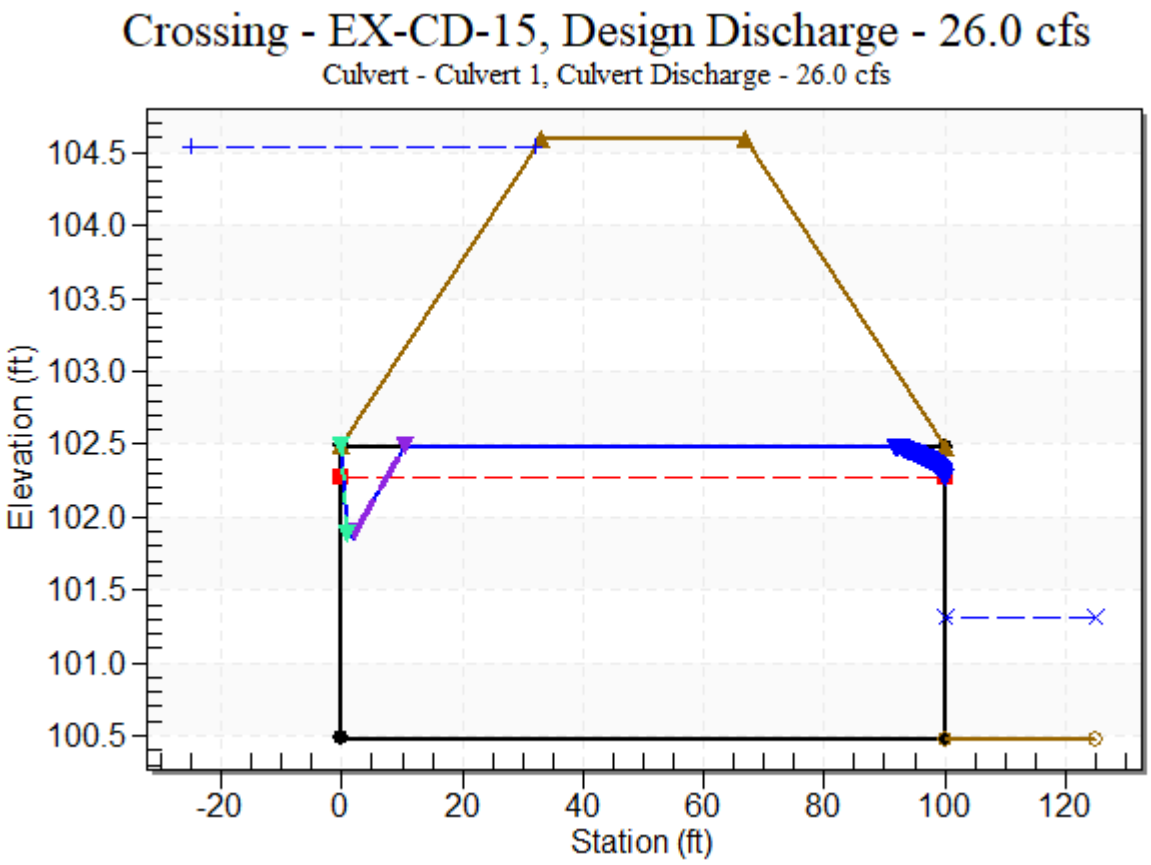
Culvert Length: 100.00 ft, Culvert Slope: 0.0001

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 100.49 ft

Outlet Station: 100.00 ft

Outlet Elevation: 100.48 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 94 - Downstream Channel Rating Curve (Crossing: EX-CD-15)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	101.31	0.83
26.00	101.31	0.83
27.40	101.31	0.83
29.60	101.31	0.83
31.80	101.31	0.83
34.00	101.31	0.83
36.20	101.31	0.83
38.40	101.31	0.83
40.60	101.31	0.83
42.80	101.31	0.83
45.00	101.31	0.83

Tailwater Channel Data - EX-CD-15

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 101.31 ft

Roadway Data for Crossing: EX-CD-15

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 104.60 ft

Roadway Surface: Paved

Roadway Top Width: 34.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 95 - Summary of Culvert Flows at Crossing: PR-CD-15

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
103.29	23.00	23.00	0.00	1
103.57	26.00	26.00	0.00	1
103.73	27.40	27.40	0.00	1
104.00	29.60	29.60	0.00	1
104.28	31.80	31.80	0.00	1
104.60	34.00	34.00	0.00	1
104.91	36.20	36.20	0.00	1
105.23	38.40	38.40	0.00	1
105.50	40.60	40.23	0.06	54
105.52	42.80	40.30	2.19	5
105.53	45.00	40.43	4.37	4
105.50	40.17	40.17	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-15

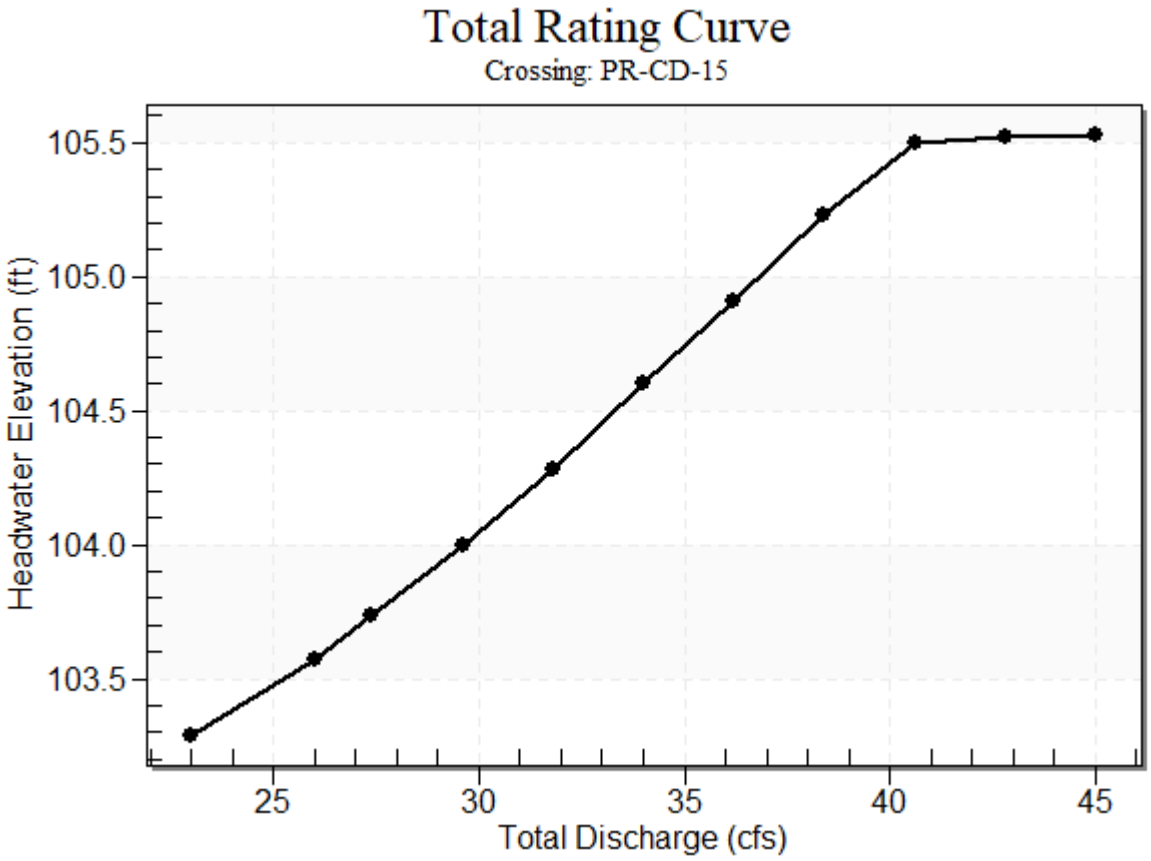


Table 96 - Culvert Summary Table: Culvert 1

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)
23.00	23.00	103.29	2.558	2.791	7-M2c	2.500	1.632	1.632	1.010	6.776	0.000
26.00	26.00	103.57	2.805	3.070	7-M2c	2.500	1.738	1.738	1.010	7.138	0.000
27.40	27.40	103.73	2.926	3.234	7-M2c	2.500	1.785	1.785	1.010	7.309	0.000
29.60	29.60	104.00	3.128	3.496	7-M2c	2.500	1.855	1.855	1.010	7.581	0.000
31.80	31.80	104.28	3.343	3.784	7-M2c	2.500	1.921	1.921	1.010	7.859	0.000
34.00	34.00	104.60	3.574	4.101	7-M2c	2.500	1.982	1.982	1.010	8.145	0.000
36.20	36.20	104.91	3.822	4.406	7-M2c	2.500	2.040	2.040	1.010	8.442	0.000
38.40	38.40	105.23	4.087	4.728	7-M2c	2.500	2.093	2.093	1.010	8.750	0.000
40.60	40.23	105.50	4.322	5.001	7-M2c	2.500	2.134	2.134	1.010	9.015	0.000
42.80	40.30	105.52	4.331	5.020	7-M2c	2.500	2.135	2.135	1.010	9.025	0.000
45.00	40.43	105.53	4.347	5.031	7-M2c	2.500	2.138	2.138	1.010	9.044	0.000

****

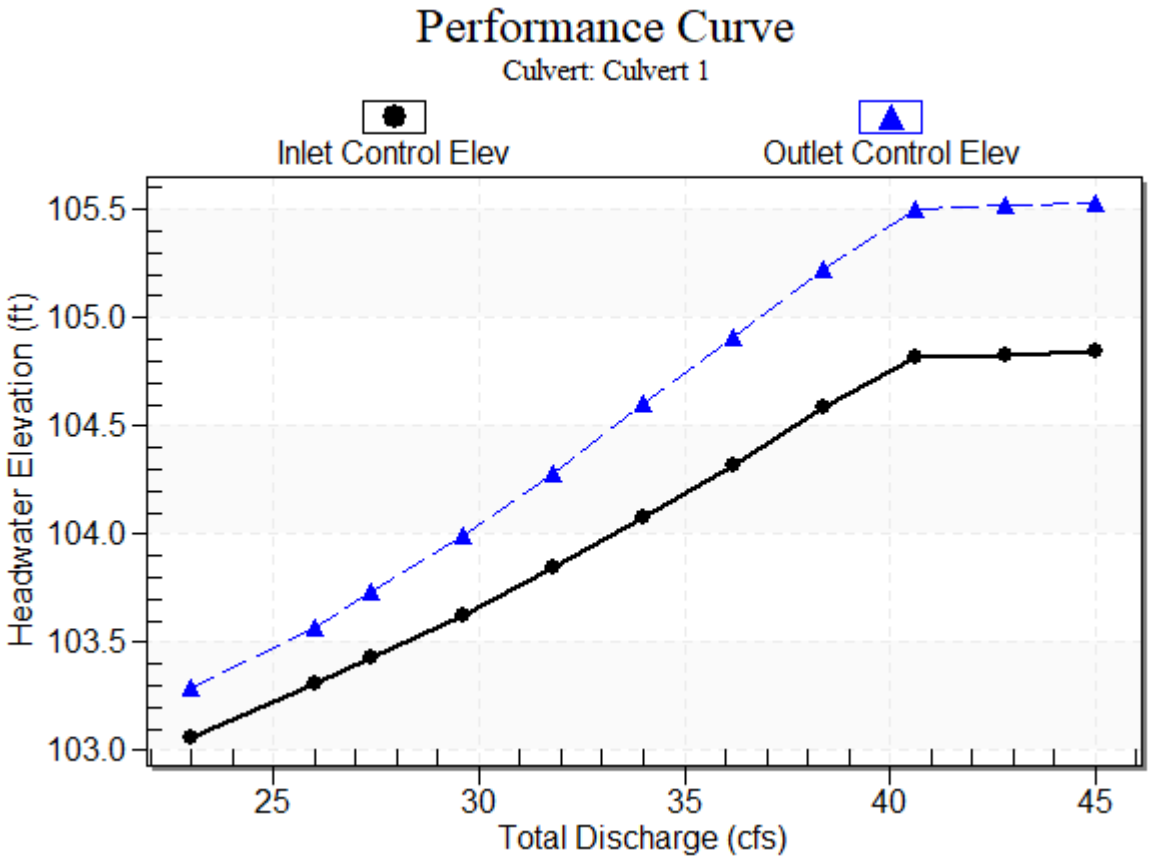
Straight Culvert

Inlet Elevation (invert): 100.50 ft, Outlet Elevation (invert): 100.30 ft

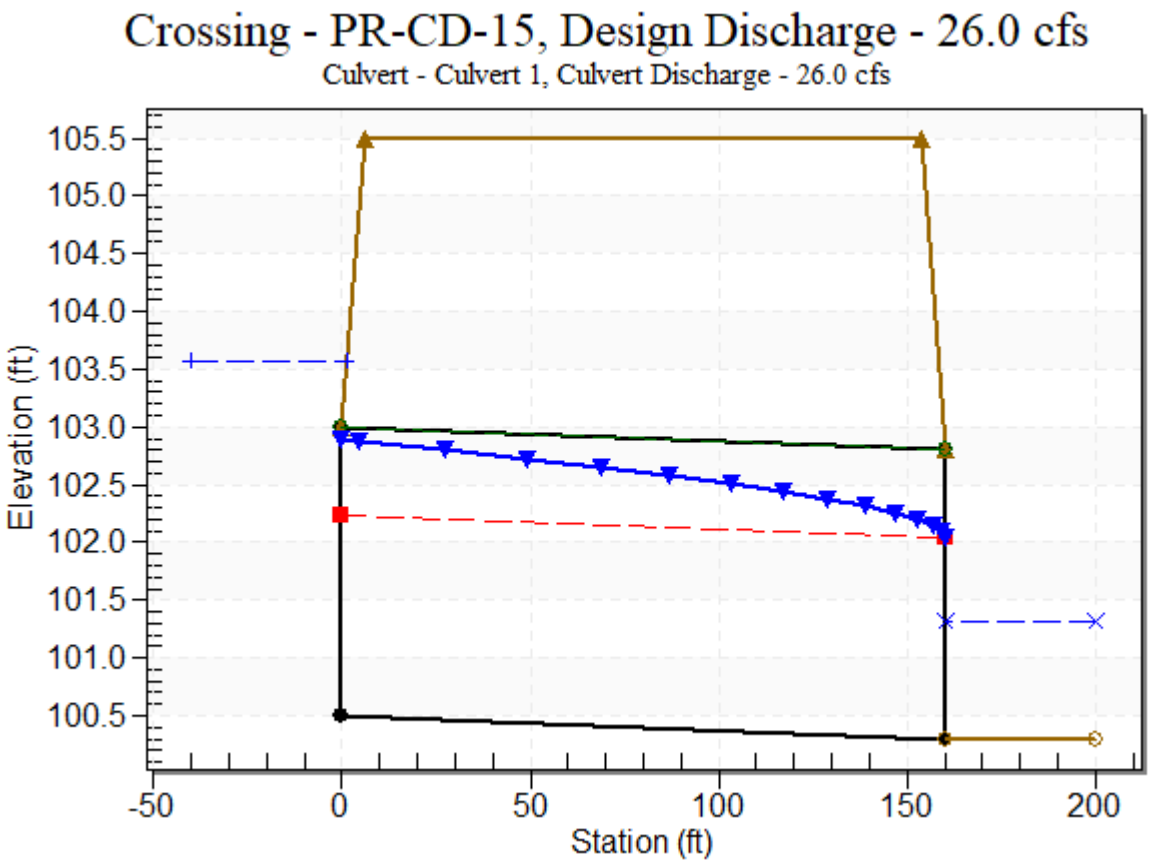
Culvert Length: 160.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 100.50 ft

Outlet Station: 160.00 ft

Outlet Elevation: 100.30 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 97 - Downstream Channel Rating Curve (Crossing: PR-CD-15)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	101.31	1.01
26.00	101.31	1.01
27.40	101.31	1.01
29.60	101.31	1.01
31.80	101.31	1.01
34.00	101.31	1.01
36.20	101.31	1.01
38.40	101.31	1.01
40.60	101.31	1.01
42.80	101.31	1.01
45.00	101.31	1.01

Tailwater Channel Data - PR-CD-15

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 101.31 ft

Roadway Data for Crossing: PR-CD-15

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 105.50 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 287 cfs

Design Flow: 336 cfs

Maximum Flow: 571 cfs

Table 98 - Summary of Culvert Flows at Crossing: EX-BC-1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
101.92	287.00	142.83	144.19	0.00	6
102.35	315.40	157.09	158.32	0.00	4
102.69	336.00	167.30	168.45	0.00	17
103.15	372.20	180.11	181.16	10.21	20
103.20	400.60	181.66	182.71	35.45	6
103.25	429.00	182.87	183.91	61.56	5
103.29	457.40	183.90	184.93	87.51	4
103.32	485.80	184.85	185.88	114.37	4
103.36	514.20	185.72	186.75	141.30	4
103.39	542.60	186.54	187.56	168.23	4
103.42	571.00	187.28	188.30	194.44	3
103.10	358.82	178.88	179.94	0.00	Overtopping

Rating Curve Plot for Crossing: EX-BC-1

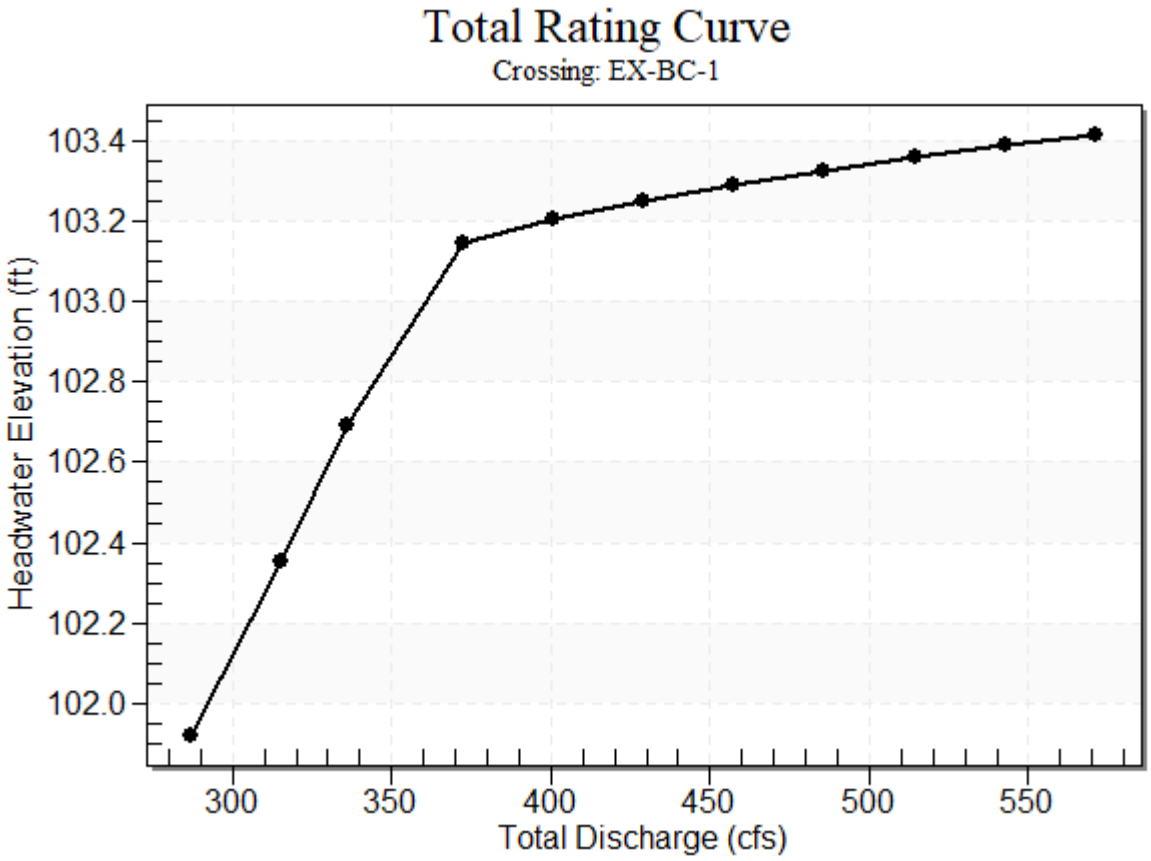


Table 99 - Culvert Summary Table: Culvert 1

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)
287.00	142.83	101.92	3.612	3.517	7-M2c	2.000	1.850	1.850	1.000	7.719	0.000
315.40	157.09	102.35	4.044	3.886	7-M2c	2.000	1.972	1.972	1.000	7.968	0.000
336.00	167.30	102.69	4.380	4.147	6-FFc	2.000	2.000	2.000	1.000	8.365	0.000
372.20	180.11	103.15	4.835	4.496	6-FFc	2.000	2.000	2.000	1.000	9.005	0.000
400.60	181.66	103.20	4.893	4.540	6-FFc	2.000	2.000	2.000	1.000	9.083	0.000
429.00	182.87	103.25	4.938	4.575	6-FFc	2.000	2.000	2.000	1.000	9.144	0.000
457.40	183.90	103.29	4.977	4.604	6-FFc	2.000	2.000	2.000	1.000	9.195	0.000
485.80	184.85	103.32	5.013	4.632	6-FFc	2.000	2.000	2.000	1.000	9.243	0.000
514.20	185.72	103.36	5.046	4.657	6-FFc	2.000	2.000	2.000	1.000	9.286	0.000
542.60	186.54	103.39	5.077	4.681	6-FFc	2.000	2.000	2.000	1.000	9.327	0.000
571.00	187.28	103.42	5.106	4.703	6-FFc	2.000	2.000	2.000	1.000	9.364	0.000

****

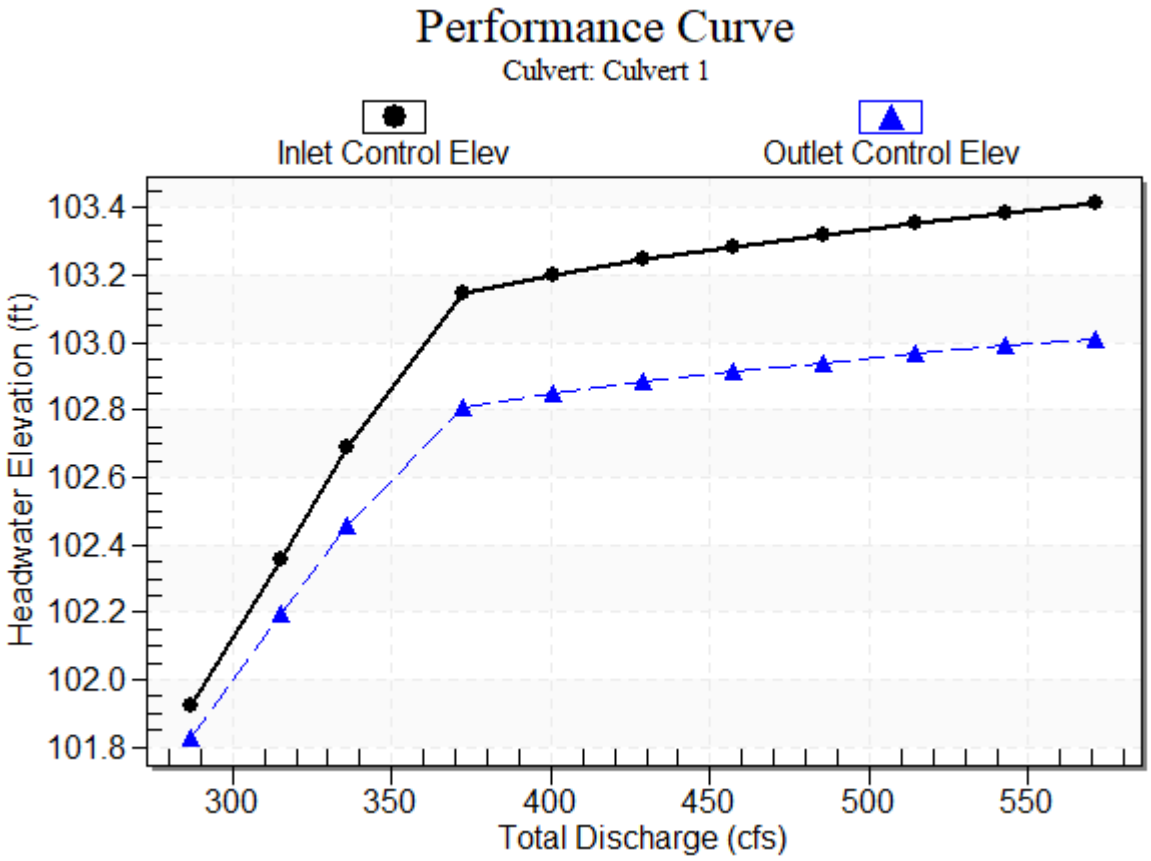
Straight Culvert

Inlet Elevation (invert): 98.31 ft, Outlet Elevation (invert): 98.26 ft

Culvert Length: 98.00 ft, Culvert Slope: 0.0005

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1

Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 98.31 ft

Outlet Station: 98.00 ft

Outlet Elevation: 98.26 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 100 - Culvert Summary Table: Culvert 2

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)
287.00	144.19	101.92	3.652	3.212	7-JA2c	-1.000	1.862	1.862	1.000	7.743	0.000
315.40	158.32	102.35	4.084	3.461	7-A2f	-1.000	1.982	1.982	1.000	7.988	0.000
336.00	168.45	102.69	4.420	3.654	7-A2c	-1.000	2.000	2.000	1.000	8.422	0.000
372.20	181.16	103.15	4.875	3.913	7-A2c	-1.000	2.000	2.000	1.000	9.058	0.000
400.60	182.71	103.20	4.933	3.946	7-A2c	-1.000	2.000	2.000	1.000	9.136	0.000
429.00	183.91	103.25	4.978	3.971	7-A2c	-1.000	2.000	2.000	1.000	9.196	0.000
457.40	184.93	103.29	5.017	3.993	7-A2c	-1.000	2.000	2.000	1.000	9.247	0.000
485.80	185.88	103.32	5.053	4.014	7-A2c	-1.000	2.000	2.000	1.000	9.294	0.000
514.20	186.75	103.36	5.086	4.032	7-A2c	-1.000	2.000	2.000	1.000	9.337	0.000
542.60	187.56	103.39	5.117	4.050	7-A2c	-1.000	2.000	2.000	1.000	9.378	0.000
571.00	188.30	103.42	5.146	4.066	7-A2c	-1.000	2.000	2.000	1.000	9.415	0.000

****

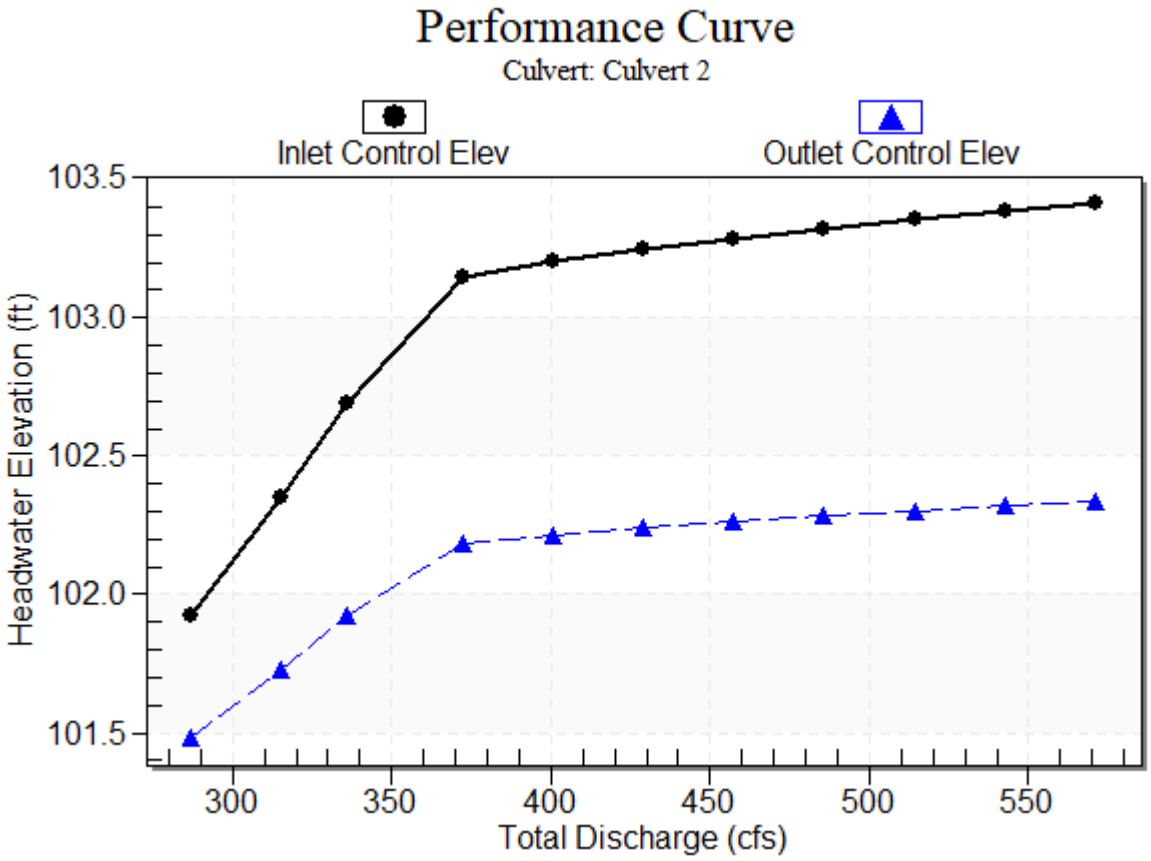
Straight Culvert

Inlet Elevation (invert): 98.27 ft, Outlet Elevation (invert): 98.30 ft

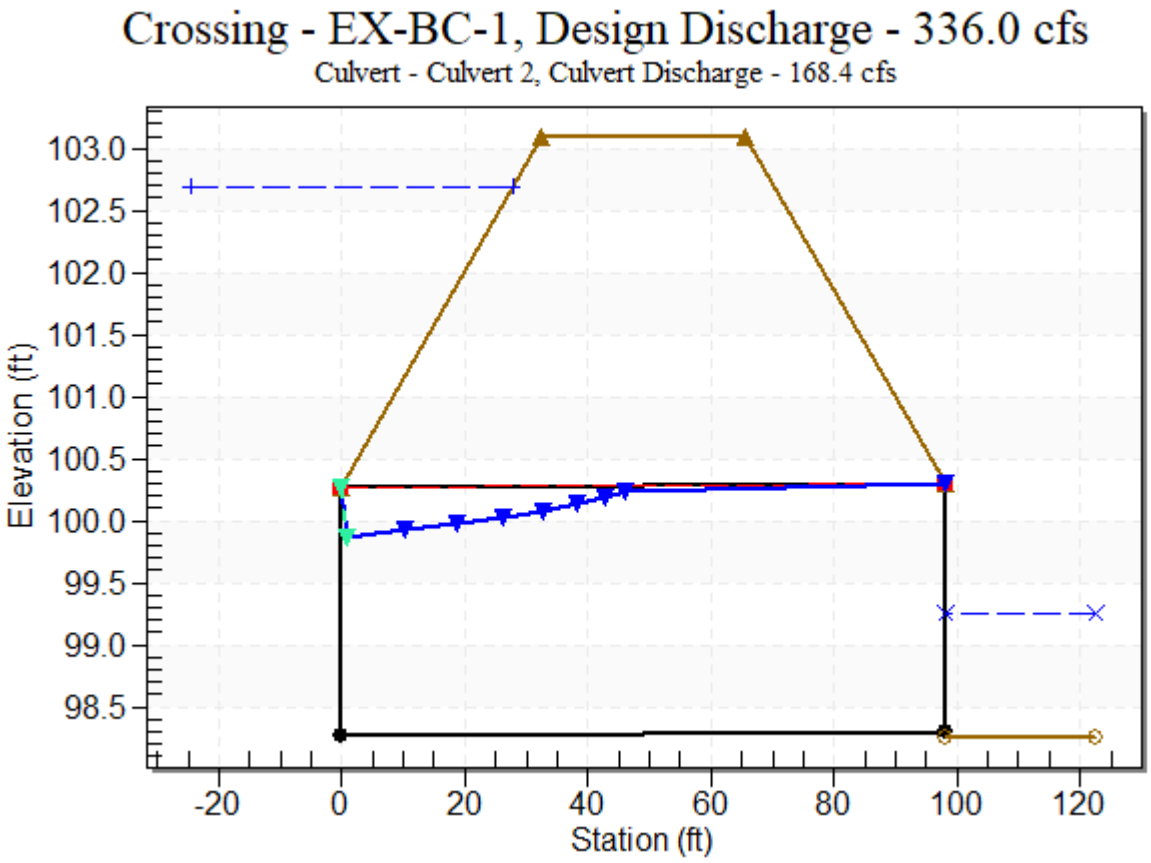
Culvert Length: 98.00 ft, Culvert Slope: -0.0003

****

Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 98.27 ft

Outlet Station: 98.00 ft

Outlet Elevation: 98.30 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 101 - Downstream Channel Rating Curve (Crossing: EX-BC-1)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
287.00	99.26	1.00
315.40	99.26	1.00
336.00	99.26	1.00
372.20	99.26	1.00
400.60	99.26	1.00
429.00	99.26	1.00
457.40	99.26	1.00
485.80	99.26	1.00
514.20	99.26	1.00
542.60	99.26	1.00
571.00	99.26	1.00

Tailwater Channel Data - EX-BC-1

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 99.26 ft

Roadway Data for Crossing: EX-BC-1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 400.00 ft

Crest Elevation: 103.10 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 287 cfs

Design Flow: 336 cfs

Maximum Flow: 571 cfs

Table 102 - Summary of Culvert Flows at Crossing: PR-BC-1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
101.94	287.00	143.49	143.49	0.00	6
102.37	315.40	157.68	157.68	0.00	3
102.70	336.00	168.00	168.00	0.00	4
103.36	372.20	186.12	186.12	0.00	3
103.74	400.60	195.75	195.75	8.41	22
103.80	429.00	197.23	197.23	33.66	6
103.85	457.40	198.37	198.37	59.96	5
103.89	485.80	199.35	199.35	86.74	5
103.92	514.20	200.22	200.22	113.10	4
103.96	542.60	201.03	201.03	140.10	4
103.99	571.00	201.79	201.79	167.14	4
103.70	389.51	194.75	194.75	0.00	Overtopping

Rating Curve Plot for Crossing: PR-BC-1

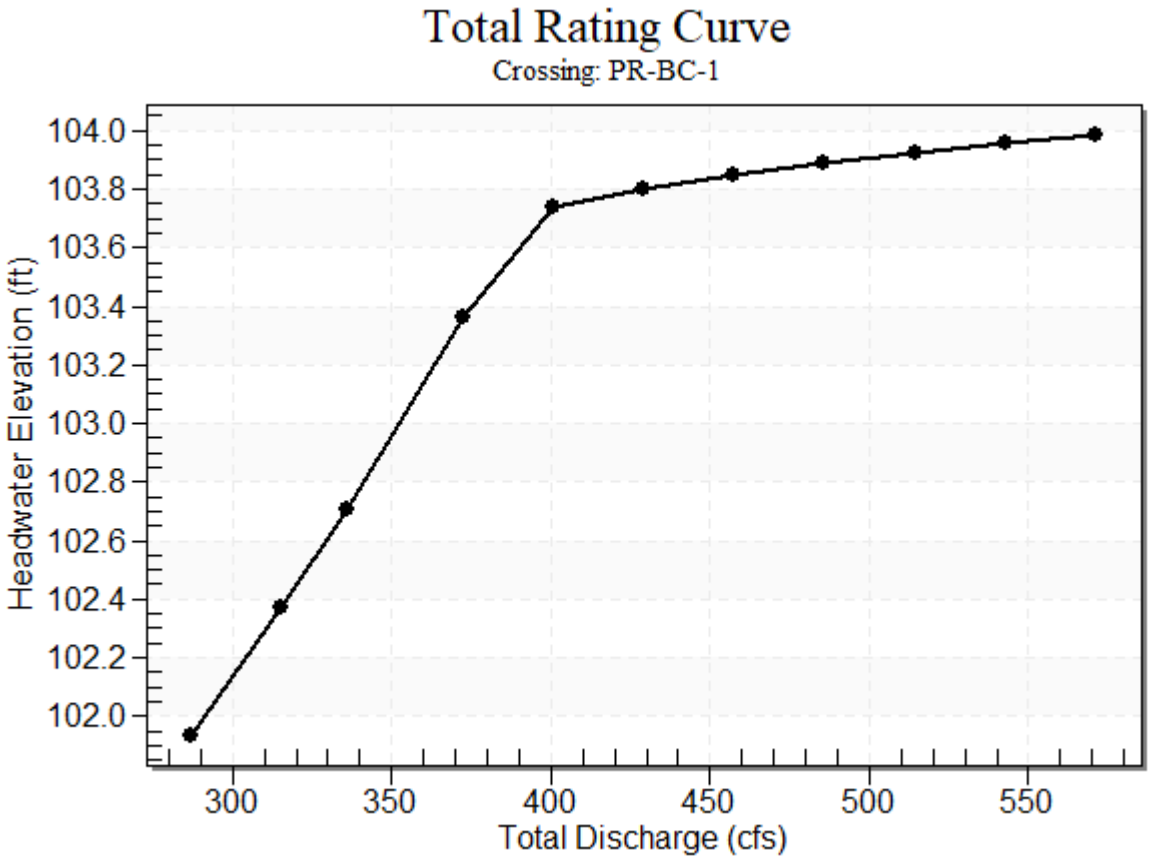


Table 103 - Culvert Summary Table: Culvert 1

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)
287.00	143.49	101.94	3.630	3.636	7-M2c	2.000	1.856	1.856	1.160	7.731	0.000
315.40	157.68	102.37	4.062	4.069	7-M2c	2.000	1.977	1.977	1.160	7.978	0.000
336.00	168.00	102.70	4.403	4.377	6-FFc	2.000	2.000	2.000	1.160	8.400	0.000
372.20	186.12	103.36	5.060	4.963	6-FFc	2.000	2.000	2.000	1.160	9.306	0.000
400.60	195.75	103.74	5.439	5.299	6-FFc	2.000	2.000	2.000	1.160	9.787	0.000
429.00	197.23	103.80	5.500	5.352	6-FFc	2.000	2.000	2.000	1.160	9.862	0.000
457.40	198.37	103.85	5.546	5.393	6-FFc	2.000	2.000	2.000	1.160	9.918	0.000
485.80	199.35	103.89	5.587	5.429	6-FFc	2.000	2.000	2.000	1.160	9.968	0.000
514.20	200.22	103.92	5.622	5.460	6-FFc	2.000	2.000	2.000	1.160	10.011	0.000
542.60	201.03	103.96	5.656	5.490	6-FFc	2.000	2.000	2.000	1.160	10.052	0.000
571.00	201.79	103.99	5.688	5.518	6-FFc	2.000	2.000	2.000	1.160	10.089	0.000

****

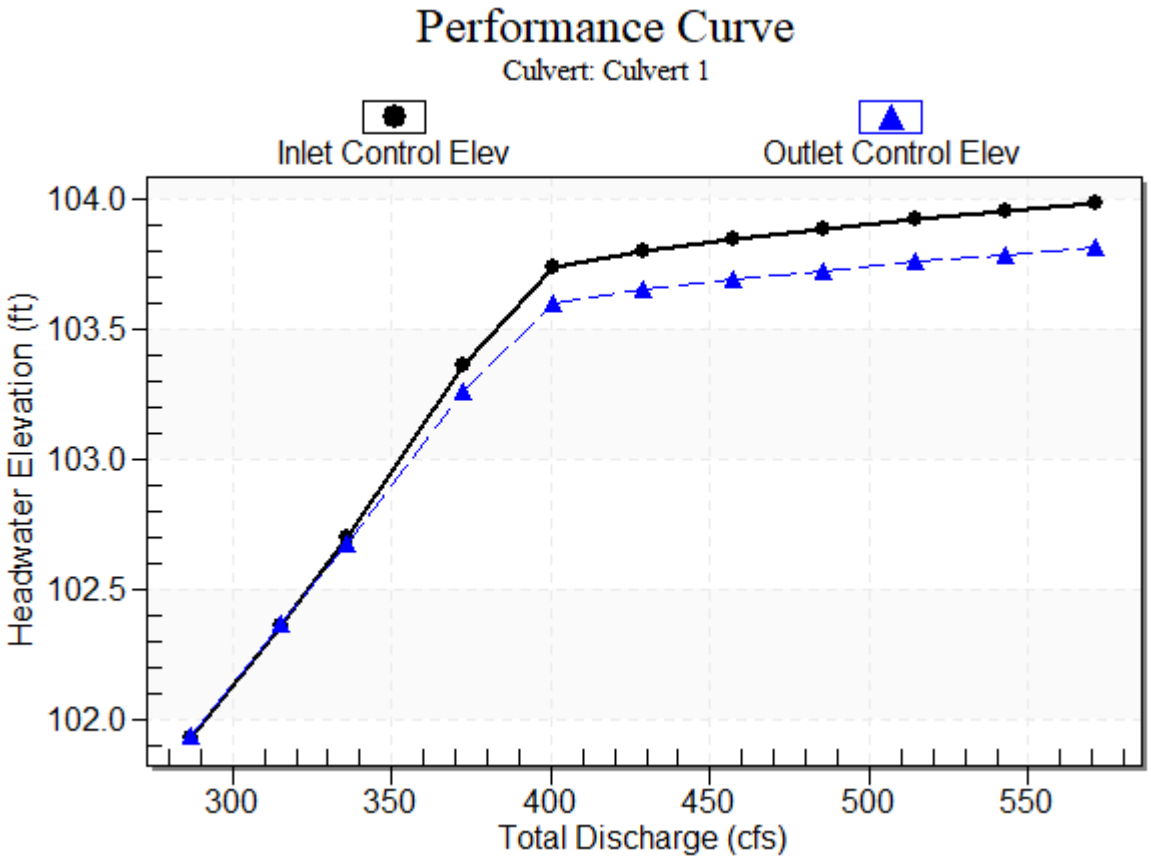
Straight Culvert

Inlet Elevation (invert): 98.30 ft, Outlet Elevation (invert): 98.10 ft

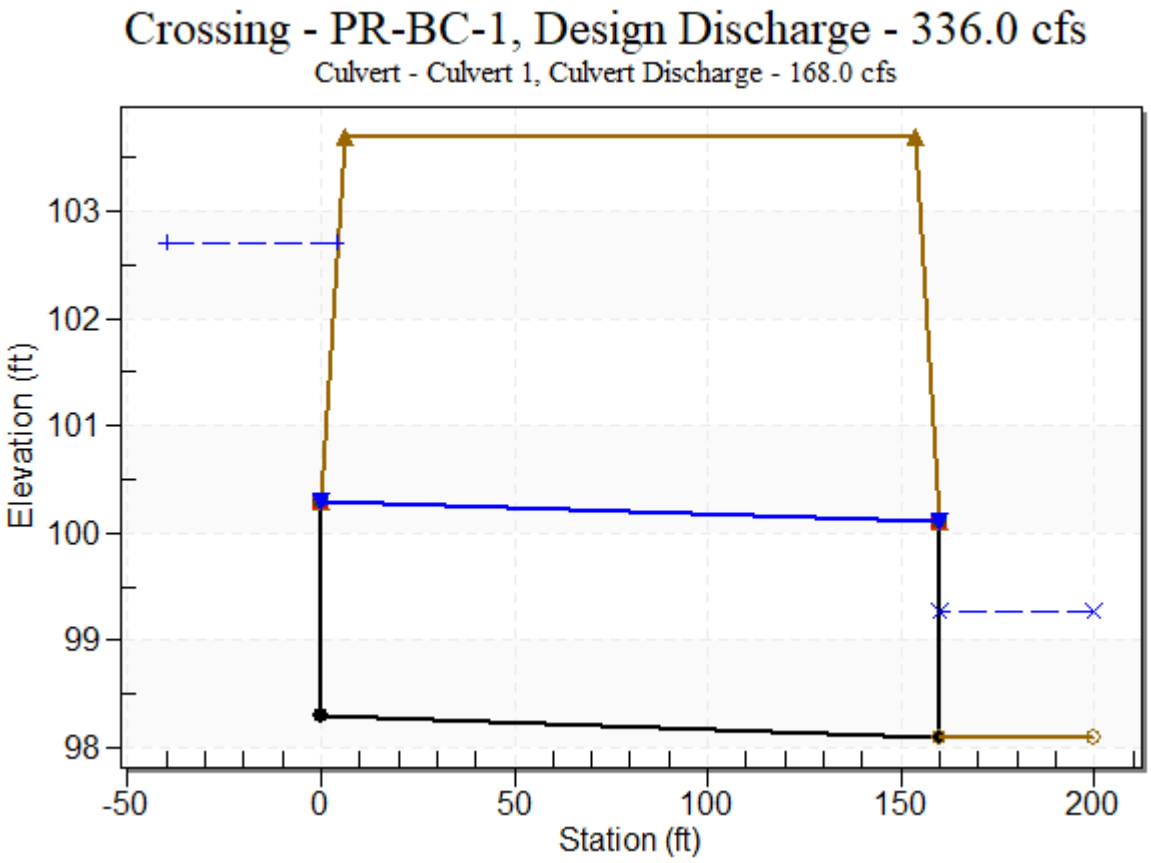
Culvert Length: 160.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 98.30 ft

Outlet Station: 160.00 ft

Outlet Elevation: 98.10 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 104 - Culvert Summary Table: Culvert 2

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)
287.00	143.49	101.94	3.630	3.636	7-M2c	2.000	1.856	1.856	1.160	7.731	0.000
315.40	157.68	102.37	4.062	4.069	7-M2c	2.000	1.977	1.977	1.160	7.978	0.000
336.00	168.00	102.70	4.403	4.377	6-FFc	2.000	2.000	2.000	1.160	8.400	0.000
372.20	186.12	103.36	5.060	4.963	6-FFc	2.000	2.000	2.000	1.160	9.306	0.000
400.60	195.75	103.74	5.439	5.299	6-FFc	2.000	2.000	2.000	1.160	9.787	0.000
429.00	197.23	103.80	5.500	5.352	6-FFc	2.000	2.000	2.000	1.160	9.862	0.000
457.40	198.37	103.85	5.546	5.393	6-FFc	2.000	2.000	2.000	1.160	9.918	0.000
485.80	199.35	103.89	5.587	5.429	6-FFc	2.000	2.000	2.000	1.160	9.968	0.000
514.20	200.22	103.92	5.622	5.460	6-FFc	2.000	2.000	2.000	1.160	10.011	0.000
542.60	201.03	103.96	5.656	5.490	6-FFc	2.000	2.000	2.000	1.160	10.052	0.000
571.00	201.79	103.99	5.688	5.518	6-FFc	2.000	2.000	2.000	1.160	10.089	0.000

****

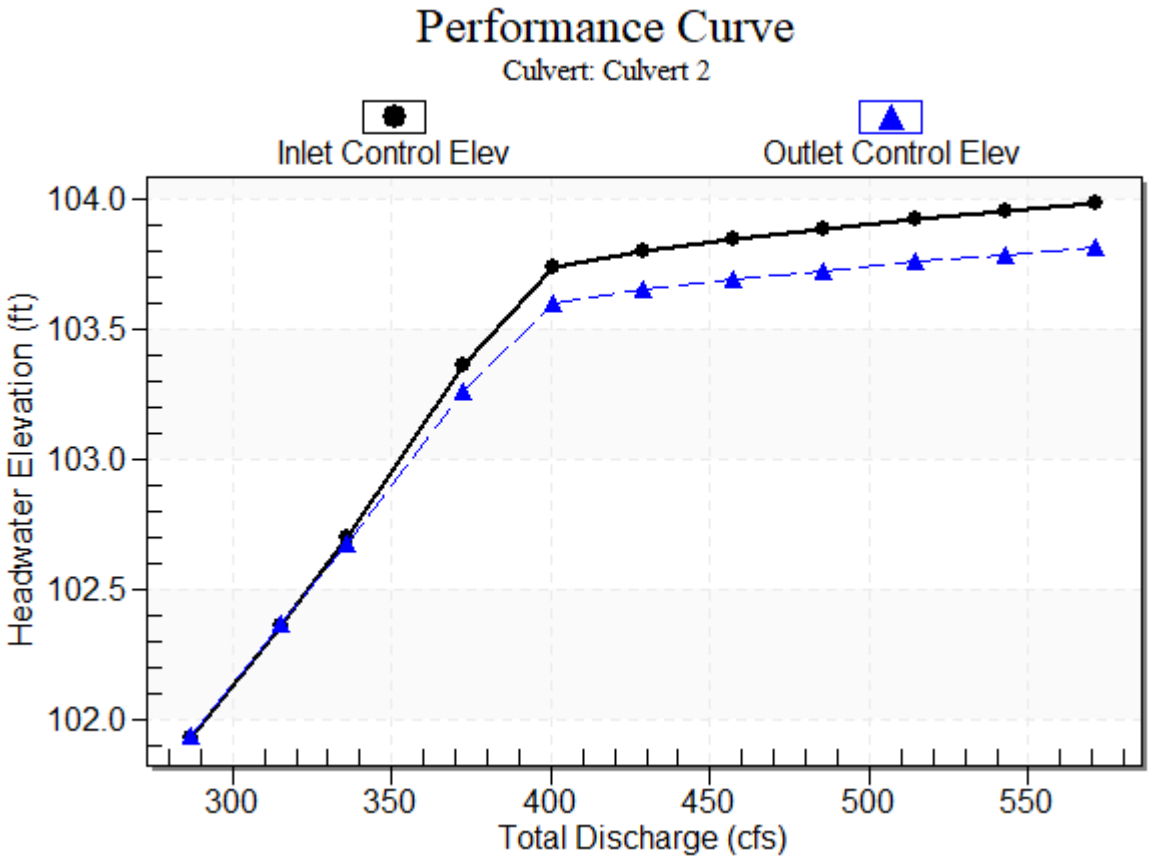
Straight Culvert

Inlet Elevation (invert): 98.30 ft, Outlet Elevation (invert): 98.10 ft

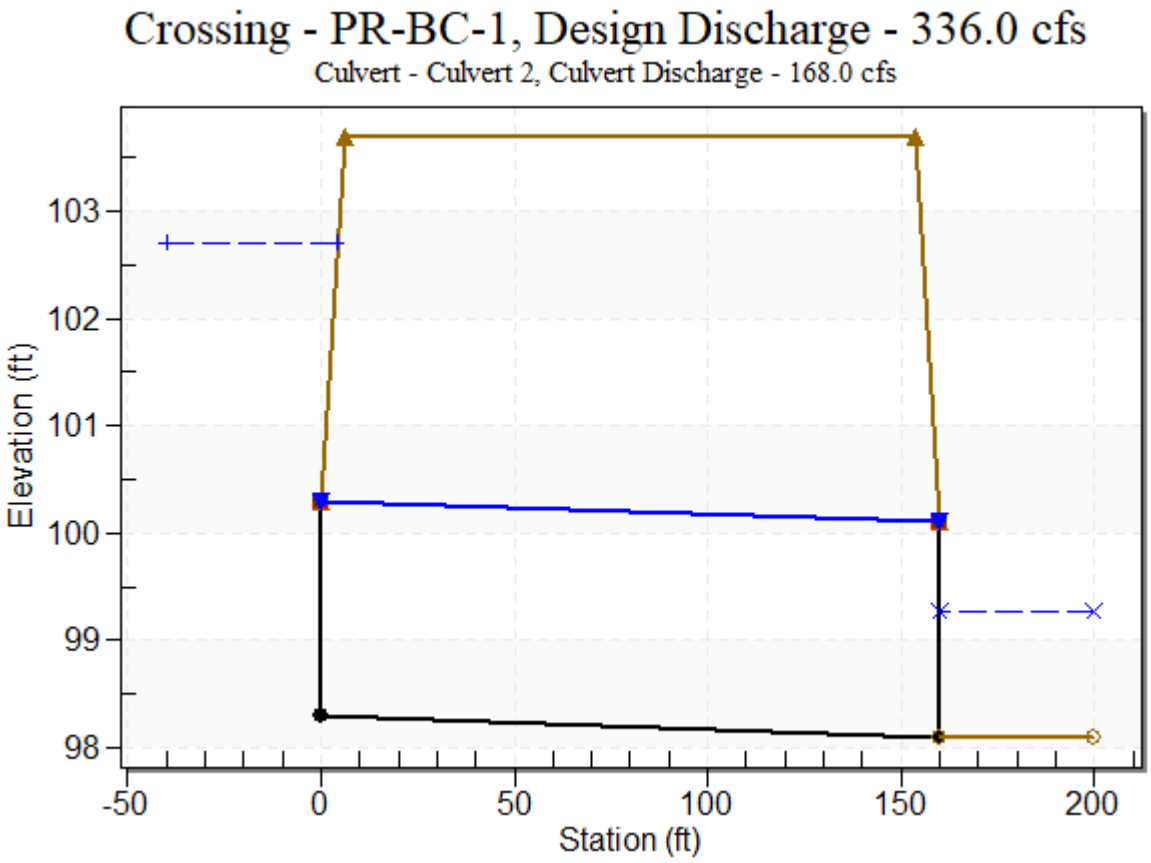
Culvert Length: 160.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 98.30 ft

Outlet Station: 160.00 ft

Outlet Elevation: 98.10 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 105 - Downstream Channel Rating Curve (Crossing: PR-BC-1)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
287.00	99.26	1.16
315.40	99.26	1.16
336.00	99.26	1.16
372.20	99.26	1.16
400.60	99.26	1.16
429.00	99.26	1.16
457.40	99.26	1.16
485.80	99.26	1.16
514.20	99.26	1.16
542.60	99.26	1.16
571.00	99.26	1.16

Tailwater Channel Data - PR-BC-1

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 99.26 ft

Roadway Data for Crossing: PR-BC-1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 400.00 ft

Crest Elevation: 103.70 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 860 cfs

Design Flow: 1008 cfs

Maximum Flow: 1714 cfs

Table 106 - Summary of Culvert Flows at Crossing: EX-BC-2

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Culvert 3 Discharge (cfs)	Culvert 4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
97.00	860.00	214.81	214.39	215.43	215.39	0.00	6
97.43	945.40	236.21	235.83	236.79	236.75	0.00	3
97.77	1008.00	251.74	251.38	252.28	252.24	0.00	12
98.15	1116.20	267.81	267.47	268.32	268.28	43.77	8
98.27	1201.60	272.81	272.48	273.31	273.27	109.36	6
98.37	1287.00	276.90	276.57	277.39	277.36	178.24	5
98.46	1372.40	280.52	280.20	281.01	280.97	249.37	5
98.54	1457.80	283.80	283.49	284.28	284.25	320.97	4
98.62	1543.20	286.89	286.58	287.36	287.33	394.25	4
98.70	1628.60	289.79	289.48	290.26	290.22	468.20	4
98.77	1714.00	292.54	292.23	293.00	292.97	542.77	4
98.00	1047.22	261.64	261.29	262.16	262.12	0.00	Overtopping

Rating Curve Plot for Crossing: EX-BC-2

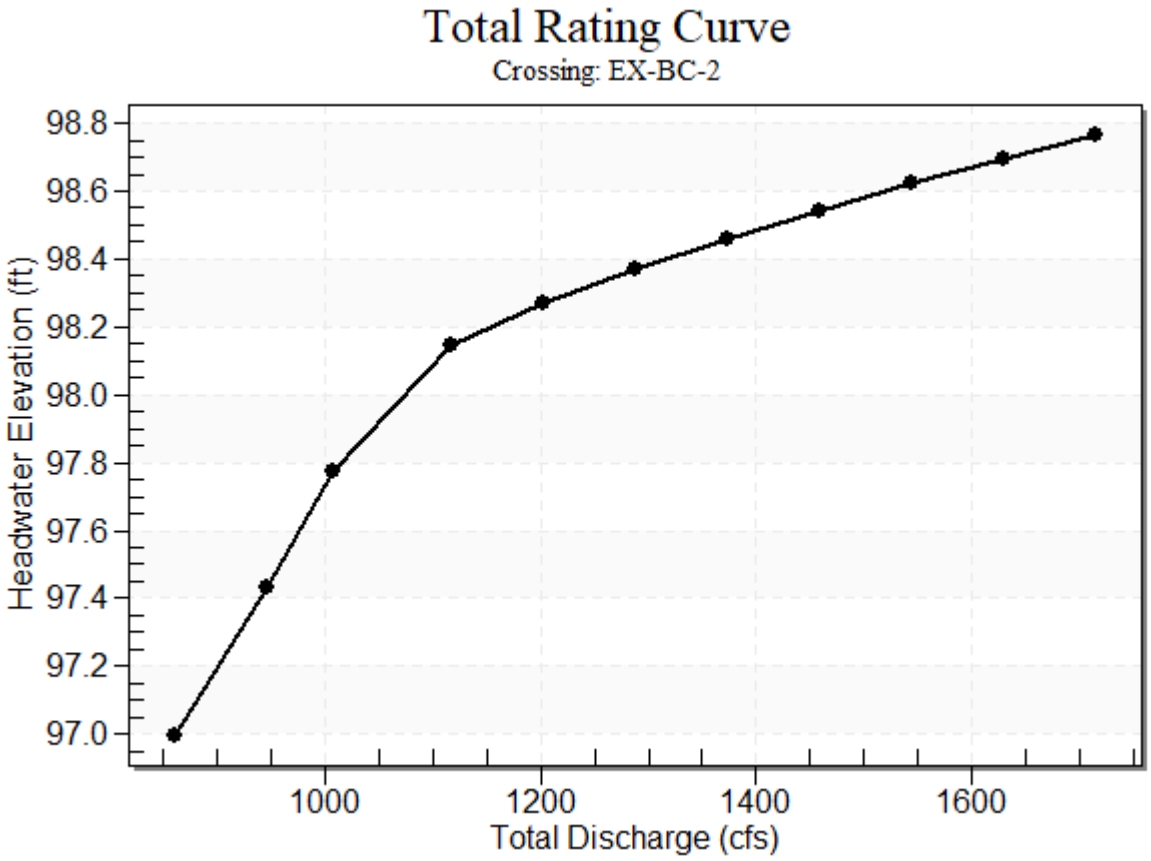


Table 107 - Culvert Summary Table: Culvert 1

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)
860.00	214.81	97.00	4.398	4.172	7-M2c	3.000	2.429	2.429	2.000	8.844	0.000
945.40	236.21	97.43	4.833	4.445	7-M2c	3.000	2.588	2.588	2.000	9.128	0.000
1008.00	251.74	97.77	5.172	4.735	7-M2c	3.000	2.700	2.700	2.000	9.324	0.000
1116.20	267.81	98.15	5.545	5.086	7-M2c	3.000	2.814	2.814	2.000	9.518	0.000
1201.60	272.81	98.27	5.666	5.191	7-M2c	3.000	2.849	2.849	2.000	9.577	0.000
1287.00	276.90	98.37	5.767	5.274	7-M2c	3.000	2.877	2.877	2.000	9.625	0.000
1372.40	280.52	98.46	5.858	5.346	7-M2c	3.000	2.902	2.902	2.000	9.667	0.000
1457.80	283.80	98.54	5.941	5.411	7-M2c	3.000	2.925	2.925	2.000	9.704	0.000
1543.20	286.89	98.62	6.020	5.471	7-M2c	3.000	2.946	2.946	2.000	9.739	0.000
1628.60	289.79	98.70	6.095	5.527	7-M2c	3.000	2.966	2.966	2.000	9.772	0.000
1714.00	292.54	98.77	6.167	5.579	7-M2c	3.000	2.984	2.984	2.000	9.803	0.000

****

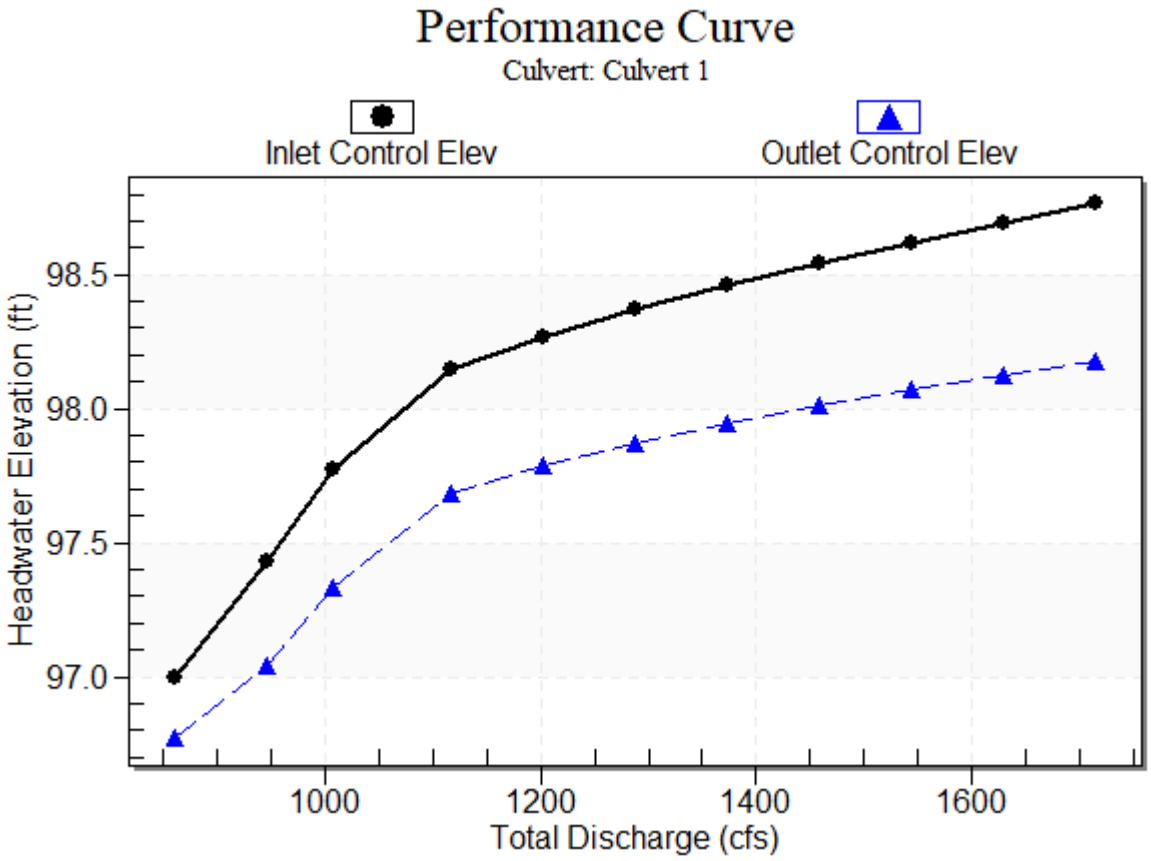
Straight Culvert

Inlet Elevation (invert): 92.60 ft, Outlet Elevation (invert): 92.45 ft

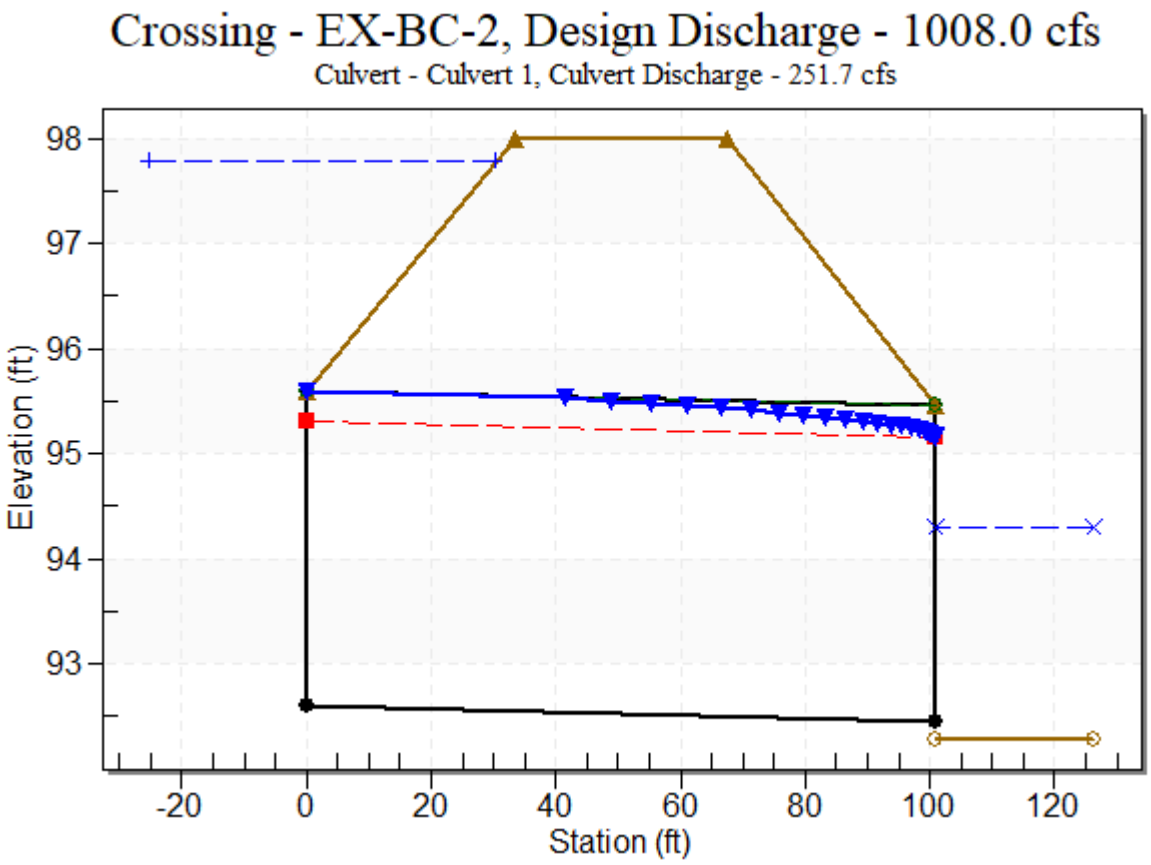
Culvert Length: 101.00 ft, Culvert Slope: 0.0015

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 92.60 ft

Outlet Station: 101.00 ft

Outlet Elevation: 92.45 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 108 - Culvert Summary Table: Culvert 2

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)
860.00	214.39	97.00	4.388	3.899	5-S2n	2.384	2.426	2.384	2.000	8.991	0.000
945.40	235.83	97.43	4.823	4.286	5-S2n	2.547	2.585	2.551	2.000	9.245	0.000
1008.00	251.38	97.77	5.162	4.584	5-S2n	2.662	2.697	2.662	2.000	9.442	0.000
1116.20	267.47	98.15	5.535	4.907	5-S2n	2.780	2.811	2.780	2.000	9.620	0.000
1201.60	272.48	98.27	5.656	5.011	5-S2n	2.817	2.846	2.817	2.000	9.674	0.000
1287.00	276.57	98.37	5.757	5.097	5-S2n	2.846	2.875	2.850	2.000	9.703	0.000
1372.40	280.20	98.46	5.848	5.174	5-S2n	2.872	2.900	2.872	2.000	9.755	0.000
1457.80	283.49	98.54	5.931	5.244	5-S2n	2.896	2.922	2.896	2.000	9.789	0.000
1543.20	286.58	98.62	6.010	5.311	5-S2n	2.918	2.944	2.918	2.000	9.820	0.000
1628.60	289.48	98.70	6.085	5.391	7-M2c	3.000	2.963	2.963	2.000	9.768	0.000
1714.00	292.23	98.77	6.157	5.210	7-M2c	3.000	2.982	2.982	2.000	9.799	0.000

****

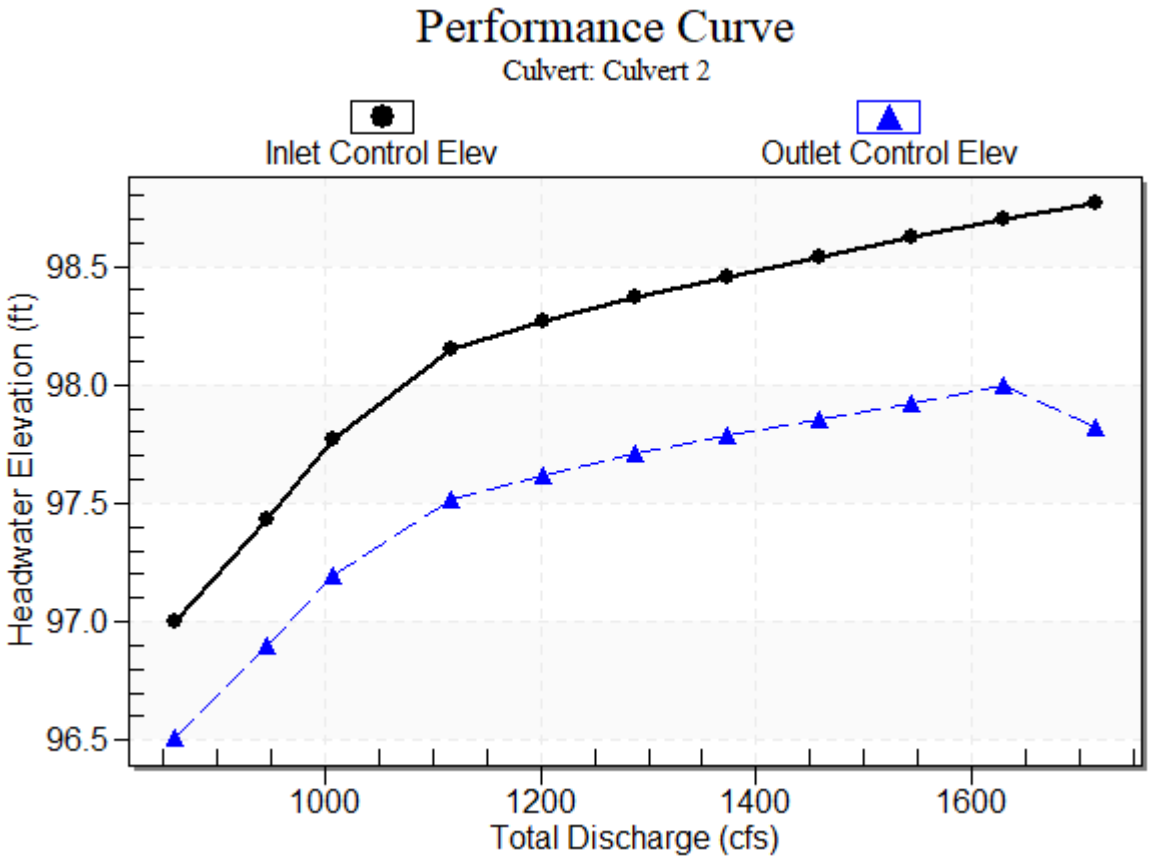
Straight Culvert

Inlet Elevation (invert): 92.61 ft, Outlet Elevation (invert): 92.33 ft

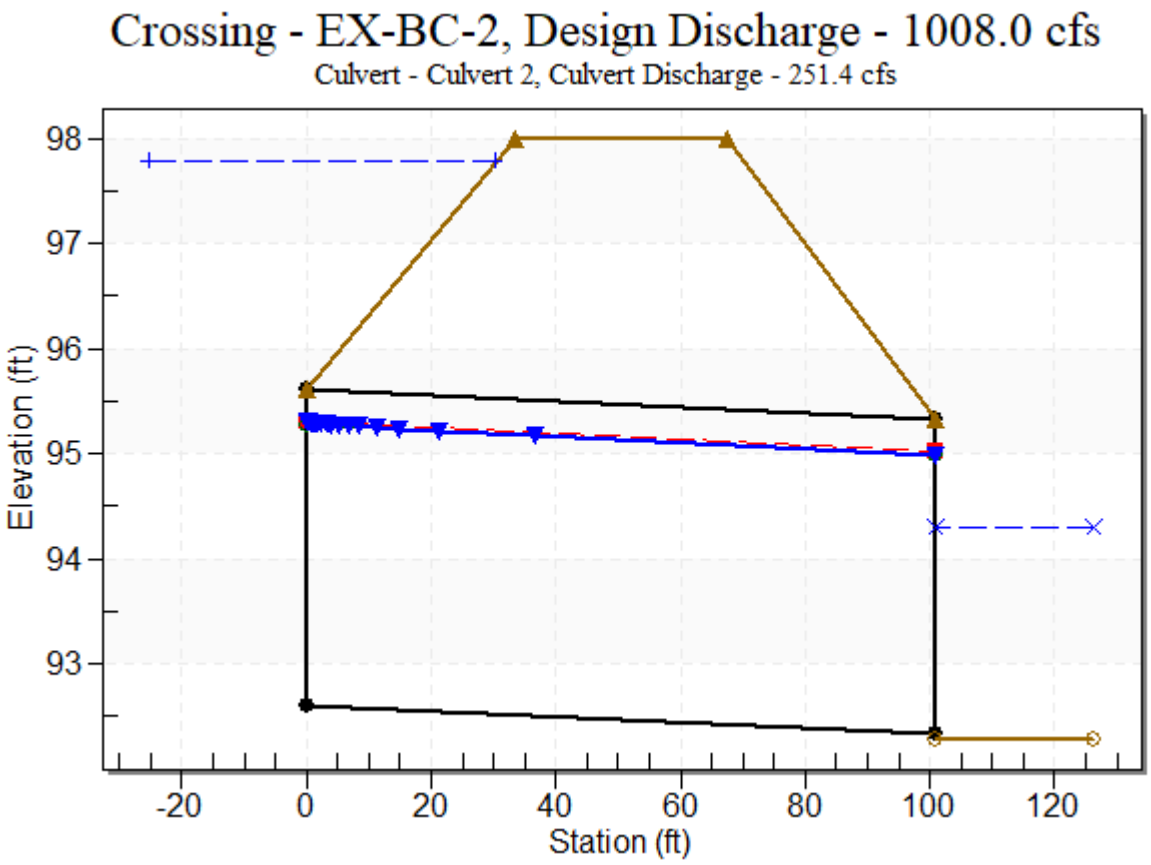
Culvert Length: 101.00 ft, Culvert Slope: 0.0028

****

Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 92.61 ft

Outlet Station: 101.00 ft

Outlet Elevation: 92.33 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 109 - Culvert Summary Table: Culvert 3

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)
860.00	215.43	97.00	4.408	3.897	5-S2n	2.336	2.434	2.342	2.000	9.198	0.000
945.40	236.79	97.43	4.843	4.284	5-S2n	2.494	2.592	2.500	2.000	9.472	0.000
1008.00	252.28	97.77	5.182	4.582	5-S2n	2.606	2.704	2.612	2.000	9.658	0.000
1116.20	268.32	98.15	5.555	4.905	5-S2n	2.720	2.817	2.727	2.000	9.841	0.000
1201.60	273.31	98.27	5.676	5.008	5-S2n	2.755	2.852	2.762	2.000	9.896	0.000
1287.00	277.39	98.37	5.777	5.094	5-S2n	2.784	2.880	2.791	2.000	9.940	0.000
1372.40	281.01	98.46	5.868	5.171	5-S2n	2.809	2.905	2.816	2.000	9.979	0.000
1457.80	284.28	98.54	5.951	5.241	5-S2n	2.832	2.928	2.839	2.000	10.014	0.000
1543.20	287.36	98.62	6.030	5.308	5-S2n	2.854	2.949	2.860	2.000	10.046	0.000
1628.60	290.26	98.70	6.105	5.371	5-S2n	2.874	2.969	2.881	2.000	10.076	0.000
1714.00	293.00	98.77	6.177	5.432	5-S2n	2.893	2.987	2.900	2.000	10.104	0.000

****

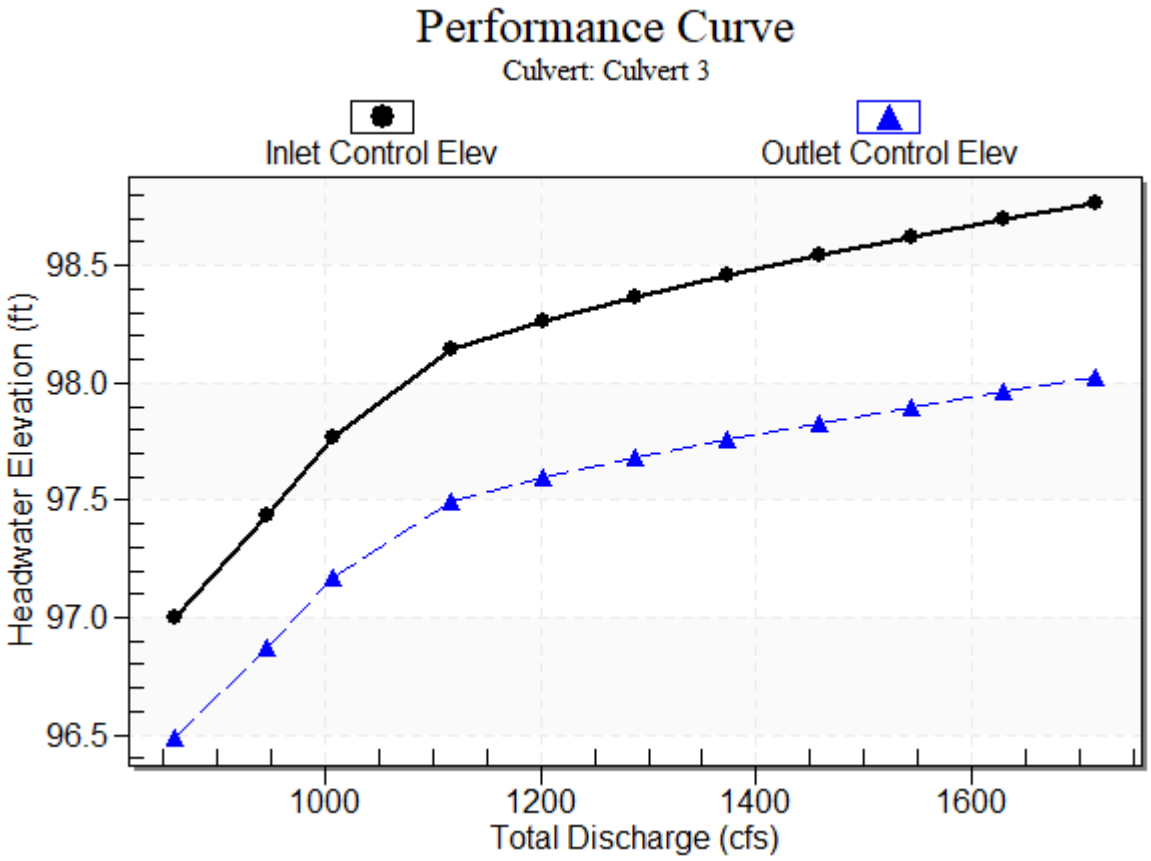
Straight Culvert

Inlet Elevation (invert): 92.59 ft, Outlet Elevation (invert): 92.29 ft

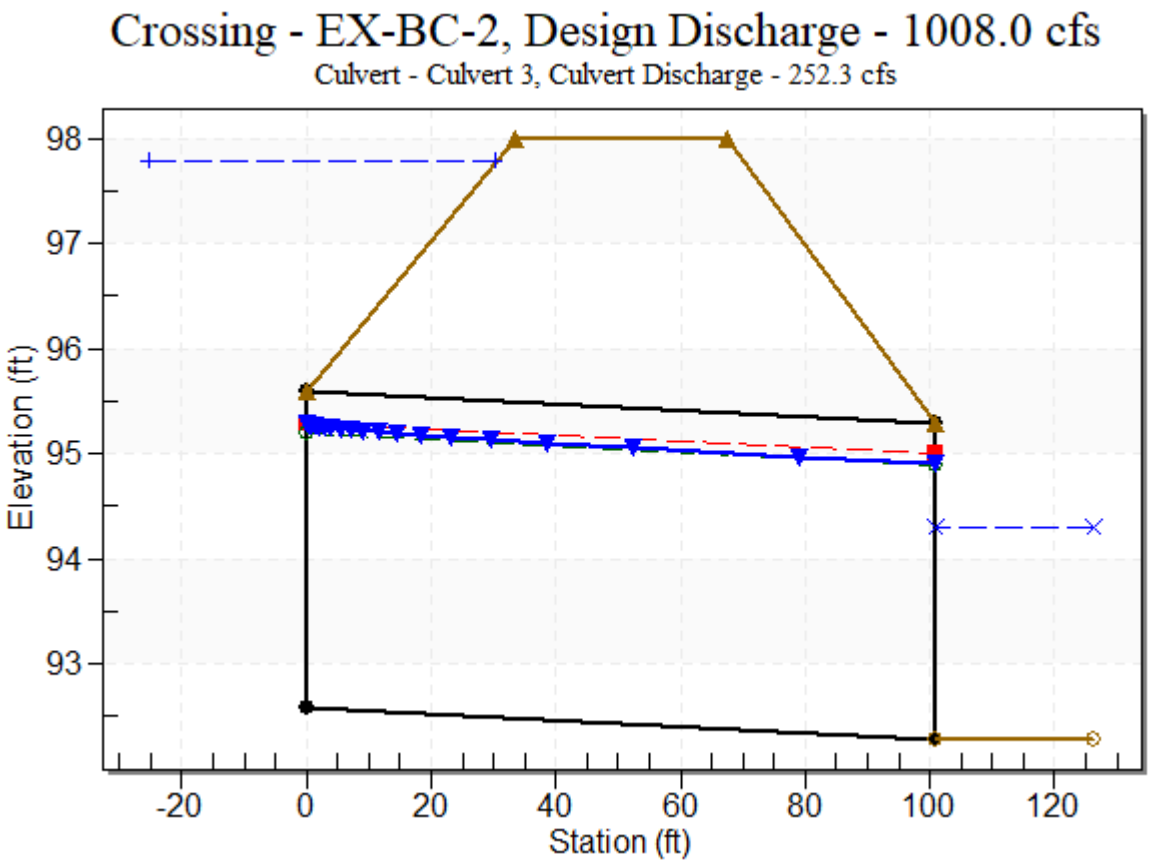
Culvert Length: 101.00 ft, Culvert Slope: 0.0030

****

Culvert Performance Curve Plot: Culvert 3



Water Surface Profile Plot for Culvert: Culvert 3



Site Data - Culvert 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 92.59 ft

Outlet Station: 101.00 ft

Outlet Elevation: 92.29 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 3

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 110 - Culvert Summary Table: Culvert 4

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)
860.00	215.39	97.00	4.408	4.222	7-M2c	2.523	2.433	2.433	2.000	8.852	0.000
945.40	236.75	97.43	4.843	4.494	7-M2c	2.694	2.592	2.592	2.000	9.135	0.000
1008.00	252.24	97.77	5.182	4.686	7-M2c	2.816	2.703	2.703	2.000	9.330	0.000
1116.20	268.28	98.15	5.555	4.882	7-M2c	3.000	2.817	2.817	2.000	9.524	0.000
1201.60	273.27	98.27	5.676	4.942	7-M2c	3.000	2.852	2.852	2.000	9.583	0.000
1287.00	277.36	98.37	5.777	5.071	7-M2c	3.000	2.880	2.880	2.000	9.630	0.000
1372.40	280.97	98.46	5.868	5.218	7-M2c	3.000	2.905	2.905	2.000	9.672	0.000
1457.80	284.25	98.54	5.951	5.309	7-M2c	3.000	2.928	2.928	2.000	9.709	0.000
1543.20	287.33	98.62	6.030	5.381	7-M2c	3.000	2.949	2.949	2.000	9.744	0.000
1628.60	290.22	98.70	6.105	5.442	7-M2c	3.000	2.968	2.968	2.000	9.777	0.000
1714.00	292.97	98.77	6.177	5.497	7-M2c	3.000	2.987	2.987	2.000	9.808	0.000

****

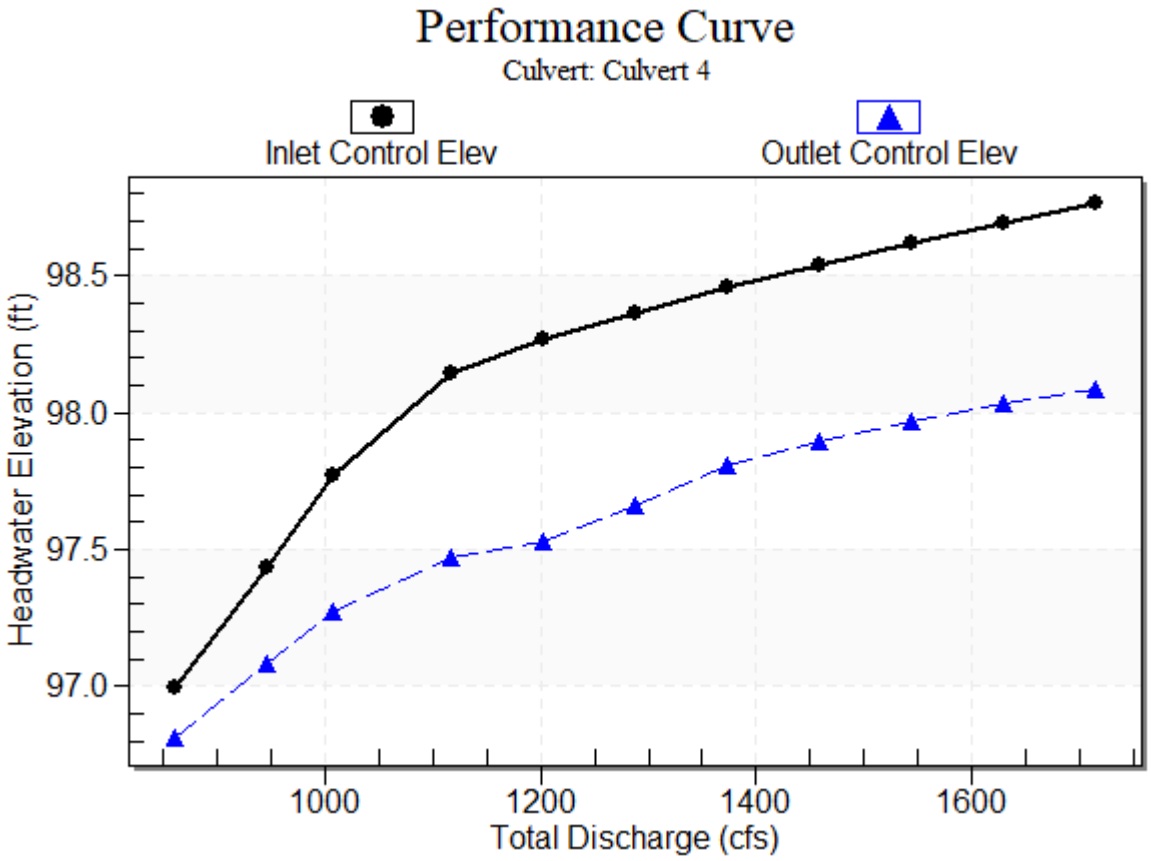
Straight Culvert

Inlet Elevation (invert): 92.59 ft, Outlet Elevation (invert): 92.35 ft

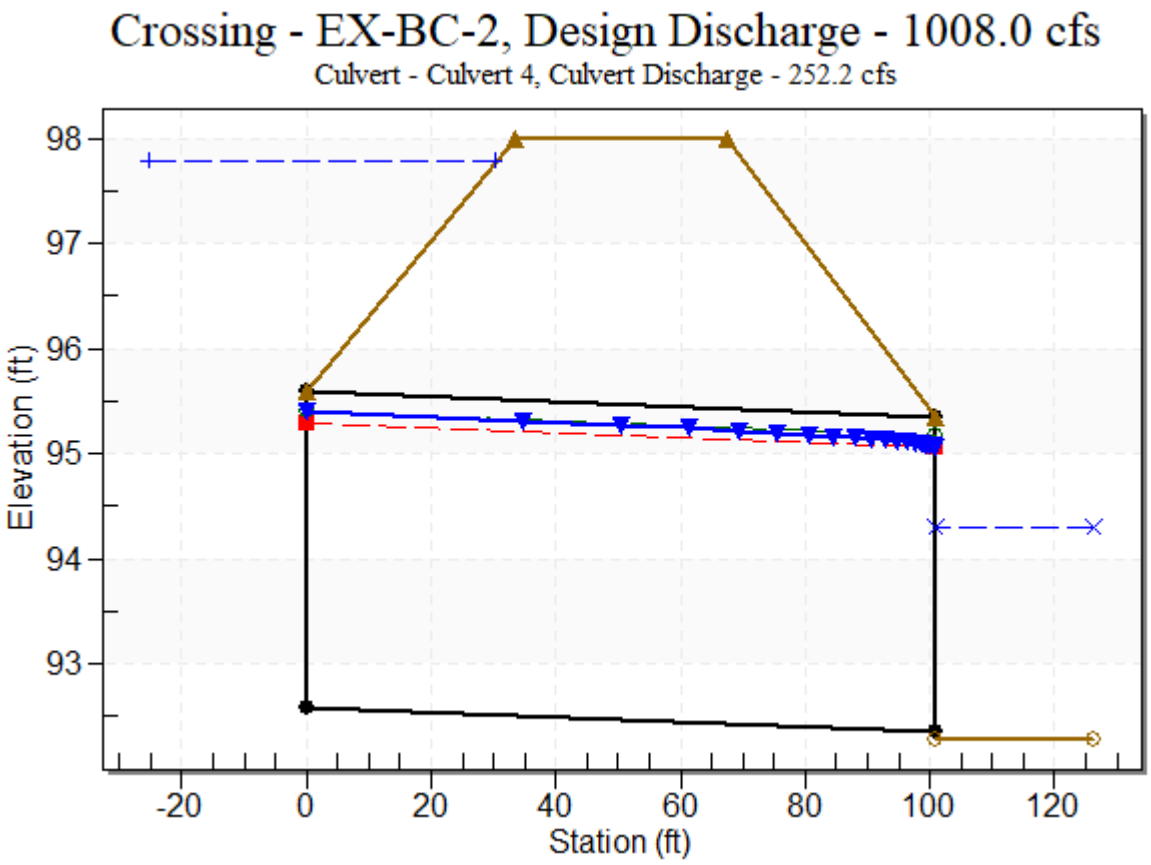
Culvert Length: 101.00 ft, Culvert Slope: 0.0024

****

Culvert Performance Curve Plot: Culvert 4



Water Surface Profile Plot for Culvert: Culvert 4



Site Data - Culvert 4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 92.59 ft

Outlet Station: 101.00 ft

Outlet Elevation: 92.35 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 4

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 111 - Downstream Channel Rating Curve (Crossing: EX-BC-2)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
860.00	94.29	2.00
945.40	94.29	2.00
1008.00	94.29	2.00
1116.20	94.29	2.00
1201.60	94.29	2.00
1287.00	94.29	2.00
1372.40	94.29	2.00
1457.80	94.29	2.00
1543.20	94.29	2.00
1628.60	94.29	2.00
1714.00	94.29	2.00

Tailwater Channel Data - EX-BC-2

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 94.29 ft

Roadway Data for Crossing: EX-BC-2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 98.00 ft

Roadway Surface: Paved

Roadway Top Width: 34.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 860 cfs

Design Flow: 1008 cfs

Maximum Flow: 1714 cfs

Table 112 - Summary of Culvert Flows at Crossing: PR-BC-2

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Culvert 3 Discharge (cfs)	Culvert 4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
97.00	860.00	215.01	215.01	215.01	215.01	0.00	6
97.44	945.40	236.40	236.40	236.40	236.40	0.00	3
97.78	1008.00	252.03	252.03	252.03	252.03	0.00	3
98.42	1116.20	279.09	279.09	279.09	279.09	0.00	3
98.97	1201.60	300.28	300.28	300.28	300.28	0.00	17
99.17	1287.00	307.56	307.56	307.56	307.56	56.13	7
99.29	1372.40	311.81	311.81	311.81	311.81	124.13	5
99.40	1457.80	315.40	315.40	315.40	315.40	195.71	5
99.49	1543.20	318.58	318.58	318.58	318.58	268.58	5
99.57	1628.60	321.47	321.47	321.47	321.47	341.74	4
99.65	1714.00	324.19	324.19	324.19	324.19	416.46	4
99.00	1205.01	301.25	301.25	301.25	301.25	0.00	Overtopping

Rating Curve Plot for Crossing: PR-BC-2

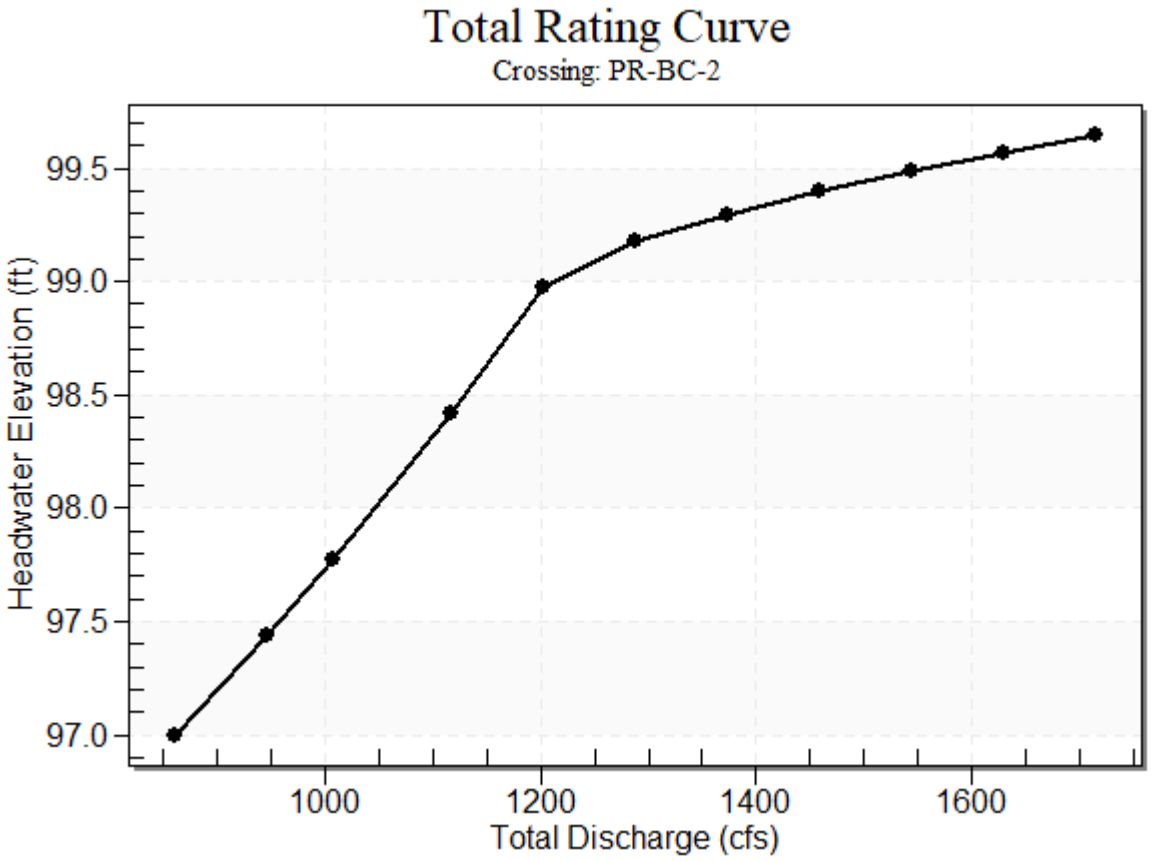


Table 113 - Culvert Summary Table: Culvert 1

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)
860.00	215.01	97.00	4.401	4.234	7-M2c	2.476	2.430	2.430	2.000	8.847	0.000
945.40	236.40	97.44	4.835	4.507	7-M2c	2.644	2.589	2.589	2.000	9.131	0.000
1008.00	252.03	97.78	5.177	4.702	7-M2c	2.765	2.702	2.702	2.000	9.328	0.000
1116.20	279.09	98.42	5.820	5.027	7-M2c	3.000	2.892	2.892	2.000	9.650	0.000
1201.60	300.28	98.97	6.373	5.792	6-FFc	3.000	3.000	3.000	2.000	10.009	0.000
1287.00	307.56	99.17	6.573	5.949	6-FFc	3.000	3.000	3.000	2.000	10.252	0.000
1372.40	311.81	99.29	6.692	6.042	6-FFc	3.000	3.000	3.000	2.000	10.394	0.000
1457.80	315.40	99.40	6.794	6.122	6-FFc	3.000	3.000	3.000	2.000	10.513	0.000
1543.20	318.58	99.49	6.886	6.193	6-FFc	3.000	3.000	3.000	2.000	10.619	0.000
1628.60	321.47	99.57	6.970	6.259	6-FFc	3.000	3.000	3.000	2.000	10.716	0.000
1714.00	324.19	99.65	7.050	6.321	6-FFc	3.000	3.000	3.000	2.000	10.806	0.000

****

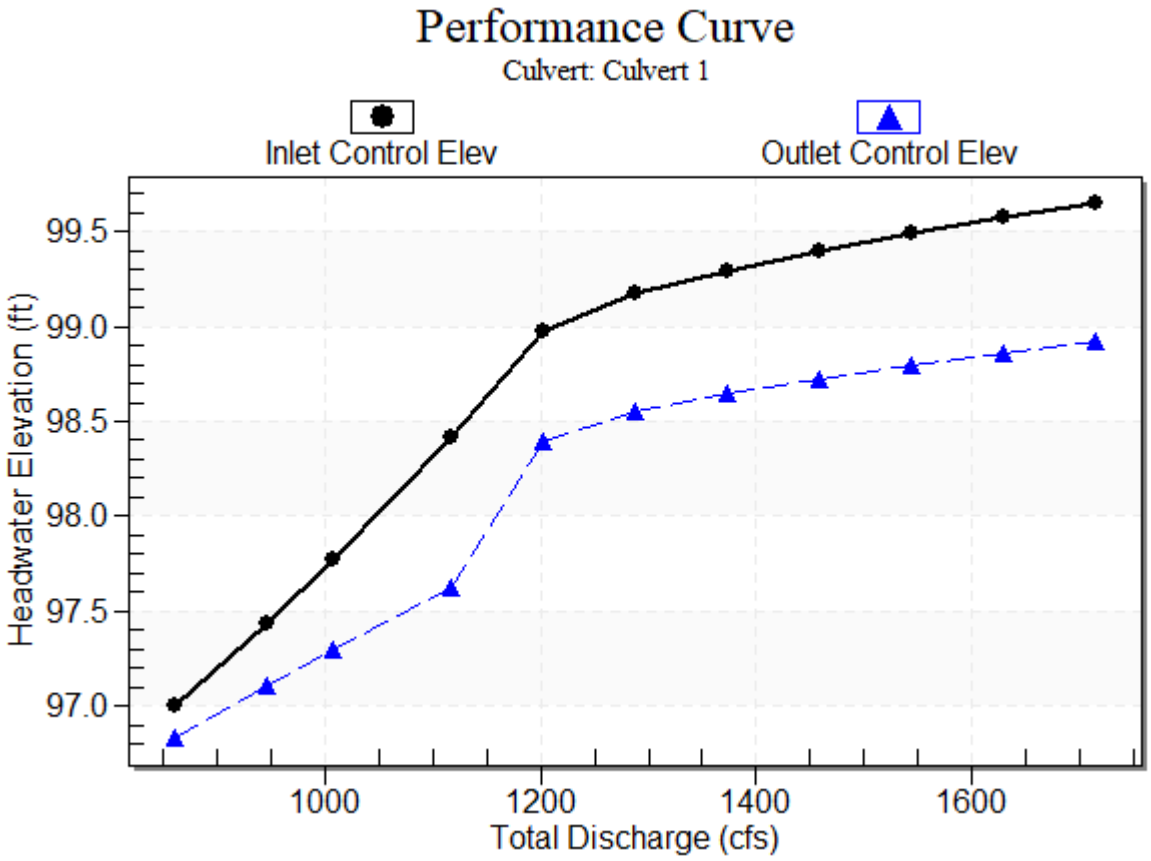
Straight Culvert

Inlet Elevation (invert): 92.60 ft, Outlet Elevation (invert): 92.20 ft

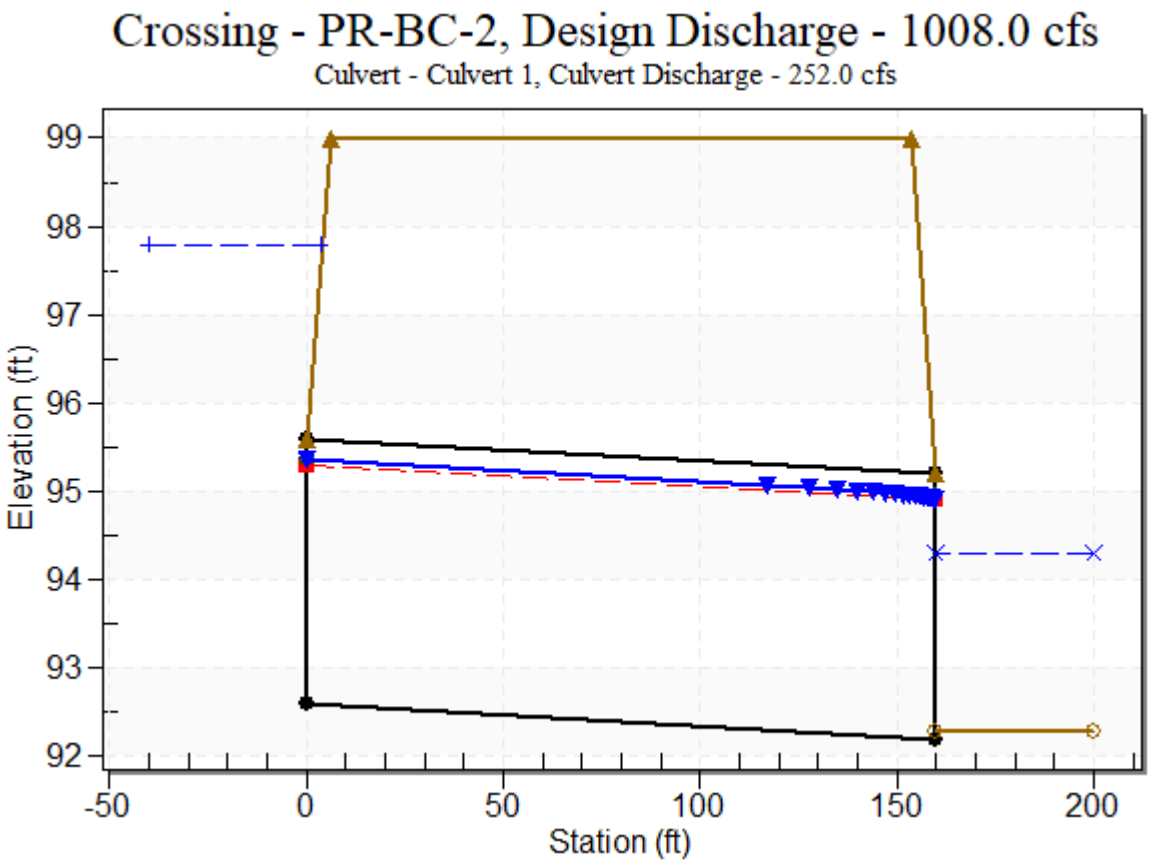
Culvert Length: 160.00 ft, Culvert Slope: 0.0025

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 92.60 ft

Outlet Station: 160.00 ft

Outlet Elevation: 92.20 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 114 - Culvert Summary Table: Culvert 2

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)
860.00	215.01	97.00	4.401	4.234	7-M2c	2.476	2.430	2.430	2.000	8.847	0.000
945.40	236.40	97.44	4.835	4.507	7-M2c	2.644	2.589	2.589	2.000	9.131	0.000
1008.00	252.03	97.78	5.177	4.702	7-M2c	2.765	2.702	2.702	2.000	9.328	0.000
1116.20	279.09	98.42	5.820	5.027	7-M2c	3.000	2.892	2.892	2.000	9.650	0.000
1201.60	300.28	98.97	6.373	5.792	6-FFc	3.000	3.000	3.000	2.000	10.009	0.000
1287.00	307.56	99.17	6.573	5.949	6-FFc	3.000	3.000	3.000	2.000	10.252	0.000
1372.40	311.81	99.29	6.692	6.042	6-FFc	3.000	3.000	3.000	2.000	10.394	0.000
1457.80	315.40	99.40	6.794	6.122	6-FFc	3.000	3.000	3.000	2.000	10.513	0.000
1543.20	318.58	99.49	6.886	6.193	6-FFc	3.000	3.000	3.000	2.000	10.619	0.000
1628.60	321.47	99.57	6.970	6.259	6-FFc	3.000	3.000	3.000	2.000	10.716	0.000
1714.00	324.19	99.65	7.050	6.321	6-FFc	3.000	3.000	3.000	2.000	10.806	0.000

****

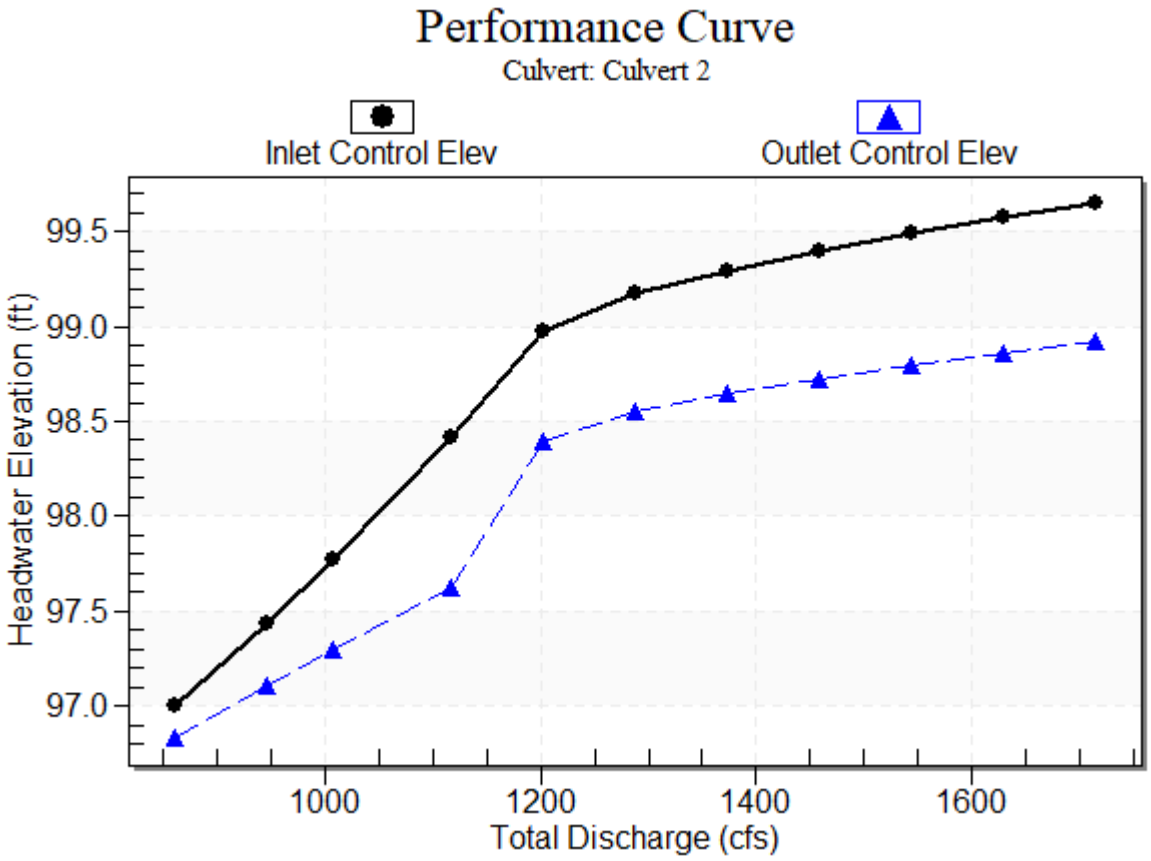
Straight Culvert

Inlet Elevation (invert): 92.60 ft, Outlet Elevation (invert): 92.20 ft

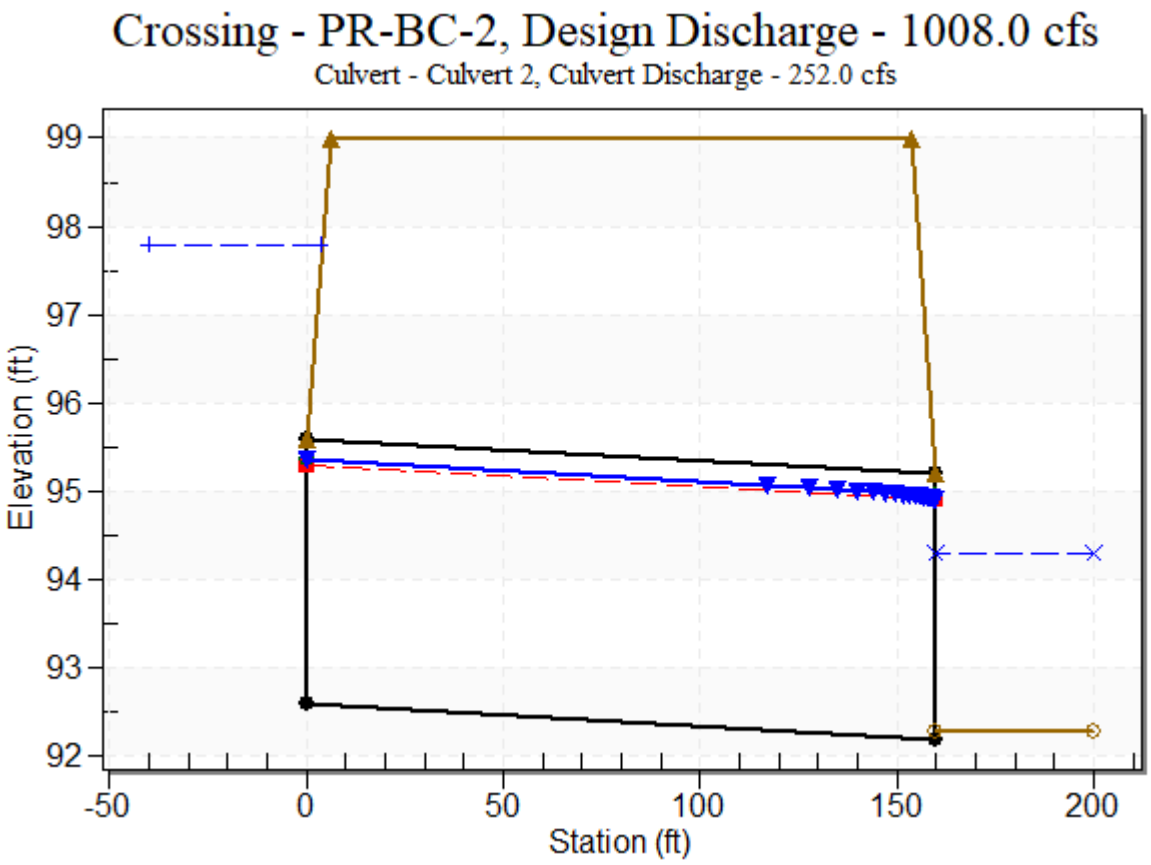
Culvert Length: 160.00 ft, Culvert Slope: 0.0025

****

Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 92.60 ft

Outlet Station: 160.00 ft

Outlet Elevation: 92.20 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 115 - Culvert Summary Table: Culvert 3

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)
860.00	215.01	97.00	4.401	4.234	7-M2c	2.476	2.430	2.430	2.000	8.847	0.000
945.40	236.40	97.44	4.835	4.507	7-M2c	2.644	2.589	2.589	2.000	9.131	0.000
1008.00	252.03	97.78	5.177	4.702	7-M2c	2.765	2.702	2.702	2.000	9.328	0.000
1116.20	279.09	98.42	5.820	5.027	7-M2c	3.000	2.892	2.892	2.000	9.650	0.000
1201.60	300.28	98.97	6.373	5.792	6-FFc	3.000	3.000	3.000	2.000	10.009	0.000
1287.00	307.56	99.17	6.573	5.949	6-FFc	3.000	3.000	3.000	2.000	10.252	0.000
1372.40	311.81	99.29	6.692	6.042	6-FFc	3.000	3.000	3.000	2.000	10.394	0.000
1457.80	315.40	99.40	6.794	6.122	6-FFc	3.000	3.000	3.000	2.000	10.513	0.000
1543.20	318.58	99.49	6.886	6.193	6-FFc	3.000	3.000	3.000	2.000	10.619	0.000
1628.60	321.47	99.57	6.970	6.259	6-FFc	3.000	3.000	3.000	2.000	10.716	0.000
1714.00	324.19	99.65	7.050	6.321	6-FFc	3.000	3.000	3.000	2.000	10.806	0.000

****

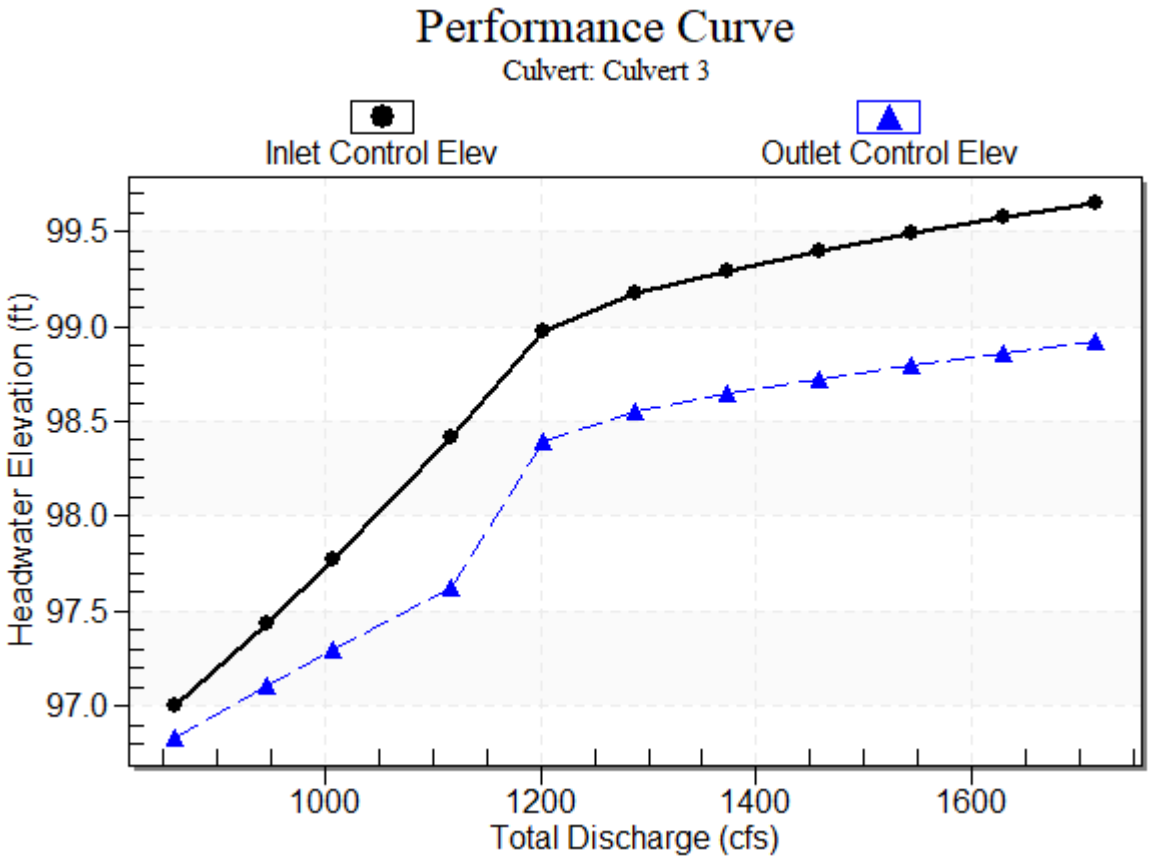
Straight Culvert

Inlet Elevation (invert): 92.60 ft, Outlet Elevation (invert): 92.20 ft

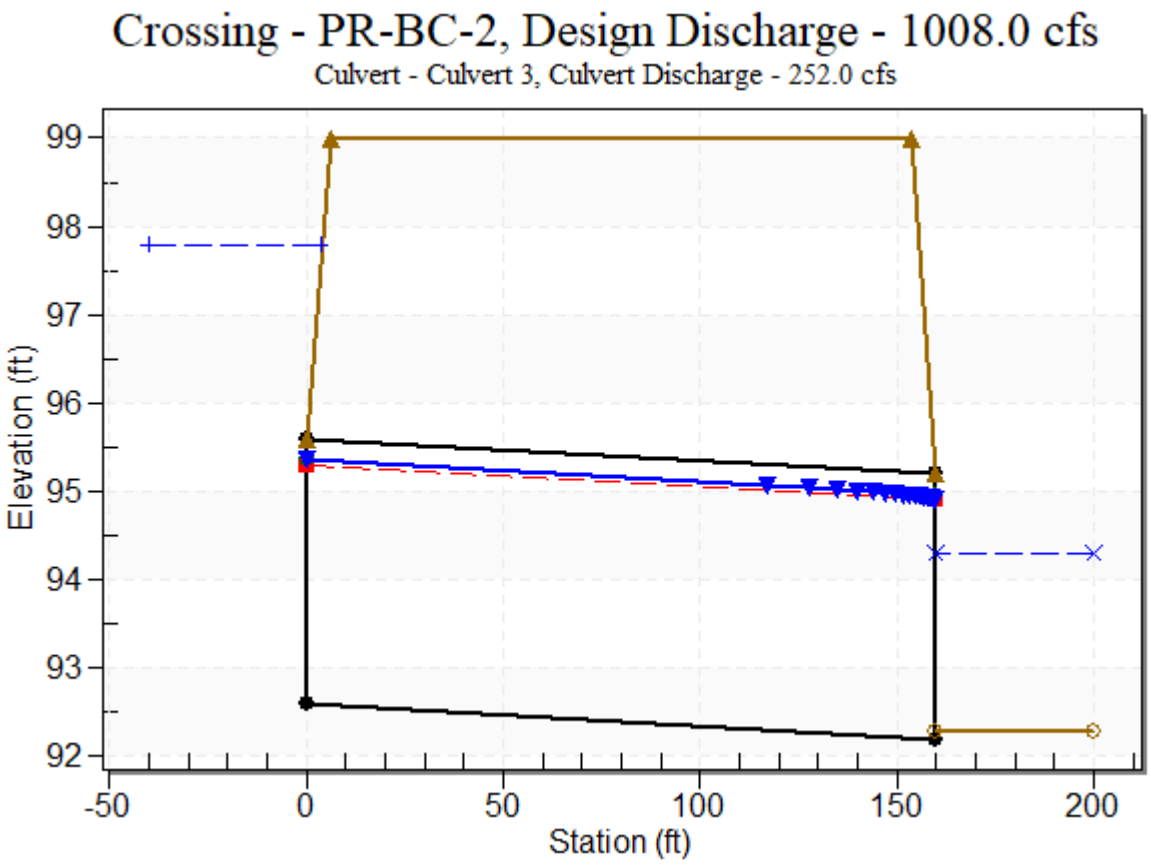
Culvert Length: 160.00 ft, Culvert Slope: 0.0025

****

Culvert Performance Curve Plot: Culvert 3



Water Surface Profile Plot for Culvert: Culvert 3



Site Data - Culvert 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 92.60 ft

Outlet Station: 160.00 ft

Outlet Elevation: 92.20 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 3

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 116 - Culvert Summary Table: Culvert 4

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)
860.00	215.01	97.00	4.401	4.234	7-M2c	2.476	2.430	2.430	2.000	8.847	0.000
945.40	236.40	97.44	4.835	4.507	7-M2c	2.644	2.589	2.589	2.000	9.131	0.000
1008.00	252.03	97.78	5.177	4.702	7-M2c	2.765	2.702	2.702	2.000	9.328	0.000
1116.20	279.09	98.42	5.820	5.027	7-M2c	3.000	2.892	2.892	2.000	9.650	0.000
1201.60	300.28	98.97	6.373	5.792	6-FFc	3.000	3.000	3.000	2.000	10.009	0.000
1287.00	307.56	99.17	6.573	5.949	6-FFc	3.000	3.000	3.000	2.000	10.252	0.000
1372.40	311.81	99.29	6.692	6.042	6-FFc	3.000	3.000	3.000	2.000	10.394	0.000
1457.80	315.40	99.40	6.794	6.122	6-FFc	3.000	3.000	3.000	2.000	10.513	0.000
1543.20	318.58	99.49	6.886	6.193	6-FFc	3.000	3.000	3.000	2.000	10.619	0.000
1628.60	321.47	99.57	6.970	6.259	6-FFc	3.000	3.000	3.000	2.000	10.716	0.000
1714.00	324.19	99.65	7.050	6.321	6-FFc	3.000	3.000	3.000	2.000	10.806	0.000

****

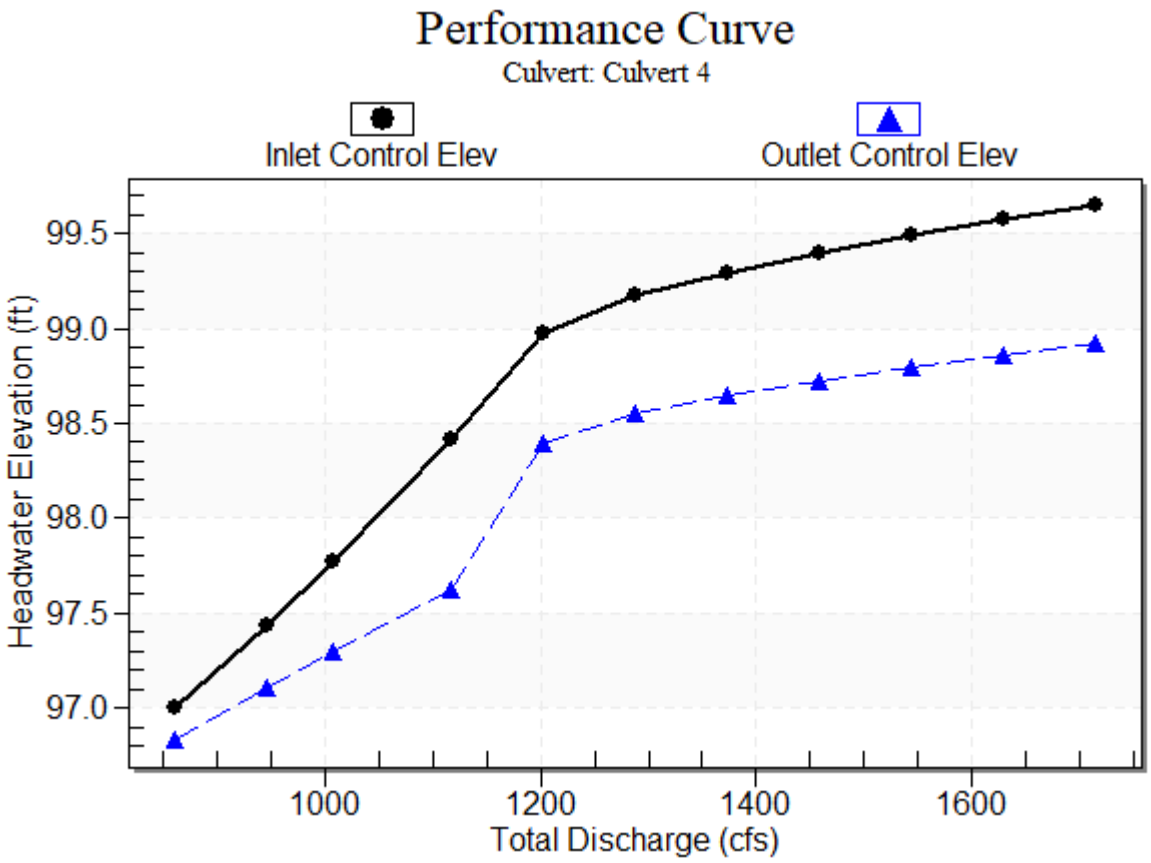
Straight Culvert

Inlet Elevation (invert): 92.60 ft, Outlet Elevation (invert): 92.20 ft

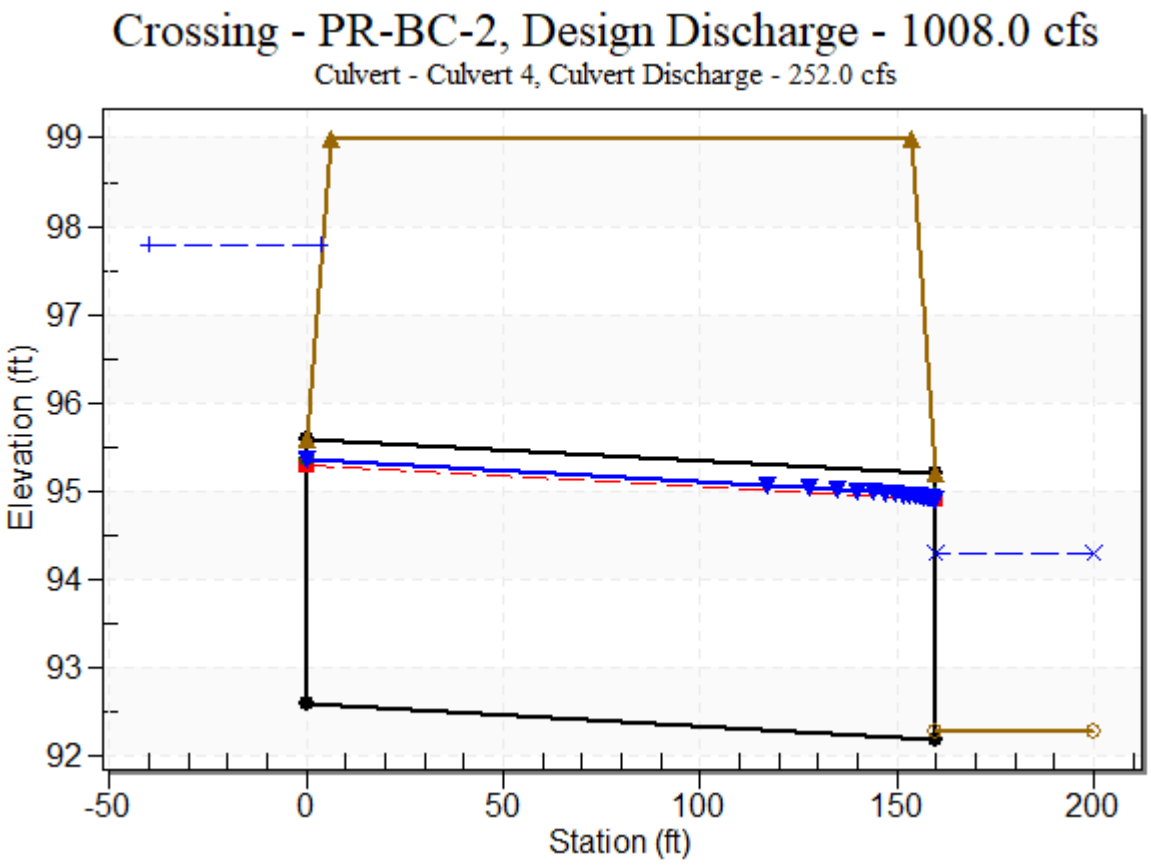
Culvert Length: 160.00 ft, Culvert Slope: 0.0025

****

Culvert Performance Curve Plot: Culvert 4



Water Surface Profile Plot for Culvert: Culvert 4



Site Data - Culvert 4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 92.60 ft

Outlet Station: 160.00 ft

Outlet Elevation: 92.20 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 4

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 117 - Downstream Channel Rating Curve (Crossing: PR-BC-2)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
860.00	94.29	2.00
945.40	94.29	2.00
1008.00	94.29	2.00
1116.20	94.29	2.00
1201.60	94.29	2.00
1287.00	94.29	2.00
1372.40	94.29	2.00
1457.80	94.29	2.00
1543.20	94.29	2.00
1628.60	94.29	2.00
1714.00	94.29	2.00

Tailwater Channel Data - PR-BC-2

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 94.29 ft

Roadway Data for Crossing: PR-BC-2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 99.00 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 51 cfs

Design Flow: 59 cfs

Maximum Flow: 101 cfs

Table 118 - Summary of Culvert Flows at Crossing: EX-CD-16

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
96.40	51.00	51.00	0.00	1
96.82	56.00	56.00	0.00	1
97.01	59.00	58.14	0.38	44
97.03	66.00	58.47	6.97	5
97.05	71.00	58.62	12.01	4
97.06	76.00	58.77	17.03	4
97.07	81.00	58.89	21.67	3
97.08	86.00	59.01	26.60	3
97.09	91.00	59.11	31.59	3
97.10	96.00	59.22	36.56	3
97.11	101.00	59.32	41.52	3
97.00	58.08	58.08	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-16

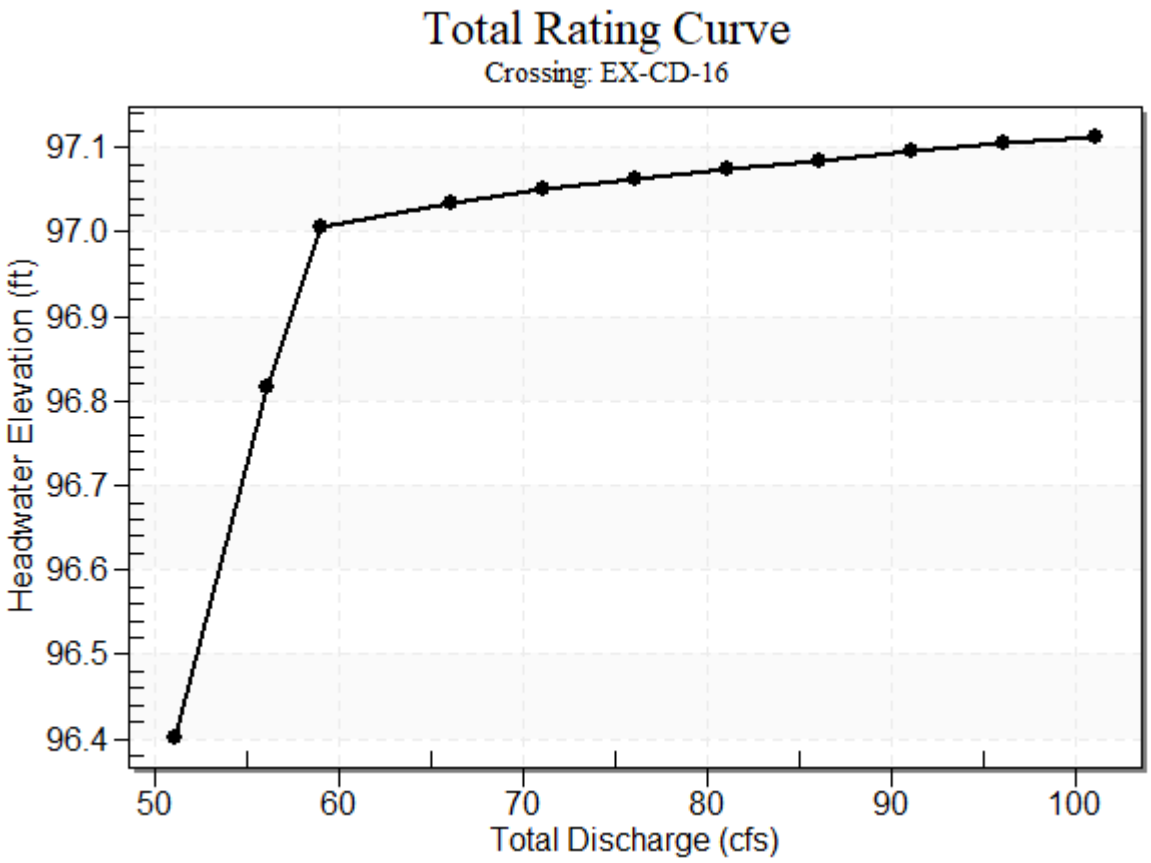


Table 119 - Culvert Summary Table: Culvert 1

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)
51.00	51.00	96.40	4.073	4.036	7-M2c	3.000	2.323	2.323	1.080	8.684	0.000
56.00	56.00	96.82	4.486	4.366	7-M2c	3.000	2.426	2.426	1.080	9.143	0.000
59.00	58.14	97.01	4.675	4.527	7-M2c	3.000	2.467	2.467	1.080	9.347	0.000
66.00	58.47	97.03	4.705	4.553	7-M2c	3.000	2.473	2.473	1.080	9.378	0.000
71.00	58.62	97.05	4.719	4.566	7-M2c	3.000	2.476	2.476	1.080	9.394	0.000
76.00	58.77	97.06	4.732	4.578	7-M2c	3.000	2.479	2.479	1.080	9.408	0.000
81.00	58.89	97.07	4.744	4.588	7-M2c	3.000	2.481	2.481	1.080	9.419	0.000
86.00	59.01	97.08	4.755	4.598	7-M2c	3.000	2.483	2.483	1.080	9.431	0.000
91.00	59.11	97.09	4.764	4.607	7-M2c	3.000	2.485	2.485	1.080	9.441	0.000
96.00	59.22	97.10	4.774	4.617	7-M2c	3.000	2.487	2.487	1.080	9.452	0.000
101.00	59.32	97.11	4.783	4.626	7-M2c	3.000	2.489	2.489	1.080	9.462	0.000

****

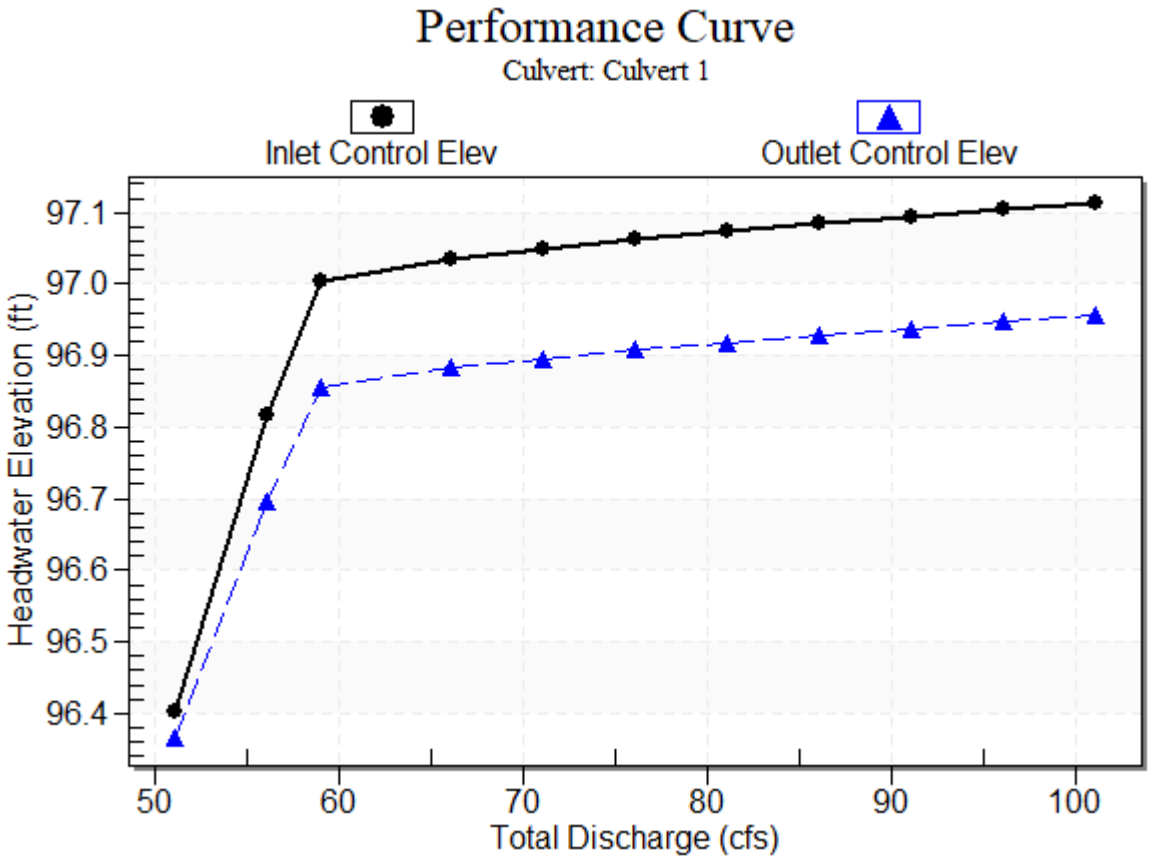
Straight Culvert

Inlet Elevation (invert): 92.33 ft, Outlet Elevation (invert): 91.93 ft

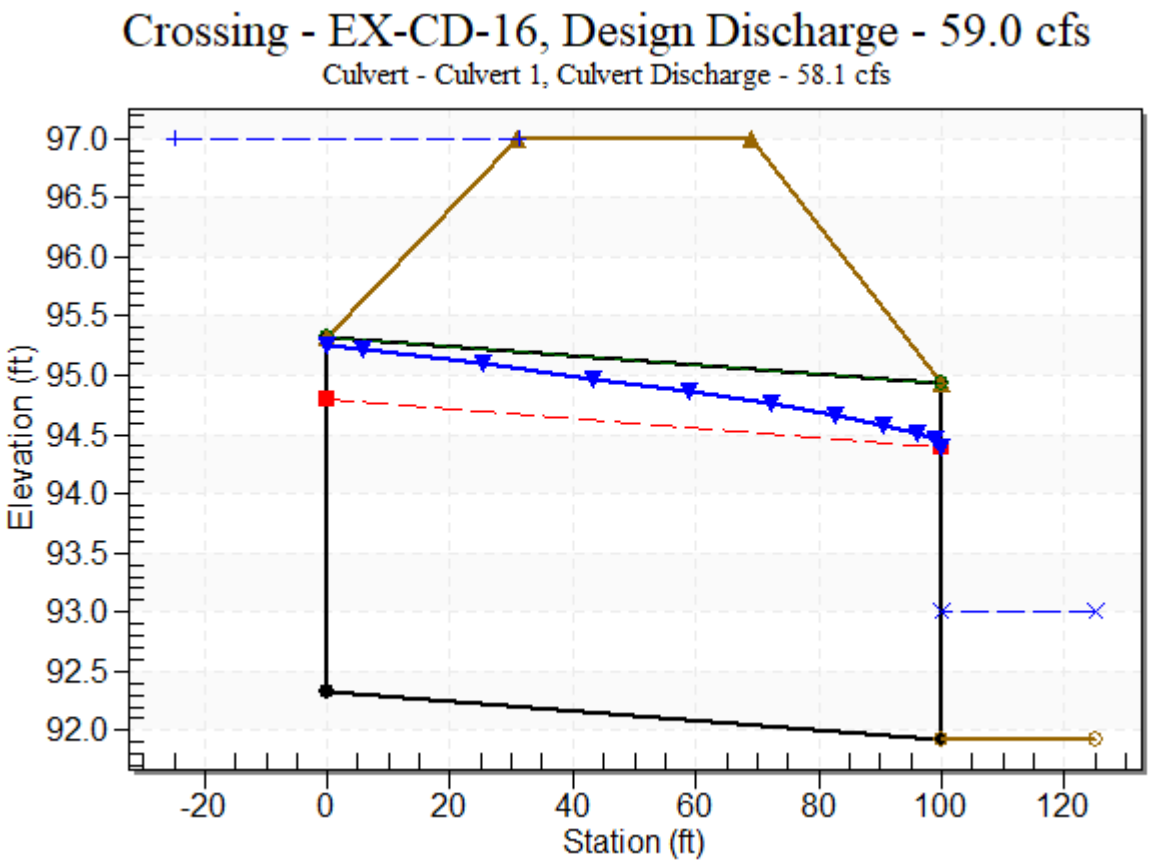
Culvert Length: 100.00 ft, Culvert Slope: 0.0040

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 92.33 ft

Outlet Station: 100.00 ft

Outlet Elevation: 91.93 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 120 - Downstream Channel Rating Curve (Crossing: EX-CD-16)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
51.00	93.01	1.08
56.00	93.01	1.08
59.00	93.01	1.08
66.00	93.01	1.08
71.00	93.01	1.08
76.00	93.01	1.08
81.00	93.01	1.08
86.00	93.01	1.08
91.00	93.01	1.08
96.00	93.01	1.08
101.00	93.01	1.08

Tailwater Channel Data - EX-CD-16

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 93.01 ft

Roadway Data for Crossing: EX-CD-16

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 400.00 ft

Crest Elevation: 97.00 ft

Roadway Surface: Paved

Roadway Top Width: 38.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 51 cfs

Design Flow: 59 cfs

Maximum Flow: 101 cfs

Table 121 - Summary of Culvert Flows at Crossing: PR-CD-16

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
95.93	51.00	51.00	0.00	1
96.16	56.00	56.00	0.00	1
96.30	59.00	59.00	0.00	1
96.64	66.00	66.00	0.00	1
96.91	71.00	71.00	0.00	1
97.02	76.00	72.98	2.59	15
97.04	81.00	73.30	7.42	5
97.05	86.00	73.55	12.14	4
97.06	91.00	73.77	17.04	4
97.07	96.00	73.96	21.62	3
97.09	101.00	74.14	26.48	3
97.00	72.66	72.66	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-16

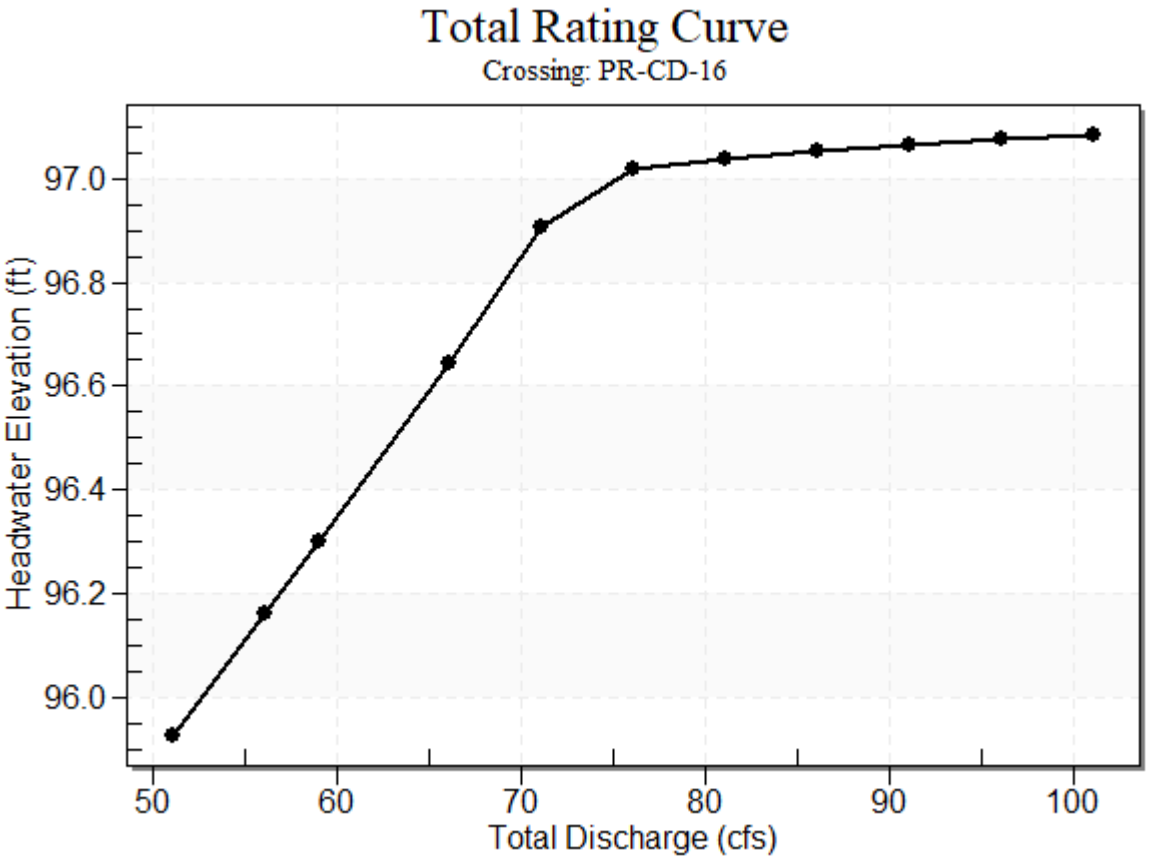


Table 122 - Culvert Summary Table: Culvert 1

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)
51.00	51.00	95.93	3.468	3.628	7-M2c	2.681	2.232	2.232	1.110	7.874	0.000
56.00	56.00	96.16	3.708	3.861	7-M2c	2.957	2.343	2.343	1.110	8.181	0.000
59.00	59.00	96.30	3.858	4.002	7-M2c	3.500	2.406	2.406	1.110	8.366	0.000
66.00	66.00	96.64	4.228	4.344	7-M2c	3.500	2.546	2.546	1.110	8.802	0.000
71.00	71.00	96.91	4.513	4.607	7-M2c	3.500	2.640	2.640	1.110	9.120	0.000
76.00	72.98	97.02	4.632	4.718	7-M2c	3.500	2.675	2.675	1.110	9.249	0.000
81.00	73.30	97.04	4.651	4.737	7-M2c	3.500	2.681	2.681	1.110	9.270	0.000
86.00	73.55	97.05	4.666	4.751	7-M2c	3.500	2.685	2.685	1.110	9.286	0.000
91.00	73.77	97.06	4.680	4.764	7-M2c	3.500	2.689	2.689	1.110	9.300	0.000
96.00	73.96	97.07	4.691	4.775	7-M2c	3.500	2.692	2.692	1.110	9.312	0.000
101.00	74.14	97.09	4.702	4.785	7-M2c	3.500	2.696	2.696	1.110	9.324	0.000

****

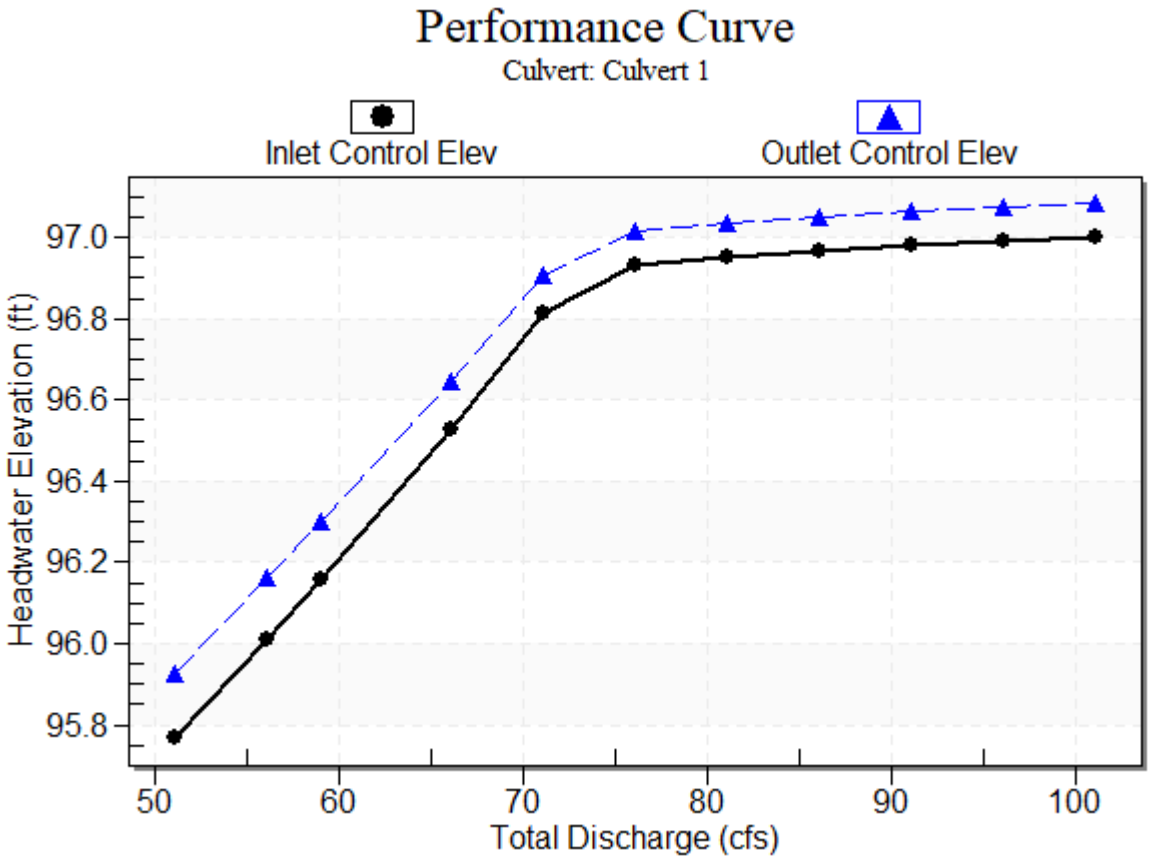
Straight Culvert

Inlet Elevation (invert): 92.30 ft, Outlet Elevation (invert): 91.90 ft

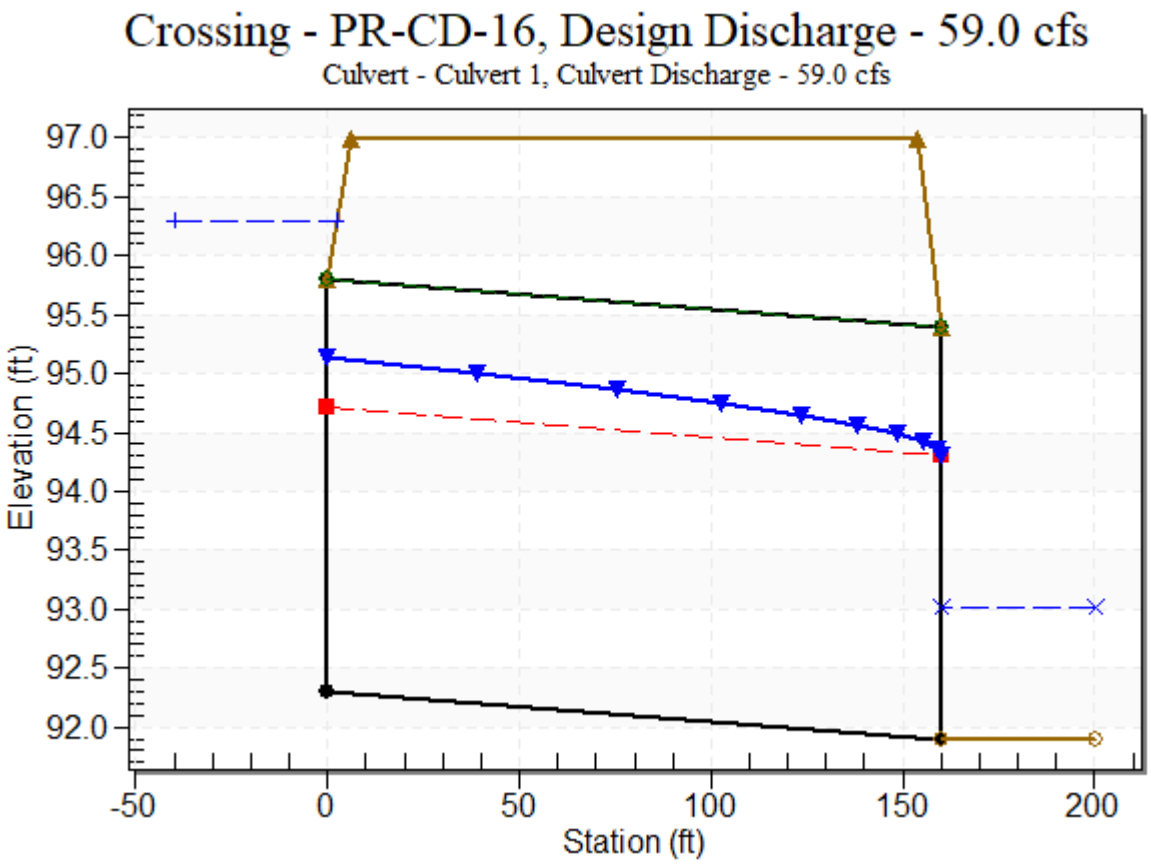
Culvert Length: 160.00 ft, Culvert Slope: 0.0025

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 92.30 ft

Outlet Station: 160.00 ft

Outlet Elevation: 91.90 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 123 - Downstream Channel Rating Curve (Crossing: PR-CD-16)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
51.00	93.01	1.11
56.00	93.01	1.11
59.00	93.01	1.11
66.00	93.01	1.11
71.00	93.01	1.11
76.00	93.01	1.11
81.00	93.01	1.11
86.00	93.01	1.11
91.00	93.01	1.11
96.00	93.01	1.11
101.00	93.01	1.11

Tailwater Channel Data - PR-CD-16

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 93.01 ft

Roadway Data for Crossing: PR-CD-16

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 400.00 ft

Crest Elevation: 97.00 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 143 cfs

Design Flow: 168 cfs

Maximum Flow: 286 cfs

Table 124 - Summary of Culvert Flows at Crossing: EX-CD-17

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
93.90	143.00	143.00	0.00	1
94.34	157.30	157.30	0.00	1
94.69	168.00	168.00	0.00	1
94.86	185.90	172.96	12.60	11
94.90	200.20	174.04	25.67	5
94.94	214.50	174.95	38.88	4
94.96	228.80	175.78	52.58	4
94.99	243.10	176.53	66.29	4
95.02	257.40	177.23	79.99	4
95.04	271.70	177.87	93.24	3
95.06	286.00	178.49	106.99	3
94.80	171.13	171.13	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-17

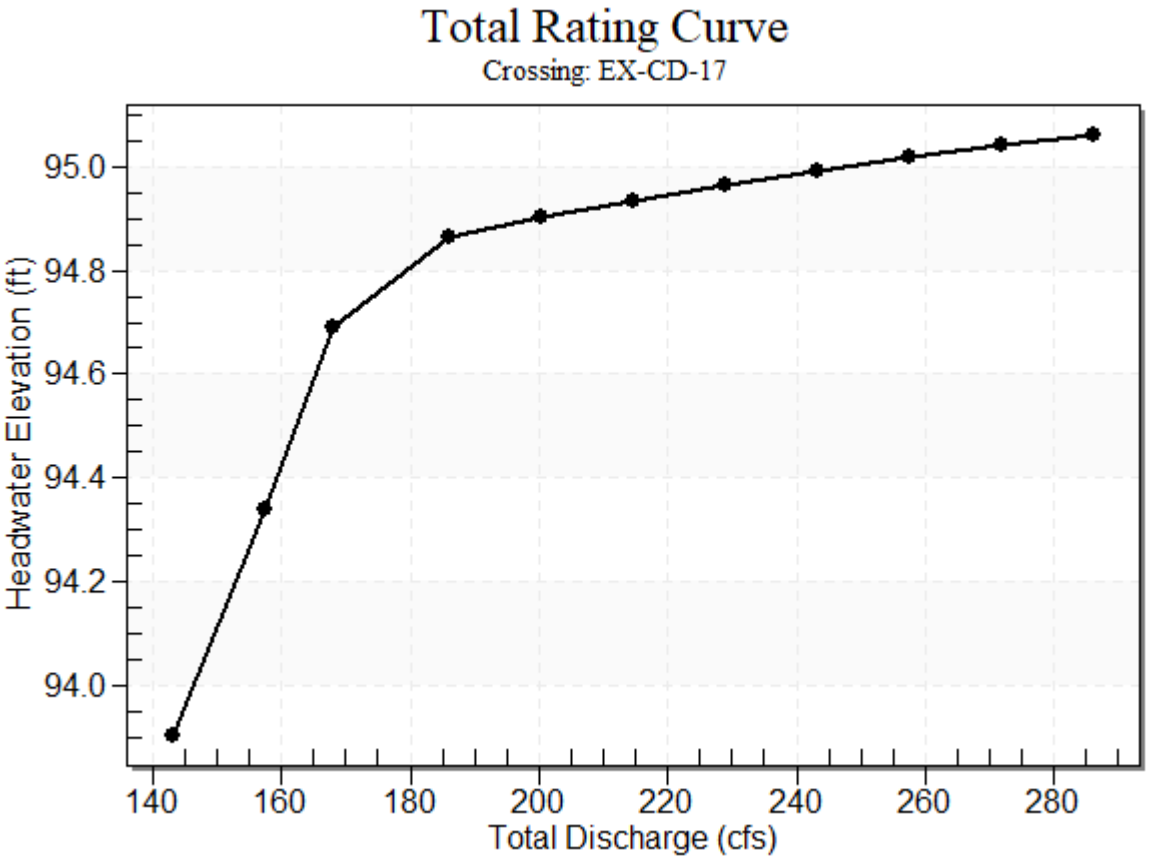


Table 125 - Culvert Summary Table: Culvert 1

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)
143.00	143.00	93.90	3.615	3.241	5-S2n	1.771	1.852	1.775	1.000	8.055	0.000
157.30	157.30	94.34	4.048	3.639	5-S2n	1.888	1.973	1.888	1.000	8.329	0.000
168.00	168.00	94.69	4.402	3.925	6-FFc	2.000	2.000	2.000	1.000	8.400	0.000
185.90	172.96	94.86	4.574	4.058	6-FFc	2.000	2.000	2.000	1.000	8.648	0.000
200.20	174.04	94.90	4.613	4.088	6-FFc	2.000	2.000	2.000	1.000	8.702	0.000
214.50	174.95	94.94	4.645	4.112	6-FFc	2.000	2.000	2.000	1.000	8.747	0.000
228.80	175.78	94.96	4.675	4.135	6-FFc	2.000	2.000	2.000	1.000	8.789	0.000
243.10	176.53	94.99	4.702	4.156	6-FFc	2.000	2.000	2.000	1.000	8.827	0.000
257.40	177.23	95.02	4.727	4.175	6-FFc	2.000	2.000	2.000	1.000	8.862	0.000
271.70	177.87	95.04	4.750	4.193	6-FFc	2.000	2.000	2.000	1.000	8.893	0.000
286.00	178.49	95.06	4.773	4.211	6-FFc	2.000	2.000	2.000	1.000	8.925	0.000

****

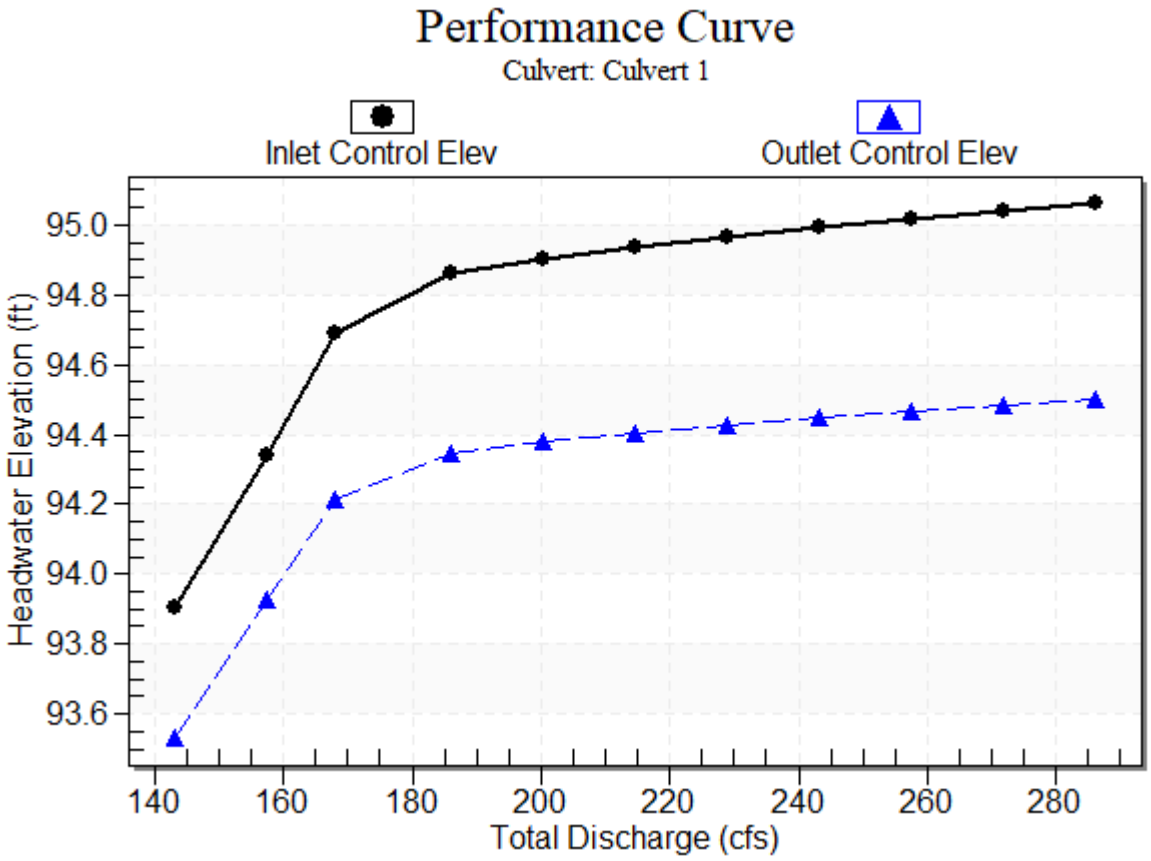
Straight Culvert

Inlet Elevation (invert): 90.29 ft, Outlet Elevation (invert): 90.00 ft

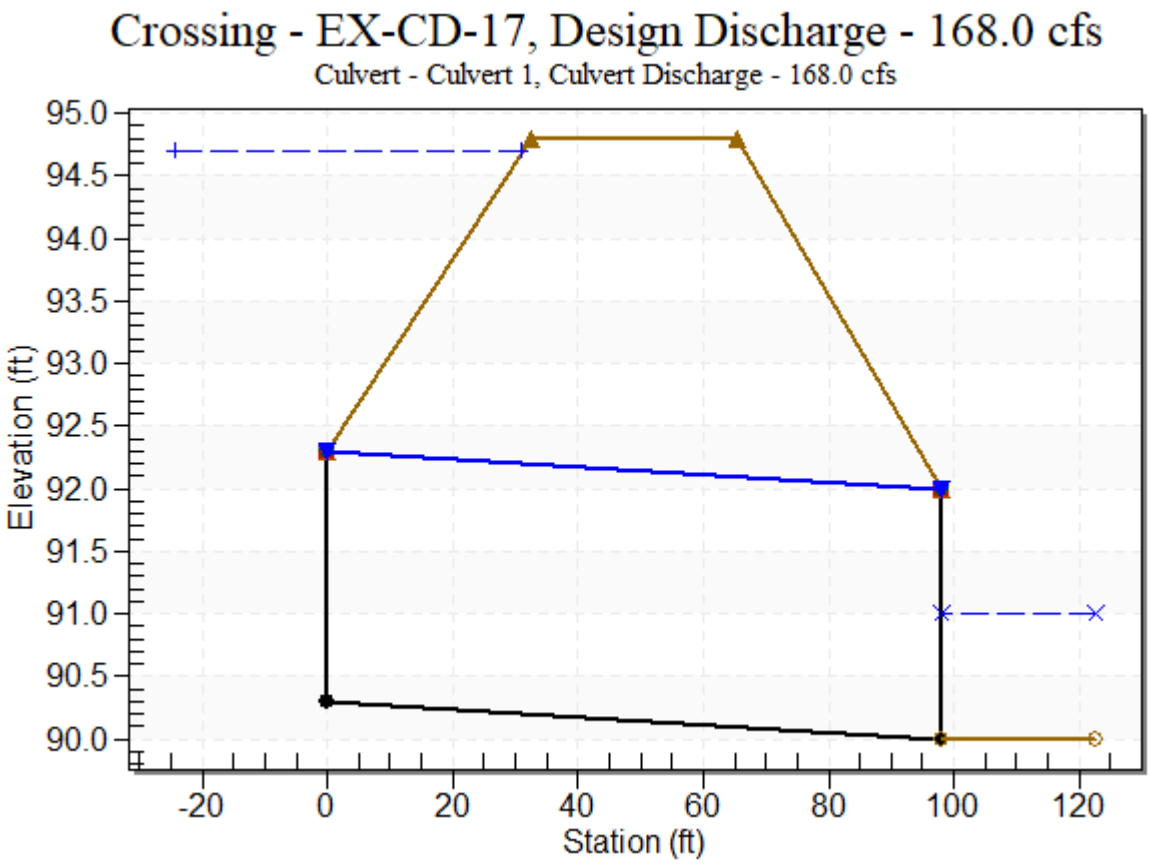
Culvert Length: 98.00 ft, Culvert Slope: 0.0030

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 90.29 ft

Outlet Station: 98.00 ft

Outlet Elevation: 90.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 126 - Downstream Channel Rating Curve (Crossing: EX-CD-17)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
143.00	91.00	1.00
157.30	91.00	1.00
168.00	91.00	1.00
185.90	91.00	1.00
200.20	91.00	1.00
214.50	91.00	1.00
228.80	91.00	1.00
243.10	91.00	1.00
257.40	91.00	1.00
271.70	91.00	1.00
286.00	91.00	1.00

Tailwater Channel Data - EX-CD-17

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 91.00 ft

Roadway Data for Crossing: EX-CD-17

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 94.80 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 143 cfs

Design Flow: 168 cfs

Maximum Flow: 286 cfs

Table 127 - Summary of Culvert Flows at Crossing: PR-CD-17

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
93.92	143.00	143.00	0.00	1
94.35	157.30	157.30	0.00	1
94.70	168.00	168.00	0.00	1
95.35	185.90	185.90	0.00	1
95.92	200.20	200.20	0.00	1
96.24	214.50	207.77	6.33	20
96.29	228.80	208.83	19.61	6
96.32	243.10	209.61	33.17	5
96.35	257.40	210.25	46.64	4
96.38	271.70	210.85	60.50	4
96.41	286.00	211.41	74.38	4
96.20	206.82	206.82	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-17

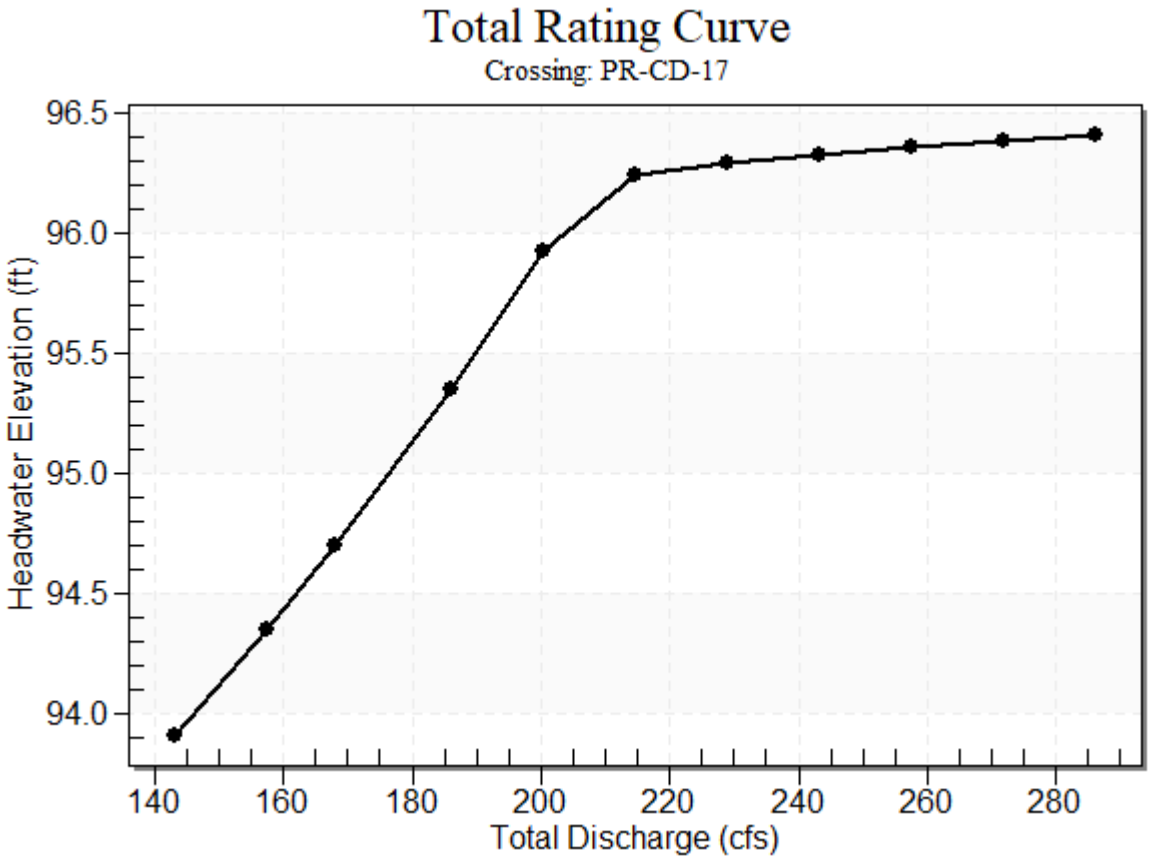


Table 128 - Culvert Summary Table: Culvert 1

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)
143.00	143.00	93.92	3.616	3.460	7-M2c	2.000	1.852	1.852	1.100	7.722	0.000
157.30	157.30	94.35	4.049	3.957	7-M2c	2.000	1.973	1.973	1.100	7.971	0.000
168.00	168.00	94.70	4.403	4.277	6-FFc	2.000	2.000	2.000	1.100	8.400	0.000
185.90	185.90	95.35	5.051	4.855	6-FFc	2.000	2.000	2.000	1.100	9.295	0.000
200.20	200.20	95.92	5.621	5.360	6-FFc	2.000	2.000	2.000	1.100	10.010	0.000
214.50	207.77	96.24	5.941	5.642	6-FFc	2.000	2.000	2.000	1.100	10.389	0.000
228.80	208.83	96.29	5.987	5.682	6-FFc	2.000	2.000	2.000	1.100	10.442	0.000
243.10	209.61	96.32	6.023	5.712	6-FFc	2.000	2.000	2.000	1.100	10.480	0.000
257.40	210.25	96.35	6.054	5.736	6-FFc	2.000	2.000	2.000	1.100	10.513	0.000
271.70	210.85	96.38	6.083	5.759	6-FFc	2.000	2.000	2.000	1.100	10.543	0.000
286.00	211.41	96.41	6.109	5.781	6-FFc	2.000	2.000	2.000	1.100	10.570	0.000

****

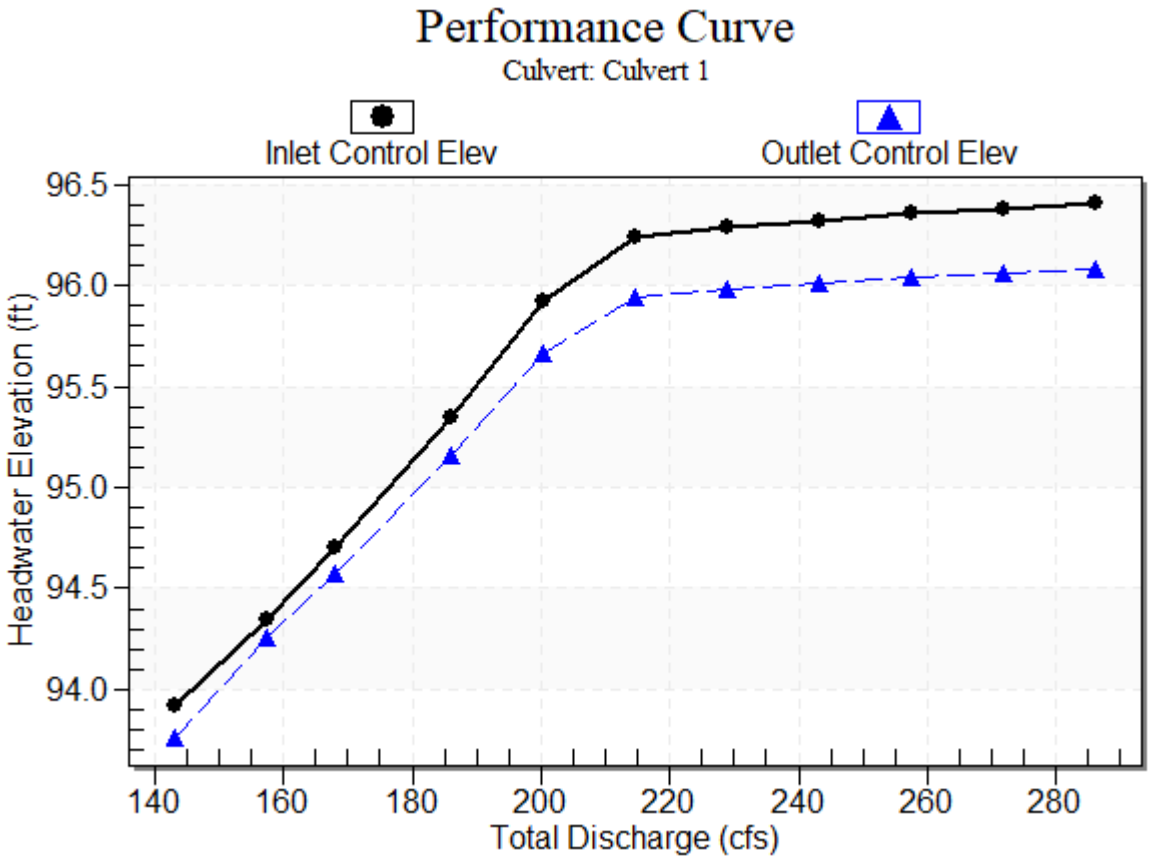
Straight Culvert

Inlet Elevation (invert): 90.30 ft, Outlet Elevation (invert): 90.00 ft

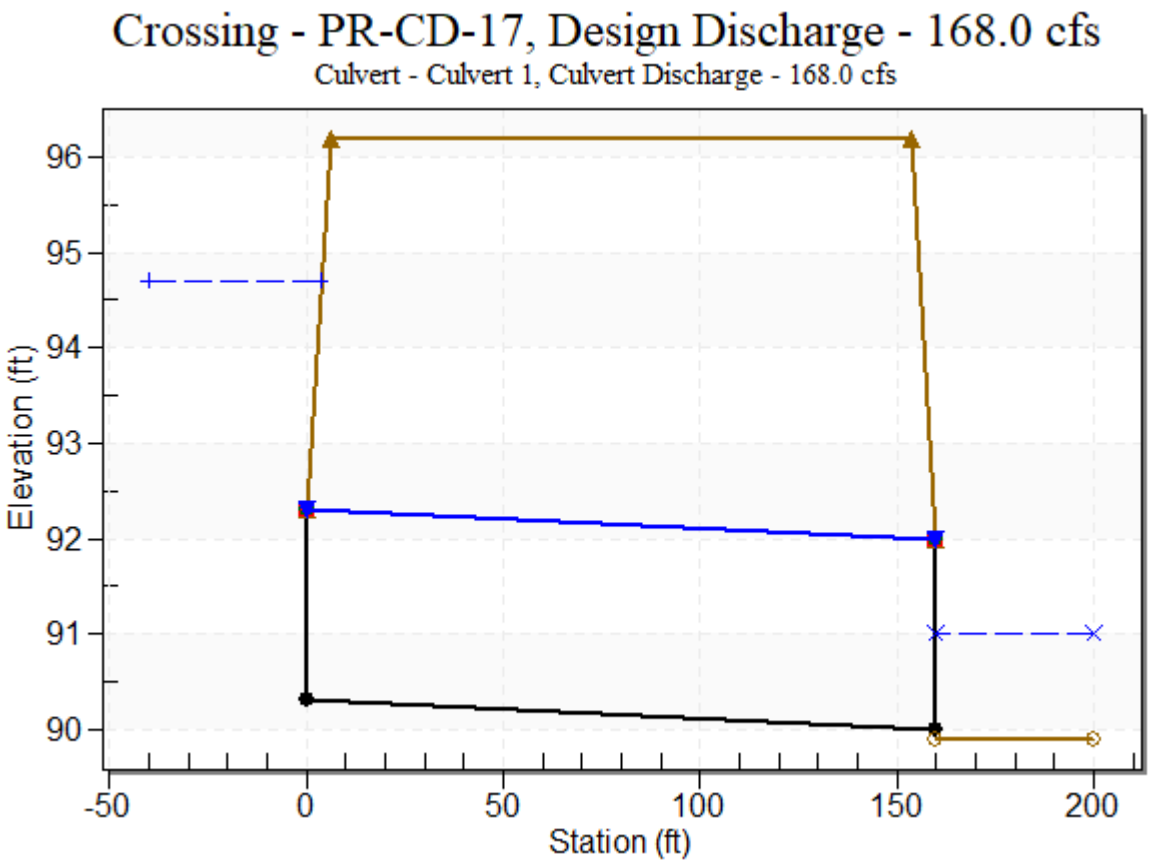
Culvert Length: 160.00 ft, Culvert Slope: 0.0019

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 90.30 ft

Outlet Station: 160.00 ft

Outlet Elevation: 90.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 129 - Downstream Channel Rating Curve (Crossing: PR-CD-17)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
143.00	91.00	1.10
157.30	91.00	1.10
168.00	91.00	1.10
185.90	91.00	1.10
200.20	91.00	1.10
214.50	91.00	1.10
228.80	91.00	1.10
243.10	91.00	1.10
257.40	91.00	1.10
271.70	91.00	1.10
286.00	91.00	1.10

Tailwater Channel Data - PR-CD-17

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 91.00 ft

Roadway Data for Crossing: PR-CD-17

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 96.20 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 430 cfs

Design Flow: 504 cfs

Maximum Flow: 857 cfs

Table 130 - Summary of Culvert Flows at Crossing: EX-BC-3

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Culvert 3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
92.07	430.00	143.93	144.25	141.84	0.00	6
92.51	472.70	158.10	158.40	156.21	0.00	4
92.85	504.00	168.44	168.72	166.68	0.00	10
93.30	558.10	181.13	181.39	179.51	15.80	10
93.42	600.80	184.15	184.40	182.56	49.28	6
93.51	643.50	186.57	186.81	185.00	84.63	5
93.59	686.20	188.68	188.93	187.13	121.19	5
93.66	728.90	190.56	190.80	189.03	157.77	4
93.73	771.60	192.34	192.58	190.83	195.28	4
93.80	814.30	194.01	194.25	192.51	233.16	4
93.86	857.00	195.58	195.82	194.09	271.25	4
93.20	533.71	178.37	178.63	176.72	0.00	Overtopping

Rating Curve Plot for Crossing: EX-BC-3

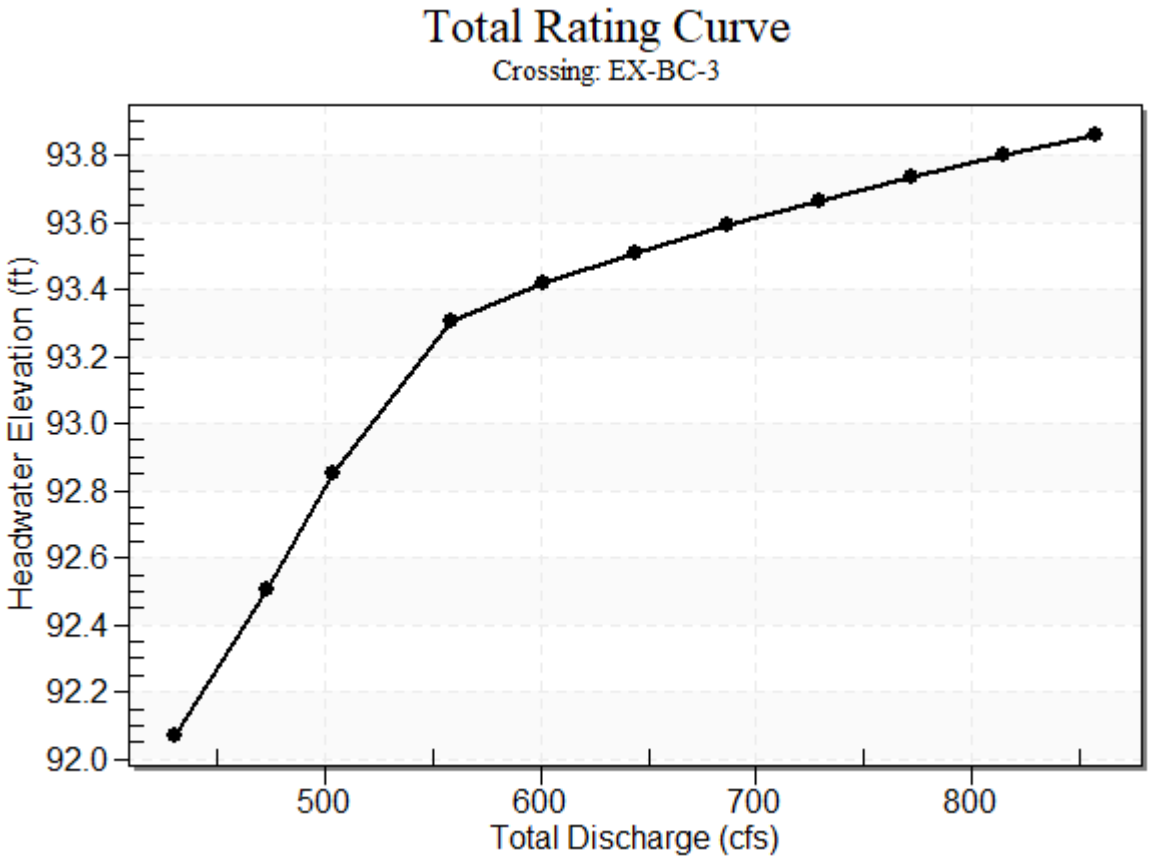


Table 131 - Culvert Summary Table: Culvert 1

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)
430.00	143.93	92.07	3.642	3.325	7-M2c	2.000	1.860	1.860	1.000	7.739	0.000
472.70	158.10	92.51	4.075	3.771	7-M2c	2.000	1.980	1.980	1.000	7.985	0.000
504.00	168.44	92.85	4.418	4.037	6-FFc	2.000	2.000	2.000	1.000	8.422	0.000
558.10	181.13	93.30	4.871	4.385	6-FFc	2.000	2.000	2.000	1.000	9.057	0.000
600.80	184.15	93.42	4.985	4.472	6-FFc	2.000	2.000	2.000	1.000	9.208	0.000
643.50	186.57	93.51	5.077	4.542	6-FFc	2.000	2.000	2.000	1.000	9.328	0.000
686.20	188.68	93.59	5.158	4.604	6-FFc	2.000	2.000	2.000	1.000	9.434	0.000
728.90	190.56	93.66	5.232	4.660	6-FFc	2.000	2.000	2.000	1.000	9.528	0.000
771.60	192.34	93.73	5.302	4.714	6-FFc	2.000	2.000	2.000	1.000	9.617	0.000
814.30	194.01	93.80	5.369	4.764	6-FFc	2.000	2.000	2.000	1.000	9.701	0.000
857.00	195.58	93.86	5.432	4.812	6-FFc	2.000	2.000	2.000	1.000	9.779	0.000

****

Straight Culvert

Inlet Elevation (invert): 88.43 ft, Outlet Elevation (invert): 88.24 ft

Culvert Length: 98.00 ft, Culvert Slope: 0.0019

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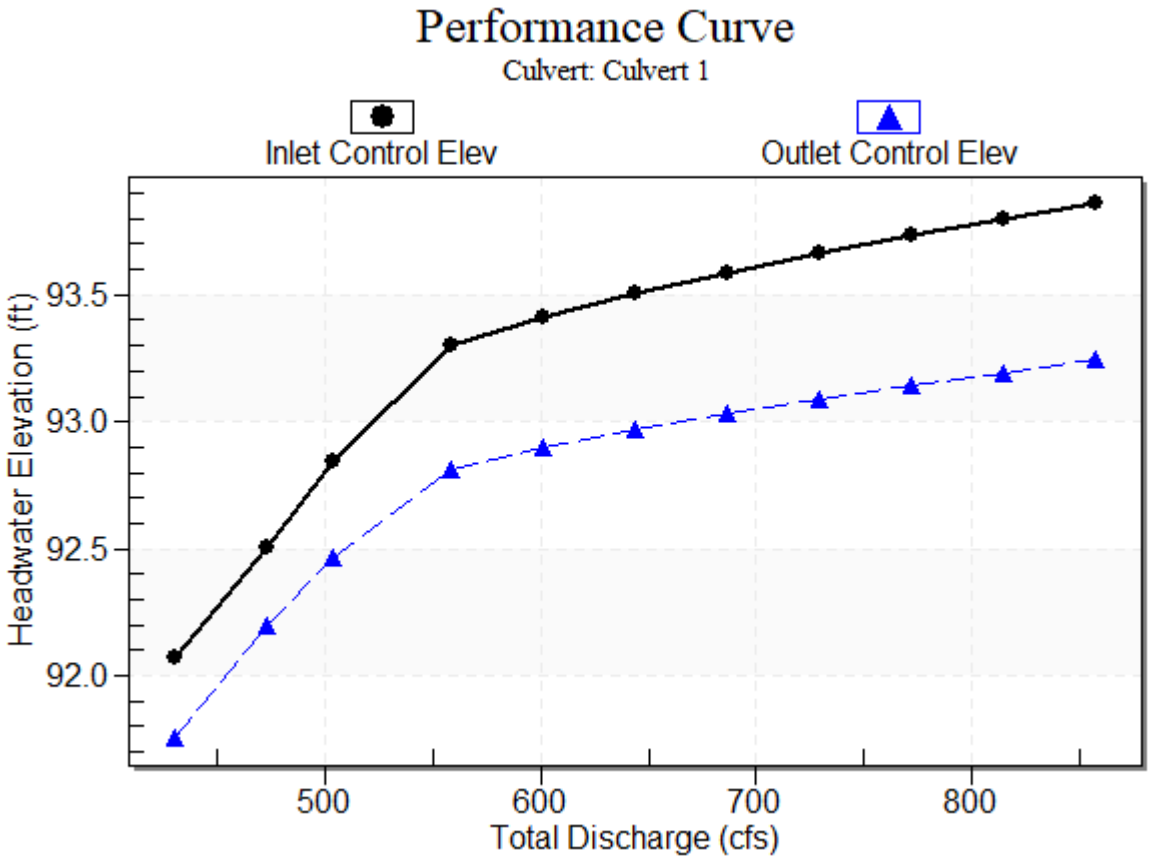
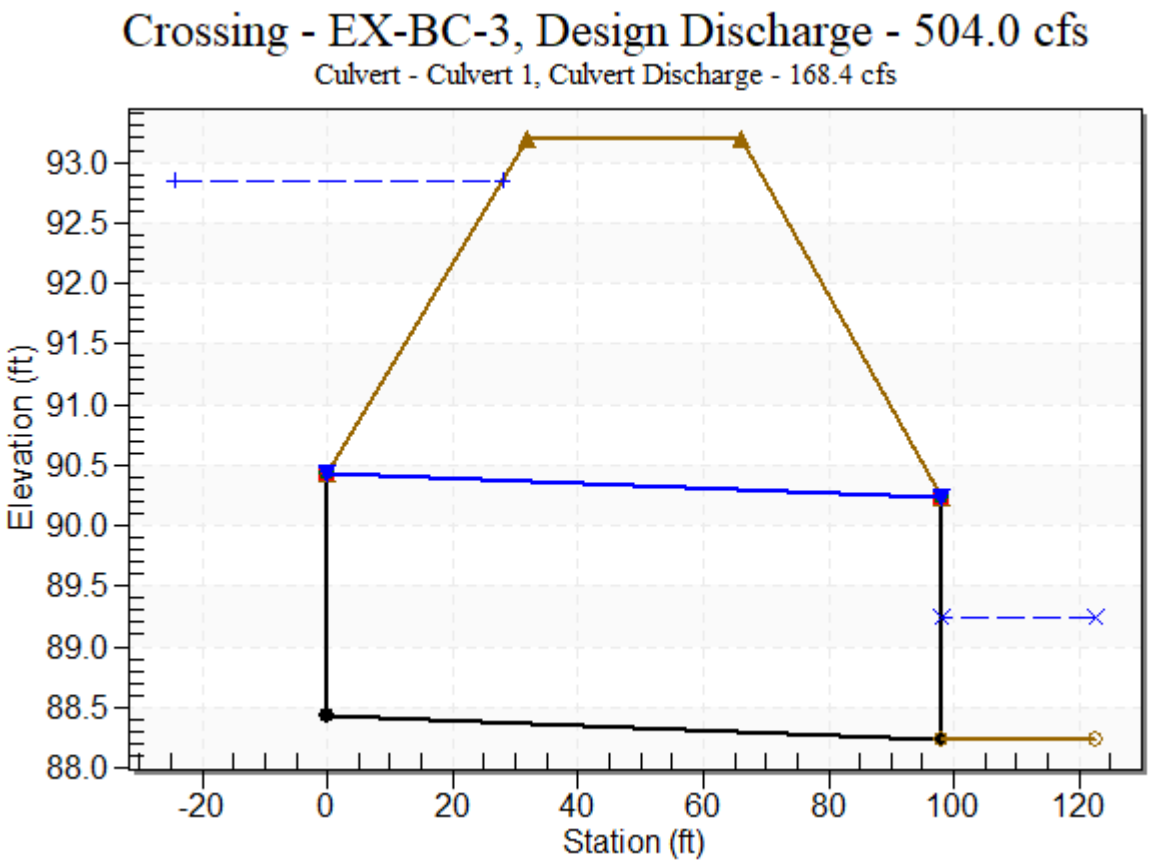
Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 88.43 ft

Outlet Station: 98.00 ft

Outlet Elevation: 88.24 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 132 - Culvert Summary Table: Culvert 2

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)
430.00	144.25	92.07	3.652	3.448	7-M2c	2.000	1.863	1.863	1.000	7.745	0.000
472.70	158.40	92.51	4.085	3.829	7-M2c	2.000	1.982	1.982	1.000	7.990	0.000
504.00	168.72	92.85	4.428	4.094	6-FFc	2.000	2.000	2.000	1.000	8.436	0.000
558.10	181.39	93.30	4.881	4.442	6-FFc	2.000	2.000	2.000	1.000	9.069	0.000
600.80	184.40	93.42	4.995	4.529	6-FFc	2.000	2.000	2.000	1.000	9.220	0.000
643.50	186.81	93.51	5.087	4.599	6-FFc	2.000	2.000	2.000	1.000	9.341	0.000
686.20	188.93	93.59	5.168	4.661	6-FFc	2.000	2.000	2.000	1.000	9.446	0.000
728.90	190.80	93.66	5.242	4.718	6-FFc	2.000	2.000	2.000	1.000	9.540	0.000
771.60	192.58	93.73	5.312	4.771	6-FFc	2.000	2.000	2.000	1.000	9.629	0.000
814.30	194.25	93.80	5.379	4.822	6-FFc	2.000	2.000	2.000	1.000	9.712	0.000
857.00	195.82	93.86	5.442	4.870	6-FFc	2.000	2.000	2.000	1.000	9.791	0.000

****

Straight Culvert

Inlet Elevation (invert): 88.42 ft, Outlet Elevation (invert): 88.28 ft

Culvert Length: 98.00 ft, Culvert Slope: 0.0014

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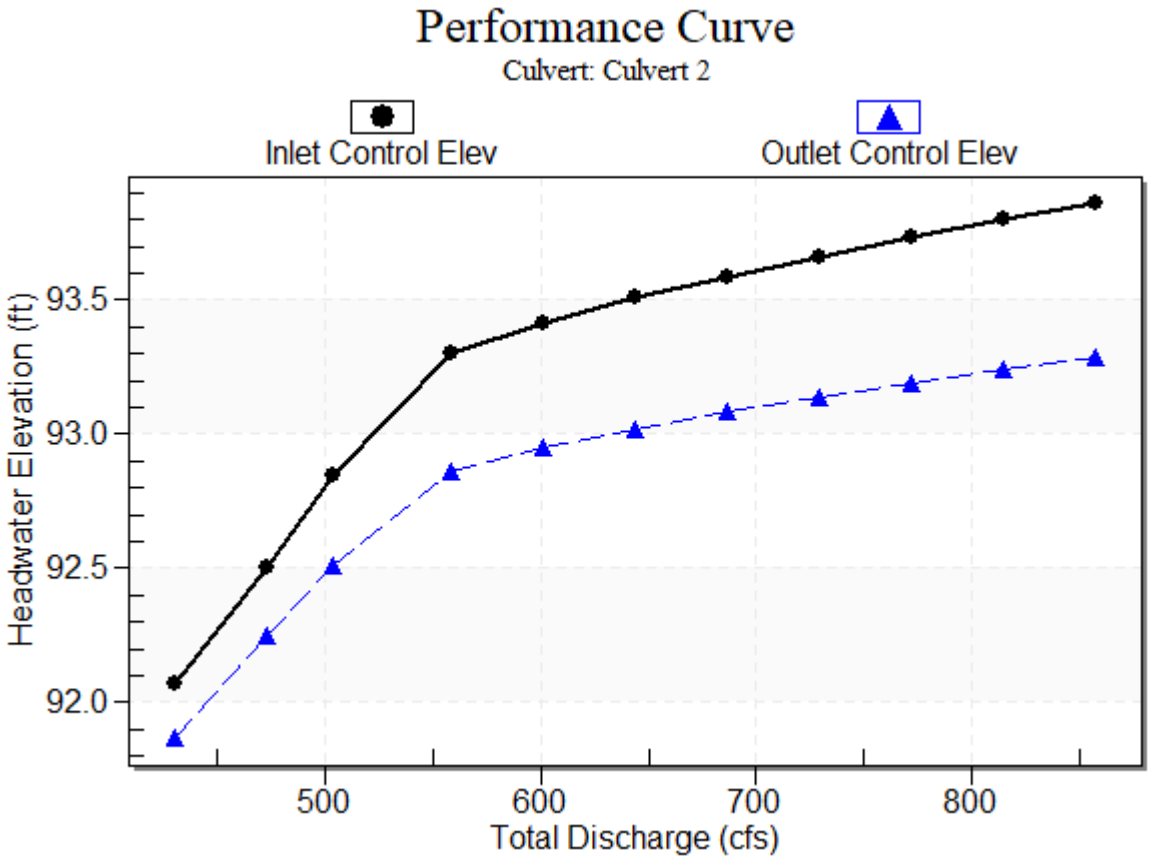
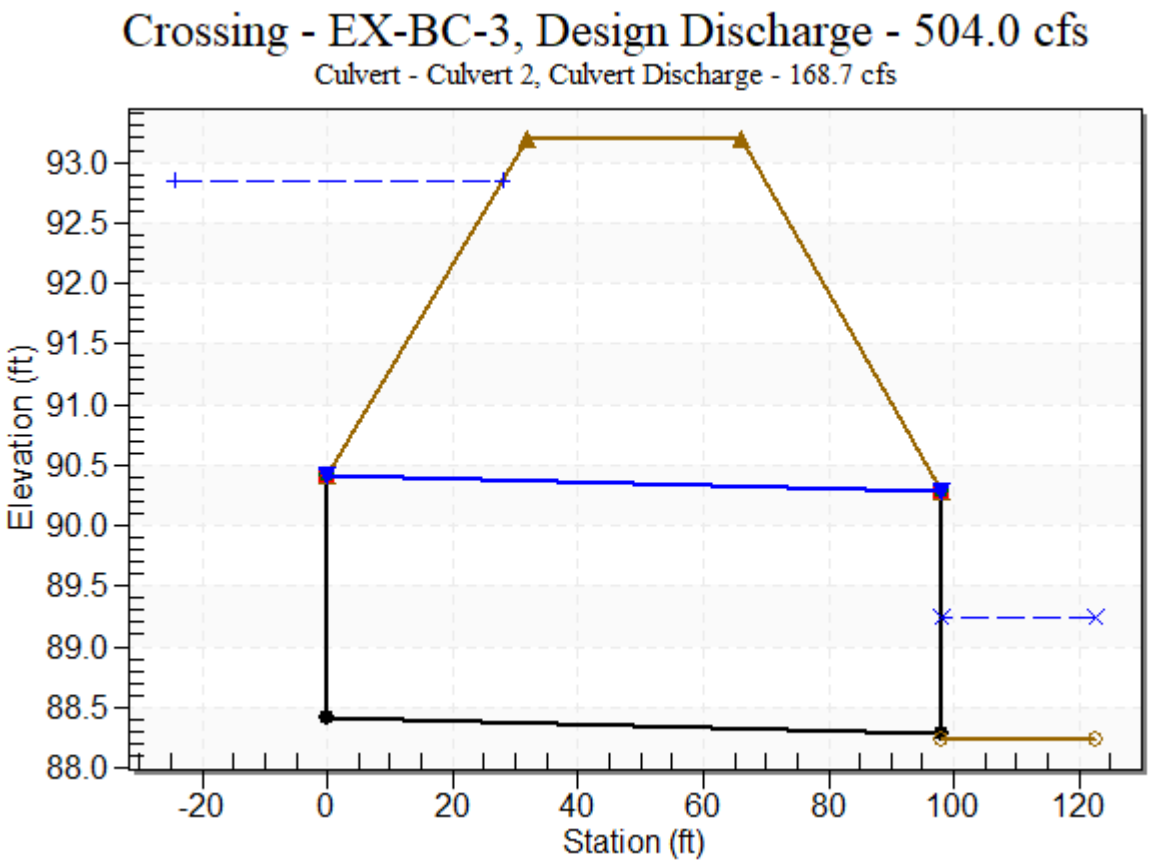
Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 88.42 ft

Outlet Station: 98.00 ft

Outlet Elevation: 88.28 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 133 - Culvert Summary Table: Culvert 3

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)
430.00	141.84	92.07	3.582	3.224	7-M2c	2.000	1.842	1.842	1.000	7.701	0.000
472.70	156.21	92.51	4.015	3.721	7-M2c	2.000	1.964	1.964	1.000	7.953	0.000
504.00	166.68	92.85	4.358	3.991	6-FFc	2.000	2.000	2.000	1.000	8.334	0.000
558.10	179.51	93.30	4.811	4.339	6-FFc	2.000	2.000	2.000	1.000	8.976	0.000
600.80	182.56	93.42	4.925	4.426	6-FFc	2.000	2.000	2.000	1.000	9.128	0.000
643.50	185.00	93.51	5.017	4.496	6-FFc	2.000	2.000	2.000	1.000	9.250	0.000
686.20	187.13	93.59	5.098	4.558	6-FFc	2.000	2.000	2.000	1.000	9.356	0.000
728.90	189.03	93.66	5.172	4.615	6-FFc	2.000	2.000	2.000	1.000	9.451	0.000
771.60	190.83	93.73	5.242	4.668	6-FFc	2.000	2.000	2.000	1.000	9.541	0.000
814.30	192.51	93.80	5.309	4.719	6-FFc	2.000	2.000	2.000	1.000	9.625	0.000
857.00	194.09	93.86	5.372	4.767	6-FFc	2.000	2.000	2.000	1.000	9.705	0.000

****

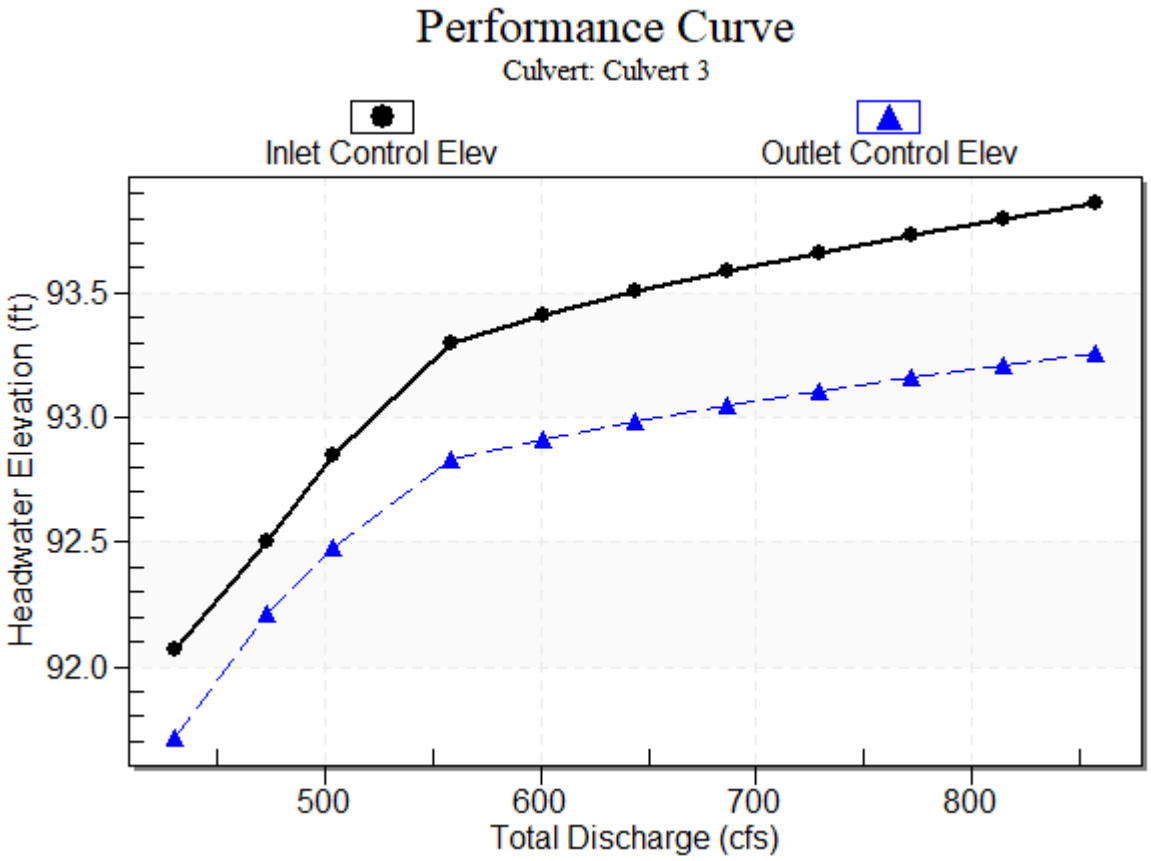
Straight Culvert

Inlet Elevation (invert): 88.49 ft, Outlet Elevation (invert): 88.30 ft

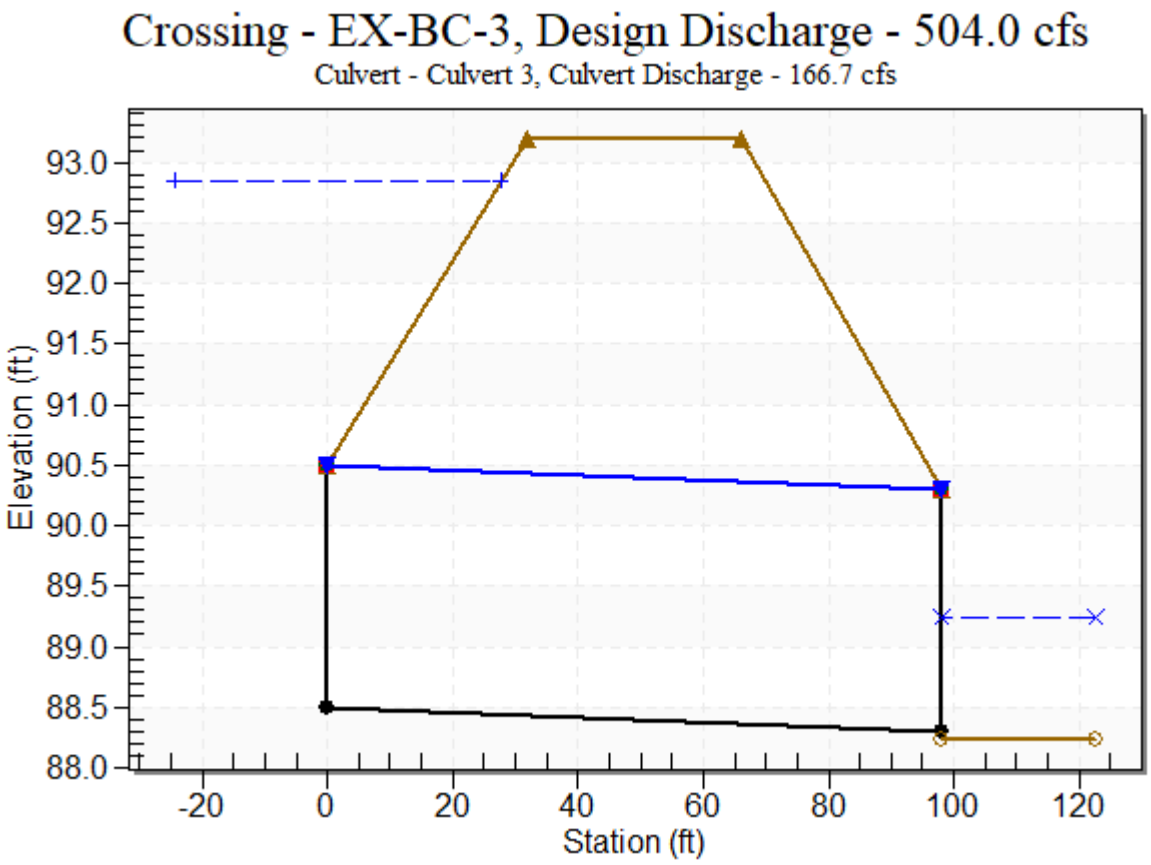
Culvert Length: 98.00 ft, Culvert Slope: 0.0019

****

Culvert Performance Curve Plot: Culvert 3



Water Surface Profile Plot for Culvert: Culvert 3



Site Data - Culvert 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 88.49 ft

Outlet Station: 98.00 ft

Outlet Elevation: 88.30 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 3

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 134 - Downstream Channel Rating Curve (Crossing: EX-BC-3)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
430.00	89.24	1.00
472.70	89.24	1.00
504.00	89.24	1.00
558.10	89.24	1.00
600.80	89.24	1.00
643.50	89.24	1.00
686.20	89.24	1.00
728.90	89.24	1.00
771.60	89.24	1.00
814.30	89.24	1.00
857.00	89.24	1.00

Tailwater Channel Data - EX-BC-3

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 89.24 ft

Roadway Data for Crossing: EX-BC-3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 93.20 ft

Roadway Surface: Paved

Roadway Top Width: 34.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 430 cfs

Design Flow: 504 cfs

Maximum Flow: 857 cfs

Table 135 - Summary of Culvert Flows at Crossing: PR-BC-3

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Culvert 3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
92.08	430.00	143.34	143.34	143.34	0.00	6
92.51	472.70	157.57	157.57	157.57	0.00	4
92.85	504.00	168.02	168.02	168.02	0.00	3
93.51	558.10	186.06	186.06	186.06	0.00	3
94.07	600.80	200.27	200.27	200.27	0.00	4
94.71	643.50	214.45	214.45	214.45	0.00	10
95.03	686.20	220.97	220.97	220.97	22.92	9
95.15	728.90	223.21	223.21	223.21	58.94	6
95.24	771.60	225.03	225.03	225.03	96.08	5
95.32	814.30	226.63	226.63	226.63	134.14	5
95.40	857.00	228.08	228.08	228.08	172.02	4
94.90	655.00	218.33	218.33	218.33	0.00	Overtopping

Rating Curve Plot for Crossing: PR-BC-3

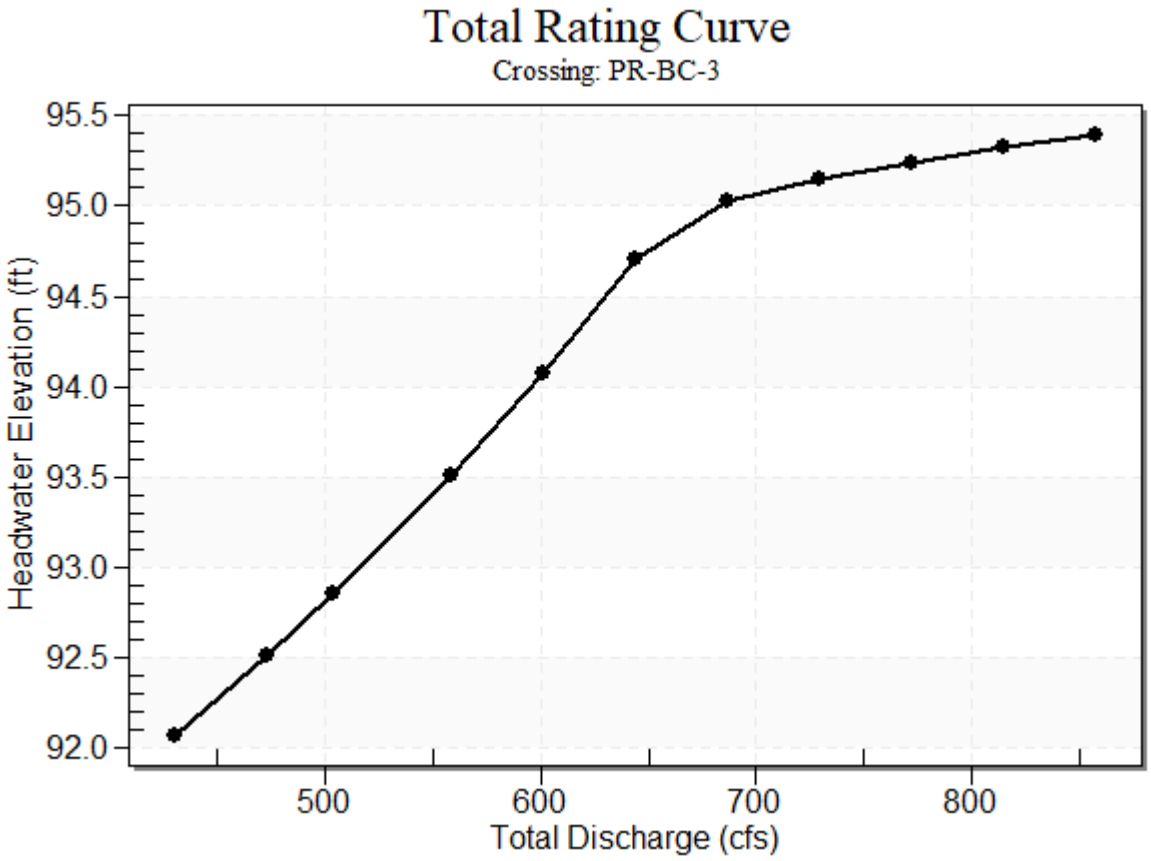


Table 136 - Culvert Summary Table: Culvert 1

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)
430.00	143.34	92.08	3.625	3.476	7-M2c	2.000	1.855	1.855	1.090	7.728	0.000
472.70	157.57	92.51	4.058	3.965	7-M2c	2.000	1.976	1.976	1.090	7.976	0.000
504.00	168.02	92.85	4.403	4.278	6-FFc	2.000	2.000	2.000	1.090	8.401	0.000
558.10	186.06	93.51	5.057	4.861	6-FFc	2.000	2.000	2.000	1.090	9.303	0.000
600.80	200.27	94.07	5.624	5.362	6-FFc	2.000	2.000	2.000	1.090	10.013	0.000
643.50	214.45	94.71	6.257	5.899	6-FFc	2.000	2.000	2.000	1.090	10.723	0.000
686.20	220.97	95.03	6.582	6.158	6-FFc	2.000	2.000	2.000	1.090	11.048	0.000
728.90	223.21	95.15	6.696	6.249	6-FFc	2.000	2.000	2.000	1.090	11.160	0.000
771.60	225.03	95.24	6.789	6.323	6-FFc	2.000	2.000	2.000	1.090	11.251	0.000
814.30	226.63	95.32	6.872	6.390	6-FFc	2.000	2.000	2.000	1.090	11.332	0.000
857.00	228.08	95.40	6.947	6.450	6-FFc	2.000	2.000	2.000	1.090	11.404	0.000

****

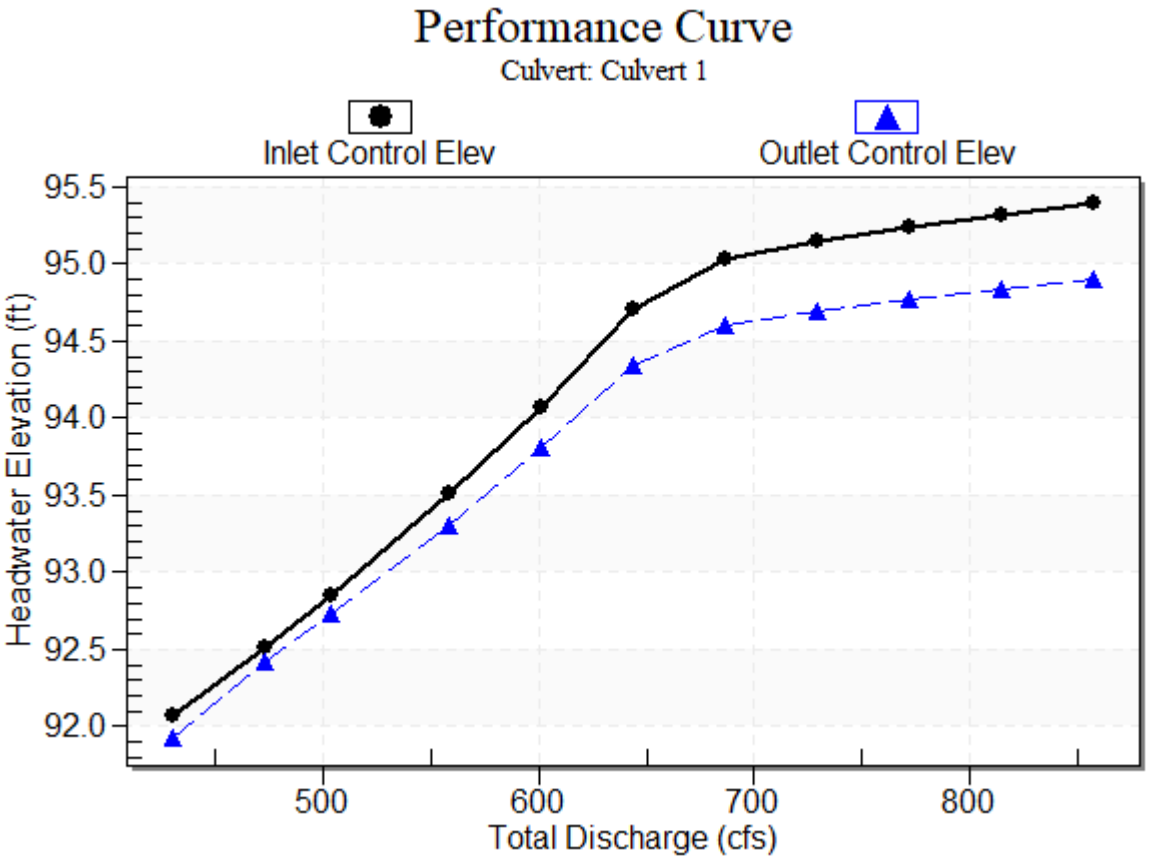
Straight Culvert

Inlet Elevation (invert): 88.45 ft, Outlet Elevation (invert): 88.15 ft

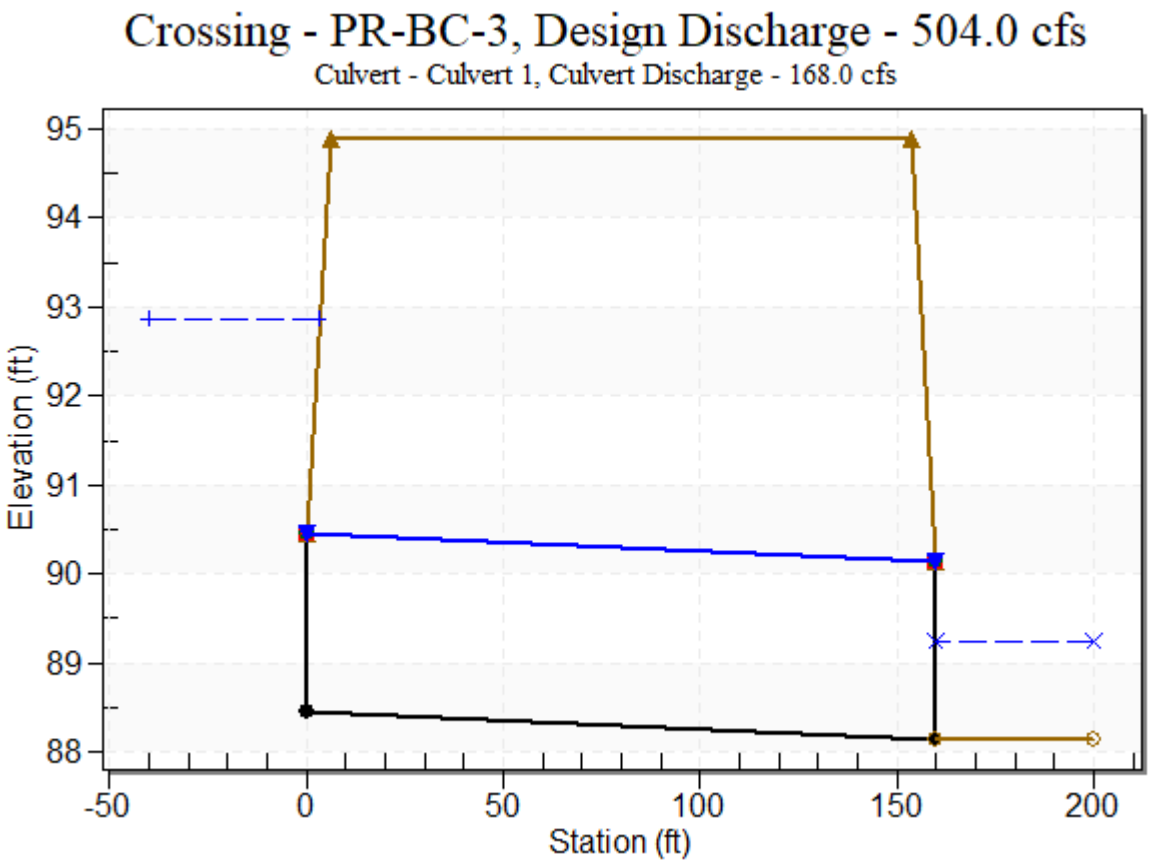
Culvert Length: 160.00 ft, Culvert Slope: 0.0019

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 88.45 ft

Outlet Station: 160.00 ft

Outlet Elevation: 88.15 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 137 - Culvert Summary Table: Culvert 2

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)
430.00	143.34	92.08	3.625	3.476	7-M2c	2.000	1.855	1.855	1.090	7.728	0.000
472.70	157.57	92.51	4.058	3.965	7-M2c	2.000	1.976	1.976	1.090	7.976	0.000
504.00	168.02	92.85	4.403	4.278	6-FFc	2.000	2.000	2.000	1.090	8.401	0.000
558.10	186.06	93.51	5.057	4.861	6-FFc	2.000	2.000	2.000	1.090	9.303	0.000
600.80	200.27	94.07	5.624	5.362	6-FFc	2.000	2.000	2.000	1.090	10.013	0.000
643.50	214.45	94.71	6.257	5.899	6-FFc	2.000	2.000	2.000	1.090	10.723	0.000
686.20	220.97	95.03	6.582	6.158	6-FFc	2.000	2.000	2.000	1.090	11.048	0.000
728.90	223.21	95.15	6.696	6.249	6-FFc	2.000	2.000	2.000	1.090	11.160	0.000
771.60	225.03	95.24	6.789	6.323	6-FFc	2.000	2.000	2.000	1.090	11.251	0.000
814.30	226.63	95.32	6.872	6.390	6-FFc	2.000	2.000	2.000	1.090	11.332	0.000
857.00	228.08	95.40	6.947	6.450	6-FFc	2.000	2.000	2.000	1.090	11.404	0.000

****

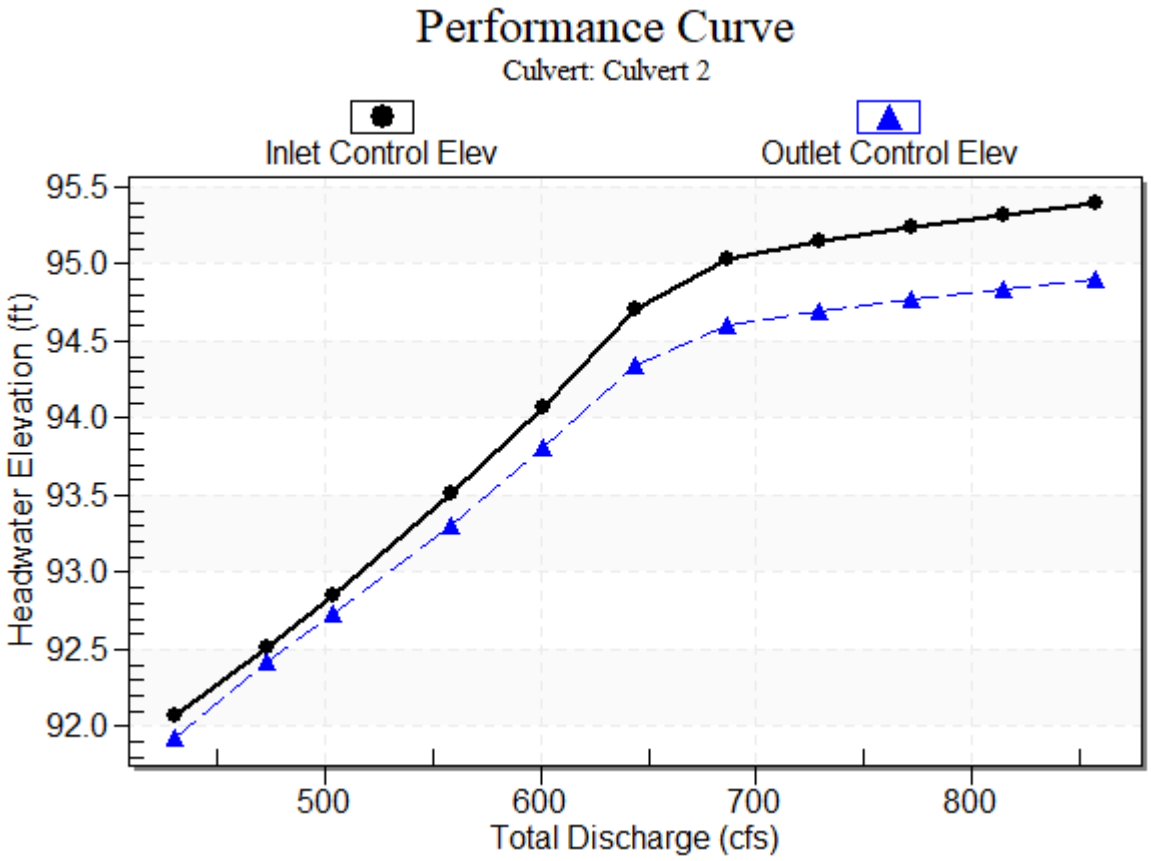
Straight Culvert

Inlet Elevation (invert): 88.45 ft, Outlet Elevation (invert): 88.15 ft

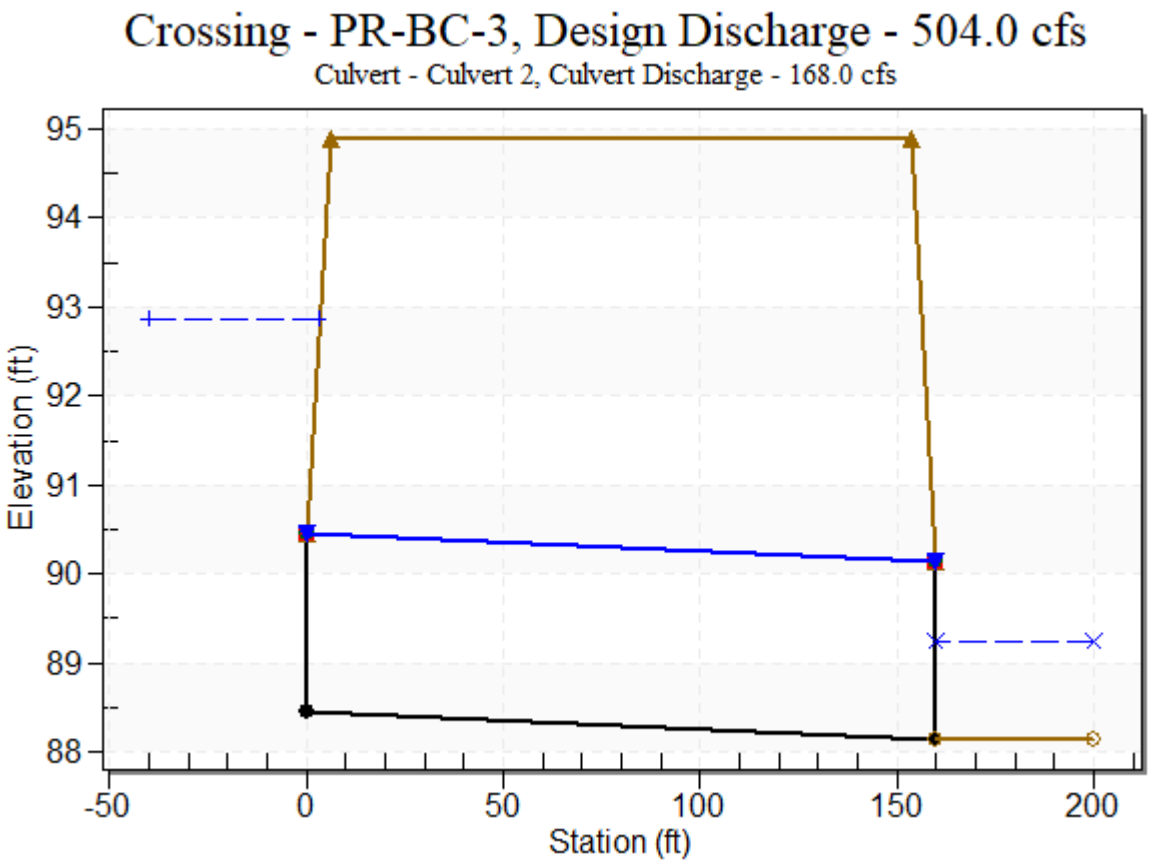
Culvert Length: 160.00 ft, Culvert Slope: 0.0019

****

Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 88.45 ft

Outlet Station: 160.00 ft

Outlet Elevation: 88.15 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 138 - Culvert Summary Table: Culvert 3

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)
430.00	143.34	92.08	3.625	3.476	7-M2c	2.000	1.855	1.855	1.090	7.728	0.000
472.70	157.57	92.51	4.058	3.965	7-M2c	2.000	1.976	1.976	1.090	7.976	0.000
504.00	168.02	92.85	4.403	4.278	6-FFc	2.000	2.000	2.000	1.090	8.401	0.000
558.10	186.06	93.51	5.057	4.861	6-FFc	2.000	2.000	2.000	1.090	9.303	0.000
600.80	200.27	94.07	5.624	5.362	6-FFc	2.000	2.000	2.000	1.090	10.013	0.000
643.50	214.45	94.71	6.257	5.899	6-FFc	2.000	2.000	2.000	1.090	10.723	0.000
686.20	220.97	95.03	6.582	6.158	6-FFc	2.000	2.000	2.000	1.090	11.048	0.000
728.90	223.21	95.15	6.696	6.249	6-FFc	2.000	2.000	2.000	1.090	11.160	0.000
771.60	225.03	95.24	6.789	6.323	6-FFc	2.000	2.000	2.000	1.090	11.251	0.000
814.30	226.63	95.32	6.872	6.390	6-FFc	2.000	2.000	2.000	1.090	11.332	0.000
857.00	228.08	95.40	6.947	6.450	6-FFc	2.000	2.000	2.000	1.090	11.404	0.000

****

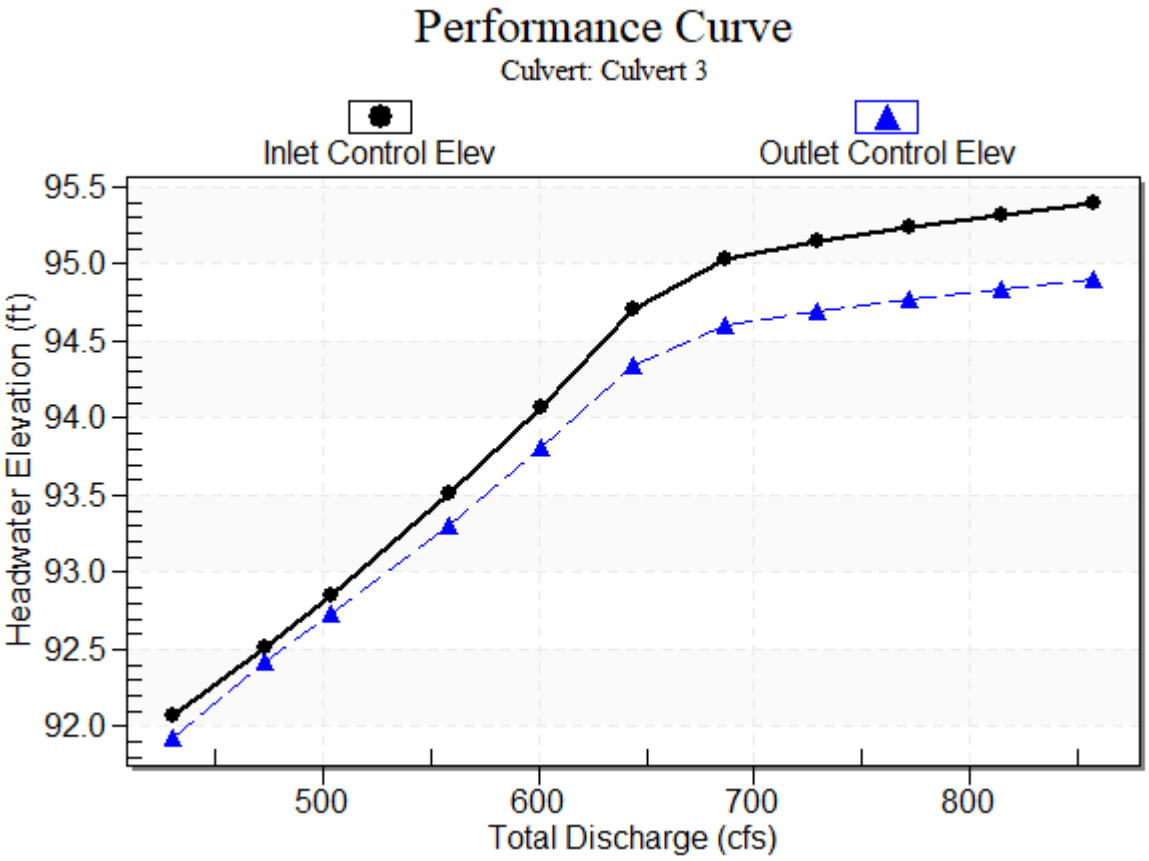
Straight Culvert

Inlet Elevation (invert): 88.45 ft, Outlet Elevation (invert): 88.15 ft

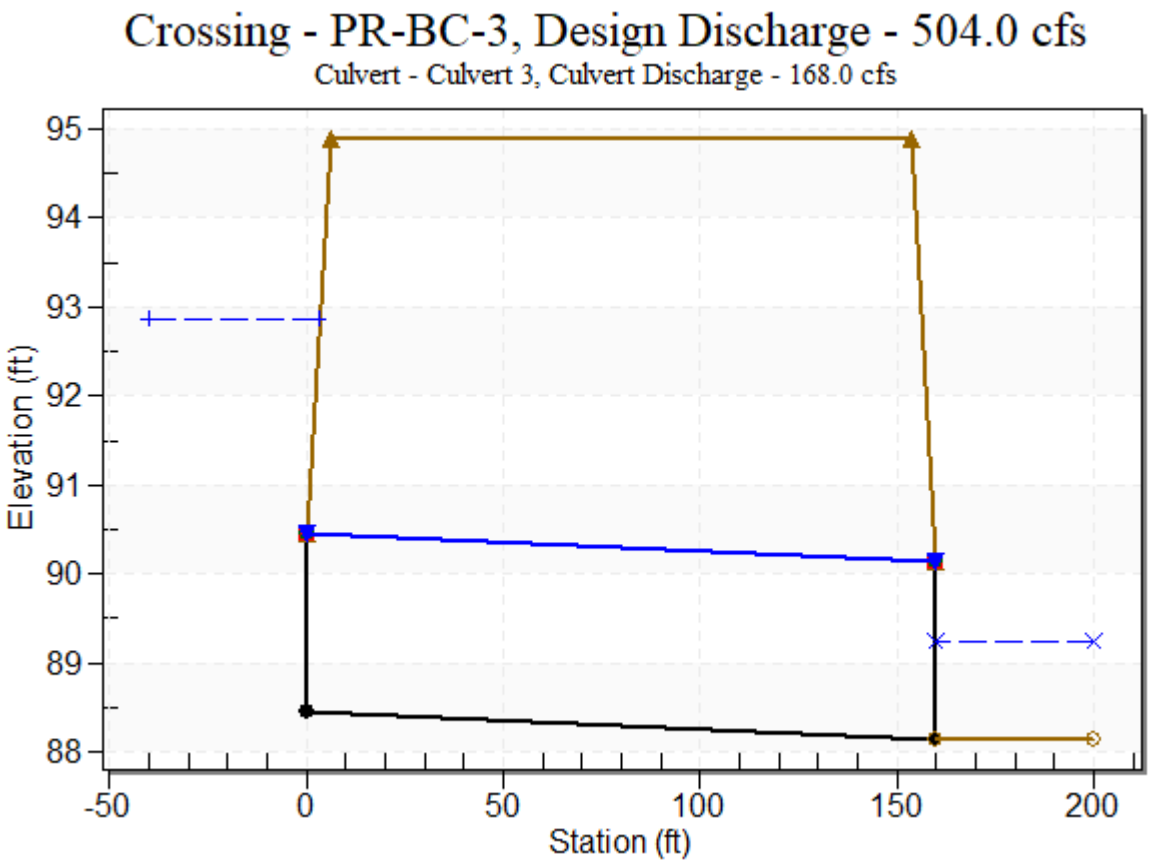
Culvert Length: 160.00 ft, Culvert Slope: 0.0019

****

Culvert Performance Curve Plot: Culvert 3



Water Surface Profile Plot for Culvert: Culvert 3



Site Data - Culvert 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 88.45 ft

Outlet Station: 160.00 ft

Outlet Elevation: 88.15 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 3

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 139 - Downstream Channel Rating Curve (Crossing: PR-BC-3)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
430.00	89.24	1.09
472.70	89.24	1.09
504.00	89.24	1.09
558.10	89.24	1.09
600.80	89.24	1.09
643.50	89.24	1.09
686.20	89.24	1.09
728.90	89.24	1.09
771.60	89.24	1.09
814.30	89.24	1.09
857.00	89.24	1.09

Tailwater Channel Data - PR-BC-3

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 89.24 ft

Roadway Data for Crossing: PR-BC-3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 94.90 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 215 cfs

Design Flow: 252 cfs

Maximum Flow: 428 cfs

Table 140 - Summary of Culvert Flows at Crossing: EX-CD-18

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
91.60	215.00	215.00	0.00	1
92.04	236.30	236.30	0.00	1
92.38	252.00	252.00	0.00	1
92.69	278.90	265.37	13.21	12
92.76	300.20	268.27	31.59	6
92.82	321.50	270.65	50.49	5
92.87	342.80	272.76	69.86	5
92.91	364.10	274.64	89.08	4
92.96	385.40	276.41	108.74	4
93.00	406.70	278.07	128.47	4
93.04	428.00	279.57	147.81	3
92.60	261.58	261.58	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-18

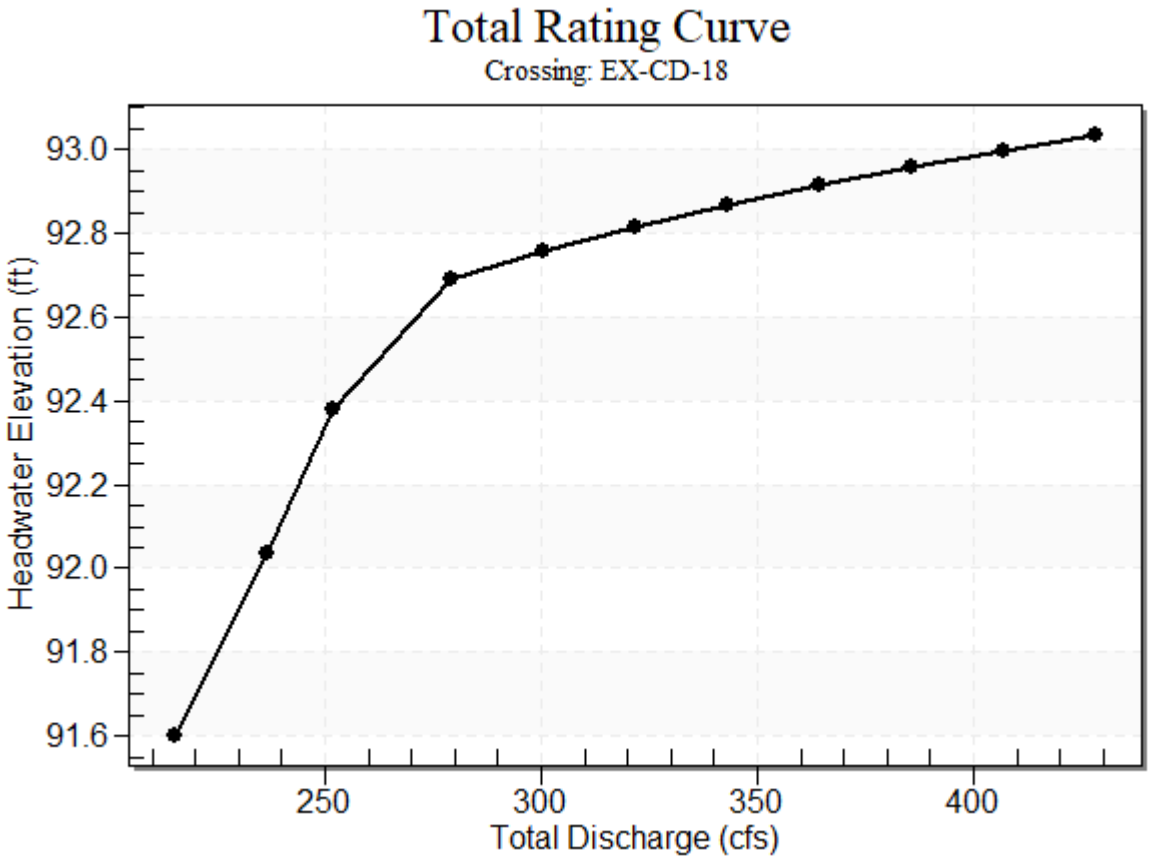


Table 141 - Culvert Summary Table: Culvert 1

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)
215.00	215.00	91.60	4.404	4.210	7-M2t	3.000	2.430	2.630	2.630	8.175	0.000
236.30	236.30	92.04	4.836	4.601	7-M2t	3.000	2.588	2.630	2.630	8.985	0.000
252.00	252.00	92.38	5.179	4.907	7-M2c	3.000	2.702	2.702	2.630	9.327	0.000
278.90	265.37	92.69	5.489	5.166	7-M2c	3.000	2.797	2.797	2.630	9.489	0.000
300.20	268.27	92.76	5.558	5.223	7-M2c	3.000	2.817	2.817	2.630	9.524	0.000
321.50	270.65	92.82	5.616	5.269	7-M2c	3.000	2.833	2.833	2.630	9.552	0.000
342.80	272.76	92.87	5.667	5.308	7-M2c	3.000	2.848	2.848	2.630	9.577	0.000
364.10	274.64	92.91	5.713	5.345	7-M2c	3.000	2.861	2.861	2.630	9.599	0.000
385.40	276.41	92.96	5.757	5.378	7-M2c	3.000	2.874	2.874	2.630	9.619	0.000
406.70	278.07	93.00	5.798	5.410	7-M2c	3.000	2.885	2.885	2.630	9.638	0.000
428.00	279.57	93.04	5.836	5.439	7-M2c	3.000	2.895	2.895	2.630	9.656	0.000

****

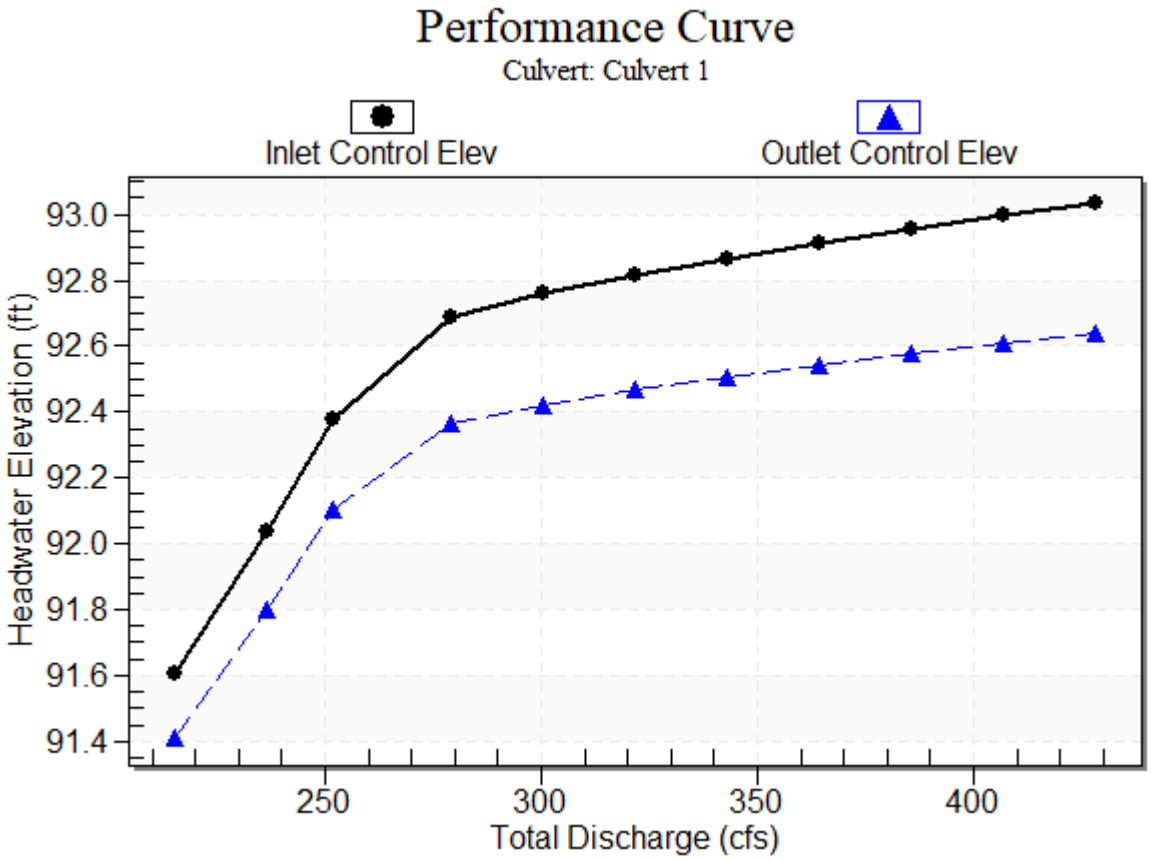
Straight Culvert

Inlet Elevation (invert): 87.20 ft, Outlet Elevation (invert): 87.17 ft

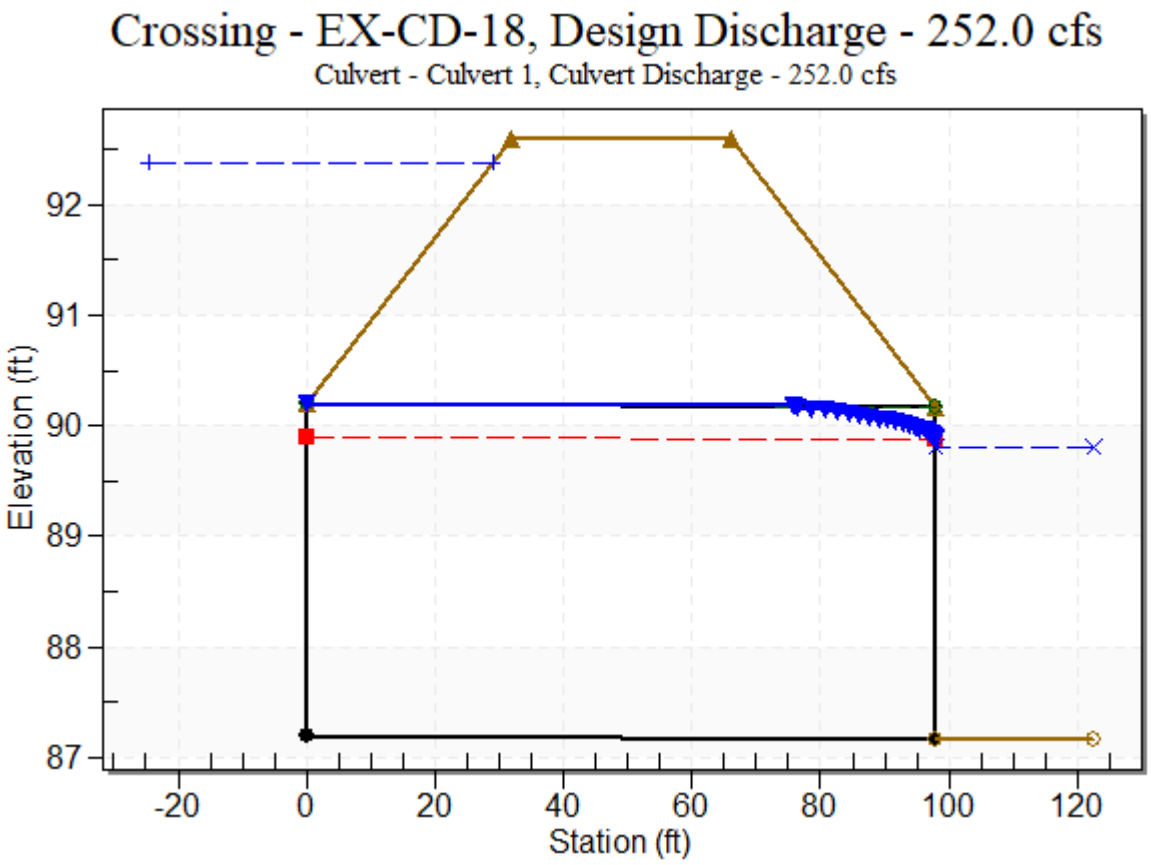
Culvert Length: 98.00 ft, Culvert Slope: 0.0003

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 87.20 ft

Outlet Station: 98.00 ft

Outlet Elevation: 87.17 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 142 - Downstream Channel Rating Curve (Crossing: EX-CD-18)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
215.00	89.80	2.63
236.30	89.80	2.63
252.00	89.80	2.63
278.90	89.80	2.63
300.20	89.80	2.63
321.50	89.80	2.63
342.80	89.80	2.63
364.10	89.80	2.63
385.40	89.80	2.63
406.70	89.80	2.63
428.00	89.80	2.63

Tailwater Channel Data - EX-CD-18

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 89.80 ft

Roadway Data for Crossing: EX-CD-18

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 92.60 ft

Roadway Surface: Paved

Roadway Top Width: 34.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 215 cfs

Design Flow: 252 cfs

Maximum Flow: 428 cfs

Table 143 - Summary of Culvert Flows at Crossing: PR-CD-18

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
91.60	215.00	215.00	0.00	1
92.03	236.30	236.30	0.00	1
92.38	252.00	252.00	0.00	1
92.86	278.90	272.36	6.21	15
92.94	300.20	275.68	24.27	7
93.00	321.50	278.15	42.83	5
93.06	342.80	280.40	62.16	5
93.10	364.10	282.35	81.30	4
93.15	385.40	284.17	100.94	4
93.19	406.70	285.86	120.65	4
93.24	428.00	287.46	140.42	4
92.80	270.07	270.07	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-18

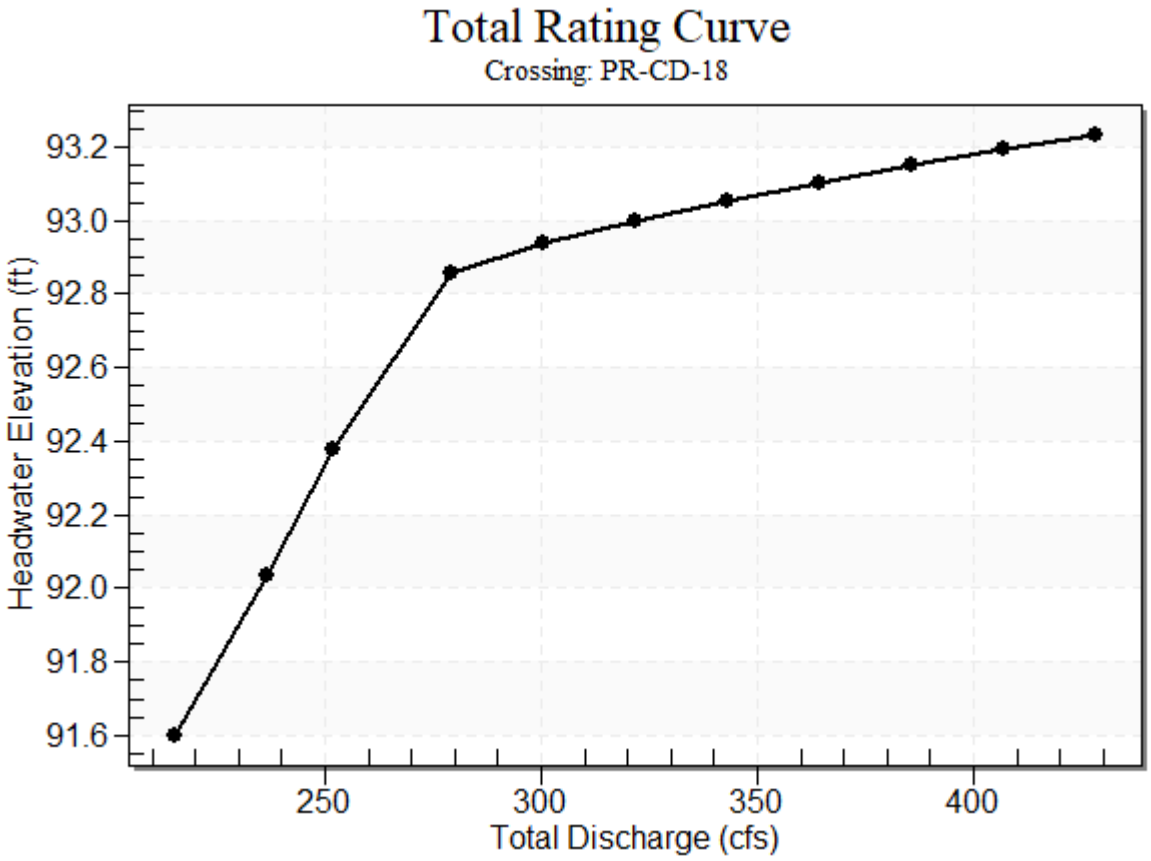


Table 144 - Culvert Summary Table: Culvert 1

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)
215.00	215.00	91.60	4.402	4.188	3-M2t	3.000	2.430	2.800	2.700	7.679	0.000
236.30	236.30	92.03	4.835	4.598	7-M2t	3.000	2.588	2.800	2.700	8.439	0.000
252.00	252.00	92.38	5.178	4.945	7-M2t	3.000	2.702	2.800	2.700	9.000	0.000
278.90	272.36	92.86	5.656	5.397	7-M2c	3.000	2.845	2.845	2.700	9.572	0.000
300.20	275.68	92.94	5.737	5.470	7-M2c	3.000	2.868	2.868	2.700	9.611	0.000
321.50	278.15	93.00	5.799	5.523	7-M2c	3.000	2.886	2.886	2.700	9.639	0.000
342.80	280.40	93.06	5.855	5.572	7-M2c	3.000	2.901	2.901	2.700	9.665	0.000
364.10	282.35	93.10	5.904	5.613	7-M2c	3.000	2.915	2.915	2.700	9.688	0.000
385.40	284.17	93.15	5.951	5.652	7-M2c	3.000	2.927	2.927	2.700	9.708	0.000
406.70	285.86	93.19	5.994	5.689	7-M2c	3.000	2.939	2.939	2.700	9.728	0.000
428.00	287.46	93.24	6.035	5.723	7-M2c	3.000	2.950	2.950	2.700	9.746	0.000

****

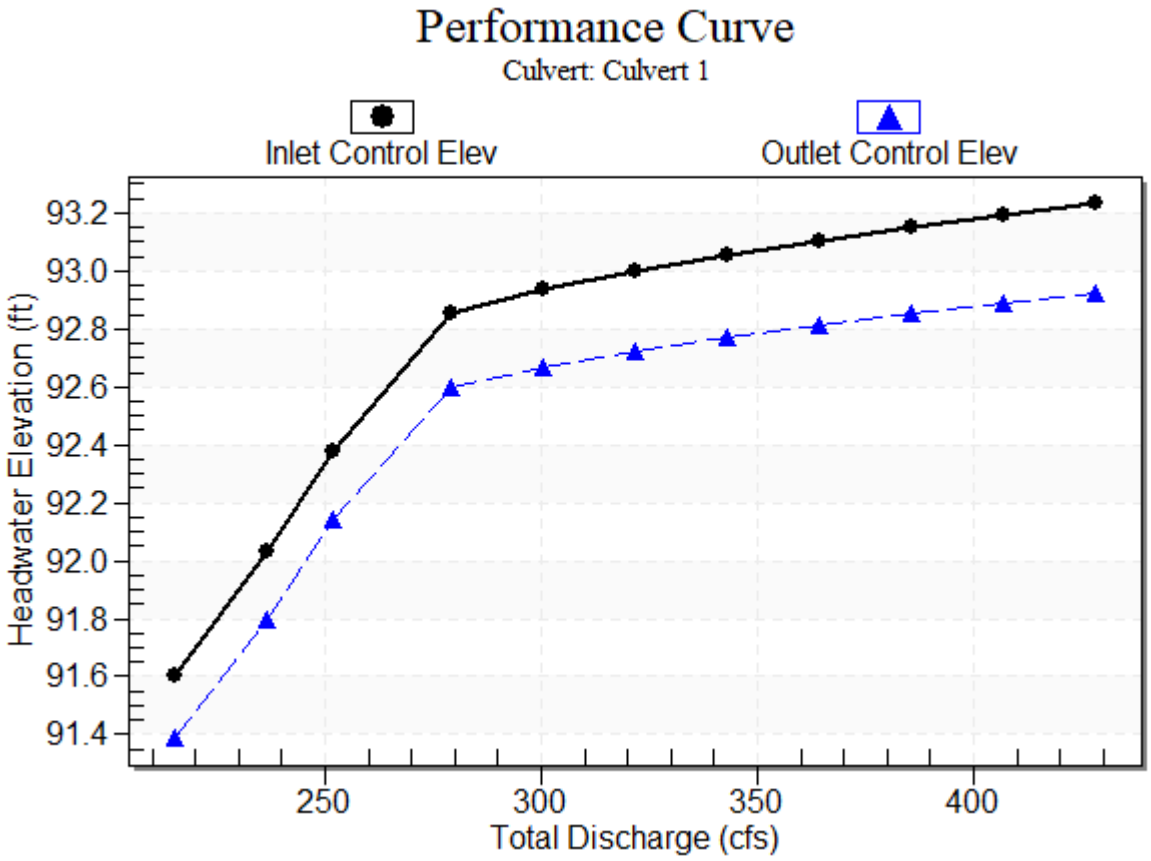
Straight Culvert

Inlet Elevation (invert): 87.20 ft, Outlet Elevation (invert): 87.00 ft

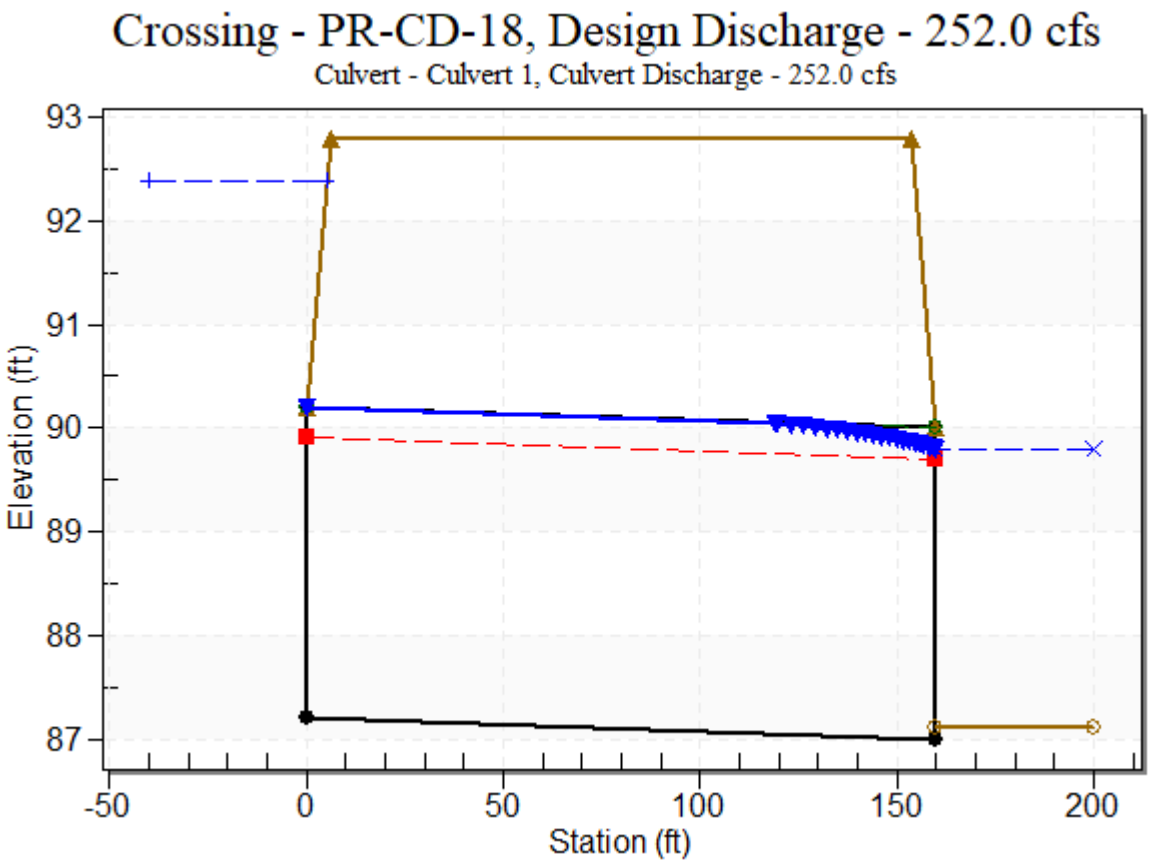
Culvert Length: 160.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 87.20 ft

Outlet Station: 160.00 ft

Outlet Elevation: 87.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 145 - Downstream Channel Rating Curve (Crossing: PR-CD-18)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
215.00	89.80	2.70
236.30	89.80	2.70
252.00	89.80	2.70
278.90	89.80	2.70
300.20	89.80	2.70
321.50	89.80	2.70
342.80	89.80	2.70
364.10	89.80	2.70
385.40	89.80	2.70
406.70	89.80	2.70
428.00	89.80	2.70

Tailwater Channel Data - PR-CD-18

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 89.80 ft

Roadway Data for Crossing: PR-CD-18

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 92.80 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 108 cfs

Design Flow: 126 cfs

Maximum Flow: 214 cfs

Table 146 - Summary of Culvert Flows at Crossing: EX-CD-19

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
91.21	108.00	108.00	0.00	1
91.64	118.60	118.60	0.00	1
91.97	126.00	126.00	0.00	1
92.12	139.80	129.44	9.50	15
92.14	150.40	129.76	19.61	4
92.15	161.00	130.05	30.36	4
92.16	171.60	130.28	40.18	3
92.17	182.20	130.50	50.69	3
92.18	192.80	130.72	61.33	3
92.19	203.40	130.91	71.94	3
92.20	214.00	131.10	82.51	3
92.10	128.91	128.91	0.00	Overtopping

Rating Curve Plot for Crossing: EX-CD-19

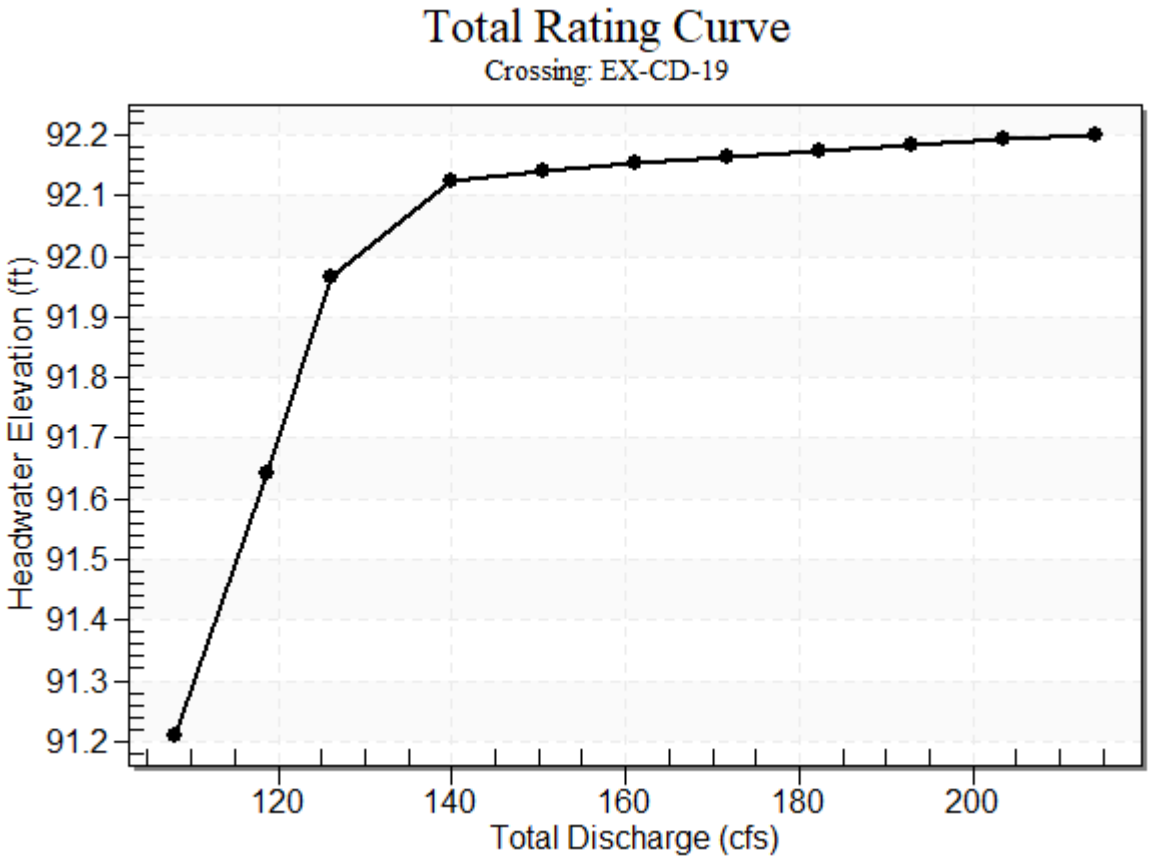


Table 147 - Culvert Summary Table: Culvert 1

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)
108.00	108.00	91.21	4.421	4.191	7-M2c	3.000	2.438	2.438	2.420	8.860	0.000
118.60	118.60	91.64	4.853	4.544	7-M2c	3.000	2.595	2.595	2.420	9.141	0.000
126.00	126.00	91.97	5.177	4.863	7-M2c	3.000	2.702	2.702	2.420	9.327	0.000
139.80	129.44	92.12	5.334	5.010	7-M2c	3.000	2.751	2.751	2.420	9.411	0.000
150.40	129.76	92.14	5.349	5.021	7-M2c	3.000	2.755	2.755	2.420	9.419	0.000
161.00	130.05	92.15	5.362	5.035	7-M2c	3.000	2.759	2.759	2.420	9.426	0.000
171.60	130.28	92.16	5.373	5.045	7-M2c	3.000	2.763	2.763	2.420	9.432	0.000
182.20	130.50	92.17	5.384	5.054	7-M2c	3.000	2.766	2.766	2.420	9.437	0.000
192.80	130.72	92.18	5.394	5.063	7-M2c	3.000	2.769	2.769	2.420	9.442	0.000
203.40	130.91	92.19	5.403	5.071	7-M2c	3.000	2.772	2.772	2.420	9.447	0.000
214.00	131.10	92.20	5.412	5.077	7-M2c	3.000	2.774	2.774	2.420	9.451	0.000

****

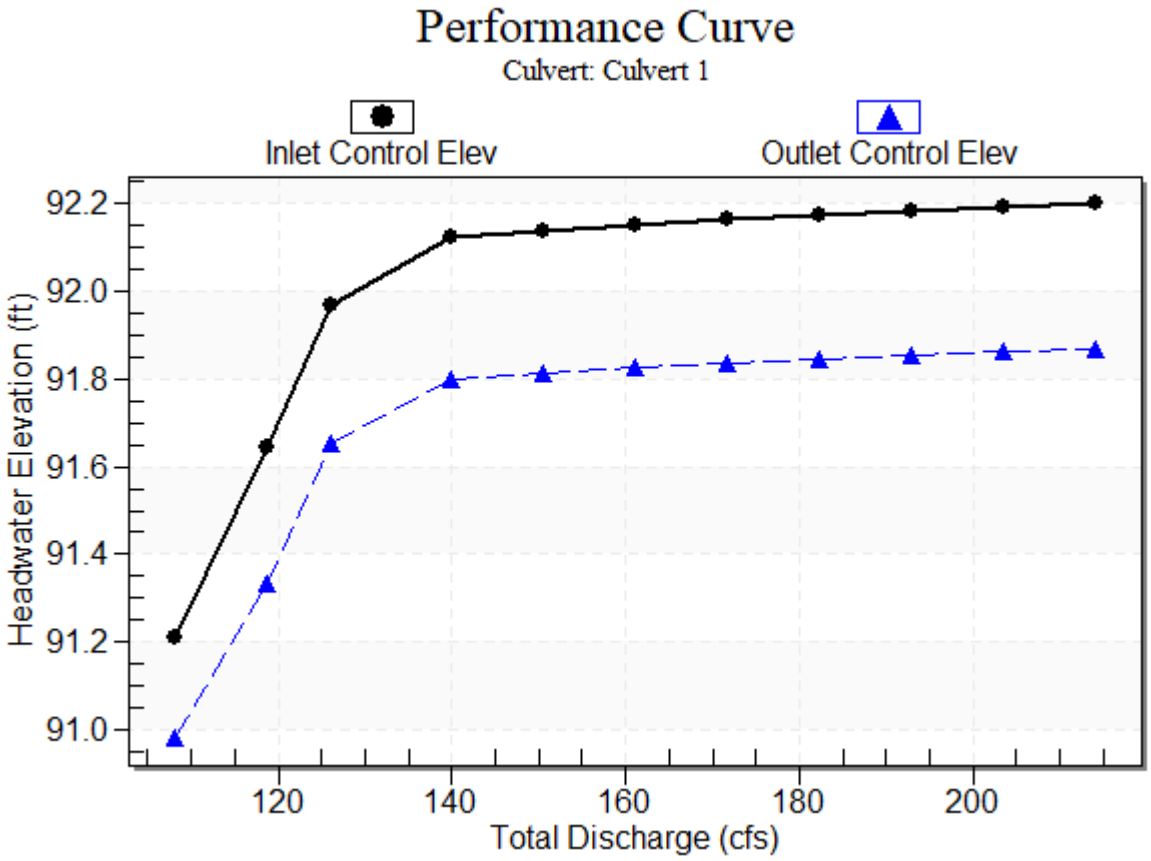
Straight Culvert

Inlet Elevation (invert): 86.79 ft, Outlet Elevation (invert): 86.61 ft

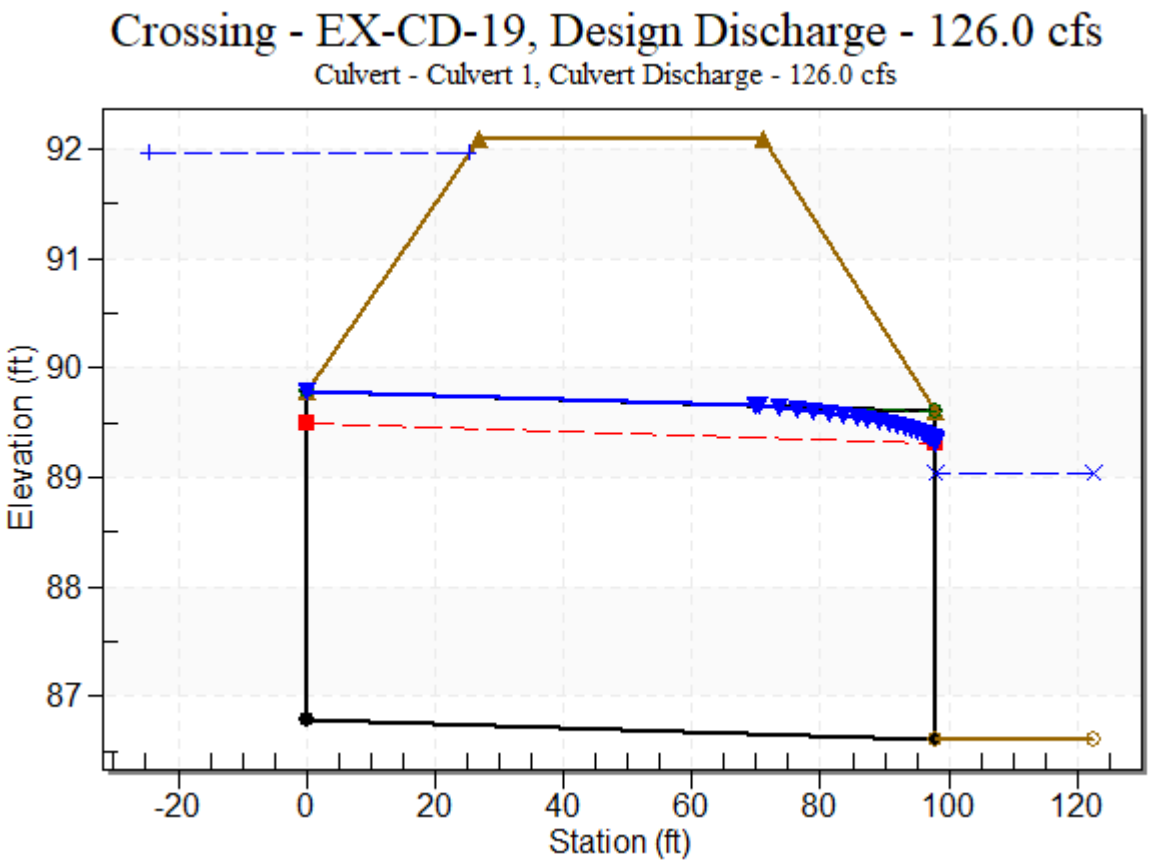
Culvert Length: 98.00 ft, Culvert Slope: 0.0018

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 86.79 ft

Outlet Station: 98.00 ft

Outlet Elevation: 86.61 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 148 - Downstream Channel Rating Curve (Crossing: EX-CD-19)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
108.00	89.03	2.42
118.60	89.03	2.42
126.00	89.03	2.42
139.80	89.03	2.42
150.40	89.03	2.42
161.00	89.03	2.42
171.60	89.03	2.42
182.20	89.03	2.42
192.80	89.03	2.42
203.40	89.03	2.42
214.00	89.03	2.42

Tailwater Channel Data - EX-CD-19

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 89.03 ft

Roadway Data for Crossing: EX-CD-19

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 900.00 ft

Crest Elevation: 92.10 ft

Roadway Surface: Paved

Roadway Top Width: 44.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 108 cfs

Design Flow: 126 cfs

Maximum Flow: 214 cfs

Table 149 - Summary of Culvert Flows at Crossing: PR-CD-19

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
91.22	108.00	108.00	0.00	1
91.65	118.60	118.60	0.00	1
91.98	126.00	126.00	0.00	1
92.12	139.80	129.22	9.49	14
92.14	150.40	129.55	19.78	4
92.15	161.00	129.84	30.57	4
92.16	171.60	130.07	40.39	3
92.17	182.20	130.30	50.90	3
92.18	192.80	130.51	61.54	3
92.19	203.40	130.71	72.15	3
92.20	214.00	130.90	82.71	3
92.10	128.70	128.70	0.00	Overtopping

Rating Curve Plot for Crossing: PR-CD-19

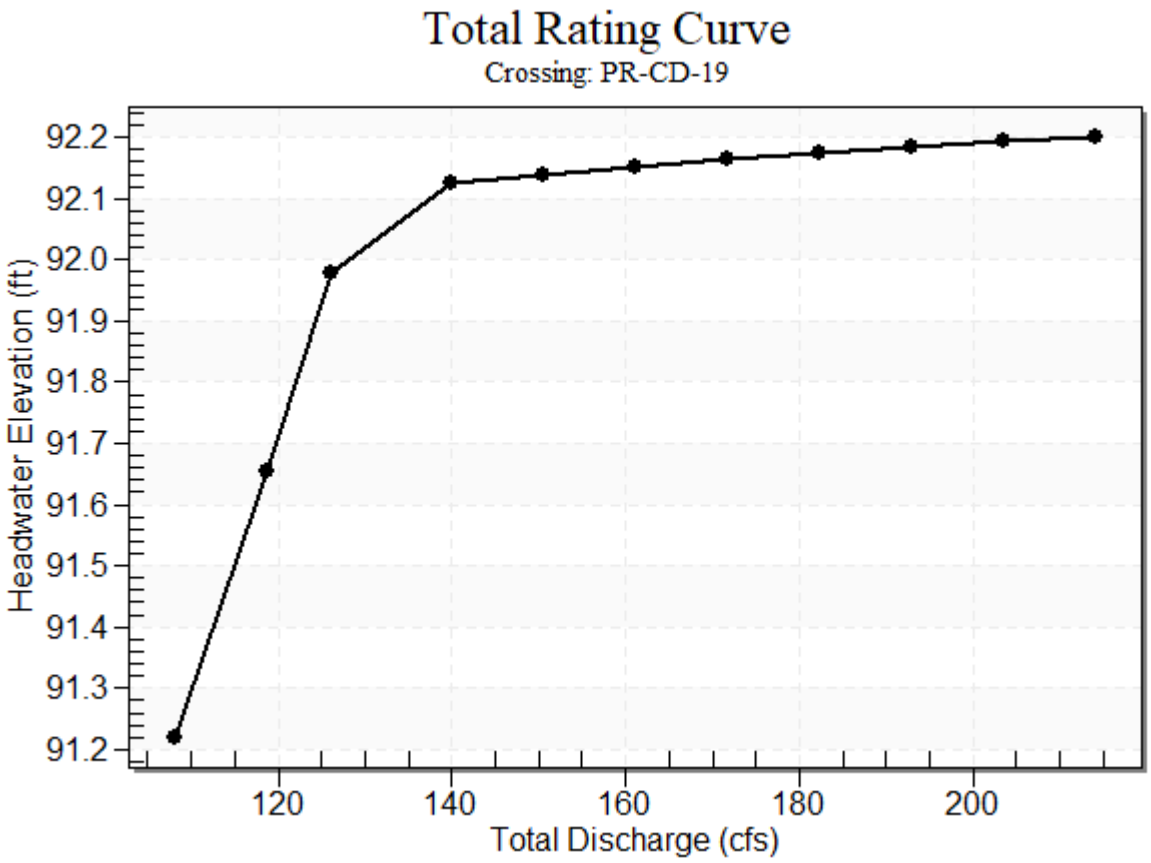


Table 150 - Culvert Summary Table: Culvert 1

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)
108.00	108.00	91.22	4.421	4.201	3-M2t	3.000	2.438	2.530	2.530	8.538	0.000
118.60	118.60	91.65	4.853	4.695	7-M2c	3.000	2.595	2.595	2.530	9.141	0.000
126.00	126.00	91.98	5.177	5.051	7-M2c	3.000	2.702	2.702	2.530	9.327	0.000
139.80	129.22	92.12	5.324	5.203	7-M2c	3.000	2.748	2.748	2.530	9.406	0.000
150.40	129.55	92.14	5.339	5.221	7-M2c	3.000	2.752	2.752	2.530	9.414	0.000
161.00	129.84	92.15	5.353	5.234	7-M2c	3.000	2.756	2.756	2.530	9.421	0.000
171.60	130.07	92.16	5.363	5.243	7-M2c	3.000	2.760	2.760	2.530	9.427	0.000
182.20	130.30	92.17	5.374	5.254	7-M2c	3.000	2.763	2.763	2.530	9.432	0.000
192.80	130.51	92.18	5.384	5.265	7-M2c	3.000	2.766	2.766	2.530	9.437	0.000
203.40	130.71	92.19	5.393	5.273	7-M2c	3.000	2.769	2.769	2.530	9.442	0.000
214.00	130.90	92.20	5.402	5.283	7-M2c	3.000	2.771	2.771	2.530	9.447	0.000

****

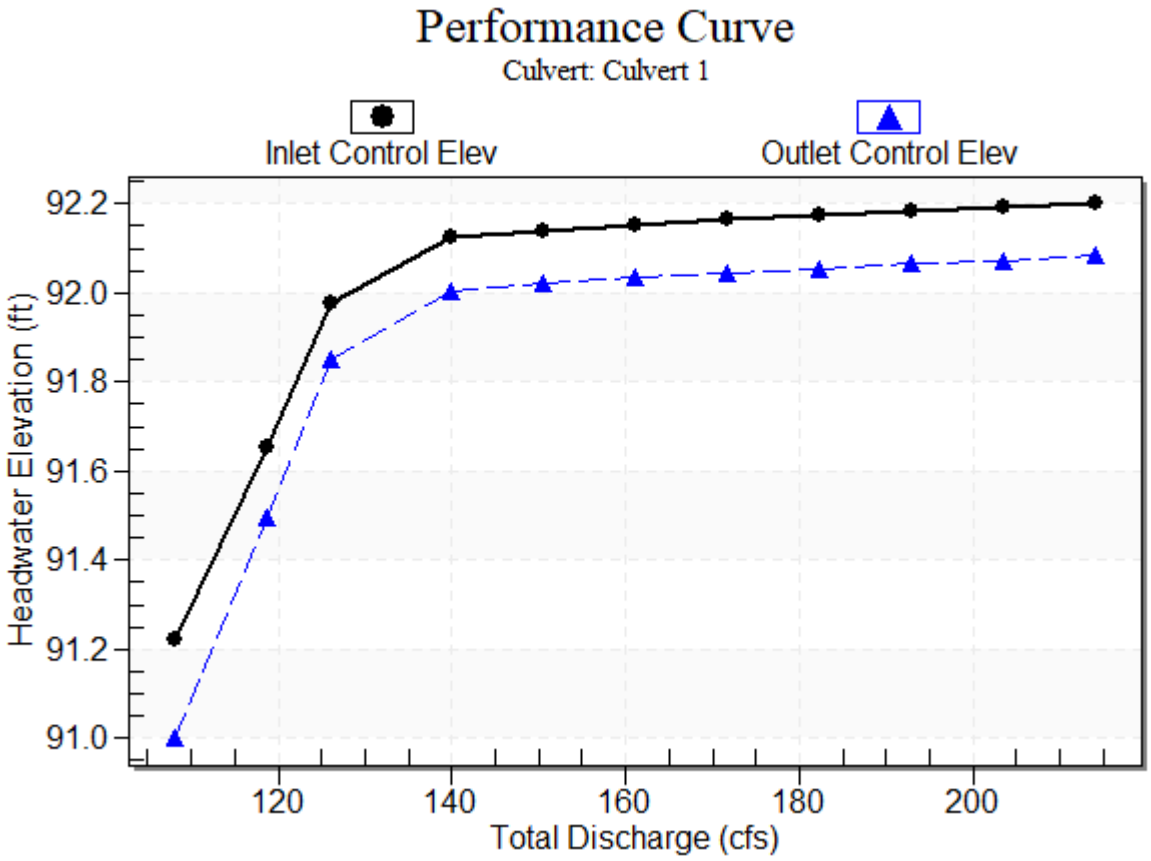
Straight Culvert

Inlet Elevation (invert): 86.80 ft, Outlet Elevation (invert): 86.50 ft

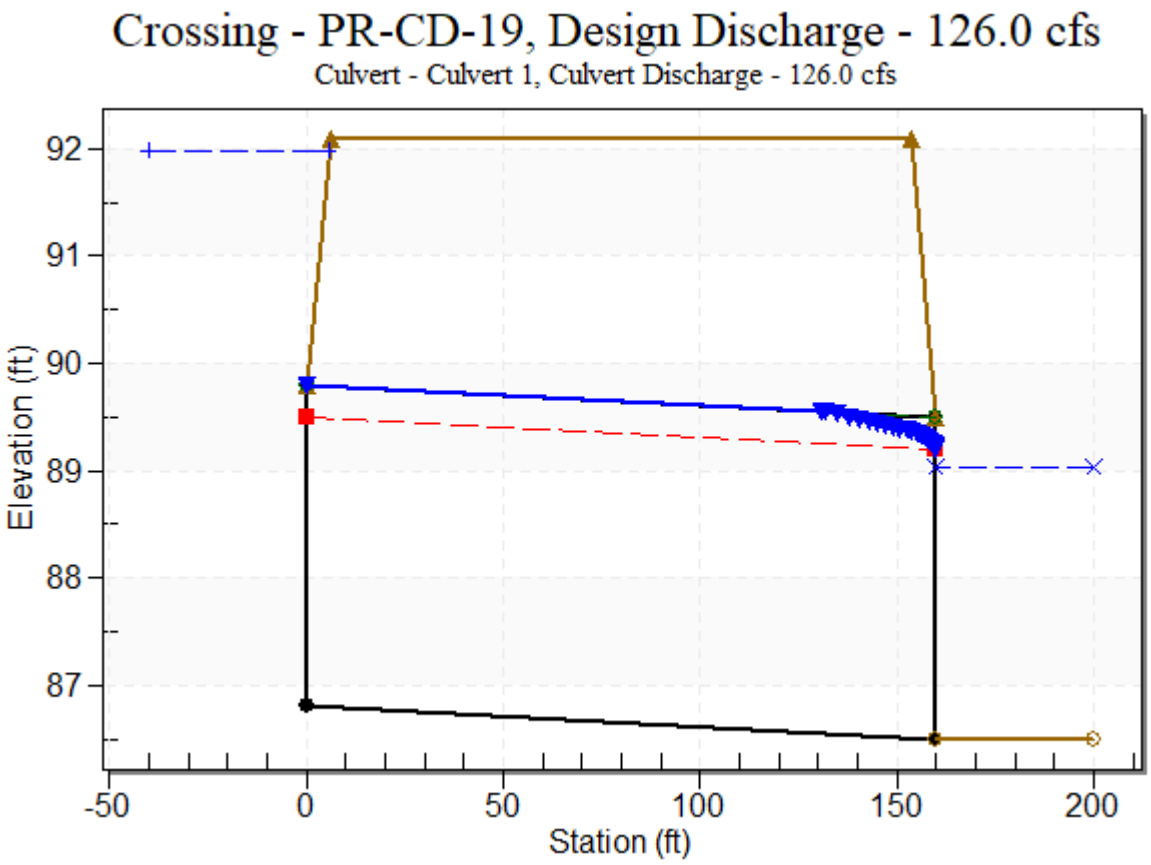
Culvert Length: 160.00 ft, Culvert Slope: 0.0019

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 86.80 ft

Outlet Station: 160.00 ft

Outlet Elevation: 86.50 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 151 - Downstream Channel Rating Curve (Crossing: PR-CD-19)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
108.00	89.03	2.53
118.60	89.03	2.53
126.00	89.03	2.53
139.80	89.03	2.53
150.40	89.03	2.53
161.00	89.03	2.53
171.60	89.03	2.53
182.20	89.03	2.53
192.80	89.03	2.53
203.40	89.03	2.53
214.00	89.03	2.53

Tailwater Channel Data - PR-CD-19

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 89.03 ft

Roadway Data for Crossing: PR-CD-19

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 900.00 ft

Crest Elevation: 92.10 ft

Roadway Surface: Paved

Roadway Top Width: 148.00 ft

APPENDIX D

Cross Drain Pictures, Review Checklist and FDOT SLD

Review Checklist

CD-1

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 463+36 Size/Type 42" RCP

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 21" from pipe crown

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp* (circled)

Erosion/Sedimentation:

Misc. Comments:

CD-01

East Headwall

West Headwall

Review Checklist

CD-2

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 472+52 Size/Type 30" RCP

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 6" from pipe crown

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp* (circled)

Erosion/Sedimentation:

Misc. Comments:

CD-02

East Headwall

West Headwall

Review Checklist

CD-3

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 489+64 Size/Type 5' x 3' CBC

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 10" from pipe crown

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp*

Erosion/Sedimentation:

Misc. Comments:

CD-3

East Headwall

West Headwall

Review Checklist

CD-4

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 499+51 Size/Type 24" RCP

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 10" from invert

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp*

Erosion/Sedimentation:

Misc. Comments:

CD-04

East Headwall

West Headwall

Review Checklist

CD-5

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 559+35 Size/Type 5' x 3' CBC

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 20" from invert

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp* (circled)

Erosion/Sedimentation:

Misc. Comments: Double elliptical pipe downstream (beneath Morthen Dr)

CD-05

East Headwall

West Headwall

Review Checklist

CD-6

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 580+00 Size/Type 42" RCP

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 6" from pipe crown

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp* (circled)

Erosion/Sedimentation: Silted halfway on west side, half full of water on east side

Misc. Comments:

CD-06

East Headwall

West Headwall

Review Checklist

CD-7

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 597+50 Size/Type Triple 24" RCP

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 12" from invert

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp* (circled)

Erosion/Sedimentation:

Misc. Comments:

CD-07

East Headwall

West Headwall

Review Checklist

CD-8

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 625+00 Size/Type 10' x 3' CBC

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 25" from invert

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp* (circled)

Erosion/Sedimentation:

Misc. Comments:

CD-08

East Headwall

West Headwall

Review Checklist

CD-9

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 655+00 Size/Type 4' x 3' CBC

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 23" from invert

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp* (circled)

Erosion/Sedimentation:

Misc. Comments:

CD-09

East Headwall

West Headwall

Review Checklist

CD-10

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 666+00 Size/Type 30" RCP

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 10" from invert

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp*

Erosion/Sedimentation: _____

Misc. Comments: _____

CD-10

East Headwall

West Headwall

Review Checklist

CD-11

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 682+00 Size/Type 30" RCP

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 4" from pipe crown

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp*

Erosion/Sedimentation: _____

Misc. Comments: _____

CD-11

East Headwall

West Headwall

Review Checklist

CD-12

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 725+00 Size/Type Double 30" RCP

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 18" from invert

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp*

Erosion/Sedimentation:

Misc. Comments:

CD-12

East Headwall

West Headwall

Review Checklist

CD-13

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 738+00 Size/Type 8' x 4' CBC

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 16" from pipe crown

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp*

Erosion/Sedimentation: _____

Misc. Comments: _____

CD-13

East Headwall

West Headwall

Review Checklist

CD-14

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 750+00 Size/Type 24" RCP

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 3" from pipe crown

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp* (circled)

Erosion/Sedimentation: _____

Misc. Comments: _____

CD-14

East Headwall

West Headwall

Review Checklist

CD-15

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 766+00 Size/Type 24" RCP

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 10" from invert

Tailwater: *Ditch* *Piped outfall* *(Overland flow)* *Swamp*

Erosion/Sedimentation: _____

Misc. Comments: _____

CD-15

East Headwall

West Headwall

Review Checklist

BC-1

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 784+50 Size/Type Double 10' x 2' CBC

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 12" from invert

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp* (circled)

Erosion/Sedimentation:

Misc. Comments:

BC-1

East Headwall

West Headwall

Review Checklist

BC-2

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 849+00 Size/Type Quadruple 10' x 3' CBC

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 24" from invert

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp* (circled)

Erosion/Sedimentation:

Misc. Comments:

BC-2

East Headwall

West Headwall

Review Checklist

CD-16

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 867+00 Size/Type 36" RCP

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 13" from invert

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp* (circled)

Erosion/Sedimentation:

Misc. Comments:

CD-16

East Headwall

West Headwall

Review Checklist

CD-17

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 888+50 Size/Type 10' x 2' CBC

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 12" from invert

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp*

Erosion/Sedimentation: _____

Misc. Comments: _____

CD-17

East Headwall

West Headwall

Review Checklist

BC-3

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 914+00 Size/Type Triple 10' x 2' CBC

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 12" from invert

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp*

Erosion/Sedimentation:

Misc. Comments:

BC-3

East Headwall

West Headwall

Review Checklist

CD-18

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 921+24 Size/Type 10'x 3' CBC

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 4.5" from pipe crown

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp*

Erosion/Sedimentation:

Misc. Comments:

CD-18

East Headwall

West Headwall

Review Checklist

CD-19

Date: 04/08/2021

Project: US 98 PD&E from W Socrum Loop Rd to CR 54

Location: STA 929+00 Size/Type 5' x 3' CBC

Road surface/Leaking joints? No

Recent development in basin? No

Overtopping? *Roadway* *Basin divide* *In roadway ditch*

None

Concerns with culvert extension? *Limited right of way* *Wetlands*

Normal high water marks: 7" from pipe crown

Tailwater: *Ditch* *Piped outfall* *Overland flow* *Swamp* (circled)

Erosion/Sedimentation: _____

Misc. Comments: _____

CD-19

East Headwall

West Headwall

	5 YR INV	SLD REV	BMP	EMP	INV	SLD REV
DATE	09/20/2017	10/19/2017	00.000	17.750		12/16/19(C.DRAINS)
BY	FTE	FTE				

FLORIDA DEPARTMENT OF TRANSPORTATION

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

SECTION STATUS	INT. or US ROUTE NO.	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO:
02	US 98	SR 35/SR 700	POLK	01	16210000	3 OF 4

7.0 — 8.0 — 9.0

ROADWAY FEATURES

INSIDE URBAN, OUTSIDE CITY
* LAKELAND
*|<=US-98
*|<SR 35/SR 700
*|<US 98

BONNIE GLEN ST 7.035 | RITTER RD 7.133 | BANANA RD 7.643 | LANIER RD 8.027 | DR 8.270 | RD 8.398 | POLK CO FIRESTATION 8.483 | 35A W SOCRUM LP RD 8.661

MHP ENT 7.028 | 7.052 PINE LANE MHP | PRINCETON MANOR RD 7.188 | BRENTWOOD LN 7.565 | WILDER RD 7.643 | W SOCRUM LOOP RD 7.895 | THOMAS RD 8.223 | W OAK 8.270 | W DEES 8.398 | HALL RD 8.661

BEGIN STUDY

LANE WIDTHS ARE AVERAGED

7.052: 121.0' - 48.0' / 4 - 12.0' RDWY / 40.0 TFSP MED / 4.0' PVD SHLD1 - LT / 5.0' PVD SHLD1 - RT / 2 - 12.0' LWN SHLD2

121.0' - 48.0' / 4 - 12.0' RDWY / 41.0 VEG MED / 2 - 4.0' PVD SHLD1 / 2 - 12.0' LWN SHLD2

7.133: 120.0' - 48.0' / 4 - 12.0' RDWY / 40.0 VEG MED / 2 - 4.0' PVD SHLD1 / 2 - 12.0' LWN SHLD2

8.223: 122.0' - 48.0' / 4 - 12.0' RDWY / 40.0 TFSP MED / 2 - 5.0' PVD SHLD1 / 2 - 12.0' LWN SHLD2

8.483: 122.0' - 48.0' / 4 - 12.0' RDWY / 40.0 VEG MED / 2 - 5.0' PVD SHLD1 / 2 - 12.0' LWN SHLD2

8.661: 123.0' - 24.0'L+13.0'R / 2 - 12.0'L + 1 - 13.0'R RDWY / 43.0 VEG MED / 4.0' PVD INSHLD1 - RT / 5.0' PVD SHLD1 - LT / 14.0' WARN SHLD1 - RT / 2 - 12.0' LWN SHLD2

8.916: 92.0' - 24.0' / 2 - 12.0' RDWY / 33.0 PVD MED / 5.0' PVD SHLD1 - LT / 6.0' PVD SHLD1 - RT / 2 - 12.0' LWN SHLD2

8.989: 56.0' - 24.0' / 2 - 12.0' RDWY / 2 - 4.0' PVD SHLD1 / 2 - 12.0' LWN SHLD2

ROADWAY COMPOSITION

28/FC-4 | 28/FC-4 (8.989) | 28/FC-4

HORIZONTAL ALIGNMENT

CURVE DATA NOT FIELD VERIFIED

Δ=37°20'23.92" D=2°00'00.00" PC=8.423 PI=8.608 PT=8.793

Δ=14°23'28.87" D=3°00'00.00" PC=8.793 PI=8.839 PT=8.884

PC=8.984 PI=8.994 PT=9.003 Δ=5°00'00.00" D=5°00'

STRUCTURE DESCRIPTION

7.028 1 - 15" X 80' CC

7.083 2 - 6' X 5' X 200' CBC

7.521 1 - 15" X 80' CC

7.556 1 - 36" X 175' CC

7.774 1 - 24" X 155' CC

7.863 1 - 42" X 185' CC

7.902 1 - 42" X 175' CC

8.067 1 - 15" X 80' CC

8.639 1 - 15" X 90' CC

8.828 1 - 42" X 185' CC

DISTRICT USE

SIS

FUN CLASS

URBAN PRIN ART OTHER

9.0 — 10.0 — 11.0

ROADWAY FEATURES

INSIDE URBAN, OUTSIDE CITY
* LAKELAND
*|<=US-98
*|<SR 35/SR 700
*|<US 98

GATOR CREEK RESERVE 9.763 | CYPRESS LAKES BLVD 10.178 | PIONEER DR 10.492 | CYPRESS LAKES ENT 10.732

LANE WIDTHS ARE AVERAGED

56.0' - 24.0' / 2 - 12.0' RDWY / 2 - 4.0' PVD SHLD1 / 2 - 12.0' LWN SHLD2

10.017: 69.0' - 24.0' / 2 - 12.0' RDWY / 13.0 PVD MED / 2 - 4.0' PVD SHLD1 / 2 - 12.0' LWN SHLD2

10.279: 56.0' - 24.0' / 2 - 12.0' RDWY / 2 - 4.0' PVD SHLD1 / 2 - 12.0' LWN SHLD2

10.565: 68.0' - 24.0' / 2 - 12.0' RDWY / 12.0 PVD MED / 2 - 4.0' PVD SHLD1 / 2 - 12.0' LWN SHLD2

10.893: 56.0' - 24.0' / 2 - 12.0' RDWY / 2 - 4.0' PVD SHLD1 / 2 - 12.0' LWN SHLD2

ROADWAY COMPOSITION

28/FC-4 | 10.017 28/FC-4 / 28/FC-4 | 10.279 28/FC-4 | 10.565 28/FC-4 / 28/FC-4 | 10.893 28/FC-4

HORIZONTAL ALIGNMENT

CURVE DATA NOT FIELD VERIFIED

PC=10,242 PI=10,456 PT=10,665 Δ=22°20'00.00" D=1°00'00 00

B=N47°20'00"W

B=N25°00'00"W

STRUCTURE DESCRIPTION

9.002 1 - 30" X 100' CC

9.357 1 - 5' X 3' X 100' CBC

9.512 1 - 30" X 100' CC

10.677 1 - 5' X 3' X 100' CBC

DISTRICT USE

SIS

FUN CLASS

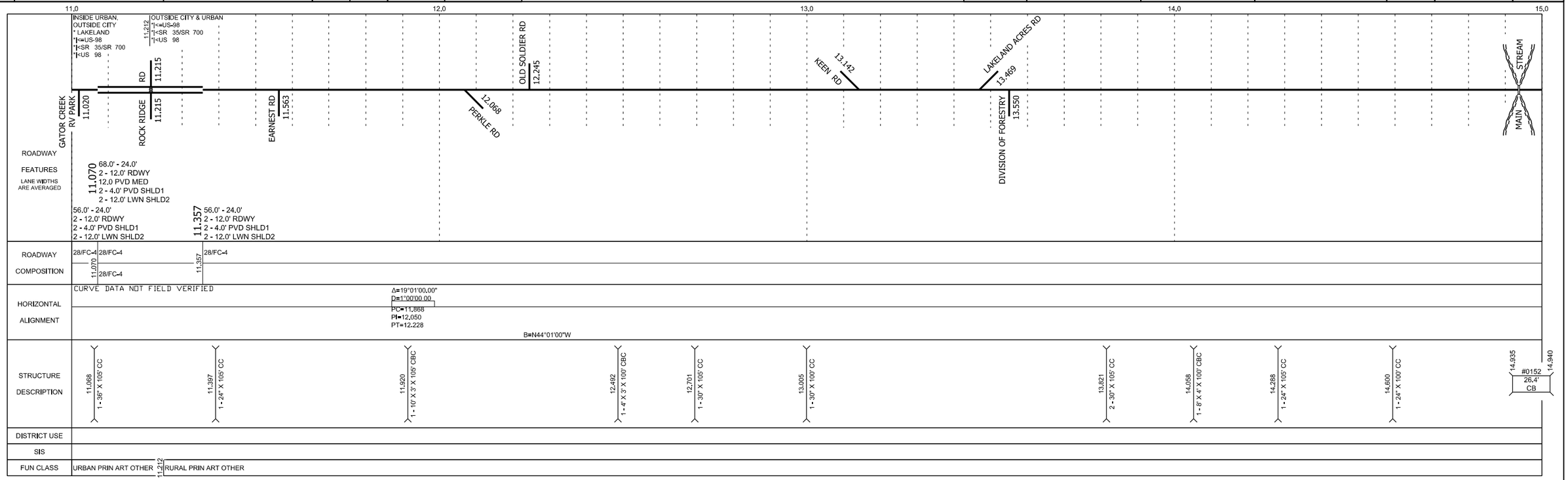
URBAN PRIN ART OTHER

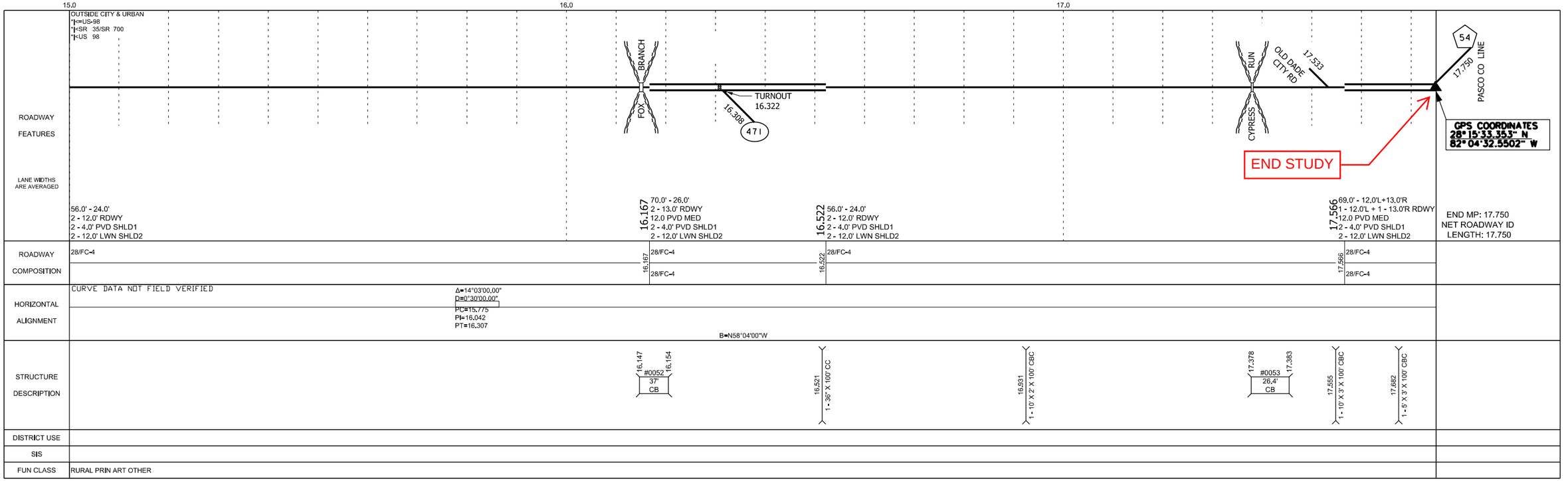
	5 YR INV	SLD REV	BMP	EMP	INV	SLD REV
DATE	09/20/2017	10/19/2017	00.000	17.750		12/16/19(C.DRAINS)
BY	FTE	FTE				

FLORIDA DEPARTMENT OF TRANSPORTATION

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

SECTION STATUS	INT. or US ROUTE NO.	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO:
02	US 98	SR 35/SR 700	POLK	01	16210000	4 OF 4





APPENDIX E

National Bridge Inventory Data

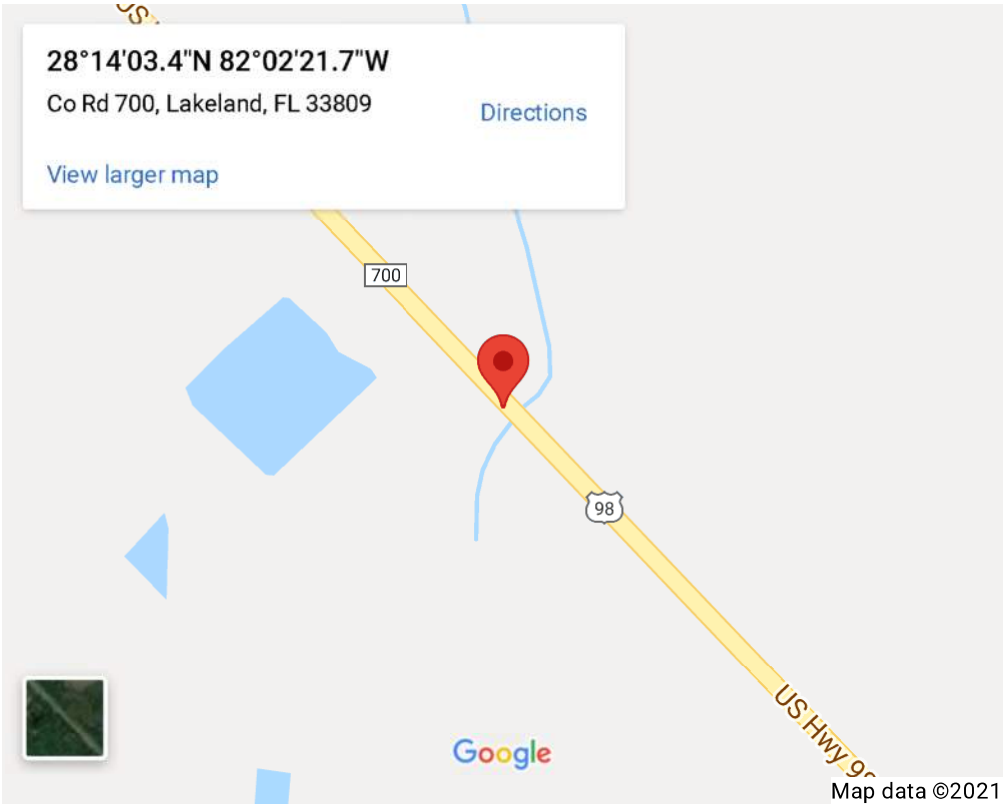
US-98 (SR-700) over MAIN STREAM

Polk County, Florida

Map

- Google Maps
- Bing Maps
- OpenStreetMap
- MapQuest.com
- USGS National Map
- Geo URI (Android)

Coordinates:
+28.23429, -82.03936
28°14'03" N, 82°02'22" W



Facts

Source: National Bridge Inventory. Information not verified; use at your own risk.

Name:	US-98 (SR-700) over MAIN STREAM
Structure number:	160152
Location:	1.4 MI EAST OF SR-471
Purpose:	Carries highway over waterway
Route classification:	Principal Arterial - Other (Rural) *[02]*
Length of largest span:	10.5 ft. *[3.2 m]*
Total length:	20.7 ft. *[6.3 m]*
Owner:	State Highway Agency *[01]*
Year built:	1946
Year reconstructed:	1991
Historic significance:	Bridge is not eligible for the National Register of Historic Places *[5]*
Design load:	M 13.5 / H 15 *[2]*
Number of main spans:	2
Main spans material:	Concrete *[1]*
Main spans design:	Culvert *[19]*
Deck type:	Not applicable *[N]*
Wearing surface:	Other *[9]*

Latest Available Inspection: September 2017

Good/Fair/Poor Condition:	Good
Status:	Open, no restriction *[A]*

Average daily traffic:	10,500 *[as of 2016]*
Truck traffic:	27% of total traffic
Structural appraisal:	Better than present minimum criteria *[7]*
Water adequacy appraisal:	Equal to present desirable criteria *[8]*
Roadway alignment appraisal:	Equal to present desirable criteria *[8]*
Channel protection:	Bank protection is in need of minor repairs. River control devices and embankment protection have a little minor damage. Banks and/or channel have minor amounts of drift. *[7]*
Culvert condition:	Shrinkage cracks, light scaling and insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift with no misalignment and not requiring corrective action. Some minor scouring has occured near curtain walls, wingwalls or pipes. Metal culverts have a smooth symmetrical curvature with superficial corrosion and no pitting. *[7]*
Scour condition:	Bridge foundations determined to be stable for the assessed or calculated scour condition. *[8]*
Sufficiency rating:	91.7

Previous Inspections

Date	Condition	Culvert Condition	ADT	Suff. Rating
September 2017	Good	7 out of 10	10500	91.7
September 2015	Good	7 out of 10	9100	92.7
September 2013	Good	7 out of 10	8800	92.9
September 2011	Good	7 out of 10	11875	90.8
October 2009	Good	7 out of 10	9000	92.7
November 2007	Good	7 out of 10	9900	92.1
November 2005	Good	7 out of 10	9600	92.3
November 2003	Good	7 out of 10	8900	92.8
January 2003	Good	7 out of 10	9300	92.5
January 2001	Good	7 out of 10	9500	92.4
January 1999	Good	7 out of 10	8500	91.0
January 1997	Good	8 out of 10	15500	83.6
May 1995	Good	8 out of 10	8000	87.4
January 1994	Good	8 out of 10	10669	84.3
March 1992	Good	8 out of 10	10669	84.3
January 1991	Fair	7 out of 10	12145	63.9

Element Data

Source: National Bridge Elements dataset, 2019 edition. This feature is experimental.

Element	Units	Quantity	1-Good	2-Fair	3-Poor	4-Serious
Culvert						
Reinforced Concrete Culvert	linear ft.	196	196	0	0	0

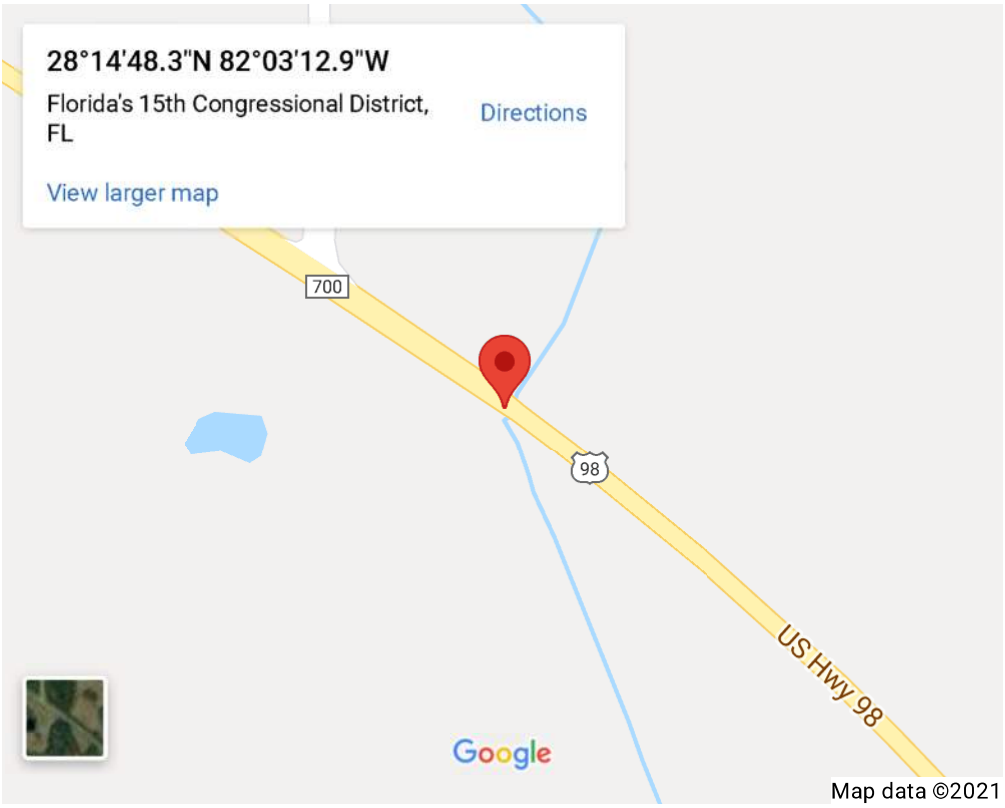
US-98 (SR-700) over FOX BRANCH

Polk County, Florida

Map

- Google Maps
- Bing Maps
- OpenStreetMap
- MapQuest.com
- USGS National Map
- Geo URI (Android)

Coordinates:
+28.24676, -82.05357
28°14'48" N, 82°03'13" W



Facts

Source: National Bridge Inventory. Information not verified; use at your own risk.

Name:	US-98 (SR-700) over FOX BRANCH
Structure number:	160052
Location:	0.15 MI EAST OF SR-471
Purpose:	Carries highway over waterway
Route classification:	Principal Arterial - Other (Rural) *[02]*
Length of largest span:	11.2 ft. *[3.4 m]*
Total length:	43.0 ft. *[13.1 m]*
Owner:	State Highway Agency *[01]*
Year built:	1947
Year reconstructed:	1991
Historic significance:	Bridge is not eligible for the National Register of Historic Places *[5]*
Design load:	M 13.5 / H 15 *[2]*
Number of main spans:	4
Main spans material:	Concrete *[1]*
Main spans design:	Culvert *[19]*
Deck type:	Not applicable *[N]*
Wearing surface:	Other *[9]*

Latest Available Inspection: September 2017

Good/Fair/Poor Condition:	Good
Status:	Open, no restriction *[A]*

Average daily traffic:	10,500 *[as of 2016]*
Truck traffic:	27% of total traffic
Structural appraisal:	Equal to present minimum criteria *[6]*
Water adequacy appraisal:	Superior to present desirable criteria *[9]*
Roadway alignment appraisal:	Equal to present desirable criteria *[8]*
Channel protection:	Bank is beginning to slump. River control devices and embankment protection have widespread minor damage. There is minor stream bed movement evident. Debris is restricting the channel slightly. *[6]*
Culvert condition:	Shrinkage cracks, light scaling and insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift with no misalignment and not requiring corrective action. Some minor scouring has occured near curtain walls, wingwalls or pipes. Metal culverts have a smooth symmetrical curvature with superficial corrosion and no pitting. *[7]*
Scour condition:	Bridge foundations determined to be stable for the assessed or calculated scour condition. *[8]*
Sufficiency rating:	86.6

Previous Inspections

Date	Condition	Culvert Condition	ADT	Suff. Rating
September 2017	Good	7 out of 10	10500	86.6
September 2015	Good	7 out of 10	9100	87.5
September 2013	Good	7 out of 10	8800	87.8
September 2011	Good	7 out of 10	11875	85.6
October 2009	Good	7 out of 10	9000	87.6
November 2007	Good	7 out of 10	9900	87.0
November 2005	Good	7 out of 10	9600	87.2
November 2003	Good	7 out of 10	8900	87.7
January 2003	Good	7 out of 10	9300	87.4
January 2001	Good	7 out of 10	9500	87.3
January 1999	Good	7 out of 10	8500	86.0
January 1997	Good	7 out of 10	15000	87.2
May 1995	Good	7 out of 10	8000	89.1
January 1994	Good	7 out of 10	10669	88.3
March 1992	Good	7 out of 10	10669	88.3
February 1990	Good	7 out of 10	12145	84.8

Element Data

Source: National Bridge Elements dataset, 2019 edition. This feature is experimental.

Element	Units	Quantity	1-Good	2-Fair	3-Poor	4-Serious
Culvert						
Reinforced Concrete Culvert	linear ft.	404	334	60	10	0

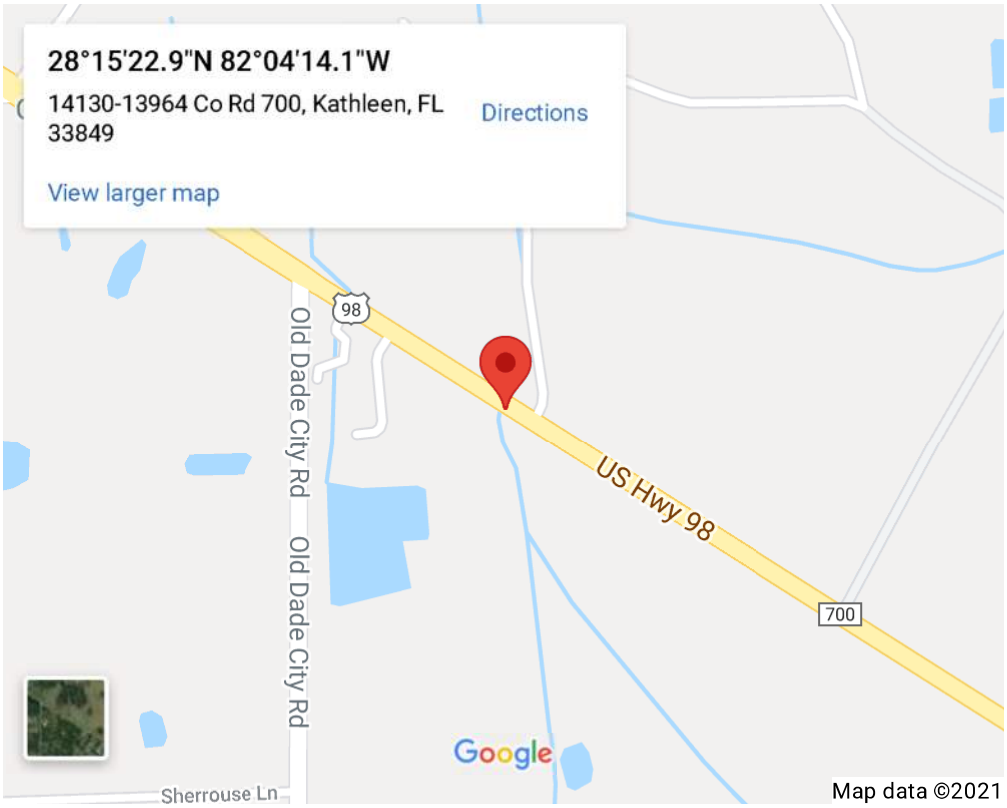
US-98 (SR-700) over CYPRESS RUN

Polk County, Florida

Map

- Google Maps
- Bing Maps
- OpenStreetMap
- MapQuest.com
- USGS National Map
- Geo URI (Android)

Coordinates:
+28.25636, -82.07057
28°15'23" N, 82°04'14" W



Facts

Source: National Bridge Inventory. Information not verified; use at your own risk.

Name:	US-98 (SR-700) over CYPRESS RUN
Structure number:	160053
Location:	1.2 MI WEST OF SR-471
Purpose:	Carries highway over waterway
Route classification:	Principal Arterial - Other (Rural) *[02]*
Length of largest span:	10.5 ft. *[3.2 m]*
Total length:	33.1 ft. *[10.1 m]*
Owner:	State Highway Agency *[01]*
Year built:	1947
Year reconstructed:	1991
Historic significance:	Bridge is not eligible for the National Register of Historic Places *[5]*
Design load:	M 13.5 / H 15 *[2]*
Number of main spans:	3
Main spans material:	Concrete *[1]*
Main spans design:	Culvert *[19]*
Deck type:	Not applicable *[N]*
Wearing surface:	Other *[9]*

Latest Available Inspection: September 2017

Good/Fair/Poor Condition:	Fair
Status:	Open, no restriction *[A]*

Average daily traffic:	8,300 *[as of 2016]*
Truck traffic:	21% of total traffic
Structural appraisal:	Somewhat better than minimum adequacy to tolerate being left in place as is *[5]*
Water adequacy appraisal:	Equal to present minimum criteria *[6]*
Roadway alignment appraisal:	Equal to present desirable criteria *[8]*
Channel protection:	Bank protection is in need of minor repairs. River control devices and embankment protection have a little minor damage. Banks and/or channel have minor amounts of drift. *[7]*
Culvert condition:	Moderate to major deterioration or disintegration, extensive cracking and leaching or spalls on concrete or masonry walls and slabs. Minor settlement or misalignment. Noticeable scouring or erosion at curtain walls, wingwalls or pipes. Metal culverts have significant distortion and deflection in one section, significant corrosion or deep pitting. *[5]*
Scour condition:	Bridge foundations determined to be stable for the assessed or calculated scour condition. *[8]*
Sufficiency rating:	78.0

Previous Inspections

Date	Condition	Culvert Condition	ADT	Suff. Rating
September 2017	Fair	5 out of 10	8300	78.0
September 2015	Good	7 out of 10	7300	91.5
September 2013	Good	7 out of 10	7100	91.7
September 2011	Good	7 out of 10	10000	88.4
October 2009	Good	7 out of 10	7500	89.3
November 2007	Good	7 out of 10	8400	88.3
November 2005	Good	7 out of 10	8100	88.6
November 2003	Good	7 out of 10	7700	89.1
January 2003	Good	7 out of 10	7500	89.3
January 2001	Good	7 out of 10	8100	88.6
January 1999	Good	7 out of 10	8500	86.2
January 1997	Good	7 out of 10	15000	82.8
May 1995	Good	7 out of 10	8000	86.5
December 1993	Good	7 out of 10	4804	87.2
March 1992	Good	7 out of 10	4804	87.2
February 1990	Good	7 out of 10	12145	82.0

Element Data

Source: National Bridge Elements dataset, 2019 edition. This feature is experimental.

Element	Units	Quantity	1-Good	2-Fair	3-Poor	4-Serious
Culvert						
Reinforced Concrete Culvert	linear ft.	294	0	0	294	0

BridgeReports.com: National Bridge Inventory data