

Rock Hill Quarries – Existing Conditions Study

**Deer Creek
City of Ladue, MO**

Prepared for:

**Rock Hill Quarries Company
1233 North Rock Hill Road
Ladue, MO 63124**

**1864 Properties LLC
1341 North Rock Hill Road
Ladue, MO 63124**

Prepared By:

**Stock & Associates Consulting Engineers, Inc.
257 Chesterfield Business Parkway
St. Louis, MO 63005**

Stock Project No. 213-5216.2

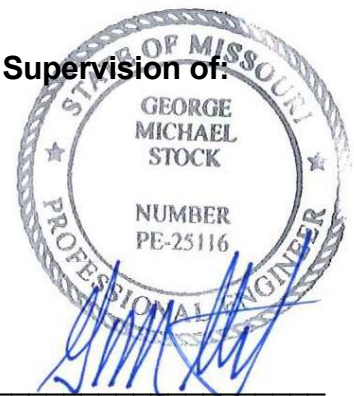
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I. EXECUTIVE SUMMARY

Introduction

This Existing Conditions Study was prepared by Stock & Associates Consulting Engineers, Inc. for Rock Hill Quarries Company for a property located at 1200 North Rock Hill Rd. in Ladue, Missouri. The site lies within the Deer Creek watershed and is located along Deer Creek with Old Warson Rd. to the South and McKnight Rd. to the East. The total tract of property is approximately 77 Acres. The landfill began in 1975 when MDNR issued Permit 218904 to Rock Hill Quarries Co. on February 28, 1975. Later that year, the City of Ladue issued the first Special Use Permit to the landfill on December 17, 1975.

The purpose of this study is to analyze the 100 yr. floodplain of Deer Creek to demonstrate that the existing floodway limits as graphically plotted on the published FIRM, dated February 4, 2015, is shown in error. This is based on the existing natural topography located along the south bank of Deer Creek adjacent to Rock Hill Quarry landfill.

The FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the finalization of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are being prepared using the NAVD88 as the referenced vertical datum. All flood elevations shown in the St. Louis County FIS report and on the FIRM are referenced to NAVD88 (please see Appendix VII). Deer Creek has an Average Conversion Factor of -0.29. Therefore, to equate the elevations shown in this flood study based on NGVD29 to the published FIS results NAVD88 one will need to subtract 0.29 ft. to the elevations shown in this study, see Appendix III.

Example: Cross Section 4.148 (Section AJ)

Model Elevation = 470.96

FIS published elevation = 470.67 (470.7)

Pre-Project Conditions

For the hydraulic analysis of this area, the hydraulic model from the FEMA project library was obtained. This model was in hard copy form and used a HEC-2 model for the hydraulic analysis. For this study, this model was converted to a HEC-RAS model.

The table below shows the starting water surface boundary conditions used for the hydraulic models.

Cross Section	100 Yr. Starting Water Surface Elevation (ft.)*	15 Yr. Starting Water Surface Elevation (ft.)**	100 Yr. Flow Rate (cfs)*	15 Yr. Flow Rate (cfs)**
4.036	470.33	467.45	17,035	11,750
*FROM HEC-2 DATA OBTAINED FROM FEMA FOR DEER CREEK				
**FROM FLOOD FREQUENCY PROBABILITY PLOTS USING HEC-2 DATA OBTAINED FROM FEMA FOR DEER CREEK				

A comparison of the elevations from the hard copy of FEMA’s HEC-2 model and our Duplicate Effective (HEC-RAS) model for the 100 yr. floodplain is as shown on Table 1 of this report. Input and output data from this original HEC-2 model is included in Appendix I for reference.

Table 1: Comparison of Duplicate Effective Model vs. Original Hec-2 Model (100 Yr. BFE)

Flood Data from Deer Creek HEC-2 data from FEMA				Flood Data from Deer Creek HEC-RAS Duplicate Effective Model				Difference E2-E1	Location of X-Section
Station/ Section	Profile	100 yr Flow	100 yr. Elev. E1(ft.)	Station/ Section	Profile	100 yr Flow	100 yr. Elev. E2(ft.)		
5.259	100-yr	11,243	478.49	5.259	100-yr	11,243	478.56	0.07	Upstream of Project
5.029	100-yr	11,243	477.82	5.029	100-yr	11,243	477.88	0.06	Upstream of Project
5.022	100-yr	11,243	477.31	5.022	100-yr	11,243	477.38	0.07	Upstream of Project
5.021	100-yr	11,243	477.33	5.021	100-yr	11,243	477.38	0.05	Upstream of Project
5.020	100-yr	Bridge		5.020	100-yr	Bridge		-	Upstream of Project
5.018	100-yr	11,243	477.11	5.018	100-yr	11,243	477.15	0.04	Upstream of Project
5.017	100-yr	11,243	477.08	5.017	100-yr	11,243	477.15	0.07	Upstream of Project
5.013	100-yr	11,243	477.19	5.013	100-yr	11,243	477.26	0.07	Upstream of Project
4.859	100-yr	11,243	476.97	4.859	100-yr	11,243	477.04	0.07	Upstream of Project
4.743	100-yr	16,358	476.22	4.743	100-yr	16,358	476.28	0.06	Upstream of Project
4.612	100-yr	16,358	474.33	4.612	100-yr	16,358	474.43	0.10	Onsite Section
4.563	100-yr	16,358	472.84	4.563	100-yr	16,358	472.98	0.14	Onsite Section
4.464	100-yr	16,358	472.67	4.464	100-yr	16,358	472.84	0.17	Onsite Section
4.419	100-yr	16,358	471.48	4.419	100-yr	16,358	471.54	0.06	Onsite Section
4.365	100-yr	17,157	471.91	4.365	100-yr	17,157	472.02	0.11	Onsite Section
4.259	100-yr	17,157	471.78	4.259	100-yr	17,157	471.90	0.12	Onsite Section
4.165	100-yr	17,157	471.47	4.165	100-yr	17,157	471.58	0.11	Onsite Section
4.160	100-yr	17,157	471.45	4.160	100-yr	17,157	471.56	0.11	Onsite Section
4.158	100-yr	Bridge		4.158	100-yr	Bridge		-	Onsite Section
4.157	100-yr	17,157	471.35	4.157	100-yr	17,157	471.44	0.09	Onsite Section
4.148	100-yr	17,157	470.96	4.148	100-yr	17,157	471.04	0.08	Onsite Section
4.073	100-yr	17,157	470.79	4.073	100-yr	17,157	470.83	0.04	Onsite Section
4.069	100-yr	17,157	470.63	4.069	100-yr	17,157	470.55	-0.08	Onsite Section
4.060	100-yr	Bridge		4.060	100-yr	Bridge		-	Downstream of Project
4.057	100-yr	17,035	470.63	4.057	100-yr	17,035	470.49	-0.14	Downstream of Project
4.049	100-yr	17,035	470.43	4.049	100-yr	17,035	470.45	0.02	Downstream of Project
4.036	100-yr	17,035	470.33	4.036	100-yr	17,035	470.33	0.00	Downstream of Project

The cross sections (shown on C1: Existing Conditions Plan) were revised to reflect a Surdex aerial topography survey and a topographical survey of the site dated June 29, 2020. The existing buildings were also added to the model which accounts for the 4:1 influence line downstream of the buildings and the 1:1 influence line upstream of the buildings. Cross sections 4.464 through 4.259 were revised to reflect the Rock Hill Quarry construction landfill operation by creating ineffective flow for the areas within the right overbank that are below the existing natural topography (see C1: Existing Conditions Plan for a blow-up of the existing elevations on the top of bank along the landfill). Cross sections 4.080 and 4.625 were added at the downstream and upstream limits of the site to account for the limits of the proposed work. Per the SCI Engineering, Inc. report titled “Wetland and Waterbody Delineation Report and Section 404/401 Permit Application,” dated April 29, 2021, Deer Creek Ordinary High-Water Mark

(OHWM) was frequently observed at or near the toe of the slope of its banks. The observed OHWM is between 15 and 35 feet in width depending on the location along the length of the stream and water depths range between 6 and 18 inches.

The model was also revised to correct the floodway limits of Deer Creek. We feel the floodway limits graphically shown on the published FIRM map dated February 4, 2015 are shown in error based on existing natural topography. The FEMA HEC-2 Model and Published FIRM map show the floodway limits encroaching on the existing landfill at section 4.419. The 100-year high water elevation of the creek at section 4.419 is 473.81 and the existing natural topography of the right overbank elevation at section 4.419 is approximately 478.31 therefore, Deer Creek stays within its right bank at this location. In fact, Deer Creek does not overflow its right bank until just after cross section 4.259. At section 4.259 the 100-year high water elevation is 471.93 and the top of the right overbank is approximately 472.00. Because of the existing natural topography the floodway line should follow the right bank of Deer Creek until just after section 4.259 once Deer Creek can overflow its right bank. Sheet C1: Existing Conditions Plan shows the corrected floodway limits based on this information.

The model was also revised between section 4.625 to section 5.259 based on channel distances observed based on the latest topographical information.

For the purposes of this study, this hydraulic model becomes the Corrected Effective/Existing Conditions Model. The combination of the inclusion of the existing buildings and the added ineffective flow areas due to the existing natural topography of the right bank of Deer Creek at active landfill operation creates a variation in the water surface elevations between the Duplicate Effective Model and the Corrected Effective/Existing Conditions Model of up to +2.51 ft. The model was expanded upstream of the site to where the computed water surface elevations meet the effective elevations. These revisions to the model were required to create an accurate model of the existing site conditions. A comparison of the elevations from this Corrected Effective/Existing Conditions model and the Duplicate Effective model for the 100 yr. floodplain is as shown on Table 2 of this report.

Table 2: Comparison of Corrected Effective/Ex Cond Model vs. Duplicate Effective Model (100 Yr. BFE)

Flood Data from Deer Creek HEC-RAS Duplicate Effective Model				Flood Data from Deer Creek HEC-RAS Corrected Effective/Ex Cond Model				Difference E2-E1	Location of X-Section
Station/ Section	Profile	100 yr Flow	100 yr. Elev. E1(ft.)	Station/ Section	Profile	100 yr Flow	100 yr. Elev. E2(ft.)		
5.259	100-yr	11,243	478.56	5.259	100-yr	11,243	478.30	-0.26	Upstream of Project
5.029	100-yr	11,243	477.88	5.029	100-yr	11,243	477.93	0.05	Upstream of Project
5.022	100-yr	11,243	477.38	5.022	100-yr	11,243	477.58	0.20	Upstream of Project
5.021	100-yr	11,243	477.38	5.021	100-yr	11,243	477.58	0.20	Upstream of Project
5.020	100-yr	Bridge		5.020	100-yr	Bridge		-	Upstream of Project
5.018	100-yr	11,243	477.15	5.018	100-yr	11,243	477.37	0.22	Upstream of Project
5.017	100-yr	11,243	477.15	5.017	100-yr	11,243	477.36	0.21	Upstream of Project
5.013	100-yr	11,243	477.26	5.013	100-yr	11,243	477.51	0.25	Upstream of Project
4.859	100-yr	11,243	477.04	4.859	100-yr	11,243	477.34	0.30	Upstream of Project
4.743	100-yr	16,358	476.28	4.743	100-yr	16,358	476.93	0.65	Upstream of Project
				4.625	100-yr	16,358	476.29	-	Onsite Section
4.612	100-yr	16,358	474.43	4.612	100-yr	16,358	474.16	-0.27	Onsite Section
4.563	100-yr	16,358	472.98	4.563	100-yr	16,358	474.55	1.57	Onsite Section
4.464	100-yr	16,358	472.84	4.464	100-yr	16,358	474.54	1.70	Onsite Section
4.419	100-yr	16,358	471.54	4.419	100-yr	16,358	474.05	2.51	Onsite Section
4.365	100-yr	17,157	472.02	4.365	100-yr	17,157	473.13	1.11	Onsite Section
4.259	100-yr	17,157	471.90	4.259	100-yr	17,157	472.52	0.62	Onsite Section
4.165	100-yr	17,157	471.58	4.165	100-yr	17,157	472.33	0.75	Onsite Section
4.160	100-yr	17,157	471.56	4.160	100-yr	17,157	472.18	0.62	Onsite Section
4.158	100-yr	Bridge		4.158	100-yr	Bridge		-	Onsite Section
4.157	100-yr	17,157	471.44	4.157	100-yr	17,157	471.98	0.54	Onsite Section
4.148	100-yr	17,157	471.04	4.148	100-yr	17,157	471.88	0.84	Onsite Section
				4.080	100-yr	17,157	471.50	-	Onsite Section
4.073	100-yr	17,157	470.83	4.073	100-yr	17,157	471.53	0.70	Onsite Section
4.069	100-yr	17,157	470.55	4.069	100-yr	17,157	471.20	0.65	Onsite Section
4.060	100-yr	Bridge		4.060	100-yr	Bridge		-	Downstream of Project
4.057	100-yr	17,035	470.49	4.057	100-yr	17,035	470.67	0.18	Downstream of Project
4.049	100-yr	17,035	470.45	4.049	100-yr	17,035	470.6	0.15	Downstream of Project
4.036	100-yr	17,035	470.33	4.036	100-yr	17,035	470.33	0.00	Downstream of Project

Floodway Analysis

The floodway analysis for this project includes correcting the floodway limits shown in the effective HEC-2 model. The Corrected Effective/Existing Conditions Model updates the floodway limits to be per what is shown on the Effective FIRM Map. With the exception of two locations. Between sections 4.165 to just upstream of 4.419 the floodway limits are revised to account for the natural topography of the right bank and the landfill operation. The second revision is just downstream of section 4.464 to just upstream of section 4.625. The floodway is shown to be widened within this location. All floodway revisions are limited to within the property lines of this project. Please see Table 3 below for the floodway analysis.

Table 3: Comparison of Corrected Effective/Ex Cond Floodway Model vs. Corrected Effective/Ex Cond Model (100 Yr. BFE)

Flood Data from Deer Creek				Flood Data from Deer Creek				Difference E2-E1	Location of X-Section
HEC-RAS Corrected Effective/Ex Cond Model				HEC-RAS Corrected Eff./Ex Cond Floodway Model					
Station/ Section	Profile	100 yr Flow	100 yr. Elev. E1(ft.)	Station/ Section	Profile	100 yr Flow	100 yr. Elev. E2(ft.)		
5.259	100-yr	11,243	478.30	5.259	FW	11,243	478.63	0.33	Upstream of Project
5.029	100-yr	11,243	477.93	5.029	FW	11,243	477.98	0.05	Upstream of Project
5.022	100-yr	11,243	477.58	5.022	FW	11,243	477.74	0.16	Upstream of Project
5.021	100-yr	11,243	477.58	5.021	FW	11,243	477.74	0.16	Upstream of Project
5.020	100-yr	Bridge		5.020	FW	Bridge		-	Upstream of Project
5.018	100-yr	11,243	477.37	5.018	FW	11,243	477.57	0.20	Upstream of Project
5.017	100-yr	11,243	477.36	5.017	FW	11,243	477.57	0.21	Upstream of Project
5.013	100-yr	11,243	477.51	5.013	FW	11,243	477.62	0.11	Upstream of Project
4.859	100-yr	11,243	477.34	4.859	FW	11,243	477.55	0.21	Upstream of Project
4.743	100-yr	16,358	476.93	4.743	FW	16,358	477.01	0.08	Upstream of Project
4.625	100-yr	16,358	476.29	4.625	FW	16,358	476.45	0.16	Onsite Section
4.612	100-yr	16,358	474.16	4.612	FW	16,358	474.62	0.46	Onsite Section
4.563	100-yr	16,358	474.55	4.563	FW	16,358	474.89	0.34	Onsite Section
4.464	100-yr	16,358	474.54	4.464	FW	16,358	474.71	0.17	Onsite Section
4.419	100-yr	16,358	474.05	4.419	FW	16,358	474.08	0.03	Onsite Section
4.365	100-yr	17,157	473.13	4.365	FW	17,157	473.38	0.25	Onsite Section
4.259	100-yr	17,157	472.52	4.259	FW	17,157	472.91	0.39	Onsite Section
4.165	100-yr	17,157	472.33	4.165	FW	17,157	472.69	0.36	Onsite Section
4.160	100-yr	17,157	472.18	4.160	FW	17,157	472.43	0.25	Onsite Section
4.158	100-yr	Bridge		4.158	FW	Bridge		-	Onsite Section
4.157	100-yr	17,157	471.98	4.157	FW	17,157	472.20	0.22	Onsite Section
4.148	100-yr	17,157	471.88	4.148	FW	17,157	472.16	0.28	Onsite Section
4.080	100-yr	17,157	471.50	4.080	FW	17,157	471.84	-	Onsite Section
4.073	100-yr	17,157	471.53	4.073	FW	17,157	471.82	0.29	Onsite Section
4.069	100-yr	17,157	471.2	4.069	FW	17,157	471.54	0.34	Onsite Section
4.060	100-yr	Bridge		4.060	FW	Bridge		-	Downstream of Project
4.057	100-yr	17,035	470.67	4.057	FW	17,035	470.96	0.29	Downstream of Project
4.049	100-yr	17,035	470.60	4.049	FW	17,035	470.73	0.13	Downstream of Project
4.036	100-yr	17,035	470.33	4.036	FW	17,035	470.52	0.19	Downstream of Project

- II. HEC-RAS Output – Deer Creek Duplicate Effective Model
 - HEC-RAS Input
 - 100 Yr.-Flood Profile Table
 - Cross Sections Showing 100 yr Water Surface Elevation

HEC-RAS HEC-RAS 6.2 March 2022
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X   X XXXXXX   XXXX   XXXX   XX   XXXX
X   X X   X   X X   X X   X X   X
X   X X   X   X   X   X X   X X   X
XXXXXXXX XXXX   X   XXX XXXX   XXXXXX   XXXX
X   X X   X   X   X X   X X   X   X
X   X X   X   X X   X X   X X   X
X   X XXXXXX   XXXX   X X   X X   XXXXX
```

PROJECT DATA

Project Title: 5216FS-CLOMR221014
Project File : 5216FS-CLOMR221014.prj
Run Date and Time: 10/14/2022 11:40:05 AM

Project in English units

Project Description:

DEER CREEK
RIVER DES PERES STUDY JUNE 1982
RETURN PERIODS
OF 10, 50, 100 AND 500 YEAR
DEER CREEK
RIVER DES PERES STUDY JUNE
1982
RETURN PERIODS OF 10, 50, 100 AND 500 YEAR

PLAN DATA

Plan Title: Duplicate Effective Model
Plan File : o:\DRAW5200\2135216\Floodstudy\LOMR Application\Hec-Ras\2022-10-14\5216FS-CLOMR221014.p02

Geometry Title: Imported Geom 01
Geometry File : o:\DRAW5200\2135216\Floodstudy\LOMR Application\Hec-Ras\2022-10-14\5216FS-CLOMR221014.g01

Flow Title : Imported Flow 01
 Flow File : o:\DRAW5200\2135216\Floodstudy\LOMR Application\Hec-Ras\2022-10-14\5216FS-CLOMR221014.f01

Plan Description:
 Duplicate Effective Model

Plan Summary Information:
 Number of: Cross Sections = 24 Multiple Openings = 0
 Culverts = 0 Inline Structures = 0
 Bridges = 3 Lateral Structures = 0

Computational Information
 Water surface calculation tolerance = 0.01
 Critical depth calculation tolerance = 0.01
 Maximum number of iterations = 20
 Maximum difference tolerance = 0.3
 Flow tolerance factor = 0.001

Computation Options
 Critical depth computed only where necessary
 Conveyance Calculation Method: At breaks in n values only
 Friction Slope Method: Average Conveyance
 Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Imported Flow 01
 Flow File : o:\DRAW5200\2135216\Floodstudy\LOMR Application\Hec-Ras\2022-10-14\5216FS-CLOMR221014.f01

Flow Data (cfs)

River FW	Reach	RS	10 Yr.	15 Yr.	50 Yr.	100 Yr.	500 Yr.
RIVER-1 11243	Reach-1	5.259	7280	8000	10096	11243	13610
RIVER-1 11243	Reach-1	4.859	7280	8000	10096	11243	13610
RIVER-1 16358	Reach-1	4.743	10212	11300	14451	16358	19884
RIVER-1 16358	Reach-1	4.419	10212	11300	14451	16358	19884

RIVER-1 17157	Reach-1	4.365	10647	11770	15166	17157	20828
RIVER-1 17157	Reach-1	4.069	10647	11770	15166	17157	20828
RIVER-1 17035	Reach-1	4.057	10631	11750	15084	17035	20761
RIVER-1 17035	Reach-1	4.036	10631	11750	15084	17035	20761

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
RIVER-1	Reach-1	10 Yr.		Known WS = 466.8
RIVER-1	Reach-1	15 Yr.		Known WS = 467.45
RIVER-1	Reach-1	50 Yr.		Known WS = 469.35
RIVER-1	Reach-1	100 Yr.		Known WS = 470.33
RIVER-1	Reach-1	500 Yr.		Known WS = 471.68
RIVER-1	Reach-1	FW		Known WS = 470.52

GEOMETRY DATA

Geometry Title: Imported Geom 01

Geometry File : o:\DRAW5200\2135216\Floodstudy\LOMR Application\Hec-Ras\2022-10-14\5216FS-CLOMR221014.g01

CROSS SECTION

RIVER: RIVER-1

REACH: Reach-1 RS: 5.259

INPUT

Description: 5.259

Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
620.5	498	650.5	495	670.5	492	680.5	489	700.5	486
720.5	483	750.5	480	775.5	477	900.5	475.2	949.5	474.2
963.5	463.3	975.5	463.6	994.5	465.7	1000.5	468.9	1050.5	471.3
1100.5	471	1470.5	474	1490.5	477	1510.5	480	1540.5	489
1560.5	492	1580.5	495						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
620.5	.08	949.5	.04	1050.5	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	949.5	1050.5		1100	1215	1175	.1	.3

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 5.029

INPUT

Description: 5.029

Station Elevation Data		num=	25						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
760	501	790	498	800	495	835	483	865	480
890	477	918	472.4	968	473	990	459.6	1000	459.1
1009	459.5	1020	461.3	1041	464.7	1059	467.7	1070	470
1108	469.1	1570	471	1620	474	1650	477	1660	480
1670	483	1690	486	1710	489	1730	492	1740	495

Manning's n Values		num=	3						
Sta	n Val	Sta	n Val	Sta	n Val				
760	.08	968	.04	1059	.1				

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	968	1059		37	37	37	.3	.5

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 5.022

INPUT

Description: 5.022

Station Elevation Data		num=	28						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
751	498	761	495	771	492	781	489	786	486
791	483	836	480	856	477	929	474	947	471
949	465.6	977	459.5	987	459.6	1017	459.3	1019	461.8
1053	471.3	1054	471.3	1074	474.9	1154	474.9	1171	474.5
1451	474	1561	477	1591	480	1631	483	1671	486
1701	489	1751	492	1781	495				

Manning's n Values		num=	3						
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Sta	n Val	Sta	n Val	Sta	n Val
751	.08	947	.04	1054	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	947	1054		2	2		.3	.5

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 5.021

INPUT

Description: 5.021

Station Elevation Data		num=	28						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
751	498	761	495	771	492	781	489	786	486
791	483	836	480	856	477	929	474	947	471
949	465.6	977	459.5	987	459.6	1017	459.3	1019	461.8
1053	471.3	1054	471.3	1074	474.9	1154	474.9	1171	474.5
1451	474	1561	477	1591	480	1631	483	1671	486
1701	489	1751	492	1781	495				

Manning's n Values		num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
751	.08	947	.04	1054	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	947	1054		22	22		.3	.5

BRIDGE

RIVER: RIVER-1
 REACH: Reach-1 RS: 5.020

INPUT

Description: Litzinger Rd. Bridge
 Distance from Upstream XS = .1
 Deck/Roadway Width = 21.85
 Weir Coefficient = 2.6
 Upstream Deck/Roadway Coordinates

num=		7						
Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
929	474	474	947	474.3	471	949	474.3	471
1017	474.5	471.2	1053	474.9	471.3	1054	474.9	471.3
1074	474.9	474.9						

Upstream Bridge Cross Section Data

Station Elevation Data num= 28									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
751	498	761	495	771	492	781	489	786	486
791	483	836	480	856	477	929	474	947	471
949	465.6	977	459.5	987	459.6	1017	459.3	1019	461.8
1053	471.3	1054	471.3	1074	474.9	1154	474.9	1171	474.5
1451	474	1561	477	1591	480	1631	483	1671	486
1701	489	1751	492	1781	495				

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
751	.08	947	.04	1054	.1

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	947	1054	.3		.5

Downstream Deck/Roadway Coordinates

num= 7									
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
929		474		474	947		474.3		471
1017		474.5		471.2	1053		474.9		471.3
1074		474.9		474.9	1054		474.9		471.3

Downstream Bridge Cross Section Data

Station Elevation Data num= 28									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
751	498	761	495	771	492	781	489	786	486
791	483	836	480	856	477	929	474	947	471
949	465.6	977	459.5	987	459.6	1017	459.3	1019	461.8
1053	471.3	1054	471.3	1074	474.9	1154	474.9	1171	474.5
1451	474	1561	477	1591	480	1631	483	1671	486
1701	489	1751	492	1781	495				

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
751	.08	947	.04	1054	.1

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	947	1054	.3		.5

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =

Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
 Energy
 Selected Low Flow Methods = Highest Energy Answer

High Flow Method
 Energy Only

Additional Bridge Parameters
 Add Friction component to Momentum
 Do not add Weight component to Momentum
 Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end
 Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 5.018

INPUT

Description: 5.018

Station Elevation Data		num= 28							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
751	498	761	495	771	492	781	489	786	486
791	483	836	480	856	477	929	474	947	471
949	465.6	977	459.5	987	459.6	1017	459.3	1019	461.8
1053	471.3	1054	471.3	1074	474.9	1154	474.9	1171	474.5
1451	474	1561	477	1591	480	1631	483	1671	486
1701	489	1751	492	1781	495				

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
751	.08	947	.04	1054	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	947	1054		2	2	.3	.5

CROSS SECTION

RIVER: RIVER-1

REACH: Reach-1 RS: 5.017

INPUT

Description: 5.017

Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
751	498	761	495	771	492	781	489	786	486
791	483	836	480	856	477	929	474	947	471
949	465.6	977	459.5	987	459.6	1017	459.3	1019	461.8
1053	471.3	1054	471.3	1074	474.9	1154	474.9	1171	474.5
1451	474	1561	477	1591	480	1631	483	1671	486
1701	489	1751	492	1781	495				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
751	.08	947	.04	1054	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

947	1054	22	22	22	.3	.5
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CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 5.013

INPUT

Description: 5.013

Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
735.5	498	760.5	495	770.5	492	780.5	489	790.5	486
795.5	483	840.5	480	860.5	477	932.5	475.1	947.5	474.5
959.5	469.9	999.5	459.7	1012.5	458.3	1033.5	458.6	1040.5	469.4
1092.5	472.9	1210.5	471	1470.5	471	1550.5	471	1580.5	474
1600.5	480	1670.5	480	1695.5	489	1720.5	492		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
735.5	.08	959.5	.04	1040.5	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

959.5	1040.5	800	815	820	.3	.5
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CROSS SECTION

RIVER: RIVER-1

REACH: Reach-1 RS: 4.859

INPUT

Description: 4.859

Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
660	489	715	486	740	483	770	480	810	477
835	474	870	471	923	469.2	963	468.3	979	462.9
990	456	1000	455.5	1012	456.2	1028	466.1	1063	466.5
1200	467.5	1850	468	1875	471	1890	474	1900	477
1910	480	1920	483	1930	486	1940	489		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
660	.08	963	.04	1028	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
963 1028 610 610 610 .3 .5

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
660	963	468.3	1300	1940	470.5

CROSS SECTION

RIVER: RIVER-1

REACH: Reach-1 RS: 4.743

INPUT

Description: 4.743

LADUE FIS 25044 STANLEY SURVEY SECT - APROX. 250 FT. D.S.
OF TWOMILE

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
675	489	695	486	710	483	720	480	890	477
905	474	920	471.5	940	471.5	951	471.5	964	463.8
980	456.2	1000	455.3	1023	455.8	1025	460.6	1044	466.8
1070	467	1101	467.5	1400	468	1430	471	1445	474
1455	477	1470	480	1480	483	1490	486	1500	489

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
675	.08	951	.04	1044	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
951 1044 670 695 710 .3 .5

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.612

INPUT

Description: 4.612
 LADUE FIS 24349 STANLEY SURVEY SECT

Station Elevation Data num= 19									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
820	489	835	486	850	483	870	480	895	477
905	474	925	471	940	468	955	465	975	462.5
1007	460.9	1012	456.4	1030	456.4	1049	456.3	1075	470.4
1125	475.5	1275	476	1900	477	1930	480		

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
820	.1	925	.04	1075	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	925	1075		270	255		.1	.3

Ineffective Flow num= 2				
Sta L	Sta R	Elev	Permanent	
820	925	471	F	
1075	1930	470.4	F	

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.563

INPUT

Description: 4.563
 LADUE FIS 24094 STANLEY SURVEY SECT

Station Elevation Data num= 22									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
690	489	740	486	785	483	830	480	860	477
880	474	915	473.1	967	470.5	1009	454.6	1028	454.2
1058	457.2	1063	463.5	1085	473.7	1135	473.9	1260	474
1285	471	1330	471	1510	474	1520	477	1530	478
1925	480	1970	495						

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 690 .1 967 .04 1085 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 967 1085 480 522.5 525 .1 .3

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 690 967 470.5 F
 1085 1970 473.7 F

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.464

INPUT
 Description: 4.464

Station Elevation Data num= 34
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 106 486 126 483 156 480 195 474 210 471
 216 471.1 240 468 360 468 380 465 430 465
 435 468 445 471 450 474 956 477 961 475
 970 472.9 976.7 469 1002 454.3 1009 452.7 1016 452.5
 1027 452.6 1041 453.6 1055 459 1059 463.7 1067 467.4
 1086 469 1126 470.8 1136 471 1406 471.2 1411 474
 1526 474.1 1536 477 1546 480 1606 495

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 106 .05 976.7 .045 1086 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 976.7 1086 218 238 238 .1 .3

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 106 976.7 469 F
 1086 1606 469 F

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.419

INPUT

Description: 4.419

JUNCTION WITH SABAGO

Station Elevation Data num= 52

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
94	487.3	113	485.1	143	482.8	144	482.6	163	479.8
183	477.1	192	475.8	198	474.9	205	473.1	229	472.7
261	472	290	470.7	315	469.3	340	468	351	467.8
371	465.8	421	465.1	426	466.6	428	466.9	436	468.2
441	469.9	468	469.9	488	471.4	497	472.8	948	476
954	475.6	959	474.7	969	473.9	979.2	468.6	1000	457.7
1008	455.5	1015	454.1	1026	452	1027	451.9	1040	452.2
1054	455.5	1058	458.1	1062	459.1	1066	461.6	1086	468.6
1088	469.5	1097	471.9	1133	472.7	1144	472.8	1463	472.9
1468	474.4	1604	474.5	1615	476	1628	477.7	1656	481
1668	484.7	1698	495						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
94	.05	979.2	.045	1086	.03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

979.2	1086	261	285	286	.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
94	979.2	468.6	F
1086	1698	468.6	F

CROSS SECTION

RIVER: RIVER-1

REACH: Reach-1 RS: 4.365

INPUT

Description: 4.365

LADUE FIS 23049 STANLEY SURVEY SECT - APROX. 300 FT. D.S.
OF SEBAGO

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
80	489	130	486	150	483	180	480	250	477
280	474	305	471	330	468	420	465	460	465
480	468	490	471	947	475	953	474	968	475.3
985.4	468.2	1027	451.2	1040	450.7	1063	451.7	1087	468.2
1090	470.2	1100	475	1110	467.5	1760	467.5	1760	475
1775	480	1810	495						

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 80 .05 985.4 .045 1087 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 985.4 1087 580 560 520 .1 .3

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 80 985.4 468.2 F
 1087 1810 468.2 F

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.259

INPUT
 Description: 4.259
 LADUE FIS 22489 STANLEY SURVEY SECT.

Station Elevation Data num= 22
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 100 489 130 486 200 483 220 480 330 477
 360 474 395 471 480 468 890 465.8 940 466.6
 970 448.9 989 450.5 1006 452.6 1021 459.2 1040 459.3
 1060 466.6 1074 471.9 1076 467 1800 467 1820 471.9
 1825 480 1860 495

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 100 .05 940 .045 1060 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 940 1060 480 500 530 .1 .3

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.165

INPUT
 Description: 4.165

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
4000	489	4020	486	4060	483	4120	480	4170	477
4320	471	4405	468	4830	465	4909	465.1	4949	464
4983	448.6	5000	447.4	5016	448.3	5040	459.6	5050	463
5070	468	5079	472.3	5100	466	5300	466	5370	468
5480	471	5530	474	5680	477	5720	480	5730	483
5750	486	5790	489						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
4000	.05	4949	.045	5050	.08

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	4949	5050		28	28		.3	.5

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.16

INPUT
 Description: 4.16
 This is a REPEATED section.

Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
3950	486	4000	483	4050	480	4120	477	4200	474
4290	471	4450	468	4525	465	4870	463.1	4950	467.5
4970	450.6	4972	450.6	4980	448.5	4995	448.6	5010	448.7
5028	459	5030	459	5050	468	5080	468	5130	465.2
5200	466	5290	466	5360	468	5480	471	5520	474
5560	474	5561	493	5730	493	5731	483	5790	486

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
3950	.075	4950	.045	5050	.075

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	4950	5050		14	14		.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
3950	4950	467.5	F
5050	5790	468	F

BRIDGE

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.158

INPUT

Description: Rock Hill Road Bridge
 Distance from Upstream XS = 1
 Deck/Roadway Width = 12
 Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates
 num= 7

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
4950	467.5	467.5	4970	468.8	450.6	4972	468.8	465.9
4995	468.8	465.9	5028	468.8	465.9	5030	468.8	459
5050	468	468						

Upstream Bridge Cross Section Data

Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
3950	486	4000	483	4050	480	4120	477	4200	474
4290	471	4450	468	4525	465	4870	463.1	4950	467.5
4970	450.6	4972	450.6	4980	448.5	4995	448.6	5010	448.7
5028	459	5030	459	5050	468	5080	468	5130	465.2
5200	466	5290	466	5360	468	5480	471	5520	474
5560	474	5561	493	5730	493	5731	483	5790	486

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
3950	.075	4950	.045	5050	.075

Bank Sta: Left Right Coeff Contr. Expan.
 4950 5050 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
3950	4950	467.5	F
5050	5790	468	F

Downstream Deck/Roadway Coordinates

num= 7

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
4950	467.5	467.5	4970	468.8	450.6	4972	468.8	465.9
4995	468.8	465.9	5028	468.8	465.9	5030	468.8	459
5050	468	468						

Downstream Bridge Cross Section Data

Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-----	------	-----	------	-----	------	-----	------	-----	------

3950	486	4000	483	4050	480	4120	477	4200	474
4290	471	4450	468	4525	465	4870	463.1	4950	467.5
4970	450.6	4972	450.6	4980	448.5	4995	448.6	5010	448.7
5028	459	5030	459	5050	468	5080	468	5130	465.2
5200	466	5290	466	5360	468	5480	471	5520	474
5560	474	5561	493	5730	493	5731	483	5790	486

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 3950 .075 4950 .045 5050 .075

Bank Sta: Left Right Coeff Contr. Expan.
 4950 5050 .3 .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 3950 4950 467.5 F
 5050 5790 468 F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Energy

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: RIVER-1

REACH: Reach-1

RS: 4.157

INPUT

Description: 4.157

LADUE FIS 21947 D.S. FACE OF ROCK HILL RD.

Station Elevation Data		num=		30					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
3950	486	4000	483	4050	480	4120	477	4200	474
4290	471	4450	468	4525	465	4870	463.1	4950	467.5
4970	450.6	4972	450.6	4980	448.5	4995	448.6	5010	448.7
5028	459	5030	459	5050	468	5080	468	5130	465.2
5200	466	5290	466	5360	468	5480	471	5520	474
5560	474	5561	493	5730	493	5731	483	5790	486

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
3950	.075	4950	.045	5050	.075

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	4950	5050		43	43	.3	.5

Ineffective Flow		num=		2	
Sta L	Sta R	Elev	Permanent		
3950	4950	467.5	F		
5050	5790	468	F		

CROSS SECTION

RIVER: RIVER-1

REACH: Reach-1

RS: 4.148

INPUT

Description: 4.148

Station Elevation Data		num=		34					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
3890	486	3970	483	4020	480	4110	477	4205	474
4320	471	4455	468	4530	465	4569	464	4570	485
4700	485	4799	485	4800	462	4820	462	4860	462
4912	464.6	4962	463.4	4982	449.3	5000	448	5015	450.2
5030	463.4	5038	466	5070	468	5087	470.5	5100	466
5300	466	5380	468	5440	471	5550	474	5551	490
5730	490	5731	480	5770	483	5810	486		

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
3890	.075	4962	.045	5030	.075

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	4962	5030		380	400		.1	.3
Blocked Obstructions			num=	2				
	Sta L	Sta R	Elev	Sta L	Sta R	Elev		
	3890	4800	464	5030	5810	463.4		

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.073

INPUT
 Description: 4.073

Station Elevation Data			num=	31						
	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
	300	486	350	483	410	480	470	477	530	474
	580	471	655	468	715	465	740	462	908	460.3
	958	461	979	454.3	990	447.9	1000	446.9	1014	447.5
	1023	454.8	1036	461	1050	467.6	1080	465	1098	463
	1235	465	1485	468	1640	471	1690	474	1691	490
	1800	490	1801	475	1870	477	1930	480	1955	483
	1990	486								

Manning's n Values			num=	3		
	Sta	n Val	Sta	n Val	Sta	n Val
	300	.075	958	.045	1036	.075

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	958	1036		18	18		.3	.5

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.069

INPUT
 Description: 4.069
 This is a REPEATED section.

Station Elevation Data			num=	29						
	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
	350	486	400	483	460	480	525	477	595	474
	690	471	765	468	842	466	943	461.1	944	461.1

981	460.3	984	448	1003	447.5	1022	447.5	1025	456.6
1026	456.6	1056	459.3	1057	459.4	1206	466.7	1430	468
1780	468	1880	468	1935	471	2050	471	2080	474
2100	477	2110	480	2125	483	2150	486		

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 350 .075 981 .045 1025 .075

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 981 1025 64 64 64 .3 .5

BRIDGE

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.060

INPUT

Description: S. McKnight Road Bridge
 Distance from Upstream XS = .5
 Deck/Roadway Width = 63
 Weir Coefficient = 2.4

Upstream Deck/Roadway Coordinates

num=		24													
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	
350		486		486	400		483		483	460		480		480	
525		477		477	595		474		474	690		471		471	
765		468		468	842		466		466	943		465.7		461.1	
944		465.7		464	1003		465.5		463.8	1056		465.2		463.7	
1057		465.2		459.3	1206		466.7		466.7	1430		468		468	
1780		468		468	1880		468		468	1935		471		471	
2050		471		471	2080		474		474	2100		477		477	
2110		480		480	2125		483		483	2150		486		486	

Upstream Bridge Cross Section Data

Station Elevation Data		num=		29											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
350	486	400	483	460	480	525	477	595	474	690	471	765	468	842	466
981	460.3	984	448	1003	447.5	1022	447.5	1025	456.6	1056	459.3	1057	459.4	1206	466.7
1780	468	1880	468	1935	471	2050	471	2080	474	2100	477	2110	480	2125	483
2100	477	2110	480	2125	483	2150	486								

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val

350 .075 981 .045 1025 .075

Bank Sta: Left Right Coeff Contr. Expan.
981 1025 .3 .5

Downstream Deck/Roadway Coordinates

num= 24

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
350		486		486	400		483		483	460		480		480
525		477		477	595		474		474	690		471		471
765		468		468	842		466		466	943	465.7	461.1		
944	465.7		464		1003	465.5	463.8			1056	465.2	463.7		
1057	465.2	459.3			1206	466.7	466.7			1430	468	468		
1780	468		468		1880	468	468			1935	471	471		
2050	471		471		2080	474	474			2100	477	477		
2110	480		480		2125	483	483			2150	486	486		

Downstream Bridge Cross Section Data

Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
350	486	400	483	460	480	525	477	595	474
690	471	765	468	842	466	943	461.1	944	461.1
981	460.3	984	448	1003	447.5	1022	447.5	1025	456.6
1026	456.6	1056	459.3	1057	459.4	1206	466.7	1430	468
1780	468	1880	468	1935	471	2050	471	2080	474
2100	477	2110	480	2125	483	2150	486		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
350	.075	981	.045	1025	.075

Bank Sta: Left Right Coeff Contr. Expan.
981 1025 .3 .5

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins = 465.2
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 1

Pier Data

Pier Station Upstream= 1003 Downstream= 1003
Upstream num= 2

Width	Elev	Width	Elev
6	447.5	6	464.8
Downstream		num=	2
Width	Elev	Width	Elev
6	447.5	6	464.8

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Yarnell KVal = 1.25

Selected Low Flow Methods = Yarnell

High Flow Method

Pressure and Weir flow

Submerged Inlet Cd =

Submerged Inlet + Outlet Cd = .6726728

Max Low Cord = 464.8

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: RIVER-1

REACH: Reach-1 RS: 4.057

INPUT

Description: 4.057

LADUE FIS 21422 D.S. FACE OF MCKNIGHT RD. - ROCK HILL
CORPORATE LIMITS

Station Elevation Data		num=	29						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
350	486	400	483	460	480	525	477	595	474
690	471	765	468	842	466	943	461.1	944	461.1
981	460.3	984	448	1003	447.5	1022	447.5	1025	456.6
1026	456.6	1056	459.3	1057	459.4	1206	466.7	1430	468
1780	468	1880	468	1935	471	2050	471	2080	474
2100	477	2110	480	2125	483	2150	486		

Manning's n Values		num=	3		
Sta	n Val	Sta	n Val	Sta	n Val

350 .075 981 .045 1025 .075

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
981 1025 43 43 43 .3 .5

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 4.049

INPUT
Description: 4.049

Station Elevation Data num= 14
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
495 480 550 475 625 470 950 465 965 460
977 455 985 446.8 1015 446.8 1030 455 1050 460
1070 465 1605 468 1740 475 1800 480

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
495 .07 950 .04 1070 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
950 1070 100 70 20 .3 .5

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 4.036

INPUT
Description: 4.036

BRENTWOOD FIS =4.15
Station Elevation Data num= 13
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
668 485 724 480 757 475 808 470 867 465
963 460 973 455 985 445.9 1015 445.9 1055 465
1600 468 1745 475 1913 480

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
668 .07 963 .04 1055 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

963 1055 0 0 0 .3 .5

SUMMARY OF MANNING'S N VALUES

River: RIVER-1

Reach	River Sta.	n1	n2	n3
Reach-1	5.259	.08	.04	.1
Reach-1	5.029	.08	.04	.1
Reach-1	5.022	.08	.04	.1
Reach-1	5.021	.08	.04	.1
Reach-1	5.020	Bridge		
Reach-1	5.018	.08	.04	.1
Reach-1	5.017	.08	.04	.1
Reach-1	5.013	.08	.04	.1
Reach-1	4.859	.08	.04	.1
Reach-1	4.743	.08	.04	.1
Reach-1	4.612	.1	.04	.1
Reach-1	4.563	.1	.04	.1
Reach-1	4.464	.05	.045	.03
Reach-1	4.419	.05	.045	.03
Reach-1	4.365	.05	.045	.03
Reach-1	4.259	.05	.045	.03
Reach-1	4.165	.05	.045	.08
Reach-1	4.16	.075	.045	.075
Reach-1	4.158	Bridge		
Reach-1	4.157	.075	.045	.075
Reach-1	4.148	.075	.045	.075
Reach-1	4.073	.075	.045	.075
Reach-1	4.069	.075	.045	.075
Reach-1	4.060	Bridge		
Reach-1	4.057	.075	.045	.075
Reach-1	4.049	.07	.04	.06
Reach-1	4.036	.07	.04	.06

SUMMARY OF REACH LENGTHS

River: RIVER-1

Reach	River Sta.	Left	Channel	Right
-------	------------	------	---------	-------

Reach-1	5.259	1100	1215	1175
Reach-1	5.029	37	37	37
Reach-1	5.022	2	2	2
Reach-1	5.021	22	22	22
Reach-1	5.020	Bridge		
Reach-1	5.018	2	2	2
Reach-1	5.017	22	22	22
Reach-1	5.013	800	815	820
Reach-1	4.859	610	610	610
Reach-1	4.743	670	695	710
Reach-1	4.612	270	255	240
Reach-1	4.563	480	522.5	525
Reach-1	4.464	218	238	238
Reach-1	4.419	261	285	286
Reach-1	4.365	580	560	520
Reach-1	4.259	480	500	530
Reach-1	4.165	28	28	28
Reach-1	4.16	14	14	14
Reach-1	4.158	Bridge		
Reach-1	4.157	43	43	43
Reach-1	4.148	380	400	360
Reach-1	4.073	18	18	40
Reach-1	4.069	64	64	64
Reach-1	4.060	Bridge		
Reach-1	4.057	43	43	43
Reach-1	4.049	100	70	20
Reach-1	4.036	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: RIVER-1

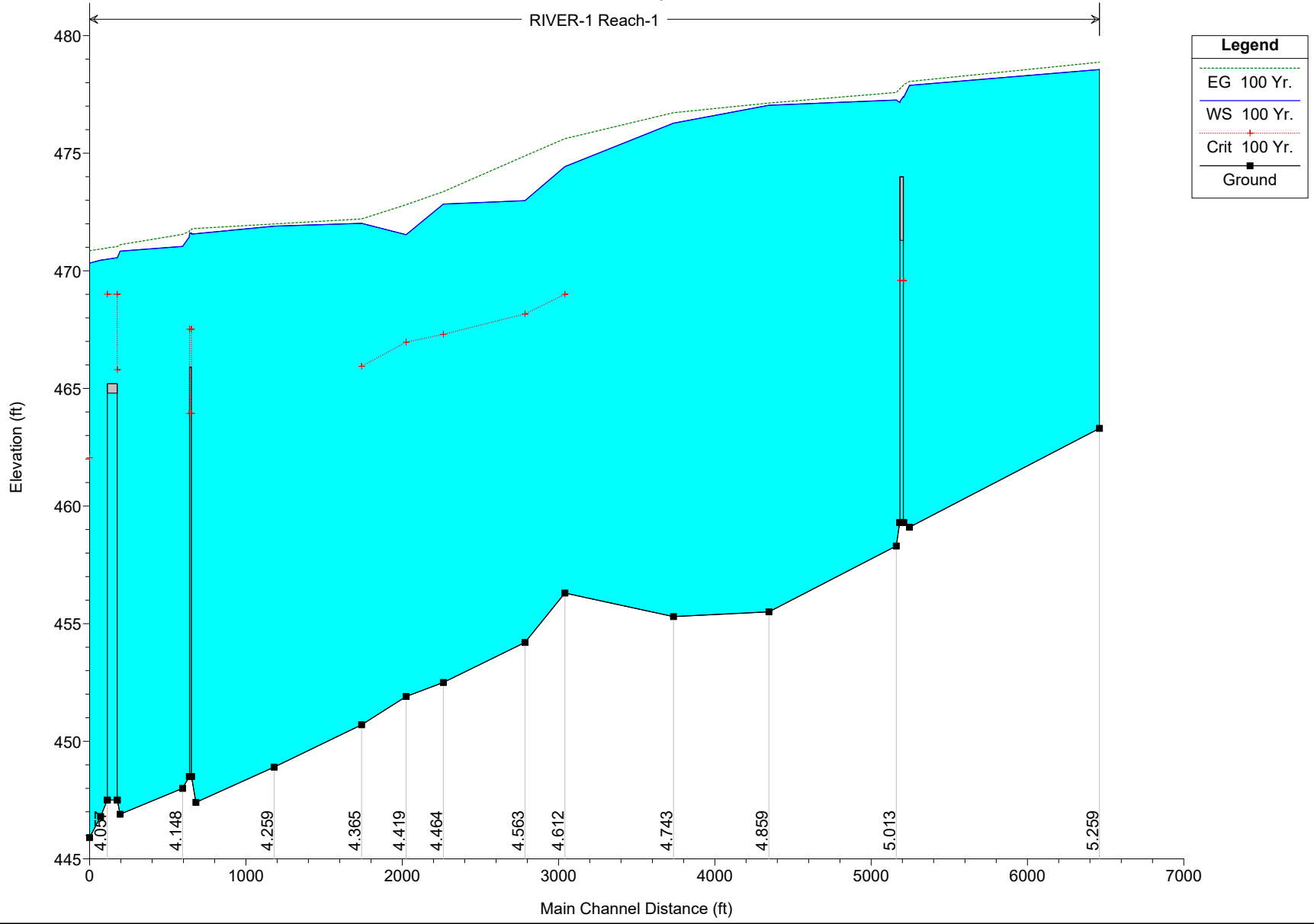
Reach	River Sta.	Contr.	Expan.
Reach-1	5.259	.1	.3
Reach-1	5.029	.3	.5
Reach-1	5.022	.3	.5
Reach-1	5.021	.3	.5
Reach-1	5.020	Bridge	
Reach-1	5.018	.3	.5
Reach-1	5.017	.3	.5
Reach-1	5.013	.3	.5
Reach-1	4.859	.3	.5
Reach-1	4.743	.3	.5

Reach-1	4.612	.1	.3
Reach-1	4.563	.1	.3
Reach-1	4.464	.1	.3
Reach-1	4.419	.1	.3
Reach-1	4.365	.1	.3
Reach-1	4.259	.1	.3
Reach-1	4.165	.3	.5
Reach-1	4.16	.3	.5
Reach-1	4.158	Bridge	
Reach-1	4.157	.3	.5
Reach-1	4.148	.1	.3
Reach-1	4.073	.3	.5
Reach-1	4.069	.3	.5
Reach-1	4.060	Bridge	
Reach-1	4.057	.3	.5
Reach-1	4.049	.3	.5
Reach-1	4.036	.3	.5

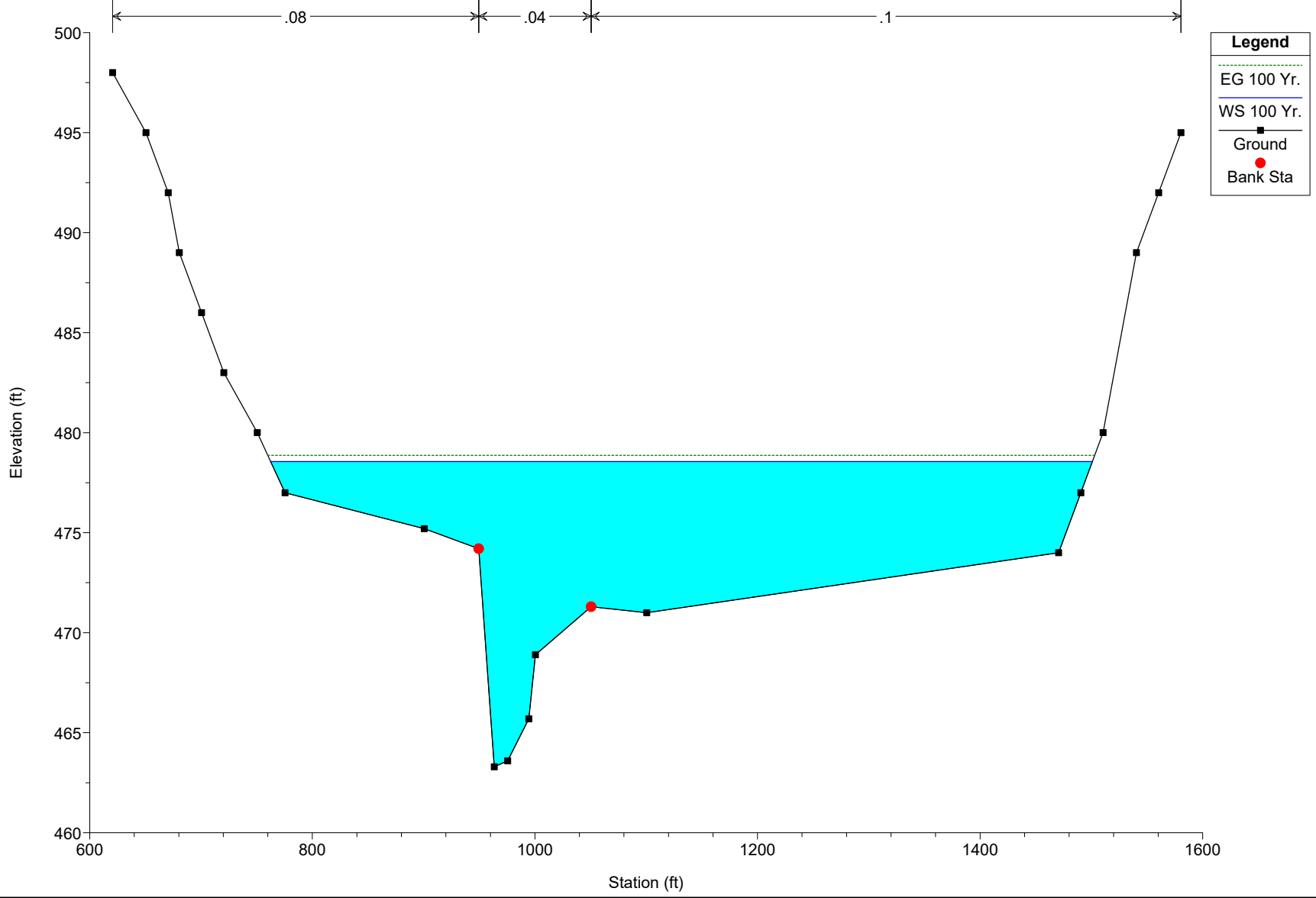
HEC-RAS Plan: DupEff River: RIVER-1 Reach: Reach-1 Profile: 100 Yr.

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	5.259	100 Yr.	11243.00	463.30	478.56		478.87	0.001120	5.83	4260.99	738.37	0.32
Reach-1	5.029	100 Yr.	11243.00	459.10	477.88		478.05	0.000423	4.41	6051.63	770.31	0.20
Reach-1	5.022	100 Yr.	11243.00	459.30	477.38		477.92	0.000876	6.29	3197.11	711.35	0.29
Reach-1	5.021	100 Yr.	11243.00	459.30	477.38	469.58	477.92	0.000877	6.29	3195.29	711.30	0.29
Reach-1	5.020		Bridge									
Reach-1	5.018	100 Yr.	11243.00	459.30	477.15		477.73	0.000950	6.48	3036.78	707.58	0.30
Reach-1	5.017	100 Yr.	11243.00	459.30	477.15		477.73	0.000950	6.48	3035.16	707.54	0.30
Reach-1	5.013	100 Yr.	11243.00	458.30	477.26		477.58	0.000704	5.69	4643.67	732.63	0.26
Reach-1	4.859	100 Yr.	11243.00	455.50	477.04		477.13	0.000274	3.83	8535.62	1090.61	0.16
Reach-1	4.743	100 Yr.	16358.00	455.30	476.28		476.72	0.000852	6.65	5090.02	558.96	0.29
Reach-1	4.612	100 Yr.	16358.00	456.30	474.43	469.00	475.62	0.002070	8.78	1966.96	210.91	0.44
Reach-1	4.563	100 Yr.	16358.00	454.20	472.98	468.16	474.89	0.003319	11.09	1531.58	346.63	0.55
Reach-1	4.464	100 Yr.	16358.00	452.50	472.84	467.30	473.37	0.001496	6.92	3370.05	686.07	0.33
Reach-1	4.419	100 Yr.	16358.00	451.90	471.54	466.97	472.81	0.002988	9.73	2142.68	339.70	0.47
Reach-1	4.365	100 Yr.	17157.00	450.70	472.02	465.94	472.21	0.000501	4.32	5574.87	1083.64	0.19
Reach-1	4.259	100 Yr.	17157.00	448.90	471.90		471.99	0.000251	3.11	8033.22	1435.49	0.14
Reach-1	4.165	100 Yr.	17157.00	447.40	471.58		471.80	0.000514	4.95	6817.68	1180.24	0.21
Reach-1	4.16	100 Yr.	17157.00	448.50	471.56	463.94	471.79	0.000662	5.16	7308.69	1214.27	0.22
Reach-1	4.158		Bridge									
Reach-1	4.157	100 Yr.	17157.00	448.50	471.44	463.94	471.67	0.000696	5.26	7157.76	1208.87	0.23
Reach-1	4.148	100 Yr.	17157.00	448.00	471.04		471.55	0.001296	7.53	5011.22	892.57	0.31
Reach-1	4.073	100 Yr.	17157.00	446.90	470.83		471.11	0.000732	5.80	6662.75	1047.32	0.24
Reach-1	4.069	100 Yr.	17157.00	447.50	470.55	465.80	471.03	0.001403	7.92	5861.57	1225.70	0.30
Reach-1	4.060		Bridge									
Reach-1	4.057	100 Yr.	17035.00	447.50	470.49		470.97	0.001424	7.96	5785.87	1223.02	0.30
Reach-1	4.049	100 Yr.	17035.00	446.80	470.45		470.92	0.000869	6.48	4983.88	1034.02	0.29
Reach-1	4.036	100 Yr.	17035.00	445.90	470.33	462.05	470.86	0.000801	6.91	4757.73	843.63	0.28

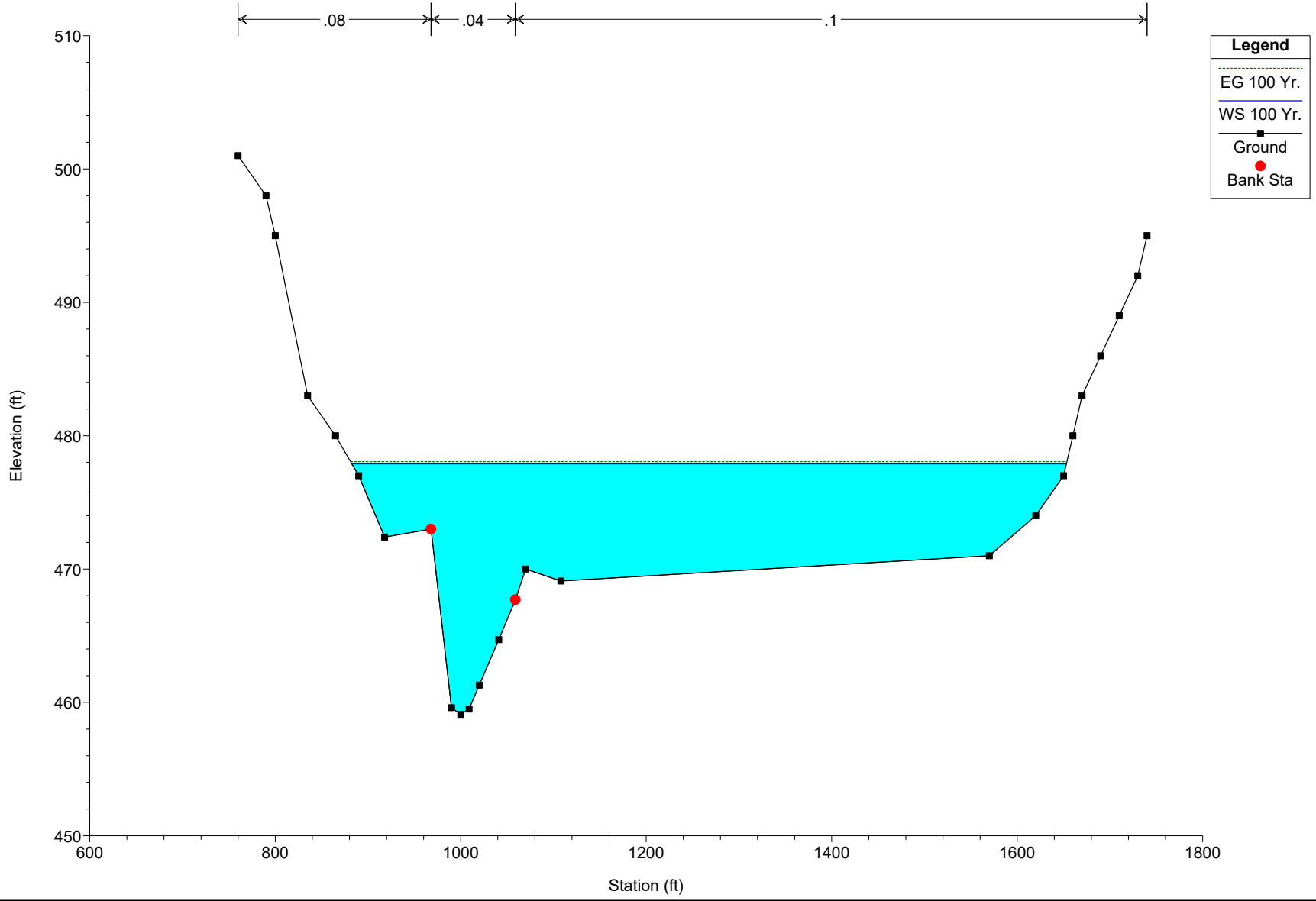
RIVER-1 Reach-1



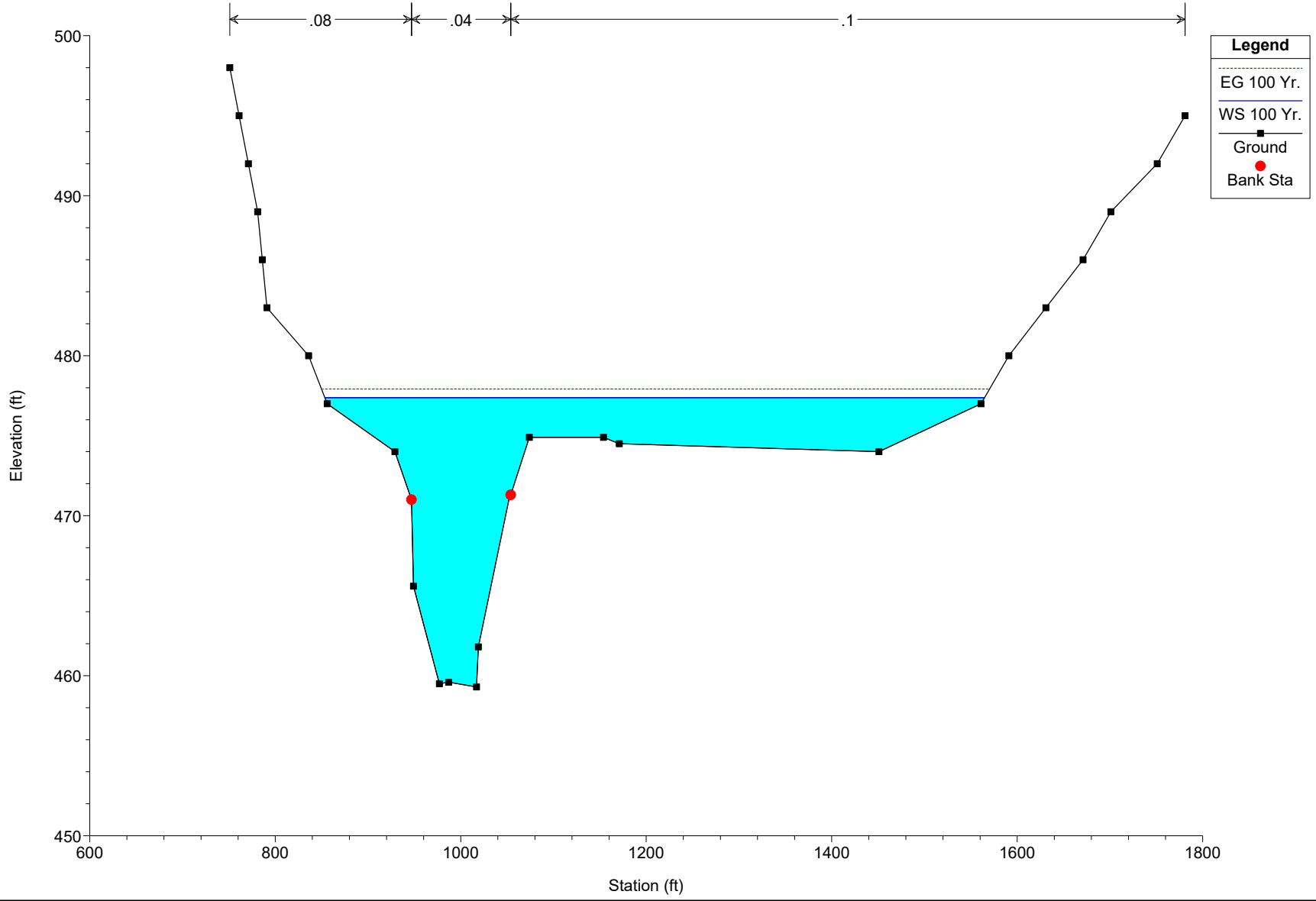
5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 5.259 5.259



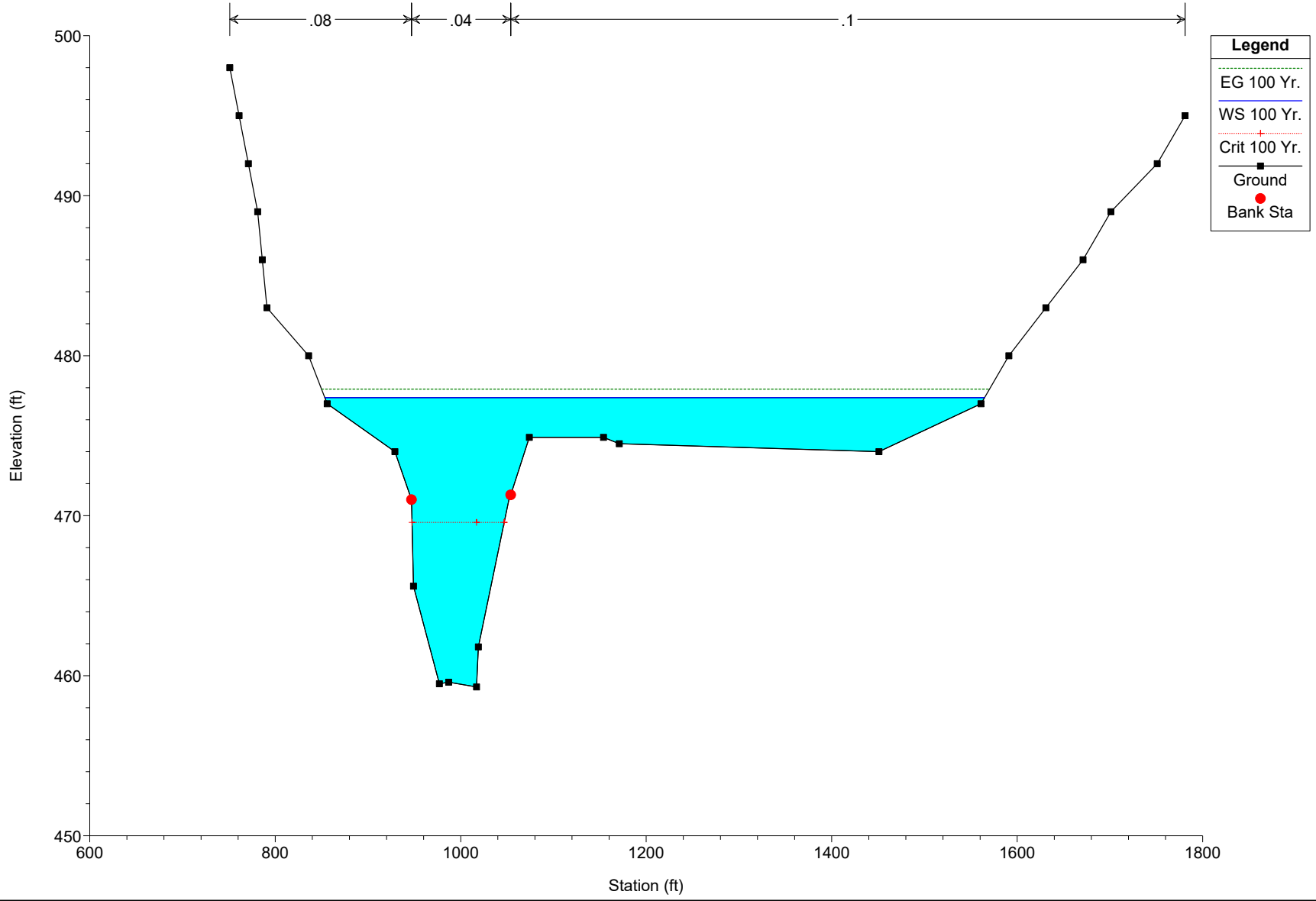
5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 5.029 5.029



5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 5.022 5.022

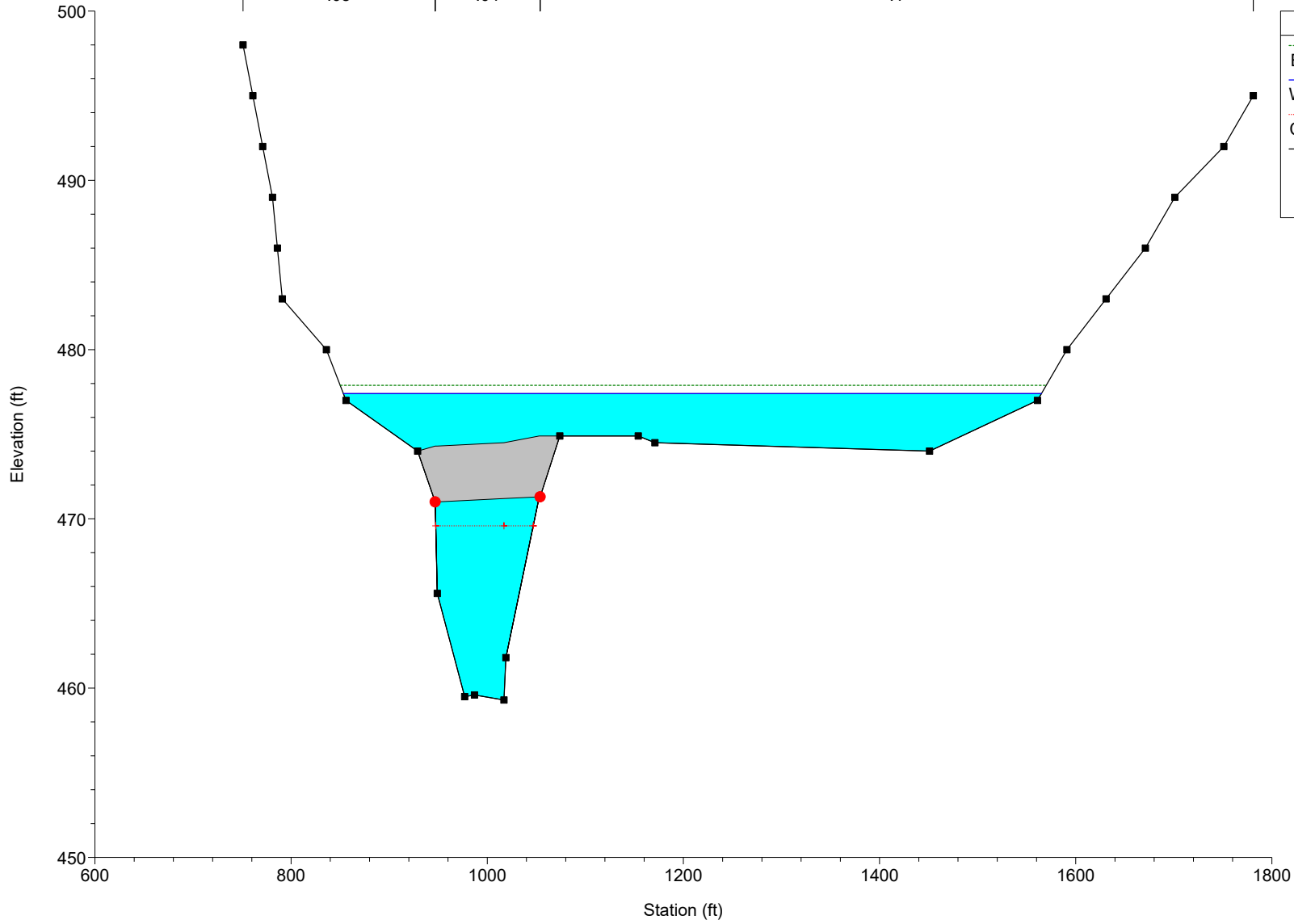


5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 5.021 5.021



5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022

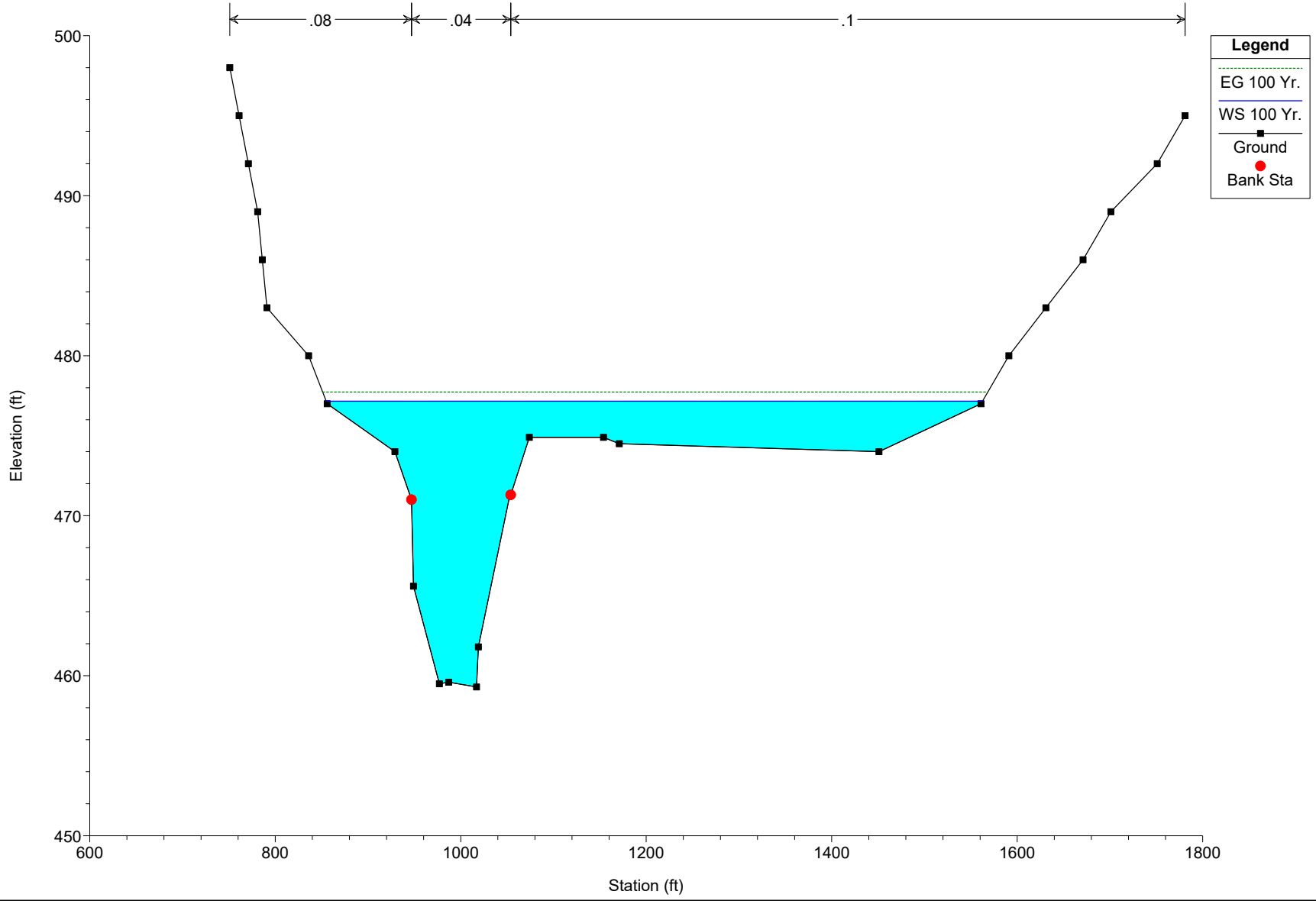
RS = 5.020 BR Litzinger Rd. Bridge



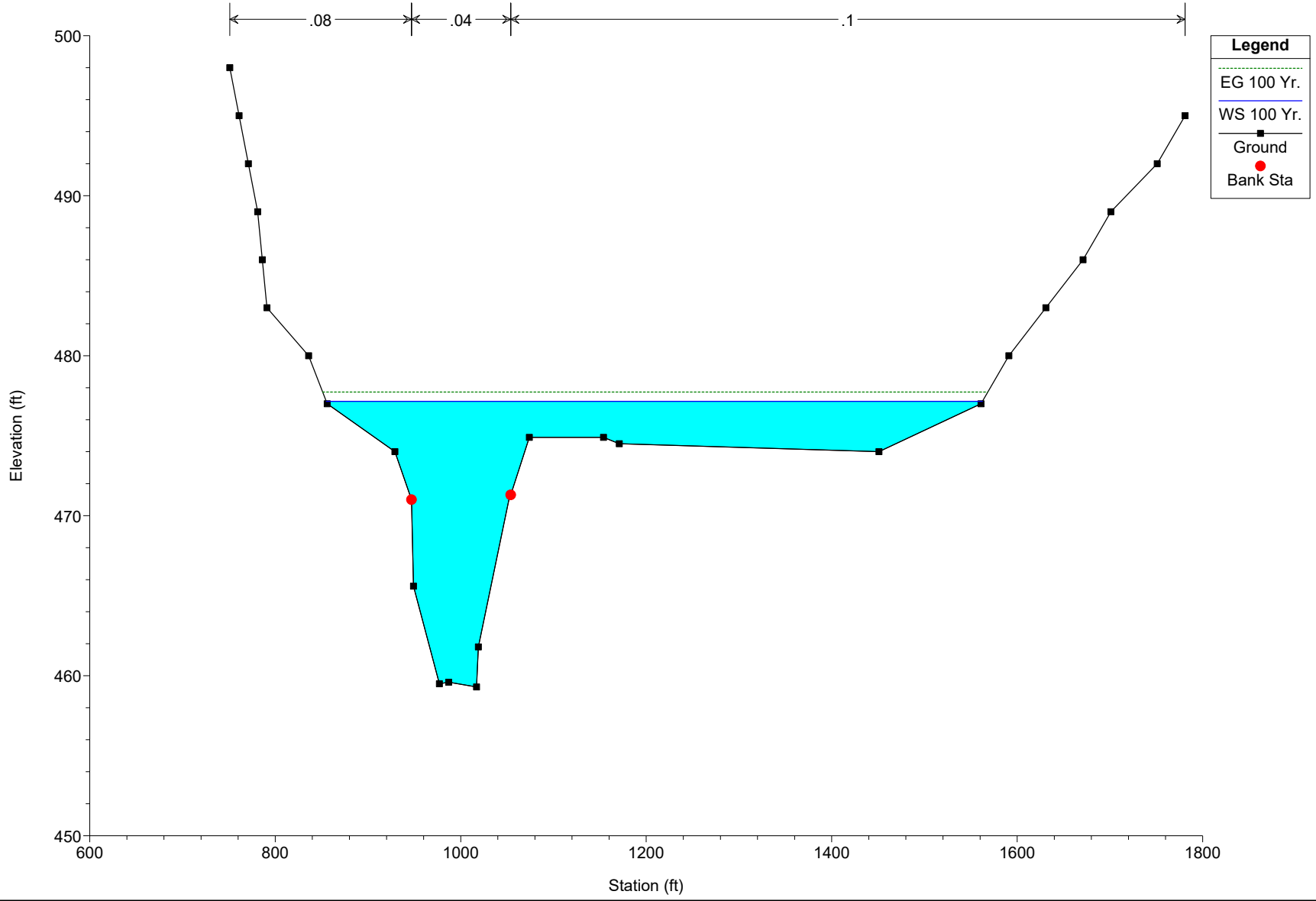
Legend

- EG 100 Yr. (dashed green line)
- WS 100 Yr. (solid blue line)
- Crit 100 Yr. (red dotted line with cross)
- Ground (solid black line with square)
- Bank Sta (red dot)

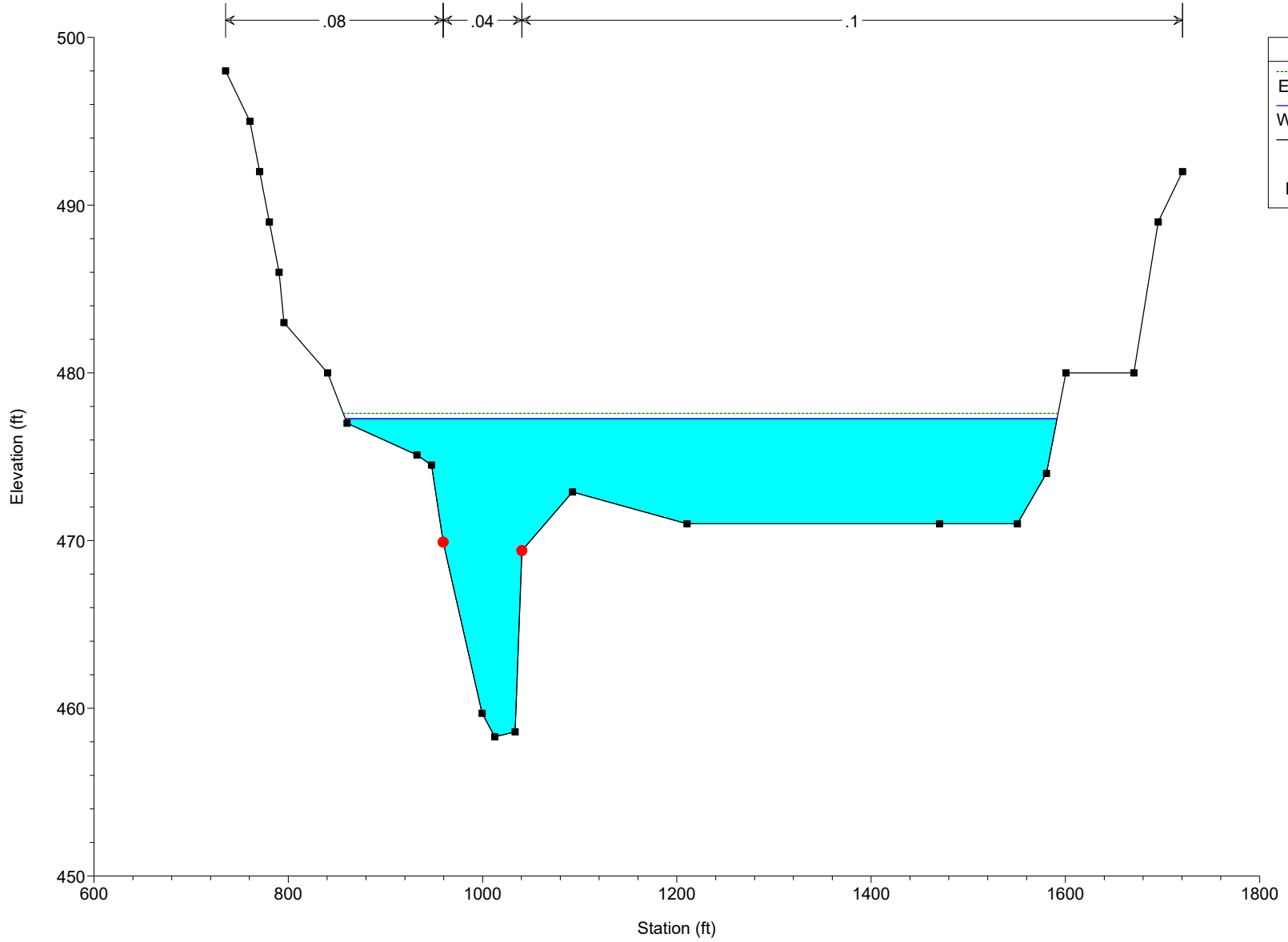
5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 5.018 5.018



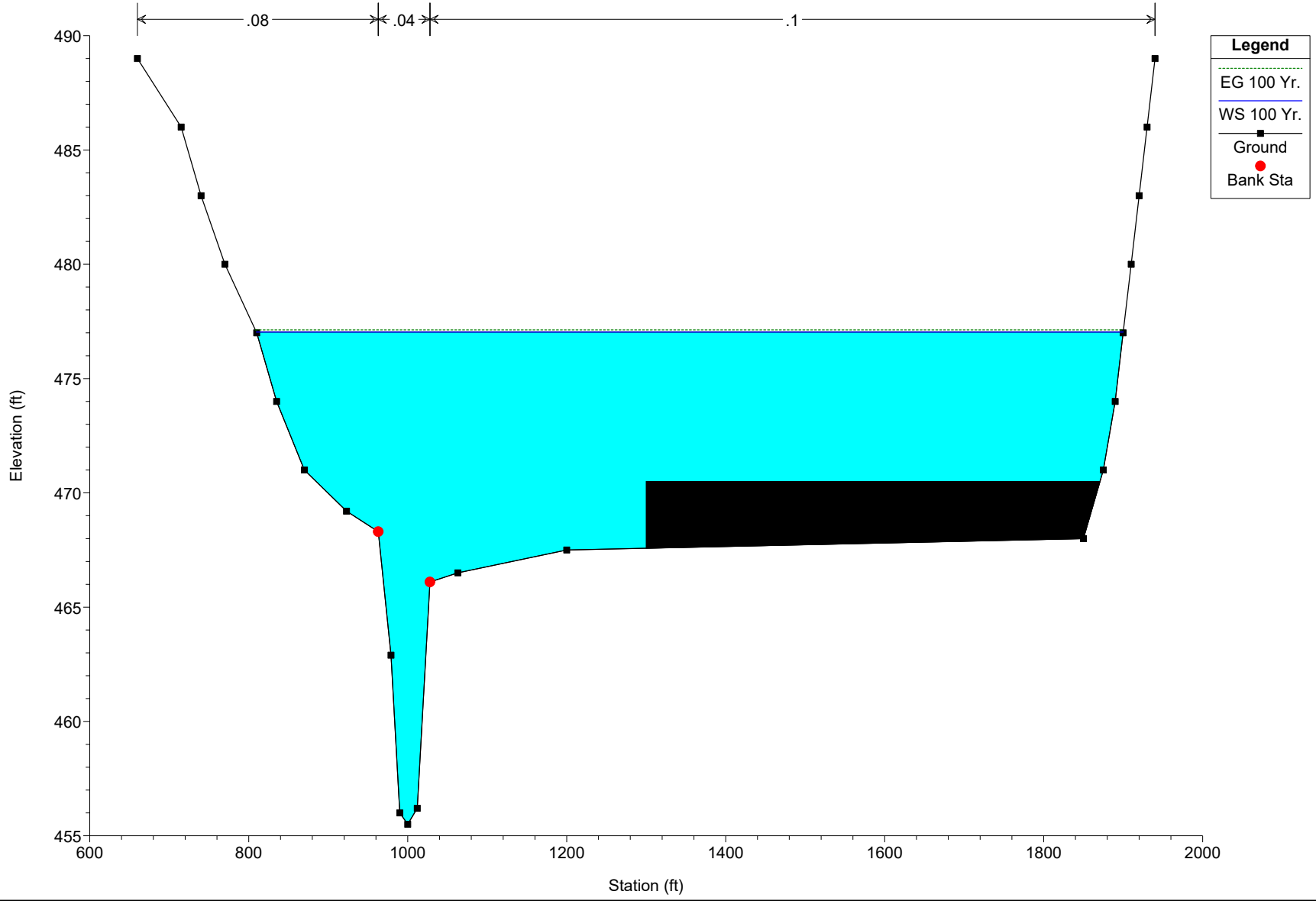
5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 5.017 5.017



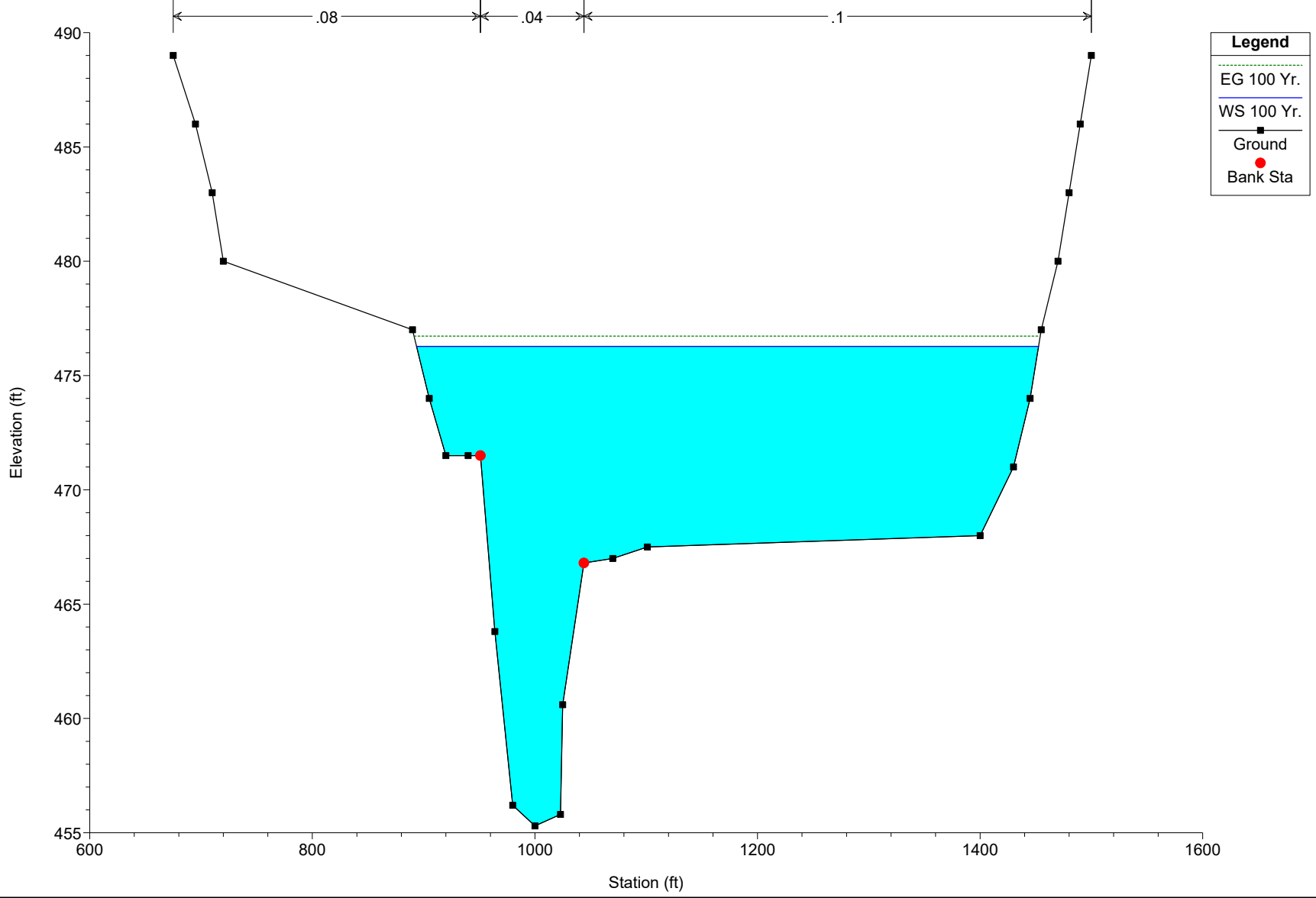
5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 5.013 5.013



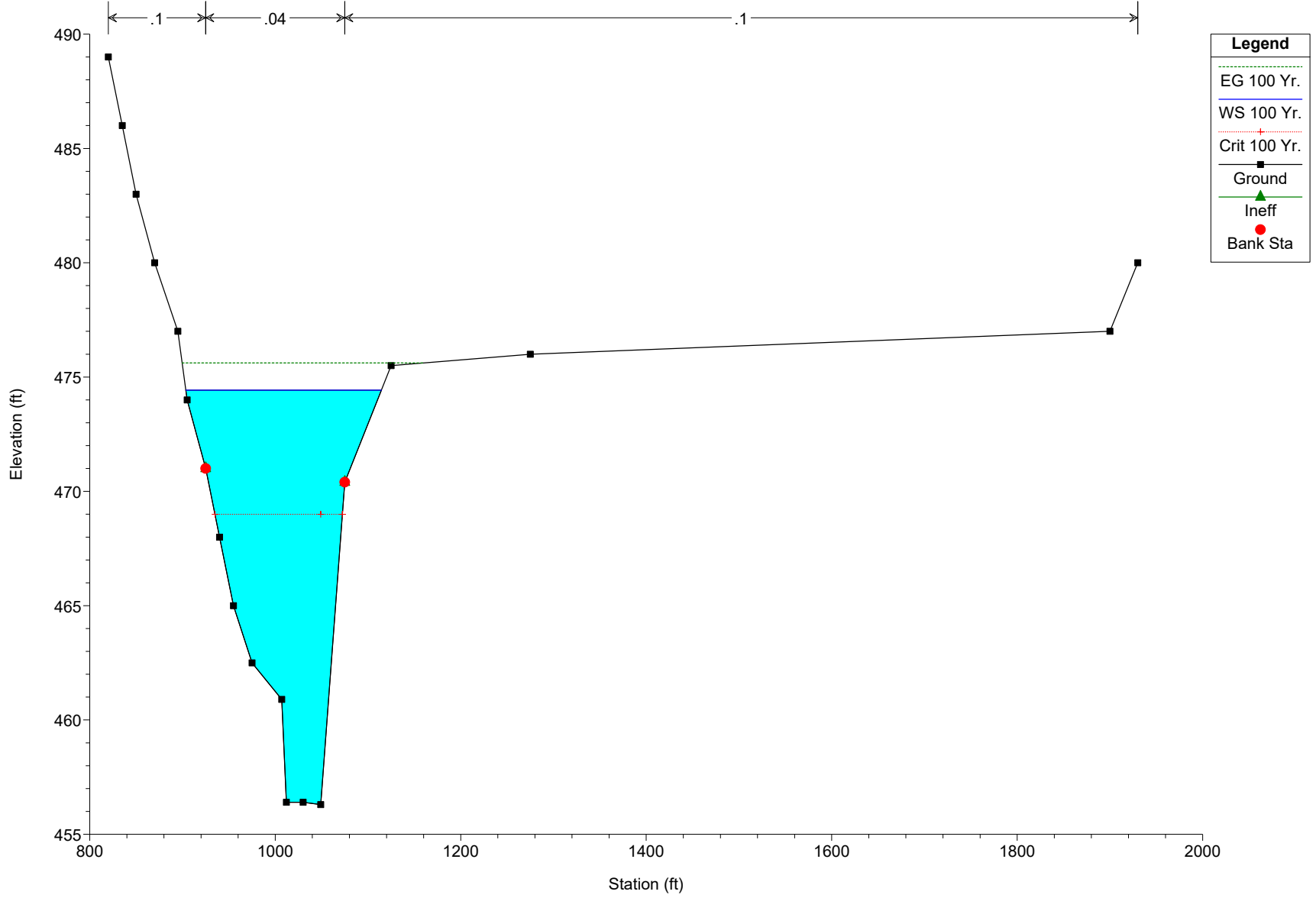
5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 4.859 4.859



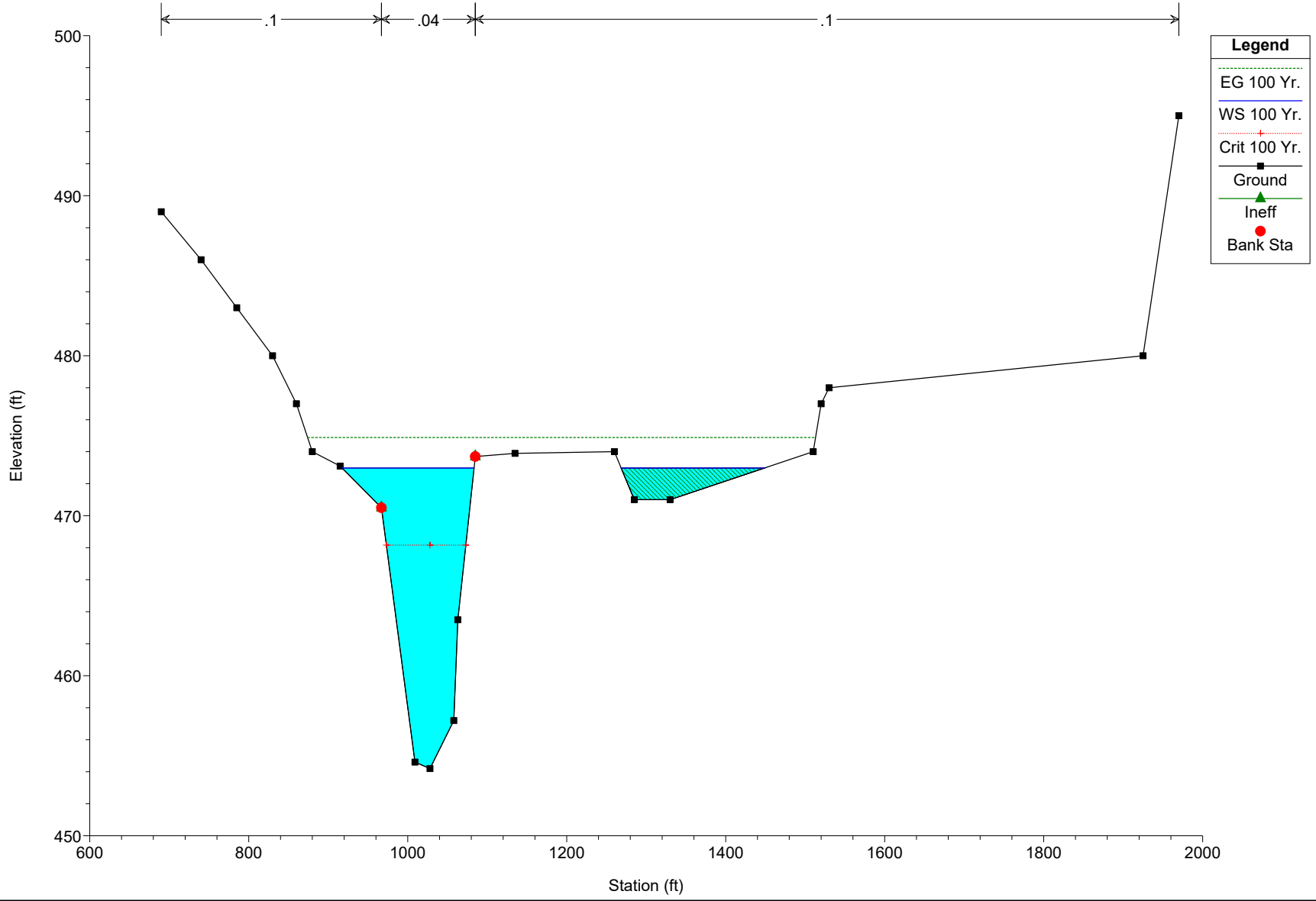
5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 4.743 4.743



5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 4.612 4.612

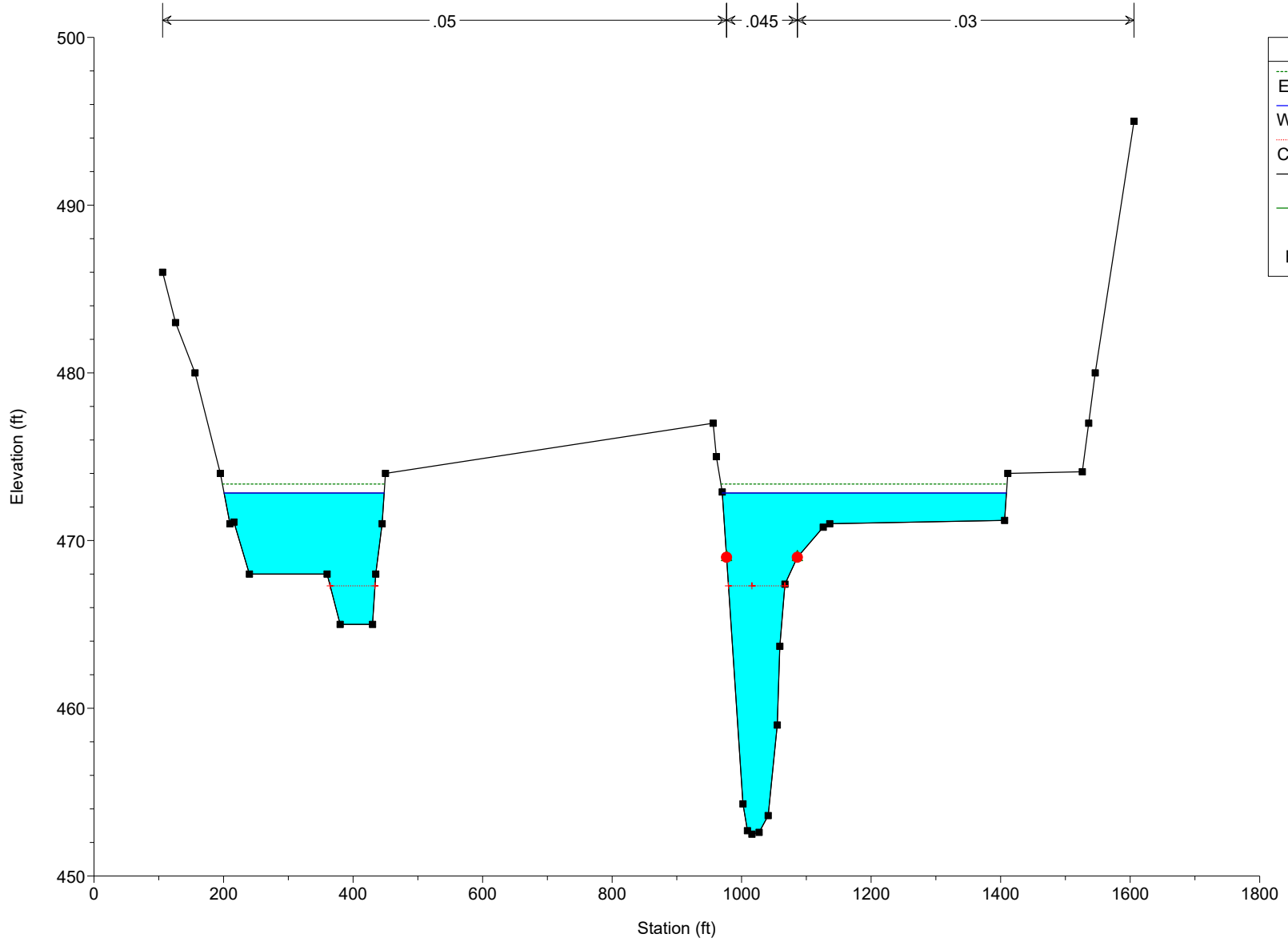


5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 4.563 4.563



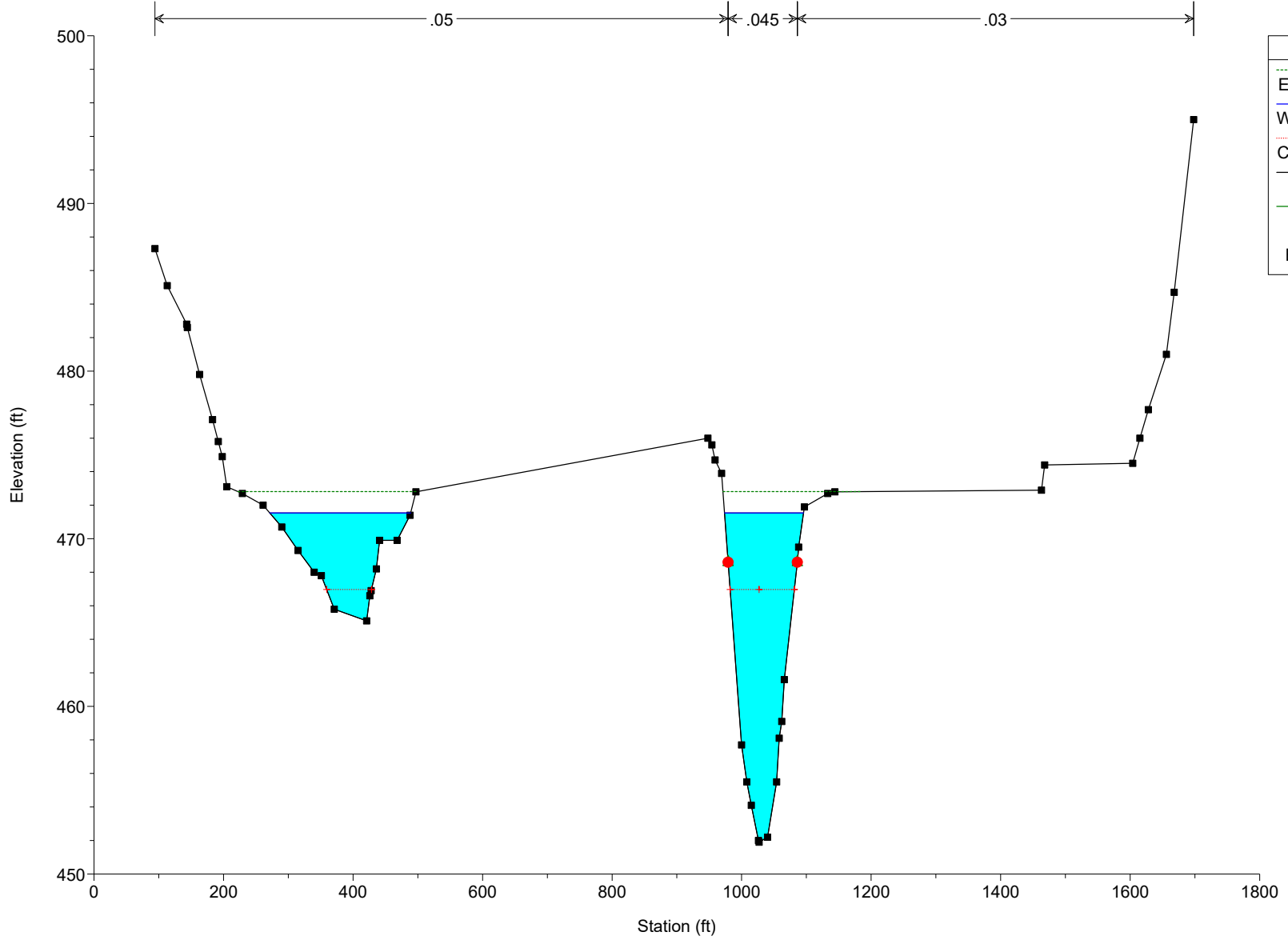
5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022

RS = 4.464 4.464



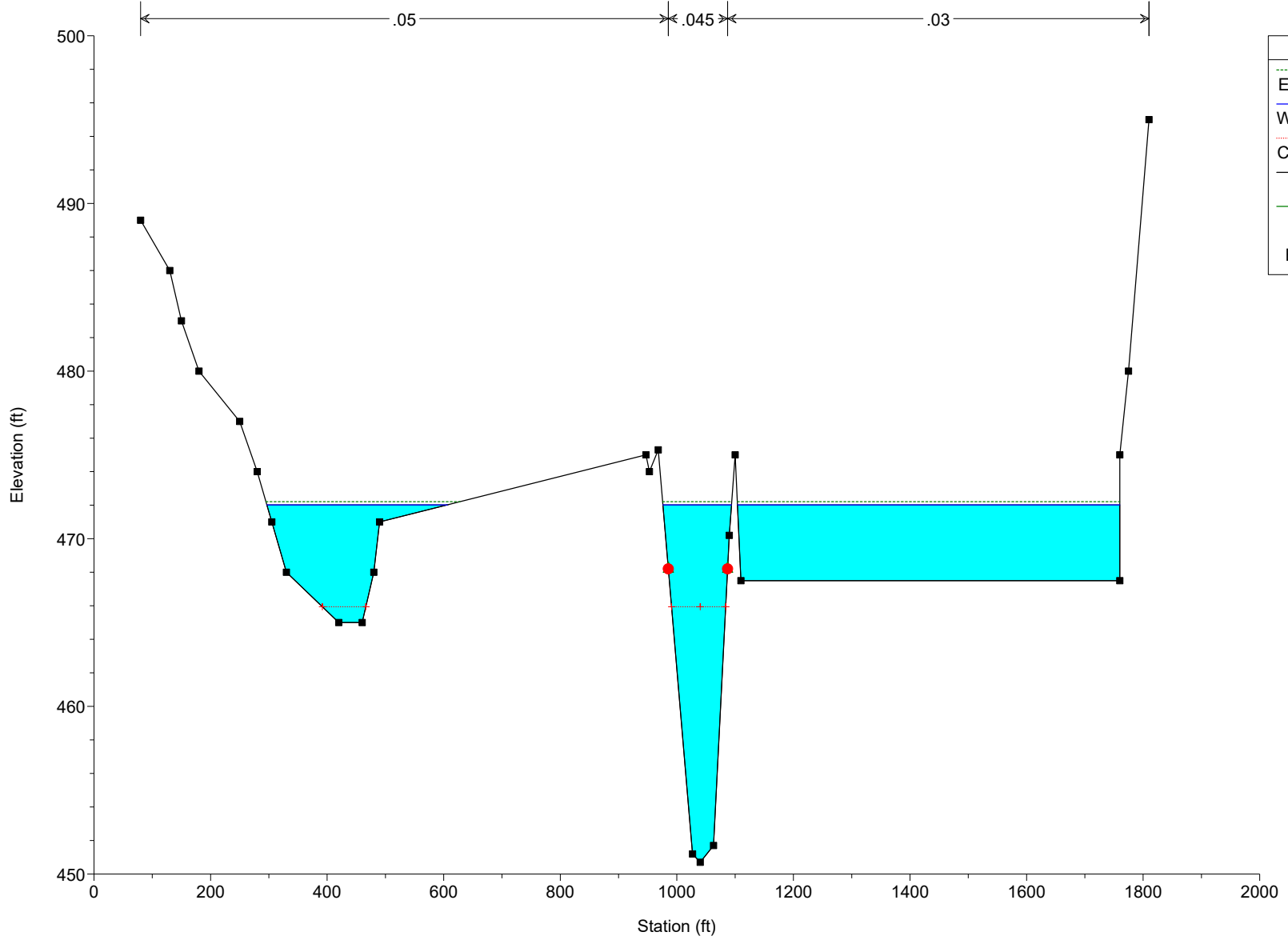
5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022

RS = 4.419 4.419



5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022

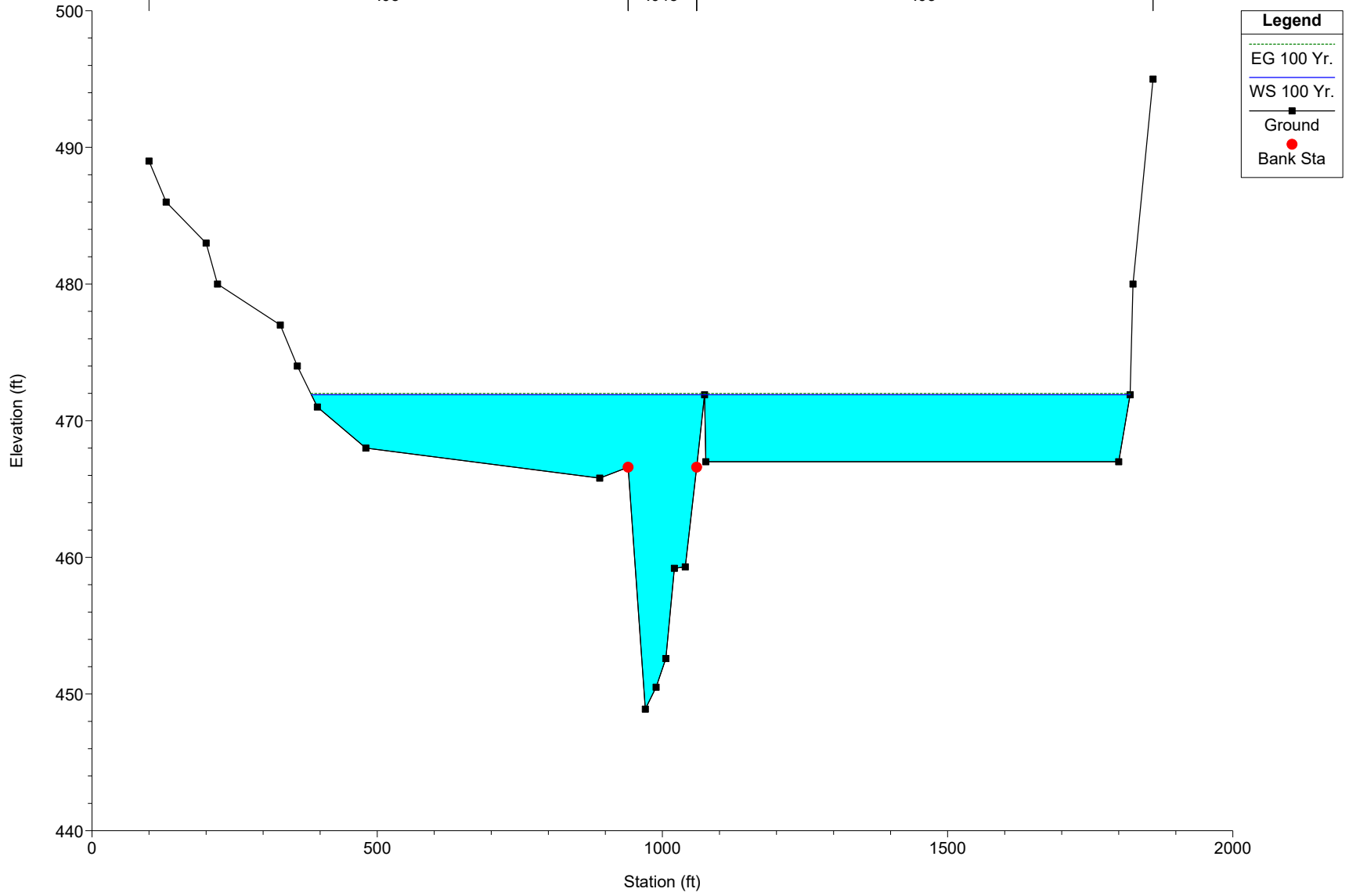
RS = 4.365 4.365



5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022

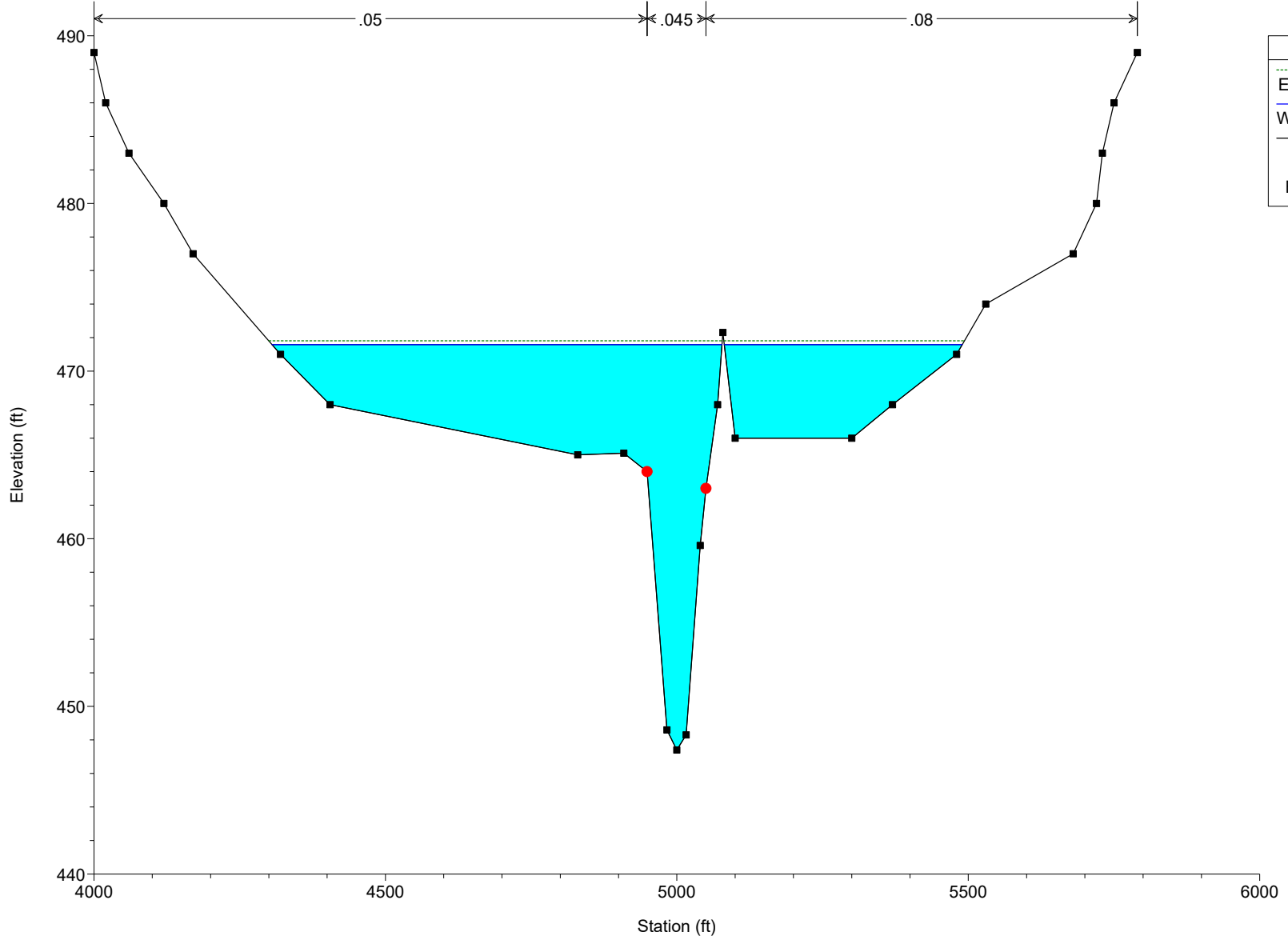
RS = 4.259 4.259

← .05 → * .045 * ← .03 →

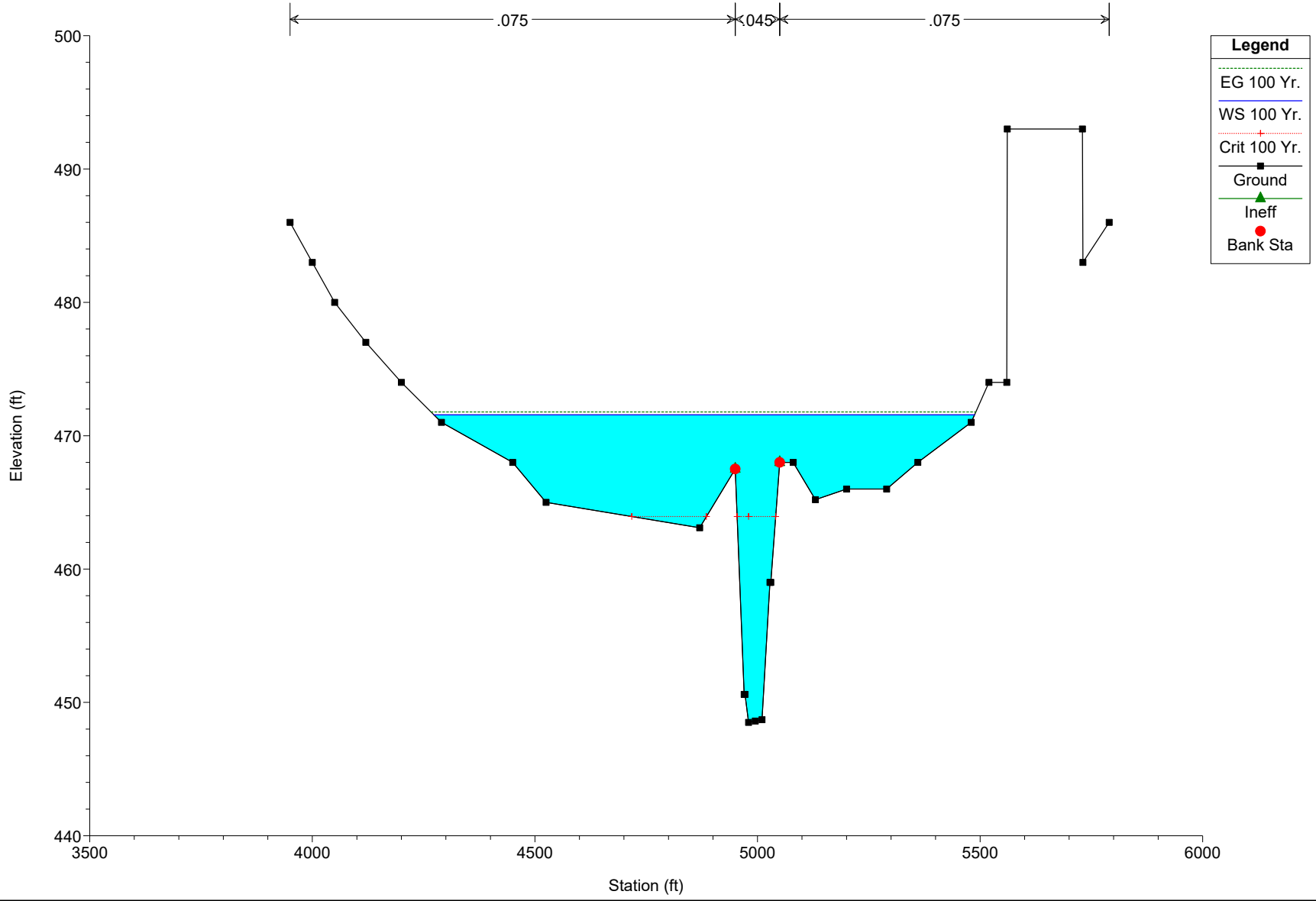


5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022

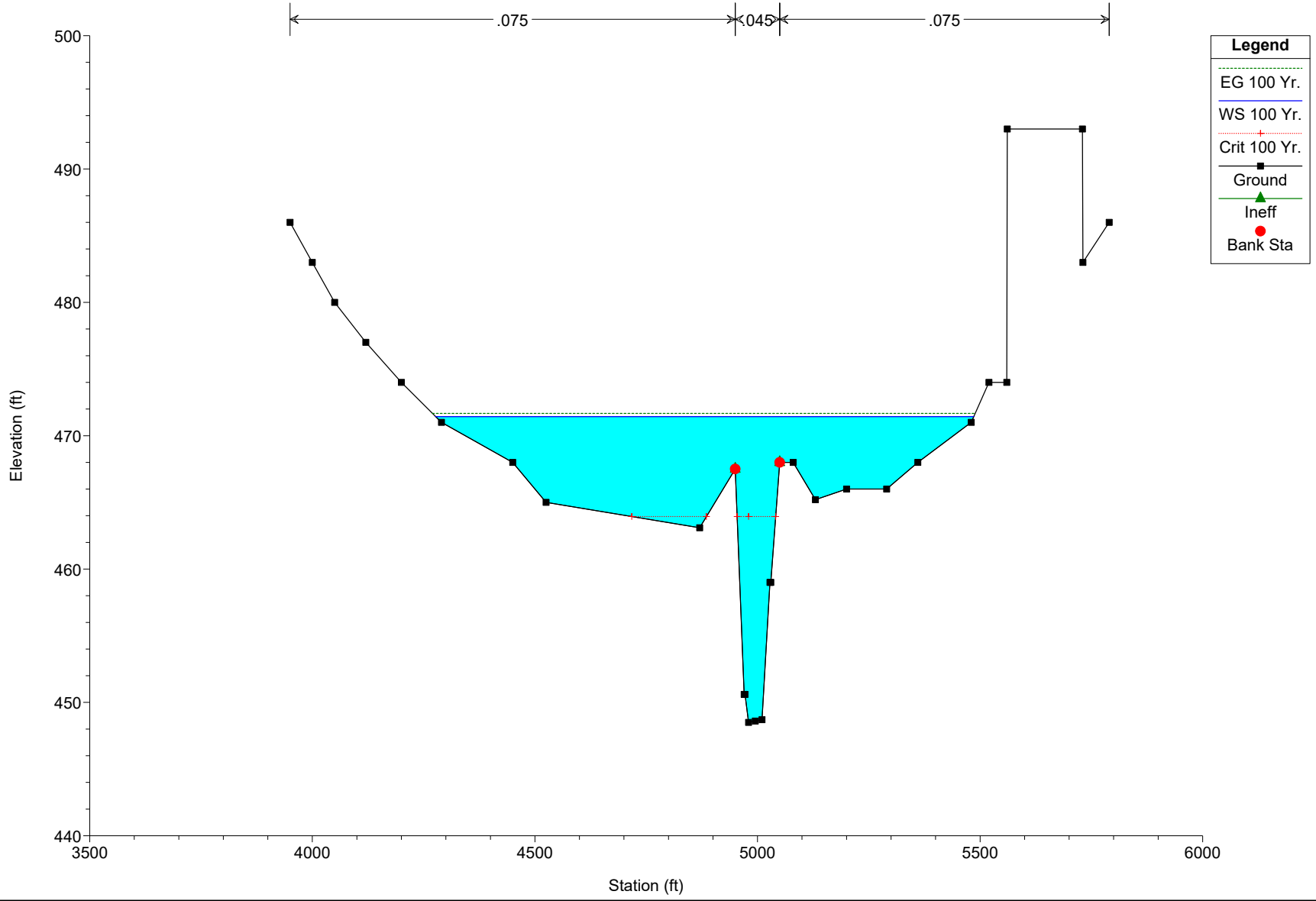
RS = 4.165 4.165



5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 4.16 4.16

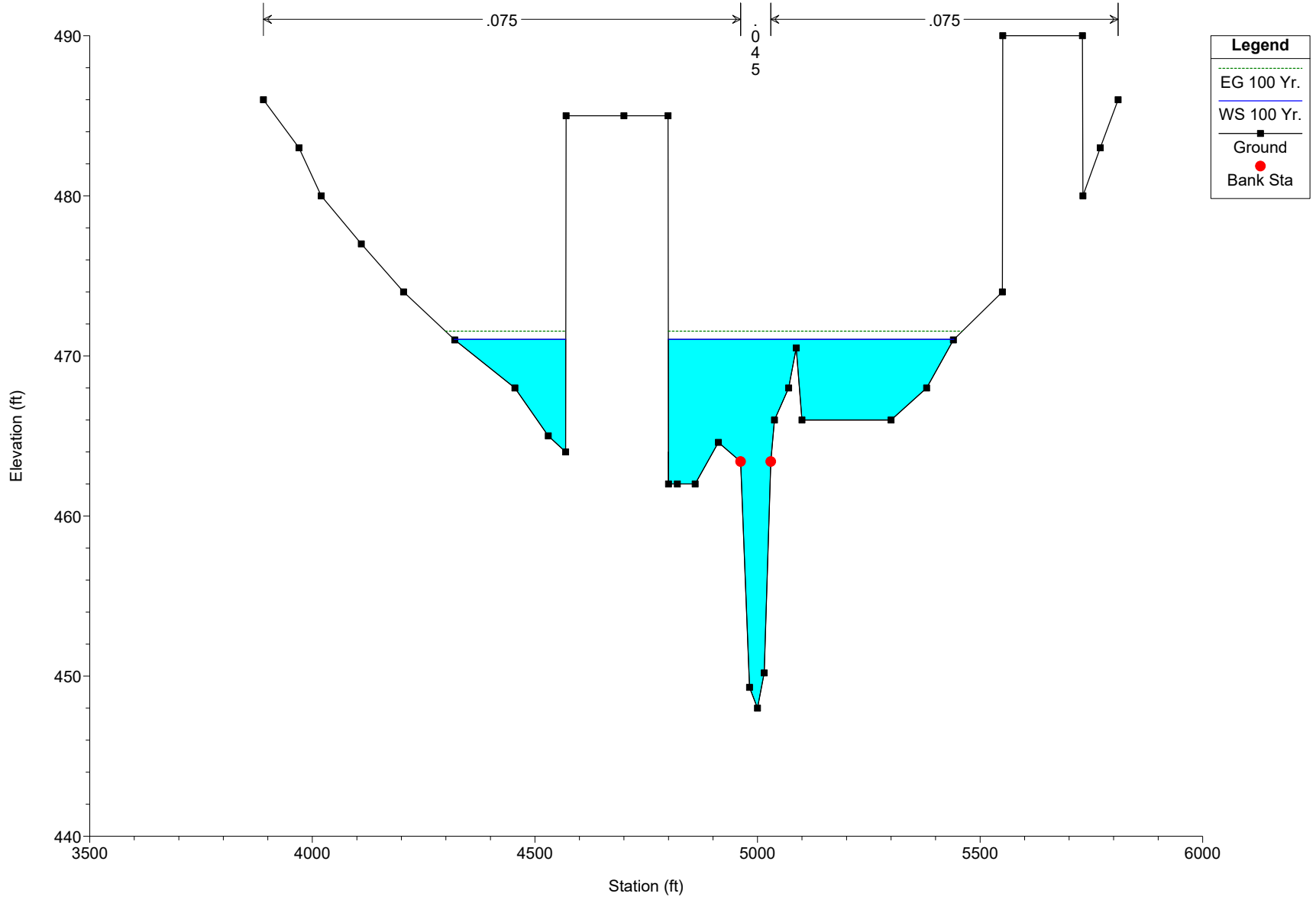


5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 4.157 4.157

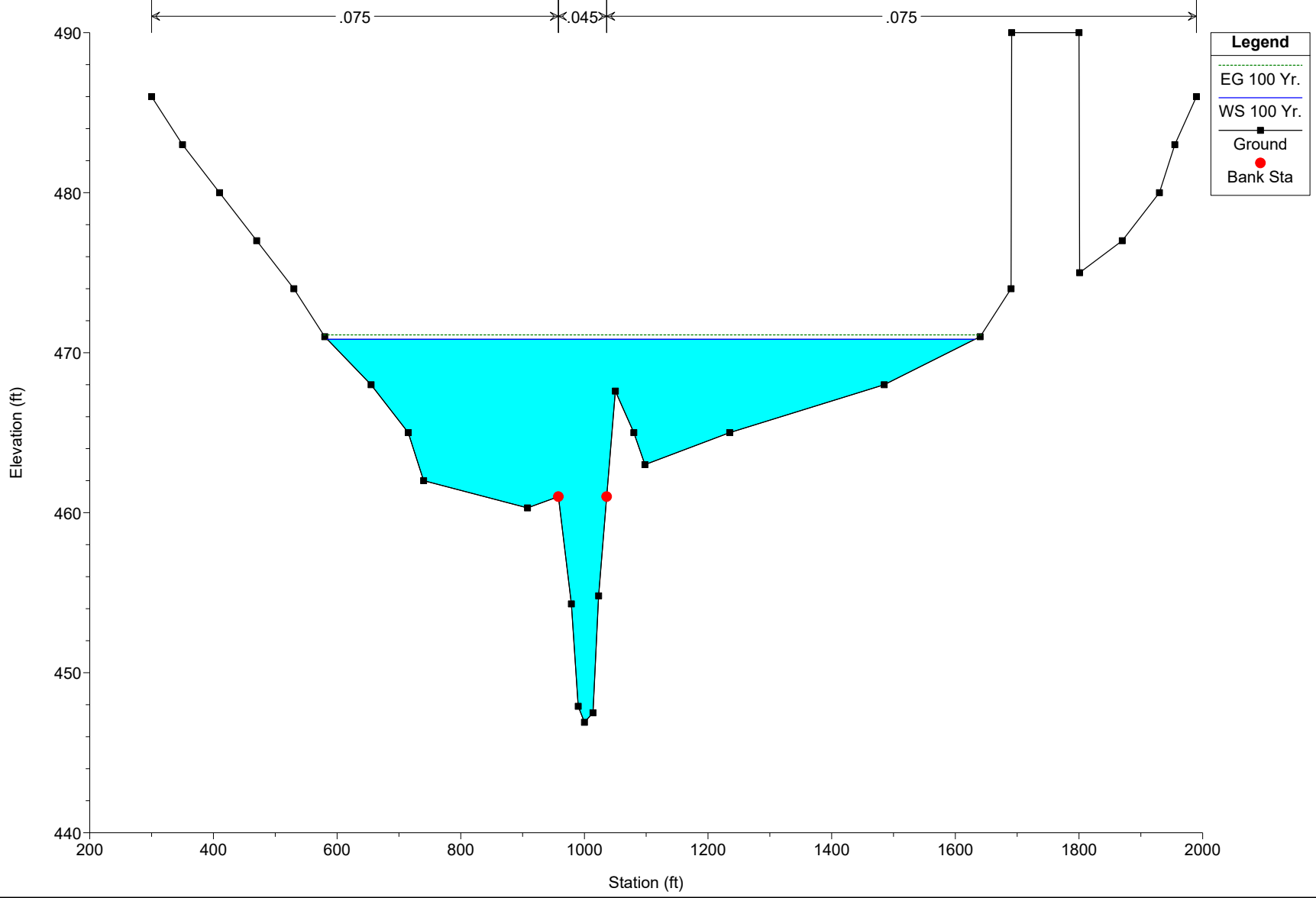


5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022

RS = 4.148 4.148



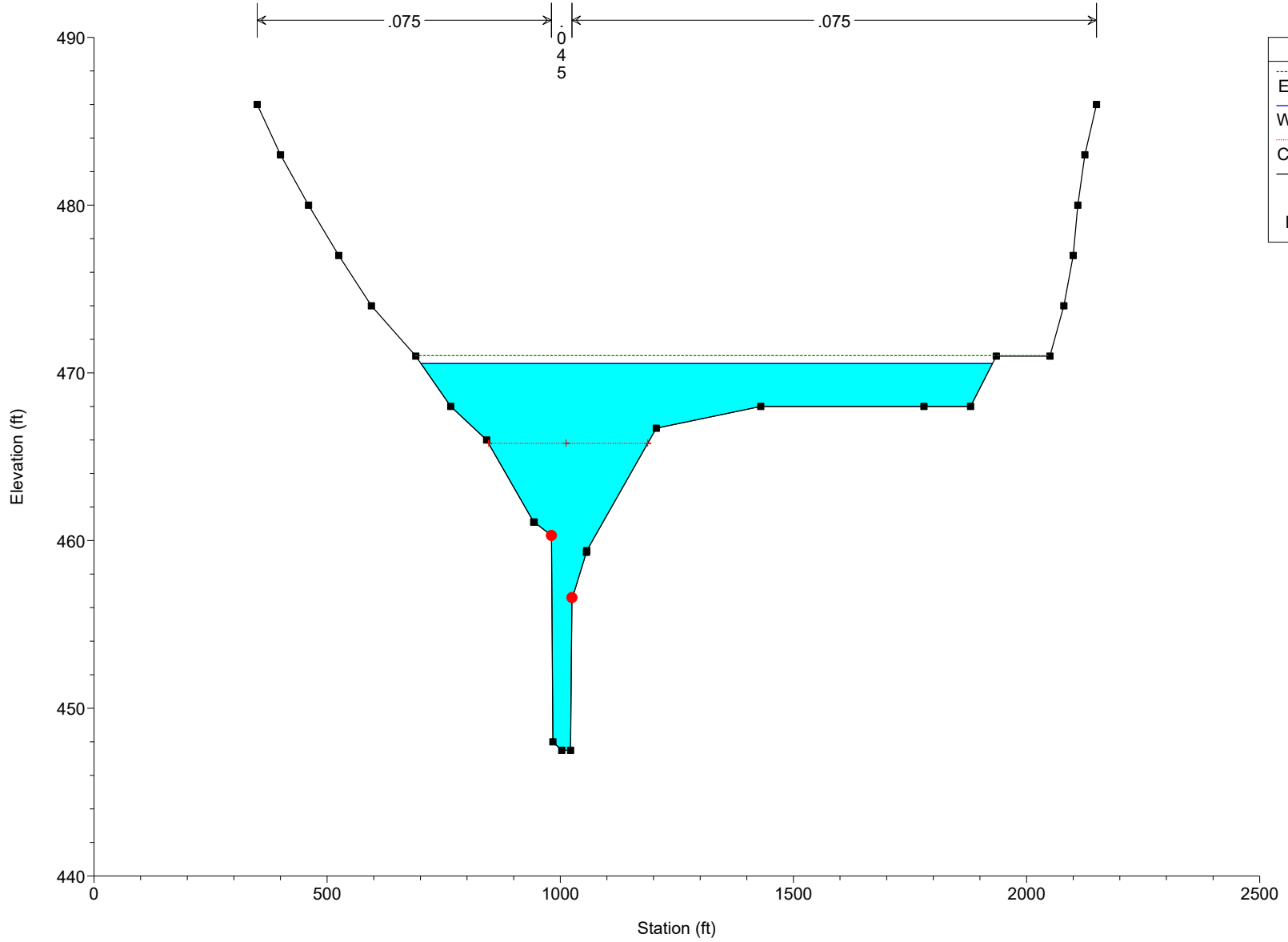
5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 4.073 4.073



5216FS-CLOMR221014

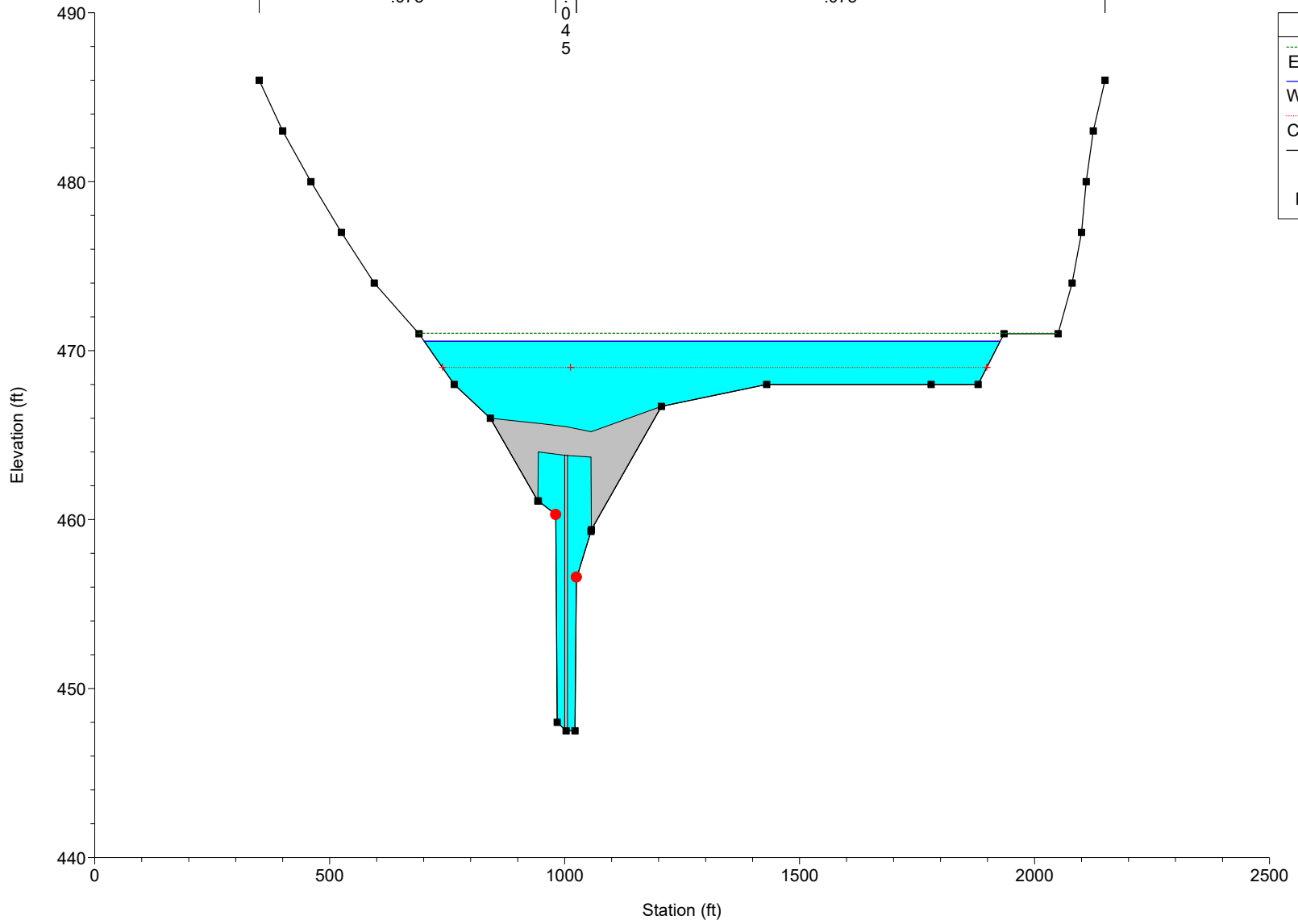
Plan: Duplicate Effective Model 10/14/2022

RS = 4.069 4.069



5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022

RS = 4.060 BR S. McKnight Road Bridge



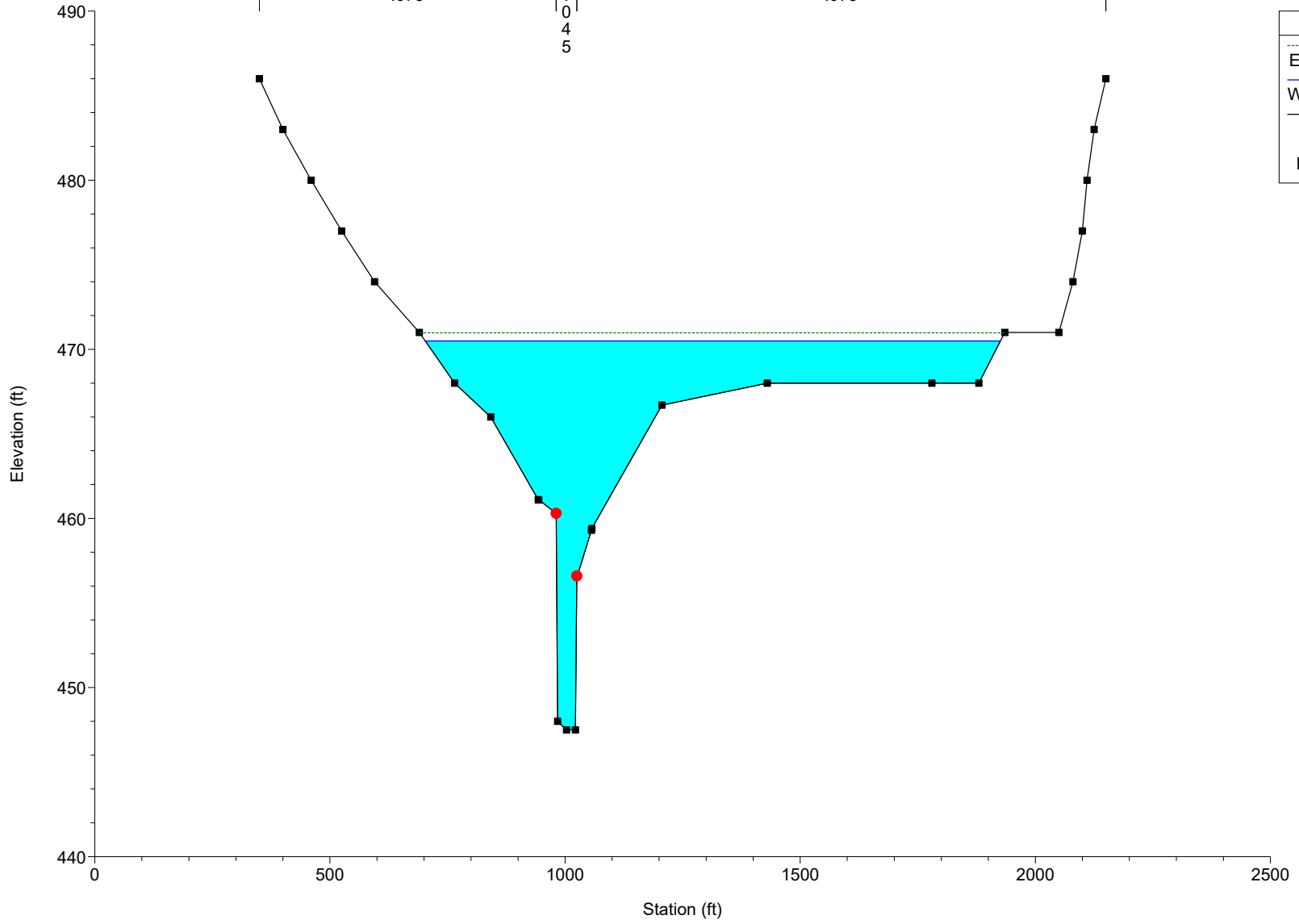
Legend

- EG 100 Yr. (dashed green line)
- WS 100 Yr. (solid blue line)
- Crit 100 Yr. (dotted red line with cross markers)
- Ground (solid black line with square markers)
- Bank Sta (red circle)

5216FS-CLOMR221014

Plan: Duplicate Effective Model 10/14/2022

RS = 4.057 4.057

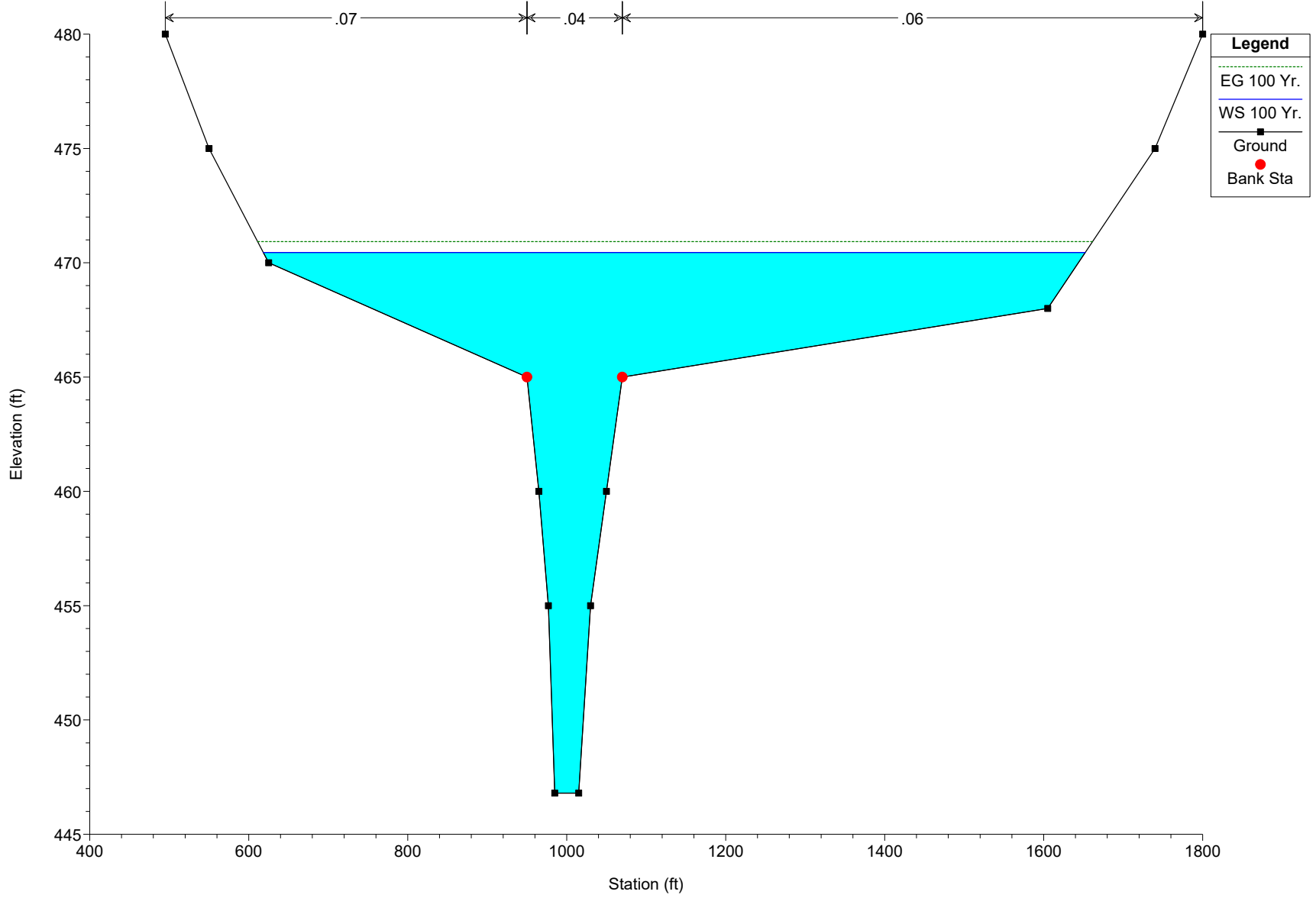


Legend

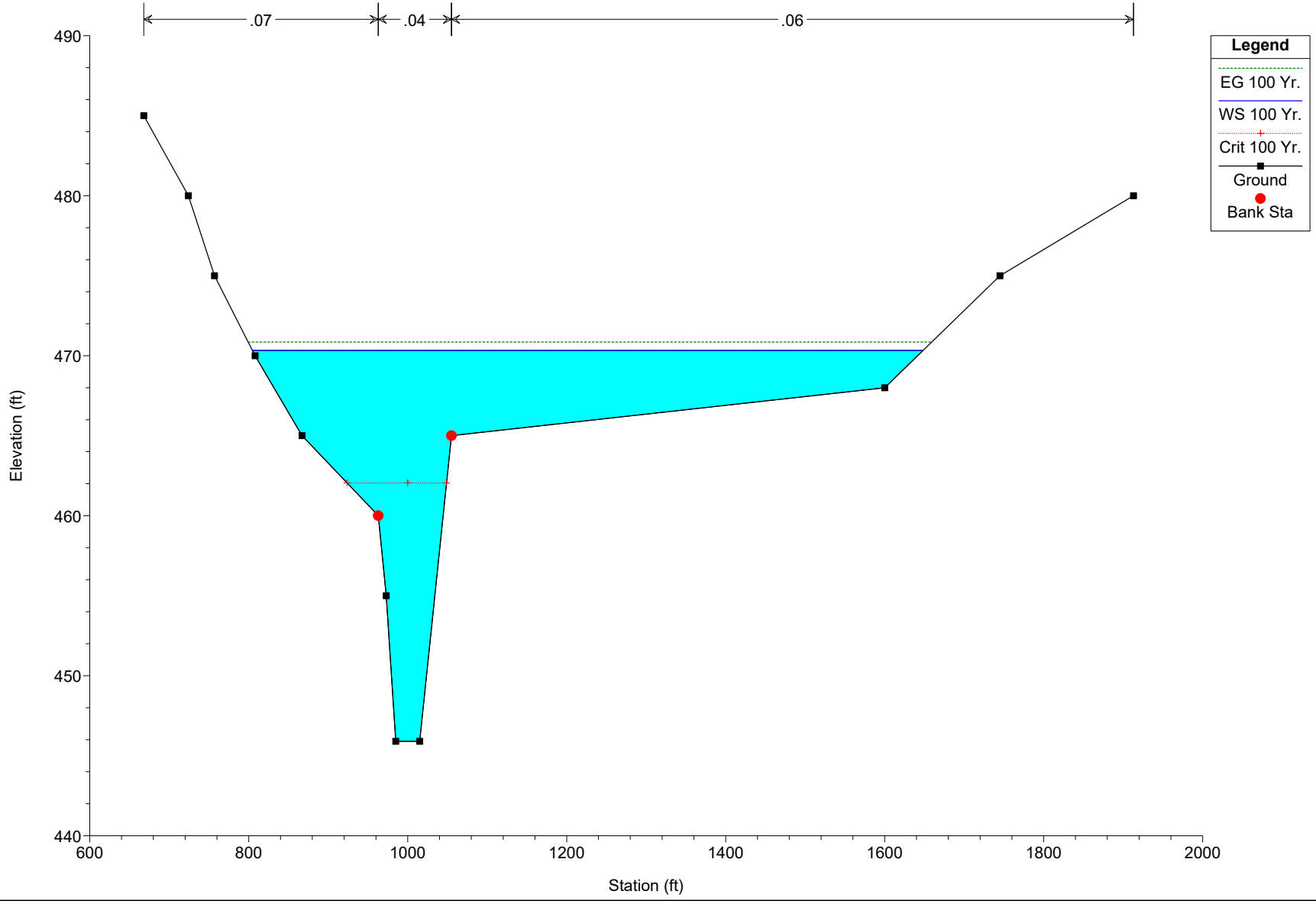
- EG 100 Yr.
- WS 100 Yr.
- Ground
- Bank Sta

5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022

RS = 4.049 4.049



5216FS-CLOMR221014 Plan: Duplicate Effective Model 10/14/2022
RS = 4.036 4.036



Legend

- EG 100 Yr. (dotted green line)
- WS 100 Yr. (solid blue line)
- Crit 100 Yr. (dotted red line with cross)
- Ground (solid black line with square)
- Bank Sta (red dot with cross)

- III. HEC-RAS Output – Deer Creek Corrected Effective/Existing Conditions Model
 - HEC-RAS Input
 - 15 Yr. and 100 Yr.-Flood Profile Table
 - Cross Sections Showing 100 yr Water Surface Elevation
 - 100 Yr. and Floodway-Flood Profile Table
 - Cross Sections Showing 100 yr and Floodway Water Surface Elevation

HEC-RAS HEC-RAS 6.2 March 2022
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X   X XXXXXX   XXXX   XXXX   XX   XXXX
X   X X   X   X X   X X   X X   X
X   X X   X   X   X   X X   X X   X
XXXXXXXX XXXX   X   XXX XXXX   XXXXXX   XXXX
X   X X   X   X   X X   X X   X   X
X   X X   X   X X   X X   X X   X   X
X   X XXXXXX   XXXX   X X   X X   XXXXX
```

PROJECT DATA

Project Title: 5216FS-CLOMR230123
Project File : 5216FS-CLOMR230123.prj
Run Date and Time: 1/23/2023 10:33:47 AM

Project in English units

Project Description:

DEER CREEK
RIVER DES PERES STUDY JUNE 1982
RETURN PERIODS
OF 10, 50, 100 AND 500 YEAR
DEER CREEK
RIVER DES PERES STUDY JUNE
1982
RETURN PERIODS OF 10, 50, 100 AND 500 YEAR

PLAN DATA

Plan Title: Corrected Effective/Ex Cond Model
Plan File : o:\DRAW5200\2135216\Floodstudy\LOMR Application\Sent to FEMA\2023-01-19 - Resubmittal\HEC-RAS
Files\5216FS-CLOMR230123.p03

Geometry Title: Corrected Effective/Ex Cond Model

Geometry File : o:\DRAW5200\2135216\Floodstudy\LOMR Application\Sent to FEMA\2023-01-19 - Resubmittal\HEC-RAS Files\5216FS-CLOMR230123.g02

Flow Title : Imported Flow 01
Flow File : o:\DRAW5200\2135216\Floodstudy\LOMR Application\Sent to FEMA\2023-01-19 - Resubmittal\HEC-RAS Files\5216FS-CLOMR230123.f01

Plan Description:
Corrected Effective/Existing Conditions Model

Plan Summary Information:

Number of: Cross Sections =	26	Multiple Openings =	0
Culverts =	0	Inline Structures =	0
Bridges =	3	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3
Flow tolerance factor =	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

Encroachment Data

Equal Conveyance =	True
Left Offset =	0
Right Offset =	0

River = RIVER-1		Reach = Reach-1		
RS	Profile	Method	Value1	Value2
5.259	15 Yr.	0	0	0
5.029	15 Yr.	0	0	0
5.022	15 Yr.	0	0	0
5.021	15 Yr.	0	0	0
5.018	15 Yr.	0	0	0
5.017	15 Yr.	0	0	0
5.013	15 Yr.	0	0	0
4.859	15 Yr.	0	0	0
4.743	15 Yr.	0	0	0
4.625	15 Yr.	0	0	0
4.612	15 Yr.	0	0	0

4.563	15 Yr.	0	0	0
4.464	15 Yr.	0	0	0
4.419	15 Yr.	0	0	0
4.365	15 Yr.	0	0	0
4.259	15 Yr.	0	0	0
4.165	15 Yr.	0	0	0
4.16	15 Yr.	0	0	0
4.157	15 Yr.	0	0	0
4.148	15 Yr.	0	0	0
4.080	15 Yr.	0	0	0
4.073	15 Yr.	0	0	0
4.069	15 Yr.	0	0	0
4.057	15 Yr.	0	0	0
4.049	15 Yr.	0	0	0
4.036	15 Yr.	0	0	0

River = RIVER-1		Reach = Reach-1		
RS	Profile	Method	Value1	Value2
5.259	50 Yr.	0	0	0
5.029	50 Yr.	0	0	0
5.022	50 Yr.	0	0	0
5.021	50 Yr.	0	0	0
5.018	50 Yr.	0	0	0
5.017	50 Yr.	0	0	0
5.013	50 Yr.	0	0	0
4.859	50 Yr.	0	0	0
4.743	50 Yr.	0	0	0
4.625	50 Yr.	0	0	0
4.612	50 Yr.	0	0	0
4.563	50 Yr.	0	0	0
4.464	50 Yr.	0	0	0
4.419	50 Yr.	0	0	0
4.365	50 Yr.	0	0	0
4.259	50 Yr.	0	0	0
4.165	50 Yr.	0	0	0
4.16	50 Yr.	0	0	0
4.157	50 Yr.	0	0	0
4.148	50 Yr.	0	0	0
4.080	50 Yr.	0	0	0
4.073	50 Yr.	0	0	0
4.069	50 Yr.	0	0	0
4.057	50 Yr.	0	0	0
4.049	50 Yr.	0	0	0
4.036	50 Yr.	0	0	0

River = RIVER-1		Reach = Reach-1		
RS	Profile	Method	Value1	Value2

5.259	100 Yr.	0	0	0
5.029	100 Yr.	0	0	0
5.022	100 Yr.	0	0	0
5.021	100 Yr.	0	0	0
5.018	100 Yr.	0	0	0
5.017	100 Yr.	0	0	0
5.013	100 Yr.	0	0	0
4.859	100 Yr.	0	0	0
4.743	100 Yr.	0	0	0
4.625	100 Yr.	0	0	0
4.612	100 Yr.	0	0	0
4.563	100 Yr.	0	0	0
4.464	100 Yr.	0	0	0
4.419	100 Yr.	0	0	0
4.365	100 Yr.	0	0	0
4.259	100 Yr.	0	0	0
4.165	100 Yr.	0	0	0
4.16	100 Yr.	0	0	0
4.157	100 Yr.	0	0	0
4.148	100 Yr.	0	0	0
4.080	100 Yr.	0	0	0
4.073	100 Yr.	0	0	0
4.069	100 Yr.	0	0	0
4.057	100 Yr.	0	0	0
4.049	100 Yr.	0	0	0
4.036	100 Yr.	0	0	0

River = RIVER-1		Reach = Reach-1		
RS	Profile	Method	Value1	Value2
5.259	500 Yr.	0	0	0
5.029	500 Yr.	0	0	0
5.022	500 Yr.	0	0	0
5.021	500 Yr.	0	0	0
5.018	500 Yr.	0	0	0
5.017	500 Yr.	0	0	0
5.013	500 Yr.	0	0	0
4.859	500 Yr.	0	0	0
4.743	500 Yr.	0	0	0
4.625	500 Yr.	0	0	0
4.612	500 Yr.	0	0	0
4.563	500 Yr.	0	0	0
4.464	500 Yr.	0	0	0
4.419	500 Yr.	0	0	0
4.365	500 Yr.	0	0	0
4.259	500 Yr.	0	0	0
4.165	500 Yr.	0	0	0
4.16	500 Yr.	0	0	0

4.157	500 Yr.	0	0	0
4.148	500 Yr.	0	0	0
4.080	500 Yr.	0	0	0
4.073	500 Yr.	0	0	0
4.069	500 Yr.	0	0	0
4.057	500 Yr.	0	0	0
4.049	500 Yr.	0	0	0
4.036	500 Yr.	0	0	0

River = RIVER-1		Reach = Reach-1		
RS	Profile	Method	Value1	Value2
5.259	FW	1	760	1214
5.029	FW	1	884	1263
5.022	FW	1	866	1250
5.021	FW	1	866	1250
5.018	FW	1	862	1247
5.017	FW	1	862	1247
5.013	FW	1	855	1245
4.859	FW	1	964	1682
4.743	FW	1	949	1337
4.625	FW	1	912	1828
4.612	FW	1	948	1845
4.563	FW	1	887	1857
4.464	FW	1	374	1360
4.419	FW	1	238	1048
4.365	FW	1	295	1039
4.259	FW	1	443	1101
4.165	FW	1	4377	5107
4.16	FW	1	4376	5096
4.157	FW	1	4377	5093
4.148	FW	1	4380	5083
4.080	FW	1	619	1172
4.073	FW	1	647	1195
4.069	FW	1	658	1194
4.057	FW	1	708	1198
4.049	FW	1	721	1196
4.036	FW	1	855	1157

FLOW DATA

Flow Title: Imported Flow 01

Flow File : o:\DRAW5200\2135216\Floodstudy\LOMR Application\Sent to FEMA\2023-01-19 - Resubmittal\HEC-RAS Files\5216FS-CLOMR230123.f01

Flow Data (cfs)

River FW	Reach	RS	10 Yr.	15 Yr.	50 Yr.	100 Yr.	500 Yr.
RIVER-1 11243	Reach-1	5.259	7280	8000	10096	11243	13610
RIVER-1 11243	Reach-1	4.859	7280	8000	10096	11243	13610
RIVER-1 16358	Reach-1	4.743	10212	11300	14451	16358	19884
RIVER-1 16358	Reach-1	4.419	10212	11300	14451	16358	19884
RIVER-1 17157	Reach-1	4.365	10647	11770	15166	17157	20828
RIVER-1 17157	Reach-1	4.069	10647	11770	15166	17157	20828
RIVER-1 17035	Reach-1	4.057	10631	11750	15084	17035	20761
RIVER-1 17035	Reach-1	4.036	10631	11750	15084	17035	20761

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
RIVER-1	Reach-1	10 Yr.		Known WS = 466.8
RIVER-1	Reach-1	15 Yr.		Known WS = 467.45
RIVER-1	Reach-1	50 Yr.		Known WS = 469.35
RIVER-1	Reach-1	100 Yr.		Known WS = 470.33
RIVER-1	Reach-1	500 Yr.		Known WS = 471.68
RIVER-1	Reach-1	FW		Known WS = 470.52

GEOMETRY DATA

Geometry Title: Corrected Effective/Ex Cond Model
 Geometry File : o:\DRAW5200\2135216\Floodstudy\LOMR Application\Sent to FEMA\2023-01-19 - Resubmittal\HEC-RAS
 Files\5216FS-CLOMR230123.g02

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 5.259

INPUT

Description: 5.259

LADUE FIS 25044 STANLEY SURVEY SECT - APROX. 250 FT. D.S.
OF TWOMILE

Station Elevation Data		num=		14					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
647	490	681	480	747	480	772	474	926	472
948	464	1000	463.3	1083	464	1098	470	1228	470
1378	472	1445	476	1507	478	1612	486		

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
647	.08	926	.04	1098	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	926	1098		1114	1229	1189	.1	.3

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 5.029

INPUT

Description: 5.029

LADUE FIS 25044 STANLEY SURVEY SECT - APROX. 250 FT. D.S.
OF TWOMILE

Station Elevation Data		num=		14					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
816	490	835	482	872	480	918	470	965	470
987	460	1000	459.1	1011	460	1032	466	1061	468
1466	470	1563	472	1607	474	1679	486		

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
816	.08	965	.04	1061	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	965	1061		37	37	37	.1	.3

CROSS SECTION

RIVER: RIVER-1

REACH: Reach-1 RS: 5.022

INPUT

Description: 5.022

LADUE FIS 25044 STANLEY SURVEY SECT - APROX. 250 FT. D.S.
OF TWOMILE

Station Elevation Data		num=		20					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
780	490	801	482	852	480	868	476	929	474
947	471	949	465.6	977	459.5	987	459.6	1017	459.3
1019	461.8	1053	471.3	1054	471.3	1074	474.9	1145	472
1229	471.8	1285	472	1526	478	1572	480	1676	486

Manning's n Values		num=		3					
Sta	n Val	Sta	n Val	Sta	n Val				
780	.08	947	.04	1054	.1				

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	947	1054		2	2		.3	.5

CROSS SECTION

RIVER: RIVER-1

REACH: Reach-1 RS: 5.021

INPUT

Description: 5.021

LADUE FIS 25044 STANLEY SURVEY SECT - APROX. 250 FT. D.S.
OF TWOMILE

Station Elevation Data		num=		20					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
780	490	801	482	852	480	868	476	929	474
947	471	949	465.6	977	459.5	987	459.6	1017	459.3
1019	461.8	1053	471.3	1054	471.3	1074	474.9	1145	472
1229	471.8	1285	472	1526	478	1572	480	1676	486

Manning's n Values		num=		3					
Sta	n Val	Sta	n Val	Sta	n Val				
780	.08	947	.04	1054	.1				

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	947	1054		22	22		.3	.5

BRIDGE

RIVER: RIVER-1
 REACH: Reach-1 RS: 5.020

INPUT

Description:

Distance from Upstream XS = .1
 Deck/Roadway Width = 21.85
 Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 7														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
929		474		474	947	474.3		471		949	474.3		471	
1017	474.5		471.2		1053	474.9		471.3		1054	474.9		471.3	
1074	474.9		474.9											

Upstream Bridge Cross Section Data

Station Elevation Data num= 20											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
780	490	801	482	852	480	868	476	929	474		
947	471	949	465.6	977	459.5	987	459.6	1017	459.3		
1019	461.8	1053	471.3	1054	471.3	1074	474.9	1145	472		
1229	471.8	1285	472	1526	478	1572	480	1676	486		

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
780	.08	947	.04	1054	.1

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	947	1054	.3		.5

Downstream Deck/Roadway Coordinates

num= 7														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
929		474		474	947	474.3		471		949	474.3		471	
1017	474.5		471.2		1053	474.9		471.3		1054	474.9		471.3	
1074	474.9		474.9											

Downstream Bridge Cross Section Data

Station Elevation Data num= 20											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
780	490	801	482	852	480	868	476	929	474		
947	471	949	465.6	977	459.5	987	459.6	1017	459.3		
1019	461.8	1053	471.3	1054	471.3	1074	474.9	1145	472		
1229	471.8	1285	472	1526	478	1572	480	1676	486		

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val

780 .08 947 .04 1054 .1

Bank Sta: Left Right Coeff Contr. Expan.
947 1054 .3 .5

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: RIVER-1

REACH: Reach-1 RS: 5.018

INPUT

Description: 5.018

LADUE FIS 25044 STANLEY SURVEY SECT - APROX. 250 FT. D.S.
OF TWOMILE

Station Elevation Data		num=		20					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
780	490	801	482	852	480	868	476	929	474
947	471	949	465.6	977	459.5	987	459.6	1017	459.3
1019	461.8	1053	471.3	1054	471.3	1074	474.9	1145	472
1229	471.8	1285	472	1526	478	1572	480	1676	486

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
780	.08	947	.04	1054	.1

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	947	1054		2	2	2		.3	.5

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 5.017

INPUT

Description: 5.017
 LADUE FIS 25044 STANLEY SURVEY SECT - APROX. 250 FT. D.S.
 OF TWOMILE

Station Elevation Data		num=		20					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
780	490	801	482	852	480	868	476	929	474
947	471	949	465.6	977	459.5	987	459.6	1017	459.3
1019	461.8	1053	471.3	1054	471.3	1074	474.9	1145	472
1229	471.8	1285	472	1526	478	1572	480	1676	486

Manning's n Values		num=		3			
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
780	.08	947	.04	1054	.1		

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	947	1054		22	22	22		.1	.3

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 5.013

INPUT

Description: 5.013
 LADUE FIS 25044 STANLEY SURVEY SECT - APROX. 250 FT. D.S.
 OF TWOMILE

Station Elevation Data		num=		21					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
766	492	792	482	844	480	860	476	924	474
953	470	965	468	982	459.7	1000	458.3	1018	458.6
1048	468	1216	470	1357	471.9	1416	471.9	1537	471
1571	472	1600	480	1618	480	1627	478	1657	478
1702	490								

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 766 .08 965 .04 1048 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 965 1048 810 825 830 .1 .3

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.859

INPUT

Description: 4.859
 LADUE FIS 25044 STANLEY SURVEY SECT - APROX. 250 FT. D.S.
 OF TWOMILE

Station Elevation Data num= 17
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 854 484 895 482 915 476 953 476 989 456
 1000 455.5 1006 456 1011 458 1044 460 1080 466
 1482 467.4 1702 467.4 1712 468 1738 474 1759 476
 1808 478 1858 486

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 854 .08 953 .04 1080 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 953 1080 610 610 610 .1 .3

Blocked Obstructions num= 2
 Sta L Sta R Elev Sta L Sta R Elev
 854 963 468.3 1300 1858 470.5

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.743

INPUT

Description: 4.743
 LADUE FIS 25044 STANLEY SURVEY SECT - APROX. 250 FT. D.S.
 OF TWOMILE

Station Elevation Data num= 10
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 Sta Elev Sta Elev Sta Elev Sta Elev

900	481	938	480	938	472	956	472	990	456
1000	455.3	1016	456	1067	466	1407	466	1480	482

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 900 .08 956 .04 1067 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 956 1067 680 766 771 .1 .3

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.625

INPUT
 Description: 4.625

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
862.8	484	923.8	472	944	470	983.4	456	1000	454.4
1017.3	456	1040.7	458	1083.3	470	1132.5	474	1229.2	474
1259.1	472	1732.4	472	1764.4	458	1811.7	458	1875.9	476
1904.2	480								

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 862.8 .1 944 .04 1083.3 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 944 1083.3 110 105 64 .1 .3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 1732.4 1864.4 472 T

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.612

INPUT
 Description: 4.612

LADUE FIS 24349 STANLEY SURVEY SECT
 Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
885	482	925.7	474	943.8	472	963.6	471.08	980.8	456.98

1000	454.06	1022.2	456.23	1035.7	465.2	1060.1	466	1085.2	476.65
1097.6	476	1133.4	474.91	1149.2	476	1168.2	476.3	1195	476
1256.4	474	1278.8	474	1739	472	1776	458	1792	456
1805	456	1849	470	2075	500				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 885 .1 963.6 .04 1035.7 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 963.6 1035.7 270 255 240 .1 .3
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 1739 2075 472 T

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.563

INPUT

Description: 4.563

LADUE FIS 24094 STANLEY SURVEY SECT
 Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
781	480	851.7	474	890.6	470	936.8	468	960.5	466
972.5	465.37	989.8	454.27	1000	453.43	1033	455.25	1078.5	472.33
1087	474	1116.5	476	1163.7	476.5	1262.8	476	1342.4	474
1676	472	1759	470	1791	458	1807	456	1816	456
2087	500								

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 781 .1 972.5 .04 1078.5 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 972.5 1078.5 480 522.5 525 .1 .3
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 1759 2087 470 T

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.464

927.4	1053.7		261	285	286		.1	.3
Blocked Obstructions			num=	1				
Sta L	Sta R	Elev						
1066.2	1741	478.31						

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.365

INPUT

Description: 4.365

LADUE FIS 23049 STANLEY SURVEY SECT - APROX. 300 FT. D.S.
 OF SEBAGO

Station Elevation Data		num=	29						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
144	480	314	468	393	466	398	465.5	451	474
863.5	470.82	905.8	470.28	931.6	472	941.8	472	979.3	452.93
1000	452.64	1021.6	453.12	1050	477.04	1062	477.04	1084.4	468
1103.5	466	1156.1	465.5	1164.9	466	1186.7	469.7	1208.4	470
1366.1	471	1409.3	472	1512.2	472.6	1548.2	476	1626.5	476.8
1689.1	476	1702.8	474	1732.1	474	1795	502		

Manning's n Values		num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
144	.05	941.8	.045	1050	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
	941.8	1050	580	560	520	.1	.3
Blocked Obstructions		num=	1				
Sta L	Sta R	Elev					
1062	1795	477.04					

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.259

INPUT

Description: 4.259

LADUE FIS 22489 STANLEY SURVEY SECT.

Station Elevation Data		num=	36						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
325	480	371	474	443	470	478	468	873.4	467.43
914.9	467.85	942.1	467.45	962.1	468.15	988.9	452.3	993.1	451.13

1000	450.84	1014.8	451.74	1028.3	452.38	1037.6	460.17	1067.3	462.41
1090.5	471.24	1106.9	472	1120	472	1145.1	473.6	1190.7	473.6
1203.5	474	1224.5	474.7	1231	474	1242.4	473	1257.1	473
1304.5	475	1368.2	476	1394.1	476.7	1411.8	475.4	1436.4	476
1491.1	477	1622.1	477.8	1651.5	481.5	1816	484	1844	485
1860	498								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
325	.05	962.1	.045	1037.6	.03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

962.1	1037.6	480	500	530	.1	.3
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Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
695	798	490	T

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.165

INPUT

Description: 4.165

Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
4058	480	4197	474	4429	468	4529	466	4635	464
4850	464	4910	466	4935	466	4953.2	465.49	4980.8	450.18
5000	449.16	5016	450.11	5040	459.6	5050	470	5054	466
5100	466	5116	466	5116	481	5198	481	5198	466
5247	466	5315	468	5442	470	5556	475	5707	480
5744	485								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
4058	.05	4953.2	.045	5050	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

4953.2	5050	28	28	28	.3	.5
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Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
4572	4711	490	T

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.16

INPUT

Description: 4.16
 This is a REPEATED section.

Station Elevation Data num= 24									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
4031	480	4199	474	4345	470	4525	466	4697	464
4869	464	4913.6	465.4	4930.5	466.1	4957.7	468.1	4975.9	468.52
4980.1	450.18	5000	449.16	5017.4	450.11	5038.3	468.75	5052	467.6
5109.2	465.7	5227	466	5342	468	5414	470	5581	476
5581	490	5714	490	5715	481	5738	483		

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
4031	.075	4975.9	.045	5038.3	.075

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	4975.9	5038.3		14	14		.3	.5

Ineffective Flow num= 2			
Sta L	Sta R	Elev	Permanent
4578	4700	490	T
5117	5179	481	T

BRIDGE

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.158

INPUT

Description: Rock Hill Road Bridge
 Distance from Upstream XS = 1
 Deck/Roadway Width = 12
 Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates					
num= 2					
Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
4975.9	468.52	465.2	5038.3	468.75	465.85

Upstream Bridge Cross Section Data

Station Elevation Data num= 24									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
4031	480	4199	474	4345	470	4525	466	4697	464
4869	464	4913.6	465.4	4930.5	466.1	4957.7	468.1	4975.9	468.52
4980.1	450.18	5000	449.16	5017.4	450.11	5038.3	468.75	5052	467.6

5109.2	465.7	5227	466	5342	468	5414	470	5581	476
5581	490	5714	490	5715	481	5738	483		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
4031	.075	4975.9	.045	5038.3	.075

Bank Sta: Left Right Coeff Contr. Expan.
 4975.9 5038.3 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
4578	4700	490	T
5117	5179	481	T

Downstream Deck/Roadway Coordinates num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
4976	468.8	465.7	5039.7	469.12	466.22

Downstream Bridge Cross Section Data Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
4031	480	4199	474	4345	470	4525	466	4690	464
4863	464	4913.3	465.6	4928.3	466.2	4954	468	4967.6	468.6
4976	468.8	4985.9	450.03	5000	449.16	5017.5	450.02	5039.7	469.12
5049.4	468.4	5079.1	466.6	5103	466	5234	466	5326	468
5585	476	5585	490	5714	490	5715	481	5738	483

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
4031	.075	4976	.045	5039.7	.075

Bank Sta: Left Right Coeff Contr. Expan.
 4976 5039.7 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
4581	4694	490	T
5122	5173	481	T

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Energy

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: RIVER-1

REACH: Reach-1

RS: 4.157

INPUT

Description: 4.157

LADUE FIS 21947 D.S. FACE OF ROCK HILL RD.

Station Elevation Data

num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
4031	480	4199	474	4345	470	4525	466	4690	464
4863	464	4913.3	465.6	4928.3	466.2	4954	468	4967.6	468.6
4976	468.8	4985.9	450.03	5000	449.16	5017.5	450.02	5039.7	469.12
5049.4	468.4	5079.1	466.6	5103	466	5234	466	5326	468
5585	476	5585	490	5714	490	5715	481	5738	483

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
4031	.075	4976	.045	5039.7	.075

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	4976	5039.7		43	43		.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
4581	4694	490	T
5122	5173	481	T

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.148

INPUT

Description: 4.148

Station Elevation Data		num= 22							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
4023	480	4211	474	4377	470	4513	466	4692	464
4824	464	4900	464	4962	464	4982	449.3	5000	448
5015	450.2	5030	463.4	5036	470	5072	470	5082	468
5341	468	5479	474	5500	474	5501	490	5710	490
5711	478	5730	481						

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
4023	.075	4962	.045	5030	.075

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	4962	5030		300	308	255	.1	.3

Ineffective Flow		num= 2	
Sta L	Sta R	Elev	Permanent
4587	4674	490	T
5135	5151	481	T

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.080

INPUT

Description: 4.080

Station Elevation Data		num= 20							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
381.7	480	489.6	474	533.6	472	590.5	470	678.9	468
708.5	466	730.3	464	847.7	462	853.7	462	971.9	460
989.5	448.5	1000	447.15	1011	448.5	1044	468	1151.5	468
1267	468	1304.1	470	1516.9	470	1585.6	472	1797.2	474

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
381.7	.075	971.9	.045	1044	.075

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	971.9	1044		80	92	105	.3	.5

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.073

INPUT

Description: 4.073

Station Elevation Data		num= 30							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
449.2	480	523	476	567.7	474	618.1	472	690	470
715	465	740	462	908	460.3	958	461	979	454.3
990	447.9	1000	446.9	1014	447.5	1023	454.8	1036	461
1050	467.6	1080	465	1098	463	1235	465	1485	468
1541.9	470	1649	472	1690	474	1691	490	1800	490
1801	475	1870	477	1930	480	1955	483	1990	486

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
449.2	.075	958	.045	1036	.075

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	958	1036		18	18	40	.3	.5

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.069

INPUT

Description: 4.069

This is a REPEATED section.

Station Elevation Data		num= 22							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
456.7	480	537.9	476	582.3	474	639.9	472	700.8	470
765	468	842	466	943	461.1	944	461.1	981	460.3
984	448	1003	447.5	1022	447.5	1025	456.6	1026	456.6
1056	459.3	1057	459.4	1206	466.7	1430	468	1555.6	470
1683.8	472	1863.4	474						

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
456.7	.075	981	.045	1025	.075

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	981	1025		64	64	64	.3	.5

BRIDGE

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.060

INPUT

Description: S. McKnight Road Bridge
 Distance from Upstream XS = .5
 Deck/Roadway Width = 63
 Weir Coefficient = 2.4

Upstream Deck/Roadway Coordinates
 num= 24

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
350		486		486	400		483		483	460		480		480
525		477		477	595		474		474	690		471		471
765		468		468	842		466		466	943	465.7		461.1	
944	465.7		464		1003	465.5		463.8		1056	465.2		463.7	
1057	465.2		459.3		1206	466.7		466.7		1430	468		468	
1780		468		468	1880		468		468	1935		471		471
2050		471		471	2080		474		474	2100		477		477
2110		480		480	2125		483		483	2150		486		486

Upstream Bridge Cross Section Data

Station Elevation Data

num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
456.7	480	537.9	476	582.3	474	639.9	472	700.8	470
765	468	842	466	943	461.1	944	461.1	981	460.3
984	448	1003	447.5	1022	447.5	1025	456.6	1026	456.6
1056	459.3	1057	459.4	1206	466.7	1430	468	1555.6	470
1683.8	472	1863.4	474						

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
456.7	.075	981	.045	1025	.075

Bank Sta: Left Right Coeff Contr. Expan.
 981 1025 .3 .5

Downstream Deck/Roadway Coordinates

num= 24

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
350		486		486	400		483		483	460		480		480
525		477		477	595		474		474	690		471		471
765		468		468	842		466		466	943	465.7		461.1	
944	465.7		464		1003	465.5		463.8		1056	465.2		463.7	
1057	465.2		459.3		1206	466.7		466.7		1430	468		468	

1780	468	468	1880	468	468	1935	471	471
2050	471	471	2080	474	474	2100	477	477
2110	480	480	2125	483	483	2150	486	486

Downstream Bridge Cross Section Data

Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
350	486	400	483	462.5	480	497.4	476	572.5	474
634	472	715.9	470	765	468	842	466	943	461.1
944	461.1	981	460.3	984	448	1003	447.5	1022	447.5
1025	456.6	1026	456.6	1056	459.3	1057	459.4	1206	466.7
1430	468	1604.7	470	1708.8	472	1905	474		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
350	.075	981	.045	1025	.075

Bank Sta: Left Right Coeff Contr. Expan.

	981	1025	.3	.5
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Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins = 465.2
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Piers = 1

Pier Data

Pier Station	Upstream=	1003	Downstream=	1003
Upstream	num=	2		
Width	Elev	Width	Elev	
6	447.5	6	464.8	
Downstream	num=	2		
Width	Elev	Width	Elev	
6	447.5	6	464.8	

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
 Yarnell KVal = 1.25
 Selected Low Flow Methods = Yarnell

High Flow Method
 Pressure and Weir flow

Submerged Inlet Cd =
 Submerged Inlet + Outlet Cd = .6726728
 Max Low Cord = 464.8

Additional Bridge Parameters

Add Friction component to Momentum
 Do not add Weight component to Momentum
 Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end
 Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.057

INPUT

Description: 4.057
 LADUE FIS 21422 D.S. FACE OF MCKNIGHT RD. - ROCK HILL
 CORPORATE LIMITS

Station Elevation Data num= 24									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
350	486	400	483	462.5	480	497.4	476	572.5	474
634	472	715.9	470	765	468	842	466	943	461.1
944	461.1	981	460.3	984	448	1003	447.5	1022	447.5
1025	456.6	1026	456.6	1056	459.3	1057	459.4	1206	466.7
1430	468	1604.7	470	1708.8	472	1905	474		

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
350	.075	981	.045	1025	.075

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	981	1025		43	43		.3	.5

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.049

INPUT

Description: 4.049

Station Elevation Data num= 16									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
459.1	480	514.5	476	552	474	613.4	472	654.5	470

950	465	965	460	977	455	985	446.8	1015	446.8
1030	455	1050	460	1070	465	1605.4	470	1707.3	472
1903.2	474								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
459.1	.07	950	.04	1070	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	950	1070		100	70		.1	.3

CROSS SECTION

RIVER: RIVER-1
 REACH: Reach-1 RS: 4.036

INPUT

Description: 4.036

BRENTWOOD FIS =4.15

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
731	480	794.1	474	819.8	472	853.5	470	867	465
963	460	973	455	985	445.9	1015	445.9	1055	465
1268.9	468	1583.4	470	1703.1	472	1880.4	474		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
731	.07	963	.04	1055	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	963	1055		0	0		.1	.3

SUMMARY OF MANNING'S N VALUES

River:RIVER-1

Reach	River Sta.	n1	n2	n3
Reach-1	5.259	.08	.04	.1
Reach-1	5.029	.08	.04	.1
Reach-1	5.022	.08	.04	.1
Reach-1	5.021	.08	.04	.1
Reach-1	5.020	Bridge		
Reach-1	5.018	.08	.04	.1

Reach-1	5.017	.08	.04	.1
Reach-1	5.013	.08	.04	.1
Reach-1	4.859	.08	.04	.1
Reach-1	4.743	.08	.04	.1
Reach-1	4.625	.1	.04	.1
Reach-1	4.612	.1	.04	.1
Reach-1	4.563	.1	.04	.1
Reach-1	4.464	.05	.045	.03
Reach-1	4.419	.05	.045	.03
Reach-1	4.365	.05	.045	.03
Reach-1	4.259	.05	.045	.03
Reach-1	4.165	.05	.045	.08
Reach-1	4.16	.075	.045	.075
Reach-1	4.158	Bridge		
Reach-1	4.157	.075	.045	.075
Reach-1	4.148	.075	.045	.075
Reach-1	4.080	.075	.045	.075
Reach-1	4.073	.075	.045	.075
Reach-1	4.069	.075	.045	.075
Reach-1	4.060	Bridge		
Reach-1	4.057	.075	.045	.075
Reach-1	4.049	.07	.04	.06
Reach-1	4.036	.07	.04	.06

SUMMARY OF REACH LENGTHS

River: RIVER-1

Reach	River Sta.	Left	Channel	Right
Reach-1	5.259	1114	1229	1189
Reach-1	5.029	37	37	37
Reach-1	5.022	2	2	2
Reach-1	5.021	22	22	22
Reach-1	5.020	Bridge		
Reach-1	5.018	2	2	2
Reach-1	5.017	22	22	22
Reach-1	5.013	810	825	830
Reach-1	4.859	610	610	610
Reach-1	4.743	680	766	771
Reach-1	4.625	110	105	64
Reach-1	4.612	270	255	240
Reach-1	4.563	480	522.5	525
Reach-1	4.464	218	238	238

Reach-1	4.419	261	285	286
Reach-1	4.365	580	560	520
Reach-1	4.259	480	500	530
Reach-1	4.165	28	28	28
Reach-1	4.16	14	14	14
Reach-1	4.158	Bridge		
Reach-1	4.157	43	43	43
Reach-1	4.148	300	308	255
Reach-1	4.080	80	92	105
Reach-1	4.073	18	18	40
Reach-1	4.069	64	64	64
Reach-1	4.060	Bridge		
Reach-1	4.057	43	43	43
Reach-1	4.049	100	70	20
Reach-1	4.036	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: RIVER-1

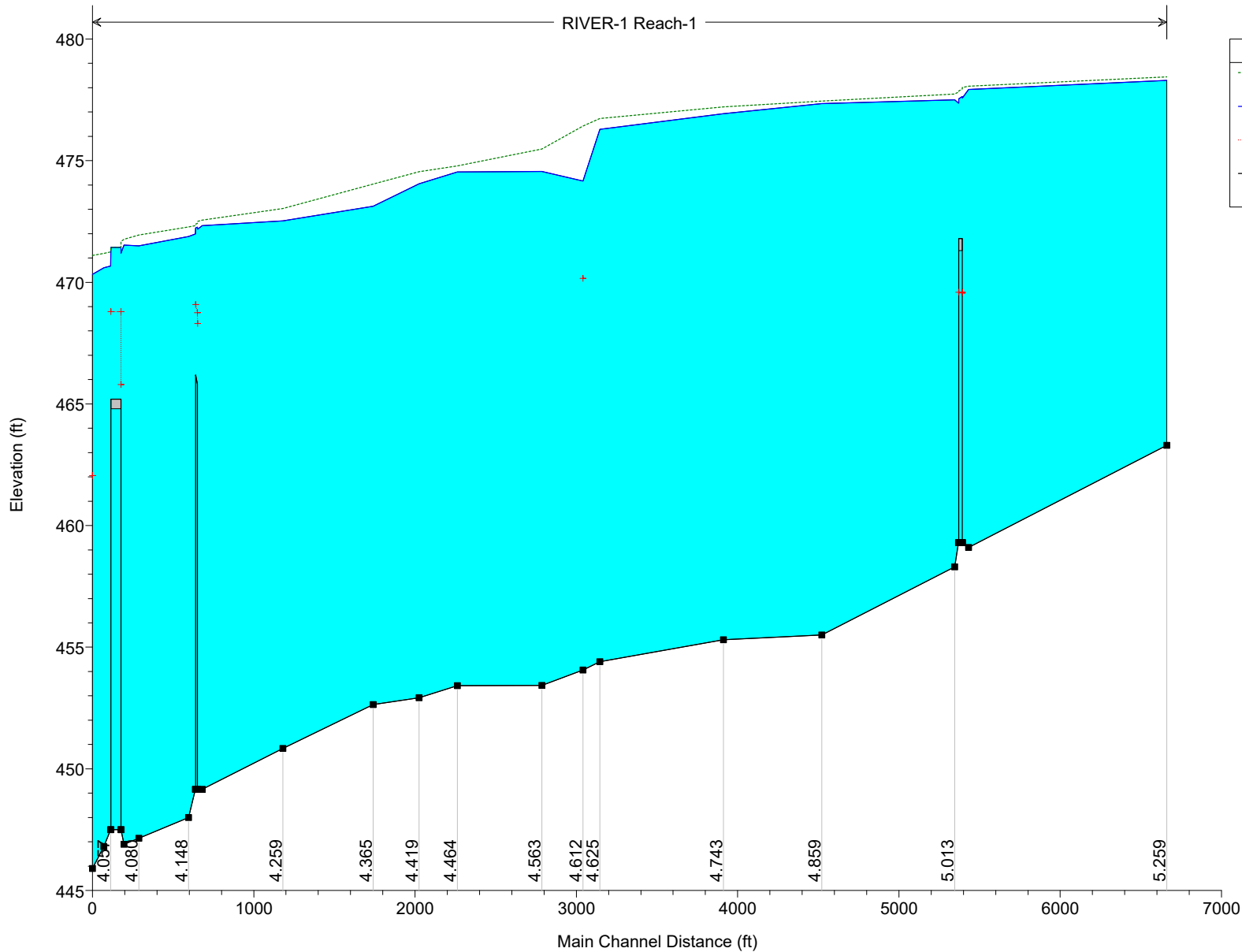
Reach	River Sta.	Contr.	Expan.
Reach-1	5.259	.1	.3
Reach-1	5.029	.1	.3
Reach-1	5.022	.3	.5
Reach-1	5.021	.3	.5
Reach-1	5.020	Bridge	
Reach-1	5.018	.3	.5
Reach-1	5.017	.1	.3
Reach-1	5.013	.1	.3
Reach-1	4.859	.1	.3
Reach-1	4.743	.1	.3
Reach-1	4.625	.1	.3
Reach-1	4.612	.1	.3
Reach-1	4.563	.1	.3
Reach-1	4.464	.1	.3
Reach-1	4.419	.1	.3
Reach-1	4.365	.1	.3
Reach-1	4.259	.1	.3
Reach-1	4.165	.3	.5
Reach-1	4.16	.3	.5
Reach-1	4.158	Bridge	
Reach-1	4.157	.3	.5
Reach-1	4.148	.1	.3

Reach-1	4.080	.3	.5
Reach-1	4.073	.3	.5
Reach-1	4.069	.3	.5
Reach-1	4.060	Bridge	
Reach-1	4.057	.3	.5
Reach-1	4.049	.1	.3
Reach-1	4.036	.1	.3

HEC-RAS Plan: CE-EXCond River: RIVER-1 Reach: Reach-1 Profile: 100 Yr.

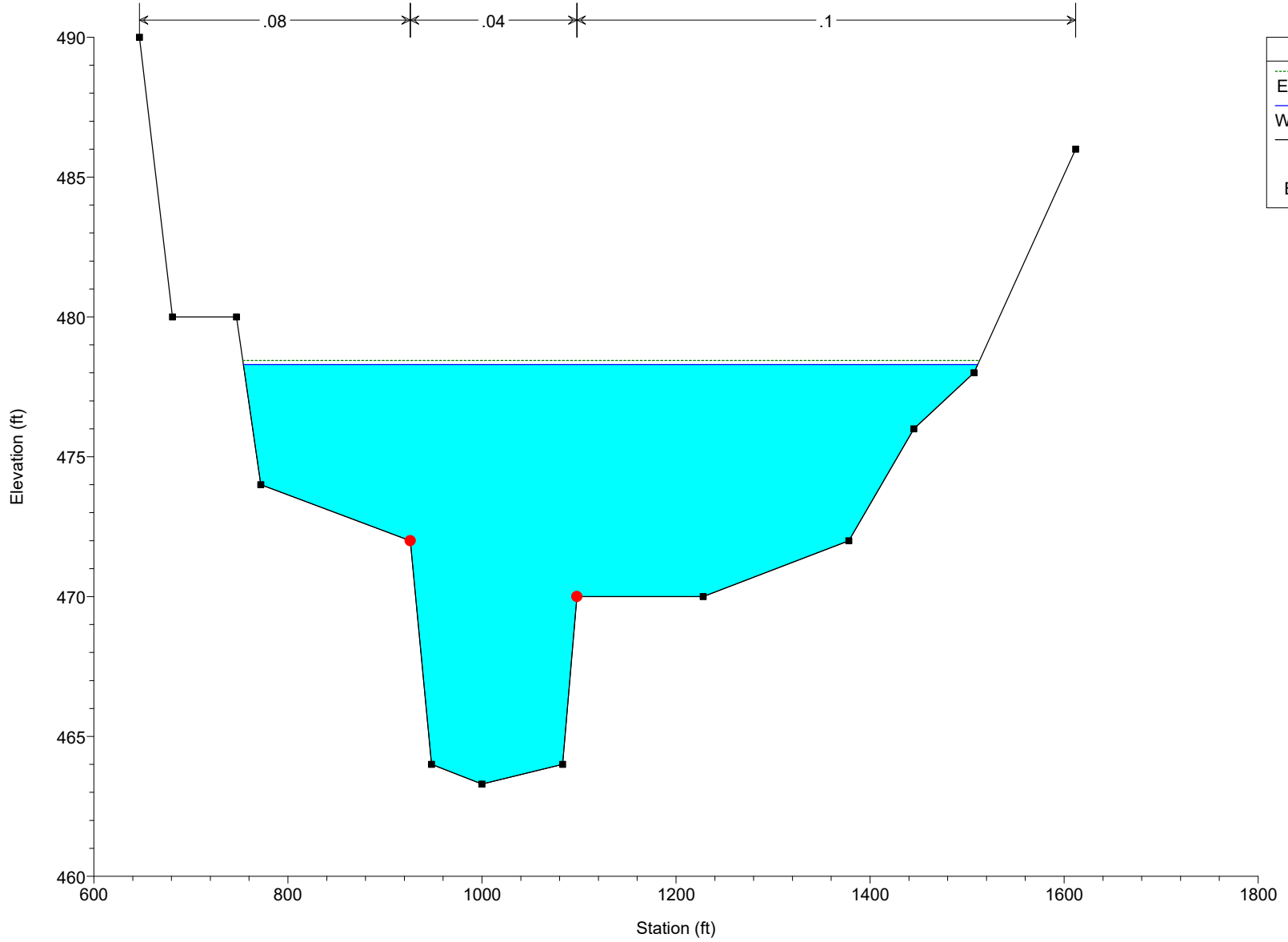
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	5.259	100 Yr.	11243.00	463.30	478.30		478.45	0.000277	3.52	5771.09	756.84	0.17
Reach-1	5.029	100 Yr.	11243.00	459.10	477.93		478.06	0.000363	4.05	6421.99	749.01	0.19
Reach-1	5.022	100 Yr.	11243.00	459.30	477.58		478.01	0.000733	5.80	3637.66	647.55	0.27
Reach-1	5.021	100 Yr.	11243.00	459.30	477.58	469.56	478.01	0.000733	5.80	3636.44	647.47	0.27
Reach-1	5.020		Bridge									
Reach-1	5.018	100 Yr.	11243.00	459.30	477.37		477.82	0.000787	5.95	3498.19	637.97	0.28
Reach-1	5.017	100 Yr.	11243.00	459.30	477.36		477.82	0.000787	5.95	3497.06	637.89	0.28
Reach-1	5.013	100 Yr.	11243.00	458.30	477.51		477.74	0.000464	4.96	5437.61	736.99	0.22
Reach-1	4.859	100 Yr.	11243.00	455.50	477.34		477.45	0.000215	3.31	7507.38	881.42	0.15
Reach-1	4.743	100 Yr.	16358.00	455.30	476.93		477.22	0.000543	5.41	5881.66	518.86	0.24
Reach-1	4.625	100 Yr.	16358.00	454.40	476.29		476.74	0.000672	5.96	5515.25	975.95	0.26
Reach-1	4.612	100 Yr.	16358.00	454.06	474.16	470.16	476.43	0.003462	12.80	2322.99	783.38	0.57
Reach-1	4.563	100 Yr.	16358.00	453.43	474.55		475.48	0.001463	8.42	3815.01	859.86	0.38
Reach-1	4.464	100 Yr.	16358.00	453.42	474.54		474.78	0.000670	4.99	4658.62	718.25	0.22
Reach-1	4.419	100 Yr.	16358.00	452.92	474.05		474.55	0.001289	6.52	3328.78	418.84	0.31
Reach-1	4.365	100 Yr.	17157.00	452.64	473.13		474.04	0.002248	8.64	2903.44	685.77	0.40
Reach-1	4.259	100 Yr.	17157.00	450.84	472.52		473.04	0.001160	7.07	3801.73	730.58	0.30
Reach-1	4.165	100 Yr.	17157.00	449.16	472.33		472.55	0.000579	5.01	6319.93	1151.48	0.21
Reach-1	4.16	100 Yr.	17157.00	449.16	472.18	468.31	472.50	0.001165	6.48	5991.13	1209.39	0.26
Reach-1	4.158		Bridge									
Reach-1	4.157	100 Yr.	17157.00	449.16	471.98		472.33	0.001315	6.78	5747.45	1182.21	0.29
Reach-1	4.148	100 Yr.	17157.00	448.00	471.88		472.27	0.000997	6.77	5870.32	1131.37	0.27
Reach-1	4.080	100 Yr.	17157.00	447.15	471.50		471.94	0.001191	7.06	5308.69	1020.84	0.30
Reach-1	4.073	100 Yr.	17157.00	446.90	471.53		471.77	0.000606	5.42	6979.86	988.86	0.22
Reach-1	4.069	100 Yr.	17157.00	447.50	471.20	465.80	471.67	0.001328	7.85	5481.48	967.87	0.29
Reach-1	4.060		Bridge									
Reach-1	4.057	100 Yr.	17035.00	447.50	470.67		471.25	0.001588	8.45	5042.88	951.20	0.32
Reach-1	4.049	100 Yr.	17035.00	446.80	470.60		471.19	0.000998	6.99	4458.53	993.80	0.31
Reach-1	4.036	100 Yr.	17035.00	445.90	470.33	462.05	471.10	0.001044	7.89	3726.53	755.21	0.32

RIVER-1 Reach-1



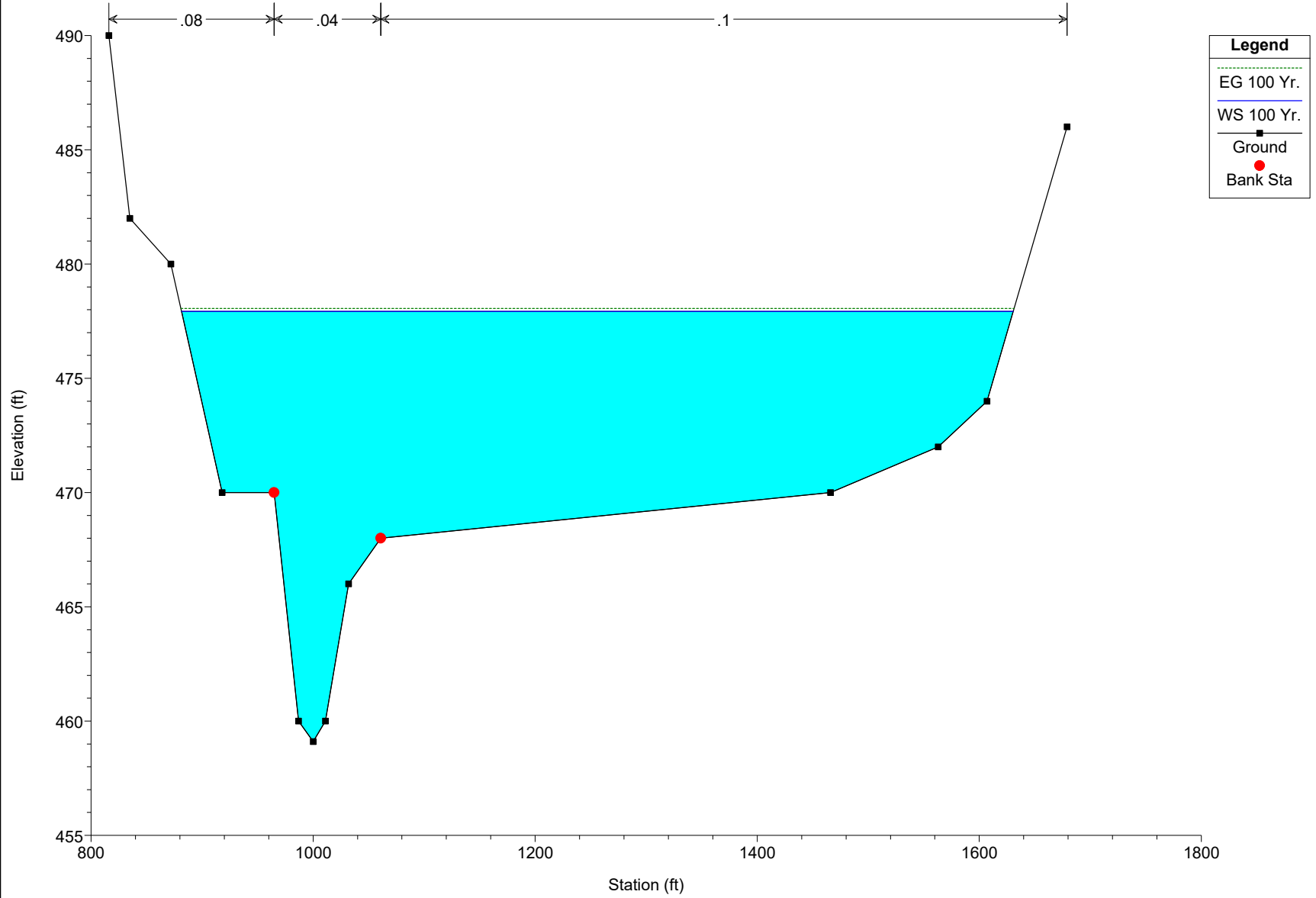
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.259 5.259



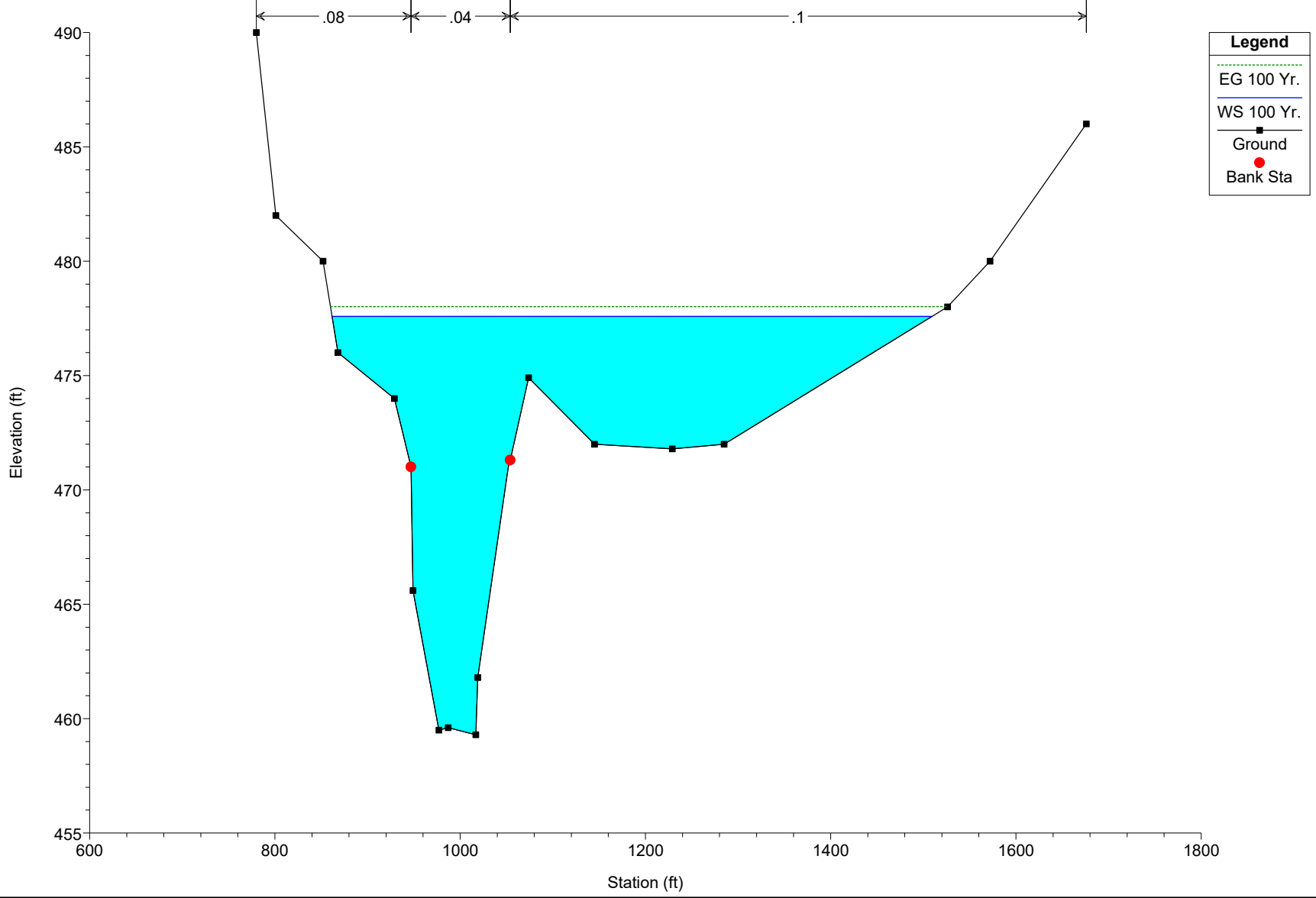
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.029 5.029



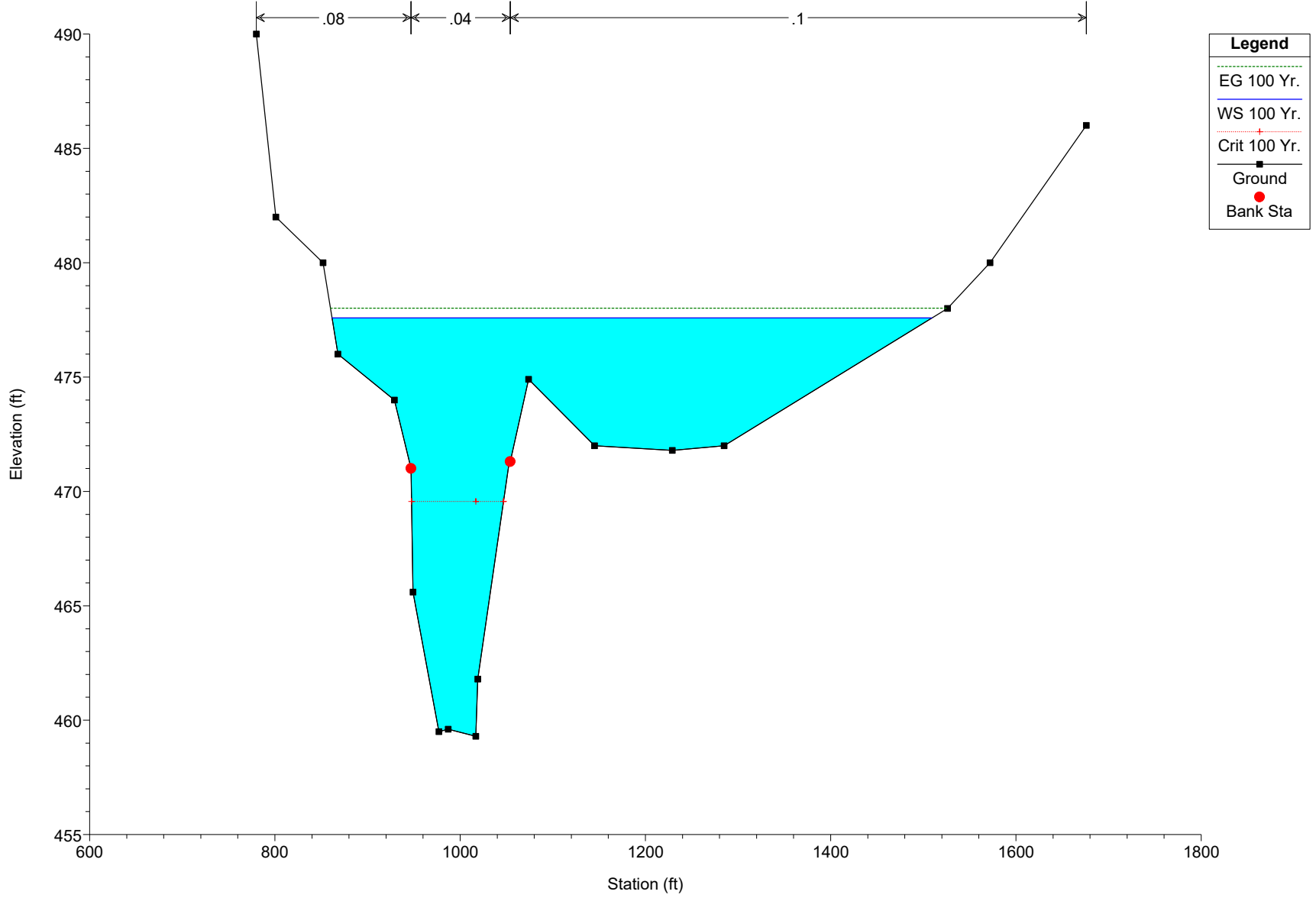
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.022 5.022



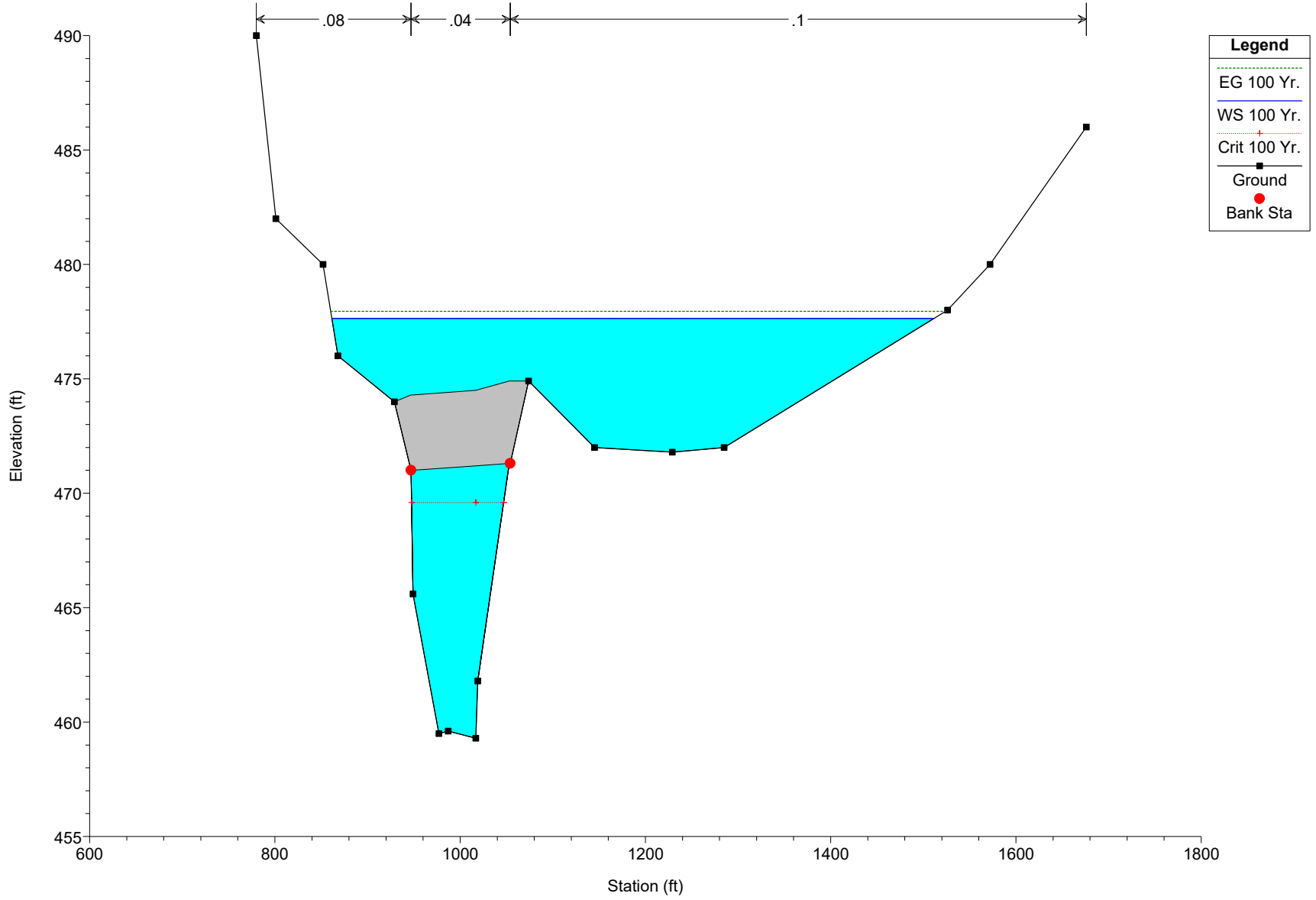
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.021 5.021



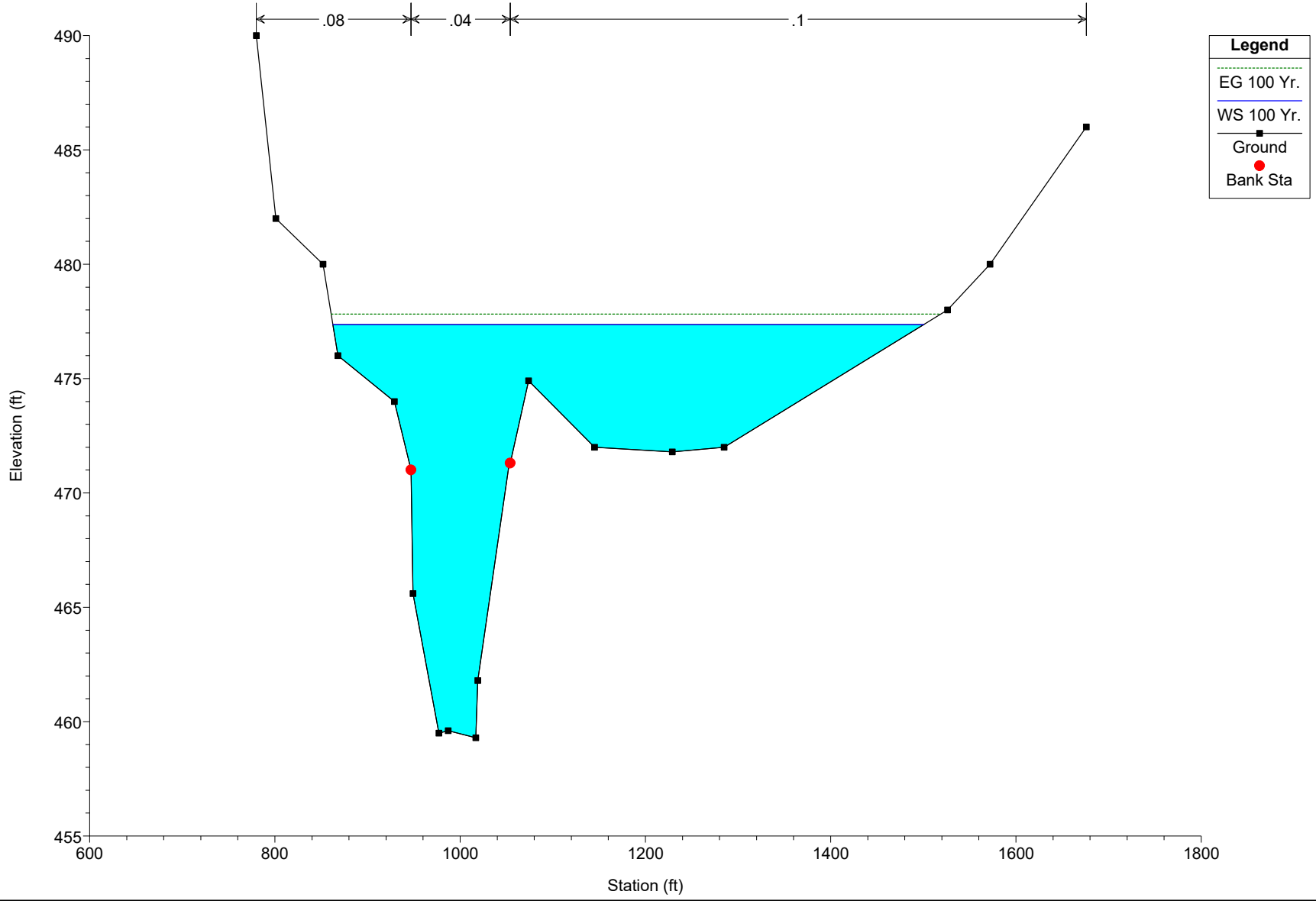
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.020 BR



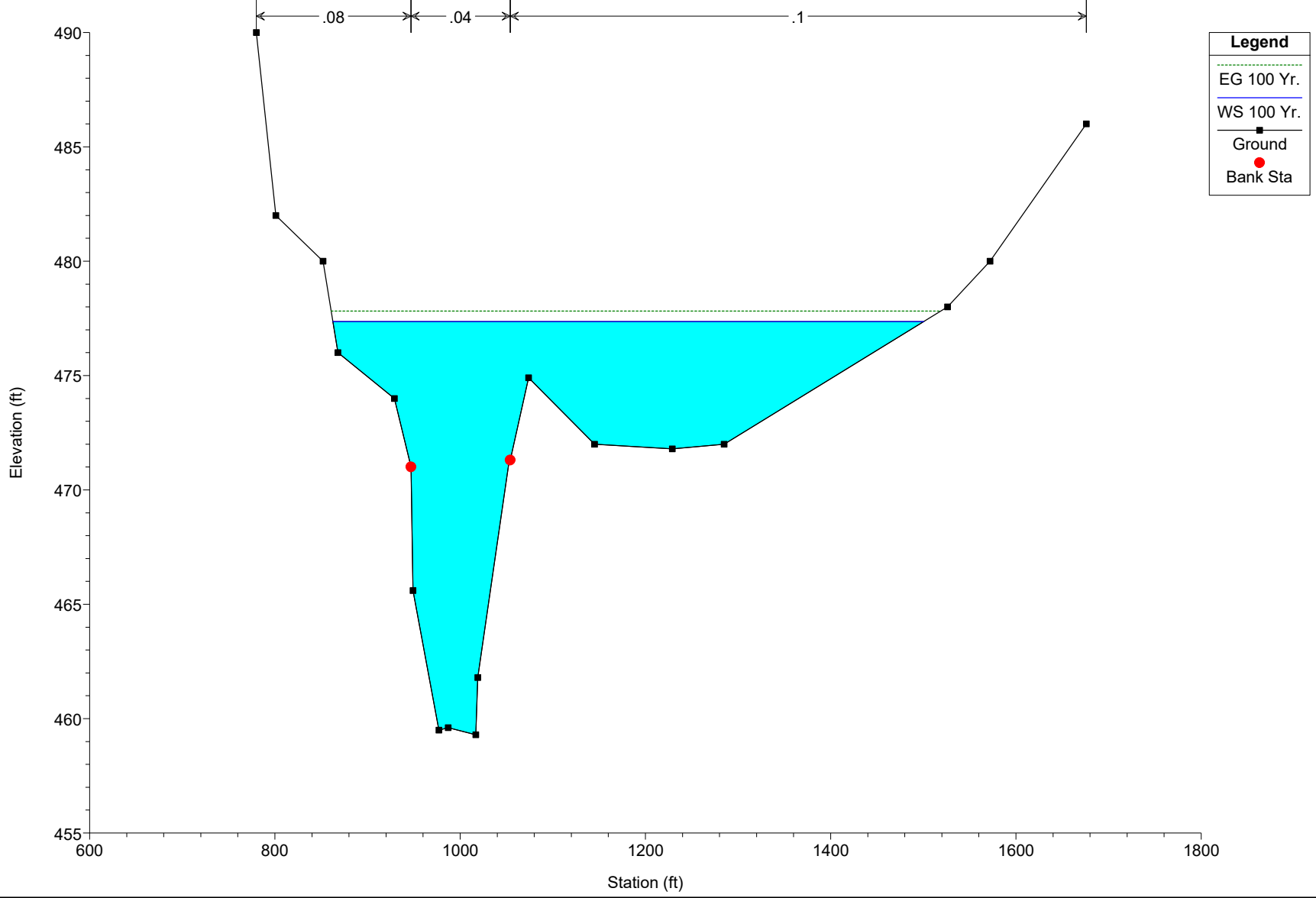
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.018 5.018



5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.017 5.017



Legend

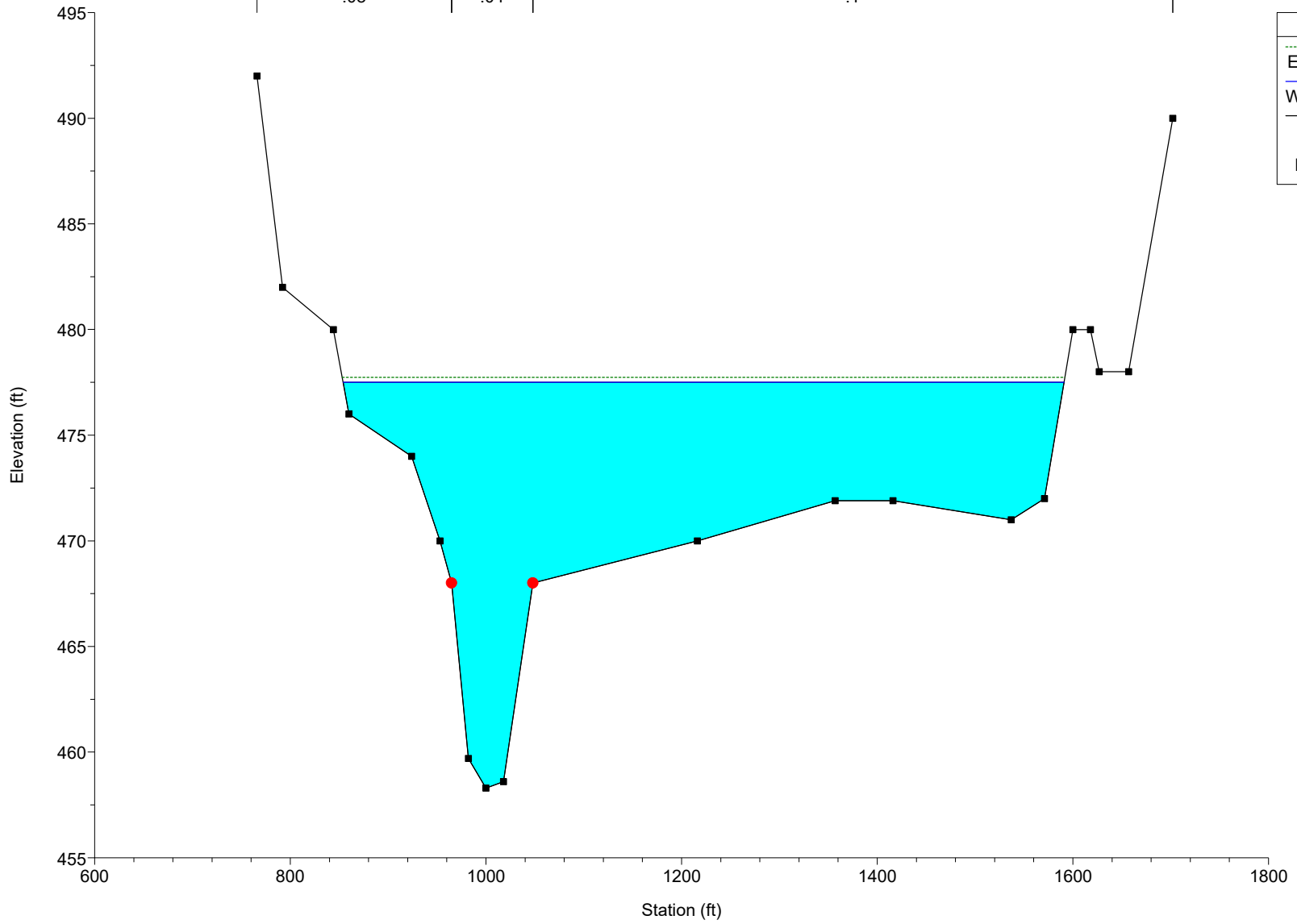
- EG 100 Yr.
- WS 100 Yr.
- Ground
- Bank Sta

5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.013 5.013



Legend	
EG 100 Yr.	--- (dotted line)
WS 100 Yr.	— (solid line)
Ground	■ (black square)
Bank Sta	● (red circle)

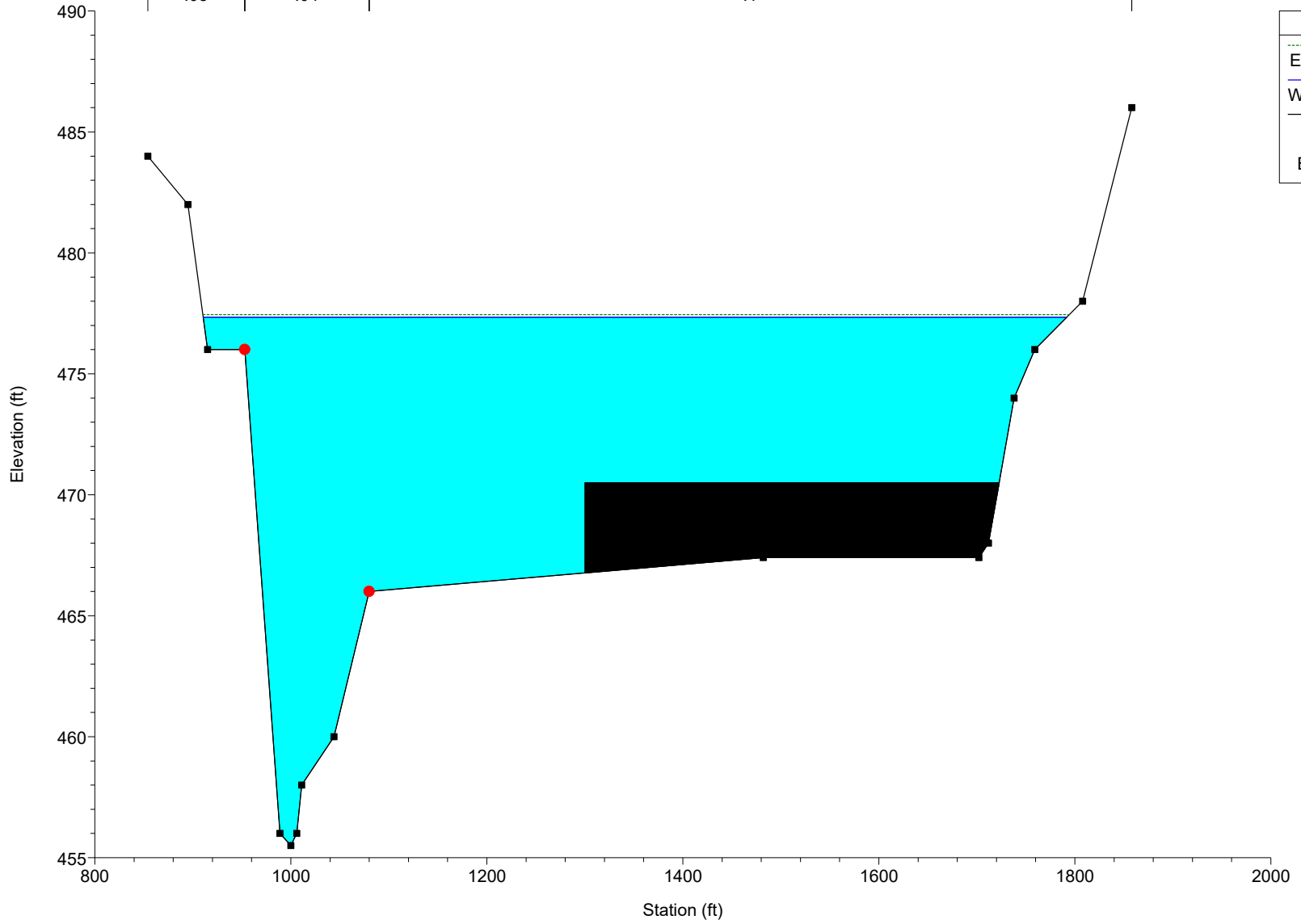


5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.859 4.859

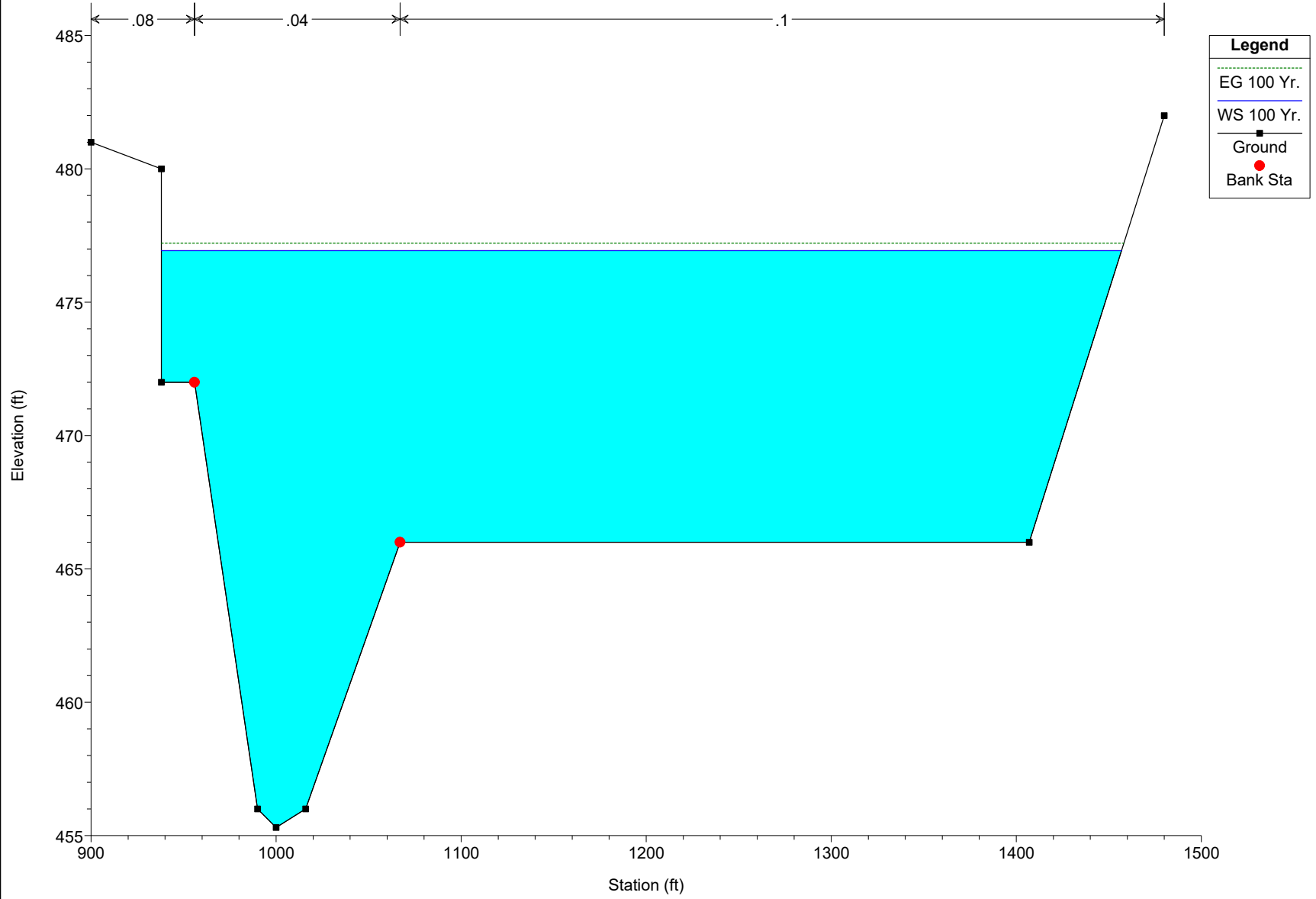
← .08 → | ← .04 → | ← .1 →

Legend	
EG 100 Yr.	— (dotted line)
WS 100 Yr.	— (solid line)
Ground	■ (black square)
Bank Sta	● (red circle)



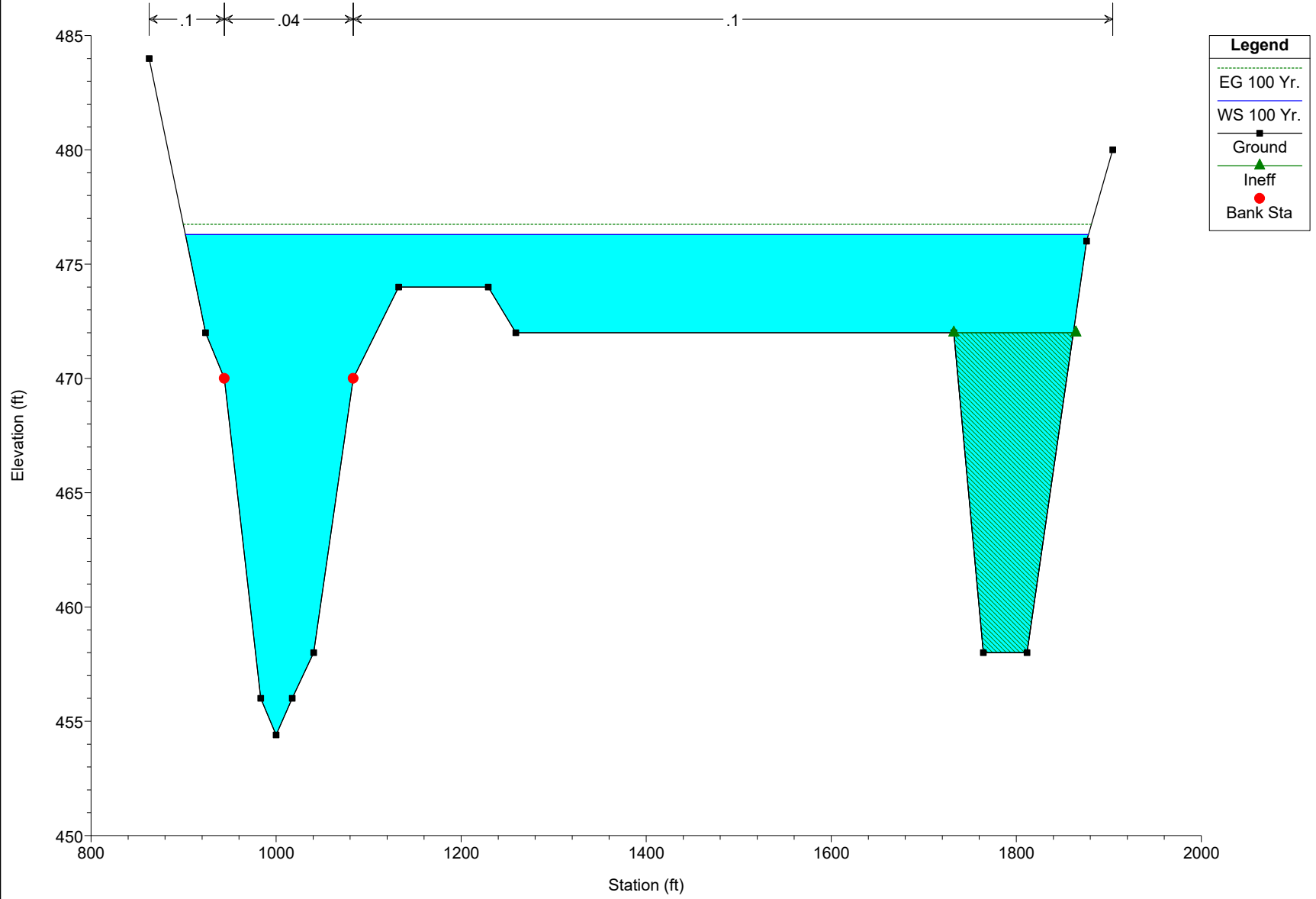
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.743 4.743



5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.625 4.625

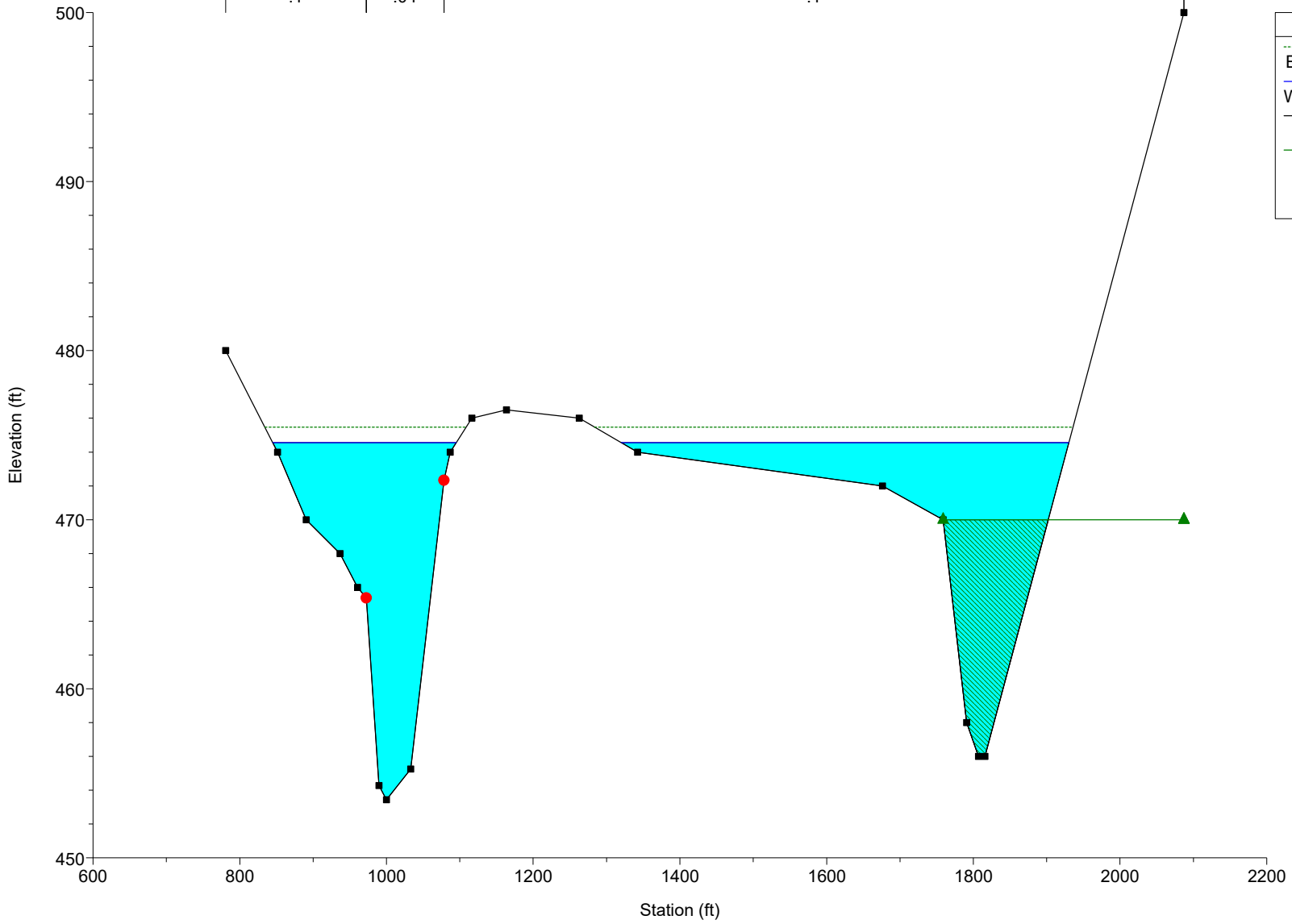


5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.563 4.563

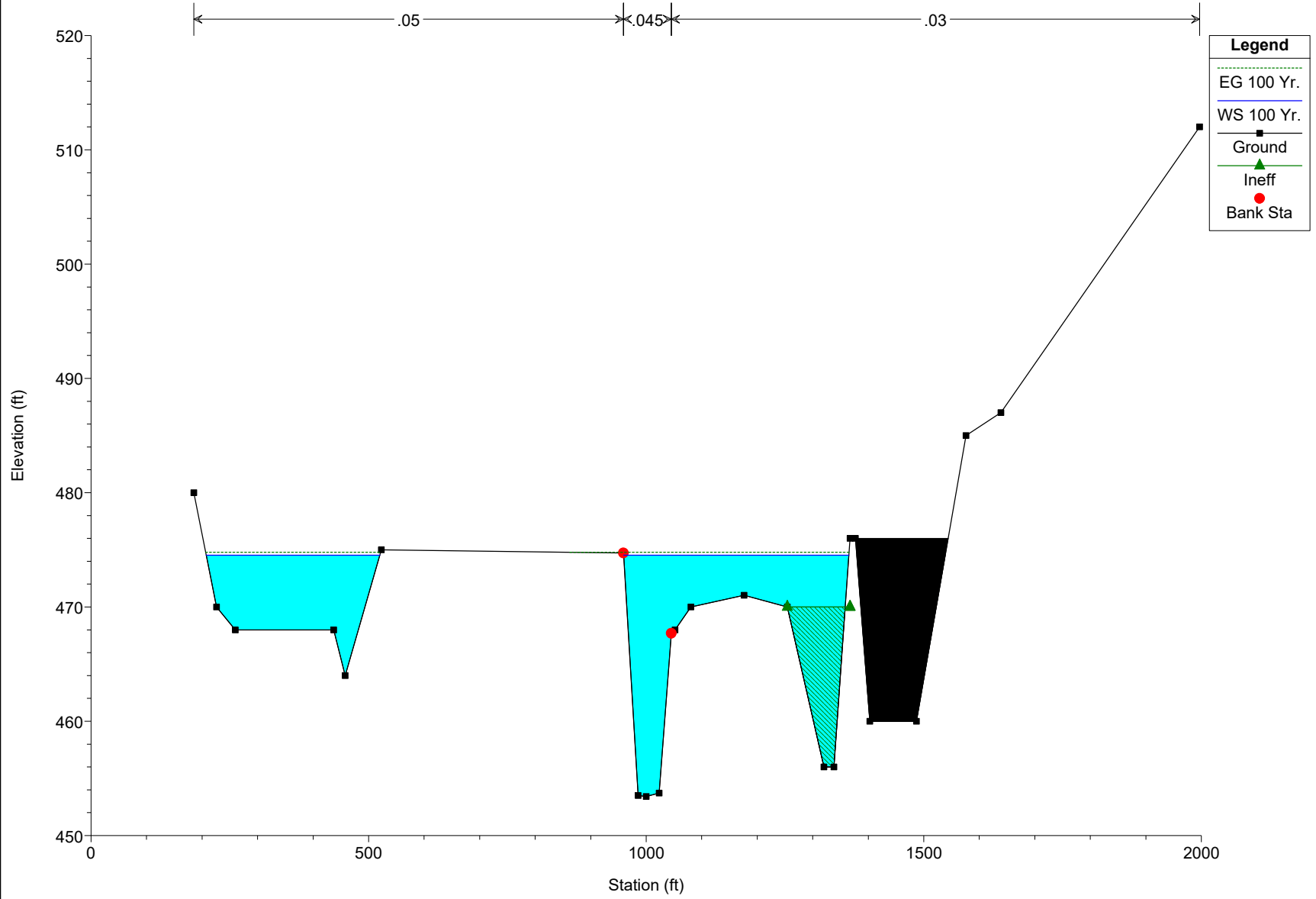


Legend	
EG 100 Yr.	--- (dotted green line)
WS 100 Yr.	— (solid blue line)
Ground	— (solid black line)
Ineff	— (solid green line)
Bank Sta	● (red dot)



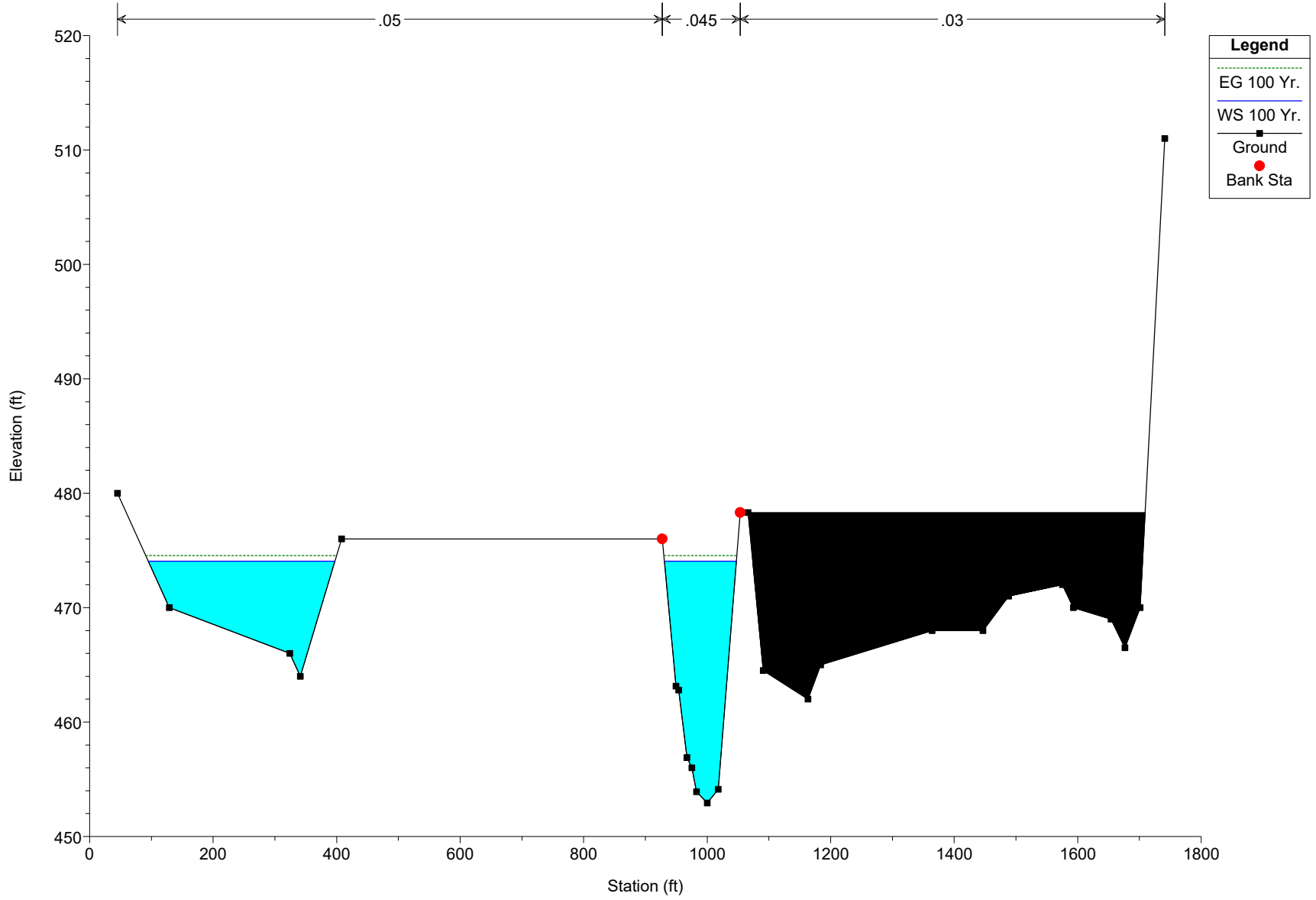
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.464 4.464



5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.419 4.419

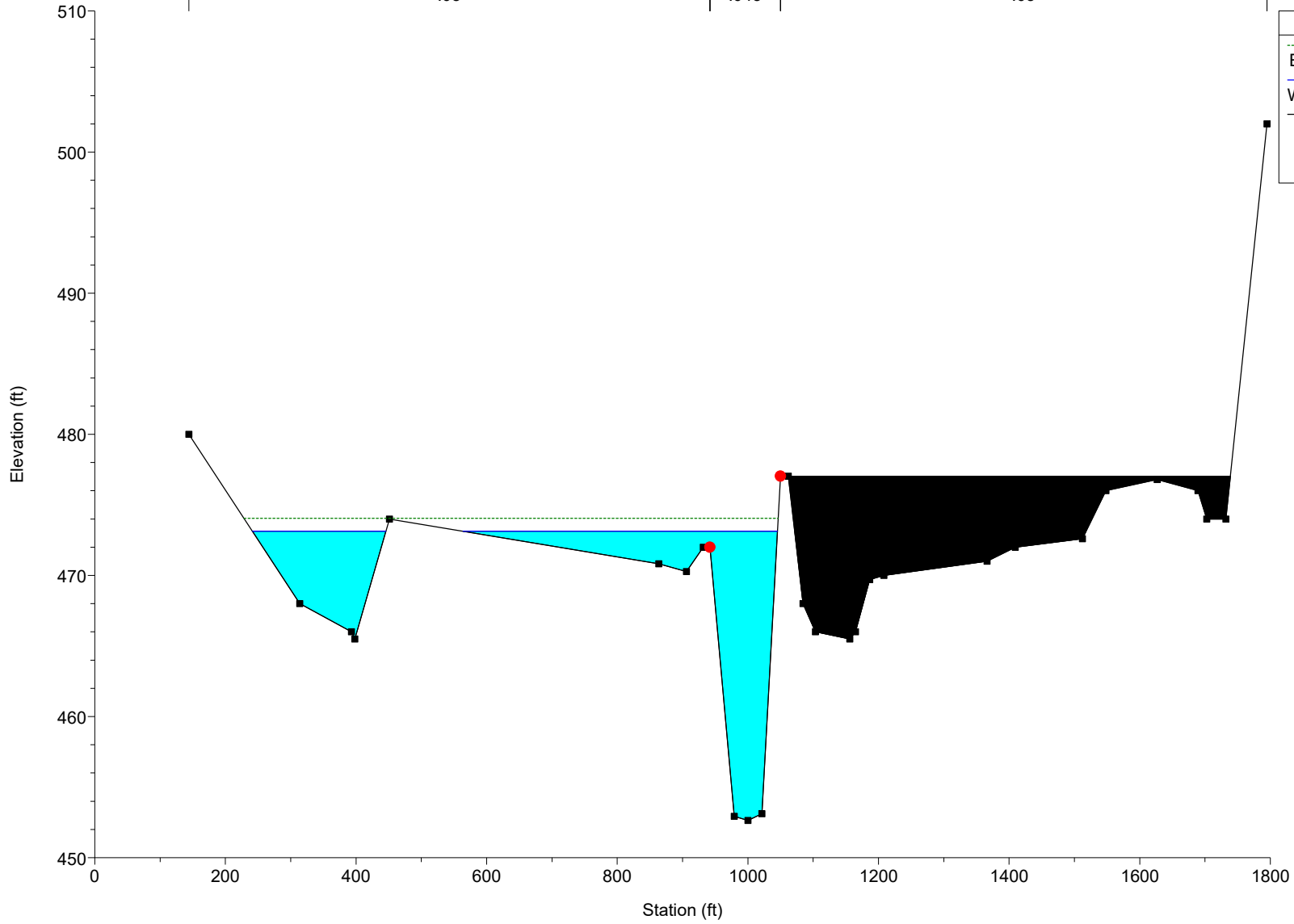


5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.365 4.365

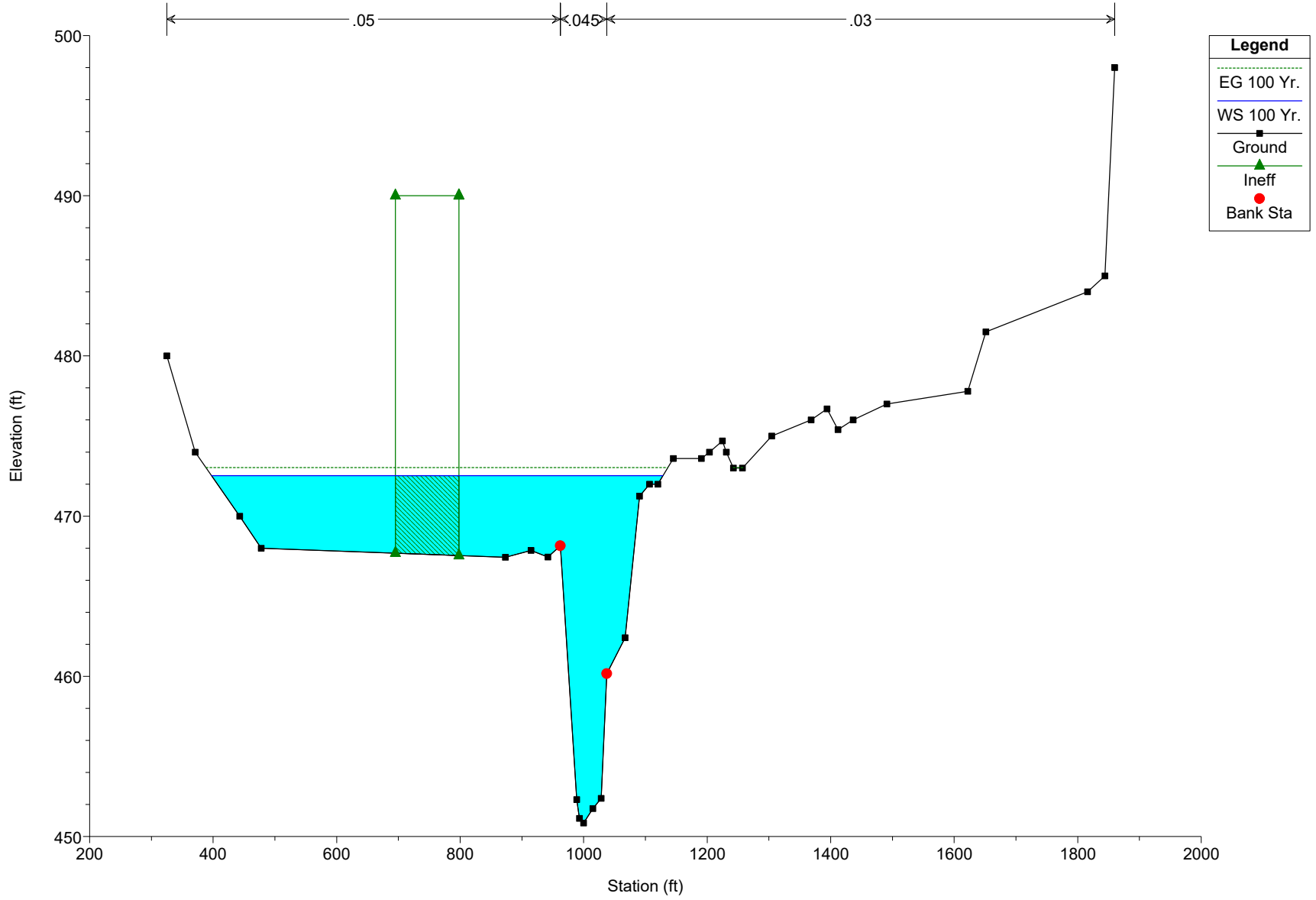
← .05 → † .045 † → .03 →

Legend	
EG 100 Yr.	
WS 100 Yr.	
Ground	
Bank Sta	



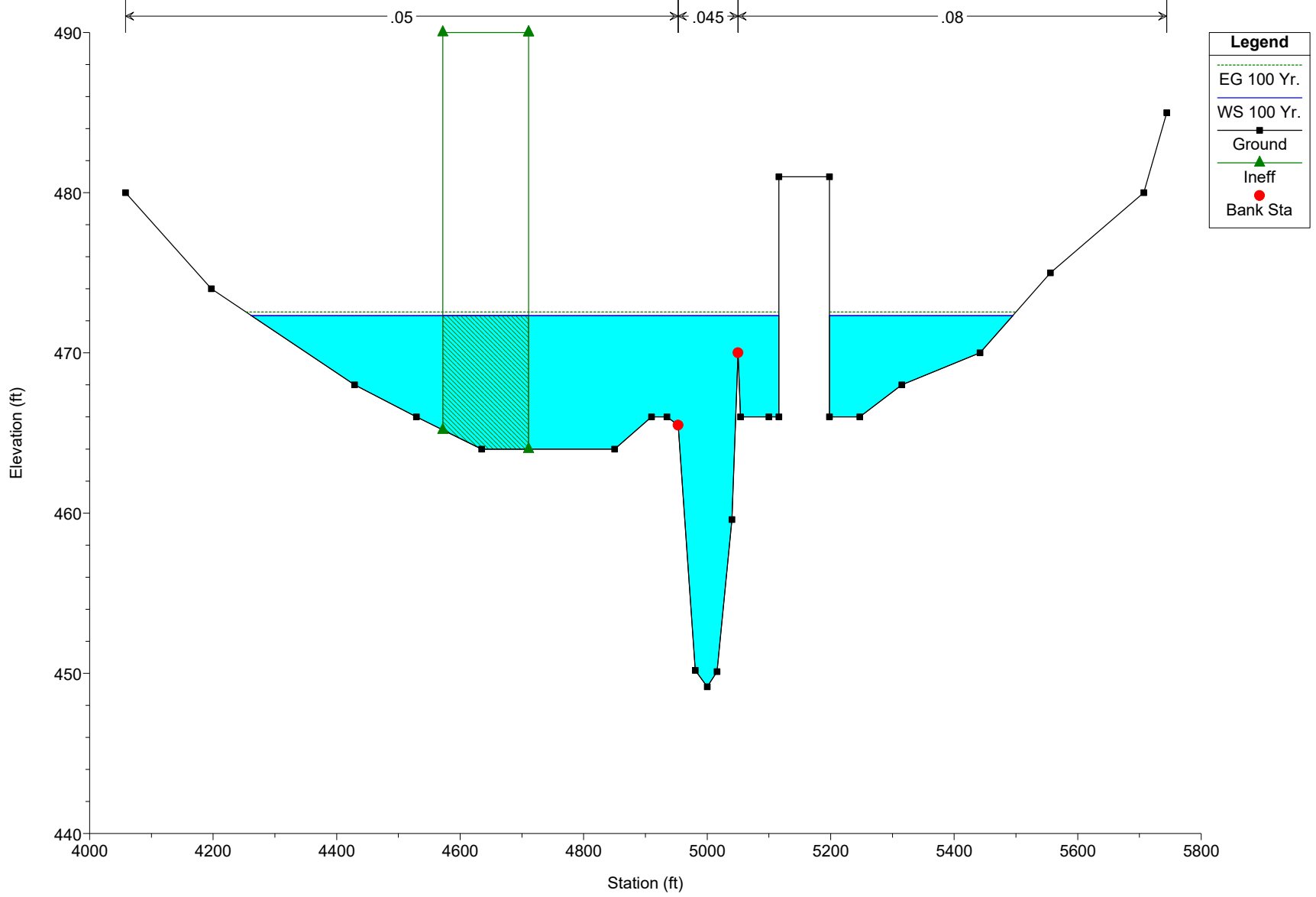
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.259 4.259



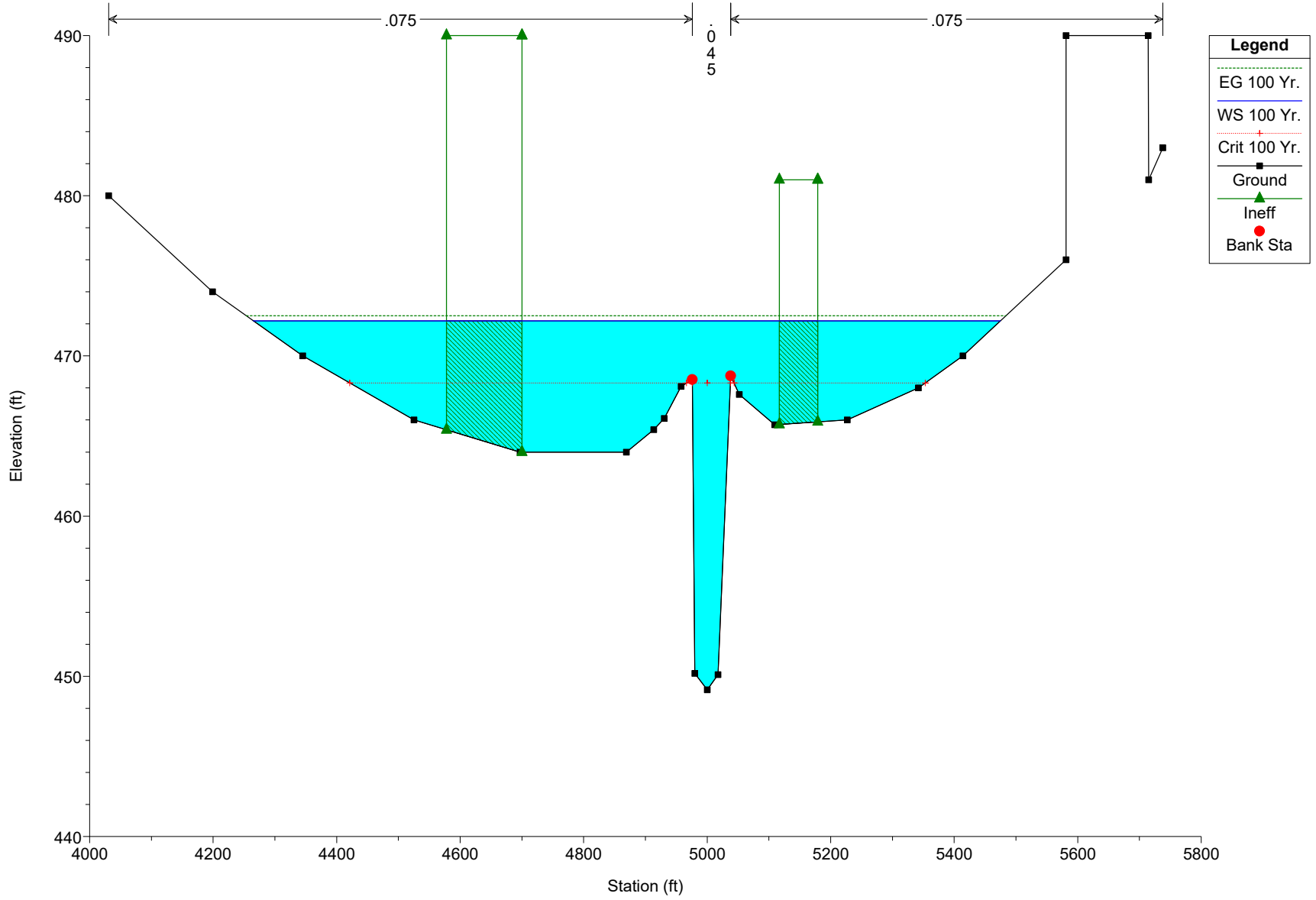
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.165 4.165



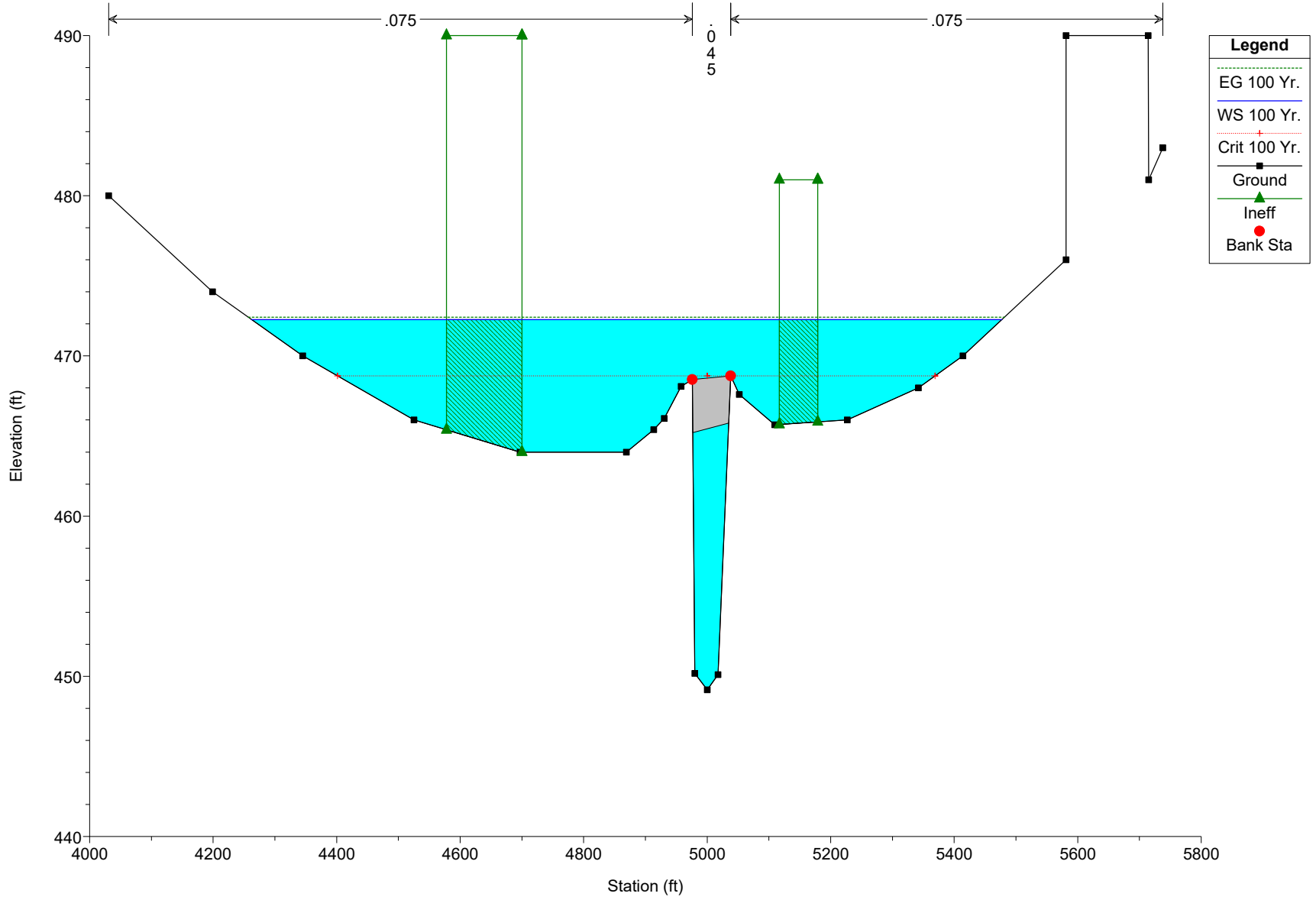
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.16 4.16



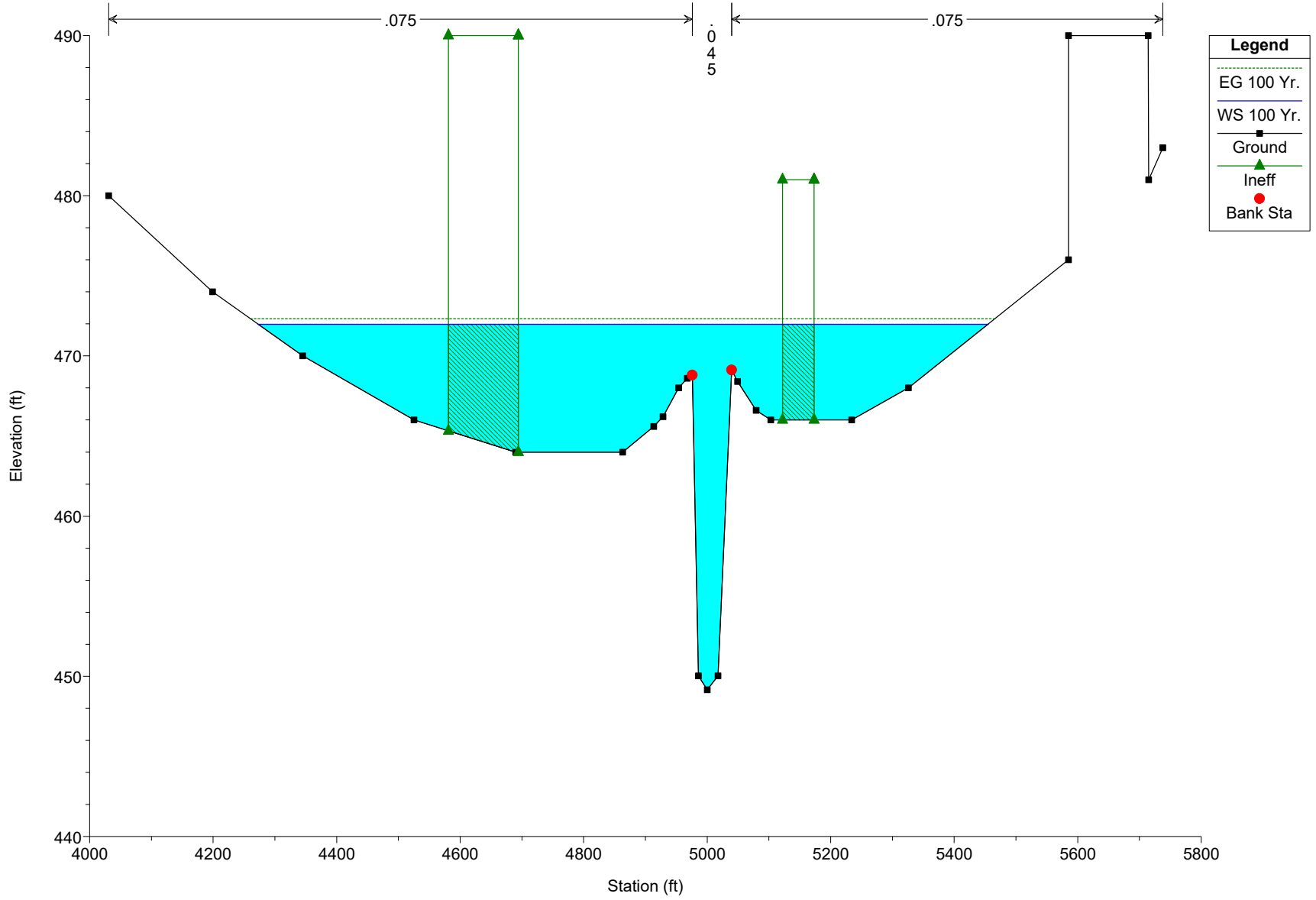
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.158 BR Rock Hill Road Bridge



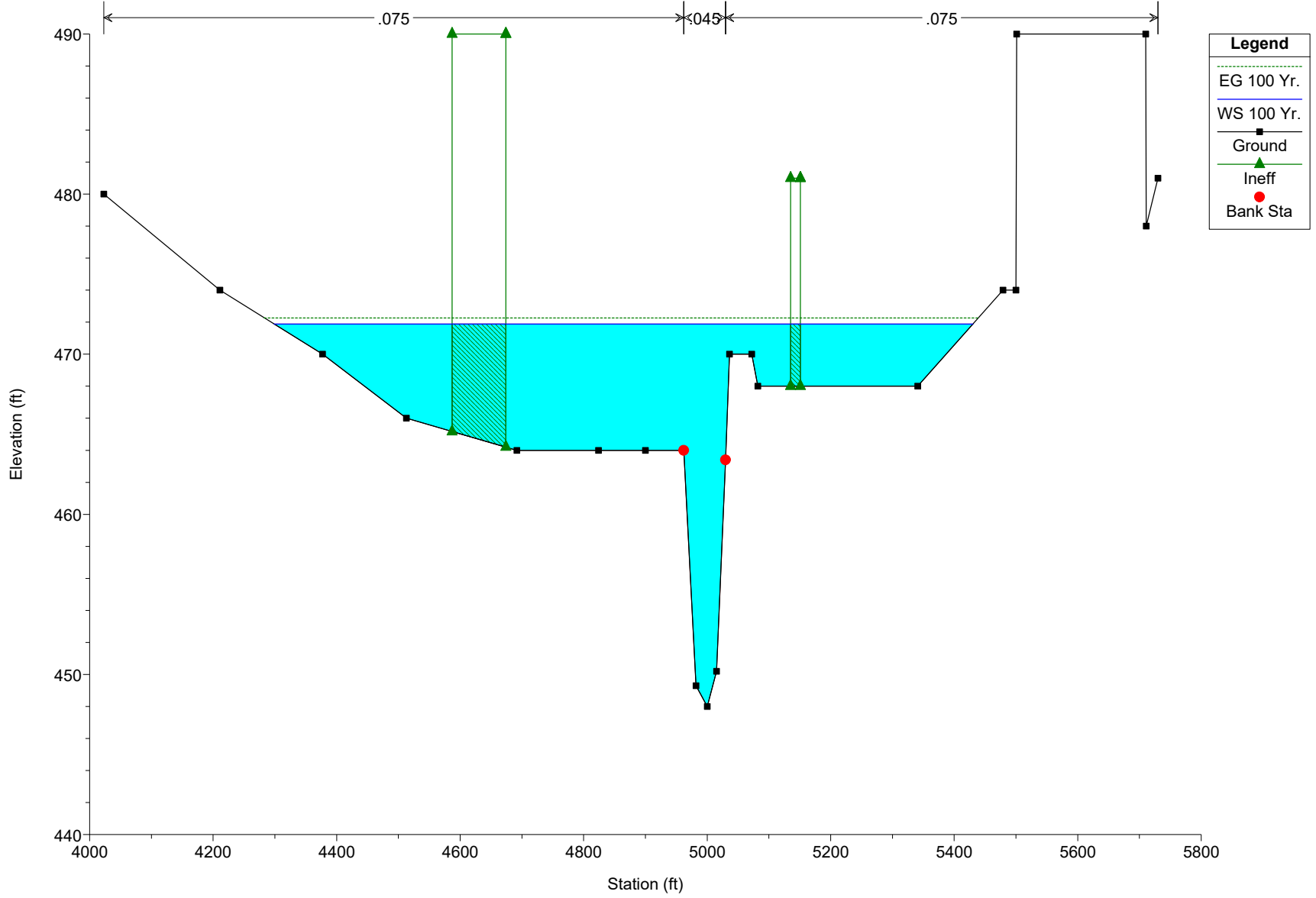
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.157 4.157



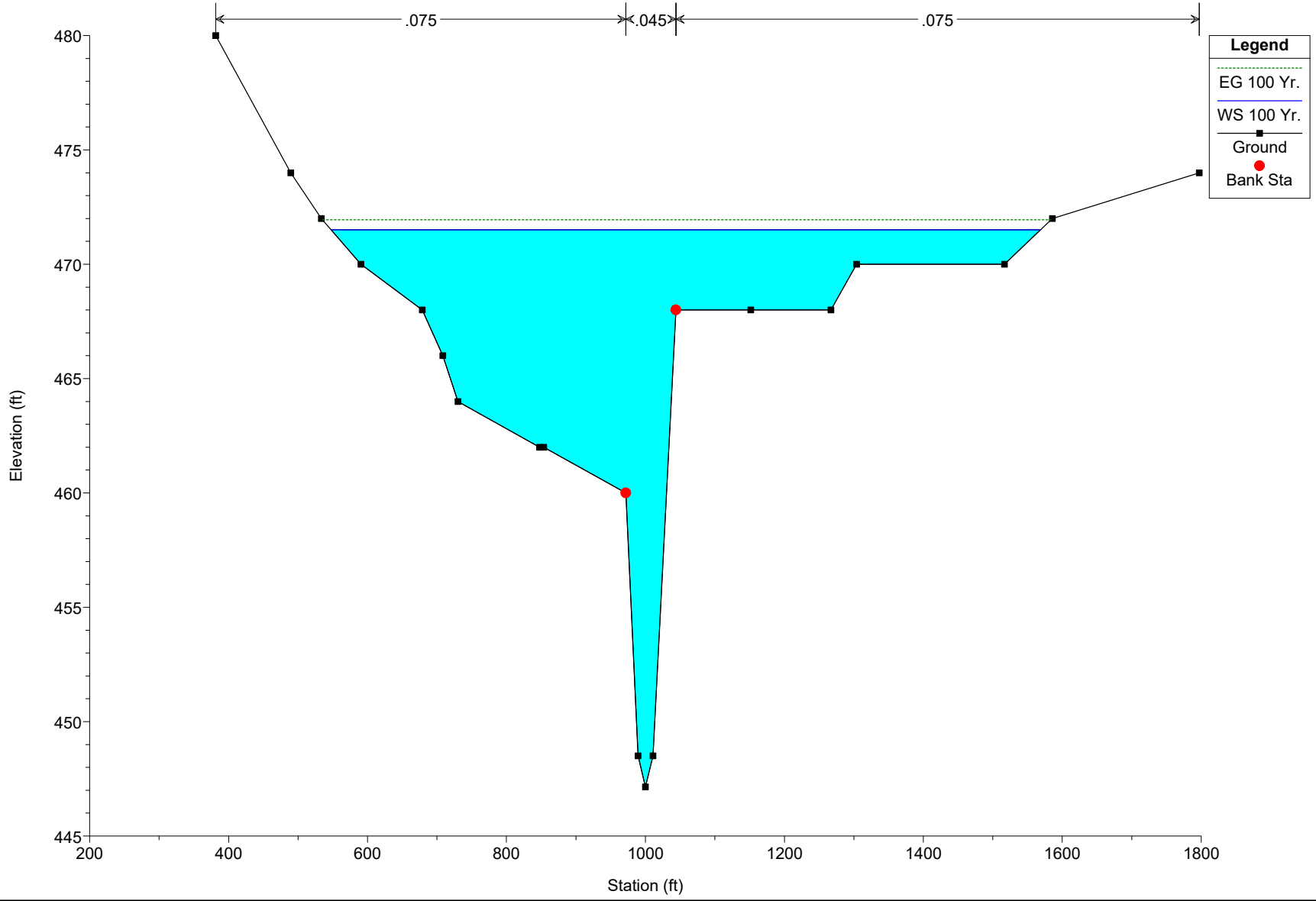
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.148 4.148



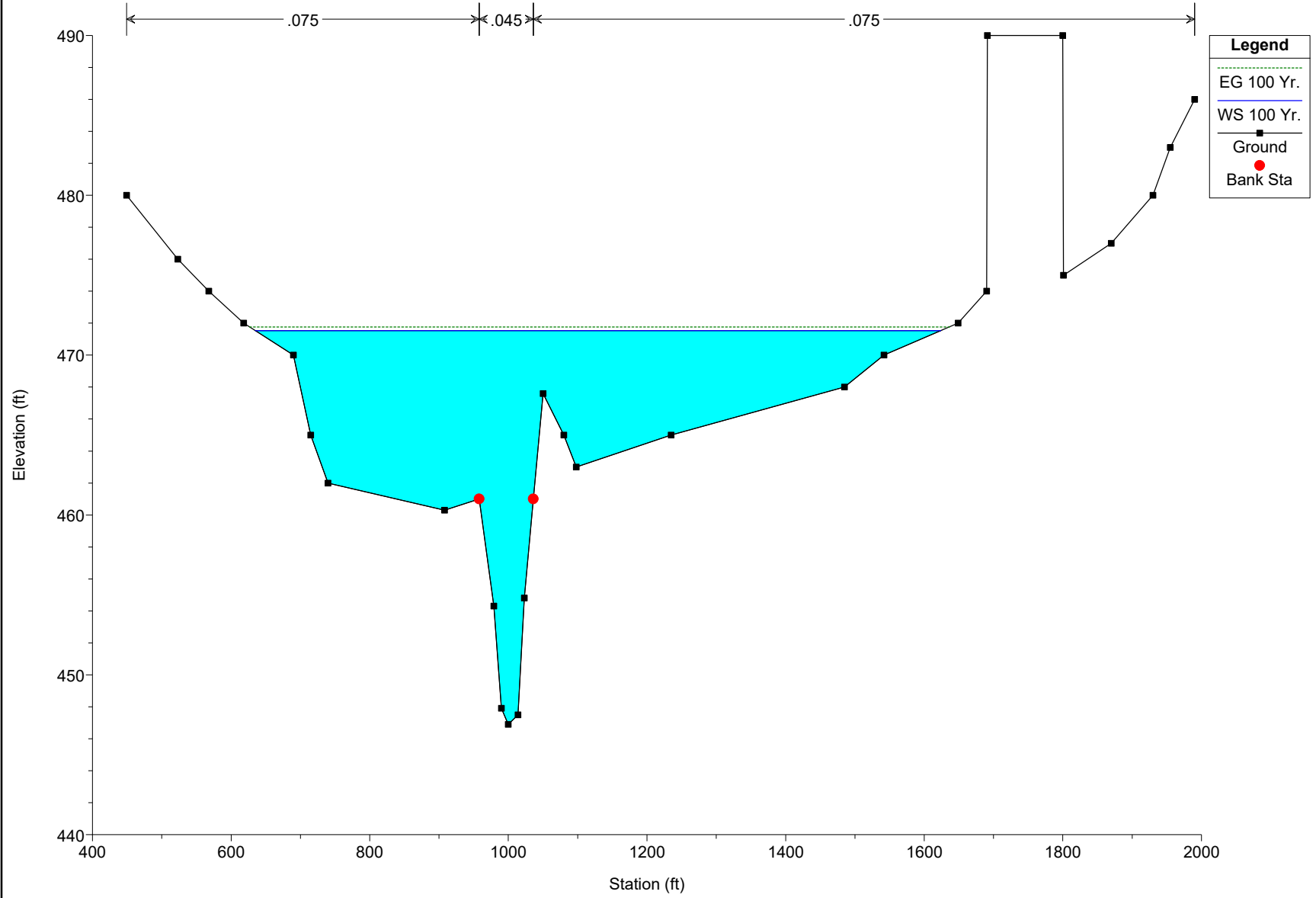
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.080 4.080



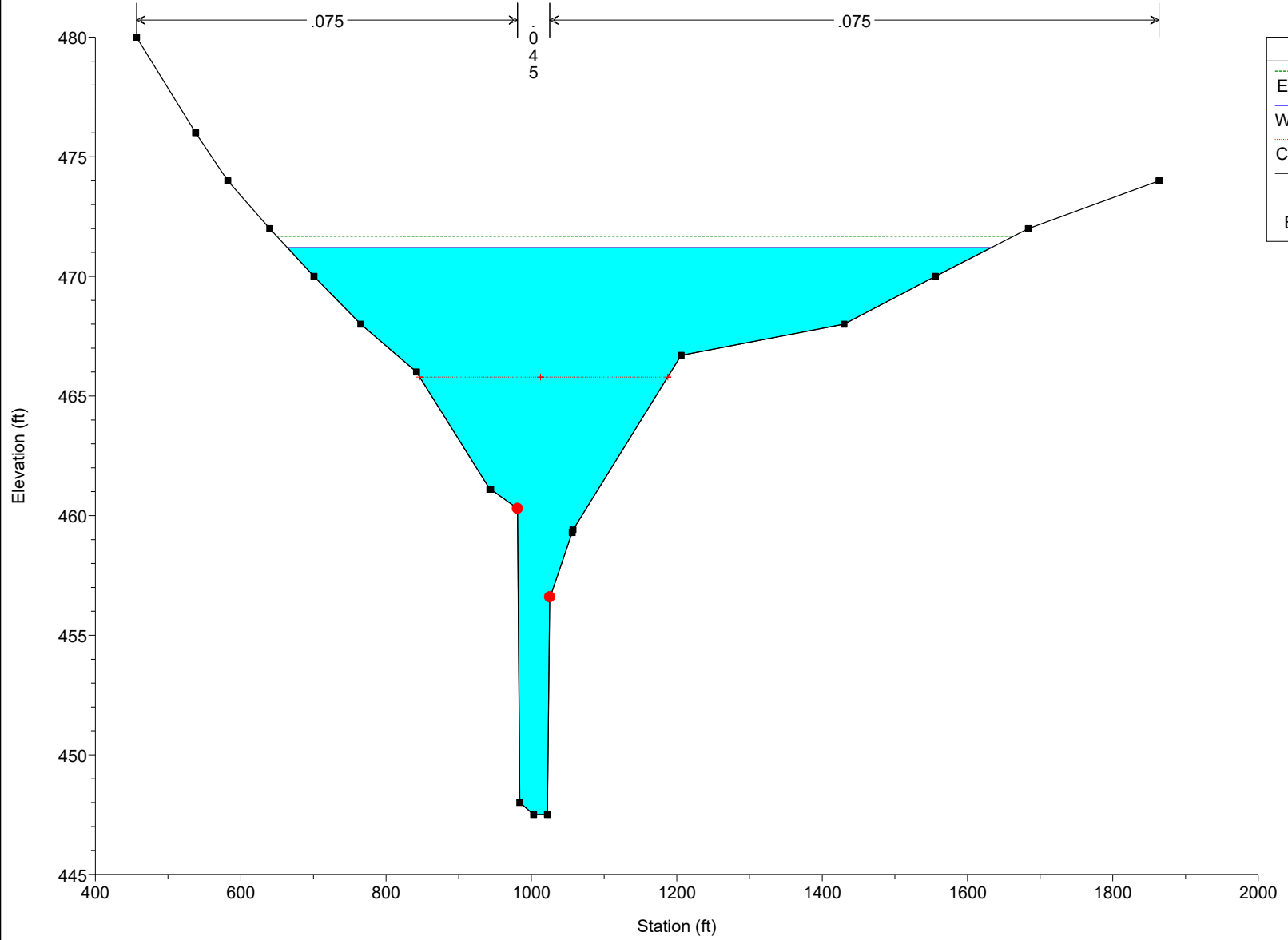
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.073 4.073



5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.069 4.069

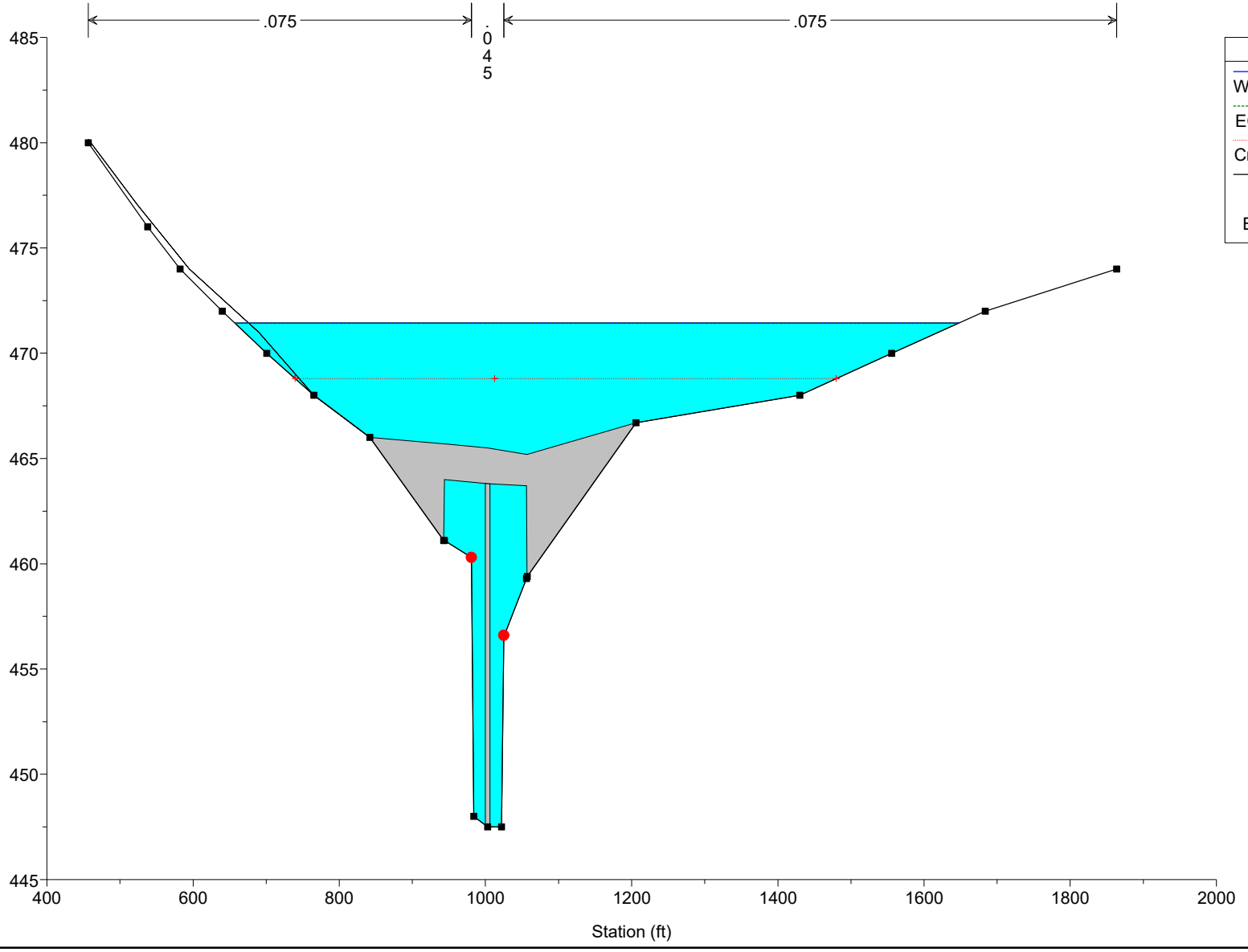


Legend

- EG 100 Yr. (dashed green line)
- WS 100 Yr. (solid blue line)
- Crit 100 Yr. (dashed red line with cross)
- Ground (solid black line with square)
- Bank Sta (red dot)

5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.060 BR S. McKnight Road Bridge

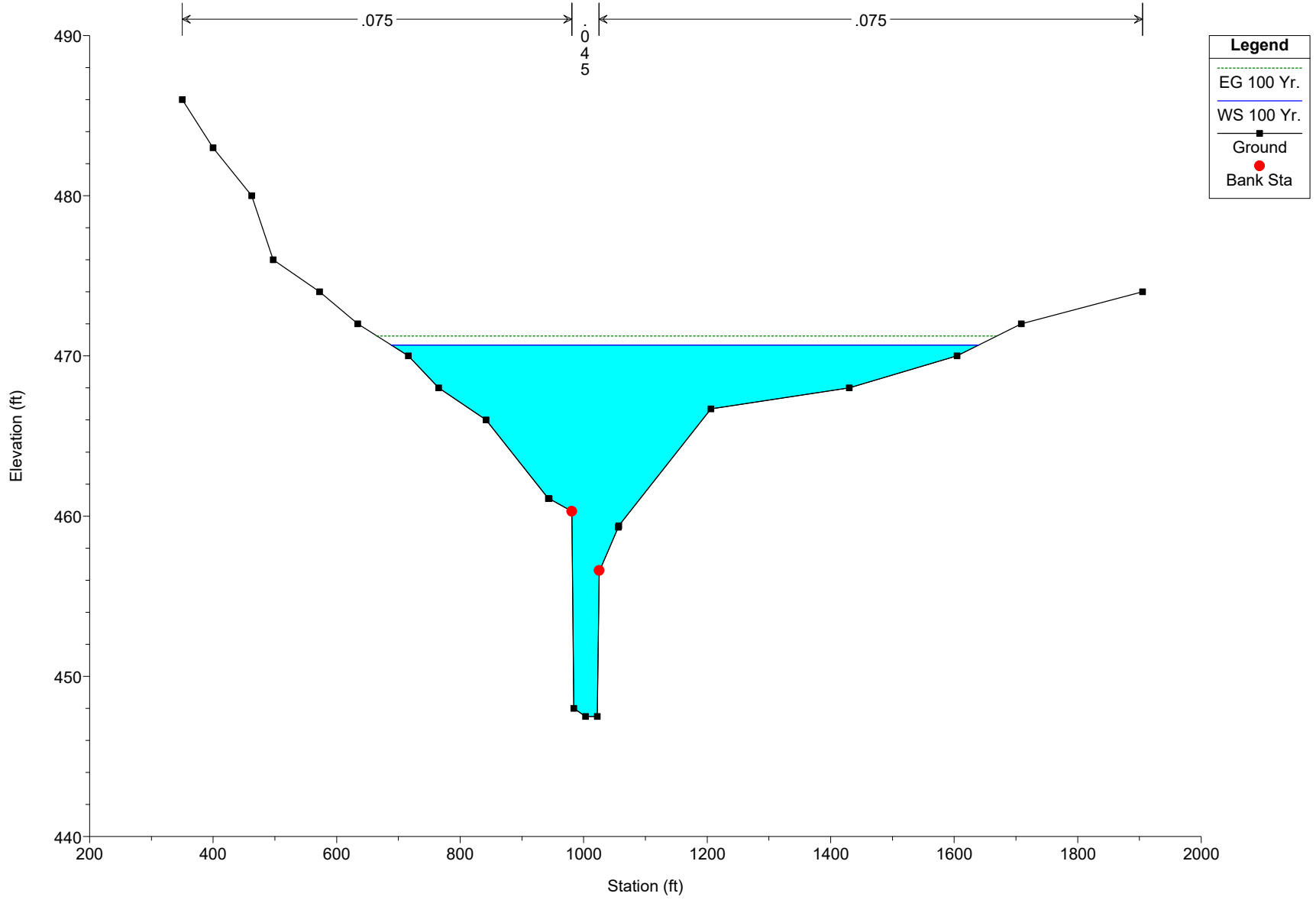


Legend

- WS 100 Yr.
- EG 100 Yr.
- Crit 100 Yr.
- Ground
- Bank Sta

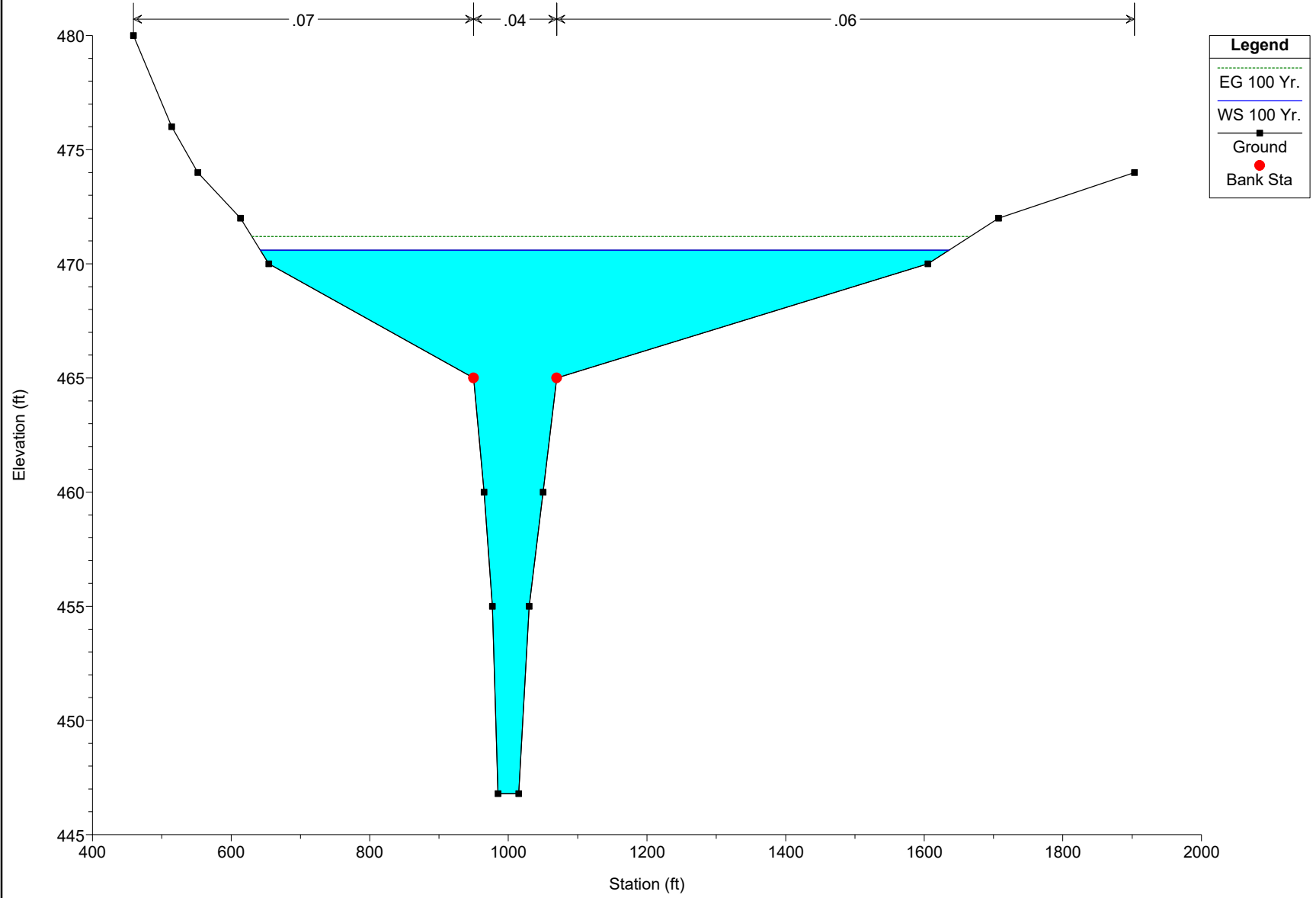
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.057 4.057



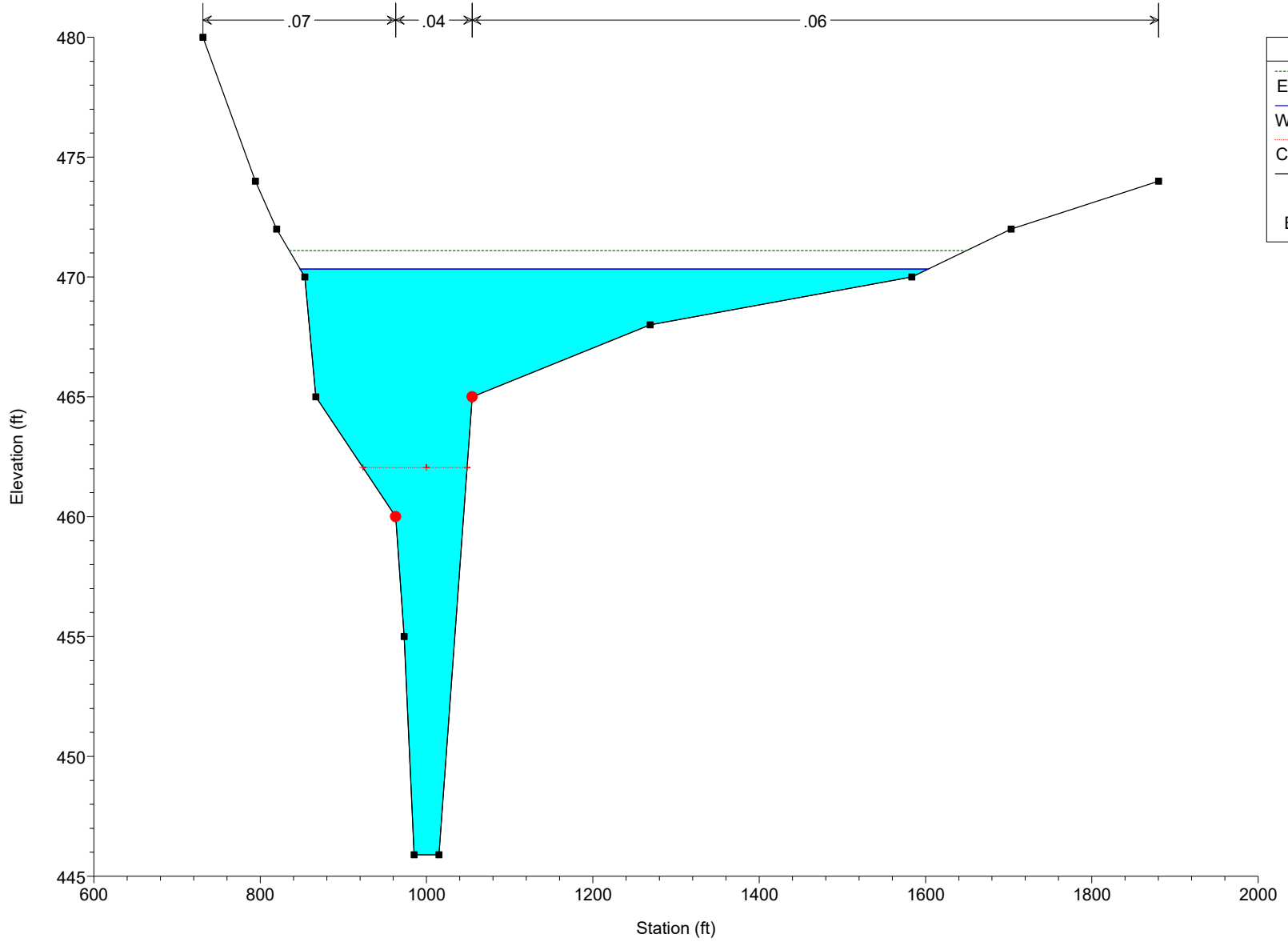
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.049 4.049



5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.036 4.036



Legend

- EG 100 Yr. (dashed green line)
- WS 100 Yr. (solid blue line)
- Crit 100 Yr. (dotted red line with red cross)
- Ground (solid black line with square marker)
- Bank Sta (red dot)

HEC-RAS Plan: CE-EXCond River: RIVER-1 Reach: Reach-1

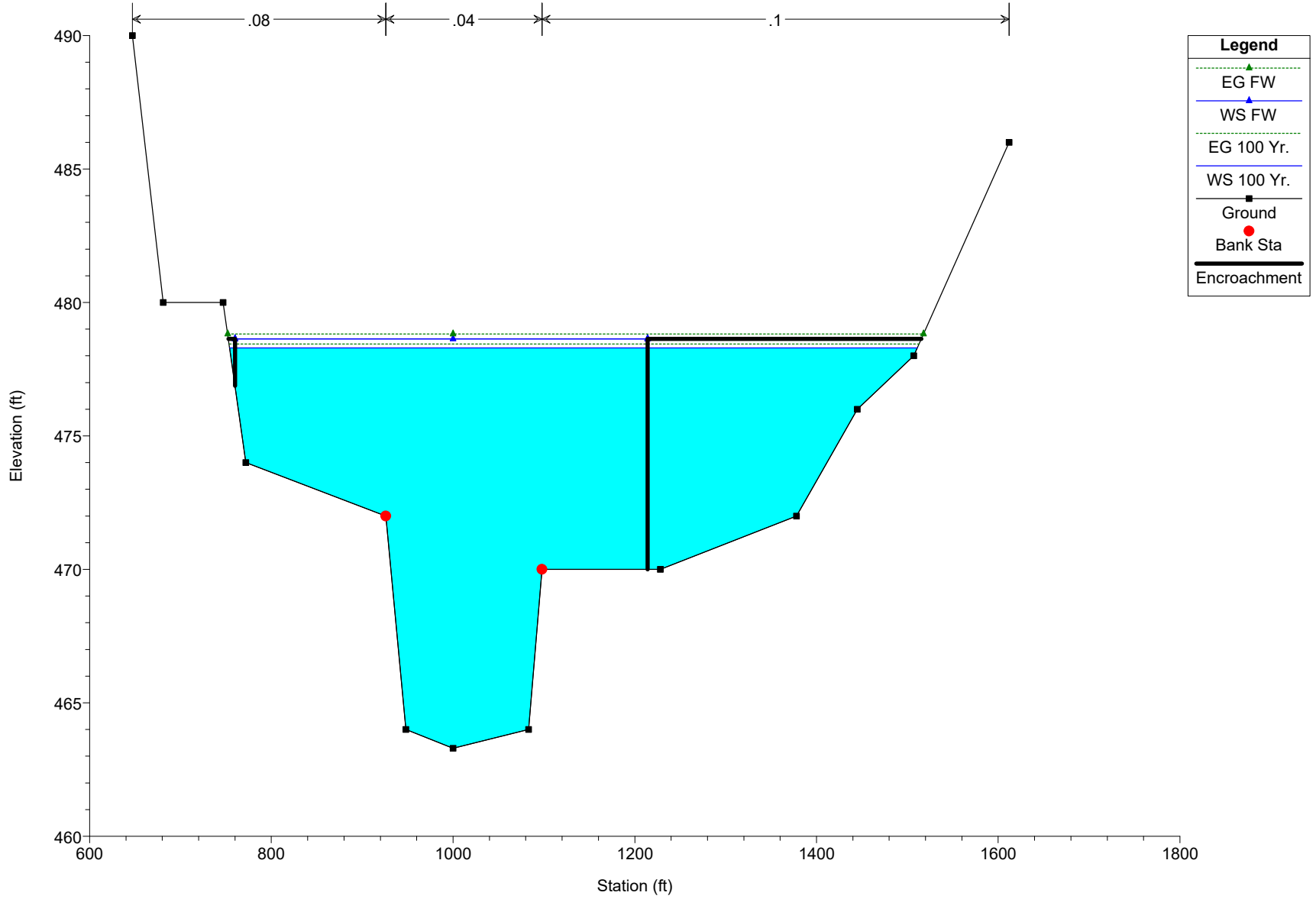
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	5.259	100 Yr.	11243.00	463.30	478.30		478.45	0.000277	3.52	5771.09	756.84	0.17
Reach-1	5.259	FW	11243.00	463.30	478.63		478.82	0.000314	3.81	4338.31	454.00	0.18
Reach-1	5.029	100 Yr.	11243.00	459.10	477.93		478.06	0.000363	4.05	6421.99	749.01	0.19
Reach-1	5.029	FW	11243.00	459.10	477.98		478.29	0.000633	5.36	3797.41	379.00	0.25
Reach-1	5.022	100 Yr.	11243.00	459.30	477.58		478.01	0.000733	5.80	3637.66	647.55	0.27
Reach-1	5.022	FW	11243.00	459.30	477.74		478.24	0.000793	6.08	2872.82	384.00	0.28
Reach-1	5.021	100 Yr.	11243.00	459.30	477.58	469.56	478.01	0.000733	5.80	3636.44	647.47	0.27
Reach-1	5.021	FW	11243.00	459.30	477.74	469.56	478.24	0.000793	6.08	2872.02	384.00	0.28
Reach-1	5.020		Bridge									
Reach-1	5.018	100 Yr.	11243.00	459.30	477.37		477.82	0.000787	5.95	3498.19	637.97	0.28
Reach-1	5.018	FW	11243.00	459.30	477.57		478.09	0.000837	6.20	2792.06	385.00	0.28
Reach-1	5.017	100 Yr.	11243.00	459.30	477.36		477.82	0.000787	5.95	3497.06	637.89	0.28
Reach-1	5.017	FW	11243.00	459.30	477.57		478.09	0.000838	6.20	2791.32	385.00	0.28
Reach-1	5.013	100 Yr.	11243.00	458.30	477.51		477.74	0.000464	4.96	5437.61	736.99	0.22
Reach-1	5.013	FW	11243.00	458.30	477.62		478.04	0.000678	6.03	3448.33	390.00	0.26
Reach-1	4.859	100 Yr.	11243.00	455.50	477.34		477.45	0.000215	3.31	7507.38	881.42	0.15
Reach-1	4.859	FW	11243.00	455.50	477.55		477.66	0.000213	3.36	7125.54	718.00	0.14
Reach-1	4.743	100 Yr.	16358.00	455.30	476.93		477.22	0.000543	5.41	5881.66	518.86	0.24
Reach-1	4.743	FW	16358.00	455.30	477.01		477.40	0.000660	5.98	4822.28	388.00	0.26
Reach-1	4.625	100 Yr.	16358.00	454.40	476.29		476.74	0.000672	5.96	5515.25	975.95	0.26
Reach-1	4.625	FW	16358.00	454.40	476.45		476.89	0.000653	5.92	5471.00	916.00	0.26
Reach-1	4.612	100 Yr.	16358.00	454.06	474.16	470.16	476.43	0.003462	12.80	2322.99	783.38	0.57
Reach-1	4.612	FW	16358.00	454.06	474.62	470.16	476.61	0.002999	12.14	2569.88	740.08	0.53
Reach-1	4.563	100 Yr.	16358.00	453.43	474.55		475.48	0.001463	8.42	3815.01	859.86	0.38
Reach-1	4.563	FW	16358.00	453.43	474.89		475.79	0.001373	8.28	3713.90	763.15	0.37
Reach-1	4.464	100 Yr.	16358.00	453.42	474.54		474.78	0.000670	4.99	4658.62	718.25	0.22
Reach-1	4.464	FW	16358.00	453.42	474.71		475.07	0.000871	5.72	3769.22	548.00	0.25
Reach-1	4.419	100 Yr.	16358.00	452.92	474.05		474.55	0.001289	6.52	3328.78	418.84	0.31
Reach-1	4.419	FW	16358.00	452.92	474.08		474.76	0.001615	7.31	2704.22	276.05	0.34
Reach-1	4.365	100 Yr.	17157.00	452.64	473.13		474.04	0.002248	8.64	2903.44	685.77	0.40
Reach-1	4.365	FW	17157.00	452.64	473.38		474.24	0.002069	8.45	2943.01	659.23	0.38
Reach-1	4.259	100 Yr.	17157.00	450.84	472.52		473.04	0.001160	7.07	3801.73	730.58	0.30
Reach-1	4.259	FW	17157.00	450.84	472.91		473.36	0.000933	6.44	3947.98	658.00	0.27
Reach-1	4.165	100 Yr.	17157.00	449.16	472.33		472.55	0.000579	5.01	6319.93	1151.48	0.21
Reach-1	4.165	FW	17157.00	449.16	472.69		472.94	0.000575	5.06	5148.58	730.00	0.21
Reach-1	4.16	100 Yr.	17157.00	449.16	472.18	468.31	472.50	0.001165	6.48	5991.13	1209.39	0.26
Reach-1	4.16	FW	17157.00	449.16	472.43	468.12	472.87	0.001371	7.09	4652.08	720.00	0.29
Reach-1	4.158		Bridge									
Reach-1	4.157	100 Yr.	17157.00	449.16	471.98		472.33	0.001315	6.78	5747.45	1182.21	0.29
Reach-1	4.157	FW	17157.00	449.16	472.20		472.67	0.001552	7.43	4479.14	716.00	0.31
Reach-1	4.148	100 Yr.	17157.00	448.00	471.88		472.27	0.000997	6.77	5870.32	1131.37	0.27
Reach-1	4.148	FW	17157.00	448.00	472.16		472.60	0.001046	7.00	4847.61	703.00	0.28
Reach-1	4.080	100 Yr.	17157.00	447.15	471.50		471.94	0.001191	7.06	5308.69	1020.84	0.30
Reach-1	4.080	FW	17157.00	447.15	471.84		472.27	0.001109	6.90	4626.35	553.00	0.29
Reach-1	4.073	100 Yr.	17157.00	446.90	471.53		471.77	0.000606	5.42	6979.86	988.86	0.22
Reach-1	4.073	FW	17157.00	446.90	471.82		472.13	0.000706	5.91	5400.84	548.00	0.24
Reach-1	4.069	100 Yr.	17157.00	447.50	471.20	465.80	471.67	0.001328	7.85	5481.48	967.87	0.29
Reach-1	4.069	FW	17157.00	447.50	471.54	465.75	472.05	0.001307	7.87	4423.25	536.00	0.29
Reach-1	4.060		Bridge									
Reach-1	4.057	100 Yr.	17035.00	447.50	470.67		471.25	0.001588	8.45	5042.88	951.20	0.32

HEC-RAS Plan: CE-EXCond River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	4.057	FW	17035.00	447.50	470.96		471.54	0.001492	8.26	4099.26	490.00	0.31
Reach-1	4.049	100 Yr.	17035.00	446.80	470.60		471.19	0.000998	6.99	4458.53	993.80	0.31
Reach-1	4.049	FW	17035.00	446.80	470.73		471.45	0.001112	7.42	3401.86	475.00	0.33
Reach-1	4.036	100 Yr.	17035.00	445.90	470.33	462.05	471.10	0.001044	7.89	3726.53	755.21	0.32
Reach-1	4.036	FW	17035.00	445.90	470.52	462.04	471.36	0.001074	8.06	3012.01	302.00	0.33

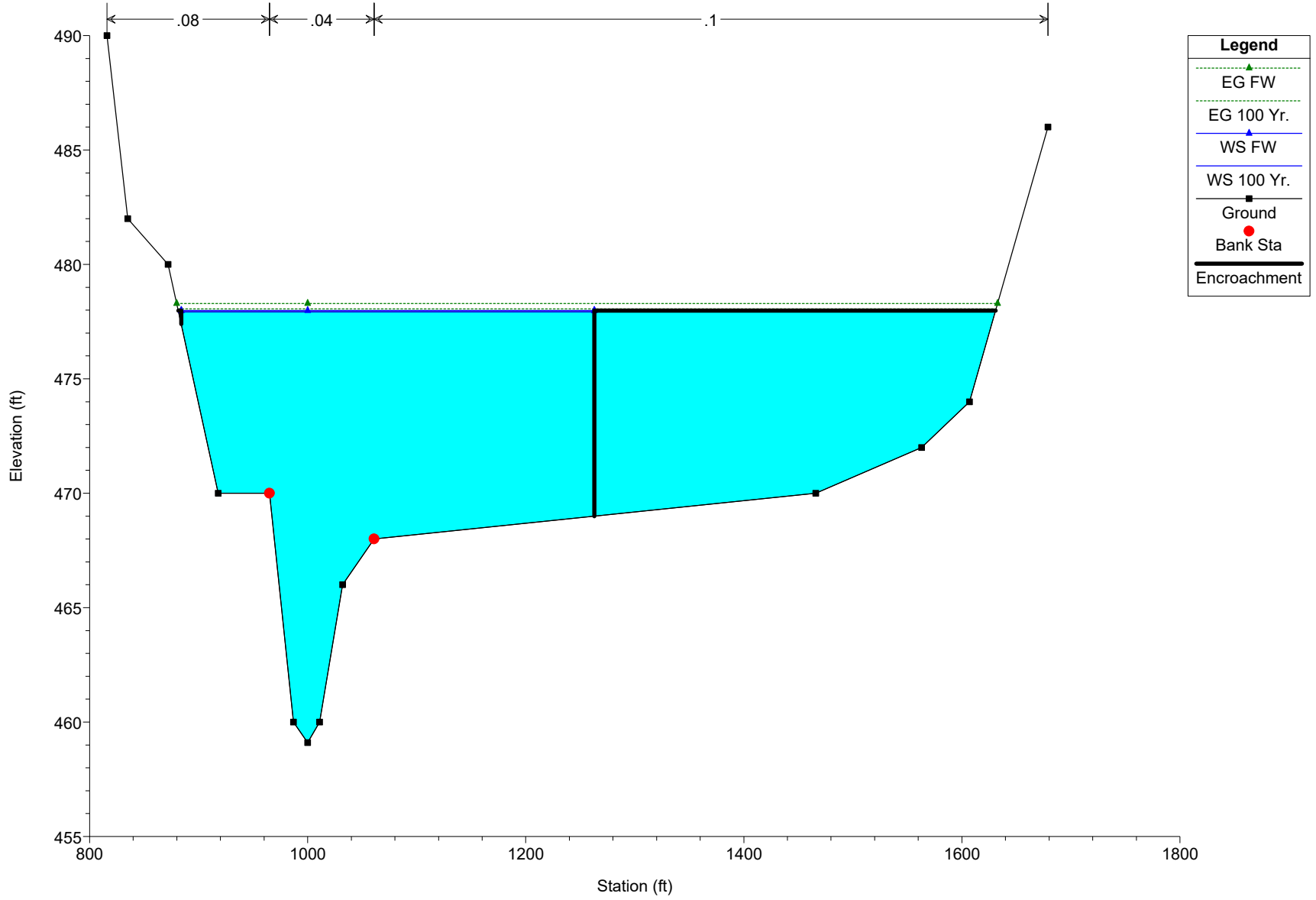
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.259 5.259



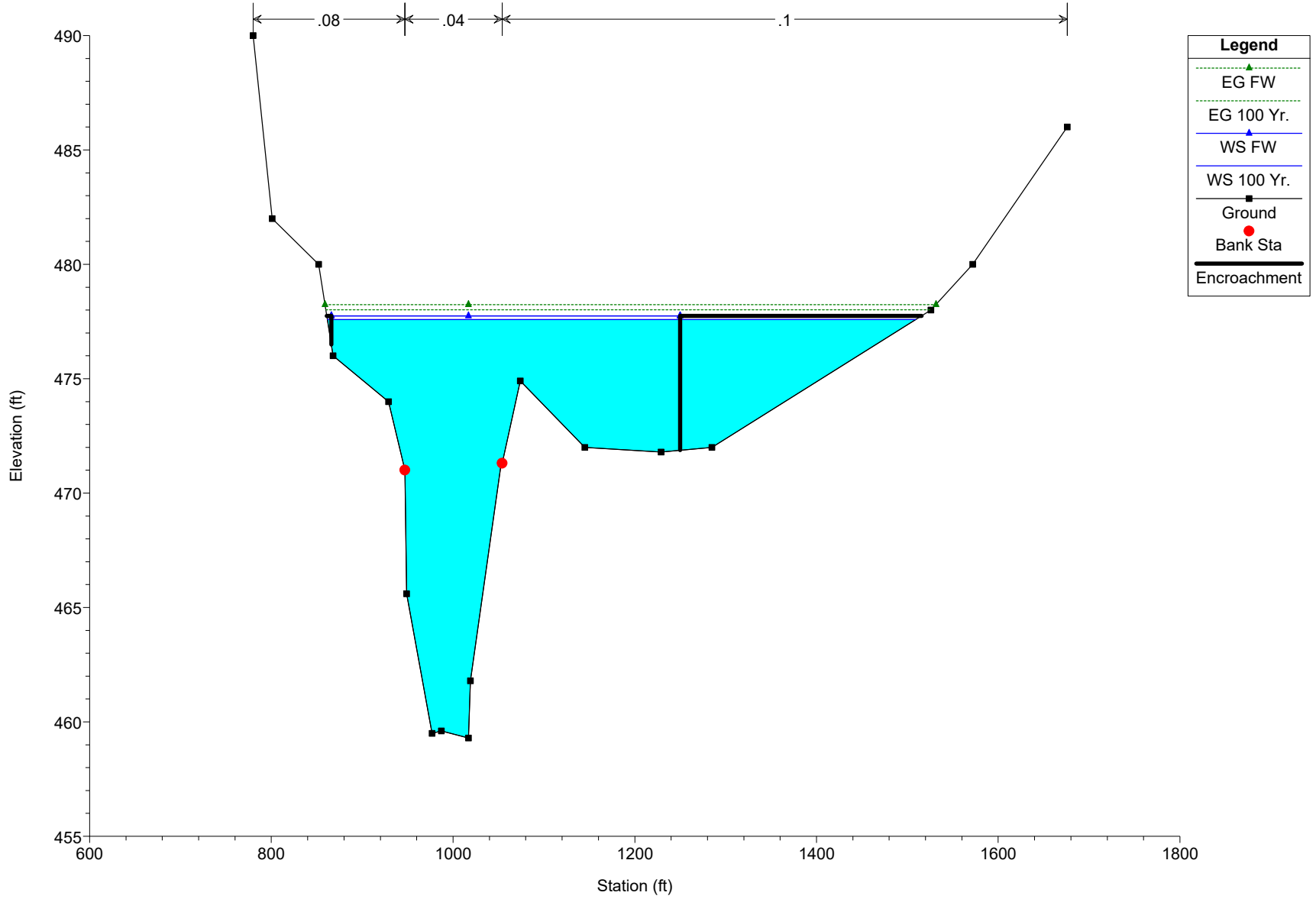
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.029 5.029



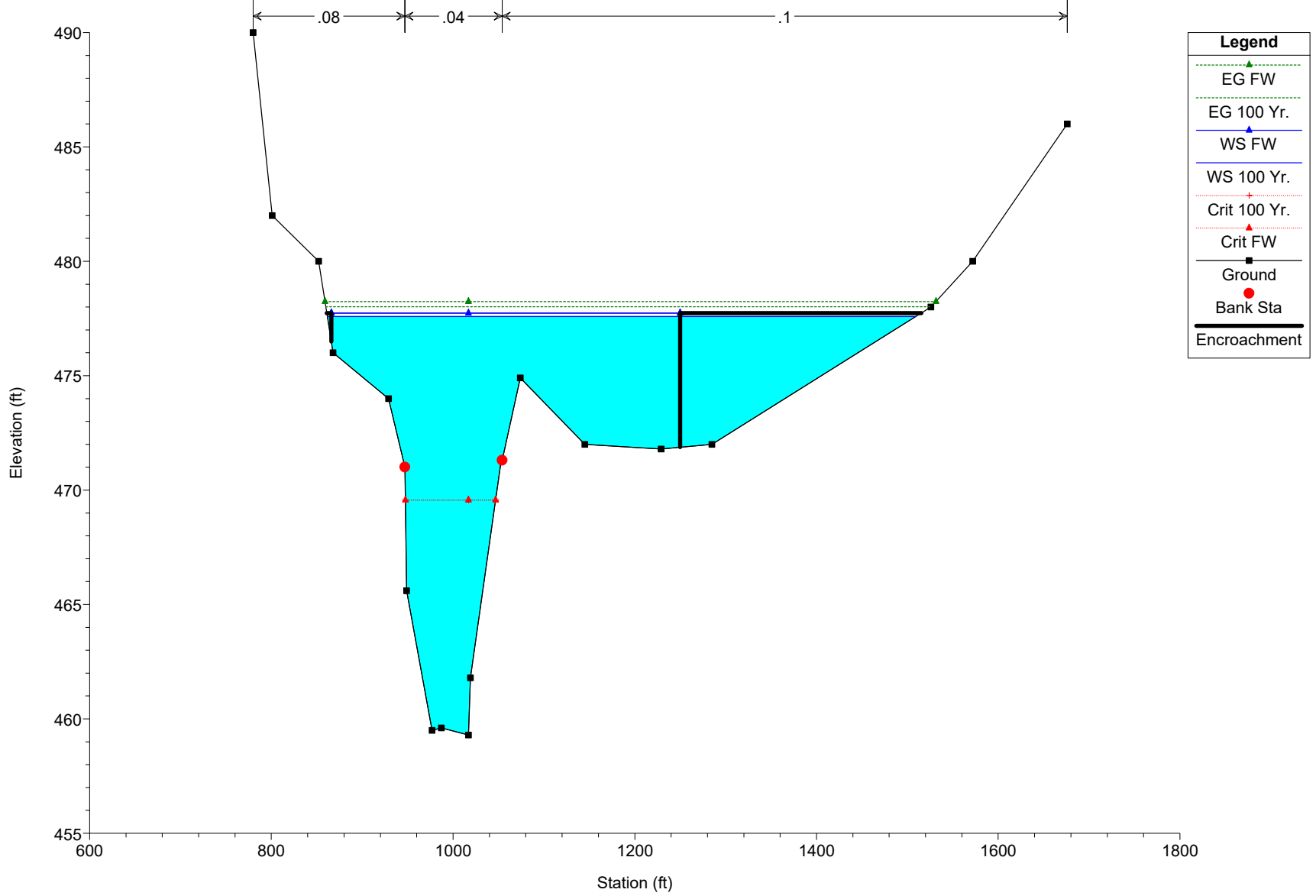
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.022 5.022



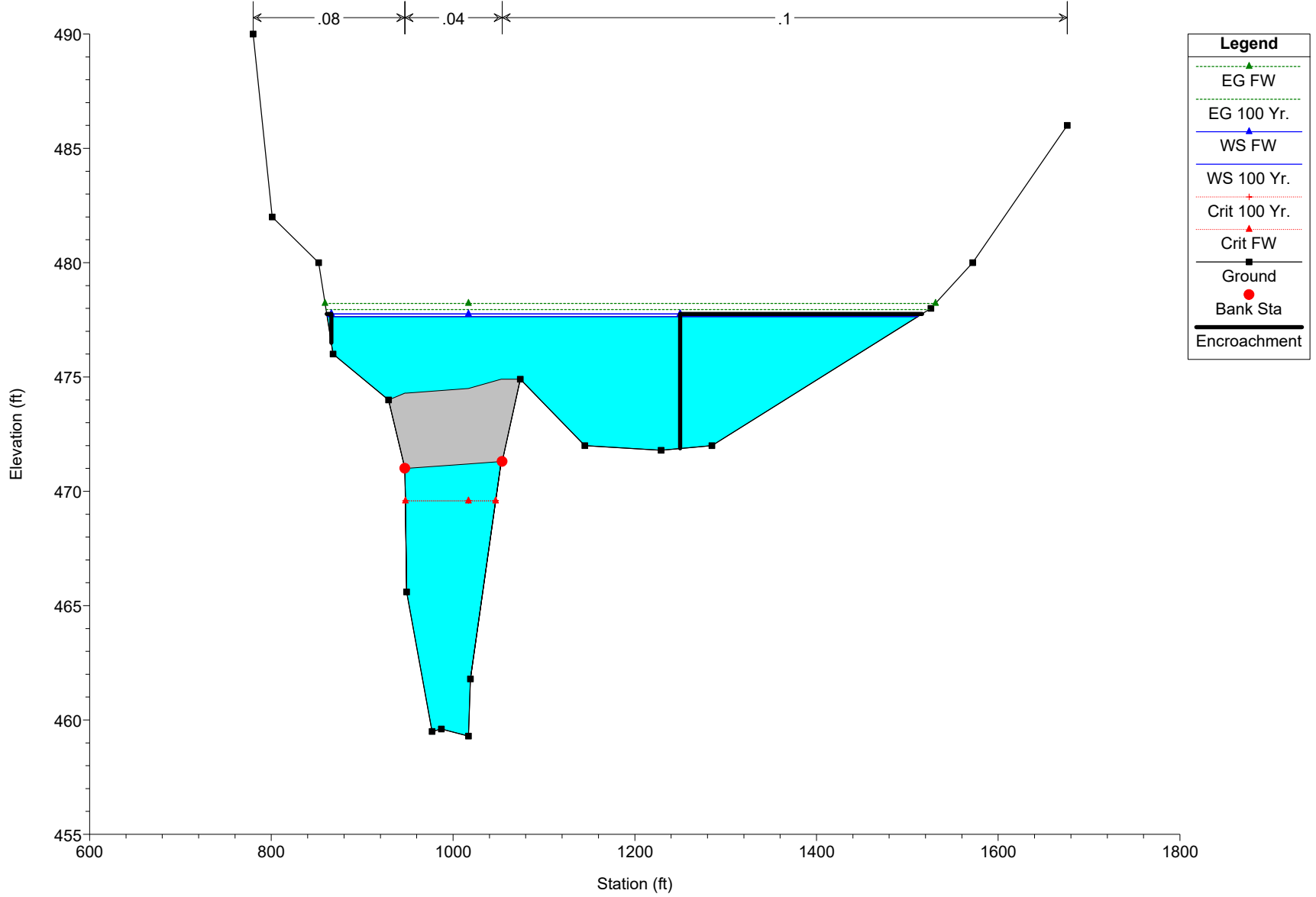
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.021 5.021



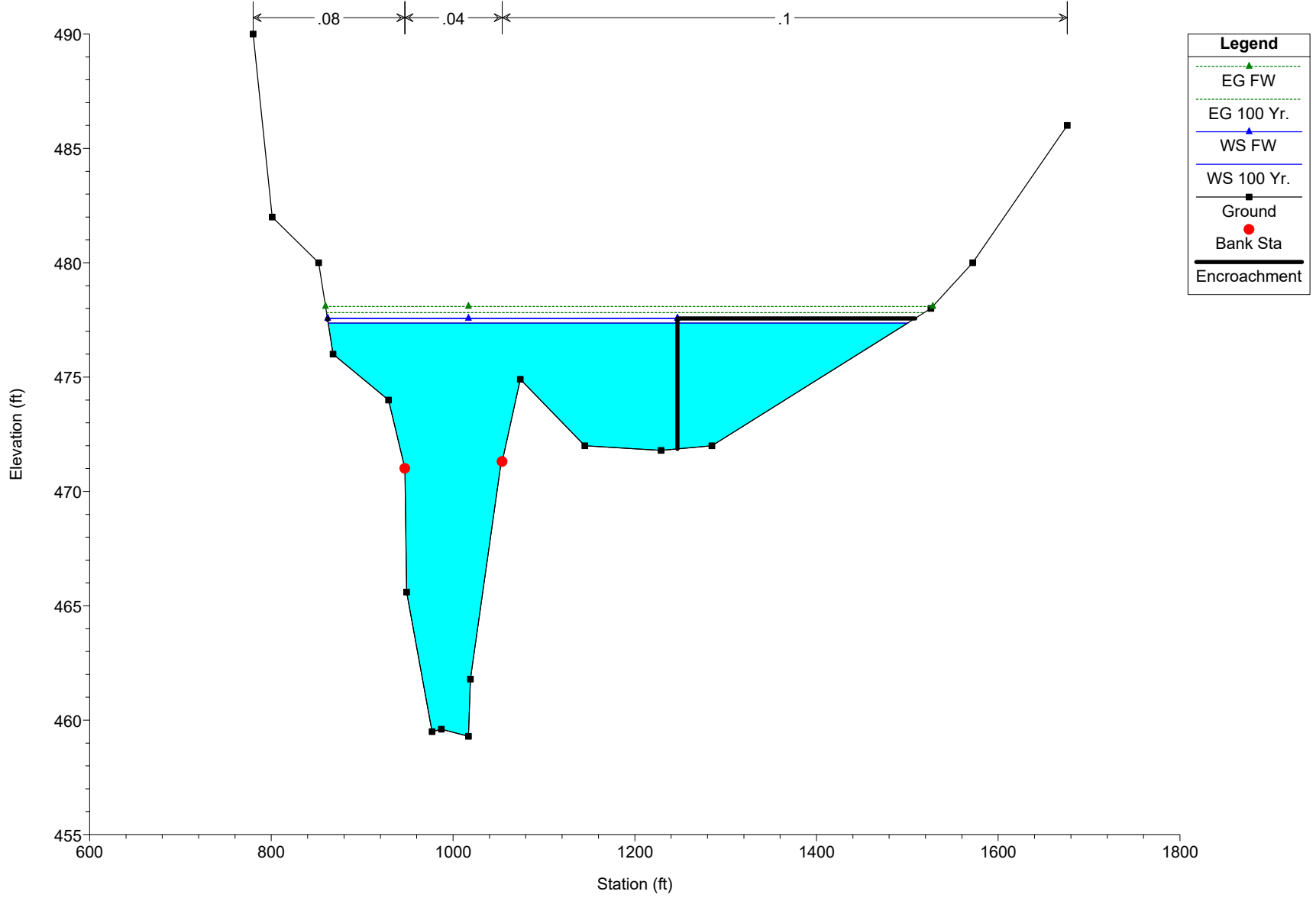
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.020 BR



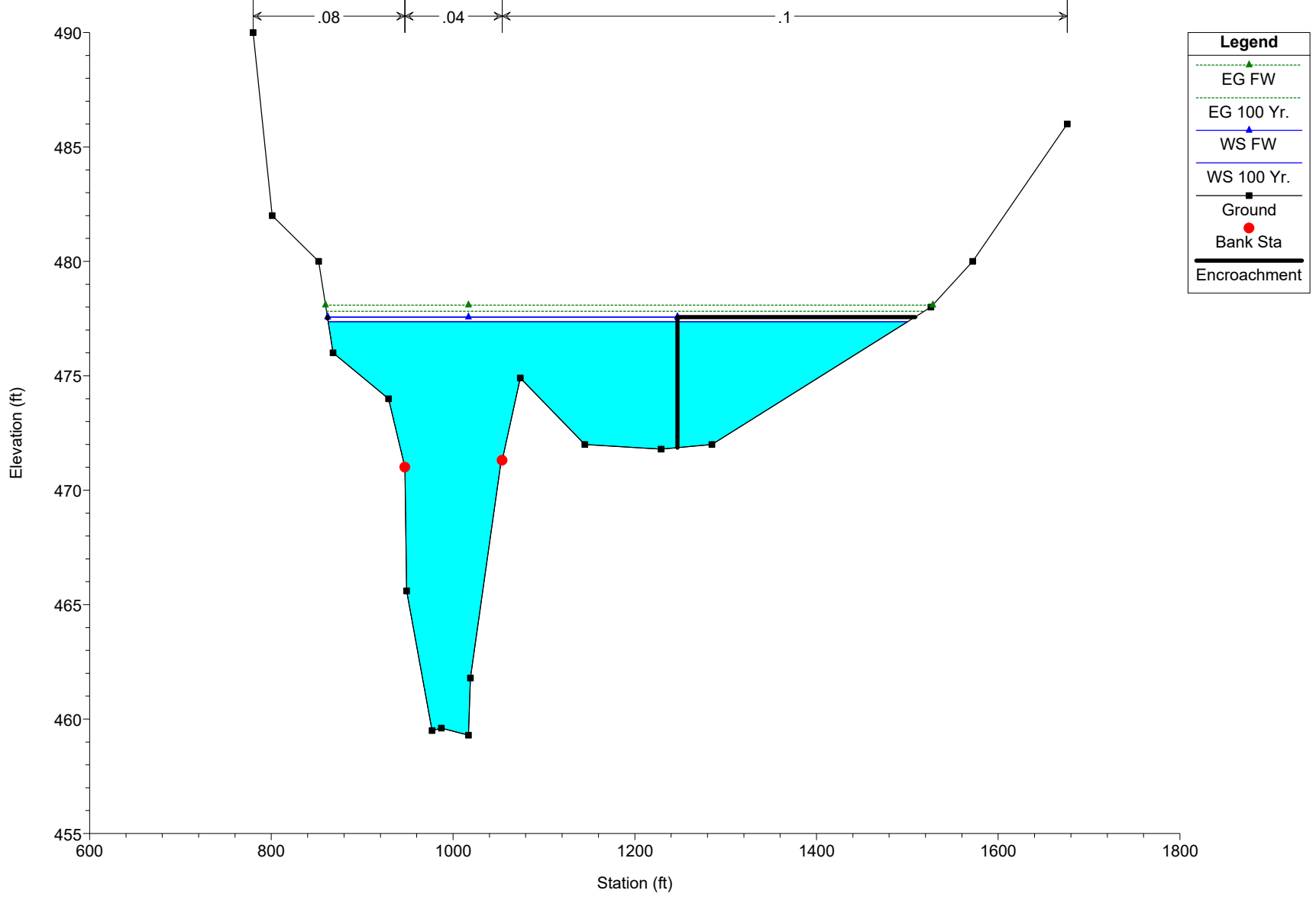
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.018 5.018



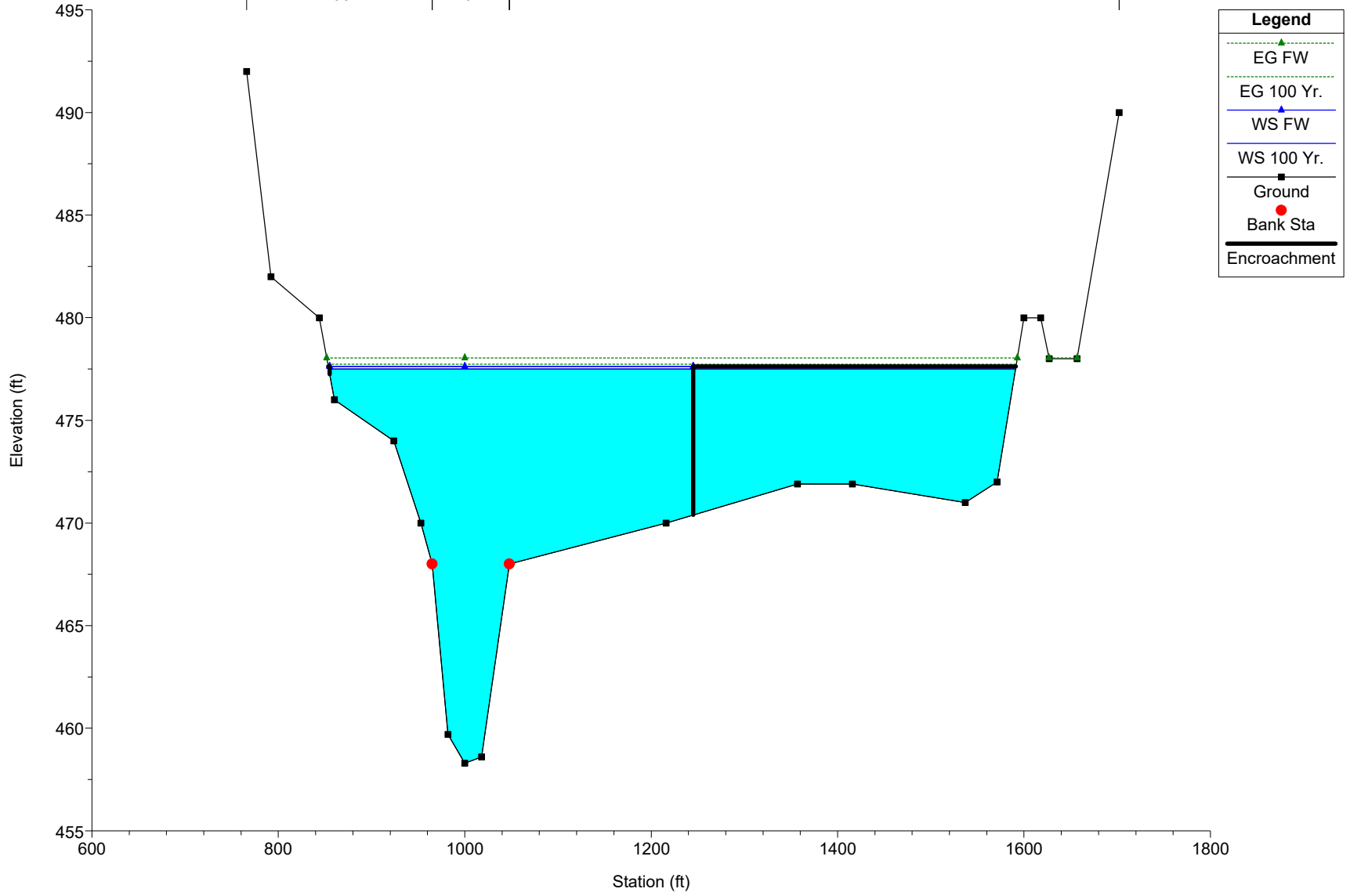
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.017 5.017



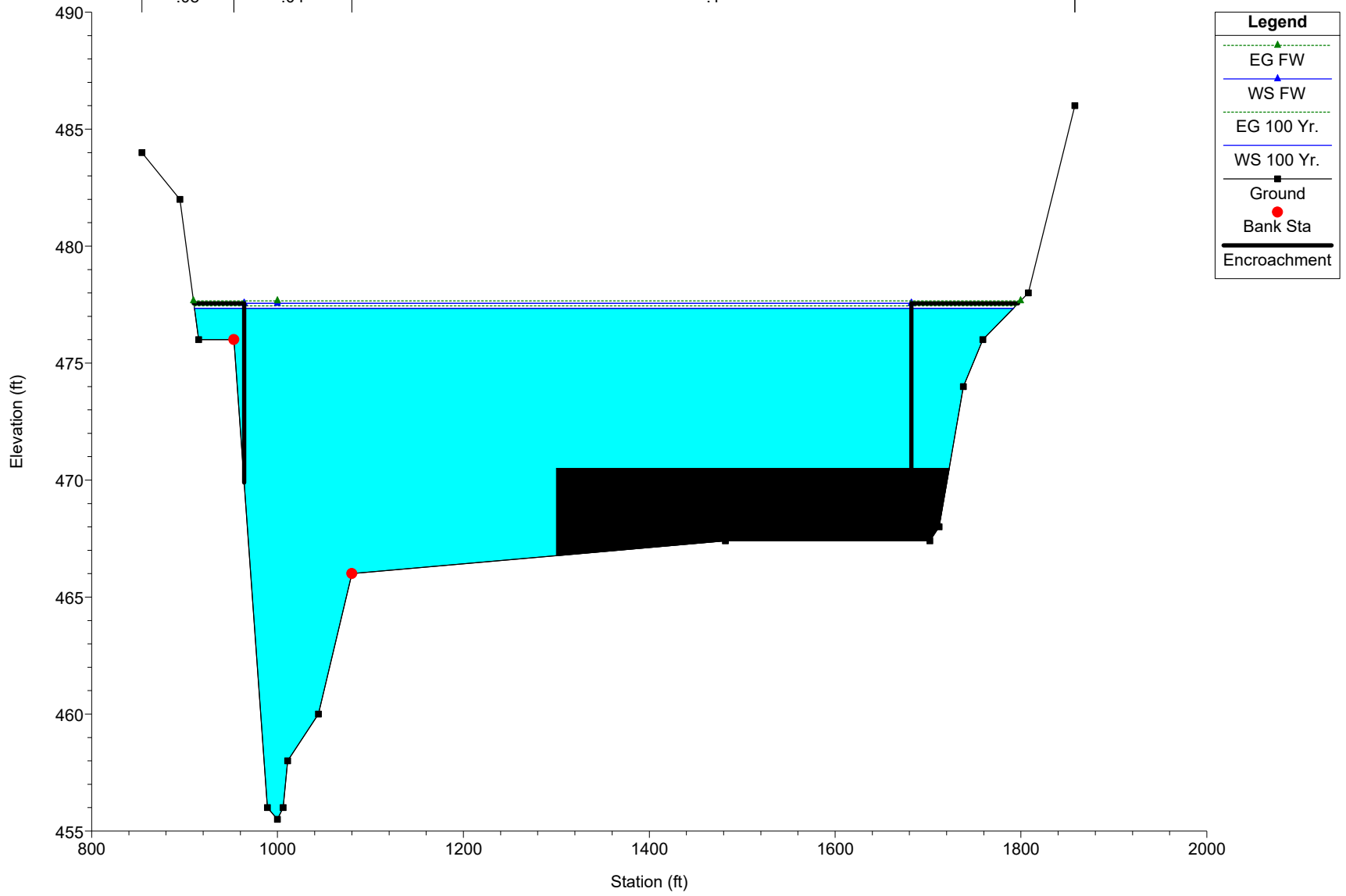
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 5.013 5.013



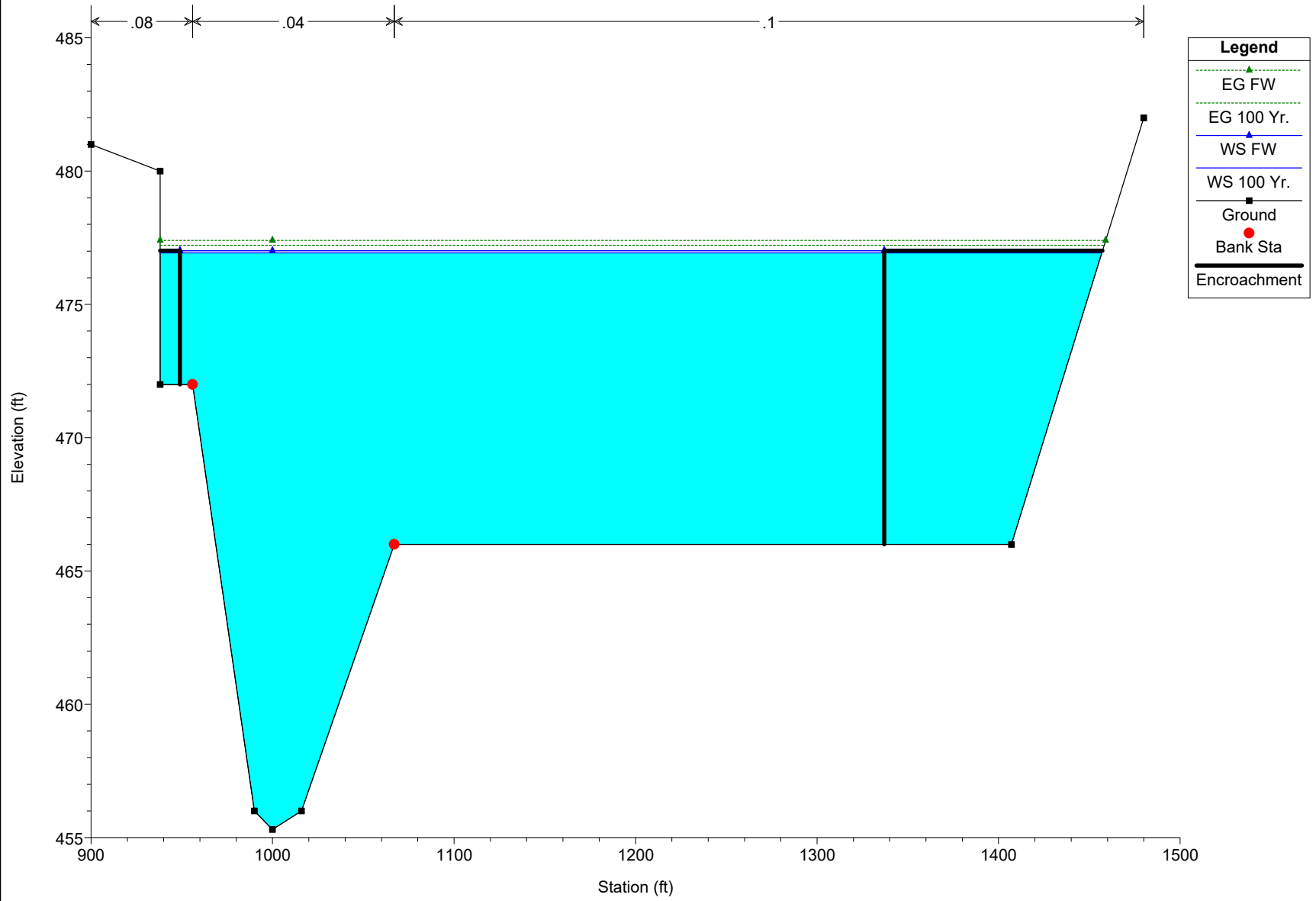
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.859 4.859



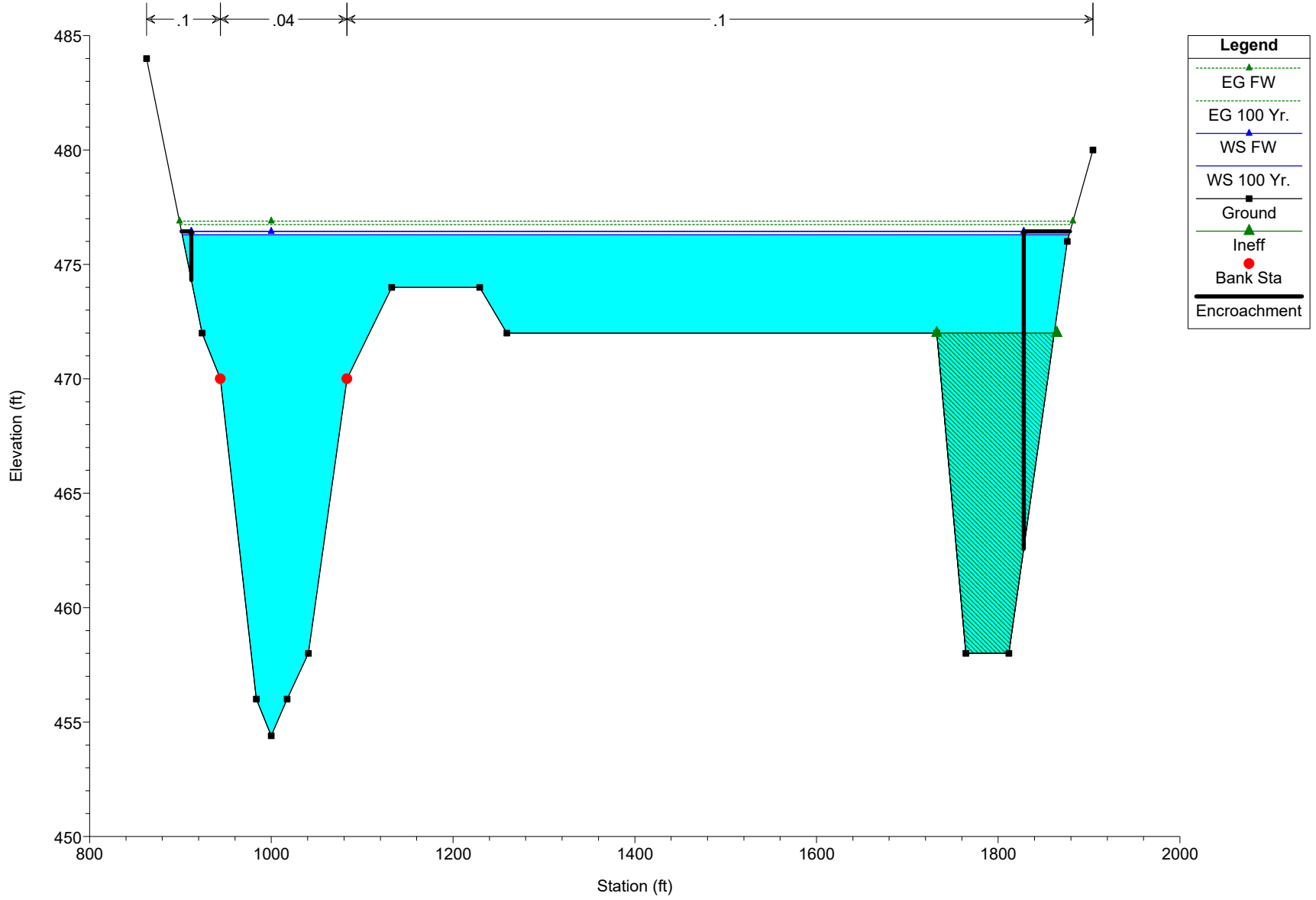
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.743 4.743



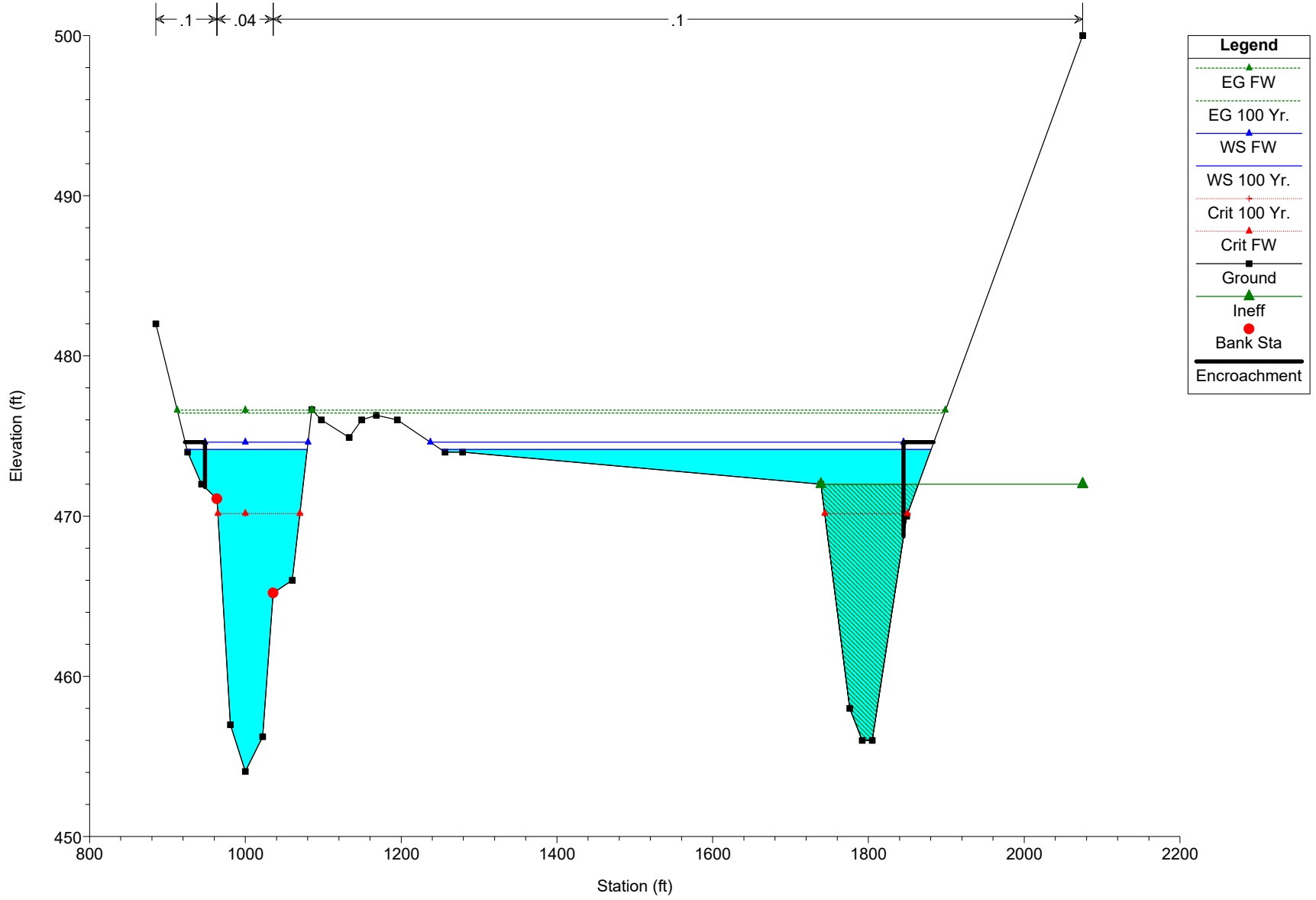
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.625 4.625



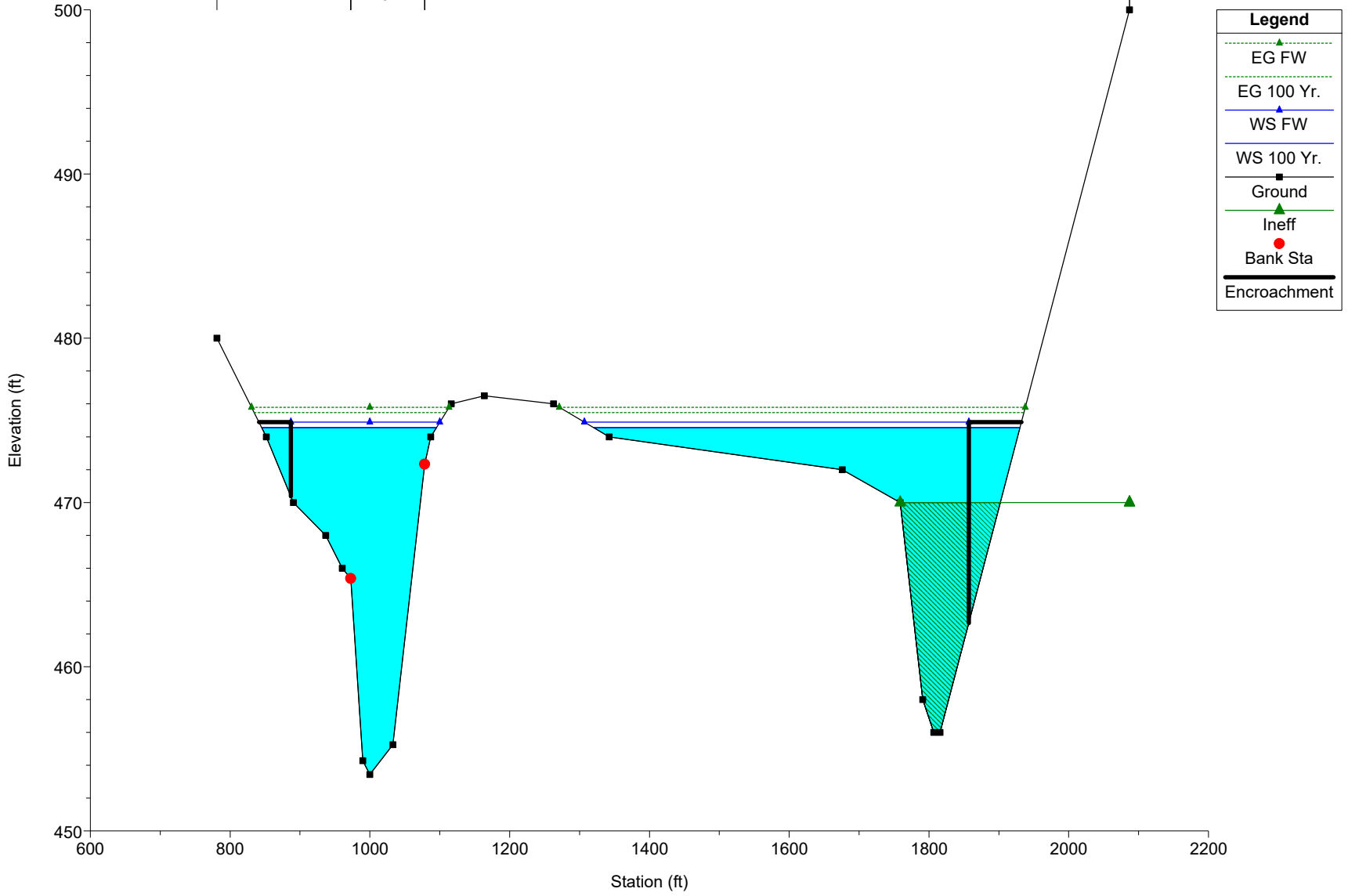
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.612 4.612



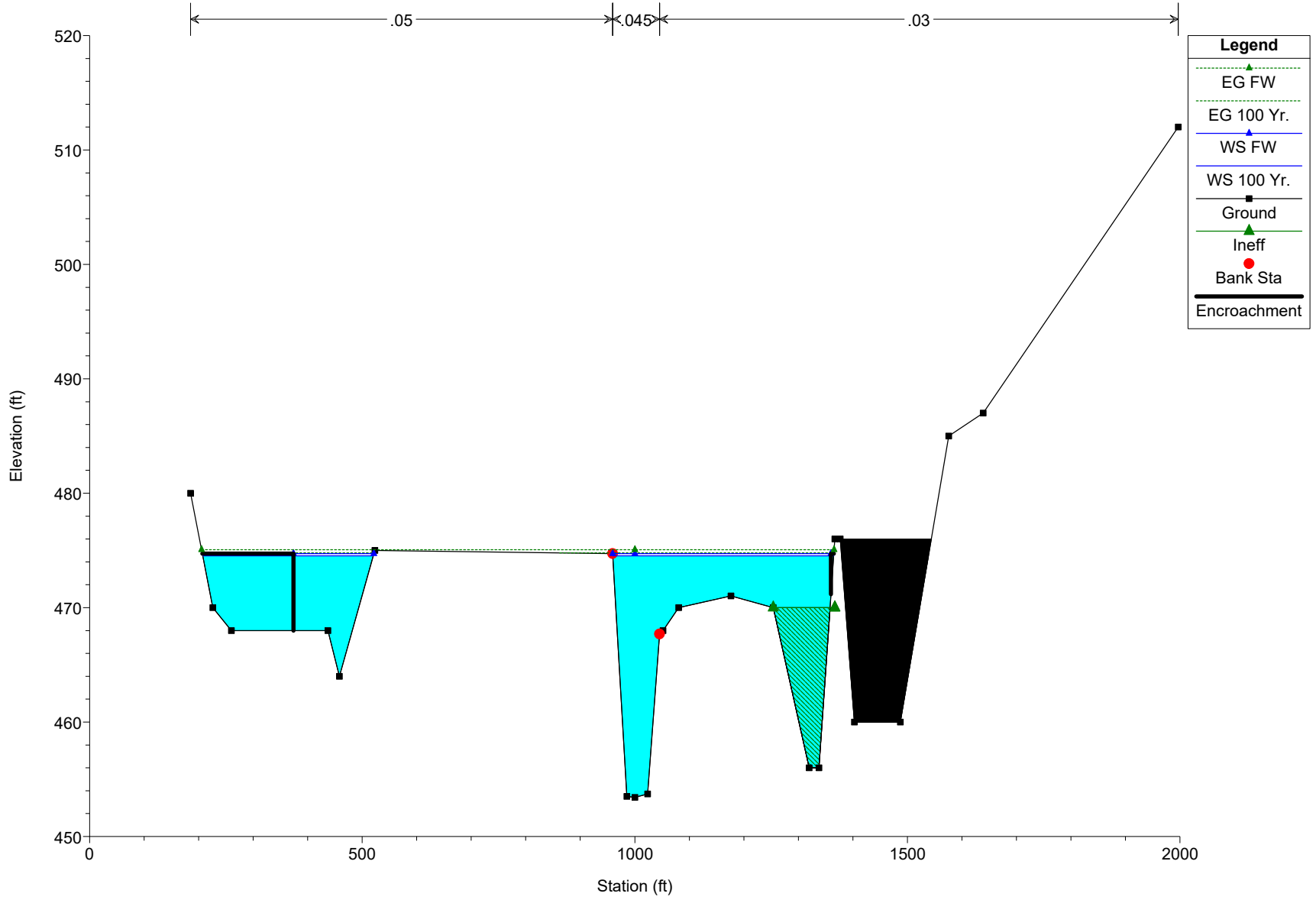
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.563 4.563



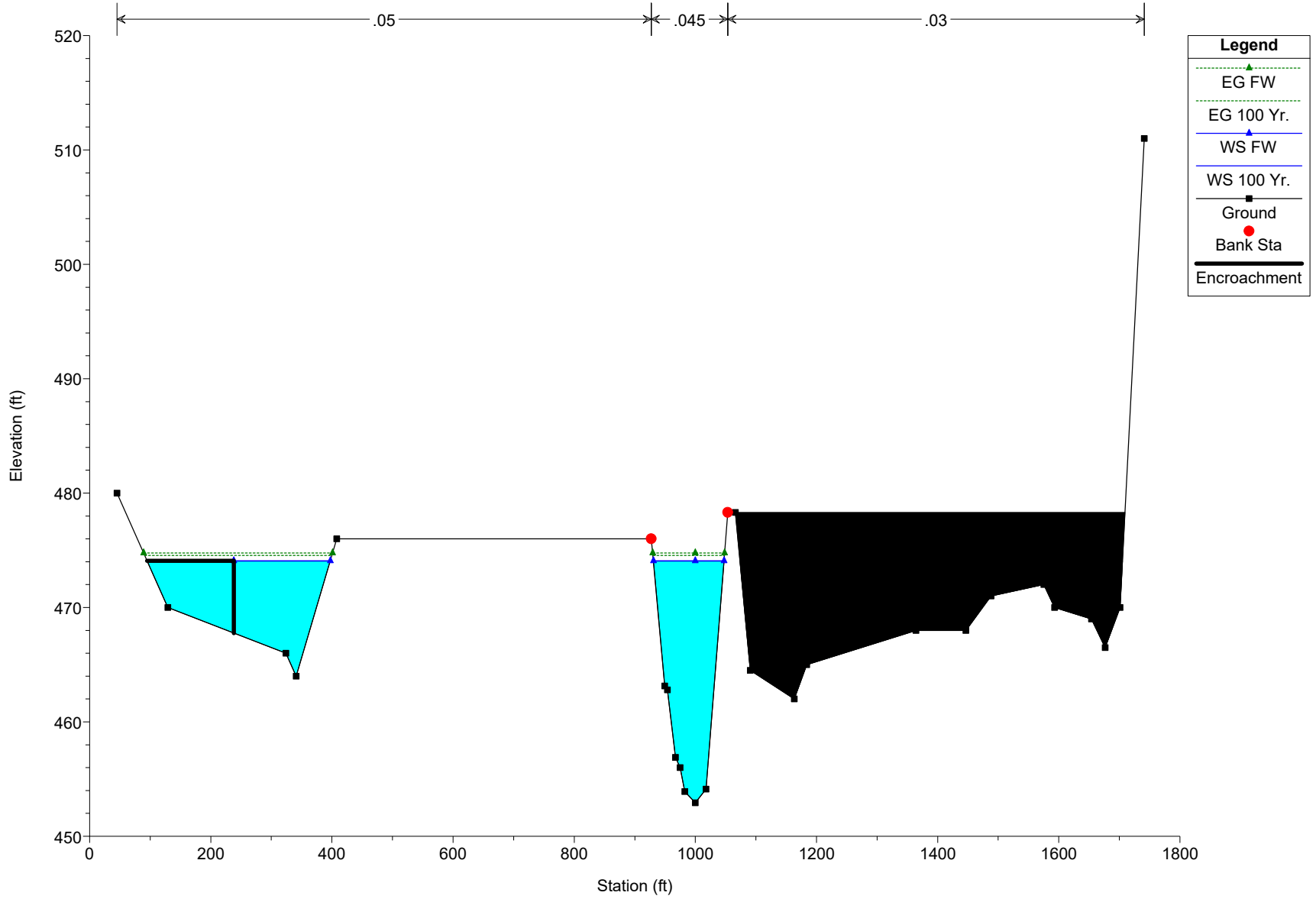
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.464 4.464



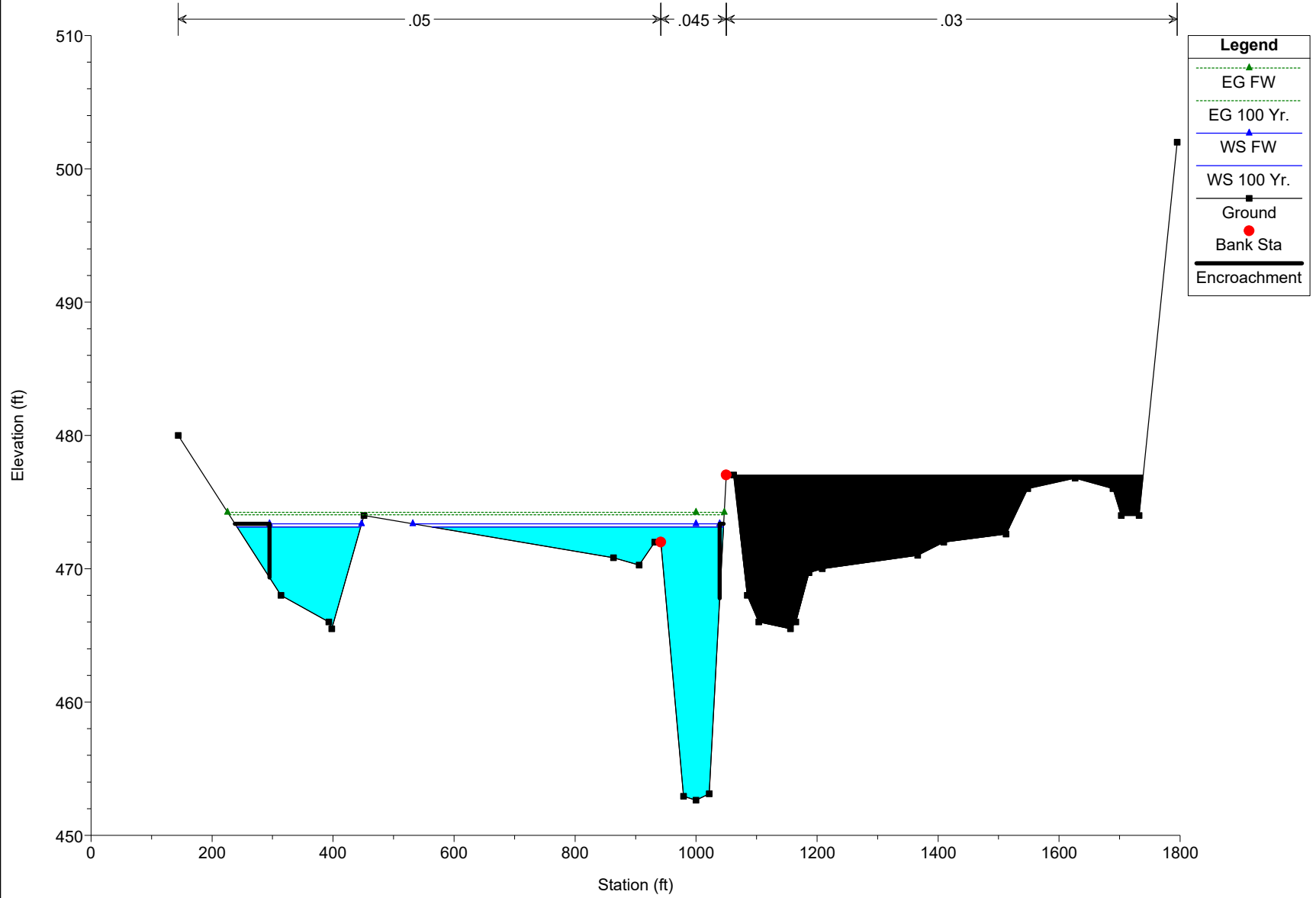
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.419 4.419



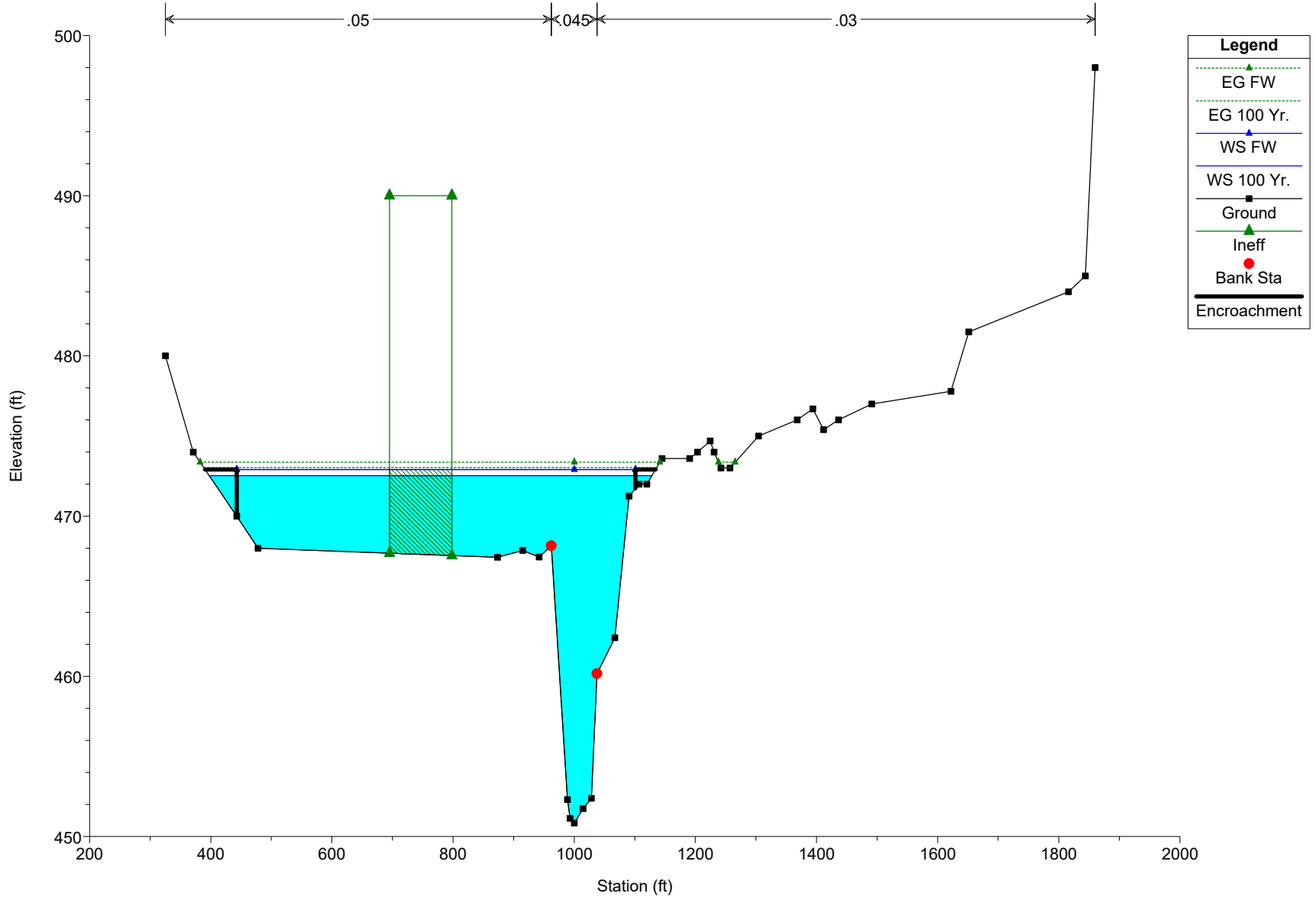
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.365 4.365



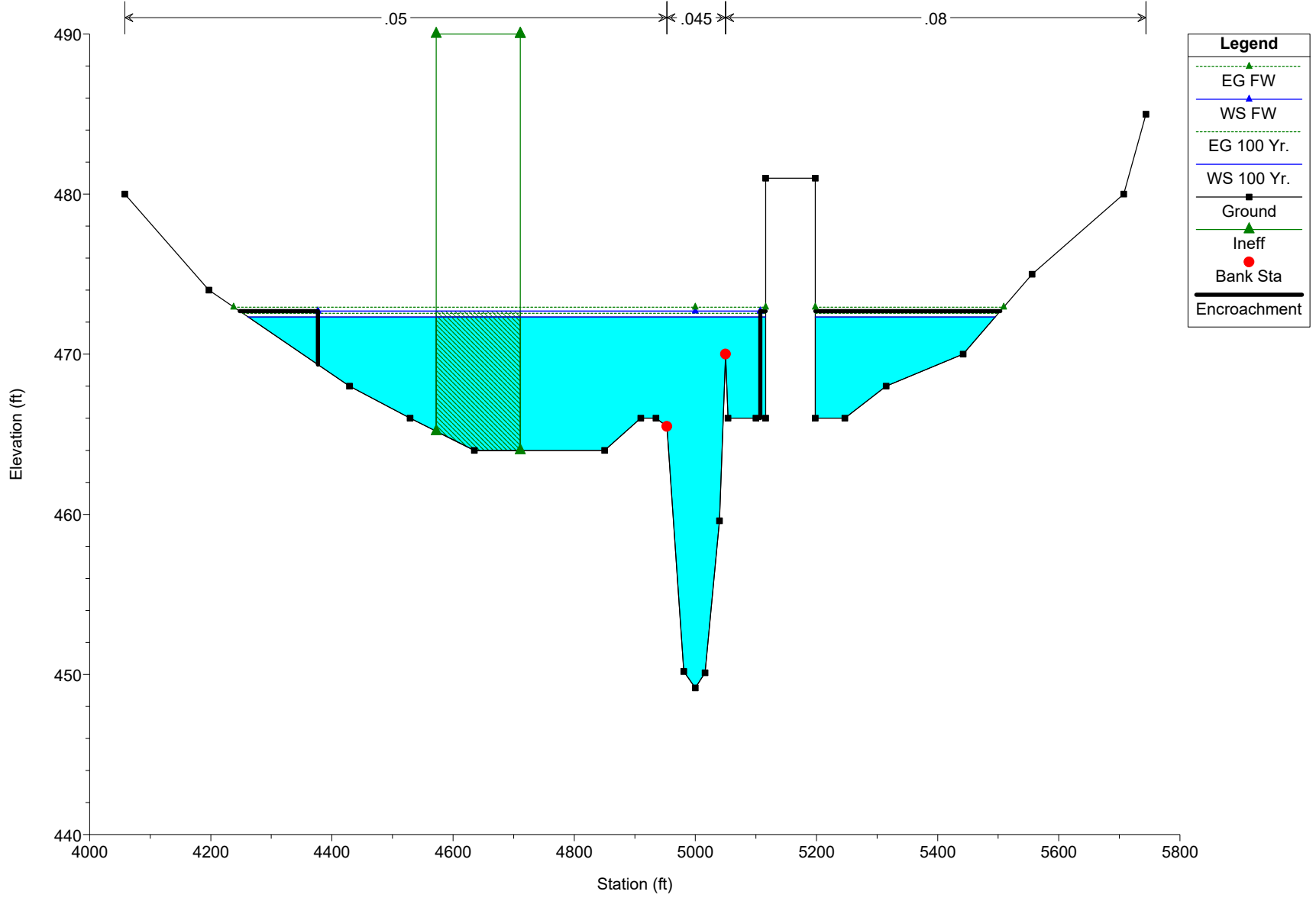
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.259 4.259



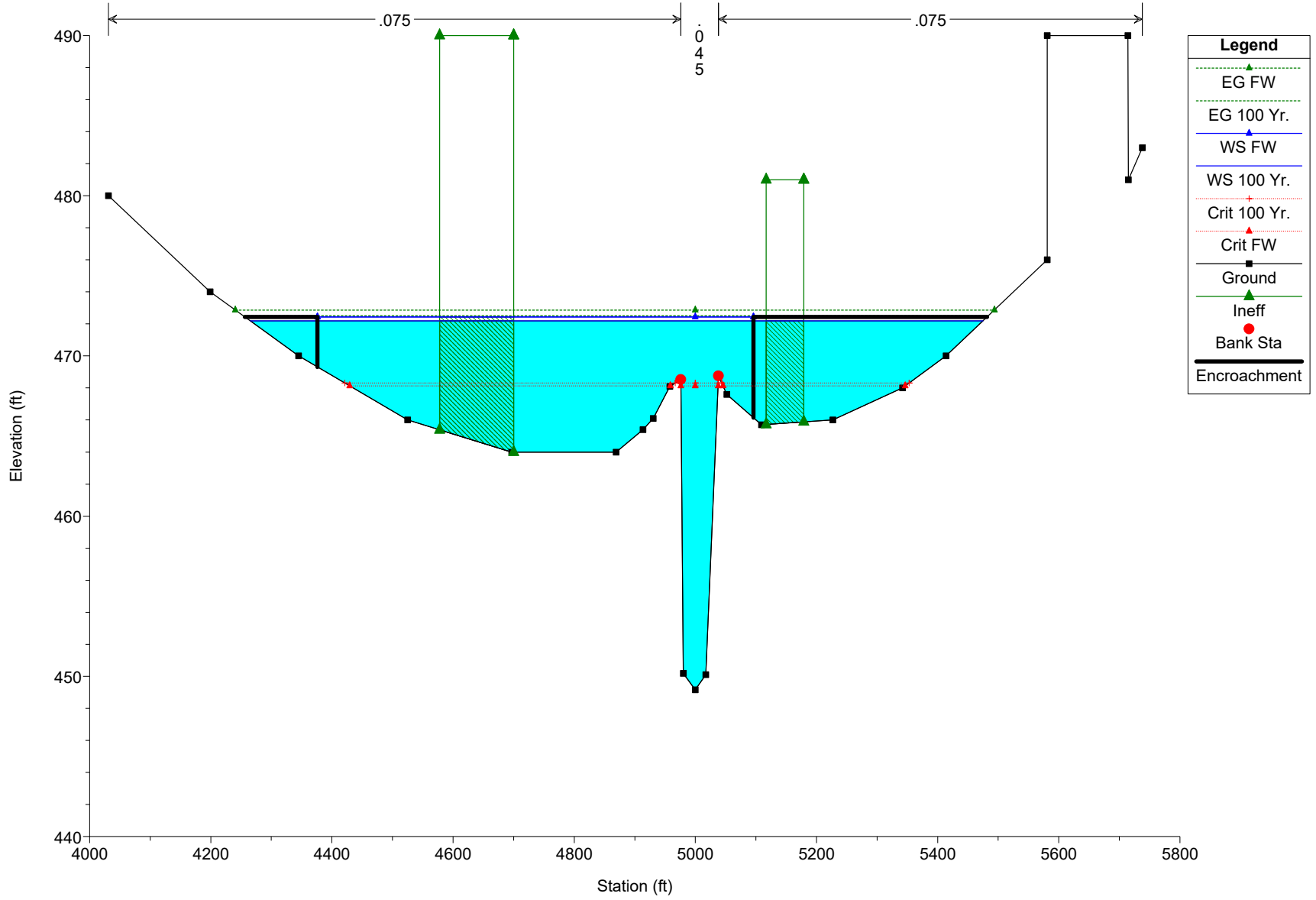
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.165 4.165



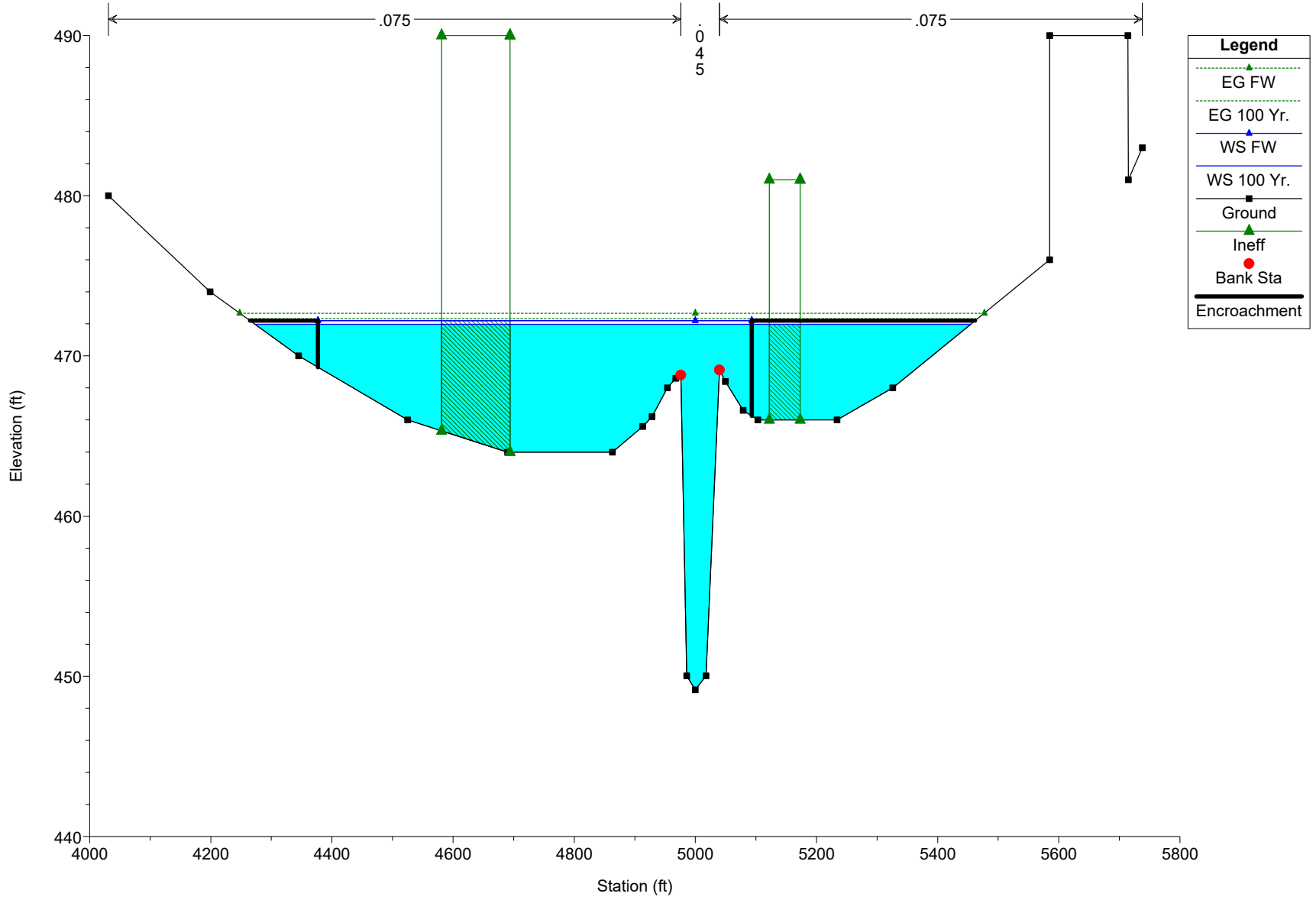
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.16 4.16



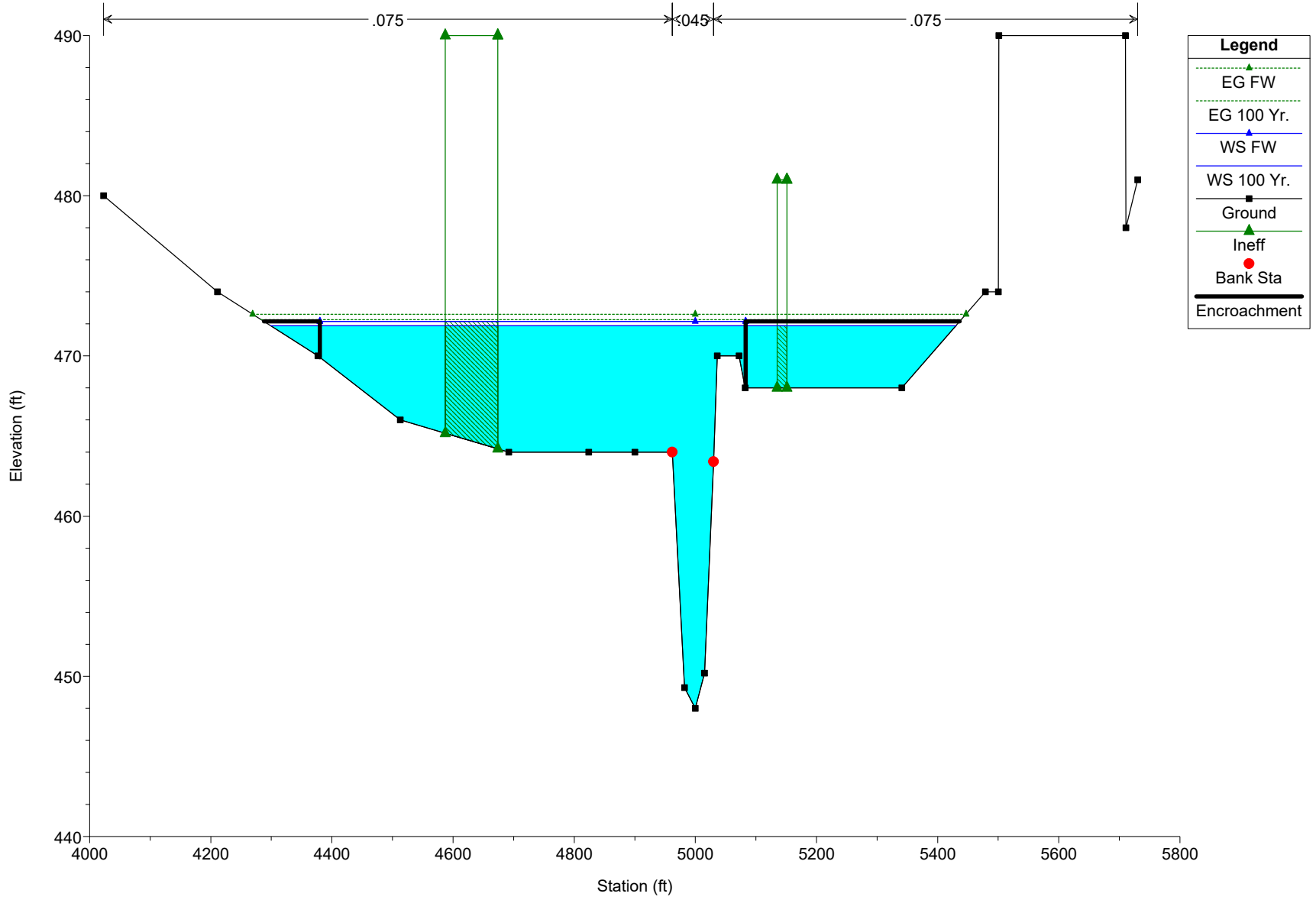
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River = RIVER-1 Reach = Reach-1 RS = 4.157 4.157



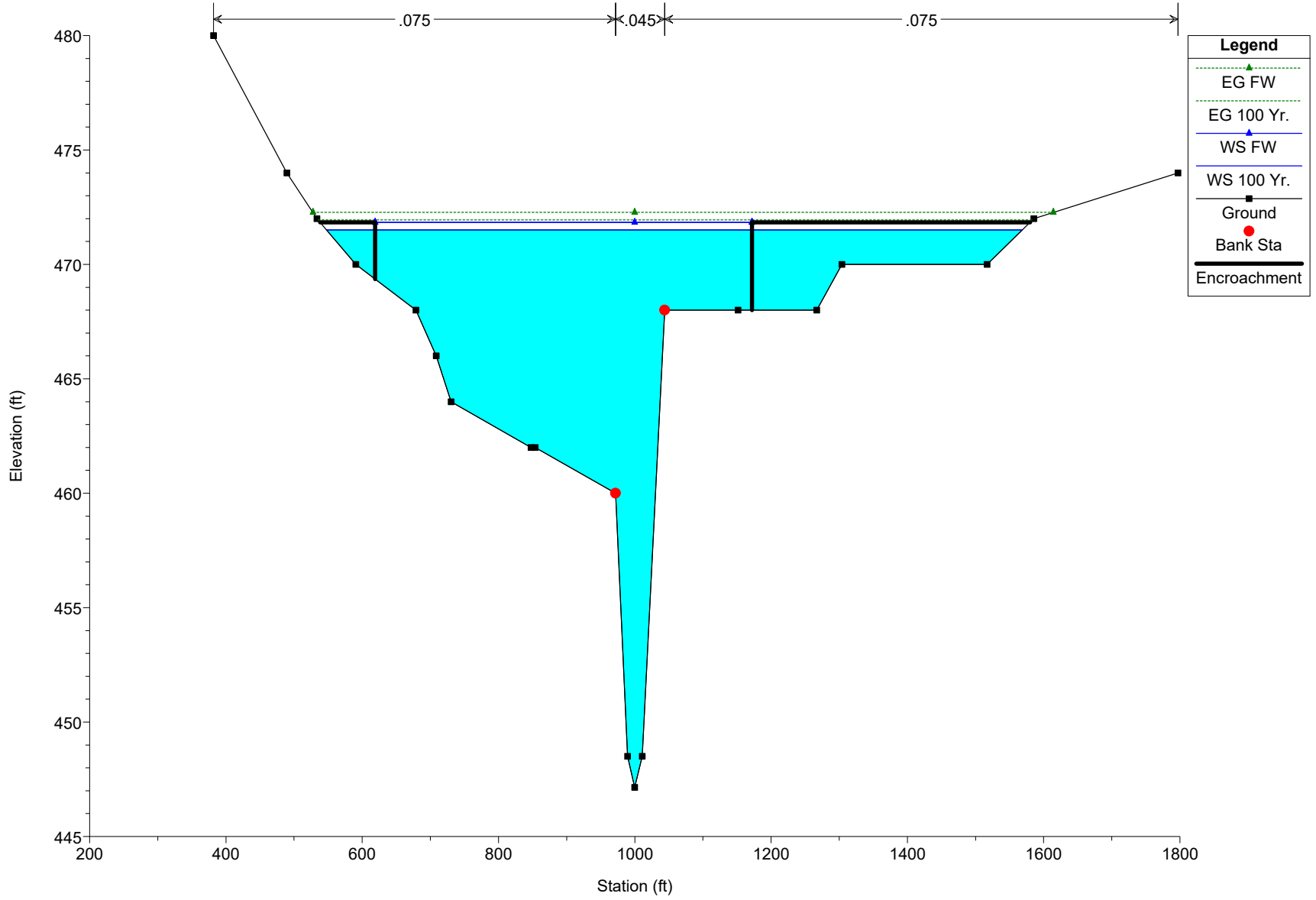
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.148 4.148



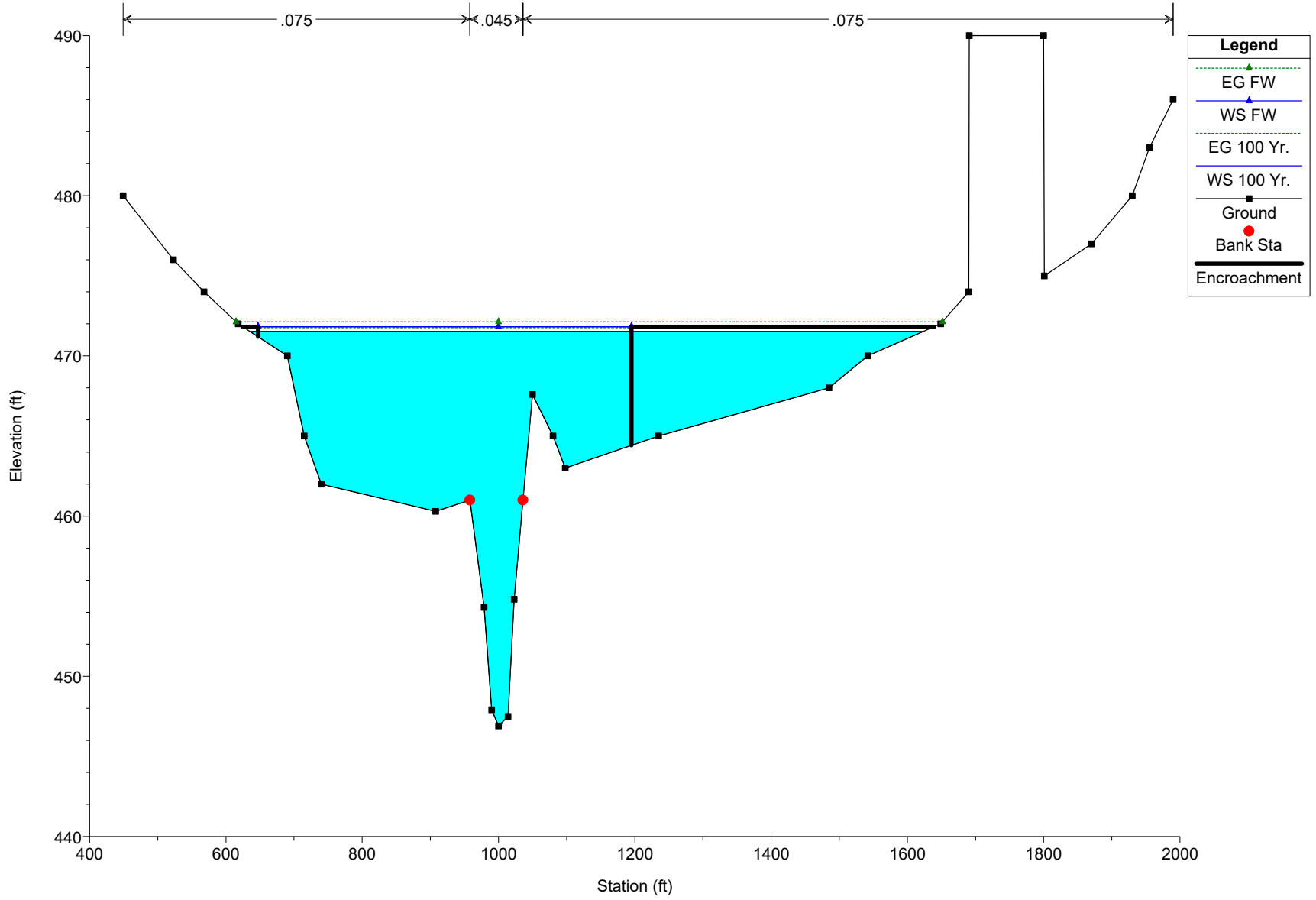
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.080 4.080



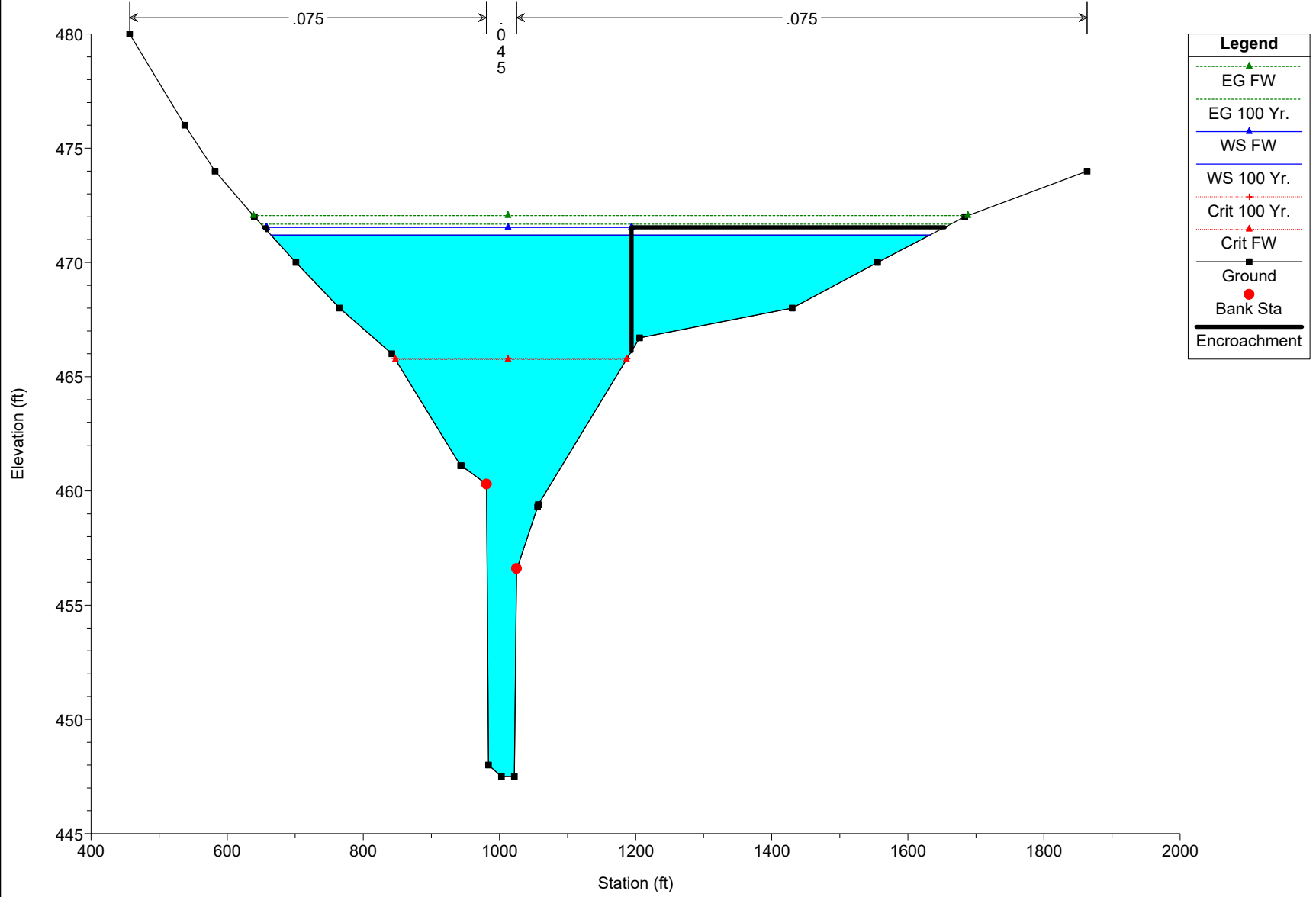
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.073 4.073



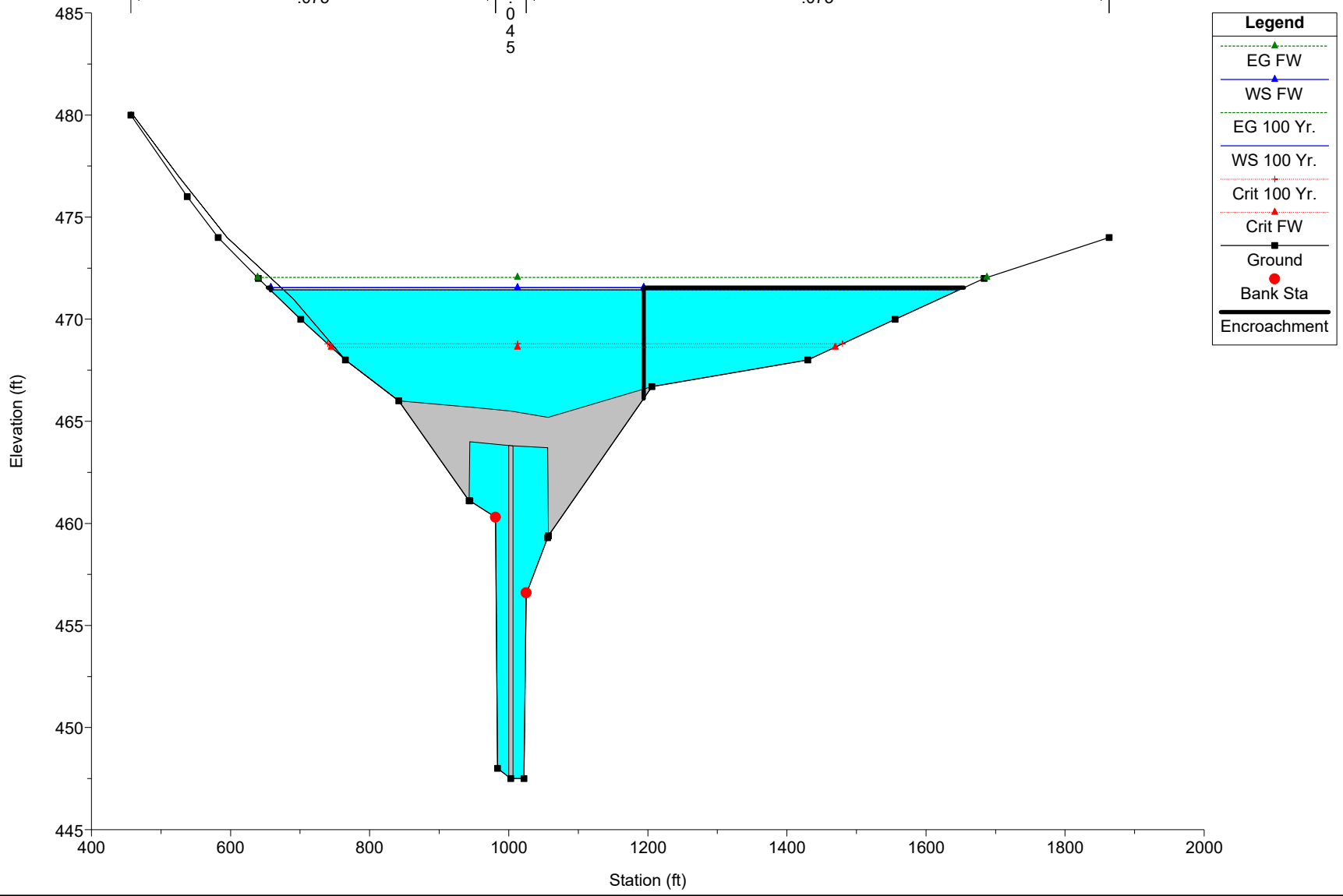
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.069 4.069



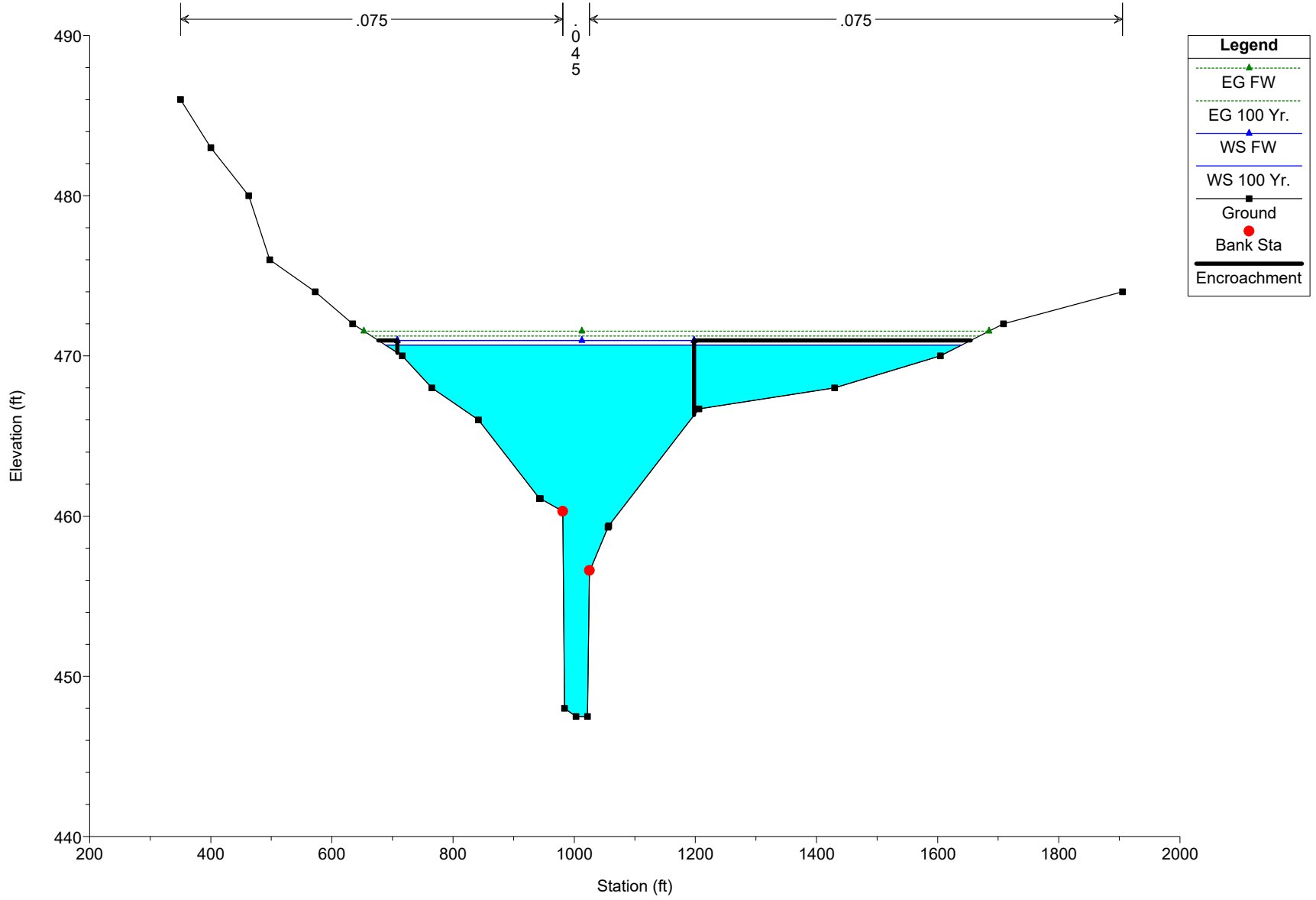
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.060 BR S. McKnight Road Bridge



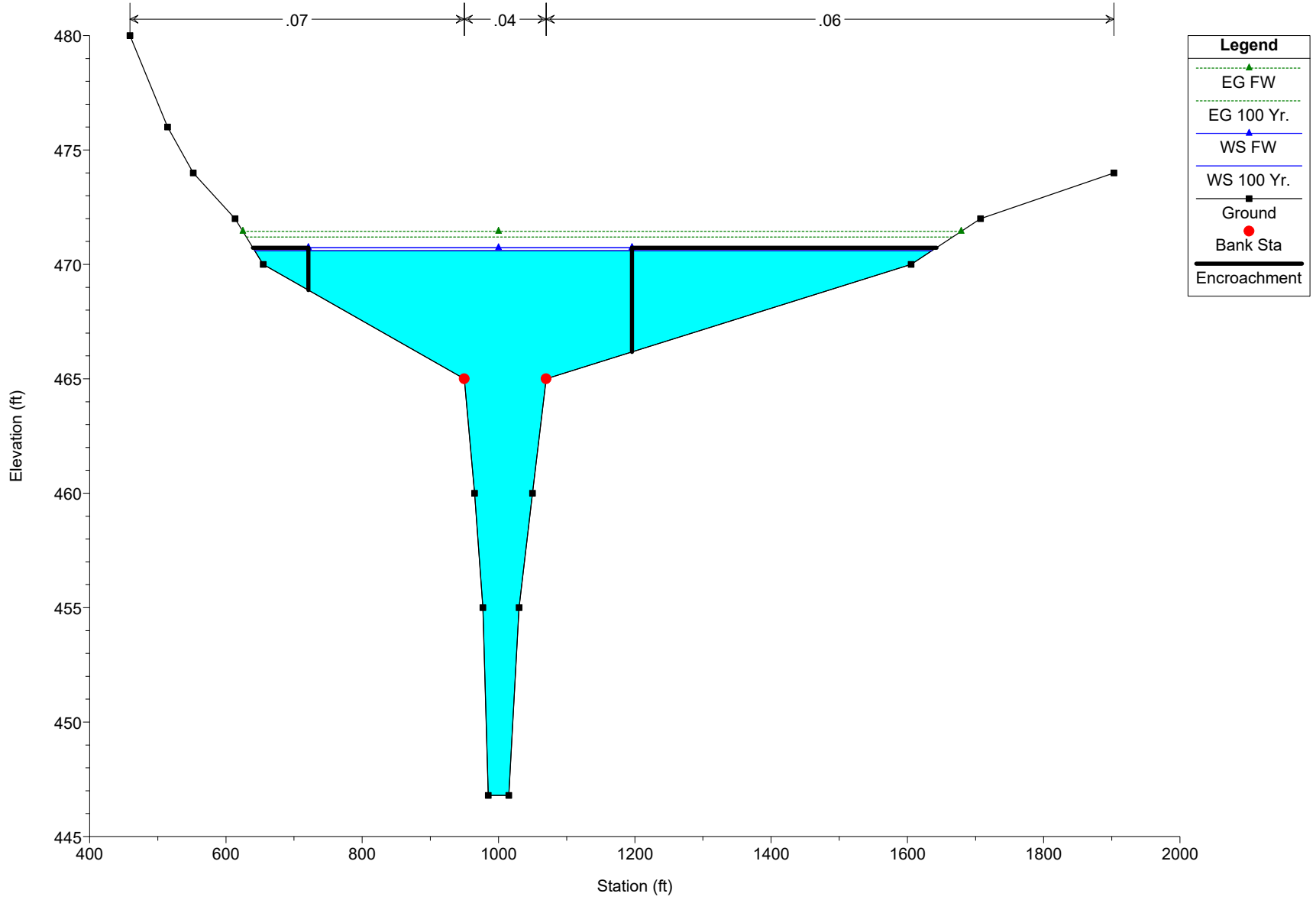
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.057 4.057



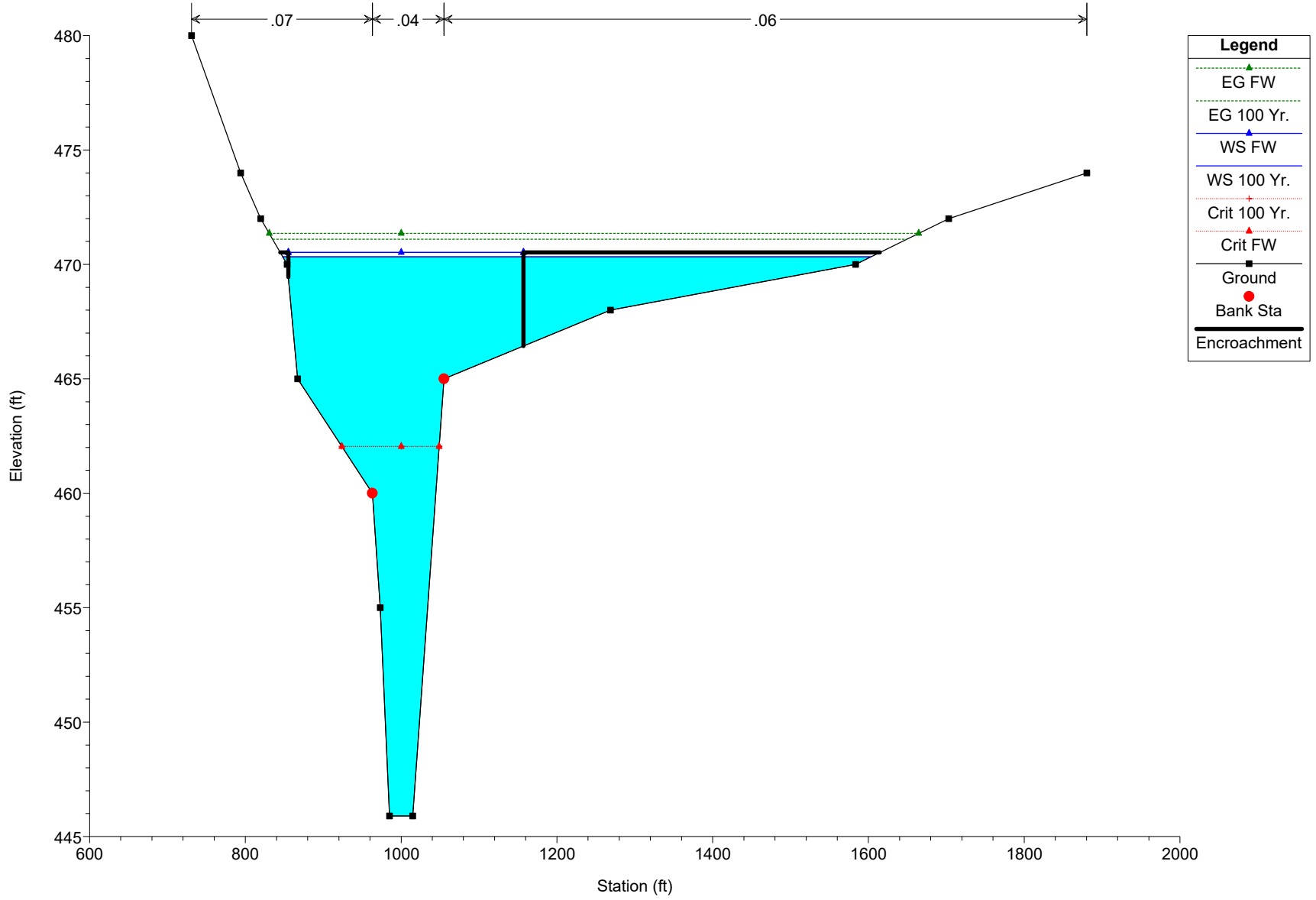
5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.049 4.049



5216FS-CLOMR230123 Plan: Corrected Effective/Ex Cond Model 1/23/2023

River = RIVER-1 Reach = Reach-1 RS = 4.036 4.036



IV. APPENDIX I

Original HEC-2 output for Deer Creek

Account	Code	Address	City	State	Zip	Phone	Balance	Debit	Credit	Balance
X1	4.036	BRENTWOOD FIS =4.15								
GR	485.00	13	963.00				58.00		58.00	
GR	460.00	668.00	480.00				475.00		470.00	867.00
GR	468.00	963.00	455.00				445.90		445.90	1055.00
		1600.00	475.00				480.00			
			1745.00						1913.00	
X1	4.049		950.00				100.00		70.00	
GR	480.00	14	475.00				470.00		465.00	965.00
GR	455.00	495.00	446.80				446.80		455.00	950.00
GR	465.00	1070.00	468.00				475.00		480.00	1050.00
			1605.00						1740.00	
NC	.075	.075	.300				.500			
		LADUE FIS 21422	D.S. FACE OF MCKNIGHT RD. - ROCK HILL CORPORATE LIMITS							
X1	4.057	29	981.00				43.00		43.00	
GR	486.00	350.00	483.00				480.00		477.00	525.00
GR	471.00	690.00	468.00				466.00		461.10	595.00
GR	460.30	981.00	448.00				447.50		447.50	944.00
GR	456.60	1026.00	459.30				459.40		466.70	1025.00
GR	468.00	1780.00	468.00				471.00		471.00	1430.00
GR	477.00	2100.00	480.00				483.00		486.00	2080.00
			2110.00						2125.00	
QT	9	5655.	8476.				11460.		15166.	
SB	1.25	2.21	2.40				25.00		960.00	17157.
X1	4.069						64.00		64.00	2.16
X2	-24		1.00				465.20			
BT		350.00	486.00				400.00		483.00	480.00
BT		525.00	477.00				595.00		474.00	480.00
BT		765.00	468.00				842.00		466.00	471.00
BT		944.00	465.70				1003.00		463.80	461.10
BT		1057.00	465.20				1206.00		466.70	463.70
BT		1780.00	468.00				1880.00		474.00	468.00
BT		2050.00	471.00				2080.00		474.00	471.00
BT		2110.00	480.00				2125.00		483.00	477.00
			10647.				13088.		15166.	20828.
			464.80				64.00		64.00	447.56
			486.00				465.20			
			477.00				400.00		483.00	480.00
			468.00				595.00		474.00	471.00
			465.70				842.00		466.00	465.70
			465.20				1003.00		463.80	461.10
			468.00				1206.00		466.70	463.70
			471.00				1880.00		474.00	468.00
			480.00				2080.00		474.00	471.00
			480.00				2125.00		483.00	477.00
			483.00						483.00	486.00
			13088.						15166.	39567.
			6.00				6.00		960.00	447.56
			64.00				64.00		64.00	
			483.00				483.00		483.00	480.00
			474.00				474.00		474.00	471.00
			466.00				466.00		466.00	461.10
			465.50				465.50		463.80	465.20
			466.70				466.70		466.70	468.00
			468.00				468.00		468.00	468.00
			474.00				474.00		474.00	471.00
			483.00				483.00		483.00	477.00
			483.00						483.00	486.00
			18.00				18.00		18.00	480.00
			40.00				40.00		477.00	530.00
			410.00				410.00		462.00	908.00
			715.00				715.00		446.90	1014.00
			990.00				990.00		465.00	1098.00
			1050.00				1050.00		474.00	1691.00
			1640.00				1640.00		480.00	1955.00
			1870.00				1870.00		480.00	
			40.00				40.00		470.00	474.00
			410.00				410.00		740.00	460.30
			715.00				715.00		1000.00	447.50
			990.00				990.00		1080.00	463.00
			1050.00				1050.00		1690.00	1098.00
			1640.00				1640.00		1930.00	1691.00
			1870.00				1870.00		480.00	1955.00
			40.00				40.00		470.00	483.00
			360.00				360.00		462.00	530.00
			5030.00				5030.00		463.40	908.00
			4020.00				4020.00		464.00	1014.00
			4530.00				4530.00		448.00	1098.00
			4800.00				4800.00		474.00	1691.00
			4982.00				4982.00		480.00	1955.00
			5070.00				5070.00		474.00	480.00
			5440.00				5440.00		486.00	486.00
			5770.00				5770.00		486.00	486.00
			360.00				360.00		400.00	400.00
			5030.00				5030.00		463.40	463.40
			4020.00				4020.00		477.00	477.00
			4530.00				4530.00		464.00	464.00
			4800.00				4800.00		462.00	462.00
			4982.00				4982.00		448.00	448.00
			5070.00				5070.00		470.50	470.50
			5440.00				5440.00		474.00	474.00
			5770.00				5770.00		486.00	486.00
			380.00				380.00		400.00	400.00
			464.00				464.00		463.40	463.40
			480.00				480.00		477.00	477.00
			4455.00				4455.00		464.00	464.00
			4799.00				4799.00		462.00	462.00
			4962.00				4962.00		448.00	448.00
			5038.00				5038.00		470.50	470.50
			5380.00				5380.00		474.00	474.00
			5731.00				5731.00		486.00	486.00
			5030.00				5030.00		400.00	400.00
			4800.00				4800.00		463.40	463.40
			3970.00				3970.00		477.00	477.00
			4455.00				4455.00		464.00	464.00
			4799.00				4799.00		462.00	462.00
			4962.00				4962.00		448.00	448.00
			5038.00				5038.00		470.50	470.50
			5380.00				5380.00		474.00	474.00
			5731.00				5731.00		486.00	486.00
			4962.00				4962.00		400.00	400.00
			483.00				483.00		463.40	463.40
			468.00				468.00		477.00	477.00
			485.00				485.00		464.00	464.00
			463.40				463.40		462.00	462.00
			466.00				466.00		450.20	450.20
			468.00				468.00		466.00	466.00
			480.00				480.00		490.00	490.00
			4962.00				4962.00		483.00	483.00
			380.00				380.00		400.00	400.00
			464.00				464.00		463.40	463.40
			480.00				480.00		477.00	477.00
			4455.00				4455.00		464.00	464.00
			4799.00				4799.00		462.00	462.00
			4962.00				4962.00		448.00	448.00
			5038.00				5038.00		470.50	470.50
			5380.00				5380.00		474.00	474.00
			5731.00				5731.00		486.00	486.00
			4962.00				4962.00		400.00	400.00
			483.00				483.00		463.40	463.40
			468.00				468.00		477.00	477.00
			485.00				485.00		464.00	464.00
			463.40				463.40		462.00	462.00
			466.00				466.00		450.20	450.20
			468.00				4			

STANLEY SURVEY SECT - APPROX. 400 FT U.S. OF TOWMILE.	LADUE FIS 20034	STANLEY SURVEY SECT - APPROX. 400 FT U.S. OF TOWMILE.	LADUE FIS 26491	D.S. FACE OF LITZINGER RD.	LADUE FIS 27769	STANLEY SURVEY SECT.	LADUE FIS 28929	STANLEY SURVEY SECT.
X1 4.859	963.00	1028.00	963.00	1028.00	963.00	1028.00	963.00	1028.00
GR 489.00	660.00	963.00	660.00	963.00	660.00	963.00	660.00	963.00
GR 474.00	835.00	715.00	835.00	715.00	835.00	715.00	835.00	715.00
GR 456.00	990.00	870.00	990.00	870.00	990.00	870.00	990.00	870.00
GR 467.50	1200.00	1000.00	456.20	1012.00	1200.00	1000.00	456.20	1012.00
GR 480.00	1910.00	1850.00	471.00	1875.00	1910.00	1850.00	471.00	1875.00
NC		1920.00	486.00	1930.00		1920.00	486.00	1930.00
X1 5.013	24	300	500	820.00	24	300	500	820.00
GR 498.00	735.50	1040.50	800.00	770.50	498.00	735.50	800.00	770.50
GR 483.00	795.50	760.50	492.00	860.50	483.00	760.50	492.00	860.50
GR 469.90	959.50	840.50	477.00	1012.50	469.90	840.50	477.00	1012.50
GR 472.90	1092.50	999.50	458.30	1470.50	472.90	999.50	458.30	1470.50
GR 480.00	1600.50	1210.50	471.00	1695.50	480.00	1210.50	471.00	1695.50
NC		1670.50	489.00			1670.50	489.00	
X1 5.017	28	1054.00	22.00	22.00	28	1054.00	22.00	22.00
GR 498.00	751.00	761.00	492.00	771.00	498.00	751.00	492.00	771.00
GR 483.00	791.00	836.00	477.00	856.00	483.00	791.00	477.00	856.00
GR 465.60	949.00	977.00	459.60	987.00	465.60	949.00	459.60	987.00
GR 471.30	1053.00	1054.00	474.90	1074.00	471.30	1053.00	474.90	1074.00
GR 474.00	1451.00	1561.00	480.00	1591.00	474.00	1451.00	480.00	1591.00
GR 489.00	1701.00	1751.00	495.00	1781.00	489.00	1701.00	495.00	1781.00
X1 5.018			2.00	2.00	5.018		2.00	2.00
BT -7	929.00	474.00	947.00	474.30	-7	929.00	947.00	474.30
BT 1017.00	1017.00	471.20	1053.00	474.90	1017.00	1017.00	1053.00	474.90
BT 1074.00	1074.00	474.90			1074.00	1074.00		
1 08NOV07	11:30:13				08NOV07	11:30:13		
X1 5.021			22.00	22.00	5.021		22.00	22.00
X2					X2			
X1 5.022			2.00	2.00	5.022		2.00	2.00
X1 5.029	25	1059.00	37.00	37.00	5.029	25	1059.00	37.00
GR 501.00	760.00	790.00	495.00	800.00	GR 501.00	760.00	495.00	800.00
GR 477.00	890.00	918.00	473.00	968.00	GR 477.00	890.00	473.00	968.00
GR 459.50	1009.00	1020.00	464.70	1041.00	GR 459.50	1009.00	464.70	1041.00
GR 469.10	1108.00	1570.00	474.00	1620.00	GR 469.10	1108.00	474.00	1620.00
GR 483.00	1670.00	1690.00	489.00	1710.00	GR 483.00	1670.00	489.00	1710.00
NC			.300		NC		.300	
X1 5.259	22	1050.50	1100.00	1175.00	5.259	22	1050.50	1175.00
GR 498.00	620.50	650.50	492.00	670.50	GR 498.00	620.50	492.00	670.50
GR 483.00	720.50	750.50	477.00	775.50	GR 483.00	720.50	477.00	775.50
GR 463.30	963.50	975.50	465.70	994.50	GR 463.30	963.50	465.70	994.50
GR 471.00	1100.50	1474.00	477.00	1490.50	GR 471.00	1100.50	477.00	1490.50
GR 492.00	1560.50	1580.50	477.00	480.00	GR 492.00	1560.50	477.00	480.00
NC			.100		NC		.100	
X1 5.259	22	1050.50	1100.00	1175.00	5.259	22	1050.50	1175.00
GR 498.00	620.50	650.50	492.00	670.50	GR 498.00	620.50	492.00	670.50
GR 483.00	720.50	750.50	477.00	775.50	GR 483.00	720.50	477.00	775.50
GR 463.30	963.50	975.50	465.70	994.50	GR 463.30	963.50	465.70	994.50
GR 471.00	1100.50	1474.00	477.00	1490.50	GR 471.00	1100.50	477.00	1490.50
GR 492.00	1560.50	1580.50	477.00	480.00	GR 492.00	1560.50	477.00	480.00
NC			.045		NC		.045	
X1 5.259	22	1050.50	1100.00	1175.00	5.259	22	1050.50	1175.00
GR 498.00	620.50	650.50	492.00	670.50	GR 498.00	620.50	492.00	670.50
GR 483.00	720.50	750.50	477.00	775.50	GR 483.00	720.50	477.00	775.50
GR 463.30	963.50	975.50	465.70	994.50	GR 463.30	963.50	465.70	994.50
GR 471.00	1100.50	1474.00	477.00	1490.50	GR 471.00	1100.50	477.00	1490.50
GR 492.00	1560.50	1580.50	477.00	480.00	GR 492.00	1560.50	477.00	480.00

STATION	DATE	TIME	DESCRIPTION	APPROX 100 FT.	D. S. OF TRIB.	1100.00	1160.00	746.00	483.00	791.00
GR	495.00	691.00	STANLEY SURVEY SECT. APPROX 100 FT.	1100.00	1035.00	1100.00	1160.00	746.00	483.00	791.00
GR	480.00	811.00	STANLEY SURVEY SECT. APPROX 100 FT.	1100.00	1035.00	731.00	486.00	976.00	466.50	984.00
GR	466.30	1000.00	STANLEY SURVEY SECT. APPROX 100 FT.	1100.00	1035.00	886.00	473.10	1024.00	475.80	1035.00
GR	476.30	1066.00	STANLEY SURVEY SECT. APPROX 100 FT.	1100.00	1035.00	1016.00	471.00	1611.00	486.00	1626.00
GR	489.00	1636.00	STANLEY SURVEY SECT. APPROX 100 FT.	1100.00	1035.00	1421.00	480.00			
GR	489.00	1636.00	STANLEY SURVEY SECT. APPROX 100 FT.	1100.00	1035.00	1641.00	495.00			
NC										
X1	5.678	LADUE FIS 29979	STANLEY SURVEY SECT. APPROX 100 FT.	1100.00	1035.00					
GR	495.00	481.50	STANLEY SURVEY SECT. APPROX 100 FT.	1100.00	1035.00	1051.50	1050.00			
GR	480.00	821.50	STANLEY SURVEY SECT. APPROX 100 FT.	1100.00	1035.00	521.50	486.00	591.50	483.00	671.50
GR	483.00	881.50	STANLEY SURVEY SECT. APPROX 100 FT.	1100.00	1035.00	851.50	486.00	869.50	486.00	871.50
GR	471.10	987.50	STANLEY SURVEY SECT. APPROX 100 FT.	1100.00	1035.00	895.50	476.50	958.50	469.60	971.50
GR	480.00	1181.50	STANLEY SURVEY SECT. APPROX 100 FT.	1100.00	1035.00	990.50	472.40	1031.50	477.00	1051.50
GR	495.00	1266.50	STANLEY SURVEY SECT. APPROX 100 FT.	1100.00	1035.00	1211.50	486.00	1241.50	492.00	1246.50
QT	9	3864.	5982.	7894.	8985.	10168.				
X1	5.848	LADUE FIS 30879	STANLEY SURVEY SECT.	920.00	890.00					
GR	495.00	320.00	STANLEY SURVEY SECT.	920.00	890.00	1024.00	900.00			
GR	483.00	790.00	STANLEY SURVEY SECT.	920.00	890.00	600.00	486.00	755.00	486.00	770.00
GR	472.70	979.00	STANLEY SURVEY SECT.	920.00	890.00	820.00	489.00	950.00	477.50	975.00
GR	483.00	1120.00	STANLEY SURVEY SECT.	920.00	890.00	1000.00	480.00	1024.00	480.70	1075.00
GR	495.00	1460.00	STANLEY SURVEY SECT.	920.00	890.00	1220.00	473.10	1430.00	492.00	1450.00
1	08NOV07	11:30:13								
NC										
X1	5.902	18	500	286.00	286.00					
GR	495.00	160.00	500	286.00	286.00	1033.00	286.00	590.00	483.00	630.00
GR	483.00	900.00	500	489.00	510.00	370.00	489.00	990.00	470.30	1000.00
GR	472.70	1015.00	500	481.60	968.00	918.00	479.80	1110.00	489.00	1180.00
GR	492.00	1220.00	500	482.00	1083.00	1033.00	483.40			
			500	495.00	1265.00	1250.00	498.00			
X1	5.908	LADUE FIS 31196	D. S. FACE OF LOG CABIN RD.	31.00	31.00					
GR	504.00	3800.00	D. S. FACE OF LOG CABIN RD.	31.00	31.00	5050.00	4950.00	3960.00	495.00	4100.00
GR	492.00	4360.00	D. S. FACE OF LOG CABIN RD.	31.00	31.00	3890.00	498.00	4860.00	484.30	4950.00
GR	478.50	4960.00	D. S. FACE OF LOG CABIN RD.	31.00	31.00	4550.00	486.00	4994.00	475.60	4997.00
GR	472.10	5014.00	D. S. FACE OF LOG CABIN RD.	31.00	31.00	4961.00	478.50	5050.00	486.00	5090.00
GR	486.50	5130.00	D. S. FACE OF LOG CABIN RD.	31.00	31.00	5030.00	471.90	5250.00	498.00	5265.00
GR	501.00	5280.00	D. S. FACE OF LOG CABIN RD.	31.00	31.00	5185.00	489.00			
			D. S. FACE OF LOG CABIN RD.	31.00	31.00	5290.00	504.00			
SB	1.00	2.08	2.60	16.50	2.00					
X1	5.913		22.00	22.00	22.00			3.61	471.94	471.94
X2										
BT	-24	3800.00	1.00	481.90	501.00			3920.00	498.00	498.00
BT		3960.00	504.00	504.00	495.00			4360.00	492.00	492.00
BT		4550.00	495.00	4100.00	495.00			4860.00	484.60	484.60
BT		4950.00	489.00	4600.00	486.00			4961.00	484.20	481.90
BT		4994.00	484.30	4960.00	478.50			5031.00	484.90	471.90
BT		5050.00	484.50	5030.00	481.40			5130.00	486.50	486.50
BT		5185.00	485.00	5090.00	486.00			5250.00	495.00	495.00
BT		5265.00	489.00	5220.00	492.00					
			498.00	5280.00	501.00					

5787.84	4.049	70.00	.00	.00	446.80	20761.00	471.81	.00	472.21	7.31	6.29	6425.04
7680.42												
2401.87	4.057	43.00	.00	.00	447.50	10631.00	466.99	.00	467.72	19.59	8.33	2309.81
4142.87	4.057	43.00	.00	.00	447.50	15084.00	469.63	.00	470.07	13.26	7.48	4748.92
5182.11	4.057	43.00	.00	.00	447.50	17035.00	470.63	.00	470.98	10.81	6.97	5960.91
6939.53	4.057	43.00	.00	.00	447.50	20761.00	472.01	.00	472.28	8.95	6.60	7814.19
2792.66	4.069	64.00	465.20	464.80	447.50	10647.00	467.82	.00	468.36	14.54	7.38	2755.63
4138.39	4.069	64.00	465.20	464.80	447.50	15166.00	469.62	.00	470.07	13.43	7.53	4743.27
5175.03	4.069	64.00	465.20	464.80	447.50	17157.00	470.63	.00	470.98	10.99	7.03	5953.18
6936.02	4.069	64.00	465.20	464.80	447.50	20828.00	472.01	.00	472.28	9.02	6.62	7810.73

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SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA
.01K											
* 4.073	18.00	.00	.00	446.90	10647.00	468.22	.00	468.47	6.82	5.05	4189.30
4077.17	18.00	.00	.00	446.90	15166.00	469.89	.00	470.15	7.11	5.52	5712.17
5686.64	18.00	.00	.00	446.90	17157.00	470.79	.00	471.03	6.54	5.48	6616.42
6708.25	18.00	.00	.00	446.90	20828.00	472.09	.00	472.31	6.13	5.56	8007.55
8410.57											
* 4.148	400.00	.00	.00	448.00	10647.00	468.37	.00	468.93	13.94	7.04	2887.79
2851.45	400.00	.00	.00	448.00	15166.00	470.07	.00	470.61	13.95	7.54	4177.16
4060.57	400.00	.00	.00	448.00	17157.00	470.96	.00	471.45	12.60	7.41	4938.25
4834.02	400.00	.00	.00	448.00	20828.00	472.25	.00	472.69	11.42	7.38	6148.41
6163.48											
3859.23	43.00	.00	.00	448.50	10647.00	468.81	.00	469.06	7.61	4.90	4260.22
4.157	43.00	.00	.00	448.50	15166.00	470.51	.00	470.75	7.23	5.16	6065.77
5641.25	43.00	.00	.00	448.50	17157.00	471.35	.00	471.57	6.55	5.09	7054.47
6705.45	43.00	.00	.00	448.50	20828.00	472.60	.00	472.80	5.97	5.10	8592.09
8525.93											
* 4.158	1.00	467.50	468.00	448.50	10647.00	468.96	.00	469.10	22.80	3.86	3924.86

* 3065.39 * 3678.23	4.419 4.419	285.00 285.00	.00 .00	451.90 451.90	16358.00 19884.00	471.48 472.52	.00 .00	472.67 473.82	28.48 29.22	9.48 10.10	2123.78 2504.20	
1	08NOV07	11:30:13									PAGE 60	
.01K	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIMS	EG	10*KS	VCH	AREA
2340.30	4.464	238.00	.00	.00	452.50	10212.00	470.28	.00	470.89	19.04	6.80	1887.00
3399.29	4.464	238.00	.00	.00	452.50	14451.00	471.90	.00	472.52	18.07	7.26	2730.29
4137.23	4.464	238.00	.00	.00	452.50	16358.00	472.67	.00	473.21	15.63	7.02	3250.61
* 5540.42	4.464	238.00	.00	.00	452.50	19884.00	473.86	.00	474.34	12.88	6.74	4075.60
2203.18	4.563	522.50	.00	.00	454.20	10212.00	471.02	.00	472.07	21.48	8.20	1248.63
2631.77	4.563	522.50	.00	.00	454.20	14451.00	472.37	.00	474.02	30.15	10.31	1434.36
* 2789.30	4.563	522.50	.00	.00	454.20	16358.00	472.84	.00	474.79	34.39	11.22	1507.59
* 3027.66	4.563	522.50	.00	.00	454.20	19884.00	473.51	.00	476.08	43.13	12.90	1623.18
2409.46	4.612	255.00	.00	.00	456.30	10212.00	471.84	.00	472.59	17.96	6.99	1472.49
3208.33	4.612	255.00	.00	.00	456.30	14451.00	473.63	.00	474.70	20.29	8.32	1804.00
3553.55	4.612	255.00	.00	.00	456.30	16358.00	474.33	.00	475.54	21.19	8.85	1949.17
4159.05	4.612	255.00	.00	.00	456.30	19884.00	475.51	.00	476.97	22.86	9.76	2202.45
* 3434.91	4.743	695.00	.00	.00	455.30	10212.00	473.16	.00	473.56	8.84	5.89	3389.64
* 4928.96	4.743	695.00	.00	.00	455.30	14451.00	475.34	.00	475.77	8.60	6.43	4572.23
* 5605.51	4.743	695.00	.00	.00	455.30	16358.00	476.22	.00	476.66	8.52	6.63	5057.18
* 6860.64	4.743	695.00	.00	.00	455.30	19884.00	477.71	.00	478.17	8.40	6.98	5912.07
3636.79	4.859	610.00	.00	.00	455.50	7280.00	473.88	.00	474.01	4.01	4.03	5143.62
5840.95	4.859	610.00	.00	.00	455.50	10096.00	476.09	.00	476.19	2.99	3.84	7501.04
6872.41	4.859	610.00	.00	.00	455.50	11243.00	476.97	.00	477.06	2.68	3.77	8461.22
8824.90	4.859	610.00	.00	.00	455.50	13610.00	478.48	.00	478.57	2.38	3.77	10127.26

SECNO	CWSEL	DIFKWS	STENCL	STCHL	STCHR	STENCR	TOPWID	VCH	SSTA	ENDST	Q
4.036	470.52	.18	825.00	963.00	1055.00	1400.00	575.00	6.97	825.00	1400.00	17035.00
4.049	470.54	.12	750.00	950.00	1070.00	1300.00	550.00	7.05	750.00	1300.00	17035.00
4.057	470.74	.11	750.00	981.00	1025.00	1300.00	550.00	7.84	750.00	1300.00	17035.00
4.069	470.73	.10	750.00	981.00	1025.00	1300.00	550.00	7.90	750.00	1300.00	17157.00
4.073	470.98	.19	750.00	958.00	1036.00	1300.00	550.00	6.12	750.00	1300.00	17157.00
4.148	471.15	.19	4500.00	4962.00	5030.00	5200.00	469.74	8.35	4500.00	5200.00	17157.00
4.157	471.75	.40	4500.00	4950.00	5050.00	5200.00	700.00	5.44	4500.00	5200.00	17157.00
4.158	471.89	.40	4500.00	4950.00	5050.00	5200.00	700.00	3.91	4500.00	5200.00	17157.00
4.159	471.91	.40	4500.00	4950.00	5050.00	5200.00	700.00	3.90	4500.00	5200.00	17157.00
4.160	471.86	.40	4500.00	4950.00	5050.00	5200.00	700.00	5.36	4500.00	5200.00	17157.00
4.165	471.88	.40	4500.00	4949.00	5050.00	5200.00	697.69	5.24	4500.00	5200.00	17157.00
4.259	472.22	.44	600.00	940.00	1060.00	1400.00	800.00	4.20	600.00	1400.00	17157.00
4.365	472.42	.50	400.00	985.40	1087.00	1400.00	667.89	5.80	400.00	1400.00	17157.00
4.419	472.39	.90	300.00	979.20	1086.00	1087.00	309.42	8.54	300.00	1087.00	16358.00
4.464	472.83	.16	380.00	976.70	1086.00	1140.00	237.91	8.97	380.00	1140.00	16358.00
4.563	473.78	.94	910.00	967.00	1085.00	1084.00	174.00	10.38	910.00	1084.00	16358.00
4.612	474.97	.64	900.00	925.00	1075.00	1100.00	198.25	8.39	901.75	1100.00	16358.00
4.743	476.50	.29	900.00	951.00	1044.00	1290.00	390.00	7.41	900.00	1290.00	16358.00
4.859	477.45	.48	963.00	963.00	1028.00	1300.00	337.00	5.57	963.00	1300.00	11243.00
5.013	477.96	.77	900.00	959.50	1040.50	1300.00	400.00	6.59	900.00	1300.00	11243.00
5.017	477.96	.88	900.00	947.00	1054.00	1300.00	400.00	6.25	900.00	1300.00	11243.00
5.018	477.94	.83	900.00	947.00	1054.00	1300.00	400.00	6.90	900.00	1300.00	11243.00
5.021	478.11	.78	900.00	947.00	1054.00	1300.00	400.00	6.72	900.00	1300.00	11243.00
5.022	478.16	.85	900.00	947.00	1054.00	1300.00	400.00	6.13	900.00	1300.00	11243.00
5.029	478.47	.65	900.00	968.00	1059.00	1300.00	400.00	5.38	900.00	1300.00	11243.00
5.259	479.37	.87	850.00	949.50	1050.50	1300.00	450.00	6.04	850.00	1300.00	11243.00
5.479	481.00	.79	900.00	976.00	1035.00	1300.00	400.00	9.02	900.00	1300.00	11243.00
5.678	483.79	.71	900.00	948.50	1051.50	1150.00	250.00	7.97	900.00	1150.00	11243.00
5.848	486.44	.51	900.00	975.00	1024.00	1125.00	225.00	11.56	900.00	1125.00	11354.00
5.902	488.26	.78	650.00	968.00	1033.00	1050.00	400.00	8.26	650.00	1050.00	11354.00
5.908	488.23	.84	4700.00	4950.00	5050.00	5050.00	350.00	8.08	4700.00	5050.00	11354.00

V. APPENDIX II

FIRM Map 29189C0326 K
FEMA FIS vertical datum explanation
FEMA FIS summary of discharges table
FEMA FIS data table for Deer Creek
FEMA FIS river profile for Deer Creek

National Flood Hazard Layer FIRMette



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) <i>Zone A, V, AH</i>	
	With BFE or Depth	
	Regulatory Floodway <i>Zone AE, AO, AH, VE, F</i>	
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>	
	Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>	
	Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>	
	Area with Flood Risk due to Levee <i>Zone X</i>	
OTHER AREAS	Area of Minimal Flood Hazard <i>Zone X</i>	
	Effective LOMRS	
	Area of Undetermined Flood Hazard <i>Zor</i>	
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer	
	Levee, Dike, or Floodwall	
OTHER FEATURES	Cross Sections with 1% Annual Chance Water Surface Elevation	
	Coastal Transect	
	Base Flood Elevation Line (BFE)	
	Limit of Study	
	Jurisdiction Boundary	
	Coastal Transect Baseline	
	Profile Baseline	
	Hydrographic Feature	
MAP PANELS	Digital Data Available	
	No Digital Data Available	
	Unmapped	

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/23/2018 at 10:11:26 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmortized areas cannot be used for regulatory purposes.



38°37'11.59"N
80°21'40.96"W
38°36'43.48"N
1:6,000
0 250 500 1,000 1,500 2,000 Feet

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

where improved topographic data was used to redelineate floodplain boundaries, the “profile base line” may deviate significantly from the channel centerline or may be outside the SFHA.

Hydraulic modeling for approximate Zone A streams was performed using HEC-RAS, version 4.0 (Reference 39). Forty-three (43) individual streams and their tributaries were modeled by approximate methods (Table 5). For this method no survey was completed and hydraulic structures were not incorporated into the models. Valley and channel cross-sections were derived from a one meter digital elevation model (DEM). The one meter DEM was compiled from light detection and ranging (LiDAR) topographic data with a vertical accuracy of 18cm for flat, bare ground and 37cm for hillsides. LiDAR data for the eastern portion of the county was collected in 2006 and provided by the St. Louis Metropolitan Sewer District (MSD). LiDAR data for the remaining western portion of the county outside of the MSD service area was collected in 2008. The vertical positional accuracy of the LiDAR data is sufficiently accurate to support generation of 2-foot contours. The 1-percent-annual chance flood discharges were developed during the hydrologic phase of this project.

For streams studied by approximate methods Manning’s n-values were determined from downstream reaches in the effective HEC-2 models or based upon values determined from aerial photographs. Contraction and expansion coefficients were set at 0.1 and 0.3, respectively. The effective water surface elevation was set as the downstream boundary condition for the approximate streams that tie-in to the limit of previously detailed studied streams. The downstream boundary condition starting water surface elevation for the remaining approximate streams was based on the normal depth calculation.

In all approximate method studies except for the Tributary to Mackenzie Creek, the resulting 1-percent-annual-chance floodplain elevations produced by the HEC-RAS computations were plotted on the digital terrain models produced from the LiDAR one meter DEMs. The floodplains were merged at confluences using best fit engineering judgment. For water bodies within the study limits, which hydrologic and hydraulic information is not available, the water boundary on the aerial photograph was digitized and incorporated in the floodplain boundaries. The approximate portion of the Tributary to Mackenzie Creek which is located between lettered cross-sections “C” and “D” was digitized from the effective mapping due to the length of the culvert and the uncertainty of the resulting base flood elevations due to overtopping of the culvert. The approximate floodplains provide the State of Missouri and St. Louis County a topographically accurate flood hazard boundary for the approximate areas.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the finalization of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are being prepared using NAVD88 as the referenced vertical datum.

The studied reach of the Mississippi and Missouri Rivers span multiple counties in multiple states, and the river forms the actual border between adjacent counties. The UMRSFFS was originally performed using the NGVD29 vertical datum. Applying an average countywide datum shift to convert to NAVD88 would have resulted in a mismatch of elevations between counties. Therefore, in order to perform the most accurate vertical datum conversion possible, and to maintain consistency in approach across county lines, the datum conversion for the Mississippi and Missouri Rivers were performed on a cross-section by cross-section basis, rather than by applying an average county-wide or stream-wide value.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Structure and ground elevations in the community must, therefore, be referenced to NAVD88. It is important to note that adjacent communities may be referenced to NGVD29. This may result in differences in BFEs across the corporate limits between communities. Effective information for this FIS was converted from NGVD29 to NAVD88. In accordance with the April 2003 Appendix B of the Guidelines and Specifications for Flood Hazard Mapping Partners, a stream by stream datum conversion was applied across the county to convert all effective BFEs and other profile elevations. Datum shift computations are shown in Table 11. The value in the Average Conversion column was used because the maximum offset was less than the tolerance allowed by Appendix B.

Table 11. St. Louis County Stream by Stream Datum Shift

Stream Name	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset
Anthony Creek	0.07	0.09	0.08	0.01
Antire Creek	-0.37	-0.34	-0.36	-0.02
Black Creek	-0.27	-0.17	-0.23	0.06
Black Jack Creek	0.13	0.14	0.13	0.01
Bonhomme Creek	-0.21	-0.16	-0.19	0.03
Ball Creek	0.04	0.09	0.07	-0.02
Butler Hill Creek	-0.63	-0.63	-0.63	0.00
Calumet Creek	0.13	0.13	0.13	0.00
Carr Creek	-0.27	-0.24	-0.25	-0.02
Caulks Creek	-0.23	-0.18	-0.2	-0.03
Claytonia Creek	-0.31	-0.27	-0.29	-0.02
Clifte Creek – Forby Creek	-0.3	-0.26	-0.28	0.02
Coldwater Creek	-0.03	0.19	0.07	0.12
Country Club Drainage	-0.2	-0.17	-0.19	0.02
Cowmire Creek	-0.04	-0.03	-0.04	0.01
Creve Coeur Creek	-0.23	-0.07	-0.15	0.09
Creve Coeur Creek Tributary	-0.14	-0.13	-0.14	-0.01
Daniel Boone Creek	0.02	0.06	0.04	0.02
Dawson Creek	-0.02	-0.01	-0.02	0.00
Deer Creek	-0.38	-0.2	-0.29	-0.09
Dellwood Creek	0.12	0.13	0.12	0.01
Des Peres Creek	-0.34	-0.34	-0.34	0.00
Dorsett Tributary	-0.09	-0.08	-0.09	0.00

Table 11. St. Louis County Stream by Stream Datum Shift (continued)

Stream Name	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset
Dunn Creek	-0.03	-0.02	-0.02	0.01
East Tributary Cowmire Creek	-0.04	-0.03	-0.03	-0.01
East Tributary Fee Fee Creek	-0.09	-0.08	-0.09	-0.01
East Tributary Williams Creek	-0.43	-0.41	-0.42	-0.01
Engelholm Creek	-0.17	-0.04	-0.1	-0.07
Engelholm Creek Bypass	-0.16	-0.15	-0.16	0.01
Fee Fee Creek	-0.11	-0.08	-0.09	-0.02
Fenton Creek	-0.56	-0.48	-0.52	-0.04
Ferguson Branch	0.09	0.09	0.09	0.00
Ferguson Park Branch	0.1	0.11	0.1	-0.01
Ferridge Creek	-0.17	-0.16	-0.16	0.00
Fishpot Creek	-0.37	-0.26	-0.32	0.06
Flat Creek	-0.31	-0.27	-0.29	0.03
Flatrock Creek	-0.24	-0.24	-0.24	0.00
Fountain Creek	0.06	0.08	0.06	0.01
Fox Creek	-0.26	-0.23	-0.25	0.02
Glaize Creek	-0.28	-0.25	-0.27	-0.02
Grand Glaize Creek	-0.4	-0.26	-0.33	-0.07
Grand Glaize East Creek	-0.3	-0.28	-0.29	-0.01
Grand Glaize West Creek	-0.28	-0.26	-0.27	-0.01
Gravois Creek	-0.53	-0.3	-0.4	-0.13
Halls Ferry Creek	0.13	0.14	0.13	0.00
Hamilton Creek	-0.28	-0.22	-0.25	-0.03
Hampton Branch	-0.33	-0.25	-0.29	0.04
Hollow Tributary	-0.23	-0.22	-0.22	-0.01
Jefferson Barracks Creek	-0.43	-0.42	-0.42	0.01
Kiefer Creek	-0.34	-0.29	-0.31	0.03
Kirkwood Creek	-0.44	-0.39	-0.42	0.03
Lawnview Creek	0.03	0.06	0.05	-0.02
Lemay Creek	-0.64	-0.63	-0.63	-0.01
Little Antire Creek	-0.39	-0.37	-0.38	-0.01
Little Fox Creek	-0.25	-0.24	-0.25	0.00
Lynnhaven - Elmgrove Creek	0.03	0.04	0.03	0.01
Mackenzie Creek	-0.44	-0.42	-0.43	-0.01
Maline Creek	0.03	0.13	0.09	-0.06
Martigney Creek	-0.51	-0.24	-0.38	0.14
Maryville Creek	-0.2	-0.18	-0.19	0.01
Mattese Creek	-0.59	-0.57	-0.58	-0.01
Mehlville Creek	-0.51	-0.5	-0.5	0.01
Meramec River	-0.35	-0.23	-0.28	-0.08
Midland Creek	-0.08	-0.06	-0.07	-0.01
Mill Creek	0.05	0.08	0.06	0.02
Mississippi River*	-0.23	0.11	-0.08	0.19
Missouri River*	-0.24	0.11	-0.07	0.18

*Individual datum conversions were applied to each cross-section for the Mississippi and Missouri Rivers.

Table 11. St. Louis County Stream by Stream Datum Shift (continued)

Stream Name	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset
Monsanto-Sunswept Creek	-0.21	-0.18	-0.19	0.02
Mulberry Creek	-0.47	-0.46	-0.47	0.01
New Halls Ferry Creek	0.04	0.06	0.05	0.01
North Tributary Midland Creek	-0.06	-0.06	-0.06	0.00
North Tributary Williams Creek	-0.4	-0.38	-0.39	-0.01
Northeast Branch River Des Peres	-0.14	-0.05	-0.09	-0.05
Northwest Branch River Des Peres	-0.12	-0.09	-0.1	0.01
Northwest Branch Twomile Creek	-0.27	-0.26	-0.26	0.00
Paddock Creek	0.06	0.11	0.08	-0.02
River Des Peres	-0.17	-0.1	-0.13	-0.04
Rock Hill Creek	-0.33	-0.32	-0.33	0.00
Sappington Creek	-0.53	-0.51	-0.52	0.01
Sebago Drainage	-0.29	-0.28	-0.29	0.00
Shady Grove Creek	-0.36	-0.34	-0.35	0.01
Shotwell Creek	-0.21	-0.2	-0.21	-0.01
Smith Creek	-0.21	-0.17	-0.19	-0.03
South Tributary Cowmire Creek	-0.04	-0.04	-0.04	0.00
Southwest Branch River Des Peres	-0.13	-0.12	-0.12	-0.01
Spencer Creek	-0.1	-0.09	-0.09	0.00
Spring Branch	-0.33	-0.3	-0.31	0.01
St. George Creek	-0.48	-0.46	-0.47	0.01
Stormwater Creek	0.13	0.13	0.13	0.00
Sugar Creek	-0.35	-0.34	-0.34	0.01
Sugar Tributary	-0.27	-0.17	-0.23	0.05
Tavern Creek	-0.22	-0.21	-0.22	0.00
Tributary A	-0.54	-0.51	-0.53	0.02
Tributary B	-0.54	-0.47	-0.5	-0.04
Tributary to Mackenzie Creek	-0.43	-0.42	-0.43	0.01
Twomile Creek	-0.28	-0.27	-0.27	0.01
Tyson Hollow	-0.34	-0.33	-0.34	0.01
Union Creek	-0.53	-0.52	-0.53	0.01
Warson Woods Creek	-0.3	-0.29	-0.29	-0.01
Watkins Creek	0.14	0.16	0.15	0.01
West Branch Caulks Creek	-0.2	-0.2	-0.2	0.00
West Tributary Mattese Creek	-0.62	-0.61	-0.62	0.01
Westwood Creek	-0.2	-0.19	-0.19	0.01
Wildhorse Creek	-0.21	-0.18	-0.2	0.02
Williams Creek	-0.44	-0.36	-0.4	-0.04
Wilson Tributary	-0.2	-0.19	-0.19	0.00
Yarnell Creek	-0.53	-0.42	-0.48	0.06

For more information on NAVD88, see the FEMA publication entitled *Converting the National Flood Insurance Program to the North American Vertical Datum of 1988* (FEMA, June 1992), or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic

and Atmospheric Administration, Silver Spring, Maryland 20910. (Internet address <http://www.ngs.noaa.gov>.)

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the TSDN associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent-annual-chance flood elevations and delineations of the 1- and 0.2-percent-annual-chance floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles and FWDTs. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

In order to provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base for floodplain management purposes. The 0.2-percent-annual-chance floods are employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the existing 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross-section.

The 1-percent and 0.2-percent annual chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zone A, AE, AH, and AO); and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards (Zone X). In cases where the 1-percent and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown on the FIRM (published separately). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM (published separately).

Floodplain boundaries for the detailed and approximate streams were plotted on a one meter DEM that was derived from LiDAR with a vertical accuracy of 18cm for flat, bare ground and 37 cm for hillsides. The bare earth surface meets NSDDA accuracy specifications at the 95% confidence level or better for two-foot contours. The LiDAR data for the eastern portion of the county was

Table 7. Summary of Discharges (continued)

<u>Flooding Source and Location</u>	<u>Drainage Area (sq. mi.)</u>	<u>Peak Discharges (cubic feet per second)</u>			
		<u>10-Percent-Annual Chance</u>	<u>2-Percent-Annual Chance</u>	<u>1-Percent-Annual Chance</u>	<u>0.2-Percent-Annual Chance</u>
Dawson Creek					
At mouth	1.40	1,500	2,300	2,600	3,500
Deer Creek					
Just US of Big Bend Boulevard	36.90	14,900	19,690	22,300	27,290
Just US of Breckenridge Industrial Court	27.20	10,900	15,250	17,240	21,070
Just US of Brentwood Boulevard	25.90	10,900	15,270	17,690	21,550
At Rock Mill Road	21.61	10,647	15,166	17,157	20,828
At Lindeburgh Boulevard	6.55	4,835	6,763	7,493	9,185
At DS Frontenac corporate limit	5.70	3,924	5,621	6,270	7,420
Spoeede Road	4.10	3,876	5,572	6,212	7,322
Dellwood Creek					
At mouth	2.29	2,659	3,790	4,440	6,000
At Green Valley Drive	N/A	2,319	3,389	3,895	5,175
Des Peres Creek					
At mouth	1.64	1,700	2,700	3,100	4,400
Entrance road to Normandy Osteopathic Hospital	0.83	1,100	1,800	2,000	2,800
Dorsett Tributary					
Confluence with Fee Fee Creek	1.94	2,050	3,100	3,600	4,850
Rush Creek Way	1.20	1,550	2,300	2,650	3,550
Dunn Creek					
4,600 feet US of Aubuchon Road	1.89	1,850	2,850	3,300	4,500
500 feet US of Dunn Road	1.45	1,600	2,450	2,850	3,900
East Tributary Cowmire Creek					
Confluence with Cowmire Creek	1.10	800	1,200	1,400	2,000
East Tributary Fee Fee Creek					
Schuetz Road	2.91	2,600	4,050	4,700	5,400
Page Boulevard	2.30	2,250	3,500	4,050	4,650
5,500 feet US of Lackland Avenue	0.82	1,250	1,850	2,100	2,400

FLOODING SOURCE		DISTANCE ¹	FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	WIDTH (FEET)		SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE	
Deer Creek (continued)		17,376	507	2,536	6.7	459.1	459.1	460.0	0.9
AB		17,534	560	2,453	7.0	460.3	460.3	460.6	0.3
AC		18,064	570	2,579	6.6	461.6	461.6	462.0	0.4
AD		19,020	645	2,262	7.5	464.1	464.1	465.0	0.9
AE		20,100	520	2,434	7.0	466.4	466.4	467.0	0.6
AF		20,435	200	1,923	8.9	466.8	466.8	467.5	0.7
AG		20,770	240	1,756	9.7	467.7	467.7	468.3	0.6
AH		21,120	550	5,178	3.3	470.6	470.6	470.7	0.1
AI		21,520	700	3,763	4.6	470.7	470.7	470.8	0.1
AJ		22,105	800	5,572	3.1	471.5	471.5	471.9	0.4
AK		22,665	1000	3,378	4.5	471.7	471.7	472.2	0.5
AL		23,711	174	1,670	9.8	472.6	472.6	473.5	0.9
AM		23,966	198	2,065	7.9	474.0	474.0	474.6	0.6
AN		24,661	390	3,987	4.1	475.9	475.9	476.2	0.3
AO		26,086	400	3,163	3.6	476.9	476.9	477.7	0.8
AP		27,386	450	3,495	3.2	478.2	478.2	479.1	0.9
AQ		28,546	400	2,492	4.5	479.9	479.9	480.7	0.8
AR		29,596	250	1,990	5.6	482.8	482.8	483.5	0.7
AS		30,834	338	2,709	4.2	487.9	487.9	488.6	0.7
AT		31,586	218	1,766	6.4	489.8	489.8	490.2	0.4
AU		32,456	175	1,300	8.7	493.6	493.6	494.0	0.4
AV		33,436	175	1,456	7.3	499.0	499.0	499.5	0.5
AW		34,220	275	1,965	5.4	503.8	503.8	503.9	0.1
AX		35,310	175	1,754	5.6	506.0	506.0	506.8	0.8
AY		37,000	275	1,724	5.7	510.2	510.2	511.0	0.8
AZ		37,480	313	1,691	5.8	511.3	511.3	512.2	0.9
BA									

¹Feet above confluence with River Des Peres

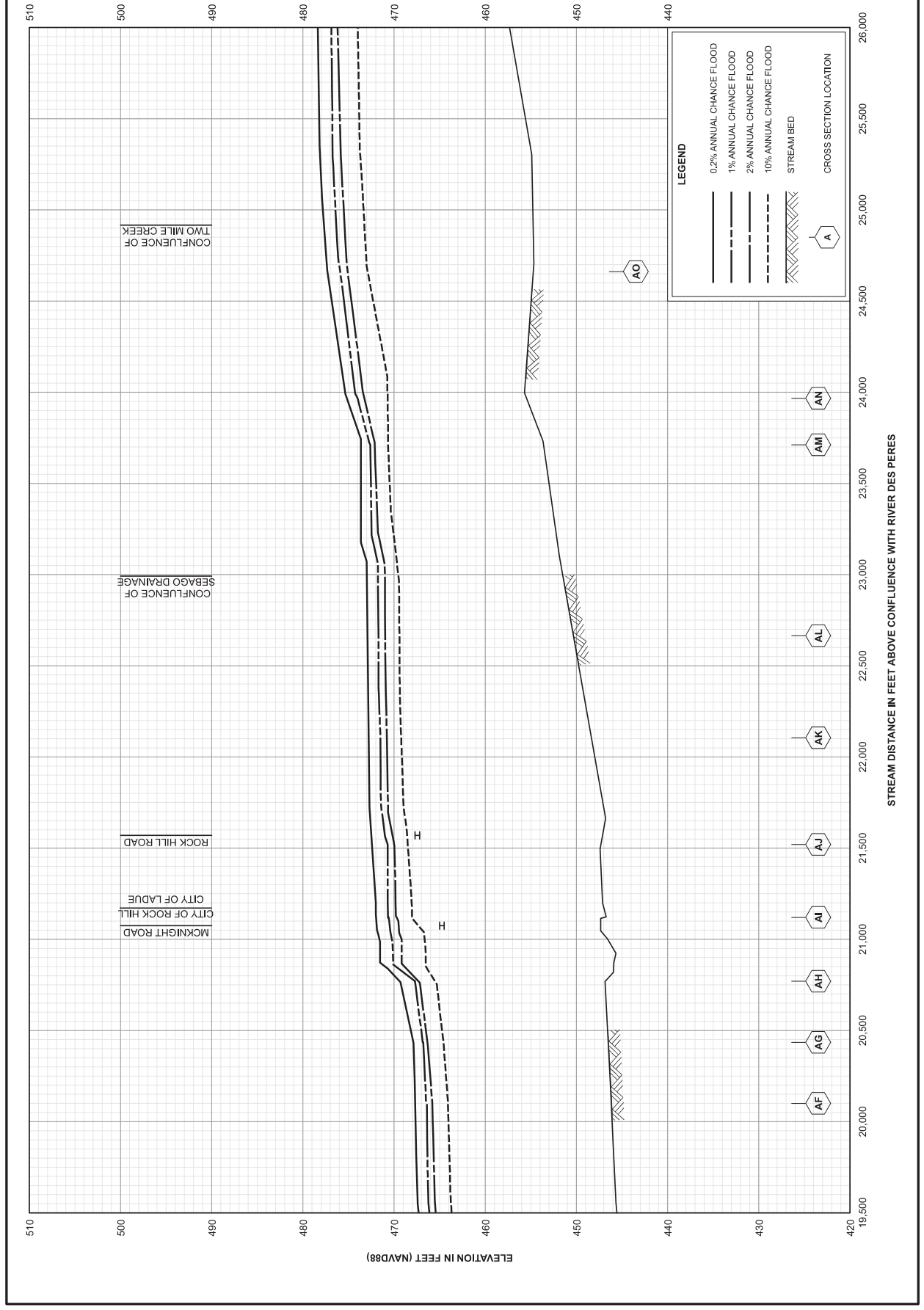
TABLE 12

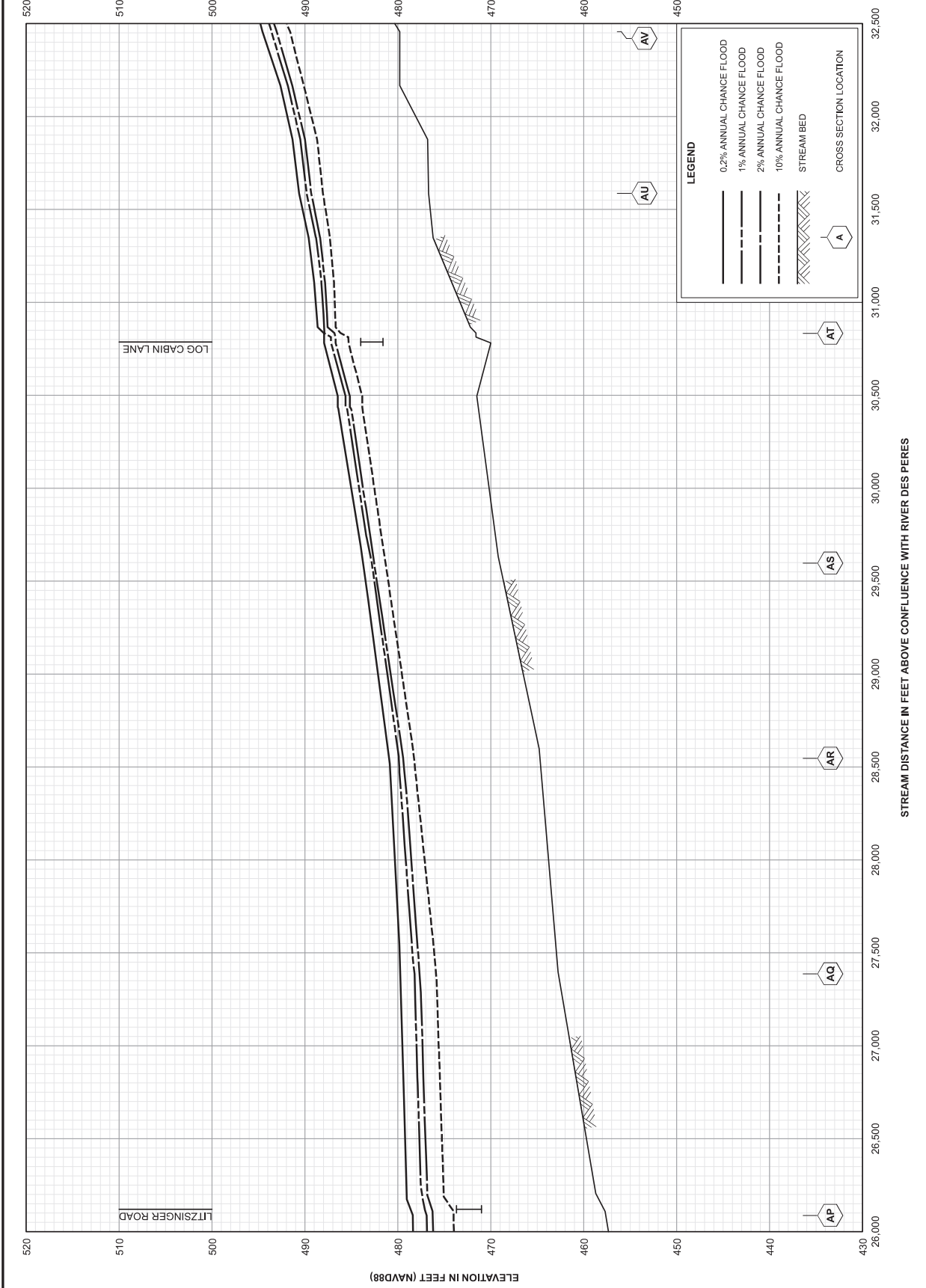
FEDERAL EMERGENCY MANAGEMENT AGENCY

FLOODWAY DATA

ST. LOUIS COUNTY, MO
AND INCORPORATED AREAS

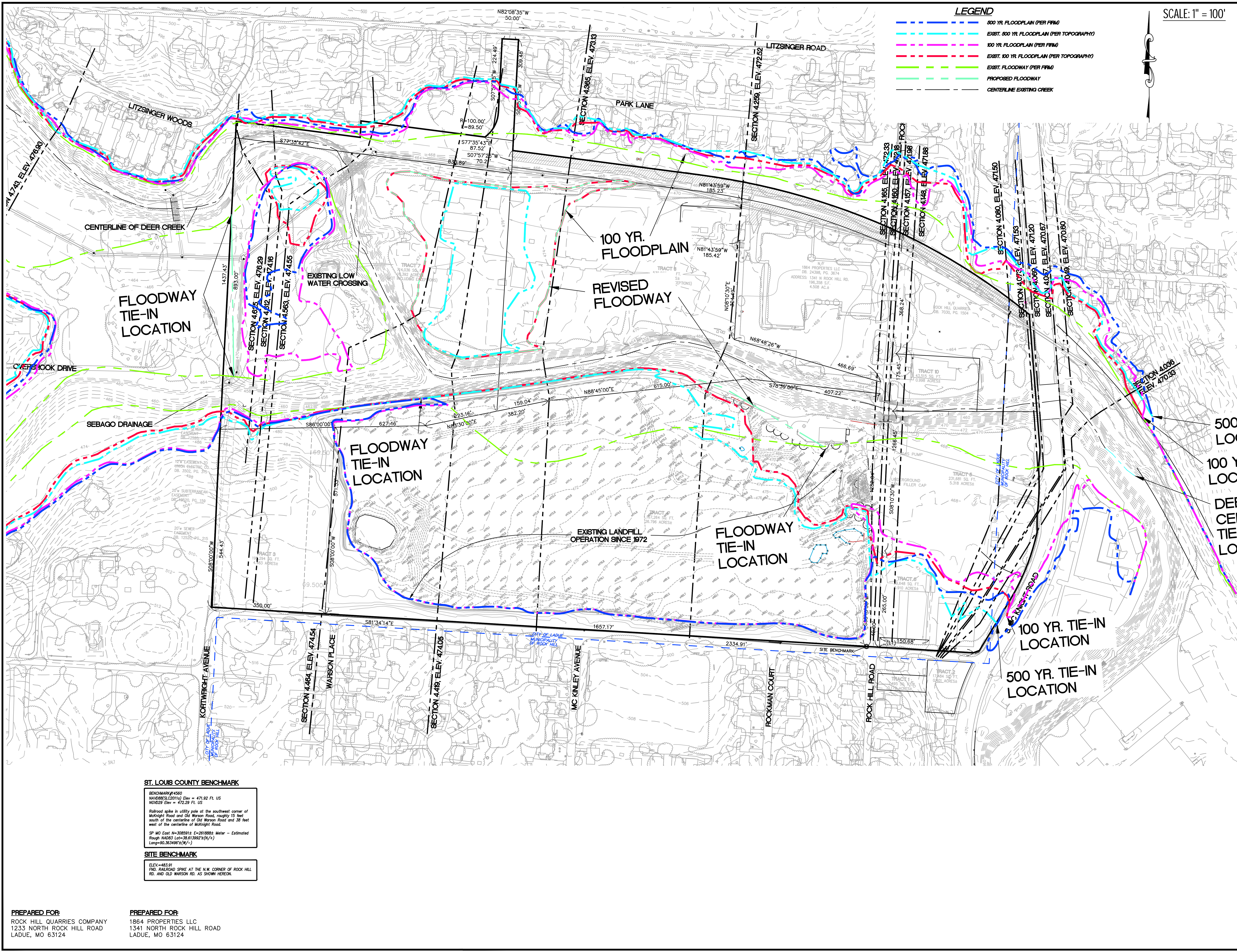
DEER CREEK (continued)





VI. APPENDIX III

- C1: Overall Existing Conditions Plan
- C2: Site Existing Conditions Plan



LEGEND

- 500 YR. FLOODPLAIN (PER FRM)
- EXIST. 500 YR. FLOODPLAIN (PER TOPOGRAPHY)
- 100 YR. FLOODPLAIN (PER FRM)
- EXIST. 100 YR. FLOODPLAIN (PER TOPOGRAPHY)
- EXIST. FLOODWAY (PER FRM)
- PROPOSED FLOODWAY
- CENTERLINE EXISTING CREEK

SCALE: 1" = 100'

FLOODWAY TIE-IN LOCATION

FLOODWAY TIE-IN LOCATION

FLOODWAY TIE-IN LOCATION

100 YR. TIE-IN LOCATION

500 YR. TIE-IN LOCATION

500 YR. LOC.
100 YR. LOC.
DEE CREEK TIE-LOC.

ST. LOUIS COUNTY BENCHMARK

BENCHMARK #14560
NAVD88(SL2011a) Elev = 471.92 Ft. US
NAD83 Elev = 472.29 Ft. US
Railroad spike in utility pole at the southwest corner of McKnight Road and Old Warson Road, roughly 15 feet south of the centerline of Old Warson Road and 38 feet west of the centerline of McKnight Road.
SP 40 East N=328591± E=261888± Meter - Estimated
Rough NAD83 Lat=36.613992±(N/A)
Long=90.363496±(W/-)

SITE BENCHMARK

ELEV=463.91
FWD. RAILROAD SPIKE AT THE N.W. CORNER OF ROCK HILL RD. AND OLD WARSON RD. AS SHOWN HEREON.

PREPARED FOR:
ROCK HILL QUARRIES COMPANY
1233 NORTH ROCK HILL ROAD
LADUE, MO 63124

PREPARED FOR:
1864 PROPERTIES LLC
1341 NORTH ROCK HILL ROAD
LADUE, MO 63124

PREPARED BY:



FLOODSTUDY FOR:

ROCK HILL QUARRIES

1200 N. ROCK HILL ROAD
LADUE, MISSOURI 63124

DATE: 01/24/2023

GEORGE M. STOCK E-25116
CIVIL ENGINEER
CERTIFICATE OF AUTHORITY
NUMBER: 000996

REVISIONS:

1.	MSD/City Comments	06/10/21
2.	City Comments	07/06/21
3.	City Comments	07/08/21
4.	City Comments	07/09/21
5.	Existing Conditions	07/09/21
6.	Final Comments	01/24/23

DRAWN BY:	E.A.F.	CHECKED BY:	G.M.S.
DATE:	3/31/2021	JOB NO.:	213-5216.2
KEY: P #	21FLPLS-00017	BASE MAP: P	Z1L
S.L.C. MAT #		MAT SUP. #	

SHEET TITLE:
SITE EXISTING
CONDITIONS PLAN

SHEET NO.:
C2.0